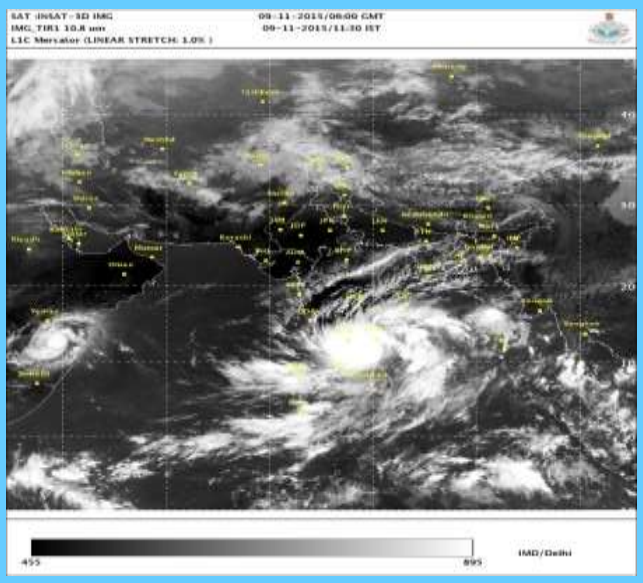
INDIA METEOROLOGICAL DEPARTMENT

Report No.: FDP/TCR/1/2015

Forecast Demonstration Project (FDP) for Improving Track, Intensity and Landfall of Bay of Bengal Tropical Cyclones:Implementation Report, 2015



Satellite imagery of Deep Depression

M. Mohapatra, Ranjeet Singh, Kamaljit Ray, S.D. Kotal, Suman Goyal, B.P Yadav, Charan Singh, Naresh Kumar, R.G. Ashrit, Anumeha Dube, S. Balachandran, L.S. Rathore, U.C. Mohanty, E. Rajagopal, S.B. Thampi and S.R. Ramanan

Cyclone Warning Division, New Delhi

January, 2016

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Preface

Worldwide huge technological advancements have been achieved to observe the inner core of the cyclone. Accordingly a programme has been evolved on prediction of track of tropical cyclone over north Indian ocean resulting in planning of the Forecast Demonstration Project (FDP) over Bay of Bengal since 2008 (15 October – 30 November). The programme is aimed to demonstrate the improvement in cyclogenesis, intensification and movement of cyclones over the north Indian Ocean with enhanced observations over the data sparse region. This report deals with implementation of the programme, salient features of the systems developed, weather summaries issued and the lessons learnt during 15 October–30 November, 2015

The FDP on landfalling cyclones over the Bay of Bengal was conducted during 15th October to 30 November, 2015 as per the Implementation Plan. The daily bulletin was prepared during the period and circulated to all concerned. The National Operation Committee (NOC) meeting was held thrice a week, viz. Monday, Wednesday and Friday.

The FDP helped in continuous monitoring of environmental conditions for cyclogenesis. Further, intense observation during IOP helped in better monitoring and prediction of cyclonic disturbances. The additional data collected during the FDP included enhanced Automatic Weather Station (AWS), High Wind Speed Recoder (HWSR) network of the coast, eighteen activated buoy observations from the north Indian Ocean, coastal AWS, ships and microwave imagery products. As a result of above, the cyclone track forecast errors reduced in 2015 compared to previous FDP campaigns. It also helped in refining the Standard Operation Procedure of the IMD and in strengthening the multi-institutional mechanism which will further improve the FDP campaign in future. Various lessons were also learnt during the campaign.

Many research and observational inputs were received from various national agencies including National Centre for Medium Range Weather Forecasting, Indian Air Force, Indian Navy, Indian Institute of Technology-Bhubaneswar, Indian National Centre for Ocean Information Services, National Institute of Ocean Technology, which are highly appreciated and duly acknowledged. I would like to place my appreciation on record to Dr. M. Mohapatra, Shri. B.P. Yadav and Shri R.P. Sharma of IMD, New Delhi for their contribution in compilation, editing and publication of this document. I also thank to Mr. D. P. Nayak, Mr. V.Vijay Kumar, Mr. R.G. Bali, Mrs. Monica Sharma, Mrs. Bharati Sabade and Dr. (Mrs.) B. Geetha of Cyclone Warning Division for their valuable contribution to bring out this report.

Dr. L.S. Rathore
Director General of Meteorology

January 2016

Abstract

During the past few years huge technological advancements have been achieved elsewhere in the world to observe the inner core of the cyclone. Accordingly a programme has been evolved on prediction of track & intensity of tropical cyclone over north Indian Ocean resulting in planning of the Forecast Demonstration Project (FDP) over the Bay of Bengal.

FDP programme is aimed to demonstrate the improvement in cyclogenesis, intensification and movement of cyclones over the north Indian Ocean with enhanced observations over the data sparse region and numerical weather prediction (NWP) models. Several national institutions participated for joint observational, communicational & NWP activities during FDP-2015. This report deals with implementation programme, salient features of the systems developed, weather summaries issued and the lessons learnt during the FDP-2015.

The FDP on landfalling cyclones over the Bay of Bengal was conducted during 15th October to 30th November, 2015 as per the implementation plan. There were in all 12 days of Intense Observation Period (IOP) in association with one Deep Depression, one well marked low pressure area and two low pressure area over the Bay of Bengal. The daily bulletin was prepared during the period and circulated to all concerned.

The FDP helped in continuous monitoring of environmental conditions for cyclogenesis. Further, intense observation during IOP helped in better monitoring and prediction of cyclonic disturbances. The additional data collected during FDP 2015 included enhanced AWS network of the coast, eighteen activated buoy observations from the north Indian Ocean, HWSR, geostationary satellite and microwave imagery products. The Tropical Cyclone module in Synergie System was used for monitoring, prediction and preparation of track & intensity forecast.

As a result of above, the average cyclone track forecast error was reduced in 2015 compared to previous FDP campaign. It helped in refining the Standard Operation Procedure of the IMD and in strengthening the multi-institutional mechanism. Various lessons were also learnt from the FDP campaign 2015, which will further help in improving the campaign in future. To mention a few, we should have better availability of consumables and other logistic support for the coastal observatories and ships to ensure good collection of data, GPS-sonde based upper air observation, better data reception from the coastal stations of all WMO/ESCAP Panel countries on real time basis, improved buoy network, improved NWP model and ensumle prediction system (EPS) guidance with better data assimilation, objective analysis of various cyclogenesis, intensification and track forecast parameters by preparing a check list and threshold values of various NWP products

Key words: Tropical cyclone, Bay of Bengal, Forecast Demonstration Project (FDP)

CHAPTER–I

Introduction

1.1 Background

Extensive operational mode activities are in place involving a range of global(currently T-574) and meso-scale(WRF/HWRF) models for generating short(up to 3 days in advance) and medium range (4-7 days in advance) forecast products for use in the prediction of tropical cyclone genesis, intensification, movement and landfall characteristics. Continuous assimilation of all available land based, ocean based and space based observations is carried out at the NCMRWF and IMD for Global models. Regional scale assimilation is also carried out at NCMRWF and IMD for generating most representative 3-D atmospheric fields for forcing the regional and meso-scale models.

Extensive performance evaluation and numerical experimentation studies carried out by the operational, R & D and academic groups on tropical cyclone forecasting over the Bay of Bengal and Arabian Sea indicates that though the cyclone forecasts have improved significantly in recent years due to modernisation programme of IMD and other intiatives of Ministry of Earth Sciences, there is still scope for further improvement. It is concluded that the tropical cyclone track and intensity forecast errorsin 3-5 days scale can be further improved significantly. Also, it is strongly believed that the establishment of necessary aircraft probing of cyclone (APC) facility for generating data from the cyclone core environment can successfully address this critical data gap in cyclone intensity and track forecasting.

1.2. Key Scientific Objectives and Goals for FDP

The key objectives of the FDP are:

i) To demonstrate the ability of the Numerical Models using enhanced observation over the region including the measurements from the dropsonde's over the periphery of the cyclone and to assess overall accuracy limits in terms of the cyclone track, intensity and landfall for one to two Seasons.

ii) To incorporate modification into the models which could be specific to the Bay of Bengal based on the in-situ measurements and following the actual track through Satellite and Radar observations.

1.3. Programme

An FDP on landfalling tropical cyclones over the Bay of Bengal has been taken up by the IMD which aims to improve the skill of TC track & intensity prediction during 15 Oct.-30 Nov. since 2008.

During this year's campaign **(15 Oct - 30 Dec, 2015),** several national institutions participated for joint observational, communicational & NWP activities like that during previous years. In this Phase (October –November, 2015), There were in all 12 days of Intensive Observational Period (IOP) in association with one Deep Depression, one well marked low pressure and two low pressure area over the Bay of Bengal.

However the aircraft probing could not be attempted so far dueto various reasons.

The detailed implementation programme is presented in Chapter-II. The salient features of cyclone Season 2015 are presented and discussed in Chapter-III. Daily weather summary and advisory issued during FDP-2015 are presented in Chapter-IV. The lessons learnt are presented in Chapter-V. The summary and conclusions are presented in Chapter-VI.

CHAPTER–II

PROGRAMME IMPLEMENTATION PLAN FOR FDP-2015

Background

Currently in India, extensive operational mode activities are in place involving a range of global(GFS-IMD,NCMRWF, T-574), regional and meso-scale(WRF/HWRF) models for generating short(up to 3 days in advance) and medium range(4-7 days in advance) forecast products for use in the prediction of tropical cyclone genesis, intensification, movement and landfall characteristics. Continuous assimilation of all available land based, ocean based and space based observations is carried out at the NCMRWF and regional scale assimilation is carried out at NCMRWF and IMD for generating most representative 3-D atmospheric fields for forcing the regional and meso-scale models.

Recent initiatives for FDP Planning

IMD has been made the nodal agency for this purpose. The programme started in 2008 based upon the available observational, NWP and communication infrastructure in the absence of aircraft probing. It continued in 2009-15 with the upgradation of observational network and NWP modeling system. Based on the experience of these past phases of FDP, the implementation plan has been modified for the year 2015.

Key Scientific Objectives and Goals for FDP-2015

i. To demonstrate the ability of the Numerical Models using enhanced observation over the region and to assess overall accuracy limits in terms of the cyclone track, intensity and landfall.
ii. To incorporate modification into the models which could be specific to the Bay of Bengal based on the in-situ measurements and following the actual track through Satellite and Radar observations.

Programme

The objectives of the programme will be met by conducting a joint observational communication and NWP effort by several institutes in the country during the period 15 Oct.-30 Nov., 2015. There will be Intensive Observational Phases (IOP) within this period tuning actual cyclone events. There will be a National Operational Centre (NOC) at New Delhi and a Field Operational Centre (FOC) at Chennai.

National Operational Centre (NOC):

The overall campaign will be monitored and guided by a Weather Monitoring and Advisory Group (WMAG) at National Weather Forecasting Centre (NWFC), IMD. In addition, communication conferencing and data exchange will be facilitated from this nodal cell. It will be called the NOC. The announcement of IOP will be made by NOC. (Contact: Dr. M. Mohapatra, Cyclone Warning Division, IMD, New Delhi, e-mail mohapatraimd@gmail.com & cwdhq2008@gmail.com, Phone no. 011-24652484, 24631913 Mobil: 9868623475, Fax No. 011-24623220).

Field Operational Centre (FOC):
The FOC, Chennai will work in unison with the NOC coordinating all activities of every institution during the IOP (Contact: Dr. S. Balachandran, Sc. E, Cyclone Warning Research Centre, RMC, Chennai, E-mail: balaimd@gmail.com, Phone No. 044-28276752, Fax No. 044-28276752)

Multi institutional initiative
The institutions involved in the program are as follows:-

1. IMD
2. NCMRWF
3. ISRO
4. IAF
5. INDIAN NAVY
6. IIT DELHI & BHUBNESWAR
7. NIOT
8. INCOIS

Targeted FDP Requirements for the FDP Campaign of October-November 2015
Observational program:

(I)AWS:
Operational meso-scale AWS network of IMD along the east coast of India available for FDP is shown below.

S. No.	State	Existing No. of AWS Stations
1	West Bengal	27
2	Orissa	38
3	Andhra Pradesh	24
4	Tamilnadu and Puducherry	35
5	Andaman & Nicobar	1
6	Lakshadweep	1
7	Kerala	15
8	Karnataka	25
9	Goa	3
10	Maharashtra	39
11	Gujarat, Daman & Diu and Dadra Nagar & Haveli	40
12	East coast + A&N Islands	125
13	West coast + Lakshadweep	123

The locations of the stations are shown in Fig.1

- DDGM(SI), Pune will ensure the real time transmission of data from AWS stations along east coast of India and additional 14 in the Northeast to DDGM(ISSD) Delhi in GTS mobile synop format. DDGM(SI) will submit status report by 1st October 2015 to Project Manager on the availability of such data.

- Data from PRWONAM and northeast India Meso-scale AWS network will be made available by ISRO from the MOSDAC server of SAC, Ahmedabad on real time (Fig.2).
- DDGM(Sat. Met) will make arrangements to download ISRO AWS data and relay it to NOC for operational and NWP application.
- AWS data from 10 stations commissioned (under STORM Project) by Kolkata University and Guwahati university will also be communicated to NOC. DDGM, RMC, Kolkata and Guwahati will coordinate and intimate the status to NOC and FOC by 1st October 2015.
- RMCs at Kolkata and Guwahati will work out modalities to collect and transmit data on real time basis from AWS network established under the storm programme by Kolkata University, Jadavpur University and Guwahati University by 1st October. The data will be transmitted through AMSS of respective RMC. FOC shall coordinate the exercise.

IMD AWS network over NE India is given below.

S. No.	State	Existing No. of AWS Stations
1	Assam	29
2	Meghalaya	7
3	Nagaland	10
4	Arunachal Pradesh	15
5	Tripura	4
6	Manipur	8
7	Mizoram	8
8	Sikkim	4

(II) Synoptic observation

- Synoptic observatories of IMD network (Fig.3 and Fig.4) over the peninsular/east India under the RMCs of Chennai and Kolkata shall report data on hourly basis, during IOP. During normal period of FDP, 3 hrly. SYNOP will be collected.
- RMC Kolkata and Chennai will ensure hourly observation and transmission through telephone/fax/e-mail of all synops of coastal stations during IOP to NOC and FOC. In addition, RMC Chennai shall organize transmission of such data through AMSS.
- RSMC, New Delhi will write to concerned WMO/ESCAP Panel member countries to ensure the availability of synoptic data from there respective region for the FDP period.
- FOC will also intimate the status of Cyclone Distress Mitigation Committee (CDMC) stations along east coast to NOC and ensure their functioning during FDP period.

(III) Buoys:

Real-time collection of hourly data from deep ocean and met-ocean buoy network over the Bay of Bengal from INCOIS Server will be ensured by DDGM(ISSD).

- NOC & FOC will utilize these data received through GTS/E-mail.
- INCOIS will ensure availability of additional marine surface pressure observation through E-mail to NOC & FOC

(IV) High wind speed recorder (HWSR)

There are twenty HWSRs along the coast of India in the operational conditions as mentioned below.

Digha	: West Bengal
Haldia	: West Bengal
Sagar Island	: West Bengal
Puri	: Odisha
Gopalpur	: Odisha
Balasore	: Odisha
Paradip	: Odisha
Visakhapatnam	: Andhra Pradesh
Machilipatnam	: Andhra Pradesh
Nellore	: Andhra Pradesh
Kalingapatnam	: Andhra Pradesh
Kakinada	: Tamil Nadu
Chennai	: Tamil Nadu
Karaikal	: Puducherry
Pune	: Maharashtra
Goa	: Goa
Veraval	: Gujarat
Dwarka	: Gujarat
Bhuj	: Gujarat
Naliya	: Gujarat

FOC, Chennai will ascertain the functioning of the HWSRs along the east coast. It will make arrangement for collection and dissemination of HWSR data on real time basis to NOC and NWP Division of IMD. It will also make arrangement for archival of this data. NWP Division of IMD and NCMRWF will try to ingest these data in NWP models. The performance of HWSRs during IOP period will be evaluated.

(V) Upper air

Augmentation of coastal/peninsular upper air measurements (Fig.5)

- Upper air RS/RW data from IMD stations (Guwahati, Kolkata, Port Blair, Bhubaneswar, Visakhapatnam, Machilipatnam, Hyderabad, Chennai, Karaikal, Minicoy/Amini Divi, Trivendrum) will be collected at least once(based on 0000 UTC) for normal days of FDP period. However, during the IOP phase of FDP, 12 hrly. data shall be collected. The flights terminating below 250 hPa are to be repeated.
- DDGM(UI), RMCs Kolkata, Chennai and Guwahati will take all necessary steps in support of FDP observational requirements. The readiness report should be sent to NOC by 1st October 2015.
- Additional GPS Sonde soundings will be taken at Balasore, Gopalpur, Kalingapatnam, Ongole/Bapatla and Pamban with the support of ISRO.
- DDGM, Chennai and DDGM(UI) shall liaise with VSSC, Trivendrum to ensure commissioning of equipment along with training to IMD staff to operate during the IOP phase of FDP. DDGM, Kolkata will depute suitable staff for Balasore and Gopalpur and remain in touch with RMC Chennai.
- Upper air GPS Sonde data from Indian Navy stations shall be made available by the DNOM HQs, Delhi through e-mail. DDGM(UI) shall liaise with DNOM and ensure real time data transfer for the FDP period.

- FOC may explore the availability of Upper air data from GPS Sonde network of ISRO at Gadanki, SHAR, Arakkonam, Kochi etc. for the IOP Phase of FDP. DDGM, Chennai shall liaise with VSSC, Trivendrum to ensure commissioning of equipment along with training to IMD staff to operate at these stations if agreed by ISRO during the IOP phase.
- Due arrangements are to be made by DDGM (UI) to receive all available Pilot Balloon data sets for the FDP 2015 period.
- Arrangements have to be made by DDGM(UI) to collect pilot balloon data from IAF. In case of becoming dark by 12UTC, IAF be advised to take the Pilot assent by 11UTC. Daily flight level winds as collected by IAF flights between Carnicobar and Tambaram are also to be received for FDP 2015 period. DDGM(UI) shall liaison with IAF to receive GTS coded data.
- Wind profiler support from the existing Gadanki and SHAR is to be activated so as to receive hourly profiles in the lower troposphere. FOC, Chennai will request ISRO (Principal Scientist) for organizing necessary observational support during FDP campaign. ISSD, IMD, New Delhi will identify nodal officers to workout real time data reception modalities in this regard.

(VI) DWR Support

DWR Support from 5 locations (Fig.6) at Kolkata, Visakhapatanm, Machillipatnam, SHAR and Chennai with uniform storm scanning strategy will be ensured prior to the FDP-2015. DDGM(UI) shall make due arrangements to receive the DWR data in real time to DDGM (ISSD) for the FDP 2015.

(VII) Satellite observations

DDG(Sat Met) shall make all available satellite derived products (high resolution AMVs; rapid scan winds; OLR; ASCAT and WINDSAT winds; local HRPT Temperature and moisture profiles from INCOIS; GPS occultation data; MODIS moisture data; TMI; SSMI and AMSU data sets, Rapid products etc.) for its utilization by the global and regional data assimilation-forecast systems of IMD and NCMRWF during the FDP 2015 period.

Satmet. Division will issue special bulletin every three hourly about the cyclonic disturbance.

Telecommunication

1. DDGM (ISSD) shall take all necessary steps so as to receive the observational data at the NOC and FOC from all identified sources both from FDP partners and the regional countries (Bangladesh, Myanmar, Malaysia, Thailand, Indonesia and Sri Lanka) in real time. ISSD and NWP division shall continuously monitor the data reception at NWP/Telecom and ensure the timely data reception and onward transmission of data to NWP Division and NCMRWF throughout the FDP 2015 period.
2. IMD shall update FDP Web Page on IMD (linked at NCMRWF as well). The existing FDP e-mail group will be updated with full contact details). An FDP discussion group for the exchange of FDP related information among the FDP partners may be created. DDGM (ISSD), IT cell will take necessary action in this regard.

NWP analysis and prediction

1. NWP Division shall make all necessary arrangements for the generation of global and regional analyses fields by using special FDP 2015 data at 4 analysis times (00, 06,12,18 UTC) for the whole of FDP 2015 period. Arrangements are also to be made to

keep FDP 2015 analyses and forecast boundary fields upto 72hrs on ftp servers of NCMRWF and IMD for their utilization by FDP partners in India. Efforts will be made to bring out the Regional Model forecast within three hours of the observation time.

2. NWP Division, IMD shall workout arrangements to provide analyses fields of ECMWF and UKMO as well on the ftp servers at NCMRWF and IMD for the FDP 2015 period.

International Cooperation

Director RSMC, New Delhi shall request the ESCAP Panel, SAARC and BIMSTEC countries about the FDP over the Bay of Bengal programme of India and solicit their cooperation in the real time exchange of data (surface, upper air and special observations) for their utilization in the generation of most representative meso-scale analysis fields over the Bay of Bengal and its neighbourhood for generating improved quality of track, intensity and landfall of tropical cyclones.

FDP Operation Centre

Project Director will be assisted by a National FDP Operations Centre (NOC) at NWFC and a FDP Weather Monitoring and Advisory Group will be constituted to identify the IOP phases during FDP 2015 period.

FDP Weather Monitoring and Advisory Group (WMAG)

1. DGM Chairman
2. Shri D.R. Sikka
3. Head ,NCMRWF
4. DDGM(S)
5. All members of FDP Project Team
6. Representatives from IAF, Indian Navy.

The WMAG shall meet thrice a week (Monday, Wednesday & Friday) at 1530 hrs. (including holidays) during the period 15 Oct.- 30 Nov., 2015 at NWFC Meeting Room IInd floor to review the FDP activity regularly and decide on IOP declaration. Weather summaries and current information will be presented by Project Scientist, FDP. The weather summaries and information will be prepared daily and uploaded in the website along with circulation through e-mail like previous years.

Implementation Strategy

- Preparatory Phase for the

FDP-2015: 1-30 September 2015

(Actions to be completed as mentioned above)

- FDP-2015 Field Phase: 15 October to 30 November

(Actions to be completed as mentioned above)

- IOP Phase: Identified by the NOC at NWFC in consultation with the Weather Monitoring and Advisory Group
- NOC: The NOC will be established at NWFC, New Delhi which will be responsible for entire co-ordination and declaration of IOP. The center will function independently. The usual operational activity of RSMC will be separate.
- FOC: Cyclone Warning ReSearch Centre at RMC, Chennai shall function as the FOC and establish links with all FDP partners, notify all IOP phases to FDP partners, coordinate and update the status of observation collection and transmission from FDP partners from time to time. The RMCs at Kolkata and Guwahati; ACWCs at Kolkata and

CWCs at Visakhapatnam and Bhubaneswar shall work in close liaison with FDP FOC and NOC, NWFC, Delhi for smooth and efficient organization of FDP 2015 pilot observational campaign.

- FDP Data Centre: All special observations collected by the FDP project partners shall be archived along with meso-scale analysis and forecast fields at IMD and NCMRWF computing centres.
- Post Experiment Phase:

1. Preparation of weather summery data CD will be carried out by the project management team and NWP group of IMD.
2. Project management team shall Plan and coordinate necessary R&D work involving not only FDP partners but also other academic and reSearch groups in the country to maximize the utilization of FDP data for accomplishing the envisaged targets of the project.
3. An implementation report will be prepared at the end of FDP-2015. It will highlight societal issues along with the programme implementation, out come and lessons learnt.
4. The daily rainfall data along the coast during landfall of a cyclone will be analysed to find out the diurnal variation of rainfall.
5. A report will be prepared at the end of FDP about the performance of HWSR.

Fig.1(a).

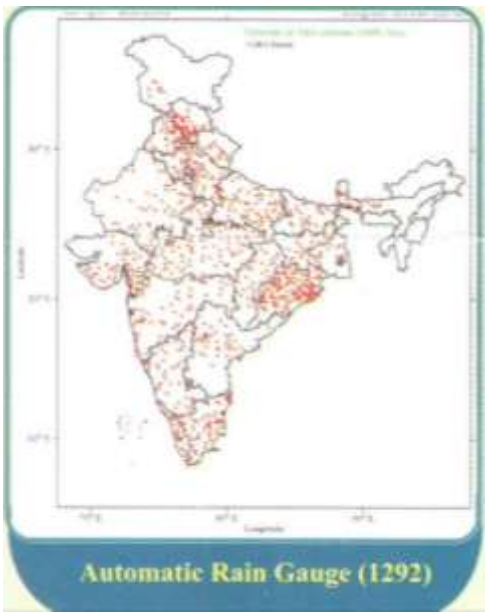


Fig.1(b)

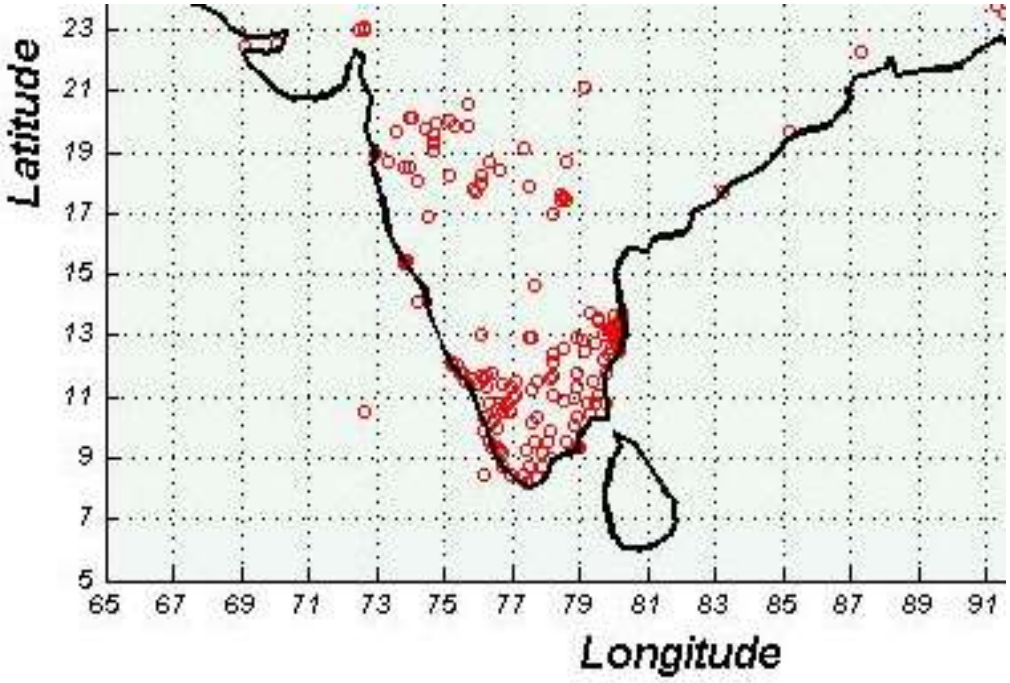


Fig.2. ISRO AWS stations under PRWONAM project.

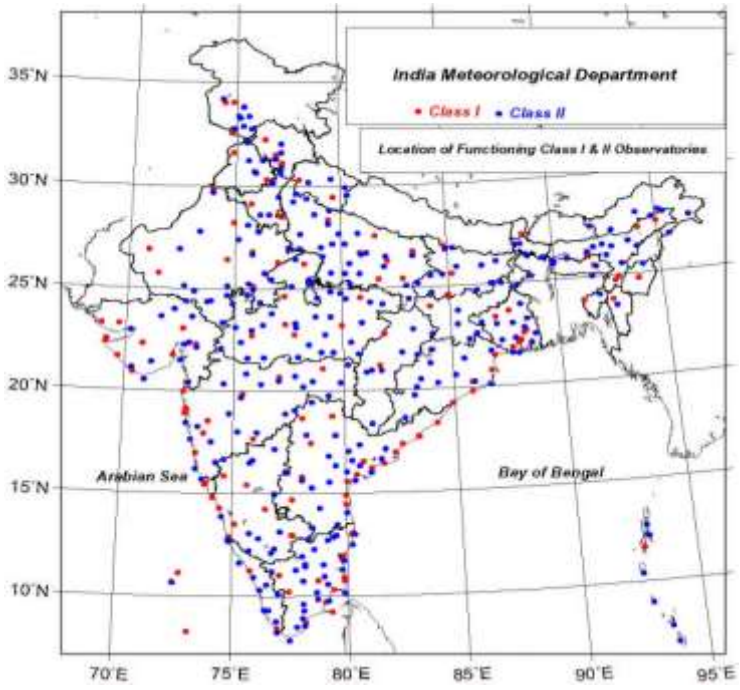
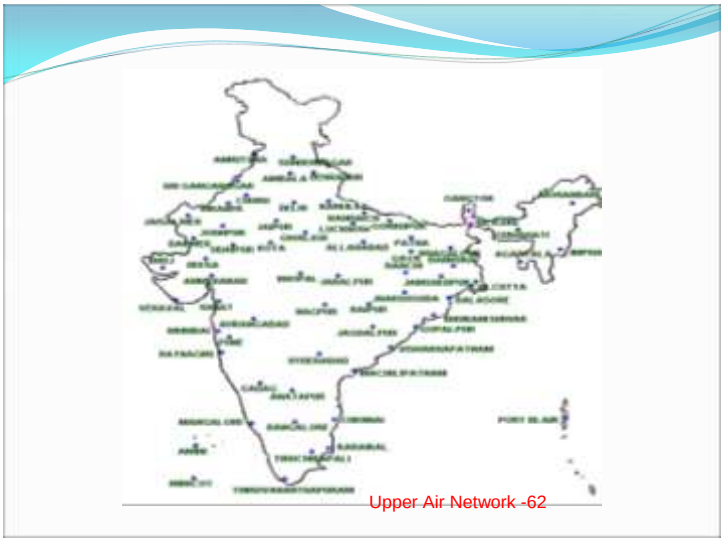


Fig.3. Synoptic stations of IMD



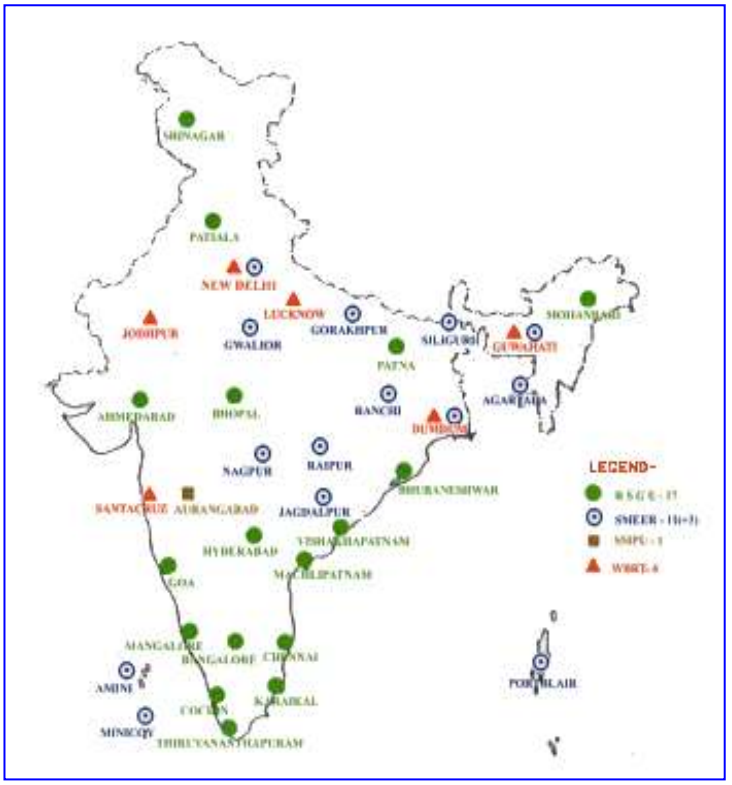


Fig.4 Pilot balloon and RS/RW network of IMD

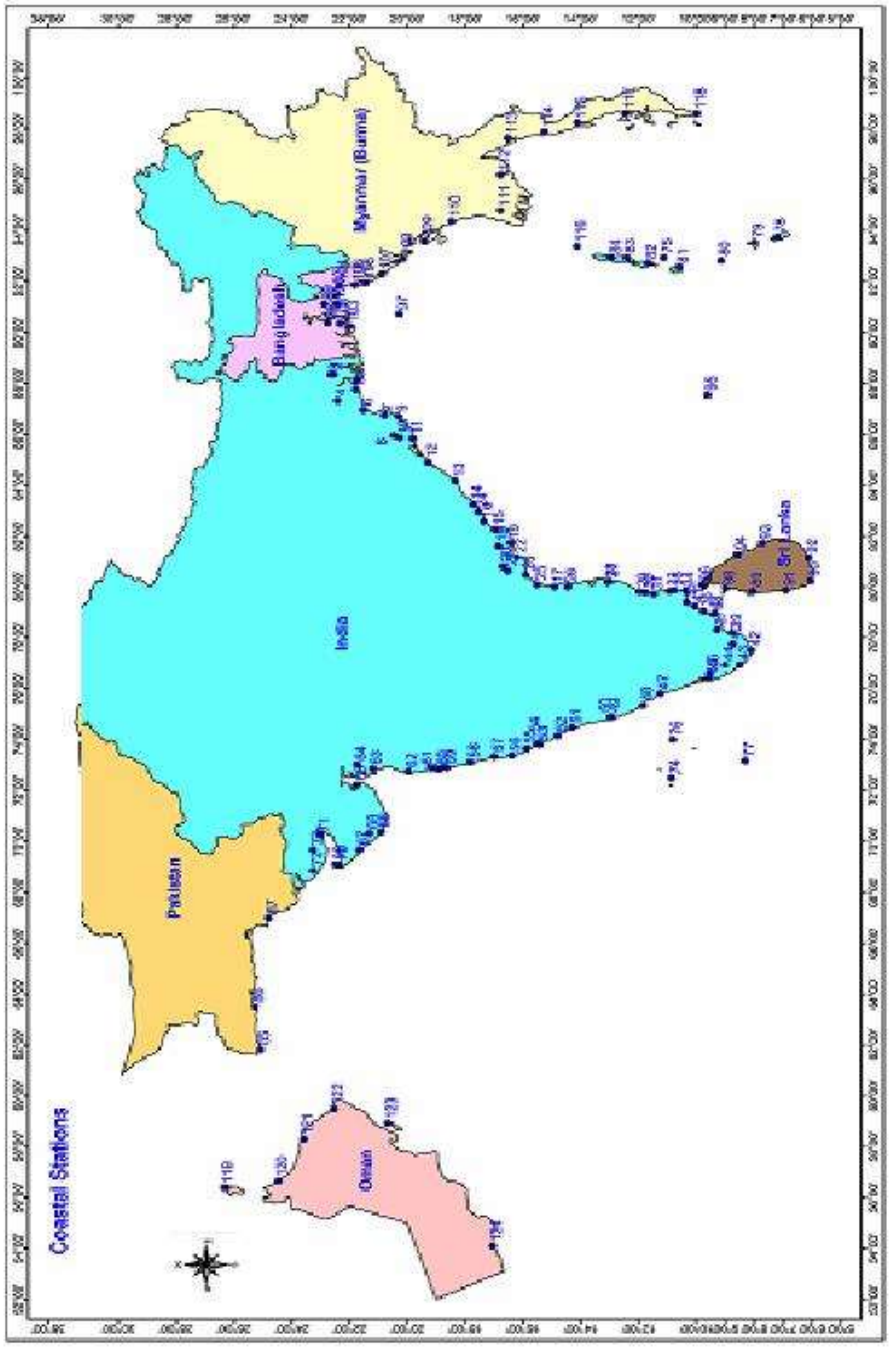


Fig.5. Coastal synoptic stations

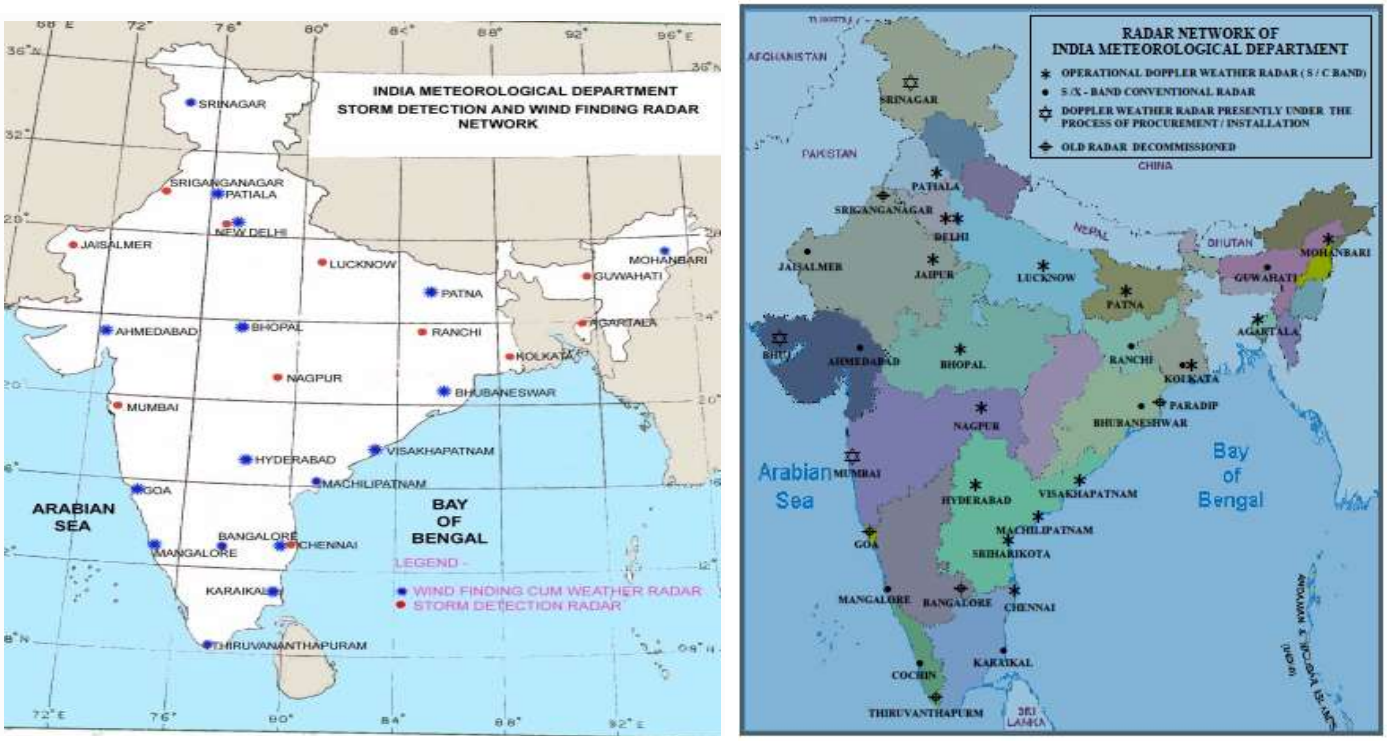


Fig.6. Cyclone detection radar network of IMD

Table 1. List of East Coast stations in India

Station	Index	Latitude	Longitude	Class	00Z	03Z	06Z	09Z	12Z	15Z	18Z	21Z
Kolkota(Alipore)	42807	22 32N	88 20E	I	X	X	X	X	X	X	X	X
Kolkota(DumDum)	42809	22 39N	88 20E	I	X	X	X	X	X	X	X	X
Diamond Harbour	42811	22 11N	88 12E		X	X	X	X	X	X	X	X
Canning	42812	22 15n	88 40 E		0	X	0	0	X	0	0	0
Midnapore	42803	22 25N	87 19E	IIb	0	X	0	0	X	0	0	0
Digha	42901	21 50N	87 47 E		X	X	X	X	X	X	X	X
Basirhat	42810				0	X	X	X	X	0	0	0
Contai	42900	21 47N	87 45E	IIb	0	X	0	0	X	0	0	0
Balasore	42895	21 31N	86 56E	I	0	X	X	X	X	X	0	0
Chandbali	42973	20 47N	86 44E	I	0	X	X	X	X	X	X	X
Cuttack	42970	20 28N	85 56E	IIb	0	X	0	0	X	0	0	0
Paradip	42976	20 18N	86 41E	IIa	0	X	0	0	X	0	0	0
Bubaneshwar	42971	20 15N	85 50E	I	X	X	X	X	X	X	X	X
Puri	43053	19 48N	85 49E	I	X	X	X	X	X	X	X	X
Gopalpur	43049	19 16N	84 53E	I	X	X	X	X	X	X	X	X
Kalingapatnam	43105	18 20N	84 08E	I	X	X	X	X	X	X	X	X
Vishakapatnam	43149	17 43N	83 14E	I	X	X	X	X	X	X	X	X
Kakinada	43189	16 57N	82 14E	I	X	X	X	X	X	X	X	X
Tuni	43147	17 21N	82 33E	I	X	X	X	X	X	X	X	X
Kavali	43243	14 54N	79 59E	I	X	X	X	X	X	X	X	X
Nidadavole	43184	16 50N	81 35E	IIb	0	X	0	X	X	0	0	0
Narsapur	43187	16 26N	81 42E	I	X	X	X	X	X	X	X	X
Gannavaram	43181	16 42N	80 48E	I	X	X	X	X	X	X	X	X
Machlipatnam	43185	16 12N	81 09E	I	X	X	X	X	X	X	X	X
Bapatla	43220	15 54N	80 28E	I	0	X	X	X	X	0	0	0
Ongole	43221	15 30N	80 05E	I	X	X	X	X	X	X	X	X
Nellore	43245	14 27N	79 59E	I	X	X	X	X	X	X	X	X
Minambakkam	43279	13 00N	80 12E	I	X	X	X	X	X	X	X	X
Pondicherry	43331	11 58N	79 49E	I	X	X	X	X	X	X	X	X
Cuddalore	43329	11 46N	79 46E	I	X	X	X	X	X	X	X	X
Karaikal	43346	10 55N	79 50E	I	X	X	X	X	X	X	X	X
Nagapattinam	43347	10 46N	79 51E	I	X	X	X	X	X	X	X	X
Vedaranyam	43349	10 22N	79 51E	IIb	0	X	0	0	X	0	0	0
Adiramapattinam	43348	10 20N	79 23E	I	X	X	X	X	X	X	X	X
Tondi	43361	09 44N	79 02E	I	X	X	X	X	X	X	X	X
Pamban	43363	09 16N	78 18E	I	X	X	X	X	X	X	X	X
Tuticorin	43379	08 45N	78 11E	I0	0	X	X	X	X	0	0	0
Palayamkottai	43376	08 44N	77 45E	IIb	0	X	0	0	X	0	0	0
Kanniyakumari	43377	08 05N	77 30E	IIa	0	X	X	0	X	0	0	0
Kondul	43385	07 13N	93 44E	IIb	0	X	0	0	X	0	0	0
Nancowri	43382	07 59N	93 32E	IIb	0	X	0	0	X	0	0	0
Carnicobar	43367	09 09N	92 49E	IIb	X	X	X	X	X	X	X	X
Hut bay	43364	10 35N	92 33E	IIb0	0	X	0	0	X	0	0	0
Portblair	43333	11 40N	92 43E	I	X	X	X	X	X	X	X	X
Longisland	43310	12 25N	92 56E	IIb	0	X	0	0	X	0	0	0

Mayabandar	43309	12 55N	92 55E	IIb	0	X	0	0	X	0	0	0

Table 2: List of Foreign Coastal stations

Station	Index	Latitude	Longitude	00Z	03Z	06Z	09Z	12Z	15Z	18Z	21Z
SRI LANKA											
Mannar	43413	08 59N	79 55E	X	X	X	X	X	X	X	X
Puttalam	43424	08 02N	79 50E	X	X	X	X	X	X	X	X
Galle	43495	06 02N	80 13E	X	X	X	X	X	0	X	0
Colombo	43466	06 54N	79 52E	X	X	X	X	X	X	X	X
Hambantota	43497	06 07N	81 08E	X	X	X	X	X	X	X	X
Batticloa	43436	07 43N	81 42E	X	X	X	X	X	X	X	X
Trincomalee	43418	08 35N	81 15E	X	X	X	X	X	X	X	X
Jaffna	43404	09 39N	88 01E	X	X	X	X	X	0	X	0
BANGLADESH											
Chandpur	41941	20 16N	90 42E	X	X	X	X	X	X	X	X
Barisal	41950	22 45N	90 22E	X	X	X	X	X	X	X	X
Majidcourt	41953	22 52N	91 06E	X	X	X	X	X	X	X	X
Patuakhali	41960	22 20N	90 20E	X	X	X	X	X	X	X	X
Hatia	41963	22 26N	91 06E	X	X	X	X	X	X	X	X
Sandwip	41964	22 29N	91 26E	X	X	X	X	X	X	X	X
Khepura	41984	21 59N	90 14E	X	X	X	X	X	X	X	X
Chittagong	41977	22 21N	91 49E	X	X	X	X	X	X	X	X
Cox'sBazzar	41992	21 26N	91 56E	X	X	X	X	X	X	X	X
Kutubdia	41989	21 49N	91 51E	X	X	X	X	X	X	X	X
Teknaf	41998	20 52N	92 18E	X	X	X	X	X	X	X	X
MYANMAR											
Sittwe	48062	20 08N	92 53E	X	X	X	X	X	0	X	0
Kyaukpyu	48071	19 25N	93 33E	X	X	X	X	X	0	X	0
Sandoway	48080	18 28N	94 21E	X	X	X	X	X	0	X	0
Pathein	48094	16 46N	94 46E	X	X	X	X	X	0	X	0
Yangon	48097	16 46N	96 10E	X	X	X	X	X	X	X	X
Moulmein	48103	16 30N	97 37E	X	X	X	X	X	0	X	0
Ye	48107	15 15N	97 52E	X	X	X	X	X	0	X	0
Dawei	48108	14 06N	98 13E	X	X	X	X	X	0	X	0
Mergui	48110	12 26N	98 36E	X	X	X	X	X	0	X	0
Bictoria Point	48112	09 58N	98 35E	X	X	X	X	X	0	X	0
THIALAND											
Phuket Airport	48565	08 07 N	98 19 E	X	X	X	X	X	X	X	X

Table 3 List of Co-operative Cyclone Reporting Network of Stations (Andhra Pradesh & Orissa)

S. No	Station	District	Nearest Telegraphic Office	Distance From Station
Andhra Pradesh				
	Palasa	Srikakulam	Palasa	2 km
2	Sompeta	Srikakulam	Sompeta	100 meters
3	Anakapalli	Vishakapatnam	Anakapalli	1.5 km
4	Rajamundry	East Godavari	Rajamundry	2.5 km
5	Yanam	East Godavari	Yanam	1.0 km
6	Razaole	East Godavari	Razaole	200 meters
7	Eluru	West Godavari	Eluru	1.0 km
8	Challapalli	Krishna	Challapalli	0.5 km
9	Avani Gadda	Krishna	Avani Gadda	200 meters
10	Nagayalanka	Krishna	Nagayalanka	1.0 km
11	Bantimalli	Krishna	Bantimalli	1.0 km
12	Kothapatnam	Prakasam	Kothapatnam	200 meters
13	Narasapuram	Nellore	Narasapuram	0.5 km
ORISSA				
1	Bhogral	Balasore	Bhogral	2Km
2	Basta	Balasore	Basta	1 Km
3	Bhadrak	Balasore	Bhadrak	2 Km
4	Bansara	Balasore	Bansara	2 Km
5	Rajkanika	Cuttack	Rajkanika	2 Km
6	Aul	Cuttack	Aul	2 Km
7	Rajnagar	Cuttack	Rajnagar	1 Km
8	Kendrapara	Cuttack	Kendrapara	2 Km
9	Mahakalpara	Cuttack	Mahakalpara	2 Km
10	Jagatsingpur	Cuttack	Jagatsingpur	1 Km
11	Ersama	Cuttack	Ersama	2 Km
12	Nimapara	Puri	Nimapara	0.5 Km
13	Brahmagiri	Puri	Brahmagiri	1 Km
14	Krishnaprasad	Puri	Krishnaprasad	0.5 Km
15	Chatrapur	Ganjam	Chatrapur	0.5 Km
16	Berhampur	Ganjam	Berhampur	3 Km

CHAPTER–III
IMPLEMENTATION OF FDP – 2015

3.1. Introduction

The objectives of the programme were met by conducting a joint observational communication and NWP effort by several institutes in the country during the period 15 Oct.-30 Nov., 2015. There were in all 12 days of Intensive Observational Period (IOP) in association with one Deep Depression, one well marked low pressure area and two low pressure area over the Bay of Bengal.

The overall campaign was monitored and guided by a Weather Monitoring and Advisory Group (WMAG) at National Operation Centre (NOC) in NWFC, IMD. In addition, communication conferencing and data exchange were facilitated from this nodal cell.

Field Operational Centre (FOC) worked at Regional Meteorological Centre, Chennai in unison with the NOC coordinating all activities of every institution during the IOP.

3.2. Observational programme

The observational programme was taken up as per the project implementation plan prepared by NOC. However, the buoy data with 12 such stations in Bay of Bengal during the campaign in 2015. IMD has augmented AWS network under its modernisation programme. The number of AWS/ Automatic Rain Gauge (ARG) stations in the country is 675 by the end of 2015. The AWS data including wind and pressure could very well help in monitoring the genesis, intensity, structure and movement of the landfalling cyclonic disturbances. Availability of hourly observations without an observer's need at the site helped immensely the monitoring and prediction of cyclonic disturbances. 39 GPS sonde stations at helped in improving the initial conditions of the NWP models resulting in forecast also.

3.3. Operation Management

The announcement of IOP was made by NOC. Field Operational Centre (FOC) worked at Regional Meteorological Centre, Chennai in unison with the NOC coordinating all activities of every institution during the IOP.

The following were the periods of IOP declared during 2015

IOP was declared for 12 days in view of low pressure area (27-28 Oct., 2015)-2 days, deep depression (7-10 Nov. 2015)-4 days, well karked low pressure area (15-16 Nov., 2015)-2 days and low pressure area (29 Nov.-2 Dec., 2015)-4 days over the Bay of Bengal.

The following methods were used for monitoring and forecasting of cyclonic disturbances.

Genesis:

Genesis of the disturbances (formation of depression) was monitored and predicted using following methods.

- Synoptic
- Satellite
- NWP Models
- Dynamic Statistical Models

- Genesis Potential Parameter(GPP)

GPP was calculated based on a dynamic statistical model. It uses mainly the Gray's parameters for the IMD GFS model. If the GPP> 30, it suggests cyclogenesis, otherwise not.

Track forecasting:

i) Analogue Techniques
ii) Methods based on climatology
iii) Methods based on Persistence
iv) Climatology and persistence(CLIPER)
v) Synoptic Techniques
vi) Satellite Techniques
vii) Radar Technique
viii) NWP Models

- IMD GFS (T-574), NCMRWF(GFS),NCEP GFS, JMA, IMD WRF,
- ARP Model of Meteo France
- NCMRWF Unified Model
- HWRF

i. Multi Model Ensemble (MME) technique developed by NWP Division
ii. MME based on Tropical Cyclone Module (TCM)
iii. Ensemble Prediction System(EPS) (JMA, UKMO, ECMWF, NCEP)
iv. TIGGE (THORPEX Grand Global Ensemble) forecast

Operational consensus is based mainly on the above NWP guidance supported with synoptic and statistical guidance. The forecast was issued up to 120 hrs. lead time alongwith cone of uncertainty.

Intensity forecasting:

Intensity forecast was mainly based on deterministic NWP models, dynamical statistical model, synoptic, satellite and Radar inputs. However following techniques were used.

- Climatology persistence Analogue
- Synoptic
- Satellite
- Radar
- NWP Models (same as those for track forecasting)
- Dynamical Statistical Model: Statistical Cyclone Intensity Prediction (SCIP) model of IMD

Tropical Cyclone Module:

The Tropical Cyclone Module (TCM) installed in this forecasting system has the facilities to serve the above purpose. The automation of the process has increased the efficiency of system, visibility of IMD and utility of warning products.
The TCM installed in this forecasting system has the following facilities.

- Analysis of all synoptic, satellite, radar and NWP model products for genesis, intensity and track monitoring and prediction
- Preparation of past and forecast tracks upto 120 hrs.
- Depiction of uncertainty in track forecast

- Structure forecasting (Forecast of wind in four geographical quadrants of cyclone)
- However all the data are not still available in TCM through synergie. For better monitoring and prediction, additional help is taken of ftp and websites

3.4. Achievements

3.4.1. Official forecast

During FDP-2015 only one cyclonic disturbance formed over the Bay of Bengal which intensified into deep depression and two cyclonic disturbances formed over the Arabian Sea which intensified into ESCS. The official average track and intensity forecast errors for deep depression formed over Bay of Bengal are shown in Table 3.1-3.2.

Table 3.1. Operational landfall point and landfall time forecast errors

Lead Period (hrs)	N	Actual Landfall point and time	Forecast Landfall point and time	Operational Landfall Error in	
				LPE(km)	LTE(hours)
12	1	12.2^0N/80.0^0E at 1400 UTC of 9^{th}	11.8^0N/79.8^0E at 0800 UTC of 9^{th}	49	-6.0
24	1		Near Puducherry around 1630 UTC of 09^{th}	41	+2.0
36	1		Near Puducherry around 1830 UTC of 09^{th}	41	+4.5

LTE : Landfall forecast time – Actual landfall time,

LPE : Landfall forecast point – Actual landfall point, N: No. of observations verified

Table 3.2 Operational Intensity forecast errors and skill

Lead Period (hrs)	N	Operational Error (knot)		Persistence based Error (knot)		Operational skill against Persistence forecast (%)	
		AE	RMSE	AE	RMSE	AE	RMSE
12	3	1.7	2.0	1.7	2.9	0	31.0
24	1	3.0	3.0	10.0	10.0	70.3	70.3

N: No. of forecasts verified; AE: Absolute Error; RMSE: Root Mean Square Error

3.4.2 NWP models forecast performance

3.4.2.1 Introduction:

India Meteorological Department (IMD) operationally runs one regional models, WRF for short-range prediction and one Global model T574L64 for medium range prediction (7 days). The WRF-Var model is run at the horizontal resolution of 27 km, 9 km and 3 km with 38 Eta levels in the vertical and the integration is carried up to 72 hours over three domains covering the area between lat. 25^o S to 45^o N long 40^o E to 120^o E. Initial and boundary conditions are obtained from the IMD Global Forecast System (IMD-GFS) at the resolution of 23 km. The boundary conditions are updated at every six hours interval. IMD also makes use of NWP products prepared by some other operational NWP Centres like, ECMWF (European Centre for Medium Range Weather Forecasting), GFS (NCEP), JMA (Japan Meteorological Agency). A multi-model ensemble (MME) for predicting the track of tropical cyclones for the Indian Seas is developed. The MME is developed applying multiple linear regression technique using the member models IMD-GFS, IMD-WRF, QLM, GFS (NCEP), ECMWF and JMA. In addition to the above NWP

models, IMD also run operationally the SCIP model for 12 hourly intensity predictions upto 72h and Genesis potential parameter (GPP) for potential of cyclogenesis and forecast for potential cyclogenesis zone. In this report performance of these individual models, MME forecasts, SCIP and GPP for cyclones during FDP-2015 are presented and discussed.

Recently the Hurricane WRF (HWRF) model and Ensemble prediction system (EPS) has been implemented at the NWP Division of the IMD HQ for operational forecasting of cyclones and a rapid intensification index (RII) is developed for the probability forecast of rapid intensification (RI). The performances of these models for cyclones during FDP-2015 are also presented.

Table-3.3. Average track forecast errors (Direct Position Error) in km (Number of forecasts verified)

Lead time →	12 hr	24 hr	36 hr
IMD-GFS	63(2)	94(2)	107(1)
IMD-WRF	42(2)	60(2)	168(1)
JMA	60(2)	103(2)	138(1)
NCEP	33(2)	35(2)	97(1)
UKMO	85(2)	126(2)	169(1)
ECMWF	40(2)	66(2)	45(1)
IMD-MME	48(2)	52(2)	60(1)

Table-3.4. Landfall point forecast errors (km) of NWP Models at different lead time (hour)

Forecast Lead Time (hour) →	14hr	26hr
IMD-GFS	70	**
IMD-WRF	31	114
JMA	91	**
NCEP-GFS	31	112
UKMO	113	81
ECMWF	25	33
IMD-MME	39	49

Table-3.5 Landfall time forecast errors (hour) at different lead time (hr)

('+' indicates delay landfall, '-' indicates early landfall)

Forecast Lead Time (hour) →	14hr	26hr
IMD-GFS	+4	**
IMD-WRF	-2	-3
JMA	+11	**
NCEP-GFS	-4	-5
UKMO	+24	+10
ECMWF	+10	+10
IMD-MME	-2	-2

Intensity (kt) prediction by SCIP Model

Table-3.6 Average absolute errors (AAE) and Root Mean Square (RMSE) errors of SCIP model (Number of forecasts verified is given in the parentheses)

Lead time →	12 hr	24 hr	36 hr
IMD-SCIP (AAE)	10.5(2)	11.5(2)	8.0(1)
IMD-SCIP (RMSE)	10.6	12.0	8.0

CHAPTER-IV

CYCLONIC ACTIVITIES OVER THE BAY OF BENGAL DURING FIELD PHASE - 2015

4.1 Introduction

During the year 2015, 12 cyclonic disturbances developed over north Indian Ocean including two Extremely Severe Cyclonic Storm (ESCS) and one Cyclonic Storm (CS) and two deep deression over Arabian Sea where as one cyclonic storm, one deep deression and one depression over Bay of Bengal. Four land depression (D) also formed during 2015. Considering season-wise distribution, out of 12 disturbances, eight during monsoon and three during post-monsoon season as shown in Table 4.1. The track of cyclonic disturbances formed over the NIO during the year are shown in Fig. 4.1

During field phase-2015**,** two extremely severe cyclonic storms, Chapala and Megh, over Arabian Sea and one Deep Depression formed over Bay of Bengal. The salient features of these systems are discussed in section 4.2.

Table 4.1: Cyclonic disturbances formed over north Indian Ocean and adjoining land areas during 2015

1.	Cyclonic Storm, ASHOBAA, over Arabian Sea (07-12 June, 2015)
2.	Depression over Bay of Bengal (20-21 June, 2015)
3.	Deep depression over Arabian Sea (22-24 June, 2015)
4.	Land Depression (10-12 July, 2015)
5.	Land Deep Depression (27 - 30 July, 2015)
6.	Cyclonic Storm, KOMEN, over Bay of Bengal (26 Jul – 2 Aug 2015)
7.	Land Depression (4 August, 2015)
8.	Land Deep Depression (16 -19 September, 2015)
9.	Deep depression over Arabian Sea (09-12 October, 2015)
10.	Extremely Severe Cyclonic Storm, CHAPALA, over Arabian Sea (28 October to 04 November 2015)
11.	Extremely Severe Cyclonic Storm, MEGH, over Arabian Sea (05 – 10 November, 2015)
12.	Deep depression over Bay of Bengal (08-10 November, 2015)

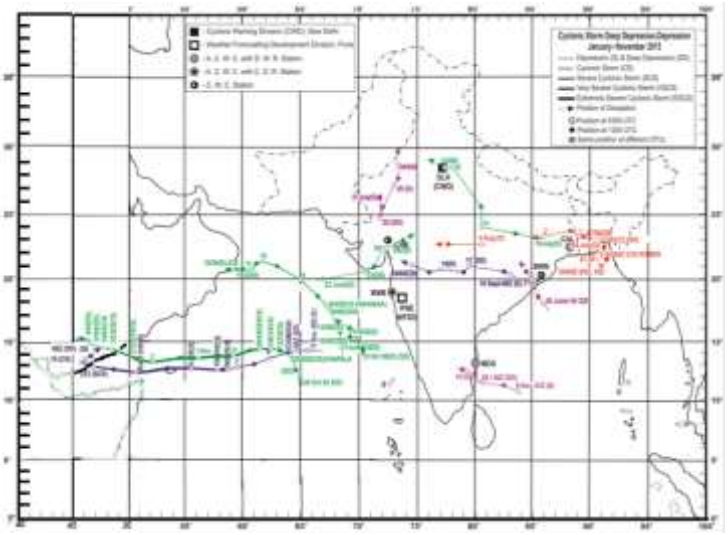


Fig. 4.1 Tracks of the cyclonic disturbances over the north Indian Ocean and adjoining land regions during the year, 2015

4.2 Salient features of the systems formed during FDP Phase-2015

4.2.1 Extremely Severe Cyclonic Storm (ESCS) Chapala over the Arabian Sea (28 October - 04 November 2015)

4.2.1.1 Introduction

An Extremely Severe Cyclonic Storm (ESCS) 'Chapala' formed from a low pressure area over southeast Arabian Sea (AS) which concentrated into a depression in the morning of 28th October. It moved north-northwestwards and intensified into a deep depression in the same evening. It further intensified into a cyclonic storm in the early hours of 29th over eastcentral Arabian Sea. It then moved west-northwestwards, further intensified into a severe cyclonic storm in the evening and a very severe cyclonic storm in the midnight of 29th and into an extremely severe cyclonic storm in the morning of 30th. It then moved mainly westwards, maintained its intensity till 1st November and then started weakening gradually. Moving west-northwestwards, it crossed Yemen coast to the southwest of Riyan (14.1/48.65) during 0100-0200 UTC of 3rd November as very severe cyclonic storm. It further westwards and weakened into a severe cyclonic storm in the morning , into a cyclonic storm by noon and into deep depression around midnight of 3rd November. it then weakened into a depression in the early morning of 4th and lay as well marked low pressure area over Yemen at 0300 UTC of 4th November. The salient features of this cyclone are as follows.

I. ESCS Chapala is the first severe cyclone to cross Yemen coast after the severe cyclonic storm of May 1960.
II. The ESCS Chapala had a life period of 7 days , which is above normal (average life period of VSCS/ESCS is 6 days in NIO and 4.7 days in Post monsoon season for VSCS/ESCS)
III. It had the maximum intensity of 115 kts (215 kmph) and crossed Yemen coast with a speed of 65 knots (120 kmph).
IV. The system had the longest track length after VSCS Phet in 2010. It travelled a distance of about 2248 km during its life period.

V. The Accumulated Cyclone Energy (ACE) was about 18.29 X 10^4 $knot^2$ (the mean for the period (1990-2013) in the post monsoon season over Arabian Sea is 0.8 X 10^4 $knot^2$), which is same as VSCS, Phet over Arabian Sea in 2010.

VI. The Power Dissipation Index was 17.92 X 10^6 $knot^3$ which is also same as that of VSCS Phet in 2010 (the mean for the period (1990-2013) in the post monsoon season is 0.4 X 10^6 $knot^3$.

VII. The system rapidly intensified from 29th morning to 30th afternoon, when the speed increased from 35 kts at 0000 UTC of 29th Oct to 90 kts at 0900 UTC of 30th Oct.

VIII. Though the system moved over to colder Gulf of Aden, experienced dry air intrusion and interacted with the land surface, it did not weaken rapidly due to low vertical wind shear around the centre and in the forward sector of the system.

IX. There was large divergence and hence higher than normal errors in NWP models for prediction of its track and intensity especially, the landfall over Yemen.

X. RSMC New Delhi predicted genesis on 25th October, 3 days in advance and its intensification to ESCS one day in advance on 29th October 2015. The forecast of landfall over Yemen and adjoining Oman coast was issued on the day of genesis i.e., 28th Oct., 6 days advance and landfall over Yemen was issued on 31 Oct. with a lead period of 5 days. Every 3 hourly Tropical Cyclone Advisory were issued to WMO/ESCAP panel countries including Oman and Yemen & Somalia.

Brief life history, characteristic features and associated weather along with performance of numerical weather prediction models and operational forecast of IMD are presented and discussed in following sections.

5.2.1.2 Monitoring of ESCS, Chapala

The ESCS Chapala was monitored & predicted continuously since its inception by the India Meteorological Department (IMD). The forecast of its genesis (formation of Depression) on 28th October, its track, intensity, point & time of landfall was well predicted by IMD. The system was monitored mainly by observations from satellite throughout its life period. Various national and international NWP models and dynamical-statistical models including IMD and National Centre for Medium Range Weather Forecasting (NCMRWF) global and meso-scale models, dynamical statistical models for genesis and intensity were utilized to predict the genesis, track and intensity of the storm. Tropical Cyclone Module, the digitized forecasting system of IMD was utilized for analysis and comparison of various models guidance, decision making process and warning product generation.

4.2.1.3 Brief life history

4.2.1.3.1. Genesis

During the onset phase of northeast monsoon, a trough of low with embedded upper air cyclonic circulation in lower levels lay over southeast Bay of Bengal on 25th Oct. Under its influence, a low pressure area formed over southeast and adjoining southwest and eastcentral Arabian Sea at 0300 UTC of 26th Nov. with associated cyclonic circulation extending upto mid-tropospheric levels. It became well marked over the same region at 0300 UTC of 27th morning. It concentrated into a depression over southeast and adjoining southwest and central Arabian Sea at 0300 UTC of 28th October near Lat. 11.5°N and Long. 65.0°E.

The winds were stronger in northern sector (25-30 knots) under the influence of northeast monsoon current and were about 15-20 knots in other sectors as seen from multi-satellite surface winds. The Sea Surface Temperature (SST) was about 30°C around the region of depression. The vertical wind shear was moderate (10-20 knots) around the system centre

and was low (5-10 knots) to the west-northwest of the system centre. The low level relative vorticity was about 100 x 10^{-5} $second^{-1}$ and low level convergence was 5-10 x 10^{-5} $second^{-1}$. The upper level divergence was 30 x 10^{-5} $second^{-1}$. The ocean thermal energy was about 60-80kJ/cm^2. MJO lay in phase 2 (west equatorial region) with amplitude greater than 2.

4.2.1.3.2 Track and intensification

Best track parameters of ESCS, Chapala over AS (28th Oct.-4nd Nov., 2015) are given in Table 4.2.1.1. The observed track of the system is also shown in Fig. 4.2.1.1

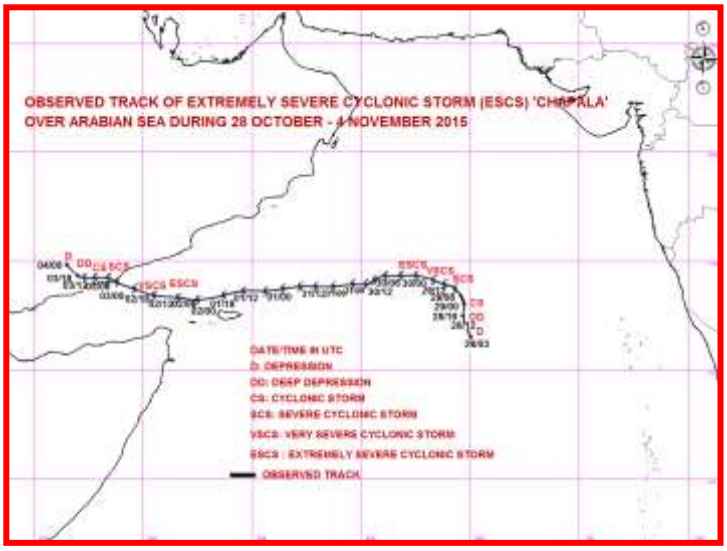


Fig. 4.2.1.1 Observed track of ESCS Chapala during 28th Oct. to 04th Nov 2015.

The environmental features and large scale features as mentioned in the previous section continuously favoured the intensification of the system during 28th -30 Oct. The system rapidly intensified from 29th to 30th, when the speed increased from 35 kts at 0000 UTC of 29th Oct to 90 kts at 0900 UTC of 30th Oct. There was land interaction and impact of dry air intrusion from northwest from 01 Nov. onwards. However, the impact of dry air intrusion from northwest and land interaction was slow because of low vertical wind shear to the west and west-southwest of the system as can be seen in Fig. 4.2.1.2 and hence the system could maintain its intensity of ESCS from 0000 UTC of 30th Oct. to 0900 UTC of 2 Nov. The Total Precipitable Water (TPW) imageries during 28 Oct. to 04 Nov. is shown in Fig. 4.2.1.4 which clearly exemplifies the low impact of dry air intrusion into the wall cloud region. From 0300 UTC of 2nd Nov., the system started interacting with land surface and also the convection in the wall cloud region showed signs of disorganisation indicating the weakening trend of the system. **It crossed Yemen coast to the southwest of Riyan (14.1/48.65) during 0100-0200 UTC of 3rd November** as Very Severe Cyclonic Storm (VSCS). It then weakened rapidly into SCS at 0300 UTC, into a CS at 0600 UTC and into a Deep Depression (DD) at 1800 UTC on the same day due to land interaction. It further weakened into a Depression at 0000 UTC and into a well marked low pressure area at 0300 UTC of 4th November 2015 over Yemen.

The system initially moved north-northwestwards in association with the anti-cyclonic circulation lying to the northeast of the system centre. It then came under the influence of another anti-cyclonic circulation to its northwest on 29th which increased westward component in the movement of the system. The system lay in the south eastern periphery of this anticyclone. Thus the system moved nearly westwards to west-southwestward upto 0300 UTC of 2 Nov. It

then lay to the southwest of the anticyclone and the ridge (Lat. 16°N) at 200 hPa and thus moved west-northwestwards towards Yemen coast. It moved normally with a speed of 13 kmph initially, its speed gradually picked up and became about 20 kmph on the day before landfall. The direction and translational speed of movement of the system is illustrated in Fig. 4.2.1.3

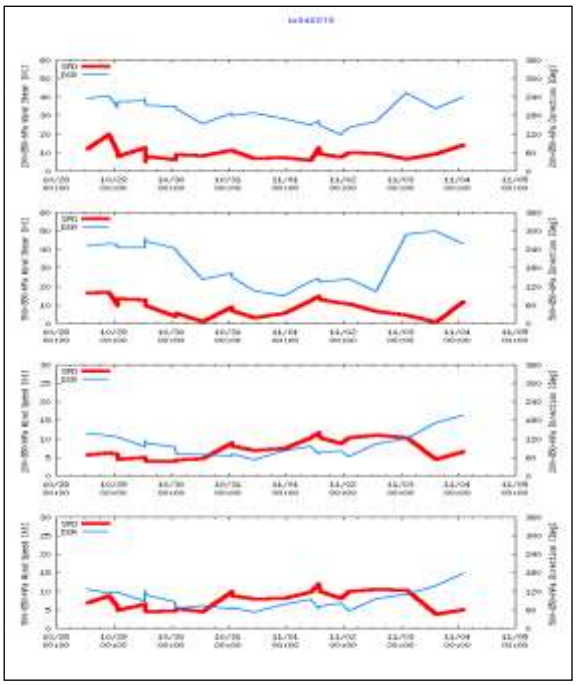


Fig. 4.2.1.2 Wind shear and wind speed in the middle and deep layer around the system during 28th Oct. to 05th Nov 2015.

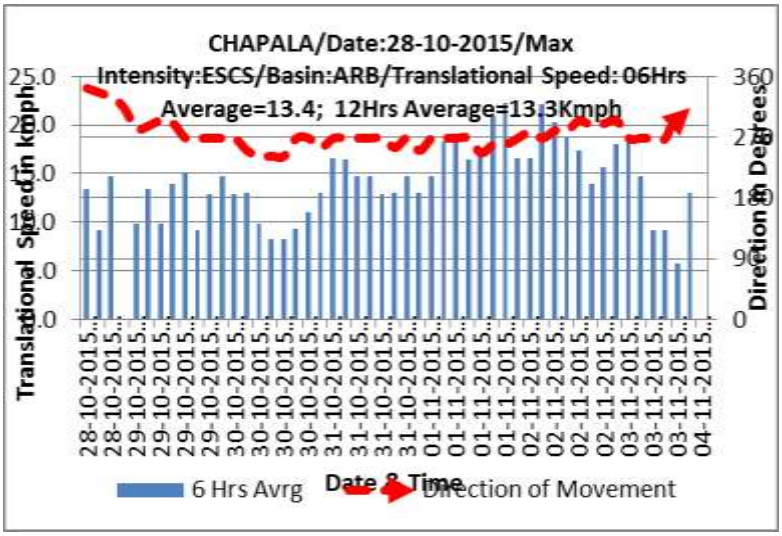


Fig. 4.2.1.3 Translational speed and direction of ESCS Chapala during 28th Oct. to 04th Nov 2015.

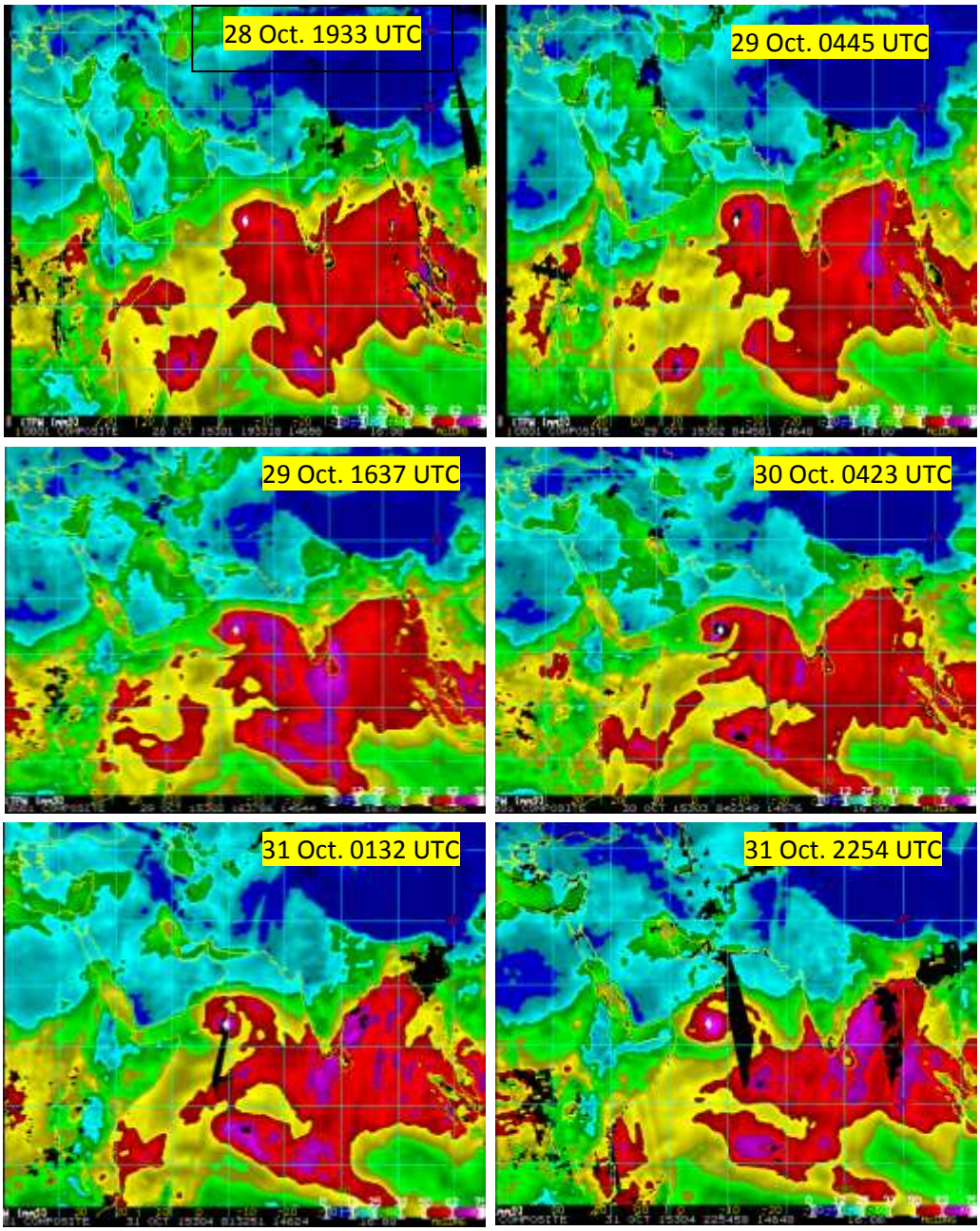


Fig. 4.2.1.4(a) TPW imageries of ESCS Chapala during 28th Oct. to 31st Nov 2015.

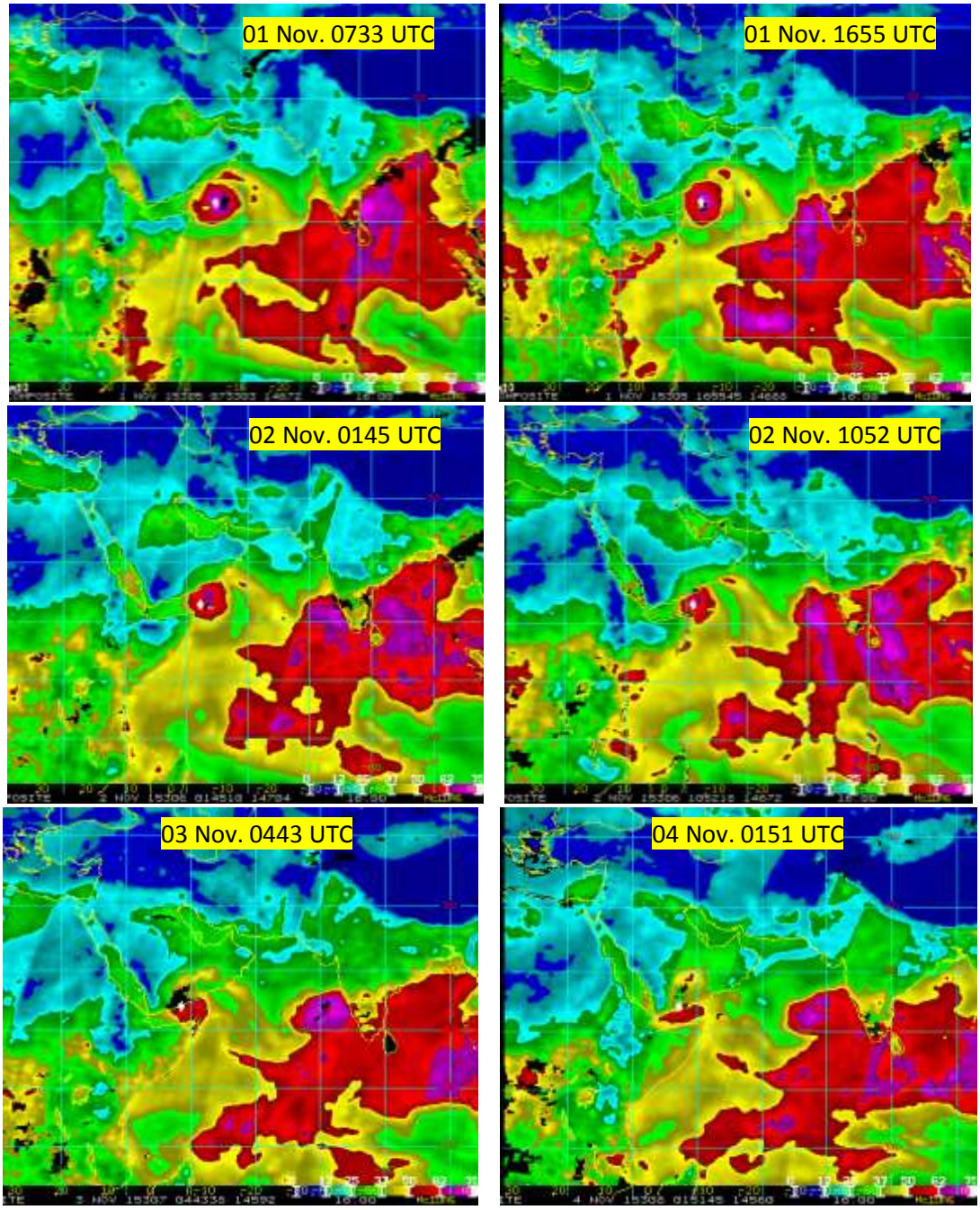


Fig. 4.2.1.4 (b) TPW imageries of ESCS Chapala during 01-04 2015.

Table 4.2.1.1: Best track positions and other parameters of ESCS CHAPALA over the Arabian Sea during 28 October-04 November, 2015

Date	Time (UTC)	Centre lat.° N/ long.˚ E	C.I. NO.	Estimated Central Pressure (hPa)	Estimated Maximum Sustained Surface Wind (kt)	Estimated Pressure drop at the Centre (hPa)	Grade
28-10-2015	0300	11.5/65.0	1.5	1005	25	3	**D**
	0600	11.8/64.9	2.0	1004	25	4	D
	1200	12.5/64.7	2.0	1001	30	5	**DD**
	1800	13.0/64.7	2.0	1001	30	5	DD
29-10-2015	0000	13.7/64.3	2.5	999	35	7	**CS**
	0300	13.8/64.2	2.5	997	40	9	CS
	0600	13.9/63.8	3.0	996	45	10	CS
	0900	14.0/63.5	3.0	994	50	12	**SCS**
	1200	14.1/63.3	3.5	990	55	16	SCS
	1500	14.3/62.8	3.5	988	60	18	SCS
	1800	14.3/62.5	4.0	984	65	22	**VSCS**
	2100	14.3/62.3	4.5	976	75	30	VSCS
30-10-2015	0000	14.3/61.8	5.0	966	90	40	**ESCS**
	0300	14.3/61.5	5.5	954	105	52	ESCS
	0600	14.3/61.1	5.5	948	110	58	ESCS
30-10-2015	0900	14.2/60.8	6.0	940	115	66	ESCS
	1200	14.1/60.6	6.0	940	115	66	ESCS
	1500	14.0/60.4	6.0	940	115	66	ESCS
	1800	13.9/60.2	6.0	940	115	66	ESCS
	2100	13.9/59.9	6.0	942	115	64	ESCS
31-10-2015	0000	13.9/59.6	5.5	944	110	62	ESCS
	0300	13.8/59.2	5.5	946	110	60	ESCS
	0600	13.8/58.7	5.5	950	105	56	ESCS
	0900	13.8/58.3	5.5	950	105	56	ESCS
	1200	13.8/57.9	5.5	950	105	56	ESCS
	1500	13.8/57.5	5.5	950	105	56	ESCS
	1800	13.8/57.2	5.5	950	105	56	ESCS
	2100	13.7/56.8	5.5	950	105	56	ESCS
01-11-2015	0000	13.7/56.4	5.5	950	105	56	ESCS
	0300	13.6/56.1	5.5	952	105	54	ESCS
	0600	13.6/55.6	5.5	954	100	52	ESCS
	0900	13.6/55.1	5.5	956	100	50	ESCS
	1200	13.6/54.6	5.5	956	100	50	ESCS
	1500	13.6/54.2	5.5	956	100	50	ESCS
	1800	13.4/53.7	5.5	956	100	50	ESCS

	2100	13.3/53.1	5.5	956	100	50	ESCS
02-11-2015	0000	13.2/52.5	5.5	958	100	48	ESCS
	0300	13.2/52.2	5.0	960	95	46	ESCS
	0600	13.3/51.6	5.0	964	90	42	ESCS
	0900	13.3/51.0	5.0	966	90	40	ESCS
	1200	13.4/50.5	4.5	968	85	38	**VSCS**
	1500	13.5/50.0	4.5	970	85	36	VSCS
	1800	13.7/49.6	4.5	974	80	32	VSCS
	2100	13.8/49.3	4.0	978	75	28	VSCS
3-11-2015	0000	14.0/48.8	4.0	984	65	22	VSCS
	Crossed Yemen coast to the southwest of Riyan (14.1/48.65) during 0100-0200 UTC.						
	0300	14.2/48.4	-	990	55	16	**SCS**
	0600	14.2/47.8	-	996	45	10	**CS**
	0900	14.2/47.6	-	998	40	8	CS
	1200	14.2/47.3	-	998	40	8	CS
	1500	14.2/47.1	-	998	40	8	CS
	1800	14.3/47.0	-	1001	30	5	**DD**
04-11-2015	0000	14.8/46.5	-	1003	25	3	**D**
	0300	**Well marked low pressure area over Yemen.**					

4.2.1.3.3 Maximum Sustained Surface Wind speed and estimated central pressure:

The lowest estimated central pressure has been 940 hPa. The estimated maximum sustained surface wind (MSW) was 115 knots during 0900 - 2100 UTC of 30th Oct. However, at the time of landfall, the ECP was 984 hPa and MSW was 65 knots (very severe cyclonic storm) due to weakening of the system over Gulf of Aden.

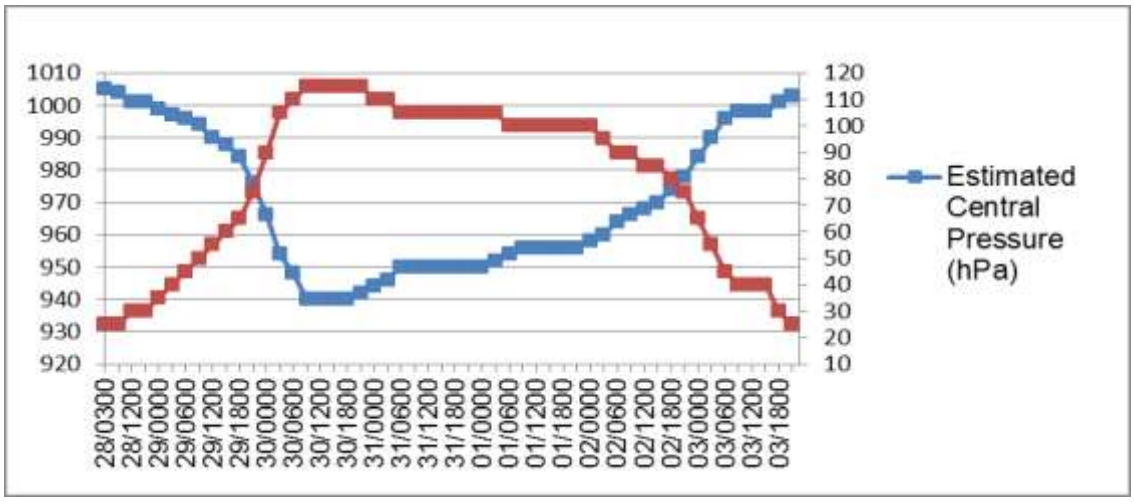


Fig. 4.2.1.5 Estimated Central Pressure (ECP) and estimated maximum sustained surface wind speed during 28th Oct./0300 UTC to 04th Nov/0000 UTC.

It can be seen from Fig. 4.2.1.5 that there was rapid intensification from 29/0000 UTC to 30/0900 UTC.

4.2.1.4 Climatological aspects

Climatologically, the severe cyclonic storms crossing Yemen coasts are very rare. Prior to Chapala, only one SCS in May 1960 crossed Yemen coast during the 1891-2014). The track of the SCS is shown in Fig. 4.2.1.6

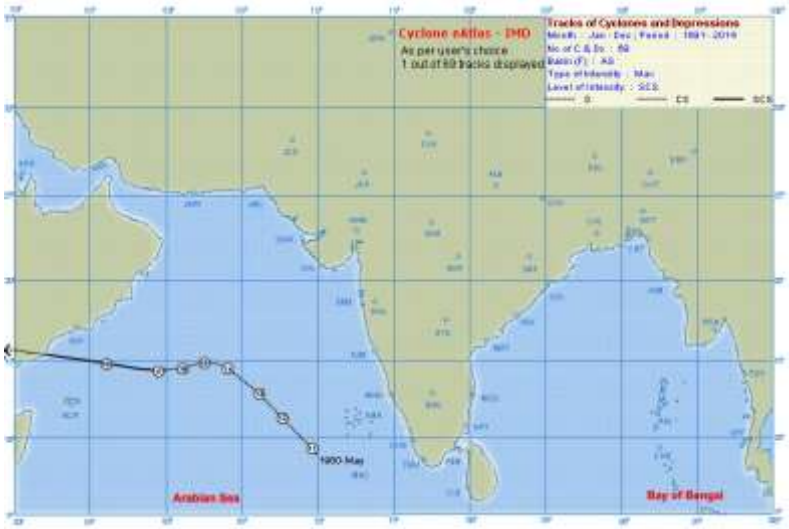


Fig. 4.2.1.6 Tracks of Severe cyclonic storm over Arabian Sea during the period 1891-2014 that crossed Yemen coast.

4.2.1.5 Features observed through satellite

(a) INSAT 3D and Kalpana imageries:

Half hourly Kalpana-1 and INSAT-3D imageries were utilised for monitoring of ESCS, Chapala. Satellite imageries of international geostationary satellites Meteosat-7 and MTSAT and microwave & high resolution images of polar orbiting satellites DMSP, NOAA series, TRMM, Metops were also considered. Typical satellite INSAT-3D imageries (IR, visible, IRBD and enhanced colour imageries) of ESCS Chapala representing the life cycle of the cyclone are shown in Fig. 4.2.1.7-11.

As per the satellite imageries, on 26th October, broken low and medium clouds with embedded intense to very intense convection lay over south Arabian Sea between equator to latitude 10.0°N and longitude 61.0°E to 74.0°E in association with the low pressure area over the area.

On 27th/0300, vortex was observed over south Arabian Sea centered within half a degree of latitude 8.5˚N and longitude 66.0˚E with intensity T1.0 and poorly defined centre. Associated broken low and medium clouds with embedded moderate to intense convection lay over the area between latitude 6.0˚N to 14.5˚N and longitude 60.0˚E to 72.0˚E. The lowest cloud top temperature (CTT) associated with the vortex was -70°C. On 28th/0300 UTC, intensity of the system was T1.5 with convective clouds showing shear pattern and increase in organisation. On 28th/1200 UTC, the intensity of the system became T2.0 with increased convection and organisation into curved band pattern during the past 12 hours.

On 29th, the intensity of the system increased rapidly by three T numbers in 24 hrs. At 29/0000 UTC, the intensity of the system was T.2.5. At 29/0300 UTC, it became T3.0, at 1200 UTC,T3.5 and at 1800 UTC of the same day, it was T4.0 and eye started appearing. On 30th/0000 UTC, intensity further increased to T5.5 with convective cloud showing eye pattern with well-defined eye of diameter about 15 km in both visible and IR imageries. By 0900 UTC

of 30th, intensity further increased to T6.0 with well-defined eye of diameter about 15 km. At 2100 UTC of the same day, the eye pattern became ragged. By 31st/0000 UTC, intensity became T5.5 / CI 6.0 and the eye was ragged. At 0600 UTC of the same day, intensity became T5.0 / CI 6.0. However, ragged eye was observed in both visible and IR imageries. Minimum wall cloud temperature was -80°C. By 0900 of the same day, weakening trend was observed in the associated convection. At 1200 UTC of 31st, eye was defined in visible and IR imageries. At 1800 UTC of the same day, minimum wall cloud temperature was -77°C. There was a good poleward outflow from 0000 UTC of 29th Oct. which changed to radial outflow from 0000 UTC of 31st Oct. The poleward outflow again was seen from 1200 UTC of 01st Nov. to 0000 UTC of 2nd Nov.

On 01st November/0300 UTC, ragged eye re-appeared and the minimum wall cloud temperature was -90°C. At 0300 UTC of the same day, intensity slightly decreased to T5.5/ CI 5.5 and convection showed ragged eye pattern. On 2nd/0000 UTC, the eye diameter increased to about 45 km. At 0300 UTC of the same day, intensity decreased to T5.0/ CI 5.5 and convection in the wall cloud region started showing disorganisation. At 1200 UTC of the same day, intensity further decreased to T4.5/ CI 5.5. However, well defined ragged eye was observed in both visible and IR imageries. At 2100 UTC, the intensity further decreased to T4.0 / CI 4.5 and on 03rd/0000 UTC, convection was sheared to the northwest due to increase in vertical wind shear and further disorganisation continued till day of landfall.

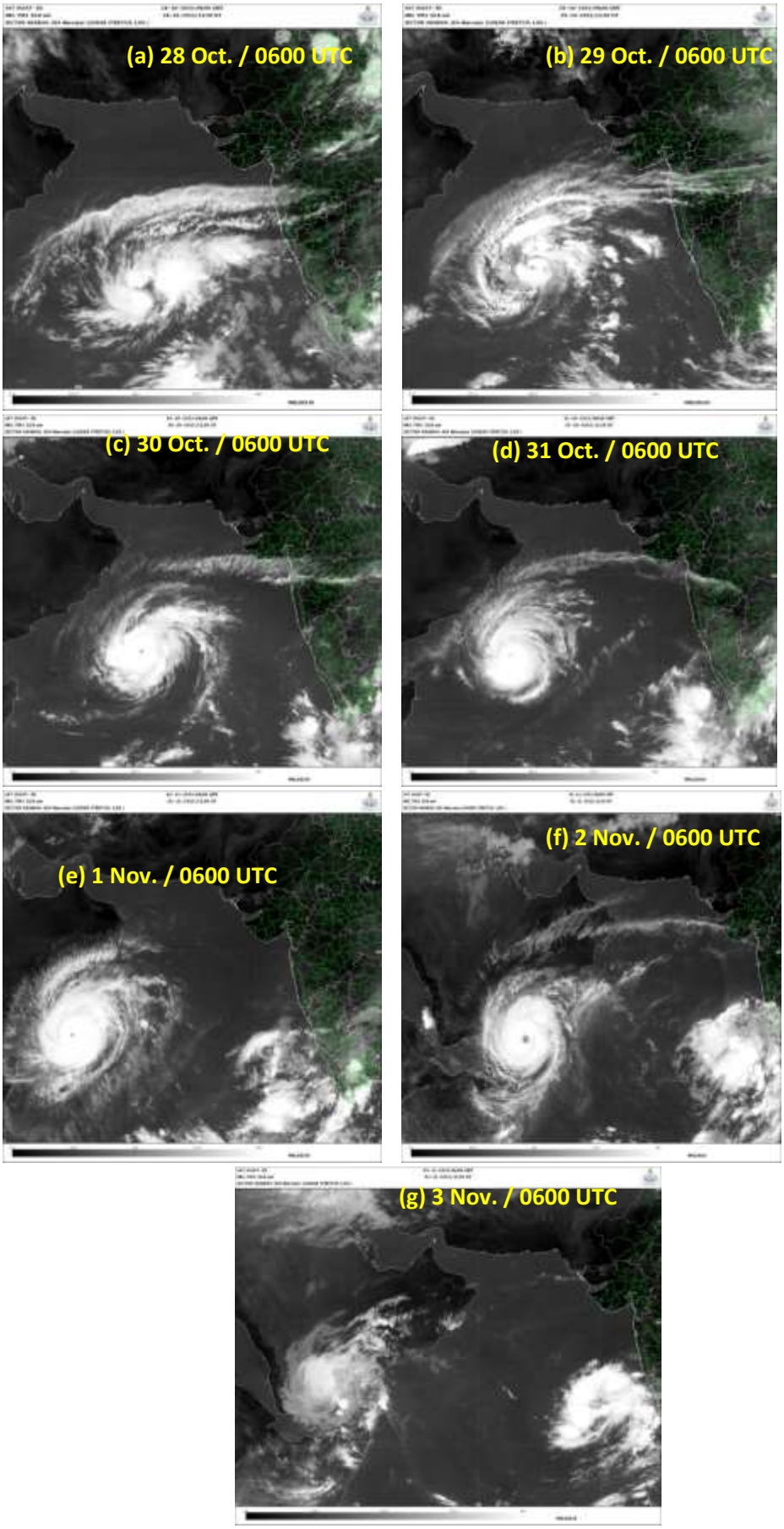


Fig. 4.2.1.7(a-g): INSAT 3D IR Imageries during 28 Oct.-4 Nov. 2015 based on 0600 UTC.

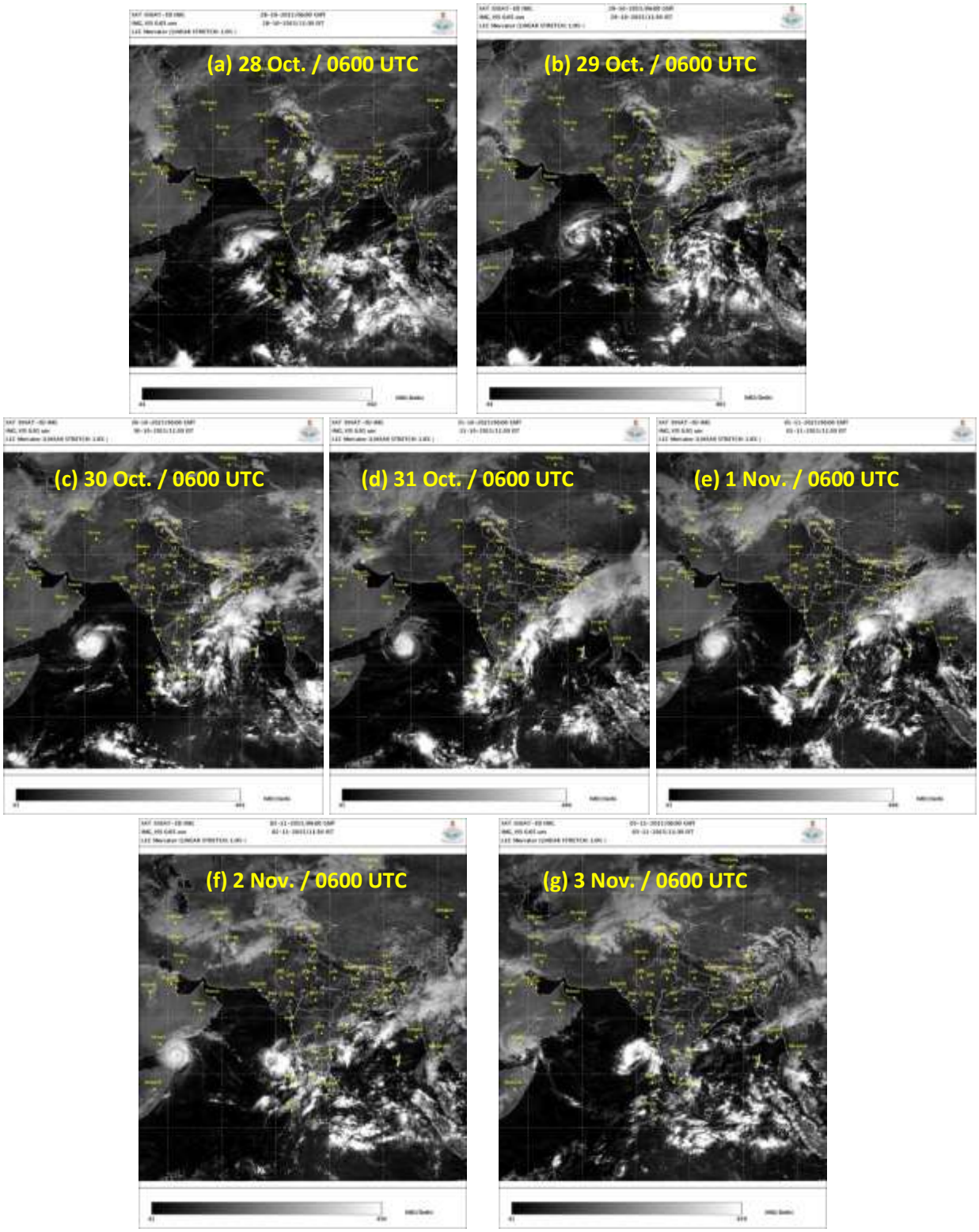


Fig. 4.2.1.8(a-g): INSAT 3D Visible Imageries during 28 Oct.-4 Nov. 2015 based on 0600 UTC.

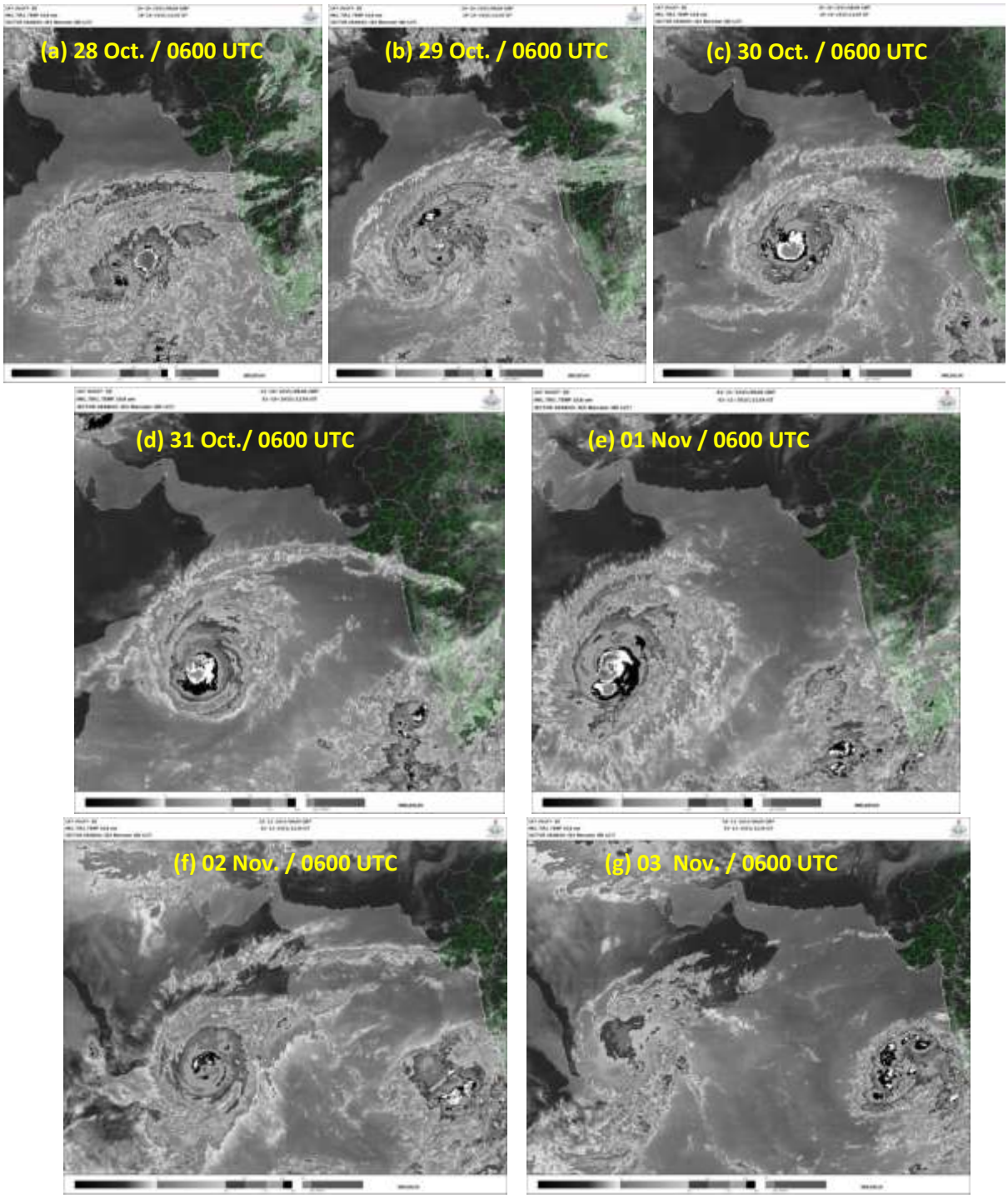


Fig. 4.2.1.9(a-e) INSAT 3D Imageries during 28 Oct. - 4 Nov. 2015 based on 0600 UTC.

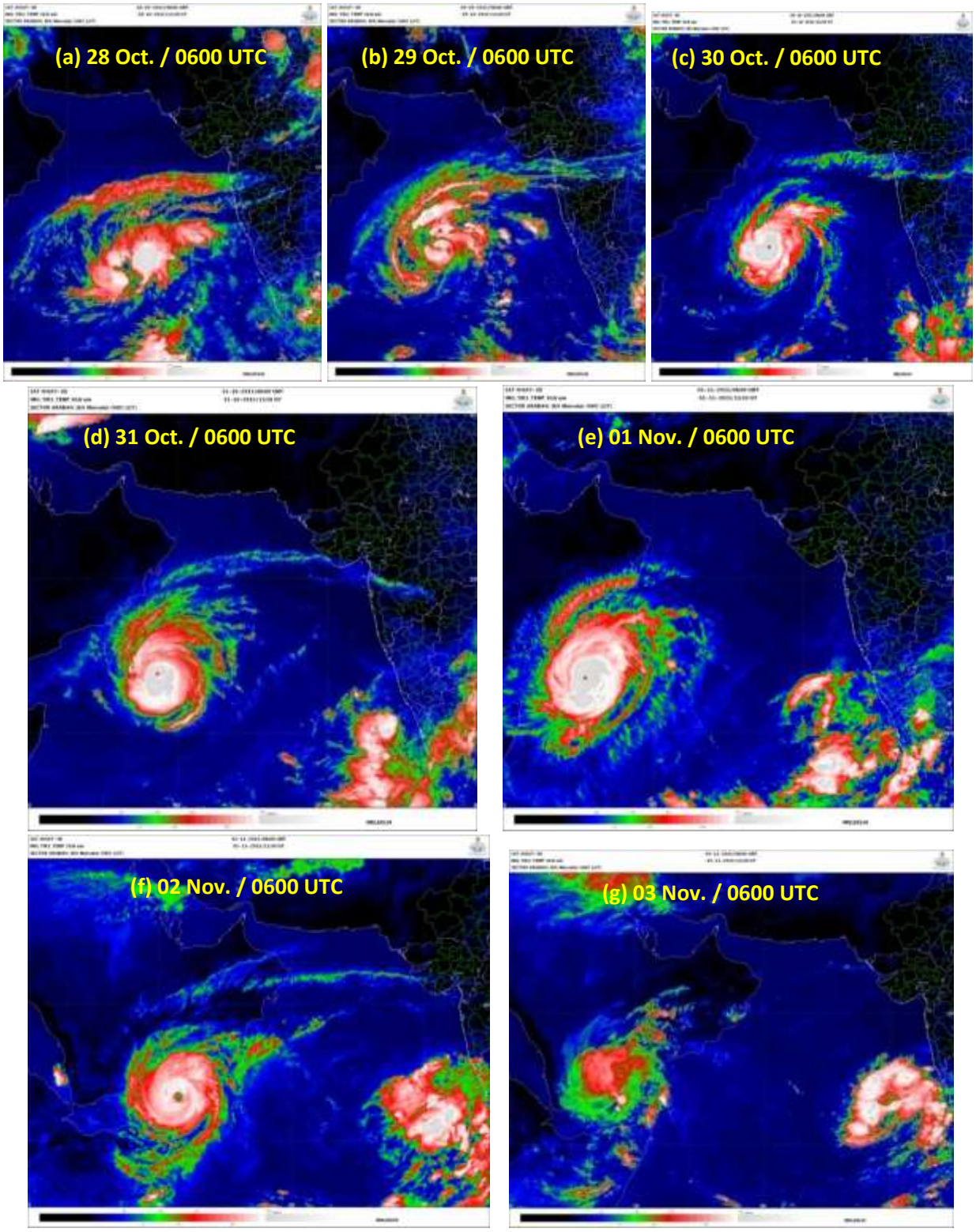


Fig. 4.2.1.10(a-g): INSAT 3D enhanced imageries during 28 Oct. - 4 Nov. 2015 based on 0600 UTC.

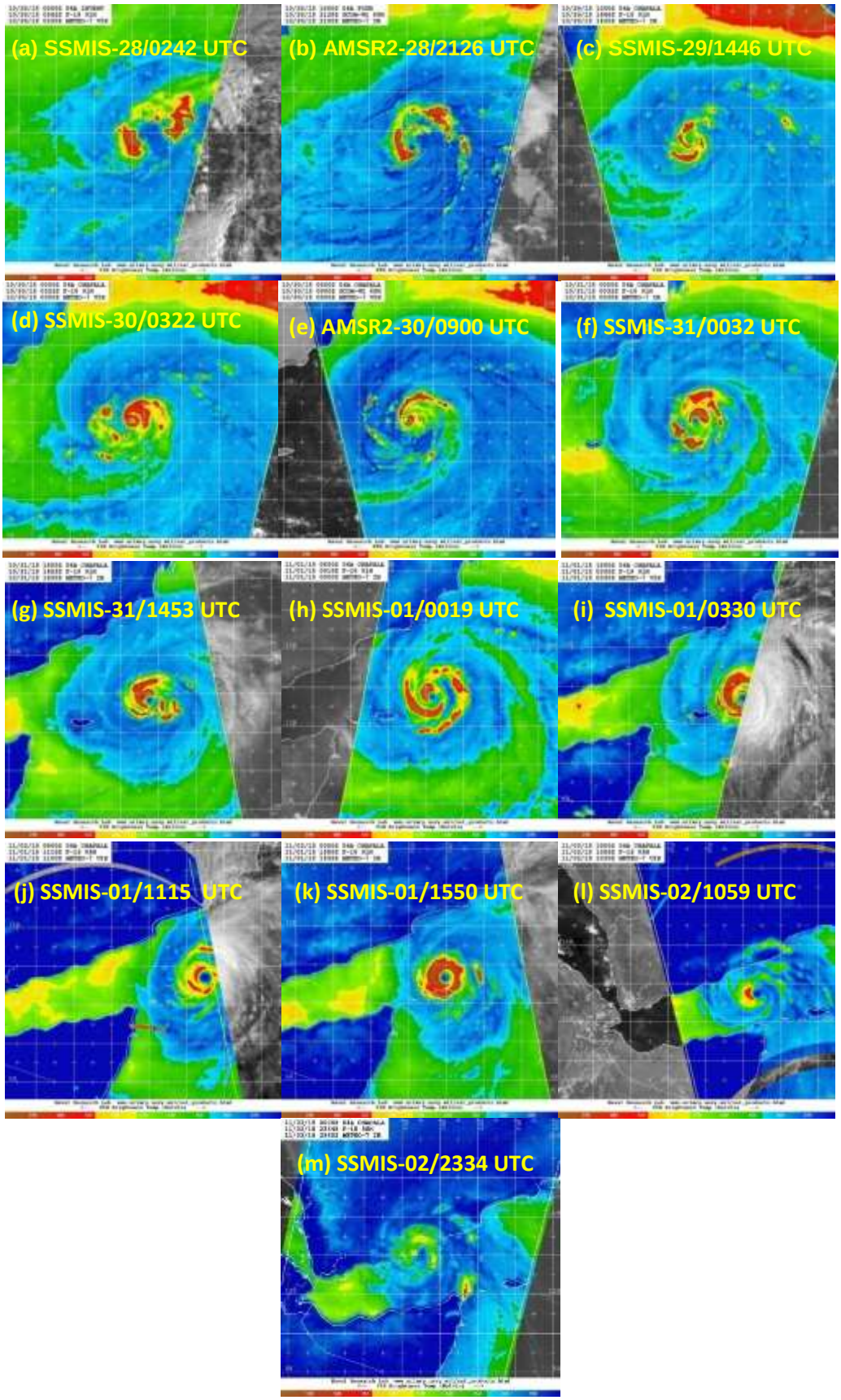


Fig. 4.2.1.11(a-m) Evolution of TC Chapala during 28 Oct - 03 Nov 2015 based on microwave imageries (SSMIS / AMSR2).

(b) Microwave features and eye characteristics

Fig. 4.2.1.11(a-m) presents the SSMIS / AMSR2 microwave imageries depicting the organisation of convective clouds associated with the system. As seen, on 28th October, convective clouds organised from shear pattern to curved band pattern (a&b: 28/0242 & 28/2126). On 29th, curved banding improved considerably and eye feature started appearing (c: 29/1446 UTC). Subsequently, as the system intensified, the eye feature became very well-defined and eye wall completely covered the eye (d: 30/0322 UTC). However, by 30/0900 UTC, the eye wall started opening (e), the eye became more and more exposed and an outer eye wall started forming on 31st (f: 31/0032 UTC). Thereafter, on 31/1453 UTC, the outer eye wall is observed to have shifted inwards towards the partially dissolved inner eye wall (g). On 1st November, by 01/0019 UTC, the inner eye wall has disappeared and the outer eye wall surrounds the eye (h). Associated with this eye wall replacement cycle, there has been a temporary weakening of the system on 30th. With the formation and strengthening of the secondary eye wall (i: 01/0330 UTC), the intensity of the system increased further on 31st October and 01st November (j:01/1115 UTC). On 01/1530 UTC, the outer eye wall completely surrounds the eye and the system attained its mature stage (k). The eye diameter during this stage was about 37 km. Subsequently, by 02/0300 UTC, the intensity of the system started decreasing and at 02/1059 UTC, most of the wall cloud portion had dissolved and a partial eye wall with an exposed eye is seen (l). As the system approached close to the coast, further disorganisation occurred due to land interaction (m: 02/2334 UTC).

4.2.1.6 Surface wind structure

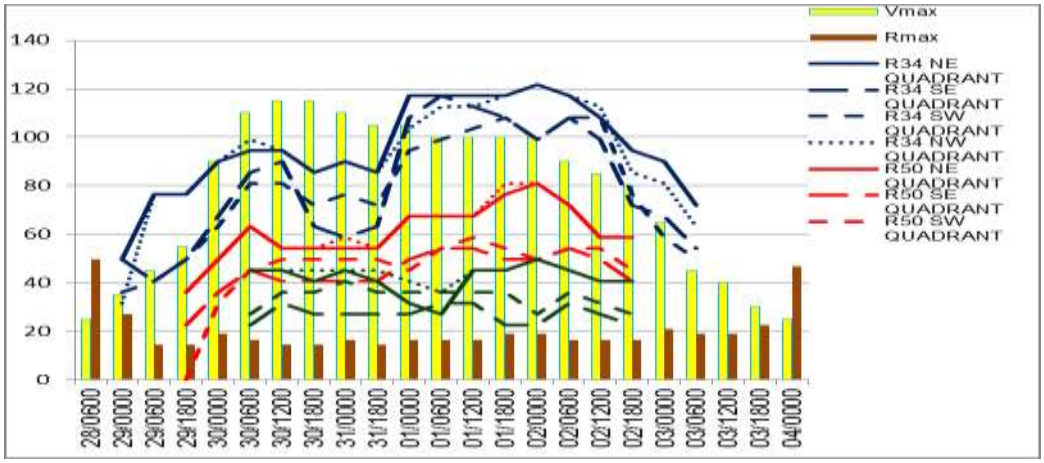


Fig. 4.2.1.12 Radius 34 knot (R34), radius of 50 knot (R50) & radius of 64 knot (R64), estimated maximum sustained surface winds (Vmax in knots) and Radius of Maximum winds (Rmax in nautical mile) based on multi-satellite surface wind (http://rammb.cira.colostate.edu/)

The surface wind structure during the life period of ESCS, Chapala based on multi-satellite surface wind developed by CIRA, USA is shown in Fig. 12. It can be seen that the radius of 34 kt (outer core size) winds was higher in northeast (NE) sector. It was maximum of about 120 nm during its mature stage. Also in the radius of 50 kt/64 kt (inner core size), the winds were higher in the northeastern sector as compared to the other sector. Further it can be seen that the size of the outer core gradually increased till 0600 UTC of 30th Oct., then it slightly decreased upto 1800 UTC of 30 Oct. followed by a sharp increase upto 0000 UTC of 1st Nov. The size then almost remained same upto 0000 UTC of 2nd Nov. and then gradually decreased. The change

in the inner core (R50) was similar to that of R34 and the temporal variation in R64 was less. Similarly the Radius of Maximum Winds (RMW) did not show significant variation throughout the TC stage and it varied from 15-20 nm.

4.2.1.7 Dynamical features

The genesis of the system took place on 28th under favourable environmental conditions of high SST (around 30°C), low to moderate wind shear (10-20 knots), conducive MJO conditions (phase 2 and amplitude greater than 1).

The system was initially located along the southwestern periphery of an anticyclone to the northeast which steered the system northward / north-northwestward on 28th. Subsequently, from 29th onwards, the system was steered by another anti-cyclone located to the northwest of its centre. On 29th October, the system was located along the southeastern periphery of the western anti-cyclone which steered the system westward to west-southwestward and subsequently, during 30th October to 01st November also the system was tracking west to west-southwestward under its influence. On 2nd, the system centre was located along the southwestern periphery of this anti-cyclone and was steered west-northwestward to northwestward on 2nd and 3rd November.

During the period 28th October to 01 November, outflow above the system centre strengthened significantly. On 29th, the poleward outflow increased and subsequently, during 30th October to 01st November, the outflow from the system centre was enhanced radially in all directions due to significant favourable interaction with upper tropospheric trough and divergence associated with sub tropical westerly jet located to the northeast of the system centre and the system continued to intensify despite intrusion of cold air from the northwest. The system underwent rapid intensification during 29/0000-30/00000 UTC in association with lowering of vertical wind shear to about 5-10 knots near the system centre, enhanced poleward outflow associated with an upper air westerly trough located to the northeast of the system centre and continued prevalence of favourable MJO conditions. However, as the system tracked more and more westwards towards Yemen coast on 2nd November, it started weakening due to intrusion of cold and dry air and interaction with land.

Dynamical features observed in the IMD-GFS analysis of MSLP, 10m, 850 hPa, 500 hPa and 200 hPa winds based on 0000 UTC of 28-October to 03 November 2015 [Fig. 4.2.1.13 (i)-(vii)] are discussed herewith.

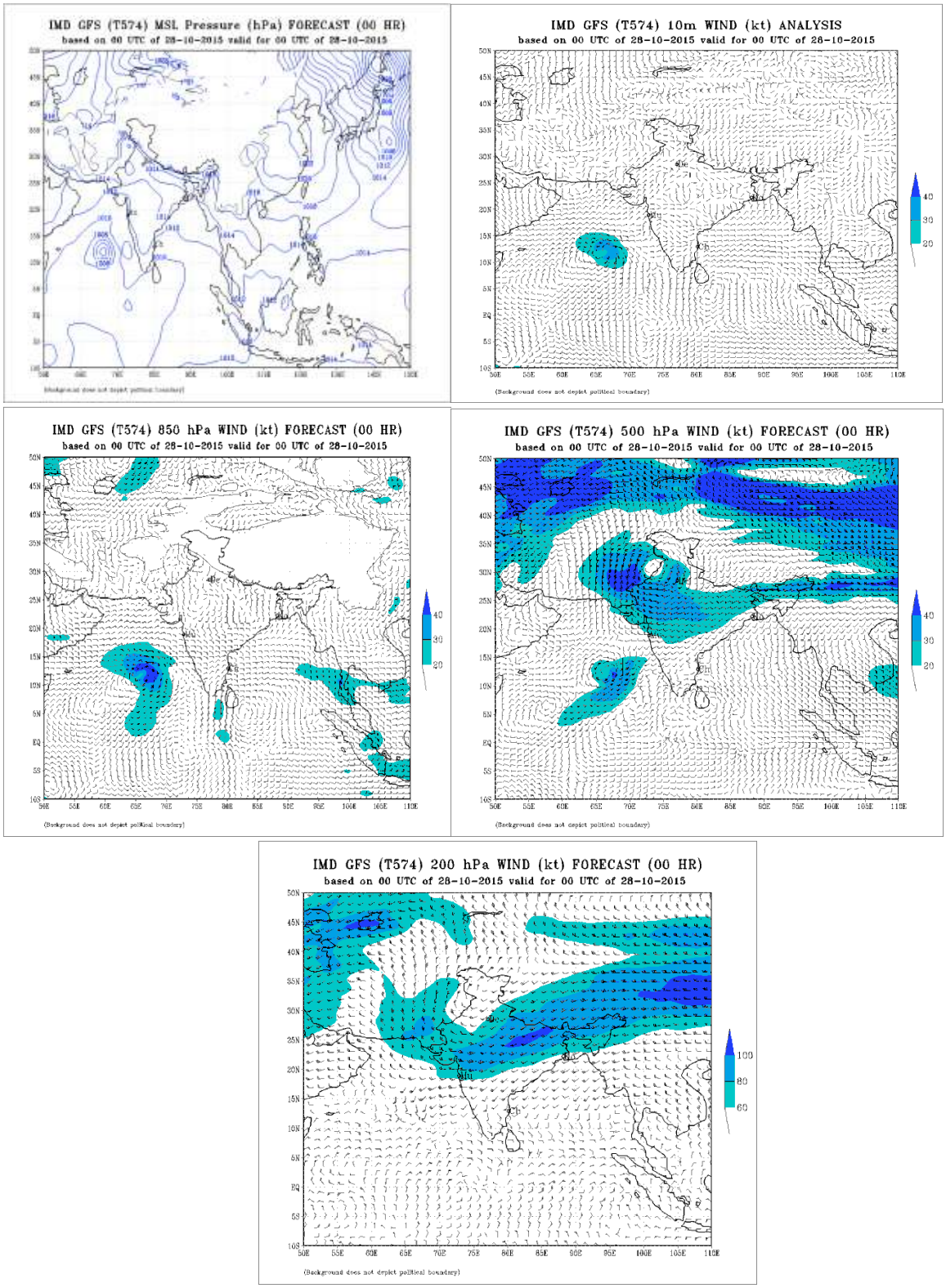


Fig 4.2.1.13 (i) IMD-GFS analyses of (a) MSLP and winds at (b) 10 m (c) 850 hPa (d) 500 hPa & (e) 200 hPa levels based on 0000 UTC of 28th October, 2015

As seen, cyclogenesis of the system and its subsequent intensification is indicated by the model. On 28th and 29th, surface winds of about 30-35 kts are predicted and winds are stronger over the northeastern sector. The extent of subsequent intensification is not indicated clearly by the model. However, major synoptic features associated with movement and intensification of

the system are predicted well. A deep amplitude westerly trough at 500 hPa level is located north-northeast / northeast of the system centre on 28th and 29th. At 200 hPa level, northeast-southwest oriented westerly trough is located to the northeast of the system centre on 28th and 29th and poleward outflow from the system merges with the sub-tropical westerly jet located to the northeast of the system centre during 28th-31st. These features contributed significantly to enhanced deepening of the central pressure and hence intensification of the system. On 31st, associated with rapid intensification of the system, surface winds are symmetric about the centre.

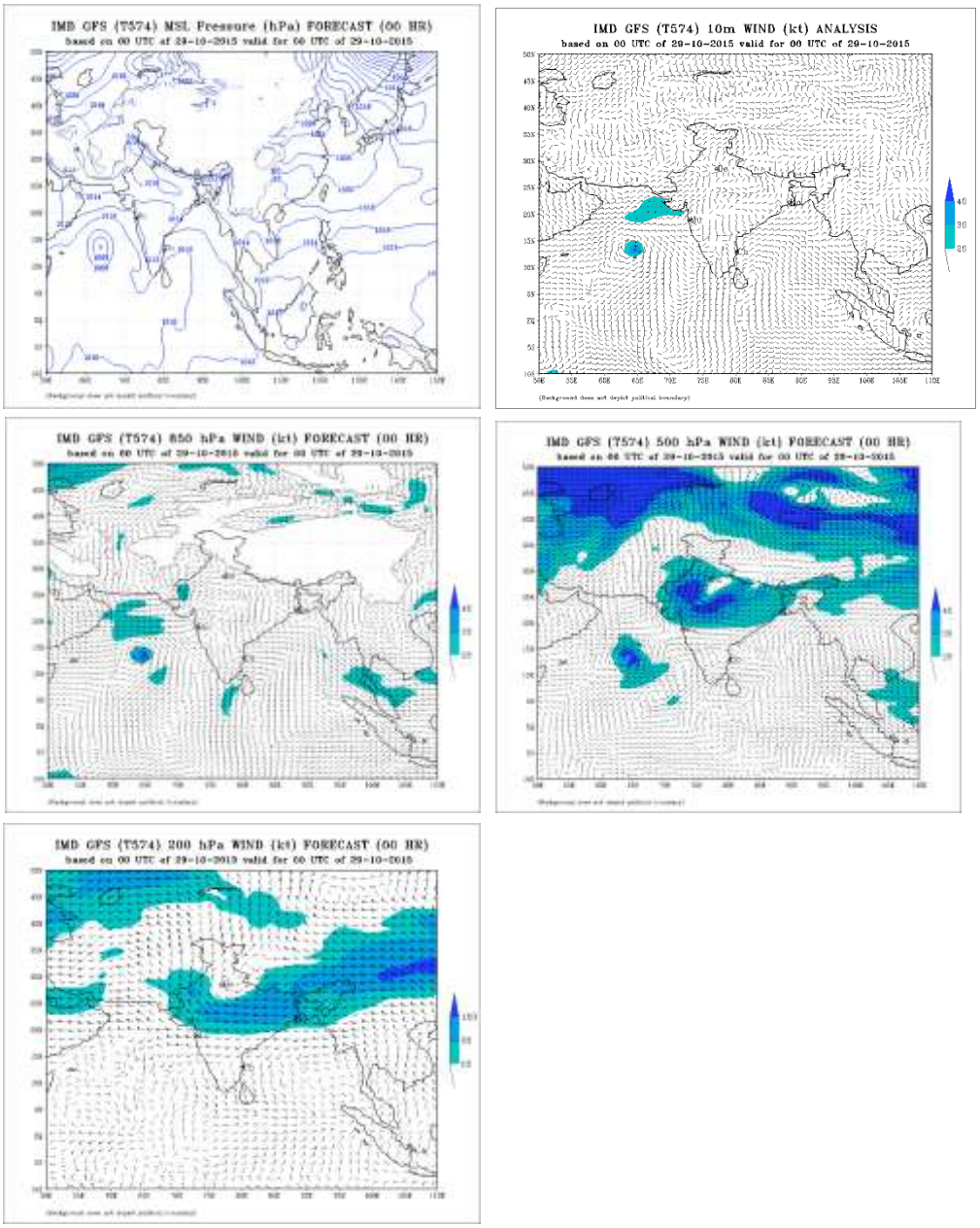


Fig 4.2.1.13 (ii) IMD-GFS analyses of (a) MSLP and winds at (b) 10 m (c) 850 hPa (d) 500 hPa & (e) 200 hPa levels based on 0000 UTC of 29th October, 2015

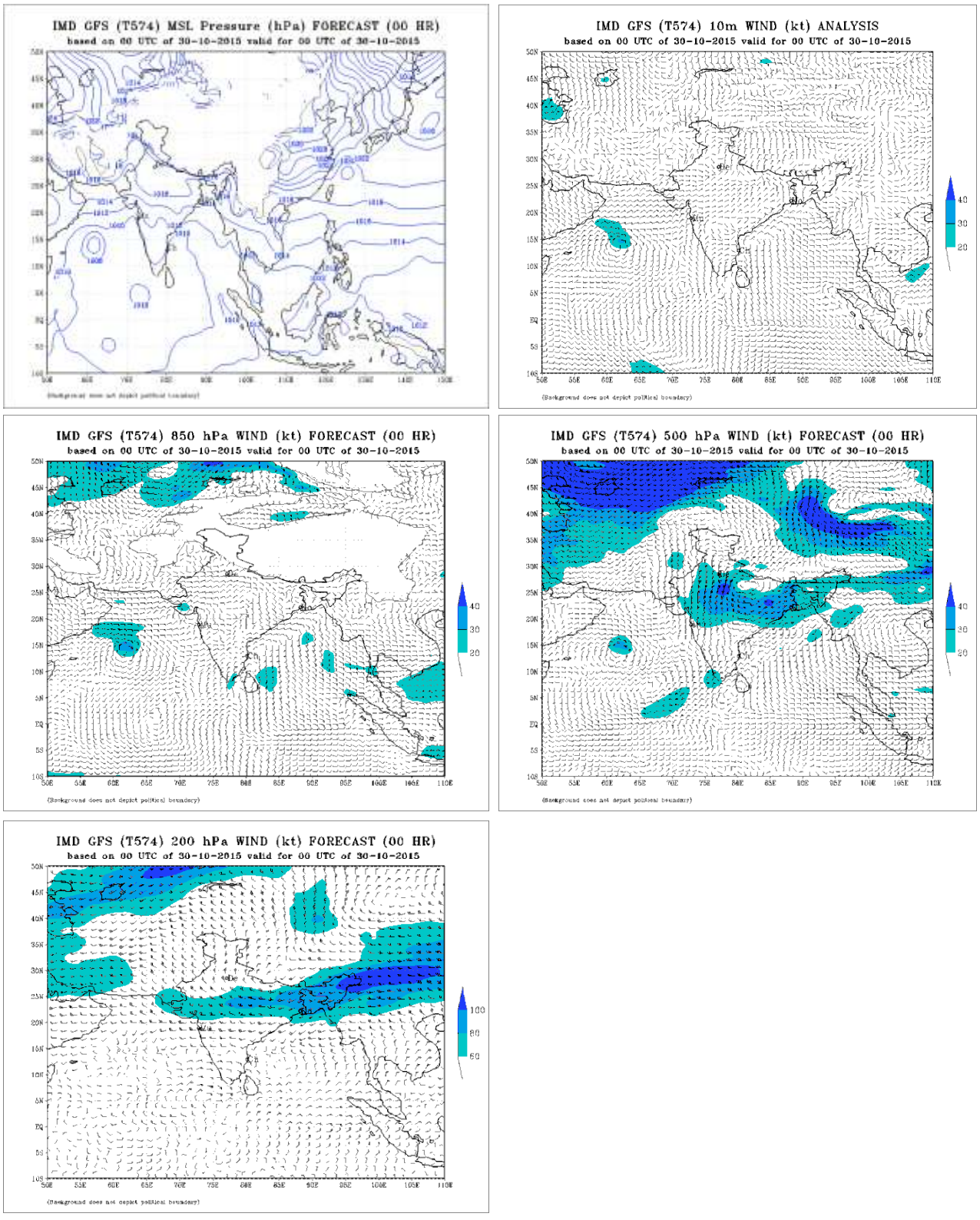
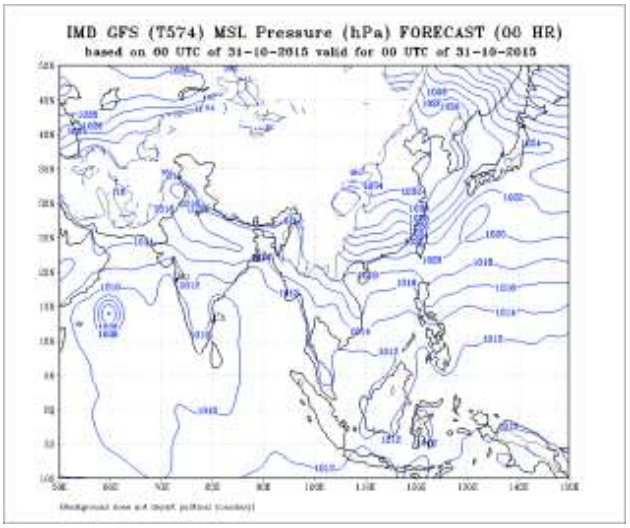
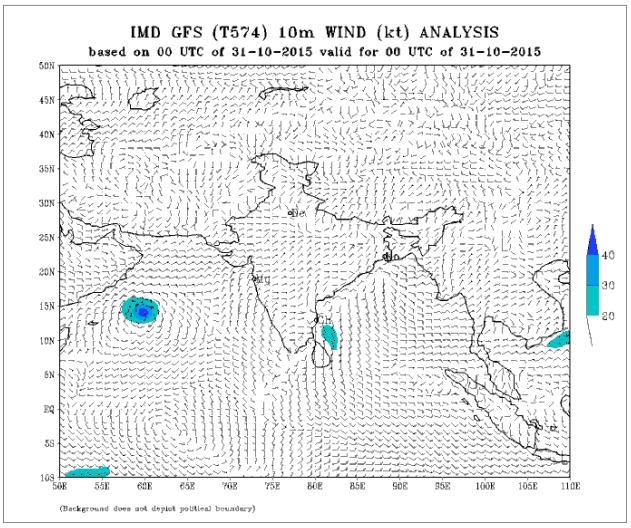
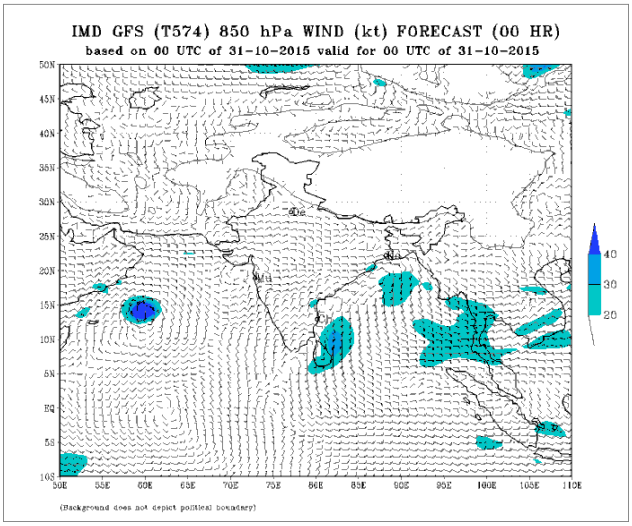
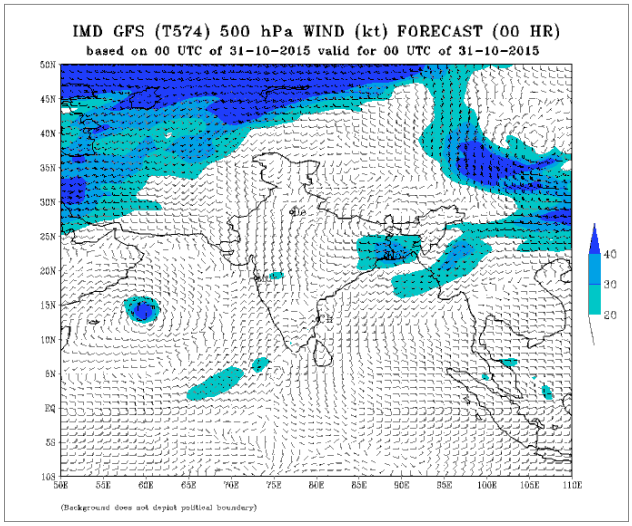


Fig 4.2.1.13 (iii)IMD-GFS analyses of (a) MSLP and winds at (b) 10 m (c) 850 hPa (d) 500 hPa & (e) 200 hPa levels based on 0000 UTC of 30th October, 2015









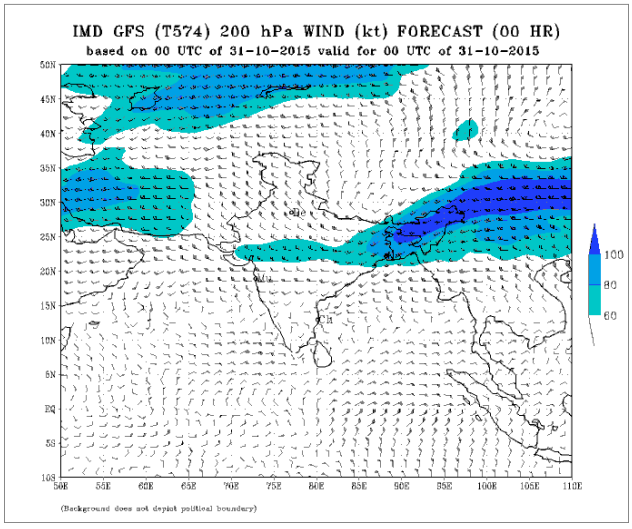
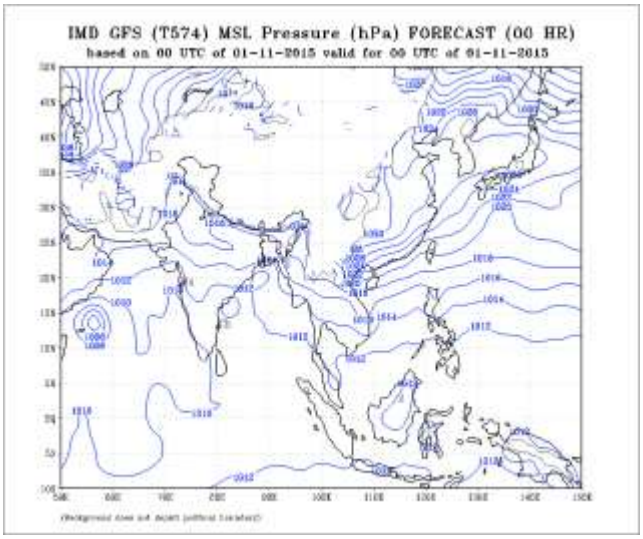
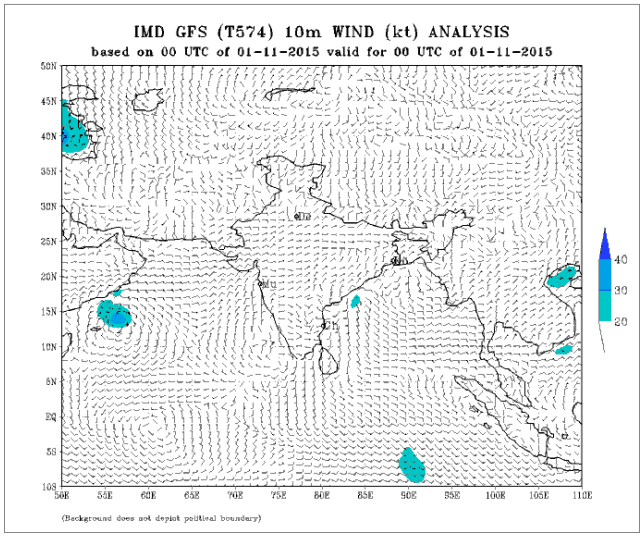
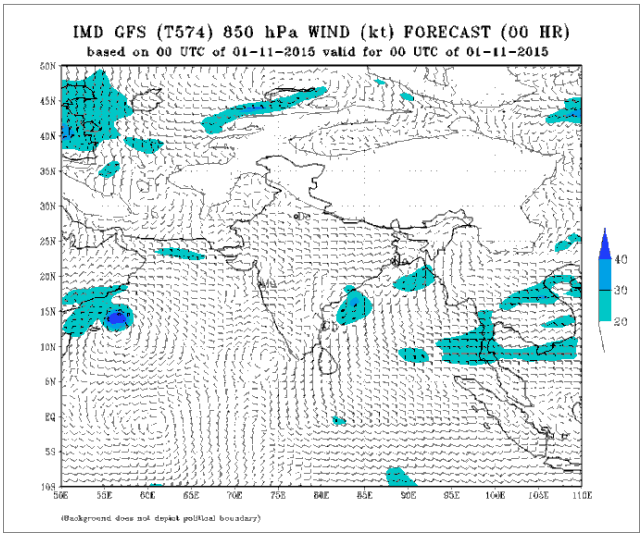
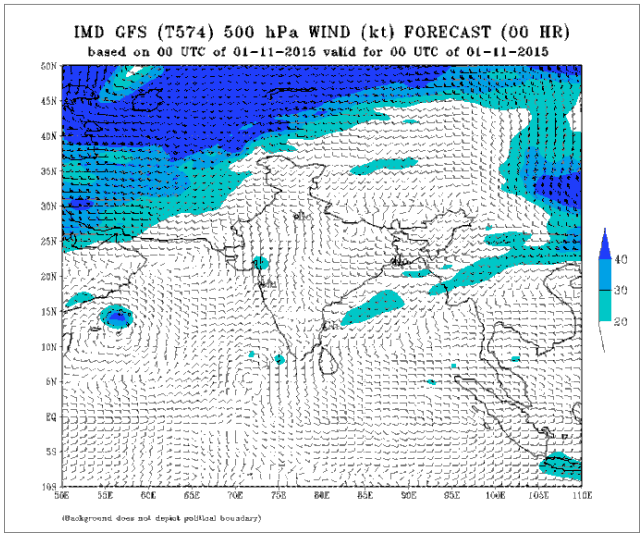


Fig 4.2.1.13 (iv) IMD-GFS analyses of (a) MSLP and winds at (b) 10 m (c) 850 hPa (d) 500 hPa & (e) 200 hPa levels based on 0000 UTC of 31st October, 2015









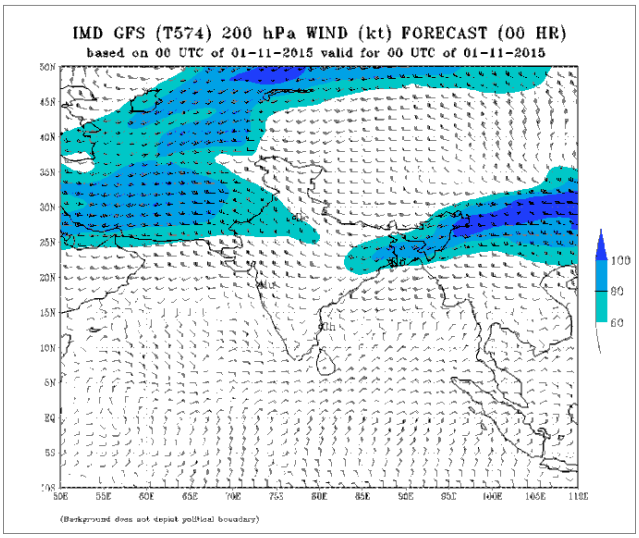


Fig 4.2.1.13 (v) IMD-GFS analyses of (a) MSLP and winds at (b) 10 m (c) 850 hPa (d) 500 hPa & (e) 200 hPa levels based on 0000 UTC of 1st Nov. 2015

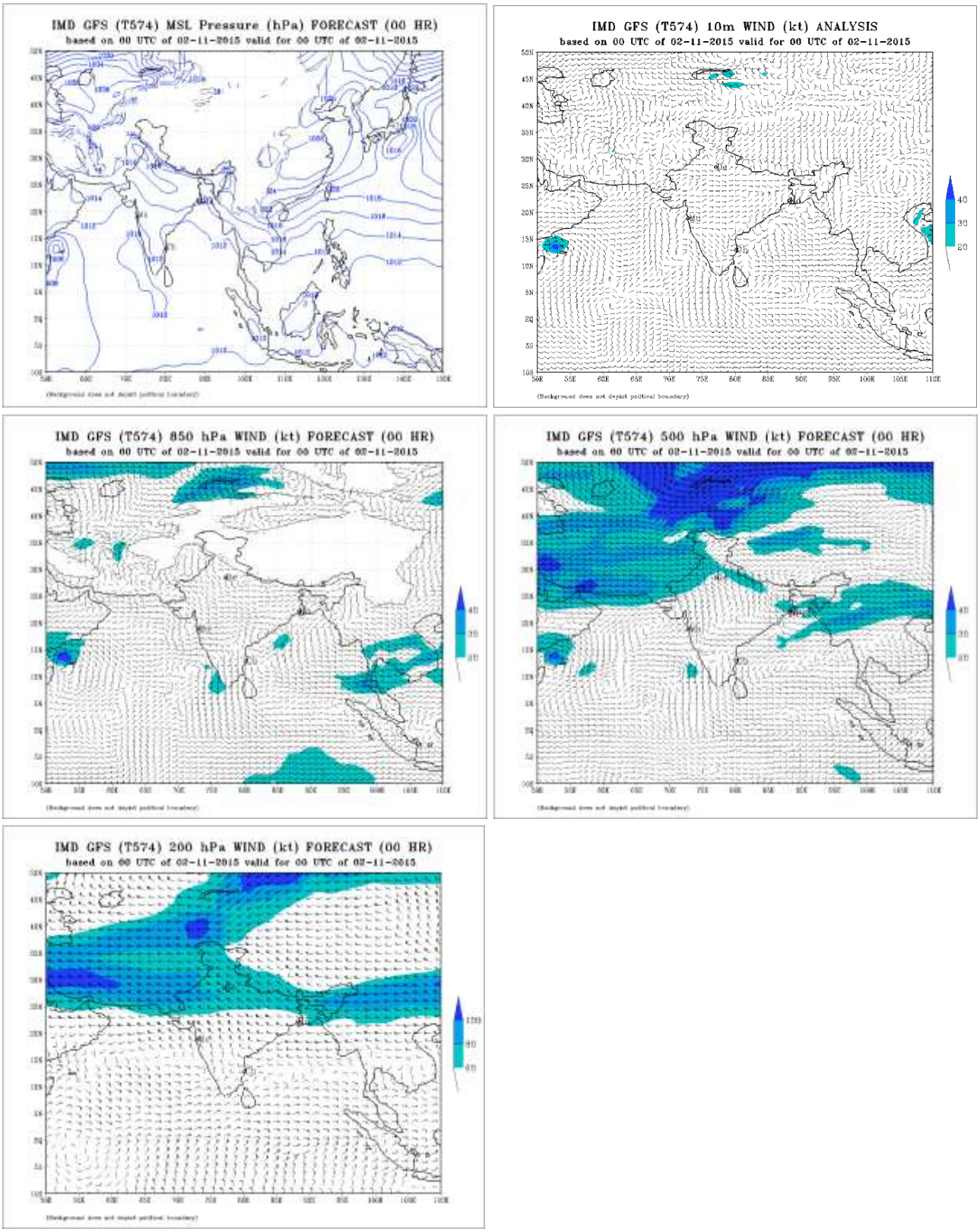
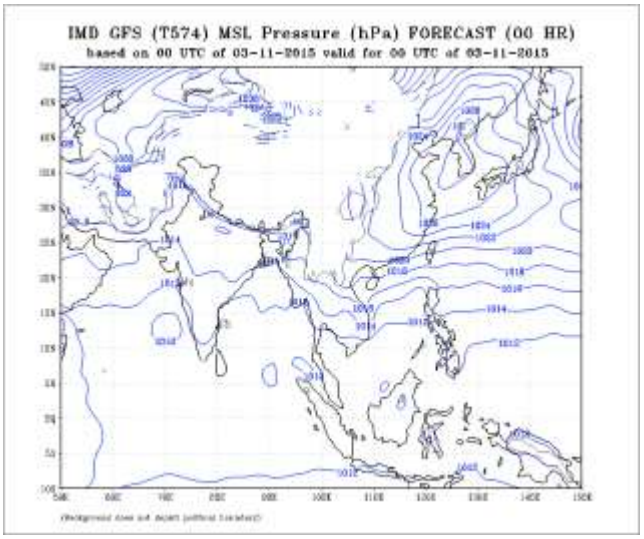
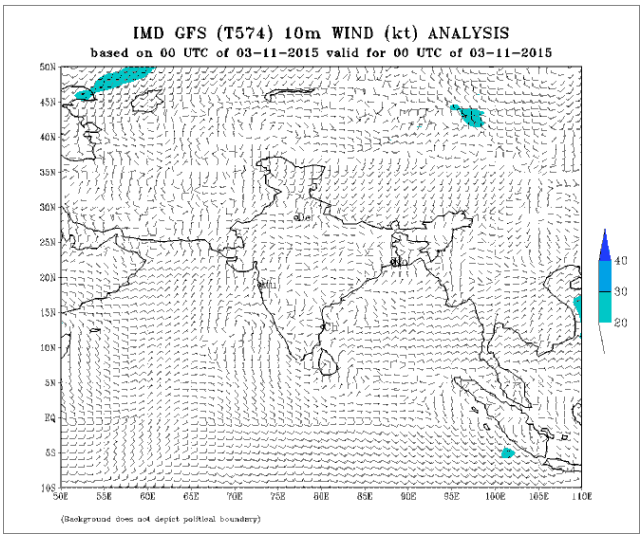
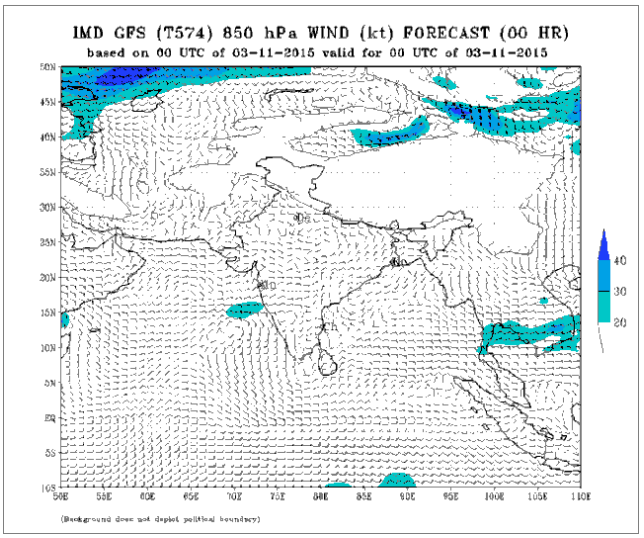
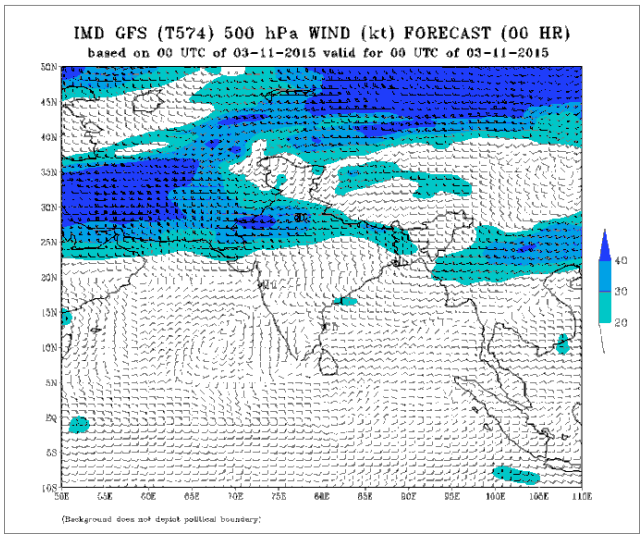


Fig 4.2.1.13 (vi) IMD-GFS analyses of (a) MSLP and winds at (b) 10 m (c) 850 hPa (d) 500 hPa & (e) 200 hPa levels based on 0000 UTC of 2nd Nov. 2015









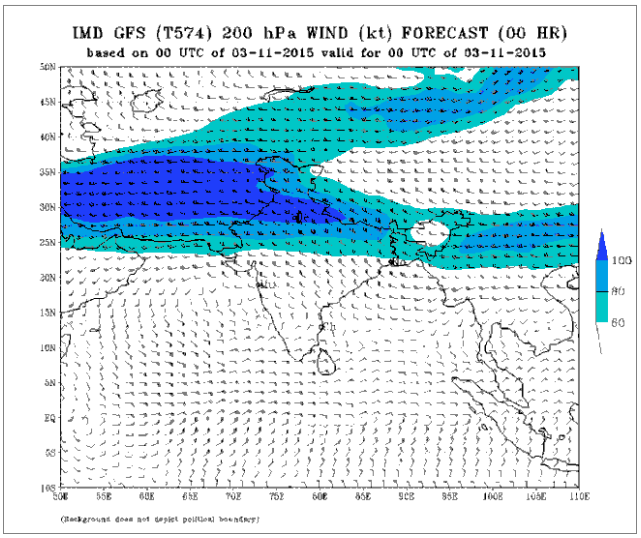


Fig 4.2.1.13 (vii) IMD-GFS analyses of (a) MSLP and winds at (b) 10 m (c) 850 hPa (d) 500 hPa & (e) 200 hPa levels based on 0000 UTC of 3rd Nov. 2015

4.2.1.8 Realized Weather:

Rainfall:

Rainfall associated with the system is depicted in Fig 4.2.1.14 (a & b) based on IMD-NCMRWF GPM merged gauge rainfall data.

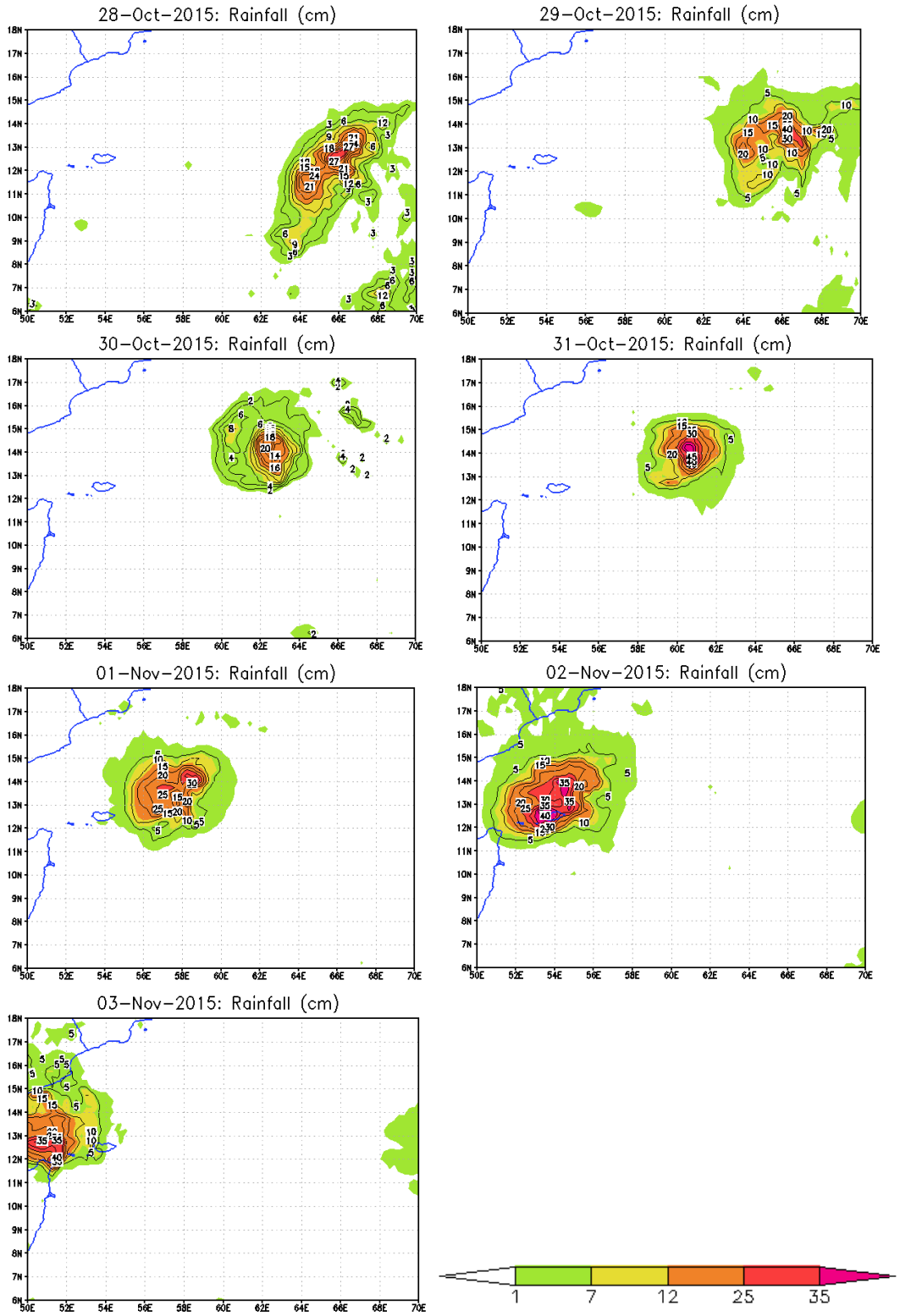


Fig. 4.2.1.14 (a) IMD-NCMRWF GPM merged gauge rainfall data during the period 28 October to 03 November 2015 (with the rainfall categories as per IMD as per IMD's criteria)

During the initial stage of formation of the system, on 28th, rainfall belt was oriented along NE-SW and the rainfall maximum was observed to the northeast of the system centre. Subsequently, with the organisation of the system, convection became more and more organised and rainfall was symmetric about the centre on 31st. Rainfall of the order of 25-30 cm was realised near the core of the system on 28th and about 30-45 cm was realised in the wall cloud region during 29th October to 03rd November.

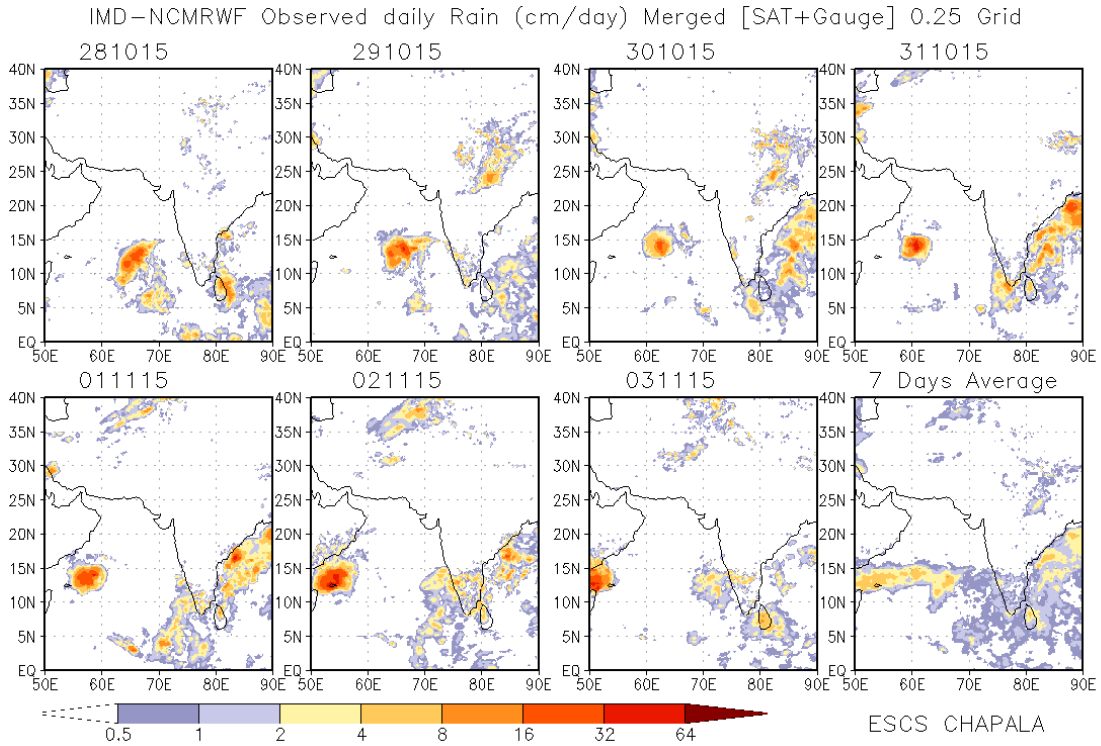


Fig. 4.2.1.14 (b) IMD-NCMRWF GPM merged gauge rainfall data during the period 28 October to 03 November 2015

4.2.1.9 Damage due to ESCS Chapala

As per media and press report, ESCS Chapala killed at least five people and caused widespread damage as it brushed past Socotra Island of Yemen. More than 50,000 people in Yemen, including about 18,000 on Socotra, were displaced because of Cyclone Chapala.

Some photographs of damages caused by ECSC Chapala in Yemen are given in Fig. 4.2.1.15.

Shore of Hadramout, damaged vehicles due to heavy rains and winds

Vehicles swept away by water in Socotra

Mukkala, 2rd Nov

Southern Yemen hits by flooding and high winds

City flooded in Mukkala, 3rd Nov

City flooded in Mukkala, 2nd Nov

Fig. 4.2.1.15 Damages caused due to ESCS Chapala over Yemen

4.2.2 Extremely Severe Cyclonic Storm, 'Megh' over the Arabian Sea (05-10 November 2015)

4.2.2.1 Introduction

A depression formed over the eastcentral Arabian Sea (AS) at 0000 UTC of 5th November from a low level circulation over Lakshadweep and neighbourhood. It moved westwards/west-southwestwards and intensified into a cyclonic storm (CS) at 1200 UTC of 5th November. It continued its west-southwestward movement and intensified into a severe cyclonic storm (SCS) at 0600 UTC of 7th, into a very severe cyclonic storm (VSCS) at 1500 UTC of 7th and rapidly intensified into an extremely severe cyclonic storm (ESCS) at 0300 UTC of 8th. Maintaining its peak intensity for a short period of about 6 hrs, it weakened gradually into a VSCS at 0000 UTC of 9th. From 0600 UTC of 9th, it exhibited west-northwestward movement, weakened rapidly into an SCS at 2100 UTC of 9th, into a CS at 0300 UTC of 10th and deep depression (DD) at 0600 UTC of 10th. It recurved northeastwards from 0300 UTC of 10th and crossed Yemen coast near latitude 13.4°N and longitude 46.1°E around 0900 UTC 10th as a DD. Continuing its northeastwards movement, it weakened into a depression at 1500 UTC of 10th and into a well marked low pressure area over Yemen and neighborhood at 1800 UTC of 10th.

The salient features of the system are as follows.

i. ESCS Megh occurred just after a week of formation of ESCS, Chapala over Arabian Sea. Also, ESCS Megh has been the first back to back cyclone after Chapala that reached Gulf of Aden and crossed Yemen within a week.
ii. ESCS Megh was the second ESCS after Chapala crossing Yemen coast in the satellite era. Chapala crossed Yemen coast close to the southwest of Riyan near 14.1^0N/48.65^0E during

0100-0200 UTC as a VSCS (with maximum sustained wind speed (MSW) of 65 knots) and Megh crossed Yemen coast near 13.4°N/46.1°E around 0900 UTC as a DD (with MSW of 30 knots).

iii. Unlike Chapala, ESCS Megh was a small core system with a pin hole eye.

iv. Megh maintained the intensity of ESCS for 18 hours (0803-0821) unlike Chapala which maintained the intensity of ESCS for 78 hours (3003-0209). The peak intensity in Megh was 95 knots for a period of 3 hours (0806-0809) against 115 knots for a period of 15 hours (3009-3100) in case of Chapala.

v. Lowest estimated central pressure (ECP) was 964 hPa with a pressure drop of 44 hPa unlike Chapala where it was 940 hPa with a pressure drop of 66 hPa.

vi. Like Chapala, ESCS Megh also experienced rapid intensification on 0000 UTC of 7^{th} when its MSW increased from 45 knots to 85 knots at 0000 UTC of 8^{th} (rise in wind speed 40 knots in 24 hours). During same period the ECP fell from 994 hPa to 974 hPa (20 hPa fall in 24 hours).

vii. ESCS Megh experienced rapid weakening over Gulf of Aden from 1800 UTC of 9^{th} (MSW 65 knots) to 0600 UTC of 10^{th} (MSW 35 knots), i.e. Megh experienced a fall in MSW by 30 knots in 12 hours.

viii. The ESCS Megh moved west to west-southwestwards throughout its life period till landfall over Yemen. While, ESCS Chapala moved initially north-northwestwards and then west-southwestwards to Yemen.

ix. Both ESCS Chapala and Megh could intensify upto the stage of ESCS under favourable environmental conditions, mainly low vertical wind shear (5-10 knots) around the system centre and the forward sector of the storm.

x. The system had the longest track length after VSCS Phet in 2010, as it travelled a distance of about 2307 km during its life period.

xi. The Accumulated Cyclone Energy (ACE) was about 8.2 X 10^4 $knot^2$ which is also the maximum after VSCS Phet in 2010 and ESCS Chapala in 2015 over the Arabian Sea.

xii. The Power Dissipation Index was 6.07 X 10^6 $knot^3$ which is the maximum after VSCS Phet in 2010 and ESCS Chapala in 2015 over the Arabian Sea.

xiii. The ESCS Megh had a life period of 5.7 days against long period average of 4.7 days in post-monsoon season for VSCS/ESCS over Arabian Sea)

xiv. The westward movement of the cyclone away from the Indian coasts was predicted from the first bulletin itself i.e. on 5^{th} November 2015 (0300 UTC). Every three hourly Tropical Cyclone Advisories were issued to WMO/ESCAP member countries, Yemen and Somalia.

xv. The numerical weather prediction (NWP) and dynamical statistical models provided reasonable guidance with respect to its genesis and track. However, most of the NWP and dynamical statistical models except HWRF could not predict the landfall and rapid intensification/ weakening of ESCS Megh.

Brief life history, characteristic features and associated weather along with performance of NWP and operational forecast of IMD are presented and discussed in following sections.

4.2.2.2 Monitoring of ESCS,'Megh'

The cyclone was monitored & predicted continuously since its inception by IMD. The forecast of its genesis on 5^{th} November, its track, intensity, landfall over Yemen were predicted with sufficient lead time. The observed track of the cyclone over AS during 5^{th} -10^{th} November is presented in fig.4.2.2.1.

At the genesis stage, the system was monitored mainly with satellite observations. Various national and international NWP models and dynamical-statistical models including

IMD's and NCMRWF's global and meso-scale models, dynamical statistical models for genesis and intensity were utilized to predict the genesis, track and intensity of the cyclone. Tropical Cyclone Module, the digitized forecasting system of IMD was utilized for analysis and comparison of various models guidance, decision making process and warning product generation.

4.2.2.3 Brief life history

4.2.2.3.1. Genesis

An upper air cyclonic circulation in lower levels lay over southeast AS and adjoining Lakshadweep area on 1st November. It moved west-nothwestwards and lay over eastcentral AS on 2nd. It persisted over the same region on 3rd and extended upto mid-tropospheric levels. Under its influence, a low pressure area formed over eastcentral AS on 4th. On 0000 UTC of 5th, the winds were higher over the northeastern sector. The sea surface temperature (SST) was 29^0C and the ocean thermal energy (OTE) was about 60-80 KJ/cm^2 around system centre. The vertical wind shear was about 5-10 knots (low) around the system centre. The low level relative vorticity was 50 KJ/cm^2. Lower level convergence was 5X10^{-5}s^{-1} and upper level divergence was 10X10^{-5}s^{-1}. Vorticity at 850 hPa was 50 X10^{-5}s^{-1}. The low level relative vorticity and convergence had increased during previous 12 hrs. The upper tropospheric ridge at 200 hpa level ran along 16^0N. There was favourable poleward and westward outflow in association with the anti-cyclonic circulation lying to the northeast of the system centre alongwith this ridge. All these conditions led to intensification of the low pressure area into a depression at 0000 UTC of 5th. Considering the large scale features, the Madden Jullian Oscillation Index was in phase -2 over west-equatorial Indian Ocean with amplitude greater than 2. The Indian Ocean Dipole was positive, indicating higher warming over west equatorial Iindian Ocean, which helped in maintaining the warmer SST over AS even after passage of ESCS Chapala.

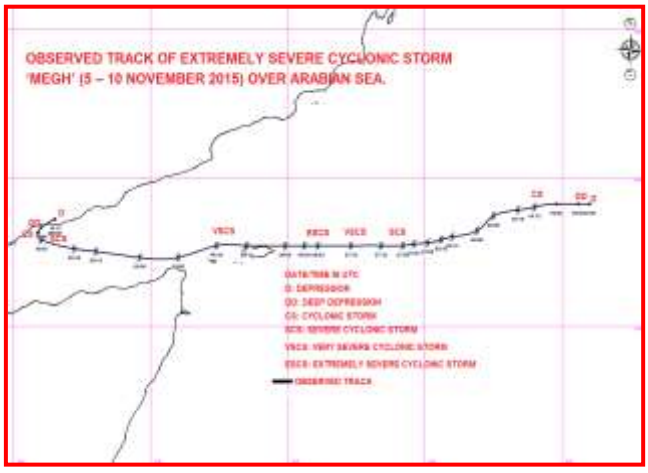


Fig. 4.2.2.1 Observed track of ESCS,'Megh' over AS during 5th-10th November 2015

4.2.2.3.2 Intensification

Similar environmental conditions prevailed and the system intensified into a CS at 1200 UTC of 5th. Due to favourable large scale environmental features like MJO Index and weak vertical wind shear, the system experienced rapid intensification from 0300 UTC of 7th when its maximum sustained wind speed increased from 45 knots to 90 knots at 0300 UTC of 8th (rise in wind speed by 45 knots in 24 hours). During same period the ECP fell from 994 hPa to 968 (fall of 26 hPa in 24 hours). On 0300 UTC of 7th, the low level relative vorticity was 150 x 10^{-5} sec-1, convergence was 5-10 x 10^{-5} sec-1, and divergence was 30 x 10^{-5} sec-1. The SST around the

system centre was 29°C. The OTE was about 35-50 KJ/cm^2 around system centre and 50-75 KJ/cm2 to west-southwest of the system centre The vertical wind shear was about 10 knots (low) around the system centre during the period of rapid intensification. The system reached its peak intensity (95 kt) at 0600 UTC of 8th.

The system started weakening from 1200 UTC of 8th. At 1200 UTC, the low level relative vorticity was 150 x 10^{-5} sec^{-1} and convergence was 20 x 10-5 sec-1. The upper level divergence decreased and was about 10 x 10^{-5} sec^{-1}. The SST around the system centre was 28°C. The OTE was 40-50 KJ/cm^2 around the system centre and then showed decreasing trends towards Gulf of Aden. The vertical wind shear was about 10 knots around the system centre. The low vertical wind shear was mitigating the adverse impact of cold and dry air intrusion from northwest. However, the system started weakening as it passed very close to Gulf of Aden around 0600 UTC of 8th and suffered land interaction. Also, it moved over an area with lower OTE over Gulf of Aden. Enhanced rapid weakening was observed from 1800 UTC of 9th due to land interaction with rugged terrain of Yemen, lower OTE over Gulf of Aden and dry air incursion. The system started weakening from 1200 UTC of 8th, the rate of weakening was slow till 1800 UTC of 9th. During this period the system passed close to the northern border of Socotra Island, moved into colder Gulf of Aden and the track was close to northern tip of Somalia, but the low vertical wind shear inhibited the adverse effect of cold and dry air from northwest in weakening the wall cloud region. It indicates that the internal dynamics played a significant role in maintaining intensity of the system apart from the external dynamics including environmental conditions. From 2100 UTC of 9th, the system exhibited rapid weakening as it lay over western part of Gulf of Aden and had interaction with rugged terrain of Yemen. It rapidly weakened from 65 kts at 1800 UTC of 9th to 30 kts at 0600 UTC of 10th just before landfall. The best track parameters of the systems are presented in Table 1**.** The total precipitable water imageries (TPW) during 5th to 10th November are presented in fig. 4.2.2.2 to show the role of TPW on intensification and weakening. The vertical wind shear during the life period of the system is shown in fig. 4.2.2.3 to illustrate its impact on intensification and weakening.

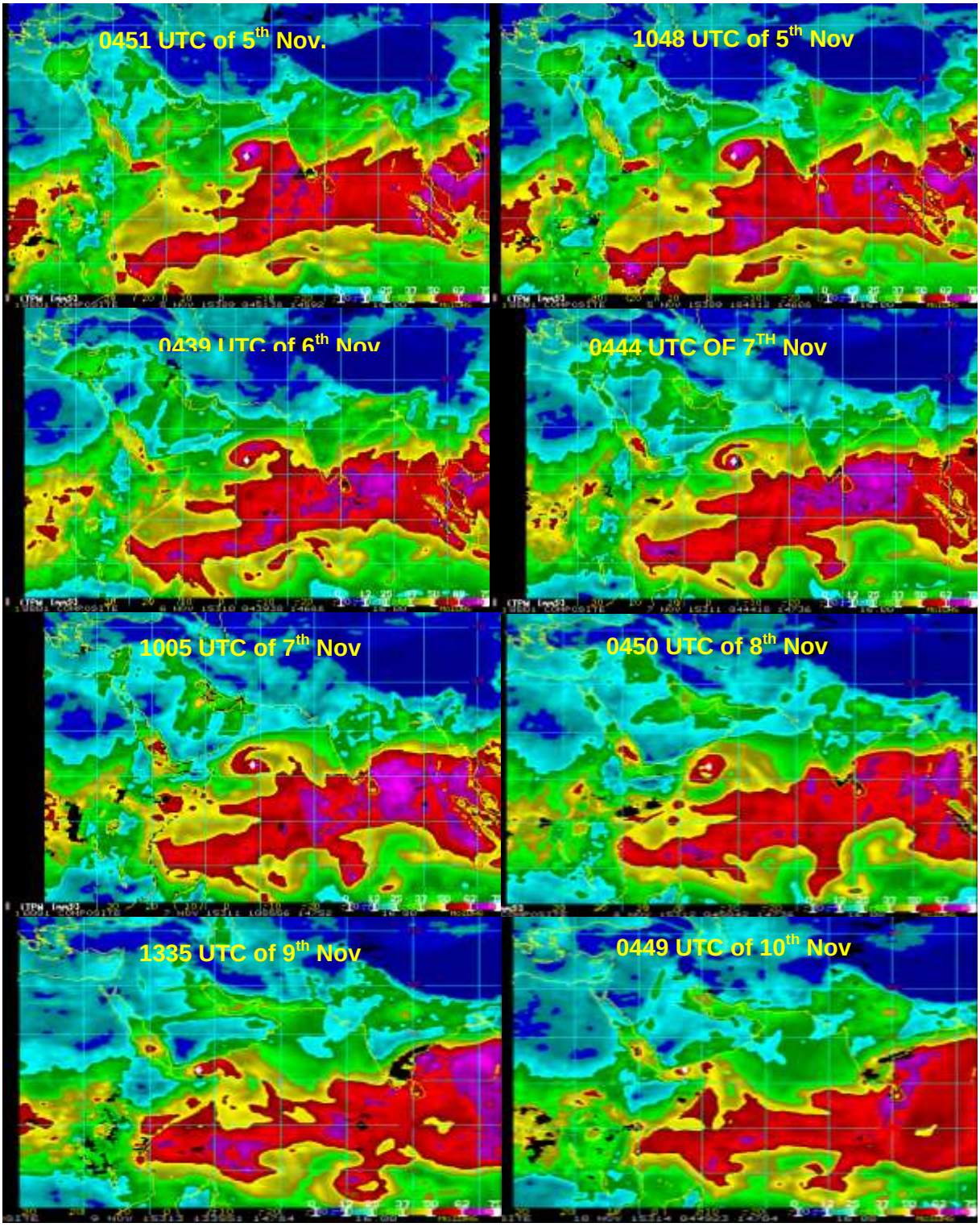


Fig. 4.2.2.2 Total precipitable water imageries during 5th to 10th November 2015

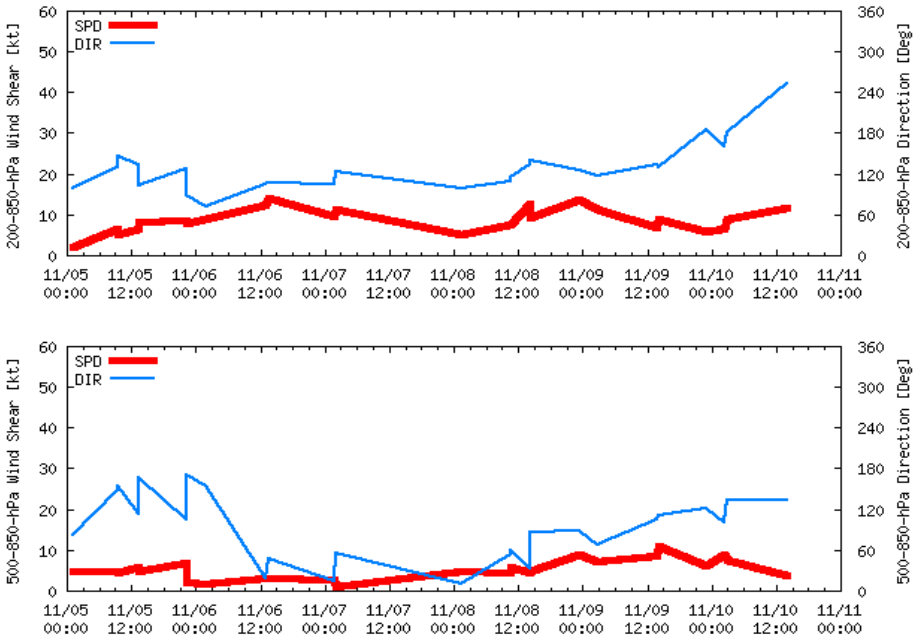


Fig. 4.2.2.3 Wind shear and wind speed in the middle and deep layer around the system during 05th to 10th Nov 2015.

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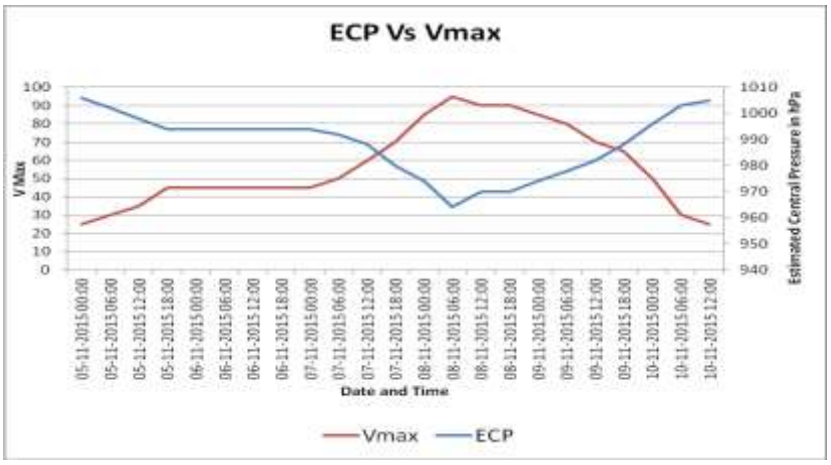


Fig. 4.2.2.4 Lowest estimated central pressure and the maximum sustained wind speed

4.2.2.3.3 MSW and estimated central pressure (ECP)

The lowest ECP and the MSW speed during the life cycle of ESCS Megh are presented in fig. 4.2.2.4. The lowest ECP has been 964 hPa. The highest MSW speed was 95 knots during 0600 - 0900 UTC of 8th November. At the time of landfall, the ECP was 1003 hPa and MSW was 30 knots (deep depression) due to weakening of the system over Gulf of Aden. The figure also indicates that rapid intensification of the system commenced from 0300 UTC of 7th and continued upto 0600 UTC of 8th. It is mainly attributed to low vertical wind shear (05-10 kts) around the system centre and the forward sector of the system accompanied with favourable upper level divergence due to radial outflow. Also the large scale features like IOD and MJO were favouring amplification of the convection.

4.2.2.3.4 Translational Speed and direction of movement

The six hourly translational speed and direction of movement of ESCS is presented in fig. 4.2.2.5(a).

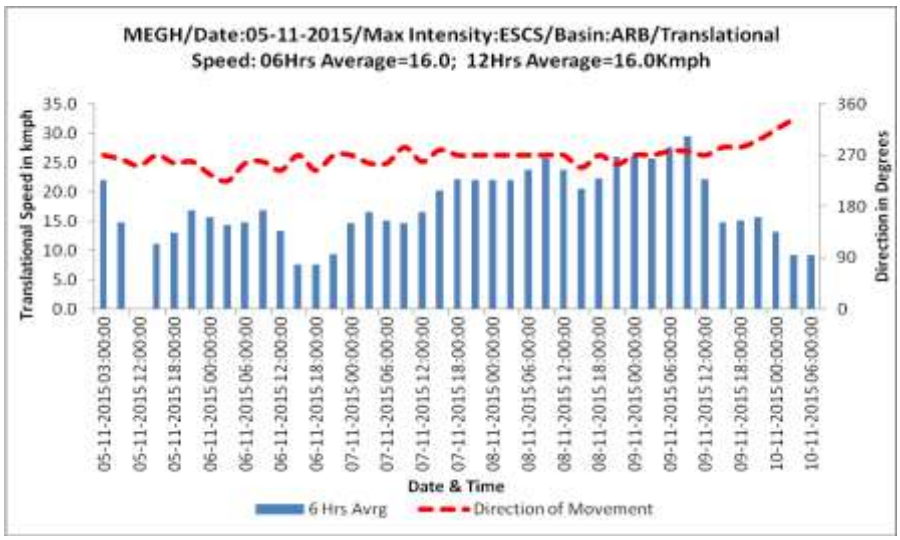


Fig. 4.2.2.5(a).Six hours average translational speed and direction of movement in association with ESCS Megh

The average translational speed of the system during entire life cycle was 16 kmph. However, on 8th and 9th November it moved with an average translational speed of 22.0 kmph and reached maximum of 29.6 kmph at 1200 UTC of 9th. It the decreased sharply till 1500 UTC of 9th (14.8 kmph). It moved slowly till 0000 UTC of 10th and then decreased sharply.

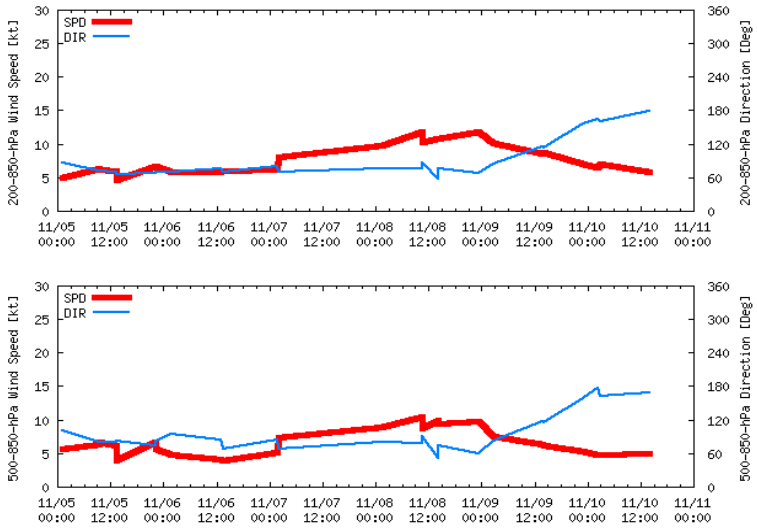


Fig. 4.2.2.5(b) Wind speed and direction in the middle and deep layer around the system during 05th to 10th Nov 2015.

ESCS Megh moved west to west-southwestwards till 10th November, then recurved northeastwards and crossed Yemen coast. The upper tropospheric ridge was running along 16.0^{0}N in association with anti-cyclonic circulation lying to the northeast of the system centre. Under its influence, the system moved west/west-southwestwards till 0900 UTC of 9th November. Thereafter, the system started recurving northwards as the anticyclonic circulation moved northeastwards gradually from 9th with the ridge extending southwestwards towards northern tip of Somalia adjacent to Gulf of Aden on 0600 UTC of 10th leading to northeastwards recurvature. Continuing its northeastwards movement, the system crossed Yemen coast near lat. 13.4^{0}N/long.46.1^{0}E. To examine the steering flow, the mean wind speed and direction in

middle and deep layer around the cyclone field is shown in Fig. 4.2.2.5 (b). It indicates that the ESCS Megh was steered by middle to upper tropospheric winds.

The system had the longest track length after VSCS Phet in 2010 as it travelled a distance of about 2307 km during its life period (Chapala-2250 km).

To summarise, the genesis and intensification of the system just after the passage of ESCS Chapala, can be attributed to the favourable environmental conditions like vertical wind shear and large scale features like IOD and MJO.

Table 4.2.2.1: Best track positions and other parameters of Extremely Severe Cyclonic Storm (ESCS) 'MEGH' over the Arabian Sea during 05-10 November, 2015

Date	Time (UTC)	Centre lat.° N/ long.° E	C.I. NO.	Estimated Central Pressure (hPa)	Estimated Maximum Sustained Surface Wind (kt)	Estimated Pressure drop at the Centre (hPa)	Grade
05-11-2015	0000	14.1/66.0	1.5	1006	25	3	**D**
	0300	14.1/65.6	1.5	1004	25	4	D
	0600	14.1/64.8	2.0	1002	30	5	**DD**
	1200	14.0/64.0	2.5	998	35	7	**CS**
	1500	13.9/63.7	2.5	996	40	8	CS
	1800	13.9/63.4	3.0	994	45	10	CS
	2100	13.8/63.0	3.0	994	45	10	CS
06-11-2015	0000	13.7/62.5	3.0	994	45	10	CS
	0300	13.5/62.2	3.0	994	45	10	CS
	0600	13.2/61.9	3.0	994	45	10	CS
	0900	13.1/61.5	3.0	994	45	10	CS
	1200	13.0/61.0	3.0	994	45	10	CS
	1500	12.9/60.8	3.0	994	45	10	CS
	1800	12.9/60.6	3.0	994	45	10	CS
	2100	12.8/60.4	3.0	994	45	10	CS
07-11-2015	0000	12.8/60.1	3.0	994	45	10	CS
	0300	12.8/59.6	3.0	994	45	10	CS
	0600	12.7/59.2	3.0	992	50	12	**SCS**
	0900	12.6/58.8	3.5	990	55	16	SCS
	1200	12.7/58.4	3.5	988	60	18	SCS
	1500	12.6/57.9	4.0	984	65	22	**VSCS**
	1800	12.7/57.3	4.0	980	70	26	VSCS
	2100	12.7/56.7	4.5	976	80	32	VSCS
08-11-2015	0000	12.7/56.1	4.5	974	85	36	VSCS
	0300	12.7/55.5	5.0	968	90	40	**ESCS**
	0600	12.7/54.9	5.0	964	95	44	ESCS
	0900	12.7/54.2	5.0	964	95	44	ESCS

	1200	12.7/53.5	5.0	970	90	40	ESCS
	1500	12.7/52.9	5.0	970	90	40	ESCS
	1800	12.5/52.4	5.0	970	90	40	ESCS
	2100	12.5/51.7	5.0	970	90	40	ESCS
09-11-2015	0000	12.3/51.0	4.5	974	85	36	**VSCS**
	0300	12.3/50.3	4.5	976	80	32	VSCS
	0600	12.3/49.6	4.5	978	80	30	VSCS
	0900	12.4/48.8	4.0	980	75	28	VSCS
	1200	12.5/48.0	4.0	982	70	26	VSCS
	1500	12.5/47.6	4.0	986	65	22	VSCS
	1800	12.6/47.2	4.0	988	65	20	VSCS
	2100	12.7/46.8	3.5	990	60	18	**SCS**
10-11-2015	0000	12.9/46.4	3.0	996	50	14	SCS
	0300	13.1/46.2	3.0	998	40	12	**CS**
	0600	13.3/46.1	2.0	1003	30	5	**DD**
	0900	**System crossed Yemen coast near Lat. 13.4°N/Long. 46.1°E around 0900 UTC**					
	1200	13.6/46.5	1.5	1005	25	3	**D**
	1800	**Weakened into a well marked low pressure area over Yemen and neighbourhood**					

D: Depression, DD: Deep Depression, CS: Cyclonic Storm, SCS: Severe Cyclonic Storm, VSCS: Very Severe Cyclonic Storm, ESCS: Extremely Severe Cyclonic Storm

4.2.2.4 Climatological aspects

Climatologically, the severe cyclonic storms crossing Yemen coasts are very rare. Prior to Megh and Chapala, one SCS (May 1960) crossed Yemen coast during 1891-2014. The track of the SCS crossing Yemen coast is shown in Fig. 4.2.2.6.

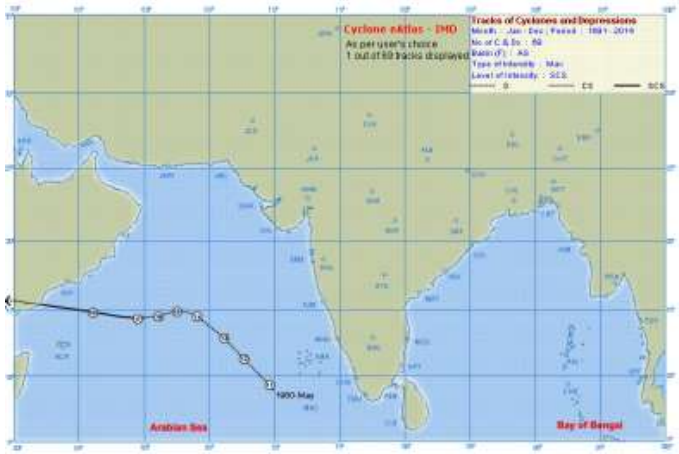


Fig. 4.2.2.6 Track of Severe cyclonic storm over Arabian Sea during the period 1891-2014 that crossed Yemen coast.

4.2.2.5 Features observed through satellite

Satellite monitoring of the system was mainly done by using half hourly Kalpana-1 and INSAT-3D imageries. Satellite imageries of international geostationary satellites Meteosat-7 and microwave & high resolution images of polar orbiting satellites DMSP, NOAA series, TRMM, Metops were also considered. Typical INSAT-3D visible/IR imageries, enhanced colored imageries and cloud top brightness tempearture imageries are presented in fig. 4.2.2.7-9.

4.2.2.5.1 INSAT-3D features

Intensity estimation using Dvorak's technique suggested that the system attained the intensity of T 1.5 on 0000 UTC of 5^{th,} Associated broken low and medium clouds with embedded moderate to intense convection lay over AS between latitude 12.0^{0}N to 17.5^{0}N and longitude 63.0^{0}E to 69.5^{0}E. Lowest cloud top temperature (CTT) was -81^{0}C. The cloud pattern was curved band type. Convection wrapped 0.5 on log 10 spiral. At 0600 UTC of 5^{th,} the system intensified to T2.0. At 1200 UTC of 5th, the depth of convection increased, the lowest CTT was -83^{0}C and system intensified to T2.5. At 1800 UTC of 5th convection further organised and the system intensified to T3.0. Convection wrapped 0.6 on log10 spiral. The system maintained its intensity till 0300 UTC of 7th. At 0600 UTC of 7th, convection further organised and intensity was T3.0. Associated broken low and medium clouds with embedded intense to very intense convection lay over the area between latitude 10.5^{0}N to 15.0^{0}N and longitude 57.0^{0}E to 61.0^{0}E. Lowest CTT was -80°C. Ragged eye was seen. The system further intensified to T3.5 at 0900 UTC of 7th. The convection showed eye pattern. Ragged eye was seen in visible imagery. Lowest CTT in wall cloud region was -81°C. Area of convection extended between latitude 10.5^{0N} to 15.0^{0}N and longitude 56.5^{0}E to 60.5^{0}E. The system further intensified to T5.0 at 0300 UTC of 8th. Area of convection extended between latitude 11.0^{0}N to 14.5^{0}N and longitude 54.0^{0}E to 57.0^{0}E. Eye was seen in both visible and IR imageries. Lowest CTT in wall cloud region was -85°C. From 1200 UTC of 8th, the system started weakening. Lowest CTT in wall cloud region was -84°C. The clouds started disorganising. At 1430 UTC, the system lost its distinct eye feature in IR imagery. Thereafter the system underwent rapid weakening from 1800 UTC of 9th.

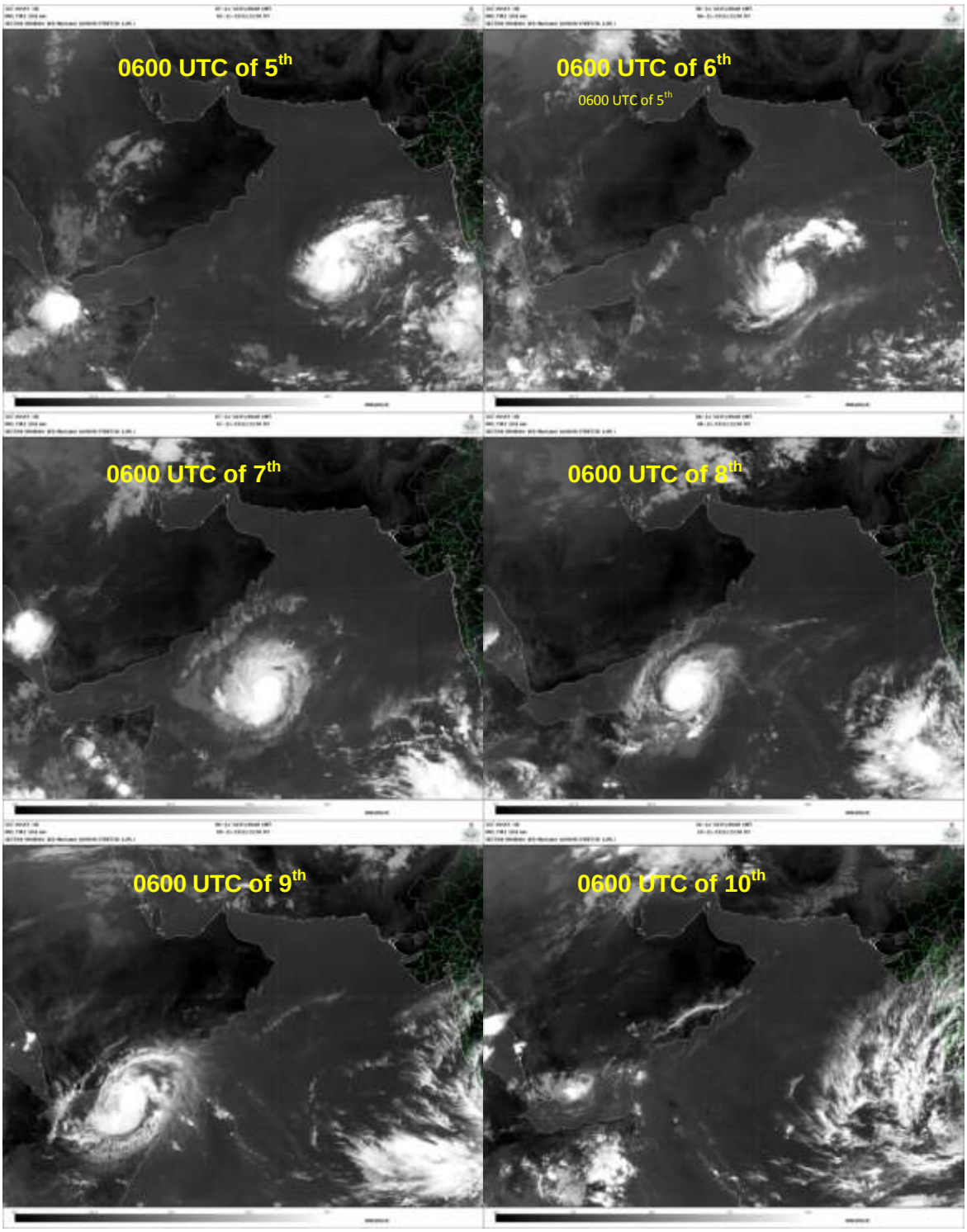


Fig. 4.2.2.7 INSAT-3D IR imageries based on 0600 UTC of 5th to 10th November 2015

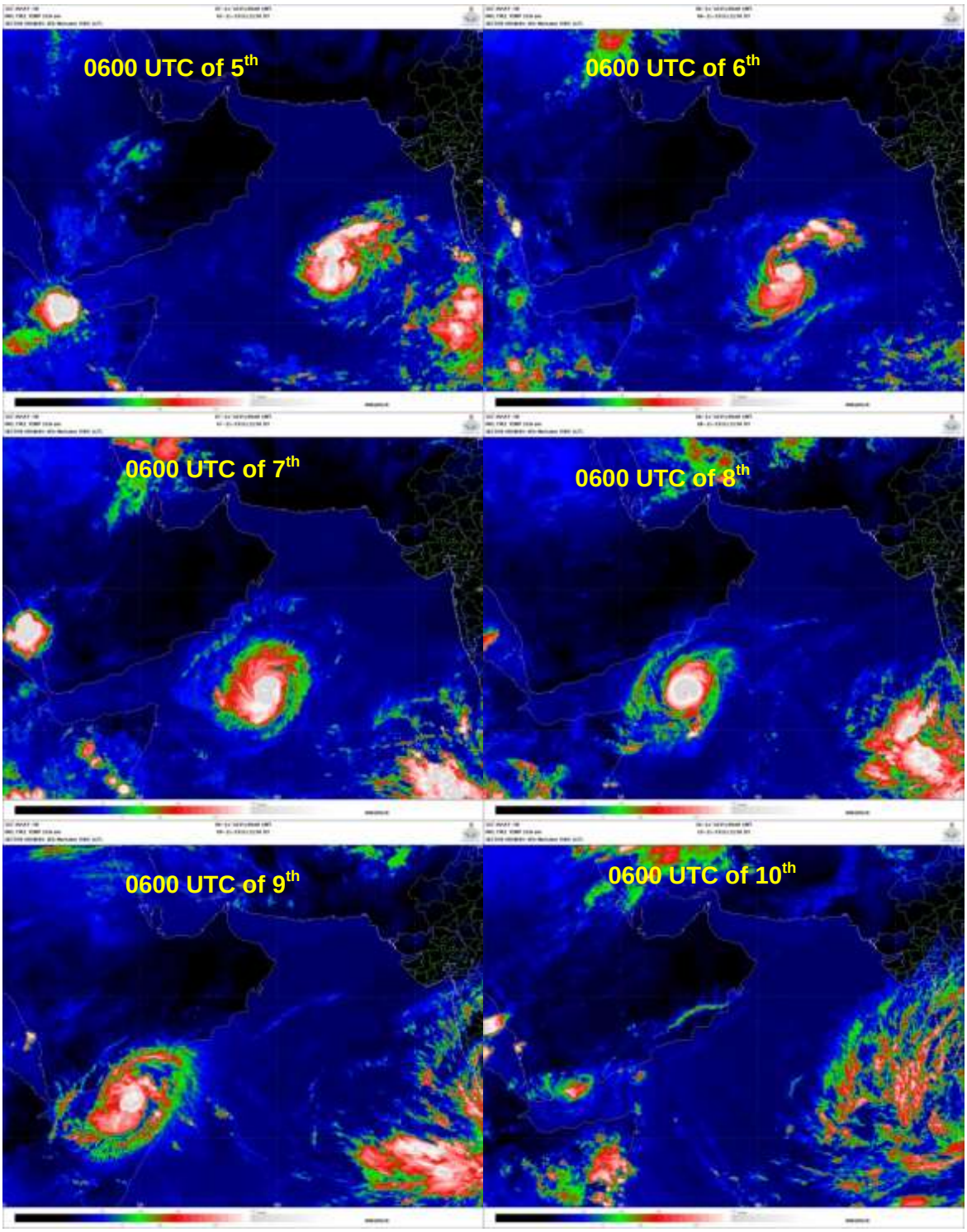


Fig. 4.2.2.8 INSAT-3D enhanced colored imageries based on 0600 UTC of 5th to 10th November 2015

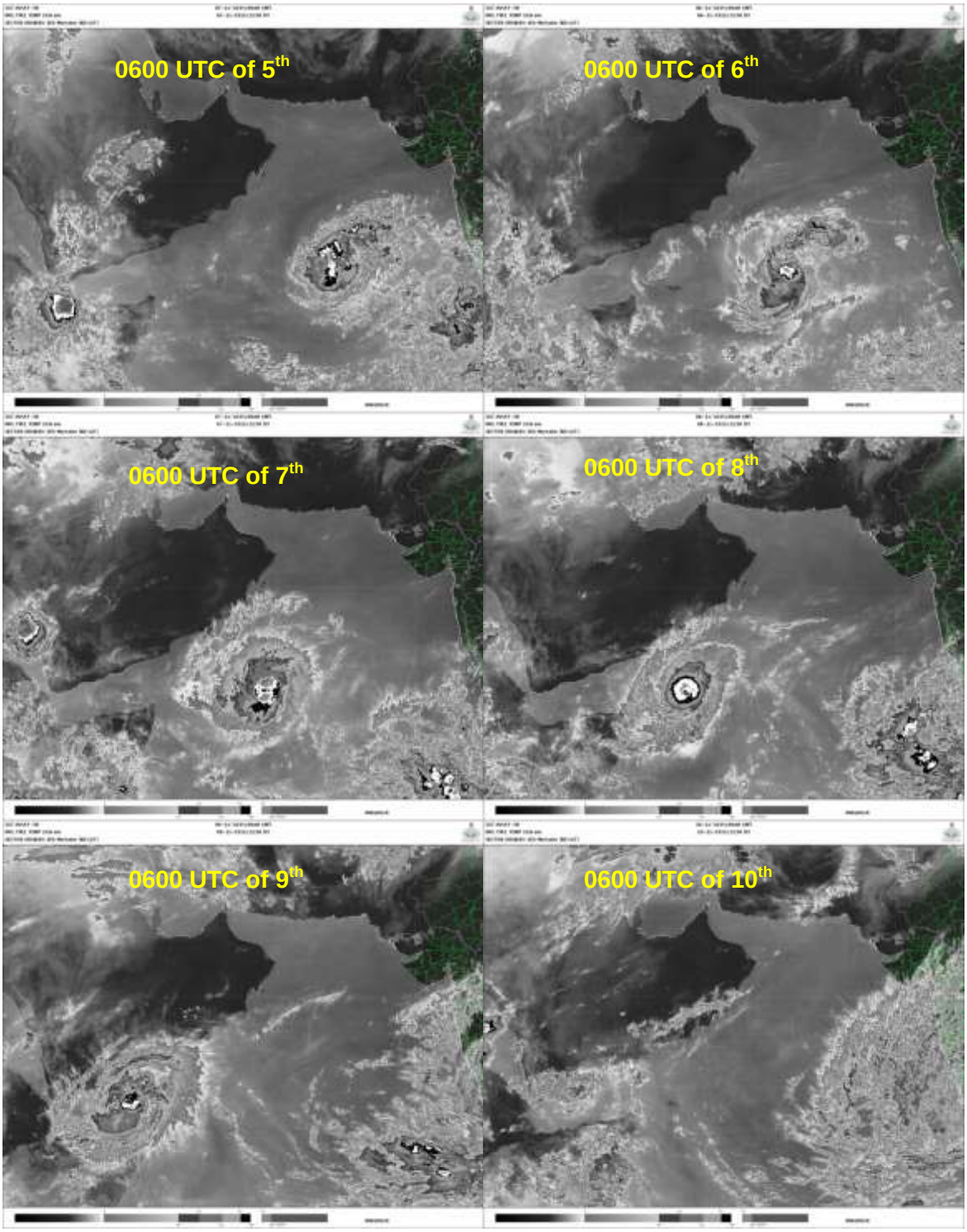


Fig. 4.2.2.9 INSAT-3D cloud top brightness temperature imageries based on 0600 UTC of 5th to 10th November 2015

4.2.2.5.2 Microwave features

SSMIS, AMSR2 and WINDSAT(37) microwave imageries of the ESCS Megh covering its life period from 05th to 10th November 2015 are presented in Fig. 4.2.2.10 .

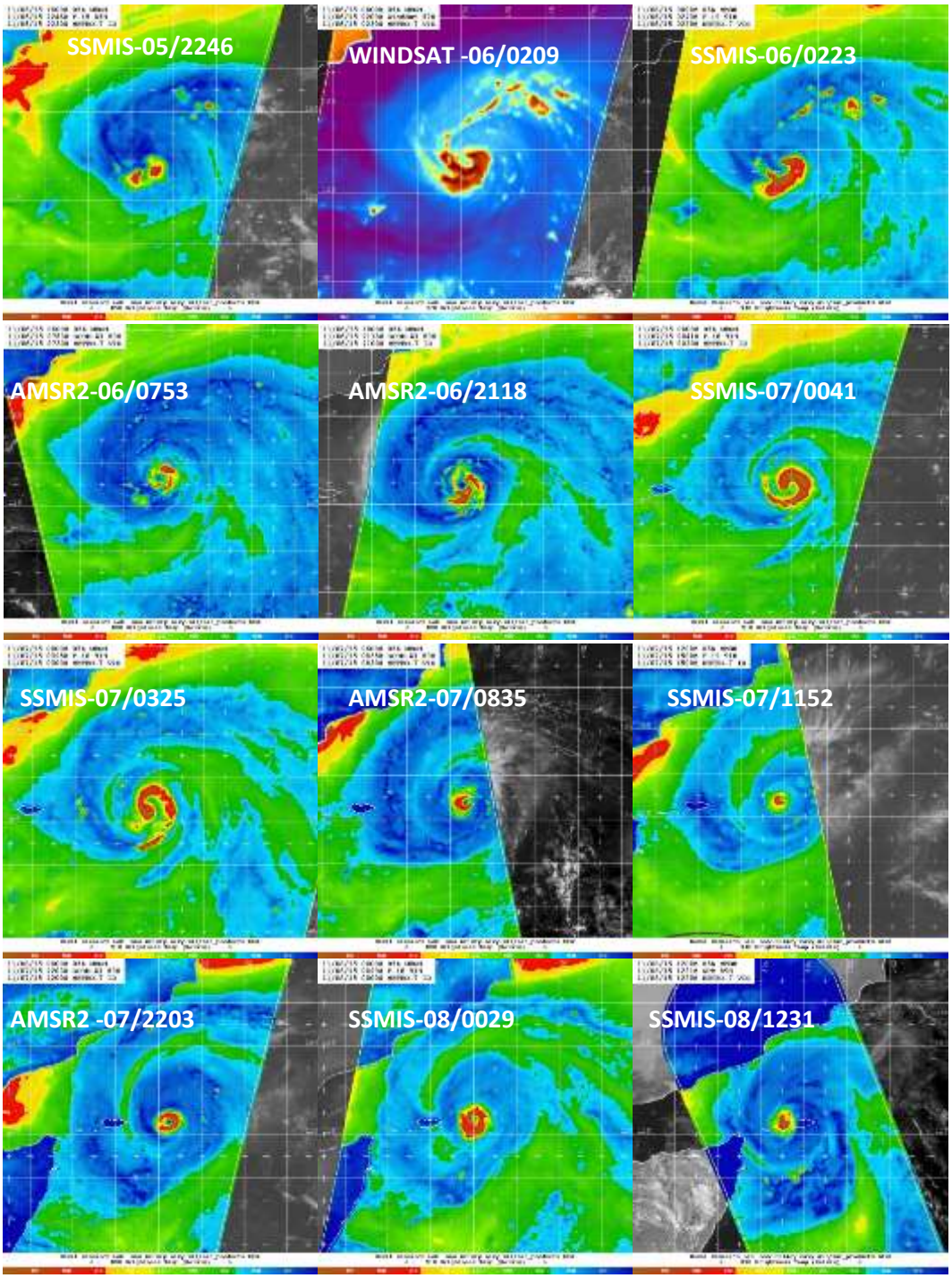


Fig. 4.2.2.10 Typical microwave imageries during 5th to 8th November 2015 in association with ESCS Megh.

On 05th and 06th, organisation of convective clouds along curved band is seen. On 06th/0753 UTC, formation of eye and development of wall cloud are observed. On 07th, the wall cloud region developed further and expanded. It is observed to spiral inwards cyclonically and completely covering the eye by 08th/0029 UTC. However, by 08th/1231 UTC, the eye-wall opened and the eye became exposed. Subsequently, disorganisation of convective clouds took place, eye became ill-defined and the system underwent rapid weakening on 09th (from T.5.0 at 09/0000 UTC to T 2.5 at 10/0000 UTC).

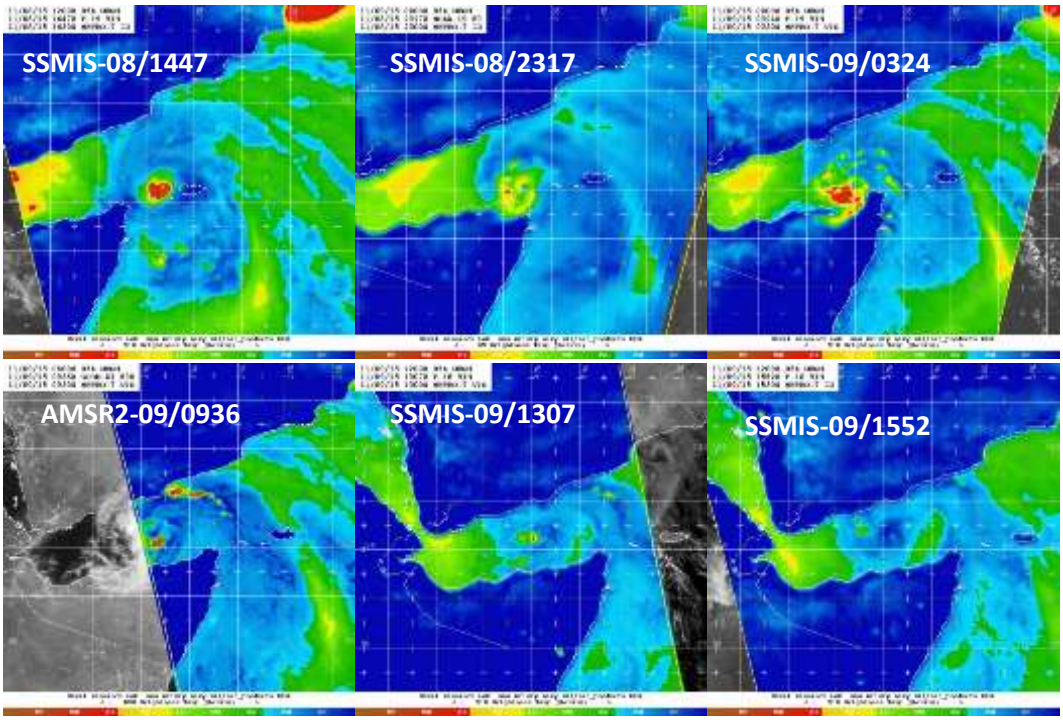


Fig. 4.2.2.10 (contd.) Typical microwave imageries during 8th to 9th November 2015 in association with ESCS Megh.

4.2.2.6 Surface wind structure

The surface wind structure during the life period of ESCS, Megh based on multi-satellite surface wind developed by CIRA, USA is shown in Fig. 4.2.2.11. It can be seen that the radius of 34 kt (outer core size) winds was higher in northeast (NE) sector. It was maximum of about 125 nm during its mature stage. Also in the radius of 50 kt/64 kt (inner core size), the winds were higher in the northeastern sector as compared to the other sector. The size of the system was maximum, especially in northeast quadrant at 0600 UTC of 9th November, while the intensity was decreasing gradually. Then it decreased sharply to 63 nm at 1200 UTC of 9th. The size then remained same upto 1800 UTC of 9th Nov. and then gradually decreased. The change in the inner core (R50) was similar to that of R34 and the temporal variation in R64 was less. The radius of maximum winds (RMW) remained almost same till 1800 UTC of 6th November. It then decreased gradually reaching minimum of 8nm at 1800 UTC of 8th, as the cyclone experienced rapid intensification from 0300 UTC of 7th to 0300 UTC of 8th. It then increased with weakening of the system from 1200 UTC of 8th. It was one of the lowest RMW, as the cyclone was associated with one of the smallest eye or a pin hole eye.

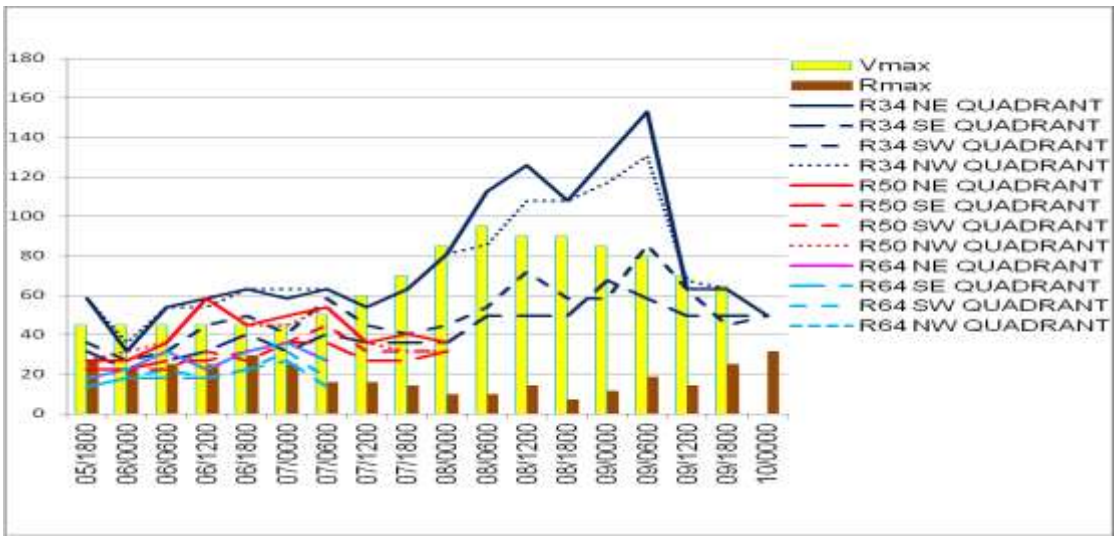


Fig. 4.2.2.11: Radius 34 knot (R34), radius of 50 knot (R50) & radius of 64 knot (R64), estimated maximum sustained surface winds (Vmax in knots) and Radius of Maximum winds (Rmax in nautical mile) based on multi-satellite surface wind (http://rammb.cira.colostate.edu/)

4.2.2.7 Dynamical features

To analyse the dynamical features, the mean sea level pressure (MSLP), 10 metre wind and winds at 850, 500 & 200 hPa levels based on 0000 UTC of 5th to 10th November are presented in fig. 4.2.2.12 (a-f). From the analysis of MSLP and 10m wind, it is observed that the GFS model underestimated the intensification of the system. However, it could detect the genesis at 0000 UTC of 5th November with the formation of 2 closed isobars at the interval of 2 hPa and ECP of 1008 hPa against the best track ECP of 1006 hPa. It could detect the movement towards Yemen coast across the Gulf of Aden, but could not predict the landfall. Though the centre based on GFS analysis lay to the south of the best track. The rapid intensification on 7th and rapid weakening on 10th could not be detected. The associated cyclonic circulation extended upto mid-tropospheric levels. Considering the upper tropospheric wind analysis, ridge over AS ran along 15.0^{0}N throughout the life period at 200 hPa level. At 500 hPa level, it ran along 18.0^{0}N during 5th to 7th and along 20.0^{0}N during 8th to 10th November. Under the influence of this ridge, northerly to northeasterly winds prevailed over the cyclone field leading to west-southwestwards movement of the system. From the GFS analysis, it can be concluded that the system was steered west-southwestwards by the lower mid-tropospheric winds. However, on 10th November the system recurved northeastwards which can be associated with the upper tropospheric flow at 200 hPa level.

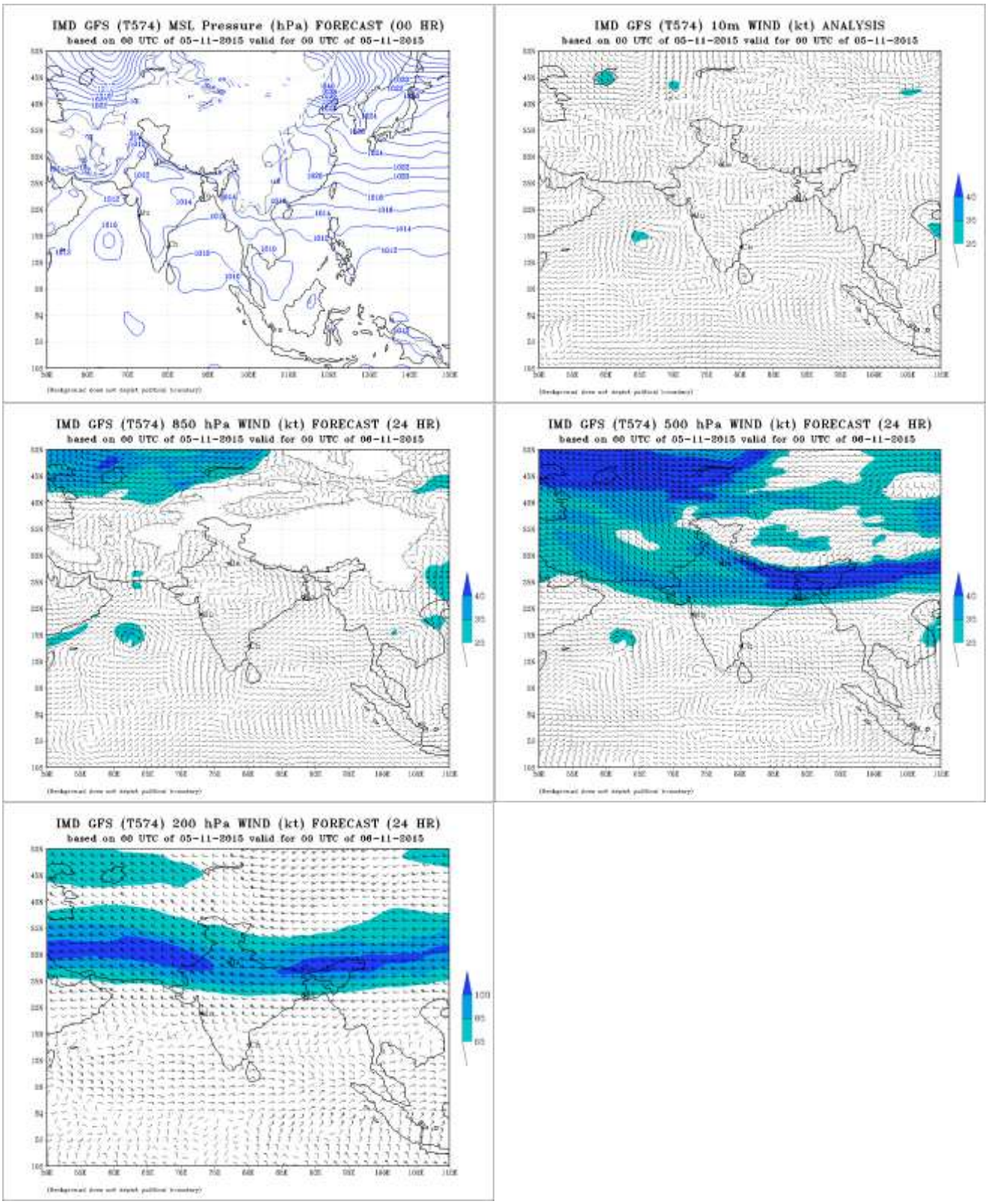


Fig. 4.2.2.12(a) IMD GFS analysis of MSLP, 10m wind and winds at 850, 500 & 200 hPa levels based on 0000 UTC of 6th November.

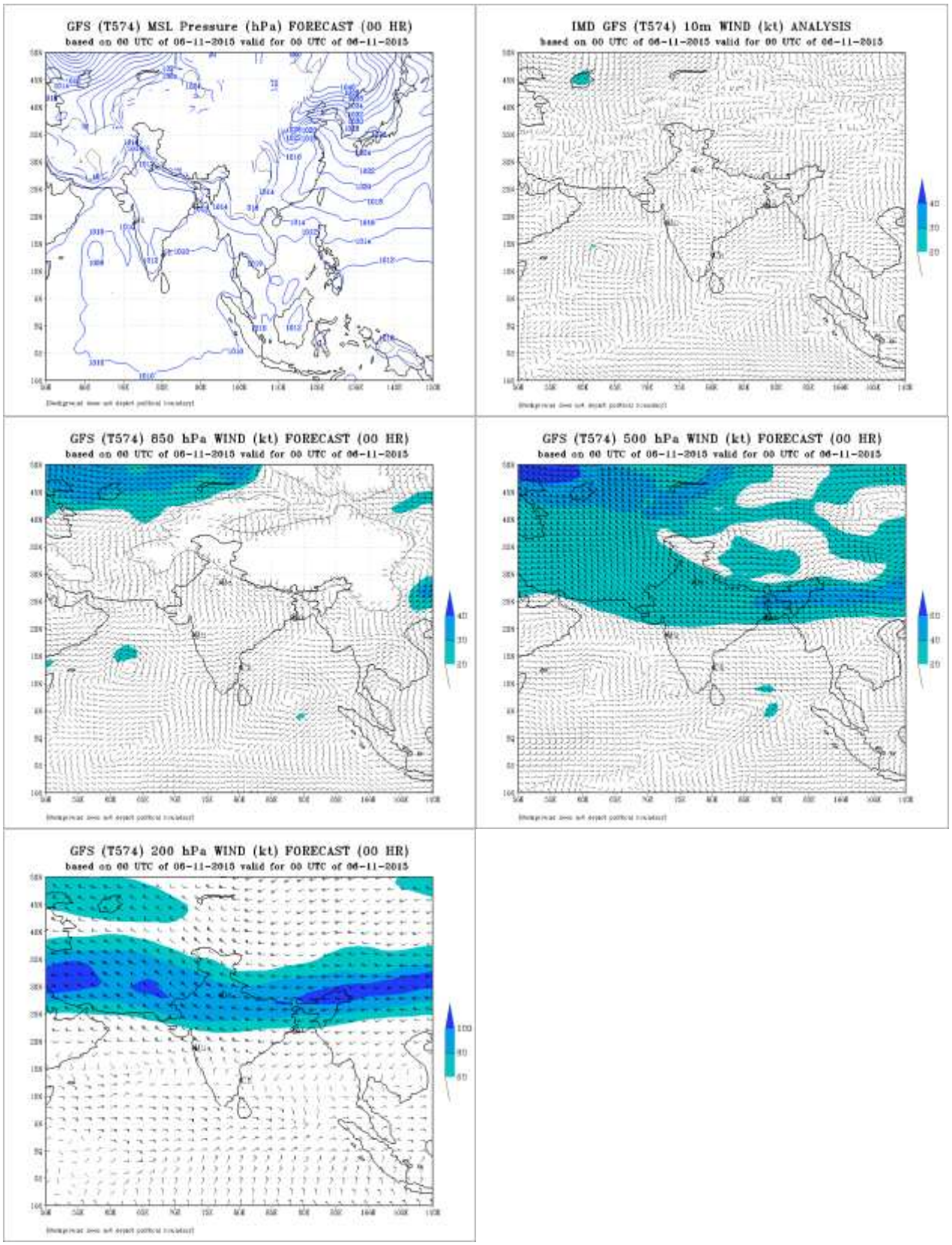


Fig. 4.2.2.12(b) IMD GFS analysis of MSLP, 10m wind and winds at 850, 500 & 200 hPa levels based on 0000 UTC of 6th November.

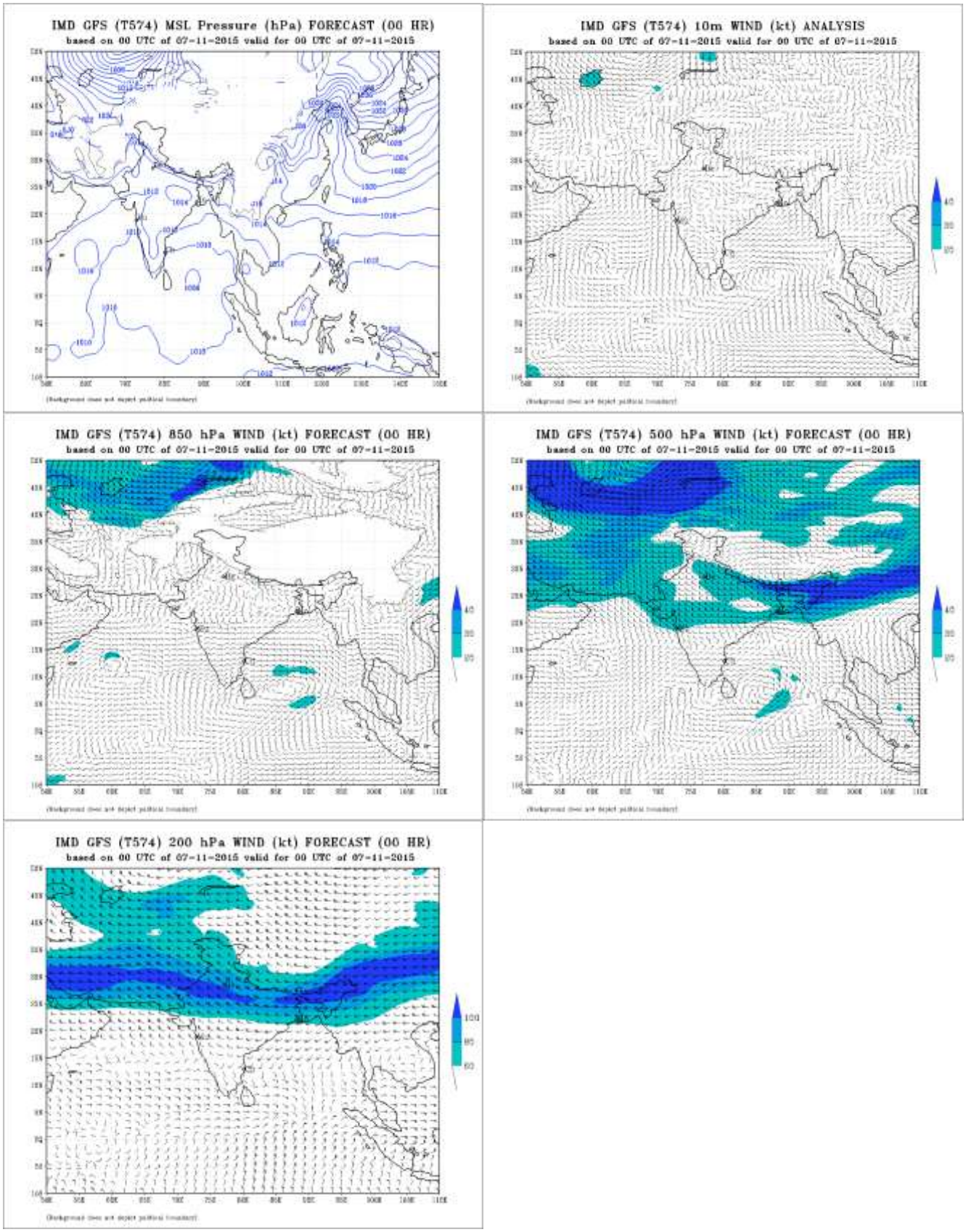


Fig. 4.2.2.12(c) IMD GFS analysis of MSLP, 10m wind and winds at 850, 500 & 200 hPa levels based on 0000 UTC of 7th November.

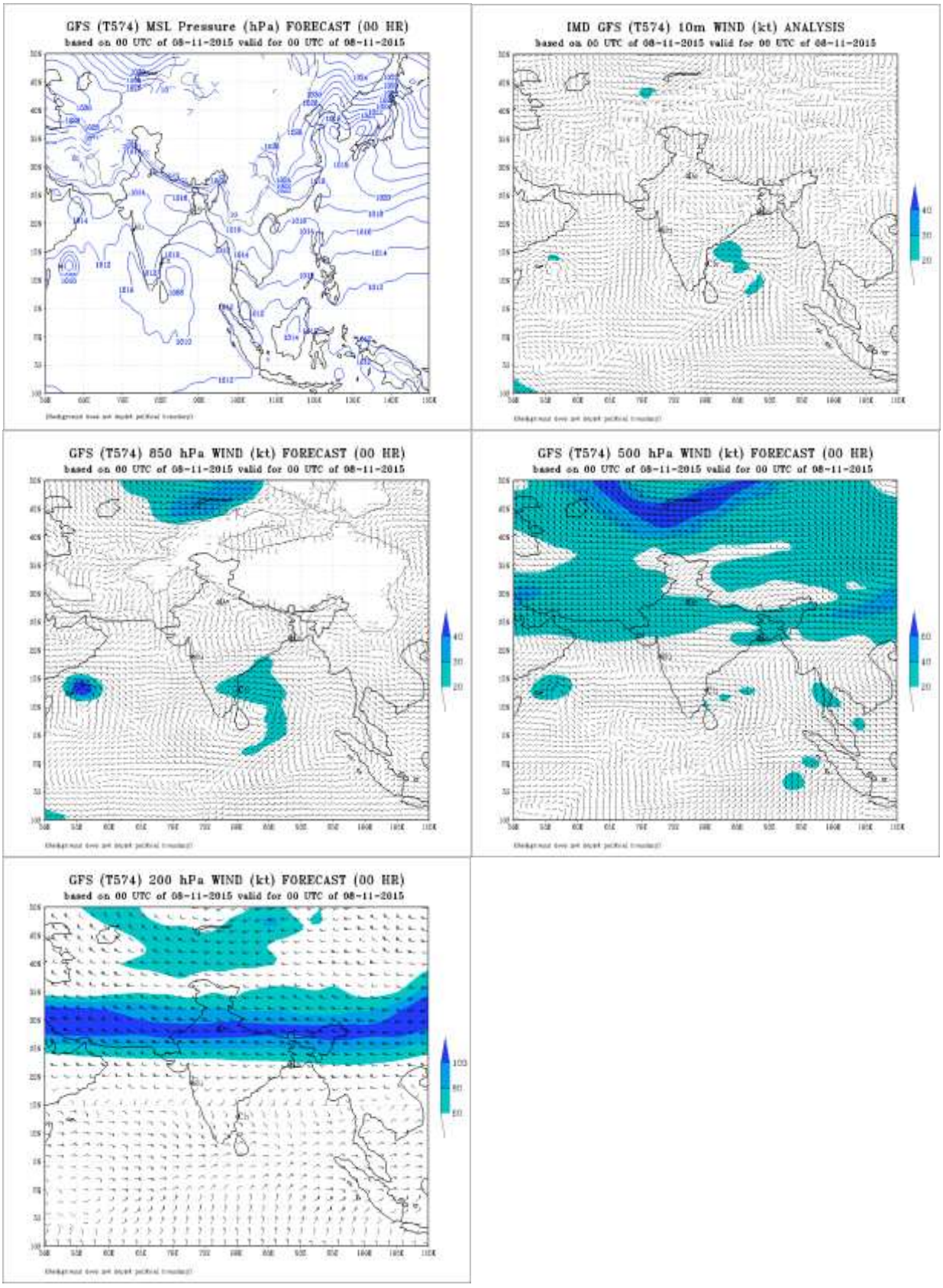


Fig. 4.2.2.12(d) IMD GFS analysis of MSLP, 10m wind and winds at 850, 500 & 200 hPa levels based on 0000 UTC of 8th November.

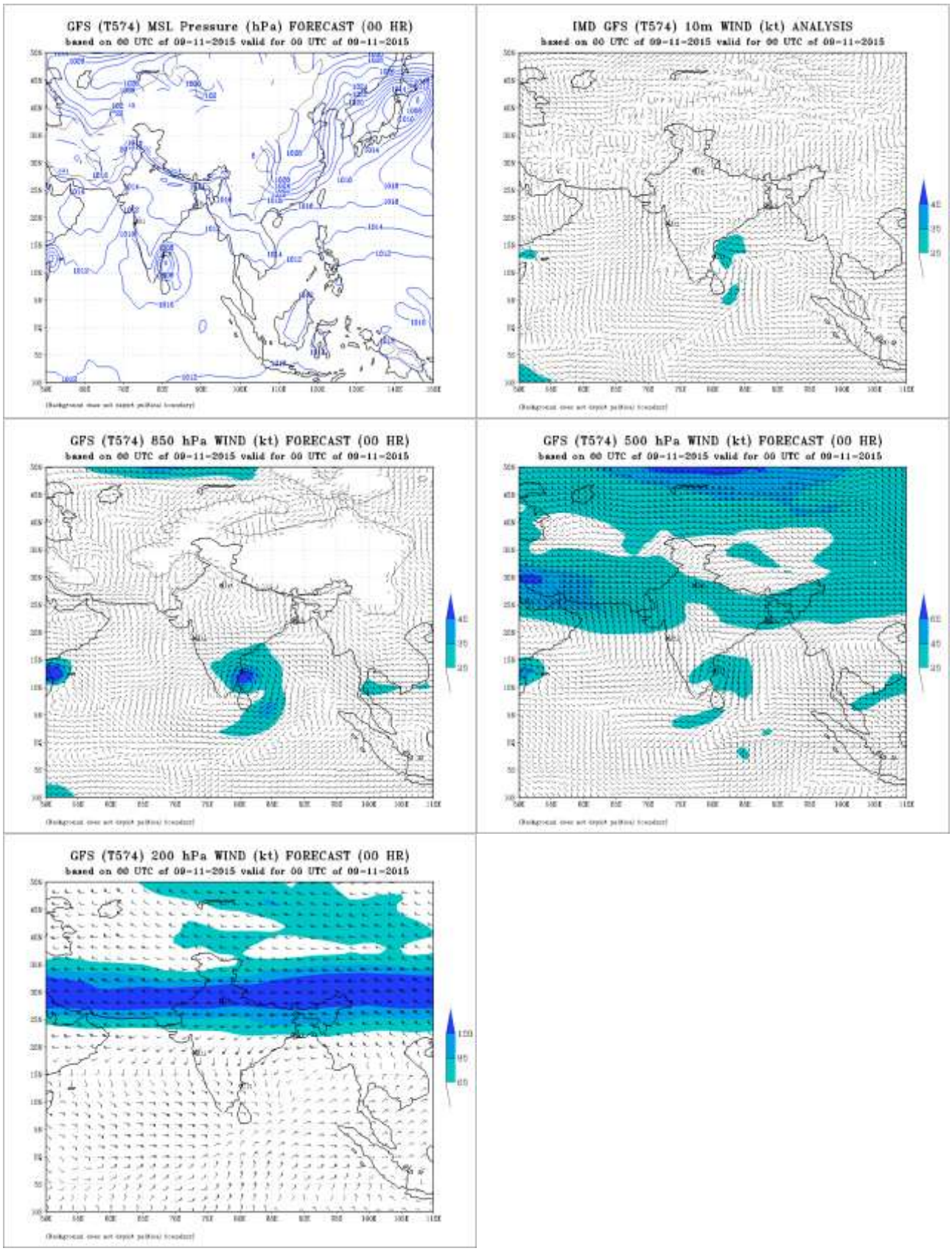


Fig. 4.2.2.12(e) IMD GFS analysis of MSLP, 10m wind and winds at 850, 500 & 200 hPa levels based on 0000 UTC of 9th November.

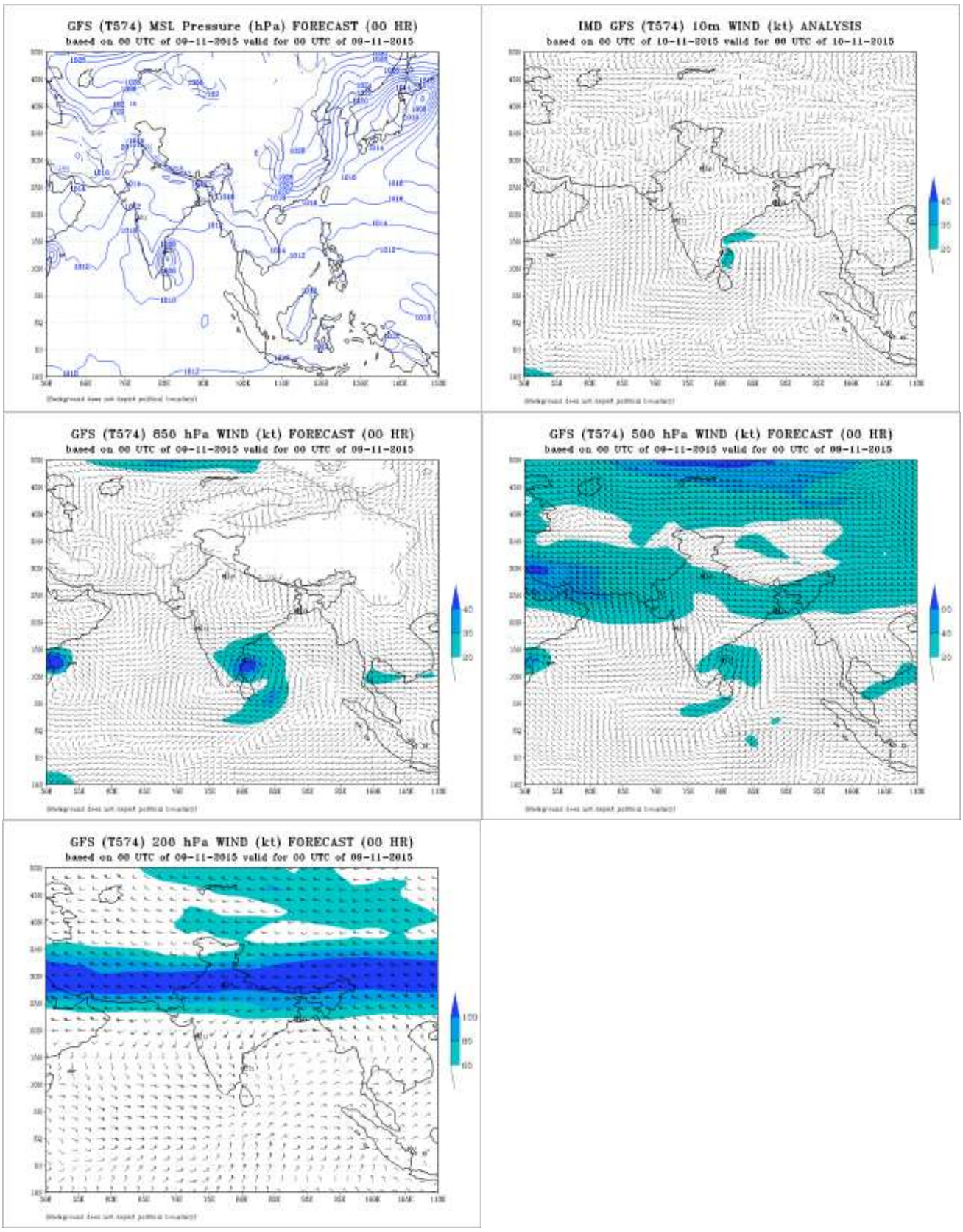


Fig. 4.2.2.12(f) IMD GFS analysis of MSLP, 10m wind and winds at 850, 500 & 200 hPa levels based on 0000 UTC of 10th November.

4.2.2.8 Realised Weather:

4.2.2.8.1 Rainfall:

Rainfall associated with the system is depicted in Fig. 4.2.2.13 based on IMD-NCMRWF GPM merged gauge rainfall data

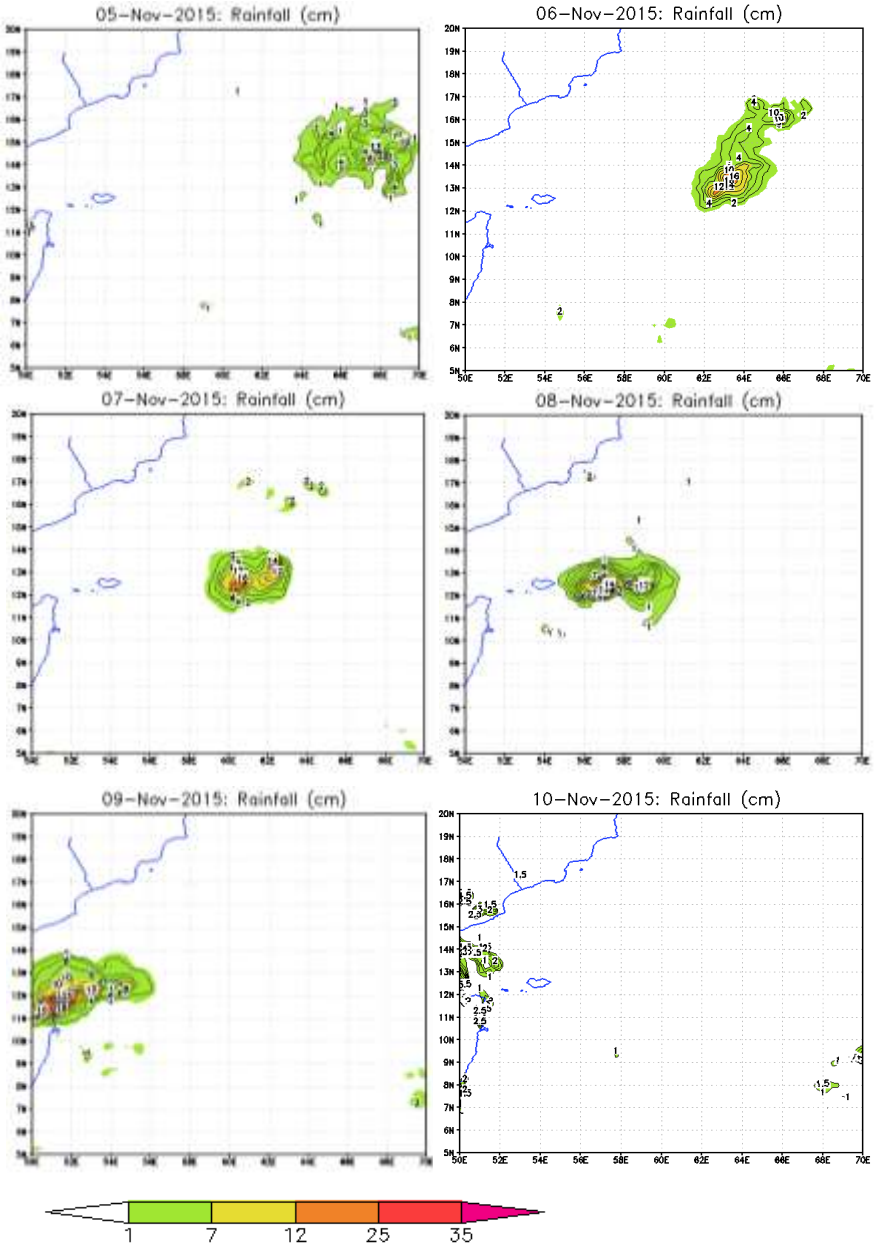


Fig. 4.2.2.13 IMD-NCMRWF GPM-gauge merged 24-hr rainfall as on 0300 UTC of the date indicated in each plot for the period 05-10 November 2015

During the initial stage of formation of the system, on 5th November, rainfall belt was east-west oriented and the rainfall maximum was observed to the northeast of the system centre. Similar pattern was observed on 6th November with extension of rainfall belt from southwest to northeast. Subsequently, with the organisation of the system, convection became more and more organised and rainfall was symmetric about the centre on 7th and 8th November. However, gradually the rainfall maximum shifted to the southwest with gradual weakening of the system from 8th and west-southwestwards movement, the rainfall belt was elongated towards

west-southwest from east-northeast. As a result the northern tip of Somalia experienced haevy rainfall on 9th. The rainfall almost decreased on 9th and 10th due to rapid weakening of the system.

4.2.2.9. Damage due to ESCS Megh

As per media and press report, ESCS Megh caused extensive devastation, killing at least eighteen people and injuring dozens of others. More than 500 houses were completely destroyed and another 3,000 were damaged. In addition, hundreds of fishing boats were damaged and more than 3,000 families were displaced. The typical damage photographs over Socotra Island are presented in fig. 4.2.2.14.

Yemini Island, Socotra lashed by high winds and torrential rains

Dragon's blood tree is seen on the ground after Megh hits Socotra Island

Fig. 4.2.2.14 Typical damage photographs over in asssociation with ESCS Megh over Socotra Island

4.2.3 Deep Depression over the Bay of Bengal (08-10 November 2015)

4.2.3.1 Introduction

The Deep Depression (DD) over the Bay of Bengal (BOB) during 08-10 November 2015, formed from a low pressure area (LOPAR) that lay over southwest BOB on 06th. It concentrated into a depression (D; maximum sustained surface wind speed (MSW):17-27 kts) over southwest BOB close to north Tamil Nadu and Sri Lanka coasts at 0300 UTC (0830 IST) of 08th. Moving initially west-northwestward with a speed of 17 kmph, it intensified into a DD (MSW: 28-33 kts) around 08th/midnight. It subsequently moved slowly northwestwards at a speed of about 10 kmph towards north Tamil Nadu and Puducherry coasts on 09th morning. By 09th noon, when the system was close to the coast, it moved very slowly (with a speed of about 5 kmph) nearly northward off north Tamil Nadu and Puducherry coasts and made landfall over north Tamil Nadu coast close to north of Puducherry near latitude 12.2°N and longitude 80.0°E around 1930 hrs IST of 09th. Due to its proximity to the coast throughout the day, it caused exceptionally heavy rainfall over north Tamil Nadu on 9th. The salient features of this system are as follows:

(i) It was a short lived system, forming over southwest BOB close to Tamil Nadu and Sri Lanka coasts, intensifying into a DD and crossing coast within 36 hrs of formation.
(ii) On the day of landfall, the 9th November, maintaining the intensity of DD and moving very slowly northward along the coast, it caused heavy to extremely heavy rainfall over north Tamil Nadu. Even after landfall, the system moved slowly and dissipated over north Tamil Nadu, within about 100 km from the coast, by 1130 hrs IST of 10th November.
(iii) It weakened rapidly after landfall into a well marked low pressure area within 15 hrs of landfall.
(iv) It was the first cyclonic disturbance over the BOB during the post-monsoon season (October-December) of 2015. The activity over BOB in terms of frequency and intensity of cyclonic disturbances has been below normal during this season, mainly due to the fact that 2015 is a strong El Nino year and El Nino has adverse impact on cyclonic activity over BOB.

Brief life history, characteristic features and associated weather along with performance of numerical weather prediction models and operational forecast of IMD are presented and discussed in following sections.

4.2.3.2 Monitoring of DD(08-10 November, 2015)

The DD(08-10 November, 2015) was monitored & predicted by IMD continuously since its formation. Despite the system forming and intensifying close to the coast and making landfall within 36 hrs of formation, forecast of its genesis, movement, intensity, point & time of landfall, as well as associated adverse weather like heavy rain and strong wind were predicted well by IMD with sufficient lead time to enable civil administrators and disaster managers to take necessary mitigatory actions. The genesis of the system on 08th November was forecast by IMD on 02nd November itself. Its movement towards north Tamil Nadu coast, maximum intensity it would attain (DD / Cyclonic Storm (CS; MSW: 34-47 kts) , landfall near to Puducherry coast and expected adverse weather such as extremely heavy rainfall along north coastal Tamil Nadu on 09th November were predicted by IMD even before its genesis, i.e., from 07th morning itself.

Since the pre-genesis stage itself, the system was monitored continuously by satellite based observations available at every half-an-hour interval. Enhanced INSAT-3D imageries formed the basic satellite input for cyclone monitoring. As the system formed close to the coast, the system was monitored with meteorological buoys, coastal and ship observations from the genesis stage onwards in addition to satellite based observations. Special hourly synoptic observations were taken along Tamil Nadu and Puducherry coasts from 08th morning onwards. As the system moved within the range of coastal radars, continuous radar observations were also taken at Doppler Weather Radar (DWR) facilities at Karaikal and Chennai. Observations from Automatic Weather Stations (AWS) and High Wind Speed Recorders (HWSR) installed along coastal Tamil Nadu also provided crucial data for successful monitoring of the system. Satellite data products and scatterometry products available from other leading meteorological services of the globe were also used for location, intensity and structure estimations.

Various national and international Numerical Weather Prediction (NWP) models and dynamical-statistical models including IMD's and NCMRWF's global and meso-scale models, dynamical statistical models for genesis and intensity prediction were utilized to predict the genesis, track and intensity of the system. Tropical Cyclone Module, the digitized forecasting system of IMD was utilized for analysis and comparison of various model guidances, decision making process and warning products generation.

4.2.3.3 Brief life history

4.2.3.3.1 Genesis

Under active northeast monsoon conditions, an upper air cyclonic circulation lay over southwest BOB and adjoining equatorial Indian Ocean on 04th November 2015 which was observed over southwest BOB and neighbourhood extending upto mid-tropospheric levels on 05th. Under its influence, a LOPAR formed over southwest BOB off Sri Lanka and Tamil Nadu coasts on 06th morning which became well-marked over the same region on 07th. It concentrated into a Depression and lay centred at 0830 hrs IST of 08th November over southwest BOB off Tamil Nadu coast near latitude 10.7°N and longitude 83.7°E about 440 km east-southeast of Puducherry. According to satellite imagery, intensity at 08th/0300 IST was T 1.5 as convection became more organised during the previous 6 hours. Based on synoptic analysis using buoy, ship and coastal observations and satellite wind analysis products available from leading satellite based analysis centre, MSW was determined to be 25 knots gusting to 35 knots. Winds were higher over the northeast sector due to basic northeast monsoon circulation. The estimated central pressure was about 1004 hPa. State of sea around system centre was rough to very rough. Minimum cloud top temperature associated with the system was -88°C.

The environmental features associated with the genesis of the system were high sea surface temperature (SST) near the system centre (around 29-30°C), increased upper level divergence and low level relative vorticity & convergence, moderate vertical wind shear (VWS; 10-20 kts) and favourable Madden-Jullian Oscillation (MJO) conditions [MJO index was in phase-3 (east equatorial Indian ocean) with amplitude greater than 1 which is favourable for genesis and intensification of cyclonic disturbances over the BOB].

4.2.3.3.2 Intensification and movement

On 08th/0300 UTC, the upper tropospheric ridge at 200 hPa level was observed along 16°N latitude. In association with an upper air anticyclonic circulation that lay to the northeast of the system centre, the middle and upper tropospheric winds near the system centre were east-southeasterly and the system was initially steered west-northwestward by the steering current. The system moved at a speed of about 20 kmph on this day under the influence of the anticyclonic circulation.

By 08th/1200 UTC, VWS near the system centre decreased considerably and was about 5-10 kts. This, along with other favourable environmental conditions of high SST near the system centre (around 29-30°C), increased poleward outflow above the system centre and favourable MJO conditions (as mentioned in previous section), caused intensification of the system and the system attained the intensity of DD on 08th/2330 IST near latitude 11.5°N and longitude 82.0°E. According to satellite imagery, the intensity was T 2.0.

On 09th 0300 UTC, as the system was located close to the coast, it started interacting with the land which restricted further intensification of the system. By 09th noon, the system started showing signs of slight weakening due to land interaction and slight increase in vertical wind shear. Subsequently, the system started moving northward off Tamil Nadu / Puducherry coasts into regions of higher VWS (20-30 kts) by 09th/1200 UTC. At 1200 UTC of 09th, the system was located near latitude 12.1°N and 80.1°E before crossing coast close to north of Puducherry near latitude 12.2° N and longitude 80.0°E around 1930 hrs IST of 09th with a wind speed of 55-65 kmph. By 09th/1800 UTC, the system was located over north coastal Tamil Nadu near latitude 12.4°N and 79.9°E. As the system was over land, moisture supply decreased considerably and under the influence of higher vertical wind shear, the system weakened

gradually into a D on 10th by 0830 IST and subsequently into a well marked LOPAR by 1130 IST of 10th.

The observed track of DD (08-10 November, 2015) and the best track parameters of the system are given in Fig. 4.2.3.1 and Table. 4.2.3.1 respectively.

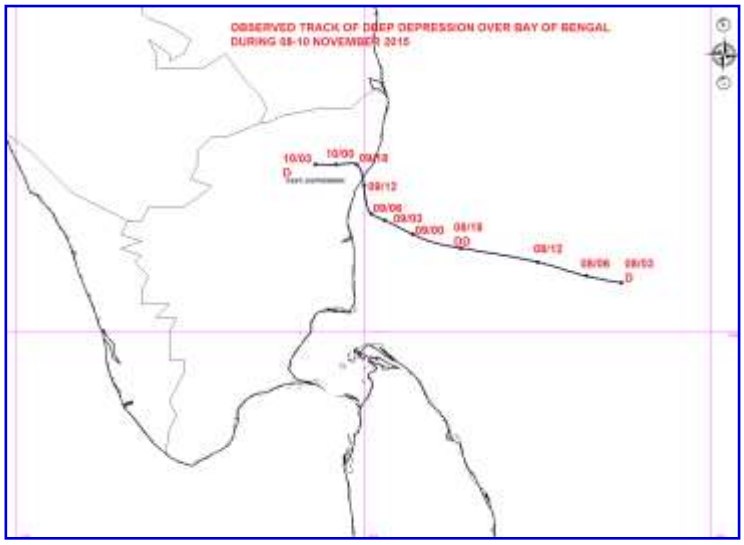


Fig. 4.2.3.1 Observed track of Deep Depression over Bay of Bengal during 8-10 November 2015 (D: Depression; DD: Deep Depression)

Table 4.2.3.1 Best track positions and other parameters of Deep Depression over Bay of Bengal during 8-10 November, 2015

Date	Time (UTC)	Centre lat.^{0} N/ long.^{0} E	C.I. NO.	Estimated Central Pressure (hPa)	Estimated Maximum Sustained Surface Wind (kt)	Estimated Pressure drop at the Centre (hPa)	Grade
08-11-2015	0300	10.7/83.7	1.5	1003	25	3	D
	0600	10.8/83.2	1.5	1003	25	3	D
	1200	11.0/82.5	1.5	1002	25	4	D
	1800	11.2/81.4	2.0	1000	30	5	DD
09-11-2015	0000	11.4/80.7	2.0	999	30	6	DD
	0300	11.6/80.3	2.0	998	30	6	DD
	0600	11.7/80.1	2.0	996	30	6	DD
	1200	12.1/80.0	2.0	996	30	6	DD
	Crossed north Tamil Nadu coast close to north of Puducherry near latitude 12.2°N/80.0°E around 1400 UTC						
	1800	12.4/79.9	-	998	30	6	DD
10-11-2015	0000	12.4/79.6	-	1000	30	5	DD
	0300	12.4/79.3		1002	20	4	D
	0600	Well marked low pressure area over north Tamil Nadu and neighbourhood.					

D: Depression; DD: Deep Depression

Speed and direction of movement of the system based on the best track parameters are furnished in Fig. 2. On 08th/0600 UTC, the six hourly average speed of movement of the system was high at about 20 kmph. Subsequently, its speed decreased gradually to about 12 kmph at 1800 UTC. The direction of movement was west-northwestward during this period. However, on 09th/0000 UTC, the direction of movement changed to northward and at 0600 UTC of 09th, speed decreased considerably to about 5-6 kmph when the system centre was located about 50-60 km from the coast.

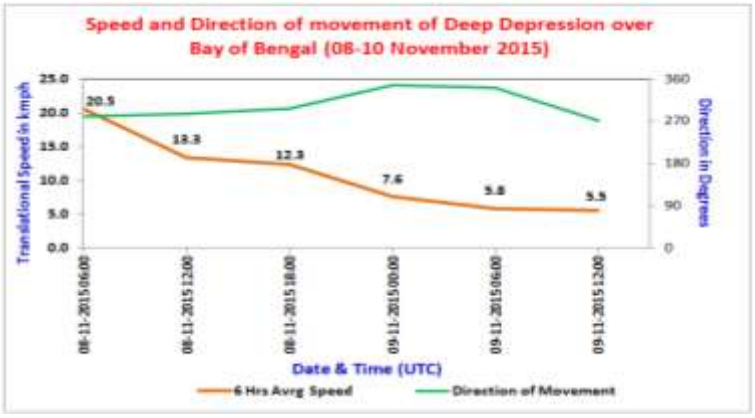


Fig. 4.2.3.2 Speed and direction of movement of Deep Depression over Bay of Bengal (08-10 November 2015)

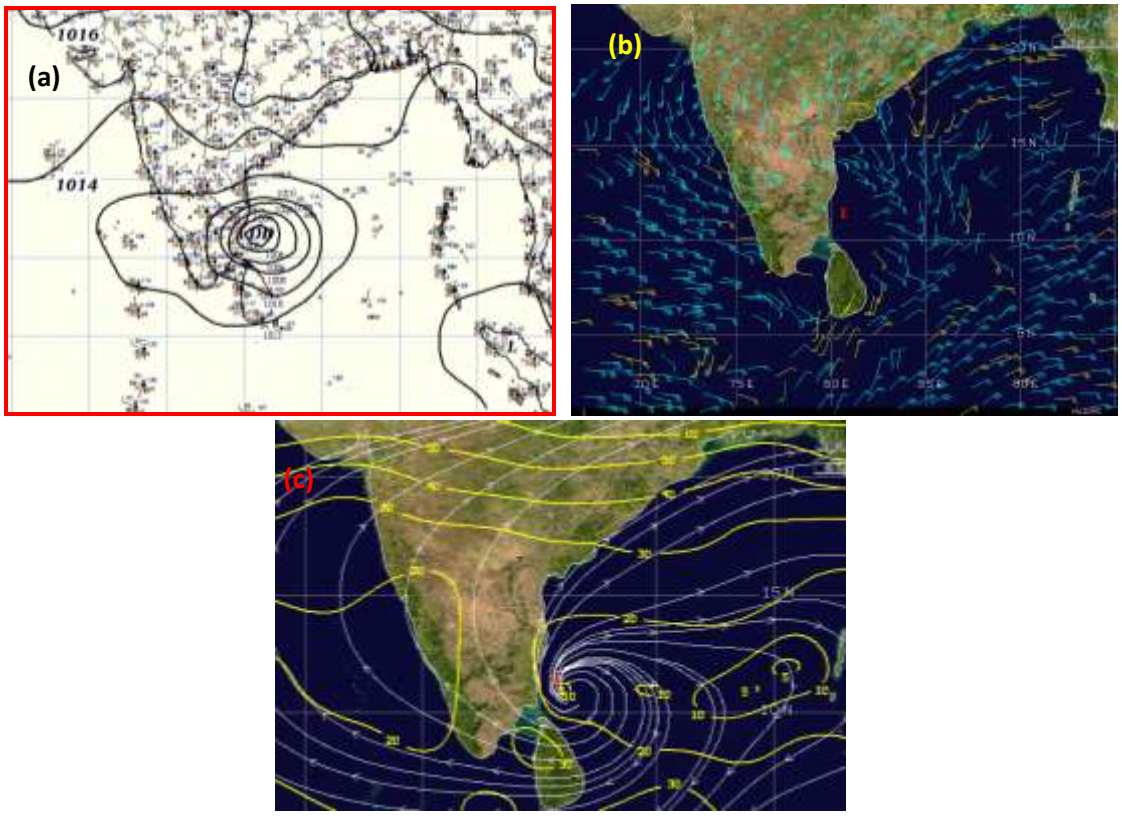


Fig. 4.2.3.3 (a) Analysed surface chart (09/0300 UTC), (b) satellite based upper tropospheric winds (09/0000 UTC) and (c) vertical wind shear between upper and lower tropospheric levels (09/0000 UTC)
(Source for b & c: CIMSS Tropical Cyclones)

Synoptic features associated with the location, movement and intensification of the system on 09th when the system was close to the coast are depicted in Fig. 4.2.3.3 (a) surface analysed

chart based on 09th/0300 UTC, (b) upper level winds based on 09th/0000 UTC satellite winds (CIMSS - METEOSAT-7 product) and (c) VWS based on 09th/0000 UTC (CIMSS - METEOSAT-7 product). The anti-cyclone located to the northeast of the system centre initially steered it west-northwestwards. However, subsequently, when the system moved to the southwestern periphery of the anti-cyclone, it was steered slowly northwards just prior to landfall.

4.2.3.4 Landfall

The place and time of landfall was determined through monitoring of hourly observations from the coastal stations as shown in Fig. 4.2.3.4. The veering of wind over Chennai and backing of wind over Puducherry along with the lowest pressure and maximum sustained surface wind over Puducherry clearly suggested landfall close to north of Puducherry by 1930 IST.

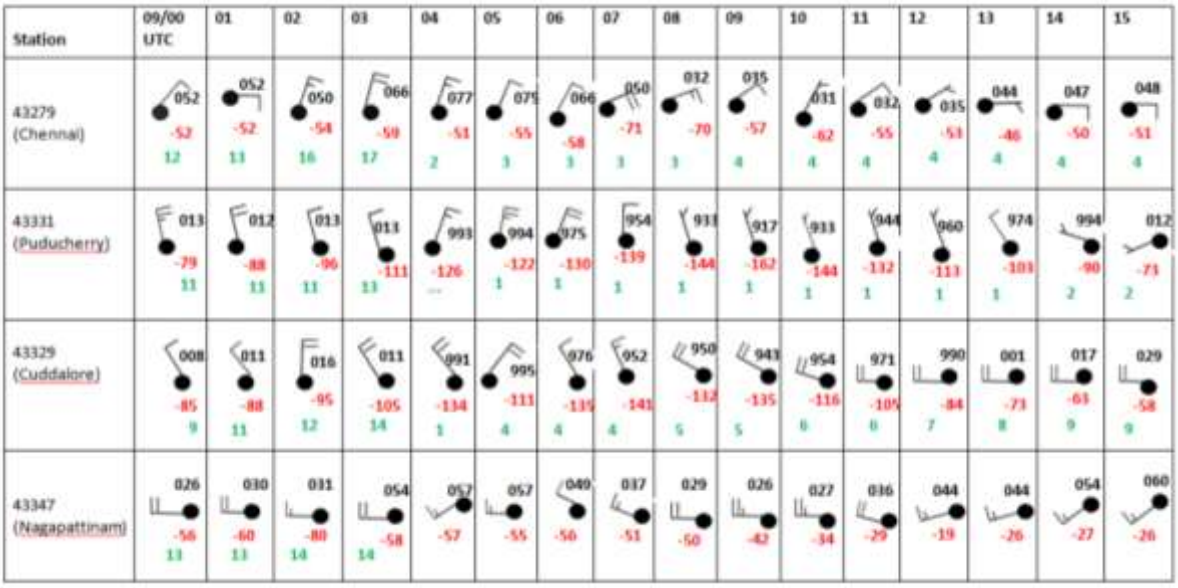


Fig. 4.2.3.4 Hourly observations from coastal stations on 09th November 2015

At 0600 UTC of 09th, the system centre was located about 40-50 km south-southeast of Puducherry. The lowest MSLP of 997.5 hPa was recorded at Puducherry and the ECP was 996 hPa. At 1200 UTC of 09th, the system was located about 30 km east-northeast of Puducherry with 996 hPa MSLP over Puducherry and ECP also about 996 hPa. However, Puducherry recorded the lowest MSLP of 991.7 hPa at 0900 UTC (1430 IST) of 09th thus indicating slight intensification of the system during this time. However, this intensity did not sustain as seen from increase in MSLP over Puducherry from 1000 UTC onwards indicating signs of weakening of the system just prior to landfall.

4.2.3.5 Maximum Sustained Surface Wind speed and estimated central pressure at the time of landfall:

The MSW in association with a cyclonic disturbance affecting Indian coasts is defined as the average surface wind speed over a period of 3 minutes measured at a height of 10 meters. The MSW is either estimated by the remotely sensed observations or recorded by the surface based instruments. As the system crossed north Tamil Nadu coast north of Puducherry, the MSW associated with it at the time of landfall is determined from coastal observations as well as wind speed recorded by the HWSR at Chennai and Karaikal. The DWRs at Karaikal and

Chennai also continuously monitored the MSW in terms of radial velocity. Based on satellite imagery, intensity is estimated in terms of T number using Dvorak technique and using the empirical relation between the T.No and MSW, the corresponding MSW is estimated. Further, surface observatories along North Tamil Nadu and Puducherry coasts has continuously monitored the Mean Sea Level Pressure (MSLP) on the day of landfall, the 09th November. Based on the observation of the pressure drop at the centre, MSW is estimated using the empirical pressure-wind relationship (MSW= 14.2* √ pressure drop at the centre).

4.2.3.5.1 Estimated central pressure

The lowest MSLP of 991.7 hPa was recorded at Puducherry, located close to the point of landfall at 09th/0900 UTC. Hourly MSLP recorded at Puducherry on the day of landfall is shown in Fig. 4.2.3.5a. At 0600 UTC, MSLP over Puducherry was 997.5 hPa and the ECP was 996 hPa and at 1200 UTC, the corresponding values were 996 hPa each. During the period from 0600 UTC to 0900 UTC, MSLP over Puducherry fell from 997.5 hPa to 991.7 hPa after which it started rising gradually as the system started moving slightly northwards along the coastline for some time before the landfall over north of Puducherry around 1400 UTC of 09th November.

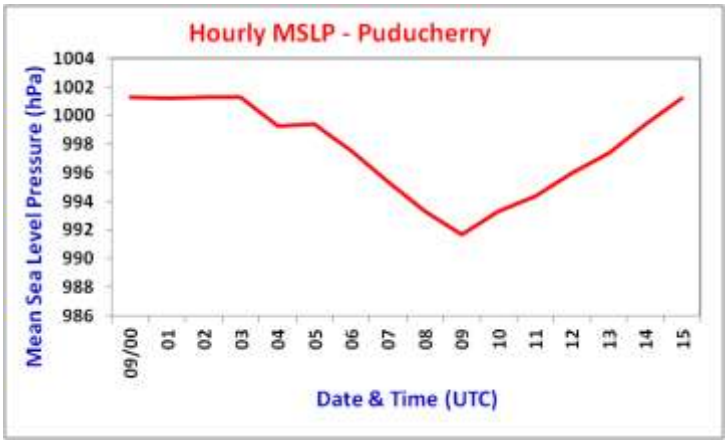


Fig. 4.2.3.5a: Hourly MSLP recorded at Puducherry during 0000-1500 UTC of 09th November 2015

4.2.3.5.2 Maximum Sustained Surface Wind speed

4.2.3.5.2.1 MSW based on coastal observations:

As the system was located very close to the coast when the system maintained the intensity of a deep depression, wind speeds recorded by hourly coastal observations provided the crucial input for determination of MSW during the time of landfall. Fig. 4.2.3.5b depicts the wind speed recorded at Cuddalore, Puducherry and Chennai (Meenambakkam) during 0000 UTC to 1500 UTC on 09th November 2015, the day of landfall. As seen, highest wind speed of 25 knots has been recorded by Puducherry observatory at 0000 and 0500 UTC of 09th. Wind speed over Puducherry decreased to less than 05 kts at 0800 UTC and continued to remain around 5 knots until landfall as the system centre was located close to Puducherry during the period 0800 to 1400 UTC prior to landfall.

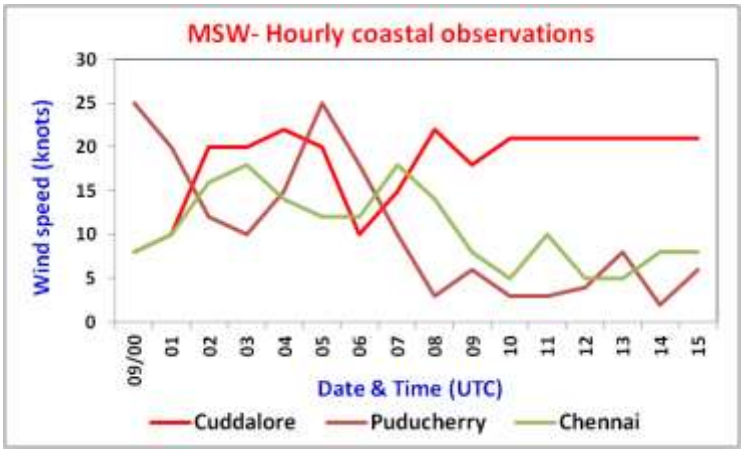


Fig. 4.2.3.5b: Hourly wind speeds recorded by coastal observatories during 0000-1500 UTC of 09th November 2015

4.2.3.5.2.2 MSW based on HWSR:

HWSR Karaikal has recorded one -minute average MSW of 22 kts wind at around 0200 UTC (0730 IST) of 09th and HWSR Chennai, 20 kts at about 0530 UTC (1100 IST). The 3-minute average MSW (standard practice of IMD) was about 18 knots at Chennai around 1103 hours IST of 09th November 2015 (Fig. 4.2.3.5c).

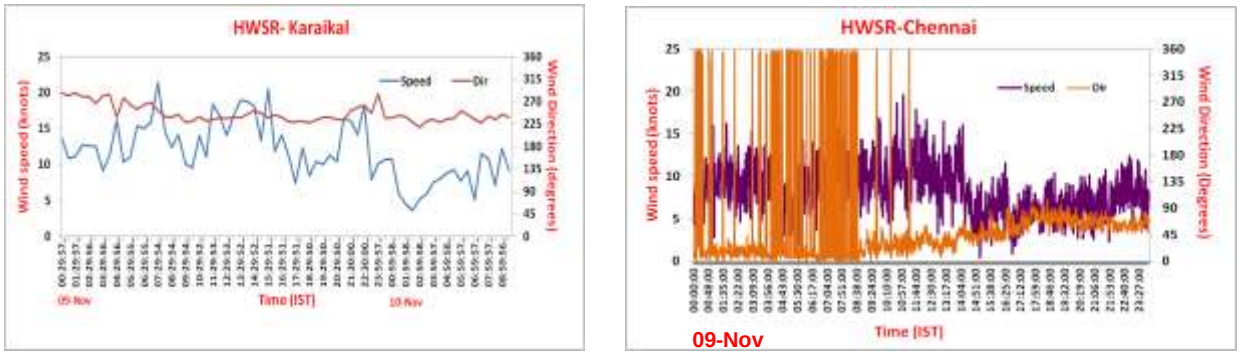


Fig. 4.2.3.5c: Wind speed and direction recorded by Karaikal and Chennai High Wind Speed Recorders on 09th November 2015.

4.2.3.5.2.3 Satellite based MSW

As per IMD's intensity estimation based on Dvorak technique, maximum intensity of the system at the time of landfall was T2.0 which corresponds to an MSW of about 30 knots (55-60 kmph).

4.2.3.5.2.3.1 MSW based on satellite derived winds

NOAA satellite ASCAT winds indicate highest wind speeds of about 40 knots at around 0430 UTC of 09th (Fig. 4.2.3.5d). This, when reduced to 3-min average wind, indicates MSW of about 30 knots.

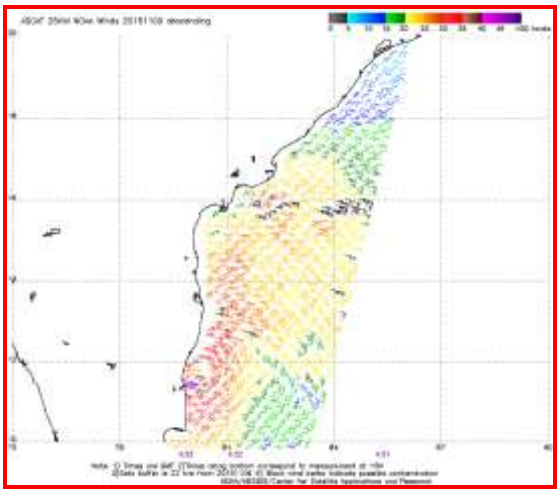


Fig. 4.2.3.5d: NOAA-ASCAT winds at 0430 UTC of 09th November 2015

NOAA, NESDIS, Cooperative Institute for Research in Atmosphere (CIRA) multi-platform satellite wind analysis product indicated highest winds of 35 knots (one-minute average) on 08th/1800 UTC with stronger winds on the northeast and northwest sectors (Fig. 4.2.3.5e).

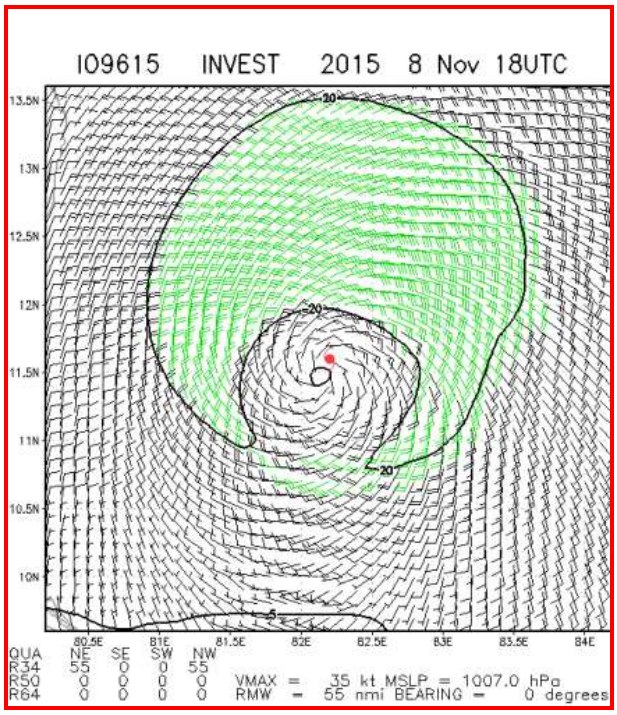


Fig. 4.2.3.5e:CIRA-multiplatform satellite wind analysis product based on 08th/1800 UTC.

4.2.3.5.2.4 MSW based on radar

DWRs Karaikal and Chennai reported highest maximum radial winds on 09th at 0030 UTC and 0500 UTC respectively (Fig.5f). Highest maximum radial wind reported by DWR Karaikal (at about 0030 UTC of 09th) works out to 42 knots radial wind (surface level, 3-min average) at a distance of about 40 km along 90° azimuth from the radar (Fig. 4.2.3.5f). Highest maximum radial wind reported by DWR Chennai (at 0500 UTC of 09th) when reduced to surface level and corrected for 3-minute average works out to about 40 knots at a distance of about 150 km along 220° azimuth from the radar, near 12.0°N and 79.4°E (over land) (Fig.5f), against the surface wind of 25 knots reported by the nearest observatory, Puducherry at that time. The radar based winds also decreased gradually thereafter.

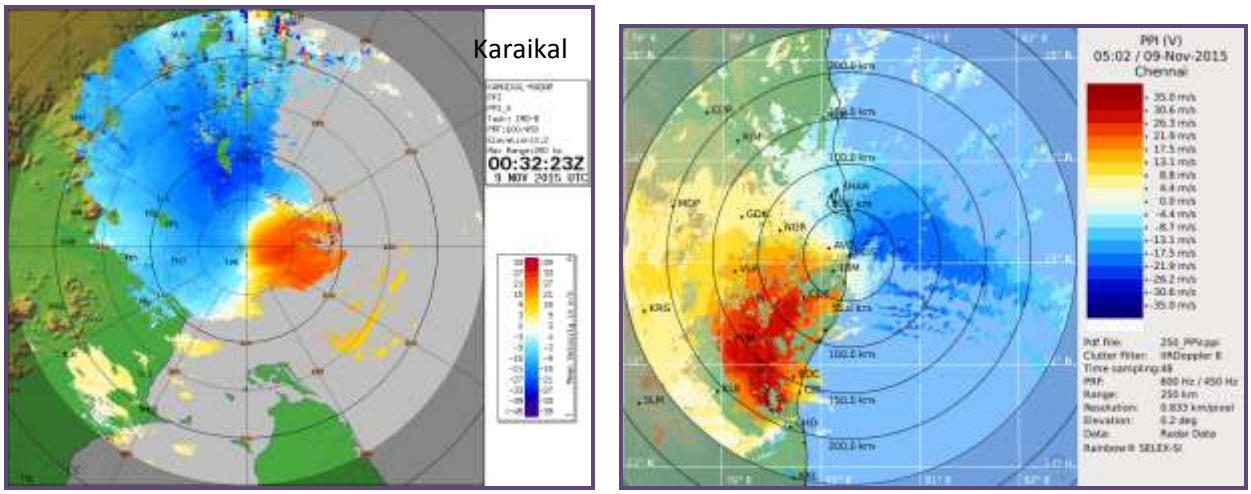


Fig. 4.2.3.5f: DWR Karakal and DWR Chennai based radial wind observation at 0030 and 0500 UTC of 09th Nov 2015 respectively.

4.2.3.5.2.5 MSW based on pressure drop

According to the hourly coastal observations, the lowest MSLP of 991.7 hPa was recorded at Puducherry at 0900 UTC of 09th. Hence, the lowest central pressure could be considered as 991 hPa. Thus, the pressure drop at the centre could have been of the order of 11 hPa as the outermost pressure in the system was 1002 hPa. According to Mishra and Gupta formula, the MSW=14.2*SQRT (pressure drop) = 47 knots. Though this estimation ties in with radar estimation, recorded coastal wind observations do not indicate wind speeds greater than 25 knots.

4.2.3.5.2.5 6 Final estimate of MSW

Considering all these observations and estimates, it can be concluded that the system could have attained peak intensity of about 35-40 knots for a short while, around 0900 UTC of 09th. However, the MSW around the time of landfall was about 30 knots (55-60 kmph) based on coastal observations and satellite and radar based winds.

4.2.3.6 Features observed through satellite

Satellite monitoring of the system was mainly done by using half hourly INSAT-3D imageries. Satellite imageries of international geostationary satellite Meteosat-7 and and microwave & high resolution images of polar orbiting satellites DMSP, NOAA series, TRMM, Metops were also considered. Typical INSAT-3D imageries representing the life cycle of the system are shown in Fig. 4.2.3.6 a-b.

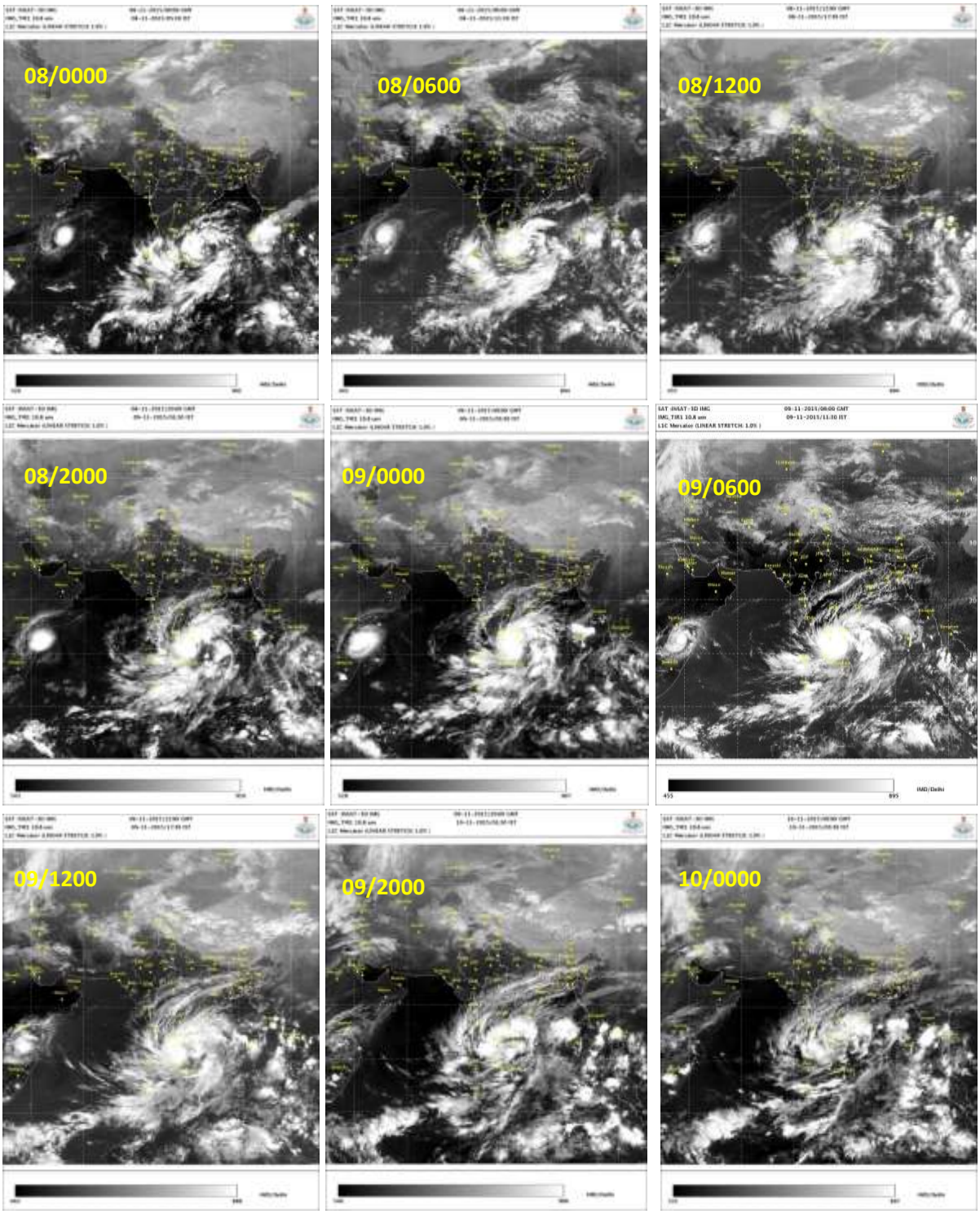


Fig. 4.2.3.6(a)Typical INSAT-3D Infra-red (IR) imageries in association with Deep Depression (08-10 November 2015)

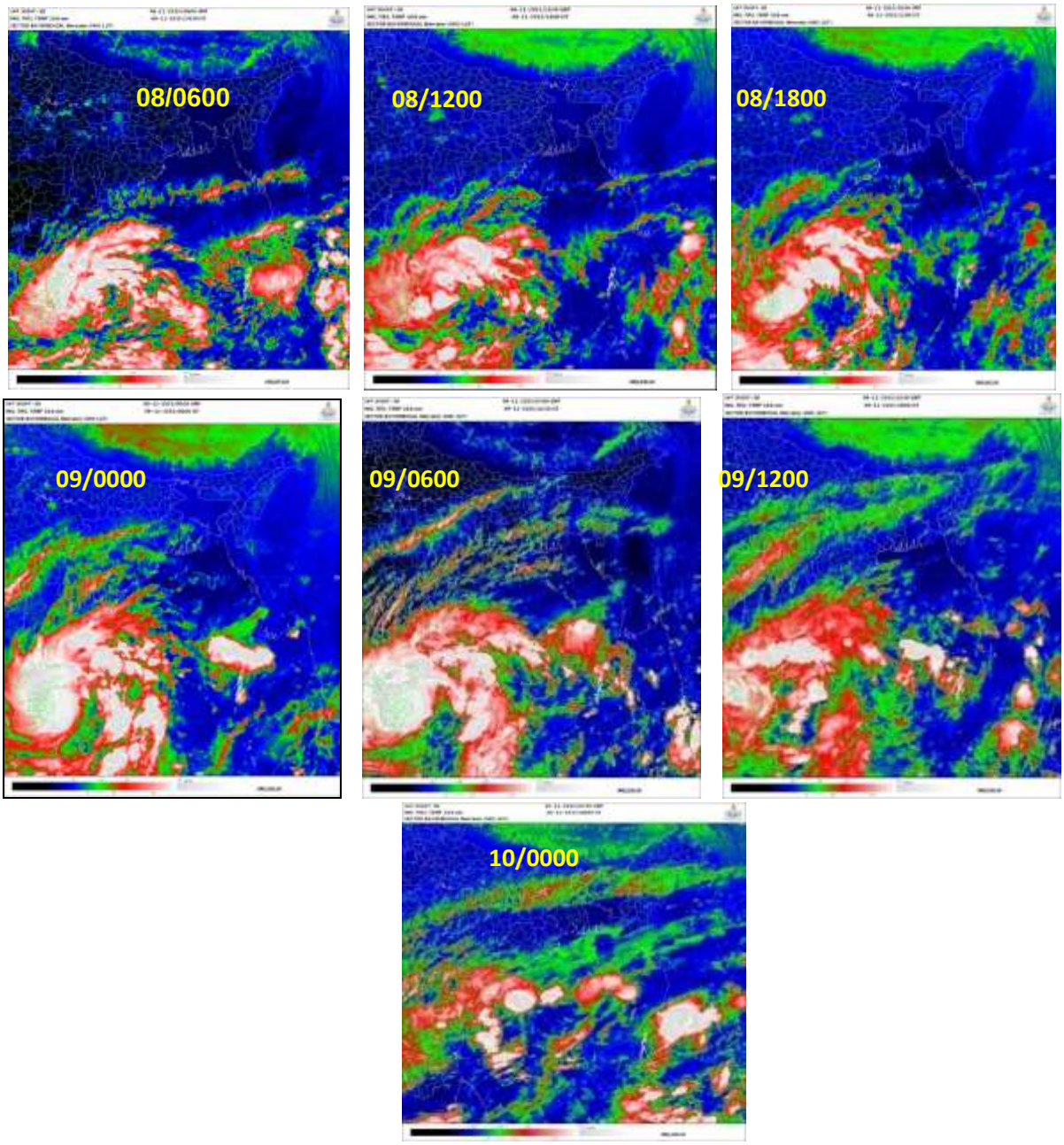


Fig. 4.2.3.6(b) Typical INSAT-3D enhanced Infra-red (IR) imageries in association with Deep Depression (08-10 November 2015)

According to INSAT-3D imageries and products, intensity of the system was T. 1.5 at 0300 UTC of 08th and convection showed shear pattern. Subsequently, the system intensified to T.2.0 at 1800 UTC of 08th and the convection showed curved band pattern. Lowest cloud top temperature associated with the system was -88.0°C. From 09th/0600 UTC onwards, intensity of the system could not be estimated as the system was located very close to land. Due to southwestward tilting of the system, the system centre, as observed through satellite, lay over land at about 0600 UTC of 9th.

4.2.3.7. Features observed through Radar

The Deep Depression (08-10 November 2015) was monitored by DWRs Karaikal and Chennai continuously when the system was within the range of these radars and hourly

observations were taken. DWR Karaikal commenced hourly observations at 1800 UTC of 08th and DWR Chennai, at 09th/0000 UTC. Typical reflectivity products of both the radars, presented in Fig. 4.2.3.7(a&b) indicate spiral band pattern. DWR Chennai reflectivity product based on 09th/1400 UTC also suggests landfall near north of Puducherry around 1400 UTC of 09th (Fig.7b).

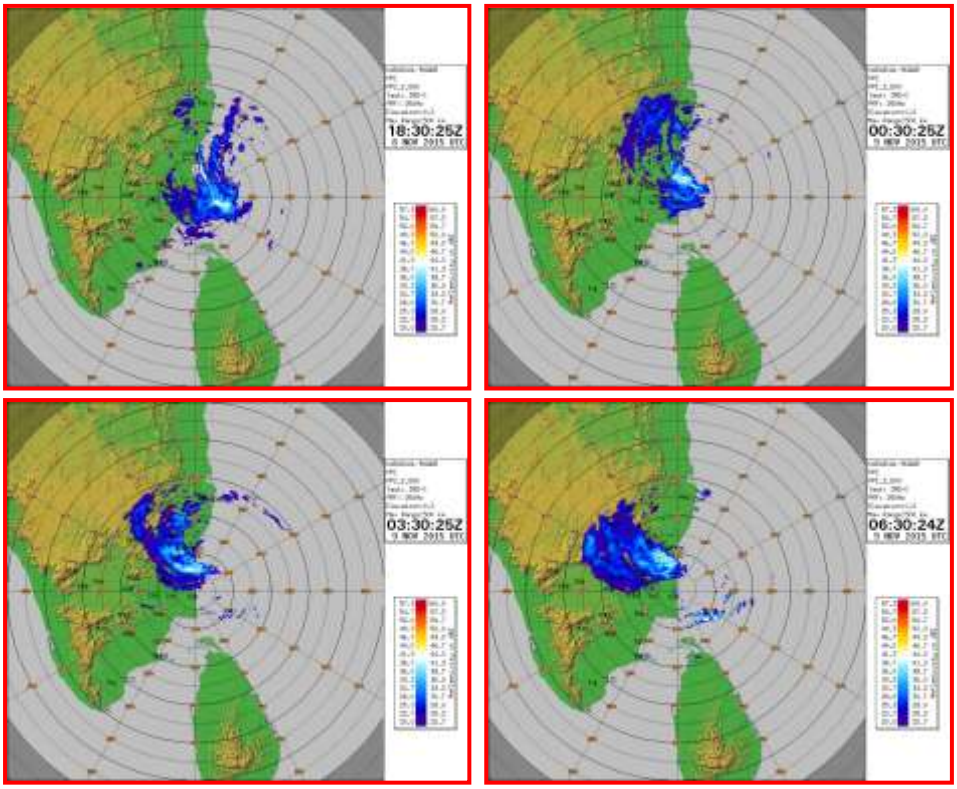


Fig. 4.2.3.7a DWR Karaikal imageries during 08th/1800 UTC to 09th/0600 UTC of November 2015

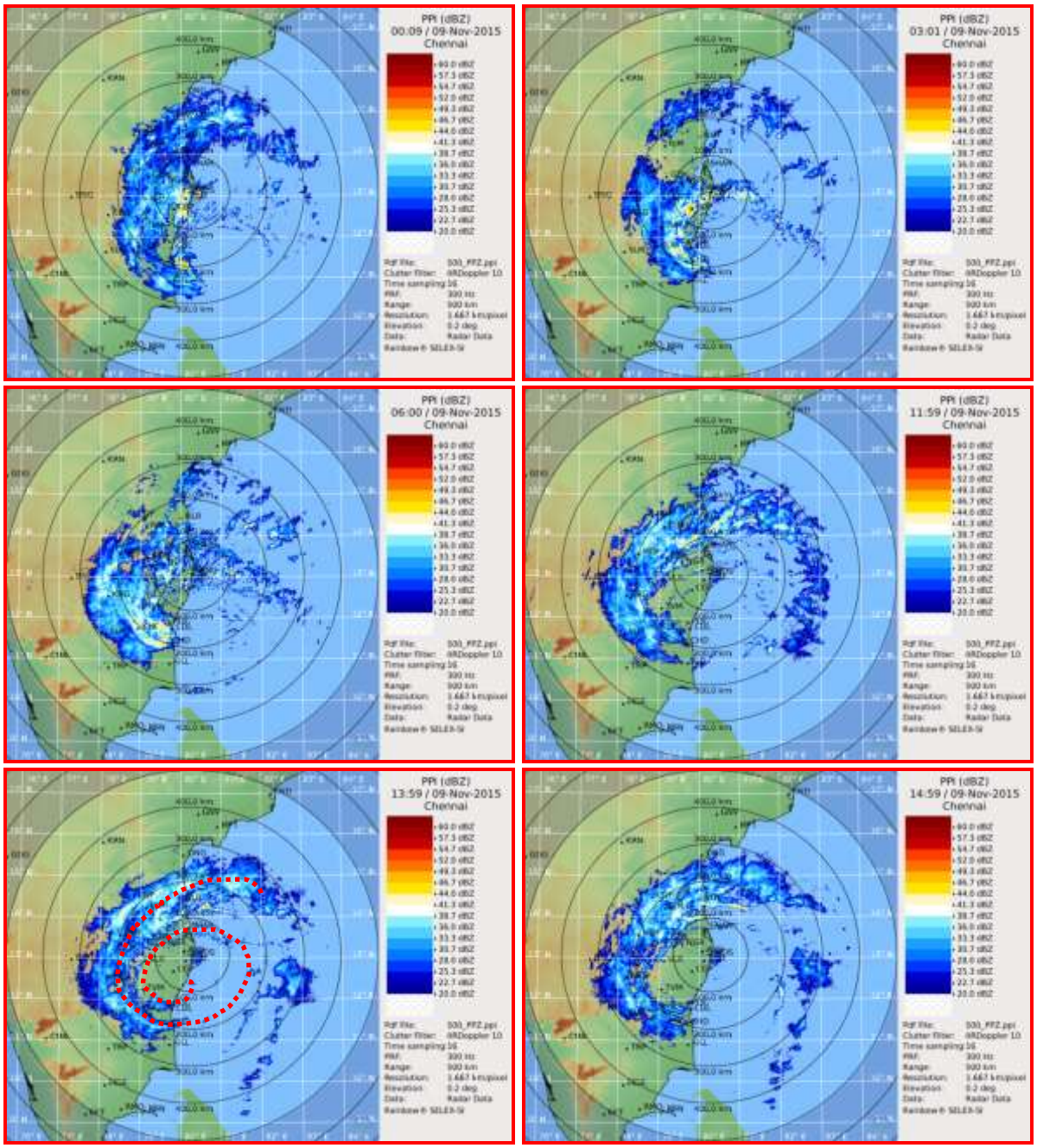


Fig. 4.2.3.7b DWR Chennai imageries during 0000-1500 UTC of 09th November 2015

4.2.3.8. Dynamical features

Dynamical models captured the genesis, track and intensity of the system fairly well. Dynamical features associated with the system are discussed based on IMD-GFS analysis fields of Mean Sea Level Pressure (MSLP), surface winds at 10 m height and winds at 850 hPa, 500 hPa and 200 hPa levels based on initial conditions of 0000 UTC of 8-10 November 2015 (Fig. 4.2.3.8).

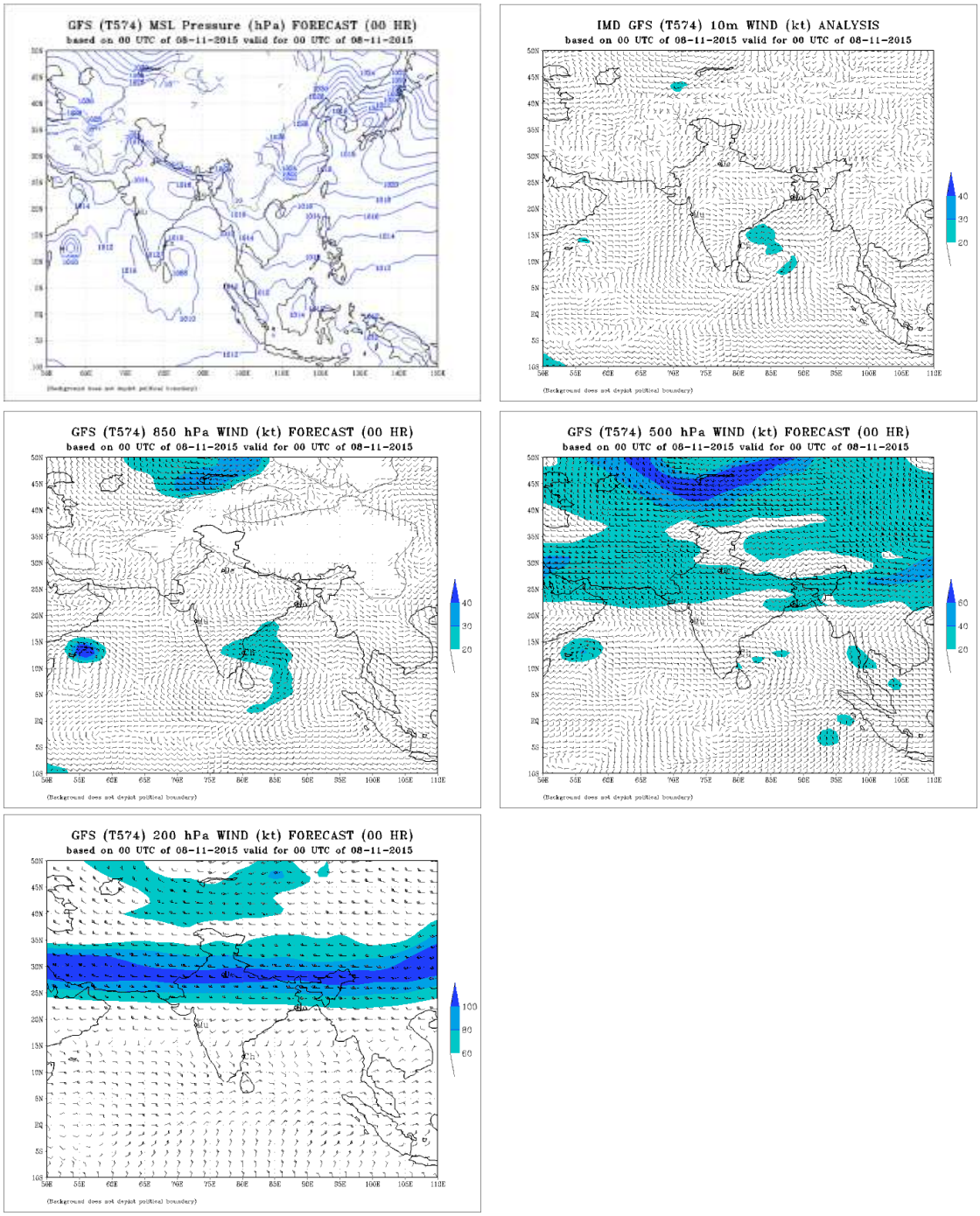


Fig. 4.2.3.8: IMD-GFS Analyses based on 0000 UTC of 8th November 2015 (a) MSLP (b) 10 m winds, (c) 850 hPa winds, (d) 500 hPa winds, (e) 200 hPa winds

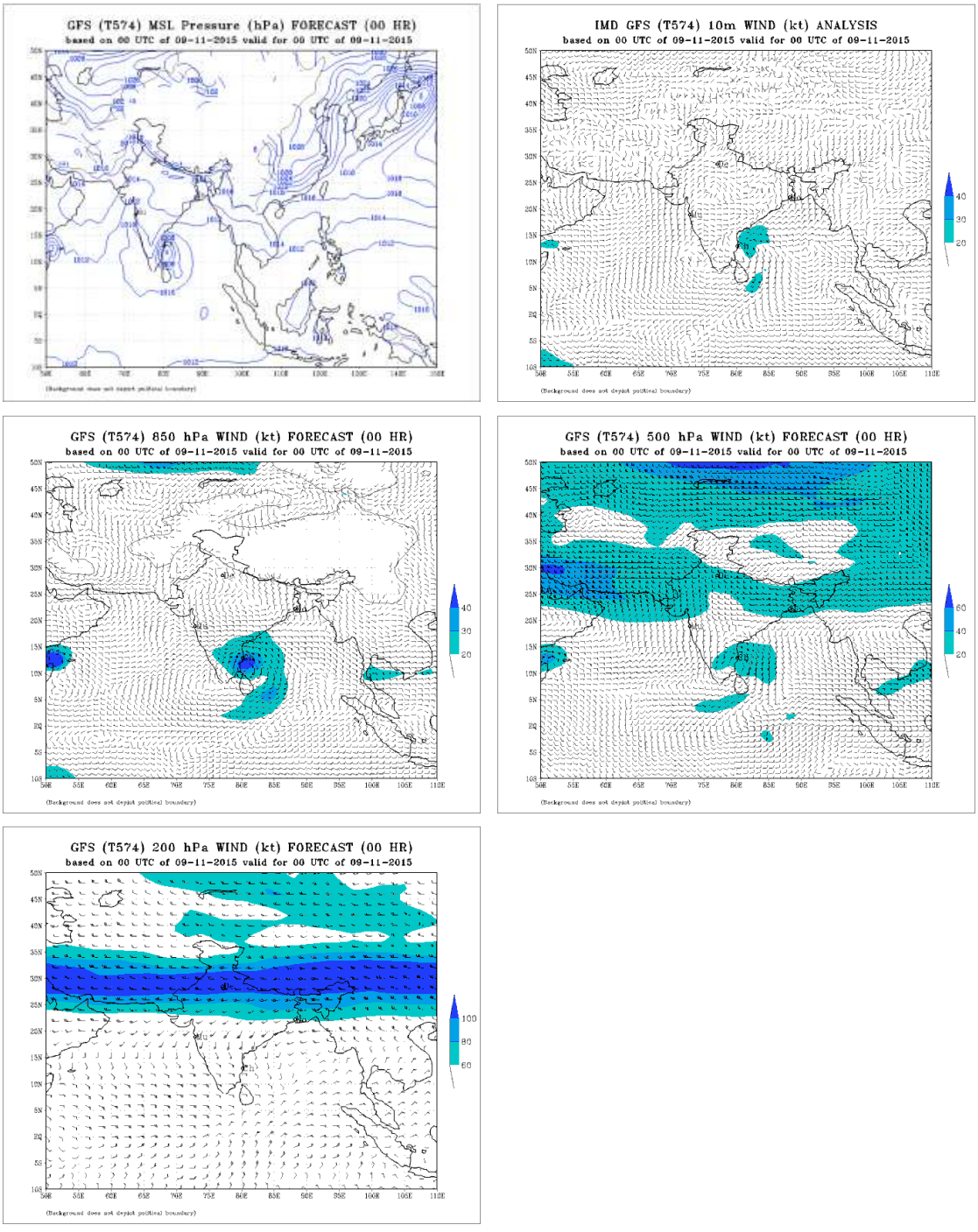


Fig. 4.2.3.8 (contd.): IMD-GFS Analyses based on 0000 UTC of 9th November 2015 (a) MSLP (b) 10 m winds, (c) 850 hPa winds, (d) 500 hPa winds, (e) 200 hPa winds

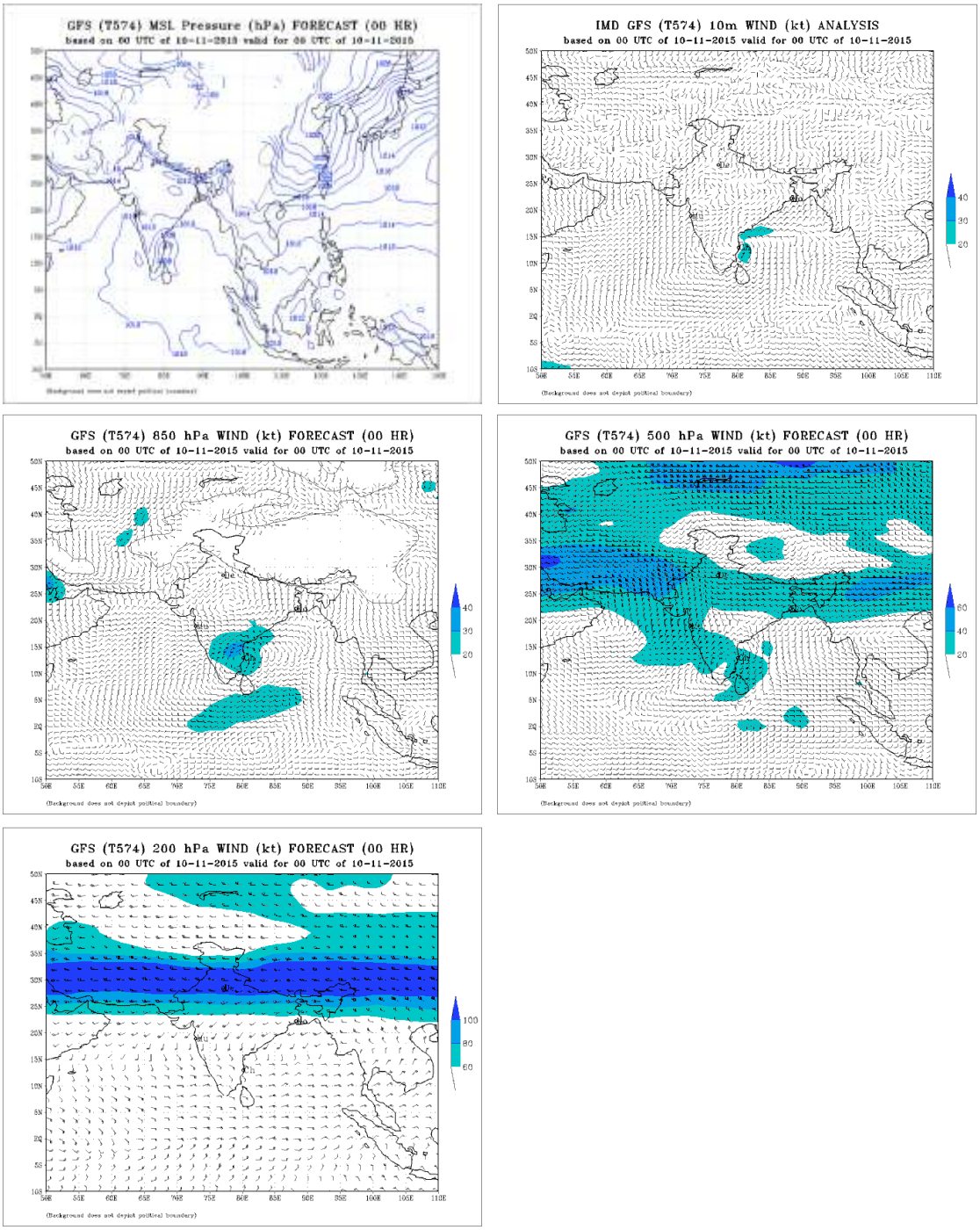


Fig. 4.2.3.8 (contd.): IMD-GFS Analyses based on 0000 UTC of 10th November 2015 (a) MSLP (b) 10 m winds, (c) 850 hPa winds, (d) 500 hPa winds, (e) 200 hPa winds

It is observed that genesis of the system took place over the east-west shear zone of the inter-tropical convergence zone (ITCZ). Winds are stronger over the northeastern sector at the surface which extends to southeastern sector also at 850 hPa level on 08th and 09th. Wind speeds of the order of 40 knots are seen off the north Tamil Nadu coast on 09th. An upper air anti-cyclone at 200 hPa level is observed to the east of the system centre on 09th and the system being located close to the ridge, at the western periphery of the eastern anti-cyclone, was steered very slowly northwards prior to the landfall on 09th.

4.2.3.9. Realised Weather:

4.2.3.9.1 Heavy rainfall:

North Tamil Nadu and adjoining Rayalaseema received heavy to extremely heavy rainfall on 09th. (Description of rainfall terminologies: *Rainfall amount*: ***Heavy***: 64.5 to 124.4 mm, ***Very Heavy***: 124.5 to 244.4 mm and ***Extremely Heavy***: ≥244.5 mm; *Spatial distribution*: ***Isolated (ISOL)***: 1-25% of stations reporting rainfall, ***Scattered (SCT / A few places)*** : 26-50% of stations reporting rainfall, ***Fairly WideSpread (FWS/ Many places)***: 51-75% of stations reporting rainfall and ***Widespread (WS/ Most places)***: 76-100% of stations reporting rainfall during the last 24 hours ending at 0300 UTC of every day).

Neyveli of Cuddalore district in north coastal Tamil Nadu recorded highest 24 hr rainfall amount of 48 cm ending at 10th/0300 IST. Tirumala in Rayalaseema recorded extremely heavy rainfall of 30 cm during the same period. The chief amounts of rainfall ≥ 7 cm (associated with the system) realised in 24 hours ending 0300 UTC of 9-12 November 2015 are furnished below.

:

Rainfall ≥ 7 cm recorded at 0830 IST of 09-12th November 2015:

North Coastal Tamil Nadu:

District:Tiruvallur

09th November: Red Hills, Chembarabakkam, Puzhal -19 each, Poonamallee - 17, Cholavaram - 16, Poonamalle ARG - 16, Ponneri - 15, Chembarambakkam ARG - 14, Madavaram - 14, Ennore - 12, Thamaraipakkam, Tiruvallur -11 each, Poondi – 7.

10th: November: Pallipattu - 13, Ponneri - 11, Red Hills, Chembarabakkam, Tiruvallur, R.K.pet, Tiruttani, Thiruvalangadu, Puzhal – 9 each, Cholavaram, Thamaraipakkam – 8 each, Madavaram, Poondi, Ennore, Poonamalle -7 each.

District:Chennai

09th November: Anna University - 16, Anna Univ ARG -15, Chennai(NBK) - 14, DGP Office - 13,

10th November: Chennai(NBK) – 7.

District: Kancheepuram

09th November: Kattukuppam - 20, Chengalpattu, Tambaram - 18 each, Mahabalipuram, Chennai AP, Kelambakkam – 17 each, Taramani, Kancheepuram, Kolapakkam, Cheyyur – 15 each, Sriperumbudur -14, Maduranthagam, Uthiramerur – 10 each, Satyabama Univ – 8.

10th November: Uthiramerur - 16, Kancheepuram - 13, Chengalpattu - 11, Sriperumbudur -8, Tambaram - 7.

District:Villupuram

09th November: Mylam - 12, Marakkanam - 10, Vilupuram - 7, Gingee, Tindivanam – 7 each,

10th November: Thirukoilur - 21, Vilupuram - 18, Sankarapuram - 15, Kallakurichi -15, Gingee - 12, Ulundurpet - 11, Tindivanam – 10.

District:Cuddalore

09th November: Chidambaram AWS - 19, Chidambaram - 15, Neyveli, Cuddalore -14 each, Parangipettai - 11, Sethiathope -8, Panruti – 7.

10th November: Neyveli - 48, Panruti - 35, Sethiathope , Chidambaram – 34 each, Parangipettai -33, Chidambaram AWS - 24, Virudachalam - 19, Cuddalore - 11, Tozhudur – 7.

Puducherry

09th November: Karaikal -17, Puducherry – 13.

District:Nagapattinam

09th November: Sirkali, Anaikaranchatram - 20, Nagapattinam -14, Mayiladuthurai -12, Vedaranyam -10, Tarangambadi- 7.

10th November: Anaikaranchatram- 15, Tarangambadi- 10, Sirkali – 7.

District:Tiruvarur

09th November: Tiruvarur, Nannilam – 10 each, Thiruthuraipoondi - 9, Valangaiman – 7.

District:Thanjavur

09th November: Thiruvidaimaruthur, Kumbakonam, Aduthurai – 7 each.

North Interior Tamil Nadu:

District:Tiruvannamalai:

09th November: Cheyyar – 13.

10th November: Sathanur Dam – 19.

District:Vellore

09th November: Arakonam -7.

10th November: Ambur - 19, Vaniaymbadi, Alangayam - 18 each, Tirupattur - 17, Vellore - 11, Kaveripakkam, Melalathur, Gudiyatham–10 each, Kalavai-9, Arakonam–7.

District:Dharmapuri

10th November: Dharamapuri - 21, Pappireddipatti - 17, Pennagaram, Harur – 15 each, Palacode - 14, Hogenekal, Marandahalli – 11 each.

District:Krishnagiri

10th November: Uthangarai - 19, Barur - 15, Shoolagiri, Penucondapuram – 14 each, Pochampalli, Krishnagiri – 13 each, Hosur - 11, Anjatti - 10, Thali, Rayakottah, Denkanikottai -9 each.

District:Salem

10th November: Yercaud - 25, Omalur - 13, Salem - 12, Vazhapadi - 10, Attur, Mettur - 8 each, Thammampatty – 7.

District:Namakkal-

10th November: Rasipuram - 10, Mangalapuram – 8.

District:Perambalur:

10th November: Perambalur – 7.

Coastal Andhra Pradesh:

Nellore district:

10th November: Venkatagiri-24, Gudur-20, Rapur-19, Atmakur-17, Podalakur-13, Vinjamur, Nellore-10 each, Tada-8, Sullurpeta, Udayagiri, Shar, Kavali-7 each.

11th November: Atmakur-23, Rapur-20, Gudur-14, Nellore-8.

12th November: Atmakur-9.

Rayalaseema:

Chittoor district:

09th November: Tirumalla- 12, Satyavedu - 8, Puttur -7.

10th November: Tirumala-30, Kalakada-15, Chittoor-14, Mandapalle, Pakala, Palamaner-13 each, Tirupati, Arogyavaram -12 each, Palasamudram, Tirupati Aero, Santhipuram, Thottambedu, Gurramkonda -11 each, Venkatagiri Kota -9

11th November: Kalakada-9.

12th November: Chittoor-7.

Cuddapah district:

09th November: Kodur, Srikalahasti – 7 each.

10th November: Kodur-23, Ananthrajpeta-20, Pullampeta-15, Rajampet-12, Penagaluru -11, Nagari, Kuppam, Punganur, Satyavedu, Srikalahasti -10 each, Chinnamandem, Royachoti -9 each.

11th November: Rajampet-18, Sambepalle-17, Pullampeta-16, Penagaluru-13, Royachoti-8, Chinnamandem, Kodur, Lakkireddipalle -7 each.

Anantapur district:

11th **November**: Nambulipulikunta-7

South Interior Karnataka:

10th November: M M Hills-18, Anekal-9, Kolar, Kanakapura, Yelandur, Chamarajanagar -7 each.

IMD-NCMRWF GPM gauge merged rainfall during the life period of the system are depicted in Fig. 4.2.3.9(a&b). Fig.9a depicts the spatial distribution of rainfall occurrence over the Indian region during the above period and Fig. 4.2.3.9b depicts the spatial distribution of heavy rainfall amounts (at 24-hr ending 0300 UTC of the date indicated in the plots) associated with the system.

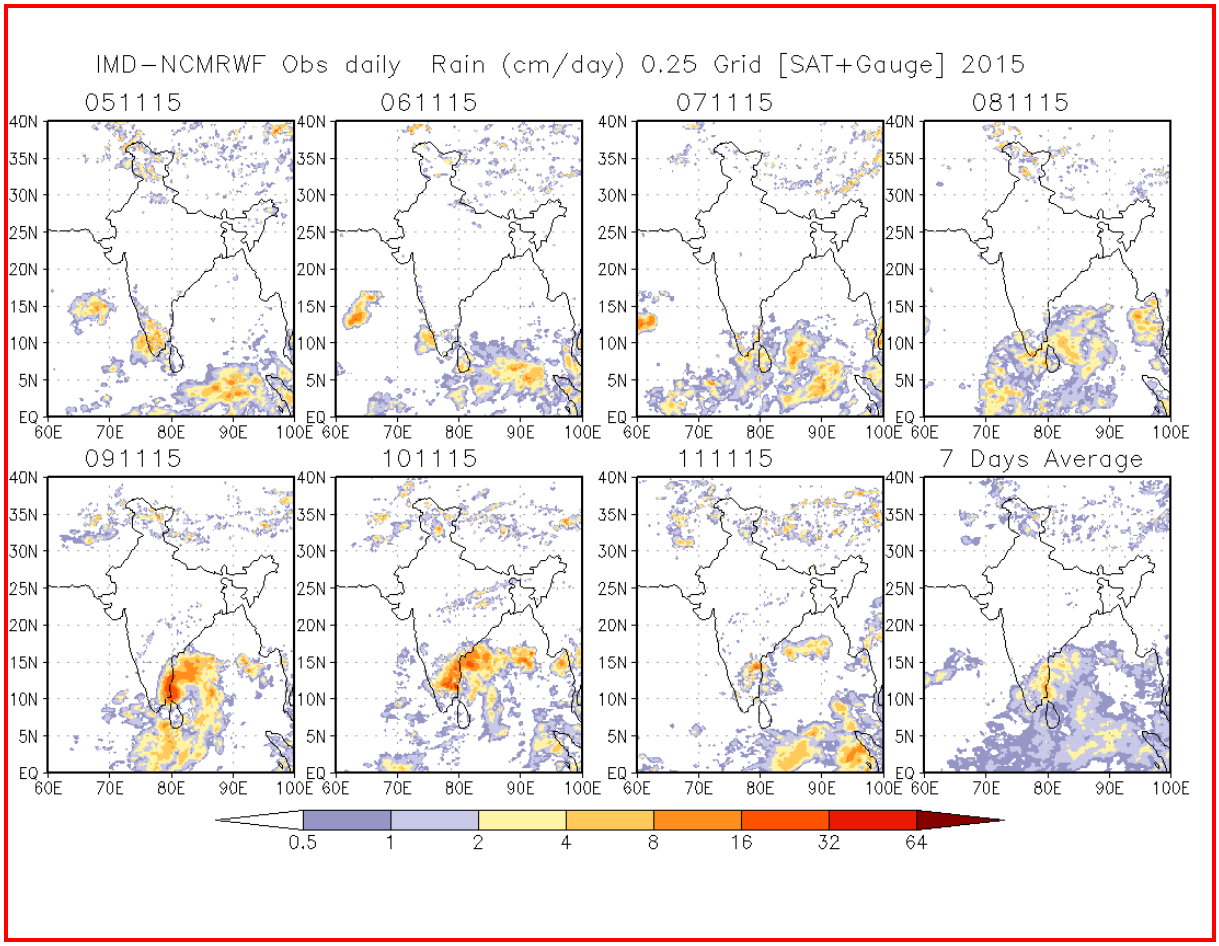


Fig. 4.2.3.9a IMD-NCMRWF GPM gauge merged rainfall during the life period of the Deep Depression (08-10 November 2015)

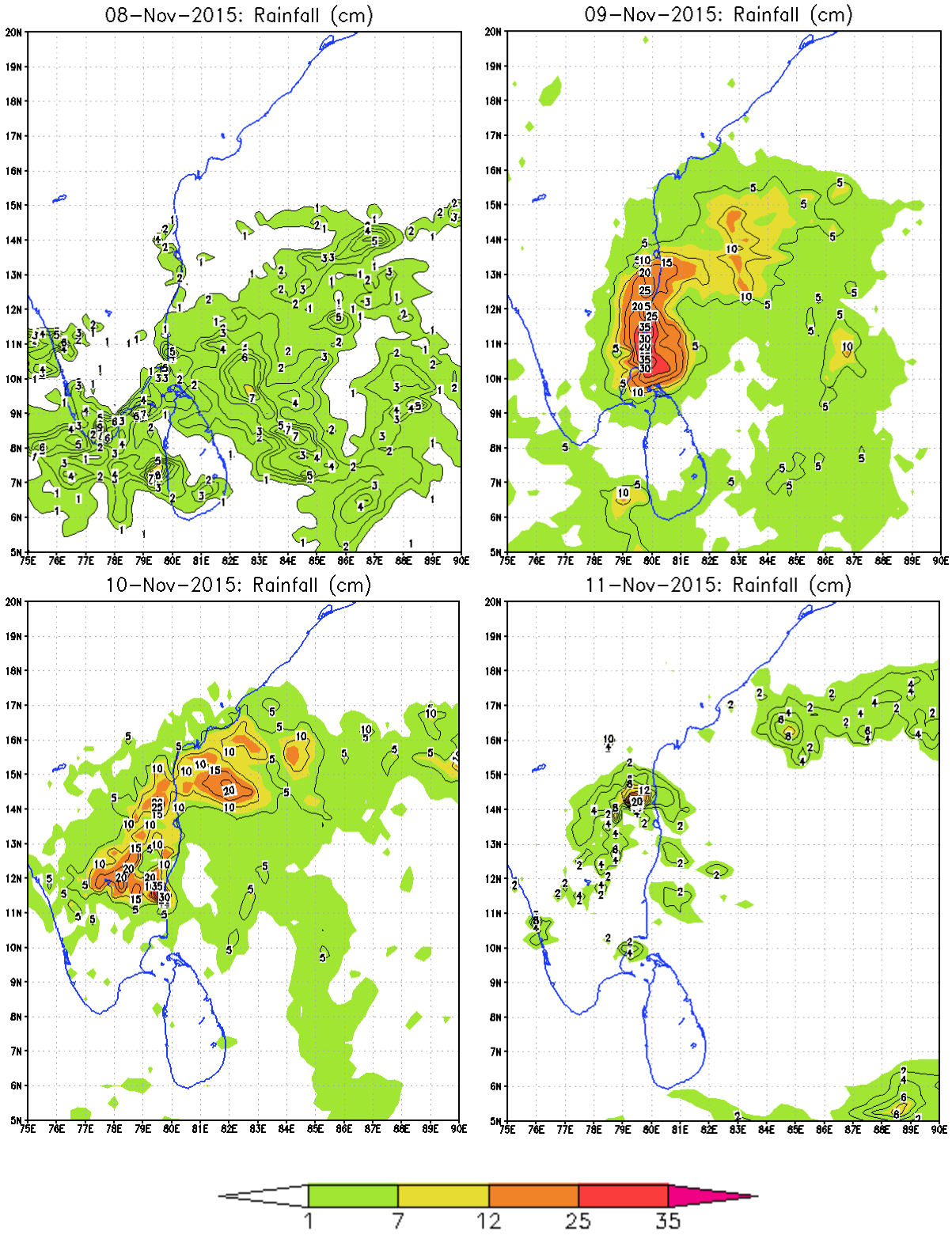


Fig. 4.2.3.9b IMD-NCMRWF GPM gauge merged rainfall depicting heavy rainfall occurences in association with the Deep Depression (08-10 November 2015) (24-hr ending 0300 UTC as on the date indicated in each plot).

The above rainfall figures indicate that extremely heavy rainfall (≥ 25 cm) is observed along coastal districts of north Tamil Nadu between 10°N to 11.5°N as on 09th/0300 UTC. Rainfall > 35 cm is observed near 10.4°N and 79.7°E. Rainfall amount decreases sharply over the interior parts thus suggesting role of frictional convergence along the coast in enhancing the rainfall along the coastal districts.

4.2.3.9.2 Strong Wind

Strong winds of the order of 25-30 knots prevailed along and off north Tamil Nadu coast on 08th and 09th November 2015. Winds were stronger over the northeastern sector due to the northeast monsoon seasonal flow. NOAA-NESDIS- CIRA, Multi-platform satellite wind analysis based on 0000 UTC of 08th and 09th depicting prevalence of strong winds of the order of 30 knots (55-60 kmph) along and off the north Tamil Nadu coast on 09th are presented in Fig. 4.2.3.10.

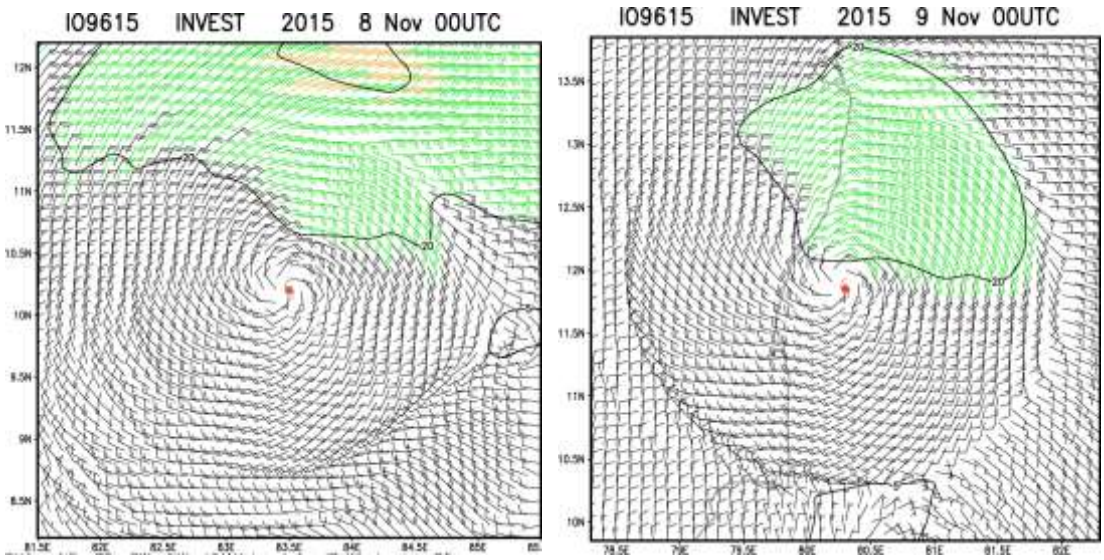


Fig. 4.2.3.10: Multi-platform satellite wind analysis based on 0000 UTC of 08th and 09th November.

(Source: NOAA-NESDIS-Coperative Institute for Research in Atmosphere (CIRA))

4.2.3.9.3. Storm Surge

No storm surge has been reported in association with the system as it was a deep depression.

4.2.3.10. Damages due to Deep Depression (08-10 November 2015)

As the system caused extremely heavy rainfall, it caused extensive inland flooding over coastal districts of north coastal Tamil Nadu. IMD's issued warnings on 09th morning (based on 09/0830 IST) regarding expected damages - Minor damage to banana trees and near coastal agriculture due to salt spray. Damage to ripe paddy crops. Some breaches in Kutcha road due to flooding. Minor damage to Kutcha embankments. Minor damage to loose / unsecured structures.

About 31 deaths were reported in Tamil Nadu and Puducherry in association with the damages caused by the system (flood related casualities and due to wall collapses in kutcha houses). A few photographs depicting the flood situation in north Tamil Nadu are shown in Fig. 4.2.3.11.

Fig. 4.2.3.11 A few damage photographs due to the Deep Depression (08-10 November 2015)

CHAPTER-V

FDP (Cyclone) NOC Report Dated 15 October, 2015

Synoptic features based on 0300 UTC of today:

- An upper air cyclonic circulation lies over south Andaman Sea & neighbourhood and extends upto 1.5 km above mean sea level.
- An upper air trough runs from Gangetic West Bengal to westcentral Bay of Bengal off coastal Andhra Pradesh and extends upto 4.5 km above mean sea level.
- An upper air cyclonic circulation lies over Lakshadweep-Maldives areas and extends upto 0.9 km above mean sea level.

Environmental features based on 0300 UTC of today:

Sea Surface Temperature:

- Sea Surface Temperature is 28-31^{0}C over Bay of Bengal and Andaman Sea.
- It is 28-31^{0}C over Arabian Sea except southwest Arabian sea where it is 26-28^{0}C

Tropical Cyclone Heat Potential (TCHP):

- The ocean thermal energy is 6 0-80kJ/cm^2 over Bay of Bengal and Andaman Sea except north Bay of Bengal where it is less than 6 0-kJ/cm^2. It is 100-120 kJ/cm^2 over the equatorial region.
- It is around 6 0-80 kJ/cm^2 over most parts of Arabian Sea except over western part of Arabian Sea off Somalia, Oman coast. It is 100-120 kJ/cm^2. It is 100-120 kJ/cm^2 over the equatorial parts of southeast Arabian Sea.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive (30-40*10^{-5} s^{-1}) over Andaman Sea off Andaman & Nicobar islands and parts of Bay of Bengal.
- It is positive (30-40*10^{-5} s^{-1}) over the south Arabian Sea and western parts of Arabian Sea off Somalia and Oman coast.

Convergence:

- Lower level convergence is positive (5*10^{-5}s^{-1}) over Andaman sea.
- It is positive over Lakshadweep area and south Arabian Sea and of the order 5-10*10^{-5} s^{-1}

Divergence:

- Upper level divergence is positive over South Bay of Bengal & south Arabian Sea and of the order (5-10*10^{-5} s^{-1}).

Wind Shear:

- Wind Shear is 5-10 knots over Andaman Sea, southeast Bay of Bengal and southeast Arabian sea

Wind Shear Tendency:

- The vertical wind shear tendency is decreasing and is of the order of -5 to -10 knots over south Andaman Sea, south Bay of Bengal and south Arabian Sea.

Upper tropospheric ridge:

- The upper tropospheric **ridge** at 200 hPa passes through 17.0°N.

M.J.O. Index:

- Located in phase 8 with amplitude less than 1.0. As per forecast by dynamical and statistical models, it would continue to be in phase 8 during next 2 days.

Storms and Depression over South China Sea:

- Active Tropical Storm KOPPU lies over Northwest Pacific Ocean near Latitude15.7^{0}N and longitude 130.2^{0}E at 150600 UTC.

Status of observational system:

- Details of the status of observational systems are given in **Annexure I.**

Satellite:

Inference based on INSAT imagery of 150300 UTC:

Bay of Bengal & Andaman Sea:-
Scattered low / medium clouds with embedded isolated moderate to intense convection lies over extreme northeast Bay of Bengal and south Andaman sea.
Arabian Sea:-
Broken low and medium clouds with embedded moderate to intense convection lie over central Arabian Sea between latitude 19.0˚N to 21.5 ˚N and longitude 60.0˚E to 63.5˚E in association with feeble low level circulation over the area. Scattered low and medium clouds with embedded moderate to intense convection lie over southeast Arabian Sea.

NWP Analysis
The analysis of **IMD-GFST574** model charts based on 0000 UTC of 15th October, 2015 show a feeble trough/cyclonic circulation in the lower level over south Andaman Sea and neighborhood extending upto 1.5 km above mean sea level, which is likely to move northwestward in next 72 hours towards southeast Bay of Bengal off Sri Lanka coast as cyclonic circulation. In (ANNEXRE – II)

The **WRF model** analysis and forecasts over the Bay of Bengal also shows almost similar patterns like that is seen with GFS model.

The **Genesis Potential Parameter (GPP)** analysis and forecasts based on 0000 UTC of 15 October shows a moderate GPP zone over south Andaman Sea associated with the circulation. The GPP zone likely to move in northwest direction during next 72 hours, however, without further intensification.

NWP products are available at:
http://202.54.31.51/bias/gfsproducts.php
http://202.54.31.51/bias/wrf27pro.php
http://202.54.31.51/bias/potentialparameter.php

NCMRWF-UKMO model does not suggest any cyclogenesis over Bay of Bengal during the next 3 days.
NCMRWF-GFS model does not suggest any cyclogenesis over Bay of Bengal during the next 3 days.

ECMWF Model does not suggest any cyclogenesis over Bay of Bengal during the next 5 days.

Summary and Conclusion:

Bay of Bengal & Andaman Sea

PROBABILITY OF CYCLOGENESIS OVER BAY OF BENGAL AND ANDAMAN SEA DURING NEXT 72 HOURS:

24 hours	24-48 hours	48-72 hours
Nil	Nil	Nil

PROBABILITY OF CYCLOGENESIS OVER ARABIAN SEA DURING NEXT 72 HOURS:

24 hours	24-48 hours	48-72 hours
Nil	Nil	Nil

Advisory: No IOP for next five days.

Annexure-I

Status of Observation system:

Synoptic observation:

Region	Date/Time (UTC)		
	14/12	**15/00**	**15/03**
India	37	32	43
Coastal stations			
WB	6	3	6
Odisha	7	5	7
AP	12	12	13
Tamil Nadu	11	10	10
Puducherry	1	1	1
A & N	6	1	6
Bangladesh	-	-	-
Myanmar	10	10	9
Thailand	3	3	3
Sri Lanka	9	7	8

AWS Observations:

Region	Date/Time (UTC)		
	15/12	**16/00**	**16/03**
India	61	68	80
Coastal stations			
WB	5	5	6
Odisha	12	5	11
AP	14	13	12
Tamil Nadu	13	12	25
Puducherry	1	1	1
A & N	-	-	-

- **RS/RW** (12Z) of 14/11/2015 **-0/39**
- **No. of Ascents reaching 250 hPa level: 0, MISDA: 39**
- **RS/RW** (00Z) of 15/11/2014-24**/39**
- **No. of Ascents reaching 250 hPa level: 8, MISDA: 04**

No. of PILOT Ascents

15/12Z	**16/00Z**
10	04

Buoy Data

15/12Z	**16/00Z**	**16/03Z**
16	13	16

FOC CHENNAI: STATUS OF OBSERVATION

No. of Synop data

Date→	**14.10.2015**							
UTC→	**00**	**03**	**06**	**09**	**12**	**15**	**18**	**21**
Chennai Region (Coasts of AP & TN)	**7**	**13**	**7**	**12**	**7**	**12**	**7**	**11**

No. of RS/RW Ascents

00Z /14.10.2015 : 4
No. of Ascents reaching 250 hPa level = 4
MISDA : 4

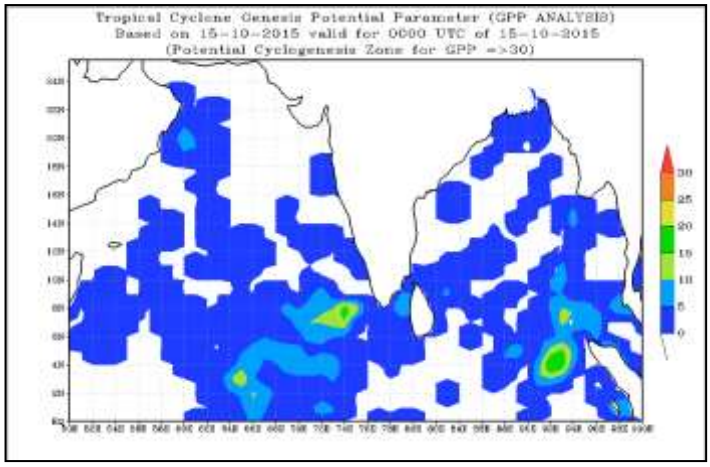
12Z /14.10.2015 : 1
No. of Ascents reaching 250 hPa level =1
MISDA : 7

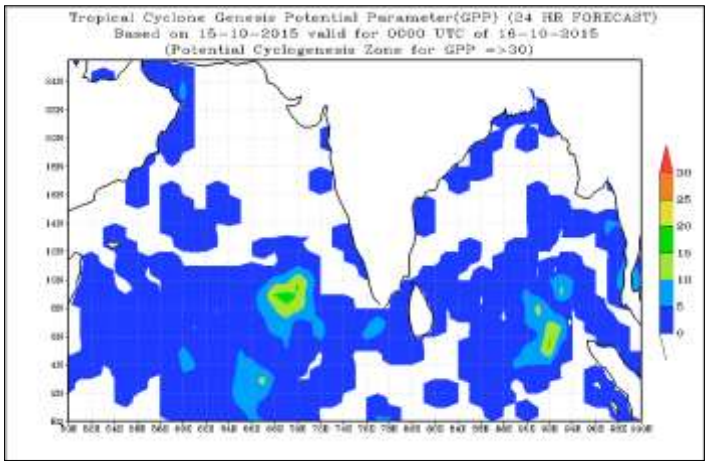
No. of PILOT Ascents:

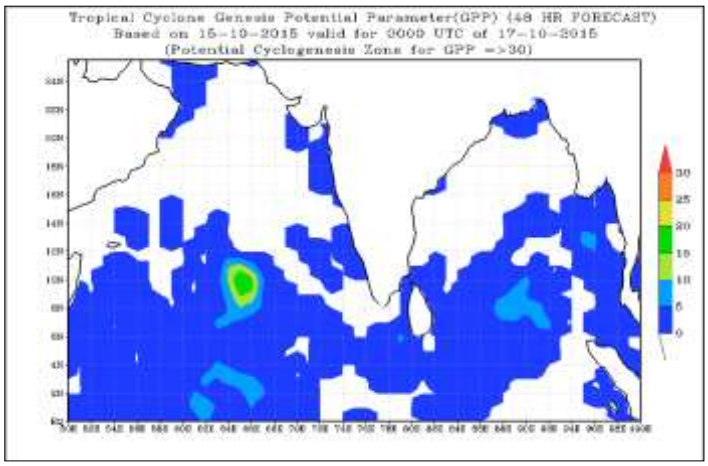
14.10.2015

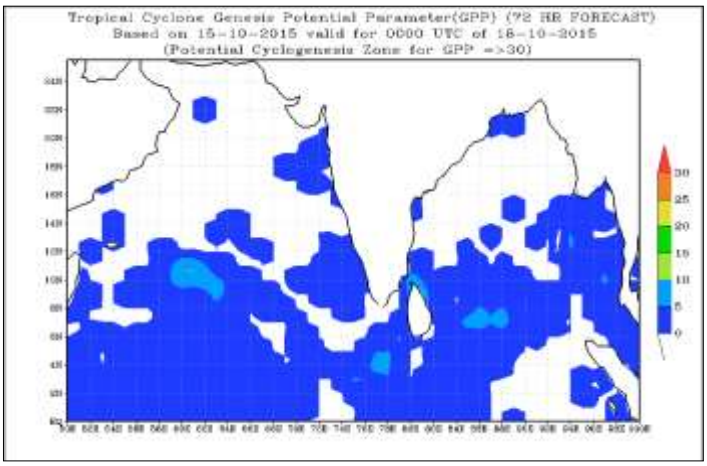
06Z	18Z
4	1

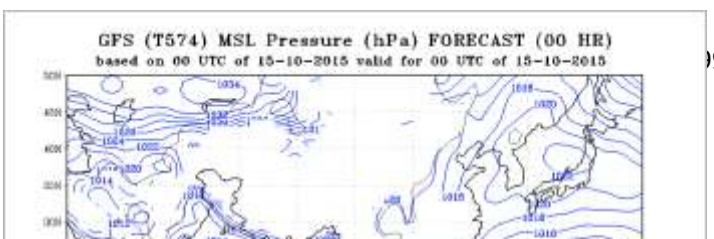
Annexure-II


Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 15-10-2015 valid for 0000 UTC of 15-10-2015
(Potential Cyclogenesis Zone for GPP =>30)

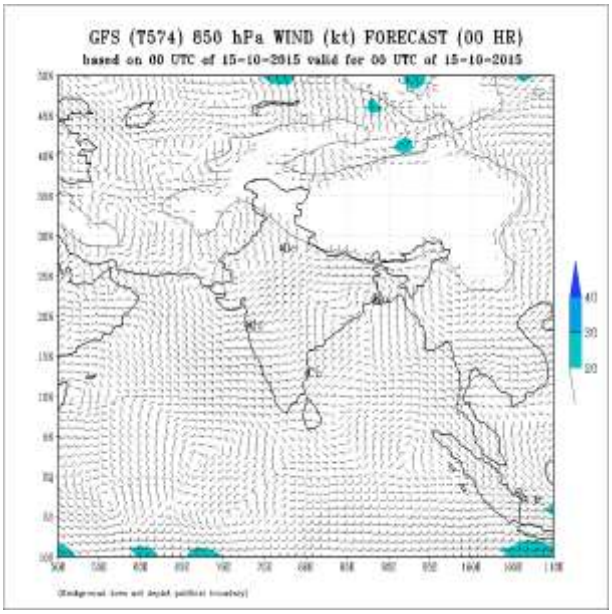

Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 15-10-2015 valid for 0000 UTC of 16-10-2015
(Potential Cyclogenesis Zone for GPP =>30)

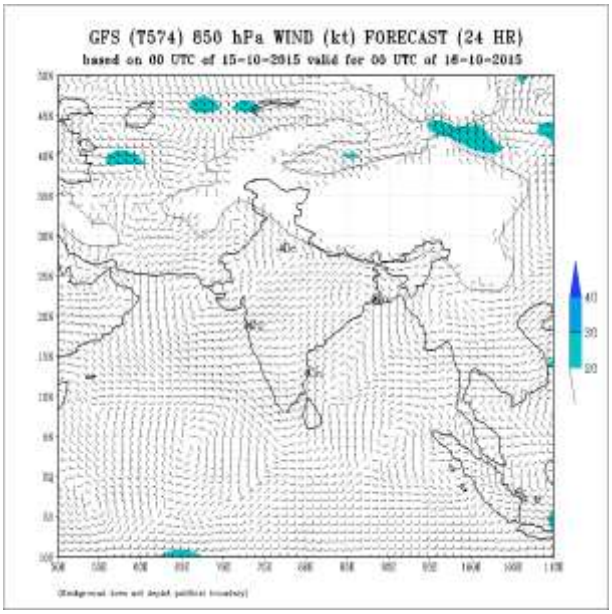

Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
Based on 15-10-2015 valid for 0000 UTC of 17-10-2015
(Potential Cyclogenesis Zone for GPP =>30)

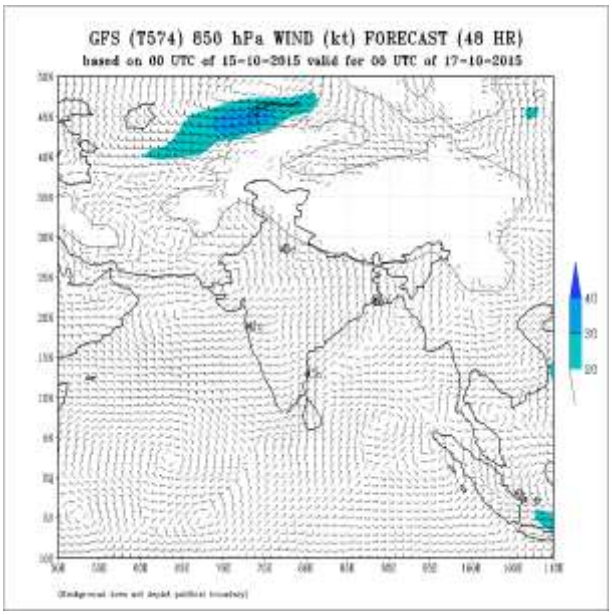

Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 15-10-2015 valid for 0000 UTC of 18-10-2015
(Potential Cyclogenesis Zone for GPP =>30)

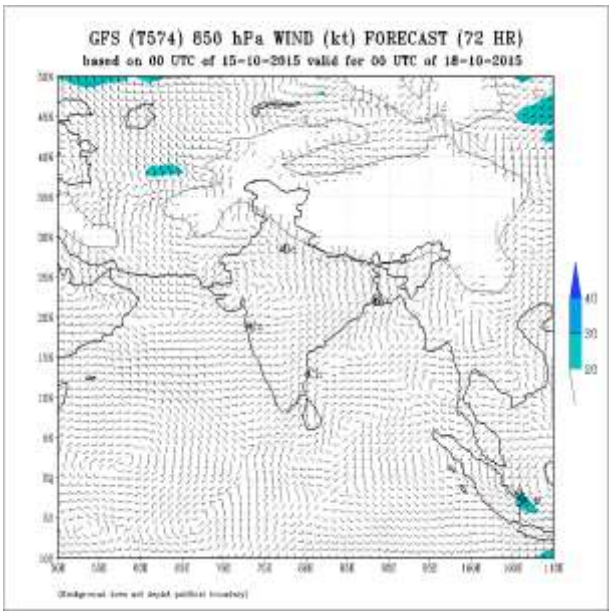

GFS (T574) MSL Pressure (hPa) FORECAST (00 HR)
based on 00 UTC of 15-10-2015 valid for 00 UTC of 15-10-2015

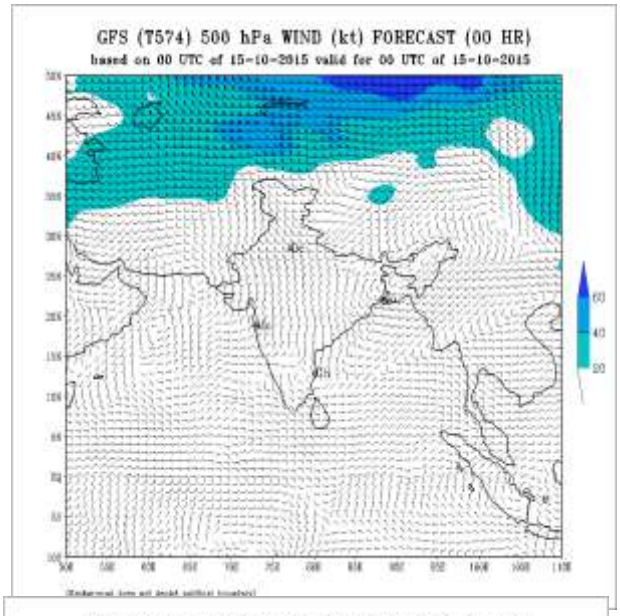

GFS (T574) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 15-10-2015 valid for 00 UTC of 16-10-2015

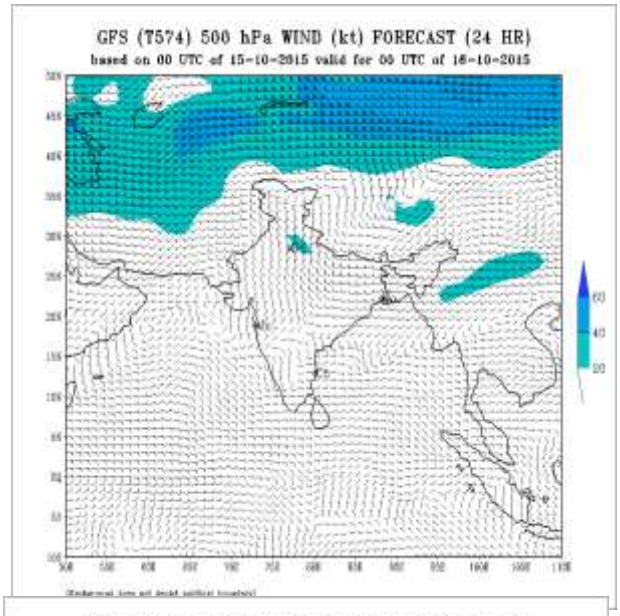

GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 15-10-2015 valid for 00 UTC of 15-10-2015

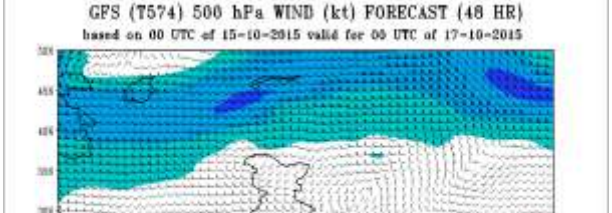

GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 15-10-2015 valid for 00 UTC of 16-10-2015

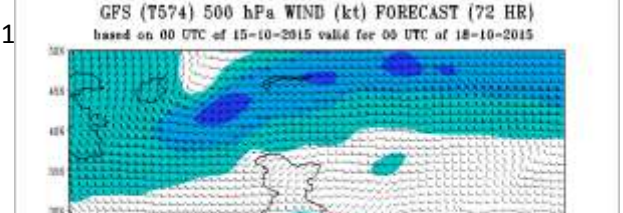

GFS (T574) 850 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 15-10-2015 valid for 00 UTC of 17-10-2015


GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 15-10-2015 valid for 00 UTC of 18-10-2015


GFS (T574) 500 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 15-10-2015 valid for 00 UTC of 15-10-2015


GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 15-10-2015 valid for 00 UTC of 16-10-2015


GFS (T574) 500 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 15-10-2015 valid for 00 UTC of 17-10-2015


GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 15-10-2015 valid for 00 UTC of 18-10-2015

Synoptic features based on 0300 UTC of today:

- The upper air cyclonic circulation over southeast Bay of Bengal (BoB) & neighbourhood extending upto 1.5 km above mean sea level persists.
- An upper air cyclonic circulation lies over Comorin area & adjoining south Tamilnadu and extends upto 0.9 km above mean sea level.
- A trough in the easterlies extends from southwest BoB to westcentral BoB off north Andhra Pradesh coast between 3.1 & 4.5 km above mean sea level.
- The upper air trough from Gangetic West Bengal to westcentral BoB off coastal Andhra Pradesh has become less marked.
- The upper air cyclonic circulation over Lakshadweep and Maldives area now lies over Maldives area & neighbourhood and extends upto 0.9 km above mean sea level.

Environmental features based on 0300 UTC of today:

Sea Surface Temperature (SST):

- SST is 29-30^{0}C over BoB and Andaman Sea.
- SST 29-30^{0}C over Arabian Sea (AS).

Tropical Cyclone Heat Potential (TCHP):

- TCHP is 60-80 kJ/cm^2 over entire Bay of Bengal and Andaman Sea and 40 kJ/cm^2 over north BoB.
- TCHP is around 60-80 kJ/cm^2 over most parts of AS except over western part of AS off Somalia, Oman coast.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive (25*10^{-5}s^{-1}) over north Andaman Sea and Gulf of Martaban. It is negative over rest BoB.
- It is positive (25*10^{-5}s^{-1}) over the southeast AS and negative over rest AS.

Convergence:

- Lower level convergence is 10-20 *10^{-5}s^{-1}over Gulf of Martaban. No significant convergence zone is seen over BoB and Andaman Sea.
- Lower level convergence is 5-10*10^{-5}s^{-1}over southeast AS. No significant zone over rest parts.

Divergence:

- Upper level divergence is positive over Gulf of Martaban (5-10*10^{-5}s^{-1}). No other significant zone over rest BoB and Andaman Sea.
- Upper level divergence is positive over southeast AS (5-10*10^{-5}s^{-1}). No other significant zone over rest AS.

Wind Shear:

- Wind Shear is 5-10 knots over southeast and eastcentral BoB. It is >20 knots over north BoB and 10-20 knots over Andaman Sea.
- Wind Shear is 5-10 knots over south ARB. It is >20 knots as we move northwards.

Wind Shear Tendency:

- The vertical wind shear tendency is decreasing and is of the order of -5 to -10 knots over north BoB and parts of central BoB. Shear tendency shows increasing trend (5-10 knots) over Andaman Sea and parts of southeast BoB.
- The vertical wind shear tendency is increasing (5 to 10 knots) over southwest, eastcentral and north AS. Decreasing tendency is seen over northwest AS off Gulf of Oman. No change in wind shear tendency during past 24 hours over southeast AS.

Upper tropospheric ridge:

- The upper tropospheric **ridge** at 200 hPa runs along 18.0°N over BoB and 16.0°N over AS.

M.J.O. Index:

- Located in phase 7 with amplitude less than 1.0. As per forecast by dynamical and statistical models, it would continue to be in phase 7 during next 3 days.

Storms and Depression over South China Sea:

- The active Tropical Storm KOPPU over Northwest Pacific Ocean moved west-northwestwards and lay centred near latitude15.5^{0}N and longitude 126.8^{0}E at 160300 UTC. It would move west-northwestwards during next 2 days and then recurve northwards.

Status of observational system:

Details of the status of observational systems are given in **Annexure I.**

Satellite:

Inference based on INSAT imagery of 160900 UTC:

Bay of Bengal & Andaman Sea:

Low and medium clouds with embedded moderate to intense convective clouds lay over south BoB and Andaman sea. CTT is -55^{0}C.

Arabian Sea:

Low and medium clouds with embedded weak to moderate convective clouds lay at few places over sotheast AS and southwest parts of northwest AS.

NWP Analysis

IMD GFS: The analysis of **IMD-GFST574** model charts based on 0000 UTC of 16th October, 2015 show a feeble trough in the lower level over south Andaman Sea and neighborhood and extending upto 1.5 km above mean sea level, which is likely to move northwestward in next 48 hours and seen as cyclonic circulation to the south off Sri Lanka coast. This cyclonic circulation is further likely to move westward during subsequent 24 hrs. Another cyclonic circulation over the south-central part of the AS in the analysis wind of 16th October, 2015 is likely to move westward during next 72 hrs**.(Annexure-II)**

IMD WRF: The **WRF model** analysis and forecasts over the BoB also show almost similar patterns like that is seen with **IMD-GFST574** model. However, the Arabian Sea circulation in WRF model analysis and forecasts appeared slightly in the southern latitude (close to equator) compared to that is seen in **IMD-GFST574** model.

NWP products are available at:

http://202.54.31.51/bias/gfsproducts.php
http://202.54.31.51/bias/wrf27pro.php
http://202.54.31.51/bias/potentialparameter.php

NCMRWF-UM: NCUM model does not suggest any cyclogenesis over BoB and AS during the next 2 days. Forecast beyond 48 hours is not available.

NCMRWF-GFS: NCMRWF-GFS model does not suggest any cyclogenesis over BoB and AS during the next 5 days.
ECMWF Model: ECMWF Model shows Low over SE AS on 17th with no further intensification.
JMA: JMA Model shows low over SE AS on 19 Oct.
ARP-Meteo France: ARP-Meteo France Model suggests formation of low over SE AS at 0000 UTC of 16 Oct. It becomes less marked on 17th.
IMD GPP Guidance: The **Genesis Potential Parameter (GPP)** analysis and forecasts based on 0000 UTC of 16th October shows a moderate GPP zone over south Andaman Sea and also over the southern part of central AS. The GPP zone over the south Andaman Sea is likely to move in northwest direction during next 72 hours, however, without further intensification. The GPP value over the Arabian Sea is also likely to move westward and weaken after 48 hrs. **(Annexure-II)**

Summary and Conclusion:

According to a few models and the favourable environmental conditions, a low pressure area may form over the SE AS. However, no model suggests its further intensification.

Bay of Bengal & Andaman Sea

Probability of cyclogenesis over Bay of Bengal and Andaman Sea during next 120 hours:

24 hours	24-48 hours	48-72 hours	72-96 hours	96-120 hours
NIL	NIL	NIL	NIL	NIL

Probability of cyclogenesis over Arabian Sea during next 120 hours:

24 hours	24-48 hours	48-72 hours	72-96 hours	96-120 hours
NIL	NIL	NIL	NIL	NIL

Advisory: No IOP for next five days.

Annexure-I

Status of Observation system:

Synoptic observation:

Region	Date/Time (UTC)		
	15/12	**16/00**	**16/03**
India	46	37	47
Coastal stations			
WB	8	6	8
Odisha	7	7	7
AP	13	12	14
Tamil Nadu	11	10	12
Puducherry	1	1	1
A & N	6	1	5
Bangladesh	11	8	11
Myanmar	11	8	10
Thailand	3	3	3
Sri Lanka	9	6	9

AWS Observations:

Region	Date/Time (UTC)		
	15/12	**16/00**	**16/03**
India	59	55	56
Coastal stations			
WB	6	5	6
Odisha	12	12	12
AP	14	13	14
Tamil Nadu	27	25	24
Puducherry	-	-	-
A & N	-	-	-

- **RS/RW** (12Z) of 15/10/2015 **-0/39**
- **No. of Ascents reaching 250 hPa level: 0, MISDA: 39**
- **RS/RW** (00Z) of 16/10/2015-24**/39**
- **No. of Ascents reaching 250 hPa level: 8, MISDA: 04**

No. of PILOT Ascents

15/12Z	**16/00Z**
NIL	08

Buoy Data

15/12Z	**16/00Z**	**16/03Z**
21	18	20

FOC CHENNAI: STATUS OF OBSERVATION

No. of Synop data

Date→	**15.10.2015**							
UTC→	**00**	**03**	**06**	**09**	**12**	**15**	**18**	**21**
Chennai Region (Coasts of AP & TN)	**20**	**21**	**20**	**20**	**22**	**20**	**20**	**20**

No. of RS/RW Ascents

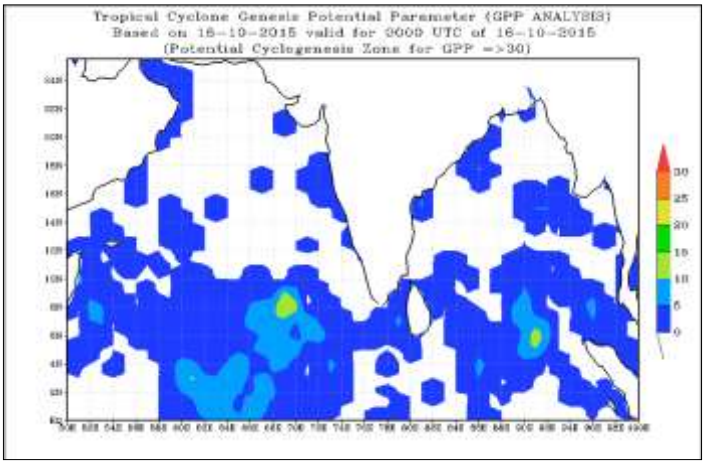
00Z /15.10.2015 : 6
No. of Ascents reaching 250 hPa level = 6
MISDA : 2

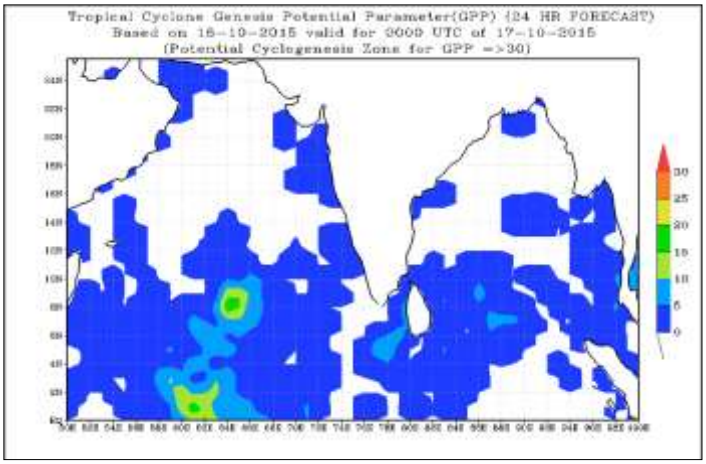
12Z /15.10.2015 : 1
No. of Ascents reaching 250 hPa level =1
MISDA : 7

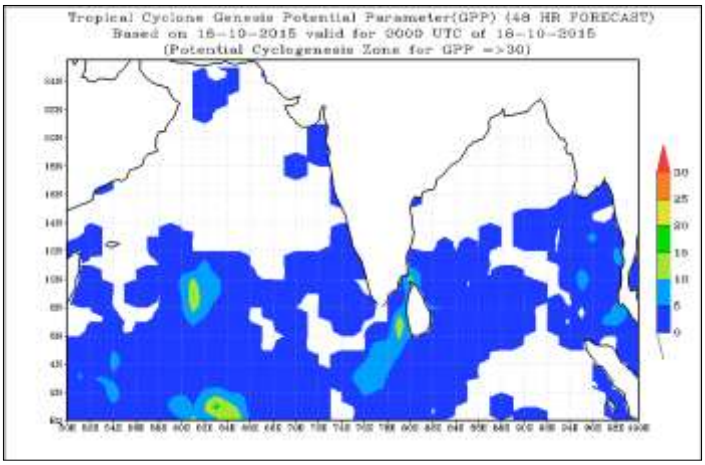
No. of PILOT Ascents:

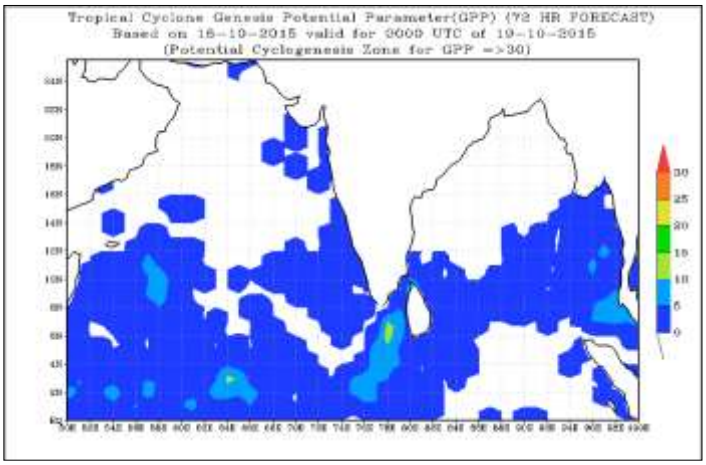
15.10.2015	
06Z	18Z
5	5

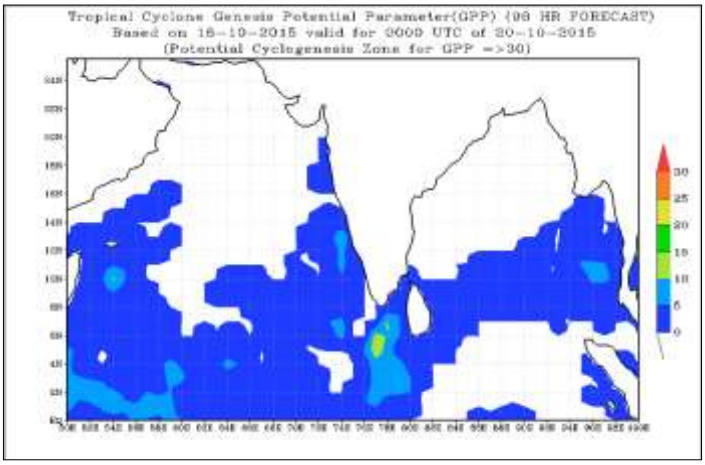
Annexure-II

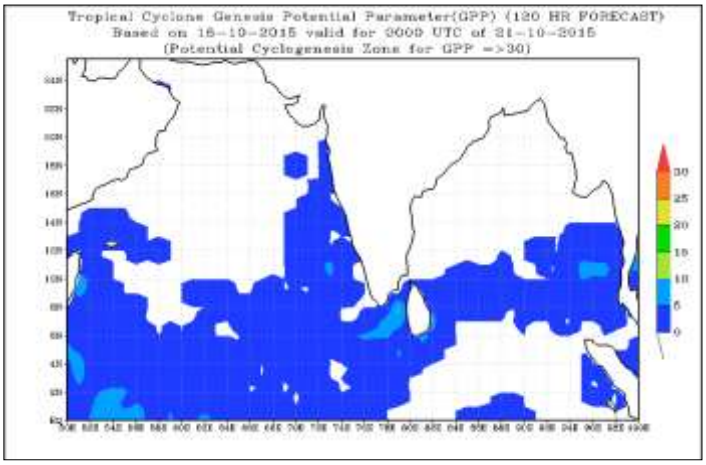

Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 16-10-2015 valid for 0000 UTC of 16-10-2015
(Potential Cyclogenesis Zone for GPP =>30)

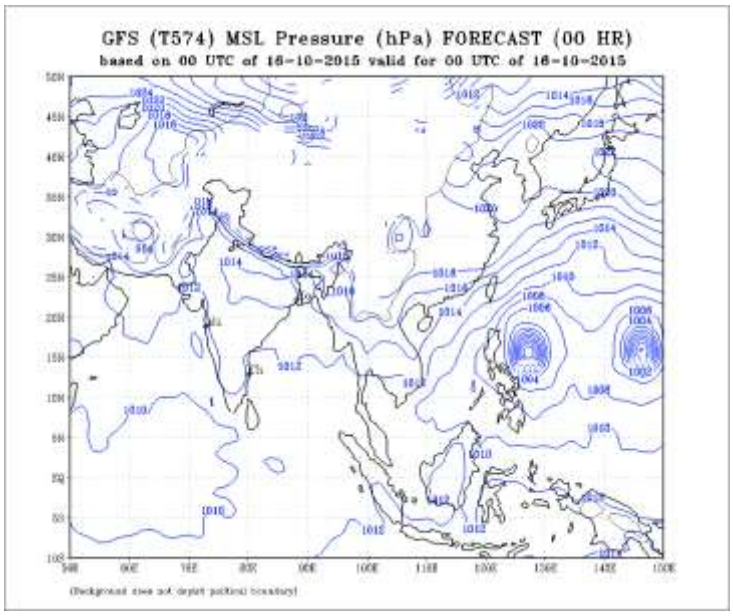

Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 16-10-2015 valid for 0000 UTC of 17-10-2015
(Potential Cyclogenesis Zone for GPP =>30)

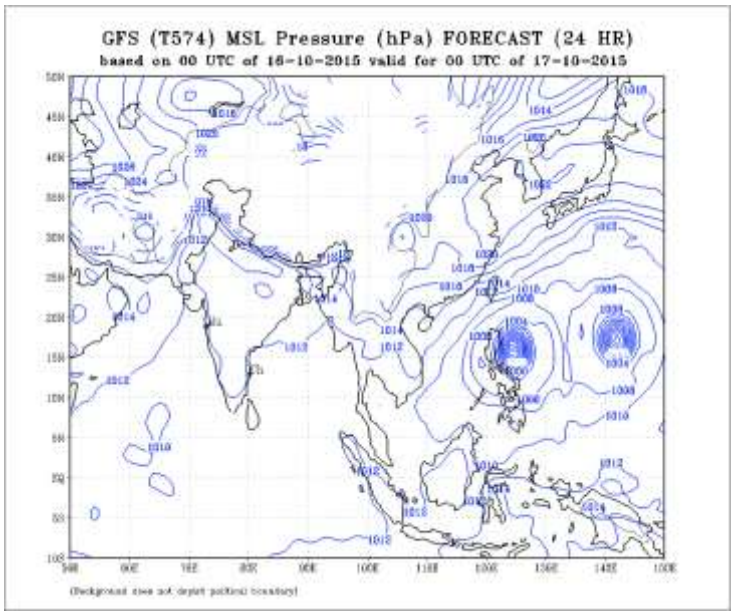

Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
Based on 16-10-2015 valid for 0000 UTC of 18-10-2015
(Potential Cyclogenesis Zone for GPP =>30)

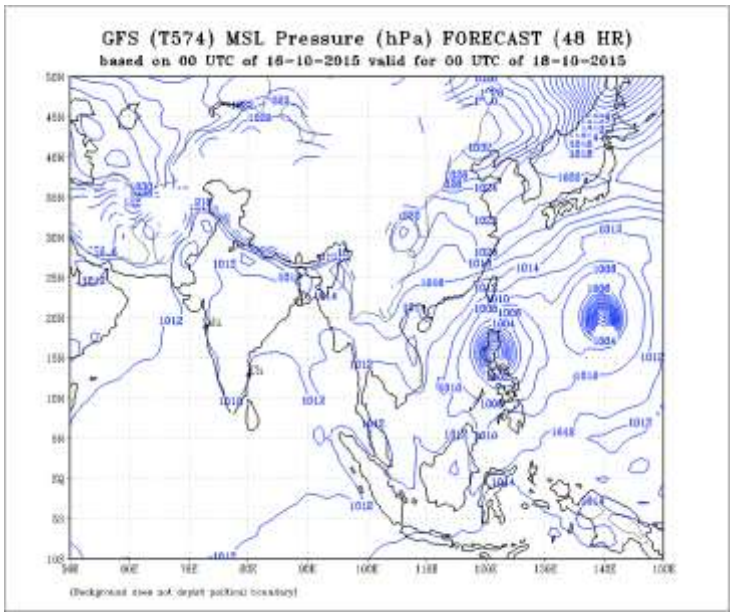

Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 16-10-2015 valid for 0000 UTC of 19-10-2015
(Potential Cyclogenesis Zone for GPP =>30)

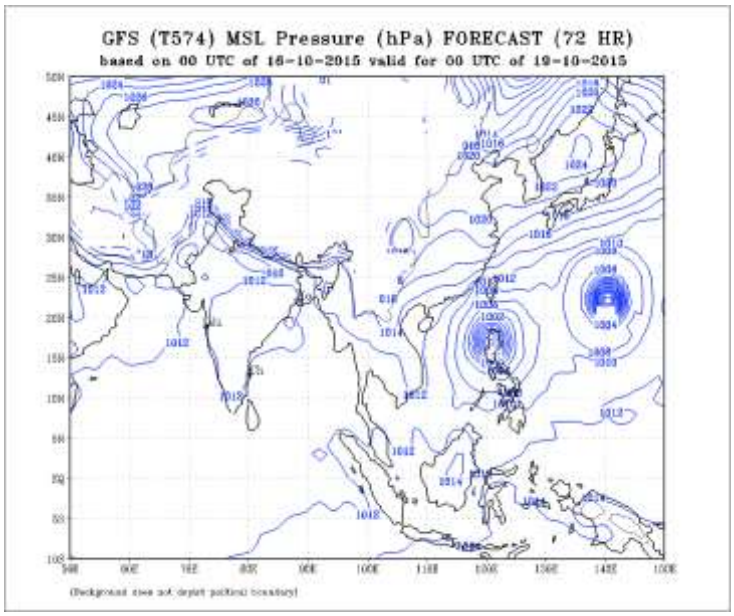

Tropical Cyclone Genesis Potential Parameter(GPP) (96 HR FORECAST)
Based on 16-10-2015 valid for 0000 UTC of 20-10-2015
(Potential Cyclogenesis Zone for GPP =>30)

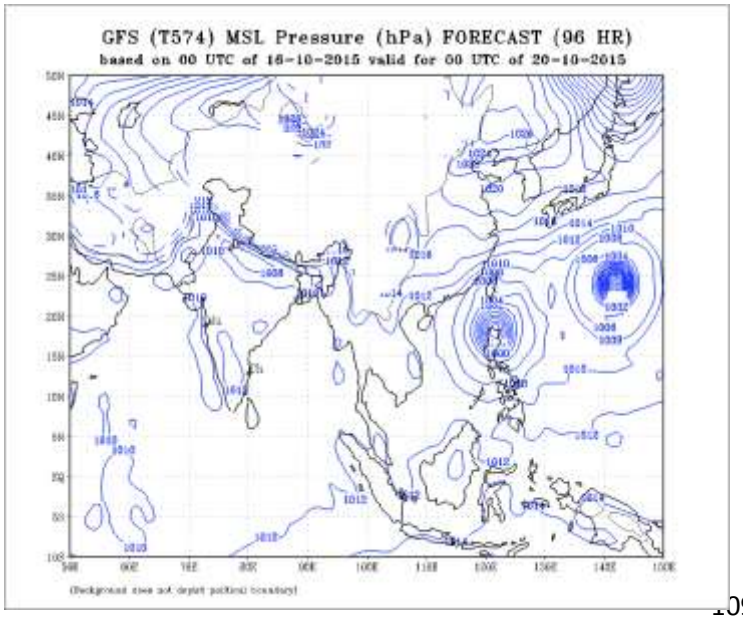

Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 16-10-2015 valid for 0000 UTC of 21-10-2015
(Potential Cyclogenesis Zone for GPP =>30)

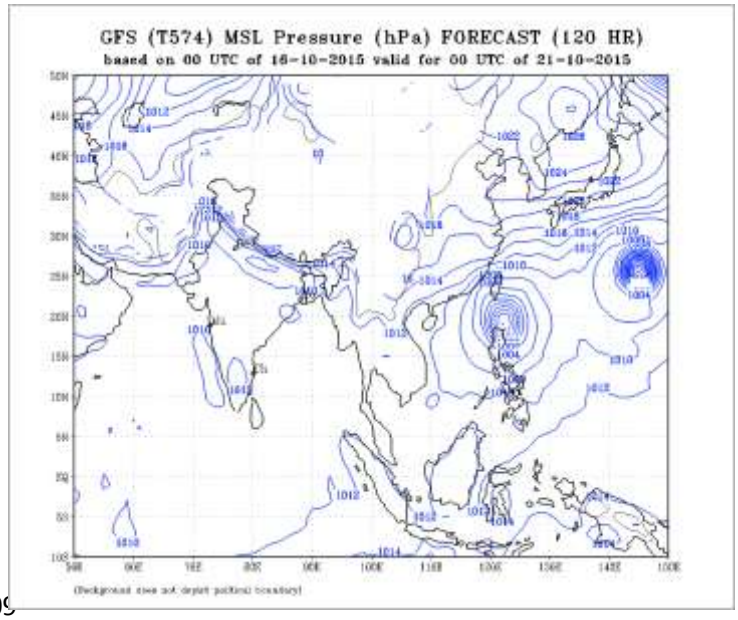

GFS (T574) MSL Pressure (hPa) FORECAST (00 HR)
based on 00 UTC of 16-10-2015 valid for 00 UTC of 16-10-2015


GFS (T574) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 16-10-2015 valid for 00 UTC of 17-10-2015


GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 16-10-2015 valid for 00 UTC of 18-10-2015


GFS (T574) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 16-10-2015 valid for 00 UTC of 19-10-2015


GFS (T574) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 16-10-2015 valid for 00 UTC of 20-10-2015


GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 16-10-2015 valid for 00 UTC of 21-10-2015

FDP (Cyclone) NOC Report Dated 17 October, 2015

Synoptic features based on 0300 UTC of today:

- The upper air cyclonic circulation over southeast Bay of Bengal & neighbourhood now lies over southeast & adjoining southwest Bay of Bengal and extends upto 1.5 km above mean sea level.
- The upper air cyclonic circulation over Comorin area & adjoining south Tamil Nadu extending upto 0.9 km above mean sea level persists.
- The trough in easterlies from southwest Bay of Bengal to westcentral Bay of Bengal off north Andhra Pradesh coast persists at 3.1km above mean sea level.

Environmental features based on 0300 UTC of today:

Sea Surface Temperature (SST):

- SST is 29-30^{0}C over BoB and Andaman Sea.
- SST 29-30^{0}C over Arabian Sea (AS).

Tropical Cyclone Heat Potential (TCHP):

- TCHP is 60-80 kJ/cm^2 over Bay of Bengal and Andaman Sea except north BoB where it is 40 kJ/cm^2.
- TCHP is around 60-80 kJ/cm^2 over most parts of AS except over western part of AS off Somalia, Oman coast.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive (25*10^{-5} s^{-1}) over north Andaman Sea. It is negative over rest BoB.
- It is positive (25*10^{-5} s^{-1}) over the southeast AS and negative over rest AS.

Convergence:

- Lower level convergence is 5*10^{-5} s^{-1} over southwest BoB. No significant convergence zone is seen over BoB and Andaman Sea.
- . No significant lower level convergence zone over AS.

Divergence:

- No significant upper level divergence zone over rest BoB and Andaman Sea.
- Upper level divergence is positive over south AS (5-10*10^{-5} s^{-1}). No other significant zone over rest AS.

Wind Shear:

- Wind Shear is 5-10 knots over south & central BoB and Andaman Sea.
- Wind Shear is 5-10 knots over south ARB. It is >20 knots as we move northwards.

Wind Shear Tendency:

- The vertical wind shear tendency is decreasing and is of the order of -5 to -10 knots over Andaman Sea and Gulf of Martaban. Shear tendency shows increasing (5 knots) over southeast and east central BoB.
- No change in wind shear tendency during past 24 hours over southeast AS. It is increasing over rest part of AS.

Upper tropospheric ridge:

- The upper tropospheric **ridge** at 200 hPa runs along 11.0°N over BoB and 17.0°N over AS.

M.J.O. Index:

- Located with amplitude less than 1.0. As per forecast by dynamical and statistical models, it would continue with amplitude less than 1.0 during next 5 days.

Storms and Depression over South China Sea:

- The active Tropical Storm KOPPU over Northwest Pacific Ocean moved west-northwestwards and lay centred near latitude15.7^{0}N and longitude 123.8^{0}E at 170600 UTC. It would move west-northwestwards during next 24 hrs and then recurve northwards.

Status of observational system:

Details of the status of observational systems are given in **Annexure I.**

Satellite:

Inference based on INSAT imagery of 170900 UTC:

Bay of Bengal & Andaman Sea:-
Low and medium clouds with embedded moderate to intense convection lay over south BoB and Andaman sea and CTT is -55^{0}C.
Arabian Sea:-
Low and medium clouds with embedded moderate to intense convection lay between latitude 12.^{0}N to 5.^{0}N longitude 55.0E to 67.0E over AS.

NWP Analysis

IMD GFS: The analysis of IMD-GFST574 model charts based on 0000 UTC of 17th October, 2015 show a feeble trough in easterly in the lower level lies over south-central Bay of Bengal and neighbourhood and extends upto 1.5 km above mean sea level, which is likely to move northwestward in next 48 hours and seen as cyclonic circulation to the south off Sri Lanka coast. This cyclonic circulation is further likely to move westward during subsequent 24 hrs. Another cyclonic circulation over the south-central part of the Arabian Sea in the analysis wind of 17th October, 2015, which is likely to move northwestward during next 72 hrs.
IMD WRF: The WRF model analysis and forecasts over the Bay of Bengal also shows almost similar patterns like that of IMD-GFST574 model. The WRF model analysis of 17th also indicate a cyclonic circulation over the south-central Arabian Sea, which is likely to move in north-westward direction and intensify gradually in next 72 hrs.
NWP products are available at:

http://202.54.31.51/bias/gfsproducts.php
http://202.54.31.51/bias/wrf27pro.php
http://202.54.31.51/bias/potentialparameter.php

NCMRWF-UM: NCUM model does not suggest any cyclogenesis over BoB and AS during the next 2 days. Forecast beyond 48 hours is not available.
NCMRWF-GFS: NCMRWF-GFS model does not suggest any cyclogenesis over BoB and AS during the next 5 days.
ECMWF Model: ECMWF Model shows Low over South BOB on 17th moving southeastwards on 18th and no further intensification.

JMA: JMA Model shows low over SE BOB on 18TH Oct and 19th Oct and no further intensification

ARP-Meteo France: ARP-Meteo France Model suggests formation of low over SouthCentral BOB at 0000 UTC of 17 Oct. It becomes less marked on 18th.

IMD GPP Guidance: The **Genesis Potential Parameter (GPP)** The Genesis Potential Parameter (GPP) analysis and forecasts based on 0000 UTC of 17th October shows a moderate GPP zone over south-central Bay of Bengal and also over the southern part of central Arabian Sea moving southwest wards without further intensification. **(Annexure-II)**

Summary and Conclusion:

The cyclonic circulation over southeast adjoining southwest BOB is expected to move westwards. A few models suggests that the formation of a feeble low pressure area under the influence of this cyclonic circulation. No further intensification is predicted by any model.

Bay of Bengal & Andaman Sea

Probability of cyclogenesis over Bay of Bengal and Andaman Sea during next 120 hours:

24 hours	24-48 hours	48-72 hours	72-96 hours	96-120 hours
NIL	NIL	NIL	NIL	NIL

Probability of cyclogenesis over Arabian Sea during next 120 hours:

24 hours	24-48 hours	48-72 hours	72-96 hours	96-120 hours
NIL	NIL	NIL	NIL	NIL

Advisory: No IOP for next five days.

Annexure-I

Status of Observation system:
Synoptic observation:

Region	Date/Time (UTC)		
	15/12	**17/00**	**17/03**
India	43	33	42
Coastal stations			
WB	8	3	8
Odisha	7	7	7
AP	14	14	14
Tamil Nadu	7	7	7
Puducherry	1	1	1
A & N	6	1	5
Bangladesh	11	11	11
Myanmar	10	8	10
Thailand	3	3	3
Sri Lanka	9	7	8

AWS Observations:

Region	Date/Time (UTC)		
	15/12	**17/00**	**17/03**
India	58	58	59
Coastal stations			
WB	5	5	6
Odisha	13222	12	12
AP	16	15	16
Tamil Nadu	24	26	25
Puducherry	-	-	-
A & N	-	-	-

RS/RW (12Z) of 15/10/2015 **-0/39**
No. of Ascents reaching 250 hPa level: 0, MISDA: 39

RS/RW (00Z) of 17/10/2015-23**/39**
No. of Ascents reaching 250 hPa level: 8, MISDA: 02

No. of PILOT Ascents

15/12Z	17/00Z
8	6

Buoy Data

15/12Z	17/00Z	17/03Z
21	18	20

FOC CHENNAI: STATUS OF OBSERVATION

No. of Synop data

Date→	16.10.2015							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	20	22	20	20	22	20	20	20

No. of RS/RW Ascents

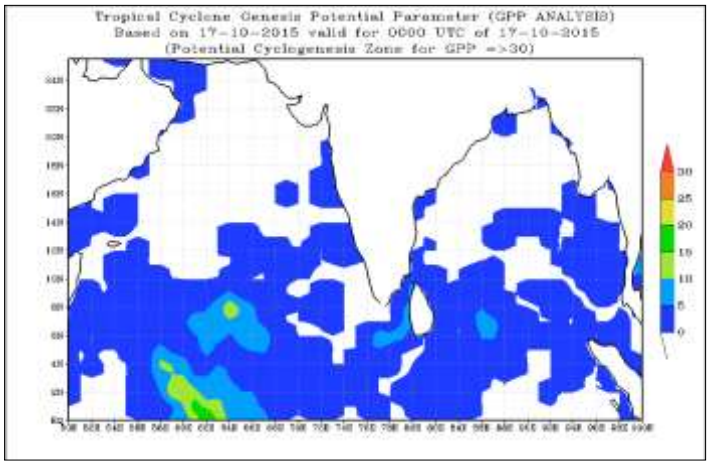
00Z /16.10.2015 : 6
No. of Ascents reaching 250 hPa level = 6
MISDA : 2

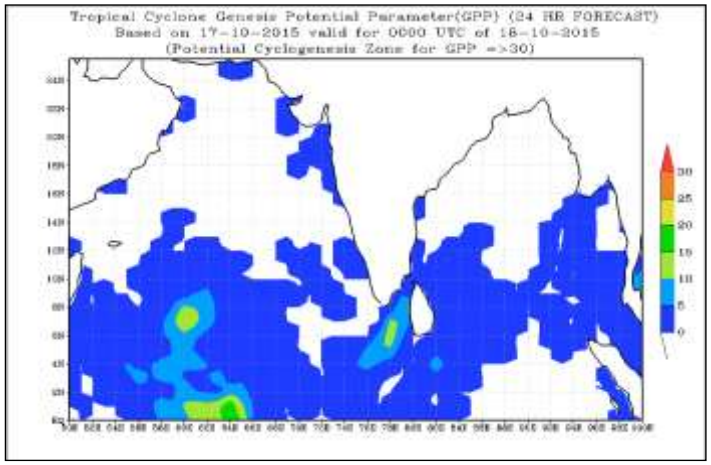
12Z /16.10.2015 : 0
No. of Ascents reaching 250 hPa level =0
MISDA : 8

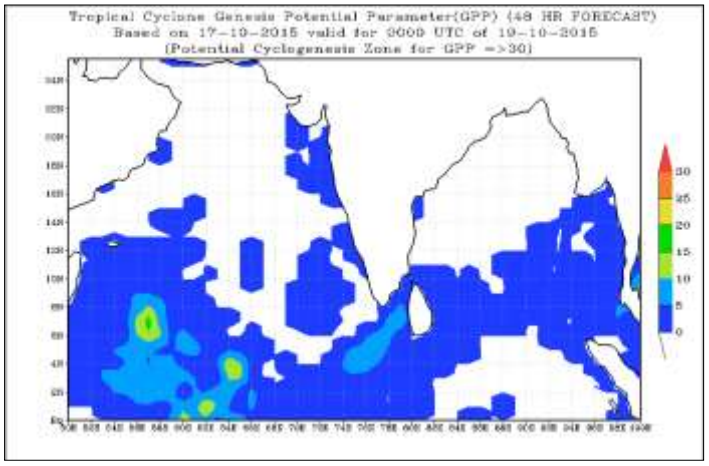
No. of PILOT Ascents:

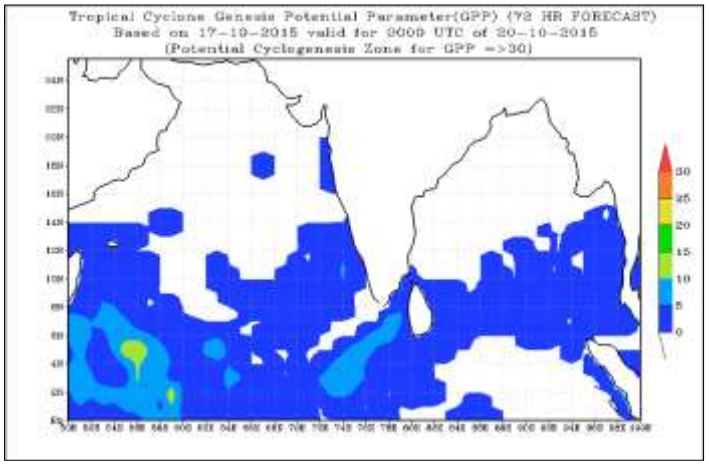
16.10.2015	
06Z	18Z
3	5

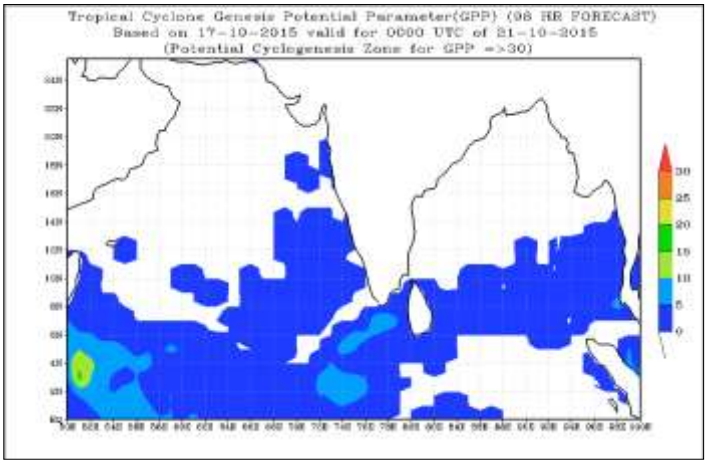
Annexure-II

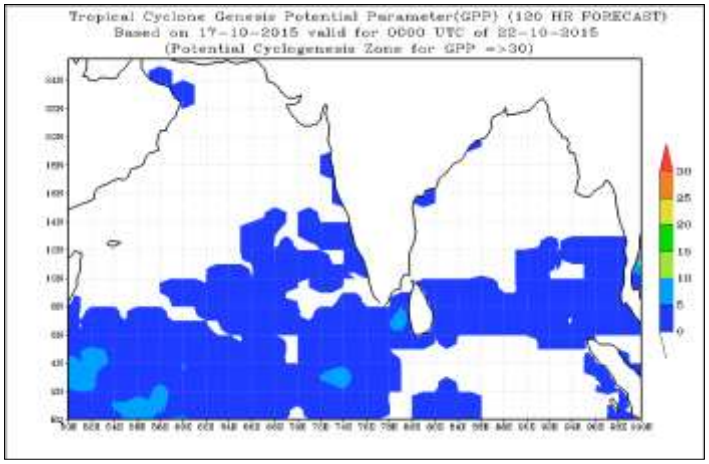

Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 17-10-2015 valid for 0000 UTC of 17-10-2015
(Potential Cyclogenesis Zone for GPP =>30)

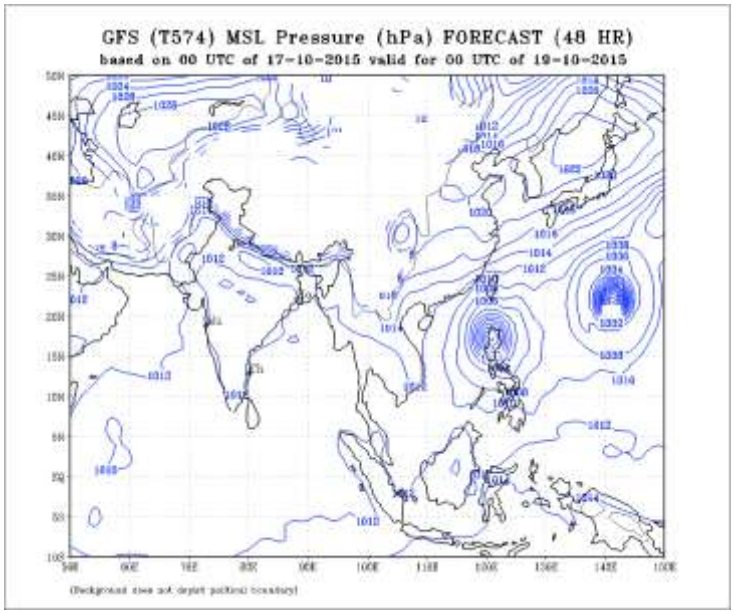

Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 17-10-2015 valid for 0000 UTC of 18-10-2015
(Potential Cyclogenesis Zone for GPP =>30)

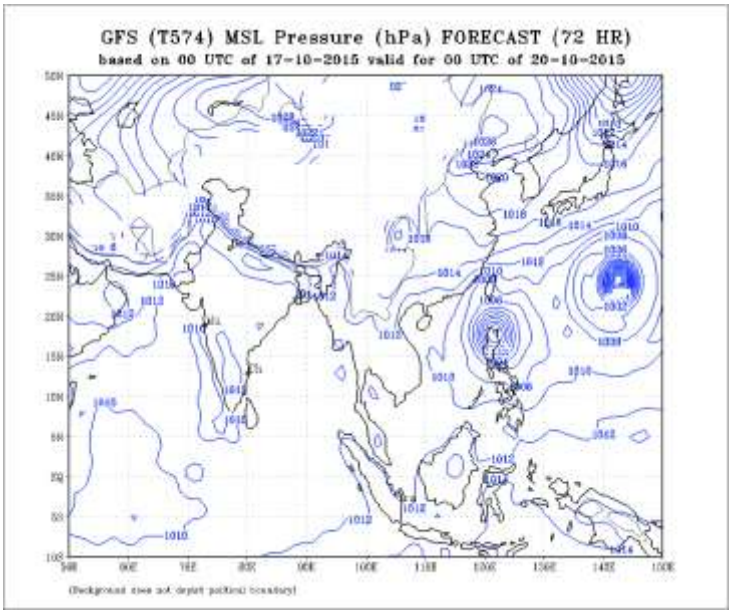

Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
Based on 17-10-2015 valid for 0000 UTC of 19-10-2015
(Potential Cyclogenesis Zone for GPP =>30)

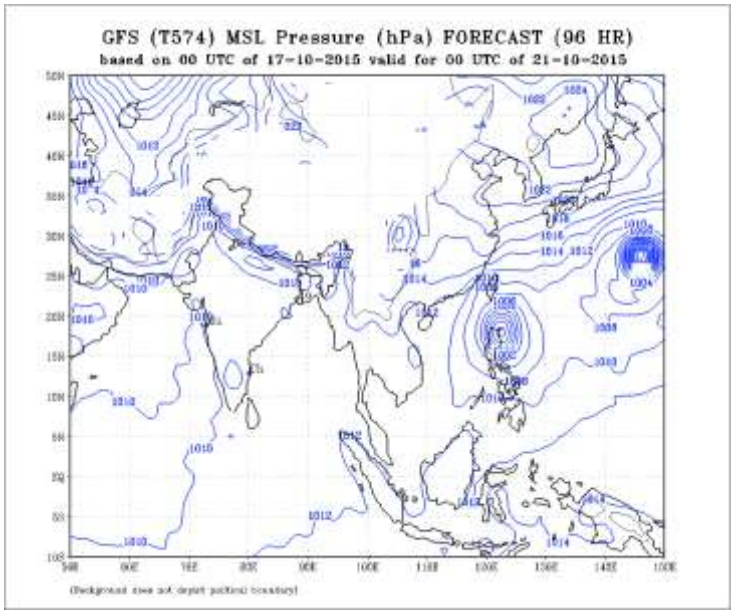

Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 17-10-2015 valid for 0000 UTC of 20-10-2015
(Potential Cyclogenesis Zone for GPP =>30)

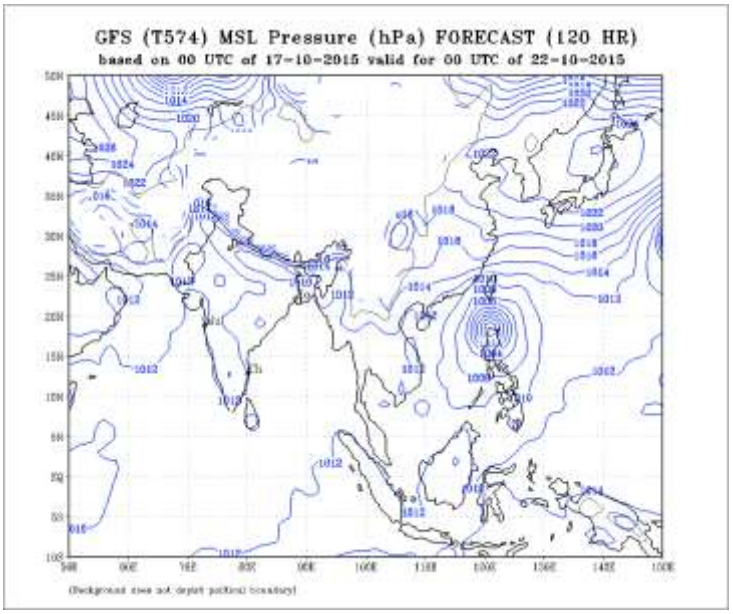

Tropical Cyclone Genesis Potential Parameter(GPP) (96 HR FORECAST)
Based on 17-10-2015 valid for 0000 UTC of 21-10-2015
(Potential Cyclogenesis Zone for GPP =>30)

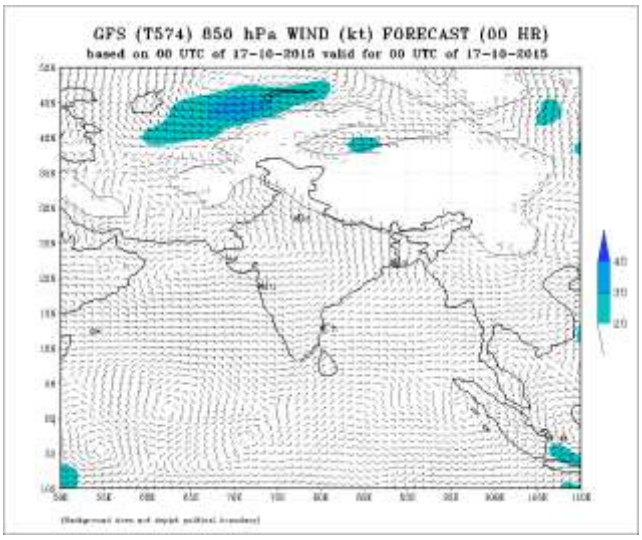

Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 17-10-2015 valid for 0000 UTC of 22-10-2015
(Potential Cyclogenesis Zone for GPP =>30)

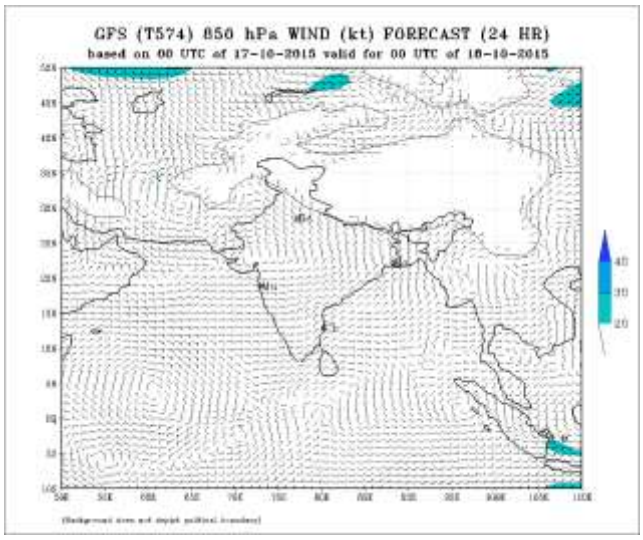

GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 17-10-2015 valid for 00 UTC of 19-10-2015

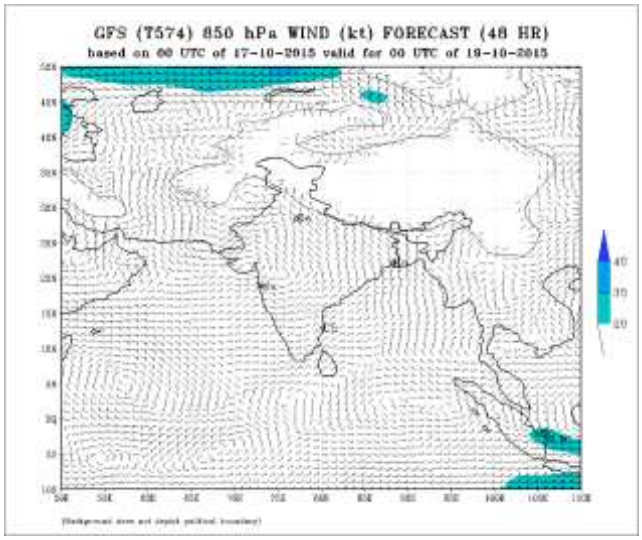

GFS (T574) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 17-10-2015 valid for 00 UTC of 20-10-2015

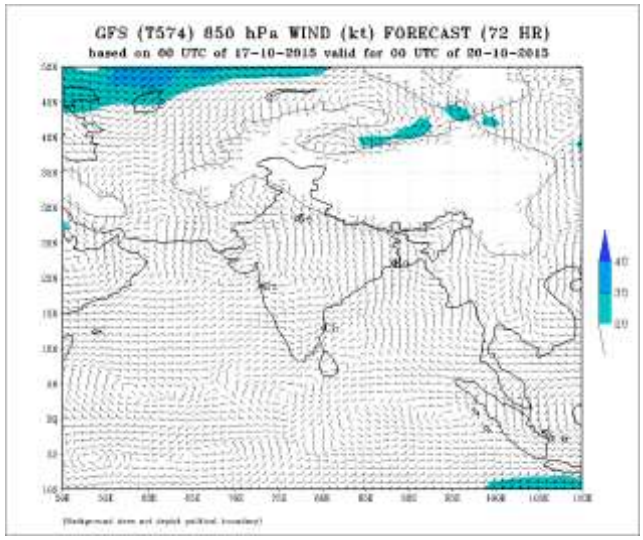

GFS (T574) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 17-10-2015 valid for 00 UTC of 21-10-2015

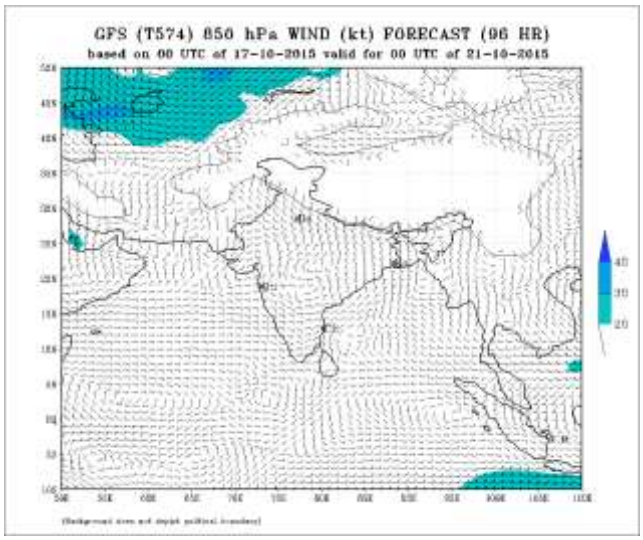

GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 17-10-2015 valid for 00 UTC of 22-10-2015

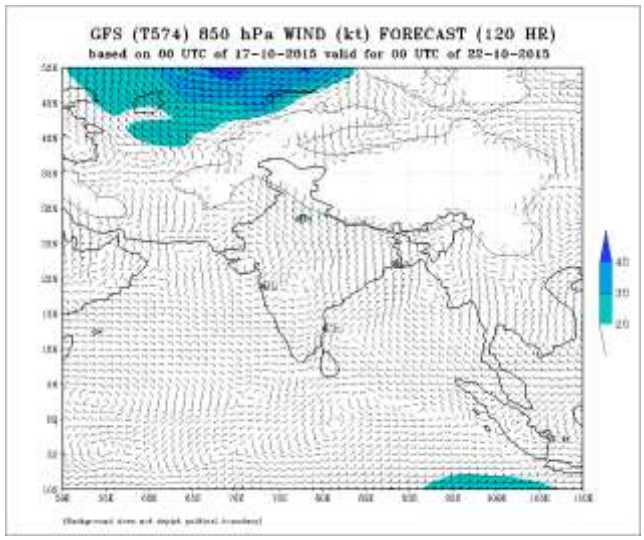

GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 17-10-2015 valid for 00 UTC of 17-10-2015

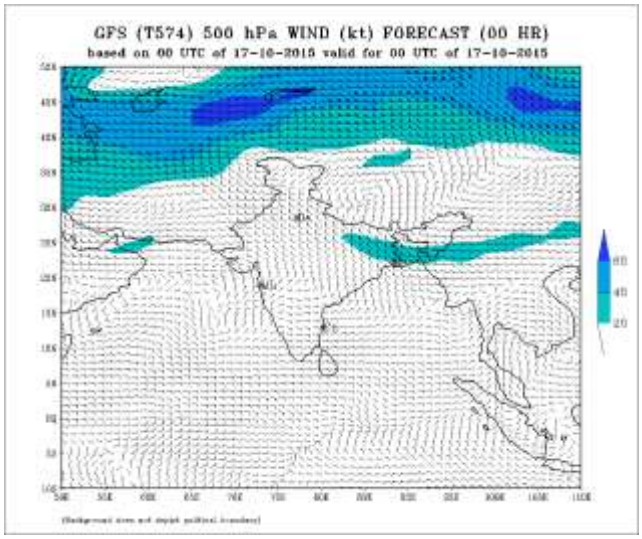

GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 17-10-2015 valid for 00 UTC of 18-10-2015

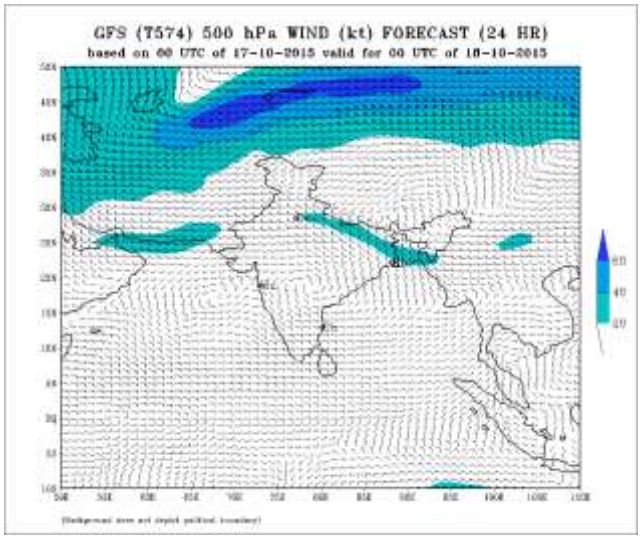

GFS (T574) 850 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 17-10-2015 valid for 00 UTC of 19-10-2015

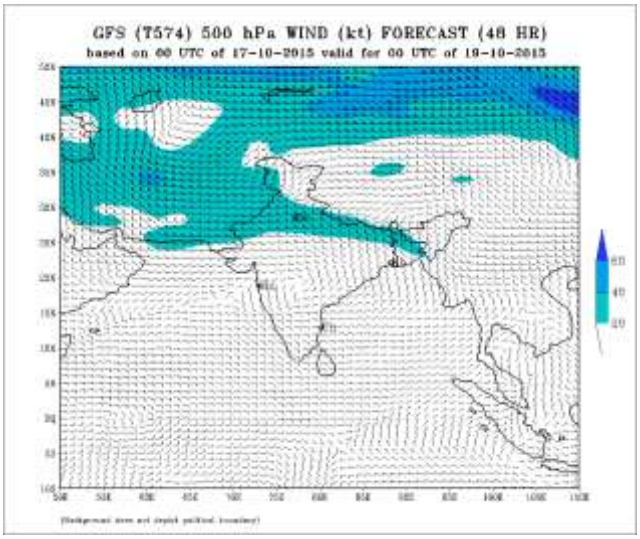

GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 17-10-2015 valid for 00 UTC of 20-10-2015

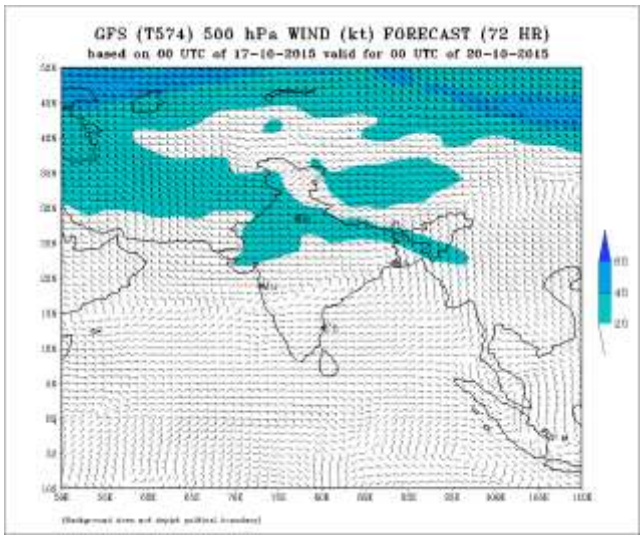

GFS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 17-10-2015 valid for 00 UTC of 21-10-2015

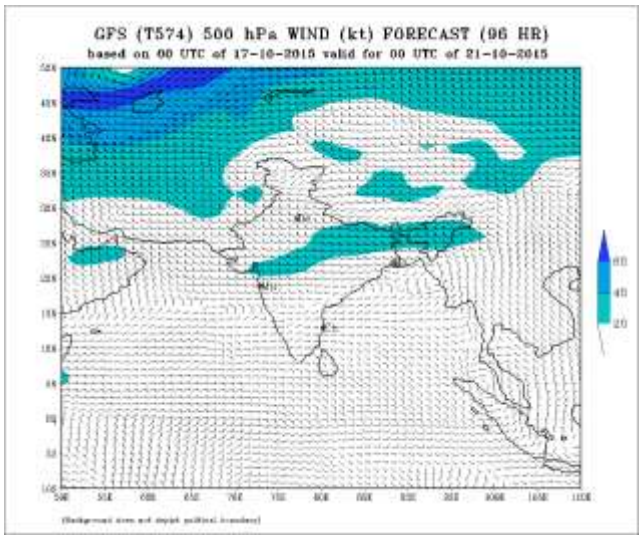

GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 17-10-2015 valid for 00 UTC of 22-10-2015

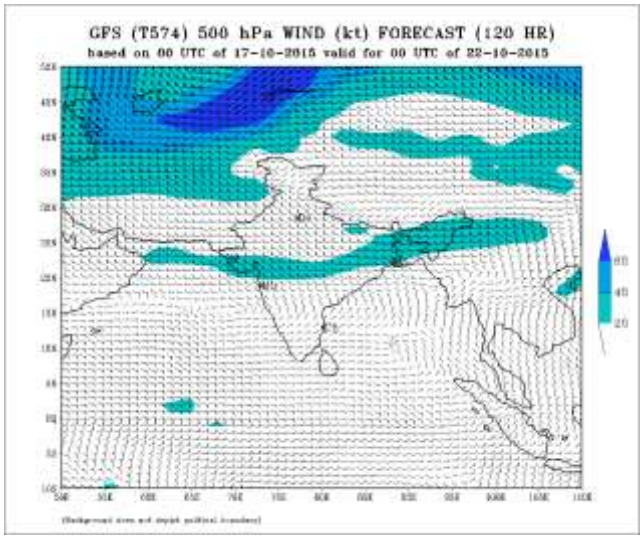

GFS (T574) 500 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 17-10-2015 valid for 00 UTC of 17-10-2015


GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 17-10-2015 valid for 00 UTC of 18-10-2015


GFS (T574) 500 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 17-10-2015 valid for 00 UTC of 19-10-2015


GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 17-10-2015 valid for 00 UTC of 20-10-2015


GFS (T574) 500 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 17-10-2015 valid for 00 UTC of 21-10-2015


GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 17-10-2015 valid for 00 UTC of 22-10-2015

FDP (Cyclone) NOC Report Dated 18 October, 2015

Synoptic features based on 0300 UTC of today:

- The upper air cyclonic circulation over southeast & adjoining southwest Bay of Bengal now lies over south west & adjoining southeast Bay of Bengal and extends upto 1.5 km above mean sea level.
- The upper air cyclonic circulation over Comorin area & adjoining south Tamilnadu extending upto 0.9 km above mean sea level persists.
- The trough in easterlies from southwest Bay of Bengal to westcentral Bay of Bengal off north Andhra Pradesh coast has become less marked.

Environmental features based on 0300 UTC of today:

Sea Surface Temperature (SST):

- SST is 28-30^{0}C over BoB and Andaman Sea.
- SST 28-30^{0}C over Arabian Sea (AS).

Tropical Cyclone Heat Potential (TCHP):

- TCHP is 60-100 kJ/cm^2 over rest parts of Bay of Bengal and Andaman Sea except north BoB where it is 40 kJ/cm^2.
- TCHP is 100-110 kJ/cm^2 over some equatorial parts of Arabian Sea and around 60-80 kJ/cm^2 over most parts of AS except over western part of AS off Somalia, Oman coast where it is less than 50 kJ/cm^2.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive (25*10^{-5}s^{-1}) over southwest BoB and Andaman Sea. It is negative over rest BoB.
- It is positive (25*10^{-5}s^{-1}) over the southeast AS & (30-40*10^{-5}s^{-1}) over southwest AS and negative over rest AS.

Convergence:

- Lower level convergence is 5-10*10-5s-1 over southwest BoB. No significant convergence zone is seen over rest parts of BoB and Andaman Sea.
- It is 5-10 *10-5s-1over some parts of southwest AS. No significant convergence zone is seen over the rest parts of AS.

Divergence:

- Upper level divergence is positive (5-10*10^{-5}s^{-1}) over Comorin area and adjoining southwest Bay of Bengal & southeast AS. No significant upper level divergence zone over rest BoB & Andaman Sea.
- Upper level divergence is positive over southwest AS (5*10^{-5}s^{-1}). No other significant zone over rest AS.

Wind Shear:

- Wind Shear is 5-10 knots over south & central BoB and Andaman Sea and many parts of equatorial regions. It is >20 over the region north of 20 ˚N latitude.
- Wind Shear is 5-10 knots over south ARB and increasing towards north AS

Wind Shear Tendency:

- The vertical wind shear tendency is increasing over Andaman Sea is of the order of 5 knots decreasing over south Bay of Bengal and is of the order of -5 to -10 knots.
- The vertical wind shear tendency is decreasing and is of the order of -5 to -10 knots over south east Arabian Sea.

Upper tropospheric ridge:

- The upper tropospheric ridge at 200 hPa runs along 11.0°N over AS and 16.0°N over BoB.

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- Located with Phase 8 with amplitude less than 1.0. As per forecast by dynamical and statistical models, it would continue to move within the same phase and amplitude during next 5 days.

Storms and Depression over South China Sea:

Vortex of Tropical Cyclone (KOPPU) over west Pacific Ocean moved over land of North Philippines and lay centered near 16.2 °N and 120.5 °E at 0600 UTC of 18th. It would move in northwesterly direction for next 24 hrs and then recurve to northeast.

Satellite

Inference based on INSAT imagery of 180900 UTC:

Bay of Bengal & Andaman Sea

Scattered low / medium clouds with embedded isolated moderate to intense convection lies over southeast Andaman Sea.

Arabian Sea:-

Broken low / medium clouds with embedded moderate to intense convection over east parts of southeast Arabian Sea and southwest Arabian Sea off Kerala coast.

NWP Analysis

IMD GFS: The analysis of IMD-GFST574 model charts based on 0000 UTC of 18th October, 2015 show a cyclonic circulation lies over south-west off Sri Lanka coast and extends upto1.5 km above mean sea level, which is likely to move westward very slowly in next 72 hours. Another cyclonic circulation over the south-central part of the Arabian Sea seen in the analysis field of 18th October, 2015 is likely to move northwestward very slowly during next 72 hrs.

IMD WRF: The WRF model analysis of 18th indicates a cyclonic circulation over the south-central Arabian Sea, which is likely to move in north-westward direction and intensify gradually in next 72 hrs.

NWP products are available at:

http://202.54.31.51/bias/gfsproducts.php
http://202.54.31.51/bias/wrf27pro.php
http://202.54.31.51/bias/potentialparameter.php

NCMRWF-UM: NCUM model does not suggest any cyclogenesis over BoB and AS during the next 2 days.

NCMRWF-GFS: NCMRWF-GFS model does not suggest any cyclogenesis over BoB and AS during the next 5 days.

ECMWF Model: ECMWF Model does not suggest any cyclogenesis over BoB and AS during the next 5 days.

JMA: JMA Model does not suggest any cyclogenesis over BoB and AS during the next 3 days.

ARP-Meteo France: ARP-Meteo France Model does not suggest any cyclogenesis over BoB and AS during the next 3 days.

IMD GPP Guidance:

The **Genesis Potential Parameter (GPP)** analysis of 18th October shows moderate GPP zones over south-west off Sri Lanka and south-central part of the Arabian Sea, which is not likely to intensify further.

Summary and Conclusion:

The cyclonic circulation over southeast adjoining southwest BOB is expected to move westwards. A few models suggests that the formation of a feeble low pressure area under the influence of this cyclonic circulation. No further intensification is predicted by any model.

Bay of Bengal & Andaman Sea

Probability of cyclogenesis over Bay of Bengal and Andaman Sea during next 120 hours:

24 hours	24-48 hours	48-72 hours	72-96 hours	96-120 hours
NIL	NIL	NIL	NIL	NIL

Probability of cyclogenesis over Arabian Sea during next 120 hours:

24 hours	24-48 hours	48-72 hours	72-96 hours	96-120 hours
NIL	NIL	NIL	NIL	NIL

Advisory: No IOP for next five days.

Status of observational system:

Details of the status of observational systems are given in **Annexure I.**

Annexure-I

Status of Observation system:

Synoptic observation:

Region	Date/Time (UTC)		
	17/12	**18/00**	**18/03**
India	43	23	44
Coastal stations			
WB	6	4	6
Odisha	7	6	7
AP	12	12	12
Tamil Nadu	11	9	12
Puducherry	1	1	1
A & N	6	1	6
Bangladesh	10	10	10
Myanmar	11	9	11
Thailand	2	2	2
Sri Lanka	8	6	8

AWS Observations:

Region	Date/Time (UTC)		
	17/12	**18/00**	**18/03**
India	54	63	63
Coastal stations			
WB	4	5	6
Odisha	14	15	14
AP	16	15	16
Tamil Nadu	30	28	27
Puducherry	-	-	-
A & N	-	-	-

RS/RW (12Z) of 17/10/2015 **-7/39**
No. of Ascents reaching 250 hPa level: 6, MISDA: 00

RS/RW (00Z) of 18/10/2015-23**/39**
No. of Ascents reaching 250 hPa level: 22, MISDA: 03

No. of PILOT Ascents

17/12Z	18/00Z
8	6

Buoy Data

17/12Z	18/00Z	18/03Z
16	14	15

FOC CHENNAI: STATUS OF OBSERVATION

No. of Synop data

Date→	17.10.2015							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	20	22	20	20	22	20	20	20

No. of RS/RW Ascents

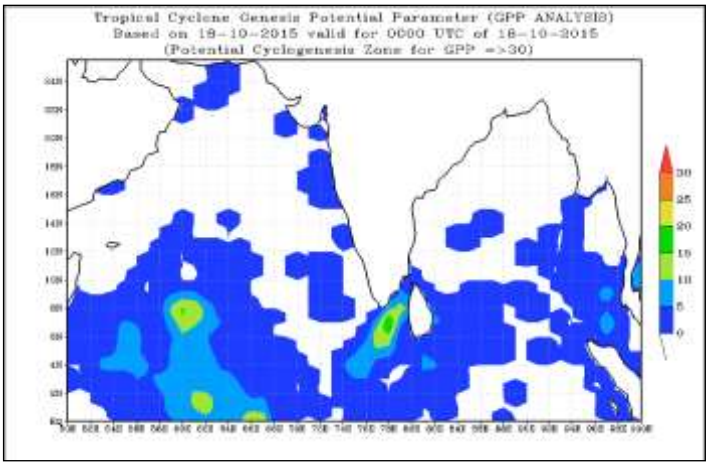
00Z /17.10.2015 : 5
No. of Ascents reaching 250 hPa level = 5
MISDA : 3

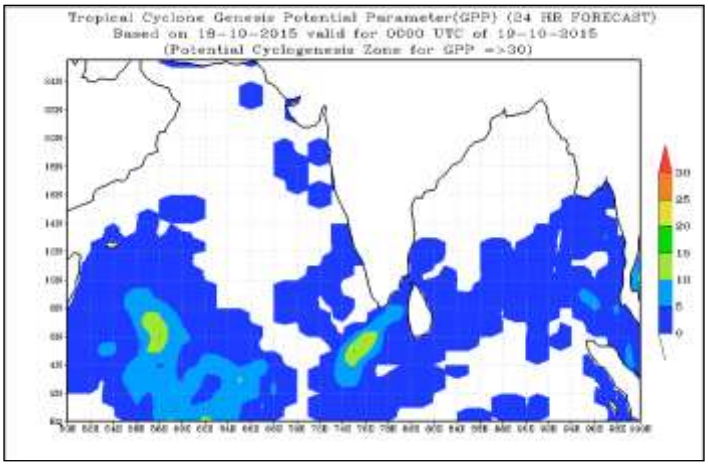
12Z /17.10.2015 : 0
No. of Ascents reaching 250 hPa level =0
MISDA : 8

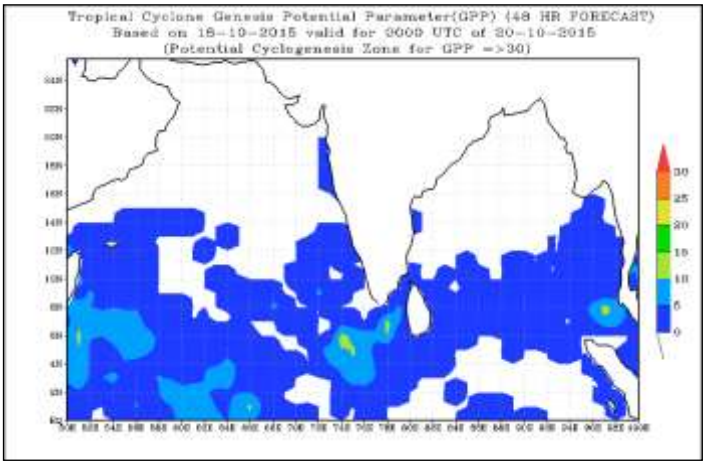
No. of PILOT Ascents:

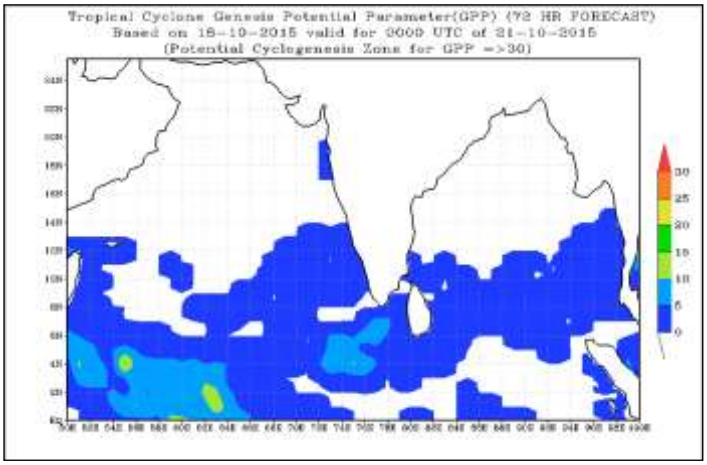
17.10.2015	
06Z	18Z
2	2

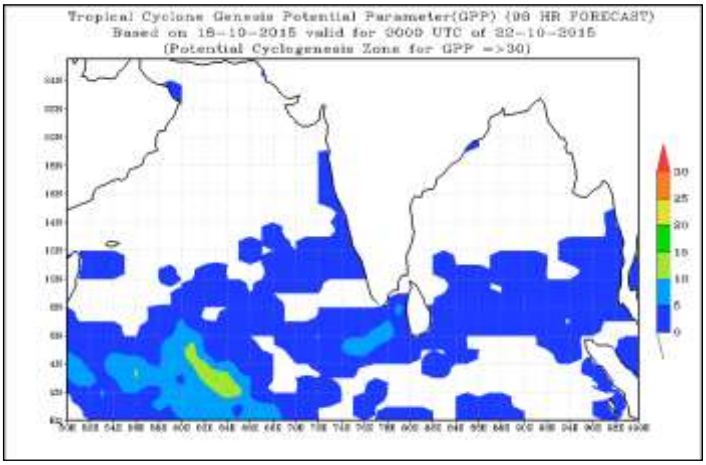
Annexure-II

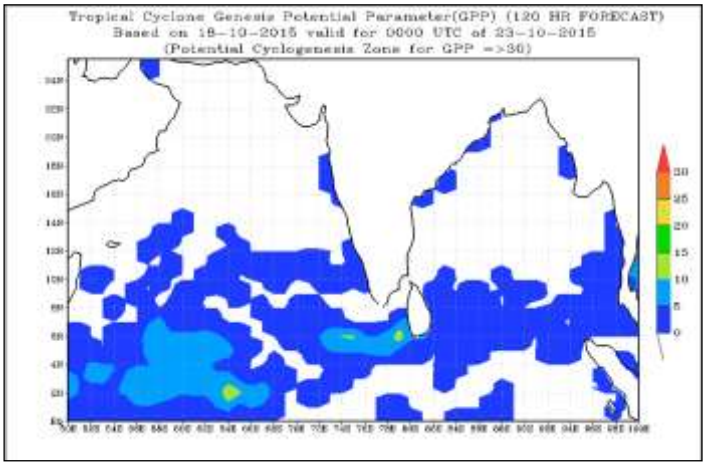

Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 18-10-2015 valid for 0000 UTC of 18-10-2015
(Potential Cyclogenesis Zone for GPP =>30)

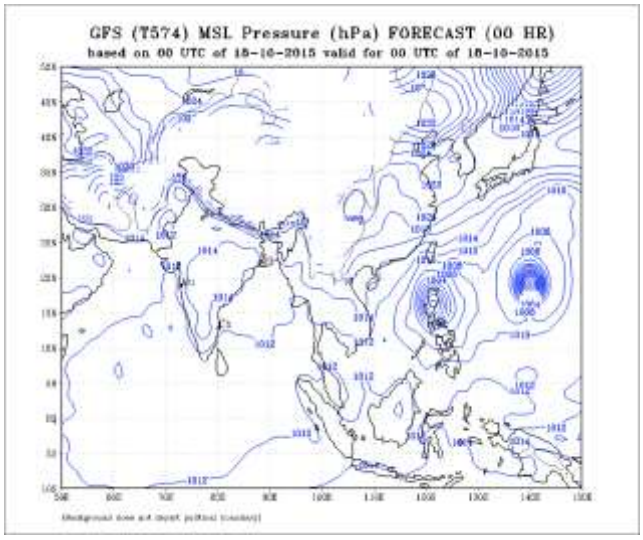

Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 18-10-2015 valid for 0000 UTC of 19-10-2015
(Potential Cyclogenesis Zone for GPP =>30)

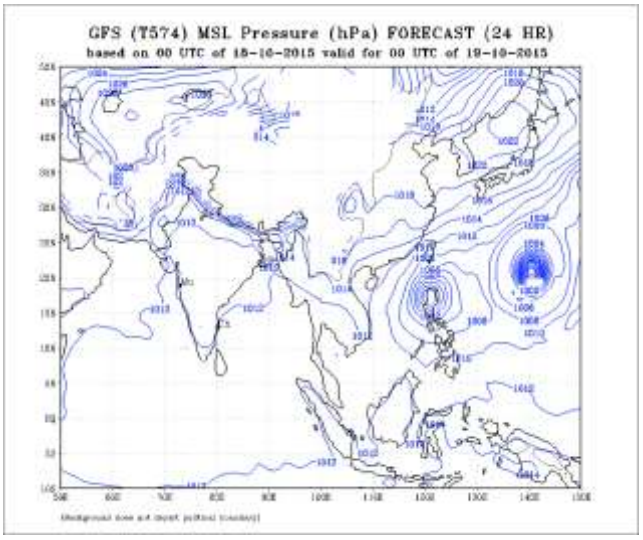

Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
Based on 18-10-2015 valid for 0000 UTC of 20-10-2015
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 18-10-2015 valid for 0000 UTC of 21-10-2015
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (96 HR FORECAST)
Based on 18-10-2015 valid for 0000 UTC of 22-10-2015
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 18-10-2015 valid for 0000 UTC of 23-10-2015
(Potential Cyclogenesis Zone for GPP =>30)


GFS (T574) MSL Pressure (hPa) FORECAST (00 HR)
based on 00 UTC of 18-10-2015 valid for 00 UTC of 18-10-2015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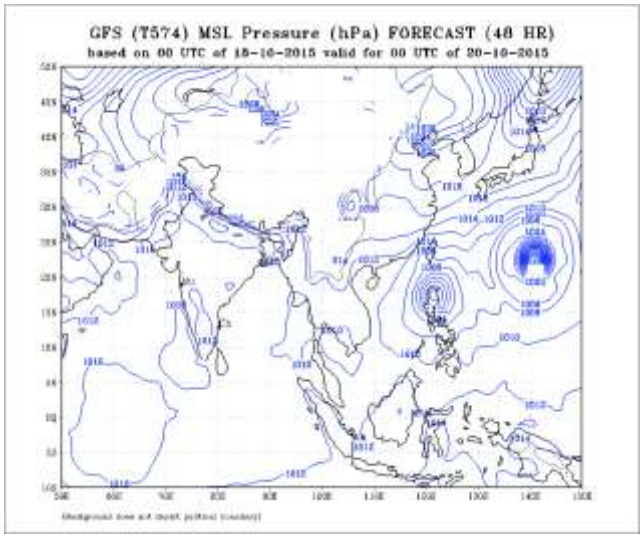
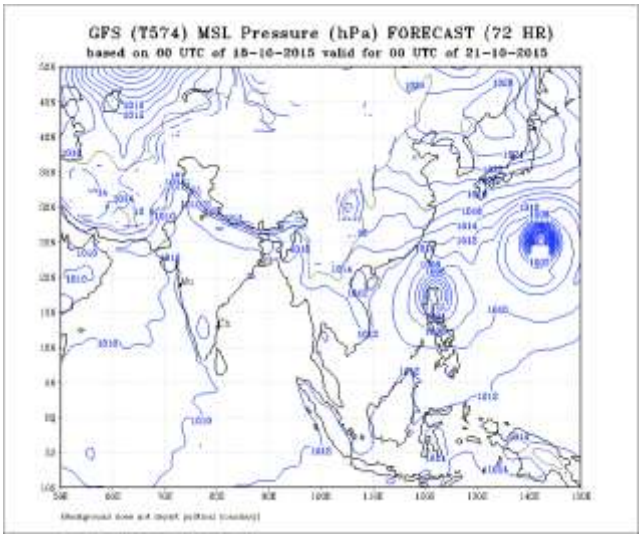
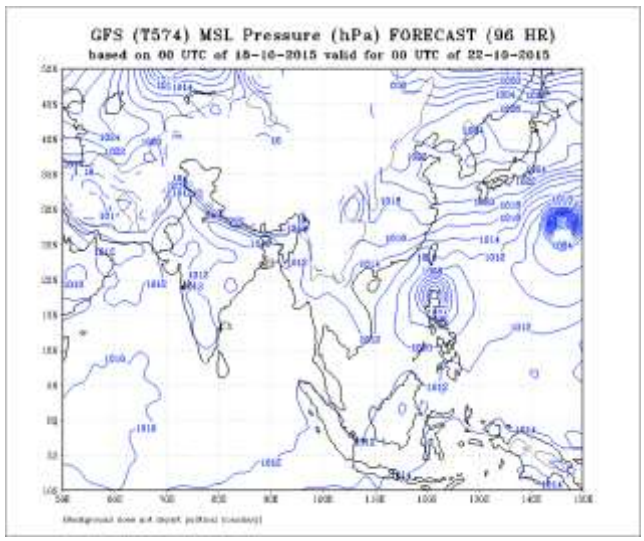
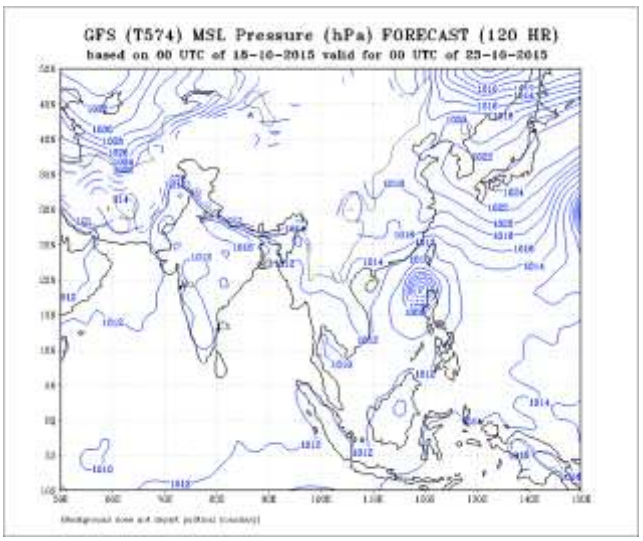
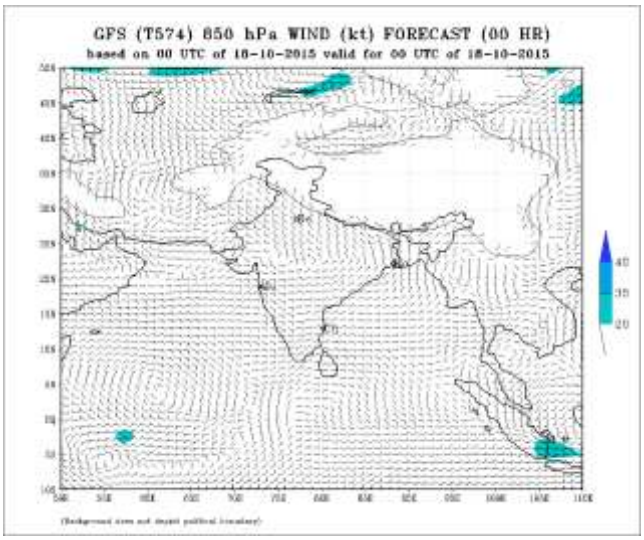
based on 00 UTC of 18-10-2015 valid for 00 UTC of 19-10-2015

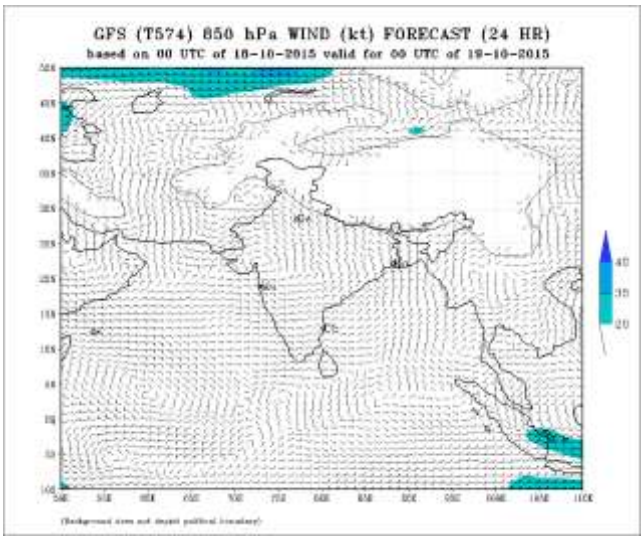

GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 18-10-2015 valid for 00 UTC of 20-10-2015

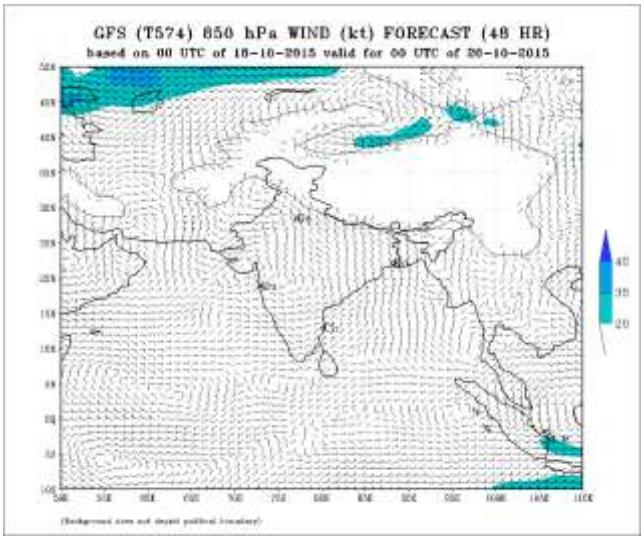

GFS (T574) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 18-10-2015 valid for 00 UTC of 21-10-2015

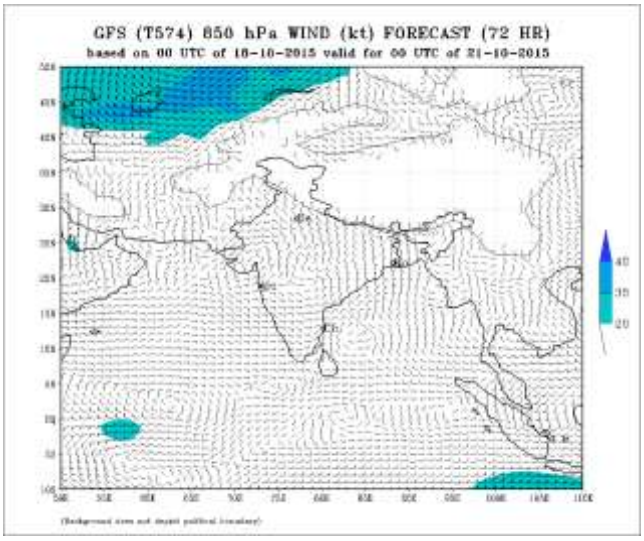

GFS (T574) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 18-10-2015 valid for 00 UTC of 22-10-2015

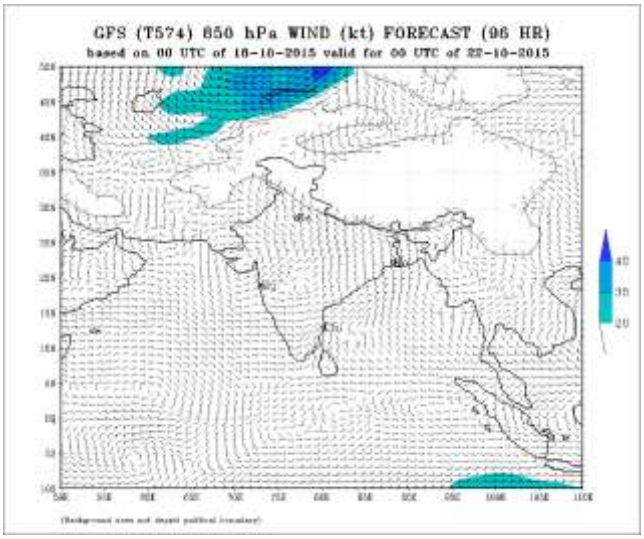

GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 18-10-2015 valid for 00 UTC of 23-10-2015


GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 18-10-2015 valid for 00 UTC of 18-10-2015


GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 18-10-2015 valid for 00 UTC of 19-10-2015


GFS (T574) 850 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 18-10-2015 valid for 00 UTC of 20-10-2015


GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 18-10-2015 valid for 00 UTC of 21-10-2015


GFS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
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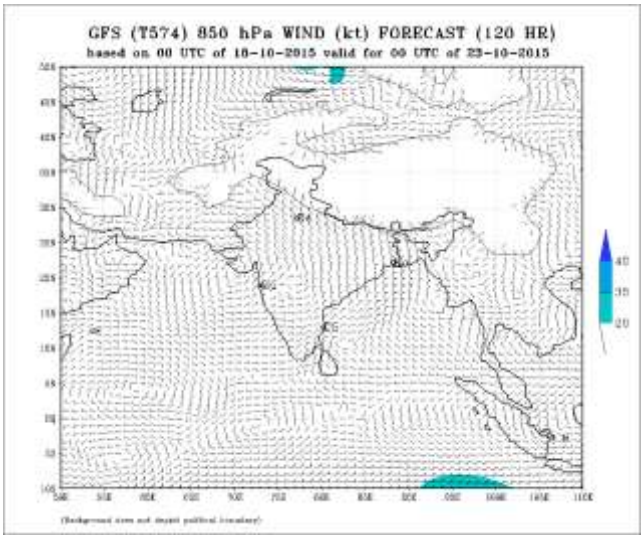
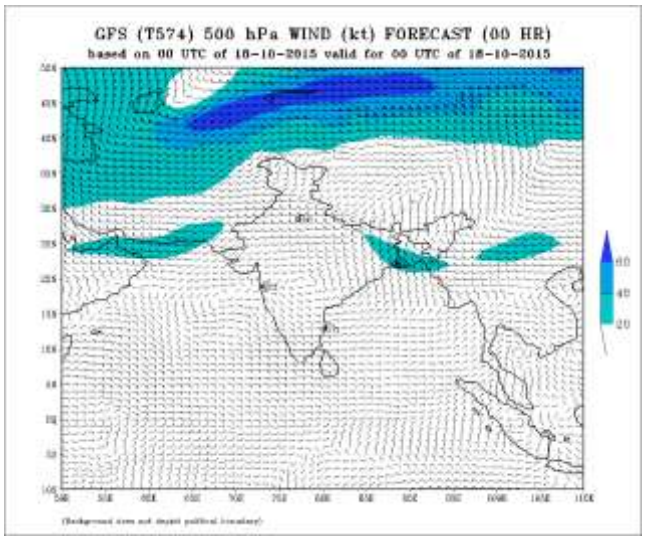

GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 18-10-2015 valid for 00 UTC of 23-10-2015


GFS (T574) 500 hPa WIND (kt) FORECAST (00 HR)
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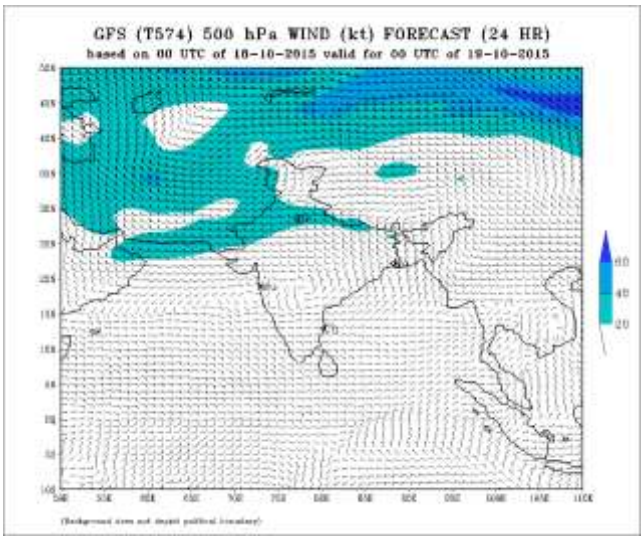
GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
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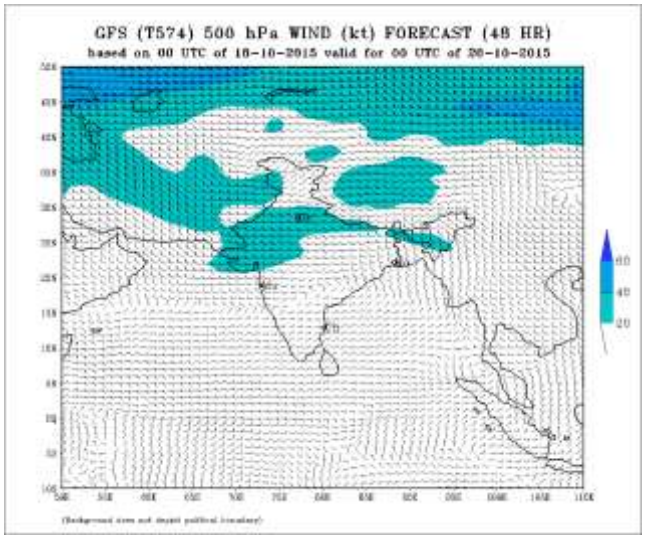
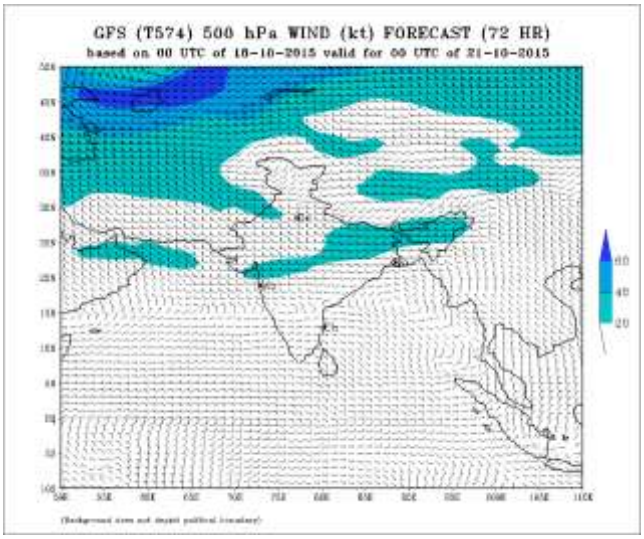
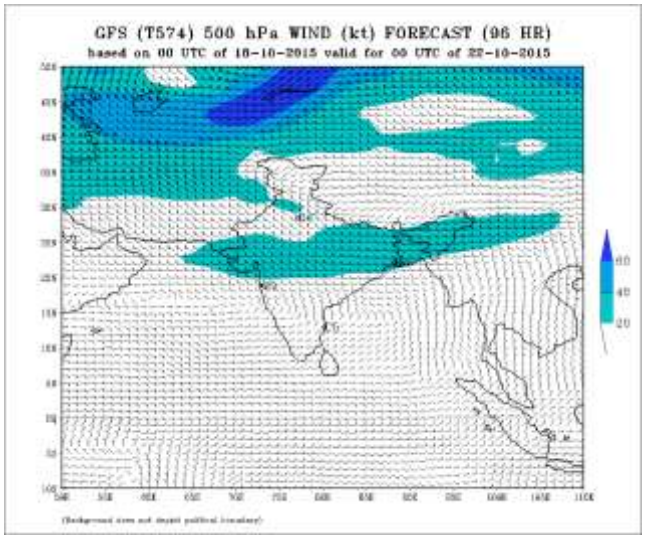

GFS (T574) 500 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 18-10-2015 valid for 00 UTC of 20-10-2015


GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 18-10-2015 valid for 00 UTC of 21-10-2015


GFS (T574) 500 hPa WIND (kt) FORECAST (96 HR)
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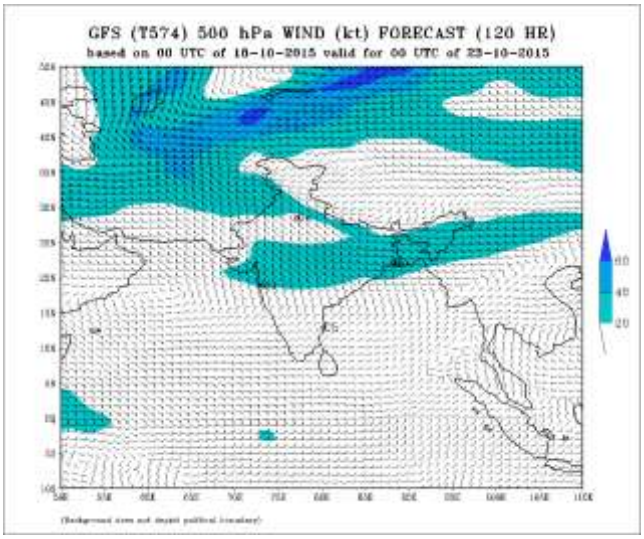
GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
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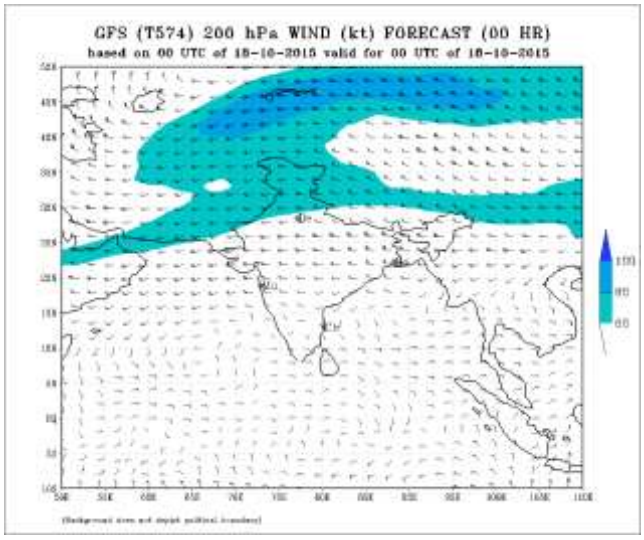
GFS (T574) 200 hPa WIND (kt) FORECAST (00 HR)
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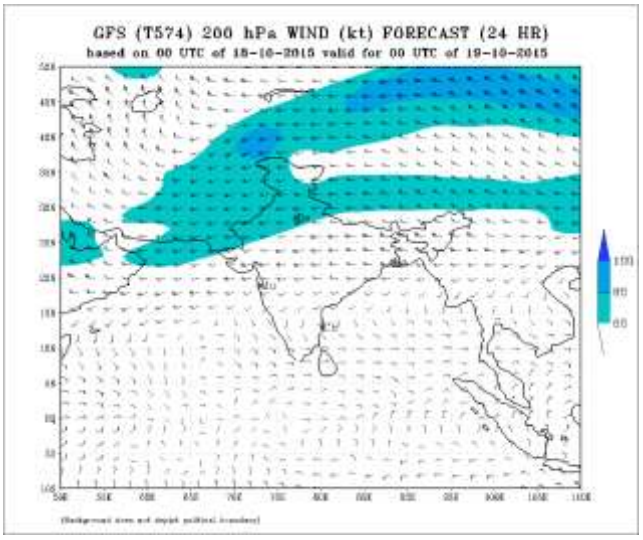
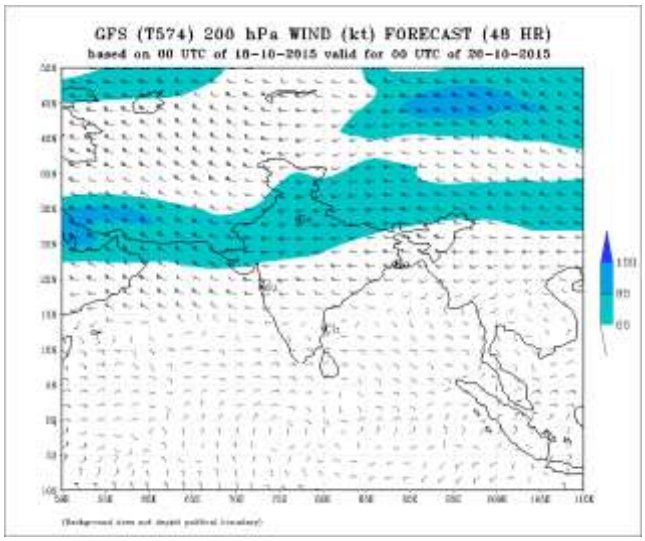

GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 18-10-2015 valid for 00 UTC of 19-10-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (48 HR)
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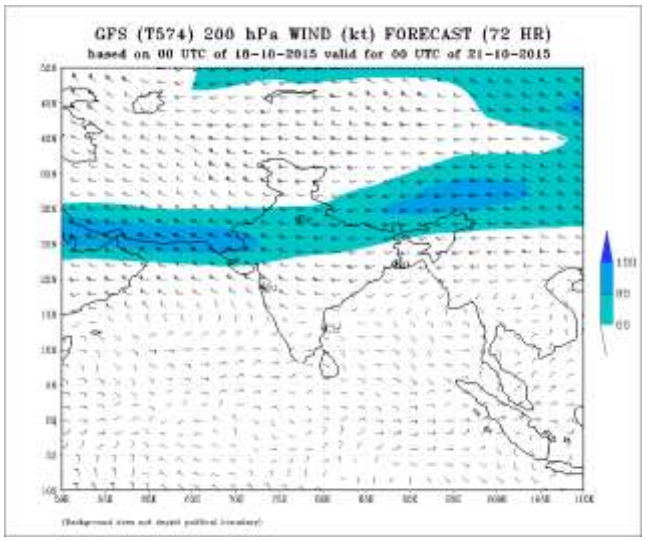
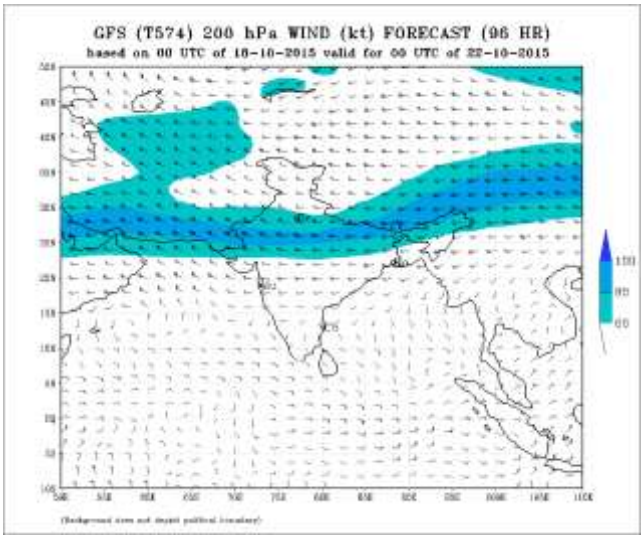
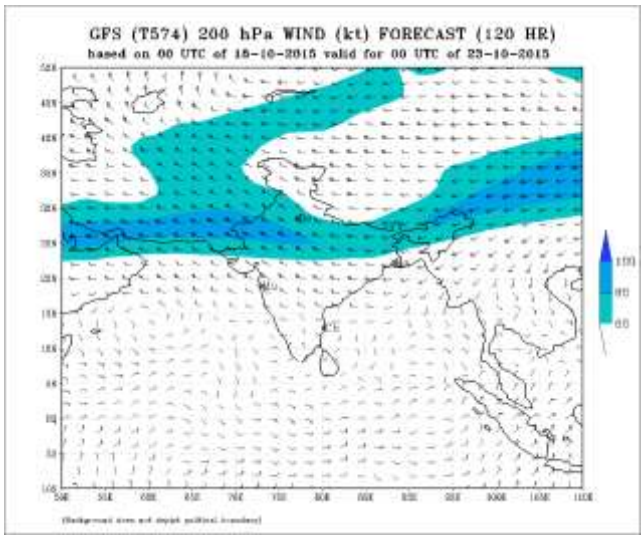

GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 18-10-2015 valid for 00 UTC of 21-10-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 18-10-2015 valid for 00 UTC of 22-10-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 18-10-2015 valid for 00 UTC of 23-10-2015

FDP (Cyclone) NOC Report Dated 19 October, 2015

Synoptic features based on 0300 UTC of today:

- The upper air cyclonic circulation over Comorin area & adjoining south Tamilnadu extending upto 0.9 km above mean sea level persists.
- The upper air cyclonic circulation over southwest & adjoining southeast Bay of Bengal has become less marked.

Environmental features based on 0300 UTC of today:

Sea Surface Temperature (SST):

- SST is 28-30°C over Bay of Bengal (BoB) and Andaman Sea.
- SST 28-30°C over Arabian Sea (AS).

Tropical Cyclone Heat Potential (TCHP):

- TCHP is about 100 kJ/cm^2 over equatorial parts of BoB, south of 8°N. It is 60-80 kJ/cm^2 over rest of BoB and Andaman Sea except over north BoB where it is 40 kJ/cm^2.
- TCHP is 80-100 kJ/cm^2 over parts of equatorial Arabian Sea and around 60-80 kJ/cm^2 over most parts of AS except over the western part of AS off Somalia and Oman coasts where it is about 40 kJ/cm^2.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive ($10*10^{-5}s^{-1}$) over eastern parts of BoB and Andaman Sea. It is negative over rest of the BoB.
- Relative vorticity is positive over the equatorial AS ($25*10^{-5}s^{-1}$) & parts of eastcentral AS ($10*10^{-5}s^{-1}$). It is negative over rest of the AS.

Convergence:

- Lower level convergence is $5\text{-}10*10^{-5}s^{-1}$ over parts of equatorial BoB. No significant convergence zone is seen over rest of BoB and Andaman Sea.
- Lower level convergence is $5\text{-}10*10^{-5}s^{-1}$ over parts of southwest AS. No significant convergence zone is seen over the rest of AS.

Divergence:

- Upper level divergence is positive ($5\text{-}10*10^{-5}s^{-1}$) over Comorin area and adjoining southeast AS. No significant upper level divergence zone over rest of BoB & Andaman Sea.
- Upper level divergence is positive over southwest AS ($5\text{-}10*10^{-5}s^{-1}$). No other significant zone over rest of AS.

Wind Shear:

- Wind Shear is 10-20 knots over most parts of BoB and Andaman Sea except over the region north of 20 ˚N latitude where it is >20 kts.
- Wind Shear is 5-15 knots over south AS and 40-50 kts over the northern parts of AS.

Wind Shear Tendency:

- There is no significant change in the wind shear over the BoB and Andaman Sea during the past 24 hrs.
- The vertical wind shear tendency is decreasing and is of the order of -5 to -10 knots over southwest AS. It is increasing (10-20 kts) over the northern parts of AS.

Upper tropospheric ridge:

- The upper tropospheric ridge at 200 hPa runs along 15.0°N.

M.J.O. Index:

- MJO has entered Phase 1 with amplitude less than 1.0. As per forecast by dynamical and statistical models, it would continue to move within the same phase and amplitude during next 2-3 days.

Storms and Depression over South China Sea:

Typhoon KOPPU over northwest Pacific Ocean lay centered near 17.9 °N and 120.4 °E, about 370 km north of Manila, Philippines at 0600 UTC of 19th. It would move northeastward for 24 hrs and then northwards subsequently.

Satellite

Inference based on INSAT imagery of 190900 UTC:

Bay of Bengal & Andaman Sea:-

Scattered low and medium clouds with embedded isolated moderate to intense convection lie over south Andaman Sea.

Arabian Sea:-

Broken low and medium clouds with embedded moderate to intense convection lie over eastern parts of southeast Arabian Sea and southwest Arabian Sea.

NWP Analysis

The analysis of **IMD-GFST574** model charts based on 0000 UTC of 19th October, 2015 show a cyclonic circulation lies over the Arabian Sea south-west off Sri Lanka coast and extends upto 1.5 km above mean sea level, which is likely to move westward very slowly in next 72 hours without any intensification. Another trough is seen in the analysis field of 19th October and forecasts for next 3 days over Andaman Sea and neighbourhood.

The **WRF model** analysis of 19th and forecasts for next 3 days almost indicate the similar trough over the Andaman Sea like that is seen in **GFST574**, whereas the cyclonic circulation over the south-central Arabian Sea in WRF model is likely to move westward slowly during next 3 days with slight intensification after 48 hrs.

NWP products are available at:
http://202.54.31.51/bias/gfsproducts.php
http://202.54.31.51/bias/wrf27pro.php
http://202.54.31.51/bias/potentialparameter.php

NCMRWF-UM: NCUMmodel does not show any low / circulation over BOB and AS during 19-22nd.
NCMRWF-GFS: NCMRWF-GFS model does not show any low / circulation over BOB and AS during 19-22nd.
ECMWF Model: ECMWF Model shows low over south BoB off Sri Lanka / Tamilnadu coast on 21st which moves westwards subsequently. It also shows a low over eastcentral AS off Konkan / Gujarat during 20th-22nd.
JMA: JMA Model shows low over SE Bay and adjoining Andaman Sea on 21st Oct which becomes less marked on 22nd.

ARP-Meteo France: ARP-Meteo France Model shows feeble low over southeast BoB and Andaman Sea on 22nd.

IMD GPP Guidance:

The **Genesis Potential Parameter (GPP)** analysis of 19th October shows moderate GPP zones over south-west off Sri Lanka and south-western part of the Arabian Sea. The GPP over the south-west off Sri Lanka is not likely to intensify further. The GPP over the south-western part of the Arabian Sea is likely to move westward during next 48 hrs and weaken over the Sea.

Summary and Conclusion:

Bay of Bengal and Andaman Sea:

A few models suggest formation of cyclonic circulation over southeast Bay of Bengal on 21st/22nd which is expected to move westward. However, no model suggests its intensification beyond a low pressure area.

Arabian Sea:

Prediction of a low pressure area by ECMWF over eastcentral Arabian Sea off Konkan / Gujarat coast during 20th-22nd needs to be watched as no other model suggests such a development.

Probability of cyclogenesis over Bay of Bengal and Andaman Sea during next 120 hours:

24 hours	24-48 hours	48-72 hours	72-96 hours	96-120 hours
NIL	NIL	NIL	NIL	NIL

Probability of cyclogenesis over Arabian Sea during next 120 hours:

24 hours	24-48 hours	48-72 hours	72-96 hours	96-120 hours
NIL	NIL	NIL	NIL	NIL

Advisory: No IOP for next five days.

Status of observational system:

Details of the status of observational systems are given in **Annexure I.**

Annexure-I

Status of Observation system:

Synoptic observation:

Region	Date/Time (UTC)		
	18/12	**19/00**	**19/03**
India	78	57	71
Coastal stations			
WB	8	3	8
Odisha	7	5	7
AP	12	12	12
Tamil Nadu	11	7	8
Puducherry	2	2	2
A & N	6	1	6
Bangladesh	11	8	11
Myanmar	11	11	8
Thailand	2	1	1
Sri Lanka	8	7	8

AWS Observations:

Region	Date/Time (UTC)		
	18/12	**19/00**	**19/03**
India	67	64	66
Coastal stations			
WB	6	5	6
Odisha	15	16	16
AP	15	14	15
Tamil Nadu	30	28	29
Puducherry	1	1	-
A & N	-	-	-

RS/RW (12Z) of 18/10/2015 **-7/39**
No. of Ascents reaching 250 hPa level: 6, MISDA: 00

RS/RW (00Z) of 19/10/2015-23**/39**
No. of Ascents reaching 250 hPa level: 22, MISDA: 02

No. of PILOT Ascents

18/12Z	19/00Z
8	5

Buoy Data

18/12Z	19/00Z	19/03Z
16	14	15

FOC CHENNAI: STATUS OF OBSERVATION

No. of Synop data

Date→	**18.10.2015**							
UTC→	**00**	**03**	**06**	**09**	**12**	**15**	**18**	**21**
Chennai Region (Coasts of AP & TN)	**20**	**22**	**20**	**20**	**22**	**20**	**20**	**20**

No. of RS/RW Ascents

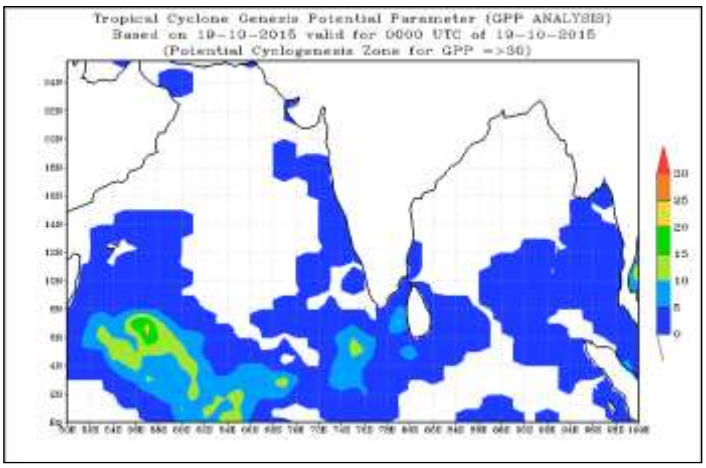
00Z /18.10.2015 : 4
No. of Ascents reaching 250 hPa level = 4
MISDA : 4

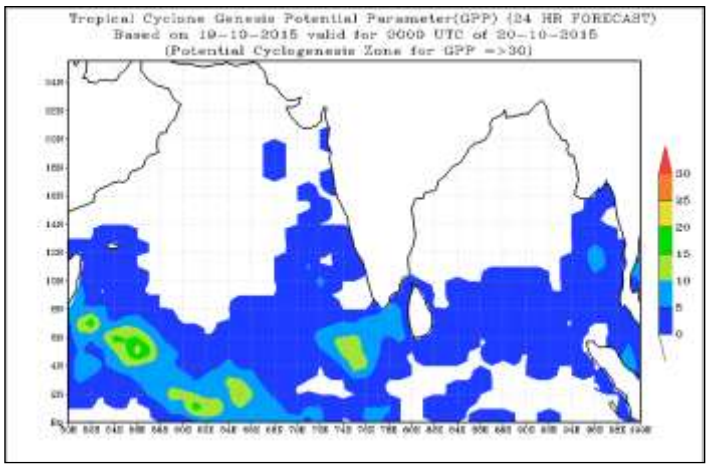
12Z /18.10.2015 : 0
No. of Ascents reaching 250 hPa level =0
MISDA : 8

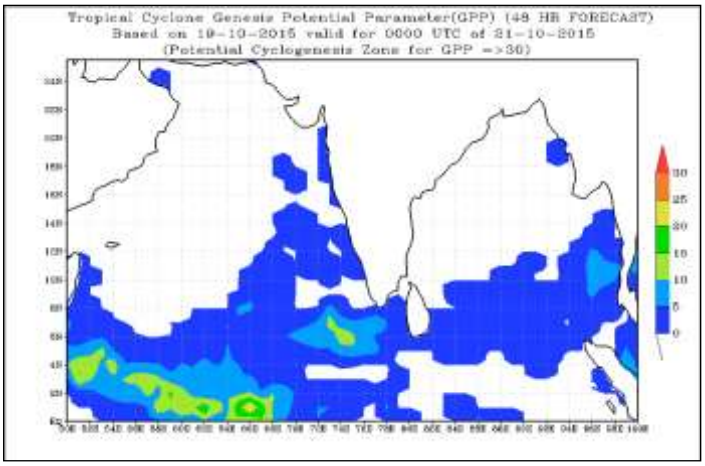
No. of PILOT Ascents:

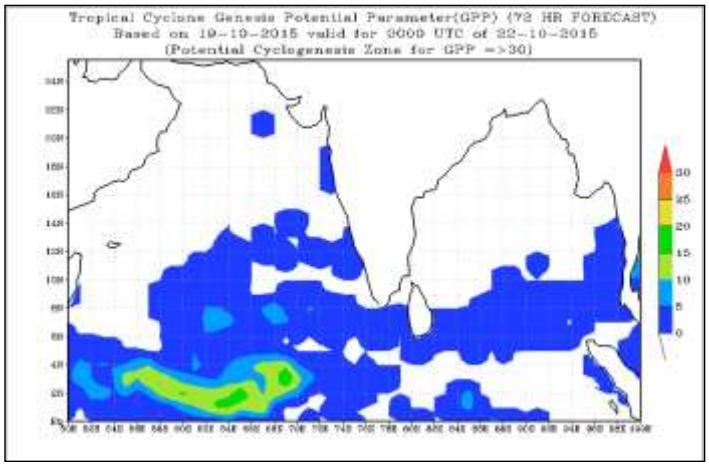
18.10.2015	
06Z	18Z
4	2

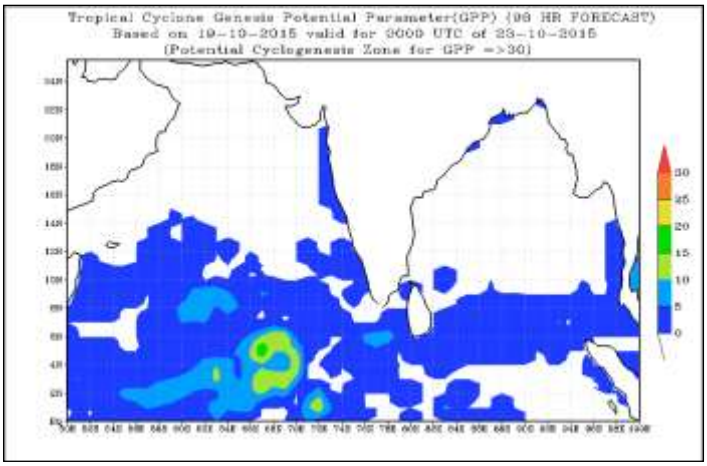
Annexure-II

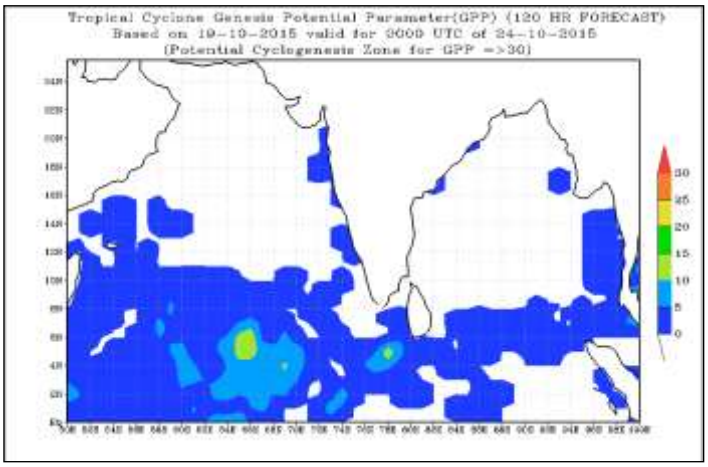

Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 19-10-2015 valid for 0000 UTC of 19-10-2015
(Potential Cyclogenesis Zone for GPP =>30)

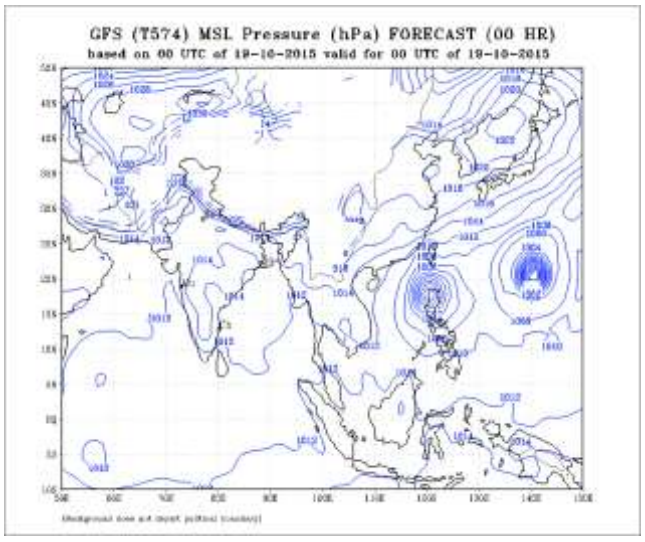

Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 19-10-2015 valid for 0000 UTC of 20-10-2015
(Potential Cyclogenesis Zone for GPP =>30)

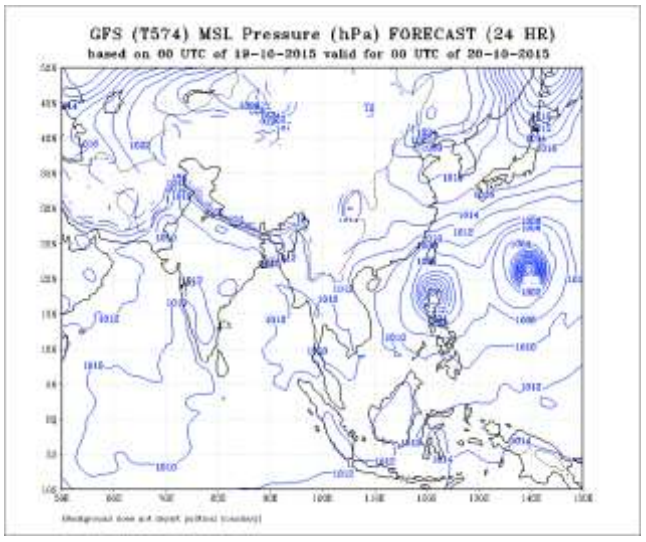

Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
Based on 19-10-2015 valid for 0000 UTC of 21-10-2015
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 19-10-2015 valid for 0000 UTC of 22-10-2015
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (96 HR FORECAST)
Based on 19-10-2015 valid for 0000 UTC of 23-10-2015
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 19-10-2015 valid for 0000 UTC of 24-10-2015
(Potential Cyclogenesis Zone for GPP =>30)


GFS (T574) MSL Pressure (hPa) FORECAST (00 HR)
based on 00 UTC of 19-10-2015 valid for 00 UTC of 19-10-2015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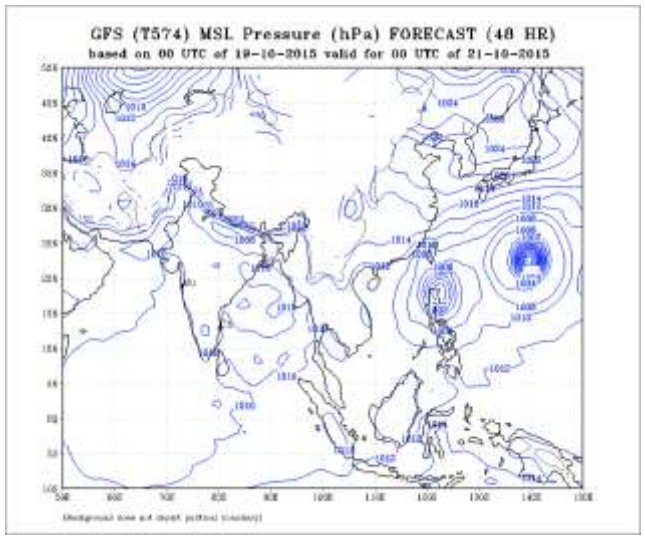
GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
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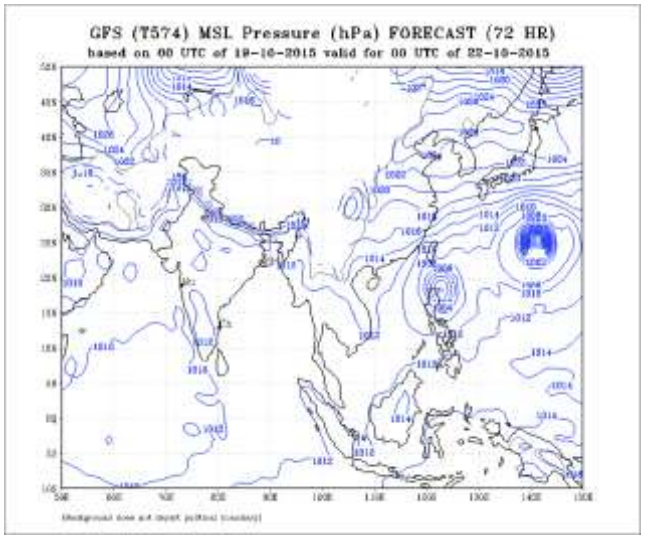
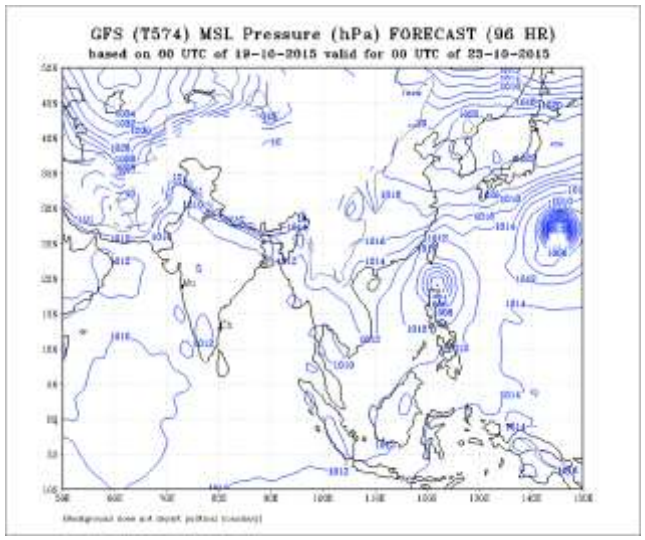

GFS (T574) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 19-10-2015 valid for 00 UTC of 22-10-2015


GFS (T574) MSL Pressure (hPa) FORECAST (96 HR)
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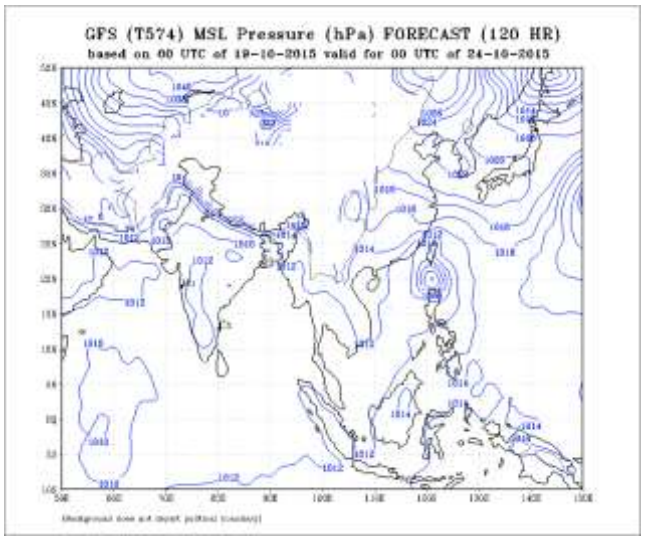
GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
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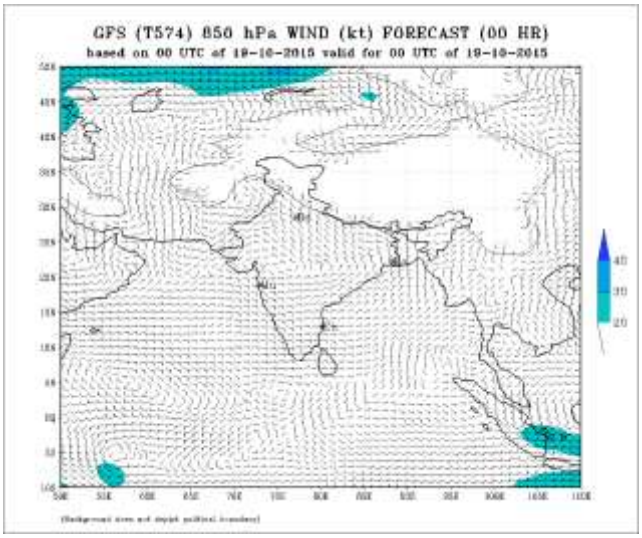
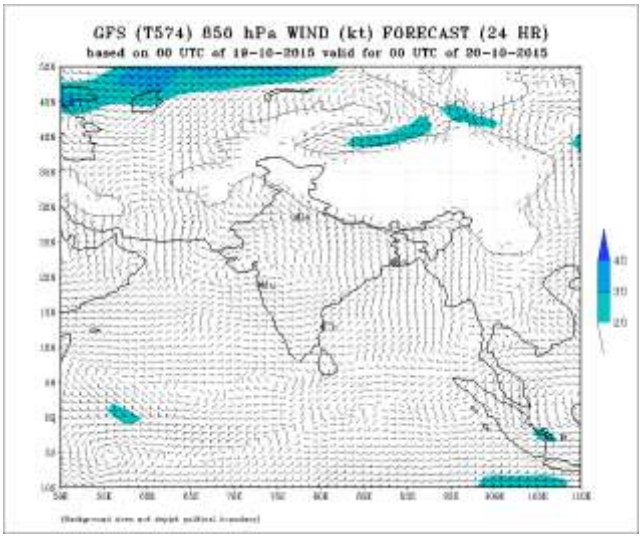
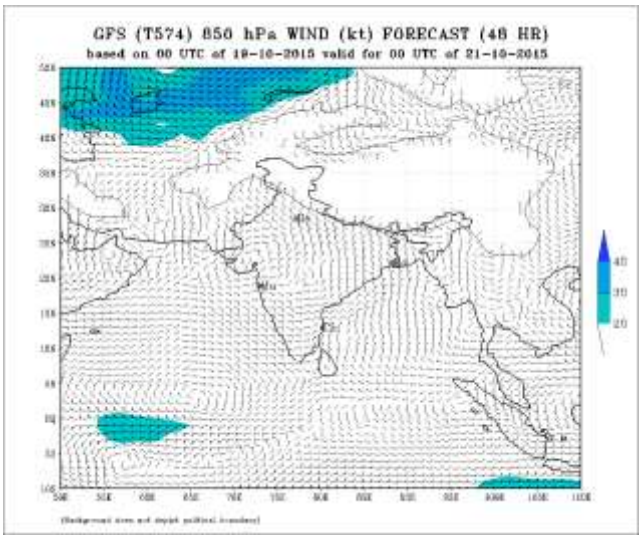

GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 19-10-2015 valid for 00 UTC of 19-10-2015


GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 19-10-2015 valid for 00 UTC of 20-10-2015


GFS (T574) 850 hPa WIND (kt) FORECAST (48 HR)
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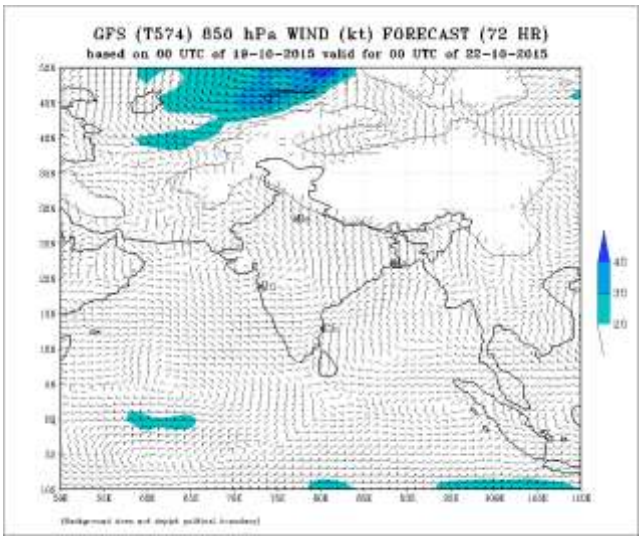
GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
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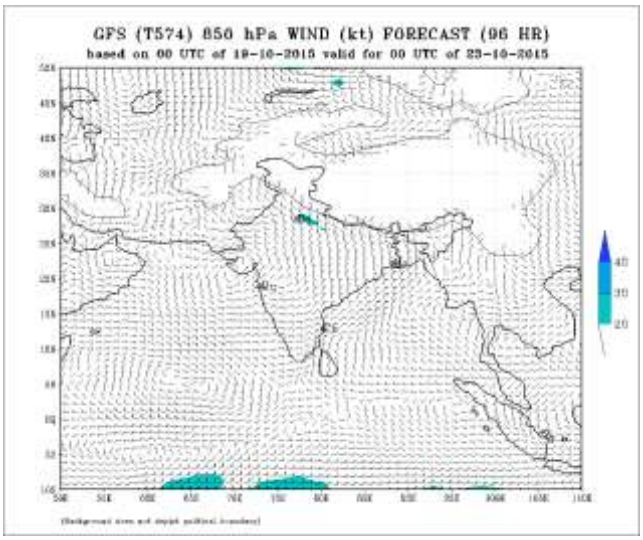
GFS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
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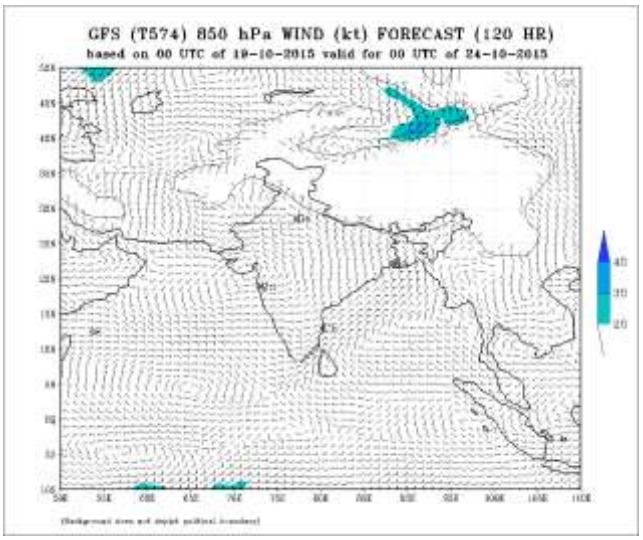
GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
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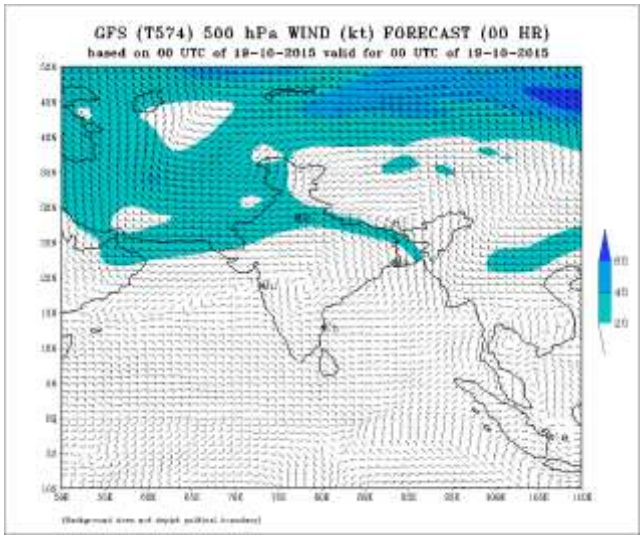
GFS (T574) 500 hPa WIND (kt) FORECAST (00 HR)
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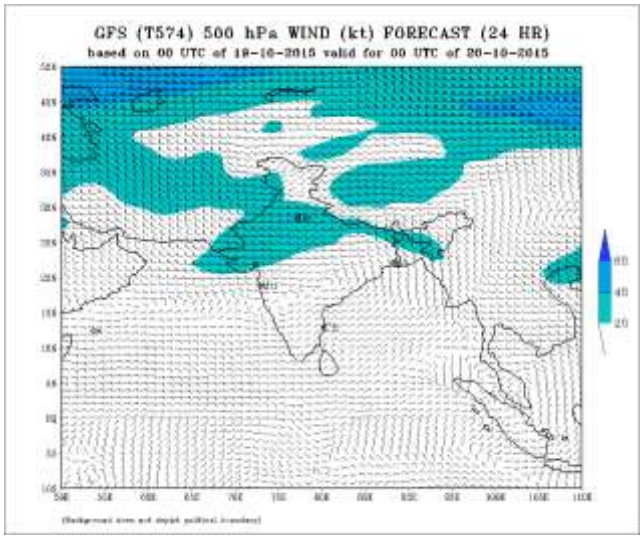
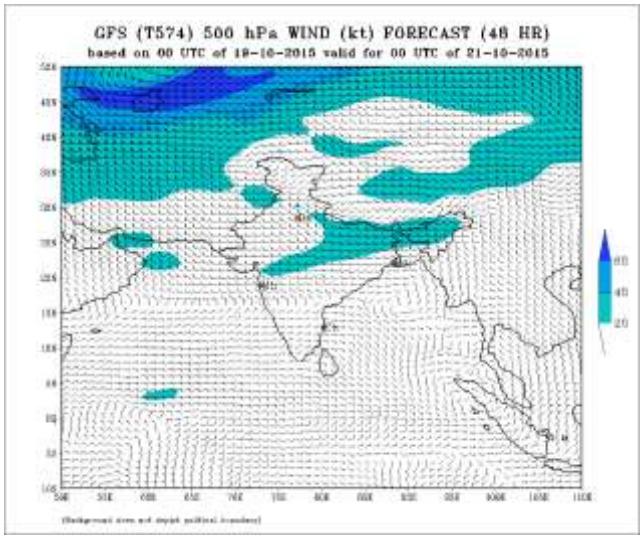
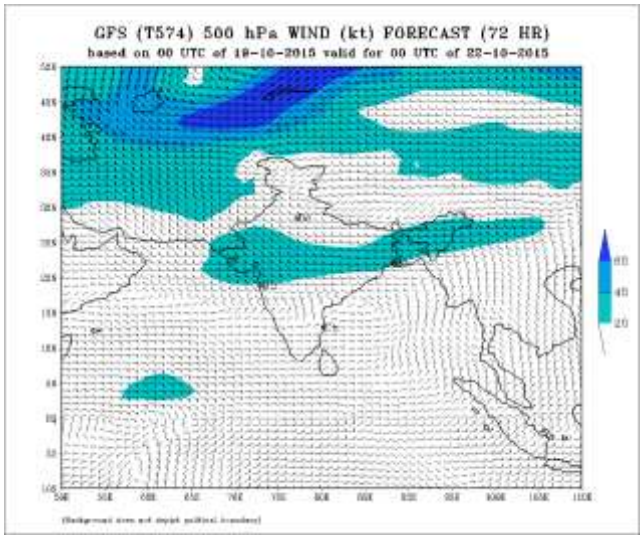
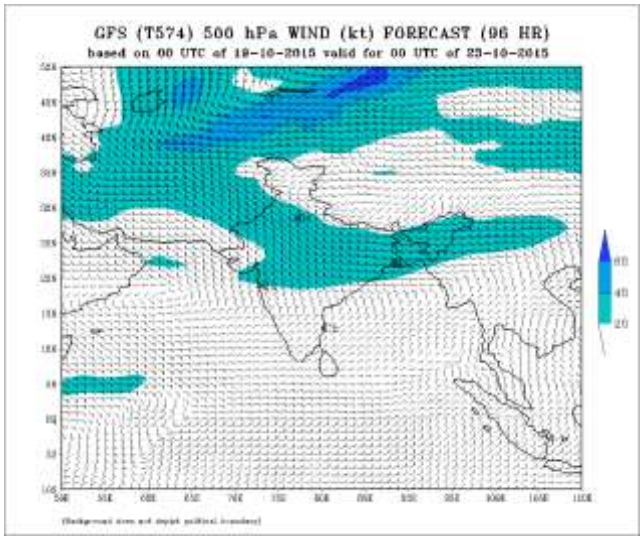

GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 19-10-2015 valid for 00 UTC of 20-10-2015


GFS (T574) 500 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 19-10-2015 valid for 00 UTC of 21-10-2015


GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 19-10-2015 valid for 00 UTC of 22-10-2015


GFS (T574) 500 hPa WIND (kt) FORECAST (96 HR)
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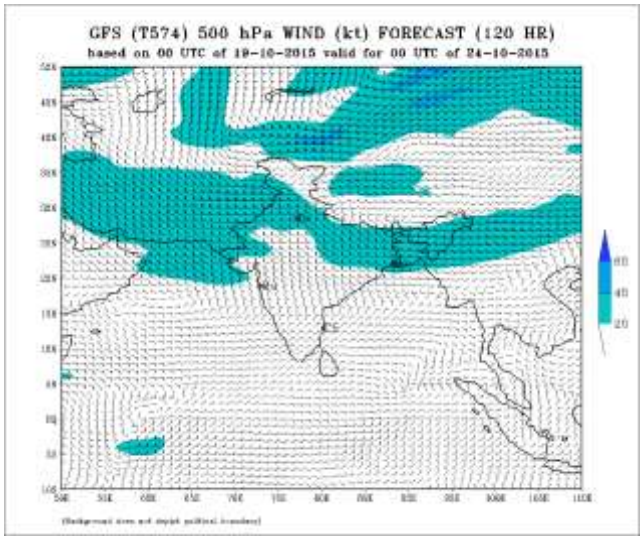
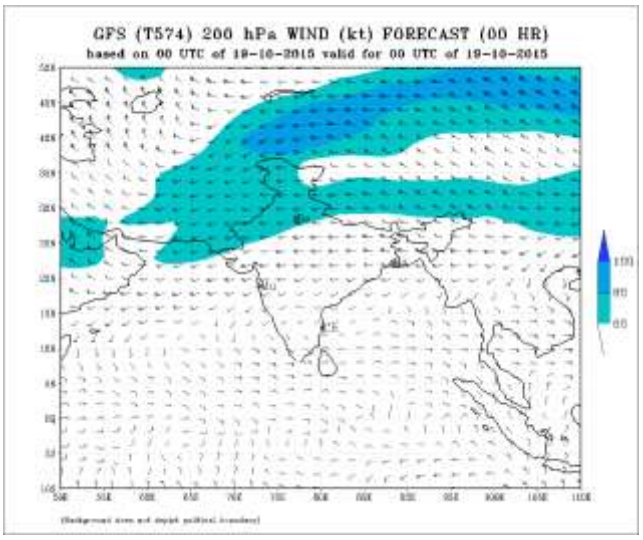

GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 19-10-2015 valid for 00 UTC of 24-10-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (00 HR)
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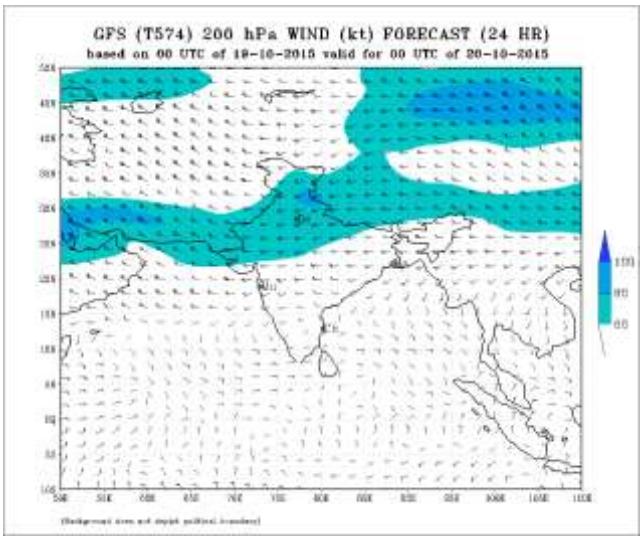
GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
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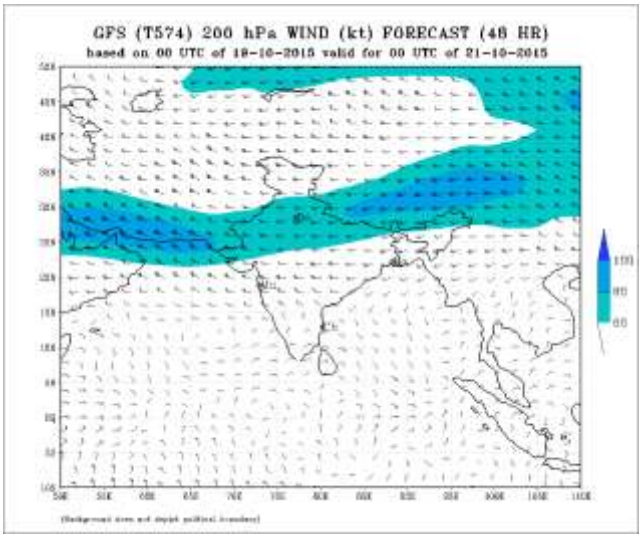
GFS (T574) 200 hPa WIND (kt) FORECAST (48 HR)
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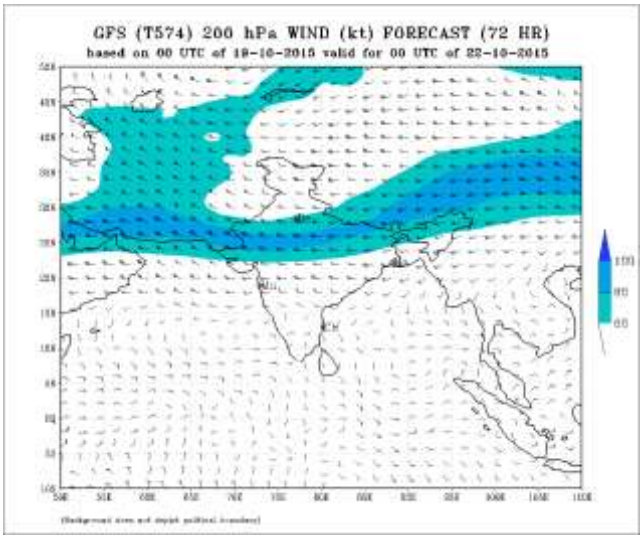
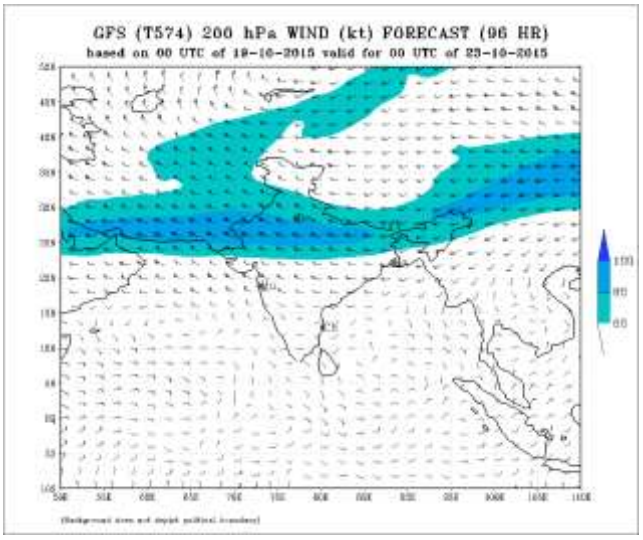

GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 19-10-2015 valid for 00 UTC of 22-10-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (96 HR)
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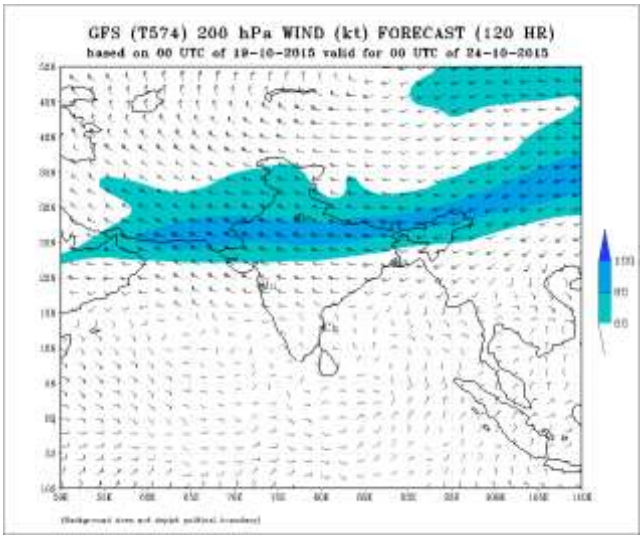

GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 19-10-2015 valid for 00 UTC of 24-10-2015

FDP (Cyclone) NOC Report Dated 20 October, 2015

Synoptic features based on 0300 UTC of today:

- Yesterday's upper air cyclonic circulation over Comorin area now lies over Lakshadweep & neighbourhood and extends upto 0.9 km above mean sea level.

Environmental features based on 0300 UTC of today:

Sea Surface Temperature (SST):

- SST is 30-31°C over parts of Gulf of Thailand and south Andaman Sea. It is 28-30°C over most parts of Bay of Bengal (BoB) and Andaman Sea.
- SST is 30-31°C along the east coast. It is 29-30°C over rest parts of Arabian Sea (AS).

Tropical Cyclone Heat Potential (TCHP):

- TCHP is about 80-90 kJ/cm^2 over parts of south Andaman Sea southeast BoB and < 40 kJ/cm^2 over north BoB.
- TCHP is 100-110 kJ/cm^2 over southeast AS off Kerala and Karnataka coast. It is 80-90 kJ/cm^2 over most parts of AS except over the western parts off Somalia and Oman coasts where it is about 40 kJ/cm$^{2.}$

Relative Vorticity:

- Relative vorticity at 850 hPa is positive (20*10^{-5}s^{-1}) over eastern parts of BoB and Andaman Sea. It is negative over rest of the BoB.
- Relative vorticity is positive over parts of southeast and central AS (25*10^{-5}s^{-1}) & parts of eastcentral AS (10*10^{-5}s^{-1}). It is not significant over rest of the AS.

Convergence:

- Lower level convergence is 5-10*10^{-5}s^{-1}over south Andaman Sea and adjoining Gulf of Thailand. No significant upper level divergence zone over rest of BoB & Andaman Sea.
- Lower level convergence is positive over equatorial parts of southwest AS (5-10*10^{-5}s^{-1}). No other significant zone over rest of AS.

Divergence:

- Upper level divergence is positive (5-10*10^{-5}s^{-1}) over north Andaman Sea. No significant upper level divergence zone over rest of BoB & Andaman Sea.
- Upper level divergence is positive over parts of southwest AS and parts of southeast AS off Oman coast (5-10 *10^{-5}s^{-1}). No other significant zone over rest of AS.

Wind Shear:

- Wind Shear is 10-20 knots over most parts of BoB and Andaman Sea except over the region north of 20 ˚N latitude where it is >20 kts.
- Wind Shear is 5-10 knots over south AS and >20 kts over the central and northern parts of AS.

Wind Shear Tendency:

- There is no significant change in the wind shear over the BoB. It shows decreasing trend (-5 kts) over south Andaman Sea during the past 24 hrs.
- The vertical wind shear tendency is decreasing and is of the order of -5 to -10 knots over southwest and westcentral AS. No significant change in shear tendency over southeast AS during past 24 hours.

Upper tropospheric ridge:

- The upper tropospheric ridge at 200 hPa runs along 19.0°N over BoB.
- The upper tropospheric ridge at 200 hPa runs along 11.5°N over AS.

M.J.O. Index:

- MJO lies over Phase 1 with amplitude less than 1.0. As per forecast by dynamical and statistical models, it would continue to move within the same phase and amplitude during next 2-3 days.

Storms and Depression over South China Sea:

Typhoon KOPPU over northwest Pacific Ocean lay centered near 19.1 °N and 120.7 °E, about 550 km north of Manila, Philippines at 0600 UTC of 20th. It would move northeastwards for 36 hrs and then recurve northwards.

Satellite:

Inference based on INSAT imagery of 200900 UTC:

Bay of Bengal & Andaman Sea:-

Scattered low and medium clouds with embedded isolated moderate to intense convection lie over south Andaman Sea.

Arabian Sea:-

Broken low and medium clouds with embedded moderate to intense convection lie over eastern parts of southeast Arabian Sea and southwest Arabian Sea.

NWP Analysis

IMD GFS: The analysis of **IMD-GFST574** model charts based on 0000 UTC of 19th October, 2015 show a cyclonic circulation lies over the Arabian Sea south-west off Sri Lanka coast and extends upto 1.5 km above mean sea level, which is likely to move westward very slowly in next 72 hours without any intensification. Another trough is seen in the analysis field of 19th October and forecasts for next 3 days over Andaman Sea and neighbourhood.

IMD WRF: The **WRF model** analysis of 19th and forecasts for next 3 days almost indicate the similar trough over the Andaman Sea like that is seen in **GFST574**, whereas the cyclonic circulation over the south-central Arabian Sea in WRF model is likely to move westward slowly during next 3 days with slight intensification after 48 hrs.

NWP products are available at:
http://202.54.31.51/bias/gfsproducts.php
http://202.54.31.51/bias/wrf27pro.php
http://202.54.31.51/bias/potentialparameter.php

NCMRWF-UM: NCUM model shows formation of a feeble low on 22nd which becomes less marked on 23rd. any low / circulation over BOB and AS during 19-22nd.

NCMRWF-GFS: NCMRWF-GFS model does not show any low / circulation over BOB and AS during next five days.

ECMWF Model: ECMWF Model shows a feeble low over Gulf of Martaban moving westwards and becoming insignificant on 23rd. Another low formation is suggested over southwest BoB on 23rd. It would move west-southwestwards towards Sri Lanka coast with no intensification during next five days.

It also shows a low over eastcentral AS off Konkan / Goa coasts on 20th which becomes insignificant during next 72 hours.

JMA: JMA Model products are not available.

ARP-Meteo France: ARP-Meteo France Model shows development of a feeble low over south Andaman Sea on 21st. On 23rd it would lie over southeast BoB. Model does not suggest any intensification during next 72 hours.

IMD GPP Guidance:

The **Genesis Potential Parameter (GPP)** analysis of 19th October shows moderate GPP zones over south-west off Sri Lanka and south-western part of the Arabian Sea. The GPP over the south-west off Sri Lanka is not likely to intensify further. The GPP over the south-western part of the Arabian Sea is likely to move westward during next 48 hrs and weaken over the Sea.

Summary and Conclusion:

Bay of Bengal and Andaman Sea:

A few models suggest formation of cyclonic circulation over south Andaman Sea and adjoining southeast Bay of Bengal on 21st/23rd which is expected to move westwards. However, no model suggests its intensification beyond a low pressure area.

Arabian Sea:

Prediction of a low pressure area by ECMWF over eastcentral Arabian Sea off Konkan / Goa coast during 20th-21st needs to be watched as no other model suggests such a development.

Probability of cyclogenesis over Bay of Bengal and Andaman Sea during next 120 hours:

24 hours	24-48 hours	48-72 hours	72-96 hours	96-120 hours
NIL	NIL	NIL	NIL	NIL

Probability of cyclogenesis over Arabian Sea during next 120 hours:

24 hours	24-48 hours	48-72 hours	72-96 hours	96-120 hours
NIL	NIL	NIL	NIL	NIL

Advisory: No IOP for next five days.

Status of observational system:

Details of the status of observational systems are given in **Annexure I.**

Annexure-I

Status of Observation system:

Synoptic observation:

Region	Date/Time (UTC)		
	19/12	**20/00**	**20/03**
India	78	57	71
Coastal stations			
WB	8	3	8
Odisha	7	5	7
AP	12	12	12
Tamil Nadu	11	7	8
Puducherry	2	2	2
A & N	6	1	6
Bangladesh	11	8	11
Myanmar	11	11	8
Thailand	2	1	1
Sri Lanka	8	7	8

AWS Observations:

Region	Date/Time (UTC)		
	19/12	**20/00**	**20/03**
India	67	64	66
Coastal stations			
WB	6	5	6
Odisha	15	16	16
AP	15	14	15
Tamil Nadu	30	28	29
Puducherry	1	1	-
A & N	-	-	-

RS/RW (12Z) of 19/10/2015 **-7/39**
No. of Ascents reaching 250 hPa level: 6, MISDA: 00

RS/RW (00Z) of 20/10/2015-23**/39**
No. of Ascents reaching 250 hPa level: 22, MISDA: 02

No. of PILOT Ascents

19/12Z	20/00Z
8	5

Buoy Data

19/12Z	20/00Z	20/03Z
16	14	15

FOC CHENNAI: STATUS OF OBSERVATION

No. of Synop data

Date→	**19.10.2015**							
UTC→	**00**	**03**	**06**	**09**	**12**	**15**	**18**	**21**
Chennai Region (Coasts of AP & TN)	**20**	**20**	**20**	**20**	**22**	**20**	**20**	**20**

No. of RS/RW Ascents

00Z /19.10.2015 : 6
No. of Ascents reaching 250 hPa level = 2
MISDA : 2

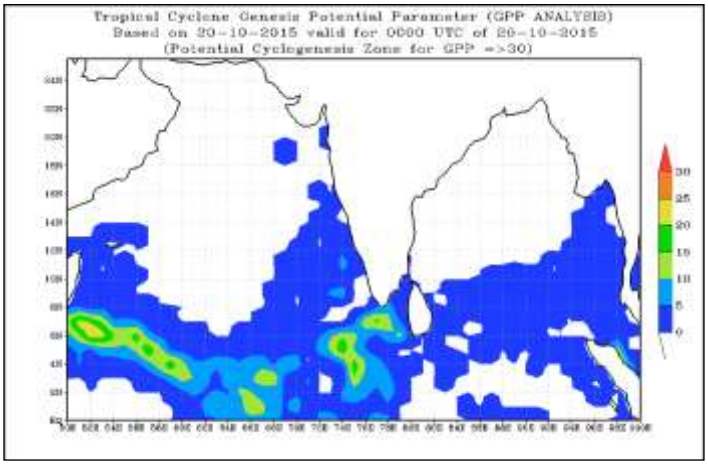
12Z /19.10.2015 : 0
No. of Ascents reaching 250 hPa level =0
MISDA : 8

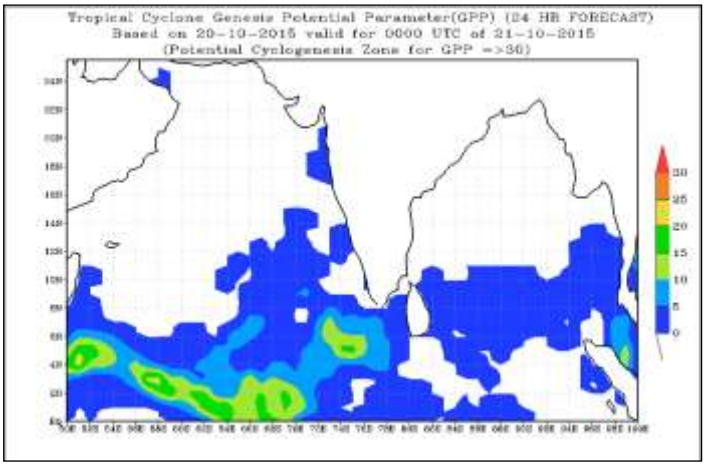
No. of PILOT Ascents:

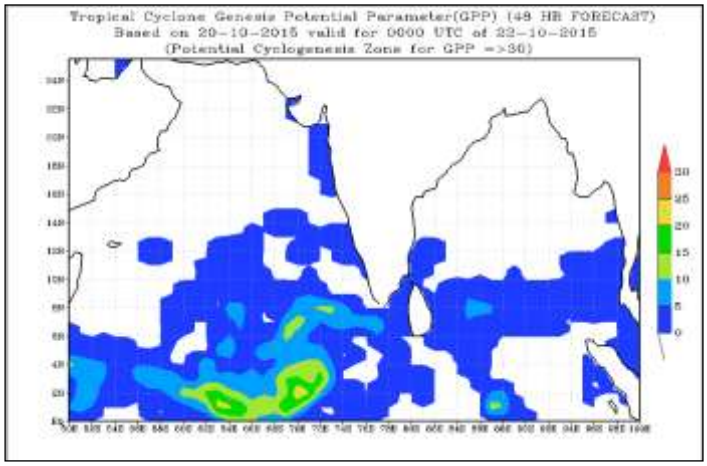
19.10.2015

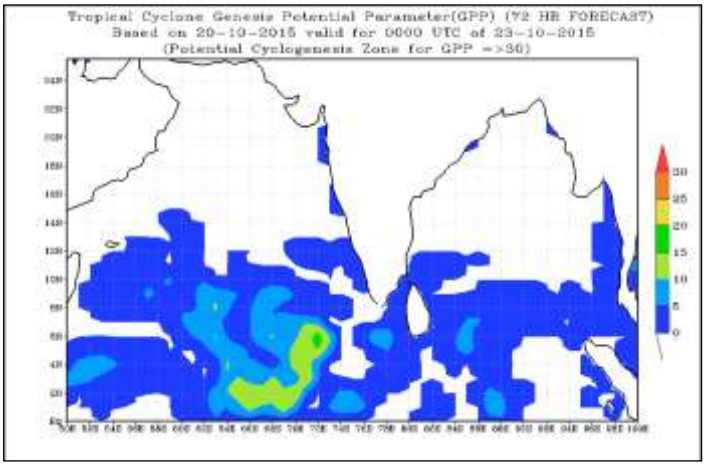
06Z	18Z
2	3

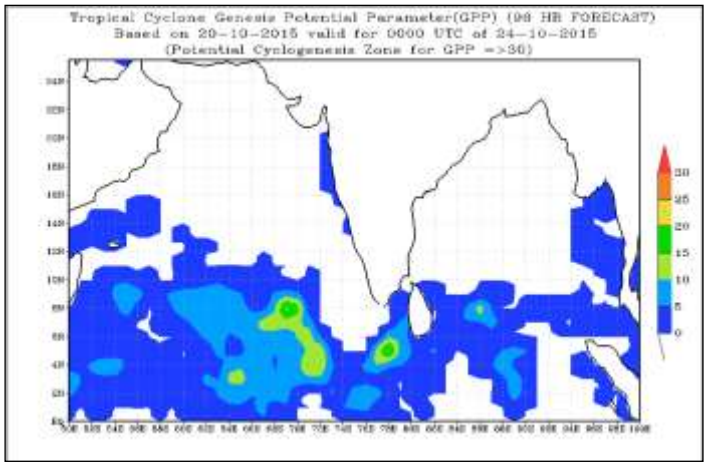
Annexure-II

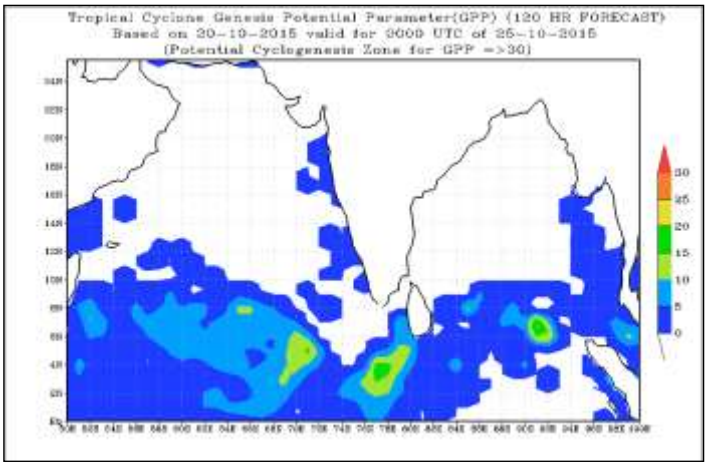

Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 20-10-2015 valid for 0000 UTC of 20-10-2015
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 20-10-2015 valid for 0000 UTC of 21-10-2015
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
Based on 20-10-2015 valid for 0000 UTC of 22-10-2015
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 20-10-2015 valid for 0000 UTC of 23-10-2015
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (96 HR FORECAST)
Based on 20-10-2015 valid for 0000 UTC of 24-10-2015
(Potential Cyclogenesis Zone for GPP =>30)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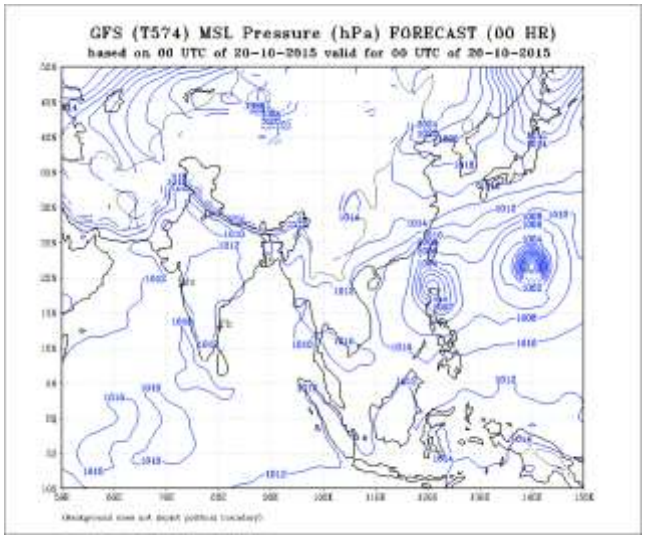
Based on 20-10-2015 valid for 0000 UTC of 25-10-2015
(Potential Cyclogenesis Zone for GPP =>30)


GFS (T574) MSL Pressure (hPa) FORECAST (00 HR)
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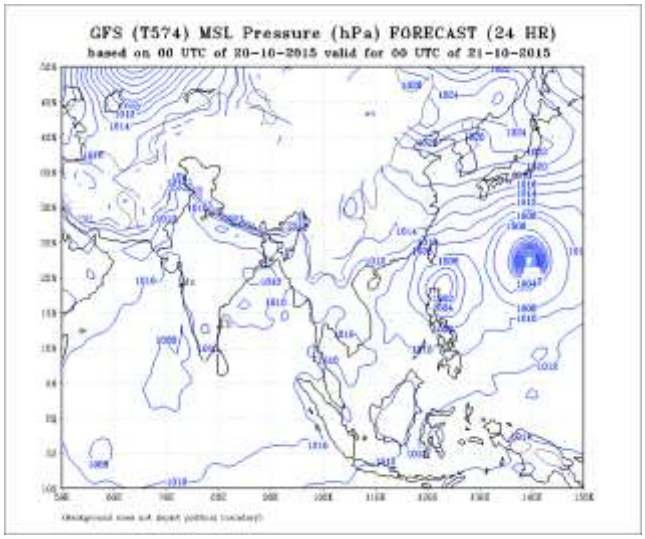
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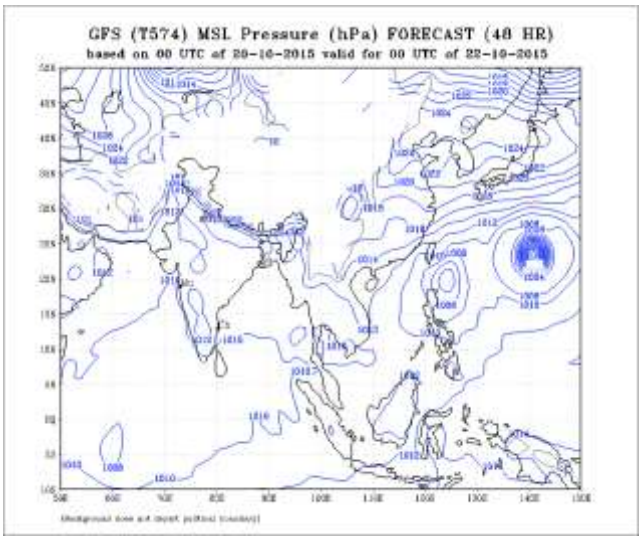
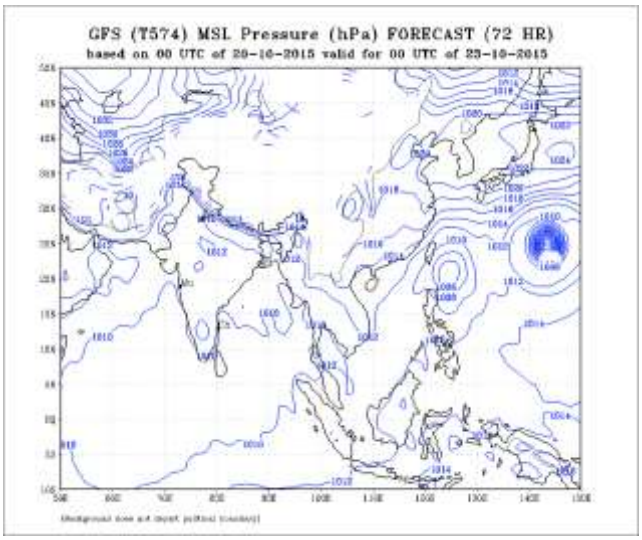

GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 20-10-2015 valid for 00 UTC of 22-10-2015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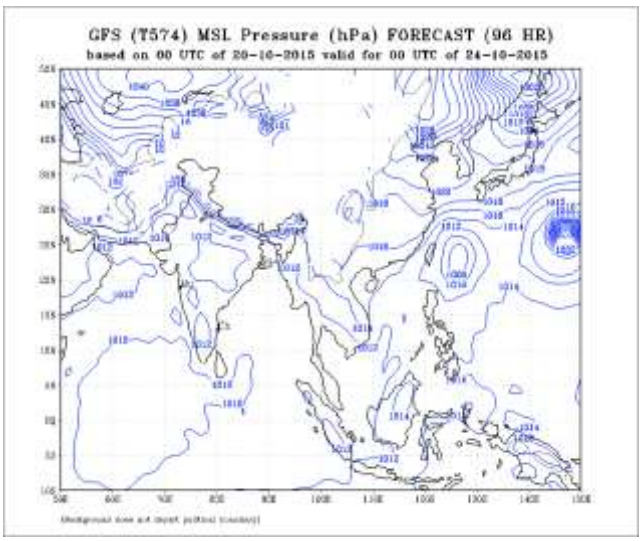
based on 00 UTC of 20-10-2015 valid for 00 UTC of 23-10-2015


GFS (T574) MSL Pressure (hPa) FORECAST (96 HR)
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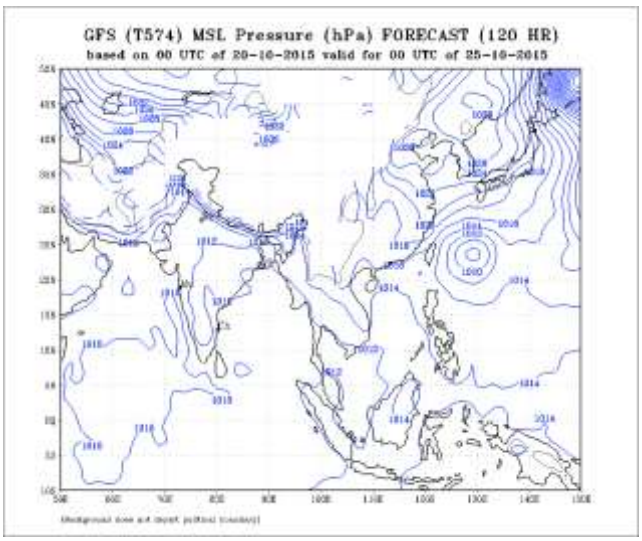
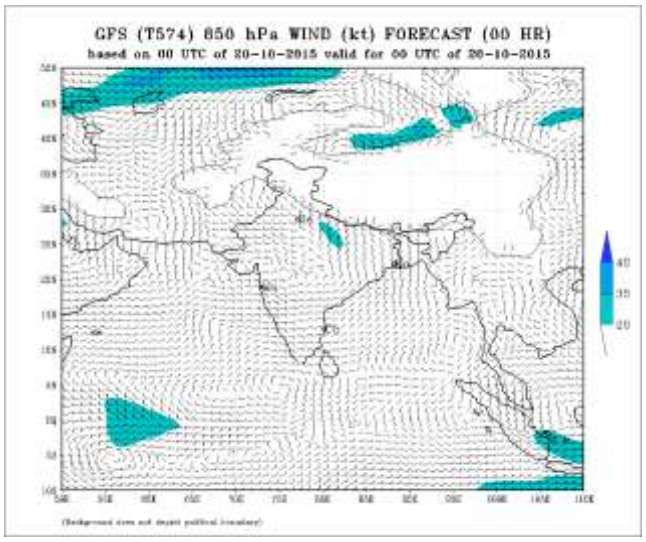
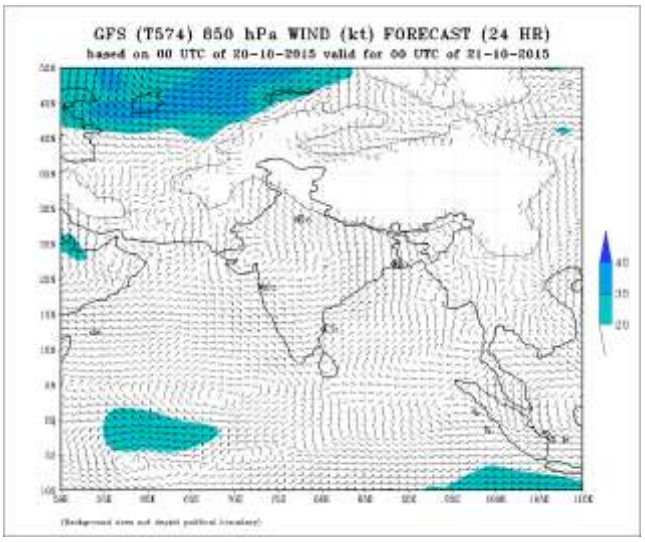
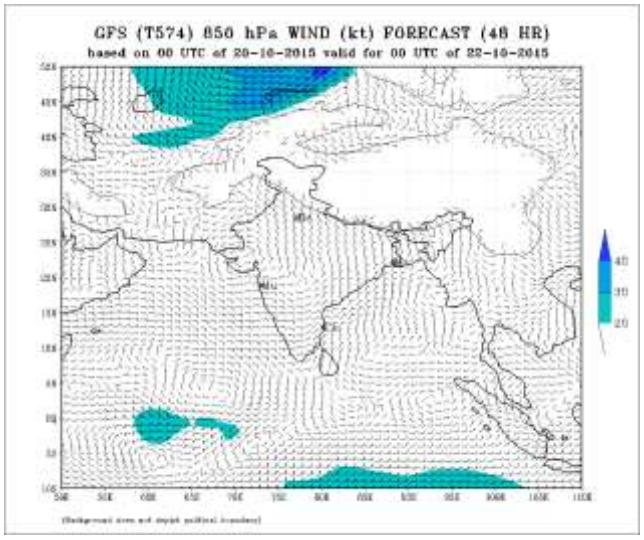

GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 20-10-2015 valid for 00 UTC of 25-10-2015


GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 20-10-2015 valid for 00 UTC of 20-10-2015


GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 20-10-2015 valid for 00 UTC of 21-10-2015


GFS (T574) 850 hPa WIND (kt) FORECAST (48 HR)
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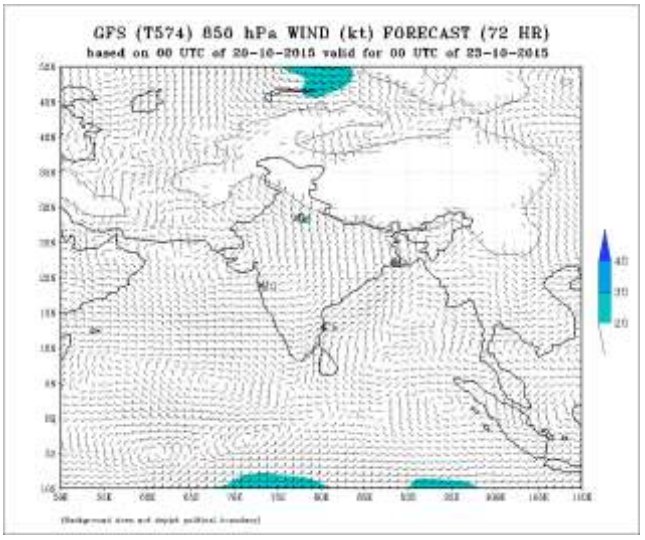
GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
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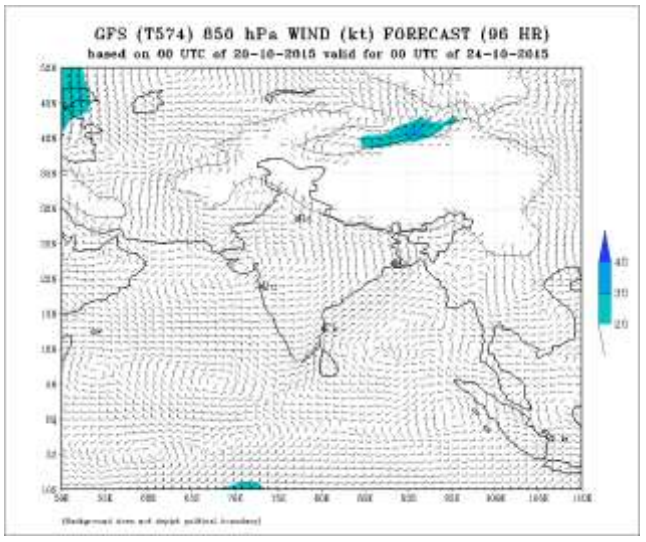
GFS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
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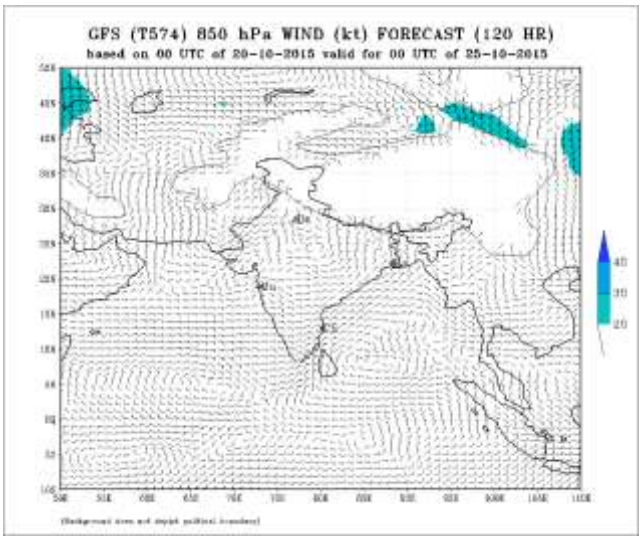
GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
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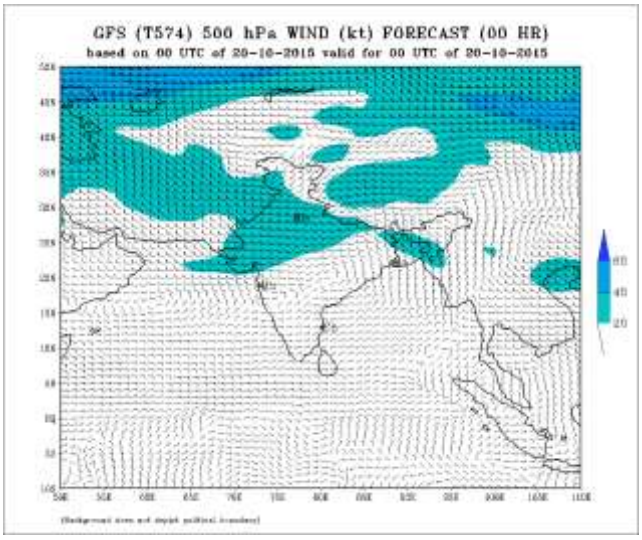
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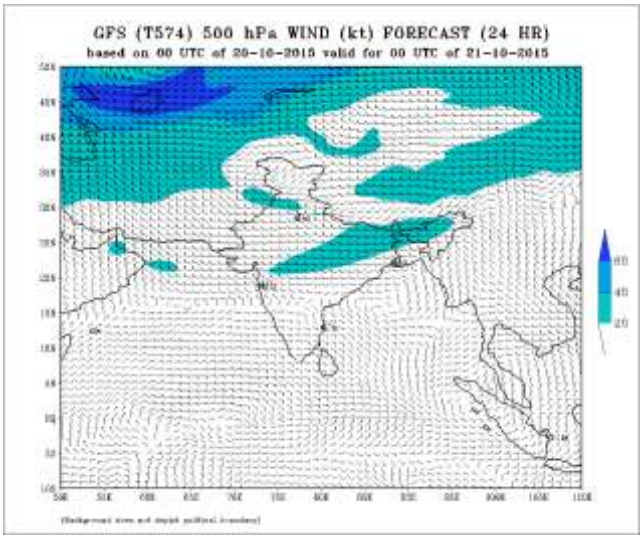
GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
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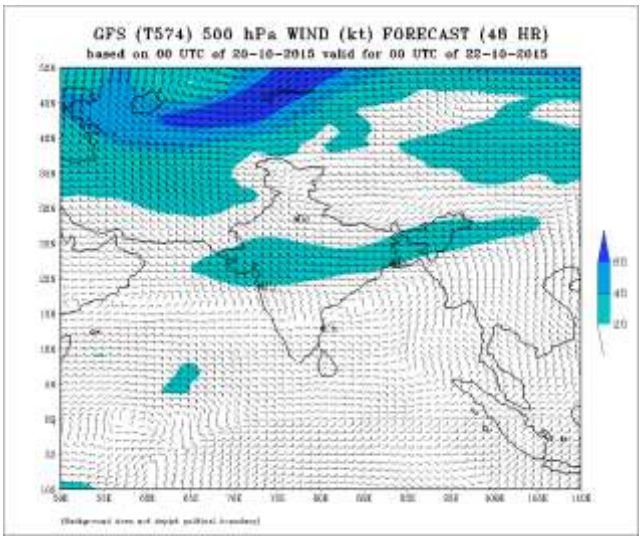
GFS (T574) 500 hPa WIND (kt) FORECAST (48 HR)
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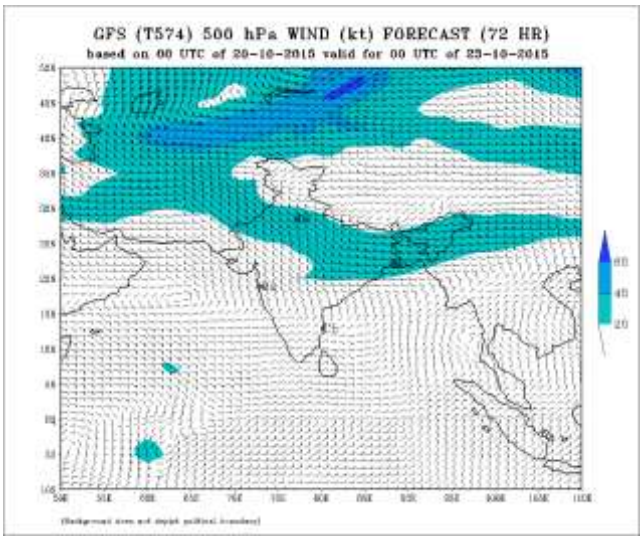
GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
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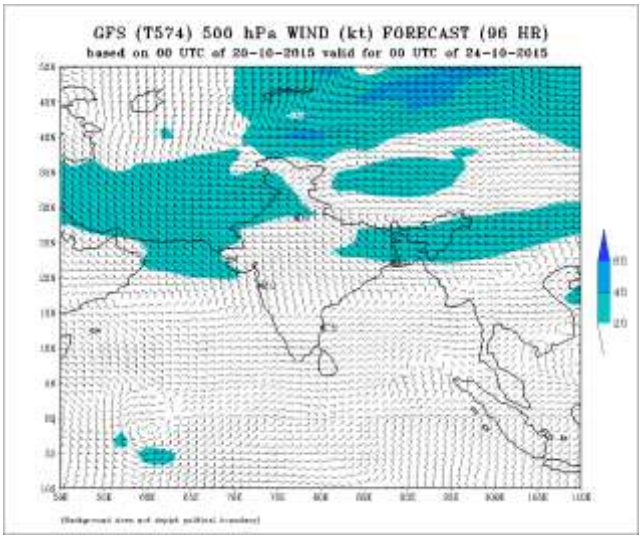
GFS (T574) 500 hPa WIND (kt) FORECAST (96 HR)
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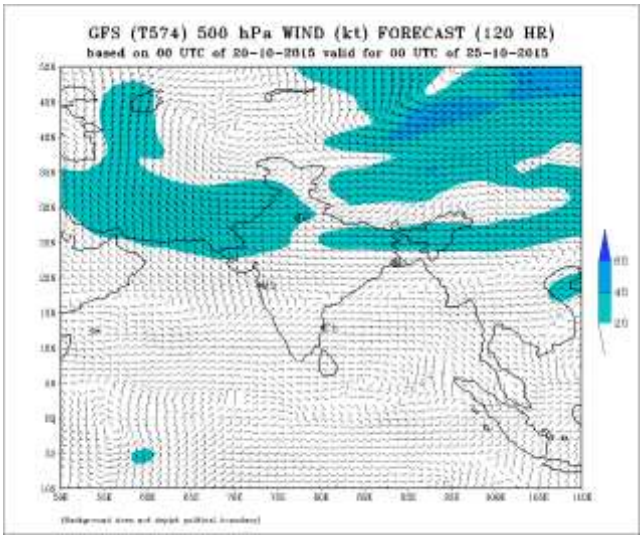
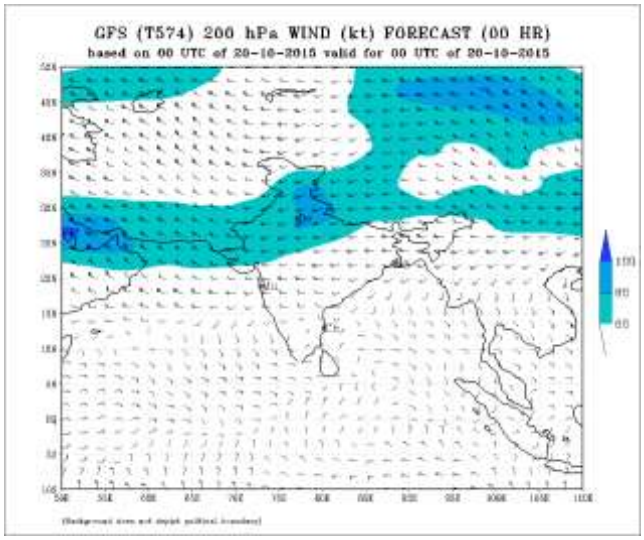
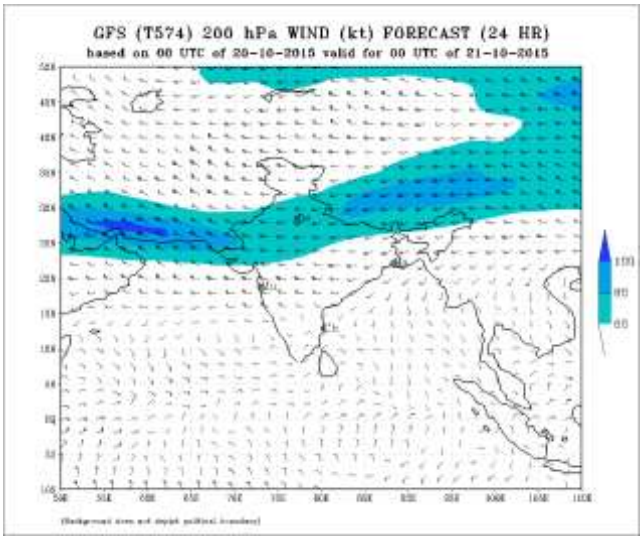

GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 20-10-2015 valid for 00 UTC of 25-10-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 20-10-2015 valid for 00 UTC of 20-10-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
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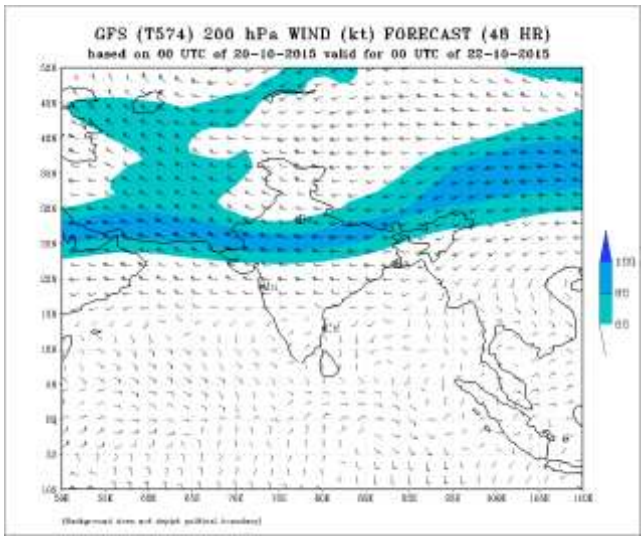
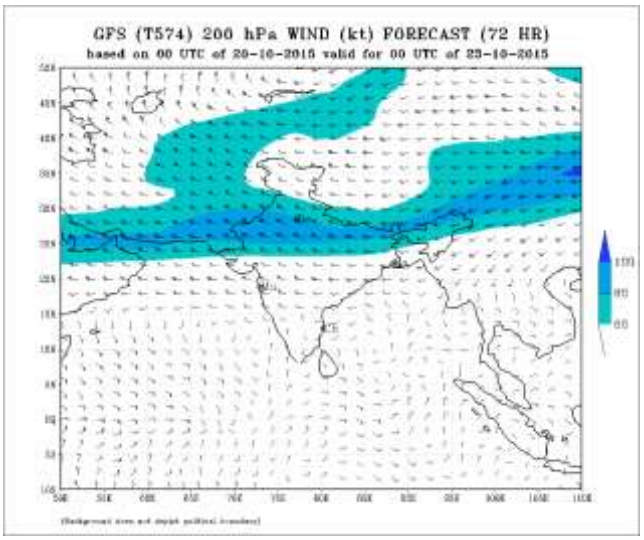
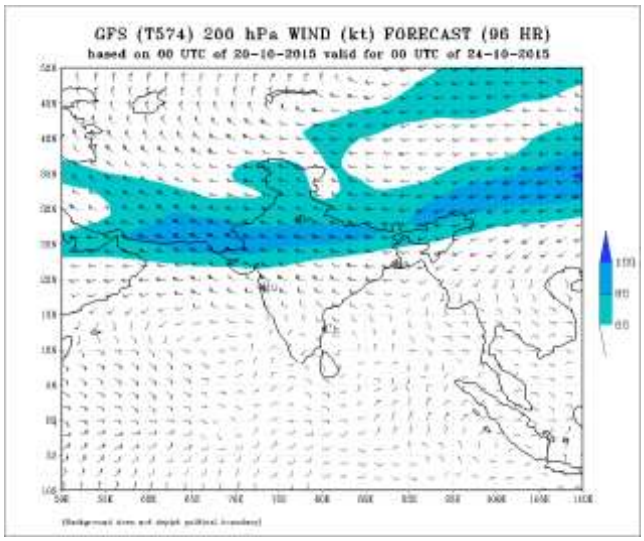
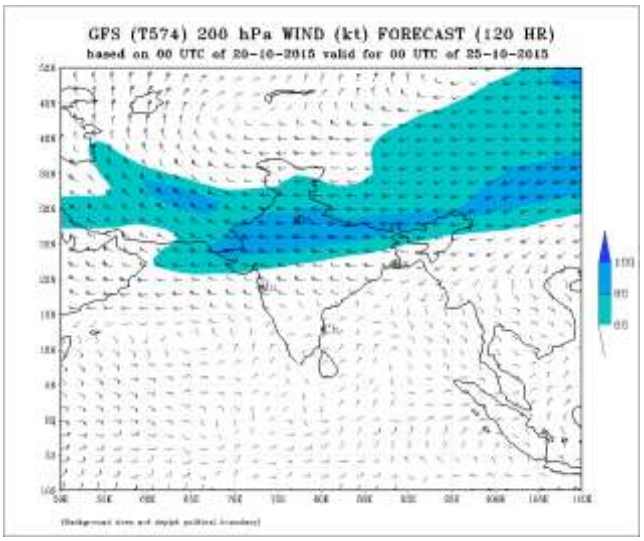

GFS (T574) 200 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 20-10-2015 valid for 00 UTC of 22-10-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 20-10-2015 valid for 00 UTC of 23-10-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 20-10-2015 valid for 00 UTC of 24-10-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 20-10-2015 valid for 00 UTC of 25-10-2015

FDP (Cyclone) NOC Report Dated 22 October, 2015

Synoptic features based on 0300 UTC of today:

- An upper air cyclonic circulation lies over Andaman sea & neighbourhood and extends upto 3.1 km above mean sea level.
- Yesterday's upper air cyclonic circulation over Lakshadweep & neighbourhood has moved now lie over Lakshadweep & Maldive area and extends up to 0.9 km above mean sea level.

Environmental features based on 0300 UTC of today:

Sea Surface Temperature (SST):

- SST is 30-31°C over along the east coast. And it is 28-30°C over most parts of Bay of Bengal (BoB) and Andaman Sea.
- SST is 30-31°C along the west coast and neighbhourhood. It is 29-30°C over rest parts of Arabian Sea (AS).

Tropical Cyclone Heat Potential (TCHP):

- TCHP is about 90-100 kJ/cm^2 over most parts of Bay of Bengal (BoB) and Andaman Sea.
- TCHP is 110-120 kJ/cm^2 over southeast AS adjoining Kerala–Karnataka coast. It is 80-90 kJ/cm^2 over remaining parts of south AS except over the western parts off Somalia and Oman coasts where it is less than 50 kJ/cm$^{2.}$

Relative Vorticity:

- Relative vorticity at 850 hPa is positive ($20*10^{-5}s^{-1}$) over northeast, central & southern parts of BoB and Andaman Sea. It is negative over rest of the BoB.
- Relative vorticity is positive over parts of north central, southeast AS adjoining Karnataka coast ($25*10^{-5}s^{-1}$). It is not significant over rest of the AS.

Convergence:

- Lower level convergence is $5\text{-}10*10^{-5}s^{-1}$ over Martaban coast and Gulf of Thailand. No significant upper level divergence zone over rest of BoB & Andaman Sea.
- Lower level convergence is positive over equatorial parts of southwest AS ($5\text{-}15\ 10^{-5}s^{-1}$) and ($5\text{-}10\ 10^{-5}s^{-1}$) is positive over equatorial parts of southeast AS . No other significant zone over rest of AS.

Divergence:

- Upper level divergence is positive ($5\text{-}10*10^{-5}s^{-1}$) over west of southwest off Sri Lanka Coast, Martaban coast and Gulf of Thailand. No other significant upper level divergence zone over rest of BoB & Andaman Sea.
- Upper level divergence is positive over central parts of southwest AS and negative over Oman coast ($5\text{-}10*10^{-5}s^{-1}$). No other significant zone over rest of AS.

Wind Shear:

- Wind Shear is 5-10 knots over most parts of BoB and Andaman Sea except over north BoB where it is >20 kts.
- Wind Shear is 5-10 knots over southeast AS and it is increasing northwards.

Wind Shear Tendency:

- There is no significant change in the wind shear over most parts of the BoB. It shows decreasing trend (-10 kts) over south Andaman Sea during the past 24 hrs.
- The vertical wind shear tendency is decreasing and is of the order of -5 to -10 knots over parts of southeast and eastcentral AS.

Upper tropospheric ridge:

- The upper tropospheric ridge at 200 hPa runs along 9.0°N over BoB.
- The upper tropospheric ridge at 200 hPa runs along 10.0°N over AS.

M.J.O. Index:

- MJO lies over Phase 1 with amplitude greater than 1.0. As per forecast by dynamical and statistical models, it would move to Phase 2 during next 24 hours.

Storms and Depression over South China Sea/ South Indian Ocean:

- Typhoon KOPPU over northwest Pacific Ocean has further weakened into a low pressure area and dissipate over sea during next 24 hours.
- Yesterday's low level circulation intensified into a well-marked low pressure area and lies over 5.5°S and 61.1°E at 0300 UTC of 22nd October 2015 for its development within next 24 hours needs to be watched..

Satellite:

Inference based on INSAT imagery of 220900 UTC:

Bay of Bengal & Andaman Sea:-

Scattered low and medium clouds with embedded moderate to intense convection lie over south BoB.

Arabian Sea:-

Broken low and medium clouds with embedded moderate to intense convection lie over south AS east of longitude 55.0°E.

NWP Analysis

IMD GFS: The analysis of IMD-GFST574 model charts based on 0000 UTC of 22nd October, 2015 shows a cyclonic circulation over south-central Arabian Sea and extends up to 1.5 km above mean sea level, which is likely to move westward very slowly in next 72 hours with slight intensification. Another cyclonic circulation is also seen in the analysis field of 22nd over the southwest Bay of Bengal and adjoining east off Sri Lanka coast, which is likely to persists with sight westward movement during next 3 days.

IMD WRF: The WRF model analysis of 22nd October and forecasts for next 3 days almost indicate the similar synoptic features like that is seen in GFST574.

NWP products are available at:

http://202.54.31.51/bias/gfsproducts.php
http://202.54.31.51/bias/wrf27pro.php
http://202.54.31.51/bias/potentialparameter.php

NCMRWF-UM: NCUMmodel does not show any low / circulation over BOB and AS during next 3 days.

NCMRWF-GFS: NCMRWF-GFS model does not show any low / circulation over BOB during next five days. Formation of a low over southwest AS on 27th with further intensification thereafter is suggested.

ECMWF Model: ECMWF Model shows a feeble low over southwest Bay on 25th near off Sri Lanka coast afterwards it become an extended low during next 24 hours

and extended towards northwards on 27th it remains as a low over the same area for 36 hrs for further intensification into a depression on 31st needs to watch.
No developments had noticed over AS for next 72 hours.
No potential zone for development of a system is suggested by ecmwf analysis based on 00 UTC of 22nd for next 5 days.
JMA: JMA Model shows development of low over southwest AS on 24th. An extended low is predicted over BoB during next 2 days.
ARP-Meteo France: ARP-Meteo France Model does not suggest any low over BoB. Development of a low over southeast AS on 23rd and no further intensification over the same region is expected.
IMD GPP Guidance: The Genesis Potential Parameter (GPP) analysis of 21st October shows moderate GPP zone over south east Arabian Sea, which is likely to move southwest-ward with likely increase of GPP value to the range of about 20 to 30 units.

Summary and Conclusion:

Bay of Bengal and Andaman Sea: No model is suggesting for development of any low pressure area over the region for next 5 days. Global models like ECMWF and GFS suggest formation of low pressure area over southwest BOB on 28th which may further intensify into a depression/29th / 30th it needs to be watched.
Arabian Sea: No models are suggesting formation of a low pressure area over AS.

Probability of cyclogenesis over Bay of Bengal and Andaman Sea during next 120 hours:

24 hours	24-48 hours	48-72 hours	72-96 hours	96-120 hours
NIL	NIL	NIL	NIL	NIL

Probability of cyclogenesis over Arabian Sea during next 120 hours:

24 hours	24-48 hours	48-72 hours	72-96 hours	96-120 hours
NIL	NIL	NIL	NIL	NIL

Advisory: No IOP for next five days.

Status of observational system:

Details of the status of observational systems are given in **Annexure I.**

Annexure-I

Status of Observation system:

Synoptic observation:

Region	Date/Time (UTC)		
	21/12	**22/00**	**22/03**
India	45	35	40
Coastal stations			
WB	5	3	3
Odisha	6	6	5
AP	14	13	14
Tamil Nadu	12	10	10
Puducherry	2	2	2
A & N	6	1	6
Bangladesh	10	10	11
Myanmar	11	11	11
Thailand	2	2	2
Sri Lanka	8	7	8

AWS Observations:

Region	Date/Time (UTC)		
	21/12	**22/00**	**22/03**
India	18	64	62
Coastal stations			
WB	1	5	5
Odisha	2	15	15
AP	6	17	17
Tamil Nadu	9	27	25
Puducherry	-	-	-
A & N	-	-	-

RS/RW (12Z) of 21/10/2015 **-0/39**
No. of Ascents reaching 250 hPa level: 0, MISDA: 0

RS/RW (00Z) of 22/10/2015- 24**/39**
No. of Ascents reaching 250 hPa level: 22, MISDA: 1

No. of PILOT Ascents

21/12Z	**22/00Z**
8	5

Buoy Data

21/12Z	22/00Z	22/03Z
0	0	0

STATUS OF CHENNAI REGION OBSERVATIONS

No. of Synop data

Date→	**21.10.2015**							
UTC→	**00**	**03**	**06**	**09**	**12**	**15**	**18**	**21**
Chennai Region (Coasts of AP & TN)	**20**	**20**	**20**	**20**	**22**	**20**	**20**	**19**

No. of RS/RW Ascents

00Z /21.10.2015 : 4
No. of Ascents reaching 250 hPa level = 3
MISDA : 4

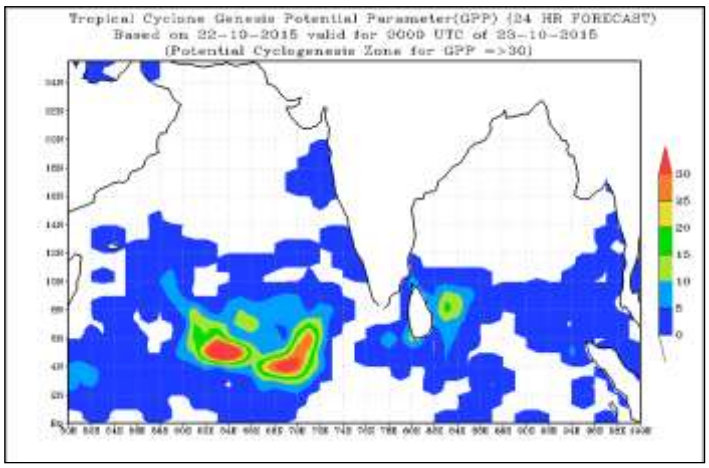
12Z /21.10.2015 : 0
No. of Ascents reaching 250 hPa level =0
MISDA : 8

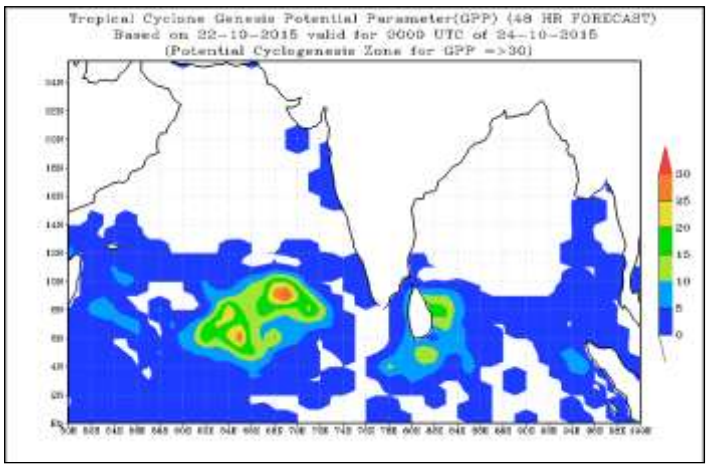
No. of PILOT Ascents:

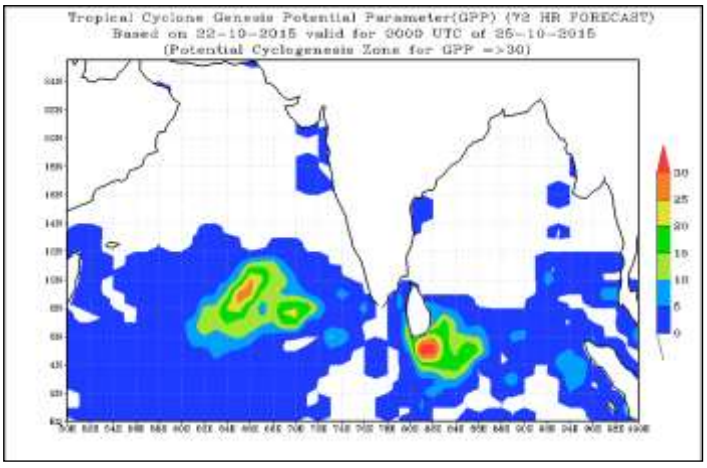
21.10.2015

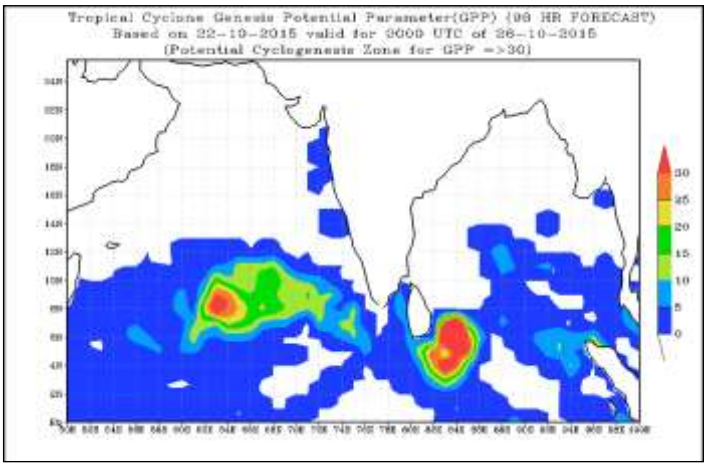
06Z	18Z
5	4

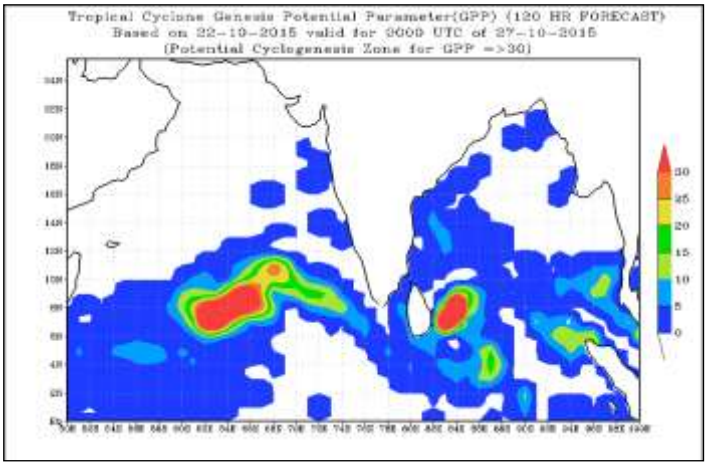
Annexure-II

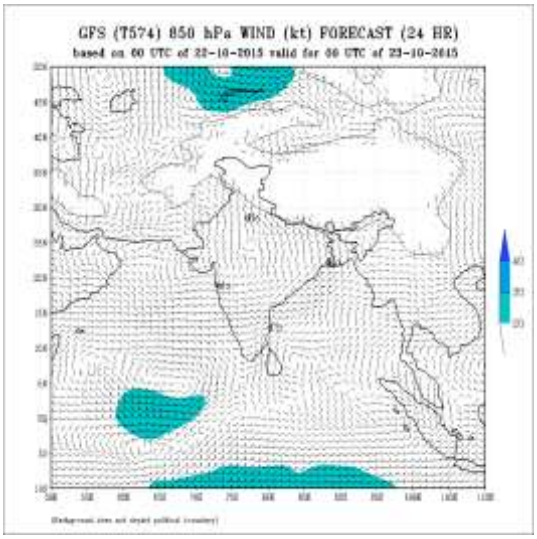

Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 22-10-2015 valid for 0000 UTC of 23-10-2015
(Potential Cyclogenesis Zone for GPP =>30)

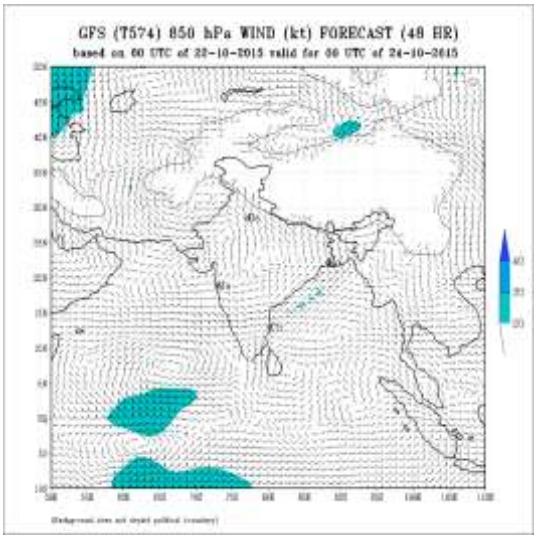

Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
Based on 22-10-2015 valid for 0000 UTC of 24-10-2015
(Potential Cyclogenesis Zone for GPP =>30)

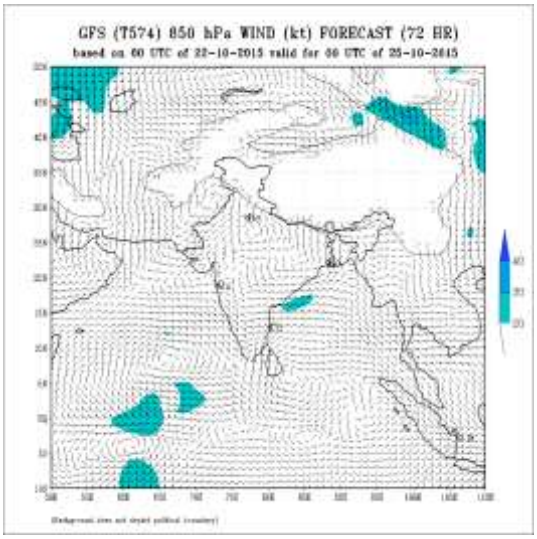

Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 22-10-2015 valid for 0000 UTC of 25-10-2015
(Potential Cyclogenesis Zone for GPP =>30)

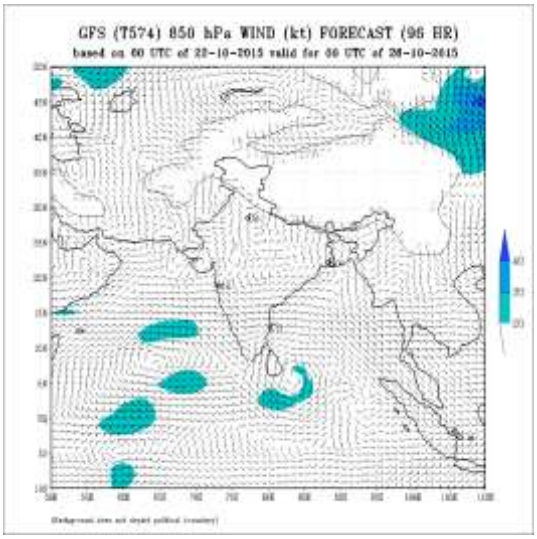

Tropical Cyclone Genesis Potential Parameter(GPP) (96 HR FORECAST)
Based on 22-10-2015 valid for 0000 UTC of 26-10-2015
(Potential Cyclogenesis Zone for GPP =>30)

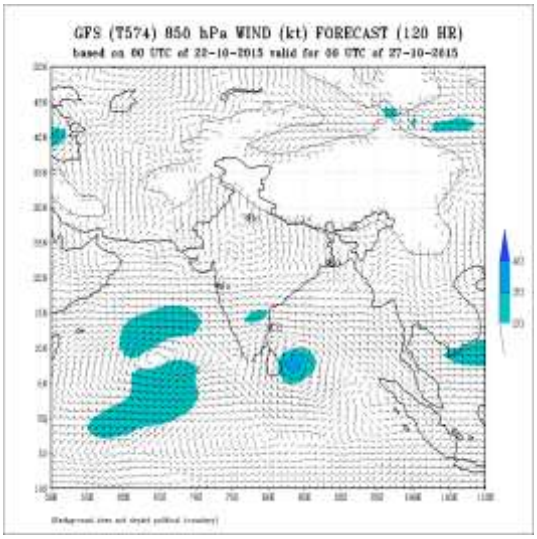

Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 22-10-2015 valid for 0000 UTC of 27-10-2015
(Potential Cyclogenesis Zone for GPP =>30)

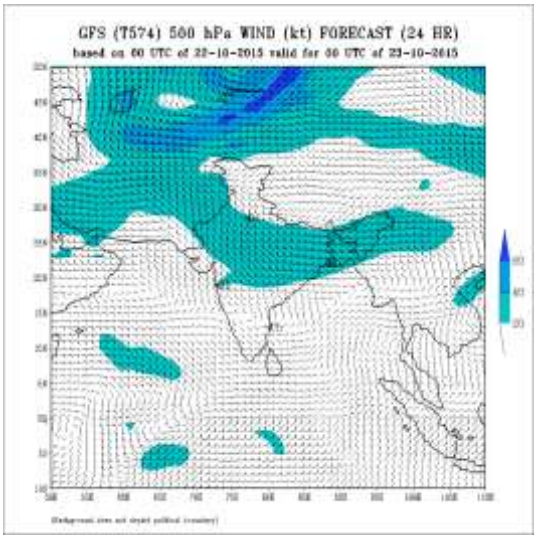

GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 22-10-2015 valid for 00 UTC of 23-10-2015

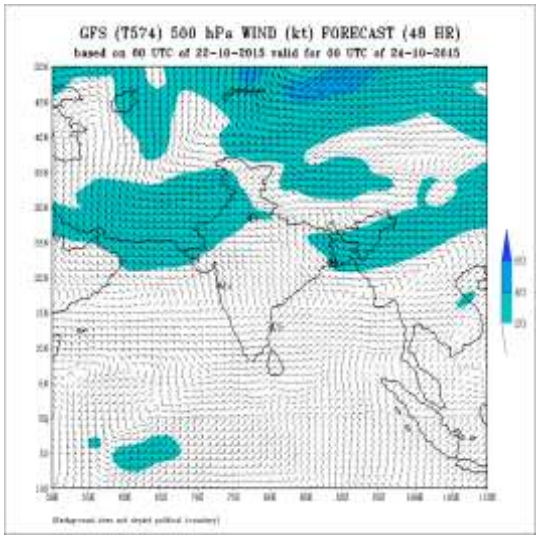

GFS (T574) 850 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 22-10-2015 valid for 00 UTC of 24-10-2015

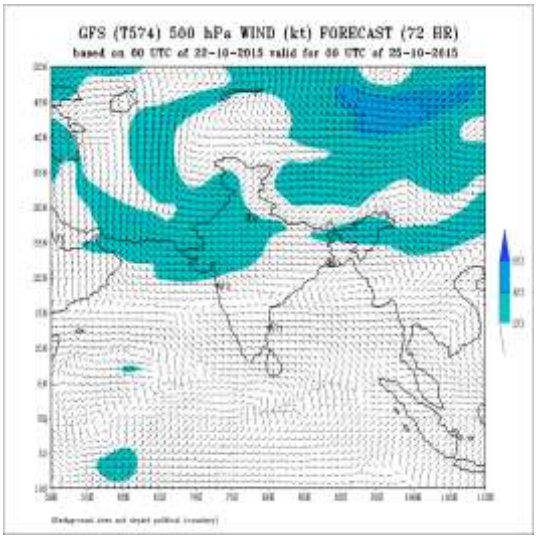

GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 22-10-2015 valid for 00 UTC of 25-10-2015

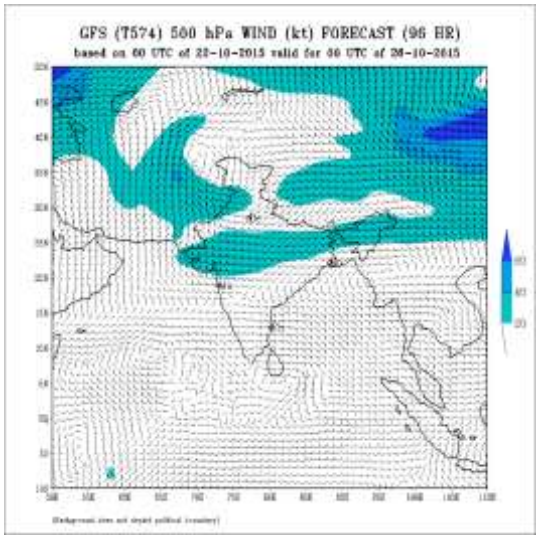

GFS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 22-10-2015 valid for 00 UTC of 26-10-2015

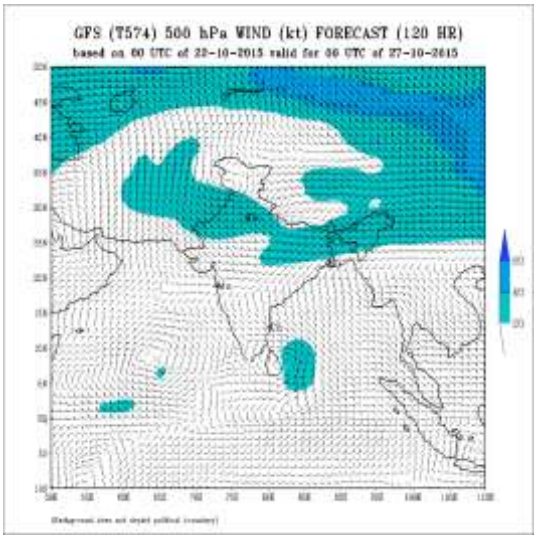

GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 22-10-2015 valid for 00 UTC of 27-10-2015

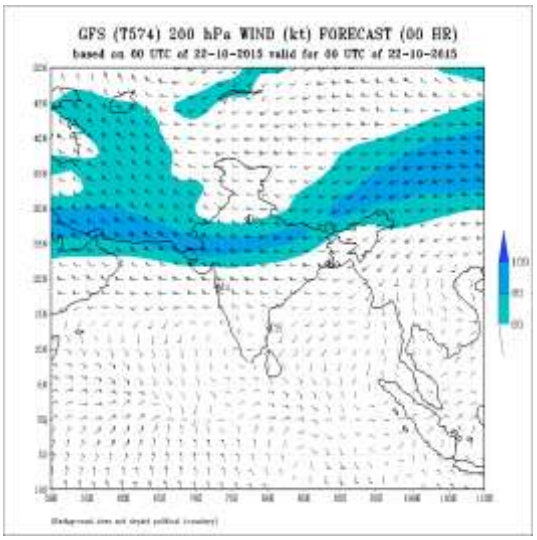

GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 22-10-2015 valid for 00 UTC of 23-10-2015

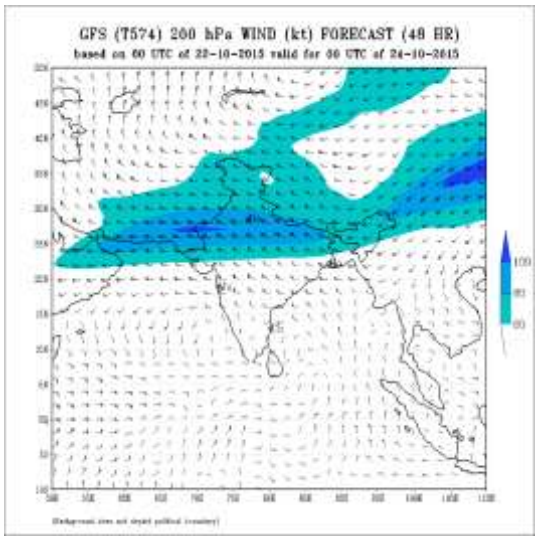

GFS (T574) 500 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 22-10-2015 valid for 00 UTC of 24-10-2015

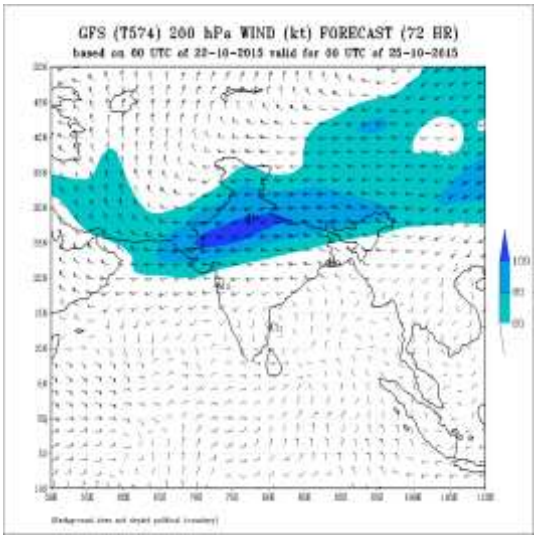

GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 22-10-2015 valid for 00 UTC of 25-10-2015

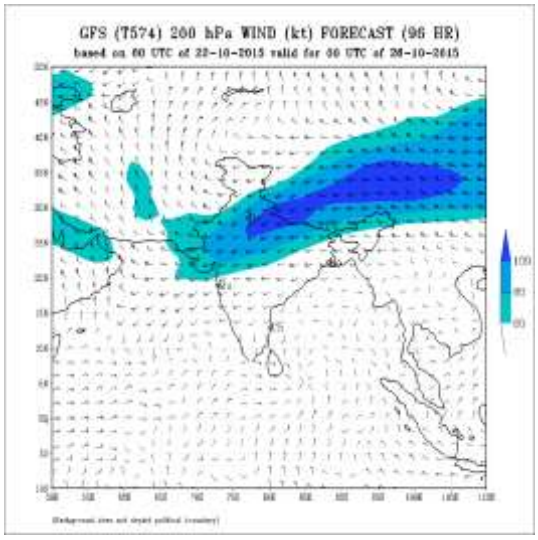

GFS (T574) 500 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 22-10-2015 valid for 00 UTC of 26-10-2015

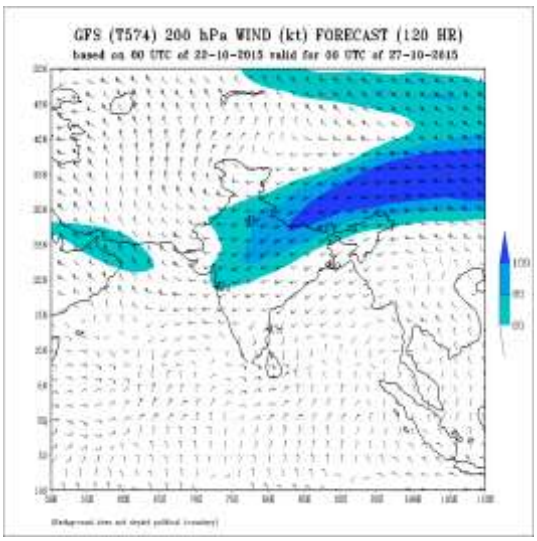

GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 22-10-2015 valid for 00 UTC of 27-10-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 22-10-2015 valid for 00 UTC of 22-10-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 22-10-2015 valid for 00 UTC of 24-10-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 22-10-2015 valid for 00 UTC of 25-10-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 22-10-2015 valid for 00 UTC of 26-10-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 22-10-2015 valid for 00 UTC of 27-10-2015

FDP (Cyclone) NOC Report Dated 23 October, 2015

Synoptic features based on 0300 UTC of today:

- Associated with yesterday's upper air cyclonic circulation over Lakshadweep and Maldive area, a trough of low at mean sea level lies over southeast Arabian sea & neighbourhood with an upper air cyclonic circulation aloft that extends upto 0.9 km above mean sea level.
- Yesterday's upper air cyclonic circulation over Andaman Sea & neighbourhood now lies oversouth Andaman sea & neighbourhood and extends upto 3.1 km above mean sea level.
- An upper air cyclonic circulation lies over southwest Bay of Bengal and adjoining Sri Lanka coast and extends upto 1.5 km above mean sea level.

Environmental features based on 0300 UTC of today:

Sea Surface Temperature (SST):

- SST is 28-30°C over Bay of Bengal (BOB) and Andaman Sea.
- SST is 28-30°C over most parts of Arabian Sea (AS) except over extreme southwestern parts where it is 26-28°C.

Tropical Cyclone Heat Potential (TCHP):

- TCHP is about 100-120 kJ/cm^2 over equatorial Bay of Bengal. It is 60-80 kJ/cm^2 over the rest of BOB except over the extreme northern parts where it is 40-60 kJ/cm^2.
- TCHP is 100-120 kJ/cm^2 over southeast AS adjoining kerala – Karnataka coast. It is 60-80 kJ/cm^2 over remaining parts of south AS except over the western parts off Somalia and Oman coasts where it is less than 50 kJ/cm$^{2.}$

Relative Vorticity:

- Relative vorticity at 850 hPa is positive (30-40*10^{-5}s^{-1}) over southwest BOB adjoining southeastern parts of Sri Lanla. It is about 20*10^{-5}s^{-1} over parts of rest of the BOB and Andaman Sea and negative over the remaining parts.
- Relative vorticity at 850 hPa is positive (30-40*10^{-5}s^{-1}) over equatorial AS between 60-72°E and south of 8°N. It is about 20*10^{-5}s^{-1} over parts of AS south of 12°N. It is not significant over rest of the AS.

Convergence:

- Lower level convergence is 5-10*10^{-5}s^{-1} over equatorial BOB south of 6°N and off the east caost of Sri Lanka. No significant low level convergence zone over rest of BOB & Andaman Sea.
- Lower level convergence is positive over parts of southeast AS (5-10 10^{-5}s^{-1}) off west coast of Sri Lanka and Kerala coast. No other significant zone over rest of AS.

Divergence:

- Upper level divergence is positive (10-20*10^{-5}s^{-1}) over southeastern parts of equatorial BOB east of 85°E and south of 6°N. It is 5-10*10^{-5}s^{-1} over southwest BOB and adjoining AS along and off Sri Lanka, south Tamil Nadu and Kerala coasts.
- Upper level divergence is positive (10-20*10^{-5}s^{-1}) over parts of southwest AS.

Wind Shear:

- Wind Shear is 5-10 knots over equatorial BOB and Andaman Sea south of 10°N. It is 10-20 knots over the central parts and >20 knots over north BOB.
- Wind Shear is >20 knots over northern and extreme southern parts of AS and it is 5-15 knots over parts of AS within the latitudinal belt of 5-12°N.

Wind Shear Tendency:

- Vertical wind shear tendency is decreasing (-5 knots) over parts of southwest BOB off southeastern parts of Sri Lanka and parts of eastcentral BOB off Myanmar coast during the past 24 hrs.
- The vertical wind shear tendency is increasing over southern parts of AS and decreasing over northeastern parts of AS off Gujarat coast.

Upper tropospheric ridge:

- The upper tropospheric ridge at 200 hPa runs along 10.0°N over BOB.
- The upper tropospheric ridge at 200 hPa runs along 10.0°N over AS.

M.J.O. Index:

- MJO lies over Phase 2 with amplitude greater than 1.0. As per forecast by dynamical and statistical models, it would continue in Phase 2 during next 2-3 days.

Storms and Depression over South China Sea/ South Indian Ocean:

- Yesterday's well-marked low pressure area over southwest Indian Ocean has concentrated into a depression and lay centred near 4.5°S and 61.0°E at 0900 UTC of 23rd October 2015.

Satellite:

Inference based on INSAT imagery of **230900** UTC:

Bay of Bengal & Andaman Sea:-

Scattered low and medium clouds with embedded moderate to intense convection over southwest Bay of Bengal between latitude 5.0°N to 9.0°N and longitude 81.5°E to 85.5°E in association with the low level circulation over the area. Broken low and medium clouds with embedded moderate to intense convection lie over rest of south Bay of Bengal and isolated clouds lie over south Andaman Sea.

Arabian Sea:-

Scattered low and medium clouds with embedded moderate to intense convection over southwest Arabian Sea between latitude 5.0°N to 12.0°N and longitude 56.0°E to 64.0°E in association with a low level circulation over the area. Broken low and medium clouds with embedded moderate to intense convection lie over southeast Arabian Sea.

NWP Analysis

IMD GFS: The analysis of IMD-GFST574 model of 0000 UTC of 23rd October, 2015 shows a cyclonic circulation over south-central Arabian Sea and extends up to 1.5 km above mean sea level, which is likely to move westward very slowly in next 72 hours with slight intensification. Another cyclonic circulation is also seen in the analysis field of 23rd over the southwest Bay of Bengal and adjoining Sri Lanka coast, which is likely to persists with slight westward movement during next 3 days. It would become a low pressure area on 26th. It would concentrate into a depression on 27th near the same region. Moving northwards, it would intensify and become a deep depression / cyclonic storm during 28-29th off Tamil Nadu coast.

IMD WRF: WRF model analysis of 23rd October indicate a cyclonic circulation over the south-central Arabian Sea, which is likely to move westward very slowly in next 72 hours with gradual intensification. The model also indicate another cyclonic circulation in the analysis field of 23rd

over the southwest Bay of Bengal and adjoining east off Sri Lanka coast, which is likely to persists with slow westward movement and intensification after 48hr.

IMD-NWP products are available at:
http://202.54.31.51/bias/gfsproducts.php
http://202.54.31.51/bias/wrf27pro.php
http://202.54.31.51/bias/potentialparameter.php

NCMRWF-UM: NCUM model shows formation of a low pressure area off east coast of Sri Lanka on 24th and moving westwards during the next 24 hrs.
NCMRWF-GFS: NCMRWF-GFS model shows formation of a low pressure area over southwest BOB, south of Sri Lanka on 26th. It intensifies into a depression and moves northward towards south Tamil Nadu coast on 29th.
This model shows formation of another low pressure area over southwest Arabian sea during 25-26th and moving westwards towards Africa-Arabia coasts intensifying gradually into a cyclonic storm on 29th.
NCEP-GFS: NCEP-GFS model shows formation of a low pressure area over southwest BOB off southeastern coast of Sri Lanka on 24th which intensifies into a depression near the same region on 28th. Moving northward, along Sri Lanka and Tamil Nadu coasts, it intensifies into a deep depression / cyclonic storm on 29th and moves north-northeastward skirting Tamil Nadu - Andhra Pradesh coasts on 30th.
ECMWF: ECMWF Model shows formation of a low pressure area over southwest BOB off southeastern coast of Sri Lanka on 26th. It would intensify into a depression and move northward skirting Sri Lanka, Tamil Nadu and Andhra Pradesh during the next 4 days before recurving northeast-wards.
JMA: JMA Model shows formation of a low pressure area over southwest BOB off southeast coast of Sri Lanka on 24th and persisting around the same region during the next 2 days.
ARP-Meteo France: ARP-Meteo France Model suggests formation of a low over BOB on 25th.
IMD GPP Guidance: **IMD GPP Guidance**: The Genesis Potential Parameter (GPP) analysis of 23rd October shows two moderate GPP zones over south-central Arabian Sea and southwest Bay of Bengal off Sri Lanka. The GPP zone over the south-central Arabian Sea shows intensification (value exceeding 25) during day 3. The moderate GPP over the southwest Bay of Bengal shows slight westward movement with intensification in 48 hr forecast (value exceeding 25), which further intensified in 72 hr forecast over the south-eastern coast of Sri Lanka (value exceeding 30).

Summary and Conclusion:

Bay of Bengal and Andaman Sea: Most NWP models are suggesting development of a low pressure area over the southwest Bay of Bengal region off southeast coast of Sri Lanka by 26th October. There is difference with respect to intensification with GFS group suggesting intensification further into a deep depression / cyclonic storm and other models suggesting upto depression. The models are unanimous with respect to track, with most of them suggesting initial north-northwestward movement upto north TN coast and then northeastward recurvature, skirting TN and AP coast.

Arabian Sea: NCMRWF-GFS model suggestion of cyclogenesis over southwest AS on 25-26th which gradually intensifies into a cyclonic storm and moves westward towards Africa-Arabia coasts during the next 3 days needs to be watched.

Probability of cyclogenesis over Bay of Bengal and Andaman Sea during next 120 hours:

24 hours	24-48 hours	48-72 hours	72-96 hours	96-120 hours
NIL	NIL	NIL	Low	Moderate

Probability of cyclogenesis over Arabian Sea during next 120 hours:

24 hours	24-48 hours	48-72 hours	72-96 hours	96-120 hours
NIL	NIL	NIL	NIL	NIL

Advisory: IOP will be conducted for Tamil Nadu, Puducherry and south AP coast during 27-30th Oct 2015.

Status of observational system:

Details of the status of observational systems are given in **Annexure I.**

Annexure-I

Status of Observation system:

Synoptic observation:

Region	Date/Time (UTC)		
	22/12	**23/00**	**23/03**
India	40	34	41
Coastal stations			
WB	5	3	6
Odisha	6	6	5
AP	14	14	14
Tamil Nadu	07	8	8
Puducherry	2	2	2
A & N	6	1	6
Bangladesh	8	7	10
Myanmar	10	9	7
Thailand	3	3	3
Sri Lanka	6	3	6

AWS Observations:

Region	Date/Time (UTC)		
	22/12	**23/00**	**23/03**
India	18	64	62
Coastal stations			
WB	5	4	5
Odisha	5	17	17
AP	18	16	17
Tamil Nadu	27	25	25
Puducherry	1	1	1
A & N	1	1	1

RS/RW (12Z) of 22/10/2015 **-0/39**
No. of Ascents reaching 250 hPa level: 0, MISDA: 0

RS/RW (00Z) of 23/10/2015- 24**/39**
No. of Ascents reaching 250 hPa level: 22, MISDA: 1

No. of PILOT Ascents

22/12Z	**23/00Z**
9	4

Buoy Data

22/12Z	23/00Z	23/03Z
7	7	6

STATUS OF CHENNAI REGION OBSERVATIONS

No. of Synop data

Date→	**22.10.2015**							
UTC→	**00**	**03**	**06**	**09**	**12**	**15**	**18**	**21**
Chennai Region (Coasts of AP & TN)	**20**	**20**	**20**	**20**	**21**	**20**	**20**	**20**

No. of RS/RW Ascents

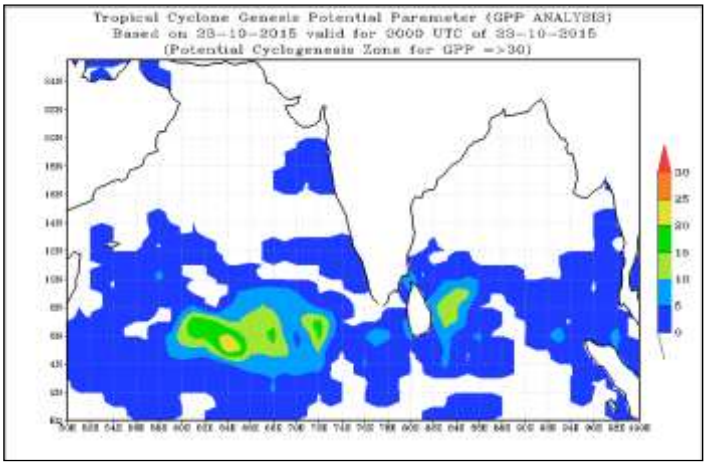
00Z /22.10.2015 : 4
No. of Ascents reaching 250 hPa level = 3
MISDA : 4

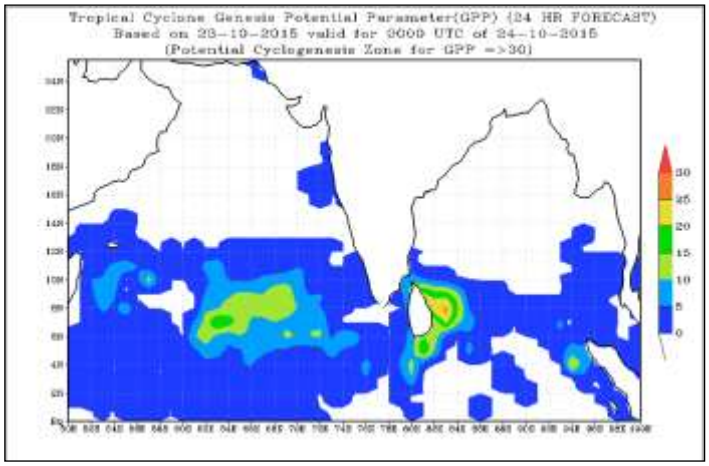
12Z /22.10.2015 : 0
No. of Ascents reaching 250 hPa level =0
MISDA : 8

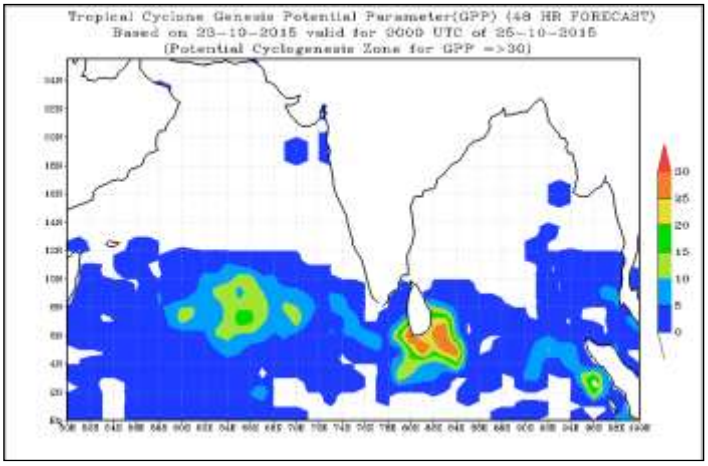
No. of PILOT Ascents:

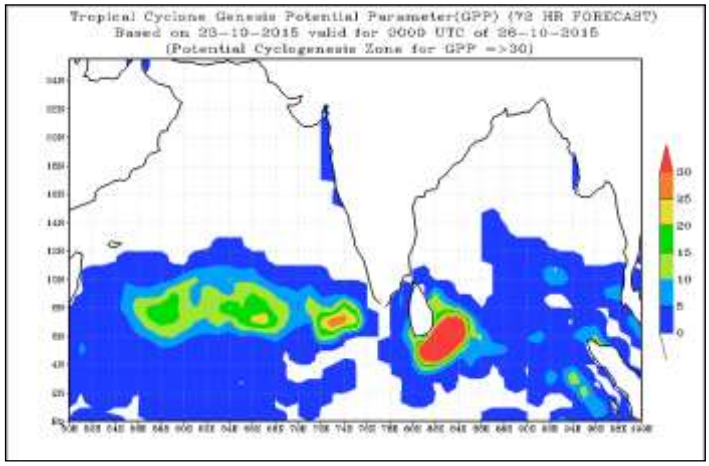
22.10.2015	
06Z	18Z
6	4

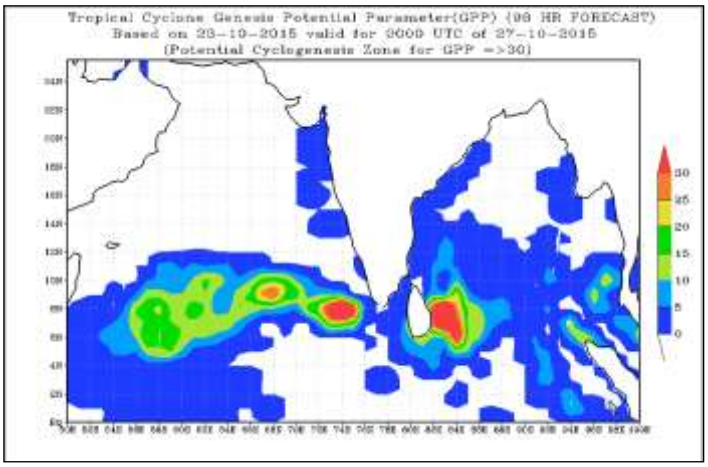
Annexure-II

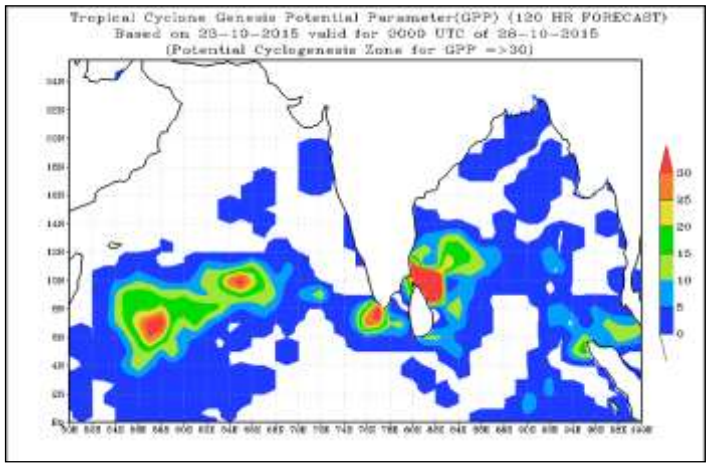

Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 28-10-2015 valid for 0000 UTC of 28-10-2015
(Potential Cyclogenesis Zone for GPP =>30)

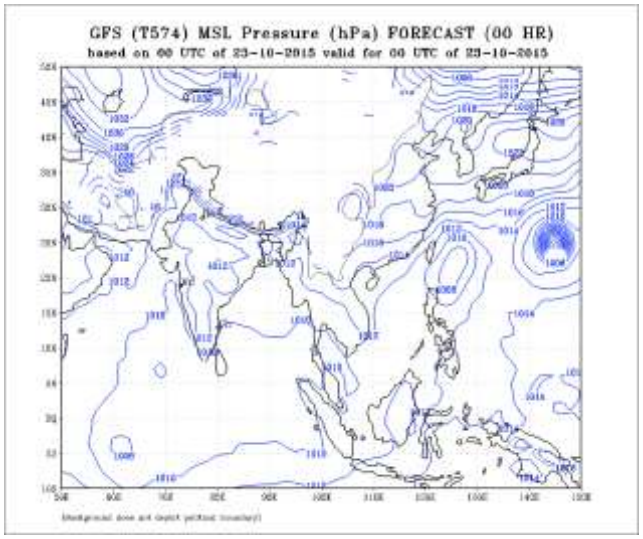

Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 28-10-2015 valid for 0000 UTC of 29-10-2015
(Potential Cyclogenesis Zone for GPP =>30)

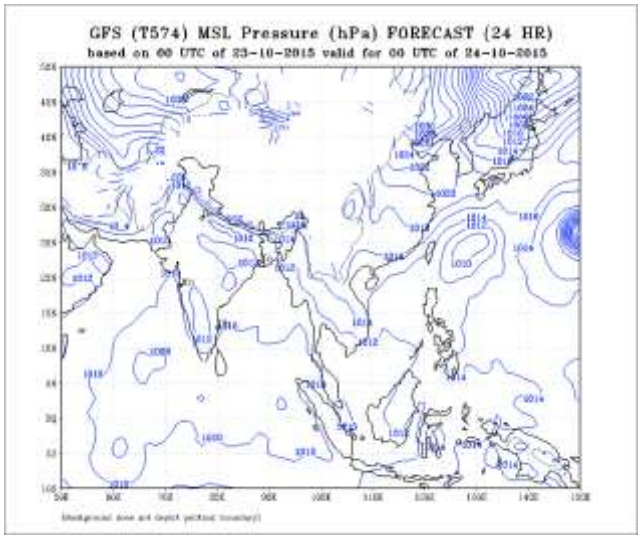

Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
Based on 28-10-2015 valid for 0000 UTC of 30-10-2015
(Potential Cyclogenesis Zone for GPP =>30)

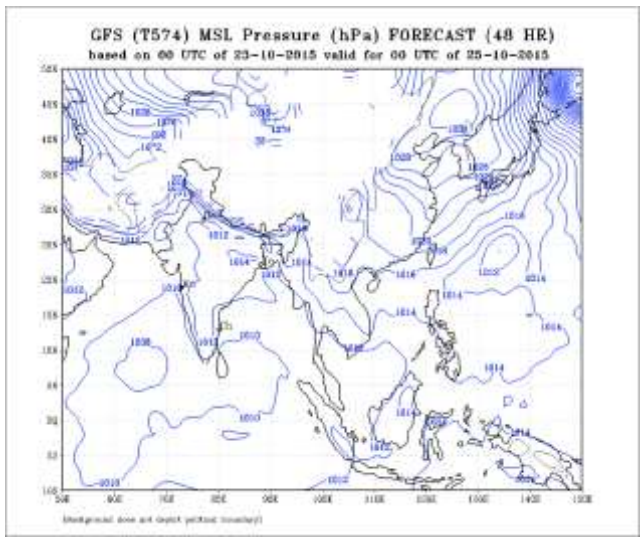

Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 28-10-2015 valid for 0000 UTC of 31-10-2015
(Potential Cyclogenesis Zone for GPP =>30)

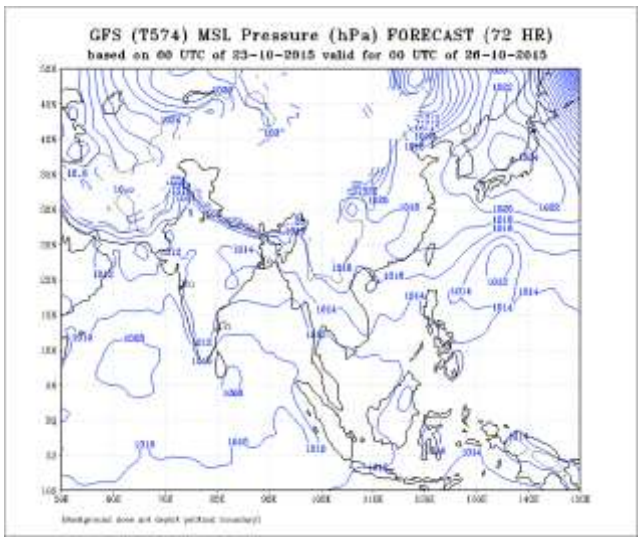

Tropical Cyclone Genesis Potential Parameter(GPP) (96 HR FORECAST)
Based on 28-10-2015 valid for 0000 UTC of 01-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

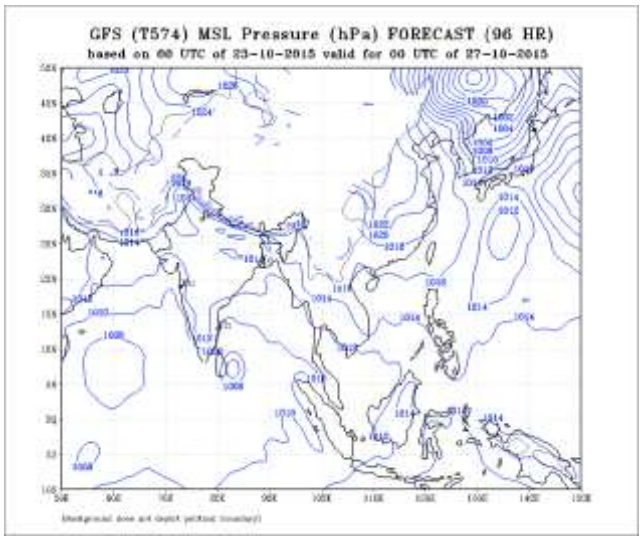

Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 28-10-2015 valid for 0000 UTC of 02-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

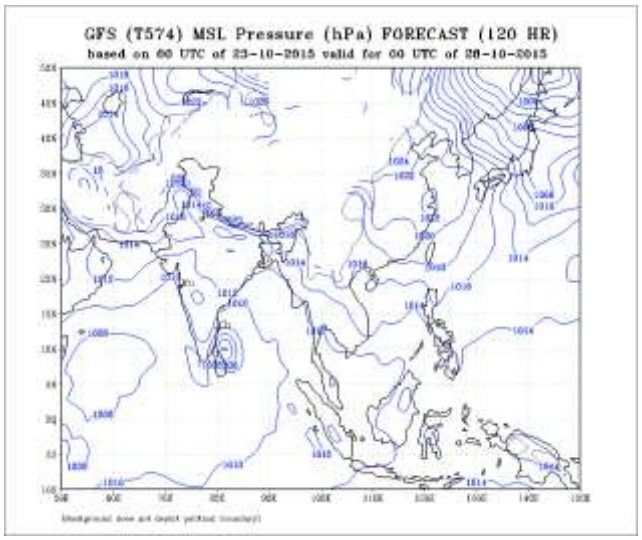

GFS (T574) MSL Pressure (hPa) FORECAST (00 HR)
based on 00 UTC of 23-10-2015 valid for 00 UTC of 23-10-2015

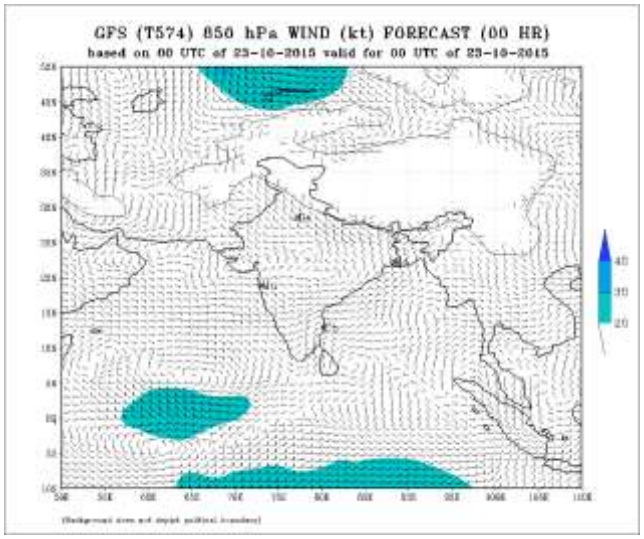

GFS (T574) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 23-10-2015 valid for 00 UTC of 24-10-2015

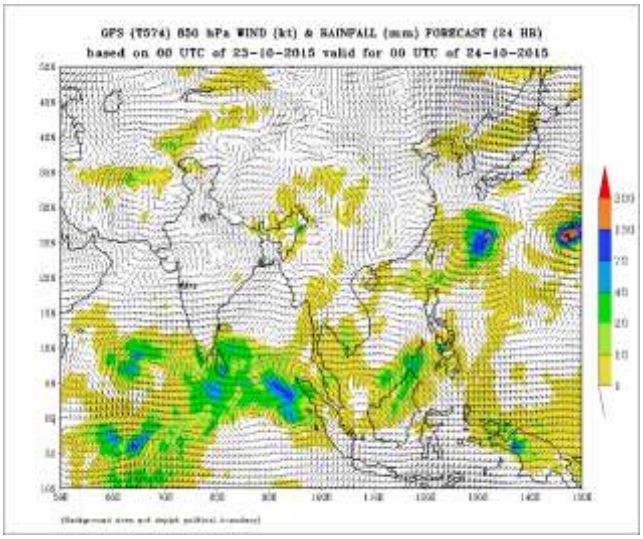

GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 23-10-2015 valid for 00 UTC of 25-10-2015

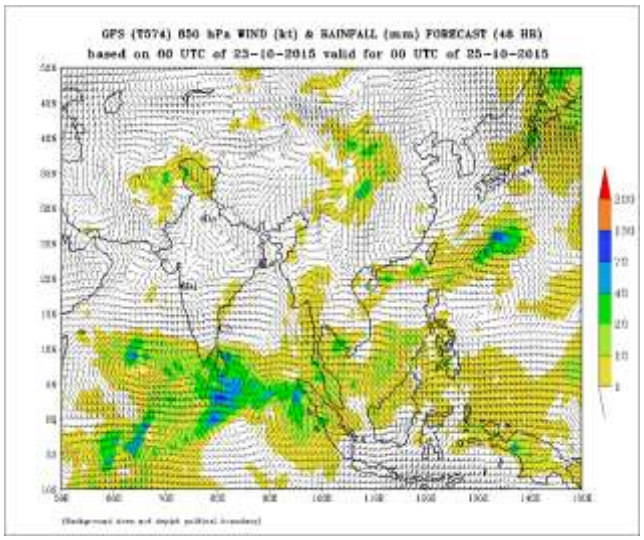

GFS (T574) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 23-10-2015 valid for 00 UTC of 26-10-2015

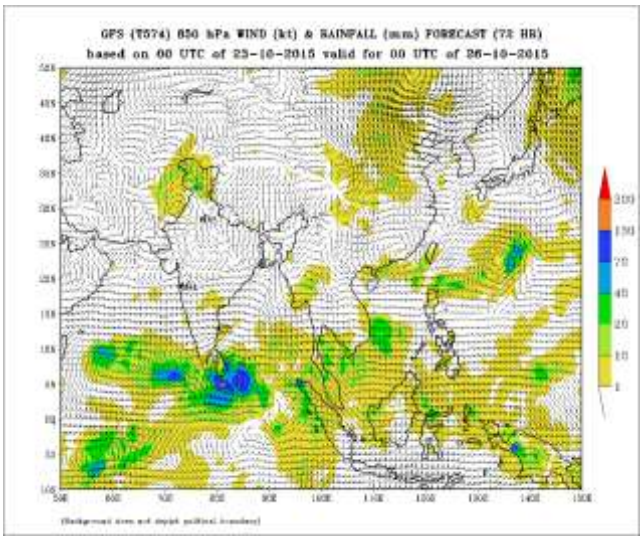

GFS (T574) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 23-10-2015 valid for 00 UTC of 27-10-2015

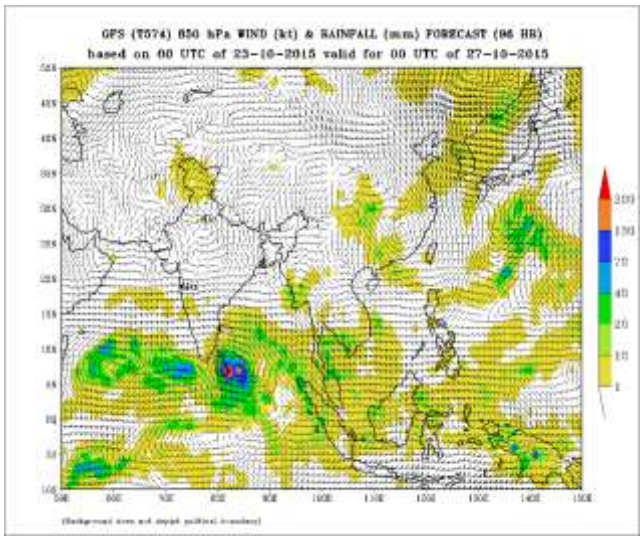

GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 23-10-2015 valid for 00 UTC of 28-10-2015

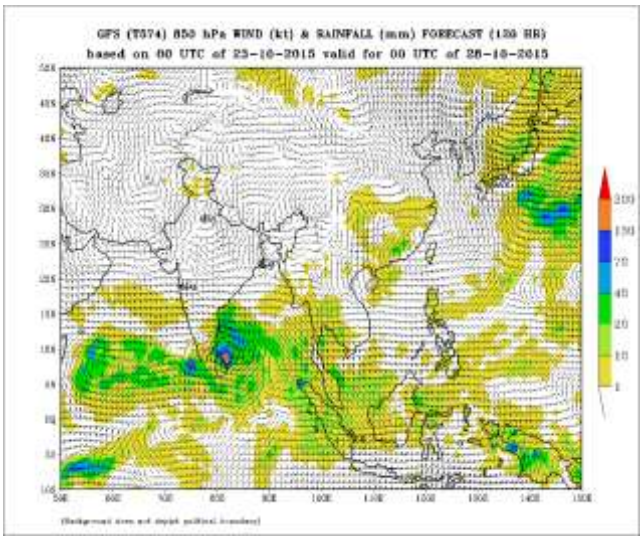

GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 23-10-2015 valid for 00 UTC of 23-10-2015

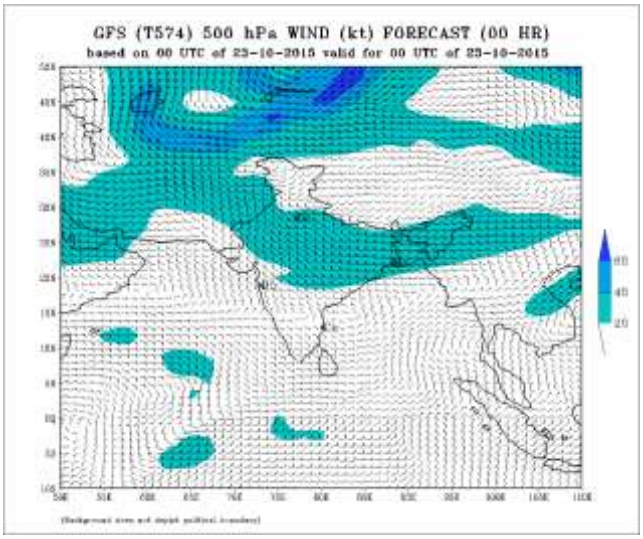

GFS (T574) 850 hPa WIND (kt) & RAINFALL (mm) FORECAST (24 HR)
based on 00 UTC of 23-10-2015 valid for 00 UTC of 24-10-2015

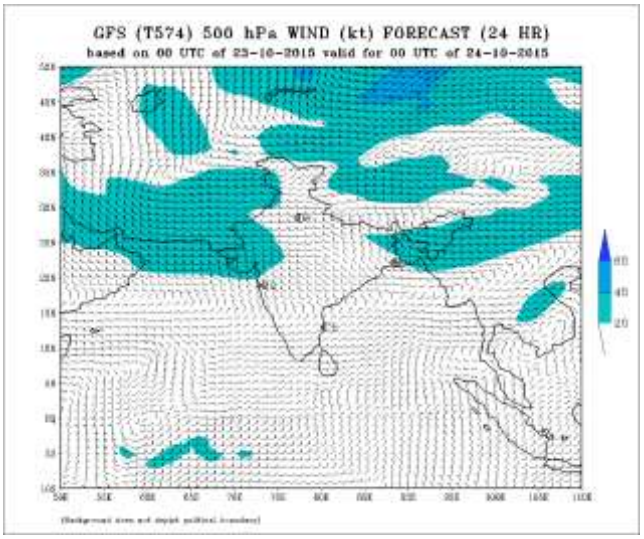

GFS (T574) 850 hPa WIND (kt) & RAINFALL (mm) FORECAST (48 HR)
based on 00 UTC of 23-10-2015 valid for 00 UTC of 25-10-2015

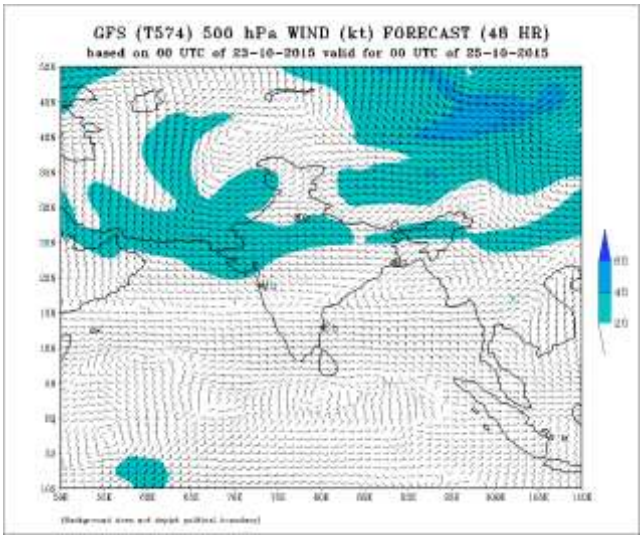

GFS (T574) 850 hPa WIND (kt) & RAINFALL (mm) FORECAST (72 HR)
based on 00 UTC of 23-10-2015 valid for 00 UTC of 26-10-2015

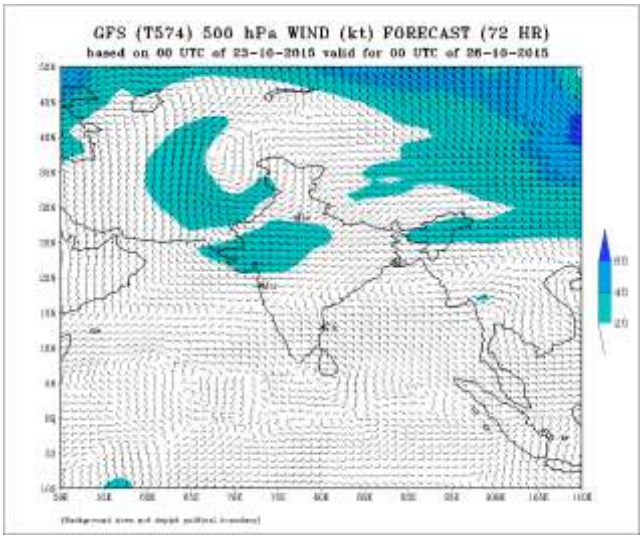

GFS (T574) 850 hPa WIND (kt) & RAINFALL (mm) FORECAST (96 HR)
based on 00 UTC of 23-10-2015 valid for 00 UTC of 27-10-2015

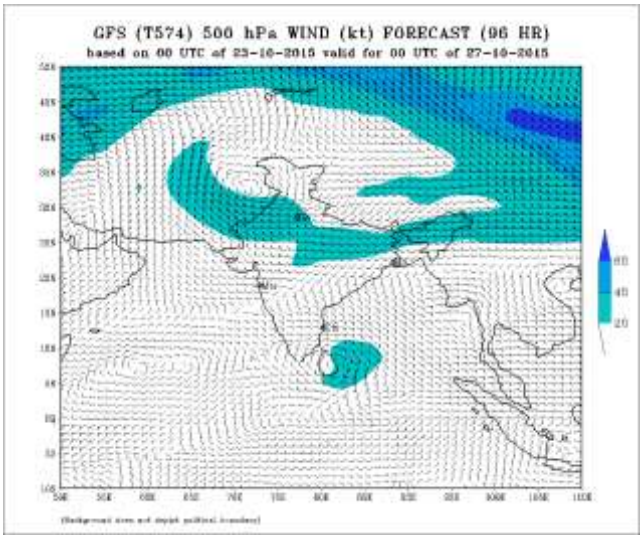

GFS (T574) 850 hPa WIND (kt) & RAINFALL (mm) FORECAST (120 HR)
based on 00 UTC of 23-10-2015 valid for 00 UTC of 28-10-2015

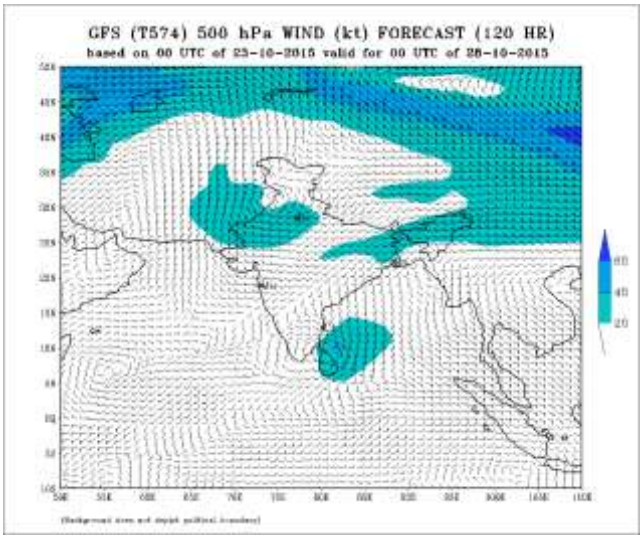

GFS (T574) 500 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 23-10-2015 valid for 00 UTC of 23-10-2015

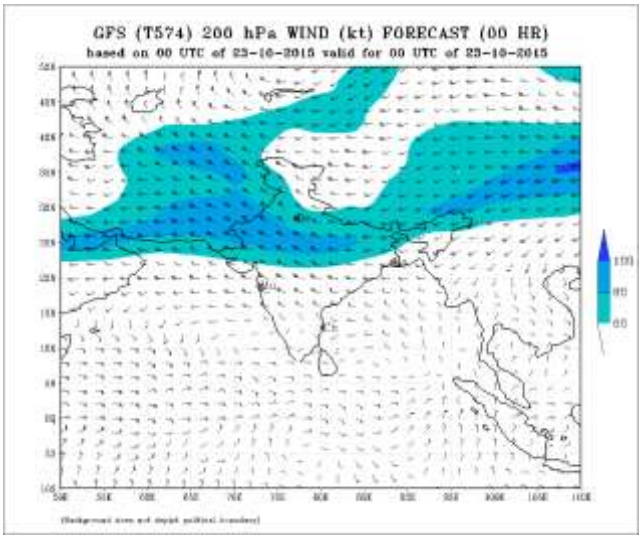

GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 23-10-2015 valid for 00 UTC of 24-10-2015

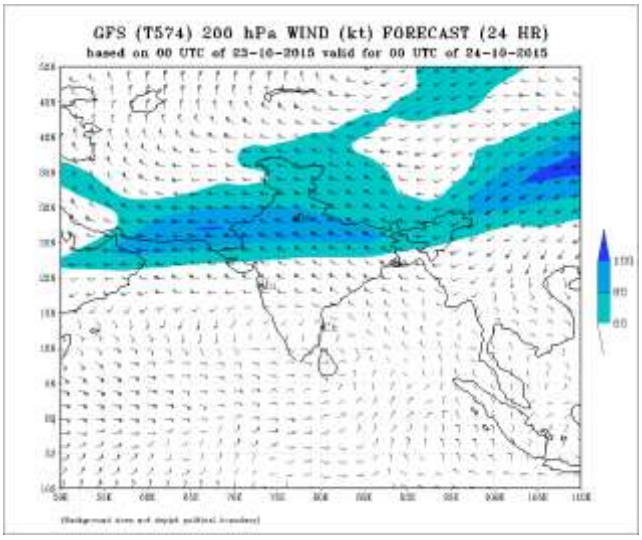

GFS (T574) 500 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 23-10-2015 valid for 00 UTC of 25-10-2015

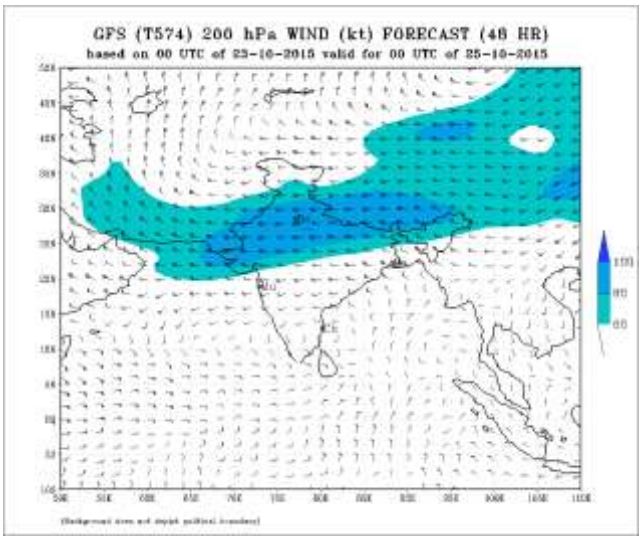

GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 23-10-2015 valid for 00 UTC of 26-10-2015

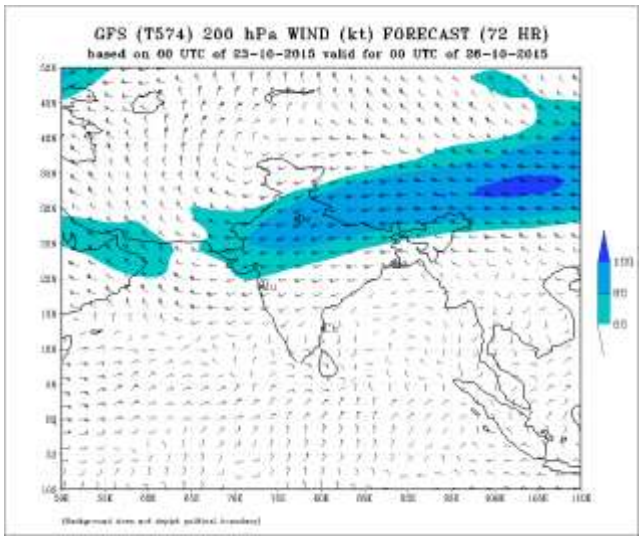

GFS (T574) 500 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 23-10-2015 valid for 00 UTC of 27-10-2015

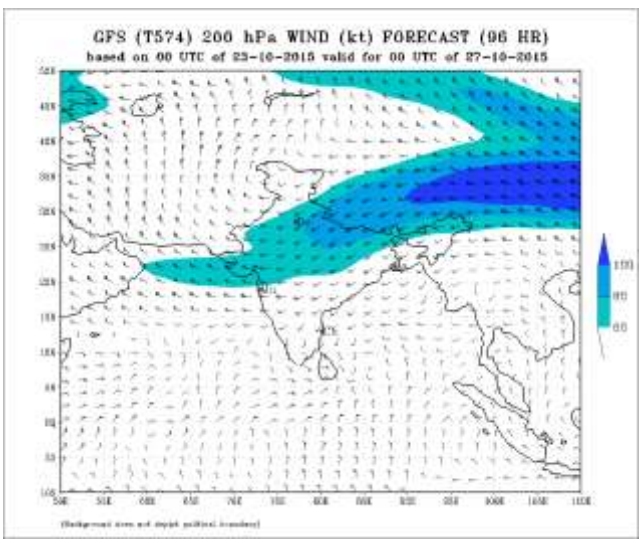

GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 23-10-2015 valid for 00 UTC of 28-10-2015

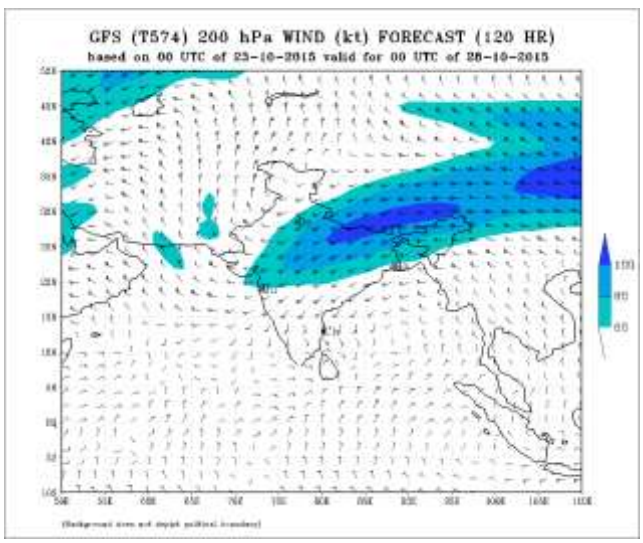

GFS (T574) 200 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 23-10-2015 valid for 00 UTC of 23-10-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 23-10-2015 valid for 00 UTC of 24-10-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 23-10-2015 valid for 00 UTC of 25-10-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 23-10-2015 valid for 00 UTC of 26-10-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 23-10-2015 valid for 00 UTC of 27-10-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 23-10-2015 valid for 00 UTC of 28-10-2015

FDP (Cyclone) NOC Report Dated 26 October, 2015

Synoptic features based on 0300 UTC of today:

- A low pressure area formed over southeast & adjoining southwest Arabian sea today morning. Associated upper air cyclonic circulation extends upto mid¬tropospheric level. It would become well marked low pressure area during next 24 hours.
- The low pressure area over southwest Bay of Bengal off Sri Lanka coast persists. Associated upper air cyclonic circulation, now extends upto 4.5 km above mean sea level.

Environmental features based on 0300 UTC of today:

Sea Surface Temperature (SST):

- SST is 29-31°C over most parts of Bay of Bengal (BOB) and Andaman Sea.
- SST is 28-30°C over most parts of Arabian Sea (AS) except over extreme southwestern parts where it 26-28°C .

Tropical Cyclone Heat Potential (TCHP):

- TCHP is about 100-120 kJ/cm^2 over equatorial Bay of Bengal. It is 60-80 kJ/cm^2 over the rest of BOB except over the extreme northern parts.
- TCHP is 80-110 kJ/cm^2 over some parts of southeast AS , 60-80 kJ/cm^2 over remaining parts of AS except over the western parts off Somalia and Oman coasts where it is less than 50 kJ/cm$^{2.}$

Relative Vorticity:

- Relative vorticity at 850 hPa is positive (40-50*10^{-5}s^{-1}) over southwest BOB adjoining parts of south Sri Lanka. It is about10-20*10^{-5}s^{-1} over parts of rest of the BOB and Andaman Sea and negative over the northeast parts of BoB and remaining parts.
- Relative vorticity at 850 hPa is positive (40-50*10^{-5}s^{-1}) over south central AS. It is about 20*10^{-5}s^{-1} over parts of rest parts AS .It is negative over northeast and adjoining parts of the AS.

Convergence:

- Lower level convergence is 10-15*10^{-5}s^{-1} over south BOB, 5-10*10^{-5}s^{-1} over southwest BOB off Sri Lanka coast and south Andaman Sea .No significant low level convergence zone over rest of BOB.
- Lower level convergence is positive (20-30*10^{-5}s^{-1}) over some parts of southcentral AS, (5-10*10^{-5}s^{-1}) over southeast AS. No other significant zone over rest of AS.

Divergence:

- Upper level divergence is positive (5-15*10^{-5}s^{-1}) over many parts of south BOB, and adjoining south Andaman sea. .It is negative(-5-10*10^{-5}s^{-1}) over west central BoB.
- Upper level divergence is positive (20-40*10^{-5}s^{-1}) near the low level circulation over southeast AS and (5-20*10^{-5}s^{-1}) over the rest parts of southeast AS. It is negative(-5-10*10^{-5}s^{-1}) over northwest and adjoining west central AS.

Wind Shear:

- It is 5-10 knots in many parts between latitude 5 to 12° N over BoB and Arabian Sea. It is increasing significantly on the both, northward and southward direction.

Wind Shear Tendency:

- Vertical wind shear tendency
- Increasing by 5 to10 over the parts of south of southeast BOB off Myanmar coast during the past 24 hrs. It is decreasing (-5-10 knots) over parts of southwest BOB off south Sri Lanka coast and rest BoB.

- The vertical wind shear tendency is decreasing (-5-10 knots) over southeast Arabian Sea west of west central AS and increasing (5 to 10 knots) over remaining parts of AS.

Upper tropospheric ridge:

- The upper tropospheric ridge at 200 hPa runs along 16.0°N over BOB.
- The upper tropospheric ridge at 200 hPa runs along 11.0°N over AS.

M.J.O. Index:

- MJO lies over Phase 2 with amplitude greater than 1.0. As per forecast by dynamical and statistical models, it would continue in Phase 2 during next 3-5 days.

Storms and Depression over South China Sea/ South Indian Ocean:

The vortex over southwest Indian Ocean centered within half a degree of 7.0°S /56.4°E. Intensity is T1.0. Associated broken low/medium clouds with embedded moderate to intense convection over area between latitude 4.5°S to 12.5°S longitude 49.0°E to 60.5°E.

Satellite:

Inference based on INSAT imagery of **260300** UTC:

Bay of Bengal & Andaman Sea:-

Broken low / medium clouds with embedded moderate to intense convection lies over southwest Bay of Bengal between latitude 5.0°N to 10.0°N and longitude 80.0°E to 85.0°E and east of Sri Lanka coast and neighborhood in association with low pressure area over the area. Broken low / medium clouds with embedded moderate to intense convection lies over rest southwest and southeast Bay of Bengal and south Andaman Sea

Arabian Sea:-

Broken low / medium clouds with embedded intense to very intense convection lies over south Arabian sea adjoining Indian coast between equator to latitude 10.0°N and longitude 61.0°E to 74.0°E in association with low pressure area over the area. Broken low / medium clouds with embedded intense to very intense convection lies over southeast Arabian sea between latitude 5.0°N to 10.0°N and longitude 62.5°E to 75.5°E. Broken low / medium clouds with embedded moderate to intense convection lies over rest south Arabian Sea.

NWP Input for FDP Cyclone based on 0000 UTC of 26.10.2014

NWP Analysis

IMD-GFS model wind (850 hPa) analysis based on 00UTC of 26 October 2015 shows a low level circulation over southeast Arabian sea & neighbourhood along with extended northeast-southwest oriented cyclonic circulation around 8 deg N. Due to this low level circulation a low pressure area is formed over SE Arabian sea .This low pressure system is likely to intensify further and move north-westward during the next 2-3 days. Model analysis also shows an upper air cyclonic circulation over south Bay of Bengal & adjoining Sri Lanka coast. Forecasts also show north-westward movement of this BOB system towards Tamilnadu coast during next 2-3 days.

IMD-WRF model forecasts based on 00UTC of 26 October 2015 shows a low level circulation over southeast Arabian Sea & neighbourhood along with extended northeast-southwest oriented cyclonic circulation and intensification of the system into a depression with NW-ward

movement during next 3 days. It also shows an upper air cyclonic circulation over south Bay of Bengal & adjoining Sri Lanka coast with NW movement in the forecast.

IMD-NWP products are available at:
http://202.54.31.51/bias/gfsproducts.php
http://202.54.31.51/bias/wrf27pro.php
http://202.54.31.51/bias/potentialparameter.php

NCMRWF-UM: NCUMmodel suggest a low pressure area over southwest BOB during the next 24 hrs and its further intensification into Depression, moving initially northwards towards south Andhra caost and then northnortheast wards.during next 3-4 days.
This model also shows formation of another low pressure area over southwest Arabian sea and intensifying gradually into a cyclonic storm on 29/30th moving northwestwards crossing between Somalia and Yemen coasts around 2 or 3 Nov.
NCMRWF-GFS: NCMRWF-GFS model shows a low pressure area over southwest BOB, Off Sri Lanka, and its persistence over the same area for next 2 days, moving northward towards Tamil Nadu coast and south Andhra coast during next subsequent 2 days.
This model suggests further intensification of low pressure area over southwest Arabian moving northwestwards towards Yemen-Oman coasts intensifying gradually into a cyclonic storm on 29th, and crossing the coast between 4-5 Nov.
NCEP-GFS: NCEP-GFS model shows formation of a low pressure area over southwest BOB off Sri Lanka which intensifies into a depression near the same region on 28th. Moving northward, along Sri Lanka and Tamil Nadu coasts,
It also suggest a low pressure area, its intensification as a cyclonic storm on 30th, moving northwestward and crossing Yemen coast on 2nd Nov.
ECMWF: ECMWF Model shows formation of a low pressure area over southwest ARB on 28th with further intensification and its movement in northwesterly direction upto 30th and thereafter westwards movement towards the Somalia coast .
ECMWF Model shows formation another low pressure area over southwest BOB on 26th. It would intensify into a depression and move north-northwestwards towards Andhra Pradesh coast during the next3-4 days. Thereafter it suggests recurving in northeastward direction along the coast.
JMA: JMA Model shows a low pressure area over southwest BOB off southeast coast of Sri Lanka and persisting around the same region during the next 2 days.
It also suggests low pressure area over southeast Arabian Sea .It would move in northwesterly direction and intensify further into well marked low pressure in next 2 days.
ARP-Meteo France: ARP-Meteo France Model suggests a low over south west BOB. It would intensify into a well marked low pressure area on 26th persisting around the same region with slight movement in northwesterly direction during the next 2 day.
It also suggests a low over southeast Arabian Sea moving in northwesterly direction and intensify further into Depression in next 2 days.
Genesis Potential Parameter (GPP) forecasts based on 00UTC of 26 October 2015 show a potential cyclogenesis zone over southeast Arabian Sea & neighbourhood. GPP forecast shows further intensification and NW ward movement of this system during the next 2-3 days. It also shows a potential cyclogenesis zone over south Bay of Bengal & adjoining Sri Lanka coast with NW movement in the forecast.

Summary and Conclusion:

Bay of Bengal and Andaman Sea:

Most NWP models are suggesting slow intensification of the low pressure area over the southwest Bay of Bengal region off Sri Lanka coast. A few models suggest intensification upto depression stage. Most of the models suggest initial north-northwestward movement upto north AP coast during next five days and then recurve northeastwards towards Bangladesh coast.

Arabian Sea:

Most NWP models are suggesting intensification of low pressure area over southeast and adjoining southwest Arabian Sea upto severe cyclonic storm and west-northwestward with landfall over Yemen coast or lying over Gulf of Aden by 2/3 November.

Probability of cyclogenesis over Bay of Bengal and Andaman Sea during next 120 hours:

24 hours	24-48 hours	48-72 hours	72-96 hours	96-120 hours
NIL	NIL	Low	Low	Low

Probability of cyclogenesis over Arabian Sea during next 120 hours:

24 hours	24-48 hours	48-72 hours	72-96 hours	96-120 hours
NIL	Low	Moderate	High	High

Advisory: IOP will be conducted for Tamil Nadu, Puducherry and south AP coast during 27-30th Oct 2015.

Status of observational system:

Details of the status of observational systems are given in **Annexure I.**

Annexure-I

Status of Observation system:

Synoptic observation:

Region	Date/Time (UTC)		
	25/12	**26/00**	**26/03**
India	46	31	46
Coastal stations			
WB	8	3	8
Odisha	7	5	7
AP	12	12	12
Tamil Nadu	11	8	11
Puducherry	2	2	2
A & N	6	1	6
Bangladesh	8	7	8
Myanmar	11	11	11
Thailand	0	0	0
Sri Lanka	2	2	2

AWS Observations:

Region	Date/Time (UTC)		
	25/12	**26/00**	**26/03**
India	58	57	56
Coastal stations			
WB	4	5	5
Odisha	13	14	13
AP	15	14	15
Tamil Nadu	26	24	23
Puducherry	-	-	-
A & N	-	-	-

RS/RW (12Z) of 25/10/2015 **-0/39**
No. of Ascents reaching 250 hPa level: 0, MISDA: 0

RS/RW (00Z) of 26/10/2015- 2**2/39**
No. of Ascents reaching 250 hPa level: 20, MISDA: 2

No. of PILOT Ascents

25/12Z	**26/00Z**
7	2

Buoy Data

25/12Z	26/00Z	26/03Z
8	9	12

STATUS OF CHENNAI REGION OBSERVATIONS

No. of Synop data

Date→	**25.10.2015**							
UTC→	**00**	**03**	**06**	**09**	**12**	**15**	**18**	**21**
Chennai Region (Coasts of AP & TN)	**20**	**22**	**20**	**20**	**22**	**20**	**20**	**20**

No. of RS/RW Ascents

00Z /25.10.2015 : 6
No. of Ascents reaching 250 hPa level = 6
MISDA : 2

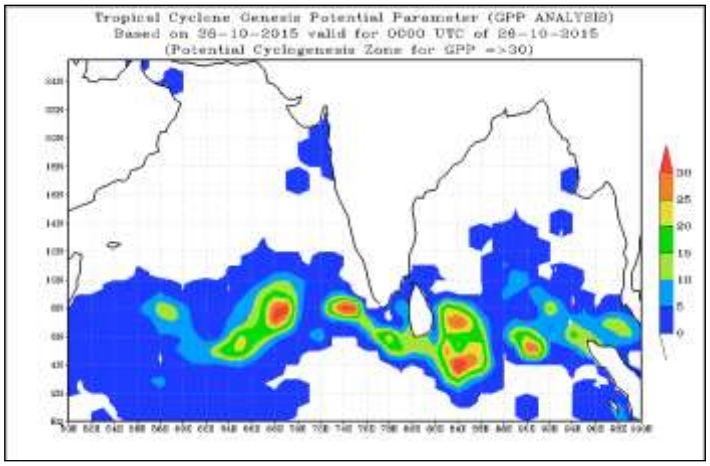
12Z /25.10.2015 : 0
No. of Ascents reaching 250 hPa level =0
MISDA : 8

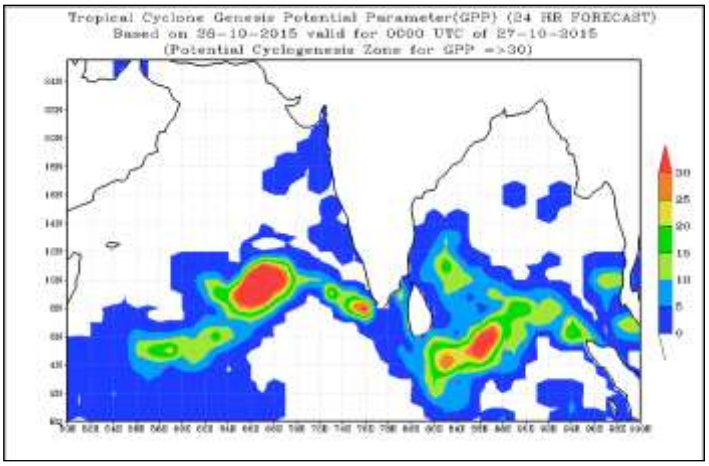
No. of PILOT Ascents:

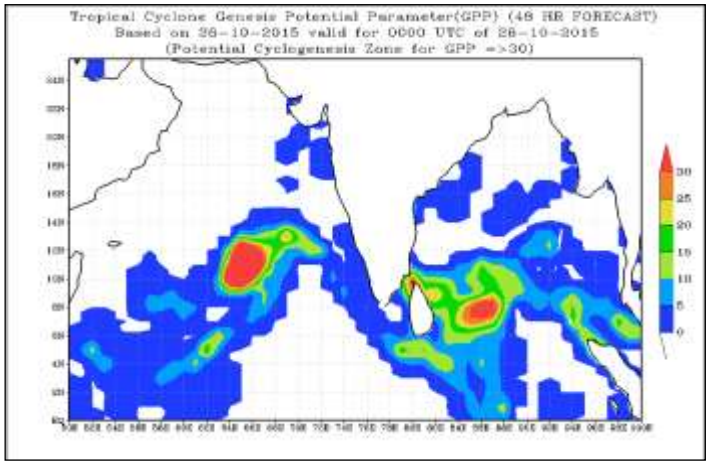
25.10.2015

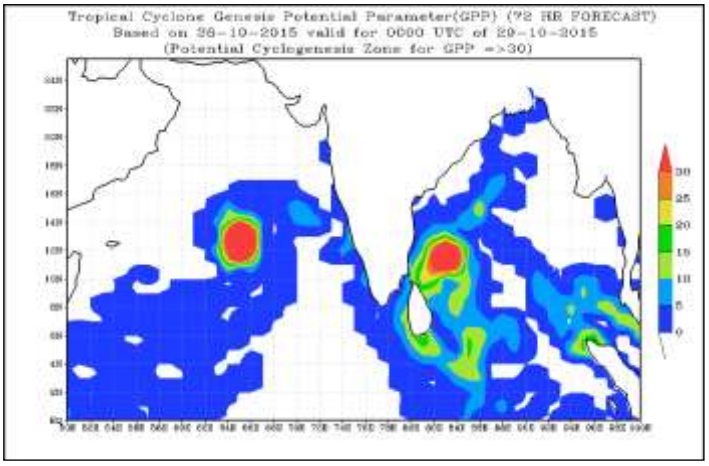
06Z	18Z
3	3

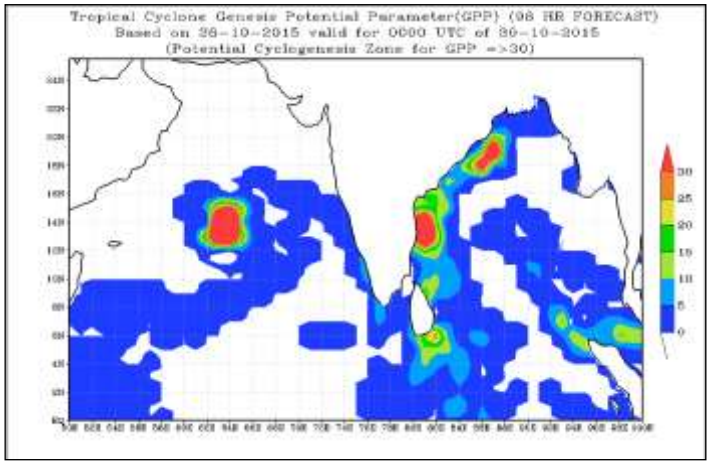
Annexure-II

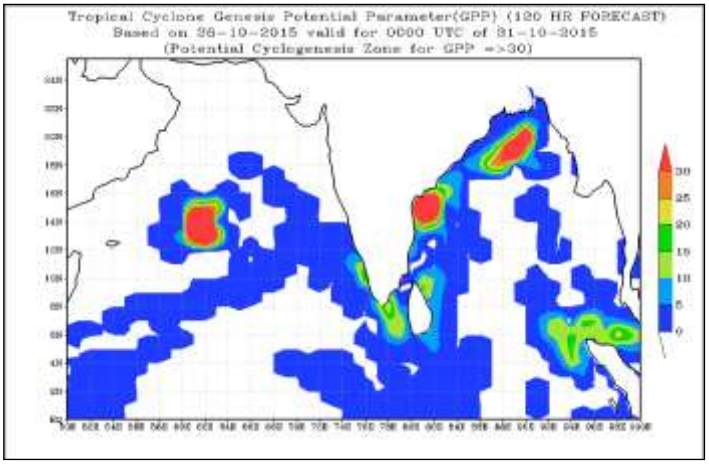

Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 26-10-2015 valid for 0000 UTC of 26-10-2015
(Potential Cyclogenesis Zone for GPP =>30)

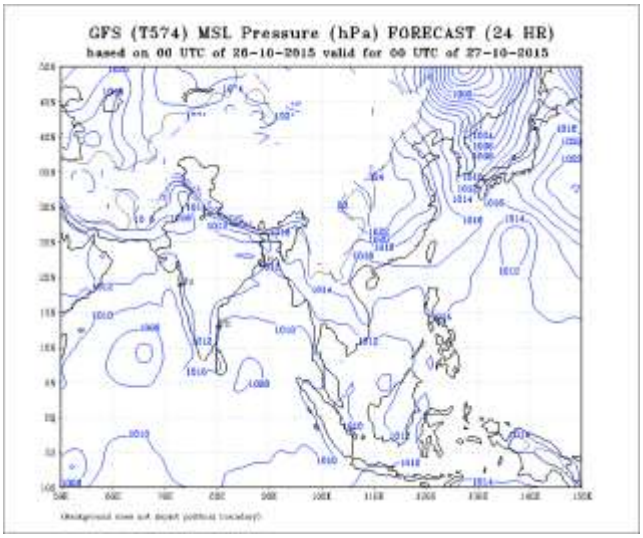

Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 26-10-2015 valid for 0000 UTC of 27-10-2015
(Potential Cyclogenesis Zone for GPP =>30)

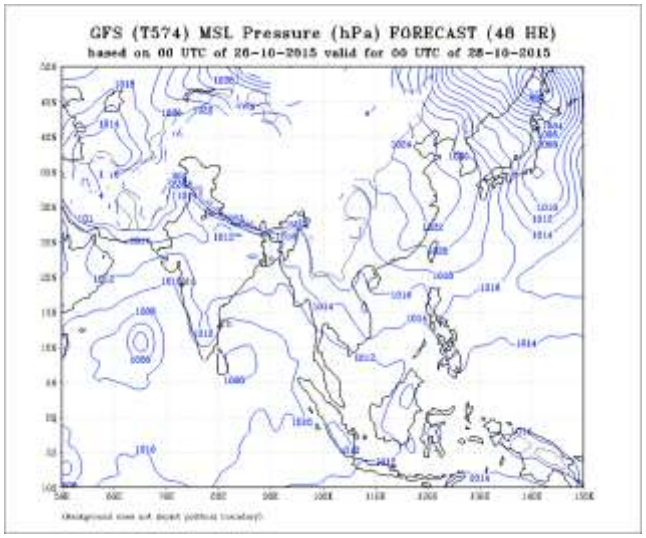

Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
Based on 26-10-2015 valid for 0000 UTC of 28-10-2015
(Potential Cyclogenesis Zone for GPP =>30)

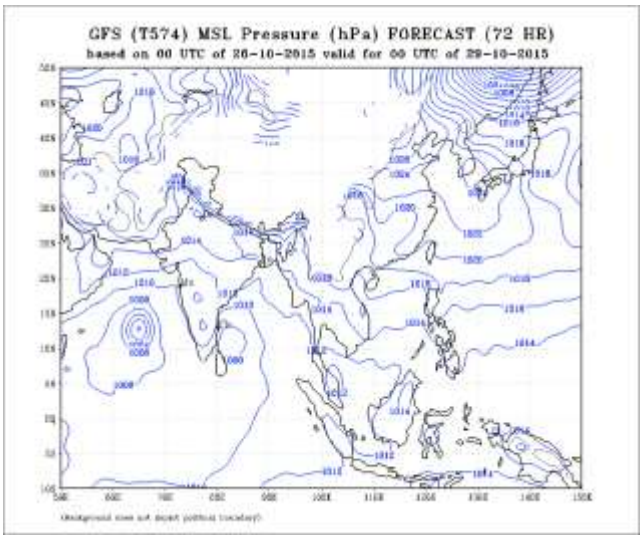

Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 26-10-2015 valid for 0000 UTC of 29-10-2015
(Potential Cyclogenesis Zone for GPP =>30)

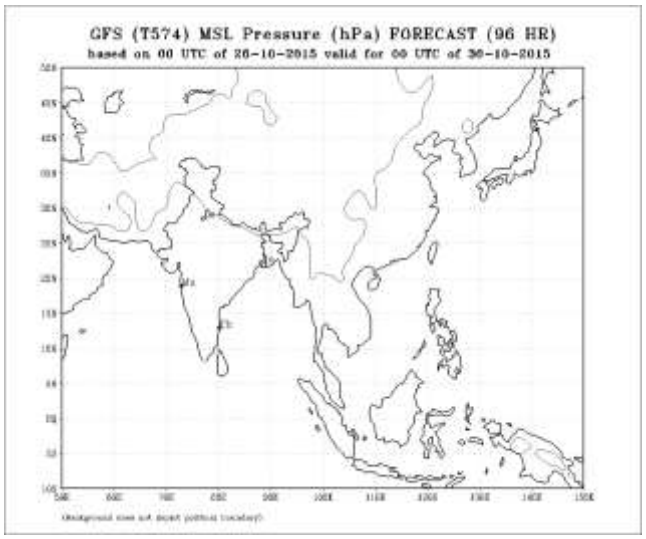

Tropical Cyclone Genesis Potential Parameter(GPP) (96 HR FORECAST)
Based on 26-10-2015 valid for 0000 UTC of 30-10-2015
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 26-10-2015 valid for 0000 UTC of 31-10-2015
(Potential Cyclogenesis Zone for GPP =>30)


GFS (T574) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 26-10-2015 valid for 00 UTC of 27-10-2015


GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 26-10-2015 valid for 00 UTC of 28-10-2015


GFS (T574) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 26-10-2015 valid for 00 UTC of 29-10-2015


GFS (T574) MSL Pressure (hPa) FORECAST (96 HR)
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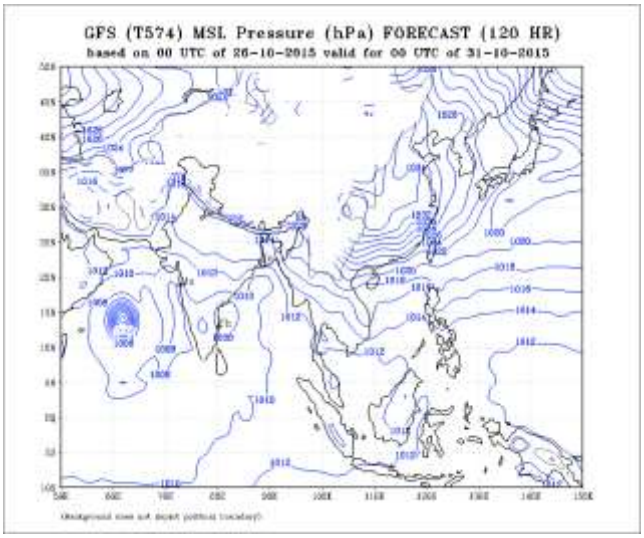
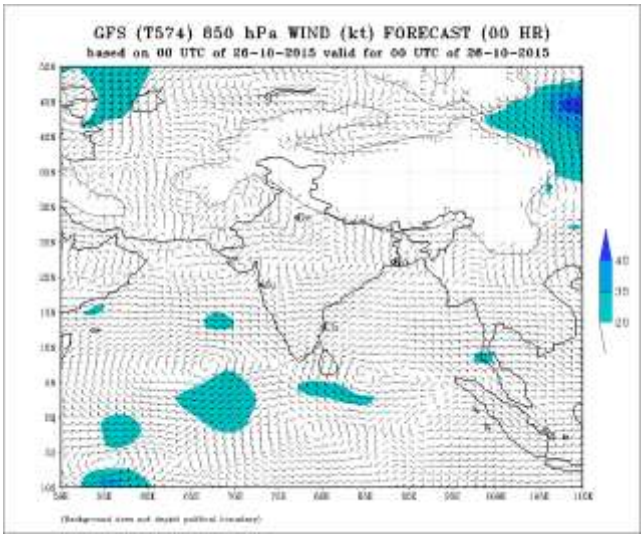
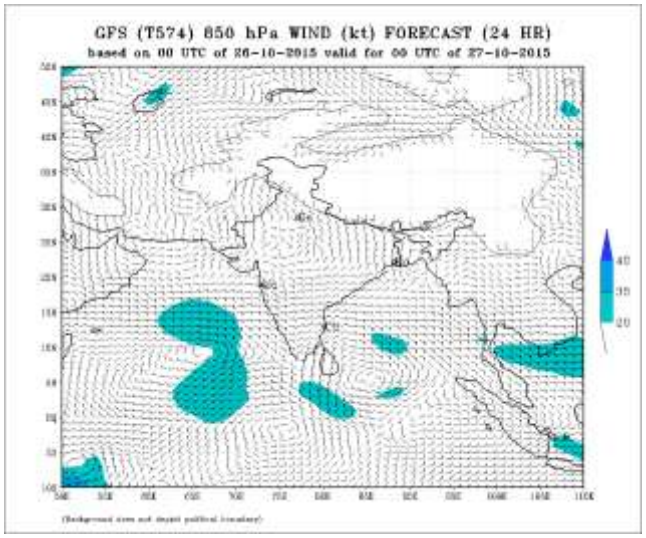
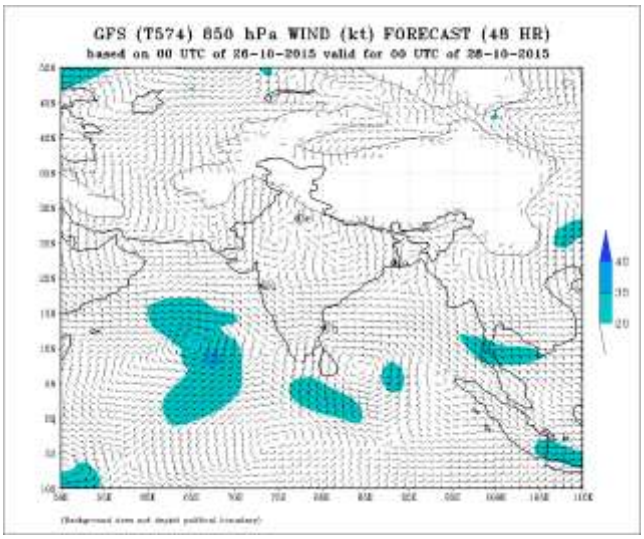

GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 26-10-2015 valid for 00 UTC of 31-10-2015


GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 26-10-2015 valid for 00 UTC of 26-10-2015


GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 26-10-2015 valid for 00 UTC of 27-10-2015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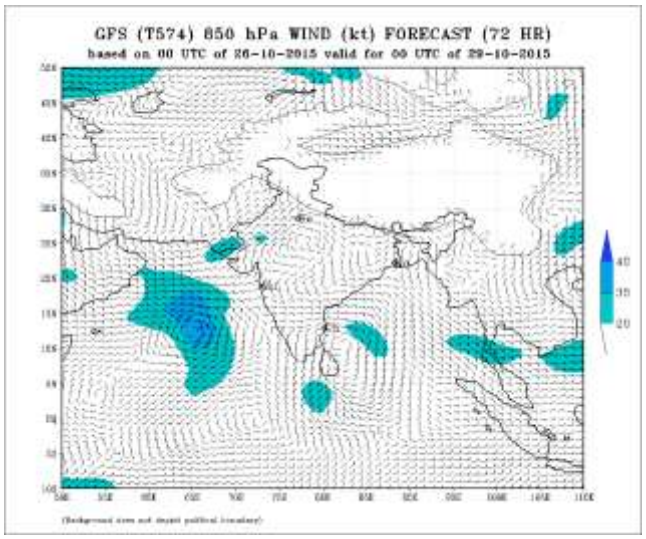
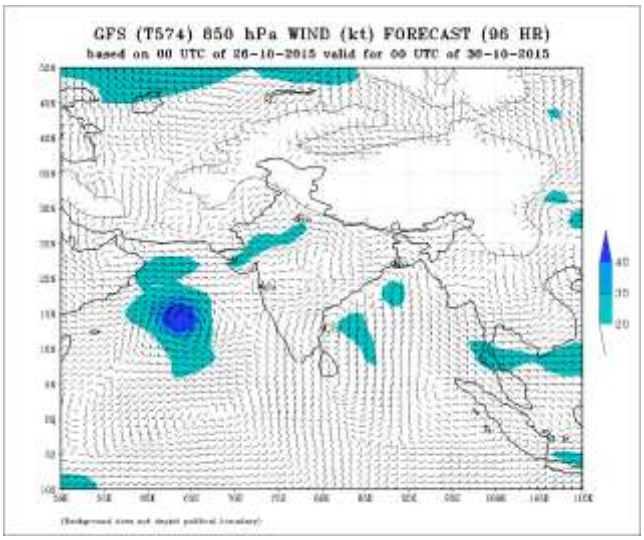

GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 26-10-2015 valid for 00 UTC of 29-10-2015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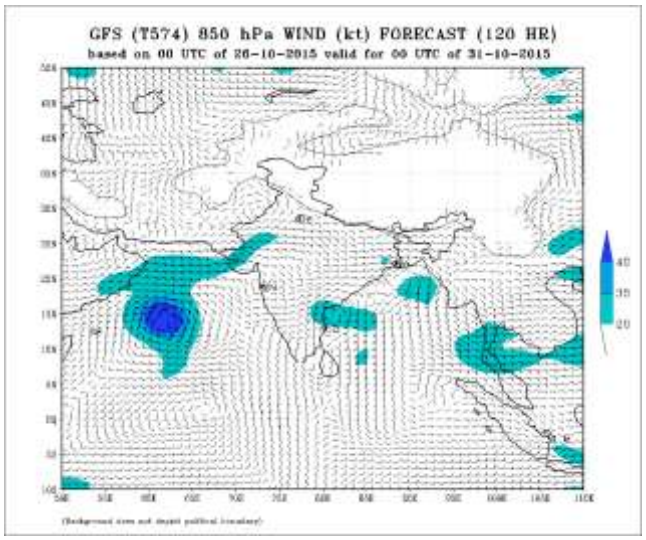
based on 00 UTC of 26-10-2015 valid for 00 UTC of 30-10-2015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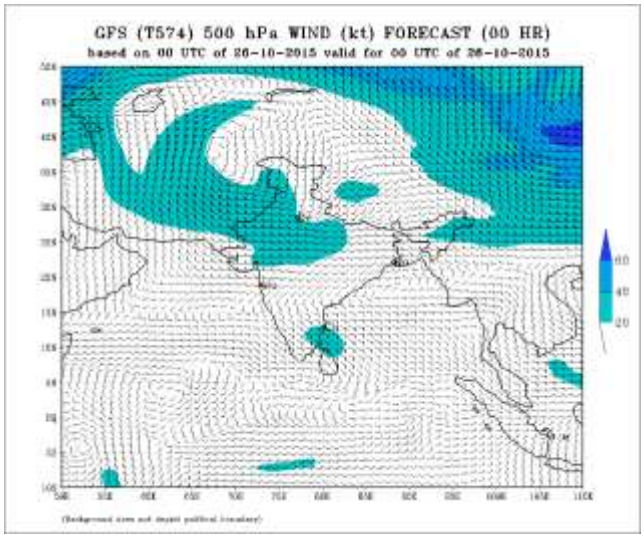
based on 00 UTC of 26-10-2015 valid for 00 UTC of 31-10-2015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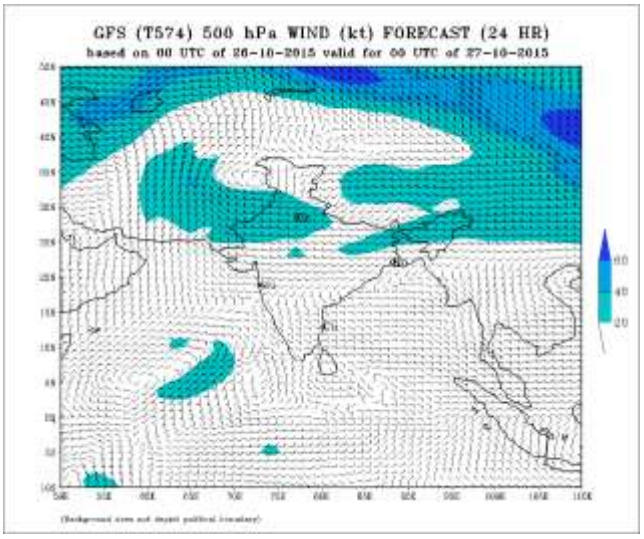
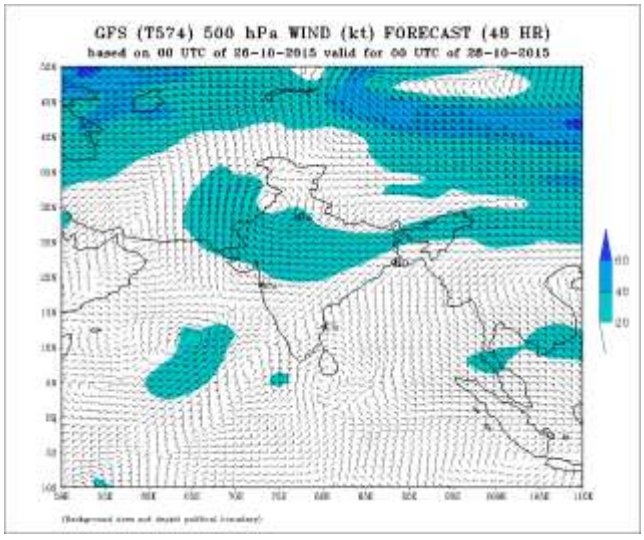
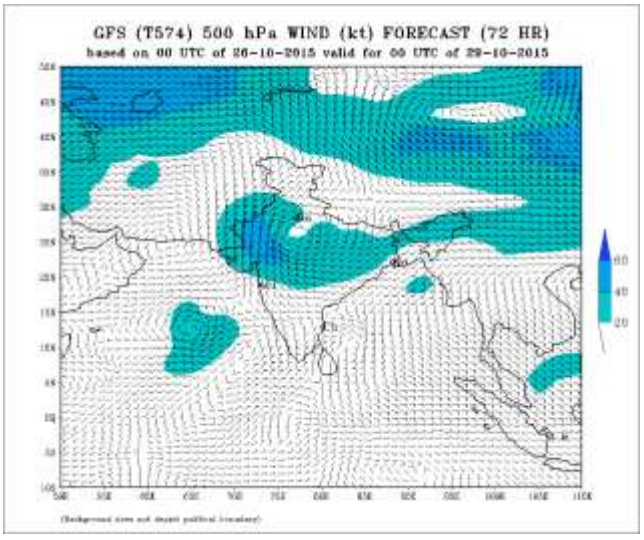
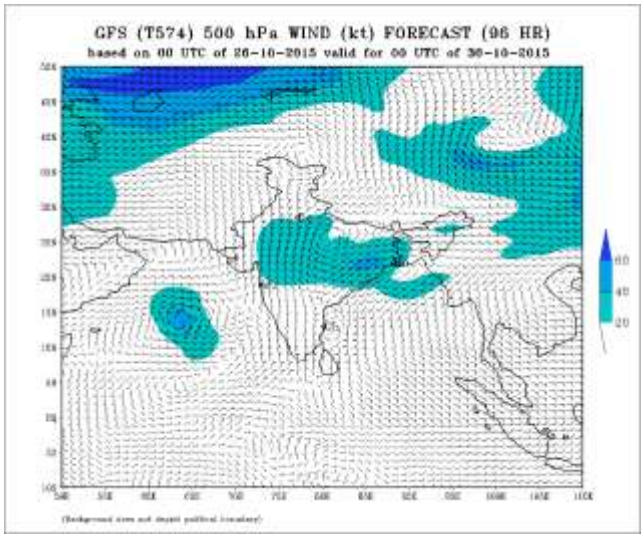
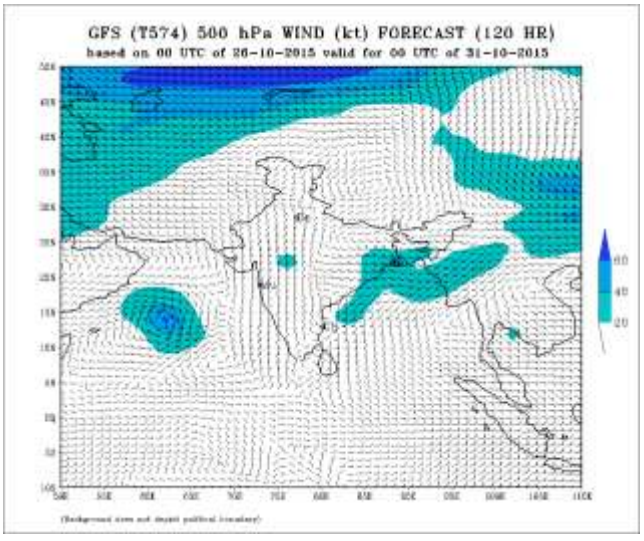
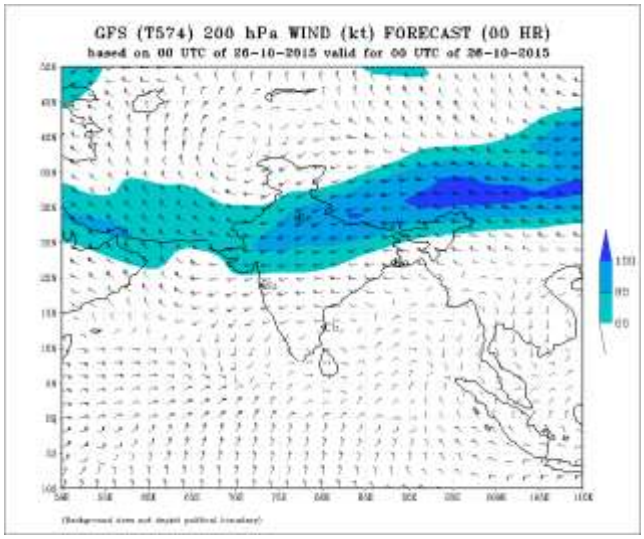

GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 26-10-2015 valid for 00 UTC of 27-10-2015


GFS (T574) 500 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 26-10-2015 valid for 00 UTC of 28-10-2015


GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 26-10-2015 valid for 00 UTC of 29-10-2015


GFS (T574) 500 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 26-10-2015 valid for 00 UTC of 30-10-2015


GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 26-10-2015 valid for 00 UTC of 31-10-2015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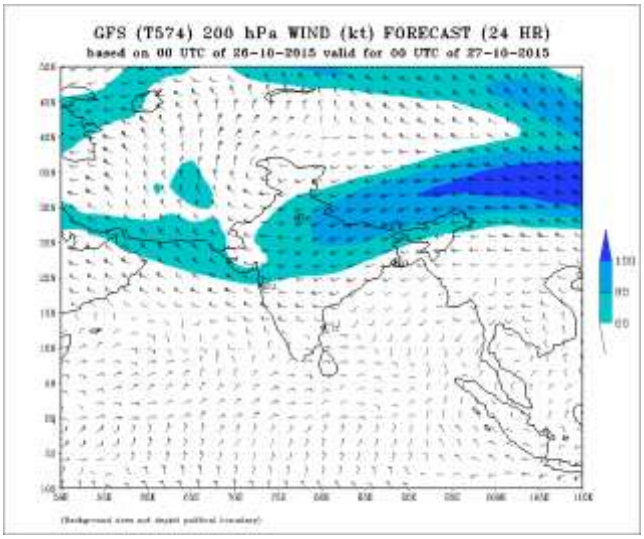
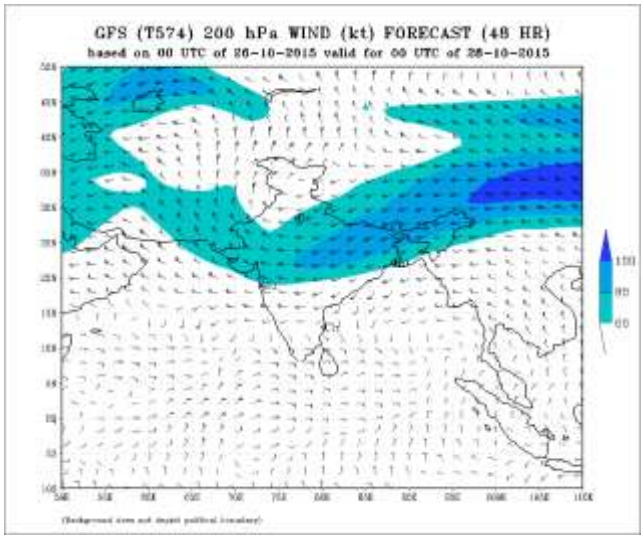
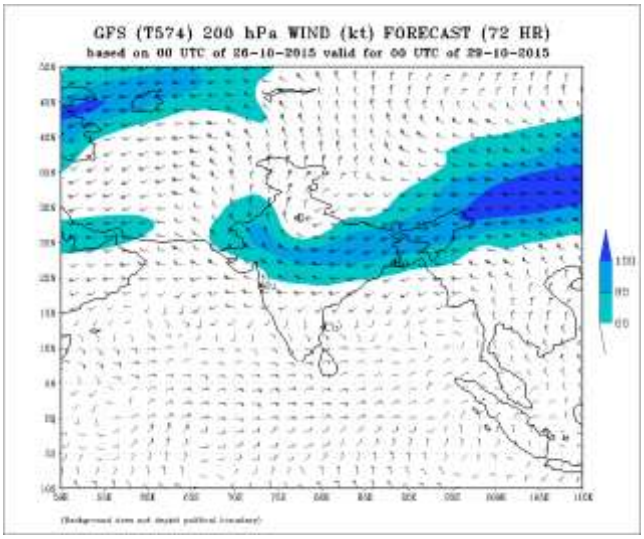
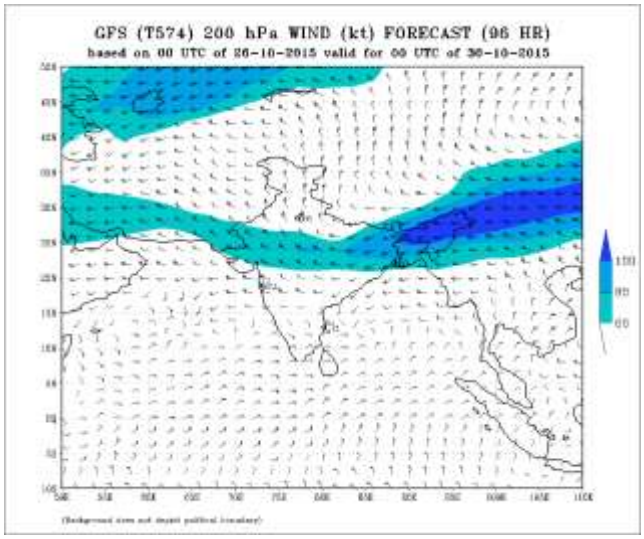
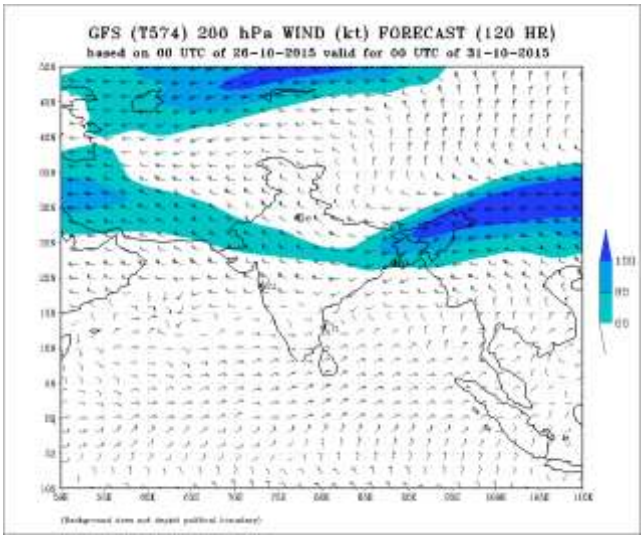
based on 00 UTC of 26-10-2015 valid for 00 UTC of 26-10-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 26-10-2015 valid for 00 UTC of 27-10-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 26-10-2015 valid for 00 UTC of 28-10-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 26-10-2015 valid for 00 UTC of 29-10-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 26-10-2015 valid for 00 UTC of 30-10-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 26-10-2015 valid for 00 UTC of 31-10-2015

FDP (Cyclone) NOC Report Dated 27 October, 2015

Synoptic features based on 0300 UTC of today:

- The low pressure area over southeast & adjoining southwest Arabian sea persists and is well marked. Associated upper air cyclonic circulation extends upto mid¬tropospheric level. It would become depression during next 48 hrs.
- The low pressure area over southwest Bay of Bengal off Sri Lanka coast persists. Associated upper air cyclonic circulation, now extends upto 4.5 km above mean sea level.

Environmental features based on 0300 UTC of today:

Sea Surface Temperature (SST):

- SST is 30-31°C over the west central and southwest parts of BoB and 29-30°C over most parts of Bay of Bengal (BOB) and Andaman Sea.
- SST is 29-30°C over most parts of Arabian Sea (AS) except over eastern parts of AS where is slightly higher (30-31°C).

Tropical Cyclone Heat Potential (TCHP):

- TCHP is about 100-120 kJ/cm^2 over equatorial Bay of Bengal. It is 60-80 kJ/cm^2 over the rest of BOB except over extreme norther BoB (less than 50 kJ/cm$^{2)}$.
- TCHP is 110-120 kJ/cm^2 over some parts of southeast AS off Kerala and Karnataka coasts and over parts of equatorial region of southeast AS. It is 60-80 kJ/cm^2 around well marked low pressure area (WML) and less than (less than 50 kJ/cm^2 over Gulf of Aden and adjoining west central and southwest Arabian Sea.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive (30-40*10^{-5}s^{-1}) over southwest BOB and adjoining parts of south Sri Lanka.
- Relative vorticity at 850 hPa is positive (50*10^{-5}s^{-1}) around well marked low over SE and adjoining SW AS.

Convergence:

- Lower level convergence is 10-15*10^{-5}s^{-1} over southwest & adjoining westcentral BOB.
- Lower level convergence is positive (5-10*10^{-5}s^{-1}) over some parts of southeast and adjoining southwest AS around WML.

Divergence:

- Upper level divergence is 5-10*10^{-5}s^{-1} over parts of southwest BOB.
- Upper level divergence is positive (10-20*10^{-5}s^{-1}) near the WML over southeast AS.

Wind Shear:

- Wind shear is 10 knots over southwest BoB, TamilNadu and Kearal. It is 10-20 knots over southeast BoB and Andaman Sea. It is increasing towards north BoB.
- Wind shear is 10-20 knots over southeast Arabian Sea. It is increasing as we move away from 10^{0}N over AS on both sides. It is low (< 10 knots) to the west-northwest of WML, i.e. towards Gulf of Aden and adjoining areas.

Wind Shear Tendency:

- It shows increasing trend over entire BoB and north Andaman Sea during past 24 hours except the area of Low, where there is no change.
- The vertical wind shear tendency is decreasing (-5 to -10 knots) over southeast and adjoining southwest AS and increasing (5 to 10 knots) over northern parts of AS. No change in wind shear is seen over parts of central AS.

Upper tropospheric ridge:

- The upper tropospheric ridge at 200 hPa runs along 10.0°N over BOB.
- The upper tropospheric ridge at 200 hPa runs along 13.0°N over AS.

M.J.O. Index:

- MJO lies over Phase 2 with amplitude greater than 2.0 and would continue in the same phase for next 5 days.

Storms and Depression over South China Sea/ South Indian Ocean:

According to satellite imagery, the vortex over southwest Indian Ocean is centered near 8.0°S /54.0°E at 0600 UTC of today, the 27th October. Intensity of the system is T1.0. Associated low and medium clouds with embedded moderate to intense convection lies at many places over the area between latitude 6.0°S to 12.5°S and longitude 50.0°E to 58.0°E.

Satellite:

Inference based on INSAT imagery of **270900** UTC:

Bay of Bengal & Andaman Sea:-

Broken low / medium clouds with embedded moderate to intense convection lies over southwest Bay of Bengal between latitude 5.0°N to 10.0°N and longitude 80.0°E to 85.0°E and east of Sri Lanka coast and neighborhood in association with low pressure area over the area. Broken low / medium clouds with embedded moderate to intense convection lies over rest southwest and southeast Bay of Bengal and south Andaman Sea

Arabian Sea:-

Vortex over south AS within half a degree of 9.0^0N/66.0^0E. Intensity T-1.0. Associated broken low and medium clouds with embedded moderate to intense convection lies over area between latitude 4.5°N to 15.0°N and longitude 58.5°E to 71.0°E. Minimum cloud top temperature is -69.0^0C.

NWP Input for FDP Cyclone based on 0000 UTC of today

NWP Analysis

IMD-GFS: IMD-GFS model wind (850 hPa) analysis based on 00UTC of 27 October 2015 shows a low pressure area over southeast Arabian sea & neighbourhood along with extended northeast-southwest oriented cyclonic circulation around 9-10 deg N. This low pressure system is likely to intensify further and move **north-westward** during the next 2-3 days. Model analysis also shows a low level cyclonic circulation over south Bay of Bengal & adjoining Sri Lanka coast. Forecasts show **north-westward movement** of this BOB system towards south Tamilnadu coast during next 2-3 days.

IMD-WRF: IMD-WRF model forecasts based on 00UTC of 27 October 2015 shows a low level circulation over southeast Arabian Sea & neighbourhood along with extended northeast-southwest oriented cyclonic circulation and intensification of the system into a depression with NW-ward movement during next 3 days. It also shows an upper air cyclonic circulation over south Bay of Bengal & adjoining Sri Lanka coast with NW movement in the forecast.

IMD-NWP products are available at:

http://202.54.31.51/bias/gfsproducts.php
http://202.54.31.51/bias/wrf27pro.php

http://202.54.31.51/bias/potentialparameter.php

NCMRWF-UM: It shows NNW movement till 2912 UTC and then west-northwestward movement till 0100 UTC with gradual intensification.

NCMRWF-GFS: NCMRWF-GFS model shows formation of a feeble low southwest BOB near Sri Lanka and its intensification into a depression on 30th. Weakening into a low is suggested on 31st, intensification into CS on 1st Nov and weakening on 2nd Nov into depression. Model guidance is fluctuating w.r.t. intensification of system.

This model suggests formation of low pressure area over southeast Arabian on 27th October moving northwestwards and intensifying gradually into a cyclonic storm on 29th. It also suggests further intensification of the system and landfall near north Yemen coast between 4-5 Nov.

NCEP-GFS: NCEP-GFS model shows formation of a low pressure area over southwest BOB on 27th off Sri Lanka which intensifies into a depression near the same region on 28th and weakening on 29th.

It suggests a low pressure area over southeast AS on 27th, intensifying into a cyclonic storm on 1st November. Moving northwestwards, it would intensify further and cross north Yemen coast on 3rd Novemeber.

ECMWF: ECMWF Model shows low pressure area over southwest BOB on 27th. No further intensification is suggested.

ECMWF Model shows a low pressure area over southwest ARB on 27th with further intensification into a depression on 28th and cyclonic storm on 30th. Further intensification is suggested for next 72 hours. It suggests initial north-northwest movement till 29th and westward movemewnt thereafter reaching lat13.5^{0}N and 57.5^{0}E by 0000 UTC of 01 Novemebr. It further indicates the system to move westwards and cross Yemen coast by 3rd November.

JMA: JMA Model shows a feeble low pressure area over southwest BOB on 27th, intensifying into a low pressure area during next 48 hours and weakening thereafter.

It also suggests a low pressure area over southeast Arabian Sea on 27th, intensifying into a depression on 28th, cyclonic storm on 30th and further intensification thereafter. It would move NW wards till 29th and then westwards till 12 UTC of 30th.

ARP-Meteo France: ARP-Meteo France Model suggests a low over southwest BOB on 29th intensifying into a depression on 30th.

It also suggests a low over southeast Arabian Sea on 27th intensifying into a depression during next 48 hours over southwest AS.

Genesis Potential Parameter (GPP): Genesis Potential Parameter (GPP) forecasts based on 00UTC of 27 October 2015 show a potential cyclogenesis zone over southeast Arabian Sea & neighbourhood.. It also shows a potential cyclogenesis zone over south Bay of Bengal & adjoining Sri Lanka coast. GPP forecast also shows a cyclogenesis zone over central BOB on 31 October 2015.

Summary and Conclusion:

Bay of Bengal and Andaman Sea:

Most NWP models are not suggesting intensification of the low pressure area over the southwest Bay of Bengal region off Sri Lanka coast. A few models suggest intensification upto depression stage. Most of the models suggest initial north-northwestward movement upto north AP coast during next three days and then recurve northeastwards towards Bangladesh coast.

Arabian Sea:

Most NWP models are suggesting intensification of low pressure area over southeast and adjoining southwest Arabian Sea upto severe cyclonic storm. Most of the models suggest NNW/NW movement upto 1200 UTC of 29 Oct. and then west/west-northwest movement towards Gulf of Aden. The global models ECMWF and NCEP GFS in its 10 day forecasts predict landfall of the severe cyclonic storm over north Yemen coast by 3rd November. The parameters like vertical wind shear, SST, clow level convergence, upper level divergence are favourable for genesis alongwith GPP.

Probability of cyclogenesis over Bay of Bengal and Andaman Sea during next 120 hours:

24 hours	24-48 hours	48-72 hours	72-96 hours	96-120 hours
NIL	NIL	NIL	Low	Low

Probability of cyclogenesis over Arabian Sea during next 120 hours:

24 hours	24-48 hours	48-72 hours	72-96 hours	96-120 hours
Low	Moderate	High	High	High

Advisory: IOP will be conducted for Tamil Nadu, Puducherry and south AP coast during 27-30th Oct 2015.

Status of observational system:

Details of the status of observational systems are given in **Annexure I.**

Annexure-I

Status of Observation system:

Synoptic observation:

Region	Date/Time (UTC)		
	26/12	**27/00**	**27/03**
India	46	33	46
Coastal stations			
WB	9	4	9
Odisha	6	5	6
AP	12	12	12
Tamil Nadu	12	10	12
Puducherry	1	1	1
A & N	6	1	6
Bangladesh	12	13	16
Myanmar	12	12	12
Thailand	3	3	3
Sri Lanka	10	8	10

AWS Observations:

Region	Date/Time (UTC)		
	26/12	**27/00**	**27/03**
India	37	36	40
Coastal stations			
WB	2	2	2
Odisha	5	4	3
AP	18	15	17
Tamil Nadu	11	14	17
Puducherry	1	1	1
A & N	-	-	-

RS/RW (12Z) of 26/10/2015 **-4/39**
No. of Ascents reaching 250 hPa level: 3, MISDA: 35

RS/RW (00Z) of 27/10/2015- **29/39**
No. of Ascents reaching 250 hPa level: 27, MISDA: 10

No. of PILOT Ascents

26/12Z	27/00Z
8	5

Buoy Data

26/12Z	27/00Z	27/03Z
12	11	11

STATUS OF CHENNAI REGION OBSERVATIONS

No. of Synop data

Date→	**26.10.2015**							
UTC→	**00**	**03**	**06**	**09**	**12**	**15**	**18**	**21**
Chennai Region (Coasts of AP & TN)	**20**	**22**	**20**	**20**	**22**	**20**	**20**	**20**

No. of RS/RW Ascents

00Z /26.10.2015: 5
No. of Ascents reaching 250 hPa level = 5
MISDA : 3

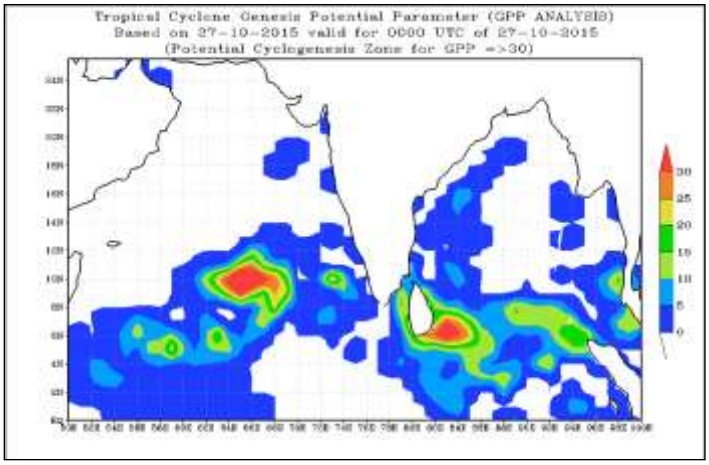
12Z /26.10.2015: 0
No. of Ascents reaching 250 hPa level =0
MISDA : 8

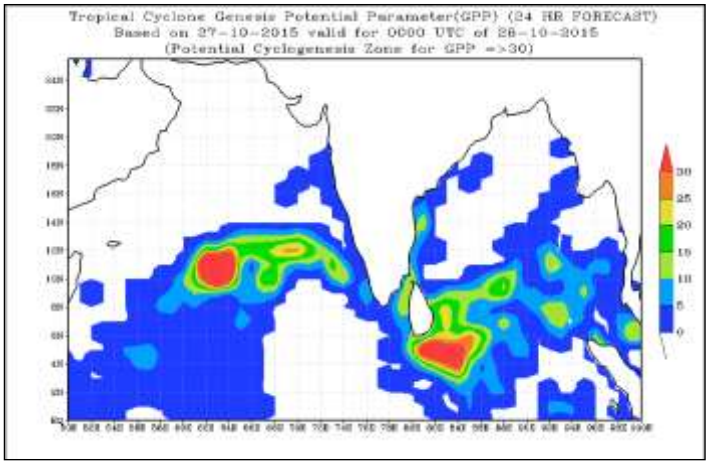
No. of PILOT Ascents:

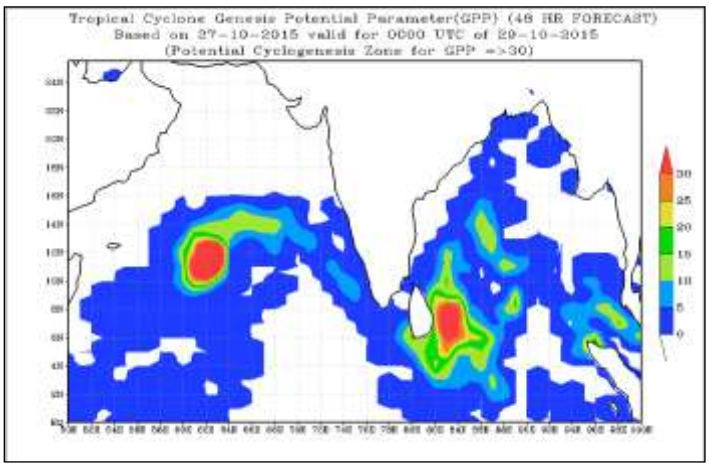
26.10.2015

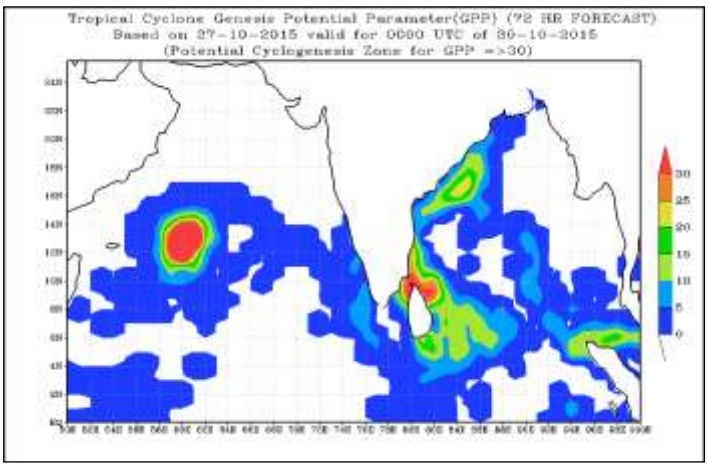
06Z	18Z
3	4

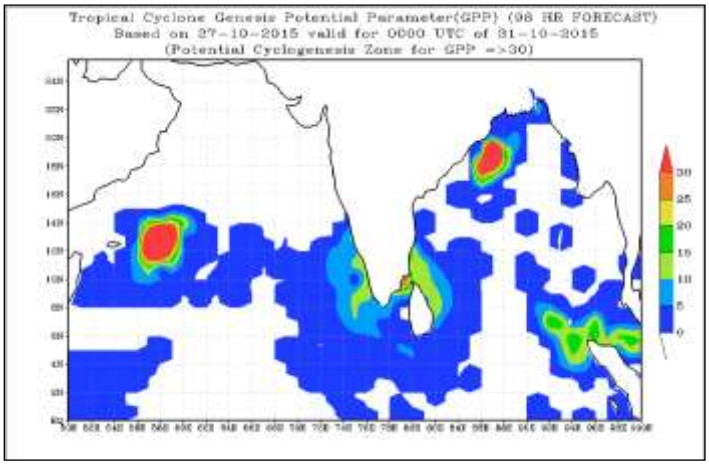
Annexure-II

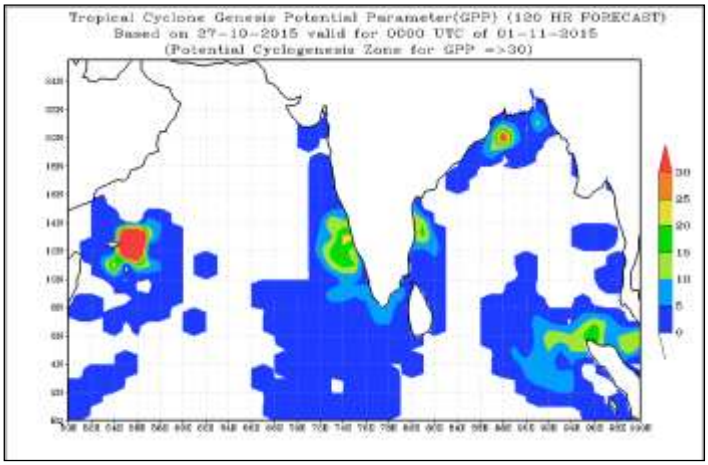

Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 27-10-2015 valid for 0000 UTC of 27-10-2015
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 27-10-2015 valid for 0000 UTC of 28-10-2015
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
Based on 27-10-2015 valid for 0000 UTC of 29-10-2015
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 27-10-2015 valid for 0000 UTC of 30-10-2015
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (96 HR FORECAST)
Based on 27-10-2015 valid for 0000 UTC of 31-10-2015
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
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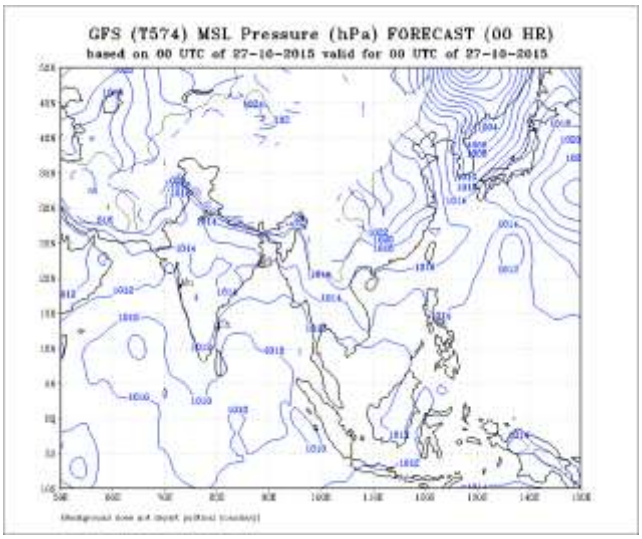
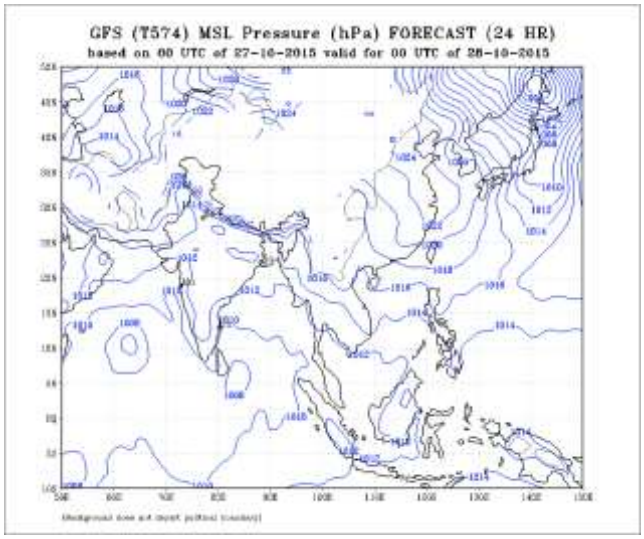
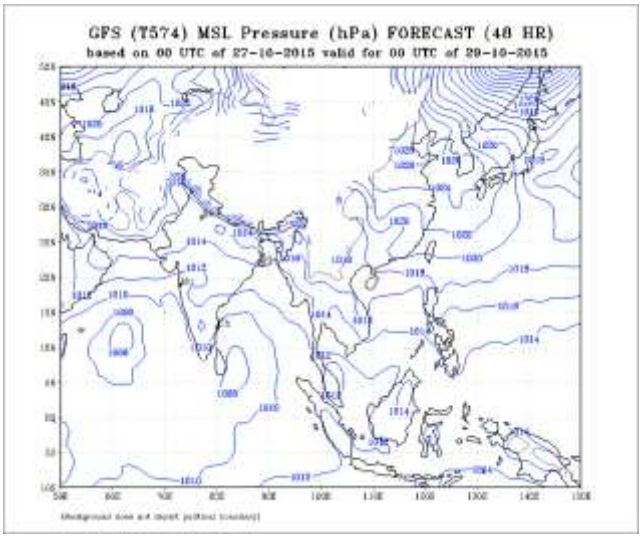
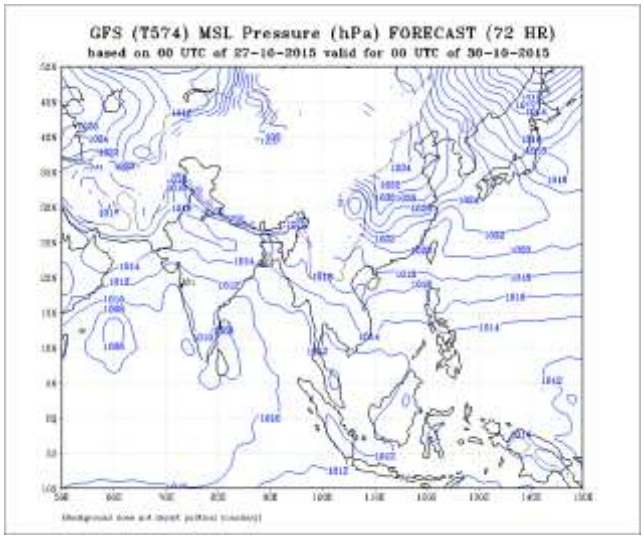
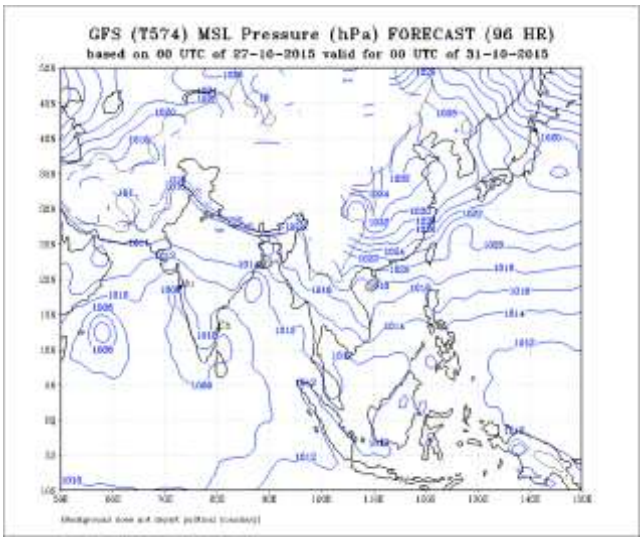
(Potential Cyclogenesis Zone for GPP =>30)

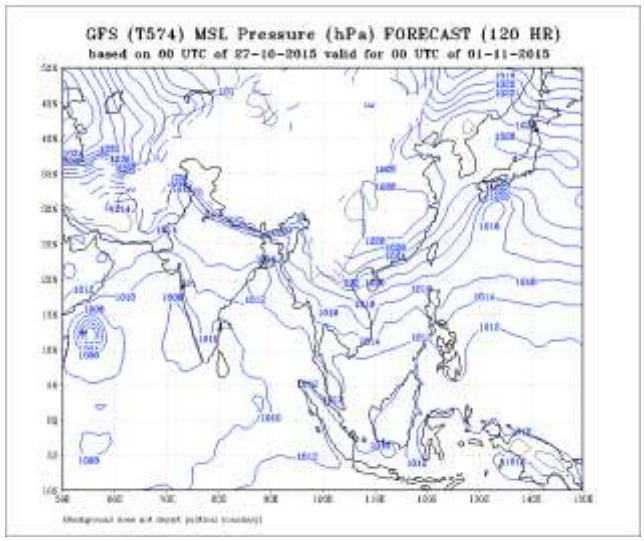

GFS (T574) MSL Pressure (hPa) FORECAST (00 HR)
based on 00 UTC of 27-10-2015 valid for 00 UTC of 27-10-2015

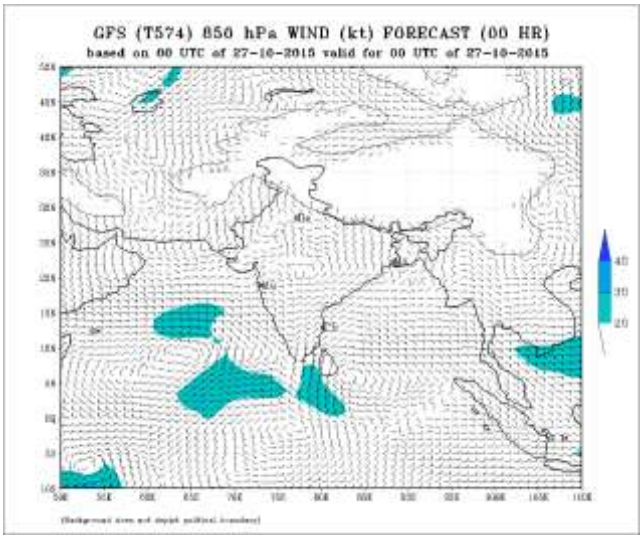

GFS (T574) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 27-10-2015 valid for 00 UTC of 28-10-2015

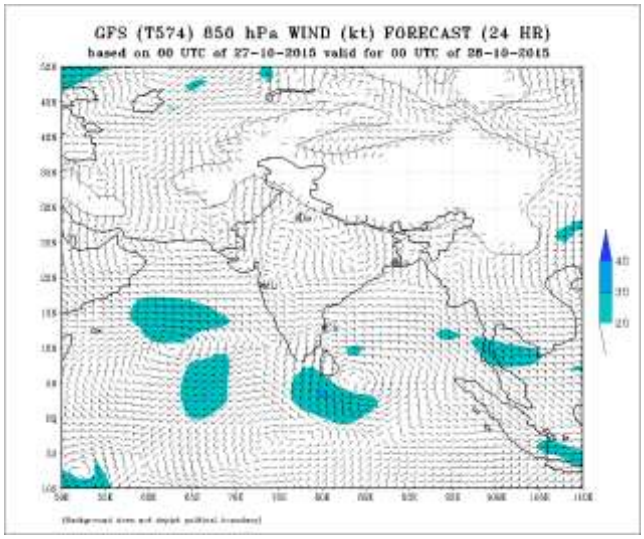

GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 27-10-2015 valid for 00 UTC of 29-10-2015

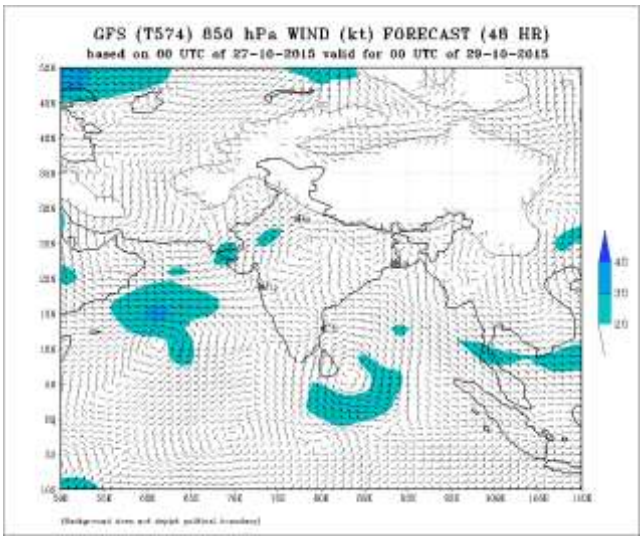

GFS (T574) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 27-10-2015 valid for 00 UTC of 30-10-2015


GFS (T574) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 27-10-2015 valid for 00 UTC of 31-10-2015


GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 27-10-2015 valid for 00 UTC of 01-11-2015


GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 27-10-2015 valid for 00 UTC of 27-10-2015


GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 27-10-2015 valid for 00 UTC of 28-10-2015


GFS (T574) 850 hPa WIND (kt) FORECAST (48 HR)
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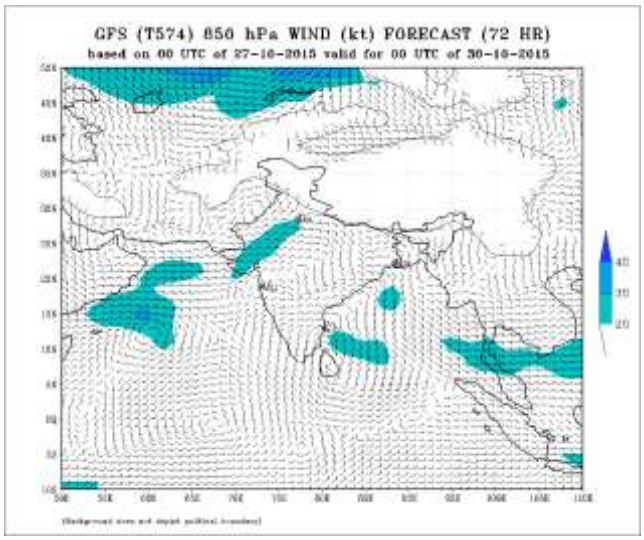
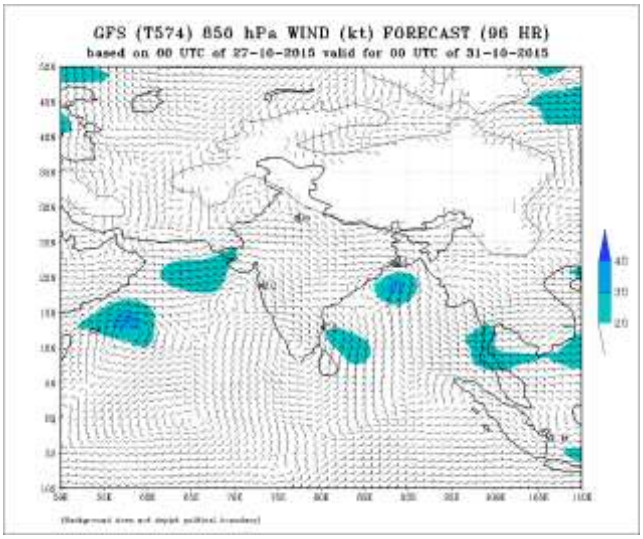
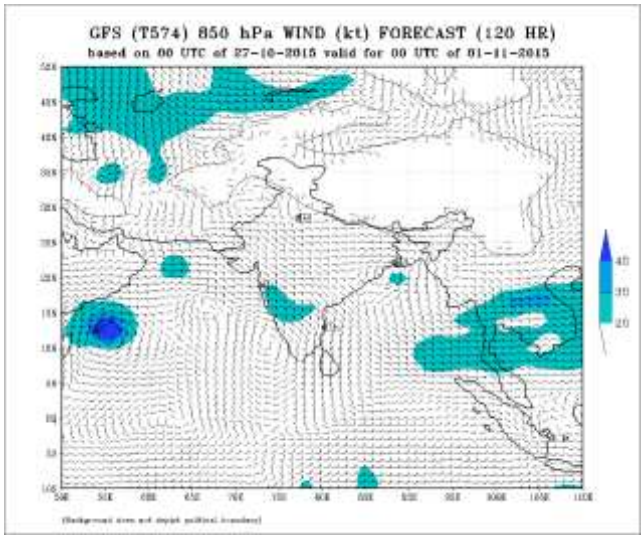
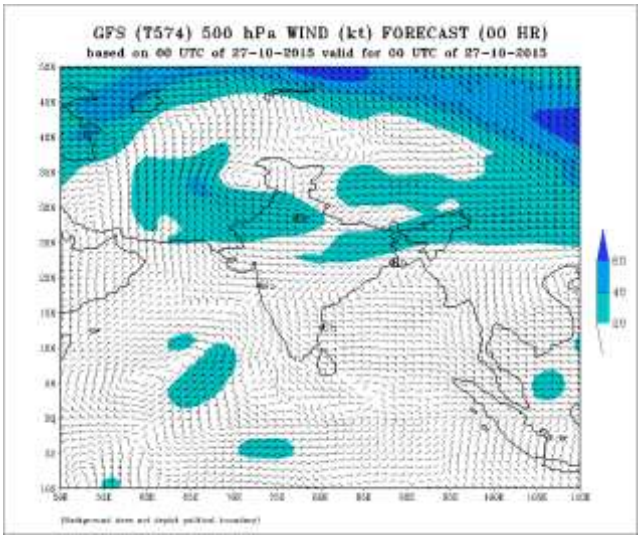
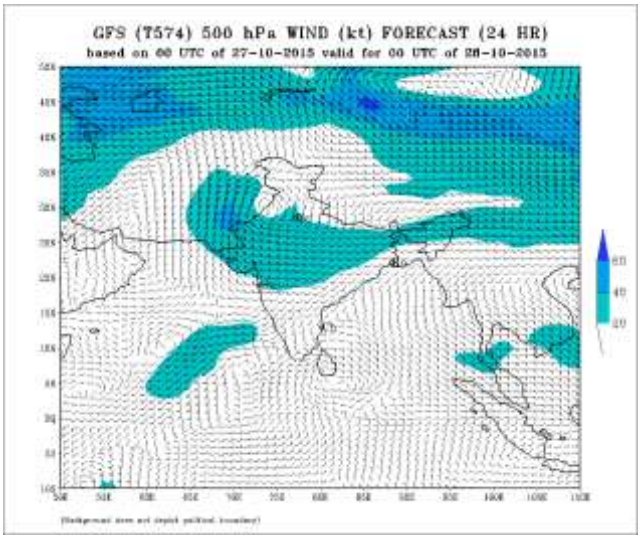
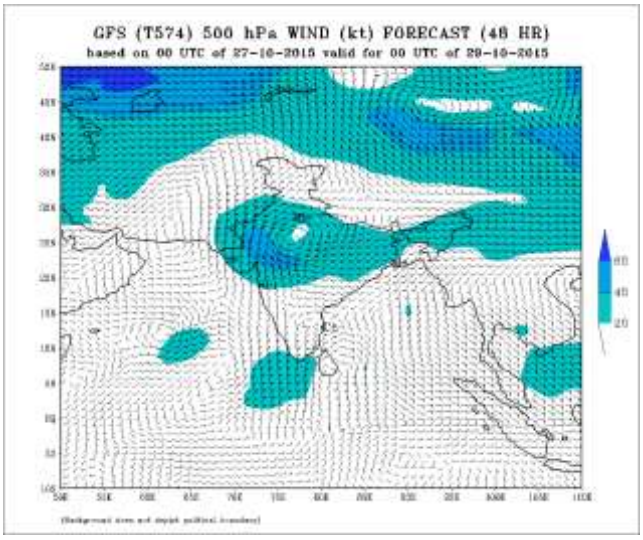

GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 27-10-2015 valid for 00 UTC of 30-10-2015

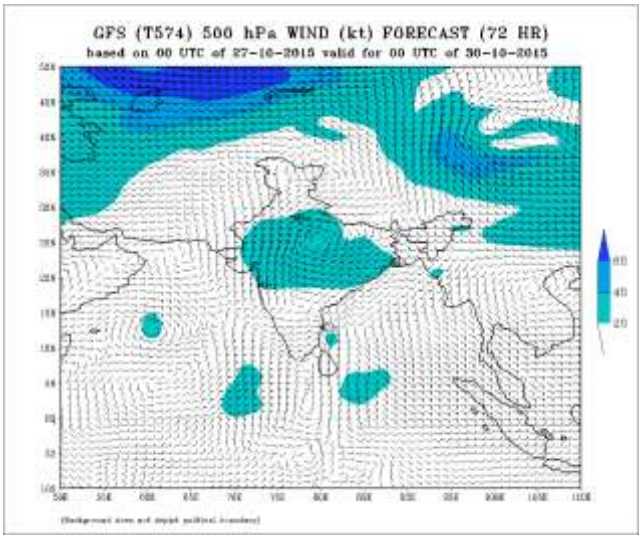

GFS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 27-10-2015 valid for 00 UTC of 31-10-2015

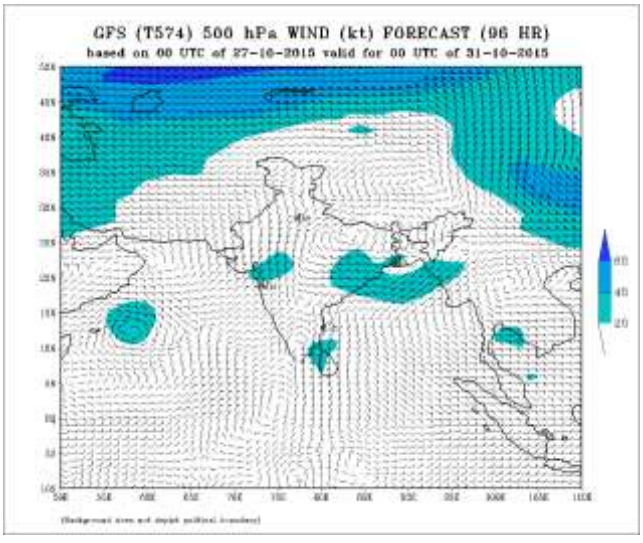

GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 27-10-2015 valid for 00 UTC of 01-11-2015

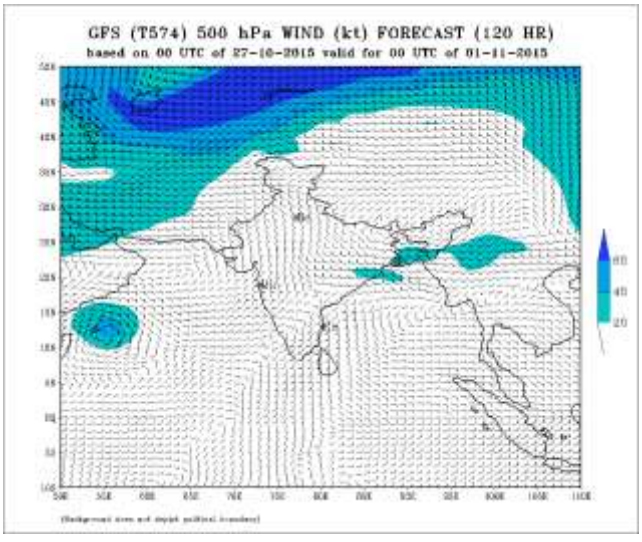

GFS (T574) 500 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 27-10-2015 valid for 00 UTC of 27-10-2015


GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 27-10-2015 valid for 00 UTC of 28-10-2015


GFS (T574) 500 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 27-10-2015 valid for 00 UTC of 29-10-2015


GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 27-10-2015 valid for 00 UTC of 30-10-2015


GFS (T574) 500 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 27-10-2015 valid for 00 UTC of 31-10-2015


GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
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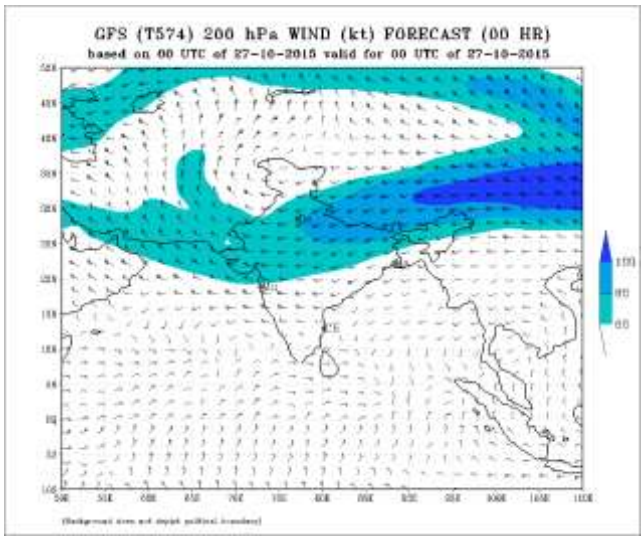
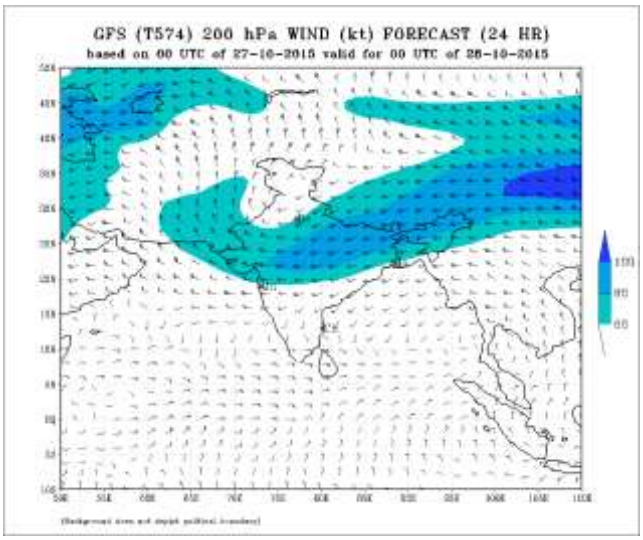
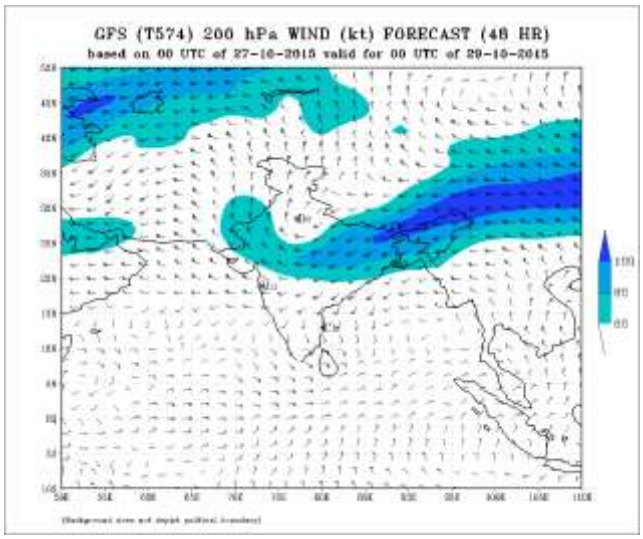
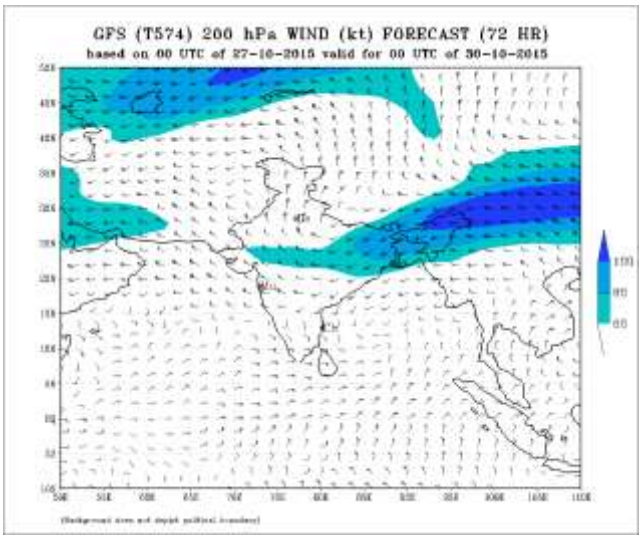
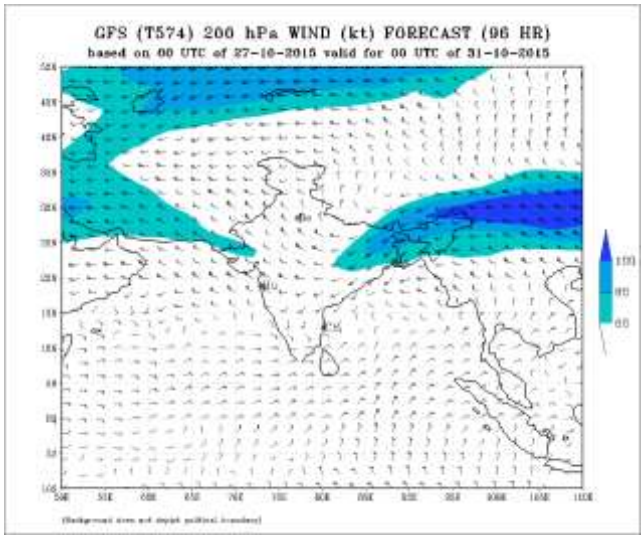
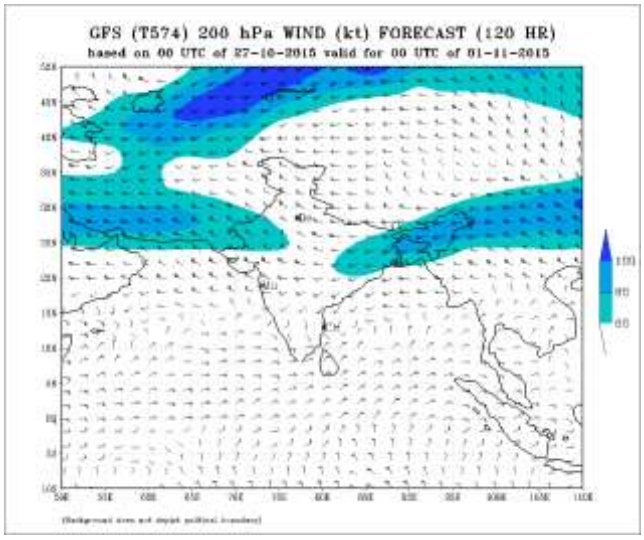

GFS (T574) 200 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 27-10-2015 valid for 00 UTC of 27-10-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 27-10-2015 valid for 00 UTC of 28-10-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 27-10-2015 valid for 00 UTC of 29-10-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 27-10-2015 valid for 00 UTC of 30-10-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 27-10-2015 valid for 00 UTC of 31-10-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 27-10-2015 valid for 00 UTC of 01-11-2015

FDP (Cyclone) NOC Report Dated 28 October, 2015

Synoptic features based on 0300 UTC of today:

- The well marked low pressure area over southeast & adjoining southwest Arabian sea has concentrated into a depression over southeast Arabian Sea and adjoining areas of southwest & central Arabian Sea and lay centered at 0830 hours IST of today, the 28th October near Latitude 11.5 N and Long. 65.0 E, about 1200 km southwest of Mumbai and about 1320 km southeast of Salalah (Oman). It would move north northwestwards and intensify into a Deep Depression during next 24 hours and into a Cyclonic Storm during subsequent 24 hours. It would then move westwards towards Yemen and adjoining Oman coast. The low pressure area over southwest Bay of Bengal off Srilanka coast now lies over southwest Bay of Bengal &adjoining Srilanka. Associated upper air cyclonic circulation extending upto 4.5 km above mean sea level persists.

Environmental features based on 0300 UTC of today:

Sea Surface Temperature (SST):

- SST is 29-30°C over southwest Bay of Bengal and adjoining southeast of Sri Lanka coast and 30-32°C over southeast Bay of Bengal (BOB) and Andaman Sea.
- SST is 30°C around the system centre over Arabian Sea (AS) and 29-30^0 over rest part of of AS

Tropical Cyclone Heat Potential (TCHP):

- TCHP is about 110-120 kJ/cm^2 over equatorial Bay of Bengal. It is also 110-120 kJ/cm^2 over southwest BoB off Sri Lanka coast.
- TCHP is 110-120 kJ/cm^2 around the system centre over AS.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive (30-40*10^{-5}s^{-1}) over southwest BOB and adjoining parts of south Sri Lanka.
- Relative vorticity at 850 hPa is positive (100-150*10^{-5}s^{-1}) around the system centre over AS

Convergence:

- Lower level convergence is 10-20*10^{-5}s^{-1} over southwest & adjoining eastern parts of Sri Lanka coast and Andaman Sea.
- Lower level convergence is positive (20-30*10^{-5}s^{-1}) around the system centre over AS.

Divergence:

- Upper level divergence is 10-20*10^{-5}s^{-1} over parts of southwest BOB.
- Upper level divergence is positive (20-30*10^{-5}s^{-1}) around the system centre over AS.

Wind Shear:

- Wind shear is 5-10 knots over southwest BoB, It is increasing towards north BoB.
- Wind shear is 10-20 knots around the system centre

Wind Shear Tendency:

- It shows increasing trend over BoB except Andaman Sea where it is decreasing.
- The vertical wind shear tendency is decreasing (-5 to -10 knots) around the system centre and increasing over south of 10^{0}N over AS.

Upper tropospheric ridge:

- The upper tropospheric ridge at 200 hPa runs along 10.0°N over BOB.
- The upper tropospheric ridge at 200 hPa runs along 13.0°N over AS.

M.J.O. Index:

- MJO lies over Phase 2 with amplitude greater than 2.0 and would continue in the same phase for next 5 days.

Storms and Depression over South China Sea/ South Indian Ocean:

According to satellite imagery, the vortex over southwest Indian Ocean is centered near 8.5°S /52.5°E at 0900 UTC of today, the 28th October. Intensity of the system is T1.0.

Satellite:

Inference based on INSAT imagery of **270900** UTC:

Bay of Bengal & Andaman Sea:-

Scattered low/ medium clouds with embedded moderate to intense convection lies over west central BoB, south Bo Bans Andaman Sea

Arabian Sea:-

Low/Medium clouds with embedded moderate to intense convective clouds lies over the area between Lat 09.0N to 15.0N Long 62.0E to 70.0E. Minimum CTT -76^0 C

NWP Input for FDP Cyclone based on 0000 UTC of today

NWP Analysis

IMD-GFS: IMD-GFS model wind (850 hPa) analysis based on 00UTC of 28 October 2015 shows a low pressure area over southeast Arabian sea & neighbourhood along with extended northeast-southwest oriented cyclonic circulation around 12 deg N. This low pressure system is likely to intensify further and move north-westward during the next 2-3 days. Model analysis also shows a low level cyclonic circulation over south Bay of Bengal & adjoining Srilanka coast and it merged with the tropical easterly in the 24 hour forecast.

IMD-WRF: IMD-WRF model forecasts based on 00UTC of 28 October 2015 shows a low level circulation over southeast Arabian Sea & neighbourhood along with extended northeast-southwest oriented cyclonic circulation and intensification of the system into a depression with NW-ward movement during next 3 days. It also shows an upper air cyclonic circulation over south Bay of Bengal & adjoining Srilanka coast.

IMD-NWP products are available at:

http://202.54.31.51/bias/gfsproducts.php
http://202.54.31.51/bias/wrf27pro.php
http://202.54.31.51/bias/potentialparameter.php

NCMRWF-UM: It shows cyclonic circulation over southwest BoB and adjoining south east Sri Lanka coast on 28th and NNW movement towards north coastal Andhra Pradesh and south Odisha coast during next 72 hrs.

NCMRWF-GFS: NCMRWF-GFS model shows formation of a low pressure area over westcentral BOB on 30th with intensification into a deep depression on 31st over north Bay. This model suggests formation of low pressure area over southeast Arabian on 28th October moving west-northwestward, intensifying depression on 30th and further intensification and movement towards Yemen coast.

NCEP-GFS: NCEP-GFS model shows formation of a low pressure area over southwest BOB on 27th off Sri Lanka which intensifies into a depression near the same region on 28th and weakening on 29th.

It suggests a low pressure area over southeast AS on 27th, intensifying into a cyclonic storm. Moving northwestwards, it would intensify further and cross north Yemen coast on 3rd Novemeber.

ECMWF:

ECMWF Model shows feeble low over southwest BOB on 28th. No further intensification is suggested. It also suggests formation of feeble low on 2nd November without further intensification.

ECMWF Model shows a depression over southwest ARB on 28th with further intensification into a deep depression on 29th and cyclonic storm on 30th. Further intensification is suggested for next 72 hours. It suggests west-northwest movement towards Yemen and adjoining Oman coast

JMA: JMA Model shows a feeble low pressure area over southwest BOB on 27th, intensifying into a low pressure area during next 48 hours and weakening thereafter.

It also suggests a low pressure area over southeast Arabian Sea on 27th, intensifying into a depression on 28th, cyclonic storm on 30th and further intensification thereafter. It would move NWwards till 29th and then westwards till 12 UTC of 30th.

ARP-Meteo France: ARP-Meteo France Model suggests a low over southwest BOB on 29th intensifying into a depression on 30th.

It also suggests a low over southeast Arabian Sea on 27th intensifying into a depression during next 48 hours over southwest AS.

Genesis Potential Parameter (GPP): Genesis Potential Parameter (GPP) forecasts based on 00UTC of 28 October 2015 show a potential cyclogenesis zone over southeast Arabian Sea & neighbourhood. GPP forecast shows further intensification and **NW** ward movement of this system during the next 2-3 days. It also shows a potential cyclogenesis zone over south Bay of Bengal & adjoining Srilanka coast. GPP forecast shows dissipation of this BOB system.

Summary and Conclusion:

Bay of Bengal and Andaman Sea:

Most NWP models are not suggesting intensification of the low pressure area over the southwest Bay of Bengal region off Sri Lanka coast. A few models suggest intensification upto depression stage. Most of the models suggest initial north-northwestward movement upto north AP coast during next three days and then recurve northeastwards towards Bangladesh coast.

Arabian Sea:

Most NWP models are suggesting intensification of depression over southeast and adjoining southwest Arabian Sea upto severe cyclonic storm. Most of the models suggest NNW/NW movement upto 1200 UTC of 29 Oct. and then west/west-northwest movement towards Gulf of Aden. The global models ECMWF and NCEP GFS in its 10 day forecasts predict landfall of the severe cyclonic storm over north Yemen and adjoining Oman coast by 3rd Novemeber.

The parameters like vertical wind shear, SST, low level convergence, upper level divergence are favourable for intensification.

Probability of cyclogenesis over Bay of Bengal and Andaman Sea during next 120 hours:

24 HOURS	24-48 HOURS	48-72 HOURS	72-96 hours	96-120 hours
LOW	NIL	NIL	NIL	NIL

Advisory: IOP will be conducted for Tamil Nadu, Puducherry and south AP coast during 27-30th Oct 2015.

Status of observational system:

Details of the status of observational systems are given in **Annexure I.**

Annexure-I

Status of Observation system:

Synoptic observation:

Region	Date/Time (UTC)		
	27/12	**28/00**	**28/03**
India	46	32	44
Coastal stations			
WB	8	3	8
Odisha	6	5	6
AP	13	13	13
Tamil Nadu	12	9	10
Puducherry	1	1	1
A & N	6	1	6
Bangladesh	11	11	11
Myanmar	-	10	11
Thailand	2	2	2
SriLanka	10	8	10

AWS Observations:

Region	Date/Time (UTC)		
	27/12	**28/00**	**28/03**
India	37	36	40
Coastal stations			
WB	2	2	2
Odisha	5	4	3
AP	18	15	17
Tamil Nadu	11	14	17
Puducherry	1	1	1
A & N	-	-	-

RS/RW (12Z) of 27/10/2015 **-6/39**
No. of Ascents reaching 250 hPa level: 6, MISDA: 33

RS/RW (00Z) of 28/10/2015- **24/39**
No. of Ascents reaching 250 hPa level: 24, MISDA: 15

No. of PILOT Ascents

27/12Z	28/00Z
5	4

Buoy Data

27/12Z	28/00Z	28/03Z
5	7	6

STATUS OF CHENNAI REGION OBSERVATIONS

No. of Synop data

Date→	**27.10.2015**											
UTC→	**00**	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**
Chennai Region (Coasts of AP & TN)	**20**	**10**	**12**	**22**	**13**	**12**	**20**	**12**	**11**	**19**	**12**	**11**
UTC→	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**
Chennai Region (Coasts of AP & TN)	**22**	**12**	**9**	**20**	**11**	**12**	**20**	**12**	**12**	**19**	**12**	**7**

No. of RS/RW Ascents

00Z /27.10.2015 : 6
No. of Ascents reaching 250 hPa level = 5
MISDA : 2

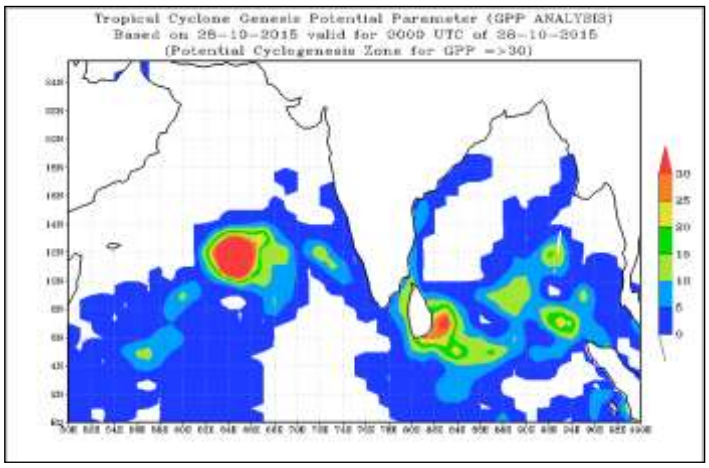
12Z /27.10.2015 : 0
No. of Ascents reaching 250 hPa level =0
MISDA : 8

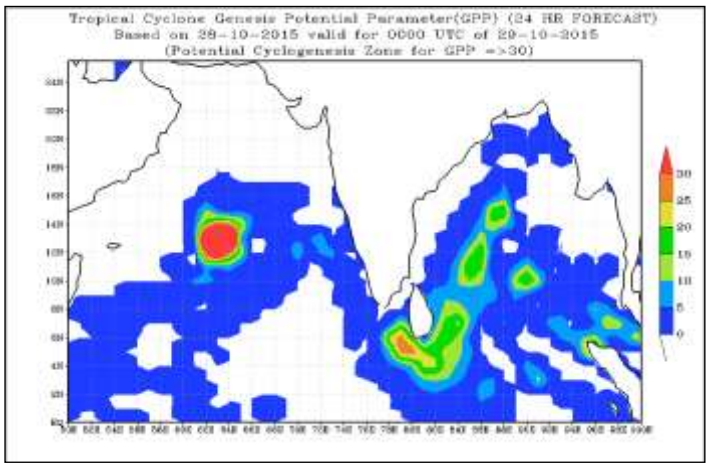
No. of PILOT Ascents:

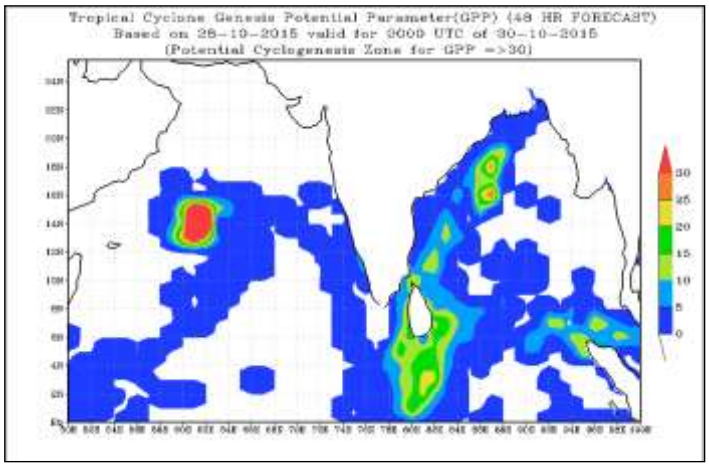
27.10.2015

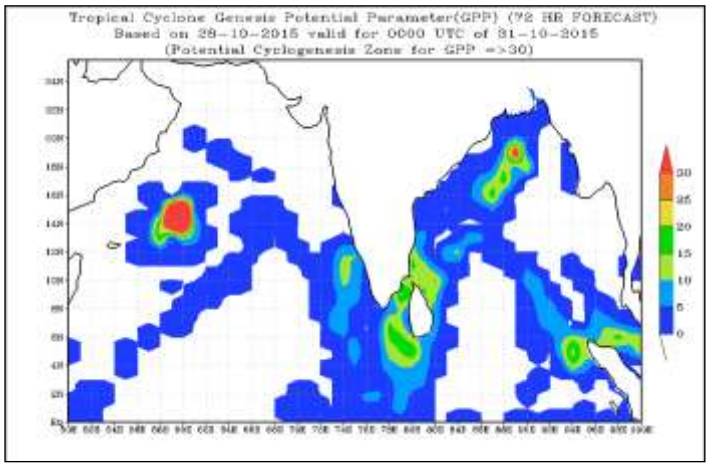
06Z	18Z
2	4

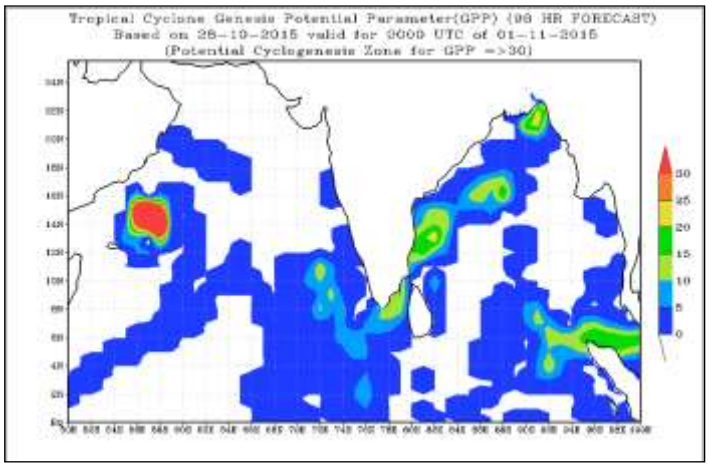
Annexure-II

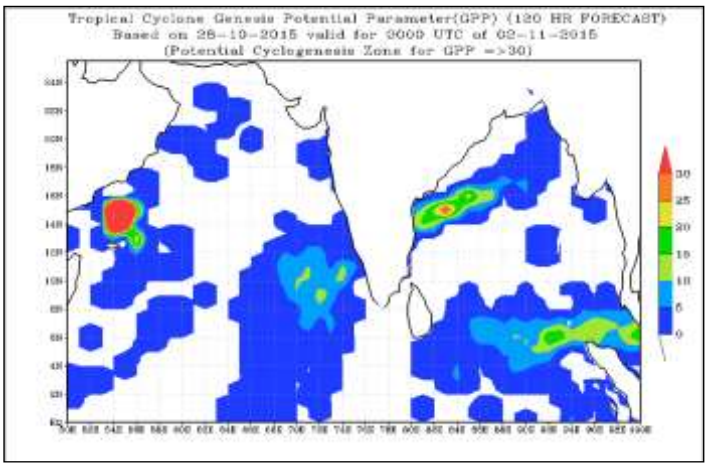

Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 28-10-2015 valid for 0000 UTC of 28-10-2015
(Potential Cyclogenesis Zone for GPP =>30)

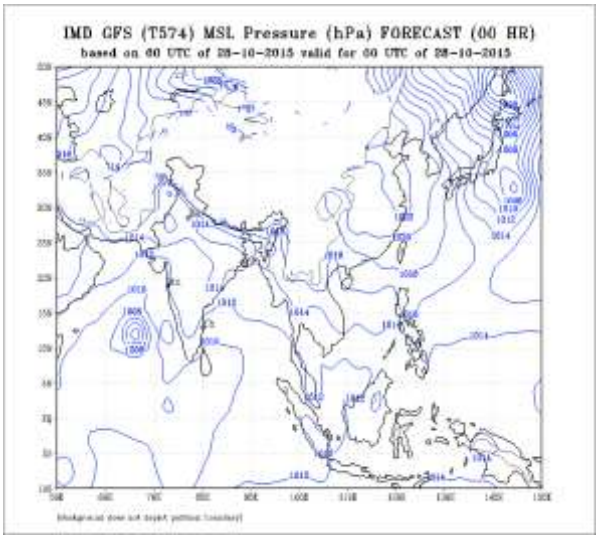

Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 28-10-2015 valid for 0000 UTC of 29-10-2015
(Potential Cyclogenesis Zone for GPP =>30)

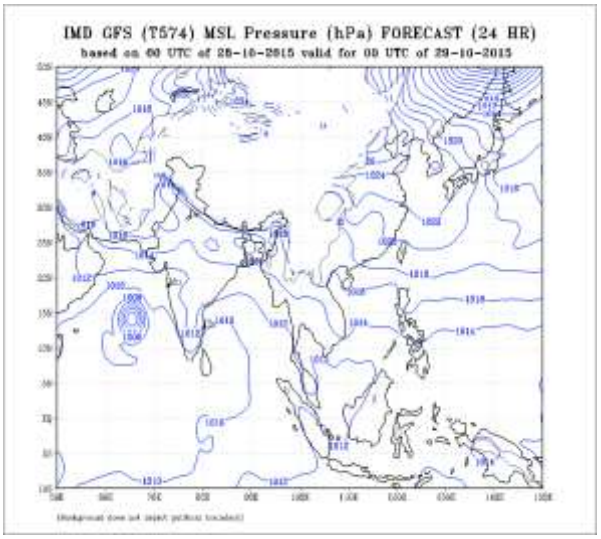

Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
Based on 28-10-2015 valid for 0000 UTC of 30-10-2015
(Potential Cyclogenesis Zone for GPP =>30)

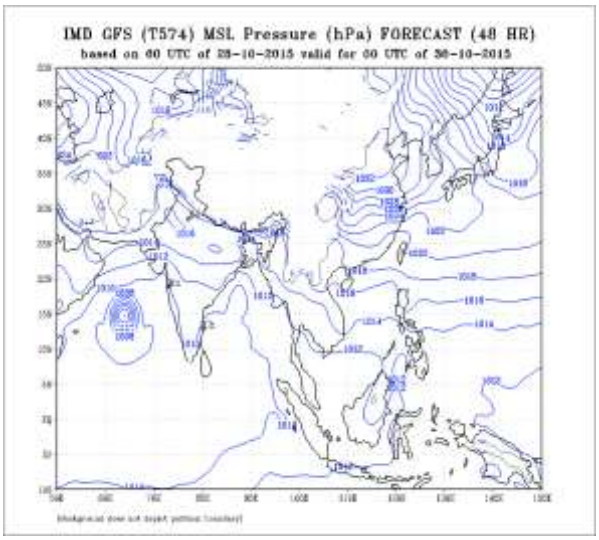

Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 28-10-2015 valid for 0000 UTC of 31-10-2015
(Potential Cyclogenesis Zone for GPP =>30)

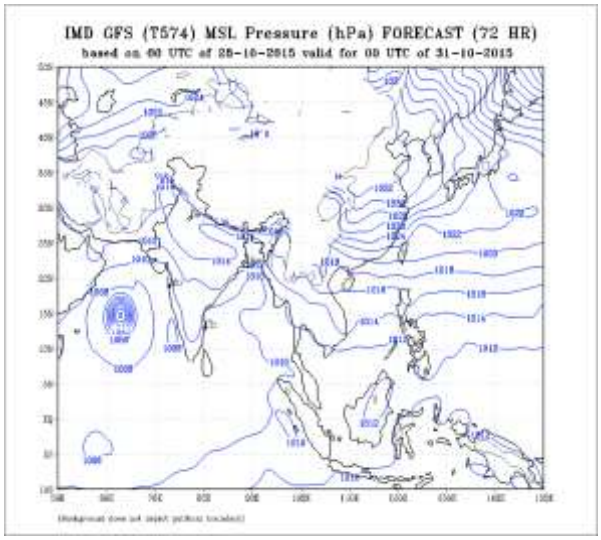

Tropical Cyclone Genesis Potential Parameter(GPP) (96 HR FORECAST)
Based on 28-10-2015 valid for 0000 UTC of 01-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

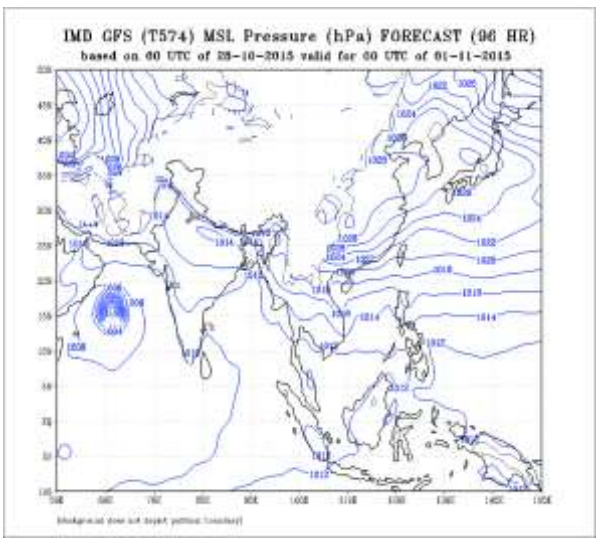

Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 28-10-2015 valid for 0000 UTC of 02-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

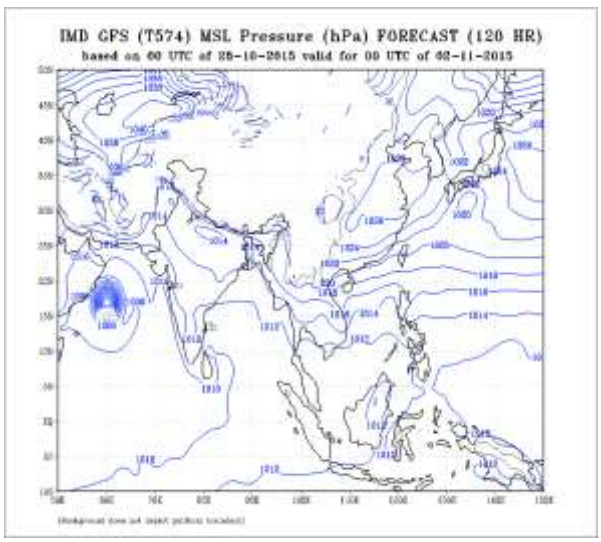

IMD GFS (T574) MSL Pressure (hPa) FORECAST (00 HR)
based on 00 UTC of 28-10-2015 valid for 00 UTC of 28-10-2015

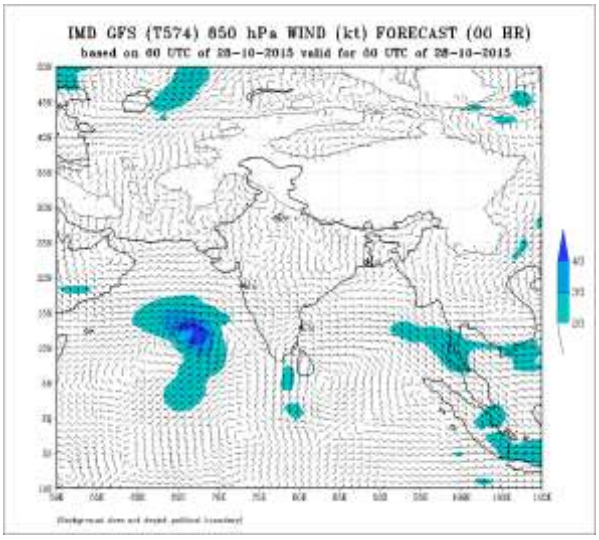

IMD GFS (T574) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 28-10-2015 valid for 00 UTC of 29-10-2015

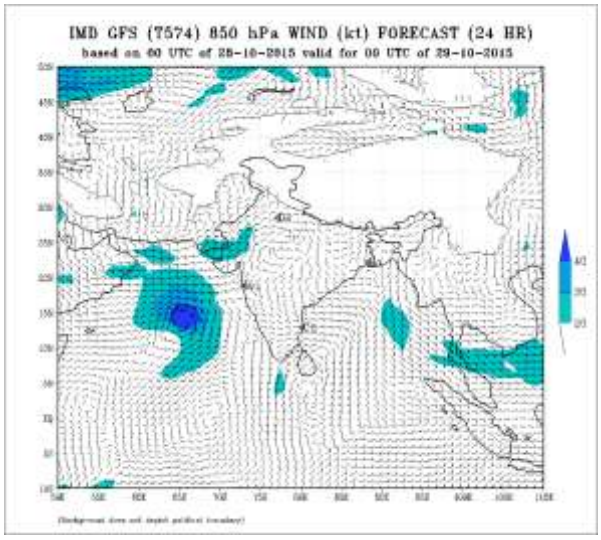

IMD GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 28-10-2015 valid for 00 UTC of 30-10-2015

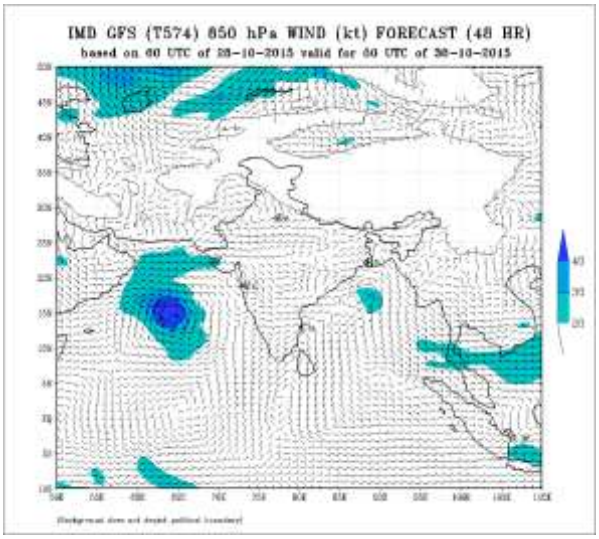

IMD GFS (T574) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 28-10-2015 valid for 00 UTC of 31-10-2015

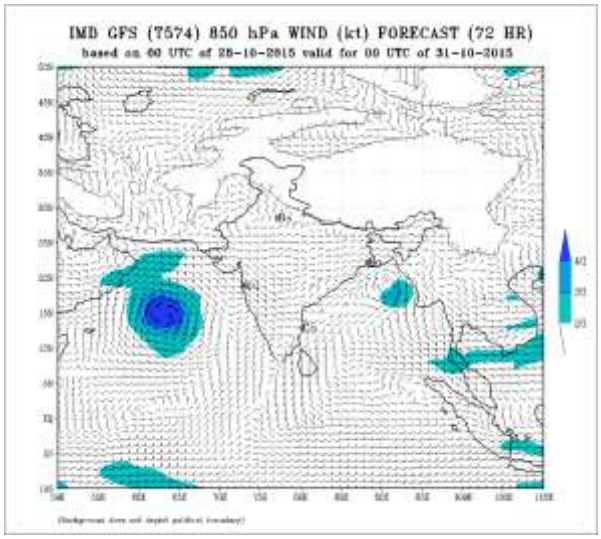

IMD GFS (T574) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 28-10-2015 valid for 00 UTC of 01-11-2015


IMD GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 28-10-2015 valid for 00 UTC of 02-11-2015


IMD GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 28-10-2015 valid for 00 UTC of 28-10-2015


IMD GFS (7574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 28-10-2015 valid for 00 UTC of 29-10-2015


IMD GFS (T574) 850 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 28-10-2015 valid for 00 UTC of 30-10-2015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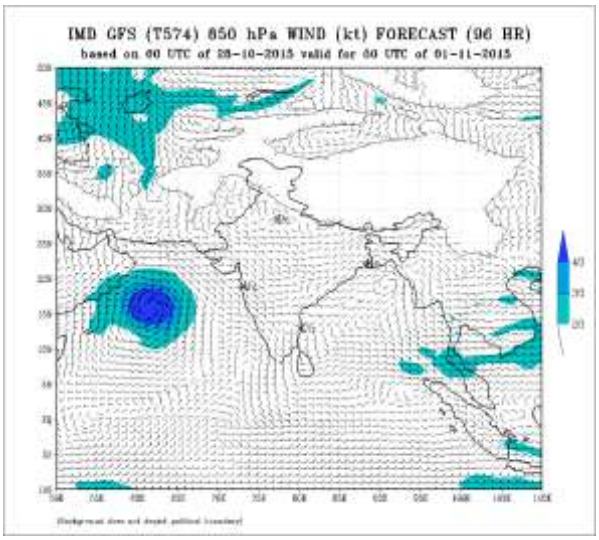
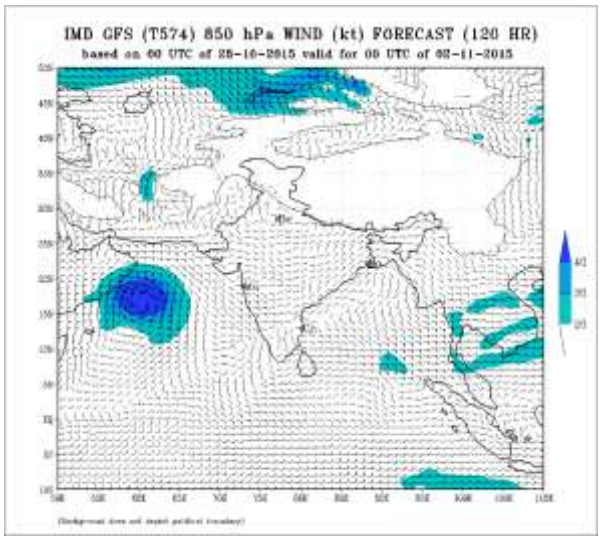
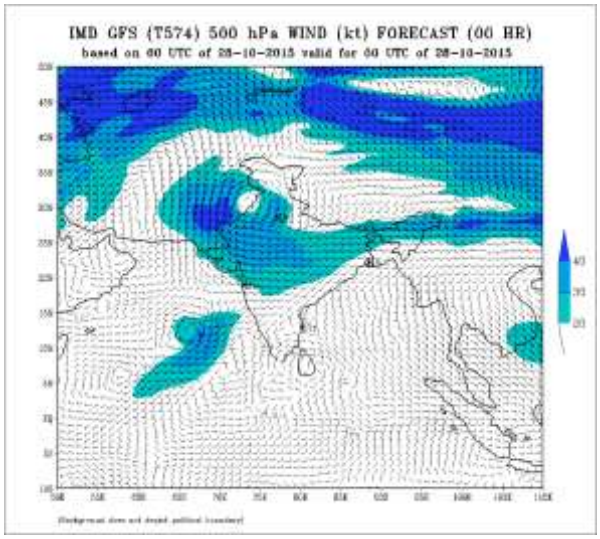
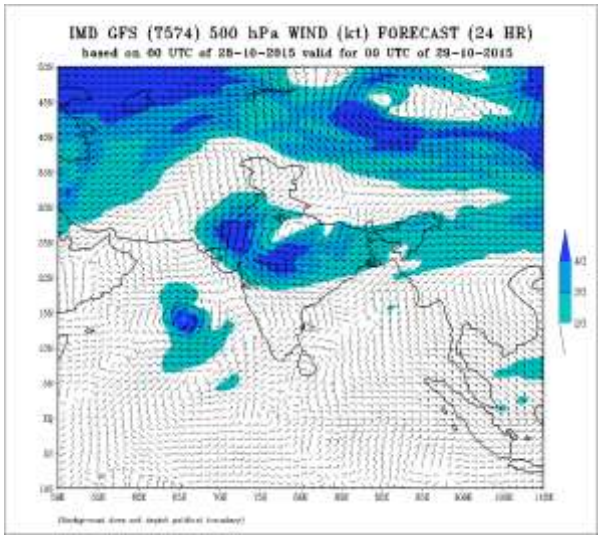
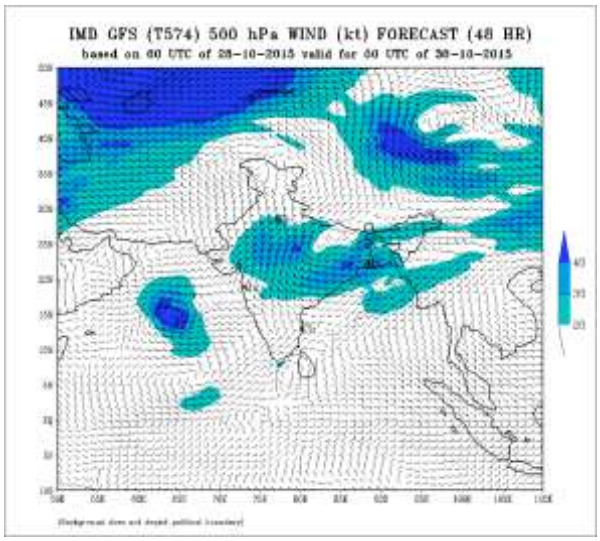
based on 00 UTC of 28-10-2015 valid for 00 UTC of 31-10-2015

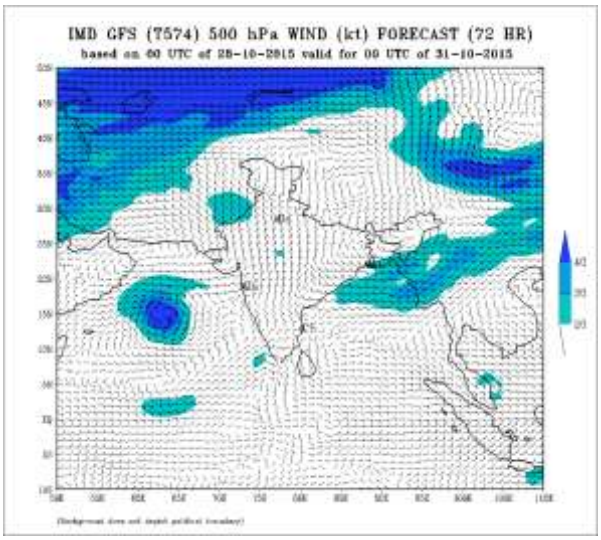

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 28-10-2015 valid for 00 UTC of 01-11-2015

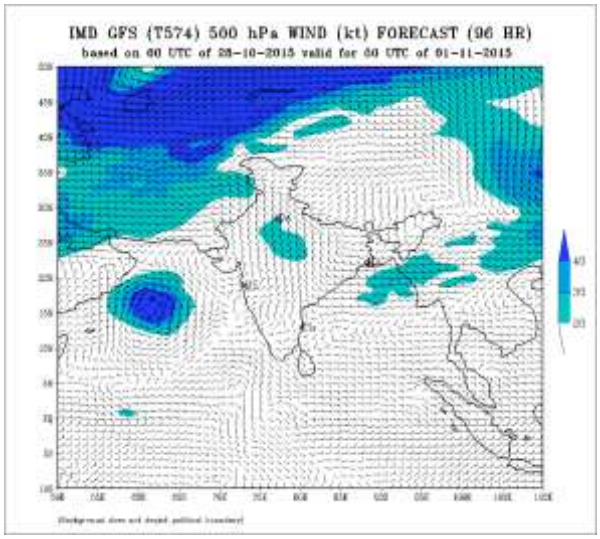

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 28-10-2015 valid for 00 UTC of 02-11-2015

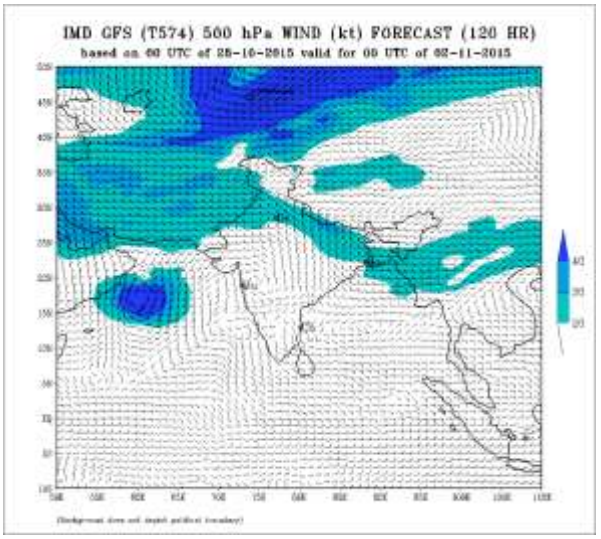

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 28-10-2015 valid for 00 UTC of 28-10-2015

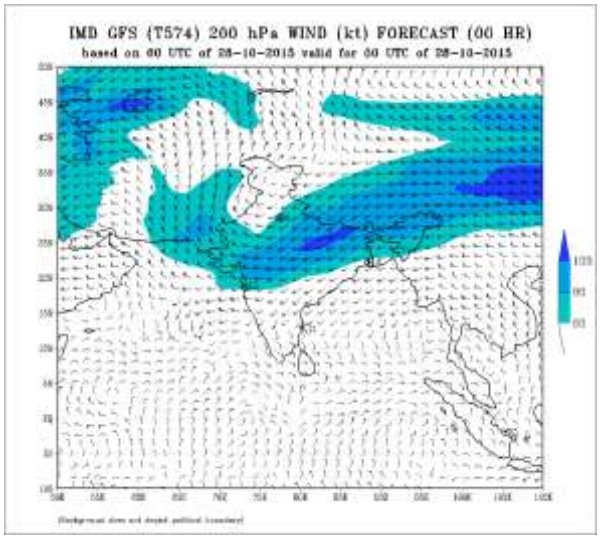

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 28-10-2015 valid for 00 UTC of 29-10-2015

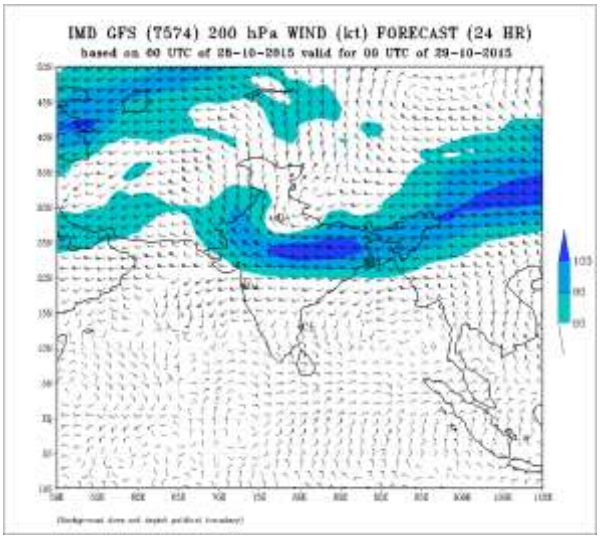

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 28-10-2015 valid for 00 UTC of 30-10-2015

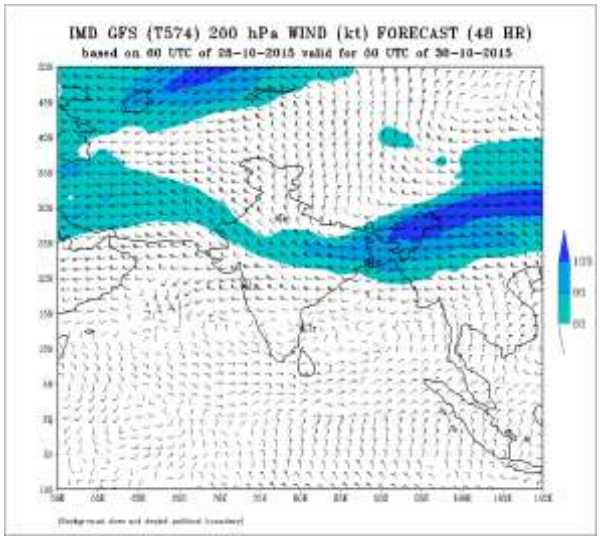

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 28-10-2015 valid for 00 UTC of 31-10-2015

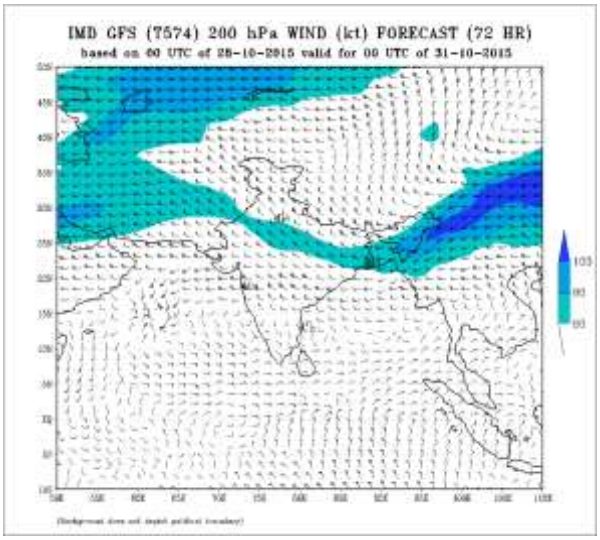

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 28-10-2015 valid for 00 UTC of 01-11-2015

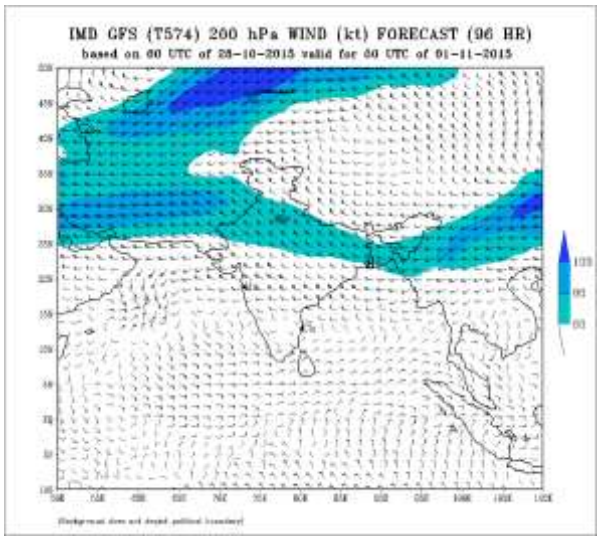

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 28-10-2015 valid for 00 UTC of 02-11-2015

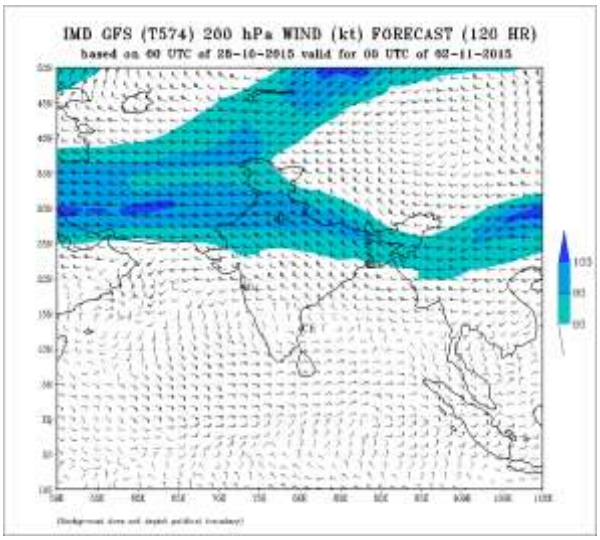

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 28-10-2015 valid for 00 UTC of 28-10-2015


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 28-10-2015 valid for 00 UTC of 29-10-2015


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 28-10-2015 valid for 00 UTC of 30-10-2015


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 28-10-2015 valid for 00 UTC of 31-10-2015


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 28-10-2015 valid for 00 UTC of 01-11-2015


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 28-10-2015 valid for 00 UTC of 02-11-2015

FDP (Cyclone) NOC Report Dated 29 October, 2015

Synoptic features based on 0300 UTC of today:

- Yesterday's **Depression** over southeast Arabian Sea (AS) and adjoining areas of southwest & central Arabian Sea moved north-northwestwards, intensified into a **Deep Depression** at 1730 hours IST of yesterday. It continued to move north-northwestwards and further intensified into a **Cyclonic Storm, 'Chapala'** and lay centered at 0530 hours IST of today, the 29th October 2015 over eastcentral and adjoining westcentral and south Arabian Sea near Lat.13.7° N / Long. 64.3° E, about 1080 kms southwest of Mumbai and about 1150 kms east-southeast of Salalah (Oman). It then moved northwestwards and lay centred at 0830 hours IST over eastcentral and adjoining westcentral and south Arabian Sea, near Lat.13.8° N / Long. 64.2° E, about 1090 kms southwest of Mumbai and about 1140 kms east-southeast of Salalah (Oman). It would move northwestwards during next 6 hours and then move westwards towards Yemen and adjoining Oman coast. It would intensify into a Severe Cyclonic Storm during next 24 hours and into a Very Severe Cyclonic Storm in the subsequent 12 hours.
- The low pressure area over southwest Bay of Bengal (BoB) and adjoining Sri Lanka has become less marked. However, the associated cyclonic circulation lies over Sri Lanka and adjoining areas of southwest Bay of Bengal and extends upto 4.5 kms a.s.l.

Environmental features based on 0300 UTC of today:

Sea Surface Temperature (SST):

- SST is 30-32°C over entire Bay of Bengal and Andaman Sea.
- SST is more than 32°C off northern west coast of India and 30-32°C over entire Arabian Sea.

Tropical Cyclone Heat Potential (TCHP):

- The Ocean Thermal Energy is about 50-75 kJ/cm2 to the east and north of the system centre.
- TCHP is 110-120 kJ/cm2 off Karnataka-Kerala coast.
- TCHP is about 110-120 kJ/cm2 over equatorial Indian Ocean and southwest BoB.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive ($30\text{-}40*10^{-5}s^{-1}$) over southwest BOB and adjoining parts of south Sri Lanka.
- Relative vorticity at 850 hPa is positive ($250*10^{-5}s^{-1}$) around the system centre over Arabian Sea

Convergence:

- Lower level convergence is $5\text{-}15*10^{-5}s^{-1}$ over southwest & adjoining westcentral BoB and is $5*10^{-5}s^{-1}$ over Andaman Sea.
- Lower level convergence is positive ($5\text{-}15*10^{-5}s^{-1}$) around the system centre over AS.

Divergence:

- Upper level divergence is $20*10^{-5}s^{-1}$ over parts of southwest BOB and $5\text{-}10*10^{-5}s^{-1}$ over westcentral BoB and Andaman Sea.
- Upper level divergence is positive ($10\text{-}20*10^{-5}s^{-1}$) around the system centre over AS.

Wind Shear:

- Wind shear is 5-10 knots over south BoB and south Andaman Sea. It is increasing towards north BoB.
- Wind shear is 5-10 knots around the system centre

Wind Shear Tendency:

- The vertical wind shear tendency is decreasing (-5 to -10 knots) over westcentral BoB.
- The vertical wind shear tendency is decreasing (-10 to -20 knots) around the system centre over AS.

Upper tropospheric ridge:

- The upper tropospheric ridge at 200 hPa runs along 15.0°N over BOB and AS.

M.J.O. Index:

- MJO index lies over Phase 2 with amplitude greater than 2.0 and would continue in the same phase for next 5 days. It is highly favourable for intensification of the system.

Storms and Depression over South China Sea/ South Indian Ocean:

Satellite:

Inference based on INSAT imagery of **270900** UTC:

Bay of Bengal & Andaman Sea:-

Low level circulation:- Broken low and medium clouds with embedded moderate to intense convection over southwest BoB bet lat 3.0°N to 11.0°N and long 80.0°E to 88.0°E and Srilanka in association with the low level circulation area.

Arabian Sea:-

Vortex 'Chapala' over eastcentral and adjoining westcentral Arabian Sea centred near 14.0°N/63.5°E. According to satellite imagery, intensity is T 3.0. Associated low and medium clouds with embedded intense to very intense convective clouds at many places over area between Lat 11.0°N to 19.0°N and Long 61.0°E to 68.0°E. The minimum cloud top temperature around the system centre is about minus 84°C.

NWP Input for FDP Cyclone based on 0000 UTC of today

NWP Analysis

IMD-GFS: IMD-GFS model wind (850 hPa) and MSLP analysis based on 00UTC of 29 October 2015 shows a low pressure system (CYCLONIC STORM: Chapala) over east-central and adjoining areas of Arabian Sea around 14.N/64.E. This cyclonic storm is likely to intensify further and move north-westward during the next 2-3 days. Forecast also shows landfall of this cyclone over YEMEN coast near 16^{o} N, / 54^{o} E at around 0000 UTC of 03 November 2015. Model analysis also shows a low level cyclonic circulation in association with the tropical easterly waves over south Bay of Bengal & adjoining Srilanka coast.

IMD-WRF: IMD-WRF model forecasts based on 00UTC of 29 October 2015 shows a low pressure system (CYCLONIC STORM: Chapala) over east-central and adjoining areas of Arabian Sea around 13.5N/64.E. This cyclonic storm is likely to intensify further and move towards YEMEN coast during the next 2- 3 days.

IMD-NWP products are available at:

http://202.54.31.51/bias/gfsproducts.php
http://202.54.31.51/bias/wrf27pro.php
http://202.54.31.51/bias/potentialparameter.php

NCMRWF-UM: NCEP-GFS model suggest initial northwest movement upto 0000 UTC of 30 Oct., then west-northwestward movement upto 31 OCt./0000 UTC and then west-

southwestwards movement reaching 13.6°N/58.6°E at 01 Nov./0000 UTC with initial intensification and then weakening.

NCMRWF-GFS: NCMRWF-GFS model shows initital north-northwest movement upto 0000 UTC of 30 Oct., then southwestward movement upto 01 Nov./0000 UTC and then westward movement till 02 Nov./0000 UTC reaching 14.1°N/50.9°E with gradual intensification into a very severe cyclonic storm.

NGEFS: Shows similar track and intensity forecast as that of NCUM.

NCEP-GFS: NCEP-GFS model suggest initial northwest movement upto 0000 UTC of 30 Oct., then westward movement upto 01 Nov./0000 UTC and then west-northwestwards movement with landfall near 16°N (Yemen coast) around 0000 UTC of 3rd Nov with gradual intensification into a very severe cyclonic storm.

ECMWF:

ECMWF Model indicates west-northwestwards movement and landfall near 15.7°N around 1500 UTC of 2 Nov.

JMA: JMA Model shows initial northwestwards movement till 1200 UTC of 29 Oct., then west-southwestward movement upto 01 Nov./0000 over westcentral Arabian Sea.

ARP-Meteo France: Not available.

UKMO: UKMO shows initial west-northwestwards movement till 0000 UTC of 1 Nov., then westwestward movement upto 03 Nov./0000 UTC ending over Gulf of Aden.

Genesis Potential Parameter (GPP): A Genesis Potential Parameter (GPP) forecast based on 00UTC of 29 October 2015 shows a strong potential cyclogenesis zone (Cyclone: Chapala) over east -central and adjoining areas of Arabian Sea. GPP forecast also shows further intensification this cyclonic storm 'CHAPALA' over the Arabian Sea up to 02 Nov 2015 and undergo rapid weakening thereafter before landfall on 00UTC of 03 Nov 2015.

Summary and Conclusion:

Bay of Bengal and Andaman Sea:

No significant system expected during next five days.

Probability of cyclogenesis over Bay of Bengal and Andaman Sea during next 120 hours:

24 HOURS	24-48 HOURS	48-72 HOURS	72-96 hours	96-120 hours
NIL	NIL	NIL	NIL	NIL

Arabian Sea:

The **cyclonic storm, 'Chapala'** over eastcentral and adjoining areas of westcentral & south arabian sea moved west-northwestwards with a speed of about 14 kmph during past 6 hours and lay centered at 0900 UTC of today, the 29th october 2015 over westcentral and adjoining eastcentral & south Arabian sea near latitude 14.0°N and longitude 63.5°E, about 1140 km west-southwest of Mumbai (43003) and about 1060 km east-southeast of Salalah (41316) (Oman). It would move west-northwestwards and intensify into a severe cyclonic storm during next 12 hours and into a very severe cyclonic storm in subsequent 12 hours. It would move west-northwestward and cross north Yemen and adjoining Oman coast between latitude 15.0ºN and 17.0ºN around 1800 UTC of 02 November 2015.

Advisory: NO IOP for next five days.

Status of observational system:

Details of the status of observational systems are given in **Annexure I.**

Annexure-I

Synoptic observation:

Region	Date/Time (UTC)		
	28/12	**29/00**	**29/03**
India	46	30	46
Coastal stations			
WB	8	3	8
Odisha	7	5	7
AP	12	12	12
Tamil Nadu	11	7	11
Puducherry	2	2	2
A & N	6	1	6
Bangladesh	11	11	9
Myanmar	10	11	0
Thailand	2	2	2
SriLanka	8	7	8

AWS Observations:

Region	Date/Time (UTC)		
	28/12	**29/00**	**29/03**
India	35	33	35
Coastal stations			
WB	3	3	3
Odisha	10	9	9
AP	7	7	7
Tamil Nadu	15	14	16
Puducherry	-	-	-
A & N	-	-	-

RS/RW (12Z) of 28/10/2015 **-4/39**
No. of Ascents reaching 250 hPa level: 3, MISDA: 35

RS/RW (00Z) of 29/10/2015- 24**/39**
No. of Ascents reaching 250 hPa level:22, MISDA: 17

No. of PILOT Ascents

28/12Z	29/00Z
3	1

Buoy Data

28/12Z	29/00Z	29/03Z
12	12	11

STATUS OF CHENNAI REGION OBSERVATIONS

No. of Synop data

Date→	28.10.2015											
UTC→	00	01	02	03	04	05	06	07	08	09	10	11
Chennai Region (Coasts of AP & TN)	20	12	12	21	10	12	20	11	10	20	12	12
UTC→	12	13	14	15	16	17	18	19	20	21	22	23
Chennai Region (Coasts of AP & TN)	22	12	12	20	11	12	20	11	10	20	12	12

No. of RS/RW Ascents

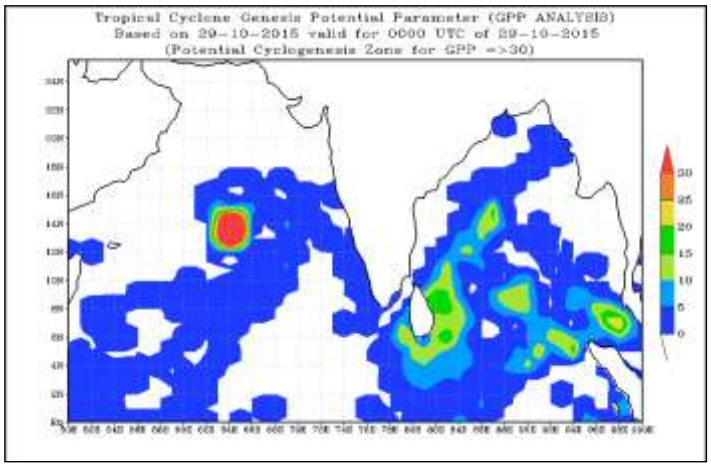
00Z /28.10.2015 : 7
No. of Ascents reaching 250 hPa level = 7
MISDA : 1

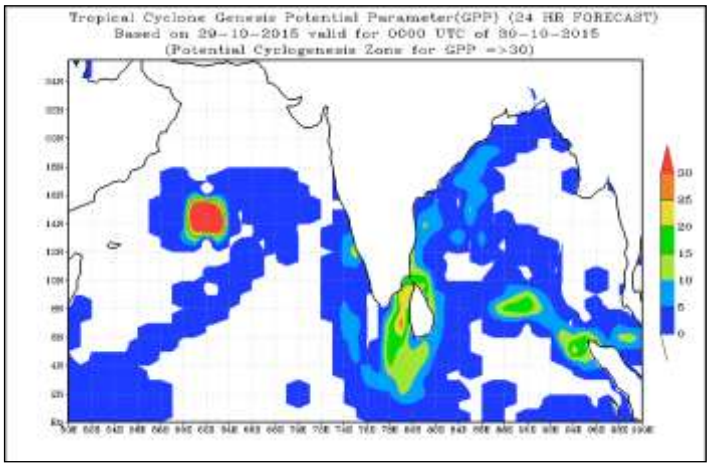
12Z /28.10.2015 : 2
No. of Ascents reaching 250 hPa level =2
MISDA : 6

No. of PILOT Ascents:

28.10.2015	
06Z	18Z
2	2

Annexure-II


Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 29-10-2015 valid for 0000 UTC of 29-10-2015
(Potential Cyclogenesis Zone for GPP =>30)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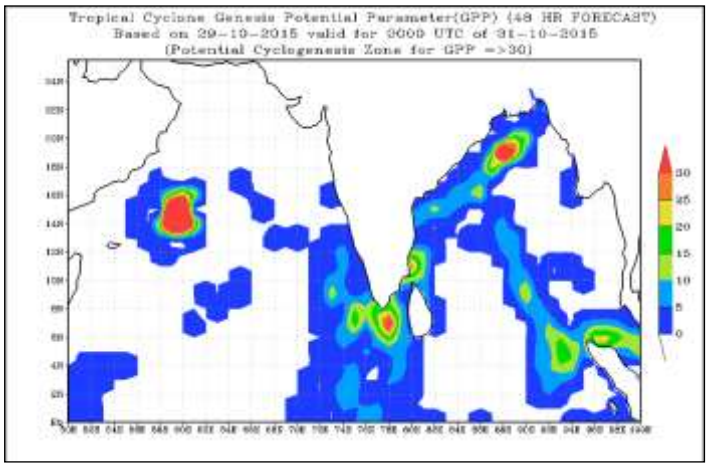
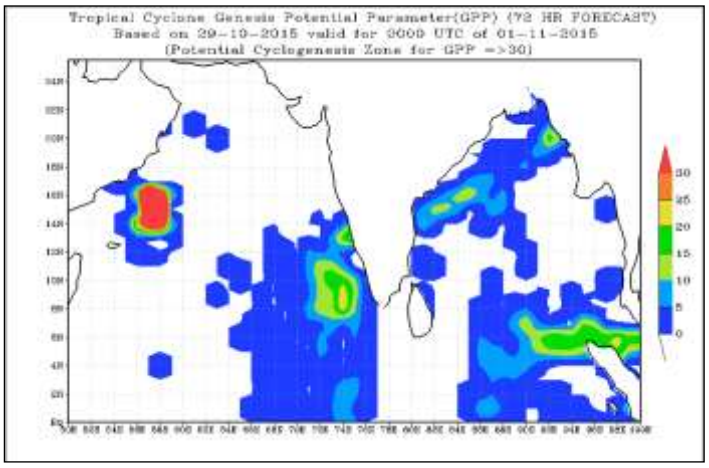
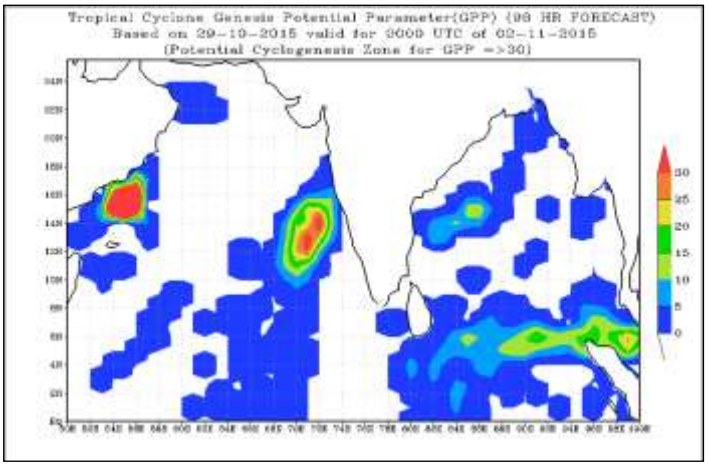
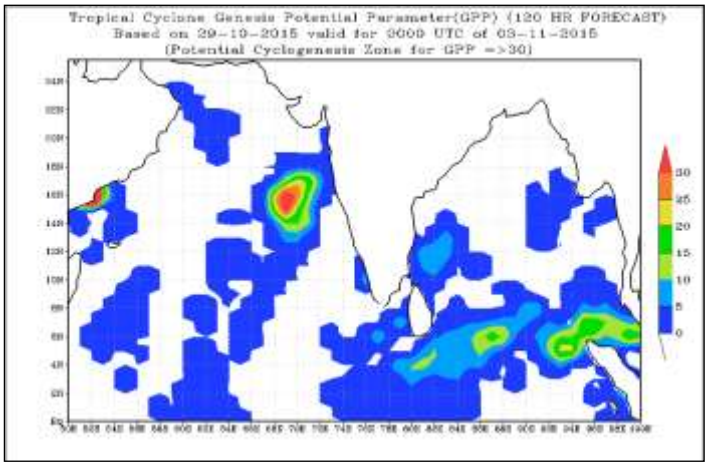
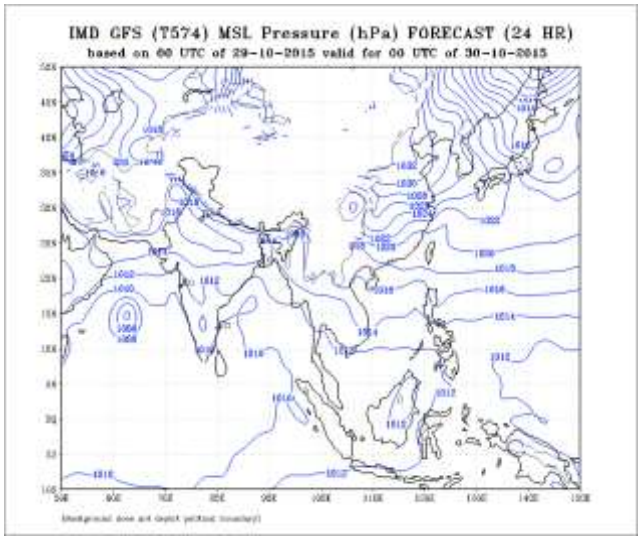
(Potential Cyclogenesis Zone for GPP =>30)

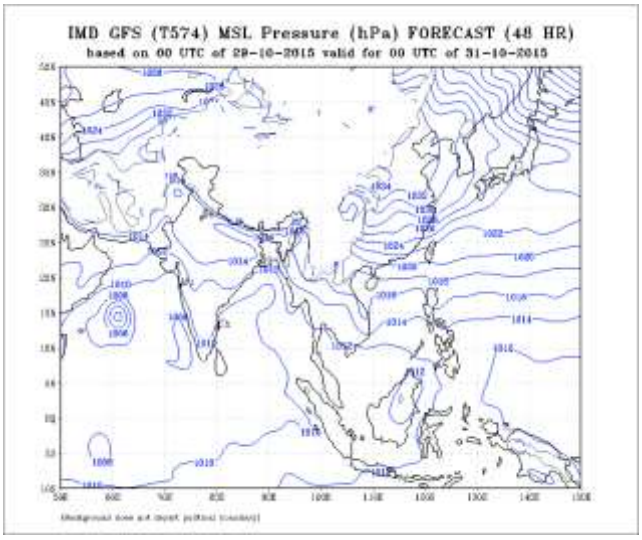

Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
Based on 29-10-2015 valid for 0000 UTC of 31-10-2015
(Potential Cyclogenesis Zone for GPP =>30)

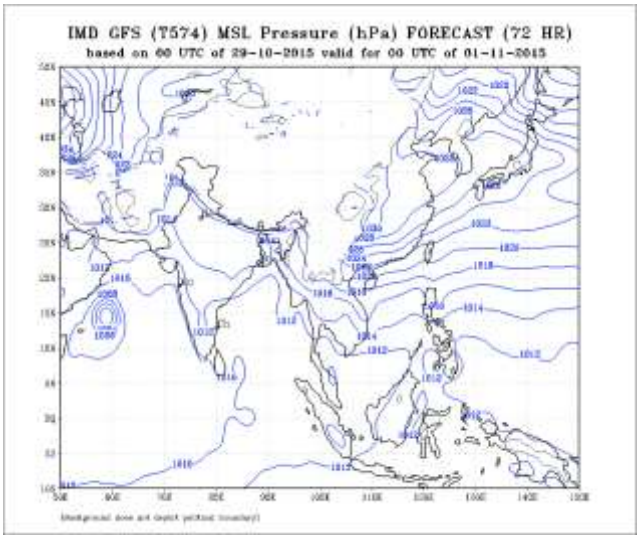

Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 29-10-2015 valid for 0000 UTC of 01-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

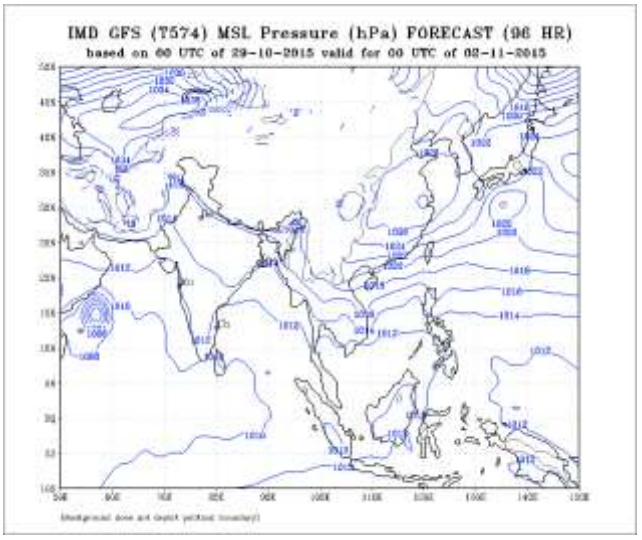

Tropical Cyclone Genesis Potential Parameter(GPP) (96 HR FORECAST)
Based on 29-10-2015 valid for 0000 UTC of 02-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

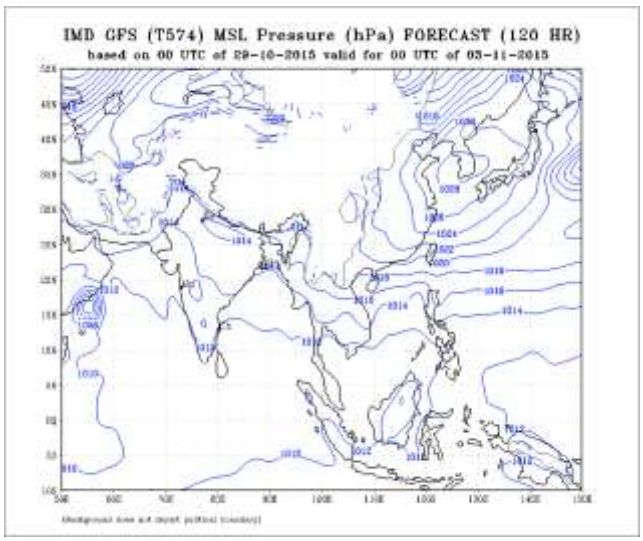

Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 29-10-2015 valid for 0000 UTC of 03-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

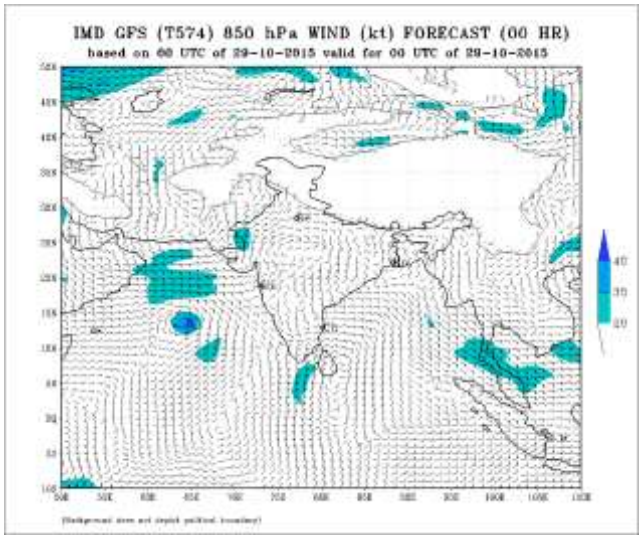

IMD GFS (T574) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 29-10-2015 valid for 00 UTC of 30-10-2015

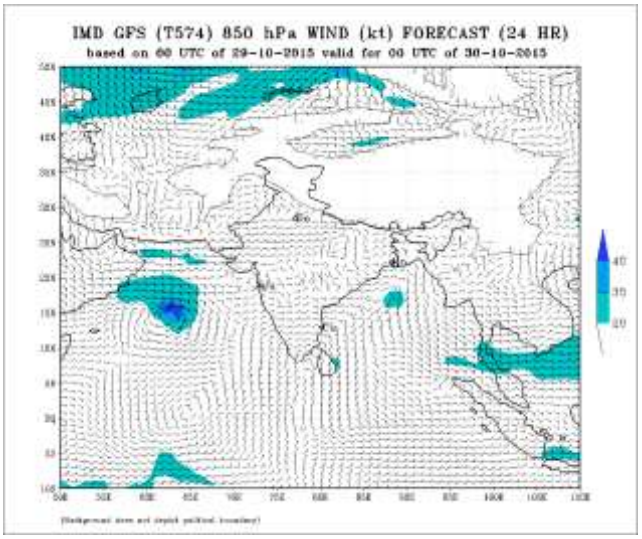

IMD GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 29-10-2015 valid for 00 UTC of 31-10-2015

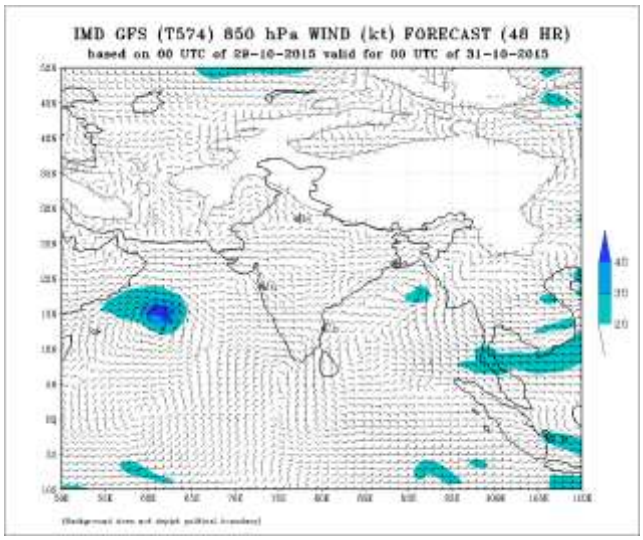

IMD GFS (T574) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 29-10-2015 valid for 00 UTC of 01-11-2015

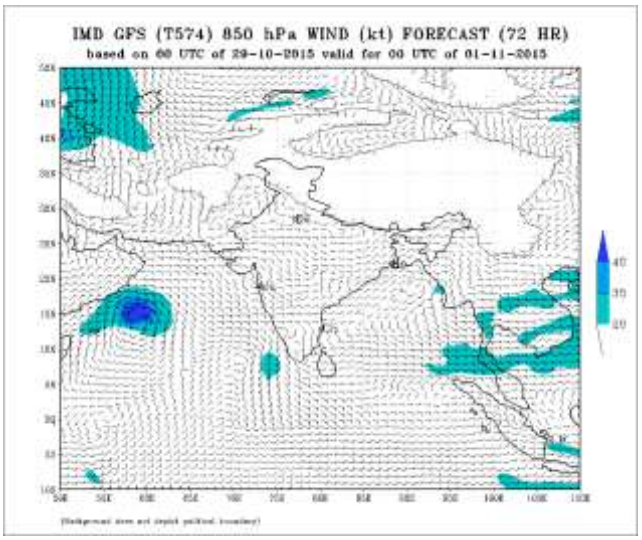

IMD GFS (T574) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 29-10-2015 valid for 00 UTC of 02-11-2015

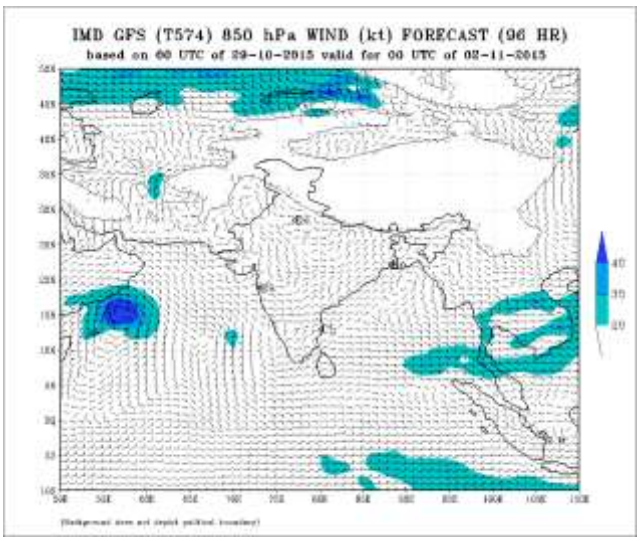

IMD GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 29-10-2015 valid for 00 UTC of 03-11-2015

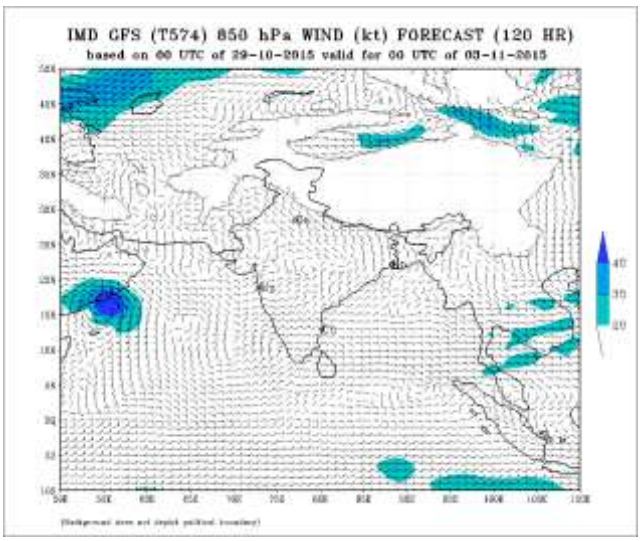

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 29-10-2015 valid for 00 UTC of 29-10-2015

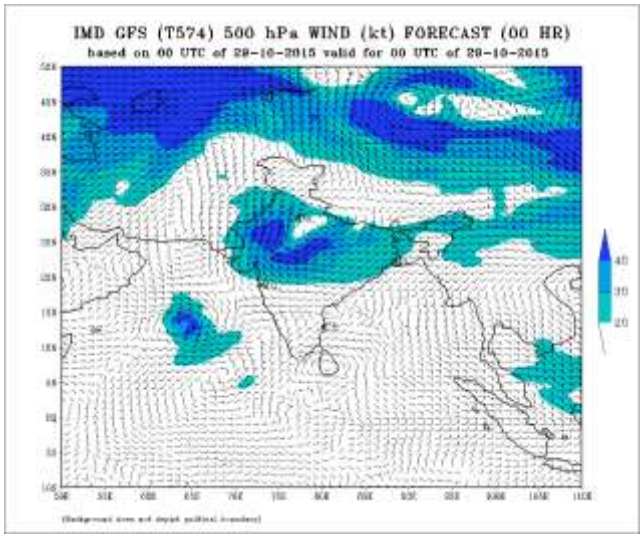

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 29-10-2015 valid for 00 UTC of 30-10-2015

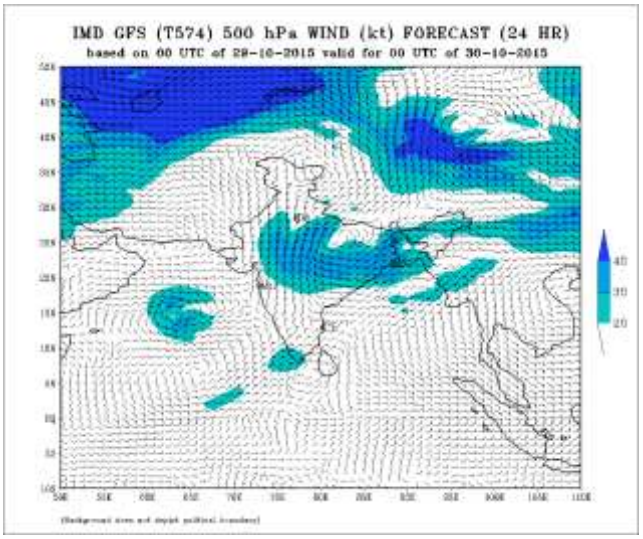

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 29-10-2015 valid for 00 UTC of 31-10-2015

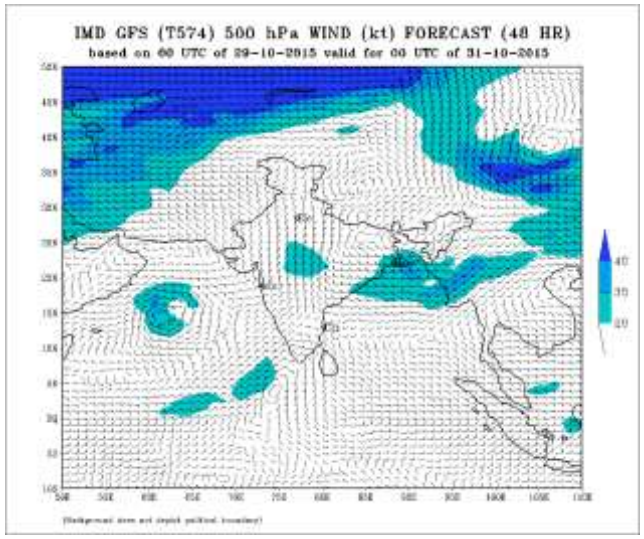

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 29-10-2015 valid for 00 UTC of 01-11-2015

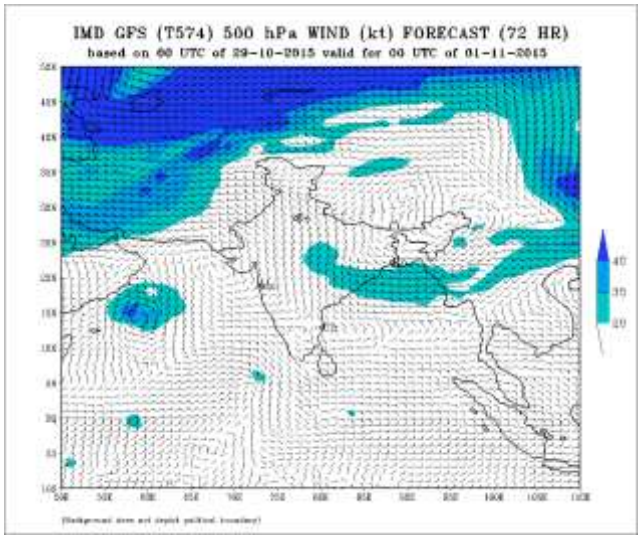

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 29-10-2015 valid for 00 UTC of 02-11-2015

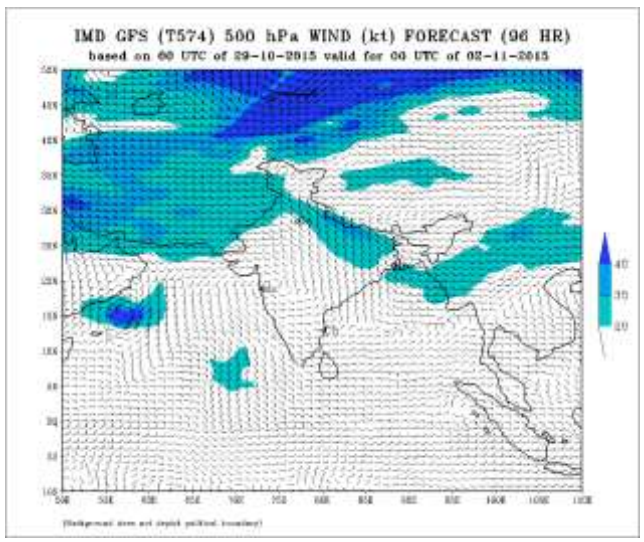

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 29-10-2015 valid for 00 UTC of 03-11-2015

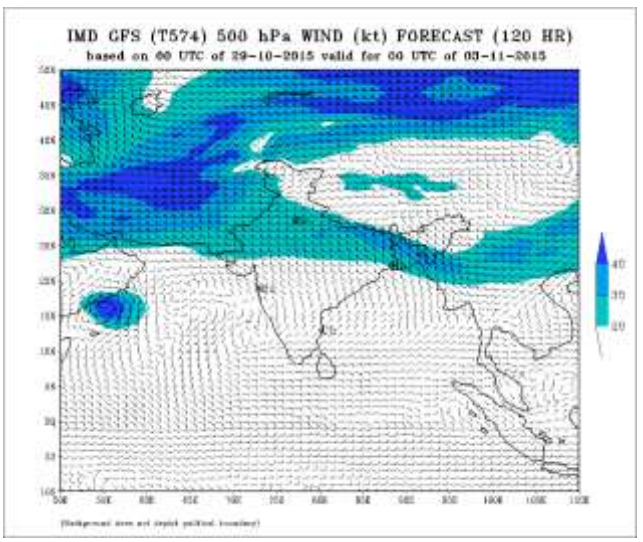

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 29-10-2015 valid for 00 UTC of 29-10-2015


IMD GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 29-10-2015 valid for 00 UTC of 30-10-2015


IMD GFS (T574) 500 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 29-10-2015 valid for 00 UTC of 31-10-2015


IMD GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 29-10-2015 valid for 00 UTC of 01-11-2015


IMD GFS (T574) 500 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 29-10-2015 valid for 00 UTC of 02-11-2015


IMD GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 29-10-2015 valid for 00 UTC of 03-11-2015

FDP (Cyclone) NOC Report Dated 30 October, 2015

Synoptic features based on 0300 UTC of today:

- The Cyclonic Storm, 'Chapala' over eastcentral and adjoining westcentral and south Arabian Sea moved west-northwestwards and intensified into a Severe Cyclonic Storm and lay centered at 1730 hours IST and further intensified into a Very Severe Cyclonic Storm at 2330 hours IST of yesterday. Then It moved westwards and further intensified into an Extremely Severe Cyclonic Storm and lay centred at 0830 hours IST of today, the 30th October 2015 over westcentral Arabian Sea , near Lat.14.3°N/ Long. 61.5°E, about 1320 kms west-southwest of Mumbai and 850 kms east-southeast of Salalah(Oman). It would move westwards and intensify further into a Super Cyclonic Storm during next 24 hours and cross north Yemen and adjoining Oman coast between Lat. 15.0° N and 16.0° N around the midnight of 2nd November 2015. Due to entrainment of dry air and lower Ocean thermal energy over Gulf of Aden and adjoining westcentral Arabian Sea off Yemen and Oman coast, there is possibility of slight weakening of the system before the landfall over north Yemen and adjoining Oman coast.
- The cyclonic circulation extending upto 4.5 kms a.s.l. over Sri Lanka and adjoining areas of southwest Bay of Bengal now lies over Sri Lanka and adjoining Comorin area.

Environmental features based on 0300 UTC of today:

Sea Surface Temperature (SST):

- SST is 29-30°C over entire Bay of Bengal and Andaman Sea.
- SST is more than 32°C off northern west coast of India and 29-31°C over entire Arabian Sea.

Tropical Cyclone Heat Potential (TCHP):

- The Ocean thermal energy is about 60-80 kJ/cm2 around the system centre and it decreases to the west of 60 degree east.
- TCHP is 110-120 kJ/cm2 off Karnataka-Kerala coast.
- TCHP is about 110-120 kJ/cm2 over equatorial Indian Ocean and southwest BoB.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive ($30\text{-}40*10^{-5}s^{-1}$) over eastern parts of southwest BOB.
- Relative vorticity at 850 hPa is positive ($250*10^{-5}s^{-1}$) around the system centre over Arabian Sea

Convergence:

- Lower level convergence is $30*10^{-5}s^{-1}$ over westcentral BoB. Lower level convergence is positive ($30*10^{-5}s^{-1}$) around the system centre over AS.

Divergence:

- Upper level divergence is $30*10^{-5}s^{-1}$ over westcentral BoB and is $20*10^{-5}s^{-1}$ over Comorin area.
- Upper level divergence is positive ($40*10^{-5}s^{-1}$) around the system centre over AS.

Wind Shear:

- Wind shear is 20-30 knots over westcentral BoB.
- Wind shear is 5-10 knots around the system centre. It is 10-20 knots to the west and west-northwest.

Wind Shear Tendency:

- The vertical wind shear tendency is decreasing (-10 to -20 knots) over some parts of westcentral BoB.
- The vertical wind shear tendency is decreasing (-10 to -20 knots) north of the system centre over AS.

Upper tropospheric ridge:

- The upper tropospheric ridge at 200 hPa runs along 15.0°N over BOB and AS.

M.J.O. Index:

- MJO index lies over Phase 2 with amplitude greater than 2.0 and would continue in the same phase for next 5 days. It is highly favourable for intensification of the system.

Storms and Depression over South China Sea/ South Indian Ocean:

NIL

Satellite:

Inference based on INSAT imagery of **300900** UTC:

Bay of Bengal & Andaman Sea:-

Low level circulation:- Broken low and medium clouds with embedded moderate to intense convection over southwest BoB bet lat 5.0°N to 11.0°N and long 77.0°E to 86.0°E and south coastal Tamil Nadu, Gulf of Mannar, Palk Strait, Comorin area and Sri Lanka in association with the low level circulation area over the area.

Arabian Sea:-

According to satellite imagery, intensity is T 6.0 and convective cloud shows eye pattern with well-defined eye of diameter about 15 km and eye temperature is +12.7°C. Associated low and medium clouds with embedded intense to very intense convective clouds over area between lat 11.0 degree north to 16.5 degree north and longitude 58.0 degree east to 64.0 degree east. Lowest cloud top temperature is minus 80 degree c.

NWP Input for FDP Cyclone based on 0000 UTC of today

NWP Analysis

IMD-GFS: The model indicates nearly westward movement of the system till 02/1200 UTC and then west-northwestwards movement reaching 14.5°N/52.0°E by 03/0000.

IMD-WRF: IMD-WRF model forecasts shows track similar to JMA.

IMD-NWP products are available at:

http://202.54.31.51/bias/gfsproducts.php
http://202.54.31.51/bias/wrf27pro.php
http://202.54.31.51/bias/potentialparameter.php

NCMRWF-UM: NA

NCMRWF-GFS: NCMRWF-GFS model shows southwestward movement upto 02 Nov./0000 UTC and then northwestward movement and crossing coast near 15.2°N around 03/1200 UTC.

NGEFS: NA

NCEP-GFS: NCEP-GFS model suggest westward movement upto 31/1200 UTC, then west-northwestwards movement and crossing coast near 16°N (Yemen coast) around 0000 UTC of 3rd Nov.

ECMWF:
ECMWF Model predicts southwestwards movement till 31/0000 UTC, westwards till 01/0000 and then west-northwestwards crossing Yemen coast near 15.3°N with slight weakening before landfall.
JMA: JMA Model shows west-southwestwards movement till 01/0000 UTC, then westward movement upto 02 Nov./0000 and then west-northwestwards upto 02/1200 UTC reaching 14.0/51.0.
ARP-Meteo France: Not available.
UKMO: UKMO shows initial westwards movement till 02/1200 UTC., then west-northwestward and crossing coast near 14.7°N by 03/0000.

Summary and Conclusion:

Bay of Bengal and Andaman Sea:
No significant system expected during next five days.

Probability of cyclogenesis over Bay of Bengal and Andaman Sea during next 120 hours:

24 HOURS	24-48 HOURS	48-72 HOURS	72-96 hours	96-120 hours
NIL	NIL	NIL	NIL	NIL

Arabian Sea:
The extremely severe cyclonic storm, 'Chapala' over westcentral Arabian sea moved west-southwestwards with a speed of about 12 kmph during past 6 hours, slightly intensified further and lay centered at 0900 UTC of today, the 30th October 2015 near latitude 14.2°N and longitude 60.8°E, about 1390 km west-southwest of Mumbai (43003) and about 780 km east-southeast of Salalah (41316) (Oman). It would move westwards, intensify further during next 12 hours and cross Yemen and adjoining Oman coast between latitude 15.0°N and 16.0°N around midnight of 2nd November, 2015. Due to entrainment of dry air and lower ocean thermal energy over Gulf of Aden and adjoining westcentral Arabian Sea off Yemen and Oman coast, there is possibility of slight weakening of the system before the landfall over Yemen and adjoining Oman coast.

Advisory: NO IOP for next five days.
Status of observational system:
Details of the status of observational systems are given in **Annexure I.**

Annexure-I

Status of observational system:

Synoptic observation:

Region	Date/Time (UTC)		
	29/	**30/**	**30/03**
India	46	31	46
Coastal stations			
WB	8	3	8
Odisha	7	5	7
AP	12	12	12
Tamil	11	8	11
Puducher	2	2	2
A & N	6	1	6
Banglade	11	9	10
Myanmar	11	9	0
Thailand	2	2	2
SriLanka	8	7	8

AWS Observations:

Region	Date/Time (UTC)		
	29/	**30/0**	**30/0**
India	34	34	26
Coastal stations			
WB	3	3	2
Odisha	8	8	7
AP	7	7	7
Tamil	16	16	10
Puducher	-	-	-
A & N	-	-	-

RS/RW (12Z) of 29/10/2015 **-4/39**
No. of Ascents reaching 250 hPa level: 3, MISDA: 35

RS/RW (00Z) of 29/10/2015- **21/39**
No. of Ascents reaching 250 hPa level:21, MISDA: 4

No. of PILOT Ascents

29/12Z	30/00Z
6	4

Buoy Data

29/12	30/00Z	30/03Z
11	10	11

STATUS OF CHENNAI REGION OBSERVATIONS

No. of Synop data

Date→	28.10.2015											
UTC→	00	01	02	03	04	05	06	07	08	09	10	11
Chennai Region (Coasts of AP & TN)	20	11	12	20	12	12	20	12	12	20	12	12
UTC→	12	13	14	15	16	17	18	19	20	21	22	23
Chennai Region (Coasts of AP & TN)	21	12	12	20	12	12	20	12	12	20	12	12

No. of RS/RW Ascents

00Z /29.10.2015 : 6
No. of Ascents reaching 250 hPa level = 6
MISDA : 2

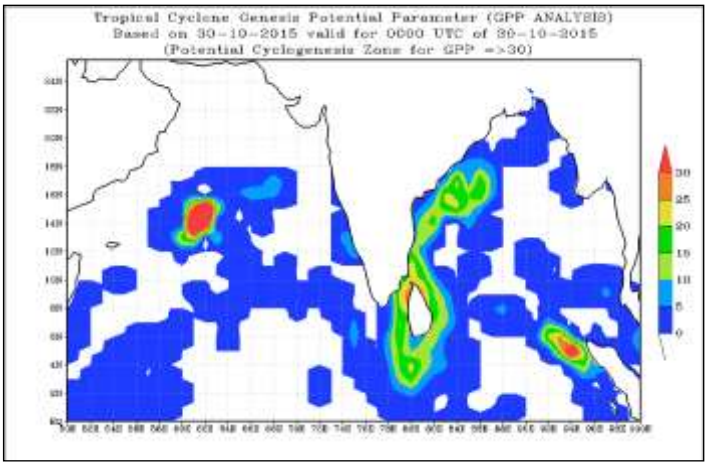
12Z /29.10.2015 : 0
No. of Ascents reaching 250 hPa level = 3
MISDA : 0

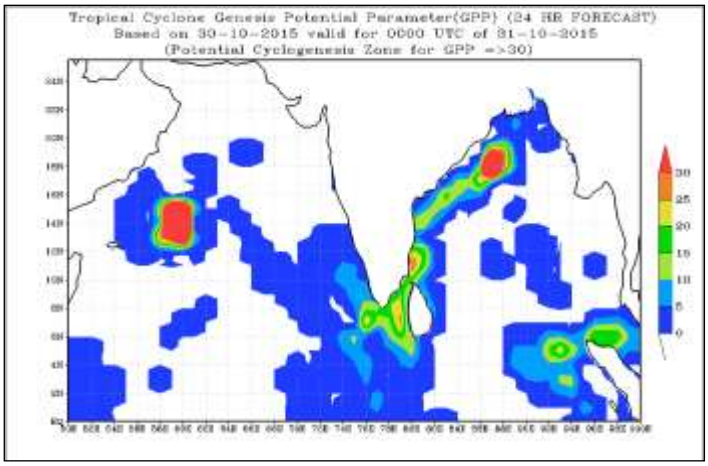
No. of PILOT Ascents:

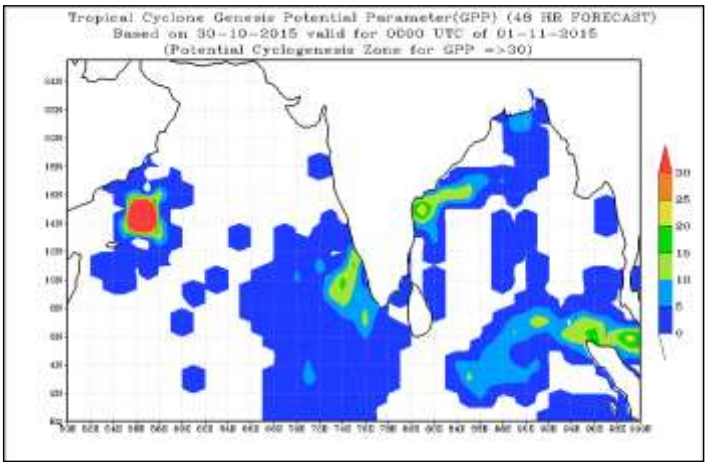
29.10.2015

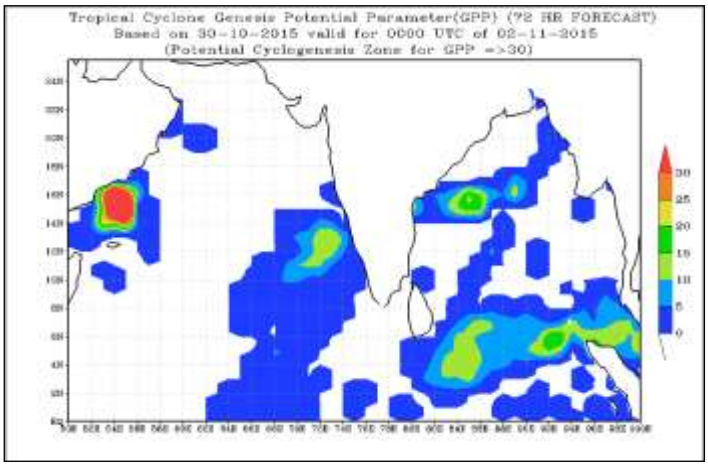
06Z	18Z
3	3

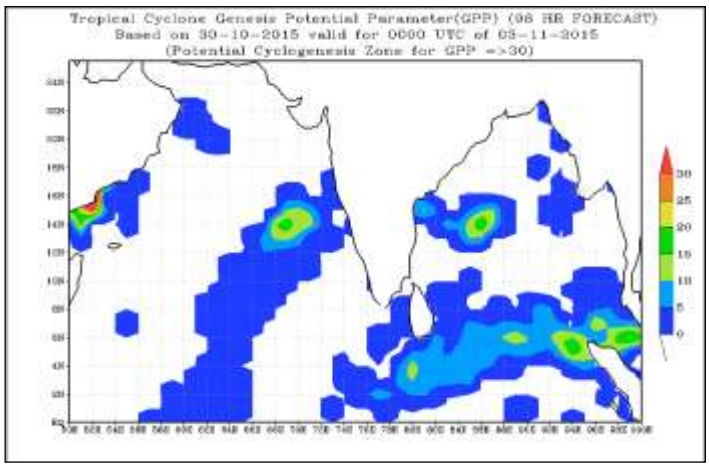
Annexure-II

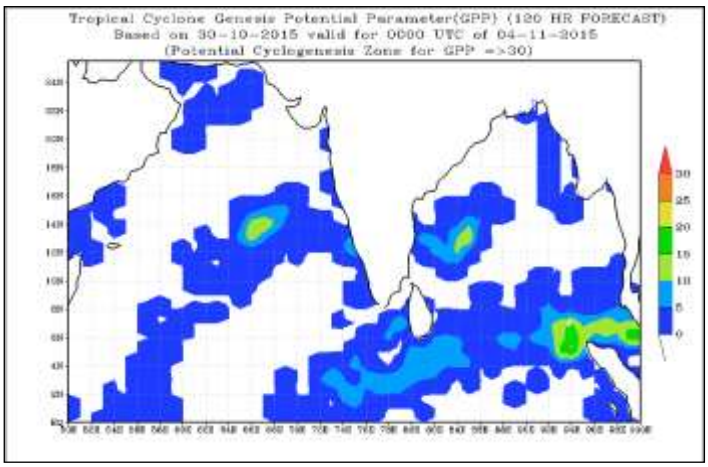

Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 30-10-2015 valid for 0000 UTC of 30-10-2015
(Potential Cyclogenesis Zone for GPP =>30)

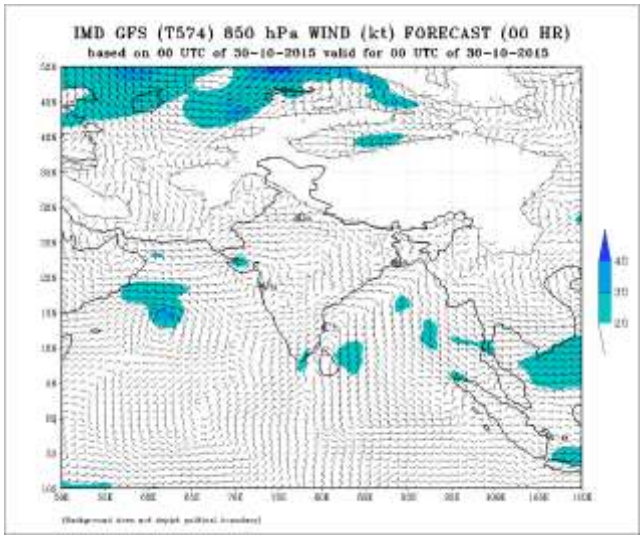

Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 30-10-2015 valid for 0000 UTC of 31-10-2015
(Potential Cyclogenesis Zone for GPP =>30)

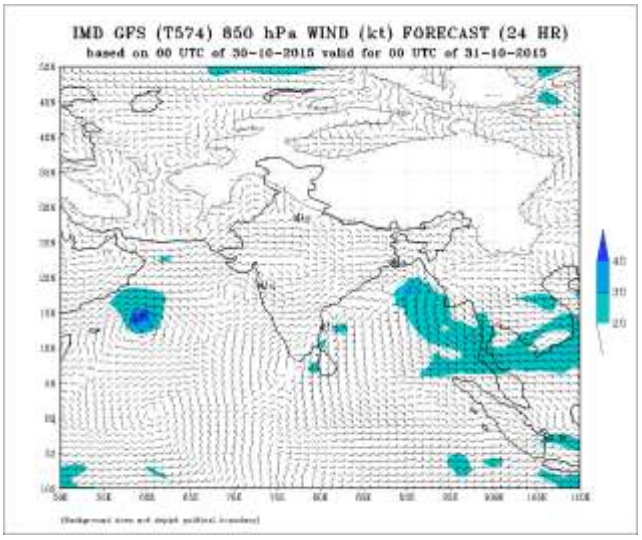

Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
Based on 30-10-2015 valid for 0000 UTC of 01-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

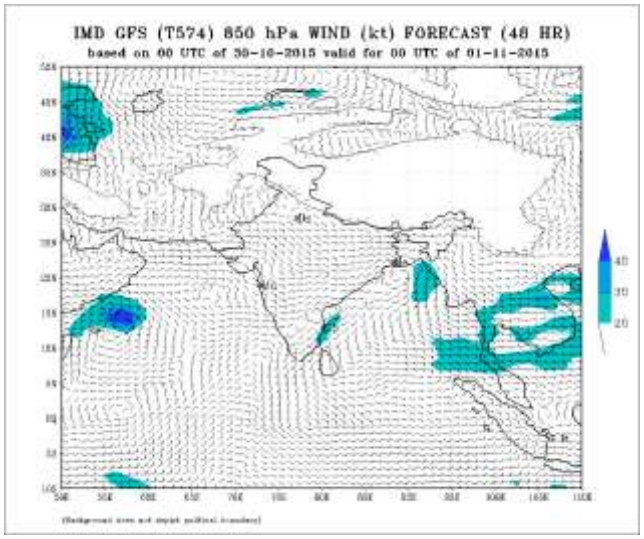

Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 30-10-2015 valid for 0000 UTC of 02-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

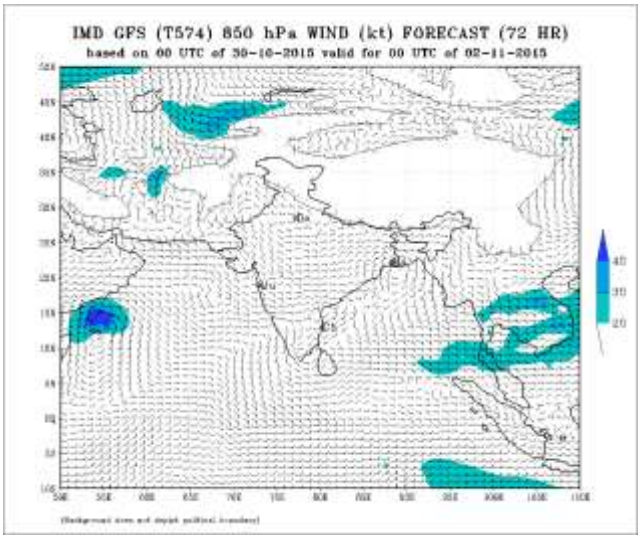

Tropical Cyclone Genesis Potential Parameter(GPP) (96 HR FORECAST)
Based on 30-10-2015 valid for 0000 UTC of 03-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

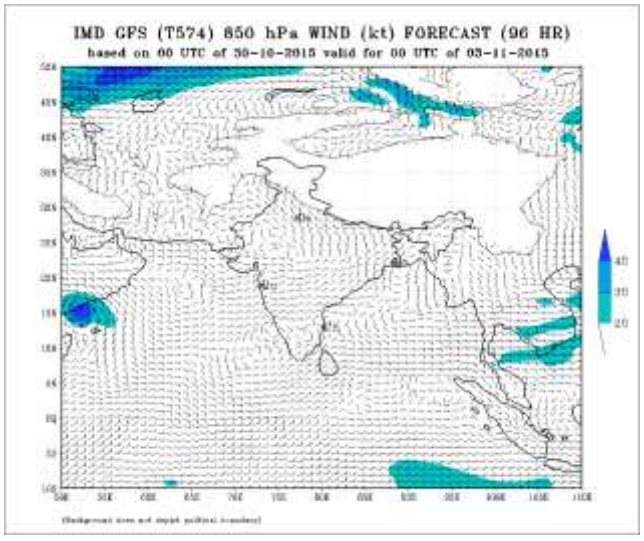

Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 30-10-2015 valid for 0000 UTC of 04-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

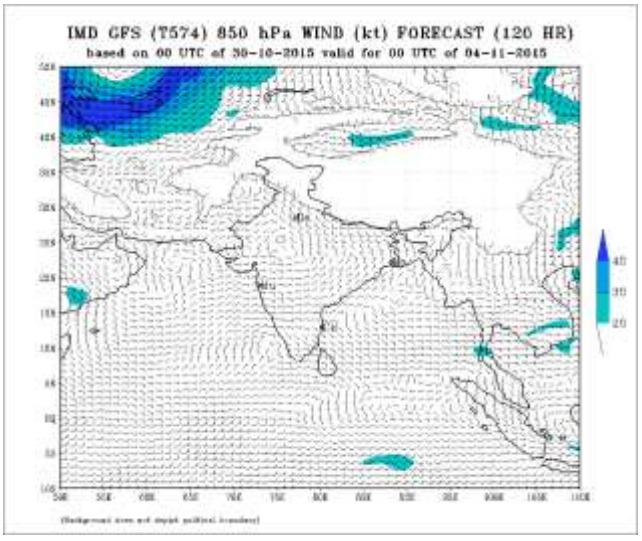

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 30-10-2015 valid for 00 UTC of 30-10-2015

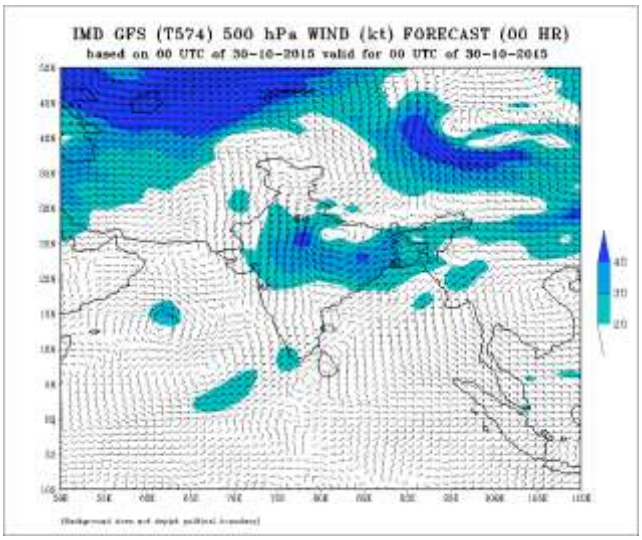

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 30-10-2015 valid for 00 UTC of 31-10-2015

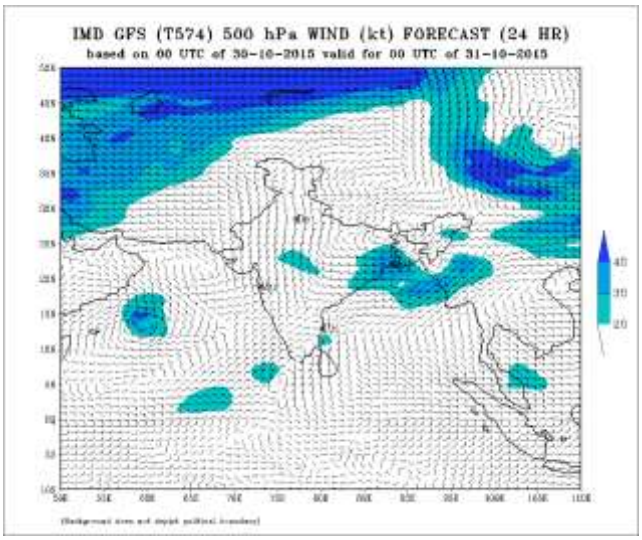

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 30-10-2015 valid for 00 UTC of 01-11-2015

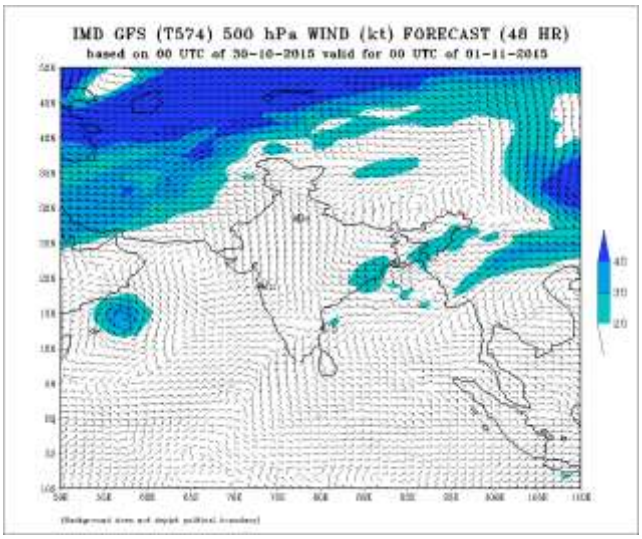

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 30-10-2015 valid for 00 UTC of 02-11-2015

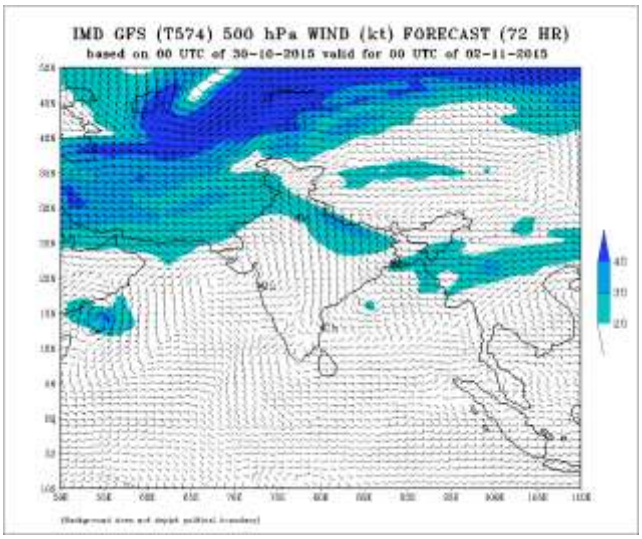

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 30-10-2015 valid for 00 UTC of 03-11-2015

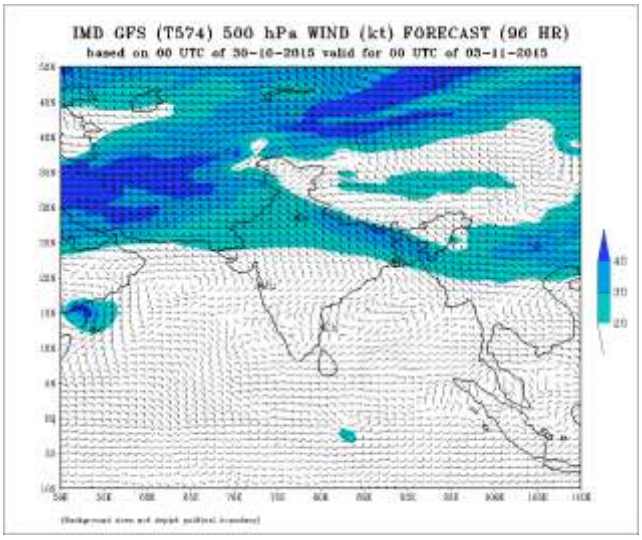

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 30-10-2015 valid for 00 UTC of 04-11-2015

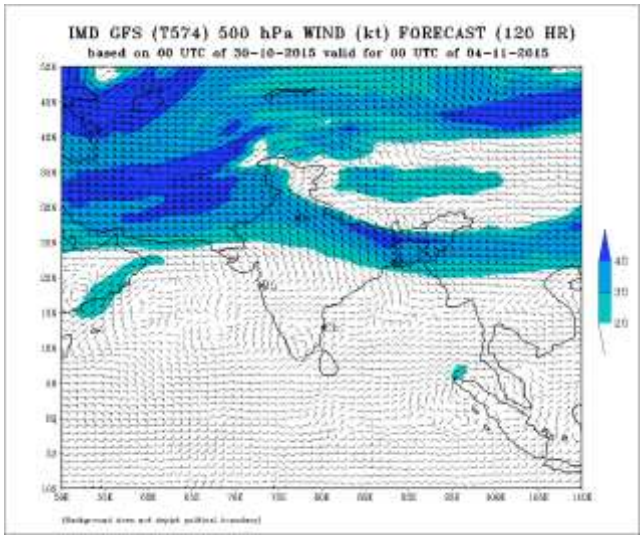

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 30-10-2015 valid for 00 UTC of 30-10-2015

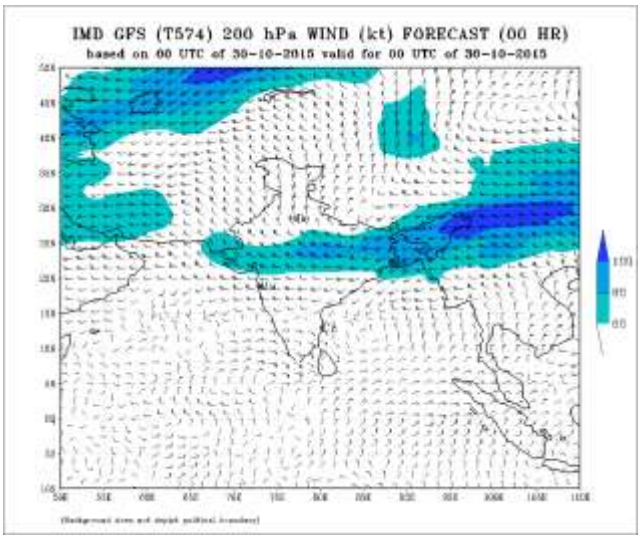

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 30-10-2015 valid for 00 UTC of 31-10-2015

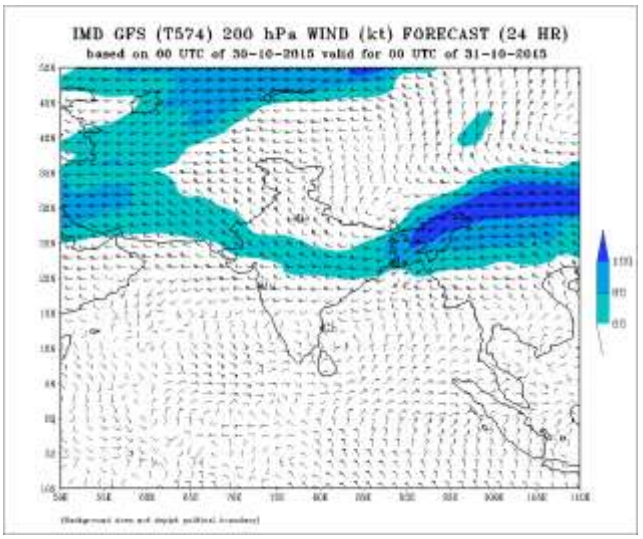

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 30-10-2015 valid for 00 UTC of 01-11-2015

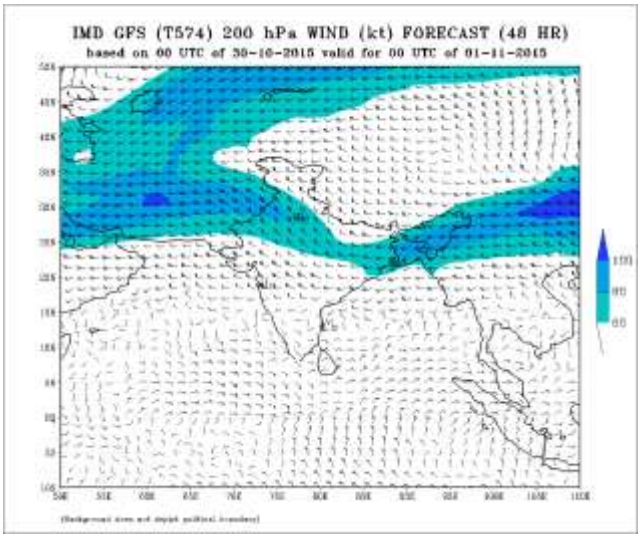

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 30-10-2015 valid for 00 UTC of 02-11-2015

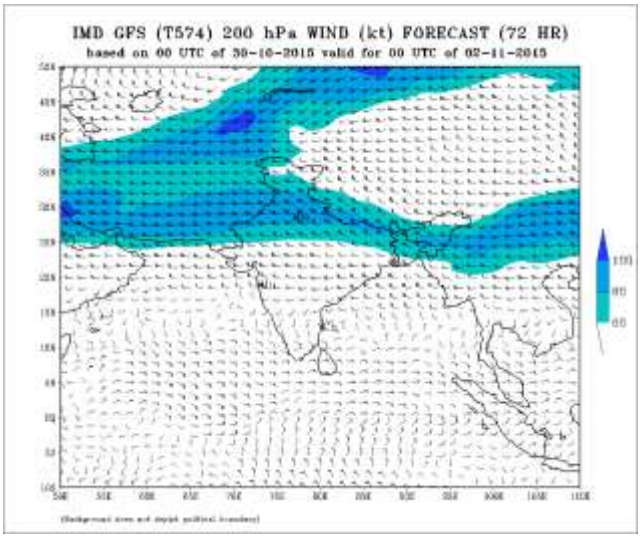

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 30-10-2015 valid for 00 UTC of 03-11-2015

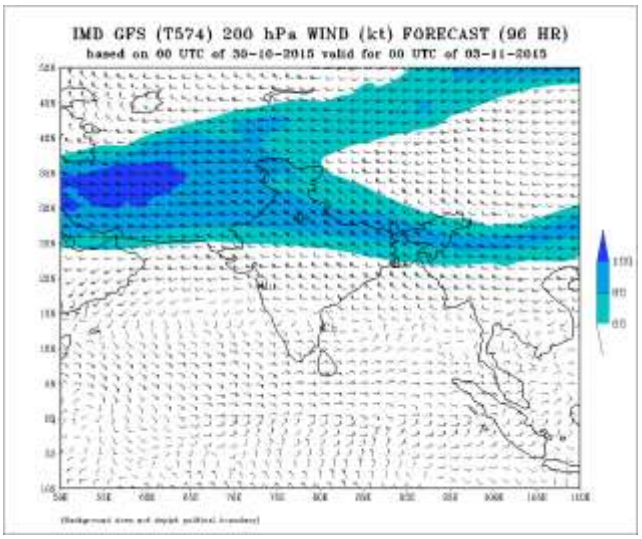

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 30-10-2015 valid for 00 UTC of 04-11-2015

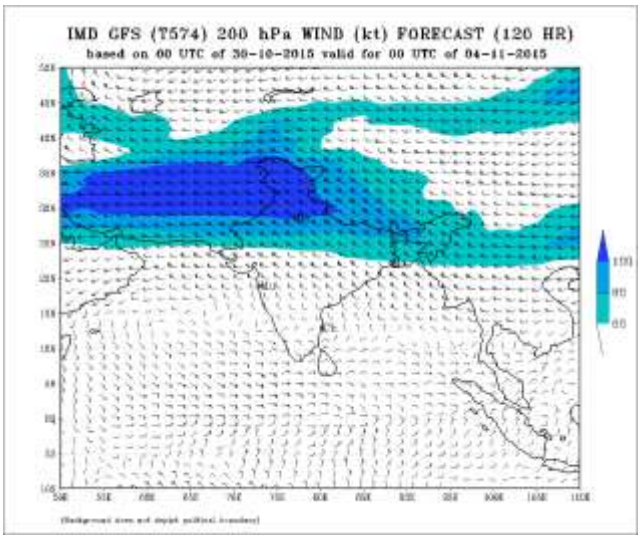

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 30-10-2015 valid for 00 UTC of 30-10-2015


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 30-10-2015 valid for 00 UTC of 31-10-2015


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 30-10-2015 valid for 00 UTC of 01-11-2015


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 30-10-2015 valid for 00 UTC of 02-11-2015


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 30-10-2015 valid for 00 UTC of 03-11-2015


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 30-10-2015 valid for 00 UTC of 04-11-2015

FDP (Cyclone) NOC Report Dated 31 October, 2015

Synoptic features based on 0300 UTC of today:

- The Extremely Severe Cyclonic Storm 'CHAPALA' over westcentral Arabian Sea moved west-southwestwards and lay centered at 0830 hrs IST of today, the 31st October 2015 near Lat. 13.8° N / Long. 59.2° E, about 1560 kms west-southwest of Mumbai and 650 kms southeast of Salalah (Oman). It would move nearly westwards during next 24 hours and then west northwestwards and cross Yemen and adjoining Oman coast near Lat. 15.0° N around midnight of 2nd November 2015. Due to entrainment of dry air and lower Ocean thermal energy to the west of the system, the Extremely Severe Cyclonic Storm 'CHAPALA' would weaken gradually into a Very Severe Cyclonic Storm during next 24 hours, further into a Severe Cyclonic Storm in the subsequent 24 hours and cross Yemen and adjoining Oman coast as a Severe Cyclonic storm.
- The cyclonic circulation over Sri Lanka and adjoining Comorin area now lies over Comorin area and neighbourhood and extends upto 5.8 kms a.s.l.

Environmental features based on 0300 UTC of today:

Sea Surface Temperature (SST):

- SST is 29-30°C over entire Bay of Bengal and Andaman Sea.
- SST is 29-30°C over entire Arabian Sea except for west coast of India where it is 30-31°C off west coast of India.

Tropical Cyclone Heat Potential (TCHP):

- The Ocean thermal energy is about 50-70 kJ/cm^2 around the system centre and it decreases to the west.
- TCHP is 110-120 kJ/cm2 off Karnataka-Kerala coast.
- TCHP is about 110-120 kJ/cm2 over equatorial Indian Ocean and some parts of south BoB.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive ($100*10^{-5}s^{-1}$) over westcentral BOB off north Andhra-Odisha coast.
- Relative vorticity at 850 hPa is positive ($250*10^{-5}s^{-1}$) around the system centre over Arabian Sea

Convergence:

- Lower level convergence is $20*10^{-5}s^{-1}$ over westcentral BoB off north Andhra-Odisha coast and $10\text{-}15*10^{-5}s^{-1}$ over remaining east coast and Comorin area.
- Lower level convergence is positive ($30*10^{-5}s^{-1}$) around the system centre over AS.

Divergence:

- Upper level divergence is $30*10^{-5}s^{-1}$ over westcentral BoB off north Andhra-Odisha coast and is $10\text{-}20*10^{-5}s^{-1}$ over remaining east coast and Comorin area.
- Upper level divergence is positive ($30*10^{-5}s^{-1}$) around the system centre over AS.

Wind Shear:

- Wind shear is 30-60 knots over westcentral and north BoB.
- The vertical wind shear around the system centre has slightly increased and is about 10-15 knots. It is 10-20 knots to the west and west-northwest.

Wind Shear Tendency:

- The vertical wind shear tendency is decreasing (-5 to -10 knots) over some parts of north BoB.
- The vertical wind shear tendency is increasing (5 to 10 knots) to the west and south of the system centre over AS.

Upper tropospheric ridge:

- The upper tropospheric ridge at 200 hPa runs along 16.0°N over BOB and AS.

M.J.O. Index:

- MJO index lies over Phase 2 with amplitude greater than 2.0 and would continue in the same phase for next 5 days.

Storms and Depression over South China Sea/ South Indian Ocean:

NIL

Satellite:

Inference based on INSAT imagery of **310900** UTC:

Bay of Bengal & Andaman Sea:-

Low level circulation:- Broken low and medium clouds with embedded moderate to intense convection over Comorin area and neighbourhood in association with the low level circulation area over the area. Broken low and medium clouds with embedded moderate to intense convection over North, central & southwest BoB & isolated convection over Andaman Sea.

Arabian Sea:-

According to satellite imagery, intensity is T 5.0/CI 6.0 and convective cloud shows ragged eye pattern and eye temperature is -18.0°C. Associated broken low and medium clouds with embedded intense to very intense convective clouds over area between lat 11.5 degree north to 17.0 degree north and longitude 56.0 degree east to 62.5 degree east. Minimum wall cloud region temperature is minus 80°C.

NWP Input for FDP Cyclone based on 0000 UTC of today

NWP Analysis

IMD-GFS: The model indicates nearly westward movement of the system till 03/0000 UTC reaching 14.0°N/52.0°E.

IMD-WRF: IMD-WRF model forecasts indicates westward movement and then southwestward movement towards Gulf of Aden.

IMD-NWP products are available at:

http://202.54.31.51/bias/gfsproducts.php
http://202.54.31.51/bias/wrf27pro.php
http://202.54.31.51/bias/potentialparameter.php

NCMRWF-UM: The model indicates that the system would move in a west-northwesterly direction till 0000 UTC of 3 Nov towards Yemen coast.

NCMRWF-GFS: NCMRWF-GFS model shows westward movement upto 02/0000 UTC , then southwestward movement and further west-northwestward movement and crossing coast near 13.0°N around 03/0000 UTC.

NCEP-GFS: NCEP-GFS model suggest westward movement upto 02/1200 UTC, then northwestwards movement and crossing coast near 15°N/51°E (Yemen coast) around 0000 UTC of 3rd Nov.

ECMWF:

ECMWF Model predicts westward movement till 02/0000 UTC, and then west-northwestwards crossing Yemen coast near 15.0°N with slight weakening before landfall.

JMA: JMA Model shows west-southwestwards movement till 01/1200 UTC, then west-northwestwrdward movement upto 03 Nov./0000 reaching 14.0/50.0.

ARP-Meteo France: Not available.

UKMO: UKMO shows nearly westwards movement till 02/1200 UTC., then west-northwestward crossing coast near 14.2°N/49.8°E by 03/0000.

Summary and Conclusion:

Bay of Bengal and Andaman Sea:

No significant system expected during next five days.

Probability of cyclogenesis over Bay of Bengal and Andaman Sea during next 120 hours:

24 Hours	24-48 Hours	48-72 Hours	72-96 Hours	96-120 Hours
NIL	NIL	NIL	NIL	NIL

Arabian Sea:

The Extremely severe cyclonic storm 'Chapala would move nearly westwards during next 24 hours and then west-northwestwards and cross yemen coast near latitude 15.0°N around 1800 UTC OF 2ND november, 2015. Due to entrainment of dry air and lower ocean thermal energy, the extremely severe cyclonic storm would weaken gradually into a very severe cyclonic storm during next 24 hours, further into a severe cyclonic storm in subsequent 24 hours and would cross Yemen coast as a severe cyclonic storm.

Advisory: NO IOP for next five days.

Status of observational system:

Details of the status of observational systems are given in **Annexure I.**

Annexure-I

Status of observational system:

Synoptic observation:

Region	Date/Time (UTC)		
	30/12	**31/00**	**31/03**
India	62	53	67
Coastal stations			
WB	8	3	8
Odisha	7	5	7
AP	13	13	13
Tamil Nadu	11	8	11
Puducherry	2	2	2
A & N	7	1	6
Bangladesh	4	11	10
Myanmar	0	11	1
Thailand	2	2	2
SriLanka	8	6	7

AWS Observations:

Region	Date/Time (UTC)		
	30/12	**31/00**	**31/03**
India	34	34	26
Coastal stations			
WB	3	3	2
Odisha	8	8	7
AP	7	7	7
Tamil Nadu	16	16	10
Puducherry	-	-	-
A & N	-	-	-

RS/RW (12Z) of 30/10/2015 **-4/39**
No. of Ascents reaching 250 hPa level: 3, MISDA: 35

RS/RW (00Z) of 31/10/2015- **20/39**
No. of Ascents reaching 250 hPa level:2, MISDA: 5

No. of PILOT Ascents

30/12Z	31/00Z
4	5

Buoy Data

30/12Z	31/00Z	31/03Z
11	10	12

STATUS OF CHENNAI REGION OBSERVATIONS

No. of Synop data

Date→				**30.10.2015**				
UTC→	**00**	**03**	**06**	**09**	**12**	**15**	**18**	**21**
Chennai Region (Coasts of AP & TN)	**20**	**22**	**20**	**20**	**22**	**20**	**20**	**20**

No. of RS/RW Ascents

00Z /30.10.2015 : 6
No. of Ascents reaching 250 hPa level = 6
MISDA : 2

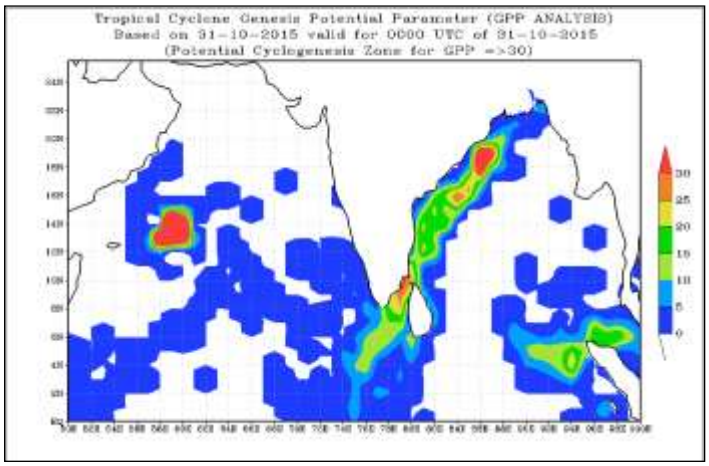
12Z /30.10.2015 : 0
No. of Ascents reaching 250 hPa level =0
MISDA : 8

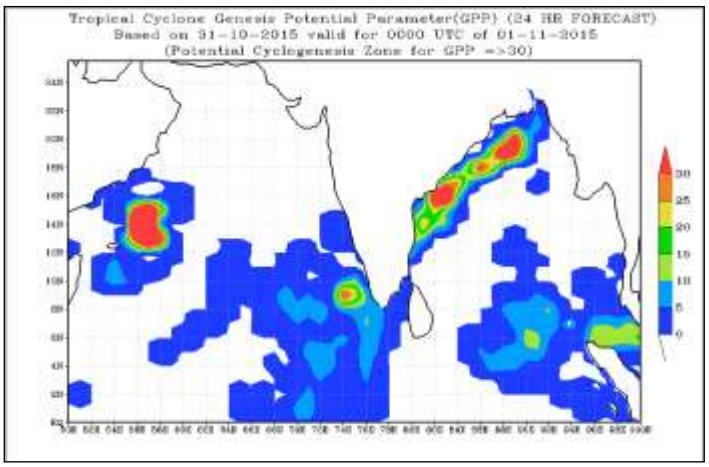
No. of PILOT Ascents:

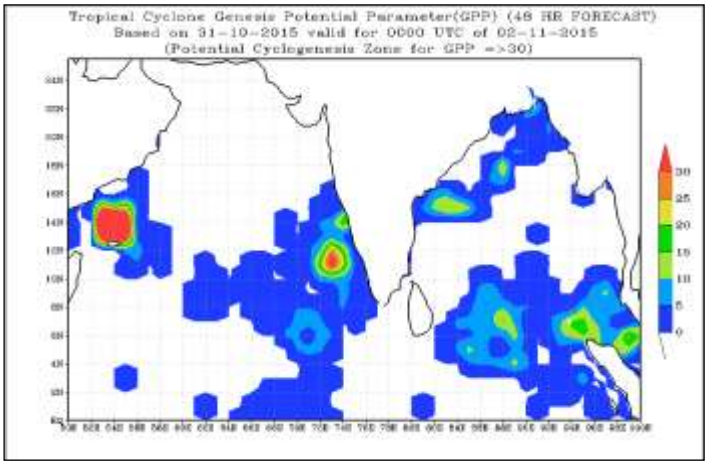
30.10.2015

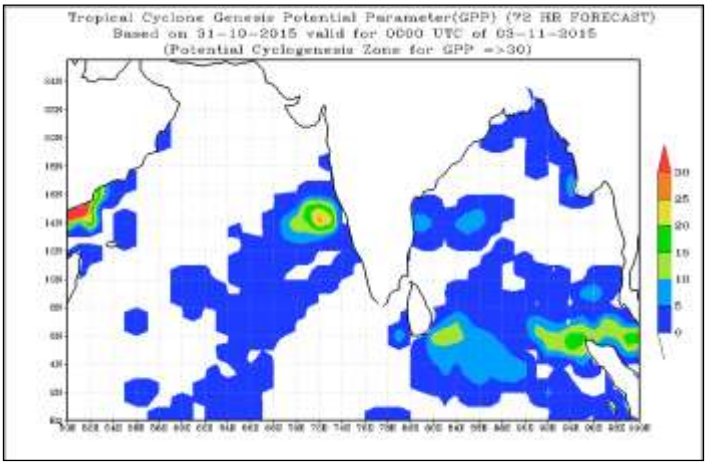
06Z	18Z
3	5

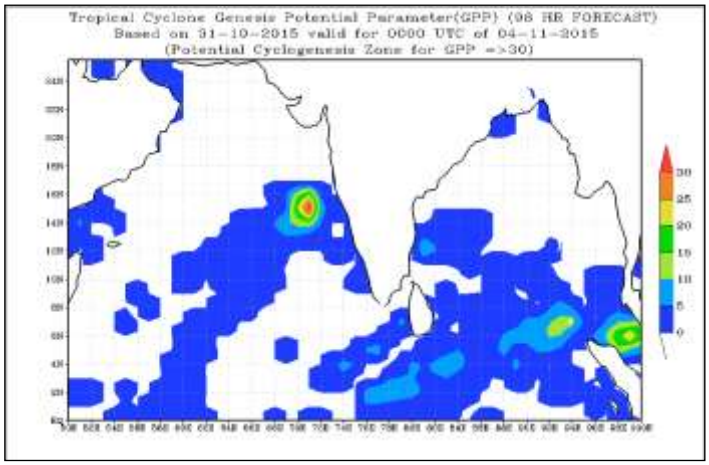
Annexure-II

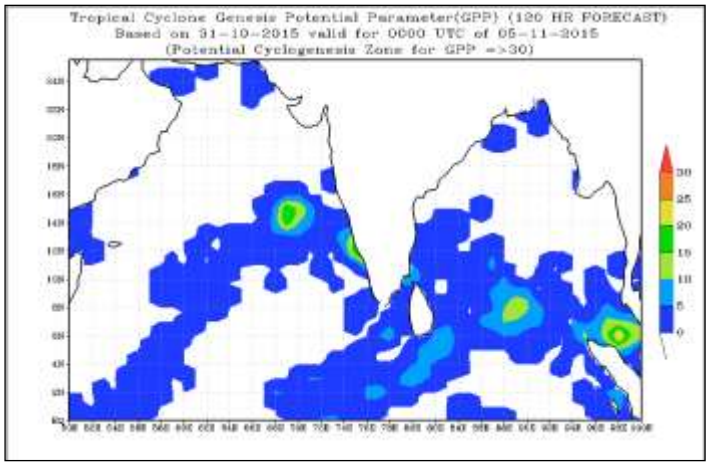

Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 31-10-2015 valid for 0000 UTC of 31-10-2015
(Potential Cyclogenesis Zone for GPP =>30)

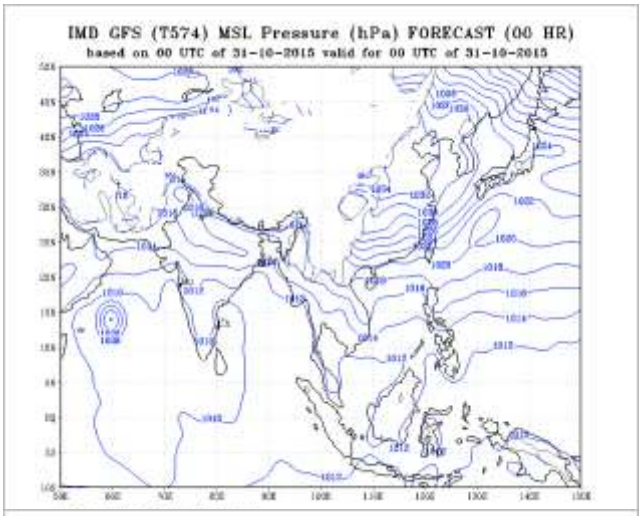

Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 31-10-2015 valid for 0000 UTC of 01-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

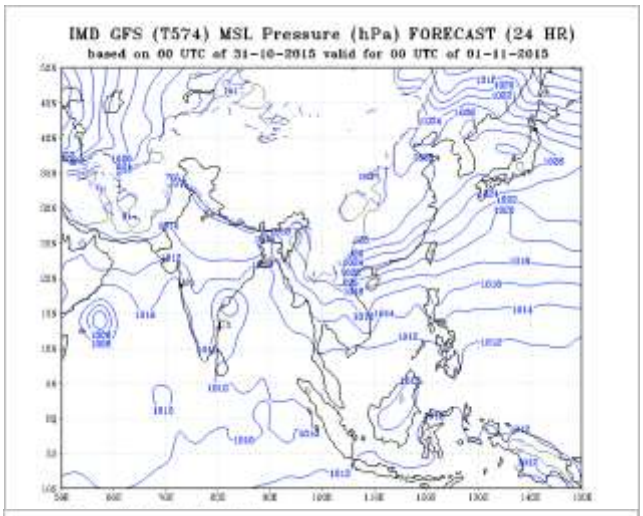

Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
Based on 31-10-2015 valid for 0000 UTC of 02-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

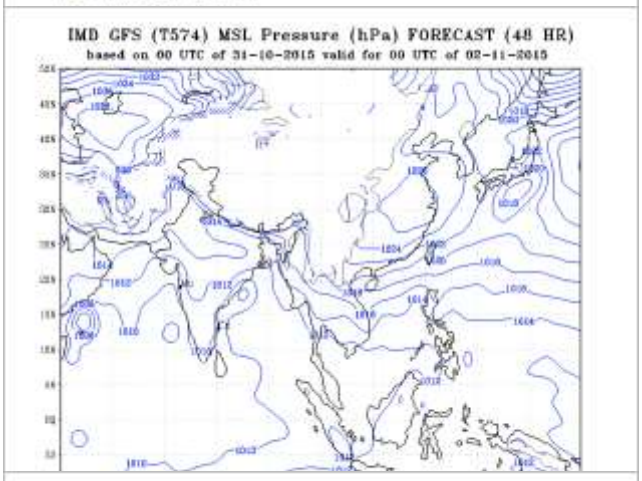

Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 31-10-2015 valid for 0000 UTC of 03-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

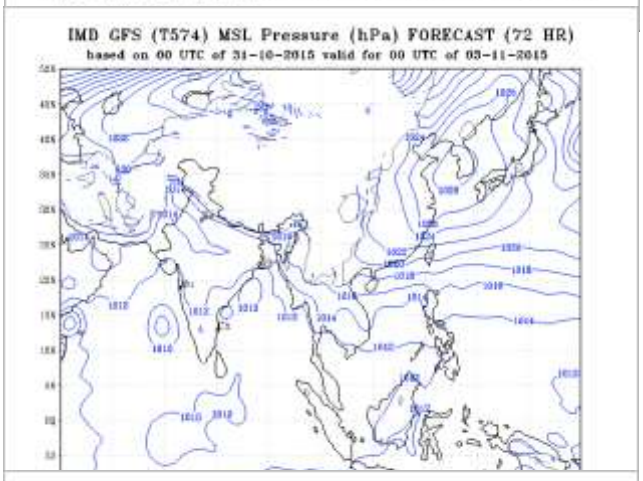

Tropical Cyclone Genesis Potential Parameter(GPP) (96 HR FORECAST)
Based on 31-10-2015 valid for 0000 UTC of 04-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

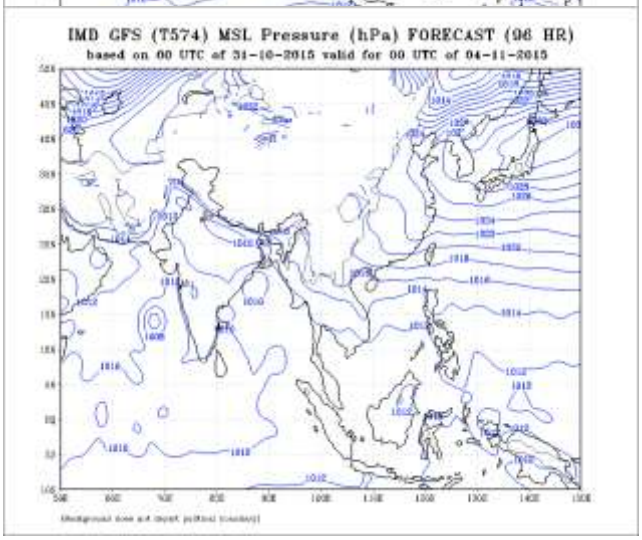

Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 31-10-2015 valid for 0000 UTC of 05-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

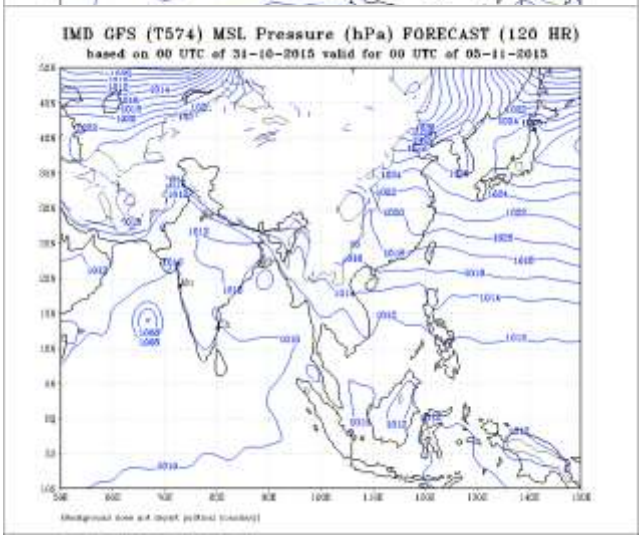

IMD GFS (T574) MSL Pressure (hPa) FORECAST (00 HR)
based on 00 UTC of 31-10-2015 valid for 00 UTC of 31-10-2015

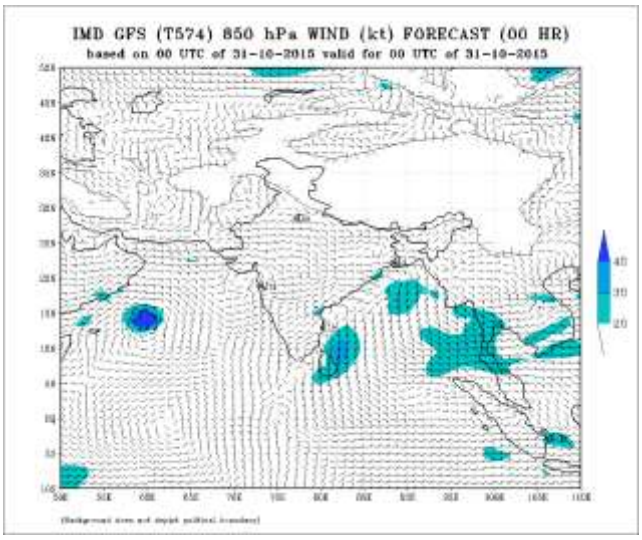

IMD GFS (T574) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 31-10-2015 valid for 00 UTC of 01-11-2015

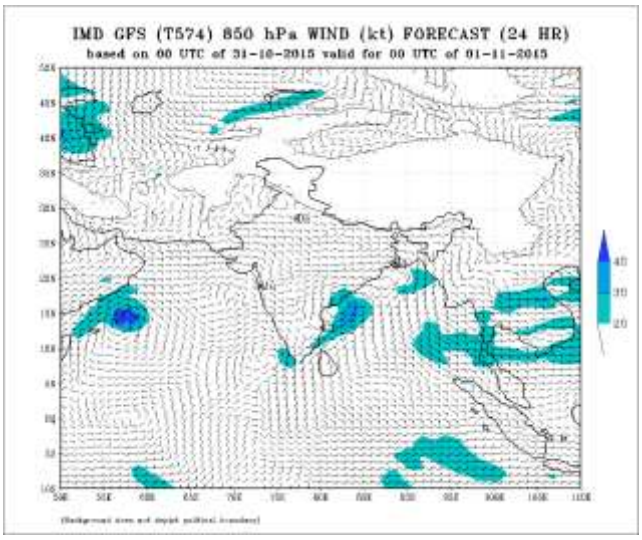

IMD GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 31-10-2015 valid for 00 UTC of 02-11-2015

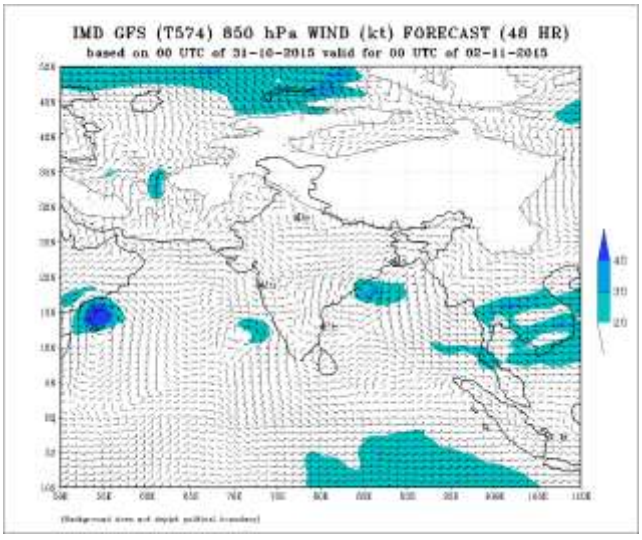

IMD GFS (T574) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 31-10-2015 valid for 00 UTC of 03-11-2015

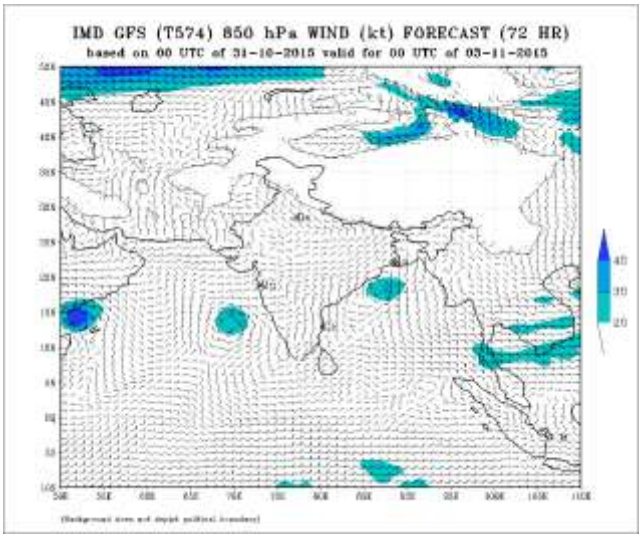

IMD GFS (T574) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 31-10-2015 valid for 00 UTC of 04-11-2015


IMD GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 31-10-2015 valid for 00 UTC of 05-11-2015


IMD GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 31-10-2015 valid for 00 UTC of 31-10-2015


IMD GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 31-10-2015 valid for 00 UTC of 01-11-2015


IMD GFS (T574) 850 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 31-10-2015 valid for 00 UTC of 02-11-2015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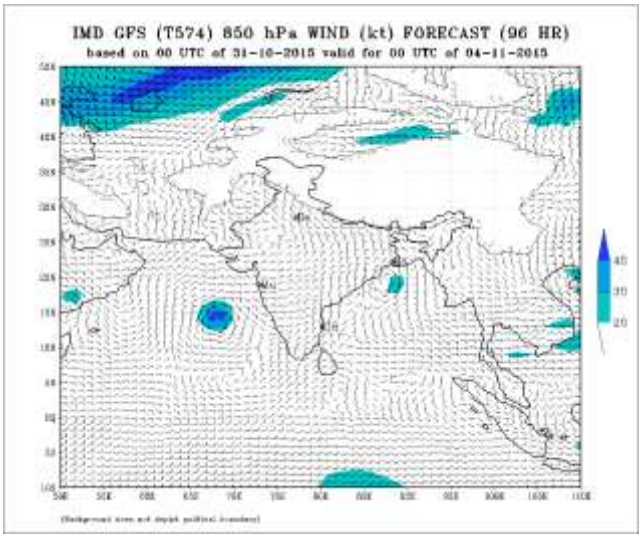
based on 00 UTC of 31-10-2015 valid for 00 UTC of 03-11-2015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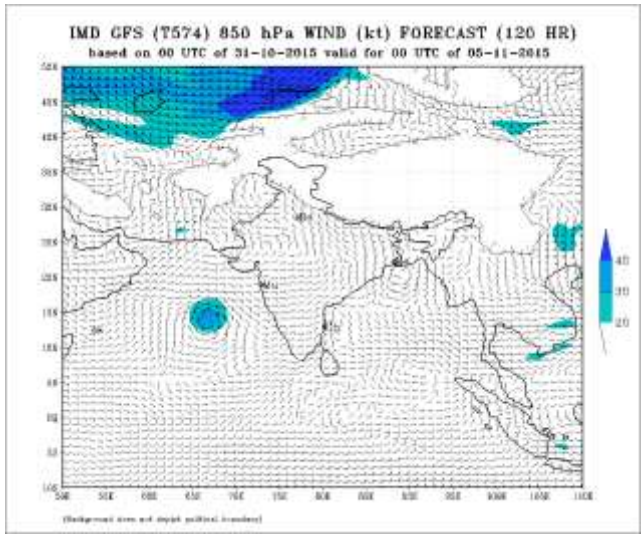
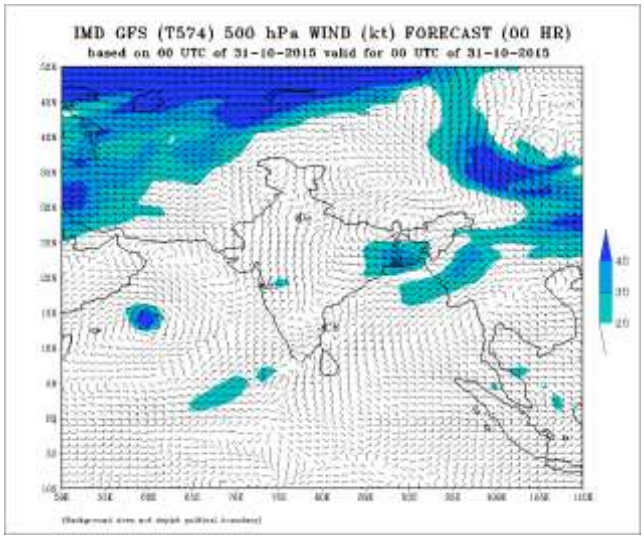
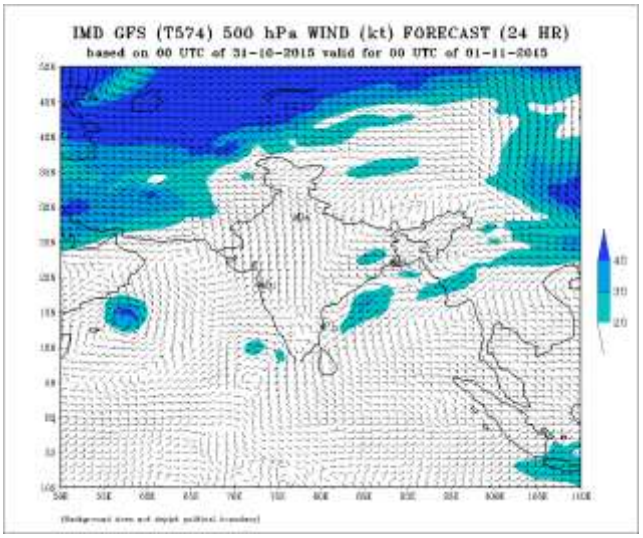
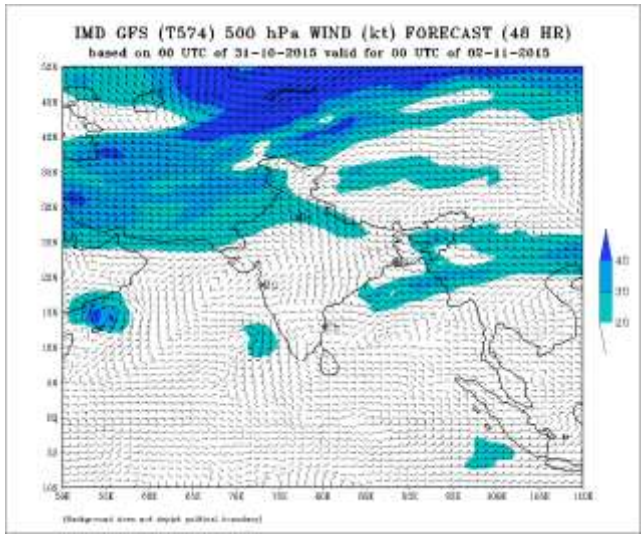
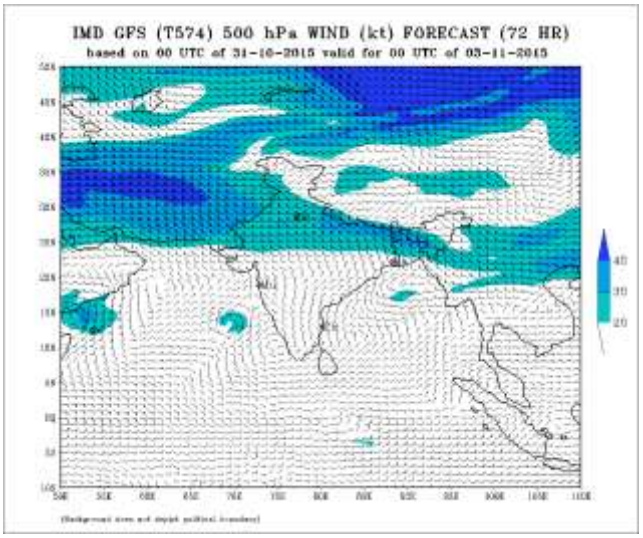
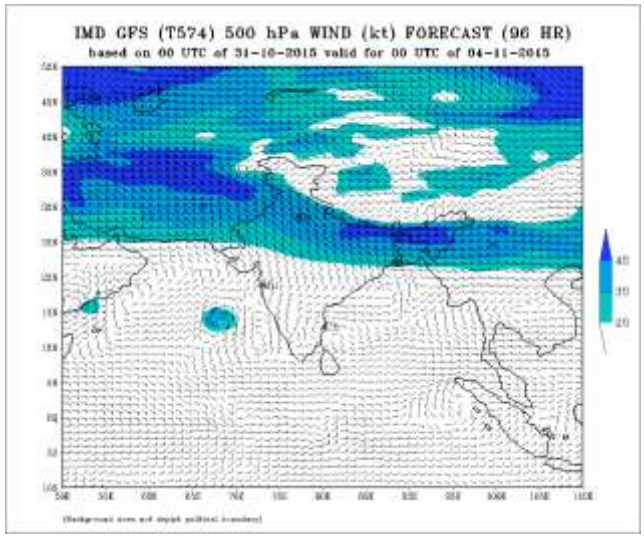

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 31-10-2015 valid for 00 UTC of 05-11-2015

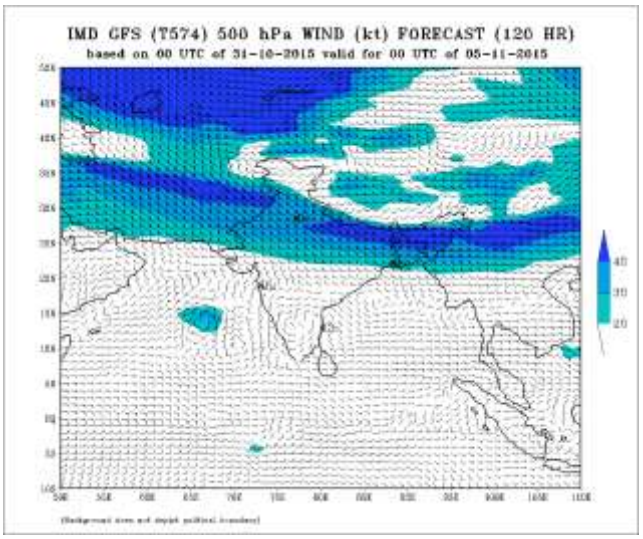

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 31-10-2015 valid for 00 UTC of 31-10-2015

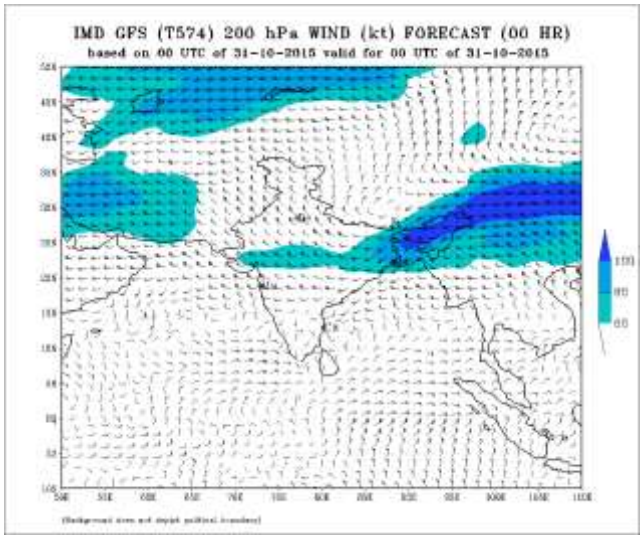

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 31-10-2015 valid for 00 UTC of 01-11-2015

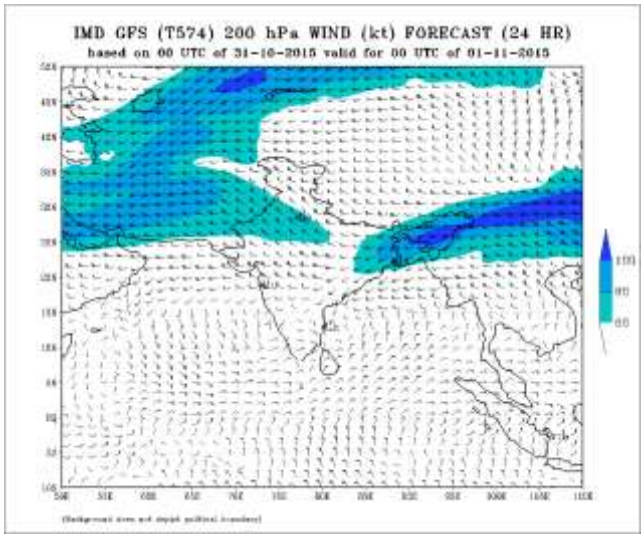

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 31-10-2015 valid for 00 UTC of 02-11-2015

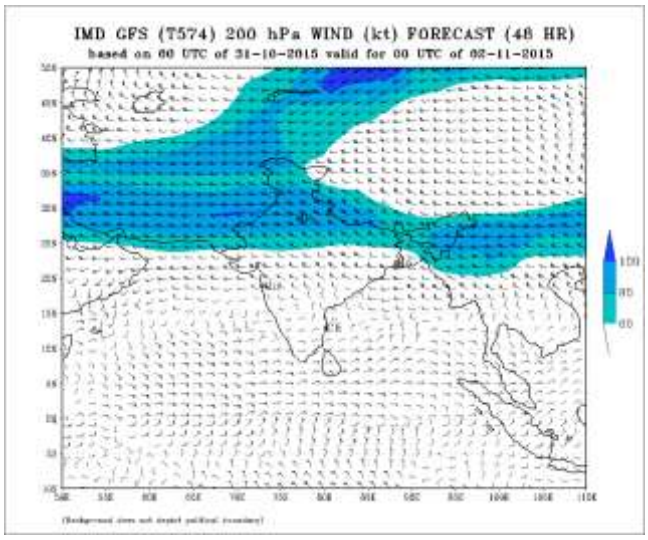

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 31-10-2015 valid for 00 UTC of 03-11-2015

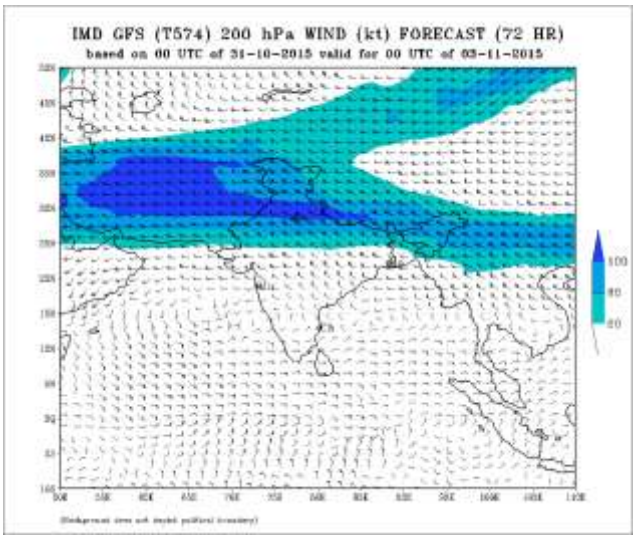

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 31-10-2015 valid for 00 UTC of 04-11-2015

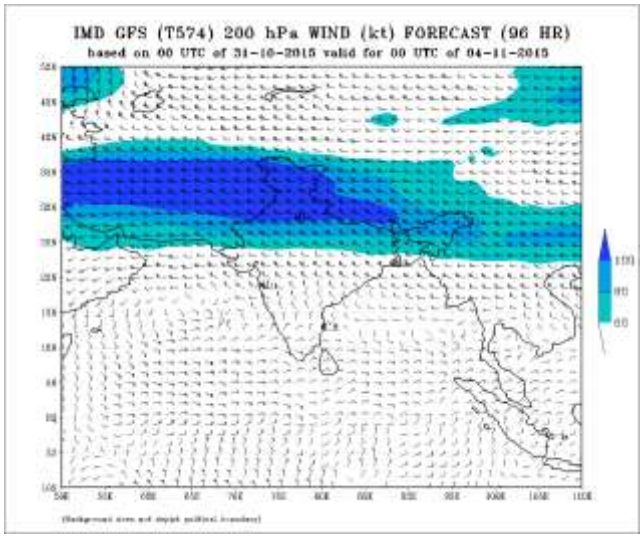

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 31-10-2015 valid for 00 UTC of 05-11-2015

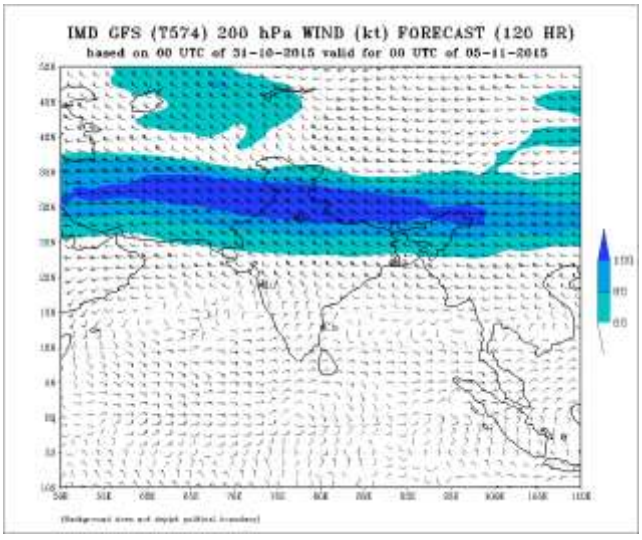

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 31-10-2015 valid for 00 UTC of 31-10-2015


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 31-10-2015 valid for 00 UTC of 01-11-2015


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 31-10-2015 valid for 00 UTC of 02-11-2015


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 31-10-2015 valid for 00 UTC of 03-11-2015


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 31-10-2015 valid for 00 UTC of 04-11-2015


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 31-10-2015 valid for 00 UTC of 05-11-2015

FDP (Cyclone) NOC Report Dated 01 November, 2015

Synoptic features based on 0300 UTC of today:

- The Extremely Severe Cyclonic Storm 'CHAPALA' over westcentral Arabian Sea moved wests-southwestwards and lay centered at 0830 hours IST of today, the 1st November 2015 near Lat.13.6°N/Long. 56.1°E, about 430 kms south-southeast of Salalah (Oman), 740 kms east-southeast of Riyan (Yemen) and 260 kms east-northeast of Socotra Island (Yemen). Due to entrainment of dry air and lower Ocean thermal energy, the Extremely Severe Cyclonic Storm would weaken gradually into a Very Severe Cyclonic Storm during next 24 hours. It would move nearly westwards during next 12 hours, then west-northwestwards and cross Yemen coast as a Very Severe Cyclonic Storm near Lat. 15.0°N (about 100 kms northeast of Riyan) around early hours of 3rd November 2015.
- The cyclonic circulation over Comorin area and neighbourhood now lies over Lakshadweep and neighbourhood and extends upto 4.5 kms a.s.l

Environmental features based on 0300 UTC of today:

Sea Surface Temperature (SST):

- SST is 29-30°C over entire Bay of Bengal and Andaman Sea.
- The sea surface temperature around the system centre is about 29°C and it decreases towards the west. SST is about 30-31°C off west coast of India.

Tropical Cyclone Heat Potential (TCHP):

- The ocean thermal energy is about 50-70 kJ/cm2 around the system centre and it decreases to the west-northwest.
- TCHP is 110-120 kJ/cm2 off Karnataka-Kerala coast.
- TCHP is about 110-120 kJ/cm2 over equatorial Indian Ocean and some parts of south BoB.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive ($50\text{-}75*10^{-5}s^{-1}$) over westcentral BOB off north Andhra-Odisha coast and north BoB.
- Relative vorticity at 850 hPa is positive ($250*10^{-5}s^{-1}$) around the system centre over Arabian Sea

Convergence:

- Lower level convergence is $30*10^{-5}s^{-1}$ over westcentral BoB and $15\text{-}20*10^{-5}s^{-1}$ over north BoB.
- Lower level convergence is positive ($20*10^{-5}s^{-1}$) around the system centre over AS.

Divergence:

- Upper level divergence is $10\text{-}20*10^{-5}s^{-1}$ over westcentral and north BoB.
- Upper level divergence is positive ($40*10^{-5}s^{-1}$) around the system centre over AS.

Wind Shear:

- Wind shear is 20-30 knots over westcentral and north BoB.
- The vertical wind shear around the system centre is about 5-15 knots. It is 10-20 knots near Yemen and Oman coast.

Shear Tendency:

- The vertical wind shear tendency is decreasing (-5 to -10 knots) over some parts of southwest BoB and is -5 to -10 knots over north BoB and adjoining westcentral BoB.
- The vertical wind shear tendency is decreasing (5 to 10 knots) to the west and southwest of the system centre over AS.

Upper tropospheric ridge:

- The upper tropospheric ridge at 200 hPa runs along 15.0°N over BOB and AS.

M.J.O. Index:

- MJO index lies over Phase 2 with amplitude greater than 2.0 and would continue in the same phase for next 5 days.

Storms and Depression over South China Sea/ South Indian Ocean:
NIL

Satellite:
Inference based on INSAT imagery of **310900** UTC:
Bay of Bengal & Andaman Sea:-
Low level circulation:- Broken low and medium clouds with embedded moderate to intense convection over Lakshadweep and neighbourhood in association with the low level circulation area over the area.
Arabian Sea:-
According to satellite imagery, intensity is T 5.5 and convective cloud shows ragged eye pattern and eye temperature is -22.0°C. Associated broken low and medium clouds with embedded intense to very intense convection over area between lat 10.5 degree north to 17.0 degree north and longitude 52.0 degree east to 58.0 degree east. Minimum wall cloud region temperature is minus 86°C.

NWP Input for FDP Cyclone based on 0000 UTC of today

NWP Analysis
IMD-GFS: The model indicates nearly westward movement of the system till 03/1200 UTC over sea.
IMD-WRF: IMD-WRF model forecasts indicates west-southwestward movement till 1200 UTC /02 November and then northwestwards crossing Yemen coast near Lat. 14.2°N.
IMD-NWP products are available at:
http://202.54.31.51/bias/gfsproducts.php
http://202.54.31.51/bias/wrf27pro.php
http://202.54.31.51/bias/potentialparameter.php

NCMRWF-UM: The model indicates that the system would move in a west-northwesterly direction till 0000 UTC of 3 Nov towards Yemen coast.
NCMRWF-GFS: NCMRWF-GFS model shows west-southwestward movement upto 03/0000 UTC reaching Gulf of Aden.
NCEP-GFS: NCEP-GFS model suggest westward movement till 01/1200 UTC, and southwestwards movement till 1200 UTC/02 UTC. Then moving west-northwestwards the model indicates weakening of the system before crossing coast in the afternoon of 3 Nov. near 14° N.
ECMWF:ECMWF Model predicts west to west-northwestward movement till 03/0000 UTC, reaching 14.2^0N and 49.2^0N.
JMA: JMA Model shows westwards movement till 02/0000 UTC, then west-northwestward movement towards Gulf of Aden reaching 13.5°N/48.0°E by 03/0000 UTC.
ARP-Meteo France: Not available.

UKMO: UKMO shows nearly west-southwestwards movement till 02/0000 UTC., then northwestward movement crossing coast near 14.0°N/48.0°E around 0900 UTC of 03 Nov.

Summary and Conclusion:

Bay of Bengal and Andaman Sea:

No significant system expected during next five days.

Probability of cyclogenesis over Bay of Bengal and Andaman Sea during next 120 hours:

24 HOURS	24-48 HOURS	48-72 HOURS	72-96 hours	96-120 hours
NIL	NIL	NIL	NIL	NIL

Arabian Sea:

The extremely severe cyclonic storm, 'Chapala' over westcentral Arabian Sea moved westwards with a speed of about 18 kmph during past 6 hours and lay centered at 1430 hrs IST of today, the 1st November 2015 near latitude 13.6°N and longitude 55.1°E, about 390 km south-southeast of Salalah (Oman), 640 km east-southeast of Riyan (Yemen) and about 170 km northeast of Socotra Island (Yemen). Due to entrainment of dry air and lower ocean thermal energy, the extremely severe cyclonic storm shows signs of weakening. It would weaken gradually into a very severe cyclonic storm during next 12 hours. It would move nearly westwards during next 24 hours, then west-northwestwards and cross Yemen coast as a very severe cyclonic storm near Riyan in the early morning of hours of 3rd November 2015.

Advisory: NO IOP for next five days.

Details of the status of observational systems are given in **Annexure I**

Annexure-I

Status of observational system:

Synoptic observation:

Region	Date/Time (UTC)		
	31/12	01/00	01/03
India	45	30	42
Coastal stations			
WB	8	3	8
Odisha	7	5	7
AP	13	12	12
Tamil Nadu	10	8	9
Puducherry	1	1	1
A & N	6	1	5
Bangladesh	11	9	10
Myanmar	11	7	11
Thailand	2	2	2
SriLanka	8	7	8

AWS Observations:

Region	Date/Time (UTC)		
	31/12	01/00	01/03
India	34	34	26
Coastal stations			
WB	3	3	2
Odisha	8	8	7
AP	7	7	7
Tamil Nadu	16	16	10
Puducherry	-	-	-
A & N	-	-	-

RS/RW (12Z) of 31/10/2015 **-4/39**
No. of Ascents reaching 250 hPa level: 3, MISDA: 35

RS/RW (00Z) of 01/10/2015- **25/39**
No. of Ascents reaching 250 hPa level:20, MISDA: 4

No. of PILOT Ascents

31/12Z	01/00Z
0	2

Buoy Data

31/12Z	01/00Z	01/03Z
5	3	4

STATUS OF CHENNAI REGION OBSERVATIONS

No. of Synop data

Date→	**31.10.2015**							
UTC→	**00**	**03**	**06**	**09**	**12**	**15**	**18**	**21**
Chennai Region (Coasts of AP & TN)	**20**	**22**	**20**	**20**	**20**	**20**	**20**	**20**

No. of RS/RW Ascents

00Z /31.10.2015 : 6
No. of Ascents reaching 250 hPa level = 6
MISDA : 2

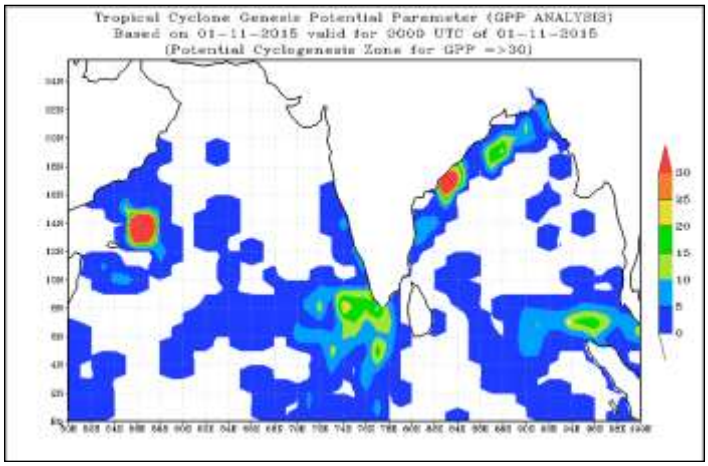
12Z /31.10.2015 : 0
No. of Ascents reaching 250 hPa level =0
MISDA : 8

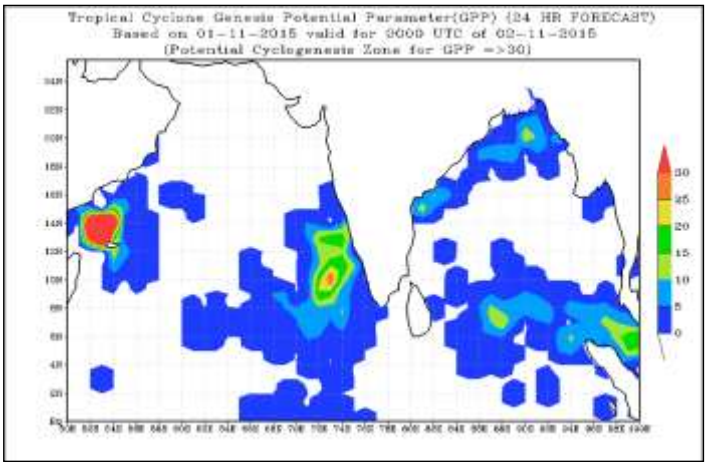
No. of PILOT Ascents:

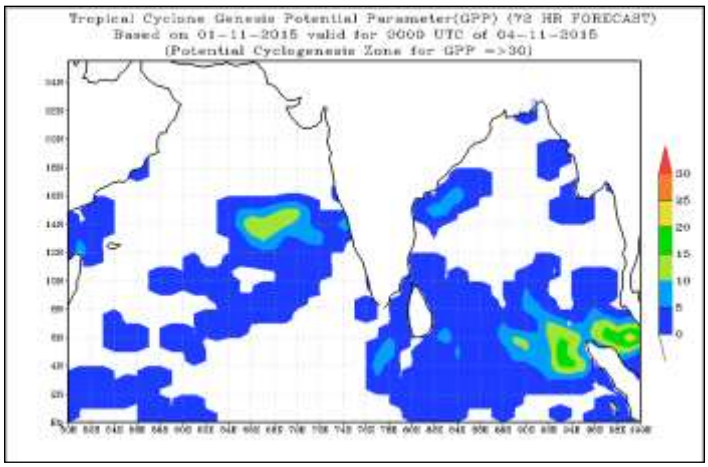
31.10.2015

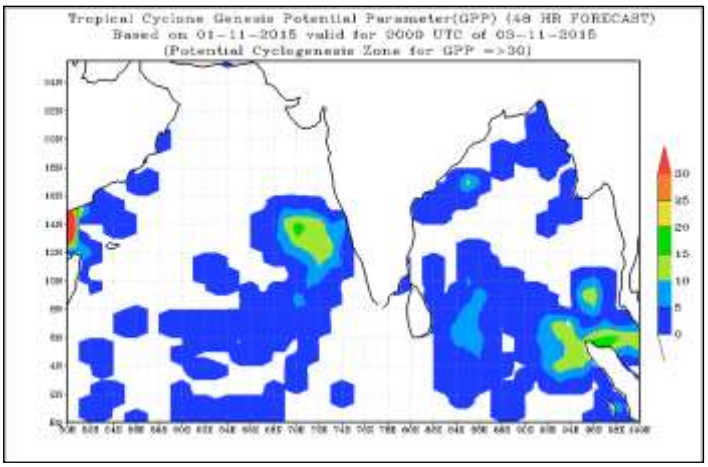
06Z	18Z
4	3

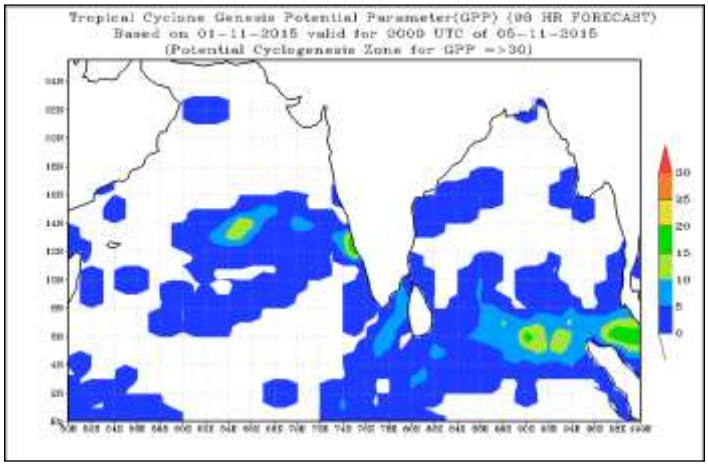
Annexure-II

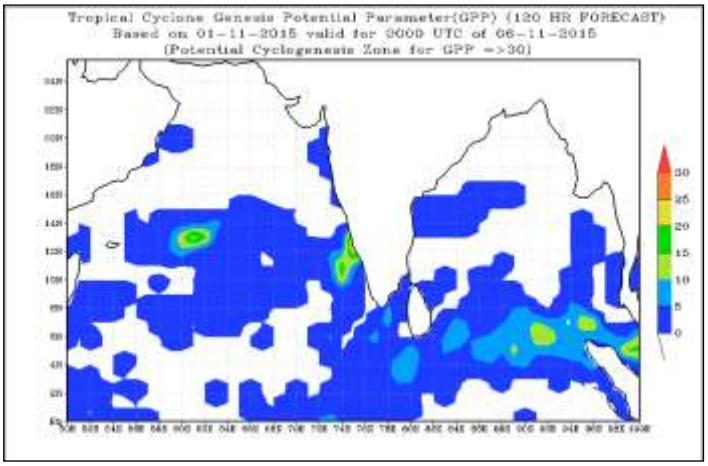

Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 01-11-2015 valid for 0000 UTC of 01-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

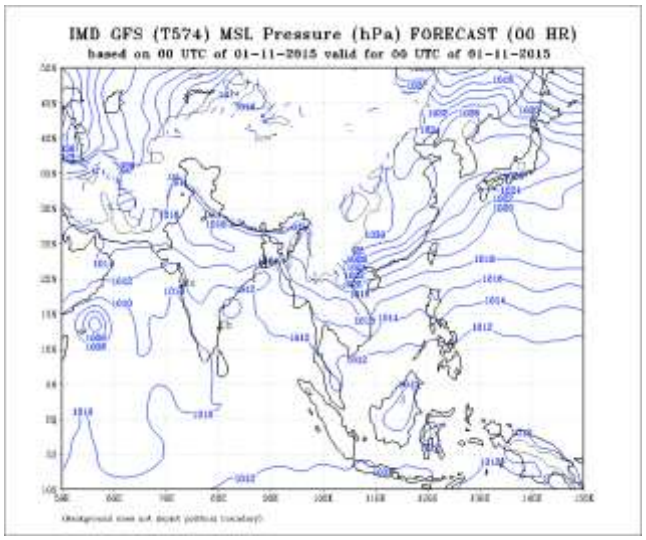

Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 01-11-2015 valid for 0000 UTC of 02-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

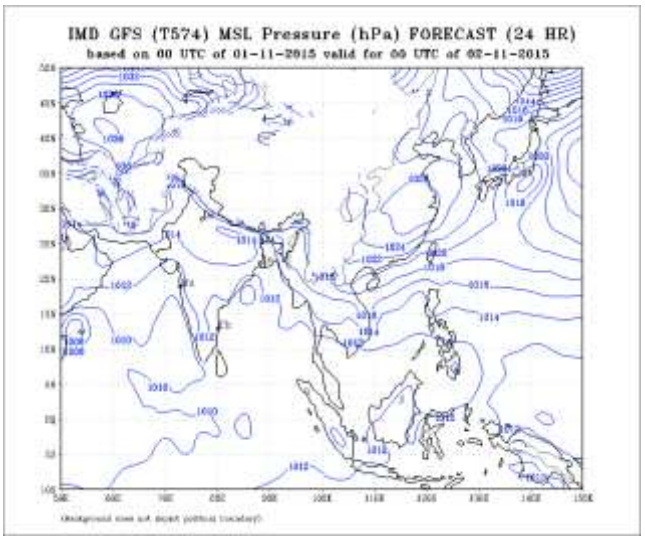

Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 01-11-2015 valid for 0000 UTC of 04-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

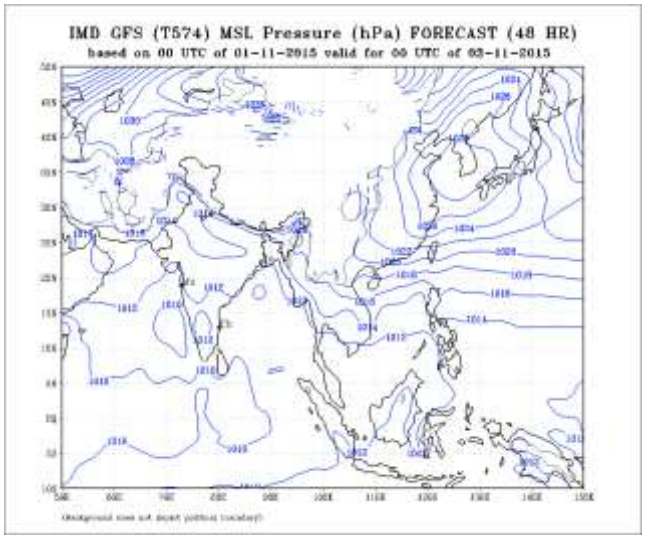

Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
Based on 01-11-2015 valid for 0000 UTC of 03-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

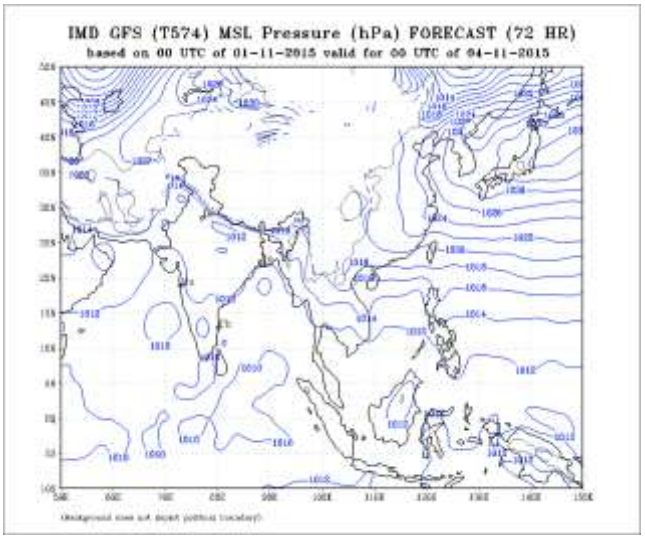

Tropical Cyclone Genesis Potential Parameter(GPP) (96 HR FORECAST)
Based on 01-11-2015 valid for 0000 UTC of 05-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

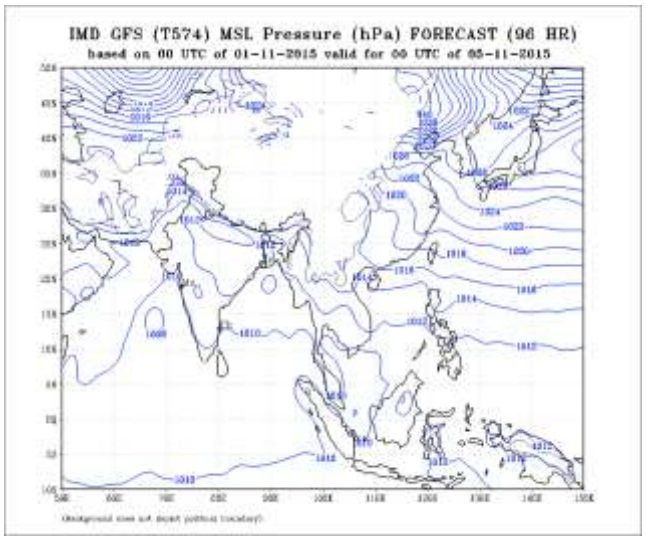

Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 01-11-2015 valid for 0000 UTC of 06-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

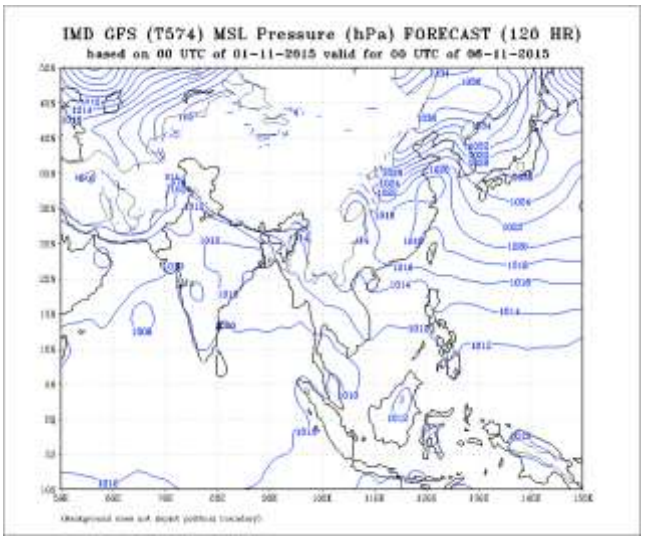

IMD GFS (T574) MSL Pressure (hPa) FORECAST (00 HR)
based on 00 UTC of 01-11-2015 valid for 00 UTC of 01-11-2015

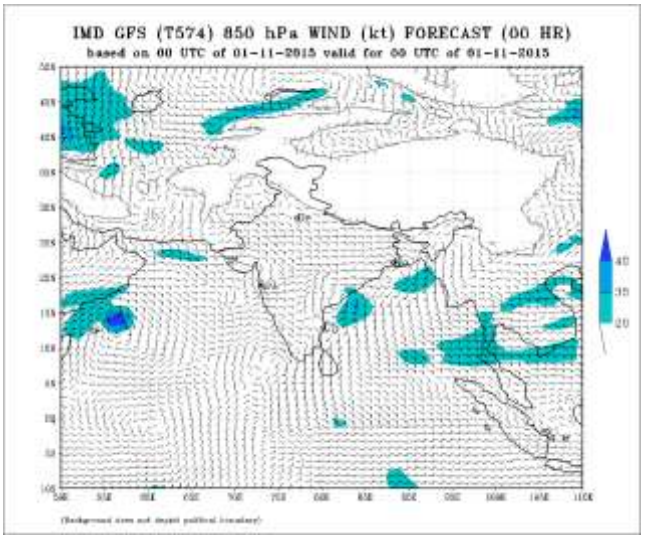

IMD GFS (T574) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 01-11-2015 valid for 00 UTC of 02-11-2015

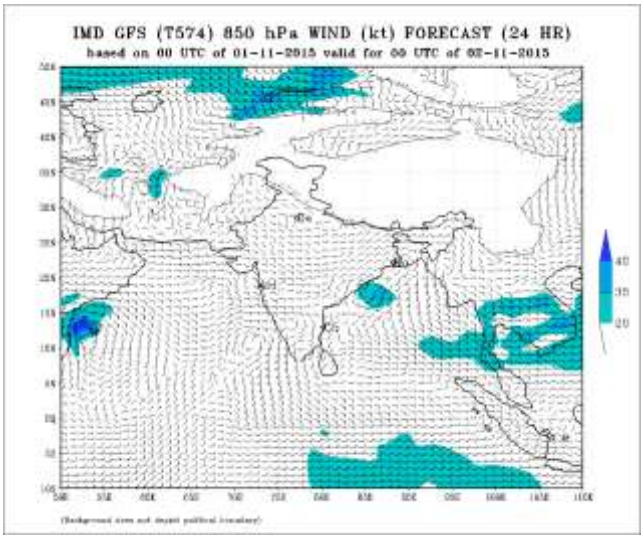

IMD GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 01-11-2015 valid for 00 UTC of 03-11-2015

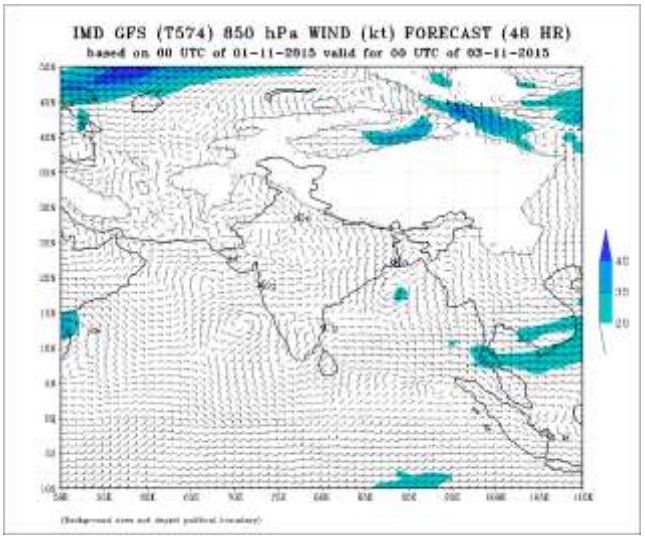

IMD GFS (T574) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 01-11-2015 valid for 00 UTC of 04-11-2015

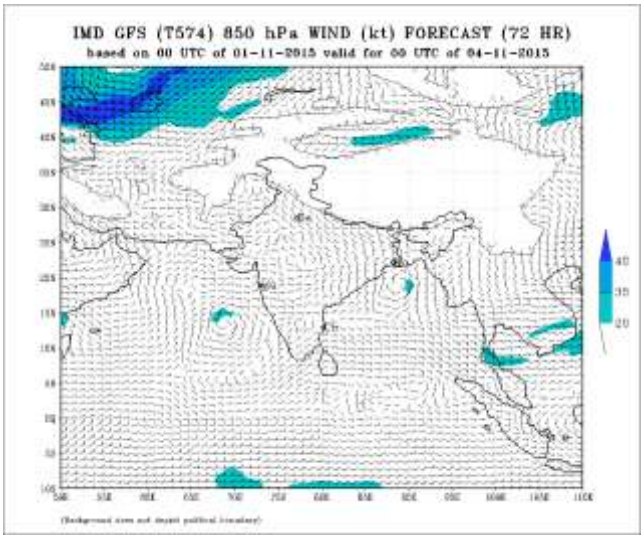

IMD GFS (T574) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 01-11-2015 valid for 00 UTC of 05-11-2015

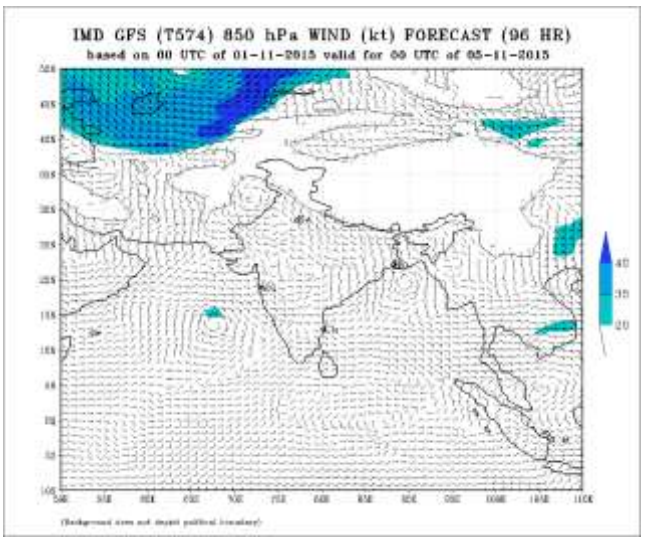

IMD GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 01-11-2015 valid for 00 UTC of 06-11-2015

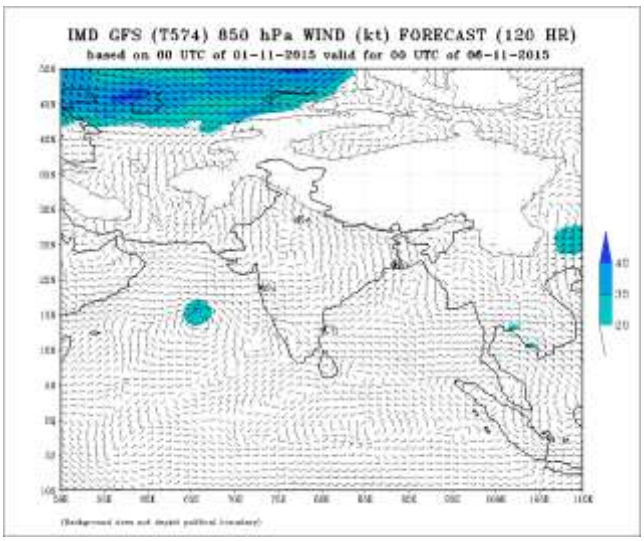

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 01-11-2015 valid for 00 UTC of 01-11-2015

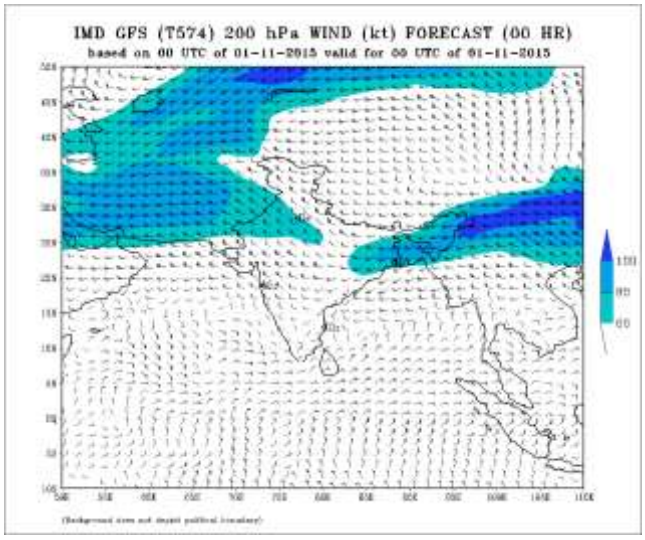

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 01-11-2015 valid for 00 UTC of 02-11-2015

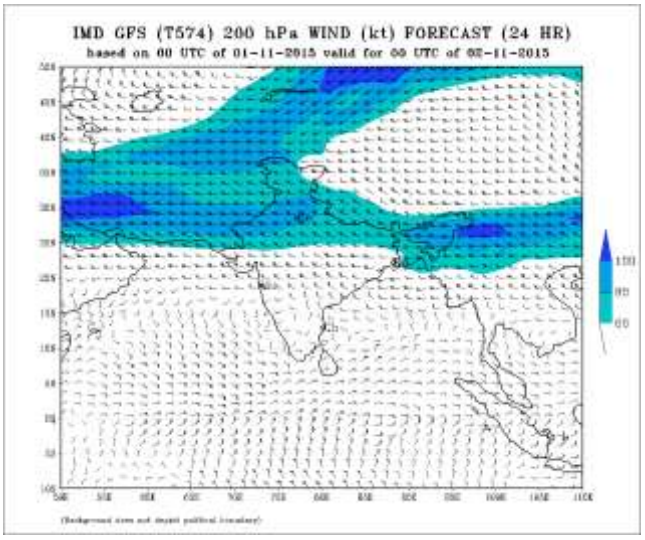

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 01-11-2015 valid for 00 UTC of 03-11-2015

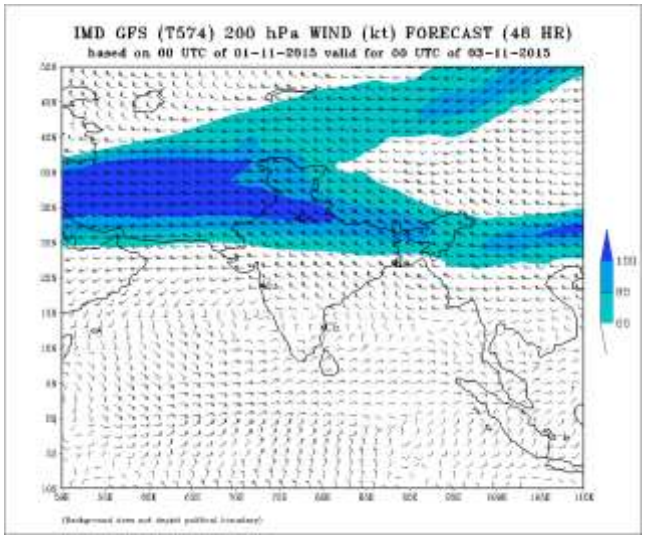

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 01-11-2015 valid for 00 UTC of 04-11-2015

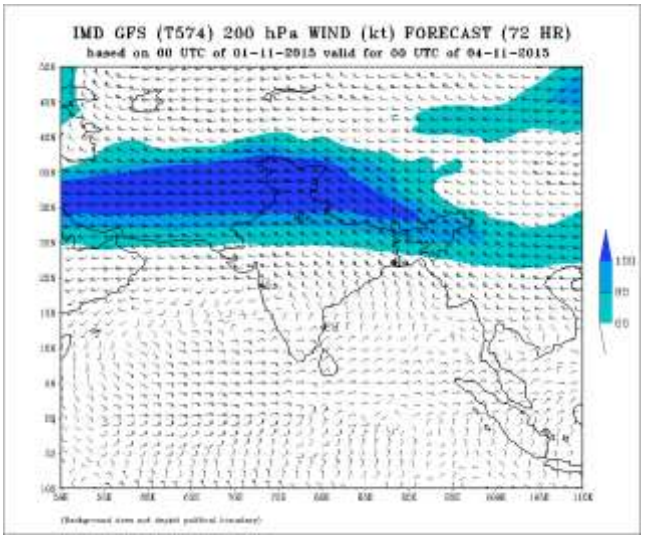

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 01-11-2015 valid for 00 UTC of 05-11-2015

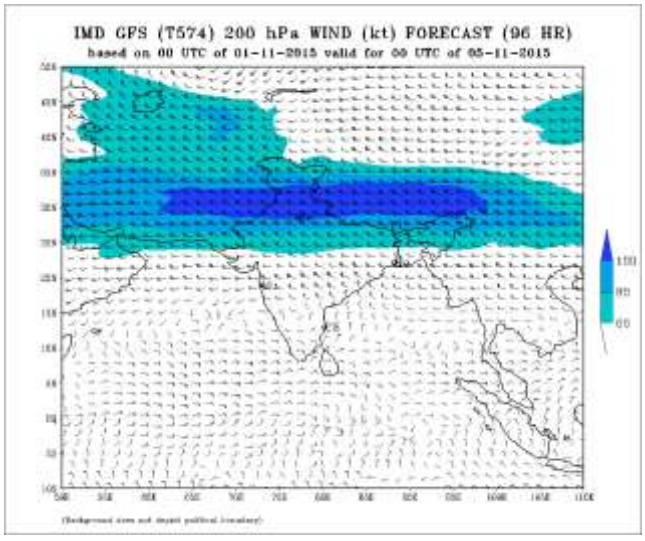

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 01-11-2015 valid for 00 UTC of 06-11-2015

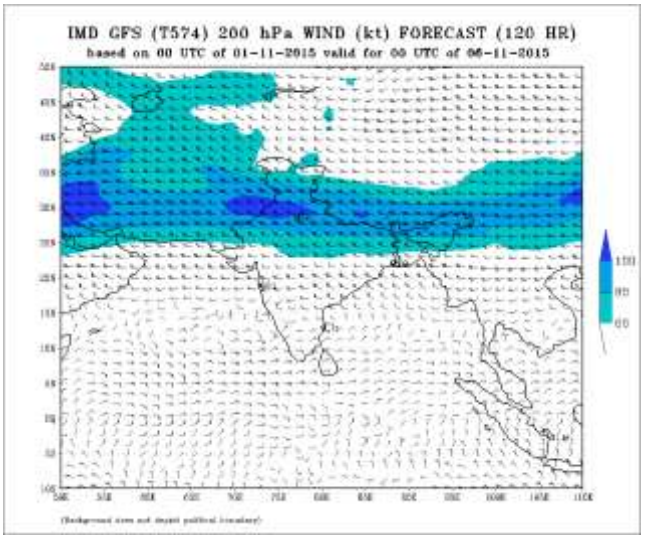

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 01-11-2015 valid for 00 UTC of 01-11-2015


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 01-11-2015 valid for 00 UTC of 02-11-2015


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 01-11-2015 valid for 00 UTC of 03-11-2015


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 01-11-2015 valid for 00 UTC of 04-11-2015


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 01-11-2015 valid for 00 UTC of 05-11-2015


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 01-11-2015 valid for 00 UTC of 06-11-2015

FDP (Cyclone) NOC Report Dated 02 November, 2015

Synoptic features based on 0300 UTC of today:

- The **extremely severe cyclonic storm (ESCS), 'Chapala'** over westcentral Arabian Sea moved west-southwestwards with a speed of about 20 kmph during past 6 hours and lay centered at 0300 UTC of today, the 2nd November 2015 near latitude **13.2** degree North and longitude **52.2** degree East, about **470** km south-southwest of Salalah (Oman), **350** km southeast of Riyan (Yemen) and about **190** km west-northwest of Socotra Island (Yemen). It would weaken gradually into a very severe cyclonic storm during next 12 hours. It would move nearly westwards during next 12 hours, then west-northwestwards and cross Yemen coast south of Riyan as a very severe cyclonic storm around 0600 UTC of 3rd November, 2015.
- The upper air cyclonic circulation over Lakshadweep area & neighbourhood now lies over eastcentral Arabian Sea off Karnataka coast and extends upto 3.1 km above mean sea level. Under its influence a low pressure area may form during next 48 hours·

Environmental features based on 0300 UTC of today:

Sea Surface Temperature (SST):

- The sea surface temperature around the system centre over Arabian Sea (AS) is about 29°C and it decreases towards the west. SST is about 30-31°C off west coast of India.
- SST is 29-30°C over entire Bay of Bengal (BoB) and Andaman Sea.

Tropical Cyclone Heat Potential (TCHP):

- The ocean thermal energy is about 50-70 kJ/cm^2 around the system centre and it decreases to the west-northwest. TCHP is 110-120 kJ/cm^2 off Karnataka-Kerala coast.
- TCHP is about 110-120 kJ/cm^2 over equatorial Indian Ocean and some parts of south BoB.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive ($250*10^{-5}s^{-1}$) around the system centre over AS. It is around 50-70 $*10^{-5}s^{-1}$ over southeast and adjoining eastcentral AS.
- Relative vorticity at 850 hPa is positive ($30-40*10^{-5}s^{-1}$) over parts of north BOB.

Convergence:

- Lower level convergence is positive ($60*10^{-5}s^{-1}$) around the system centre over AS. It is $10-15*10^{-5}s^{-1}$ over southeast and adjoining eastcentral AS.
- Lower level convergence is $10-15*10^{-5}s^{-1}$ over eastcentral BoB and adjoining north Andaman Sea.

Divergence:

- Upper level divergence is 40 X 10^{-5} s^{-1} around the system centre over AS. It is.around $20-30*10^{-5}s^{-1}$ over southeast AS along Kerala and Karnataka coasts.
- Upper level divergence is $5-10*10^{-5}s^{-1}$ over central and parts of north BoB.

Wind Shear:

- Wind shear is 5-10 knots over south and westcentral BoB.
- The vertical wind shear around the system centre is about 5-10 knots. It is increasing towards Yemen and Oman coast. It is about 5-10 knots over southeast AS.

Wind Shear Tendency:

- The vertical wind shear tendency remains the same around the system centre. It is increasing (5 to 10 knots) towards Gulf of Aden.
- The vertical wind shear tendency is decreasing over most parts of BoB and is about -5 to-10 kts.

Upper tropospheric ridge:

- The upper tropospheric ridge at 200 hPa runs along 16.0°N over AS.
- The upper tropospheric ridge at 200 hPa runs along 14.0°N over BoB.

M.J.O. Index:

MJO index lies over Phase 2 with amplitude greater than 2.0 and would continue in the same phase for next 3 days.

Storms and Depression over South China Sea/ South Indian Ocean:

NIL

Satellite:

Inference based on INSAT imagery of **020900** UTC:

Bay of Bengal & Andaman Sea:-

Low level circulation:- Broken low and medium clouds with embedded moderate to intense convection lay over Lakshadweep and neighbourhood in association with the low level circulation area over the area.

Arabian Sea:-

According to satellite imagery, intensity is T 5.0/ C.I. 5.5 and convective cloud shows ragged eye pattern. Associated broken low and medium clouds with embedded intense to very intense convection lay over area between lat 10.5 degree North to 17.0 degree North and longitude 48.0 degree East to 54.0 degree East. Minimum wall cloud region temperature is minus 74°C.

NWP Input for FDP Cyclone based on 0000 UTC of today

NWP Analysis

IMD-GFS: The model indicates nearly west-southwestward movement of the ESCS Chapala over AS till 02/1200 UTC and northeastward movement thereafter till 03/0000 UTC before dissipation over sea.

A low pressure area will form on 3rd and moving west-northwestward will concentrate into a depression on 6 November over central Arabian Sea.

IMD-WRF: IMD-WRF model forecasts indicates west-southwestward movement of the system till 02/1200 UTC and then north-northwest to northwestward movement over Gulf of Aden till 03/1200 UTC.

IMD-NWP products are available at:

http://202.54.31.51/bias/gfsproducts.php
http://202.54.31.51/bias/wrf27pro.php
http://202.54.31.51/bias/potentialparameter.php

NCMRWF-UM: The model indicates that the system would move southwestwards till 03/0000 UTC followed by northwestward movement and dissipation over Gulf of Aden around 03/1800 UTC.

NCMRWF-GFS: NCMRWF-GFS model data - not available for ESCS, Chapala

A low pressure area will form on 3rd and moving west-northwestward will concentrate into a depression on 6 November over central Arabian Sea.

NCEP-GFS: NCEP-GFS model suggests that the system would move initially westward till 03/0000 UTC and then northwestwards and cross Yemen coast south of 14^0N around 03/1200 UTC.

A low pressure area will form on 3rd and moving west-northwestward will concentrate into a depression on 6 November over central Arabian Sea.

ECMWF: ECMWF Model predicts that the system would move westwards and cross Yemen coast south of 14^0N around 03/1200 UTC.

A low pressure area will form on 7th and moving west-northwestward will concentrate into a depression on 8th November over southwest Bay of Bengal.

JMA: JMA Model shows that the system would move initially west-northwestward till 02/1200 UTC, then westward towards Gulf of Aden and dissipate over sea around 03/1200 UTC.

ARP-Meteo France: Not available.

UKMO: UKMO shows that the system would move initially westwards till 02/1200 UTC, then northwestward and dissipate over sea around 13/1200 UTC.

GPP: It shows potential area of cyclogenesis over east central Arabian Sea on 3rd which moves west-nortrhwestwards with gradual increase in probability of genesis

Summary and Conclusion:

Bay of Bengal and Andaman Sea:

No significant system expected during next five days. However, the formation of depression is predicted by ECMWF on 8th November over southwest Bay of Bengal

Probability of cyclogenesis over Bay of Bengal and Andaman Sea during next 120 hours:

24 HOURS	24-48 HOURS	48-72 HOURS	72-96 hours	96-120 hours
NIL	NIL	NIL	NIL	NIL

Arabian Sea:

(i) The **extremely severe cyclonic storm, 'Chapala'** over westcentral AS moved west-northwestwards with a speed of about 22 kmph during past 6 hours and lay centered at 0900 UTC of today, the 2nd November 2015 near latitude **13.3** degree North and longitude **51.0** degree East, about **530** km south-southwest of Salalah (Oman) (41316), **235** km east-southeast of Riyan (Yemen) (41443) and about **320** km west-northwest of Socotra Island (41494) (Yemen). It would weaken gradually into a very severe cyclonic storm during next 6 hours. It would move west-northwestwards and cross Yemen coast south of Riyan as a very severe cyclonic storm with a maximum sustained surface wind speed of 120-130 kmph gusting to 145 kmph around 0600 UTC of 3rd November, 2015.

(ii) Under the influence of the upper air cyclonic circulation, currently located over southeast Arabian Sea, a low pressure area may form over east central Arabian Sea off Karnataka coast.

Advisory: NO IOP for next five days.

The possible development of low pressure area over eastcentral Arabian Sea on 4th Novemeber and another low pressure area over southeast Bay of Bengal on 7th November need to be watched.

Annexure-I

Status of observational system:

Synoptic observation:

Region	Date/Time (UTC)		
	01/12	02/00	02/03
India	45	40	45
Coastal stations			
WB	7	3	8
Odisha	7	5	7
AP	12	12	11
Tamil Nadu	11	8	11
Puducherry	2	2	2
A & N	6	1	6
Bangladesh	10	11	8
Myanmar	10	8	11
Thailand	2	1	1
SriLanka	8	7	8

AWS Observations:

Region	Date/Time (UTC)		
	01/12	02/00	02/03
India	34	34	26
Coastal stations			
WB	3	3	2
Odisha	8	8	7
AP	7	7	7
Tamil Nadu	16	16	10
Puducherry	-	-	-
A & N	-	-	-

RS/RW (12Z) of 01/11/2015 **-0/39**
No. of Ascents reaching 250 hPa level: 0, MISDA: 0

RS/RW (00Z) of 02/11/2015- **21/39**
No. of Ascents reaching 250 hPa level:21, MISDA: 5

No. of PILOT Ascents

01/12Z	02/00Z
3	0

Buoy Data

01/12Z	02/00Z	02/03Z
11	10	9

STATUS OF CHENNAI REGION OBSERVATIONS

No. of Synop data

Date→	**01.11.2015**							
UTC→	**00**	**03**	**06**	**09**	**12**	**15**	**18**	**21**
Chennai Region (Coasts of AP & TN)	**20**	**20**	**20**	**20**	**22**	**20**	**20**	**20**

No. of RS/RW Ascents

00Z /01.11.2015 : 6
No. of Ascents reaching 250 hPa level = 6
MISDA : 2

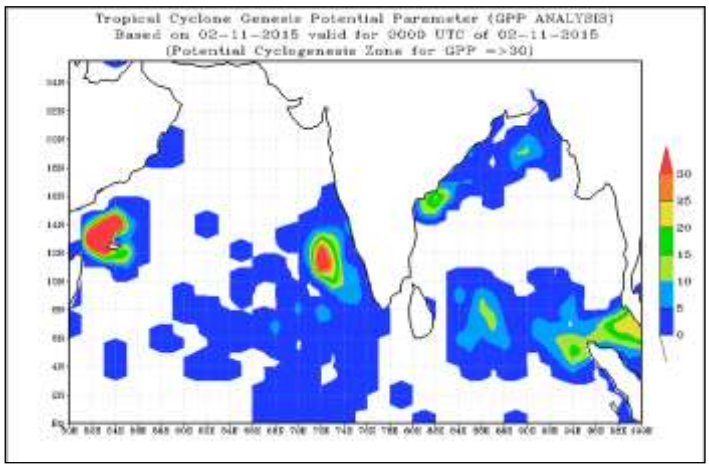
12Z /01.11.2015 : 0
No. of Ascents reaching 250 hPa level =0
MISDA : 8

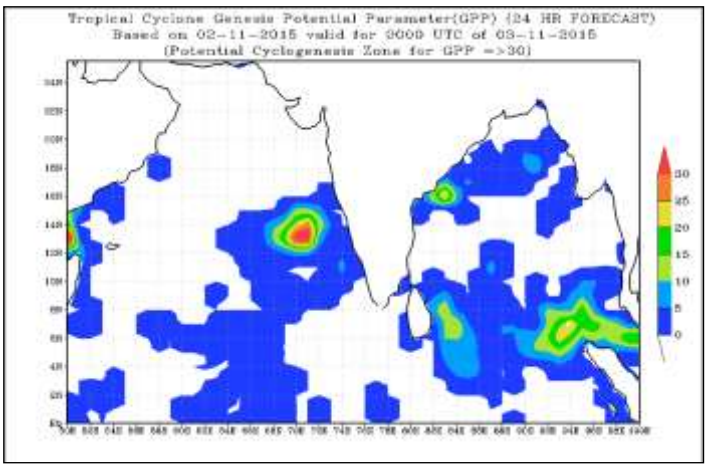
No. of PILOT Ascents:

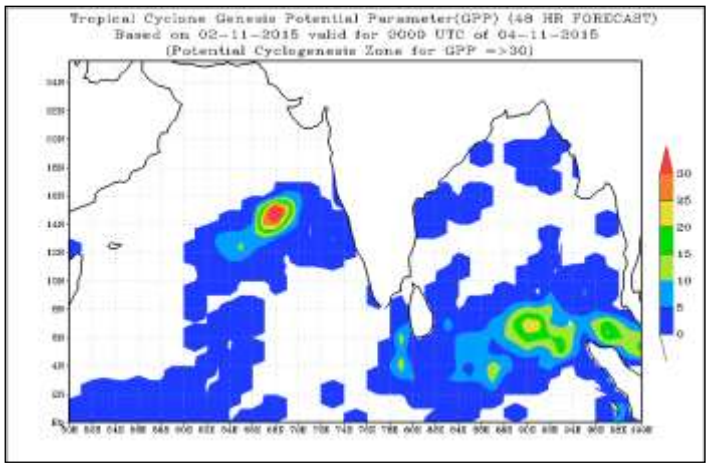
01.11.2015

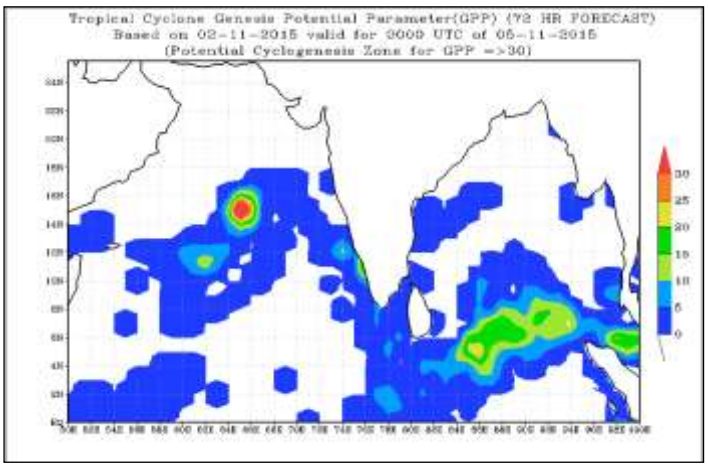
06Z	18Z
3	3

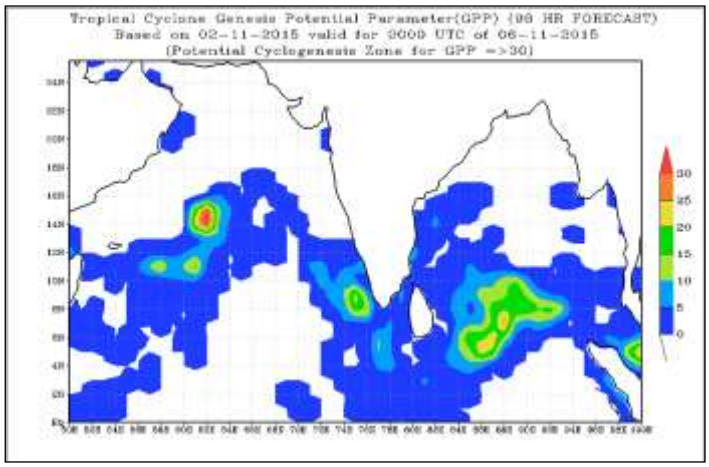
Annexure-II

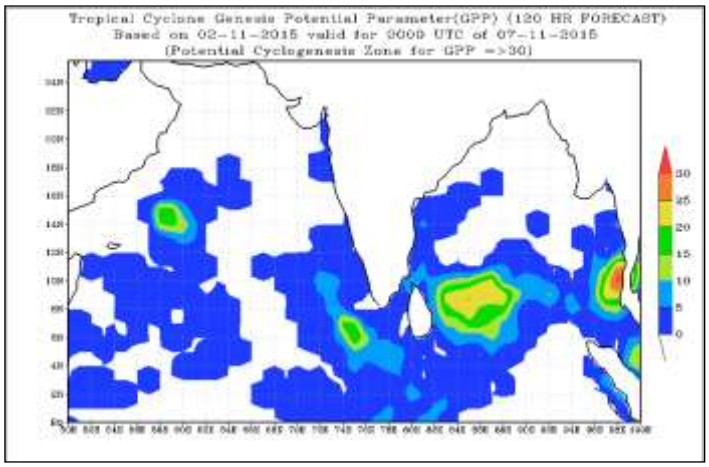

Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 02-11-2015 valid for 0000 UTC of 02-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

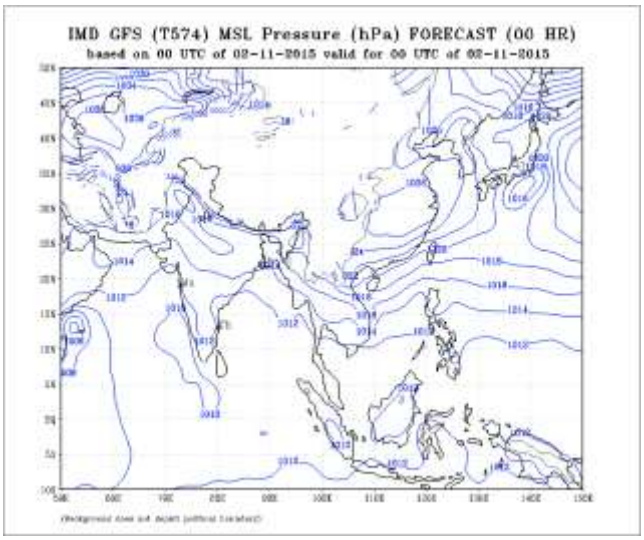

Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 02-11-2015 valid for 0000 UTC of 03-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

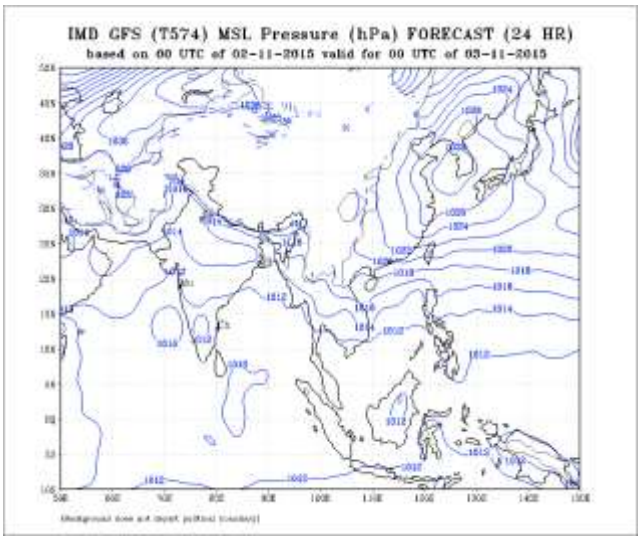

Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
Based on 02-11-2015 valid for 0000 UTC of 04-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

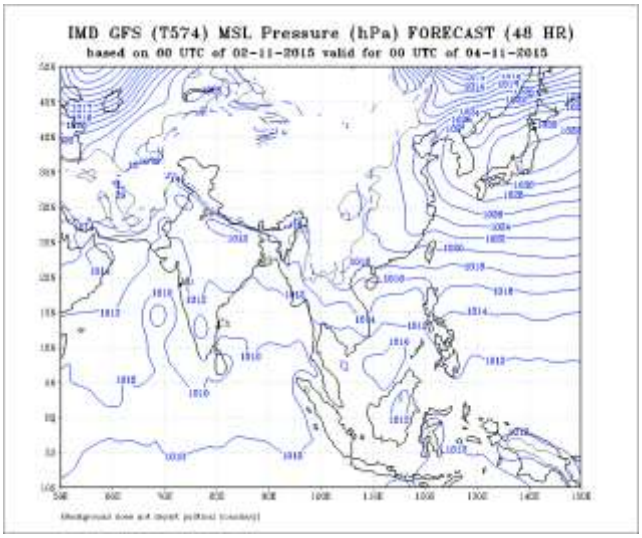

Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 02-11-2015 valid for 0000 UTC of 05-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

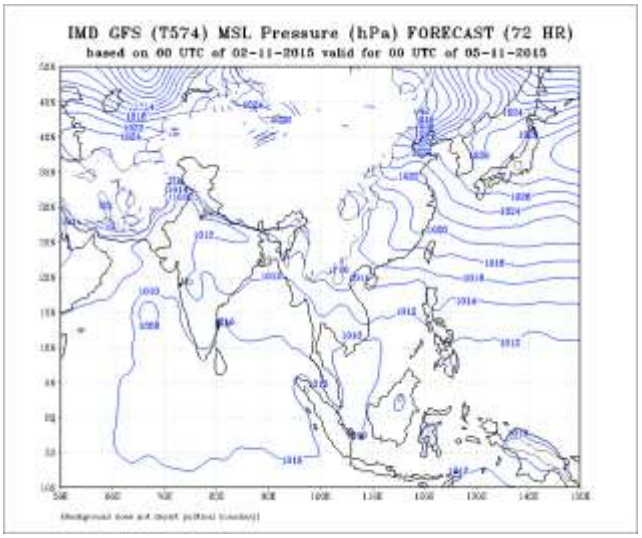

Tropical Cyclone Genesis Potential Parameter(GPP) (96 HR FORECAST)
Based on 02-11-2015 valid for 0000 UTC of 06-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

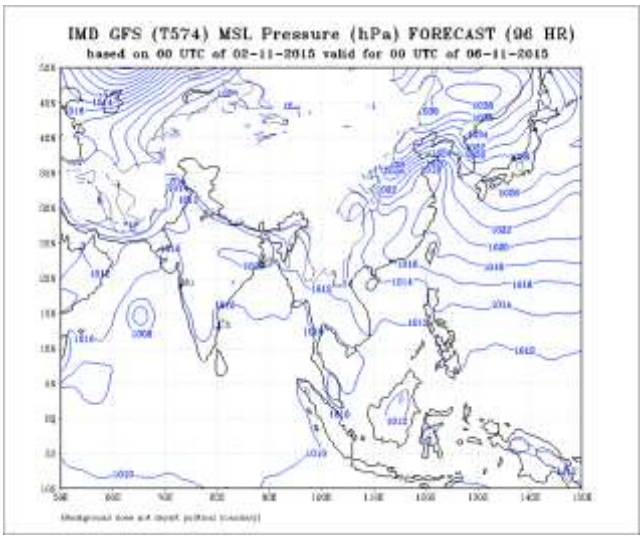

Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 02-11-2015 valid for 0000 UTC of 07-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

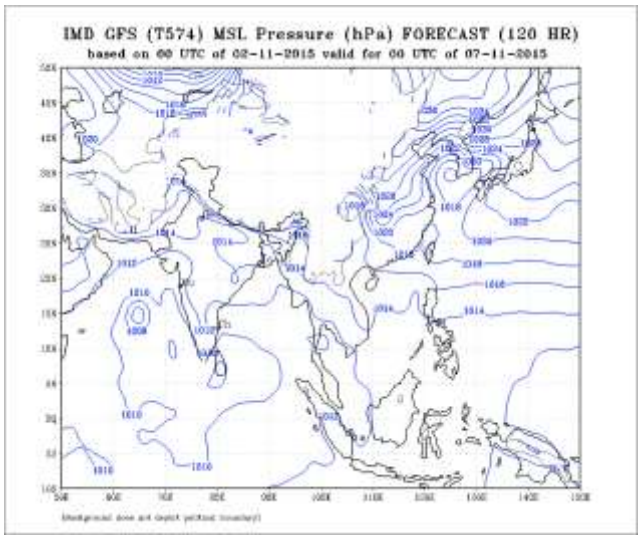

IMD GFS (T574) MSL Pressure (hPa) FORECAST (00 HR)
based on 00 UTC of 02-11-2015 valid for 00 UTC of 02-11-2015

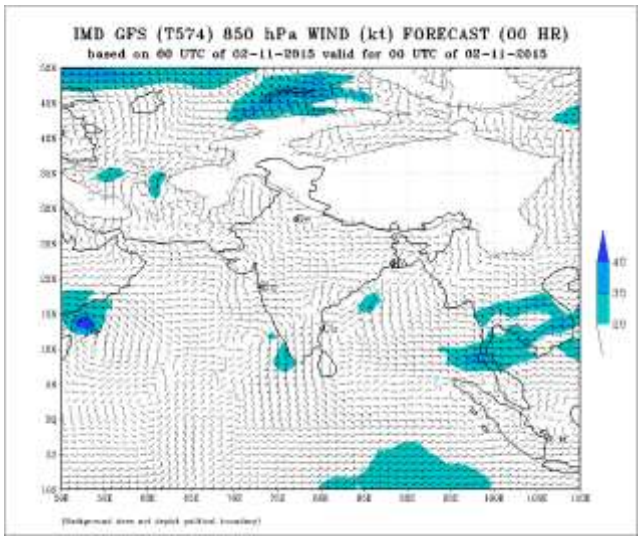

IMD GFS (T574) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 02-11-2015 valid for 00 UTC of 03-11-2015

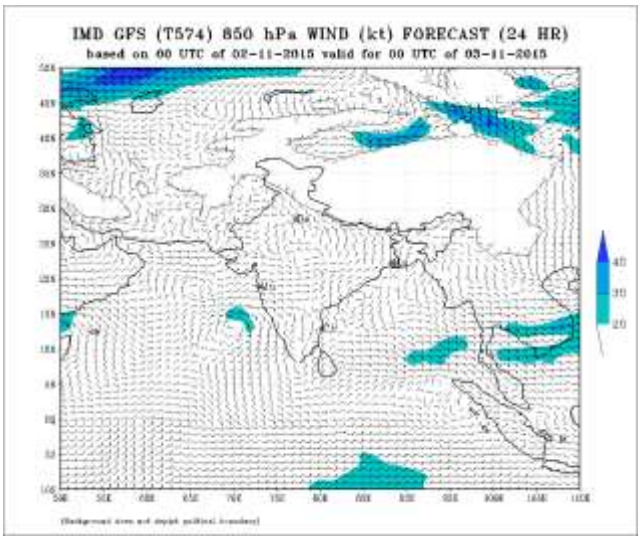

IMD GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 02-11-2015 valid for 00 UTC of 04-11-2015

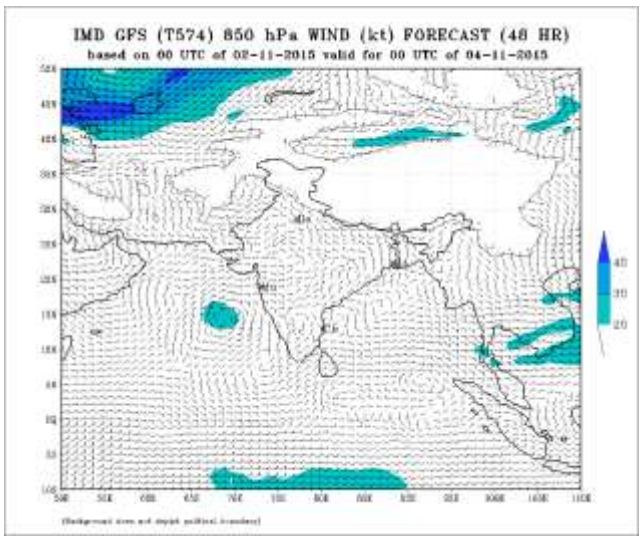

IMD GFS (T574) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 02-11-2015 valid for 00 UTC of 05-11-2015

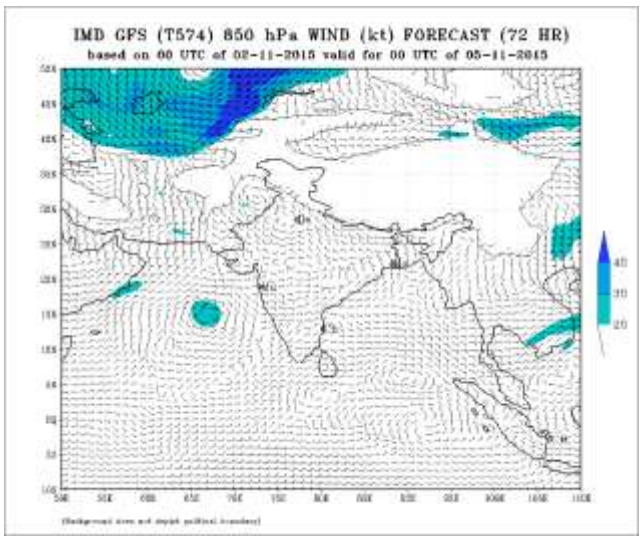

IMD GFS (T574) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 02-11-2015 valid for 00 UTC of 06-11-2015

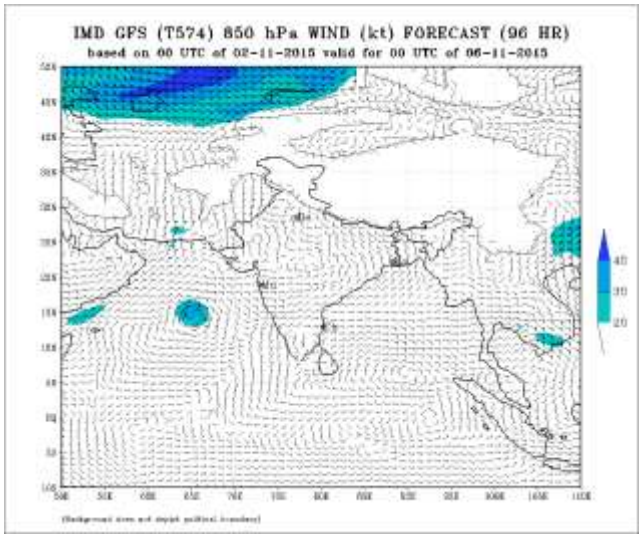

IMD GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 02-11-2015 valid for 00 UTC of 07-11-2015

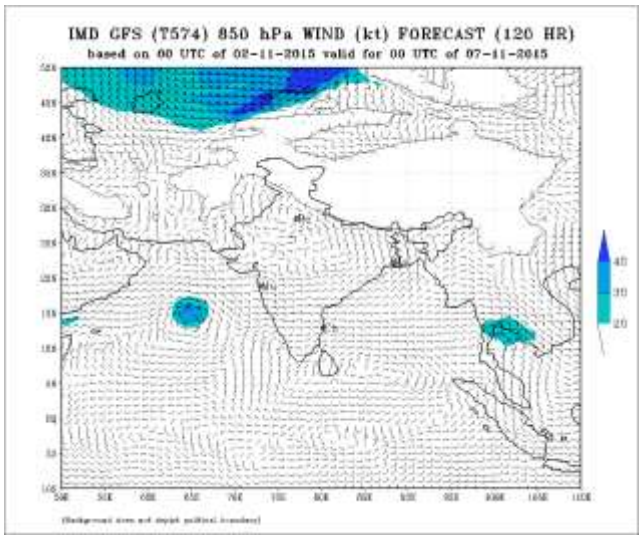

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 02-11-2015 valid for 00 UTC of 02-11-2015

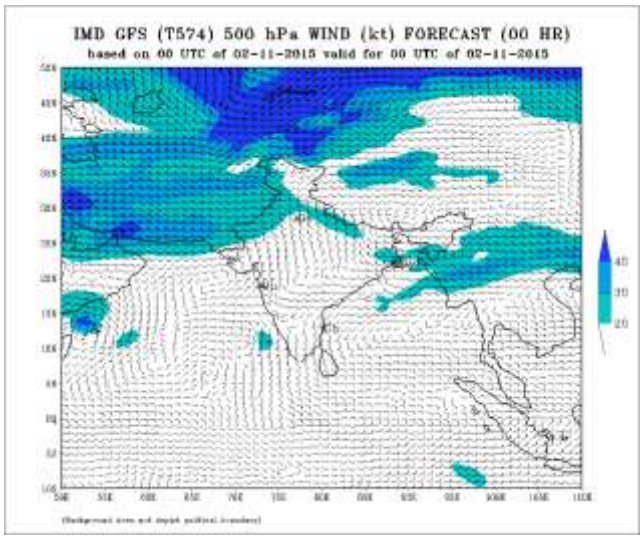

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 02-11-2015 valid for 00 UTC of 03-11-2015


IMD GFS (T574) 850 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 02-11-2015 valid for 00 UTC of 04-11-2015


IMD GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 02-11-2015 valid for 00 UTC of 05-11-2015


IMD GFS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 02-11-2015 valid for 00 UTC of 06-11-2015


IMD GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 02-11-2015 valid for 00 UTC of 07-11-2015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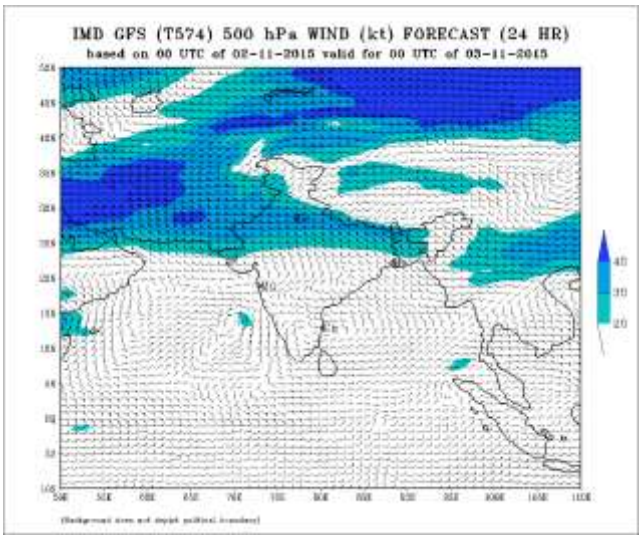
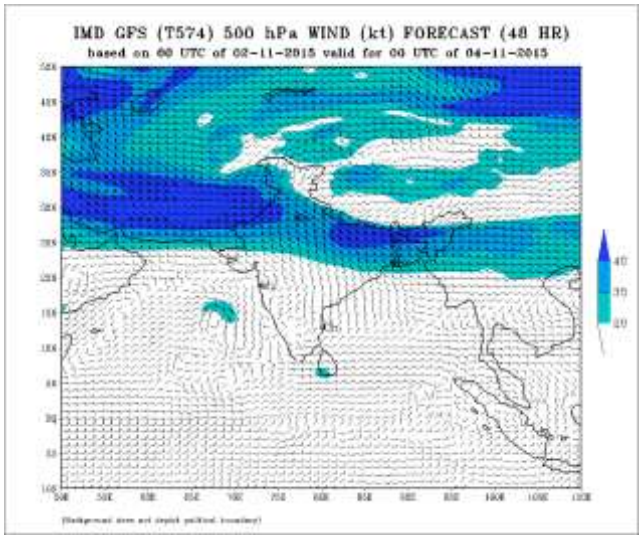
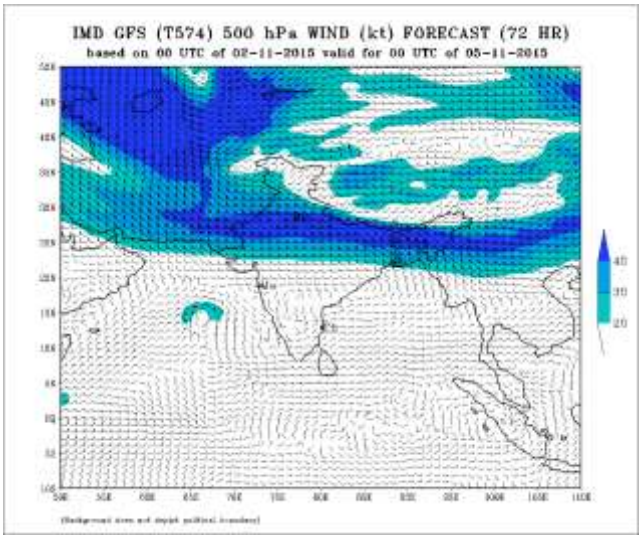
based on 00 UTC of 02-11-2015 valid for 00 UTC of 02-11-2015


IMD GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 02-11-2015 valid for 00 UTC of 03-11-2015


IMD GFS (T574) 500 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 02-11-2015 valid for 00 UTC of 04-11-2015


IMD GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
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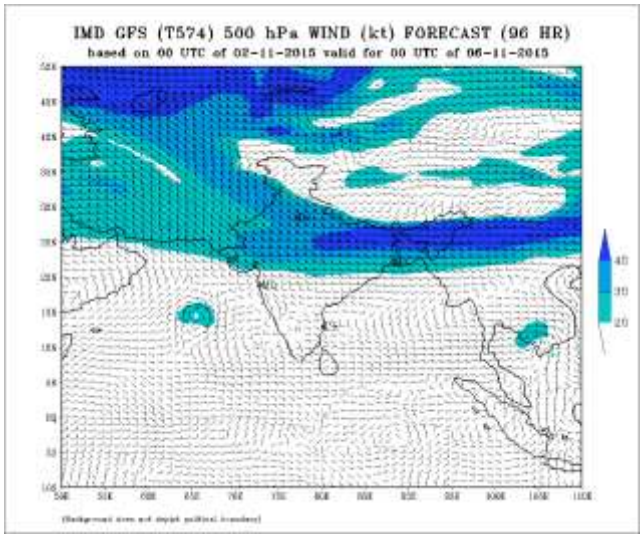
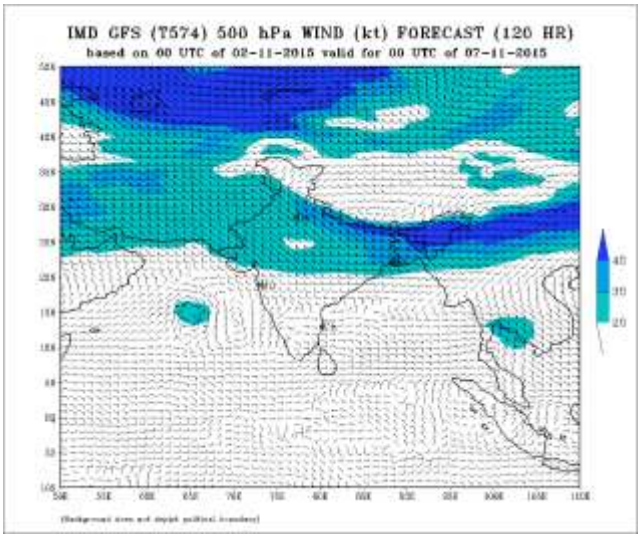
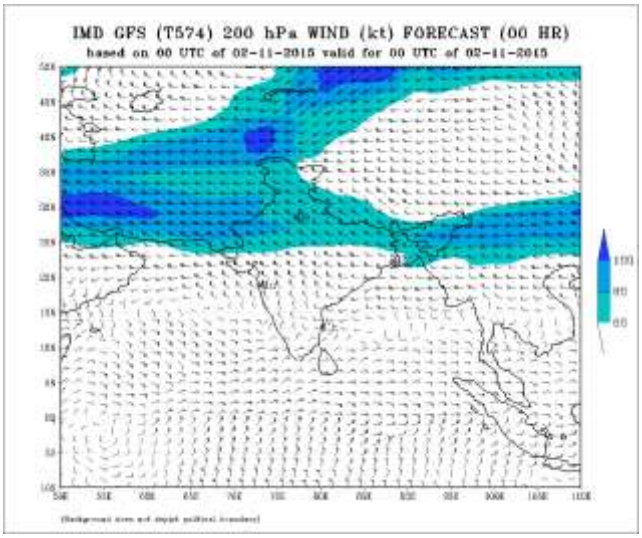
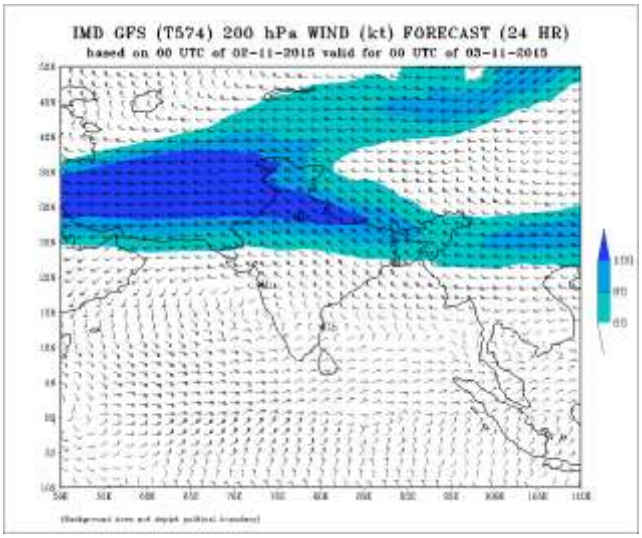
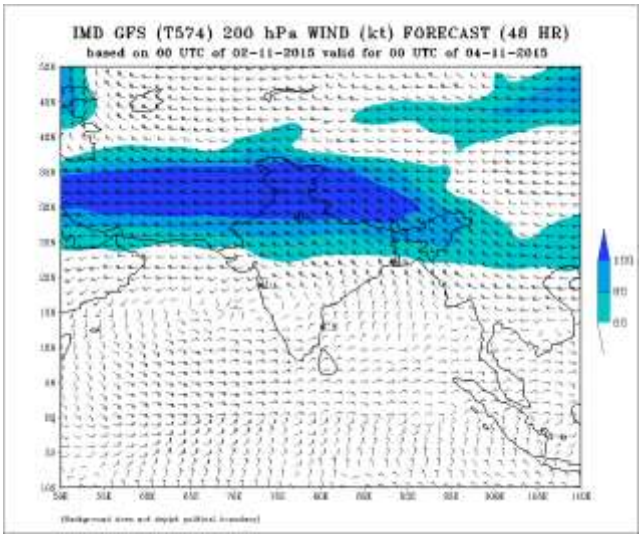
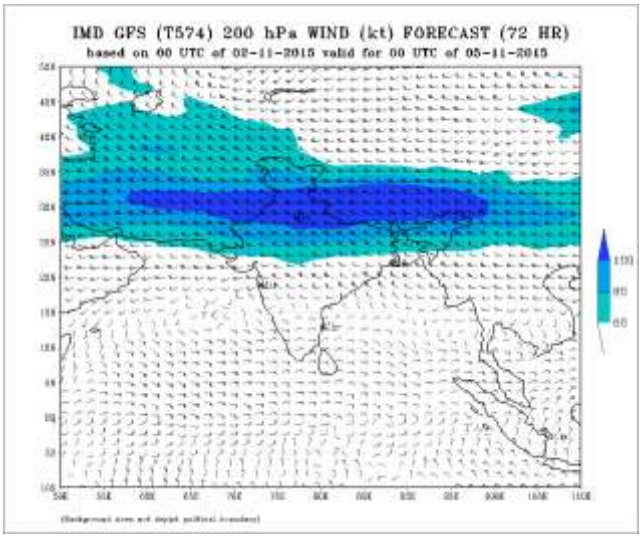

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 02-11-2015 valid for 00 UTC of 06-11-2015

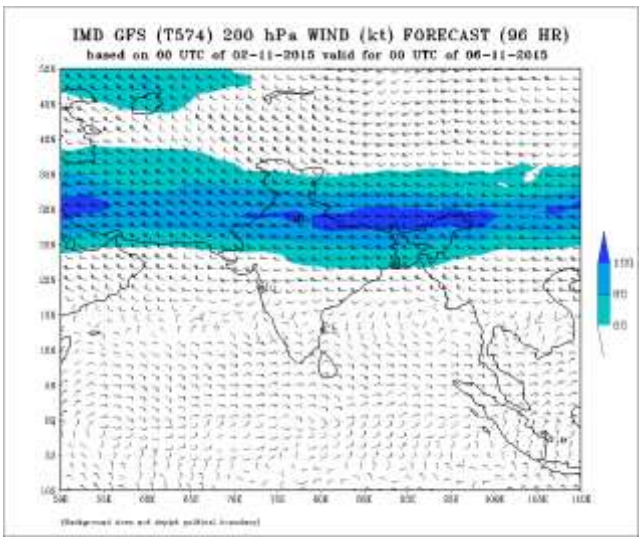

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 02-11-2015 valid for 00 UTC of 07-11-2015

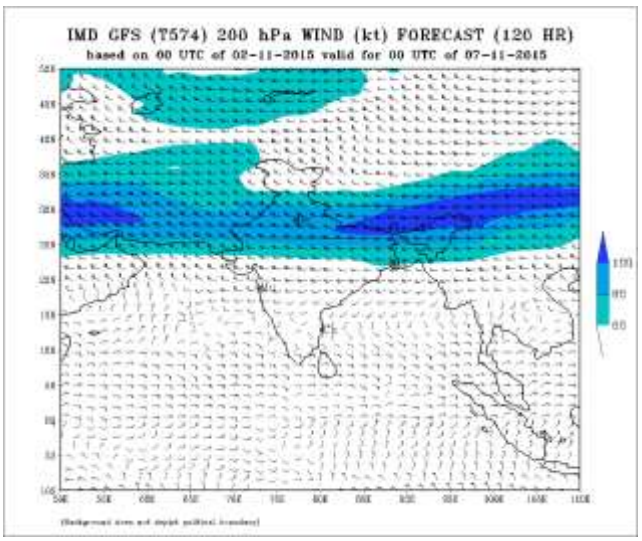

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 02-11-2015 valid for 00 UTC of 02-11-2015


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 02-11-2015 valid for 00 UTC of 03-11-2015


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 02-11-2015 valid for 00 UTC of 04-11-2015


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 02-11-2015 valid for 00 UTC of 05-11-2015


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 02-11-2015 valid for 00 UTC of 06-11-2015


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 02-11-2015 valid for 00 UTC of 07-11-2015

FDP (Cyclone) NOC Report Dated 03 November, 2015

Synoptic features:

- The extremely severe cyclonic storm 'Chapala' over westcentral Arabian Sea (AS) weakened into a very severe cyclonic storm over Gulf of Aden and adjoining westcentral Arabian Sea, moved west-northwestwards, crossed Yemen coast to the southwest of Riyan, near latitude 14.1 degree North and longitude 48.65 degree East during 0100-0200 UTC of today as a very severe cyclonic storm with a maximum sustained surface wind speed of 120-130 kmph gusting to 145 kmph. It then continued to move west-northwestwards, weakened into a cyclonic storm and lay centered at 0900 UTC of today, the 3rd November 2015 over Yemen, near latitude 14.2 degree North and longitude 47.6 degree. It would weaken into a depression during next 12 hours.
- Yesterday's upper air cyclonic circulation over eastcentral Arabian Sea off Karnataka coast still extends upto 3.1 km above mean sea level. Under its influence a low pressure area may form during next 24 hours·
- The upper air circulation over north coastal Andhra Pradesh and neighbourhood extending upto 2.1 km above mean sea level persists.

Environmental features based on 0300 UTC of today:

Sea Surface Temperature (SST):

- SST is 28-30°C over most parts of Bay of Bengal (BoB) and Andaman Sea.
- SST is 26-28°C over most parts of AS except around the region of 60°E and 14°N where it is <26°C due to the passage of tropical cyclone 'Chapala' over this region.

Tropical Cyclone Heat Potential (TCHP):

- TCHP is >100 kJ/cm^2 over equatorial parts of BoB, less than 50 kJ/cm^2 over north BoB and 80-90 kJ/cm^2 over rest of the BoB and Andaman Sea.
- TCHP is 80-100 kJ/cm^2 over eastcentral AS and less than 50 kJ/cm^2 over westcentral and northwest AS. It is 60-80 kJ/cm^2 over rest of the AS.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive (30-40x10^{-5}s^{-1}) over equatorial region of south BoB.
- Relative vorticity at 850 hPa is around 100x10^{-5}s^{-1} near storm Chapala. It is around 50-70x10^{-5}s^{-1} over parts of southeast and adjoining eastcentral AS.

Convergence:

- Lower level convergence is about 5x10^{-5}s^{-1} over parts of eastcentral BoB and adjoining north Andaman Sea.
- Lower level convergence is positive (30x10^{-5}s^{-1}) around storm Chapala over AS. It is 10-15*10^{-5}s^{-1} over eastcentral AS.

Divergence:

- Upper level divergence is 5-10x10^{-5} s^{-1} around the region of TC Chapala over AS. It is around 10-20x10^{-5}s^{-1} over eastcentral and adjoining southeast AS.
- Upper level divergence is 10-20x10^{-5}s^{-1} over south Sri Lanka and adjoining TamilNadu coast and 5-10x10^{-5}s^{-1} over parts of south Andaman Sea.

Wind Shear:

- Wind shear is 5-10 knots over southeast BoB and adjoining south Andaman Sea, south of 12°N. It increases towards the northern parts.
- The vertical wind shear around storm Chapala is about 10-20 knots and it increases northwards. It is about 10 knots over eastcentral AS.

Wind Shear Tendency:

- The vertical wind shear tendency shows no change over most parts of east BoB and Andaman Sea. It is decreasing -5 to -10 knots over parts of southwest BoB.
- The vertical wind shear tendency is -5 to -10 knots over eastern parts of AS along the west coast of India, north of 12°N.

Upper tropospheric ridge:

- The upper tropospheric ridge at 200 hPa runs along 14.0°N over AS.
- The upper tropospheric ridge at 200 hPa runs along 13.0°N over BoB.

M.J.O. Index:

MJO index lies over Phase 2 with amplitude greater than 2.0 and would move to Phase 3 during next 2 days.

Storms and Depression over South China Sea/ South Indian Ocean:

NIL

Satellite:

Inference based on INSAT imagery of **030900** UTC:

Bay of Bengal & Andaman Sea:-

Scattered low and medium clouds with embedded moderate to intense convection lie over central and south BoB and over south Andaman Sea and Tenasserim coast.

Arabian Sea:-

Broken low and medium clouds with embedded moderate to intense convection lie over area between latitude 12.0°N to 17.5°N and longitude 44.5°E to 51.5°E in association with TC Chapala. Minimum cloud top temperature is minus 61°C.

Broken low and medium clouds with embedded moderate to intense convection lie over Lakshadweep & neighbourhood between latitude 9.0°N to 16.5°N and east of longitude 66.0°E in association with low level circulation over the area.

NWP Input for FDP Cyclone based on 0000 UTC of today

NWP Analysis

IMD-GFS model MSLP and wind analysis and forecasts based on 00UTC of 3rd November 2015 shows a feeble low pressure area over eastcentral Arabian Sea and adjoining areas with associated upper air cyclonic circulation extending up to 500 hPa level. The system is likely to move slowly in a westward direction during next 72 hours.

IMD-WRF model wind analysis and forecasts based on 00UTC of 3rd November 2015 shows an upper air cyclonic circulation over eastcentral Arabian Sea and adjoining areas extending up to 500 hPa level. The system is likely to move slowly in a westward direction during next 72 hours.

IMD-NWP products are available at:

http://202.54.31.51/bias/gfsproducts.php
http://202.54.31.51/bias/wrf27pro.php
http://202.54.31.51/bias/potentialparameter.php

NCMRWF-UM: Not available

NCMRWF-GFS: NCMRWF-GFS model shows formation of a low over eastcentral AS on 6th November. It would move westwards towards Africa-Arabia coasts and intensify into a depression during the next 3 days.

NCEP-GFS: NCEP-GFS model shows a low over eastcentral and adjoining southeast AS. It would move westwards and intensify into a depression during the next 5 days.

ECMWF model suggests formation of a low pressure area over southwest BoB on 7th. It would move west-northwestwards, concentrate into a depression/deep depression over southwest Bay of Bengal and cross Tamilnadu coast on 9th November.

This model also shows a low over eastcentral and adjoining southeast AS which would move northwestwards during the next 72 hours and become well-marked on 6th November.

JMA: JMA model indicates a low over southeast and adjoining eastcentral AS off Kerala coast on 3rd/0000 UTC which moves westwards and intensifies into a depression on 6th.

ARP-Meteo France: ARP model shows formation of a low over southeast and adjoining eastcentral AS on 4th/0000 UTC which intensifies into a depression on 5th and moves west-northwestwards.

ARP model also indicates a low over southwest BoB on 3rd November which initially moves east-northeastwards and then north-northwestwards during the next 3 days.

GPP: Genesis Potential Parameter (GPP) analysis based on 00UTC of 3rd November, 2015 shows a zone of potential cyclogenesis centered over eastcentral Arabian Sea and adjoining areas. The forecasts of GPP shows northwest ward shift of the zone of potential cyclogenesis during next 72 hours.

Summary and Conclusion:

Bay of Bengal and Andaman Sea:

ECMWF predicts formation of depression over southwest BoB on 8th November.

Probability of cyclogenesis over Bay of Bengal and Andaman Sea during next 120 hours:

24 HOURS	24-48 HOURS	48-72 HOURS	72-96 hours	96-120 hours
NIL	NIL	NIL	Low	Moderate

Arabian Sea:

Most models predict formation of a depression over eastcentral AS during the next 72-96 hours.

Probability of cyclogenesis over Arabian Sea during next 120 hours:

24 HOURS	24-48 HOURS	48-72 HOURS	72-96 hours	96-120 hours
NIL	NIL	Low	Moderate	Moderate

Advisory: Most models suggest formation of a depression over eastcentral Arabian Sea during the next 2-3 days. ECMWF model predicts formation of a depression over southwest BoB on 7th November which would cross Tamilnadu coast on 9th November as a depression.

IOP will be decided after the formation of low pressure area over the Bay of Bengal.

Annexure-I

Status of observational system:
Synoptic observation:

Region	Date/Time (UTC)		
	02/12	03/00	03/03
India	44	30	36
Coastal stations			
WB	8	3	8
Odisha	7	4	7
AP	11	12	12
Tamil Nadu	11	8	11
Puducherry	2	2	2
A & N	6	1	6
Bangladesh	11	11	11
Myanmar	11	11	11
Thailand	2	2	2
SriLanka	8	7	8

AWS Observations: Not available

RS/RW (12Z) of 02/11/2015 **-0/39**
No. of Ascents reaching 250 hPa level: 0, MISDA: 0

RS/RW (00Z) of 03/11/2015- **24/39**
No. of Ascents reaching 250 hPa level:24, MISDA: 4

No. of PILOT Ascents

02/12Z	03/00Z
8	1

Buoy Data

02/12Z	03/00Z	03/03Z
8	10	7

STATUS OF CHENNAI REGION OBSERVATIONS

No. of Synop data

Date→	02.11.2015							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	20	22	20	20	22	20	20	20

No. of RS/RW Ascents

00Z /02.11.2015 : 7
No. of Ascents reaching 250 hPa level = 7
MISDA : 1

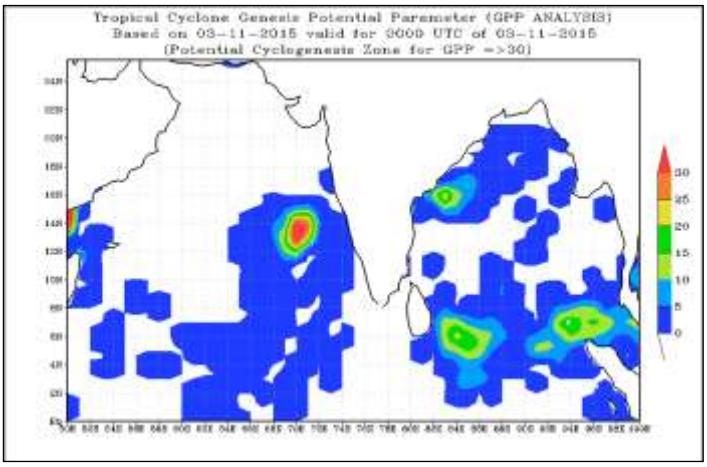
12Z /02.11.2015 : 1
No. of Ascents reaching 250 hPa level =1
MISDA : 7

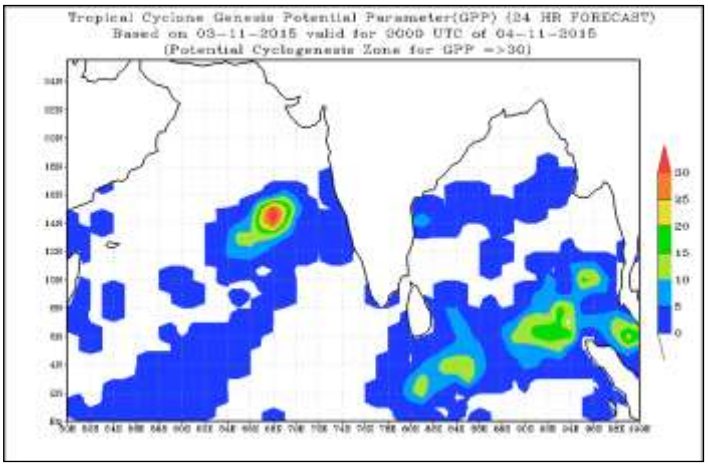
No. of PILOT Ascents:

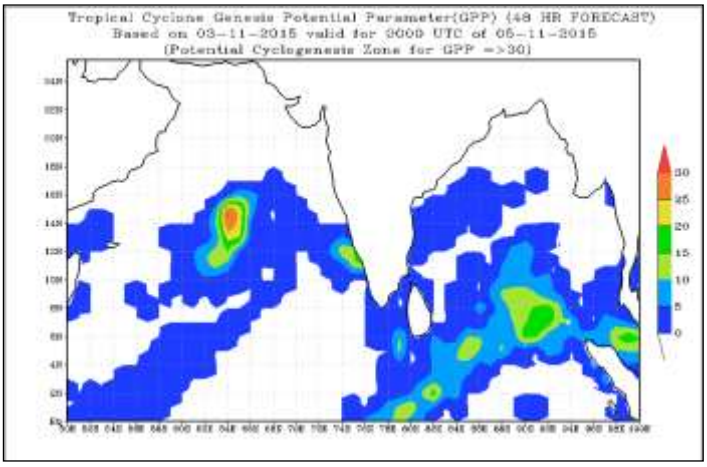
02.11.2015

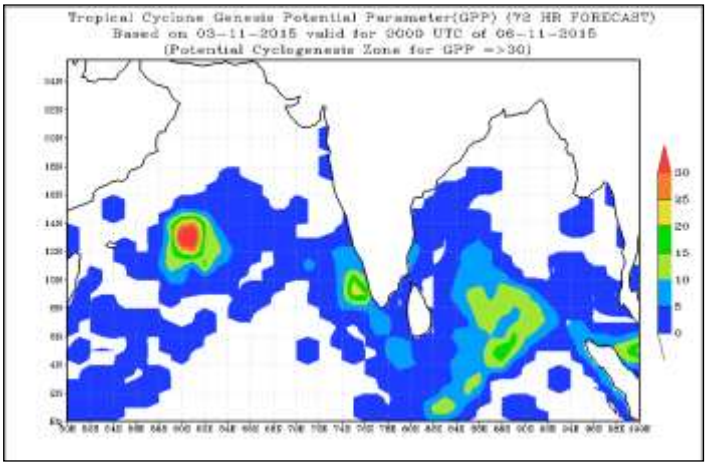
06Z	18Z
2	4

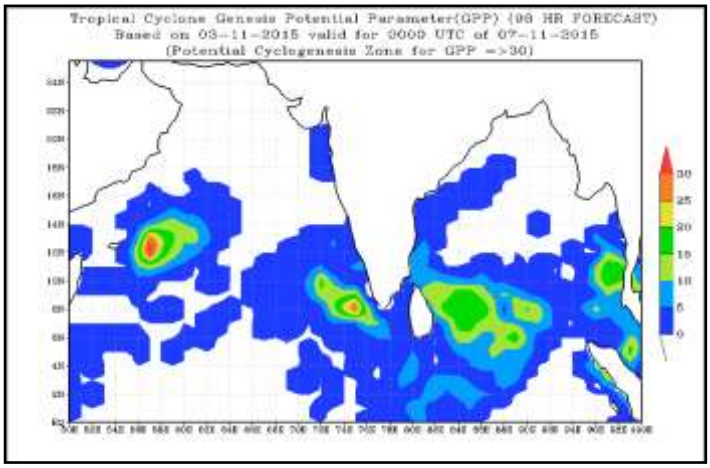
Annexure-II

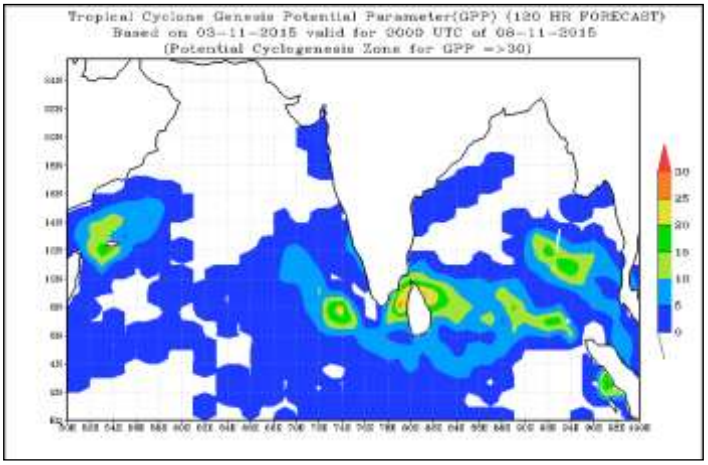

Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 03-11-2015 valid for 0000 UTC of 03-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

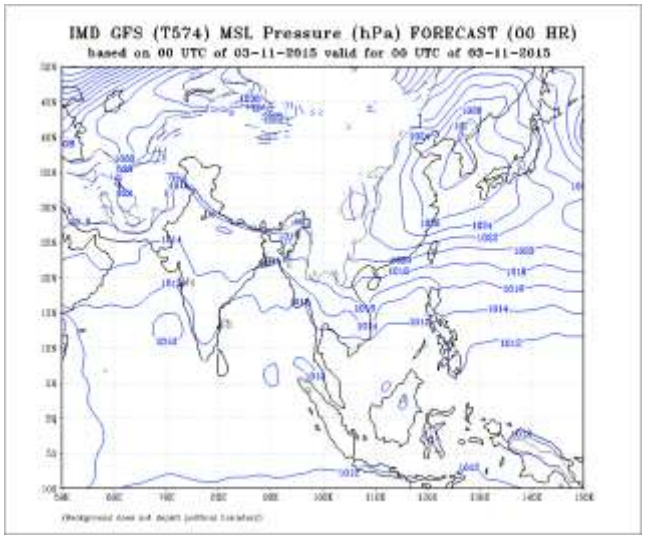

Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 03-11-2015 valid for 0000 UTC of 04-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

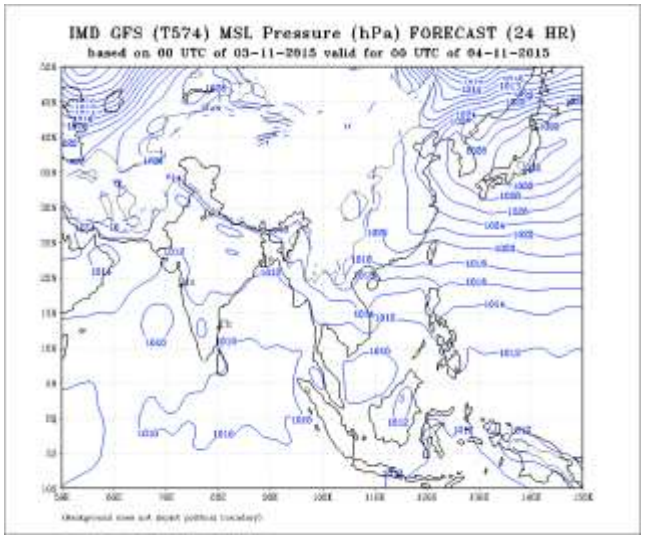

Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
Based on 03-11-2015 valid for 0000 UTC of 05-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

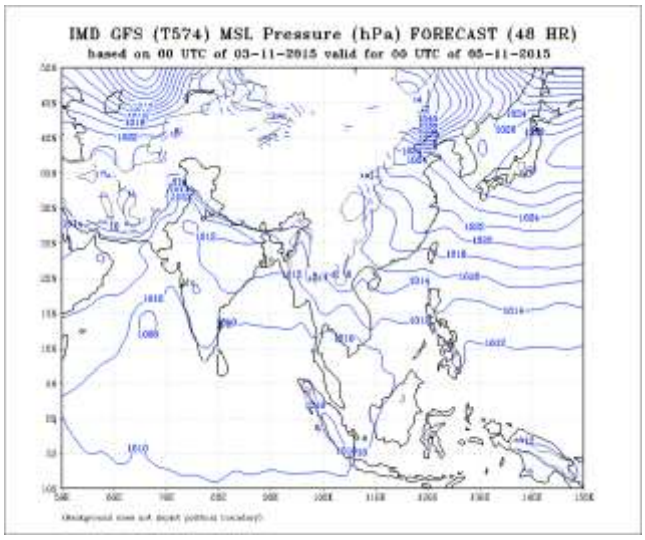

Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 03-11-2015 valid for 0000 UTC of 06-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

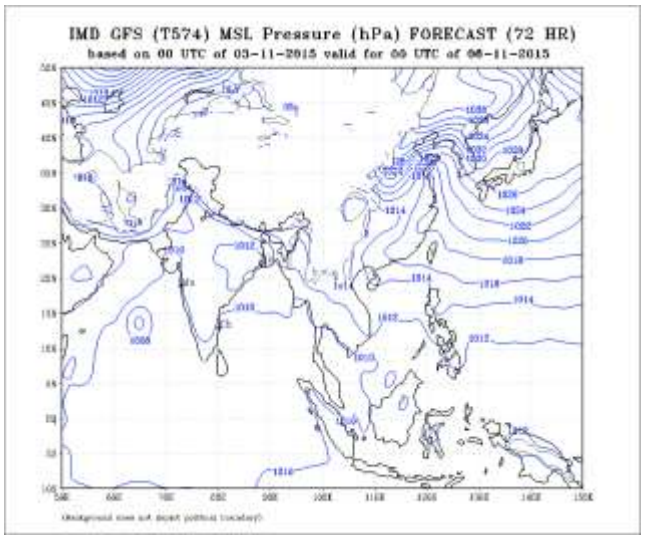

Tropical Cyclone Genesis Potential Parameter(GPP) (96 HR FORECAST)
Based on 03-11-2015 valid for 0000 UTC of 07-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

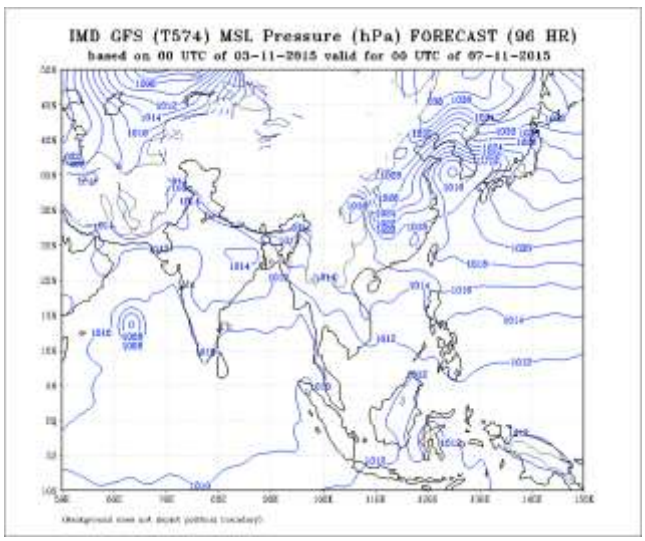

Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 03-11-2015 valid for 0000 UTC of 08-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

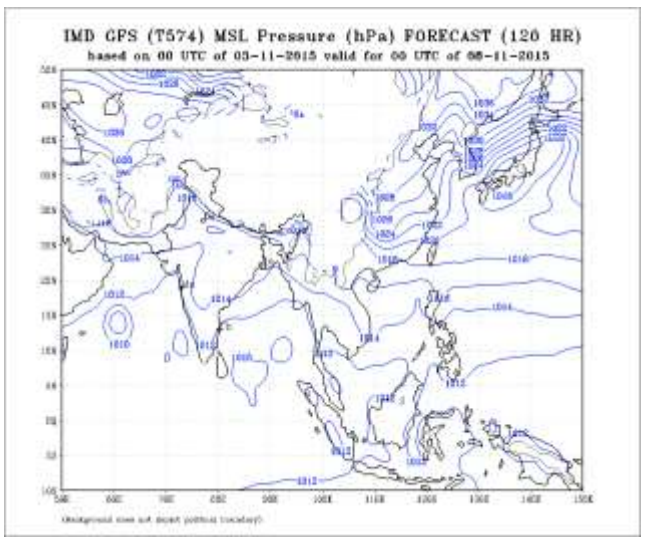

IMD GFS (T574) MSL Pressure (hPa) FORECAST (00 HR)
based on 00 UTC of 03-11-2015 valid for 00 UTC of 03-11-2015

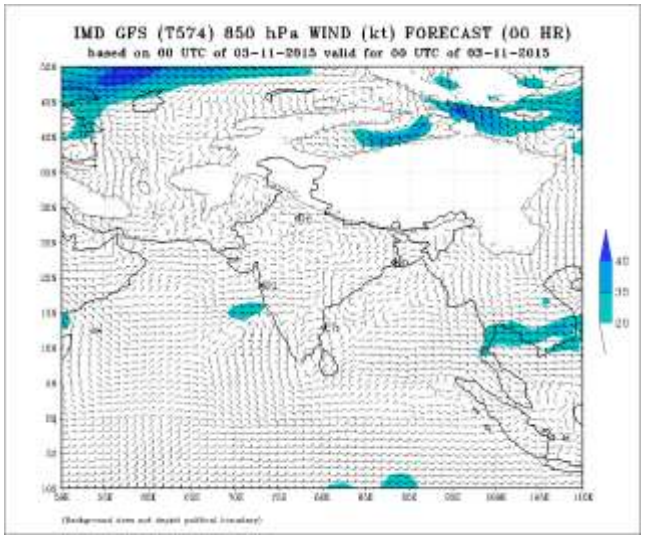

IMD GFS (T574) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 03-11-2015 valid for 00 UTC of 04-11-2015

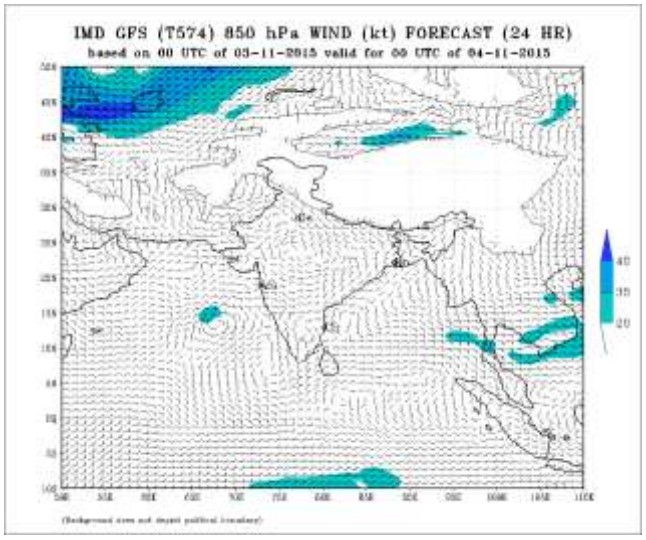

IMD GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 03-11-2015 valid for 00 UTC of 05-11-2015

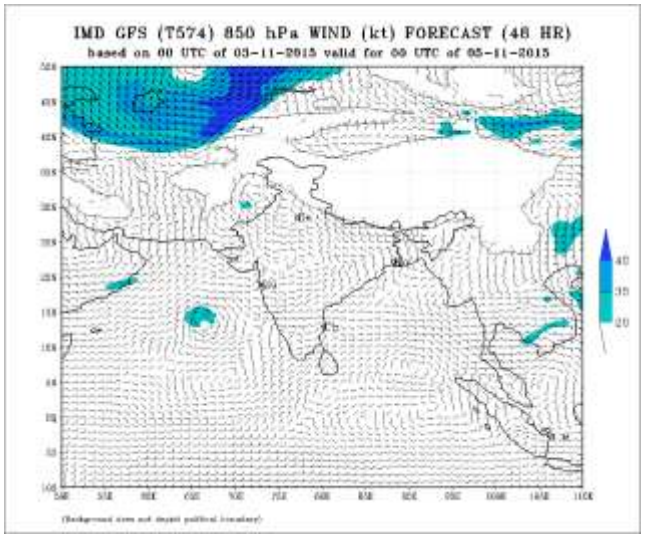

IMD GFS (T574) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 03-11-2015 valid for 00 UTC of 06-11-2015

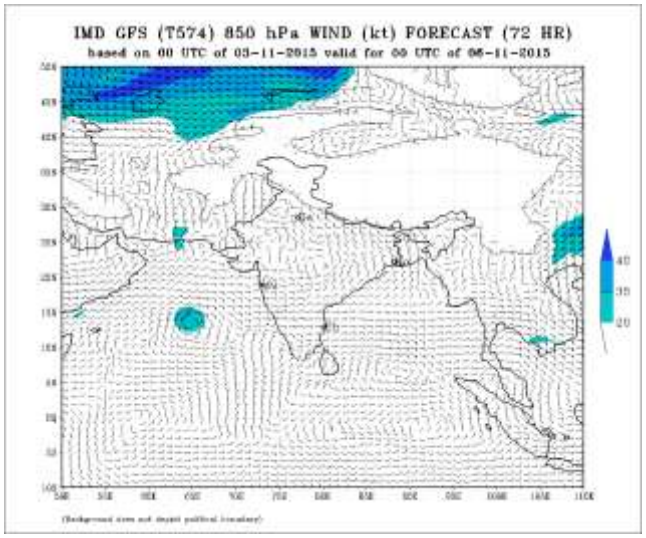

IMD GFS (T574) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 03-11-2015 valid for 00 UTC of 07-11-2015

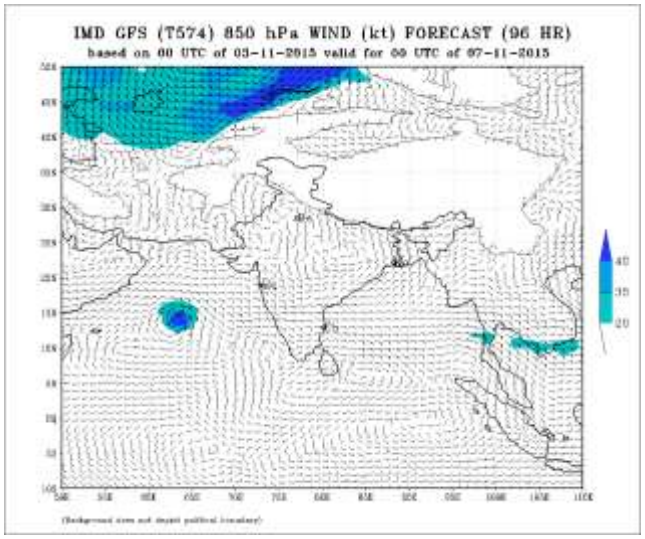

IMD GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 03-11-2015 valid for 00 UTC of 08-11-2015

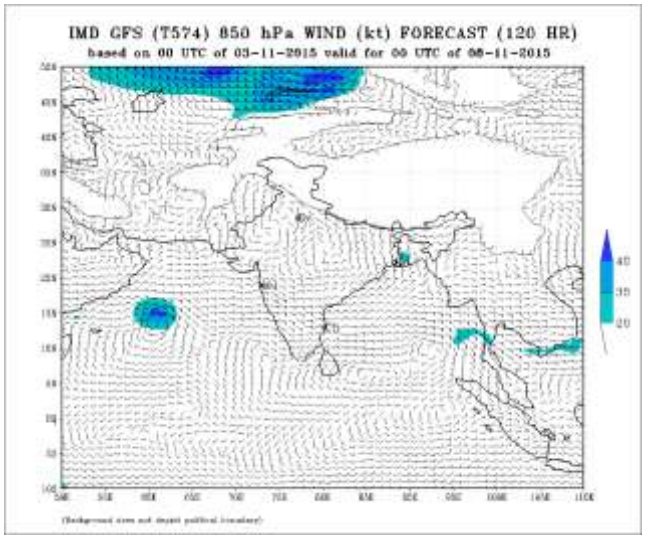

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 03-11-2015 valid for 00 UTC of 03-11-2015

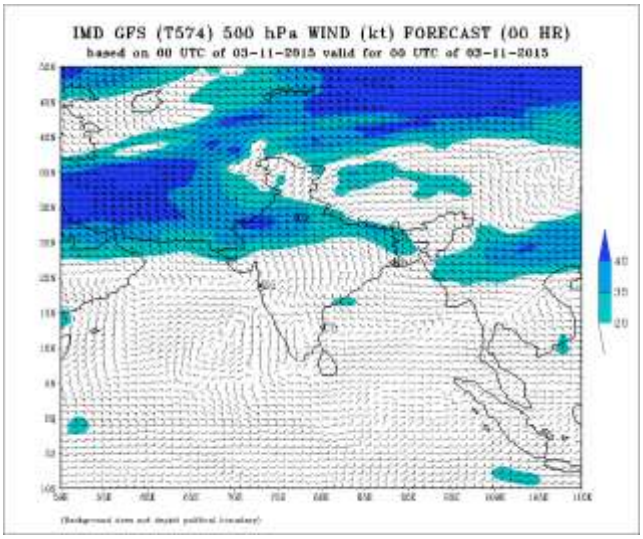

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 03-11-2015 valid for 00 UTC of 04-11-2015

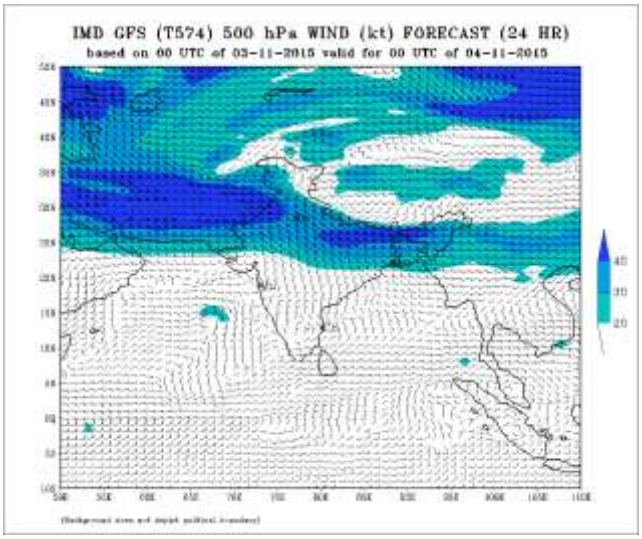

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 03-11-2015 valid for 00 UTC of 05-11-2015

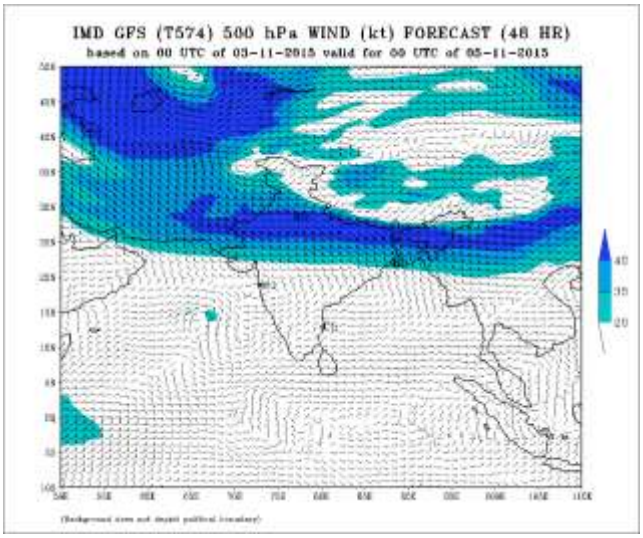

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 03-11-2015 valid for 00 UTC of 06-11-2015

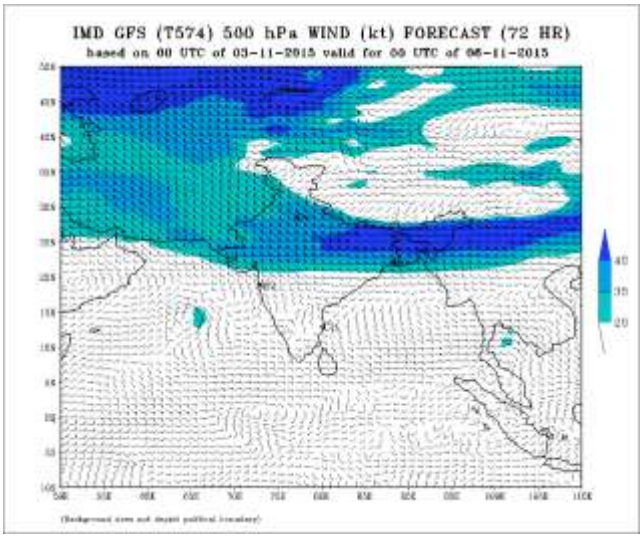

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 03-11-2015 valid for 00 UTC of 07-11-2015

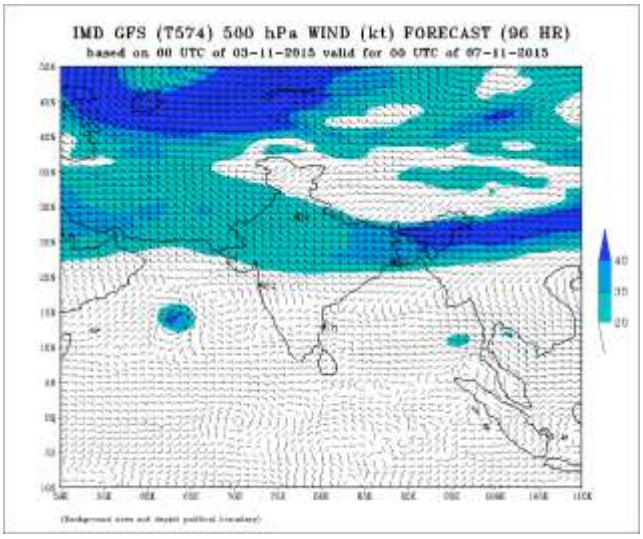

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 03-11-2015 valid for 00 UTC of 08-11-2015

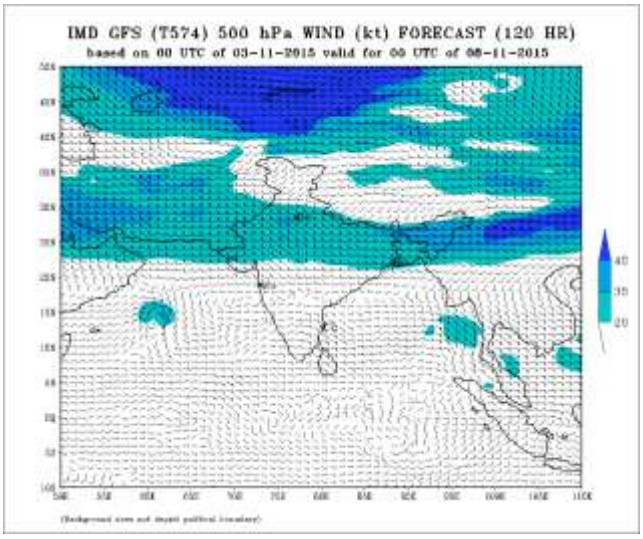

IMD GPS (T574) 500 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 03-11-2015 valid for 00 UTC of 03-11-2015

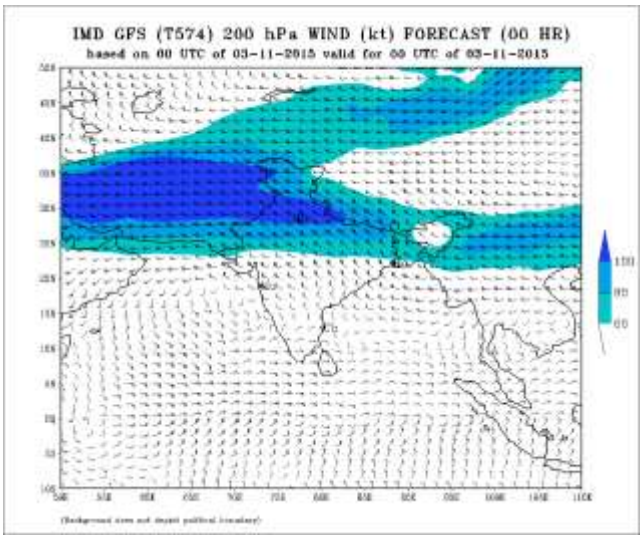

IMD GPS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 03-11-2015 valid for 00 UTC of 04-11-2015

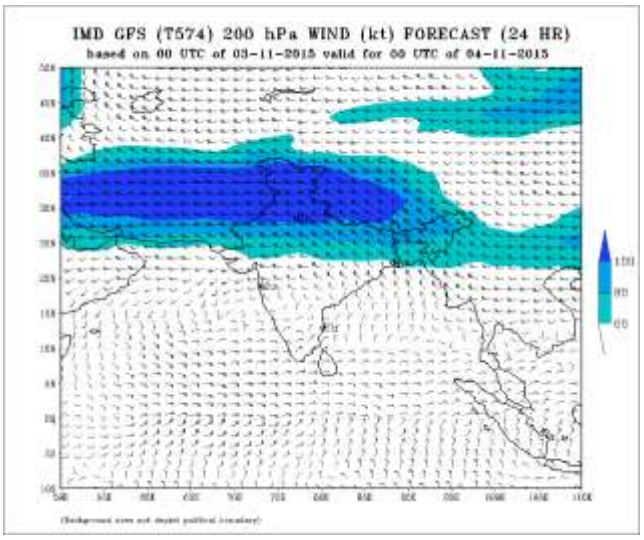

IMD GPS (T574) 500 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 03-11-2015 valid for 00 UTC of 05-11-2015

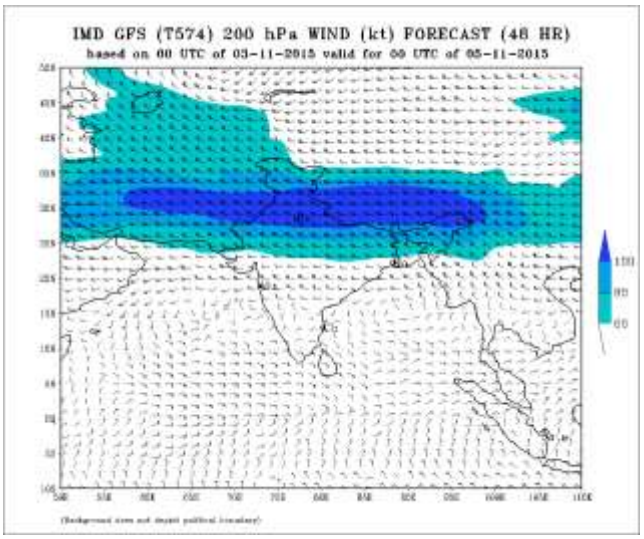

IMD GPS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 03-11-2015 valid for 00 UTC of 06-11-2015

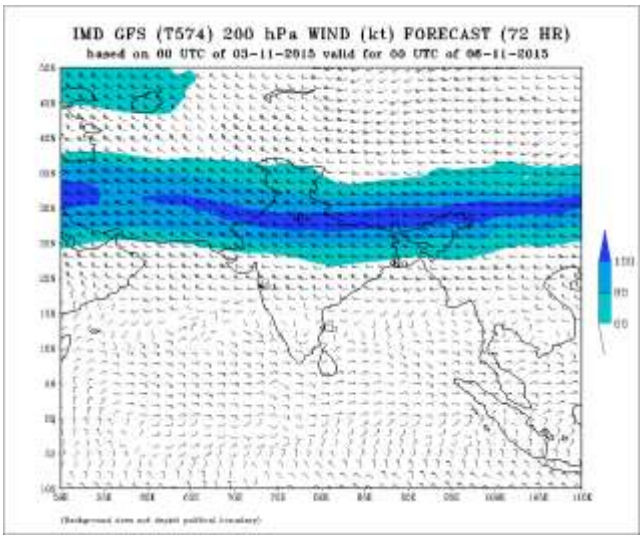

IMD GPS (T574) 500 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 03-11-2015 valid for 00 UTC of 07-11-2015

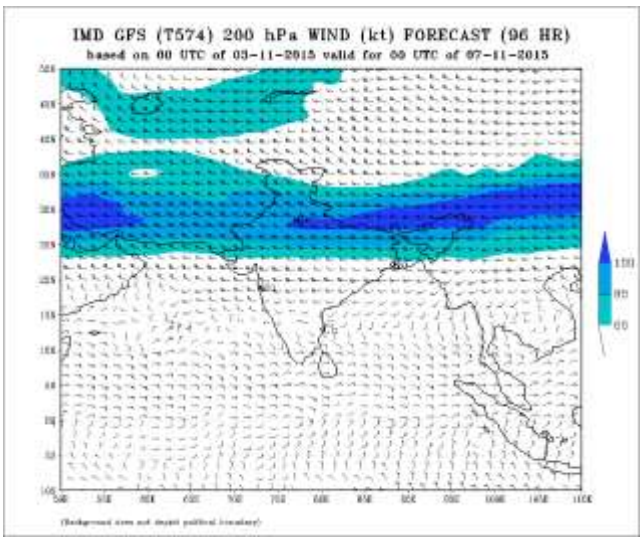

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 03-11-2015 valid for 00 UTC of 08-11-2015

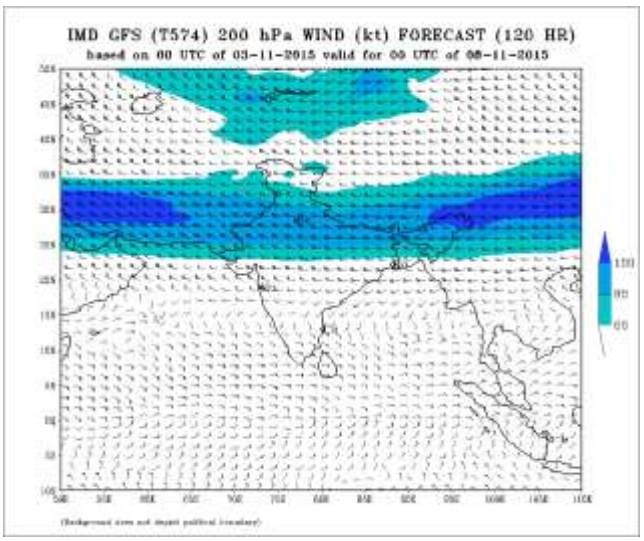

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 03-11-2015 valid for 00 UTC of 03-11-2015


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 03-11-2015 valid for 00 UTC of 04-11-2015


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 03-11-2015 valid for 00 UTC of 05-11-2015


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 03-11-2015 valid for 00 UTC of 06-11-2015


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 03-11-2015 valid for 00 UTC of 07-11-2015


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 03-11-2015 valid for 00 UTC of 08-11-2015

FDP (Cyclone) NOC Report Dated 04 November, 2015

Synoptic features:

- The low pressure area over eastcentral & neighbourhood Arabian Sea has become a well marked low pressure area over the same region. Associated upper air cyclonic circulation extends upto 5.8 km above mean sea level. The system would concentrate into a Depression during next 48hours.
- The upper air cyclonic circulation over westcentral Bay of Bengal off Andhra Pradesh coast persists and now extends upto 1.5 km above mean sea level.
- An upper air cyclonic circulation lies over Equatorial Indian Ocean and adjoining southwest Bay of Bengal and extends upto 1.5 km above mean sea level.

Environmental features based on 0300 UTC of today:

Sea Surface Temperature (SST):

- SST is 29-30°C around the system over eastcentral Arabian Sea.
- SST is 26-28°C over most parts of AS except some parts of westcentral AS where it is 24-26°C due to the passage of tropical cyclone 'Chapala' over this region.
- SST is 28-30°C over most parts of Bay of Bengal (BoB) and Andaman Sea.

Tropical Cyclone Heat Potential (TCHP):

- TCHP is 80-100 kJ/cm^2 over eastcentral AS and less than 60 kJ/cm^2 over westcentral and northwest AS. It is 60-80 kJ/cm^2 over rest of the AS.
- TCHP is 100-120 kJ/cm^2 over equatorial parts of BoB, less than 60 kJ/cm^2 over north BoB and 80-90 kJ/cm^2 over rest of the BoB and Andaman Sea.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive (30-40x10^{-5}s^{-1}) over equatorial region of south BoB.
- Relative vorticity at 850 hPa is around 50x10^{-5}s^{-1} around the system over eastcentral Arabian Sea. It is around 20-30x10^{-5}s^{-1} over parts of eastcentral AS, and negative in rest parts of AS.

Convergence:

- Lower level convergence is positive (10x10^{-5}s^{-1}) around the system over eastcentral Arabian Sea.
- Lower level convergence is about 5-10x10^{-5}s^{-1} over many parts of south BoB and adjoining Andaman Sea.

Divergence:

- Upper level divergence is 20-30-10x10^{-5} s^{-1} and increasing around the system over eastcentral Arabian Sea.
- It is 5-10x10^{-5}s^{-1} over many parts of south BoB

Wind Shear:

- Wind shear is 05 knots over south BoB extended upto adjoining Andaman Sea, south of 12°N. It increases towards the northern parts.
- The vertical wind shear around the system over eastcentral Arabian Sea is about 5-10 knots and it increases towards both northwards and southwards .

Wind Shear Tendency:

- The vertical wind shear tendency shows no change over most parts of east BoB and Andaman Sea. It is decreasing -5 to -10 knots over parts of southwest BoB.

- The vertical wind shear tendency shows -5 knots around the system over eastcentral Arabian Sea and -5 to -10 knots over extreme southwest AS and positive 5 to 10 knots over central parts and adjoining west central parts of AS.

Upper tropospheric ridge:

- The upper tropospheric ridge at 200 hPa runs along 16.0°N

M.J.O. Index:

- MJO index lies over Phase 3 with amplitude greater than 2.0 and would continue to move in the same phase during next 2 days.

Storms and Depression over South China Sea/ South Indian Ocean:

NIL

Satellite:

Inference based on INSAT imagery of **030900** UTC:

Bay of Bengal & Andaman Sea:-

Broken low/medium clouds with embedded moderate to intense convection over southeast Bay of Bengal and Andaman sea.

Arabian Sea:-

Broken low/medium clouds with isolated embedded weak convection lies over area bet latitude 13.0 N to 22.0 N longitude 44.0 E to 51.5 E in association with vortex (TS Chapala weakened into well marked low)over the area .

Vortex over eastcentral Arabian Sea now centered within a half degree of 14.0 N/67.9E. Intensity is T1.0. Associated broken low & medium clouds with embedded intense to very intense convection lies over the area between latitude 11.0 N to 17.5 N longitude 64.5 E to 71.5 E. Minimum CTT is minus 71 deg C.

Scattered low/medium clouds with embedded moderate to intense convection over southeast Arabian Sea.

NWP Analysis

IMD-GFS

IMD-GFS model charts analysis and forecasts based on 00UTC of 4th November 2015 shows a low pressure area over East Central Arabian Sea and adjoining areas with associated upper air cyclonic circulation extending up to 500 hPa level. The system likely to move in a westward direction during next 72 hours. The analysis and forecasts of IMD-GFS model charts also shows an upper air cyclonic circulation over west central Bay of Bengal and adjoining areas extending up to 850 hPa level and likely to become less marked during next 24 hours.

IMD-WRF

IMD-WRF model charts analysis and forecasts based on 00UTC of 4th November 2015 shows a low pressure area over East Central Arabian Sea and adjoining areas with associated upper air cyclonic circulation extending up to 500 hPa level. The system likely to move in a westward direction during next 72 hours. The analysis and forecasts of IMD-WRF model charts also shows an upper air cyclonic circulation over west central Bay of Bengal and adjoining areas extending up to 850 hPa level and likely to become less marked during next 24 hours.

IMD-NWP products are available at:

http://202.54.31.51/bias/gfsproducts.php
http://202.54.31.51/bias/wrf27pro.php
http://202.54.31.51/bias/potentialparameter.php

NCMRWF-UM: Model suggest formation of Low over eastcental Arabian sea moving in northwesterly direction with no significant intensification. It also suggest formation of Low over southwest BoB on 6th and crossing Tamil Nadu coast on 8th and further moving in Arabian sea during next 2-3 days.

NCMRWF-GFS model shows formation of a low over eastcentral AS on 6th November. It would move northwestwards towards Oman coasts and intensify into a depression during the next 3 days. It also suggest formation of Low over southeast Bay of Bengal on 9th, intensifying into a depression during the next 3 days, crossing towards Tamil Nadu coast on 12th.

NCEP-GFS model suggest formation of Low over eastcental Arabian sea moving in northwesterly direction with no significant intensification.

It also suggests formation of Low over southwest BoB on 6th and crossing south Tamil Nadu coast on 10th.

ECMWF model suggest a low over eastcentral and adjoining southeast AS which would initially move northwestwards with marginal intensification during the next 72 hours thereafter weakening into a well-marked low on 9th November moving in westerly direction.

Model suggests formation of another low pressure area over southwest BoB on 9th. It would move west-northwestwards, concentrate into a depression/deep depression over southwest Bay of Bengal and cross Tamil Nadu coast in next 2-3 days.

JMA: JMA model indicates a low over southeast and adjoining eastcentral AS moving in northwestward direction towards Oman with no significant intensification. Another Low over southwest BoB on 6th and moving towards Sri Lanka in next 2-3 days.

ARP-Meteo France: model indicates a low over southeast AS moving in northwestward direction towards Oman . Another Low over southwest BoB on 6th and moving towards Sri Lanka in next 2-3 days.

GPP: Genesis Potential Parameter (GPP) analysis based on 00UTC of 4th November, 2015 shows a zone of high GPP centered over East Central Arabian Sea and adjoining areas. The forecasts of GPP shows northwest ward movement of the region of high GPP with increase in intensity during next 72 hours.

Summary and Conclusion:

Bay of Bengal and Andaman Sea:

ECMWF predicts formation of depression over southwest BoB on 7th November.

Probability of cyclogenesis over Bay of Bengal and Andaman Sea during next 120 hours:

24 HOURS	24-48 HOURS	48-72 HOURS	72-96 hours	96-120 hours
NIL	NIL	Low	Fair	Moderate

Arabian Sea:

Most models predict formation of a depression over eastcentral AS during the next 72-96 hours.

Probability of cyclogenesis over Arabian Sea during next 120 hours:

24 HOURS	24-48 HOURS	48-72 HOURS	72-96 hours	96-120 hours
Moderate	High	High	High	High

Advisory:

Most models suggest formation of a depression over eastcentral Arabian Sea moving in northwesterly direction during the next 2 days.

ECMWF model predicts formation of a depression over southwest BoB on 7th November which would cross south Tamil Nadu coast on 9th November as a depression.

IOP will be conducted during 8-10 for Coastal Tamil Nadu.

Details of the status of observational systems are given in **Annexure I.**

Annexure-I

Status of observational system:

Synoptic observation:

Region	Date/Time (UTC)		
	03/12	04/00	04/03
India	30	30	29
Coastal stations			
WB	4	4	5
Odisha	7	4	5
AP	7	10	5
Tamil Nadu	5	9	6
Puducherry	2	2	2
A & N	5	1	6
Bangladesh	10	9	10
Myanmar	11	-	-
Thailand	2	2	2
SriLanka	8	7	8

AWS Observations: Not available

RS/RW (12Z) of 03/11/2015 **-0/39**

No. of Ascents reaching 250 hPa level: 0, MISDA: 0

RS/RW (00Z) of 04/11/2015- **28/39**
No. of Ascents reaching 250 hPa level:25, MISDA: 3

No. of PILOT Ascents

03/12Z	04/00Z
5	3

Buoy Data

03/12Z	04/00Z	04/03Z
3	5	6

STATUS OF CHENNAI REGION OBSERVATIONS

No. of Synop data

Date→				**03.11.2015**				
UTC→	**00**	**03**	**06**	**09**	**12**	**15**	**18**	**21**
Chennai Region (Coasts of AP & TN)	**20**	**22**	**20**	**20**	**21**	**20**	**20**	**20**

No. of RS/RW Ascents

00Z /03.11.2015 : 7
No. of Ascents reaching 250 hPa level = 1
MISDA : 1

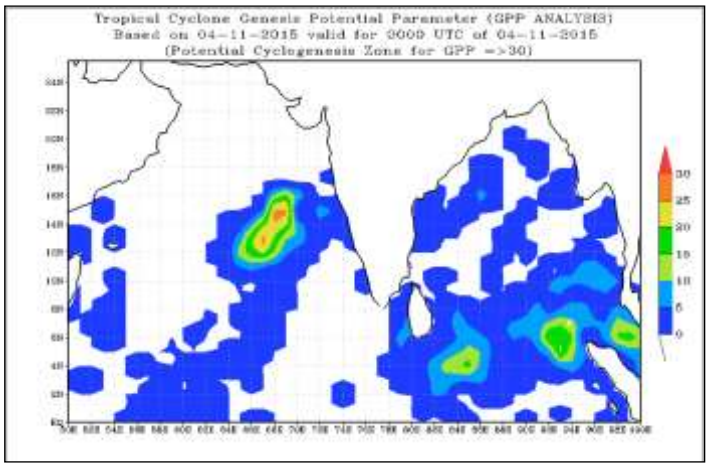
12Z /03.11.2015 : 0
No. of Ascents reaching 250 hPa level = 0
MISDA : 8

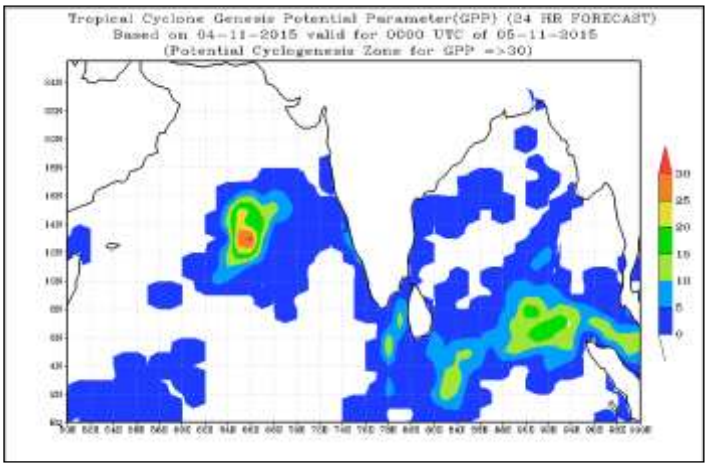
No. of PILOT Ascents:

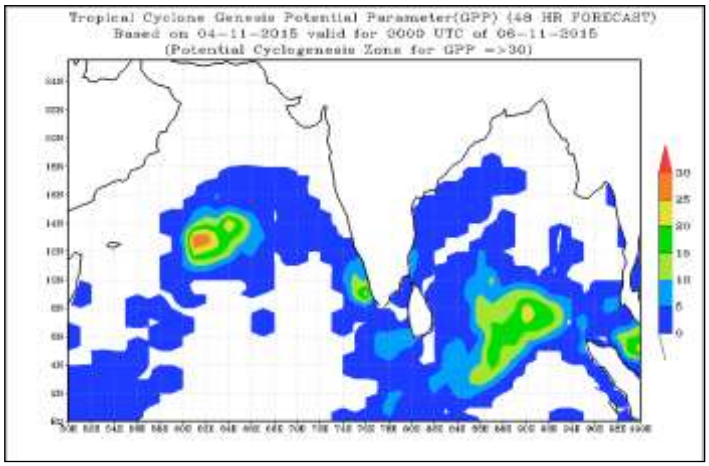
03.11.2015

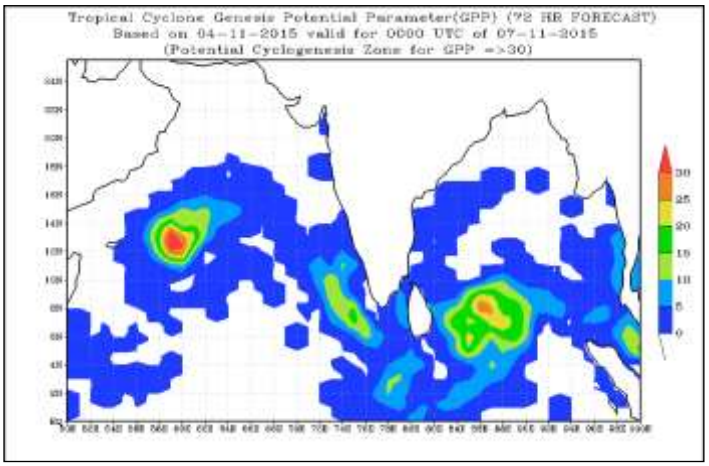
06Z	18Z
4	4

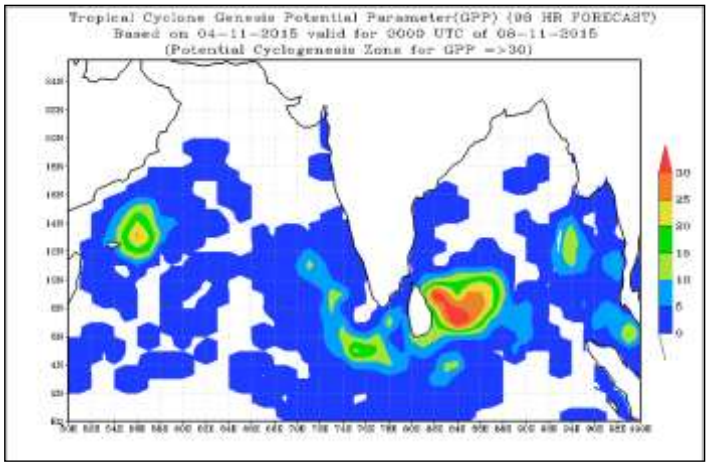
Annexure-II

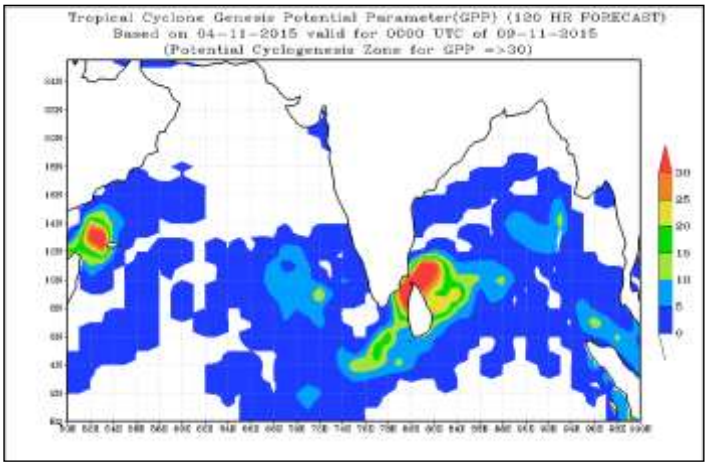

Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 04-11-2015 valid for 0000 UTC of 04-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

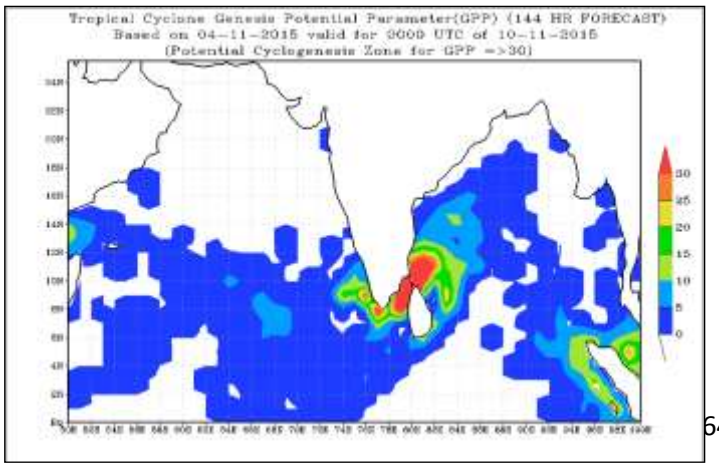

Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 04-11-2015 valid for 0000 UTC of 05-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

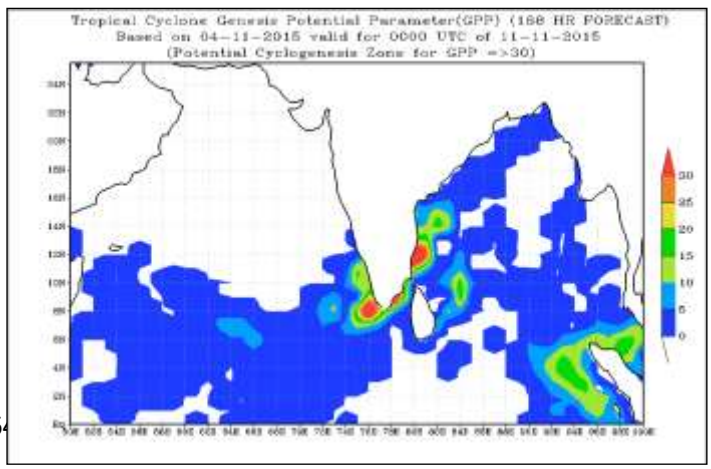

Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
Based on 04-11-2015 valid for 0000 UTC of 06-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

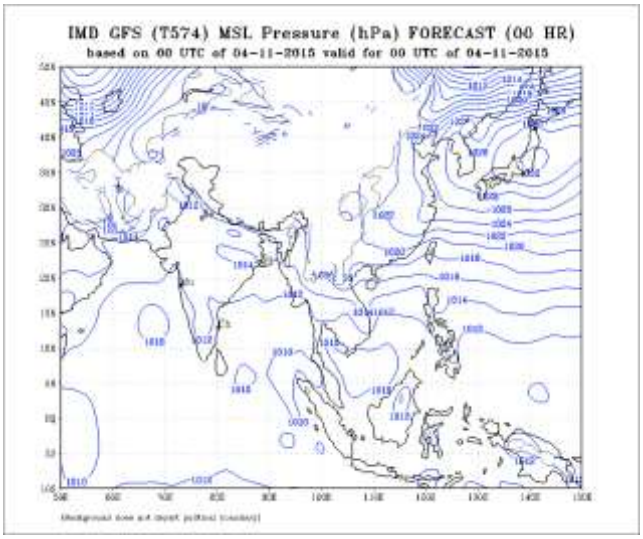

Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 04-11-2015 valid for 0000 UTC of 07-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

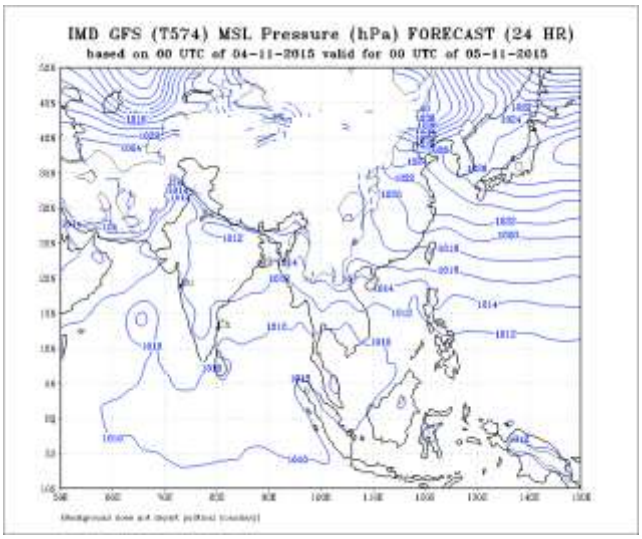

Tropical Cyclone Genesis Potential Parameter(GPP) (96 HR FORECAST)
Based on 04-11-2015 valid for 0000 UTC of 08-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

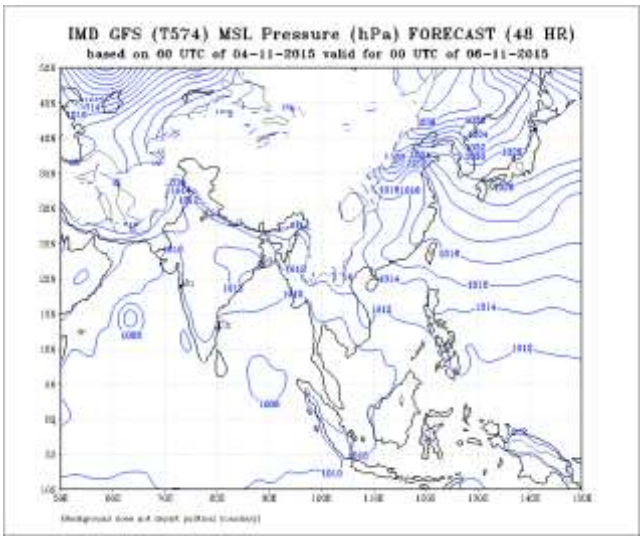

Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 04-11-2015 valid for 0000 UTC of 09-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

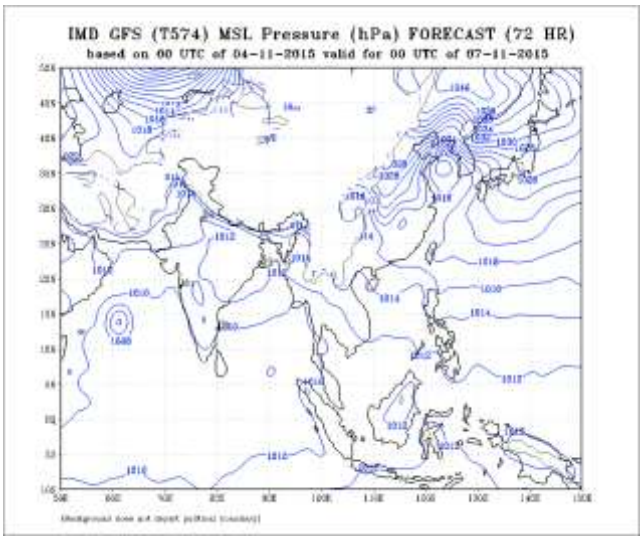

Tropical Cyclone Genesis Potential Parameter(GPP) (144 HR FORECAST)
Based on 04-11-2015 valid for 0000 UTC of 10-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

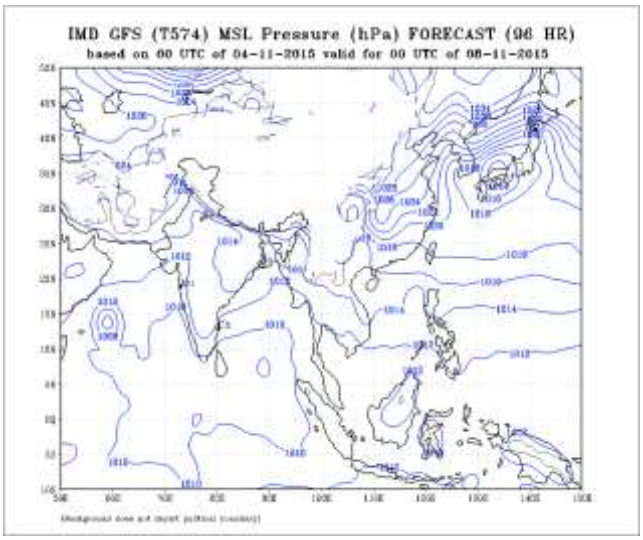

Tropical Cyclone Genesis Potential Parameter(GPP) (168 HR FORECAST)
Based on 04-11-2015 valid for 0000 UTC of 11-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

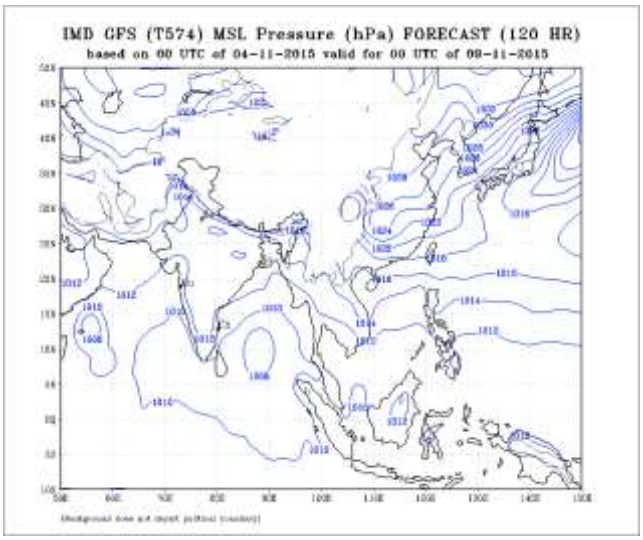

IMD GFS (T574) MSL Pressure (hPa) FORECAST (00 HR)
based on 00 UTC of 04-11-2015 valid for 00 UTC of 04-11-2015

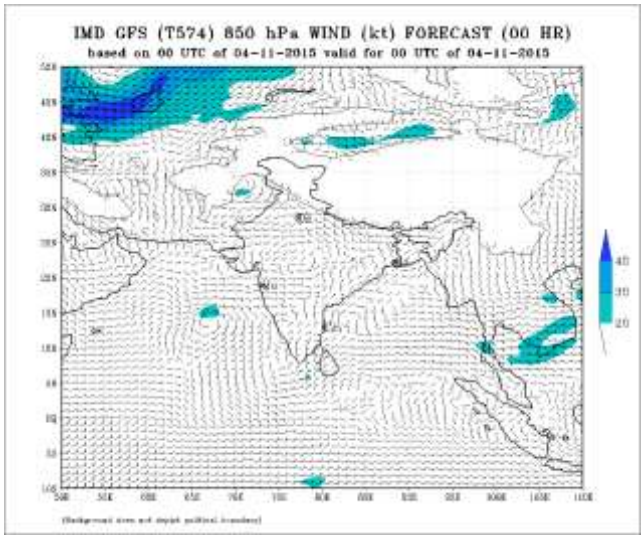

IMD GFS (T574) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 04-11-2015 valid for 00 UTC of 05-11-2015

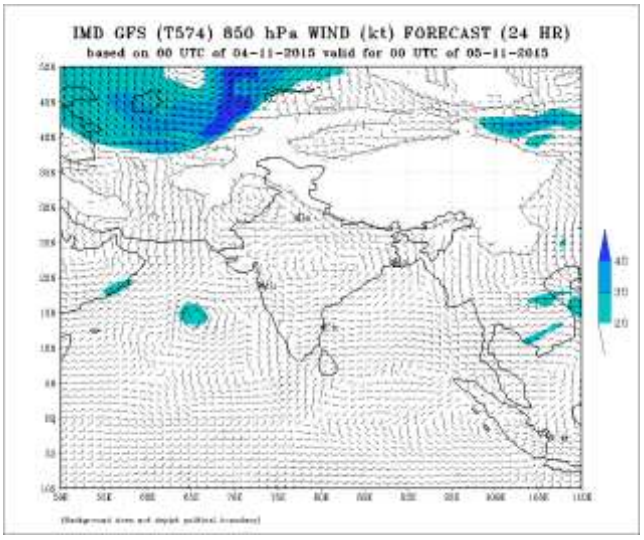

IMD GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 04-11-2015 valid for 00 UTC of 06-11-2015

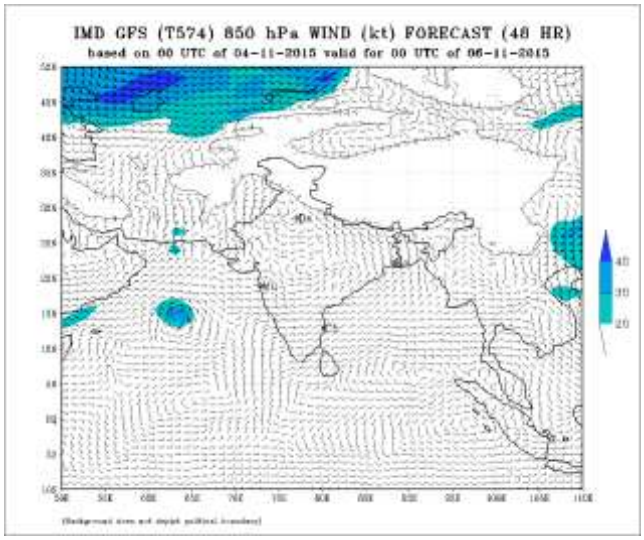

IMD GFS (T574) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 04-11-2015 valid for 00 UTC of 07-11-2015

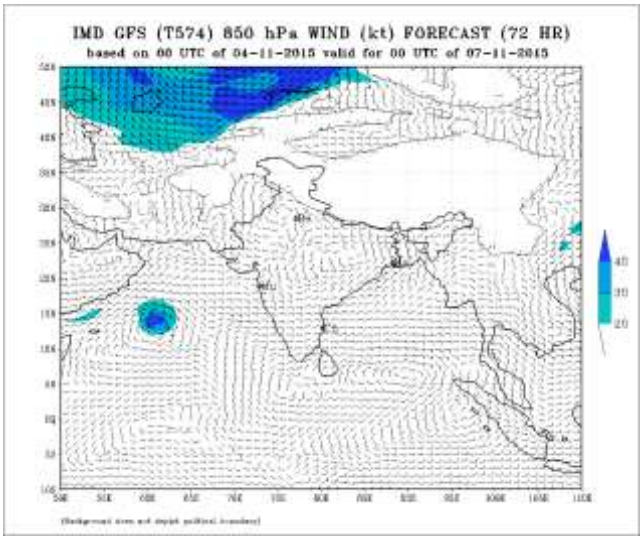

IMD GFS (T574) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 04-11-2015 valid for 00 UTC of 08-11-2015

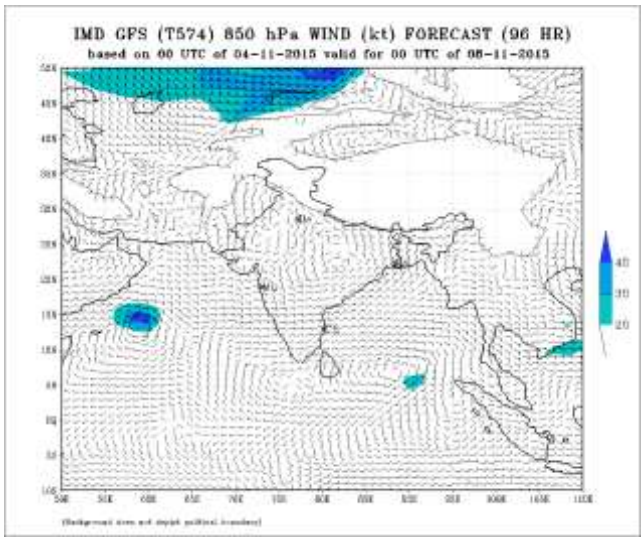

IMD GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 04-11-2015 valid for 00 UTC of 09-11-2015

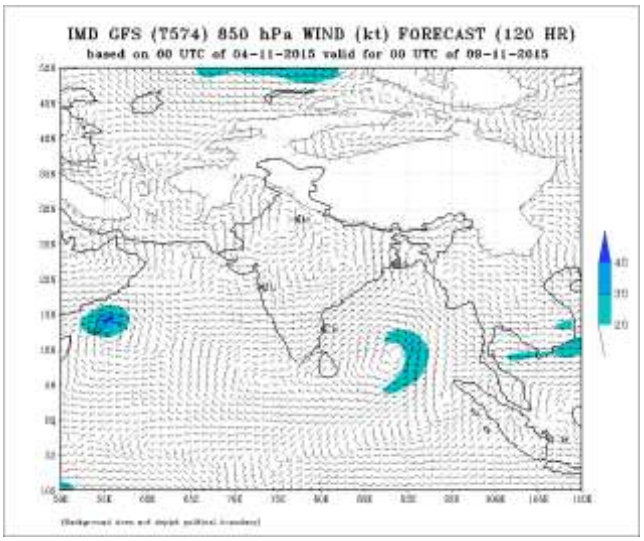

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 04-11-2015 valid for 00 UTC of 04-11-2015

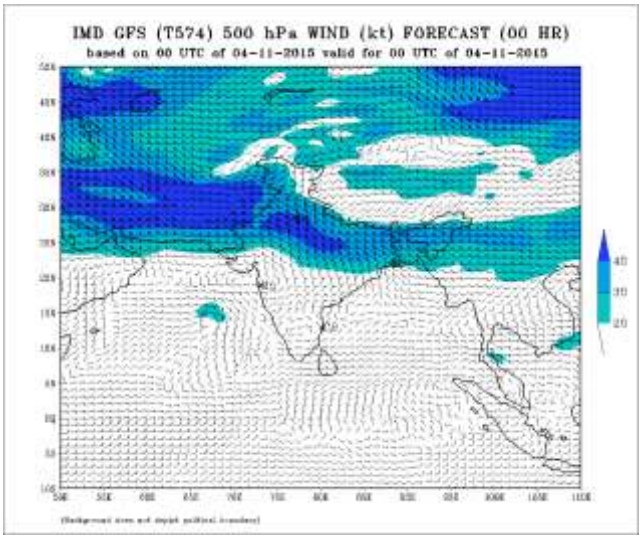

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 04-11-2015 valid for 00 UTC of 05-11-2015

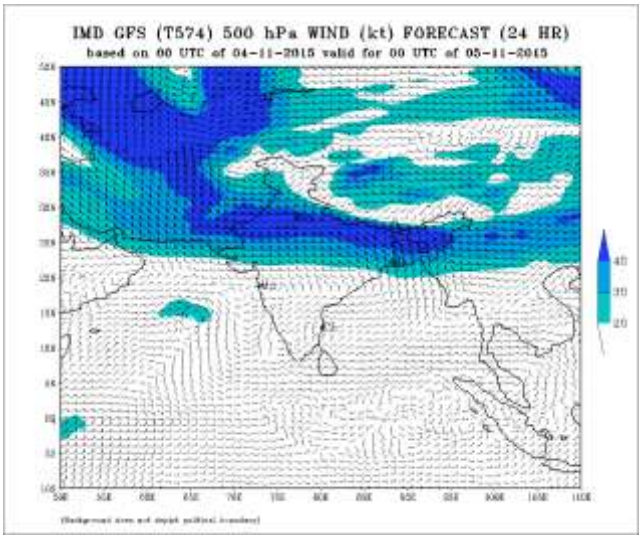

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 04-11-2015 valid for 00 UTC of 06-11-2015

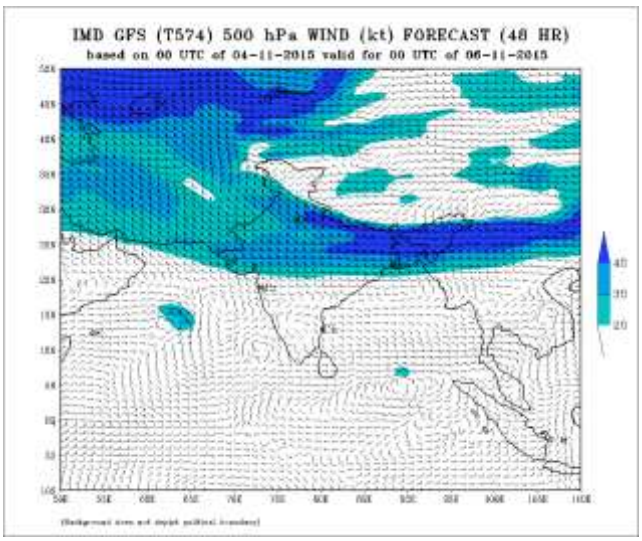

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 04-11-2015 valid for 00 UTC of 07-11-2015

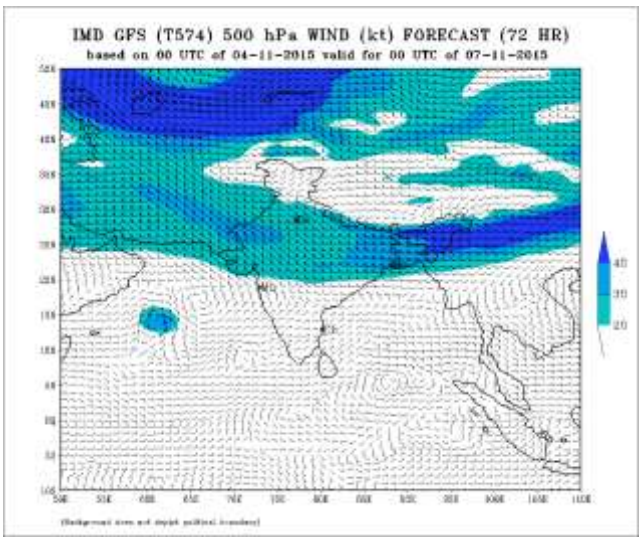

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 04-11-2015 valid for 00 UTC of 08-11-2015

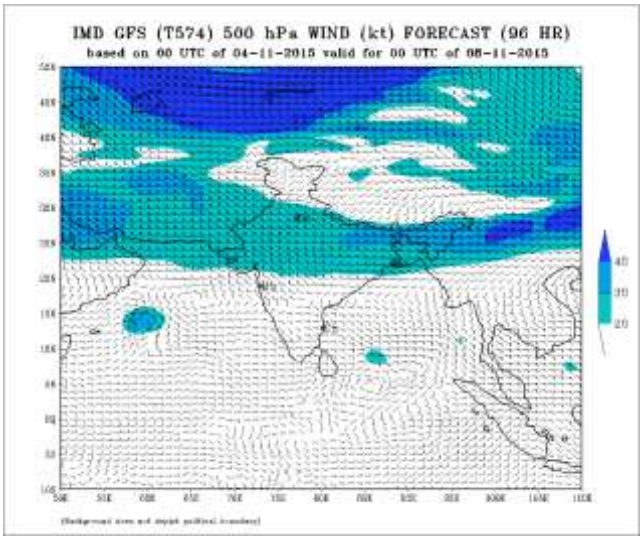

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 04-11-2015 valid for 00 UTC of 09-11-2015

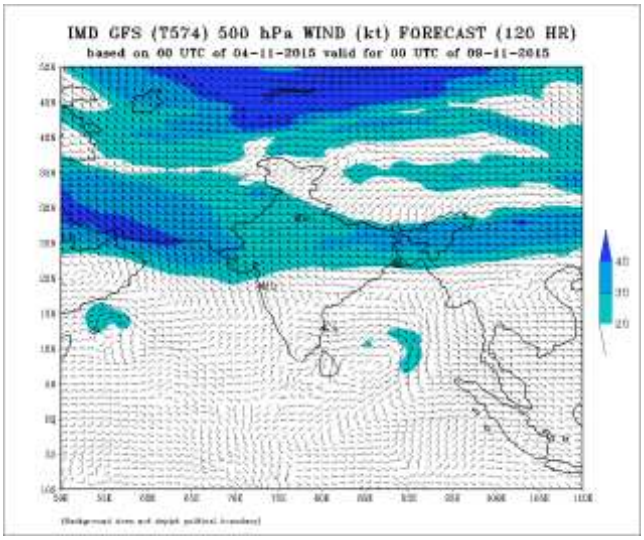

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 04-11-2015 valid for 00 UTC of 04-11-2015


IMD GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 04-11-2015 valid for 00 UTC of 05-11-2015


IMD GFS (T574) 500 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 04-11-2015 valid for 00 UTC of 06-11-2015


IMD GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 04-11-2015 valid for 00 UTC of 07-11-2015


IMD GFS (T574) 500 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 04-11-2015 valid for 00 UTC of 08-11-2015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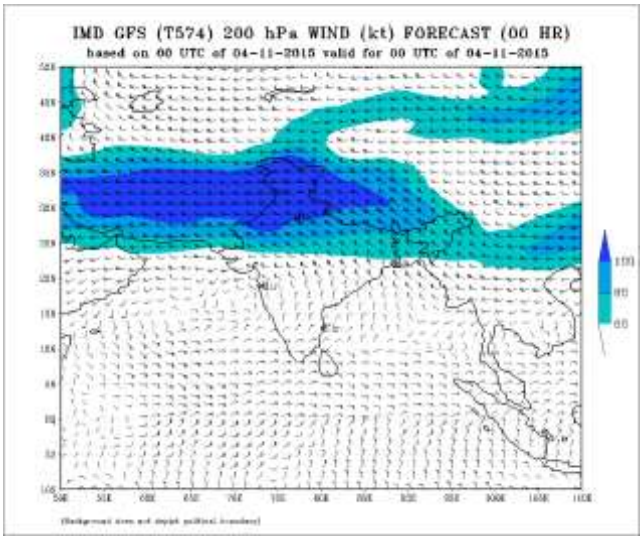
based on 00 UTC of 04-11-2015 valid for 00 UTC of 09-11-2015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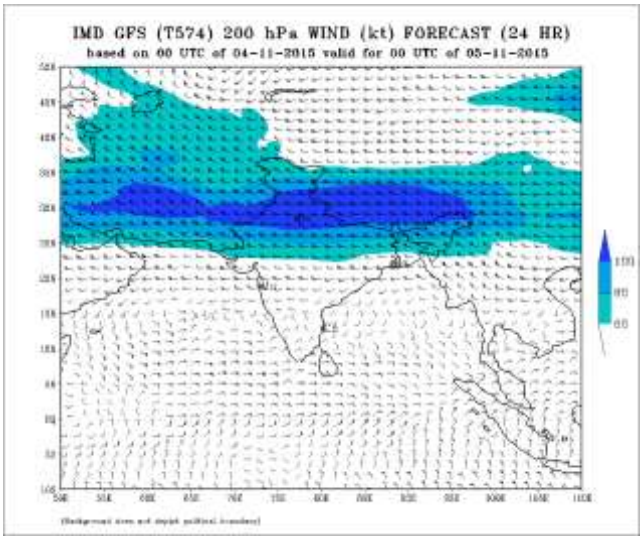
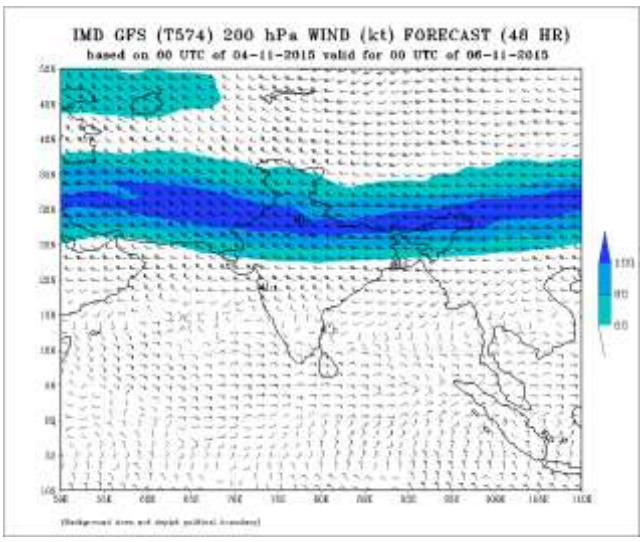
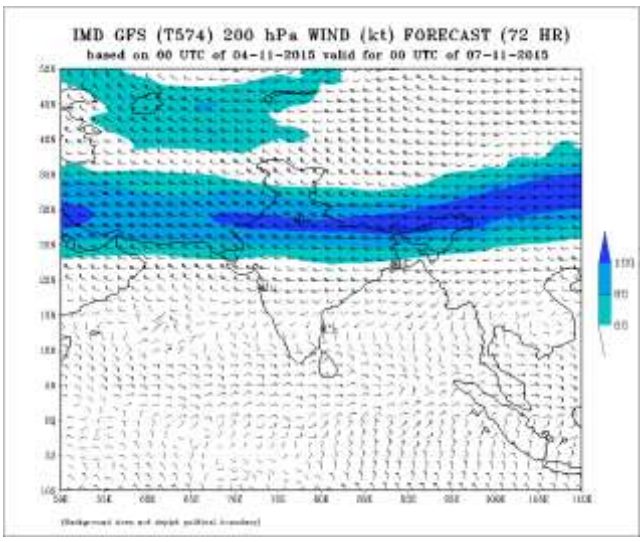
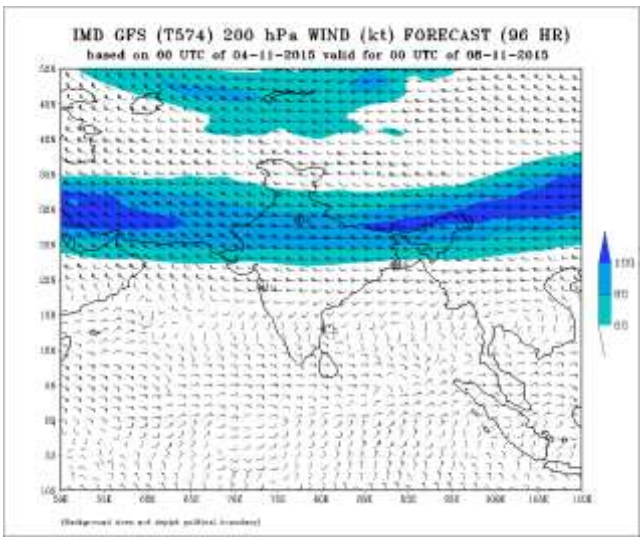
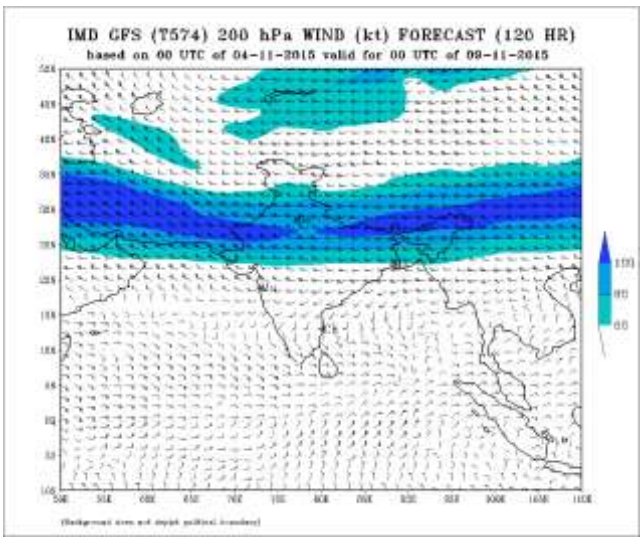

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 04-11-2015 valid for 00 UTC of 05-11-2015


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 04-11-2015 valid for 00 UTC of 06-11-2015


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 04-11-2015 valid for 00 UTC of 07-11-2015


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 04-11-2015 valid for 00 UTC of 08-11-2015


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 04-11-2015 valid for 00 UTC of 09-11-2015

FDP (Cyclone) NOC Report Dated 05 November, 2015

Synoptic features:

- The depression over eastcentral Arabian Sea moved westward at a speed of 22 kmph in past six hours, intensified into deep depression and lay centred at 0600 UTC of today the 5th November 2015 over eastcentral Arabian Sea near latitude **14.1^0** N and longitude **64.8^0** E, about **1020** km southwest of Mumbai (43003) and **1200** km east-southeast of Salalah (41316), Oman. It would move nearly westwards and intensify into a cyclonic storm during next 12 hrs. Thereafter it would move west-southwestwards towards gulf of Aden.
- The upper air cyclonic circulation over westcentral Bay of Bengal off Andhra Pradesh coast extending up to 1.5 km above mean Sea level persists. The upper air cyclonic circulation over equatorial Indian Ocean and adjoining southwest Bay of Bengal extending up to 1.5 km above mean Sea level persists.

Sea Surface Temperature (SST):

- SST is 29-30°C around the system over eastcentral Arabian Sea.
- SST is 26-28°C over most parts of AS except some parts of westcentral AS where it is 26-28°C.
- SST is 28-30°C over most parts of Bay of Bengal (BoB) and Andaman Sea.

Tropical Cyclone Heat Potential (TCHP):

- TCHP is 80-100 kJ/cm^2 over eastcentral AS and less than 60 kJ/cm^2 over westcentral and northwest AS. It is 60-80 kJ/cm^2 over rest of the AS.
- TCHP is 100-120 kJ/cm^2 over equatorial parts of BoB, less than 60 kJ/cm^2 over north BoB and 80-90 kJ/cm^2 over rest of the BoB and Andaman Sea.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive (30-40x10^{-5}s^{-1}) over equatorial region of south BoB.
- Relative vorticity at 850 hPa is around 50x10^{-5}s^{-1} around the system over eastcentral Arabian Sea. It is around 20-30x10^{-5}s^{-1} over parts of eastcentral AS, and negative in rest parts of AS.

Convergence:

- Lower level convergence is positive (5x10^{-5}s^{-1}) around the system over eastcentral Arabian Sea.
- Lower level convergence is about 10-15x10^{-5}s^{-1} over many parts of south BoB and adjoining Andaman Sea.

Divergence:

- Upper level divergence is 05-10x10^{-5} s^{-1} and increasing around the system over eastcentral Arabian Sea and 10-20x10^{-5} s^{-1} over Southeast of AS.
- It is 10-20x10^{-5}s^{-1} over many parts of south BoB

Wind Shear:

- Wind shear is 05 knots over south BoB extended upto adjoining Andaman Sea, south of 12°N. It increases towards the northern parts.
- The vertical wind shear around the system over eastcentral Arabian Sea is about 5-10 knots and it increases towards both northwards and southwards .

Wind Shear Tendency:

- The vertical wind shear tendency shows no change over most parts of east BoB and Andaman Sea. It is increasing 5 to 10 knots over parts of southwest BoB.

- The vertical wind shear tendency shows -5 knots around the system over eastcentral Arabian Sea and -5 to -10 knots over extreme southwest AS and positive 5 to 10 knots over central parts and adjoining west central parts of AS.

Upper tropospheric ridge:

- The upper tropospheric ridge at 200 hPa runs along 16.0°N

M.J.O. Index:

- MJO index lies over Phase 3 with amplitude greater than 2.0 and would continue to move in the same phase during next 5 days.

Storms and Depression over South China Sea/ South Indian Ocean:

NIL

Satellite:

Inference based on INSAT imagery of **050900** UTC:

Bay of Bengal & Andaman Sea:-

Broken low/medium clouds with embedded moderate to intense convection over south Bay of Bengal and Andaman Sea.

Arabian Sea:-

Vortex over eastcentral adjoining westcentral Arabian Sea now lies centered near latitude 14.1°N and longitude 64.3°E with intensity T.2.0 at 0900 UTC. In association with broken low and medium clouds with embedded intense to very intense convection lie over the area between latitude 12.0°N to 17.0°N and longitude 62.0°E to 66.0°E. Minimum cloud top temperature is minus 84°C. The system has moved westwards direction during last 6 hours.

Scattered low medium clouds with embedded moderate to intense convection over southeast Arabian Sea.

NWP Inputs:

IMD-GFS IMD-GFS model charts analysis and forecasts based on 00UTC of 5th November 2015 shows a a depression over East Central Arabian Sea and adjoining areas near Lat. 14.1°N and Long.65.6°E with associated upper air cyclonic circulation extending up to 500 hPa level. The system is likely to move in a westward direction during next 72 hours. The analysis and forecasts of IMD-GFS model charts also shows an upper air cyclonic circulation over south west Bay of Bengal and adjoining areas extending up to 700 hPa level.

IMD-WRF IMD-WRF model charts analysis and forecasts based on 00UTC of 5th November 2015 shows a low pressure area over East Central Arabian Sea and adjoining areas with associated upper air cyclonic circulation extending up to 500 hPa level. The system likely to intensify and move in a westward direction during next 72 hours. The analysis and forecasts of IMD-WRF model charts also shows an upper air cyclonic circulation over south west Bay of Bengal and adjoining areas extending up to 700 hPa level.

NWP products are available at:

http://202.54.31.51/bias/gfsproducts.php

http://202.54.31.51/bias/wrf27pro.php

http://202.54.31.51/bias/potentialparameter.php

NCMRWF-UM:

Model suggest the depression over eastcental Arabian Sea moving in westnorthwesterly direction with no significant intensification.

It also suggest formation of Low over southwest BoB on 8th and crossing Tamil Nadu coast on 8th and further moving in Arabian Sea during next 2-3 days.

NCMRWF-GFS suggest the depression would form over eastcental Arabian Sea on 8th moving in westerly direction with no significant intensification.

It also suggests formation of Low over southcentral BoB on 8th and crossing south Tamil Nadu coast on 11th as severe cyclonic storm.

NCEP-GFS model suggest the depression would form over eastcental Arabian Sea on 8th moving in westerly direction with no significant intensification.

It also suggests formation of Low over southcentral BoB on 8th and crossing south Tamil Nadu coast on 11th.

ECMWF model suggest the Depression over eastcentral Arabian Sea near Lat. 14.0°N and Long.64.5°E, westward direction, will intensify into a deep depression during next 12 hours, will become tropical cyclone within 24 hrs expected to track westward direction with gradual intensification From 8th Nov system expecting to weaken near 58 - 60E longitude (Central & West Arabian Sea) may be due to cooler SST's and Dry air intrusion. Finally System may weaken in low pressure area on 9th /10th Nov over Gulf of Aden

An upper air cyclonic circulation over Extreme South East Bay of Bengal, under this influence Low pressure area will form South Central & South West Bay of Bengal on 7th night / 8th November, will become depression on 9th Nov over South West Bay of Bengal and adjacent South Coastal Tamil Nadu. System crosses over South Coastal Tamil Nadu on 10th Nov, moves West North West direction enters South East Arabian Sea and emerge as well marked low pressure area on 11th /12th Nov

JMA: JMA model indicates the deep depression lies over eastcentral AS moving in westwards direction towards Oman with no significant intensification. Another Low over southwest BoB on 8th and moving towards northwards north Sri Lanka in next 2-3 days.

ARP-Meteo France: Not available

GPP: Genesis Potential Parameter (GPP) analysis based on 00UTC of 5th November, 2015 does not show genesis over Arabian Sea. It shows a potential zone over southwest BoB adjoining Sri Lanka and TN coast on 9th and 10th November.

Summary and Conclusion:

Bay of Bengal and Andaman Sea:

Most of the models predicts the formation of depression over southwest BoB on 9th November intensify into cyclonic storm and crossing Tamil Nadu coast during next 2-3 days

Probability of cyclogenesis over Bay of Bengal and Andaman Sea during next 120 hours:

24 HOURS	24-48 HOURS	48-72 HOURS	72-96 hours	96-120 hours
NIL	NIL	Low	Fair	Moderate

Arabian Sea:

Most models predict Deep depression has no significant intensification it would weaken rapidly over westcentral AS.

Advisory:

IOP will be conducted during 8-10 for Coastal Tamil Nadu.

Details of the status of observational systems are given in **Annexure I.**

Annexure-I

Status of observational system:
Synoptic observation:

Region	Date/Time (UTC)		
	04/12	**05/00**	**05/03**
India	45	48	30
Coastal stations			
WB	8	8	2
Odisha	2	7	4
AP	13	14	12
Tamil Nadu	14	12	9
Puducherry	2	2	2
A & N	6	7	1
Bangladesh	11	11	11
Myanmar	11	-	11
Thailand	2	2	2
SriLanka	8	7	8

AWS Observations: Not available

RS/RW (12Z) of 04/11/2015 **-0/39**
No. of Ascents reaching 250 hPa level: 0, MISDA: 0

RS/RW (00Z) of 05/11/2015- **24/39**
No. of Ascents reaching 250 hPa level:23, MISDA: 4

No. of PILOT Ascents

04/12Z	**05/00Z**
9	2

Buoy Data

04/12Z	**05/00Z**	**05/03Z**
7	6	8

STATUS OF CHENNAI REGION OBSERVATIONS

No. of Synop data

Date→	**04.11.2015**							
UTC→	**00**	**03**	**06**	**09**	**12**	**15**	**18**	**21**
Chennai Region (Coasts of AP & TN)	**20**	**22**	**20**	**20**	**22**	**20**	**20**	**20**

No. of RS/RW Ascents

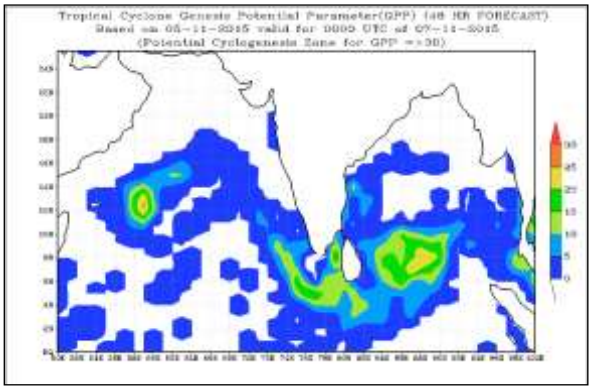
00Z /05.11.2015 : 7
No. of Ascents reaching 250 hPa level = 6
MISDA : 1

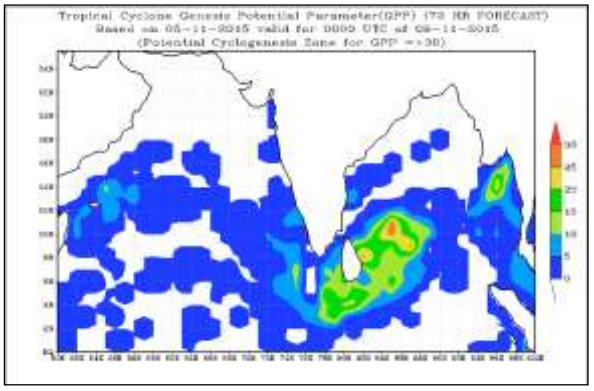
12Z /04.11.2015 : 0
No. of Ascents reaching 250 hPa level = 0
MISDA : 8

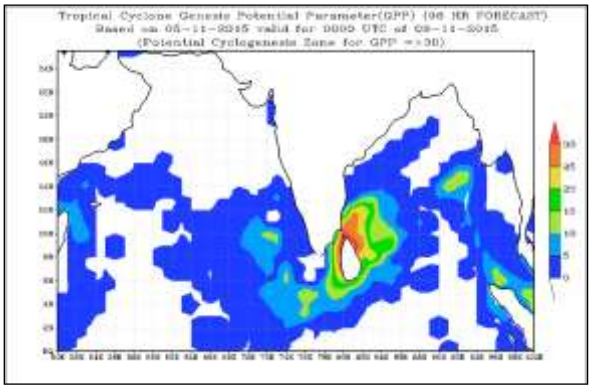
No. of PILOT Ascents:

04.11.2015	
00Z	12Z
3	3

Annexure-II


Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
Based on 05-11-2015 valid for 0000 UTC of 07-11-2015
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 05-11-2015 valid for 0000 UTC of 08-11-2015
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (96 HR FORECAST)
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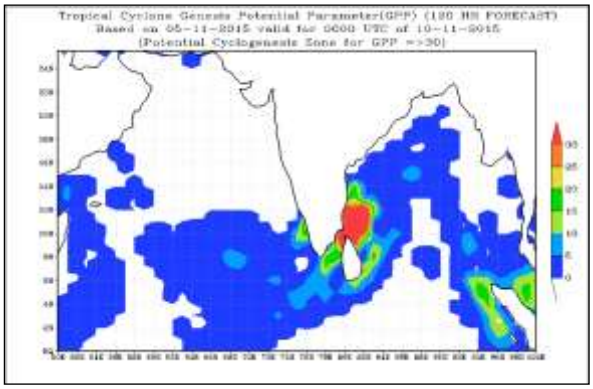
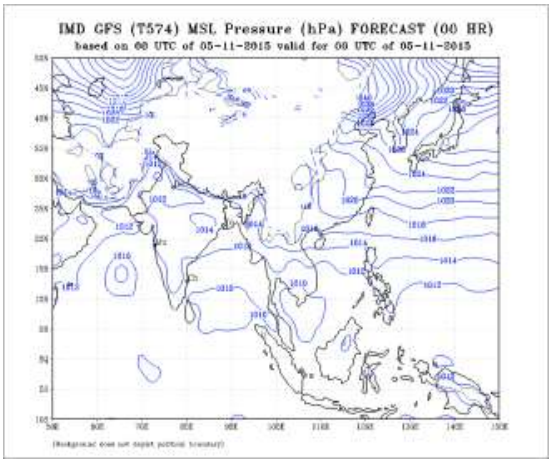
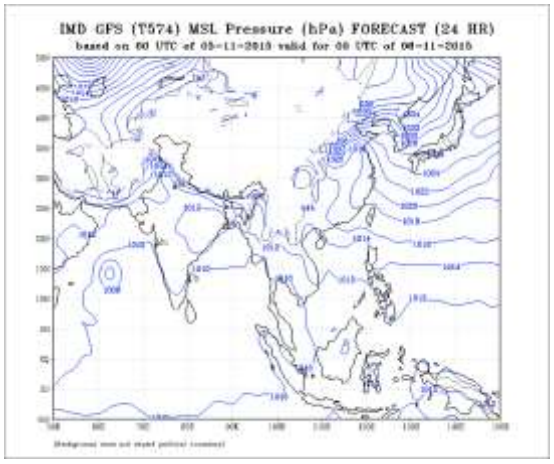
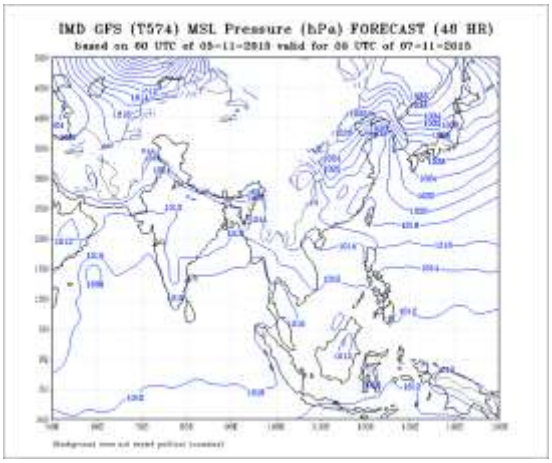
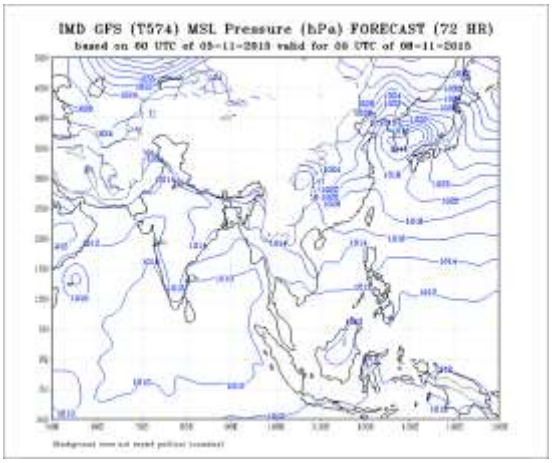
(Potential Cyclogenesis Zone for GPP =>30)

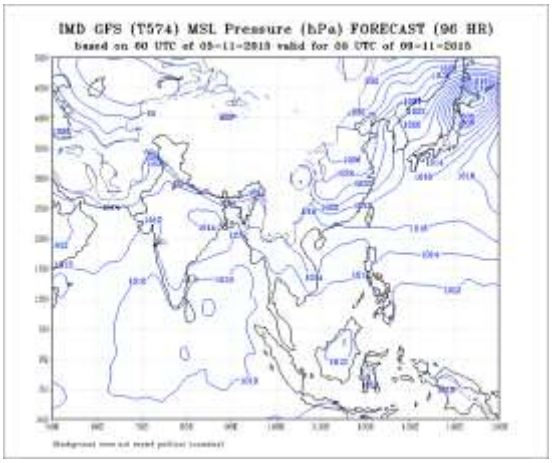

Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 05-11-2015 valid for 0000 UTC of 10-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

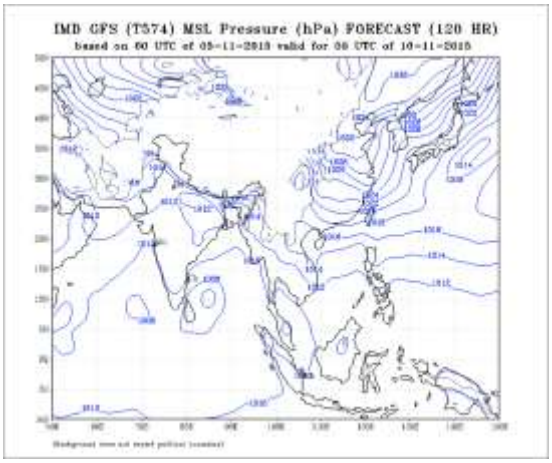

IMD GFS (T574) MSL Pressure (hPa) FORECAST (00 HR)
based on 00 UTC of 05-11-2015 valid for 00 UTC of 05-11-2015

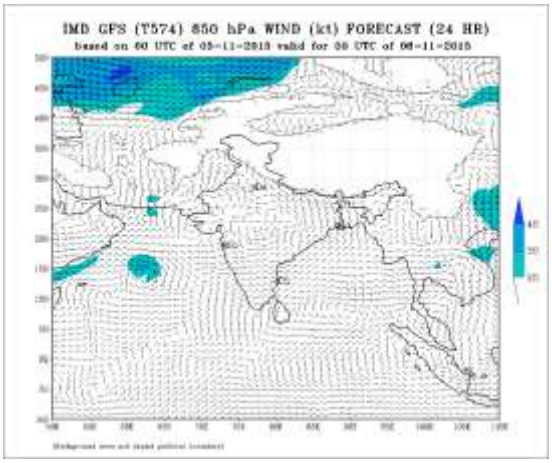

IMD GFS (T574) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 05-11-2015 valid for 00 UTC of 06-11-2015

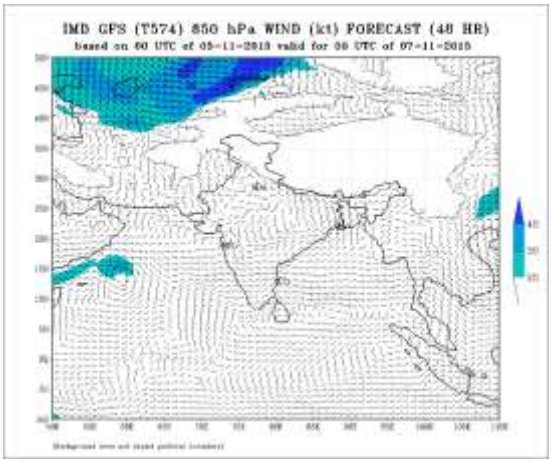

IMD GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 05-11-2015 valid for 00 UTC of 07-11-2015


IMD GFS (T574) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 05-11-2015 valid for 00 UTC of 08-11-2015


IMD GFS (T574) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 05-11-2015 valid for 00 UTC of 09-11-2015


IMD GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 05-11-2015 valid for 00 UTC of 10-11-2015


IMD GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 05-11-2015 valid for 00 UTC of 06-11-2015


IMD GFS (T574) 850 hPa WIND (kt) FORECAST (48 HR)
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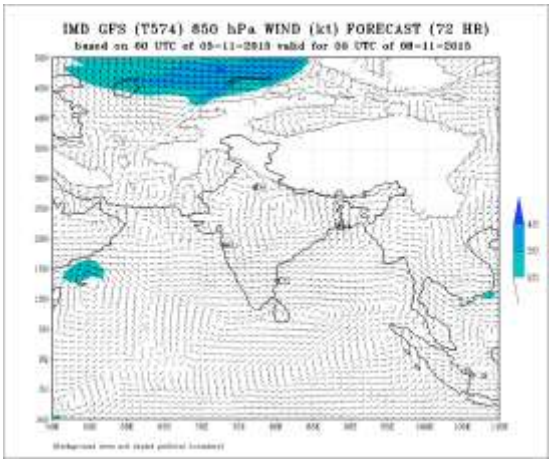
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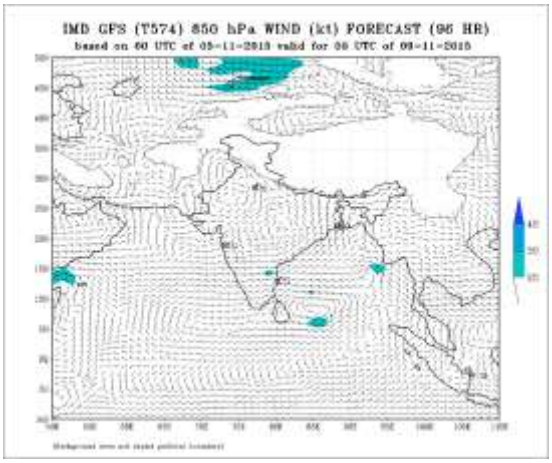
IMD GFS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
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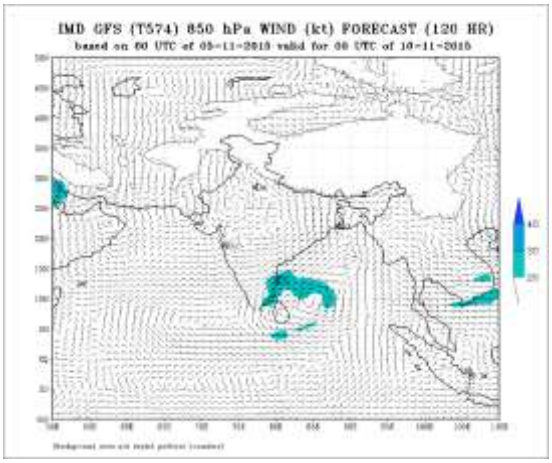
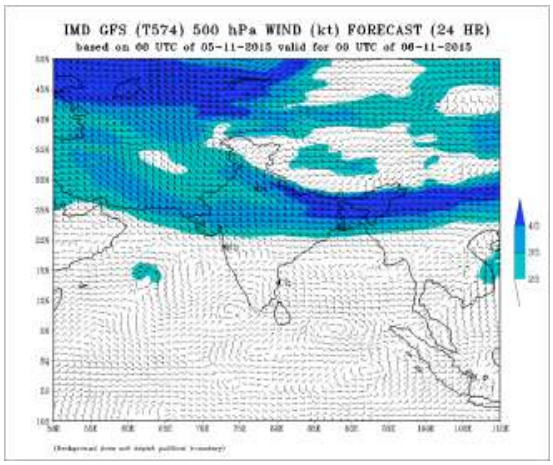

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 05-11-2015 valid for 00 UTC of 10-11-2015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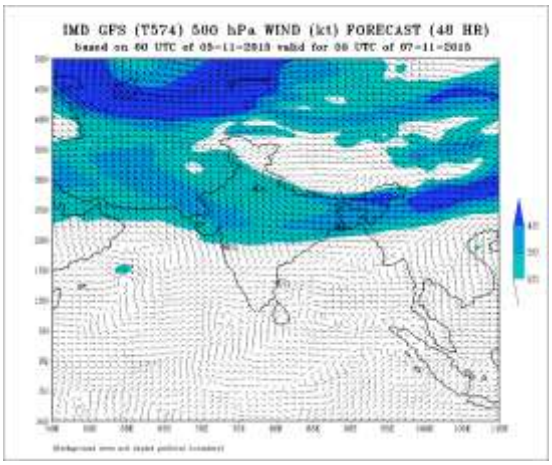
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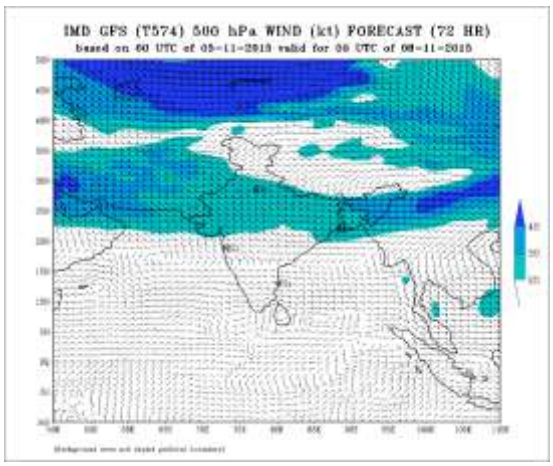
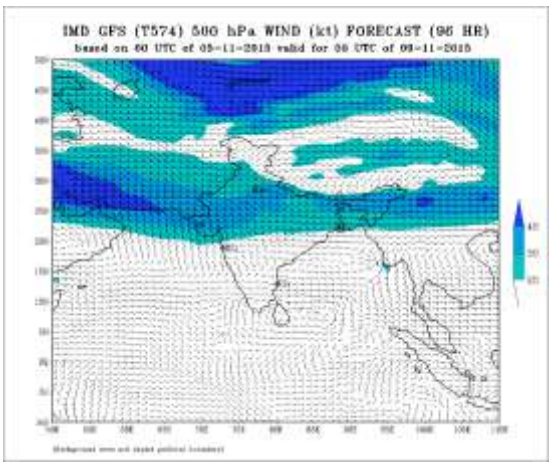

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 05-11-2015 valid for 00 UTC of 08-11-2015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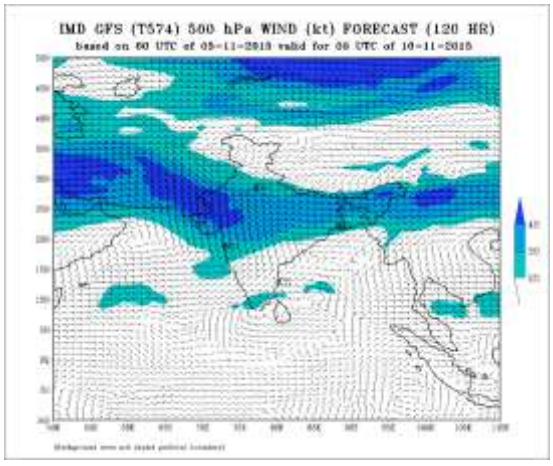
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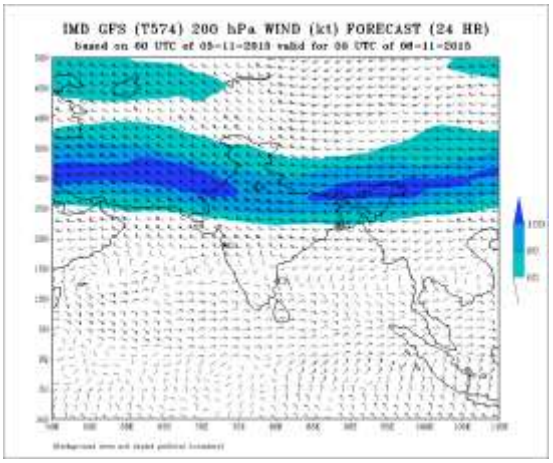
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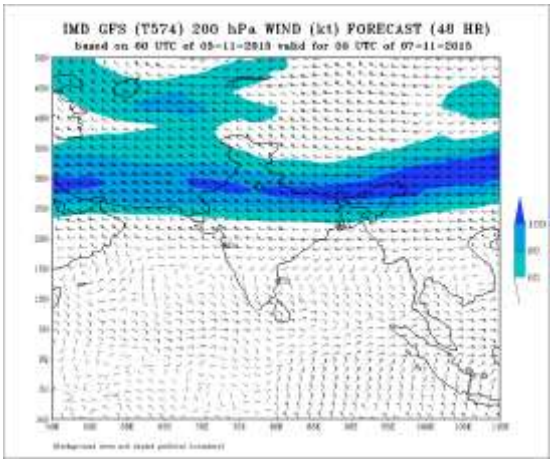
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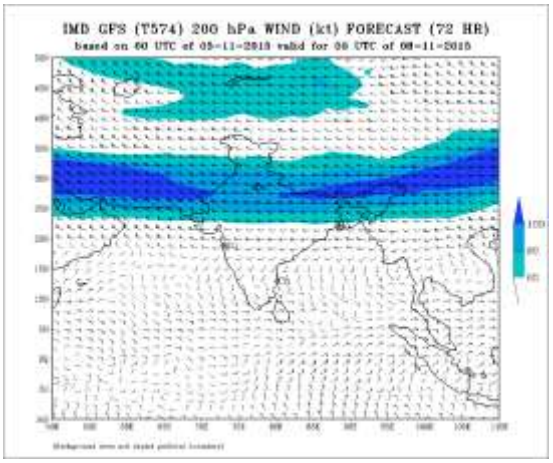
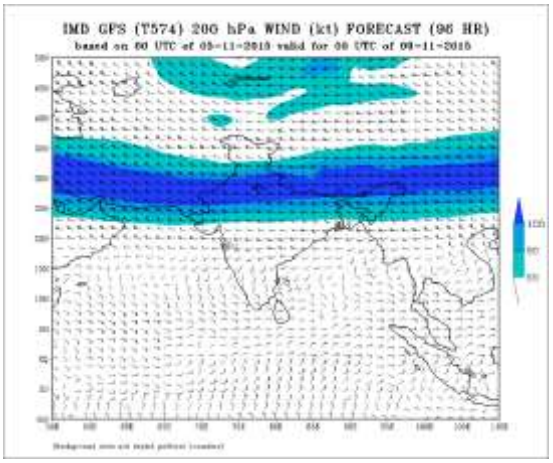
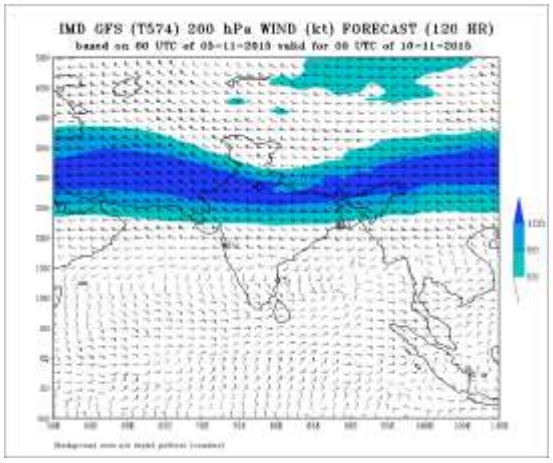

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 05-11-2015 valid for 00 UTC of 08-11-2015


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 05-11-2015 valid for 00 UTC of 09-11-2015


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 05-11-2015 valid for 00 UTC of 10-11-2015

FDP (Cyclone) NOC Report Dated 06 November, 2015

Synoptic features:

- Yesterday's deep depression of eastcentral Arabian Sea moved west-southwestwards, intensified into **cyclonic storm 'Megh'** and lay centred at 0600 UTCof today the 6th NNovember 2015 over westcentral Arabian Sea (AS) near latitude **13.2^0** N and longitude **61.9^0** E, about **860** km east-northeast of Socotra Island (Yemen), **1320** km southwest of Mumbai, and **940 km** east-southeast of Salalah (Oman). It would move west-southwestwards and intensify into a severe cyclonic storm during next 24 hrs. Thereafter it would continue to move west-southwestwards towards Gulf of Aden and weaken gradually from 8th November morning onwards.
- The upper air cyclonic circulation over southwest Bay of Bengal & neighbourhood extends upto 3.1 km above mean sea level persists. Under its influence, a low pressure area is likely to form during next 12 hrs
- An upper air cyclonic circulation lies over Lakshadweep & neighbourhood and extends upto 2.1 km above mean sea level.

Sea Surface Temperature (SST):

- SST is 28-29°C around the system over eastcentral Arabian Sea and is decreasing towards Gulf of Aden. SST is 29-30°C over most parts east AS.
- SST is 28-30°C over most parts of Bay of Bengal (BoB) and Andaman Sea.

Tropical Cyclone Heat Potential (TCHP):

- TCHP is around 50-75 kJ/cm^2 around system centre, around 100 kJ/cm^2 over eastcentral AS off Kerala- Karnataka coasts and less than 50 kJ/cm^2 over westcentral and northwest AS.
- TCHP is 100-120 kJ/cm^2 over equatorial parts of BoB, less than 50 kJ/cm^2 over north BoB and 80-90 kJ/cm^2 over most parts of the BoB and Andaman Sea.

Relative Vorticity:

- Relative vorticity at 850 hPa is around 50x10^{-5}s^{-1} around the system over eastcentral Arabian Sea. It is around 20-30x10^{-5}s^{-1} over parts of eastcentral AS, and negative in rest parts of AS.
- Relative vorticity at 850 hPa is positive (30-40x10^{-5}s^{-1}) over equatorial region of south BoB.

Convergence:

- Lower level convergence is positive (5x10^{-5}s^{-1}) around the system over eastcentral Arabian Sea.
- Lower level convergence is about 20x10^{-5}s^{-1} over parts of southwest BoB.

Divergence:

- Upper level divergence is 05-10x10^{-5} s^{-1} around the system over eastcentral AS.
- Upper level divergence is 20-30x10^{-5} s^{-1} over southwest and adjoining southeast BoB.

Wind Shear:

- Wind shear is 10-20 knots over southern parts of BoB, between 6°N and 15°N. It increases both southwards and northwards.
- The vertical wind shear around the system over eastcentral Arabian Sea is about 5-10 knots and it increases towards both westwards and southwards.

Wind Shear Tendency:

- The vertical wind shear tendency is increasing over most parts of BoB.

- The vertical wind shear tendency is decreasing to the northwest of the system centre over AS and it is increasing towards the southwest of the system centre.

Upper tropospheric ridge:

- The upper tropospheric ridge at 200 hPa runs along 16.0°N

M.J.O. Index:

- MJO index lies over Phase 3 with amplitude greater than 1 and would continue to move in the same phase during next 5 days.

Storms and Depression over South China Sea/ South Indian Ocean:

NIL

Satellite:

Inference based on INSAT imagery of **060900** UTC:

Bay of Bengal & Andaman Sea:-

Broken low and medium clouds with embedded moderate to intense convection lie over southwest BoB and neighbourhood between latitude 5.0°N to 12.5°N and long 83.0°E to 93.0°E in association with a low level circulation over the area.

Arabian Sea:-

Vortex (Megh) over westcentral and adjoining eastcentral AS is now centered near 13.2°N/61.7°E. Intensity of the system is T2.5. Associated broken low and medium clouds with embedded intense to very intense convection over area between latitude 11.0°N to 15.0°N and longitude 60.0°E to 63.5°E. Minimum cloud top temperature is -74°C.

NWP Input based on 0000 UTC of 06.11.2015

IMD-GFS: IMD-GFS model charts analysis and forecasts based on 00UTC of 6th November 2015 shows a cyclonic storm over west central Arabian Sea centered near lat. 13.5°N and Long. 62.4°E, with associated upper air cyclonic circulation extending up to 500 hPa level. The system likely to move in a west south westwards direction during next 72 hours. The analysis and forecasts of IMD-GFS model charts also shows an upper air cyclonic circulation over south east Bay of Bengal and adjoining areas extending up to 500 hPa level. The system likely to move in a west -north west ward direction during next 72 hours.

IMD-WRF: The model charts analysis and forecasts based on 00UTC of 6th November 2015 shows a cyclonic storm over west central Arabian Sea centred near lat.13.5°N and Long.62.4°E with associated upper air cyclonic circulation extending up to 500 hPa level. The system likely to move in a west-southwestwards direction during next 72 hours. The analysis and forecasts of IMD-WRF model charts also shows an upper air cyclonic circulation over southeast Bay of Bengal and adjoining areas extending upto 500 hPa level. The system likely to move in a north west ward direction during next 72 hours.

GPP: Genesis Potential Parameter (GPP) analysis and forecasts based on 00UTC of 6th November, 2015 shows a zone of potential cyclogenesis centered over West Central Arabian Sea and adjoining areas and likely to shift west-southwest ward during next 72 hours with decrease in intensity after 48 hours.

Genesis Potential Parameter (GPP) analysis and forecasts based on 00UTC of 6th November, 2015 also shows another zone of high GPP over southeast Bay of Bengal and adjoining areas and likely to shift northwestward during next 72 hours with increase in intensity after 48 hours.

NWP products are available at:

IMD-NWP products are available at:
http://202.54.31.51/bias/gfsproducts.php
http://202.54.31.51/bias/wrf27pro.php
http://202.54.31.51/bias/potentialparameter.php

NCMRWF-UM: The model indicates that the CS Megh would move in a west-southwesterly direction till 0000 UTC of 9 Nov.
The model also indicates the development of a low pressure area over southwest Bay of Bengal on 0000 UTC of 7th which would concentrate into a depression by 0000 UTC of 8th and into a CS by 0000 UTC of 9th.
NCMRWF-GFS: The model indicates that the CS Megh would move in a west-southwesterly direction till 0000 UTC of 9 Nov.
The model also indicates the development of another low pressure area over southwest Bay of Bengal on 0000 UTC of 7th which would become well marked by 0000 UTC of 8th and into a CS by 0000 UTC of 9th.
NCEP-GFS model suggests that the system over eastcental Arabian sea would move west-southwestwards towards Gulf of Aden without further intensification.
The model also suggests formation of a depression over southwest BoB on 8th . It would move west-northwestwards and intensify into a deep depression and cross Tamil Nadu coast on 10th.
ECMWF model suggest that the Tropical Cyclone Megh over eastcentral Arabian sea near Lat. 13.8°N and Long.62.8°E, would move nearly westwards during the next 2 days. The system would start weakening gradually from 08 Nov onwards and move towards Gulf of Aden during the next two days.
This model further suggests formation of a depression over southwest BoB on 8th. It would intensify further into a cyclonic storm and move west-northwestwards and cross Tamil Nadu coast near 12°N on 11th.
JMA: JMA model indicates that Tropical Cyclone Megh over eastcentral Arabian sea would move westwards towards Oman without significant intensification.
JMA also indicates formation of another Low over southwest BoB on 7th. It would intensify into a deep depression during the next two days, move northwest-wards towards Tamil nadu coast on 10th.
ARP-Meteo France: ARP model suggests that the tropical cyclone Megh over Arabian Sea would move west-soutwestwards during the next 3 days and weaken gradually from 7th onwards.
ARP also suggests formation of a depression over BoB on 8th. It would intensify into a cyclonic storm and move northwestwards during the next 24 hrs.
GPP: Genesis Potential Parameter (GPP) analysis based on 06UTC of 6th November, 2015 shows a potential zone over southwest BoB adjoining Sri Lanka and TN coast on 8th. It moves northwest wards towards Tamil Nadu coast on 9th and 10th.

Summary and Conclusion:

Bay of Bengal and Andaman Sea:

Most of the models predict formation of depression over southwest BoB on 8th November. It would intensify into deep depression / cyclonic storm and cross Tamilnadu coast during next 2-3 days.

Probability of cyclogenesis over Bay of Bengal and Andaman Sea during next 120 hours:

24 HOURS	24-48 HOURS	48-72 HOURS
NIL	Moderate	High

Arabian Sea:

Most models predict that the Tropical Cyclone Megh over Arabian Sea may not intensify further. It would move nearly westwards towards Gulf of Aden during the next 3 days and weaken gradually.

Advisory:

IOP will be conducted during 7-10 November 2015 for Coastal Tamil Nadu.

Annexure-I

Status of observational system:

Synoptic observation:

Region	Date/Time (UTC)		
	05/12	06/00	06/03
India	46	31	45
Coastal stations			
WB	8	3	8
Odisha	7	5	7
AP	12	12	12
Tamil Nadu	11	8	10
Puducherry	2	2	2
A & N	6	1	6
Bangladesh	11	11	11
Myanmar	1	0	11
Thailand	2	2	2
Sri Lanka	8	7	8

AWS Observations: Not available

RS/RW (12Z) of 05/11/2015 **-0/39**

No. of Ascents reaching 250 hPa level: 0, MISDA: 39

RS/RW (00Z) of 06/11/2015- **27/39**

No. of Ascents reaching 250 hPa level:21, MISDA: 4

No. of PILOT Ascents

05/12Z	06/00Z
4	2

Buoy Data

05/12Z	06/00Z	06/03Z
8	6	10

Status Of Chennai Region Observations

No. of Synop data

Date→	**05.11.2015**							
UTC→	**00**	**03**	**06**	**09**	**12**	**15**	**18**	**21**
Chennai Region (Coasts of AP & TN)	**20**	**22**	**20**	**20**	**20**	**20**	**20**	**20**

No. of RS/RW Ascents

00Z /05.11.2015 : 1
No. of Ascents reaching 250 hPa level = 1
MISDA : 7

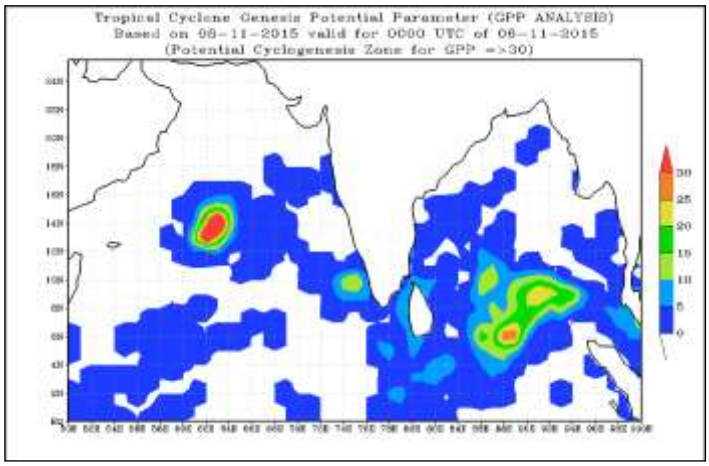
12Z /05.11.2015 : 1
No. of Ascents reaching 250 hPa level = 1
MISDA : 7

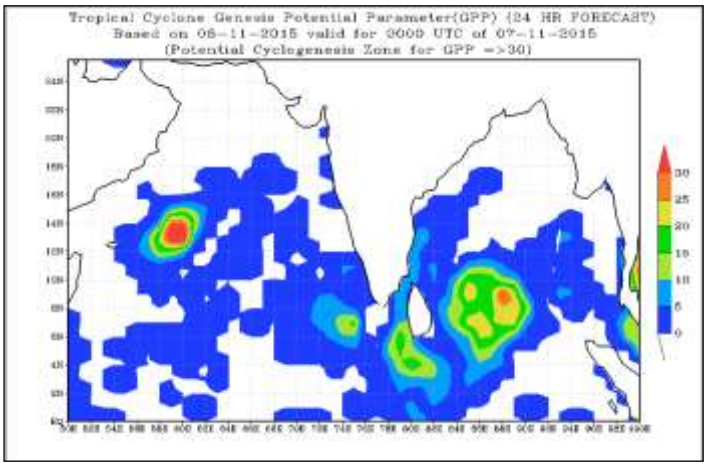
No. of PILOT Ascents:

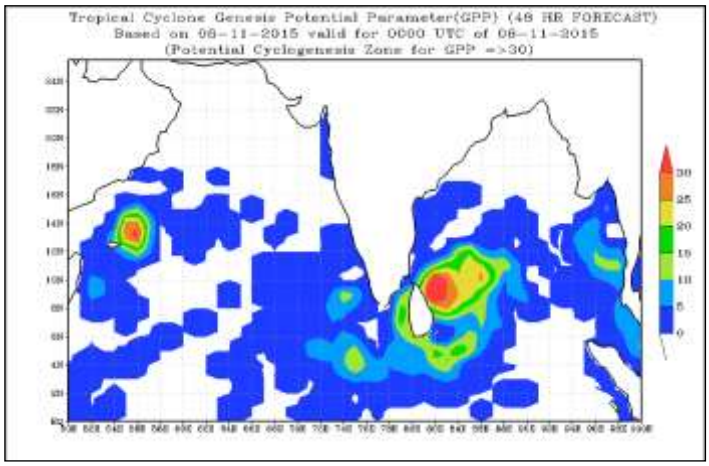
05.11.2015

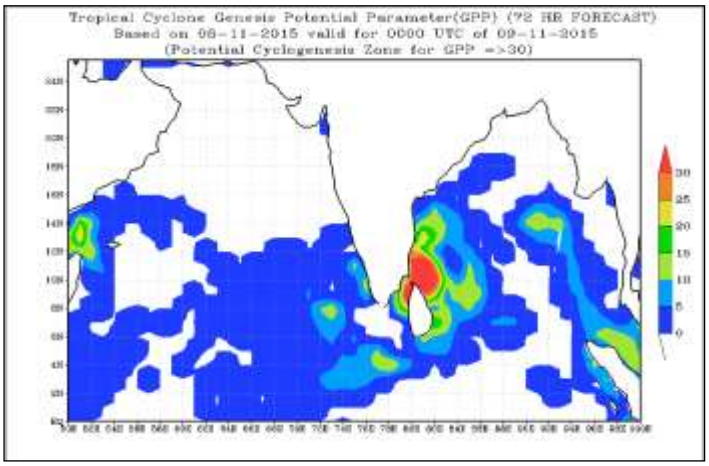
06Z	18Z
4	4

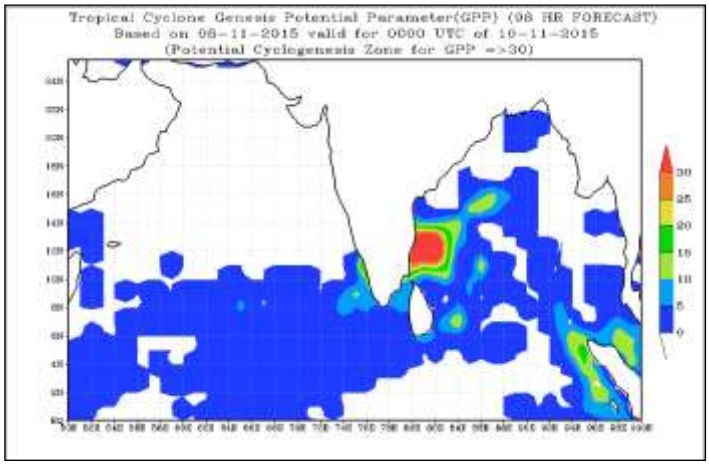
Annexure-II

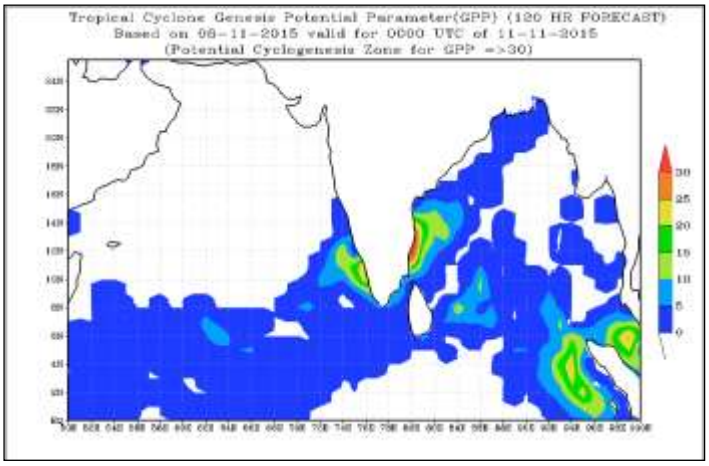

Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 06-11-2015 valid for 0000 UTC of 06-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

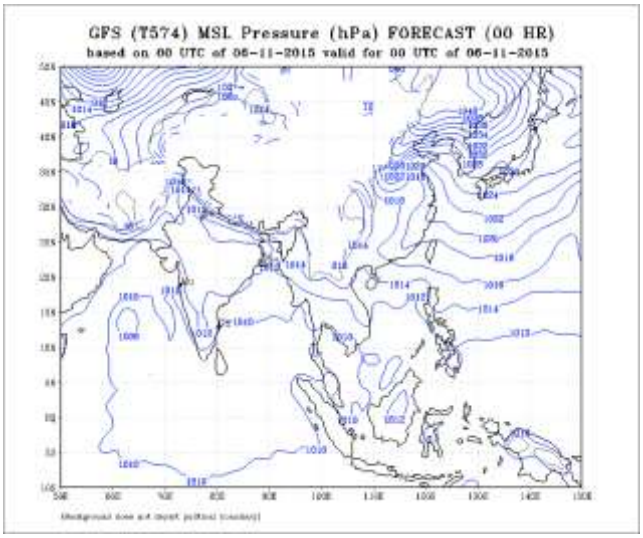

Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 06-11-2015 valid for 0000 UTC of 07-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

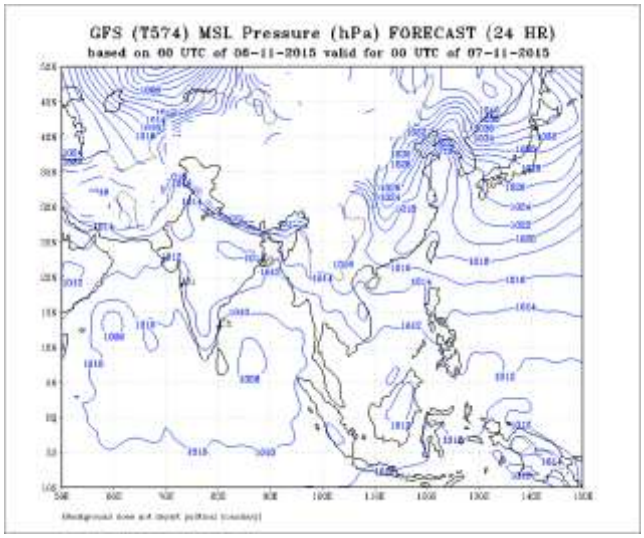

Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
Based on 06-11-2015 valid for 0000 UTC of 08-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

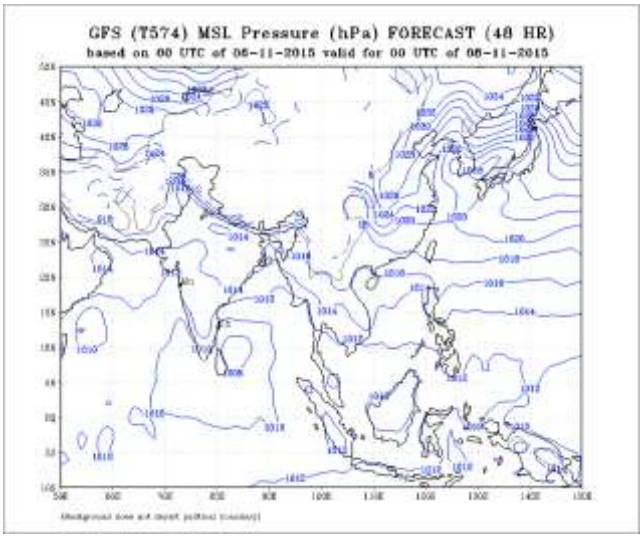

Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 06-11-2015 valid for 0000 UTC of 09-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

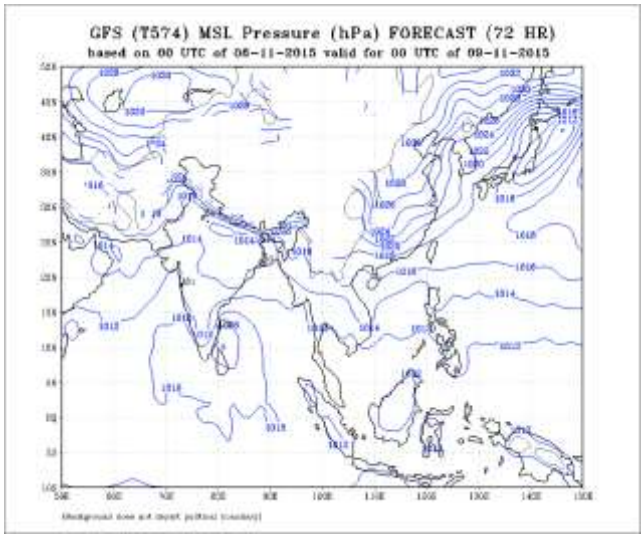

Tropical Cyclone Genesis Potential Parameter(GPP) (96 HR FORECAST)
Based on 06-11-2015 valid for 0000 UTC of 10-11-2015
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 06-11-2015 valid for 0000 UTC of 11-11-2015
(Potential Cyclogenesis Zone for GPP =>30)


GFS (T574) MSL Pressure (hPa) FORECAST (00 HR)
based on 00 UTC of 06-11-2015 valid for 00 UTC of 06-11-2015


GFS (T574) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 06-11-2015 valid for 00 UTC of 07-11-2015


GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 06-11-2015 valid for 00 UTC of 08-11-2015


GFS (T574) MSL Pressure (hPa) FORECAST (72 HR)
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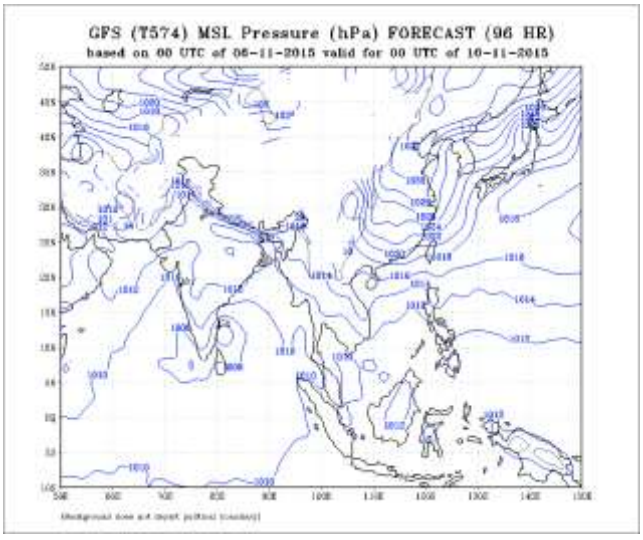
GFS (T574) MSL Pressure (hPa) FORECAST (96 HR)
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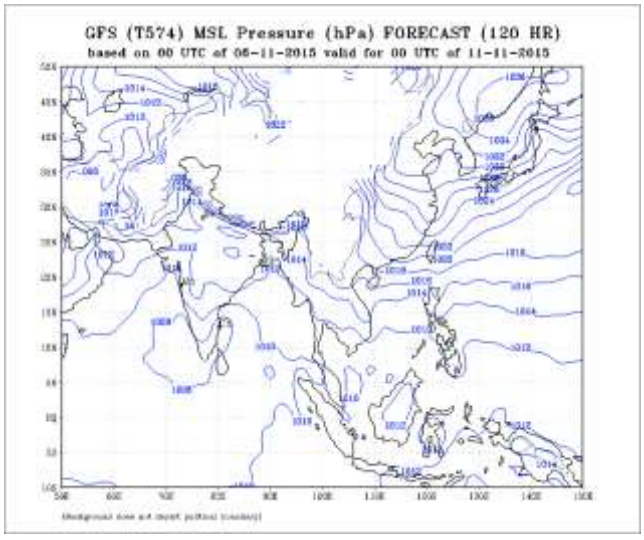
GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
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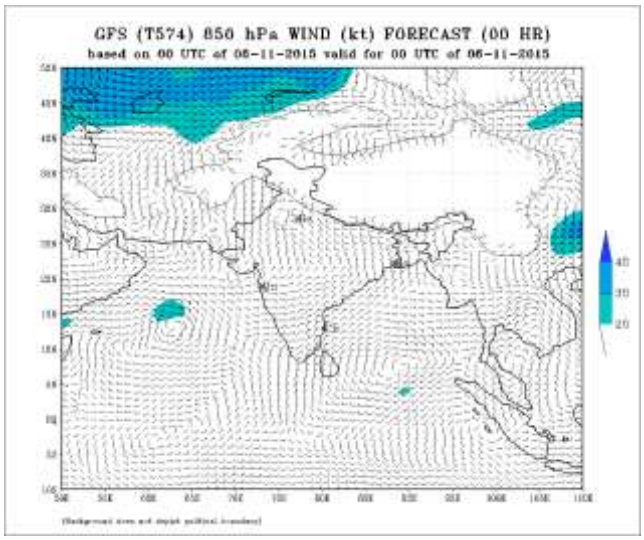
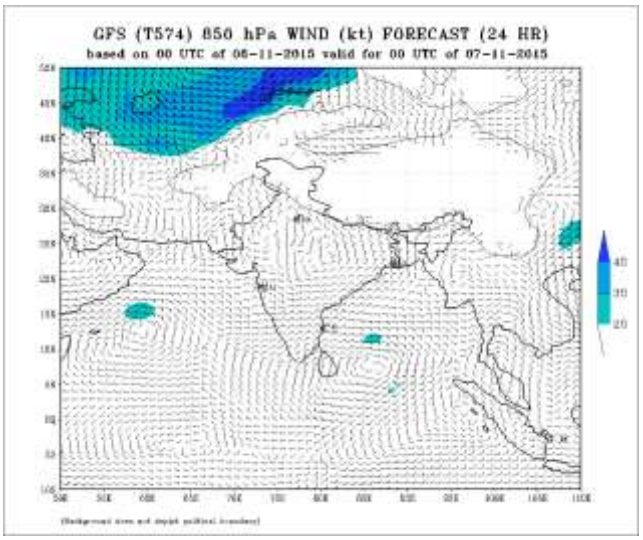
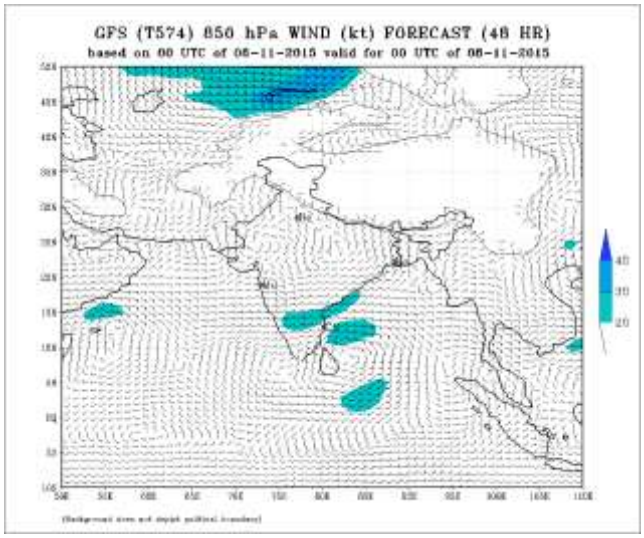
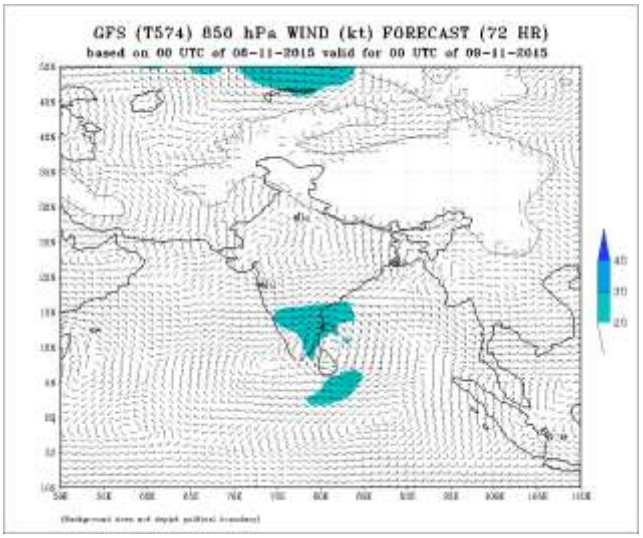

GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 06-11-2015 valid for 00 UTC of 06-11-2015


GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 06-11-2015 valid for 00 UTC of 07-11-2015


GFS (T574) 850 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 06-11-2015 valid for 00 UTC of 08-11-2015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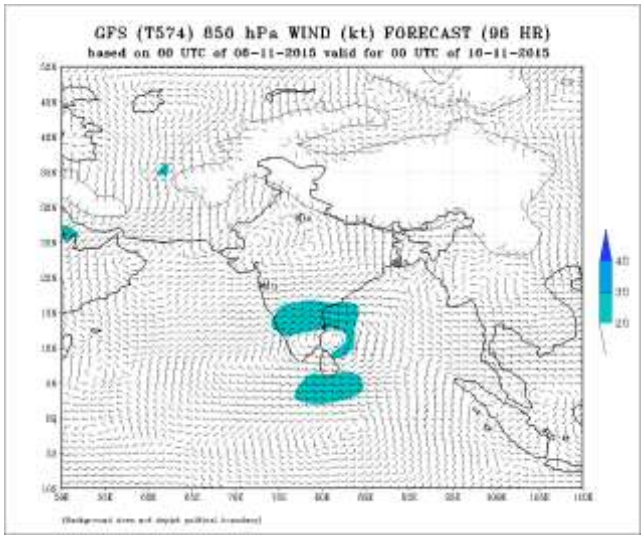
GFS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
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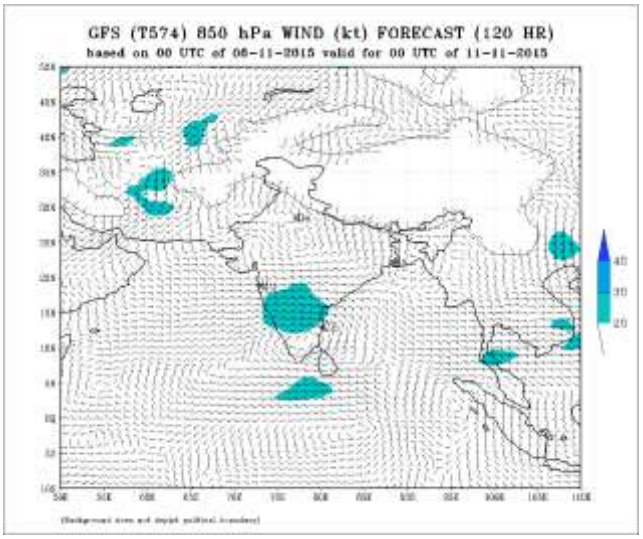
GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
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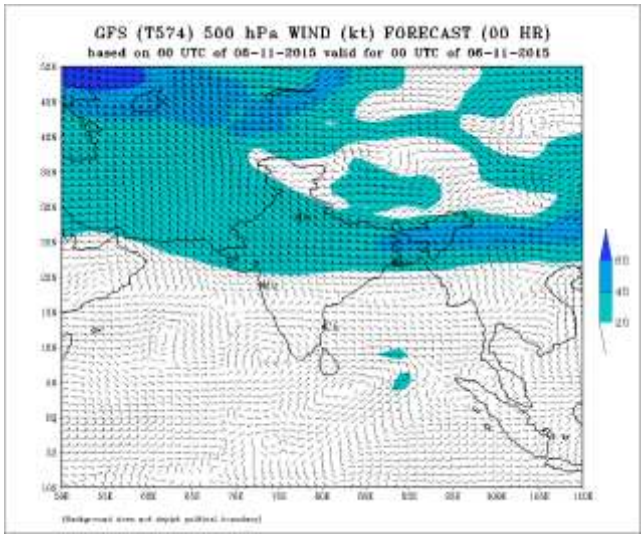
GFS (T574) 500 hPa WIND (kt) FORECAST (00 HR)
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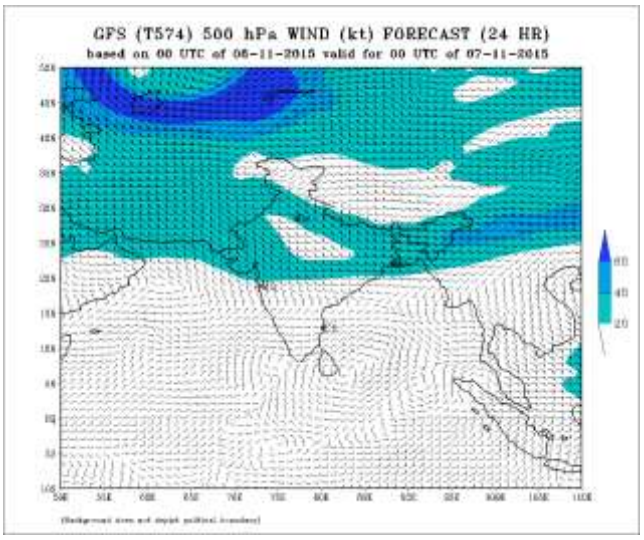
GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
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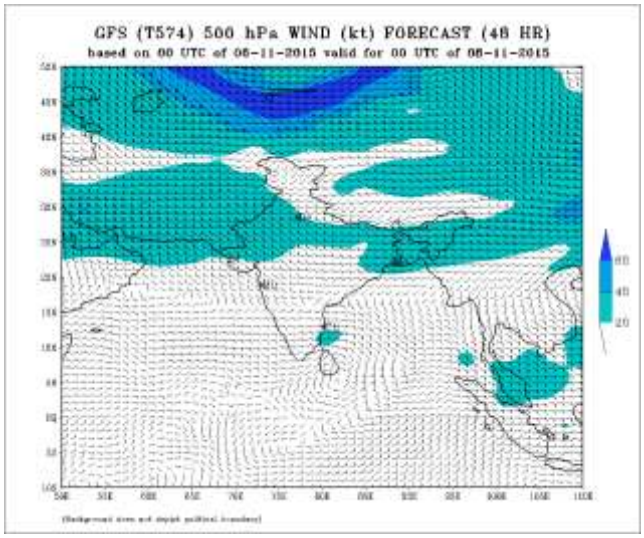
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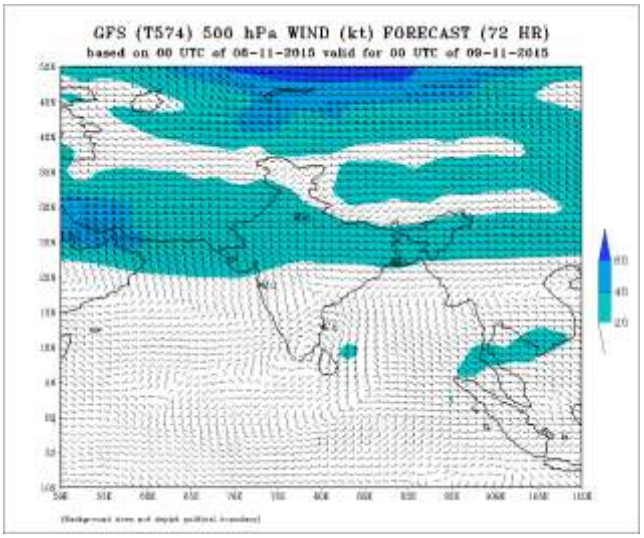
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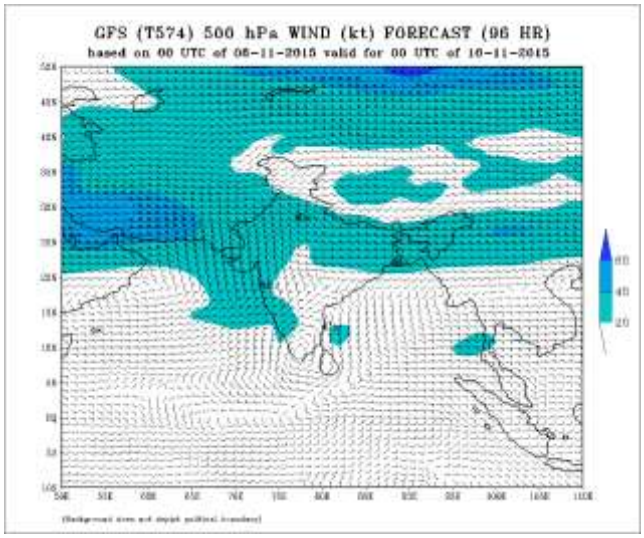
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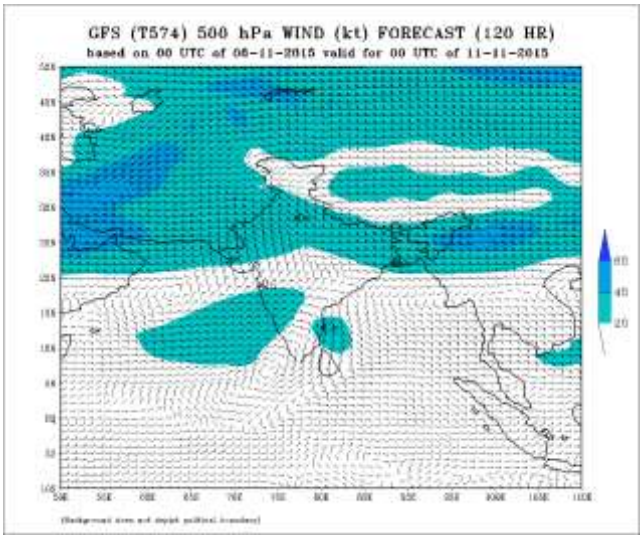
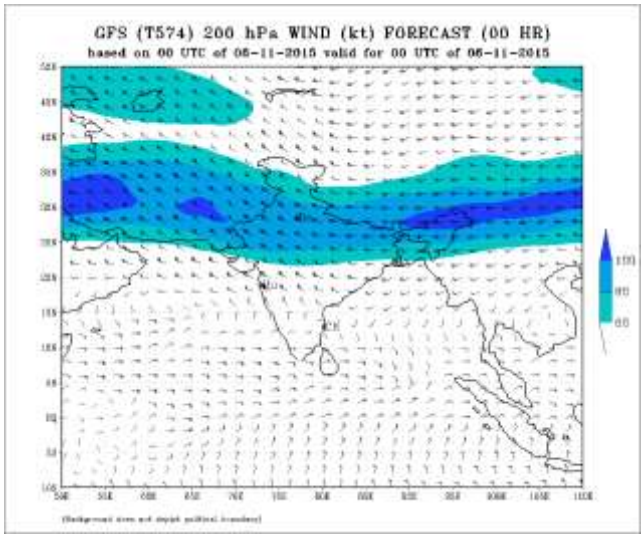
based on 00 UTC of 06-11-2015 valid for 00 UTC of 10-11-2015


GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 06-11-2015 valid for 00 UTC of 11-11-2015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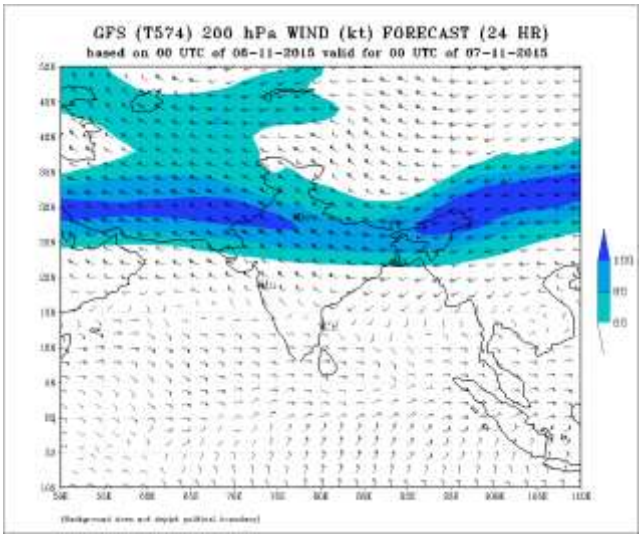
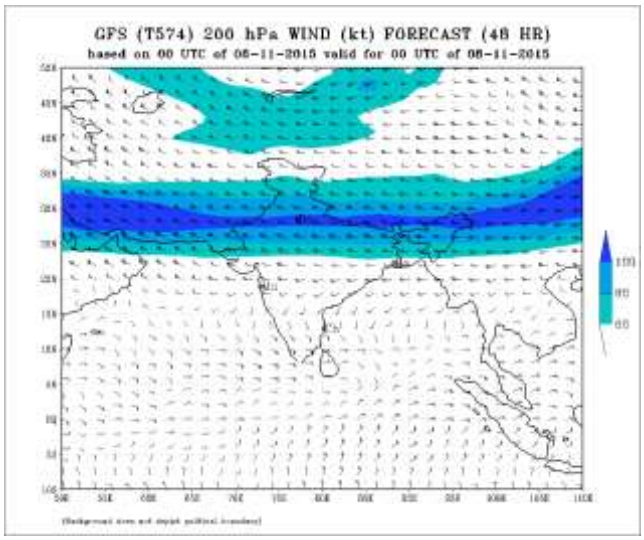
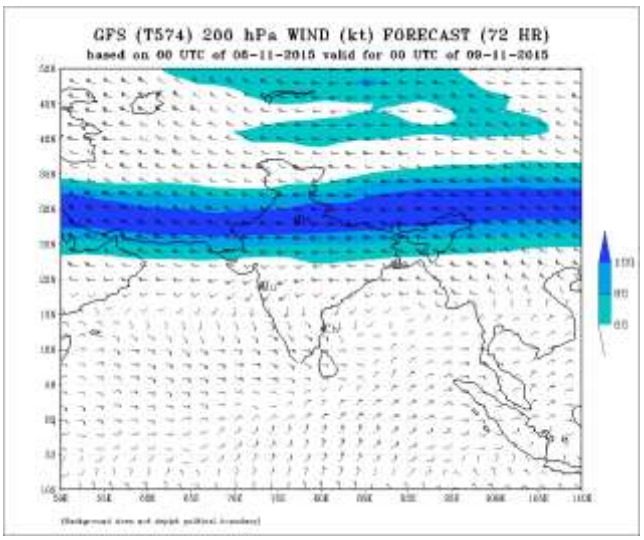
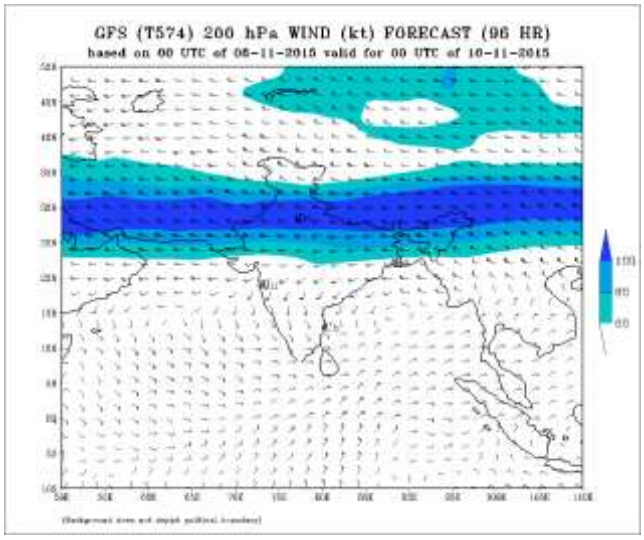
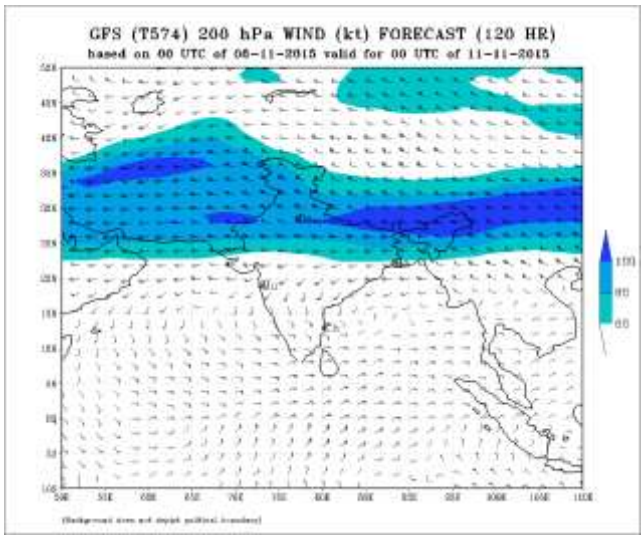
based on 00 UTC of 06-11-2015 valid for 00 UTC of 06-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 06-11-2015 valid for 00 UTC of 07-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 06-11-2015 valid for 00 UTC of 08-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 06-11-2015 valid for 00 UTC of 09-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 06-11-2015 valid for 00 UTC of 10-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 06-11-2015 valid for 00 UTC of 11-11-2015

FDP (Cyclone) NOC Report Dated 07 November, 2015

Synoptic features:

- Yesterday's **cyclonic storm 'Megh'** over Arabian Sea intensified into a Severe Cyclonic Storm and lay centred at 0900 UTCof today the 7th November 2015 near latitude **12.6^0** N and longitude 58.8^0 E, about **530** km east of Socotra Island (Yemen). It would move west-southwestwards passing close to south of Socotra Island during 1200 to 1800 UTC of 8th November 2015. It would then move west-northwestwards towards Gulf of Aden, reaching close to northern tip of Somalia around 0600 UTC of 9th November. The system would intensify further into a **very severe cyclonic storm** during next 12 hours. It would maintain its intensity till 0600 UTC of 8th November and weaken gradually thereafter.
- A low pressure area lies over southwest Bay of Bengal at 0300 UTC of today, the 7th November 2015. It would become well marked and further concentrate into a depression during next 48 hours. Associated upper air cyclonic circulation extends upto 4.5 km above mean sea level.
- The upper air cyclonic circulation over Lakshadweep & neighbourhood has become less marked.

Sea Surface Temperature (SST):

- SST is 28-29°C around the system over eastcentral Arabian Sea and is decreasing significantly towards Gulf of Aden. SST is 29-30°C over most parts east AS.
- SST is 28-30°C over most parts of Bay of Bengal (BoB) and Andaman Sea.

Tropical Cyclone Heat Potential (TCHP):

- TCHP is around 35-50 kJ/cm^2 around system centre and 50-75 kJ/cm^2 to west-southwest of system centre over a limited area and then it decreases towards Gulf of Aden. It is less than 50 kJ/cm^2 over westcentral and northwest AS.
- TCHP is 100-120 kJ/cm^2 over equatorial parts of BoB, less than 50 kJ/cm^2 over north BoB and 80-90 kJ/cm^2 over most parts of the BoB and Andaman Sea.

Relative Vorticity:

- Relative vorticity at 850 hPa is around 150x10^{-5}s^{-1} around the system over eastcentral Arabian Sea. It is around 20-30x10^{-5}s^{-1} over parts of westcentral AS, and negative over other parts of AS.
- Relative vorticity at 850 hPa is positive (30-40x10^{-5}s^{-1}) over equatorial region of south BoB.

Convergence:

- Lower level convergence is 5-10x10^{-5}s^{-1} around the system over eastcentral Arabian Sea.
- Lower level convergence is about 5-10x10^{-5}s^{-1} over parts of southwest BoB and adjoining Andaman Sea and over equatorial region of southeast BoB.

Divergence:

- Upper level divergence is 30x10^{-5} s^{-1} around the system over eastcentral AS.
- Upper level divergence is 20x10^{-5} s^{-1} over equatorial region of southwest BoB and 5-10 x10^{-5} s^{-1} over Gulf of Mannar.

Wind Shear:

- The vertical wind shear over eastcentral Arabian Sea is about 5-10 knots upto 52^{0}E and it is around 20 knots west upto 48^{0}E. It slightly decreases thereafter towards west.

- Wind shear is 5-10 knots over southern parts of BoB, between 8°N and 11°N. It is increasing towards north.

Wind Shear Tendency:

- The vertical wind shear tendency is decreasing to the northwest of the system centre over AS.
- The vertical wind shear tendency is decreasing (-5 to -10 knots) over equatorial parts of southwest BoB.

Upper tropospheric ridge:

- The upper tropospheric ridge at 200 hPa runs along 16.0°N.

M.J.O. Index:

- MJO index lies over Phase 3 with amplitude greater than 1 and would continue to move in the same phase during next 5 days.

Storms and Depression over South China Sea/ South Indian Ocean:

NIL

Satellite:

Inference based on INSAT imagery of **070900** UTC:

Bay of Bengal & Andaman Sea:-

Broken low and medium clouds with embedded intense to very intense convection lie over south BoB between latitude 6.0°N to 13.0°N and long 81.0°E to 90.0°E in association with a low level circulation over the area.

Arabian Sea:-

Vortex (Megh) over westcentral and adjoining eastcentral AS is now centered near 12.7°N/58.7°E. Intensity of the system is T3.5. Convection is eye pattern. Associated broken low and medium clouds with embedded intense to very intense convection lie over area between latitude 10.5°N to 15.0°N and longitude 56.5°E to 60.5°E. Minimum cloud top temperature is -81°C.

NWP Input based on 0000 UTC of 07.11.2015

IMD-GFS: IMD-GFS model charts analysis and forecasts based on 00UTC of 7th November 2015 shows a cyclonic storm over westcentral Arabian sea centred near lat. 12.8°N and Long. 59.6°E, with associated upper air cyclonic circulation extending up to 500 hPa level. The system likely to move in a west south westwards direction during next 72 hours. The analysis and forecasts of IMD-GFS model charts also shows a low pressure area over southwest & adjoining southeast Bay of Bengal with associated upper air cyclonic circulation extending up to 500 hPa level. The system likely to intensify and move in a west -north west ward direction during next 72 hours.

IMD-WRF: IMD-WRF model charts analysis and forecasts based on 00UTC of 7th November 2015 shows a cyclonic storm over west central Arabian Sea centered near lat. 12.8°N and Long. 59.6°E with associated upper air cyclonic circulation extending upto 500hPa level. The system is likely to move in a westsouthwestwards direction during next 72 hours. The analysis and forecasts of IMD-WRF model charts also show a low pressure area over southwest & adjoining southeast Bay of Bengal with associated upper air cyclonic circulation extending up to 500 hPa level. The system is likely to intensify and move in west-northwestward direction during next 72 hours.

NWP products are available at:

IMD-NWP products are available at:

http://202.54.31.51/bias/gfsproducts.php
http://202.54.31.51/bias/wrf27pro.php
http://202.54.31.51/bias/potentialparameter.php

NCMRWF-UM:

The model indicates development of a low pressure area over southwest Bay of Bengal on 0000 UTC of 7th which would concentrate into a depression by 0000 UTC of 8th and intensify into a cyclonic storm by 0000 UTC of 9th and cross Tamil Nadu near 10.0°N latitude.

NCMRWF-GFS: The model indicates that the CS Megh would move in a west-southwestwards till 0000 UTC of 9 Nov.

The model also indicates the development of another low pressure area over southwest Bay of Bengal at 0000 UTC of 7th which would intensify into a depression by 0000 UTC of 8th and into a cyclonic storm by 0000 UTC of 9th and cross Tamil Nadu coast near 12.5°N on 10th.

NCEP-GFS model suggests that the CS Megh over Arabian Sea would move west-southwestwards towards Gulf of Aden without further intensification.

The model also suggests formation of a depression over southwest BoB on 8th. It would move west-northwestwards and intensify into a deep depression and cross Tamil Nadu coast near 11.0°N on 10th.

ECMWF model suggest that the Tropical Cyclone Megh over Arabian Sea, would move nearly westwards towards Gulf of Aden during the next 2 days.

This model further suggests formation of a depression over southwest BoB on 8th. It would intensify further into a deep depression and move west-northwestwards and cross Tamil Nadu coast near 10°N on 10th.

JMA: JMA model indicates that Tropical Cyclone Megh over Arabian sea would move west-southwestwards towards Yemen without significant intensification.

JMA also indicates formation of a Low over southwest BoB on 7th. It would intensify into a deep depression during the next two days and move northwest-wards towards Tamil nadu coast on 10th.

ARP-Meteo France: ARP model suggests that the tropical cyclone Megh over Arabian Sea would move west-soutwestwards during the next 3 days.

ARP also suggests formation of a depression over BoB on 8th. It would intensify into a severe cyclonic storm on 10th and move northwestwards towards north Tamil Nadu / south Andhra Pradesh coast.

GPP: Genesis Potential Parameter (GPP) analysis and forecasts based on 00UTC of 7th November, 2015 shows a zone of high potential cyclogenesis centered over southwest & adjoining southeast Bay of Bengal and it is likely to shift northwestward during next 72 hours with increase in intensity.

Summary and Conclusions:

Bay of Bengal and Andaman Sea:

The environmental, atmospheric and Oceanic conditions are favourable for intensification of the low over southwest Bay of Bengal and moving northwestward reaching Sri Lanka and Tamil Nadu coast by 9th night/10th morning. Most of the models suggest intensification into a deep depression / cyclonic storm near Tamil Nadu coast on 9th November.

Probability of cyclogenesis over Bay of Bengal and Andaman Sea during next 72 hours:

24 HOURS	24-48 HOURS	48-72 HOURS
Moderate	High	High

Arabian Sea:

Most models predict that the Tropical Cyclone Megh over Arabian Sea move towards Gulf of Aden during the next 3 days and weaken gradually from 8th afternoon.

Advisory:

IOP will be conducted during 7-10 November 2015 for Coastal Tamil Nadu.

Annexure-I

Status of observational system:

Synoptic observation:

Region	Date/Time (UTC)		
	06/12	07/00	07/03
India	44	30	45
Coastal stations			
WB	7	3	8
Odisha	7	5	7
AP	11	12	12
Tamil Nadu	10	7	10
Puducherry	2	2	2
A & N	7	1	6
Bangladesh	8	10	7
Myanmar	1	11	11
Thailand	2	2	2
SriLanka	8	4	8

AWS Observations: Not available

RS/RW (12Z) of 06/11/2015 **-0/39**
No. of Ascents reaching 250 hPa level: 0, MISDA: 39

RS/RW (00Z) of 07/11/2015- **27/39**
No. of Ascents reaching 250 hPa level:22, MISDA: 4

No. of PILOT Ascents

06/12Z	07/00Z
7	3

Buoy Data

06/12Z	07/00Z	07/03Z
8	6	10

STATUS OF CHENNAI REGION OBSERVATIONS

No. of Synop data

Date→	**06.11.2015**							
UTC→	**00**	**03**	**06**	**09**	**12**	**15**	**18**	**21**
Chennai Region (Coasts of AP & TN)	**20**	**22**	**20**	**20**	**22**	**20**	**20**	**20**

No. of RS/RW Ascents

00Z /06.11.2015 : 8
No. of Ascents reaching 250 hPa level = 7
MISDA : 0

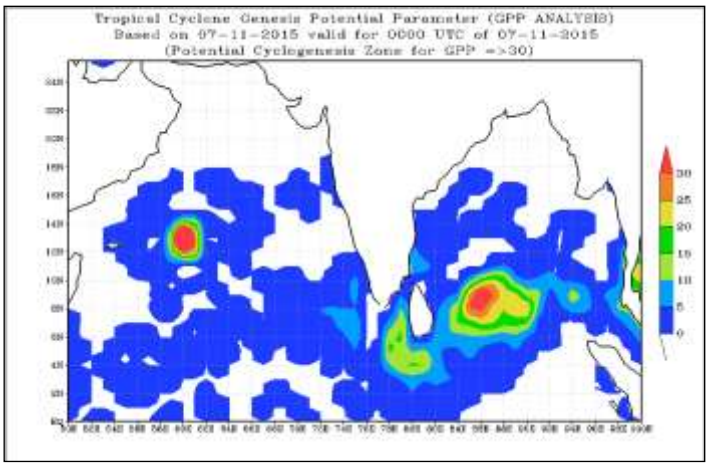
12Z /06.11.2015 : 0
No. of Ascents reaching 250 hPa level = 0
MISDA : 8

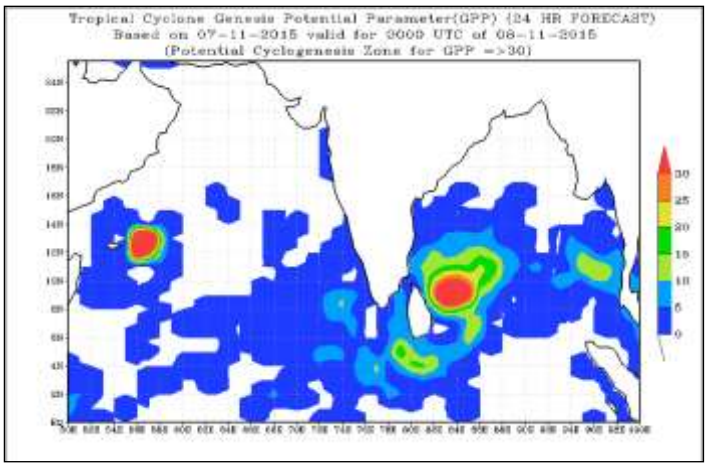
No. of PILOT Ascents:

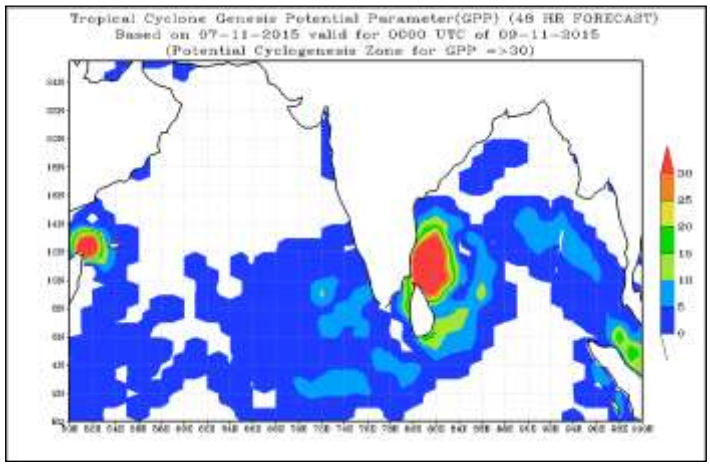
06.11.2015

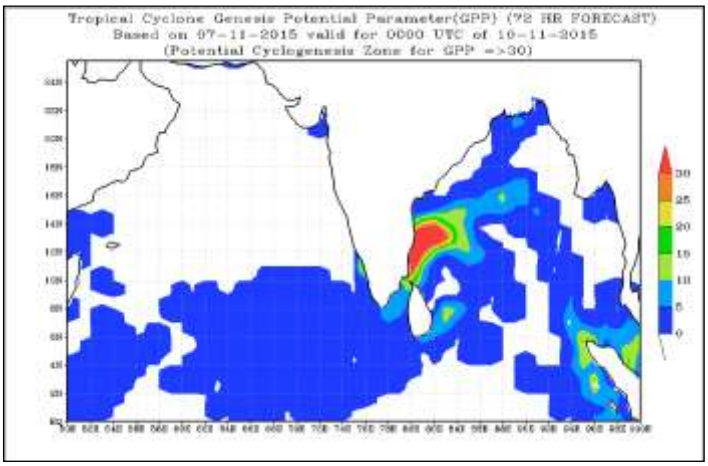
06Z	18Z
6	5

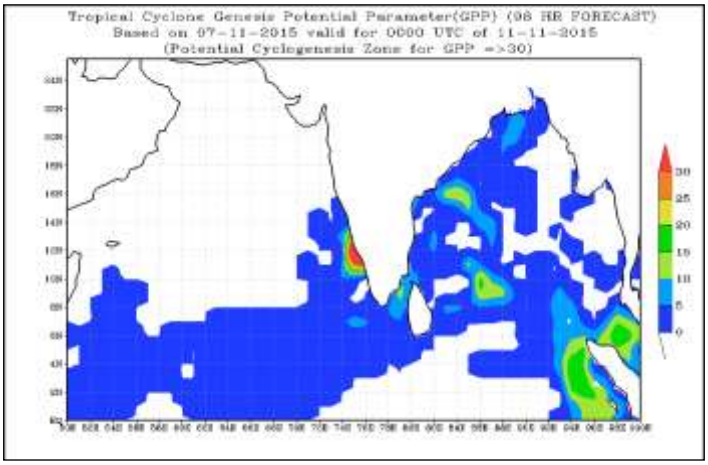
Annexure-II

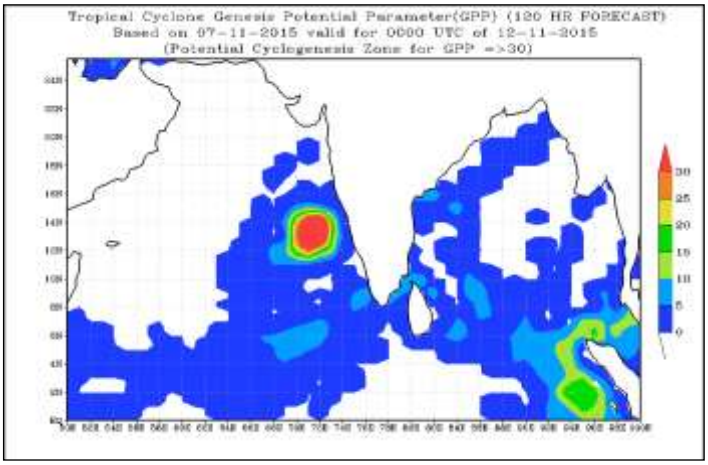

Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 07-11-2015 valid for 0000 UTC of 07-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

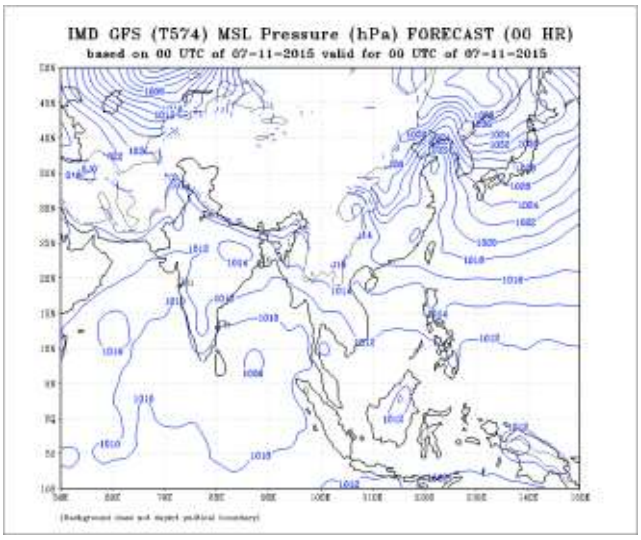

Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 07-11-2015 valid for 0000 UTC of 08-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

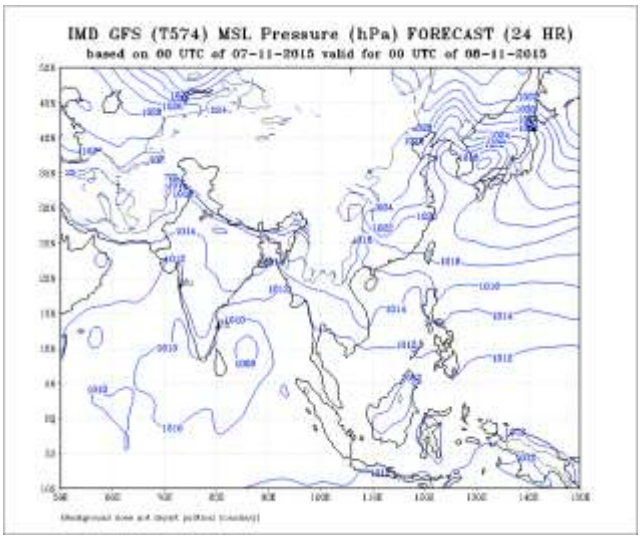

Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
Based on 07-11-2015 valid for 0000 UTC of 09-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

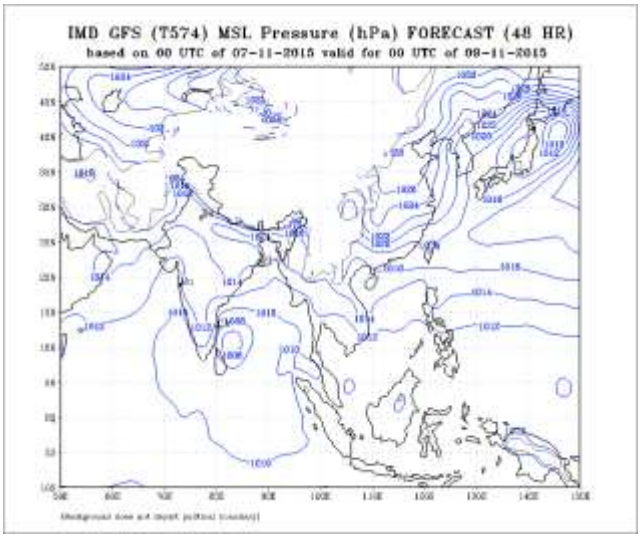

Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 07-11-2015 valid for 0000 UTC of 10-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

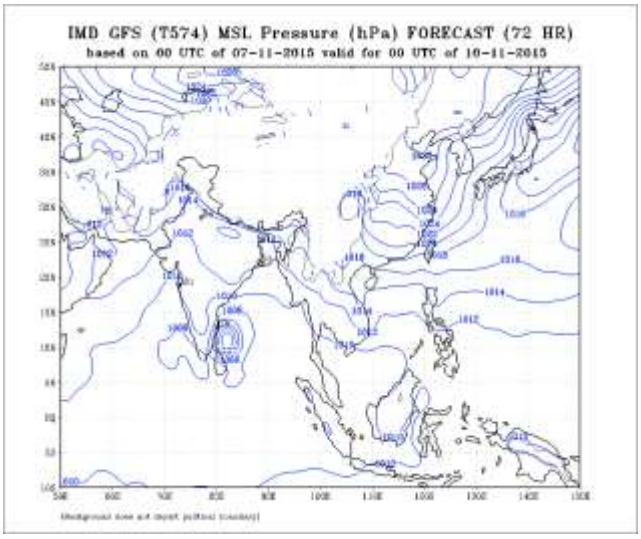

Tropical Cyclone Genesis Potential Parameter(GPP) (96 HR FORECAST)
Based on 07-11-2015 valid for 0000 UTC of 11-11-2015
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 07-11-2015 valid for 0000 UTC of 12-11-2015
(Potential Cyclogenesis Zone for GPP =>30)


IMD GFS (T574) MSL Pressure (hPa) FORECAST (00 HR)
based on 00 UTC of 07-11-2015 valid for 00 UTC of 07-11-2015


IMD GFS (T574) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 07-11-2015 valid for 00 UTC of 08-11-2015


IMD GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 07-11-2015 valid for 00 UTC of 09-11-2015


IMD GFS (T574) MSL Pressure (hPa) FORECAST (72 HR)
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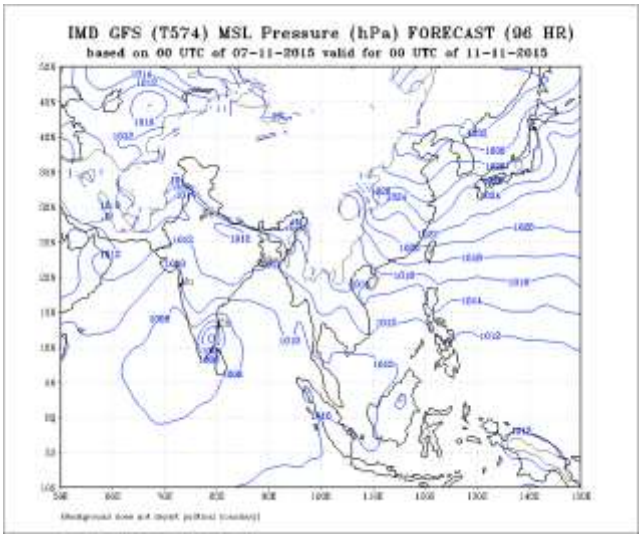
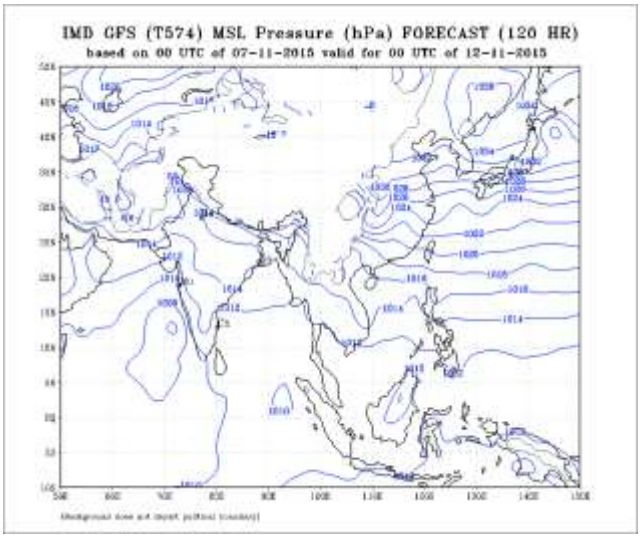

IMD GFS (T574) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 07-11-2015 valid for 00 UTC of 11-11-2015


IMD GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
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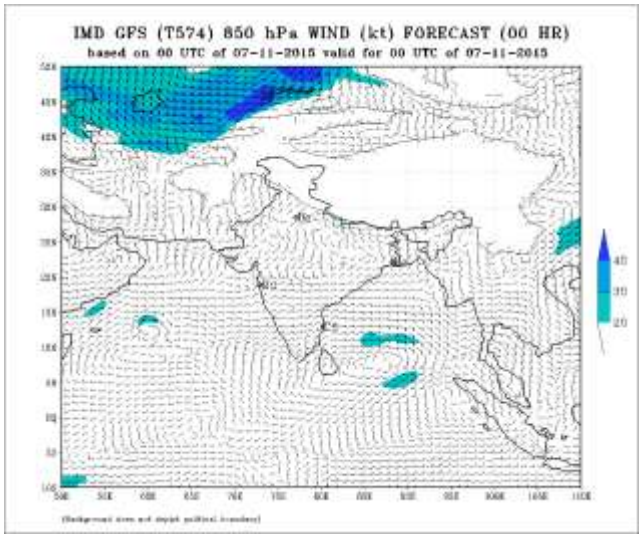
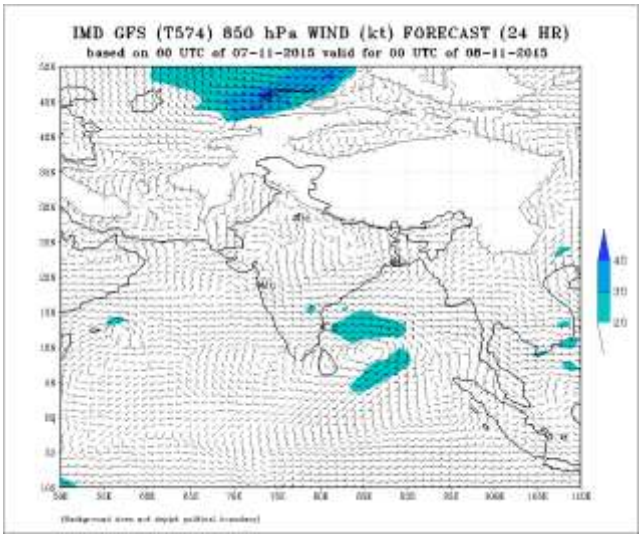
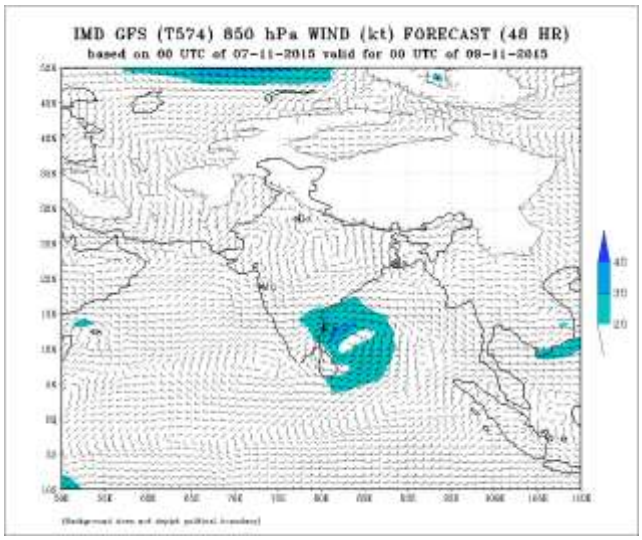
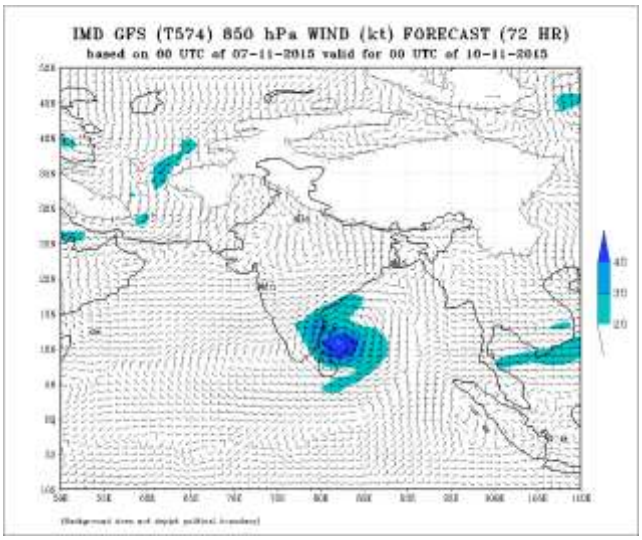

IMD GPS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 07-11-2015 valid for 00 UTC of 07-11-2015


IMD GPS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 07-11-2015 valid for 00 UTC of 08-11-2015


IMD GPS (T574) 850 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 07-11-2015 valid for 00 UTC of 09-11-2015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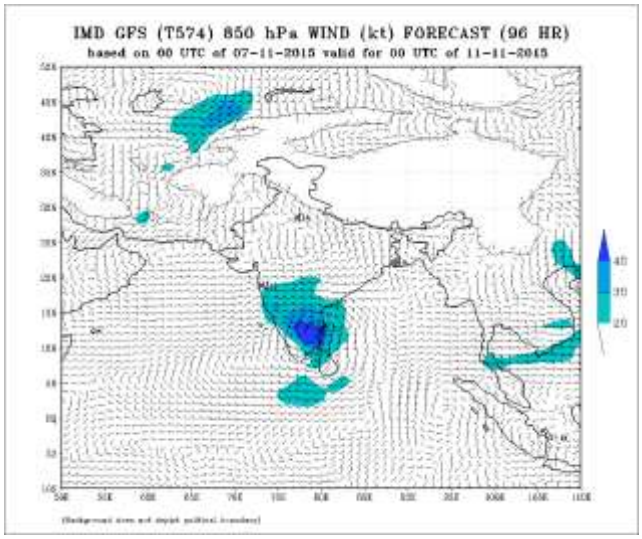
based on 00 UTC of 07-11-2015 valid for 00 UTC of 10-11-2015


IMD GPS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
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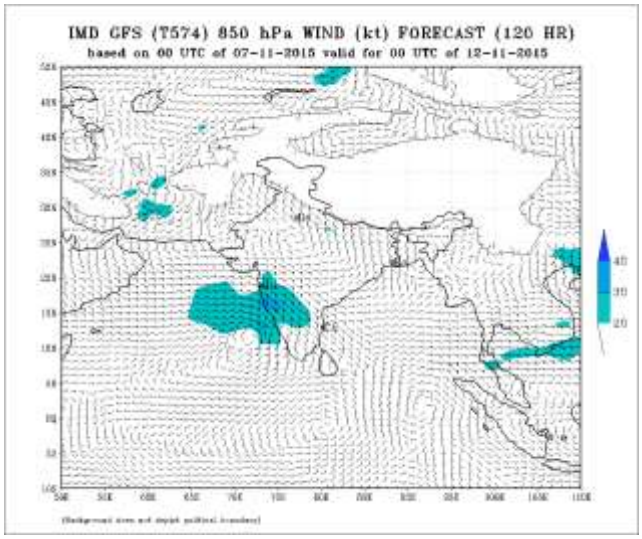
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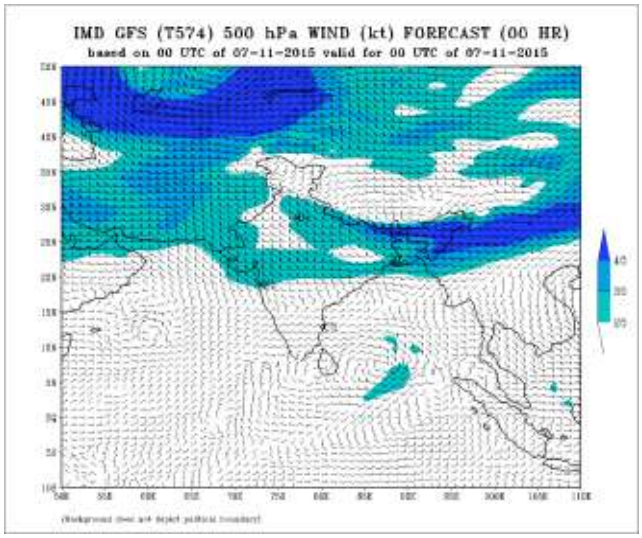
IMD GFS (T574) 500 hPa WIND (kt) FORECAST (00 HR)
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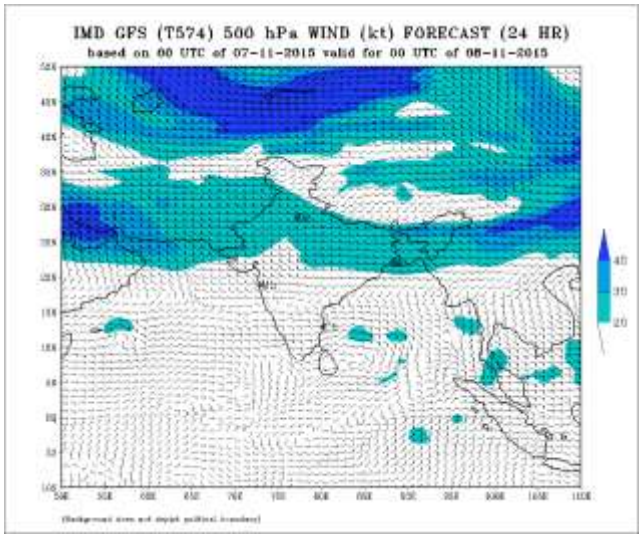
IMD GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
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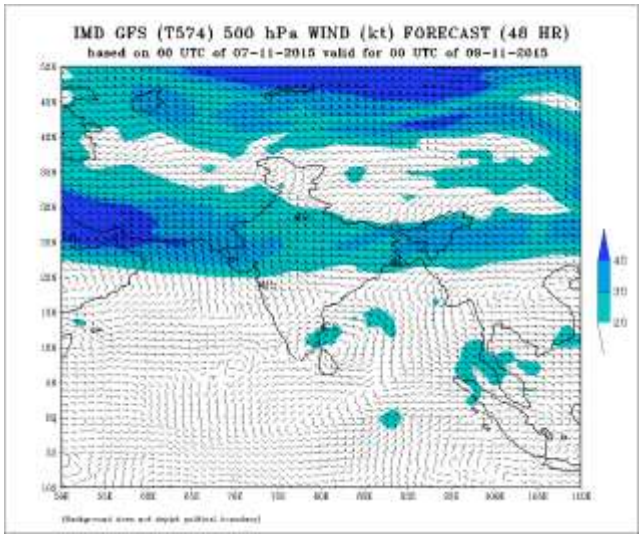
IMD GFS (T574) 500 hPa WIND (kt) FORECAST (48 HR)
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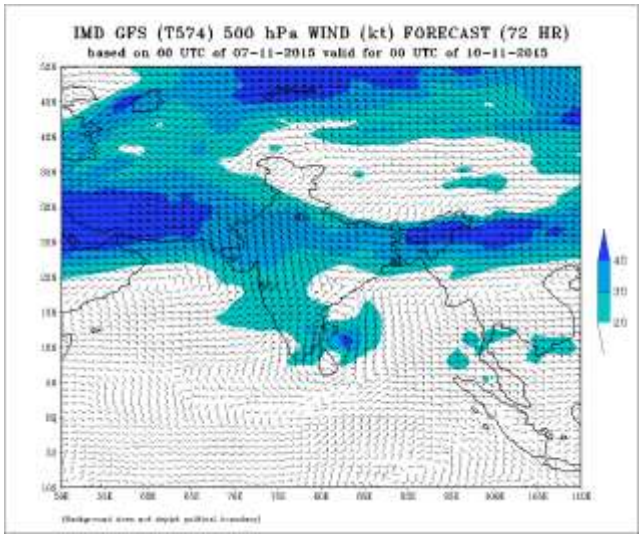
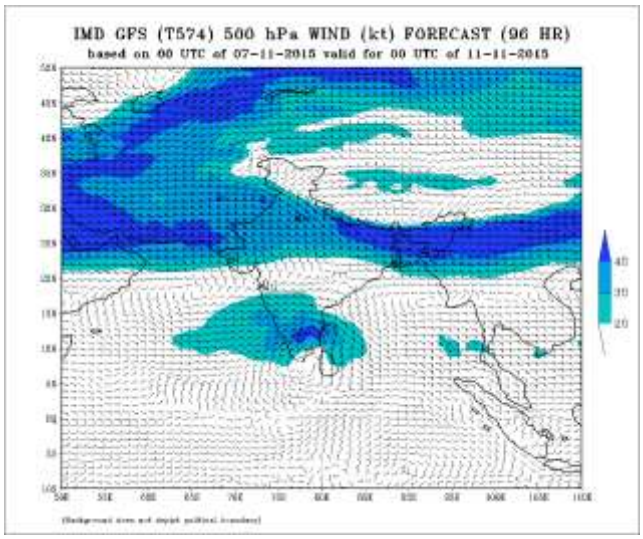
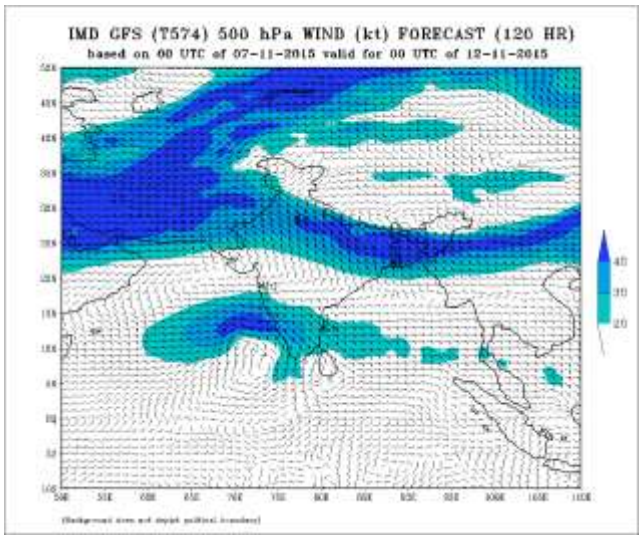
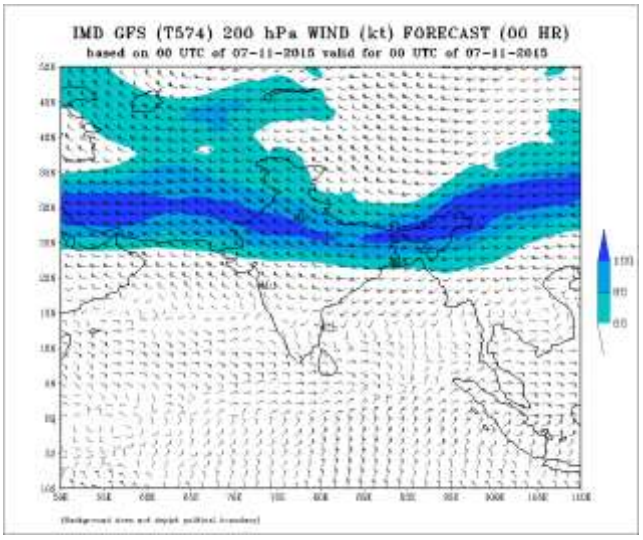
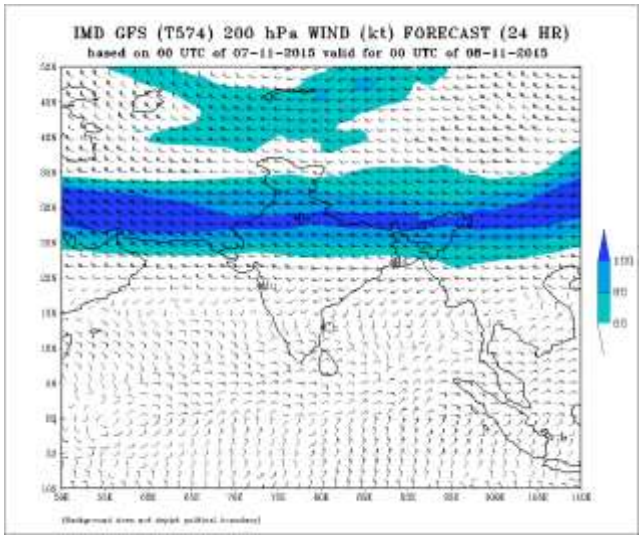
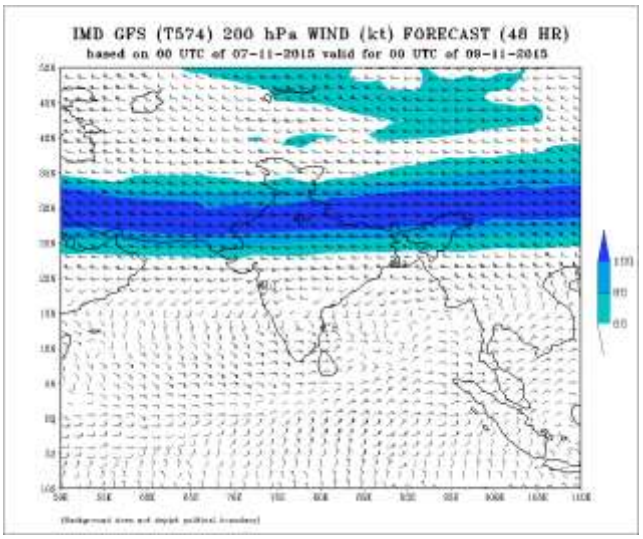

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 07-11-2015 valid for 00 UTC of 10-11-2015

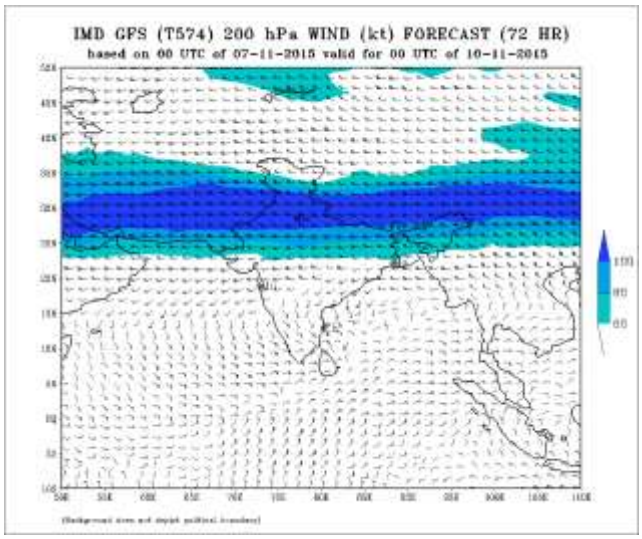

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 07-11-2015 valid for 00 UTC of 11-11-2015

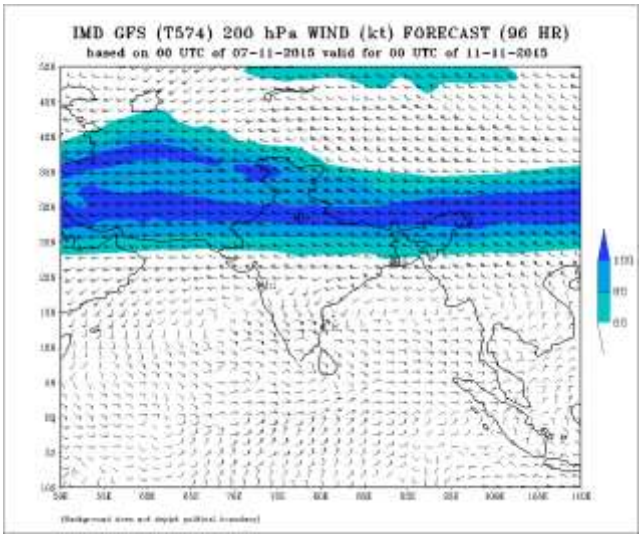

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 07-11-2015 valid for 00 UTC of 12-11-2015

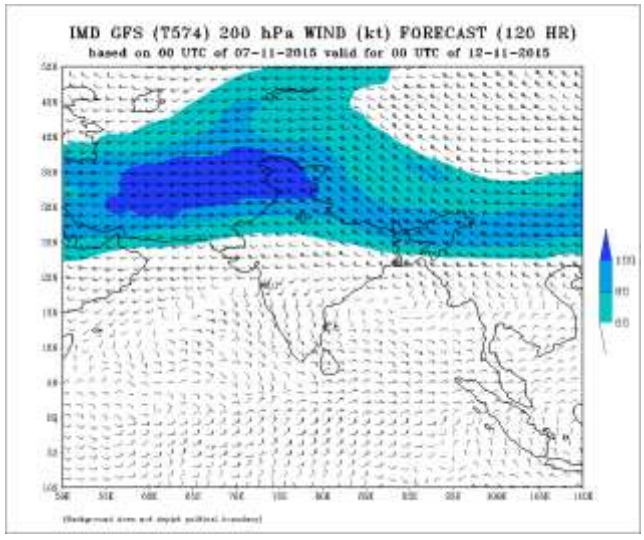

IMD GPS (T574) 200 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 07-11-2015 valid for 00 UTC of 07-11-2015


IMD GPS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 07-11-2015 valid for 00 UTC of 08-11-2015


IMD GPS (T574) 200 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 07-11-2015 valid for 00 UTC of 09-11-2015


IMD GPS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 07-11-2015 valid for 00 UTC of 10-11-2015


IMD GPS (T574) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 07-11-2015 valid for 00 UTC of 11-11-2015


IMD GPS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 07-11-2015 valid for 00 UTC of 12-11-2015

FDP (Cyclone) NOC Report Dated 08 November, 2015

Synoptic features:

- Yesterday's Severe Cyclonic Storm Megh moved westwards and further intensified into an Extremely Severe Cyclonic Storm today early morning and lay centred at 0900 UTCof today the 8th November 2015) over westcentral and adjoining southwest Arabian Sea near latitude 12.7°N and longitude 54.2°E, about 30 km east of Socotra Island (41494) (Yemen) and 480 km south-southeast of Salalah (41316) (Oman). It would move westwards passing close to Socotra Island around 1200 UTC of 8th November 2015. It would then move nearly westwards initially & then west-northwestwards across Gulf of Aden and cross Yemen coast between latitude 13 & 14 degree north around 1200 UTC of 10th November as a **Severe Cyclonic Storm.**
- Yesterdays low pressure area over southwest Bay of Bengal concentrated into a Depression over southwest Bay of Bengal and neighbourhood and lay centered at 0300 UTC of today, the 8th November 2015 near Lat. 10.7°N and Long. 83.7°N, about 450 km southeast of Chennai,440 km east-southeast of Puducherry, 420 km east of Karaikal and 480 km east-northeast of Jafna (Sri Lanka). It would move west-northwestwards, intensify into a deep depression during next 24 hours and subsequently into a cyclonic storm. It would cross Tamil Nadu coast between Karaikal and Chennai close to Puducherry around 9th midnight.

Sea Surface Temperature (SST):

- SST is 28°C around the system centre over eastcentral Arabian Sea. SST is 28-29°C over most parts east AS.
- SST is 29-30°C around the system centre and over most parts of Bay of Bengal (BoB) and Andaman Sea.

Tropical Cyclone Heat Potential (TCHP):

- TCHP is around 50-75 kJ/cm^2 around system centre and it decreases towards Gulf of Aden.
- TCHP is 80-90 kJ/cm^2 around the system centre and most parts of the BoB and Andaman Sea. It is 100-110 kJ/cm^2 over equatorial parts of BoB, less than 50 kJ/cm^2 over north.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive and is 150x10^{-5}s^{-1} around the system over eastcentral Arabian Sea.
- Relative vorticity at 850 hPa is positive and is 100 x10^{-5}s^{-1}) around the system centre over southwest BoB.

Convergence:

- Lower level convergence is 5 x10^{-5}s^{-1} around the system over eastcentral Arabian Sea.
- Lower level convergence is about 20x10^{-5}s^{-1} around the system centre over southwest BoB.

Divergence:

- Upper level divergence is 10x10^{-5} s^{-1} around the system over eastcentral AS.
- Upper level divergence is 20x10^{-5} s^{-1} over around the system centre over southwest BoB, 10-20x10^{-5} s^{-1} over north Andaman Sea and 5-10 x10^{-5} s^{-1} off Kerala coast.

Wind Shear:

- The vertical wind shear over eastcentral Arabian Sea is about 5-10 knots along the forecast track of the system.

- Wind shear is 10-20 knots around the system centre over southwest BoB.

Wind Shear Tendency:

- The vertical wind shear tendency is decreasing to the northwest and southeast of the system centre over AS.
- The vertical wind shear tendency is increasing (5 to 10 knots) around the system centre.

Upper tropospheric ridge:

- The upper tropospheric ridge at 200 hPa runs along 16.0°N.

M.J.O. Index:

- MJO index lies over Phase 3 with amplitude greater than 1 and would continue to move in the same phase during next 5 days.

Storms and Depression over South China Sea/ South Indian Ocean:

NIL

Satellite:

Inference based on INSAT imagery of **080900** UTC:

Bay of Bengal & Andaman Sea:-

Vortex over southwest BoB is centered near 11.0°N/82.7°E. The intensity is T1.5. Broken low and medium clouds with embedded intense to very intense convection lie over BoB between latitude 9.0°N to 17.0°N and west of long. 88.0°E. Minimum cloud top temperature is -85°C.

Arabian Sea:-

Vortex (Megh) over westcentral AS is now centered near 12.7°N/54.0°E. Intensity of the system is T5.0. Convection is eye (Ragged) pattern. Associated broken low and medium clouds with embedded intense to very intense convection lie over area between latitude 11.0°N to 14.5°N and longitude 52.5°E to 55.5°E. Minimum cloud top temperature is -77°C.

NWP Input for FDP Cyclone based on 0000 UTC of today

NWP Analysis

IMDGFS: IMD-GFS model charts analysis and forecasts based on 00UTC of 8th November 2015 shows an extremely severe cyclonic storm over westcentral and adjoining southwest Arabian sea centered near lat. 12.7°N and Long. 55.6°E, with associated upper air cyclonic circulation extending up to 500 hPa level. The system likely to move in a westwards direction during next 72 hours. The analysis and forecasts of IMD-GFS model charts also shows a depression over south west Bay of Bengal centered near latitude 10.7°N and longitude 83.7°E with associated upper air cyclonic circulation extending up to 500 hPa level. The system likely to intensify and move in a north west ward direction during next 72 hours.

IMD-WRF: The model charts analysis and forecasts based on 0000 UTC of 8th November 2015 shows an extremely severe cyclonic storm over west central and adjoining southwest Arabian sea centred near lat. 12.7°N and Long. 55.6°E, with associated upper air cyclonic circulation extending up to 500 hPa level. The system likely to move in a westwards direction during next 72 hours. The analysis and forecasts of IMD-WRF model charts also shows a depression over south west Bay of Bengal centred near latitude 10.7 °N and longitude 83.7°E with associated upper air cyclonic circulation extending up to 500 hPa level. The system likely to intensify and move in a north west ward direction during next 72 hours**.**

GPP: Genesis Potential Parameter (GPP) analysis and forecasts based on 00UTC of 8th November, 2015 shows zone of high potential cyclogenesis centered over south west Bay of Bengal and likely to shift north west ward during next 72 hours with increase in intensity.
NWP products are available at:

IMD-NWP products are available at:

http://202.54.31.51/bias/gfsproducts.php
http://202.54.31.51/bias/wrf27pro.php
http://202.54.31.51/bias/potentialparameter.php

NCMRWF-NCUM: NCUM model indicates that the depression over southwest Bay of Bengal would move west-northwestwards and intensify into a deep depression by 0000 UTC of 9th. It would cross Tamil Nadu near 12.0°N latitude on 9th.

NCMRWF-GFS: NCMRWF-GFS indicates that the depression over southwest Bay of Bengal will move west-northwestwards and intensify into a deep depression /cyclonic storm by 0000 UTC of 9th and and cross Tamil Nadu coast near 12.5°N on 10th.

NCEP-GFS model suggests that the CS Megh over Arabian Sea would move west-southwestwards towards Gulf of Aden without further intensification.

The model also suggests that the depression over southwest Bay of Bengal would move nearly westwards and intensify into a deep depression. It would cross Tamil Nadu coast near 11.0°N on 9th.

ECMWF model suggest that the Tropical Cyclone Megh over Arabian Sea, would move nearly westwards towards Gulf of Aden during the next 2 days.

This model further suggests that the depression over southwest BoB would move west-northwestwards and cross Tamil Nadu coast near 11.5°N on 9th.

JMA: JMA model indicates that Tropical Cyclone Megh over Arabian sea would move west-southwestwards towards Yemen and weaken gradually during the next 2 days.

JMA also indicates that the depression over southwest BoB would move northwest-wards and intensify into a deep depression. It would cross Tamil nadu coast on 9th near 11.0°N.

ARP-Meteo France: ARP model suggests that the tropical cyclone Megh over Arabian Sea would move west-soutwestwards during the next 3 days and weaken gradually.

ARP also suggests that the depression over BoB would move west-northwestwards and intensify into a cyclonic storm. It would cross Tamil Nadu coast near 12°N on 10th.

GPP: Genesis Potential Parameter (GPP) analysis and forecasts based on 00UTC of 7th November, 2015 shows a zone of high potential cyclogenesis centered over southwest & adjoining southeast Bay of Bengal and it is likely to shift northwestward during next 72 hours with increase in intensity.

Summary and Conclusions:

Bay of Bengal and Andaman Sea:

The system would move west-northwestards and intensify into a deep depression during next 24 hours. Most of the model suggests west-northwestward movement reaching north Tamil nadu coast by 9th night /10th morning. But there is divergence among the NWP models regarding the peak intensity which varies from deep depression to cyclonic storm.

Arabian Sea:

The system would maintain its intensity till 1200 UTC of 8th November and weaken gradually thereafter due to lower ocean thermal energy over Gulf of Aden and interaction with land surface as the system will pass near Socotra Island and northern tip of Somalia.

Advisory: IOP will be conducted during 8-10 November 2015 for Coastal Tamil Nadu.

Annexure-I

Status of observational system:

Synoptic observation:

Region	Date/Time (UTC)		
	06/12	07/00	07/03
India	44	30	45
Coastal stations			
WB	7	3	8
Odisha	7	5	7
AP	11	12	12
Tamil Nadu	10	7	10
Puducherry	2	2	2
A & N	7	1	6
Bangladesh	8	10	7
Myanmar	1	11	11
Thailand	2	2	2
SriLanka	8	4	8

AWS Observations: Not available

RS/RW (12Z) of 07/11/2015 **-0/39**
No. of Ascents reaching 250 hPa level: 0, MISDA: 39

RS/RW (00Z) of 08/11/2015- **24/39**
No. of Ascents reaching 250 hPa level:19, MISDA: 3

No. of PILOT Ascents

07/12Z	08/00Z
6	3

Buoy Data

06/12Z	07/00Z	07/03Z
8	6	10

STATUS OF CHENNAI REGION OBSERVATION

No. of Synop data

Date→	07.11.2015							
UTC→	**00**	**03**	**06**	**09**	**12**	**15**	**18**	**21**
Chennai Region (Coasts of AP & TN)	**20**	**22**	**20**	**20**	**22**	**20**	**20**	**20**

No. of RS/RW Ascents

00Z /07.11.2015 : 6
No. of Ascents reaching 250 hPa level = 6
MISDA : 2

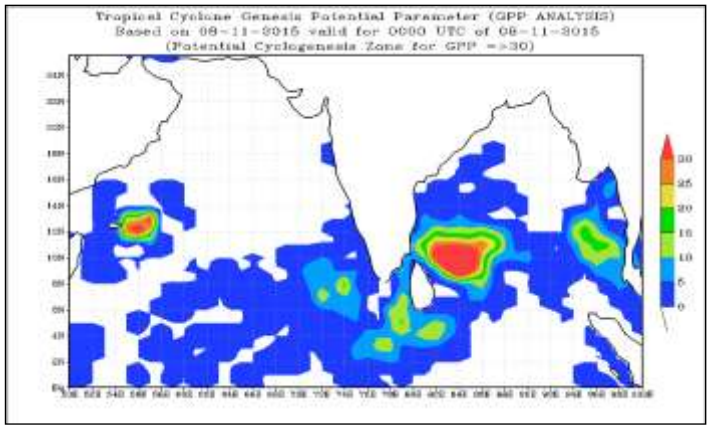
12Z /07.11.2015 : 1
No. of Ascents reaching 250 hPa level = 1
MISDA : 7

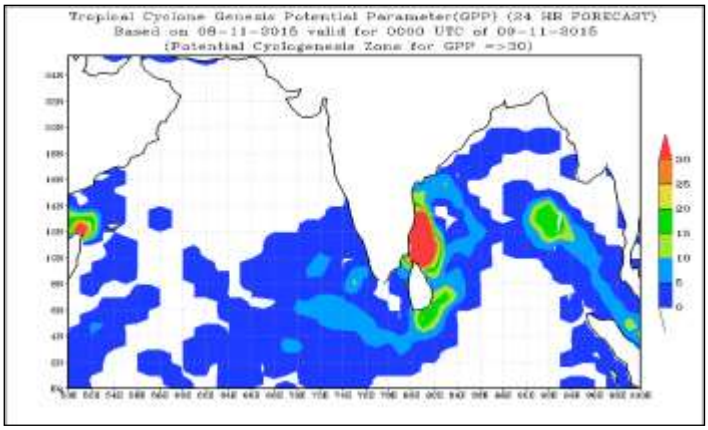
No. of PILOT Ascents:

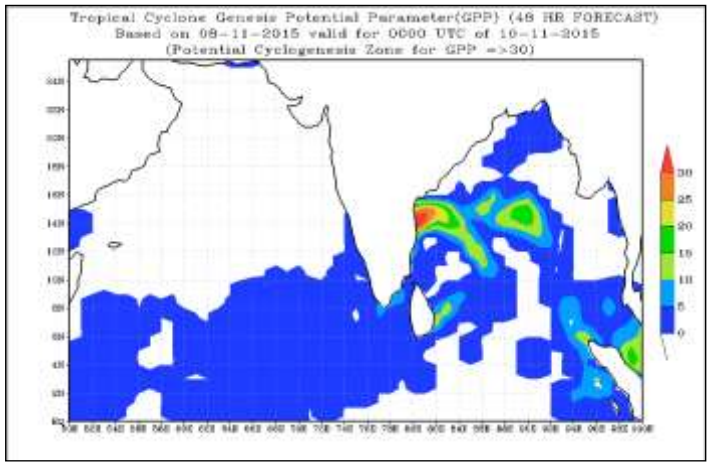
07.11.2015

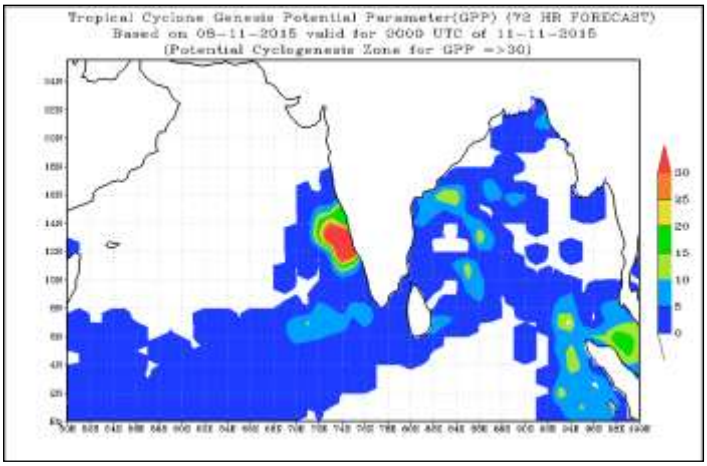
06Z	18Z
3	2

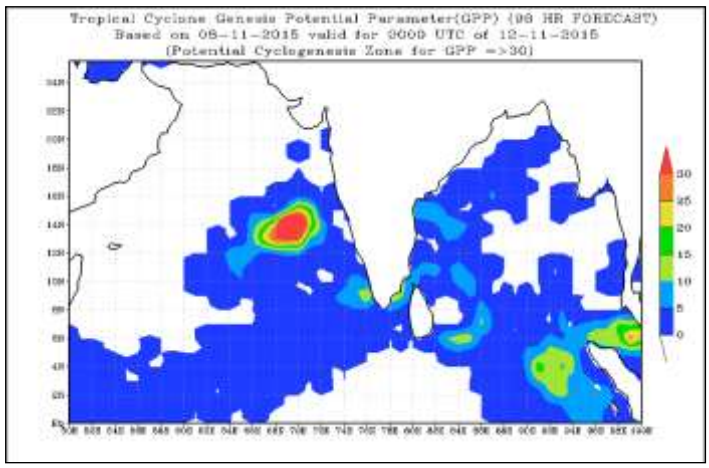
Annexure-II

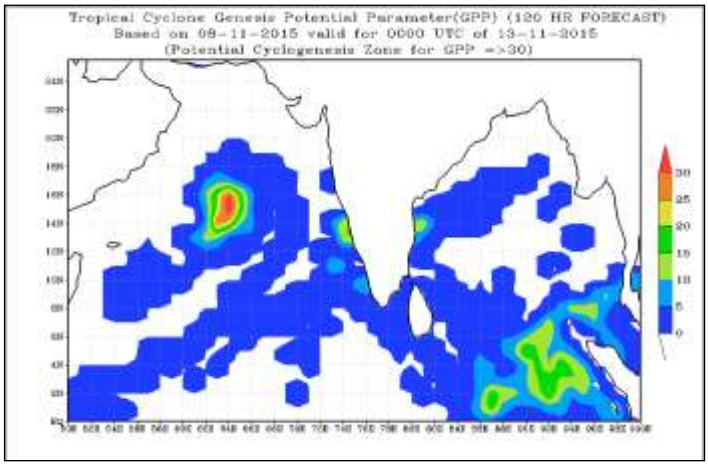

Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 08-11-2015 valid for 0000 UTC of 08-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

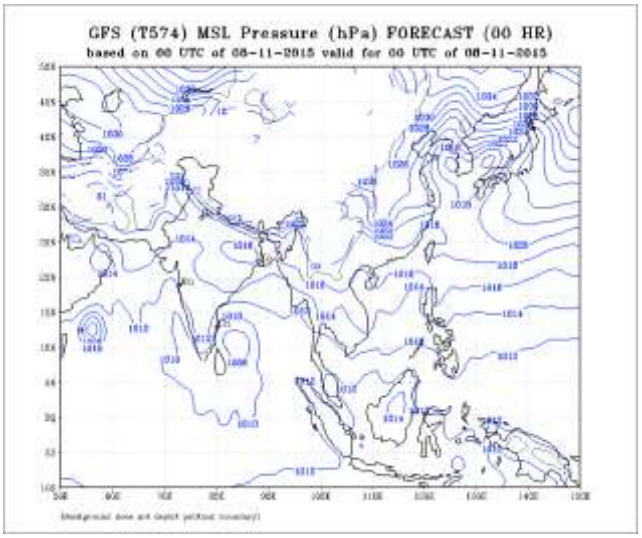

Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 08-11-2015 valid for 0000 UTC of 09-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

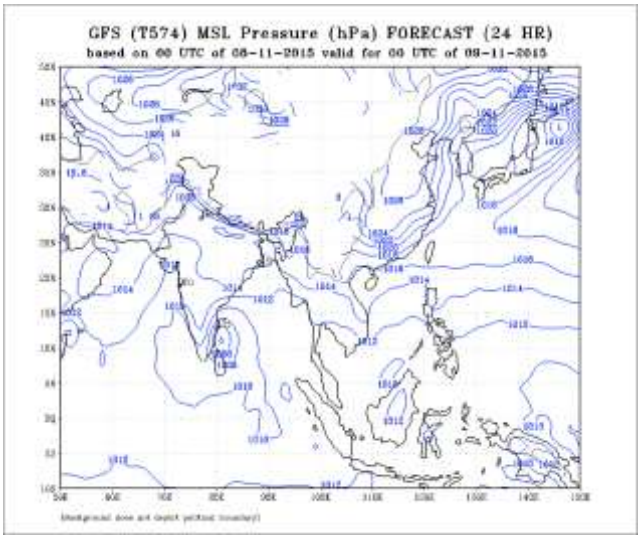

Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
Based on 08-11-2015 valid for 0000 UTC of 10-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

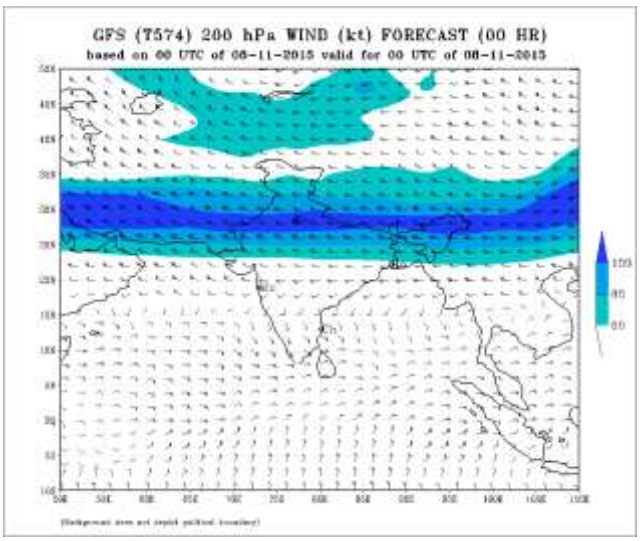

Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 08-11-2015 valid for 0000 UTC of 11-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

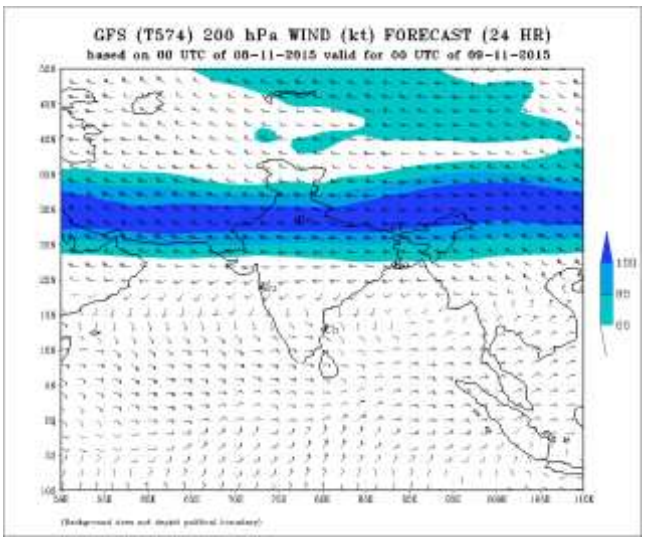

Tropical Cyclone Genesis Potential Parameter(GPP) (96 HR FORECAST)
Based on 08-11-2015 valid for 0000 UTC of 12-11-2015
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 08-11-2015 valid for 0000 UTC of 13-11-2015
(Potential Cyclogenesis Zone for GPP =>30)


GFS (T574) MSL Pressure (hPa) FORECAST (00 HR)
based on 00 UTC of 08-11-2015 valid for 00 UTC of 08-11-2015


GFS (T574) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 08-11-2015 valid for 00 UTC of 09-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 08-11-2015 valid for 00 UTC of 08-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 08-11-2015 valid for 00 UTC of 09-11-2015

FDP (Cyclone) NOC Report Dated 09 November, 2015

Synoptic features:

- Yesterday's Extremely Severe Cyclonic Storm moved westwards and weakened into a very severe cyclonic storm yesterday evening. It further moved west-southwestwards and then westwards and lay centred at 0900 UTC of today the 9th November 2015) over Gulf of Aden and adjoining Arabian Sea near latitude 12.4°N and longitude 49.2°E, about 240 km south of Riyan (Yemen). It would move west-northwestwards, weaken gradually and cross Yemen coast between latitude 13 & 14 degree north around noon of 10th November as a severe cyclonic storm.
- Yesterdays Depression over southwest Bay of Bengal and neighbourhood intensified into Deep Depression today morning It further moved north-northwestwards with a speed of 11 kmph during past 6 hours and lay centred at 1430 hours IST of today, the 9th November 2015 over southwest Bay of Bengal near latitude 12.0°N and longitude 80.0°E, very close to north Tamil Nadu coast near Puducherry. It would move north-The very severe cyclonic storm 'Megh' moved nearly westwards with a speed of 15 kmph during past six hours, and lay centred at 1430 hours IST of today, the 9th November 2015 over Gulf of Aden near latitude 12.4°N and longitude 49.2°E, about 240 km south of Riyan (Yemen). It would move west-northwestwardsnorthwestwards and cross north Tamil Nadu coast close to Puducherry within a few hours.

Sea Surface Temperature (SST):

- SST is 28-29°C around the system centre over eastcentral Arabian Sea and adjoining . SST is 28-29°C over most parts east AS.
- SST is 29-30°C around the system centre and over most parts of Bay of Bengal (BoB) and Andaman Sea.

Tropical Cyclone Heat Potential (TCHP):

- TCHP is around 30-40 kJ/cm^2 around system centre and it decreases towards Gulf of Aden.
- TCHP is 60-80 kJ/cm^2 around the system centre. and most parts of the BoB and Andaman Sea. It is 90-100 kJ/cm^2 over equatorial parts of BoB, less than 50 kJ/cm^2 over north.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive and is 100x10^{-5}s^{-1} around the system over eastcentral Arabian Sea.
- Relative vorticity at 850 hPa is positive and is 150 x10^{-5}s^{-1}) around the system centre over southwest BoB.

Convergence:

- Lower level convergence is 10 x10^{-5}s^{-1} around the system over eastcentral Arabian Sea.
- Lower level convergence is about 10x10^{-5}s^{-1} around the system centre over southwest BoB.

Divergence:

- Upper level divergence is 20x10^{-5} s^{-1} around the system over eastcentral AS.
- Upper level divergence is 30x10^{-5} s^{-1} around the system centre over southwest and adjoining westcentral Bay of Bengal and 5-10 x10^{-5} s^{-1} off Kerala coast.

Wind Shear:

- The vertical wind shear over eastcentral Arabian Sea is about 10 knots around the system centre.

- Wind shear is about 10 knots around the system centre over southwest BoB.

Wind Shear Tendency:

- The vertical wind shear tendency is decreasing to the northwest and southeast of the system centre over AS by 5- 10 knots.
- The vertical wind shear tendency is decreasing (5 to 10 knots) around the system centre over BoB

Upper tropospheric ridge:

- The upper tropospheric ridge at 200 hPa runs along 16.0°N.

M.J.O. Index:

- MJO index lies over Phase 3 with amplitude greater than 1 and would continue to move in the same phase during next 5 days.

Storms and Depression over South China Sea/ South Indian Ocean:

NIL

Satellite:

Inference based on INSAT imagery of **090900** UTC:

Bay of Bengal & Andaman Sea:-

Vortex over land and lies over coastal Tamil Nadu and neighbourhood. Associated broken low and medium clouds with embedded intense to very intense convection lie over Tamil Nadu, Kerala, south interior Karnataka, coastal Andhra Pradesh, Rayalaseema, Palk Strait and over BoB between latitude 9.0°N to 16.0°N and west of long. 87.0°E. Minimum cloud top temperature is -93°C.

Arabian Sea:-

Vortex (Megh) over westcentral AS is now centered near 12.5°N/49.2°E. Intensity of the system is T4.0/CI 4.5. Associated broken low and medium clouds with embedded intense to very intense convection lie over area between latitude 10.5°N to 14.5°N and longitude 47.0°E to 51.0°E. Minimum cloud top temperature is -83°C.

NWP Input for FDP Cyclone based on 0000 UTC of today

NWP Analysis

IMDGFS: IMD-GFS model charts analysis and forecasts based on 0000UTC of 9th November 2015 shows a very severe cyclonic storm over west central and adjoining southwest Arabian Sea centred near lat.12.3°N and Long.50.4°E, with associated upper air cyclonic circulation extending up to 500 hPa level. The analysis and forecasts of IMD-GFS model charts also shows a deep depression over south west Bay of Bengal centred near

latitude 11.6°N and longitude 80.3°E with associated upper air cyclonic circulation extending up to 500 hPa level. The system likely to move in a west north west ward direction during next 72 hours.

IMD-WRF: IMD-WRF model charts analysis and forecasts based on 00UTC of 9th November 2015 shows a very severe cyclonic storm over west central and adjoining southwest Arabian sea centred near lat. 12.3°N and Long. 50.4°E, with associated upper air cyclonic circulation extending up to 500 hPa level. The analysis and forecasts of IMD-WRF model charts also shows a deep depression over south west Bay of Bengal centred near latitude 11.6 °N and longitude 80.3°E with associated upper air cyclonic circulation extending up to 500 hPa level. The system likely to move in a west north west ward direction during next 72 hours.

GPP: Genesis Potential Parameter (GPP) analysis based on 00UTC of 9th November, 2015 shows zone of high potential cyclogenesis centered over south west Bay of Bengal.
NWP products are available at:
IMD-NWP products are available at:
http://202.54.31.51/bias/gfsproducts.php
http://202.54.31.51/bias/wrf27pro.php
http://202.54.31.51/bias/potentialparameter.php

NCMRWF-NCUM: NCUM model indicates that the deep depression over southwest Bay of Bengal would move westwards and cross Tamil Nadu coast by 1200 UTC of 9th near 12.5°N latitude.
NCMRWF-GFS: model suggests that the CS Megh over Arabian Sea would move west-southwestwards towards Gulf of Aden and weaken by 11th.
NCMRWF-GFS indicates that the depression over southwest Bay of Bengal will move west-northwestwards and intensify into a deep depression /cyclonic storm by 0000 UTC of 9th and and cross Tamil Nadu coast near 12.5°N on 10th.
NCEP-GFS model suggests that the CS Megh over Arabian Sea would move west-southwestwards crossing Yemen coast by 0600 UTC of 11th.
The model also suggests that the deep depression over southwest Bay of Bengal would move northwestwards. It would cross Tamil Nadu coast near 12.4/80.2°N by 0900 UTC 9th. It will become a low pressure area by 0000 UTC of 10 over coastal Tamil Nadu and adjoining southwest BoB.
ECMWF model suggest that the Tropical Cyclone Megh over Arabian Sea, would move west-northwestwards towards Gulf of Aden reaching Yemen coast 14.0/48.0 by 0000 UTC of 10th.
This model further suggests that the deep depression over southwest BoB would move westwards and cross Tamil Nadu coast near 12°N/79.8 in the early morning of 10th.
JMA: JMA model indicates that Tropical Cyclone Megh over Arabian sea would move west-southwestwards towards Yemen and weaken gradually during the next 2 days.
JMA also indicates that the deep depression over southwest BoB would move northwest and then northwards crossing Tamil Nadu coast in the early morning of 10th near 13/80.4. After crossing it would move west-northwestwards and weaken.
ARP-Meteo France: ARP model suggests that the tropical cyclone Megh over Arabian Sea would become less marked by tomorrow.
ARP also suggests that the deep depression over BoB would move north-northwestwards and would cross Tamil Nadu coast near 14.4/79.6°N on 10th and weakening into low during subsequent 2 days.
Summary and Conclusions:

Bay of Bengal and Andaman Sea:
After crossing Tamil Nadu coast, the Deep depression would weaken gradually while moving northwestwards.
Arabian Sea:
The VSCS Megh would move west-northwestwards, weaken gradually and cross yemen coast between latitude 13 & 14 degree north around 0600 UTC of 10th November as a severe cyclonic storm. The system would weaken gradually, due to lower ocean thermal energy over Gulf of Aden and interaction with land surface.

Advisory: IOP will be conducted during 9-10 November 2015 for Coastal Tamil Nadu.

Annexure-I

Status of observational system:

Synoptic observation:

Region	Date/Time (UTC)		
	06/12	07/00	07/03
India	44	30	45
Coastal stations			
WB	7	3	8
Odisha	7	5	7
AP	11	12	12
Tamil Nadu	10	7	10
Puducherry	2	2	2
A & N	7	1	6
Bangladesh	8	10	7
Myanmar	1	11	11
Thailand	2	2	2
SriLanka	8	4	8

AWS Observations: Not available

RS/RW (12Z) of 07/11/2015 **-0/39**
No. of Ascents reaching 250 hPa level: 0, MISDA: 39

RS/RW (00Z) of 08/11/2015- 26**/39**
No. of Ascents reaching 250 hPa level:19, MISDA: 6

No. of PILOT Ascents

07/12Z	08/00Z
5	6

Buoy Data

06/12Z	07/00Z	07/03Z
8	6	10

STATUS OF CHENNAI REGION OBSERVATION

No. of Synop data

Date→	**08.11.2015**											
UTC→	**00**	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**
Chennai Region (Coasts of AP & TN)	**20**	**09**	**09**	**22**	**09**	**09**	**20**	**09**	**09**	**20**	**09**	**09**
UTC→	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**
Chennai Region (Coasts of AP & TN)	**22**	**09**	**09**	**20**	**09**	**09**	**20**	**09**	**09**	**20**	**09**	**09**

No. of RS/RW Ascents

00Z /08.11.2015 : 6

No. of Ascents reaching 250 hPa level = 4

MISDA : 2

12Z /08.11.2015 : 0

No. of Ascents reaching 250 hPa level =0

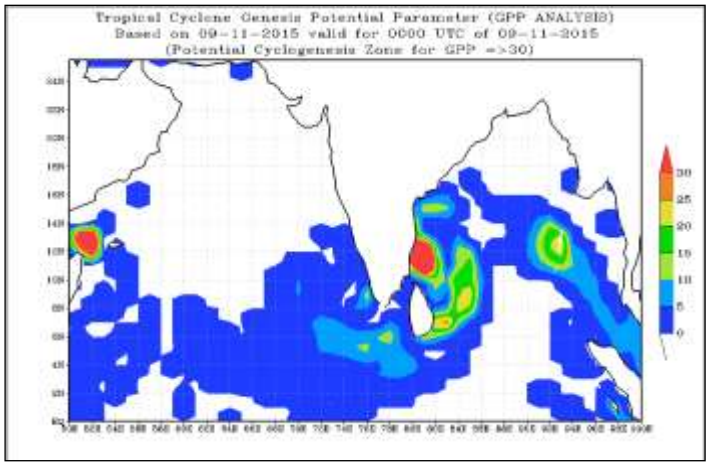
MISDA : 8

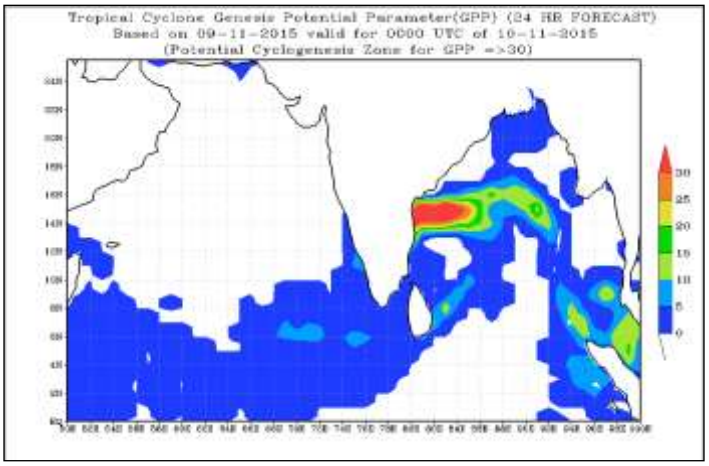
No. of PILOT Ascents:

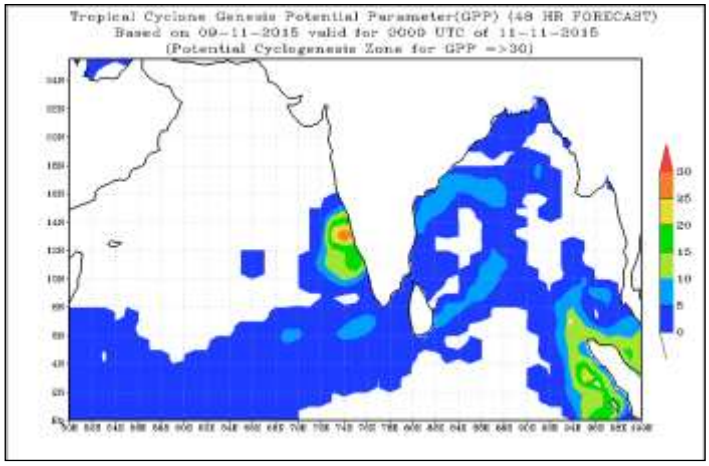
08.11.2015

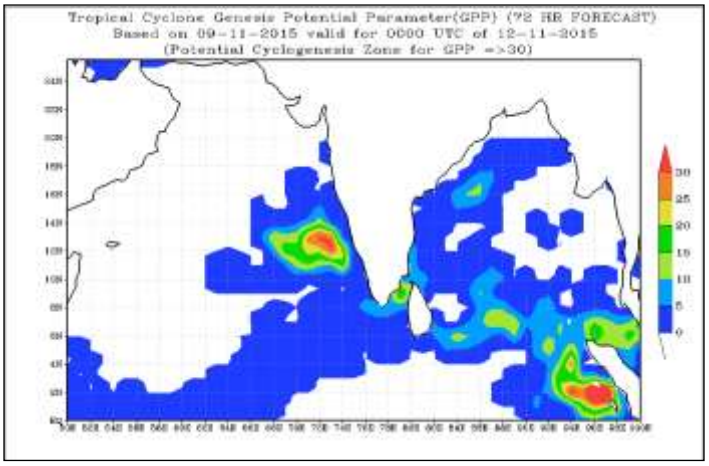
06Z	18Z
3	2

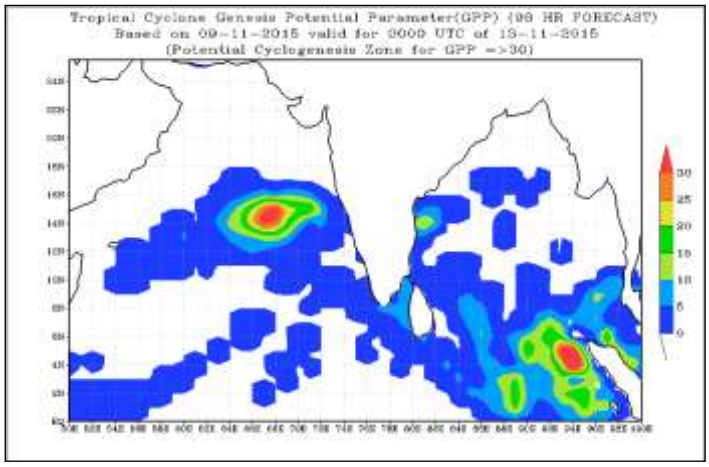
Annexure-II

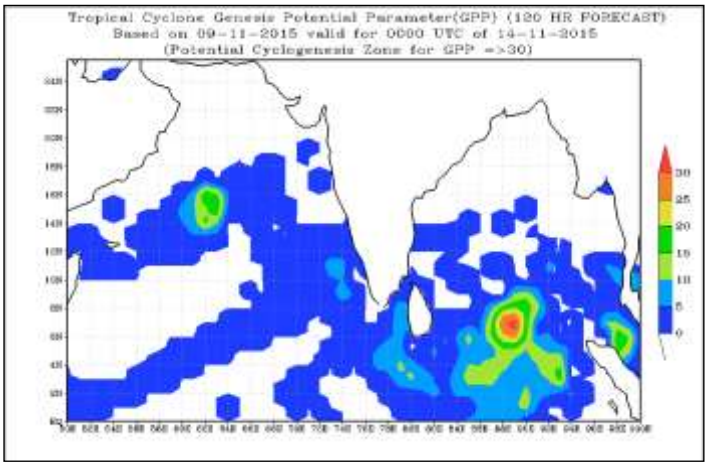

Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 09-11-2015 valid for 0000 UTC of 09-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

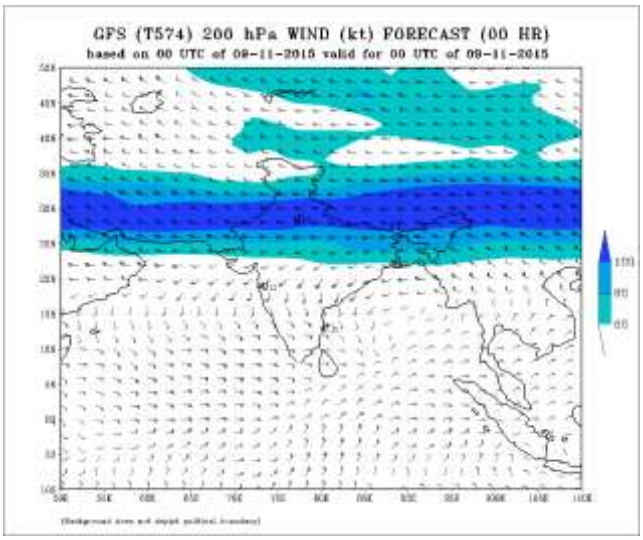

Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 09-11-2015 valid for 0000 UTC of 10-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

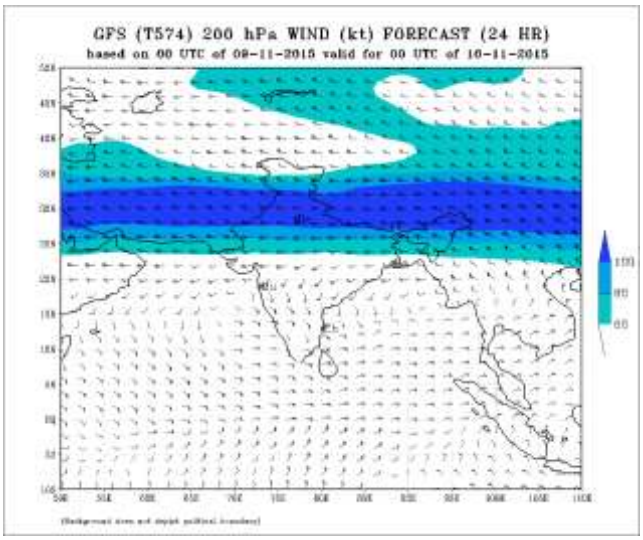

Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
Based on 09-11-2015 valid for 0000 UTC of 11-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

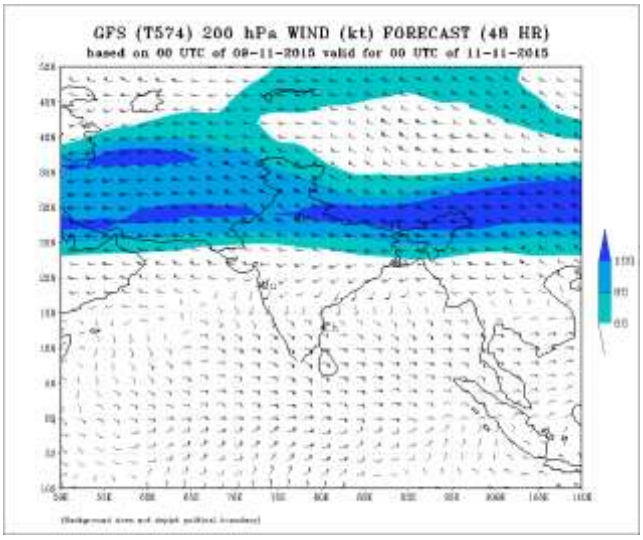

Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 09-11-2015 valid for 0000 UTC of 12-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

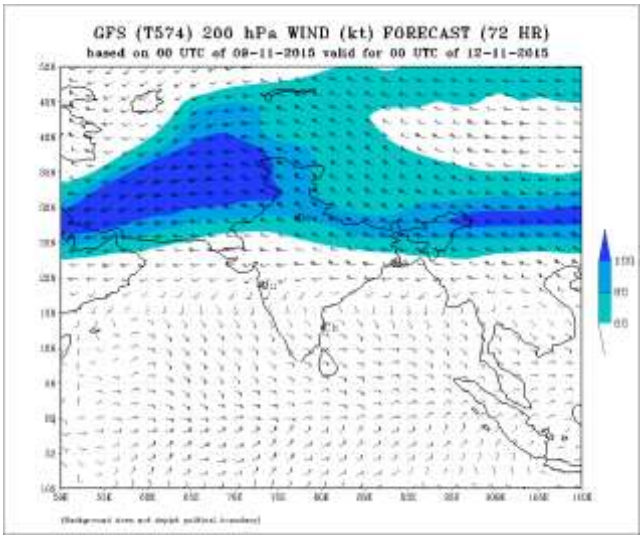

Tropical Cyclone Genesis Potential Parameter(GPP) (96 HR FORECAST)
Based on 09-11-2015 valid for 0000 UTC of 13-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

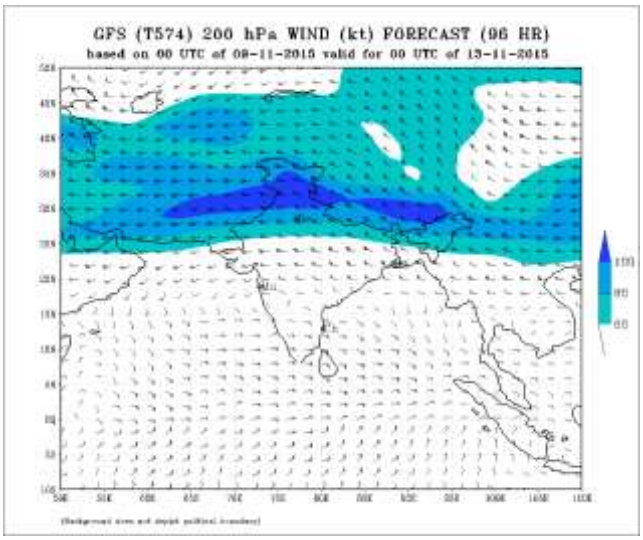

Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 09-11-2015 valid for 0000 UTC of 14-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

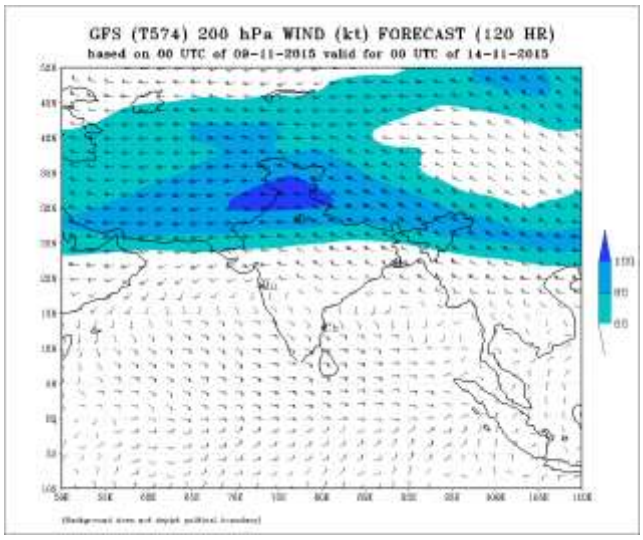

GFS (T574) 200 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 09-11-2015 valid for 00 UTC of 09-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 09-11-2015 valid for 00 UTC of 10-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 09-11-2015 valid for 00 UTC of 11-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 09-11-2015 valid for 00 UTC of 12-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 09-11-2015 valid for 00 UTC of 13-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 09-11-2015 valid for 00 UTC of 14-11-2015

FDP (Cyclone) NOC Report Dated 10 November, 2015

Synoptic features:

- Yesterday's deep depression over southwest Bay of Bengal crossed north Tamil Nadu coast close to north of Puducherry (near latitude 12.2**°** N longitude 80.0**°**E) in the evening of 9th November with a wind speed of 55-65 kmph. Moving initially north-northwestwards and then westwards, it weakened into a depression in the morning and further into a well marked low pressure area in the noon of today, the 10th November, 2015 over north Tamil Nadu and neighbourhood. It would move westwards and weaken further during next 24 hrs.
- Yesterday's very severe cyclonic storm, Megh, over Gulf of Aden and Arabian Sea moved westwards and weakened into a deep depression by 0600 UTC of today. It then recurved northeastwards and crossed Yemen coast near 13.4°N and 46.1°E around 0900 UTC of today. It would further move northeastwards and weaken into a well marked low pressure area during next 12 hrs.

Sea Surface Temperature (SST):

- SST is 28-29°C around the system centre and over entire Arabian Sea except over westcentral AS.
- SST is 28-29°C over most parts of Bay of Bengal (BoB) and Andaman Sea.

Tropical Cyclone Heat Potential (TCHP):

- TCHP is around is less than 40 kJ/cm^2 around system centre & adjoining westcentral Arabian Sea and north AS. It is 80-100 kJ/cm^2 over south and east central Arabian Sea.
- TCHP is 60-80 kJ/cm^2 over most parts of the BoB and Andaman Sea. It is 90-100 kJ/cm^2 over equatorial parts of BoB and adjoining southwest BoB and is less than 50 kJ/cm^2 over north BoB

Relative Vorticity:

- Relative vorticity at 850 hPa is positive and is 50x10^{-5}s^{-1} around the system over Gulf of Aden.
- Relative vorticity at 850 hPa is positive and is 150 x10^{-5}s^{-1}) around the system centre over north coastal Tamil Nadu.

Convergence:

- Lower level convergence is 10 x10^{-5}s^{-1} around the system over Gulf of Aden.
- Lower level convergence is about 20x10^{-5}s^{-1} around the system centre north Tamil Nadu.

Divergence:

- Upper level divergence is 20x10^{-5} s^{-1} around the system over Gulf of Aden.
- Upper level divergence is 20x10^{-5} s^{-1} around the system centre and adjoining westcentral Bay of Bengal and 5-10 x10^{-5} s^{-1} over north Andaman Sea.

Wind Shear:

- The vertical wind shear around the system centre over Gulf of Aden and eastcentral Arabian Sea is about 5-10 knots
- Wind shear is about 20-30 knots around the system centre over north Tamil Nadu.

Wind Shear Tendency:

- The vertical wind shear tendency is decreasing around the system centre over Gulf of Aden by 5- 10 knots.
- The vertical wind shear tendency is decreasing (5 to 10 knots) around the system centre over north Tamil Nadu and westcentral BoB.

Upper tropospheric ridge:

- The upper tropospheric ridge at 200 hPa runs along 16.0°N.

M.J.O. Index:

- MJO index lies over Phase 3 with amplitude greater than 1 and would continue to move in the same phase during next 5 days.

Storms and Depression over South China Sea/ South Indian Ocean:
NIL

Satellite:
Inference based on INSAT imagery of **100900** UTC:
Bay of Bengal & Andaman Sea:-
Vortex over north Tamil Nadu and neighbourhood. Broken low and medium clouds with embedded moderate to intense convection lie over Tamil Nadu, Kearla, south interior Karnataka, south coastal Andhra Pradesh, Rayalaseema and BoB between latitude 10.0°N to 19.0°N and west of longitude 89.0°E in association with a low level circulation over the area. Minimum cloud top temperature is -83.0^{0}C.
Arabian Sea:-
Vortex Megh over Gulf of Aden centered near 13.4N/46.8E. Intensityis T1.5. It is very near to Yemen coast. Centre is clear in vis imagery. Associated broken low and medium clouds with embedded moderate to intense convection over area between 13.0 degree North to 14.5 degree North and longitude 46.0 degree East to 46.5 degree East. Minimum cloud top temperature is -66.0^{0}C.

NWP Input for FDP Cyclone based on 0000 UTC of 10.11.2015

NWP Analysis
IMD-GFS model charts analysis and forecasts based on 00UTC of 10th November 2015 shows a depression over north Tamil nadu centred near latitude 12.4°N and longitude 79.3°E with associated upper air cyclonic circulation extending up to 500 hPa level. The system likely to move in a west ward direction with decrease in intensity.
IMD-WRF model charts analysis and forecasts based on 00UTC of 10th November 2015 shows a depression over north Tamil nadu centred near latitude 12.4°N and longitude 79.3°E associated upper air cyclonic circulation extending up to 500 hPa level. The system likely to move in a west ward direction with decrease in intensity.

NWP products are available at:
http://202.54.31.51/bias/gfsproducts.php
http://202.54.31.51/bias/wrf27pro.php
http://202.54.31.51/bias/potentialparameter.php

NCMRWF-NCUM: NCUM model indicates weakening of the low pressure system over over southern peninsula and reemerging into Arabian Sea on 12th. It moves westwards during the subsequent 24 hrs without intensification.
NCMRWF-GFS: NCMRWF-GFS indicates weakening of the depression of north Tamil Nadu. There is no indication of cyclogenesis during the next 3 days.

NCEP-GFS NCEP-GFS indicates weakening of the low pressure system over north Tamil Nadu within next 24 hours. It reemerges into Arabian Sea on 11th and moves westwards during the next two days without much intensification.
ECMWF model suggests formation of a low over Bay of Bengal on 13th which would concentrate into a depression on 15th and move towards Tamil Nadu coast.
JMA: JMA model indicates weakening of the system over north Tamil Nadu and re-emerging into Arabian Sea as a low off Karnataka coast on 12th which becomes well-marked on 13th over 14.0°N/67.0°E.

ARP-Meteo France: ARP model suggests re-emerging of the BOB system over north Tamil Nadu into Arabian Sea off Kerala coast on 11th which moves northwest-wards and becomes well-marked on 13th.

Summary and Conclusion:

Bay of Bengal and Andaman Sea:
ECMWF model has predicted formation of a depression over Bay of Bengal on 15th. It needs to be watched.

Probability of cyclogenesis over Bay of Bengal and Andaman Sea during next 120 hours:

24 HOURS	24-48 HOURS	48-72 HOURS	72-96 HOURS	96-120 HOURS
Nil	Nil	Nil	Low	Fair

Arabian Sea:
Most models predict re-emergence of remnant of the BOB system into the Arabian Sea on 11th/12th as a low and moving westwards without intensification.

Probability of cyclogenesis over Arabian Sea during next 120 hours:

24 HOURS	24-48 HOURS	48-72 HOURS	72-96 HOURS	96-120 HOURS
Nil	Nil	Nil	Nil	Nil

Advisory:

No IOP will be conducted during the next three days.

Annexure-I

Status of observational system:

Synoptic observation:

Region	Date/Time (UTC)		
	09/12	10/00	10/03
India	47	32	46
Coastal stations			
WB	8	3	8
Odisha	7	6	7
AP	12	12	12
Tamil Nadu	11	8	11
Puducherry	2	2	2
A & N	7	1	6
Bangladesh	11	10	11
Myanmar	11	11	11
Thailand	2	2	2
SriLanka	8	7	8

AWS Observations:

Region	Date/Time (UTC)		
	09/12	10/00	10/03
India	18	64	62
Coastal stations			
WB	8	9	9
Odisha	16	16	13
AP	13	14	14
Tamil Nadu	30	26	25
Puducherry	-	-	1
A & N	-	-	-

RS/RW (12Z) of 09/11/2015 **-0/39**
No. of Ascents reaching 250 hPa level: 0, MISDA: 39

RS/RW (00Z) of 10/11/2015- 25**/39**
No. of Ascents reaching 250 hPa level:24, MISDA: 2

No. of PILOT Ascents

09/12Z	10/00Z
6	3

Buoy Data

09/12Z	10/00Z	10/03Z
7	5	9

STATUS OF CHENNAI REGION OBSERVATION

No. of Synop data

Date→	**09.11.2015**											
UTC→	**00**	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**
Chennai Region (Coasts of AP & TN)	**20**	**08**	**09**	**22**	**09**	**09**	**20**	**09**	**05**	**20**	**08**	**09**
UTC→	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**
Chennai Region (Coasts of AP & TN)	**22**	**08**	**09**	**20**	**02**	**02**	**20**	**02**	**02**	**20**	**-**	**-**

No. of RS/RW Ascents

00Z /09.11.2015 : 6
No. of Ascents reaching 250 hPa level = 5
MISDA : 2

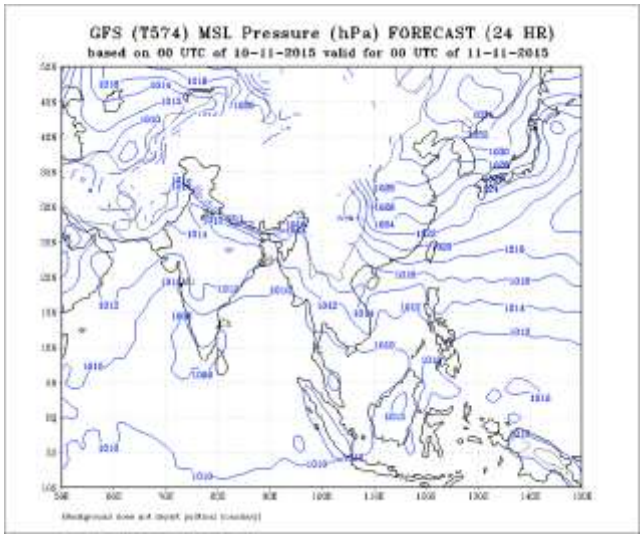
12Z /09.11.2015 : 1
No. of Ascents reaching 250 hPa level = 1
MISDA : 7

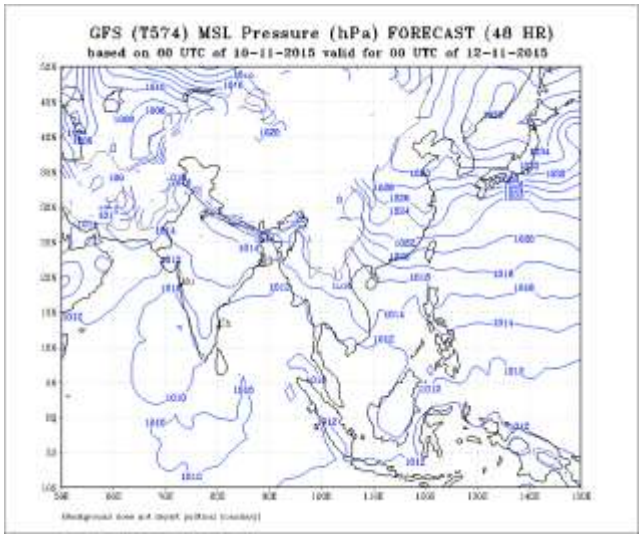
No. of PILOT Ascents:

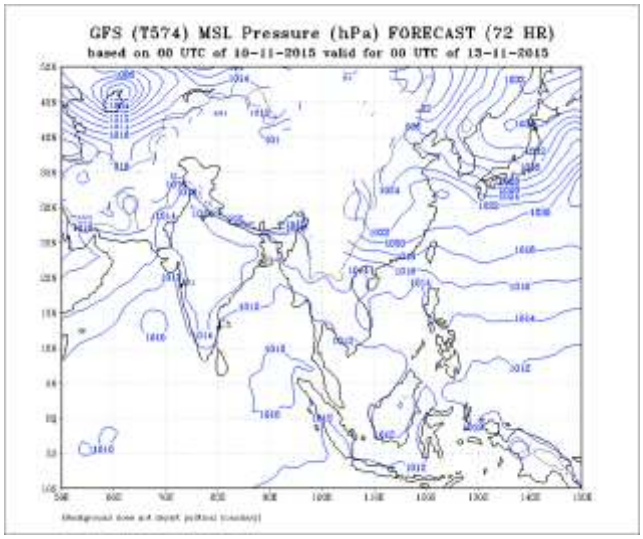
09.11.2015

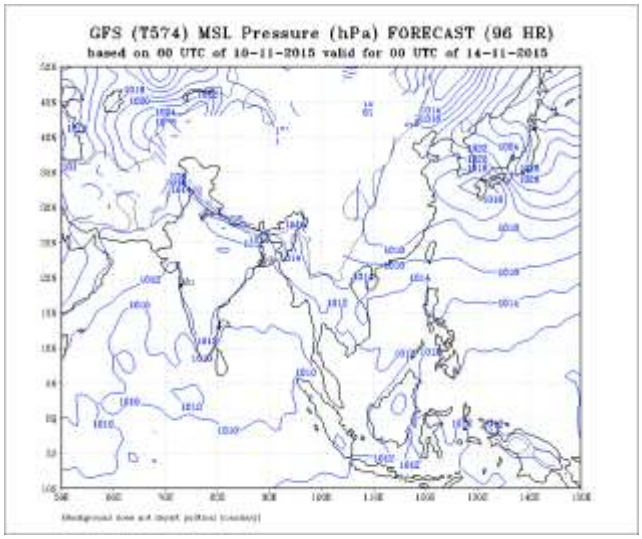
06Z	18Z
1	2

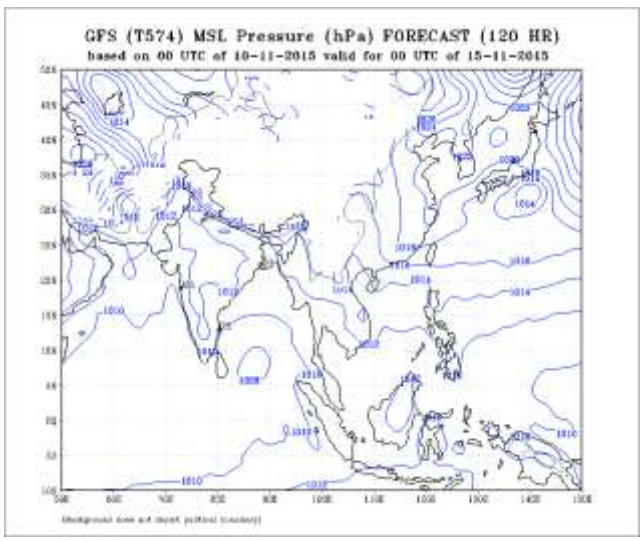
Annexure-II

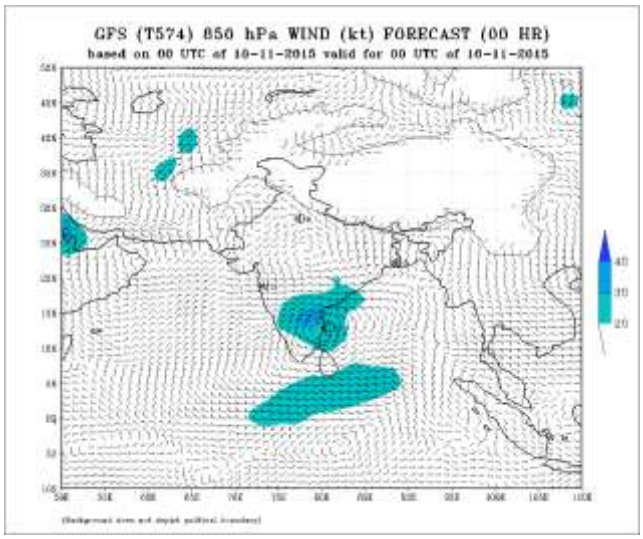

GFS (T574) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 10-11-2015 valid for 00 UTC of 11-11-2015

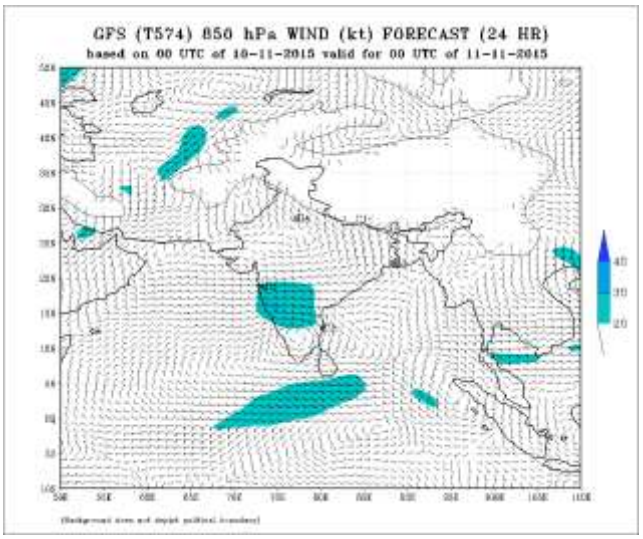

GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 10-11-2015 valid for 00 UTC of 12-11-2015

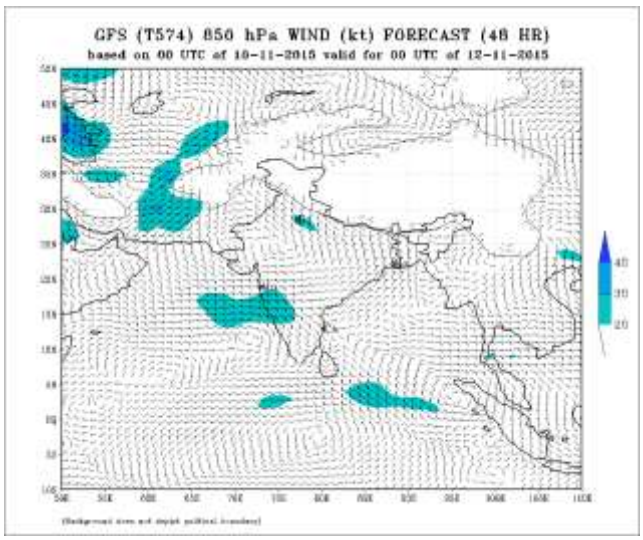

GFS (T574) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 10-11-2015 valid for 00 UTC of 13-11-2015

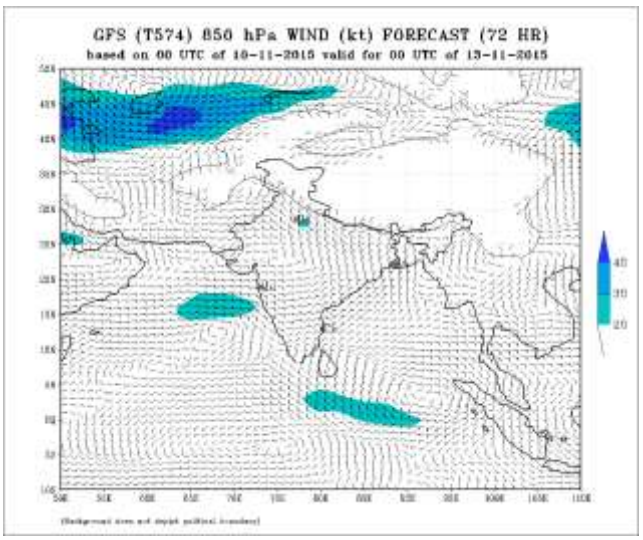

GFS (T574) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 10-11-2015 valid for 00 UTC of 14-11-2015

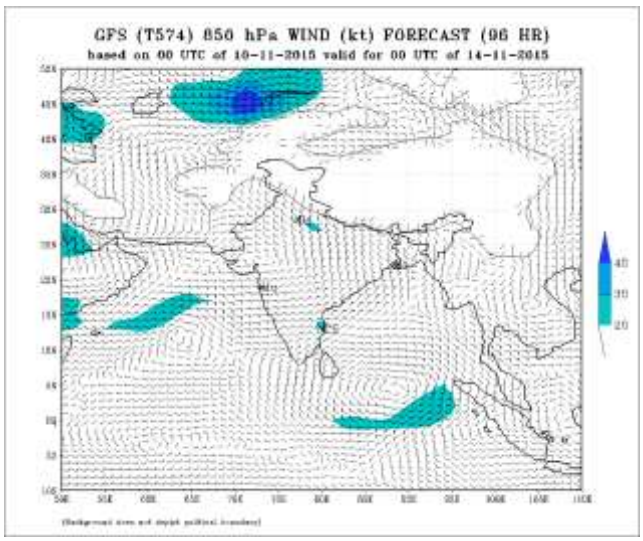

GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 10-11-2015 valid for 00 UTC of 15-11-2015

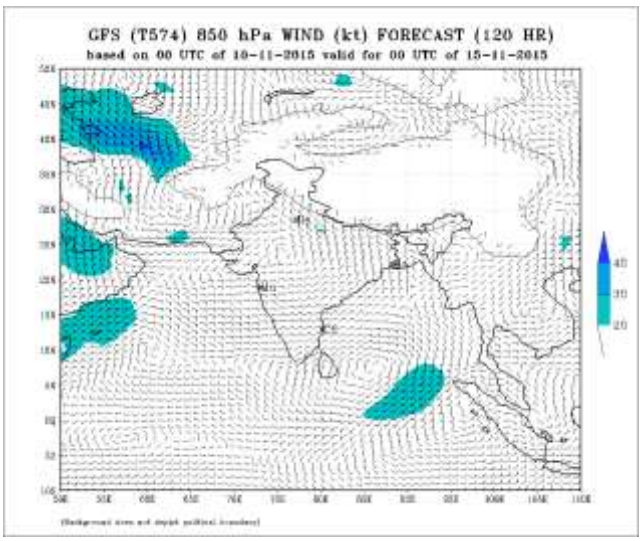

GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 10-11-2015 valid for 00 UTC of 10-11-2015

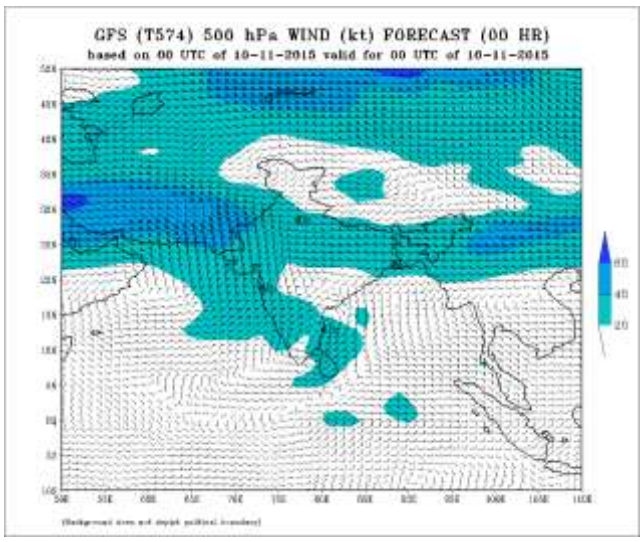

GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 10-11-2015 valid for 00 UTC of 11-11-2015

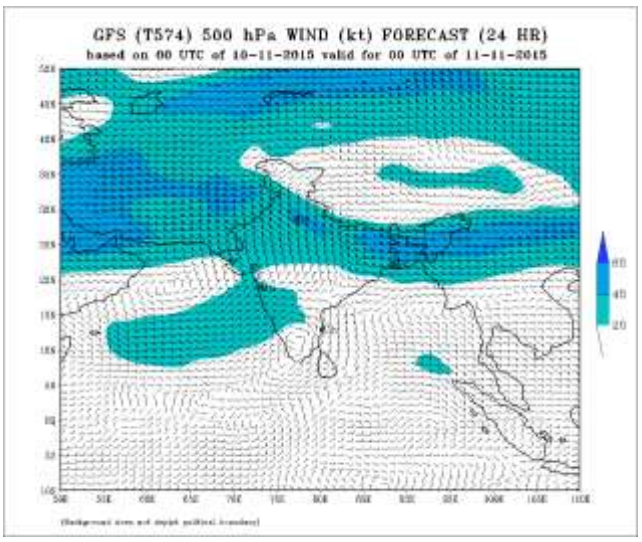

GFS (T574) 850 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 10-11-2015 valid for 00 UTC of 12-11-2015

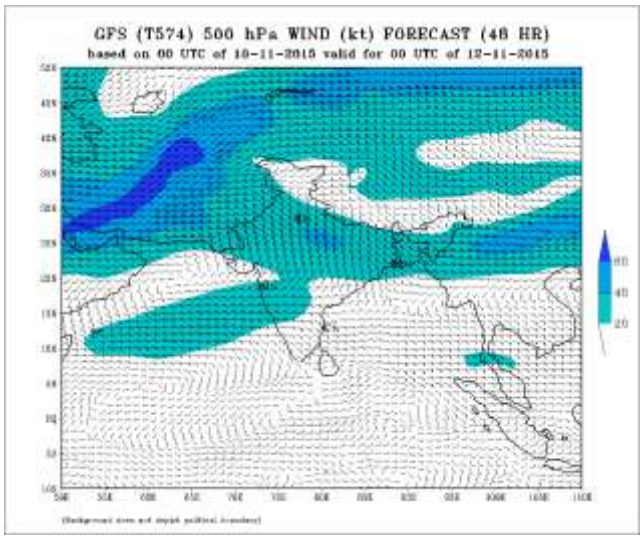

GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 10-11-2015 valid for 00 UTC of 13-11-2015

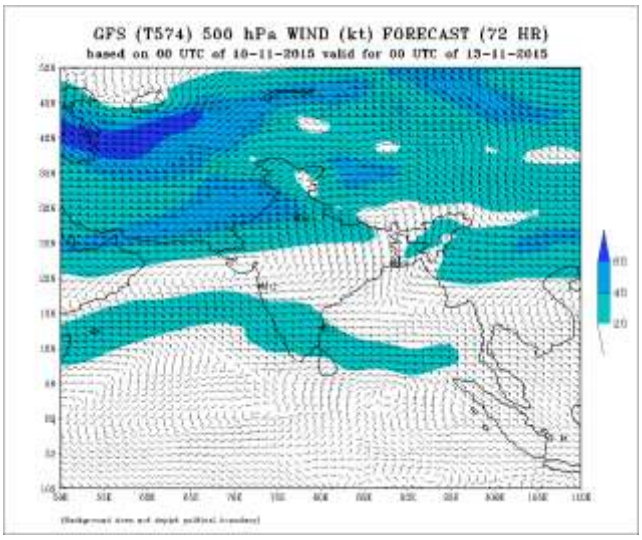

GFS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 10-11-2015 valid for 00 UTC of 14-11-2015

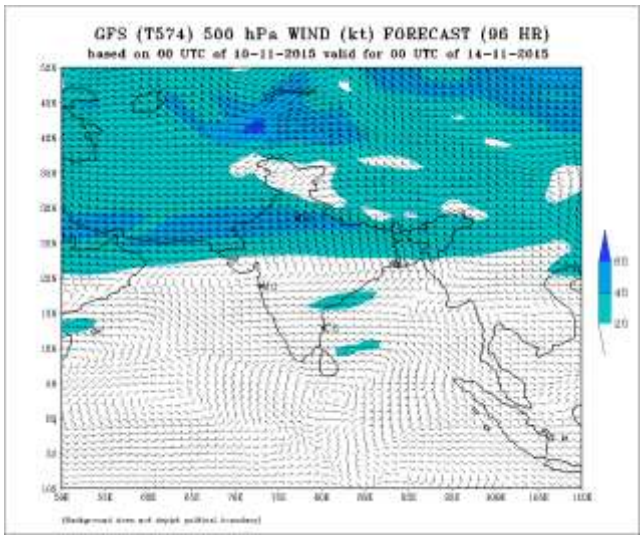

GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 10-11-2015 valid for 00 UTC of 15-11-2015

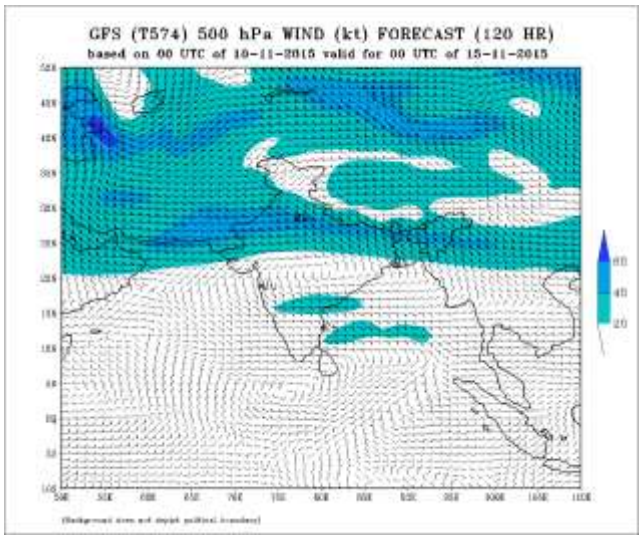

GFS (T574) 500 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 10-11-2015 valid for 00 UTC of 10-11-2015

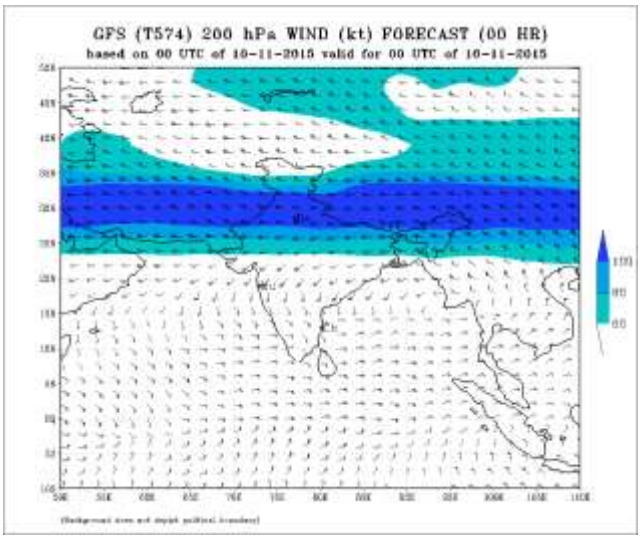

GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 10-11-2015 valid for 00 UTC of 11-11-2015

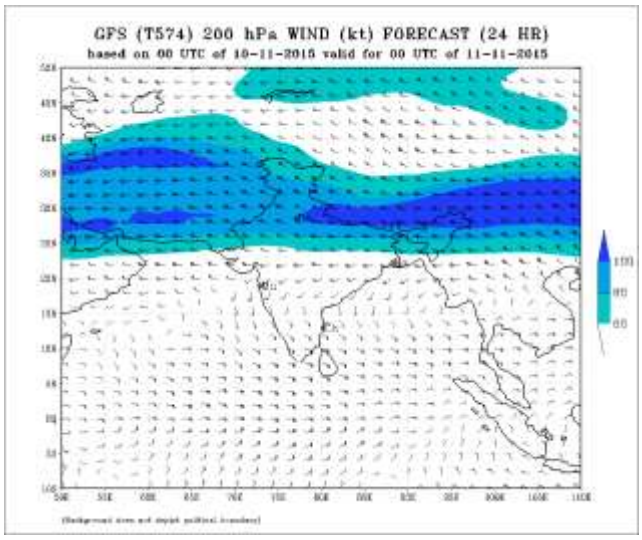

GFS (T574) 500 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 10-11-2015 valid for 00 UTC of 12-11-2015

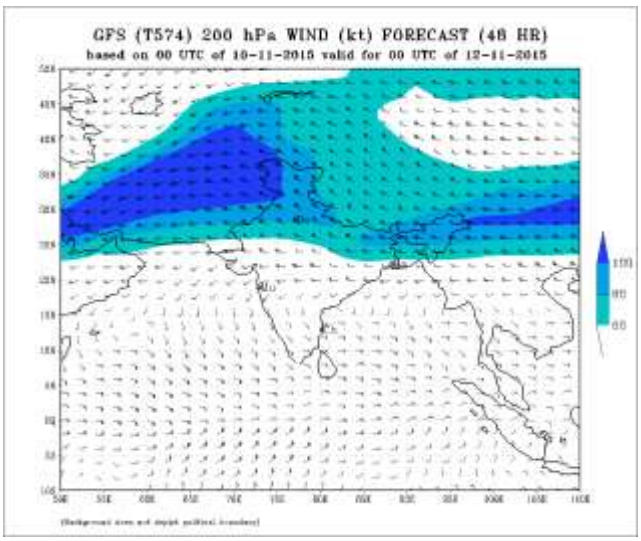

GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 10-11-2015 valid for 00 UTC of 13-11-2015

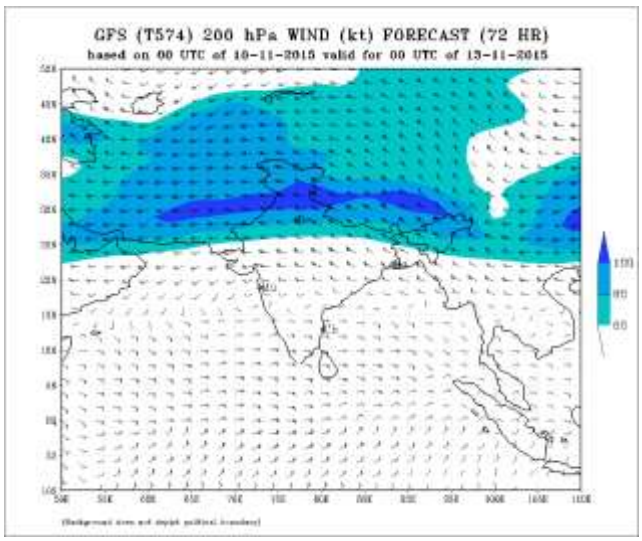

GFS (T574) 500 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 10-11-2015 valid for 00 UTC of 14-11-2015

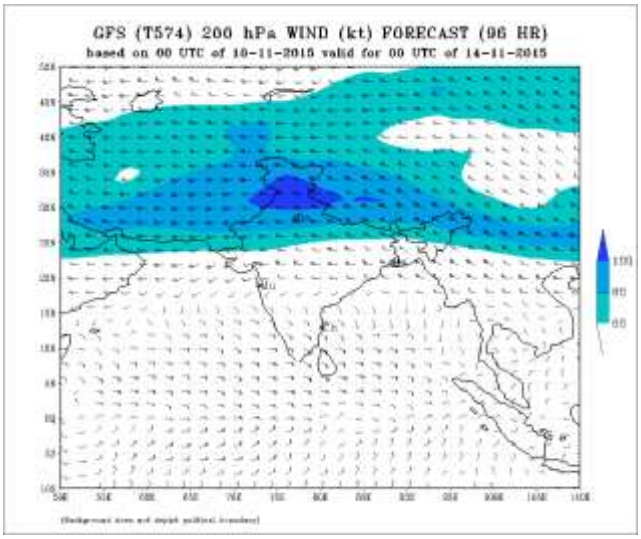

GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 10-11-2015 valid for 00 UTC of 15-11-2015

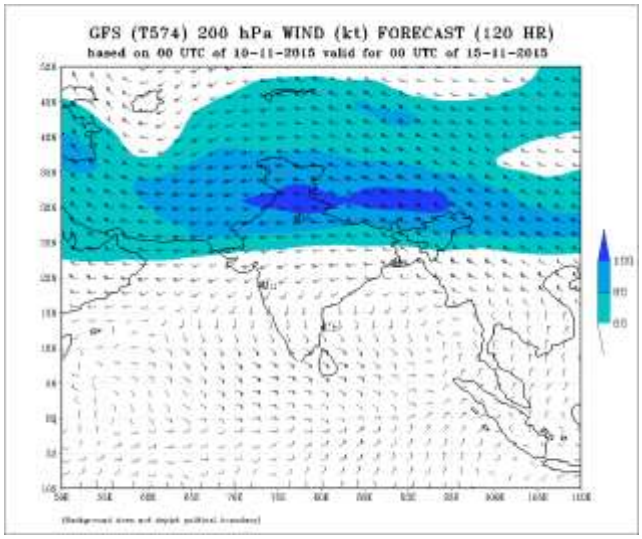

GFS (T574) 200 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 10-11-2015 valid for 00 UTC of 10-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 10-11-2015 valid for 00 UTC of 11-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 10-11-2015 valid for 00 UTC of 12-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 10-11-2015 valid for 00 UTC of 13-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 10-11-2015 valid for 00 UTC of 14-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 10-11-2015 valid for 00 UTC of 15-11-2015

FDP (Cyclone) NOC Report Dated 11 November, 2015

Synoptic features:

- Yesterday's depression over Yemen weakened into a well-marked low pressure area over Yemen and neighbourhood at 1800 UTC of 10th November, 2015.
- The low pressure area over north Tamilnadu and neighborhood moved westwards and lay as a low pressure area over north Tamil Nadu and adjoining South Interior Karnataka in the early morning of today and became less marked at 0300 UTC of 11 Nov. 2015.
- An upper air cyclonic circulation lies over Kerala & neighbourhood and extends up to 5.8km above mean sea level.

Sea Surface Temperature (SST):

- SST is 28-29°C around the system centre and over entire Arabian Sea except over westcentral AS.
- SST is 28-29°C over most parts of Bay of Bengal (BoB) and Andaman Sea.

Tropical Cyclone Heat Potential (TCHP):

- TCHP is around is less than 40 kJ/cm^2 around system centre & adjoining westcentral Arabian Sea and north AS. It is 80-100 kJ/cm^2 over south and east central Arabian Sea.
- TCHP is 60-80 kJ/cm^2 over most parts of the BoB and Andaman Sea. It is 90-100 kJ/cm^2 over equatorial parts of BoB and adjoining southwest BoB and is less than 50 kJ/cm^2 over north BoB

Relative Vorticity:

- Relative vorticity at 850 hPa is positive and is 30-50x10^{-5}s^{-1} over Kerala – Karnataka coast and southcentral Arabian sea.
- Relative vorticity at 850 hPa is positive and is 30-50 x10^{-5}s^{-1} over southeast and adjoining southwest bay of Bengal.

Convergence:

- Lower level convergence is 5-15 x10^{-5}s^{-1} over Kokan, Karnataka and north Kerala coast.
- Lower level convergence is about 5x10^{-5}s^{-1} west central bay off north Tamil Nadu adjoining south Andhra coast and 5 x10^{-5} s^{-1} over central bay of Bengal.

Divergence:

- Upper level divergence is 5-10x10^{-5} s^{-1} over southcentral, west central and east central Arabian Sea.
- Upper level divergence is 5-10x10^{-5} s^{-1} over central bay of Bengal and 5 x10^{-5} s^{-1} over Tamilnadu coast and >10 over south bay of Bengal.

Wind Shear:

- The vertical wind shear over southwest Arabian sea is about 5-10 knots and 10 knots over central Arabian Sea.
- Wind shear is about 5-10 knots over north Tamil Nadu adjoining southwest bay and 5 knots over east central and central adjoining north Andaman sea.

Wind Shear Tendency:

- The vertical wind shear tendency is decreasing by 5- 10 knots central Arabian sea and 5-10 knots increasing tendency over Kokan and south Maha coast.
- The vertical wind shear tendency is decreasing (5 to 20 knots) most parts of bay of Bengal except 5-10 knots tendency increase over north east bay of Bengal.

Upper tropospheric ridge:

- The upper tropospheric ridge at 200 hPa runs along 17.0°N.

M.J.O. Index:

- MJO index lies over Phase 3 with amplitude greater than 1 and would continue to move in the same phase during next 5 days.

Storms and Depression over South China Sea/ South Indian Ocean: NIL

Satellite:

Inference based on INSAT imagery of **110900** UTC:

Bay of Bengal & Andaman Sea:-

Scattered low and medium clouds with embedded isolated moderate to intense convection over rest bay of Bengal and Andaman sea

Arabian Sea:-

Broken low and medium clouds with embedded isolated moderate to intense convection over southeast Arabian sea. Scattered medium and high clouds over eastcentral Arabian sea

NWP Input for FDP Cyclone based on 0000 UTC of 11.11.2015

NWP Analysis

MD-GFS model charts analysis and forecasts based on 00UTC of 11th November 2015 shows formation of an extended low pressure area over southwest Bay of Bengal on 14th. It would persidt over that region and become well marked near Tamil Nadu coast on 18 Nov.

IMD-WRF model charts analysis and forecasts based on 00UTC of 11th November 2015 shows formation of low over eastcentral and adjoining southeast Arabian Sea on 12th. It would move westwards and become well marked low/ depression on 14th 0000 UTC.

NWP products are available at:

http://202.54.31.51/bias/gfsproducts.php

http://202.54.31.51/bias/wrf27pro.php

http://202.54.31.51/bias/potentialparameter.php

NCMRWF-NCUM: NCUM model indicates weakening of the low pressure system over over southern peninsula and reemerging into Arabian Sea on 12th as a cyclonic circulation. It moves westwards during the subsequent 24 hrs without intensification.

A cyclonic circulation also lies over eastcentral Bay and adjoining Andaman Sea on 12th and moves west-southwestwards gradually without no intensification.

NCMRWF-GFS: NCMRWF-GFS indicates formation of a low over east central Arabian sea. It moves westwards and is less marked on 17th.

A low will form over southwest Bay near Sri Lanka coast and become well marked on 16th near Tamil Nadu coast. It would move northward to westcentral Bay and adjoining south coastal AP and adjoining north Tamil Nadu on 17th. It would become less marked on 18th.

NCEP-GFS NCEP-GFS indicates emergence low over southeast Arabian Sea on 12th and becomes less marked on 13th

A low will form over southeast Bay on 13th. It would move west-northwestward and lie over southwest Bay on 15th and cross Sri lanka coast on 19th.

ECMWF model suggests formation of a low over southwest Bay of Bengal near Sri Lanka coast on 14th which would move northwestwards and cross towards Tamil Nadu coast 16th.

No significant system will form over Arabian Sea.

JMA: A well marked low over eastcentral Arabian Sea off Karnataka coast will form on 12th and become low on 13th and move westwards and become less marked on 15th.

A low will form over southcentral Bay on 14th and persist on 15th.

ARP-Meteo France: ARP model suggests re-emerging of the cyclonic circulation from peninsula and formation of low onver southeast & eastcentral Arabian Sea and adjoining Kerala Karnataka coast on 12th. It would move westwards without intensification on 13th and become less marked on 14th.

A low will form over southeast Bay on 13th and become well marked on 1th over southcentral Bay.

GENESIS POTENTIAL PARAMETER: It shows no significant potential for genesis over north Indian ocean during next 5 days.

Summary and Conclusion:

Bay of Bengal and Andaman Sea:

A low pressure area may form over southeast Bay of Bengal around 13/14th Nov. Models do not suggest intensification and give movement towards Sri Lanka and Tamil Nadu coast in subsequent 5 days. It needs to be watched.

The low pressure area may form over southeast and adjoining eastcentral Arabian sea on 12th. However, it would move westwards and weaken gradually.

Probability of cyclogenesis over Bay of Bengal and Andaman Sea during next 120 hours:

24 HOURS	24-48 HOURS	48-72 HOURS	72-96 HOURS	96-120 HOURS
Nil	Nil	Nil	Nil	Nil

Arabian Sea:

Most models predict re-emergence of remnant of the BOB system into the Arabian Sea on 11th/12th as a low and moving westwards without intensification.

Probability of cyclogenesis over Arabian Sea during next 120 hours:

24 HOURS	24-48 HOURS	48-72 HOURS	72-96 HOURS	96-120 HOURS
Nil	Nil	Nil	Nil	Nil

Advisory:

No IOP will be conducted during the next three days.

Annexure-I

Status of observational system:

Synoptic observation:

Region	Date/Time (UTC)		
	10/12	**11/00**	**11/03**
India	48	41	47
Coastal stations			
WB	7	6	6
Odisha	7	6	7
AP	14	14	14
Tamil Nadu	12	12	12
Puducherry	2	2	2
A & N	6	1	6
Bangladesh	10	10	10
Myanmar	11	5	10
Thailand	2	2	2
SriLanka	8	8	8

AWS Observations:

Region	Date/Time (UTC)		
	10/12	**11/00**	**11/03**
India	63	66	66
Coastal stations			
WB	7	8	8
Odisha	16	15	15
AP	14	14	14
Tamil Nadu	26	29	28
Puducherry	-	-	1
A & N	-	-	-

RS/RW (12Z) of 10/11/2015 **-0/39**
No. of Ascents reaching 250 hPa level: 0, MISDA: 39

RS/RW (00Z) of 11/11/2015- 2**6/39**
No. of Ascents reaching 250 hPa level:22, MISDA:4

No. of PILOT Ascents

10/12Z	11/00Z
4	3

Buoy Data

10/12Z	11/00Z	11/03Z
7	6	9

STATUS OF CHENNAI REGION OBSERVATION

No. of Synop data

Date→	**10.11.2015**							
UTC→	**00**	**03**	**06**	**09**	**12**	**15**	**18**	**21**
Chennai Region (Coasts of AP & TN)	**20**	**22**	**20**	**20**	**22**	**20**	**20**	**20**

No. of RS/RW Ascents

00Z /10.11.2015 : 6
No. of Ascents reaching 250 hPa level = 6
MISDA : 2

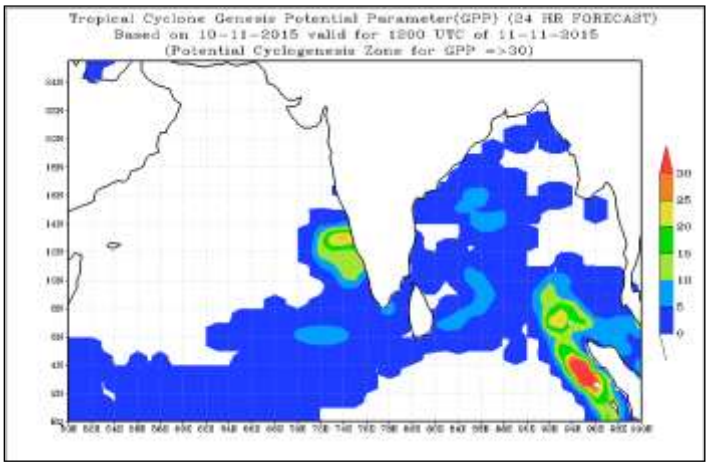
12Z /10.11.2015 : 0
No. of Ascents reaching 250 hPa level =0
MISDA : 8

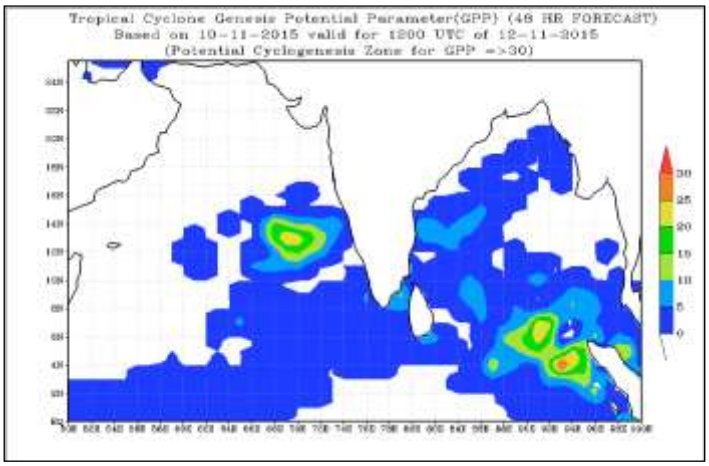
No. of PILOT Ascents:

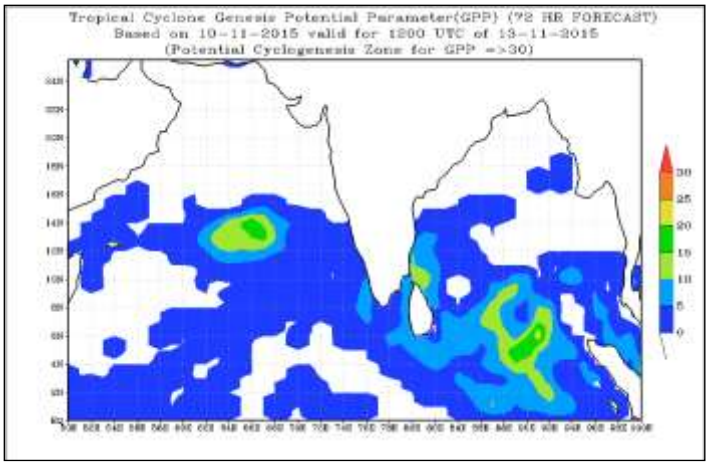
10.11.2015

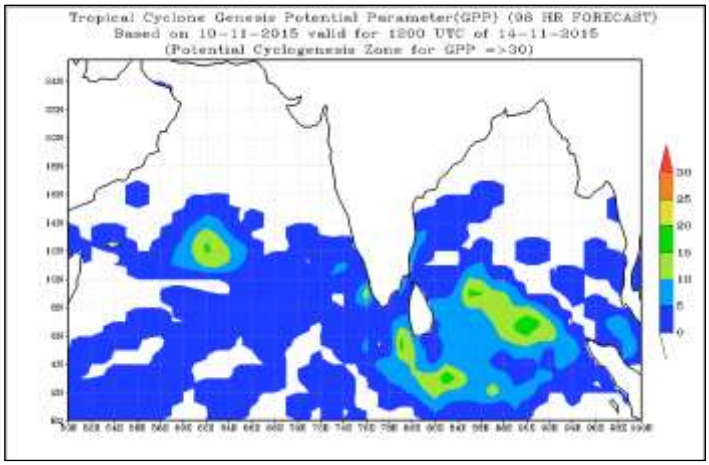
06Z	18Z
4	4

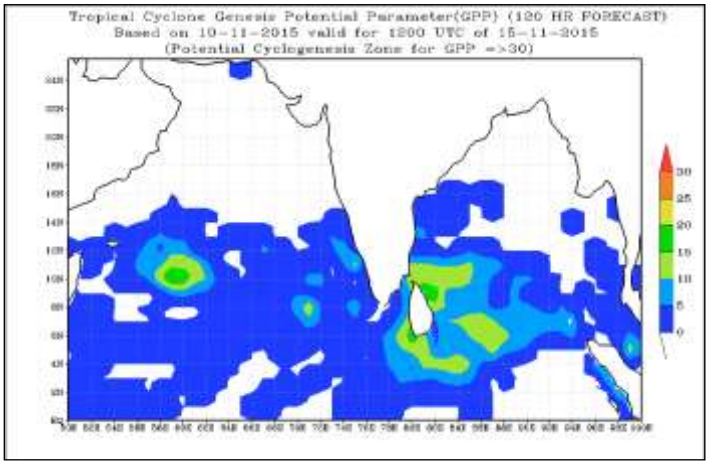
Annexure-II

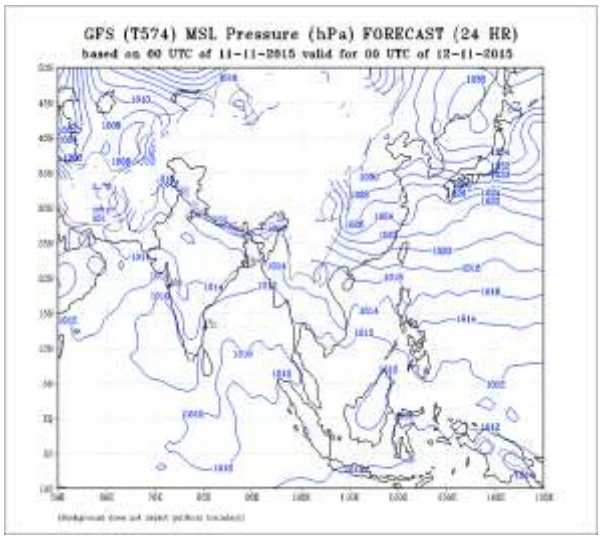

Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 10-11-2015 valid for 1200 UTC of 11-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

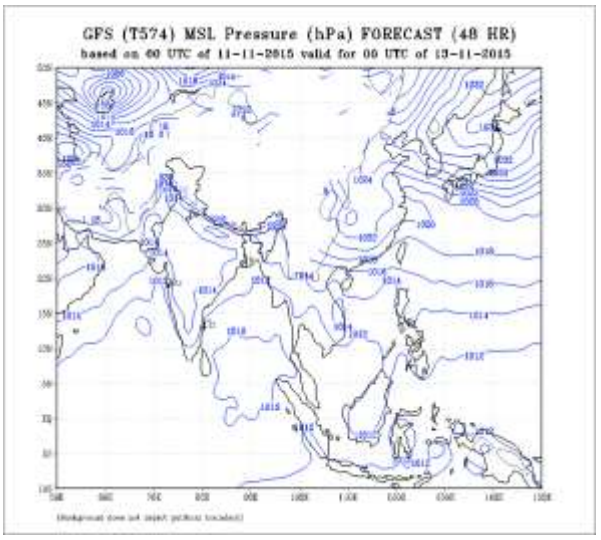

Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
Based on 10-11-2015 valid for 1200 UTC of 12-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

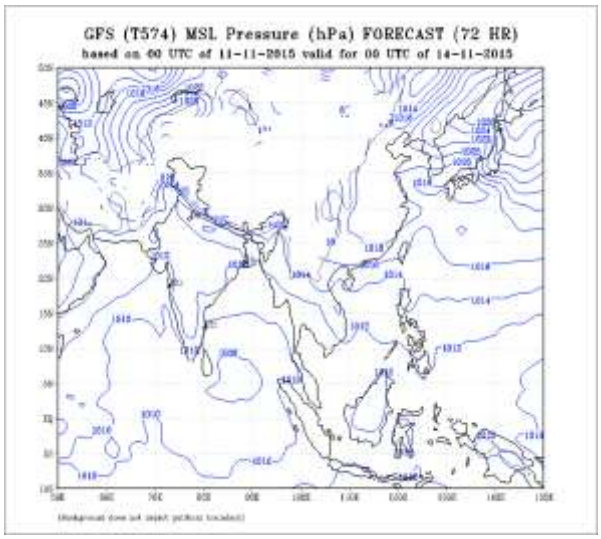

Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 10-11-2015 valid for 1200 UTC of 13-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

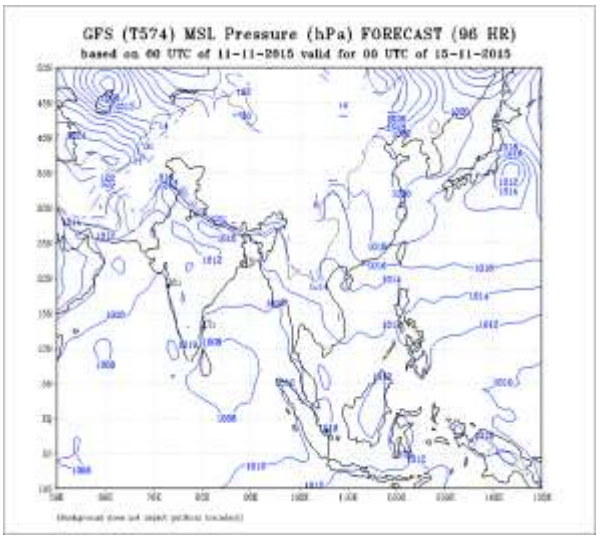

Tropical Cyclone Genesis Potential Parameter(GPP) (96 HR FORECAST)
Based on 10-11-2015 valid for 1200 UTC of 14-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

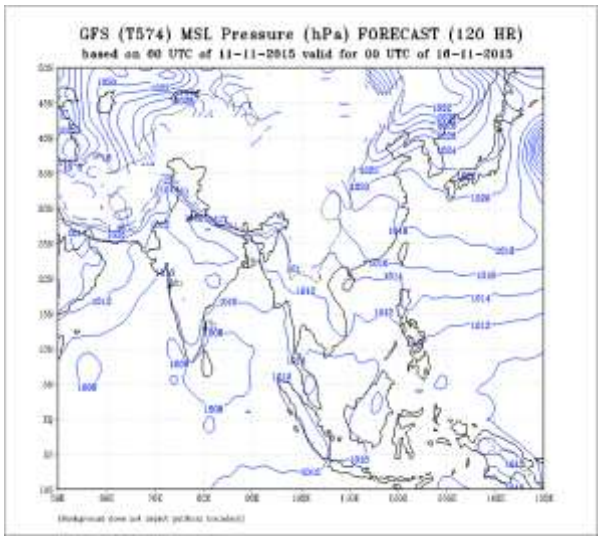

Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 10-11-2015 valid for 1200 UTC of 15-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

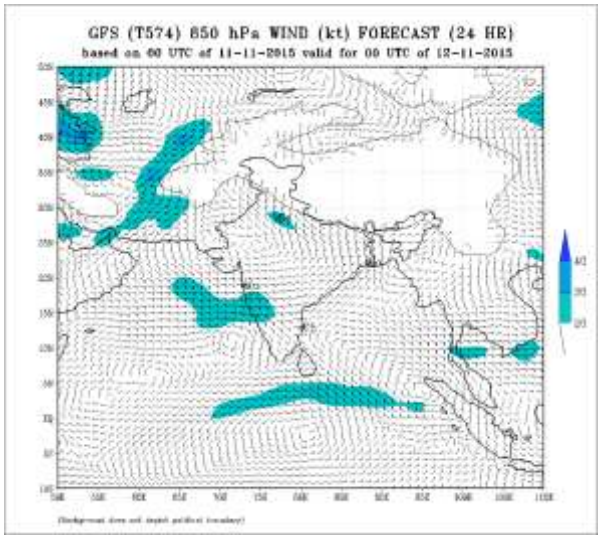

GFS (T574) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 11-11-2015 valid for 00 UTC of 12-11-2015

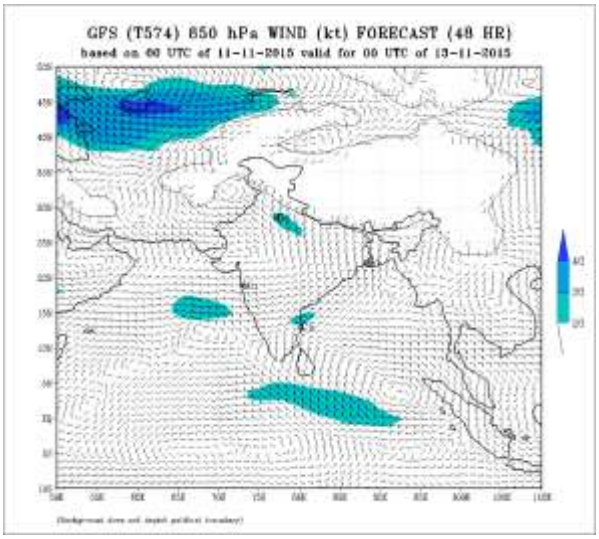

GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 11-11-2015 valid for 00 UTC of 13-11-2015

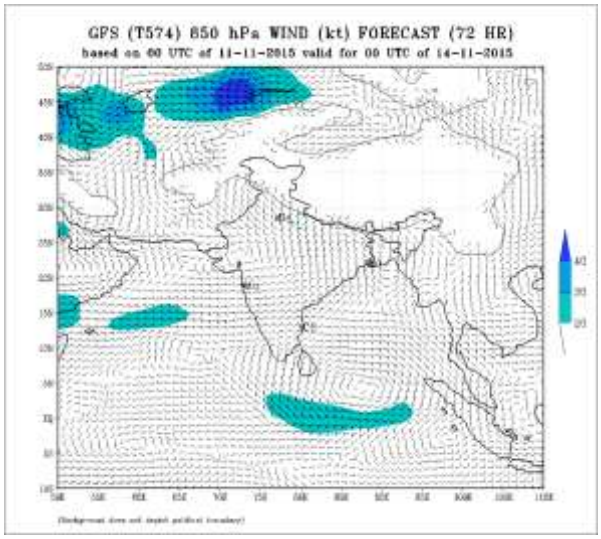

GFS (T574) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 11-11-2015 valid for 00 UTC of 14-11-2015

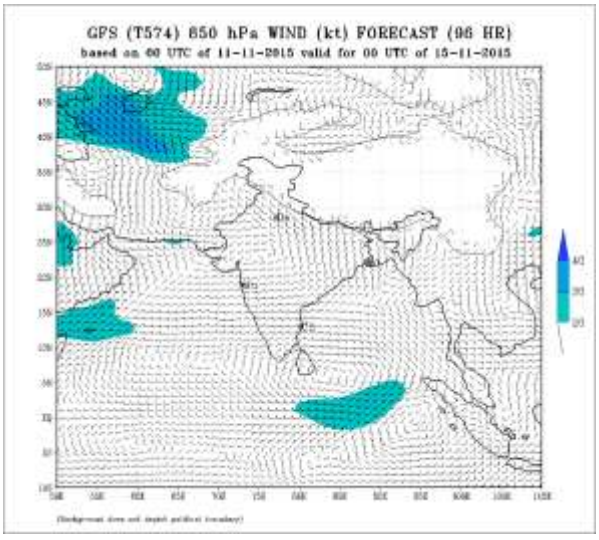

GFS (T574) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 11-11-2015 valid for 00 UTC of 15-11-2015


GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 11-11-2015 valid for 00 UTC of 16-11-2015


GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 11-11-2015 valid for 00 UTC of 12-11-2015


GFS (T574) 850 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 11-11-2015 valid for 00 UTC of 13-11-2015


GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 11-11-2015 valid for 00 UTC of 14-11-2015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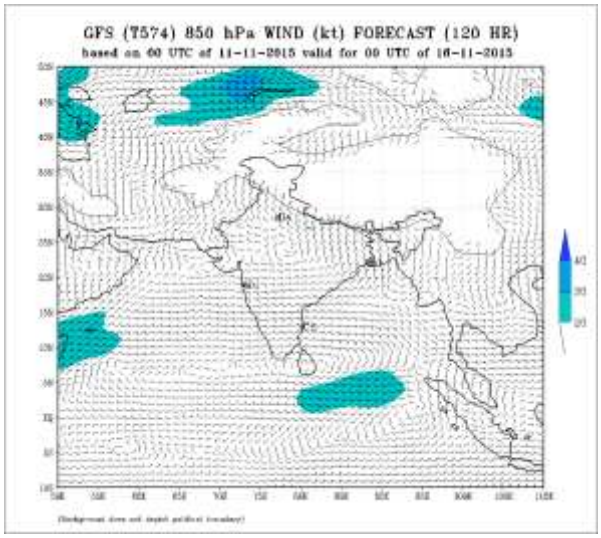
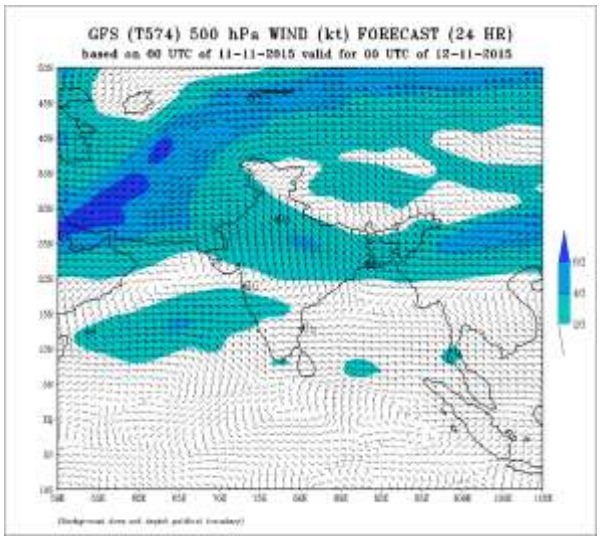
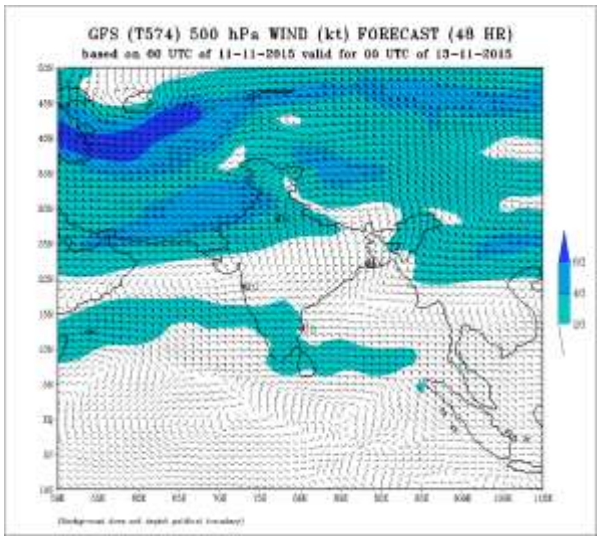
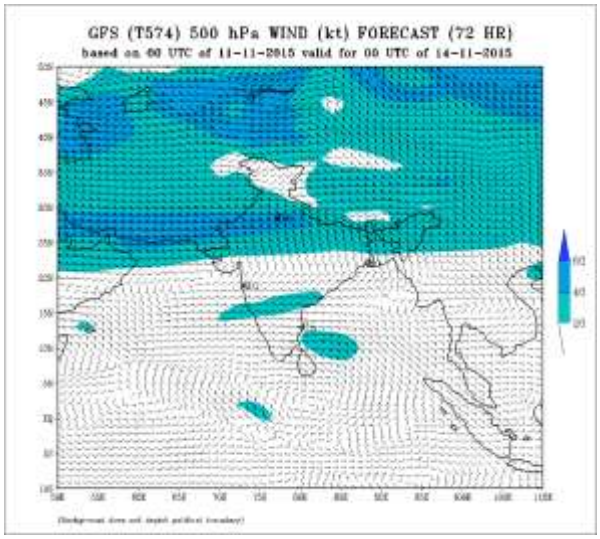
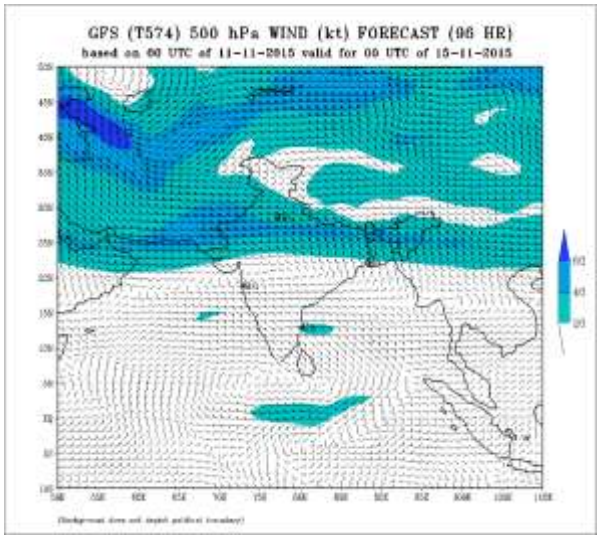
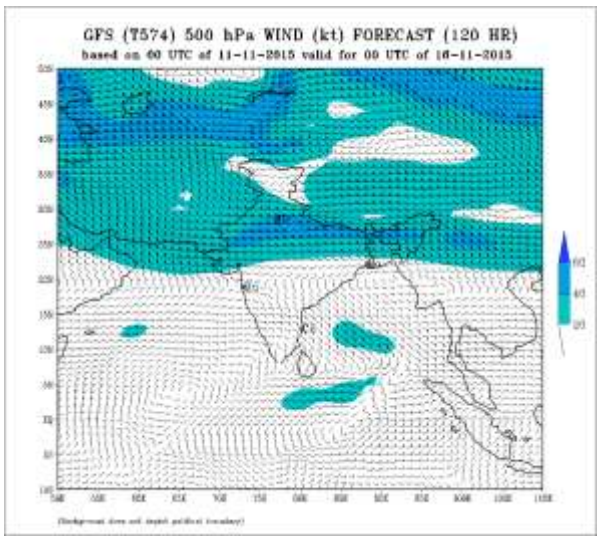

GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 11-11-2015 valid for 00 UTC of 16-11-2015

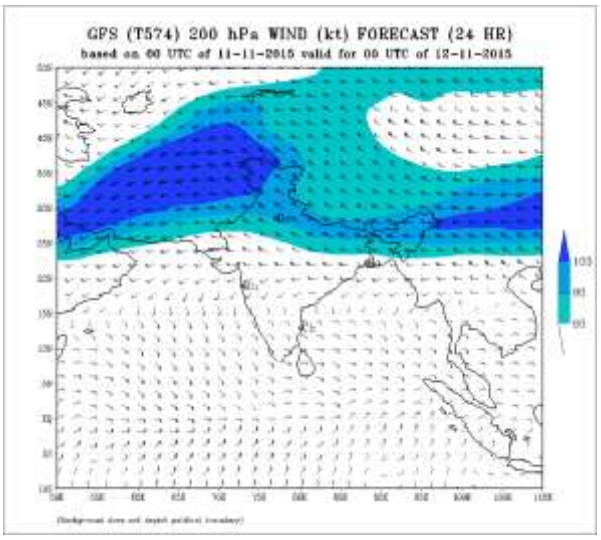

GPS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 11-11-2015 valid for 00 UTC of 12-11-2015

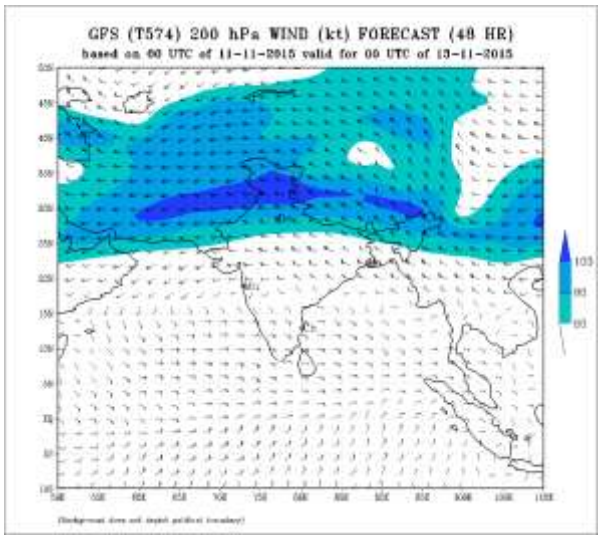

GPS (T574) 500 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 11-11-2015 valid for 00 UTC of 13-11-2015


GPS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 11-11-2015 valid for 00 UTC of 14-11-2015


GPS (T574) 500 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 11-11-2015 valid for 00 UTC of 15-11-2015


GPS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 11-11-2015 valid for 00 UTC of 16-11-2015


GPS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 11-11-2015 valid for 00 UTC of 12-11-2015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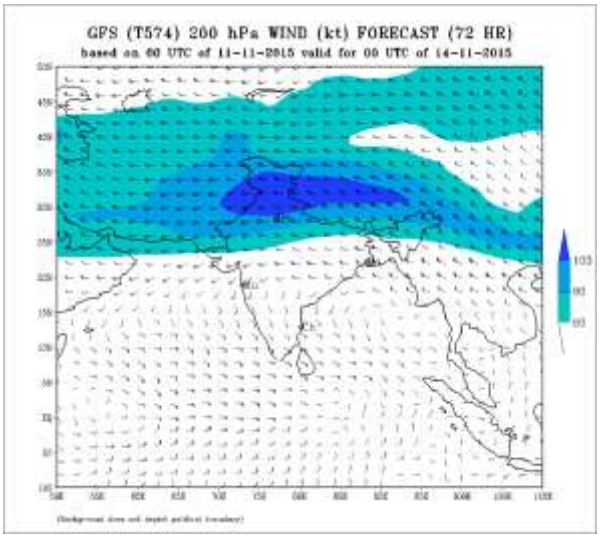
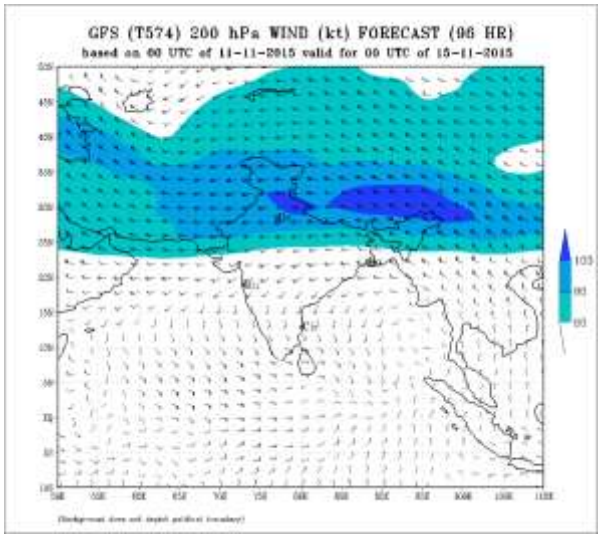
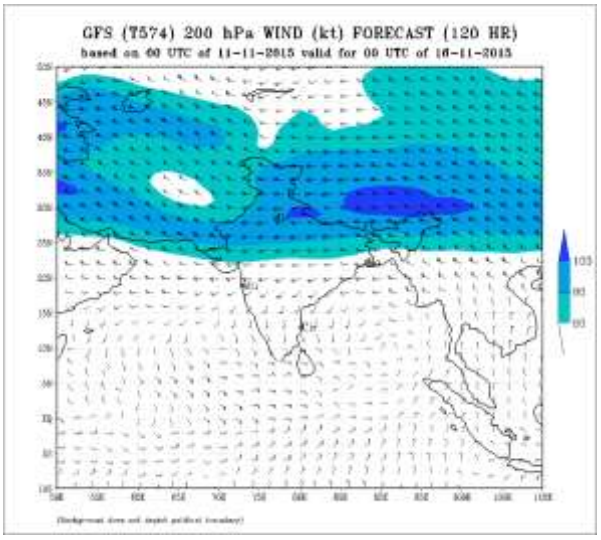
based on 00 UTC of 11-11-2015 valid for 00 UTC of 13-11-2015


GPS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 11-11-2015 valid for 00 UTC of 14-11-2015


GPS (T574) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 11-11-2015 valid for 00 UTC of 15-11-2015


GPS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 11-11-2015 valid for 00 UTC of 16-11-2015

FDP (Cyclone) NOC Report Dated 12 November, 2015

Synoptic features:

- Under the influence of an upper air cyclonic circulation over Lakshadweep & neighbourhood, a low pressure area has formed over southeast & adjoining eastcentral Arabian sea. Associated upper air cyclonic circulation extends upto mid-tropospheric levels.
- A trough of low lies over south Andaman sea & neighbourhood with a cyclonic circulation aloft and extends upto 3.1 km above mean sea level. under its influence, a low pressure area would form over southeast Bay of Bengal & neighbourhood around 14th November.2015

Sea Surface Temperature (SST):

- SST is 28-29°C over southeast adjoining east central Arabian Sea along the west coast except over westcentral AS.
- SST is 28-29°C over most parts of Bay of Bengal (BoB) and Andaman Sea.

Tropical Cyclone Heat Potential (TCHP):

- TCHP is around is less than 40 kJ/cm^2 north adjoining westcentral Arabian Sea and AS. It is 80-100 kJ/cm^2 over south and east central Arabian Sea.
- TCHP is 80 -100 kJ/cm^2 over most parts of the BoB and Andaman Sea.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive and is 30-50x10^{-5}s^{-1} over southeast adjoining eastcentral Arabian sea off Kerala – Karnataka coast
- Relative vorticity at 850 hPa is positive and is 20-40 x10^{-5}s^{-1} over southeast and adjoining southwest Bay of Bengal.

Convergence:

- Lower level convergence is 5-10 x10^{-5}s^{-1} over eastcentral Arabian sea and Kokan, Karnataka and north Kerala coast.
- Lower level convergence is about 5x10^{-5}s^{-1} southwest bay off northeast Srilanka coast

Divergence:

- Upper level divergence is 5-10x10^{-5} s^{-1} over southcentral, west central and east central Arabian Sea.
- Upper level divergence is negative over most parts of Bay of Bengal except 40 x10^{-5} s^{-1} over southeast part of Bay of Bengal

Wind Shear:

- The vertical wind shear over entire parts of Arabian sea is about > 20 knots and except southeast Arabian sea is about 5-10 knots adjoining Kerala and Karnataka coast.
- Wind shear is about 5-10 knots over entire central parts of the bay of Bengal and Andaman sea and >20 knots north and south of bay of Bengal

Wind Shear Tendency:

- The vertical wind shear tendency is increasing by 5- 10 knots central Arabian sea adjoining southcentral Arabian sea rest parts of Arabian sea is decreasing tendency The vertical wind shear tendency is decreasing (5 to 20 knots) most parts of bay of Bengal and andaman sea except 5-10 knots tendency increase over north east bay of Bengal.

Upper tropospheric ridge:

- The upper tropospheric ridge at 200 hPa runs along 16.0°N.

M.J.O. Index:

- MJO index lies over Phase 3 with amplitude greater than 1 and would continue to move in the same phase during next 2 days and it would shifts to phase 2 with amplitude greater than 1.

Storms and Depression over South China Sea/ South Indian Ocean: NIL

Satellite:

Inference based on INSAT imagery of **120900** UTC:

Bay of Bengal & Andaman Sea:-

Scattered low and medium clouds with embedded moderate to intense convection over bay of Bengal south of latitude 18.0°N and Andaman sea

Arabian Sea:-

Broken low and medium clouds with embedded moderate to intense convection over rest southeast Arabian sea.

NWP Input for FDP Cyclone based on 0000 UTC of 12.11.2015

NWP Analysis

IMD-GFS model product analysis and forecasts based on 00UTC of 12th November 2015 shows a low pressure are over the southeast Arabian Sea and formation of an extended low pressure area over southwest Bay of Bengal on 14th. Forecasts also show non intensification and dissipation of the systems during next seven days.

IMD-WRF model product analysis and forecasts based on 00UTC of 12th November 2015 shows a low pressure are over the southeast Arabian Sea and formation of an extended low pressure area over southwest Bay of Bengal on 14th. Forecasts also show non intensification and dissipation of the systems during next seven days.

NWP products are available at:
http://202.54.31.51/bias/gfsproducts.php
http://202.54.31.51/bias/wrf27pro.php
http://202.54.31.51/bias/potentialparameter.php

NCMRWF-NCUM: NCUM model indicates weakening of the low pressure system over southern peninsula and reemerging into Arabian Sea on 12th as a cyclonic circulation. It moves westwards during the subsequent 24 hrs without intensification.

A cyclonic circulation also lies over eastcentral Bay and adjoining Andaman Sea on 12th and moves west-southwestwards become as well marked low pressure area on 14th and there after it gradually with no intensification.

NCMRWF-GFS: NCMRWF-GFS indicates a low over southeast Arabian sea. It moves westwards and is less marked on 18th.

A low will form over southwest Bay near Sri Lanka coast and become well marked on 14th near Tamil Nadu coast. It would move northward to westcentral Bay and adjoining south coastal AP and adjoining north Tamil Nadu intensified into a depression on 17th. It would become well marked low on 18th.

NCEP-GFS NCEP-GFS indicates emergence low over southeast Arabian Sea on 14th and becomes less marked on 17th

A low will form over southeast Bay on 14th. It would move west-northwestward and lie over southwest Bay on 15th and cross Sri lanka coast on 18th.

ECMWF model suggests A low will form over southeast Bay on 14th. It would move west-northwestwards and lie over southcentral and then southwest Bay on 15th and moved to northwards and lie over north Tamilnadu, coastal Andhra Pradesh and south Orissa coast on 18th.

No significant system will form over Arabian Sea.

JMA: Not available

ARP-Meteo France: model suggests re-emerging of the cyclonic circulation from peninsula and a low over southeast & eastcentral Arabian Sea and adjoining Kerala Karnataka coast on 12th. It would move westwards without intensification on 13th and become less marked on 14th.

A low will form over south Bay adjoining east central bay on 13th and become well marked on 15th over southcentral Bay.

GENESIS POTENTIAL PARAMETER: It shows significant potential for genesis over southeast bay of Bengal on 13th and it would gradually move northwest wards with intensification on 17th over north Tamilnadu adjoining south Andhra coast.

Summary and Conclusion:

Bay of Bengal and Andaman Sea:

A low pressure area may form over southeast Bay of Bengal around 13/14th Nov. Models do not suggest intensification and give movement towards Sri Lanka and Tamil Nadu coast in subsequent 3 days. It needs to be watched.

The low pressure area over southeast and adjoining eastcentral Arabian sea on today the 12th.November 2015 However, it would move westwards and weaken gradually.

Probability of cyclogenesis over Bay of Bengal and Andaman Sea during next 120 hours:

24 HOURS	24-48 HOURS	48-72 HOURS	72-96 HOURS	96-120 HOURS
Nil	Nil	Low	Fair	Moderate

Arabian Sea:

Most models predict re-emergence of remnant of the BOB system into the Arabian Sea on 12th/12th as a low and moving westward without intensification.

Probability of cyclogenesis over Arabian Sea during next 120 hours:

24 HOURS	24-48 HOURS	48-72 HOURS	72-96 HOURS	96-120 HOURS
Nil	Nil	Nil	Nil	Nil

Advisory:

IOP will be conducted for Tamil Nadu and Puducherry coasts during 16-17 Nov. 2015.

Annexure-I

Status of observational system:

Synoptic observation:

Region	Date/Time (UTC)		
	11/12	**12/00**	**12/03**
India	43	38	47
Coastal stations			
WB	6	6	5
Odisha	6	6	7
AP	12	12	14
Tamil Nadu	11	11	13
Puducherry	2	2	2
A & N	6	1	6
Bangladesh	10	9	7
Myanmar	0	0	11
Thailand	2	2	2
SriLanka	8	7	8

AWS Observations:

	Date/Time		
Region	**11/12**	**12/00**	**12/03**
India	**63**	**64**	**69**
Coastal stations			
WB	**7**	**7**	**8**
Odisha	**16**	**16**	**16**
AP	**14**	**14**	**14**
Tamil Nadu	**26**	**27**	**30**
&			
Puducherry	**-**	**-**	**1**
A & N	**-**	**-**	**-**

RS/RW (12Z) of 11/11/2015 **-0/39**
No. of Ascents reaching 250 hPa level: 0, MISDA: 39

RS/RW (00Z) of 12/11/2015- **16/39**
No. of Ascents reaching 250 hPa level:13, MISDA:2

No. of PILOT Ascents

11/12Z	**12/00Z**
5	1

Buoy Data

11/12Z	12/00Z	12/03Z
7	5	8

STATUS OF CHENNAI REGION OBSERVATION

No. of Synop data

Date→	**11.11.2015**							
UTC→	**00**	**03**	**06**	**09**	**12**	**15**	**18**	**21**
Chennai Region (Coasts of AP & TN)	**20**	**22**	**20**	**20**	**22**	**20**	**20**	**20**

No. of RS/RW Ascents

00Z /11.11.2015 : 6
No. of Ascents reaching 250 hPa level = 6
MISDA : 2

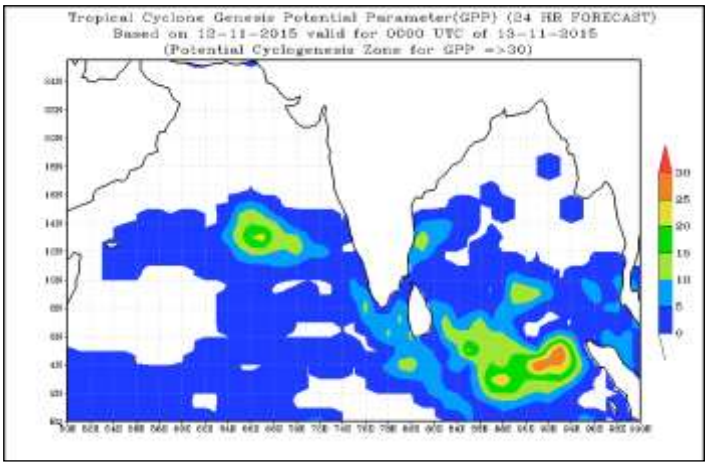
12Z /11.11.2015 : 0
No. of Ascents reaching 250 hPa level =0
MISDA : 8

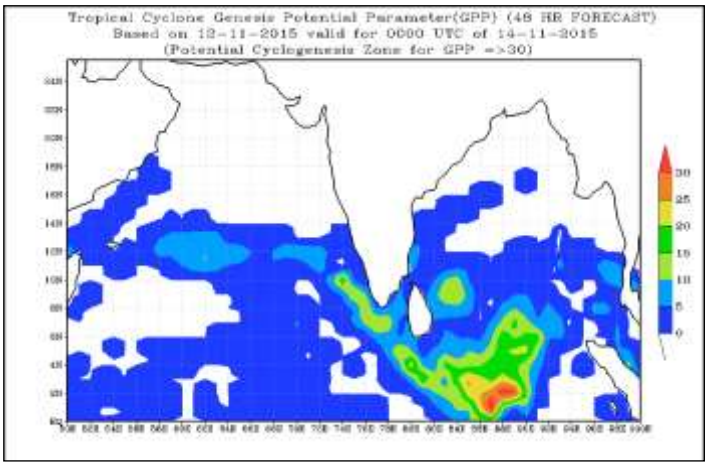
No. of PILOT Ascents:

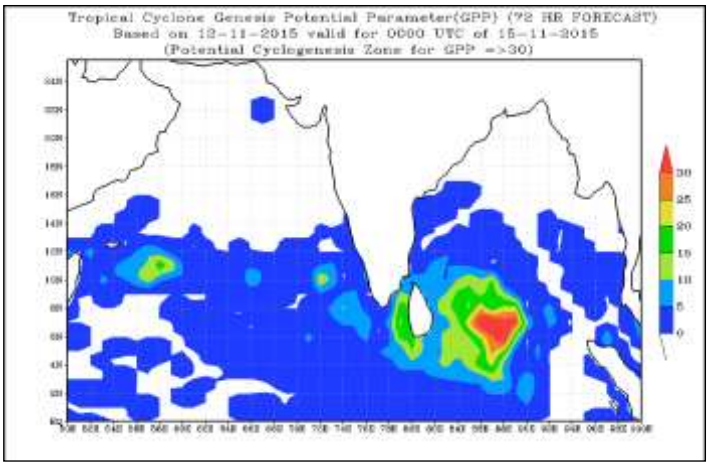
11.11.2015

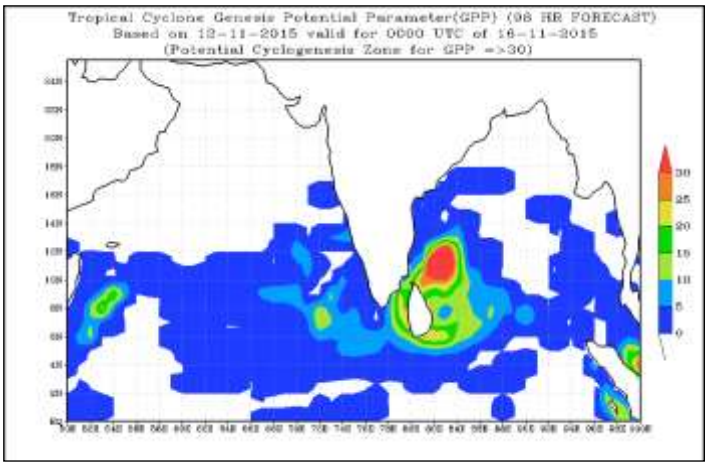
06Z	18Z
4	4

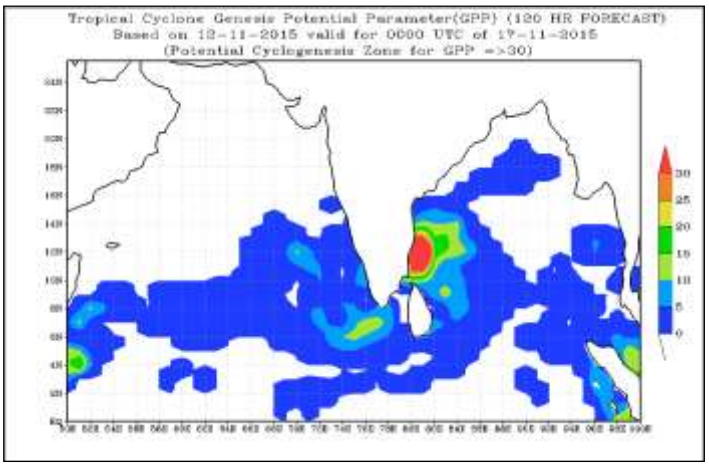
Annexure-II

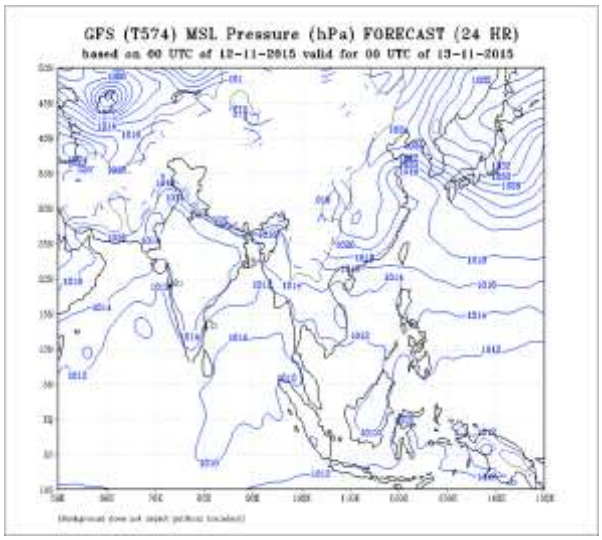

Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 12-11-2015 valid for 0000 UTC of 13-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

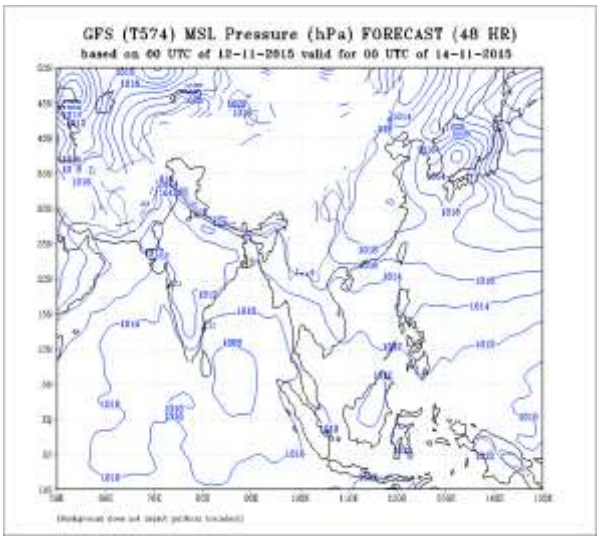

Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
Based on 12-11-2015 valid for 0000 UTC of 14-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

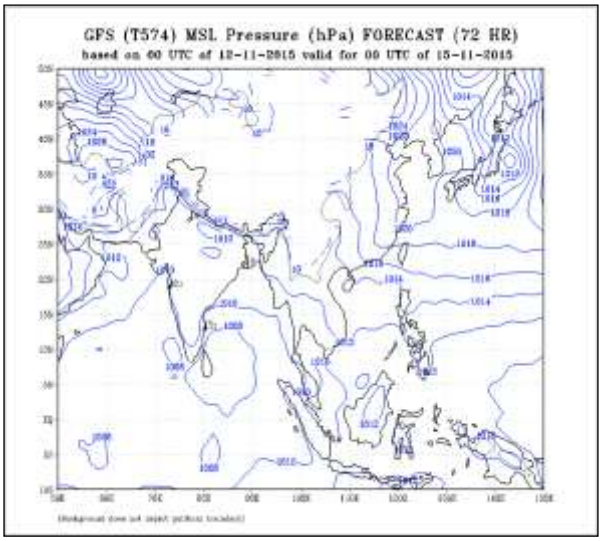

Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 12-11-2015 valid for 0000 UTC of 15-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

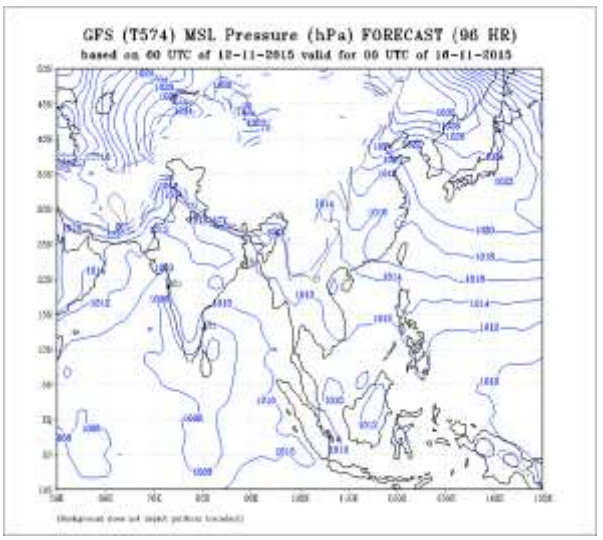

Tropical Cyclone Genesis Potential Parameter(GPP) (96 HR FORECAST)
Based on 12-11-2015 valid for 0000 UTC of 16-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

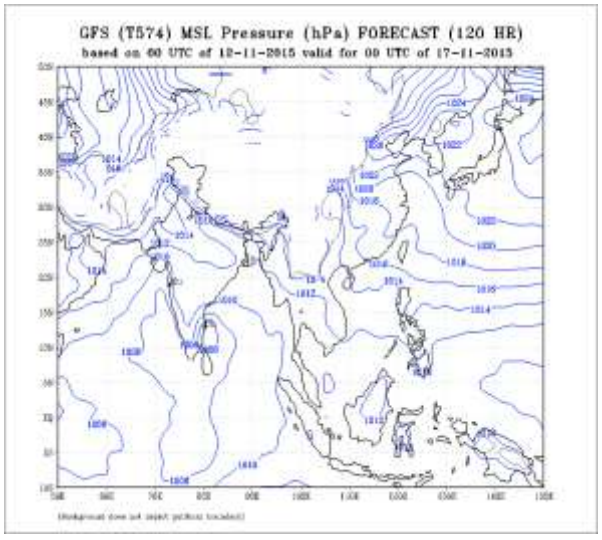

Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 12-11-2015 valid for 0000 UTC of 17-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

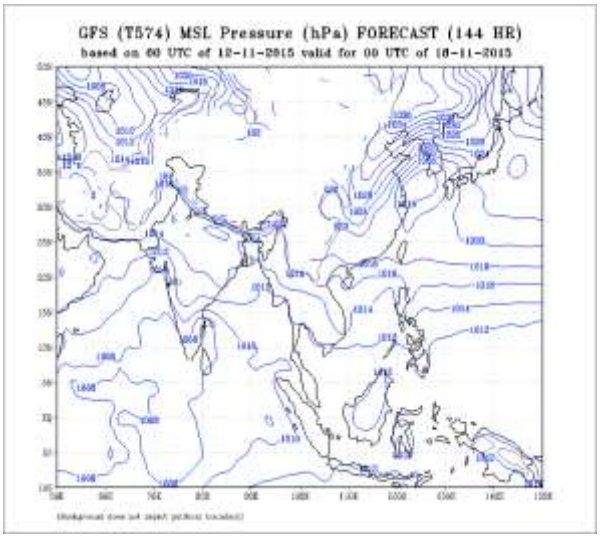

GFS (T574) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 12-11-2015 valid for 00 UTC of 13-11-2015

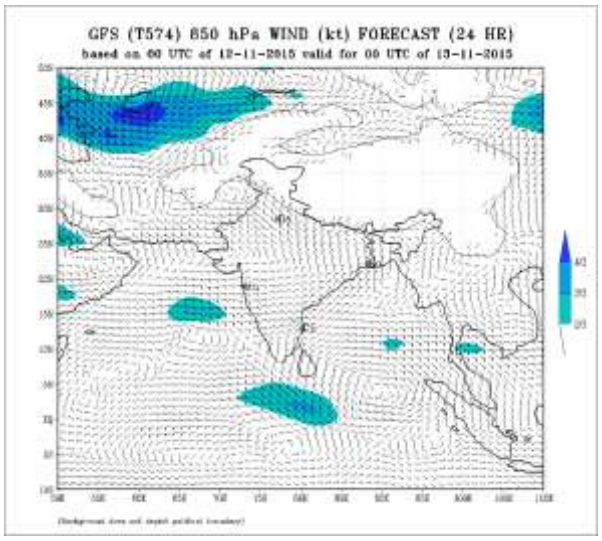

GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 12-11-2015 valid for 00 UTC of 14-11-2015

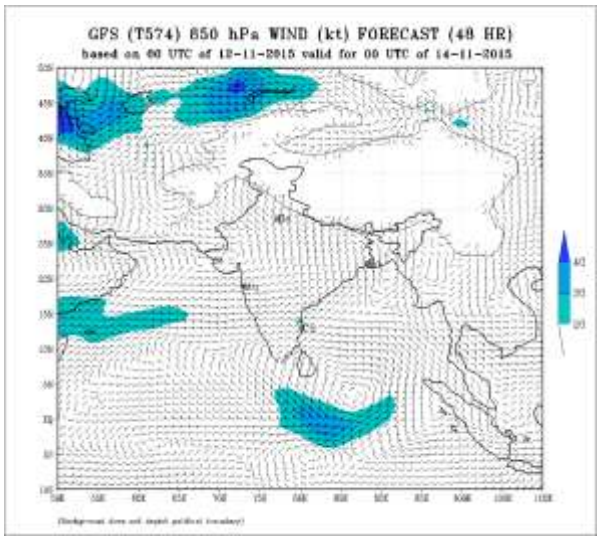

GFS (T574) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 12-11-2015 valid for 00 UTC of 15-11-2015


GFS (T574) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 12-11-2015 valid for 00 UTC of 16-11-2015


GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 12-11-2015 valid for 00 UTC of 17-11-2015


GFS (T574) MSL Pressure (hPa) FORECAST (144 HR)
based on 00 UTC of 12-11-2015 valid for 00 UTC of 18-11-2015


GPS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 12-11-2015 valid for 00 UTC of 13-11-2015


GPS (T574) 850 hPa WIND (kt) FORECAST (48 HR)
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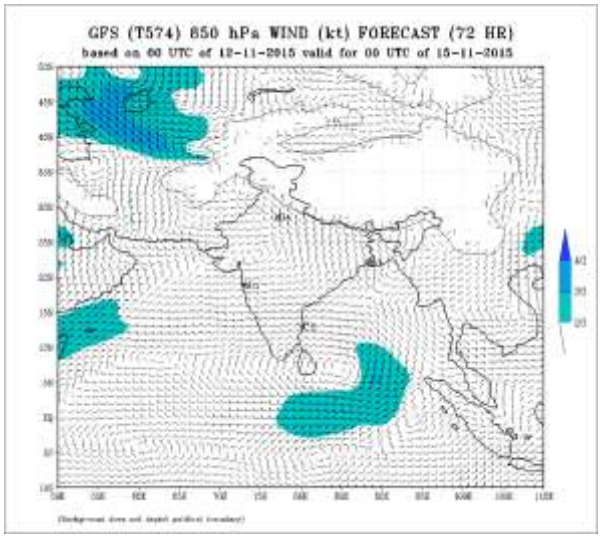
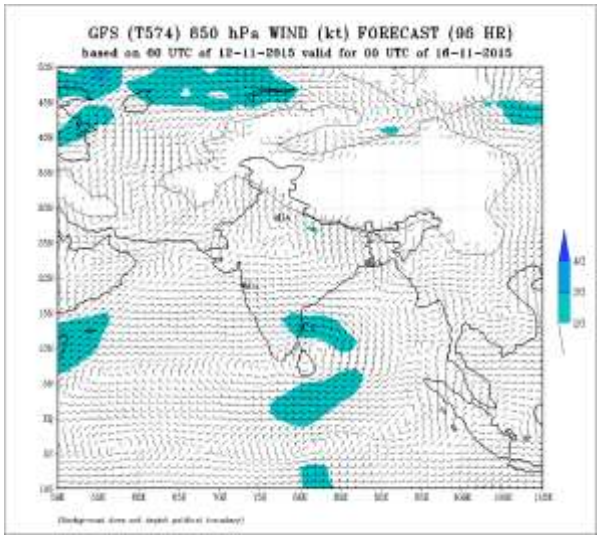
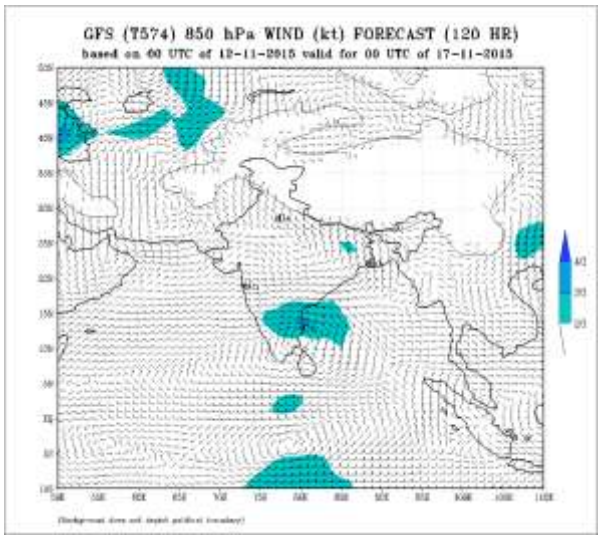
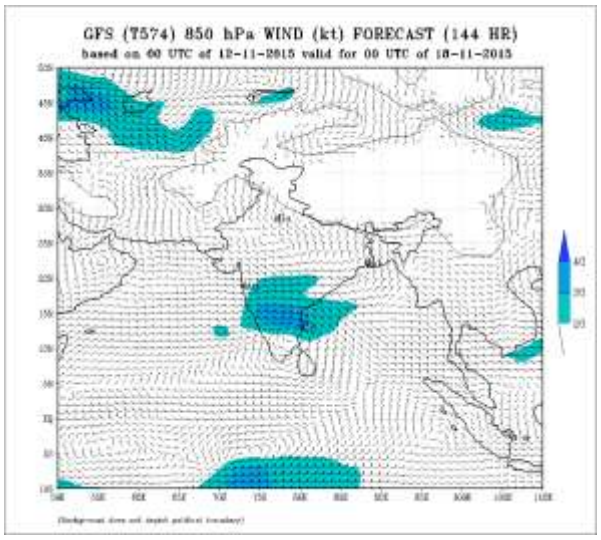
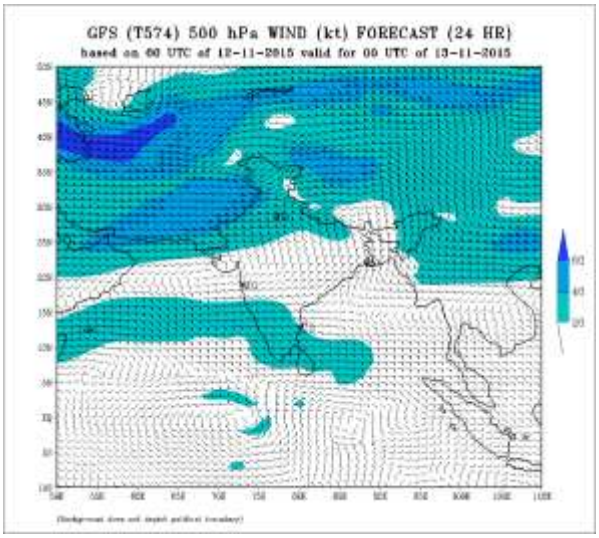
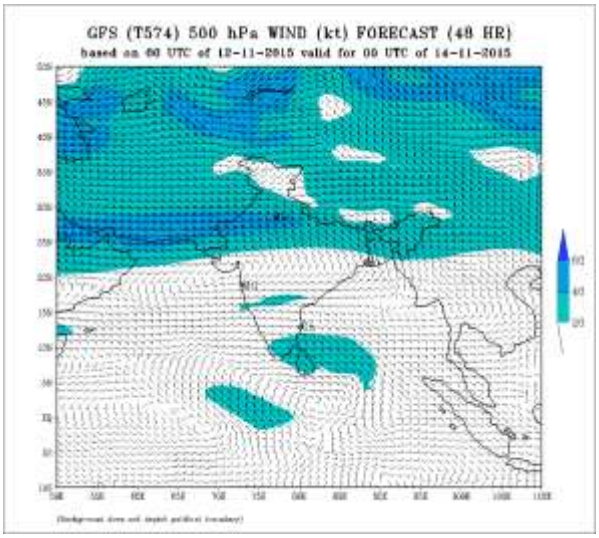

GPS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 12-11-2015 valid for 00 UTC of 15-11-2015


GPS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 12-11-2015 valid for 00 UTC of 16-11-2015


GPS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 12-11-2015 valid for 00 UTC of 17-11-2015


GPS (T574) 850 hPa WIND (kt) FORECAST (144 HR)
based on 00 UTC of 12-11-2015 valid for 00 UTC of 18-11-2015


GPS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 12-11-2015 valid for 00 UTC of 13-11-2015


GPS (T574) 500 hPa WIND (kt) FORECAST (48 HR)
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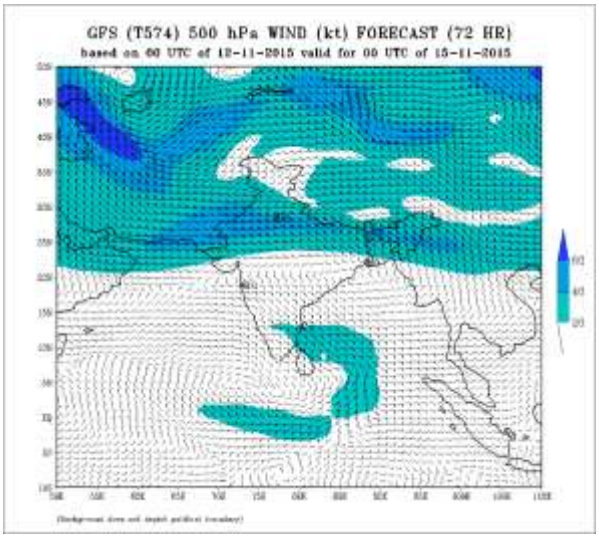
GPS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
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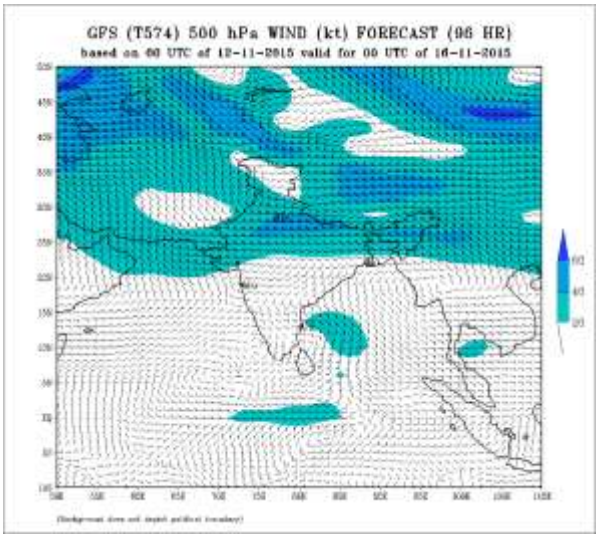
GPS (T574) 500 hPa WIND (kt) FORECAST (96 HR)
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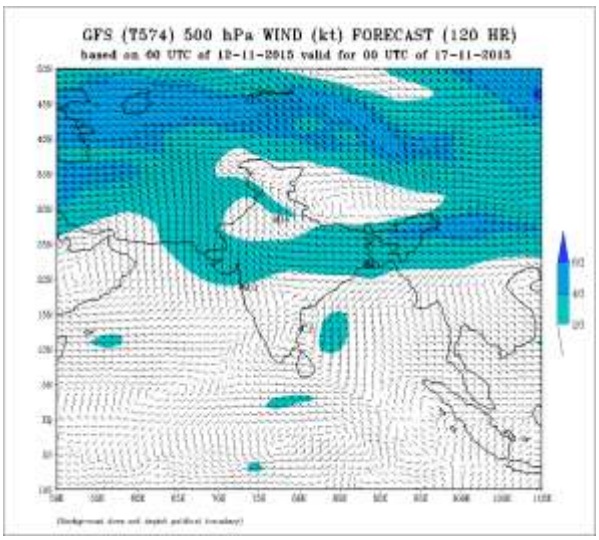
GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
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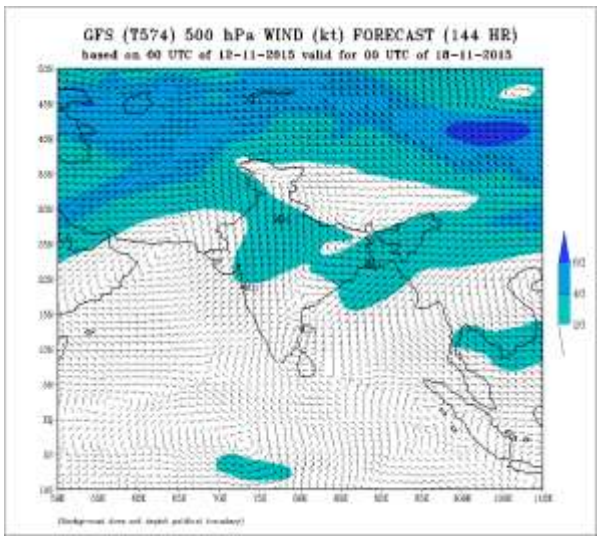
GFS (T574) 500 hPa WIND (kt) FORECAST (144 HR)
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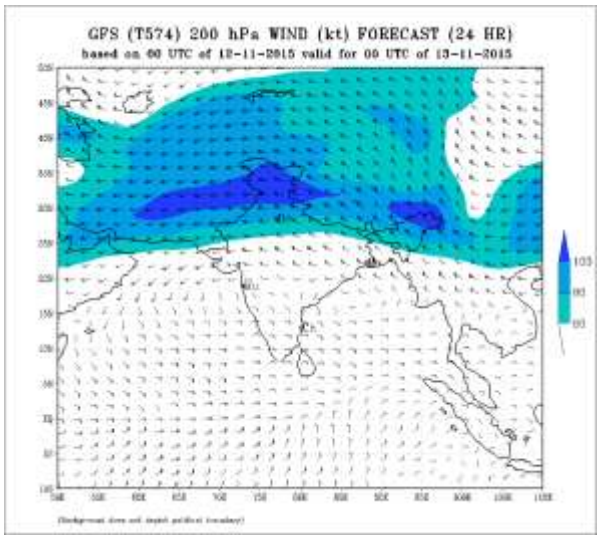
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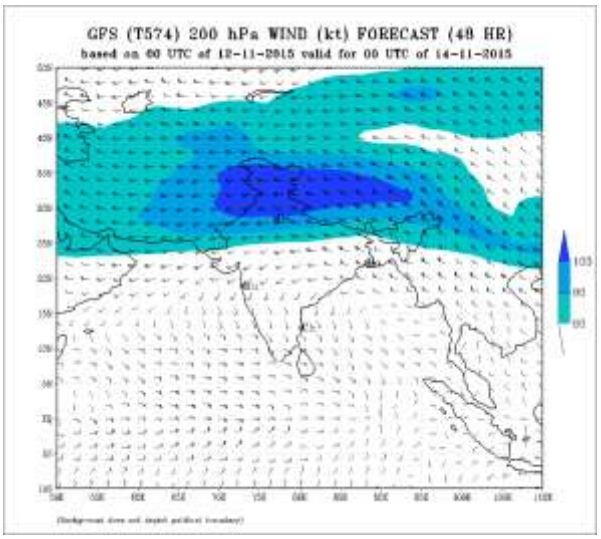
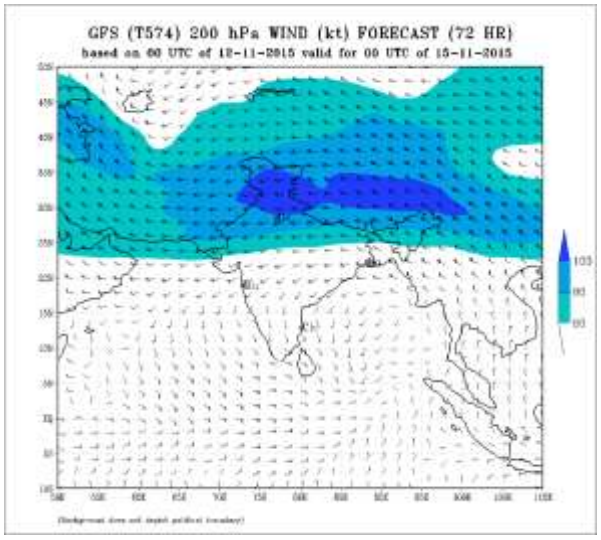

GPS (T574) 200 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 12-11-2015 valid for 00 UTC of 14-11-2015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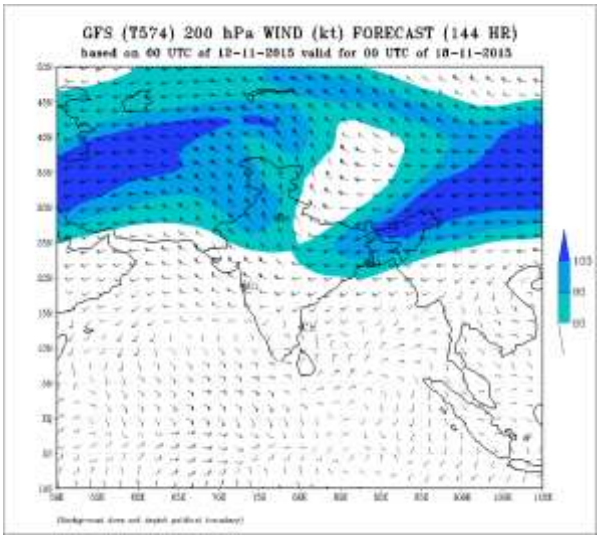
based on 00 UTC of 12-11-2015 valid for 00 UTC of 15-11-2015


GPS (T574) 200 hPa WIND (kt) FORECAST (144 HR)
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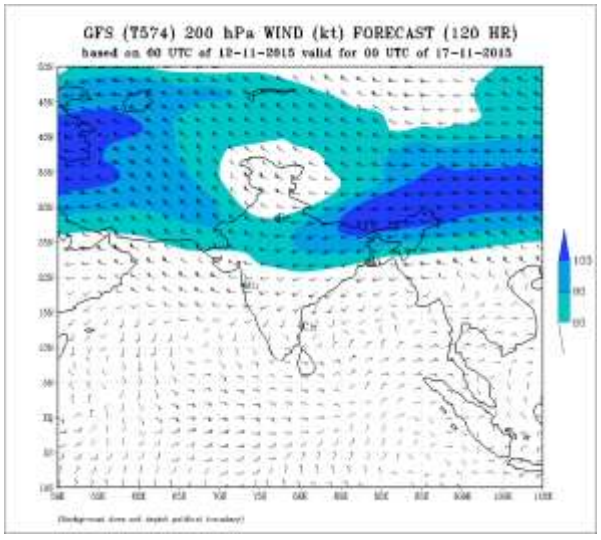
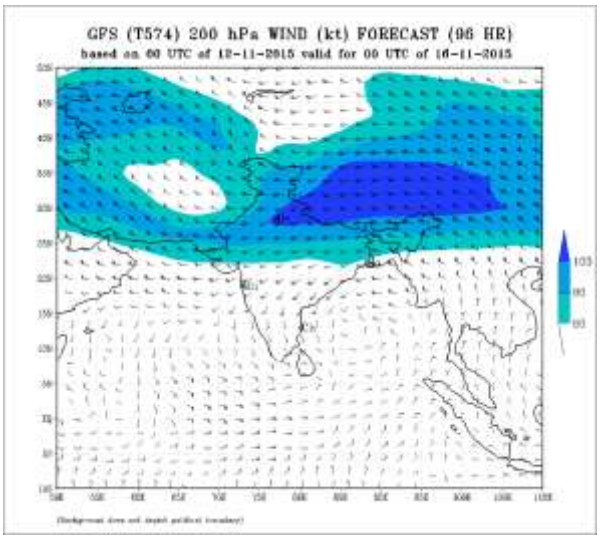

GPS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 12-11-2015 valid for 00 UTC of 17-11-2015


GPS (T574) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 12-11-2015 valid for 00 UTC of 16-11-2015

FDP (Cyclone) NOC Report Dated 13 November, 2015

Synoptic features:

- The low pressure area over eastcentral and adjoining westcentral & south Arabian Sea
- persists. Associated upper air cyclonic circulation extends upto mid-tropospheric levels.
- The trough of low at mean sea level over south Andaman Sea & adjoining southeast Bay of Bengal now lies over southeast Bay of Bengal & neighbourhood with a cyclonic circulation aloft and extends upto 4.5 km above mean sea level. Under its influence, a low pressure area would form over southeast Bay of Bengal & neighbourhood by tomorrow.

Surface Temperature (SST):

- SST is 28-29°C over southeast adjoining east central Arabian Sea along the west coast except over westcentral AS.
- SST is 28-29°C over westcentral, eastcentral and southeast Bay of Bengal (BoB) and Andaman Sea.

Tropical Cyclone Heat Potential (TCHP):

- TCHP is around is less than 40 kJ/cm^2 north adjoining westcentral Arabian Sea and AS. It is 80-100 kJ/cm^2 over south and east central Arabian Sea and along the west coast.
- TCHP is 80 -100 kJ/cm^2 over most parts of the BoB and Andaman Sea. TCHP is around is less than 40 kJ/cm^2 north adjoining westcentral bay of Bengal.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive and is 30-50x10^{-5}s^{-1} over southeast adjoining eastcentral Arabian sea off Kerala – Karnataka coast
- Relative vorticity at 850 hPa is positive and is 30-50x10^{-5}s^{-1} over and southwest bay of Bengal and Tamilnadu coast. Relative vorticity at 850 hPa is negative and is 20-40 x10^{-5}s^{-1} southeast adjoining Andaman sea.

Convergence:

- Lower level convergence is 5x10^{-5}s^{-1} over eastcentral Arabian sea
- Lower level convergence is about 5x10^{-5}s^{-1} southwest bay and Sri Lanka coast and east of Andaman sea

Divergence:

- Upper level divergence is 5-10x10^{-5} s^{-1} over southcentral, west central and east central and northwest Arabian sea and adjoining Kokan – Karnataka coast.
- Upper level divergence is 10-20x10^{-5} s^{-1} over southwest Bay of Bengal adjoining Indian ocean and 5 - 10 x10^{-5} s^{-1} over southeast part of Bay of Bengal

Wind Shear:

- The vertical wind shear over entire parts of Arabian sea is about > 20 knots and except eastcentral Arabian sea is about 5-10 knots adjoining Kerala and Karnataka coast.
- Wind shear is about 5-10 knots over entire central parts of the bay of Bengal and Andaman sea and >20 knots north and south of bay of Bengal

Wind Shear Tendency:

- The vertical wind shear tendency is increasing by 5- 10 knots south Arabian sea adjoining Indian ocean and rest parts of Arabian sea is decreasing tendency The vertical wind shear tendency is decreasing (5 to 20 knots) most parts of bay of Bengal and Andaman sea except 5-10 knots tendency increase over southwest bay of Bengal adjoining Tamilnadu coast..

Upper tropospheric ridge:

- The upper tropospheric ridge at 200 hPa runs along 17.0°N.

M.J.O. Index:

- MJO index lies over Phase 3 with amplitude greater than 1 and would continue to move in the same phase during next 1 days and it would shift to phase 2 with amplitude greater than 1.

Storms and Depression over South China Sea/ South Indian Ocean: NIL

Satellite:

Inference based on INSAT imagery of **130900** UTC:

Bay of Bengal & Andaman Sea:-

Broken low and medium clouds with embedded moderate to intense convection over southeast bay of Bengal adjoining Indian ocean between latitude 2.0°N to 7.0°N and longitude 83.0°E to 92.0°E in association with low level cyclonic circulation.

Scattered low and medium clouds with embedded isolated moderate to intense convection over rest bay of Bengal south of latitude 16.0°N and Andaman sea.

Arabian Sea:-

Scattered low and medium clouds with embedded moderate to intense convection over Arabian sea between latitude 11.0°N to 19.0°N and longitude 58.0°E to 66.0°E in association with low pressure area

Scattered low and medium clouds with embedded moderate to intense convection over rest southeast Arabian sea.

NWP Input for FDP Cyclone based on 0000 UTC of 13.11.2015

NWP Analysis

IMD-GFS model product analysis and forecasts based on 00UTC of 13th November 2015 shows a low pressure are over the southeast Arabian Sea and formation of an extended low pressure area over southwest Bay of Bengal on 14th. Forecasts also show non intensification of both the systems and dissipation of the Arabian Sea system and re-emergence of the southwest Bay of Bengal system into the southeast Arabian Sea on 17 November 2015.

IMD-WRF model product analysis and forecasts based on 00UTC of 13th November 2015 shows a low pressure are over the southeast Arabian Sea and formation of an extended low pressure area over southwest Bay of Bengal on 14th. Forecasts also show non intensification of both the systems and dissipation of the Arabian Sea system and re-emergence of the southwest Bay of Bengal system into the southeast Arabian Sea on 17 November 2015.

NWP products are available at:
http://202.54.31.51/bias/gfsproducts.php
http://202.54.31.51/bias/wrf27pro.php
http://202.54.31.51/bias/potentialparameter.php

NCMRWF-NCUM: NCUM model indicates formation of well-marked low pressure area over over southwest Bay on 14th and intensification into a depression on 15th,deep depression on 16th with northwestward movement crossing north Tamil Nadu coast by 16th.

NCMRWF-GFS: NCMRWF-GFS indicates formation of low over southwest Bay on 15th, well-marked on 17th while initially moving northwestward movement and then northward towards north Tamil Nadu & south Andhra Coast.

NCEP-GFS NCEP-GFS formation of a low pressure area over southwest Bay on 14th with movement northwestwards and intensification upto depression on 16th Weaking as lopar over Tamil Nadu and emerging in Arabian Sea as WML

ECMWF model suggests formation of low over southwest Bay off Sri Lanka coast on 15th. It will be well marked near north TN coast on 16, near south coastal AP on 17th and near north CAP coast as depression on 18th and become less marked on 19th

JMA: model suggests formation of a low on 14th over Sri Lanka coast, & adjoining southwest Bay would move northwestward with intensification into a well-marked low on 16th and become less marked on 16/1200 UTC.

ARP-Meteo France: model suggests formation of low pressure area over southwest, southeast & adjoining west central Bay on 14th with northward movement with intensification into deep depression on 16th over west central Bay.

GENESIS POTENTIAL PARAMETER: Model forecast of GPP based on 0000 UTC of 13 November 2015 suggests development of a cyclogenesis zone over southwest Bay of Bengal off Tamil Nadu coast on 16 November 2015 and re-emergence of the system into the southeast Arabian Sea on 18 November 2015.

Summary and Conclusion:

Bay of Bengal and Andaman Sea:

A low pressure area may form over southeast Bay of Bengal around 14th Nov. Most of Models suggest intensification into depression/ well marked low move northwards towards Tamil Nadu coast in subsequent on 17th.

Probability of cyclogenesis over Bay of Bengal and Andaman Sea during next 120 hours:

24 HOURS	24-48 HOURS	48-72 HOURS	72-96 HOURS	96-120 HOURS
Nil	Low	Moderate	High	Nil

Arabian Sea:

Most models predict gradual weakening of the low over central Arabian Sea.

Probability of cyclogenesis over Arabian Sea during next 120 hours:

24 HOURS	24-48 HOURS	48-72 HOURS	72-96 HOURS	96-120 HOURS
Nil	Nil	Nil	Nil	Nil

Advisory:

IOP will be conducted for Tamil Nadu and Puducherry coast during the 15-17 NOv. 2015

Annexure-I

Status of observational system:

Synoptic observation:

Region	Date/Time (UTC)		
	12/12	**13/00**	**13/03**
India	46	33	48
Coastal stations			
WB	9	3	9
Odisha	6	5	6
AP	12	12	12
Tamil Nadu	11	11	13
Puducherry	2	2	2
A & N	6	1	6
Bangladesh	15	15	15
Myanmar	12	10	12
Thailand	2	2	2
Sri Lanka	10	9	10

AWS Observations:

	Date/Time		
Region	**12/12**	**13/00**	**13/03**
India	**60**	**64**	**52**
Coastal stations			
WB	**5**	**7**	**7**
Odisha	**16**	**12**	**7**
AP	**12**	**14**	**11**
Tamil Nadu	**27**	**29**	**28**
&			
Puducherry	**-**	**-**	**1**
A & N	**-**	**-**	**-**

RS/RW (12Z) of 12/11/2015 **-0/39**
No. of Ascents reaching 250 hPa level: 0, MISDA: 39

RS/RW (00Z) of 13/11/2015- **29/39**
No. of Ascents reaching 250 hPa level:24, MISDA:5

No. of PILOT Ascents

12/12Z	**13/00Z**
5	3

Buoy Data

12/12Z	13/00Z	13/03Z
7	14	7

STATUS OF CHENNAI REGION OBSERVATION

No. of Synop data

Date→	**12.11.2015**							
UTC→	**00**	**03**	**06**	**09**	**12**	**15**	**18**	**21**
Chennai Region (Coasts of AP & TN)	**20**	**22**	**20**	**20**	**22**	**20**	**20**	**20**

No. of RS/RW Ascents

00Z /12.11.2015 : 6
No. of Ascents reaching 250 hPa level = 6
MISDA : 2

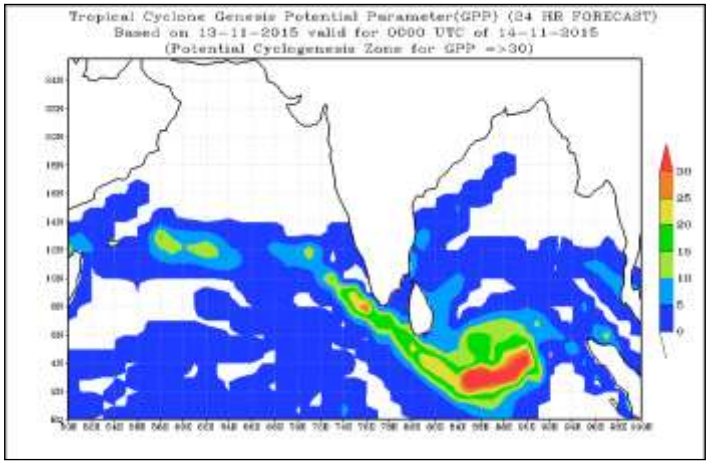
12Z /12.11.2015 : 0
No. of Ascents reaching 250 hPa level =0
MISDA : 8

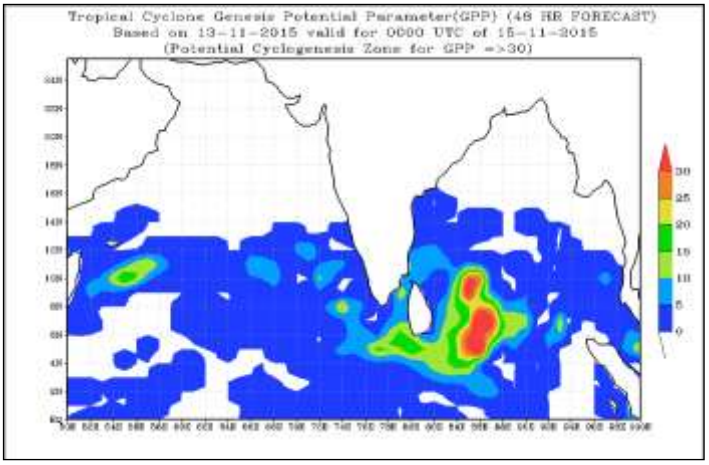
No. of PILOT Ascents:

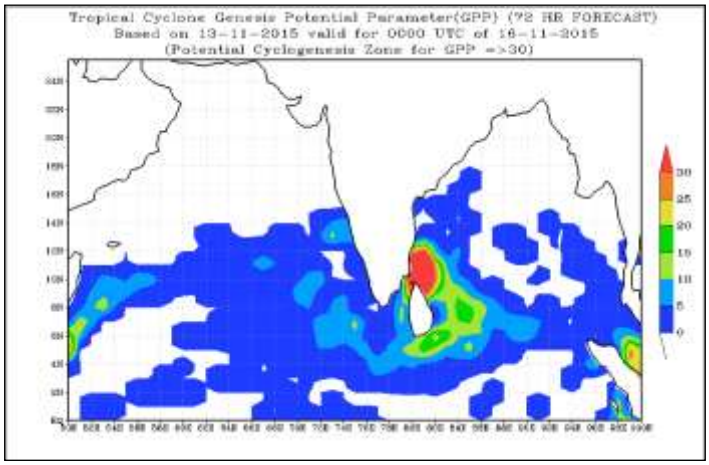
12.11.2015

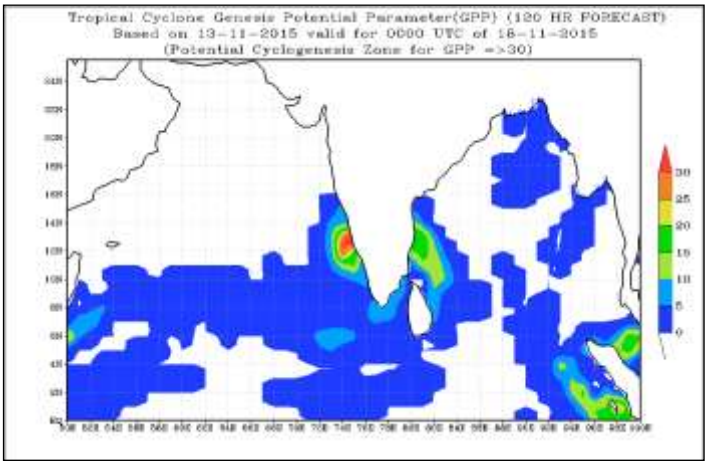
06Z	18Z
2	2

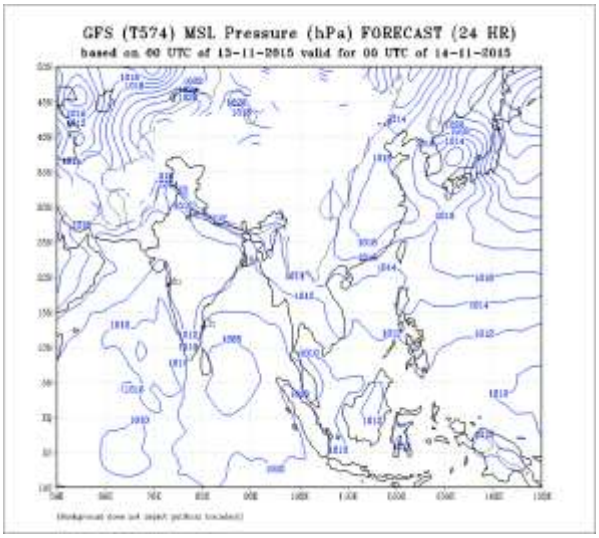
Annexure-II

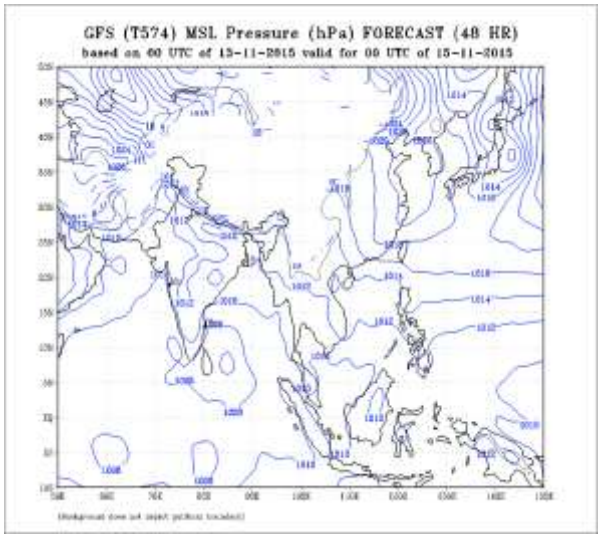

Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 13-11-2015 valid for 0000 UTC of 14-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

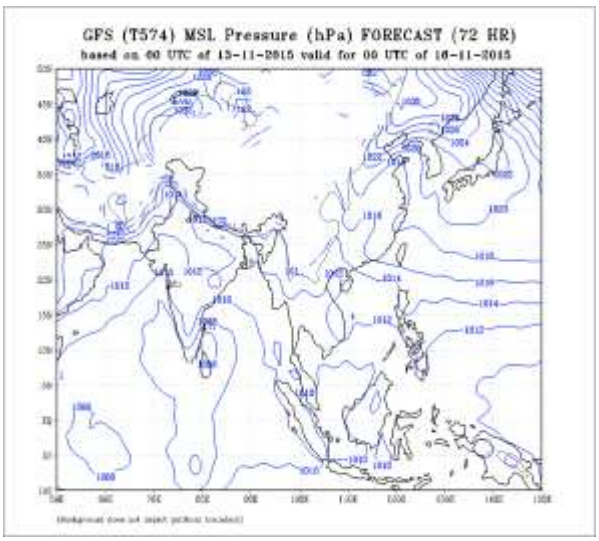

Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
Based on 13-11-2015 valid for 0000 UTC of 15-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

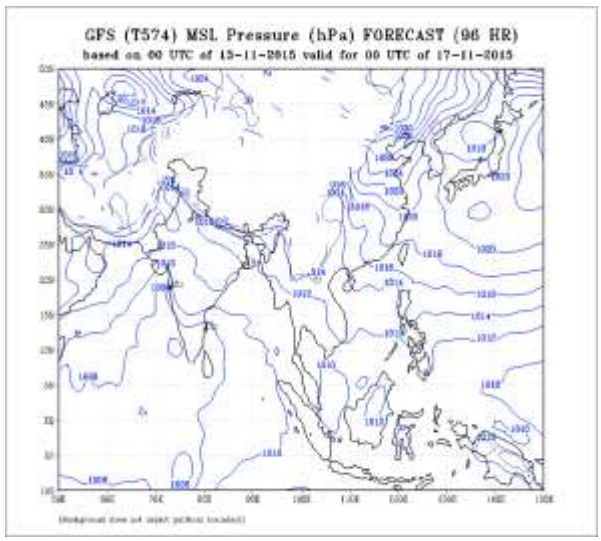

Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 13-11-2015 valid for 0000 UTC of 16-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

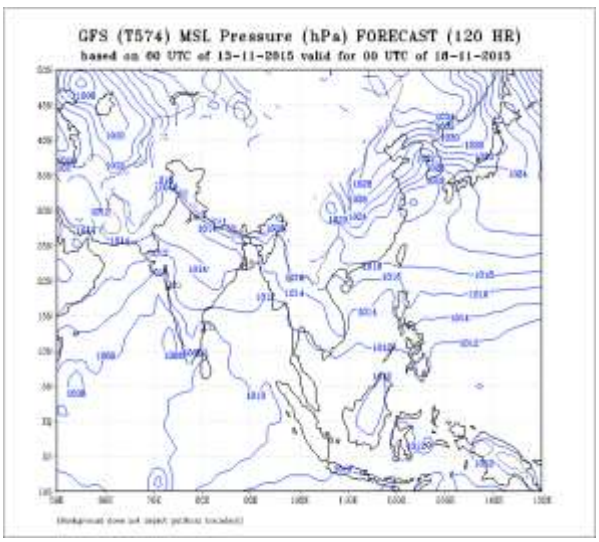

Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 13-11-2015 valid for 0000 UTC of 18-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

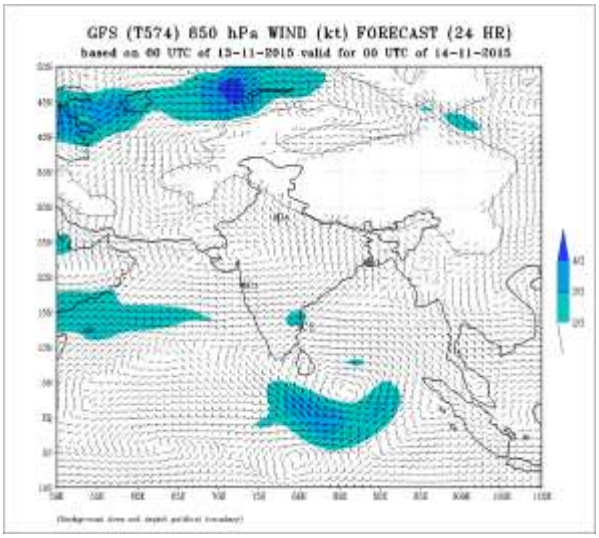

GFS (T574) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 13-11-2015 valid for 00 UTC of 14-11-2015

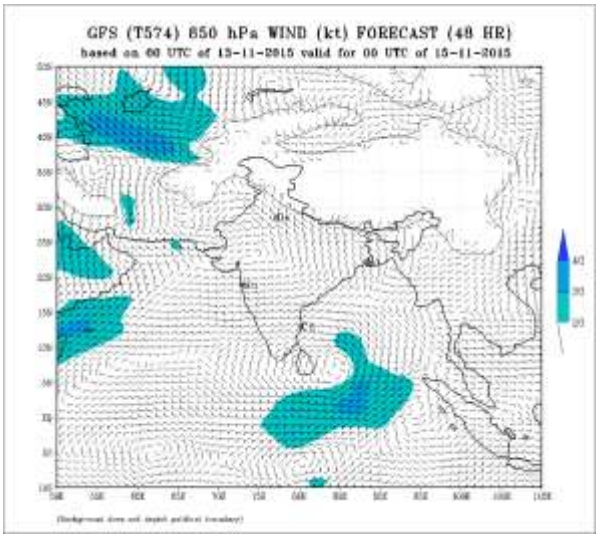

GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 13-11-2015 valid for 00 UTC of 15-11-2015

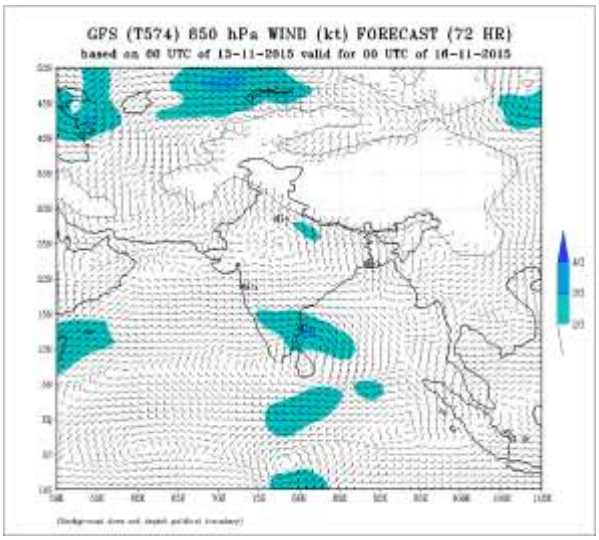

GFS (T574) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 13-11-2015 valid for 00 UTC of 16-11-2015

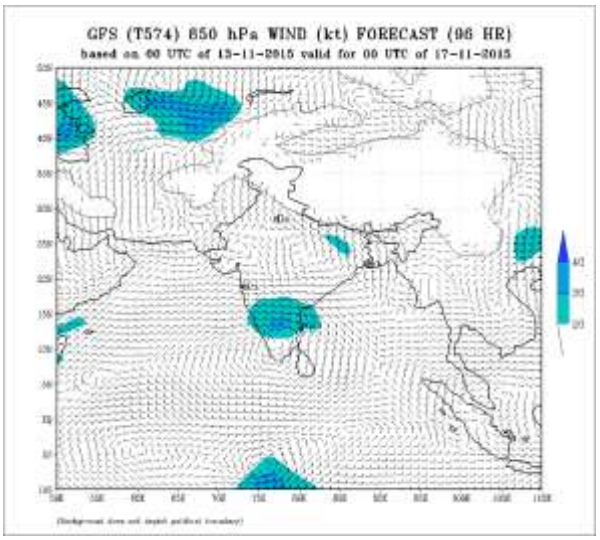

GFS (T574) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 13-11-2015 valid for 00 UTC of 17-11-2015

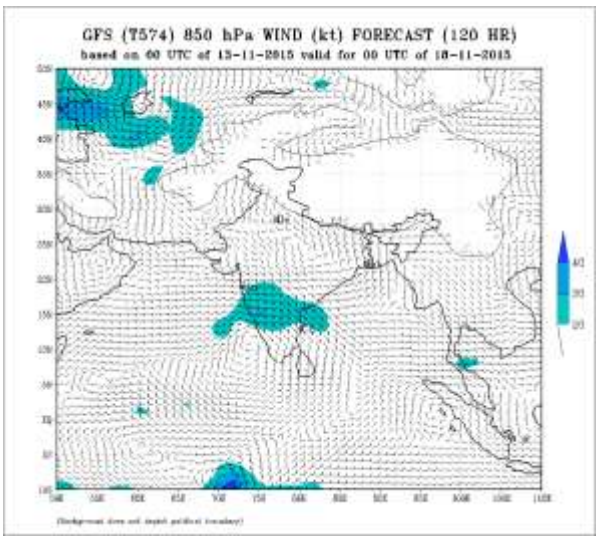

GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 13-11-2015 valid for 00 UTC of 18-11-2015

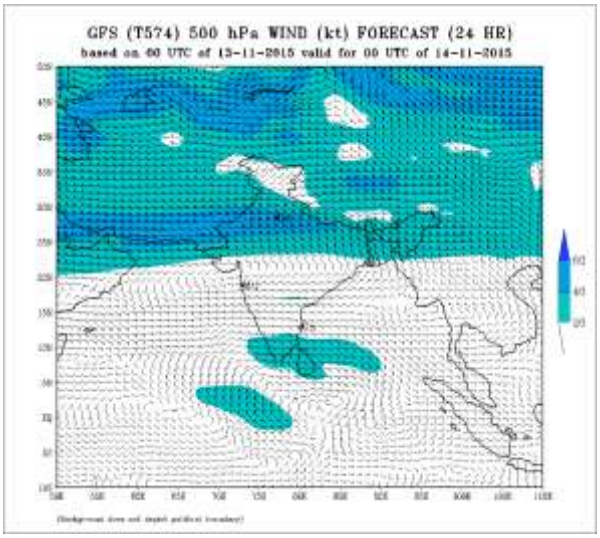

GPS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 13-11-2015 valid for 00 UTC of 14-11-2015

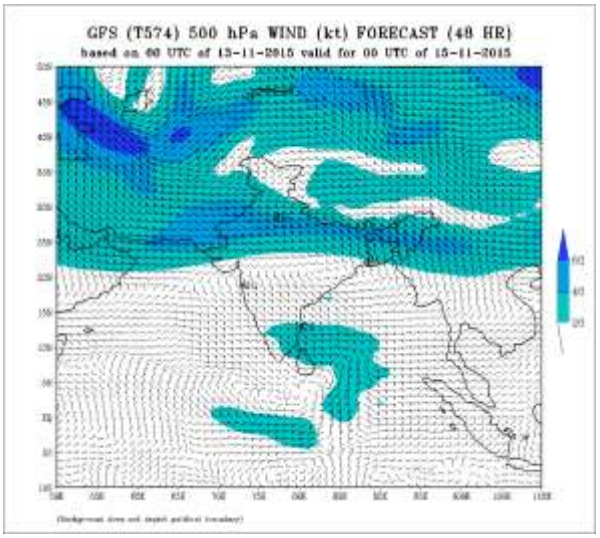

GPS (T574) 850 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 13-11-2015 valid for 00 UTC of 15-11-2015

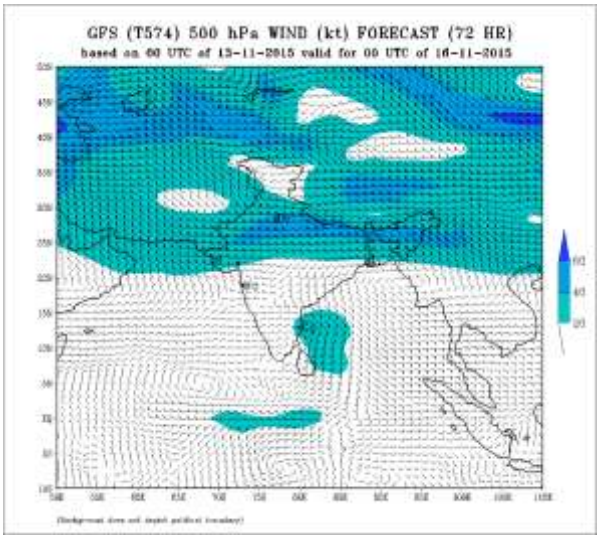

GPS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 13-11-2015 valid for 00 UTC of 16-11-2015

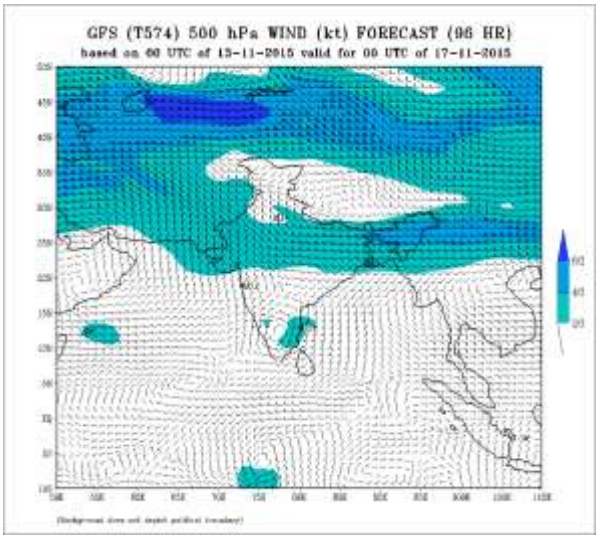

GPS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 13-11-2015 valid for 00 UTC of 17-11-2015

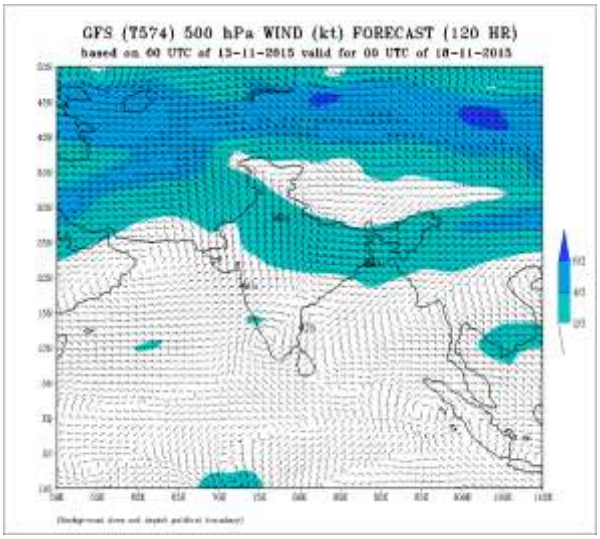

GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 13-11-2015 valid for 00 UTC of 18-11-2015

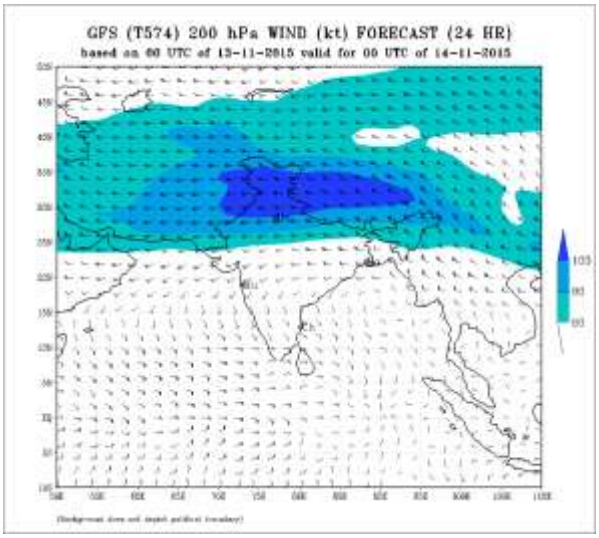

GPS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 13-11-2015 valid for 00 UTC of 14-11-2015

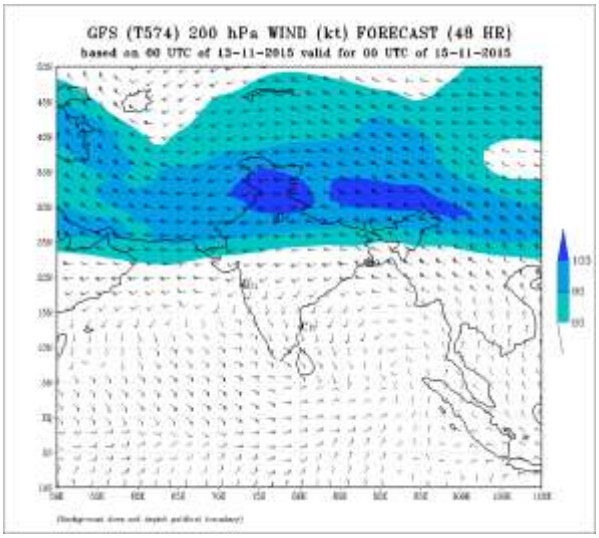

GPS (T574) 500 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 13-11-2015 valid for 00 UTC of 15-11-2015

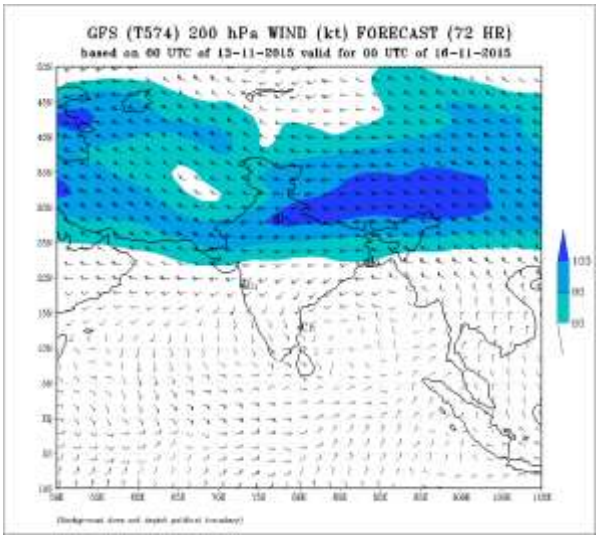

GPS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 13-11-2015 valid for 00 UTC of 16-11-2015

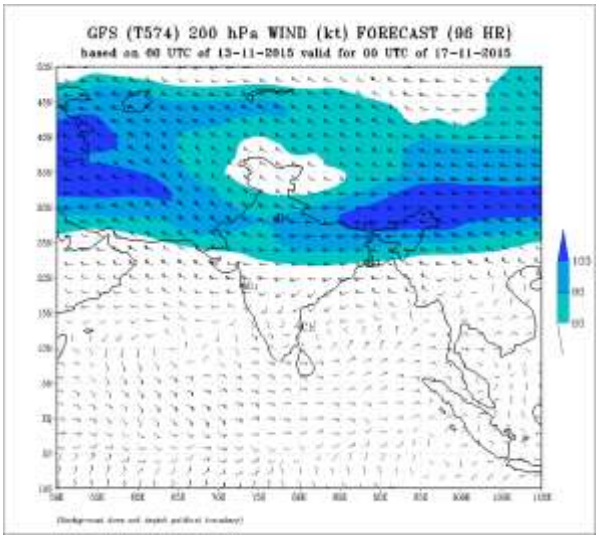

GPS (T574) 500 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 13-11-2015 valid for 00 UTC of 17-11-2015

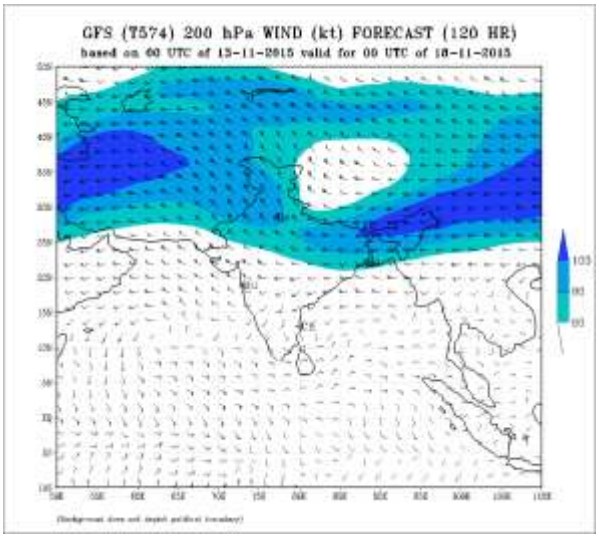

GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 13-11-2015 valid for 00 UTC of 18-11-2015


GPS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 13-11-2015 valid for 00 UTC of 14-11-2015


GPS (T574) 200 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 13-11-2015 valid for 00 UTC of 15-11-2015


GPS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 13-11-2015 valid for 00 UTC of 16-11-2015


GPS (T574) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 13-11-2015 valid for 00 UTC of 17-11-2015


GPS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 13-11-2015 valid for 00 UTC of 18-11-2015

FDP (Cyclone) NOC Report Dated 14 November, 2015

Synoptic features:

- The low pressure area over westcentral and adjoining eastcentral & south Arabian Sea has become less marked. However associated upper air cyclonic circulation lies over central Arabian sea and extends upto 3.1 km above mean sea level
- The low pressure area over southeast Bay of Bengal and neighbourhood now lies over southwest Bay of Bengal & neighbourhood as a well marked low pressure area. Associated upper air cyclonic circulation extends upto mid tropospheric levels. It is likely to move westnorthwestwards towards Tamilnadu coast and would concentrate into a Depression during next 24 hours.

Surface Temperature (SST):

- SST is 28-29°C over southeast adjoining east central Arabian Sea along the west coast except over westcentral AS.
- SST is 28-29°C over westcentral, eastcentral and southeast Bay of Bengal (BoB) and Andaman Sea.

Tropical Cyclone Heat Potential (TCHP):

- TCHP is around is less than 40 kJ/cm^2 north adjoining westcentral Arabian Sea and AS. It is 80-100 kJ/cm^2 over south and east central Arabian Sea and along the west coast.
- TCHP is 80 -100 kJ/cm^2 over most parts of the BoB and Andaman Sea. TCHP is around is less than 40 kJ/cm^2 north adjoining westcentral bay of Bengal.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive and is 30-50x10^{-5}s^{-1} over southwest adjoining westcentral Arabian sea and 20-40x10^{-5}s^{-1} over off Kerala – Karnataka coast
- Relative vorticity at 850 hPa is positive and is 100-130x10^{-5}s^{-1} over and southwest bay of Bengal and south of Sri Lanka coast. Relative vorticity at 850 hPa is positive and is 30-40 x10^{-5}s^{-1} over Tamilnadu coast adjoining south Andhra coast adjoining Andaman Sea.

Convergence:

- Lower level convergence is 5x10^{-5}s^{-1} over eastcentral and most parts of Arabian sea
- Lower level convergence is about 5-10x10^{-5}s^{-1} southwest bay adjoining Tamilnadu coast.

Divergence:

- Upper level divergence is 5-10x10^{-5} s^{-1} over westcentral, rest Arabian Sea is 5-10x10^{-5} s^{-1} is negative.
- Upper level divergence is 10-20x10^{-5} s^{-1} over southwest adjoining southeast Bay of Bengal and Tamilnadu coast.

Wind Shear:

- The vertical wind shear over entire parts of Arabian sea is about >20 knots and except eastcentral Arabian sea is about 5-10 knots adjoining Kerala and Karnataka coast.
- Wind shear is about 5 - 10 knots over entire central parts of the bay of Bengal and Andaman sea and >20 knots north and south of bay of Bengal

Wind Shear Tendency:

- The vertical wind shear tendency is increasing by 5- 10 knots south Arabian sea adjoining Indian ocean.

- The vertical wind shear tendency is increasing (5 to 10 knots) most parts of bay of Bengal and Andaman sea and also over southwest bay of Bengal adjoining Tamilnadu coast.

Upper tropospheric ridge:

- The upper tropospheric ridge at 200 hPa runs along 16.0°N.

M.J.O. Index:

- MJO index lies over Phase 3 with amplitude greater than 1 and would continue to move in the same phase during next 1 days and it would shift to phase 2 with amplitude greater than 1.

Storms and Depression over South China Sea/ South Indian Ocean: NIL

Satellite:

Inference based on INSAT imagery of **140900** UTC:

Bay of Bengal & Andaman Sea:-

Broken low and medium clouds with embedded intense to very intense convection lie over south bay of Bengal adjoining Indian ocean between latitude 2.5°N to 15.5°N west of longitude 90.5°E coastal Tamilnadu, Sri Lanka and Palk Straight in association with well-marked low pressure area.

Scattered low and medium clouds with embedded isolated moderate to intense convection over Andaman sea.

Arabian Sea:-

Scattered low and medium clouds with embedded moderate to intense convection over Arabian sea between latitude 12.0°N to 17.5°N and longitude 56.0°E to 63.5°E in association with low pressure area

Scattered low and medium clouds with embedded isolated moderate to intense convection over southeast Arabian sea off Kerala coast.

NWP Input for FDP Cyclone based on 0000 UTC of 14.11.2015

NWP Analysis

IMD-GFS model product analysis based on 00UTC of 14th November 2015 shows that the low pressure are over the southeast Arabian Sea moved westward. Forecast shows further westward movement of the system during next 48 hours. Model analysis also shows formation of an extended low pressure area over southwest Bay of Bengal. Forecasts show non intensification of both the systems and re-emergence of the southwest Bay of Bengal system into the southeast Arabian Sea on 17 November 2015.

IMD-WRF model product analysis based on 00UTC of 14th November 2015 shows that the low pressure area over the southeast Arabian Sea moved westward. Forecast shows further westward movement of the system during next 48 hours. Model analysis also shows formation of an extended low pressure area over southwest Bay of Bengal. Forecasts show non intensification of both the systems and re-emergence of the southwest Bay of Bengal system into the southeast Arabian Sea on 17 November 2015.

NWP products are available at:

http://202.54.31.51/bias/gfsproducts.php

http://202.54.31.51/bias/wrf27pro.php

http://202.54.31.51/bias/potentialparameter.php

NCMRWF-NCUM: NCUM model indicates the well-marked low pressure area over southwest Bay on 14th and intensification into a depression on 15th,deep depression on 16th with northwestward movement crossing north Tamil Nadu coast by 16th.

NCMRWF-GFS: NCMRWF-GFS indicates formation of low over southwest Bay on 15th, well-marked on 16th while initially moving northwestward movement and then northward towards north Tamil Nadu & south Andhra Coast and cross north Tamilnadu coast on 17th and weaken into low pressure area on 18th.

NCEP-GFS NCEP-GFS the low pressure area over southwest Bay on 14th movement northwestwards and intensification upto WML/depression on 16th and cross Tamilnadu coast and weakening as lopar over Tamil Nadu coast.

ECMWF model suggests formation of low over westcentral Bay adjoining north Tamilnadu and south Andhra coast on 17th. It moved west-northwestwards and cross between north Tamilnadu and south Andhra coast on 18th Nov.

JMA: model suggests formation of a low on 15th over Sri Lanka coast, & adjoining southwest Bay would move northwestward with intensification into a well-marked low on 16th and cross Tamilnadu coast on 17th become less marked on 17/1200 UTC.

ARP-Meteo France: model suggests formation of low pressure area over southwest, southeast & adjoining west central Bay on 15th with northward movement with intensification into deep depression on 17th over west central Bay near north Tamilnadu coast and south Andhra coast.

GENESIS POTENTIAL PARAMETER: Model forecast of GPP based on 0000 UTC of 14 November 2015 suggests development of a cyclogenesis zone over southwest Bay of Bengal off Tamil Nadu coast on 15 November 2015 and re-emergence of the system into the southeast Arabian Sea on 17 November 2015.

Summary and Conclusion:

Bay of Bengal and Andaman Sea:

The well-marked low pressure area over southwest Bay of Bengal and neighbourhood would move west-northwestward towards north Tamilnadu coast and concentrate into a depression during next 24 hrs.

Probability of cyclogenesis over Bay of Bengal and Andaman Sea during next 120 hours:

24 HOURS	24-48 HOURS	48-72 HOURS	72-96 HOURS	96-120 HOURS
Fair	Moderate	High	High	Nil

Arabian Sea:

Most models predict gradual weakening of the low over central Arabian Sea.

Probability of cyclogenesis over Arabian Sea during next 120 hours:

24 HOURS	24-48 HOURS	48-72 HOURS	72-96 HOURS	96-120 HOURS
Nil	Nil	Nil	Nil	Nil

Advisory:

IOP will be conducted for Tamil Nadu and Puducherry coast during the 15-17 Nov. 2015

Annexure-I

Status of observational system:

Synoptic observation:

Region	Date/Time (UTC)		
	13/12	14/00	14/03
India	48	33	51
Coastal stations			
WB	8	3	9
Odisha	6	5	6
AP	14	12	14
Tamil Nadu	12	10	14
Puducherry	2	2	2
A & N	6	1	6
Bangladesh	10	10	10
Myanmar	0	0	11
Thailand	2	2	2
Sri Lanka	8	7	8

AWS Observations:

	Date/Time		
Region	13/12	14/00	14/03
India	69	68	70
Coastal stations			
WB	7	8	9
Odisha	17	15	16
AP	16	16	16
Tamil Nadu	29	29	28
&			
Puducherry	-	-	1
A & N	-	-	-

RS/RW (12Z) of 13/11/2015 **-0/39**
No. of Ascents reaching 250 hPa level: 0, MISDA: 39

RS/RW (00Z) of 14/11/2015- **27/39**
No. of Ascents reaching 250 hPa level:23, MISDA:4

No. of PILOT Ascents

13/12Z	14/00Z
5	3

Buoy Data

13/12Z	14/00Z	14/03Z
7	13	7

STATUS OF CHENNAI REGION OBSERVATION

No. of Synop data

Date→	**13.11.2015**							
UTC→	**00**	**03**	**06**	**09**	**12**	**15**	**18**	**21**
Chennai Region (Coasts of AP & TN)	**20**	**22**	**20**	**20**	**22**	**20**	**20**	**20**

No. of RS/RW Ascents

00Z /13.11.2015 : 6
No. of Ascents reaching 250 hPa level = 5
MISDA : 2

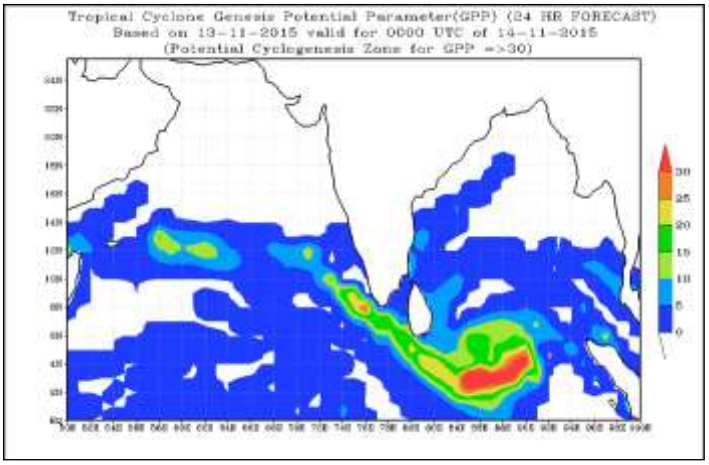
12Z /13.11.2015 : 0
No. of Ascents reaching 250 hPa level =0
MISDA : 8

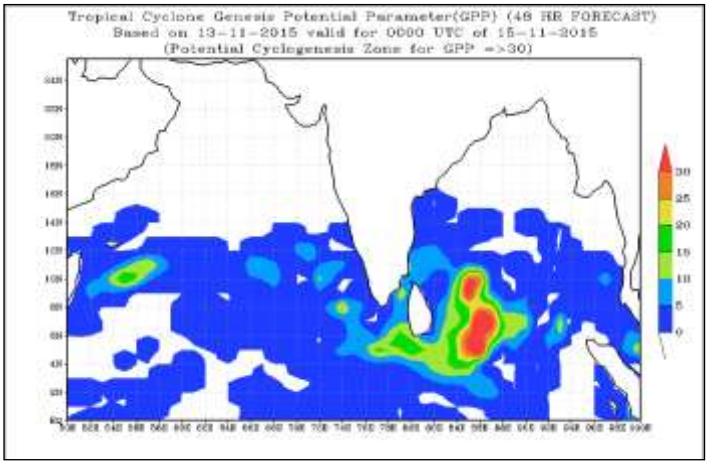
No. of PILOT Ascents:

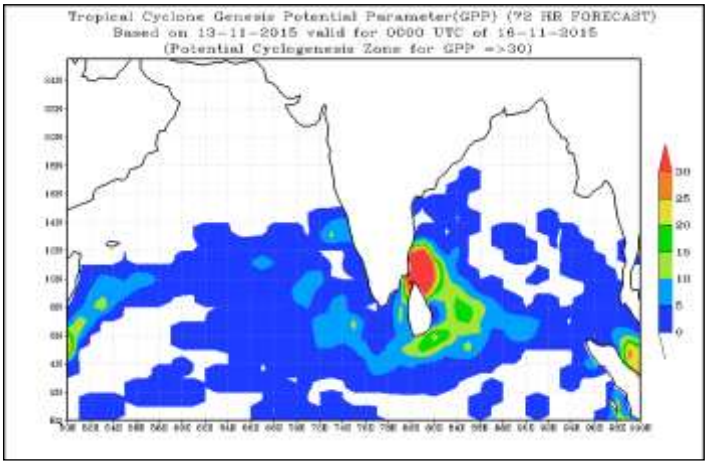
13.11.2015

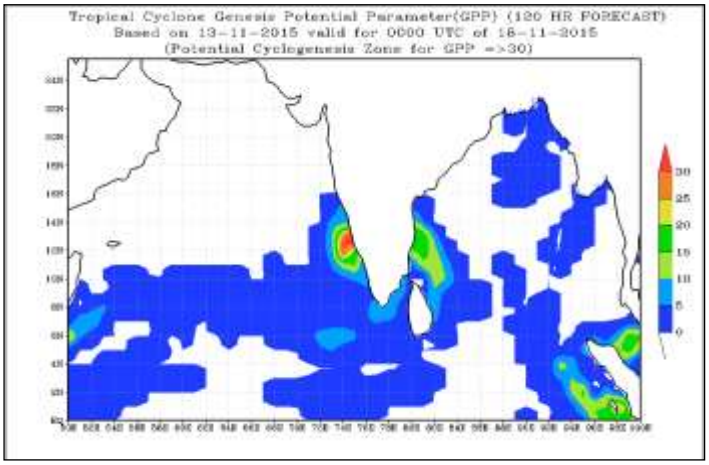
06Z	18Z
1	2

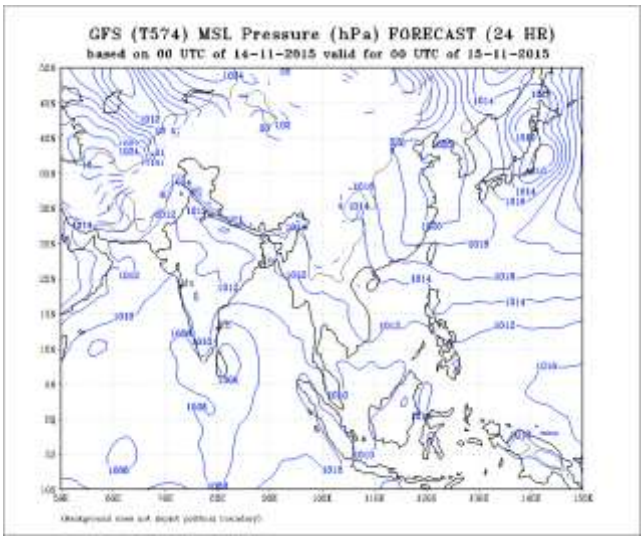
Annexure-II

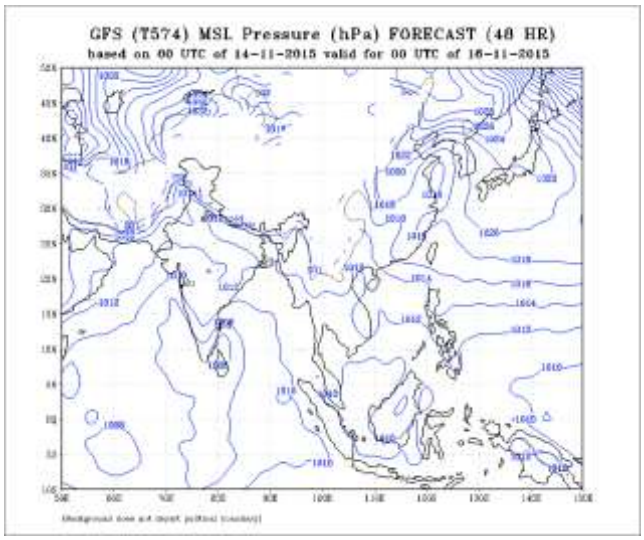

Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 13-11-2015 valid for 0000 UTC of 14-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

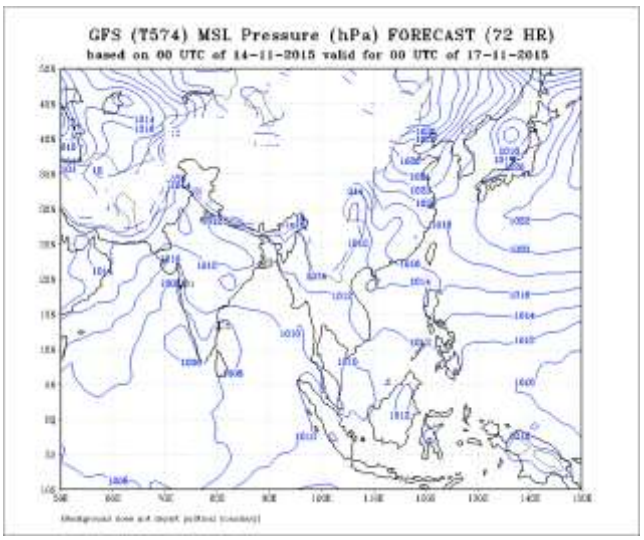

Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
Based on 13-11-2015 valid for 0000 UTC of 15-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

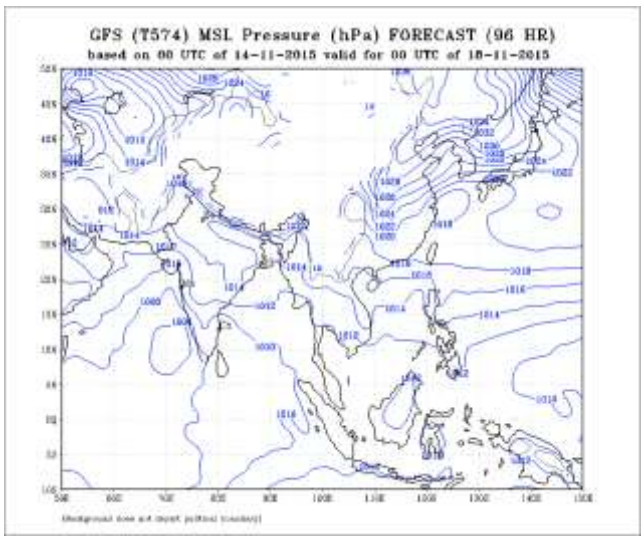

Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 13-11-2015 valid for 0000 UTC of 16-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

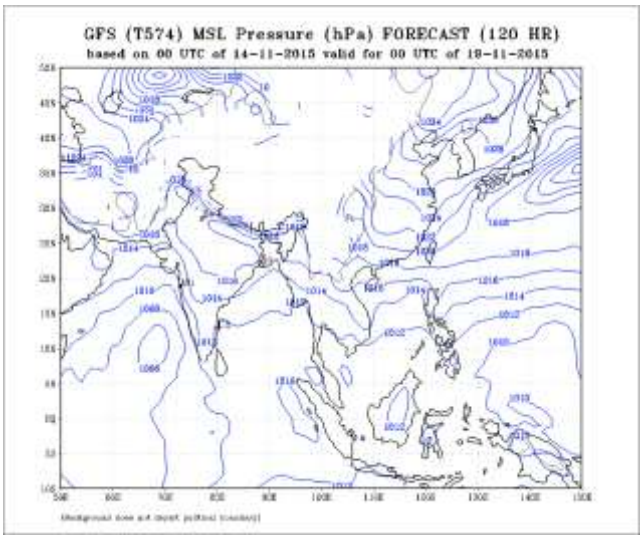

Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 13-11-2015 valid for 0000 UTC of 18-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

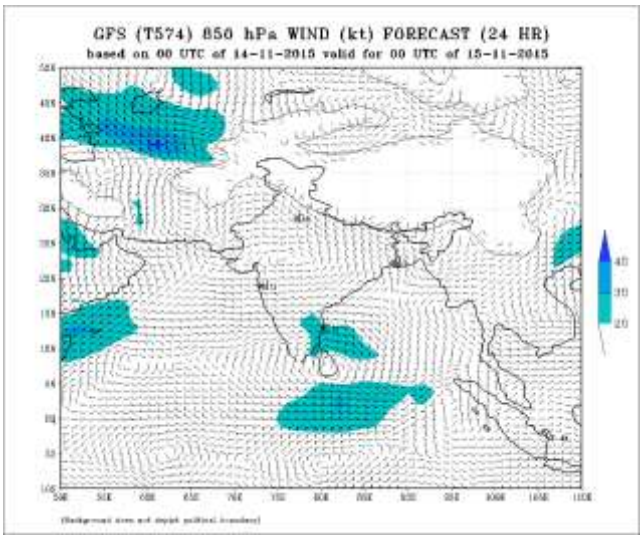

GFS (T574) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 14-11-2015 valid for 00 UTC of 15-11-2015

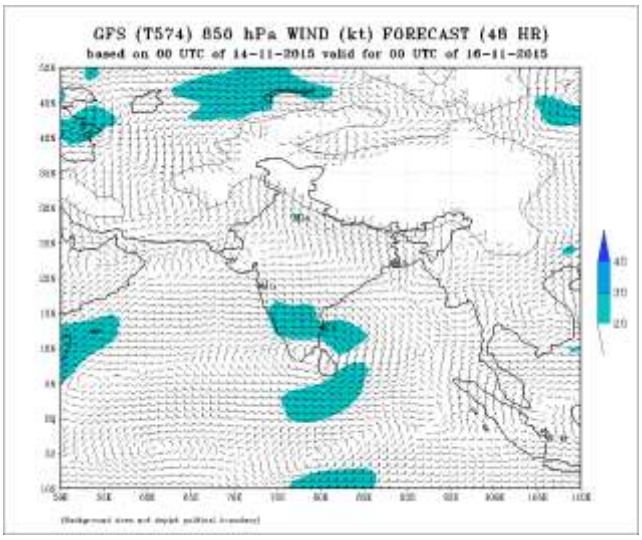

GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 14-11-2015 valid for 00 UTC of 16-11-2015

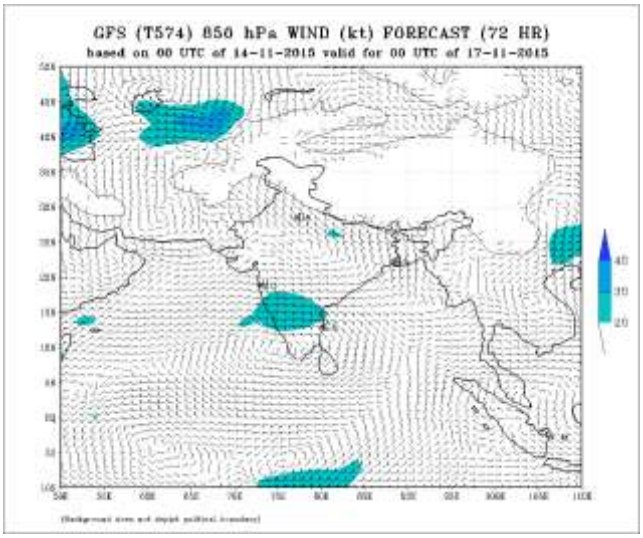

GFS (T574) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 14-11-2015 valid for 00 UTC of 17-11-2015


GFS (T574) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 14-11-2015 valid for 00 UTC of 18-11-2015


GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 14-11-2015 valid for 00 UTC of 19-11-2015


GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 14-11-2015 valid for 00 UTC of 15-11-2015


GFS (T574) 850 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 14-11-2015 valid for 00 UTC of 16-11-2015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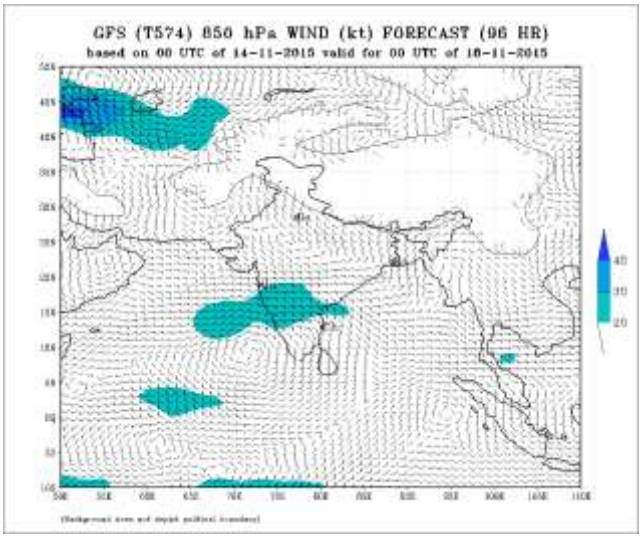
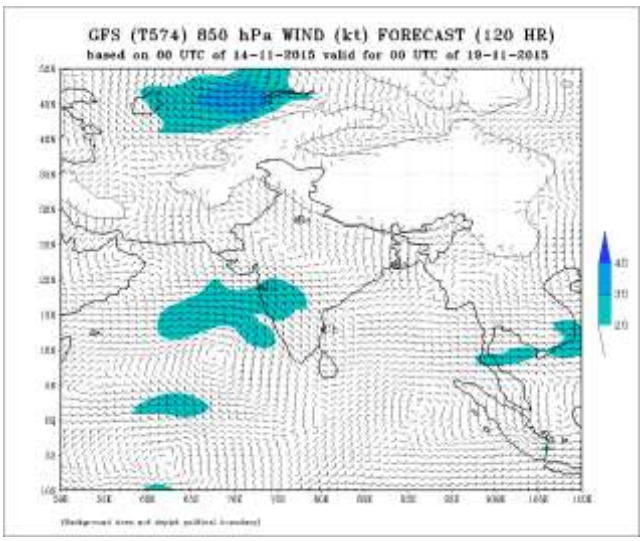
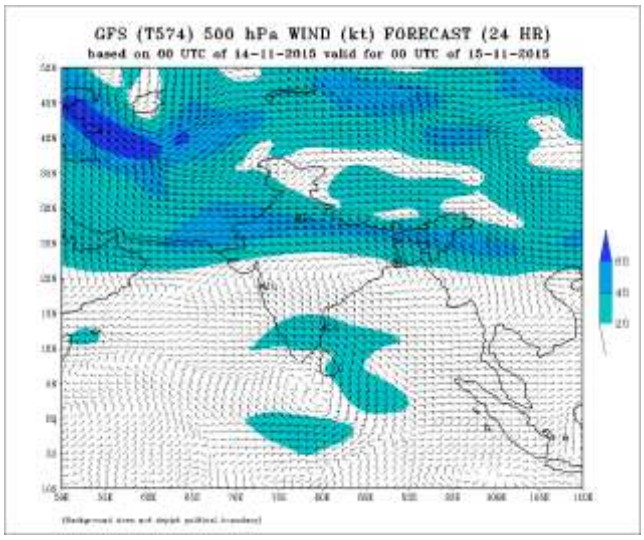
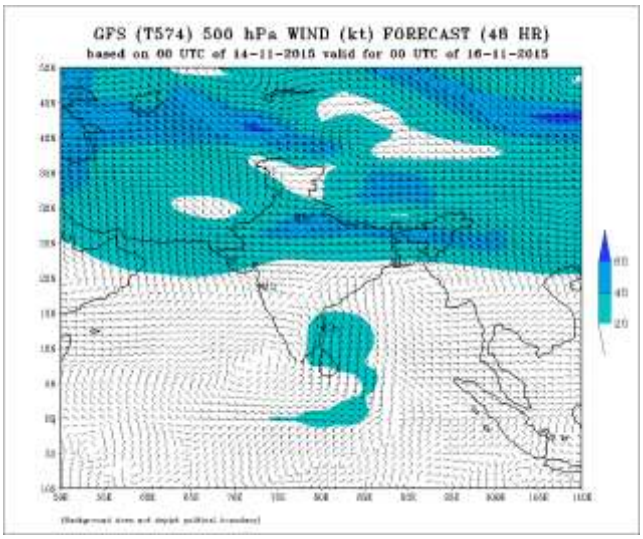
based on 00 UTC of 14-11-2015 valid for 00 UTC of 17-11-2015


GFS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 14-11-2015 valid for 00 UTC of 18-11-2015


GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 14-11-2015 valid for 00 UTC of 19-11-2015


GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 14-11-2015 valid for 00 UTC of 15-11-2015


GFS (T574) 500 hPa WIND (kt) FORECAST (48 HR)
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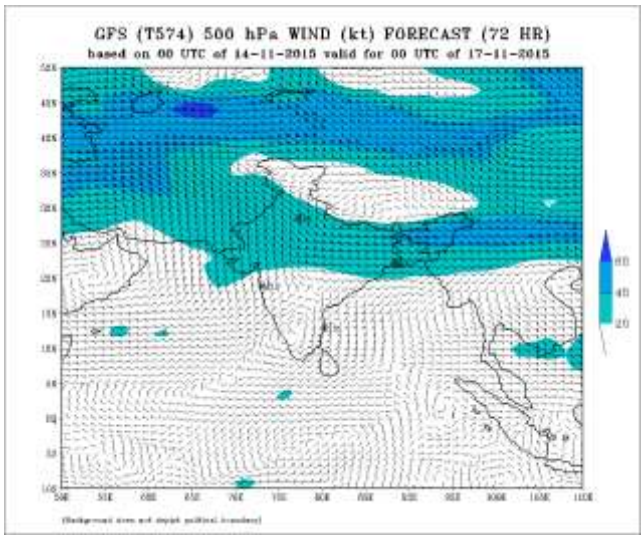
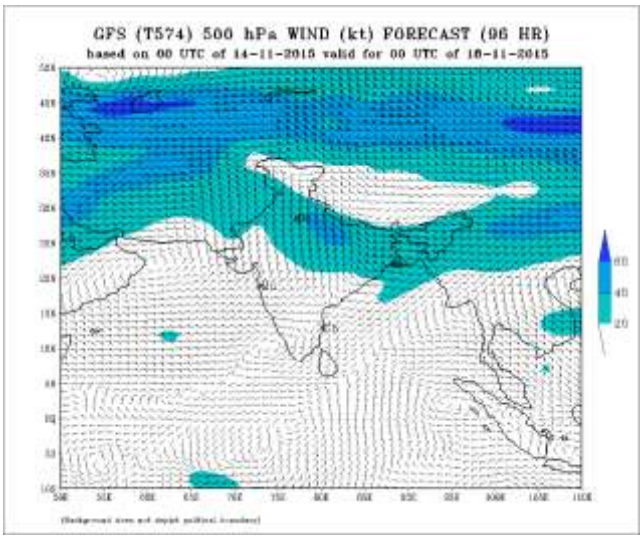

GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 14-11-2015 valid for 00 UTC of 17-11-2015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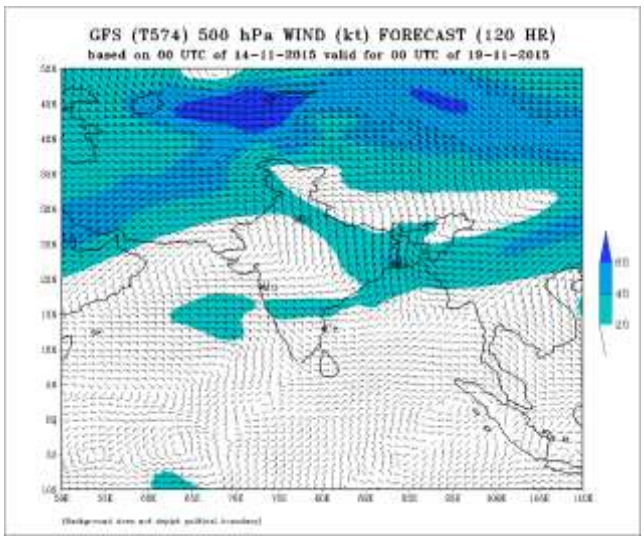
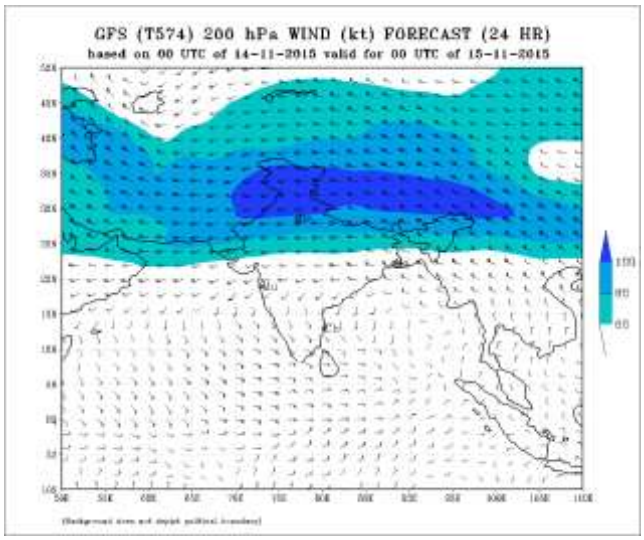
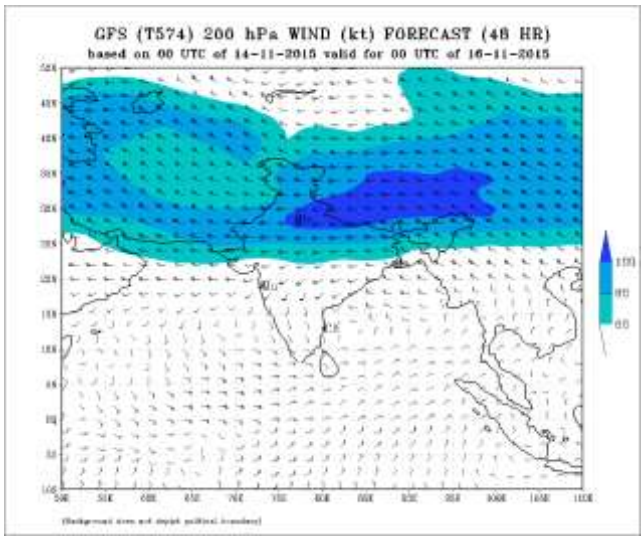
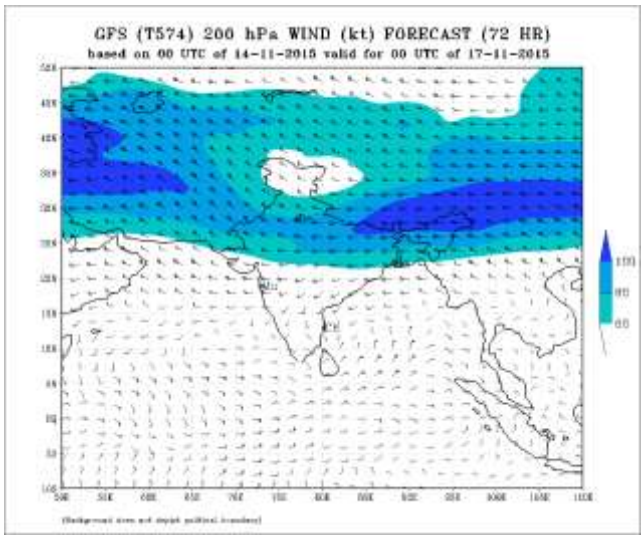
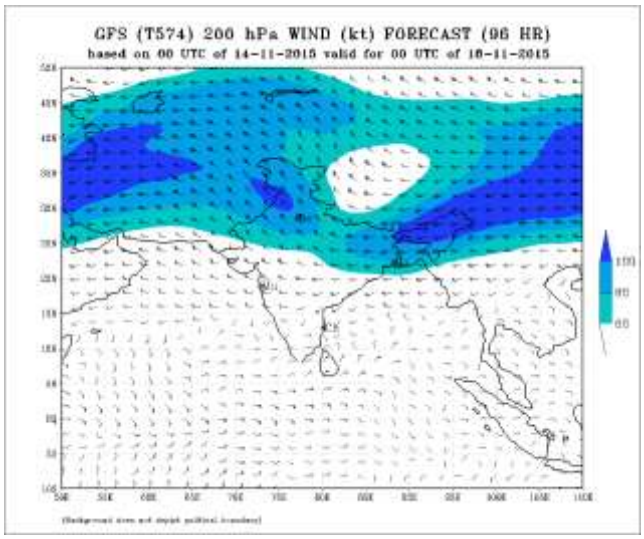
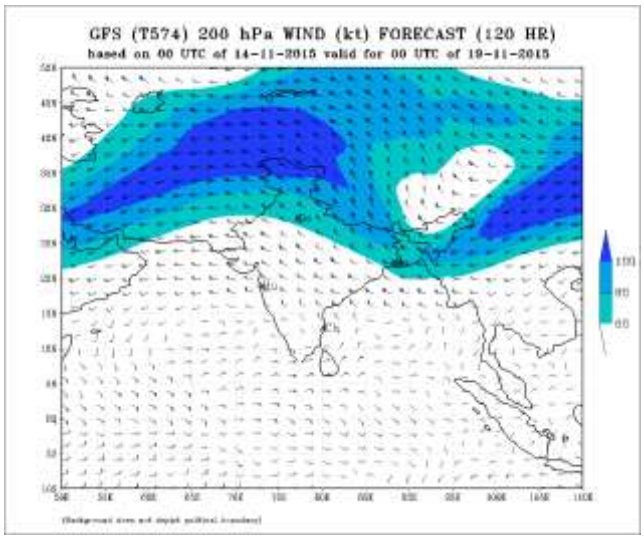

GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 14-11-2015 valid for 00 UTC of 19-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 14-11-2015 valid for 00 UTC of 15-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 14-11-2015 valid for 00 UTC of 16-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 14-11-2015 valid for 00 UTC of 17-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 14-11-2015 valid for 00 UTC of 18-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 14-11-2015 valid for 00 UTC of 19-11-2015

FDP (Cyclone) NOC Report Dated 15 November, 2015

Synoptic features:

- Yesterday's well marked low pressure area (WML) over southwest Bay of Bengal (BOB) and neighbourhood now lies over southwest BOB and adjoining Sri Lanka. It would move west-northwestward towards Tamil Nadu coast and may concentrate into a depression during next 24 hrs.

Surface Temperature (SST):

- SST is 28-29°C over westcentral, eastcentral and southeast Bay of Bengal and Andaman Sea.
- SST is 28-29°C over southeast and adjoining eastcentral Arabian Sea (AS). It is 26-28°C over most parts of westcentral AS.

Tropical Cyclone Heat Potential (TCHP):

- TCHP is 60 -80 kJ/cm^2 over the WML over southwest BOB. It is 60 -80 kJ/cm^2 off north Tamil Nadu coast.
- TCHP is 80-100 kJ/cm^2 over south and eastcentral AS and along the west coast of India. It is less than 40 kJ/cm^2 over north and adjoining westcentral AS.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive and is about 100x10^{-5}s^{-1} over southwest BOB and Sri Lanka coast.
- It is 30-50x10^{-5}s^{-1} over southwest and adjoining westcentral AS and 20-40x10^{-5}s^{-1} off Kerala – Karnataka coast

Convergence:

- Lower level convergence is about 30x10^{-5}s^{-1} near the WML over southwest BOB.
- Lower level convergence is 5x10^{-5}s^{-1} over parts of westcentral AS.

Divergence:

- Upper level divergence is 30x10^{-5} s^{-1} near the WML over southwest BOB.
- Upper level divergence is 30x10^{-5} s^{-1} over parts of westcentral AS.

Wind Shear:

- Wind shear near the WML over southwest BOB is 10-20 knots.
- The vertical wind shear over southern parts of AS south of 15°N is about 10-20 knots. It is greater than 30 knots over most parts of AS north of 15°N.

Wind Shear Tendency:

- There is not much change in the vertical wind shear near the area of WML over the southwest BOB.
- The vertical wind shear tendency is increasing by 5- 10 knots over northern parts of AS, north of 15°N.

Upper tropospheric ridge:

- The upper tropospheric ridge at 200 hPa runs along 14.0°N over the BOB.

M.J.O. Index:

- MJO index is in the border of Phase 2 and Phase 3 with amplitude greater than 1 and would move to phase2 during next 24 hrs.

Storms and Depression over South China Sea/ South Indian Ocean: NIL

Satellite:

Inference based on INSAT imagery of **150300** UTC:

Bay of Bengal & Andaman Sea:-

According to satellite imagery, intensity is T 1.0. Vortex is located near latitude 7.2°N and 82.5° E. Associated broken low and medium clouds with embedded intense to very intense convection lie over south bob and adjoining Indian Ocean between latitude 5.0°N to latitude 14.0°N and west of longitude 87.0°E and over Tamil Nadu, south coastal Andhra Pradesh, Sri Lanka, Palk Strait and gulf of Mannar. Minimum cloud top temperature is -90°C. Also scattered low and medium clouds with embedded isolated moderate to intense convection lie over rest of BOB south of latitude 18.0°N and west of longitude 90.0°E.

Arabian Sea:-

Scattered low and medium clouds with embedded intense to very intense convection lie over Arabian Sea between latitude 8.5°N to 12.5°N and longitude 51.5°E to 58.5°E in association with low level circulation over the area. Also, scattered low and medium clouds with embedded isolated moderate to intense convection lie over southeast AS.

NWP Input for FDP Cyclone based on 0000 UTC of 15.11.2015

NWP Analysis

IMD-GFS and IMD-WRF model product analysis based on 00UTC of 15 November 2015 shows that a low pressure area has formed over the southwest Bay of Bengal off Sri Lanka coast. It moves west-northwestwards towards Tamil Nadu coast. WRF model forecast shows slight intensification of the system over the Tamil Nadu coast. Forecasts also show re-emergence of the system into the southeast Arabian Sea off Kerala coast on 18 November 2015.

NWP products are available at:
http://202.54.31.51/bias/gfsproducts.php
http://202.54.31.51/bias/wrf27pro.php
http://202.54.31.51/bias/potentialparameter.php

NCMRWF-NCUM: NCUM model shows the WML off Sri Lanka coast which moves northwestwards and crosses north Tamil Nadu coast in 24 hrs. It re-emerges into the AS on 18th as a low.

NCMRWF-GFS: NCMRWF-GFS shows the WML off Sri Lanka coast which moves northwestwards with slight intensification and crosses Tamil Nadu coast on 16th. It then re-emerges into the AS on 18th as a low.

CEP-GFS NCEP-GFS shows the WML off Sri Lanka coast which moves westward with slight intensification and crosses Tamil Nadu coast on 16th. It emerges into AS on 17th as a low.

ECMWF model shows the WML off Sri Lanka coast which moves west-northwestwards and crosses Tamil Nadu coast on 16th without much intensification

JMA: model suggests intensification of the WML off Sri Lanka coast into a depression and moving northwestward towards Tamil Nadu coast on 16th. It subsequently skirts the TN coast with slight intensification and crosses north Tamil Nadu coast on 18th.

ARP-Meteo France: model shows the WML off Sri Lanka coast intensifying into a depression and moving northwestwards towards Tamil Nadu coast.

GPP: Model analysis of GPP based on 0000 UTC of 15 November 2015 shows a cyclogenesis zone over southwest Bay of Bengal off Sri Lanka coast. Forecasts show northwestward movement of the system during next 48 hours and re-emergence of the system into the southeast Arabian Sea on 19 November 2015 but becomes less marked.

Summary and Conclusion:

Bay of Bengal and Andaman Sea:

The well-marked low pressure area over southwest Bay of Bengal and neighbourhood would move northwestward towards north Tamil Nadu coast and may concentrate into a depression during next 24 hrs. Some models suggest only gradual intensification upto depression during next 48 hrs. Most models suggest initial west-northwest and then northwestward movement towards north Tamil Nadu coast during next 48 hrs.

Probability of cyclogenesis over Bay of Bengal and Andaman Sea during next 120 hours:

24 HOURS	24-48 HOURS	48-72 HOURS	72-96 HOURS	96-120 HOURS
Fair	Moderate	Nil	Nil	Nil

Arabian Sea:

Probability of cyclogenesis over Arabian Sea during next 120 hours:

24 HOURS	24-48 HOURS	48-72 HOURS	72-96 HOURS	96-120 HOURS
Nil	Nil	Nil	Nil	Nil

Advisory:

IOP will be conducted for Tamil Nadu and Puducherry coast during the 15-17 NOV. 2015

Annexure-I

Status of observational system:

Synoptic observation: Not available

AWS Observations:

	Date/Time (UTC)		
Region	**14/12**	**15/00**	**15/03**
India	**70**	**67**	**68**
Coastal stations			
WB	**7**	**7**	**9**
Odisha	**17**	**14**	**14**
AP	**15**	**16**	**15**
Tamil Nadu	**30**	**29**	**29**
&			
Puducherry	**1**	**1**	**1**
A & N	**-**	**-**	**-**

RS/RW (12Z) of 14/11/2015 **-0/39**
No. of Ascents reaching 250 hPa level: 0, MISDA: 39
RS/RW (00Z) of 15/11/2015- **23/39**
No. of Ascents reaching 250 hPa level:22, MISDA:16

No. of PILOT Ascents

14/12Z	15/00Z
6	3

Buoy Data

14/12Z	15/00Z	15/03Z
10	8	9

STATUS OF CHENNAI REGION OBSERVATION

No. of Synop data

Date→	**14.11.2015**							
UTC→	**00**	**03**	**06**	**09**	**12**	**15**	**18**	**21**
Chennai Region (Coasts of AP & TN)	**20**	**22**	**20**	**20**	**22**	**20**	**20**	**20**

No. of RS/RW Ascents

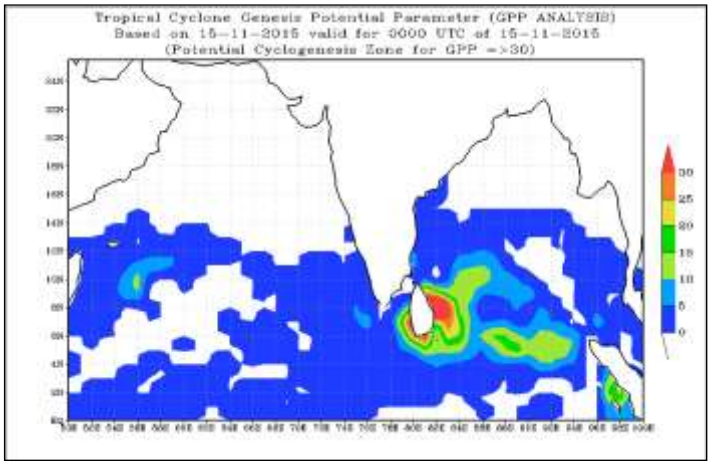
00Z /14.11.2015 : 6
No. of Ascents reaching 250 hPa level = 6
MISDA : 2
12Z /14.11.2015 : 1
No. of Ascents reaching 250 hPa level =1
MISDA : 7

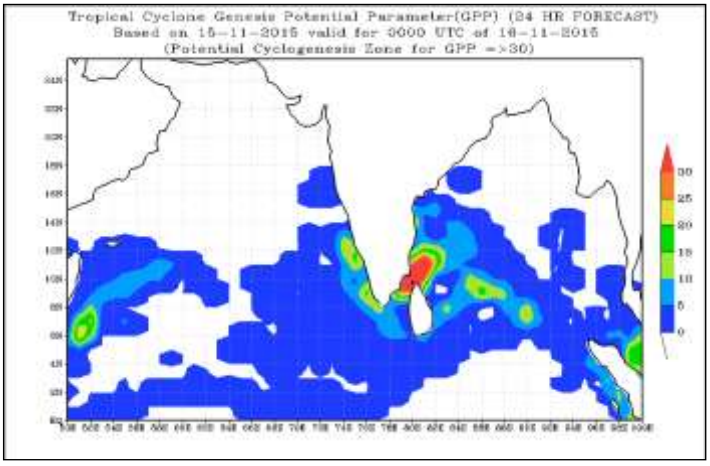
No. of PILOT Ascents:

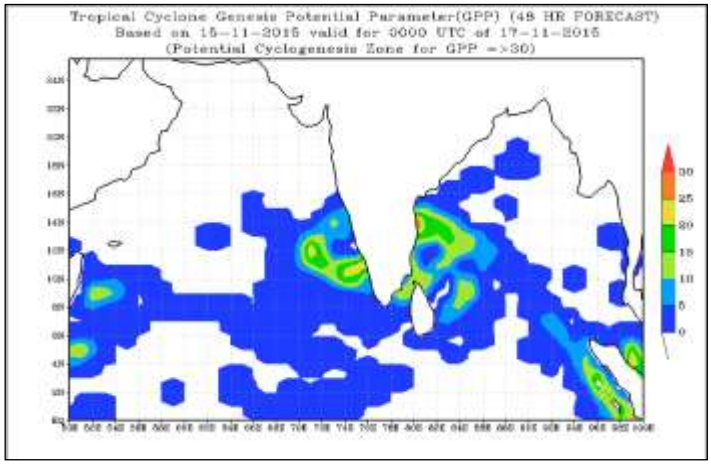
14.11.2015

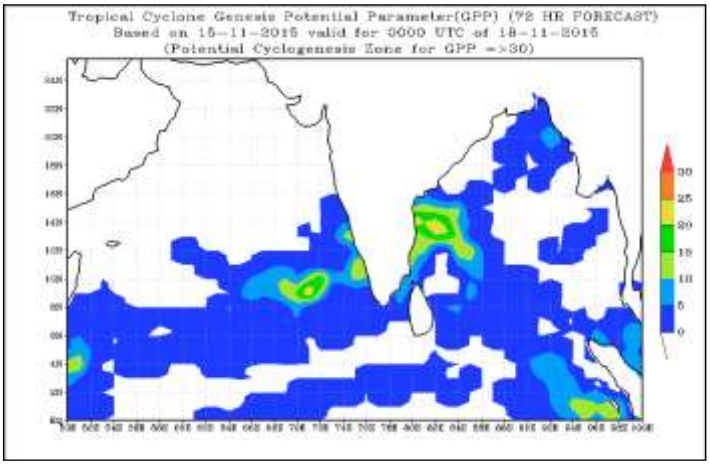
06Z	18Z
4	4

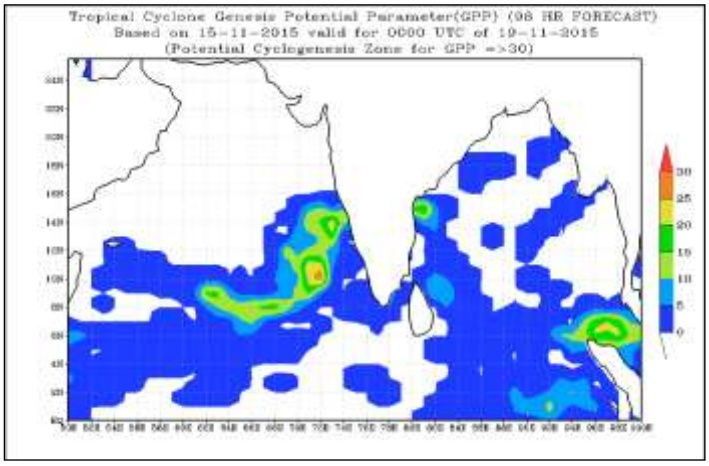
Annexure-II

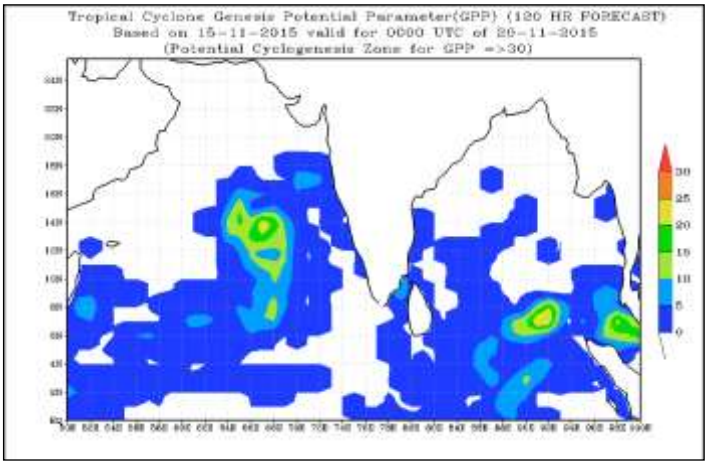

Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 15-11-2015 valid for 0000 UTC of 15-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

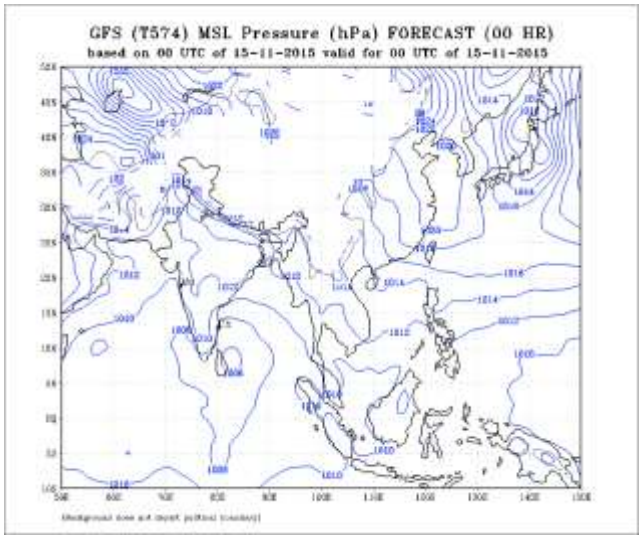

Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 15-11-2015 valid for 0000 UTC of 16-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

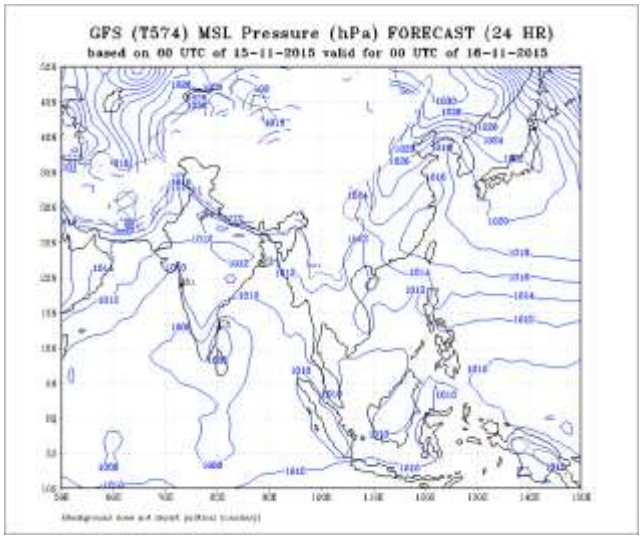

Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
Based on 15-11-2015 valid for 0000 UTC of 17-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

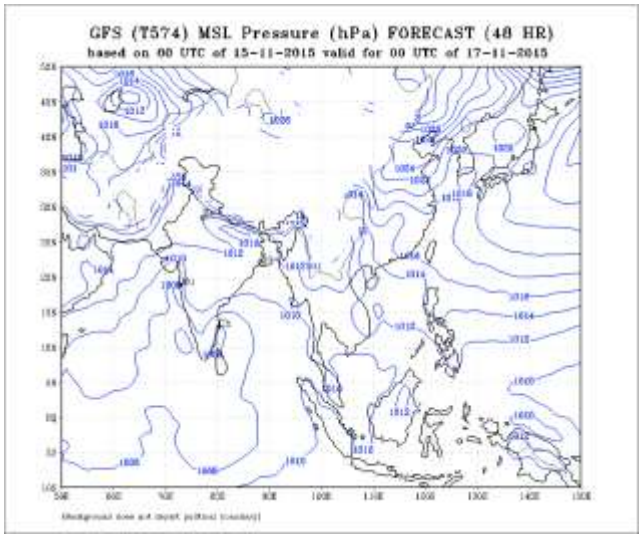

Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 15-11-2015 valid for 0000 UTC of 18-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

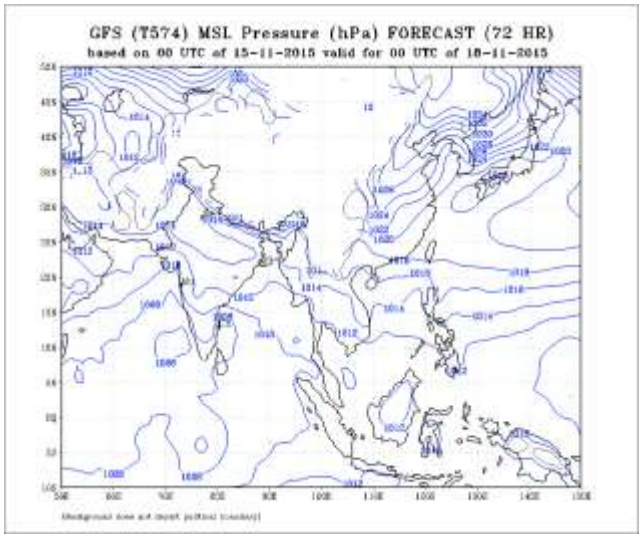

Tropical Cyclone Genesis Potential Parameter(GPP) (96 HR FORECAST)
Based on 15-11-2015 valid for 0000 UTC of 19-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

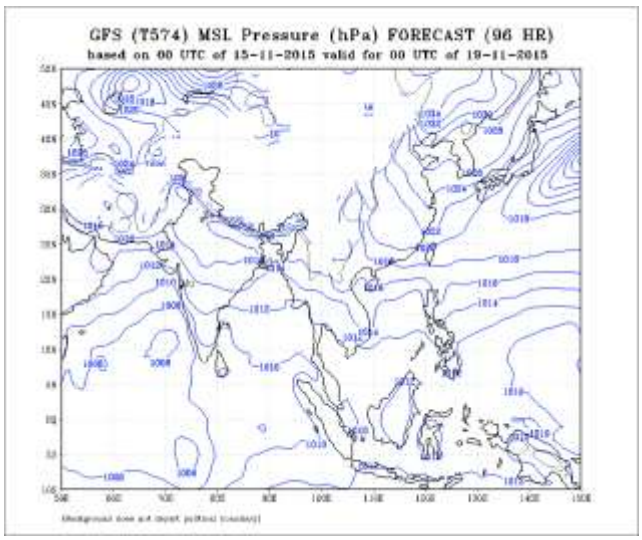

Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 15-11-2015 valid for 0000 UTC of 20-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

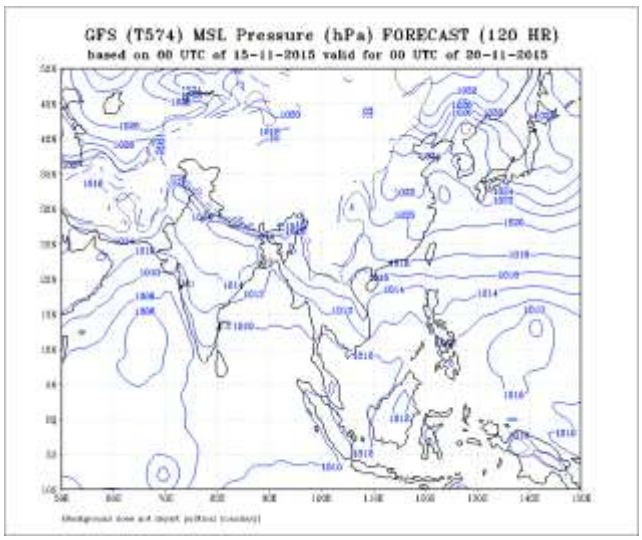

GFS (T574) MSL Pressure (hPa) FORECAST (00 HR)
based on 00 UTC of 15-11-2015 valid for 00 UTC of 15-11-2015

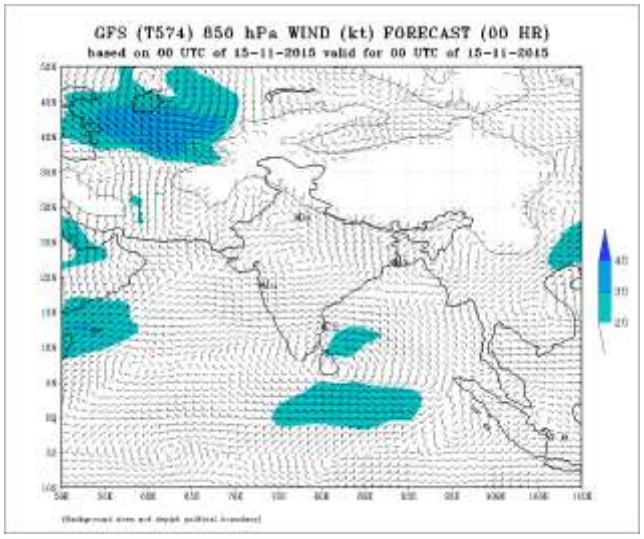

GFS (T574) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 15-11-2015 valid for 00 UTC of 16-11-2015

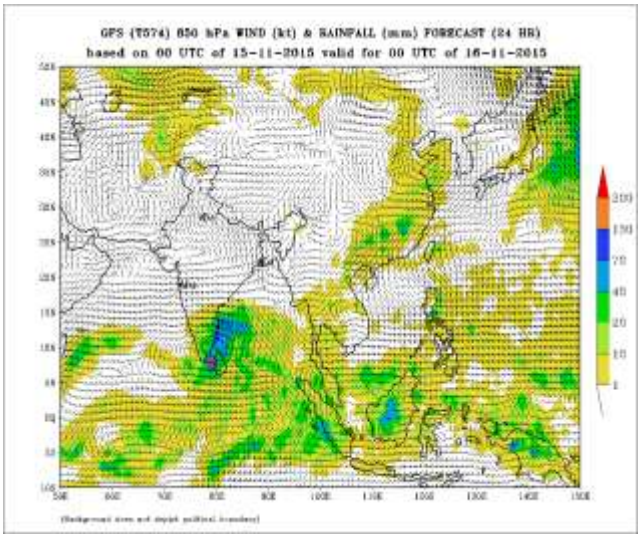

GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 15-11-2015 valid for 00 UTC of 17-11-2015

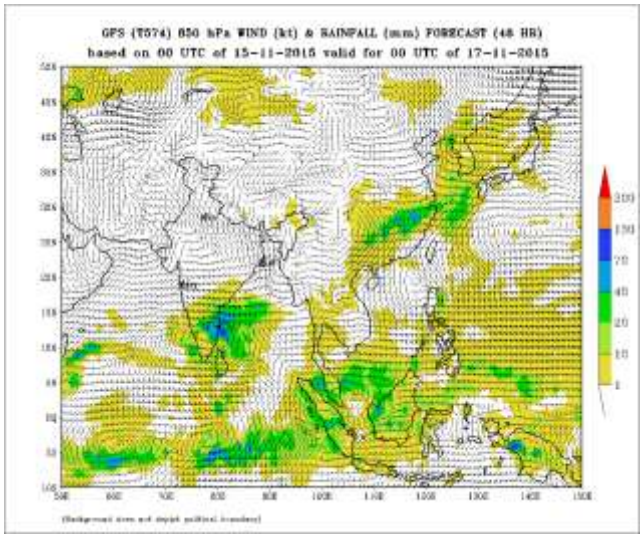

GFS (T574) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 15-11-2015 valid for 00 UTC of 18-11-2015

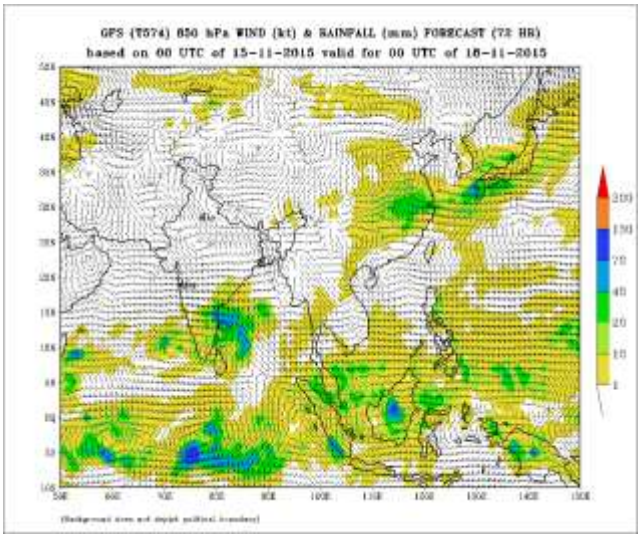

GFS (T574) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 15-11-2015 valid for 00 UTC of 19-11-2015

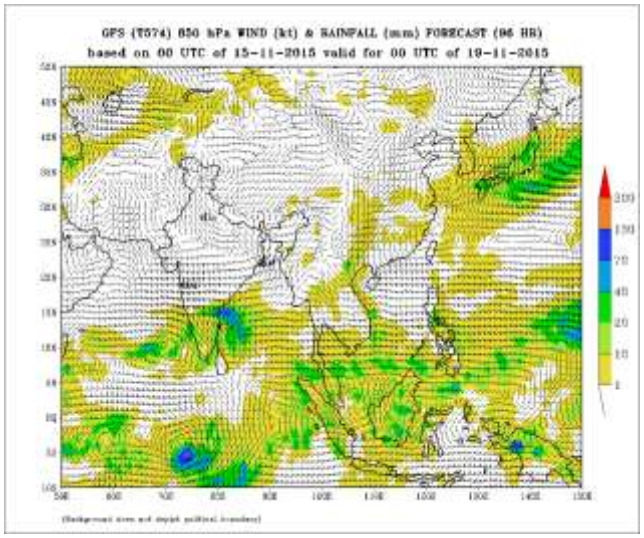

GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 15-11-2015 valid for 00 UTC of 20-11-2015

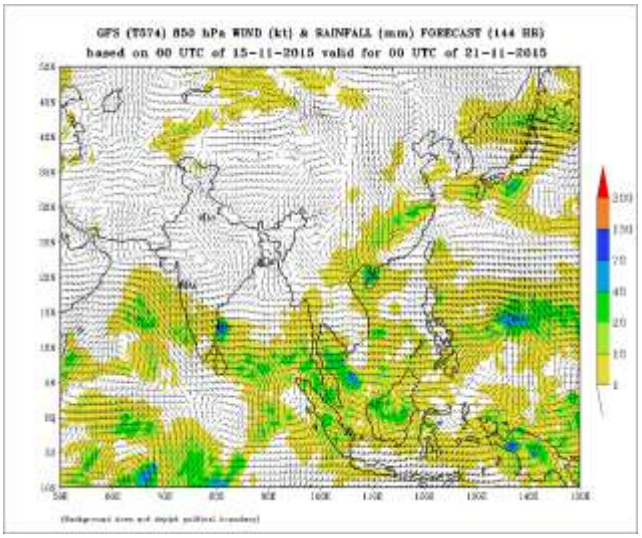

GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 15-11-2015 valid for 00 UTC of 15-11-2015

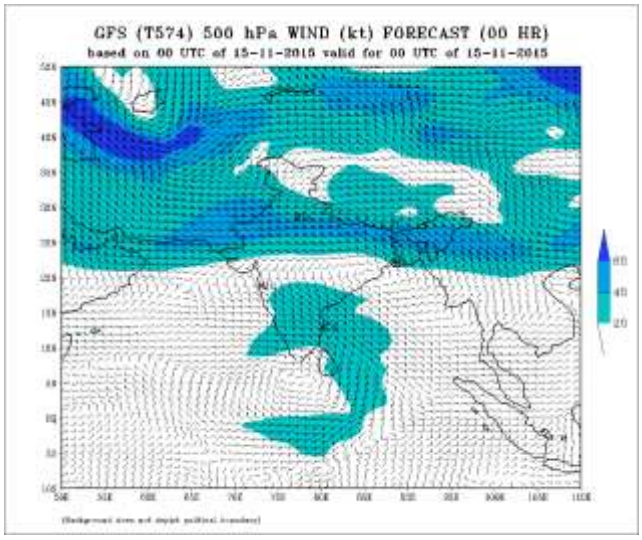

GFS (T574) 850 hPa WIND (kt) & RAINFALL (mm) FORECAST (24 HR)
based on 00 UTC of 15-11-2015 valid for 00 UTC of 16-11-2015

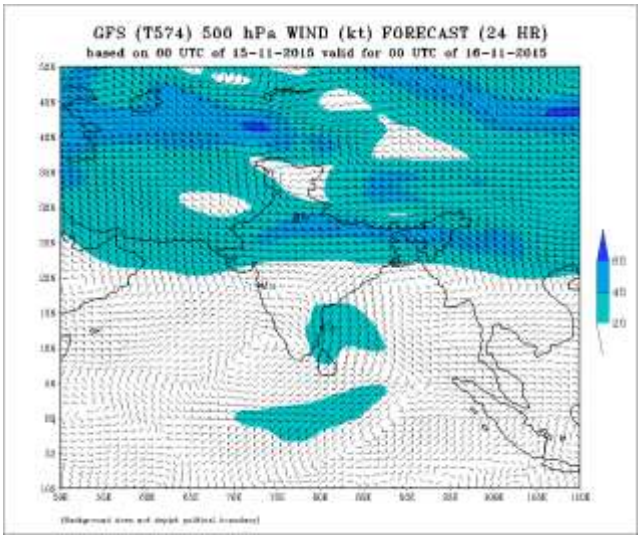

GFS (T574) 850 hPa WIND (kt) & RAINFALL (mm) FORECAST (48 HR)
based on 00 UTC of 15-11-2015 valid for 00 UTC of 17-11-2015

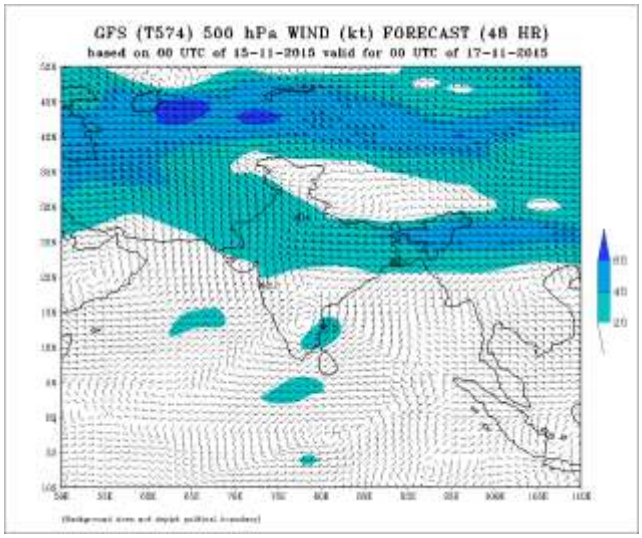

GFS (T574) 850 hPa WIND (kt) & RAINFALL (mm) FORECAST (72 HR)
based on 00 UTC of 15-11-2015 valid for 00 UTC of 18-11-2015

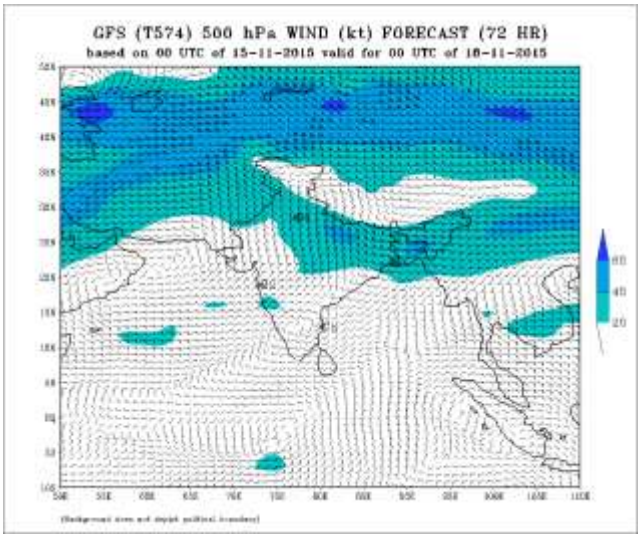

GFS (T574) 850 hPa WIND (kt) & RAINFALL (mm) FORECAST (96 HR)
based on 00 UTC of 15-11-2015 valid for 00 UTC of 19-11-2015

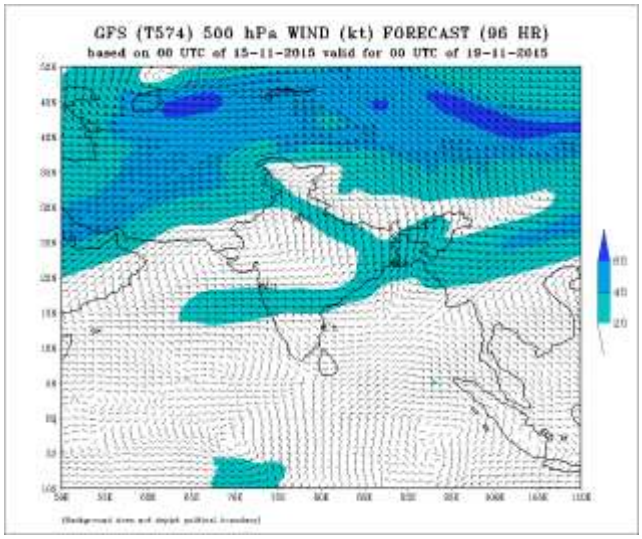

GFS (T574) 850 hPa WIND (kt) & RAINFALL (mm) FORECAST (144 HR)
based on 00 UTC of 15-11-2015 valid for 00 UTC of 21-11-2015

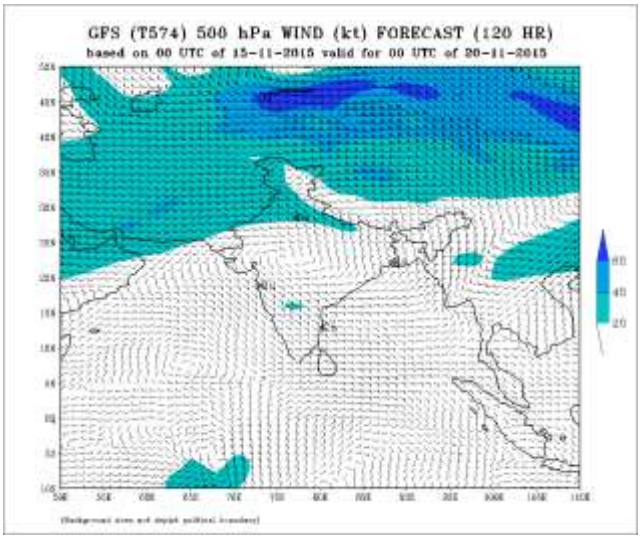

GFS (T574) 500 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 15-11-2015 valid for 00 UTC of 15-11-2015

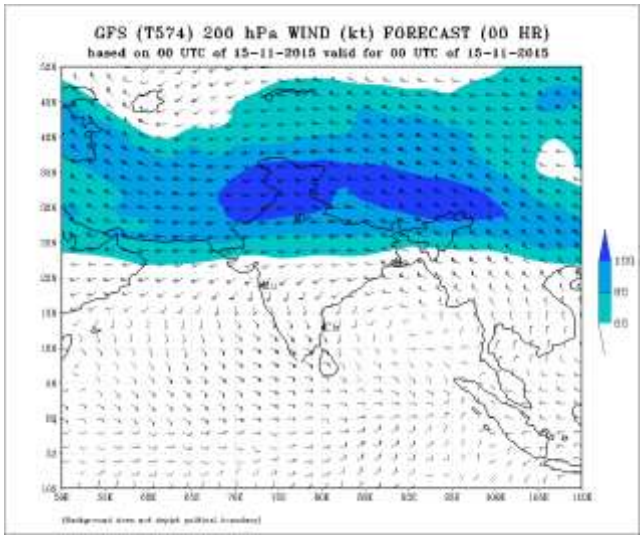

GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 15-11-2015 valid for 00 UTC of 16-11-2015

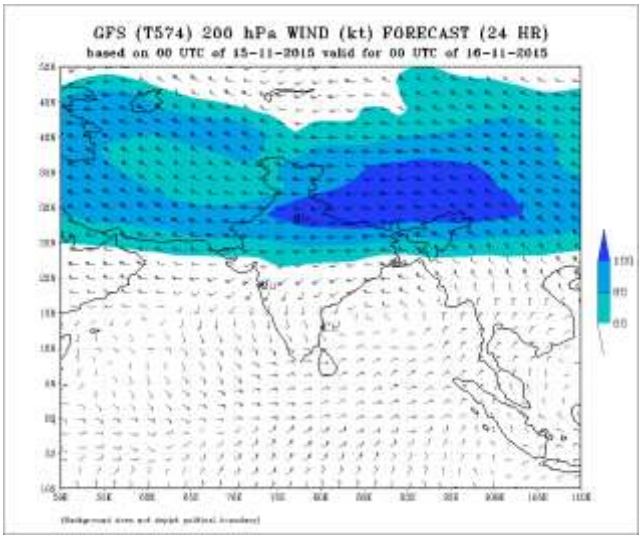

GFS (T574) 500 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 15-11-2015 valid for 00 UTC of 17-11-2015

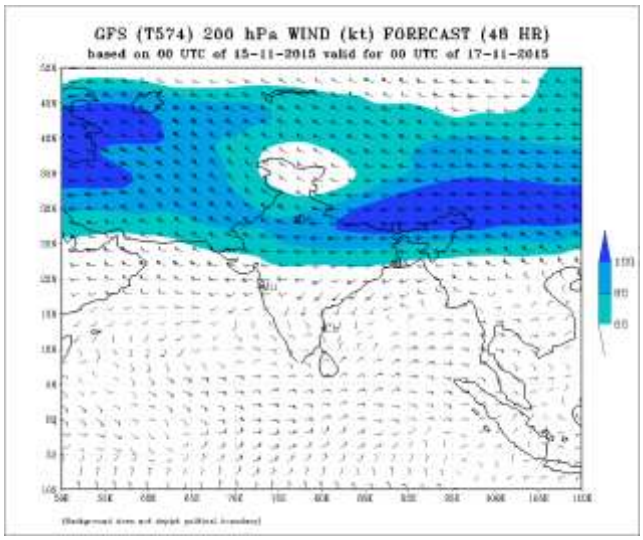

GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 15-11-2015 valid for 00 UTC of 18-11-2015

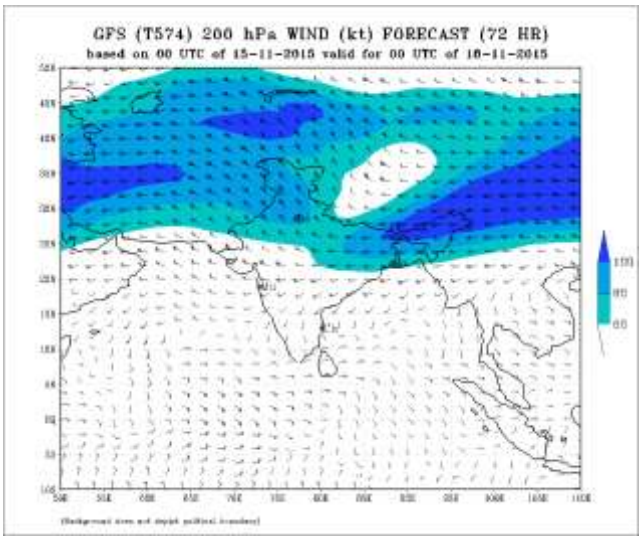

GFS (T574) 500 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 15-11-2015 valid for 00 UTC of 19-11-2015

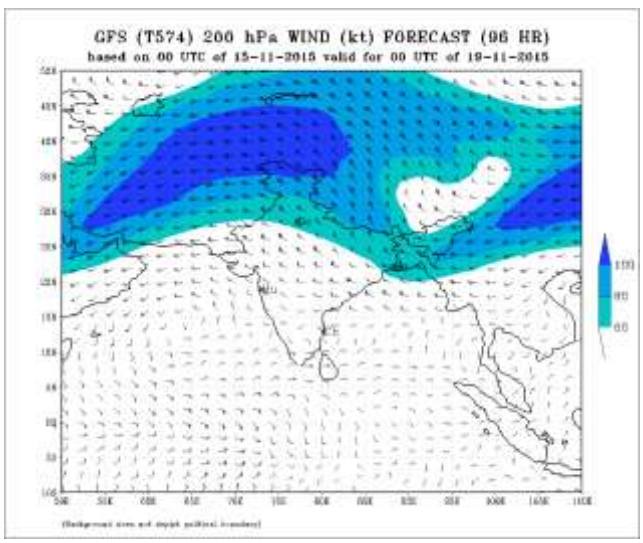

GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 15-11-2015 valid for 00 UTC of 20-11-2015

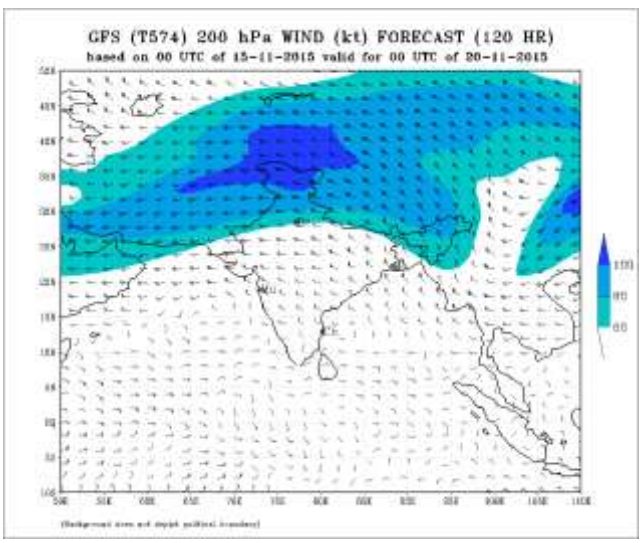

GFS (T574) 200 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 15-11-2015 valid for 00 UTC of 15-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 15-11-2015 valid for 00 UTC of 16-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 15-11-2015 valid for 00 UTC of 17-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 15-11-2015 valid for 00 UTC of 18-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 15-11-2015 valid for 00 UTC of 19-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 15-11-2015 valid for 00 UTC of 20-11-2015

FDP (Cyclone) NOC Report Dated 16 November, 2015

Synoptic features:

- Yesterday's well marked low pressure area over southwest bay of Bengal adjoining Sri Lanka coast now lies over southwest bay of Bengal and adjoining north Tamilnadu coast. It would move northwestwards.
- Associated upper air cyclonic circulation extends up to mid-tropospheric levels tilting southwestwards with height. It is likely to move northwestwards towards north Tamilnadu coast and could concentrate into a Depression during next 24 hours.

Surface Temperature (SST):

- SST is 28-29°C over westcentral, eastcentral and southeast Bay of Bengal and Andaman Sea.
- SST is 28-29°C over southeast and adjoining eastcentral Arabian Sea (AS). It is 26-28°C over most parts of westcentral AS.

Tropical Cyclone Heat Potential (TCHP):

- TCHP is 30-40 kJ/cm^2 over the WML over southwest BOB and north Tamil Nadu coast.
- TCHP is 100-120 kJ/cm^2 over south and eastcentral AS and along the west coast of India.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive and is about 50x10^{-5}s^{-1} over southwest BOB and Sri Lanka coast.
- It is 30-50x10^{-5}s^{-1} over southwest and adjoining westcentral AS

Convergence:

- Lower level convergence is about 10x10^{-5}s^{-1} near the WML over southwest BOB.
- Lower level convergence is 5x10^{-5}s^{-1} over parts of eastcentral adjoining westcentral AS.

Divergence:

- Upper level divergence is 30x10^{-5} s^{-1} near the WML over southwest BOB.

Wind Shear:

- Wind shear near the WML over southeasterly BOB is 10knots.
- The vertical wind shear is 10-20 knots over eastcentral adjoining southeast of AS

Wind Shear Tendency:

- There is 10 - 20 knots in the vertical wind shear near the area of WML over the southwest BOB and 20 – 30 knots over Tamilnadu coast.
- The vertical wind shear tendency is decreasing by 5- 10 knots over all parts of AS

Upper tropospheric ridge:

- The upper tropospheric ridge at 200 hPa runs along 14.0°N over the BOB.

M.J.O. Index:

- MJO index is in the border of Phase 2 with amplitude greater than 1 and would remain in phase 2 during next subsequent days.

Storms and Depression over South China Sea/ South Indian Ocean: NIL

Satellite:

Inference based on INSAT imagery of **160900** UTC:

Bay of Bengal & Andaman Sea:-

Yesterday's well marked low pressure area over southwest bay of Bengal adjoining Srilanka coast now lies over southwest bay of Bengal and adjoining north Tamilnadu coast. It would

move northwestwards and could concentrate into a depression during next 24 hrs. associated broken low and medium clouds with embedded intense to very intense convection lie over northeast Tamilnadu, Andhra Pradesh, Telangana, south interior Karnataka and bay of Bengal between latitude 10.0°N to 20.0°N west of longitude 90.0°E.
Broken low and medium clouds with embedded intense to very intense convection lie over rest southwest Bay of Bengal and rest eastcentral bay of Bengal and south Andaman sea.

Arabian Sea:-

Scattered low and medium clouds with embedded isolated moderate to intense convection lie over southwest Arabian sea between latitude 4.0°N to 8.0°N and longitude 51.5°E to 55.0°E in association with low level circulation over the area.
Scattered low and medium clouds with embedded isolated moderate to intense convection lie over southeast Arabian sea.

NWP Input for FDP Cyclone based on 0000 UTC of 16.11.2015

NWP Analysis

IMD-GFS and model product analysis based on 00UTC of 16 November 2015 shows a low pressure area over the southwest Bay of Bengal off Tamil Nadu coast. Forecasts show re-emergence of the southwest Bay of Bengal system into the southeast Arabian Sea off Kerala coast on 19 November 2015 and becomes less marked thereafter.

IMD-WRF model product analysis based on 00UTC of 16 November 2015 shows a low pressure area over the southwest Bay of Bengal off Tamil Nadu coast. Forecasts show re-emergence of the southwest Bay of Bengal system into the southeast Arabian Sea off Kerala coast on 19 November 2015 and becomes less marked thereafter

NWP products are available at:
http://202.54.31.51/bias/gfsproducts.php
http://202.54.31.51/bias/wrf27pro.php
http://202.54.31.51/bias/potentialparameter.php

NCMRWF-NCUM: NCUM model shows the WML off Sri Lanka coast which moves northwestwards and crosses north Tamil Nadu coast in 24 hrs. It re-emerges into the AS on 18th as a low.

NCMRWF-GFS: NCMRWF-GFS shows the WML off Sri Lanka coast which moves northwestwards with slight intensification and cross Tamil Nadu coast on 16th. It then re-emerges into the AS on 18th as a low.

NCEP-GFS NCEP-GFS shows the WML off Sri Lanka coast which moves westward with slight intensification and crosses Tamil Nadu coast on 16th. It emerges into AS on 17th as a low.

ECMWF model shows the WML off Sri Lanka coast which moves west-northwestwards and crosses Tamil Nadu coast on 16th without intensification.

JMA: model suggests intensification of the WML off Sri Lanka coast into a depression and moving northwestward towards Tamil Nadu coast on 16th. It subsequently skirts the TN coast without intensification and crosses north Tamil Nadu coast as a low on 17th and become less marked on 19th.

ARP-Meteo France: model shows the WML off Sri Lanka coast and moving northwestwards towards Tamil Nadu coast as a low pressure area.
The model suggests that the formation of low in southeast sector of Arabian sea on 19th Nov**.**

Genesis Potential Parameter: Model analysis of GPP based on 0000 UTC of 16 November 2015 shows a cyclogenesis zone over southwest Bay of Bengal off Tamil Nadu coast. Forecasts show northwestward movement of the system during next 24 hours and becomes less marked thereafter.

Summary and Conclusion:

Bay of Bengal and Andaman Sea:

The well-marked low pressure area over southwest Bay of Bengal and neighbourhood would move northwestward towards north Tamil Nadu coast and may concentrate into a depression during next 24 hrs. Some models suggest only gradual weakening during next 24 hrs. Most models suggest initial west-northwest and then northwestward movement towards north Tamil Nadu coast during next 48 hrs.

Probability of cyclogenesis over Bay of Bengal and Andaman Sea during next 120 hours:

24 HOURS	24-48 HOURS	48-72 HOURS	72-96 HOURS	96-120 HOURS
Low	Nil	Nil	Nil	Nil

Arabian Sea:

Probability of cyclogenesis over Arabian Sea during next 120 hours:

24 HOURS	24-48 HOURS	48-72 HOURS	72-96 HOURS	96-120 HOURS
Nil	Nil	Nil	Nil	Nil

Advisory:

No IOP on 17th Nov 2015

Annexure-I

Status of observational system:

Synoptic observation: Not available

AWS Observations:

	Date/Time (UTC)		
Region	**15/12**	**16/00**	**16/03**
India	**52**	**57**	**49**
Coastal stations			
WB	**5**	**8**	**7**
Odisha	**9**	**11**	**8**
AP	**12**	**12**	**10**
Tamil Nadu	**25**	**25**	**23**
Puducherry	**1**	**1**	**1**
A & N	**-**	**-**	**-**

RS/RW (12Z) of 15/11/2015 **-0/39**
No. of Ascents reaching 250 hPa level: 0, MISDA: 39
RS/RW (00Z) of 16/11/2015- **25/39**
No. of Ascents reaching 250 hPa level:22, MISDA:3

No. of PILOT Ascents

15/12Z	16/00Z
7	8

Buoy Data

15/12Z	16/00Z	16/03Z
7	3	3

STATUS OF CHENNAI REGION OBSERVATION

No. of Synop data

Date→	**15.11.2015**							
UTC→	**00**	**03**	**06**	**09**	**12**	**15**	**18**	**21**
Chennai Region (Coasts of AP & TN)	**20**	**22**	**20**	**20**	**22**	**20**	**20**	**20**

No. of RS/RW Ascents

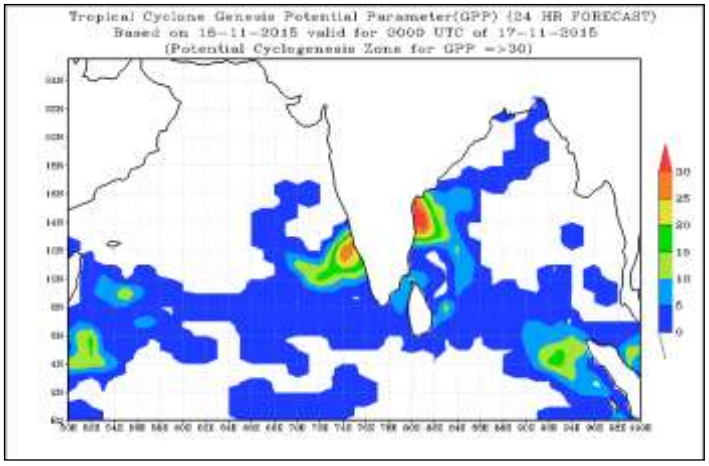
00Z /15.11.2015 : 6
No. of Ascents reaching 250 hPa level = 5
MISDA : 2
12Z /15.11.2015 : 0
No. of Ascents reaching 250 hPa level = 0
MISDA : 8

No. of PILOT Ascents:

15.11.2015

06Z	18Z
2	5

Annexure-II


Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 18-11-2015 valid for 0000 UTC of 17-11-2015
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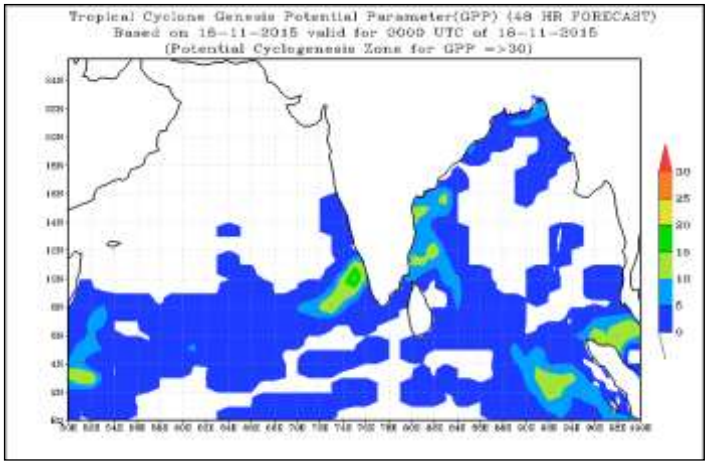
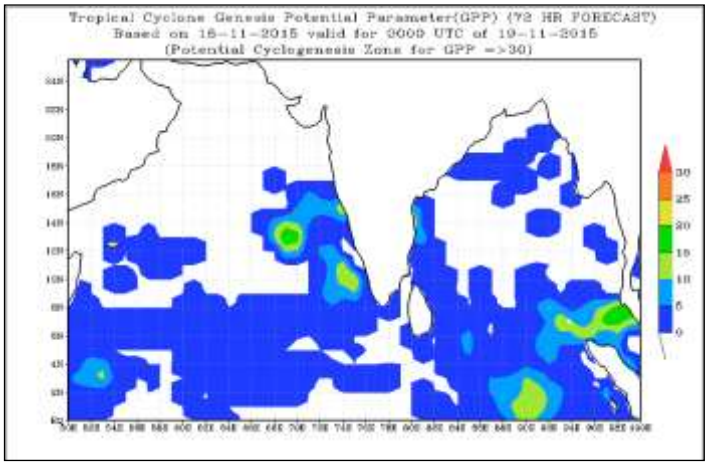
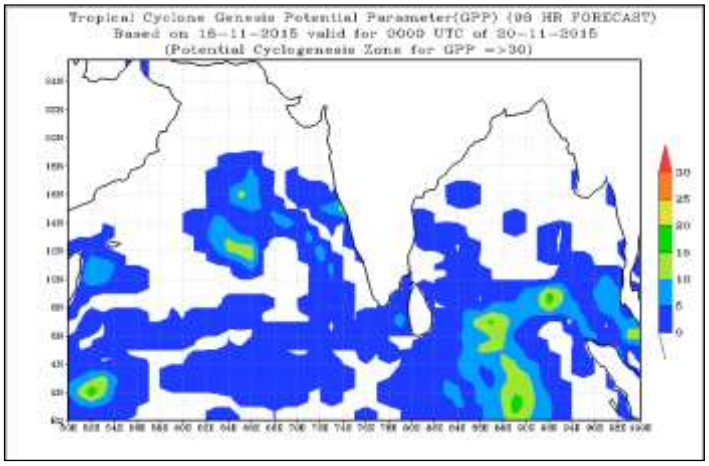
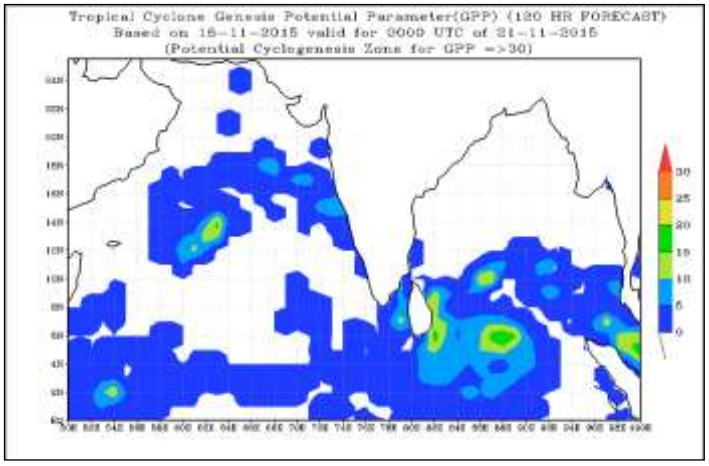
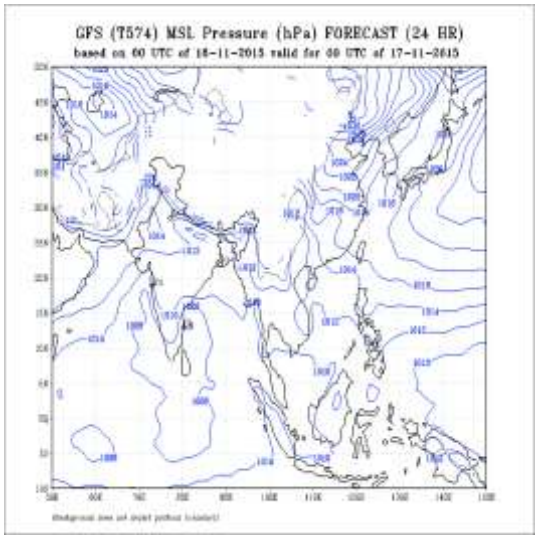
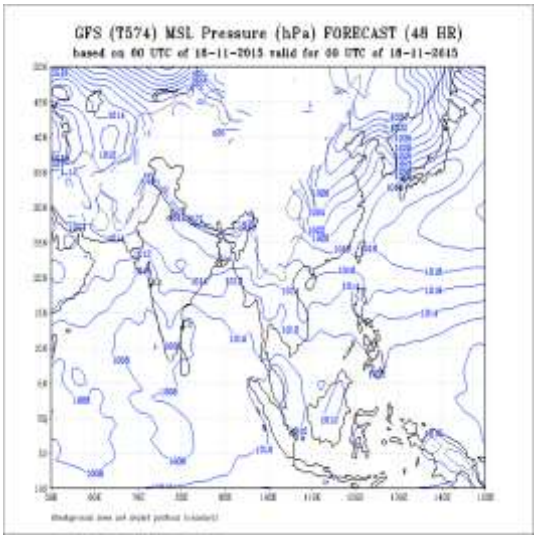

Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
Based on 18-11-2015 valid for 0000 UTC of 18-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

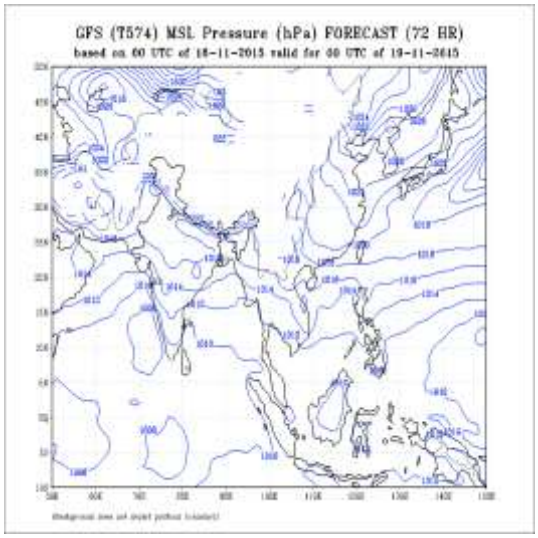

Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 18-11-2015 valid for 0000 UTC of 19-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

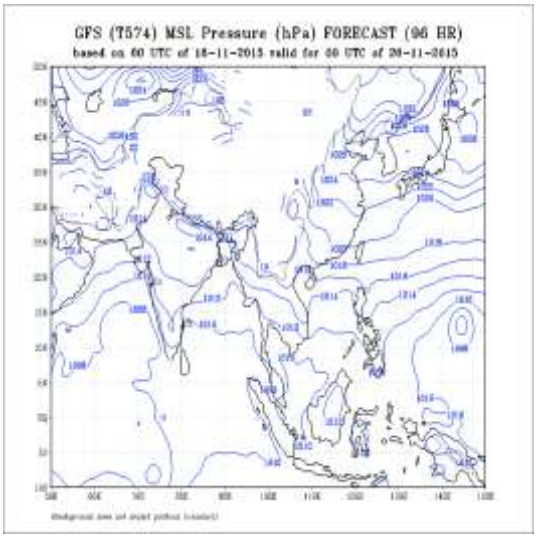

Tropical Cyclone Genesis Potential Parameter(GPP) (96 HR FORECAST)
Based on 18-11-2015 valid for 0000 UTC of 20-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

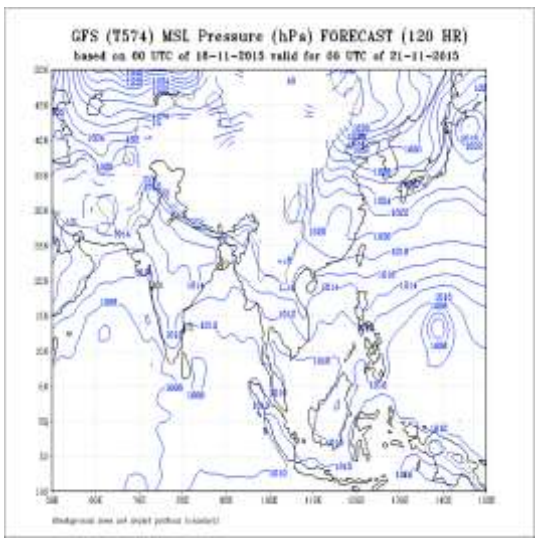

Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 18-11-2015 valid for 0000 UTC of 21-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

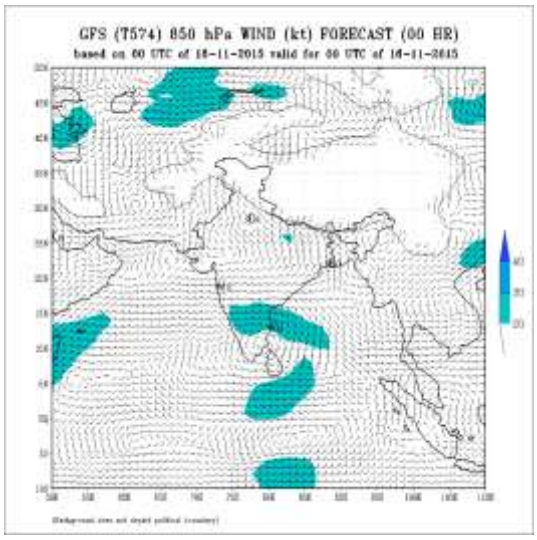

GFS (T574) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 16-11-2015 valid for 00 UTC of 17-11-2015

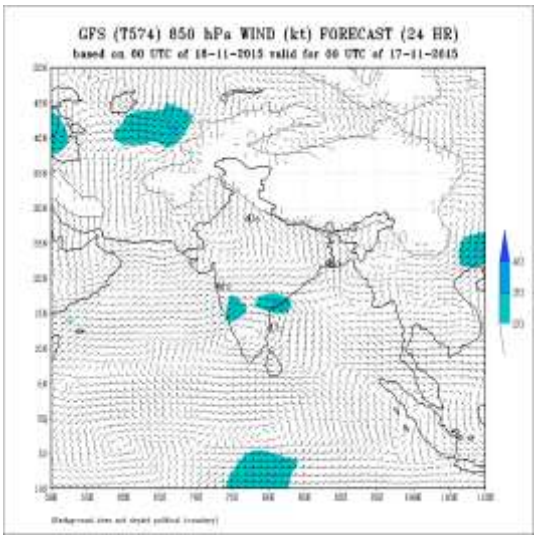

GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 16-11-2015 valid for 00 UTC of 18-11-2015

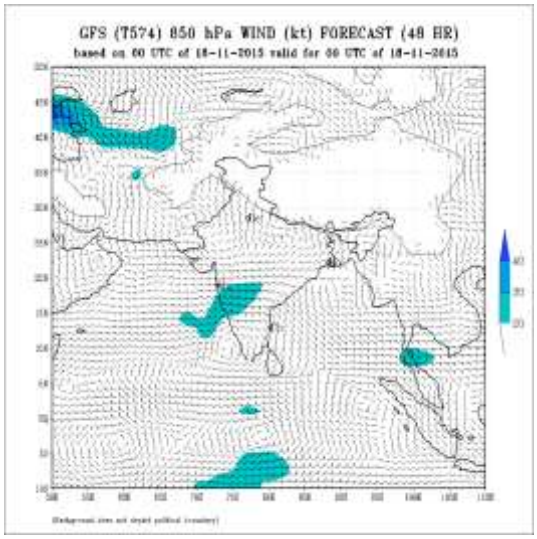

GFS (T574) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 16-11-2015 valid for 00 UTC of 19-11-2015

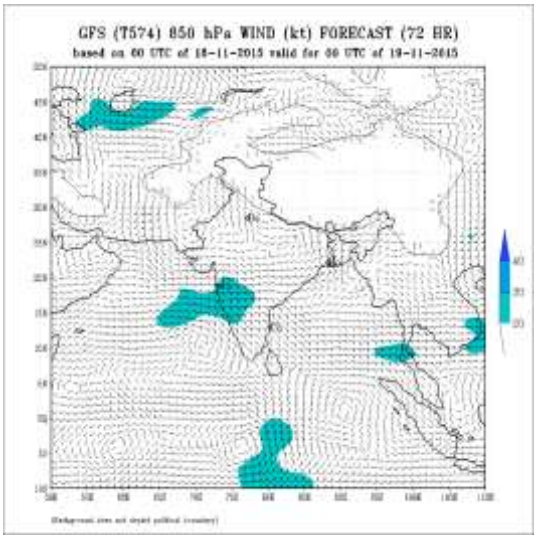

GFS (T574) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 16-11-2015 valid for 00 UTC of 20-11-2015

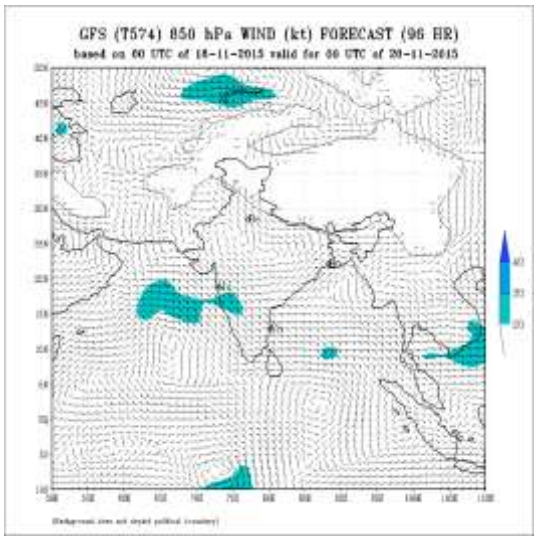

GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 16-11-2015 valid for 00 UTC of 21-11-2015

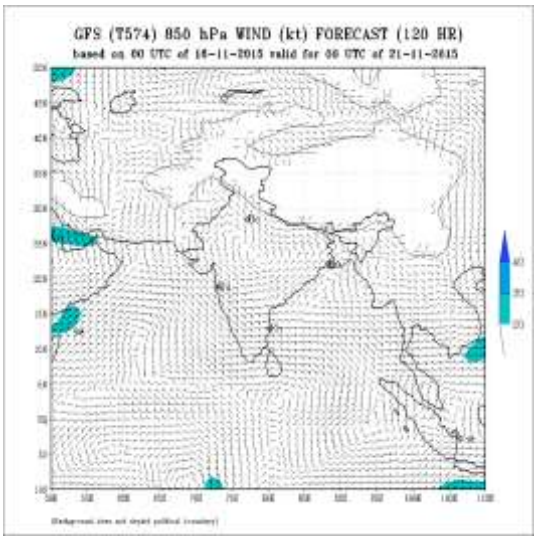

GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 16-11-2015 valid for 00 UTC of 16-11-2015

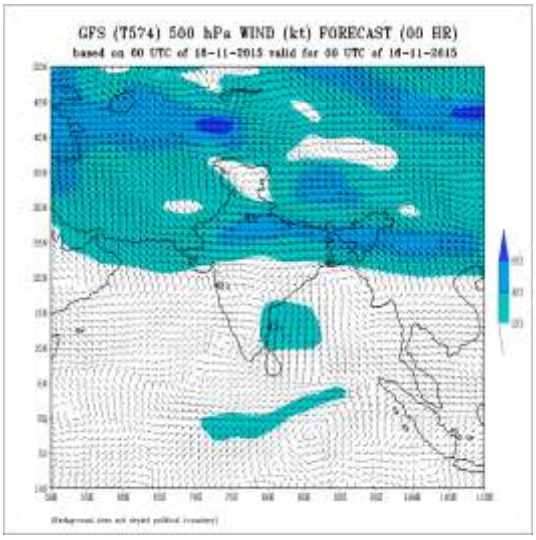

GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 16-11-2015 valid for 00 UTC of 17-11-2015

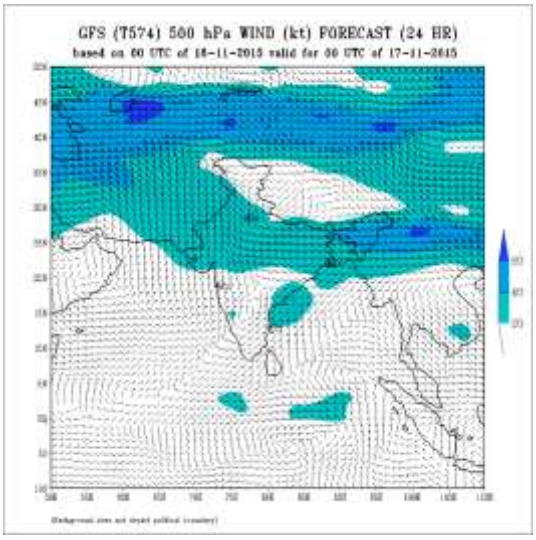

GFS (T574) 850 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 16-11-2015 valid for 00 UTC of 18-11-2015

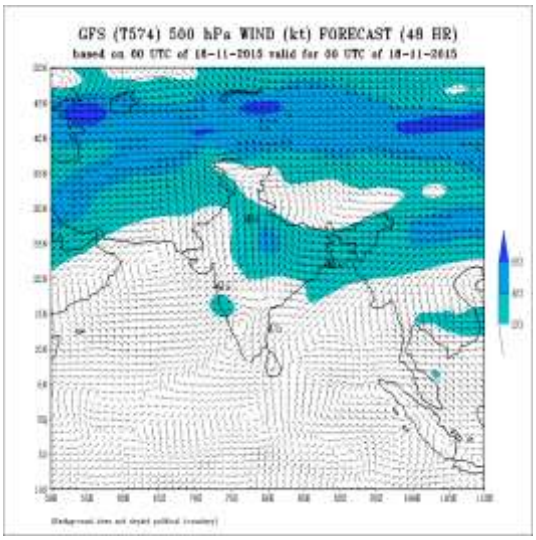

GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 16-11-2015 valid for 00 UTC of 19-11-2015

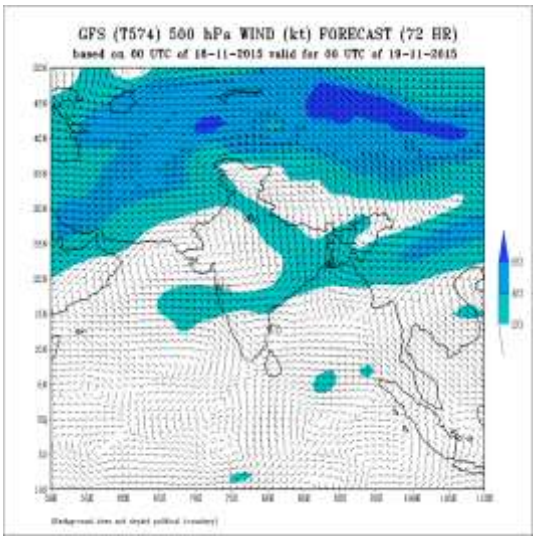

GFS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 16-11-2015 valid for 00 UTC of 20-11-2015

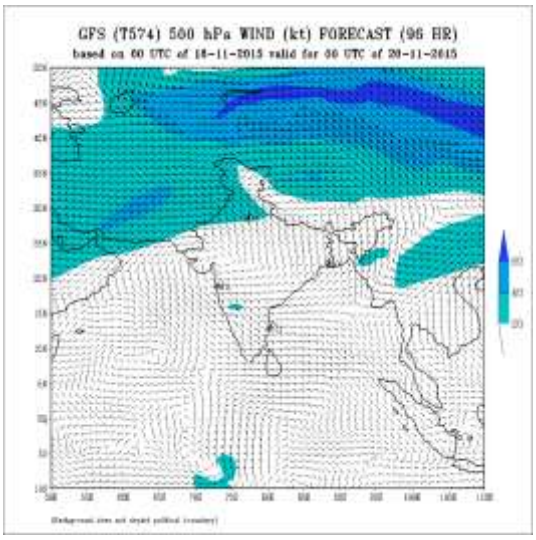

GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 16-11-2015 valid for 00 UTC of 21-11-2015

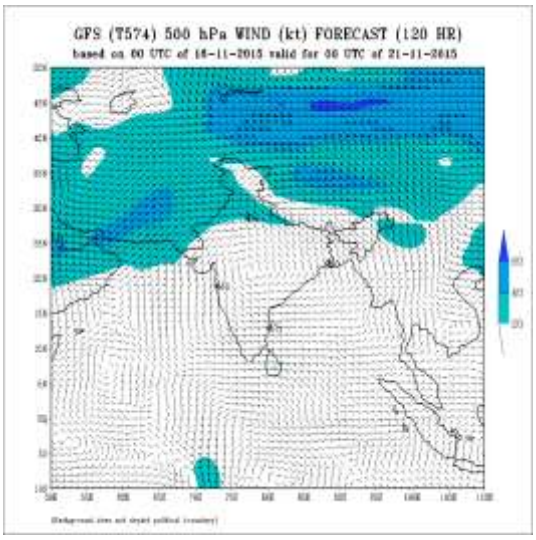

GFS (T574) 500 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 16-11-2015 valid for 00 UTC of 16-11-2015

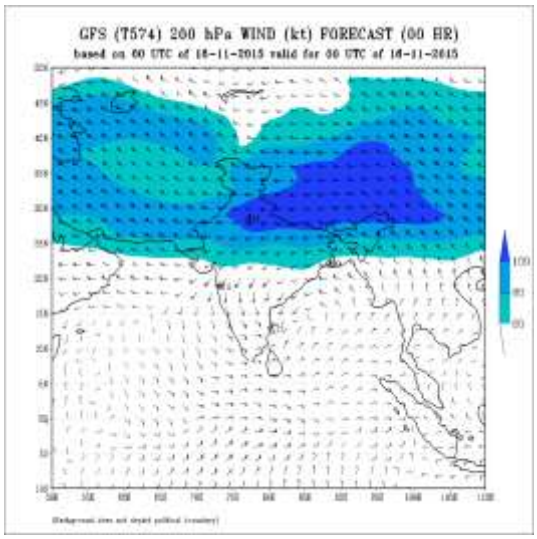

GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 16-11-2015 valid for 00 UTC of 17-11-2015

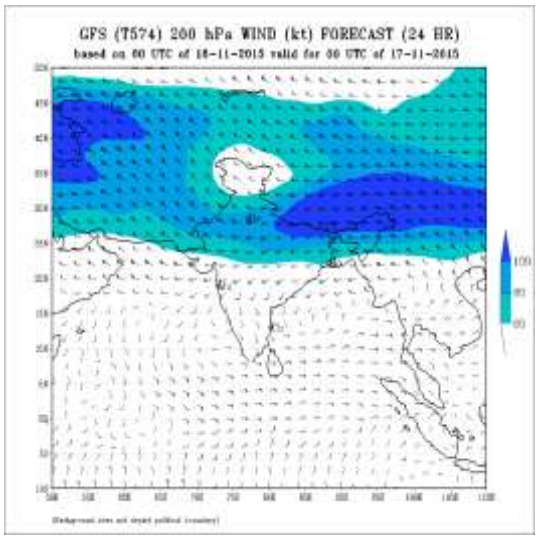

GFS (T574) 500 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 16-11-2015 valid for 00 UTC of 18-11-2015

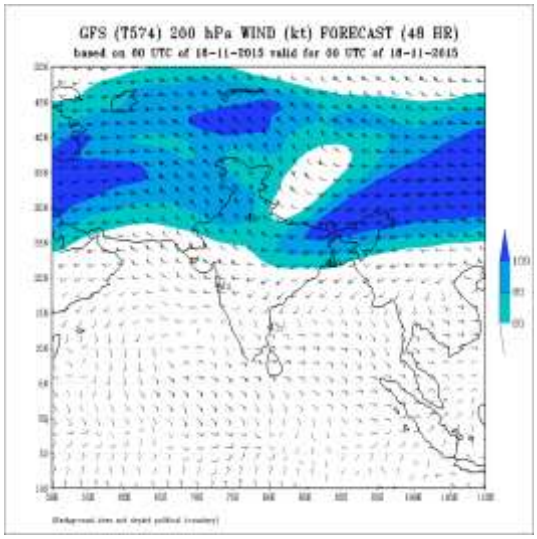

GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 16-11-2015 valid for 00 UTC of 19-11-2015

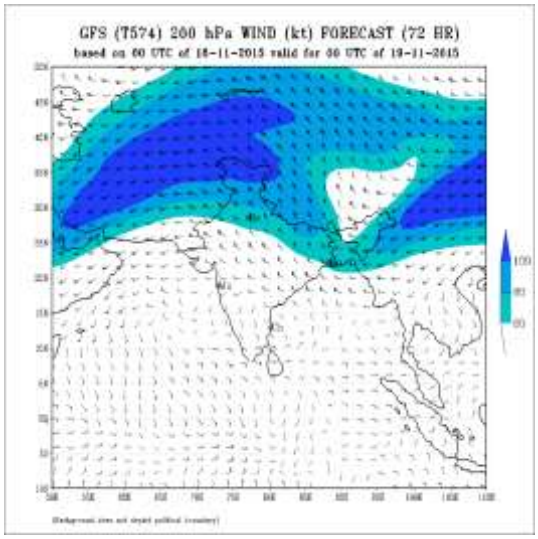

GFS (T574) 500 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 16-11-2015 valid for 00 UTC of 20-11-2015

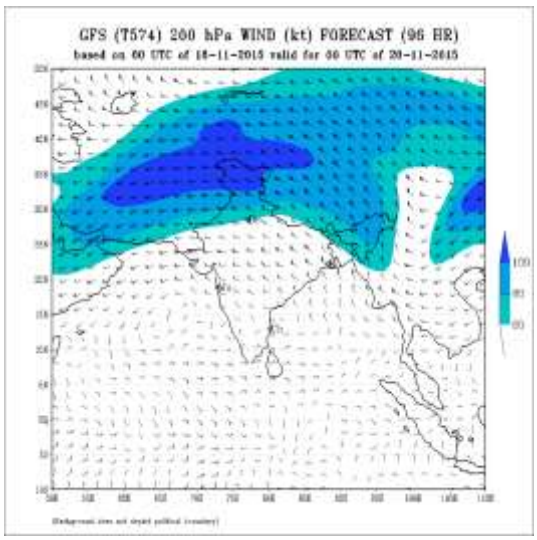

GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 16-11-2015 valid for 00 UTC of 21-11-2015

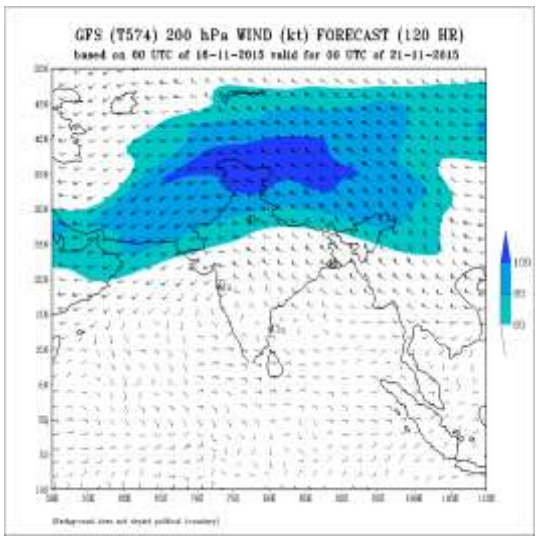

GFS (T574) 200 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 16-11-2015 valid for 00 UTC of 16-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 16-11-2015 valid for 00 UTC of 17-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 16-11-2015 valid for 00 UTC of 18-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 16-11-2015 valid for 00 UTC of 19-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 16-11-2015 valid for 00 UTC of 20-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 16-11-2015 valid for 00 UTC of 21-11-2015

FDP (Cyclone) NOC Report Dated 17 November, 2015

Synoptic features:

- Yesterday's well marked low pressure area lies over westcentral Bay of Bengal off south Andhra Pradesh coast. Associated upper air cyclonic circulation extends upto mid-tropospheric levels tilting southwestwards with height.

Surface Temperature (SST):

- SST is 28-29°C over westcentral, eastcentral and southeast Bay of Bengal and Andaman Sea.
- SST is 28-29°C over southeast and adjoining eastcentral Arabian Sea (AS). It is 26-28°C over most parts of westcentral AS.

Tropical Cyclone Heat Potential (TCHP):

- TCHP is 40-50 kJ/cm^2 over the WML over southwest BOB and north Tamil Nadu coast.
- TCHP is 100-110 kJ/cm^2 over south and eastcentral AS and along the west coast of India.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive and is about 50-110x10^{-5}s^{-1} over southwest BOB and Sri Lanka coast.
- It is 30-50x10^{-5}s^{-1} over westcentral AS.

Convergence:

- Lower level convergence is about 10-15x10^{-5}s^{-1} near the WML over southwest BOB.
- Lower level convergence is -5x10^{-5}s^{-1} over parts of eastcentral adjoining westcentral AS.

Divergence:

- Upper level divergence is 10-20x10^{-5} s^{-1} near the WML over southwest BOB.
- Upper level divergence is -5x10^{-5} s^{-1} over southwest AS.

Wind Shear:

- Wind shear near the WML over southeasterly BOB is 10-20knots.
- The vertical wind shear is 10-20 knots over westcentral adjoining southeast of AS

Wind Shear Tendency:

- There is 5-10 knots in the vertical wind shear near the area of WML over the southwest BOB
- The vertical wind shear tendency is 5 knots over east and west central and southwest of AS.

Upper tropospheric ridge:

- The upper tropospheric ridge at 200 hPa runs along 15.0°N over the BOB.

M.J.O. Index:

- MJO index is in the border of Phase 2 with amplitude greater than 1 and would remain in phase 2 during next subsequent days.

Storms and Depression over South China Sea/ South Indian Ocean: NIL

Satellite:

Inference based on INSAT imagery of **160900** UTC:

Bay of Bengal & Andaman Sea:-

Yesterday's well marked low pressure area over southwest Bay of Bengal adjoining north Tamil Nadu coast now lies over westcentral and adjoining southwest Bay of Bengal off south Andhra Pradesh and adjoining north Tamil Nadu coasts.

Associated broken low/medium clouds with embedded moderate to intense convection over coastal Andhra Pradesh, east Telangana, south Chatisgarh, Orissa and Bay between latitude 12.5^0 N to 20.0^0 N west of longitude 90^0E. scattered low/medium clouds with embedded moderate to intense convection over rest southwest Bay and south Andaman Sea.

Arabian Sea:-

Scattered low/medium clouds with embedded isolated moderate to intense convection over south east Arabian Sea off Kerala coast.

NWP Input for FDP Cyclone based on 0000 UTC of 16.11.2015

NWP Analysis

IMD-GFS and IMD-WRF model product analysis based on 00UTC of 17 November 2015 shows a low pressure area over the southwest Bay of Bengal off Tamil Nadu coast. Forecasts show re-emergence of the southwest Bay of Bengal system into the southeast Arabian Sea off Kerala coast on 19 November 2015 and becomes less marked thereafter.

NWP products are available at:
http://202.54.31.51/bias/gfsproducts.php
http://202.54.31.51/bias/wrf27pro.php
http://202.54.31.51/bias/potentialparameter.php

NCMRWF-NCUM: NCUM model shows the WML over southwest Bay. It re-emerges into the AS on 18th as a low.

NCMRWF-GFS: NCMRWF-GFS shows the WML southwest Bay and then re-emerges into the AS on 18th as a low.

NCEP-GFS NCEP-GFS shows the Low over southwest Bay and becomes less marked on 18th.

ECMWF. : No significant system

JMA: model suggests low over southwest Bay and become less marked on 18th.

ARP-Meteo France model shows the Low over southwest Bay off North Tamil Nadu and emerges to southeast Arabian as low on 19th and dissipated on 20th.

Genesis Potential Parameter (GPP): Model analysis of GPP based on 0000 UTC of 17 November 2015 shows a cyclogenesis zone over southwest Bay of Bengal off Tamil Nadu coast. Forecasts show westward movement of the system and becomes less marked during next 72 hours over the Arabian Sea.

Summary and Conclusion:

Bay of Bengal and Andaman Sea:

The well-marked low pressure area over westcentral Bay of Bengal and neighbourhood would move north-northwestward and cross Andhra Pradesh coast.

Probability of cyclogenesis over Bay of Bengal and Andaman Sea during next 120 hours:

24 HOURS	24-48 HOURS	48-72 HOURS	72-96 HOURS	96-120 HOURS
Nil	Nil	Nil	Nil	Nil

Arabian Sea:

Probability of cyclogenesis over Arabian Sea during next 120 hours:

24 HOURS	24-48 HOURS	48-72 HOURS	72-96 HOURS	96-120 HOURS
Nil	Nil	Nil	Nil	Nil

Advisory:

No IOP during next five days.

Annexure-I

Status of observational system:

Synoptic observation:

Region	Date/Time (UTC)		
	16/12	**17/00**	**17/03**
India	43	35	39
Coastal stations			
WB	9	3	8
Odisha	7	5	6
AP	12	12	12
Tamil Nadu	13	13	13
Puducherry	2	2	2
A & N	-	1	6
Bangladesh	11	11	11
Myanmar	-	11	11
Thailand	2	2	2
SriLanka	9	8	8

AWS Observations:

	Date/Time (UTC)		
Region	**16/12**	**17/00**	**17/03**
India	**57**	**55**	**53**
Coastal stations			
WB	**5**	**6**	**5**
Odisha	**13**	**11**	**9**
AP	**12**	**13**	**12**
Tamil Nadu	**26**	**24**	**26**
&			
Puducherry	**1**	**1**	**1**
A & N	**-**	**-**	**-**

RS/RW (12Z) of 16/11/2015 **-27/39**
No. of Ascents reaching 250 hPa level: 2, MISDA: 3

RS/RW (00Z) of 17/11/2015- **26/39**
No. of Ascents reaching 250 hPa level: , MISDA:2

No. of PILOT Ascents

16/12Z	**17/00Z**
6	2

Buoy Data

15/12Z	16/00Z	16/03Z
7	7	1

STATUS OF CHENNAI REGION OBSERVATION

No. of Synop data

Date→	**16.11.2015**											
UTC→	**00**	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**
Chennai Region (Coasts of AP & TN)	**20**	**12**	**12**	**22**	**12**	**10**	**20**	**11**	**10**	**20**	**11**	**12**
UTC→	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**
Chennai Region (Coasts of AP & TN)	**22**	**12**	**10**	**20**	**11**	**12**	**20**	**11**	**11**	**20**	**12**	**11**

No. of RS/RW Ascents

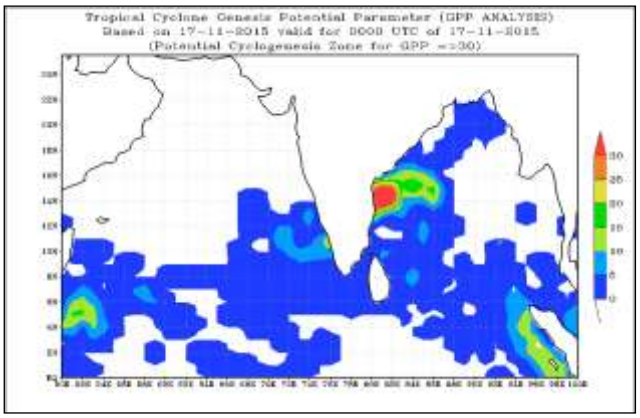
00Z /16.11.2015 : 6
No. of Ascents reaching 250 hPa level = 6
MISDA : 2
12Z /16.11.2015 : 1
No. of Ascents reaching 250 hPa level = 1
MISDA : 7

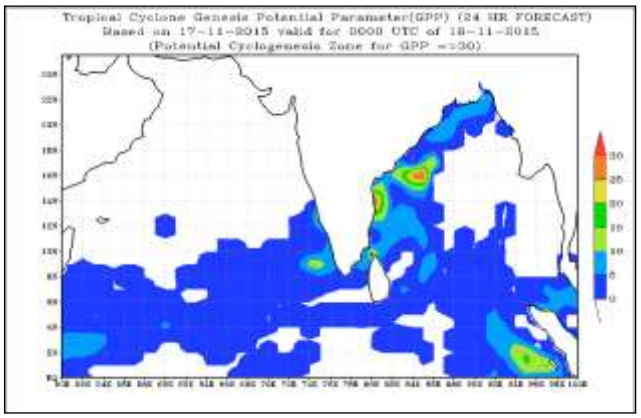
No. of PILOT Ascents:

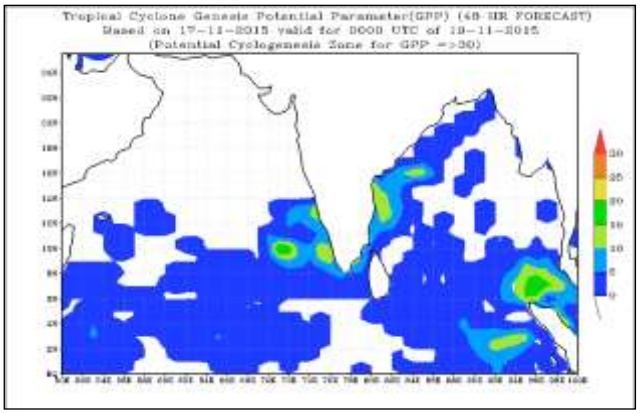
16.11.2015

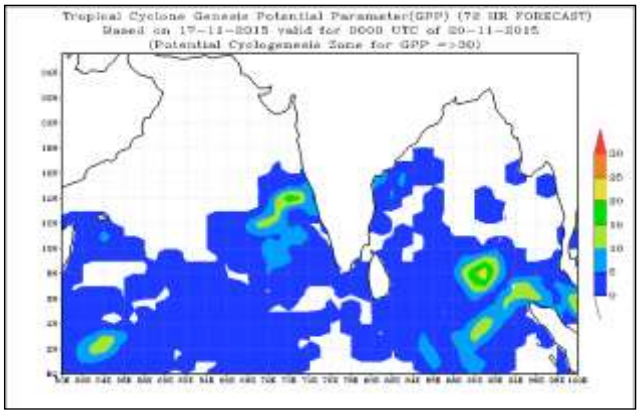
06Z	18Z
2	1

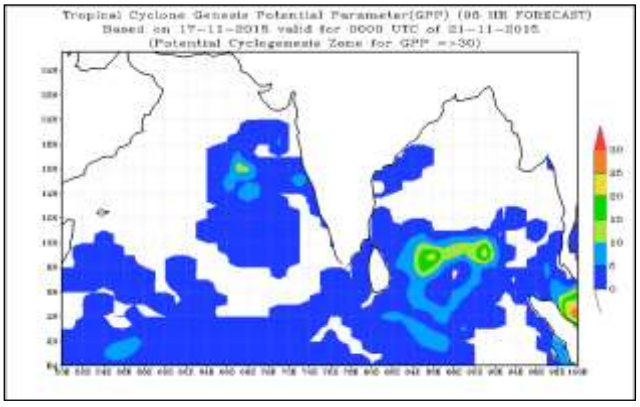
Annexure-II

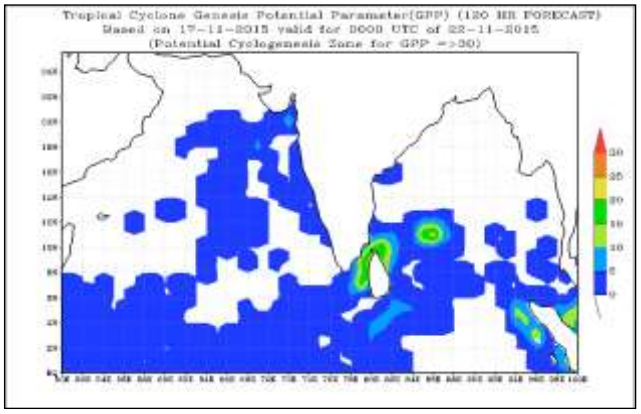

Tropical Cyclone Genesis Potential Parameter (GPP ANALYSES)
Based on 17-11-2015 valid for 0000 UTC of 17-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

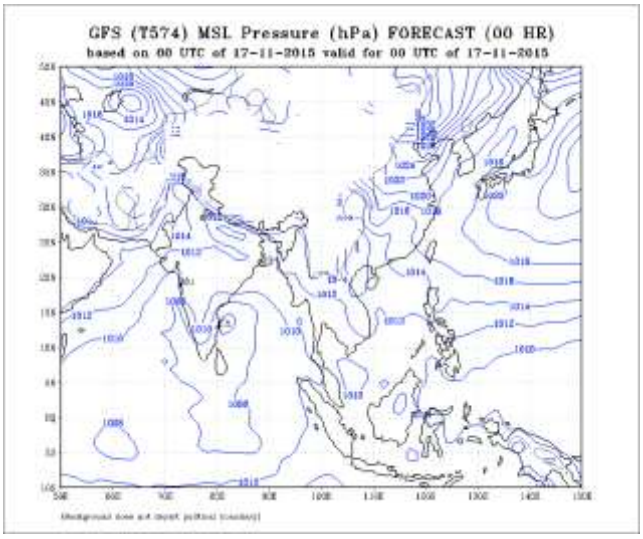

Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 17-11-2015 valid for 0000 UTC of 18-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

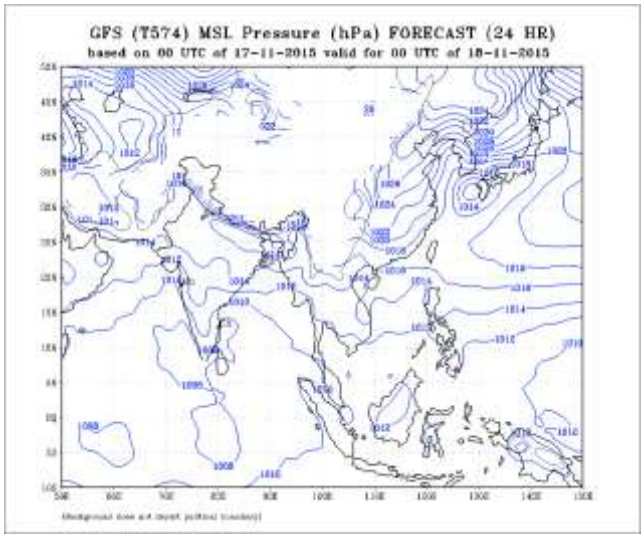

Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
Based on 17-11-2015 valid for 0000 UTC of 19-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

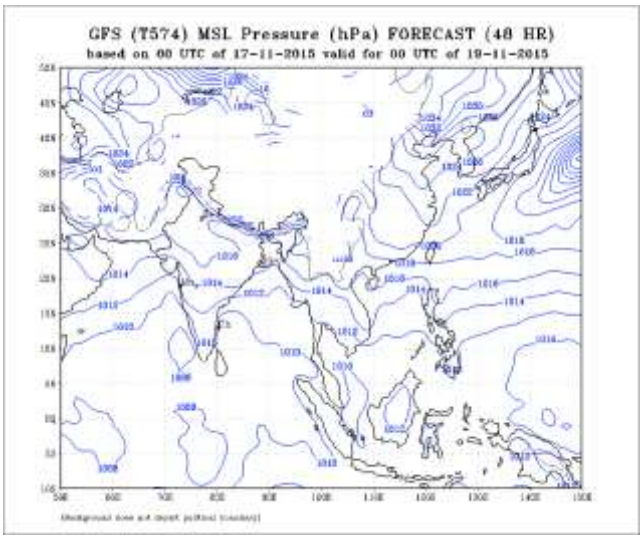

Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 17-11-2015 valid for 0000 UTC of 20-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

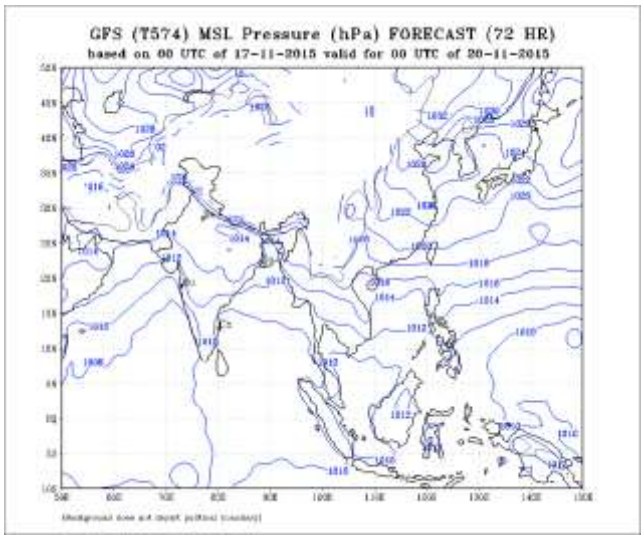

Tropical Cyclone Genesis Potential Parameter(GPP) (96 HR FORECAST)
Based on 17-11-2015 valid for 0000 UTC of 21-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

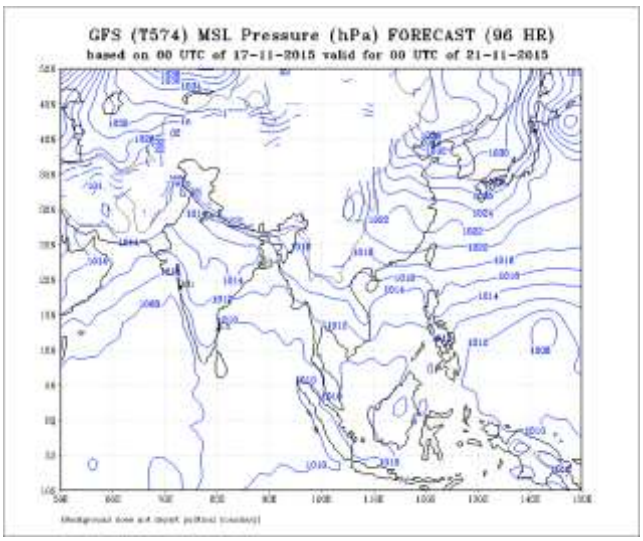

Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 17-11-2015 valid for 0000 UTC of 22-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

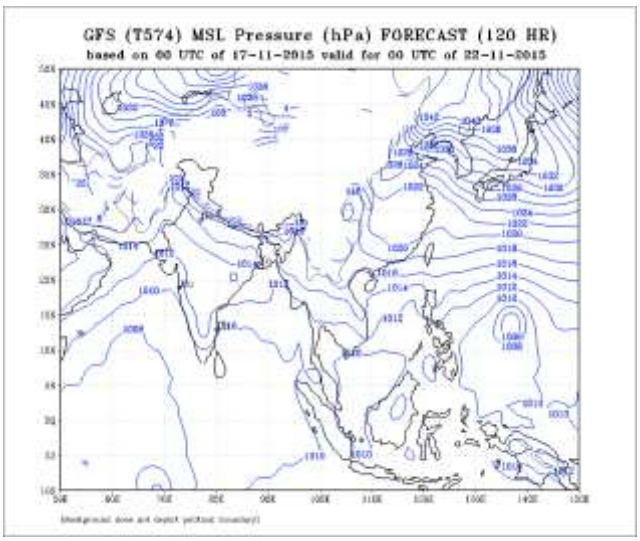

GFS (T574) MSL Pressure (hPa) FORECAST (00 HR)
based on 00 UTC of 17-11-2015 valid for 00 UTC of 17-11-2015

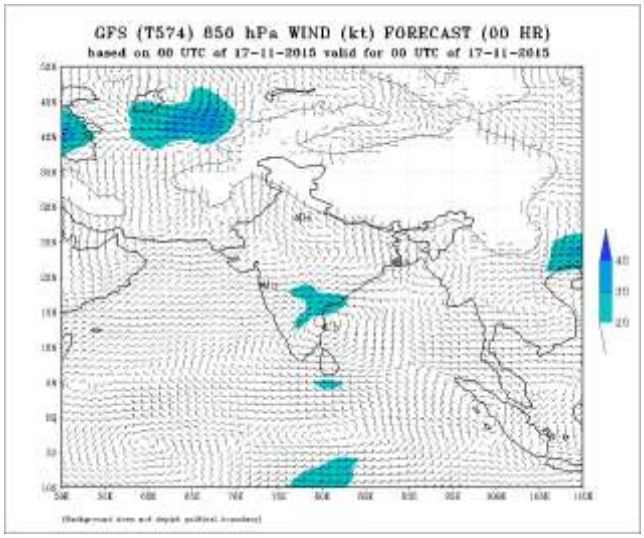

GFS (T574) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 17-11-2015 valid for 00 UTC of 18-11-2015

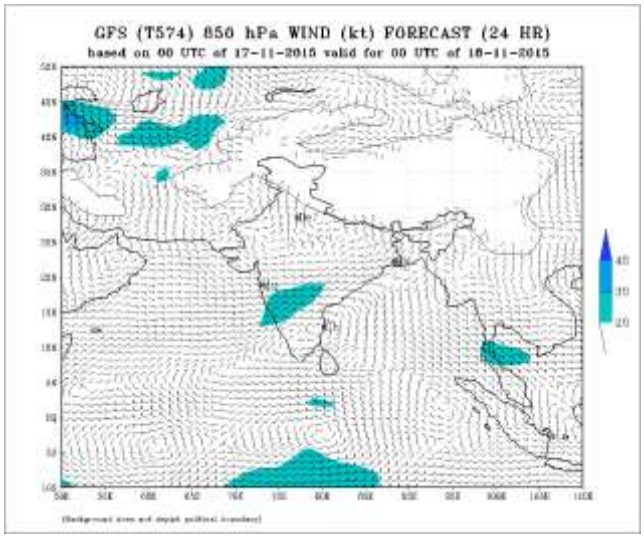

GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 17-11-2015 valid for 00 UTC of 19-11-2015

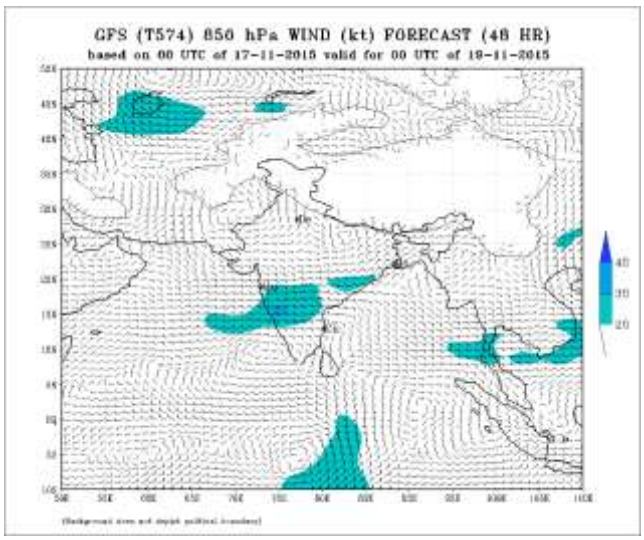

GFS (T574) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 17-11-2015 valid for 00 UTC of 20-11-2015

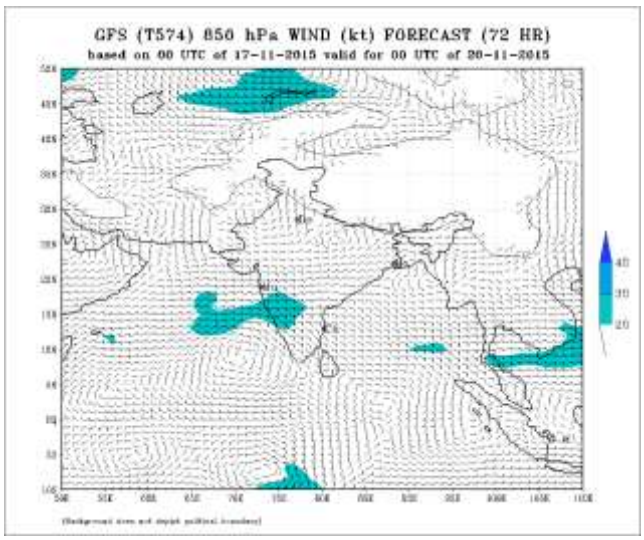

GFS (T574) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 17-11-2015 valid for 00 UTC of 21-11-2015

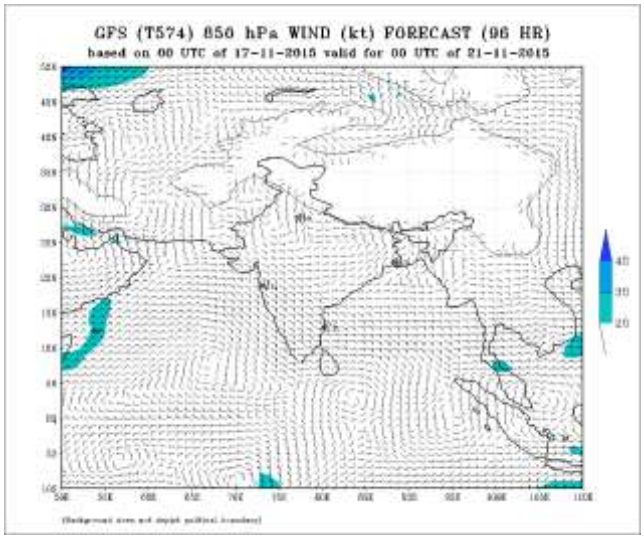

GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 17-11-2015 valid for 00 UTC of 22-11-2015

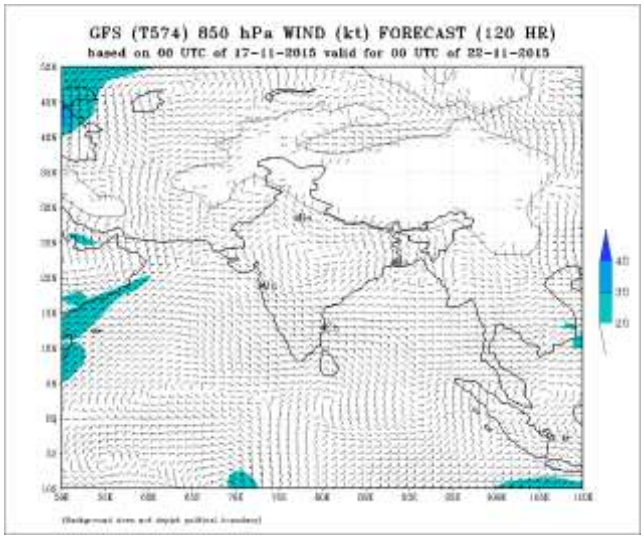

GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 17-11-2015 valid for 00 UTC of 17-11-2015

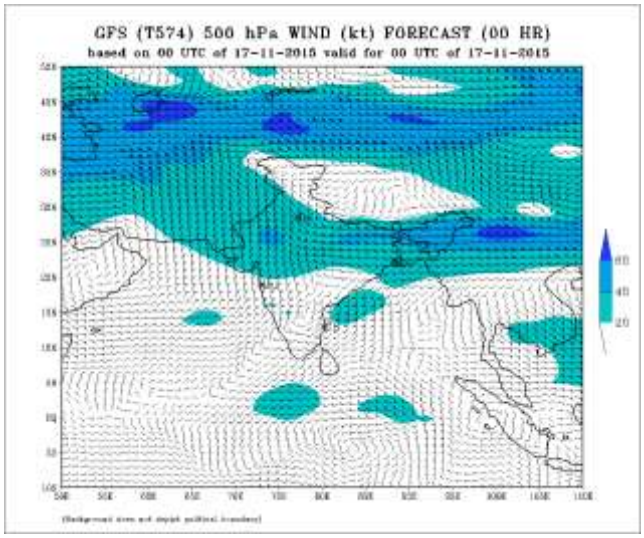

GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 17-11-2015 valid for 00 UTC of 18-11-2015

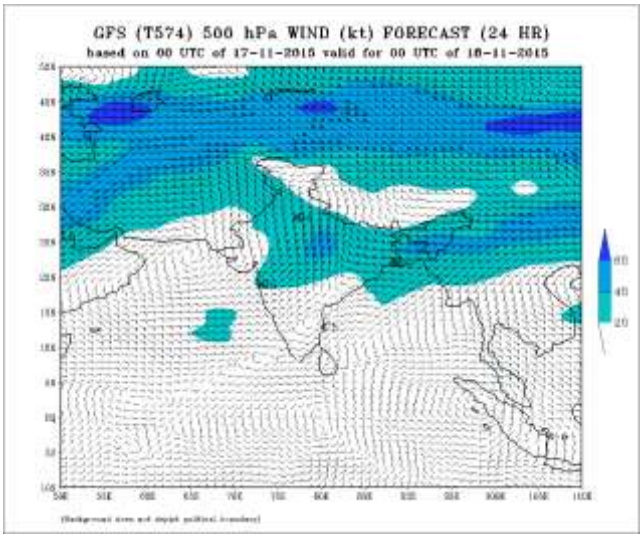

GFS (T574) 850 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 17-11-2015 valid for 00 UTC of 19-11-2015

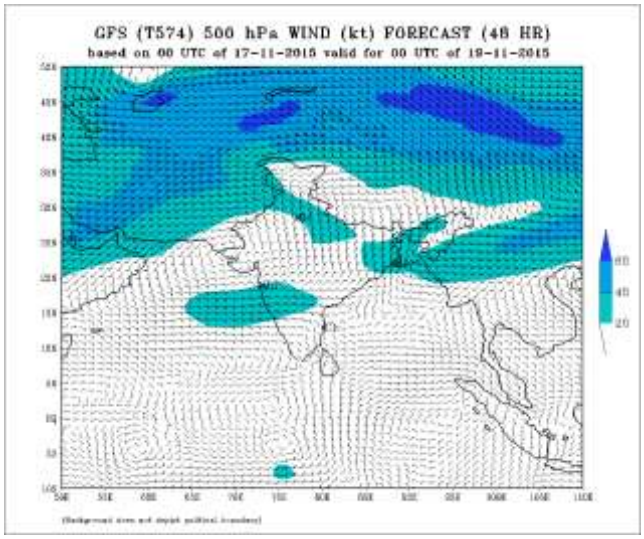

GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 17-11-2015 valid for 00 UTC of 20-11-2015

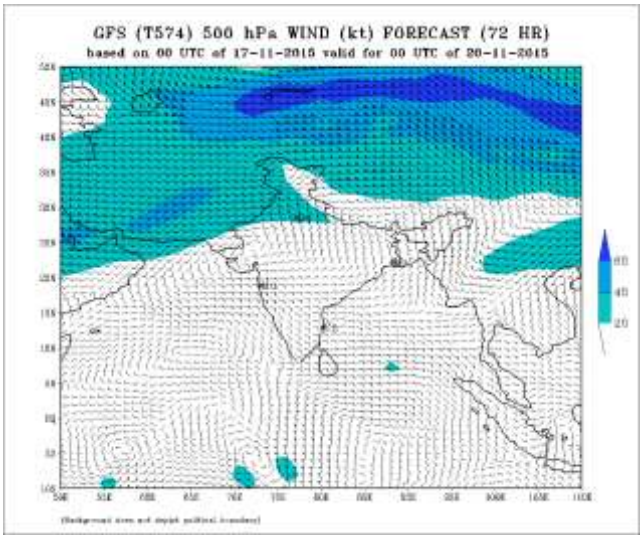

GFS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 17-11-2015 valid for 00 UTC of 21-11-2015

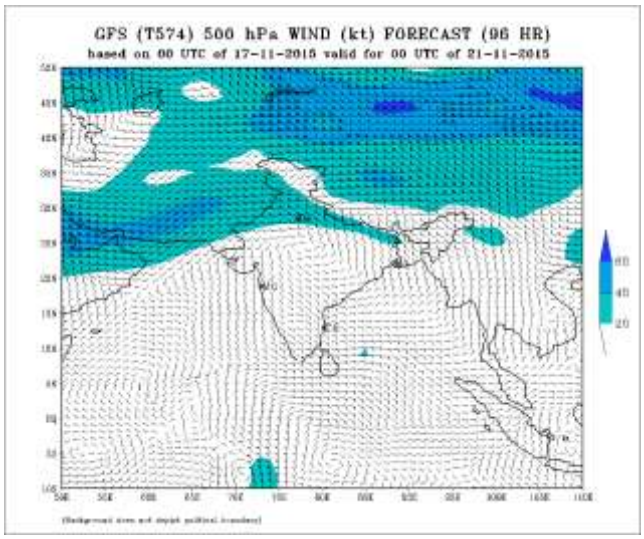

GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 17-11-2015 valid for 00 UTC of 22-11-2015

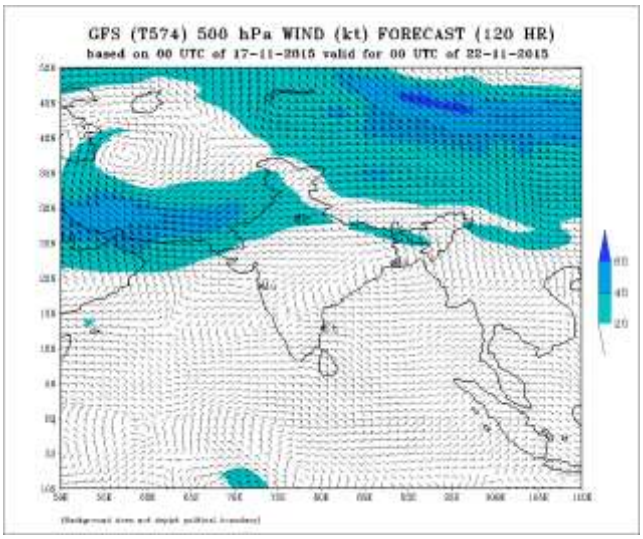

GFS (T574) 500 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 17-11-2015 valid for 00 UTC of 17-11-2015

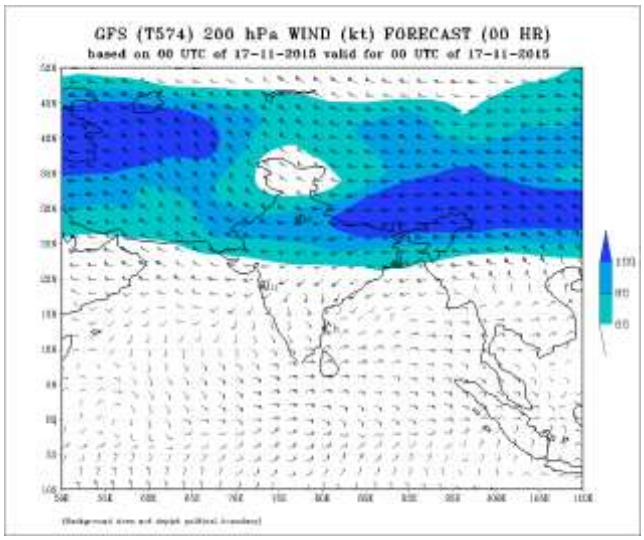

GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 17-11-2015 valid for 00 UTC of 18-11-2015

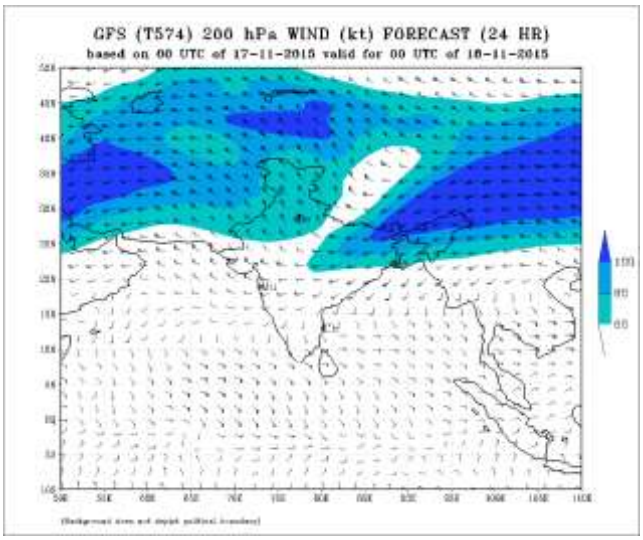

GFS (T574) 500 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 17-11-2015 valid for 00 UTC of 19-11-2015

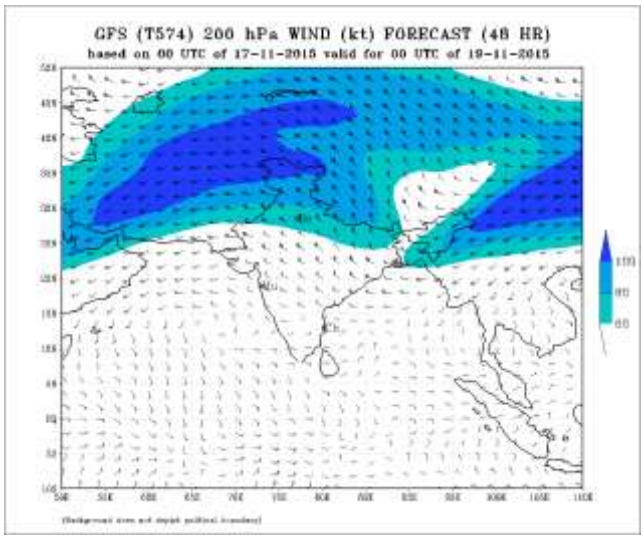

GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 17-11-2015 valid for 00 UTC of 20-11-2015

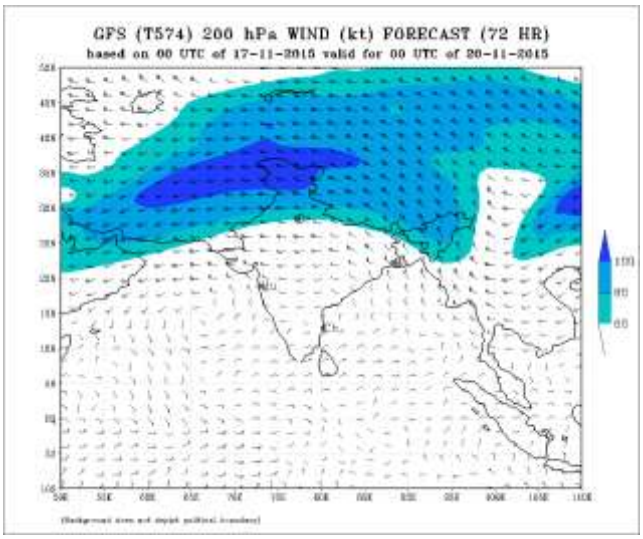

GFS (T574) 500 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 17-11-2015 valid for 00 UTC of 21-11-2015

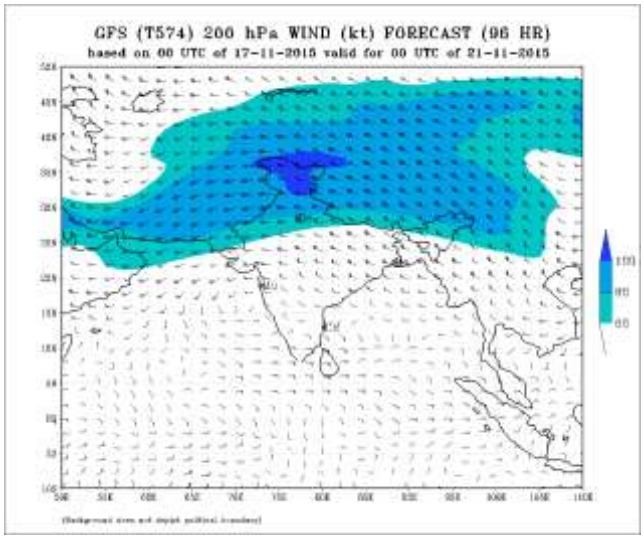

GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 17-11-2015 valid for 00 UTC of 22-11-2015

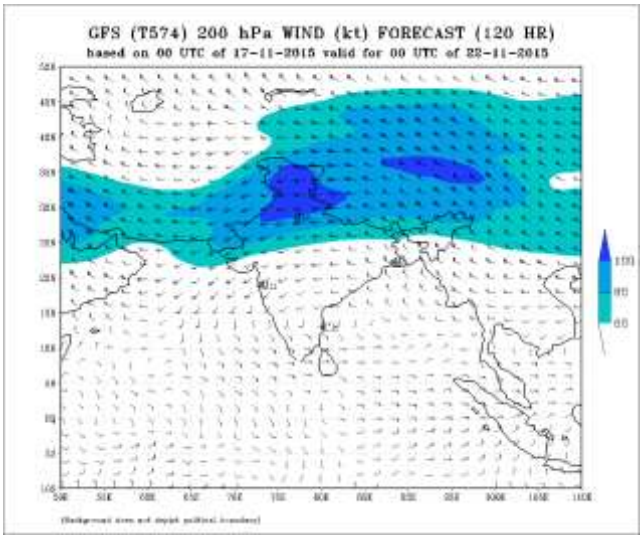

GFS (T574) 200 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 17-11-2015 valid for 00 UTC of 17-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 17-11-2015 valid for 00 UTC of 18-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 17-11-2015 valid for 00 UTC of 19-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 17-11-2015 valid for 00 UTC of 20-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 17-11-2015 valid for 00 UTC of 21-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 17-11-2015 valid for 00 UTC of 22-11-2015

FDP (Cyclone) NOC Report Dated 18 November, 2015

Synoptic features:

- Yesterday's well marked low pressure area over westcentral Bay of Bengal and adjoining south coastal Andhra Pradesh now lies over westcentral Bay of Bengal and adjoining coastal Andhra Pradesh as a low pressure area.

Surface Temperature (SST):

- SST is 28-29°C over westcentral, eastcentral and southeast Bay of Bengal and Andaman Sea.
- SST is 28-29°C over southeast and Southwest Arabian Sea (AS). It is 28-29°C over westcentral and north part of AS.

Tropical Cyclone Heat Potential (TCHP):

- TCHP is 40-50 kJ/cm^2 over southwest BOB and north Tamil Nadu coast.
- TCHP is 100-110 kJ/cm^2 over southwest and eastcentral and adjoining AS and along the west coast of India.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive and is about 30-50x10^{-5}s^{-1} over southwest BOB.
- It is 30-50x10^{-5}s^{-1} over southeast AS and is negative over rest part of AS.

Convergence:

- Lower level convergence is about 10-20x10^{-5}s^{-1} over southwest BOB.
- Lower level convergence is -5x10^{-5}s^{-1} over parts of westcentral AS.

Divergence:

- Upper level divergence is 10-20x10^{-5} s^{-1} over southwest BOB.
- Upper level divergence is -5x10^{-5} s^{-1} over east and west central AS.

Wind Shear:

- Wind shear over southwest BOB is 10-20knots north Tamilnadu and south Coastal Andhra Pradesh.
- The vertical wind shear is 10-20 knots over most part of AS.

Wind Shear Tendency:

- There is decreasing tendency from 5 to 10 knots in the vertical wind shear over the southwest BOB.
- The vertical wind shear tendency is 10 knots over westcentral and adjoining southwest AS.

Upper tropospheric ridge:

- The upper tropospheric ridge at 200 hPa runs along 16.0°N over the BOB.

M.J.O. Index:

- MJO index is in the border of Phase 2 with amplitude greater than 1 and would remain in phase 2 during next subsequent days.

Storms and Depression over South China Sea/ South Indian Ocean: NIL

Satellite:

Inference based on INSAT imagery of **180900** UTC:

Bay of Bengal & Andaman Sea:-

Broken low/medium clouds with embedded moderate to intense convection over westcentral bay adjoining southwest bay and south coastal Andhra Pradesh adjoining Rayalaseema in association with low level circulation over the area.

Arabian Sea:-
Scattered low/medium clouds with embedded isolated moderate to intense convection over southeast Arabian sea .
NWP Input for FDP Cyclone based on 0000 UTC of 18.11.2015
NWP Analysis

IMD-GFS and IMD-WRF model product analysis based on 00UTC of 18 November 2015 shows the low pressure area over the southwest Bay of Bengal off Tamil Nadu coast now lies over the south peninsula. Forecasts show emergence of the system into the southeast Arabian Sea off Kerala coast on 19 November 2015 and becomes less marked thereafter.

NWP products are available at:
http://202.54.31.51/bias/gfsproducts.php
http://202.54.31.51/bias/wrf27pro.php
http://202.54.31.51/bias/potentialparameter.php

NCMRWF-NCUM: No significant system
NCMRWF-GFS: No significant system
NCEP-GFS No significant system

ECMWF. : No significant system

JMA: No significant system

ARP-Meteo France No significant system

Genesis Potential Parameter (GPP): Model analysis of GPP based on 0000 UTC of 18 November 2015 shows no cyclogenesis zone over the North Indian Seas during next 5 days.

Summary and Conclusion:
No cyclogenesis expected over north Indian Ocean during next five days.

Bay of Bengal and Andaman Sea:

Probability of cyclogenesis over Bay of Bengal and Andaman Sea during next 120 hours:

24 HOURS	24-48 HOURS	48-72 HOURS	72-96 HOURS	96-120 HOURS
Nil	Nil	Nil	Nil	Nil

Arabian Sea:
Probability of cyclogenesis over Arabian Sea during next 120 hours:

24 HOURS	24-48 HOURS	48-72 HOURS	72-96 HOURS	96-120 HOURS
Nil	Nil	Nil	Nil	Nil

Advisory: No IOP during next five days.

Annexure-I

Status of observational system:

Synoptic observation:

Region	Date/Time (UTC)		
	17/12	18/00	18/03
India	39	34	43
Coastal stations			
WB	8	4	8
Odisha	7	5	6
AP	10	10	10
Tamil Nadu	12	12	11
Puducherry	2	2	2
A & N	-	1	6
Bangladesh	11	-	11
Myanmar	-	11	11
Thailand	2	2	2
Sri Lanka	9	9	8

AWS Observations: Not available
RS/RW (12Z) of 17/11/2015 **-6/39**
No. of Ascents reaching 250 hPa level:, MISDA:

RS/RW (00Z) of 18/11/2015- **25/39**
No. of Ascents reaching 250 hPa level:2 , MISDA:1

No. of PILOT Ascents

17/12Z	18/00Z
8	2

Buoy Data

17/12Z	18/00Z	18/03Z
9	7	5

STATUS OF CHENNAI REGION OBSERVATION

No. of Synop data

Date→	**17.11.2015**							
UTC→	**00**	**03**	**06**	**09**	**12**	**15**	**18**	**21**
Chennai Region (Coasts of AP & TN)	**20**	**22**	**20**	**20**	**22**	**20**	**20**	**20**

No. of RS/RW Ascents

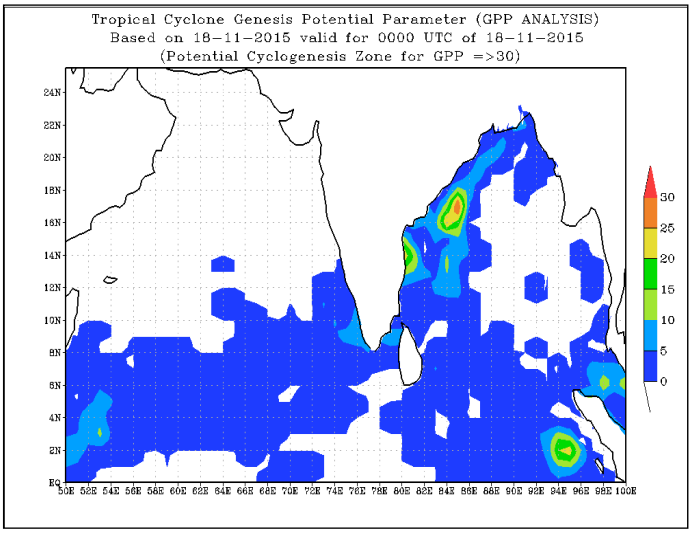
00Z /17.11.2015 : 7
No. of Ascents reaching 250 hPa level = 7
MISDA : 1

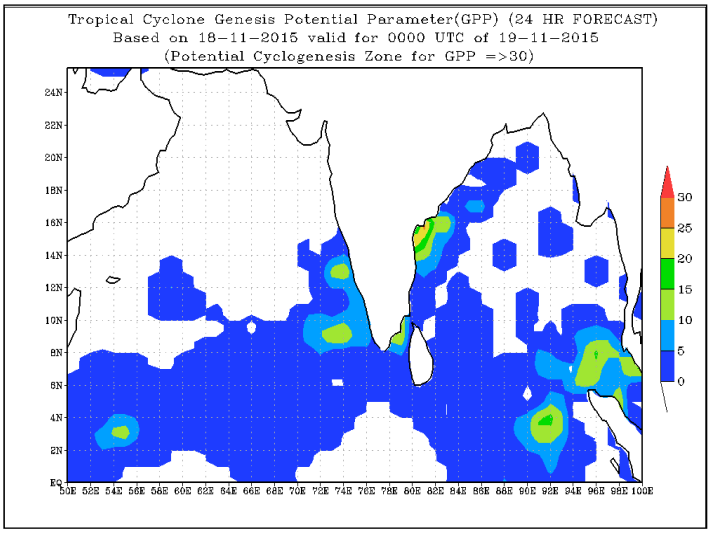
12Z /17.11.2015 : 1
No. of Ascents reaching 250 hPa level = 1
MISDA : 7

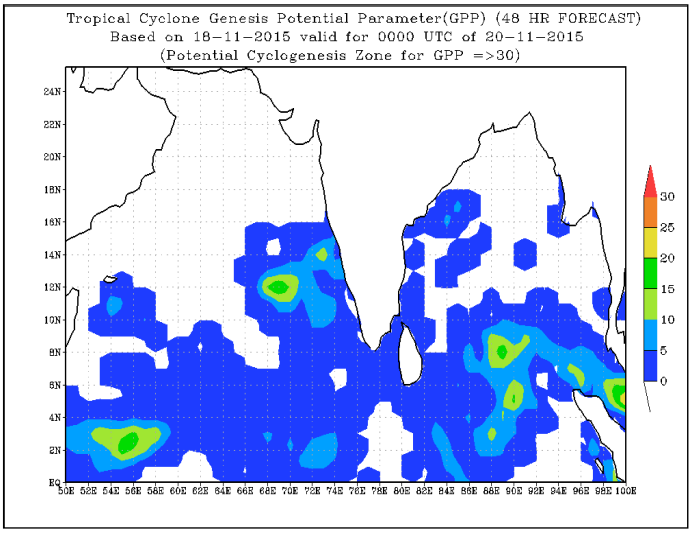
No. of PILOT Ascents:

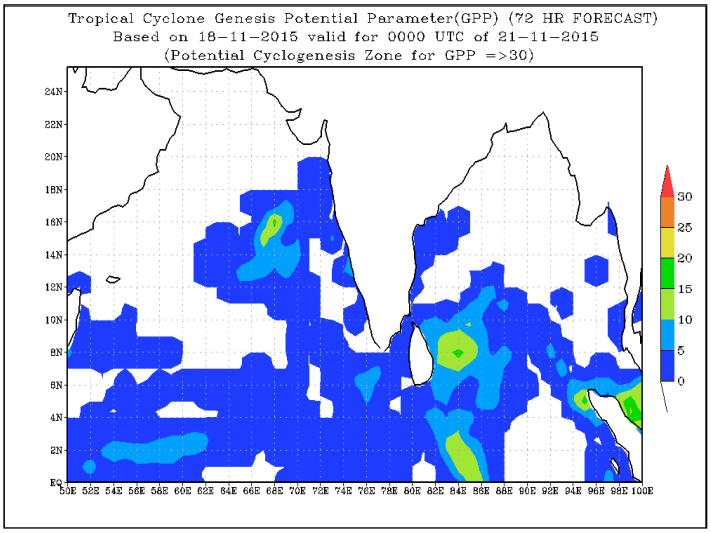
17.11.2015	
06Z	18Z
6	5

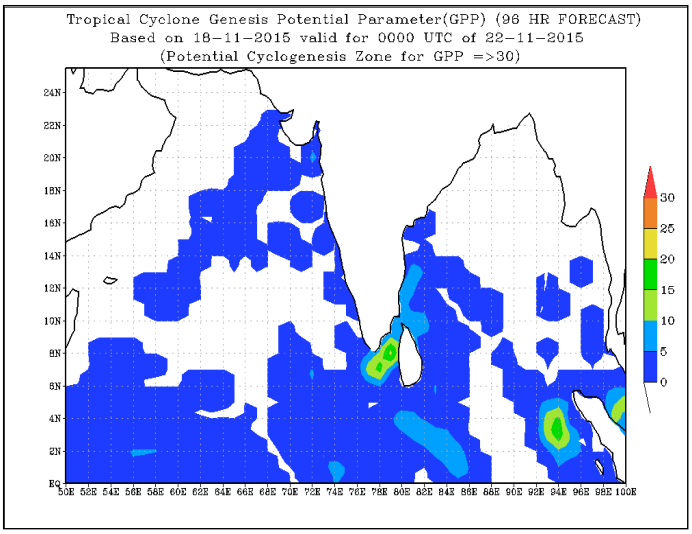
Annexure-II

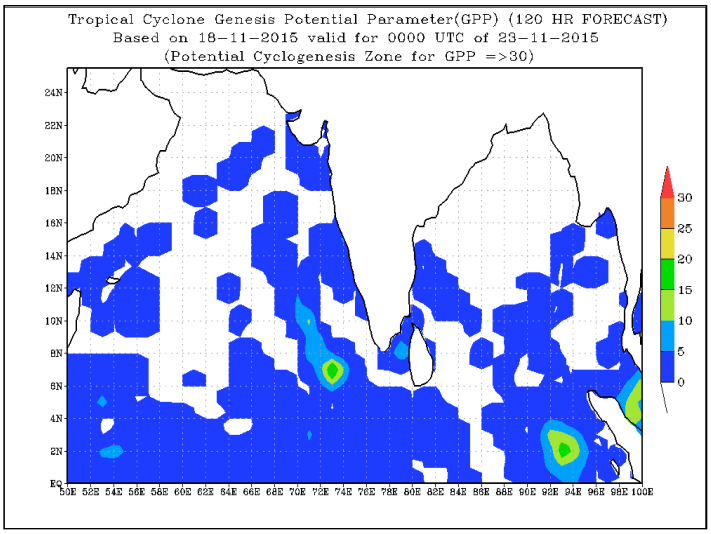

Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 18-11-2015 valid for 0000 UTC of 18-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

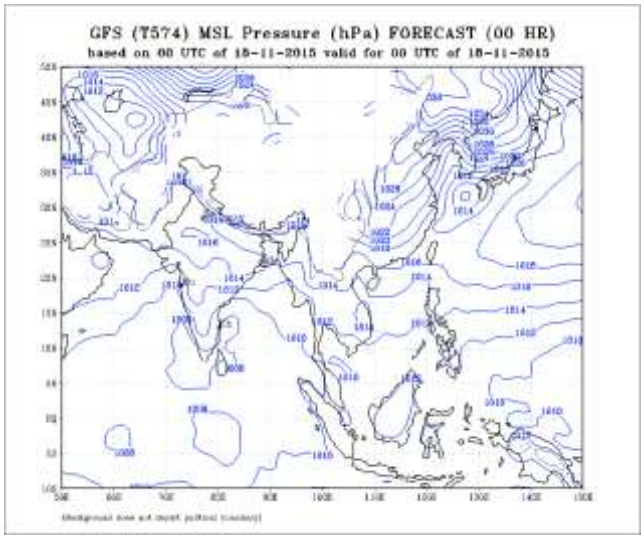

Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 18-11-2015 valid for 0000 UTC of 19-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

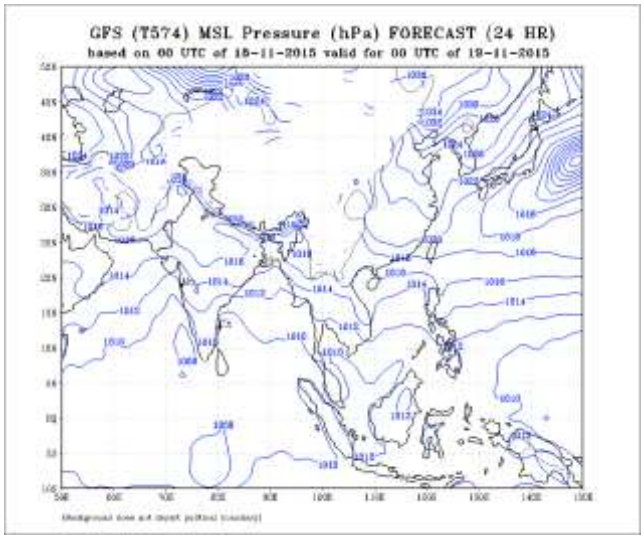

Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
Based on 18-11-2015 valid for 0000 UTC of 20-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

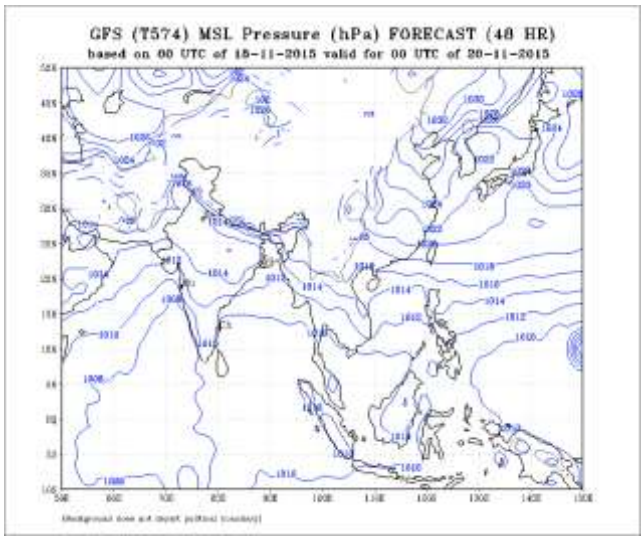

Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 18-11-2015 valid for 0000 UTC of 21-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

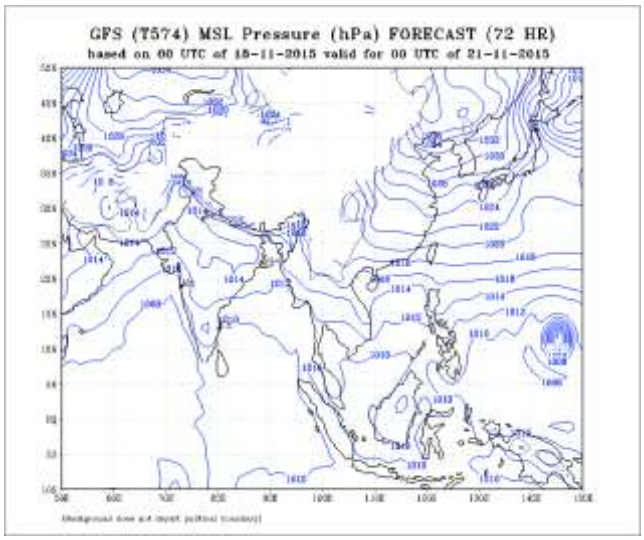

Tropical Cyclone Genesis Potential Parameter(GPP) (96 HR FORECAST)
Based on 18-11-2015 valid for 0000 UTC of 22-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

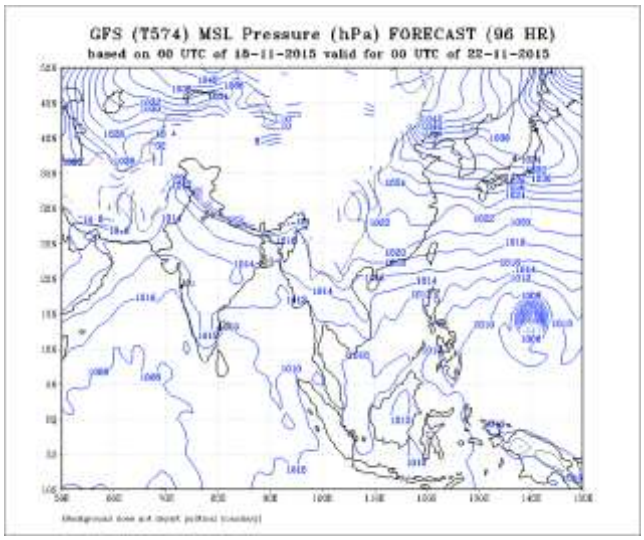

Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 18-11-2015 valid for 0000 UTC of 23-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

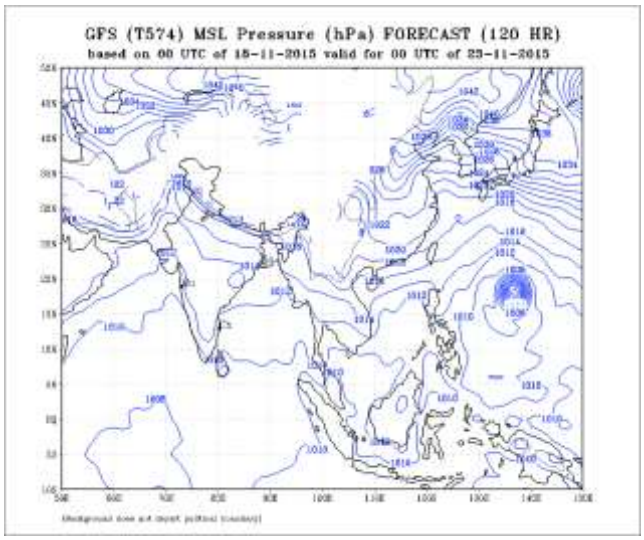

GFS (T574) MSL Pressure (hPa) FORECAST (00 HR)
based on 00 UTC of 18-11-2015 valid for 00 UTC of 18-11-2015

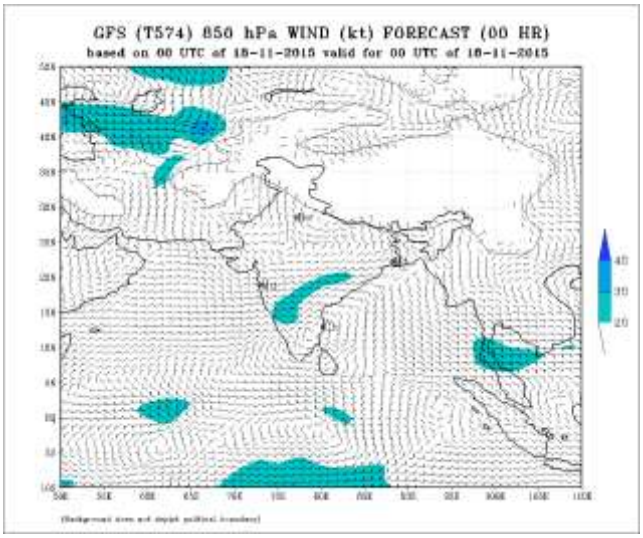

GFS (T574) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 18-11-2015 valid for 00 UTC of 19-11-2015

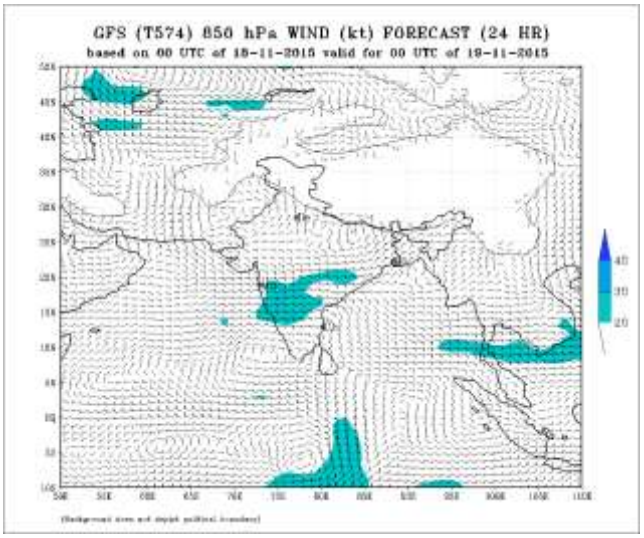

GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 18-11-2015 valid for 00 UTC of 20-11-2015

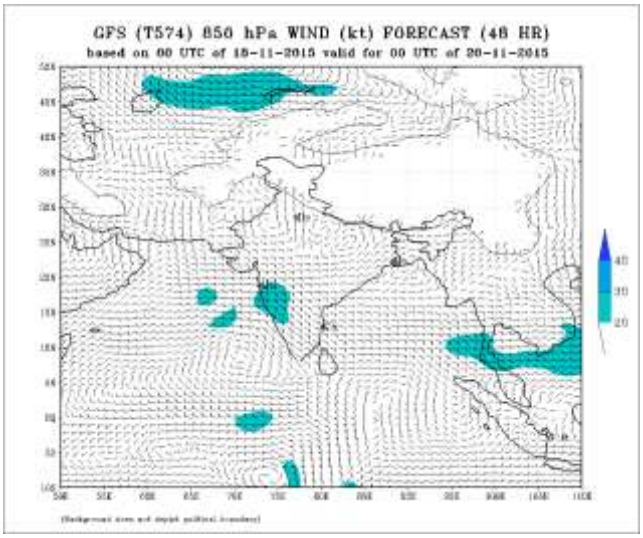

GFS (T574) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 18-11-2015 valid for 00 UTC of 21-11-2015

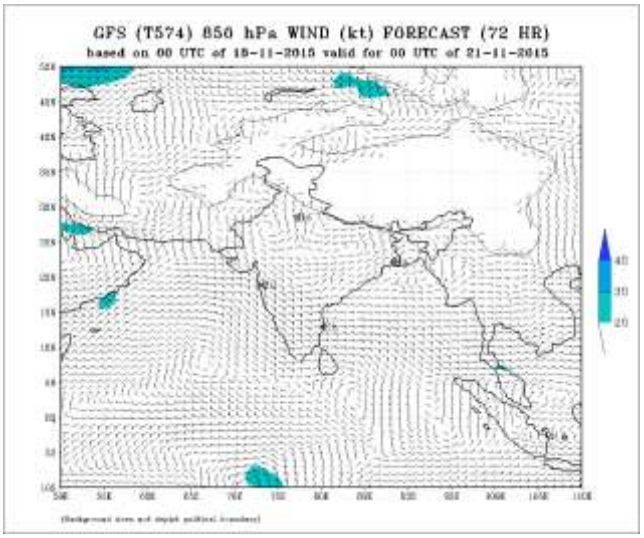

GFS (T574) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 18-11-2015 valid for 00 UTC of 22-11-2015


GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 18-11-2015 valid for 00 UTC of 23-11-2015


GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 18-11-2015 valid for 00 UTC of 18-11-2015


GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 18-11-2015 valid for 00 UTC of 19-11-2015


GFS (T574) 850 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 18-11-2015 valid for 00 UTC of 20-11-2015


GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
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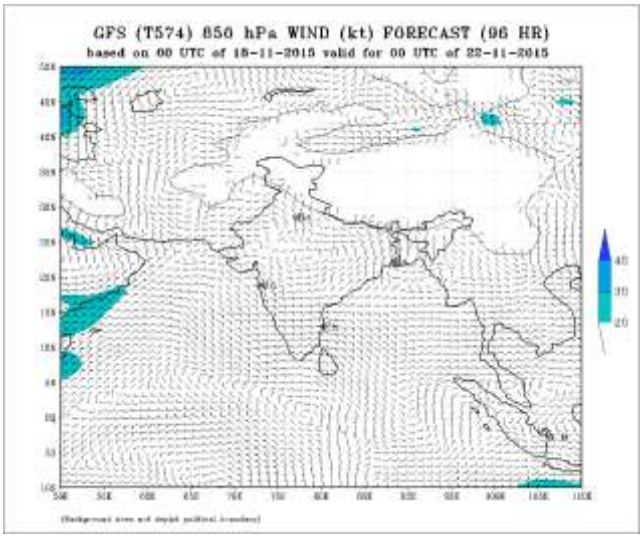
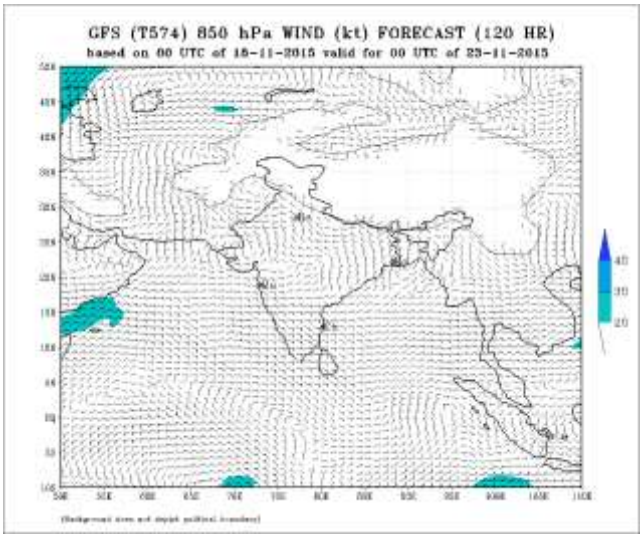
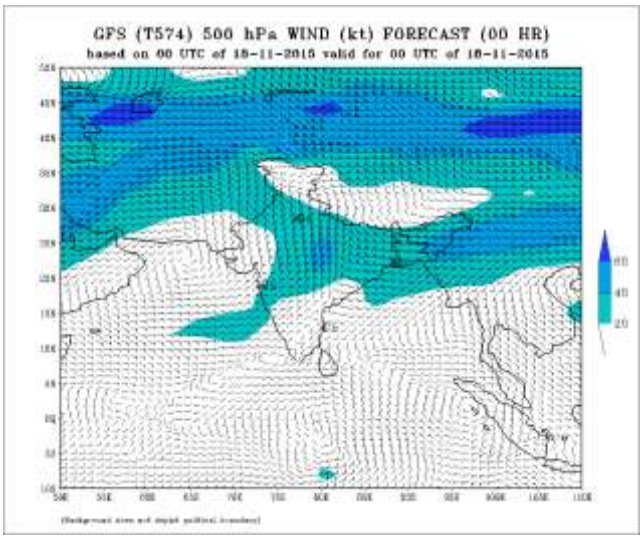
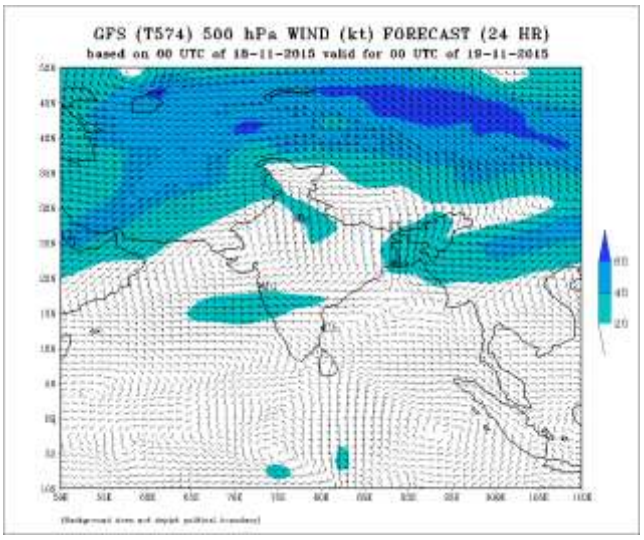
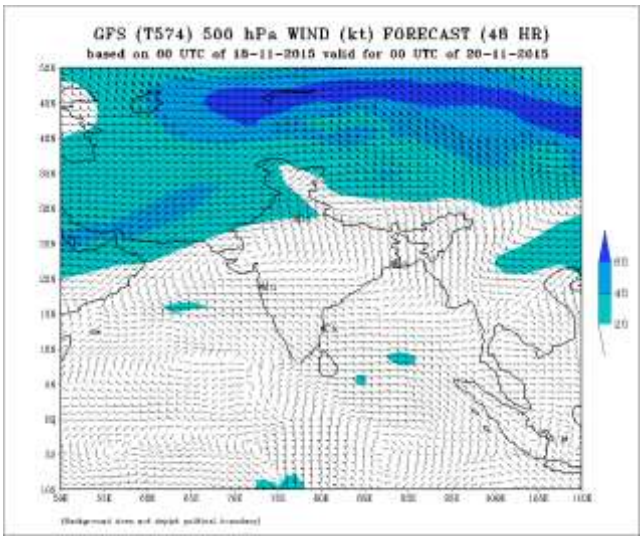
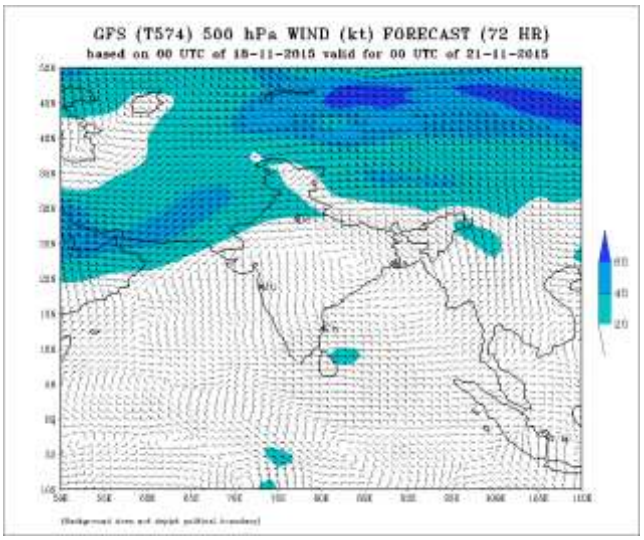

GFS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 18-11-2015 valid for 00 UTC of 22-11-2015

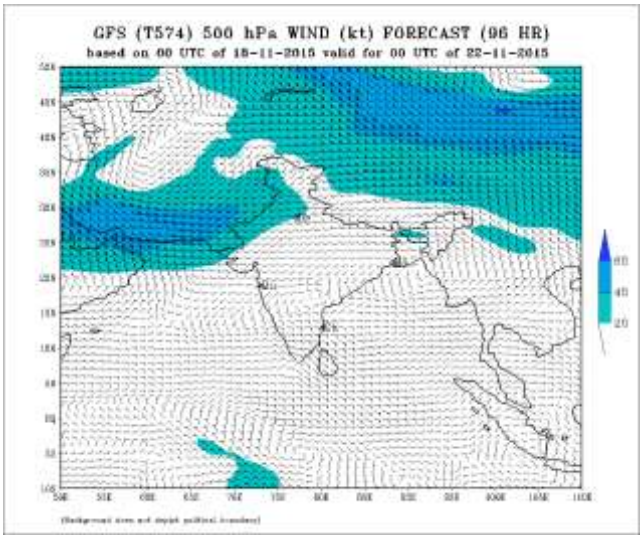

GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 18-11-2015 valid for 00 UTC of 23-11-2015

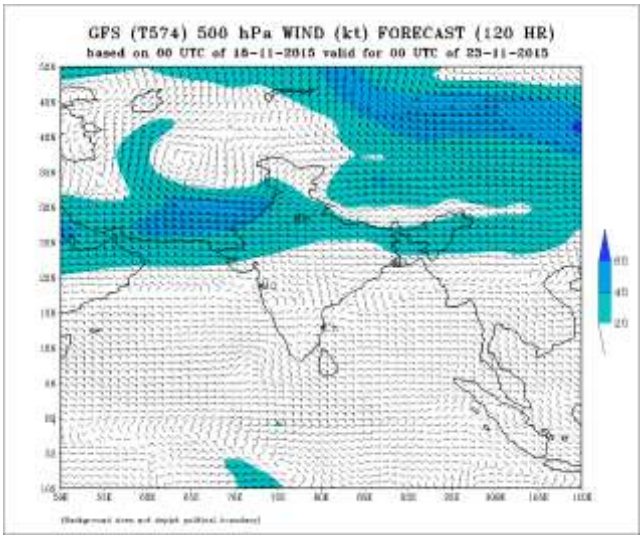

GFS (T574) 500 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 18-11-2015 valid for 00 UTC of 18-11-2015

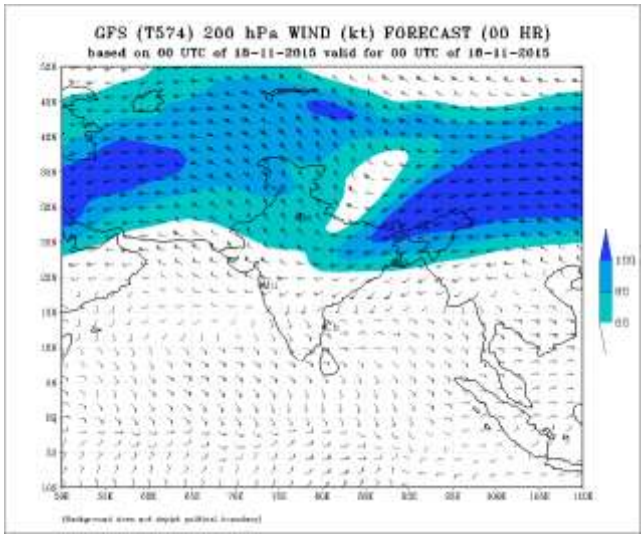

GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 18-11-2015 valid for 00 UTC of 19-11-2015


GFS (T574) 500 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 18-11-2015 valid for 00 UTC of 20-11-2015


GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 18-11-2015 valid for 00 UTC of 21-11-2015


GFS (T574) 500 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 18-11-2015 valid for 00 UTC of 22-11-2015


GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 18-11-2015 valid for 00 UTC of 23-11-2015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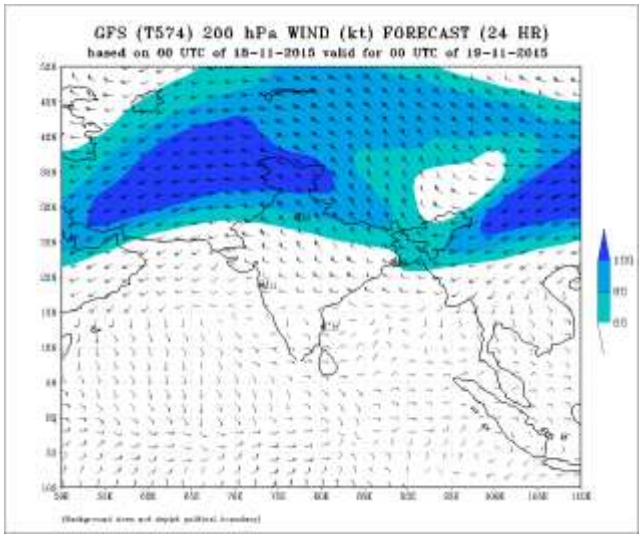
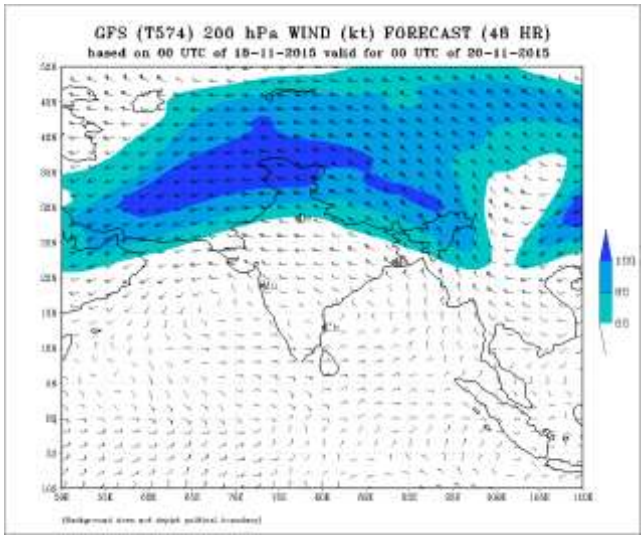
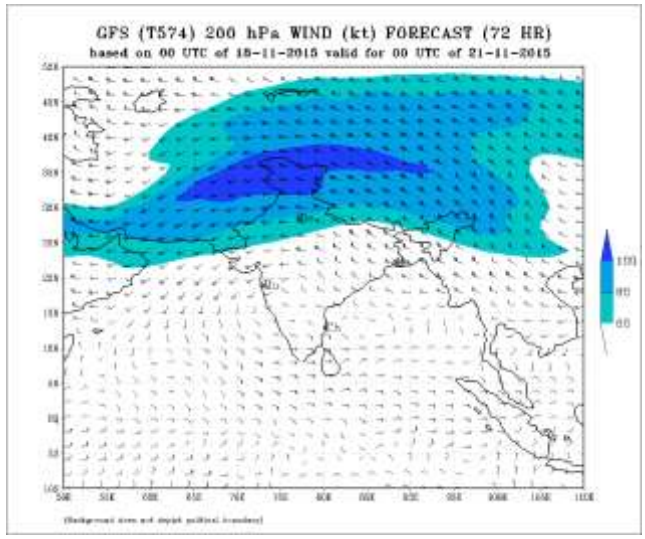
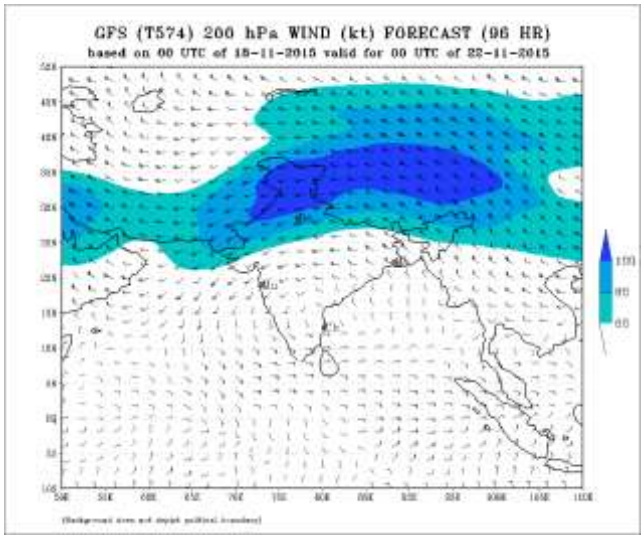
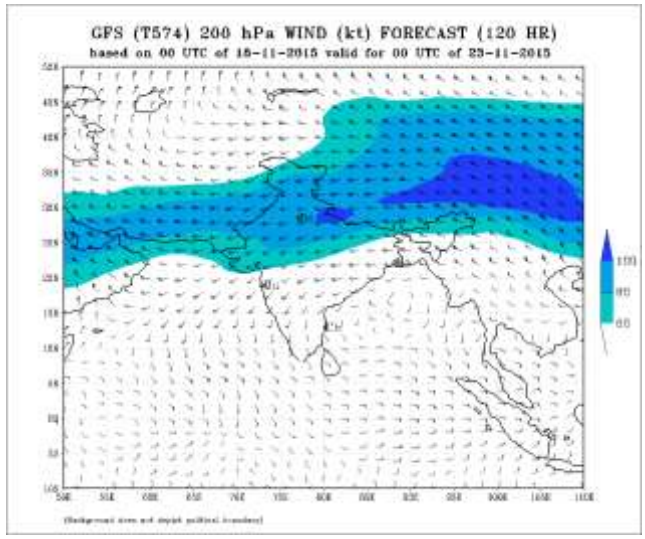
based on 00 UTC of 18-11-2015 valid for 00 UTC of 18-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 18-11-2015 valid for 00 UTC of 19-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 18-11-2015 valid for 00 UTC of 20-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 18-11-2015 valid for 00 UTC of 21-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 18-11-2015 valid for 00 UTC of 22-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 18-11-2015 valid for 00 UTC of 23-11-2015

FDP (Cyclone) NOC Report Dated 19 November, 2015

Synoptic features:

- Yesterday's low pressure area over west central Bay of Bengal off Andhra Pradesh coast has become less marked.
- A low pressure area lies over Lakshadweep area and neighbourhood. It may become well marked during next 48 hours**.**

Surface Temperature (SST):

- SST is 28-29°C over westcentral, eastcentral and southeast Bay of Bengal and Andaman Sea. It is 26-28°C over some parts of extreme north BoB.
- SST is 28-29°C over southeast and Southwest Arabian Sea (AS). It is 26-28°C over some parts of west central AS.

Tropical Cyclone Heat Potential (TCHP):

- TCHP is below 50kJ/cm^2 over extreme north of BoB. It is 50-90 kJ/cm^2 over Southern parts and 100-110 kJ/cm^2over equatorial parts of BoB.
- TCHP is below 50kJ/cm^2 over northwest part of AS and 50-80 kJ/cm^2over rest part of AS.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive and is about 30-40x10-5s-1 over many parts of BoB and AS between equatorial parts and Latitude 12^0N and it is negative over rest part of AS and BoB.

Convergence:

- Lower level convergence is about 05-10x$10^{-5}s^{-1}$ over westcentral of BOB.
- Lower level convergence is 05-10x$10^{-5}s^{-1}$ over parts of eastcentral AS.

Divergence:

- Upper level divergence is 10-20x10^{-5} s^{-1} over westcentral BOB and Andaman Sea.
- Upper level divergence is 5-10x10^{-5} s^{-1} over Lakshadweep and some parts of Southwest AS.

Wind Shear:

- Wind shear is 5-10knots over south BoB and it is higher towards northern latitude.
- The vertical wind shear is 10 knots over central parts of AS and it is higher towards northern latitude.

Wind Shear Tendency:

- There is decreasing tendency (10 Knots) in the southern parts of BOB.
- The vertical wind shear tendency is negative (10 Knots) over southern parts and is increasing towards northern parts of AS.

Upper tropospheric ridge:

- The upper tropospheric ridge at 200 hPa runs along 11.0°N over the BOB and 14.0°N over AS.

M.J.O. Index:

- MJO index is in the border of Phase 2 with amplitude greater than 1 and would remain in phase 2 during next subsequent days.

Storms and Depression over South China Sea/ South Indian Ocean: A vortex lies near 5^0S and 80^0E

Satellite based on INSAT imagery of **190900** UTC:

Bay of Bengal & Andaman Sea:-

Broken low/medium clouds with embedded moderate to intense convection over westcentral bay adjoining southwest Bay southeast Bay south Andaman sea. Broken medium layered clouds over southern of parts of northeast Bay.

Arabian Sea:-

Broken low/medium clouds with embedded moderate to intense convection over lakshadweep & neighbourhood in association with low level circulation over the area.Scattered low/medium clouds with embedded isolated moderate to intense convection over southeast Arabian Sea off Kerala coast , southwest Arabian sea and adjoining westcentral Arabian Sea

NWP Input for FDP Cyclone based on 0000 UTC of 19.11.2015

NWP Analysis

IMD-GFS AND IMD-WRF model product analysis based on 00UTC of 19 November 2015 shows the low pressure area over the south peninsula now lies over the southeast Arabian sea off Kerala coast. Forecasts show that the system becomes less marked after 24 hours.

NWP products are available at:

http://202.54.31.51/bias/gfsproducts.php

http://202.54.31.51/bias/wrf27pro.php

http://202.54.31.51/bias/potentialparameter.php

NCMRWF-NCUM: No significant system

NCMRWF-GFS: No significant system

NCEP-GFS No significant system

ECMWF. : No significant system

JMA: No significant system

ARP-Meteo France No significant system

Genesis Potential Parameter (GPP): Model analysis of GPP based on 0000 UTC of 19 November 2015 shows no cyclogenesis zone over the North Indian Seas during next 5 days.

Summary and Conclusion:

No cyclogenesis expected over north Indian Ocean during next two days.

Bay of Bengal and Andaman Sea:

Probability of cyclogenesis over Bay of Bengal and Andaman Sea during next 120 hours:

24 HOURS	24-48 HOURS	48-72 HOURS	72-96 HOURS	96-120 HOURS
Nil	Nil	Nil	Nil	Nil

Arabian Sea:

Probability of cyclogenesis over Arabian Sea during next 120 hours:

24 HOURS	24-48 HOURS	48-72 HOURS	72-96 HOURS	96-120 HOURS
Nil	Nil	Nil	Nil	Nil

Advisory: No IOP during next five days.

Annexure-I

Status of observational system:

Synoptic observation:

Region	Date/Time (UTC)		
	18/12	**19/00**	**19/03**
India	32	28	40
Coastal stations			
WB	6	3	6
Odisha	6	6	7
AP	10	10	10
Tamil Nadu	8	6	9
Puducherry	2	2	2
A & N	-	1	6
Bangladesh	10	11	11
Myanmar	11	10	11
Thailand	2	2	2
SriLanka	9	9	8

AWS Observations: Not available

RS/RW (12Z) of 18/11/2015 **-6/39**
No. of Ascents reaching 250 hPa level:, MISDA:

RS/RW (00Z) of 19/11/2015- **25/39**
No. of Ascents reaching 250 hPa level:2 , MISDA:1

No. of PILOT Ascents

18/12Z	**19/00Z**
9	7

Buoy Data

18/12Z	**19/00Z**	**19/03Z**
6	8	8

STATUS OF CHENNAI REGION OBSERVATION

No. of Synop data

Date→	18.11.2015							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	20	22	20	20	22	20	20	20

No. of RS/RW Ascents

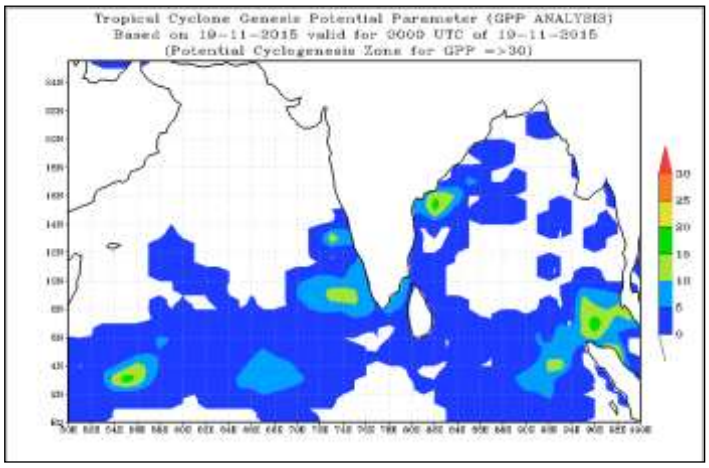
00Z /18.11.2015 : 7
No. of Ascents reaching 250 hPa level = 6
MISDA : 1

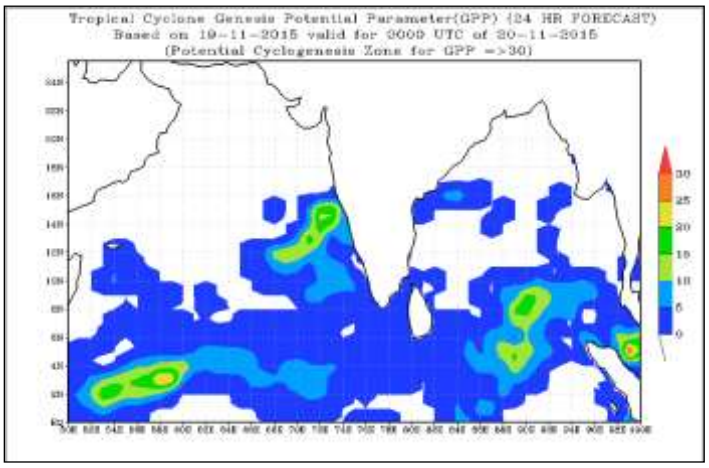
12Z /18.11.2015 : 1
No. of Ascents reaching 250 hPa level = 1
MISDA : 7

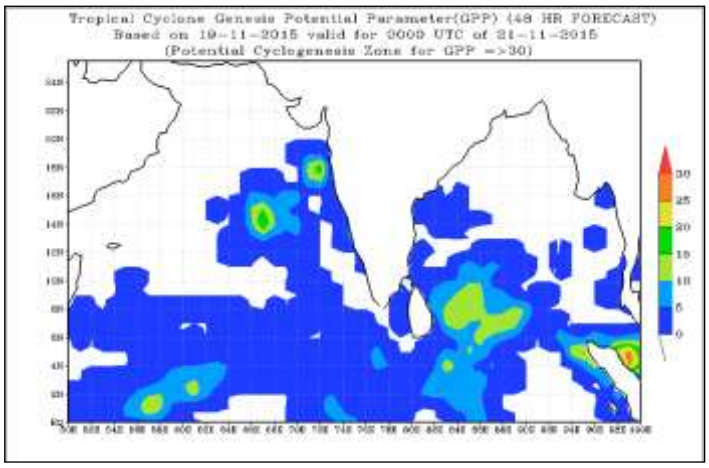
No. of PILOT Ascents:

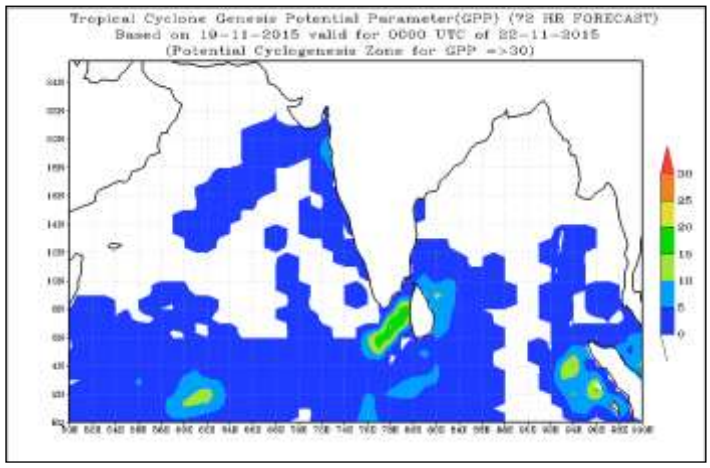
18.11.2015	
06Z	18Z
4	3

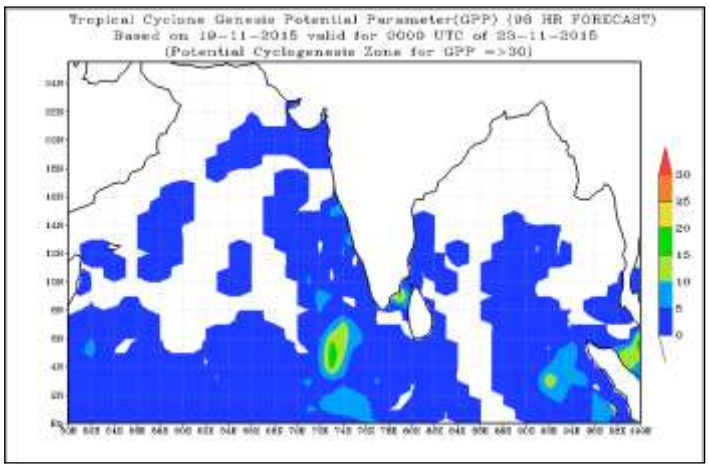
Annexure-II

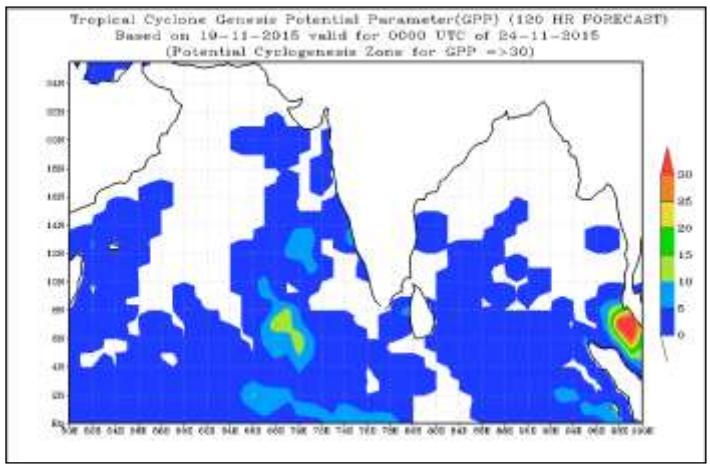

Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 19-11-2015 valid for 0000 UTC of 19-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

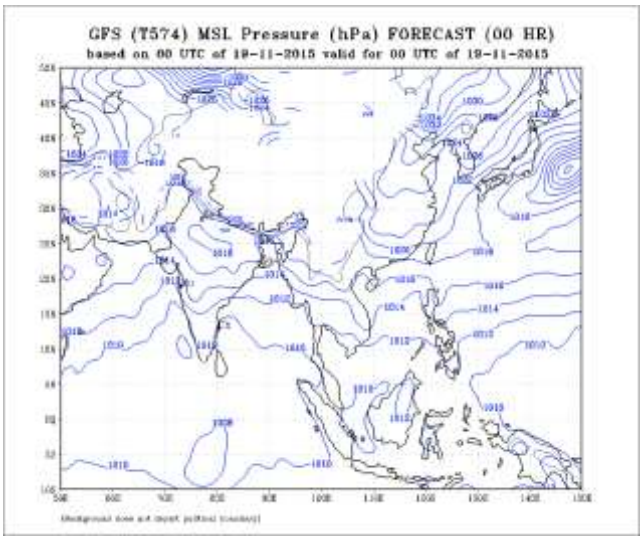

Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 19-11-2015 valid for 0000 UTC of 20-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

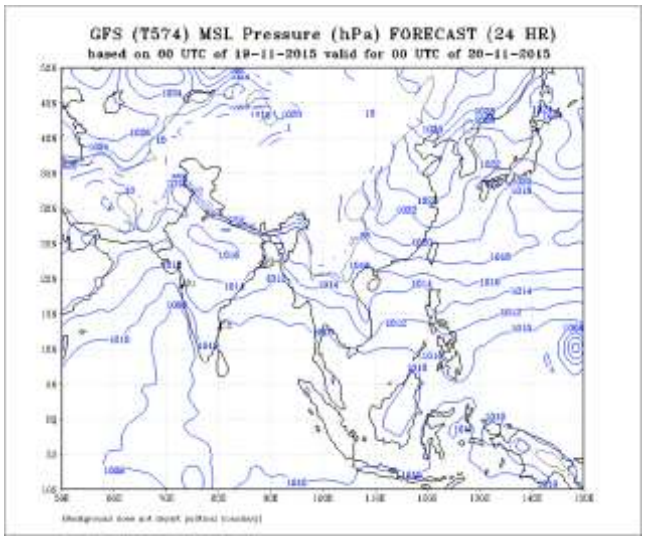

Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
Based on 19-11-2015 valid for 0000 UTC of 21-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

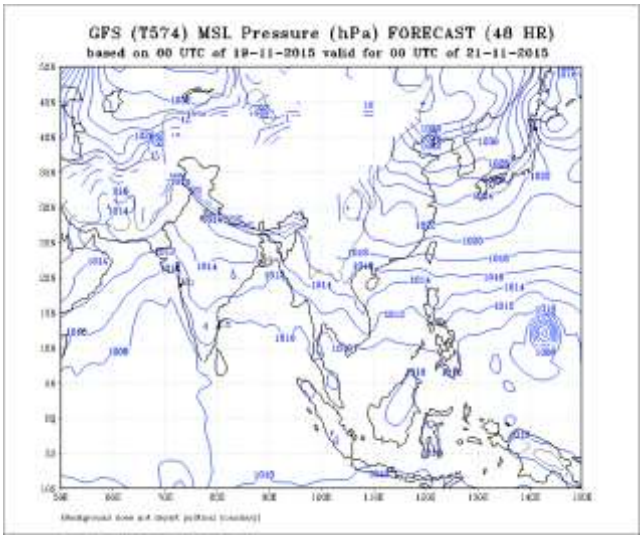

Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 19-11-2015 valid for 0000 UTC of 22-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

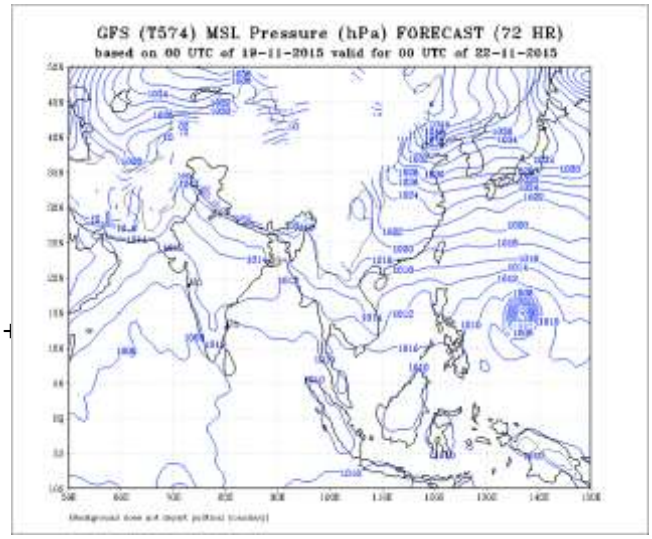

Tropical Cyclone Genesis Potential Parameter(GPP) (96 HR FORECAST)
Based on 19-11-2015 valid for 0000 UTC of 23-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

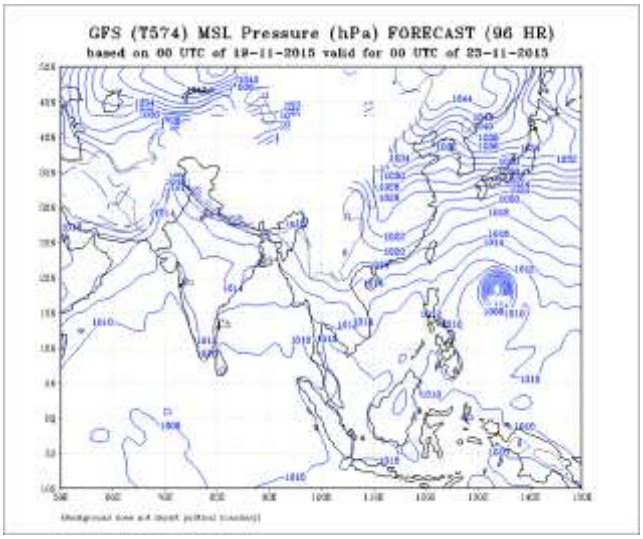

Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 19-11-2015 valid for 0000 UTC of 24-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

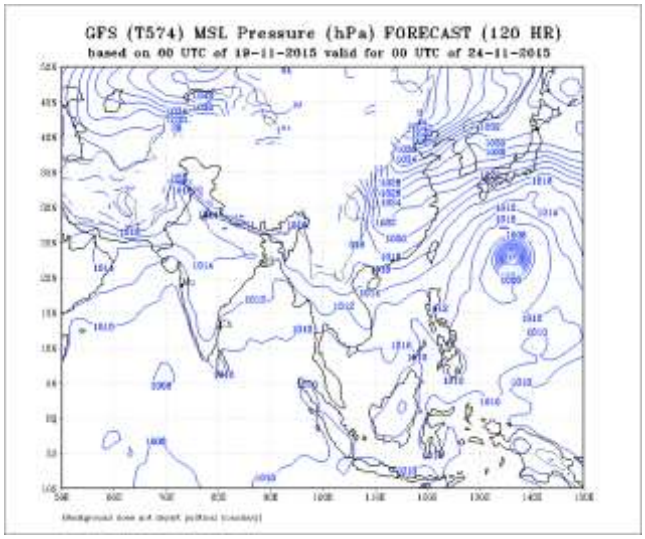

GFS (T574) MSL Pressure (hPa) FORECAST (00 HR)
based on 00 UTC of 19-11-2015 valid for 00 UTC of 19-11-2015

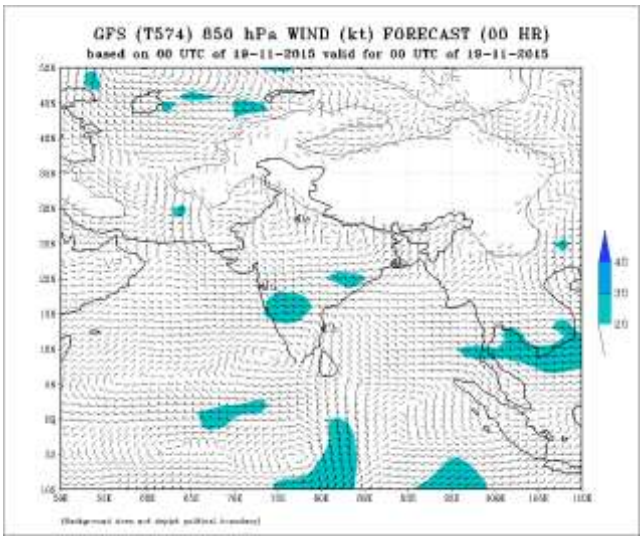

GFS (T574) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 19-11-2015 valid for 00 UTC of 20-11-2015

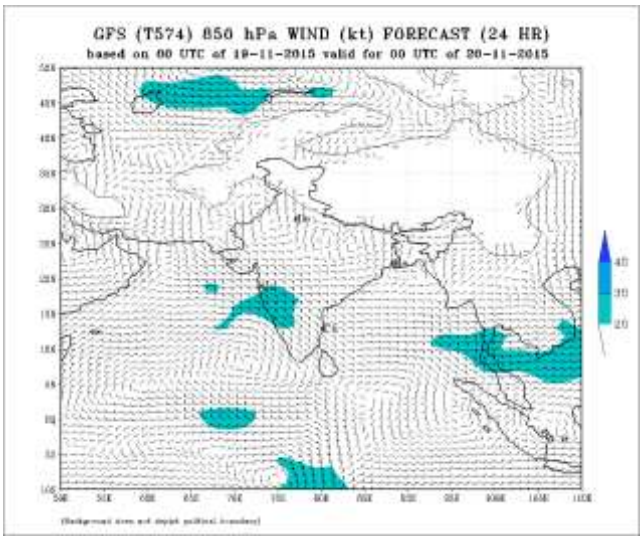

GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 19-11-2015 valid for 00 UTC of 21-11-2015

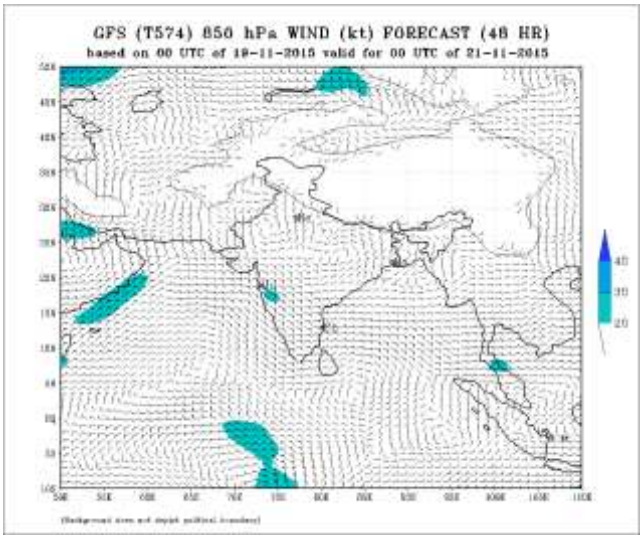

GFS (T574) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 19-11-2015 valid for 00 UTC of 22-11-2015

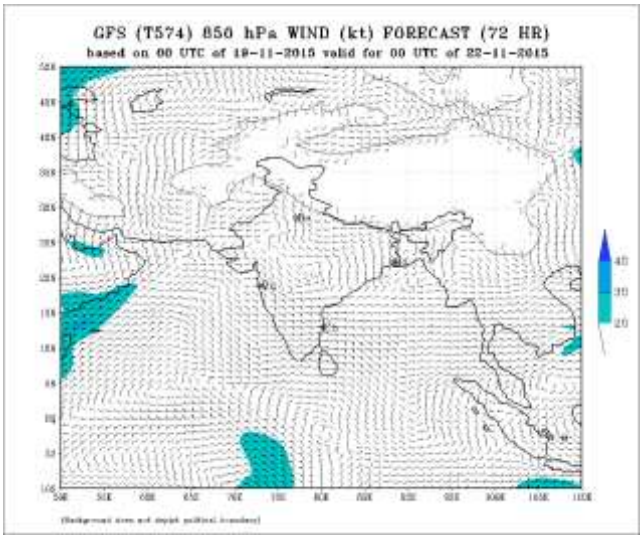

GFS (T574) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 19-11-2015 valid for 00 UTC of 23-11-2015

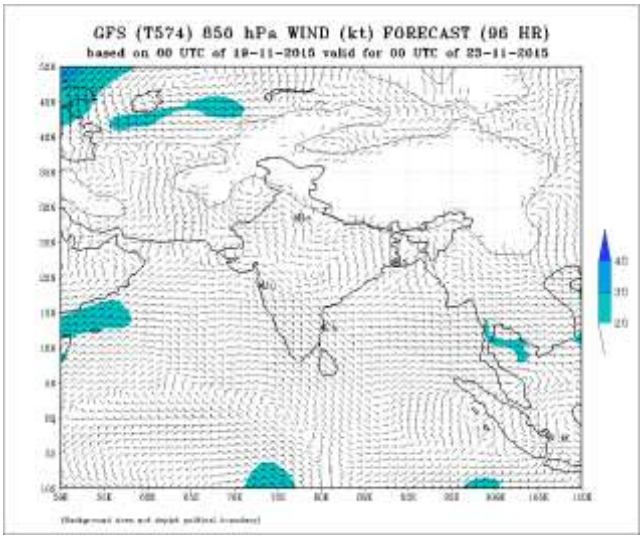

GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 19-11-2015 valid for 00 UTC of 24-11-2015

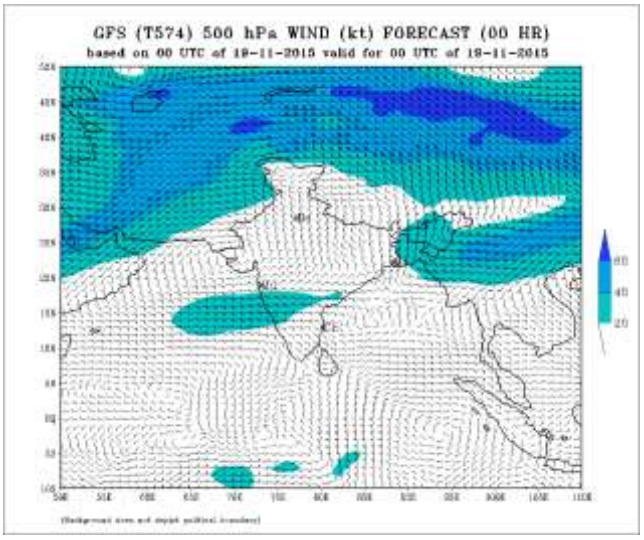

GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 19-11-2015 valid for 00 UTC of 19-11-2015

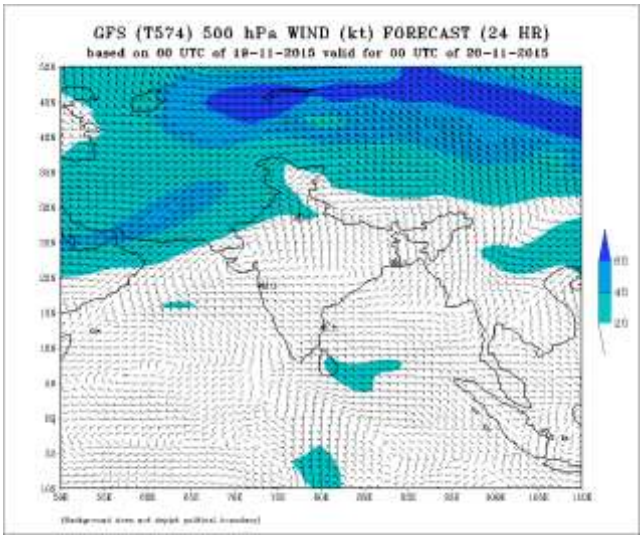

GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 19-11-2015 valid for 00 UTC of 20-11-2015

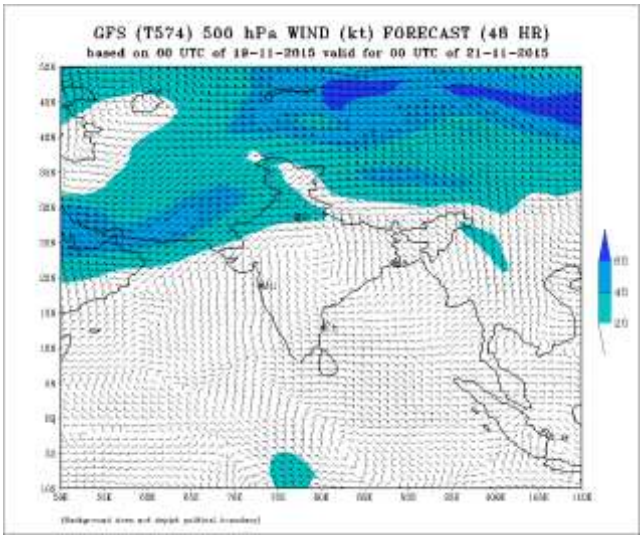

GFS (T574) 850 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 19-11-2015 valid for 00 UTC of 21-11-2015

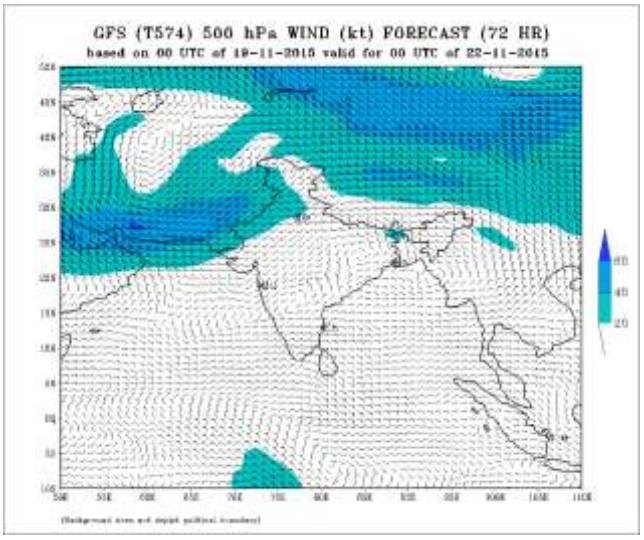

GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 19-11-2015 valid for 00 UTC of 22-11-2015

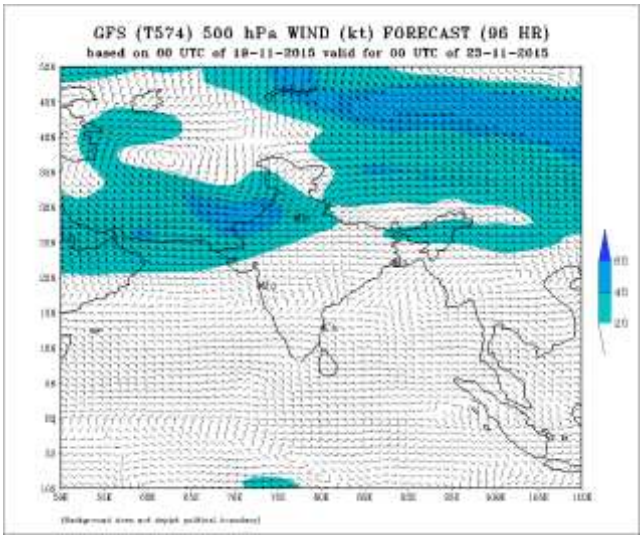

GFS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 19-11-2015 valid for 00 UTC of 23-11-2015

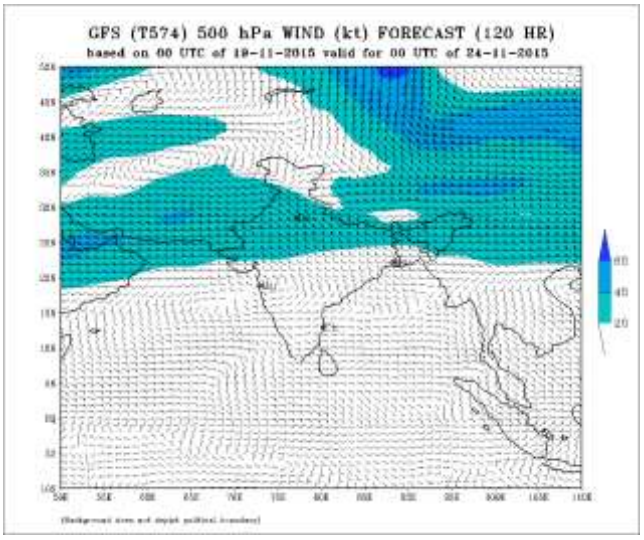

GFS (T574) 500 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 19-11-2015 valid for 00 UTC of 19-11-2015

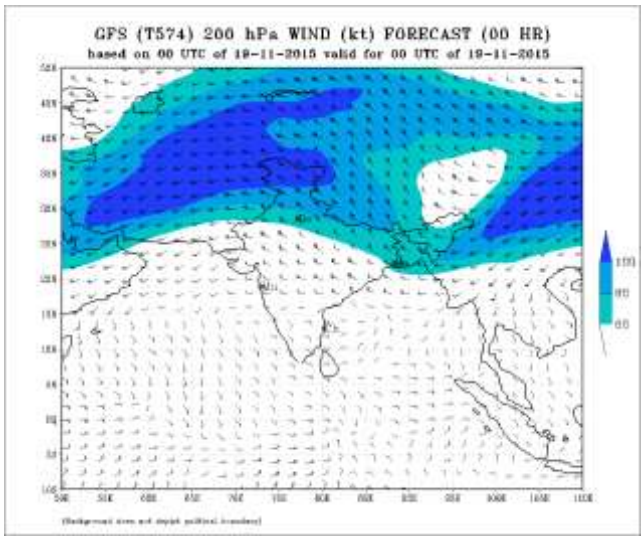

GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 19-11-2015 valid for 00 UTC of 20-11-2015

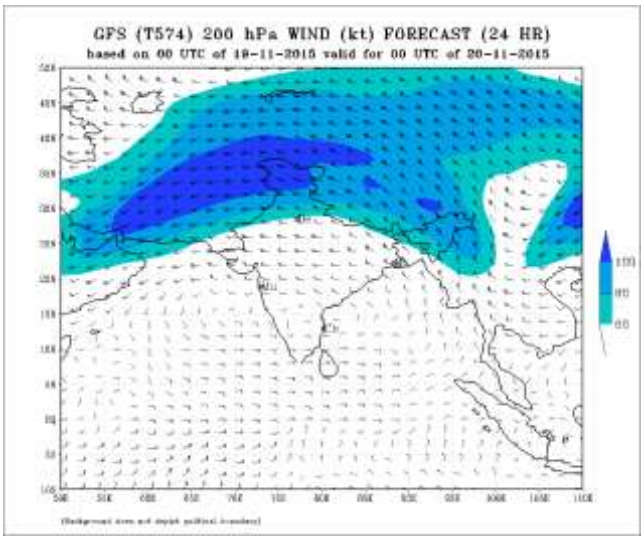

GFS (T574) 500 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 19-11-2015 valid for 00 UTC of 21-11-2015

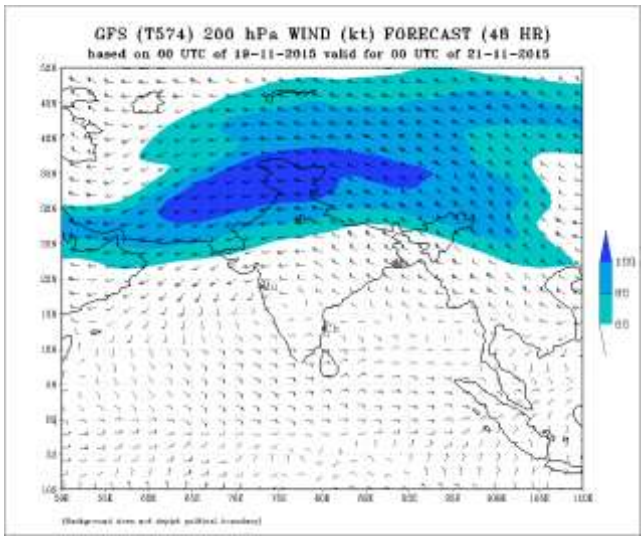

GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 19-11-2015 valid for 00 UTC of 22-11-2015

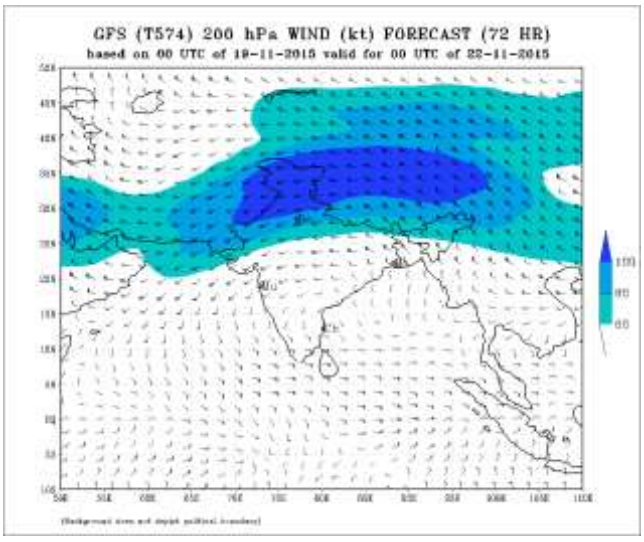

GFS (T574) 500 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 19-11-2015 valid for 00 UTC of 23-11-2015

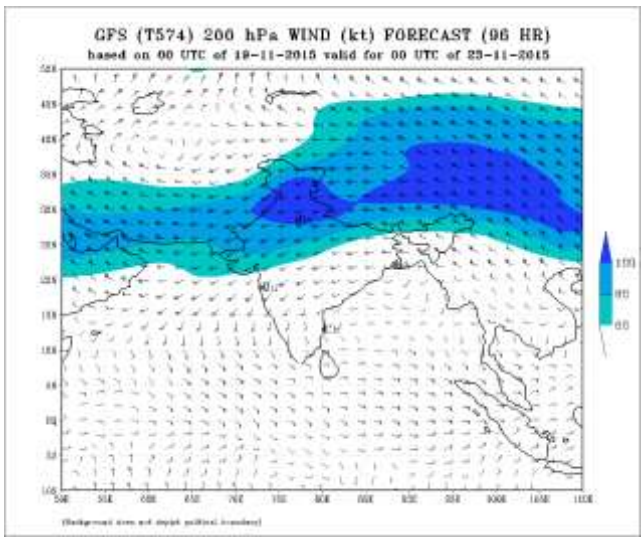

GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 19-11-2015 valid for 00 UTC of 24-11-2015

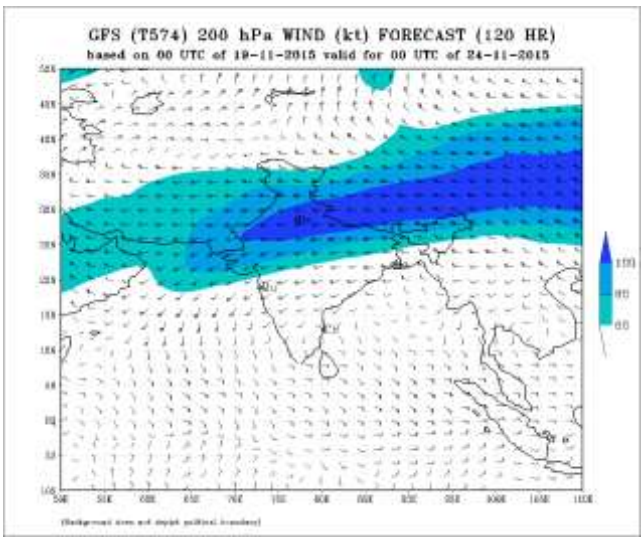

GFS (T574) 200 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 19-11-2015 valid for 00 UTC of 19-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 19-11-2015 valid for 00 UTC of 20-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 19-11-2015 valid for 00 UTC of 21-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 19-11-2015 valid for 00 UTC of 22-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 19-11-2015 valid for 00 UTC of 23-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 19-11-2015 valid for 00 UTC of 24-11-2015

FDP (Cyclone) NOC Report Dated 19 November, 2015

Synoptic features:

- Yesterday's low pressure area over west central Bay of Bengal off Andhra Pradesh coast has become less marked.
- A low pressure area lies over Lakshadweep area and neighbourhood. It may become well marked during next 48 hours**.**

Surface Temperature (SST):

- SST is 28-29°C over westcentral, eastcentral and southeast Bay of Bengal and Andaman Sea. It is 26-28°C over some parts of extreme north BoB.
- SST is 28-29°C over southeast and Southwest Arabian Sea (AS). It is 26-28°C over some parts of west central AS.

Tropical Cyclone Heat Potential (TCHP):

- TCHP is below 50kJ/cm^2 over extreme north of BoB. It is 50-90 kJ/cm^2 over Southern parts and 100-110 kJ/cm^2over equatorial parts of BoB.
- TCHP is below 50kJ/cm^2 over northwest part of AS and 50-80 kJ/cm^2over rest part of AS.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive and is about 30-40x10-5s-1 over many parts of BoB and AS between equatorial parts and Latitude 12^0N and it is negative over rest part of AS and BoB.

Convergence:

- Lower level convergence is about 05-10x$10^{-5}s^{-1}$ over westcentral of BOB.
- Lower level convergence is 05-10x$10^{-5}s^{-1}$ over parts of eastcentral AS.

Divergence:

- Upper level divergence is 10-20x10^{-5} s^{-1} over westcentral BOB and Andaman Sea.
- Upper level divergence is 5-10x10^{-5} s^{-1} over Lakshadweep and some parts of Southwest AS.

Wind Shear:

- Wind shear is 5-10knots over south BoB and it is higher towards northern latitude.
- The vertical wind shear is 10 knots over central parts of AS and it is higher towards northern latitude.

Wind Shear Tendency:

- There is decreasing tendency (10 Knots) in the southern parts of BOB.
- The vertical wind shear tendency is negative (10 Knots) over southern parts and is increasing towards northern parts of AS.

Upper tropospheric ridge:

- The upper tropospheric ridge at 200 hPa runs along 11.0°N over the BOB and 14.0°N over AS.

M.J.O. Index:

- MJO index is in the border of Phase 2 with amplitude greater than 1 and would remain in phase 2 during next subsequent days.

Storms and Depression over South China Sea/ South Indian Ocean: A vortex lies near 5^0S and 80^0E

Satellite based on INSAT imagery of **190900** UTC:

Bay of Bengal & Andaman Sea:-

Broken low/medium clouds with embedded moderate to intense convection over westcentral bay adjoining southwest Bay southeast Bay south Andaman sea. Broken medium layered clouds over southern of parts of northeast Bay.

Arabian Sea:-

Broken low/medium clouds with embedded moderate to intense convection over lakshadweep & neighbourhood in association with low level circulation over the area.Scattered low/medium clouds with embedded isolated moderate to intense convection over southeast Arabian Sea off Kerala coast , southwest Arabian sea and adjoining westcentral Arabian Sea

NWP Input for FDP Cyclone based on 0000 UTC of 19.11.2015

NWP Analysis

IMD-GFS AND IMD-WRF model product analysis based on 00UTC of 19 November 2015 shows the low pressure area over the south peninsula now lies over the southeast Arabian sea off Kerala coast. Forecasts show that the system becomes less marked after 24 hours.

NWP products are available at:

http://202.54.31.51/bias/gfsproducts.php

http://202.54.31.51/bias/wrf27pro.php

http://202.54.31.51/bias/potentialparameter.php

NCMRWF-NCUM: No significant system

NCMRWF-GFS: No significant system

NCEP-GFS No significant system

ECMWF. : No significant system

JMA: No significant system

ARP-Meteo France No significant system

Genesis Potential Parameter (GPP): Model analysis of GPP based on 0000 UTC of 19 November 2015 shows no cyclogenesis zone over the North Indian Seas during next 5 days.

Summary and Conclusion:

No cyclogenesis expected over north Indian Ocean during next two days.

Bay of Bengal and Andaman Sea:

Probability of cyclogenesis over Bay of Bengal and Andaman Sea during next 120 hours:

24 HOURS	24-48 HOURS	48-72 HOURS	72-96 HOURS	96-120 HOURS
Nil	Nil	Nil	Nil	Nil

Arabian Sea:

Probability of cyclogenesis over Arabian Sea during next 120 hours:

24 HOURS	24-48 HOURS	48-72 HOURS	72-96 HOURS	96-120 HOURS
Nil	Nil	Nil	Nil	Nil

Advisory: No IOP during next five days.

Annexure-I

Status of observational system:

Synoptic observation:

Region	Date/Time (UTC)		
	18/12	**19/00**	**19/03**
India	32	28	40
Coastal stations			
WB	6	3	6
Odisha	6	6	7
AP	10	10	10
Tamil Nadu	8	6	9
Puducherry	2	2	2
A & N	-	1	6
Bangladesh	10	11	11
Myanmar	11	10	11
Thailand	2	2	2
SriLanka	9	9	8

AWS Observations: Not available

RS/RW (12Z) of 18/11/2015 **-6/39**

No. of Ascents reaching 250 hPa level:, MISDA:

RS/RW (00Z) of 19/11/2015- **25/39**

No. of Ascents reaching 250 hPa level:2 , MISDA:1

No. of PILOT Ascents

18/12Z	**19/00Z**
9	7

Buoy Data

18/12Z	**19/00Z**	**19/03Z**
6	8	8

STATUS OF CHENNAI REGION OBSERVATION

No. of Synop data

Date→	18.11.2015							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	20	22	20	20	22	20	20	20

No. of RS/RW Ascents

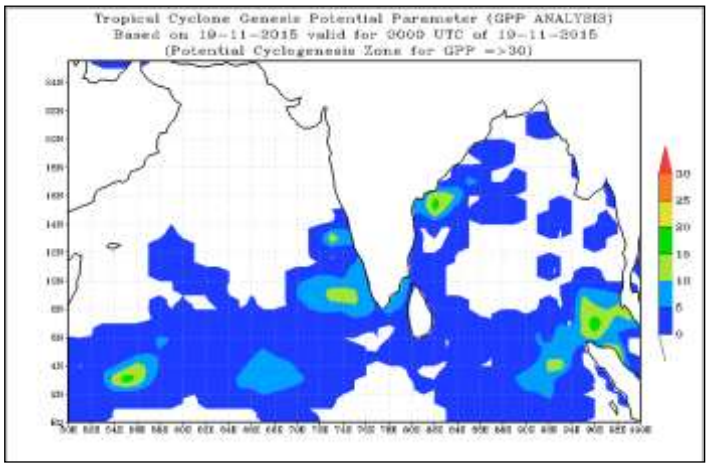
00Z /18.11.2015 : 7
No. of Ascents reaching 250 hPa level = 6
MISDA : 1

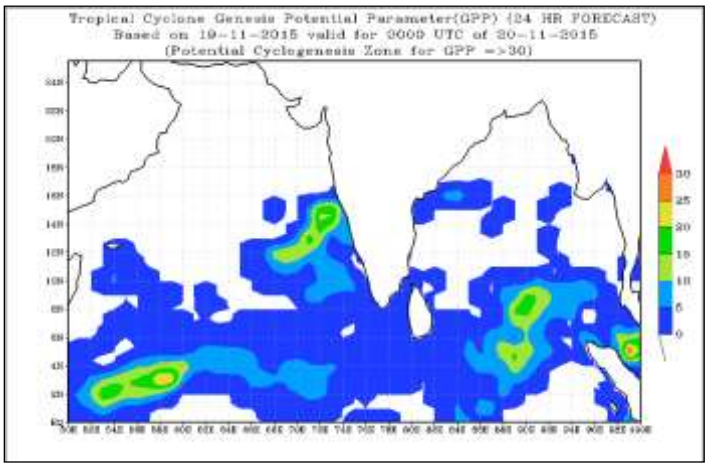
12Z /18.11.2015 : 1
No. of Ascents reaching 250 hPa level = 1
MISDA : 7

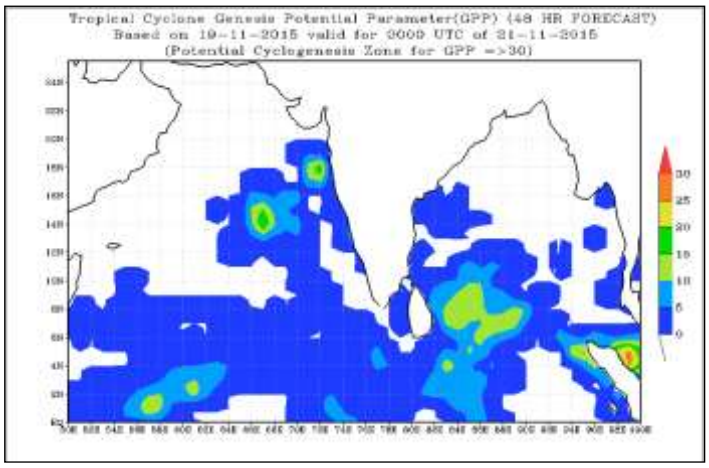
No. of PILOT Ascents:

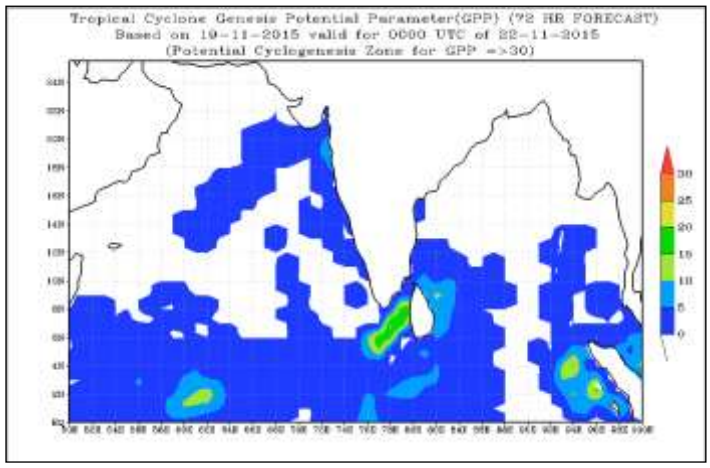
18.11.2015	
06Z	18Z
4	3

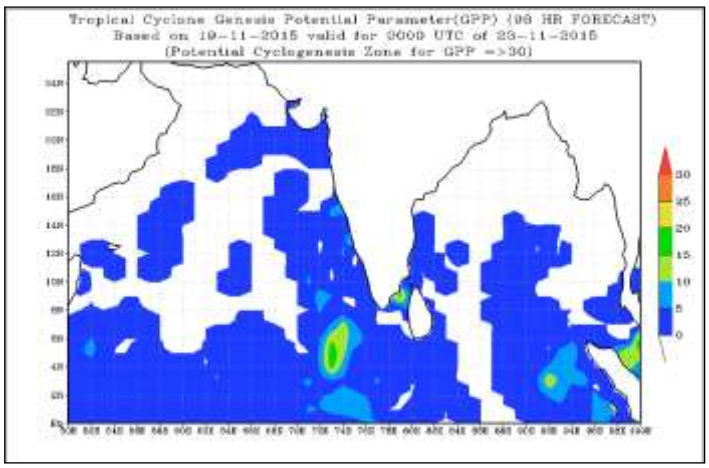
Annexure-II

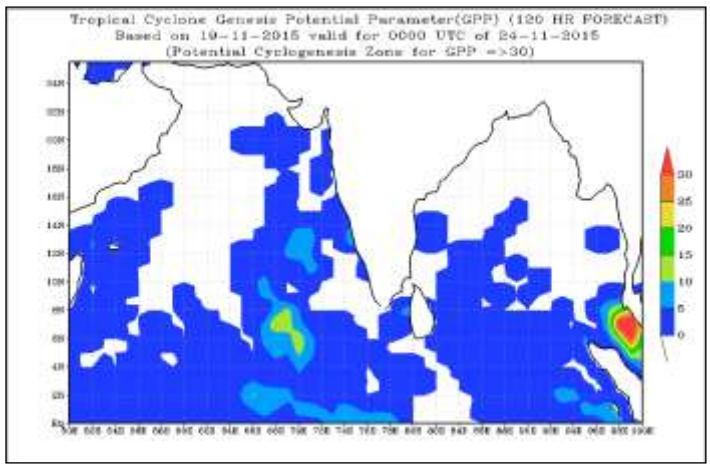

Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 19-11-2015 valid for 0000 UTC of 19-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

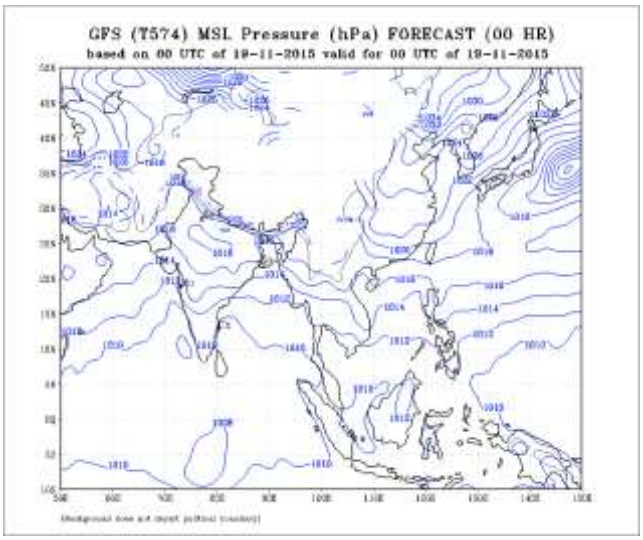

Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 19-11-2015 valid for 0000 UTC of 20-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

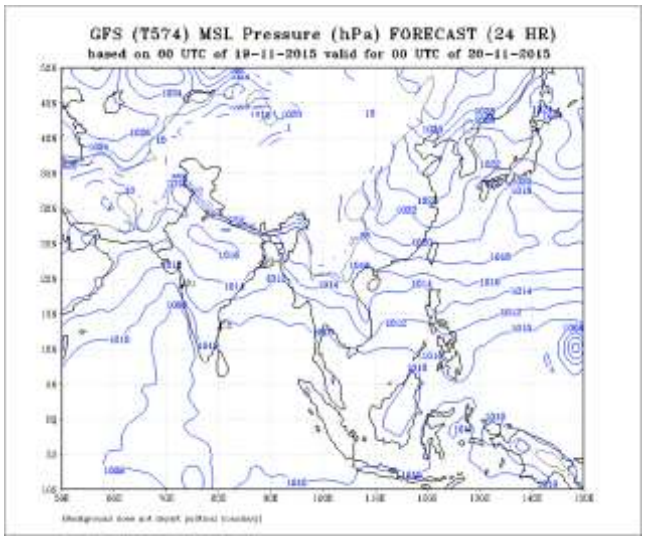

Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
Based on 19-11-2015 valid for 0000 UTC of 21-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

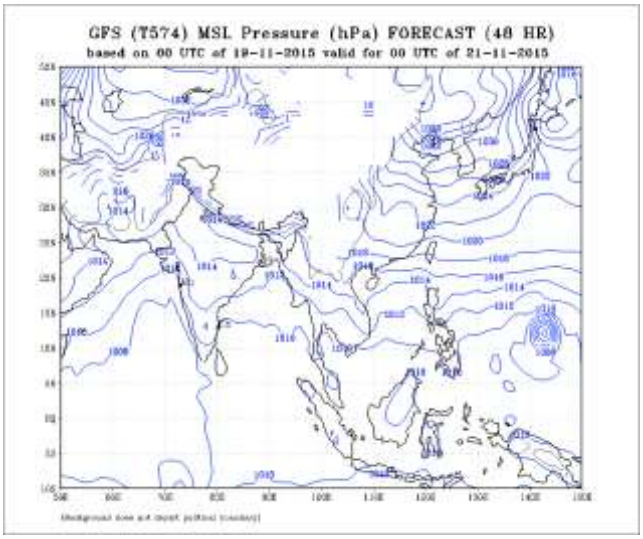

Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 19-11-2015 valid for 0000 UTC of 22-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

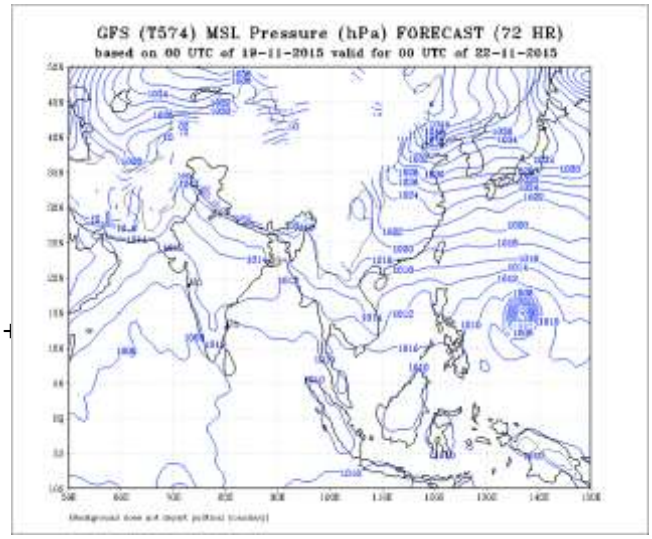

Tropical Cyclone Genesis Potential Parameter(GPP) (96 HR FORECAST)
Based on 19-11-2015 valid for 0000 UTC of 23-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

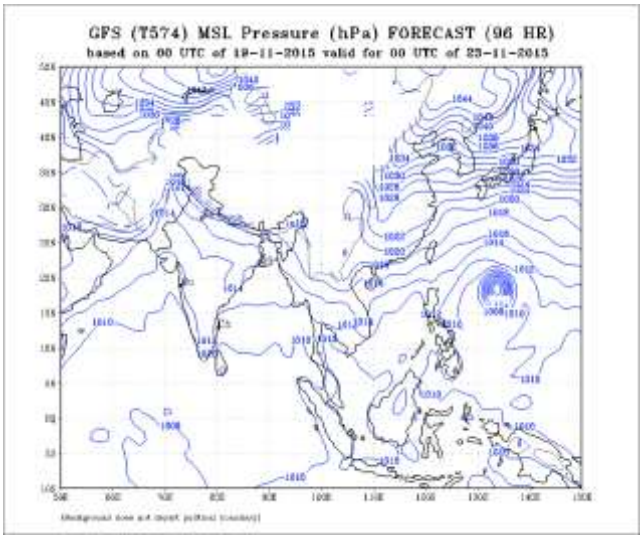

Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 19-11-2015 valid for 0000 UTC of 24-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

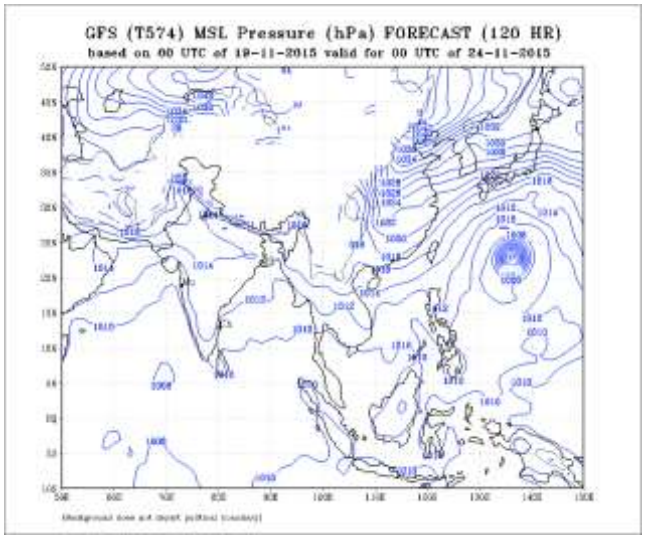

GFS (T574) MSL Pressure (hPa) FORECAST (00 HR)
based on 00 UTC of 19-11-2015 valid for 00 UTC of 19-11-2015

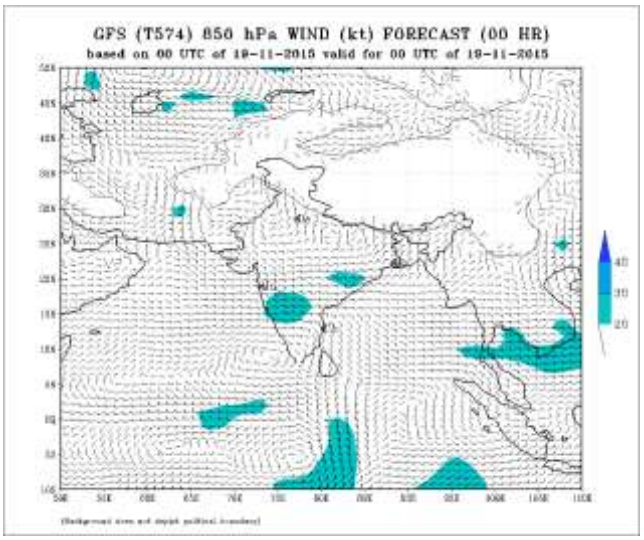

GFS (T574) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 19-11-2015 valid for 00 UTC of 20-11-2015

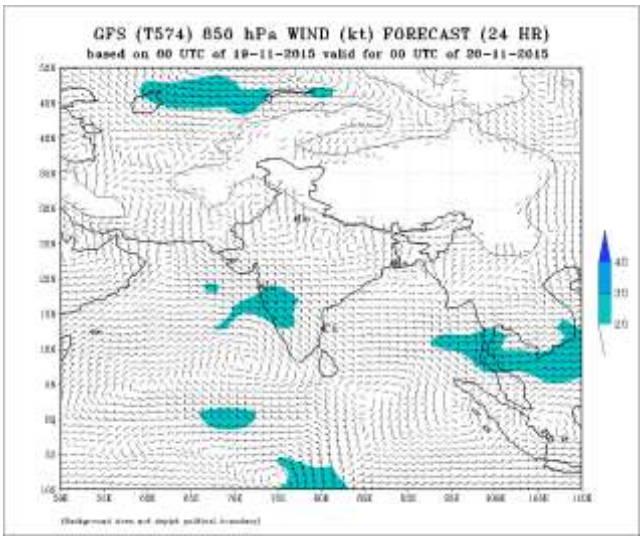

GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 19-11-2015 valid for 00 UTC of 21-11-2015

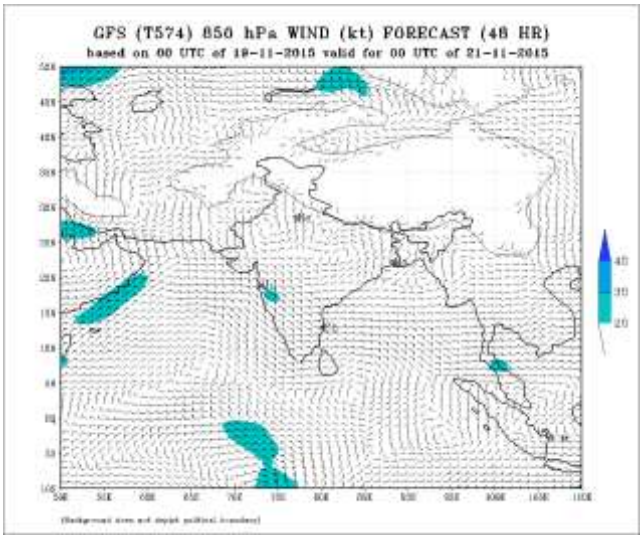

GFS (T574) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 19-11-2015 valid for 00 UTC of 22-11-2015

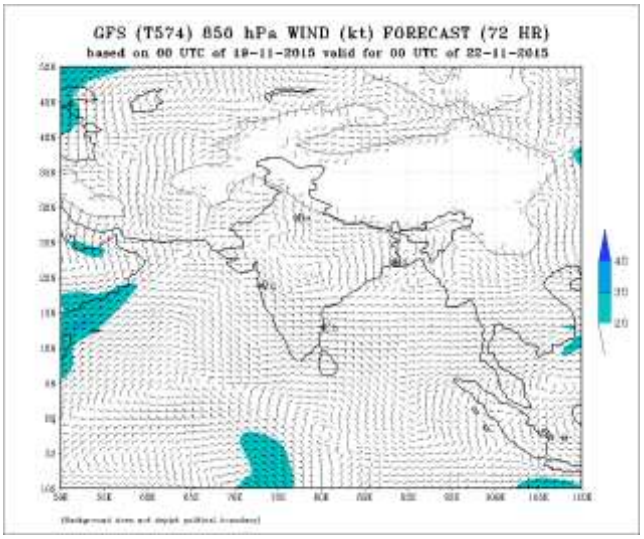

GFS (T574) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 19-11-2015 valid for 00 UTC of 23-11-2015

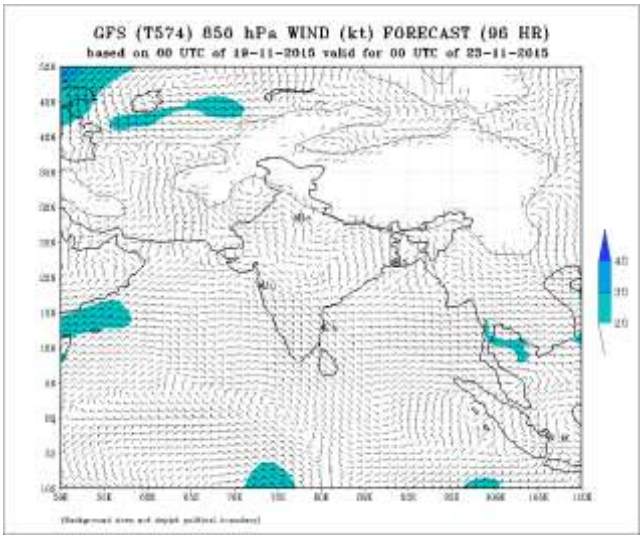

GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 19-11-2015 valid for 00 UTC of 24-11-2015


GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 19-11-2015 valid for 00 UTC of 19-11-2015


GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 19-11-2015 valid for 00 UTC of 20-11-2015


GFS (T574) 850 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 19-11-2015 valid for 00 UTC of 21-11-2015


GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 19-11-2015 valid for 00 UTC of 22-11-2015


GFS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
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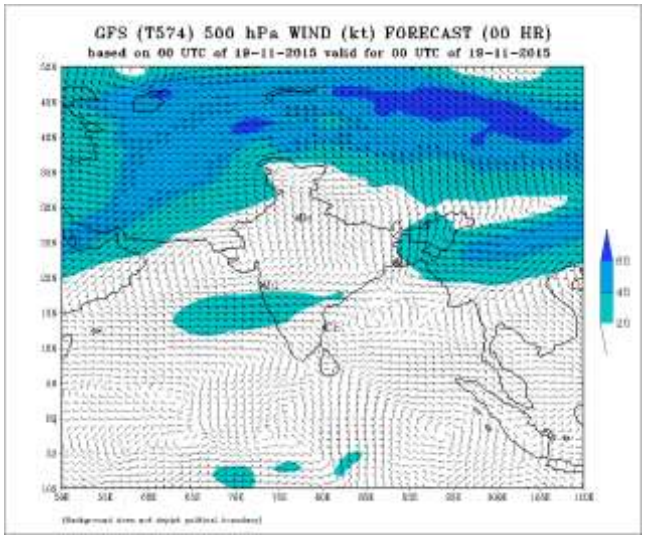
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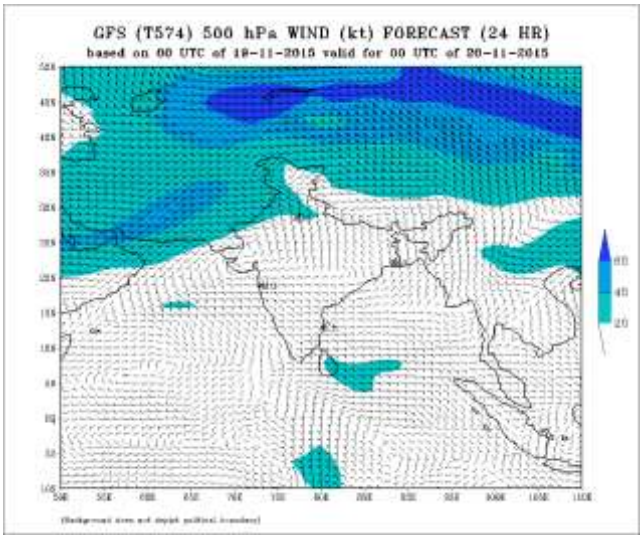
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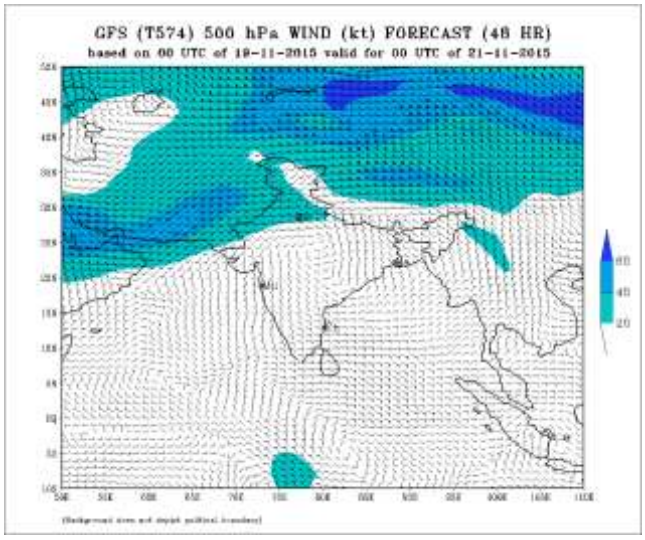
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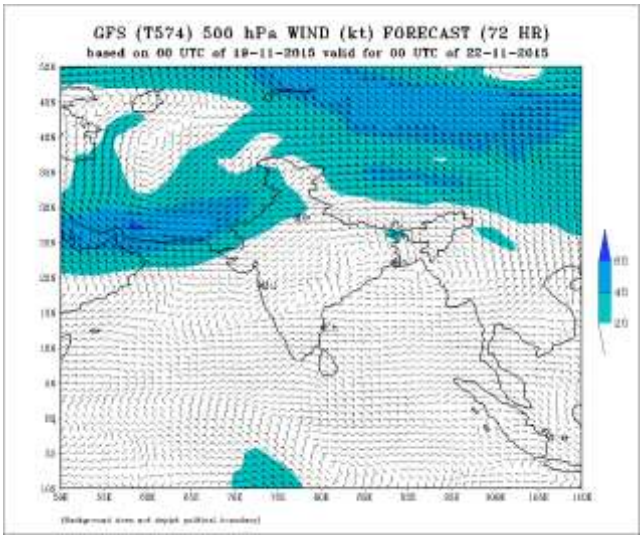
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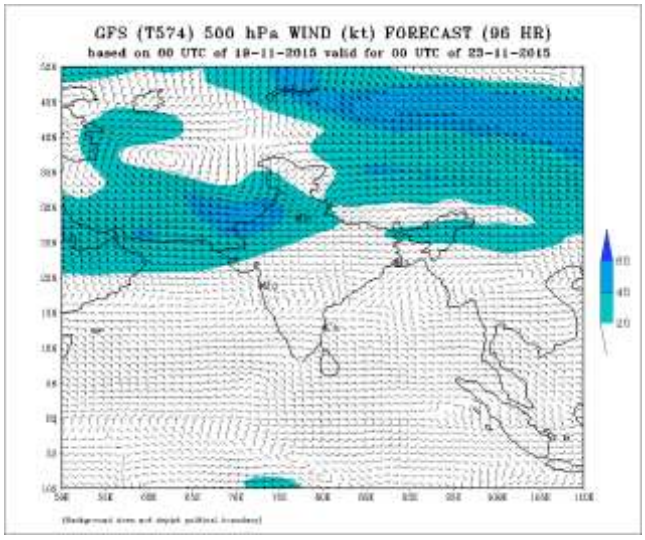
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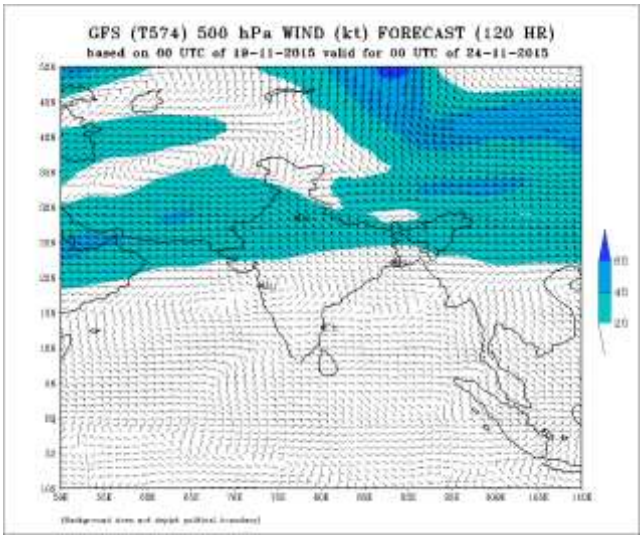
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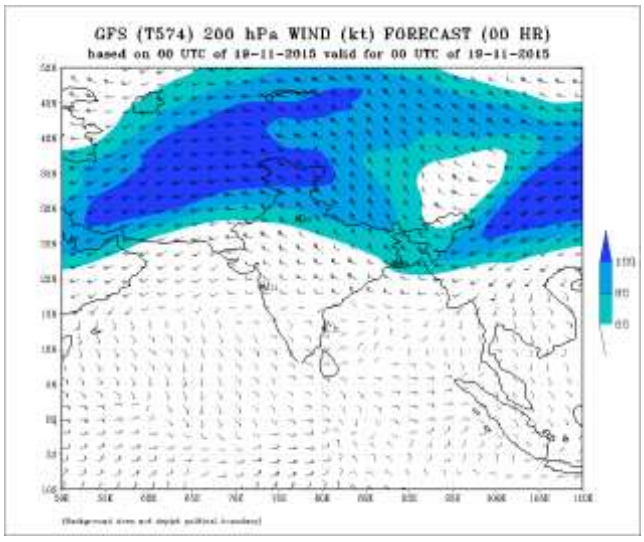
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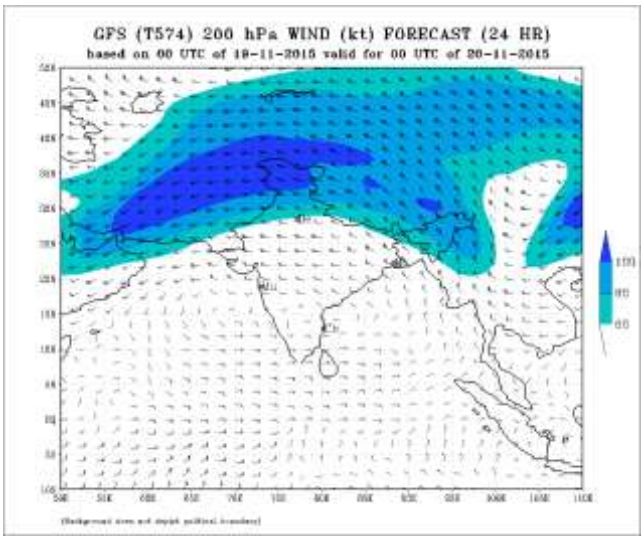
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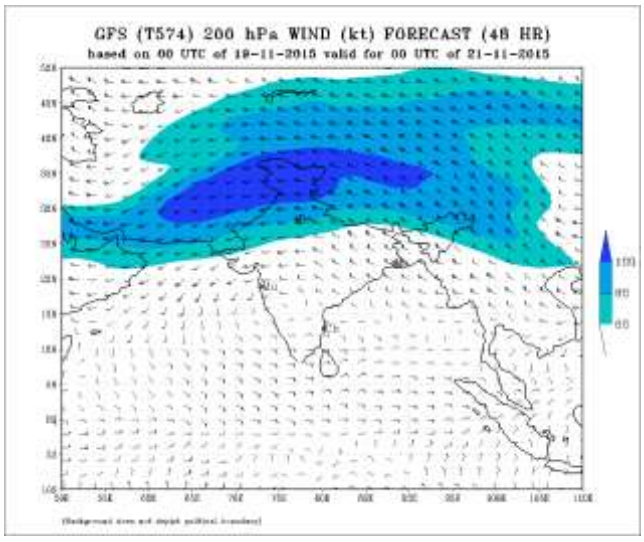
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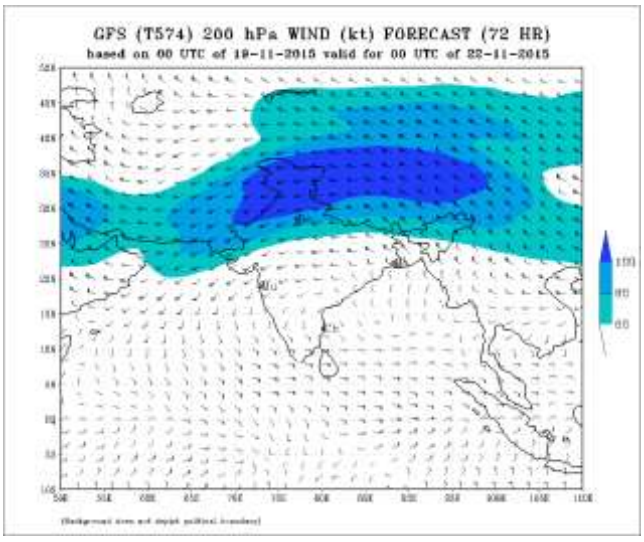
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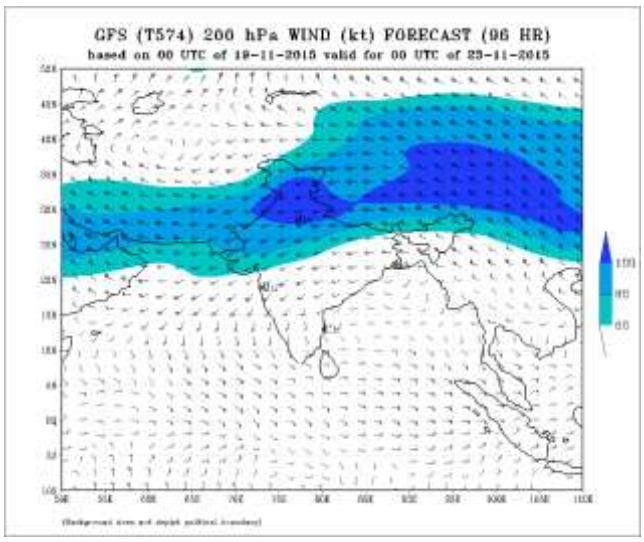
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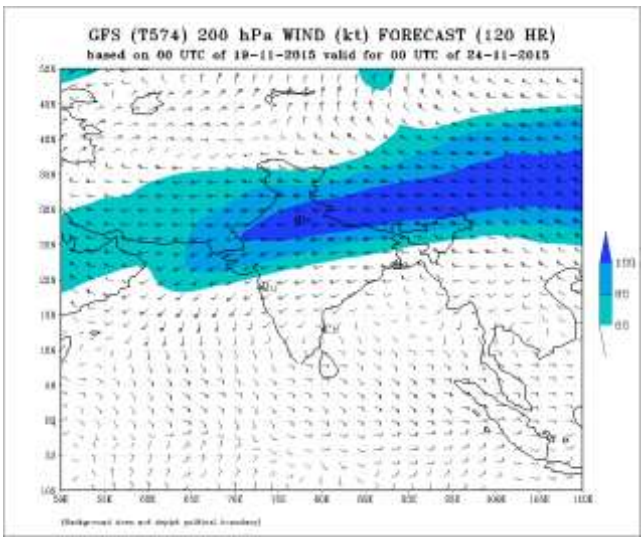
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FDP (Cyclone) NOC Report Dated 19 November, 2015

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- Relative vorticity at 850 hPa is positive and is about 30-40x10-5s-1 over many parts of BoB and AS between equatorial parts and Latitude 12^0N and it is negative over rest part of AS and BoB.

Convergence:

- Lower level convergence is about 05-10x$10^{-5}s^{-1}$ over westcentral of BOB.
- Lower level convergence is 05-10x$10^{-5}s^{-1}$ over parts of eastcentral AS.

Divergence:

- Upper level divergence is 10-20x10^{-5} s^{-1} over westcentral BOB and Andaman Sea.
- Upper level divergence is 5-10x10^{-5} s^{-1} over Lakshadweep and some parts of Southwest AS.

Wind Shear:

- Wind shear is 5-10knots over south BoB and it is higher towards northern latitude.
- The vertical wind shear is 10 knots over central parts of AS and it is higher towards northern latitude.

Wind Shear Tendency:

- There is decreasing tendency (10 Knots) in the southern parts of BOB.
- The vertical wind shear tendency is negative (10 Knots) over southern parts and is increasing towards northern parts of AS.

Upper tropospheric ridge:

- The upper tropospheric ridge at 200 hPa runs along 11.0°N over the BOB and 14.0°N over AS.

M.J.O. Index:

- MJO index is in the border of Phase 2 with amplitude greater than 1 and would remain in phase 2 during next subsequent days.

Storms and Depression over South China Sea/ South Indian Ocean: A vortex lies near 5^0S and 80^0E

Satellite based on INSAT imagery of **190900** UTC:

Bay of Bengal & Andaman Sea:-

Broken low/medium clouds with embedded moderate to intense convection over westcentral bay adjoining southwest Bay southeast Bay south Andaman sea. Broken medium layered clouds over southern of parts of northeast Bay.

Arabian Sea:-

Broken low/medium clouds with embedded moderate to intense convection over lakshadweep & neighbourhood in association with low level circulation over the area.Scattered low/medium clouds with embedded isolated moderate to intense convection over southeast Arabian Sea off Kerala coast , southwest Arabian sea and adjoining westcentral Arabian Sea

NWP Input for FDP Cyclone based on 0000 UTC of 19.11.2015

NWP Analysis

IMD-GFS AND IMD-WRF model product analysis based on 00UTC of 19 November 2015 shows the low pressure area over the south peninsula now lies over the southeast Arabian sea off Kerala coast. Forecasts show that the system becomes less marked after 24 hours.

NWP products are available at:

http://202.54.31.51/bias/gfsproducts.php

http://202.54.31.51/bias/wrf27pro.php

http://202.54.31.51/bias/potentialparameter.php

NCMRWF-NCUM: No significant system

NCMRWF-GFS: No significant system

NCEP-GFS No significant system

ECMWF. : No significant system

JMA: No significant system

ARP-Meteo France No significant system

Genesis Potential Parameter (GPP): Model analysis of GPP based on 0000 UTC of 19 November 2015 shows no cyclogenesis zone over the North Indian Seas during next 5 days.

Summary and Conclusion:

No cyclogenesis expected over north Indian Ocean during next two days.

Bay of Bengal and Andaman Sea:

Probability of cyclogenesis over Bay of Bengal and Andaman Sea during next 120 hours:

24 HOURS	24-48 HOURS	48-72 HOURS	72-96 HOURS	96-120 HOURS
Nil	Nil	Nil	Nil	Nil

Arabian Sea:

Probability of cyclogenesis over Arabian Sea during next 120 hours:

24 HOURS	24-48 HOURS	48-72 HOURS	72-96 HOURS	96-120 HOURS
Nil	Nil	Nil	Nil	Nil

Advisory: No IOP during next five days.

Annexure-I

Status of observational system:

Synoptic observation:

Region	Date/Time (UTC)		
	18/12	**19/00**	**19/03**
India	32	28	40
Coastal stations			
WB	6	3	6
Odisha	6	6	7
AP	10	10	10
Tamil Nadu	8	6	9
Puducherry	2	2	2
A & N	-	1	6
Bangladesh	10	11	11
Myanmar	11	10	11
Thailand	2	2	2
SriLanka	9	9	8

AWS Observations: Not available

RS/RW (12Z) of 18/11/2015 **-6/39**

No. of Ascents reaching 250 hPa level:, MISDA:

RS/RW (00Z) of 19/11/2015- **25/39**

No. of Ascents reaching 250 hPa level:2 , MISDA:1

No. of PILOT Ascents

18/12Z	**19/00Z**
9	7

Buoy Data

18/12Z	**19/00Z**	**19/03Z**
6	8	8

STATUS OF CHENNAI REGION OBSERVATION

No. of Synop data

Date→	18.11.2015							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	20	22	20	20	22	20	20	20

No. of RS/RW Ascents

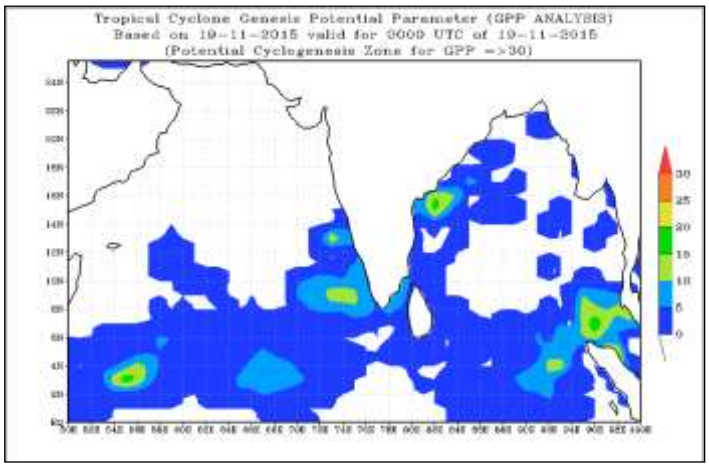
00Z /18.11.2015 : 7
No. of Ascents reaching 250 hPa level = 6
MISDA : 1

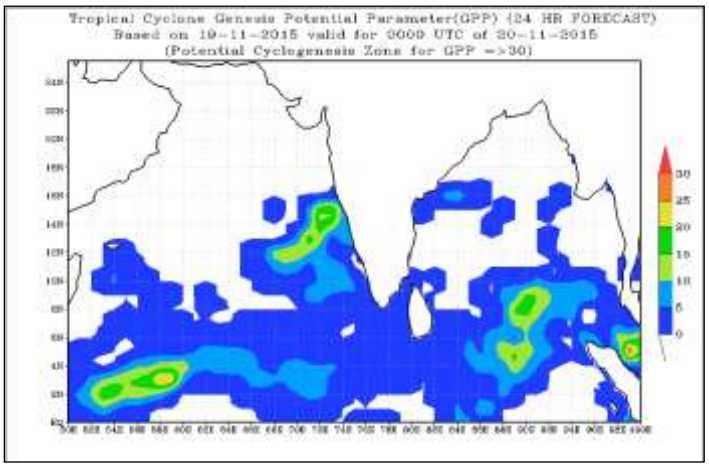
12Z /18.11.2015 : 1
No. of Ascents reaching 250 hPa level = 1
MISDA : 7

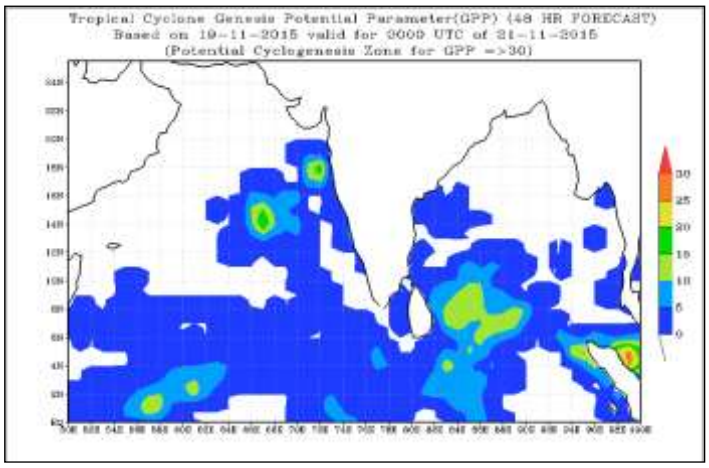
No. of PILOT Ascents:

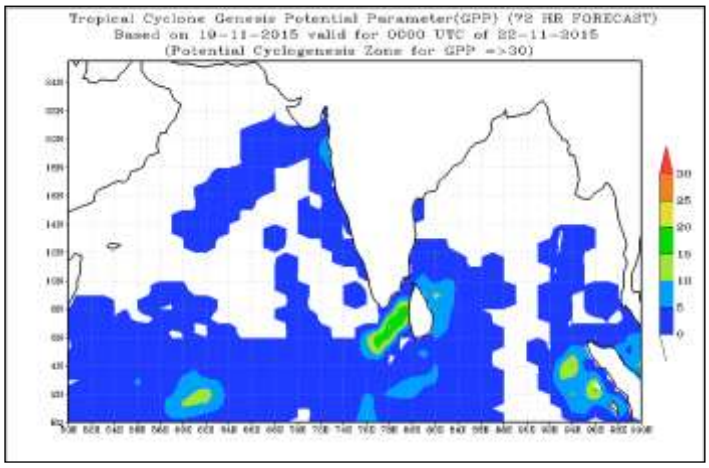
18.11.2015	
06Z	18Z
4	3

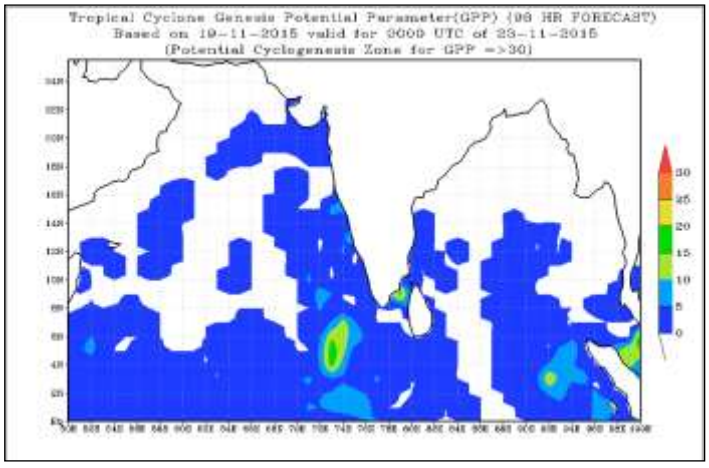
Annexure-II

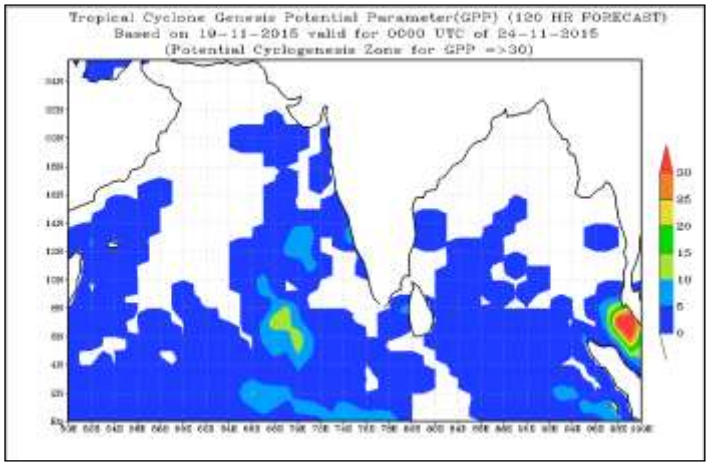

Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 19-11-2015 valid for 0000 UTC of 19-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

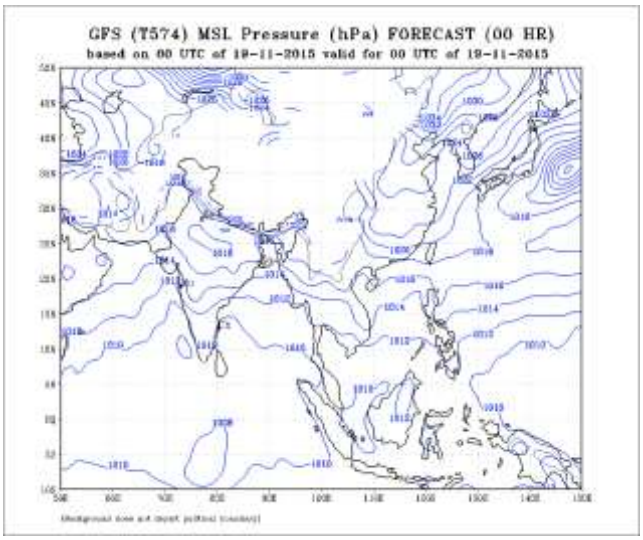

Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 19-11-2015 valid for 0000 UTC of 20-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

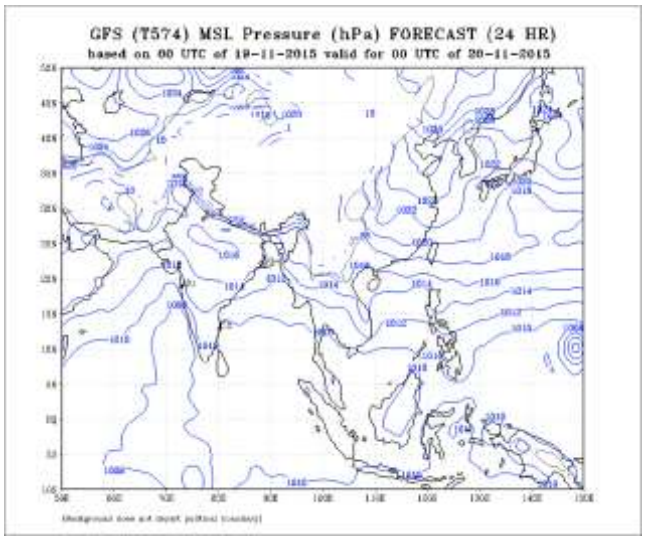

Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
Based on 19-11-2015 valid for 0000 UTC of 21-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

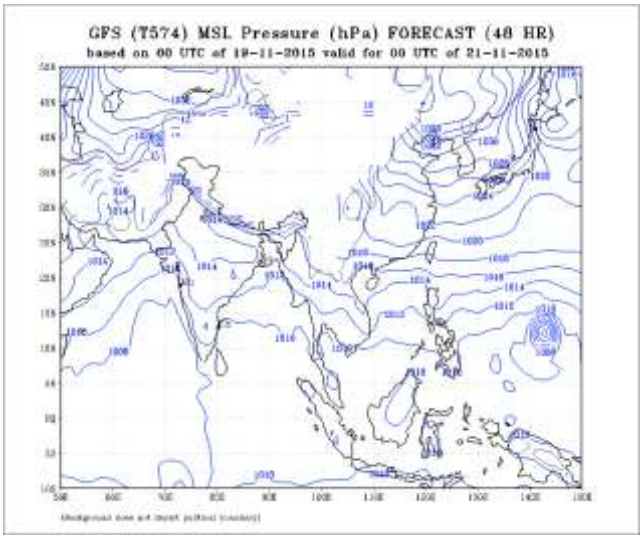

Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 19-11-2015 valid for 0000 UTC of 22-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

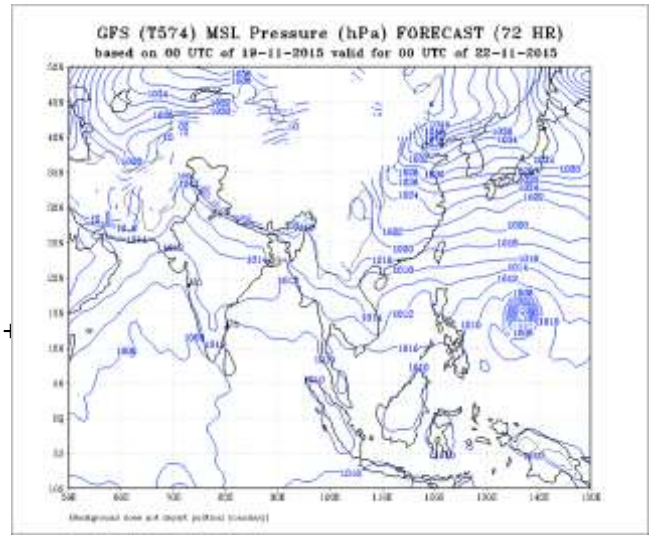

Tropical Cyclone Genesis Potential Parameter(GPP) (96 HR FORECAST)
Based on 19-11-2015 valid for 0000 UTC of 23-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

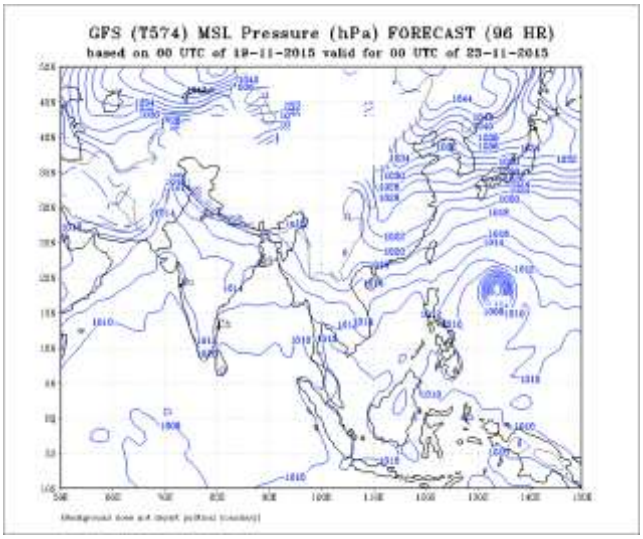

Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 19-11-2015 valid for 0000 UTC of 24-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

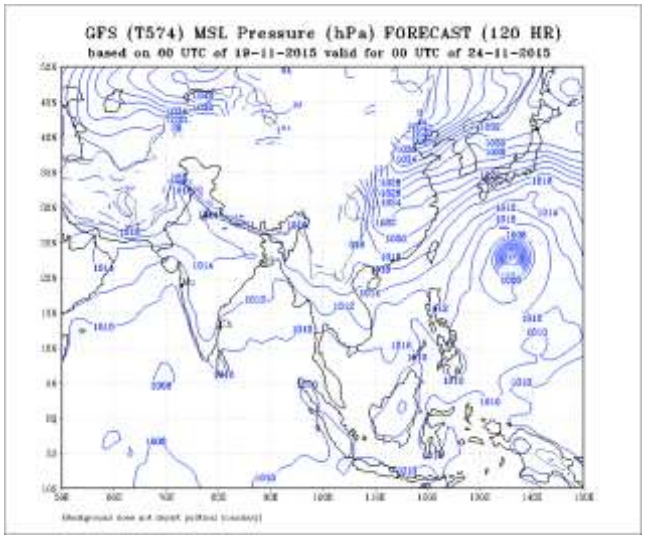

GFS (T574) MSL Pressure (hPa) FORECAST (00 HR)
based on 00 UTC of 19-11-2015 valid for 00 UTC of 19-11-2015

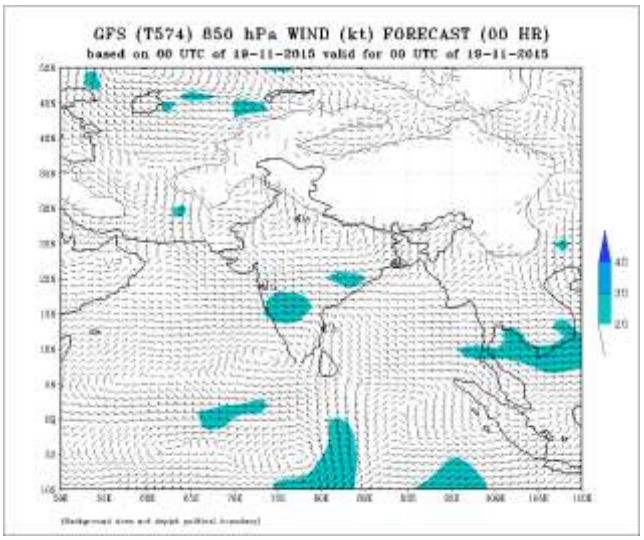

GFS (T574) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 19-11-2015 valid for 00 UTC of 20-11-2015

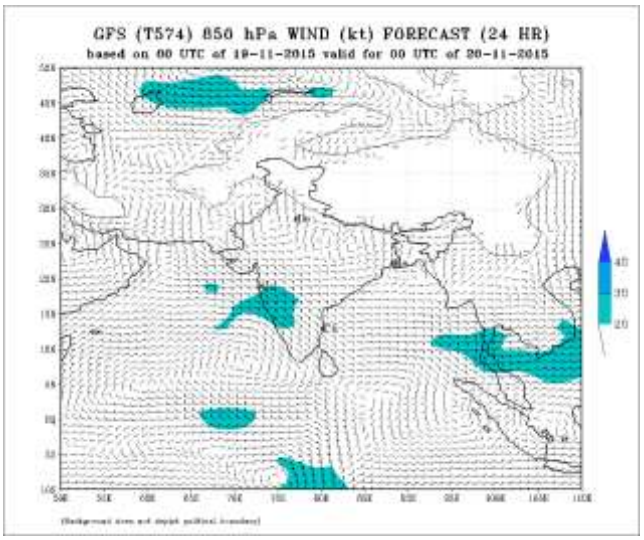

GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 19-11-2015 valid for 00 UTC of 21-11-2015

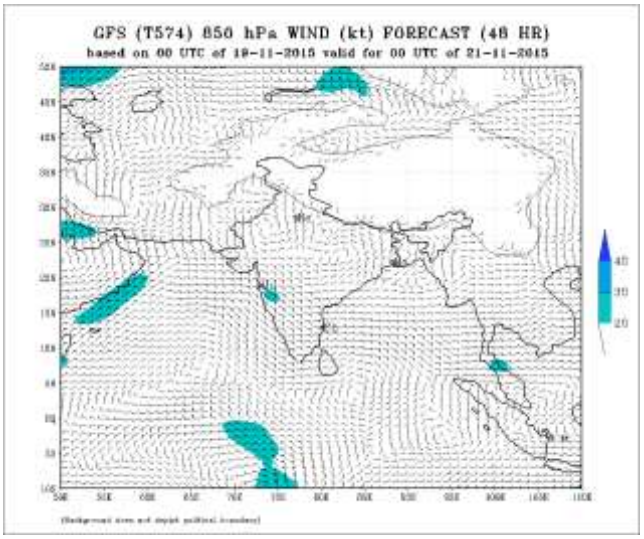

GFS (T574) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 19-11-2015 valid for 00 UTC of 22-11-2015

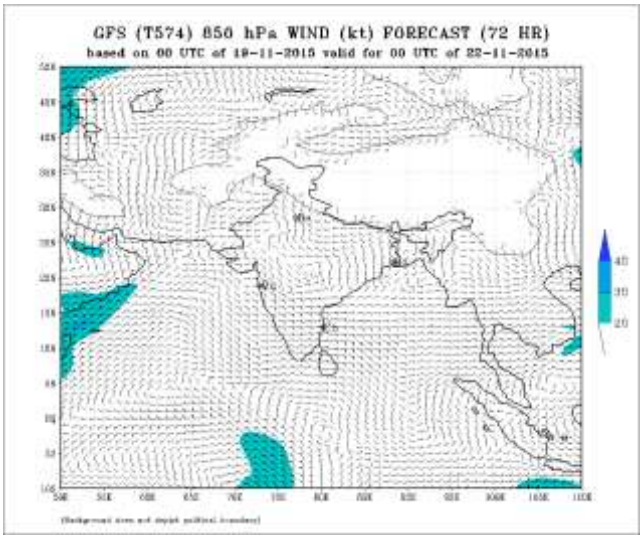

GFS (T574) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 19-11-2015 valid for 00 UTC of 23-11-2015

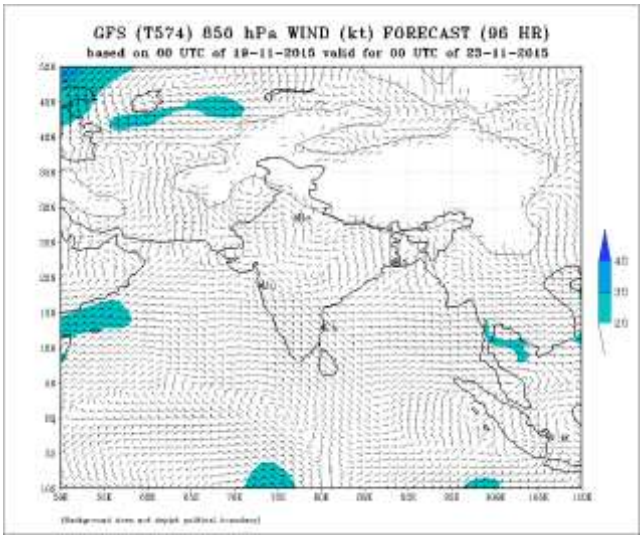

GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 19-11-2015 valid for 00 UTC of 24-11-2015

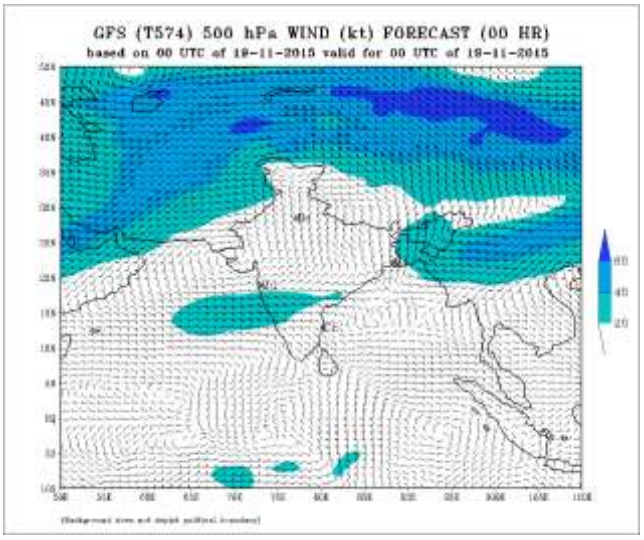

GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 19-11-2015 valid for 00 UTC of 19-11-2015

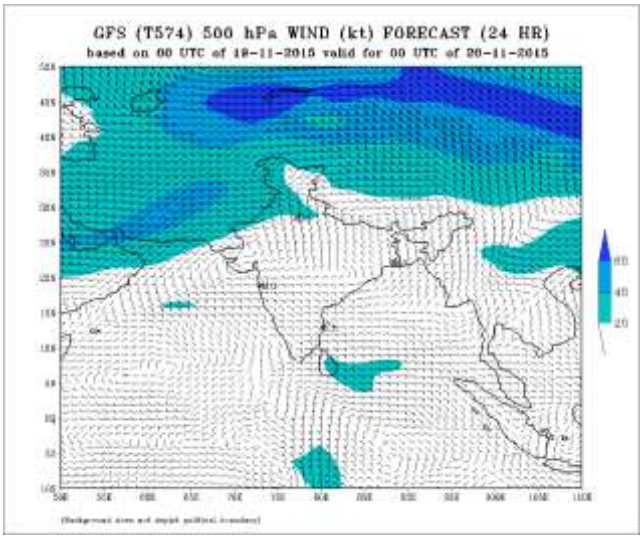

GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 19-11-2015 valid for 00 UTC of 20-11-2015

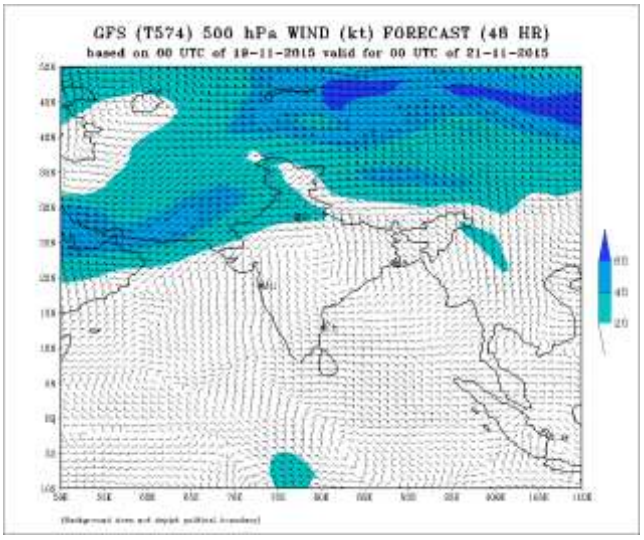

GFS (T574) 850 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 19-11-2015 valid for 00 UTC of 21-11-2015

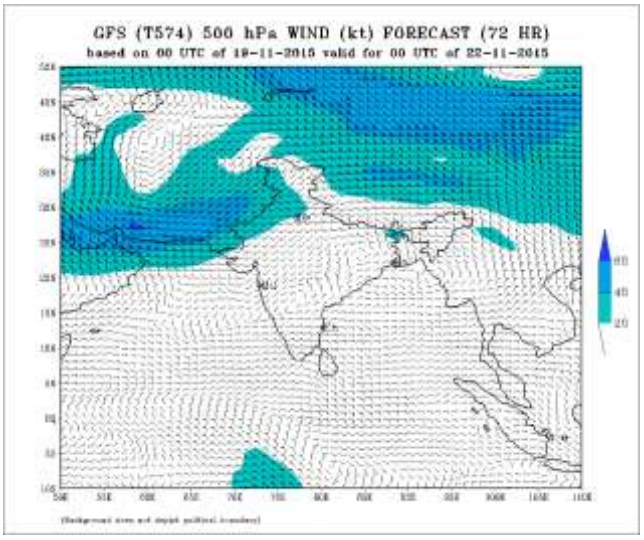

GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 19-11-2015 valid for 00 UTC of 22-11-2015

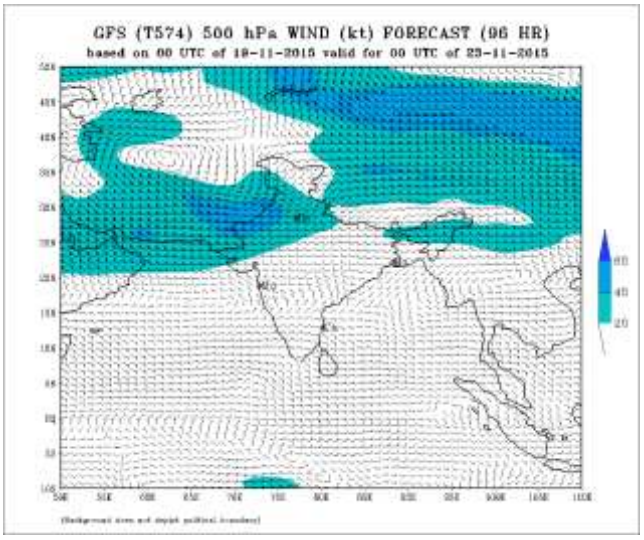

GFS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 19-11-2015 valid for 00 UTC of 23-11-2015

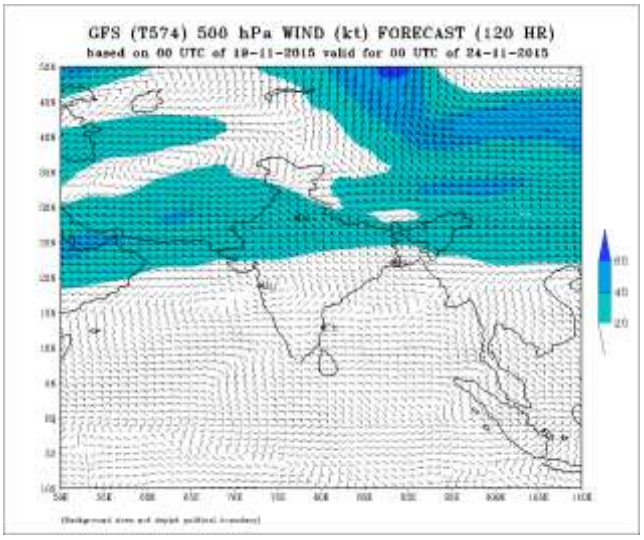

GFS (T574) 500 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 19-11-2015 valid for 00 UTC of 19-11-2015

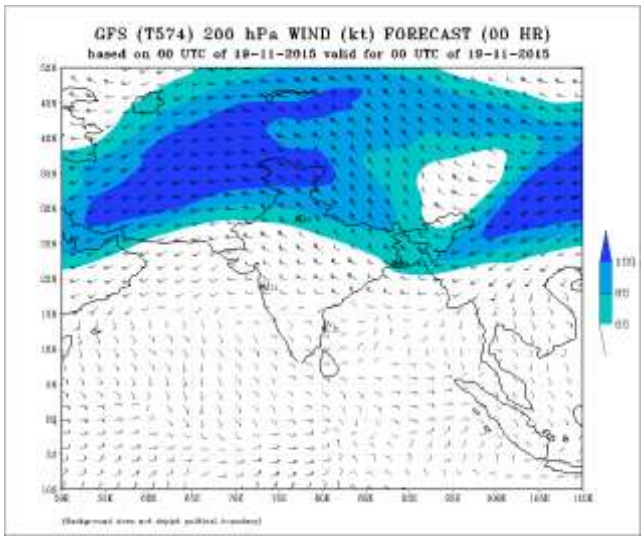

GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 19-11-2015 valid for 00 UTC of 20-11-2015

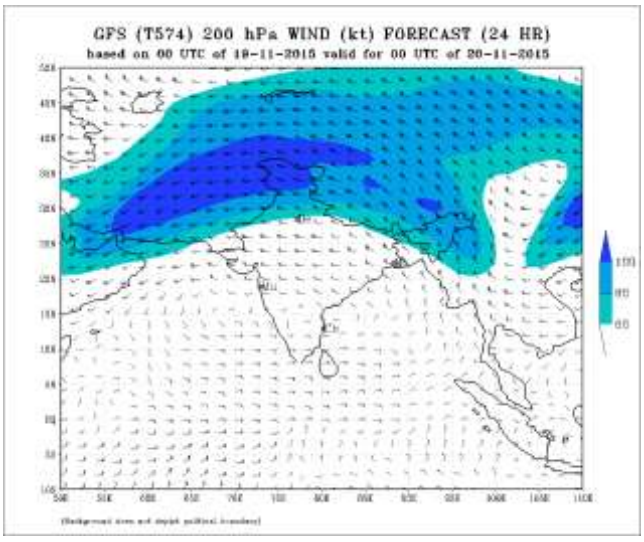

GFS (T574) 500 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 19-11-2015 valid for 00 UTC of 21-11-2015

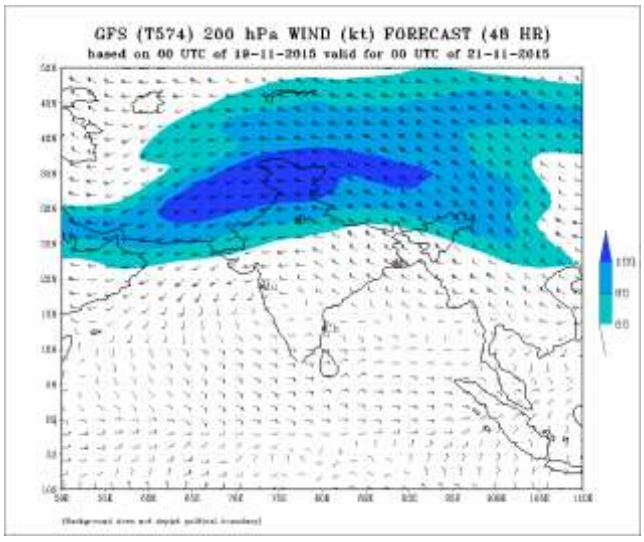

GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 19-11-2015 valid for 00 UTC of 22-11-2015

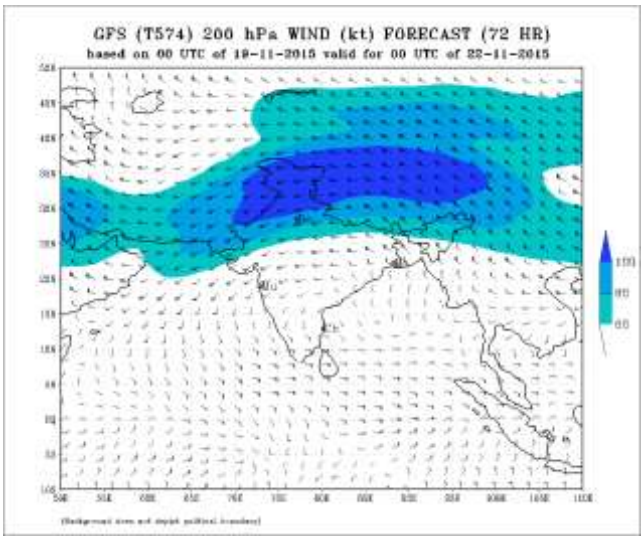

GFS (T574) 500 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 19-11-2015 valid for 00 UTC of 23-11-2015

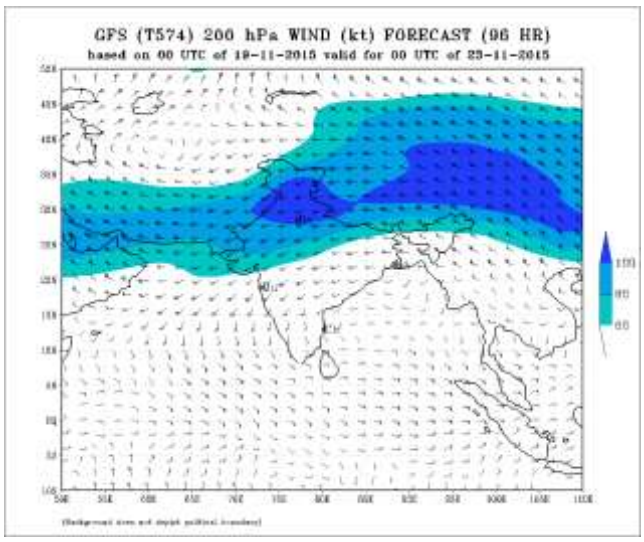

GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 19-11-2015 valid for 00 UTC of 24-11-2015

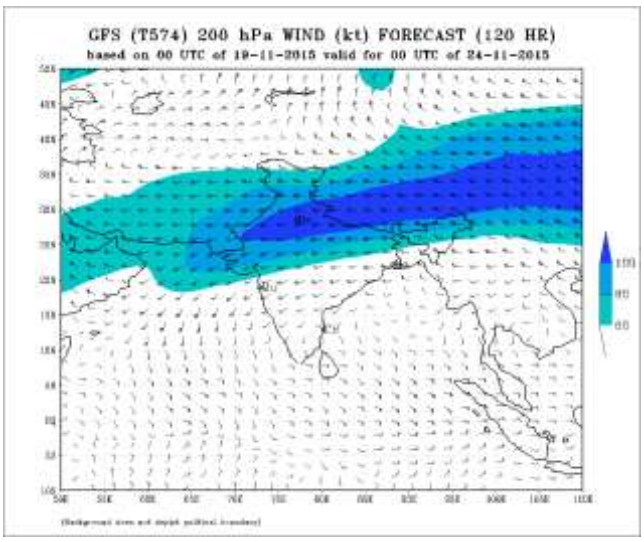

GFS (T574) 200 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 19-11-2015 valid for 00 UTC of 19-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 19-11-2015 valid for 00 UTC of 20-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 19-11-2015 valid for 00 UTC of 21-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 19-11-2015 valid for 00 UTC of 22-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 19-11-2015 valid for 00 UTC of 23-11-2015


GPS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 19-11-2015 valid for 00 UTC of 24-11-2015

FDP (Cyclone) NOC Report Dated 20 November, 2015

Synoptic features:

- A low pressure area lies over Lakshadweep area and neighbourhood persists. It may become well marked during next 24 hours**.**

Surface Temperature (SST):

- SST is 26-28°C over westcentral, northern parts of Bay of Bengal and 29-30°C near Andaman Sea. It is 27-28°C over rest part of BoB.
- SST is 26-28°C over westcentral and northwest of AS. It is 28-29°C over rest parts of Arabian Sea .

Tropical Cyclone Heat Potential (TCHP):

- TCHP is below 40kJ/cm^2 over extreme north of BoB. It is 50-100 kJ/cm^2 over Southern parts of BoB.
- TCHP is below 40kJ/cm^2 over northwest and west central parts of AS and 50-80 kJ/cm^2over rest part of AS.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive and is upto 20x10-5s-1 over southern parts of BoB and AS between equatorial parts and Latitude 10^0N and it is negative over rest part of AS and BoB.

Convergence:

- Lower level convergence is about 05-10x$10^{-5}s^{-1}$ over southern part and 05x$10^{-5}s^{-1}$ over rest part of BOB.
- Lower level convergence is 05-10x$10^{-5}s^{-1}$ over southern parts and negative (-5x$10^{-5}s^{-1}$) over rest part of AS.

Divergence:

- Upper level divergence is 10-20x10^{-5} s^{-1} over westcentral BOB and Andaman Sea.
- Upper level divergence is 5-10x10^{-5} s^{-1} over Lakshadweep and some parts of Southwest AS.

Wind Shear:

- Wind shear is 5-10knots near Andaman Sea and it is negative (-5 knots) towards northern latitude.
- The vertical wind shear is 5 knots near Lakshadweep region and northern parts and negative over southwest part of AS.

Wind Shear Tendency:

- There is decreasing tendency (-5-10 Knots) in the west central and northern parts of BOB.
- The vertical wind shear tendency is negative (-5 Knots) over most parts of AS.

Upper tropospheric ridge:

- The upper tropospheric ridge at 200 hPa runs along 13.0°N over the BOB and 16.0°N over AS.

M.J.O. Index:

- MJO index is in the border of Phase 2 with amplitude greater than 1 and would remain in phase 2 during next subsequent days.

Storms and Depression over South China Sea/ South Indian Ocean: A vortex lies neat 9.9^0S and 73.1^0E

Satellite based on INSAT imagery of **190900** UTC:

Bay of Bengal & Andaman Sea:-

Broken low/medium clouds with embedded moderate to intense convection over southeast Bay adjoining southwest Bay south Andaman Sea. Scattered low/medium clouds with embedded isolated weak to moderate convection over westcentral Bay.

Arabian Sea:-

Broken low/medium clouds with embedded moderate to intense convection over Lakshadweep & neighbourhood in association with low level circulation over the area.

Scattered low/medium clouds with embedded isolated moderate to intense convection over southwest Arabian sea and eastcentral Arabian Sea off Karnataka coast.

NWP Input for FDP Cyclone based on 0000 UTC of 20.11.2015

NWP Analysis

IMD-GFS and IMD-WRF model product analysis based on 0000 UTC of 20 November 2015 shows development of no significant weather system over the North Indian Seas during next 5 days.

NWP products are available at:

http://202.54.31.51/bias/gfsproducts.php

http://202.54.31.51/bias/wrf27pro.php

http://202.54.31.51/bias/potentialparameter.php

NCMRWF-NCUM: No significant system

NCMRWF-GFS: No significant system

NCEP-GFS No significant system

ECMWF. : No significant system

JMA: No significant system

ARP-Meteo France No significant system

Genesis Potential Parameter (GPP): Model analysis of GPP based on 0000 UTC of 20 November 2015 shows no cyclogenesis zone over the North Indian Seas during next 5 days.

Summary and Conclusion:

A low pressure area lies over Lakshadweep area and neighbourhood persists. It may become well marked during next 24 hours**.**

Bay of Bengal and Andaman Sea:

Probability of cyclogenesis over Bay of Bengal and Andaman Sea during next 120 hours:

24 HOURS	24-48 HOURS	48-72 HOURS	72-96 HOURS	96-120 HOURS
Nil	Nil	Nil	Nil	Nil

Arabian Sea:

Probability of cyclogenesis over Arabian Sea during next 120 hours:

24 HOURS	24-48 HOURS	48-72 HOURS	72-96 HOURS	96-120 HOURS
Nil	Nil	Nil	Nil	Nil

Advisory: No IOP during next five days.

Annexure-I

Status of observational system:

Synoptic observation:

Region	Date/Time (UTC)		
	19/12	**20/00**	**20/03**
India	38	29	46
Coastal stations			
WB	6	2	8
Odisha	6	5	6
AP	10	13	12
Tamil Nadu	8	7	8
Puducherry	2	1	6
A & N	6	1	6
Bangladesh	11	11	11
Myanmar	11	-	11
Thailand	2	2	2
SriLanka	9	8	8

AWS Observations: Not available

RS/RW (12Z) of 19/11/2015 **-6/39**
No. of Ascents reaching 250 hPa level: MISDA:

RS/RW (00Z) of 20/11/2015- **26/39**
No. of Ascents reaching 250 hPa level:2 MISDA:0

No. of PILOT Ascents

19/12Z	20/00Z
5	2

Buoy Data

19/12Z	20/00Z	20/03Z
8	7	5

STATUS OF CHENNAI REGION OBSERVATION

No. of Synop data

Date→	19.11.2015							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	20	22	20	20	22	20	20	20

No. of RS/RW Ascents

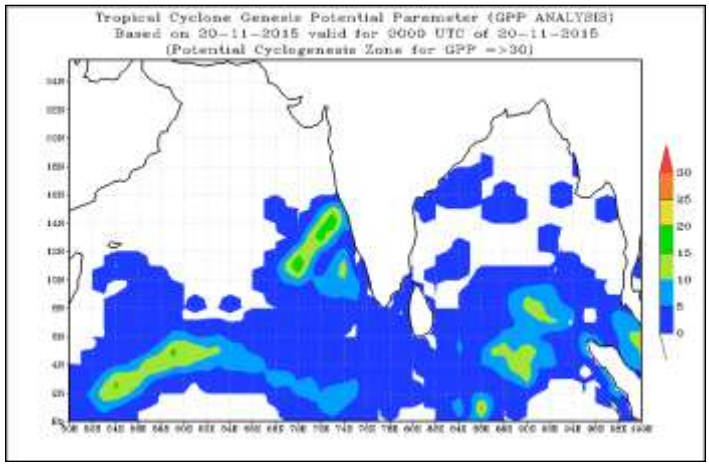
00Z /19.11.2015 : 7
No. of Ascents reaching 250 hPa level = 6
MISDA : 1

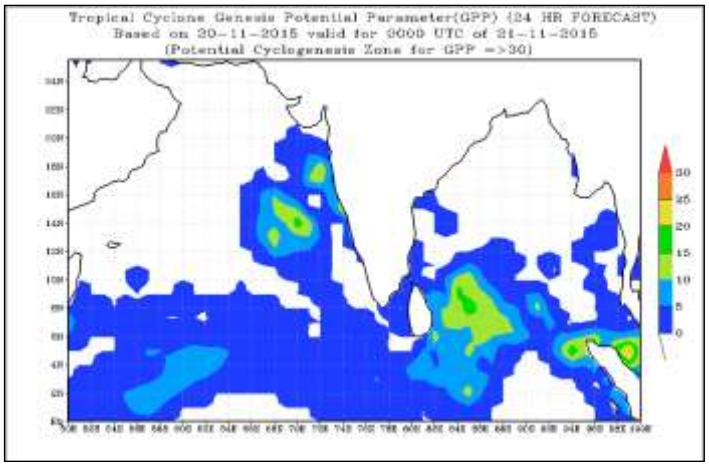
12Z /19.11.2015 : 1
No. of Ascents reaching 250 hPa level = 1
MISDA : 7

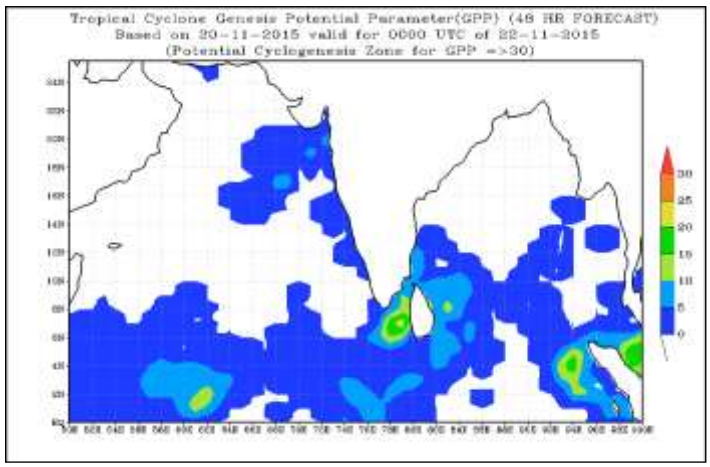
No. of PILOT Ascents:

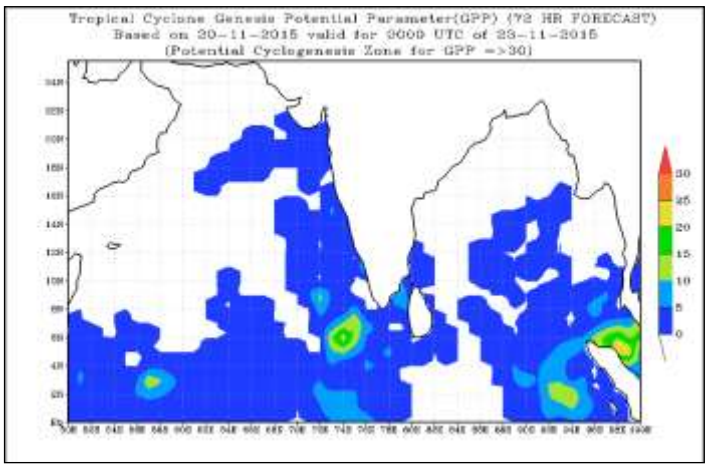
19.11.2015	
06Z	18Z
4	4

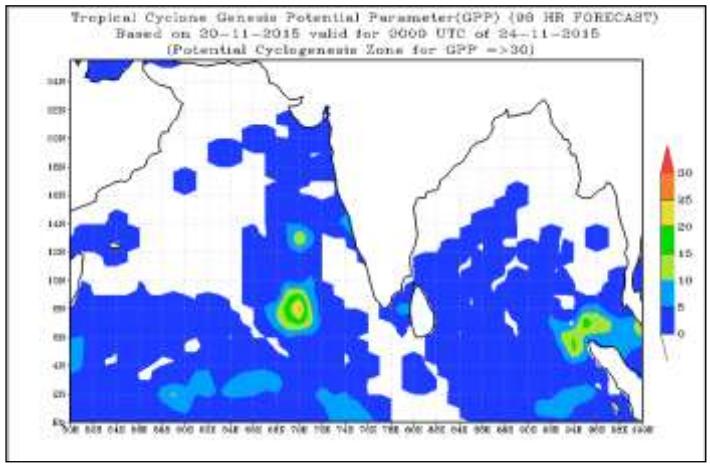
Annexure-II

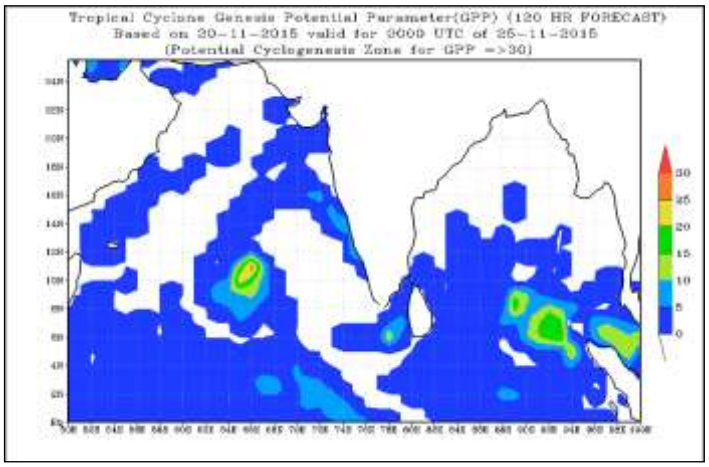

Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 20-11-2015 valid for 0000 UTC of 20-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

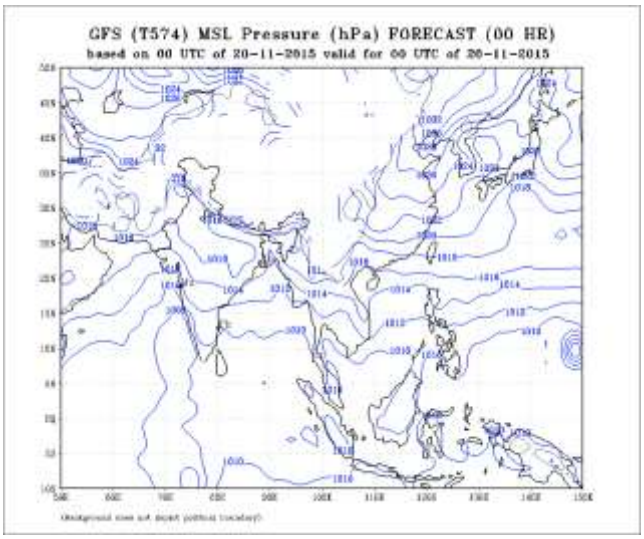

Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 20-11-2015 valid for 0000 UTC of 21-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

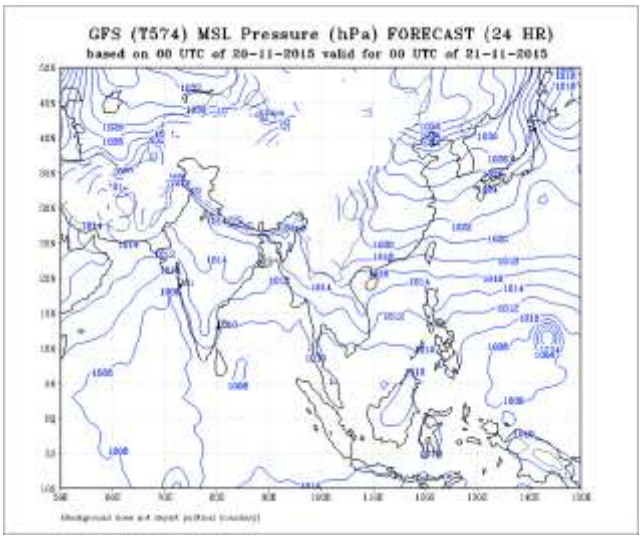

Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
Based on 20-11-2015 valid for 0000 UTC of 22-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

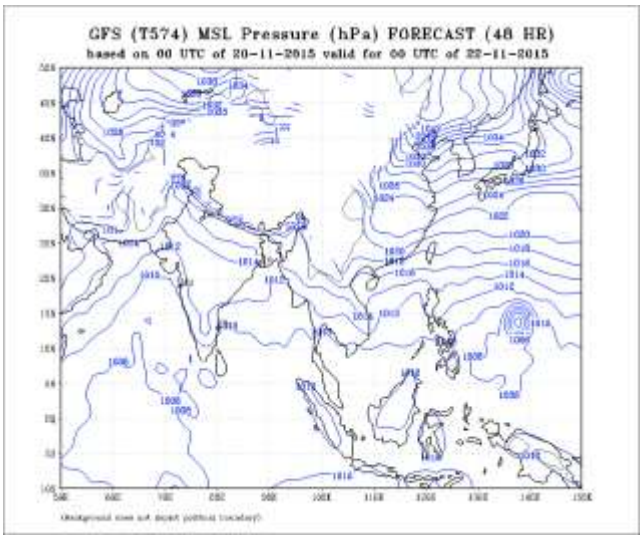

Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 20-11-2015 valid for 0000 UTC of 23-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

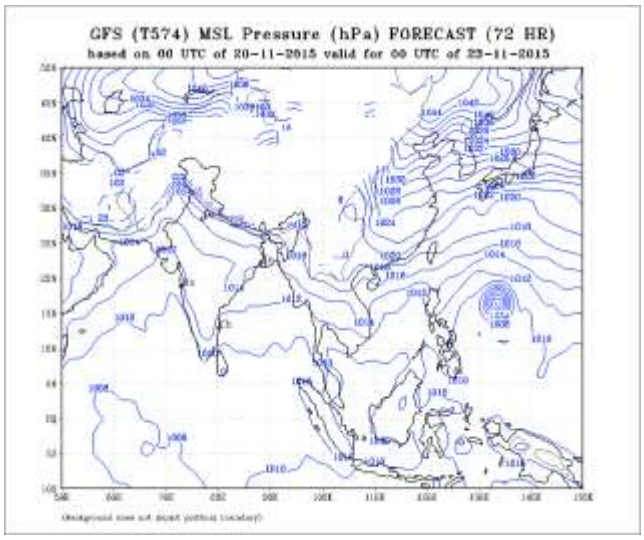

Tropical Cyclone Genesis Potential Parameter(GPP) (96 HR FORECAST)
Based on 20-11-2015 valid for 0000 UTC of 24-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

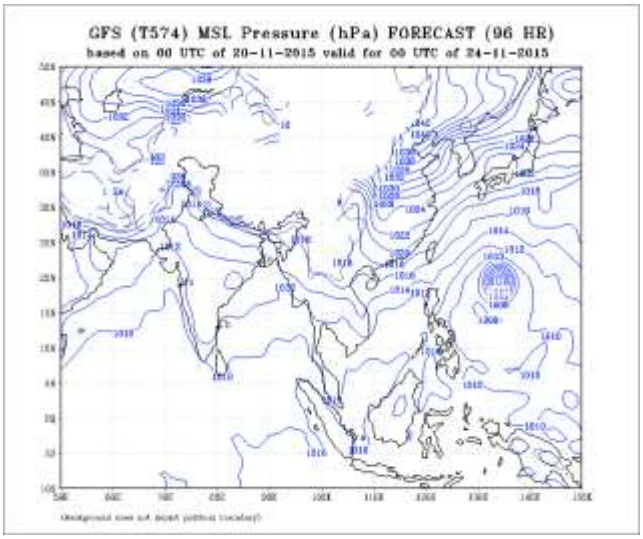

Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 20-11-2015 valid for 0000 UTC of 25-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

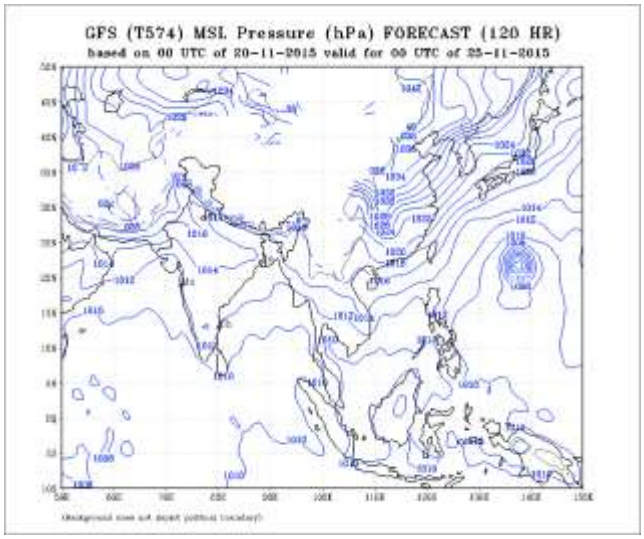

GFS (T574) MSL Pressure (hPa) FORECAST (00 HR)
based on 00 UTC of 20-11-2015 valid for 00 UTC of 20-11-2015

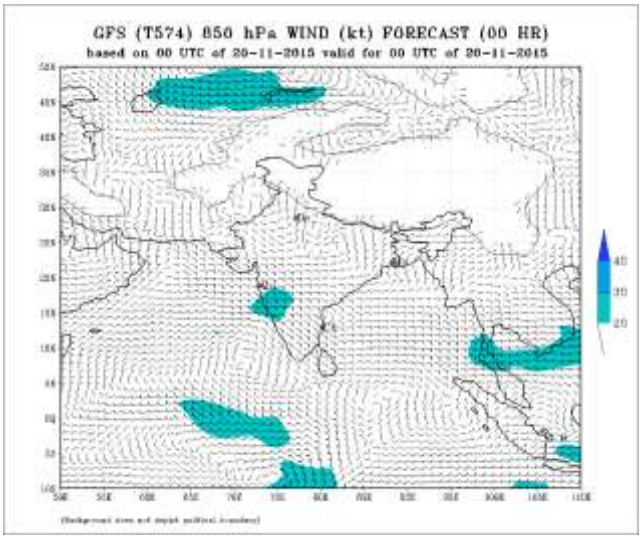

GFS (T574) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 20-11-2015 valid for 00 UTC of 21-11-2015

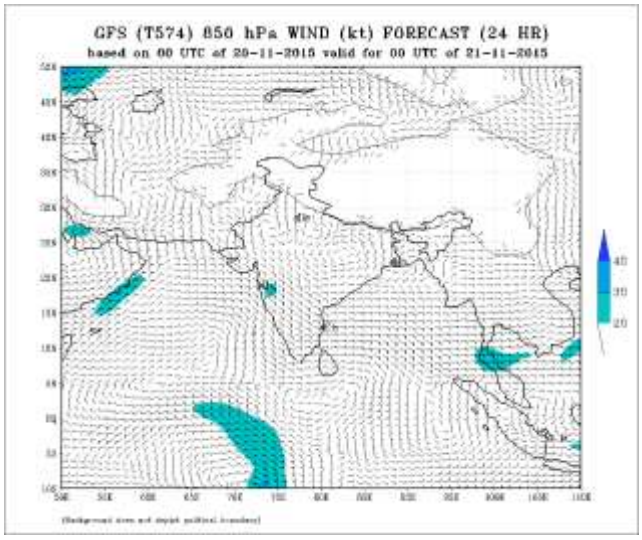

GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 20-11-2015 valid for 00 UTC of 22-11-2015

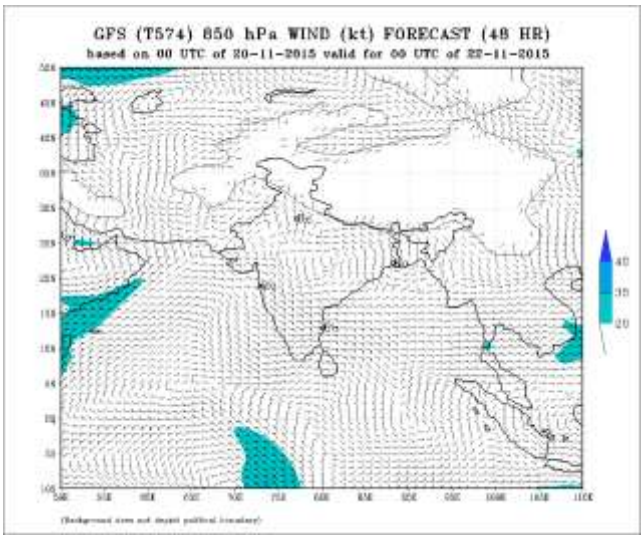

GFS (T574) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 20-11-2015 valid for 00 UTC of 23-11-2015


GFS (T574) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 20-11-2015 valid for 00 UTC of 24-11-2015


GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 20-11-2015 valid for 00 UTC of 25-11-2015


GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 20-11-2015 valid for 00 UTC of 20-11-2015


GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 20-11-2015 valid for 00 UTC of 21-11-2015


GFS (T574) 850 hPa WIND (kt) FORECAST (48 HR)
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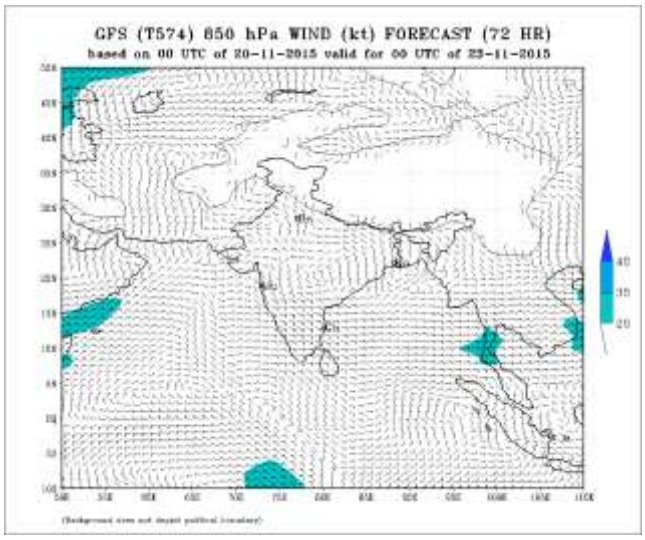
GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
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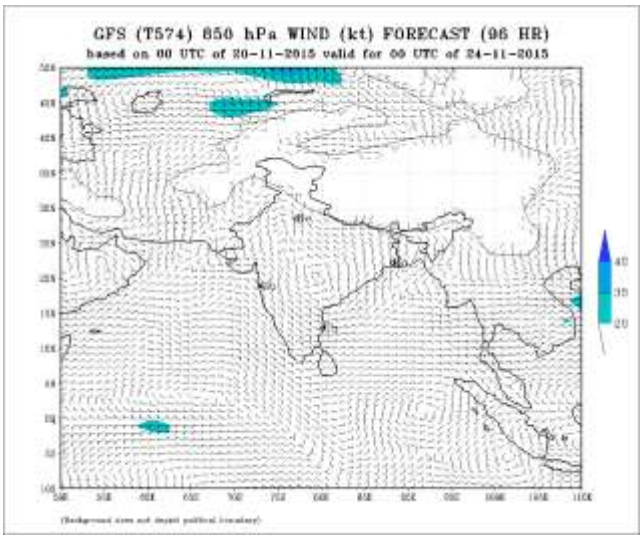
GFS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
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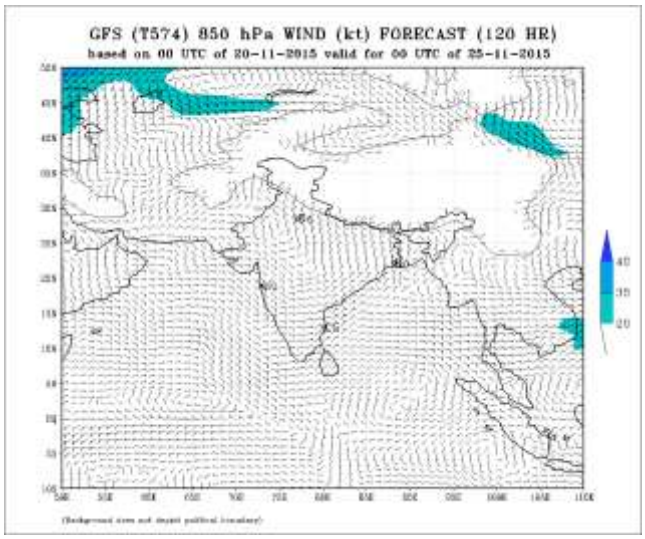
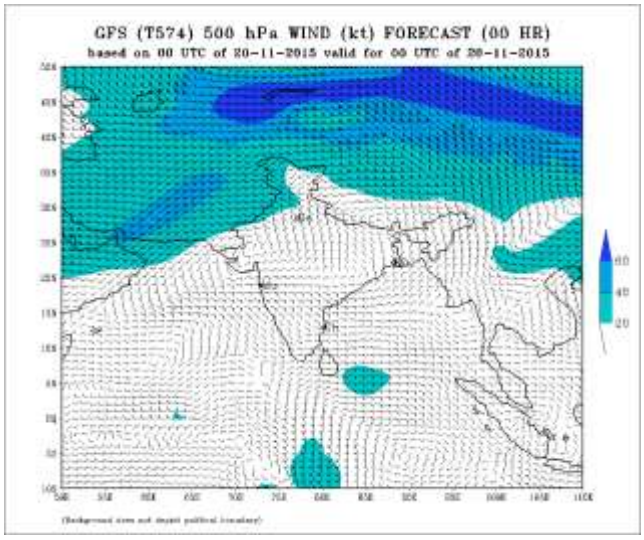
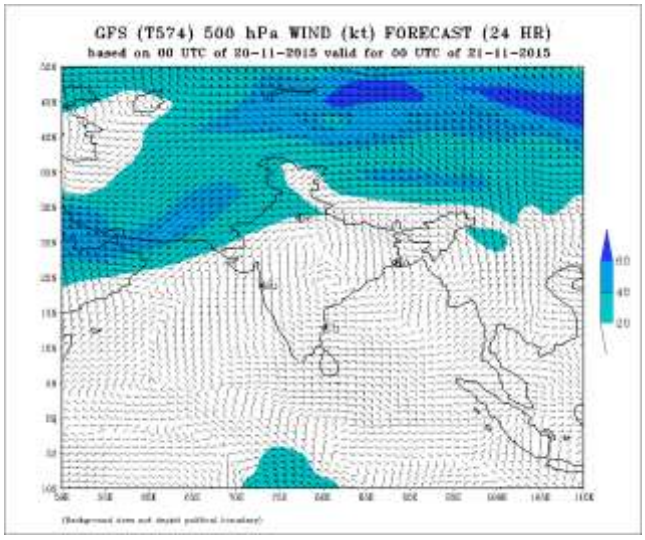
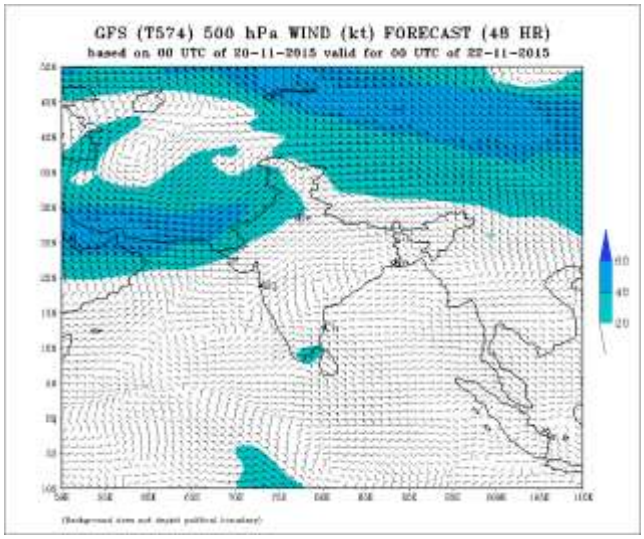
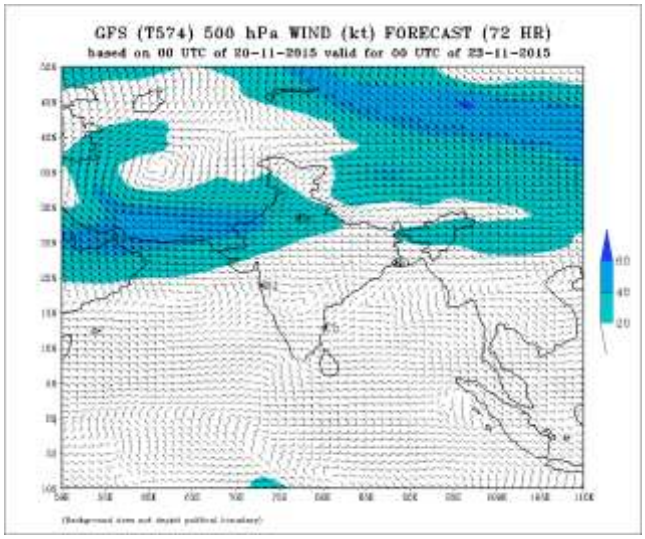
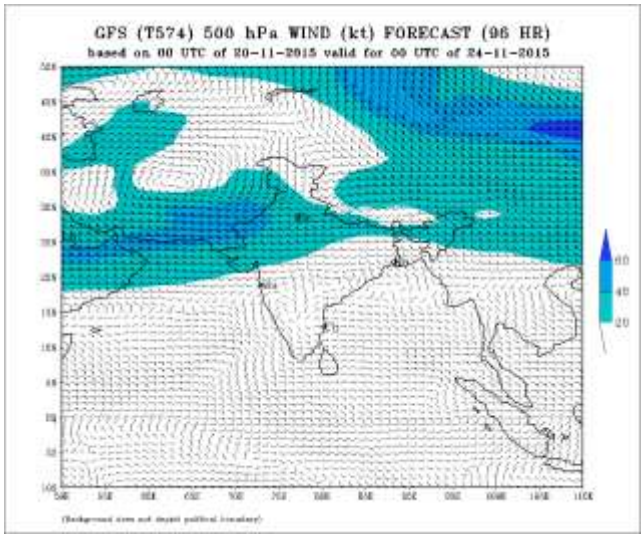

GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 20-11-2015 valid for 00 UTC of 25-11-2015

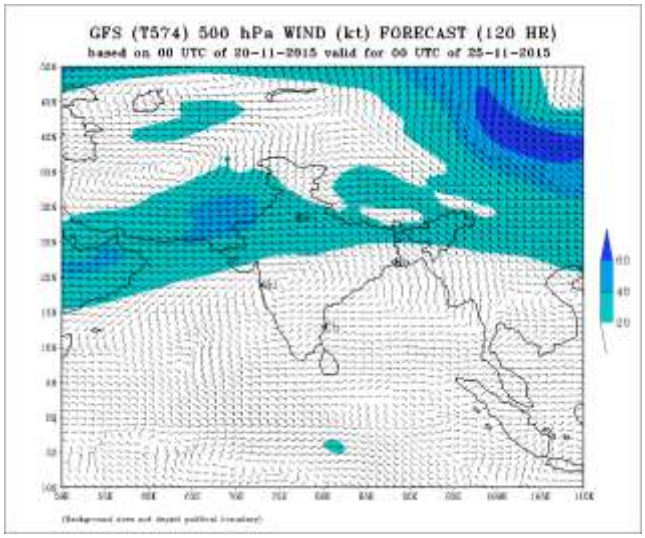

GPS (T574) 500 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 20-11-2015 valid for 00 UTC of 20-11-2015

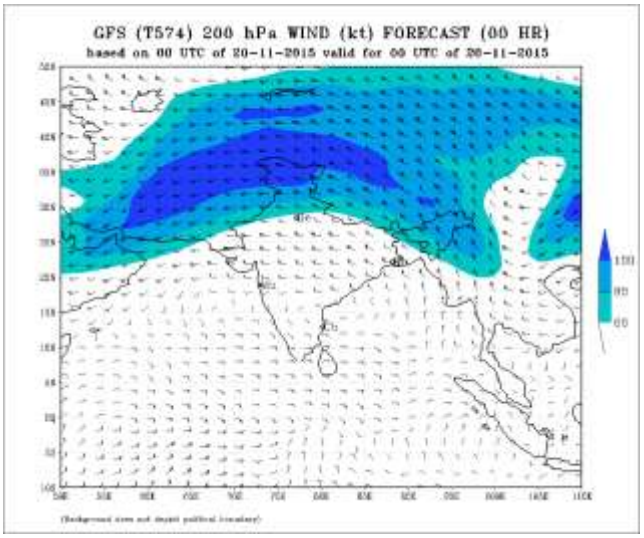

GPS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 20-11-2015 valid for 00 UTC of 21-11-2015

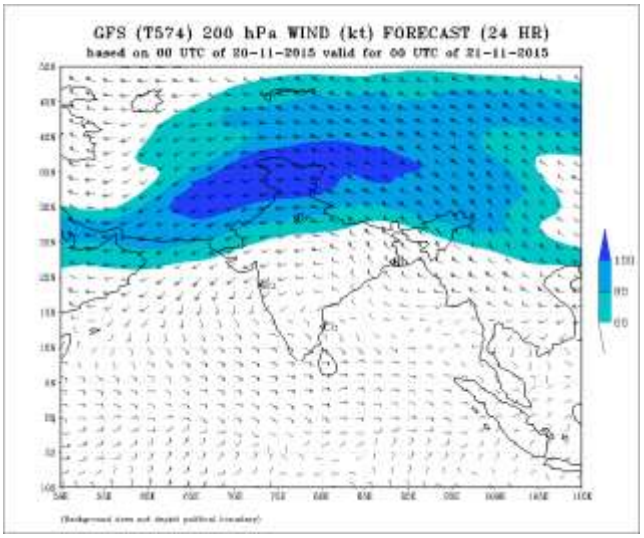

GPS (T574) 500 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 20-11-2015 valid for 00 UTC of 22-11-2015

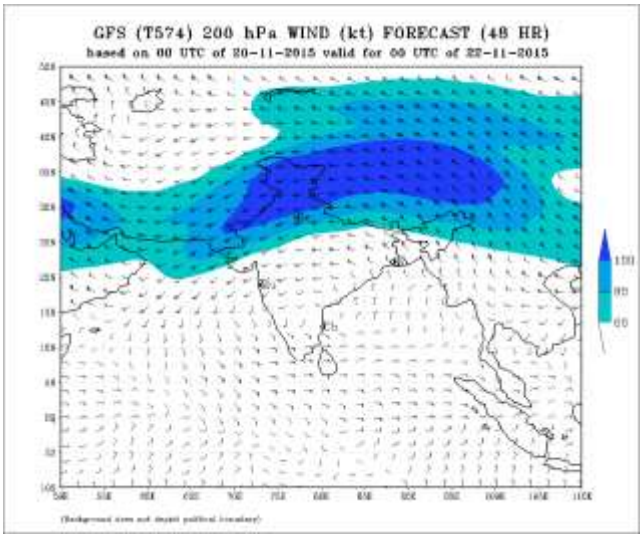

GPS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 20-11-2015 valid for 00 UTC of 23-11-2015

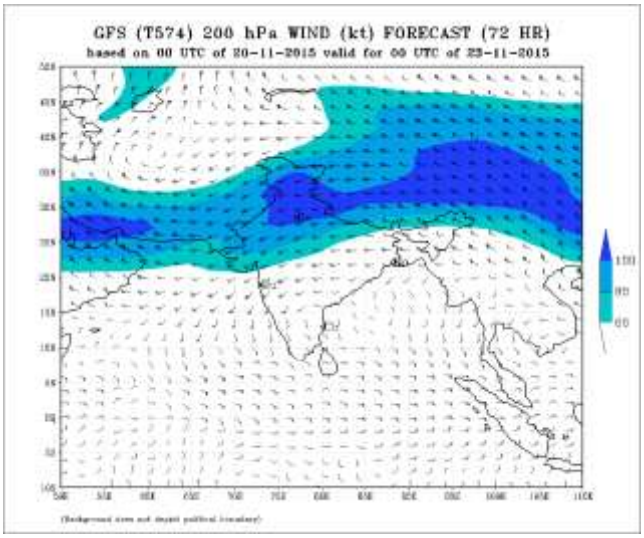

GPS (T574) 500 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 20-11-2015 valid for 00 UTC of 24-11-2015

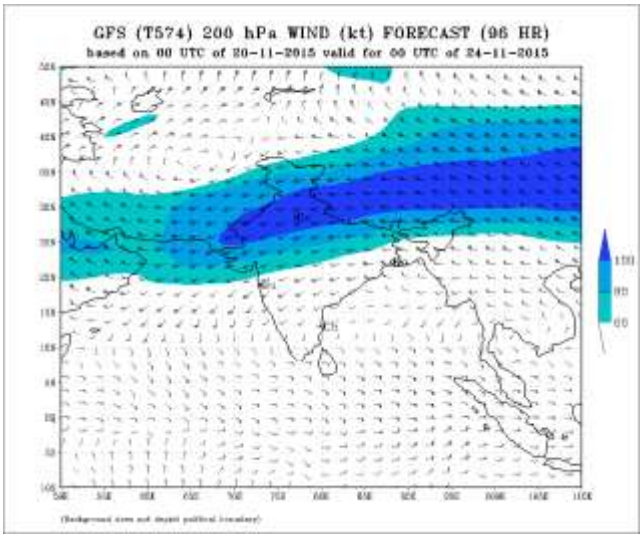

GPS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 20-11-2015 valid for 00 UTC of 25-11-2015

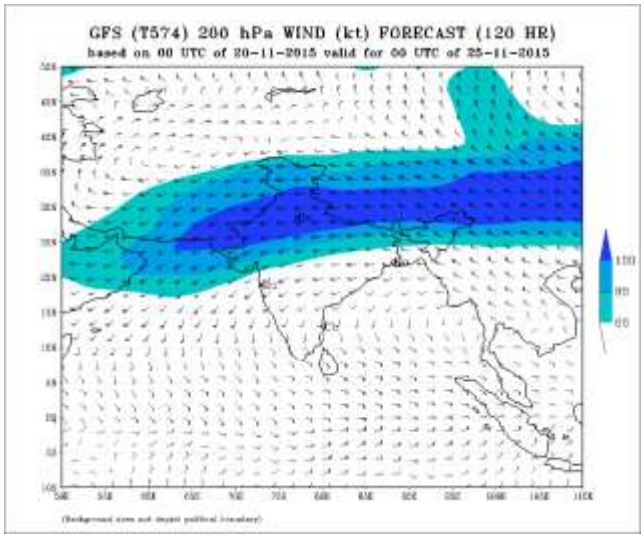

GFS (T574) 200 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 20-11-2015 valid for 00 UTC of 20-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 20-11-2015 valid for 00 UTC of 21-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 20-11-2015 valid for 00 UTC of 22-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 20-11-2015 valid for 00 UTC of 23-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 20-11-2015 valid for 00 UTC of 24-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 20-11-2015 valid for 00 UTC of 25-11-2015

FDP (Cyclone) NOC Report Dated 21 November, 2015

Synoptic features:

- The low pressure area over southeast and adjoining eastcentral Arabian Sea persists.
- The upper air cyclonic circulation over southwest Bay of Bengal off Srilanka coast, now seen as a trough of low over southwest Bay of Bengal off Srilanka coast.

Surface Temperature (SST):

- SST is 26-28°C over westcentral, extreme northern parts of Bay of Bengal and 30-31°C over north Andaman Sea. It is 28-30°C over rest part of BoB.
- SST is 26-28°C over westcentral and adjoining northwest parts of AS. It is 28-29°C over rest parts of Arabian Sea.

Tropical Cyclone Heat Potential (TCHP):

- TCHP is below 50kJ/cm^2 over extreme north and adjoining parts of westcentral BoB. It is 50-100 kJ/cm^2 over rest parts of BoB.
- TCHP is below 50kJ/cm^2 over northwest and adjoining west central parts of AS and 50-100 kJ/cm^2over rest part of AS.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive and is 25-40x10-5s-1 over southwest BoB, some parts of south Andaman Sea and it is negative over northern parts of AS and BoB.

Convergence:

- Lower level convergence is about 05-10x$10^{-5}s^{-1}$ over southwest BoB.
- It is about 05-10x$10^{-5}s^{-1}$ over southeast, southcentral and northwest AS and negative (-5 x$10^{-5}s^{-1}$) over some parts of westcentral AS.

Divergence:

- Upper level divergence is 05-10x10^{-5} s^{-1} over southwest BOB and negative(-5x10^{-5} s^{-1}) over rest parts of BoB.
- Upper level divergence is 10-20x10^{-5} s-1 over eastcentral AS and is 05-10x$10^{-5}s^{-1}$ over some parts of extreme southwest AS.

Wind Shear:

- Wind shear is 5-10knots over southwest BoB extending upto parts of Andaman Sea. Shear is increasing towards northern latitudes.
- Wind shear is 5-10knots over southeast AS extending upto parts of southwest AS. Shear is increasing towards northern latitudes.

Wind Shear Tendency:

- There is increasing tendency (5-10 Knots) over the southwest BoB and adjoining central BoB. And decreasing (-5-10 knots) over the Andaman Sea .
- The vertical wind shear tendency is increasing (5-10 knots) over northwest AS and adjoining southeast AS. It is negative (-5 Knots) over Lakshadweep and adjoining areas and extreme southwest parts of AS.

Upper tropospheric ridge:

- The upper tropospheric ridge at 200 hPa runs along 13.0°N over the BOB and 14.0°N over AS.

M.J.O. Index:

- MJO index is in Phase 2 with amplitude greater than 1 and would remain in phase 2 during next subsequent 2 days.

Storms and Depression over South China Sea/ South Indian Ocean:

Vortex over south Indian Ocean centred near 10.0°S/70.8 °E. Intensity is T2.5. Associated broken low / medium clouds with embedded intense to very intense convection over the area between latitude 6.0 °S to latitude 15.0 °S longitude 68.0 °E to 80.0 °E.

Satellite Bulletin based on INSAT imagery:

Bay of Bengal & Andaman Sea:-
According to satellite imagery, broken low / medium clouds with embedded moderate to intense convection over southwest Bay of Bengal & neighbourhood in association with low level circulation (trough of low over southwest Bay of Bengal off SriLanka coast).
Scattered low /medium clouds with embedded moderate to intense convection over westcentral Bay of Bengal.
Arabian Sea:-
Broken low / medium clouds with embedded moderate to intense convection over southeast and adjoining eastcentral Arabian Sea in association with low level circulation over the area.
Scattered low / medium clouds with embedded isolated moderate to intense convection over rest eastcentral Arabian Sea & isolated over extreme southwest Arabian Sea.

NWP Input for FDP Cyclone based on 0000 UTC of 21.11.2015
NWP Analysis
IMD-GFS and IMD-WRF model product analysis based on 0000 UTC of 21 November 2015 shows no significant weather system over the North Indian Seas and forecasts also do not show any weather development during next 5 days.
NWP products are available at:
http://202.54.31.51/bias/gfsproducts.php
http://202.54.31.51/bias/wrf27pro.php
http://202.54.31.51/bias/potentialparameter.php

NCMRWF-NCUM: No significant weather system over the North Indian Seas
NCMRWF-GFS: No significant weather system over the North Indian Seas
NCEP-GFS No significant weather system over the North Indian Seas
ECMWF. : No significant weather system over the North Indian Seas
JMA: No significant weather system over the North Indian Seas
ARP-Meteo France No significant weather system over the North Indian Seas

Genesis Potential Parameter (GPP): Model analysis of GPP based on 0000 UTC of 21 November 2015 shows no cyclogenesis zone over the North Indian Seas during next 5 days.

Summary and Conclusion:
The low pressure area over southeast and adjoining eastcentral Arabian sea persists.
NWP models do not show any weather development during next 5 days.

Bay of Bengal and Andaman Sea:

Probability of cyclogenesis over Bay of Bengal and Andaman Sea during next 120 hours:

24 HOURS	24-48 HOURS	48-72 HOURS	72-96 HOURS	96-120 HOURS
Nil	Nil	Nil	Nil	Nil

Arabian Sea:

Probability of cyclogenesis over Arabian Sea during next 120 hours:

24 HOURS	24-48 HOURS	48-72 HOURS	72-96 HOURS	96-120 HOURS
Nil	Nil	Nil	Nil	Nil

Advisory:

No IOP during next five days.

Annexure-I

Status of observational system:

Synoptic observation:

Region	Date/Time (UTC)		
	20/12	**21/00**	**21/03**
India	49	32	52
Coastal stations			
WB	8	3	6
Odisha	7	5	7
AP	13	13	13
Tamil Nadu	13	9	13
Puducherry	2	1	6
A & N	6	1	7
Bangladesh	11	11	11
Myanmar	0	8	0
Thailand	0	0	0
SriLanka	8	7	8

AWS Observations:

Region	Date/Time (UTC)		
	20/12	**21/00**	**21/03**
India	72	72	74
Coastal stations			
WB	8	9	9
Odisha	15	17	17
AP	16	16	17
Tamil Nadu	32	29	30
Puducherry	1	1	1
A & N	0	0	0

RS/RW (12Z) of 20/11/2015 **--/39**
No. of Ascents reaching 250 hPa level:, MISDA:

RS/RW (00Z) of 21/11/2015- **25/39**
No. of Ascents reaching 250 hPa level:24 , MISDA:1

No. of PILOT Ascents

20/12Z	21/00Z
8	3

Buoy Data

20/12Z	21/00Z	21/03Z
10	7	6

STATUS OF CHENNAI REGION OBSERVATION

No. of Synop data

Date→	**20.11.2015**							
UTC→	**00**	**03**	**06**	**09**	**12**	**15**	**18**	**21**
Chennai Region (Coasts of AP & TN)	**20**	**22**	**20**	**20**	**22**	**20**	**20**	**20**

No. of RS/RW Ascents

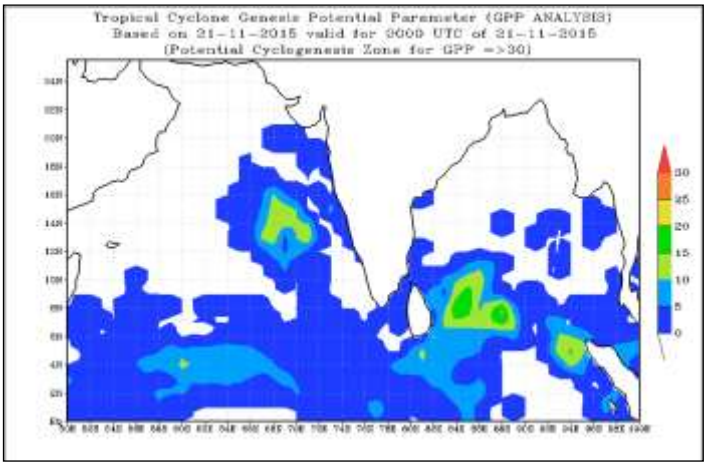
00Z /20.11.2015 : 7
No. of Ascents reaching 250 hPa level = 7
MISDA : 1

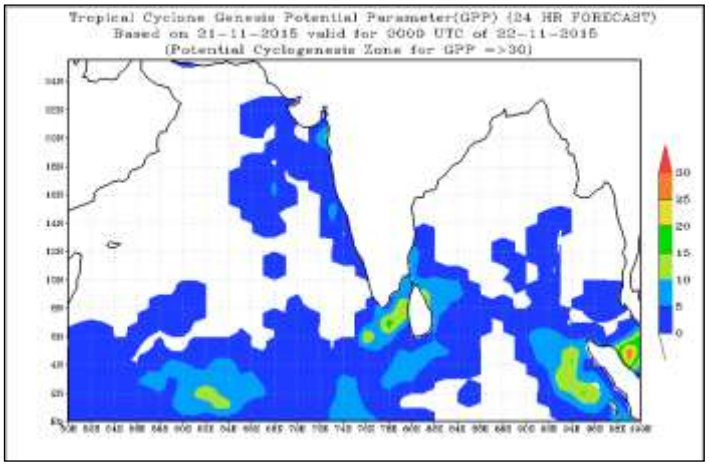
12Z /20.11.2015 : 1
No. of Ascents reaching 250 hPa level = 1
MISDA : 7

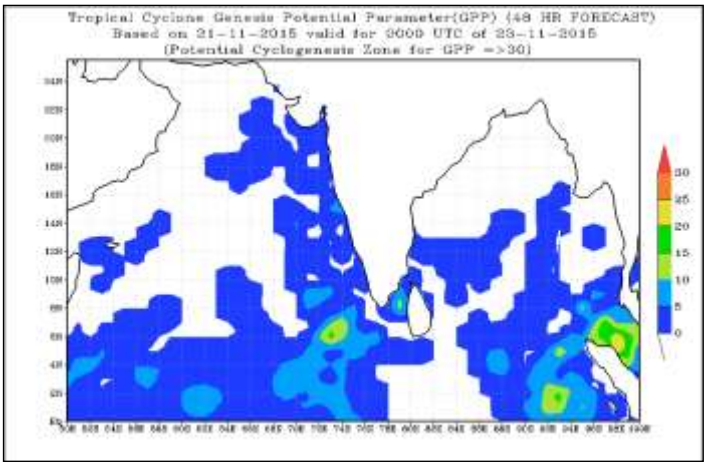
No. of PILOT Ascents:
20.11.2015

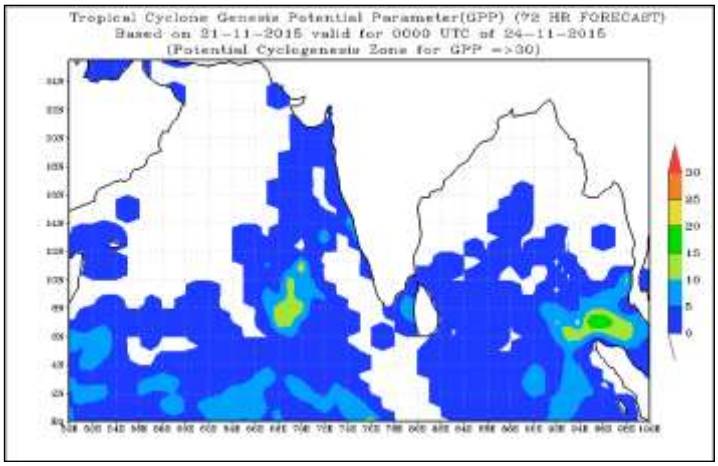
06Z	18Z
6	1

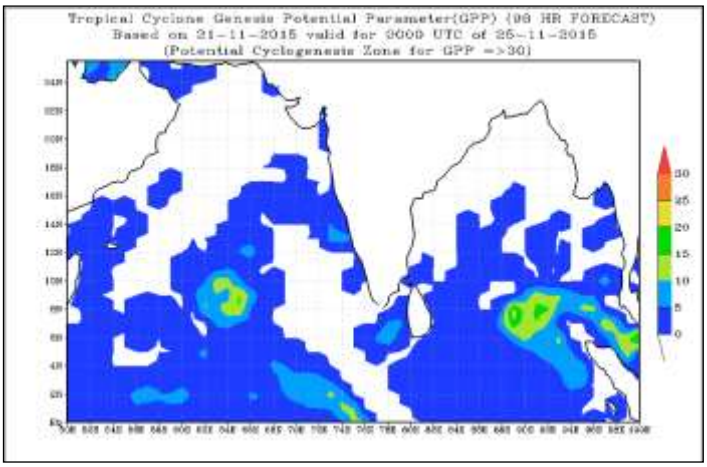
Annexure-II

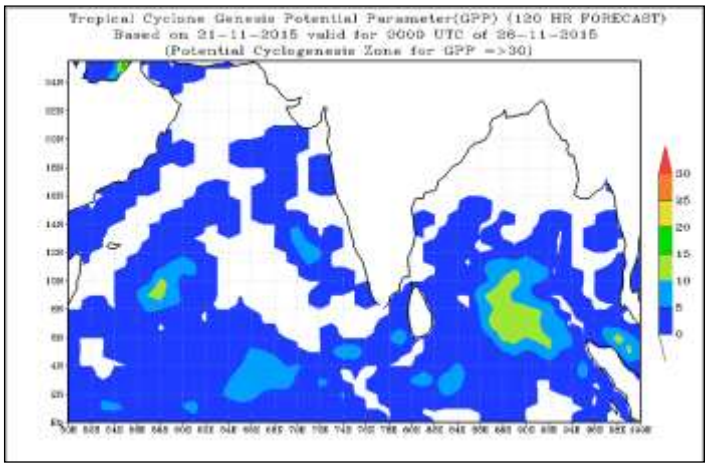

Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 21-11-2015 valid for 0000 UTC of 21-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

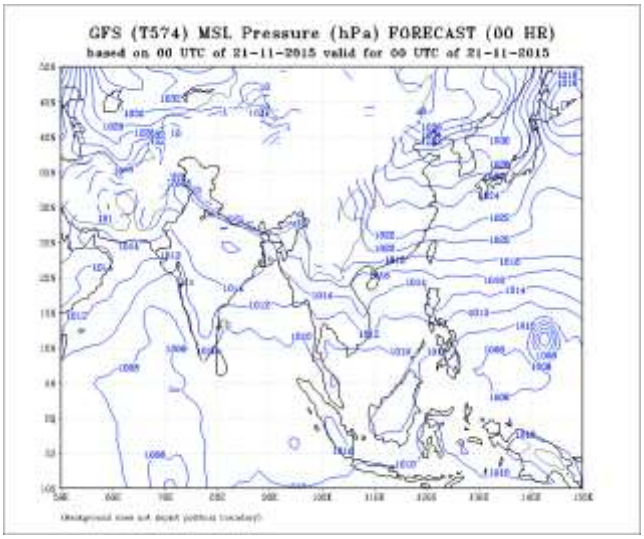

Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 21-11-2015 valid for 0000 UTC of 22-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

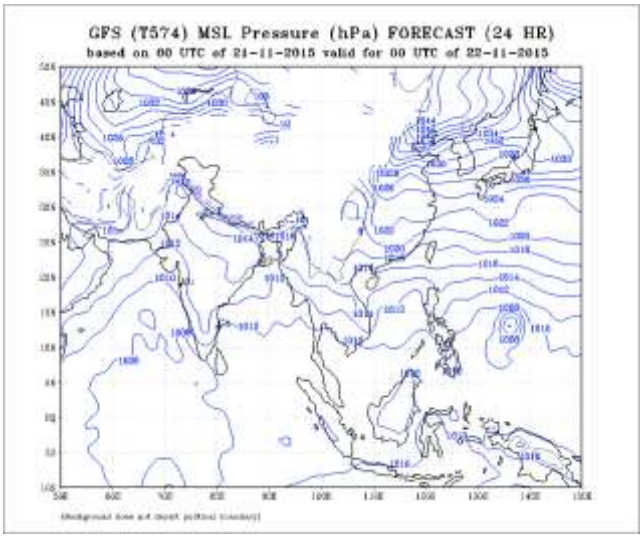

Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
Based on 21-11-2015 valid for 0000 UTC of 23-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

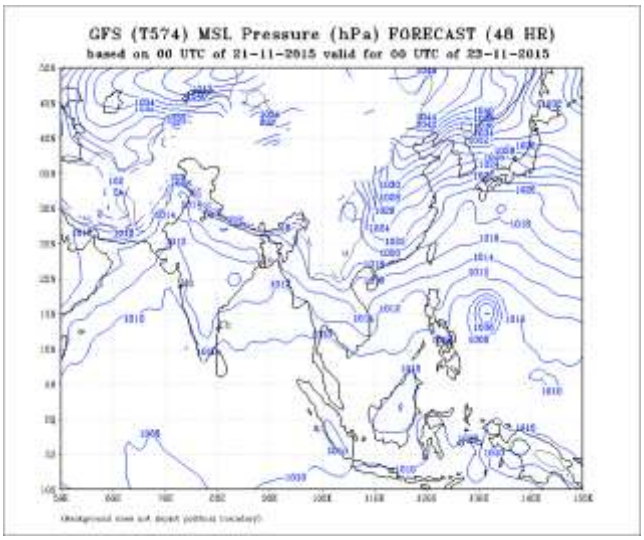

Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 21-11-2015 valid for 0000 UTC of 24-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

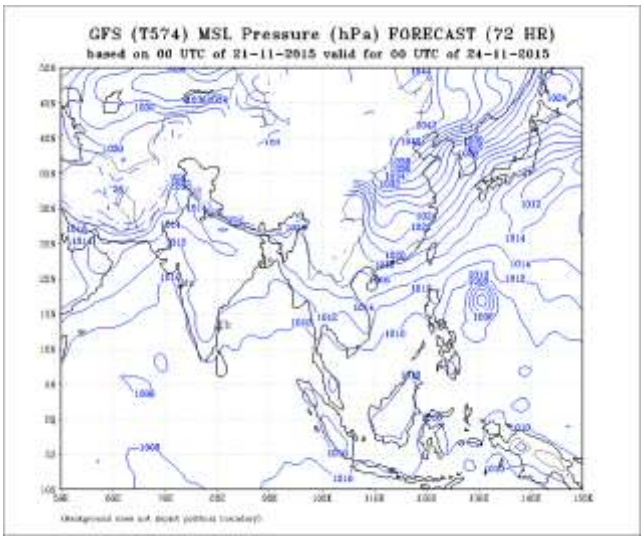

Tropical Cyclone Genesis Potential Parameter(GPP) (96 HR FORECAST)
Based on 21-11-2015 valid for 0000 UTC of 25-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

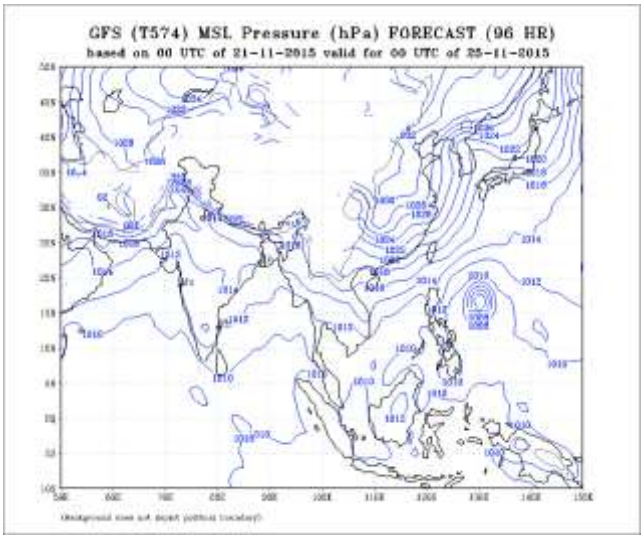

Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 21-11-2015 valid for 0000 UTC of 26-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

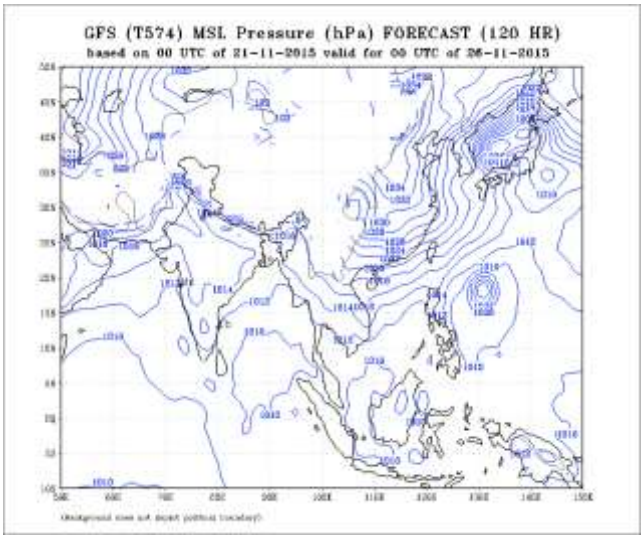

GFS (T574) MSL Pressure (hPa) FORECAST (00 HR)
based on 00 UTC of 21-11-2015 valid for 00 UTC of 21-11-2015

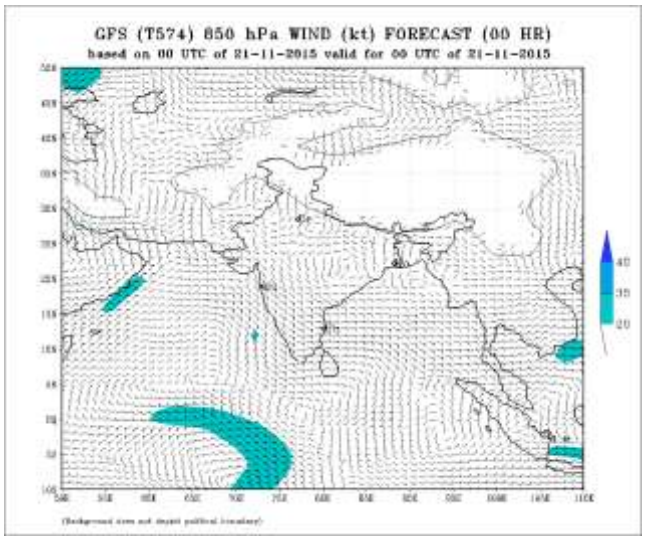

GFS (T574) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 21-11-2015 valid for 00 UTC of 22-11-2015

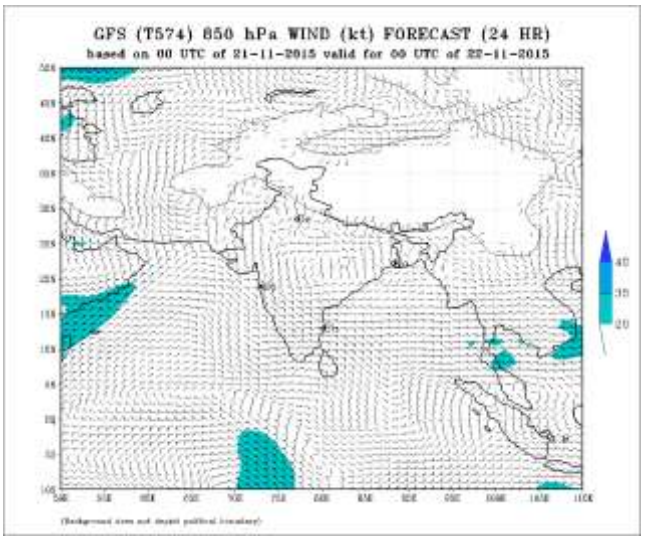

GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 21-11-2015 valid for 00 UTC of 23-11-2015

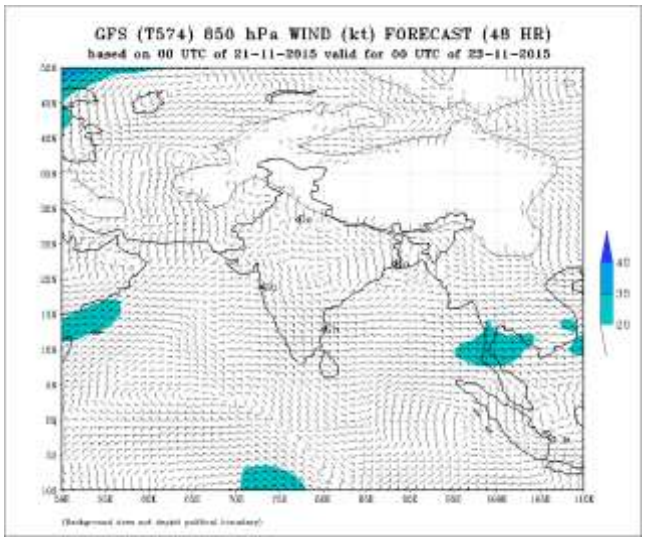

GFS (T574) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 21-11-2015 valid for 00 UTC of 24-11-2015

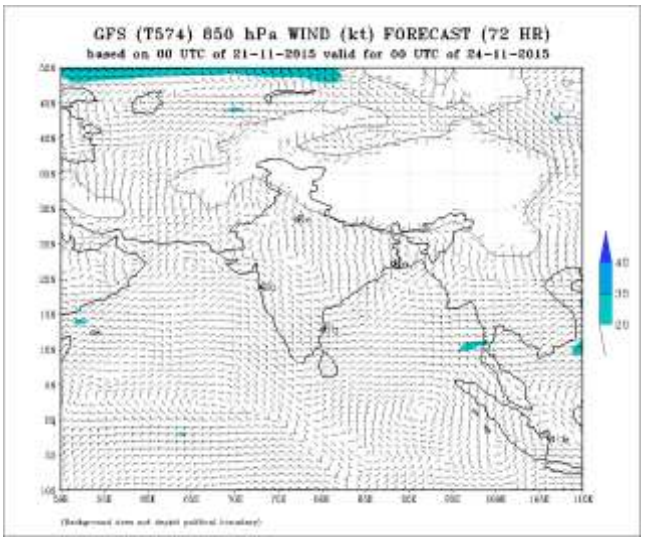

GFS (T574) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 21-11-2015 valid for 00 UTC of 25-11-2015

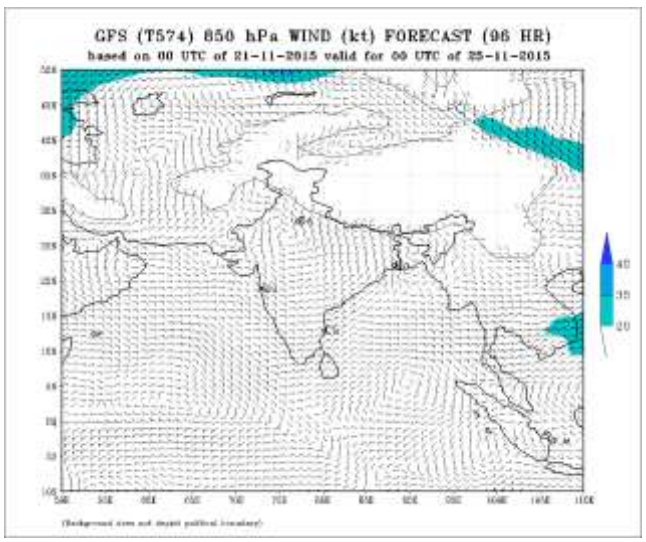

GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 21-11-2015 valid for 00 UTC of 26-11-2015

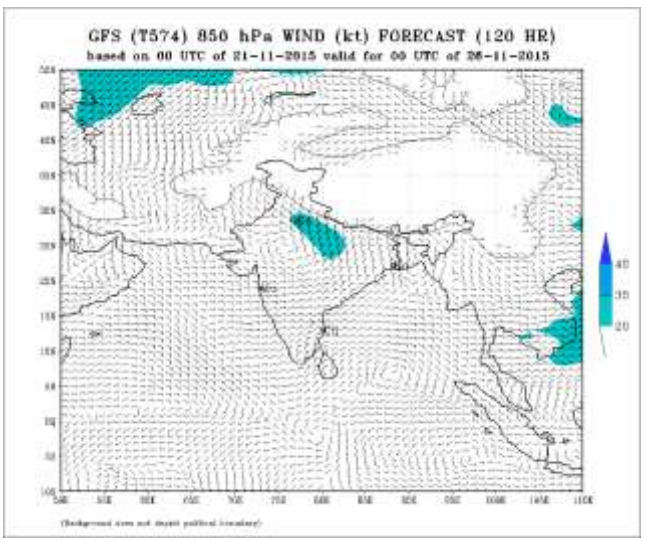

GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 21-11-2015 valid for 00 UTC of 21-11-2015

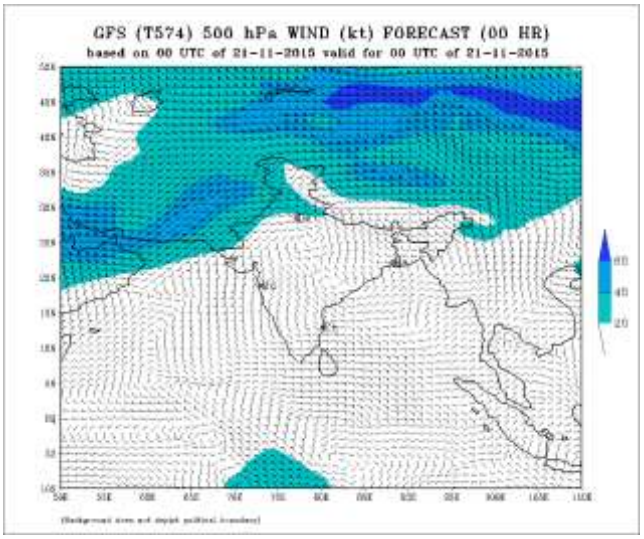

GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 21-11-2015 valid for 00 UTC of 22-11-2015

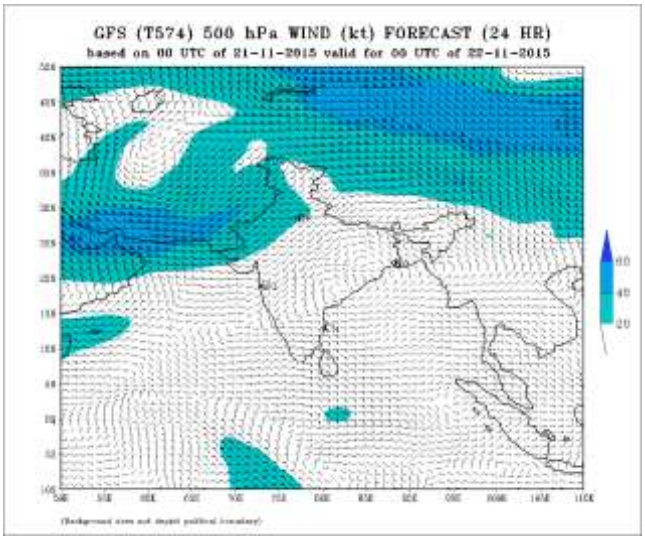

GFS (T574) 850 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 21-11-2015 valid for 00 UTC of 23-11-2015

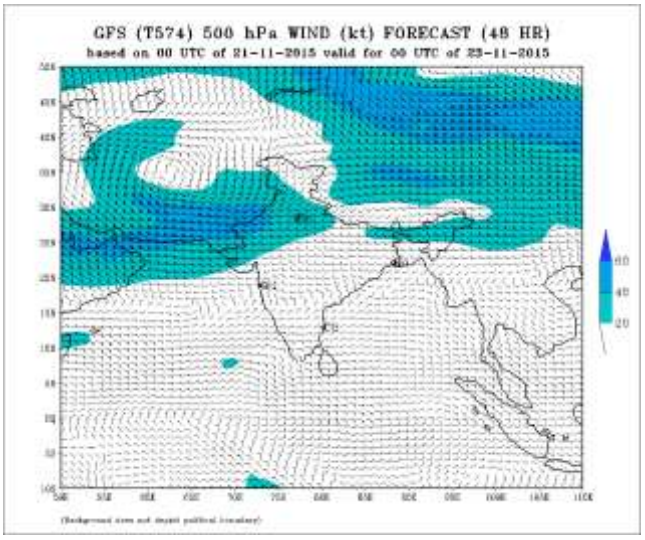

GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 21-11-2015 valid for 00 UTC of 24-11-2015

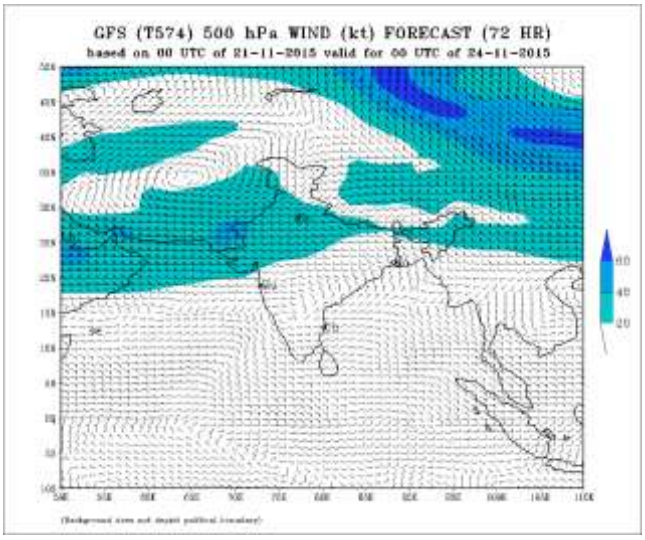

GFS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 21-11-2015 valid for 00 UTC of 25-11-2015

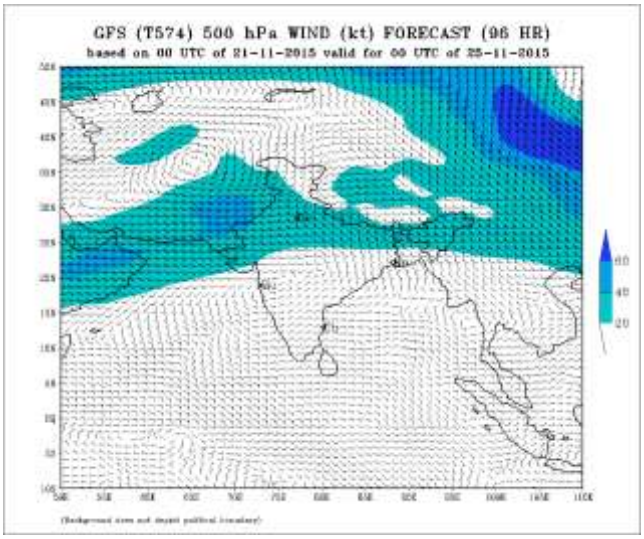

GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 21-11-2015 valid for 00 UTC of 26-11-2015

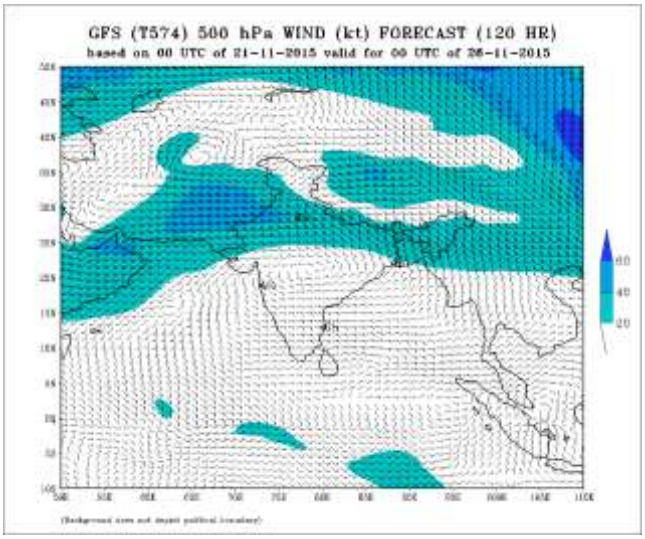

GFS (T574) 500 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 21-11-2015 valid for 00 UTC of 21-11-2015

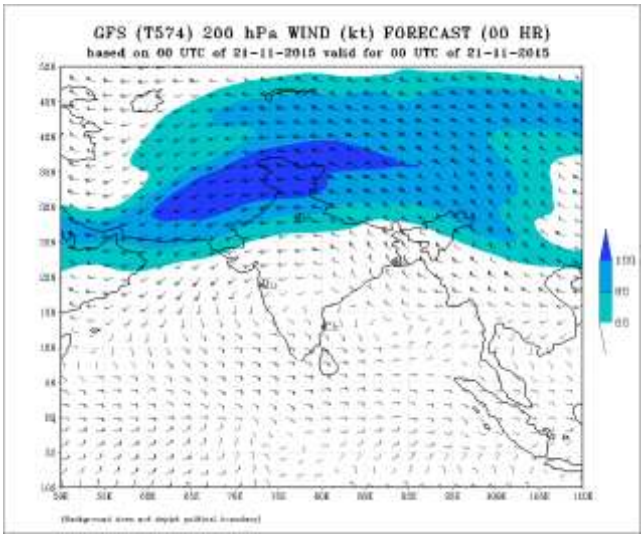

GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 21-11-2015 valid for 00 UTC of 22-11-2015

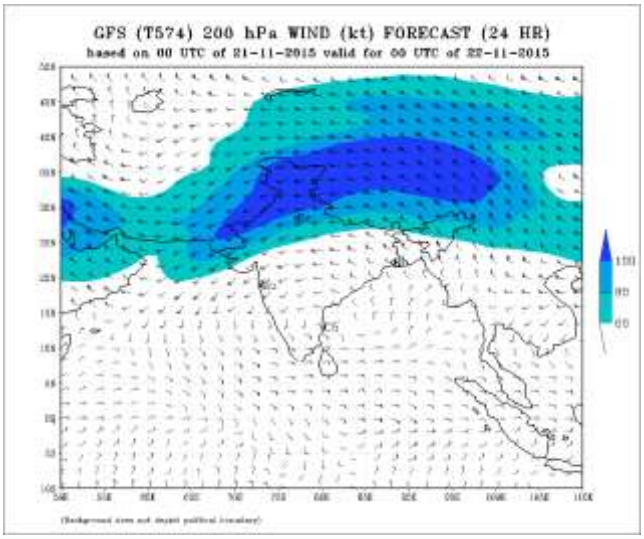

GFS (T574) 500 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 21-11-2015 valid for 00 UTC of 23-11-2015

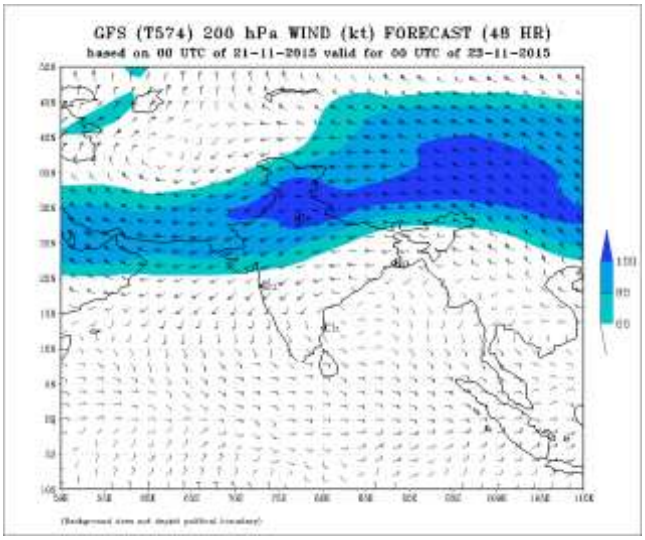

GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 21-11-2015 valid for 00 UTC of 24-11-2015

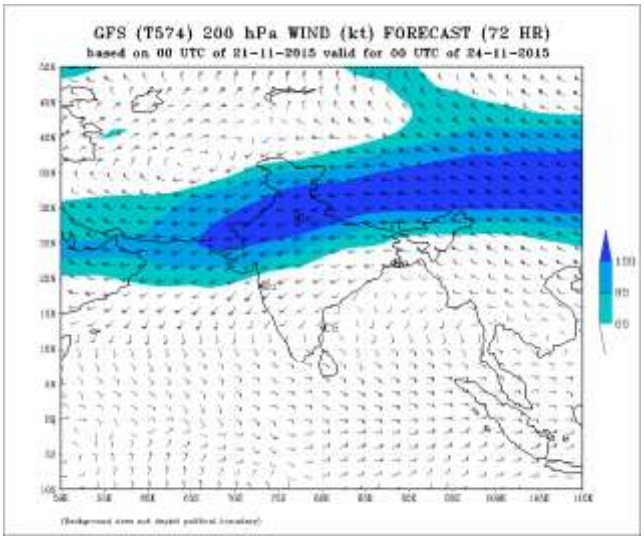

GFS (T574) 500 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 21-11-2015 valid for 00 UTC of 25-11-2015

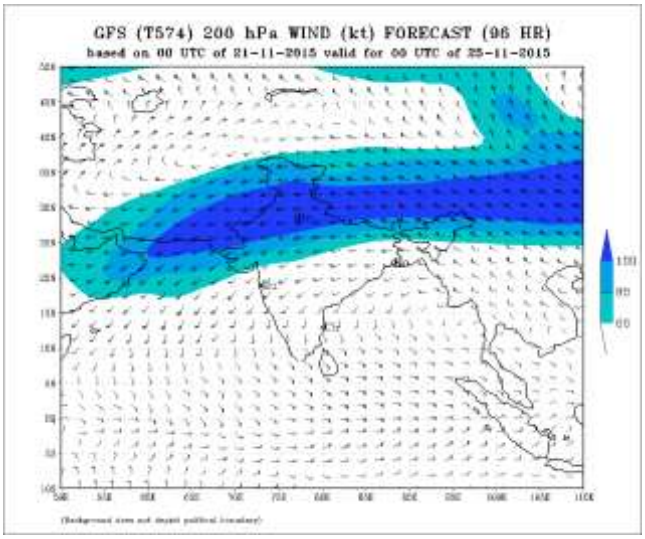

GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 21-11-2015 valid for 00 UTC of 26-11-2015

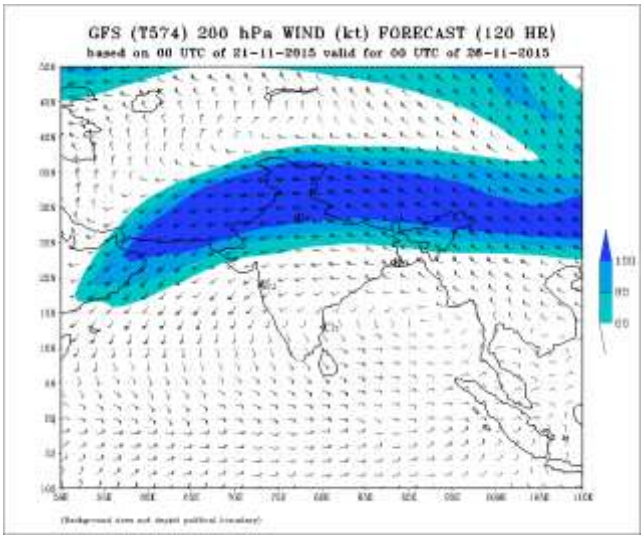

GFS (T574) 200 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 21-11-2015 valid for 00 UTC of 21-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 21-11-2015 valid for 00 UTC of 22-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 21-11-2015 valid for 00 UTC of 23-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 21-11-2015 valid for 00 UTC of 24-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 21-11-2015 valid for 00 UTC of 25-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 21-11-2015 valid for 00 UTC of 26-11-2015

FDP (Cyclone) NOC Report Dated 22 November, 2015

Synoptic features:

- The low pressure area over eastcentral Arabian Sea and neighbourhood persists.
- The trough of low over southwest Bay of Bengal off Srilanka coast now lies over Comorin area & neighbourhood.

Surface Temperature (SST):

- SST is 26-28°C over westcentral, extreme northern parts of Bay of Bengal and 30-31°C over north Andaman Sea and between 28-30°C over rest part of BoB.
- SST is 26-28°C over westcentral and northwest parts of AS. It is 29-31°C over southcentral AS and between 28-29°C over rest parts of Arabian Sea.

Tropical Cyclone Heat Potential (TCHP):

- TCHP is below 50kJ/cm^2 over extreme north and adjoining parts of westcentral BoB. It is 50-100 kJ/cm^2 over rest parts of BoB.
- TCHP is below 50kJ/cm^2 over northwest and adjoining west central parts of AS and 50-100 kJ/cm^2over rest part of AS.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive and is 25-40x10-5s-1 over southwest BoB and adjoining Comorin area, some parts of south Andaman Sea. It is negative over northern parts of BoB.
- It is 25-40x10-5s-1 over central AS, and between 10-25x10-5s-1 over adjoining westcentral and southwest AS. It is negative over eastern parts of AS.

Convergence:

- Lower level convergence is about 05-10x$10^{-5}s^{-1}$ over southwest BoB and adjoining Comorin area. It is between -5 to +5 over rest of the NIO.

Divergence:

- Upper level divergence is 05-10x10-5 s-1 over Comorin and adjoining Maldives .No significant divergence over rest parts of BoB.
- Upper level divergence is about 5x10-5 s-1 over southcentral and northeast AS and is negative -05x10-5 s-1 over some parts of southeast AS.

Wind Shear:

- Wind shear is 5-10knots over Comorin, southwest BoB and adjoining many parts of north and central BoB and Andaman Sea. Shear is increasing towards northern latitudes.
- Wind shear is 5-10knots over southwest and southwest AS. Shear is increasing towards northern latitudes.

Wind Shear Tendency:

- There is decreasing tendency (-5 to -10 Knots) over the many parts of BoB and increasing (5to10 knots) over the Andaman Sea.
- The vertical wind shear tendency is increasing (5-10 knots) over northeast AS. It is decreasing (-5 to -10 Knots) over the rest parts of AS.

Upper tropospheric ridge:

- The upper tropospheric ridge at 200 hPa runs along 13.0°N over NIO as a whole.

M.J.O. Index:

- MJO index is in Phase 2 with amplitude greater than 1 and would remain in phase 2 during next subsequent 2 days.

Storms and Depression over South China Sea/ South Indian Ocean:

Vortex over south Indian Ocean centred near 12.0°S/71.8 °E. Intensity is T2.5.

Associated broken low / medium clouds with embedded intense to very intense convection over the area between latitude 1.0 °S to latitude 17.0 °S longitude 65.0 °E to 82.0 °E.

Satellite Bulletin based on INSAT imagery:

Bay of Bengal & Andaman Sea:-

According to satellite imagery, scattered low / medium clouds with embedded isolated moderate to intense convection lie over westcentral Bay of Bengal.

Arabian Sea:-

The low pressure area over eastcentral Arabian Sea and neighbourhood persists. Broken low / medium clouds with embedded moderate to intense convection over eastcentral Arabian Sea adjoining southeast Arabian Sea in association with low level circulation over the area.

Scattered low / medium clouds with embedded isolated moderate to intense convection over southeast Arabian Sea.

NWP Input for FDP Cyclone based on 0000 UTC

NWP Analysis

IMD-GFS and IMD-WRF model product analysis based on 0000 UTC of 22 November 2015 shows no significant weather system over the North Indian Seas and forecasts also do not show any weather development during next 5 days except GPP charts show a region of cyclogenesis over central Arabian Sea in 72 hours forecast.

NWP products are available at:

http://202.54.31.51/bias/gfsproducts.php
http://202.54.31.51/bias/wrf27pro.php
http://202.54.31.51/bias/potentialparameter.php

NCMRWF-NCUM: Model suggests formation of feeble over southeast BoB on 24th moving in westward direction in next 2 days.

NCMRWF-GFS: Model suggests formation of low over southeast BoB on 30th moving westwards.

NCEP-GFS No significant weather system over the North Indian Seas

ECMWF. : No significant weather system over the North Indian Seas

JMA: No significant weather system over the North Indian Seas

ARP-Meteo France Model suggest the low pressure over eastcentral Arabian Sea would persist for next 2 day over the same region. The system over Comorin would move westwards towards southeast Arabian Sea during next 2 day. It also suggest formation of another feeble low on 24th over Andaman Sea with no significant intensification.

Genesis Potential Parameter (GPP):

GPP charts show a region of cyclogenesis over central Arabian Sea in 72 hours forecast.

Summary and Conclusion:

The low pressure area over eastcentral Arabian Sea and neighbourhood persists.
NWP models do not suggest any cyclogenesis (formation of depression)during next 5 days.
Bay of Bengal and Andaman Sea:

Probability of cyclogenesis over Bay of Bengal and Andaman Sea during next 120 hours:

24 HOURS	24-48 HOURS	48-72 HOURS	72-96 HOURS	96-120 HOURS
Nil	Nil	Nil	Nil	Nil

Arabian Sea:

Probability of cyclogenesis over Arabian Sea during next 120 hours:

24 HOURS	24-48 HOURS	48-72 HOURS	72-96 HOURS	96-120 HOURS
Nil	Nil	Nil	Nil	Nil

Advisory:
No IOP during next five days.

Annexure-I

Status of observational system:

Synoptic observation:

Region	Date/Time (UTC)		
	21/12	**22/00**	**22/03**
India	52	33	53
Coastal stations			
WB	8	3	8
Odisha	7	4	6
AP	13	13	13
Tamil Nadu	12	11	13
Puducherry	6	1	6
A & N	6	1	7
Bangladesh	11	10	07
Myanmar	10	0	12
Thailand	0	0	0
SriLanka	8	8	8

AWS Observations:

Region	Date/Time (UTC)		
	21/12	**22/00**	**22/03**
India	73	68	71
Coastal stations			
WB	9	7	9
Odisha	15	15	17
AP	16	15	17
Tamil Nadu	32	30	27
Puducherry	1	1	1
A & N	0	0	0

RS/RW (12Z) of 21/11/2015 **6/39**
No. of Ascents reaching 250 hPa level: 6:, MISDA:

RS/RW (00Z) of 22/11/2015- **24/39**
No. of Ascents reaching 250 hPa level:24 , MISDA:3

No. of PILOT Ascents

21/12Z	22/00Z
5	7

Buoy Data

21/12Z	22/00Z	22/03Z
12	11	12

STATUS OF CHENNAI REGION OBSERVATION

No. of Synop data

Date→	21.11.2015							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	20	22	20	20	22	20	20	20

No. of RS/RW Ascents

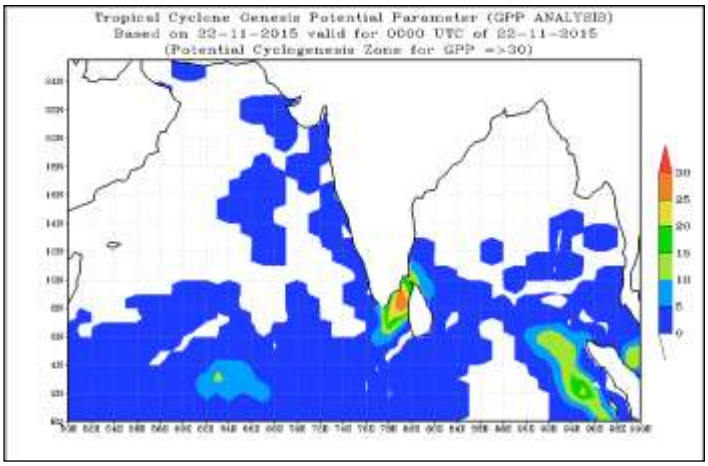
00Z /21.11.2015 : 7
No. of Ascents reaching 250 hPa level = 7
MISDA : 1

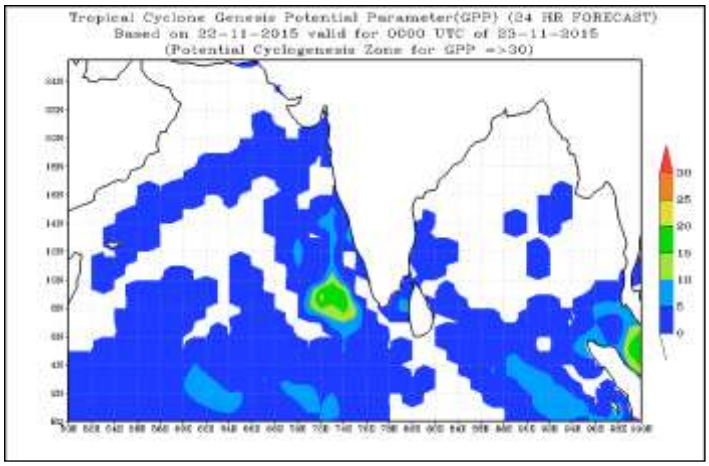
12Z /21.11.2015 : 1
No. of Ascents reaching 250 hPa level = 1
MISDA : 7

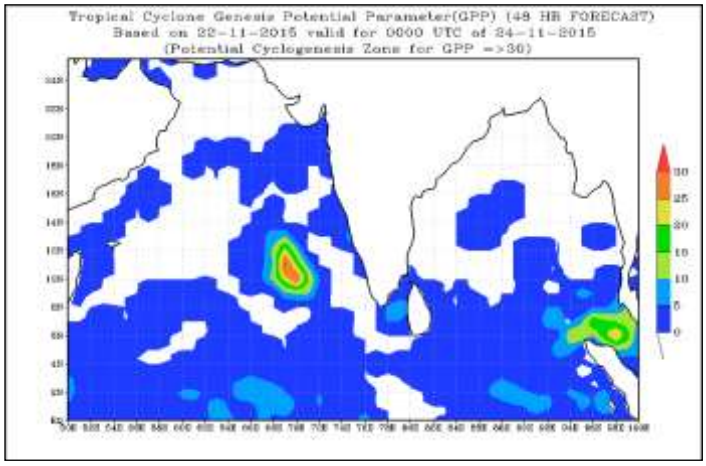
No. of PILOT Ascents:

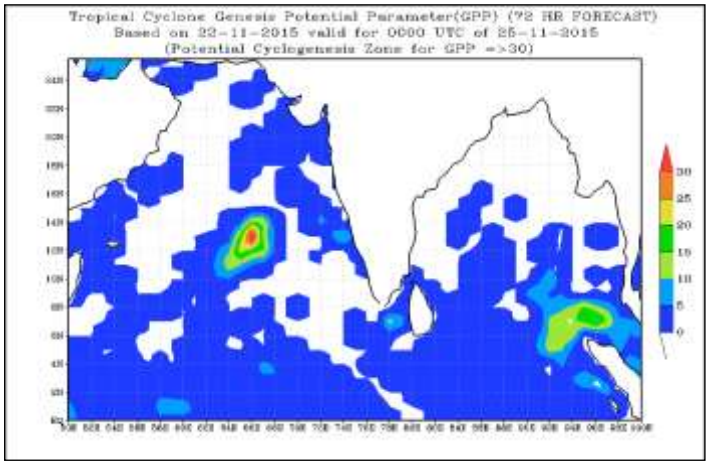
21.11.2015	
06Z	18Z
6	4

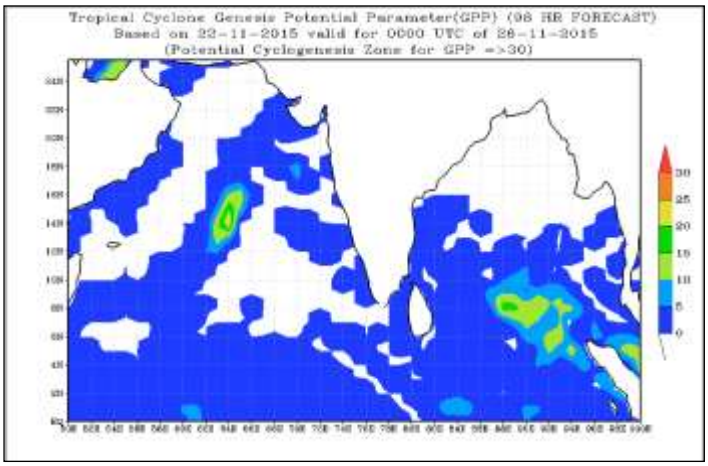
Annexure-II

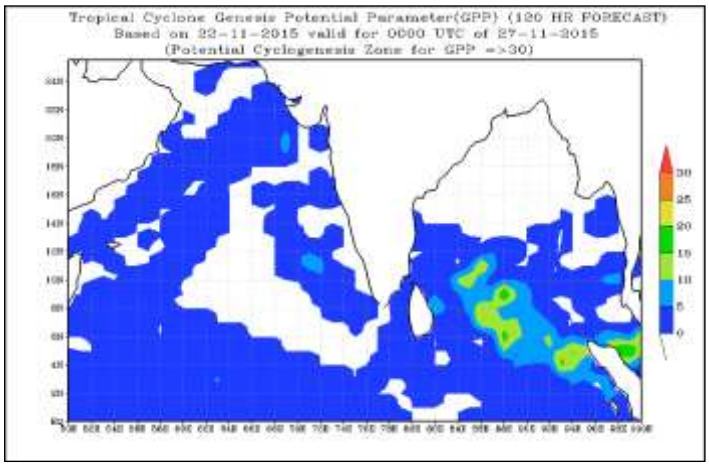

Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 22-11-2015 valid for 0000 UTC of 22-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

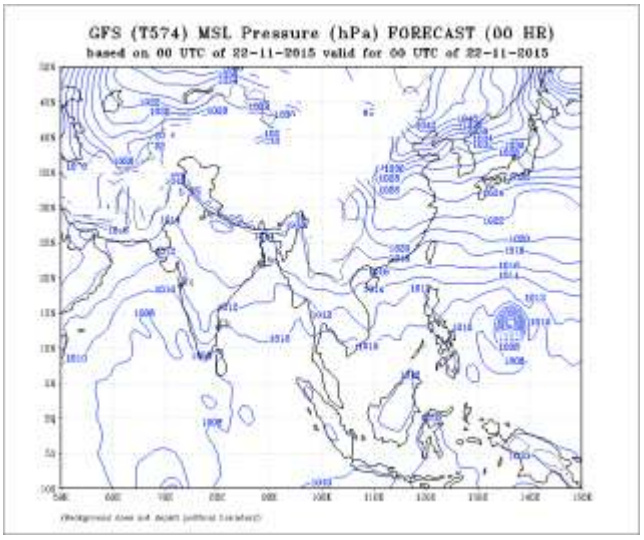

Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 22-11-2015 valid for 0000 UTC of 23-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

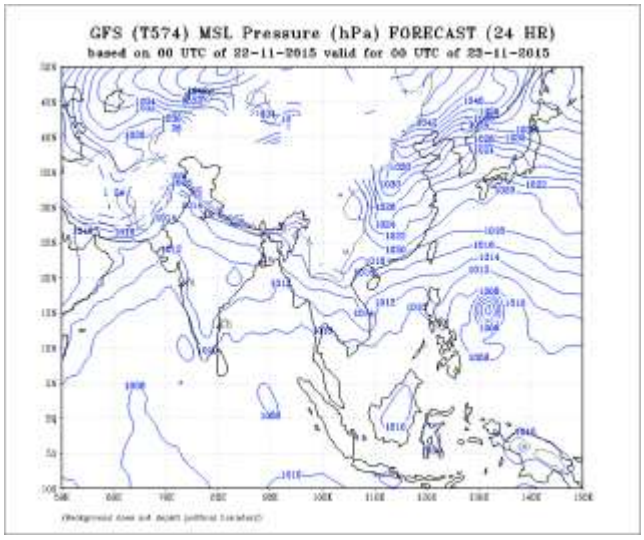

Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
Based on 22-11-2015 valid for 0000 UTC of 24-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

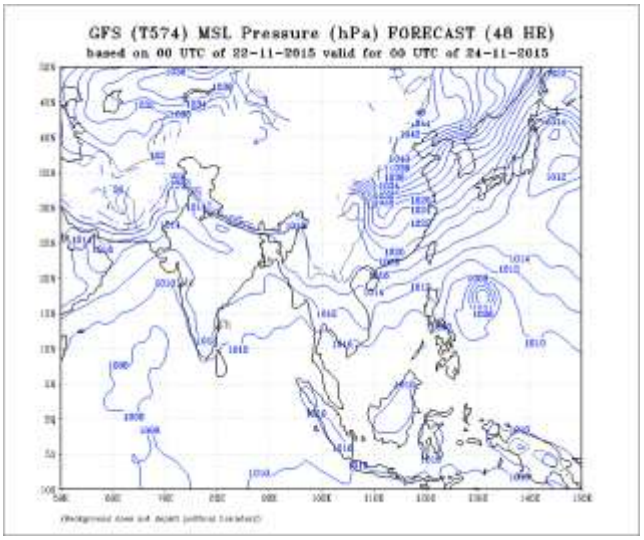

Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 22-11-2015 valid for 0000 UTC of 25-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

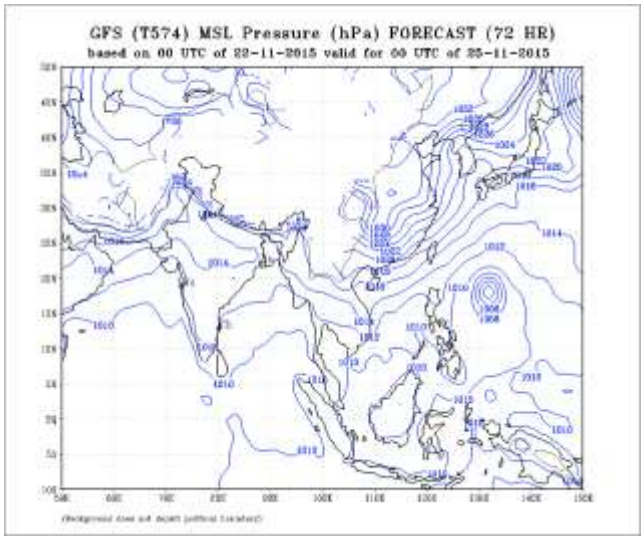

Tropical Cyclone Genesis Potential Parameter(GPP) (96 HR FORECAST)
Based on 22-11-2015 valid for 0000 UTC of 26-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

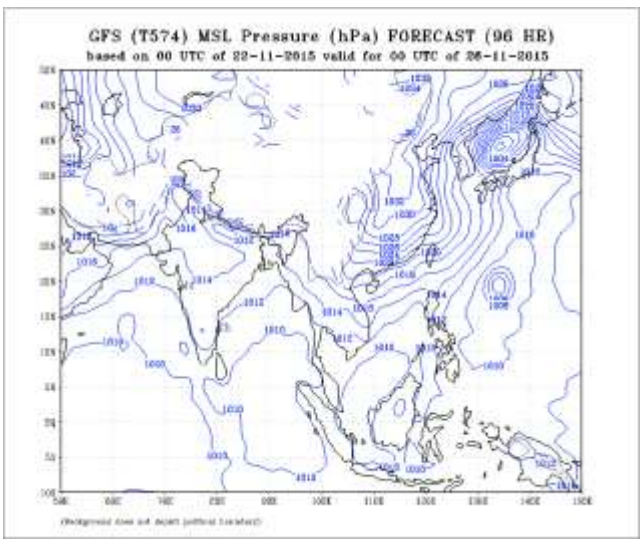

Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 22-11-2015 valid for 0000 UTC of 27-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

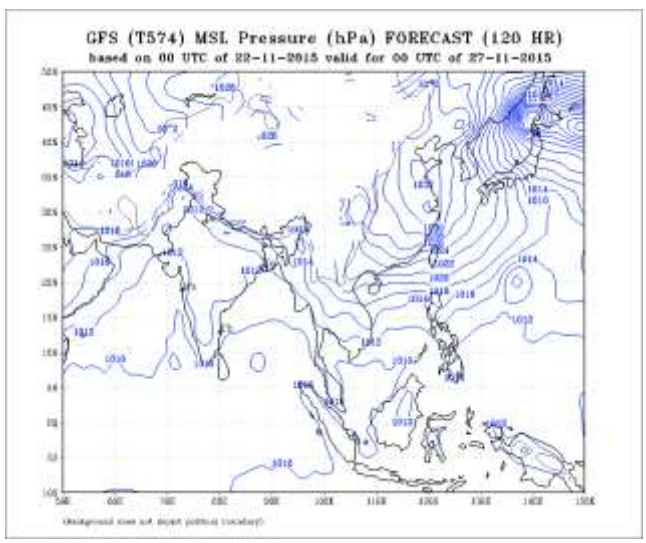

GFS (T574) MSL Pressure (hPa) FORECAST (00 HR)
based on 00 UTC of 22-11-2015 valid for 00 UTC of 22-11-2015

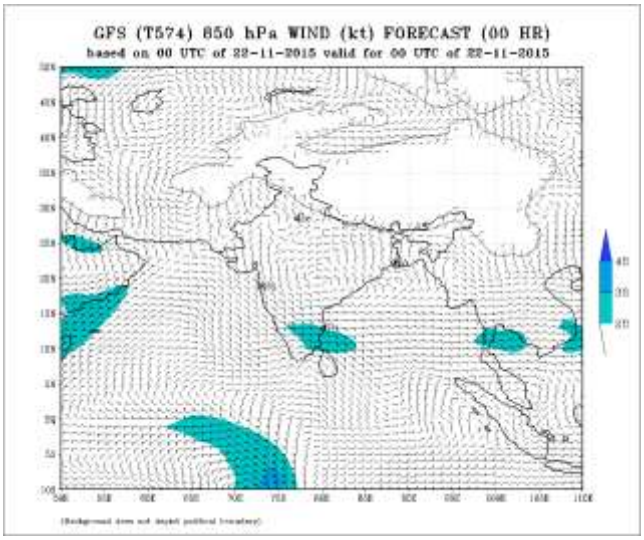

GFS (T574) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 22-11-2015 valid for 00 UTC of 23-11-2015

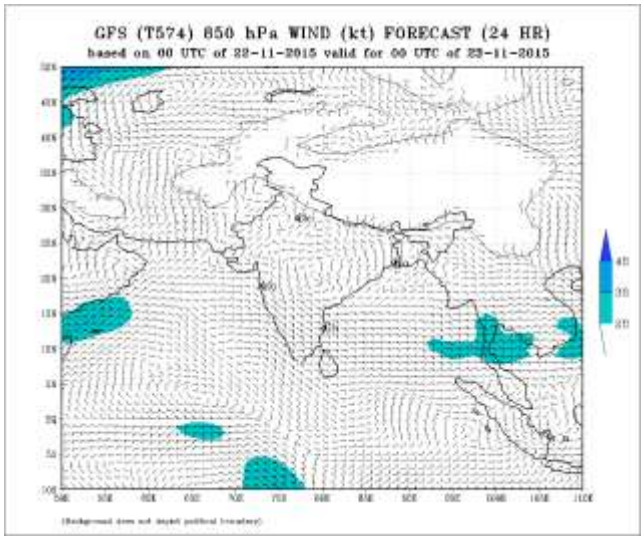

GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 22-11-2015 valid for 00 UTC of 24-11-2015

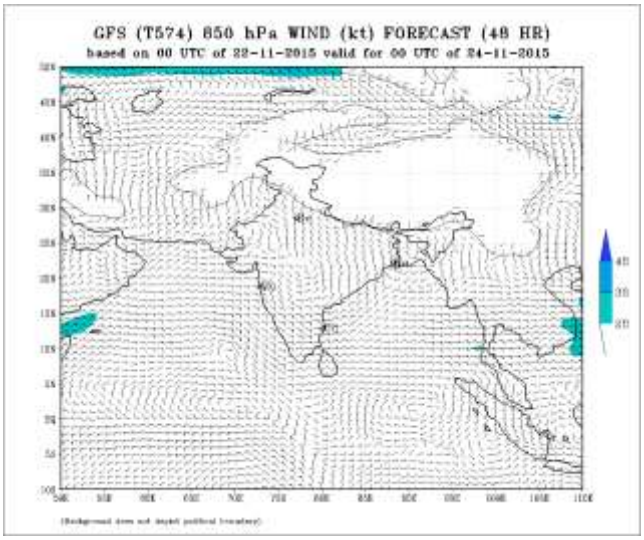

GFS (T574) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 22-11-2015 valid for 00 UTC of 25-11-2015

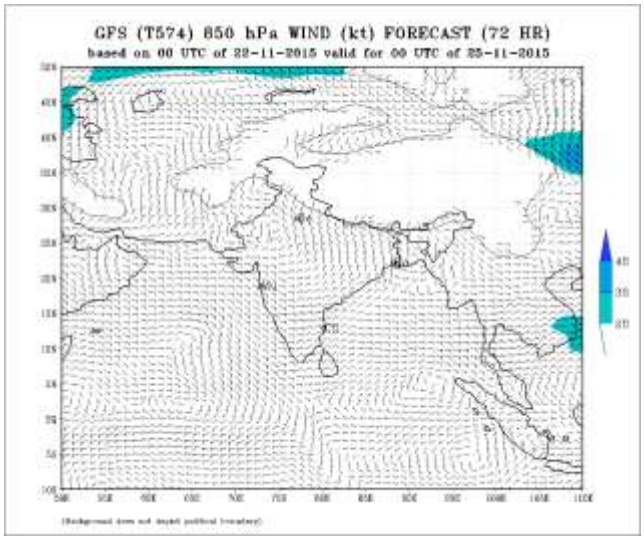

GFS (T574) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 22-11-2015 valid for 00 UTC of 26-11-2015

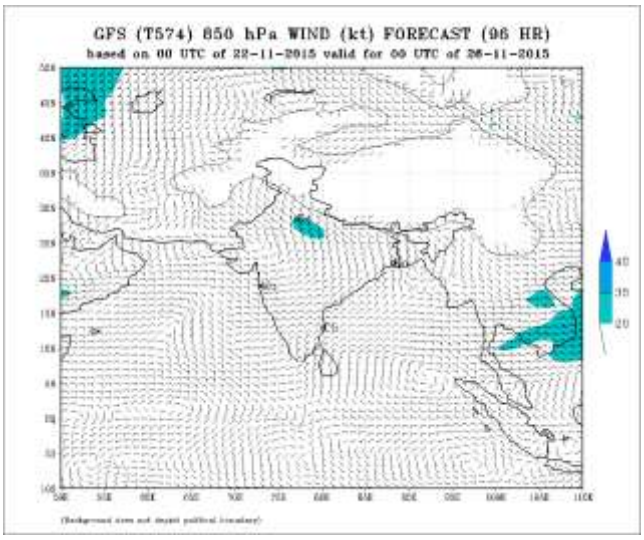

GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 22-11-2015 valid for 00 UTC of 27-11-2015

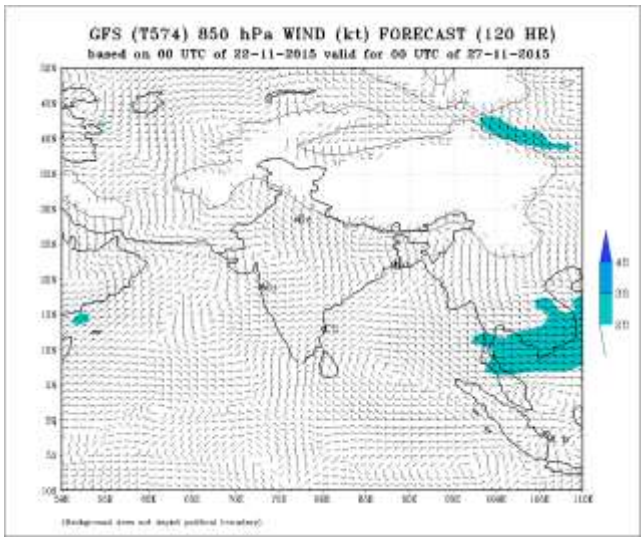

GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 22-11-2015 valid for 00 UTC of 22-11-2015

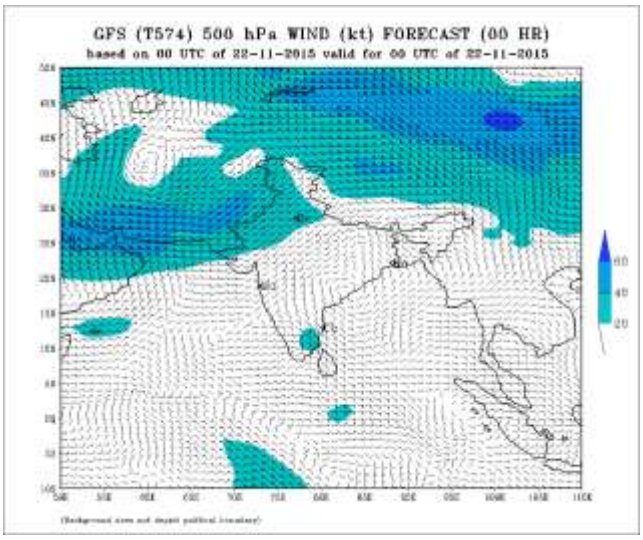

GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 22-11-2015 valid for 00 UTC of 23-11-2015

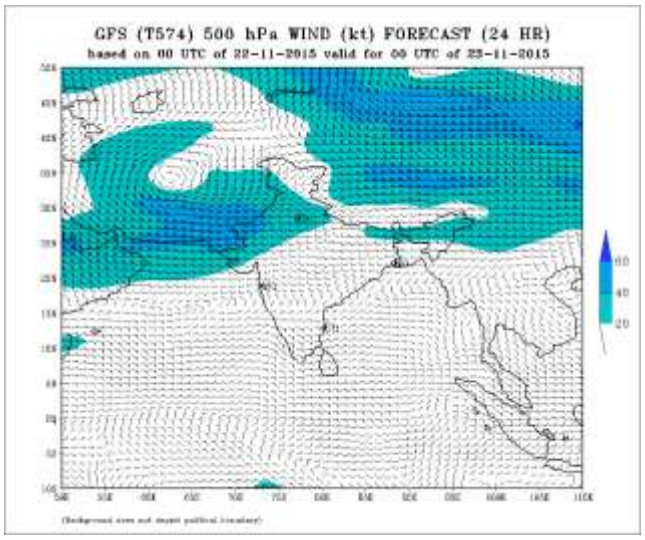

GFS (T574) 850 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 22-11-2015 valid for 00 UTC of 24-11-2015

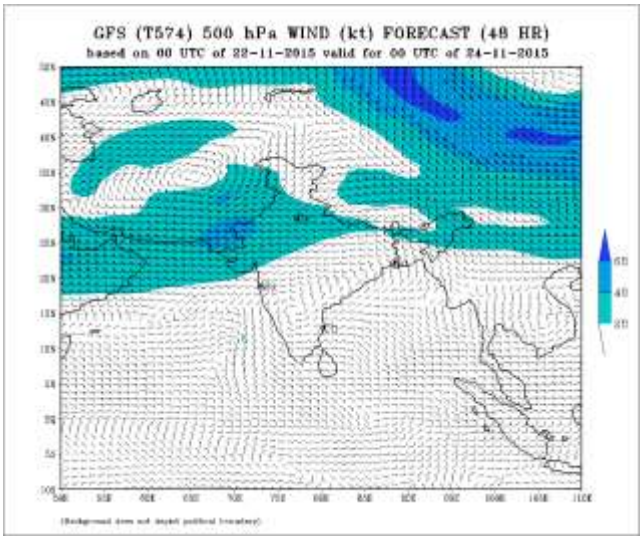

GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 22-11-2015 valid for 00 UTC of 25-11-2015

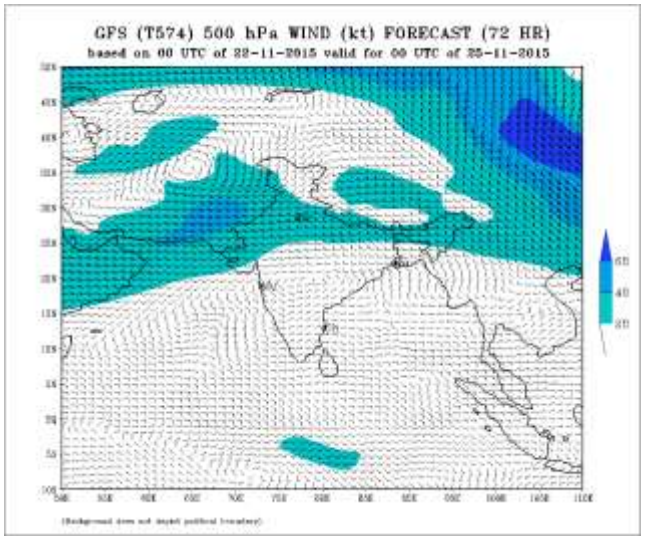

GFS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 22-11-2015 valid for 00 UTC of 26-11-2015

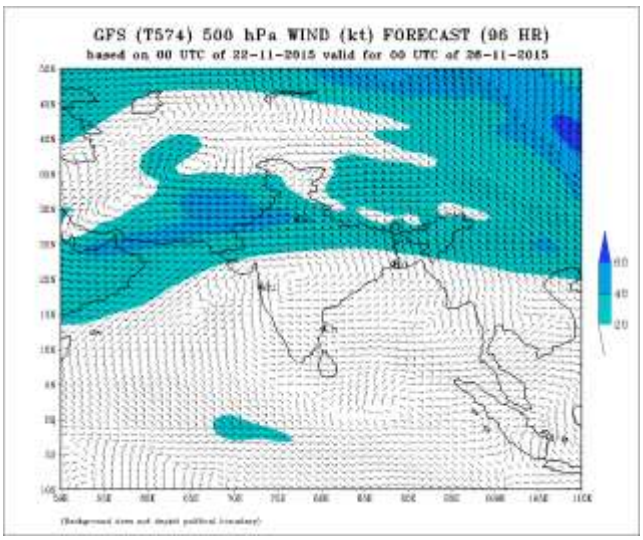

GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 22-11-2015 valid for 00 UTC of 27-11-2015

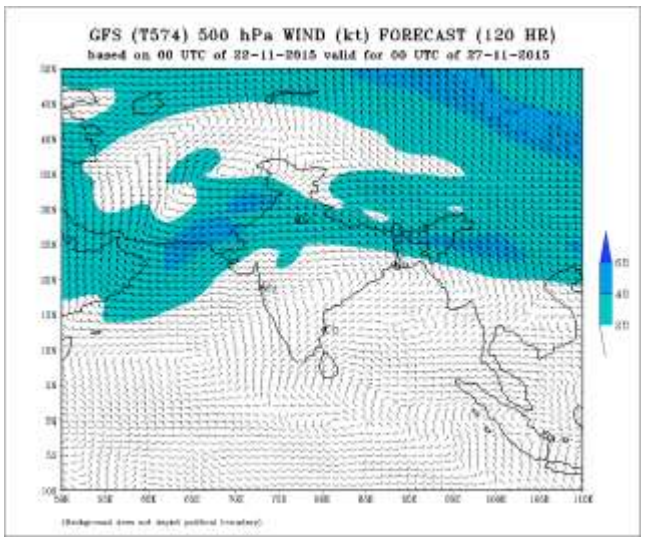

GFS (T574) 500 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 22-11-2015 valid for 00 UTC of 22-11-2015

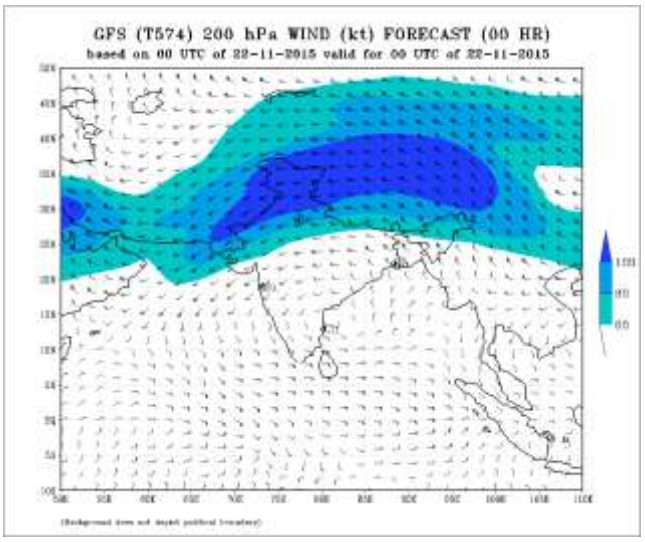

GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 22-11-2015 valid for 00 UTC of 23-11-2015

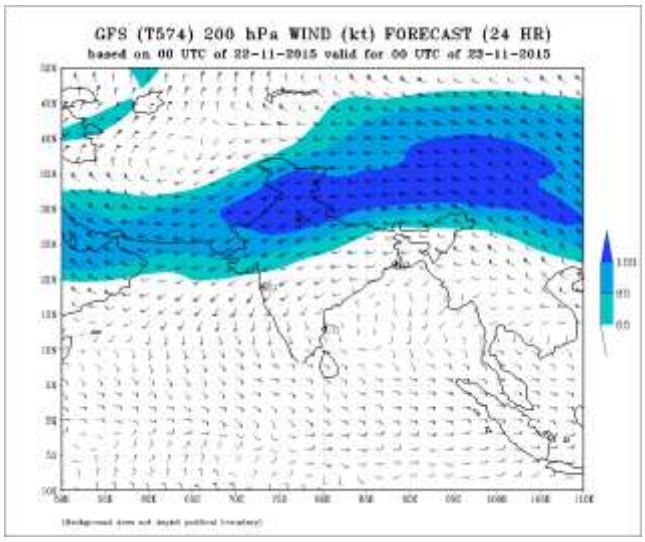

GFS (T574) 500 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 22-11-2015 valid for 00 UTC of 24-11-2015

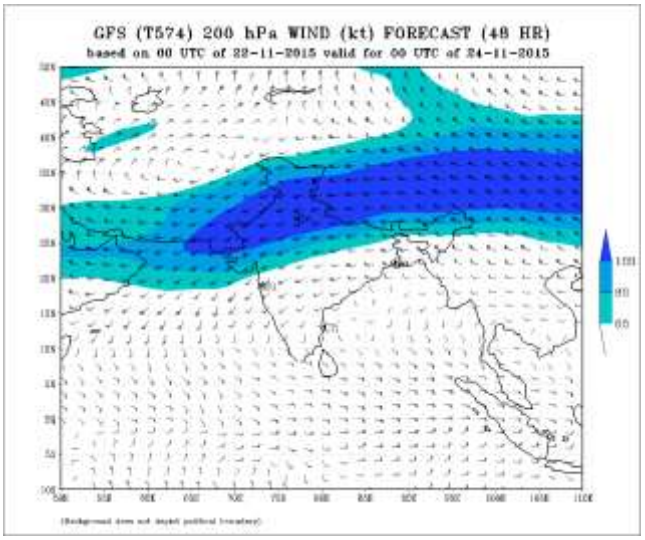

GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 22-11-2015 valid for 00 UTC of 25-11-2015

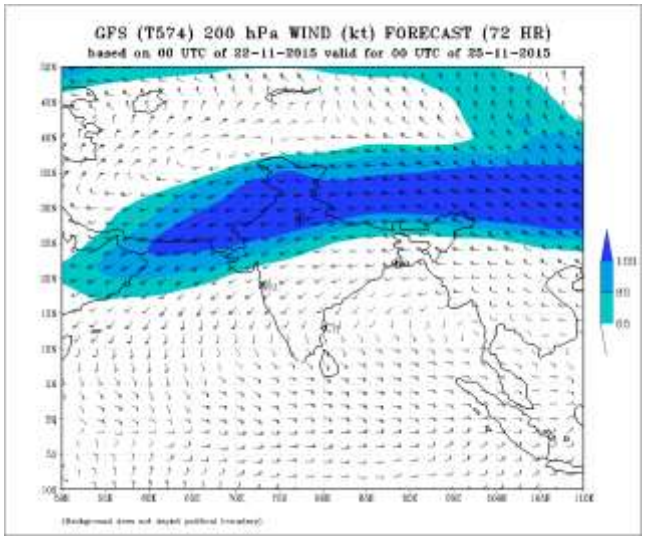

GFS (T574) 500 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 22-11-2015 valid for 00 UTC of 26-11-2015

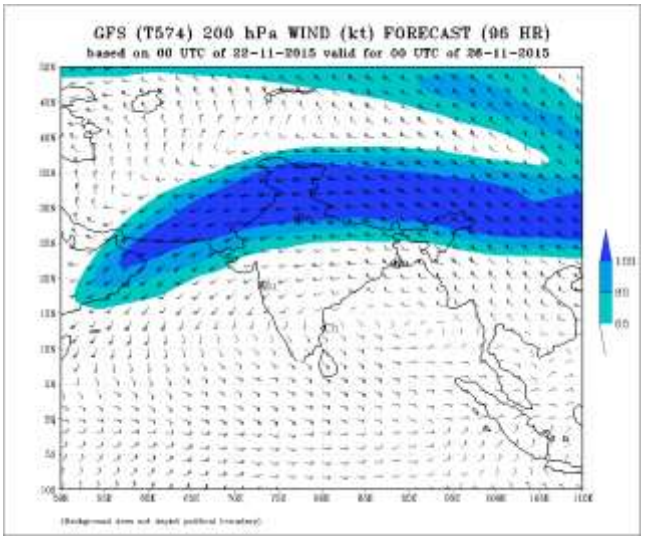

GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 22-11-2015 valid for 00 UTC of 27-11-2015

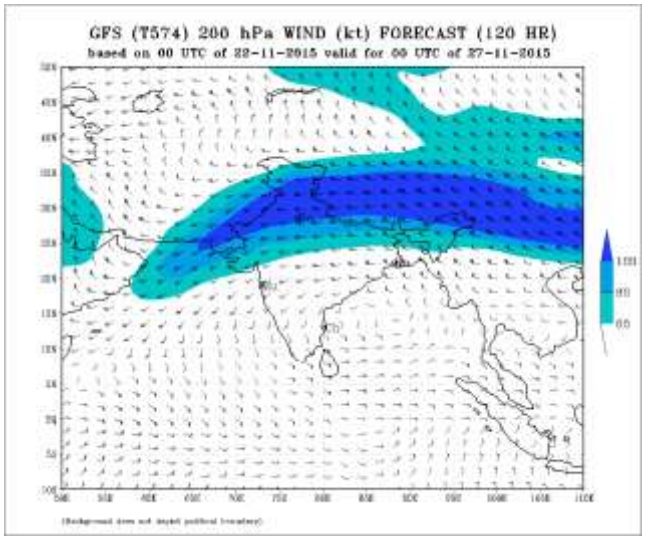

GFS (T574) 200 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 22-11-2015 valid for 00 UTC of 22-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 22-11-2015 valid for 00 UTC of 23-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 22-11-2015 valid for 00 UTC of 24-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 22-11-2015 valid for 00 UTC of 25-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 22-11-2015 valid for 00 UTC of 26-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 22-11-2015 valid for 00 UTC of 27-11-2015

FDP (Cyclone) NOC Report Dated 23 November, 2015

Synoptic features:

- The low pressure area over east central Arabian Sea & neighbourhood persists.
- The trough of low from southeast Arabian Sea to south Gujarat region persists.
- The trough of low at mean sea level over Comorin area & neighbourhood low lies over Maldives and adjoining Lakshadweep area.

Surface Temperature (SST):

- SST is 26-28°C over west central, extreme northern parts of Bay of Bengal and 30-31°C over Andaman Sea and between 28-30°C over rest part of BoB.
- SST is 26-28°C over west central and northwest parts of AS. It is 28-30°C over rest part of AS

Tropical Cyclone Heat Potential (TCHP):

- TCHP is below 40kJ/cm^2 over extreme north and adjoining parts of west central BoB. It is 100-120 kJ/cm^2 near equatorial parts and 4^0 N of BoB.
- TCHP is below 50kJ/cm^2 over northwest and adjoining west central parts of AS and 100-120 kJ/cm^2over Southeast and adjoining west central part of AS.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive and is 25-40x10-5s-1 over southwest BoB and adjoining Comorin area, some parts of south Andaman Sea. It is negative over northern parts of BoB.
- It is 25-40x10-5s-1 over central AS, and between 10-25x10-5s-1 over adjoining west central and southwest AS. It is negative over eastern parts of AS .

Convergence:

- Lower level convergence is about $10x10^{-5}s^{-1}$ over southwest BoB and adjoining Comorin area. It is between -5 to +5 over rest of the NIO.

Divergence:

- Upper level divergence is 20x10-5 s-1 over south east of AS .
- Upper level divergence is about $10x10^{-5}$ s-1 over Andaman Sea.

Wind Shear:

- Wind shear is 10-20knots over southeast and East central AS..
- Wind shear is 10-20knots over South Andaman Sea.

Wind Shear Tendency:

- There is increasing tendency (5 to 10 Knots) over the many parts of AS.
- The vertical wind shear tendency is increasing (5 knots) over Andaman Sea.

Upper tropospheric ridge:

- The upper tropospheric ridge at 200 hPa runs along 15.0°N over NIO as a whole.

M.J.O. Index:

- MJO index is in Phase 2 with amplitude greater than 1 and would remain in phase 2 during next subsequent 2 days.

Storms and Depression over South China Sea/ South Indian Ocean:

Vortex over south Indian Ocean centered near 15.2^0S/74.8^0E. Intensity T 3.5. Associated broken low/medium clouds with embedded intense to very intense convection over the area between latitude 10.0^0S to 20.0^0 S long 70.0^0E to 83.0^0E.

Satellite Bulletin based on INSAT imagery:

Bay of Bengal & Andaman Sea:-

According to satellite imagery, scattered low / medium clouds with embedded moderate to intense convection lie over southeast Bay of Bengal, South Andaman Sea and Tenasserim coast.

Arabian Sea:-

Broken low/medium clouds with embedded intense to very intense convection lie over southeast Arabian Sea adjoining southwest Arabian sea and adjoining east central Arabian sea. Broken low / medium clouds with embedded moderate to intense convection lie over between latitude 15.00n to 19.00N long 62.00E to 67.00E.

NWP Input for FDP Cyclone based on 0000 UTC

NWP Analysis

IMD-GFS and IMD-WRF model product analysis based on 0000 UTC of 23 November 2015 shows no significant weather system over the North Indian Seas and forecasts also do not show any significant weather development during next 5 days.

NWP products are available at:

http://202.54.31.51/bias/gfsproducts.php
http://202.54.31.51/bias/wrf27pro.php
http://202.54.31.51/bias/potentialparameter.php

NCMRWF-NCUM: Model suggests formation of feeble low over southeast BoB on 24th moving towards northwest direction and diminishing on 25th Nov. next 2 days.

NCMRWF-GFS: Model suggests formation of low over southeast BoB on 24th Nov.and diminishing on 25th Nov.

NCEP-GFS No significant weather system over the North Indian Seas

ECMWF. : No significant weather system over the North Indian Seas

JMA: No significant weather system over the North Indian Seas

ARP-Meteo France **Model suggest t**he low pressure over southeast of Arabian Sea would persist for next 2 day over the same region. It also suggests formation of another feeble low on 27th near SW of BoB near Sri Lanka.

Genesis Potential Parameter (GPP):

GPP charts show no cyclogenesis over central Arabian Sea in next five days.

Summary and Conclusion:

The low pressure area over east central Arabian Sea & neighbourhood persists. NWP models do not suggest any cyclogenesis (formation of depression) during next 5 days.

Bay of Bengal and Andaman Sea:

Probability of cyclogenesis over Bay of Bengal and Andaman Sea during next 120 hours:

24 HOURS	24-48 HOURS	48-72 HOURS	72-96 HOURS	96-120 HOURS
Nil	Nil	Nil	Nil	Nil

Arabian Sea:

Probability of cyclogenesis over Arabian Sea during next 120 hours:

24 HOURS	24-48 HOURS	48-72 HOURS	72-96 HOURS	96-120 HOURS
Nil	Nil	Nil	Nil	Nil

Advisory: No IOP during next five days.

Annexure-I

Status of observational system:

Synoptic observation:

Region	Date/Time (UTC)		
	22/12	**23/00**	**23/03**
India	52	58	53
Coastal stations			
WB	4	6	6
Odisha	7	12	6
AP	12	13	14
Tamil Nadu	28	26	26
Puducherry	1	1	1
A & N	--	-	-
Bangladesh	11	9	11
Myanmar	11	2	10
Thailand	2	2	2
SriLanka	9	9	8

AWS Observations:

Region	Date/Time (UTC)		
	22/12	**23/00**	**23/03**
India	73	68	71
Coastal stations			
WB	9	7	9
Odisha	15	15	17
AP	16	15	17
Tamil Nadu	32	30	27
Puducherry	1	1	1
A & N	0	0	0

RS/RW (12Z) of 22/11/2015 **6/39**
No. of Ascents reaching 250 hPa level: :, MISDA:

RS/RW (00Z) of 23/11/2015- **28/39**
No. of Ascents reaching 250 hPa level: , MISDA:4

No. of PILOT Ascents

22/12Z	23/00Z
6	8

Buoy Data

22/12Z	23/00Z	23/03Z
8	7	5

STATUS OF CHENNAI REGION OBSERVATION

No. of Synop data

Date→	22.11.2015							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	20	22	20	20	22	20	20	20

No. of RS/RW Ascents

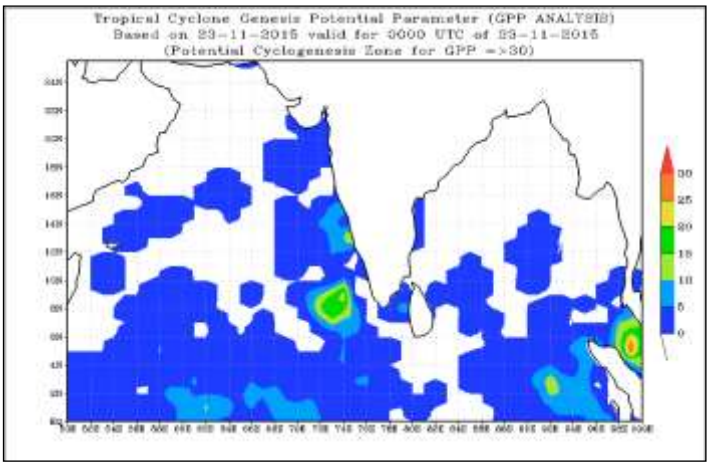
00Z /22.11.2015 : 7
No. of Ascents reaching 250 hPa level = 7
MISDA : 1

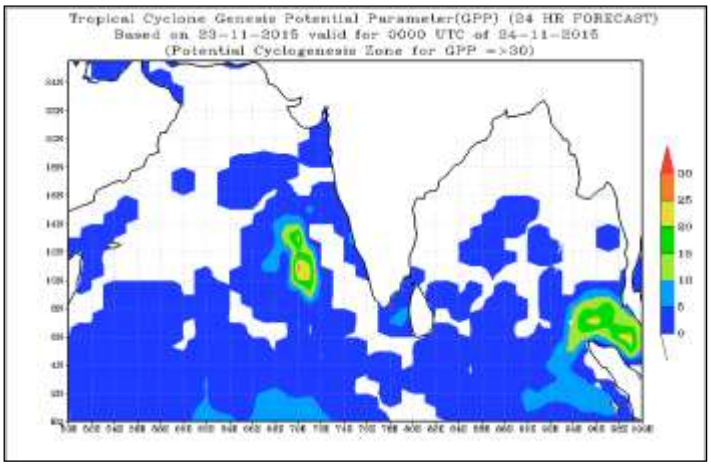
12Z /22.11.2015 : 1
No. of Ascents reaching 250 hPa level = 1
MISDA : 7

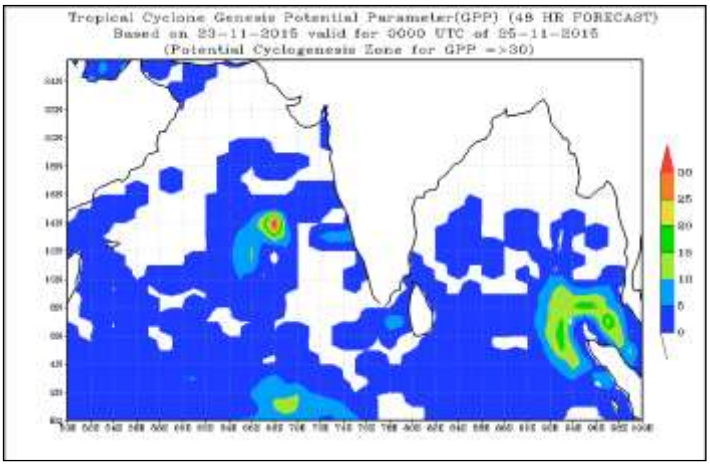
No. of PILOT Ascents:

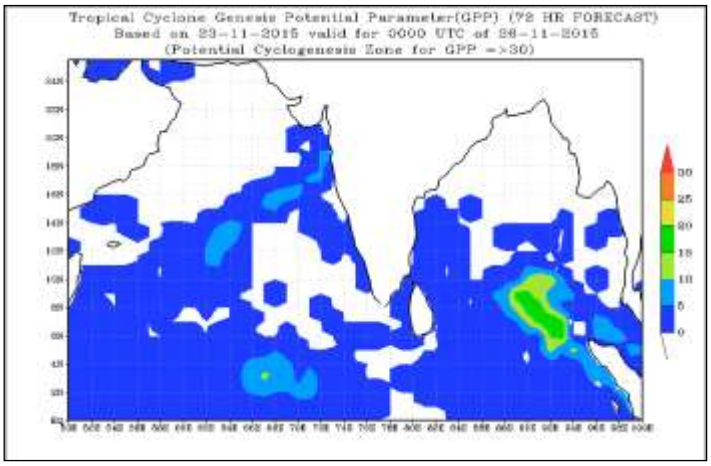
22.11.2015	
06Z	18Z
4	5

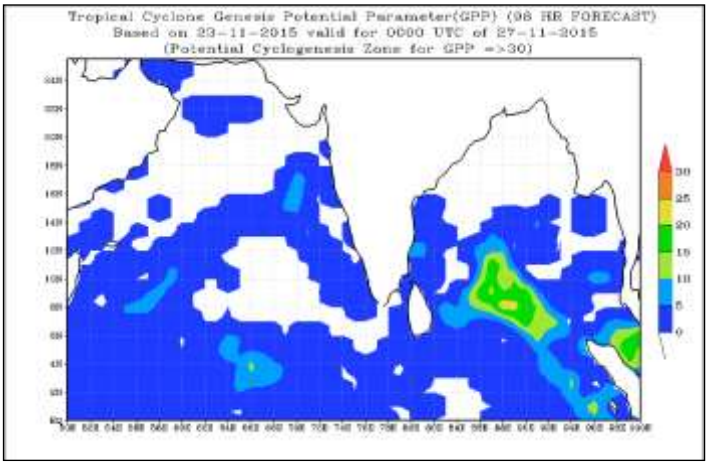
Annexure-II

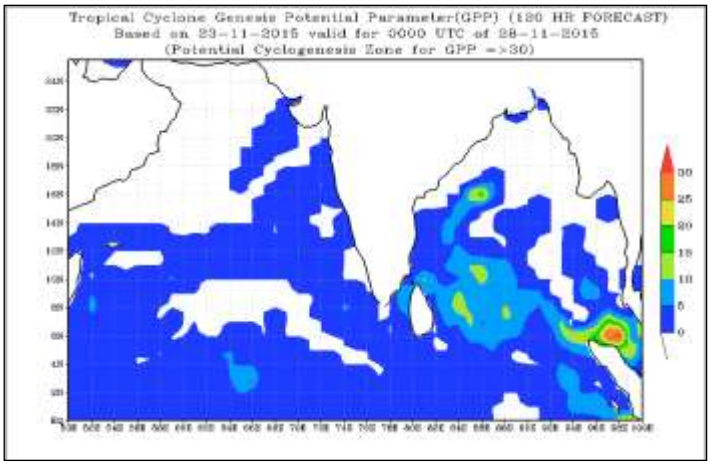

Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 23-11-2015 valid for 0000 UTC of 23-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

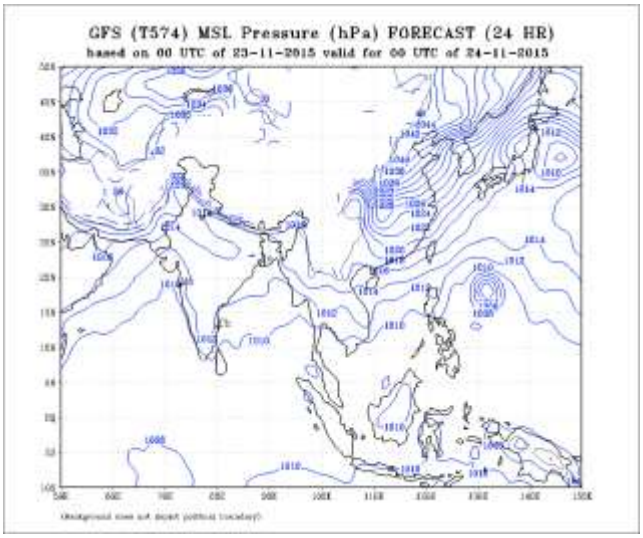

Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 23-11-2015 valid for 0000 UTC of 24-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

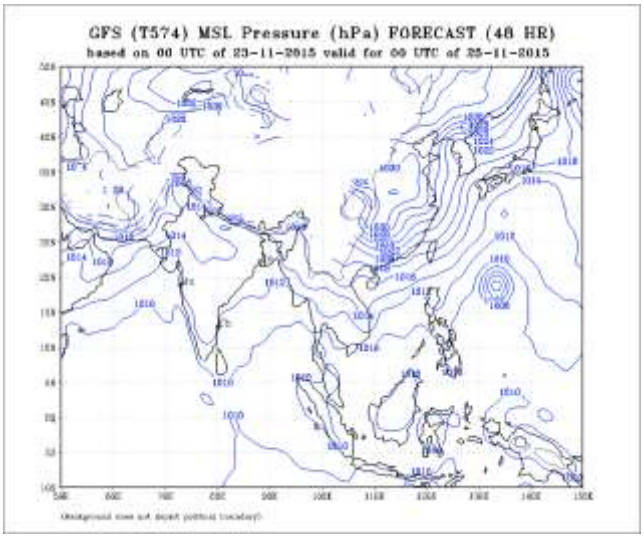

Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
Based on 23-11-2015 valid for 0000 UTC of 25-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

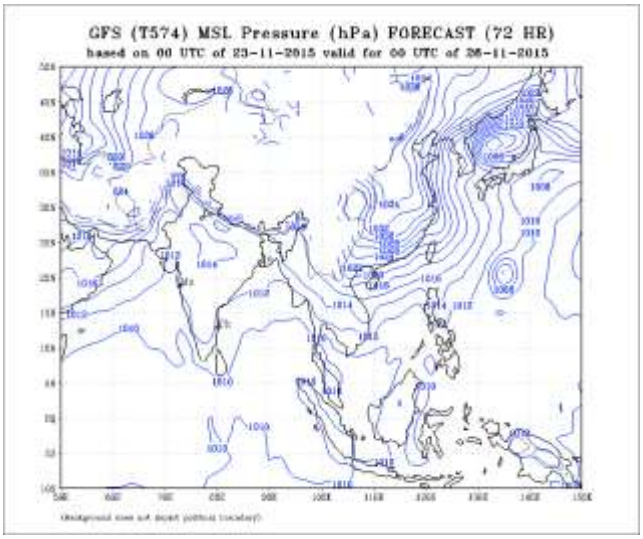

Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 23-11-2015 valid for 0000 UTC of 26-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

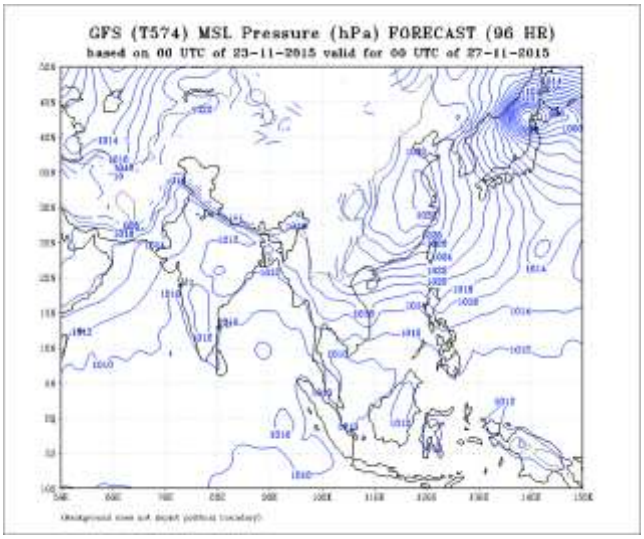

Tropical Cyclone Genesis Potential Parameter(GPP) (96 HR FORECAST)
Based on 23-11-2015 valid for 0000 UTC of 27-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

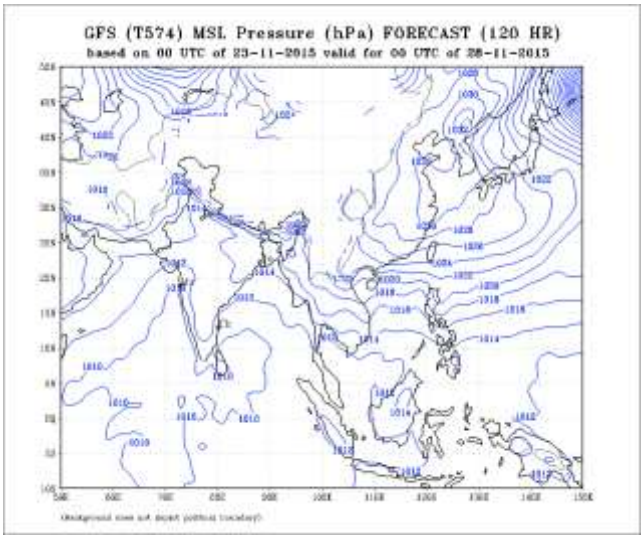

Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 23-11-2015 valid for 0000 UTC of 28-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

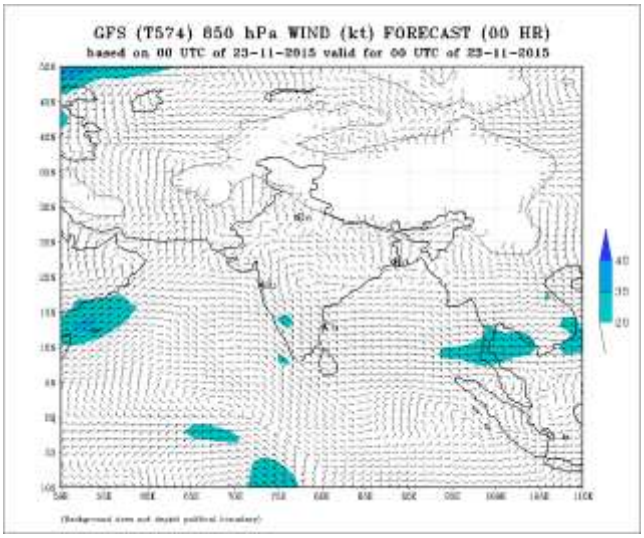

GFS (T574) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 23-11-2015 valid for 00 UTC of 24-11-2015

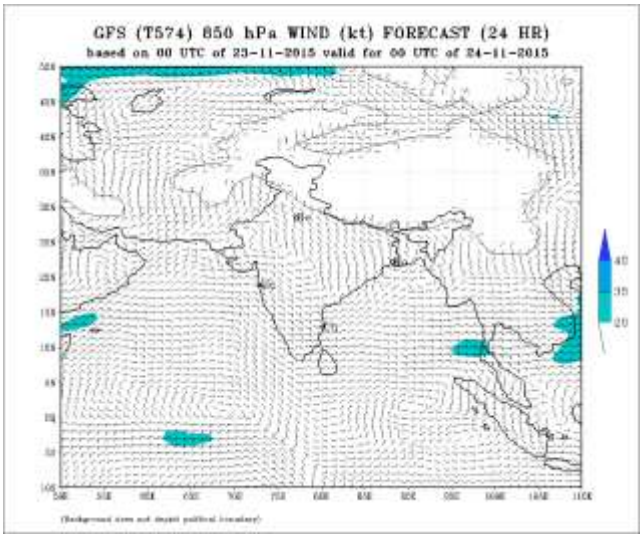

GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 23-11-2015 valid for 00 UTC of 25-11-2015


GFS (T574) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 23-11-2015 valid for 00 UTC of 26-11-2015


GFS (T574) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 23-11-2015 valid for 00 UTC of 27-11-2015


GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 23-11-2015 valid for 00 UTC of 28-11-2015


GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 23-11-2015 valid for 00 UTC of 23-11-2015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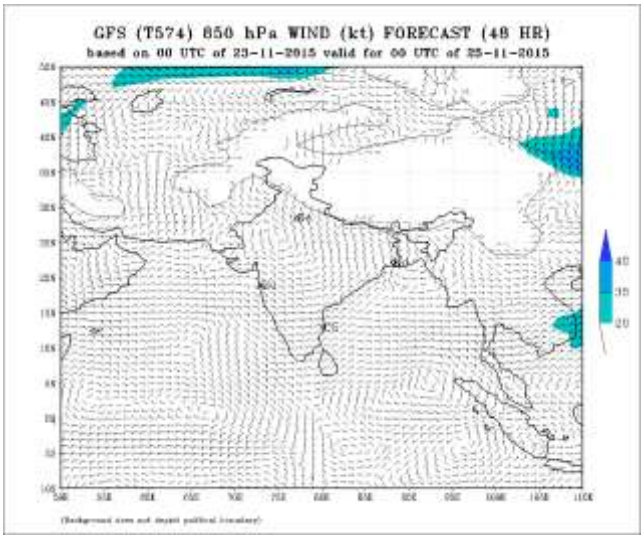
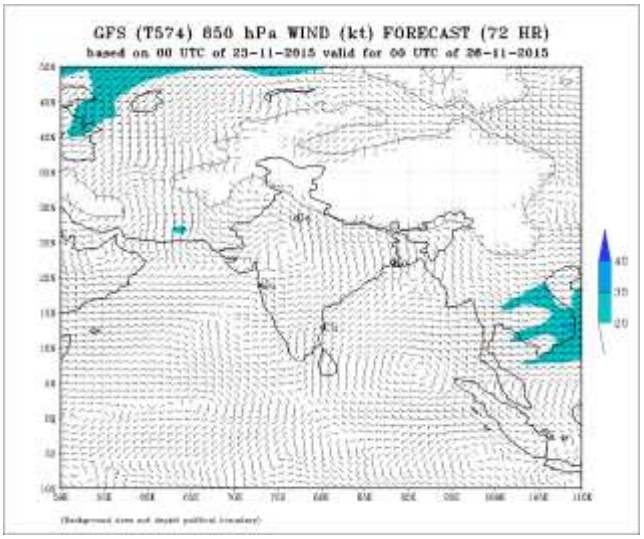
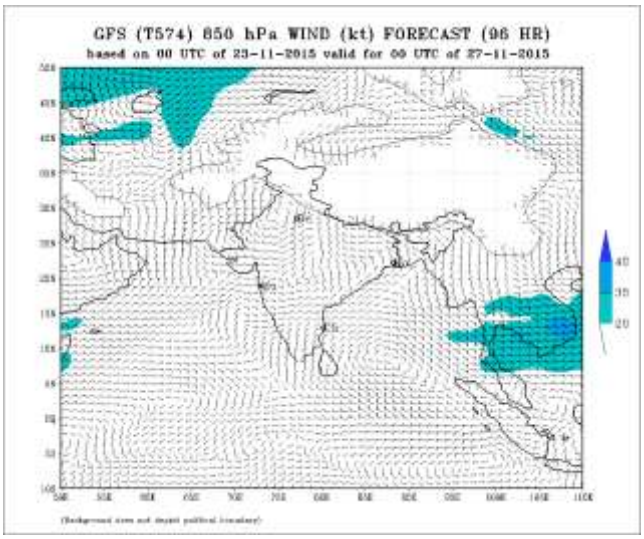
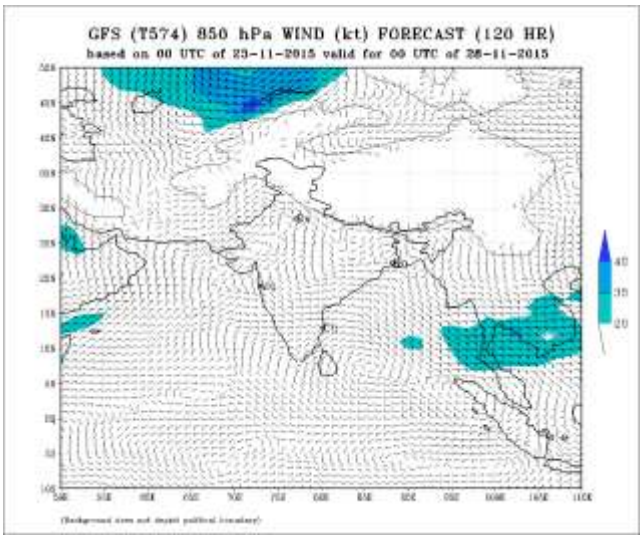
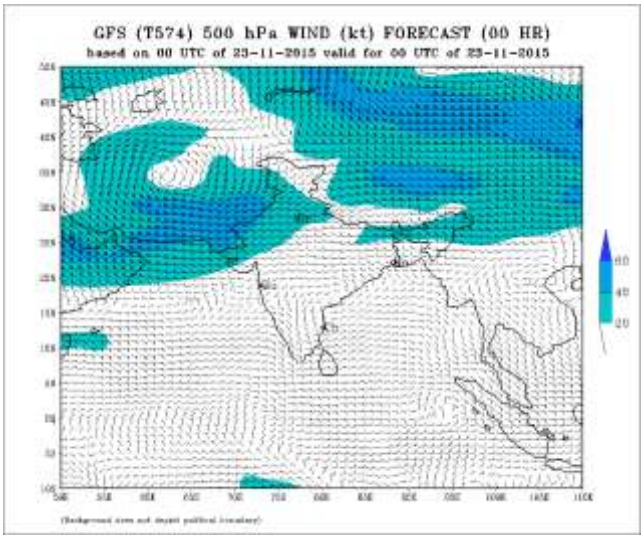
based on 00 UTC of 23-11-2015 valid for 00 UTC of 24-11-2015


GFS (T574) 850 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 23-11-2015 valid for 00 UTC of 25-11-2015


GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 23-11-2015 valid for 00 UTC of 26-11-2015


GFS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 23-11-2015 valid for 00 UTC of 27-11-2015


GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 23-11-2015 valid for 00 UTC of 28-11-2015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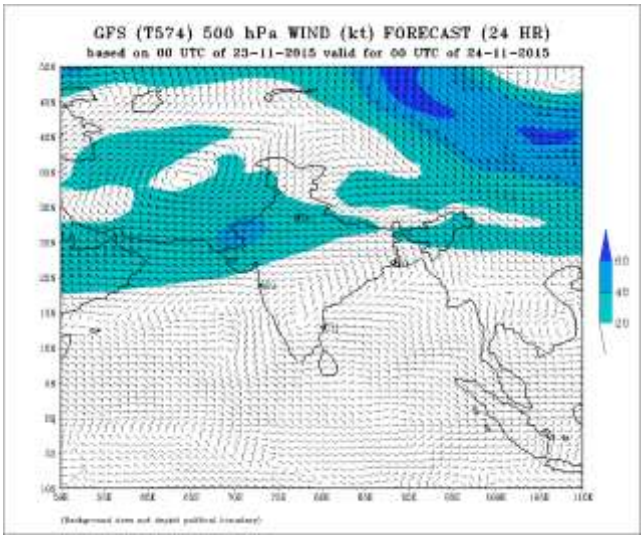
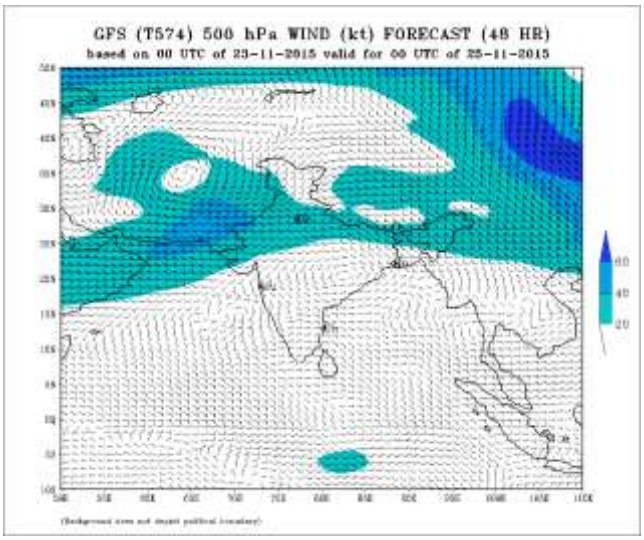
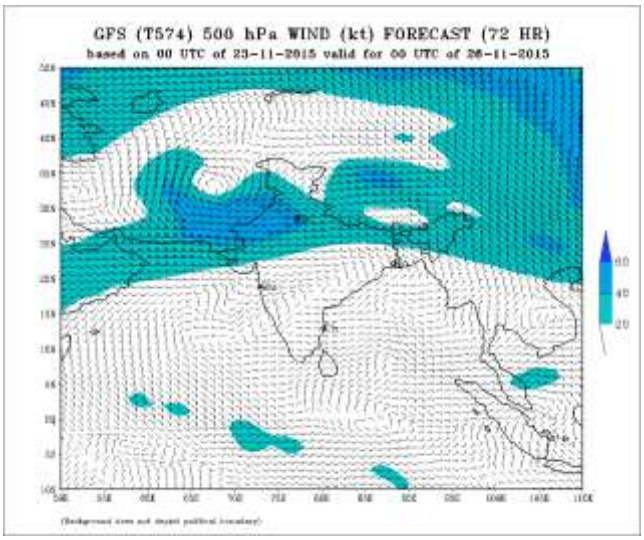
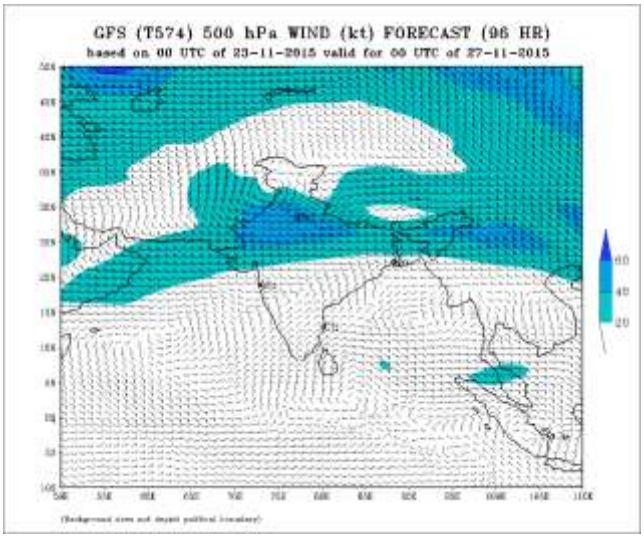
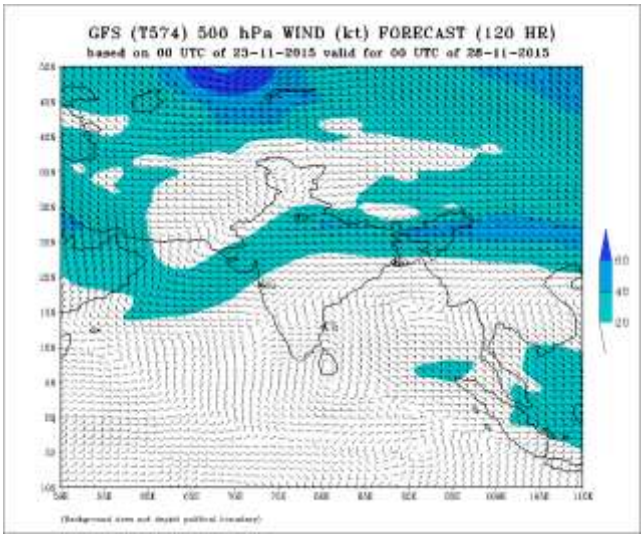
based on 00 UTC of 23-11-2015 valid for 00 UTC of 23-11-2015

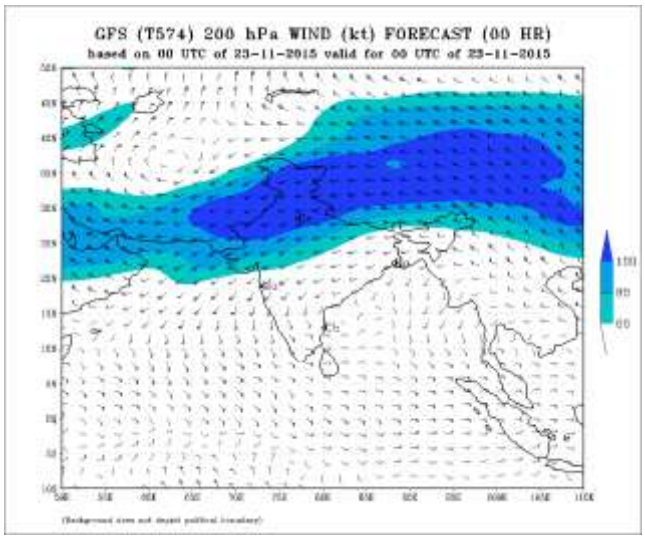

GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 23-11-2015 valid for 00 UTC of 24-11-2015

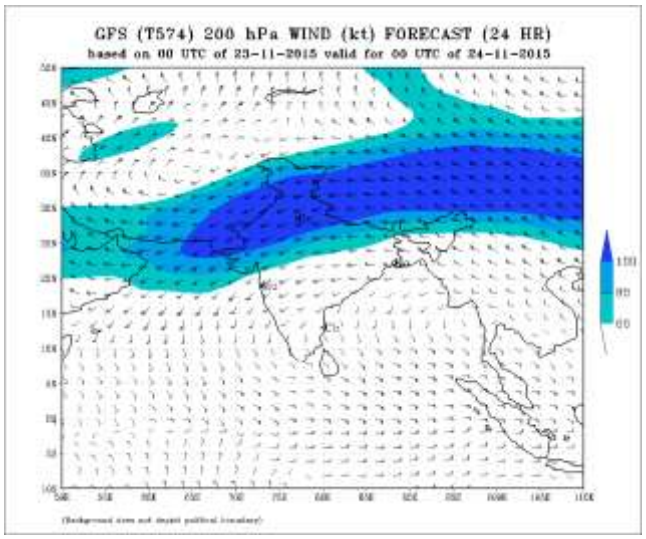

GFS (T574) 500 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 23-11-2015 valid for 00 UTC of 25-11-2015

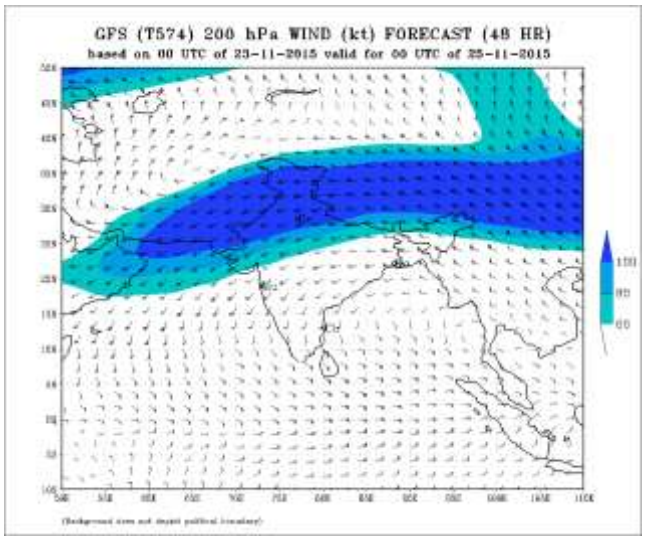

GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 23-11-2015 valid for 00 UTC of 26-11-2015

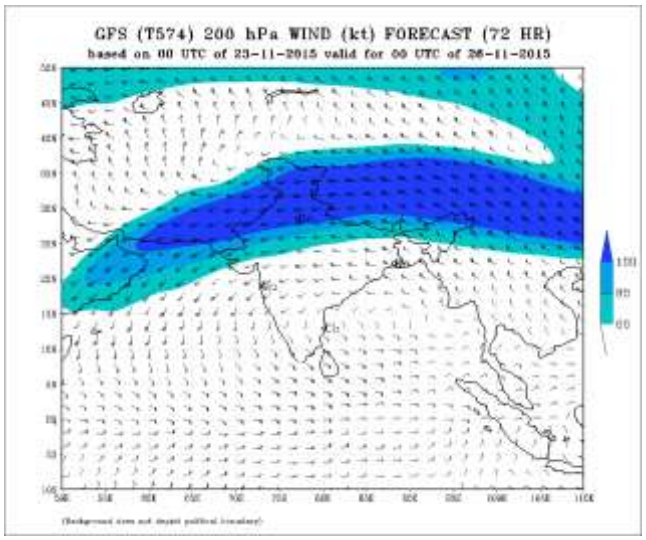

GFS (T574) 500 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 23-11-2015 valid for 00 UTC of 27-11-2015

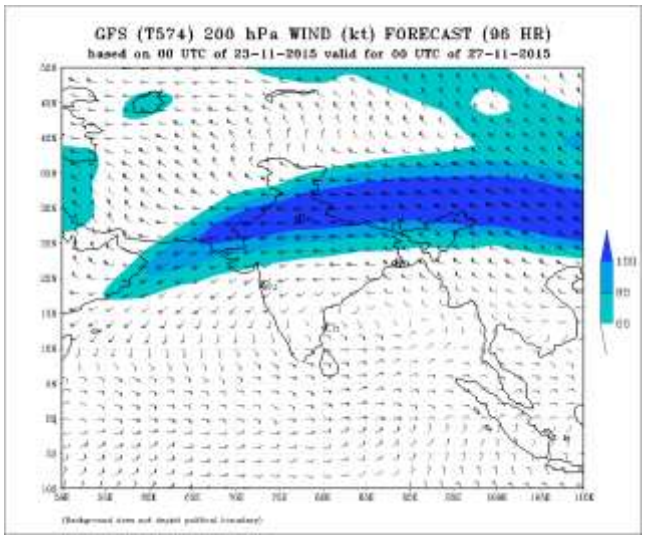

GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 23-11-2015 valid for 00 UTC of 28-11-2015

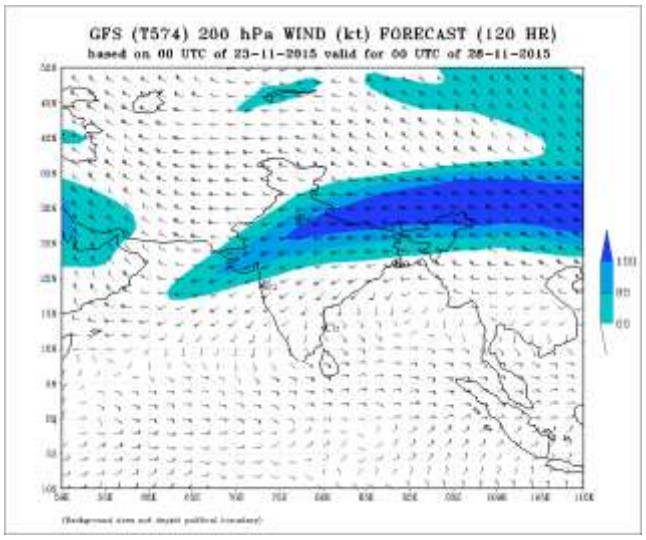

GFS (T574) 200 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 23-11-2015 valid for 00 UTC of 23-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 23-11-2015 valid for 00 UTC of 24-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 23-11-2015 valid for 00 UTC of 25-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 23-11-2015 valid for 00 UTC of 26-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 23-11-2015 valid for 00 UTC of 27-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 23-11-2015 valid for 00 UTC of 28-11-2015

FDP (Cyclone) NOC Report Dated 24 November, 2015

Synoptic features:

- An upper air cyclonic circulation lies over south Andaman Sea & neighbourhood and extends upto 3.1 km above mean sea level.
- The low pressure area over eastcentral Arabian Sea & neighbourhood has become less marked.

Surface Temperature (SST):

- SST is 26-28°C over west central, extreme northern parts of Bay of Bengal and 30-31°C over Andaman Sea and between 28-30°C over rest part of BoB.
- SST is 26-28°C over west central and northwest parts and 30-31°C over southcentral parts of AS. It is 28-30°C over rest part of AS

Tropical Cyclone Heat Potential (TCHP):

- TCHP is below 50kJ/cm^2 over extreme north and adjoining parts of west central BoB, 90-110 kJ/cm^2 over Andaman Sea,100-130 kJ/cm^2 between some equatorial parts and 4^0 N of BoB and between 50-90 kJ/cm^2 over rest parts of BoB.
- TCHP is below 50kJ/cm^2 over northwest and adjoining west central parts of AS and 90-110 kJ/cm^2over Southeast and adjoining west central part of AS.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive and is 25-40x10-5s-1 over Andaman Sea, negative over northeast and westcentral parts of BoB and positive upto 25 over rest parts of BoB.
- It is 25-40x10-5s-1 over southeast AS, between 10-25x10-5s-1 over west central and adjoining southwest AS. It is negative over parts of AS .

Convergence:

- Lower level convergence is about 5-10x$10^{-5}s^{-1}$ over Andaman Sea. It is between -5 to +5 over rest of the NIO.

Divergence:

- Upper level divergence is 10x10-5 s-1 over Andaman Sea and adjoining south east of BoB. It is negative -5-10 x10-5 s-1over west BoB.
- Upper level divergence is about 10-20x10^{-5} s-1 over eastcentral and adjoining AS.

Wind Shear:

- Wind shear is 5-10 knots over Andaman Sea and adjoining south east of BoB and is positive >20 knots over rest parts of BoB.
- Wind shear is 5-10 knots over southeast AS some parts of southwest AS and positive >10 knots over rest parts of AS.

Wind Shear Tendency:

- There is decreasing tendency (-5 -10 Knots) over Andaman Sea and adjoining south east of BoB.
- The shear tendency is decreasing -5-10 knots over southeast AS, some parts of southwest AS and positive +5+10 knots over rest parts of AS..

Upper tropospheric ridge:

- The upper tropospheric ridge at 200 hPa runs along 13.0°N over AS and 15.0°N over BoB.

M.J.O. Index:

- MJO index is in Phase 2 with amplitude greater than 1 and would remain in phase 2 during next subsequent 2 days and then emerge into phase 3.

Storms and Depression over South China Sea/ South Indian Ocean:
Vortex (Annabelle) over south Indian Ocean centered near 19.8S/79.3E.Intensity is T2.5.

Satellite Bulletin based on INSAT imagery:

Bay of Bengal & Andaman Sea:-
According to satellite imagery, scattered low / medium clouds with embedded moderate to intense convection over southeast Bay of Bengal and Andman Sea.
Arabian Sea:-
Broken low / medium clouds with embedded moderate to intense convection lies over southeast & eastcentral Arabian Sea.

NWP Input for FDP Cyclone based on 0000 UTC
NWP Analysis
IMD-GFS and IMD-WRF model product analysis based on 0000 UTC of 24 November 2015 shows no significant weather system over the North Indian Seas and forecasts also do not show any significant weather development during next 4 days.
Genesis Potential Parameter (GPP):
The GPP forecast charts show a significant of zone of cyclogenesis over Andaman Sea on 5th day (28 Nov.) forecast of GFS.
NWP products are available at:
http://202.54.31.51/bias/gfsproducts.php
http://202.54.31.51/bias/wrf27pro.php
http://202.54.31.51/bias/potentialparameter.php

NCMRWF-NCUM: Model suggests formation of a low pressure on 26th over southcentral BoB moving westward towards TN coast on 29th Nov.
It also suggests a low pressure may genesis over South Central Bay on 30th Nov, moving westwards with gradual intensification moving towards Srilanka on 02 Dec.
The low pressure area over eastcentral Arabian Sea persists for another 5 day over the same region with slight southwestward movement.
NCMRWF-GFS: Model suggests formation of a low pressure on 26th over southcentral BoB moving westward direction towards Srilanka on 28th Nov.
It also suggests a low pressure area over South Central Bay on 30th Nov, moving northwestwards with gradual intensification. It suggests its initial movement in northwest direction upto west central BoB on 3rd Dec and thereafter recurves towards northwest BoB.
ECMWF: ECMWF suggests formation of a low pressure on 26th over southcentral BoB moving westward direction with gradual intensification over North of Srilanka on 28th Nov, system will cross over Central coastal Tamilnadu on 29th and then slowly recurve north-northeastwards along and off the east coast.
NCEP-GFS : Model suggests formation of a low pressure on 26th over southcentral BoB moving westward direction with towards Srilanka on 28th Nov. It also suggests a low pressure may genesis over South Central Bay on 29th Nov, moving northwestwards with gradual intensification. It suggests its initial movement in northwest direction upto west central BoB on 2nd Dec and thereafter recurves towards northwest BoB.
JMA: Model suggests a westward moving low pressure area over southcentral BoB on 27th.

ARP-Meteo France Model suggest the low pressure over southeast Arabian Sea would move westwards during next 2-3 day. It also suggests formation of another feeble low on 26th over southcentral BoB.

Summary and Conclusion:

An upper air cyclonic circulation lies over south Andaman Sea & neighbourhood and extends upto 3.1 km above mean sea level. Under its influence, a low pressure area would form around 26th. Most of the NWP models suggest its west-northwestward movement reaching Srilanka coast on 28 and TN coast on 29th with gradual intensification.

While a few models suggest the continuity of the above system moving north-northeastward thereafter, some models suggest formation of another new low pressure area over south Bay on 30th and its movement towards Sri Lanka coast.

Bay of Bengal and Andaman Sea:

Probability of cyclogenesis over Bay of Bengal and Andaman Sea during next 120 hours:

24 HOURS	24-48 HOURS	48-72 HOURS	72-96 HOURS	96-120 HOURS
Nil	Nil	Nil	Low	Fair

Arabian Sea:

Probability of cyclogenesis over Arabian Sea during next 120 hours:

24 HOURS	24-48 HOURS	48-72 HOURS	72-96 HOURS	96-120 HOURS
Nil	Nil	Nil	Nil	Nil

Advisory: IOP will be conducted along TN and Puducherry coasts on 28 and 29 Nov. 2015.

Annexure-I

Status of observational system:

Synoptic observation:

Region	Date/Time (UTC)		
	23/12	**24/00**	**24/03**
India	34	31	38
Coastal stations			
WB	4	5	5
Odisha	6	5	5
AP	9	11	13
Tamil Nadu	8	8	9
Puducherry	1	1	1
A & N	6	1	5
Bangladesh	8	11	11
Myanmar	11	10	11
Thailand	2	2	2
SriLanka	9	9	8

AWS Observations:

Region	Date/Time (UTC)		
	23/12	**24/00**	**24/03**
India	41	23	47
Coastal stations			
WB	2	4	3
Odisha	9	1	6
AP	13	7	13
Tamil Nadu	16	10	24
Puducherry	1	1	1
A & N	0	0	0

RS/RW (12Z) of 23/11/2015 **6/39**
No. of Ascents reaching 250 hPa level: :, MISDA:

RS/RW (00Z) of 24/11/2015- **27/39**
No. of Ascents reaching 250 hPa level ..: , MISDA:2

No. of PILOT Ascents

23/12Z	24/00Z
-	6

Buoy Data

23/12Z	24/00Z	24/03Z
7	5	8

STATUS OF CHENNAI REGION OBSERVATION

No. of Synop data

Date→	**23.11.2015**							
UTC→	**00**	**03**	**06**	**09**	**12**	**15**	**18**	**21**
Chennai Region (Coasts of AP & TN)	**20**	**22**	**20**	**20**	**22**	**20**	**20**	**20**

No. of RS/RW Ascents

00Z /23.11.2015 : 6
No. of Ascents reaching 250 hPa level = 6
MISDA : 2

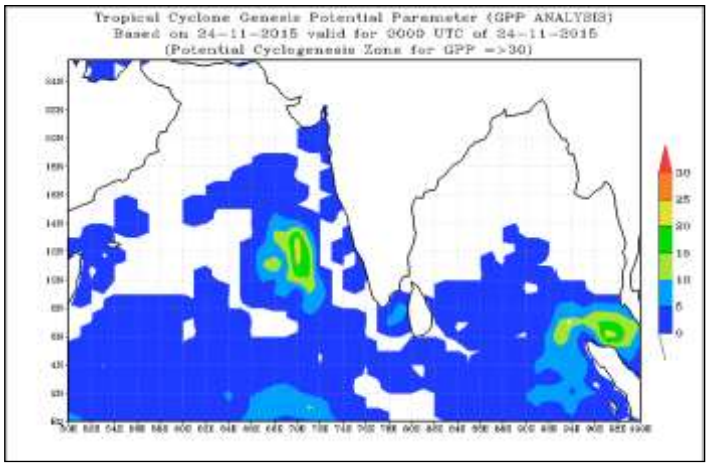
12Z /23.11.2015 : 1
No. of Ascents reaching 250 hPa level = 1
MISDA : 7

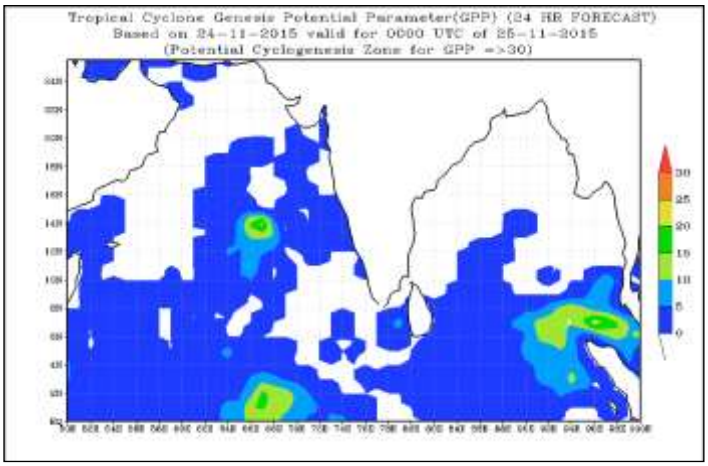
No. of PILOT Ascents:

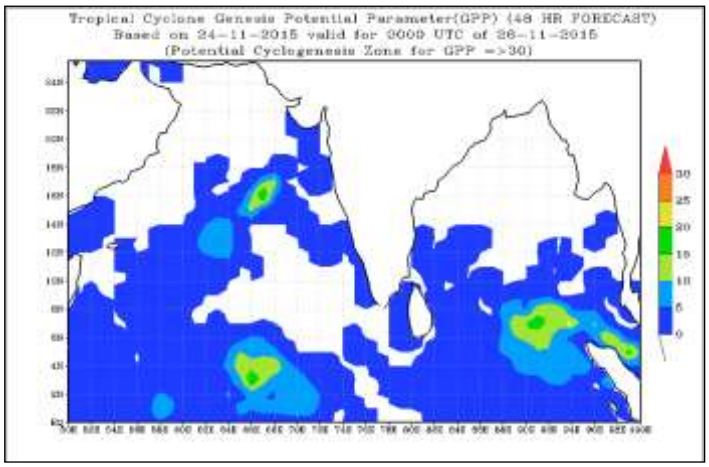
23.11.2015

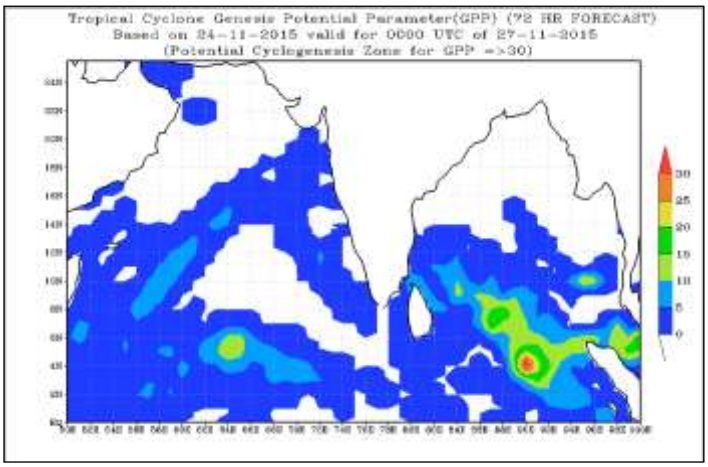
06Z	18Z
4	4

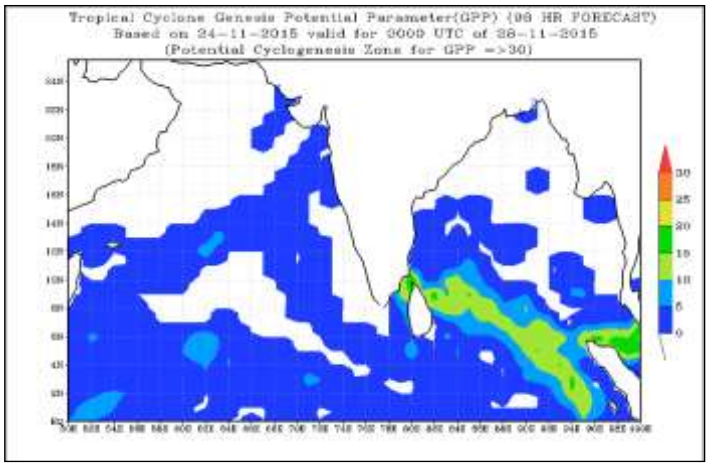
Annexure-II

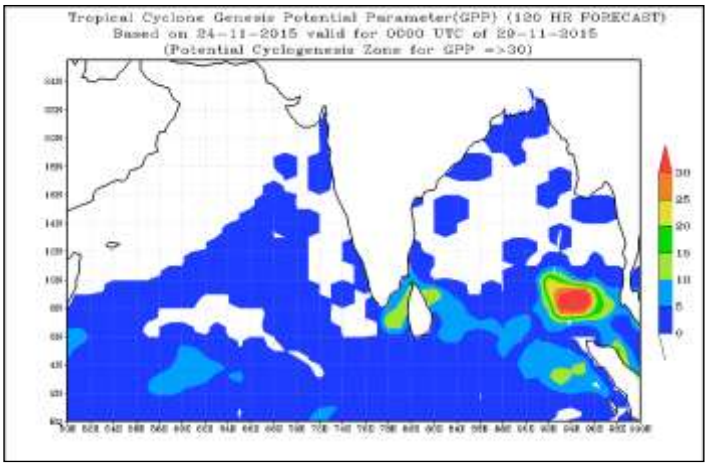

Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 24-11-2015 valid for 0000 UTC of 24-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

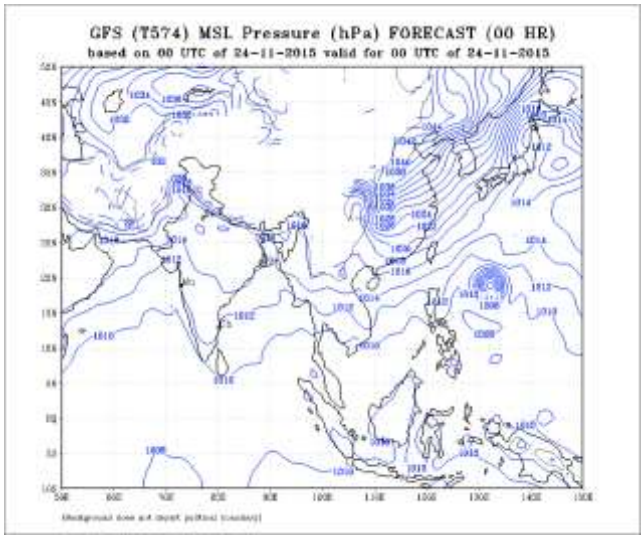

Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 24-11-2015 valid for 0000 UTC of 25-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

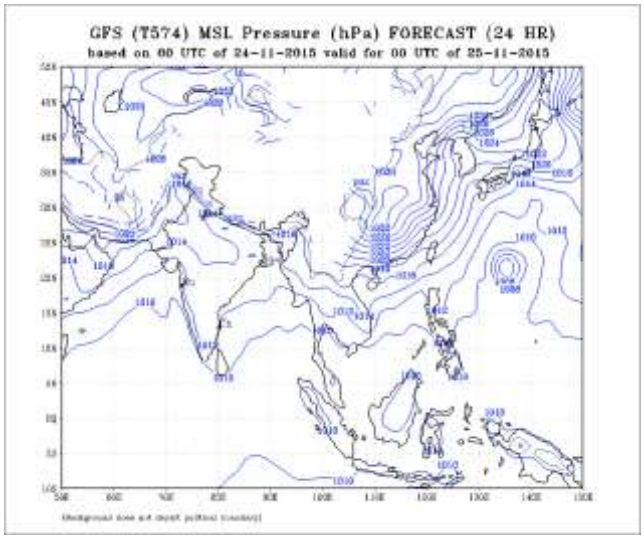

Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
Based on 24-11-2015 valid for 0000 UTC of 26-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

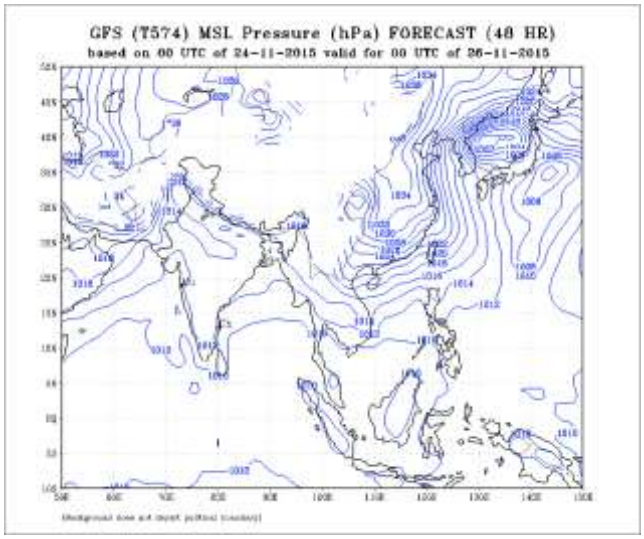

Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 24-11-2015 valid for 0000 UTC of 27-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

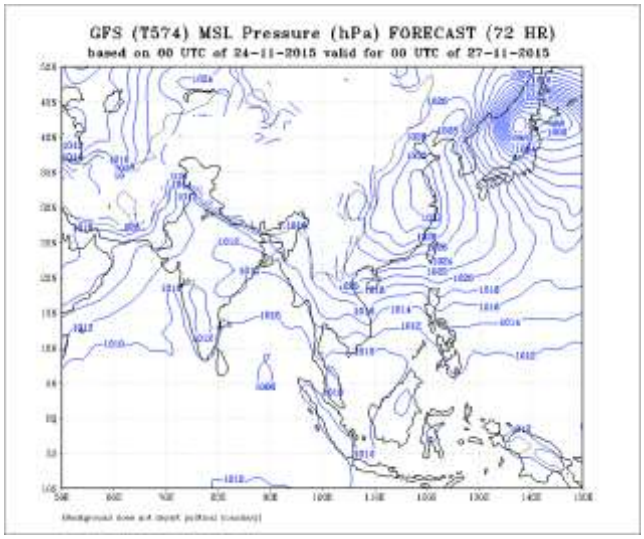

Tropical Cyclone Genesis Potential Parameter(GPP) (96 HR FORECAST)
Based on 24-11-2015 valid for 0000 UTC of 28-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

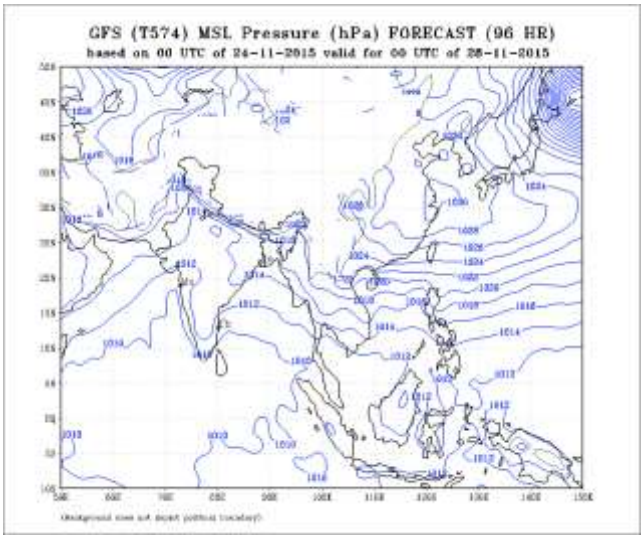

Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 24-11-2015 valid for 0000 UTC of 29-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

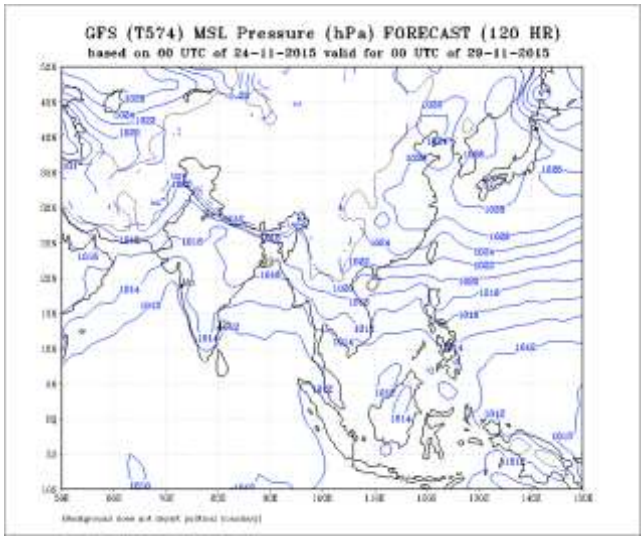

GFS (T574) MSL Pressure (hPa) FORECAST (00 HR)
based on 00 UTC of 24-11-2015 valid for 00 UTC of 24-11-2015

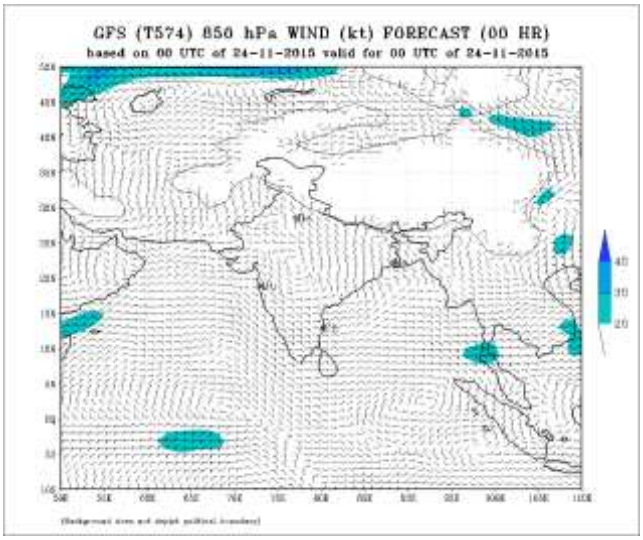

GFS (T574) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 24-11-2015 valid for 00 UTC of 25-11-2015

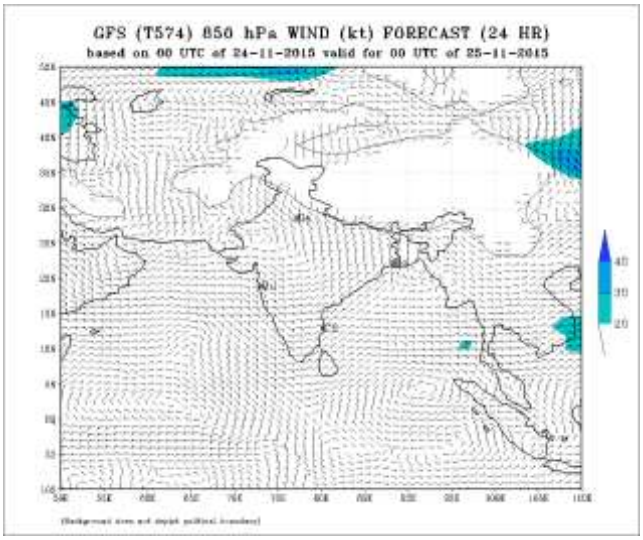

GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 24-11-2015 valid for 00 UTC of 26-11-2015

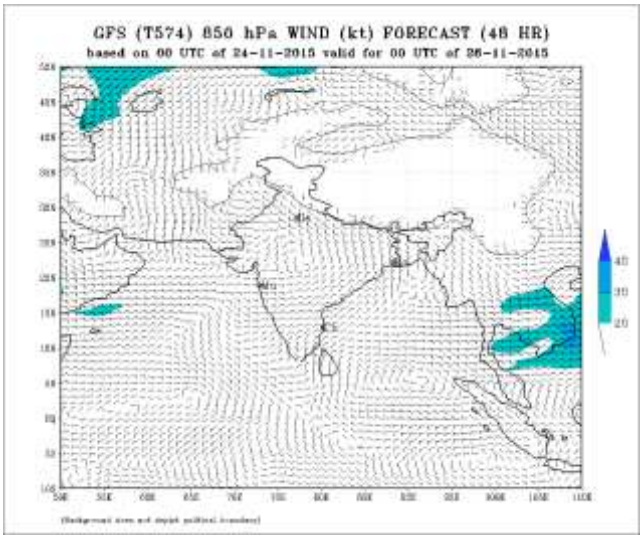

GFS (T574) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 24-11-2015 valid for 00 UTC of 27-11-2015

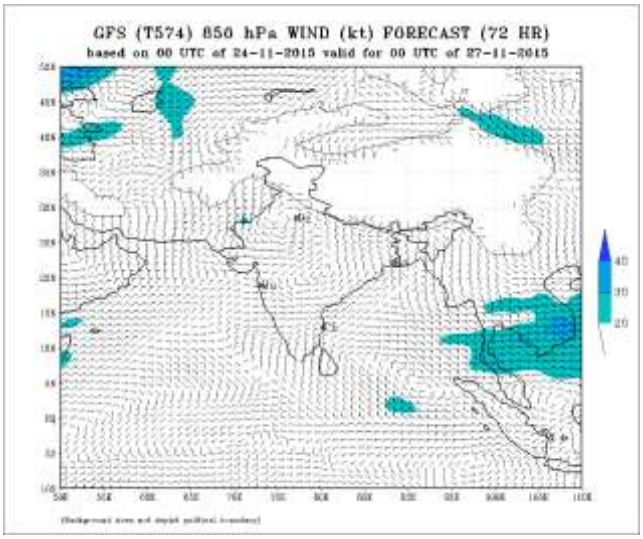

GFS (T574) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 24-11-2015 valid for 00 UTC of 28-11-2015

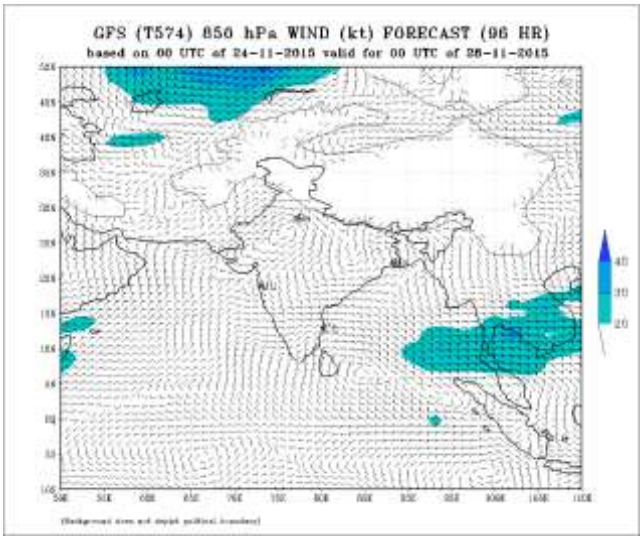

GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 24-11-2015 valid for 00 UTC of 29-11-2015

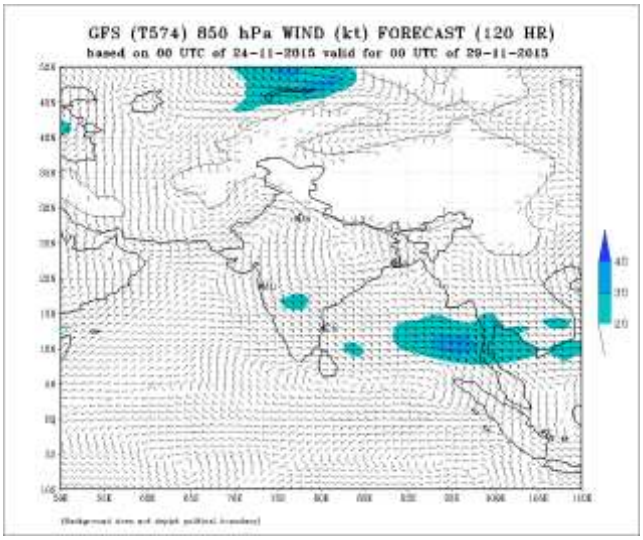

GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 24-11-2015 valid for 00 UTC of 24-11-2015

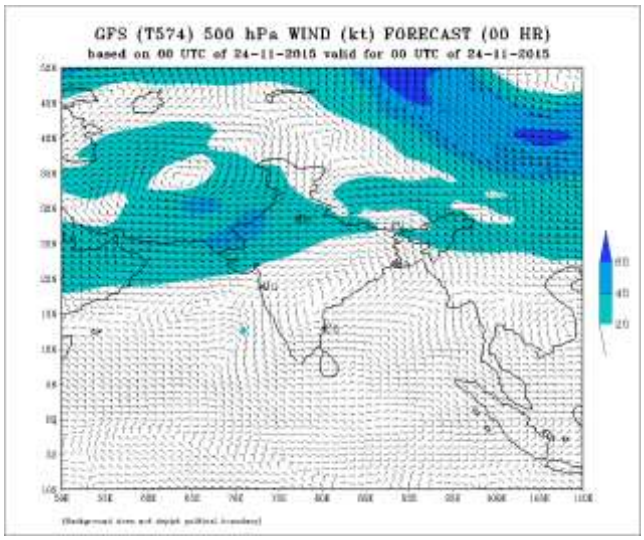

GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 24-11-2015 valid for 00 UTC of 25-11-2015

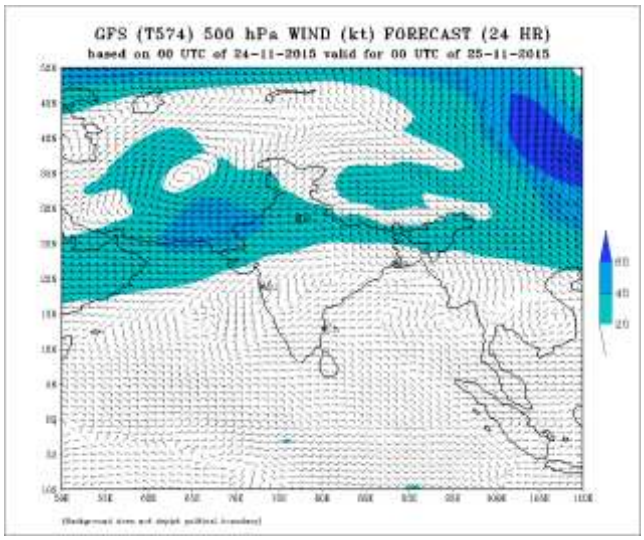

GFS (T574) 850 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 24-11-2015 valid for 00 UTC of 26-11-2015

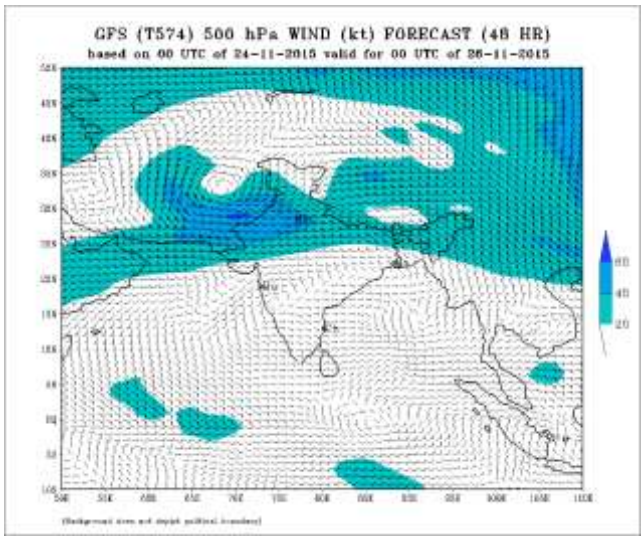

GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 24-11-2015 valid for 00 UTC of 27-11-2015

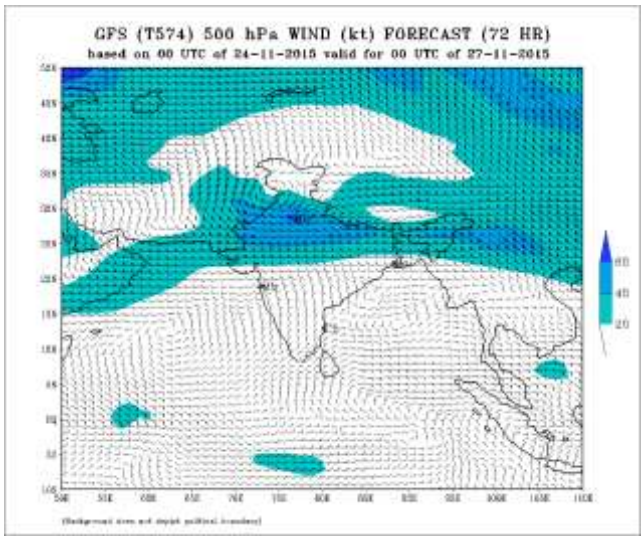

GFS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 24-11-2015 valid for 00 UTC of 28-11-2015

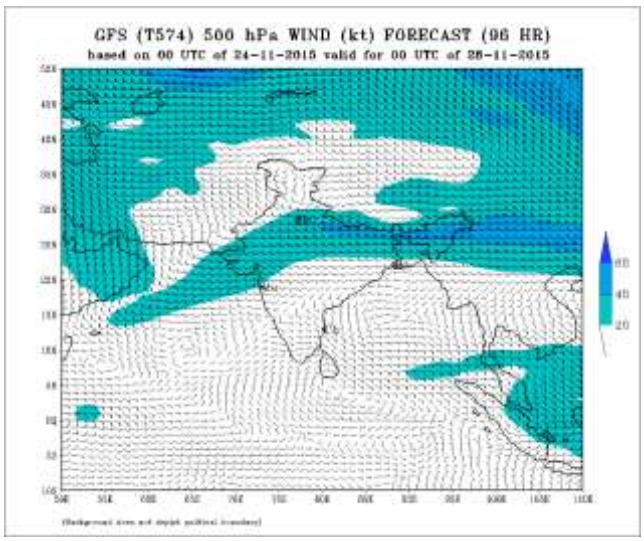

GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 24-11-2015 valid for 00 UTC of 29-11-2015

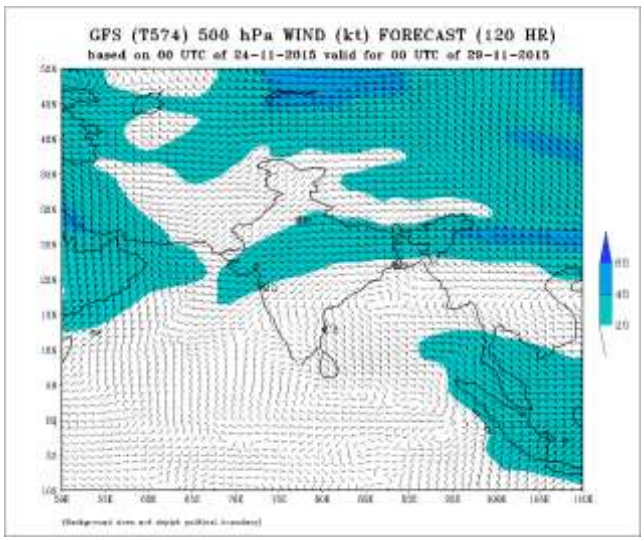

GFS (T574) 500 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 24-11-2015 valid for 00 UTC of 24-11-2015

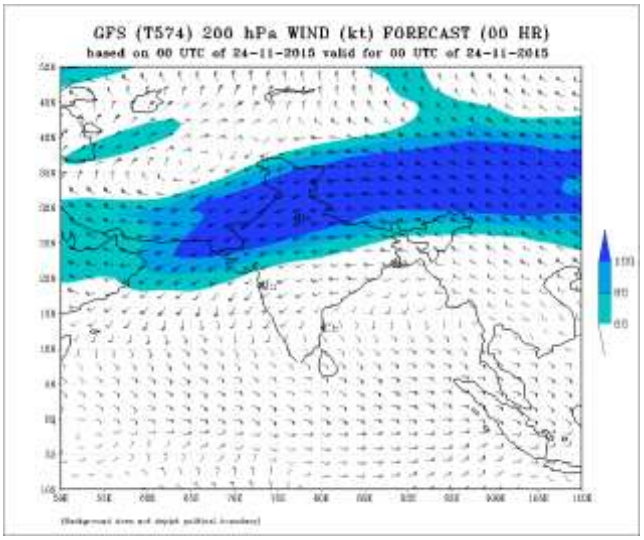

GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 24-11-2015 valid for 00 UTC of 25-11-2015

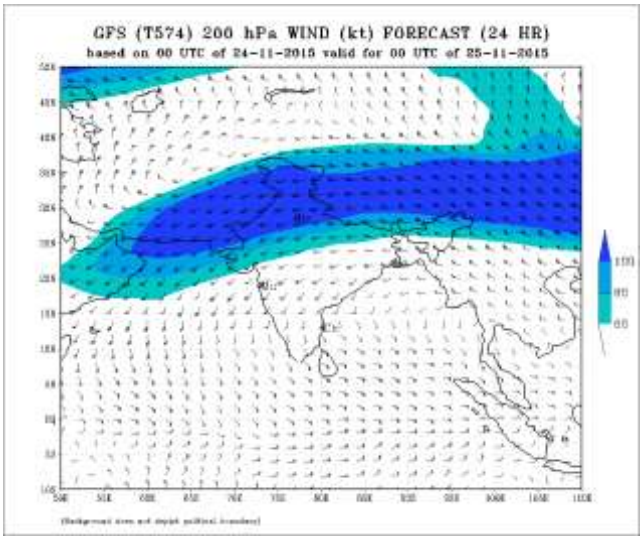

GFS (T574) 500 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 24-11-2015 valid for 00 UTC of 26-11-2015

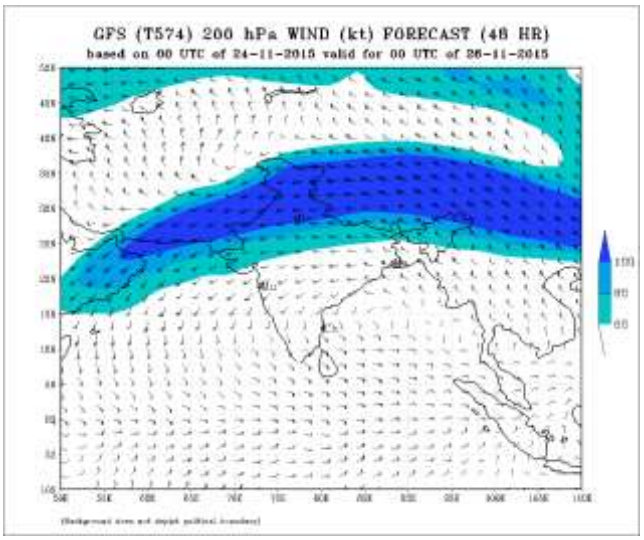

GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 24-11-2015 valid for 00 UTC of 27-11-2015

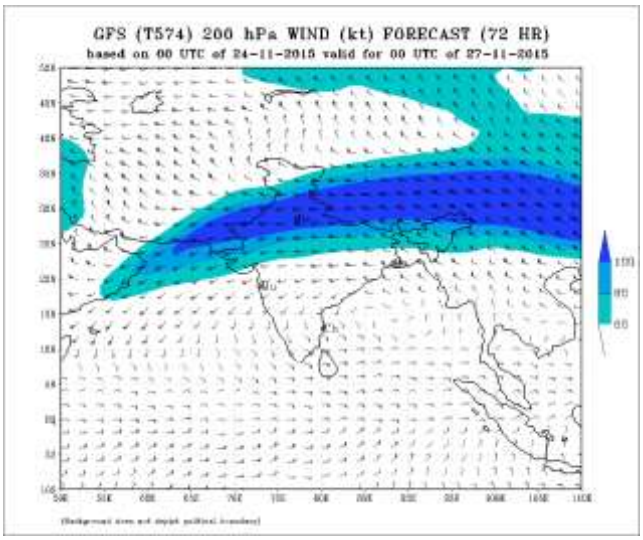

GFS (T574) 500 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 24-11-2015 valid for 00 UTC of 28-11-2015

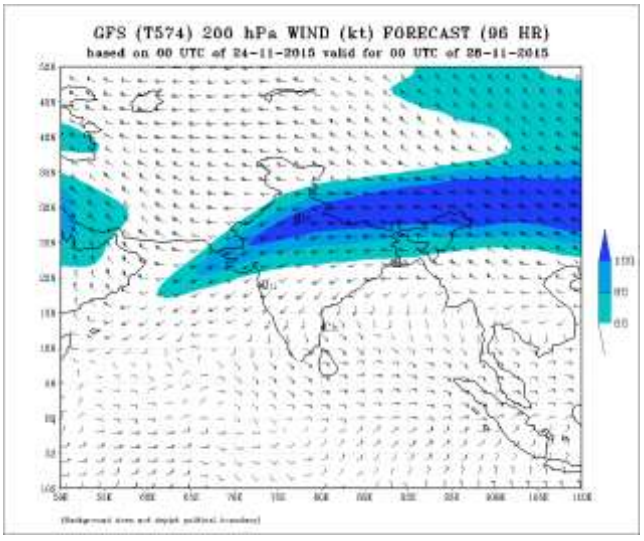

GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 24-11-2015 valid for 00 UTC of 29-11-2015

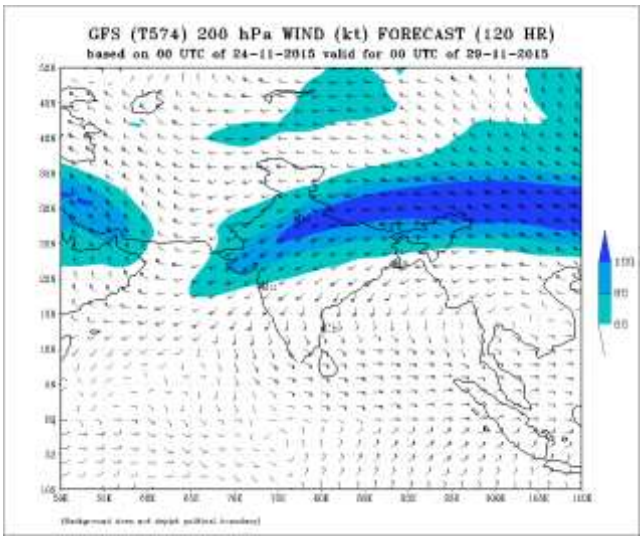

GFS (T574) 200 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 24-11-2015 valid for 00 UTC of 24-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 24-11-2015 valid for 00 UTC of 25-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 24-11-2015 valid for 00 UTC of 26-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 24-11-2015 valid for 00 UTC of 27-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 24-11-2015 valid for 00 UTC of 28-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 24-11-2015 valid for 00 UTC of 29-11-2015

FDP (Cyclone) NOC Report Dated 25 November, 2015

Synoptic features:

- The upper air cyclonic circulation over south Andaman Sea & neighbourhood extending upto 3.1 km above mean sea level persists. Under its influence, a low pressure area would form during next 48 hours.

Surface Temperature (SST):

- SST is 26-28°C over west central, extreme northern parts of Bay of Bengal and 30-31°C over Andaman Sea and between 28-30°C over rest part of BoB.
- SST is 26-28°C over west central and northwest parts and 30-31°C over southcentral parts of AS. It is 28-30°C over rest part of AS.

Tropical Cyclone Heat Potential (TCHP):

- TCHP is below 50kJ/cm^2 over extreme north and adjoining parts of west central BoB, 90-110 kJ/cm^2 over Andaman Sea,100-130 kJ/cm^2 between some equatorial parts and 4^0 N of BoB and between 50-90 kJ/cm^2 over rest parts of BoB.
- TCHP is below 50kJ/cm^2 over northwest extending upto some southwest parts of AS and 90-110 kJ/cm^2over Southeast and adjoining west central part of AS.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive and is 25-40x10-5s-1 over southcentral and adjoining Andaman Sea, positive up to 25x10-5s-1 extends upto southwest and extreme north BoB and negative over remaining northeast parts of BoB.
- It is 25-40x10-5s-1 over central AS, between 10-25x10-5s-1 over west central and adjoining southwest AS. It is negative over remaining parts of AS.

Convergence:

- Lower level convergence is about $5x10^{-5}s^{-1}$ over southcentral, southeast and Andaman Sea. It is negative -5 over rest parts of BoB.
- Lower level convergence is about $10\text{-}20x10^{-5}s^{-1}$ over central AS, $5\text{-}10x10^{-5}s^{-1}$ over adjoing southcentral AS and negative -5 over rest parts of AS.

Divergence:

- Upper level divergence is 5-10x10-5 s-1 over southcentral BoB adjoining Andaman Sea and south east of BoB. It is negative -5-10 x10-5 s-1over north and rest parts of BoB.
- Upper level divergence is about $10\text{-}20x10^{-5}$ s-1 over central and southcentral AS, positive +5+10 over extreme west central AS and negative-5-10 over rest parts of AS.

Wind Shear:

- Wind shear is 5-10 knots over Andaman Sea south east and adjoining westcentral BoB and is positive >20 knots over rest parts of BoB.
- Wind shear is 10 knots over southeast AS and positive >20 knots over rest parts of AS.

Wind Shear Tendency:

- There is decreasing tendency (-5 -10 Knots) over westcentral & southeast BoB and Andaman Sea. It is positive over extreme southwest BoB.
- The shear tendency is decreasing -5-10 knots over southeast AS, some parts of southwest AS and positive +5+10 knots over rest parts of AS.

Upper tropospheric ridge:

- The upper tropospheric ridge at 200 hPa runs along 13.0°N over AS and 15.0°N over BoB.

M.J.O. Index:

- MJO index is in Phase 2 with amplitude greater than 1 and would remain in phase 2 during next subsequent 2 days and then emerge into phase 3.

Storms and Depression over South China Sea/ South Indian Ocean:

Vortex (Annabelle) over south Indian Ocean centered near 24.6S/81.6E.Intensity is T1.5.

Satellite Bulletin based on INSAT imagery:

Bay of Bengal & Andaman Sea:-

According to satellite imagery, scattered low / medium clouds with embedded moderate to intense convection over southeast Bay of Bengal and Andaman Sea.

Arabian Sea:-

Broken low / medium clouds with embedded moderate to intense convection lies over westcentral & southwest Arabian Sea.

NWP Input for FDP Cyclone based on 0000 UTC

NWP Analysis

IMD-GFS model product analysis based on 0000 UTC of 25 November 2015 shows a significant zone of cyclogenesis over southeast BoB on Day 4 moving northwestwards towards westcentral BoB with gradual intensification.

Genesis Potential Parameter (GPP):

The GPP forecast charts show a significant of zone of cyclogenesis over Andaman Sea on 4th day (29 Nov.) moving west-northwestwards.

NWP products are available at:

http://202.54.31.51/bias/gfsproducts.php
http://202.54.31.51/bias/wrf27pro.php
http://202.54.31.51/bias/potentialparameter.php

NCMRWF-NCUM: Model suggests formation of a low pressure on 26th over southeast BoB moving westward towards TN coast on 29th Nov.

It also suggests a low pressure genesis over Southeast Bay on 29th Nov, moving westwards with gradual intensification moving towards TN coast on 02 Dec.

The low pressure area over eastcentral Arabian Sea would persists for another 4-5 day over the same region with slight northward movement with gradual intensification on 29th and weakening after 4th Dec.

NCMRWF-GFS: Model suggests formation of a low pressure on 26th over southcentral BoB moving westward direction towards TN Coast on 29th Nov.

It also suggests formation of another low pressure area on the same day i.e 29th over South Andaman Sea moving north-westwards with gradual intensification. It suggests its initial movement in northwest direction up to west central BoB on 2 Dec and thereafter recurves towards Bangladesh during next subsequent days.

ECMWF: ECMWF suggests formation of a low pressure on 26th over southcentral BoB moving westward direction with gradual intensification over North of Srilanka on 28th Nov, system will come close to Central coastal Tamilnadu on 29th and then slowly recurve north-northeastwards along and off the east coast.

NCEP-GFS: Model suggests formation of a low pressure on 26th over southcentral BoB moving westward direction and then recurving northeastwards over southwest and adjoining westcentral bay of Bengal

JMA: Model suggests a westward moving low pressure area over southeast BoB on 25 th evening with gradual intensification and moving westwards towards Srilanka coast on 28th evening.

ARP-Meteo France Model suggests the low pressure over southeast BoB and adjoining Andaman Sea moving westwards towards TN coast with gradual intensification during next 2-3 day.

Summary and Conclusion:

The upper air cyclonic circulation over south Andaman Sea & neighbourhood extending upto 3.1 km above mean sea level persists. Under its influence, a low pressure area would form during next 48 hours. It may gradually intensify into a well marked low/ depression by 29th Nov.

Most of the NWP models suggest initial west-northwestward movement and then recurving north-northeastwards from TN coast with gradually intensification upto well marked low/ depression.

Bay of Bengal and Andaman Sea:

Probability of cyclogenesis over Bay of Bengal and Andaman Sea during next 120 hours:

24 HOURS	24-48 HOURS	48-72 HOURS	72-96 HOURS	96-120 HOURS
Nil	Nil	Nil	Low	Low

Arabian Sea:

Probability of cyclogenesis over Arabian Sea during next 120 hours:

24 HOURS	24-48 HOURS	48-72 HOURS	72-96 HOURS	96-120 HOURS
Nil	Nil	Nil	Nil	Nil

Advisory: IOP will be conducted along TN and Puducherry coasts on 28 and 29 Nov. 2015.

Annexure-I

Status of observational system:

Synoptic observation:

Region	Date/Time (UTC)		
	24/12	**25/00**	**25/03**
India	48	32	48
Coastal stations			
WB	7	3	7
Odisha	6	4	5
AP	12	12	12
Tamil Nadu	11	11	11
Puducherry	6	1	6
A & N	6	1	7
Bangladesh	10	10	06
Myanmar	9	0	9
Thailand	0	0	0
SriLanka	7	7	7

AWS Observations:

Region	Date/Time (UTC)		
	24/12	**25/00**	**25/03**
India	69	65	72
Coastal stations			
WB	9	8	10
Odisha	15	14	15
AP	16	15	17
Tamil Nadu	28	27	29
Puducherry	1	1	
A & N	0	0	0

RS/RW (12Z) of 24/11/2015 **3/39**
No. of Ascents reaching 250 hPa level: :, MISDA:

RS/RW (00Z) of 25/11/2015- **23/39**
No. of Ascents reaching 250 hPa level 23 , MISDA:2

No. of PILOT Ascents

24/12Z	25/00Z
5	6

Buoy Data

24/12Z	25/00Z	25/03Z
10	9	10

STATUS OF CHENNAI REGION OBSERVATION

No. of Synop data

Date→	**24.11.2015**							
UTC→	**00**	**03**	**06**	**09**	**12**	**15**	**18**	**21**
Chennai Region (Coasts of AP & TN)	**20**	**22**	**20**	**20**	**21**	**20**	**20**	**20**

No. of RS/RW Ascents

00Z /24.11.2015 : 7
No. of Ascents reaching 250 hPa level = 7
MISDA : 1

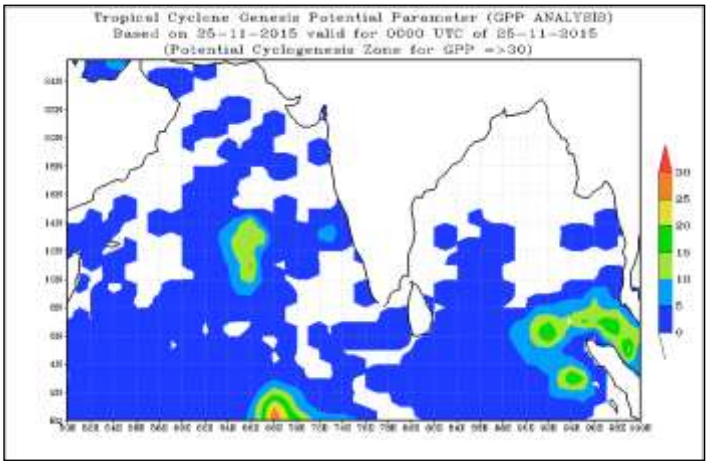
12Z /24.11.2015 : 1
No. of Ascents reaching 250 hPa level = 1
MISDA : 7

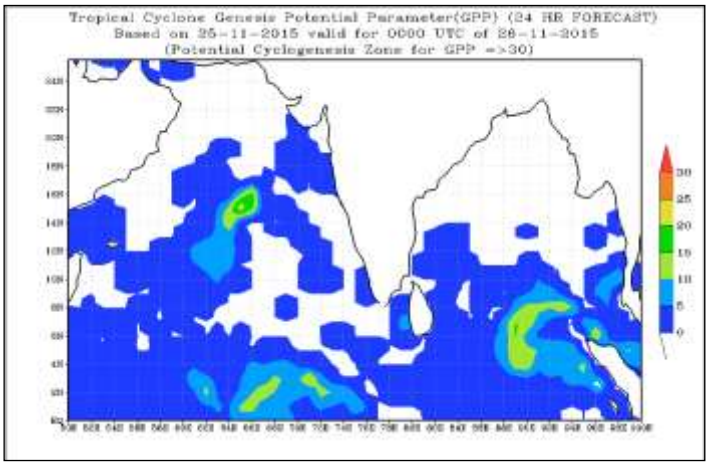
No. of PILOT Ascents:

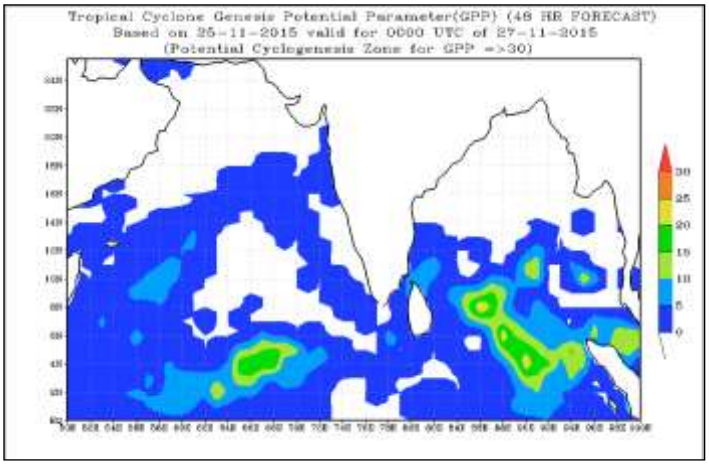
24.11.2015

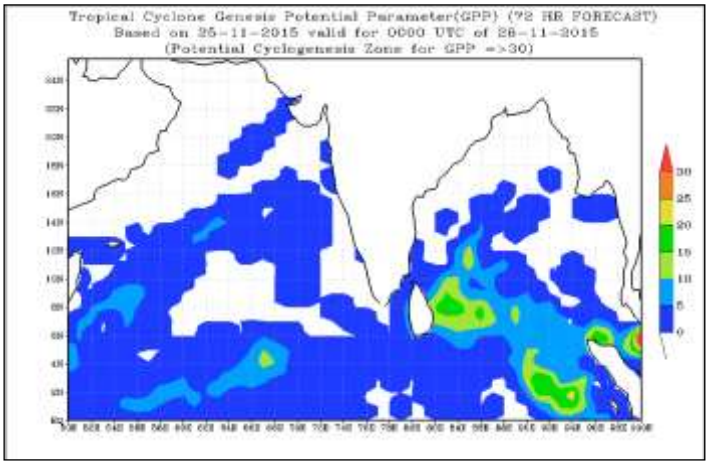
06Z	18Z
4	6

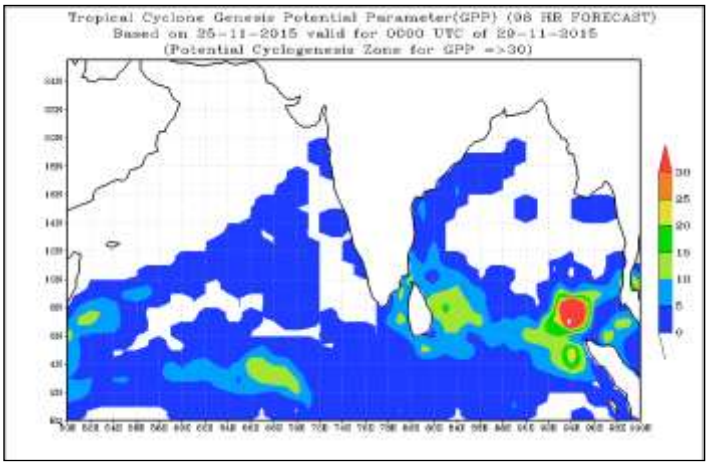
Annexure-II

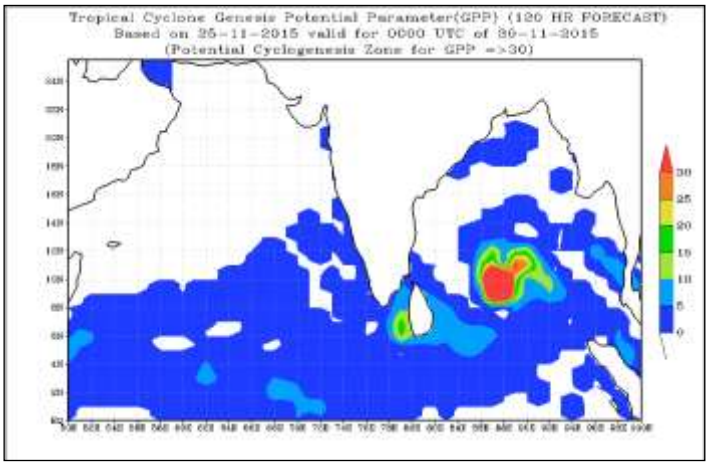

Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 25-11-2015 valid for 0000 UTC of 25-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

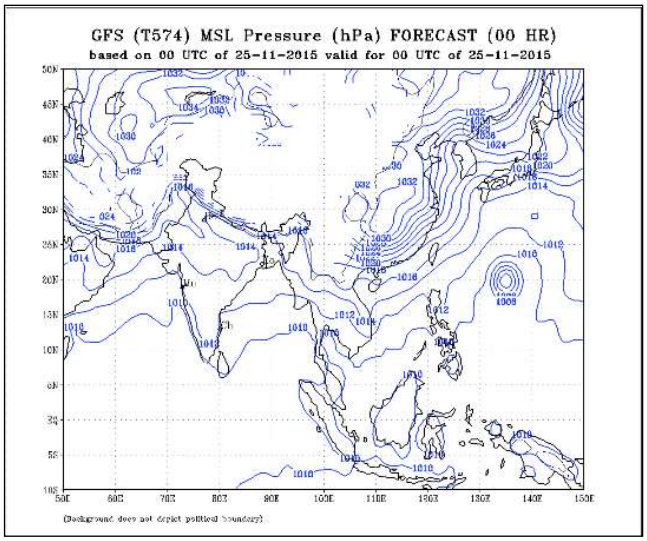

Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 25-11-2015 valid for 0000 UTC of 26-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

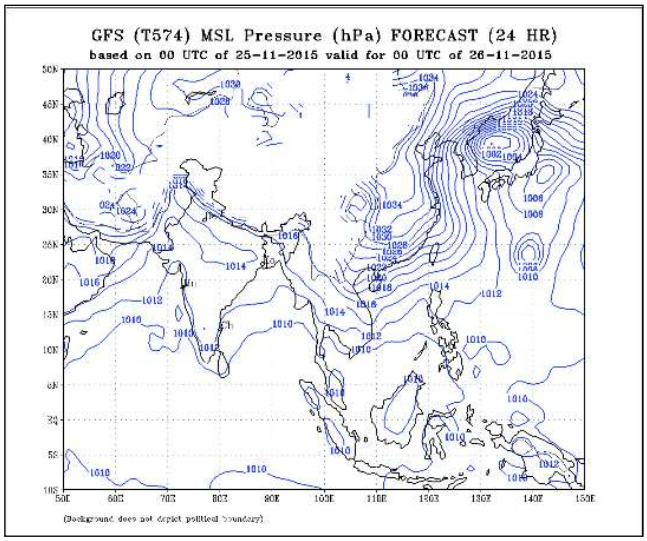

Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
Based on 25-11-2015 valid for 0000 UTC of 27-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

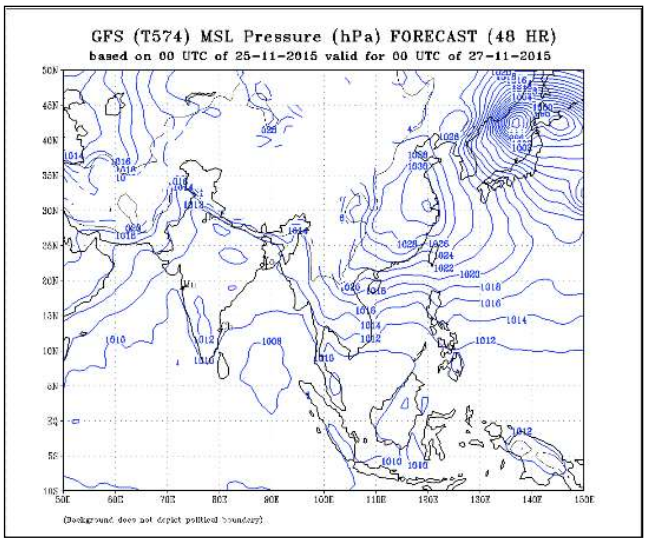

Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 25-11-2015 valid for 0000 UTC of 28-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

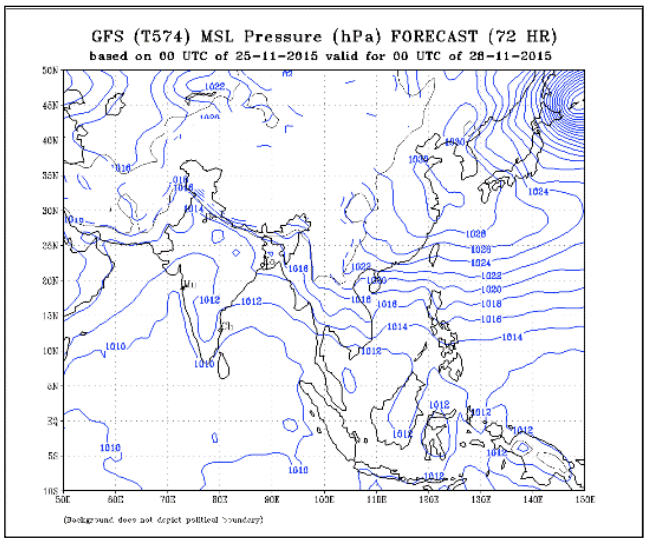

Tropical Cyclone Genesis Potential Parameter(GPP) (96 HR FORECAST)
Based on 25-11-2015 valid for 0000 UTC of 29-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

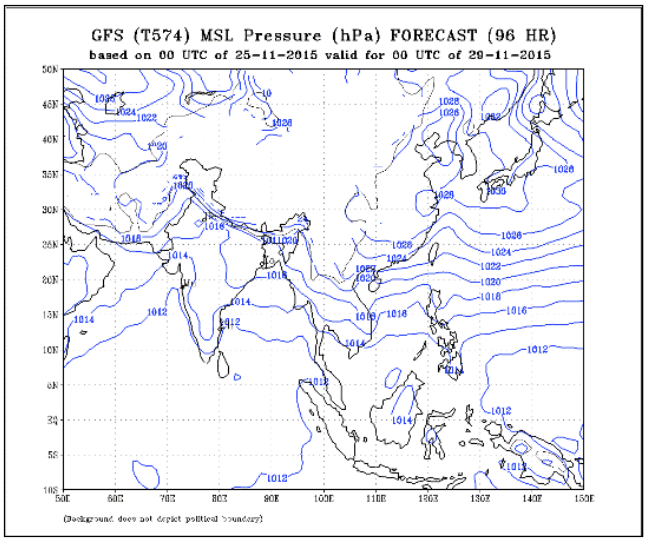

Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 25-11-2015 valid for 0000 UTC of 30-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

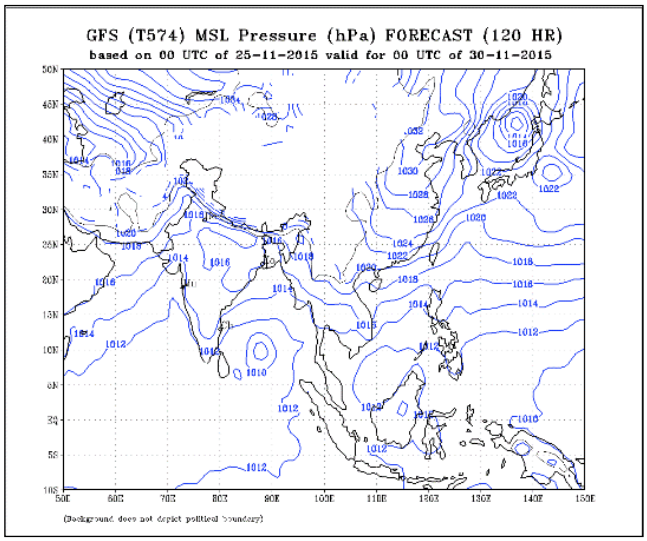

GFS (T574) MSL Pressure (hPa) FORECAST (00 HR)
based on 00 UTC of 25-11-2015 valid for 00 UTC of 25-11-2015

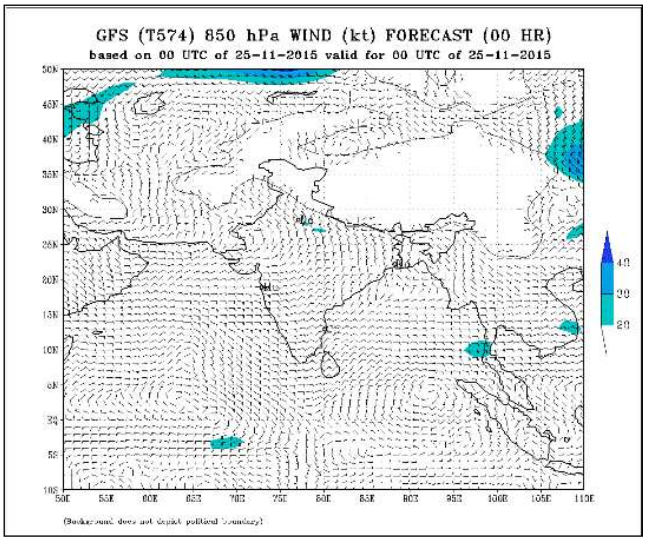

GFS (T574) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 25-11-2015 valid for 00 UTC of 26-11-2015

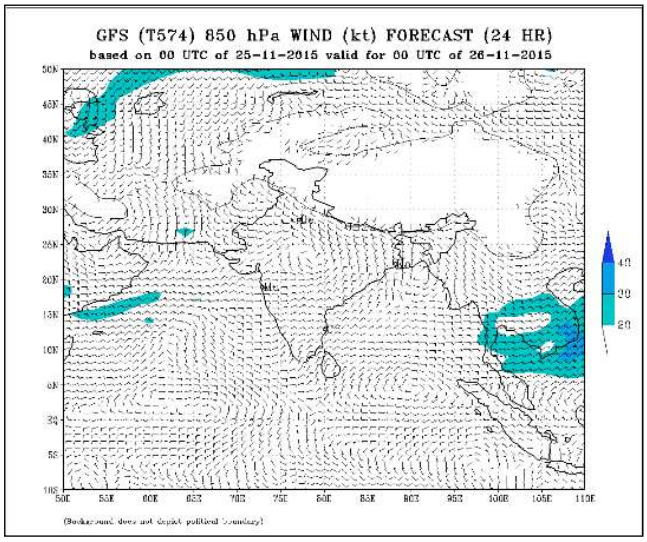

GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 25-11-2015 valid for 00 UTC of 27-11-2015

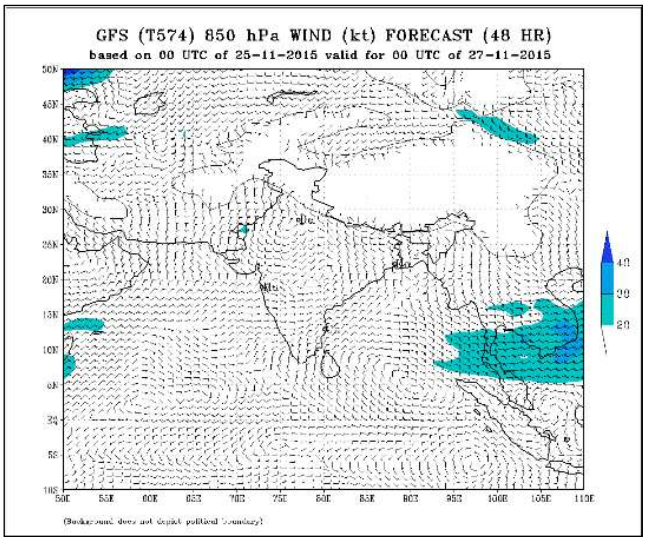

GFS (T574) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 25-11-2015 valid for 00 UTC of 28-11-2015

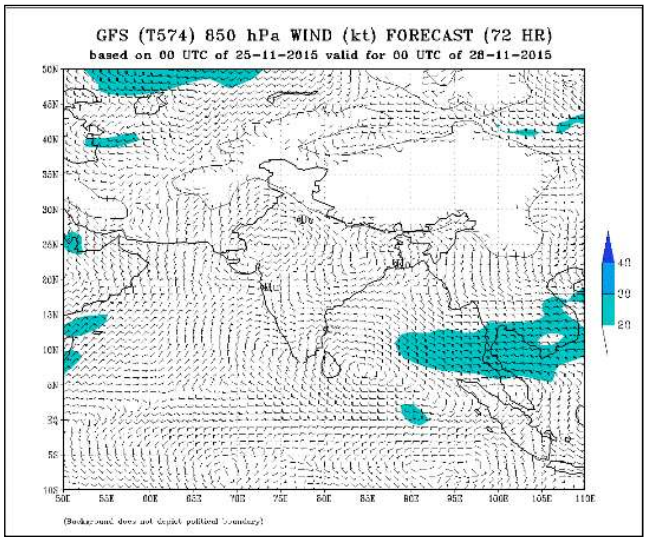

GFS (T574) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 25-11-2015 valid for 00 UTC of 29-11-2015


GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 25-11-2015 valid for 00 UTC of 30-11-2015


GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 25-11-2015 valid for 00 UTC of 25-11-2015
40
30
20
(Background does not depict political boundary)


GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 25-11-2015 valid for 00 UTC of 26-11-2015
40
30
20
(Background does not depict political boundary)


GFS (T574) 850 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 25-11-2015 valid for 00 UTC of 27-11-2015
40
30
20
(Background does not depict political boundary)


GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 25-11-2015 valid for 00 UTC of 28-11-2015
40
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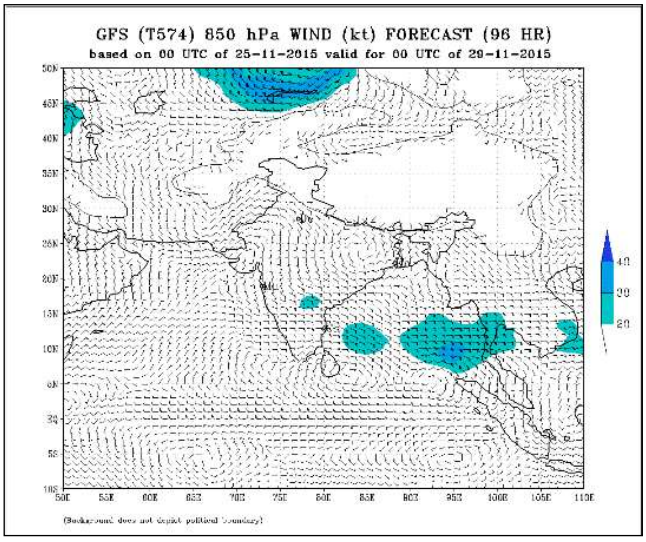
20
(Background does not depict political boundary)


GFS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 25-11-2015 valid for 00 UTC of 29-11-2015
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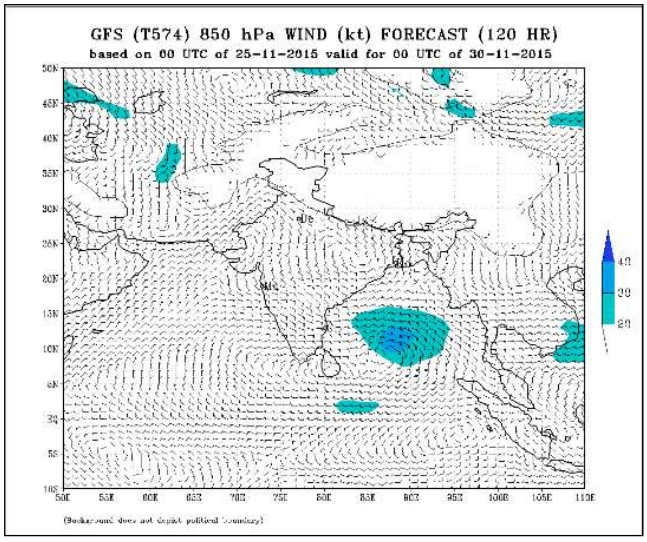
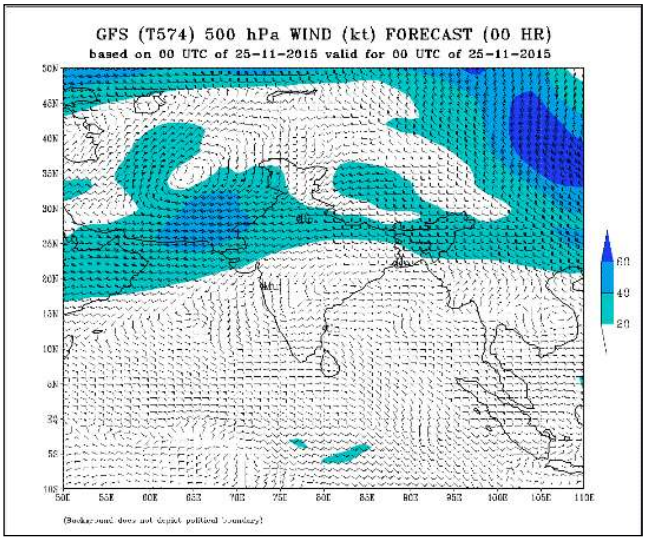
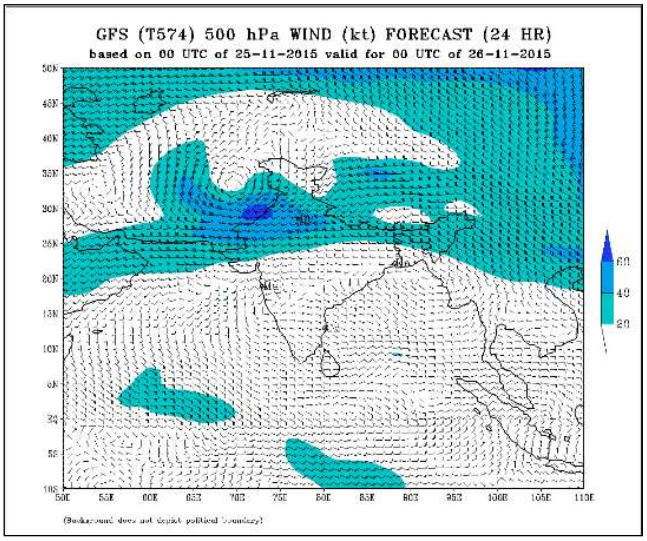
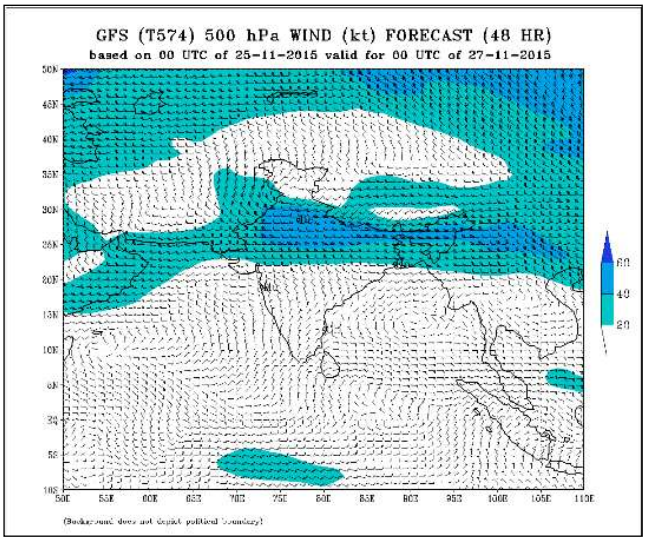
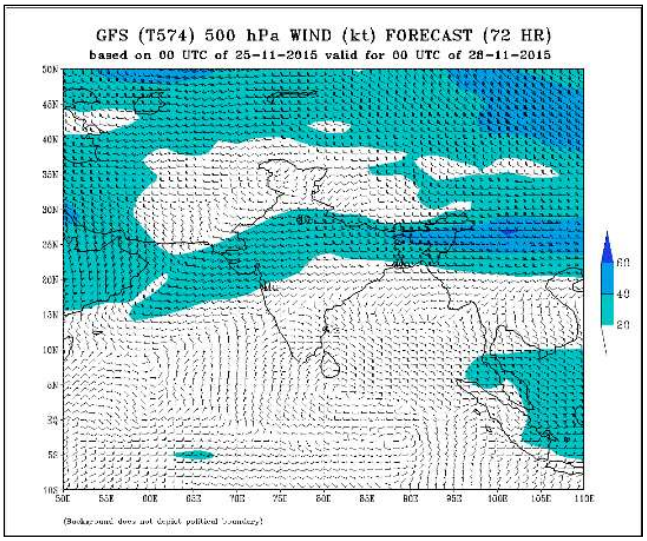
20
(Background does not depict political boundary)

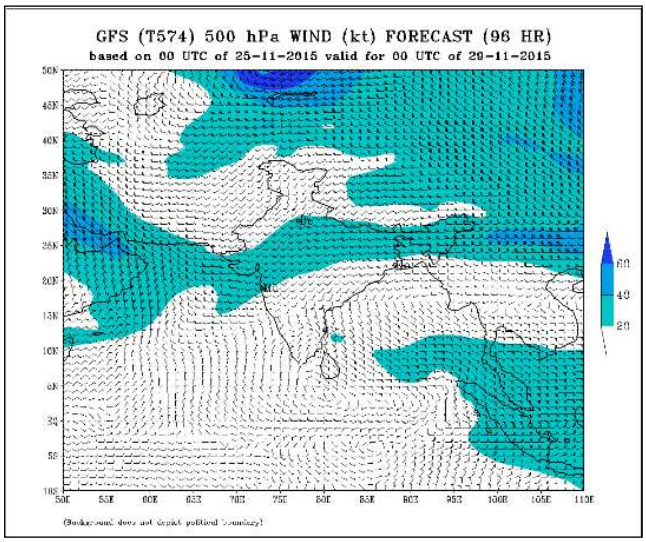

GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 25-11-2015 valid for 00 UTC of 30-11-2015
40
30
20
(Background does not depict political boundary)

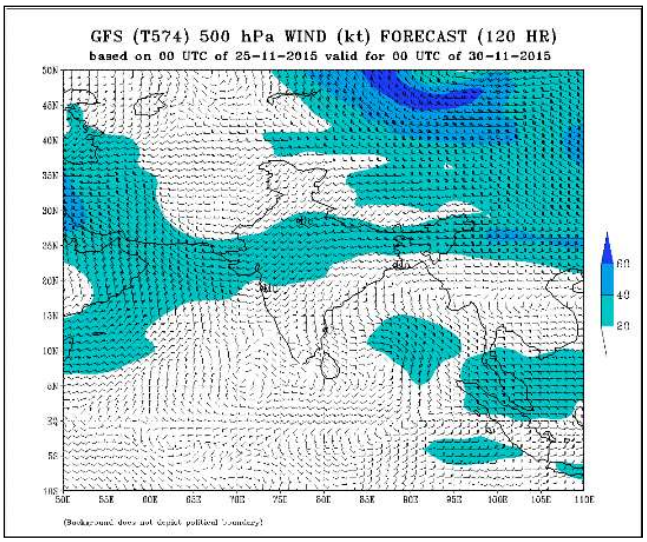

GFS (T574) 500 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 25-11-2015 valid for 00 UTC of 25-11-2015

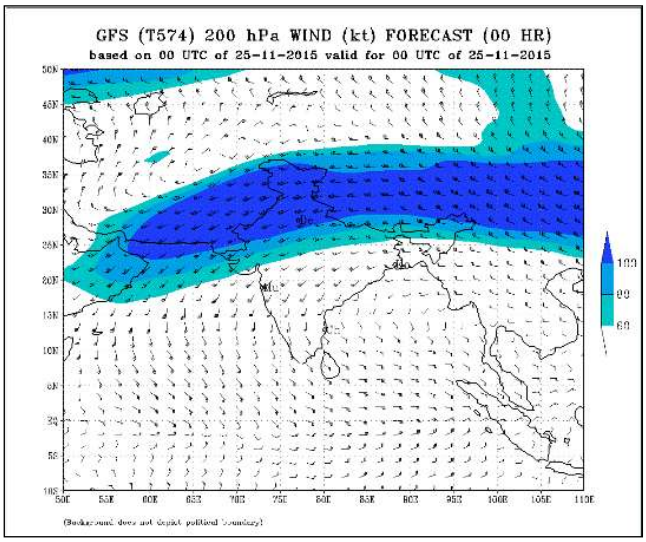

GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 25-11-2015 valid for 00 UTC of 26-11-2015

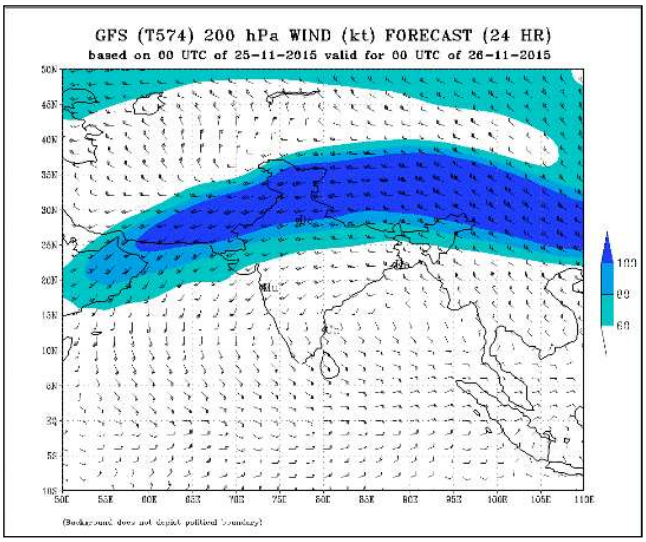

GFS (T574) 500 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 25-11-2015 valid for 00 UTC of 27-11-2015

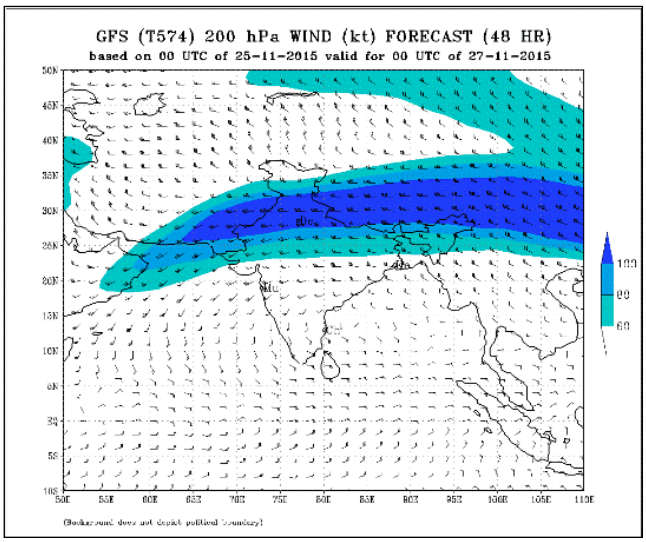

GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 25-11-2015 valid for 00 UTC of 28-11-2015

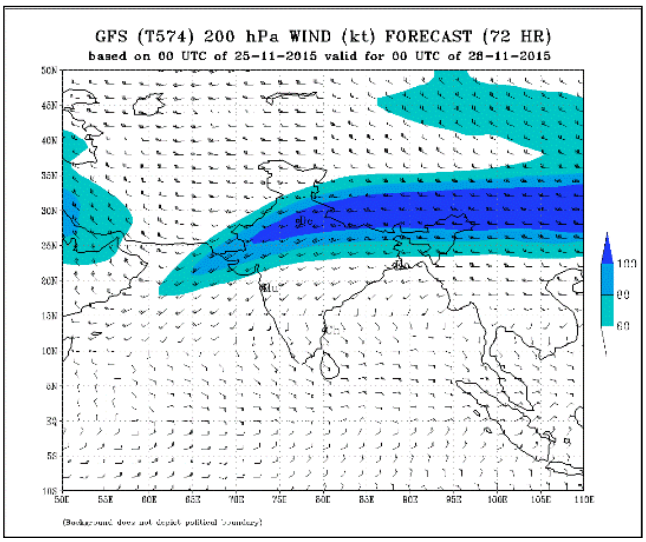

GFS (T574) 500 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 25-11-2015 valid for 00 UTC of 29-11-2015

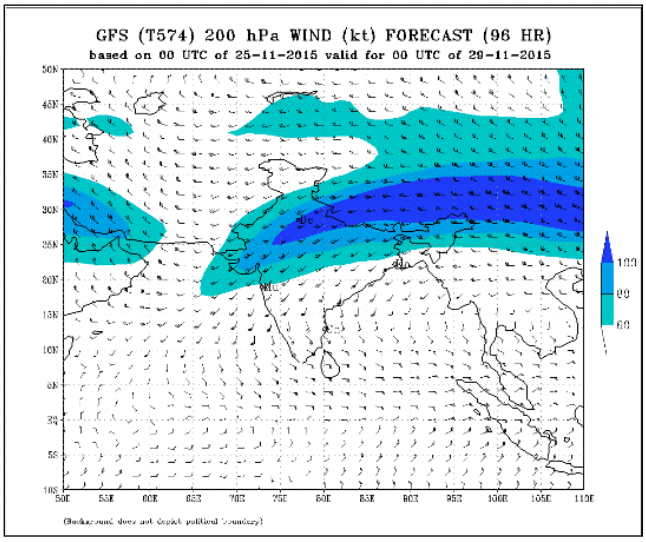

GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 25-11-2015 valid for 00 UTC of 30-11-2015

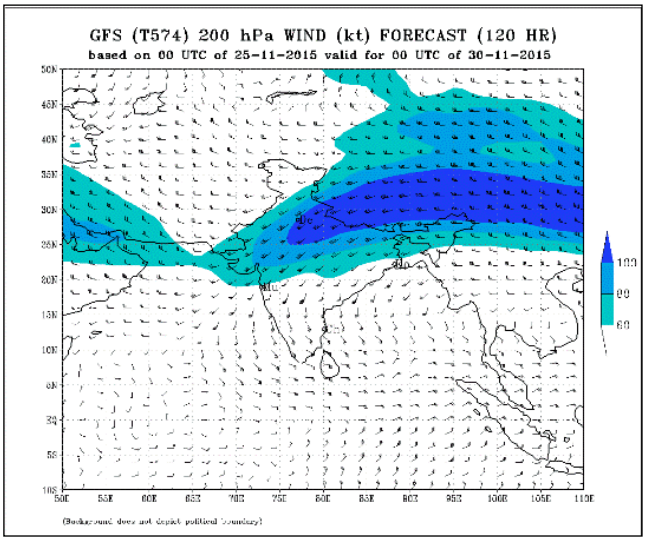

GFS (T574) 200 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 25-11-2015 valid for 00 UTC of 25-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 25-11-2015 valid for 00 UTC of 26-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 25-11-2015 valid for 00 UTC of 27-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 25-11-2015 valid for 00 UTC of 28-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 25-11-2015 valid for 00 UTC of 29-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 25-11-2015 valid for 00 UTC of 30-11-2015

FDP (Cyclone) NOC Report Dated 26 November, 2015

Synoptic features:

- The upper air cyclonic circulation over south Andaman Sea & neighbourhood extending upto 3.1 km above mean sea level persists. Under its influence, a low pressure area would form during next 48 hours.

Surface Temperature (SST):

- SST is 26-28°C over west central, extreme northern parts of Bay of Bengal and 30-31°C over Andaman Sea and between 28-30°C over rest part of BoB.
- SST is 26-28°C over west central and northwest parts and 30-31°C over southcentral parts of AS. It is 28-30°C over rest part of AS.

Tropical Cyclone Heat Potential (TCHP):

- TCHP is below 50kJ/cm^2 over extreme north and adjoining parts of west central BoB, 90-110 kJ/cm^2 over Andaman Sea,100-130 kJ/cm^2 between some equatorial parts and 4^0 N of BoB and between 50-90 kJ/cm^2 over rest parts of BoB.
- TCHP is below 50kJ/cm^2 over northwest extending up to some southwest parts of AS and 90-110 kJ/cm^2over Southeast, east central and south west part of AS.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive and is 25-40x10-5s-1 over southcentral and adjoining Andaman Sea, positive up to 25x10-5s-1 over southern part and extreme north BoB and negative over central parts and adjoining Andaman Sea of BoB.
- It is 25-40x10-5s-1 over west central AS. It is negative over remaining parts of AS.

Convergence:

- Lower level convergence is about 5-10x$10^{-5}s^{-1}$ over southcentral, southeast and Andaman Sea. It is negative -5 over rest parts of BoB.
- Lower level convergence is about 5-10x$10^{-5}s^{-1}$ over central AS, 5-10x$10^{-5}s^{-1}$ over adjoining southcentral AS and negative -5 over west central and adjoining parts of AS.

Divergence:

- Upper level divergence is 5-10x10-5 s-1 over southcentral BoB adjoining Andaman Sea. It is negative -5-10 x10-5 s-1over southwest and west central parts of BoB.
- Upper level divergence is about 10-20x10^{-5} s-1 over central and southcentral AS, positive +5+10 over extreme west central AS and negative-5-10 over rest parts of AS.

Wind Shear:

- Wind shear is 5-10 knots over central and Andaman Sea and is increasing towards north of BoB.
- Wind shear is 10-20 knots over southern and adjoining central AS and is increasing towards northern parts of AS.

Wind Shear Tendency:

- There is decreasing tendency (-5 Knots) over southern, adjoining central BoB and south Andaman Sea. It is positive over west central BoB.
- The shear tendency is decreasing -10-20 knots over southcentral and adjoining central AS, positive +5 knots over east and west central parts of AS.

Upper tropospheric ridge:

- The upper tropospheric ridge at 200 hPa runs along 16.0°N over AS and 14.0°N over BoB.

M.J.O. Index:

- MJO index is in Phase 3 with amplitude greater than 1 and would remain in phase 3 during next subsequent 2 days.

Storms and Depression over South China Sea/ South Indian Ocean:

No significant system over south china sea/ south Indian ocean:

Satellite Bulletin based on INSAT imagery:

Bay of Bengal & Andaman Sea:-

According to satellite imagery, broken low/medium clouds with embedded isolated moderate to intense convection over Lakshadweep and Bay Island. Scattered low/medium clouds with embedded isolated weak to moderate convection over north east Tamil Nadu. Scattered low/medium clouds over rest Tamil Nadu south interior Karnataka.

Arabian Sea:-

Broken low/medium clouds with embedded moderate to intense convection over Arabian sea south of latitude 20.0^0N longitude 60.0^0E to 72.5^0E

NWP Input for FDP Cyclone based on 0000 UTC

NWP Analysis

IMD-GFS and IMD-WRF model product analysis based on 0000 UTC of 26 November 2015 shows no significant weather system over the North Indian Seas. The forecasts based on the analysis do not show any significant weather system during next 48 hours. In the forecast charts, there is a cyclogenesis over south-east Bay of Bengal in day 3(29th Nov.) which moves north-westward direction over north-west BOB during next 2 days. Day 3 onwards.

Genesis Potential Parameter (GPP):

The GPP forecast charts also show the same significant zone of cyclogenesis on 29th onwards.

NWP products are available at:

http://202.54.31.51/bias/gfsproducts.php
http://202.54.31.51/bias/wrf27pro.php
http://202.54.31.51/bias/potentialparameter.php

NCMRWF-NCUM: Model suggests formation of a low pressure on 27th over southwest BoB moving westward towards TN coast on 29th Nov.

It also suggests a low pressure genesis over Southwest Bay on 29th Nov, moving westwards with gradual intensification moving towards TN coast on 02 Dec.

NCMRWF-GFS: Model suggests formation of a low pressure on 26th over southcentral BoB moving westward direction towards TN Coast on 29th Nov.

It also suggests formation of another low pressure area on the same day i.e 29th over South Andaman Sea moving north-westwards with gradual intensification. It suggests its initial movement in northwest direction upto west central BoB on 2 Dec and thereafter recurves towards Bangladesh during next subsequent days.

ECMWF : ECMWF suggests formation of a low pressure area on 26th over southcentral BoB moving westward direction with gradual intensification over North of Sri Lanka on 29th Nov, system will come close to Central coastal Tamilnadu on 30th and then slowly recurve north-northeastwards along and off the east coast.

NCEP-GFS: Model suggests formation of a low pressure area on 26th over southcentral BoB moving westward direction and then recurving northeastwards over southwest and adjoining westcentral bay of Bengal

JMA: Model suggests a westward moving low pressure area over southwest BoB on 26th evening with gradual intensification and moving westwards towards Sri Lanka coast on 28th evening.

ARP-Meteo France Model suggests the low pressure over southeast BoB and adjoining Andaman Sea moving westwards towards TN coast with gradual intensification during next 2-3 day.

Summary and Conclusion:

The upper air cyclonic circulation over south Andaman Sea & neighbourhood extending upto 3.1 km above mean sea level persists. Under its influence, a low pressure area would form during next 48 hours. It may gradually intensify into a well marked low/ depression by 29th Nov and move initially west-northwestwards and then recurve over southwest and adjoining westcentral Bay of Bengal.

Bay of Bengal and Andaman Sea:

Probability of cyclogenesis over Bay of Bengal and Andaman Sea during next 120 hours:

24 HOURS	24-48 HOURS	48-72 HOURS	72-96 HOURS	96-120 HOURS
Nil	Nil	Nil	Low	Low

Arabian Sea:

Probability of cyclogenesis over Arabian Sea during next 120 hours:

24 HOURS	24-48 HOURS	48-72 HOURS	72-96 HOURS	96-120 HOURS
Nil	Nil	Nil	Nil	Nil

Advisory: IOP will be conducted along TN and Puducherry coasts on 29 Nov. to 01 Dec. 2015.

Annexure-I

Status of observational system:

Synoptic observation:

Region	Date/Time (UTC)		
	25/12	**26/00**	**26/03**
India	54	56	55
Coastal stations			
WB	6	8	5
Odisha	7	9	8
AP	12	12	15
Tamil Nadu	28	26	26
Puducherry	1	1	1
A & N	-	-	-
Bangladesh	11	11	11
Myanmar	11	0	11
Thailand	2	2	2
SriLanka	9	9	8

AWS Observations:

Region	Date/Time (UTC)		
	25/12	**26/00**	**26/03**
India	69	65	72
Coastal stations			
WB	6	8	5
Odisha	7	9	8
AP	28	12	15
Tamil Nadu	28	26	26
Puducherry	1	1	1
A & N	0	0	0

RS/RW (12Z) of 25/11/2015 **6/39**
No. of Ascents reaching 250 hPa level: :, MISDA:

RS/RW (00Z) of 26/11/2015- **26/39**
No. of Ascents reaching 250 hPa level , MISDA:1

No. of PILOT Ascents

25/12Z	26/00Z
5	4

Buoy Data

25/12Z	26/00Z	26/03Z
5	6	7

STATUS OF CHENNAI REGION OBSERVATION

No. of Synop data

Date→	25.11.2015							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	20	22	20	20	22	20	20	20

No. of RS/RW Ascents

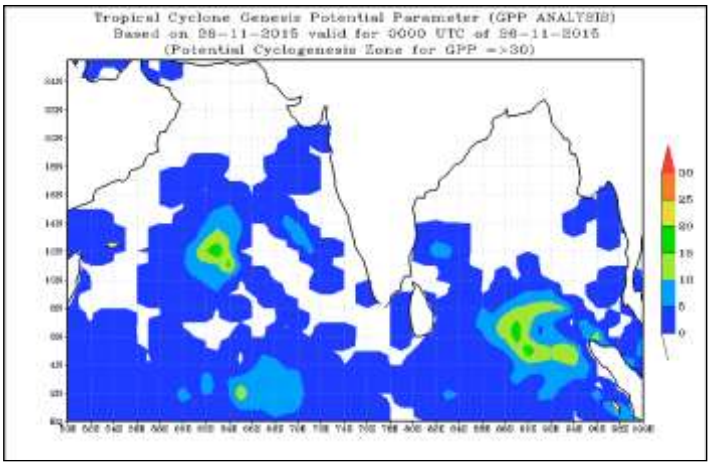
00Z /25.11.2015 : 7
No. of Ascents reaching 250 hPa level = 7
MISDA : 1

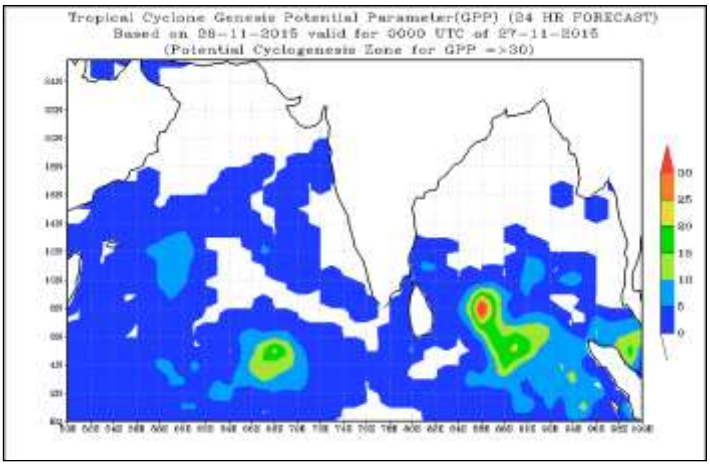
12Z /25.11.2015 : 1
No. of Ascents reaching 250 hPa level = 1
MISDA : 7

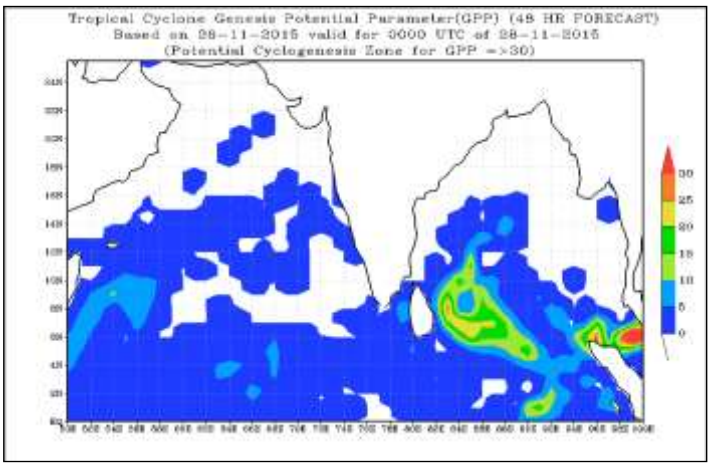
No. of PILOT Ascents:

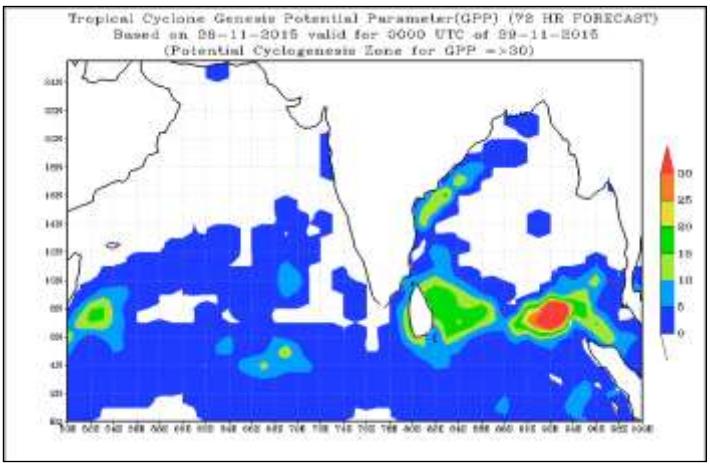
25.11.2015	
06Z	18Z
6	3

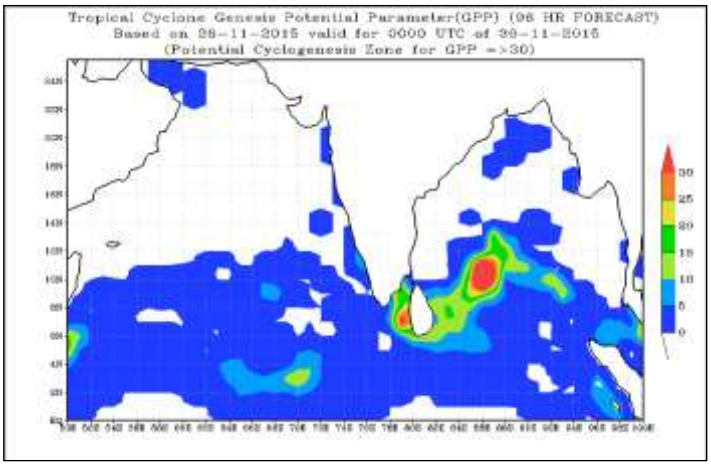
Annexure-II

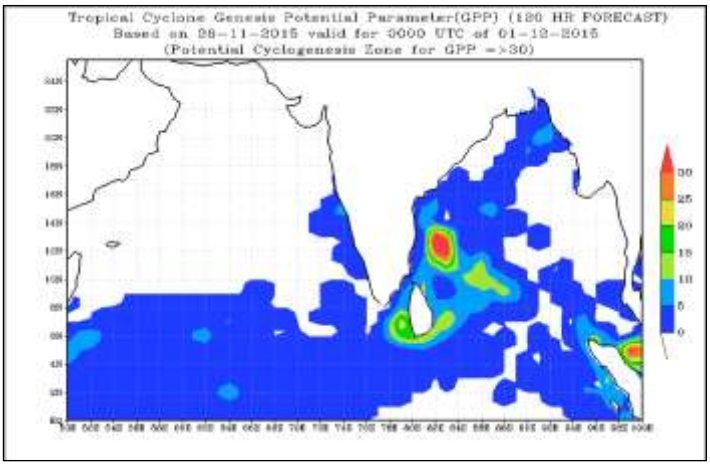

Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 28-11-2015 valid for 0000 UTC of 28-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

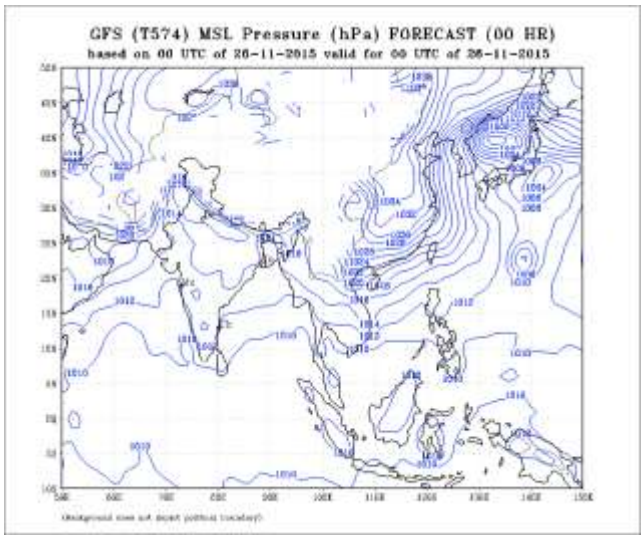

Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 28-11-2015 valid for 0000 UTC of 27-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

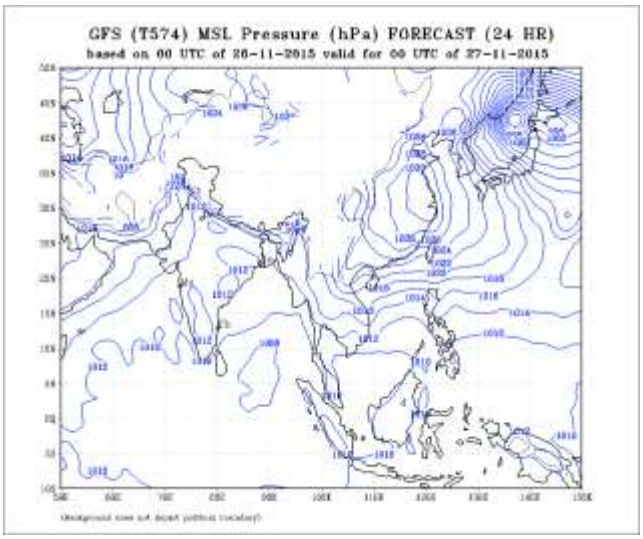

Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
Based on 28-11-2015 valid for 0000 UTC of 28-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

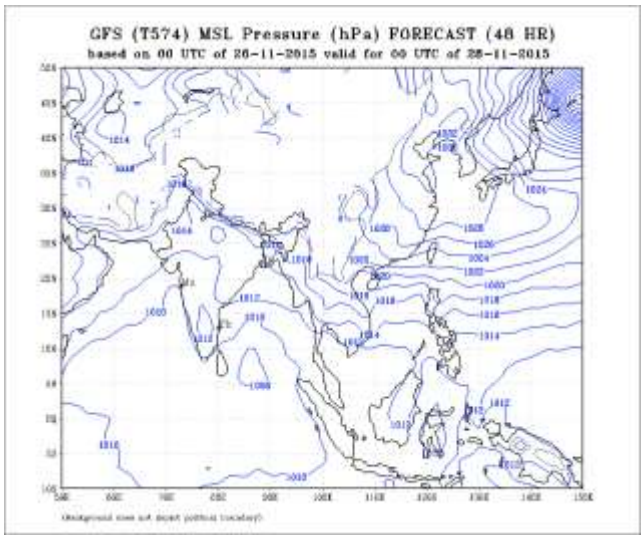

Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 28-11-2015 valid for 0000 UTC of 29-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

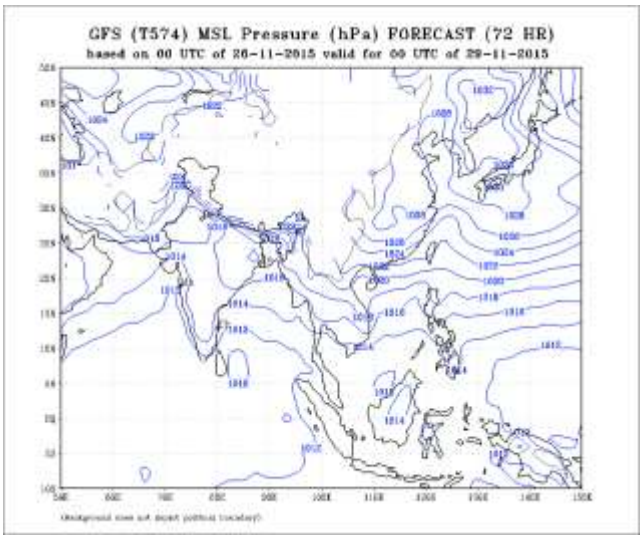

Tropical Cyclone Genesis Potential Parameter(GPP) (96 HR FORECAST)
Based on 28-11-2015 valid for 0000 UTC of 30-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

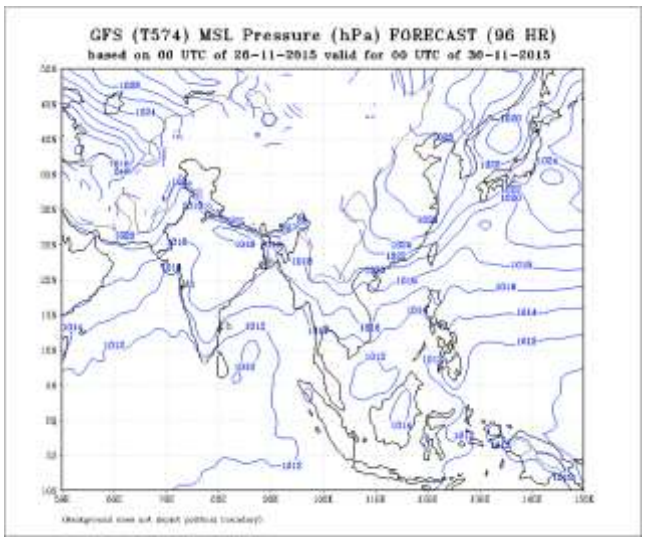

Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 28-11-2015 valid for 0000 UTC of 01-12-2015
(Potential Cyclogenesis Zone for GPP =>30)

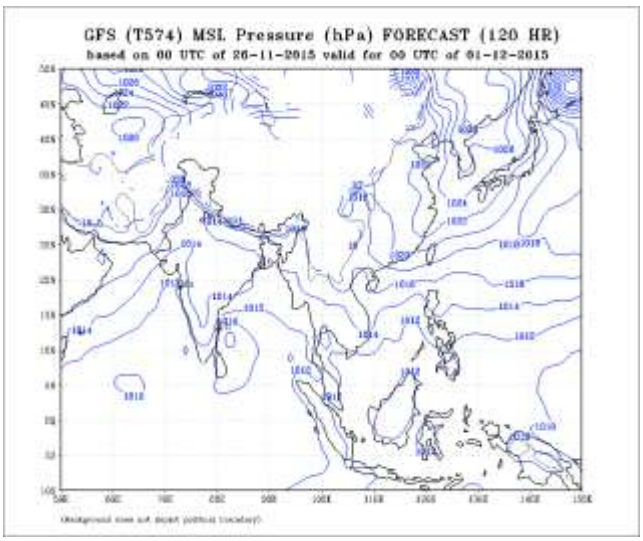

GFS (T574) MSL Pressure (hPa) FORECAST (00 HR)
based on 00 UTC of 26-11-2015 valid for 00 UTC of 26-11-2015

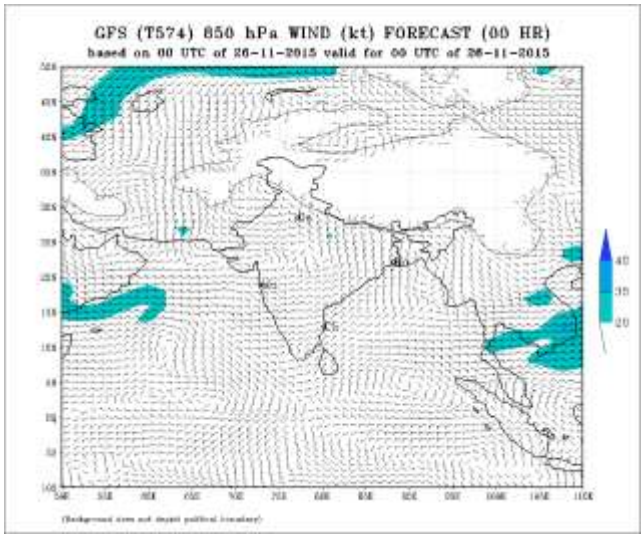

GFS (T574) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 26-11-2015 valid for 00 UTC of 27-11-2015

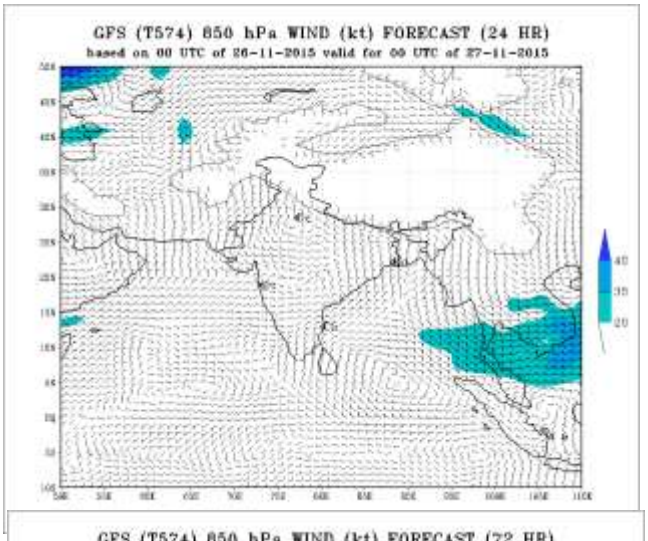

GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 26-11-2015 valid for 00 UTC of 28-11-2015

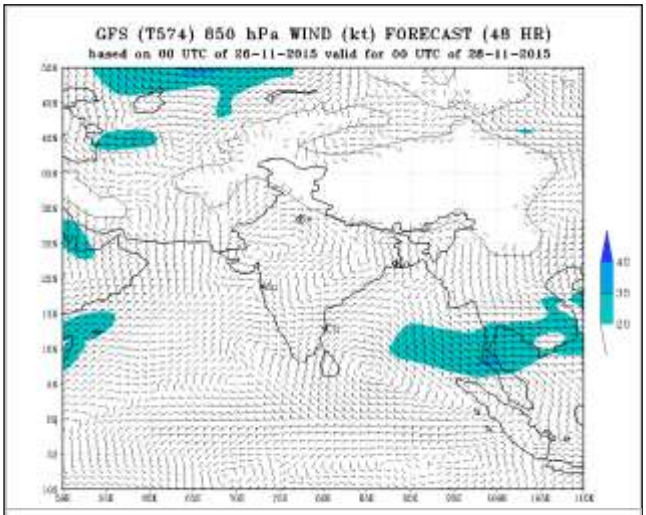

GFS (T574) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 26-11-2015 valid for 00 UTC of 29-11-2015

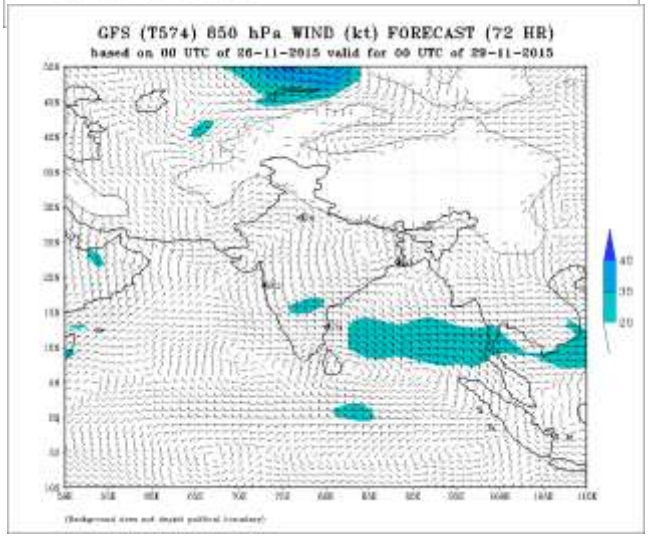

GFS (T574) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 26-11-2015 valid for 00 UTC of 30-11-2015

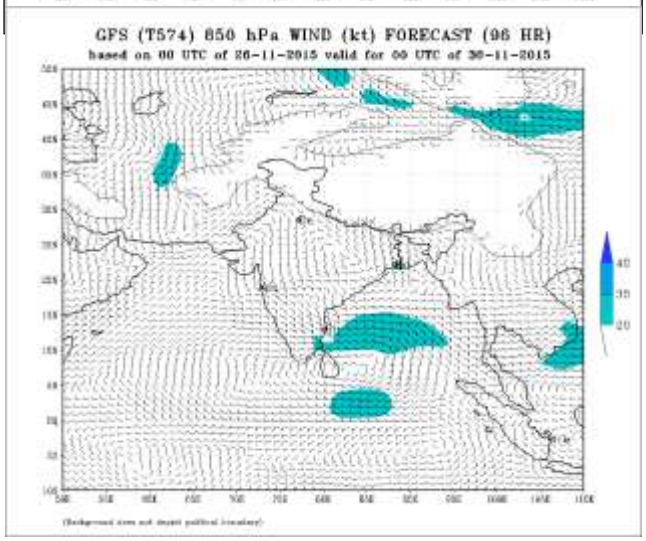

GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 26-11-2015 valid for 00 UTC of 01-12-2015

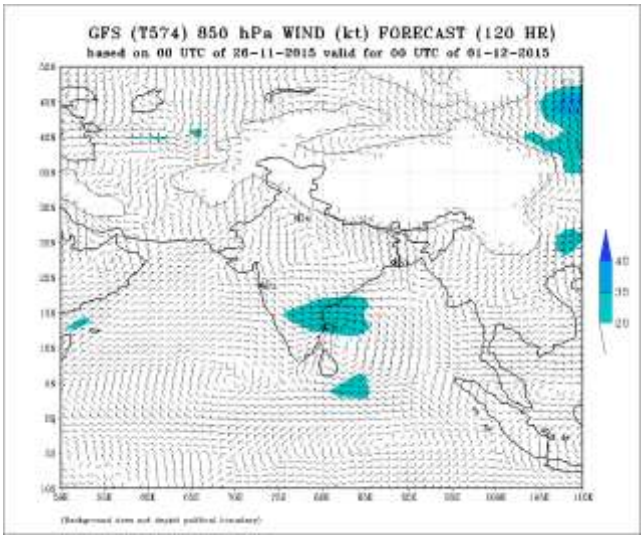

GPS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 26-11-2015 valid for 00 UTC of 26-11-2015

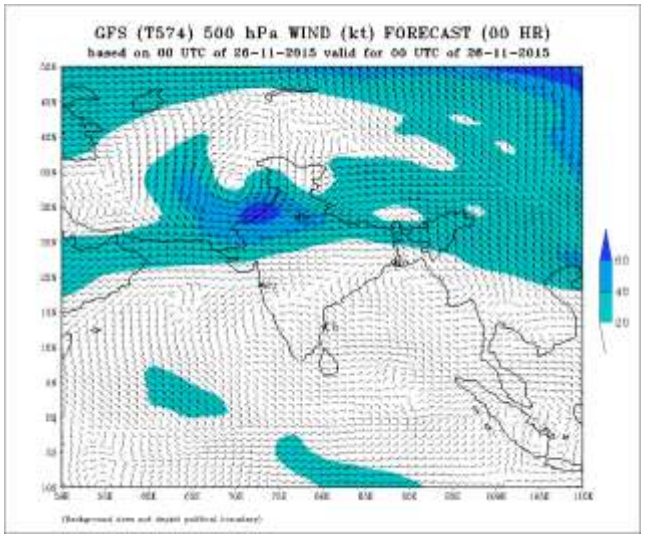

GPS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 26-11-2015 valid for 00 UTC of 27-11-2015

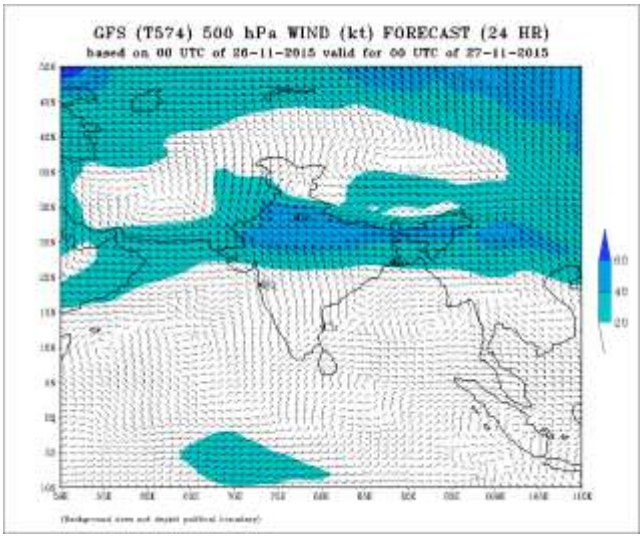

GPS (T574) 850 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 26-11-2015 valid for 00 UTC of 28-11-2015

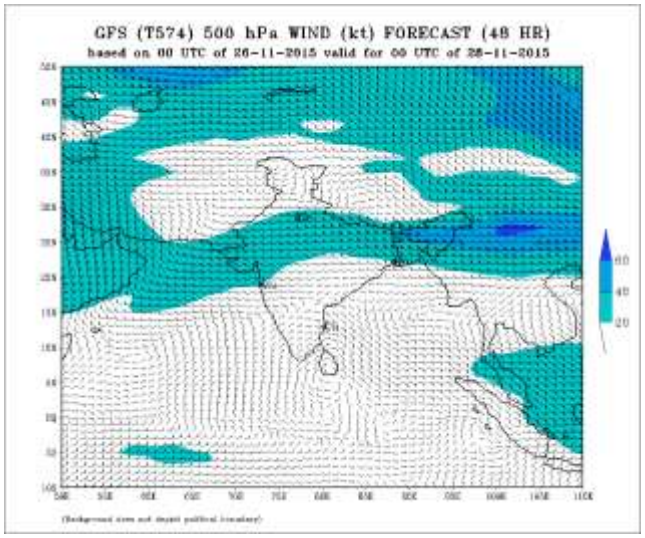

GPS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 26-11-2015 valid for 00 UTC of 29-11-2015

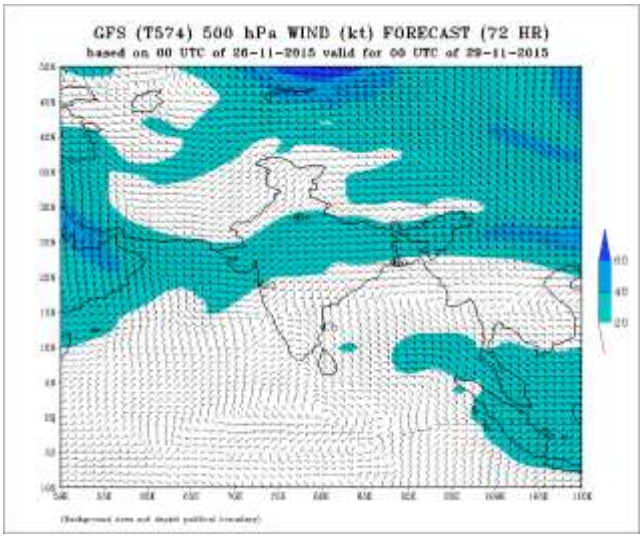

GPS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 26-11-2015 valid for 00 UTC of 30-11-2015

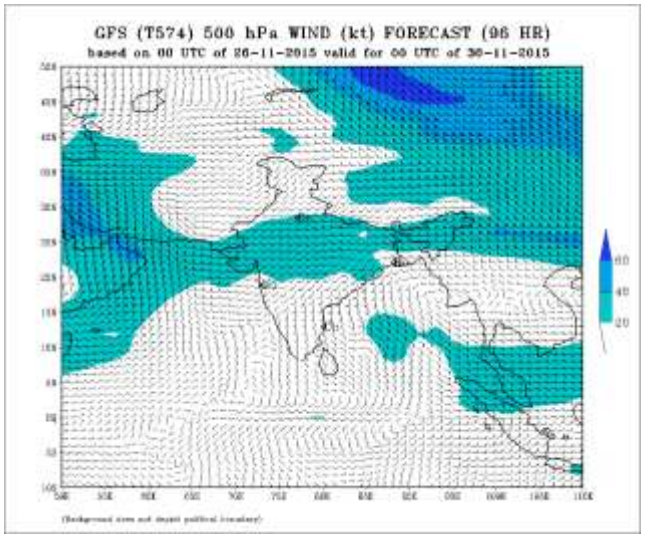

GPS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 26-11-2015 valid for 00 UTC of 01-12-2015

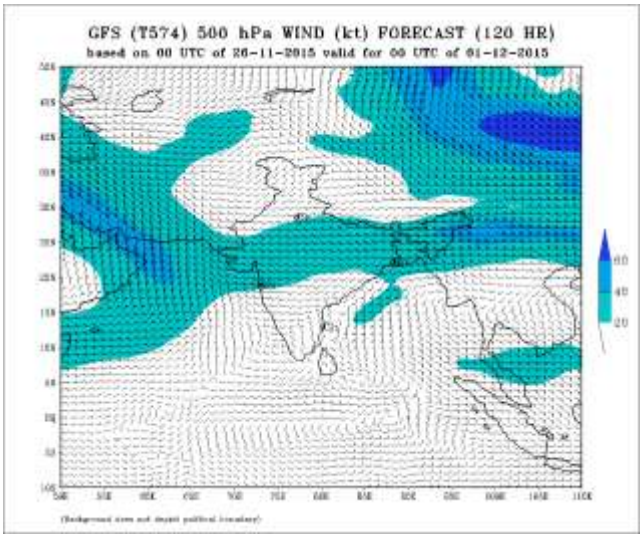

GPS (T574) 500 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 26-11-2015 valid for 00 UTC of 26-11-2015

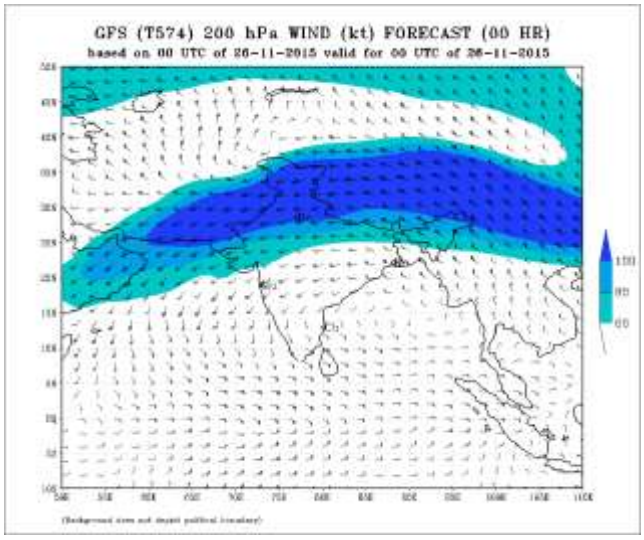

GPS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 26-11-2015 valid for 00 UTC of 27-11-2015

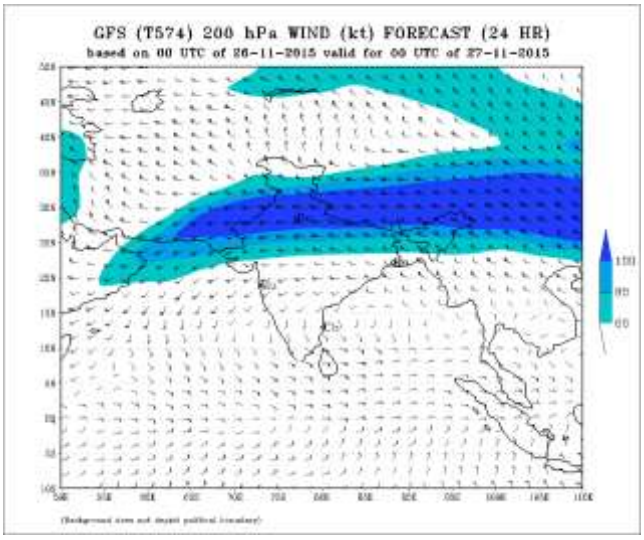

GPS (T574) 500 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 26-11-2015 valid for 00 UTC of 28-11-2015

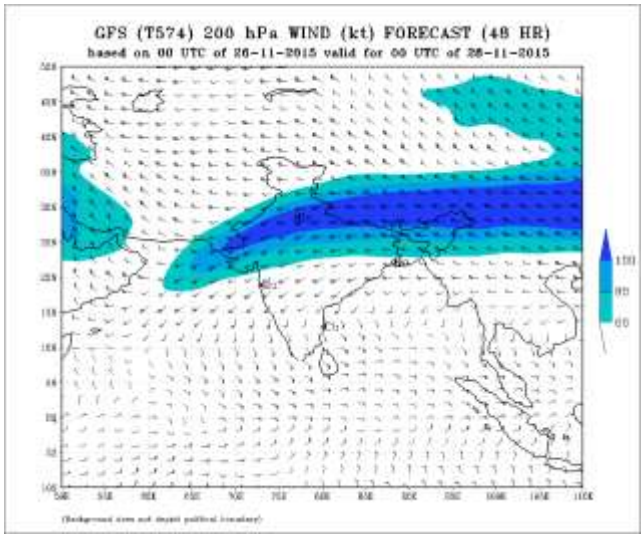

GPS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 26-11-2015 valid for 00 UTC of 29-11-2015

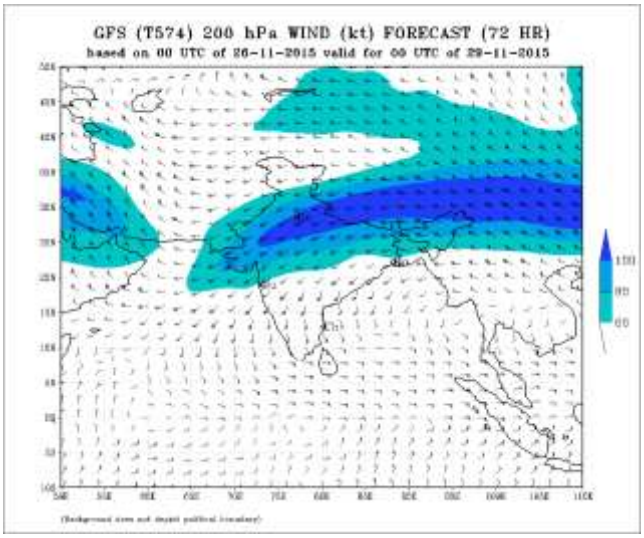

GPS (T574) 500 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 26-11-2015 valid for 00 UTC of 30-11-2015

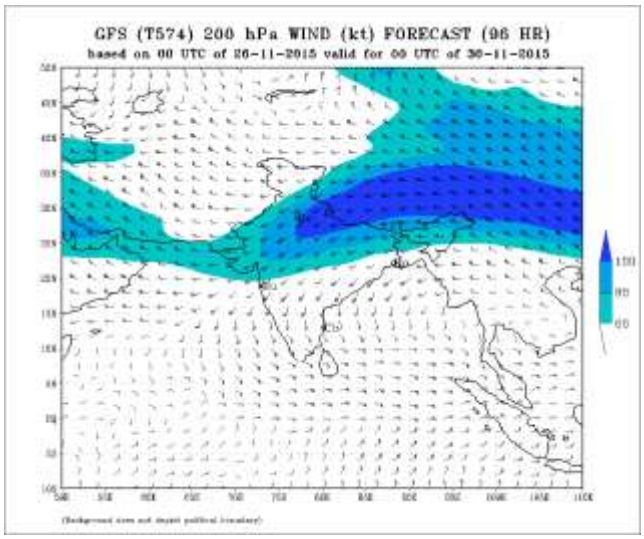

GPS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 26-11-2015 valid for 00 UTC of 01-12-2015

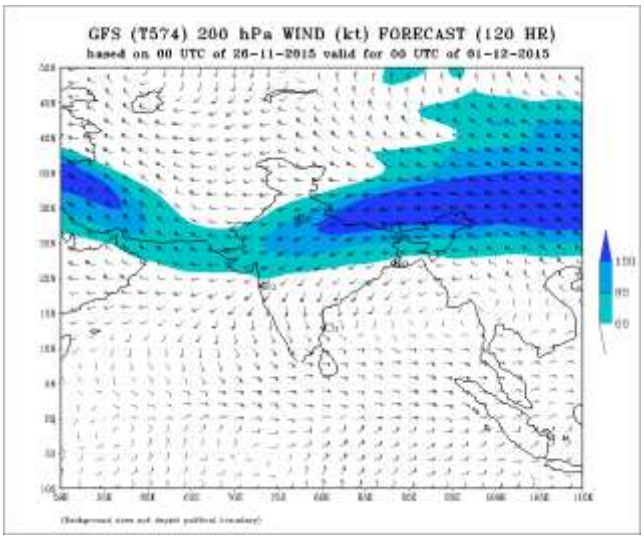

GFS (T574) 200 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 26-11-2015 valid for 00 UTC of 26-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 26-11-2015 valid for 00 UTC of 27-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 26-11-2015 valid for 00 UTC of 28-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 26-11-2015 valid for 00 UTC of 29-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 26-11-2015 valid for 00 UTC of 30-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 26-11-2015 valid for 00 UTC of 01-12-2015

FDP (Cyclone) NOC Report Dated 27 November, 2015

Synoptic features:

- A trough of low at mean sea level lies over southeast Bay of Bengal & neighbourhood with upper air cyclonic circulation aloft extending upto 3.1 km above mean sea level.

Surface Temperature (SST):

- SST is 26-28°C over west central, extreme northern parts of Bay of Bengal and 30-31°C over Andaman Sea and between 28-30°C over rest part of BoB.
- SST is 26-28°C over west central and northwest parts and 30-31°C over southcentral parts of AS. It is 28-30°C over rest part of AS.

Tropical Cyclone Heat Potential (TCHP):

- TCHP is below 50kJ/cm^2 over extreme north and adjoining parts of west central BoB, 90-110 kJ/cm^2 over Andaman Sea,100-130 kJ/cm^2 between some equatorial parts and 4^0 N of BoB and between 50-90 kJ/cm^2 over rest parts of BoB.
- TCHP is below 50kJ/cm^2 over northwest extending up to some southwest parts of AS and 90-110 kJ/cm^2over Southeast, east central and south west part of AS.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive and is 25-40x10-5s-1 over central part of north, central southwest BoB, south Andaman Sea and equatorial region. It is negative over rest of the BoB.
- It is 25-40x10-5s-1 over southwest, eastcentral AS and equatorial region. It is negative over remaining parts of AS.

Convergence:

- Lower level convergence is about 5-10x$10^{-5}s^{-1}$ over southcentral, and Andaman Sea. It is negative (-5) over rest parts of BoB.
- Lower level convergence is about 5-10x$10^{-5}s^{-1}$ over central AS and negative (-5-10x$10^{-5}s^{-1}$) over eastcentral AS.

Divergence:

- Upper level divergence is 5-10x10-5 s-1 over southcentral BoB. 10-30x10-5 s-1 over equatorial region It is negative -5-10 x10-5 s-1over southeast and southwest parts of BoB.
- Upper level divergence is about 10-20x10^{-5} s-1 over central and southcentral AS, and negative -5-10 x10-5 s-1 over rest parts of AS.

Wind Shear:

- Wind shear is 5-10 knots over southeast BoB and Andaman Sea and is increasing towards north of BoB..
- Wind shear is 5-10 knots over south AS and is increasing towards northern parts of AS.

Wind Shear Tendency:

- There is decreasing tendency (-5-10 Knots) over southeast & east central BoB and south Andaman Sea. It is positive over northwest, west central and southwest BoB. (5 knots
- The shear tendency is decreasing -10-20 knots over southwest and northeast AS (-5-10 knots), increasing 10 knots over southeast of AS..

Upper tropospheric ridge:

- The upper tropospheric ridge at 200 hPa runs along 15.0°N over AS and 14.0°N over BoB.

M.J.O. Index:

- MJO index is in Phase 3 with amplitude greater than 1 and would remain in phase 3 during next subsequent 2 days.

Storms and Depression over South China Sea/ South Indian Ocean:
No significant system over south china sea/ south Indian ocean:

Satellite Bulletin based on INSAT imagery:

Bay of Bengal & Andaman Sea:-
According to satellite imagery, broken low/medium clouds with embedded isolated moderate to intense convection lies over south BOB between latitude 5.0 to 13.0 degree north and longitude 84.0 to 91.5 degree east with associated feeble low level circulation over the area.
Arabian Sea:-
Broken low/medium clouds with embedded moderate to intense convection lies over southwest and adjoining southeast Arabian sea and scattered over central Arabian Sea

NWP Input for FDP Cyclone based on 0000 UTC
NWP Analysis

IMD-GFS and IMD-WRF model product analysis based on 0000 UTC of 27 November 2015 shows no significant weather system over the North Indian Seas. The forecasts based on the analysis do not show any significant weather system during next 24 hours. In the forecast charts, there is a cyclogenesis over south-east Bay of Bengal in day 2 which moves north-westward direction over southwest BOB and Sri Lanka Coast during next 3 days.
Genesis Potential Parameter (GPP):
The GPP forecast chartsshow the same significant zone of cyclogenesis associated with the cyclonic circulation in the lower troposphere up to 700 hPa from Day 2 onwards.

NWP products are available at:
http://202.54.31.51/bias/gfsproducts.php
http://202.54.31.51/bias/wrf27pro.php
http://202.54.31.51/bias/potentialparameter.php

NCMRWF-NCUM: Model suggests formation of a low pressure area on 29th over southwest BoB, which moves northwestwards towards TN coast on 30th Nov.
NCMRWF-GFS: Model suggests formation of a low pressure area on 29th over southwest BoB moving initially northeastwards and then westward towards TN coast on 02nd Dec and then emerging into AS on 04th Dec as a low pressure area.
ECMWF. : ECMWF suggests formation of a low pressure area on 29th over southwest BoB. It becomes well-marked on 01st Dec off Sri Lanka coast. It subsequently moves northward and is off Tamil Nadu coast on 02nd Dec. Thereafter, it intensifies slowly into a depression and recurves northeastward along and off Andhra Pradesh coast.
NCEP-GFS : Model suggests formation of a low pressure area on 27th over southcentral BoB moving westward towards Sri Lanka coast on 01st December.
JMA: JMA Model indicates a low pressure area over southcentral BOB on 27th which moves slowing west-northwestward towards Sri Lanka.

ARP-Meteo France ARP Model indicates low pressure area over southwest BoB moving west-northwestward towards Sri Lanka coast during 29th-30th.

Summary and Conclusion: A trough of low at mean sea level lies over southeast Bay of Bengal & neighbourhood with upper air cyclonic circulation aloft extends upto 3.1 km above mean sea level. Under its influence, a low pressure area would form by 29th Nov. some models suggest that It may gradually intensify upto depression, move initially west-northwestwards and then recurve over southwest and adjoining westcentral Bay of Bengal. Other move it west-northwestwards towards Sri Lanka and TN coast by 1 Dec.

Bay of Bengal and Andaman Sea:

Probability of cyclogenesis over Bay of Bengal and Andaman Sea during next 120 hours:

24 HOURS	24-48 HOURS	48-72 HOURS	72-96 HOURS	96-120 HOURS
Nil	Nil	Nil	Low	Low

Arabian Sea:

Probability of cyclogenesis over Arabian Sea during next 120 hours:

24 HOURS	24-48 HOURS	48-72 HOURS	72-96 HOURS	96-120 HOURS
Nil	Nil	Nil	Nil	Nil

Advisory: IOP will be conducted along TN and Puducherry coasts on 29 Nov. to 01 Dec. 2015.

Annexure-I

Status of observational system:

Synoptic observation:

Region	Date/Time (UTC)		
	26/12	**27/00**	**27/03**
India	48	31	49
Coastal stations			
WB	10	3	10
Odisha	7	5	7
AP	12	12	13
Tamil Nadu	12	9	12
Puducherry	1	1	1
A & N	6	1	6
Bangladesh	11	11	13
Myanmar	2	2	7
Thailand	2	2	2
SriLanka	10	8	10

AWS Observations:

Region	Date/Time (UTC)		
	26/12	**27/00**	**27/03**
India	69	65	72
Coastal stations			
WB	4	5	5
Odisha	7	5	7
AP	12	12	11
Tamil Nadu	29	26	26
Puducherry	1	1	1
A & N	0	0	0

RS/RW (12Z) of 26/11/2015 **6/39**
No. of Ascents reaching 250 hPa level: 6:, MISDA: 33

RS/RW (00Z) of 27/11/2015- **31/39**
No. of Ascents reaching 250 hPa level 30 , MISDA:8

No. of PILOT Ascents

26/12Z	27/00Z
5	4

Buoy Data

26/12Z	27/00Z	27/03Z
5	6	7

STATUS OF CHENNAI REGION OBSERVATION

No. of Synop data

Date→	**26.11.2015**							
UTC→	**00**	**03**	**06**	**09**	**12**	**15**	**18**	**21**
Chennai Region (Coasts of AP & TN)	**20**	**22**	**20**	**20**	**22**	**20**	**20**	**20**

No. of RS/RW Ascents

00Z /26.11.2015 : 7
No. of Ascents reaching 250 hPa level = 7
MISDA : 1

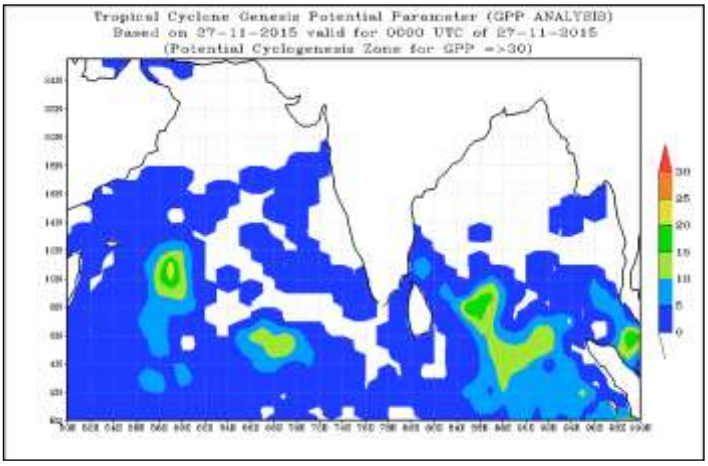
12Z /26.11.2015 : 1
No. of Ascents reaching 250 hPa level = 1
MISDA : 7

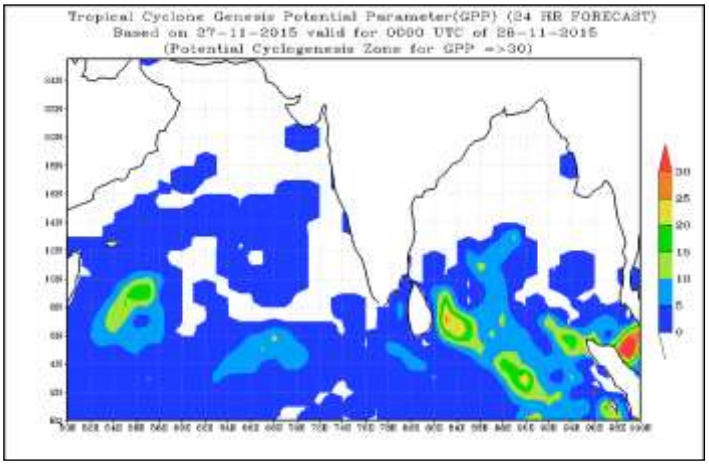
No. of PILOT Ascents:

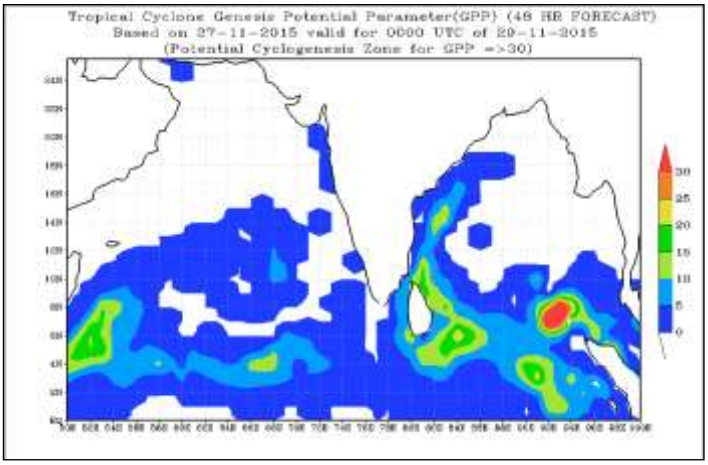
26.11.2015

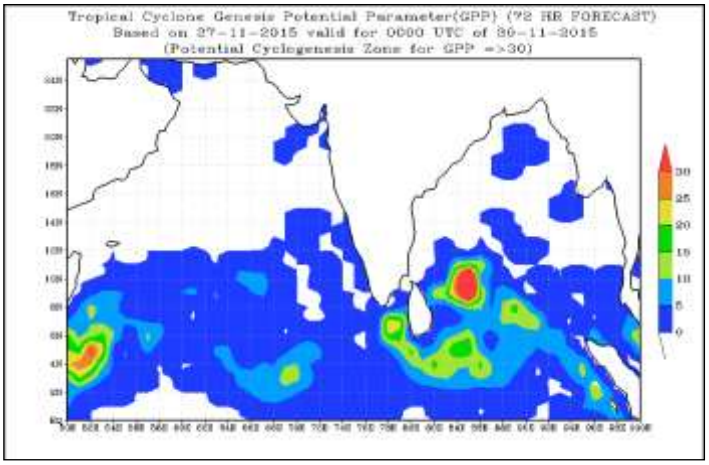
06Z	18Z
4	5

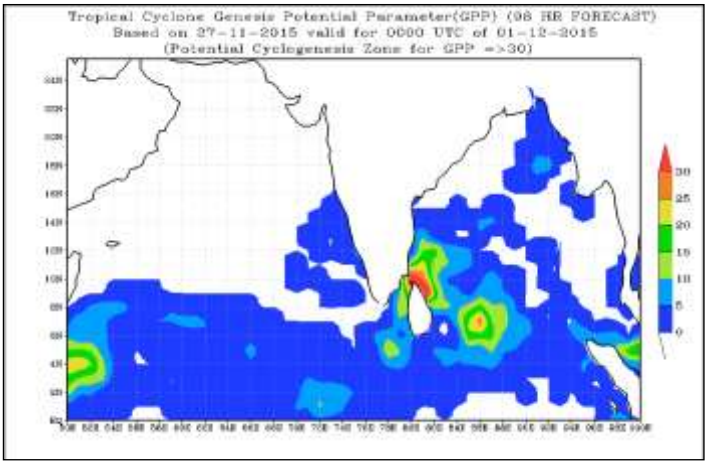
Annexure-II

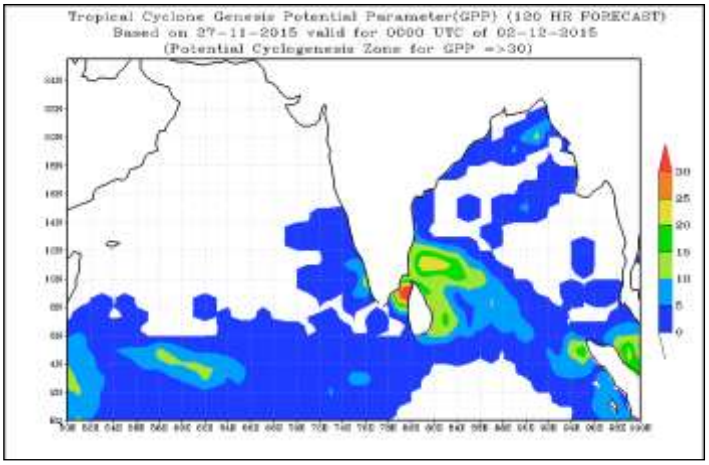

Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 27-11-2015 valid for 0000 UTC of 27-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

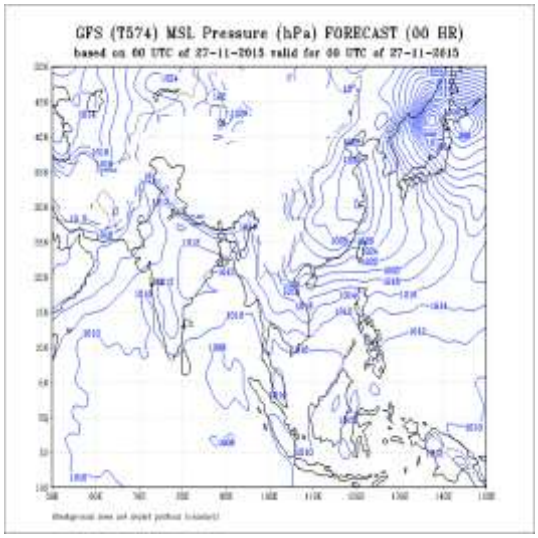

Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 27-11-2015 valid for 0000 UTC of 28-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

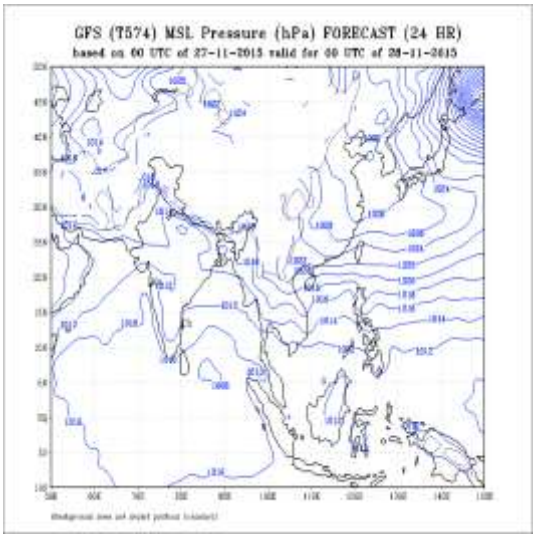

Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
Based on 27-11-2015 valid for 0000 UTC of 29-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

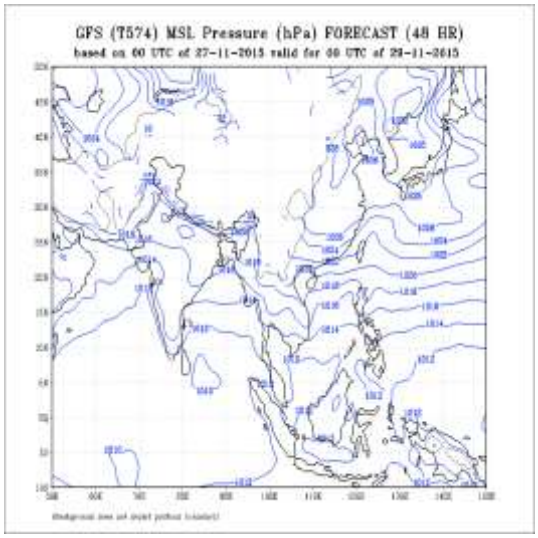

Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 27-11-2015 valid for 0000 UTC of 30-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

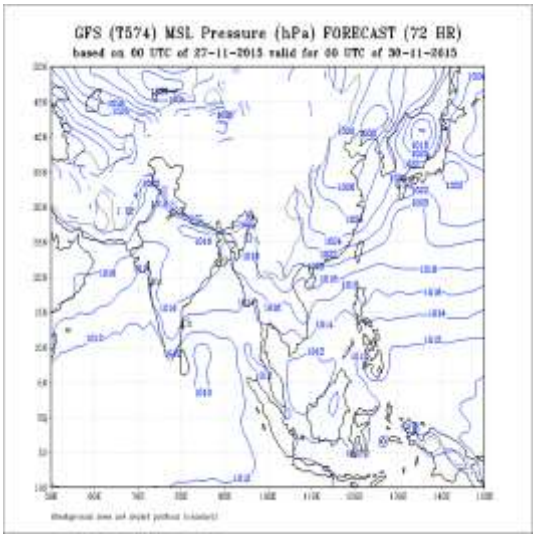

Tropical Cyclone Genesis Potential Parameter(GPP) (96 HR FORECAST)
Based on 27-11-2015 valid for 0000 UTC of 01-12-2015
(Potential Cyclogenesis Zone for GPP =>30)

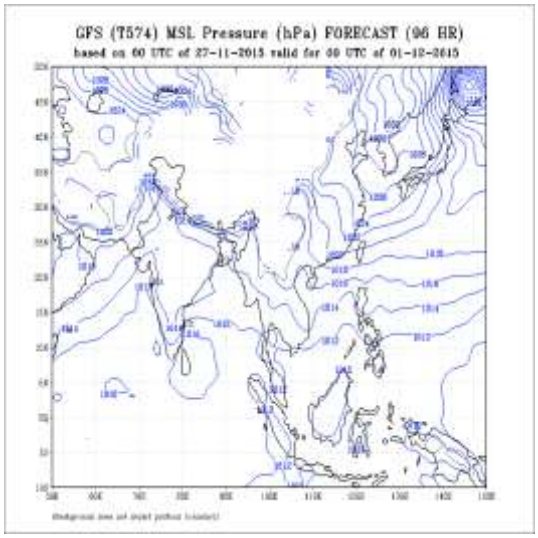

Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 27-11-2015 valid for 0000 UTC of 02-12-2015
(Potential Cyclogenesis Zone for GPP =>30)

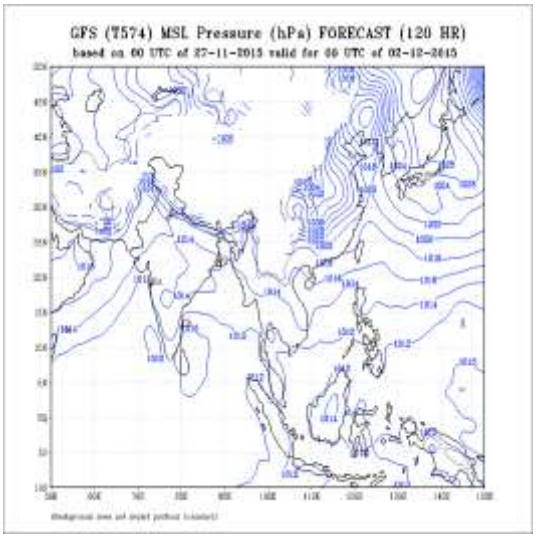

GFS (T574) MSL Pressure (hPa) FORECAST (00 HR)
based on 00 UTC of 27-11-2015 valid for 00 UTC of 27-11-2015

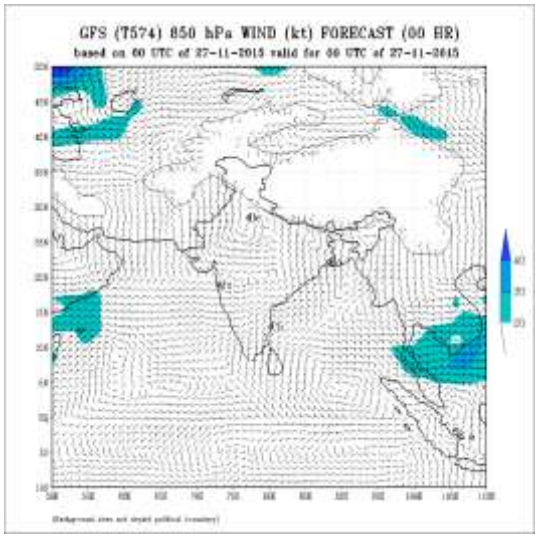

GFS (T574) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 27-11-2015 valid for 00 UTC of 28-11-2015

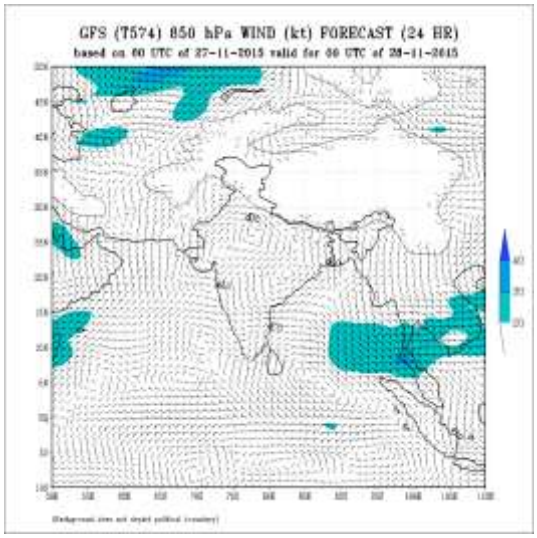

GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 27-11-2015 valid for 00 UTC of 29-11-2015

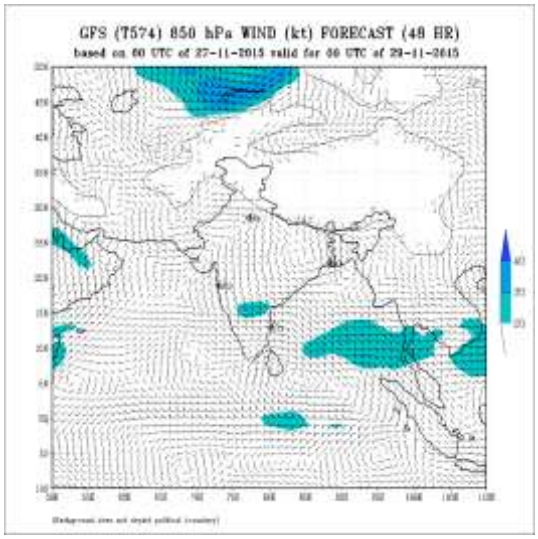

GFS (T574) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 27-11-2015 valid for 00 UTC of 30-11-2015

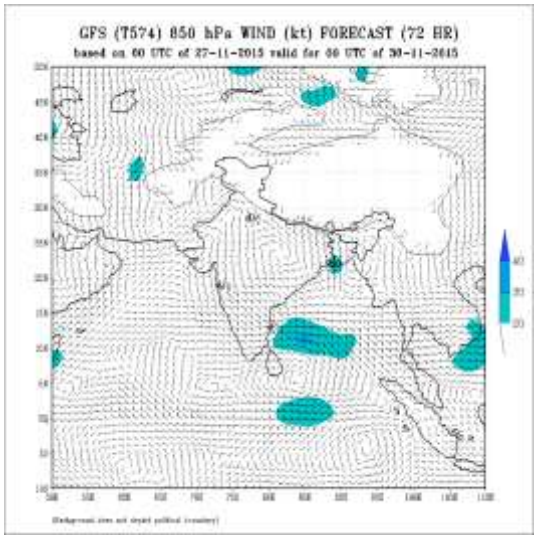

GFS (T574) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 27-11-2015 valid for 00 UTC of 01-12-2015

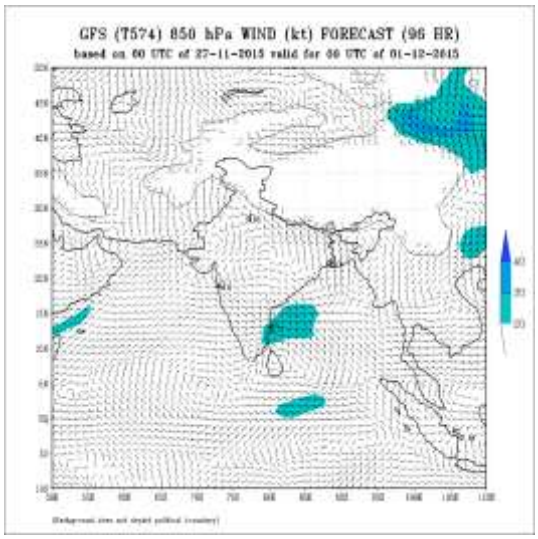

GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 27-11-2015 valid for 00 UTC of 02-12-2015

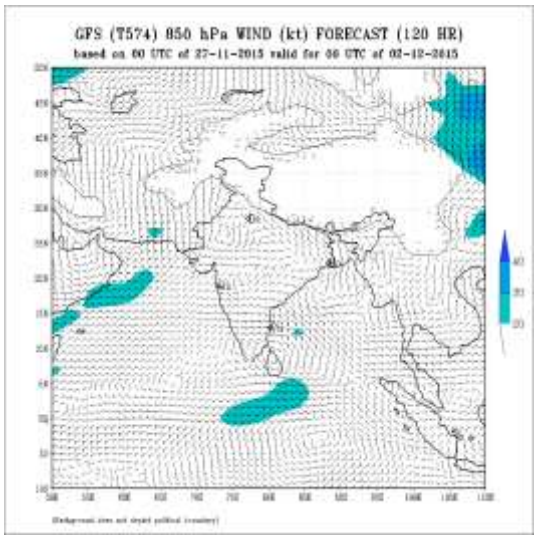

GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 27-11-2015 valid for 00 UTC of 27-11-2015

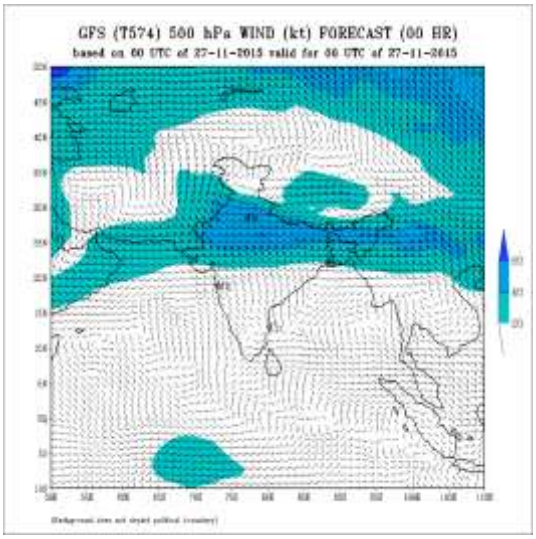

GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 27-11-2015 valid for 00 UTC of 28-11-2015

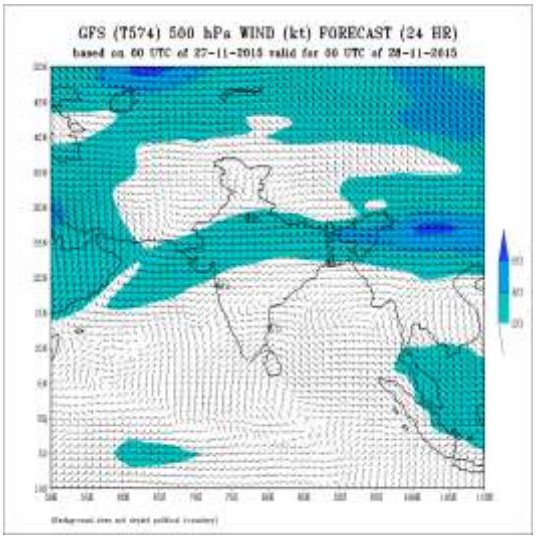

GFS (T574) 850 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 27-11-2015 valid for 00 UTC of 29-11-2015

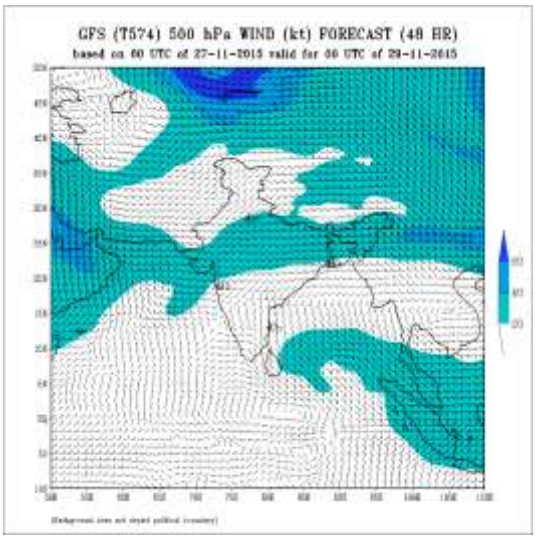

GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 27-11-2015 valid for 00 UTC of 30-11-2015

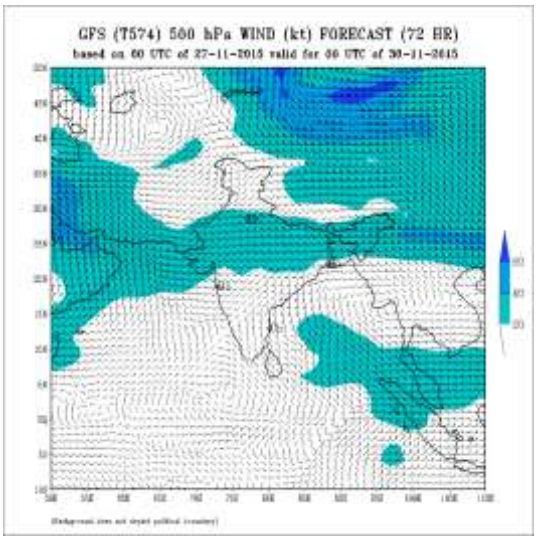

GFS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 27-11-2015 valid for 00 UTC of 01-12-2015

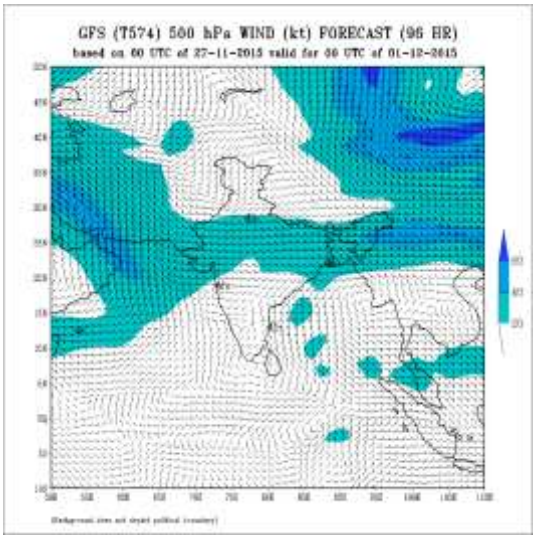

GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 27-11-2015 valid for 00 UTC of 02-12-2015

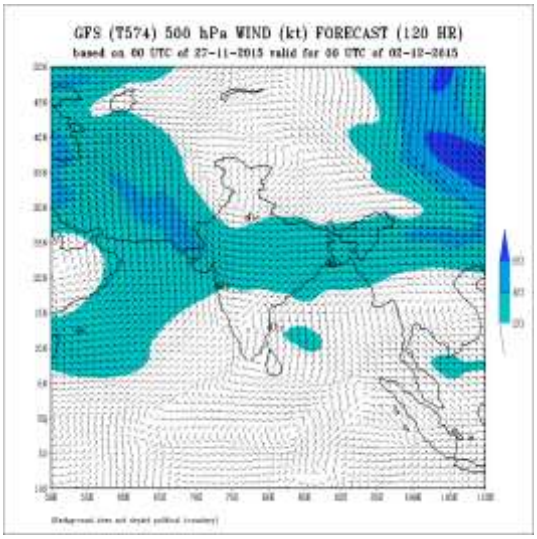

GFS (T574) 500 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 27-11-2015 valid for 00 UTC of 27-11-2015

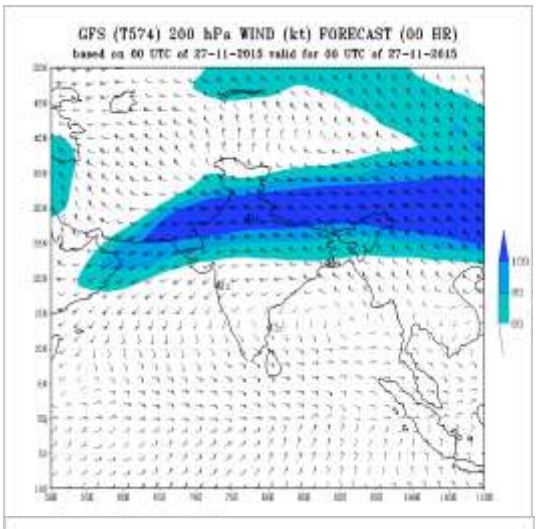

GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 27-11-2015 valid for 00 UTC of 28-11-2015

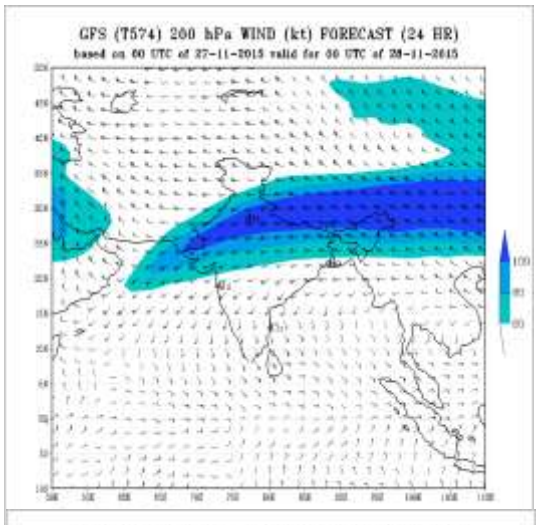

GFS (T574) 500 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 27-11-2015 valid for 00 UTC of 29-11-2015

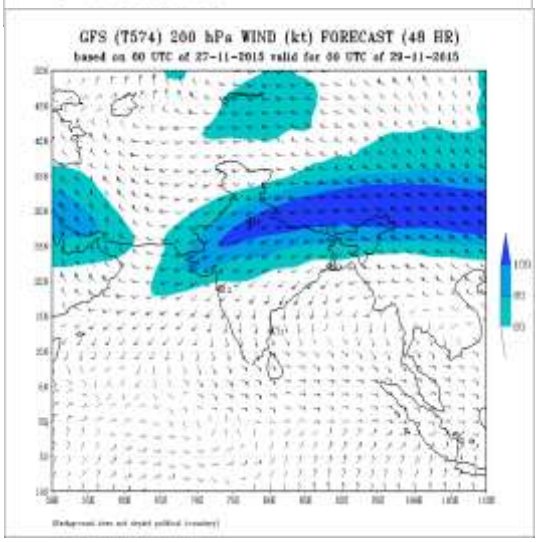

GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 27-11-2015 valid for 00 UTC of 30-11-2015

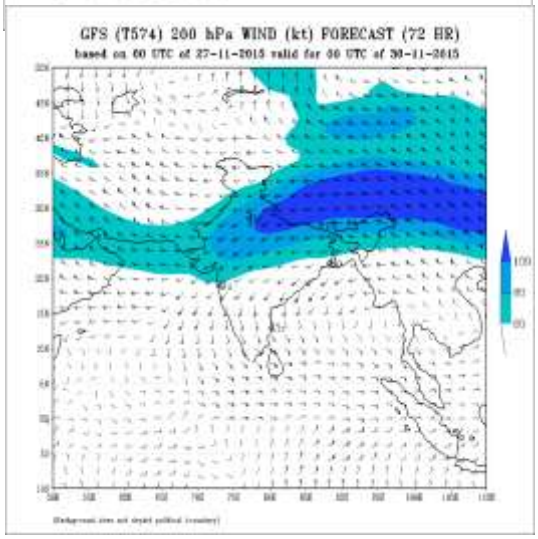

GFS (T574) 500 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 27-11-2015 valid for 00 UTC of 01-12-2015

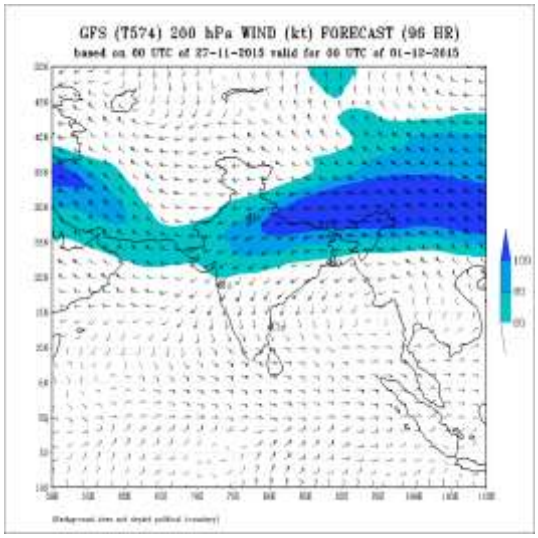

GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 27-11-2015 valid for 00 UTC of 02-12-2015

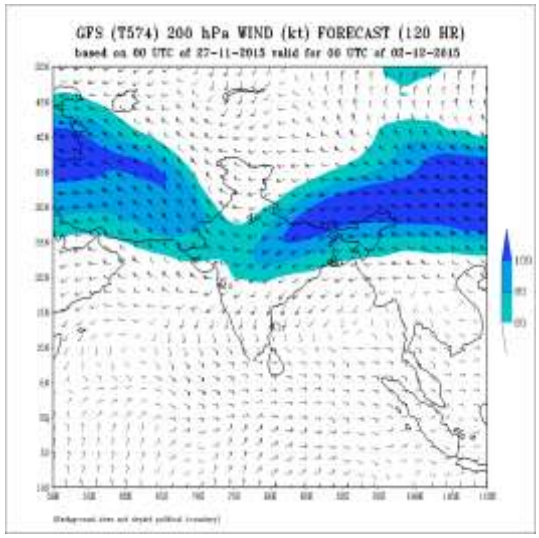

GFS (T574) 200 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 27-11-2015 valid for 00 UTC of 27-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 27-11-2015 valid for 00 UTC of 28-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 27-11-2015 valid for 00 UTC of 29-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 27-11-2015 valid for 00 UTC of 30-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 27-11-2015 valid for 00 UTC of 01-12-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 27-11-2015 valid for 00 UTC of 02-12-2015

FDP (Cyclone) NOC Report Dated 28 November, 2015

Synoptic features:

- The trough of low at mean sea level over southeast Bay of Bengal & neighbourhood now lies over southwest Bay of Bengal & neighbourhood with an upper air cyclonic circulation aloft extending upto 3.6 km above mean sea level.

Surface Temperature (SST):

- SST is 26-28°C over extreme northern and adjoining extreme west central parts of Bay of Bengal and 30-31°C over north Andaman Sea and between 28-30°C over rest part of BoB.
- SST is 26-28°C over north and adjoining west central AS and 30-31°C over some parts of southcentral AS. It is 28-30°C over rest part of AS.

Tropical Cyclone Heat Potential (TCHP):

- TCHP is below 50kJ/cm^2 over extreme north and adjoining parts of west central BoB, 90-110 kJ/cm^2 over south Andaman Sea,100-130 kJ/cm^2 between some equatorial parts and 4^0 N of south central BoB and between 50-90 kJ/cm^2 over rest parts of BoB.
- TCHP is below 50kJ/cm^2 over northwest extending up to some southwest parts of AS and 90-110 kJ/cm^2over southcentral and adjoining southeast, east central parts of AS.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive and is 25-40x10-5s-1 over southwest BoB and adjoining south Andaman sea and equatorial region. It is negative over northeast and eastcentral BoB.
- It is 25-40x10-5s-1 over southwest, about 10-25x10-5s-1 over adjoining southeast AS and some parts of northeast AS. It is negative over remaining parts of AS.

Convergence:

- Lower level convergence is about 10-15 x $10^{-5}s^{-1}$ over central and adjoining southwest BoB, Lower level convergence is between -5 to +5 x $10^{-5}s^{-1}$ over AS

Divergence:

- Upper level divergence is 20x10-5 s-1 over southwest BoB and between 10-20x10-5 s-1 over some parts of equatorial region of BoB.
- Upper level divergence is about 20-30x10^{-5} s-1 over extreme southeast AS, 10x10^{-5} s-1 over some parts of southwest and northeast AS and negative -5 x10-5 s-1 over rest parts of northwest AS.

Wind Shear:

- Wind shear is 5-10 knots over southwest BoB and Andaman Sea and is increasing towards north of BoB.
- Wind shear is 5-10 knots over extreme southwest and adjoining southeast AS and is increasing towards northern parts of AS.

Wind Shear Tendency:

- There is decreasing tendency (-10-20 Knots) over southwest adjoining southeast BoB. It is positive over north Andaman Sea.
- The shear tendency is decreasing -5-10 knots over southwest and northeast AS and decreasing significantly (-20-30) over northwest AS, increasing +5+10 knots over some parts of southcentral AS.

Upper tropospheric ridge:

- The upper tropospheric ridge at 200 hPa runs along 13.0°N over AS and 14.0°N over BoB.

M.J.O. Index:

- MJO index is in Phase 3 with amplitude greater than 1 and would remain in phase 3 during next subsequent 2 days.

Storms and Depression over South China Sea/ South Indian Ocean:
No significant system over South China Sea/ south Indian Ocean:

Satellite Bulletin based on INSAT imagery:

Bay of Bengal & Andaman Sea:-
According to satellite imagery, broken low / medium clouds with embedded moderate to intense convection lies over southwest Bay of Bengal adjoining Indian Ocean in association with feeble low level circulation over the southwest Bay of Bengal.
Arabian Sea:-
Broken low / medium clouds with embedded moderate to intense convection lies over area between latitude 5.0N to latitude 22.0N east if longitude 55.0E.

NWP Input for FDP Cyclone based on 0000 UTC
NWP Analysis

IMD-GFS and IMD-WRF model product analysis based on 0000 UTC of 28 November 2015 shows no significant weather system over the North Indian Seas. The forecasts based on the analysis do not show any significant weather system during next 24 hours. In the forecast charts, there is a cyclogenesis over south-east Bay of Bengal in day 2 which moves north-westward direction over southwest BOB and Sri Lanka Coast during next 3 days.
Genesis Potential Parameter (GPP):
The GPP forecast charts show the same significant zone of cyclogenesis over SW Bay on 30th Nov.

NWP products are available at:
http://202.54.31.51/bias/gfsproducts.php
http://202.54.31.51/bias/wrf27pro.php
http://202.54.31.51/bias/potentialparameter.php

NCMRWF-NCUM: Model suggests formation of a low pressure area on 29th over southwest BoB, which moves west-northwestwards towards TN coast on 30th Nov.
NCMRWF-GFS: Model suggests formation of a low pressure area on 29th over southwest BoB moving westward towards TN coast on 02nd Dec .
ECMWF. : ECMWF suggests formation of a low pressure area on 29th over southwest BoB. It becomes well-marked on 01st Dec off Sri Lanka coast. It subsequently moves northward and is off Tamil Nadu coast on 02nd Dec. Thereafter, it recurves northeastward along and off Andhra Pradesh coast.
NCEP-GFS : Model suggests formation of a feeble low pressure area on 28th over southcentral BoB moving westward towards Sri Lanka coast on 30th November and persisting there for next 3 day with slow north-northwestward movement.
JMA: JMA Model indicates a low pressure area over southcentral BOB on 28th which moves slowing west-northwestward towards Sri Lanka.

ARP-Meteo France ARP Model indicates low pressure area over southwest BoB moving west-northwestward towards Sri Lanka coast during 29th-30th.

Summary and Conclusion:

The trough of low at mean sea level over southeast Bay of Bengal & neighbourhood now lies over southwest Bay of Bengal & neighbourhood with an upper air cyclonic circulation aloft extending upto 3.6 km above mean sea level. Under its influence, a low pressure area may form by 29th Nov. Some models suggest that It may move initially west-northwestwards and then recurve over southwest and adjoining westcentral Bay of Bengal. Other move it west-northwestwards towards Sri Lanka and TN coast by 30 Nov.

Bay of Bengal and Andaman Sea:

Probability of cyclogenesis over Bay of Bengal and Andaman Sea during next 120 hours:

24 HOURS	24-48 HOURS	48-72 HOURS	72-96 HOURS	96-120 HOURS
Nil	Nil	Nil	Nil	Nil

Arabian Sea:

Probability of cyclogenesis over Arabian Sea during next 120 hours:

24 HOURS	24-48 HOURS	48-72 HOURS	72-96 HOURS	96-120 HOURS
Nil	Nil	Nil	Nil	Nil

Advisory: IOP will be conducted along TN and Puducherry coasts on 29 Nov. to 01 Dec. 2015.

Annexure-I

Status of observational system:

Synoptic observation:

Region	Date/Time (UTC)		
	27/12	**28/00**	**28/03**
India	43	30	44
Coastal stations			
WB	9	3	9
Odisha	6	5	6
AP	11	11	12
Tamil Nadu	11	9	11
Puducherry	1	1	1
A & N	5	1	5
Bangladesh	9	9	10
Myanmar	6	2	7
Thailand	0	0	0
SriLanka	10	8	10

AWS Observations:

Region	Date/Time (UTC)		
	27/12	**28/00**	**28/03**
India	43	41	43
Coastal stations			
WB	3	4	4
Odisha	5	6	6
AP	11	10	11
Tamil Nadu	23	20	21
Puducherry	1	1	1
A & N	0	0	0

RS/RW (12Z) of 27/11/2015 **5/39**
No. of Ascents reaching 250 hPa level: 4:, MISDA: -

RS/RW (00Z) of 28/11/2015- **23/39**
No. of Ascents reaching 250 hPa level 22 , MISDA:3

No. of PILOT Ascents

27/12Z	28/00Z
6	5

Buoy Data

27/12Z	28/00Z	28/03Z
8	9	9

STATUS OF CHENNAI REGION OBSERVATION

No. of Synop data

Date→				**27.11.2015**				
UTC→	**00**	**03**	**06**	**09**	**12**	**15**	**18**	**21**
Chennai Region (Coasts of AP & TN)	**20**	**22**	**20**	**20**	**22**	**20**	**20**	**20**

No. of RS/RW Ascents

00Z /27.11.2015 : 7
No. of Ascents reaching 250 hPa level = 7
MISDA : 1

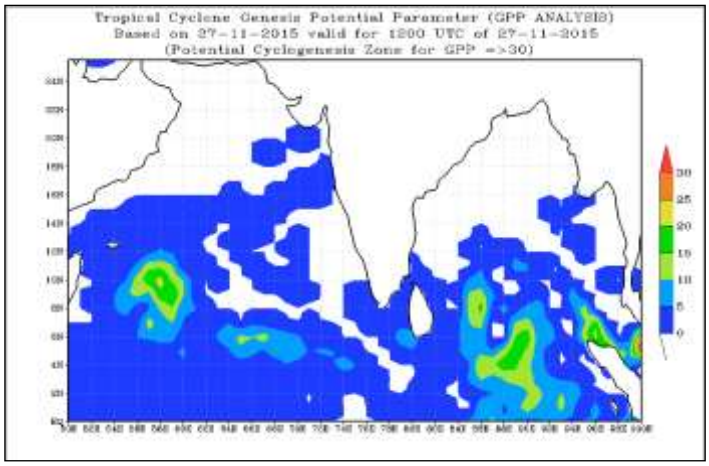
12Z /27.11.2015 : 1
No. of Ascents reaching 250 hPa level = 1
MISDA : 7

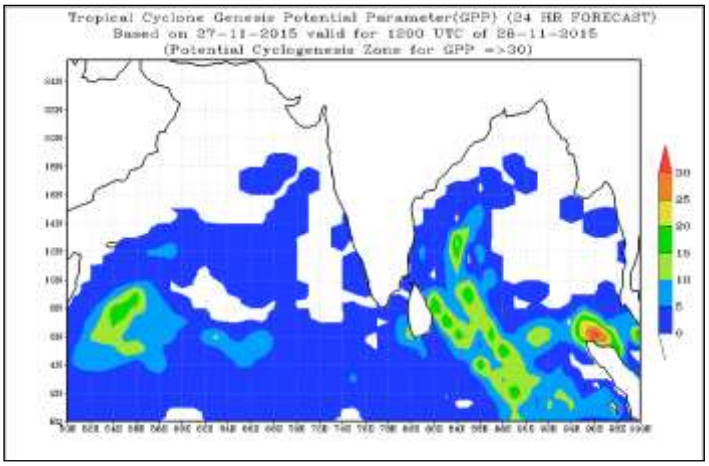
No. of PILOT Ascents:

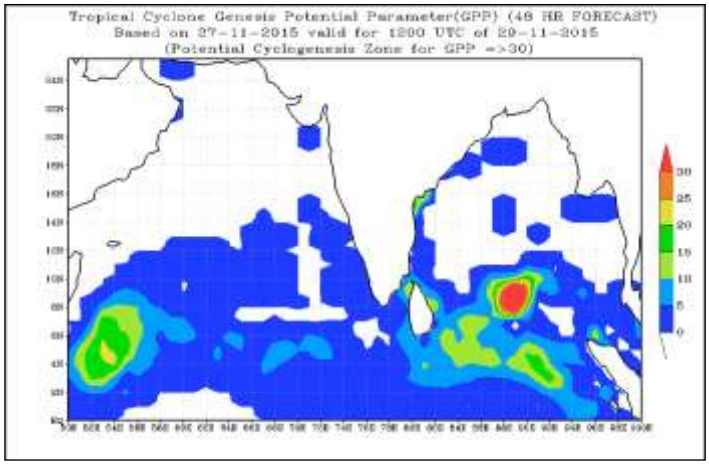
27.11.2015

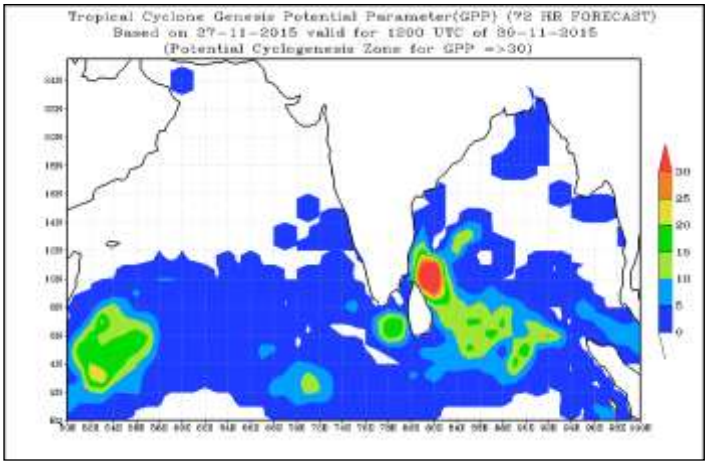
06Z	18Z
4	5

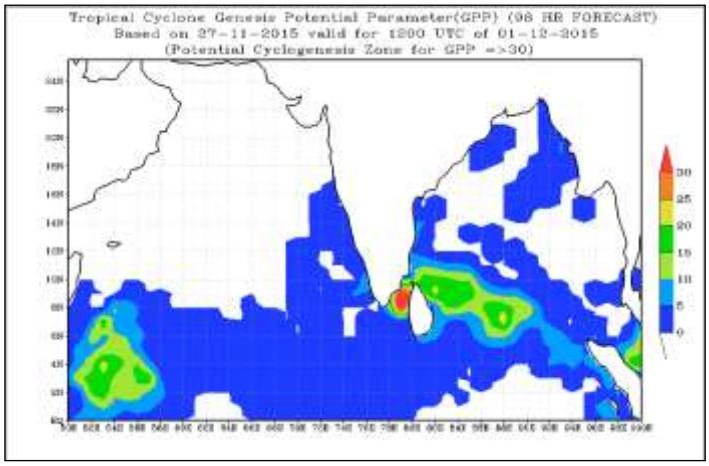
Annexure-II

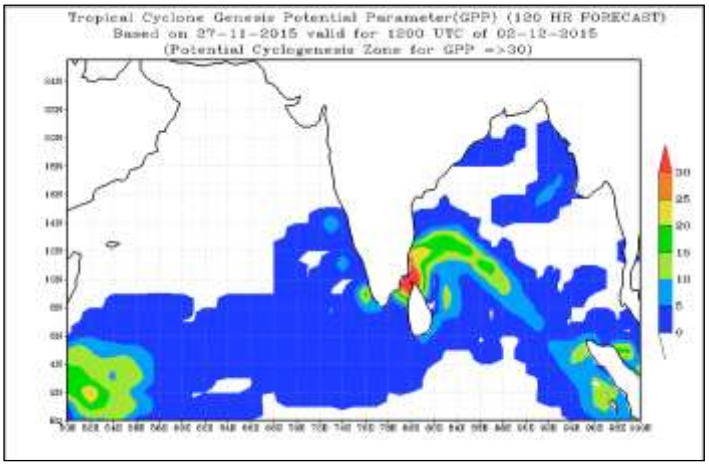

Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 27-11-2015 valid for 1200 UTC of 27-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

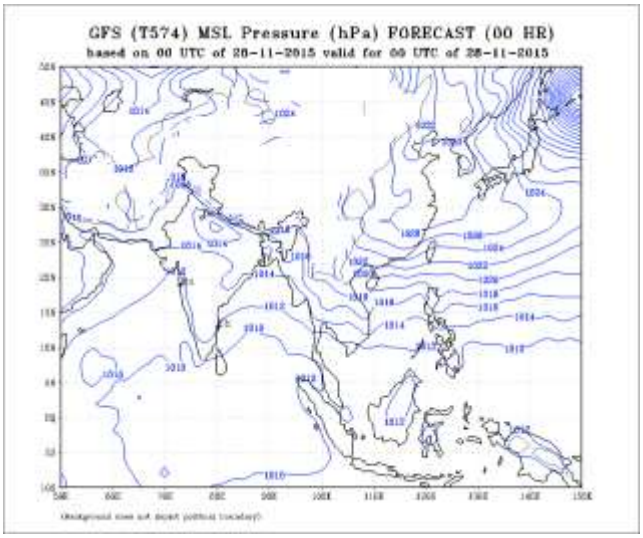

Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 27-11-2015 valid for 1200 UTC of 28-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

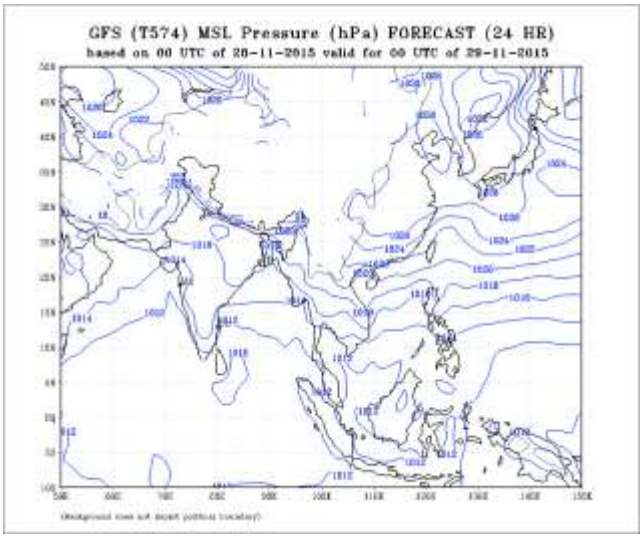

Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
Based on 27-11-2015 valid for 1200 UTC of 29-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

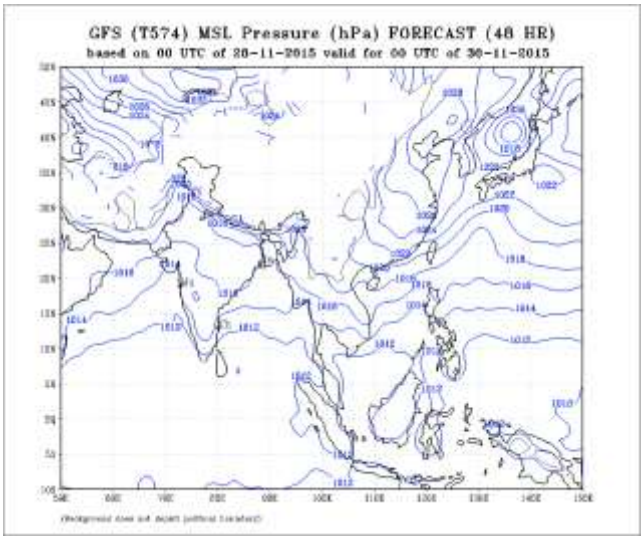

Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 27-11-2015 valid for 1200 UTC of 30-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

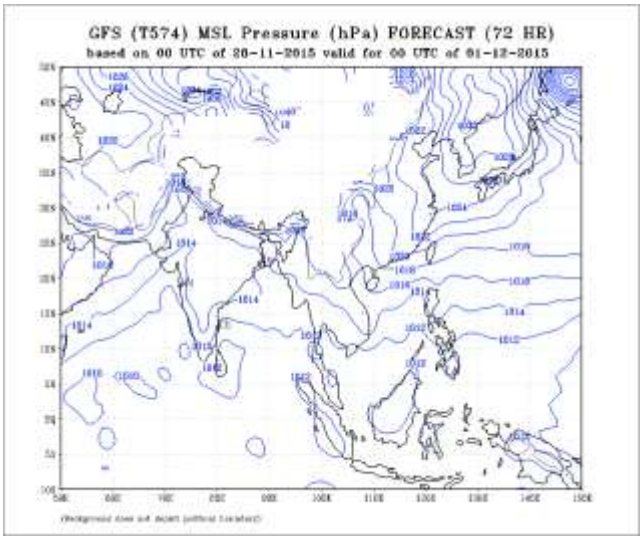

Tropical Cyclone Genesis Potential Parameter(GPP) (96 HR FORECAST)
Based on 27-11-2015 valid for 1200 UTC of 01-12-2015
(Potential Cyclogenesis Zone for GPP =>30)

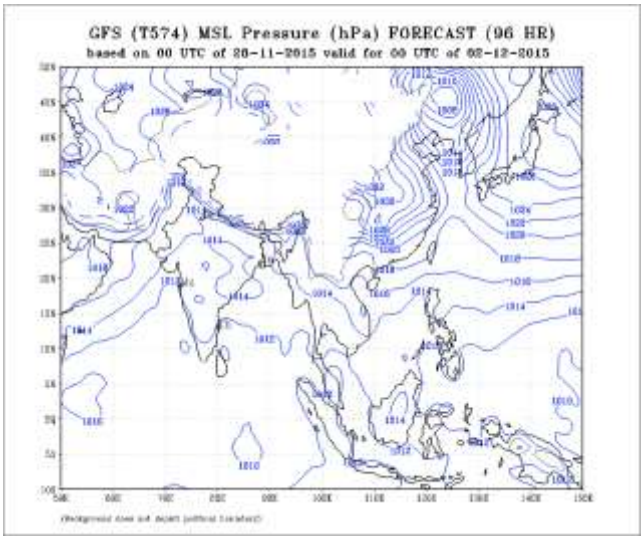

Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 27-11-2015 valid for 1200 UTC of 02-12-2015
(Potential Cyclogenesis Zone for GPP =>30)

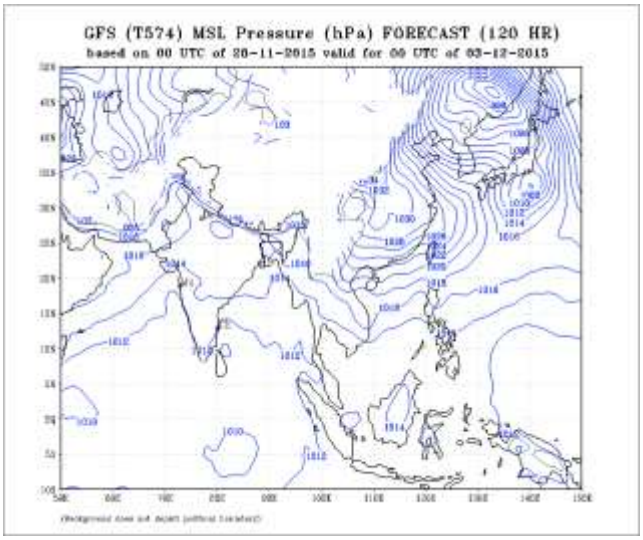

GFS (T574) MSL Pressure (hPa) FORECAST (00 HR)
based on 00 UTC of 28-11-2015 valid for 00 UTC of 28-11-2015

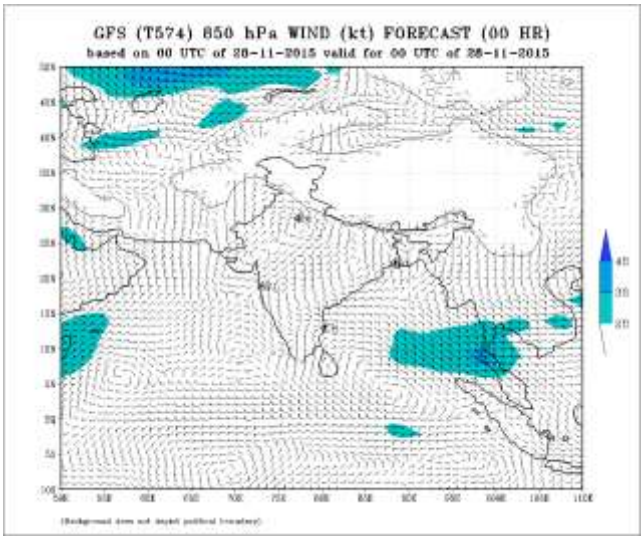

GFS (T574) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 28-11-2015 valid for 00 UTC of 29-11-2015

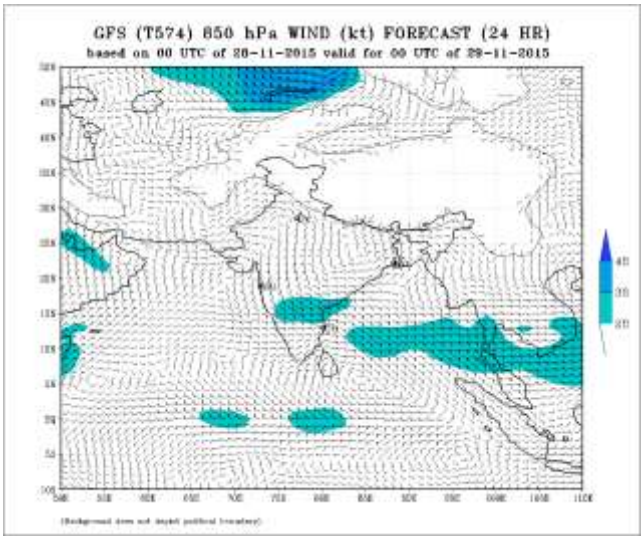

GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 28-11-2015 valid for 00 UTC of 30-11-2015

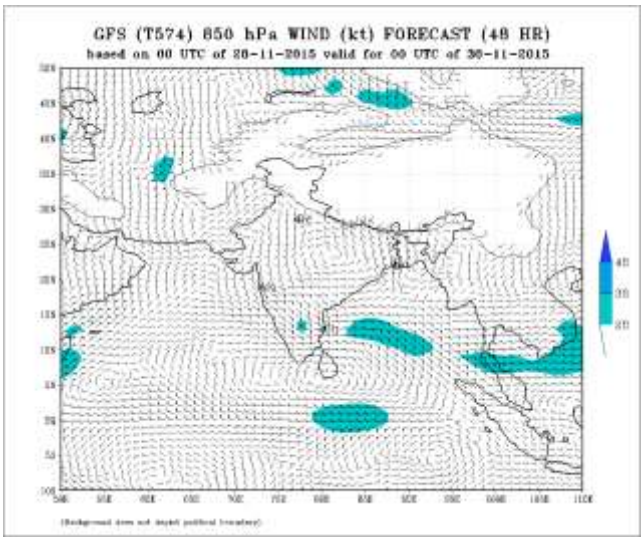

GFS (T574) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 28-11-2015 valid for 00 UTC of 01-12-2015

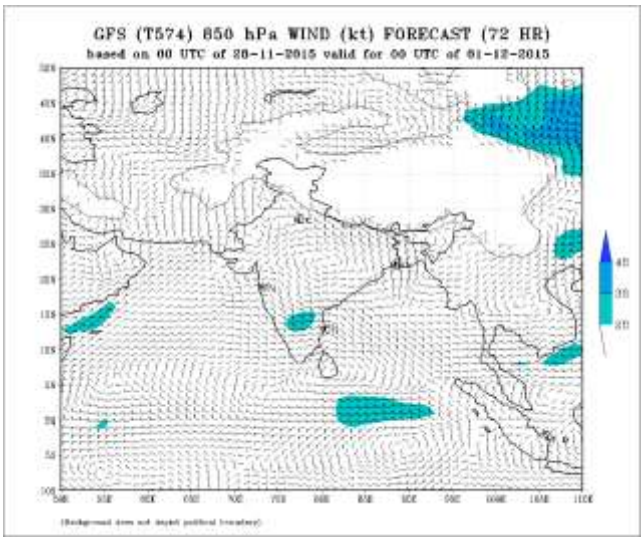

GFS (T574) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 28-11-2015 valid for 00 UTC of 02-12-2015

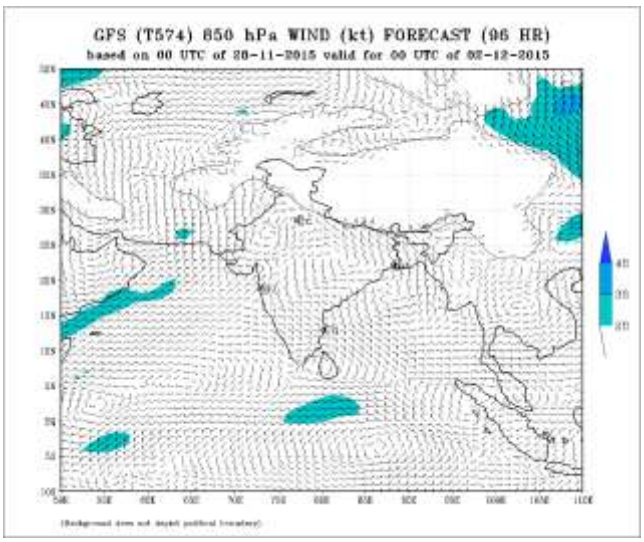

GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 28-11-2015 valid for 00 UTC of 03-12-2015

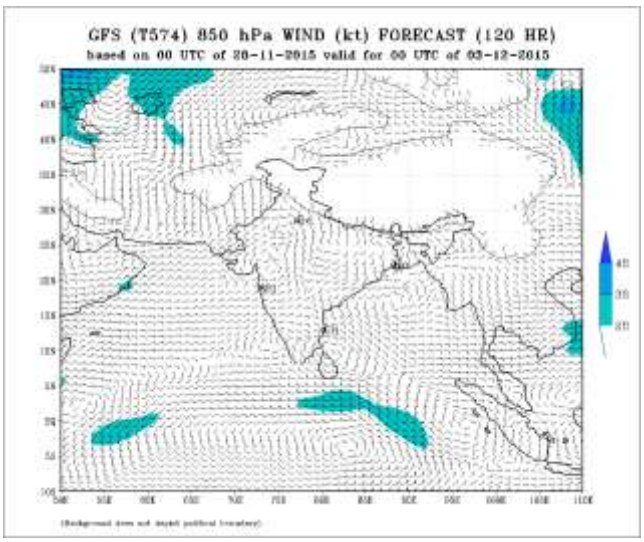

GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 28-11-2015 valid for 00 UTC of 28-11-2015

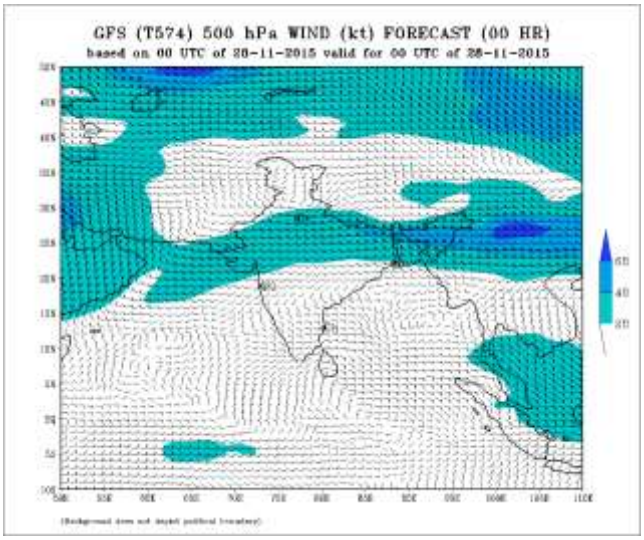

GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 28-11-2015 valid for 00 UTC of 29-11-2015

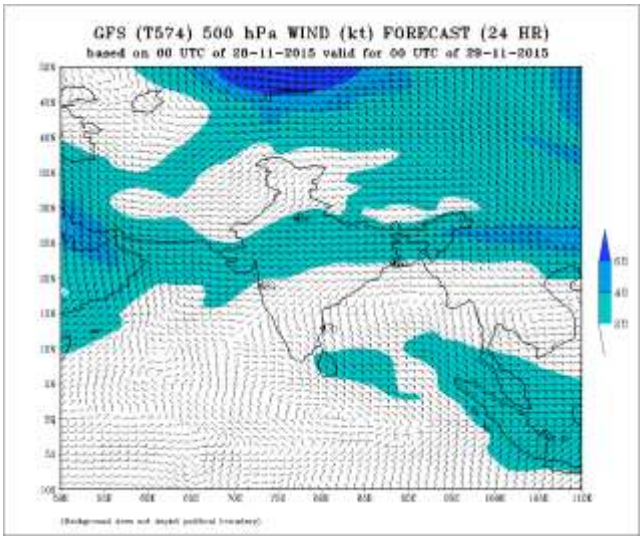

GFS (T574) 850 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 28-11-2015 valid for 00 UTC of 30-11-2015

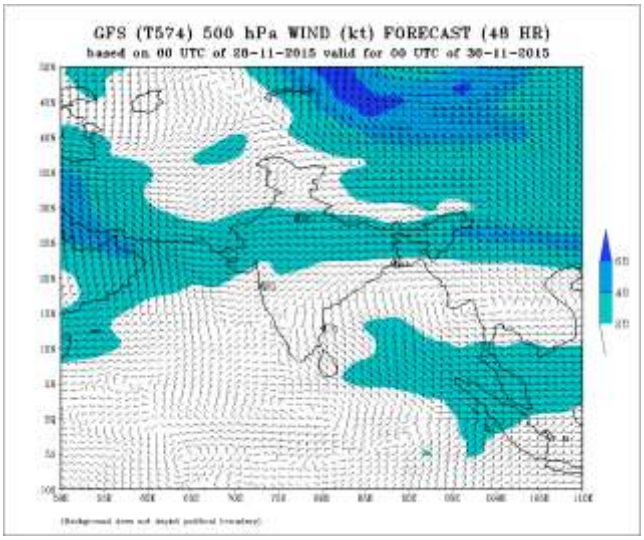

GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 28-11-2015 valid for 00 UTC of 01-12-2015

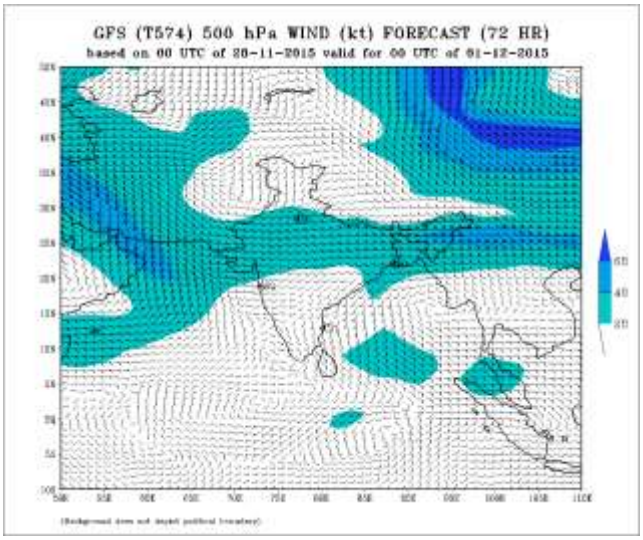

GFS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 28-11-2015 valid for 00 UTC of 02-12-2015

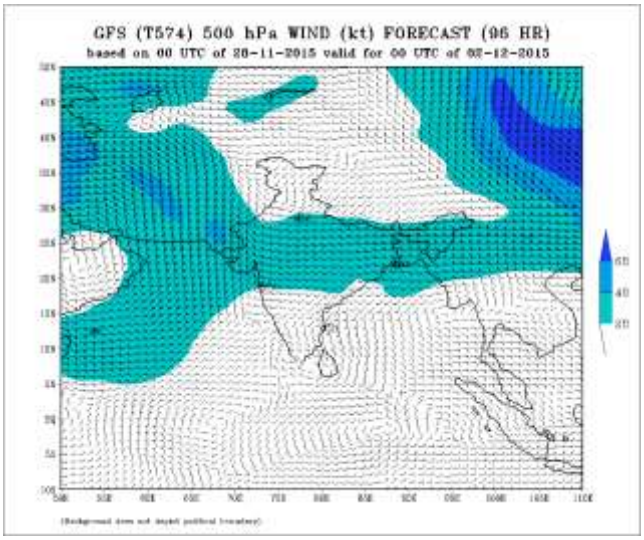

GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 28-11-2015 valid for 00 UTC of 03-12-2015


GFS (T574) 500 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 28-11-2015 valid for 00 UTC of 28-11-2015


GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 28-11-2015 valid for 00 UTC of 29-11-2015


GFS (T574) 500 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 28-11-2015 valid for 00 UTC of 30-11-2015


GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 28-11-2015 valid for 00 UTC of 01-12-2015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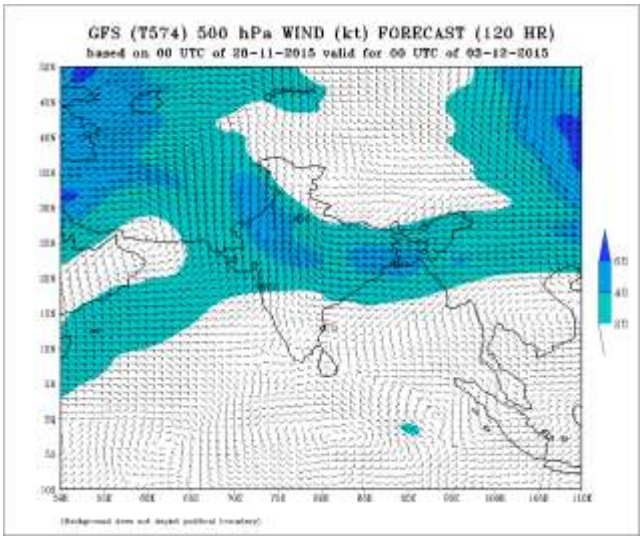
based on 00 UTC of 28-11-2015 valid for 00 UTC of 02-12-2015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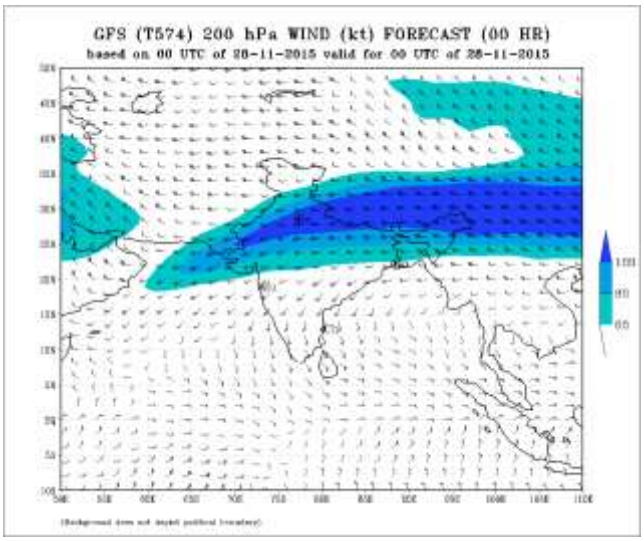
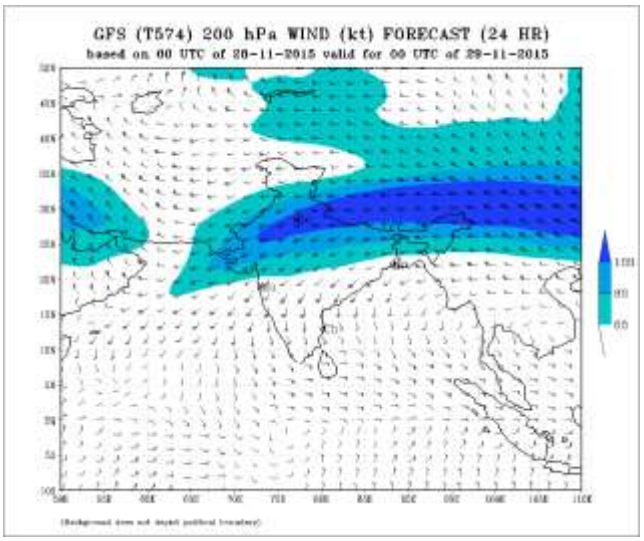
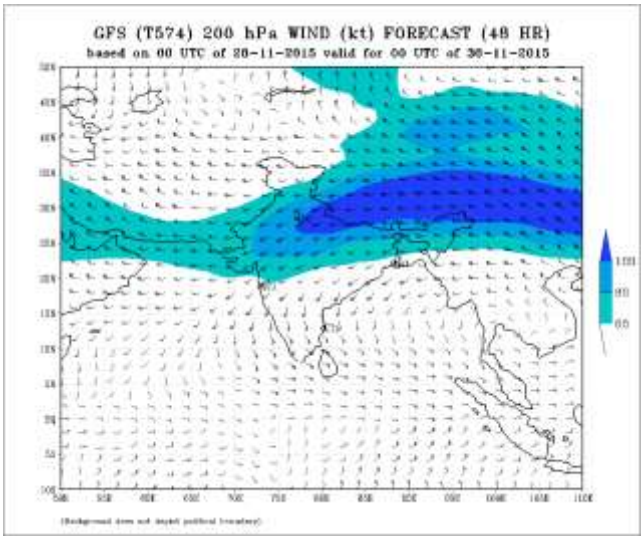
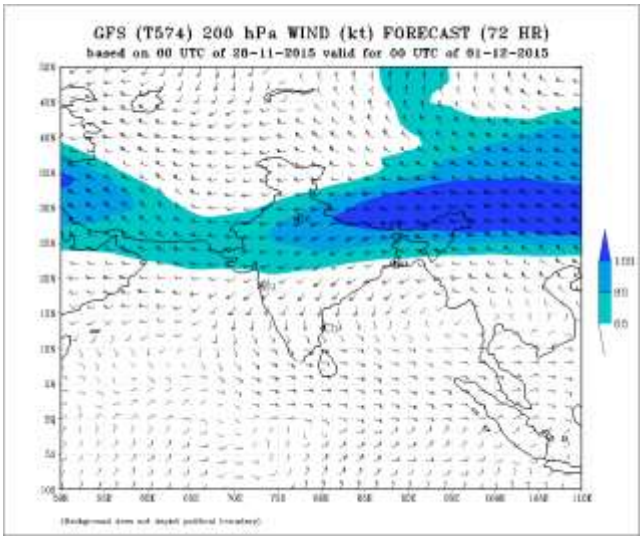
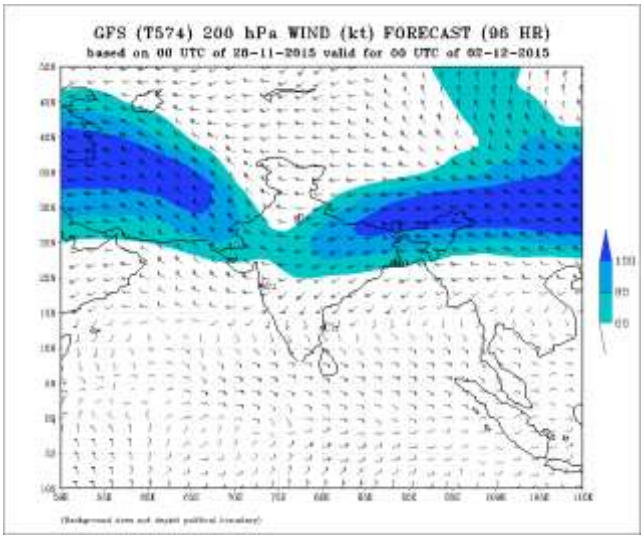
based on 00 UTC of 28-11-2015 valid for 00 UTC of 03-12-2015

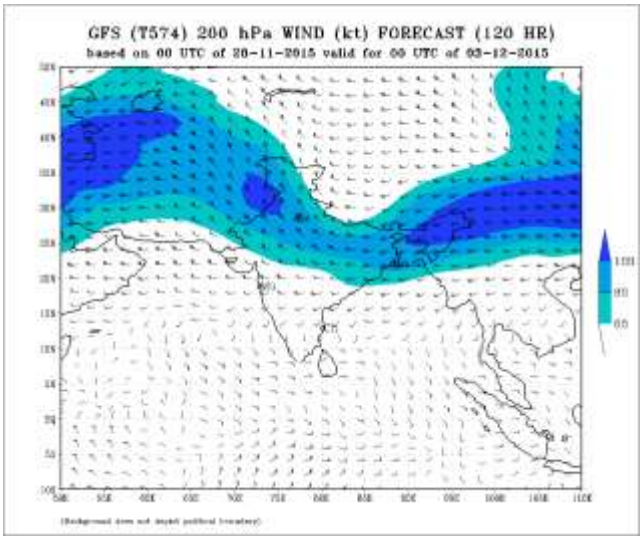

GFS (T574) 200 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 28-11-2015 valid for 00 UTC of 28-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 28-11-2015 valid for 00 UTC of 29-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 28-11-2015 valid for 00 UTC of 30-11-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 28-11-2015 valid for 00 UTC of 01-12-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 28-11-2015 valid for 00 UTC of 02-12-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 28-11-2015 valid for 00 UTC of 03-12-2015

FDP (Cyclone) NOC Report Dated 29 November, 2015

Synoptic features:

- The trough of low over southeast Bay of Bengal and adjoining south Andaman Sea with an upper air cyclonic circulation aloft persists and now extends upto 3.1 km above mean sea level.
- Under its influence, a low pressure area would form over southwest and adjoining southeast Bay of Bengal during next 24 hours.

Surface Temperature (SST):

- SST is 26-28°C over extreme northern and adjoining extreme west central parts of Bay of Bengal and 30-31°C over north Andaman Sea and between 28-30°C over rest part of BoB.
- SST is 26-28°C over north and adjoining west central AS and 30-31°C over southcentral AS. It is 28-30°C over southeast BoB adjoining south Andaman Sea and rest part of AS.

Tropical Cyclone Heat Potential (TCHP):

- TCHP 90-110 kJ/cm^2 over southeast BoB and adjoining south Andaman Sea,100-130 kJ/cm^2 between some equatorial parts and 4^0 N of south central BoB and between 50-90 kJ/cm^2 over rest parts of BoB except extreme north and adjoining parts of west central BoB where it is below 50kJ/$cm^{2.}$
- TCHP is below 50kJ/cm^2 over north AS extending up to some westcentral and southwest parts of AS and 90-110 kJ/cm^2over southcentral and adjoining southeast, east central parts of AS.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive and is 25-40x10-5s-1 over southwest BoB and adjoining south Andaman Sea and equatorial region. It is negative over northeast and central BoB.
- It is 25-40x10-5s-1 over southwest, about 10-25x10-5s-1 over adjoining southeast AS and some parts of northeast AS. It is negative over remaining parts of AS.

Convergence:

- Lower level convergence is about 10-15 x $10^{-5}s^{-1}$ over central and adjoining southwest BoB & south Andaman Sea .
- Lower level convergence is between -5 to +5 x $10^{-5}s^{-1}$ over AS

Divergence:

- Upper level divergence is 20-30x10-5 s-1 over southeast and adjoining southwest BoB and 10-20x10-5 s-1 between some parts of equatorial region and extreme southcentral BoB.
- Upper level divergence is about 20x10^{-5} s-1 over extreme southwest AS, and negative -5 x10-5 s-1 over rest parts of AS.

Wind Shear:

- Wind shear is 5-10 knots over southeast BoB and adjoining south Andaman Sea and is increasing towards northern parts of BoB.
- Wind shear is 5-10 knots over extreme southwest and adjoining southeast AS and is increasing towards northern parts of AS.

Wind Shear Tendency:

- There is decreasing tendency (-5-10 Knots) over southeast BOB and adjoining south Andaman Sea. It is positive (10-20 knots) over southwest and adjoining westcentral BoB.
- The shear tendency is increasing (10 knots) over south AS and adjoining northeast AS and decreasing significantly (-20-30) over northwest AS.

Upper tropospheric ridge:

- The upper tropospheric ridge at 200 hPa runs along 10.0°N over AS and 13.0°N over BoB.

M.J.O. Index:

- MJO index is in Phase 3 with amplitude greater than 1 and would remain in phase 3 during next subsequent 2 days.

Storms and Depression over South China Sea/ South Indian Ocean:

No significant system over South China Sea/ south Indian Ocean:

Satellite Bulletin based on INSAT imagery:

Bay of Bengal & Andaman Sea:-

According to satellite imagery, broken low / medium clouds with embedded moderate to intense convection lies over southeast, adjoining southwest Bay of Bengal and adjoining Indian Ocean in association with feeble low level circulation over southeast Bay of Bengal and adjoining south Andaman Sea.

Scattered low / medium clouds with embedded isolated moderate to intense convection over rest Bay of Bengal south of latitude 18.0˚N west of long 89.0˚E.

Arabian Sea:-

Broken low / medium clouds with embedded moderate to intense convection lies over area between latitude 5.0˚N to latitude 13.5 ˚N longitude 50.0˚E to 69.0˚E.

NWP Input for FDP Cyclone based on 0000 UTC

NWP Analysis

IMD-GFS and IMD-WRF model analyses based on 0000 UTC of 29 November 2015 show a cyclonic circulation in the lower troposphere up to 700 hPa over south Bay of Bengal which moves west-north-westward direction over southwest BOB and Sri Lanka during next 3 days in the model forecasts.

Genesis Potential Parameter (GPP):

The GPP charts do not show any significant cyclogenesis over the region during next 3 days.

NWP products are available at:

http://202.54.31.51/bias/gfsproducts.php
http://202.54.31.51/bias/wrf27pro.php
http://202.54.31.51/bias/potentialparameter.php

NCMRWF-NCUM: Model suggests a feeble low pressure area over southwest BoB, which initially moves westwards towards Sri Lanka coast and thereafter west-northwestwards towards TN coast on 01 Dec.

It suggests formation of low pressure area on 30th Nov over southwest AS which persist over the same area for next 5 days. It also suggests formation of another low pressure area on 06th Dec over southeast AS which persists over the same area for next 3 days with gradual intensification.

NCMRWF-GFS: Model suggests a feeble low pressure area on 29th over southwest BoB moving westward towards TN coast on 01st Dec and persists over the same area for next 2-3 day and weakens thereafter. Another feeble low over southwest AS would persist over the same region for next 3-4 days with gradual intensification.

ECMWF: ECMWF suggests formation of a low pressure area over southwest BoB moving towards Sri Lanka coast on 01st Dec. It subsequently moves westwards towards southeast Arabian Sea during next subsequent 2-3 days.

NCEP-GFS : Model suggests formation of a feeble low pressure area on over southwest BoB moving westward towards Sri Lanka coast on 30th November and persisting there for next 3 day with slow north-northwestward movement thereafter moving westwards towards southeast AS during next subsequent 2-3 days.

JMA: JMA Model indicates a low pressure area over southwest BOB moves slowing westwards towards Sri Lanka on 01st Dec thereafter moving towards Lakshadweep on 2ndDec.

ARP-Meteo France ARP Model indicates low pressure area over southwest BoB moving westward towards Sri Lanka coast on 1st Dec thereafter moving towards Maldives and adjoining Comorin area on 02nd Dec.

Summary and Conclusion:

The trough of low over southeast Bay of Bengal and adjoining south Andaman sea with an upper air cyclonic circulation aloft persists and now extends upto 3.1 km above mean sea level. Under its influence, a low pressure area would form over southwest and adjoining southeast Bay of Bengal during next 24 hours. Many models suggest it movement towards Sri Lanka on 30th Nov and then TN coast by 1st Dec.

Bay of Bengal and Andaman Sea:

Probability of cyclogenesis over Bay of Bengal and Andaman Sea during next 120 hours:

24 HOURS	24-48 HOURS	48-72 HOURS	72-96 HOURS	96-120 HOURS
Nil	Nil	Nil	Nil	Nil

Arabian Sea:

Probability of cyclogenesis over Arabian Sea during next 120 hours:

24 HOURS	24-48 HOURS	48-72 HOURS	72-96 HOURS	96-120 HOURS
Nil	Nil	Nil	Nil	Nil

Advisory: IOP will be conducted along TN and Puducherry coasts on 30 Nov. to 01 Dec. 2015.

Annexure-I

Status of observational system:

Synoptic observation:

Region	Date/Time (UTC)		
	28/12	**29/00**	**29/03**
India	42	32	46
Coastal stations			
WB	8	3	8
Odisha	6	6	7
AP	11	12	12
Tamil Nadu	11	9	13
Puducherry	1	1	1
A & N	5	1	5
Bangladesh	9	11	11
Myanmar	0	0	0
Thailand	0	0	0
SriLanka	8	7	8

AWS Observations:

Region	Date/Time (UTC)		
	28/12	**29/00**	**29/03**
India	66	62	66
Coastal stations			
WB	9	7	9
Odisha	15	13	15
AP	15	14	15
Tamil Nadu	26	27	26
Puducherry	1	1	1
A & N	0	0	0

RS/RW (12Z) of 28/11/2015 **5/39**
No. of Ascents reaching 250 hPa level: 2:, MISDA: -

RS/RW (00Z) of 29/11/2015- **26/39**
No. of Ascents reaching 250 hPa level 26 , MISDA:4

No. of PILOT Ascents

28/12Z	29/00Z
5	5

Buoy Data

28/12Z	29/00Z	29/03Z
10	9	10

STATUS OF CHENNAI REGION OBSERVATION

No. of Synop data

Date→				**28.11.2015**				
UTC→	**00**	**03**	**06**	**09**	**12**	**15**	**18**	**21**
Chennai Region (Coasts of AP & TN)	**20**	**22**	**20**	**20**	**22**	**20**	**20**	**20**

No. of RS/RW Ascents

00Z /28.11.2015 : 7
No. of Ascents reaching 250 hPa level = 1
MISDA : 1

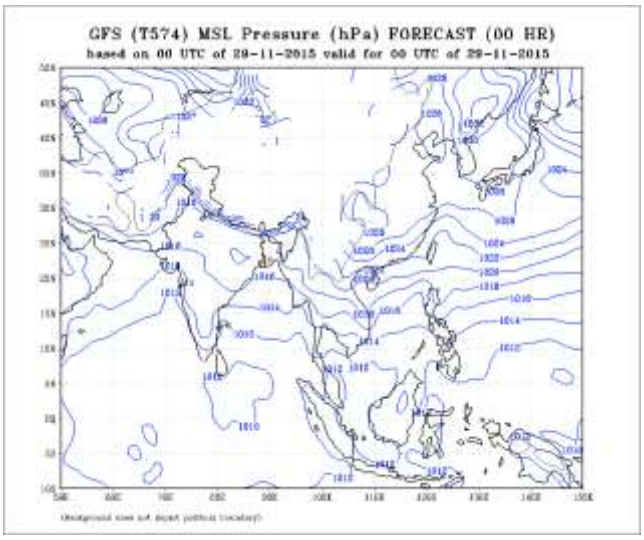
12Z /28.11.2015 : 1
No. of Ascents reaching 250 hPa level = 1
MISDA : 7

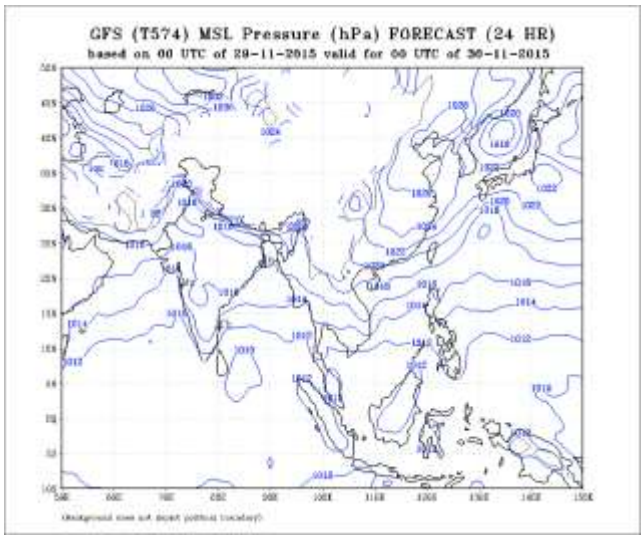
No. of PILOT Ascents:

28.11.2015

06Z	18Z
6	6

Annexure-II


GFS (T574) MSL Pressure (hPa) FORECAST (00 HR)
based on 00 UTC of 29-11-2015 valid for 00 UTC of 29-11-2015


GFS (T574) MSL Pressure (hPa) FORECAST (24 HR)
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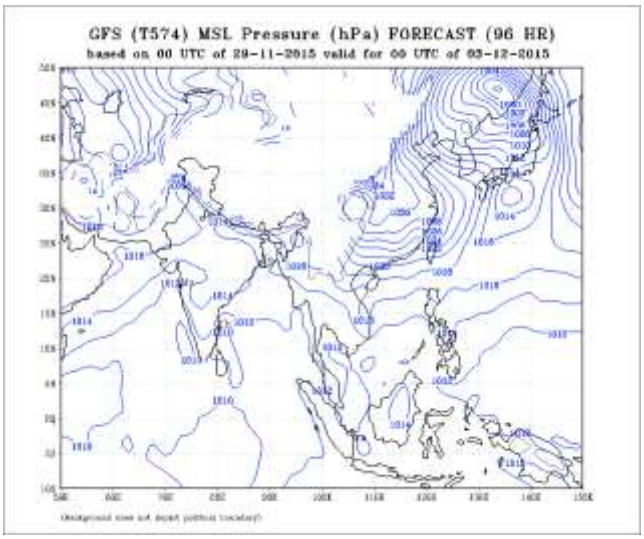
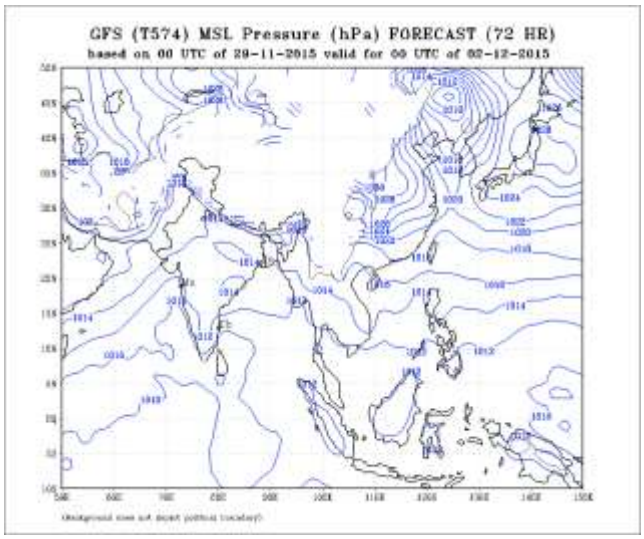
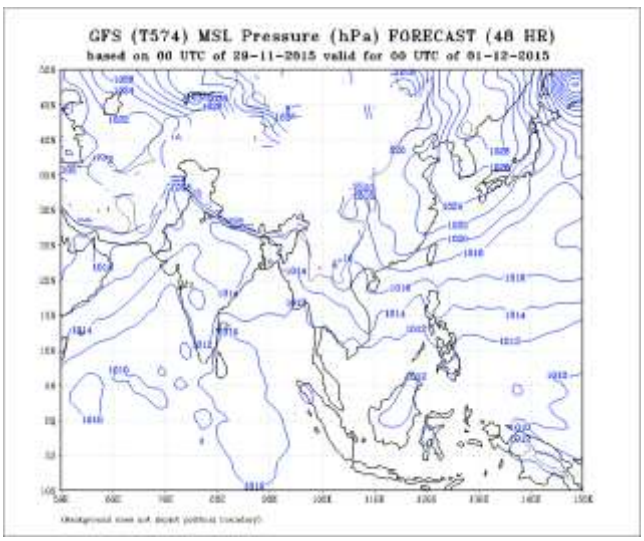
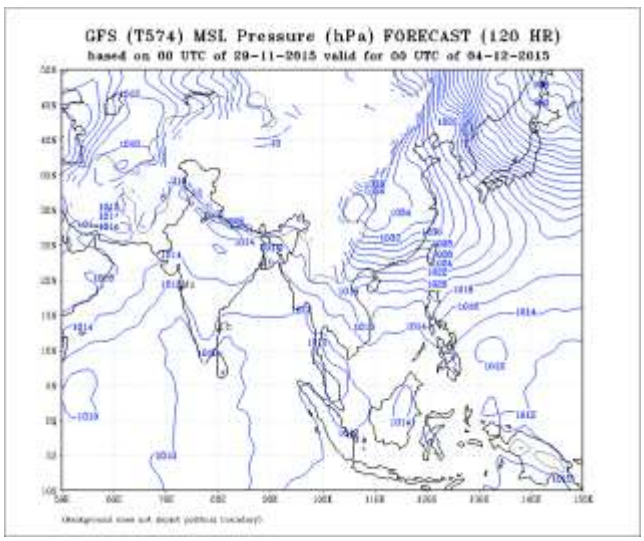
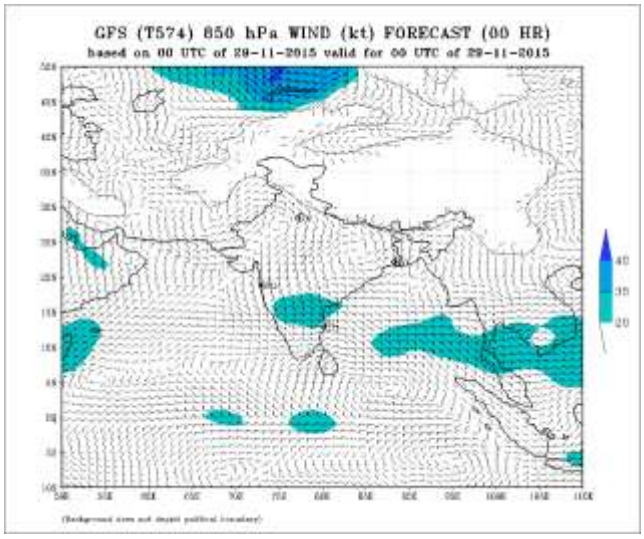
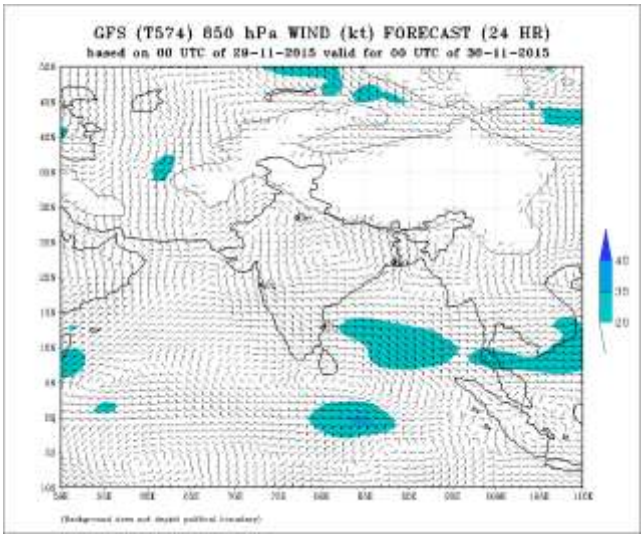

GFS (T574) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 29-11-2015 valid for 00 UTC of 03-12-2015


GFS (T574) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 29-11-2015 valid for 00 UTC of 02-12-2015


GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 29-11-2015 valid for 00 UTC of 01-12-2015


GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 29-11-2015 valid for 00 UTC of 04-12-2015


GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 29-11-2015 valid for 00 UTC of 29-11-2015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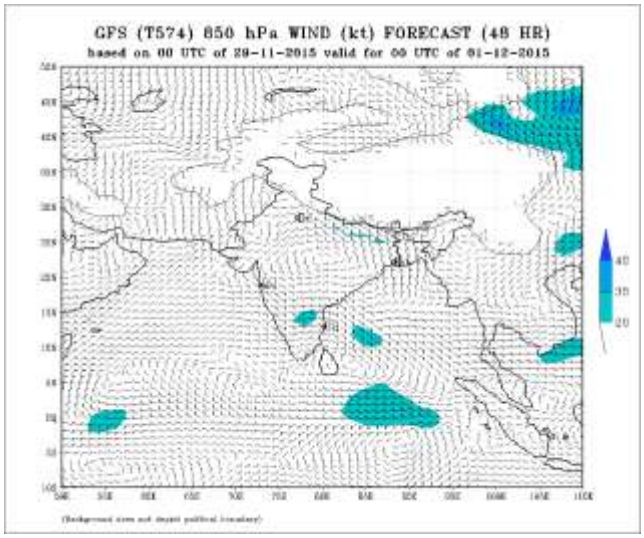
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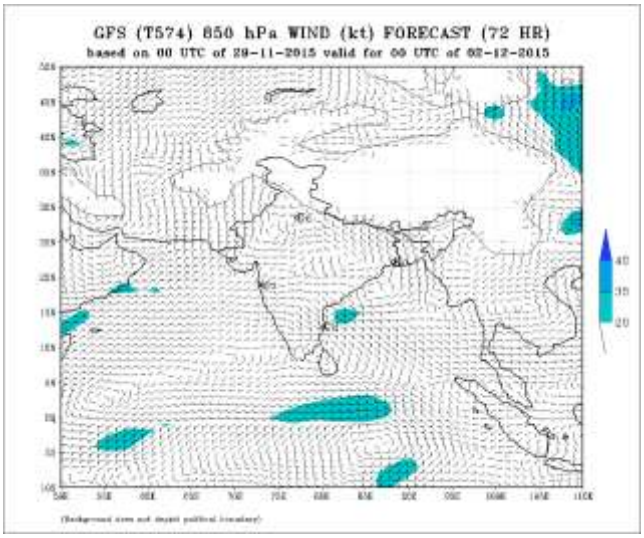
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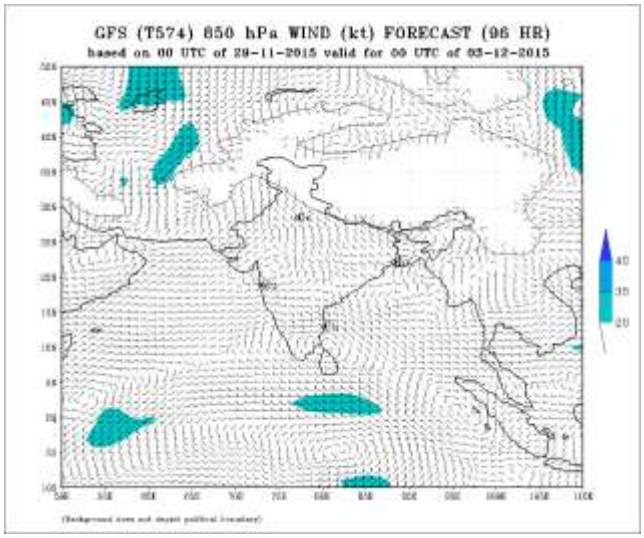
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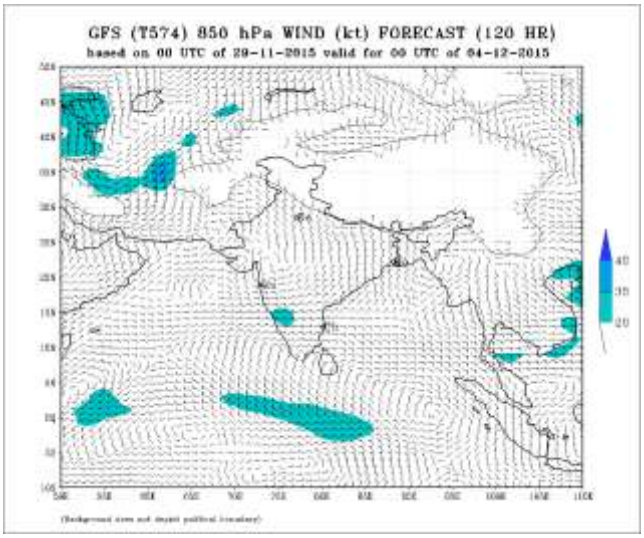
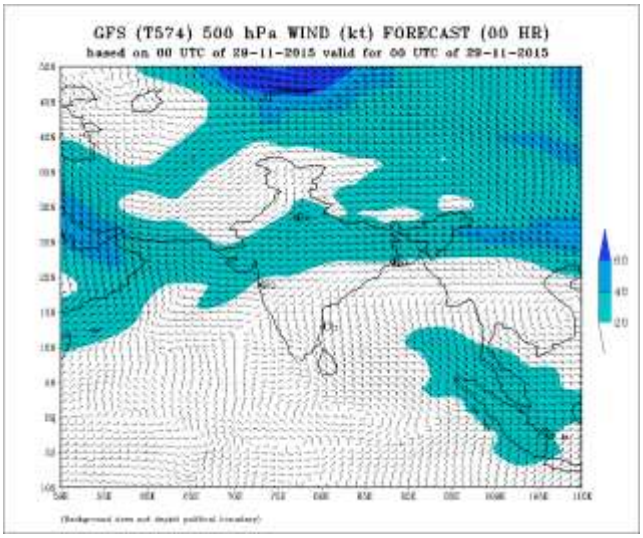

GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 29-11-2015 valid for 00 UTC of 04-12-2015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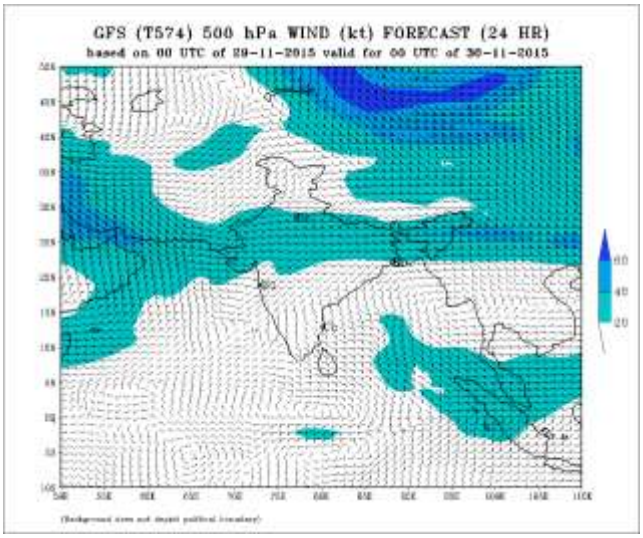
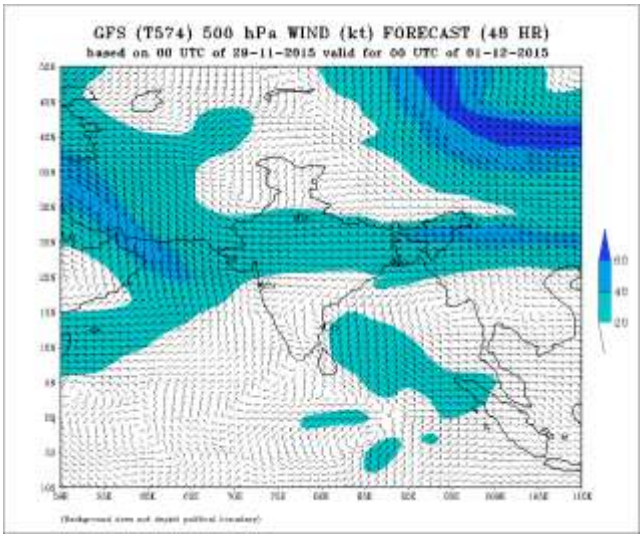
based on 00 UTC of 29-11-2015 valid for 00 UTC of 29-11-2015


GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 29-11-2015 valid for 00 UTC of 30-11-2015


GFS (T574) 500 hPa WIND (kt) FORECAST (48 HR)
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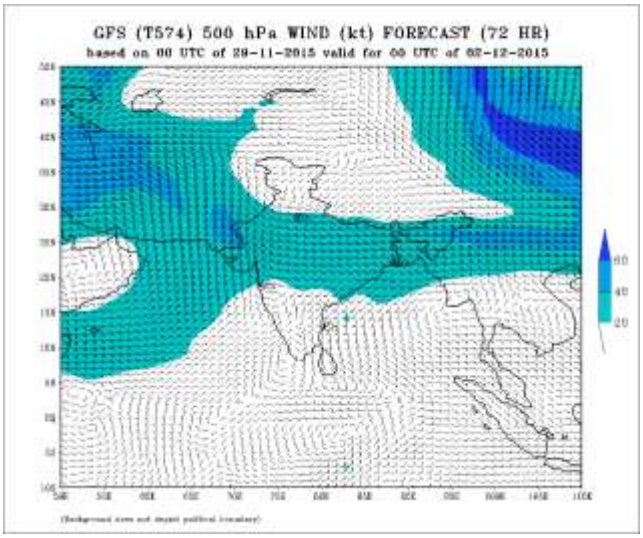
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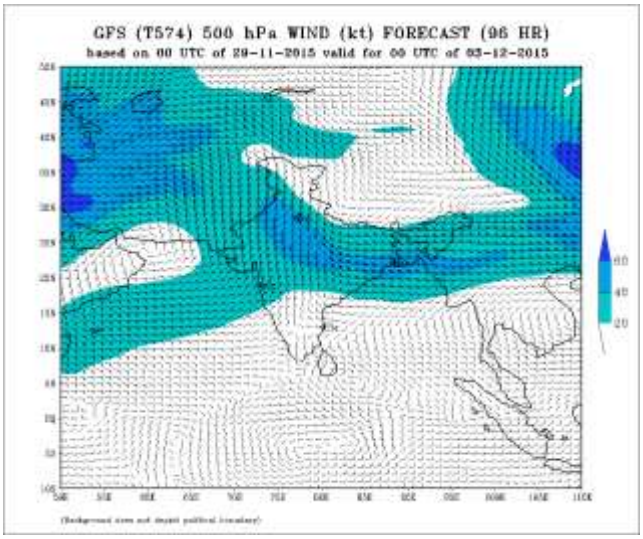
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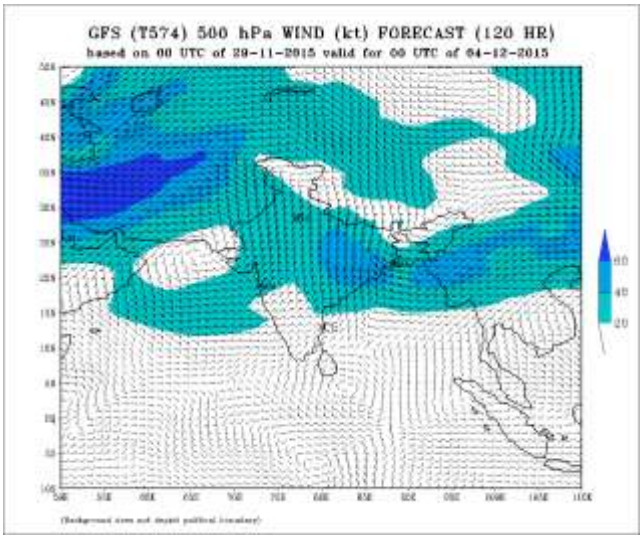
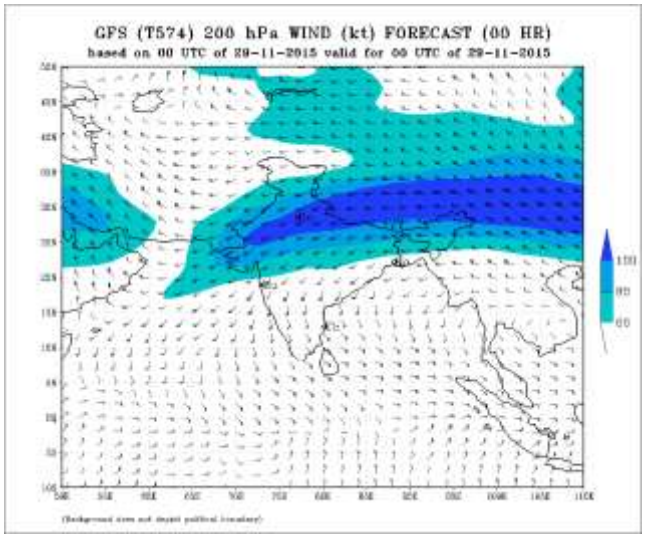
based on 00 UTC of 29-11-2015 valid for 00 UTC of 03-12-2015


GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 29-11-2015 valid for 00 UTC of 04-12-2015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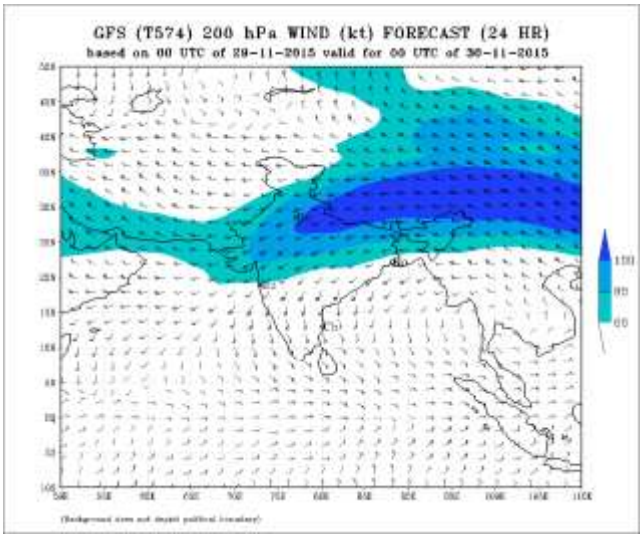
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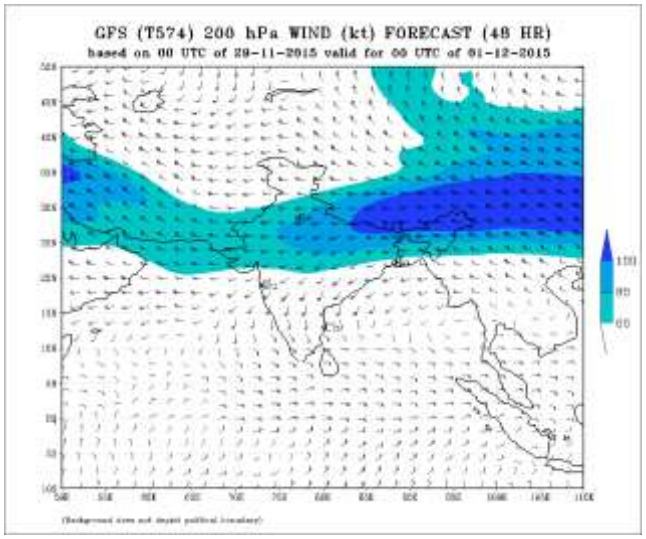
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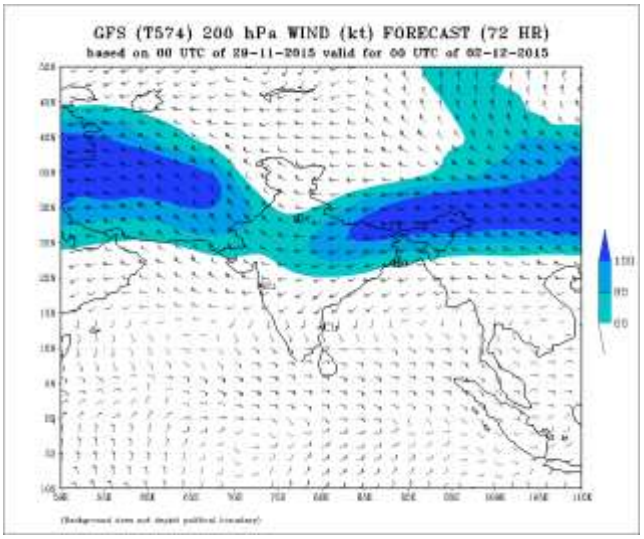
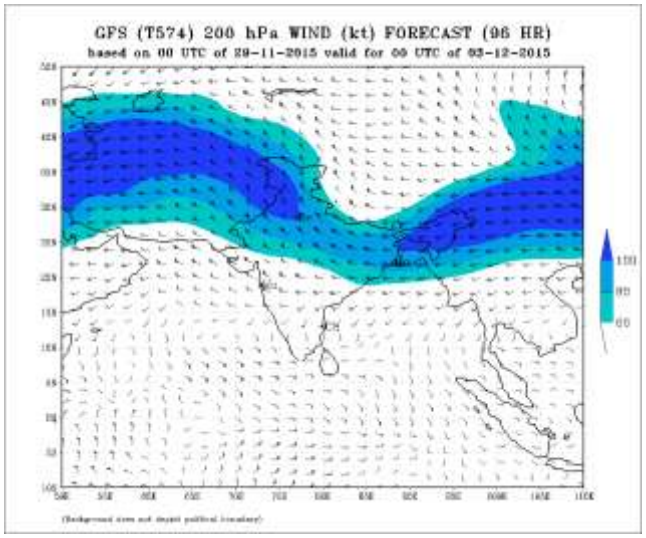
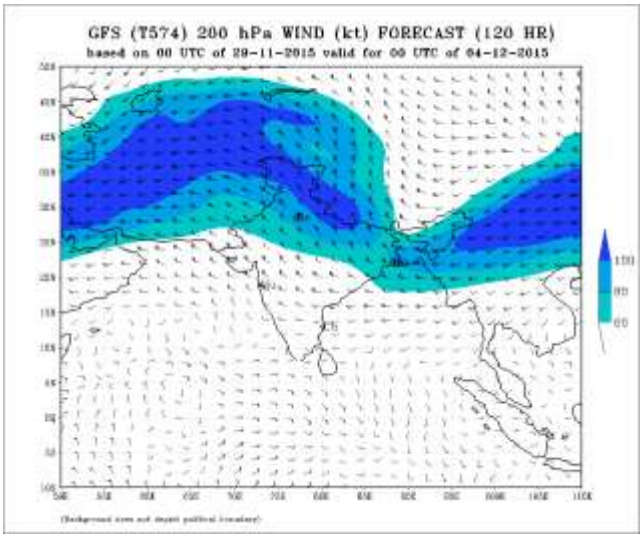

GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 29-11-2015 valid for 00 UTC of 02-12-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 29-11-2015 valid for 00 UTC of 03-12-2015


GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 29-11-2015 valid for 00 UTC of 04-12-2015

FDP (Cyclone) NOC Report Dated 30 November, 2015

Synoptic features:

- The trough of low over southeast Bay of Bengal and adjoining south Andaman Sea has moved westwards and now lies over Southwest Bay of Bengal & neighbourhood. Under its influence, a low pressure area has formed over southwest Bay of Bengal.

Surface Temperature (SST):

- SST is 26-28°C over north and adjoining west central AS and it is 28-30°C over rest part of AS.
- SST is 26-28°C over extreme north and west central of Bay of Bengal and it is 28-30°C over rest part of BoB.

Tropical Cyclone Heat Potential (TCHP):

- TCHP below 50 kJ/cm^2 over exteme north and west central and adjoining parts of AS and it is 50-100 kJ/cm^2 over the rest part of AS. It is 100-110 kJ/cm^2 over south central of AS.
- TCHP 110-130 kJ/cm^2 over southern part of BoB , below 50 kJ/cm^{2}over extreme north and west central of BoB. It is 50-110 kJ/cm^{2}over rest part of BoB.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive and is upto 25x10-5s-1 over extreme north and southern part of BoB and southern part of AS. It is negative over east and west central of BoB.
- It is 25-40x10-5s-1 over extreme southwest, about 20x10-5s-1 over southern and north part of AS. It is negative over remaining central parts of AS.

Convergence:

- Lower level convergence is about 5-10 x $10^{-5}s^{-1}$ over southwest of BoB. No significant over the rest BoB.
- Lower level convergence is between 5 to 10 x $10^{-5}s^{-1}$ over south west of BoB and -5 x $10^{-5}s^{-1}$ over rest part of AS.

Divergence:

- Upper level divergence is 5-10x10-5 s-1 over southwest and Andaman Sea.
- Upper level divergence is about 10- 20x10^{-5} s-1 over southcentral AS, and negative -5--10x10-5 s-1 over rest parts of AS.

Wind Shear:

- Wind shear is 5-10 knots over southwest BoB and it is increasing on northern side of BoB.
- Wind shear is 10-20 knots over extreme southwest and adjoining southeast AS and is increasing towards northern parts of AS.

Wind Shear Tendency:

- There is decreasing tendency (-10-20 Knots) over southwest,east central and adjoining north Andaman Sea. It is positive (5-10 knots) over southeast and north of BoB.
- The shear tendency is -5-10knots extending from west central to north part of AS.

Upper tropospheric ridge:

- The upper tropospheric ridge at 200 hPa runs along 14.0°N over BoB and 11.0°N over AS.

M.J.O. Index:

- MJO index is in Phase 3 with amplitude greater than 1 and would remain in phase 3 during next subsequent 2 days.

Storms and Depression over South China Sea/ South Indian Ocean:
No significant system over South China Sea/ south Indian Ocean:

Satellite Bulletin based on INSAT imagery:

Bay of Bengal & Andaman Sea:-
According to satellite imagery, broken low/medium clouds with embedded moderate to intense convection lie over south west , adjoining south east Bay of Bengal and adjoining Indian ocean in association with low level circulation over the south west of Bay of Bengal.
Scattered low/medium clouds with embedded moderate to intense convection lie over rest Bay of Bengal, south of latitude 18.0^0N & south Andaman Sea.
Arabian Sea:-
Scattered low/medium clouds with embedded moderate to intense convection lie over south area adjoining Indian ocean and south of latitude 14.00n.

NWP Input for FDP Cyclone based on 0000 UTC
NWP Analysis
IMD-GFS and IMD-WRF model analyses based on 0000 UTC of 30 November 2015 show no significant weather system over the North Indian Seas. The forecasts of the models show the trough in easterlies and associated cyclonic circulation in the lower troposphere up to 700 hpa over southwest Bay of Bengal which moves west-north-westward direction over Sri Lanka, Comorin and adjoining Tamil Nadu coast during next 4 days. The GPP charts do not show any significant cyclogenesis over the region.
Genesis Potential Parameter (GPP):
The GPP charts do not show any significant cyclogenesis over the region during next 3 days.

NWP products are available at:
http://202.54.31.51/bias/gfsproducts.php
http://202.54.31.51/bias/wrf27pro.php
http://202.54.31.51/bias/potentialparameter.php

NCMRWF-NCUM: Model suggests a feeble low pressure area over southwest BoB, which initially moves westwards towards Sri Lanka coast and thereafter west-northwestwards towards TN coast on 01 Dec. and will persists for next2-3 days.
NCMRWF-GFS: Model suggests a feeble low pressure area on 30th over southwest BoB moving westward towards TN coast on 01st Dec and persists over the same area for next 2-3 day and weakens thereafter..
ECMWF: ECMWF suggests formation of a low pressure area over southwest BoB moving towards Sri Lanka coast on 01st Dec. It subsequently moves westwards towards southeast Arabian Sea during next subsequent 2-3 days.
NCEP-GFS: Model suggests formation of a feeble low pressure area on over southwest BoB moving westward towards Sri Lanka coast on 30th November and persisting there for next 3 day with slow north-northwestward movement thereafter moving westwards towards southeast AS during next subsequent 2-3 days.
JMA: JMA Model indicates a low pressure area over southwest BOB moves slowing westwards towards Sri Lanka on 01st Dec thereafter moving towards Lakshadweep on 2ndDec.

ARP-Meteo France ARP Model indicates low pressure area over southwest BoB moving westward towards Sri Lanka coast on 1st Dec thereafter moving towards Maldives and adjoining Comorin area on 02nd Dec.

Summary and Conclusion:

The trough of low over southeast Bay of Bengal and adjoining south Andaman sea has moved westwards and now lies over Southwest Bay of Bengal & neighbourhood. Under its influence, a low pressure area has formed over southwest and adjoining southeast Bay of Bengal.

Many models suggest it movement towards Sri Lanka on 30th Nov and then TN coast by 1st Dec.

Bay of Bengal and Andaman Sea:

Probability of cyclogenesis over Bay of Bengal and Andaman Sea during next 120 hours:

24 HOURS	24-48 HOURS	48-72 HOURS	72-96 HOURS	96-120 HOURS
Nil	Nil	Nil	Nil	Nil

Arabian Sea:

Probability of cyclogenesis over Arabian Sea during next 120 hours:

24 HOURS	24-48 HOURS	48-72 HOURS	72-96 HOURS	96-120 HOURS
Nil	Nil	Nil	Nil	Nil

Advisory: IOP will be conducted along TN and Puducherry coasts on 1st to 2nd Dec. 2015.

This is the last bulletin of FDP for this system.

Annexure-I

Status of observational system:

Synoptic observation:

Region	Date/Time (UTC)		
	29/12	**30/00**	**30/03**
India	67	51	61
Coastal stations			
WB	6	7	5
Odisha	11	7	10
AP	14	11	13
Tamil Nadu	29	24	26
Puducherry	1	1	1
A & N	6	1	6
Bangladesh	11	10	11
Myanmar	0	10	10
Thailand	2	2	2
SriLanka	9	9	8

AWS Observations:

Region	Date/Time (UTC)		
	29/12	**30/00**	**30/03**
India	66	62	66
Coastal stations			
WB	9	7	9
Odisha	15	13	15
AP	15	14	15
Tamil Nadu	26	27	26
Puducherry	1	1	1
A & N	0	0	0

RS/RW (12Z) of 29/11/2015 **5/39**
No. of Ascents reaching 250 hPa level: :, MISDA: -2

RS/RW (00Z) of 30/11/2015- **26/39**
No. of Ascents reaching 250 hPa level , MISDA:5

No. of PILOT Ascents

29/12Z	30/00Z
5	9

Buoy Data

29/12Z	30/00Z	30/03Z
6	6	4

STATUS OF CHENNAI REGION OBSERVATION

No. of Synop data

Date→				**29.11.2015**				
UTC→	**00**	**03**	**06**	**09**	**12**	**15**	**18**	**21**
Chennai Region (Coasts of AP & TN)	**20**	**22**	**20**	**20**	**22**	**20**	**20**	**20**

No. of RS/RW Ascents

00Z /29.11.2015 : 6
No. of Ascents reaching 250 hPa level = 6
MISDA : 2

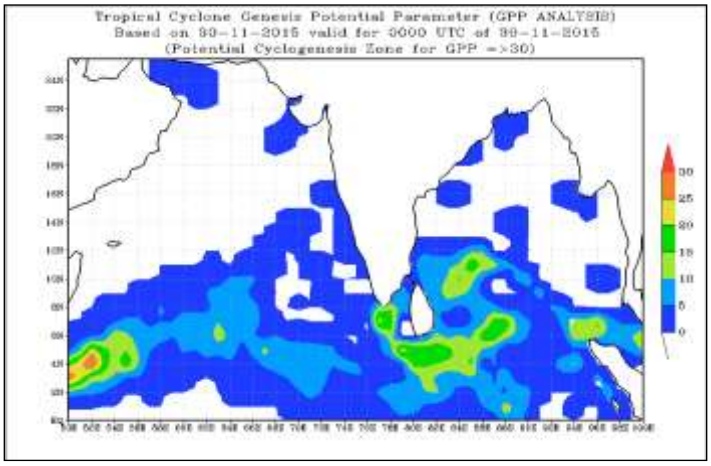
12Z /29.11.2015 : 1
No. of Ascents reaching 250 hPa level = 1
MISDA : 7

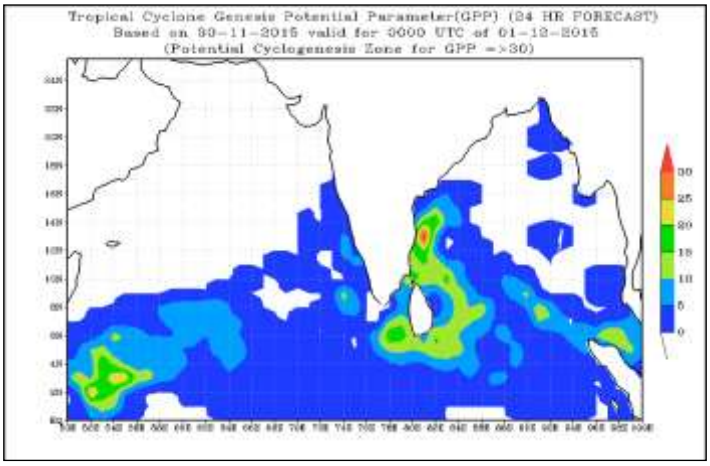
No. of PILOT Ascents:

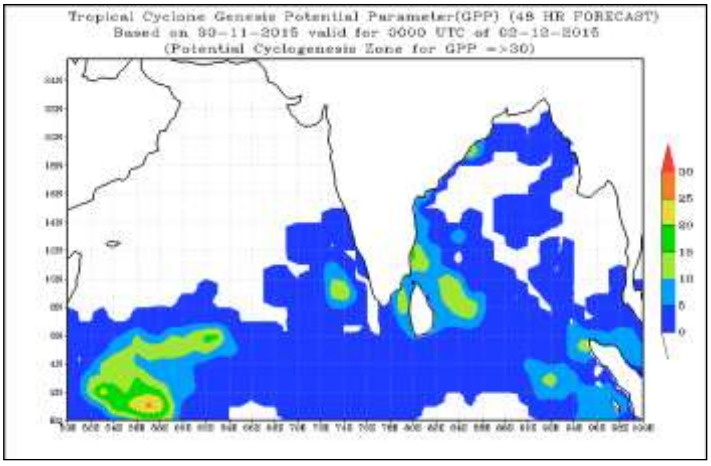
29.11.2015

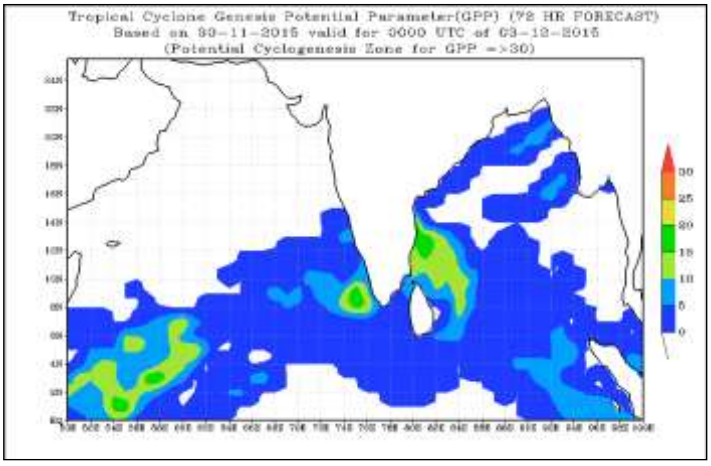
06Z	18Z
6	6

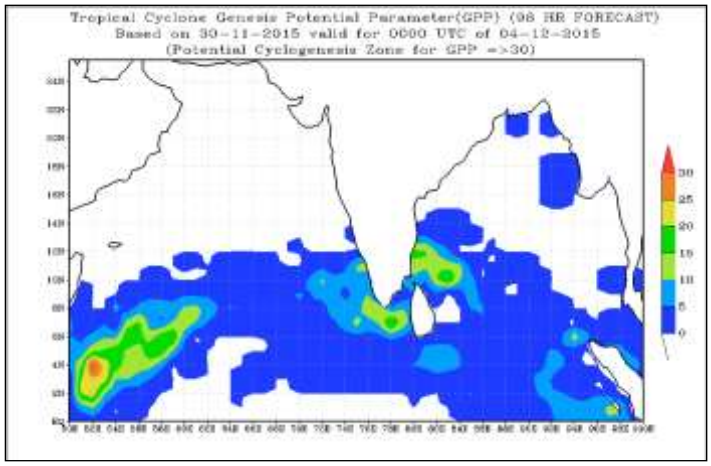
Annexure-II

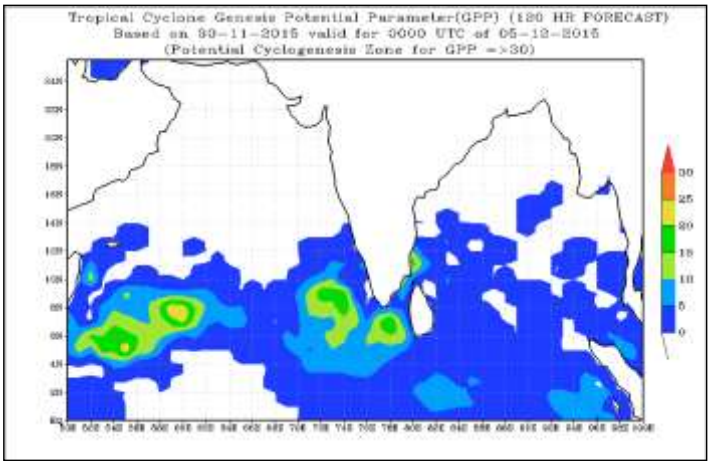

Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 30-11-2015 valid for 0000 UTC of 30-11-2015
(Potential Cyclogenesis Zone for GPP =>30)

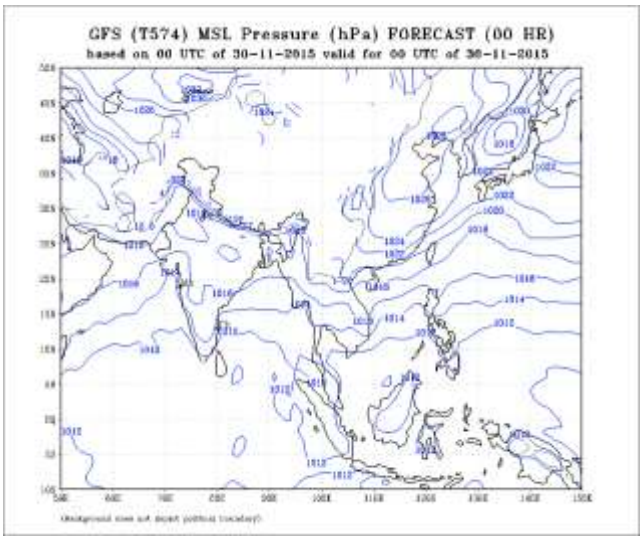

Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 30-11-2015 valid for 0000 UTC of 01-12-2015
(Potential Cyclogenesis Zone for GPP =>30)

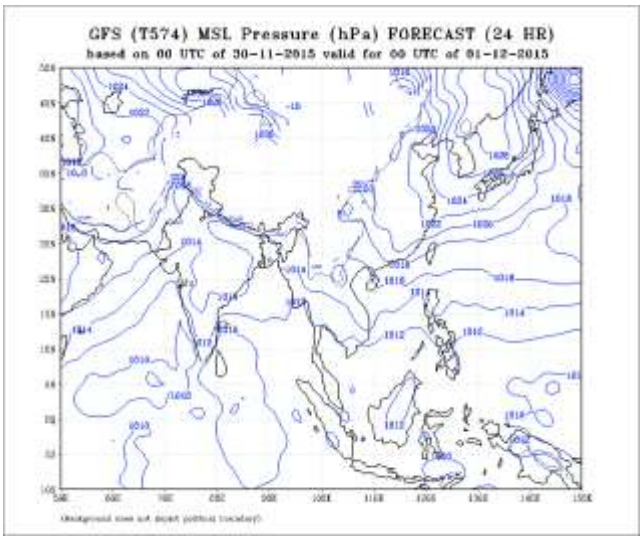

Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
Based on 30-11-2015 valid for 0000 UTC of 02-12-2015
(Potential Cyclogenesis Zone for GPP =>30)

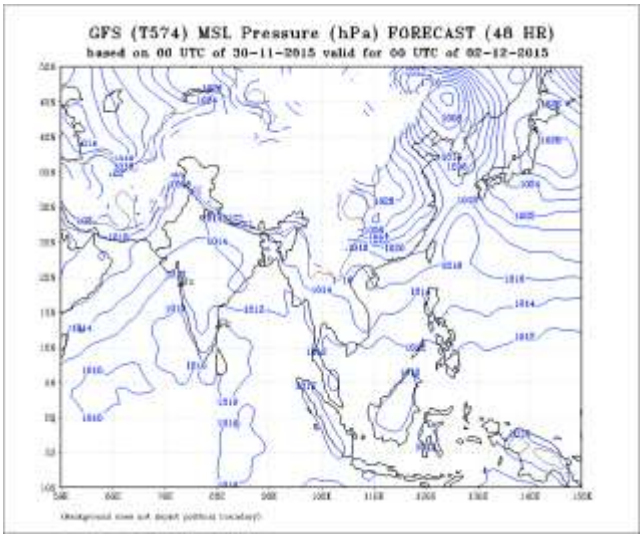

Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 30-11-2015 valid for 0000 UTC of 03-12-2015
(Potential Cyclogenesis Zone for GPP =>30)

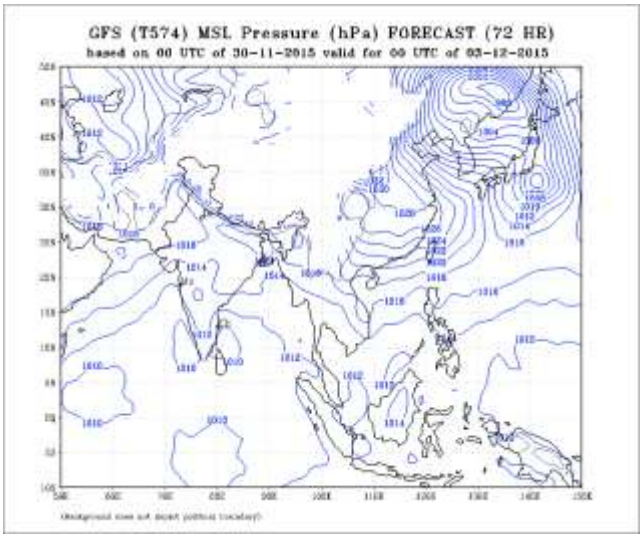

Tropical Cyclone Genesis Potential Parameter(GPP) (96 HR FORECAST)
Based on 30-11-2015 valid for 0000 UTC of 04-12-2015
(Potential Cyclogenesis Zone for GPP =>30)

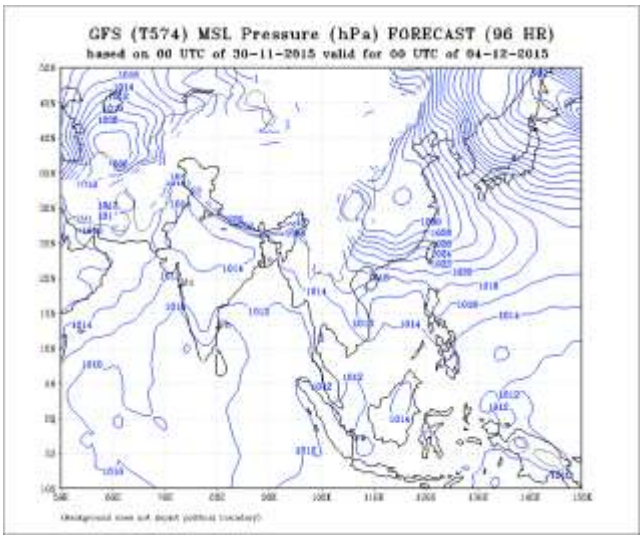

Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 30-11-2015 valid for 0000 UTC of 05-12-2015
(Potential Cyclogenesis Zone for GPP =>30)

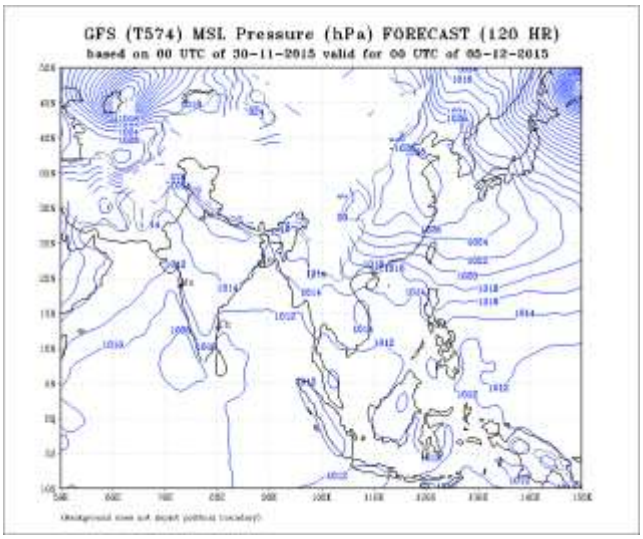

GFS (T574) MSL Pressure (hPa) FORECAST (00 HR)
based on 00 UTC of 30-11-2015 valid for 00 UTC of 30-11-2015

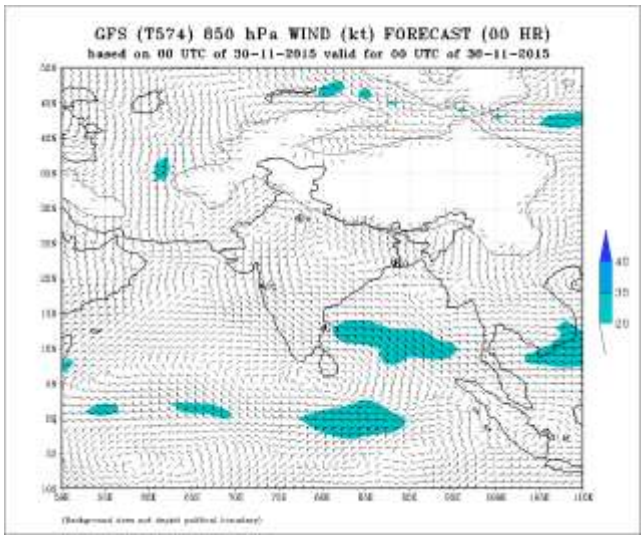

GFS (T574) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 30-11-2015 valid for 00 UTC of 01-12-2015

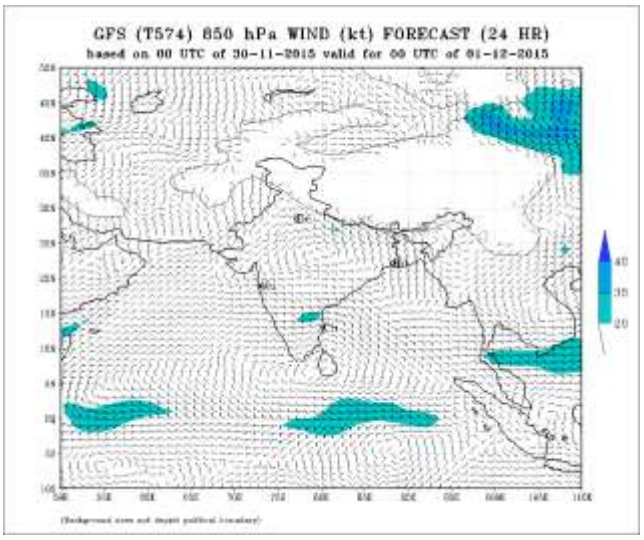

GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 30-11-2015 valid for 00 UTC of 02-12-2015

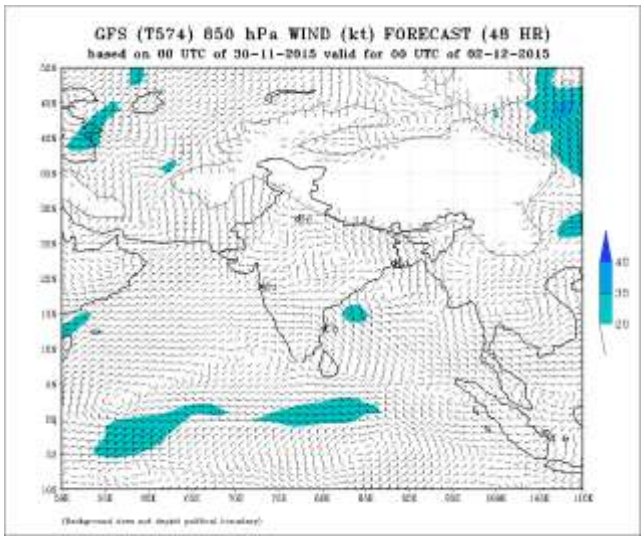

GFS (T574) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 30-11-2015 valid for 00 UTC of 03-12-2015

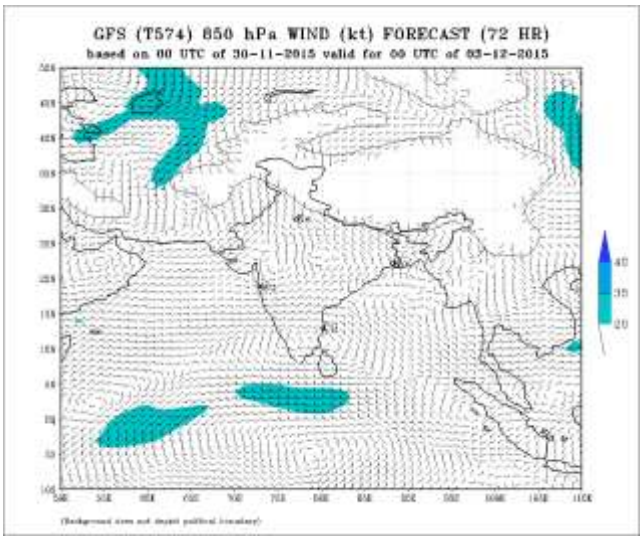

GFS (T574) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 30-11-2015 valid for 00 UTC of 04-12-2015

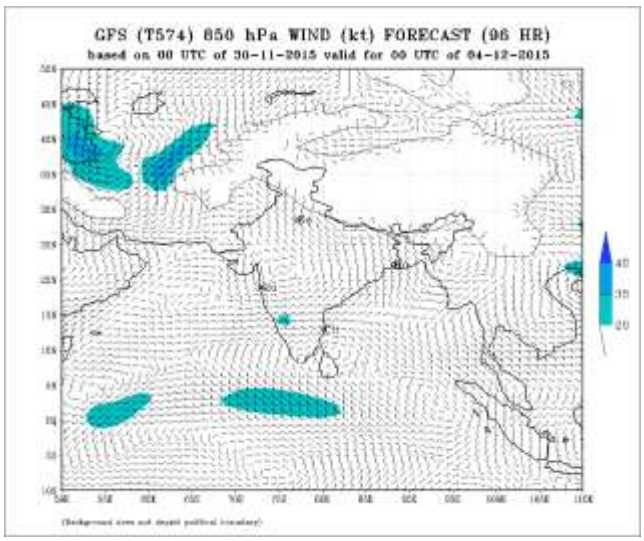

GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 30-11-2015 valid for 00 UTC of 05-12-2015

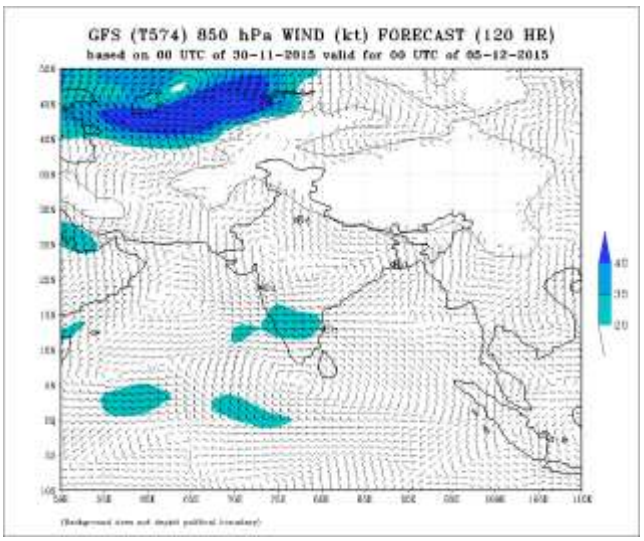

GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 30-11-2015 valid for 00 UTC of 30-11-2015

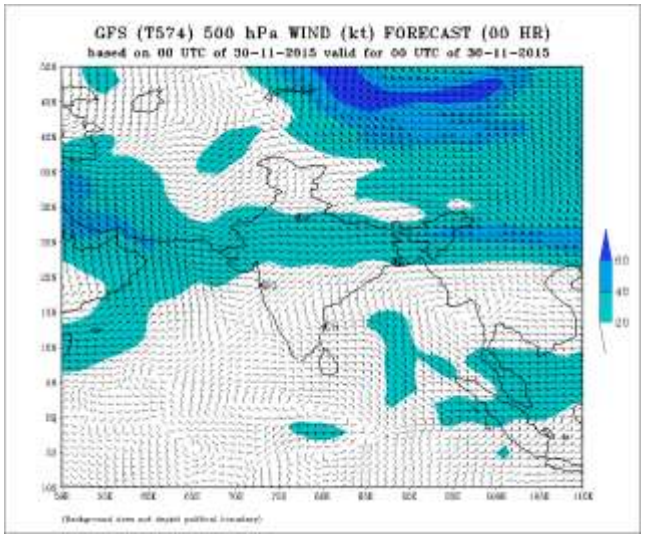

GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 30-11-2015 valid for 00 UTC of 01-12-2015

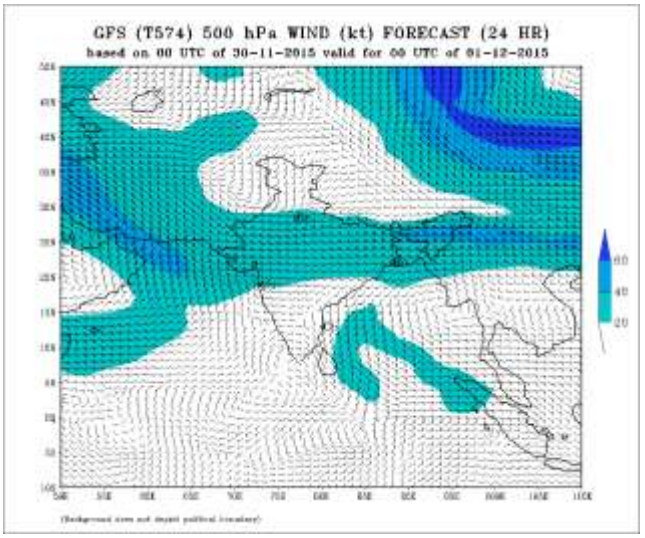

GFS (T574) 850 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 30-11-2015 valid for 00 UTC of 02-12-2015

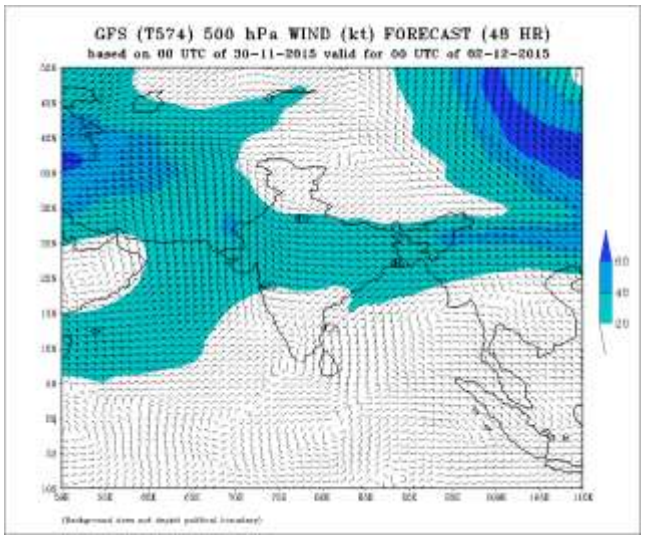

GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 30-11-2015 valid for 00 UTC of 03-12-2015

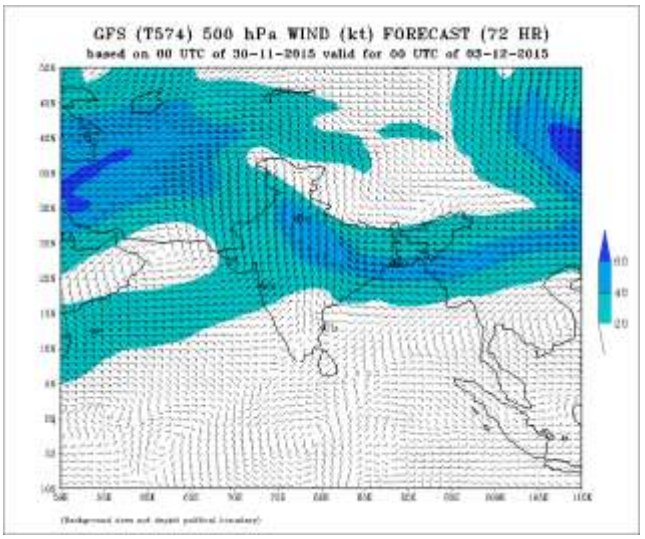

GFS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 30-11-2015 valid for 00 UTC of 04-12-2015


GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 30-11-2015 valid for 00 UTC of 05-12-2015


GFS (T574) 500 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 30-11-2015 valid for 00 UTC of 30-11-2015


GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 30-11-2015 valid for 00 UTC of 01-12-2015


GFS (T574) 500 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 30-11-2015 valid for 00 UTC of 02-12-2015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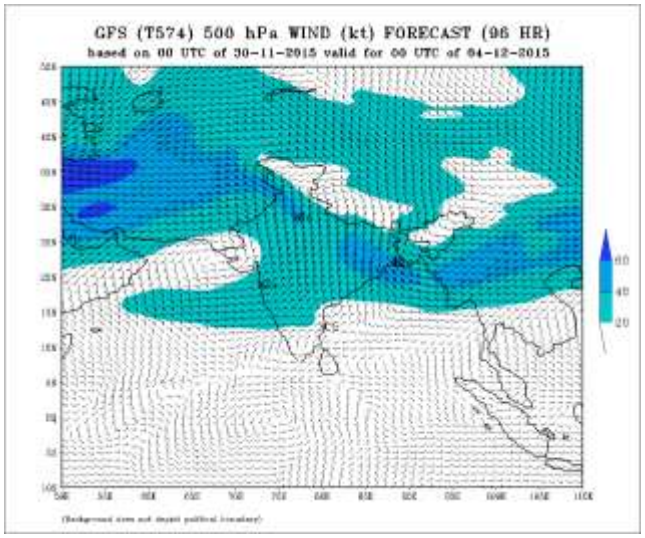
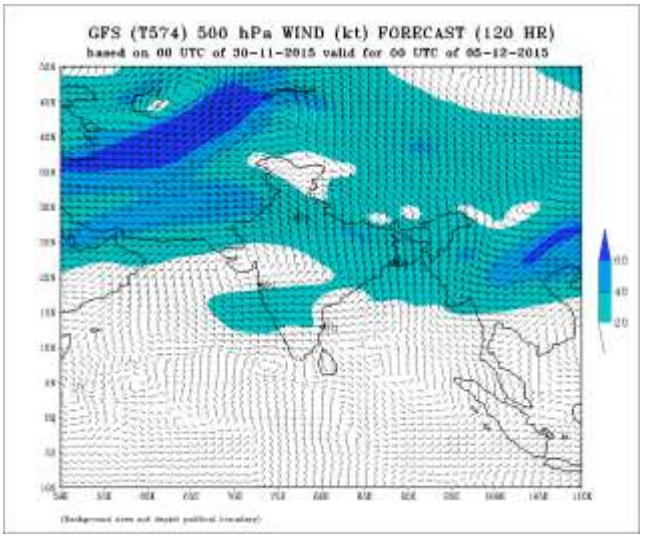
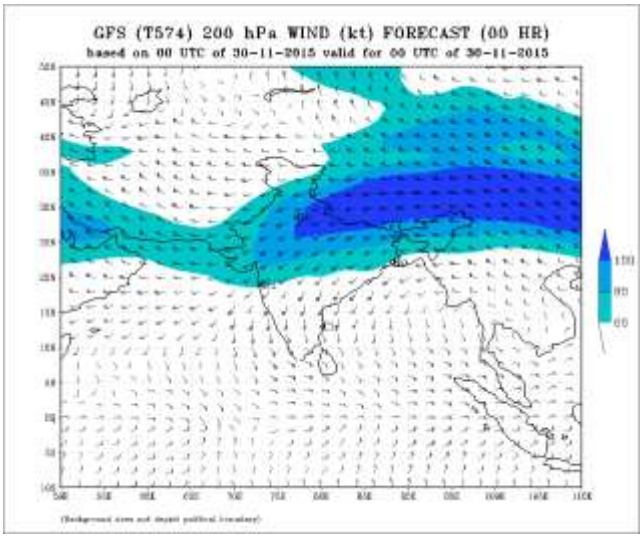
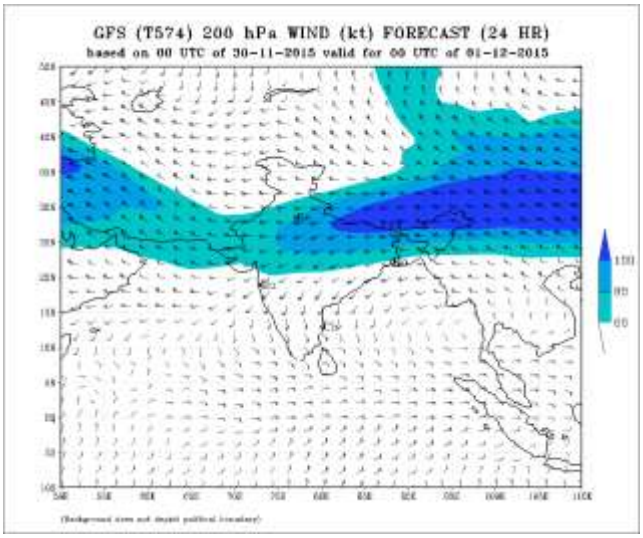
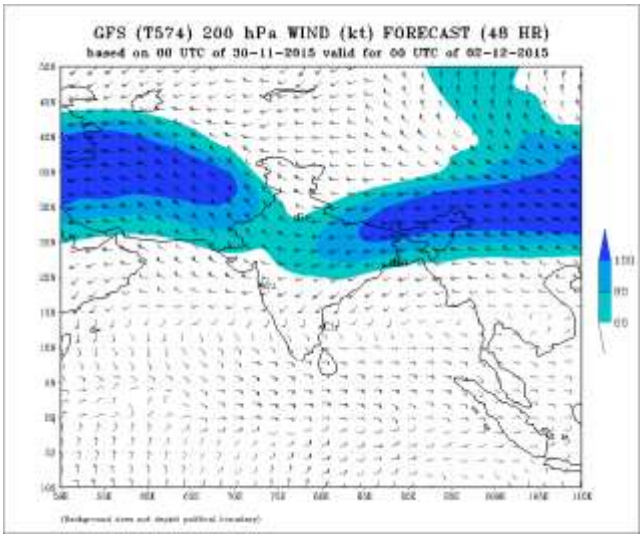
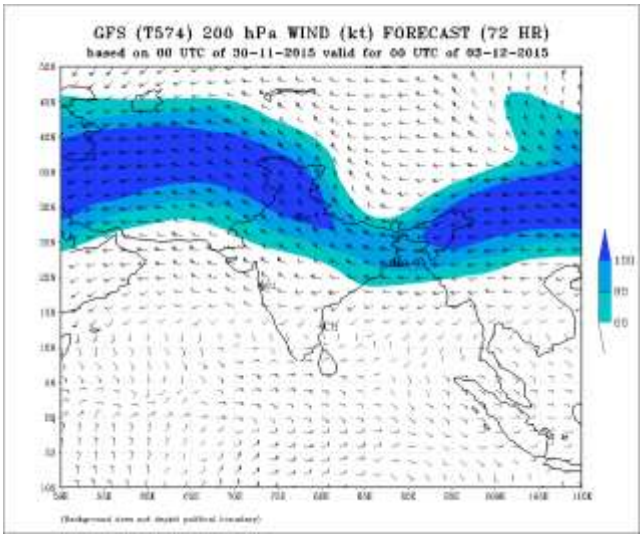

GFS (T574) 500 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 30-11-2015 valid for 00 UTC of 04-12-2015

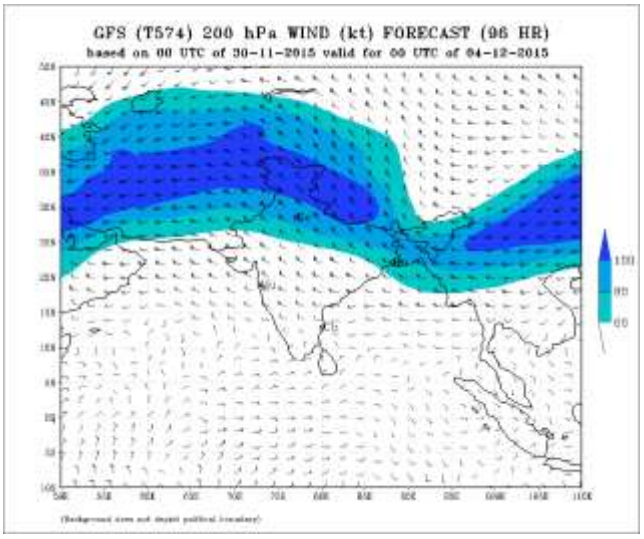

GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 30-11-2015 valid for 00 UTC of 05-12-2015

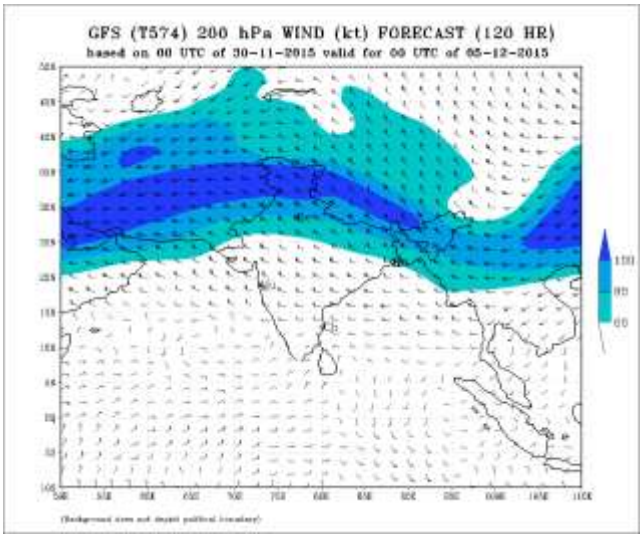

GPS (T574) 200 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 30-11-2015 valid for 00 UTC of 30-11-2015


GPS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 30-11-2015 valid for 00 UTC of 01-12-2015


GPS (T574) 200 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 30-11-2015 valid for 00 UTC of 02-12-2015


GPS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 30-11-2015 valid for 00 UTC of 03-12-2015


GPS (T574) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 30-11-2015 valid for 00 UTC of 04-12-2015


GPS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 30-11-2015 valid for 00 UTC of 05-12-2015

CHAPTER-VI

Lessons learnt from FDP-2015

IOP was declared for 12 days in view of low pressure area (27-28 Oct., 2015)-2 days, deep depression (7-10 Nov. 2015)-4 days, well karked low pressure area (15-16 Nov., 2015)-2 days and low pressure area (29 Nov.-2 Dec., 2015)-4 days over the Bay of Bengal. SST observations and ocean thermal energy showed favorable conditions for genesis as it crossed the limit of 50KJ/cm^{-2} over the Bay of Bengal for a number of days. Further intensification takes place when ocean thermal energy .100 KJ/cm^2. The system weakens if it is less than 50 KJ/cm^2 in most cases though not in all cases. Further it indicated that SST/ocean thermal energy is not the only factor for intensification/weakening. The suppressed cyclonic activity was mainly duto strong ElNino conditions which is unfavourable for genesis and intensification of cyclones over the Bay of Bengal during postmonsonn season.

1. Buoy data were very usefull for validating the scratteromery wind and intensity examination thouth they were scanty. Buoy observation is highly informative for synoptic analyses and ocean surface wind information. As such number of buoy may be enhanced over entire north Indian Ocean.
2. Conventional ship observations under IVOF scheme are very less. Hence deployment of special cruise like Sagar Kanya or Sagar Nidhi could have been very useful for cyclone forecast. Inspite of attempts, it could not be organized during 2015. Attempt should be made for future campaign.
3. Structured satellite bulletins like that issued by other international centres would be very helpful for better utilization of statellite advisories. Satmet division of IMD should issue such bulletin
4. As Oceansat-II has been defunct, ISRO should plan for its replacement as Sea surface wind from such satellite is very useful over the data sparse NIO region.
5. Based on the campaign conducted so far the NWP groups should bring out the limitation and capabilities of various models used operationally based on critical assessment of their performance.
6. In view of development in recent years in ensemble prediction, attempts should be made to create dynamical cone of uncertainty, location specific probability of precipitation, strong wind and stom surge/coastal inundation.
7. Increase in lead period with demonstrated accuracy level helps in motivating the Disaster Managers to initiate action.
8. Pre-cyclone exercise: Biennial meetings are held in the month of March and September before commencement of Cyclone Season in which IMD officials and Disaster Manager Authorities, participate to chalk out the plan for the season to examine the preparedness. This exercise helps in improving the cyclone management
9. Pre-Storm exercise: The meeting conducted within the IMD under the Chairmanship of DGM as and when a cyclonic storm is expected based on NWP guidance helps in the preparedness and last minute action, if any, regarding update of instruments, availability of spares, update of telecom lines for dissemination of bulletins /warnings and manpower issues.
10. Triggering Media and General Public with the following helps in better management of cyclone

- Daily Press release
- Holding of press conference
- SMS
- Round the clock response to press and electronic media.
- FAQs (Do's and Dont's)
- Dedicated website for cyclones

Similarly triggering of disaster managers by the following approach also helps in better management

- Introduction of SMS for Cabinet Secretary at National Level to District Collectors at district level
- Personal briefing over phone.
- Telefax and e-mail every 3 hourly
- Participation in Crisis Management Committee every day

11. Triggering Vulnerability Group like (i) Fishermen and (ii) Farmer
12. Synergised SOP (SSOP)

- INCOIS, Hyderabad disseminated warnings through SMS and Electronic Display Boards (EDB) to coastal population especially meant for fishermen. The ocean state forecast bulletins issued by INCOIS is modified in accordance with Cyclone Warning bulletins issued by IMD. This has been achieved through Synergised SOP for dissemination of bulletins between IMD and INCOIS.
- QPF and QPE for river catchments are issued by the designated Flood Meteorological Offices of IMD. Liaison with Flood Meteorological Agencies beforehand for regulation of inflow and outflow of water from Dams is essential. Hence need has been for developing Synergised SOP with the Authorities. The same is in progress.
- There is also need for location specific probabilistic forecast of rainfall and wind for major cities.

13 Diurnal cycle of convection do influence cyclonic disturbance and hence this aspect is required to be monitored and examined in detail. Satellite division of IMD and others may carry out studies on these aspects.

14 Intensity forecast especially rapid intensification and rapid weakening before landfall is still challenging e.g. Chapala and Megh. R&D group should make coordinated effort to develop a technique for forecasting rapid intensification and weakening of TC.

15 Inspite of several attempts, aircraft recorraissance which is one of the key objectives of FDP could not be carried out so far. MoES and IMD however should continue their efforts to achieve this objective.

CHAPTER-VII

Summary and Conclusions

The Pilot Phase of FDP on landfalling cyclones over the Bay of Bengal was conducted during 15th October to 30th November, 2015 as per the implementation plan. IOP was declared for 12 days in view of low pressure area (27-28 Oct., 2015)-2 days, deep depression (7-10 Nov. 2015)-4 days, well karked low pressure area (15-16 Nov., 2015)-2 days and low pressure area (29 Nov.-2 Dec., 2015)-4 days over the Bay of Bengal. The daily bulletin was prepared during the period and circulated to all concerned. The NOC meeting was held thrice a week, viz. Monday, Wednesday & Friday.

The FDP helped in continuous monitoring of environmental conditions for cyclogenesis. Further, intense observation during IOP helped in better monitoring and prediction of cyclonic disturbances. The additional data collected during FDP 2015 included the data collected from ACWC/CWCs, Enhanced AWS network of the coast, eighteen activated buoy observations from the Bay of Bengal and Arabian Sea, ASCAT wind observations and microwave imagery products. The Tropical Cyclone module installed in Synergie System was also used for monitoring and prediction purpose.

As a result of above, the cyclone track forecast errors reduced in 2015 compared to previous FDP campaign. It helped in refining the Standard Operation Procedure and strengthening the multi-institutional mechanism.

Various lessons were also learnt from the FDP campaign 2015 as mentioned in previous chapter. It will further help in improving the campaign in future. To mention a few, we should have:

- better availability of consumables and other logistic support for the coastal surface and upper air observatories to ensure good collection of data,
- improved buoy network
- replacement of Oceansat-II for Sea surface wind
- threshold values of various NWP products for genesis, intensification and movement
- structured satellite bulletins as issued by other international centres giving reason for fixation of a T number.
- DWR data with uniform scanning strategy for mosaicing and NWP modeling.
- Critical assessement of NWP models for track and intensity prediction.
- NWP/dynamical statistical guidance on rapid intensification and rapid weakening of TCs.

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