INDIA METEOROLOGICAL DEPARTMENT

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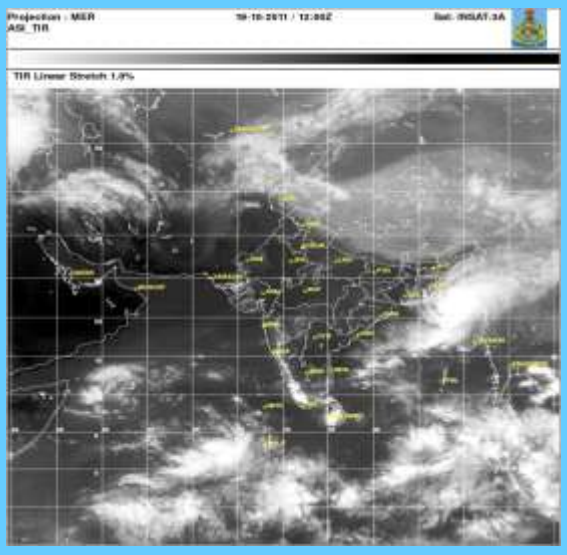
Forecast Demonstration Project (FDP) for Improving
Track, Intensity and Landfall of
Bay of Bengal Tropical Cyclones

Implementation of Pilot Phase, 2014:
A Report



Satellite imagery of Deep Depression

M. Mohapatra, Ranjit Singh, Kamaljit Ray, S.D. Kotal, Suman Goel, Charan Singh, Naresh Kumar, R.G. Ashrit, S. Balachandran, L.S. Rathore, B.K. Bandyopadhyay, U.C. Mohanty, Osuri Krishna, D.R. Sikka, Swati Basu, S.B. Thampi, S.R. Ramanan & K. Ramachandra Rao

**Forecast Demonstration Project (FDP) for Improving
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Bay of Bengal Tropical Cyclones**

Implementation of Pilot Phase, 2014: A Report

(15 October-30 November, 2014)

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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 the pilot phase, 2014 (15 October – 30 November).

The FDP on landfalling cyclones over the Bay of Bengal was conducted during 15th October to 30 November, 2014 as per the Implementation Plan. The daily bulletin was prepared during the period and circulated to all concerned. The 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 AWS 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 2014 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 Indian Space ReSearch Organisation, National Centre for Medium Range Weather Forecasting, Indian Air Force, Indian Navy, Indian Institute of Technology- Delhi & 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. K. Bandyopadhyay 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, Mr. S.V.J Kumar, and Dr. (Mrs.) Geetha of Cyclone Warning Division for their valuable contribution to bring out this report on “Pilot Phase of Forecast Demonstration Project -2014”.

I am thankful to Shri D.R. Sikka for reviewing this document and providing useful suggestions.

Dr. L.S. Rathore

January 2015 Director General of Meteorology

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 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-2014. This report deals with implementation programme, salient features of the systems developed, weather summaries issued and the lessons learnt during the FDP-2014.

The FDP on landfalling cyclones over the Bay of Bengal was conducted during 15th October to 30th November, 2014 as per the implementation plan. There were in all 5 days of Intensive Observational Period (IOP) in association with VSCS, Nilofar over Arabian Sea and one Deep Depression 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 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 FDP 2014 included enhanced AWS network of the coast, eighteen activated buoy observations from the north Indian Ocean, Oceansat-II observations and microwave imagery products. The Tropical Cyclone module in Synergie System was also used for monitoring, prediction and preparation of track of cyclone.

As a result of above, the average cyclone track forecast error was reduced in 2014 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 2014, 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 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 indication 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 large tropical cyclone track and intensity forecast errorsin 48 & 72 hrs are due to lack of critical observations from the cyclone core environment. Hence, 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.

Follow up meetings between Indo-US groups have culminated to the organizational planning of the Forecast Demonstration Project (FDP) over Bay of Bengal on the lines of NOAA-HRD and NCARs experience on cyclone probing over the Atlantic region. A Committee chaired by Shri D. R. Sikka had addressed this issue and came out with an overall Science Plan for the FDP. Keeping in mind the nature and scale of the programme that needs to be supported with adequate funding, an appropriate project management structure has been put in place to ensure the deliverables to get fully integrated with the operational cyclone forecast systems. IMD has been made the nodal agency for this purpose.

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 pilot phase **(15 Oct - 30 Dec, 2014),** several national institutions participated for joint observational, communicational & NWP activities like that during previous years. In the Pilot Phase (October –November, 2014), There were in all 5 days of Intensive Observational Period (IOP) in association with VSCS, Nilofar over Arabian Sea and one Deep Depression disturbances over the Bay of Bengal.

The detailed implementation programme is presented in Chapter-II. The salient features of cyclone Season 2014 are presented and discussed in Chapter-III. Daily weather summary and advisory issued during FDP-2014 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-2014

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 2009-13 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 2014.

Key Scientific Objectives and Goals for FDP-2014

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., 2014. There will be Intensive Observational Phases (IOP) within this period tuning actual cyclone events. There will be a National Operational Centre (NOC) 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
7. NIOT
8. INCOIS

Targeted FDP Requirements for the FDP Campaign of October-November 2014
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	17
2	Orissa	30
3	Andhra Pradesh	22
4	Tamilnadu and Puducherry	18
5	Andaman & Nicobar	1
6	Lakshadweep	1
7	Kerala	10
8	Karnataka	21
9	Goa	2
10	Maharashtra	37
11	Gujarat, Daman & Diu and Dadra Nagar & Haveli	27
12	East coast + A&N Islands	88
13	West coast + Lakshadweep	97

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 2014 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.
- Data formatting issues associated with ISRO AWS data are to be sorted out through joint effort of Shri A.K. Sharma DDGM (Satmet) and DDGM (NWP) of IMD by first 30th September 2014. On finalisation the process of converting ISRO AWS data into mobile synop (GTS) format need to be automated in liaison with DDGM(ISSD) prior to the FDP-2014 period.
- 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 2014.
- 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. Formatting issues as described above shall also be addressed. 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	26
2	Meghalaya	7
3	Nagaland	7
4	Arunachal Pradesh	7
5	Tripura	4
6	Manipur	10
7	Mizoram	8
8	Sikkim	3

(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 twelve HWSRs along the coast of India in the operational conditions as mentioned below.

Digha	: West Bengal
Haldia	: West Bengal
Sagar Island	: West Bengal
Puri	: Orissa
Gopalpur	: Orissa
Balasore	: Orissa
Visakhapatnam	: Andhra Pradesh
Machilipatnam	: Andhra Pradesh
Nellore	: Andhra Pradesh
Kalingapatnam	: Andhra Pradesh
Kakinada	: Tamil Nadu
Chennai	: Tamil Nadu
Karaikal	: Puducherry
Goa	: Goa
Veraval	: Gujarat
Dwarka	: 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 2014.
- 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 2014 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 2014 period. DDGM(UI) shall liaison with IAF to receive GTS coded data.
- DDGM(NWP) of IMD shall ensure the synchronization of data formats and collection at the NWP/NWFC of data received from outside IMD institutions in order to facilitate for the Data Processing and quality control systems at IMD and NCMRWF.
- 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-2014. DDGM(UI) shall make due arrangements to receive the DWR data in real time to DDGM (ISSD) for the FDP 2014.

(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 etc.) for its utilization by the global and regional data assimilation-forecast systems of IMD and NCMRWF during the FDP 2014 period.

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

Telecommunication

1. DDG(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 2014 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 2014 data at 4 analysis times (00, 06,12,18 UTC) for the whole of FDP 2014 period. Arrangements are also to be made to keep FDP 2014 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 2014 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 2014 period.

FDP Weather Monitoring and Advisory Group (WMAG)

1. DGM Chairman
2. Shri D.R. Sikka
3. Prof. U.C. Mohanty
4. Head ,NCMRWF
5. DDGM(S)
6. All members of FDP Project Team
7. 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., 2014 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 Pilot 2014: 1-30 September 2014

(Actions to be completed as mentioned above)

- FDP-2014 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 2014 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 article on implementation report will be prepared at the end of FDP-2014. 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.
1. A report will be prepared at the end of FDP about the performance of HWSR.

Fig.1(a). IMD's network of 675 (127 Agro+548) AWS

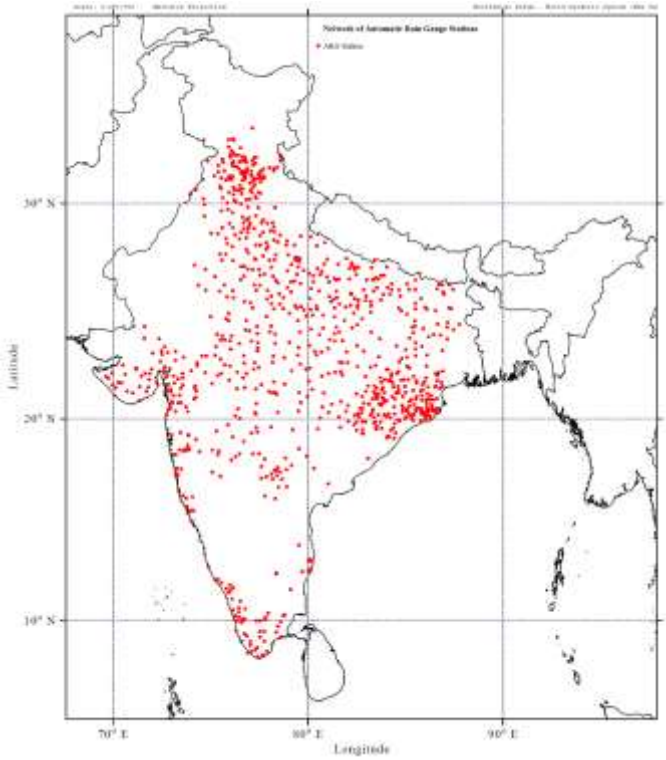


Fig.1(b). IMD's network of 900 Automatic Rain Gauge (ARG)

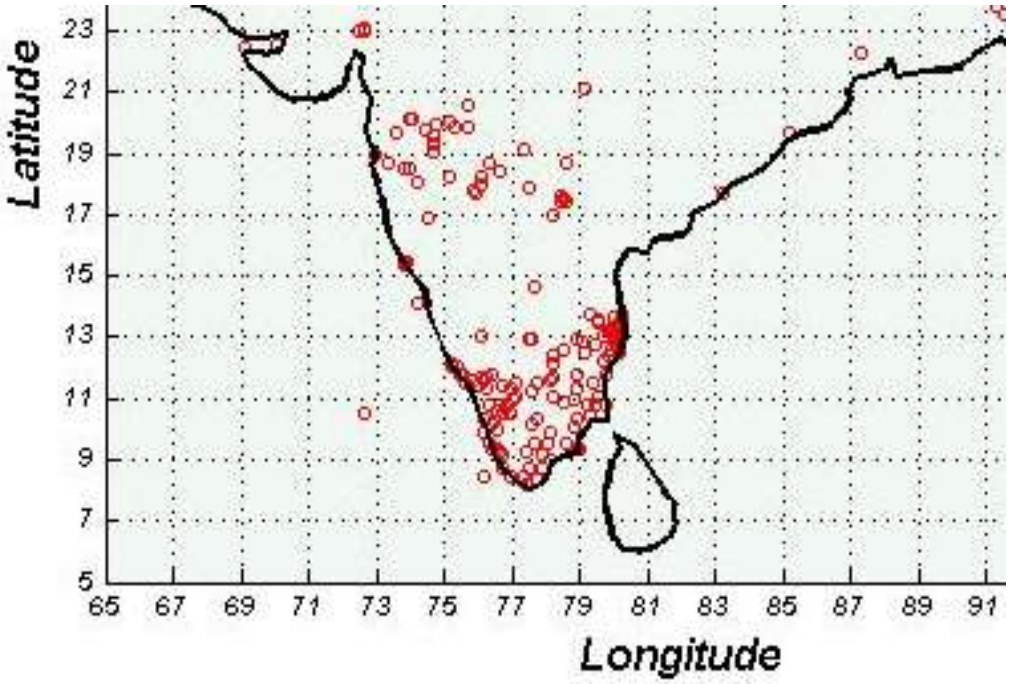


Fig.2. ISRO AWS stations under PRWONAM project.

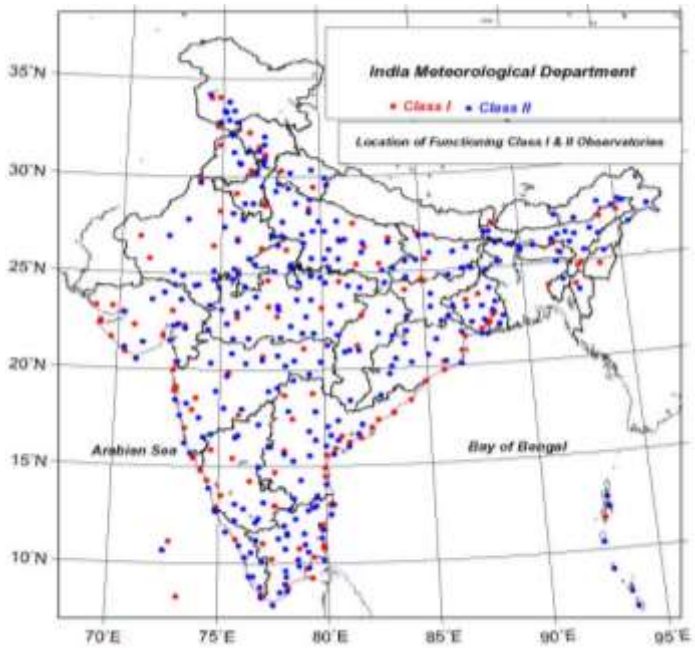
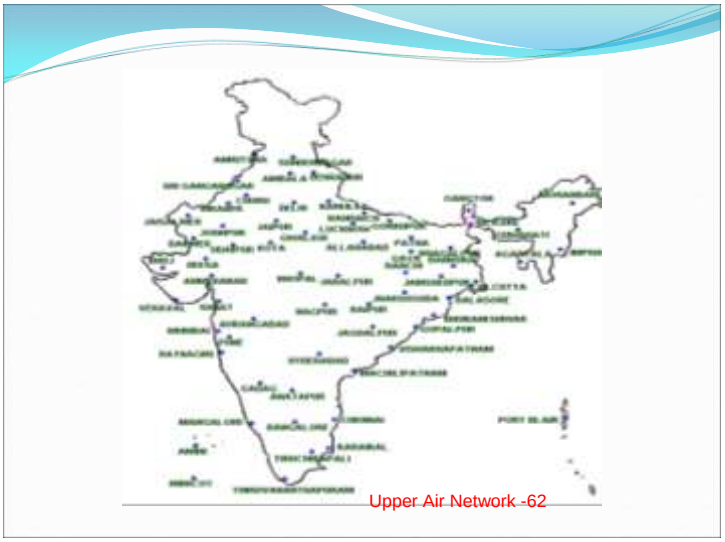


Fig.3. Synoptic stations of IMD



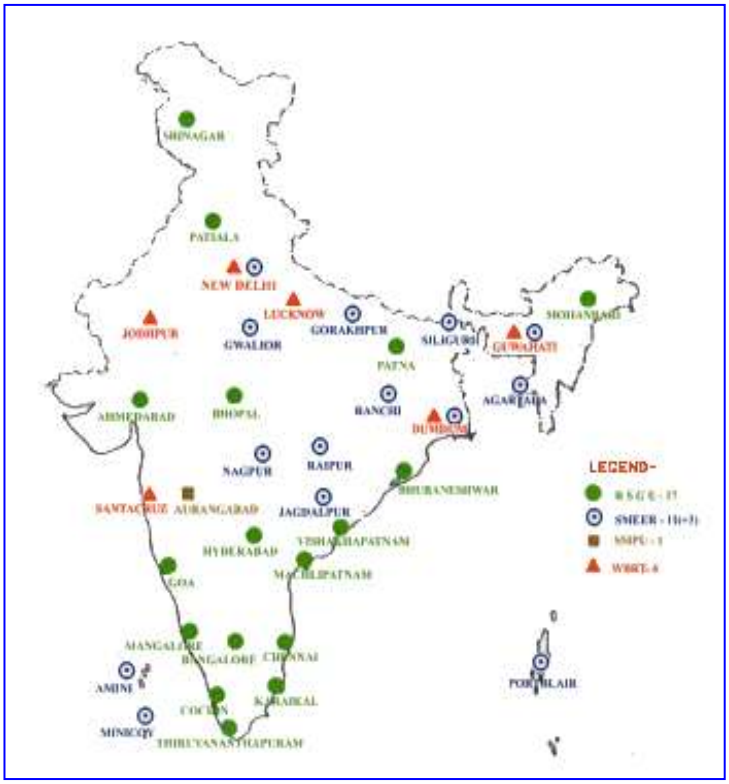


Fig.4. Coastal synoptic stations

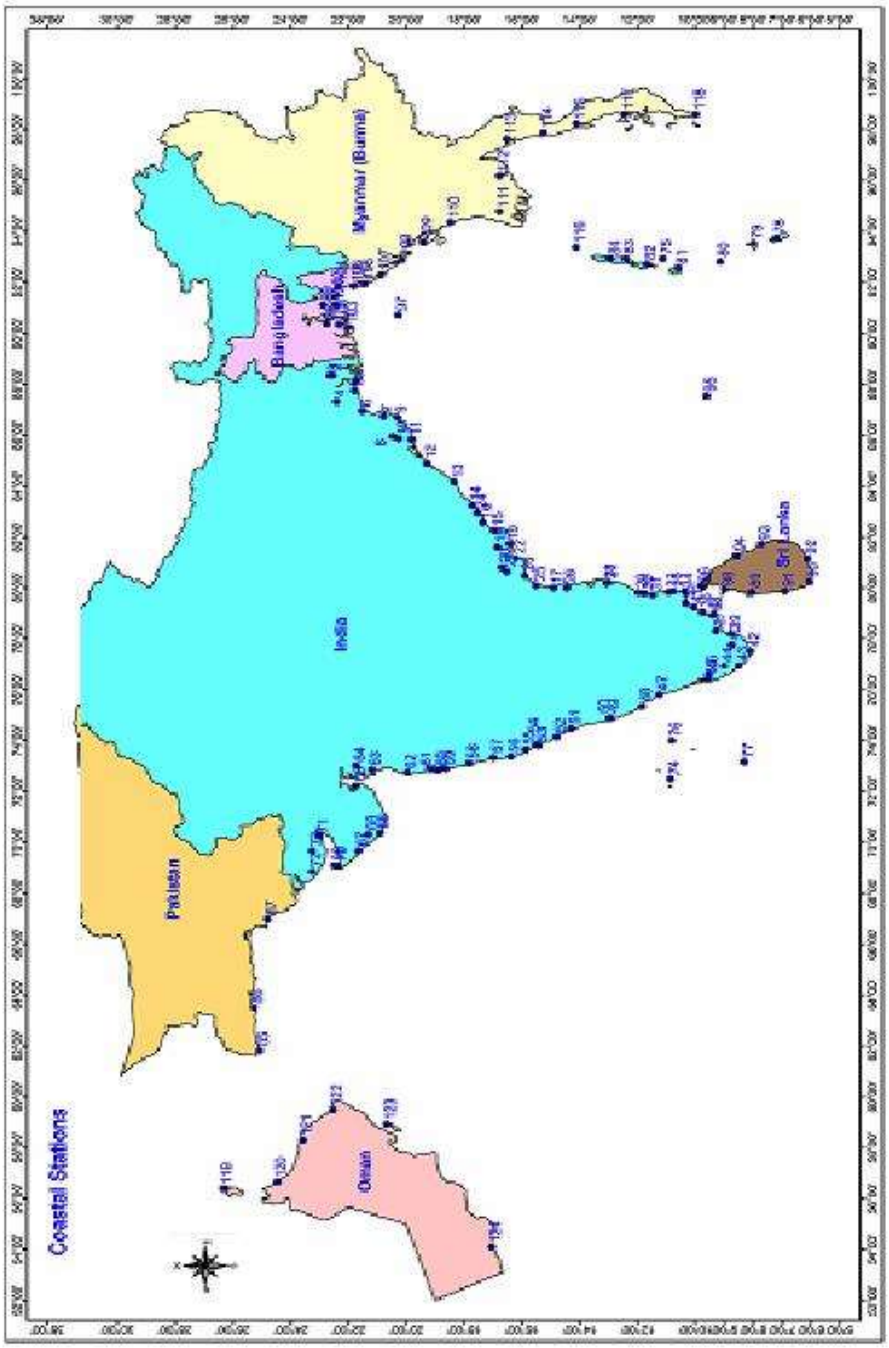


Fig.5. Pilot balloon and RS/RW (including 10 GPS stations) network of IMD

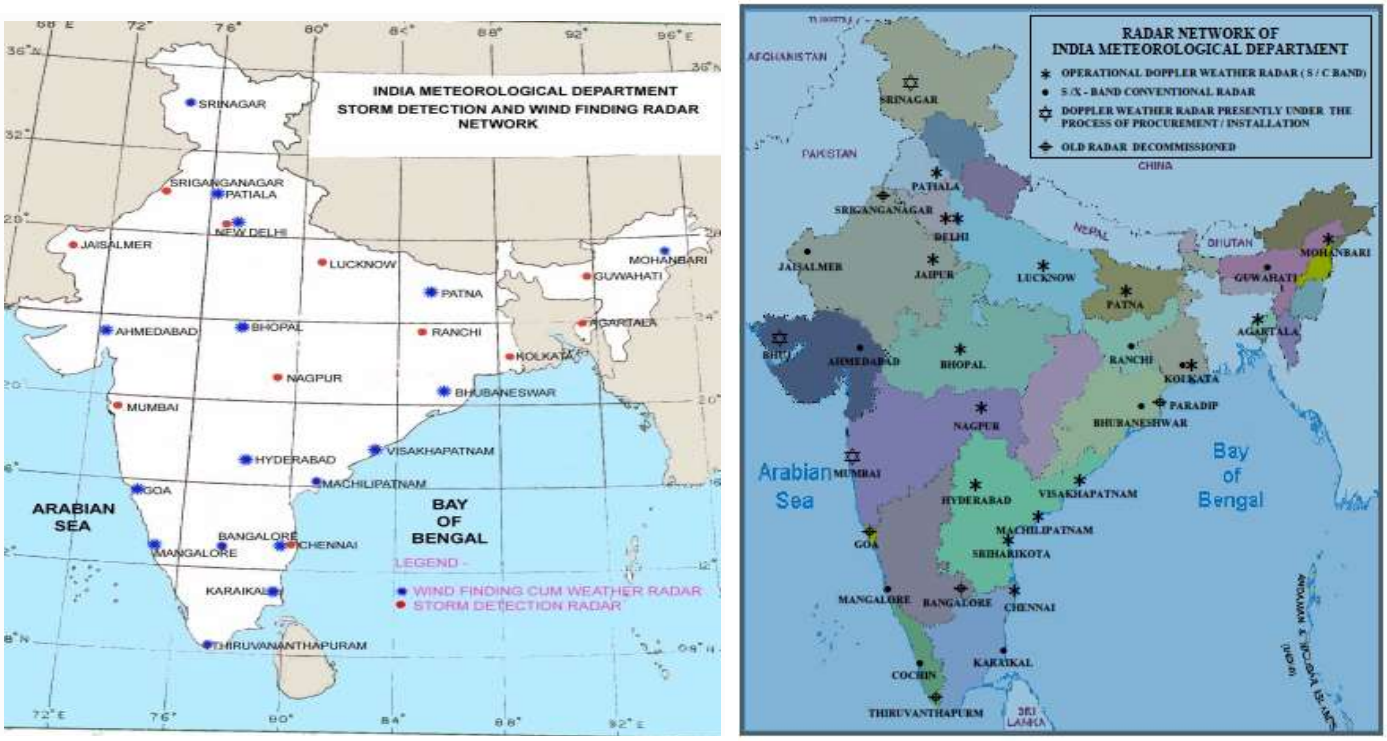


Fig.6. Cyclone detection radar network of IMD

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 – 2014

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., 2014. There were in all 5 days of Intensive Observational Period (IOP) in association with VSCS, Nilofar over Arabian Sea and one Deep Depression 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 2014. 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 2014. 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. Eleven GPS sonde stations at Thiruvananthapuram, Mohanbari, Chennai, Port Blair, Minicoy, Goa, Hyderabad, Visakhapatnam, Patna, Srinagar and New Delhi 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 2014

IOP was declared for 5 days in view of very severe cyclonic strom, Nilofar (25-31 October, 2014)-3 days over Arabian Sea and Deep Depression (05-08 Nov.2014)-2 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-2014 only one cyclonic disturbance formed over the Bay of Bengal which intensified into deep depression and one cyclonic disturbance formed over the Arabian Sea which intensified into VSCS. Both the systems dissipated over the sea therefore the official average track and intensity forecast errors are shown in Table 3.1-3.4 for these systems.

Table 3.1 Operational average track forecast errors and skill for VSCS 'Nilofar'(25-31 October, 2014) over Arabian Sea.

Lead Period (hrs)	Track forecast error(km)	Track forecast skill (%) with reference to climatology and persistence forecast	Long period Average based on 2009-13	
			Track forecast error (km)	Track forecast skill (%)
12	64.7(17)	59	68.5	31.2
24	90.5 (15)	72	124.1	35.9
36	80.4 (13)	84	163.8	43.9
48	94.1 (11)	86	202.1	52.6
60	93.8 (9)	89	233.8	58.1
72	166.1 (7)	83	268.2	61.8
84	223.5 (5)	81	-	-
96	221.7 (3)	83	-	-
108	275 (1)	74	-	-

Note-:120 hr forecast has been introduced in 2013. Hence, no long period average is available for 84-120 hrs. ( ) : Number of six hourly forecasts verified. 120 hr forecast could not be verified as the cyclone dissipated over the sea.

Table 3.2 Operational Intensity forecast errors (knots) for VSCS 'Nilofar'(25-31 October, 2014) over Arabian Sea.

Lead period (hrs)	Absolute Error	Root mean square (RMS) Error	Long period Average (2009-2013):	
			Absolute Error	RMS Error
12	10.0	12.8	10.4	14.0
24	17.1	19.6	15.7	20.5
36	23.7	27.4	20.5	25.2
48	23.9	27.4	22.5	27.6
60	21.6	25.4	23.5	26.4
72	17.4	19.3	26.7	30.8
84	15.3	17.5	-	-
96	22.2	22.5	-	-
108	21.8	21.8	-	-

Table 3.3 Operational average track forecast errors and skill for deep depression (5-8 November, 2014) over the Bay of Bengal

Lead Period (hrs)	Track forecast error (km) (Official)	Long period Average error (km)(2009-13)	Forecast skill (%)	Long period Average skill (%)(2009-13)
12	109.3 (4)	68.5	19.9	31.2
24	123.8 (4)	124.1	48.3	35.9
36	121.2 (2)	163.8	72.6	43.9

( ) : Number of six hourly forecasts verified. Due to short life period, forecast could not be verified beyond 36 hrs. The long period average error and skill are applicable to cyclone cases only.

Table 3.4 Operational Intensity forecast errors for deep depression (5-8 November, 2014) over the Bay of Bengal

Lead period (hrs)	Absolute Error (kt)	Root mean square (RMS) Error (kt)	Long period Average (2009-2013):	
			Absolute Error (kt)	RMS Error (kt)
12	8.3 (4)	8.7 (4)	10.4	14.0
24	9.4 (4)	10.2 (4)	15.7	20.5
36	8.7 (2)	8.9 (2)	20.5	25.2

( ) : Number of six hourly forecasts verified. Due to short life period, forecast could not be verified beyond 36 hrs

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-2014 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-2014 are also presented.

Very severe cyclonic storm 'Nilofar' (25-31 October, 2014)

Table-3.5. Average track forecast errors (Direct Position Error) in km for cyclone NILOFAR (Number of forecasts verified)

Lead time →	12 hr	24 hr	36 hr	48 hr	60 hr	72 hr	84 hr	96 hr	108 hr	120 hr
IMD-GFS	85(11)	111(11)	134(10)	171(9)	214(8)	261(7)	254(6)	259(5)	257(4)	392(3)
IMD-WRF	86(11)	107(11)	189(10)	320(9)	477(8)	645(7)	-	-	-	-
JMA	150(11)	151(11)	167(10)	156(9)	130(8)	82(7)	99(6)	-	-	-
NCEP-GFS	87(11)	80(11)	156(10)	184(9)	242(8)	255(7)	331(6)	313(5)	282(4)	342(3)
UKMO	113(10)	140(10)	166(10)	189(9)	185(8)	205(7)	275(6)	385(5)	560(4)	754(3)
ECMWF	80(11)	97(11)	131(10)	192(9)	243(8)	293(7)	304(6)	361(5)	376(4)	440(3)
IMD-HWRF	66(10)	106(9)	136(8)	165(7)	207(6)	284(5)	349(4)	455(3)	543(2)	849(1)
IMD-MME	76(11)	75(11)	77(10)	90(9)	108(8)	123(7)	152(6)	202(5)	266(4)	362(3)

3.4.2.2 Intensity (kt) prediction by SCIP and HWRF Model for cyclone NILOFAR

Table3.6 Average absolute errors of SCIP and HWRF model for cyclone NILOFAR (Number of forecasts verified is given in t he parentheses)

Lead time →	12 hr	24 hr	36 hr	48 hr	60 hr	72 hr	84 hr	96 hr	108 hr	120 hr
IMD-SCIP	6.3(11)	9.8(11)	10.5(10)	13.8(9)	18.6(8)	18.0(7)	-	-	-	-
IMD-HWRF	17.4(10)	11.7(9)	14.0(8)	14.6(7)	19.0(6)	24.8(5)	28.3(4)	30.3(3)	22.5(2)	5.0(1)

Table 3.7 Root Mean Square (RMSE) errors of SCIP and HWRF model for cyclone NILOFAR (Number of forecasts verified is given in the parentheses)

Lead time →	12 hr	24 hr	36 hr	48 hr	60 hr	72 hr	84 hr	96 hr	108 hr	120 hr
IMD-SCIP	8.1(11)	12.3(11)	13.4(10)	16.8(9)	21.0(8)	21.2(7)	-	-	-	-
IMD-HWRF	21.5(10)	14.0(9)	16.4(8)	15.2(7)	22.3(6)	29.5(5)	30.2(4)	34.7(3)	27.3(2)	5.0(1)

Deep Depression over the Bay of Bengal during (5-8) November 2014

Table 3.8 Average track forecast errors (Direct Position Error) in km for Deep Depression(Number of forecasts verified)

Lead time →	12 hr	24 hr	36 hr	48 hr
IMD-GFS	55 (1)	77 (1)	217 (1)	271 (1)
JMA	209 (1)	325 (1)	207 (1)	77 (1)
NCEP-GFS	41 (3)	84 (3)	99 (2)	95 (1)
UKMO	102 (3)	111 (2)	93 (2)	161 (1)
ECMWF	109 (3)	128 (3)	99 (2)	104 (1)

IMD-MME	66 (3)	82 (3)	67 (2)	46 (1)

3.4.2.4 Intensity (kt) prediction by SCIP Model for Deep Depression

Table 3.9 Average absolute errors (AAE) and Root Mean Square (RMSE) errors of SCIP model (Number of forecasts verified is given in t he parentheses)

Lead time →	**12 hr**	**24 hr**	**36 hr**	**48 hr**
AAE (kts)	0.0(3)	3.3(3)	0.0(2)	0.0(1)
RMSE (kts)	0.0	4.1	0.0	0.0

CHAPTER-IV

CYCLONIC ACTIVITIES OVER THE BAY OF BENGAL DURING FIELD PHASE - 2014

4.1 Introduction

During the year 2014, 8 cyclonic disturbances developed over north Indian Ocean including one Very Severe Cyclonic Storm (VSCS) and one Cyclonic Storm (CS) over Arabian Sea, one land depression (D) and 5 cyclonic disturbances over Bay of Bengal. Out of 5 disturbances over Bay of Bengal, 1 intensified into Very Severe Cyclonic Storm, two into Deep Depression (DD) and two into Depression. Considering season-wise distribution, out of 8 disturbances, 1 developed during winter season, 1 in pre-monsoon, 3 during monsoon and 3 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-2014**,** one Very Severe Cyclonic Storm, 'Nilofar' over the 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 2014

1.	Depression over the Bay of Bengal	04-07 January, 2014
2.	Depression over the Bay of Bengal	21-23 May, 2014
3.	Cyclonic Storm 'Nanauk' over the Arabian Sea	10-14 June, 2014
4.	Land Depression over northeastern parts of Odisha and adjoining areas of Gangetic West Bengal	21-23 July, 2014
5.	Deep Depression over coastal areas of west Bengal and neighbourhood	03-07 August, 2014
6.	Very Severe Cyclonic Storm, 'Hud Hud' over the Bay of Bengal	07-14 October, 2014
7.	Very Severe Cyclonic Storm, 'Nilofar' over the Arabian Sea	25-31 October, 2014
8.	Deep Depression over Bay of Bengal	05-08 November, 2014

4.2 Salient features of the systems formed during FDP Phase-2014

4.2.1 Very Severe Cyclonic Storm (VSCS) NILOFAR over the Arabian Sea (25-31 October 2014)

4.2.1.1 Introduction

The very severe cyclonic storm, Nilofar developed from a low pressure area which lay over southeast Arabian Sea in the morning of 21st October. It moved northwestwards and concentrated into a Depression in the early morning of 25th over westcentral and adjoining southwest Arabian Sea. It intensified into a Cyclonic Storm over the same region in the morning of 26th. It then moved nearly northwards and further intensified into a Severe Cyclonic Storm (SCS) over westcentral Arabian Sea in the early morning of 27th and into a Very Severe Cyclonic Storm (VSCS) around noon of the same day. It continued to move nearly northwards and reached its maximum intensity around midnight of 28th with wind speed of 205 kmph. It

then moved north-northeastwards and started to weaken rapidly under the influence of high vertical wind shear, entrainment of dry and cold air from the north and relatively lower ocean thermal energy. It weakened into a Severe Cyclonic Storm during early hours of 30th October and into a Cyclonic Storm in the afternoon of 30th October. It weakened into a Deep Depression in the early hours and into a Depression in the early morning of 31st October. It weakened into a well marked low pressure area over northeast Arabian Sea off north Gujarat coast in the forenoon of 31st Oct.

The salient features of this system are as follows.

(i) The track of the system was unique, as it initially moved northwestward on the day of formation and then re-curved northeastwards. It further moved nearly northwards very slowly upto 29th evening and then east-northeastwards.

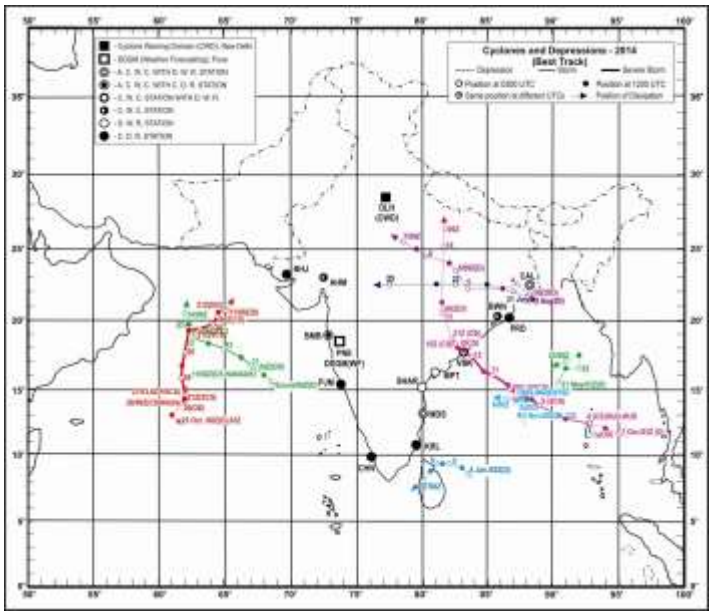
(ii) The estimated maximum sustained surface wind speed in association with the cyclone was about 110 kt (205 kmph).

(iii) The estimated central pressure was 950 hPa with a pressure drop of 56 hPa at the centre compared to surroundings.

(iv) It exhibited Rapid Intensification as well as Rapid Weakening. The maximum sustained wind increased from about 100 kmph in the early morning of 27th to about 205 kmph in the early evening of 28th (in 36 hours). It weakened rapidly from VSCS (wind speed of about 200 kmph) in the morning of 29th into SCS (wind speed of about 110 kmph) in the morning of 30th and further into a low pressure area (wind speed < 30 kmph) on 31st morning.

(v) Though the re-curvature of the track could be predicted by NWP models 3 to 4 days in advance, there was large variation in the position and time of the landfall as well as re-curvature.

(vi) The genesis, track and intensification/weakening were predicted by IMD with reasonable accuracy five days in advance.



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.

4.2.1.2 Monitoring and prediction of VSCS NILOFAR

The VSCS Nilofar was monitored & predicted continuously since its inception by the IMD. IMD could predict well in advance the genesis, intensification, weakening as well as the re-curvature of the track towards Gujarat coast. The VSCS Nilofar was monitored mainly with satellite observations, supported by meteorological buoys and ship observations. OMNI buoys deployed in the Arabian Sea captured the signals of the NILOFAR cyclone passage and the time series observations clearly exhibit the importance of the proximity of the location of the buoys to the cyclone track.

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 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

Under the influence of the active northeast monsoon, a cyclonic circulation extending upto mid–tropospheric level lay over Lakshadweep area and adjoining Kerala in the morning of 19th October. It lay over southeast Arabian Sea and adjoining Lakshadweep on 20th October. Under its influence, a low pressure area formed over southeast Arabian Sea in the morning of 21st October. It persisted over the same region and became well marked in the early morning of 23rd October. It concentrated into a Depression in the early morning of 25th October and lay centered at 0530 hrs IST of 25th over westcentral and southwest Arabian Sea near Lat. 12.5°N/ Long. 61.5°E. According to the satellite imagery intensity was T 1.5. The convection increased from 24th to 25th with increase in organization and depth of cloud. The associated cloud showed shear pattern with major convection being shifted to west of the low level circulation centre. The associated maximum sustained wind speed was 25 kts. However, the winds were higher in the northern sector due to prevailing northeast monsoon circulation. A ship located near Lat. 12.5°N/ Long. 60.3°E reported MSLP of 1001 hPa and surface wind speed of 330°/20 kts indicating the fact that areal extent of the strong winds in the northwestern sector was less compared to the northeast and southwest sector.

Considering the environmental condition, the SST was 28-30°C around the system centre prior to the genesis of Depression. Ocean thermal energy was 60-80 kJ/cm^2 and vertical wind shear was moderate 10-20 kts around the system centre. The low level convergence was about 15*10^{-5}s^{-1} and vorticity was about 200 *10^{-5}s^{-1}. The upper level divergence was about 30*10^{-5}s^{-1}. The low level relative vorticity and convergence as well as the upper level divergence increased from 24th to 25th. There was poleward favourable outflow in association with an anti-cyclone to the east-northeast of the system. The upper tropospheric ridge at 200 hPa level ran along 15°N. The MJO was located in Phase 1 with amplitude greater than 1. The observed track of the system is shown in fig. 4.2.

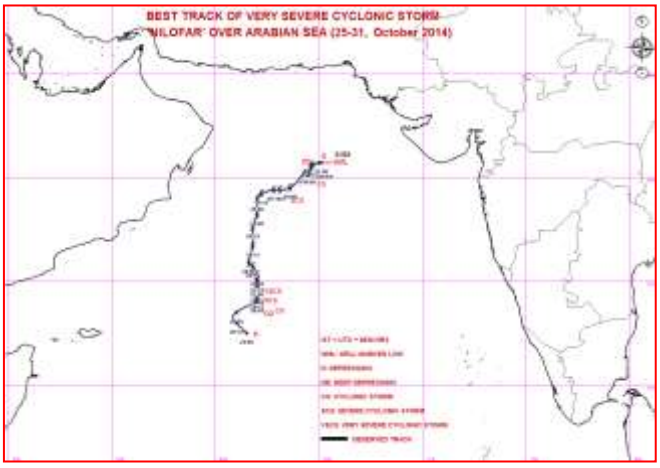


Fig. 4.2: Observed track of the Very Severe Cyclonic Storm 'NILOFAR' over Arabian Sea during 25-31 October, 2014

4.2.1.3.2. Intensification and movement

In association with the favourable environmental and meteorological conditions as mentioned in previous section, the Depression moved north-northwestwards and intensified into a Deep Depression at 0830 hrs IST of 26th over westcentral and adjoining southwest Arabian Sea near Lat. 14.0°N/ Long. 62.0°E. It intensified into a cyclonic storm over the same region at 1130 hrs IST of 26th. As the system was lying close to the ridge, it moved slowly northwards and intensified into an SCS over west central and adjoining southwest Arabian Sea at 0230 hrs IST of 27th and into a VSCS at 1130 hrs IST of the same day and lay centered over westcentral Arabian Sea near Lat. 14.9°N/ Long. 62.0°E. It continued to intensify further and reached the peak intensity with T 5.5 at 2330 hrs IST of 29th and lay centered over westcentral Arabian Sea near Lat. 17.6°N/ Long. 61.8°E.

The system exhibited Rapid Intensification as well as Rapid Weakening. The maximum sustained wind increased from about 100 kmph in the early morning of 27th to about 205 kmph in the evening of 28th (in 36 hours) because of low vertical wind shear and increase in vorticity. It weakened rapidly from VSCS (wind speed of about 200 kmph) in the morning of 29th into SCS (wind speed of about 110 kmph) in the morning of 30th and further into a low pressure area (wind speed < 30 kmph) on 31st morning under the influence of high vertical wind shear, entrainment of dry and cold air and relatively lower ocean thermal energy. Also the convection was highly sheared from the low level circulation centre. The best track parameters of VSCS 'NILOFAR' are shown in Table 4.2.

Table 4.2: Best track positions and other parameters of the Very Severe Cyclonic Storm, 'NILOFAR' over the Bay of Bengal during 07-14 October, 2014

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
25-10-2014	0000	12.5/61.5	1.5	1004	25	3	D
	0300	12.5/61.5	1.5	1004	25	3	D
	0600	12.5/61.5	1.5	1004	25	3	D
	1200	13.0/61.0	1.5	1003	25	3	D

	1800	13.5/61.0	1.5	1003	25	3	D
26-10-2014	0000	14.0/62.0	1.5	1002	25	4	D
	0300	14.0/62.0	2.0	999	30	5	DD
	0600	14.1/62.0	2.5	998	35	6	CS
	0900	14.1/62.0	2.5	996	35	7	CS
	1200	14.2/62.0	2.5	994	40	8	CS
	1500	14.3/62.0	3.0	994	40	8	CS
	1800	14.4/62.0	3.0	994	45	10	CS
	2100	14.5/62.0	3.0	994	50	12	SCS
27-10-2014	0000	14.8/62.0	3.5	990	55	16	SCS
	0300	14.9/62.0	3.5	990	60	18	SCS
	0600	14.9/62.0	4.0	986	65	20	VSCS
	0900	14.9/62.0	4.0	984	65	22	VSCS
	1200	15.0/62.0	4.0	982	70	24	VSCS
	1500	15.1/62.0	4.0	981	70	25	VSCS
	1800	15.3/62.0	4.0	980	70	26	VSCS
	2100	15.6/61.8	4.0	979	75	27	VSCS
28-10-2014	0000	15.7/61.8	4.0	978	75	28	VSCS
	0300	15.8/61.7	4.0	977	75	29	VSCS
	0600	15.9/61.6	4.5	974	80	32	VSCS
	0900	16.3/61.6	5.0	966	90	40	VSCS
	1200	16.7/61.8	5.5	954	100	52	VSCS
	1500	17.2/61.8	5.5	952	105	54	VSCS
	1800	17.6/61.8	5.5	950	110	56	VSCS
	2100	18.0/61.8	5.5	950	110	56	VSCS
29-10-2014	0000	18.2/62.0	5.5	954	105	52	VSCS
	0300	18.7/62.0	5.0	958	100	48	VSCS
	0600	18.9/62.0	5.0	962	95	44	VSCS
	0900	19.0/62.0	5.0	968	90	40	VSCS
	1200	19.2/62.2	4.5	974	80	32	VSCS
	1500	19.4/62.5	4.0	980	70	26	VSCS
	1800	19.4/62.8	4.0	986	70	24	VSCS
	2100	19.4/63.1	3.5	988	60	20	SCS
30-10-2014	0000	19.5/63.6	3.5	990	60	18	SCS
	0300	19.8/64.1	3.0	994	50	14	SCS
	0600	20.2/64.3	3.0	998	45	10	SCS
	0900	20.2/64.5	2.5	1000	40	9	CS
	1200	20.5/64.6	2.5	1001	40	8	CS
	1800	20.6/64.7	2.5	1002	35	7	CS
	2100	20.7/65.0	2.0	1003	30	5	DD
31-10-2014	0000	20.7/65.1	1.5	1004	25	4	D
	0300	Weakened into a well marked low pressure area over northeast Arabian Sea off north Gujarat coast					

4.2.1.4. Maximum Sustained Surface Wind speed (MSW) and estimated central pressure at the time of landfall:

The MSW in association with a cyclone 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. Based on satellite imagery, an empirical technique known as the Dvorak technique is utilized worldwide to estimate the intensity of cyclone and hence the associated MSW. Based on the observation of the pressure drop at the centre, MSW can also be estimated using the empirical pressure-wind relationship (MSW= 14.2* √ pressure drop at the centre).

The lowest Estimated Central Pressure (ECP) of the system was 950 hPa at 2330 hrs IST of 28th Oct. with a pressure drop of 56 hPa. The estimated MSW was 110 kts. The variations in ECP and MSW are shown in Fig. 4.3.

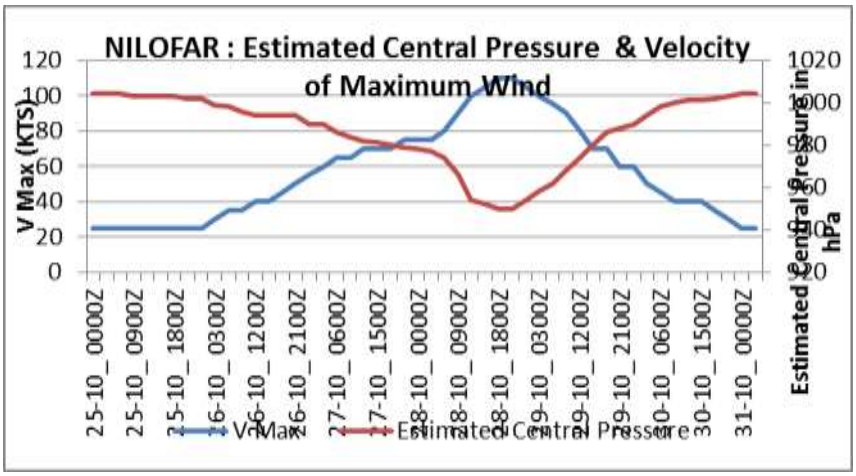


Fig. 4.3. Variations in ECP and MSW during VSCS Nilofar for the period 25 -31 Oct. 2014.

The buoys AD06, AD02 and AD07 were closer to the track. The buoys AD08, AD09 and AD10 were away from the cyclone track, with very less response in the met and ocean parameters. Table 4.3 shows the distance between NILOFAR cyclone track and OMNI buoy locations. Fig.4.3 - 5 show the atmospheric air pressure, wind speed and significant wave height during the period 22 Oct. – 2 Nov. 2014.

Table -4.3: Distance between NILOFAR cyclone track and OMNI buoy locations

Sl.No	Buoy ID	Distance between cyclone track and Buoy position
1	AD02	421 nm
2	AD04	876 nm
3	AD06	158 nm
4	AD07	417 nm
5	AD08	578 nm
6	AD09	897 nm
7	AD10	758nm

The Atmospheric Pressure showed a maximum drop observed at AD07 with recorded minimum pressure of 1004.46 hPa on October 26, 2014.

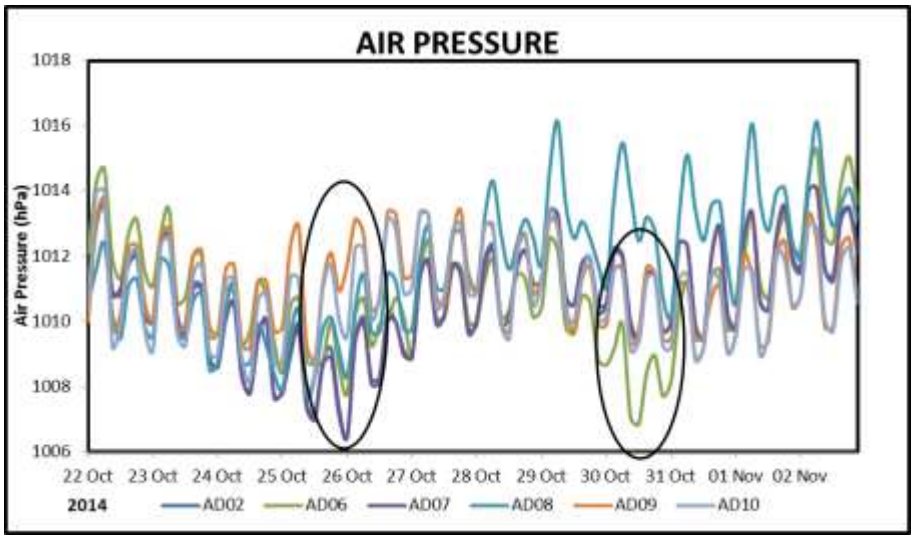


Fig. 4.4. Atmospheric Pressure recorded by the buoys during 22 Oct. – 2 Nov. 2014

The buoy AD06 which was near the track of the cyclone recorded a maximum wind speed of 11.4 m/s on October 24, 2014 and 11.2 m/s on October 30, 2014.

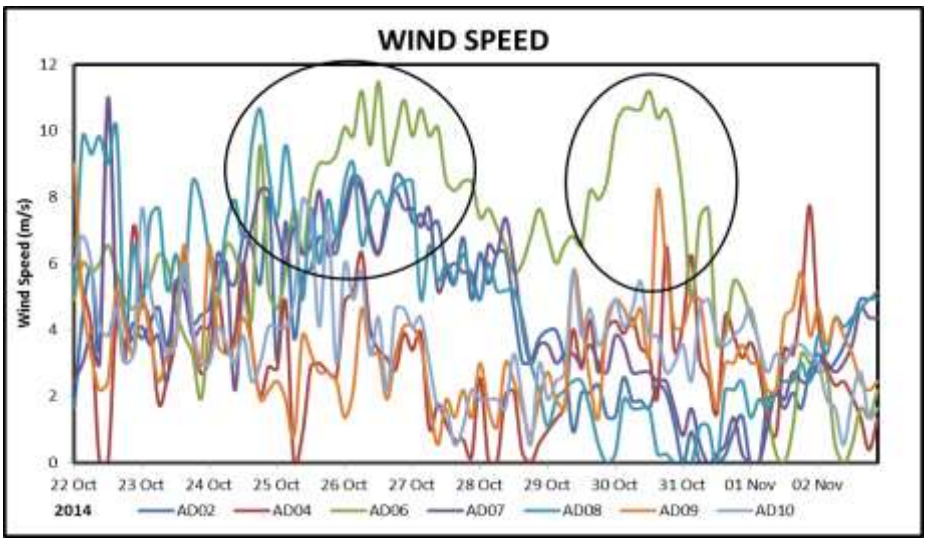


Fig. 4.5. Wind speed recorded by the buoys during 22 Oct. – 2 Nov. 2014

The increase in significant wave height was recorded maximum at AD07 and AD06 location with a significant wave height of 3.22 m and 3.16 m on 26th and 30th October, 2014 respectively.

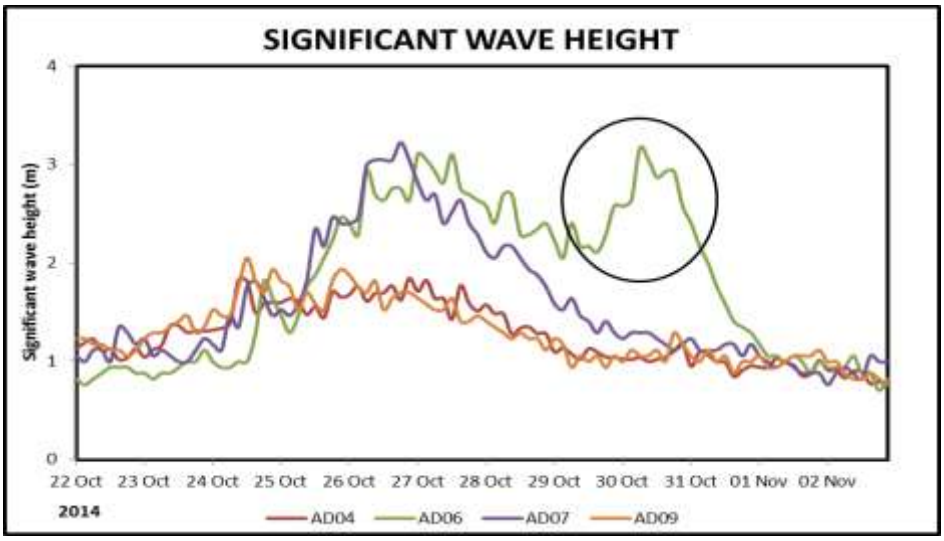


Fig. 4.6 Significant wave height recorded by the buoys during 22 Oct. – 2 Nov. 2014

4.2.1.5 Characteristic features observed through Satellite and RADAR

4.2.1.5.1 Features observed through satellite

Satellite monitoring of the cyclone was mainly done by using half hourly Kalpana-1, INSAT-3D imageries. 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 of VSCS NILOFAR representing the life cycle of the cyclone are shown in Fig. 4.6 - 4.8.

According to INSAT-3D imageries and products, a low level circulation centre (LLCC) attained intensity of T.1.5 over westcentral Arabian Sea and adjoining east-central and south Arabian Sea on 25th/0000 UTC. Associated broken low and medium clouds with embedded intense to very intense convection extended over 8-10° laittude/longitude box around the vortex centre over the Arabian Sea and adjoining Indian Ocean. Convection increased gradually and started organising. The system attained intensity of T.2.0 at 0300 UTC of 26th. It further intensified to T.2.5 at 0600 UTC of 26th and convection organised into a curved band pattern with the lowest cloud top temperature of -93.0°C. It intensified to T.3.0 and T.3.5 at 26th/1500 UTC and 27th/0000 UTC respectively. The convection showed eye pattern from 0000 UTC of 27th. It attained intensity of T.4.0. and T.4.5 around 0600 UTC of 27th and 28th respectively and further attained its peak intensity of T.5.5 within next 6 hours (28th/1200 UTC). On 29th/0300 UTC the system started showing signs of weakening with ragged eye pattern and intensity T.5.0. By 29th/1500 UTC, its intensity decreased further to T.4.0. By 30th/0300 UTC, its T. No. became T.3.0. At 2100 UTC of 30th, its intensity was T.2.0 and on 31st/0000 UTC, it was T.1.5. During weakening phase the cloud pattern changed from eye pattern to curved band pattern and finally to shear pattern on 30th and 31st Oct. 2014.

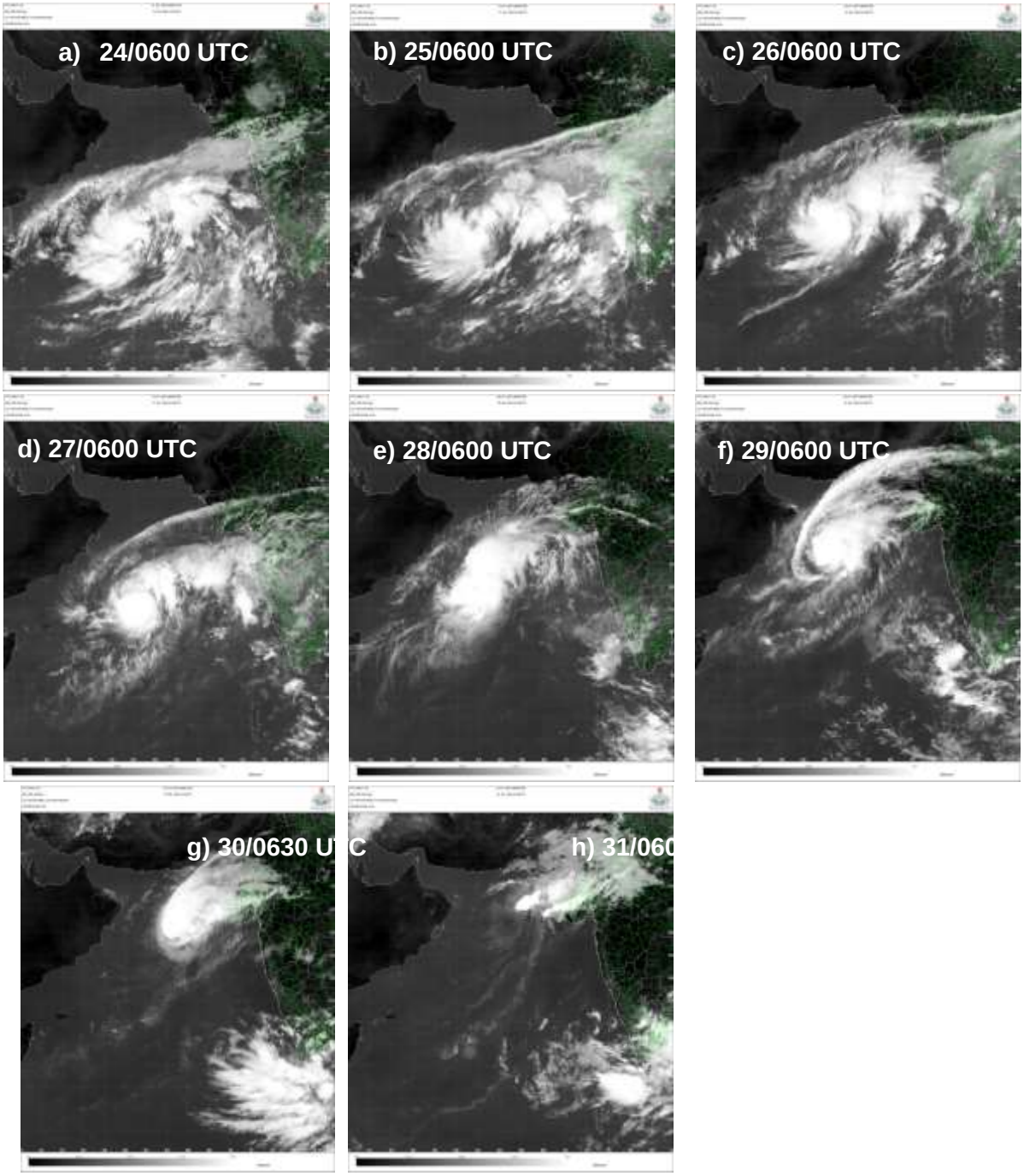


Fig. 4.6 Typical INSAT-3D IR imageries based on 0600 UTC in association with VSCS NILOFAR during 24-31 October 2014

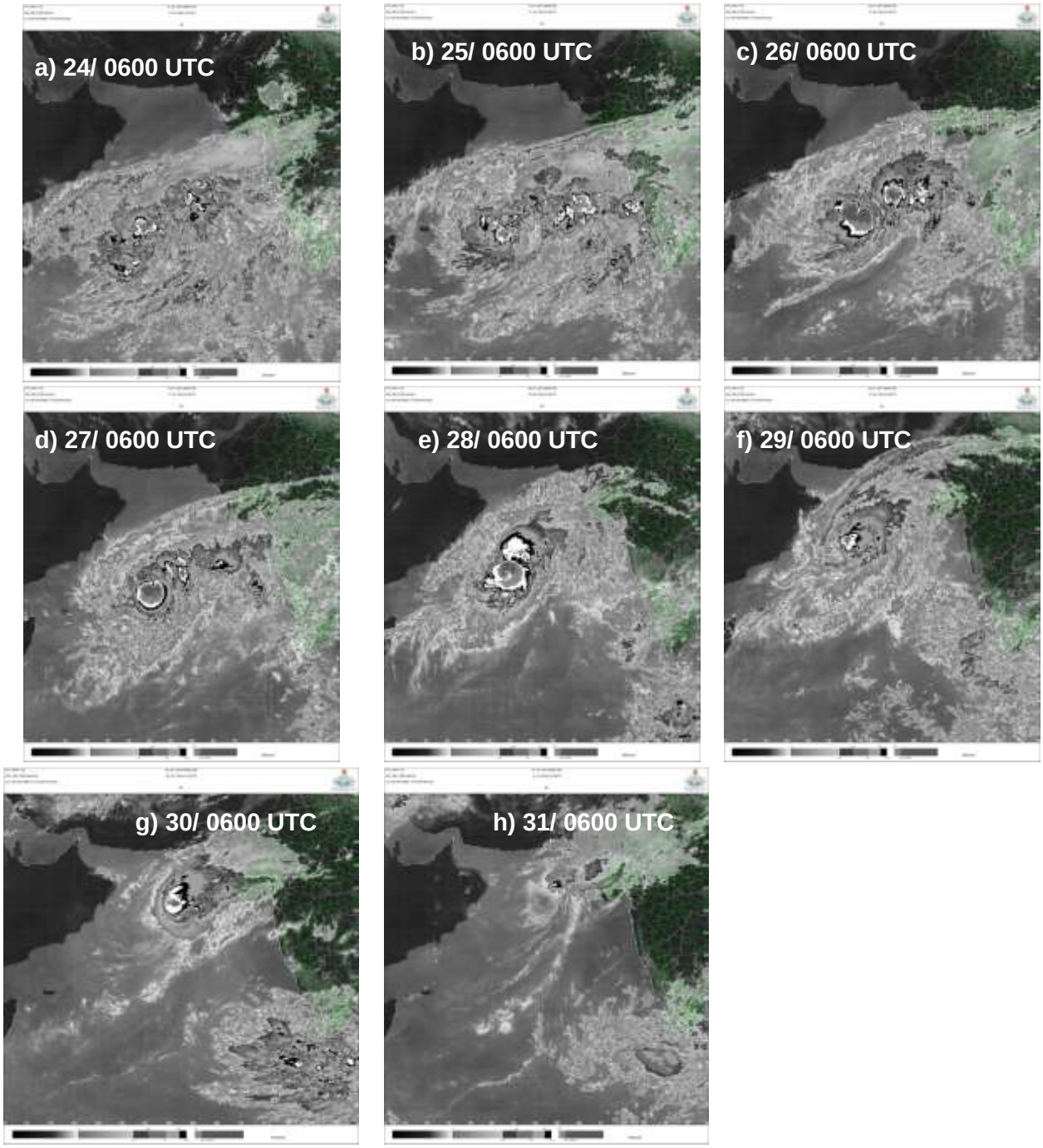


Fig. 4.7 INSAT-3D enhanced IR imageries in association with VSCS NILOFAR during 24-31 October 2014

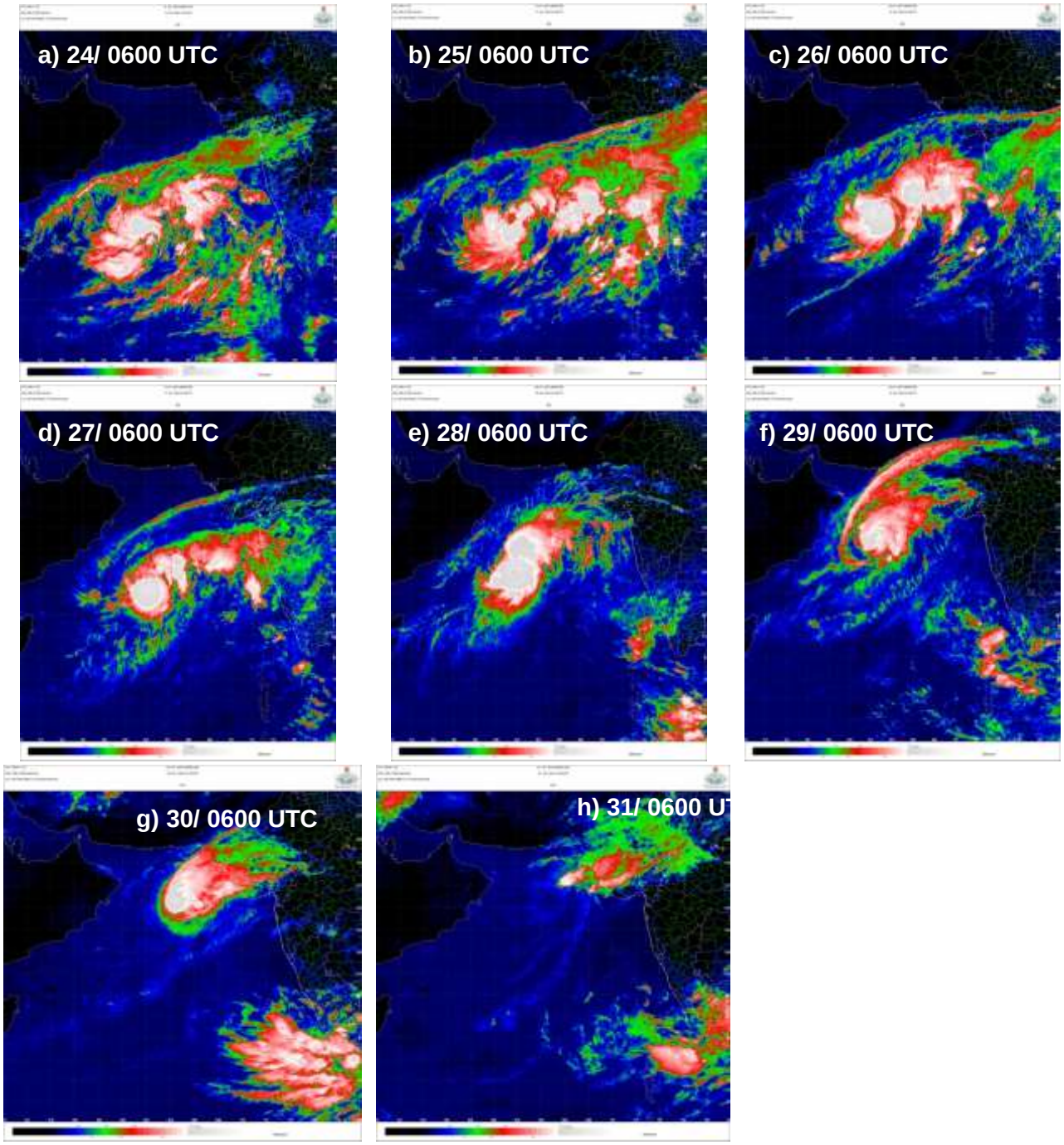


Fig. 4.8 INSAT-3D colored enhanced IR imageries based on 0600 UTC in association with VSCS NILOFAR during 24-31 October 2014

4.2.1.5.2 Features observed through RADAR

Cyclone Detection Radar (CDR) Bhuj could monitor the system on 31st Oct. as the system came in its range. Due to weakening of the system the characteristic features like location and intensity could not be detected with RADAR. However, the convection in association with the system lying to the right of the system centre was well captured in the RADAR imagery as shown in Fig. 4.9.

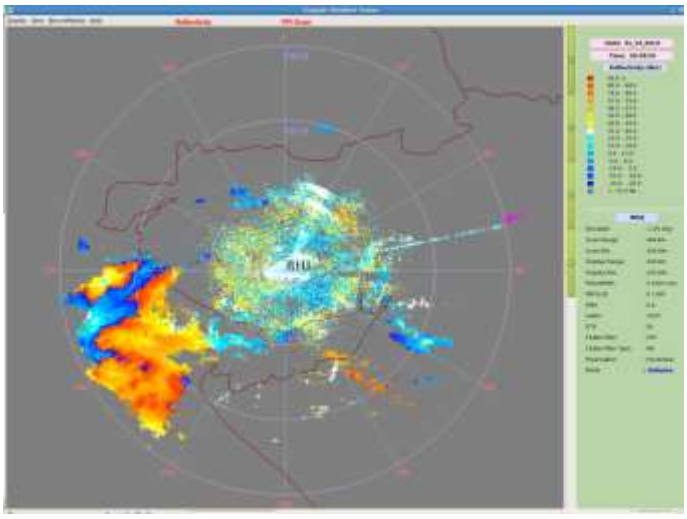


Fig. 4.9 RADAR Imagery from CDR Bhuj based on 0000 UTC of 31st Oct. 2014

4.2.1.6. Dynamical features

To analyse the dynamical features, the Mean Sea Level Pressure (MSLP), surface winds at 10 m height and winds at 850, 500 and 200 hPa levels during the period 25 – 31 October 2014 are presented in Fig. 4.10 based on IMD-GFS analysis.

The maximum wind at lower level was oriented north-south and active northeast monsoon flow prevailed to the north during genesis stage i.e., 25th Oct. The wind speed was little bit higher in the northern sector. Hence the wind distribution was asymmetric. While the size of the gale wind gradually increased with intensification of the system and continued to be asymmetric, the core wind became symmetric when system intensified into VSCS on 27th Oct. However, with the weakening of the system from 29th Oct., the size of the gale wind decreased in the northeast and southeast sector.

During 26-28th, the VSCS Nilofar was sandwiched between two anti-cyclonic circulation, one lying to the southeast and another to the west-northwest of the system centre. As a result, during 26-28th the system nearly moved northwards with very slow speed. At the same time it provided a very low vertical wind shear (5-10 kts) which resulted in rapid intensification.

A trough in the upper tropospheric westerly approached from west which led to increase in the westerlies in the storm region from 29th Oct. 2014. Subsequently, as the system moved to the north of the ridge line it was steered northeastwards from 29th onwards towards Gujarat and adjoining Pakistan coast. However, as it moved northeastwards, it encountered high vertical wind shear, entrainment of dry and cold air towards to the core due to mid-latitude westerlies. Hence, it started weakening rapidly over the sea itself before reaching the Gujarat coast.

The analysis could very well capture the genesis and track of the system. However, the rapid intensification and rapid weakening before reaching coast could not be detected reasonably.

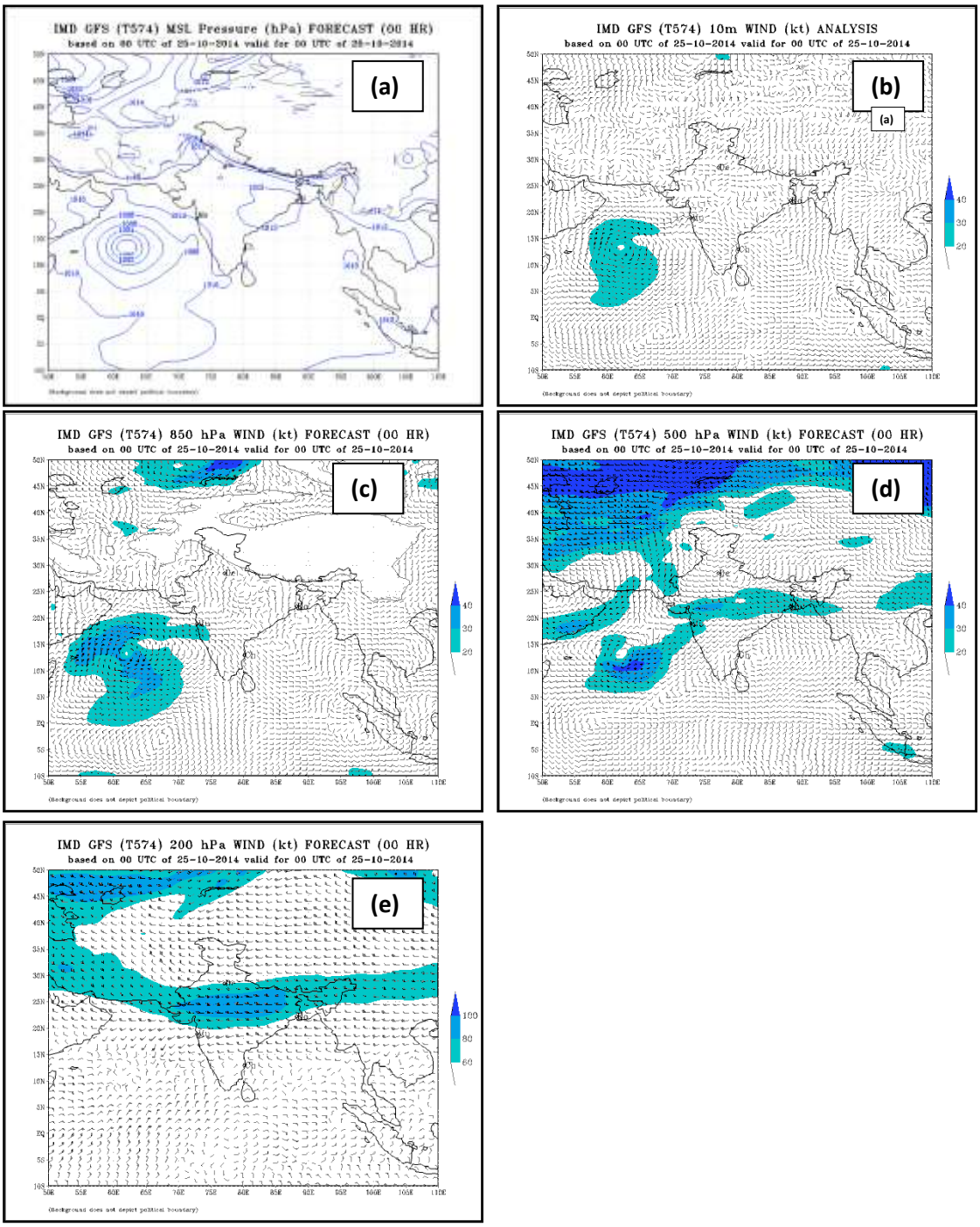


Fig. 4.10: IMD-GFS Analysed charts on 25th October 2014 MSLP Analysis, (b) 10 m winds, (c) 850 hPa winds, (d) 500 hPa winds, (e) 200 hPa winds

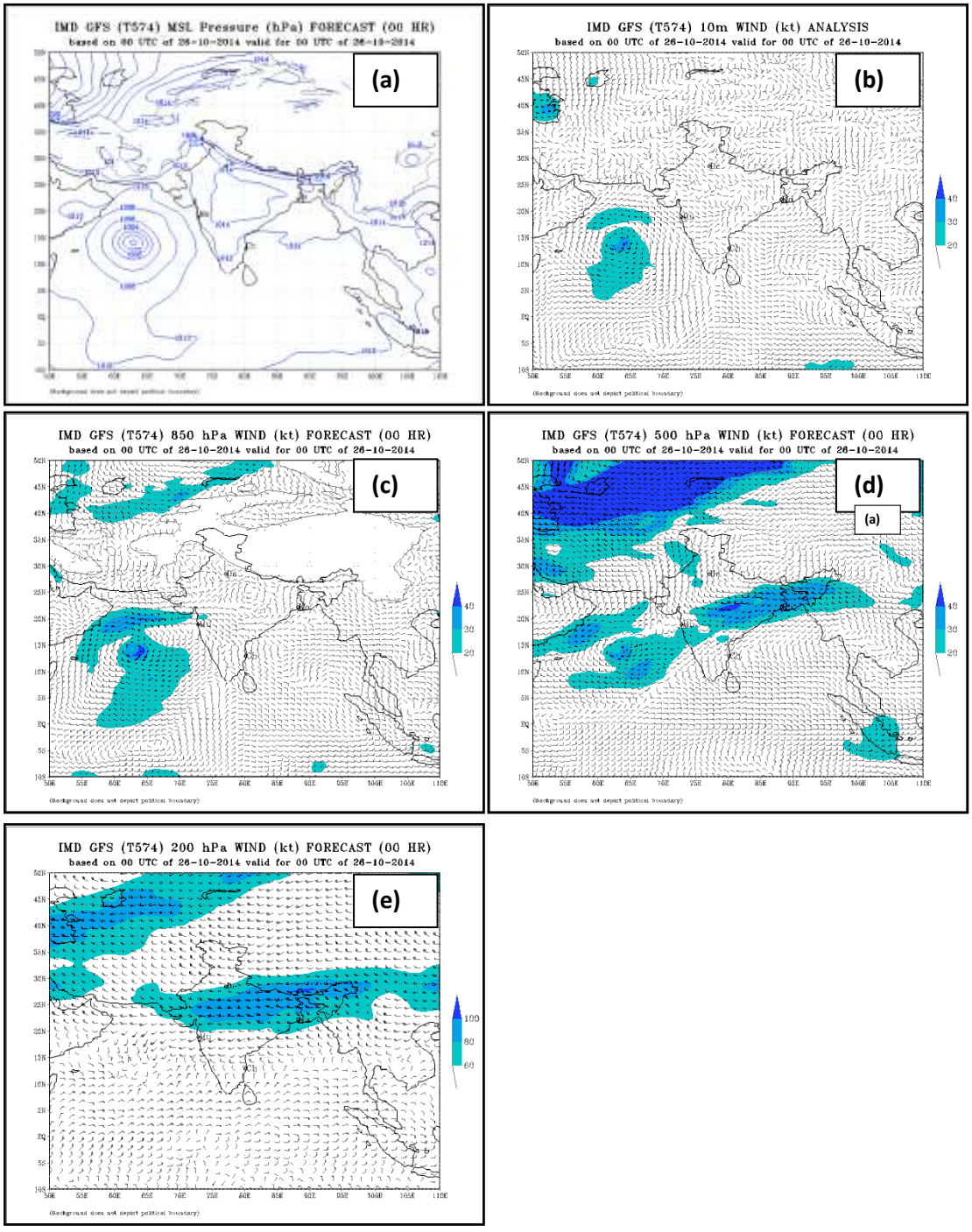


Fig. 2.7.10 (contd): IMD-GFS Analysed charts on 26th October 2014 MSLP Analysis, (b) 10 m winds, (c) 850 hPa winds, (d) 500 hPa winds, (e) 200 hPa winds

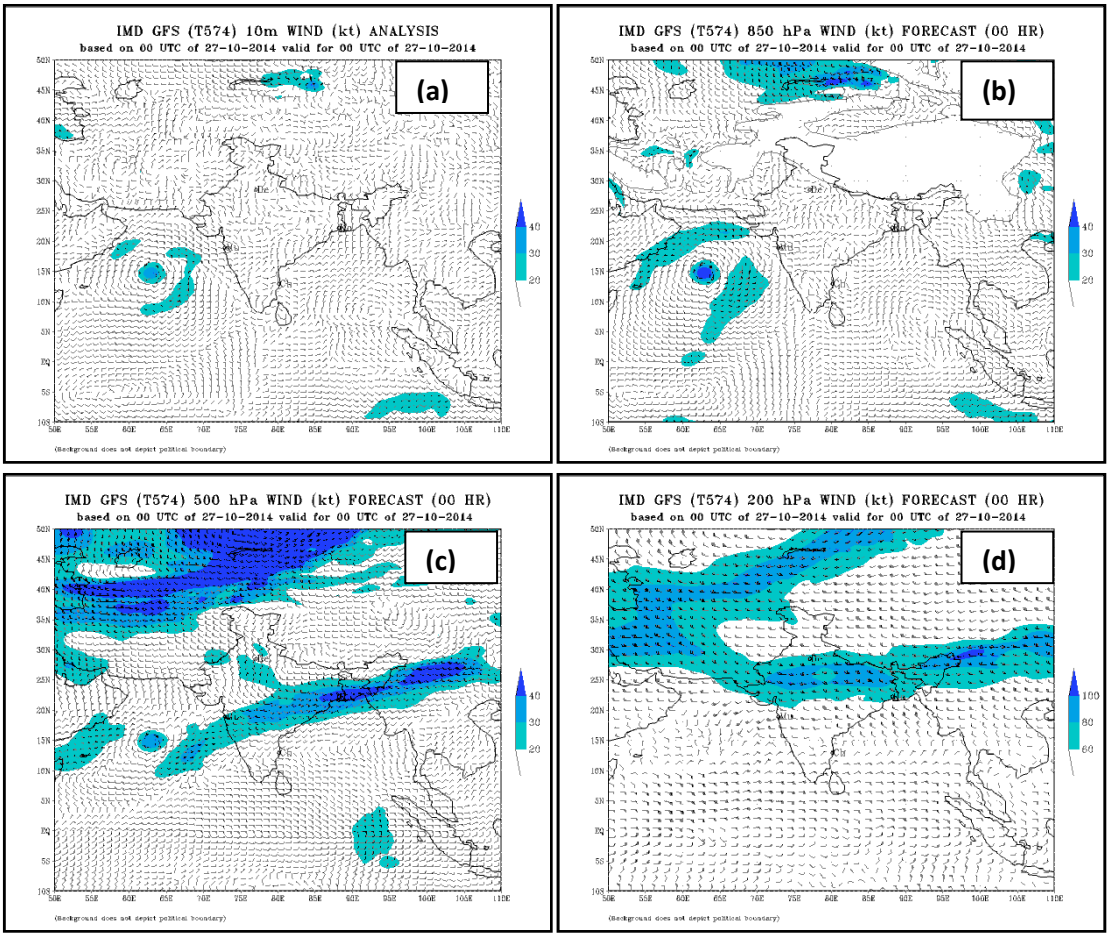


Fig. 4.10 (contd): IMD-GFS Analysed charts on 27th October 2014(a) 10 m winds, (b) 850 hPa winds, (c) 500 hPa winds, (d) 200 hPa winds

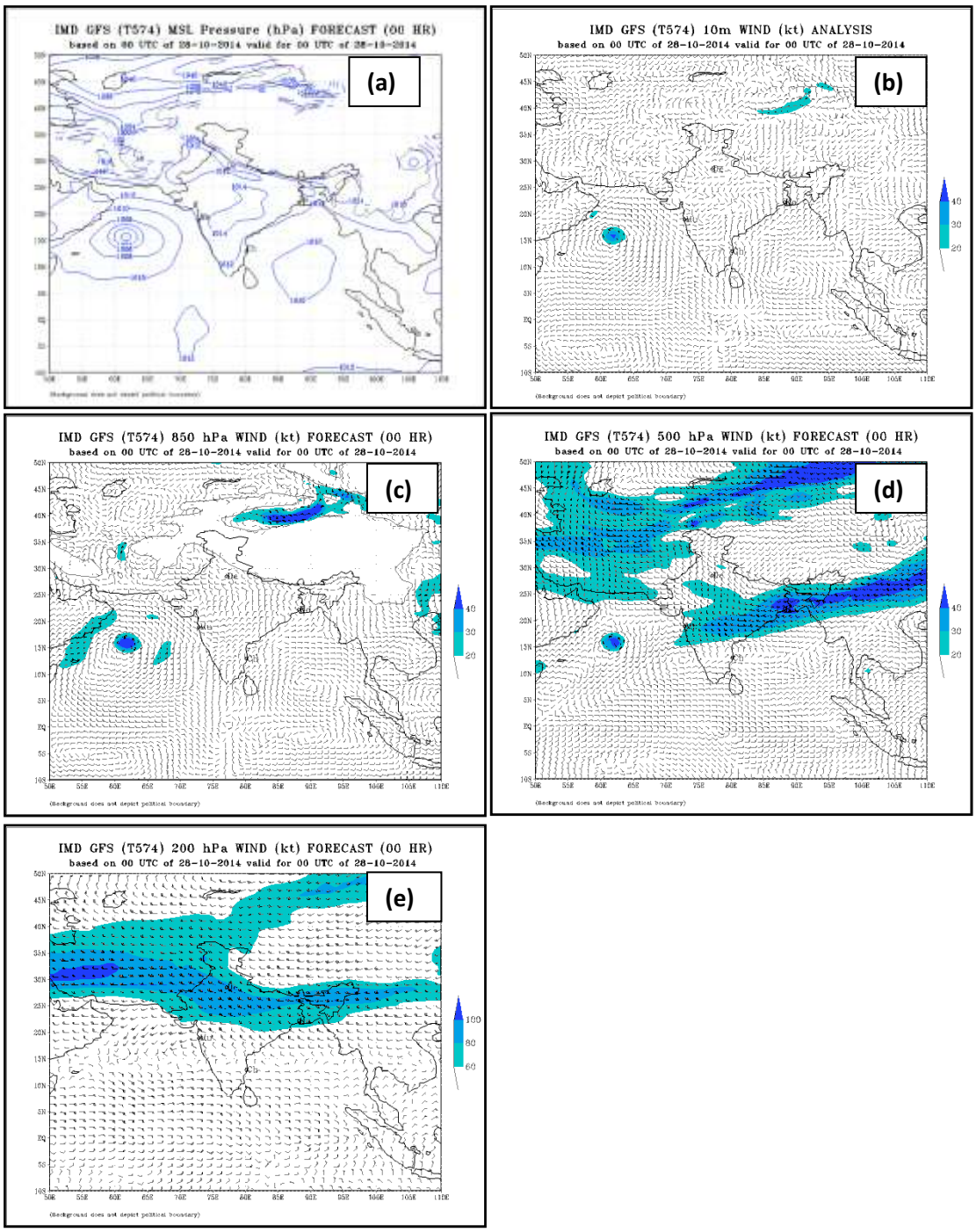


Fig. 4.10 (contd): IMD-GFS Analysed charts on 28th October 2014 MSLP Analysis, (b) 10 m winds, (c) 850 hPa winds, (d) 500 hPa winds, (e) 200 hPa winds

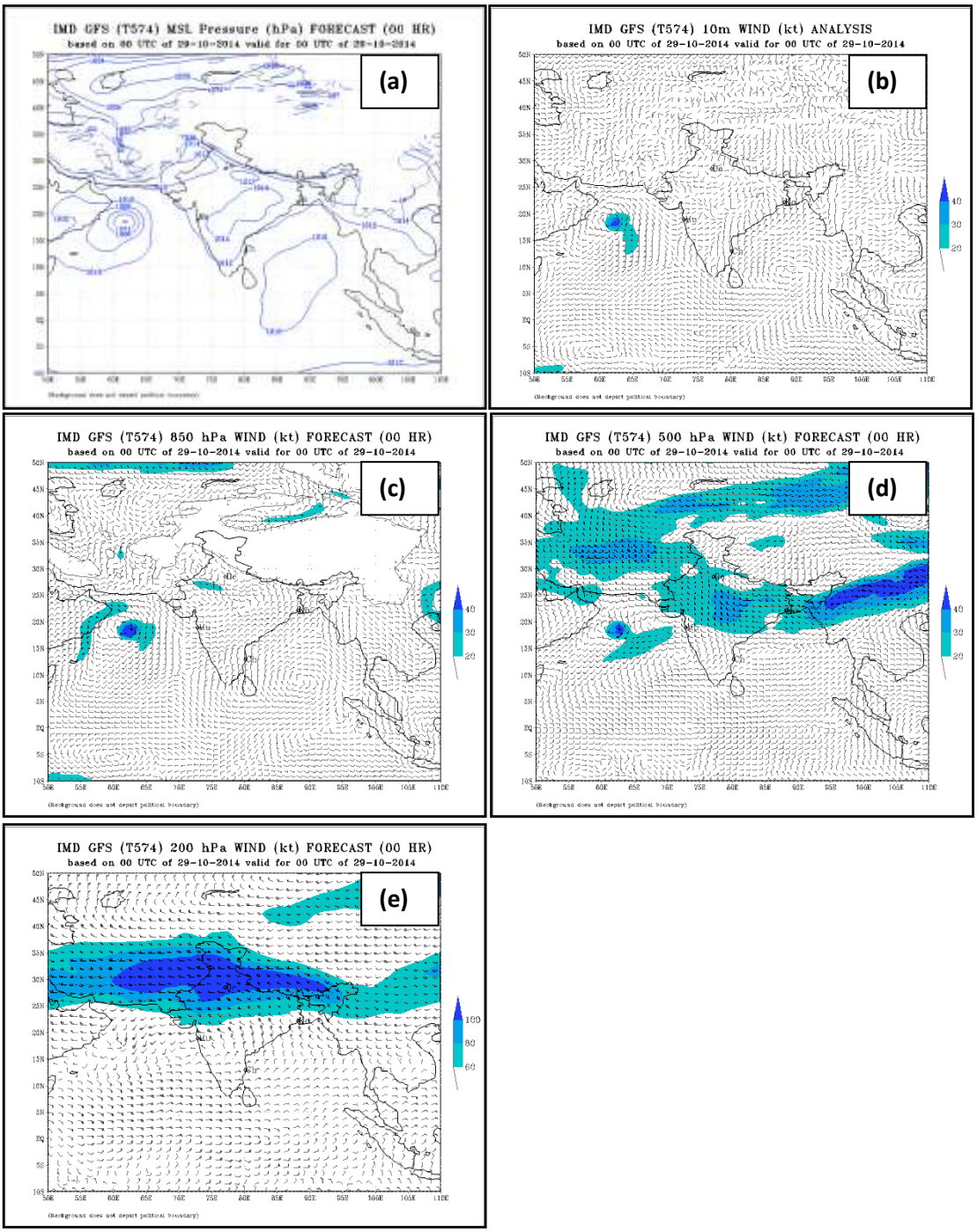


Fig. 4.10 (contd): IMD-GFS Analysed charts on 29th October 2014MSLP Analysis, (b) 10 m winds, (c) 850 hPa winds, (d) 500 hPa winds, (e) 200 hPa winds

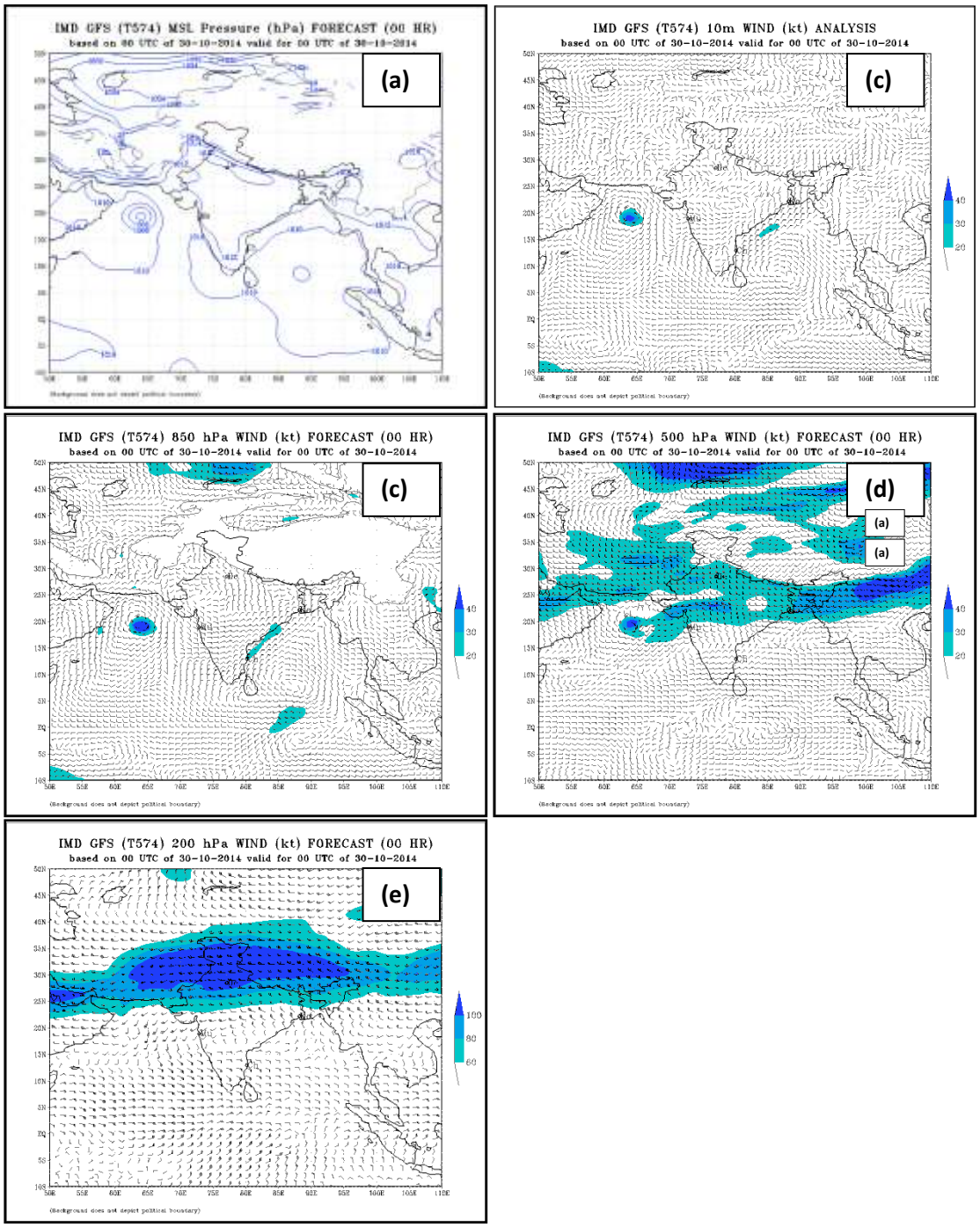


Fig. 4.10 (contd): IMD-GFS Analysed charts on 30th October 2014 MSLP Analysis, (b) 10 m winds, (c) 850 hPa winds, (d) 500 hPa winds, (e) 200 hPa winds

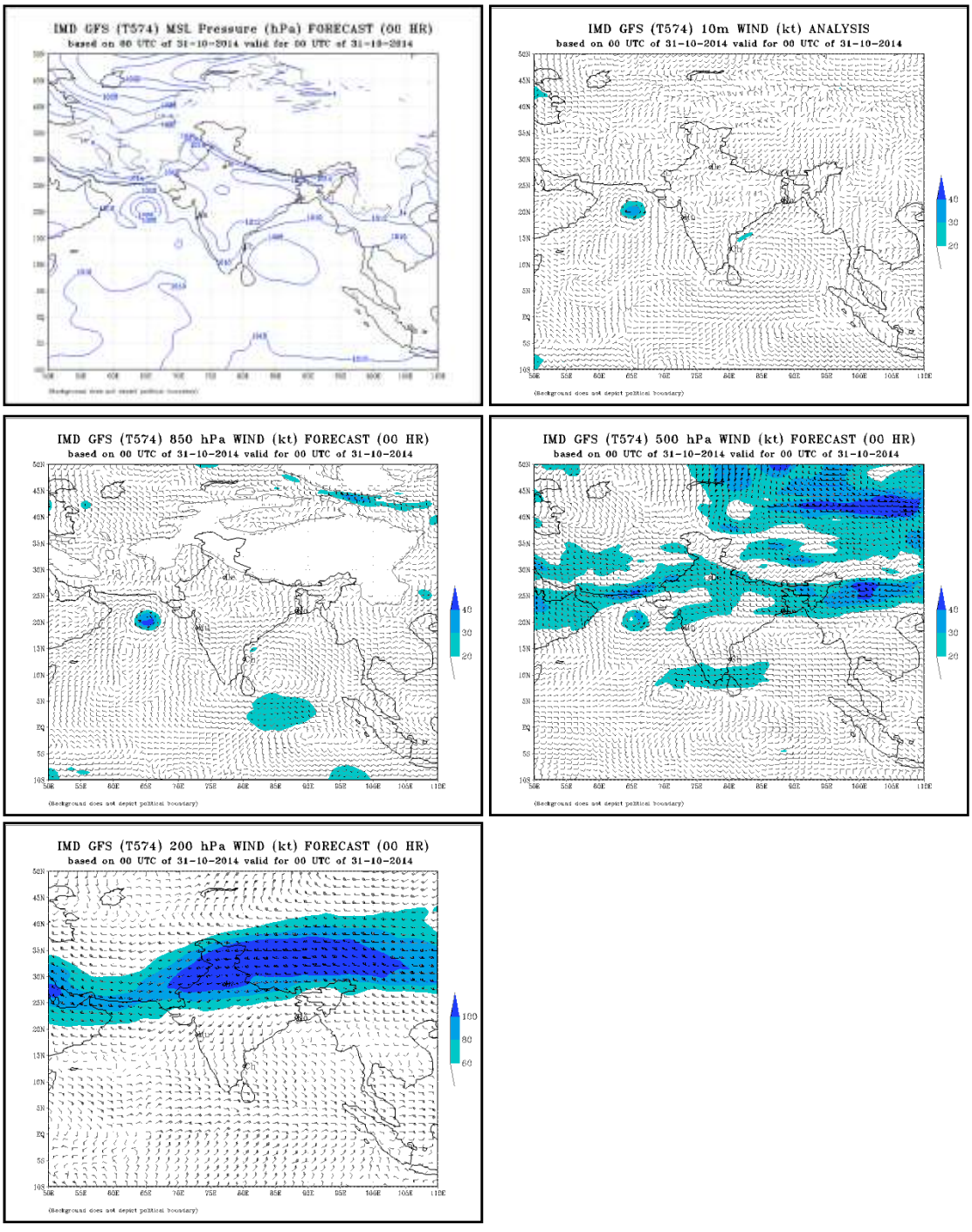


Fig. 4.10 (contd): IMD-GFS Analysed charts on 31th October 2014 MSLP Analysis, (b) 10 m winds, (c) 850 hPa winds, (d) 500 hPa winds, (e) 200 hPa winds

4.2.1.7 Realized Weather:

4.2.1.7.1. Heavy rainfall due to NILOFAR:

Under the influence of **TC NILOFAR**, Konkan and Goa region experienced widespread rain with heavy rainfall at isolated places on 25th, widespread rain with heavy to very heavy rainfalls at a few places on 26th. However, as the system started to weaken rapidly over the sea itself on 30th/31st, without crossing the coast significant rainfall was not realised over the Gujarat. Rainfall realised in association with the TC NILOFAR during the period 25-31 October 2014 is furnished below:

Rainfall amounts (≥ 7cm) realised in association with passage of TC NILOFAR' during 25-31 October 2014

25 October 2014

KONKAN & GOA:

Margaon-12

26 October 2014

KONKAN & GOA:

Margao-29, Marmugao-14, Mapusa-14, Panjim-14, Ponda-12, Dabolim N.A.S.- Navy-11, Quepem-11, Sanguem-10, Pernem-8, Vengurla-7.

MADHYA MAHARASHTRA: Chandgad-7

Rainfall associated with the TC NILOFAR when it was out in the sea is determined from satellite-gauge merged rainfall dataset generated by IMD-NCMRWF for the North Indian Ocean region from 2013 onwards based on TRMM data. 24-hour accumulated rainfall associated with the TC NILOFAR during the period 25 -31 October 2014 as well as the 7-day average rainfall during the same period are furnished in Fig. 4.11a.

As can be seen, during the period 26-27 October, when the system was in its intensification phase, rainfall was observed over a wide area covering about 8-10° latitude / longitude belt in the vicinity of the TC centre and mainly in the northeast sector of the TC centre. Rainfall of the order of 2 - 8 cm are observed in the outer storm area covering regions of Konkan and Goa and adjoining areas of Madhya Maharashtra and Marathwada. However, after the recurvature on 29th, associated with the weakening of the system, area of rainfall activity during 29 October – 1st Nov is decreased to about 5° latitude/ longitude belt. No rainfall is observed over Gujarat region as the system weakened rapidly over the sea itself on 31st Oct. and 1st Nov. 2014.

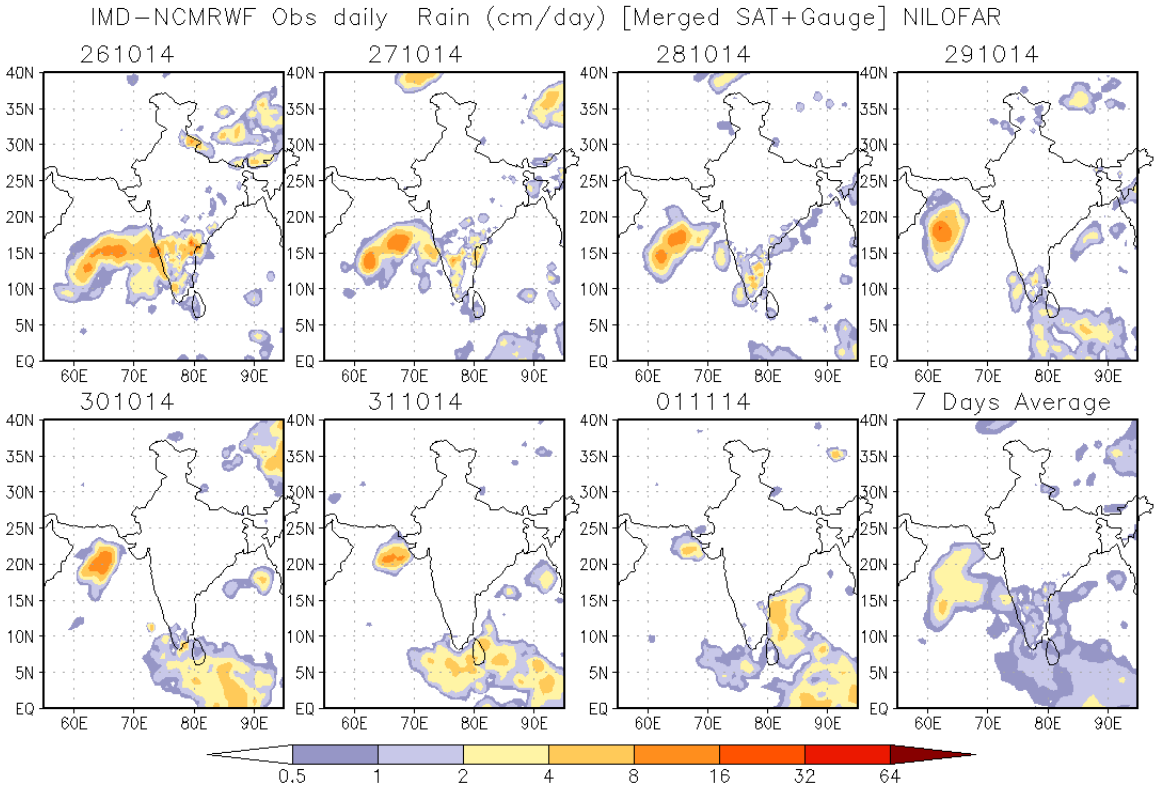


Fig. 4.11a IMD-NCMRWF satellite-gauge merged daily rainfall (in cm) during the period 25 October–1 November 2014 and the 7-day average rainfall during the same period.

4.2.1.7.2 Gale Wind

As the system weakened over the sea, no gale wind was reported. However, strong winds with speed of 30 kmph at 1435 IST and 25 kmph at 1828 IST was recorded by High Wind Speed Recorders (HWSRs) at Dwarka and Okha respectively on 31st Oct. (Fig.4.11b).

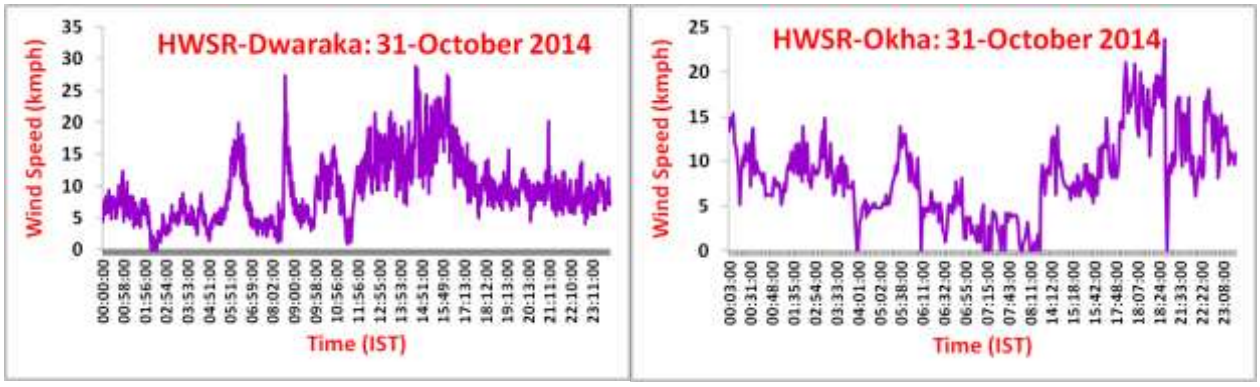


Fig. 4.11b: Time series of wind speed recorded by HWSR at Dwarka and Okha on 31st October 2014.

4.2.1.7.3. Storm Surge

No storm surge has been reported due to weakening of the system over the sea.

4.2.1.8 Damage due to Cyclone 'NILOFAR'

No damage has been reported due to this system.

4.2.2. Deep Depression over the Bay of Bengal (05-08 November 2014)

4.2.2.1. Introduction

A Deep Depression formed over the central and adjoining southeast Bay of Bengal during the period 05-08 November 2014. It initially moved northwards on 5th November 2014, took a loop on 06th and turned westwards towards Andhra Pradesh coast on 7th morning. During its westward movement, it started weakening and became a well-marked low pressure area over the westcentral Bay of Bengal on 8th morning. However, it retained its intensity of well-marked low pressure area for some time, continued its movement towards Andhra Pradesh coast, crossed coast on 09th morning as a well-marked low pressure area and caused light to moderate rainfall activity at a few places over Andhra Pradesh on 09th and 10th November 2014.

The salient features of this system were

(i) The system attained the maximum intensity of Deep Depression and weakened over the sea into a well-marked low pressure area.

(ii) It had a looping track during the period between 06th morning to 07th morning as it lay sandwiched between two anticyclonic circulations to the west and east of the centre. Such kind of looping movement is not very common in the case of cyclones and depressions of North Indian Ocean. Last such looping of a cyclonic disturbance over Bay of Bengal occurred in a cyclone during 28 November-07 December, 1996.

The system was continuously monitored by the India Meteorological Department (IMD) right from its formative stages and forecasts on future movement and intensity were issued 72 hours in advance. A brief report on details of monitoring and prediction of genesis, movement and intensity of the system, its life history, associated weather etc., along with performance of numerical weather prediction models and operational forecast of IMD is presented and discussed in following sections.

4.2.2.2. Monitoring and prediction of Deep Depression (05-08 November 2014)

The *Deep Depression* (05-08 November, 2014) was monitored & predicted continuously since its inception by the IMD. IMD could predict well in advance the genesis, intensification, as well as weakening of the system before crossing the Andhra Pradesh coast. The system was monitored mainly with satellite observations, supported by meteorological buoys and ship observations. OMNI buoys deployed in the Bay of Bengal provided crucial observations for determining the location and intensity of the system.

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 system. 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

Under the influence of active northeast monsoon conditions, a low pressure area (LOPAR) formed over the Bay of Bengal on 3rd November 2014. Moderate vertical wind shear (VWS) of the order of 10-20 knots, warm sea surface temperature (SST) of 29-30°C, moderate ocean thermal energy of about 60-80 kJ/cm^2 and increasing low level relative vorticity and convergence around the region of the LOPAR favoured genesis of the low pressure system (LPS) from the existing LOPAR. With gradual increase in the organisation of convection on 4th, the associated low level circulation attained an intensity of T 1.5 on 05th/1430 IST with associated broken low and medium clouds with embedded intense to very intense convection between latitude 10.0°N to 17°N and longitude 82.5°E to 88.5°E. The low pressure area concentrated into a *Depression* (***D,*** MSW: 17-27 knots) over central & adjoining southeast Bay of Bengal and lay centred near latitude 13.0^0 N and longitude 87.5^0 E at 1430 IST of 5th November, 2014. A buoy located near latitude 14.0^{0}N and longitude 87.0^{0}E reported mean sea level pressure (MSLP) of 1001.5 hpa and surface wind of 010^0 /21 knots. The estimated central pressure (ECP) was 1000 hPa and MSW was 25 knots.

4.2.2.3.2. Intensification and movement

The upper tropospheric ridge at 200 hPa level was located along 15°N latitude on 5th morning. As the system centre was located to the south and close to western edge of the ridge, it was initially steered northwards on 5th. Under favourable environmental conditions of moderate VWS, warm SST, moderate ocean thermal energy, increasing low level vorticity and convergence and with strong poleward outflow in association with the anticyclonic circulation lying to the east-northeast of the system centre, it intensified into a ***Deep Depression*** and lay centred near latitude 14.0^0 N and longitude 87.5^0 E at 0830 IST on 6th. However, as the system moved northwards, it encountered increasing VWS (20-30 knots) and lower ocean thermal energy on 6th. Further, as the system centre was locked in the Col region between two anticyclonic circulations, one to the east and one to the west of the system, it executed a looping movement around the same region on 6th. This movement caused cooling of SSTs due to more and more upwelling in the same region. Thus, under conditions of high VWS, low ocean thermal energy and colder SST, it started weakening and became a ***Depression*** at 0830 IST of 7th and lay centred near latitude 14.2^0 N and longitude 87.5^0 E. On 7th, as the upper tropospheric ridge moved northwards and was located along 17°N, the system centre was located to the south of the ridge and was steered westwards by the anticyclonic circulation to the north of the system centre. During its westward movement, if further weakened into a well-marked low pressure area at 0830 IST of 08th. However, it continued its westward movement and crossed Andhra Pradesh coast on 09th morning as a well-marked low pressure area. The best track parameters of the system are presented in Table-4.4 and Fig.4.12.

4.2.2.4. Maximum Sustained Surface Wind speed and estimated central pressure:

The maximum sustained wind (MSW) in association with a low pressure system 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. Based on satellite imagery, an empirical technique known as the Dvorak technique is utilized worldwide to estimate the intensity of cyclone and hence the associated MSW. Based on the observation of the pressure

drop at the centre, MSW can also be estimated using the empirical pressure-wind relationship (MSW= 14.2* √ pressure drop at the centre).

Table 4.4 Best track positions and other parameters of the Deep Depression over the Bay of Bengal (05-08 November 2014)

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
05-11-2014	0900	13.0/87.5	1.5	1000	25	4	D
	1200	13.0/87.5	1.5	1000	25	4	D
	1800	13.5/87.5	1.5	1000	25	4	D
06-11-2014	0000	13.8/87.5	1.5	1000	25	4	D
	0300	14.0/87.5	2.0	998	30	5	DD
	0600	14.1/87.5	2.0	998	30	6	DD
	1200	14.1/88.0	2.0	998	30	6	DD
	1800	13.8/88.0	2.0	1000	30	6	DD
07-11-2014	0000	14.0/87.5	2.0	1001	30	5	DD
	0300	14.2/87.5	1.5	1001	30	5	DD
	0600	14.2/87.5	1.5	1003	25	4	D
	1200	14.2/87.5	1.5	1003	25	4	D
	1800	14.3/87.0	1.5	1004	25	4	D
08-11-2014	0000	14.3/86.5	1.5	1005	25	3	D
	0300	Weakened into a well marked low pressure area over westcentral Bay of Bengal					

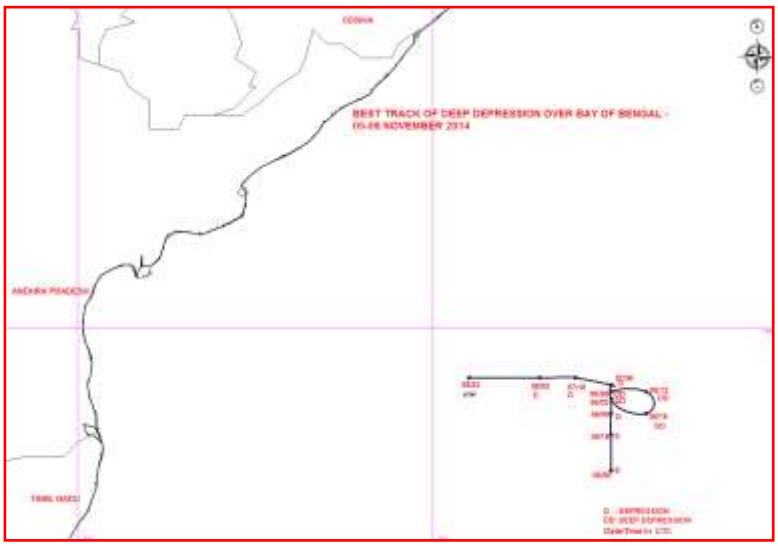


Fig. 4.12 The Best track of the Deep Depression over the Bay of Bengal during 05-08 November, 2014

The meteorological moored ocean buoys located near 14°N/87°E, 15°N/90°E, 17°N/87.3°E and 13.5°N/84°E provided some crucial wind and MSLP observations in

determining the intensity of the system. The lowest Estimated Central Pressure (ECP) of the system was 998 hPa during 0830-1730 IST of 06th November, 2014 with a pressure drop of 6 hPa. The estimated MSW was 30 knots (55 kmph) at 0830 IST of 06th.

4.2.2.5 Characteristic features observed through Satellite and RADAR

4.2.2.5.1 Features observed through satellite

Satellite monitoring of the cyclone was mainly done by using half hourly Kalpana-1, INSAT-3D imageries. 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 of the Deep Depression (05-08 November 2014) representing the life cycle of the system are shown in Fig.4.13-15.

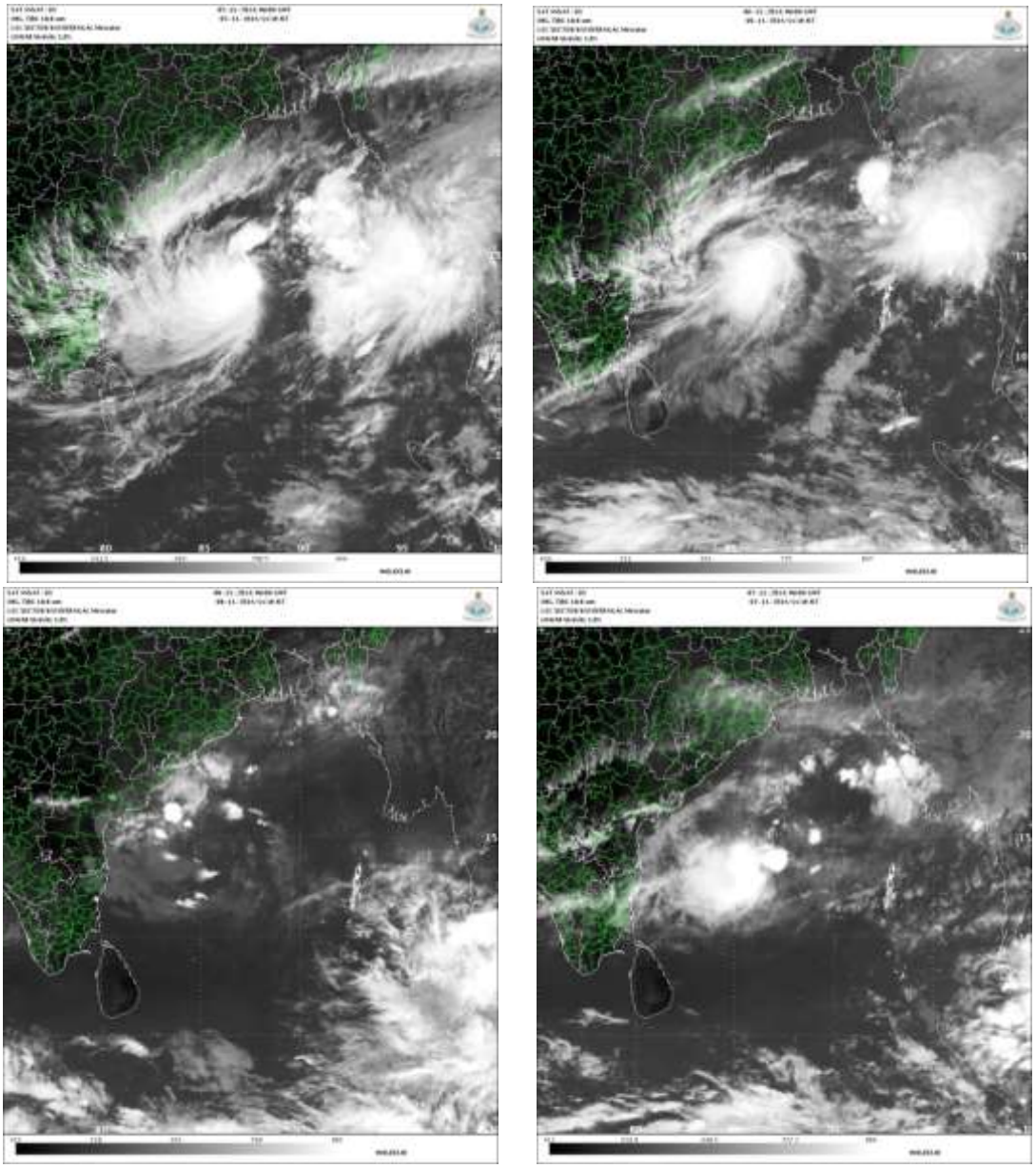


Fig. 4.13:Typical INSAT-3D IR imageries based on 0600 UTC in association with Deep Depression during 05-08 November 2014

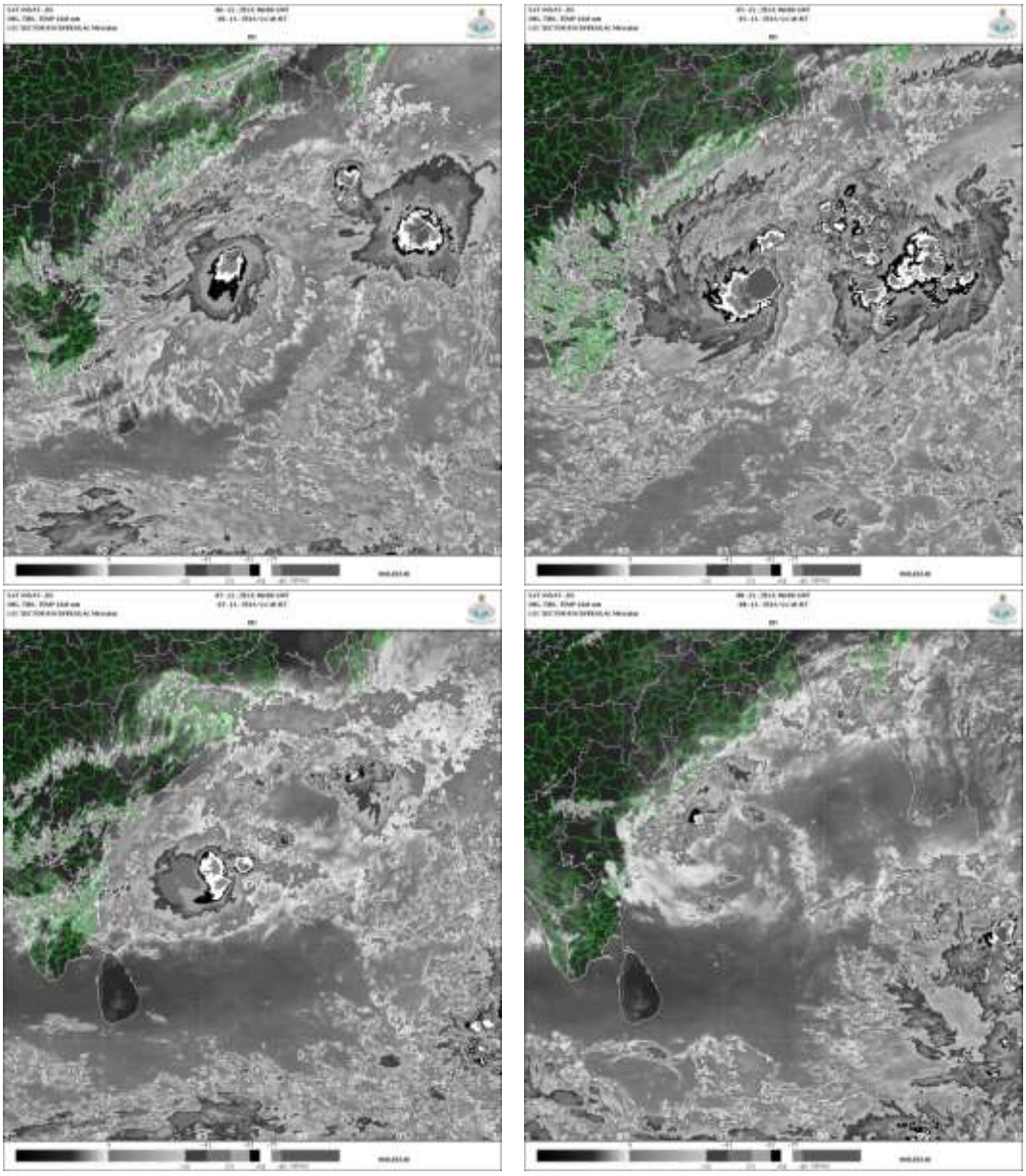


Fig. 4.14 INSAT-3D enhanced IR imageries based on 0600 UTC in association with Deep Depression during 05-08 November 2014

As per the satellite imagery of 05th/1430 IST, the vortex associated with the low level circulation attained an intensity of T.1.5. Associated broken low and medium clouds with embedded intense to very intense convection lay over Bay of Bengal between latitude 10.0°N to 17.5°N and longitude 82.5°E to 88.5°E. Convection increased during the previous 24 hours with increase in organisation. At 1730 IST of 05th, the convection sheared to the west of the system centre. Associated broken low and medium clouds with embedded intense to very intense convection lay over Bay of Bengal between latitude 10.0°N to 17.5°N and longitude 82.5°E to 88.5°E.

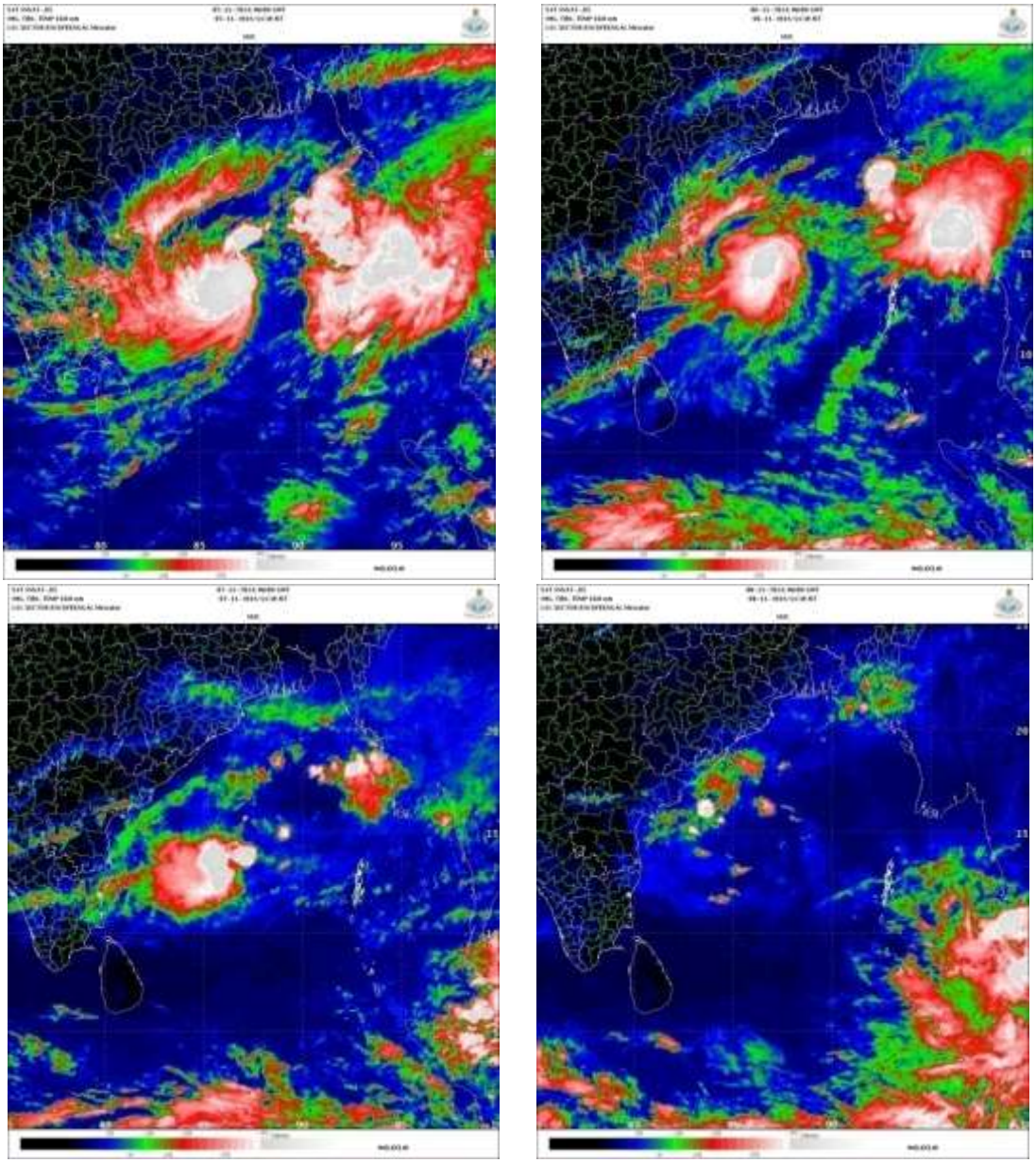


Fig. 4.15 INSAT-3D colored enhanced IR imageries based on 0600 UTC in association with Deep Depression during 05-08 November 2014

The lowest cloud top temparature (CTT) was -93°C. At 0830 IST of 6th, the system attained intensity of T.2.0 and convection showed curved band pattern. Associated with the weakening of the system, satellite imagery on 7th/0830 IST, indicated intensity of T.1.5 and pattern changed to shear pattern. Further at 1730 IST of 7th, satellite based intensity was T.1.0.

4.2.2.5.2 Features observed through RADAR

Due to weakening of the system over the westcentral Bay of Bengal the characteristic features like location and intensity could not be detected with RADAR. However, 24-hr accumulated precipitation as observed by the Doppler Weather Radar (DWR) Machilipatnam for day ending 0830 IST during the period 08-10th November 2014 is shown in Fig. 4.16.

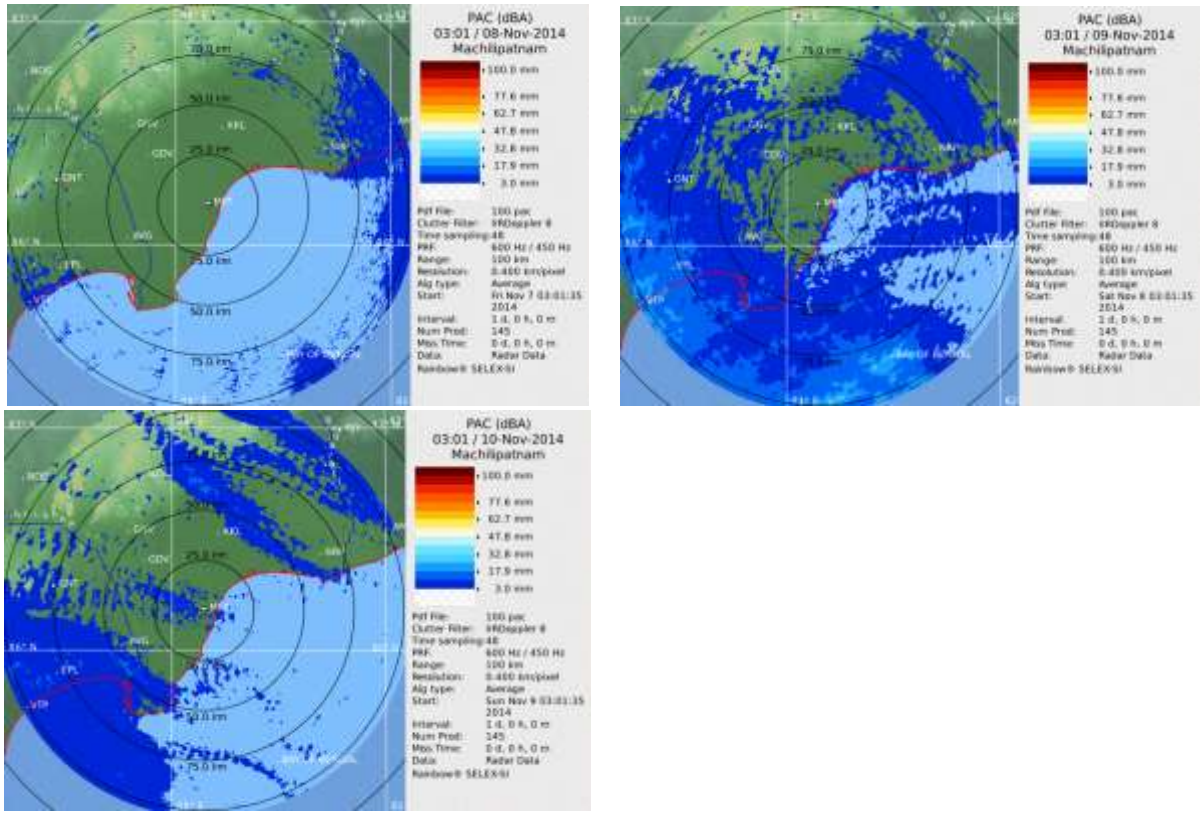


Fig. 4.16 DWR MPT 24-hr accumulated precipitation product for 08-10th November 2014 ending 0830 IST.

4.2.2.6. Dynamical features

To analyse the dynamical features, the Mean Sea Level Pressure (MSLP), surface winds at 925, 850, 500 and 200 hPa levels and vertical wind shear between 850 and 200 hPa levels during the period 05-08 November 2014 are presented in Fig.4.17 based on NCMRWF-GFS analysis. As can be seen, the system extended from southwest to northeast in the lower and mid levels on 5th. There was moderate vertical wind shear (VWS) and strong outflow at the upper levels on 05th which helped in intensification of the system. On 6th, associated with the intensification of the Depression into a Deep Depression, the system organised and wind speed increased. However, equatorial easterlies in the upper levels strengthened on 6th leading to gradual increase in VWS near the system centre. The winds are stronger in the southeast sector of the system.

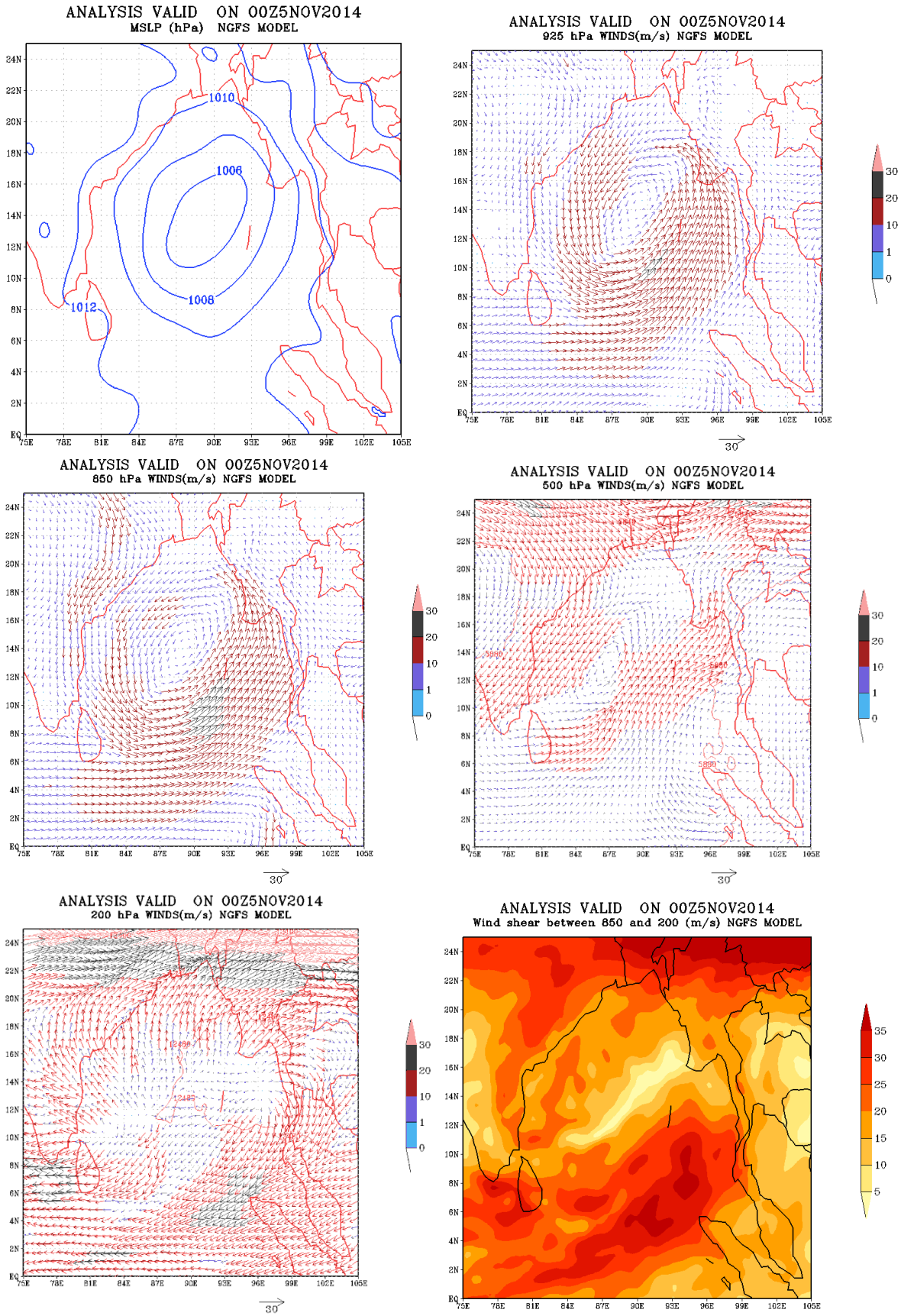


Fig. 4.17a. NCMRWF-NGFS model analysis fields of MSLP, winds at 925, 850, 500 & 200 hPa levels and vertical wind shear (between 850 and 200 hPa) based on 05th November 2014 / 0000 UTC

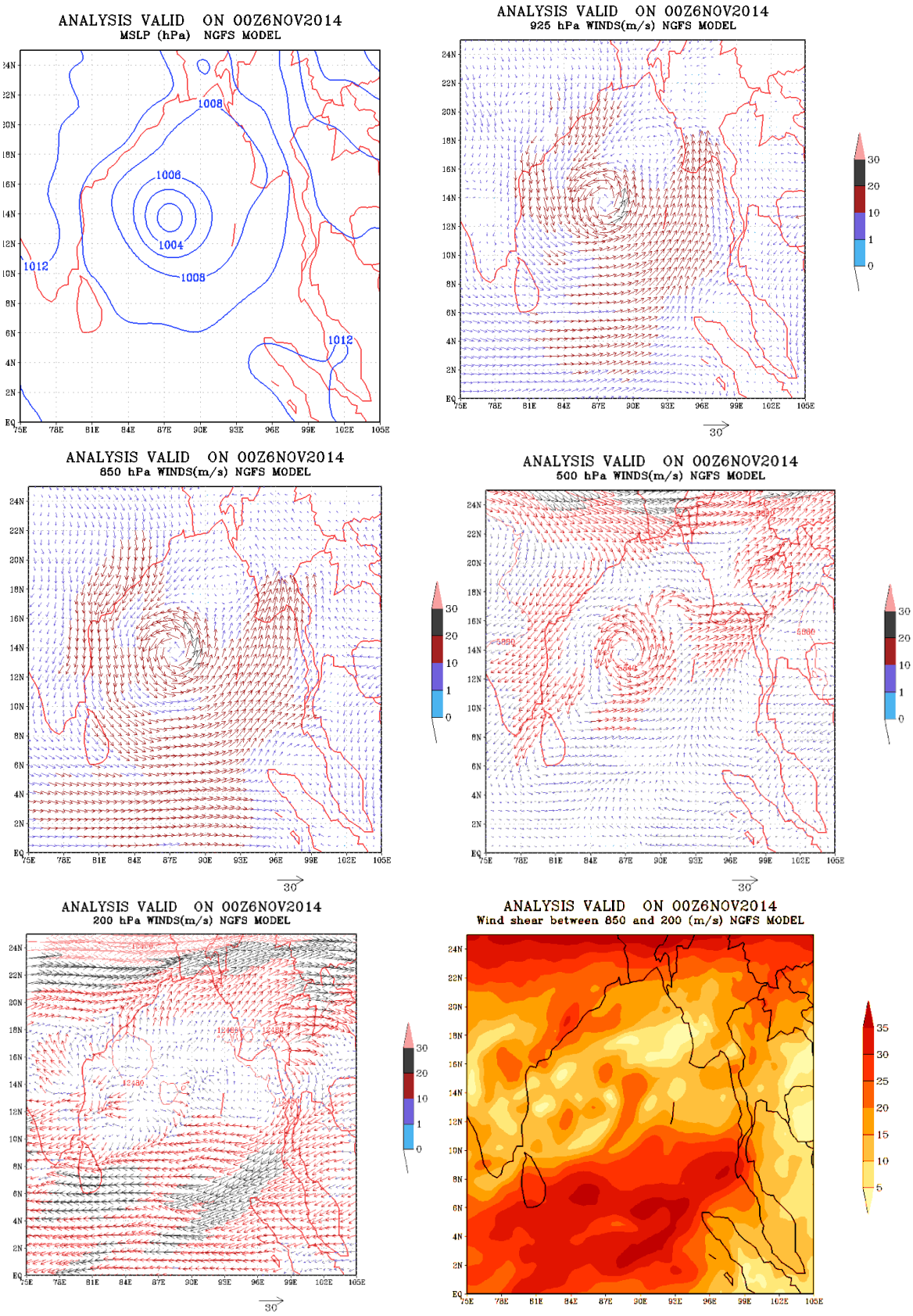


Fig. 4.17b. NCMRWF-NGFS model analysis fields of MSLP, winds at 925, 850, 500 & 200 hPa levels and vertical wind shear (between 850 and 200 hPa) based on 06th November 2014 / 0000 UTC

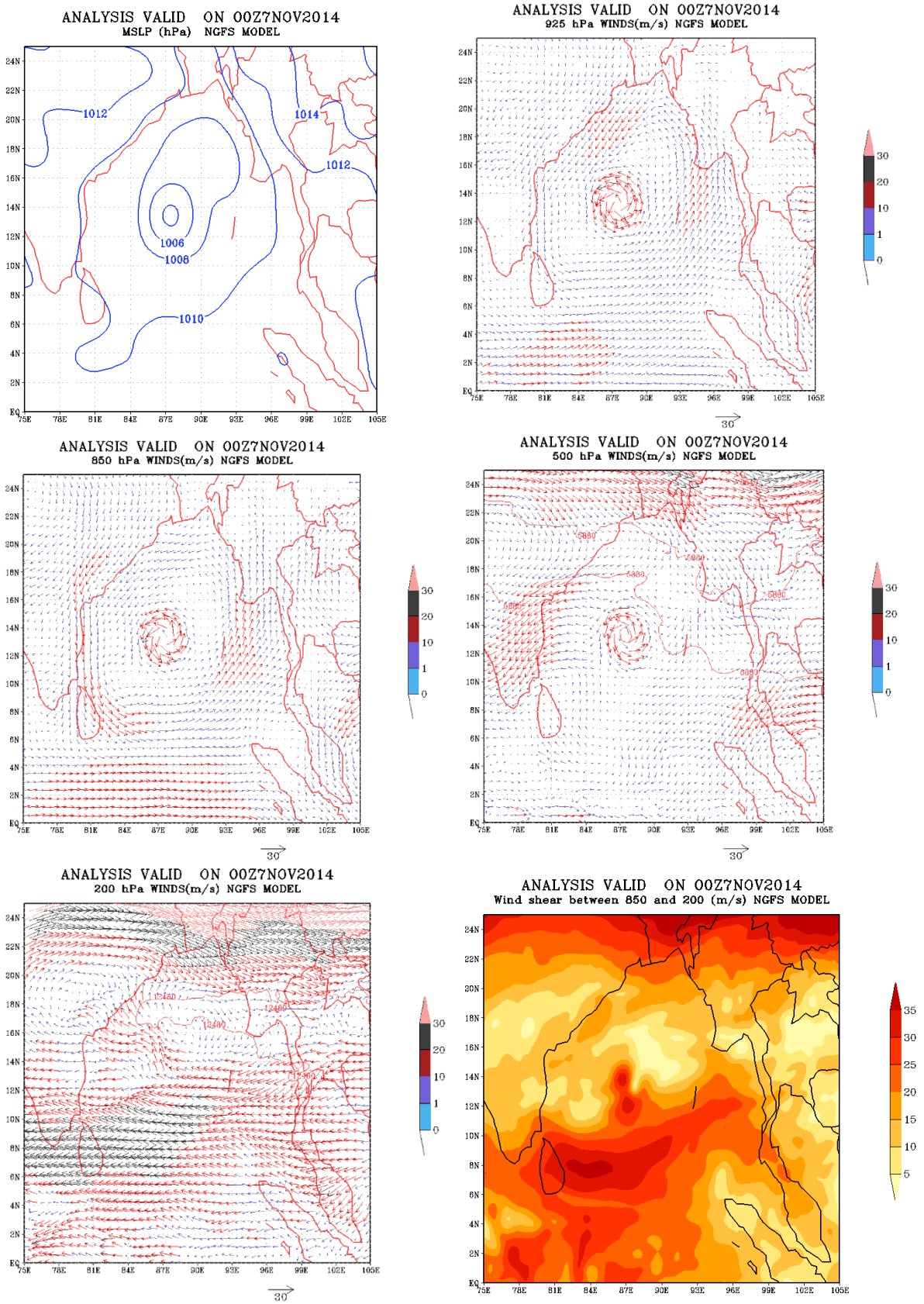


Fig. 4.17c. NCMRWF-NGFS model analysis fields of MSLP, winds at 925, 850, 500 & 200 hPa levels and vertical wind shear (between 850 and 200 hPa) based on 07th November 2014 / 0000 UTC

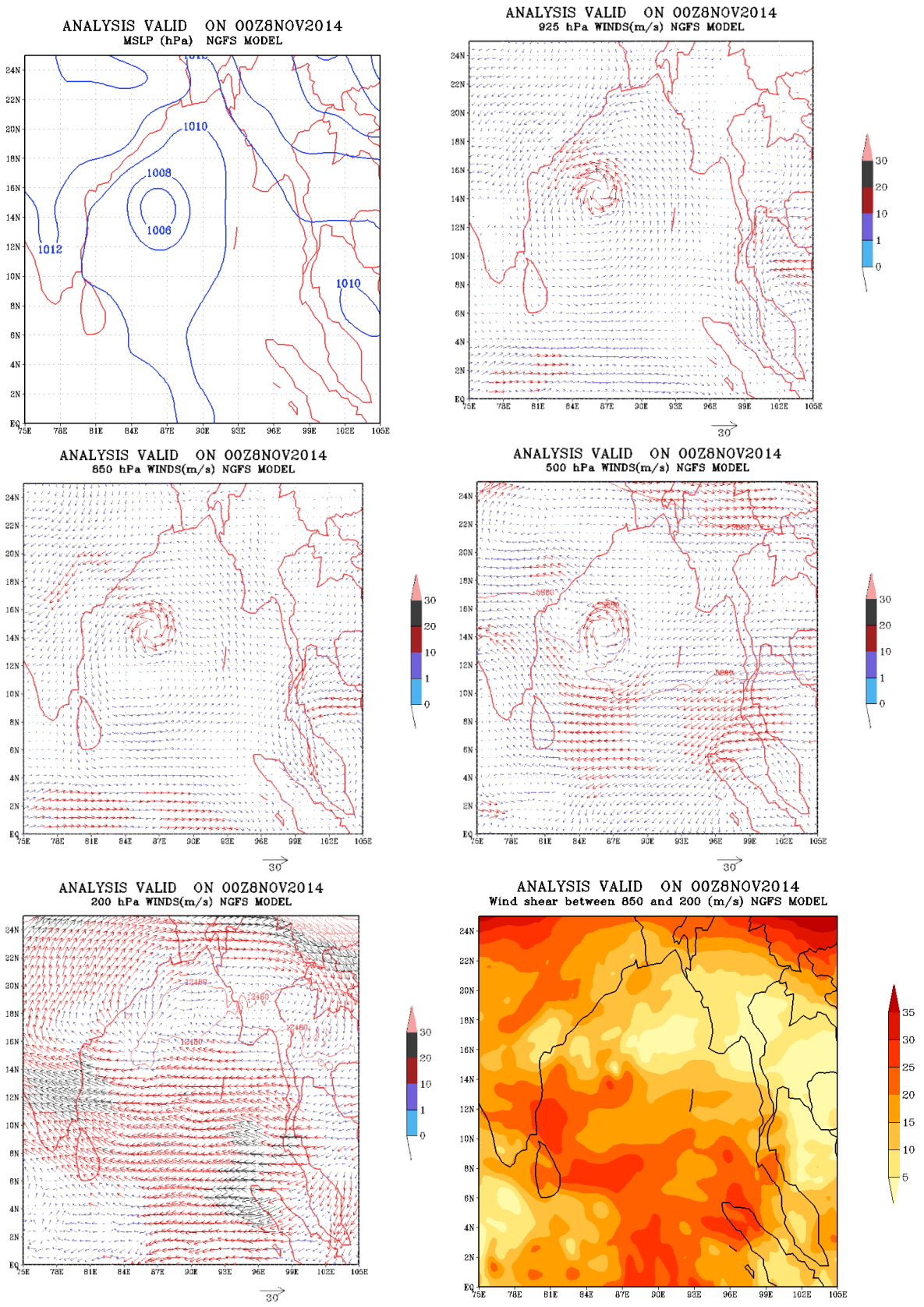


Fig. 4.17d. NCMRWF-NGFS model analysis fields of MSLP, winds at 925, 850, 500 & 200 hPa levels and vertical wind shear (between 850 and 200 hPa) based on 08th November 2014 / 0000 UTC

4.2.2.7 Realised Weather:

4.2.2.7.1. Rainfall due to Deep Depression (05-08 November 2014)

Under the influence of the Deep Depression (05-08 November 2014), scattered light to moderate rainfall occurred over Andaman Islands during 04-06th and over Andhra Pradesh on 9th and 10th November. Chief rainfall amounts realised with the passage of the system are furnished below:

4 November 2014

ANDAMAN AND NICOBAR ISLANDS: Port Blair-4, Mayabandar–3, Nancowary-2, Hut Bay-2, Long Island–2, Car Nicobar-1

5 November 2014

ANDAMAN AND NICOBAR ISLANDS: Port Blair-4, Mayabandar–2, Hut Bay-2, Car Nicobar-2, Car Nicobar(IAF)-1

6 November 2014

ANDAMAN AND NICOBAR ISLANDS: Mayabandar–2, Port Blair-1

9 November 2014

ANDHRA PRADESH: Bapatla-2, Ongole-2, Kavali-2, Sriharikota-1.

10 November 2014

ANDHRA. PRADESH: Kakinada-3, Peddapuram (EastGodavari)-3, Yerragundapalem (Prakasam)-3, Makloor(Nizamabad)-3, Mahbubnagar-3, Aswaraopeta(Khammam)-3, Mulakalapalle(Khammam)-3, Makthal(Mahabubnagar)-3, Wanaparthy(Mahabubnagar)-3, NagarKurnool(Mahabubnagar)-2, Nizamabad-2, Maganoor(Mahabubnagar)-2, Bhadrachalam(Khammam)-2, Dharpalle(Nizamabad)-2, Suryapet(Nalgonda)-1, Nizamsagar(Nizamabad)-1, Kotgiri(Nizamabad)-1, Varni(Nizamabad)-1, Thimmajipetta(Mahabubnagar)-1, Yellareddy(Nizamabad)-1, Sangareddy(Medak)-1, Dichpalle(Nizamabad)-1, Nawabpet(Rangareddy)-1, Jakranpalle(Nizamabad)-1, Bikroor(Nizamabad)-1, Kamareddy(Nizamabad)-1, Miryalaguda(Nizamabad)-1, Bodhan(Nizamabad)-1, Aswapuram(Khammam)-1, Narayankhed(Medak)-1, Yeddapalle(Nizamabad)-1, Jadcherla(Mahabubnagar)-1.

Rainfall associated with the Deep Depression (05-08 November 2014) when it was out in the sea is determined from satellite-gauge merged rainfall dataset generated by IMD-NCMRWF for the North Indian Ocean region from 2013 onwards based on TRMM data. 24-hour accumulated rainfall associated with the system during the period 3-9 November 2014 as well as the 7-day average rainfall during the same period are furnished in Fig.4.18.

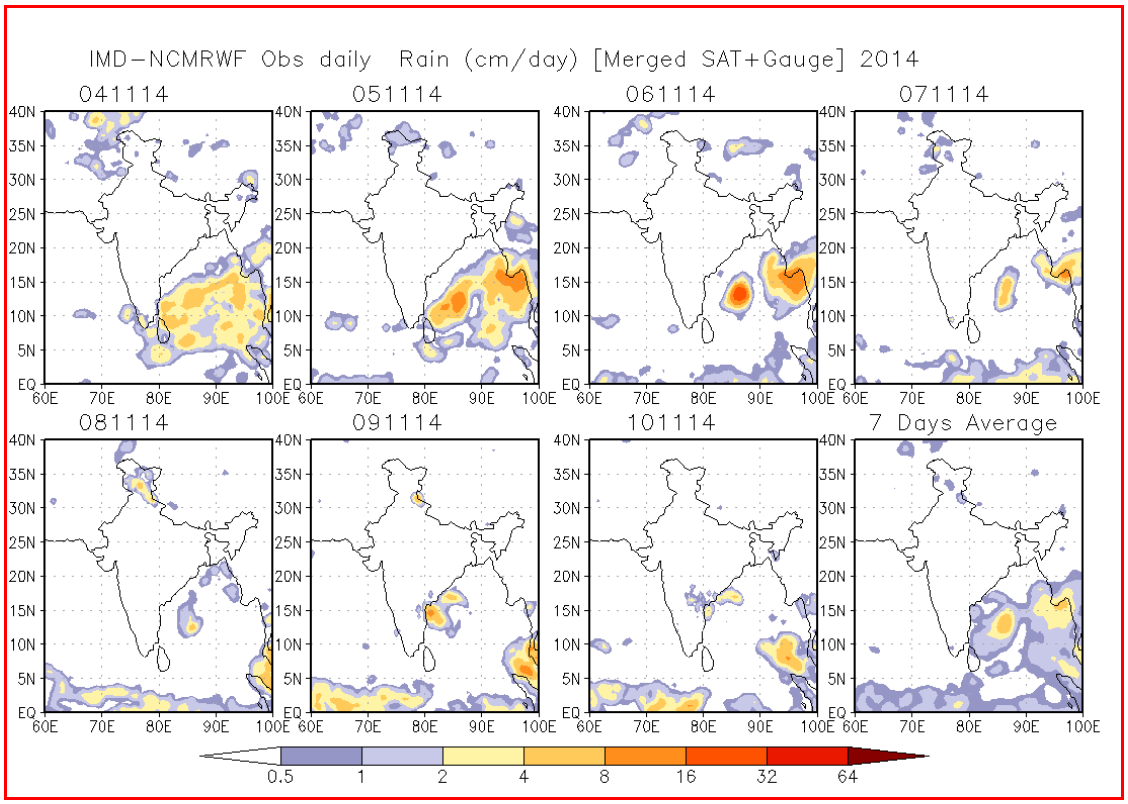


Fig. 4.18 IMD-NCMRWF satellite-gauge merged daily rainfall (in cm) during the period 04-10 November 2014 and the 7-day average rainfall during the same period.

As can be seen, during the period 4th-5th November, when the system was in its formative phase, convection was widespread and disorganised. On 6th, convection organised around the centre. However, associated with the weakening of the system, rainfall activity reduced on 7th and light to moderate rainfall acitivity is seen in isolated / a few places over Andhra Pradesh on 9th and 10th (Description of spatial rainfall distribution: Isolated (one or two places): <25% of area gets rainfall; Scattered (A few places): 26-50% of area gets rainfall; Fairly Widespread (A many places): 51-75% of area gets rainfall; Widespread (Most places): 76-100% of area gets rainfall.

Description of rainfall intensity: Light: 2.5-7.5 mm; Moderate: 7.6-35.5 mm; Rather heavy: 35.6-64.4 mm; Heavy: 64.5-124.4 mm; Very Heavy: 124.5-244.4 mm).

4.2.2.7.2 Gale Wind

As the system weakened over the sea, no gale wind was reported. However, strong winds of 33 kmph was recorded by a coastal Automatic Weather Station (AWS) in Bapatla at 1230 IST of 9th. Kavali(AWS) and Darsi(AWS) recorded 22 kmph at 0930 IST and 1330 IST of 9th respectively.

4.2.2.7.3. Storm Surge

No storm surge has been reported due to weakening of the system over the sea.

4.2.2.7.4. Damage

No damage has been reported due to this system.

CHAPTER-V

FDP (Cyclone) NOC Report Dated 15 October, 2014

Synoptic features based on 0300 UTC:

- There is no significant synoptic scale system over the north Indian Ocean.

Environmental features based on 0300 UTC of today:

Sea Surface Temperature:

- SST is around 30°C over North Bay of Bengal and between 28-29 ^{0}C over rest of the Bay of Bengal and Andaman Sea.

Ocean thermal energy:

- It is less than 50 KJ cm^{-2} over North Bay, southeast Bay and Andaman Sea. It is between 50 – 80 KJ cm^{-2} over rest Bay of Bengal.

Relative Vorticity:

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

Convergence:

- Lower level convergence is positive of the order of 5*10^{-5} s^{-1} over Bay of Bengal and Andaman Sea.

Divergence:

- It is negative of the order of -5*10^{-5} s^{-1} over Bay of Bengal and Andaman Sea.

Wind Shear:

- Wind Shear is 5 knots over central Bay and between 5-10 knots over North Bay, south Bay of Bengal and Andaman Sea.

Wind Shear Tendency:

- Shear Tendency is increasing over North Bay and decreasing over rest of Bay of Bengal and Andaman Sea.

Upper tropospheric ridge:

- The upper tropospheric **ridge** at 200 hPa passes through Lat. 20.0°N.

M.J.O. Index:

- Located in phase 8 with amplitude more than 1.0.
- Dynamical forecast:- MJO may move from phase 8 to phase 1 with amplitude more than 1.0 during next 4 days. Hence MJO is unfavourable for the next 4 days.

Storms and Depression over south China Sea:

- There is currently no Tropical Storm/Depression over south China Sea.

Status of observational system:

- Details of the status of observational system from Chennai region are given in **Annexure-I**.

Satellite:

Inference based on INSAT imagery of 150915 UTC

- Broken low and medium clouds with embedded isolated moderate to intense convection over South Bay to the south of Lat. 9.0°N, south Tenasserim coast and south Andaman Sea.

NWP Analysis

- IMD-GFS, IMD-WRF and Genesis Potential Parameter (GPP) analysis and forecasts based on 0000 UTC of 15 October 2014 shows no development of cyclogenesis over the North Indian Ocean during next 7 days.
- The analysis and forecasts for 24h, 72h, 120h and 168h of 850 hPa and 500 hPa winds and GPP are given in **Annexure II**.

(http://www.imd.gov.in/section/nhac/dynamic/welcome.htm)
(http://www.imd.gov.in/section/nhac/dynamic/Analysis.htm)

NCMRWF Model: No cyclogenesis over Bay of Bengal and Arabian Sea during next 5 days.
ECMWF Model: No cyclogenesis over Bay of Bengal and Arabian Sea during next 5 days.

METEOFRANCE –ARP Model: No cyclogenesis over Bay of Bengal and Arabian Sea during next 3 days.
UKMO Model: No cyclogenesis over Bay of Bengal and Andaman Sea during next 5 days.
Summary and Conclusion:

- No cyclogenesis would occur over Bay of Bengal and Arabian Sea during next 5 days.

Advisory:

- No IOP during next 4 days.

Annexure-I

Data Statistics over RMC Chennai Region

No. of Synop data

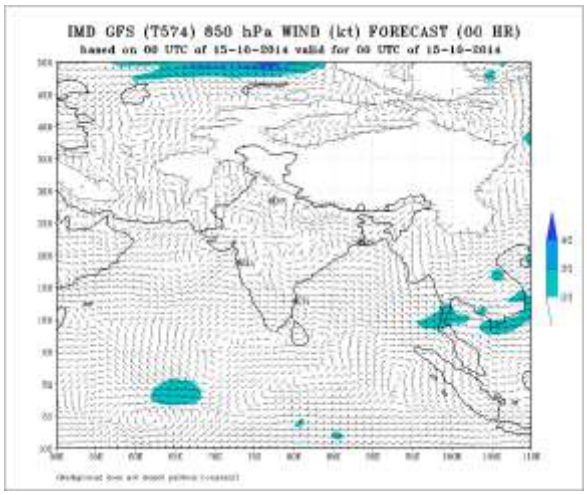
Date→	14.10.2014							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	9	12	7	10	7	11	6	11

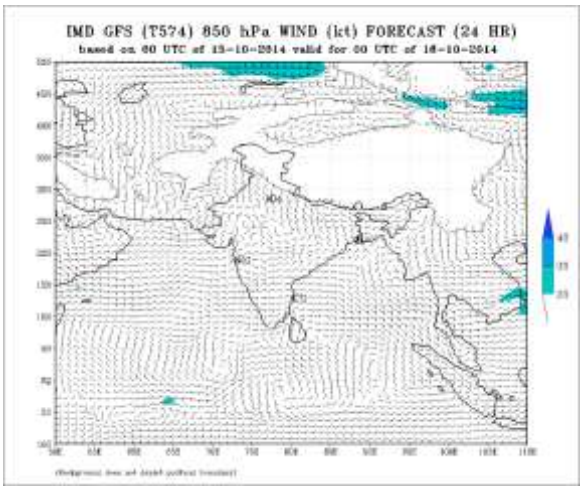
No. of RS/RW Ascents
00Z /14.10.2014 : 4
No. of Ascents reaching 250 hPa level = 4
MISDA : 4
12Z /14.10.2014 : 0
No. of Ascents reaching 250 hPa level =--
MISDA : 8

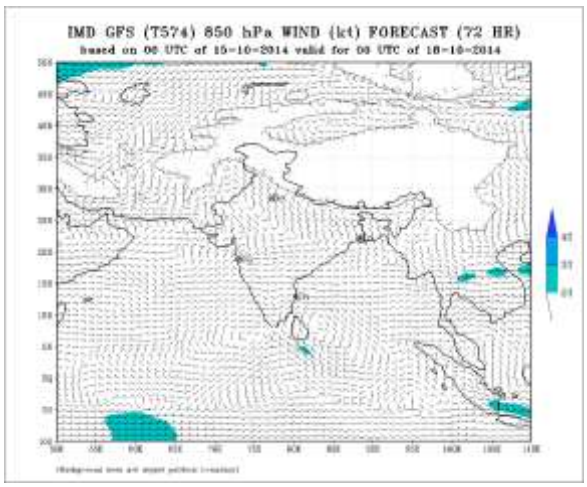
No. of PILOT Ascents:

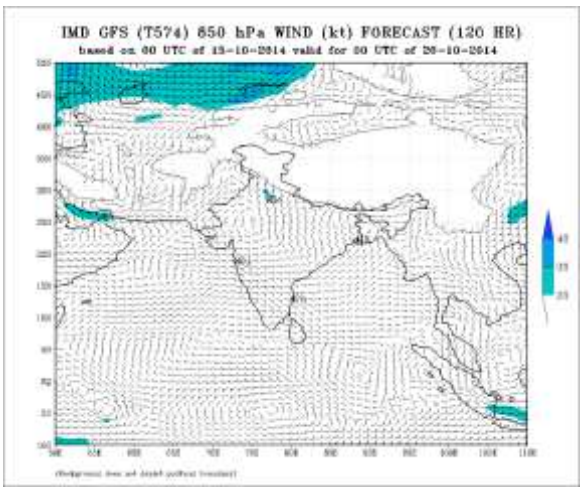
14.10.2014	
06Z	18Z
4	NIL

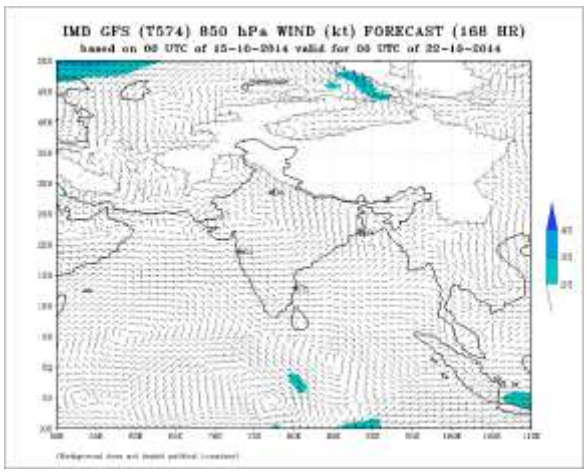
Annexure-II

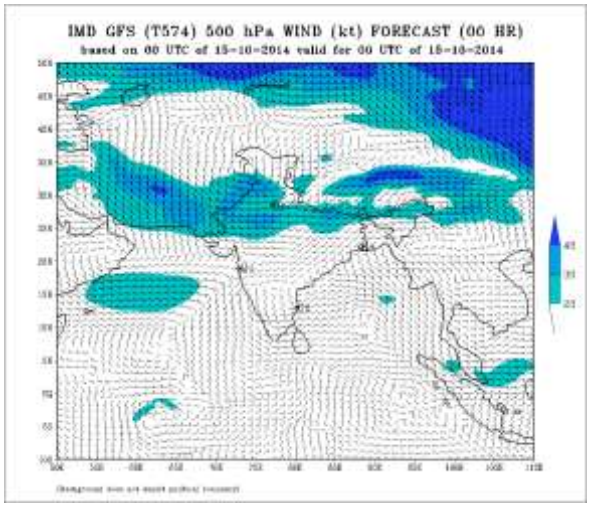

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 15-10-2014 valid for 00 UTC of 15-10-2014

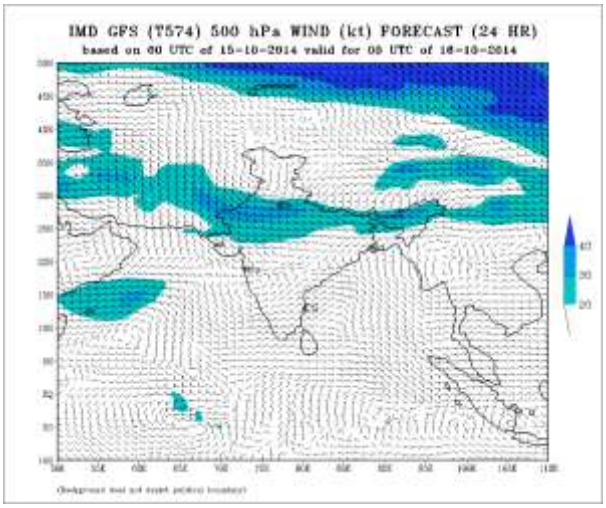

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 15-10-2014 valid for 00 UTC of 16-10-2014


IMD GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 15-10-2014 valid for 00 UTC of 18-10-2014


IMD GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 15-10-2014 valid for 00 UTC of 20-10-2014


IMD GFS (T574) 850 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 15-10-2014 valid for 00 UTC of 22-10-2014


IMD GFS (T574) 500 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 15-10-2014 valid for 00 UTC of 15-10-2014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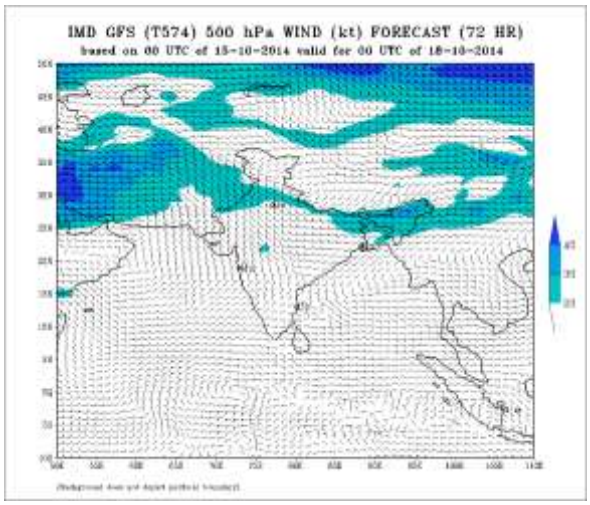
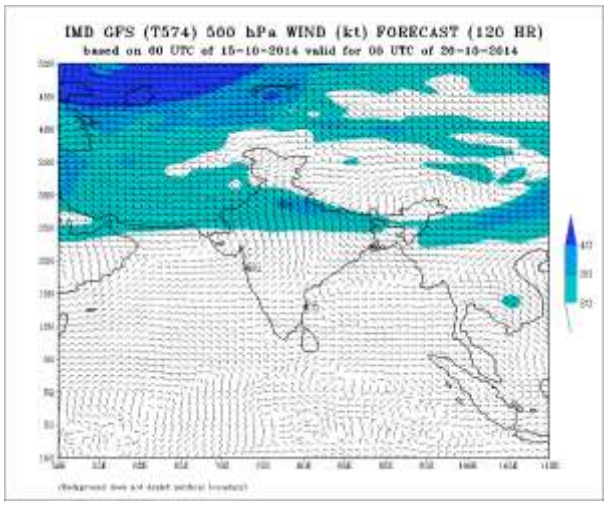
based on 00 UTC of 15-10-2014 valid for 00 UTC of 16-10-2014


IMD GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 15-10-2014 valid for 00 UTC of 18-10-2014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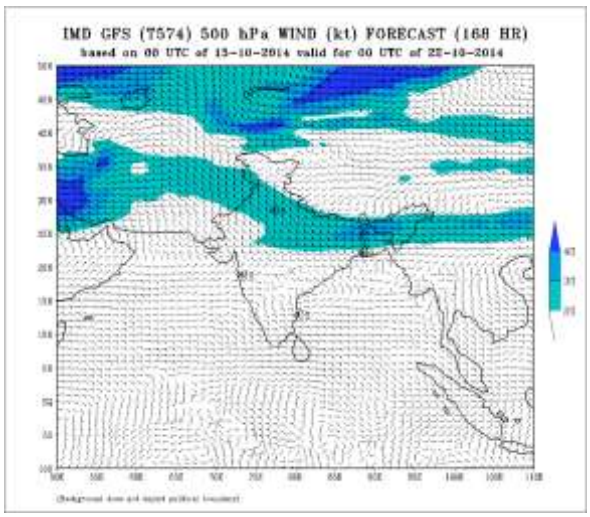
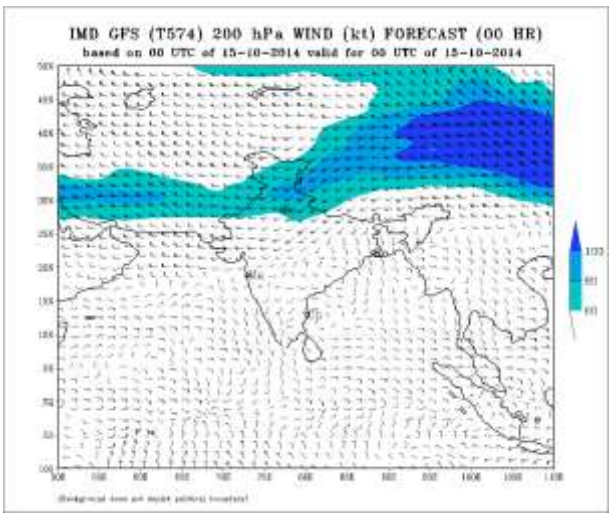
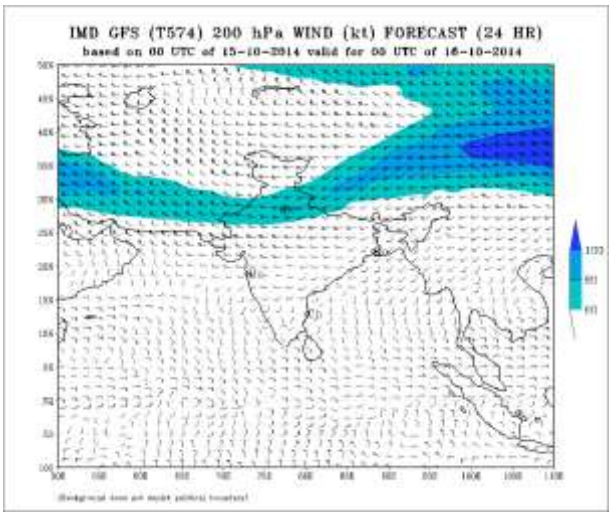
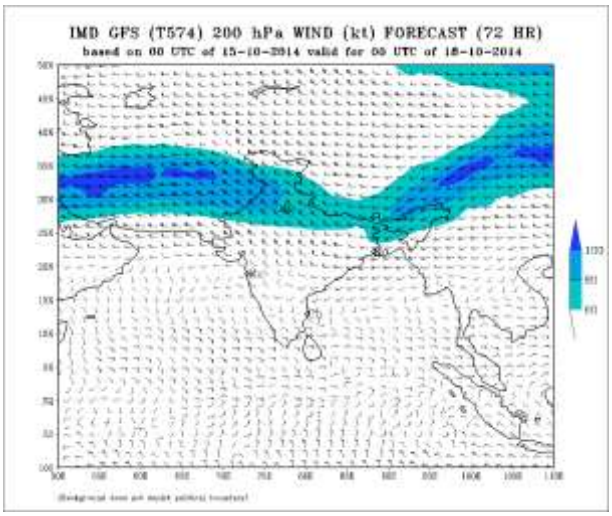
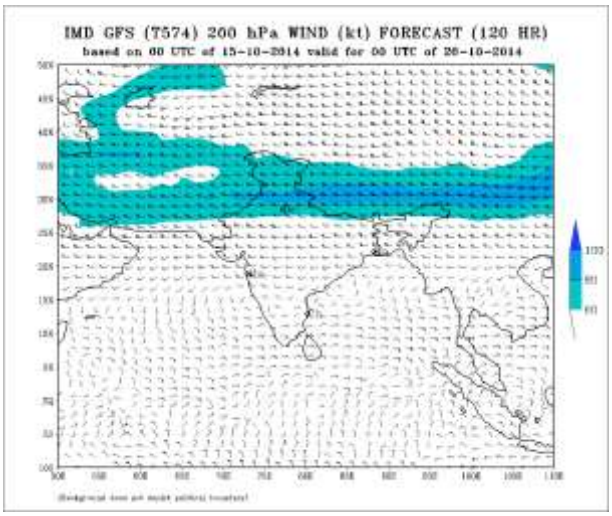
based on 00 UTC of 15-10-2014 valid for 00 UTC of 20-10-2014

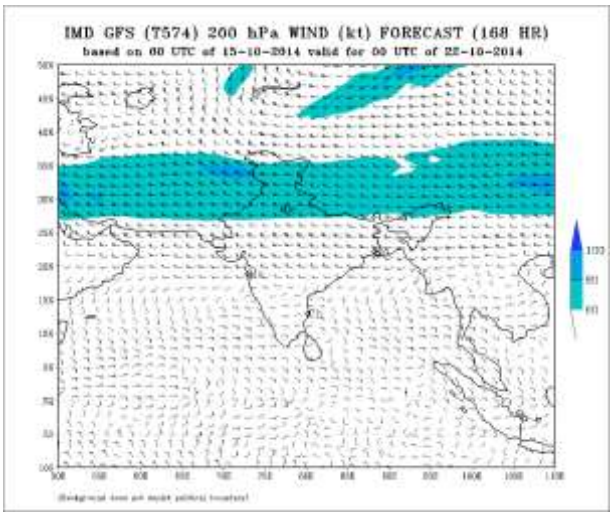

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 15-10-2014 valid for 00 UTC of 22-10-2014

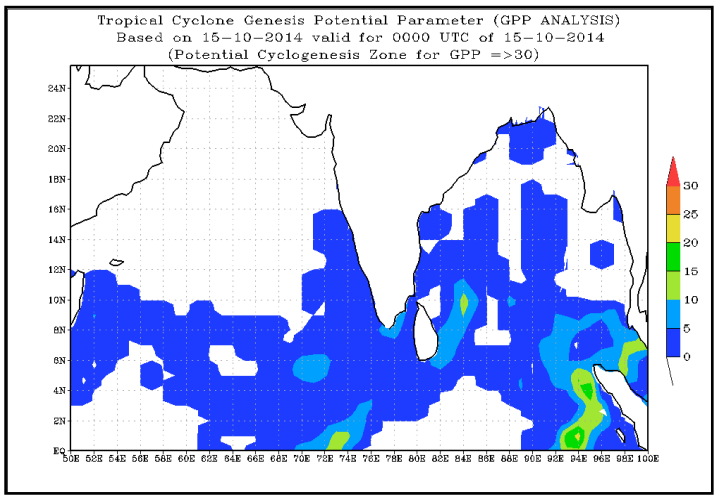

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 15-10-2014 valid for 00 UTC of 15-10-2014

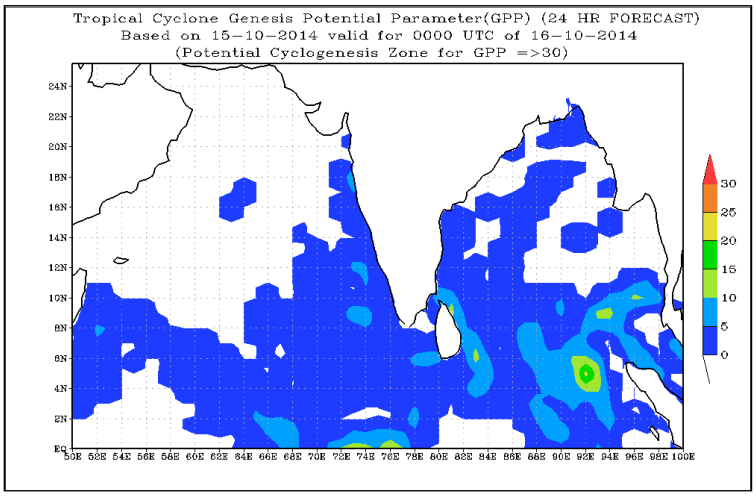

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 15-10-2014 valid for 00 UTC of 16-10-2014

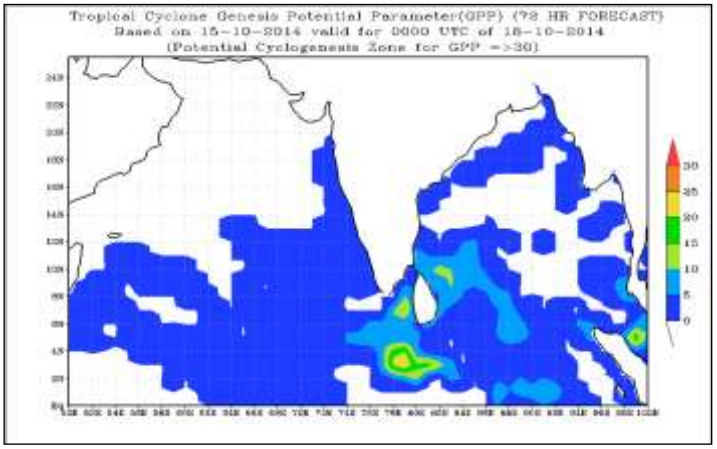

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 15-10-2014 valid for 00 UTC of 18-10-2014

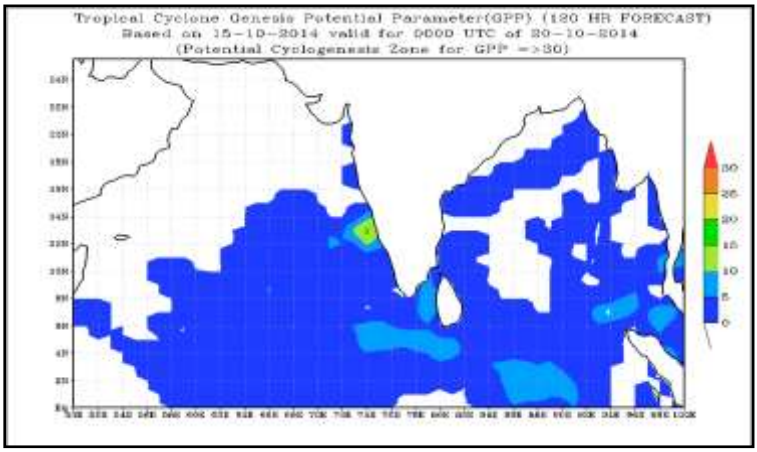

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 15-10-2014 valid for 00 UTC of 20-10-2014

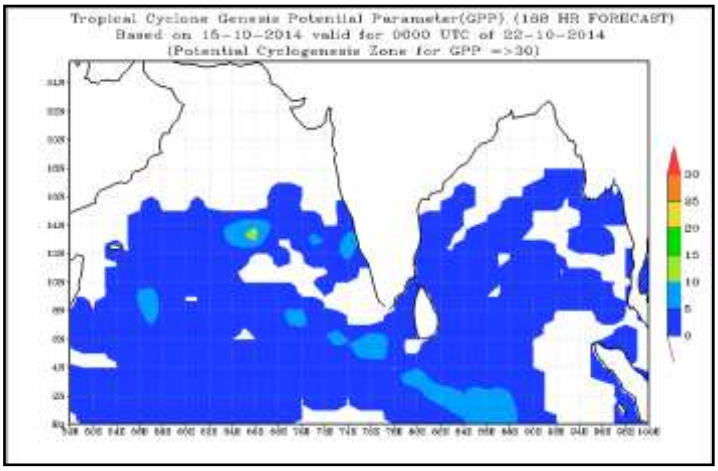

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 15-10-2014 valid for 00 UTC of 22-10-2014


Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 15-10-2014 valid for 0000 UTC of 15-10-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 15-10-2014 valid for 0000 UTC of 16-10-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 15-10-2014 valid for 0000 UTC of 18-10-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 15-10-2014 valid for 0000 UTC of 20-10-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (168 HR FORECAST)
Based on 15-10-2014 valid for 0000 UTC of 22-10-2014
(Potential Cyclogenesis Zone for GPP =>30)

FDP (Cyclone) NOC Report Dated 16 October, 2014

Synoptic features based on 0300 UTC:

- The trough of low lay over south Andaman Sea at mean Sea level.

Environmental features based on 0300 UTC of today:

Sea Surface Temperature:

- SST is between 28-29 ^{0}C over the Bay of Bengal and Andaman Sea.

Ocean thermal energy:

- It is less than 50 KJ cm^{-2} over North Bay, southeast Bay and Andaman Sea. It is between 50 – 80 KJ cm^{-2} over rest Bay of Bengal.

Relative Vorticity:

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

Convergence:

- Lower level convergence is positive of the order of 5*10^{-5} s^{-1} over Bay of Bengal and Andaman Sea.

Divergence:

- It is positive of the order of 5*10^{-5} s^{-1} over Bay of Bengal and Andaman Sea.

Wind Shear:

- Wind Shear is 5 knots over Andaman Sea and between 5-10 knots over Bay of Bengal.

Wind Shear Tendency:

- Shear Tendency is increasing over Bay of Bengal and decreasing over Andaman Sea.

Upper tropospheric ridge:

- The upper tropospheric **ridge** at 200 hPa passes through Lat. 20.0°N.

M.J.O. Index:

- Located in phase 8 with amplitude more than 1.0.
- Dynamical forecast:- MJO may move from phase 8 to phase 1 with amplitude more than 1.0 during next 4 days. Hence MJO is unfavourable for the next 4 days.

Storms and Depression over south China Sea:

- There is currently no Tropical Storm/Depression over south China Sea.

Status of observational system:

- Details of the status of observational system from Chennai region are given in **Annexure-I**.

Satellite:

Inference based on INSAT imagery of 160900 UTC

Scattered low and medium clouds with embedded isolated moderate to intense convection over southeast Bay of Bengal and southwest Andaman Sea

NWP Analysis

IMD-GFS, IMD-WRF and Genesis Potential Parameter (GPP) analysis and forecasts based on 0000 UTC of 16 October 2014 shows no development of cyclogenesis over the North Indian Ocean during next 7 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

The analysis and forecasts for 24h, 72h, 120h and 168h of 850 hPa and 500 hPa winds and GPP are given in **Annexure II**.

NCMRWF Model: No cyclogenesis over Bay of Bengal and Arabian Sea during next 5 days.

- **ECMWF Model**: No cyclogenesis over Bay of Bengal and Arabian Sea during next 5 days.
- **METEOFRANCE –ARP Model:** No cyclogenesis over Bay of Bengal and Arabian Sea during next 3 days.
- **UKMO Model:** No cyclogenesis over Bay of Bengal and Andaman Sea during next 5 days.

Summary and Conclusion:

- No cyclogenesis would occur over Bay of Bengal and Arabian Sea during next 5 days.

Advisory:

- No IOP during next 4 days.

Annexure-I

Status of Observation system:
Synoptic observation:

Region	Date/Time (UTC)		
	15/12	16/00	16/03
India	73	64	73
Coastal stations			
WB	7	3	7
Odisha	7	5	6
AP	12	11	11
Tamil Nadu	9	10	10
Puducherry	2	2	2
A & N	6	2	6
Bangladesh	10	11	11
Myanmar	10	10	10
Thailand	2	2	2
Sri Lanka	8	8	8

- **RS/RW** (12Z) of 15/10/2014 **3/39**
- **No. of Ascents reaching 250 hPa levels: 2, MISDA: 36**
- **RS/RW** (00Z) of 16/10/2014 **18/39**
- **No. of Ascents reaching 250 hPa levels: 5 , MISDA: 21**

No. of PILOT Ascents

15/12Z	16/00Z
30	24

Buoy Data

15/12Z	16/00Z	16/03Z
11	11	11

Data Statistics over RMC Chennai Region

No. of Synop data

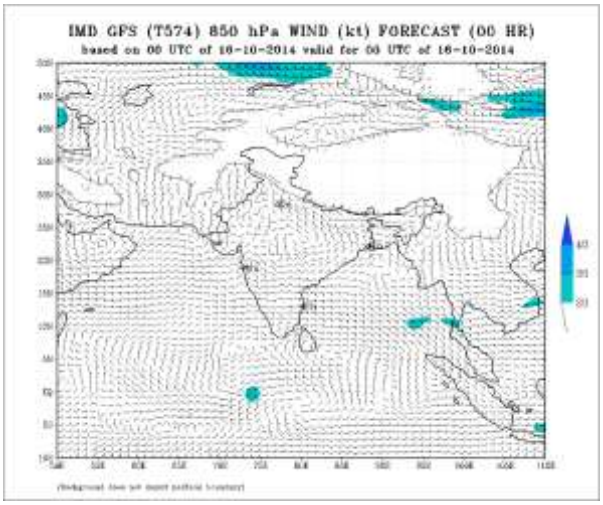
Date→	15.10.2014							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	19	22	19	19	22	19	20	20

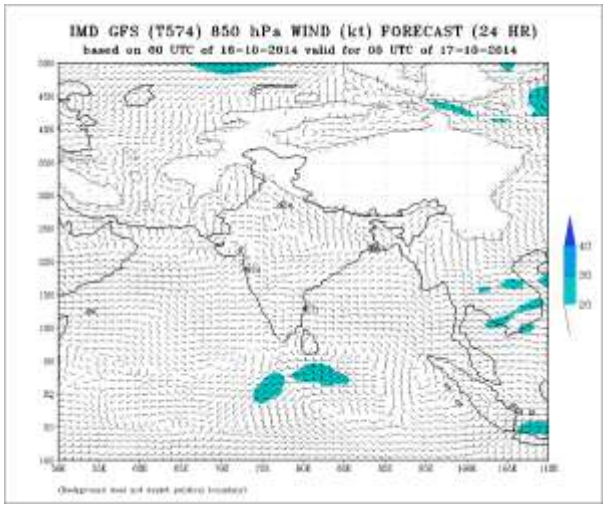
No. of RS/RW Ascents

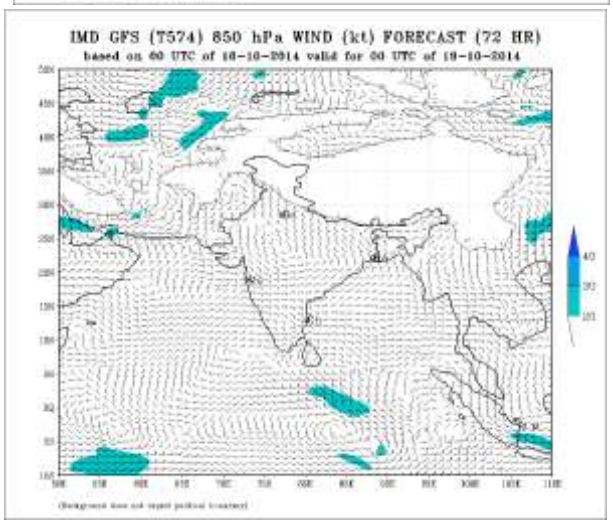
00Z /15.10.2014 : 3
No. of Ascents reaching 250 hPa level = 3
MISDA : 5
12Z /15.10.2014 : 1
No. of Ascents reaching 250 hPa level = 1
MISDA : 7
No. of PILOT Ascents:

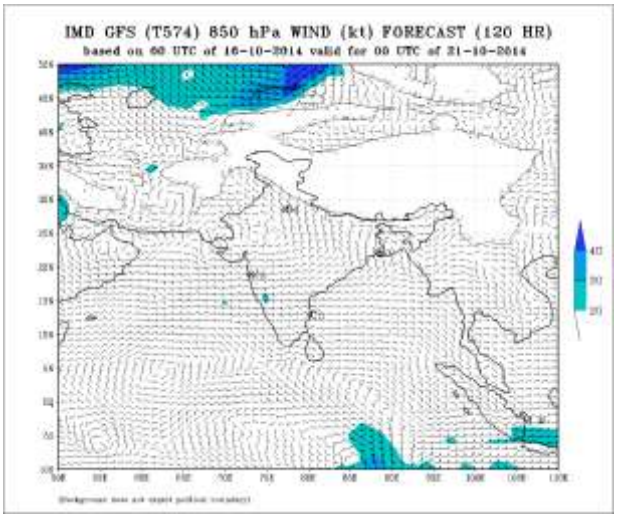
15.10.2014	
06Z	**18Z**
4	**5**

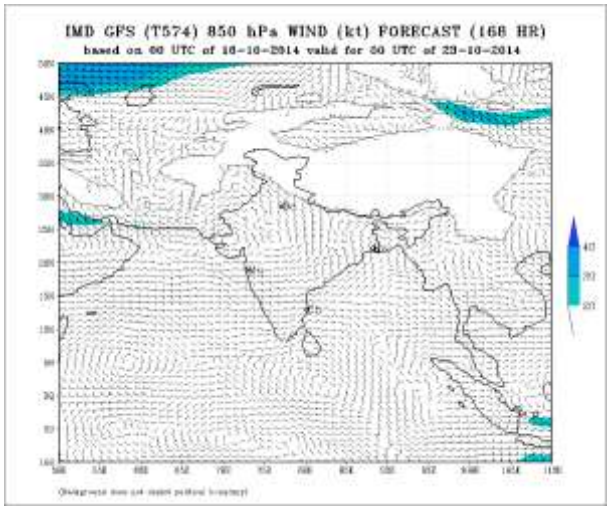
Annexure-II

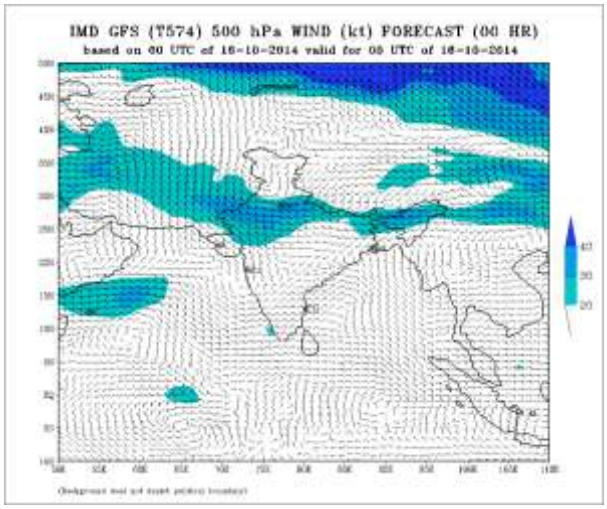

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 16-10-2014 valid for 00 UTC of 16-10-2014

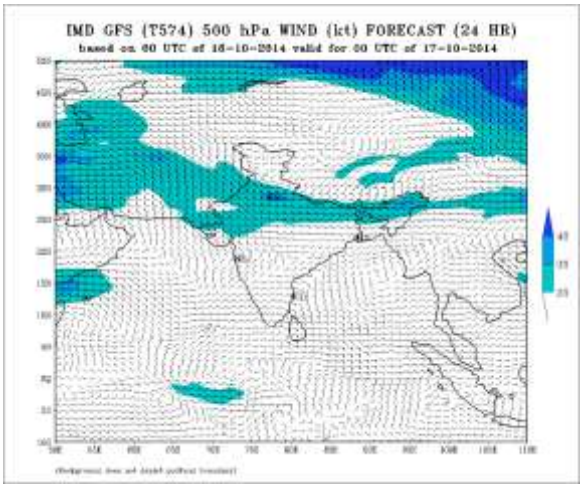

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 16-10-2014 valid for 00 UTC of 17-10-2014

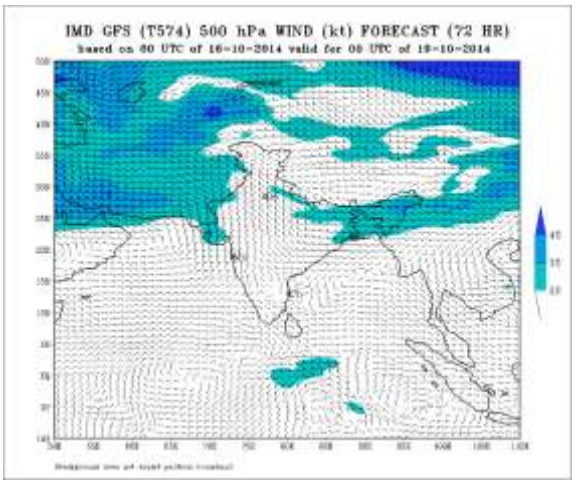

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 16-10-2014 valid for 00 UTC of 19-10-2014

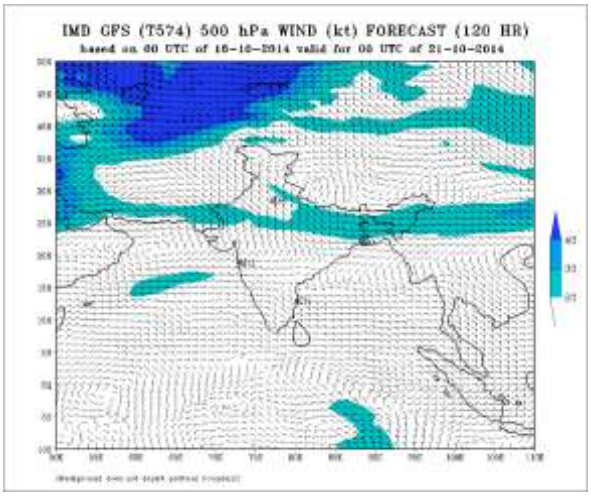

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 16-10-2014 valid for 00 UTC of 21-10-2014

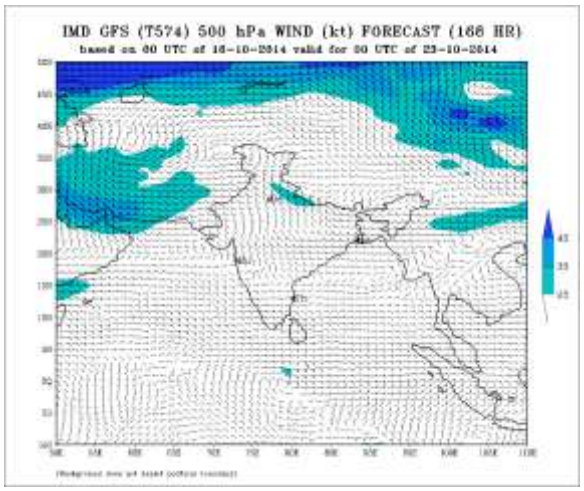

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 16-10-2014 valid for 00 UTC of 23-10-2014

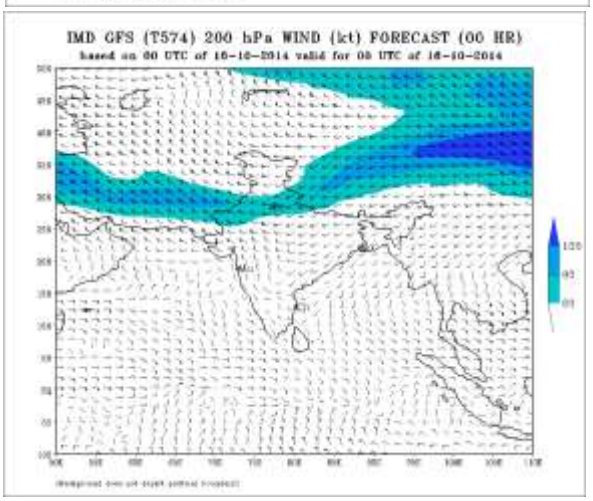

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 16-10-2014 valid for 00 UTC of 16-10-2014

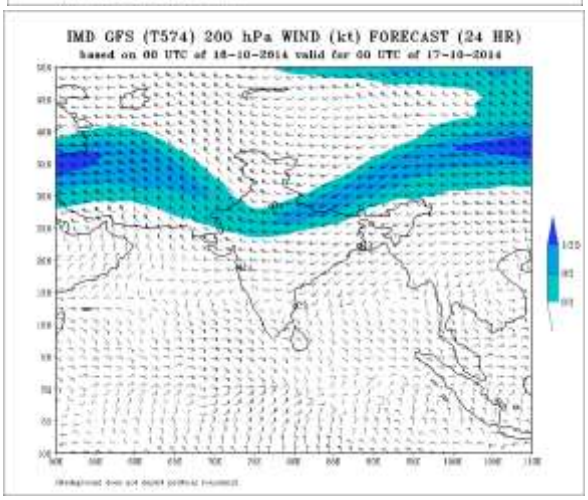

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 16-10-2014 valid for 00 UTC of 17-10-2014

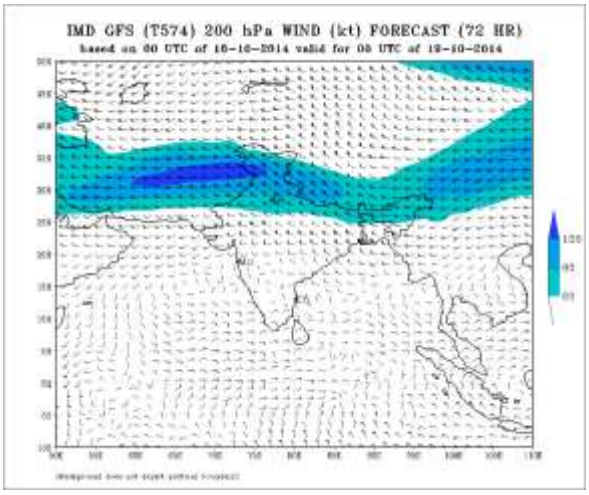

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 16-10-2014 valid for 00 UTC of 19-10-2014

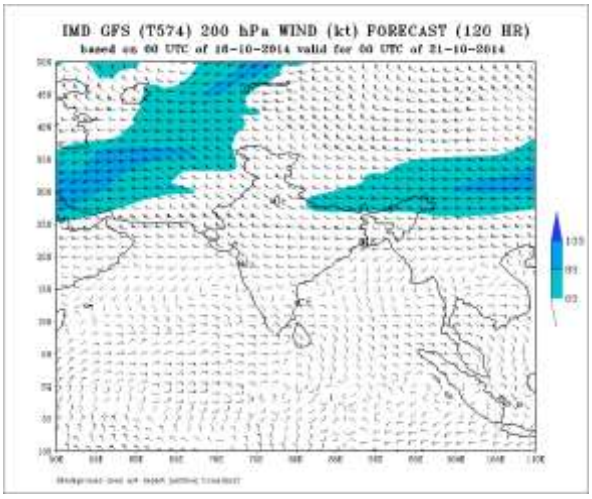

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 16-10-2014 valid for 00 UTC of 21-10-2014

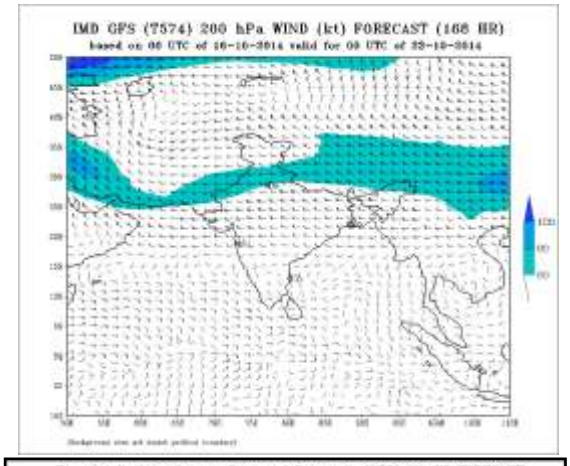

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 16-10-2014 valid for 00 UTC of 23-10-2014

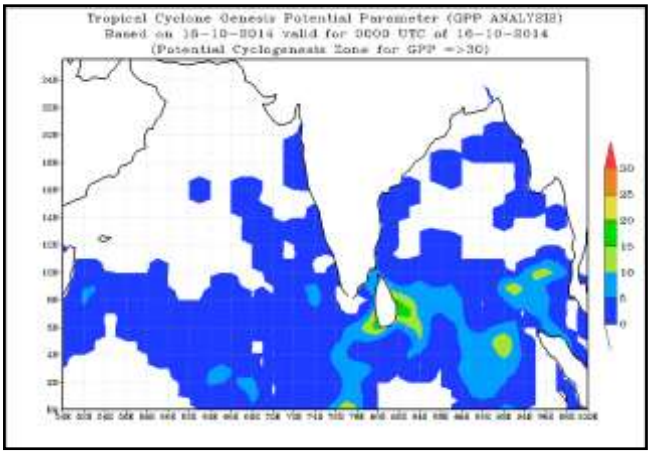

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 16-10-2014 valid for 00 UTC of 16-10-2014

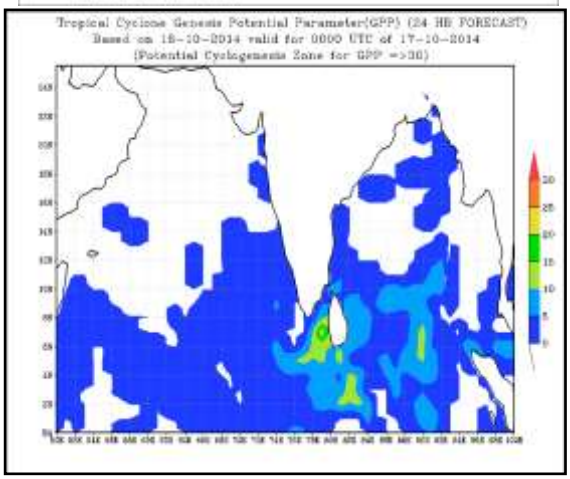

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 16-10-2014 valid for 00 UTC of 17-10-2014

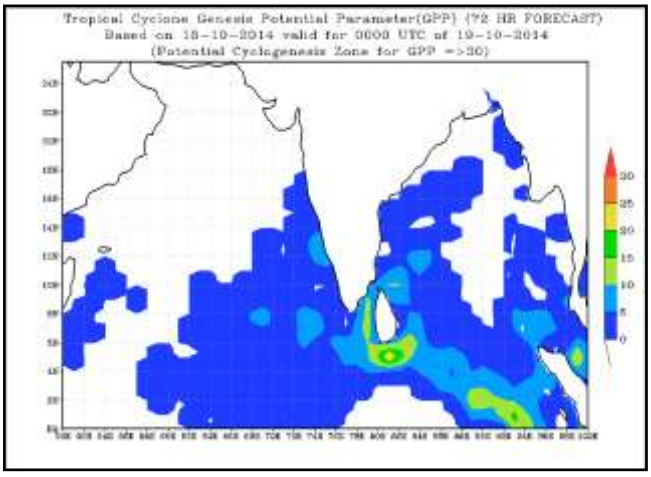

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 18-10-2014 valid for 00 UTC of 21-10-2014

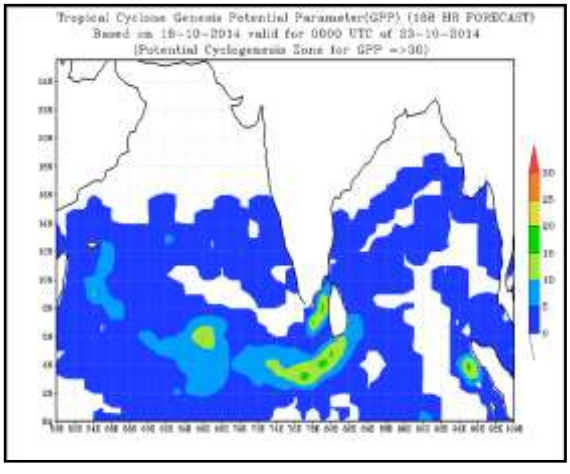

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 18-10-2014 valid for 00 UTC of 21-10-2014

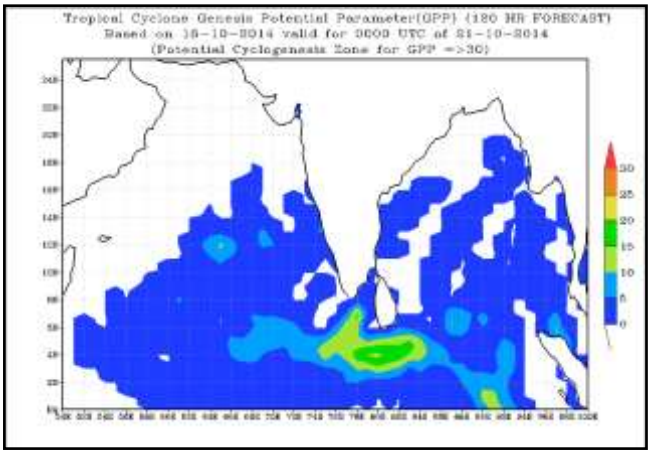

IMD GFS (7574) 200 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 16-10-2014 valid for 00 UTC of 23-10-2014


Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 16-10-2014 valid for 0000 UTC of 16-10-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 16-10-2014 valid for 0000 UTC of 17-10-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 16-10-2014 valid for 0000 UTC of 19-10-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (168 HR FORECAST)
Based on 16-10-2014 valid for 0000 UTC of 23-10-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 16-10-2014 valid for 0000 UTC of 21-10-2014
(Potential Cyclogenesis Zone for GPP =>30)

FDP (Cyclone) NOC Report Dated 17 October, 2014

Synoptic features based on 0300 UTC:

- The trough of low at mean Sea level over south Andaman Sea and neighbourhood now lies over southeast Bay of Bengal and neighbourhood.
- A trough of low lies over southwest Bay of Bengal off Sri Lanka coast.

Environmental features based on 0300 UTC of today:

Sea Surface Temperature:

- SST is more than 30°C over parts of west-central Bay of Bengal and between 28-30 ^{0}C over the rest Bay of Bengal and Andaman Sea.

Ocean thermal energy:

- It is less than 50 KJ cm^{-2} over North Bay, southern part of central Bay and Andaman Sea. It is between 50 – 80 KJ cm^{-2} over rest Bay of Bengal. It is more than 80 KJ cm^{-2} over equatorial region.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive (10-25 *10^{-5} s^{-1}) over south Bay. It is negative over the rest Bay of Bengal and Andaman Sea.

Convergence:

- Lower level convergence is positive of the order of 5-10 *10^{-5} s^{-1} over south Bay of Bengal and south Andaman Sea.

Divergence:

- It is positive of the order of 5 -10 *10^{-5} s^{-1} over south Bay of Bengal and south Andaman Sea.

Wind Shear:

- Wind Shear is 5 -10 knots over south Bay of Bengal and Andaman Sea. It is 10 - 20 knots over central Bay of Bengal and 20-30 knots over north Bay of Bengal.

Wind Shear Tendency:

- Shear Tendency is increasing over central Bay, north Bay of Bengal and Andaman Sea.

Upper tropospheric ridge:

- The upper tropospheric **ridge** at 200 hPa passes through Lat. 19.0°N.

M.J.O. Index:

- Located in phase 1 with amplitude more than 1.0.
- Dynamical forecast:- MJO may continue in phase 1 with amplitude more than 1.0 during next 4 days. Hence MJO is unfavourable for the next 4 days.

Storms and Depression over South China Sea:

- There is currently no Tropical Storm/Depression over south China Sea.

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

Scattered low and medium clouds with embedded isolated moderate to intense convection over southwest & southeast Bay of Bengal and southwest Andaman Sea.

NWP Analysis

- IMD-GFS, IMD-WRF and Genesis Potential Parameter (GPP) analysis and forecasts based on 0000 UTC of 17 October 2014 shows no development of cyclogenesis over the North Indian Ocean during next 7 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

- The analysis and forecasts for 24h, 72h, 120h and 168h of 850 hPa, 500 hPa and 200 hPa winds and GPP are given in **Annexure II**.
- **NCMRWF Model:** No cyclogenesis over Bay of Bengal and Arabian Sea during next 5 days.
- **ECMWF Model**: No cyclogenesis over Bay of Bengal and Arabian Sea during next 5 days.
- **METEOFRANCE –ARP Model:** No cyclogenesis over Bay of Bengal and Arabian Sea during next 3 days.
- **UKMO Model:** No cyclogenesis over Bay of Bengal and Andaman Sea during next 5 days.

Summary and Conclusion:

- No cyclogenesis would occur over Bay of Bengal and Arabian Sea during next 5 days.

Advisory:

- No IOP during next 4 days.

Annexure-I

Status of Observation system:
Synoptic observation:

Region	Date/Time (UTC)		
	16/12	17/00	17/03
India	73	64	73
Coastal stations			
WB	6	7	8
Odisha	2	4	4
AP	23	25	23
Tamil Nadu	20	22	24
Puducherry	3	3	3
A & N	-	-	-
Bangladesh	11	-	-
Myanmar	9	11	-
Thailand	1	1	-
Sri Lanka	8	6	-

- **RS/RW** (12Z) of 16/10/2014 **4/39**
- **No. of Ascents reaching 250 hPa levels: 1, MISDA: 33**
- **RS/RW** (00Z) of 17/10/2014 **20/39**
- **No. of Ascents reaching 250 hPa levels: 11 , MISDA: 7**

No. of PILOT Ascents

16/12Z	17/00Z
6	23

Buoy Data

16/12Z	17/00Z	17/03Z
6	3	7

Data Statistics over RMC Chennai Region

No. of Synop data

No. of Synop data

Date→	16.10.2014							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	19	22	19	19	22	20	20	20

No. of RS/RW Ascents
00Z /16.10.2014 : 5
No. of Ascents reaching 250 hPa level = 5
MISDA : 3

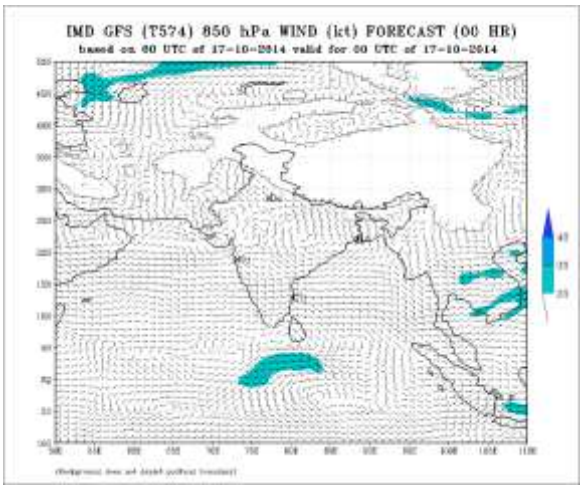
12Z /16.10.2014 : --
No. of Ascents reaching 250 hPa level = --
MISDA : 8

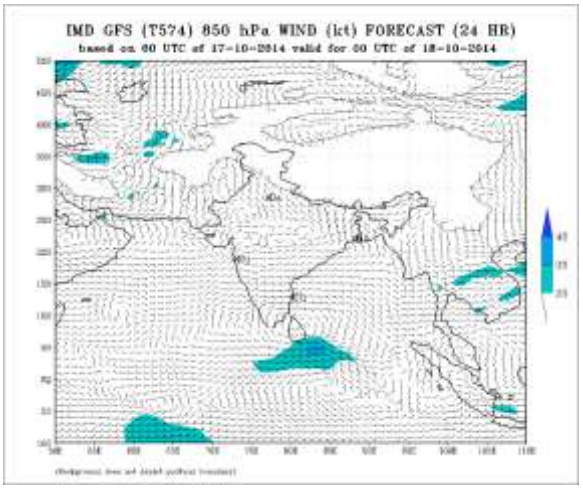
No. of PILOT Ascents:

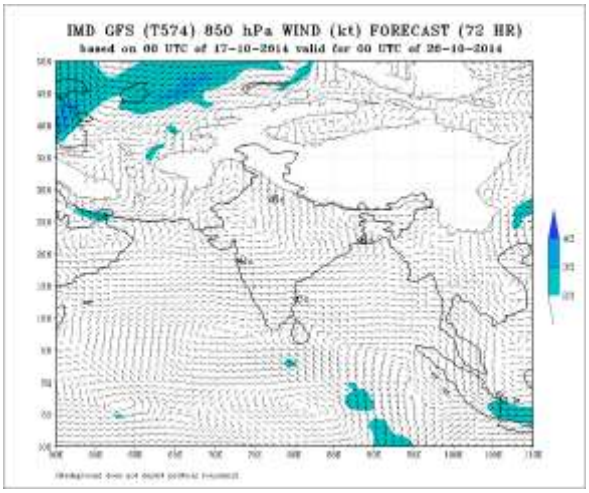
16.10.2014

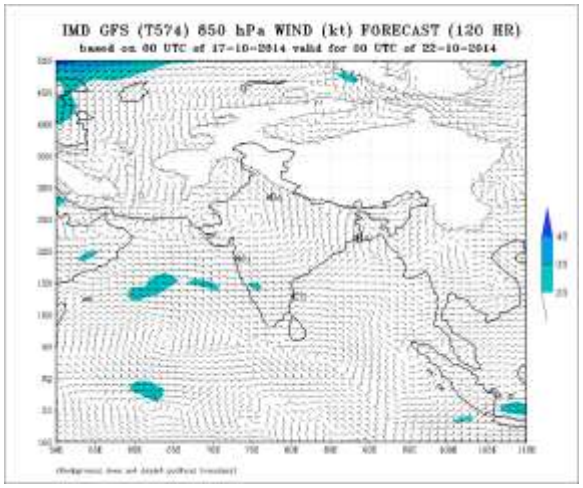
06Z	18Z
3	**4**

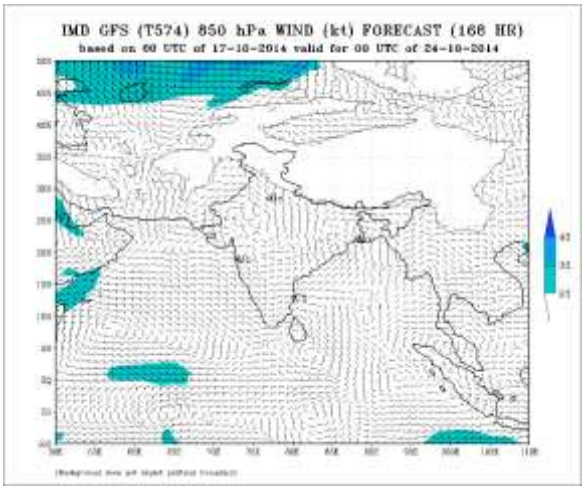
Annexure-II

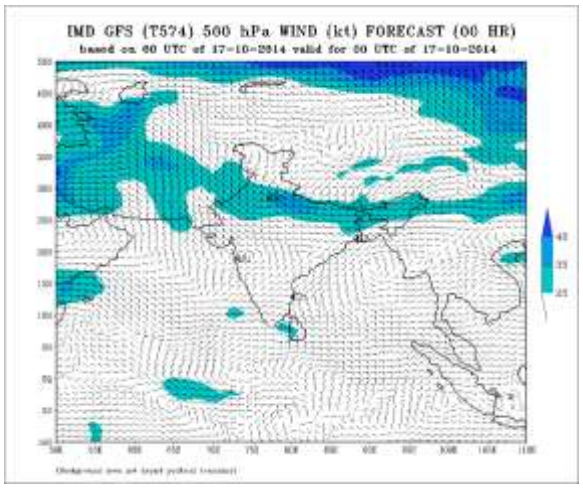

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 17-10-2014 valid for 00 UTC of 17-10-2014

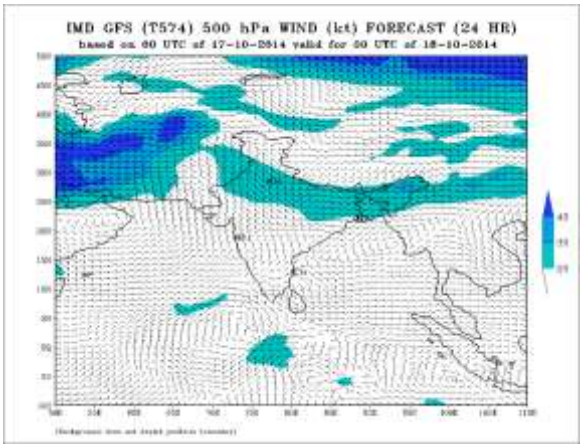

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 17-10-2014 valid for 00 UTC of 18-10-2014

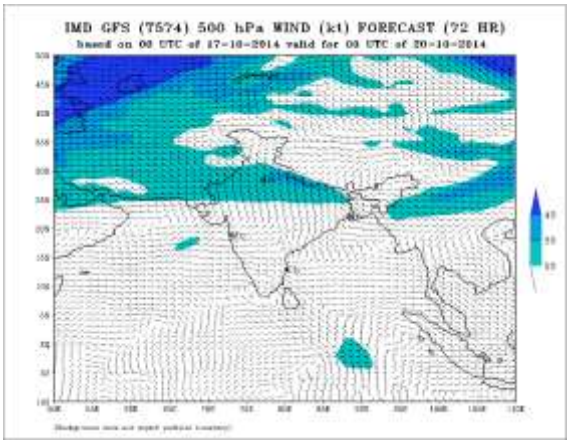

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 17-10-2014 valid for 00 UTC of 20-10-2014

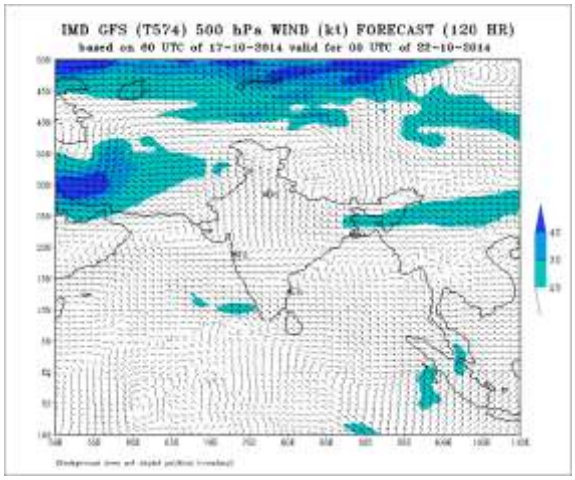

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 17-10-2014 valid for 00 UTC of 22-10-2014

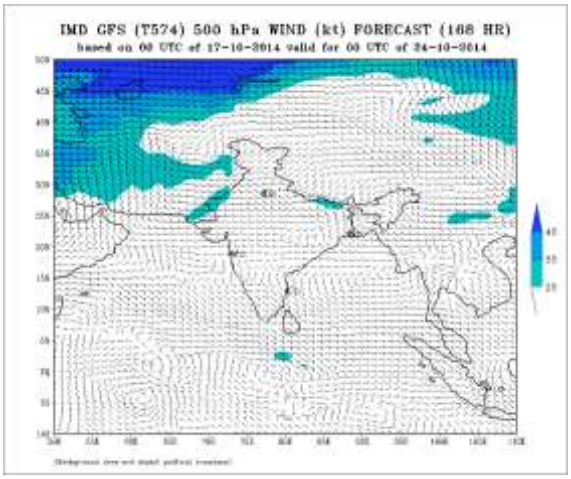

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 17-10-2014 valid for 00 UTC of 24-10-2014

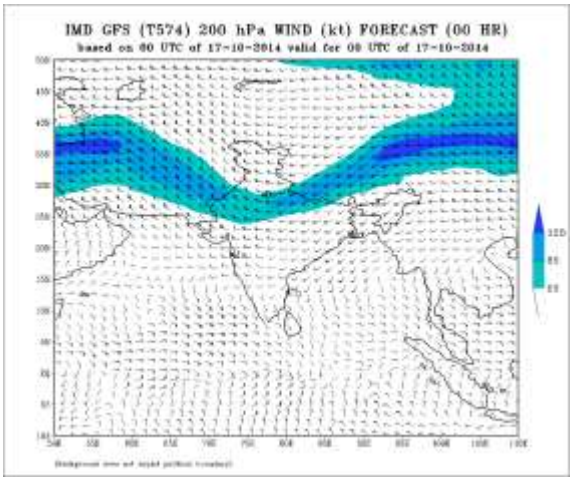

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 17-10-2014 valid for 00 UTC of 17-10-2014

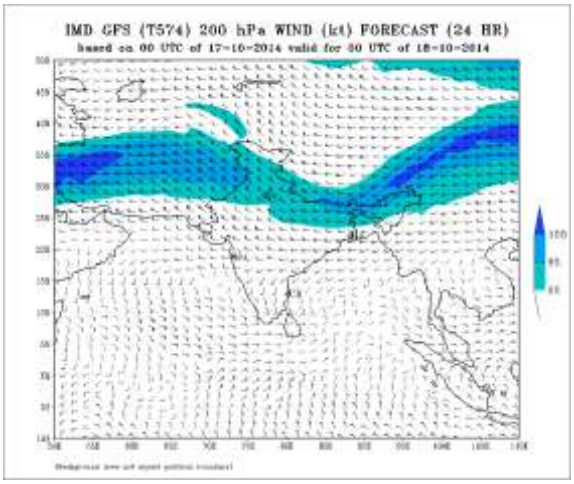

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 17-10-2014 valid for 00 UTC of 18-10-2014

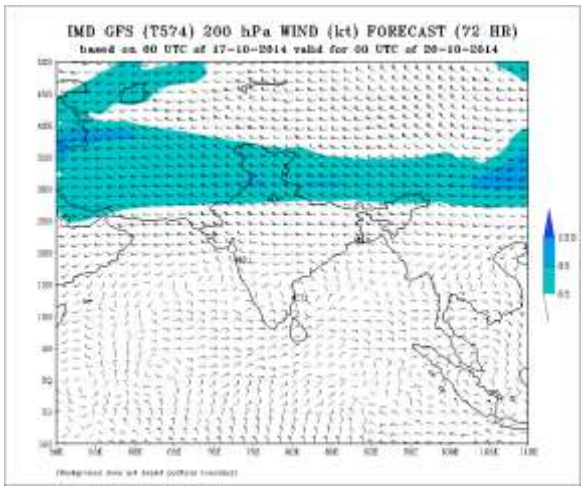

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 17-10-2014 valid for 00 UTC of 20-10-2014

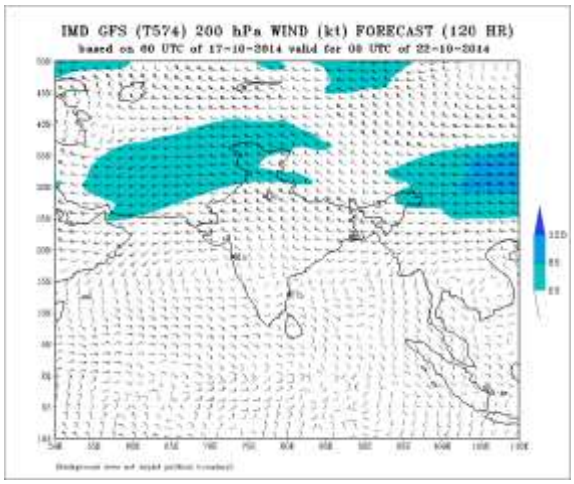

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 17-10-2014 valid for 00 UTC of 22-10-2014

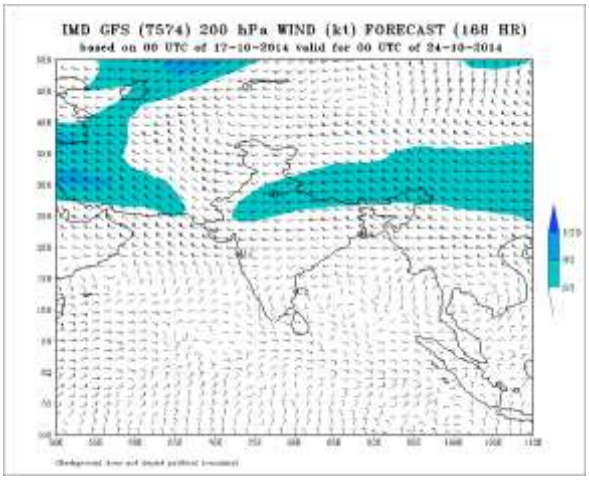

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 17-10-2014 valid for 00 UTC of 24-10-2014

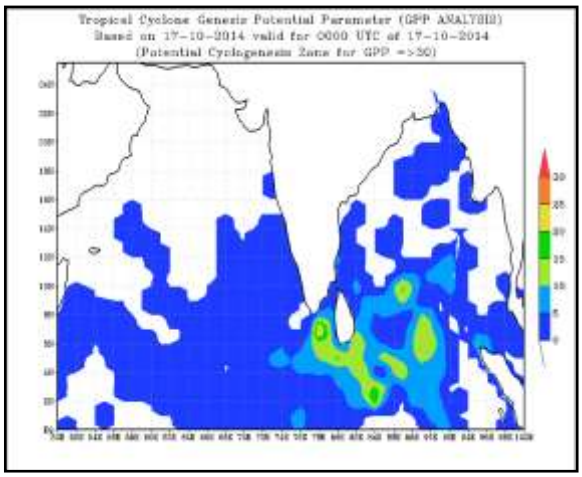

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 17-10-2014 valid for 00 UTC of 17-10-2014

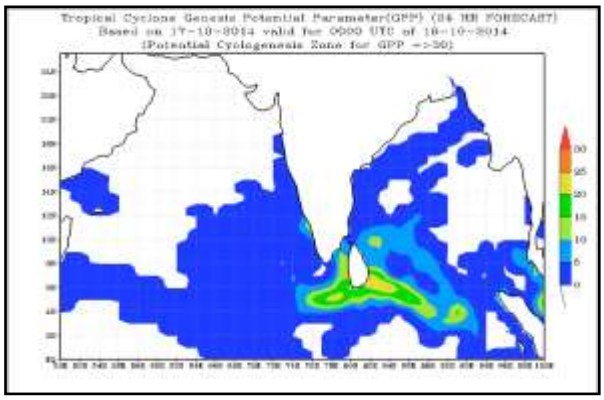

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 17-10-2014 valid for 00 UTC of 18-10-2014

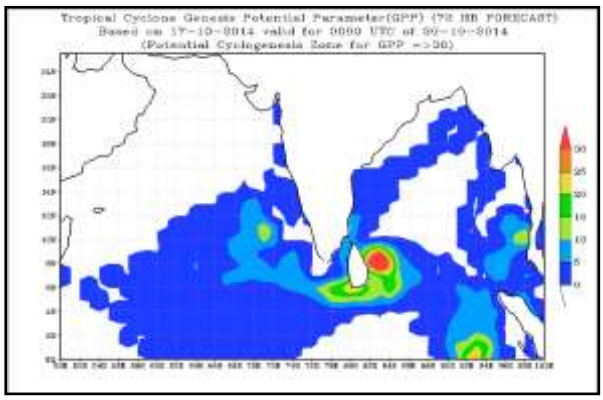

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 17-10-2014 valid for 00 UTC of 20-10-2014

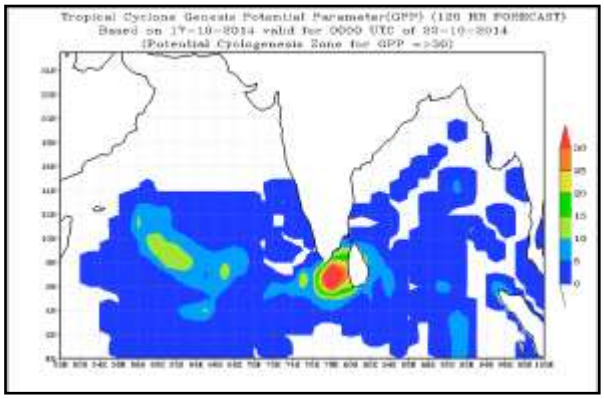

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 17-10-2014 valid for 00 UTC of 22-10-2014

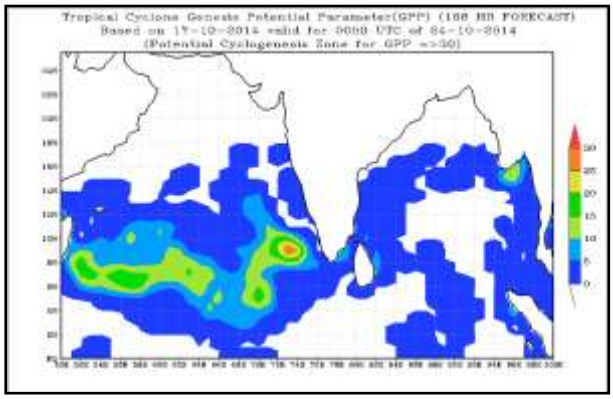

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 17-10-2014 valid for 00 UTC of 24-10-2014


Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 17-10-2014 valid for 0000 UTC of 17-10-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 17-10-2014 valid for 0000 UTC of 18-10-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 17-10-2014 valid for 0000 UTC of 20-10-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 17-10-2014 valid for 0000 UTC of 22-10-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (168 HR FORECAST)
Based on 17-10-2014 valid for 0000 UTC of 24-10-2014
(Potential Cyclogenesis Zone for GPP =>30)

FDP (Cyclone) NOC Report Dated 18 October, 2014

Synoptic features based on 0300 UTC:

- The upper air cyclonic circulation over Lakshadweep & adjoining Kerala, now seen as a trough of low and extends from Lakshadweep area to east central Arabian Sea off Goa coast.
- The trough of low over southwest Bay of Bengal off Sri Lanka coast, now runs from Sri Lanka to Tamilnadu coasts with an upper air cyclonic circulation aloft upto 3.1 km above mean Sea level.
- The trough of low over southeast Bay of Bengal & neighbourhood has merged with the trough of low over southwest Bay of Bengal.

Environmental features based on 0300 UTC of today: Sea Surface Temperature:

- SST is more than 30°C over parts of west-central and north Bay of Bengal and between 28-30 ^{0}C over the rest Bay of Bengal and Andaman Sea.

Ocean thermal energy:

- It is between 50–80 KJ cm^{-2}over west-central, parts of east-central and southwest Bay of Bengal. It is less than 50 KJ cm^{-2} over rest of Bay of Bengal. It is more than 80 KJ cm^{-2} over equatorial region.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive (10-30 *10^{-5} s^{-1}) over south Bay and parts of east-central Bay of Bengal. It is negative over the rest Bay of Bengal and Andaman Sea.

Convergence:

- Lower level convergence is positive of the order of 5-10 *10^{-5} s^{-1} over southwestBay of Bengal and southeast Arabian Sea.

Divergence:

- It is positive of the order of 5 -20 *10^{-5} s^{-1} over southwest Bay of Bengal and southeast Arabian Sea and negative of the order of 5*10^{-5} s^{-1} over the central Bay of Bengal.

Wind Shear:

- Wind Shear is 5 -10 knots over east –central, west-central Bay of Bengal and Andaman Sea. It is 10 - 30 knots over rest Bay of Bengal and 20-30 over southeast Arabian Sea.

Wind Shear Tendency:

- Shear Tendency is decreasing over central Bay and adjoining Andaman Sea. It is increasing in the rest parts of Bay of Bengal and adjoining southeast Arabian Sea.

Upper tropospheric ridge:

- The upper tropospheric **ridge** at 200 hPa passes through Lat. 14.0°N.

M.J.O. Index:

- Located in phase 1 with amplitude more than 1.0.

Dynamical forecast: MJO may continue in phase 1 with amplitude more than 1.0 during next 4 days. Hence, MJO is unfavourable for the next 4 days.

Storms and Depression over south China Sea:

- There is currently no Tropical Storm/Depression over south China Sea.

Status of observational system:

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

Satellite:

Inference based on INSAT imagery of 180900 UTC

- Broken low and medium clouds with embedded moderate to intense convection over Bay south of latitude 15.0^0 North and west of long 87.5^0 East and south Andaman Sea.
- Broken low and medium clouds with embedded moderate to intense convection Arabian Sea south of latitude 16.0^0 and east of longitude 67.5^0 East.

NWP Input for FDP Cyclone based on 0000 UTC of 18.10.2014

NWP Analysis

- IMD-GFS, IMD-WRF and Genesis Potential Parameter (GPP) analysis and forecasts based on 0000 UTC of 18 October 2014 shows no development of cyclogenesis over the North Indian Ocean during next 7 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

- The analysis and forecasts for 24h, 72h, 120h and 168h of GPP are given in **Annexure NCMRWF Model:** No cyclogenesis over Bay of Bengal and Arabian Sea during next 5 days.
- **ECMWF Model**: No cyclogenesis over Bay of Bengal and Arabian Sea during next 5 days.
- **METEOFRANCE –ARP Model:** No cyclogenesis over Bay of Bengal and Arabian Sea during next 3 days.
- **UKMO Model:** No cyclogenesis over Bay of Bengal and Andaman Sea during next 5 days.

Summary and Conclusion:

No cyclogenesis would occur over Bay of Bengal and Arabian Sea during next 5 days.

Advisory:
No IOP during next 4 days.

Annexure-I

Status of Observation system:
Synoptic observation:

Region	Date/Time (UTC)		
	17/12	**18/00**	**18/03**
India	41	31	40
Coastal stations			
WB	8	3	8
Odisha	7	6	7
AP	12	12	12
Tamil Nadu	10	6	9
Puducherry	3	3	3
A & N	1	1	1
Bangladesh	8	10	8
Myanmar	10	11	11
Thailand	1	1	-
Sri Lanka	10	11	11

- **RS/RW** (12Z) of 17/10/2014: 1**/39**
- **No. of Ascents reaching 250 hPa levels: 1, MISDA: 38**
- **RS/RW** (00Z) of 18/10/2014: **14/39**
- **No. of Ascents reaching 250 hPa levels: 11 , MISDA: 25**

No. of PILOT Ascents

17/12Z	**18/00Z**
12/25	29/45

	18/00Z	**18/03Z**
-	-	-

Data Statistics over RMC Chennai Region

No. of Synop data

Date→	**17.10.2014**							
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 /17.10.2014 : 4

No. of Ascents reaching 250 hPa level = 4

MISDA : 4

12Z /17.10.2014 : --

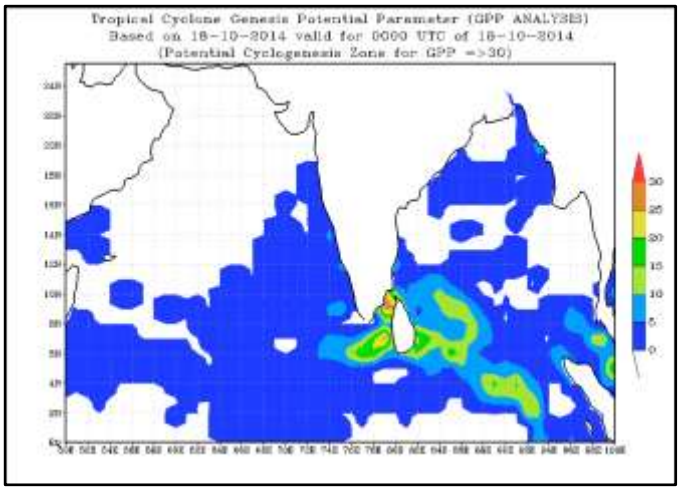
No. of Ascents reaching 250 hPa level = --

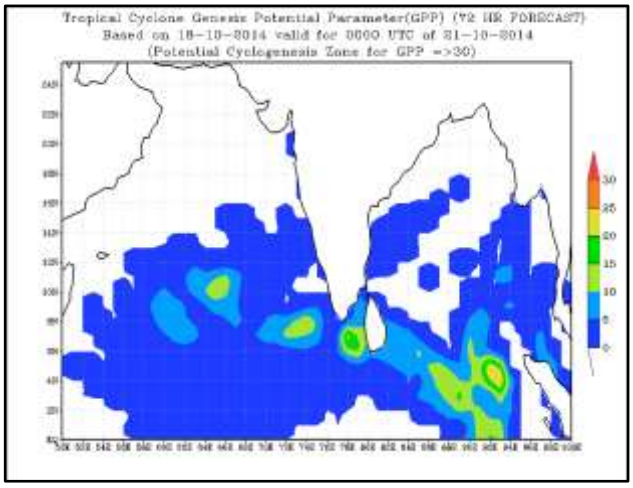
MISDA : 8

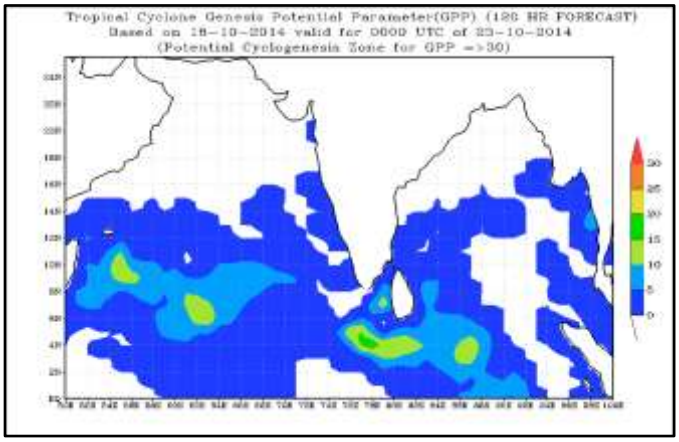
No. of PILOT Ascents:

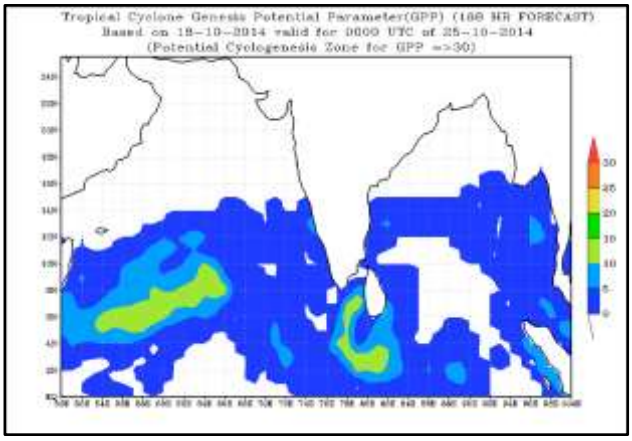
17.10.2014	
06Z	18Z
2	2

Annexure-II









FDP (Cyclone) NOC Report Dated 19 October, 2014

Synoptic features based on 0300 UTC:

- The trough of low over southwest Bay of Bengal off Sri Lanka coast at mean Sea level extending from Sri Lanka coast to Tamilnadu coast with an upper air cyclonic circulation aloft upto 3.1 km above mean Sea level persists.
- **Environmental features based on 0300 UTC of today: Sea Surface Temperature:**
- SST is about 28-30°C over Bay of Bengal and Andaman Sea.

Ocean thermal energy:

- It is 40-60 KJ cm^{-2} over Bay of Bengal. It is more than 100 KJ cm^{-2} over equatorial region.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive (20-50 *10^{-5} s^{-1}) over south Bay of Bengal and south Andaman Sea. It is 10-20*10^{-5} s^{-1} over western parts eastcentral Bay of Bengal. It is negative over the rest of Bay of Bengal.

Convergence:

- Lower level convergence is positive of the order of 5-10 *10^{-5} s^{-1} over south Bay of
- Bengal and south Andaman Sea.

Divergence:

- Upper level devergence is positive of the order of 10 -30 *10^{-5} s^{-1} over south Bay of Bengal and south Andaman Sea.

Wind Shear:

- Wind Shear is 5 -10 knots over southeast Bay of Bengal, Andaman Sea and southwest Bay of Bengal off Sri Lanka-Tamil Nadu coast. It is 20-40 knots over extreme southwest and north Bay of Bengal.

Wind Shear Tendency:

- Shear Tendency is decreasing over southwest Bay of Bengal off Tamilnadu-south Andhra Pradesh coast.

Upper tropospheric ridge:

- The upper tropospheric **ridge** at 200 hPa passes through Lat. 14.0°N.

M.J.O. Index:

- Located in phase 1 with amplitude more than 1.0.
- Dynamical forecast:- MJO may continue in phase 1 with amplitude more than during next 4 days. Hence MJO is unfavourable for the next 4 days.

Storms and Depression over south China Sea:

- There is currently no Tropical Storm/Depression over south China Sea.

Status of observational system:

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

Satellite:

Inference based on INSAT imagery of 190900 UTC

Broken low and medium clouds with embedded mederate to intense convection over extreme southwest and extreme southeast parts of southeast Bay of Bengal and Andaman Sea.

NWP Analysis

- IMD-GFS, IMD-WRF and Genesis Potential Parameter (GPP) analysis and forecasts based on 0000 UTC of 19 October 2014 shows no development of cyclogenesis over the North Indian Ocean during next 7 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

- The analysis and forecasts for 24h, 72h, 120h and 168h of 850 hPa, 500 hPa and 200 hPa winds and GPP are given in **Annexure II**.
- **NCMRWF Model:** No cyclogenesis over Bay of Bengal and Arabian Sea during next 5 days.
- **METEOFRANCE –ARP Model:** No cyclogenesis over Bay of Bengal and Arabian Sea during next 3 days.
- **JMA Model:** No cyclogenesis over Bay of Bengal and Andaman Sea during next 5 days.

Summary and Conclusion:
No cyclogenesis would occur over Bay of Bengal and Arabian Sea during next 5 days.

Advisory:
No IOP during next 4 days.

Annexure-I

Status of Observation system:
Synoptic observation:

Region	Date/Time (UTC)		
	18/12	**19/00**	**19/03**
India	34	35	40
Coastal stations			
WB	8	8	8
Odisha	7	5	7
AP	12	12	12
Tamil Nadu	10	8	11
Puducherry	2	1	2
A & N	6	1	6
Bangladesh	10	11	11
Myanmar	9	11	10
Thailand	2	2	2
Sri Lanka	8	7	8

AWS Observations:

Region	Date/Time (UTC)		
	18/12	**19/00**	**19/03**
India	69	68	75
Coastal stations			
WB	7	7	10
Odisha	6	6	9
AP	27	27	27
Tamil Nadu	28	27	28
Puducherry	1	1	1
A & N			

- **RS/RW** (12Z) of 18/10/2014 **-/39**
- **No. of Ascents reaching 250 hPa levels: -, MISDA: 39**
- **RS/RW** (00Z) of 19/10/2014 11**/39**
- **No. of Ascents reaching 250 hPa levels: 11 , MISDA: 28No. of PILOT Ascents**

18/12Z	**19/00Z**
7	28

Buoy Data

18/12Z	**19/00Z**	**19/03Z**
9	9	9

Data Statistics over RMC Chennai Region

No. of Synop data

Date→	18.10.2014							
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 /18.10.2014 : 4

No. of Ascents reaching 250 hPa level = 4

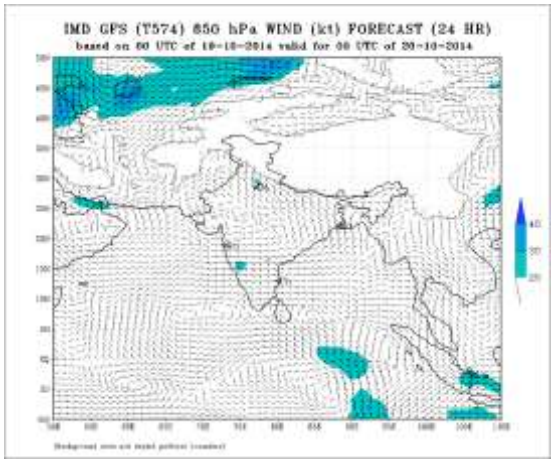
MISDA : 4
12Z /18.10.2014 : --

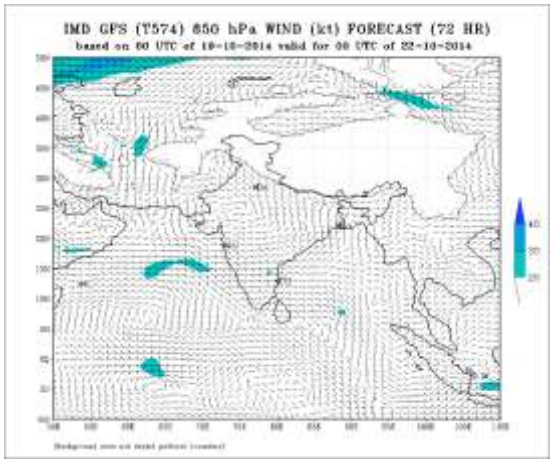
No. of Ascents reaching 250 hPa level = -- MISDA : 8

No. of PILOT Ascents:

18.10.2014	
06Z	18Z
1	2

Annexure-II


IMD GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 19-10-2014 valid for 00 UTC of 20-10-2014


IMD GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
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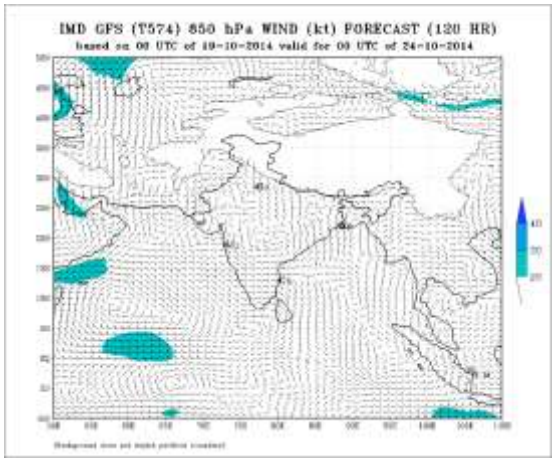
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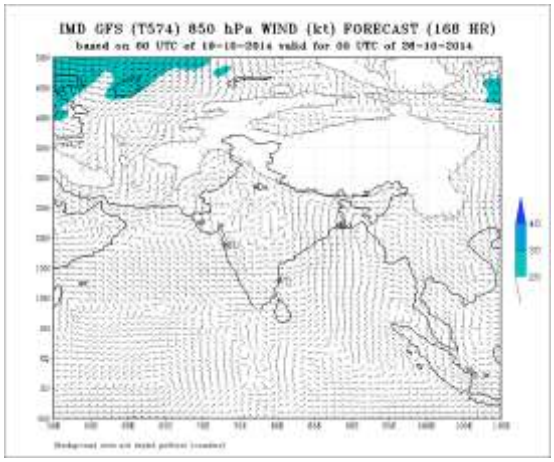
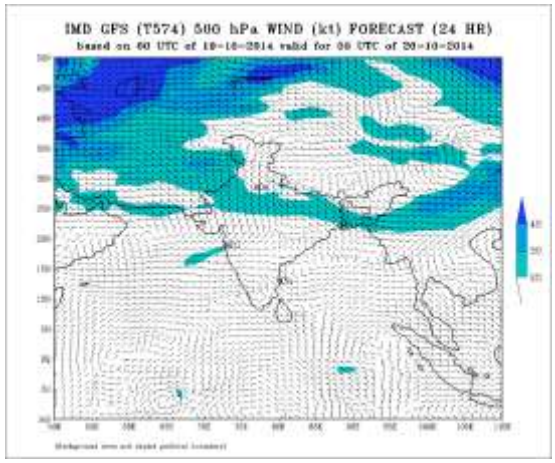
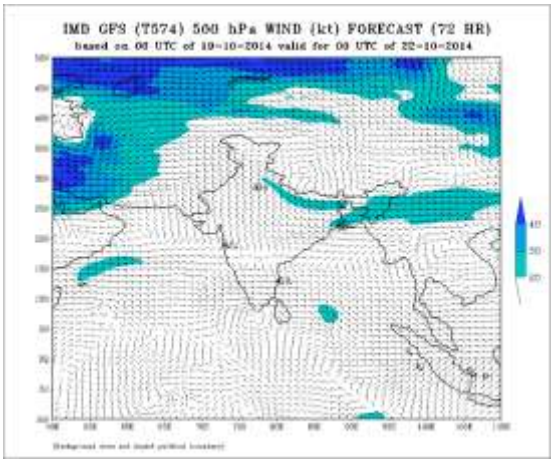
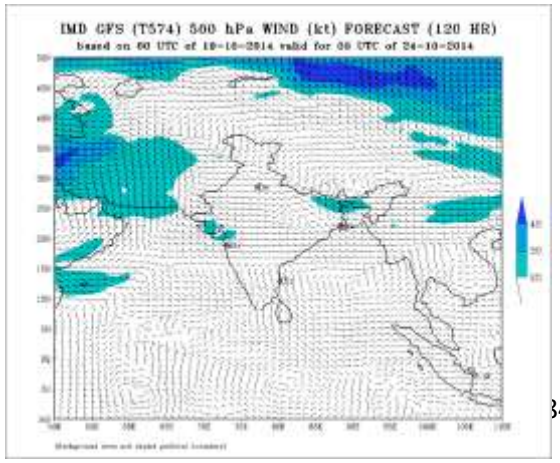
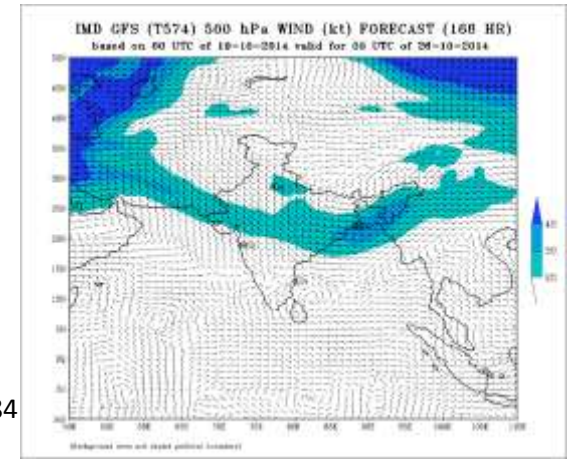
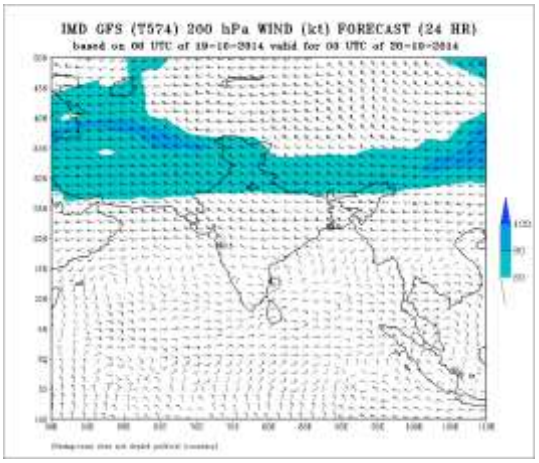

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 19-10-2014 valid for 00 UTC of 26-10-2014

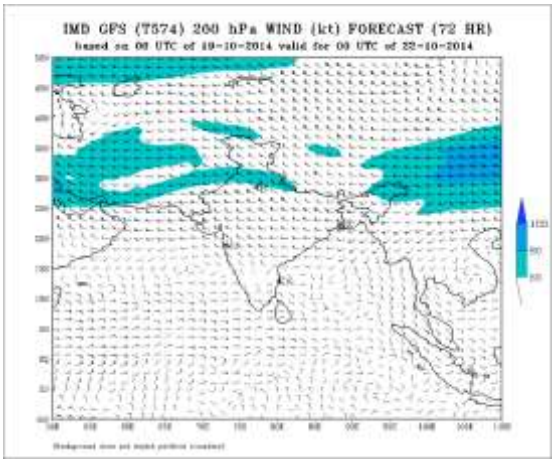

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 19-10-2014 valid for 00 UTC of 20-10-2014

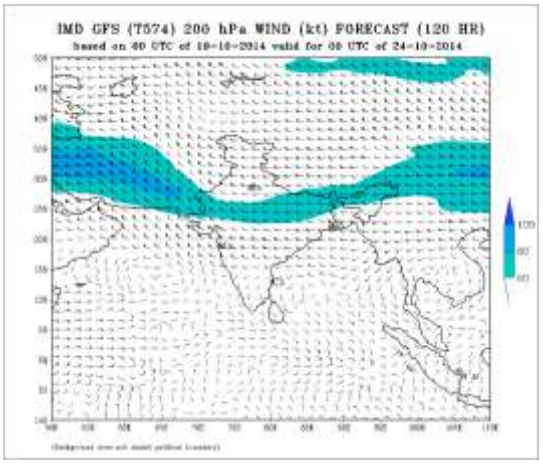

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 19-10-2014 valid for 00 UTC of 22-10-2014

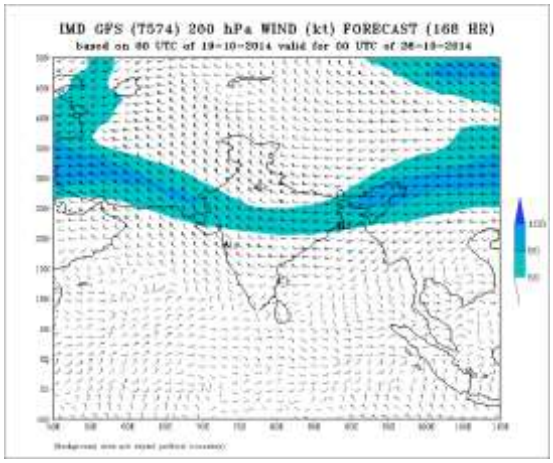

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 19-10-2014 valid for 00 UTC of 24-10-2014

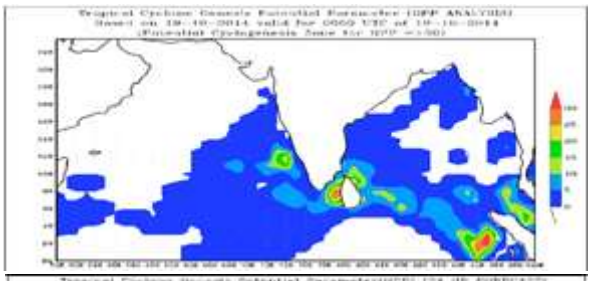

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 19-10-2014 valid for 00 UTC of 26-10-2014

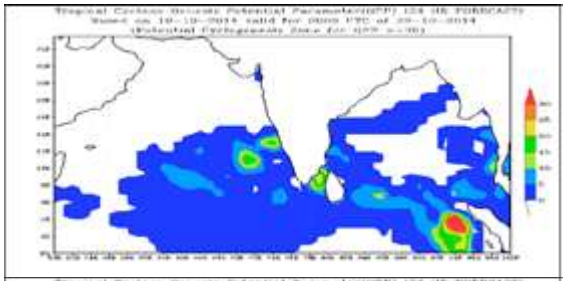

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 19-10-2014 valid for 00 UTC of 20-10-2014

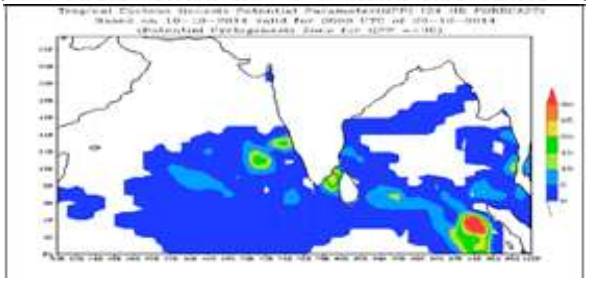

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 19-10-2014 valid for 00 UTC of 22-10-2014

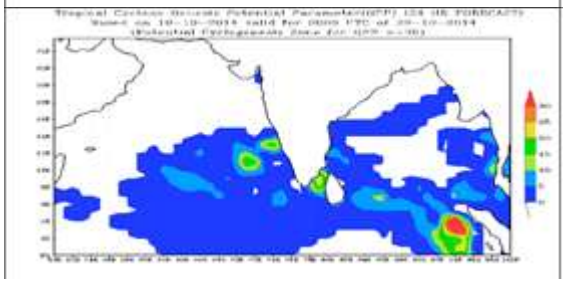

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 19-10-2014 valid for 00 UTC of 24-10-2014


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 19-10-2014 valid for 00 UTC of 26-10-2014









FDP (Cyclone) NOC Report Dated 20 October, 2014

Synoptic features based on 0300 UTC:

- The trough of low over southwest Bay of Bengal off Sri Lanka coast to Tamilnadu coast now lies over Sri Lanka and adjoining Coastal Tamilnadu and southwest Bay of Bengal.
- A trough of low lies over Andaman Sea.
- A trough of low from Lakshadweep area to eastcentral Arabian Sea off south Maharashtra coast at mean Sea level extends from southeast Arabian Sea to eastcentral Arabian Sea off Maharashtra Coast with an upper air cyclonic circulation aloft and extends upto mid-tropospheric level. Under its influence, a low pressure area may form over south Arabian Sea during next 48 hours and may subsequently concentrate into a Depression.

Environmental features based on 0300 UTC of today:

Sea Surface Temperature:

- SST is about 28-30°C over Bay of Bengal and Andaman Sea.

Ocean thermal energy:

- It is 60-80 KJ cm^{-2} over southeast Arabian Sea, 40-60 KJ cm^{-2} over Bay of Bengal. It is more than 100 KJ cm^{-2} over equatorial region.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive (20-50 $*10^{-5}$ s^{-1}) over south Bay of Bengal, south Andaman Sea. and southeast Arabian Sea It is $<20*10^{-5}$ s^{-1} over western parts eastcentral Bay of Bengal. It is negative over the rest of Bay of Bengal.

Convergence:

- Lower level convergence is positive of the order of $5*10^{-5}$ s^{-1} over southwest Bay of Bengal off Tamilnadu coast, southeast Bay of Bengal off Myanmar coast and parts of southeast Arabian Sea.

Divergence:

- Upper level devergence is positive of the order of 10 -20 $*10^{-5}$ s^{-1} over southwst Bay of Bengal off Sri Lanka-Tamilnadu coast and southeast Arabian Sea. It is 5-10 $*10^{-5}$ s^{-1} off Myanmar coast.

Wind Shear:

- Wind Shear is 5 -10 knots in the latitudinal belt of 8-15°N Bay of Bengal and Arabian Sea. It is 20-30 knots over the northern parts of Bay of Bengal and Arabian Sea and 20-40 knots over the extreme southern parts.

Wind Shear Tendency:

- Shear Tendency is decreasing over southwest Bay of Bengal west of 88°E and south of 10°N, north Bay of Bengal and southeast Arabian Sea.

Upper tropospheric ridge:

- The upper tropospheric **ridge** at 200 hPa passes through Lat. 16.0°N.

M.J.O. Index:

- Located in phase 1 with amplitude more than 1.0.
- Dynamical forecast:- MJO may continue in phase 1 with amplitude more than 1.0 during next 4 days. Hence MJO is unfavourable for the next 4 days.

Storms and Depression over south China Sea:

- There is currently no Tropical Storm/Depression over south China Sea.

Status of observational system:

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

Satellite:

Inference based on INSAT imagery of 200900 UTC:

Bay of Bengal & Andaman Sea :-

Broken low and medium clouds with embedded moderate to intense convection over southwest and adjoining westcentral Bay of Bengal between latitude 10.0ºN to 16.0ºN and west of longitude 84.0ºE and Andaman Sea.

Arabian Sea :-

Broken low and medium clouds with embedded scattered moderate to intense convection over Arabian Sea between latitude 5.0ºN to 15.0ºN and east of longitude 58.0ºE.

NWP Analysis

- IMD-GFS model forecasts based on 0000 UTC of 20 October 2014 shows development of a low pressure system over the south east Arabian Sea during next 24 hours. Forecasts also show west north-westward movement but no intensification of the system during next 7 days.
- IMD-WRF model forecasts based on 0000 UTC of 20 October 2014 shows development of a low pressure system over the south east Arabian Sea during next 24 hours. Forecasts also show westward movement and intensification into a Depression on day 3.
- Genesis Potential Parameter (GPP) forecasts based on 0000 UTC of 20 October 2014 shows development of a cyclogenesis zone over the south west Arabian Sea on 24 October 2014.

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

The analysis and forecasts for 24h, 72h, 120h and 168h of 850 hPa, 500 hPa and 200 hPa winds and GPP are given in **Annexure II**.

- **NCMRWF Model:** NCMRWF model suggests formation of a low pressure area over southeast Arabian Sea by 23rd October 2014 ,which would become a depression by 25th
- **ECMWF Model:** ECMWF forecast suggests formation of a low pressure area on 23rd October 2014, moving northwestwards and becoming Depression on 24th near 13ºN/64ºE, and then becoming well marked low on 25th, low pressure area on 26th and then move northeast wards towards eastcentral Arabian Sea during the next three days.
- **UKMO Model:** UKMO forecast suggests formation of a low pressure area over southeast Arabian Sea on 21st October 2014, move west-northwest wards and become depression on 25th, move northwestwards and cross Oman coast near 15ºN on 27th.
- **METEOFRANCE –ARP Model suggests** formation of low pressure area on 23rd October 2014 which would move northwest wards and become a depression by 25th.

Summary and Conclusion:

Most of the models suggest development of low pressure area during next 24-48 hours over southeast Arabian Sea. It would become a depression by 23rd October 2014 over southcentral Arabian Sea. While a few models such as ECMWF, suggest initial westnorthwest ward movement and then northeastward movement towards westcentral Arabian Sea for next3-4 days, other models like UKMO suggest westnorth westward movement and landfall over Arabia coast near latitude 15ºN as depression / deep depression by 27th October.

Advisory:

- Probability of cyclogenesis over southeast Arabian Sea is moderate to high during the next 48-96 hours.
- Probability of cyclogenesis over Bay of Bengal is nil during the next five days.
- No IOP during next 3 days.

Annexure-I

Status of Observation system:
Synoptic observation:

Region	Date/Time (UTC)		
	19/12	20/00	20/03
India	34	35	46
Coastal stations			
WB	8	8	8
Odisha	7	6	7
AP	12	11	12
Tamil Nadu	10	8	11
Puducherry	2	1	2
A & N	6	1	6
Bangladesh	10	11	10
Myanmar	9	10	10
Thailand	2	2	2
Sri Lanka	8	7	8

AWS Observations:

Region	Date/Time (UTC)		
	19/12	20/00	20/03
India	69	66	75
Coastal stations			
WB	7	6	10
Odisha	6	6	9
AP	27	26	27
Tamil Nadu	28	27	28
Puducherry	1	1	1
A & N			

- **RS/RW** (12Z) of 19/10/2014 **-/39**
- **No. of Ascents reaching 250 hPa levels: -, MISDA: 39**
- **RS/RW** (00Z) of 20/10/2014 11**/39**
- **No. of Ascents reaching 250 hPa levels: 11 , MISDA: 28**

No. of PILOT Ascents

18/12Z	19/00Z
7	28

Buoy Data

19/12Z	20/00Z	20/03Z
9	11	12

Data Statistics over RMC Chennai Region

No. of Synop data

No. of Synop data

Date→	19.10.2014							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	19	22	20	20	22	20	20	19

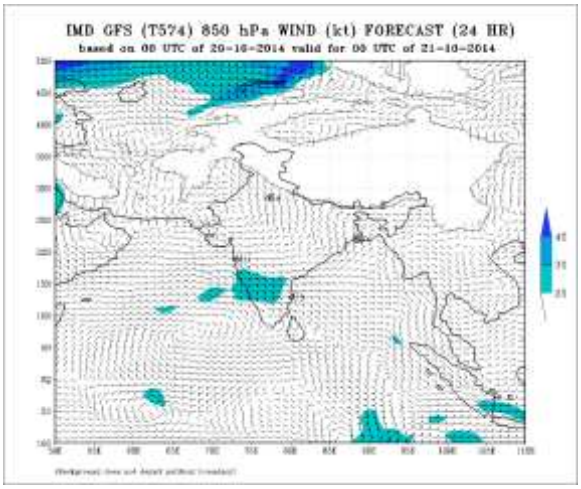
No. of RS/RW Ascents
00Z /19.10.2014 : 3
No. of Ascents reaching 250 hPa level = 3
MISDA : 5

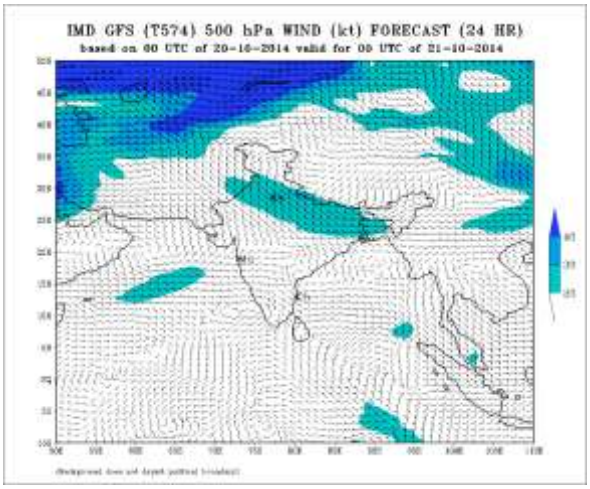
12Z /19.10.2014 : --
No. of Ascents reaching 250 hPa level = --
MISDA : 8

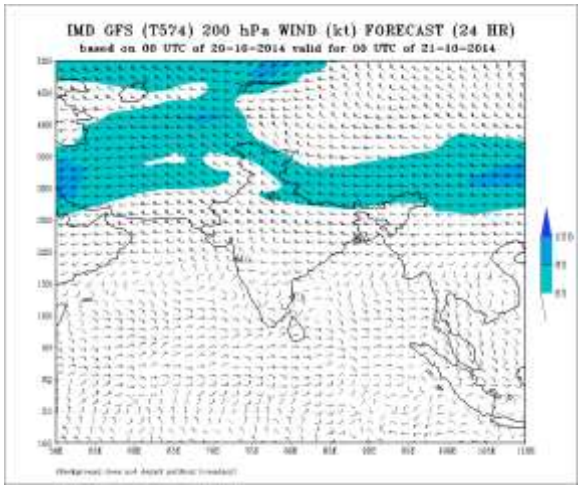
No. of PILOT Ascents:

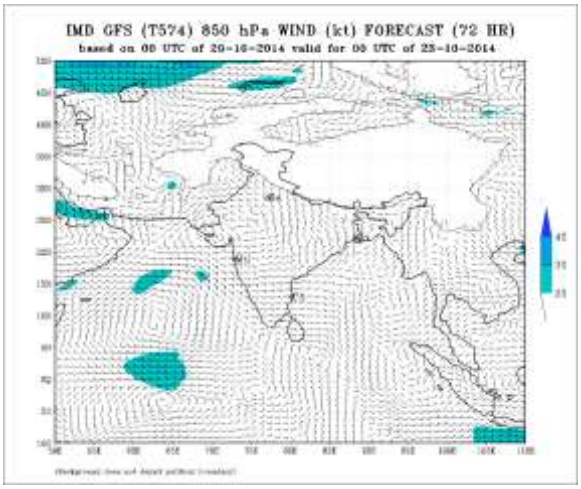
19.10.2014	
06Z	18Z
2	3

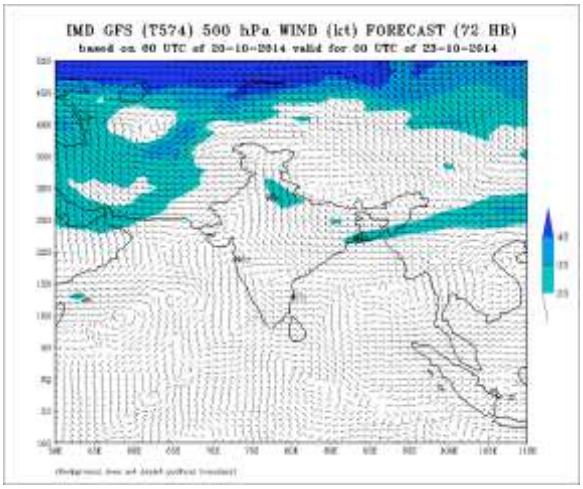
Annexure-II

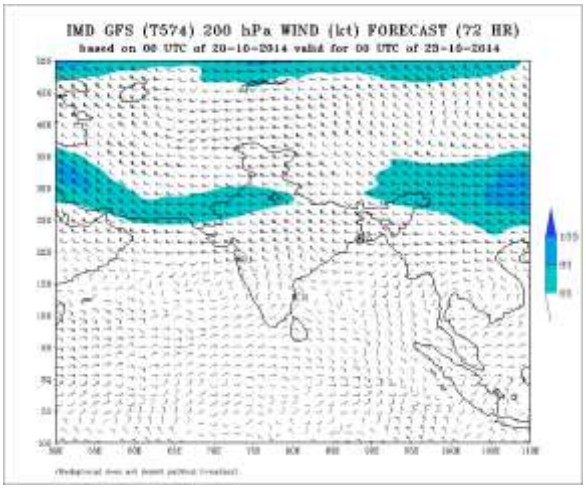

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 20-10-2014 valid for 00 UTC of 21-10-2014

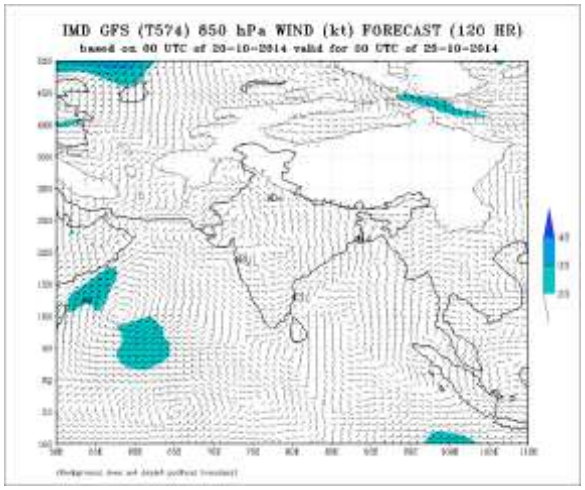

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 20-10-2014 valid for 00 UTC of 21-10-2014

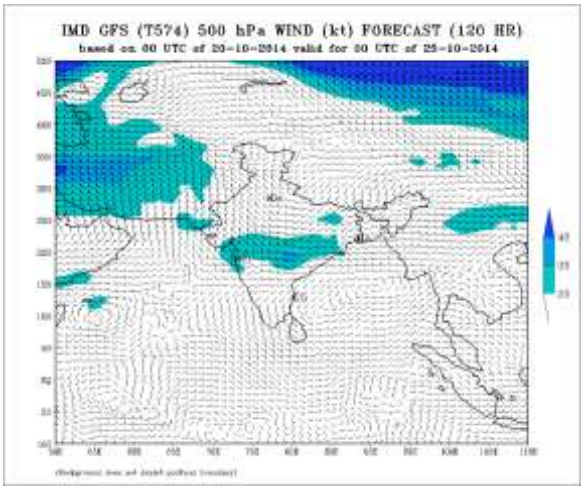

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 20-10-2014 valid for 00 UTC of 21-10-2014

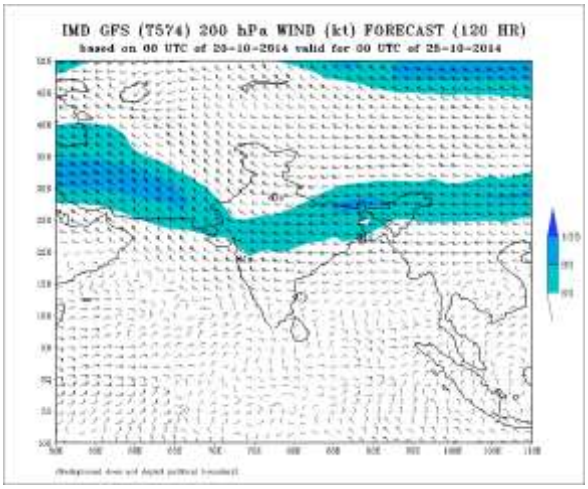

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 20-10-2014 valid for 00 UTC of 23-10-2014

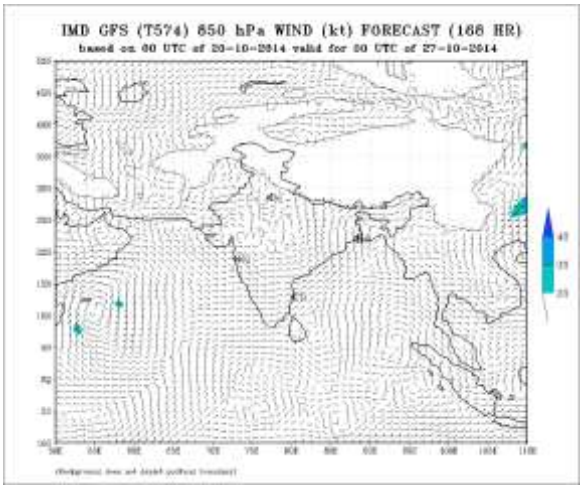

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 20-10-2014 valid for 00 UTC of 23-10-2014

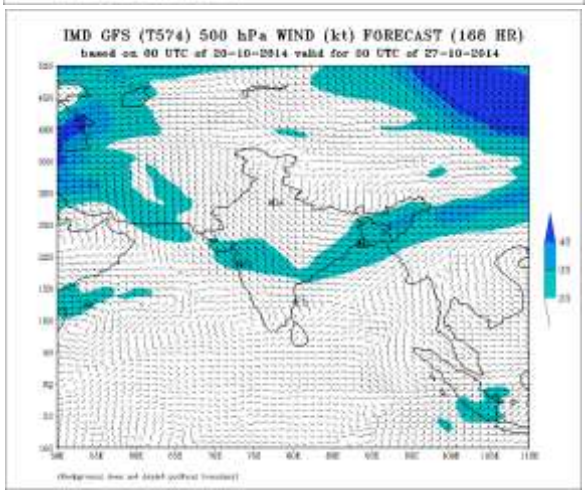

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 20-10-2014 valid for 00 UTC of 23-10-2014

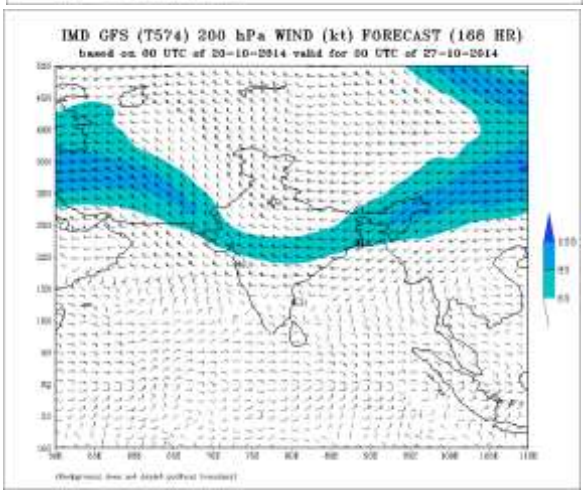

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 20-10-2014 valid for 00 UTC of 25-10-2014

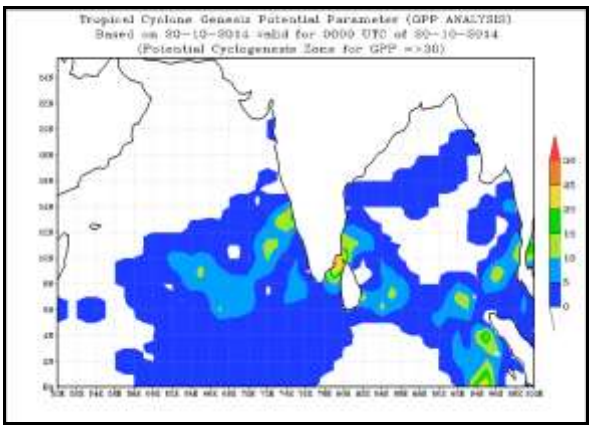

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 20-10-2014 valid for 00 UTC of 25-10-2014

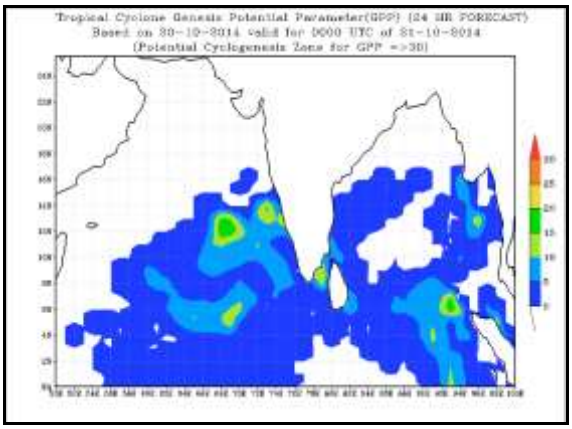

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 20-10-2014 valid for 00 UTC of 25-10-2014

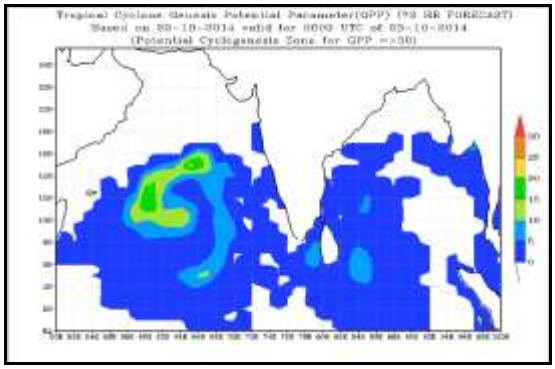

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 20-10-2014 valid for 00 UTC of 27-10-2014

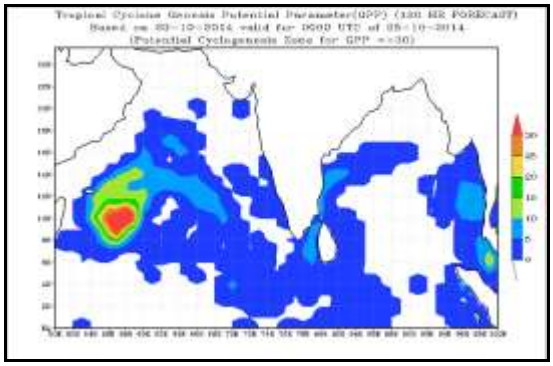

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 20-10-2014 valid for 00 UTC of 27-10-2014


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 20-10-2014 valid for 00 UTC of 27-10-2014


Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 30-10-2014 valid for 0000 UTC of 30-10-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 30-10-2014 valid for 0000 UTC of 31-10-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 30-10-2014 valid for 0000 UTC of 02-11-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 30-10-2014 valid for 0000 UTC of 03-11-2014
(Potential Cyclogenesis Zone for GPP =>30)

FDP (Cyclone) NOC Report Dated 21 October, 2014

Synoptic features based on 0300 UTC:

- A low pressure area lies over southeast Arabian Sea. It would become well marked during next 48 hrs.
- A trough of low lies over Andaman Sea.

Environmental features based on 0300 UTC of today:

Sea Surface Temperature:

- SST is about 28-32°C over Arabian Sea, Bay of Bengal and Andaman Sea.

Ocean thermal energy:

- It is 70-90KJ cm^{-2} over southeast Arabian Sea, 90-110 KJ cm^{-2} over Northwest and 100 – 140 KJ cm^{-2} over south west, south east Bay of Bengal and over equatorial region.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive (10-20 $*10^{-5}$ s^{-1}) over southwest Bay of Bengal off Tamilnadu coast and south Arabian Sea. It is negative over the rest of Bay of Bengal.

Convergence:

- Lower level convergence is positive of the order of $5*10^{-5}$ s^{-1} over southwest Bay of Bengal adjoining Tamilnadu coast, southeast Bay of Bengal off Myanmar coast and parts of southeast Arabian Sea.

Divergence:

- Upper level divergence is positive of the order of 5-10 $*10^{-5}$ s^{-1} over southwest Arabian Sea and southwest Bay of Bengal adjoining Tamilnadu coast and southeast Arabian Sea off Kerala coast. It is 5-10 $*10^{-5}$ s^{-1} off Myanmar coast.

Wind Shear:

- Wind Shear is 5 - 20 knots in the latitudinal belt of 8-15°N Bay of Bengal and Arabian Sea. It is 20-30 knots over the northern parts of Bay of Bengal and Arabian Sea.

Wind Shear Tendency:

- Shear Tendency is increasing 5 – 10 Knots over Eastcentral bay extending towards northern parts of Bay of Bengal and increasing 5 knots over west central Arabian Sea west of 65°E and East of 73°N

Upper tropospheric ridge:

- The upper tropospheric **ridge** at 200 hPa passes through Lat. 13.0°N.

M.J.O. Index:

- Located in phase 1 with amplitude more than 1.0.
- Dynamical forecast:- MJO may continue in phase 1 with amplitude more than 1.0 during next 4 days. Hence MJO is unfavourable for the next 4 days.

Storms and Depression over South China Sea:

- There is currently no Tropical Storm/Depression over South China Sea.

Status of observational system:

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

Satellite:

Inference based on INSAT imagery of 200900 UTC:

Bay of Bengal & Andaman Sea :-

Broken low and medium clouds with embedded isolated moderate to intense convection over extending southwest Bay and southeast Bay northern parts of eastcentral Bay and south Andaman Sea (.)

Arabian Sea :-

Broken low and medium clouds with embedded isolated moderate to intense convection over Arabian Sea between latitude 5.5ºN to 14.5ºN longitude 57.0ºE to 65.0ºE (.)

NWP Analysis

- IMD-GFS model forecasts based on 0000 UTC of 21 October 2014 shows development of a low pressure system over the south east Arabian Sea on 23 October 2014 and intensification of the system into a Depression on 25 October 2014 but no further intensification during next 7 days. Forecasts also show north-eastward recurvature of the system towards Gujarat coast during next 7 days.
- IMD-WRF model forecasts based on 0000 UTC of 21 October 2014 shows development of a low pressure system over the south east Arabian Sea on 23 October 2014 and intensification of the system into a Depression on 25 October 2014 with westward movement during next 3 days.
- Genesis Potential Parameter (GPP) forecasts based on 0000 UTC of 21 October 2014 shows development of a potential cyclogenesis zone over the south west Arabian Sea on 26 October 2014 and its northwestward movement towards west central Arabian Sea during 26-28 October 2014.

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

The analysis and forecasts for 24h, 72h, 120h and 168h of 850 hPa, 500 hPa and 200 hPa winds and GPP are given in **Annexure II**.

- **NCMRWF Model (GFS):** NCMRWF model suggests formation of a well marked low pressure area over southwest Arabian Sea by 24th October 2014
- **ECMWF Model:** ECMWF forecast suggests formation of a low pressure area on 22nd October 2014, moving northwestwards and becoming well marked low on 24th near 7ºN/65ºE, and then becoming Depression on 25th, low pressure area on 26th and then move northeastwards towards eastcentral Arabian Sea during the next three days.
- **UKMO Model:** UKMO forecast suggests formation of a low pressure area over southeast Arabian Sea on 21st October 2014, move west-northwest wards and become depression on 25th, moving northwestwards towards Oman.
- **METEOFRANCE –ARP Model suggests** formation of low pressure area on 22nd October 2014 which would move northwest wards and become a depression by 24th.

Summary and Conclusion:

Most of the models suggests intensification of low pressure area over southeast Arabian Sea into a depression on 24/25th October, while moving west-northwestwards.

Advisory:

- Probability of cyclogenesis over southeast Arabian Sea is low on 23 October and moderate on 24 and 25 Oct.
- Probability of cyclogenesis over Bay of Bengal is nil during the next five days.
- No IOP during next 3 days.

Annexure-I

Status of Observation system:
Synoptic observation:

Region	Date/Time (UTC)		
	20/12	21/00	21/03
India	45	37	46
Coastal stations			
WB	8	8	8
Odisha	7	6	7
AP	12	12	12
Tamil Nadu	10	9	11
Puducherry	1	1	1
A & N	6	1	6
Bangladesh	11	11	11
Myanmar	10	10	11
Thailand	2	2	2
Sri Lanka	8	7	8

AWS Observations:

Region	Date/Time (UTC)		
	20/12	21/00	21/03
India	69	66	75
Coastal stations			
WB	9	9	11
Odisha	5	7	12
AP	26	25	24
Tamil Nadu	25	24	25
Puducherry	1	1	1
A & N	-	-	-

- **RS/RW** (12Z) of 20/10/2014 **-/39**
- **No. of Ascents reaching 250 hPa levels: -, MISDA: 39**
- **RS/RW** (00Z) of 21/10/2014 16**/39**
- **No. of Ascents reaching 250 hPa levels: 11 , MISDA: 28**

No. of PILOT Ascents

20/12Z	21/00Z
2	1

Buoy Data

20/12Z	21/00Z	21/03Z
7	11	12

Data Statistics over RMC Chennai Region

No. of Synop data

Date→	20.10.2014							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	20	22	20	20	20	12	20	19

No. of RS/RW Ascents

00Z /20.10.2014 : 3

No. of Ascents reaching 250 hPa level = 3

MISDA : 5

12Z /20.10.2014 : --

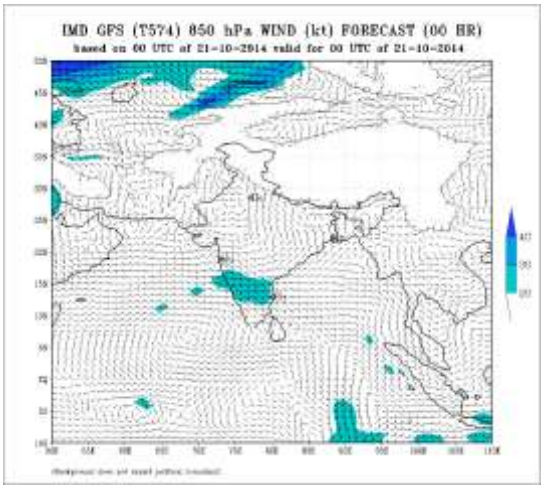
No. of Ascents reaching 250 hPa level = --

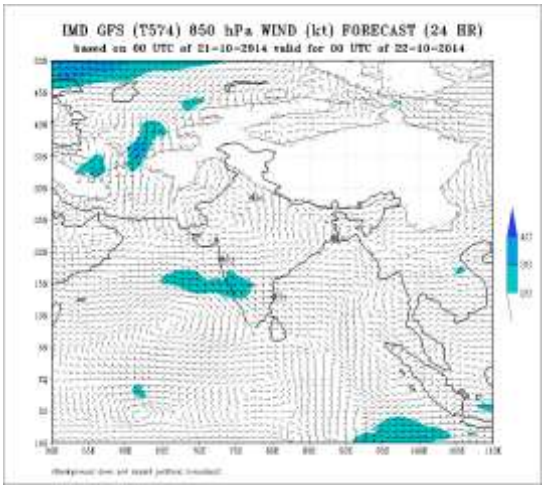
MISDA : 8

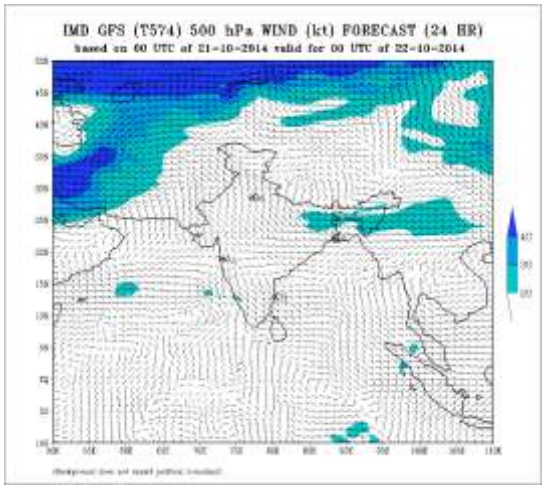
No. of PILOT Ascents:

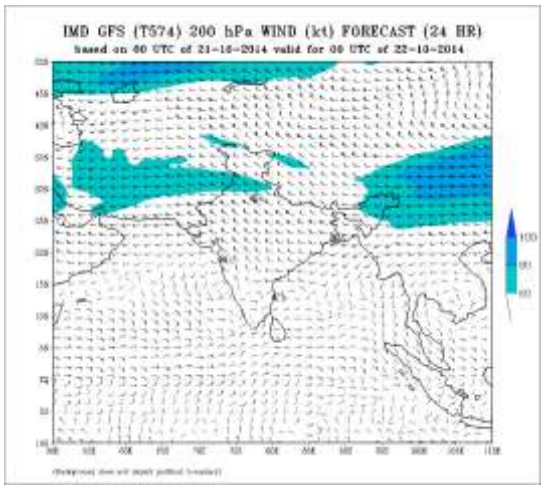
20.10.2014	
06Z	18Z
3	3

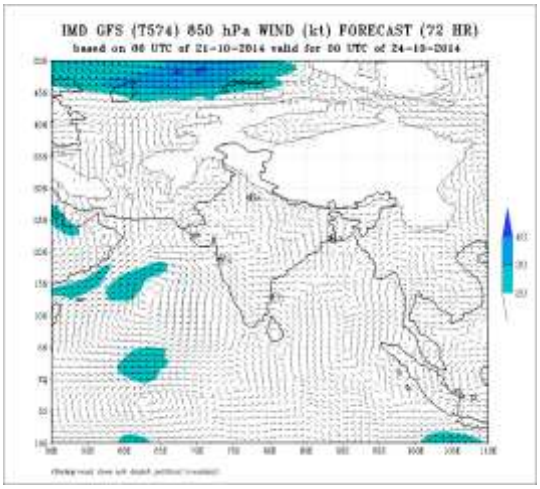
Annexure-II

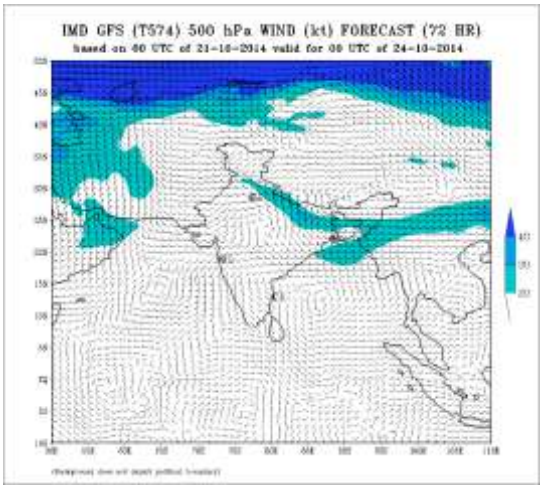

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 21-10-2014 valid for 00 UTC of 21-10-2014

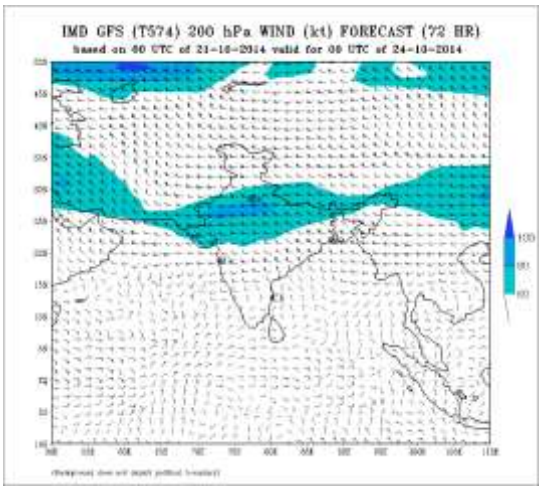

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 21-10-2014 valid for 00 UTC of 22-10-2014

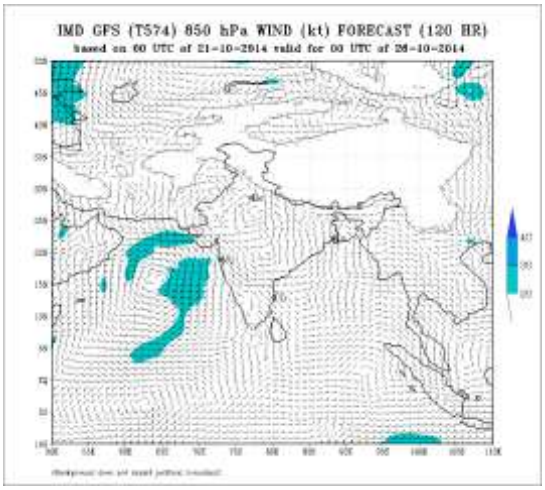

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 21-10-2014 valid for 00 UTC of 22-10-2014

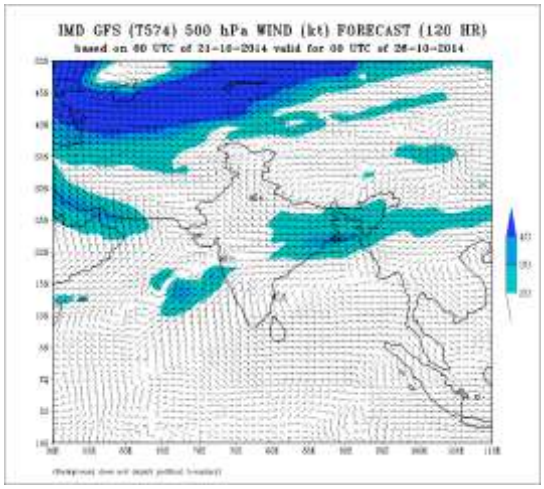

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 21-10-2014 valid for 00 UTC of 22-10-2014

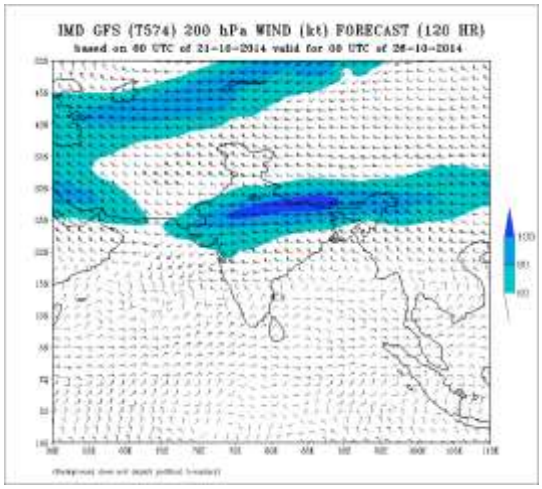

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 21-10-2014 valid for 00 UTC of 24-10-2014

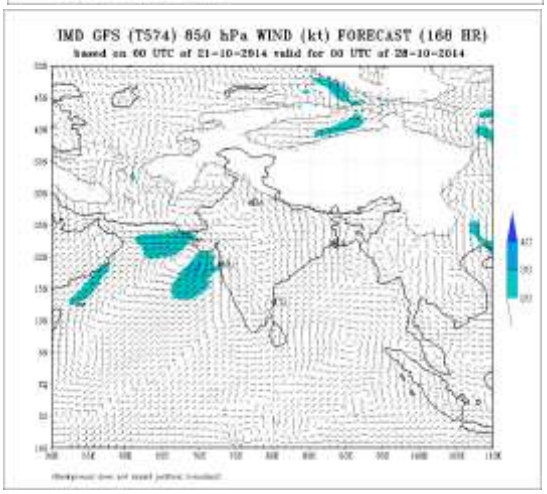

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 21-10-2014 valid for 00 UTC of 24-10-2014

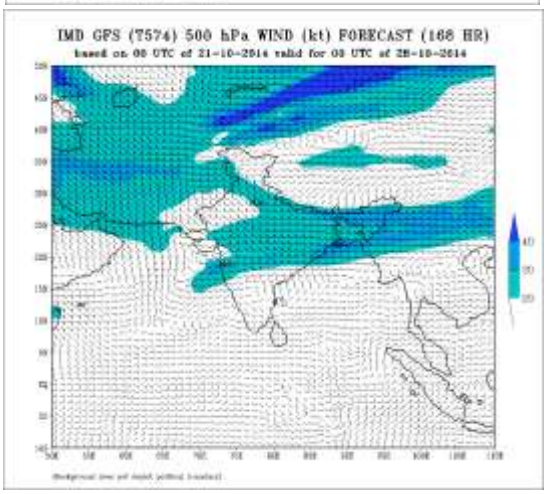

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 21-10-2014 valid for 00 UTC of 24-10-2014

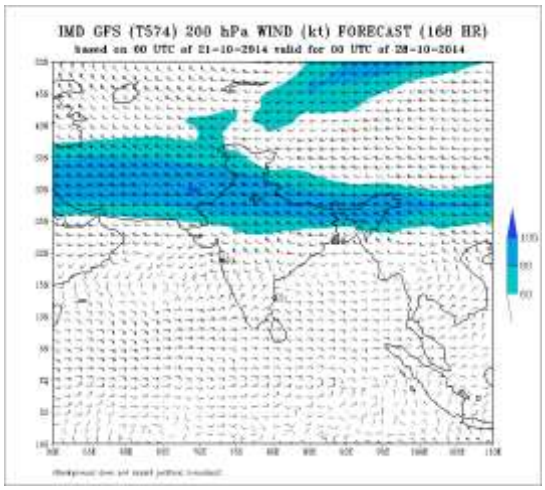

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 21-10-2014 valid for 00 UTC of 26-10-2014

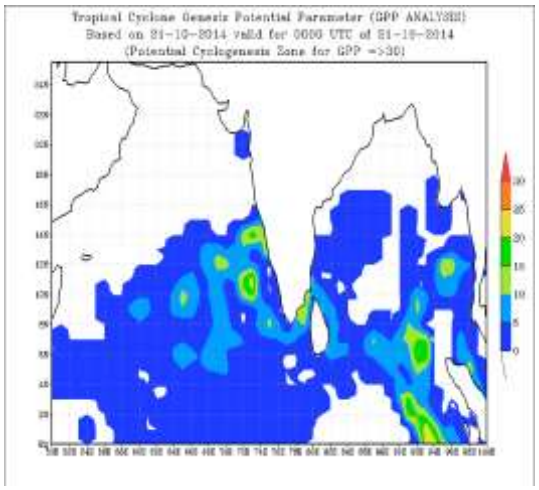

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 21-10-2014 valid for 00 UTC of 26-10-2014

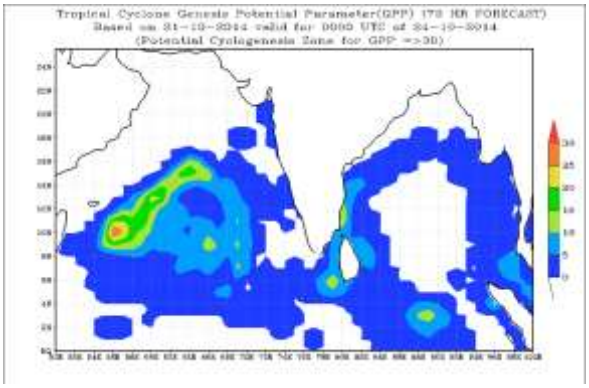

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 21-10-2014 valid for 00 UTC of 26-10-2014

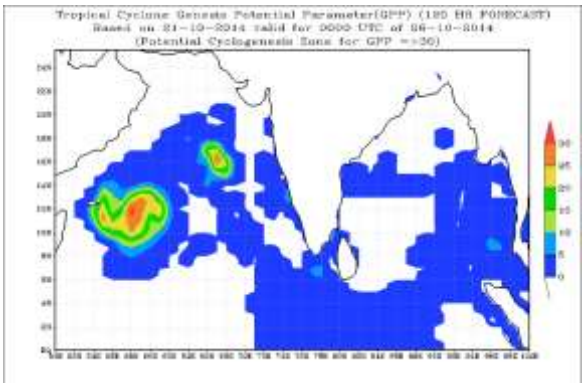

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 21-10-2014 valid for 00 UTC of 28-10-2014

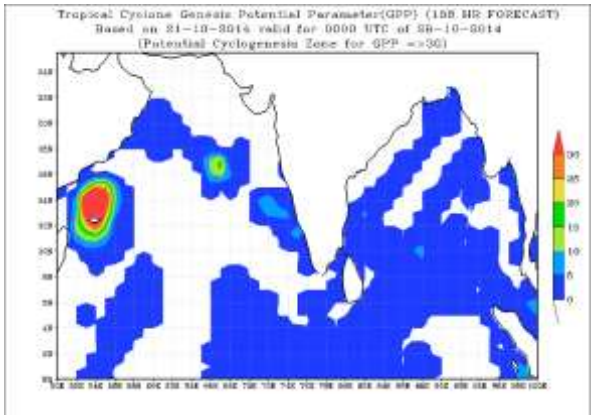

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 21-10-2014 valid for 00 UTC of 28-10-2014


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (168 HR)
Based on 00 UTC of 21-10-2014 valid for 00 UTC of 28-10-2014


Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 21-10-2014 valid for 0000 UTC of 21-10-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) 120 HR FORECAST)
Based on 21-10-2014 valid for 0000 UTC of 26-10-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (132 HR FORECAST)
Based on 21-10-2014 valid for 0000 UTC of 26-10-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (156 HR FORECAST)
Based on 21-10-2014 valid for 0000 UTC of 28-10-2014
(Potential Cyclogenesis Zone for GPP =>30)

FDP (Cyclone) NOC Report Dated 22 October, 2014

Synoptic features based on 0300 UTC:

- Yesterday's low pressure area over southeast Arabian Sea and neighbourhood persists. The system is likely to become a well marked low pressure area during next 24 hours and further concentrate into a Depression during subsequent 48 hours. The trough at mean Sea level extending from this system to eastcentral Arabian Sea off Maharashtra coast also persists.
- The trough of low over southeast Bay of Bengal and neighbourhood now seen as an upper air cyclonic circulation over southwest Bay of Bengal off Sri Lanka coast and extends upto 3.1km above mean Sea level.

Environmental features based on 0300 UTC of today:

Sea Surface Temperature:

- SST is about 27-30°C over Arabian Sea, and 28-31°C Bay of Bengal.

Ocean thermal energy:

- It is 60-90KJ cm^{-2} over southeast Arabian Sea.
- It is 80-100 KJ cm^{-2} over Eastcentral Bay and 100 – 140 KJ cm^{-2} over south Bay of Bengal and over equatorial region.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive (4 - 8 $*10^{-5}$ s^{-1}) over southeast Arabian Sea and southwest Arabian Sea.
- Relative vorticity at 850 hPa is positive (4 - 8 $*10^{-5}$ s^{-1}) over south Bay of Bengal.

Convergence:

- Lower level convergence is positive over southeast Arabian Sea.

Divergence:

- Upper level divergence is positive over southeast Arabian Sea.

Wind Shear:

- Wind Shear is 5 - 20 knots in the latitudinal belt of 8-15°N Bay of Bengal and Arabian Sea. It is 20-30 knots over the northern parts of Bay of Bengal and Arabian Sea.

Wind Shear Tendency:

- Shear Tendency is increasing 5 – 10 Knots over Eastcentral bay extending towards northern parts of Bay of Bengal and increasing 5 knots over west central Arabian Sea west of 65°E and East of 73°N

Upper tropospheric ridge:

- The upper tropospheric **ridge** at 200 hPa passes through Lat. 12.0°N.

M.J.O. Index:

- Located in phase 1 with amplitude more than 1.0.
- Dynamical forecast:- MJO may continue in phase 1 with amplitude more than 1.0 during next 4 days. Hence MJO is unfavourable for the next 4 days.

Storms and Depression over South China Sea:

- There is currently no Tropical Storm/Depression over South China Sea.

Status of observational system:

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

Satellite:

Inference based on INSAT imagery of 220900 UTC:

Bay of Bengal & Andaman Sea :-

Broken low and medium clouds with embedded isolated moderate to intense convection over southwest Bay and northern parts of eastcentral Bay and south Arkan coast south Andaman Sea.

Arabian Sea :-

Scattered low and medium clouds with embedded isolated moderate to intense convection over Arabian Sea between latitude 5.0ºN to 15.0ºN east of longitude 57.0ºE.

NWP Analysis

- IMD-GFS model analysis based on 0000 UTC of 22 October 2014 shows a closed cyclonic circulation at lower level over the south east Arabian Sea and neighbourhood. The forecasts indicate intensification into a low pressure area on 23rd October, 2014. The forecasts show intensification of the system into a Depression on 25 October 2014 along with north-westward movement during subsequent 48 hours. The forecast shows further intensification of the system during subsequent 4 days and likely to cross Oman coast on 29th October, 2014.
- IMD-WRF model analysis valid for 0000 UTC of 22 October 2014 shows a cyclonic circulation at lower level over the south east Arabian Sea and neighbourhood. The forecast indicates formation of a low pressure area on 23rd October and further intensification of the system into a Depression on 25 October 2014 with west-west-north ward movement of the system.
- Genesis Potential Parameter (GPP) forecasts based on 0000 UTC of 22 October 2014 shows development of a potential cyclogenesis zone over the south west Arabian Sea on 26 October 2014 and its northwestward movement towards west central Arabian Sea during 26-28 October 2014.
- 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

The analysis and forecasts for 24h, 72h, 120h and 168h GPP are given in **Annexure II**.

- **NCMRWF Model (GFS):** NCMRWF model suggests formation of a well marked low pressure area over southwest Arabian Sea by 23rd October 2014, it is also showing further intensification with northwestward movement.
- **ECMWF Model:** ECMWF forecast suggests formation of a low pressure area on 22nd October 2014, moving northwestwards and becoming well marked low on 23rd near 11ºN/63ºE, and then becoming Depression on 24th. The model is showing further intensification with northeastward movement.
- **UKMO Model:** UKMO forecast suggests formation of a low pressure area over southeast Arabian Sea on 22nd October 2014, move northwest wards and become depression on 25th, moving northwestwards towards Oman.
- **METEOFRANCE –ARP Model suggests** formation of low pressure area on 22nd October 2014 which would move northwestwards and become a depression by 25th.

Summary and Conclusion:

Most of the models suggests intensification of low pressure area over southeast Arabian Sea into a depression on 24/25th October, while moving northwestwards**.**

Advisory:

- Probability of cyclogenesis over southeast Arabian Sea is low on 23 October and moderate on 24 and 25 Oct.
- Probability of cyclogenesis over Bay of Bengal is nil during the next five days.
- No IOP during next 2 days.

Annexure-I

Status of Observation system:
Synoptic observation:

Region	Date/Time (UTC)		
	21/12	22/00	22/03
India	45	37	46
Coastal stations			
WB	8	8	8
Odisha	7	6	7
AP	12	12	12
Tamil Nadu	10	9	11
Puducherry	1	1	1
A & N	6	1	6
Bangladesh	11	11	11
Myanmar	10	10	11
Thailand	2	2	2
Sri Lanka	8	7	8

AWS Observations:

Region	Date/Time (UTC)		
	21/12	22/00	22/03
India	69	66	75
Coastal stations			
WB	9	9	11
Odisha	5	7	12
AP	26	25	24
Tamil Nadu	25	24	25
Puducherry	1	1	1
A & N	-	-	-

- **RS/RW** (12Z) of 21/10/2014 **-/39**
- **No. of Ascents reaching 250 hPa levels: -, MISDA: 39**
- **RS/RW** (00Z) of 22/10/2014 16**/39**
- **No. of Ascents reaching 250 hPa levels: 11 , MISDA: 28**

No. of PILOT Ascents

21/12Z	22/00Z
2	1

Buoy Data

21/12Z	22/00Z	22/03Z
7	11	12

Data Statistics over RMC Chennai Region

No. of Synop data

Date→	21.10.2014							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	20	22	20	20	22	20	19	19

No. of RS/RW Ascents

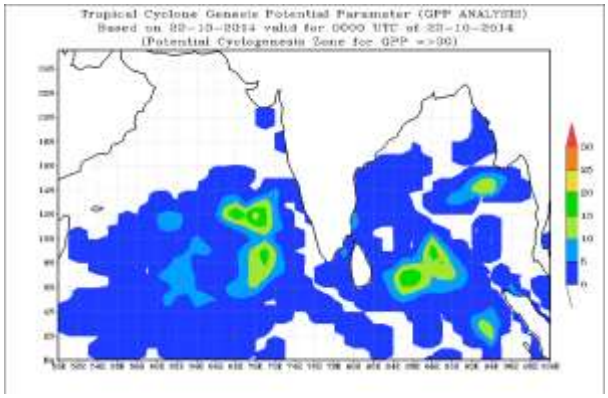
00Z /21.10.2014 : 3
No. of Ascents reaching 250 hPa level = 3
MISDA : 5

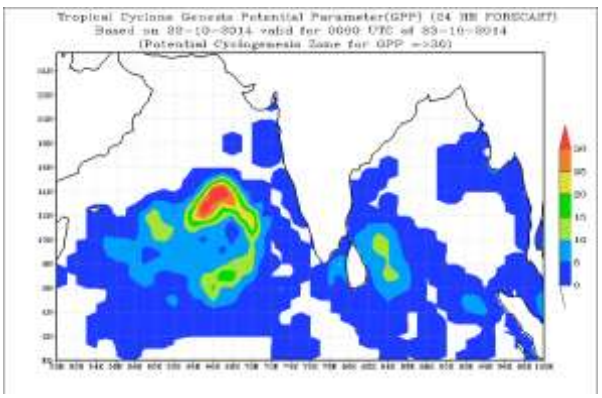
12Z /21.10.2014 : --
No. of Ascents reaching 250 hPa level = --
MISDA : 8

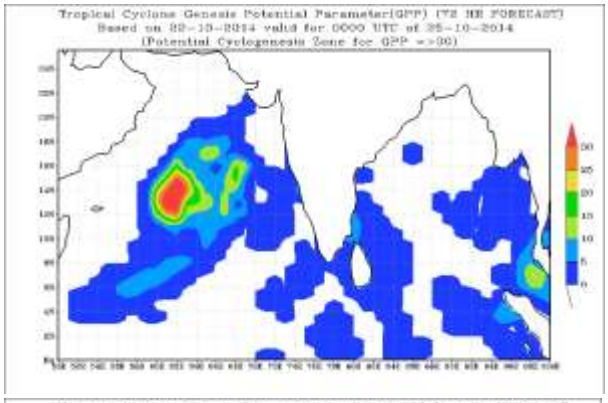
No. of PILOT Ascents:

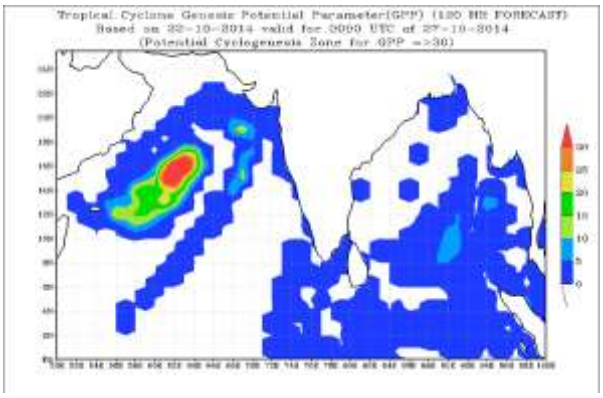
21.10.2014	
06Z	18Z
1	2

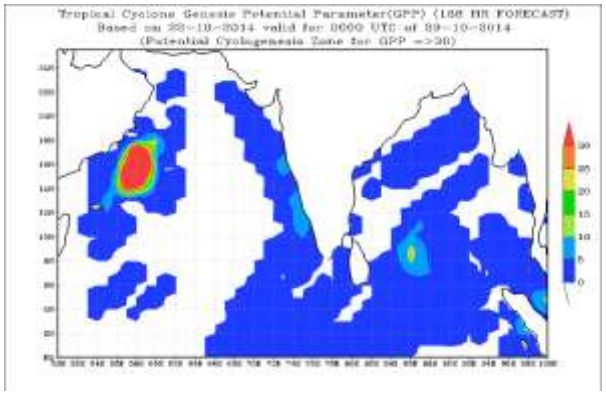
Annexure-II


Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 22-10-2014 valid for 0000 UTC of 23-10-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 22-10-2014 valid for 0000 UTC of 23-10-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 22-10-2014 valid for 0000 UTC of 25-10-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 22-10-2014 valid for 0000 UTC of 27-10-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (168 HR FORECAST)
Based on 22-10-2014 valid for 0000 UTC of 29-10-2014
(Potential Cyclogenesis Zone for GPP =>30)

FDP (Cyclone) NOC Report Dated 23 October, 2014

Synoptic features based on 0300 UTC:

- The well marked low pressure area over southeast Arabian Sea & neighbourhood now lies over southeast and adjoining astcentral Arabian Sea. The system would concentrate into a depression during next 24 hrs. It is likely to move initially in a northwest and subsequently may intensity into a cyclonic storm.
- Associated upper air cyclonic circulation extends upto mid tropospheric level.
- The upper air cyclonic circulation over southwest Bay of Bengal off Sri Lanka coast now lies over Sri Lanka and adjoining gulf of Mannar and extends upto 0.9 km above mean Sea level

Environmental features based on 0300 UTC of today:

Sea Surface Temperature:

- 28 – 30°C around the region of well marked low pressure area

Ocean thermal energy:

- It is 60 - 80KJ cm^{-2} over southeast Arabian Sea.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive (8 - 12 $*10^{-5}$ s^{-1}) over southeast Arabian Sea and southwest Arabian Sea.
- Relative vortices at 850 hPa is positive (4 - 8 $*10^{-5}$ s^{-1}) over East central Bay of Bengal.

Convergence:

- Lower level convergence is positive over southeast Arabian Sea.

Divergence:

- Upper level divergence is positive over southeast Arabian Sea.

Wind Shear:

- Wind Shear is 10 – 20 Knots over around the system.

Wind Shear Tendency:

- Shear Tendency is increasing 5 knots over around the system.

Upper tropospheric ridge:

- The upper tropospheric **ridge** at 200 hPa passes through Lat. 12.0°N.

M.J.O. Index:

- Located in phase 1 with amplitude more than 1.0.
- Dynamical forecast:- MJO may continue in phase 1 with amplitude more than 1.0 during next 4 days. Hence MJO is unfavourable for the next 4 days.

Storms and Depression over South China Sea:

- There is currently no Tropical Storm/Depression over South China Sea.

Status of observational system:

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

Satellite:

Inference based on INSAT imagery of 230900 UTC:

According nto satellite imagery the vortex over Arabian Sea centred within a half degree of 12.0°N/67.5°E. Intensity T1.0. Associated broken low and medium clouds with embedded intense to very intense convection over south Arabian Sea between latitude 1.5°N to 15.5°N and longitude 56.0°E to 72. 0°E adjoining Lakshadweep.

Bay of Bengal & Andaman Sea :-

Broken low and medium clouds with embedded moderate to intense convection over southwest Bay adjoining west central Bay of Bengal south Tenasserim coast and south Andaman Sea.

Arabian Sea :-

Scattered low and medium clouds with embedded isolated moderate to intense convection over rest southeast Arabian Sea.

NWP Analysis

- IMD-GFS model analysis based on 0000 UTC of 23 October 2014 shows a low pressure area over the south east Arabian Sea and neighbourhood. The forecasts show intensification of the system into a Depression on 25 October and into a cyclone on 26th October, 2014 along with north-westward movement of the system. The forecast shows further intensification of the system during subsequent 4 days and likely to move more in northerly direction initially and re-curve towards north-central Arabian Sea on 30th October, 2014.
- IMD-WRF model analysis valid for 0000 UTC of 23 October 2014 shows a low pressure area over the south east Arabian Sea and neighbourhood and further intensification of the system into a Depression on 25th October 2014 and into a cyclone on 26th October, 2014 with west-west-northward movement of the system.
- Genesis Potential Parameter (GPP) forecasts based on 0000 UTC of 23 October 2014 shows development of a potential cyclogenesis zone over the south west Arabian Sea on 26 October 2014 and its north-north-westward movement and re-curve towards north central Arabian Sea during 28-30 October 2014.

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
The analysis and forecasts for 24h, 72h, 120h and 168h GPP are given in **Annexure II**.

- **NCMRWF Model (GFS):** NCMRWF model suggests formation of a depression over southeast Arabian Sea by 24th October 2014, it is also showing further intensification with northnorthwestward movement and become cyclonic storm on 26th October.
- **ECMWF Model:** ECMWF forecast suggests formation of a depression on 24th October 2014, moving northnorthwestwards and becoming depression on 25th near around 13.2ºN/63.5ºE. The model is showing further intensification with northnortheastward movement towards Gujarat coast during next 3 days.
- **UKMO Model:** UKMO forecast suggests formation of a depression over southeast Arabian Sea on 24th October 2014, move northwest wards and become deep depression on 25th, moving northnorthwestwards.
- **METEOFRANCE –ARP Model suggests** formation of depression on 24th October 2014 which would move northnortheastwards and become a deep depression by 25th.

Summary and Conclusion:

- Based on NWP model guidance and current environmental and synoptic conditions, the well marked low pressure area over southeast Arabian Sea would concentrate into a

depression during next 24 hours and subsequently it would intensify further into a cyclonic storm. It would move northwest wards initially during next 48 hours.

- Probability of cyclogenesis over Bay of Bengal is nil during the next five days.

Advisory:

- No IOP during next 48 hrs.

Annexure-I

Status of Observation system:
Synoptic observation:

Region	Date/Time (UTC)		
	22/12	23/00	23/03
India	45	37	46
Coastal stations			
WB	8	8	8
Odisha	7	6	7
AP	12	12	12
Tamil Nadu	10	9	11
Puducherry	1	1	1
A & N	6	1	6
Bangladesh	11	11	11
Myanmar	10	10	11
Thailand	2	2	2
Sri Lanka	8	7	8

AWS Observations:

Region	Date/Time (UTC)		
	22/12	23/00	23/03
India	70	62	73
Coastal stations			
WB	9	9	11
Odisha	5	7	12
AP	26	25	24
Tamil Nadu	25	24	25
Puducherry	1	1	1
A & N	-	-	-

- **RS/RW** (12Z) of 22/10/2014 **-/39**
- **No. of Ascents reaching 250 hPa levels: -, MISDA: 39**
- **RS/RW** (00Z) of 23/10/2014 16**/39**
- **No. of Ascents reaching 250 hPa levels: 11 , MISDA: 28**

No. of PILOT Ascents

22/12Z	23/00Z
2	4

Buoy Data

22/12Z	23/00Z	23/03Z
9	10	12

Data Statistics over RMC Chennai Region

No. of Synop data

Date→	**22.10.2014**							
UTC→	**00**	**03**	**06**	**09**	**12**	**15**	**18**	**21**
Chennai Region (Coasts of AP & TN)	**20**	**22**	**20**	**20**	**22**	**20**	**19**	**18**

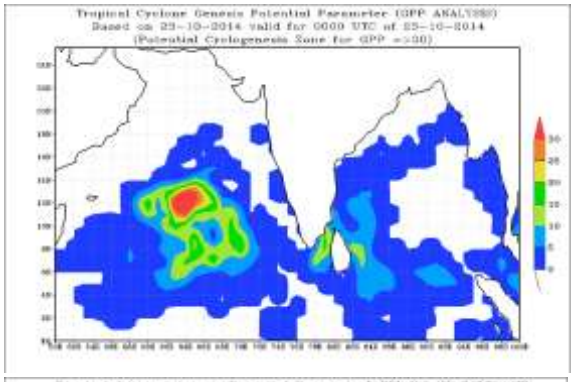
No. of RS/RW Ascents

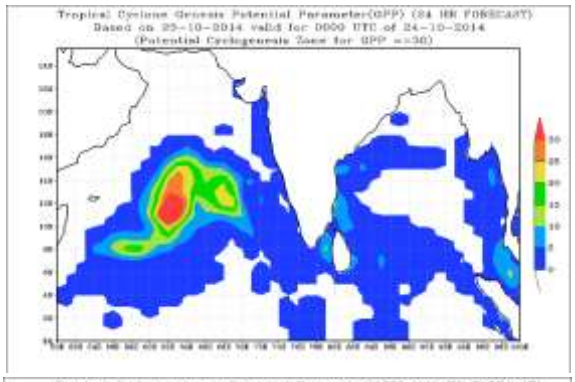
00Z /22.10.2014 : 3
No. of Ascents reaching 250 hPa level = 3
MISDA : 5
12Z /22.10.2014 : --
No. of Ascents reaching 250 hPa level = --
MISDA : 8

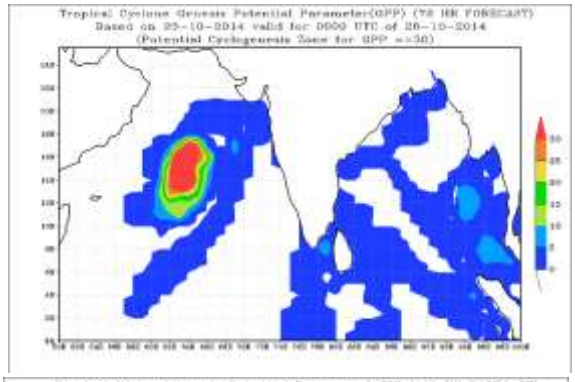
No. of PILOT Ascents:

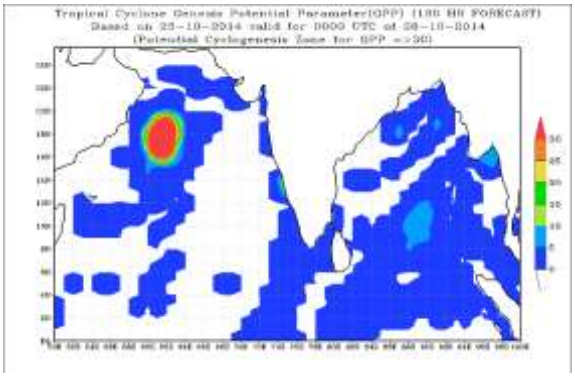
22.10.2014	
06Z	18Z
1	2

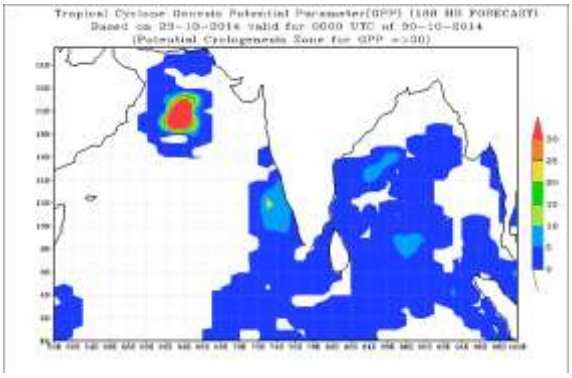
Annexure-II


Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 25-10-2014 valid for 0000 UTC of 25-10-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 25-10-2014 valid for 0000 UTC of 26-10-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 25-10-2014 valid for 0000 UTC of 28-10-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 25-10-2014 valid for 0000 UTC of 30-10-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (168 HR FORECAST)
Based on 25-10-2014 valid for 0000 UTC of 30-10-2014
(Potential Cyclogenesis Zone for GPP =>30)

FDP (Cyclone) NOC Report Dated 24 October, 2014

Synoptic features based on 0300 UTC:

- Yesterday's well marked low pressure area over southeast Arabian Sea and neighbourhood now lies over west central Arabian Sea and adjoining east-central and south Arabian Sea. The system would move northwestwards, concentrate into a depression during next 12 hours and further into a cyclonic storm during subsequent 48 hours.
- The upper air cyclonic circulation over Sri Lanka and adjoining Gulf of Mannar extending upto 0.9 km above mean Sea level persists.

Environmental features based on 0300 UTC of today:

Sea Surface Temperature:

- 28 – 30°C around the region of well marked low pressure area and 29 -31 °C over the Bay of Bengal.

Ocean thermal energy:

- It is 60 - 80KJ cm^{-2} over southeast Arabian Sea.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive (75 - 100 $*10^{-5}$ s^{-1}) over southwest and adjoining westcentral Arabian Sea.
- Relative vortices at 850 hPa is positive (10 - $20*10^{-5}$ s^{-1}) over southwest Bay of Bengal off Tamil Nadu coast.

Convergence:

- Lower level convergence is positive of the order of 5 -$15*10^{-5}$ s^{-1} over central and adjoining Arabian Sea.

Divergence:

- Upper level divergence is positive of the order of 10 -$20*10^{-5}$ s^{-1} over central and adjoining Arabian Sea. It is of the order of 5-$10*10^{-5}$ s^{-1} rest Arabian Sea.
- Upper level divergence is positive of the order of 5 -$20*10^{-5}$ s^{-1} over southwest Bay of Bengal off Tamil Nadu coast.

Wind Shear:

- Wind Shear is 5 – 15 Knots around the well marked low pressure area over Arabian Sea.
- Wind Shear is about 10 Knots over southwest Bay of Bengal off Tamil Nadu coast and over south Andaman Sea.

Wind Shear Tendency:

- The vertical wind shear has decreased slightly during past 24 hrs

Upper tropospheric ridge:

- The upper tropospheric ridge at 200 hPa passes through Lat. 14.0°N and at 500 hPa passes through 16^0N.

M.J.O. Index:

- Located in phase 1 with amplitude more than 1.0.

- Dynamical forecast:- The MJO index now lies in phase 1 and would move into phase 2 with amplitude > 1 during next 48 hrs. This will be favourable for both genesis and intensification of the system over the Arabian Sea by amplifying the convection.

Storms and Depression over South China Sea:

- There is currently no Tropical Storm/Depression over South China Sea.

Status of observational system:

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

Satellite:

Inference based on INSAT imagery of 240900 UTC:

According to satellite imagery, the vortex over Arabian Sea centred within half a degree of Lat.12.6°N/ Long. 62.5°E. Intensity is T1.0. Associated broken low and medium clouds with embedded intense to very intense convection over the Arabian Sea and adjoining Indian Ocean between Lat 7.0°N to 18.0°N and Long. 56.0°E to 70.0°E.

Bay of Bengal & Andaman Sea :-

Broken low and medium clouds with embedded moderate to intense convection over western parts of westcentral Bay of Bengal and south Andaman Sea and eastern parts of rest Andaman Sea.

Arabian Sea :-

Scattered low and medium clouds with embedded moderate to intense convection over rest Arabian Sea south of lat. 18.0°N.

NWP Analysis

- IMD-GFS model analysis based on 0000 UTC of 24 October 2014 shows a well marked low pressure area over the west-central and adjoining south & east-central Arabian Sea. The forecasts show intensification of the system into a Depression on 25 October and into a cyclone on 26th October, 2014 along with north-westward movement of the system. The forecast shows further intensification of the system during subsequent 3 days and likely to move slowly in north-north-westerly direction towards the Oman coast till 29th October, 2014. However, in subsequent 2 days the system is likely to move in north-easterly direction towards south Pakistan and adjoining Gujarat coast till 31st October, 2014.
- IMD-WRF model analysis valid for 0000 UTC of 24 October 2014 shows a well marked low pressure area over the west-central and adjoining south & east-central Arabian Sea. The system shows intensification into a Depression on 25th October and into a cyclone on 26th October, 2014 with movement in westerly direction till 27th October, 2014.
- Genesis Potential Parameter (GPP) forecasts based on 0000 UTC of 24 October 2014 shows development of a potential cyclogenesis zone over the south west Arabian Sea on 26 October 2014, its north-north-westward movement till 29th October and re-curve towards north central Arabian Sea during 30-31 October 2014.

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

The analysis and forecasts for 24h, 72h, 120h and 168h of 850 hPa, 500 hPa and 200 hPa winds and GPP are given in **Annexure II**.

- **NCMRWF Model (GFS):** NCMRWF model suggests formation of a depression over southwest Arabian Sea on 24th October 2014. It is also showing further intensification as cyclonic storm with northerly movement during 24 -26 October and northeasterly movement thereafter.
- **ECMWF Model:** ECMWF forecast suggests formation of a depression on 24th October 2014, over northwest Arabian Sea. It may further intensify as cyclonic storm and move northwestwards towards Oman coast on 29th October.
- **UKMO Model:** UKMO forecast suggests formation of a depression over southwest Arabian Sea on 24th October 2014, move northwestwards and become deep depression on 25th and cyclonic storm on 26th moving northwestwards till 28th October. It recurves the system thereafter
- **METEOFRANCE –ARP Model suggests** formation of depression on 24th October 2014 which would move northwestwards and become a deep depression by 25th and cyclonic storm on 26th October 2014.

Summary and Conclusion:

- Based on NWP model guidance and current environmental and synoptic conditions, the well marked low pressure area over southeast Arabian Sea would concentrate into a depression during next 12 hours and into a cyclonic storm during subsequent 48 hours. It would move northwest/north-northwestwards initially during next 72 hours.
- Probability of cyclogenesis over Bay of Bengal is Nil during the next five days.

Advisory:

- No IOP during next 24 hrs.

Annexure-I

Status of Observation system:
Synoptic observation:

Region	Date/Time (UTC)		
	23/12	24/00	24/03
India	44	32	43
Coastal stations			
WB	7	3	7
Odisha	7	5	7
AP	12	12	11
Tamil Nadu	9	7	9
Puducherry	3	3	3
A & N	6	2	6
Bangladesh	10	11	11
Myanmar	0	10	10
Thailand	2	2	2
Sri Lanka	8	8	8

AWS Observations:

Region	Date/Time (UTC)		
	23/12	24/00	24/03
India	65	66	71
Coastal stations			
WB	8	8	10
Odisha	3	3	7
AP	26	28	27
Tamil Nadu	27	26	26
Puducherry	1	1	1
A & N	0	0	0

- **RS/RW** (12Z) of 23/10/2014 **-1/39**
- **No. of Ascents reaching 250 hPa levels: - 1, MISDA: 38**
- **RS/RW** (00Z) of 24/10/2014 16**/39**
- **No. of Ascents reaching 250 hPa levels: 14 , MISDA: 23**

No. of PILOT Ascents

23/12Z	24/00Z
2	1

Buoy Data

23/12Z	24/00Z	24/03Z
15	14	14

No. of Synop data over Chennai region

Date→	23.10.2014							
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

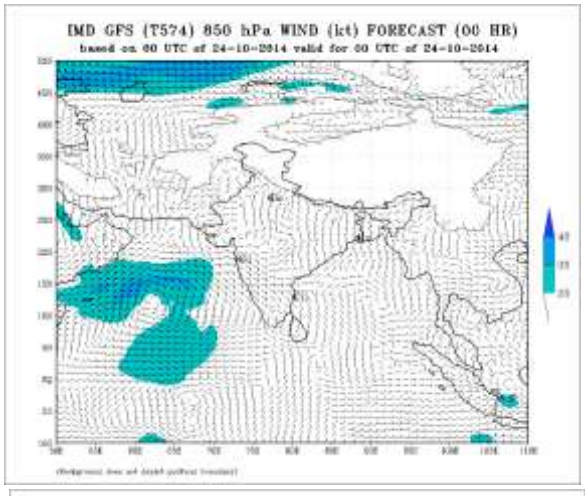
00Z /23.10.2014 : 2
No. of Ascents reaching 250 hPa level = 2
MISDA : 6

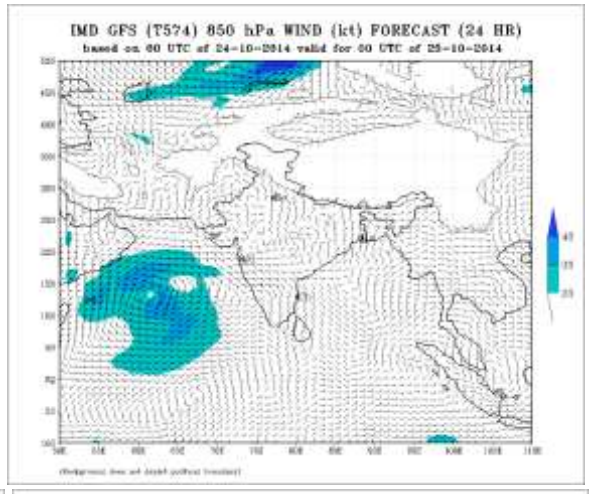
12Z /23.10.2014 : --
No. of Ascents reaching 250 hPa level = --
MISDA : 8

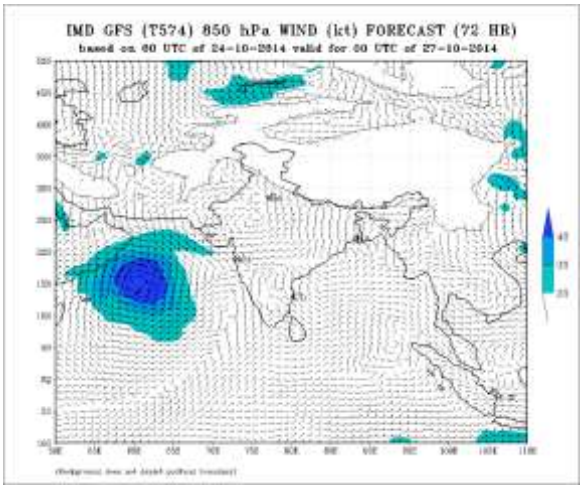
No. of PILOT Ascents:

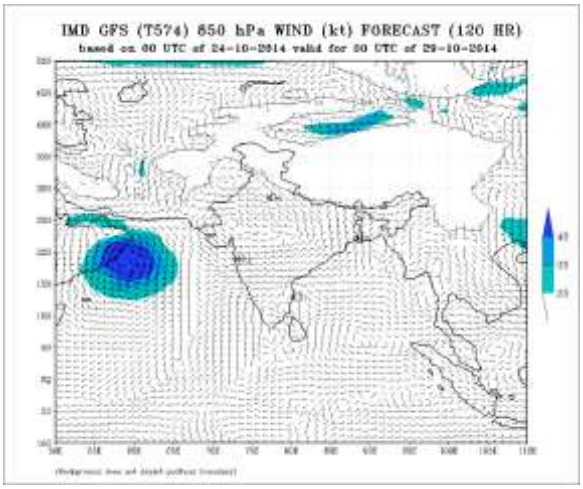
23.10.2014	
06Z	18Z
2	2

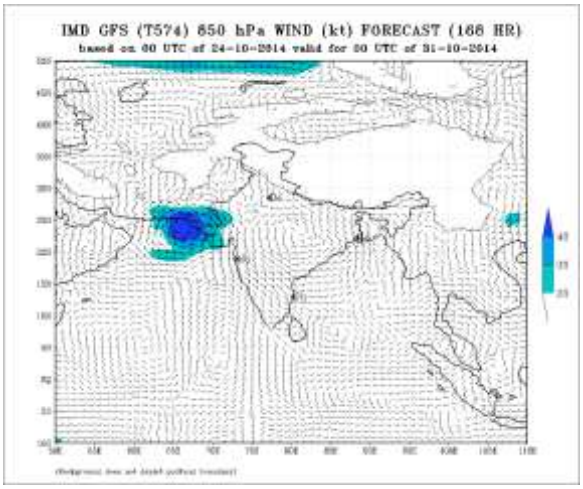
Annexure-II

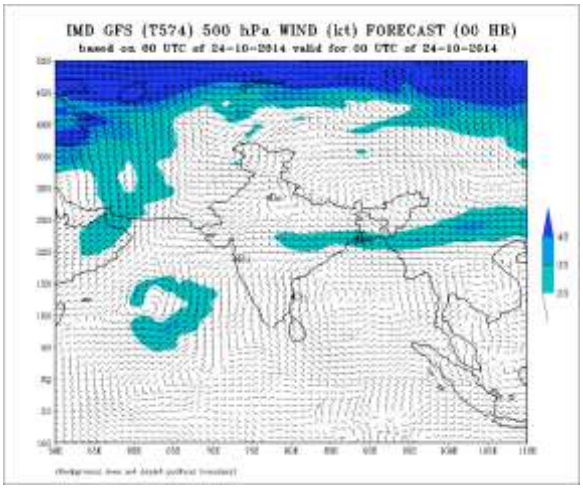

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 24-10-2014 valid for 00 UTC of 24-10-2014

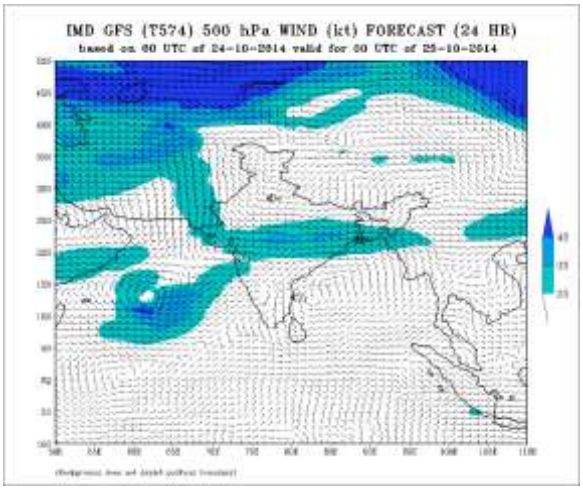

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 24-10-2014 valid for 00 UTC of 25-10-2014

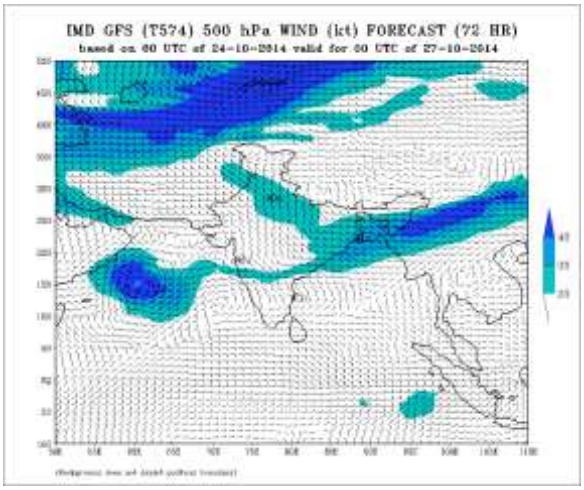

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 24-10-2014 valid for 00 UTC of 27-10-2014

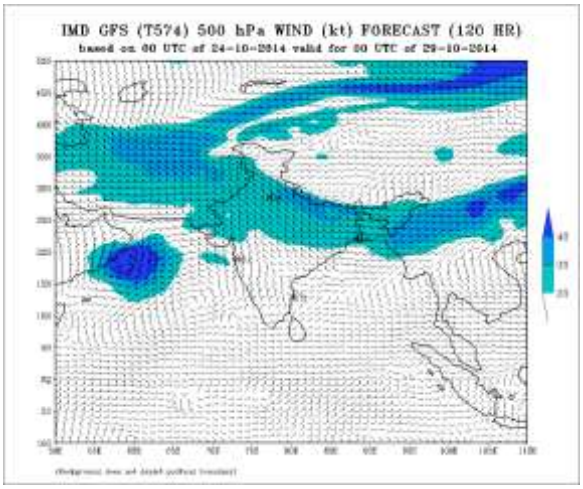

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 24-10-2014 valid for 00 UTC of 29-10-2014

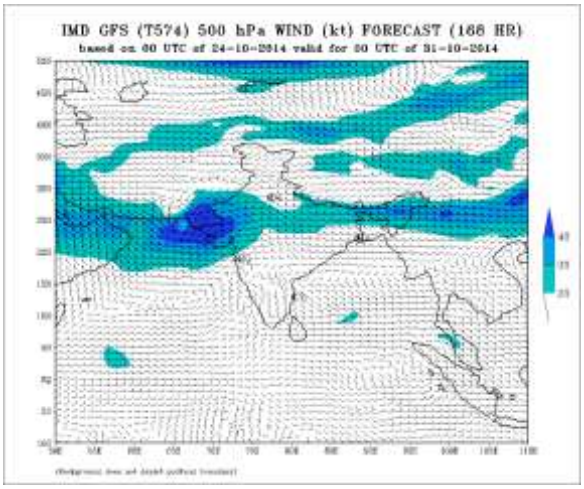

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 24-10-2014 valid for 00 UTC of 31-10-2014

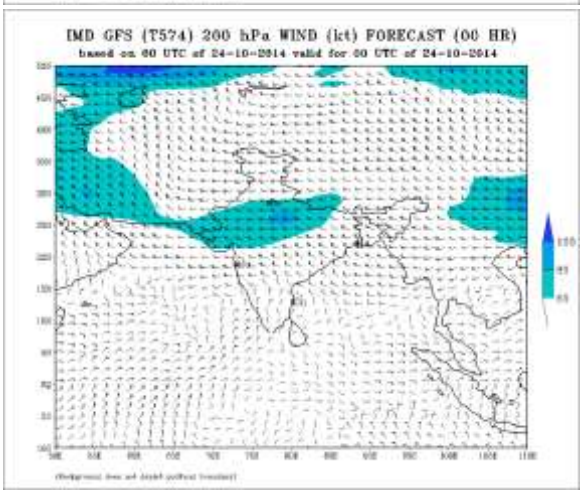

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 24-10-2014 valid for 00 UTC of 24-10-2014

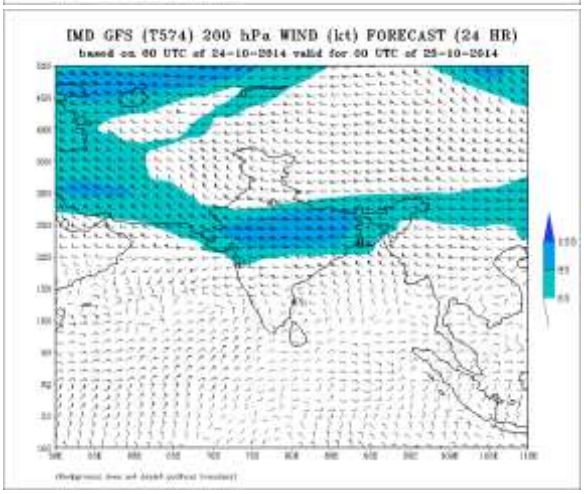

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 24-10-2014 valid for 00 UTC of 25-10-2014

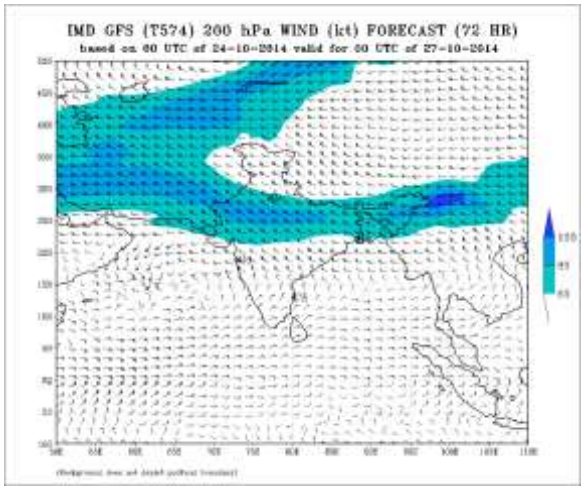

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 24-10-2014 valid for 00 UTC of 27-10-2014

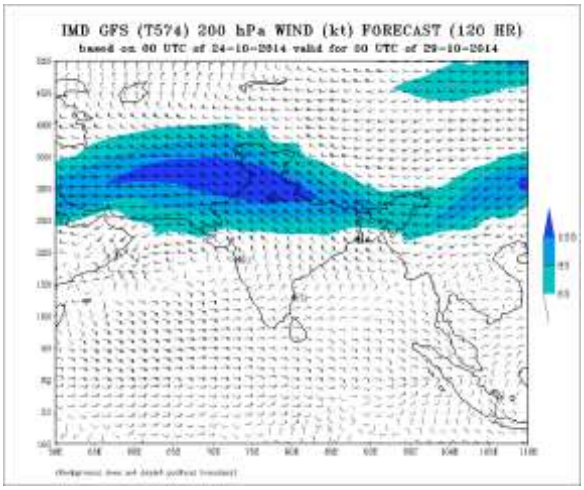

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 24-10-2014 valid for 00 UTC of 29-10-2014

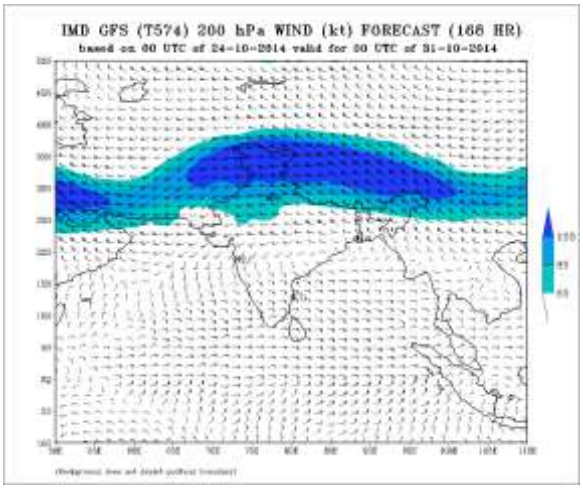

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 24-10-2014 valid for 00 UTC of 31-10-2014

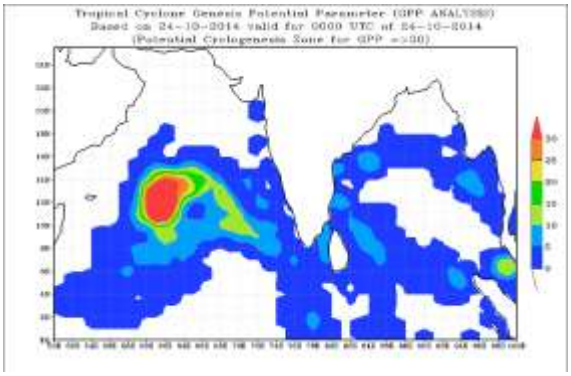

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 24-10-2014 valid for 00 UTC of 24-10-2014

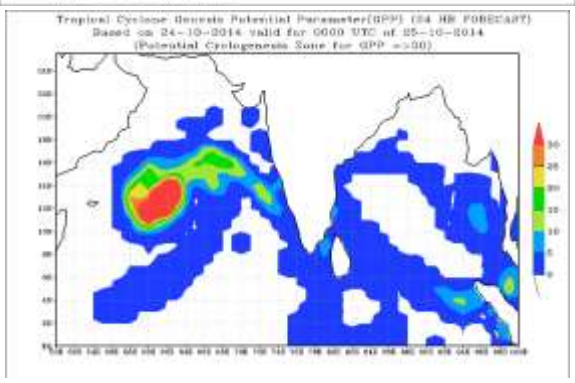

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 24-10-2014 valid for 00 UTC of 25-10-2014

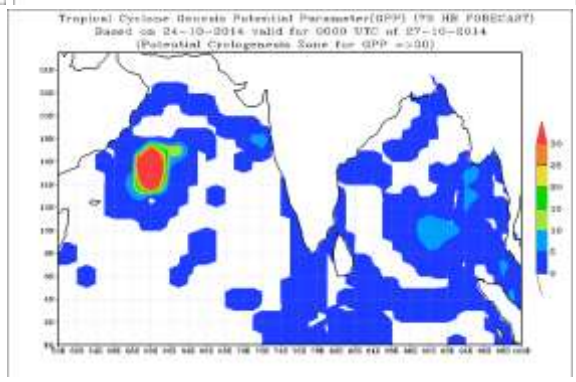

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 24-10-2014 valid for 00 UTC of 27-10-2014

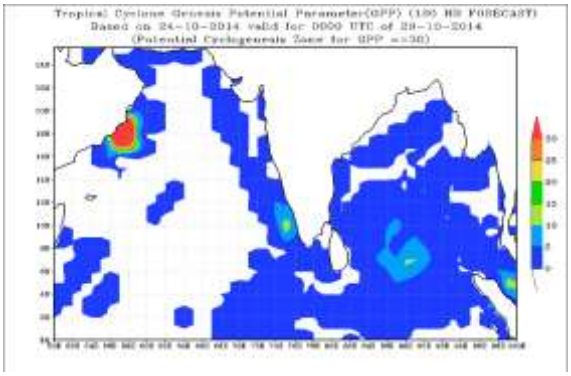

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 24-10-2014 valid for 00 UTC of 29-10-2014

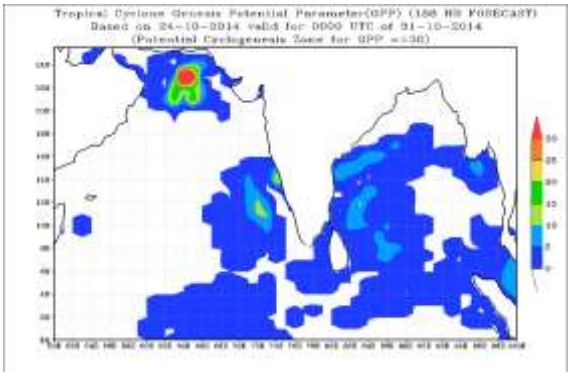

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 24-10-2014 valid for 00 UTC of 31-10-2014


Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 24-10-2014 valid for 0000 UTC of 24-10-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 24-10-2014 valid for 0000 UTC of 25-10-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 24-10-2014 valid for 0000 UTC of 27-10-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 24-10-2014 valid for 0000 UTC of 29-10-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (168 HR FORECAST)
Based on 24-10-2014 valid for 0000 UTC of 31-10-2014
(Potential Cyclogenesis Zone for GPP =>30)

FDP (Cyclone) NOC Report Dated 25 October, 2014

Synoptic features based on 0300 UTC:

- Yesterday's well marked low pressure area over west central Arabian Sea and adjoining east-central and south Arabian Sea concentrated into a Depression at 0530 hours IST of today, the 25th October 2014 over westcentral and adjoining southwest Arabian Sea and lay centred, near latitude 12.5^0 N and longitude 61.5^0 E, about 1400 km west-southwest of Mumbai and 940 km east-southeast of Salalah (Oman). It remained practically stationary over the same region at 0830 hrs IST. It would move northwestwards towards south Oman and adjoining Yemen coast during next 72 hrs. It would intensify into a deep depression within next 24 hrs and may intensify further into a cyclonic storm during subsequent 24 hrs.
- The upper air cyclonic circulation over Sri Lanka and adjoining Gulf of Mannar now lies over Comorin area and neighbourhood extending upto 0.9 km above mean Sea level.An upper air cyclonic circulation lies over south Bangladesh & adjoining Bay of Bengal and extends upto 3.1 km above mean Sea level.

Environmental features based on 0300 UTC of today:

Sea Surface Temperature:

- Sea Surface Temperature is between 28 – 30°C around the region of depression and 30 -31 °C over westcentral and southwest Bay of Bengal and 28-30°C over rest Bay of Bengal and Andaman Sea.

Ocean thermal energy:

- It is 60 - 80KJ cm^{-2} over central and southwest Arabian Sea.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive (75 - 120 $*10^{-5}$ s^{-1}) over westcentral and adjoining southwest Arabian Sea.

Convergence:

- Lower level convergence is positive of the order of 5 -15$*10^{-5}$ s^{-1} over central Arabian Sea.

Divergence:

- Upper level divergence is positive of the order of 30-40 $*10^{-5}$ s^{-1} around the region of Depression and 5 -20$*10^{-5}$ s^{-1} over rest Arabian Sea.

Wind Shear:

- Wind Shear is 10 – 20 knots around the region of depression and 30-60 knots area over rest Arabian Sea.
- Wind Shear is about 5-10 knots over south Bay of Bengal and south Andaman Sea and 20-50 knots over rest Bay of Bengal and north Andaman Sea.

Wind Shear Tendency:

- The vertical wind shear is positive between 5 -10 knots around the depression over westcentral Arabian Sea.
- The vertical wind shear is negative -5 knots over Bay of Bengal and Andaman Sea.

Upper tropospheric ridge:

- The upper tropospheric **ridge** at 200 hPa passes through Lat. 15.0°N.

M.J.O. Index:

- Located in phase 1 with amplitude more than 1.0.
- Dynamical forecast:- The MJO index now lies in phase 1 and would move into phase 2 with amplitude less than 1 during next 48 hrs. This will be favourable for both genesis and intensification of the system over the Arabian Sea by amplifying the convection.

Storms and Depression over South China Sea:

- There is currently no Tropical Storm/Depression over South China Sea.

Status of observational system:

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

Satellite:

Inference based on INSAT imagery of 250900 UTC:

Arabian Sea :-

According to satellite imagery, the vortex over west central Arabian Sea lay centred near Lat.13.0°N/61.5°E. Intensity is T1.5. Associated broken low and medium clouds with embedded intense to very intense convection over Arabian Sea between Lat 8.0°N to 15.0°N and Long 56.5°E to 65.0°E.

Bay of Bengal & Andaman Sea :-

Scattered low and medium clouds with embedded isolated weak to moderate to intense convection over westcentral Bay & Andaman Sea, Gulf of Martaban and Tenasserim coast.

NWP Analysis

- IMD-GFS model analysis based on 0000 UTC of 25 October 2014 shows a depression over the west-central and adjoining southwest Arabian Sea. The forecasts show intensification of the system into a cyclone on 26th October, 2014 over the region. The forecast shows further intensification of the system during subsequent 3 days and likely to move slowly in north-north-westerly direction till 29th October, 2014. However, in subsequently 2 days the system likely to recurve and move in north-easterly direction and cross south Pakistan and adjoining Gujarat coast on 31st October, 2014.
- IMD-WRF model analysis valid for 0000 UTC of 25 October 2014 shows a Depression over the west-central and adjoining southwest Arabian Sea. The system shows intensification into a cyclone on 26th October over the almost same region. During subsequent 2 days the system is likely to intensify further with movement in westerly direction till 28th October, 2014.
- Genesis Potential Parameter (GPP) forecasts based on 0000 UTC of 25 October 2014 shows development of a potential cyclogenesis zone over the south west Arabian Sea on 26 October 2014, its north-north-westward movement till 29th October and re-curve towards north central Arabian Sea during 30-31 October 2014.

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 (NGFS model):** NCMRWF model shows the formation of a depression over southwest Arabian Sea on 25th October 2014 and indicates northwestward movement up

to 28th Oct. 2014 and then northeastward with gradual intensification. The system is likely to cross Gujarat coast on at 00z31st Oct 2014.

- **ECMWF Model:** ECMWF forecast suggests formation of a depression on 25th October 2014, over northwest Arabian Sea. It may further intensify as cyclonic storm and move northwestwards towards Oman coast on 30th October.
- **UKMO Model:** UKMO forecast suggests formation of a depression over southwest Arabian Sea on 25th October 2014 and it may intensify into a deep depression in 24 hours and into a cyclonic storm in subsequent 24 hours. This model is showing the system is likely to move northwestwards during next 3 days and then recurve to northeastwards.
- **METEOFRANCE –ARP Model suggests** formation of depression on 25th October 2014 which would move northwestwards and become a deep depression by 26th and cyclonic storm on 27th October 2014.

Summary and Conclusion:

- The Depression over westcentral and adjoining southwest Arabian Sea moved northwestwards and lay centred at 1430 hrs IST over westcentral Bay, near latitude 13.0^0 N and longitude 61.0^0 E, about 1420 km west-southwest of Mumbai and 860 km east-southeast of Salalah (Oman).
- Based on NWP model guidance and current environmental and synoptic conditions, the depression over westcentral and southwest Arabian Sea would concentrate into a deep depression during next 24 hours and into a cyclonic storm during subsequent 24 hours. It would move northwest/north-northwestwards initially during next 72 hours.
- Probability of cyclogenesis over Bay of Bengal is Nil during the next five days.

Advisory:

- No IOP during next 48 hrs.

Annexure-I

Status of Observation system:

Synoptic observation:

Region	Date/Time (UTC)		
	24/12	25/00	25/03
India			
Coastal stations			
WB	6	3	6
Odisha	7	5	7
AP	11	12	12
Tamil Nadu	9	6	9
Puducherry	3	3	3
A & N	6	1	6
Bangladesh	11	11	11
Myanmar	11	11	11
Thailand	2	2	2
Sri Lanka	8	7	7

AWS Observations:

Region	Date/Time (UTC)		
	24/12	25/00	25/03
India	67	65	69
Coastal stations			
WB	8	8	8
Odisha	3	3	7
AP	28	26	25
Tamil Nadu	27	25	28
Puducherry	1	1	1
A & N	-	-	-

- **RS/RW** (12Z) of 24/10/2014 **-1/39**
- **No. of Ascents reaching 250 hPa levels: - 1, MISDA: 38**
- **RS/RW** (00Z) of 25/10/2014 19**/39**

No. of Ascents reaching 250 hPa levels: 13 , MISDA: 20

No. of PILOT Ascents

23/12Z	24/00Z
2	1

Buoy Data

24/12Z	25/00Z	25/03Z
14	16	16

No. of Synop data over Chennai region

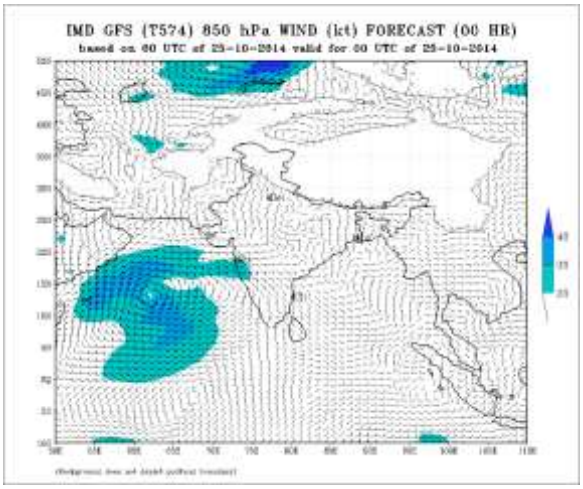
Date→	24.10.2014							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	20	22	20	20	22	20	20	20

No. of RS/RW Ascents
00Z /24.10.2014 : 2
No. of Ascents reaching 250 hPa level = 2
MISDA : 6

12Z /24.10.2014 : --
No. of Ascents reaching 250 hPa level = --
MISDA : 8
No. of PILOT Ascents:

24.10.2014	
06Z	18Z
4	4

Annexure-II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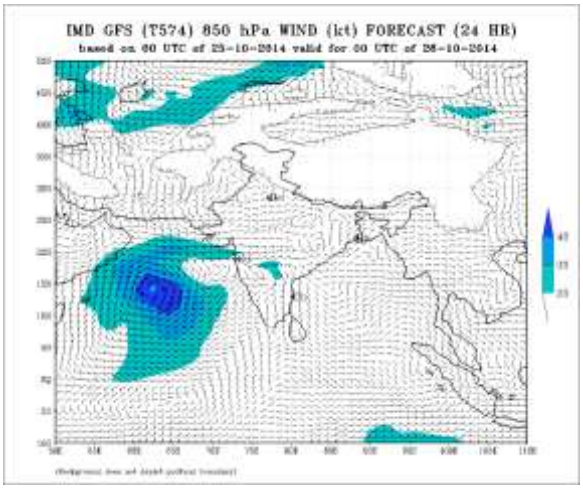
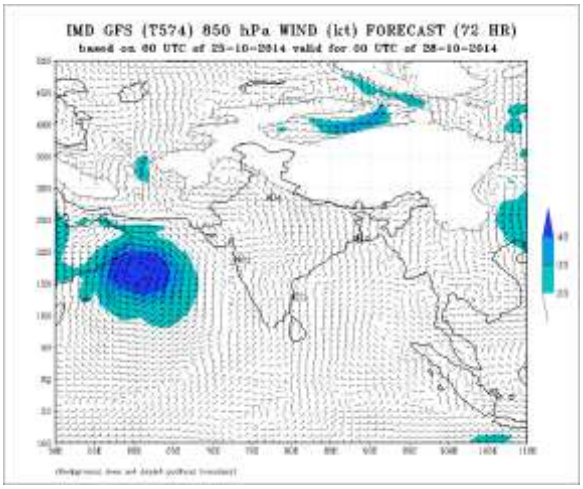
based on 00 UTC of 25-10-2014 valid for 00 UTC of 25-10-2014


IMD GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 25-10-2014 valid for 00 UTC of 26-10-2014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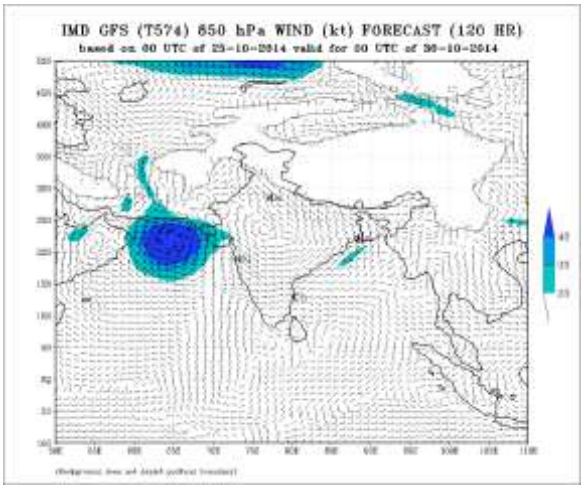
IMD GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
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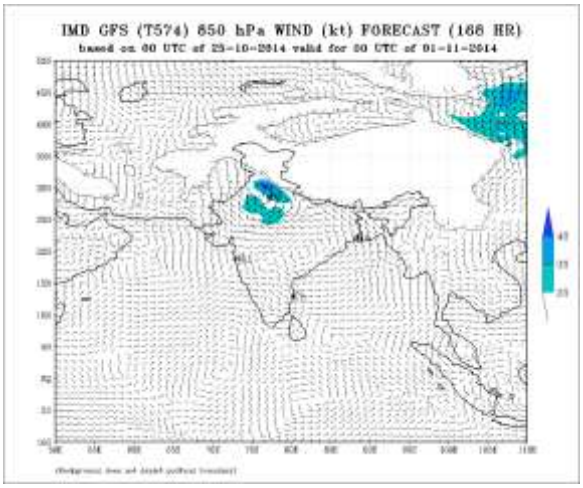
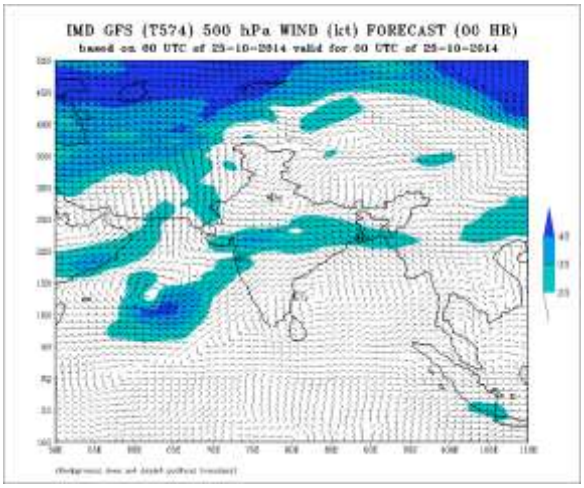
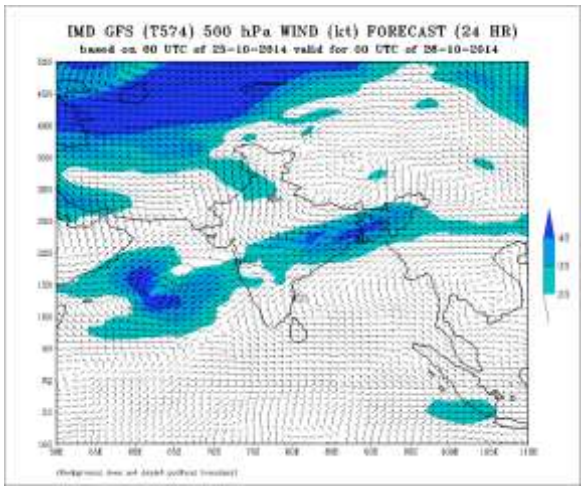
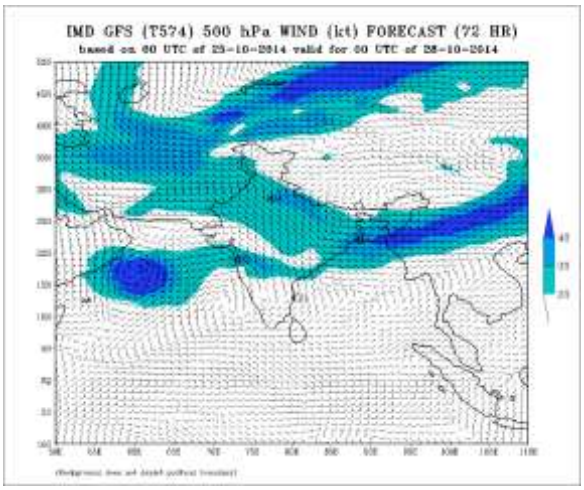
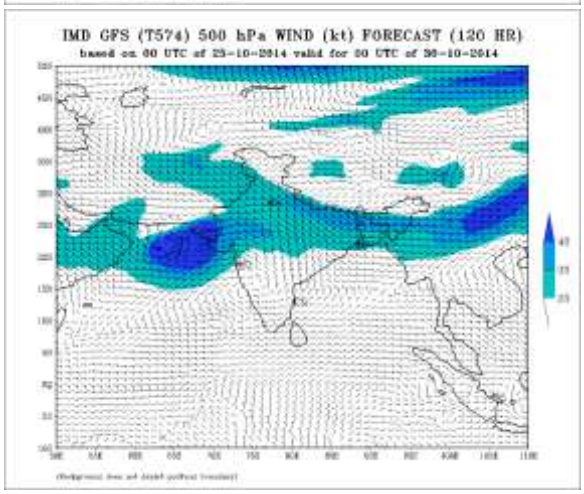
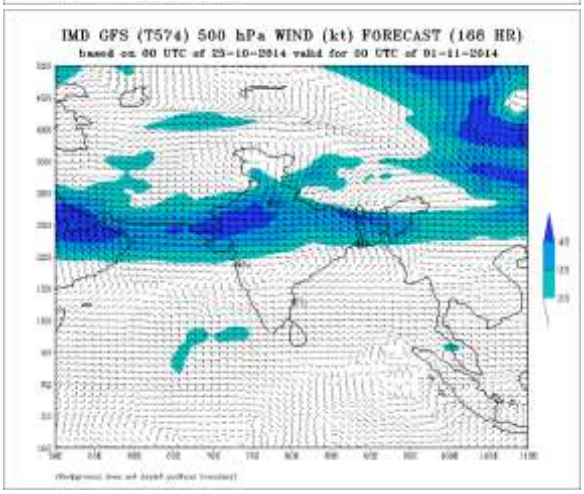

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 25-10-2014 valid for 00 UTC of 01-11-2014


IMD GFS (T574) 500 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 25-10-2014 valid for 00 UTC of 25-10-2014









FDP (Cyclone) NOC Report Dated 26 October, 2014

Synoptic features based on 0900 UTC:

- The depression over WestCentral & adjoining SouthWest Arabian Sea remained practically stationary, intensified into a Deep Depression and then into a cyclonic storm NILOFAR and lay centered at 1430 hours IST of today, near lat.14.1°N and long. 62.0°E, about 1250 km southwest of Naliya (Gujarat), 1310 km south-southwest of Karachi (Pakistan) and 910 km east-southeast of Salalah (Oman). It would move initially north-northwestwards during next 48 hrs and then recurve northeastwards towards north Gujarat and adjoining Pakistan coast during subsequent 72 hrs. It would intensify further into a severe cyclonic storm during next 24 hrs.

Environmental features based on 0300 UTC of today:

Sea Surface Temperature:

- Sea Surface Temperature around the region of system is 28-30^{0}c

Ocean thermal energy:

- It is 60 – 80 KJ cm^{-2} over central and southwest Arabian Sea. It is less than 50 KJ cm^{-2} near Oman and Yemen coasts.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive (100 - 200 $*10^{-5}$ s^{-1}) near around the system centre and it has increased during the past 6 hrs.

Convergence:

- Lower level convergence is positive of the order of 10 -20$*10^{-5}$ s^{-1} around the system centre.

Divergence:

- Upper level divergence is positive of the order of 30-40 $*10^{-5}$ s^{-1} around the system centre and 10 -20$*10^{-5}$ s^{-1} over the East Arabian Sea.

Wind Shear:

- Wind Shear is 10 – 20 knots around the region of the system centre and 30-60 knots area over the NorthEast Arabian Sea.

Wind Shear Tendency:

- The wind shear tendency is negative and is of the order of -10 to -20 knots around the system centre, but it is positive (5-10 knots) over extreme NorthEast Arabian Sea.

Upper tropospheric ridge:

- The upper tropospheric **ridge** at 200 hPa passes through Lat. 14.0°N.

M.J.O. Index:

- Located in phase 1 with amplitude more than 1.0.
- Dynamical forecast:- The MJO index now lies in phase 1 and would move into phase 2 with amplitude less than 1 during next 24 hrs. This will be favourable for both genesis and intensification of the system over the Arabian Sea by amplifying the convection.

Storms and Depression over South China Sea:

- There is currently no Tropical Storm/Depression over South China Sea.

Status of observational system:

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

Satellite:

Inference based on INSAT imagery of 260900 UTC:

VORTEX over Arabian Sea : -

Vortex over WestCentral Arabian Sea & n/hood centred near 14.1˚N/62.3˚E with Intensity T2.5. Associated broken low and medium clouds with embedded intense to very intense convection over Arabian Sea between latitude 11.0˚N to 16.0˚N longitude 59.0˚E to 65.0˚E. Minimum Cloud Top Temperature: -90˚C

Rest of Arabian Sea: Broken low and medium clouds with embedded intense to very intense convection over Arabian Sea between latitude 10.0˚N to 20.0˚N east of longitude 65.0˚E.

Bay of Bengal & Andaman Sea:

Broken low and medium clouds with embedded moderate to intense convection over WestCentral Bay of Bengal west of longitude 84.0˚E, southeast Bay of Bengal and Andaman Sea.

NWP Analysis:-

- **GPP**: Analysis and forecasts of Genesis Potential Parameter (GPP) based on 0000 UTC of 26 October 2014 indicate that the Depression over the Arabian Sea potential to intensify into a Tropical Cyclone.

- **MME TRACK**: MME track forecast based on 1000 UTC of 26 October 2014 shows recurvature from around latitude 19.0oN & longitude 61.0oE and thereafter northeastward movement towards Indo-Pak Boarder. Landfall point: Near Indo-Pak boarder at about 2100 UTC of 30 October 2014.
- **INTENSITY FORECAST BY SCIP MODEL**: The Depression over the Arabian Sea is likely to intensify into a cyclonic storm at 12 UTC of 26.10.2014, severe cyclonic storm at 00 UTC of 27.10.2014, and very severe cyclonic storm at 00 UTC of 28.10.2014.
- **RAPID INTENSIFICATION**: Probability of Rapid Intensification (RI) (Intensity increase by 30 kts or more in next 24h) = 9.4% (Inference: RI probability VERY LOW).
- **IMD GFS:** GFS analysis shows the cyclonic storm over westcentral Arabian Sea. It would intensify into severe cyclonic storm in 24 hours. It would move north-northwest wards during next 48 hours and then re-curve northeastwards and cross Saurashtra & Kutch coast near Lat. 23°N, around 31st morning.
- **NCMRWF (GFS):** it shows similar to IMD GFS, however it re-curves after 60 hours and weakens over northeast Arabian Sea in the morning of 2nd Nov.
- **WRF:** WRF shows severe cyclonic storm at 26/0000 UTC. It will move southwestwards during next 36 hours and then WNWwards. The model shows gradual intensification upto 28th and then gradual weakning.
- **UKMO:** UK Met office shows initial northwestwards movement upto 28th and then northeastwards re-curvature with system crossing Gujarat-Pakistan border in at noon of 30th Oct.
- **JMA:** JMA shows cyclonic storm at 26/0000 UTC. It shown initial northnortheast movement and then northnorthwest movement upto 72 hours and then NNE wards with gradual intensification into a very severe cyclonic storm in 84 hours forecast.
- **ARP Meteo France:** The model shows WNW movement upto 60 hours and then northward movement with intensification into a Very Severe Cyclonic Storm.

Numerical Weather Prediction models are suggesting gradual intensification of the sytem into a severe cyclonic storm during next 24 hours. Dynamical statistical models also suggest the gradual intensification of the system. Considering the movement, most of the models are unanimous about initial north-northwestward movement up to 48 hrs.

Summary and Conclusion:-

- The cyclonic storm, 'NILOFAR' over WestCentral and adjoining SouthWest Arabian Sea remained practically stationary and lay centred at 1430 hours IST of 26th October, 2014 near latitude 14.1^0 N and longitude 62.0^0 E, about 1250 km southwest of Naliya (Gujarat), 1310 km south-southwest of Karachi (Pakistan) and 910 km east-southeast of Salalah (Oman).
- It would move initially north-northwestwards during next 48 hrs and then recurve northeastwards towards north Gujarat and adjoining Pakistan coast during subsequent 72 hrs. It would intensify further into a severe cyclonic storm during next 24 hrs.
- Probability of cyclogenesis over Bay of Bengal during next 3 days is NIL.

Advisory:

- Intense observations may be taken along and off Gujarat and Pakistan coast during 29 – 31st October 2014.

Annexure-I

Status of Observation system:

Synoptic observation:

Region	Date/Time (UTC)		
	25/12	**26/00**	**26/03**
India	44	39	46
Coastal stations			
WB	9	9	8
Odisha	6	6	7
AP	11	13	13
Tamil Nadu	10	8	10
Puducherry	2	2	2
A & N	6	1	6
Bangladesh	11	11	11
Myanmar	11	11	11
Thailand	2	2	2
Sri Lanka	8	7	7

AWS Observations:

Region	Date/Time (UTC)		
	25/12	**26/00**	**26/03**
India	67	63	69
Coastal stations			
WB	8	8	8
Odisha	3	3	7
AP	28	26	25
Tamil Nadu	27	25	28
Puducherry	1	1	1
A & N	-	-	-

- **RS/RW** (12Z) of 25/10/2014 **-1/39**
- **No. of Ascents reaching 250 hPa levels: - 1, MISDA: 38**
- **RS/RW** (00Z) of 26/10/2014 20**/39**
- **No. of Ascents reaching 250 hPa levels: 14 , MISDA: 19**

No. of PILOT Ascents

25/12Z	26/00Z
2	1

Buoy Data

25/12Z	26/00Z	26/03Z
14	16	16

No. of Synop data over Chennai region

No. of Synop data

Date→	25.10.2014							
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

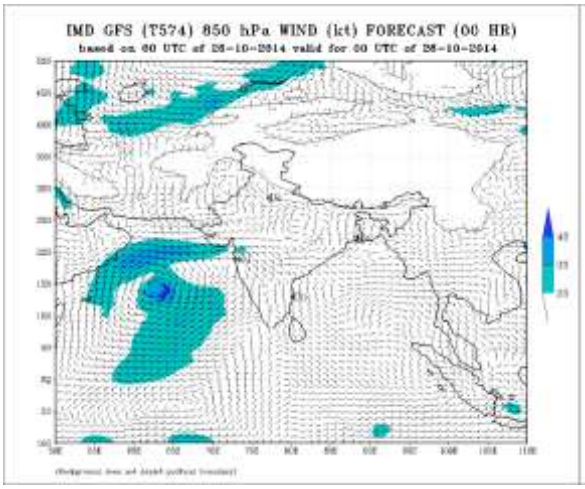
00Z /25.10.2014 : 2
No. of Ascents reaching 250 hPa level = 2
MISDA : 6

12Z /25.10.2014 : --
No. of Ascents reaching 250 hPa level = --
MISDA : 8

No. of PILOT Ascents:

25.10.2014	
06Z	18Z
3	3

Annexure-II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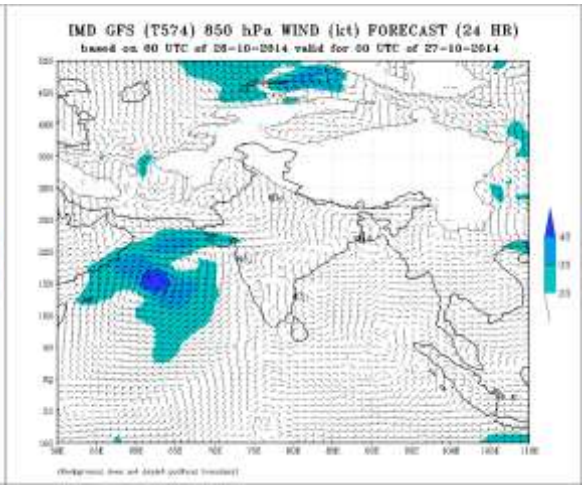
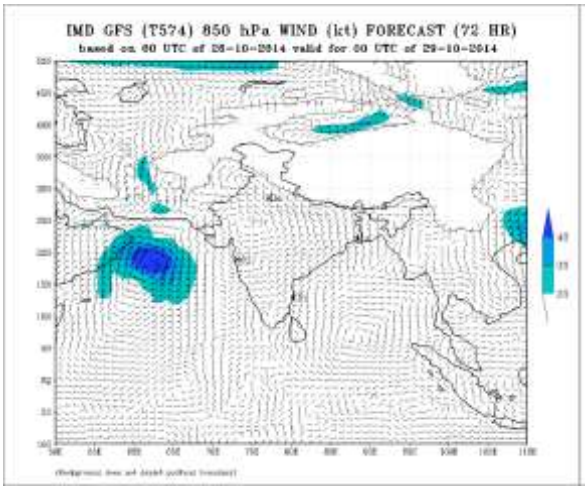
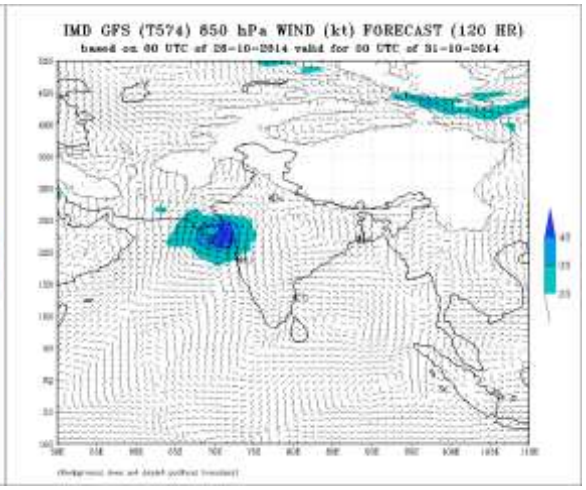
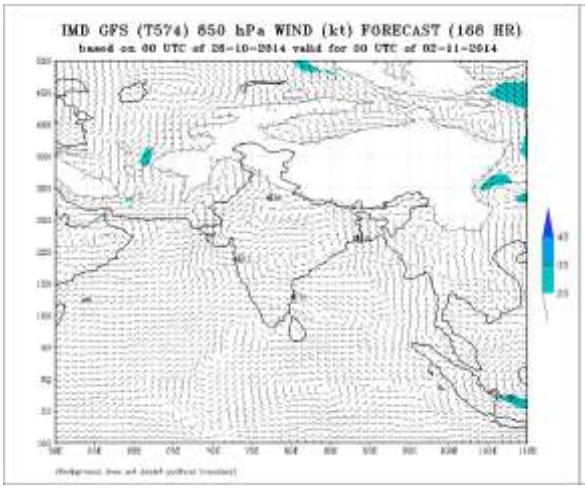
based on 00 UTC of 26-10-2014 valid for 00 UTC of 26-10-2014


IMD GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 26-10-2014 valid for 00 UTC of 27-10-2014


IMD GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 26-10-2014 valid for 00 UTC of 29-10-2014


IMD GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 26-10-2014 valid for 00 UTC of 31-10-2014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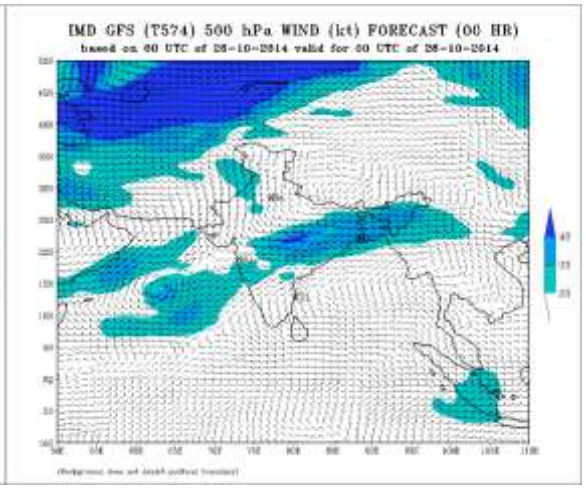
based on 00 UTC of 26-10-2014 valid for 00 UTC of 02-11-2014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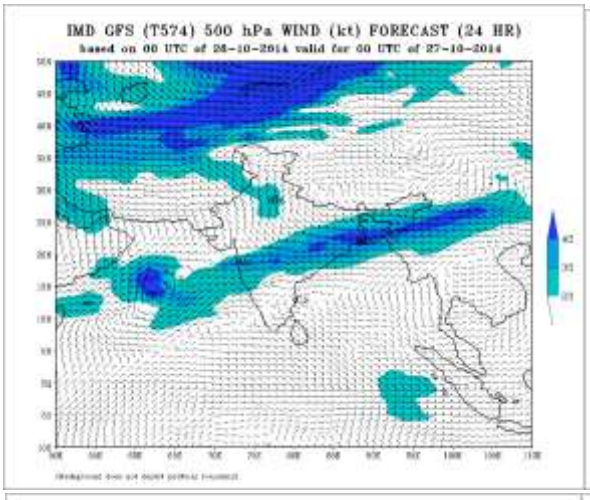
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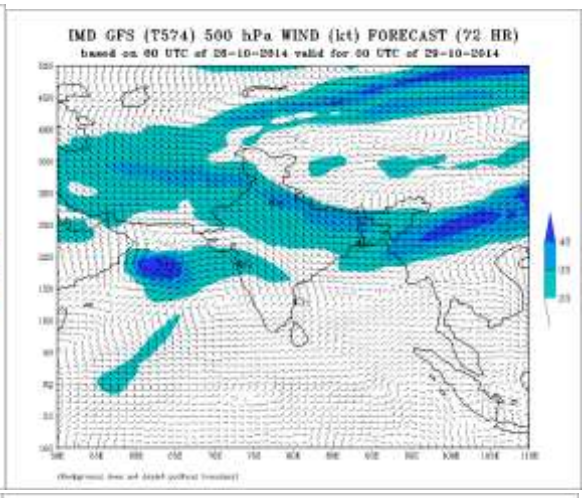
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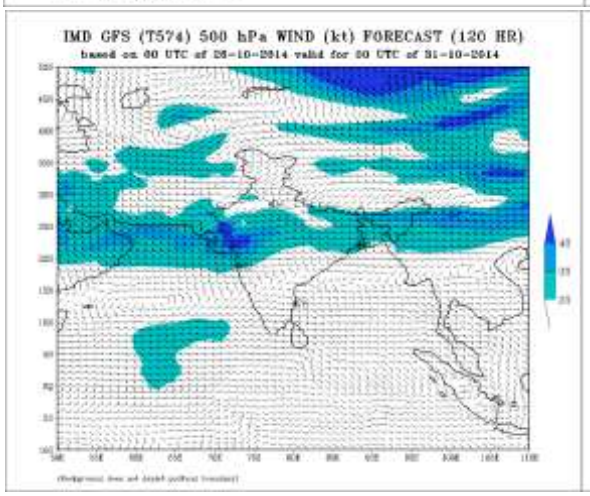
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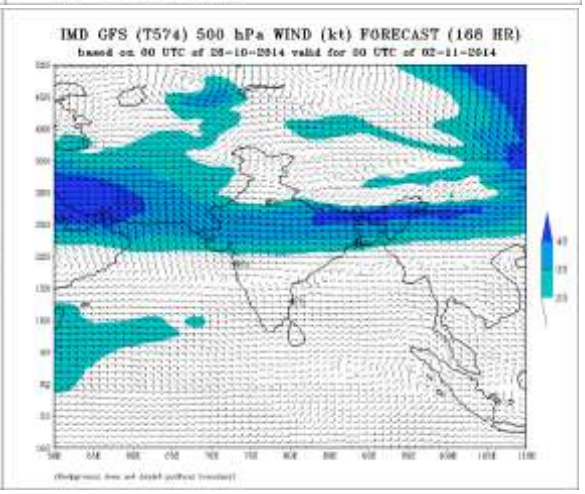
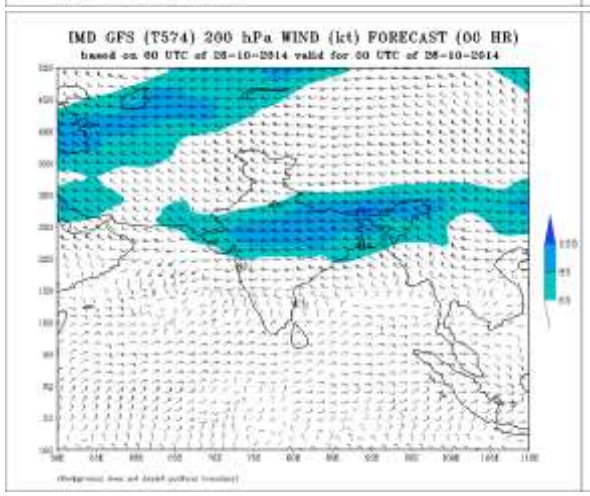
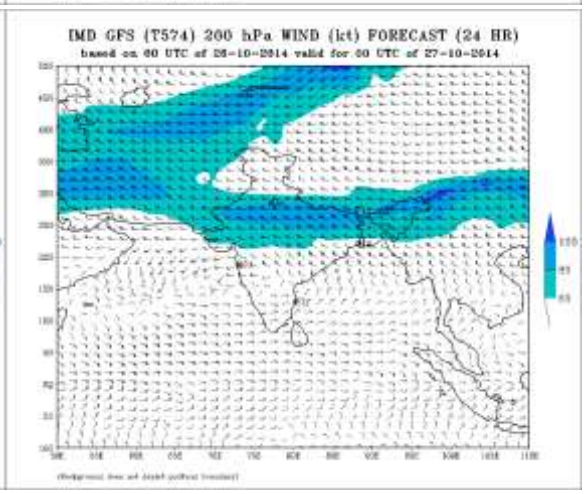
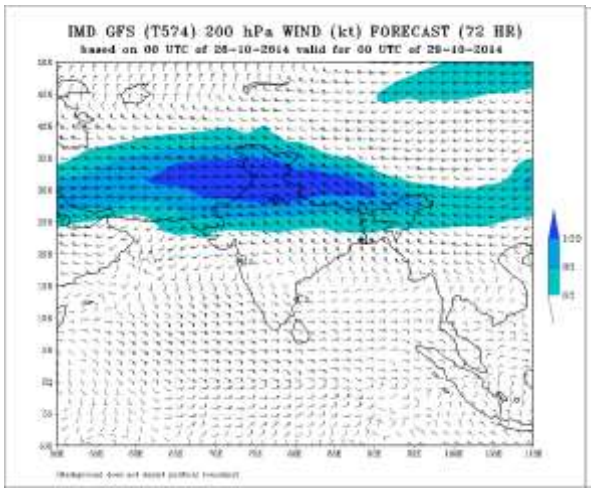
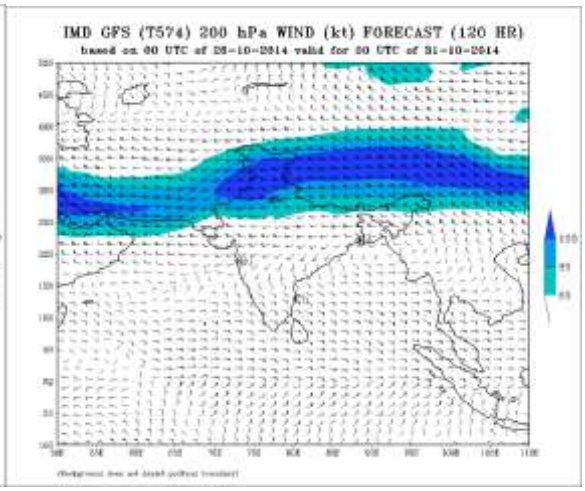
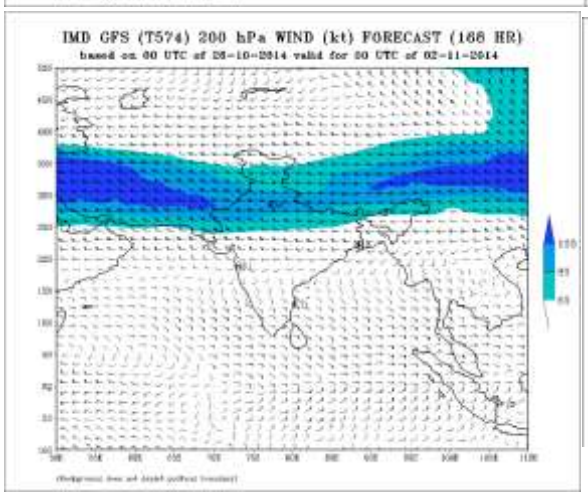

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 26-10-2014 valid for 00 UTC of 02-11-2014

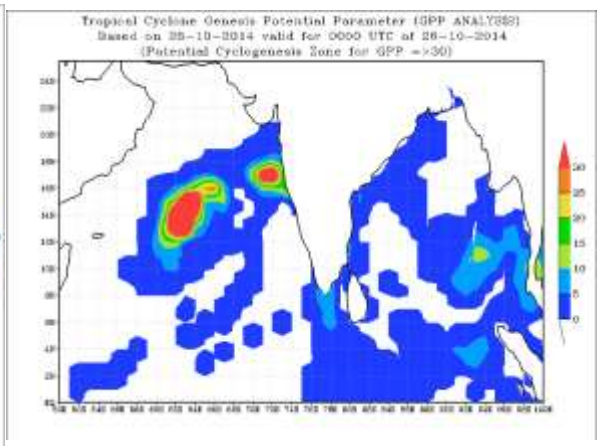

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 26-10-2014 valid for 00 UTC of 26-10-2014

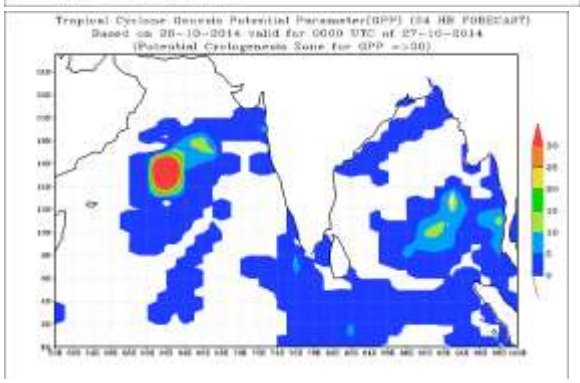

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 26-10-2014 valid for 00 UTC of 27-10-2014

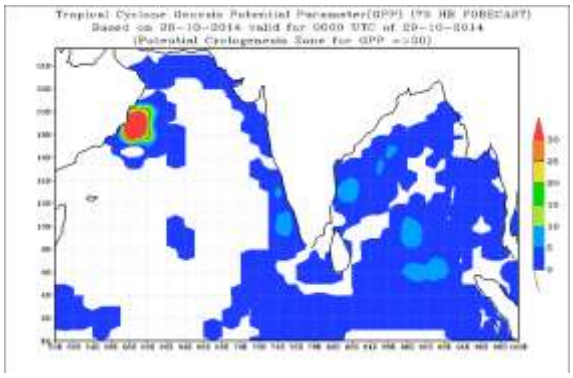

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 25-10-2014 valid for 00 UTC of 28-10-2014

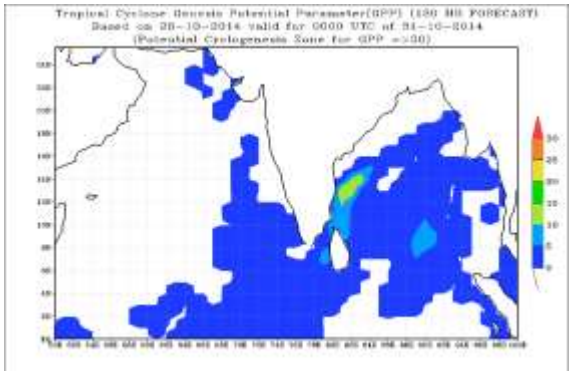

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 25-10-2014 valid for 00 UTC of 31-10-2014

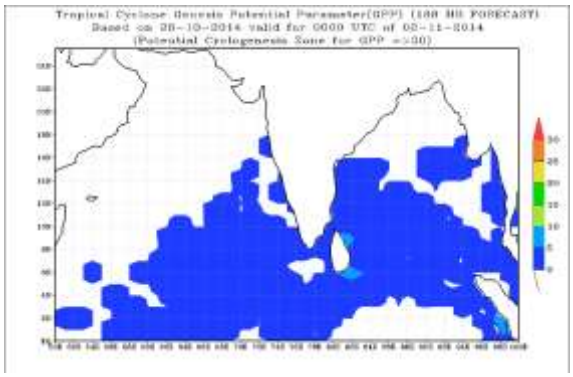

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 25-10-2014 valid for 00 UTC of 02-11-2014


Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 25-10-2014 valid for 0000 UTC of 26-10-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 25-10-2014 valid for 0000 UTC of 27-10-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 25-10-2014 valid for 0000 UTC of 28-10-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 25-10-2014 valid for 0000 UTC of 31-10-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (168 HR FORECAST)
Based on 25-10-2014 valid for 0000 UTC of 02-11-2014
(Potential Cyclogenesis Zone for GPP =>30)

FDP (Cyclone) NOC Report Dated 27 October, 2014

Synoptic features based on 0600 UTC:

- The severe cyclonic storm, 'NILOFAR' over westcentral Arabian Sea remained practically stationary, intensified into a very severe cyclonic storm and lay centred at 1130 hours IST of 27th October, 2014 near latitude 14.9^0 N and longitude 62.0^0 E, about 1170 km southwest of Naliya (Gujarat), 1230 km south-southwest of Karachi (Pakistan) and 880 km east-southeast of Salalah (Oman). It would move initially north-northwestwards during next 24 hrs and then recurve northeastwards and cross north Gujarat and adjoining Pakistan coast around Naliya by 31st October morning. However, as the system would come closer to Gujarat coast, it would weaken and cross the coast as a severe cyclonic storm.

Environmental features based on 0300 UTC of today:

Sea Surface Temperature:

- Sea Surface Temperature around the region of system is 29° C and it is 28^0C along and off Gujarat coast.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive ($200 * 10^{-5}$ s^{-1}) near around the system centre.

Convergence:

- Lower level convergence is positive of the order of $20*10^{-5}$ s^{-1} around the system centre.

Divergence:

- Upper level divergence is positive of the order of $20*10^{-5}$ s^{-1}.

Wind Shear:

- Wind Shear is 5-10 knots around the region of the system centre and 30-60 knots area over the North Arabian Sea.

Wind Shear Tendency:

- The wind shear tendency is negative over the Arabian Sea and is of the order of -5 to -10 knots around the system centre,.

Upper tropospheric ridge:

- The upper tropospheric **ridge** at 200 hPa passes through Lat. 14.0°N. System lies near the COL region due to an anti-cyclone to the east-southeast of the system and another to the northwest.

M.J.O. Index:

- Located in phase 1 with amplitude more than 1.0. Likely to continue to be in phase 1 but with amplitude less than 1.

Storms and Depression over South China Sea:

- There is currently no Tropical Storm/Depression over South China Sea.

Status of observational system:

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

Satellite:

Inference based on INSAT imagery of 270900 UTC:

Vortex over Arabian Sea : -

Vortex (NILOFAR) over WestCentral Arabian Sea & n/hood centred near 14.9°N/62.3°E with intensity T4.0. Eye pattern. Associated broken low and medium clouds with embedded intense to very intense convection over Arabian Sea between latitude 11.5°N to 18.0°N and longitude 58.0°E to 66.0°E

Rest of Arabian Sea: Broken low and medium clouds with embedded intense to very intense convection over Arabian Sea between latitude 11.0°N to 20.0°N and east of longitude 66.0°E.

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. Broken low and medium clouds with embedded isolated weak to moderate convection over NorthWest Bay.of Bengal

NWP Analysis:-

- IMD-GFS model analysis based on 0000 UTC of 27 October 2014 shows a Cyclone over the west-central and adjoining southwest Arabian Sea. The 24 hrs forecast shows slight weakening of the system and again further intensification during 48 hrs forecast valid for 29th October, 2014 with movement in the north-easterly direction. The forecast shows north-early movement during subsequent 2 days with gradual weakening of the system and cross Gujarat coast as Depression on 31st October, 2014.
- IMD-WRF model analysis valid for 0000 UTC of 27th October 2014 shows a Cyclone over the west-central and adjoining southwest Arabian Sea. The system is likely to weaken gradually and move in west/west-west-northward direction till 30th October, 2014 towards east off south Oman coast.
- Genesis Potential Parameter (GPP) forecasts based on 0000 UTC of 27th October 2014 shows presence of a potential cyclogenesis zone over the south west Arabian Sea. It indicates north-north-westward movement till 29th October and re-curve towards north east Arabian Sea during 30-31 October 2014 with slight weakening of the system.

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

- NCEP-GFS: the system would recurve northeastwards towards Gujarat-Pakistan coast. It would intensity into very severe cyclonic storm within the next 24 hours. It would subsequently start weakening around 29th/1200 UTC and cross Gujarat coast near 23.2°N/68.5°E after 31st/1200 UTC.
- ECMWF: Based on 27th/0000 UTC run, the system would recurve northeastwards towards Gujarat-Pakistan coast. It would intensity into very severe cyclonic storm within the next 24 hours, but would start weakening after 60 hours and would dissipate over Arabian Sea off Gujarat coast around 31 October-01 November 2014.
- UKMO: UK Met office also shows northeastward recurvature and intensification into very severe cyclonic storm. It would weaken over Arabian Sea off Gujarat coast

- JMA: JMA model also shows recurvature of the storm towards northeast wards and intensify into a very severe cyclonic storm. It would however weaken over Sea after 30th/0000 UTC.

Most of the models are unanimous about weakening of the system as it approaches Gujarat coast.

Summary and Conclusion:-

- The severe cyclonic storm, 'NILOFAR' over westcentral Arabian Sea remained practically stationary, intensified into a very severe cyclonic storm and lay centred at 1430 hours IST of 27th October, 2014 near latitude 14.9^0 N and longitude 62.0^0 E, about 1170 km southwest of Naliya (Gujarat), 1230 km south-southwest of Karachi (Pakistan) and 880 km east-southeast of Salalah (Oman). It would move initially north-northwestwards during next 24 hrs and then recurve northeastwards and cross north Gujarat and adjoining Pakistan coast around Naliya by 31st October morning. However, as the system would come closer to Gujarat coast, it would weaken and cross the coast as a severe cyclonic storm.
- Probability of cyclogenesis over Bay of Bengal during next 3 days is NIL.

Advisory:

Intense observations may be taken along and off Gujarat and Pakistan coast during 29 – 31st October, 2014.

Annexure-I

Status of Observation system:

Synoptic observation:

Region	Date/Time (UTC)		
	26/12	**27/00**	**27/03**
India	41	38	40
Coastal stations			
WB	8	8	8
Odisha	7	7	7
AP	13	13	14
Tamil Nadu	10	8	9
Puducherry	2	2	2
A & N	1	1	1
Bangladesh	11	11	11
Myanmar	10	11	11
Thailand	2	2	2
Sri Lanka	9	7	8

AWS Observations:

Region	Date/Time (UTC)		
	26/12	**27/00**	**27/03**
India	68	68	74
Coastal stations			
WB	8	8	10
Odisha	6	7	9
AP	26	26	26
Tamil Nadu	27	26	28
Puducherry	1	1	1
A & N	-	-	-

- **RS/RW** (12Z) of 26/10/2014 **-0/39**
- **No. of Ascents reaching 250 hPa levels: - 0, MISDA: 39**
- **RS/RW** (00Z) of 27/10/2014 11**/39**
- **No. of Ascents reaching 250 hPa levels: 11 , MISDA: 28**

No. of PILOT Ascents

26/12Z	27/00Z
2	1

Buoy Data

26/12Z	27/00Z	27/03Z
14	16	16

No. of Synop data over Chennai region

Date→	26.10.2014							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	20	22	20	20	22	20	20	20

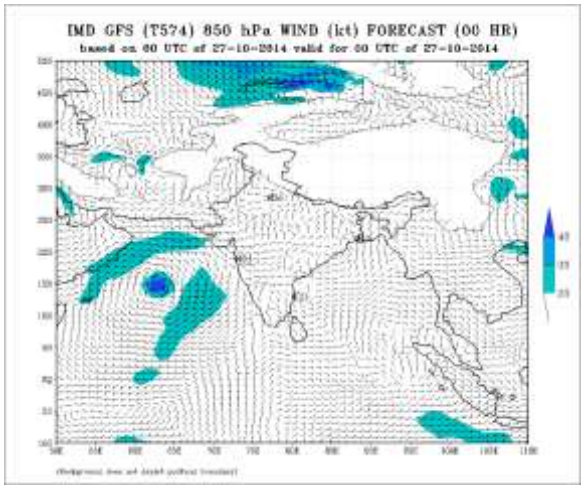
No. of RS/RW Ascents
00Z /26.10.2014 : 1
No. of Ascents reaching 250 hPa level = 1
MISDA : 7

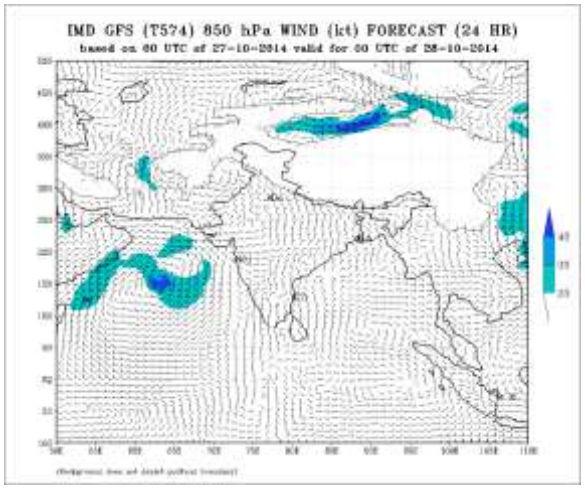
12Z /26.10.2014 : --
No. of Ascents reaching 250 hPa level = --
MISDA : 8

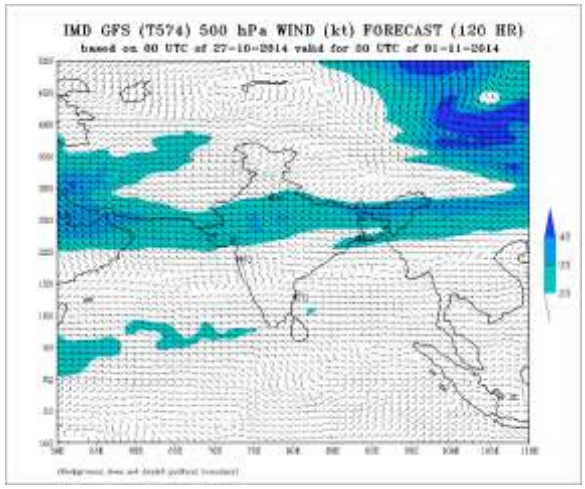
No. of PILOT Ascents:

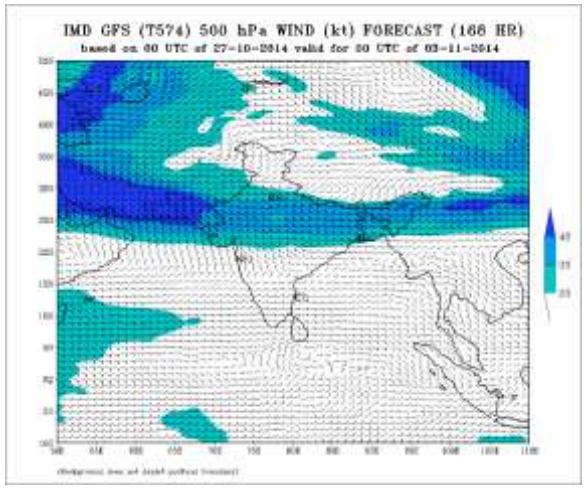
26.10.2014	
06Z	18Z
1	4

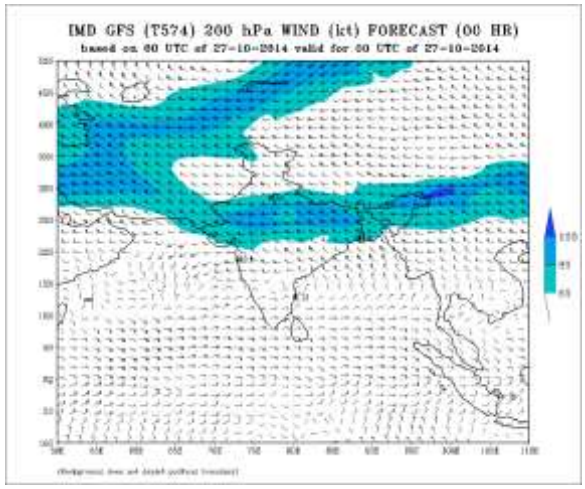
Annexure-II

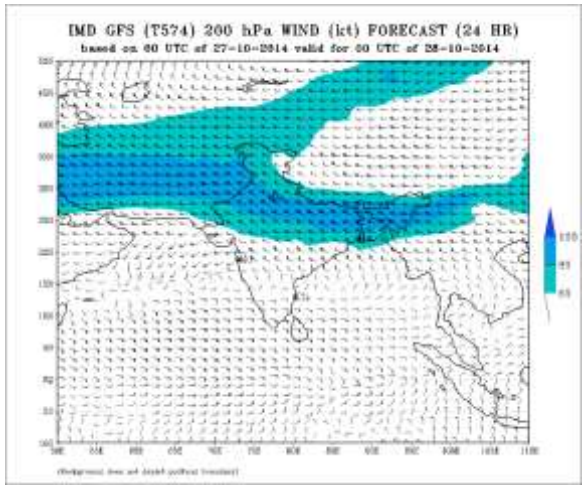

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 27-10-2014 valid for 00 UTC of 27-10-2014

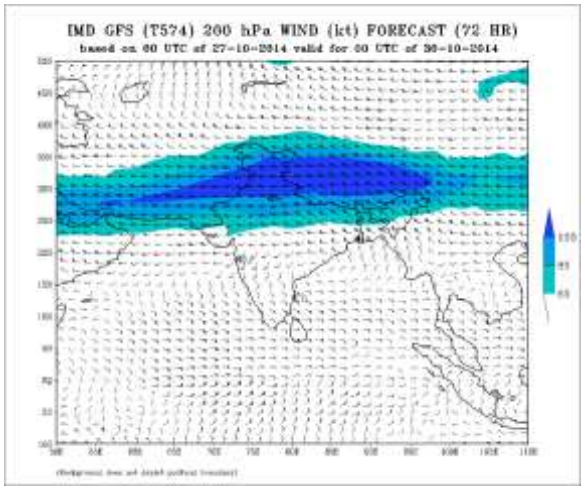

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 27-10-2014 valid for 00 UTC of 28-10-2014

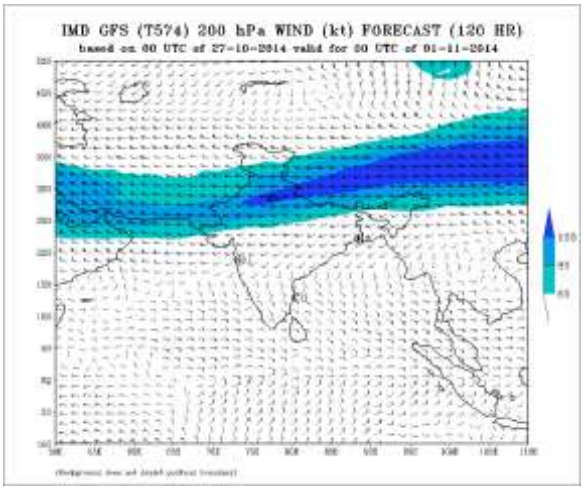

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 27-10-2014 valid for 00 UTC of 01-11-2014


IMD GFS (T574) 500 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 27-10-2014 valid for 00 UTC of 03-11-2014


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 27-10-2014 valid for 00 UTC of 27-10-2014


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 27-10-2014 valid for 00 UTC of 28-10-2014


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 27-10-2014 valid for 00 UTC of 30-10-2014


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
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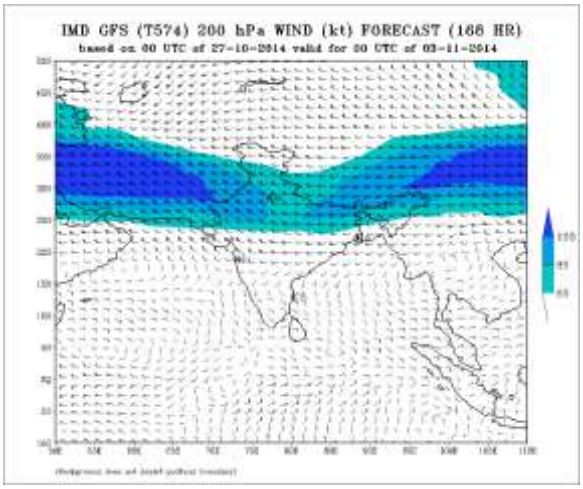
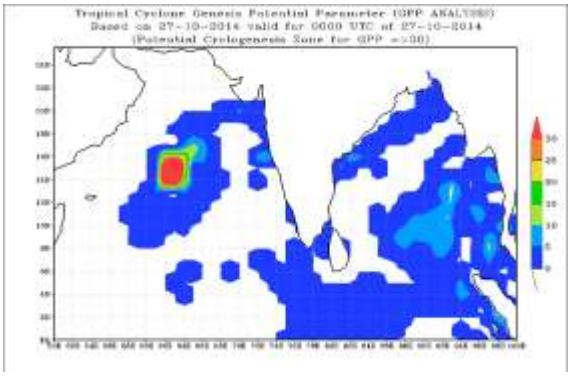
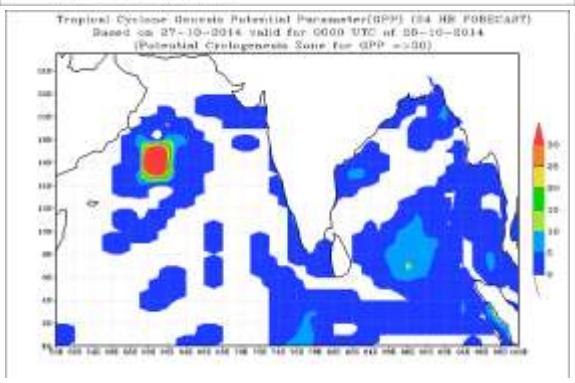
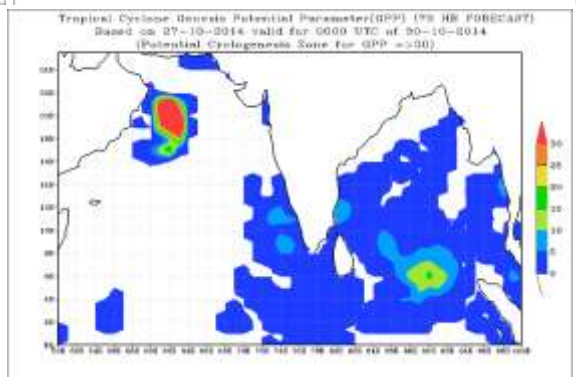
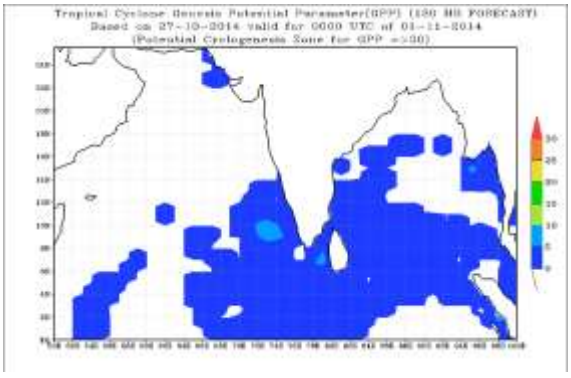
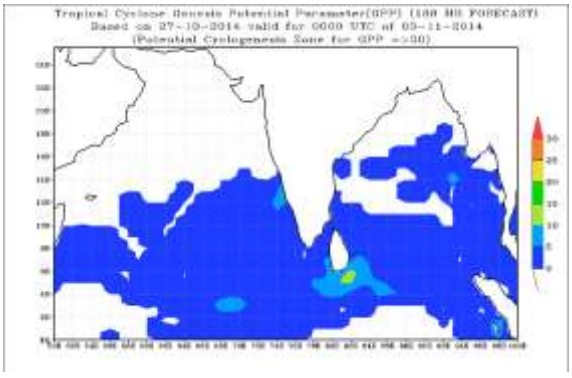

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 27-10-2014 valid for 00 UTC of 03-11-2014


Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 27-10-2014 valid for 0000 UTC of 27-10-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 27-10-2014 valid for 0000 UTC of 28-10-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 27-10-2014 valid for 0000 UTC of 30-10-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 27-10-2014 valid for 0000 UTC of 01-11-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (168 HR FORECAST)
Based on 27-10-2014 valid for 0000 UTC of 03-11-2014
(Potential Cyclogenesis Zone for GPP =>30)

FDP (Cyclone) NOC Report Dated 28 October, 2014

Synoptic features based on 0900 UTC:

- The very severe cyclonic storm moved north-northwestwards, intensified further and lay centred at 1430 hours IST of 28th October, 2014 near latitude 16.3^0 N and longitude 61.6^0 E, about 1080 km southwest of Naliya (Gujarat), 1110 km south-southwest of Karachi (Pakistan) and 800 km east-southeast of Salalah (Oman). It would move north-northwestwards during next 12 hrs and then gradually re-curve northeastwards and cross north Gujarat and adjoining Pakistan coast around Naliya by 01^{st} November forenoon. However, as the system would come closer to Gujarat coast, it would weaken and cross the coast as a cyclonic storm.

Environmental features based on 0300 UTC of today:

Sea Surface Temperature:

- Sea Surface Temperature around the region of system is 29° C and it is 28-29^0C along and off Gujarat coast.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive (250 *10^{-5} s^{-1}) near around the system centre.

Convergence:

- Lower level convergence is positive of the order of 40*10^{-5} s^{-1} around the system centre.

Divergence:

- Upper level divergence is positive of the order of 30*10^{-5} s^{-1}. The upper level divergence is oriented from southwest to northeast towards Gujarat coast.

Wind Shear:

- Wind Shear is 5-10 knots around the region of the system centre and 20-60 knots area over the North Arabian Sea.

Wind Shear Tendency:

- There is no change in vertical wind shear around system centre and it is about 5-10 knots (low). And there is decrease in wind shear to the northeast of the system centre towards Gujarat coast.

Upper tropospheric ridge:

- The upper tropospheric **ridge** at 200 hPa passes through Lat. 16.0°N.

M.J.O. Index:

- Located in phase 2 with amplitude less than 1.0. Likely to continue in phase 2 but with amplitude less than 1.

Storms and Depression over South China Sea:

- There is currently no Tropical Storm/Depression over South China Sea.

Status of observational system:

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

Satellite:

Inference based on INSAT imagery of 280900 UTC:

Vortex over Arabian Sea : -

The Vortex (Nilofar) over westcentral Arabian Sea & neighbourhood is centred near Lat. 16.3°N/61.6°E. Intensity is T 5.0. Convection is Eye pattern. Associated broken low and medium clouds with embedded intense to very intense convection over Arabian Sea between Lat. 13.5°N to 22.0°N and Long. 59.0°E to 68.0°E. Minimum CTT minus 83 deg. C.

Rest of Arabian Sea: Broken low and medium clouds with embedded moderate to intense convection over rest Arabian Sea between Lat. 16.5°N to 22.0°N and east of Long 60.0°E and also over southeast Arabian Sea off Kerala coast.

Bay of Bengal & Andaman Sea :-

Scattered low and medium clouds with embedded isolated moderate to intense convection over south Bay south of Lat. 9.0°N, northern parts of central Bay and northeast Andaman Sea. Scattered low and medium clouds with embedded isolated weak to moderate convection over northwest Bay.

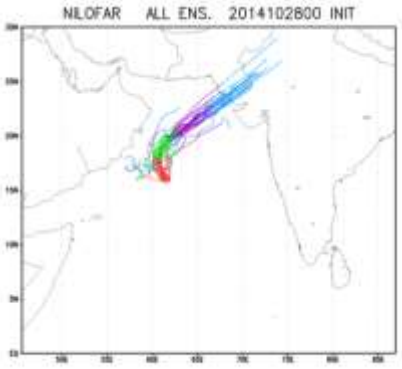
NWP Analysis:-

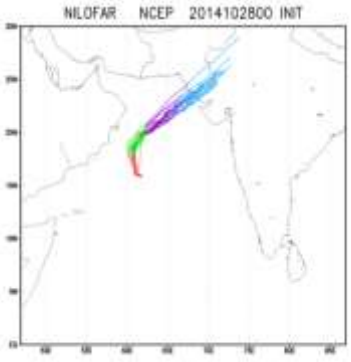
- IMD-GFS model analysis based on 0000 UTC of 28th October 2014 shows a Cyclone over the west-central Arabian Sea. The 24 hrs forecast shows slight weakening of the system with northward movement. The 48 hrs forecast valid for 30th October indicates north-eastward movement of the system towards southwest off Gujarat coast. The subsequent 3 days forecasts indicate very slow movement and gradual weakening of the system over the Sea on 2nd November, 2014 near the Gujarat coast.
- IMD-WRF model analysis valid for 0000 UTC of 28th October 2014 shows a Cyclone over the west-central Arabian Sea. The system is likely to move in west-west-north/west direction till 31st October, 2014 towards the south Oman coast.
- Genesis Potential Parameter (GPP) forecasts based on 0000 UTC of 28th October 2014 shows presence of a potential cyclogenesis zone over the west-central Arabian Sea. It indicates north/northwest movement till 29th October with slight weakening of the system. Further it moves in north-eastward direction and likely to weaken over the Sea near the Gujarat coast on 2nd November.

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

- **NCEP-GFS:** The system would re-curve northeastwards towards Gujarat-Pakistan coast, It would subsequently start weakening and cross Gujarat coast as Depression on 1st Morning.
- **ECMWF:** The system would recurve northeastwards towards Gujarat-Pakistan coast., but would dissipate over Arabian Sea off Gujarat coast by 1st November 2014.
- **UKMO:** UK Met office also shows northeastward recurvature and weakening over Arabian Sea.
- **JMA:** JMA model also shows recurvature of the storm towards northeast wards and weakening over Sea after 31st /0000 UTC.

Most of the models are unanimous about weakening of the system over the Sea area. Only NCEP GFS indicates landfall over Gujarat coast as Depression.





Summary and Conclusion:-

- As per the present synoptic conditions, the system would move north-northwestwards during next 12 hrs and then gradually re-curve northeastwards and cross north Gujarat and adjoining Pakistan coast around Naliya by 01st November forenoon. However, as the system would come closer to Gujarat coast, it would weaken and cross the coast as a cyclonic storm.
- Probability of Cyclogenesis over Bay of Bengal during next 3 days is NIL.

Advisory: Intense observations may be taken along and off Gujarat and Pakistan coast during 29 – 31st October 2014.

Annexure-I

Status of Observation system:
Synoptic observation:

Region	Date/Time (UTC)		
	27/12	28/00	28/03
India	79	67	79
Coastal stations			
WB	8	4	7
Odisha	7	7	7
AP	13	13	13
Tamil Nadu	10	8	11
Puducherry	2	2	2
A & N	6	3	6
Bangladesh	11	11	11
Myanmar	11	8	11
Thailand	2	2	2
Sri Lanka	9	9	9

AWS Observations:

Region	Date/Time (UTC)		
	26/12	27/00	27/03
India	63	68	75
Coastal stations			
WB	7	9	10
Odisha	5	7	9
AP	25	26	27
Tamil Nadu	26	26	28
Puducherry	1	1	1
A & N	-	-	-

- **RS/RW** (12Z) of 27/10/2014 **-1/39**
- **No. of Ascents reaching 250 hPa levels: - 1, MISDA: 39**
- **RS/RW** (00Z) of 28/10/2014 19**/39**
- **No. of Ascents reaching 250 hPa levels: 10 , MISDA: 20**

No. of PILOT Ascents

27/12Z	27/00Z
8	9

Buoy Data

27/12Z	28/00Z	28/03Z
14	16	16

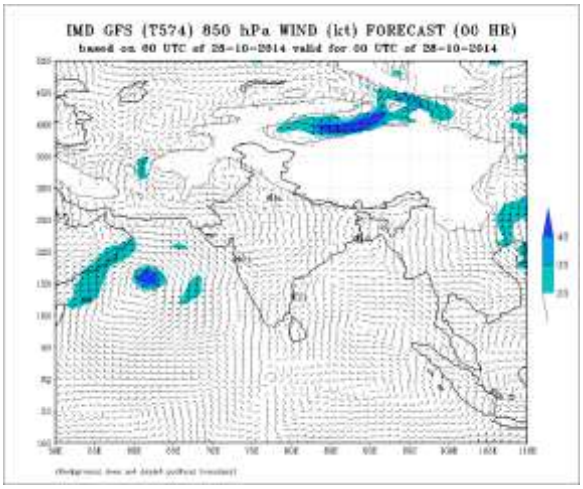
No. of Synop data over Chennai region

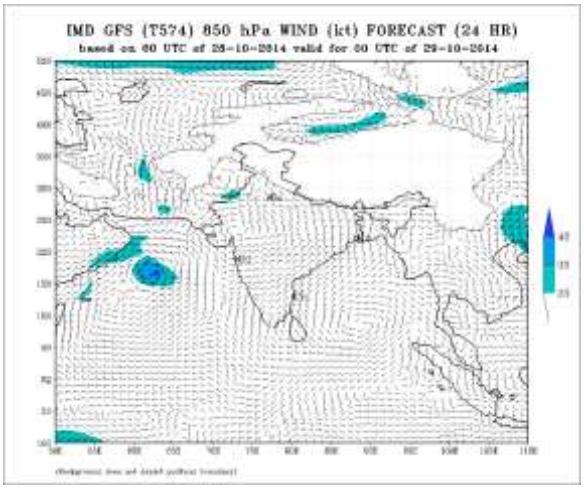
Date→	27.10.2014							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	20	22	20	20	22	19	20	20

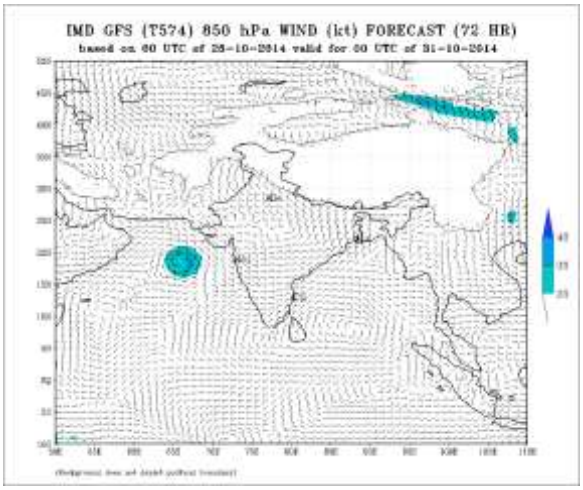
No. of RS/RW Ascents
00Z /27.10.2014 : 1
No. of Ascents reaching 250 hPa level = 1
MISDA : 7
12Z /27.10.2014 : --
No. of Ascents reaching 250 hPa level = --
MISDA : 8
No. of PILOT Ascents:

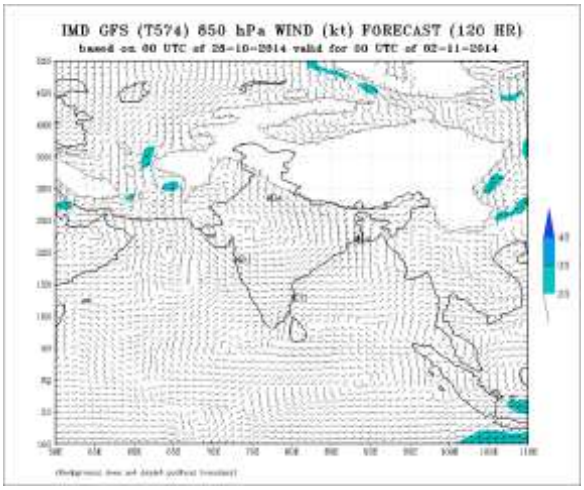
27.10.2014	
06Z	18Z
2	3

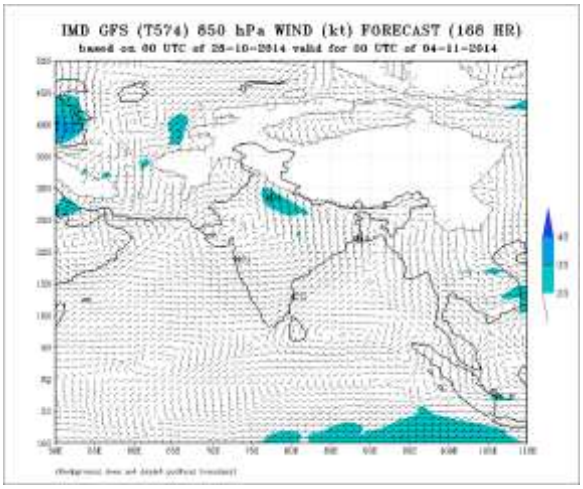
Annexure-II

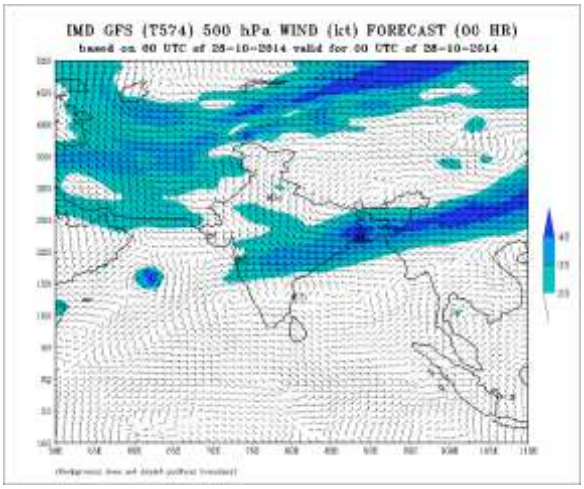

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 28-10-2014 valid for 00 UTC of 28-10-2014

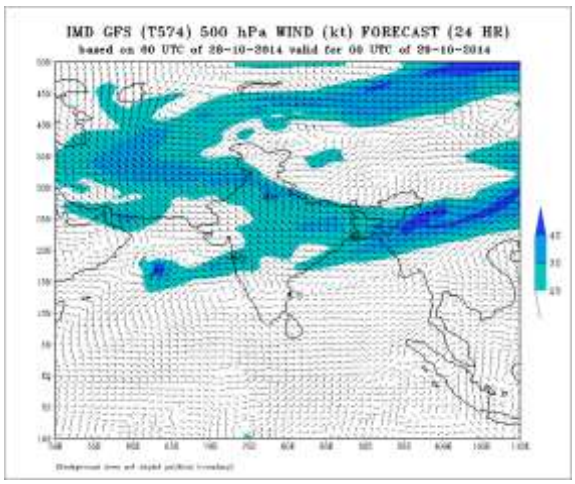

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 28-10-2014 valid for 00 UTC of 29-10-2014

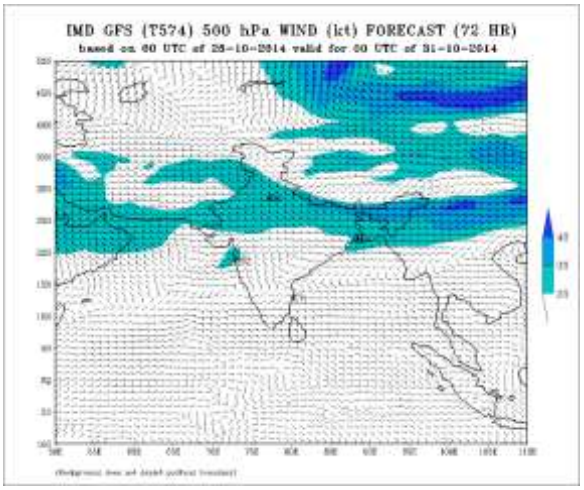

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 28-10-2014 valid for 00 UTC of 31-10-2014

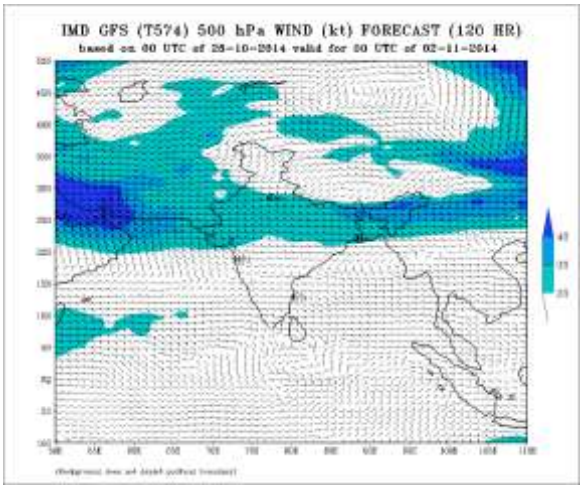

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 28-10-2014 valid for 00 UTC of 02-11-2014

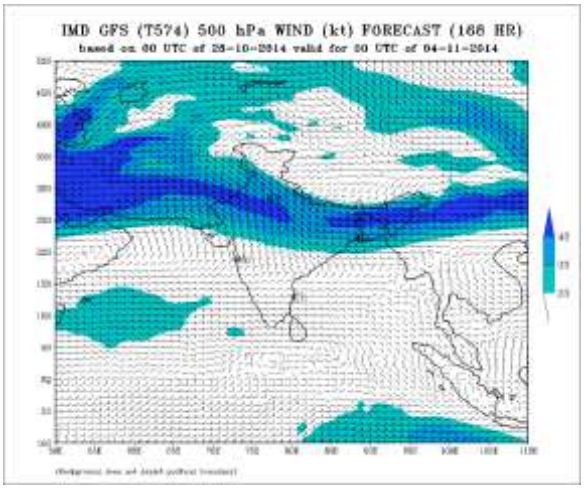

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 28-10-2014 valid for 00 UTC of 04-11-2014

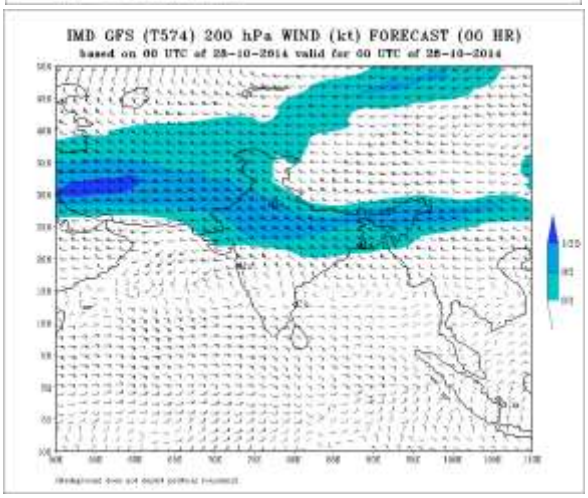

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 28-10-2014 valid for 00 UTC of 28-10-2014

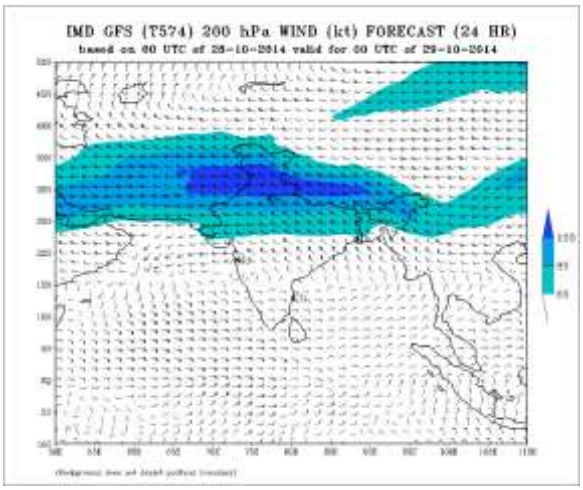

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 28-10-2014 valid for 00 UTC of 29-10-2014

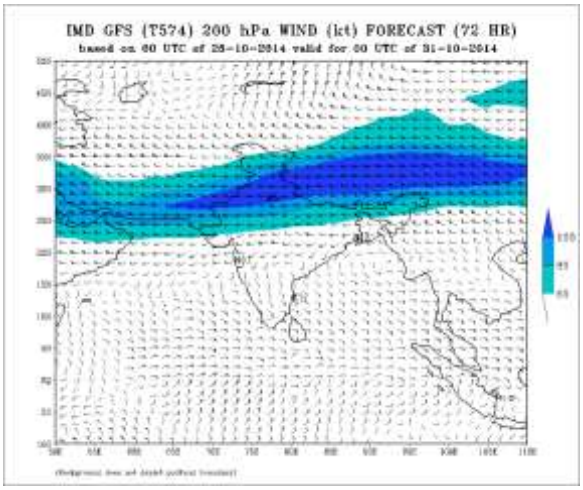

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 28-10-2014 valid for 00 UTC of 31-10-2014

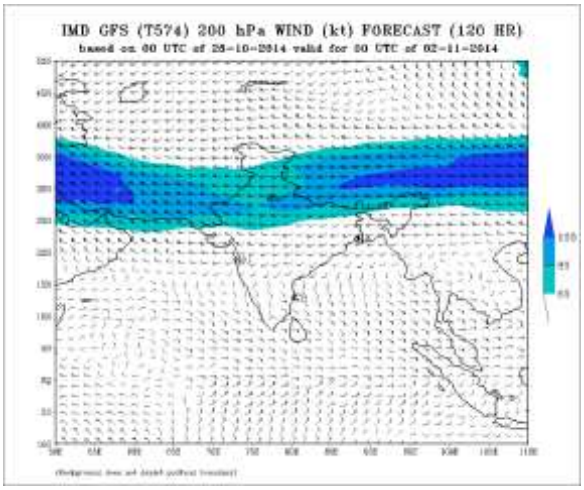

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 28-10-2014 valid for 00 UTC of 02-11-2014

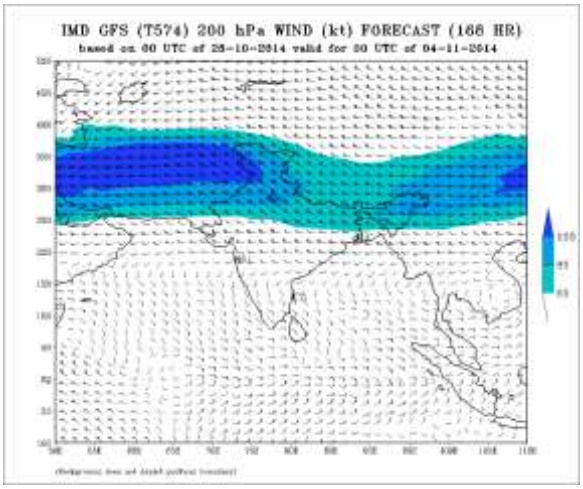

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 28-10-2014 valid for 00 UTC of 04-11-2014

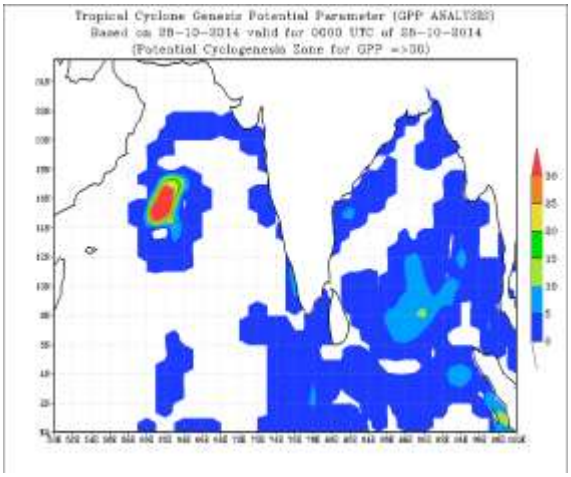

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 28-10-2014 valid for 00 UTC of 28-10-2014

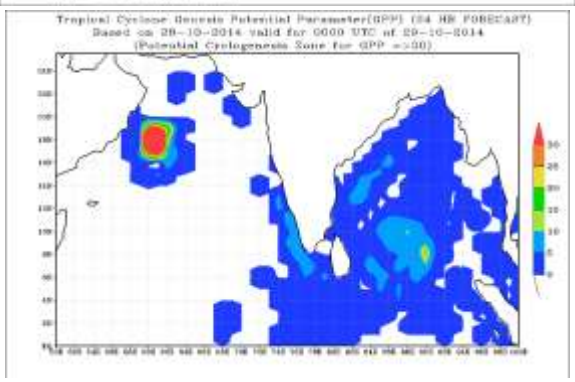

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 28-10-2014 valid for 00 UTC of 29-10-2014

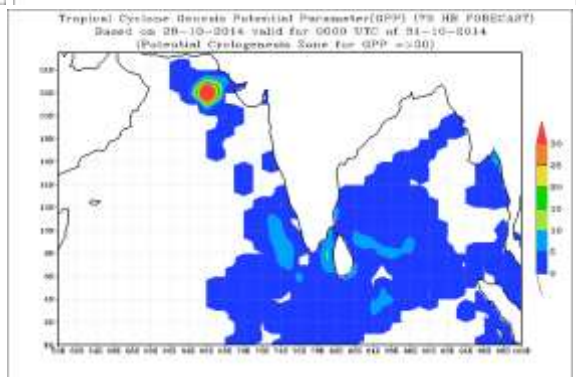

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 28-10-2014 valid for 00 UTC of 31-10-2014

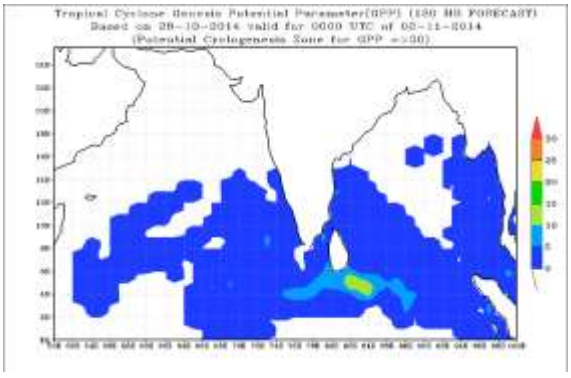

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 28-10-2014 valid for 00 UTC of 02-11-2014

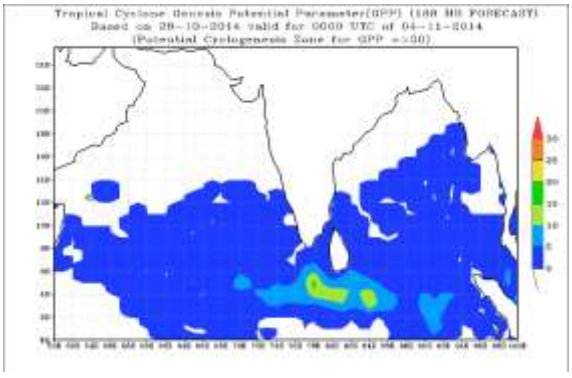

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 28-10-2014 valid for 00 UTC of 04-11-2014


Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 28-10-2014 valid for 0000 UTC of 28-10-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 28-10-2014 valid for 0000 UTC of 29-10-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 28-10-2014 valid for 0000 UTC of 31-10-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 28-10-2014 valid for 0000 UTC of 02-11-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (168 HR FORECAST)
Based on 28-10-2014 valid for 0000 UTC of 04-11-2014
(Potential Cyclogenesis Zone for GPP =>30)

FDP (Cyclone) NOC Report Dated 29 October, 2014

Synoptic features based on 0900 UTC:

- The very severe cyclonic storm, 'NILOFAR' over westcentral Arabian Sea moved slightly northwards with a speed of 13 kmph during past 6 hours and lay centred at 1430 hours IST of today, the 29th October, 2014 near latitude 19.0^0 N and longitude 62.0^0 E, about 850 km west-southwest of Naliya (Gujarat), 840 km south-southwest of Karachi (Pakistan) and 380 km east-southeast of Masirah (Oman). It would move north-northeastwards during next 12 hours and then northeastwards and cross north Gujarat and adjoining Pakistan coast around Naliya by 31st October night/early hours of 01st November. However, as the system would come closer to Gujarat coast, it would weaken and cross the coast as a marginal cyclonic storm with a wind speed of 60-70 kmph gusting to 80 kmph.

Environmental features based on 0300 UTC of today:

Sea Surface Temperature:

- Sea Surface Temperature around the region of system is 29° C and it is about 28°C near north Gujarat and adjoining Pakistan coast.
- Sea Surface Temperature is between 29 - 31^0C over entire Bay of Bengal and Andaman Sea.

Tropical Cyclone Heat Potential (TCHP):

- The TCHP is less than 50 kJ/cm^2 near the storm centre.
- The TCHP is between 70-100 kJ/cm^2 over Bay of Bengal except over north Bay of Bengal.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive (300 *10^{-5} s^{-1}) near around the system centre.

Convergence:

- Lower level convergence is positive of the order of 40*10^{-5} s^{-1} around the system centre.

Divergence:

- Upper level divergence is positive of the order of 50*10^{-5} s^{-1}.

Wind Shear:

- Wind Shear is 20-30 knots (moderate to high) around the region of the system centre and 40-70 knots area over the North Arabian Sea.
- Wind Shear is 5-10 knots over westcentral Bay and north Andaman Sea and it is 20-50 knots area over the North Bay of Bengal.

Wind Shear Tendency:

- There is no change in vertical wind shear around system centre and it is about 5 knots. And there is decrease in wind shear to the southwest of the system centre.

Upper tropospheric ridge:

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

M.J.O. Index:

- Located in phase 2 with amplitude less than 1.0. Likely to continue in phase 2 but with amplitude less than 1.

Storms and Depression over South China Sea:

- There is currently no Tropical Storm/Depression over South China Sea.

Status of observational system:

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

Satellite:

Inference based on INSAT imagery of 290900 UTC:

VORTEX over Arabian Sea : -

The Vortex (Nilofar) over westcentral Arabian Sea and neighbourhood is centred near Lat. 19.0°N/Long. 62.0°E, The intensity is T 5.0/ CI 5.5. Associated broken low and medium clouds with embedded intense to very intense convection over Arabian Sea between Lat. 17.5°N to 24.0°N and Long. 59.5°E to 68.0°E. Minimum CTT is minus 82 deg C.

Rest of Arabian Sea: Broken low and medium clouds with embedded moderate to intense convection over southeast Arabian Sea east of Long 70.0°E.

Bay of Bengal & Andaman Sea :-

Scattered low and medium clouds with embedded moderate to intense convection over south Bay south of Lat. 10.0°N, west of Long 90.0°E, Tenasserim coast. Scattered low and medium clouds with embedded isolated weak to moderate convection over northern parts of eastcentral Bay and Arakan coast.

NWP Analysis:-

- IMD-GFS model analysis based on 0000 UTC of 29th October 2014 shows a Cyclone over the west-central Arabian Sea. The 24 hrs forecast shows that the system will retain its intensity in the lower levels, while its extension in the upper levels decreases into a trough at 500 hPa, with northeastward movement. The 48 hrs forecast valid for 31st October indicates weakening of the system in the lower levels, and further north-eastward movement of the system towards west Gujarat coast. The system subsequently weakens and moves in a north-westerly direction over the subsequent 3 days, entering the Indian landmass over west Gujarat and adjoining Pakistan, as a weak low-pressure system in the 72 hour forecast valid for 01 October.
- IMD-WRF model analysis valid for 0000 UTC of 29th October 2014 also shows a Cyclone over the west-central Arabian Sea. The system is likely to retain its intensity and move in a north-westerly direction till 1st November, 2014 towards the south Oman coast.
- The Genesis Potential Parameter (GPP) forecasts based on 0000 UTC of 29th October 2014 shows cyclogenesis zone over the west-central Arabian Sea. The zone has northwesterly movement during the next 24 hours till 30th October with substantial weakening of the system. The system weakens further and no cyclogenesis zone is visible in the 48 hour 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

- MME: The system would move northeastwards and lay as a Deep Depression over north Arabian Sea off north Gujarat coast by 1st Nov.
- NCEP-GFS: The system would move northeastwards for next 36 hours and then north-northeastwards and cross Gujarat coast, by morning of 1st Nov.

- ECMWF: The system would move northeastwards, but would dissipate over Arabian Sea off Gujarat coast by 1st November 2014.
- UKMO: UK Met office shows north-northeastward for next 48 hours and later weakening over Arabian Sea.
- JMA: JMA model also shows northwards movement of the system and weakening over Sea after 1st /1200 UTC.
- NCEP ENSEMBLE: The system would move northeastwards and cross north Gujarat coast near Naliya by 1200 UTC of 31st October 2014.

Most of the models are unanimous about weakening of the system over the Sea area. Only NCEP GFS/NCEP ensemble indicates landfall over Gujarat coast as Depression or as a low pressure area.

Summary and Conclusion:-

- As per the present synoptic conditions, the system would move north-northeastwards during next 12 hours and then northeastwards and cross north Gujarat and adjoining Pakistan coast around Naliya by 31st October night/early hours of 01st November. However, as the system would come closer to Gujarat coast, it would weaken and cross the coast as a marginal cyclonic storm with a wind speed of 60-70 kmph gusting to 80 kmph.
- Probability of Cyclogenesis over Bay of Bengal during next 3 days is NIL.

Advisory: Intense observations may be taken along and off Gujarat and Pakistan coast during 30th – 31st October 2014.

Annexure-I

Status of Observation system:
Synoptic observation:

Region	Date/Time (UTC)		
	28/12	29/00	29/03
India	41	30	43
Coastal stations			
WB	6	3	7
Odisha	7	5	7
AP	11	11	12
Tamil Nadu	9	7	10
Puducherry	2	2	2
A & N	6	2	5
Bangladesh	9	9	10
Myanmar	10	10	11
Thailand	2	2	2
Sri Lanka	8	8	8

AWS Observations:

Region	Date/Time (UTC)		
	28/12	29/00	29/03
India	64	62	65
Coastal stations			
WB	8	8	9
Odisha	3	3	6
AP	28	26	24
Tamil Nadu	24	24	25
Puducherry	1	1	1
A & N	-	-	-

- **RS/RW** (12Z) of 28/10/2014 **-1/39**
- **No. of Ascents reaching 250 hPa levels: - 1, MISDA: 38**
- **RS/RW** (00Z) of 29/10/2014 20**/39**
- **No. of Ascents reaching 250 hPa levels: 7 , MISDA: 19**

No. of PILOT Ascents

28/12Z	29/00Z
7	9

Buoy Data

28/12Z	29/00Z	29/03Z
12	10	12

No. of Synop data over Chennai region

Date→	28.10.2014							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	20	22	20	20	22	20	20	19

No. of RS/RW Ascents

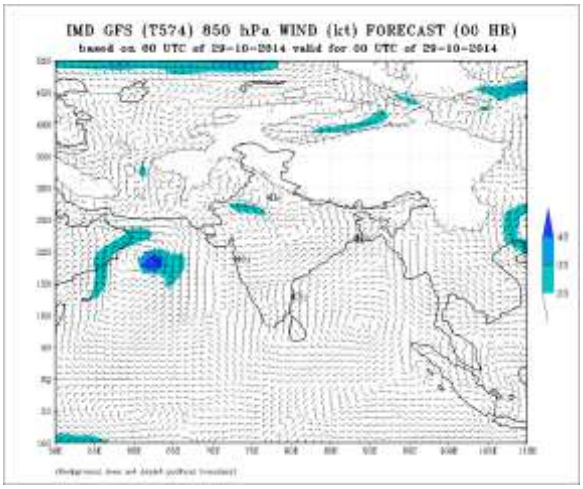
00Z /28.10.2014 : 1
No. of Ascents reaching 250 hPa level = 1
MISDA : 7

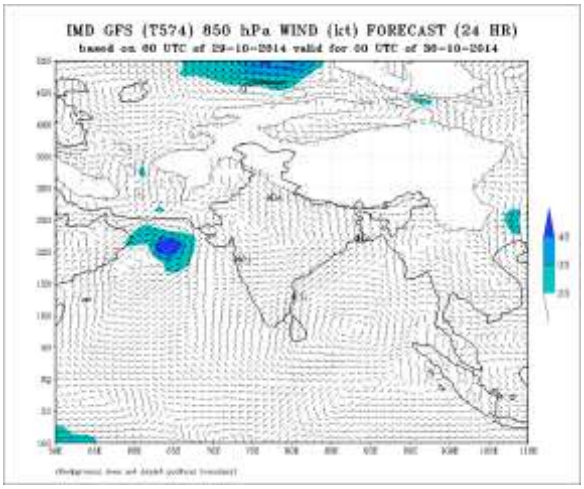
12Z /28.10.2014 : --
No. of Ascents reaching 250 hPa level = --
MISDA : 8

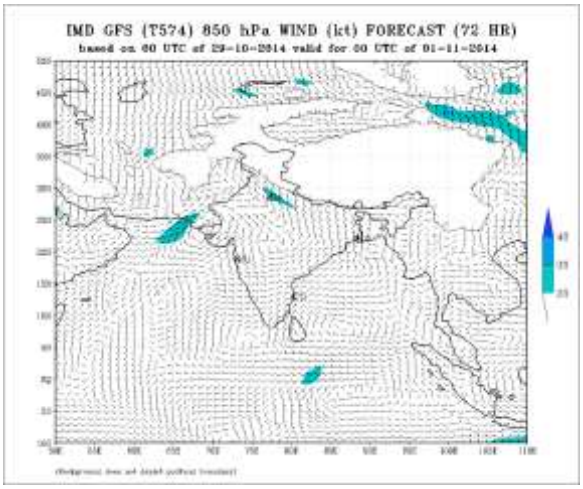
No. of PILOT Ascents:

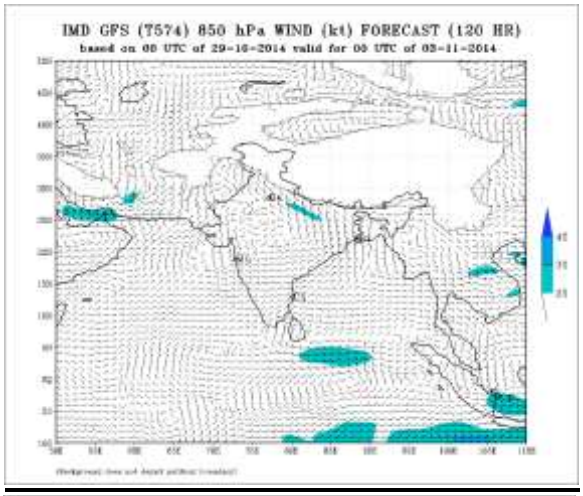
28.10.2014	
06Z	18Z
4	4

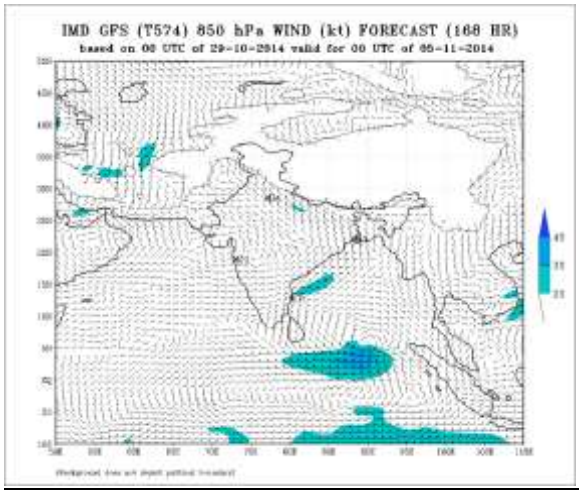
Annexure-II

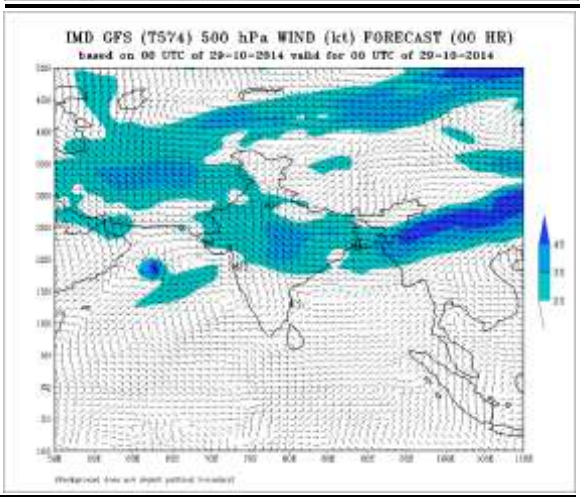

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 29-10-2014 valid for 00 UTC of 29-10-2014

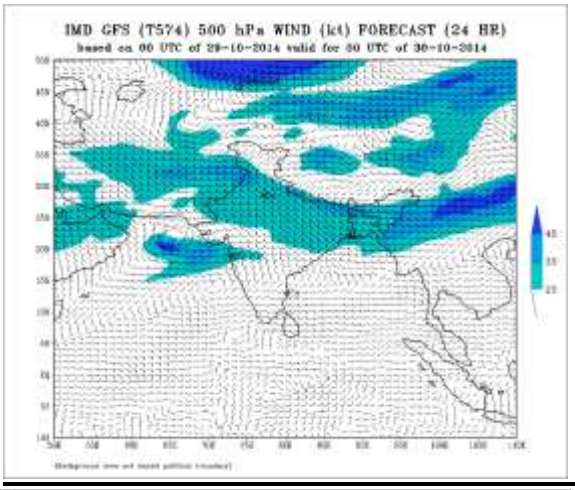

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 29-10-2014 valid for 00 UTC of 30-10-2014

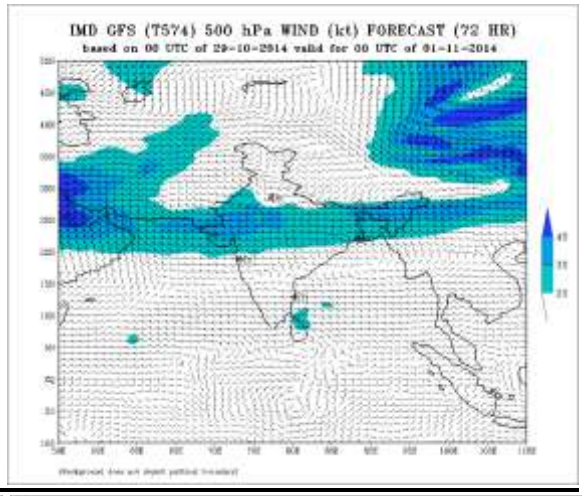

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 29-10-2014 valid for 00 UTC of 01-11-2014

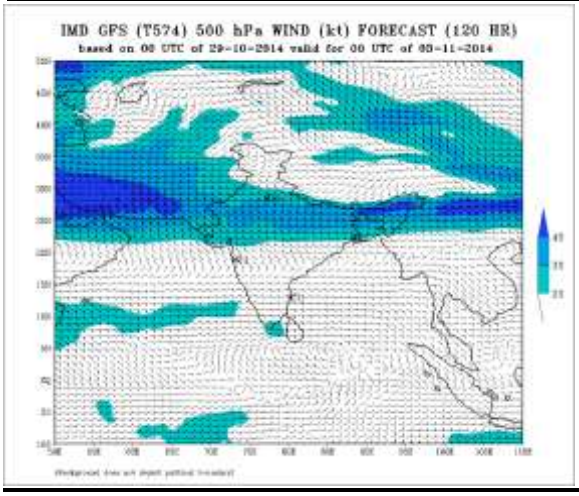

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 29-10-2014 valid for 00 UTC of 03-11-2014


IMD GFS (T574) 850 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 29-10-2014 valid for 00 UTC of 05-11-2014


IMD GFS (T574) 500 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 29-10-2014 valid for 00 UTC of 29-10-2014


IMD GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 29-10-2014 valid for 00 UTC of 30-10-2014


IMD GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 29-10-2014 valid for 00 UTC of 01-11-2014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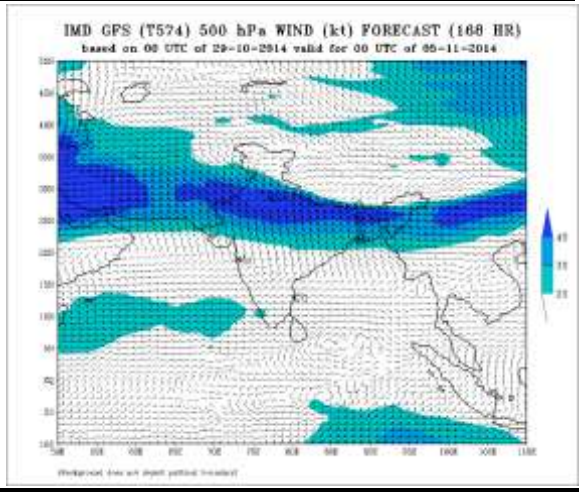
based on 00 UTC of 29-10-2014 valid for 00 UTC of 05-11-2014


IMD GFS (T574) 500 hPa WIND (kt) FORECAST (168 HR)
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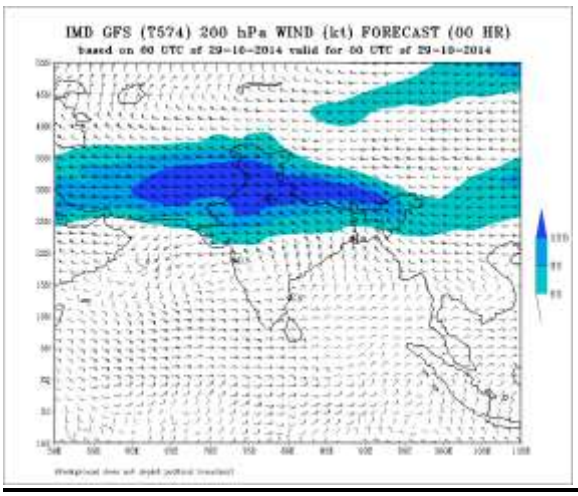
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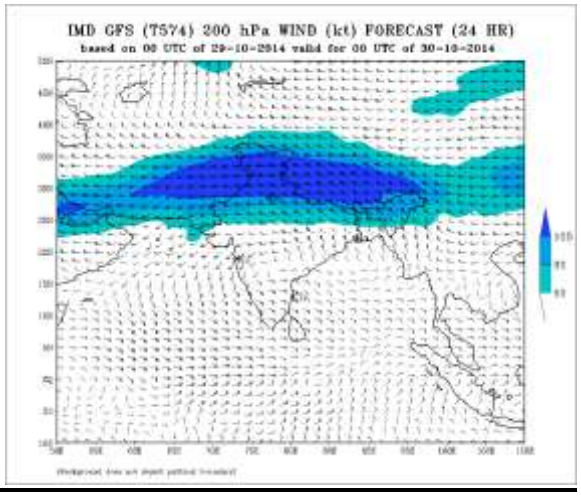
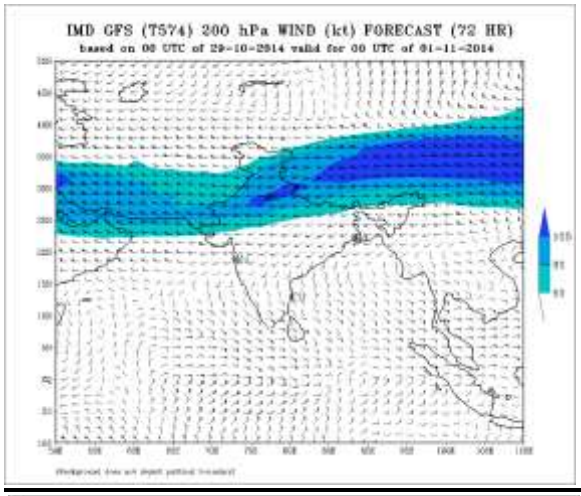
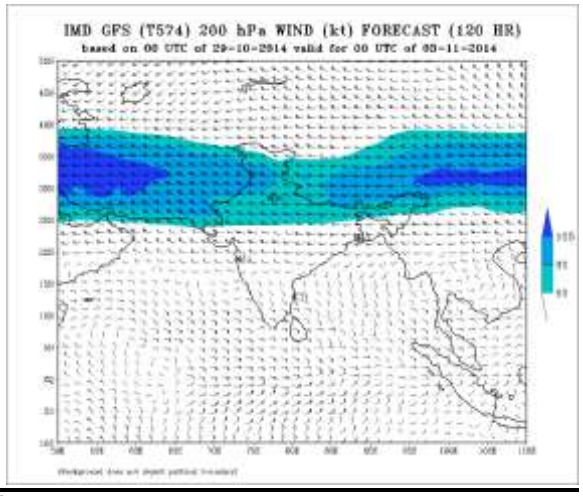
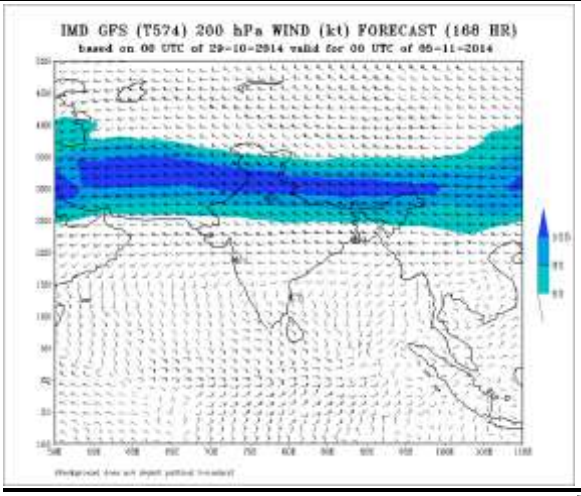
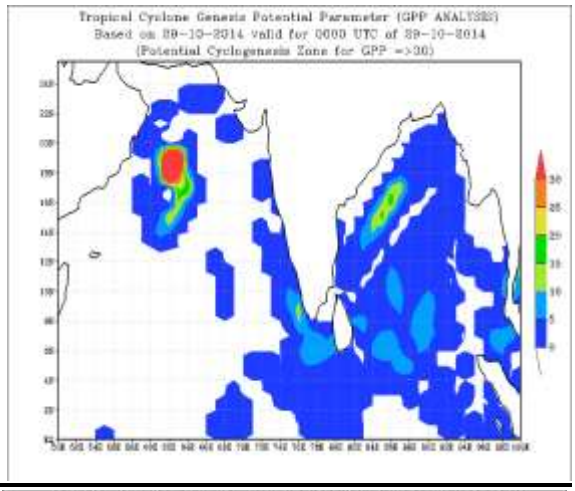
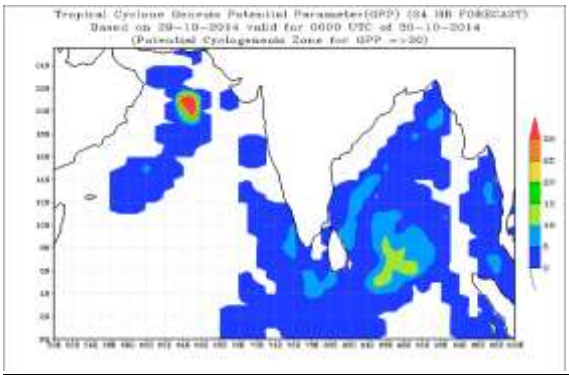

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 29-10-2014 valid for 00 UTC of 30-10-2014

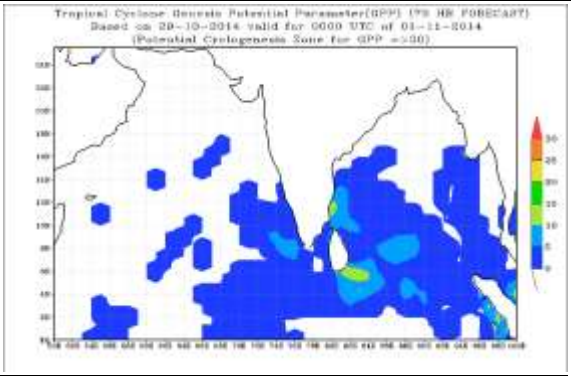

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 29-10-2014 valid for 00 UTC of 01-11-2014

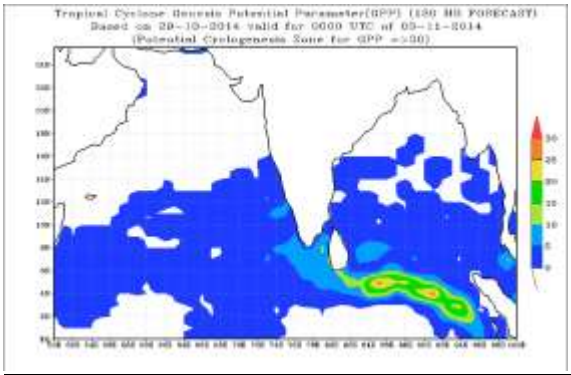

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 29-10-2014 valid for 00 UTC of 05-11-2014

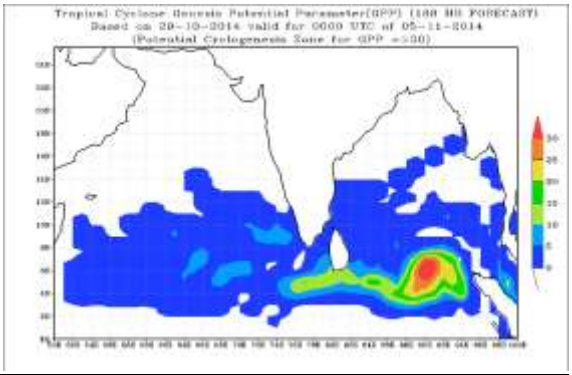

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 29-10-2014 valid for 00 UTC of 05-11-2014


Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 29-10-2014 valid for 0000 UTC of 29-10-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 29-10-2014 valid for 0000 UTC of 30-10-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 29-10-2014 valid for 0000 UTC of 01-11-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 29-10-2014 valid for 0000 UTC of 05-11-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (168 HR FORECAST)
Based on 29-10-2014 valid for 0000 UTC of 05-11-2014
(Potential Cyclogenesis Zone for GPP =>30)

FDP (Cyclone) NOC Report Dated 30 October, 2014

Synoptic features based on 0900 UTC:

- The severe cyclonic storm, 'NILOFAR' over northeast and adjoining central Arabian Sea remained practically stationary during past 3 hours, weakened into a cyclonic storm and lay centred at 1430 hours IST of today, the 30th October, 2014 near latitude 20.20 N and longitude 64.50 E, about 560 km southwest of Naliya (Gujarat) and 590 km south-southwest of Karachi (Pakistan). It would move northeastwards and weaken into a depression over northeast Arabian Sea off north Gujarat coast by 31st October evening.
- The trough of low at mean Sea level over southeast & adjoining central Bay of Bengal persists. Under its influence a low pressure area would form over central parts of south & adjoining southeast Bay of Bengal around 2nd November, 2014

Environmental features based on 0300 UTC of today:

Sea Surface Temperature:

- Sea Surface Temperature around the region of system is 28° C and it is about 29°C over east Arabian Sea.
- Surface Temperature is between 29 - 31^0C over entire Bay of Bengal and Andaman Sea.

Tropical Cyclone Heat Potential (TCHP):

- The TCHP is less than 50 kJ/cm^2 near the storm centre.
- The TCHP is between 70-100 kJ/cm^2 over Bay of Bengal except over north Bay of Bengal.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive (200 *10^{-5} s^{-1}) near around the system centre.

Convergence:

- Lower level convergence is positive of the order of 40*10^{-5} s^{-1} around the system centre.

Divergence:

- Upper level divergence is positive of the order of 50*10^{-5} s^{-1}.

Wind Shear:

- Wind Shear is 40 knots (high) around the region of the system centre and 20-80 knots area over the North Arabian Sea.
- Wind Shear is 5-10 knots over central Bay of Bengal and north Andaman Sea. It is about 20 kts over south Bay of Bengal and south Andaman Sea and it is between 20 - 30 knots area over the North Bay of Bengal.

Wind Shear Tendency:

- Wind shear tendencey is negative south of the system centre and is between - 5 to -10 kts.
- Wind shear over north Bay of Bengal is negative and is between - 5 to -10 kts.

Upper tropospheric ridge:

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

M.J.O. Index:

- Located in phase 2 with amplitude less than 1.0.
- Dynamical MJO Forecast**:** Likely to continue in phase 2 but with amplitude less than 1.

Storms and Depression over South China Sea:

- There is currently no Tropical Storm/Depression over South China Sea.

Status of observational system:

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

Satellite:

Inference based on INSAT imagery of 290900 UTC:

VORTEX over Arabian Sea : -

The Vortex (Nilofar) over central Arabian Sea & neighbourhood centred near Lat. 20.4°N/Long. 64.3°E. The intensity is T 2.5/ CI 3.5. Associated broken low and medium clouds with embedded intense to very intense convection over Arabian Sea between Lat 19.0°N to 24.0°N and Long. 63.5°E to 69.5°E (.) Minimum CTT minus 89 deg. C.

Rest of Arabian Sea: Broken low and medium clouds with embedded moderate to intense convection over southeast Arabian Sea and adjoining Indian Ocean between equator to Lat. 10.0°N and east of Long. 68.0°E.

Bay of Bengal & Andaman Sea :- Scattered low and medium clouds with embedded moderate to intense convection over south Bay, south of Lat 10.0°N and also over northeast Bay between Lat. 15.5°N to 20.0°N and Long 87.0°E to 94.0°E and east Andaman Sea.

NWP Analysis:-

Arabian Sea

- IMD-GFS model analysis based on 0000 UTC of 30th October 2014 shows a Cyclone over the west-central Arabian Sea. The 24 hrs forecast shows that the system will decrease in intensity in the lower levels, while its extension in the upper levels decreases into a trough at 500 hPa, with northeastward movement. The 48 hrs forecast valid for 31st October indicates further weakening of the system in the lower levels, and further north-westward movement of the system parallel to the west Gujarat coast. The system subsequently weakens into a low level cyclonic circulation and moves in a north-westerly direction during the subsequent 24 hours.
- IMD-WRF model analysis valid for 0000 UTC of 30th October 2014 also shows a Cyclone over the west-central Arabian Sea. However, the intensity of the system in the analysis field is higher. The system is likely to sharply de-intensify and move in a north-easterly direction towards the Gujarat coast during the next 24 hours. The intensity is likely to decrease thereafter, and the system will move as a low level cyclonic circulation parallel to the west Gujarat coast during the next 48 hours till 2nd November, 2014.
- The Genesis Potential Parameter (GPP) forecasts based on 0000 UTC of 30th October 2014 shows cyclogenesis zone over the west-central Arabian Sea. The zone has northeasterly movement during the next 24 hours till 30th October with substantial weakening of the system. The system weakens further and no cyclogenesis zone is visible in the 48 hour 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

- MME: The system would northeastwards upto 30th and then southwestwards and lay as a Depression over north Arabian Sea by 1st Nov.

- NCEP-GFS: The system would move northeastwards upto 31st Oct. and then westwards upto 1st Nov and lay over north Arabian Sea.
- ECMWF: The system would move northeastwards upto 31st Oct and then northwards on 1st November 2014.
- JMA: JMA model also shows northeastward movement upto 31st Oct. and then west to northwestward movement on 1st Nov.
- Most of the models are unanimous about weakening of the system over the Sea area.
- **Bay of Bengal**
- IMD-GFS model shows formation of a low pressure area on 2nd November 2014 over southeast Bay of Bengal that would be well-marked on 3rd and a depression on 4th November over central parts of south Bay of Bengal. It would move intensify into a marginal cyclone and would move towards Tamil Nadu coast during subsequent 3 days.
- IMD-WRF model shows formation of a low pressure area on 2nd November over central parts of south Bay of Bengal.
- NCMRWF model shows formation of low pressure area and intensification as shown by the IMD-GFS.
- Meteo-France ARP model shows formation of a low pressure area over central parts of south Bay of Bengal on 2nd November.
- JMA model also shows formation of a low pressure area over central parts of south Bay of Bengal.
- NCUM model (NCMRWF-UKMO) shows formation of a low pressure area on 30th October over southwest Bay of Bengal which would intensify into a depression and move gradually northwestwards reaching North Tamil Nadu and South Andhra Pradesh coast. The system would persist over the same region till 7th November.
- ECMWF model shows formation of a well-marked low pressure area / depression on 8th November over southwest and adjoining westcentral Bay of Bengal which would move towards Andhra Pradesh coast near Machilipatnam on 9th.

Summary and Conclusion:-

Arabian Sea

- As per the present synoptic conditions, the system would move northeastwards and weaken into a depression over northeast Arabian Sea off north Gujarat coast by 31st October evening.

Bay of Bengal

- There is a high probability of formation of a low pressure area over central parts of south Bay of Bengal on 2nd November 2014. It would intensify into a depression into a depression on 4th November and may intensify further also. The system is to be monitored continuously for further development.

Western Pacific.

- JTWC has issued tropical cyclone formation alert for the western Pacific formation of a significant tropical cyclone is possible within 125 nm either side of a line from 12.9°N 140.4°E to 13.3°N 134.1°E within 24 hours. This system also needs to be continuously monitored.

Advisory:

1. Intense observations may be taken along and off Gujarat and Pakistan coast during 31st October – 1st Nov. 2014.

2. No IOP for Bay of Bengal at present.

Annexure-I

Status of Observation system:
Synoptic observation:

Region	Date/Time (UTC)		
	29/12	**30/00**	**30/03**
India	79	63	78
Coastal stations			
WB	8	3	7
Odisha	7	5	7
AP	13	13	13
Tamil Nadu	11	8	11
Puducherry	2	2	2
A & N	6	1	6
Bangladesh	11	10	11
Myanmar	10	11	11
Thailand	2	2	2
Sri Lanka	9	8	8

AWS Observations:

Region	Date/Time (UTC)		
	29/12	**30/00**	**30/03**
India	71	68	78
Coastal stations			
WB	8	8	10
Odisha	7	6	12
AP	29	27	28
Tamil Nadu	26	26	27
Puducherry	1	1	1
A & N	-	-	-

- **RS/RW** (12Z) of 29/10/2014 **-1/39**
- **No. of Ascents reaching 250 hPa levels: - 1, MISDA: 38**
- **RS/RW** (00Z) of 30/10/2014 19**/39**
- **No. of Ascents reaching 250 hPa levels: 7 , MISDA: 20**

No. of PILOT Ascents

29/12Z	30/00Z
7	9

Buoy Data

29/12Z	30/00Z	30/03Z
12	10	12

No. of Synop data over Chennai region

Date→	29.10.2014							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	20	22	20	20	22	20	20	20

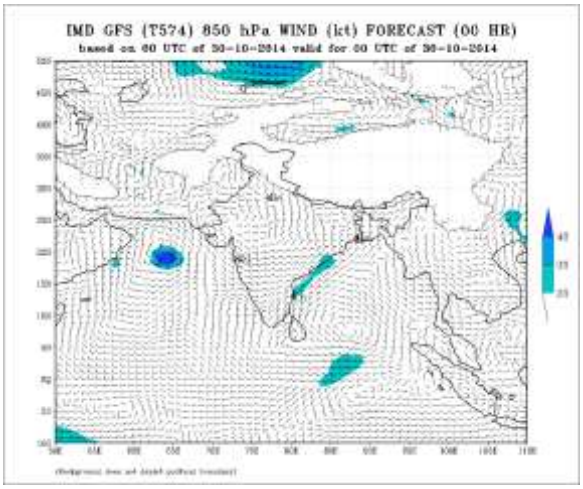
No. of RS/RW Ascents
00Z /29.10.2014 : 1
No. of Ascents reaching 250 hPa level = 1
MISDA : 7

12Z /29.10.2014 : --
No. of Ascents reaching 250 hPa level = --
MISDA : 8

No. of PILOT Ascents:

29.10.2014	
06Z	18Z
3	3

Annexure-II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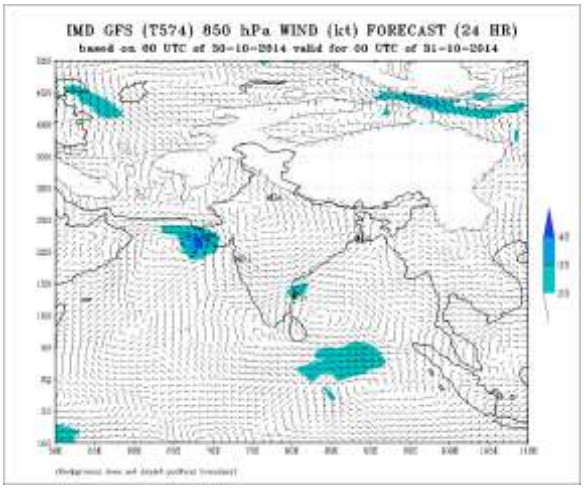
based on 00 UTC of 30-10-2014 valid for 00 UTC of 30-10-2014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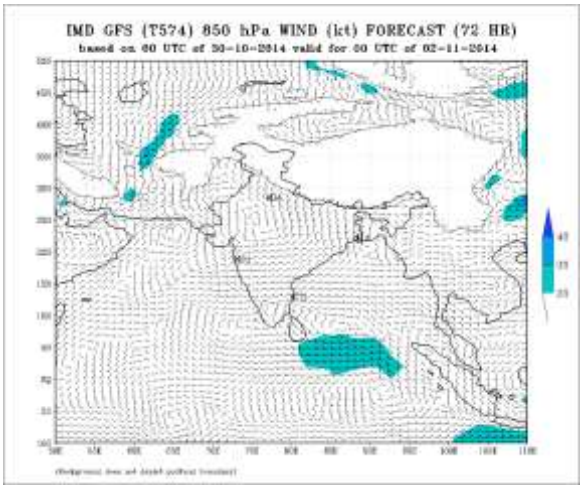
IMD GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
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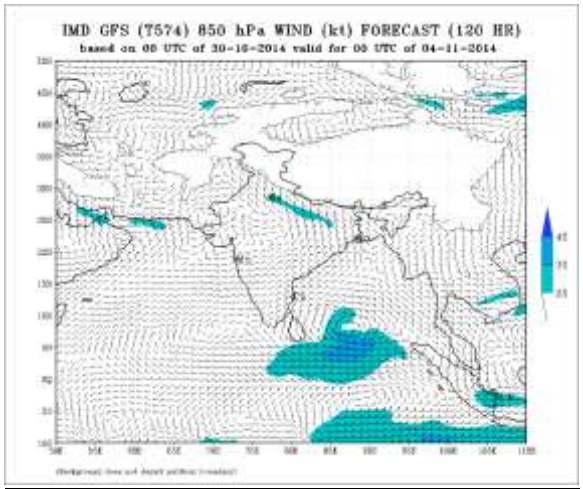
IMD GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
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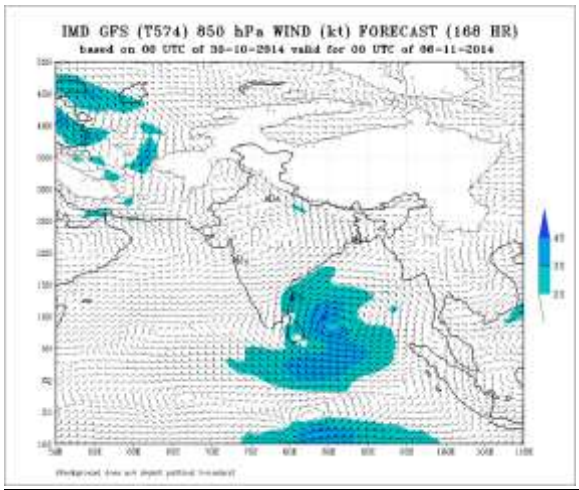
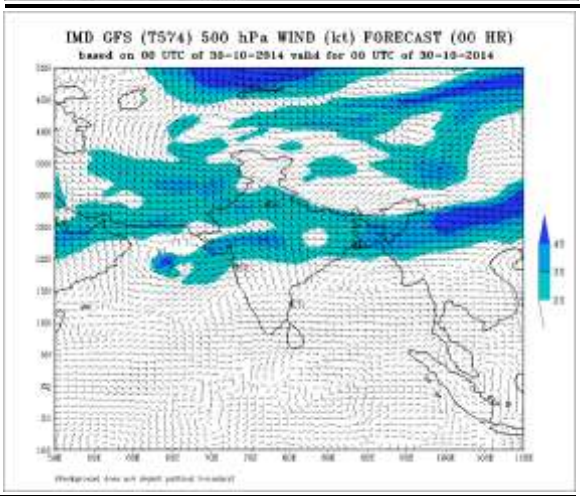
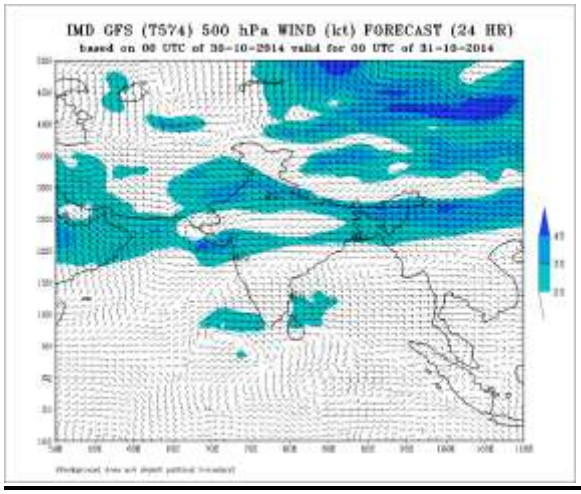
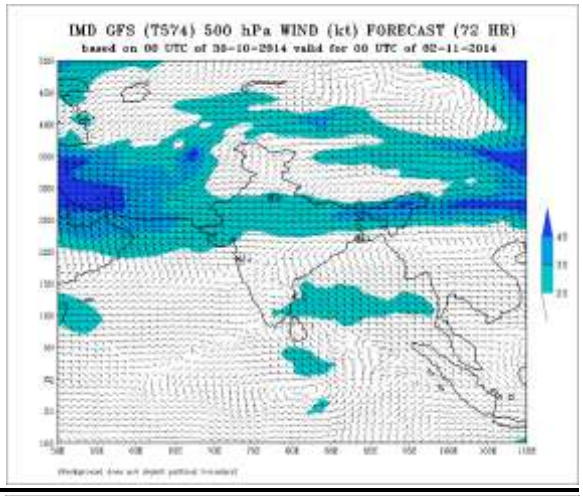
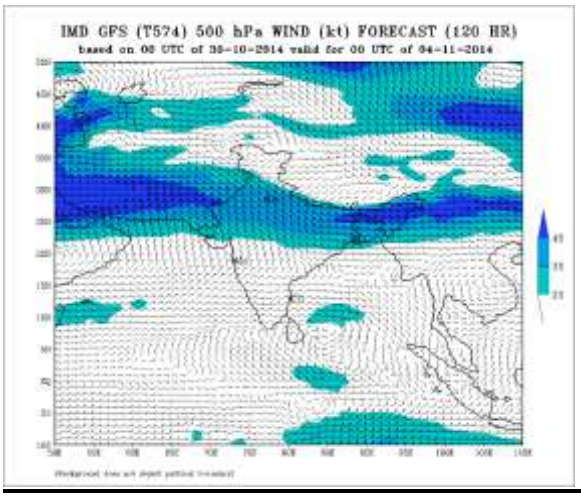

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 30-10-2014 valid for 00 UTC of 06-11-2014


IMD GFS (T574) 500 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 30-10-2014 valid for 00 UTC of 30-10-2014


IMD GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 30-10-2014 valid for 00 UTC of 31-10-2014


IMD GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 30-10-2014 valid for 00 UTC of 02-11-2014


IMD GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
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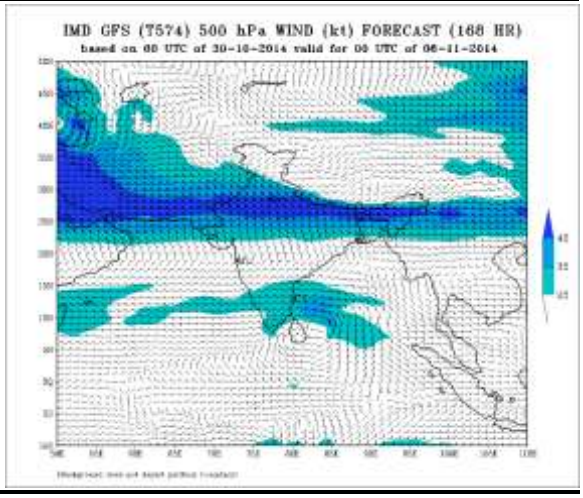
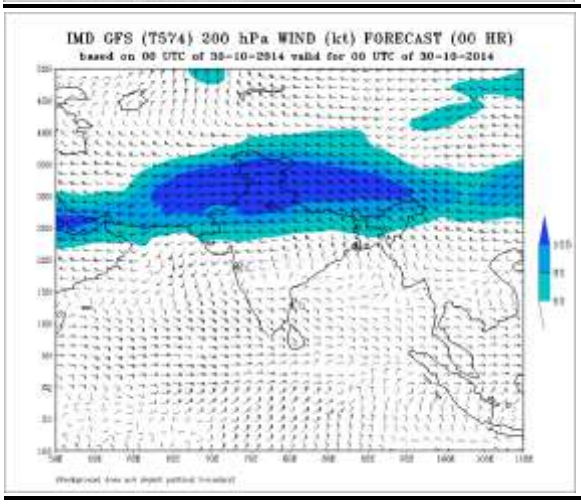
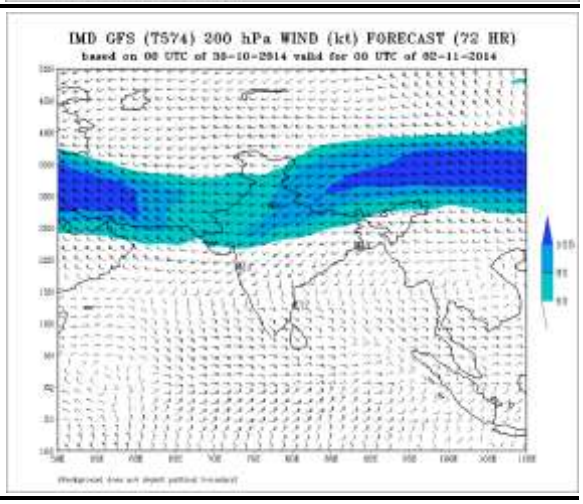

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 30-10-2014 valid for 00 UTC of 06-11-2014


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 30-10-2014 valid for 00 UTC of 30-10-2014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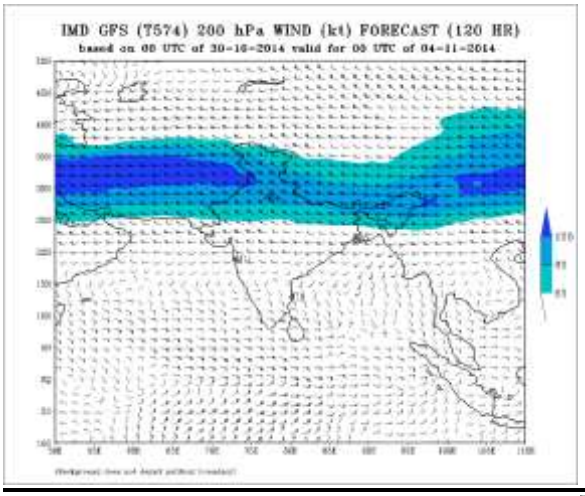
IMD GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
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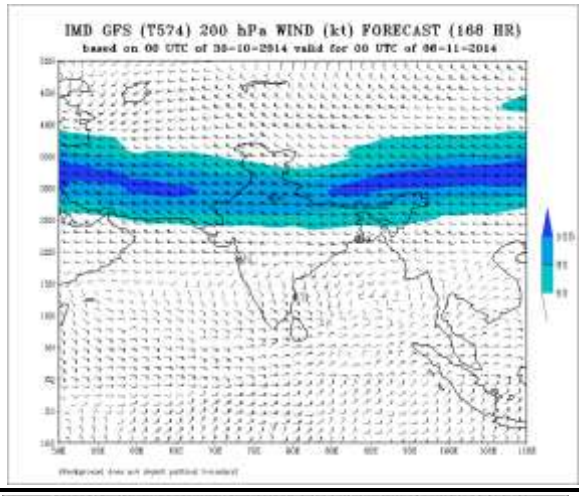
IMD GFS (T574) 200 hPa WIND (kt) FORECAST (168 HR)
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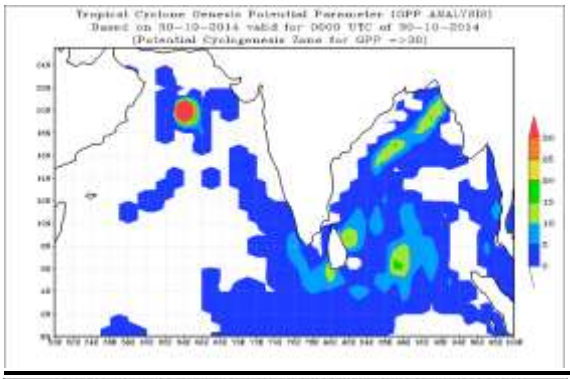
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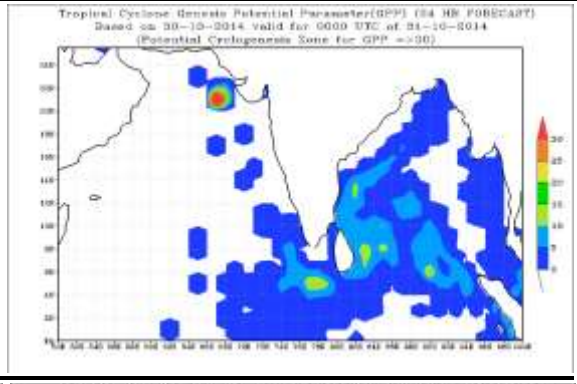
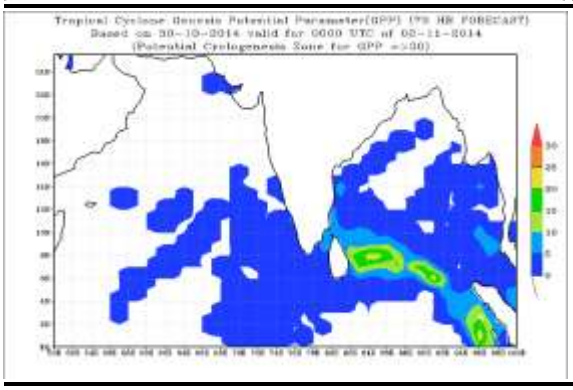
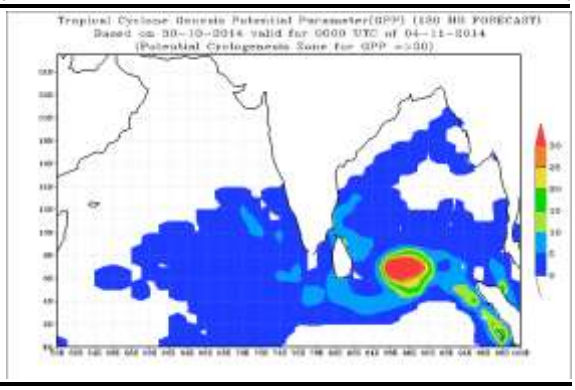
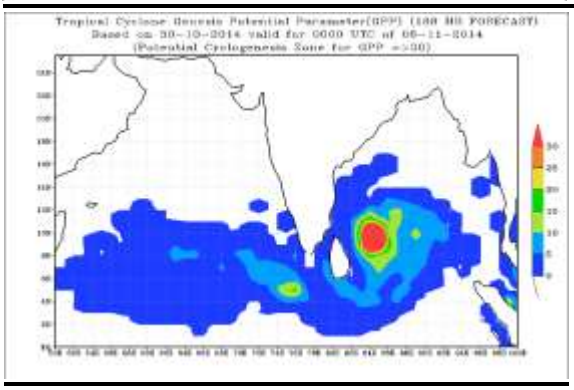

Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 30-10-2014 valid for 0000 UTC of 31-10-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 30-10-2014 valid for 0000 UTC of 02-11-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 30-10-2014 valid for 0000 UTC of 04-11-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (168 HR FORECAST)
Based on 30-10-2014 valid for 0000 UTC of 06-11-2014
(Potential Cyclogenesis Zone for GPP =>30)

FDP (Cyclone) NOC Report Dated 31October, 2014

Synoptic features based on 0900 UTC:

- The Depressionover northeast Arabian Sea moved northeastwards and weakened into a well-marked low pressure area over northeast Arabian Sea at 0830 hours IST of today, the 31th October, 2014.

Environmental features based on 0300 UTC of today:

Sea Surface Temperature:

- Sea Surface Temperature is about 28°C near north Gujarat and adjoining Pakistan coast.
- Sea Surface Temperature is between 29 -31^{0}C over entire Bay of Bengal and Andaman Sea.

Tropical Cyclone Heat Potential (TCHP):

- The TCHP is less than 50 kJ/cm^{2}near the storm centre.
- The TCHP is between 70-110 kJ/cm^{2}over Bay of Bengal except over north Bay of Bengal.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive (30-70 *10^{-5} s^{-1}) over southwest bay extending to westcentral bay.

Convergence:

- Lower level convergence is positive of the order of 10 - 15*10^{-5} s^{-1}over southwest bay and 5 – 10*10^{-5} s^{-1} over northeast Arabian Sea.

Divergence:

- Upper level divergence is positive of the order of 20 - 30*10^{-5} s^{-1} over southwest bay.

Wind Shear:

- Wind Shear is.40-60 knots area over the North Arabian Sea.
- Wind Shear is 5-20 knots over westcentral Bay and north Andaman Sea and it is 20-50 knots area over the North Bay of Bengal.

Wind Shear Tendency:

- There is increase in vertical wind shear north Arabian Sea and it is about 5 knots. and there is decrease in wind shear over eastcentral bay adjoining bay islands.

Upper tropospheric ridge:

- The upper tropospheric **ridge** at 200 hPapasses through Lat.17.0°N.

M.J.O. Index:

- Located in phase 2with amplitude lessthan1.0. Likely to continue in phase 2 but with amplitude less than 1.

Storms and Depression over South China Sea:

- There is currently no Tropical Storm/Depression over South China Sea.

Status of observational system:

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

Satellite:

Inference based on INSAT imagery of 310900 UTC:

The Vortex (Nilofar) over northeast Arabian Sea and neighbourhood nowcentred near Lat. 21.4°N/Long. 65.5°E, The intensity is T 1.0 shear pattern .Associated broken low and medium

clouds with embedded intense to very intense convection over Arabian Sea betweenLat.21.0°N to 23.5°N east of and Long.65.0°Eand broken low medium clouds with embedded moderate to intense convection over Gujrat adjoining southeast pak and gulf of Kutch.
Broken low medium clouds with embedded moderate to intense convection over southeast Arabian Sea south of Lat 10.0°N east of Long 71.0°E (.)

Bay of Bengal & Andaman Sea :-

Broken low low and medium clouds with embedded intense to very intense convection over Bay between Lat 7.0°N to Lat. 15.5°N, west of Long 89.0°E,in association with low level circulation over the area .Scattered low and medium clouds with embeddedmoderate to intense convection over rest south bay and southwest Andaman Sea.

NWP Analysis:-

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
Most of the NWP models suggest the formation of a low pressure area over southwest Bay of Bengal within next 48 hrs. Some models suggest further intensification.

Summary and Conclusion:-

As per the present synoptic conditions and model guidance, a low pressure may form, over southwest Bay of Bengal within next 48 hrs. Some models suggest further intensification.

Advisory: The possible formation of low pressure area over southwest Bay needs continuous watch for further intensification. NO IOP is declared at present.

Annexure-I

Status of Observation system:

Synoptic observation:

Region	Date/Time (UTC)		
	30/12	**31/00**	**31/03**
India	41	35	43
Coastal stations			
WB	6	4	7
Odisha	7	5	7
AP	11	11	12
Tamil Nadu	8	7	10
Puducherry	2	2	2
A & N	6	2	5
Bangladesh	10	9	10
Myanmar	10	10	11
Thailand	2	2	2
Sri Lanka	8	8	8

AWS Observations:

Region	Date/Time (UTC)		
	30/12	**31/00**	**31/03**
India	64	62	65
Coastal stations			
WB	8	8	9
Odisha	3	3	6
AP	28	26	24
Tamil Nadu	24	24	25
Puducherry	1	1	1
A & N	-	-	-

- **RS/RW** (12Z) of 30/10/2014**-1/39**
- **No. of Ascents reaching 250 hPa levels:- 1, MISDA: 38**
- **RS/RW** (00Z) of 31/10/201420**/39**
- **No. of Ascents reaching 250 hPa levels: 7 , MISDA:11**

No. of PILOT Ascents

30/12Z	31/00Z
7	9

Buoy Data

30/12Z	31/00Z	31/03Z
12	10	12

No. of Synop data over Chennai region

Date→	**31.10.2014**							
UTC→	**00**	**03**	**06**	**09**	**12**	**15**	**18**	**21**
Chennai Region (Coasts of AP & TN)	**20**	**22**	**20**	**20**	**22**	**20**	**20**	**19**

No. of RS/RW Ascents

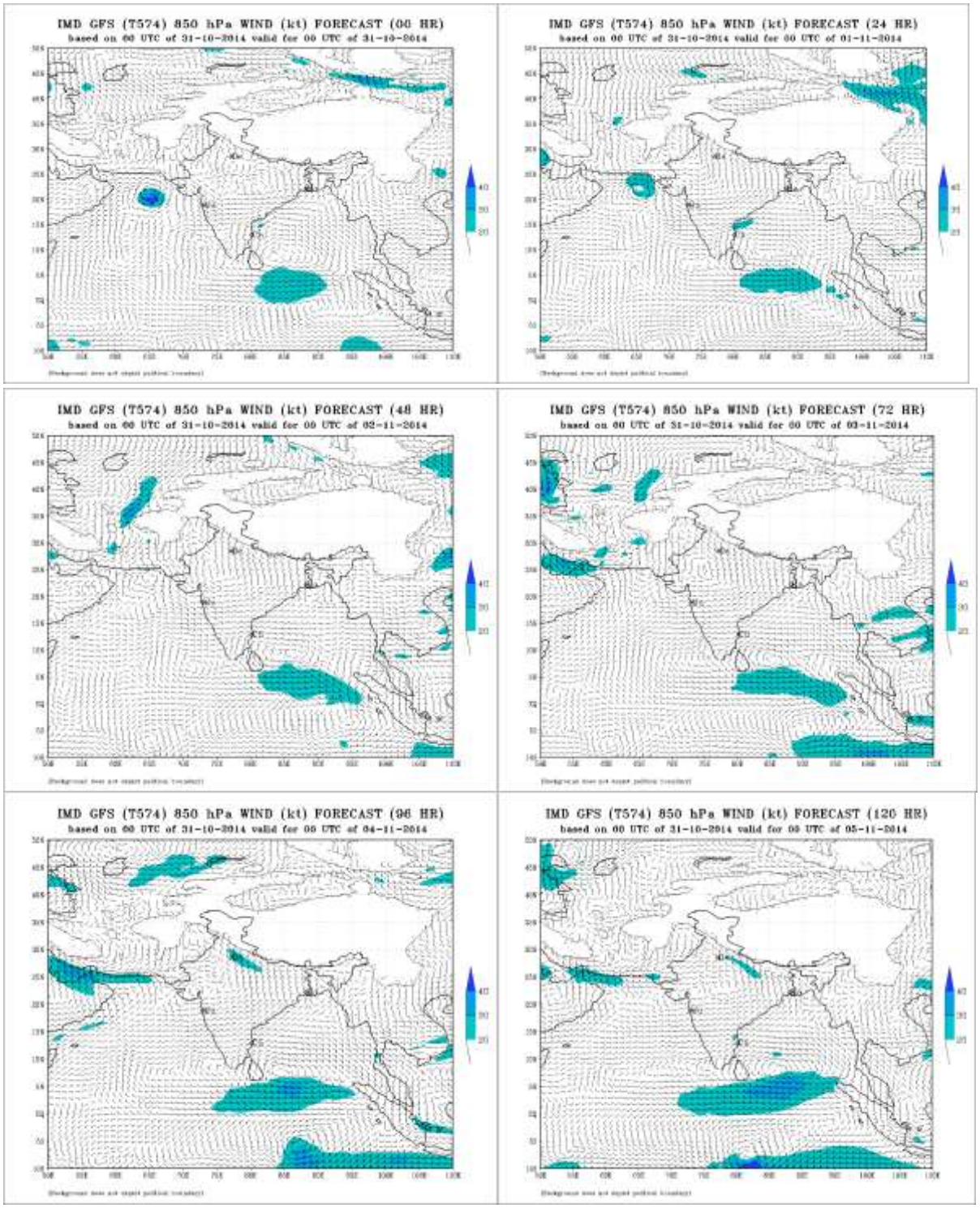
00Z /31.10.2014 : 1
No. of Ascents reaching 250 hPa level = 1
MISDA : 7

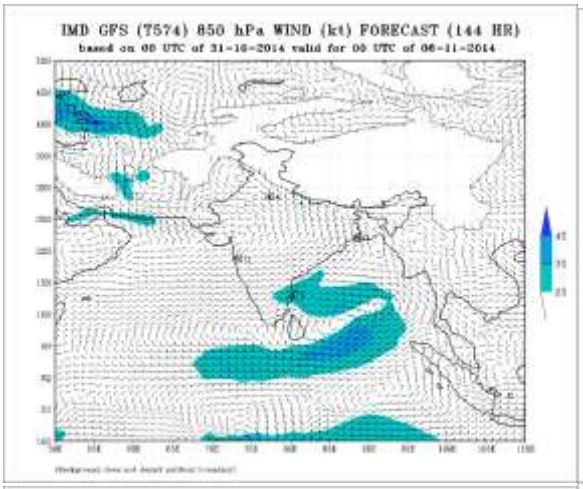
12Z /30.10.2014 : --
No. of Ascents reaching 250 hPa level = --
MISDA : 8

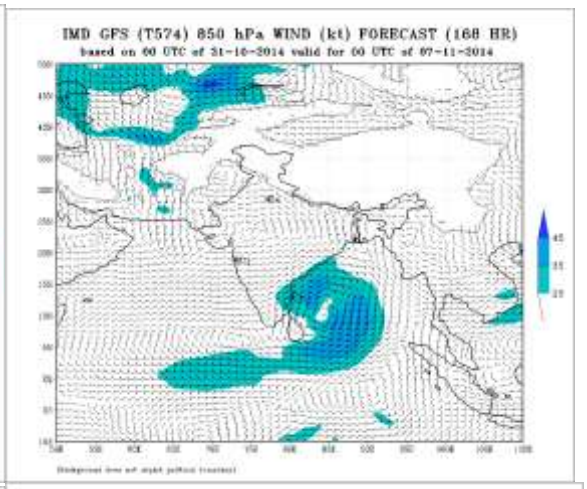
No. of PILOT Ascents:

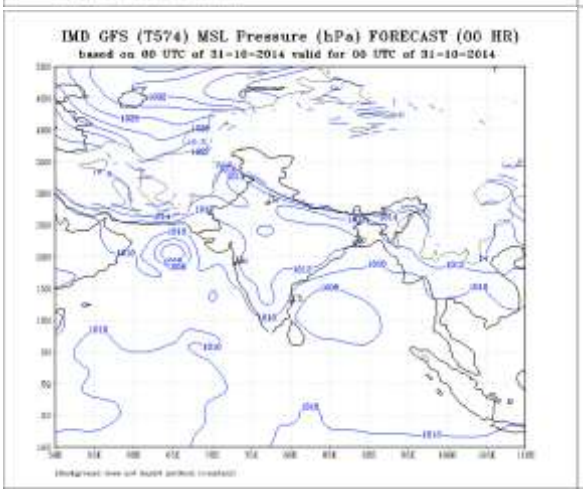
30.10.2014	
06Z	18Z
4	4

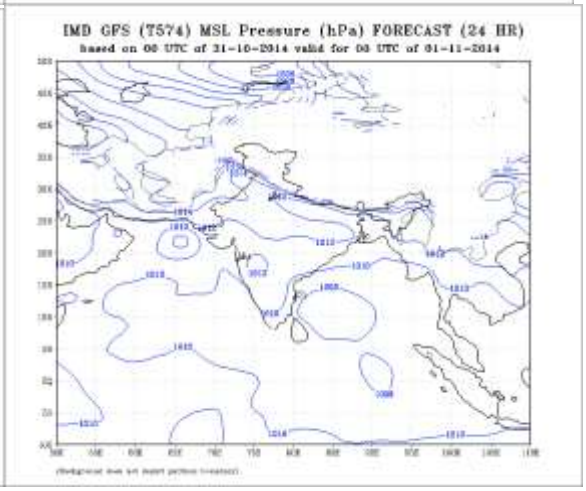
Annexure-II

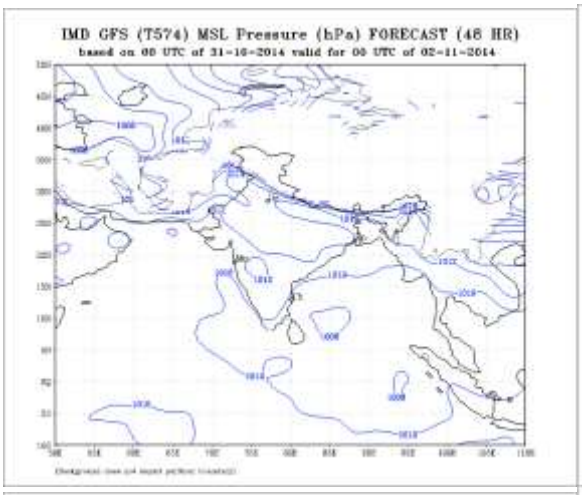

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 31-10-2014 valid for 00 UTC of 31-10-2014
IMD GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 31-10-2014 valid for 00 UTC of 01-11-2014
IMD GFS (T574) 850 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 31-10-2014 valid for 00 UTC of 02-11-2014
IMD GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 31-10-2014 valid for 00 UTC of 03-11-2014
IMD GFS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 31-10-2014 valid for 00 UTC of 04-11-2014
IMD GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 31-10-2014 valid for 00 UTC of 05-11-2014

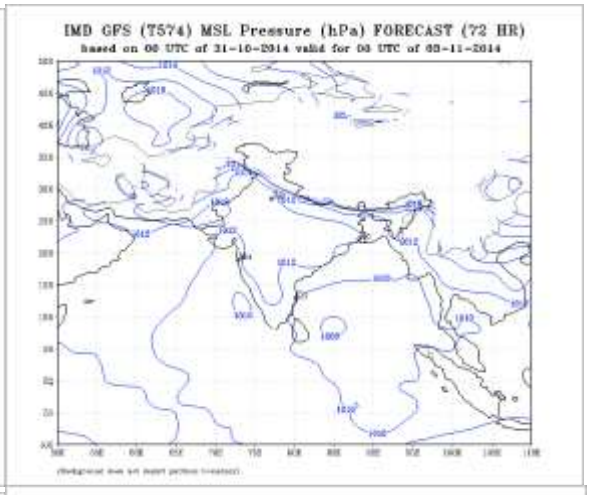

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (144 HR)
based on 00 UTC of 31-10-2014 valid for 00 UTC of 06-11-2014

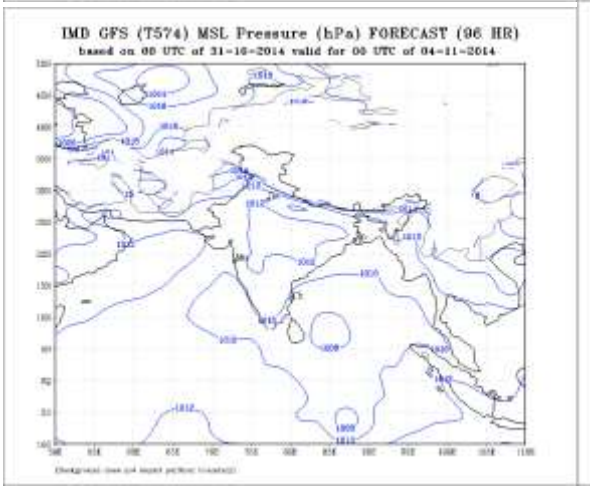

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 31-10-2014 valid for 00 UTC of 07-11-2014

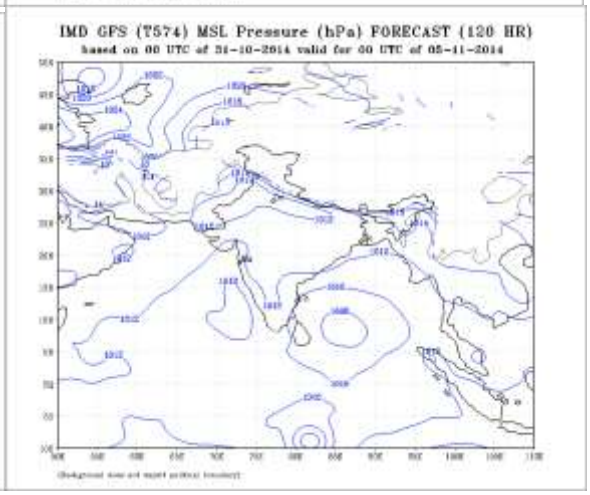

IMD GFS (T574) MSL Pressure (hPa) FORECAST (00 HR)
based on 00 UTC of 31-10-2014 valid for 00 UTC of 31-10-2014

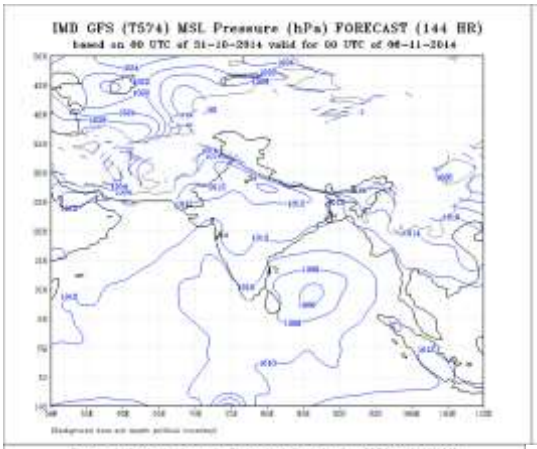

IMD GFS (T574) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 31-10-2014 valid for 00 UTC of 01-11-2014

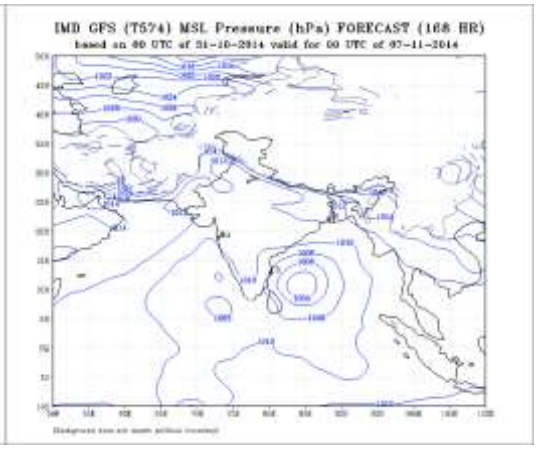

IMD GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 31-10-2014 valid for 00 UTC of 02-11-2014

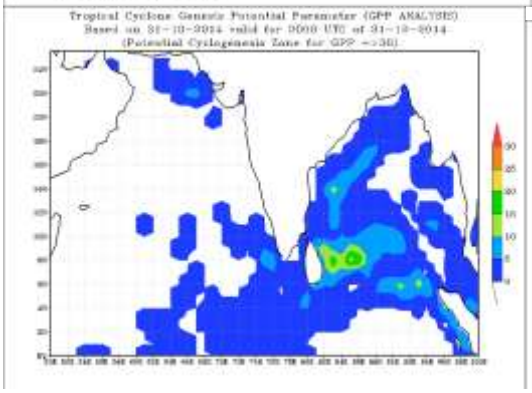

IMD GFS (T574) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 31-10-2014 valid for 00 UTC of 03-11-2014

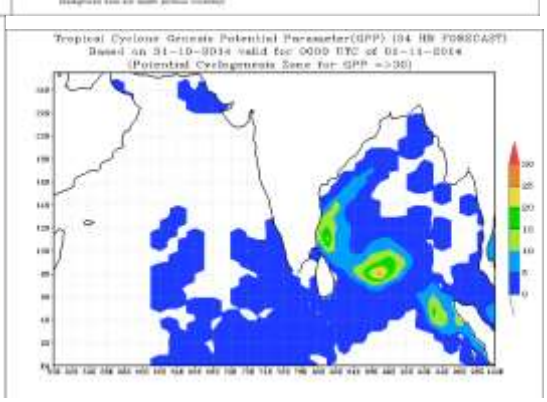

IMD GFS (T574) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 31-10-2014 valid for 00 UTC of 04-11-2014

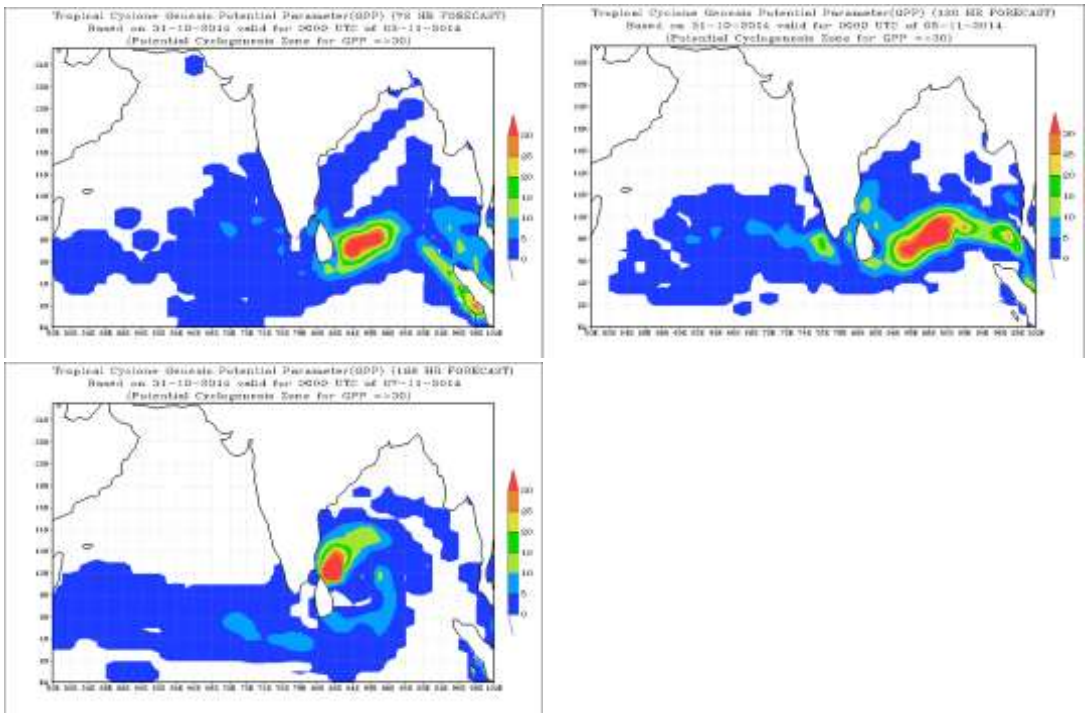

IMD GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 31-10-2014 valid for 00 UTC of 05-11-2014


IMD GFS (T574) MSL Pressure (hPa) FORECAST (144 HR)
based on 00 UTC of 31-10-2014 valid for 00 UTC of 06-11-2014


IMD GFS (T574) MSL Pressure (hPa) FORECAST (168 HR)
based on 00 UTC of 31-10-2014 valid for 00 UTC of 07-11-2014


Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 31-10-2014 valid for 0000 UTC of 31-10-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (04 HR FORECAST)
Based on 31-10-2014 valid for 0000 UTC of 01-11-2014
(Potential Cyclogenesis Zone for GPP =>30)



FDP (Cyclone) NOC Report Dated 01 November, 2014

Synoptic features based on 0900 UTC:

- The low pressure area over northeast & adjoining northwest Arabian Sea persists. The associated upper air cyclonic circulation extending upto 3.6 km above mean Sea level also persists.
- The upper air cyclonic circulation over Lakshadweep & adjoining Comorin area extending upto 3.1 km above mean Sea level persists.
- The trough of low at mean Sea level over southwest Bay of Bengal off south Andhra-north Tamilnadu coasts persists.

Environmental features based on 0300 UTC of today:

Sea Surface Temperature:

- Sea Surface Temperature is about 28°C near north Arabian Sea.
- Sea Surface Temperature is between 29 -31^{0}C over entire Bay of Bengal and Andaman Sea.

Tropical Cyclone Heat Potential (TCHP):

- The TCHP is between 110-140 kJ/cm^{2}over south Andaman Sea except over north Bay of Bengal.
- The TCHP is between 40-50 kJ/cm^{2}over central and north Arabian Sea.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive (30-50 *10^{-5} s^{-1}) over southwest bay extending to westcentral bay.

Convergence:

- Lower level convergence is positive of the order of 5 - 10*10^{-5} s^{-1}over southwest bay.

Divergence:

- Upper level divergence is positive of the order of 5 - 10*10^{-5} s^{-1} over southwest bay.

Wind Shear:

- Wind Shear is above 30 knots area over the North Arabian Sea.
- Wind Shear is around 20 knots over south west bay.

Wind Shear Tendency:

- There is increase in vertical wind shear about 5 knots over north Arabian Sea and 5 – 10 knots over southwest bay of Bengal

Upper tropospheric ridge:

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

M.J.O. Index:

- Located in phase 2 with amplitude lessthan1.0. Likely to continue in phase 2 but with amplitude more than 1.

Storms and Depression over South China Sea:

- There is currently no Tropical Storm/Depression over South China Sea.

Status of observational system:

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

Satellite:

Inference based on INSAT imagery of 010900 UTC:

- Scattered low/medium clouds with embedded isolated weak convection over north Arabian Sea adjoining northwest Gujarat southeast Pakistan in association with low level circulation over the area.
- Broken low/medium clouds with embedded moderate to intense convection over west central adjoining south west bay between latitude 13.0°N to 18.0°N west of longitude 86.5°E coastal Andhra Pradesh in association with another low level circulation over the area.

NWP Analysis:-

- IMD-GFS model analysis based on 0000 UTC of 01st November 2014 shows no zone of cyclogenesis over the Indian region. Yesterday's deep depression over the north-central Arabian Sea has further weakened into a low level cyclonic circulation off the west coast of Gujarat and adjoining Pakistan. It will weaken further over the next 24 hours and will become a trough in the lower levels in the 48 hour forecast valid for 03 November 2014. There is a fresh zone of potential cyclogenesis over the south-east Bay of Bengal in the 72 hours forecast valid for 04 November 2014, along 5 deg.N and 92 deg.E. The system is likely to intensify into a tropical cyclone and move in a northwesterly direction towards the east Indian peninsula over the subsequent days.
- IMD-WRF model analysis valid for 0000 UTC of 01st November 2014 also shows further weakening of the Tropical cyclone over the west-central Arabian Sea. The system is likely to weaken further over the next 72 hours. WRF model also shows the development of a

fresh cyclonic circulation over the south-east Bay of Bengal, off the coast of Sri Lanka in the 72 hour forecast.

- The Genesis Potential Parameter (GPP) forecasts based on 0000 UTC of 01st November 2014 shows no cyclogenesis zone over the Indian Seas over the next 24 hours. However, a fresh cyclogenesis zone develops over the over the south-east Bay of Bengal during the subsequent 48 hours. This zone appears to persist and intensify over the subsequent days and will move in a a north-westerly direction towards the Indian coast.

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
Most of the NWP models suggest the formation of a low pressure area over southwest Bay of Bengal within next 48 hrs. Some models suggest further intensification.

Summary and Conclusion:-
As per the present synoptic conditions and model guidance, a low pressure may form, over southeast Bay of Bengal within next 48 hrs. Some models suggest further intensification.

Advisory: The possible formation of low pressure area over southeast Bay needs continuous watch for further intensification. NO IOP is declared at present.

Annexure-I

Status of Observation system:
Synoptic observation:

Region	Date/Time (UTC)		
	31/12	01/00	01/03
India	41	35	43
Coastal stations			
WB	6	4	7
Odisha	7	5	7
AP	11	11	12
Tamil Nadu	8	7	10
Puducherry	2	2	2
A & N	6	2	5
Bangladesh	10	9	10
Myanmar	10	10	11
Thailand	2	2	2
Sri Lanka	8	8	8

AWS Observations:

Region	Date/Time (UTC)		
	31/12	01/00	01/03
India	64	62	65
Coastal stations			
WB	8	8	9
Odisha	3	3	6
AP	28	26	24
Tamil Nadu	24	24	25
Puducherry	1	1	1
A & N	-	-	-

- **RS/RW** (12Z) of 30/10/2014**-1/39**
- **No. of Ascents reaching 250 hPa levels:- 1, MISDA: 38**
- **RS/RW** (00Z) of 01/10/201420**/39**
- **No. of Ascents reaching 250 hPa levels: 7 , MISDA:11**

No. of PILOT Ascents

31/12Z	01/00Z
7	9

Buoy Data

31/12Z	01/00Z	01/03Z
12	10	12

No. of Synop data

Date→	**31.10.2014**							
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 /31.10.2014 : 1

No. of Ascents reaching 250 hPa level = 1

MISDA : 7

12Z /31.10.2014 : --

No. of Ascents reaching 250 hPa level = --

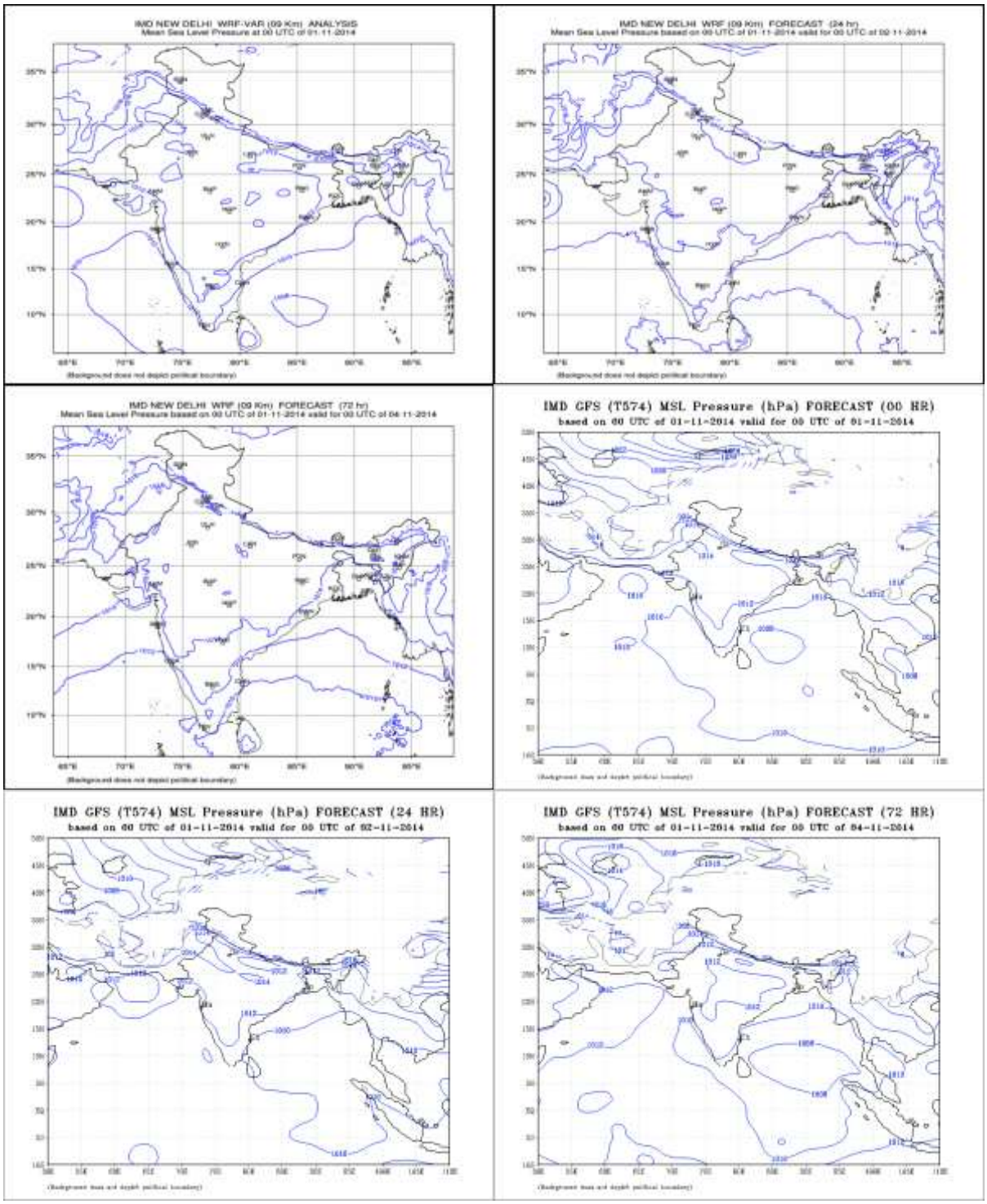
MISDA : 8

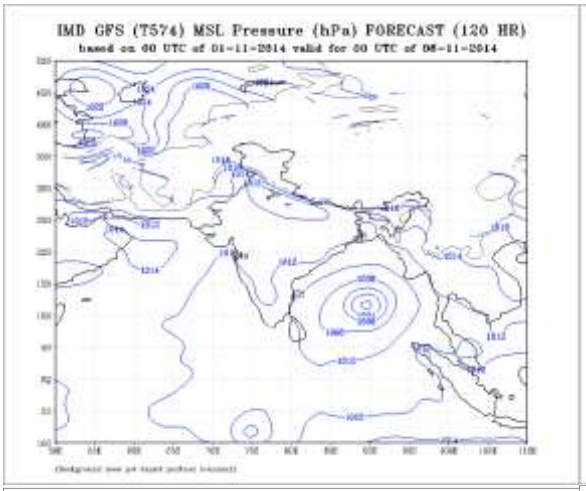
No. of PILOT Ascents:

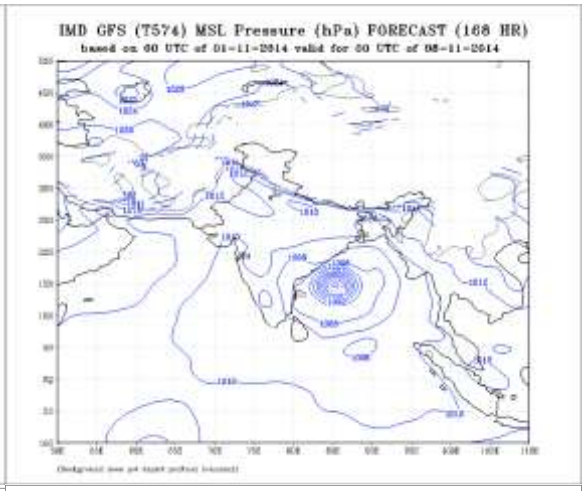
31.10.2014

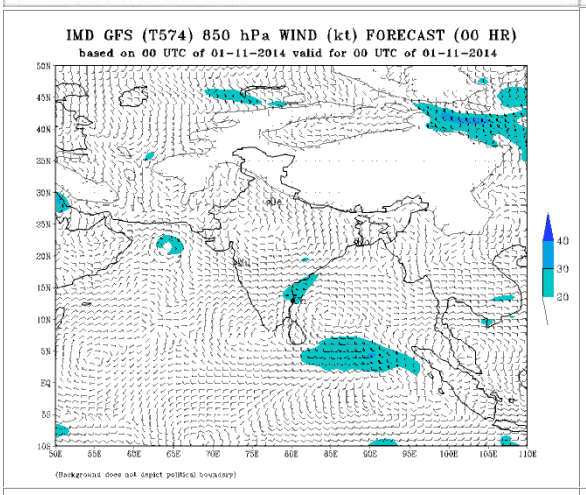
06Z	18Z
4	3

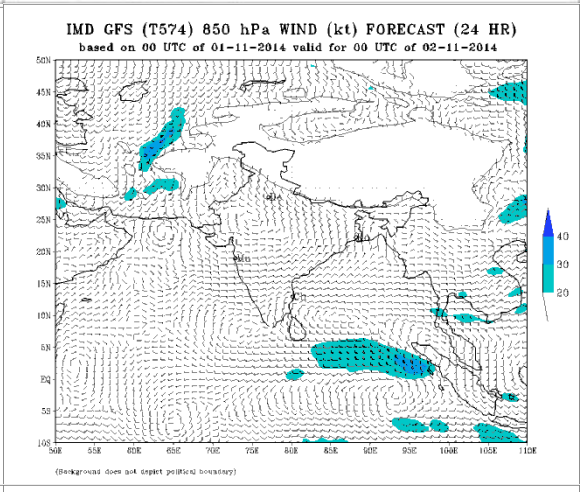
Annexure-II

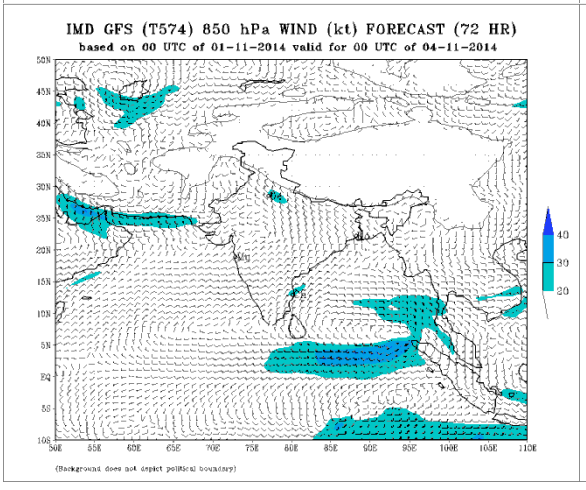

IMD NEW DELHI WRF-VAR (09 Km) ANALYSIS
Mean Sea Level Pressure at 00 UTC of 01-11-2014
IMD NEW DELHI WRF (09 Km) FORECAST (24 hr)
Mean Sea Level Pressure based on 00 UTC of 01-11-2014 valid for 00 UTC of 02-11-2014
IMD NEW DELHI WRF (09 Km) FORECAST (72 hr)
Mean Sea Level Pressure based on 00 UTC of 01-11-2014 valid for 00 UTC of 04-11-2014
IMD GPS (T574) MSL Pressure (hPa) FORECAST (00 HR)
based on 00 UTC of 01-11-2014 valid for 00 UTC of 01-11-2014
IMD GPS (T574) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 01-11-2014 valid for 00 UTC of 02-11-2014
IMD GPS (T574) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 01-11-2014 valid for 00 UTC of 04-11-2014

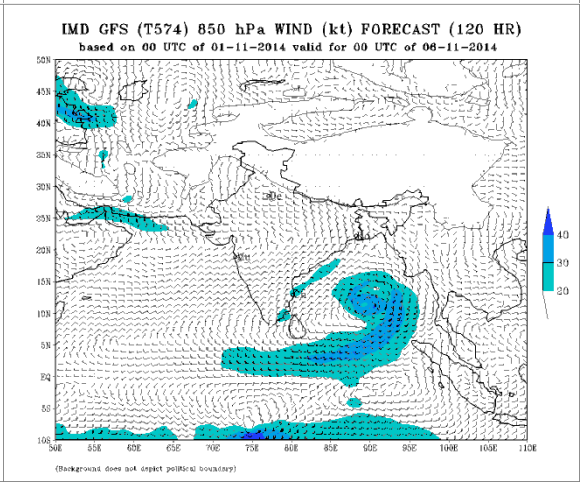

IMD GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 01-11-2014 valid for 00 UTC of 06-11-2014

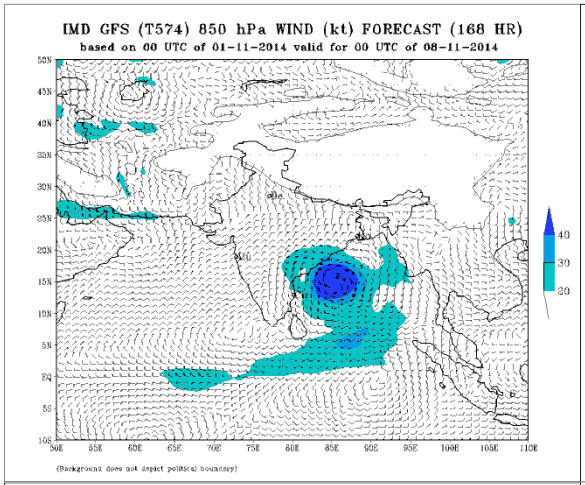

IMD GFS (T574) MSL Pressure (hPa) FORECAST (168 HR)
based on 00 UTC of 01-11-2014 valid for 00 UTC of 08-11-2014

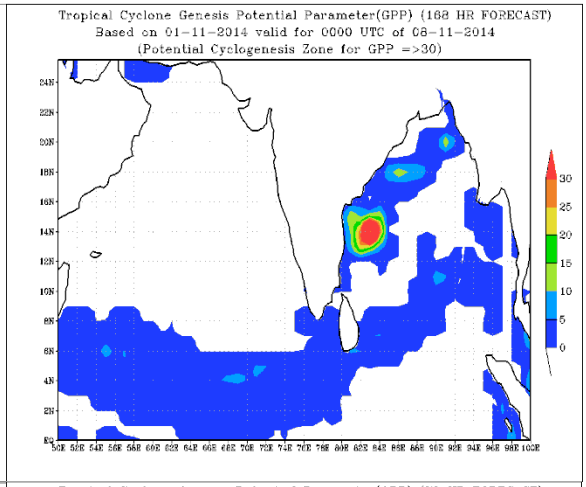

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 01-11-2014 valid for 00 UTC of 01-11-2014
40
30
20

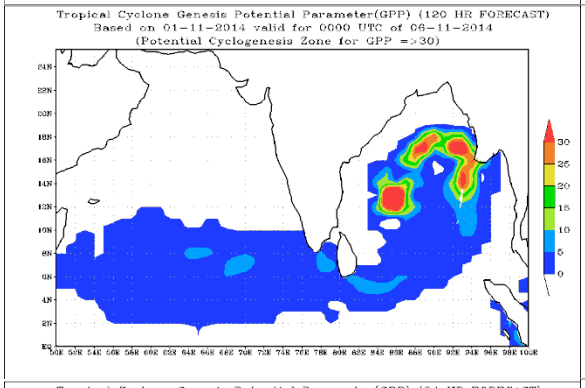

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 01-11-2014 valid for 00 UTC of 02-11-2014
40
30
20

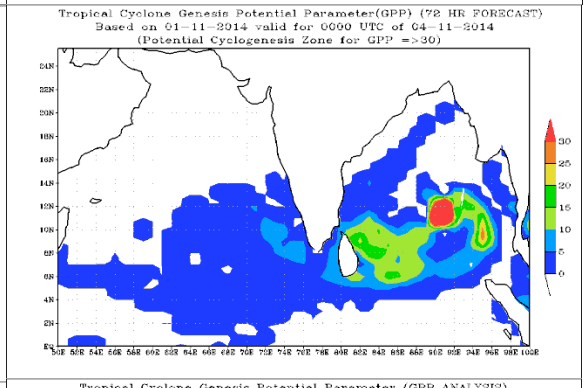

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 01-11-2014 valid for 00 UTC of 04-11-2014
40
30
20

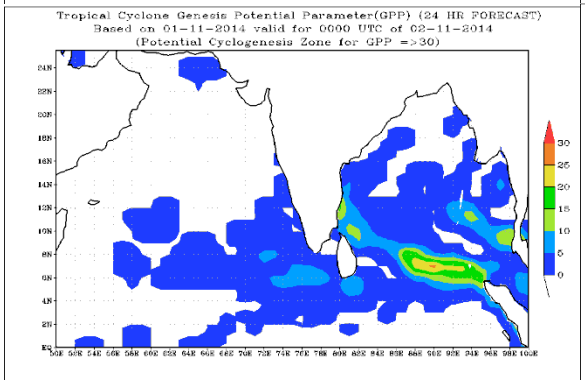

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 01-11-2014 valid for 00 UTC of 06-11-2014
40
30
20

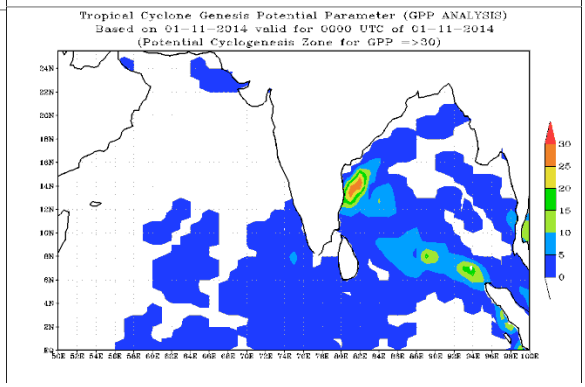

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 01-11-2014 valid for 00 UTC of 08-11-2014
40
30
20
(Background does not depict political boundary)


Tropical Cyclone Genesis Potential Parameter(GPP) (168 HR FORECAST)
Based on 01-11-2014 valid for 0000 UTC of 08-11-2014
(Potential Cyclogenesis Zone for GPP =>30)
30
25
20
15
10
5
0


Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 01-11-2014 valid for 0000 UTC of 06-11-2014
(Potential Cyclogenesis Zone for GPP =>30)
30
25
20
15
10
5
0


Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 01-11-2014 valid for 0000 UTC of 04-11-2014
(Potential Cyclogenesis Zone for GPP =>30)
30
25
20
15
10
5
0


Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 01-11-2014 valid for 0000 UTC of 02-11-2014
(Potential Cyclogenesis Zone for GPP =>30)
30
25
20
15
10
5
0


Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 01-11-2014 valid for 0000 UTC of 01-11-2014
(Potential Cyclogenesis Zone for GPP =>30)
30
25
20
15
10
5
0

DP (Cyclone) NOC Report Dated 02 November, 2014

Synoptic features based on 0300 UTC:

- The low pressure area over northeast Arabian Sea and adjoining Gujarat has become less marked.
- The trough of low at mean Sea level over southwest Bay of Bengal off south Andhra-north Tamilnadu coasts now lies over southwest Bay of Bengal & adjoining coastal areas of south Andhra and Tamilnadu with an upper air cyclonic circulation extending upto 2.1 km above mean Sea level aloft.
- A trough of low lies over south Andaman Sea and adjoining Tenasserim coast. Under its influence, a low pressure area would develop over southeast Bay of Bengal and neighbourhood around 04th November.

Environmental features based on 0300 UTC of today:

Sea Surface Temperature:

- Sea Surface Temperature is between 27-29^{0}C over North Bay of Bengal, north of 16°North. It is 28-30^{0}C over rest of the Bay of Bengal and Andaman Sea.
- Sea Surface Temperature is about 25-27°C over north Arabian Sea and 27-29°C over rest of the Arabian Sea.

Tropical Cyclone Heat Potential (TCHP):

- Bay of Bengal: The TCHP is >100 kJ/cm^2 between Equator-5°North and 85-100°East. It is 40-80 kJ/cm^2 over rest of the Bay of Bengal and Andaman Sea.
- Arabian Sea: The TCHP is 40 kJ/cm^2 over western parts of Arabian Sea west of 66°East. It is 60-80 kJ/cm^2 over the eastern parts of Arabian Sea, (east of 66°East).

Relative Vorticity:

- Relative vorticity at 850 hPa is positive (30-50 *10^{-5} s^{-1}) over South Bay of Bengal south of 10°North.
- Over the Arabian Sea, it is positive (20-40 *10^{-5} s^{-1}) over western parts of North Arabian Sea.
- **Convergence:**
- Lower level convergence is positive of the order of 15-20*10^{-5} s^{-1} over extreme southeast Bay of Bengal and Andaman Sea.

Divergence:

- Upper level divergence is positive of the order of 10-20 *10^{-5} s^{-1} over South Bay of Bengal south of 10°North and also off Tamil Nadu coast.

Wind Shear:

- Wind Shear is above 20-30 knots area over the Southeast Bay of Bengal and Andaman Sea.

Wind Shear Tendency:

There is increase in vertical wind shear of about 10-20 knots over South Bay of Bengal and West Central Bay of Bengal.

Upper tropospheric ridge:

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

M.J.O. Index:

- Located in phase 2 with amplitude less than1.0. Likely to continue in phase 2 for the next two days.

Storms and Depression over South China Sea:

- There is currently no Tropical Storm/Depression over South China Sea.

Status of observational system:

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

Satellite:

Inference based on INSAT imagery of 02/0900 UTC:

Bay of Bengal:

Broken low and medium clouds with embedded intense to very intense convection over Southwest and adjoining West Central Bay of Bengal adjoining South Andhra Pradesh and North Tamil Nadu coasts between latitude 10.0°North to 15.5°North and west of longitude 86.0°East associated with low level circulation over the area.

Scattered low and medium clouds with embedded moderate to intense convection over South Bay of Bengal south of latitude 15.5°North and Andaman Sea.

Arabian Sea:

Scattered low and medium clouds with embedded weak to moderate convection over SouthEast Arabian Sea south of latitude 8.0°North and east of longitude 68.0°East (.)

NWP Analysis:-

- IMD-GFS model analysis based on 0000 UTC of 02nd November 2014 shows formation of a low pressure area over central parts of Bay of Bengal, on 4th November. It would concentrate into a depression on 5th, intensify into a cyclonic storm on 6th, move northwest-wards and cross Andhra Pradesh coast on 9th November.
- The Genesis Potential Parameter (GPP) forecasts based on 0000 UTC of 02nd November 2014 shows Cyclogenesis zone extreme south-east Bay of Bengal during the next 24 hours. This zone appears to intensify over the subsequent days and will move in a north-westerly direction towards the Indian coast.

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

ECMWF model suggests formation of a low pressure area over Bay of Bengal on 4th. It would concentrate into a depression on 8th over south / central parts of Bay of Bengal, move west-north-west wards and cross North Andhra Pradesh coast on 10th November 2014.

NCMRWF-GFS model suggests formation of a low pressure area over Bay of Bengal on 04th November. It would concentrate into a depression on 5th over south / central parts of Bay of Bengal, intensify into a cyclone on 6th, move west-north-west wards and cross Andhra Pradesh coast on 9th November.

NCMRWF-UKMO model suggests formation of depression on 6th November over WestCentral Bay of Bengal, further intensification into a deep depression / cyclone on 8th November, move west-north-west wards and cross Andhra Pradesh on 8th November.

Summary and Conclusion:-

As per the present synoptic conditions and model guidance, a low pressure area may form, over south Bay of Bengal within next 48 hrs. Some models suggest further intensification.

Advisory: The possible formation of low pressure area over south Bay of Bengal needs continuous watch for further intensification.
NO IOP is declared at present.

Annexure-I

Status of Observation system:
Synoptic observation:

Region	Date/Time (UTC)		
	01/12	02/00	02/03
India	47	45	46
Coastal stations			
WB	8	6	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	10
Myanmar	11	11	11
Thailand	1	1	1
Sri Lanka	8	8	8

AWS Observations:

Region	Date/Time (UTC)		
	01/12	02/00	02/03
India	45	47	73
Coastal stations			
WB	8	8	10
Odisha	6	7	10
AP	5	6	28
Tamil Nadu	25	23	24
Puducherry	1	2	1
A & N	-	-	-

- **RS/RW** (12Z) of 01/11/2014: **0/39**
- **No. of Ascents reaching 250 hPa levels:- 0, MISDA: 39**

- **RS/RW** (00Z) of 02/11/2014: 8**/39**
- **No. of Ascents reaching 250 hPa levels: 5 , MISDA:31**

No. of PILOT Ascents

01/12Z	02/00Z
6	9

Buoy Data

01/12Z	02/00Z	02/03Z
7	7	3

FOC Chennai:– Status of observation

No. of Synop data

Date→	**01.11.2014**							
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 /01.11.2014 : 1

No. of Ascents reaching 250 hPa level = 1

MISDA : 7

12Z /31.10.2014 : --

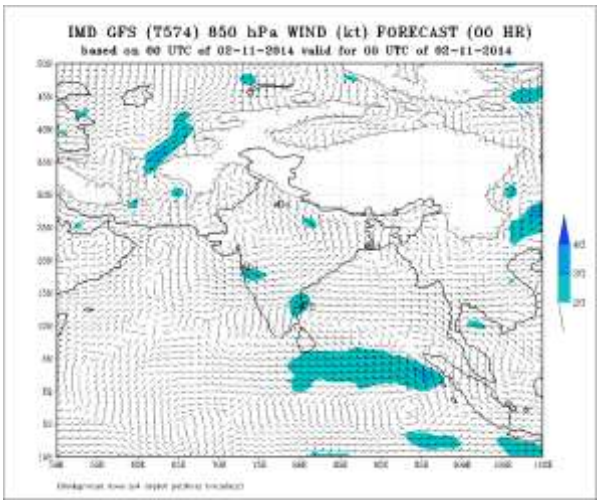
No. of Ascents reaching 250 hPa level = --

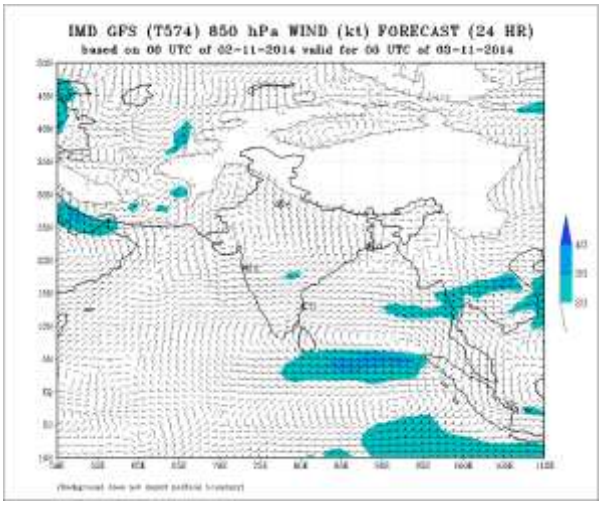
MISDA : 8

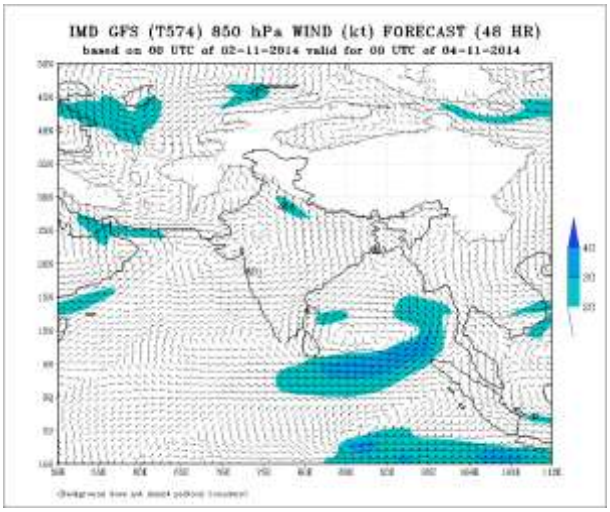
No. of PILOT Ascents:

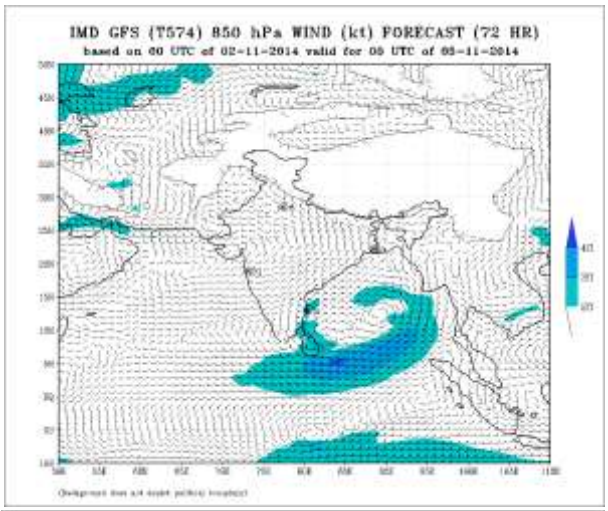
01.11.2014	
06Z	18Z
3	3

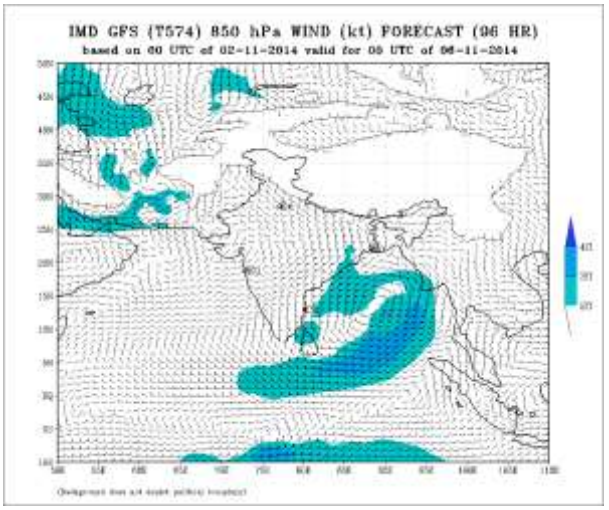
Annexure-II

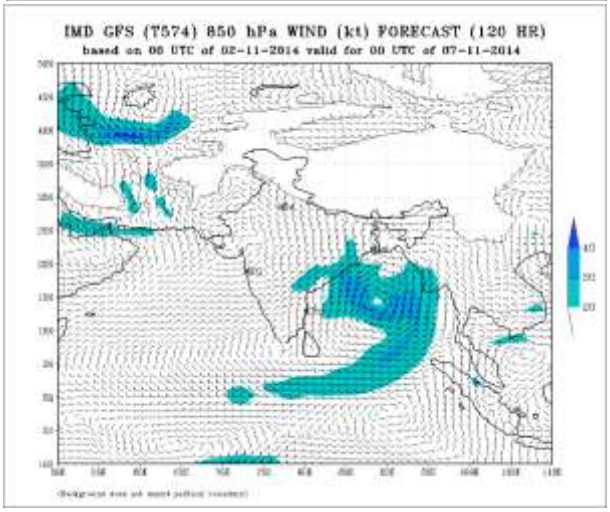

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 02-11-2014 valid for 00 UTC of 02-11-2014

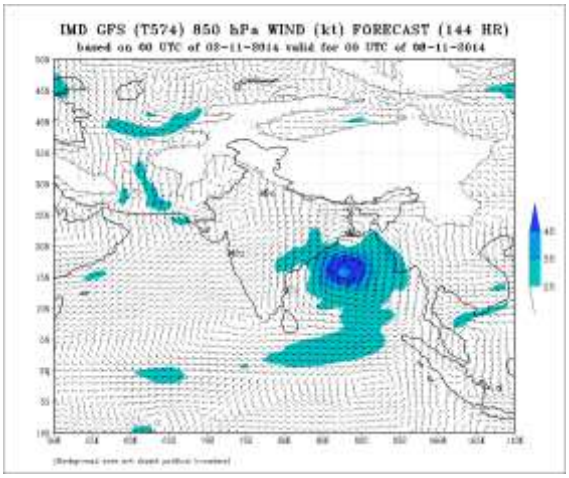

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 02-11-2014 valid for 00 UTC of 03-11-2014

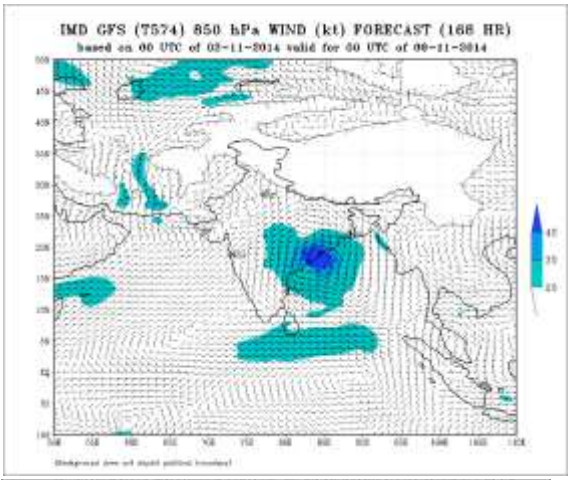

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 02-11-2014 valid for 00 UTC of 04-11-2014

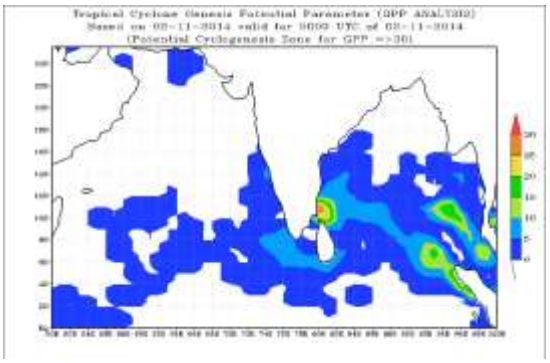

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 02-11-2014 valid for 00 UTC of 05-11-2014

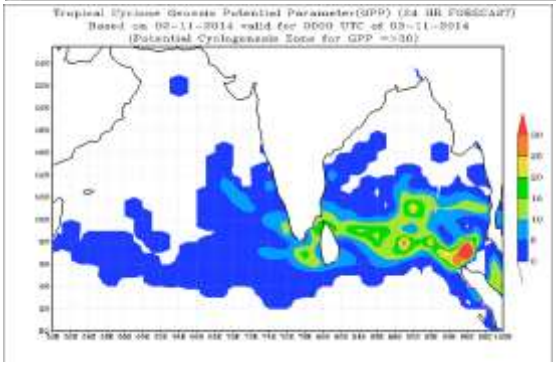

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 02-11-2014 valid for 00 UTC of 06-11-2014

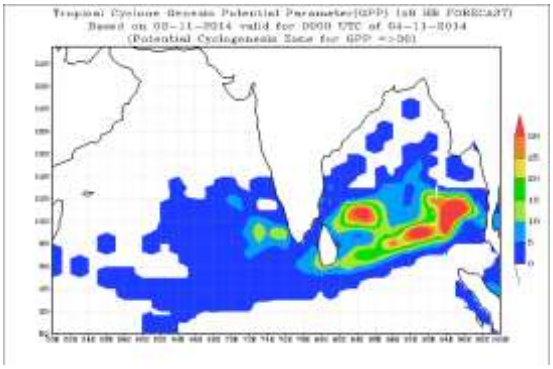

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 02-11-2014 valid for 00 UTC of 07-11-2014

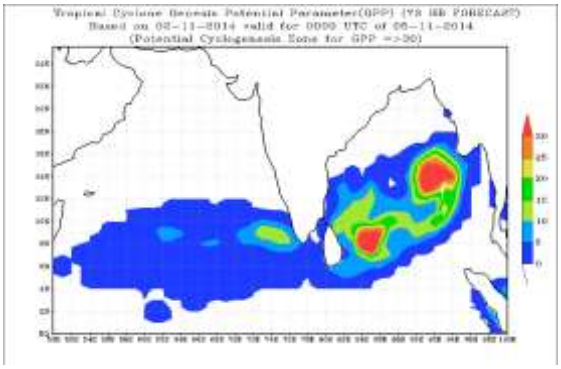

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (144 HR)
based on 00 UTC of 02-11-2014 valid for 00 UTC of 08-11-2014

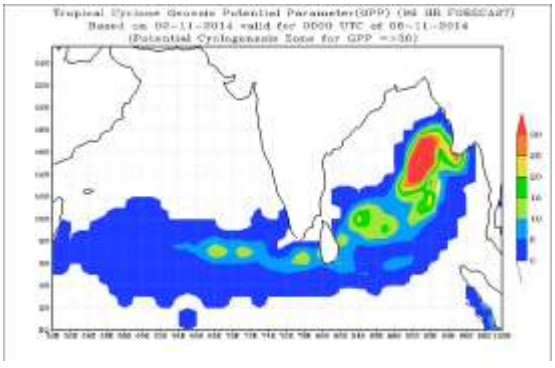

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 02-11-2014 valid for 00 UTC of 09-11-2014

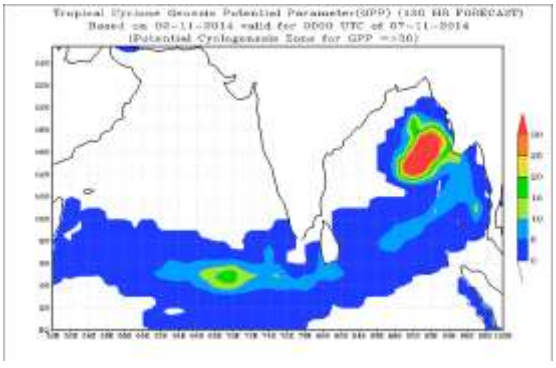

Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 00-11-2014 valid for 0000 UTC of 02-11-2014
(Potential Cyclogenesis Zone for GPP =>30)

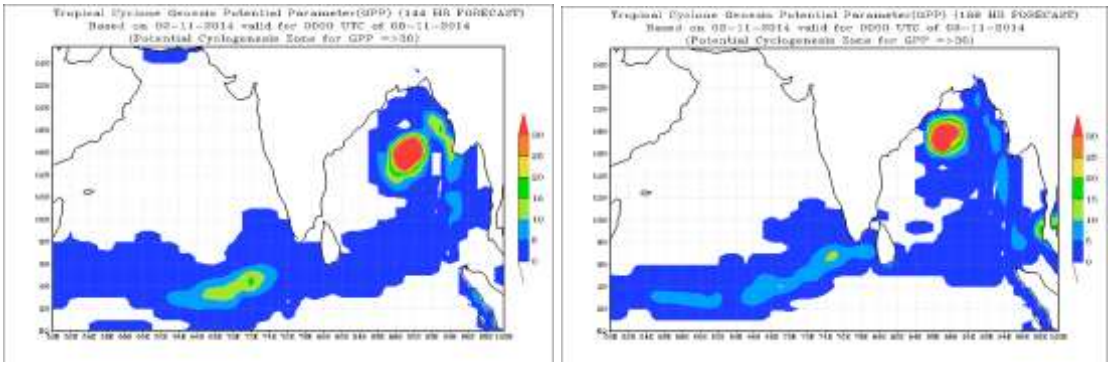

Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 00-11-2014 valid for 0000 UTC of 03-11-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
Based on 00-11-2014 valid for 0000 UTC of 04-11-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 00-11-2014 valid for 0000 UTC of 05-11-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (96 HR FORECAST)
Based on 00-11-2014 valid for 0000 UTC of 06-11-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 00-11-2014 valid for 0000 UTC of 07-11-2014
(Potential Cyclogenesis Zone for GPP =>30)



FDP (Cyclone) NOC Report Dated 03 November, 2014

Synoptic features based on 0300 UTC:

- The trough of low at mean Sea level over southwest Bay of Bengal and adjoining coastal areas of south Andhra Pradesh and Tamilnadu now lies over southwest Bay of Bengal and adjoining areas of Sri Lanka & Tamilnadu with an upper air cyclonic circulation aloft and extends up to 2.1km above mean Sea level. The trough of low over south Andaman Sea and adjoining Tenasserim coast persist with an upperaircyclonic circulation aloft and extends upto 3.1 km above mean Sea level.Under its influence, alow pressure area would form over southeast Bay of Bengal and neighbourhood during next 24 hours.The trough of low at mean Sea level over Lakshadweep area persists.The western disturbance as an upper air cyclonic circulation over northeast Afghanistan &adjoining north Pakistan extending upto 3.6 km above mean Sea level persists.

Environmental features based on 0300 UTC of today:

Sea Surface Temperature:

- Sea Surface Temperature is between 28-30^{0}C over North Bay of Bengal, north of 16°north. It is 28-30^{0}C over rest of the Bay of Bengal and Andaman Sea.

Tropical Cyclone Heat Potential (TCHP):

- Bay of Bengal: The TCHP is 80-100 kJ/cm^2 between Equator-5°North and 85-100°east.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive (30-50 *10^{-5} s^{-1}) over South Bay of Bengal south of 10°North.

Convergence:

- Lower level convergence is positive of the order of 10-20*10^{-5} s^{-1} over extreme southeast Bay of Bengal and Andaman Sea.

Divergence:

- Upper level divergence is positive of the order of 10-20 *10^{-5} s^{-1} over South Bay of Bengal south of 10°North and also off Tamil Nadu coast.

Wind Shear:

- Wind Shear is above 20-30 knots area over the Southeast Bay of Bengal and Andaman Sea.

Wind Shear Tendency:

There is a decrease in vertical wind shear of about 10-20 knots over South Bay of Bengal and West Central Bay of Bengal.

Upper tropospheric ridge:

- The upper tropospheric **ridge** at 200 hPa passes through Lat.15.0°N.

M.J.O. Index:

- Located in phase 2 with amplitude less than1.0. Likely to continue in phase 2 for the next two days.

Storms and Depression over South China Sea:

- There is currently no Tropical Storm/Depression over South China Sea.

Status of observational system:

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

Satellite:

Inference based on INSAT imagery of 030900 UTC:

BAY OF BENGAL & ANDAMAN SEA:-

Broken low/medium clouds with embedded intense to very intense convection over south east bay central bay Andman Sea. Broken low/medium clouds with embedded moderate to intense convection over rest bay.

ARABIAN SEA:-

Broken low/medium clouds with embedded moderate to intense convection over extended south east Arabian Sea between latitude 9.5N to 12.5N east of longitude 72.0E**.**

NWP Analysis

- IMD-GFS model analysis based on 0000 UTC of 03rd November 2014 shows an extended east-west oriented low pressure area over South Bay of Bengal and adjoining Indian Ocean. The region persists and becomes a northeast-southwest oriented low pressure zone in the Bay of Bengal in the 72 hours forecast. There is no significant probability for cyclogenesis.
- IMD-WRF model analysis valid for 0000 UTC of 03rd November 2014 also shows an east-west oriented trough in the lower levels over the south Bay of Bengal. However, the low level cyclonic circulation is likely to intensify in the 72 hour forecast into a depression over the south central Bay of Bengal.
- The Genesis Potential Parameter (GPP) forecasts based on 0000 UTC of 03rd November 2014 shows no cyclogenesis zone over the Indian Seas in the analysis field. However, a fresh extended cyclogenesis zone develops over the Bay of Bengal during the next 24 hours. This zone persists over the subsequent days and does not show much movement.

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

- JMA model suggests formation of a low pressure area over Bay of Bengal on 04th November. It would remain low during next 72 hrs.
- NCMRWF-UKMO model suggests formation of a low on 4th November and depression on 6th November over westcentral Bay of Bengal, further intensification into a deep depression on 8th November, move initially northwards and then north-eastwards towards Odisha coast.

- NCMRWF-GFS model suggests formation of a low pressure area over Bay of Bengal on 04th November. It would concentrate into a depression on 5th over south / central parts of Bay of Bengal, move west-north-west wards and weaken.
- ECMWF model suggests formation of a low pressure area over Bay of Bengal on 4th. It would concentrate into a depression on 7th over south / central parts of Bay of Bengal, move northwards initially and then northwest wards and cross Odisha coast on 10th November 2014.

Summary and Conclusion:
As per the present synoptic conditions and model guidance, a low pressure area may form, over south Bay of Bengal within next 24 hrs. Some models suggest further intensification.

Advisory: The possible formation of low pressure area over south Bay of Bengal needs continuous watch for further intensification.

Advisory:

- IOP issued for Bay of Bengal during next 72 hrs.

Annexure-I

Status of Observation system:
Synoptic observation:

Region	Date/Time (UTC)		
	02/12	03/00	03/03
India	46	34	47
Coastal stations			
WB	8	6	8
Odisha	7	6	8
AP	11	11	12
Tamil Nadu	11	8	11
Puducherry	2	2	2
A & N	7	1	6
Bangladesh	11	10	10
Myanmar	11	11	11
Thailand	1	1	1
Sri Lanka	7	8	8

AWS Observations:

Region	Date/Time (UTC)		
	02/12	03/00	03/03
India	45	45	72
Coastal stations			
WB	8	8	10
Odisha	6	7	10
AP	05	6	27
Tamil Nadu	25	22	24
Puducherry	1	2	1
A & N	-	-	-

- **RS/RW** (12Z) of 02/11/2014 **-0/39**
- **No. of Ascents reaching 250 hPa levels: - 0, MISDA: 39**
- **RS/RW** (00Z) of 03/11/2014 08**/39**
- **No. of Ascents reaching 250 hPa levels: 05, MISDA: 31**

No. of PILOT Ascents

02/12Z	03/00Z
6	8

Buoy Data

02/12Z	03/00Z	03/03Z
06	06	03

No. of Synop data

Date→	**02.11.2014**							
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 /02.11.2014 : 1

No. of Ascents reaching 250 hPa level = 1

MISDA : 7

12Z /02.11.2014 : --

No. of Ascents reaching 250 hPa level = --

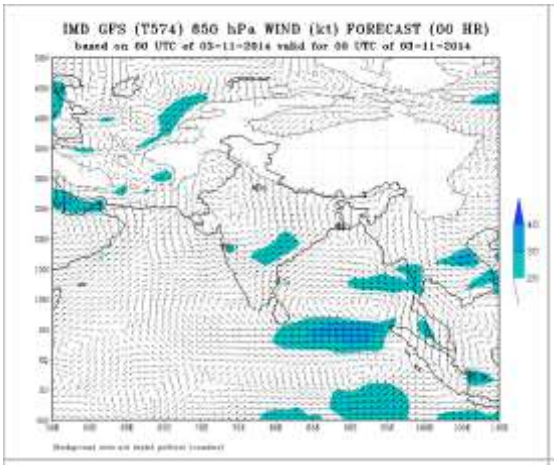
MISDA : 8

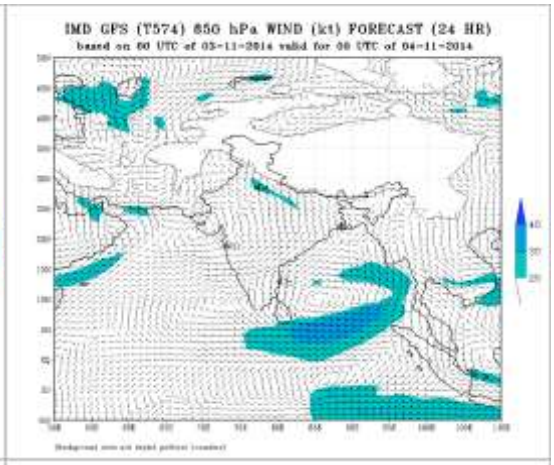
No. of PILOT Ascents:

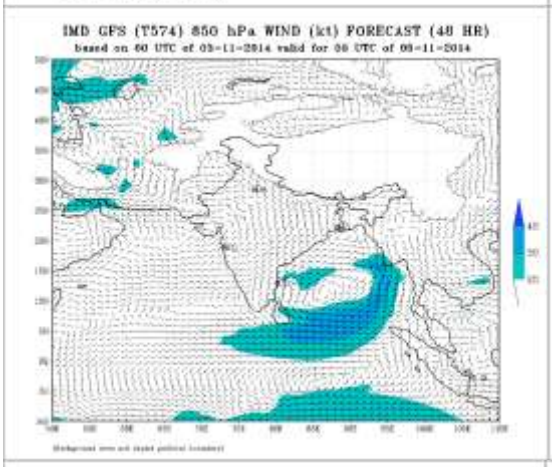
02.11.2014

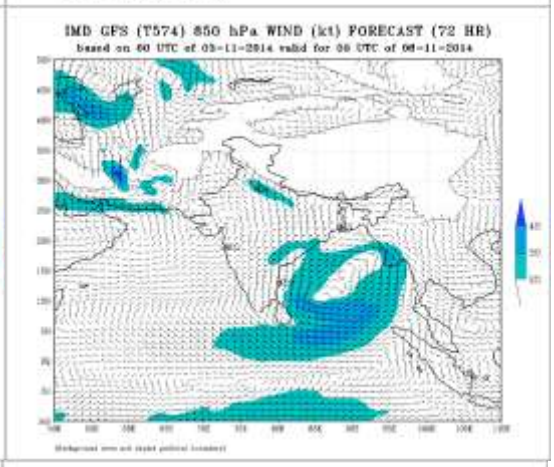
06Z	18Z
2	3

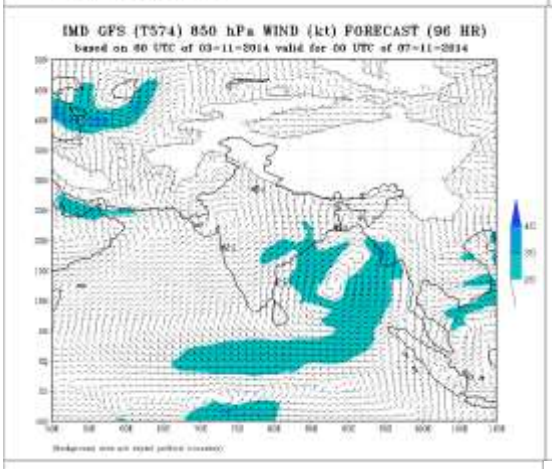
Annexure-II

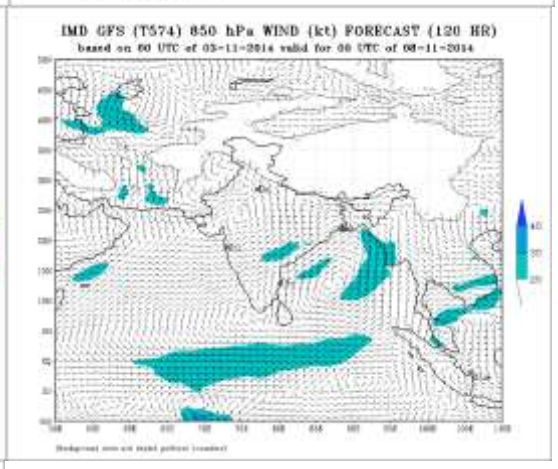

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 03-11-2014 valid for 00 UTC of 03-11-2014

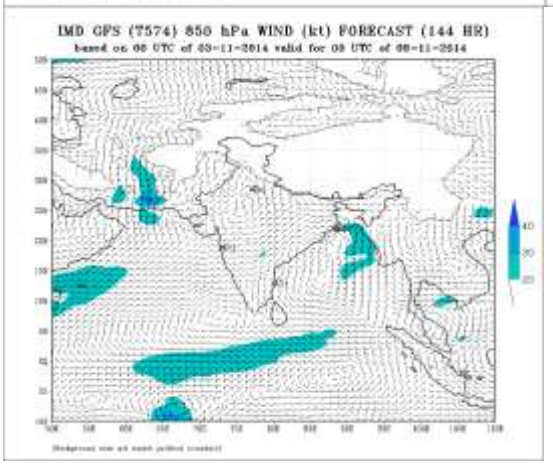

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 03-11-2014 valid for 00 UTC of 04-11-2014


IMD GFS (T574) 850 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 03-11-2014 valid for 00 UTC of 05-11-2014


IMD GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 03-11-2014 valid for 00 UTC of 06-11-2014


IMD GFS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 03-11-2014 valid for 00 UTC of 07-11-2014


IMD GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 03-11-2014 valid for 00 UTC of 08-11-2014


IMD GFS (T574) 850 hPa WIND (kt) FORECAST (144 HR)
based on 00 UTC of 03-11-2014 valid for 00 UTC of 08-11-2014

FDP (Cyclone) NOC Report Dated 04 November, 2014

Synoptic features based on 0300 UTC:

- Under the influence of the trough of low over southeast Bay of Bengal and neighbourhood, a low pressure area has formed over southeast Bay of Bengal and neighbourhood. Associated upper air cyclonic circulation extends up to 7.6 km above mean Sea level. The system would concentrate into a depression during next 48 hours.

Environmental features based on 0300 UTC of today:

Sea Surface Temperature:

- Sea Surface Temperature is between 26-28^{0}C over some parts of southwest Bay of Bengal. It is 28-30^{0}C over rest of the Bay of Bengal and Andaman Sea.

Tropical Cyclone Heat Potential (TCHP):

- Bay of Bengal: The TCHP is >100 kJ/cm^2 over extreme southeastern parts of Bay of Bengal. It is 40-80 kJ/cm^2 over rest of the Bay of Bengal.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive (50-80 *10^{-5} s^{-1}) over South Bay of Bengal south of 10°North.

Convergence:

- Lower level convergence is positive of the order of 10-15*10^{-5} s^{-1} around the region of the low pressure area in south Bay of Bengal

Divergence:

- Upper level divergence is positive of the order of 20-30 *10^{-5} s^{-1} over east central and adjoining SouthEast Bay of Bengal.

Wind Shear:

- Wind Shear is about 10-20 knots area over the Southeast Bay of Bengal and is in the range 20-30 knots over the rest Bay of Bengal and Andaman Sea.

Wind Shear Tendency:

- There is an increase in vertical wind shear of about 20-30 knots over parts of SouthEast Bay of Bengal.

Upper tropospheric ridge:

- The upper tropospheric **ridge** at 200 hPa passes through Latitude16.0°N.

M.J.O. Index:

- Located in phase 3 with amplitude less than1.0. Likely to continue in phase 3 for the next two days.

Storms and Depression over South China Sea:

- There is currently no Tropical Storm/Depression over South China Sea.

Status of observational system:

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

Satellite:

Inference based on INSAT imagery of 030900 UTC:

BAY OF BENGAL & ANDAMAN SEA:-

Broken low and medium clouds with embedded intense to very intense convection over Central Bay of Bengal and adjoining South Bay of Bengal between latitude 11.0˚North to 17.0˚North and longitude 83.0˚East to 92.0˚East in association with low level circulation over the area. Broken low and medium clouds with embedded moderate to intense convection over South Bay of Bengal south of latitude 11.0˚North and North Bay of Bengal south of latitude 20.0˚North and Andaman Sea.

ARABIAN SEA:-

Scattered low and medium clouds with embedded moderate to intense convection over SouthEast Arabian Sea between latitude 5.0˚North to 11.0˚North and east of longitude 62.0˚East.

NWP Analysis

- IMD-GFS model analysis based on 0000 UTC of 04th November 2014 shows an extended east-west oriented low pressure zone over SouthCentral Bay of Bengal at about 12 deg.N. The region intensifies into a low pressure system at the same location in the 24 hour forecast. It further intensifies into a depression and moves in a north-westward direction in the 48 hour forecast. There is no significant probability for the system to become a cyclonic storm in the 72 hour forecast. System is likely to de-intensify thereafter and continue to move in a north-westward direction towards the east peninsular coast of India.
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NWP products are available at:
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- NCMRWF-GFS (NGFS) model suggests that the low pressure area over Bay of Bengal would concentrate into a depression on 5th over south / central parts of Bay of Bengal, move west-north-west wards and weaken.
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- ECMWF model suggests concentration of the low pressure area over Bay of Bengal into a depression on 5th. It would move northwards initially and then northwest wards and cross Odisha coast on 10th November 2014.

Summary and Conclusion:

As per the present synoptic conditions and model guidance, the low pressure area over SouthEast Bay of Bengal may concentrate into a depression within next 48 hrs. While some models suggest no further intensification some others like NCUM model suggests intensification of the system.

Advisory: As the low pressure area over SouthEast Bay of Bengal may concentrate into a depression, the system needs continuous watch for further intensification.

Advisory:

- At present no IOP declared for next two days.

Annexure-I

Status of Observation system:

Synoptic observation:

Region	Date/Time (UTC)		
	03/12	04/00	04/03
India	46	32	46
Coastal stations			
WB	8	3	8
Odisha	7	5	7
AP	12	12	12
Tamil Nadu	11	9	11
Puducherry	2	2	2
A & N	6	1	6
Bangladesh	10	10	10
Myanmar	11	11	11
Thailand	1	1	1
Sri Lanka	8	8	8

AWS Observations:

Region	Date/Time (UTC)		
	03/12	04/00	04/03
India	65	65	76
Coastal stations			
WB	8	8	11
Odisha	6	6	11
AP	25	25	27
Tamil Nadu	25	25	26
Puducherry	1	1	1
A & N	-	-	-

- **RS/RW** (12Z) of 03/11/2014 **-1/39**
- **No. of Ascents reaching 250 hPa levels: - 1, MISDA: 38**
- **RS/RW** (00Z) of 04/11/2014 8**/39**
- **No. of Ascents reaching 250 hPa levels: 06 , MISDA: 31**

No. of PILOT Ascents

03/12Z	04/00Z
4	13

Buoy Data

03/12Z	04/00Z	04/03Z
06	05	07

No. of Synop data

Date→	**03.11.2014**							
UTC→	**00**	**03**	**06**	**09**	**12**	**15**	**18**	**21**
Chennai Region (Coasts of AP & TN)	**20**	**22**	**20**	**20**	**22**	**20**	**20**	**19**

No. of RS/RW Ascents

00Z /03.11.2014 : -

No. of Ascents reaching 250 hPa level = -

MISDA : 8

12Z /03.11.2014 : --

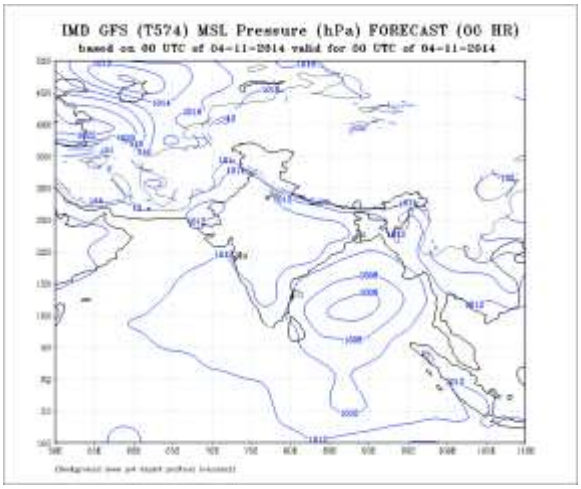
No. of Ascents reaching 250 hPa level = --

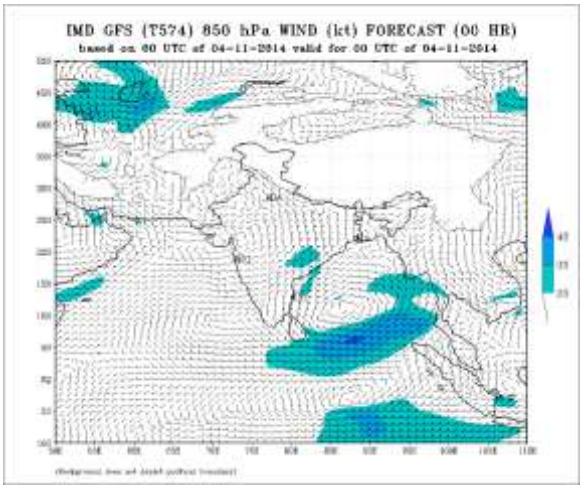
MISDA : 8

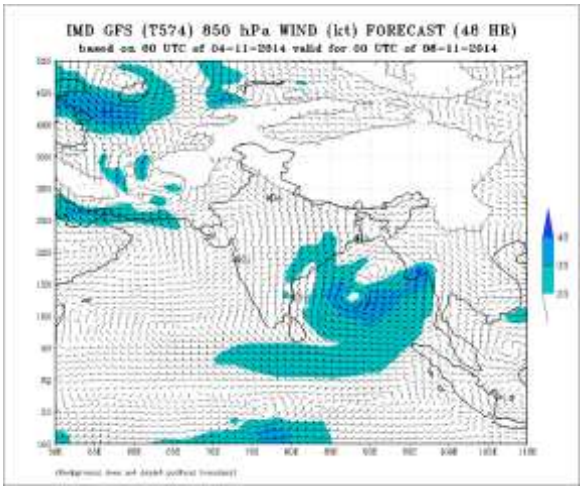
No. of PILOT Ascents:

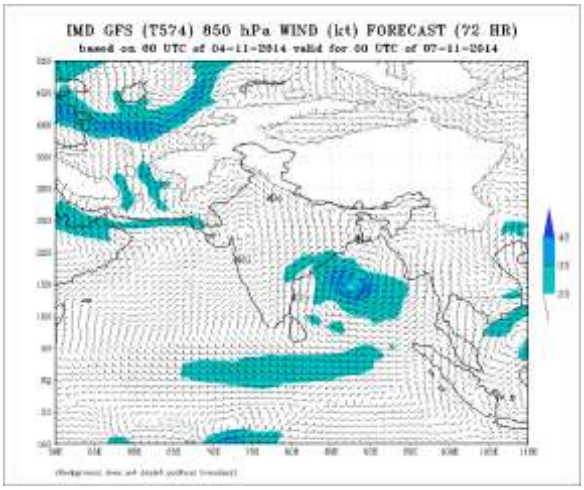
03.11.2014	
06Z	18Z
3	3

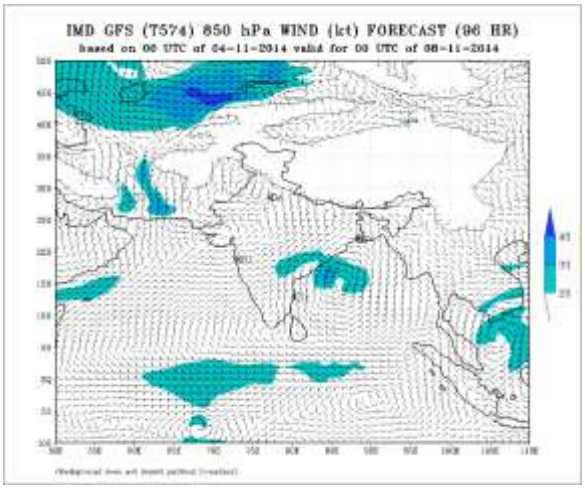
Annexure-II

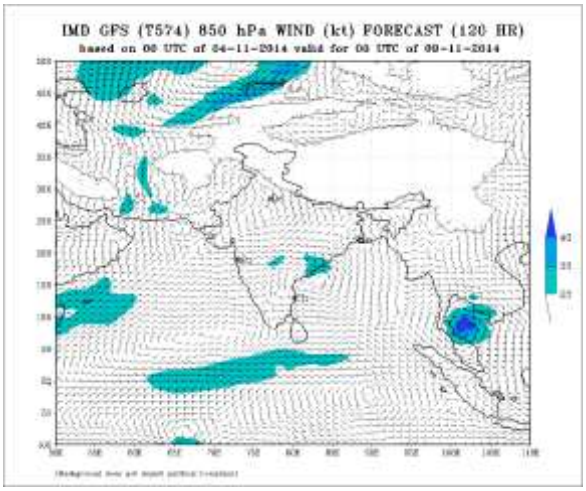

IMD GFS (T574) MSL Pressure (hPa) FORECAST (00 HR)
based on 00 UTC of 04-11-2014 valid for 00 UTC of 04-11-2014

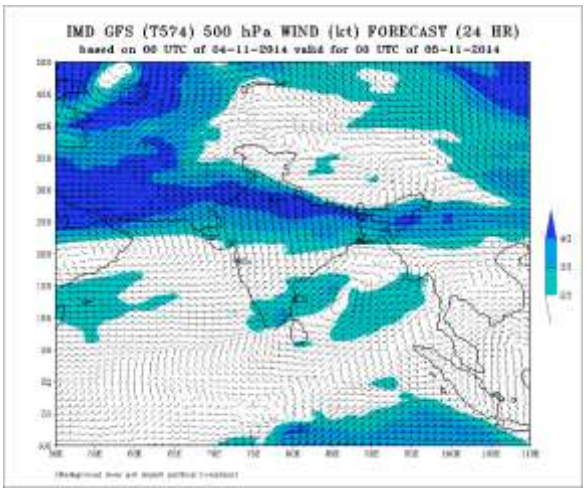

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 04-11-2014 valid for 00 UTC of 04-11-2014

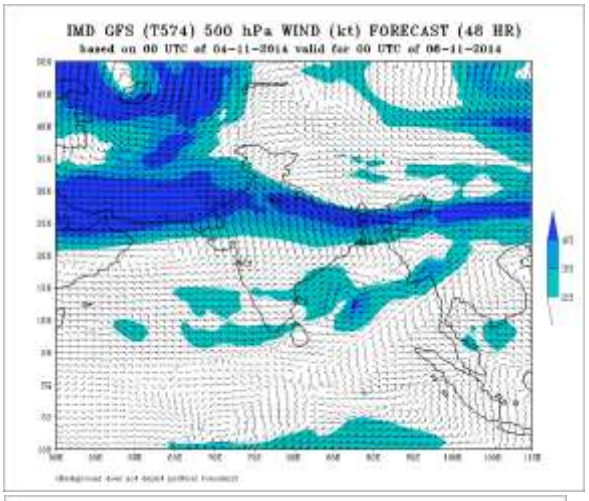

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 04-11-2014 valid for 00 UTC of 06-11-2014

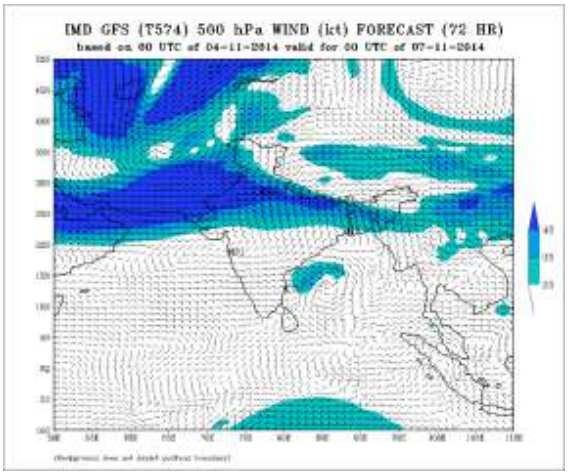

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 04-11-2014 valid for 00 UTC of 07-11-2014

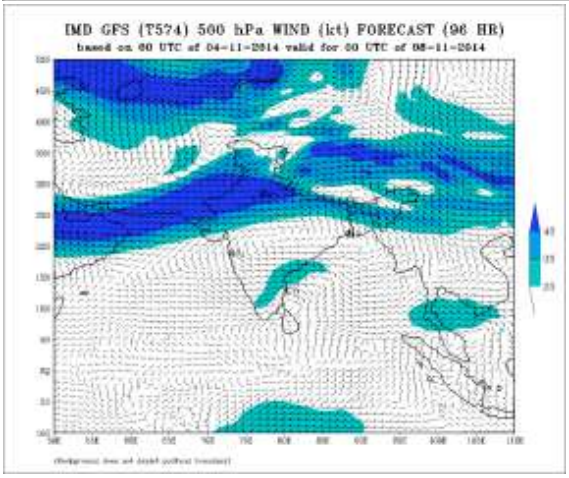

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 04-11-2014 valid for 00 UTC of 08-11-2014

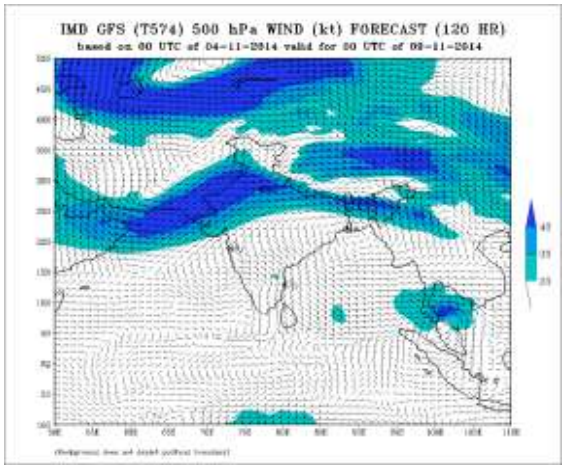

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 04-11-2014 valid for 00 UTC of 09-11-2014

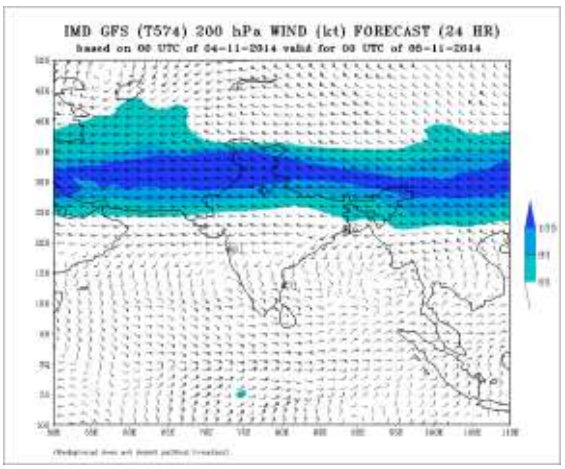

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 04-11-2014 valid for 00 UTC of 05-11-2014

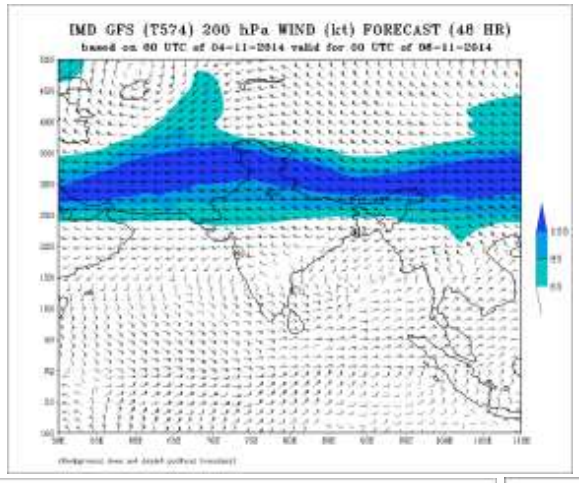

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 04-11-2014 valid for 00 UTC of 06-11-2014

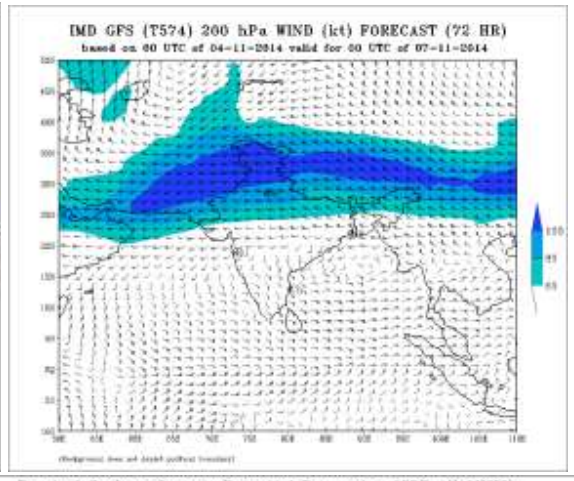

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 04-11-2014 valid for 00 UTC of 07-11-2014


IMD GFS (T574) 500 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 04-11-2014 valid for 00 UTC of 08-11-2014


IMD GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 04-11-2014 valid for 00 UTC of 09-11-2014


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 04-11-2014 valid for 00 UTC of 05-11-2014


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 04-11-2014 valid for 00 UTC of 06-11-2014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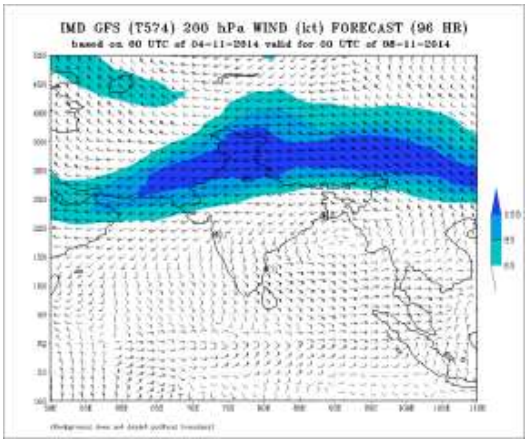
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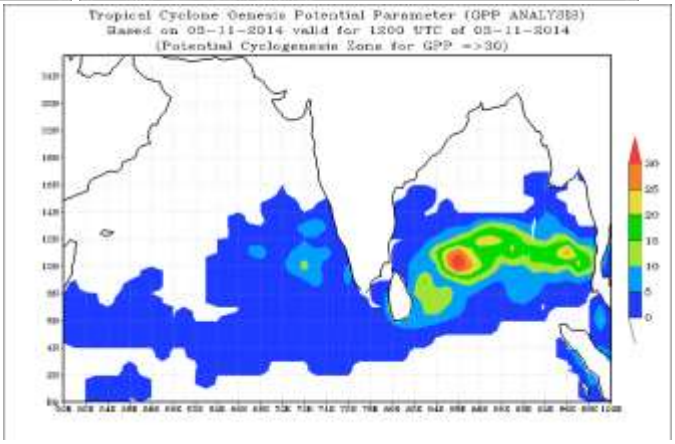
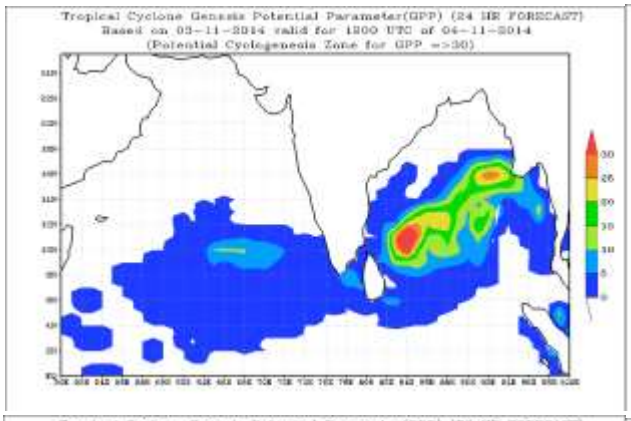
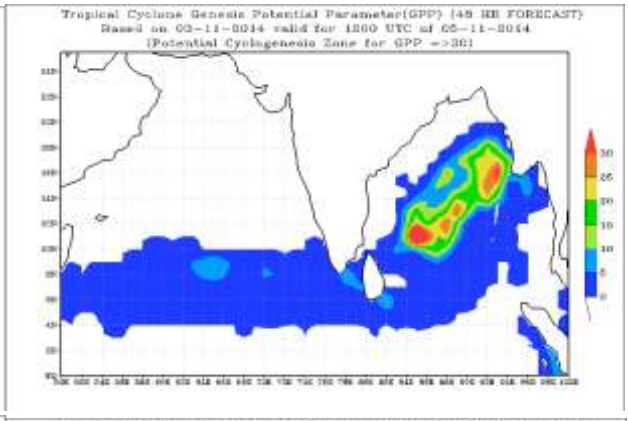

Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 03-11-2014 valid for 1200 UTC of 03-11-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 03-11-2014 valid for 1200 UTC of 04-11-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
Based on 03-11-2014 valid for 1200 UTC of 05-11-2014
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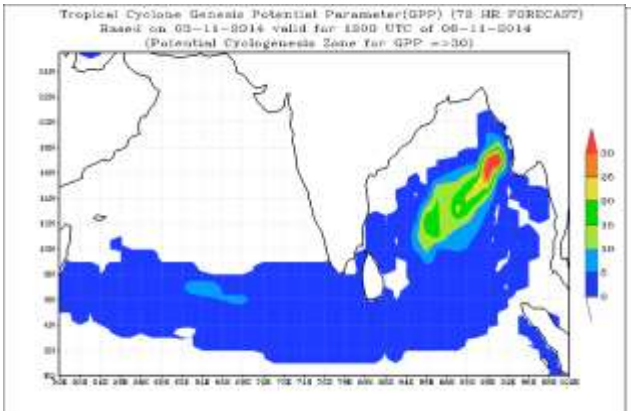
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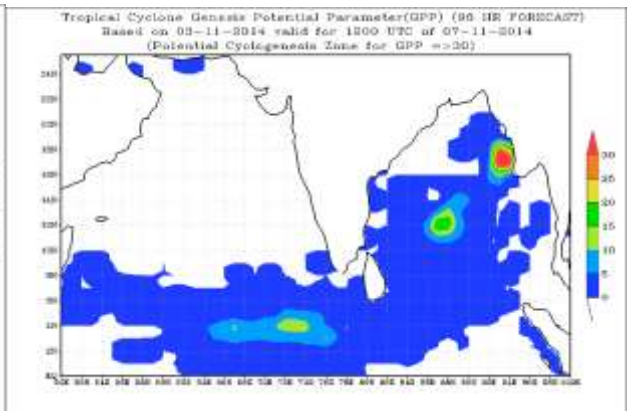
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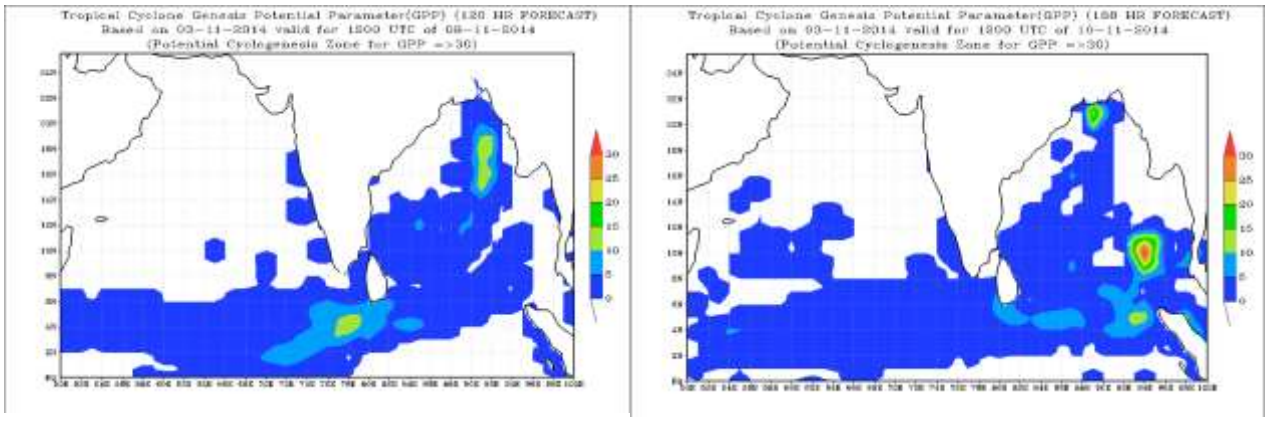

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- ECMWF model suggests concentration of the low pressure area over Bay of Bengal into a depression on 5th. It would move northwards initially and then northwest wards and cross Odisha coast on 10th November 2014.

Summary and Conclusion:
As per the present synoptic conditions and model guidance, the low pressure area over SouthEast Bay of Bengal may concentrate into a depression within next 48 hrs. While some models suggest no further intensification some others like NCUM model suggests intensification of the system.

Advisory: As the low pressure area over southeast Bay of Bengal may concentrate into a depression, the system needs continuous watch for further intensification.
Advisory:

- At present no IOP declared for next two days.

Annexure-I

Status of Observation system:

Synoptic observation:

Region	Date/Time (UTC)		
	03/12	04/00	04/03
India	46	32	46
Coastal stations			
WB	8	3	8
Odisha	7	5	7
AP	12	12	12
Tamil Nadu	11	9	11
Puducherry	2	2	2
A & N	6	1	6
Bangladesh	10	10	10
Myanmar	11	11	11
Thailand	1	1	1
Sri Lanka	8	8	8

AWS Observations:

Region	Date/Time (UTC)		
	03/12	04/00	04/03
India	65	65	76
Coastal stations			
WB	8	8	11
Odisha	6	6	11
AP	25	25	27
Tamil Nadu	25	25	26
Puducherry	1	1	1
A & N	-	-	-

- **RS/RW** (12Z) of 03/11/2014 **-1/39**
- **No. of Ascents reaching 250 hPa levels: - 1, MISDA: 38**
- **RS/RW** (00Z) of 04/11/2014 8**/39**
- **No. of Ascents reaching 250 hPa levels: 06 , MISDA: 31**

No. of PILOT Ascents

03/12Z	04/00Z
4	13

Buoy Data

03/12Z	04/00Z	04/03Z
06	05	07

No. of Synop data

Date→	03.11.2014							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	20	22	20	20	22	20	20	19

No. of RS/RW Ascents

00Z /03.11.2014 : -

No. of Ascents reaching 250 hPa level = -

MISDA : 8

12Z /03.11.2014 : --

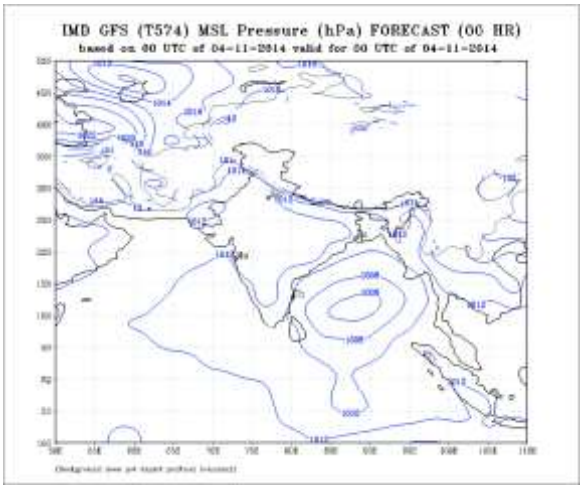
No. of Ascents reaching 250 hPa level = --

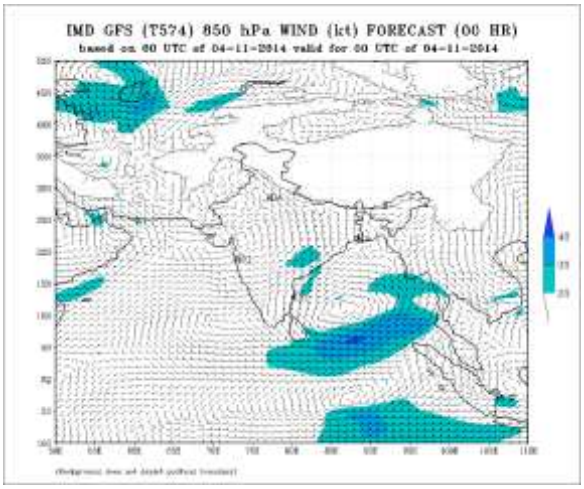
MISDA : 8

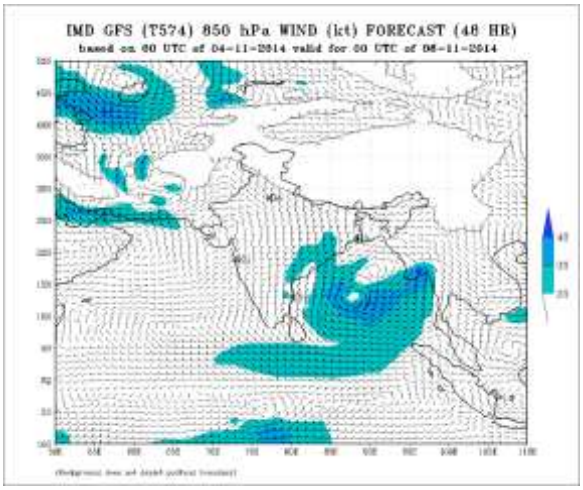
No. of PILOT Ascents:

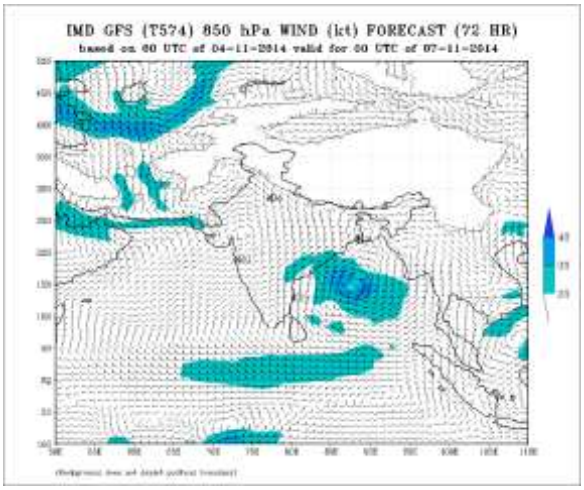
03.11.2014	
06Z	18Z
3	3

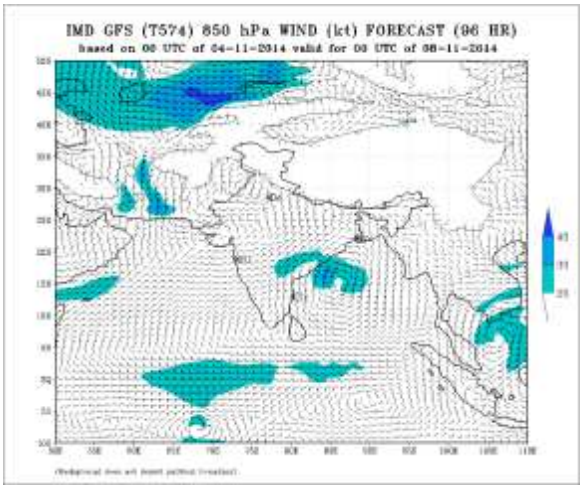
Annexure-II

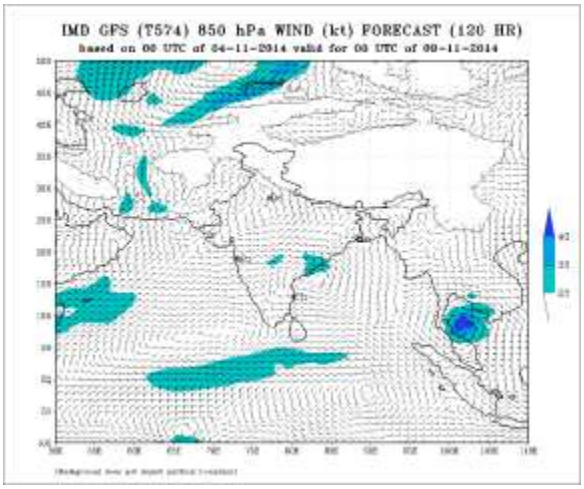

IMD GFS (T574) MSL Pressure (hPa) FORECAST (00 HR)
based on 00 UTC of 04-11-2014 valid for 00 UTC of 04-11-2014

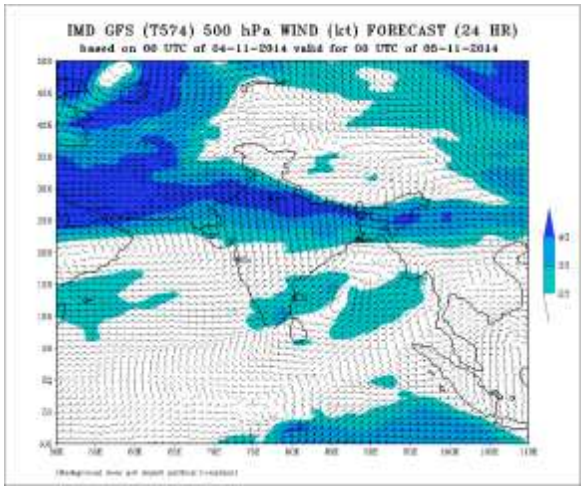

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 04-11-2014 valid for 00 UTC of 04-11-2014

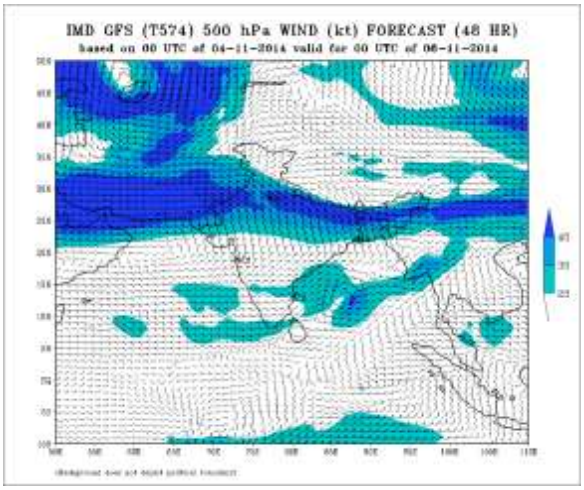

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 04-11-2014 valid for 00 UTC of 06-11-2014

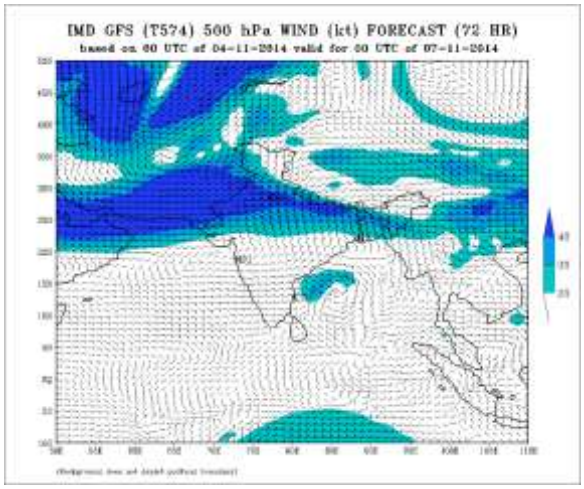

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 04-11-2014 valid for 00 UTC of 07-11-2014

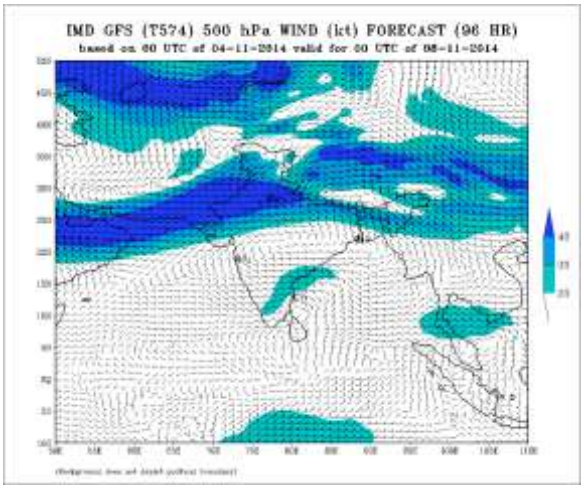

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 04-11-2014 valid for 00 UTC of 08-11-2014

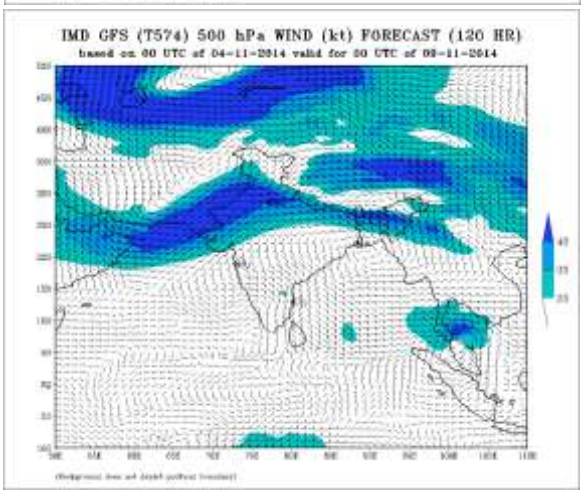

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 04-11-2014 valid for 00 UTC of 09-11-2014

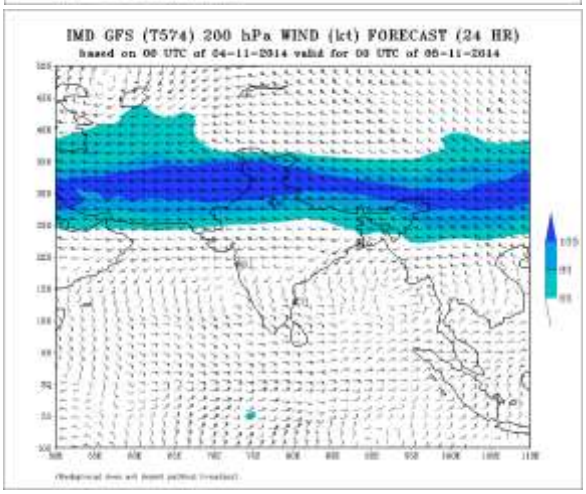

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 04-11-2014 valid for 00 UTC of 05-11-2014

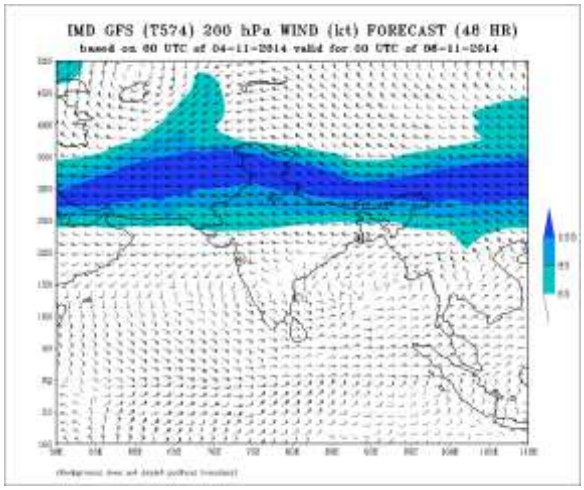

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 04-11-2014 valid for 00 UTC of 06-11-2014

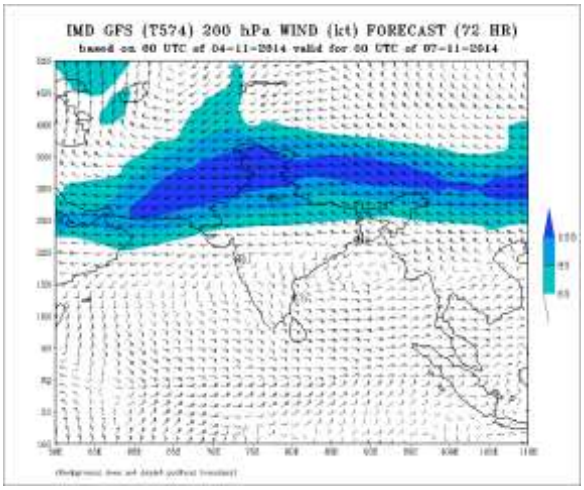

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 04-11-2014 valid for 00 UTC of 07-11-2014

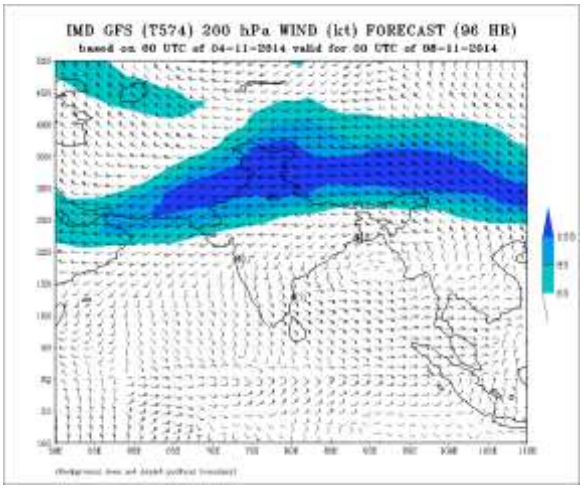

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 04-11-2014 valid for 00 UTC of 08-11-2014

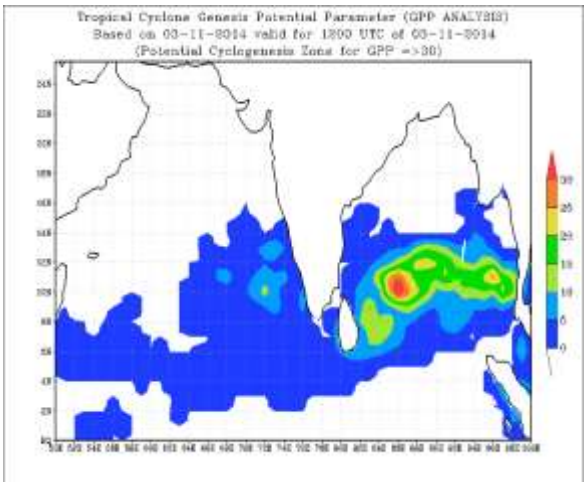

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 04-11-2014 valid for 00 UTC of 09-11-2014

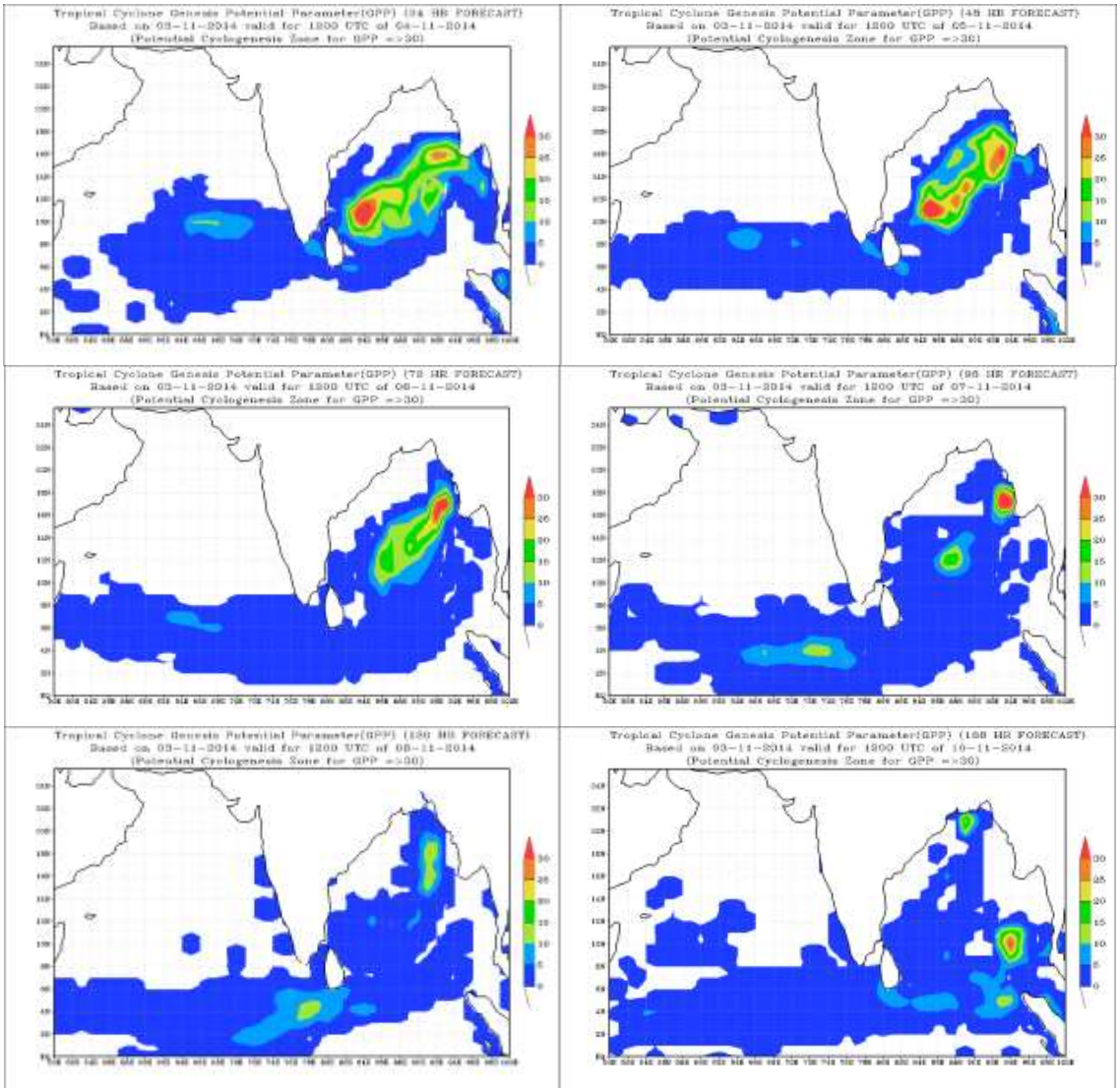

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 04-11-2014 valid for 00 UTC of 05-11-2014


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 04-11-2014 valid for 00 UTC of 06-11-2014


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 04-11-2014 valid for 00 UTC of 07-11-2014


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 04-11-2014 valid for 00 UTC of 08-11-2014


Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 03-11-2014 valid for 1200 UTC of 03-11-2014
(Potential Cyclogenesis Zone for GPP =>30)



FDP (Cyclone) NOC Report Dated 06 November, 2014

Synoptic features based on 0600 UTC:

- The depression over central Bay of Bengal moved slowly northwestwards during past six hours and lay centered at 1130 hours IST of 6th November, 2014 over central Bay of Bengal near latitude 14.1^0 N and longitude 86.9^0 E, about 690 km west-northwest of Port Blair, 560 km southeast of Vishakhapatnam and 690 km south-southeast of Paradip. It would move northwestwards and intensify further into a Cyclonic Storm during next 24 hrs. It would then move west-northwestwards towards Andhra Pradesh coast. It would weaken gradually into a Depression while reaching near the coast on 8th Nov. 2014, night.

Environmental features based on 0300 UTC of today:

Sea Surface Temperature:

- Sea Surface Temperature is between 29 - 30^{0}C around the system and over central Bay, south Bay of Bengal and Andaman Sea. It is 28^{0}c over Andhra Pradesh, Odisha and West Bengal coasts.

.

Tropical Cyclone Heat Potential (TCHP):

- The ocean thermal energy is about 60-80 kJ/cm^2 around the system. However it is less than kJ/cm^2 over parts of west central Bay and over north Bay of Bengal.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive (80-100 *10^{-5} s^{-1}) over South Bay of Bengal.

Convergence:

- Lower level convergence is positive of the order of 10-20*10^{-5} s^{-1} over eastcentral Bay of Bengal and adjoining north Andaman Sea.
- Lower level convergence is positive of the order of 5-10*10^{-5} s^{-1} around the system.

Divergence:

- Upper level divergence is positive of the order of 10-40 *10^{-5} s^{-1} over eastcentral Bay of Bengal and adjoining north Andaman Sea.
- Upper level divergence is positive of the order of 10-30 *10^{-5} s^{-1} around the system.

Wind Shear:

- Wind Shear is about 20-30 knots area around the system centre. It is between 10-20 over eastcentral Bay of Bengal and adjoining north Andaman Sea.

Wind Shear Tendency:

- There vertical wind shear tendency is decreasing and is about -10 to -20 knots over eastcentral Bay of Bengal and adjoining north Andaman Sea. It is also decreasing around the system centre and is about -5 to -10 knots.

Upper tropospheric ridge:

- The upper tropospheric **ridge** at 200 hPa passes through Lat.15.0°N.

M.J.O. Index:

- Located in phase 3 with amplitude less than 1.0. Likely to move in phase 2 with amplitude less than 1.0 during next three days. On 10th, it is likely to move to phase 1 with amplitude more than 1.

Storms and Depression over South China Sea:

- There is currently no Tropical Storm/Depression over South China Sea.

Status of observational system:

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

Satellite:

Inference based on INSAT imagery of 060900 UTC:

BAY OF BENGAL & ANDAMAN SEA:-

The vortex over central Bay is centered within half a deg. of Lat. 14.0°N/Long. 87.0°E. The intensity T 2.0. Associated broken low and medium clouds with embedded intense to very intense convection over Bay of Bengal between Lat. 11.0°N to 16.0°N and Long. 83.0°E to 88.5°E Minimum CTT is minus 85 deg. C.

REST BAY OF BENGAL & ANDAMAN SEA:-

Broken low and medium clouds with embedded intense to very intense convection over Arakan coast and adjoining eastcentral Bay of Bengal, north Andaman Sea, Gulf of martban, north Tenasserim coast.

Broken low and medium clouds with embedded moderate to intense convection over rest westcentral Bay of Bengal.

ARABIAN SEA:-

No significant cloud over the region.

NWP Analysis

- IMD-GFS model low level wind (850 hPa) analysis based on 0000 UTC of 06th November 2014 shows a depression (low pressure system) associated with an extended northeast-southwest oriented cyclonic circulation over south central Bay of Bengal around 14 deg N. The depression further intensifies into a deep depression and moves in a north-westerly direction in the 48 hour forecast. There is no significant probability for the system to become a cyclonic storm in the 72 hour forecast. System is likely to remain as deep depression thereafter and continue to move in a north-westerly direction towards the south Andhra coast. It would weaken gradually into a Depression while crossing the coast on or before the 00 UTC of 9th November 2014.
- IMD-WRF model analysis valid for 1200 UTC of 05th November 2014 also shows a depression associated with an extended northeast-southwest oriented cyclonic circulation over south central Bay of Bengal around 14 deg N. The system is likely to intensify into a deep depression in the 24 hour forecast and move in a north-westerly direction and cross the Andhra coast around 12 UTC of 08 Nov 2014.
- The Genesis Potential Parameter (GPP) forecasts based on 0000 UTC of 06th November 2014 shows an extended cyclogenesis zone over the south central Bay of Bengal between 12 -14 deg N in the analysis field. However, the zone is likely to de-organize and de-intensify in the 48 hour 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

- JMA model suggests the deep depression over central Bay of Bengal would move north-northwestwards and then westwards and would cross Visakhapatnam by 0000 UTC of 9th Nov. 2014.
- NCMRWF-UKMO model suggests that deep depression would move northwards and weaken by 0000 UTC of 8th Nov. 2014 and cross Odisha coast by 1200 UTC of 9th Nov.
- NCMRWF-GFS model suggests that the system would move northwards during next 36 hrs and thereafter westwards, crossing Odisha Coast by 0000 UTC of 9th Nov. 2014 and then weaken by 10th Nov. 2014.
- ARPS: The system would move initially north-northeastwards till 1800 UTC of 6th and then northwestwards towards Odisha coast. The system would intensify till 1200 UTC of 7th and then would weaken gradually.

- ECMWF model suggests no further intensification. The system would move west-southwestwards during next 48 hours and weaken into the Sea itself on 9th November 2014.

In addition to above depression, some models like IMD-GFS, NGEFS and NGFS model suggests formation of a cyclonic disturbance over south Andaman Sea around 10/11th Nov. 2014.

Summary and Conclusion:

- The deep depression over central Bay of Bengal lay centred at 1430 hours IST of today, the 9th November, 2014 near latitude 14.1^0 N and longitude 86.9^0 E, about 690 km west-northwest of Port Blair, 560 km southeast of Vishakhapatnam and 690 km south-southeast of Paradip. It would move west-northwestwards towards Andhra Pradesh coast and would weaken gradually into a Depression while reaching near the coast on 8th Nov. 2014, night.

Advisory:

- IOP is declared for Andhra Pradesh coast for 8th and 9th Nov. 2014.
- The possible development of depression over Andaman Sea around 10th/11th needs to be watched.

Annexure-I

Status of Observation system:
Synoptic observation:

Region	Date/Time (UTC)		
	05/12	06/00	06/03
India	41	31	45
Coastal stations			
WB	6	3	8
Odisha	7	6	7
AP	12	12	12
Tamil Nadu	9	8	11
Puducherry	1	1	1
A & N	6	1	6
Bangladesh	9	11	11
Myanmar	11	11	11
Thailand	1	1	1
Sri Lanka	8	8	8

AWS Observations:

Region	Date/Time (UTC)		
	05/12	06/00	06/03
India	62	61	67
Coastal stations			
WB	9	9	10
Odisha	4	4	6
AP	25	25	27
Tamil Nadu	23	22	23
Puducherry	1	1	1
A & N	-	-	-

- **RS/RW** (12Z) of 05/11/2014 **-1/39**
- **No. of Ascents reaching 250 hPa levels: 1-, MISDA: 38**
- **RS/RW** (00Z) of 06/11/2014 19**/39**
- **No. of Ascents reaching 250 hPa levels: 6, MISDA: 20**

No. of PILOT Ascents

05/12Z	06/00Z
10	11

Buoy Data

05/12Z	06/00Z	06/03Z
8	13	8

No. of Synop data

Date→	**05.11.2014**							
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

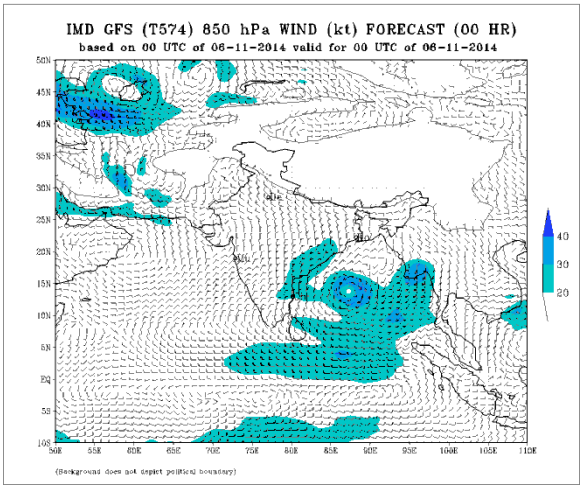
00Z /05.11.2014 : 1
No. of Ascents reaching 250 hPa level = 1
MISDA : 7
12Z /05.11.2014 : --
No. of Ascents reaching 250 hPa level = --
MISDA : 8

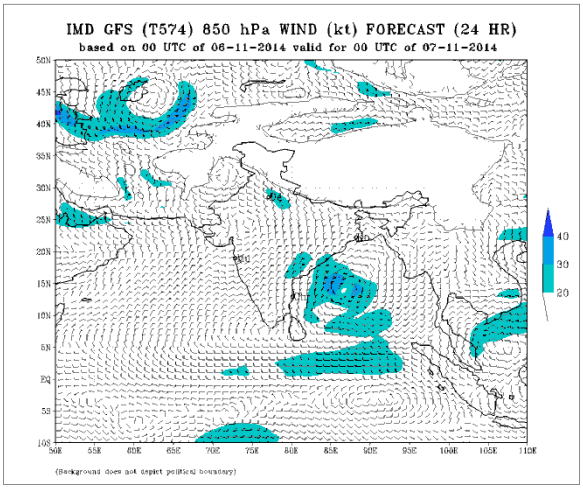
No. of PILOT Ascents:

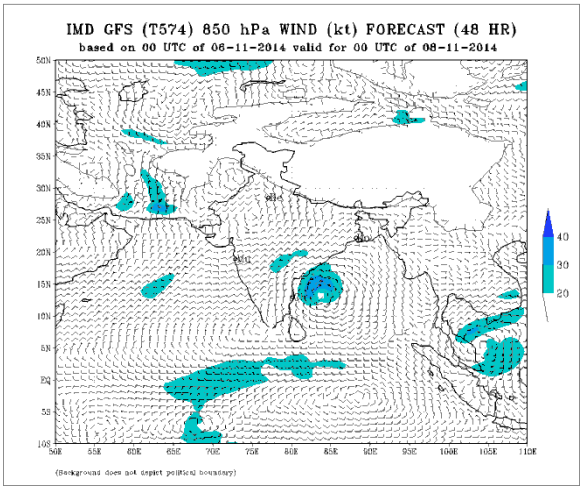
05.11.2014

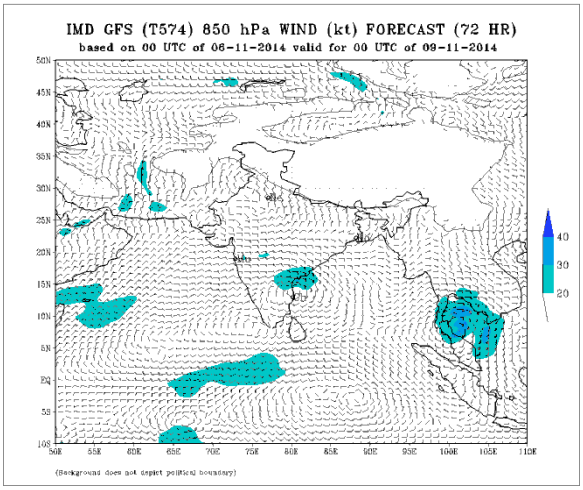
06Z	18Z
4	4

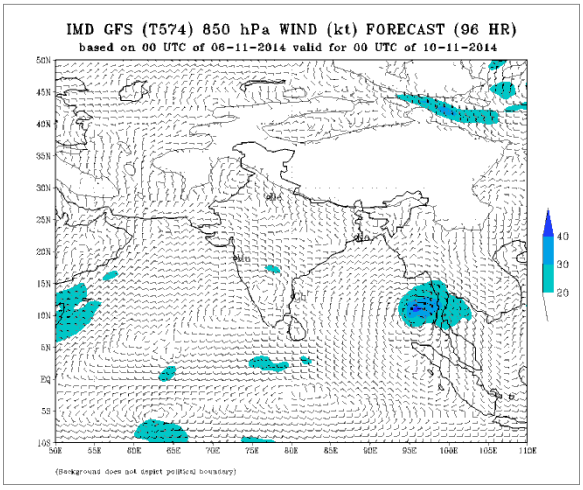
Annexure-II

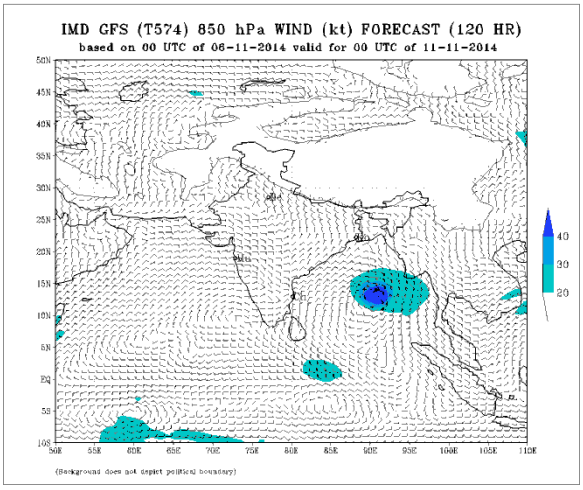

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 06-11-2014 valid for 00 UTC of 06-11-2014
40
30
20
(Background does not depict political boundary)

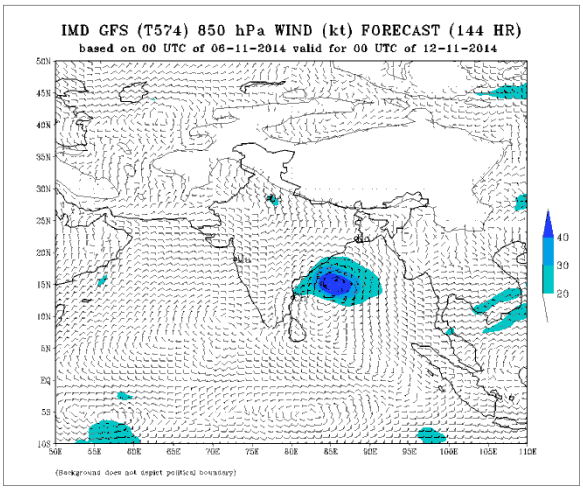

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 06-11-2014 valid for 00 UTC of 07-11-2014
40
30
20
(Background does not depict political boundary)

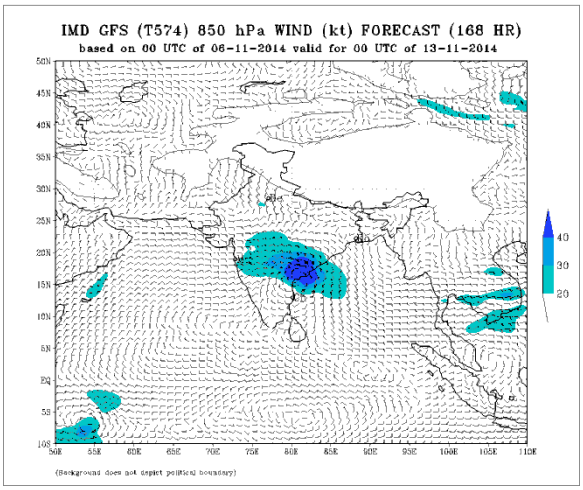

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 06-11-2014 valid for 00 UTC of 08-11-2014
40
30
20
(Background does not depict political boundary)

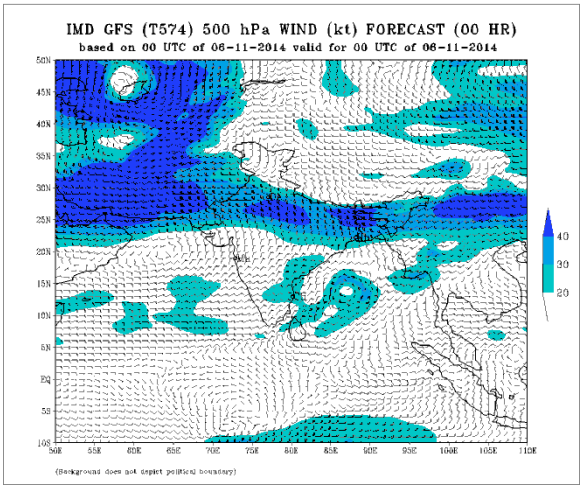

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 06-11-2014 valid for 00 UTC of 09-11-2014
40
30
20
(Background does not depict political boundary)

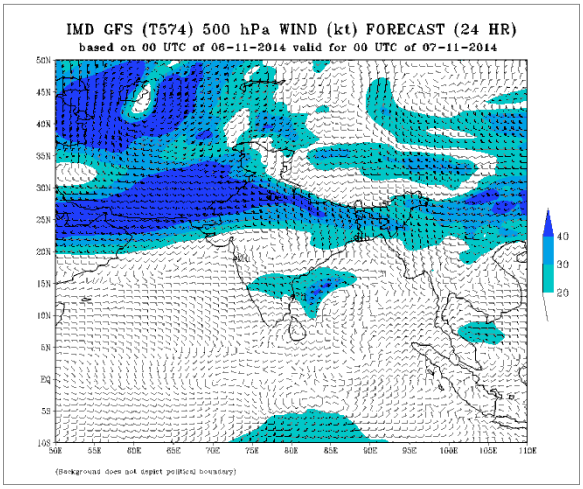

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 06-11-2014 valid for 00 UTC of 10-11-2014
40
30
20
(Background does not depict political boundary)

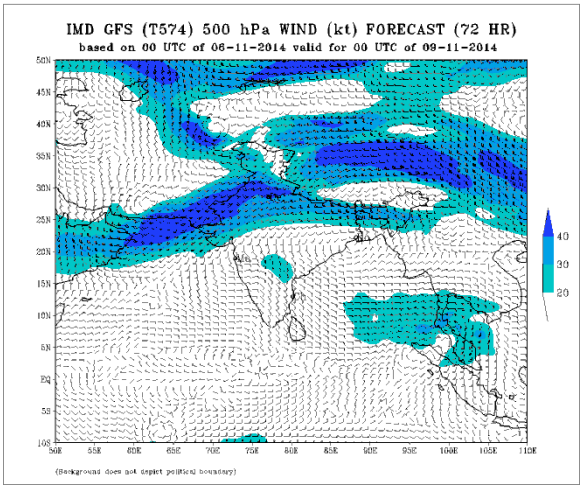

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 06-11-2014 valid for 00 UTC of 11-11-2014
40
30
20
(Background does not depict political boundary)

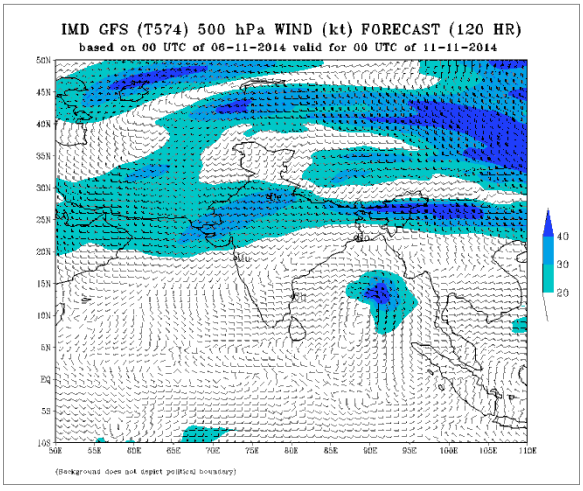

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (144 HR)
based on 00 UTC of 06-11-2014 valid for 00 UTC of 12-11-2014
40
30
20
(Background does not depict political boundary)

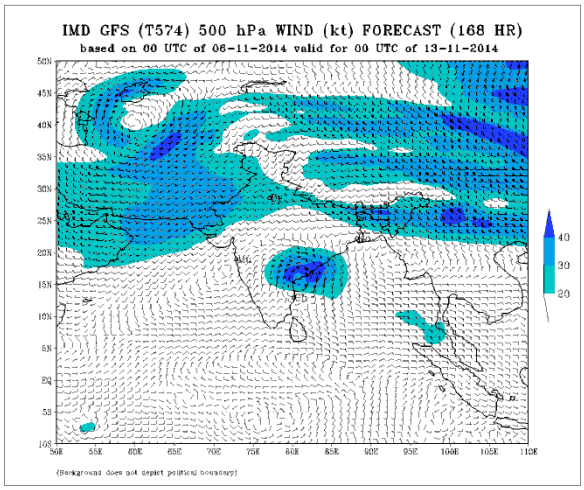

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 06-11-2014 valid for 00 UTC of 13-11-2014
40
30
20
(Background does not depict political boundary)

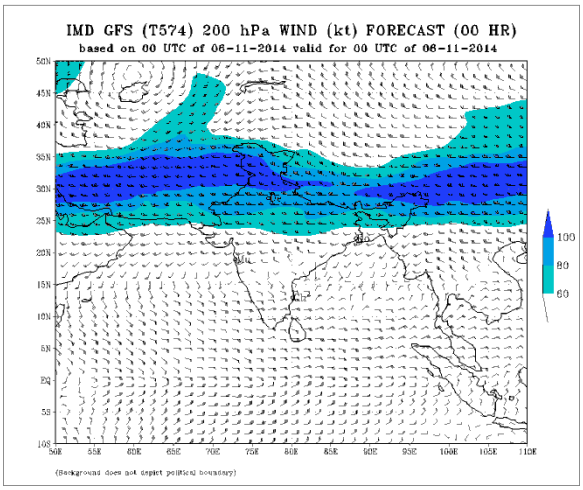

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 06-11-2014 valid for 00 UTC of 06-11-2014
40
30
20
(Background does not depict political boundary)

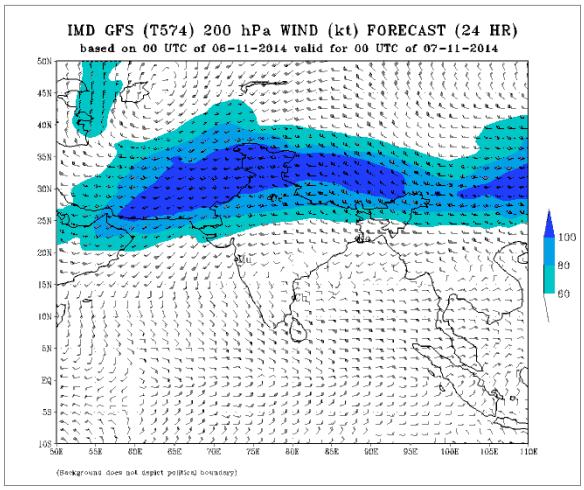

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 06-11-2014 valid for 00 UTC of 07-11-2014
40
30
20
(Background does not depict political boundary)

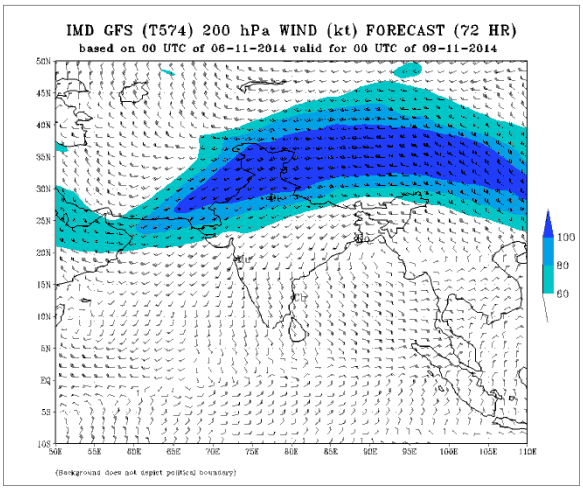

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 06-11-2014 valid for 00 UTC of 09-11-2014
40
30
20
(Background does not depict political boundary)

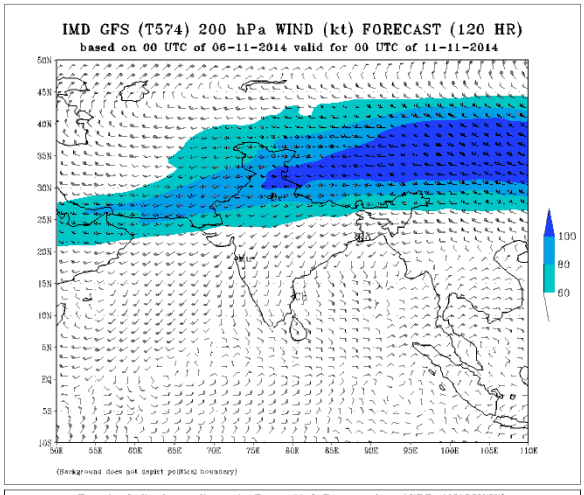

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 06-11-2014 valid for 00 UTC of 11-11-2014
40
30
20
(Background does not depict political boundary)

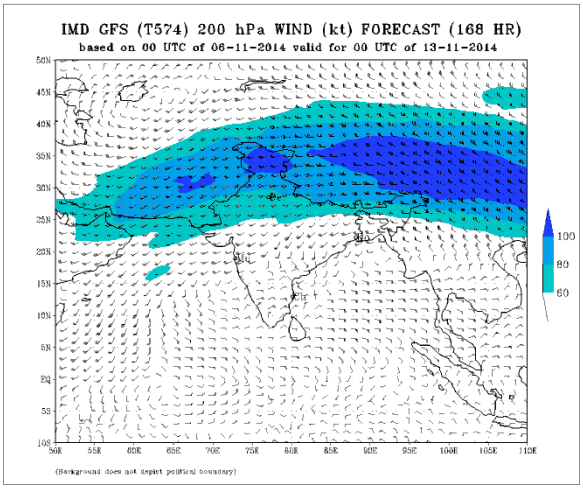

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 06-11-2014 valid for 00 UTC of 13-11-2014
40
30
20
(Background does not depict political boundary)

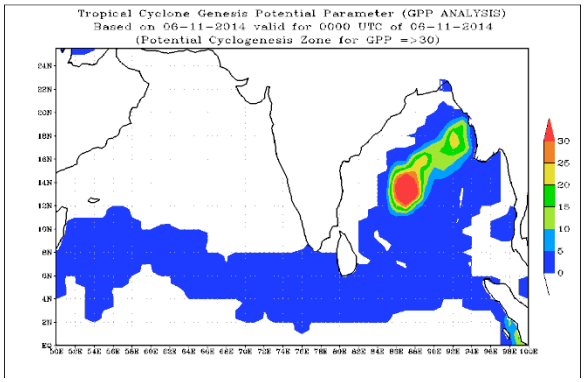

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 06-11-2014 valid for 00 UTC of 06-11-2014
100
80
60
(Background does not depict political boundary)

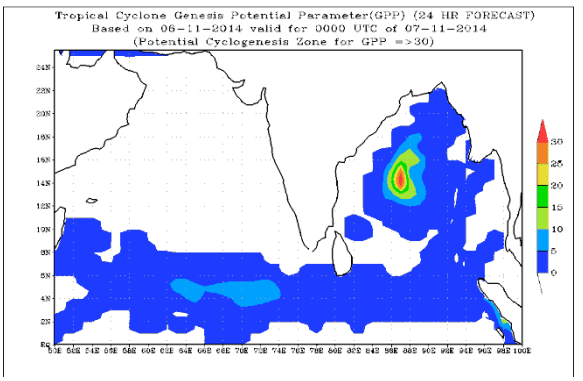

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 06-11-2014 valid for 00 UTC of 07-11-2014
100
80
60
(Background does not depict political boundary)

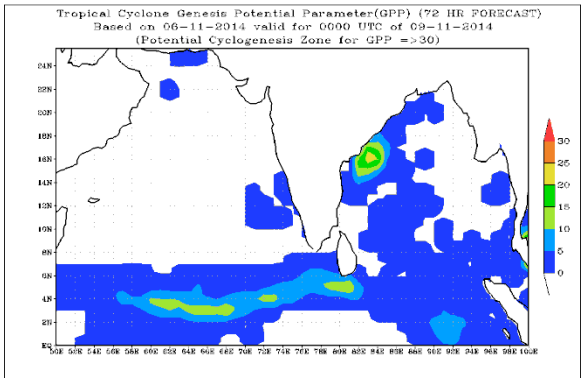

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 06-11-2014 valid for 00 UTC of 09-11-2014
100
80
60
(Background does not depict political boundary)

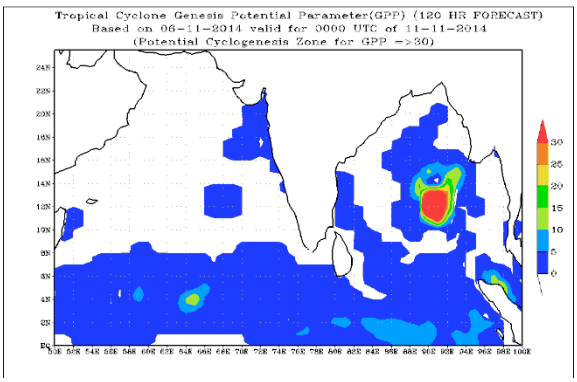

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 06-11-2014 valid for 00 UTC of 11-11-2014
100
80
60
(Background does not depict political boundary)

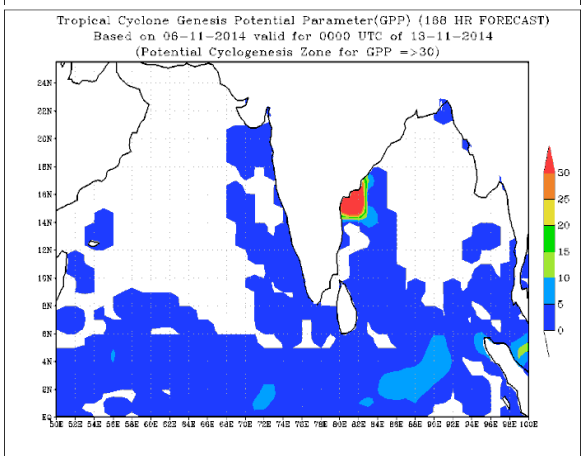

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 06-11-2014 valid for 00 UTC of 13-11-2014
100
80
60
(Background does not depict political boundary)


Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 06-11-2014 valid for 0000 UTC of 06-11-2014
(Potential Cyclogenesis Zone for GPP =>30)
30
25
20
15
10
5
0


Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 06-11-2014 valid for 0000 UTC of 07-11-2014
(Potential Cyclogenesis Zone for GPP =>30)
30
25
20
15
10
5
0







FDP (Cyclone) NOC Report Dated 07 November, 2014

Synoptic features based on 0600 UTC:

- The deep depression over central Bay of Bengal remained practically stationary, weakened into a Depression and lay centered at 1130 hours IST of 7th November, 2014 over central Bay of Bengal near latitude 14.1^0 N and longitude 86.9^0 E, about 750 km east-southeast of Ongole, 560 km southeast of Vishakhapatnam and 730 km east-northeast of Chennai. It would move westwards towards Andhra Pradesh coast and weaken into a well marked low pressure area during next 48 hours.

Environmental features based on 0300 UTC of today:

Sea Surface Temperature:

- Sea Surface Temperature is between 29 - 30^{0}C around the system and over central Bay, south Bay of Bengal and Andaman Sea. It is 28^{0}C over Andhra Pradesh, Odisha and West Bengal coasts.

.

Tropical Cyclone Heat Potential (TCHP):

- The ocean thermal energy is about 60-80 kJ/cm^2 around the system. However it is less than 50 kJ/cm^2 over parts of west central Bay and over north Bay of Bengal.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive (80-100 $*10^{-5}$ s^{-1}) over around the system centre.

Convergence:

- Lower level convergence is positive of the order of 5-10$*10^{-5}$ s^{-1} around the system.

Divergence:

- Upper level divergence is positive of the order of 5-10 $*10^{-5}$ s^{-1} around the system centre and over eastern parts of eastcentral Bay of Bengal

Wind Shear:

- Wind Shear is about 20 knots around the system centre. It is between 30-50 knots over south Bay of Bengal and south Andaman Sea and between 30-40 knots over north Bay and about 20 knots over north Andaman Sea.

Wind Shear Tendency:

- The vertical wind shear tendency is increasing south of the system and is 20 knots and decreasing north of the system by 20 knots. It is decreasing and is between -5 to -20 knots over south Andaman Sea.

Upper tropospheric ridge:

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

M.J.O. Index:

- Located in phase 1 with amplitude less than 1.0. Likely to move in phase 1 with amplitude more than 1.0.

Storms and Depression over South China Sea:

- There is currently no Tropical Storm/Depression over South China Sea.

Status of observational system:

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

Satellite:

Inference based on INSAT imagery of 070900 UTC:

Bay of Bengal & Andaman Sea:-

The vortex over central Bay and neighbourhood centred within half a deg of 14.2° N/87.5°E. The intensity is T1.0/CI 2.0. System is shear pattern. Distance from the centre to convective mass is around 100 km. Associated broken low and medium clouds with embedded intense to very intense convection over the Bay of Bengal between Lat. 10.5°N to 16.0°N and Long 81.0°E to 88.0°E. Minimum cloud top temperature minus 57 deg. C.

Rest Bay Of Bengal & Andaman Sea:-

Broken low and medium clouds with embedded moderate to intense convection over rest westcentral Bay, northeast Bay, Arakan coast, southeast Andaman Sea. Scattered low and med clouds with embedded isolated weak to moderate convection over north Bay.

Arabian Sea:-

Scattered medium and high clouds over southeast Arabian Sea.

NWP Analysis

- IMD-GFS model indicates that the depression over central Bay of Bengal would weaken into well marked low pressure area during next 24 hours. It also indicates further weakening of the system. Model is also indicating another cyclogenesis over south Andaman Sea on 10th.

- The Genesis Potential Parameter (GPP) forecasts based on 0000 UTC of 07th November 2014 shows de-organization of the depression during next 48 hour forecast. The Genesis Potential Parameter (GPP) forecasts also indicate the cyclogenesis over south Andaman Sea on 10th Nov. and would continue till 13th with northwestward movement.

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 suggests that the present depression would move west-northwestward and weaken gradually. It would cross Andhra Pradesh coast as a low pressure system on 9th. Model is showing another cyclogenesis over south Andaman Sea on 10th.
- **NCMRWF-GFS** model The NCMRWF model forecast indicate weakening of the system with northwestward movement. It would cross Andhra Pradesh coast on 9th Nov.
- **ARPS:** The system would move westwards and weaken gradually into low pressure area over west central Bay off south Andhra Pradesh and north Tamil Nadu coast.
- **ECMWF** model suggests weakening of the system. The model is also suggesting the formation of low pressure area over south Andaman Sea on 10th.

Summary and Conclusion:

- As per the latest observations, the Depression over central Bay weakened into a well marked low pressure area. It would move westwards towards Andhra Pradesh coast and weaken into a low pressure area during next 48 hours.

Advisory:

- The possible development of depression over Andaman Sea around 10th needs to be watched.

Annexure-I

Status of Observation system:
Synoptic observation:

Region	Date/Time (UTC)		
	06/12	07/00	07/03
India	45	34	46
Coastal stations			
WB	8	4	8
Odisha	7	6	7
AP	12	12	12
Tamil Nadu	11	9	11
Puducherry	1	1	1
A & N	6	2	7
Bangladesh	9	11	11
Myanmar	11	10	11
Thailand	2	2	2
Sri Lanka	8	8	8

AWS Observations:

Region	Date/Time (UTC)		
	06/12	07/00	07/03
India	66	63	65
Coastal stations			
WB	8	9	11
Odisha	5	2	3
AP	27	27	25
Tamil Nadu	26	24	25
Puducherry	-	1	1
A & N	-	-	-

- **RS/RW** (12Z) of 06/11/2014 **-1/39**
- **No. of Ascents reaching 250 hPa levels: 1-, MISDA: 38**
- **RS/RW** (00Z) of 07/11/2014 21**/39**
- **No. of Ascents reaching 250 hPa levels: 9, MISDA: 18**

No. of PILOT Ascents

06/12Z	07/00Z
8	9

Buoy Data

06/12Z	07/00Z	07/03Z
15	9	14

Date→	**06.11.2014**							
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 /06.11.2014 : 1

No. of Ascents reaching 250 hPa level = 1

MISDA : 7

12Z /06.11.2014 : --

No. of Ascents reaching 250 hPa level = --

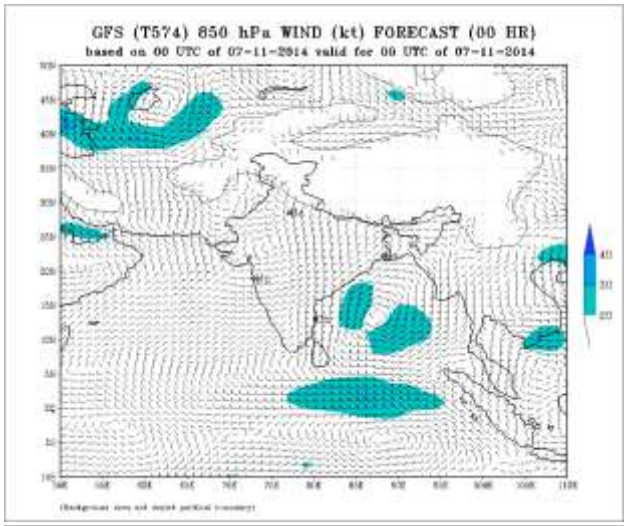
MISDA : 8

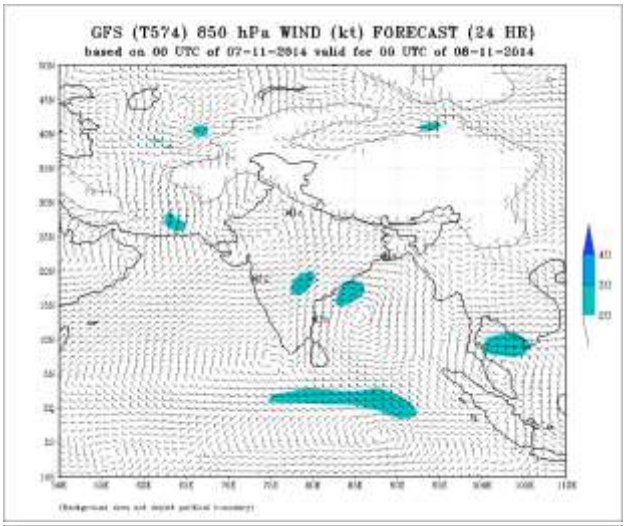
No. of PILOT Ascents:

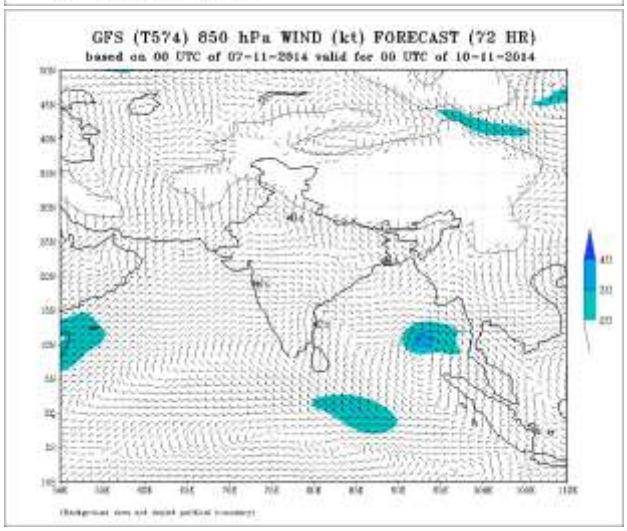
06.11.2014

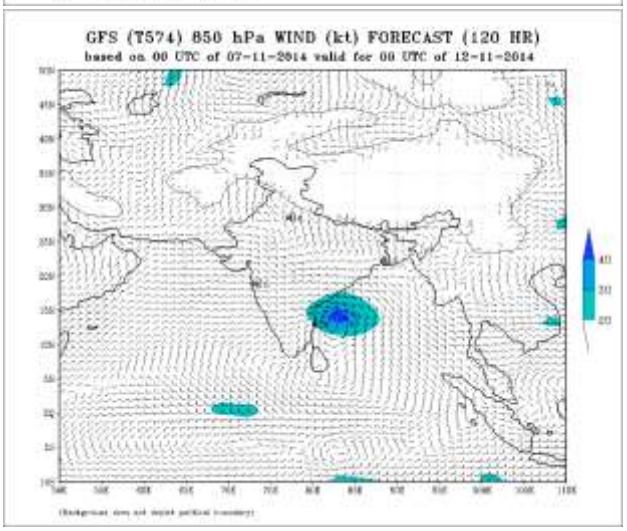
06Z	18Z
6	5

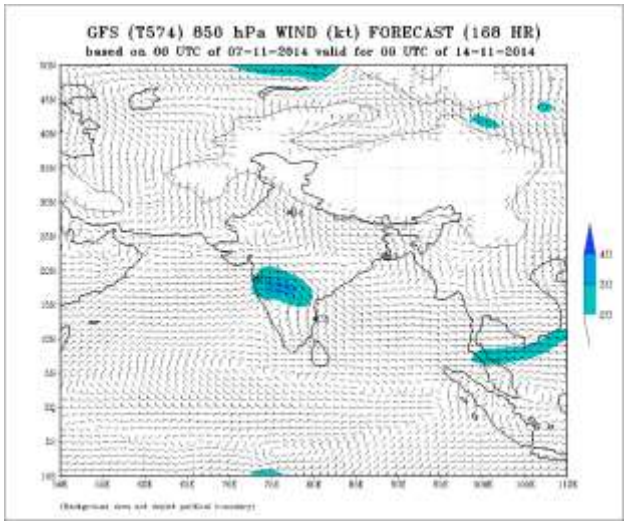
Annexure-II


GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 07-11-2014 valid for 00 UTC of 07-11-2014


GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 07-11-2014 valid for 00 UTC of 08-11-2014


GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 07-11-2014 valid for 00 UTC of 10-11-2014


GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 07-11-2014 valid for 00 UTC of 12-11-2014


GFS (T574) 850 hPa WIND (kt) FORECAST (168 HR)
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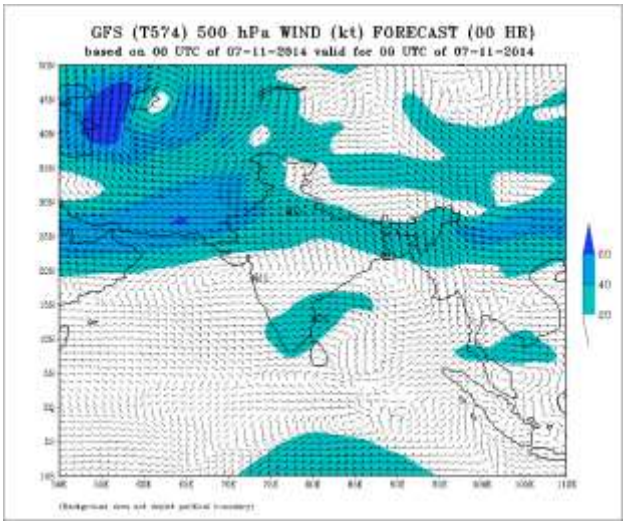
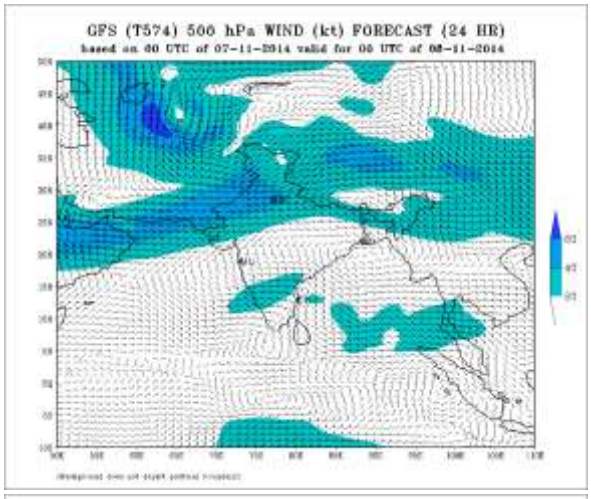

GFS (T574) 500 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 07-11-2014 valid for 00 UTC of 07-11-2014


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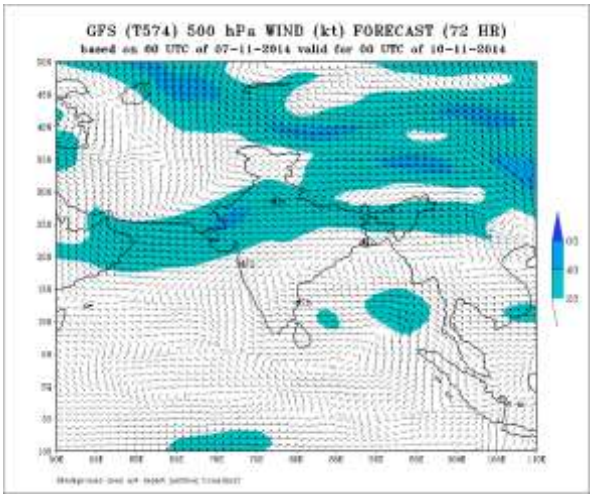
GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
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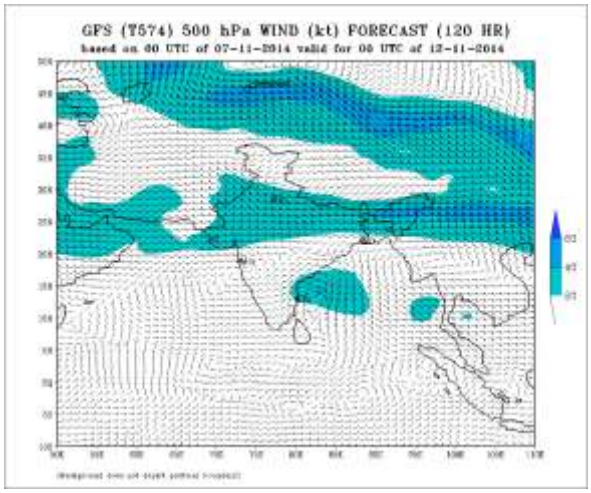
GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
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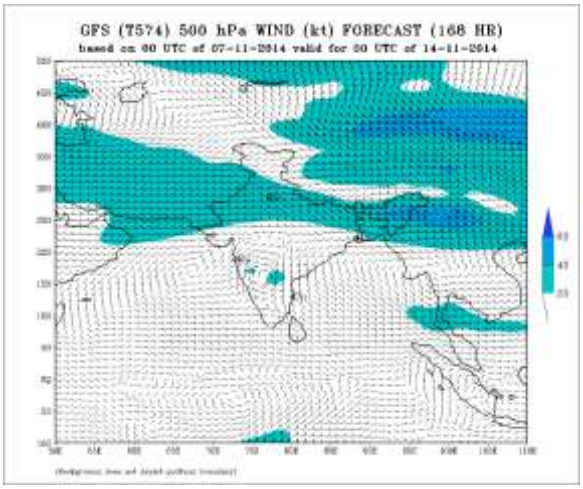
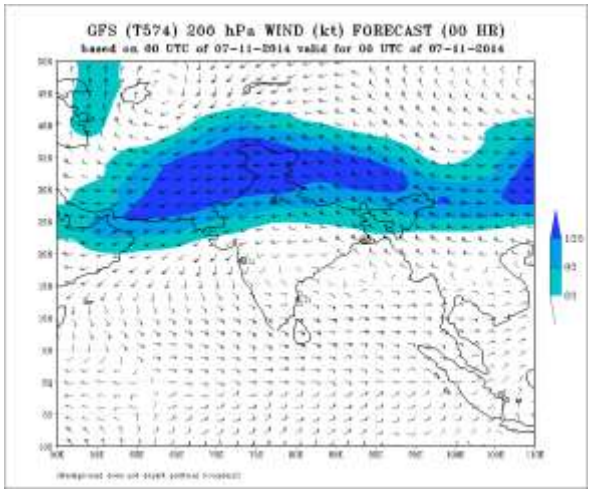
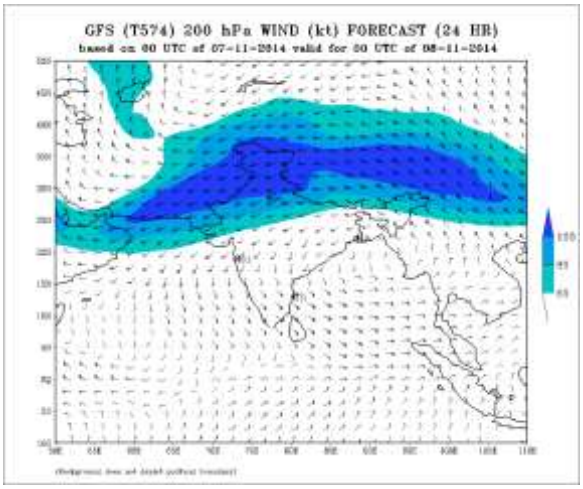
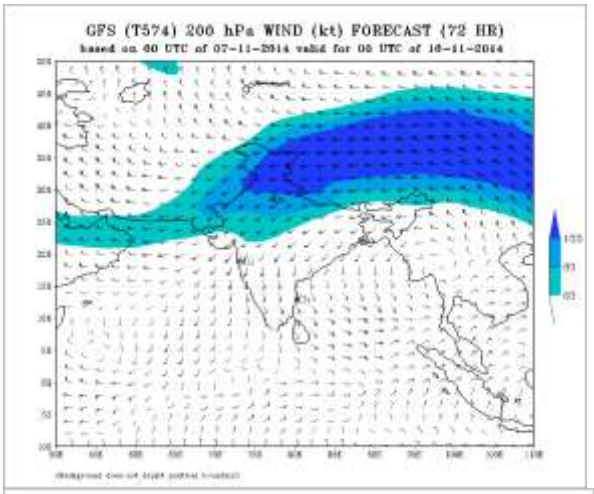
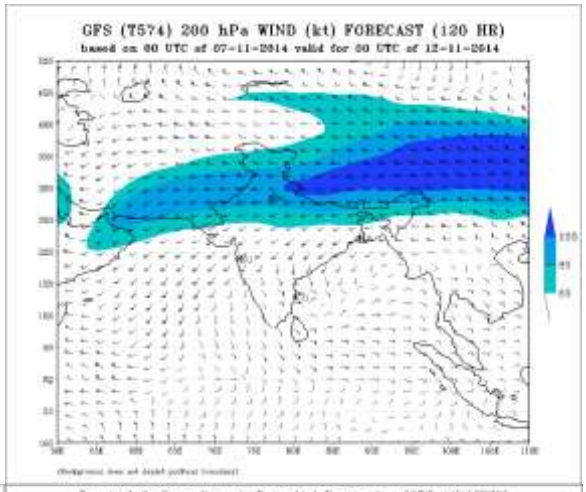
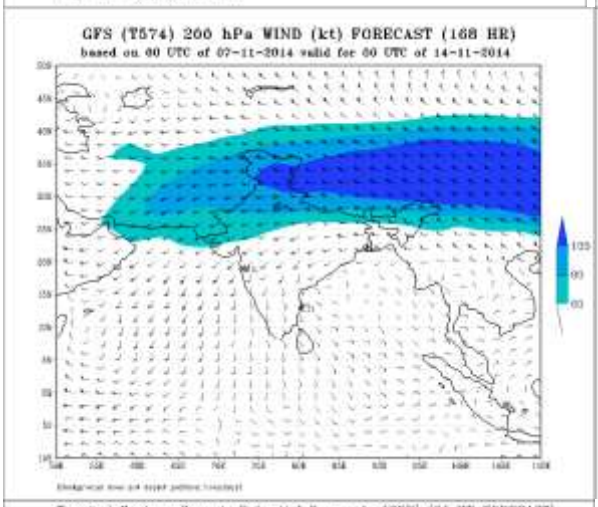

GFS (T574) 500 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 07-11-2014 valid for 00 UTC of 14-11-2014

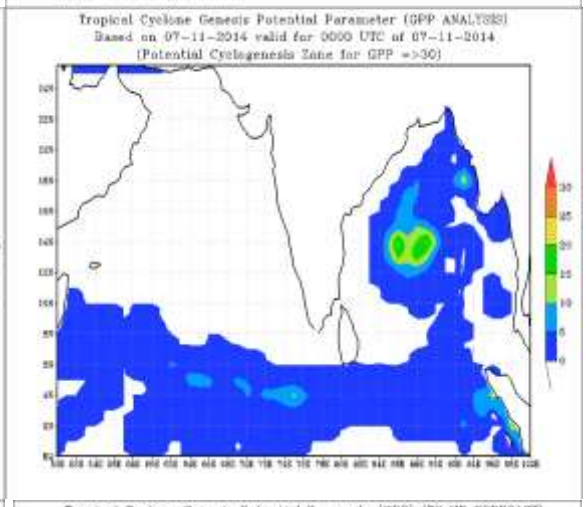

GFS (T574) 200 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 07-11-2014 valid for 00 UTC of 07-11-2014

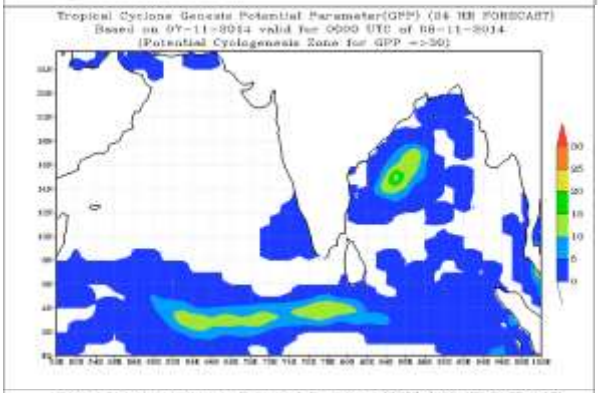

GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 07-11-2014 valid for 00 UTC of 08-11-2014

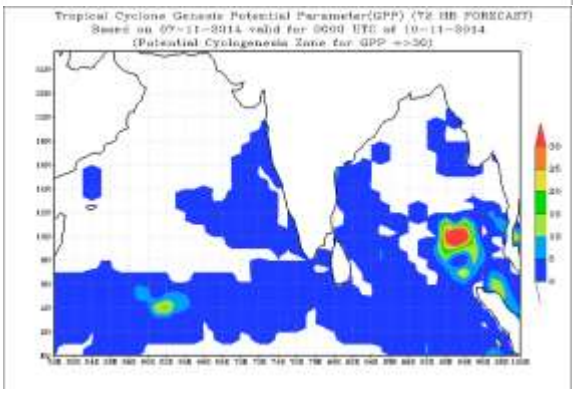

GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 07-11-2014 valid for 00 UTC of 10-11-2014

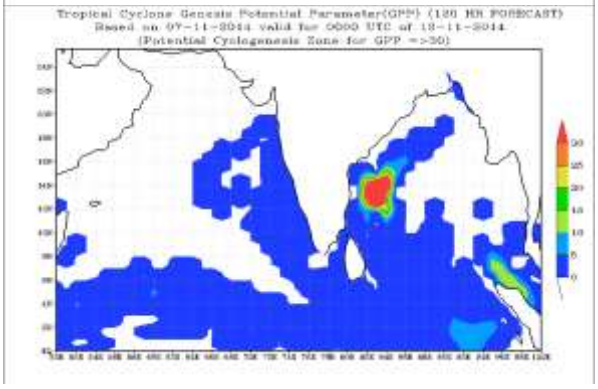

GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 07-11-2014 valid for 00 UTC of 12-11-2014

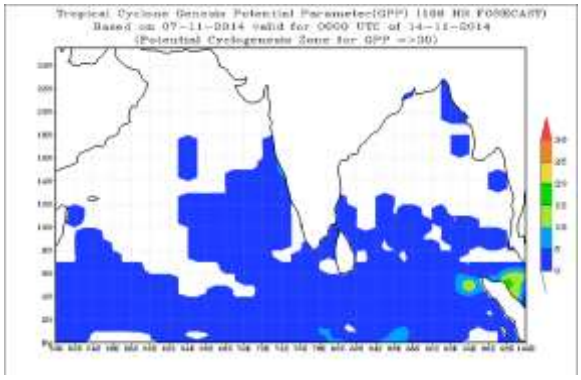

GFS (T574) 200 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 07-11-2014 valid for 00 UTC of 14-11-2014


Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 07-11-2014 valid for 0000 UTC of 07-11-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 07-11-2014 valid for 0000 UTC of 08-11-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 07-11-2014 valid for 0000 UTC of 10-11-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 07-11-2014 valid for 0000 UTC of 12-11-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (168 HR FORECAST)
Based on 07-11-2014 valid for 0000 UTC of 14-11-2014
(Potential Cyclogenesis Zone for GPP =>30)

FDP (Cyclone) NOC Report Dated 08 November, 2014

Synoptic features based on 0300 UTC of today:

- The Depression over central Bay of Bengal moved westward and weakened into a well-marked low pressure area over westcentral Bay of Bengal at 0830 hours IST of today, the 8th November, 2014.

Environmental features based on 0300 UTC of today:

Sea Surface Temperature:

- Sea Surface Temperature is between 26-28^{0}C over parts of south and adjoining eastcentral Bay of Bengal and Andaman Sea. It is 28-29^{0}C over rest of Bay of Bengal.

.

Tropical Cyclone Heat Potential (TCHP):

- The ocean thermal energy is about >100 kJ/cm^2 over equatorial region of extreme southeast Bay of Bengal and 80-100 kJ/cm^2 over rest of the eastern parts of Bay of Bengal. It is 40-60 kJ/cm^2 over southwest and westcentral Bay of Bengal.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive (30-60 *10^{-5} s^{-1}) over the region of the low pressure area.

Convergence:

- Lower level convergence is positive (5*10^{-5} s^{-1}) around the region of the low pressure area. It is 5-10*10^{-5} s^{-1} over extreme southeast Bay of Bengal off the Malay peninsula.

Divergence:

- Upper level divergence is positive of the order of 10-20 *10^{-5} s^{-1} over the extreme southeast Bay of Bengal off the Malay peninsula.

Wind Shear:

- Wind Shear is about 5-20 knots over the north Bay of Bengal. It is 20-40 knots over the south Bay of Bengal and Andaman Sea.

Wind Shear Tendency:

- The vertical wind shear tendency is decreasing in the extreme eastern parts of Bay of Bengal and is of the order of -10 to -20 knots.

Upper tropospheric ridge:

- The upper tropospheric **ridge** at 200 hPa passes through 18.0°N latitude.

M.J.O. Index:

- Located in phase 1 with amplitude less than 1.0. Likely to move in phase 1 with amplitude more than 1.0.

Storms and Depression over South China Sea:

- There is currently no Tropical Storm/Depression over South China Sea.

Status of observational system:

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

Satellite:
Inference based on INSAT imagery of 080900 UTC:
Bay of Bengal & Andaman Sea:-

Vortex over westcentral Bay of Bengal & neighbourhood centred near 14.3ºN/84.8ºE (.) Intensity T1.0. System is in shear pattern. Centre is well defined in vis imagery. Associated broken low and medium clouds with embedded moderate to intense convection over Bay of Bengal between latitude 11.5ºN to 17.5ºN and longitude 81.0ºE to 88.0ºE. Minimum Cloud Top Temperature -75ºC.
Scattered low and medium clouds with embedded isolated moderate to intense convection over northeast Bay of Bengal, south Andaman Sea and south Tenasserim coast.

Arabian Sea:-
Scattered low and medium clouds with embedded moderate to intense convection over extreme southeast parts of southwest Arabian Sea.

NWP Analysis

- IMD-GFS model low level wind (850 hPa) analysis based on 0000 UTC of 08th November 2014 shows a depression (low pressure system) associated with an extended northeast-southwest oriented cyclonic circulation over south central Bay of Bengal around 14 deg N. System is likely to remain as low in the 24 hr forecast and continue to move in a north-westerly direction towards the south Andhra coast. It would weaken gradually into a trough in the 48 hour forecast. Another a low level circulation is noticed over southern BOB in the 48 hour forecast.
- IMD-WRF model analysis valid for 00 UTC of 08th November 2014 also shows a low pressure area in associated with an extended northeast-southwest oriented cyclonic circulation over south central Bay of Bengal around 14 deg N. The system is likely to move in a north-westerly direction towards Andhra coast and weaken in the 48 hour forecast.
- The Genesis Potential Parameter (GPP) forecasts based on 0000 UTC of 08th November 2014 shows an extended cyclogenesis zone over the south central Bay of Bengal between 12 -14 deg N in the analysis field. However, the zone is likely to de-organize and de-intensify in the 48 hour forecast. Another cyclogenesis zone over the south Bay of Bengal between 8 -10 deg N is noticed in the 48 hour 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

- **ECMWF** model suggests formation of a low pressure area over south Andaman Sea on 10th. It would move westwards across Sri Lanka and south Tamil Nadu during the next 3 days.
- **NCMRWF-UKMO** model also suggests formation of a low pressure area over south Andaman Sea on 10th and westward movement across Sri Lanka and Tamil Nadu during the next 3 days.

- **NCMRWF-GFS** model indicates formation of a low pressure area over south Andaman Sea on 10th. It would move northwest wards towards South Andhra Pradesh / North Tamil Nadu coasts during the next 2 days.

Summary and Conclusion:

The Depression over central Bay of Bengal moved westward and weakened into a well-marked low pressure area over westcentral Bay of Bengal at 0830 hours IST of today, the 8th November, 2014.

Most model forecasts suggest formation of another low pressure area over south Andaman Sea on 10th November which would move westwards towards Tamil Nadu and Sri Lanka. However, most models do not suggest any further intensification of the low pressure area.

Advisory:

- Possible development of low pressure system over Andaman Sea around 10th needs to be watched.
- No IOP for next two days.

Annexure-I

Status of Observation system:

Synoptic observation:

Region	Date/Time (UTC)		
	07/12	08/00	08/03
India	46	30	45
Coastal stations			
WB	8	3	8
Odisha	7	4	7
AP	12	12	12
Tamil Nadu	11	8	11
Puducherry	2	2	2
A & N	6	1	5
Bangladesh	8	8	10
Myanmar	9	11	10
Thailand	0	1	0
Sri Lanka	8	8	8

AWS Observations:

Region	Date/Time (UTC)		
	07/12	08/00	08/03
India	61	134	151
Coastal stations			
WB	5	17	22
Odisha	6	11	20
AP	27	56	55
Tamil Nadu	22	48	52
Puducherry	1	1	2
A & N	-	-	-

- **RS/RW** (12Z) of 07/11/2014 **-1/39**
- **No. of Ascents reaching 250 hPa levels: 1-, MISDA: 38**
- **RS/RW** (00Z) of 08/11/2014 5**/39**
- **No. of Ascents reaching 250 hPa levels: 4, MISDA: 34**

No. of PILOT Ascents

07/12Z	08/00Z
6	9

Buoy Data

07/12Z	08/00Z	08/03Z
12	12	12

FOC CHENNAI: STATUS OF OBSERVATION

Date→				**07.11.2014**				
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 /07.11.2014 : 1

No. of Ascents reaching 250 hPa level = 1

MISDA : 7

12Z /07.11.2014 : --

No. of Ascents reaching 250 hPa level = --

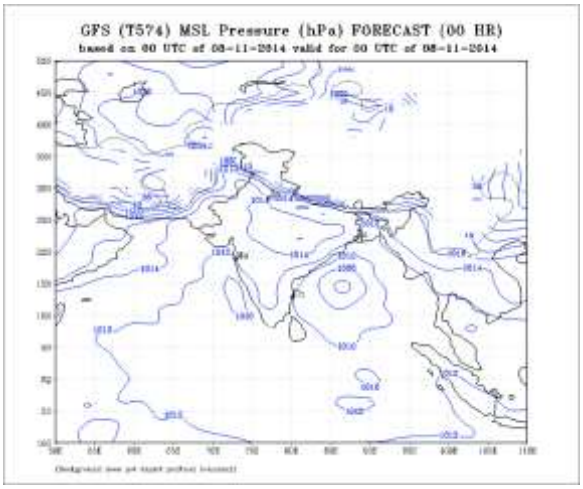
MISDA : 8

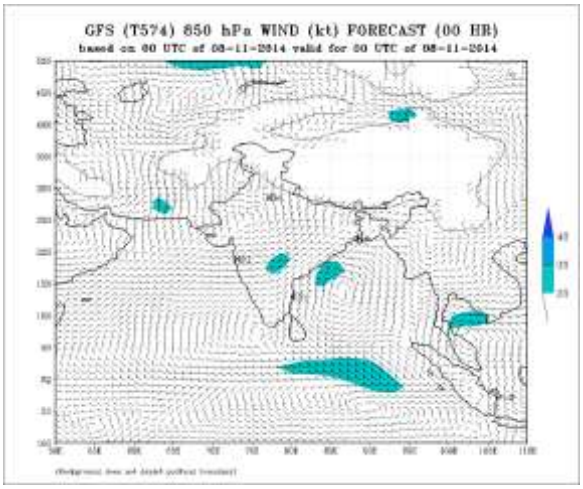
No. of PILOT Ascents:

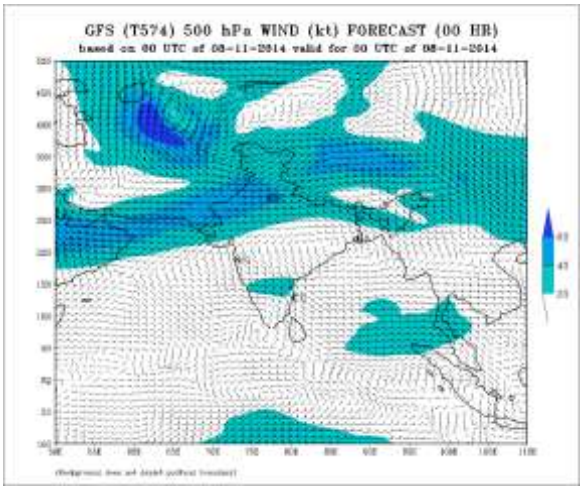
07.11.2014

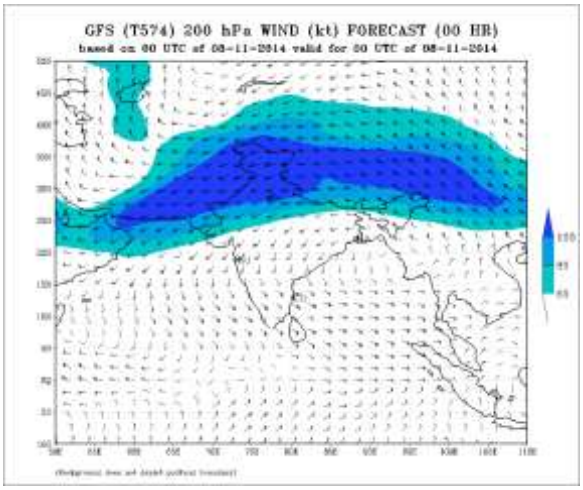
06Z	18Z
5	5

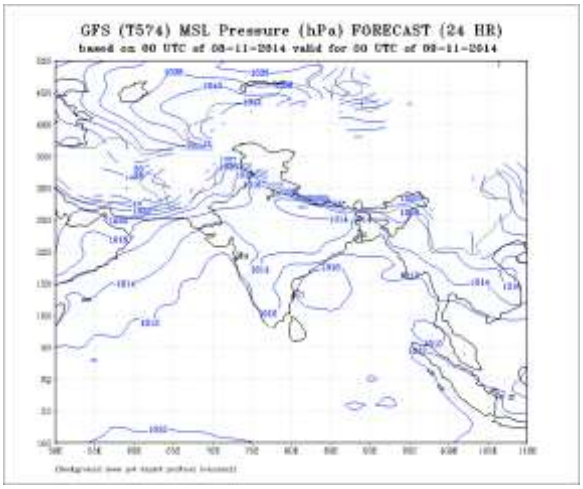
Annexure-II

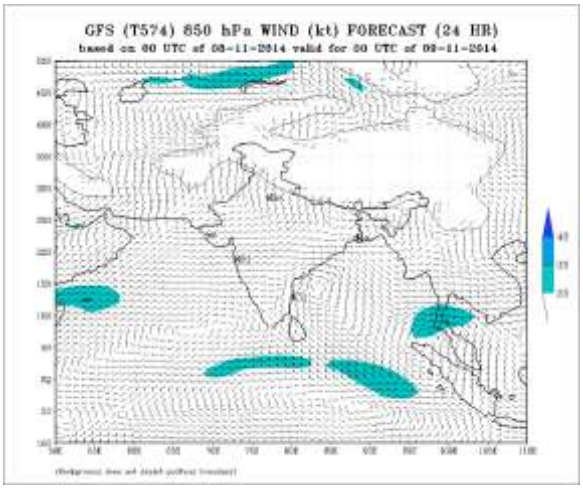

GFS (T574) MSL Pressure (hPa) FORECAST (00 HR)
based on 00 UTC of 08-11-2014 valid for 00 UTC of 08-11-2014

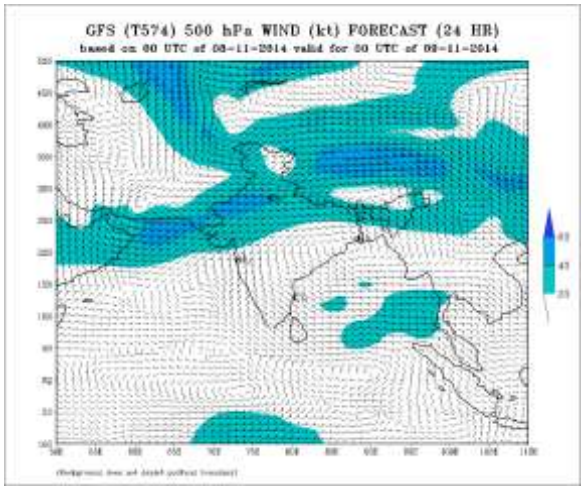

GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 08-11-2014 valid for 00 UTC of 08-11-2014

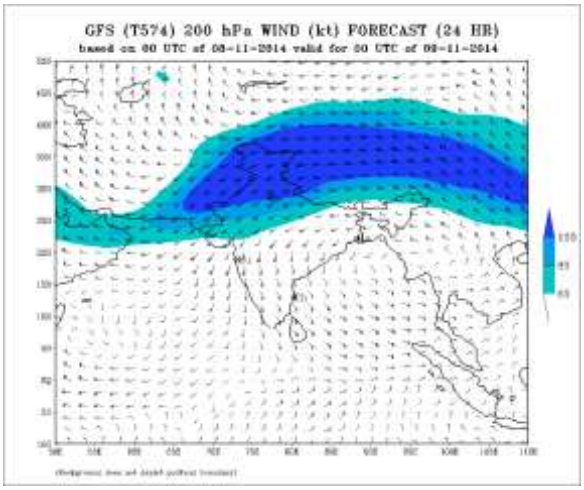

GFS (T574) 500 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 08-11-2014 valid for 00 UTC of 08-11-2014

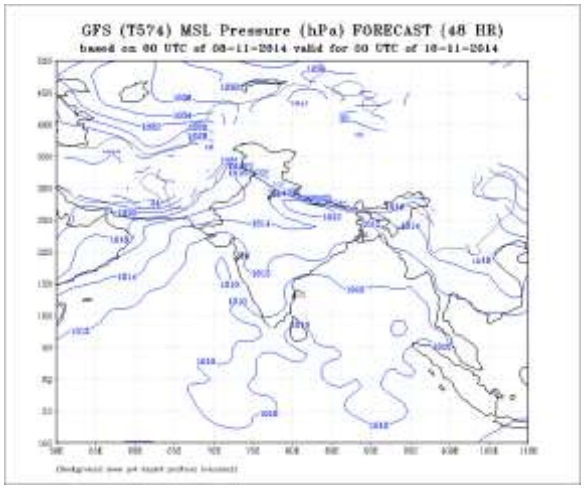

GFS (T574) 200 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 08-11-2014 valid for 00 UTC of 08-11-2014

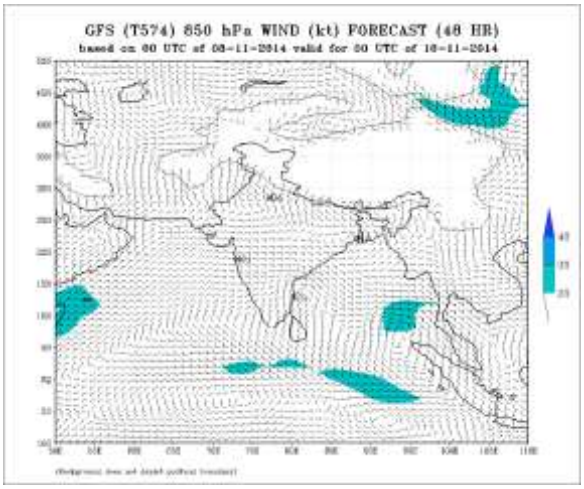

GFS (T574) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 08-11-2014 valid for 00 UTC of 08-11-2014

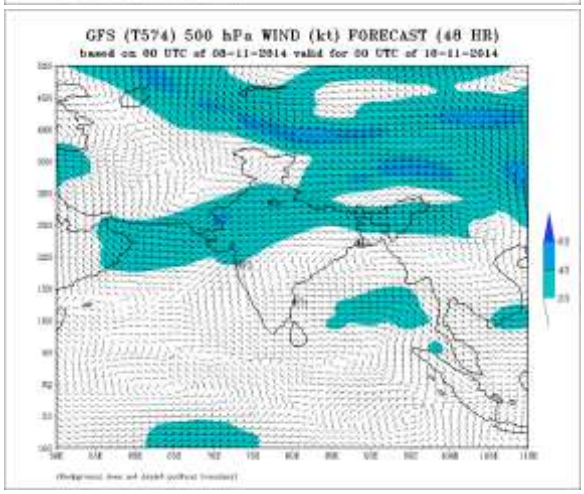

GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 08-11-2014 valid for 00 UTC of 08-11-2014

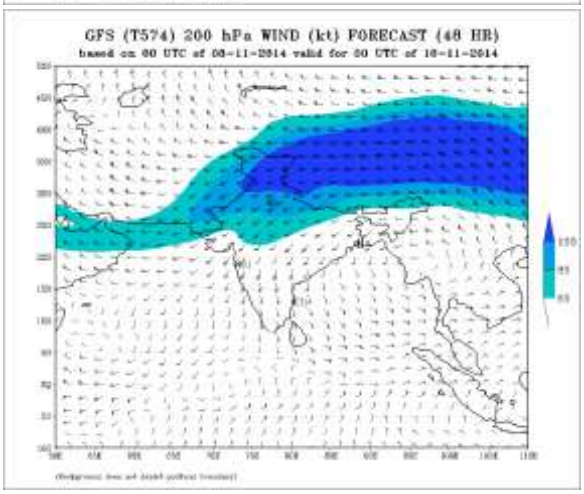

GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 08-11-2014 valid for 00 UTC of 09-11-2014

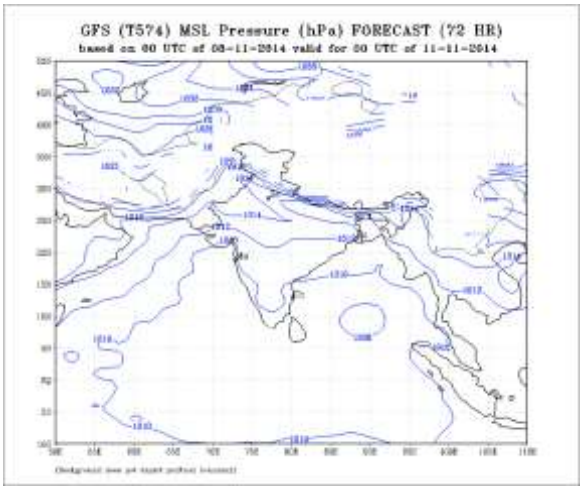

GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 08-11-2014 valid for 00 UTC of 09-11-2014

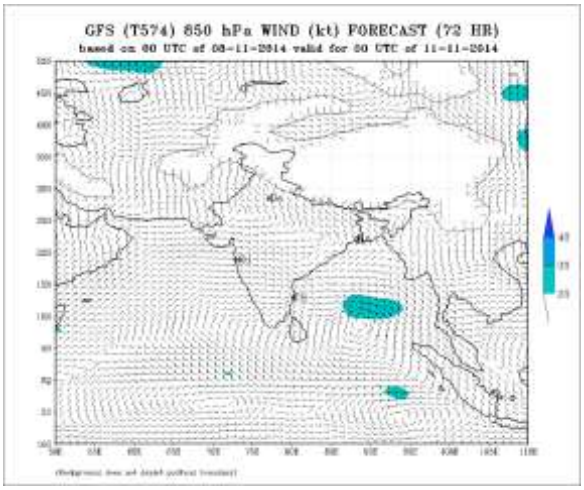

GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 08-11-2014 valid for 00 UTC of 10-11-2014

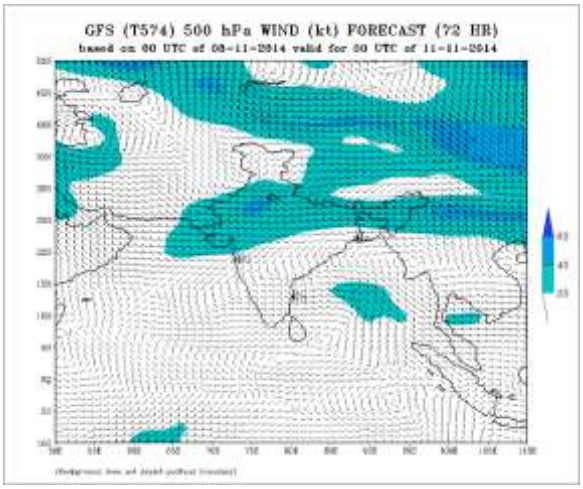

GFS (T574) 850 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 08-11-2014 valid for 00 UTC of 10-11-2014

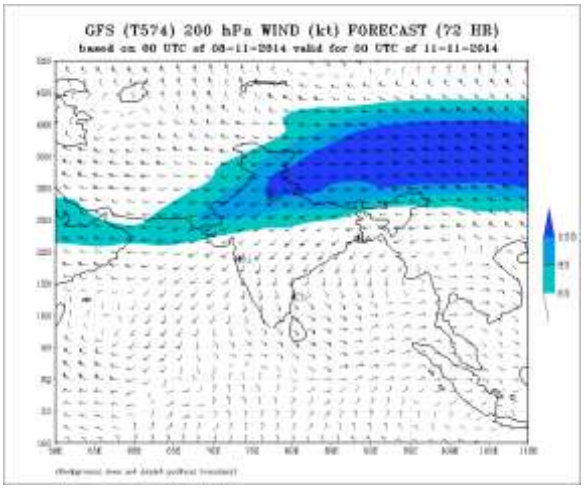

GFS (T574) 500 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 08-11-2014 valid for 00 UTC of 10-11-2014

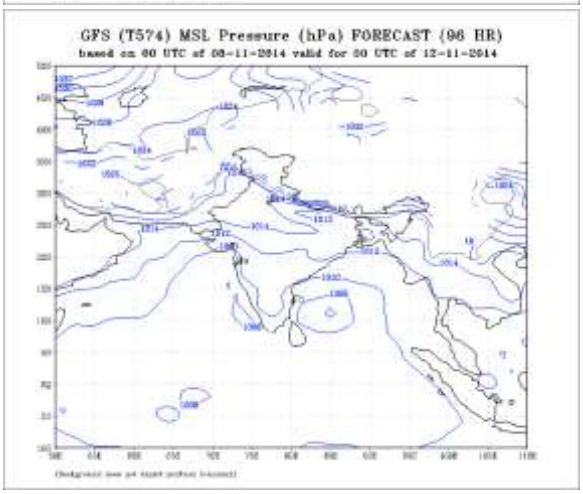

GFS (T574) 200 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 08-11-2014 valid for 00 UTC of 10-11-2014

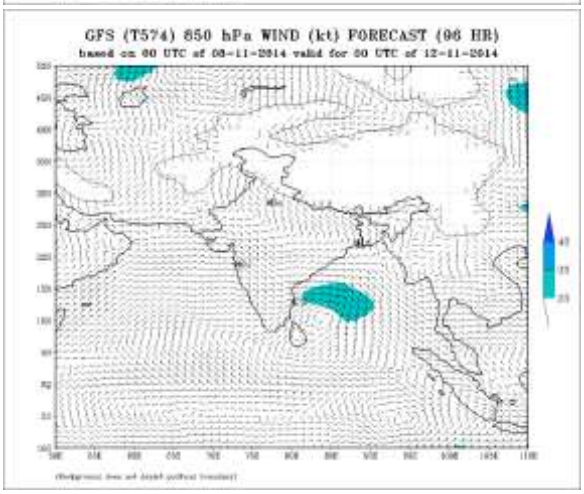

GFS (T574) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 08-11-2014 valid for 00 UTC of 11-11-2014

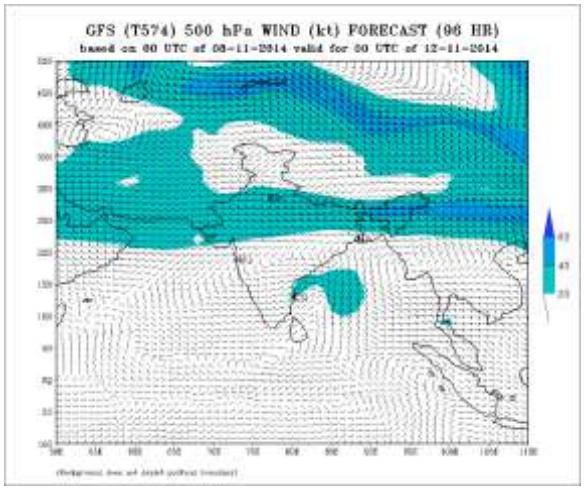

GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 08-11-2014 valid for 00 UTC of 11-11-2014

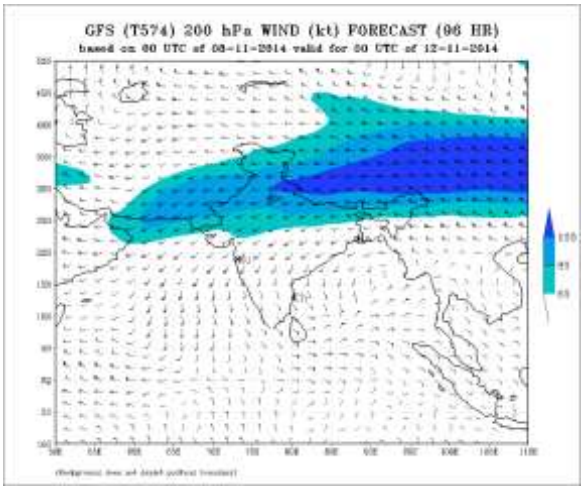

GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 08-11-2014 valid for 00 UTC of 11-11-2014

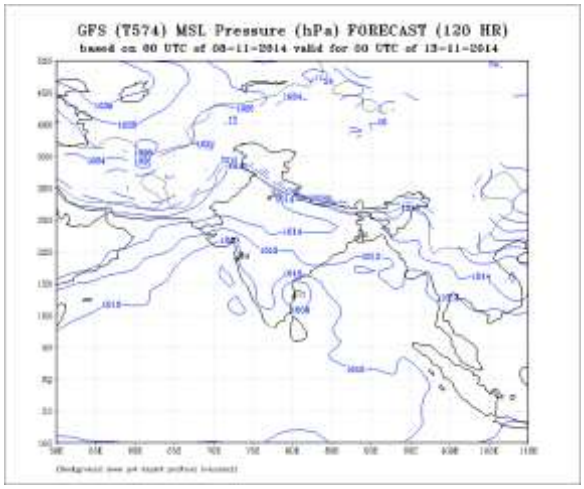

GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 08-11-2014 valid for 00 UTC of 11-11-2014

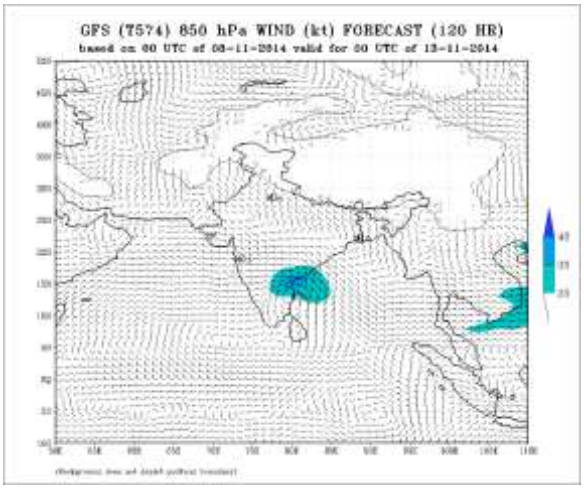

GFS (T574) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 08-11-2014 valid for 00 UTC of 12-11-2014

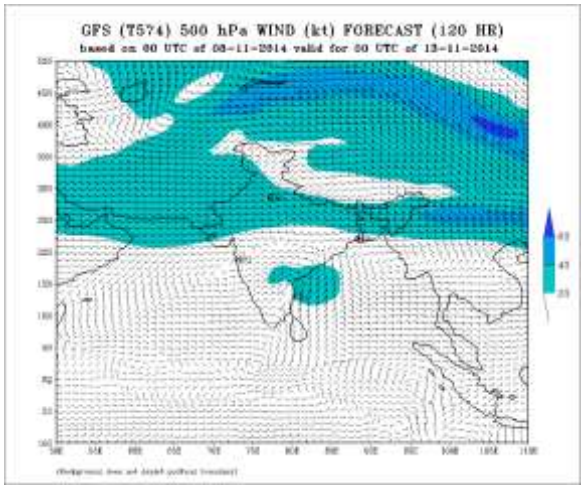

GFS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 08-11-2014 valid for 00 UTC of 12-11-2014

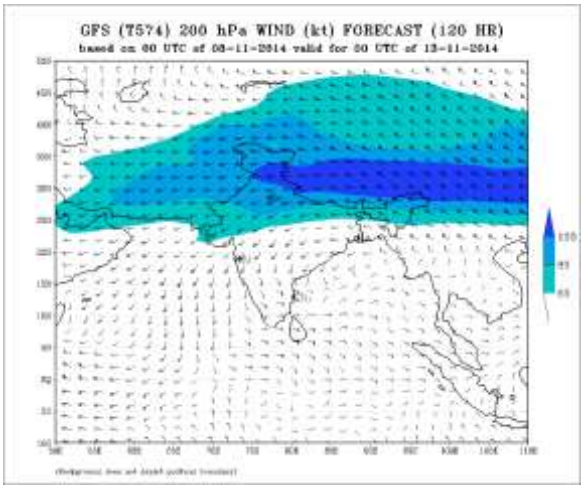

GFS (T574) 500 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 08-11-2014 valid for 00 UTC of 12-11-2014

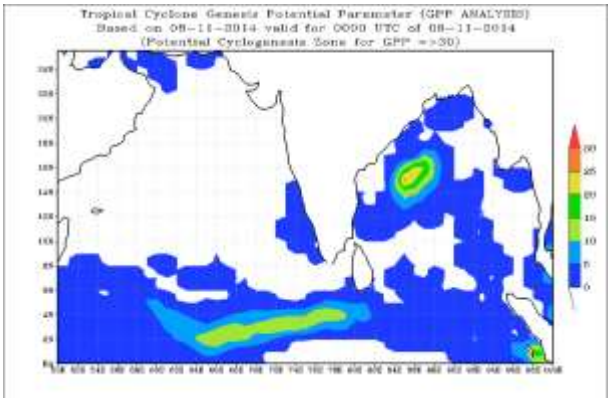

GFS (T574) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 08-11-2014 valid for 00 UTC of 12-11-2014

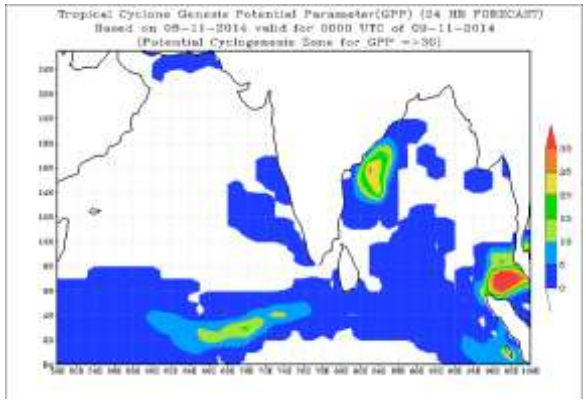

GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 08-11-2014 valid for 00 UTC of 13-11-2014

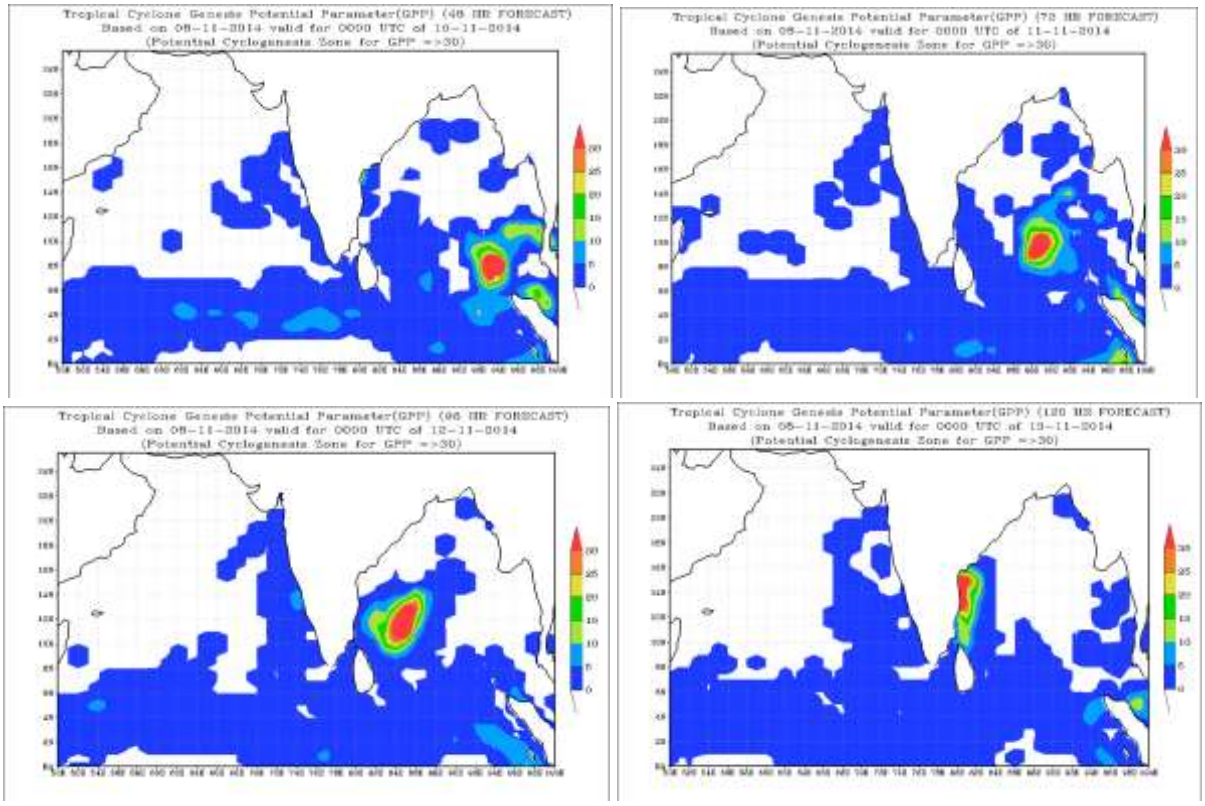

GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 08-11-2014 valid for 00 UTC of 13-11-2014


GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 08-11-2014 valid for 00 UTC of 13-11-2014


GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 08-11-2014 valid for 00 UTC of 13-11-2014


Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 08-11-2014 valid for 0000 UTC of 08-11-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 08-11-2014 valid for 0000 UTC of 09-11-2014
(Potential Cyclogenesis Zone for GPP =>30)



FDP (Cyclone) NOC Report Dated 09 November, 2014

Synoptic features based on 0300 UTC of today:

- The well-marked low pressure area over westcentral Bay of Bengal and adjoining coastal areas of Andhra Pradesh persists. It would weaken into a low pressure area during next 24 hours.
- A trough of low at mean Sea level exists over Tenasserim coast & adjoining Andaman Sea and extends upto 3.6 km above mean Sea level. A low pressure area may form over Andaman Sea & neighbourhood during next 48 hours.

Environmental features based on 0300 UTC of today: Sea Surface Temperature:

- Sea Surface Temperature is between 26-28^{0}C off Tamil Nadu and Andhra Pradesh coasts. It is 27-29^{0}C over rest of Bay of Bengal and Andaman Sea.

Tropical Cyclone Heat Potential (TCHP):

- The ocean thermal energy is 40-60 kJ/cm^2 over Bay of Bengal and Andaman Sea except over Tenasserim coast & adjoining Andaman Sea where it is 100 kJ/cm^2.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive (50-60 *10^{-5} s^{-1}) off Andhra Pradesh coast. It is 80-100 *10^{-5} s^{-1}off Tenasserim coast & adjoining Andaman Sea.

Convergence:

- Lower level convergence is positive ($5*10^{-5}$ s^{-1}) off Andhra Pradesh coast. It is 20-$30*10^{-5}$ s^{-1} off Tenasserim coast & adjoining Andaman Sea..

Divergence:

- Upper level divergence is positive of the order of 10-20 $*10^{-5}$ s^{-1} off Andhra Pradesh coast. It is 30-$40*10^{-5}$ s^{-1} off Tenasserim coast & adjoining Andaman Sea.

Wind Shear:

- Wind Shear is about 15-25 knots off Andhra Pradesh coast. It is 10-20 knots off Tenasserim coast & adjoining Andaman Sea.

Wind Shear Tendency:

- The vertical wind shear tendency is decreasing and is of the order of -10 to -20 knots off Tenasserim coast & adjoining Andaman Sea. .

Upper tropospheric ridge:

- The upper tropospheric **ridge** at 200 hPa passes through 18.0°N latitude.

M.J.O. Index:

- Located in phase 1 with amplitude greater than 1.0.

Storms and Depression over South China Sea:

- There is currently no Tropical Storm/Depression over South China Sea.

Status of observational system:

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

Inference based on INSAT imagery of 090900 UTC:

Bay of Bengal & Andaman Sea:-

Vortex over wc bay centred near 14.5°N/82.5°E. Intensity T1.5. Associated broken low and medium clouds with embedded intense to very intense convection over Bay of Bengal between latitude 13.0°N to 20.0°N and west of longitude 87.0°E and coastal Andhra Pradesh, Rayalaseema, Telengana, South Orissa and South Chhattisgarh. Minimum cloud top temperature is -75°C.

Broken low and medium clouds with embedded moderate to intense convection over rest of Bay of Bengal, south of latitude 16.5°N, east of longitude 89.0°E, rest of Andaman Sea and south Tenasserim coast.

Arabian Sea:-

Scattered low and medium clouds with embedded isolated weak to moderate convection over south Arabian Sea.

NWP Analysis

- IMD-GFS model low level wind (850 hPa) analysis based on 0000 UTC of 09th November2014 shows a low level circulation associated with an extended northeast-southwest oriented trough along the south Andra coast around 14 deg N/82 deg E. The low level circulation would merge with the easterly waves in the 24 hr forecast and give rainfall over
- south Andhra coast and adjoining areas. It would weaken gradually into a trough in the 48 hour forecast. Another low level circulation noticed over southern BOB in the analysis is moving westward along with easterly waves in the next 2 days.
- The Genesis Potential Parameter (GPP) forecasts based on 0000 UTC of 09th November 2014 shows an extended cyclogenesis zone over the south Andhra Coast

between 12 -14 deg N in the analysis field. However, the zone is likely to de-organize and de-intensify in the 24 hour forecast. Another cyclogenesis zone over the south Andaman Sea between 8-10 deg N is noticed in the analysis and likely to move westwards towards east coast of India in the next 2 days forecast.

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

ECMWF model suggests formation of a low pressure area over south Andaman Sea on 10th. It would move westwards across Sri Lanka and south Tamil Nadu during the next 3 days.

ARP (METEO FRANCE) model suggests formation of a low pressure area over south Andaman Sea on 10th. It would move westwards across Sri Lanka and south Tamil Nadu during the next 3 days.
NCMRWF-UKMO model also suggests formation of a low pressure area over south Andaman Sea on 10th and westward movement across Sri Lanka and Tamil Nadu during the next 3 days.
NCMRWF-GFS model indicates formation of a low pressure area over south Andaman Sea on
11th. It would westwards towards Tamil Nadu coasts during the next 2 days.

Summary and Conclusion:
The well-marked low pressure area over westcentral Bay of Bengal and adjoining coastal areas of Andhra Pradesh persists. It would weaken into a low pressure area during next 24 hours.

A trough of low at mean Sea level exists over Tenasserim coast & adjoining Andaman Sea and extends upto 3.6 km above mean Sea level. A low pressure area may form over Andaman Sea & neighbourhood during next 48 hours
Most model forecasts suggest formation of another low pressure area over south Andaman Sea on 10th November which would move westwards towards Tamil Nadu and Sri Lanka. However, they do not suggest any further intensification of the low pressure area.
Advisory:

- Possible development of low pressure system over Andaman Sea around 10th needs to be watched.
- No IOP for next two days.

Annexure-I

Status of Observation system:

Synoptic observation:

Region	Date/Time (UTC)		
	08/12	**09/00**	**09/03**
India	46	30	46
Coastal stations			
WB	8	3	8
Odisha	7	4	7
AP	12	12	12
Tamil Nadu	11	8	11
Puducherry	2	2	2
A & N	6	1	6
Bangladesh	9	10	4
Myanmar	11	11	11
Thailand	1	1	0
Sri Lanka	8	7	8

AWS Observations:

Region	Date/Time (UTC)		
	08/12	**09/00**	**09/03**
India	67	64	70
Coastal stations			
WB	8	7	9
Odisha	8	6	8
AP	26	27	27
Tamil Nadu	26	23	25
Puducherry	1	1	1
A & N	-	-	-

- **RS/RW** (12Z) of 08/11/2014 **-0/39**
- **No. of Ascents reaching 250 hPa levels: 0-, MISDA: 39**
- **RS/RW** (00Z) of 09/11/2014 5**/39**
- **No. of Ascents reaching 250 hPa levels: 4, MISDA: 34**

No. of PILOT Ascents

08/12Z	**09/00Z**
8	10

Buoy Data

08/12Z	09/00Z	09/03Z
8	8	8

FOC CHENNAI: STATUS OF OBSERVATION

Date→	08.11.2014							
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 /08.11.2014 : 1

No. of Ascents reaching 250 hPa level = 1

MISDA : 7

12Z /08.11.2014 : --

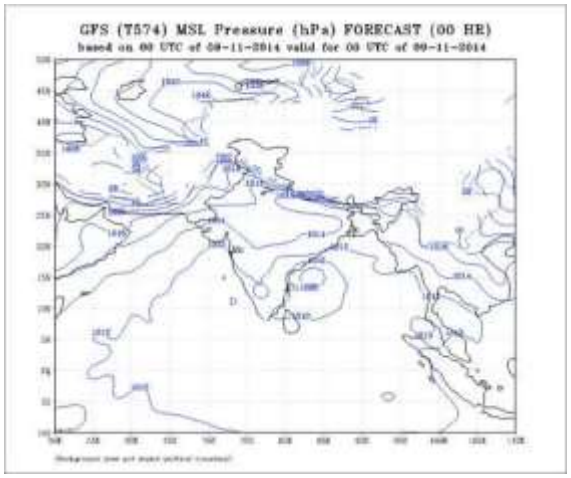
No. of Ascents reaching 250 hPa level = --

MISDA : 8

No. of PILOT Ascents:

08.11.2014	
06Z	18Z
3	1

Annexure-II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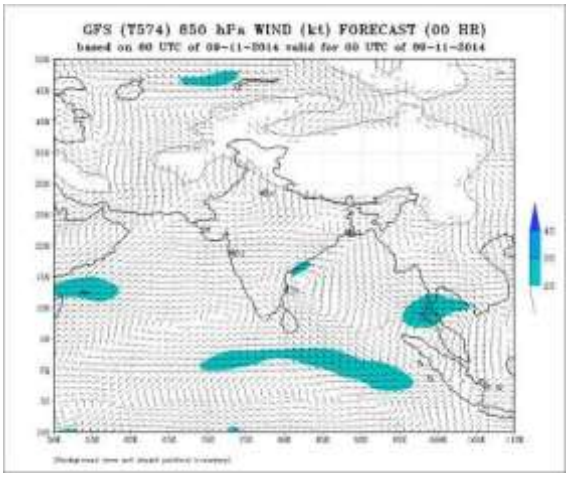
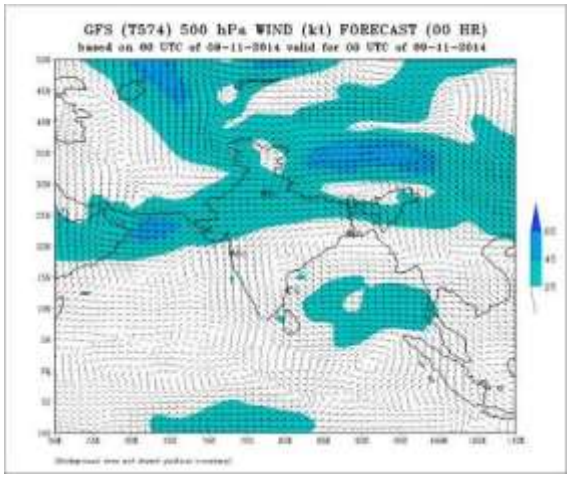
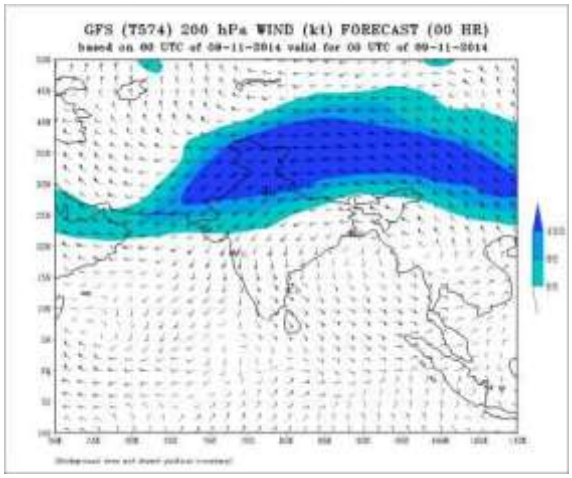
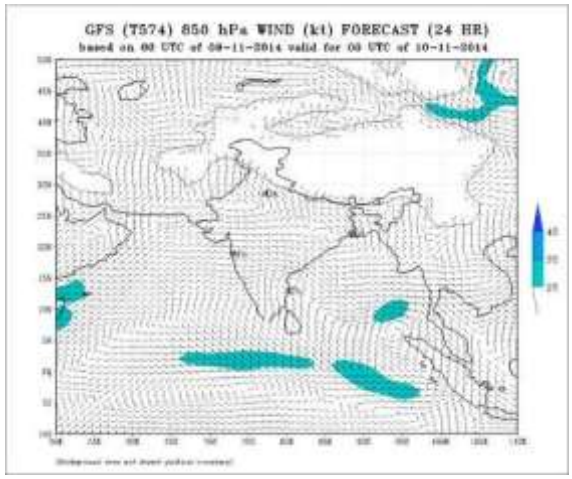
based on 00 UTC of 09-11-2014 valid for 00 UTC of 09-11-2014

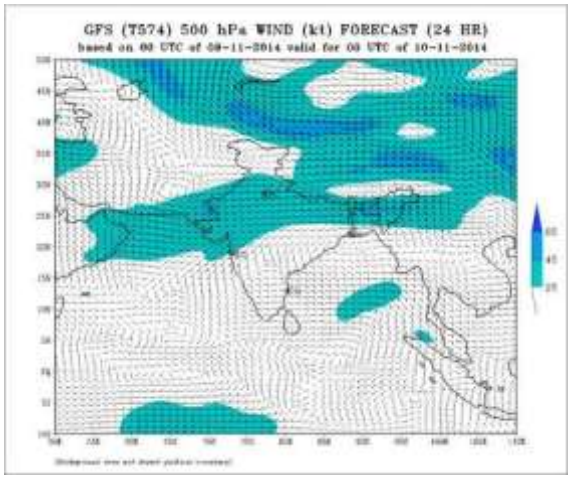

GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 09-11-2014 valid for 00 UTC of 09-11-2014

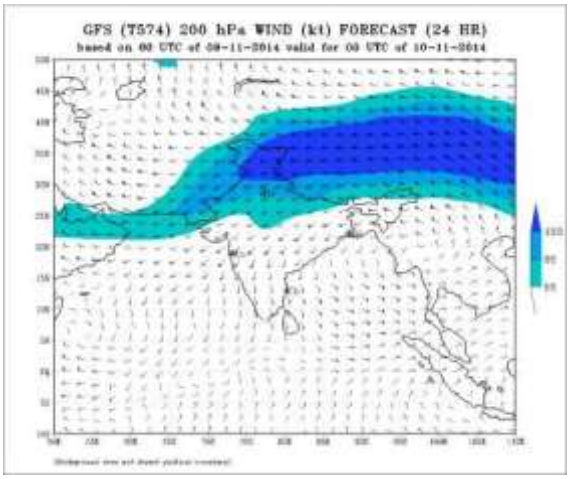

GFS (T574) 500 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 09-11-2014 valid for 00 UTC of 09-11-2014

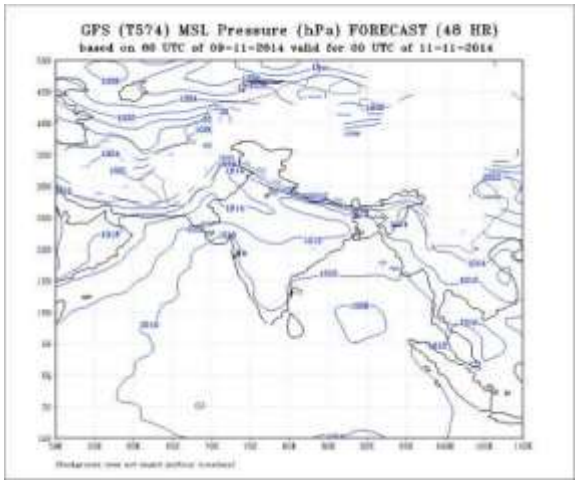

GFS (T574) 200 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 09-11-2014 valid for 00 UTC of 09-11-2014

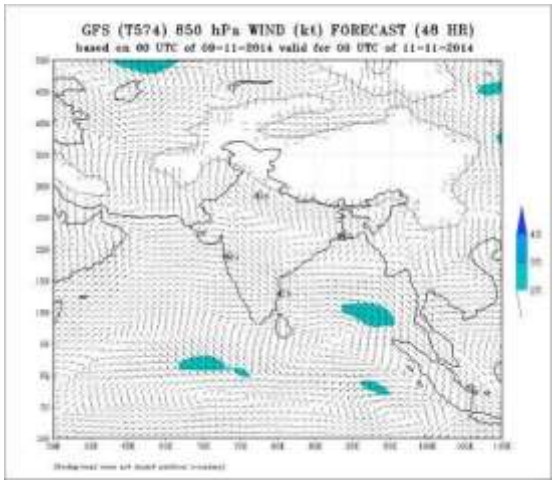

GFS (T574) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 09-11-2014 valid for 00 UTC of 10-11-2014

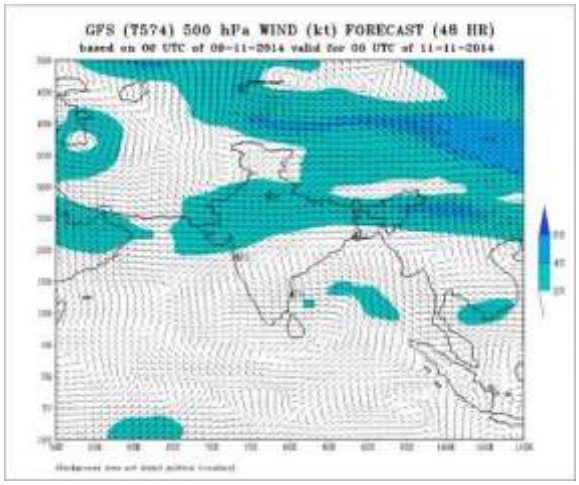

GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 09-11-2014 valid for 00 UTC of 10-11-2014

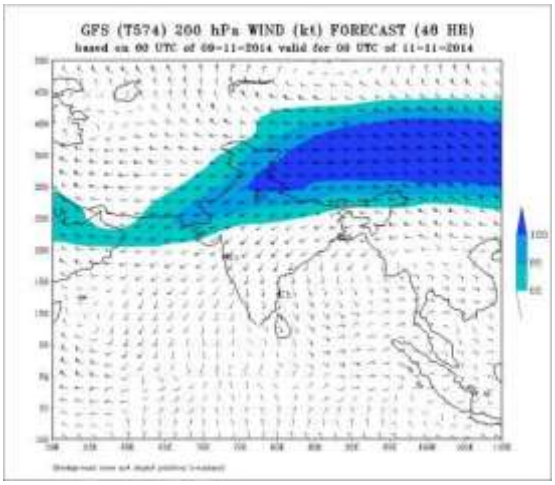

GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 09-11-2014 valid for 00 UTC of 10-11-2014

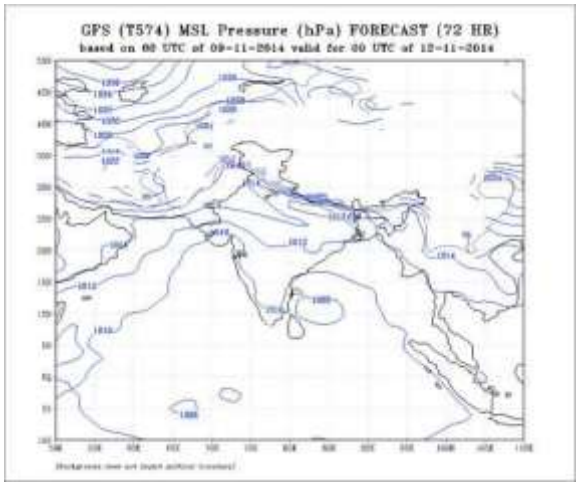

GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 09-11-2014 valid for 00 UTC of 10-11-2014

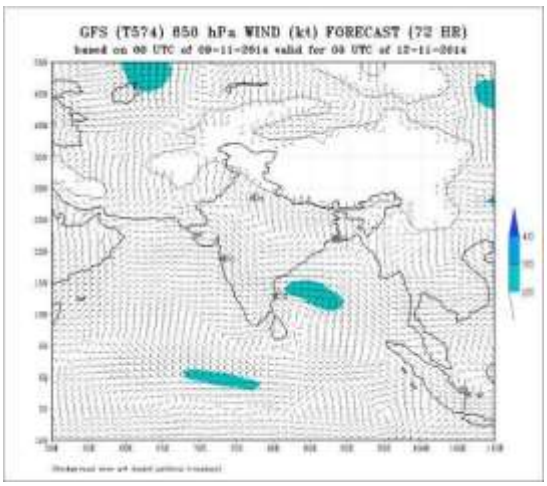

GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 09-11-2014 valid for 00 UTC of 11-11-2014

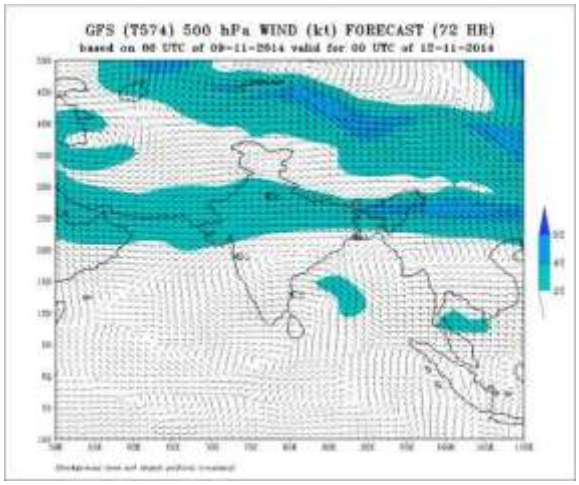

GFS (T574) 850 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 09-11-2014 valid for 00 UTC of 11-11-2014

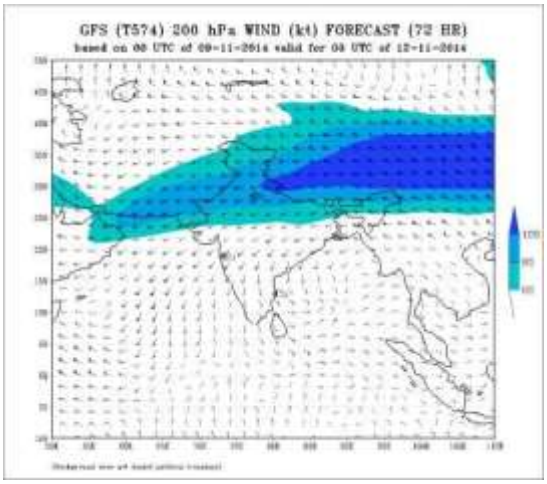

GFS (T574) 500 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 09-11-2014 valid for 00 UTC of 11-11-2014


GFS (T574) 200 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 09-11-2014 valid for 00 UTC of 11-11-2014

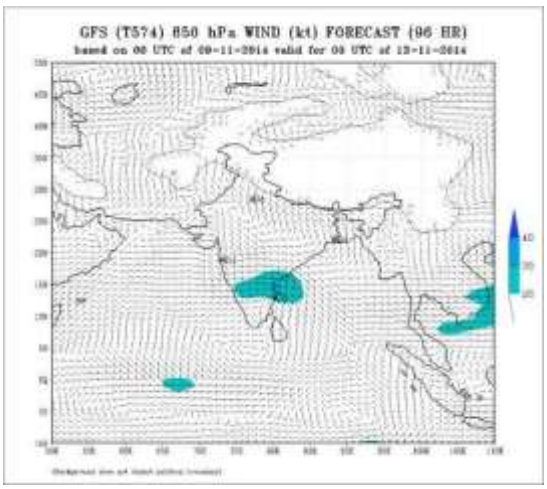

GFS (T574) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 09-11-2014 valid for 00 UTC of 12-11-2014

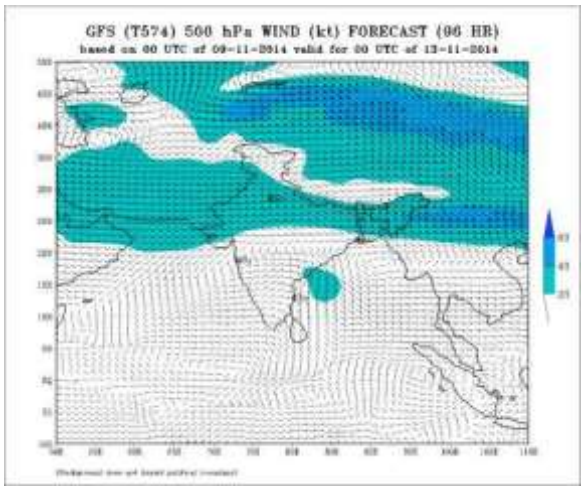

GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 09-11-2014 valid for 00 UTC of 12-11-2014

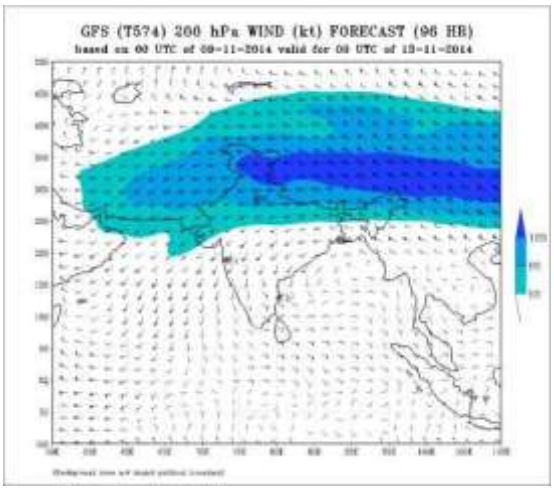

GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 09-11-2014 valid for 00 UTC of 12-11-2014

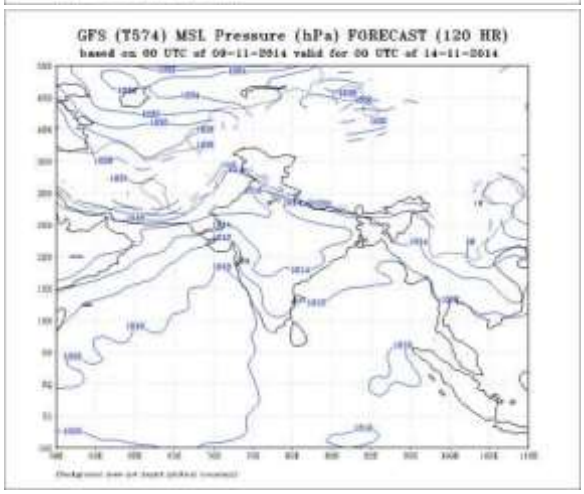

GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 09-11-2014 valid for 00 UTC of 12-11-2014

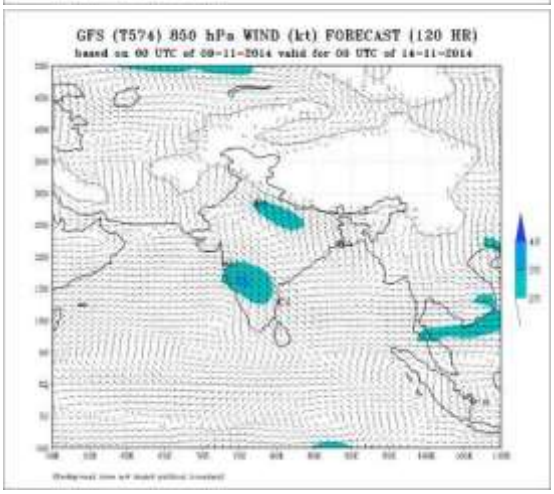

GFS (T574) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 09-11-2014 valid for 00 UTC of 13-11-2014

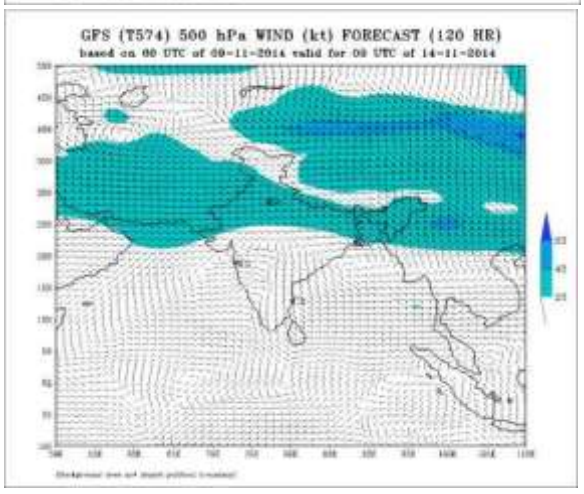

GFS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 09-11-2014 valid for 00 UTC of 13-11-2014

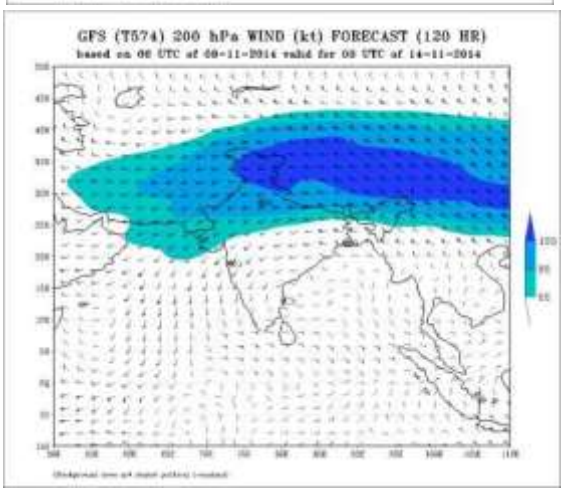

GFS (T574) 500 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 09-11-2014 valid for 00 UTC of 13-11-2014

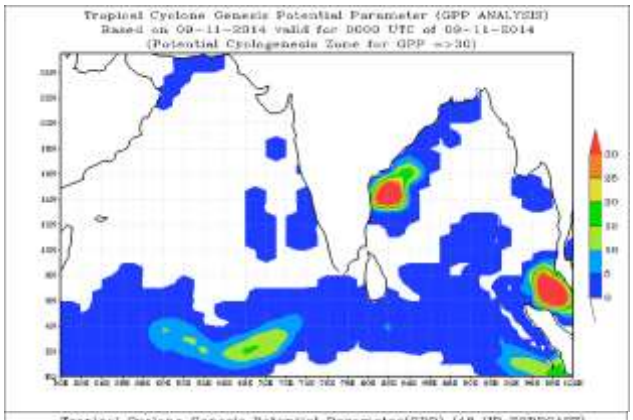

GFS (T574) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 09-11-2014 valid for 00 UTC of 13-11-2014

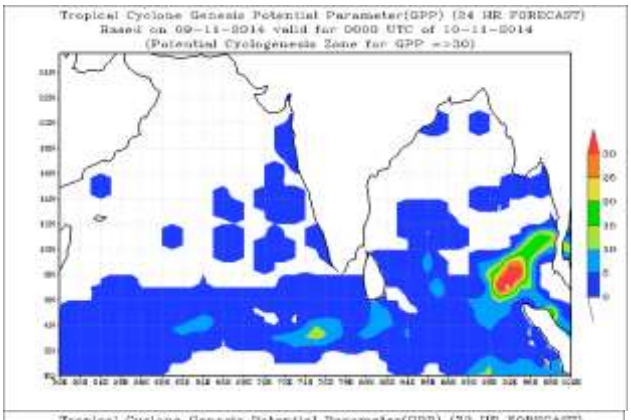

GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 09-11-2014 valid for 00 UTC of 14-11-2014

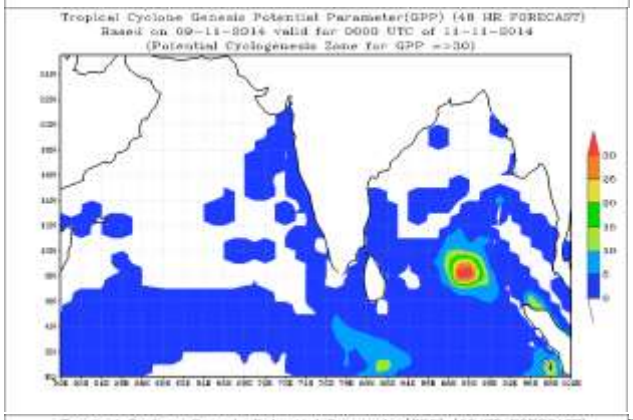

GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 09-11-2014 valid for 00 UTC of 14-11-2014

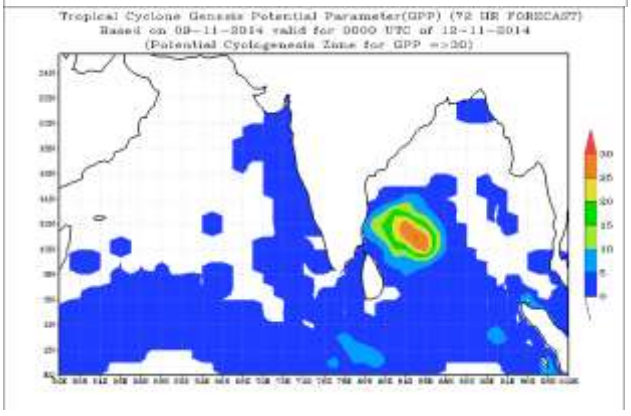

GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 09-11-2014 valid for 00 UTC of 14-11-2014

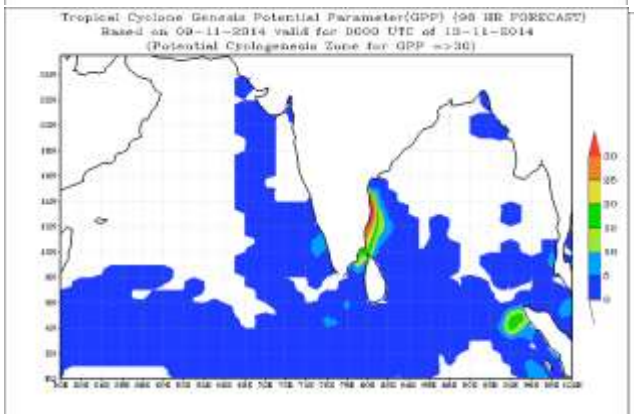

GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 09-11-2014 valid for 00 UTC of 14-11-2014

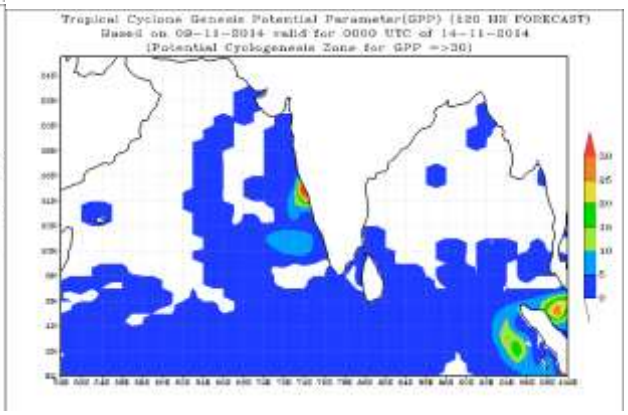

Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 09-11-2014 valid for 0000 UTC of 09-11-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 09-11-2014 valid for 0000 UTC of 10-11-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
Based on 09-11-2014 valid for 0000 UTC of 11-11-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 09-11-2014 valid for 0000 UTC of 12-11-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (96 HR FORECAST)
Based on 09-11-2014 valid for 0000 UTC of 13-11-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 09-11-2014 valid for 0000 UTC of 14-11-2014
(Potential Cyclogenesis Zone for GPP =>30)

FDP (Cyclone) NOC Report Dated 10 November, 2014

Synoptic features based on 0300 UTC of today:

- The well marked low pressure area over westcentral Bay of Bengal and adjoining coastal areas of Andhra Pradesh has become less marked. However, associated upper air cyclonic circulation lies over south Andhra Pradesh & adjoining westcentral Bay of Bengal and extends upto lower tropospheric level.
- A low pressure area has formed over south Andaman Sea and neighbourhood. Associated upper air cyclonic circulation extends upto 3.1 km above mean Sea level. The system would become well marked low pressure area during next 24 hours.

Environmental features based on 0300 UTC of today:

Sea Surface Temperature:

- Sea Surface Temperature is between 26-28^{0}C along and off the eastern coastal belt of India. It is 28-30^{0}C over rest of Bay of Bengal and Andaman Sea.

.**Tropical Cyclone Heat Potential (TCHP):**

- The ocean thermal energy is 40-60 kJ/cm^2 over Bay of Bengal and Andaman Sea except over Tenasserim coast & adjoining Andaman Sea where it is 80-100 kJ/cm^2.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive (50-60 *10^{-5} s^{-1}) over the region of low pressure area in the Andaman Sea. .

Convergence:

- Lower level convergence is positive (5-10*10^{-5} s^{-1}) over the region of low pressure area in the Andaman Sea.

Divergence:

- Upper level divergence is positive of the order of 10-20 *10^{-5} s^{-1} over the region of low pressure area in the Andaman Sea. .

Wind Shear:

- Wind Shear is 10-20 knots over the region of low pressure area in the south Andaman Sea.

Wind Shear Tendency:

- The vertical wind shear tendency is decreasing and is of the order of -10 knots over the region of low pressure area in the south Andaman Sea and in southwest Bay of Bengal. It is positive over the rest of Bay of Bengal.

Upper tropospheric ridge:

- The upper tropospheric **ridge** at 200 hPa passes through 18.0°N latitude.

M.J.O. Index:

- Located in phase 1 with amplitude greater than 1.0.

Storms and Depression over South China Sea:

- There is currently no Tropical Storm/Depression over South China Sea.

Status of observational system:

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

Satellite:

Inference based on INSAT imagery of 100900 UTC:

Bay of Bengal & Andaman Sea:-

Vortex over southeast bay centred within half a degree of Lat 8.5°N/93.5°E. Intensity T1.0. Broken low and medium clouds with embedded intense to very intense convection over south Andaman Islands adjoining southeast Bay of Bengal between latitude 6.0°N to 13.0°N and longitude 88.0°E to 96.5°E

Scattered low and medium clouds with embedded moderate to intense convection over eastcentral Bay of Bengal and Tenasserim coast.

Arabian Sea:-

Scattered low and medium clouds with embedded isolated weak convection over central parts of south Arabian Sea.

NWP Analysis

- IMD-GFS model low level wind (850 hPa) analysis based on 0000 UTC of 10th November 2014 shows a low level circulation associated with an extended northeast-southwest oriented trough over the land areas of south Andhra Pradesh. This low level circulation would merge with the easterly waves in the 24 hr forecast. Another low level circulation noticed over the south Andaman Sea in the analysis is moving westward along with easterly waves in the 24 and 48 hours forecast. This low level circulation would approach south Tamilnadu coast in the 72 hour forecast and produce rainfall over south Tamilnadu and adjoining areas.
- The Genesis Potential Parameter (GPP) forecasts based on 0000 UTC of 10th November 2014 shows an extended cyclogenesis zone over the south Andaman Sea between 7 -9 deg N/94E and likely to move westwards towards east coast of India in the next 2 days forecast. However, the zone is likely to organize and intensify in the 24 hour forecast.

The system would reach south Tamilnadu coast on 13 Nov 2014.

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

- **ECMWF** model suggests westward movement of the low pressure area over south Andaman Sea across Sri Lanka and south Tamil Nadu during the next 3 days.
- **NCMRWF-UKMO** model also suggests westward movement of the low pressure area over south Andaman Sea across Sri Lanka and south Tamil Nadu during the next 3 days.
- **NCMRWF-GFS** model also suggests westward movement of the low pressure area over south Andaman Sea across Sri Lanka and south Tamil Nadu during the next 3 days.

Most of the models do not suggest intensification of the low pressure area.

Summary and Conclusion:

A low pressure area has formed over south Andaman Sea and neighbourhood. Associated upper air cyclonic circulation extends upto 3.1 km above mean Sea level. The system would become well marked low pressure area during next 24 hours.

Advisory:

- Possible intensification of low pressure area over Andaman Sea needs to be watched.
- No IOP for next two days.

Annexure-I

Status of Observation system:

Synoptic observation:

Region	Date/Time (UTC)		
	09/12	10/00	10/03
India	41	30	44
Coastal stations			
WB	8	2	8
Odisha	7	5	7
AP	10	12	12
Tamil Nadu	8	7	10
Puducherry	2	2	2
A & N	6	1	5
Bangladesh	11	11	1
Myanmar	11	11	11
Thailand	2	2	2
Sri Lanka	8	7	8

AWS Observations:

Region	Date/Time (UTC)		
	09/12	10/00	10/03
India	61	59	58
Coastal stations			
WB	7	7	9
Odisha	3	4	6
AP	27	26	27
Tamil Nadu	23	21	25
Puducherry	1	1	1
A & N	-	-	-

- **RS/RW** (12Z) of 09/11/2014 **-1/39**
- **No. of Ascents reaching 250 hPa levels: 1-, MISDA: 38**
- **RS/RW** (00Z) of 10/11/2014 18**/39**
- **No. of Ascents reaching 250 hPa levels: 18, MISDA: 11**

No. of PILOT Ascents

09/12Z	10/00Z
9	11

Buoy Data

09/12Z	10/00Z	11/03Z
8	8	8

FOC CHENNAI: STATUS OF OBSERVATION

Date→	**09.11.2014**							
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 /09.11.2014 : 1

No. of Ascents reaching 250 hPa level = 1

MISDA : 7

12Z /09.11.2014 : --

No. of Ascents reaching 250 hPa level = --

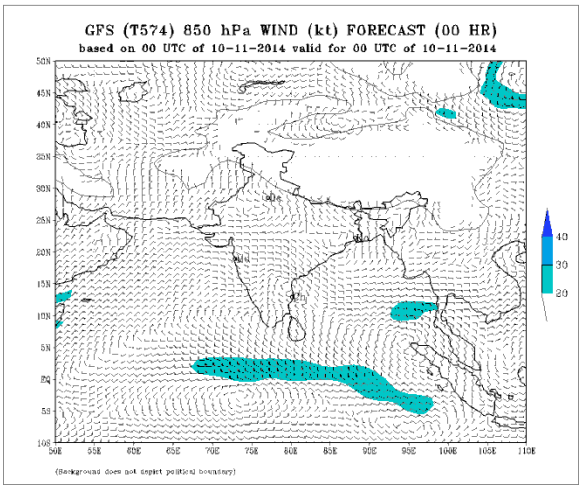
MISDA : 8

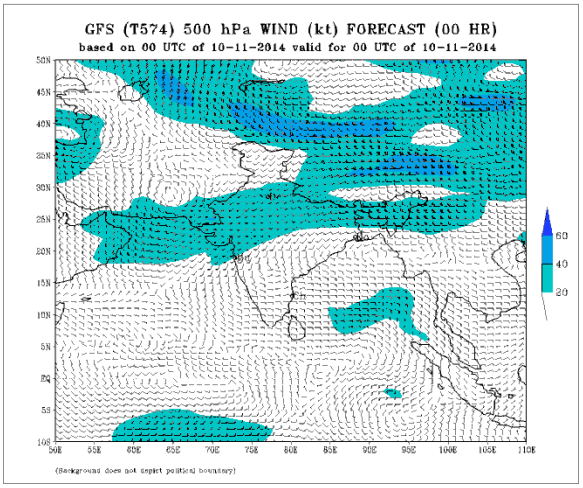
No. of PILOT Ascents:

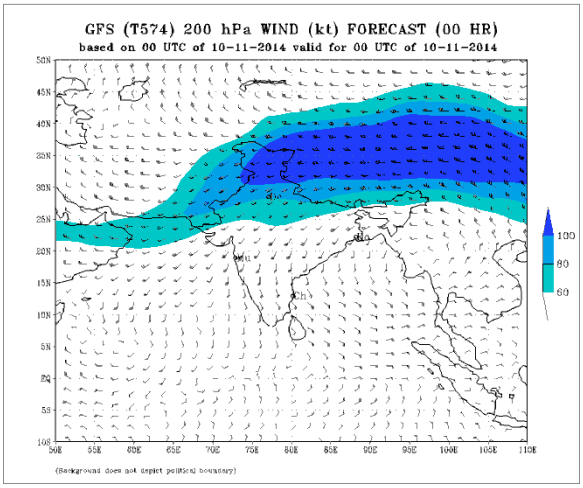
09.11.2014	
06Z	18Z
2	3

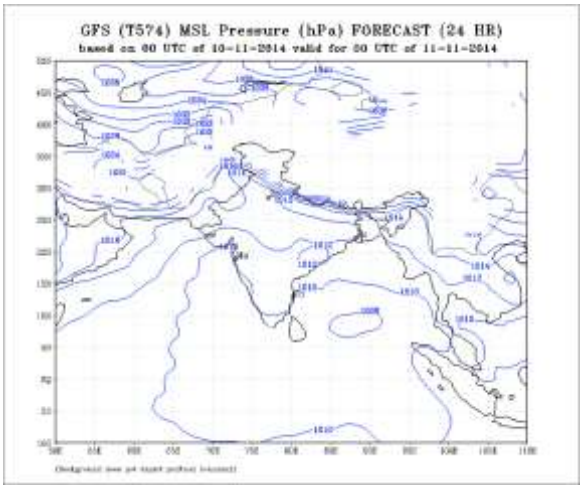
Annexure-II

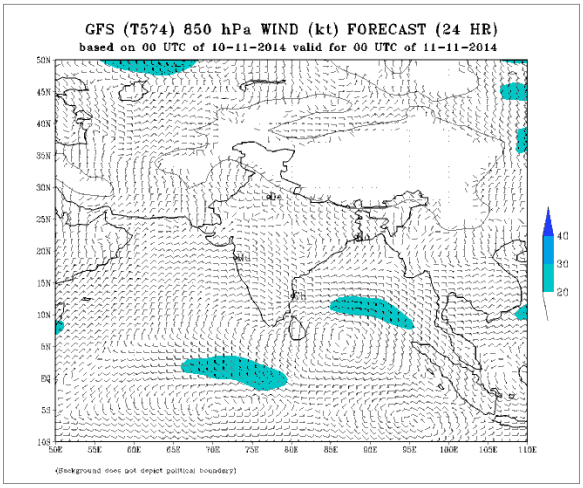

GFS (T574) MSL Pressure (hPa) FORECAST (00 HR)
based on 00 UTC of 10-11-2014 valid for 00 UTC of 10-11-2014

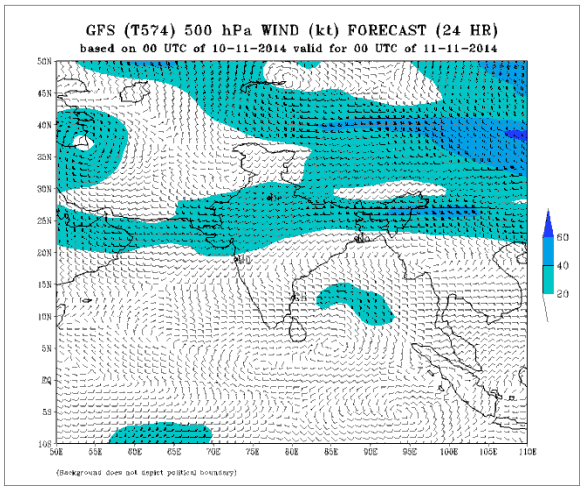

GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 10-11-2014 valid for 00 UTC of 10-11-2014


GFS (T574) 500 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 10-11-2014 valid for 00 UTC of 10-11-2014


GFS (T574) 200 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 10-11-2014 valid for 00 UTC of 10-11-2014


GFS (T574) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 10-11-2014 valid for 00 UTC of 11-11-2014


GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 10-11-2014 valid for 00 UTC of 11-11-2014


GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 10-11-2014 valid for 00 UTC of 11-11-2014
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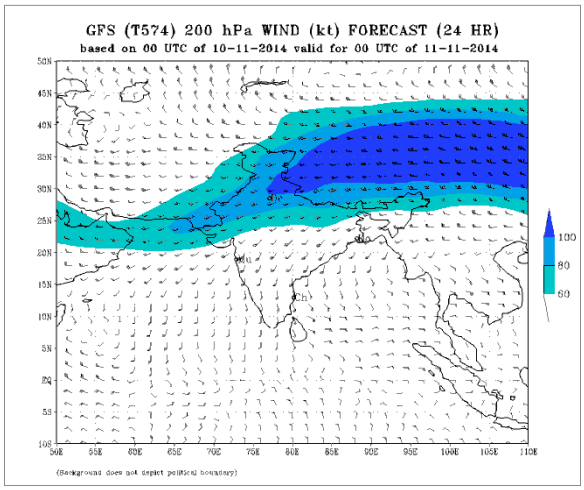
(Background does not depict political boundary)


GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 10-11-2014 valid for 00 UTC of 11-11-2014
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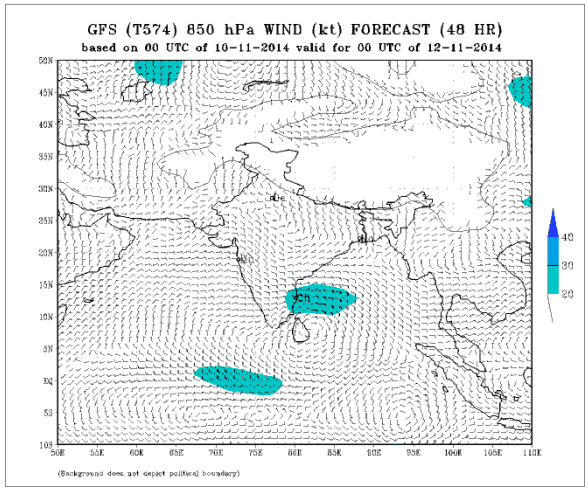
(Background does not depict political boundary)


GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 10-11-2014 valid for 00 UTC of 12-11-2014


GFS (T574) 850 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 10-11-2014 valid for 00 UTC of 12-11-2014
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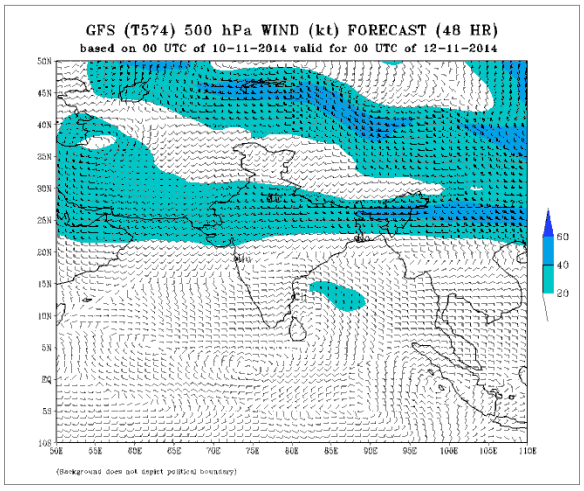
GFS (T574) 500 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 10-11-2014 valid for 00 UTC of 12-11-2014
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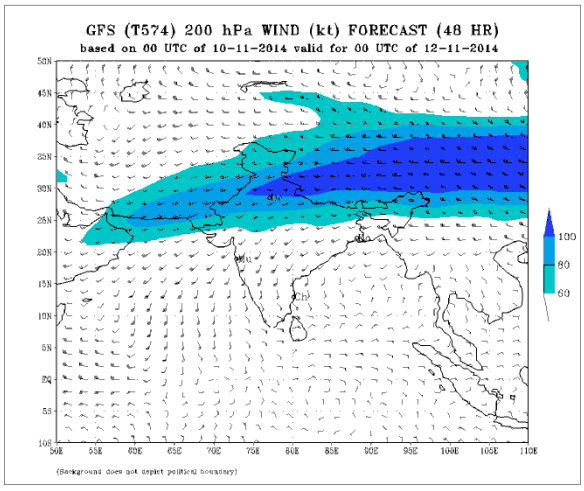
(Background does not depict political boundary)


GFS (T574) 200 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 10-11-2014 valid for 00 UTC of 12-11-2014
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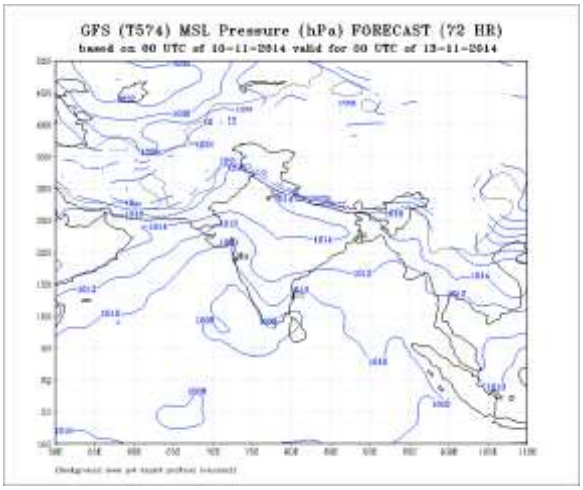
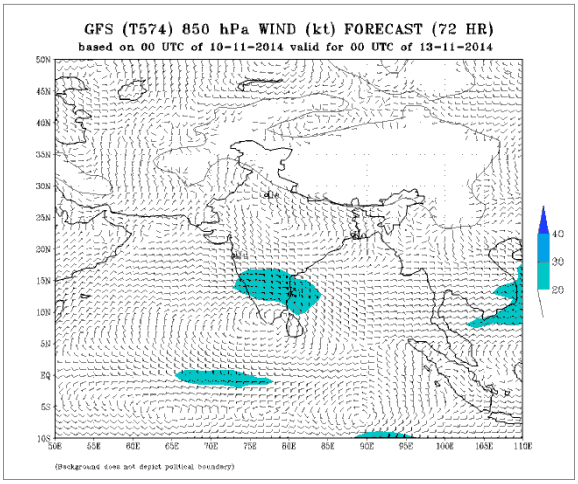
(Background does not depict political boundary)


GFS (T574) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 10-11-2014 valid for 00 UTC of 13-11-2014


GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 10-11-2014 valid for 00 UTC of 13-11-2014
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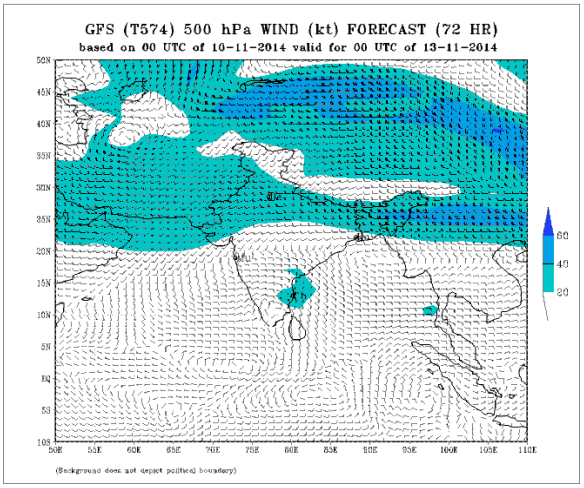
(Background does not depict political boundary)


GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 10-11-2014 valid for 00 UTC of 13-11-2014
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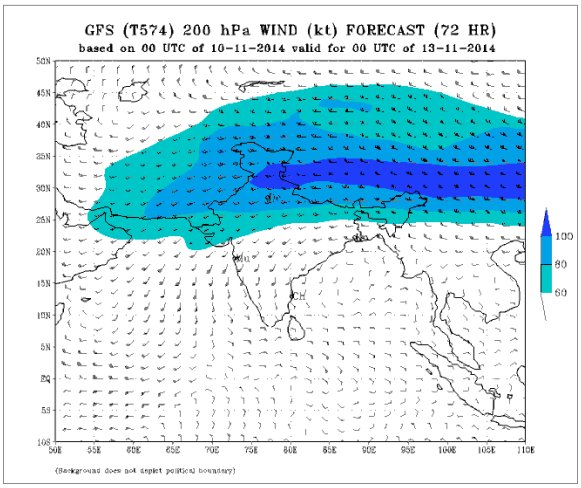
(Background does not depict political boundary)


GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 10-11-2014 valid for 00 UTC of 13-11-2014
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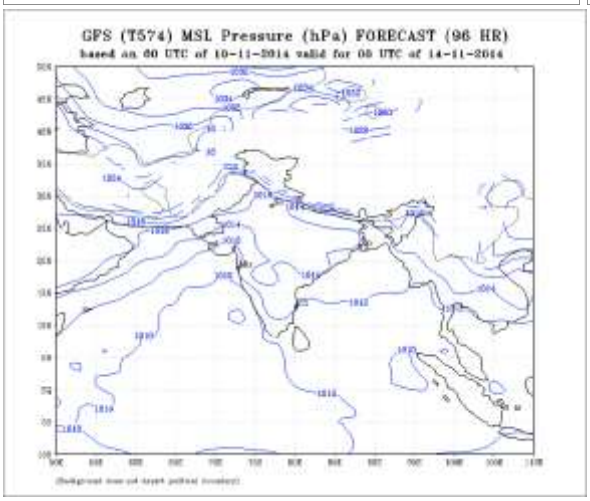
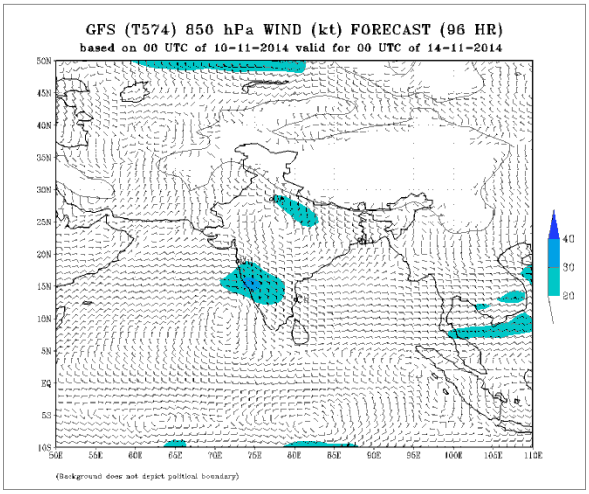
(Background does not depict political boundary)


GFS (T574) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 10-11-2014 valid for 00 UTC of 14-11-2014


GFS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 10-11-2014 valid for 00 UTC of 14-11-2014
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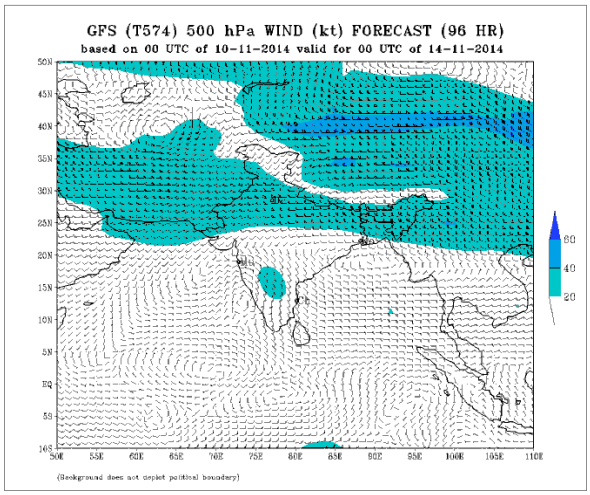
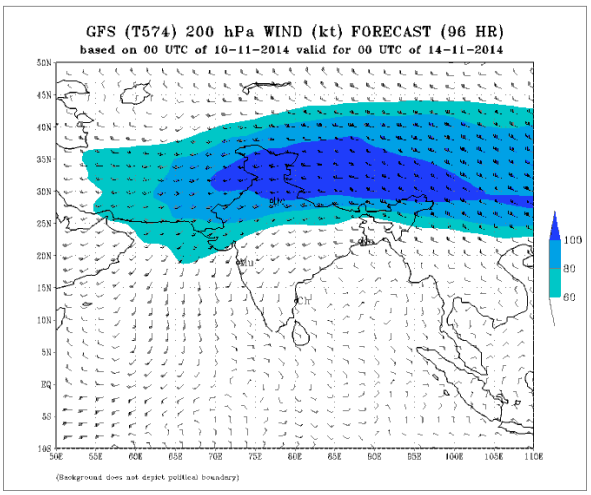
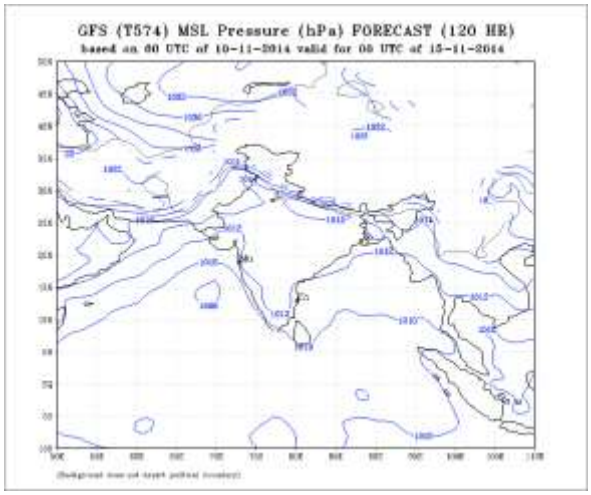
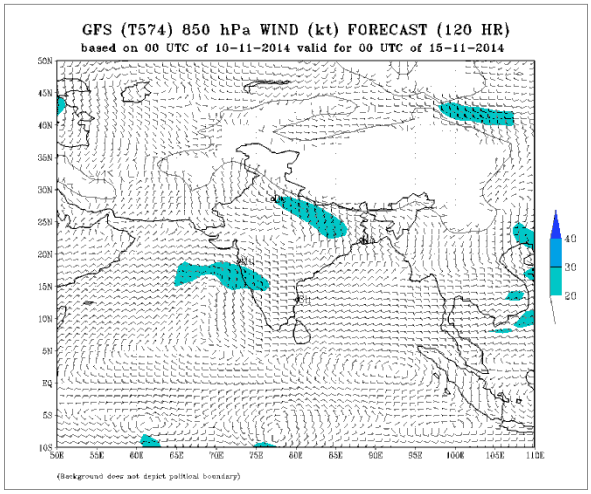
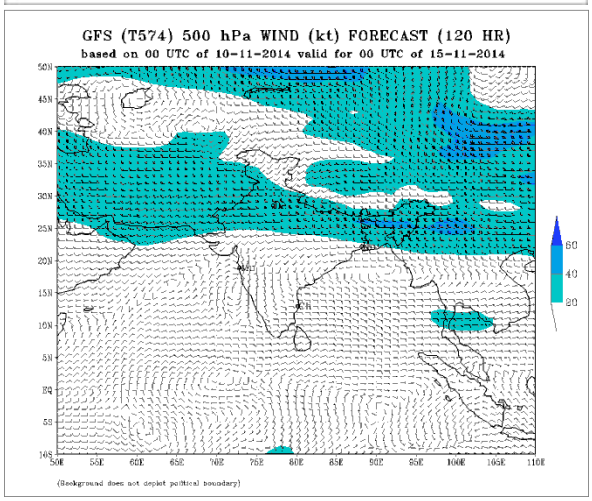
(Background does not depict political boundary)

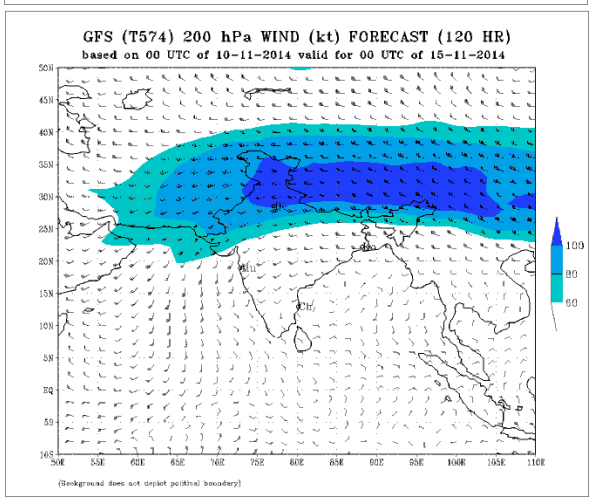

GFS (T574) 500 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 10-11-2014 valid for 00 UTC of 14-11-2014
(Background does not depict political boundary)

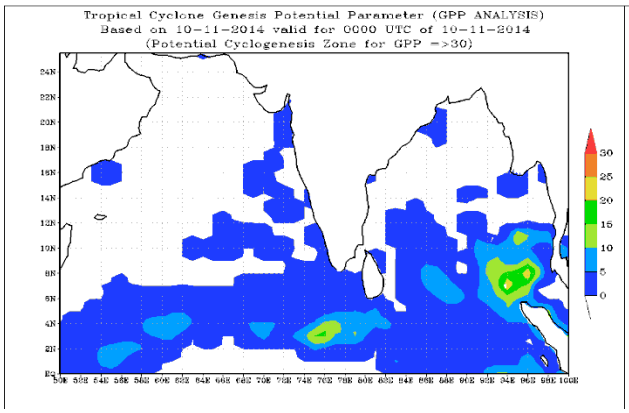

GFS (T574) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 10-11-2014 valid for 00 UTC of 14-11-2014
(Background does not depict political boundary)

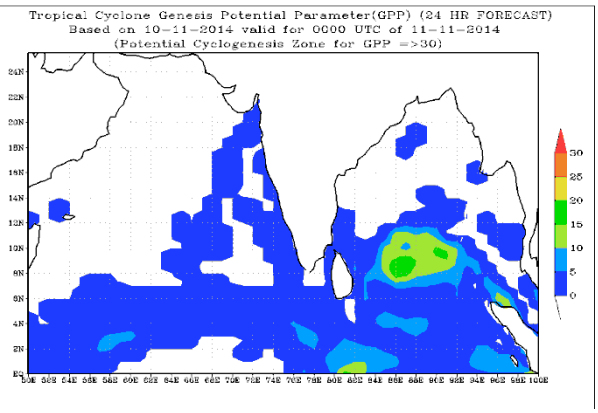

GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 10-11-2014 valid for 00 UTC of 15-11-2014

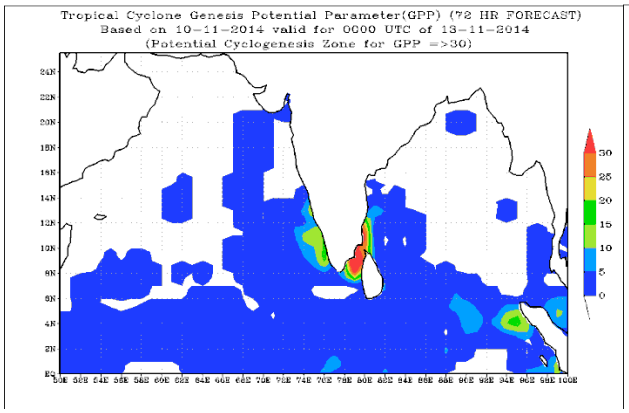

GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 10-11-2014 valid for 00 UTC of 15-11-2014
(Background does not depict political boundary)

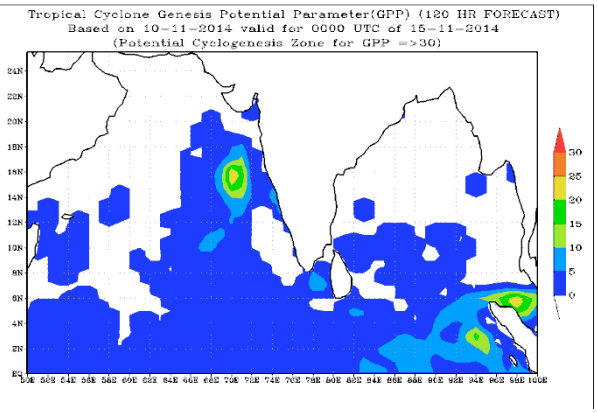

GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 10-11-2014 valid for 00 UTC of 15-11-2014
(Background does not depict political boundary)

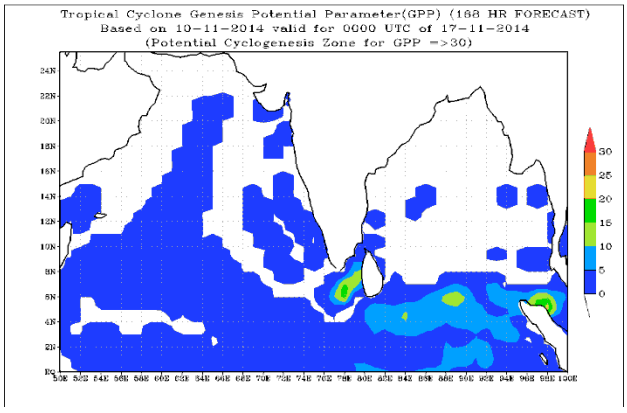

GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 10-11-2014 valid for 00 UTC of 15-11-2014
(Background does not depict political boundary)


Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 10-11-2014 valid for 0000 UTC of 10-11-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 10-11-2014 valid for 0000 UTC of 11-11-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 10-11-2014 valid for 0000 UTC of 13-11-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 10-11-2014 valid for 0000 UTC of 15-11-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (168 HR FORECAST)
Based on 10-11-2014 valid for 0000 UTC of 17-11-2014
(Potential Cyclogenesis Zone for GPP =>30)

FDP (Cyclone) NOC Report Dated 11 November, 2014

Synoptic features based on 0300 UTC of today:

- The upper air cyclonic circulation over south Andhra Pradesh & adjoining westcentral Bay of Bengal has become less marked.
- The low pressure area over south Andaman Sea and adjoining southeast Bay of Bengal now lies over southeast Bay of Bengal & neighbourhood. Associated upper air cyclonic circulation and extends upto 3.1 km above mean Sea level. The system would become well marked low pressure area during next 24 hours.

Environmental features based on 0300 UTC of today:

Sea Surface Temperature:

- Sea Surface Temperature is between 26-28^{0}C along and off the eastern coastal belt of India. It is 28-30^{0}C over rest of Bay of Bengal.

Tropical Cyclone Heat Potential (TCHP):

- The ocean thermal energy is 40-60 kJ/cm^2 over Bay of Bengal and Andaman Sea except over southeast Bay of Bengal & neighbourhood **,**where it is 60-80 kJ/cm^2

Relative Vorticity:

- Relative vorticity at 850 hPa is positive (50-60 *10^{-5} s^{-1}) over the region of low pressure area in the southeast Bay of Bengal & neighbourhood

Convergence:

- Lower level convergence is positive (10-15*10^{-5} s^{-1}) over the region of low pressure area in the southeast Bay of Bengal & neighbourhood

Divergence:

- Upper level divergence is positive of the order of 20-30 *10^{-5} s^{-1} over the region of low pressure area in southeast Bay of Bengal & neighbourhood

Wind Shear:

- Wind Shear is 05-20 knots over the region of low pressure area in the southeast Bay of Bengal & neighbourhood

Wind Shear Tendency:

- The vertical wind shear tendency is decreasing and is of the order of -5 to-10 knots over the region of low pressure area in the southeast Bay of Bengal & neighbourhood. It is positive over the rest of Bay of Bengal.

Upper tropospheric ridge:

- The upper tropospheric **ridge** at 200 hPa passes through 18.0°N latitude.

M.J.O. Index:

- Located in phase 1 with amplitude greater than 1.0.

Storms and Depression over South China Sea:

- There is currently no Tropical Storm/Depression over South China Sea.

Status of observational system:

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

Satellite:

Inference based on INSAT imagery of 110900 UTC:

Bay of Bengal & Andaman Sea:-

Vortex over southeast Bay & neighbourhood centred within half a degree of latitude 9.5°N and longitude 88.0°E. Intensity of convection is T1.0. Associated broken low and medium clouds with embedded intense to very intense convection is seen over Bay of Bengal between latitude 7.0°N to 16.0°N and long 82.0°E to 90.0°E.

Scattered low and medium clouds with embedded moderate to intense convection over rest eastcentral Bay of Bengal and Tenasserim coast.

Arabian Sea:-

No significant cloud over the region.

NWP Analysis

- IMD-GFS model low level wind (850 hPa) analysis based on 0000 UTC of 11th November 2014 shows a low level circulation noticed over south central BOB and in the 24 hour forecast it is moving westward along with easterly waves. In the 48 hours forecast it would became a trough and merge with the easterly waves. This low level trough would approach south Tamilnadu coast in the 72 hour forecast and produce rainfall over south Tamilnadu and adjoining areas.
- The Genesis Potential Parameter (GPP) forecasts based on 0000 UTC of 11th November 2014 shows an extended cyclogenesis zone over the south central BOB between 8-10 deg N/94E and likely to move westwards towards east coast of India in the next 2 days forecast. However, the zone is likely to de-organize and de-intensify in the 24 hour forecast.
- The system would reach south Tamilnadu coast on 13 Nov 2014.

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

- **ECMWF** model suggests westward movement of the low pressure area over south Andaman Sea across Sri Lanka and south Tamil Nadu during the next 3 days.
- **NCMRWF-UKMO** model also suggests westward movement of the low pressure area over south Andaman Sea across Sri Lanka and south Tamil Nadu during the next 3 days.
- **NCMRWF-GFS** model also suggests westward movement of the low pressure area over south Andaman Sea across Sri Lanka and south Tamil Nadu during the next 2 days.

Most of the models do not suggest intensification of the low pressure area.

Summary and Conclusion:

The low pressure area over south Andaman Sea and adjoining southeast Bay of Bengal now lies over southeast Bay of Bengal & neighbourhood. The system would become well marked low pressure area during next 24 hours.

Advisory:

- Possible intensification of low pressure area over southeast Bay of Bengal & neighbourhood needs to be watched.
- No IOP for next two days.

Annexure-I

Status of Observation system:

Synoptic observation:

Region	Date/Time (UTC)		
	10/12	**11/00**	**11/03**
India	44	29	45
Coastal stations			
WB	8	3	8
Odisha	7	6	7
AP	12	10	12
Tamil Nadu	10	8	11
Puducherry	1	1	1
A & N	6	1	6
Bangladesh	11	11	11
Myanmar	11	11	11
Thailand	2	2	2
Sri Lanka	8	8	8

AWS Observations:

Region	Date/Time (UTC)		
	10/12	**11/00**	**11/03**
India	61	57	63
Coastal stations			
WB	7	8	10
Odisha	4	3	3
AP	27	24	25
Tamil Nadu	22	21	24
Puducherry	1	1	1
A & N	-	-	-

- **RS/RW** (12Z) of 10/11/2014 **-1/39**
- **No. of Ascents reaching 250 hPa level: 1-, MISDA: 38**
- **RS/RW** (00Z) of 11/11/2014 21**/39**
- **No. of Ascents reaching 250 hPa level: 7, MISDA: 18**

No. of PILOT Ascents

10/12Z	11/00Z
10	11

Buoy Data

10/12Z	11/00Z	11/03Z
8	8	8

FOC CHENNAI: STATUS OF OBSERVATION

Date→	**10.11.2014**							
UTC→	**00**	**03**	**06**	**09**	**12**	**15**	**18**	**21**
Chennai Region (Coasts of AP & TN)	**20**	**21**	**20**	**20**	**22**	**20**	**20**	**19**

No. of RS/RW Ascents

00Z /10.11.2014 : 1

No. of Ascents reaching 250 hPa level = 1

MISDA : 7

12Z /10.11.2014 : --

No. of Ascents reaching 250 hPa level = --

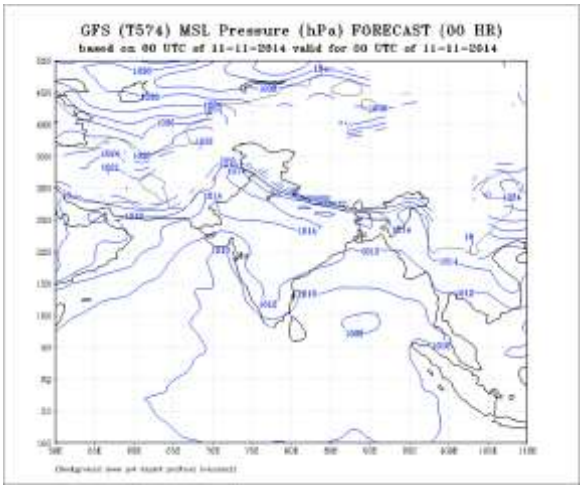
MISDA : 8

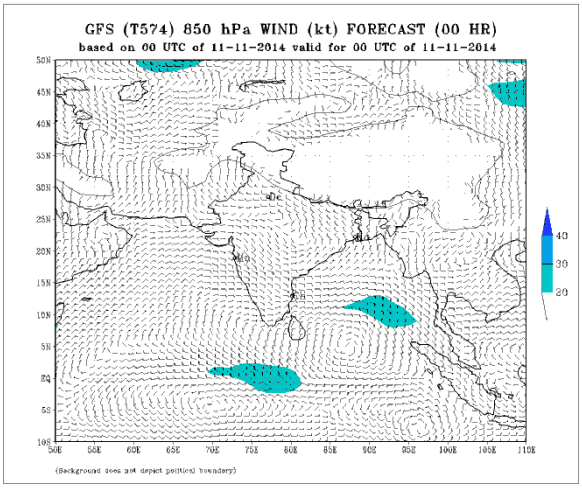
No. of PILOT Ascents:

10.11.2014

06Z	18Z
4	4

Annexure-II


GFS (T574) MSL Pressure (hPa) FORECAST (00 HR)
based on 00 UTC of 11-11-2014 valid for 00 UTC of 11-11-2014


GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 11-11-2014 valid for 00 UTC of 11-11-2014
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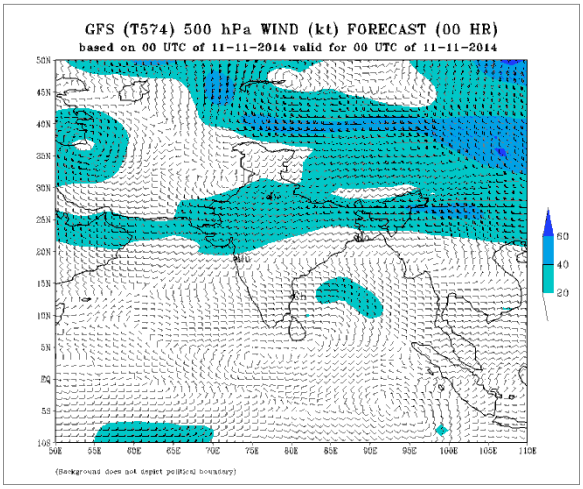
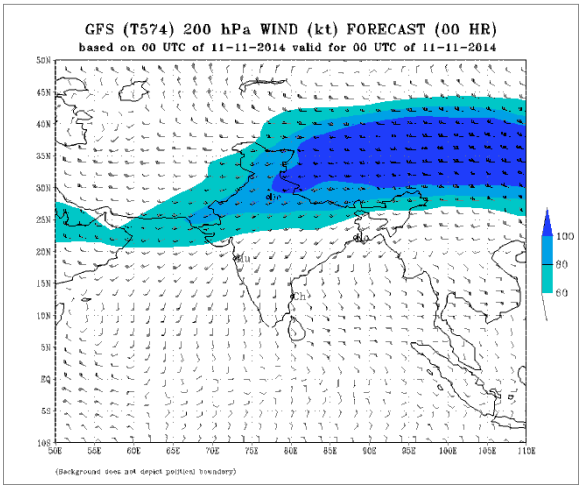
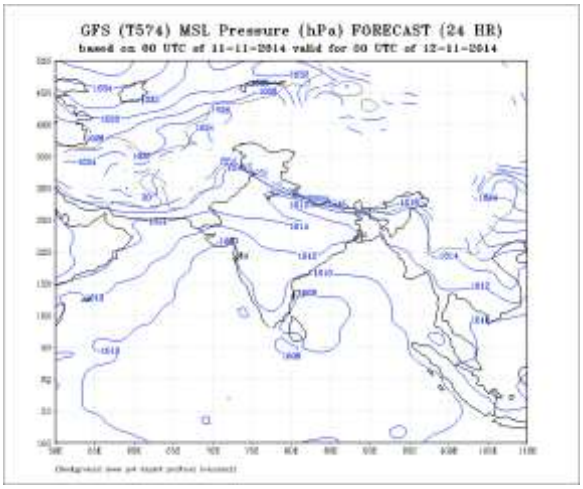
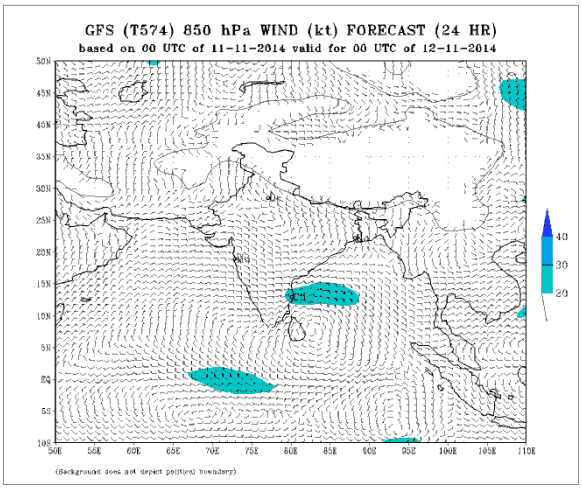

GFS (T574) 500 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 11-11-2014 valid for 00 UTC of 11-11-2014
60
40
20


GFS (T574) 200 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 11-11-2014 valid for 00 UTC of 11-11-2014
100
80
60


GFS (T574) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 11-11-2014 valid for 00 UTC of 12-11-2014


GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 11-11-2014 valid for 00 UTC of 12-11-2014
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30
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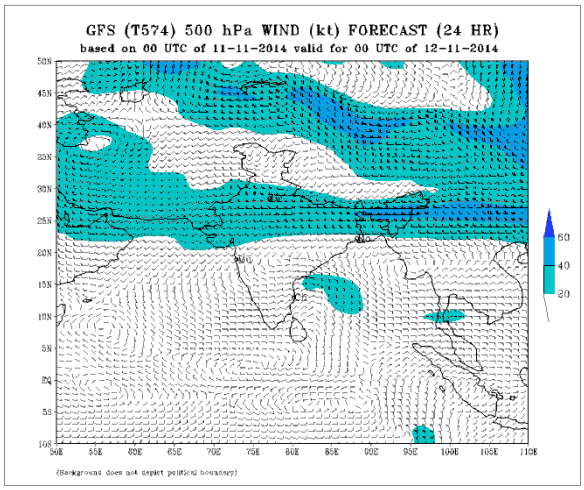
GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 11-11-2014 valid for 00 UTC of 12-11-2014
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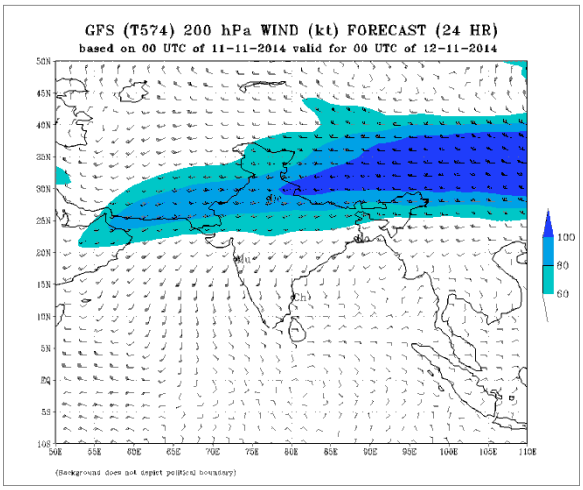
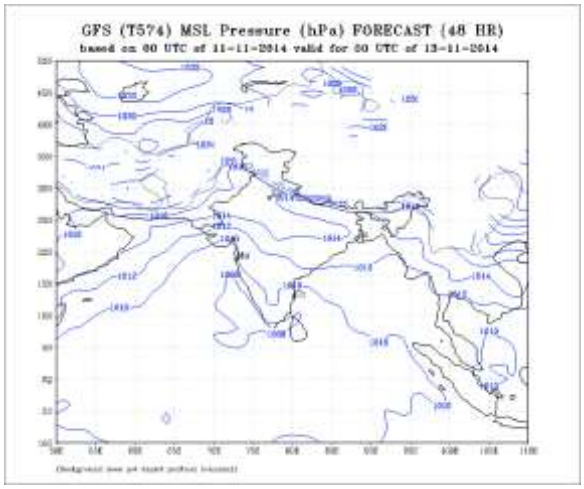
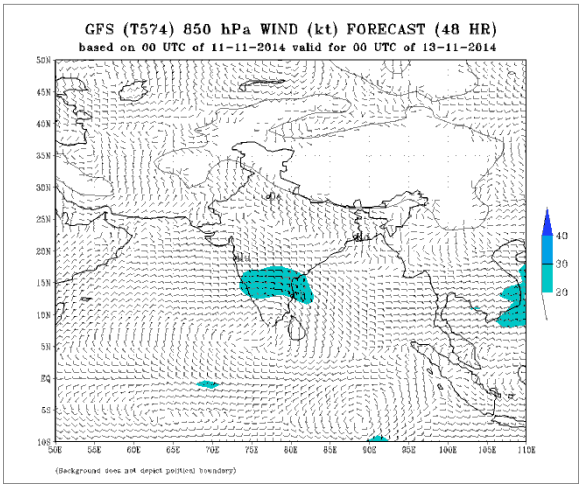
(Background does not depict political boundary)


GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 11-11-2014 valid for 00 UTC of 12-11-2014
100
80
60
(Background does not depict political boundary)


GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 11-11-2014 valid for 00 UTC of 13-11-2014


GFS (T574) 850 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 11-11-2014 valid for 00 UTC of 13-11-2014
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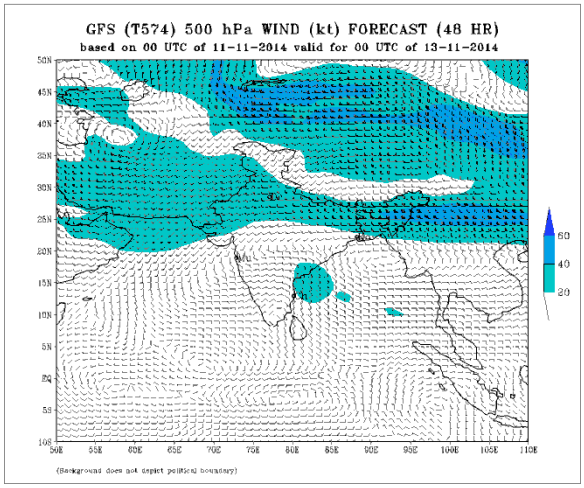
(Background does not depict political boundary)


GFS (T574) 500 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 11-11-2014 valid for 00 UTC of 13-11-2014
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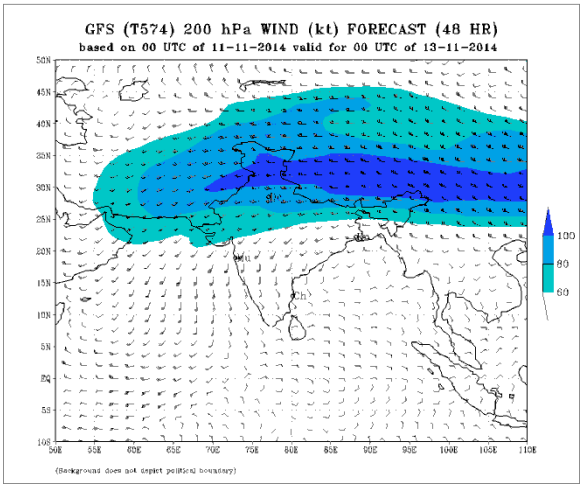
GFS (T574) 200 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 11-11-2014 valid for 00 UTC of 13-11-2014
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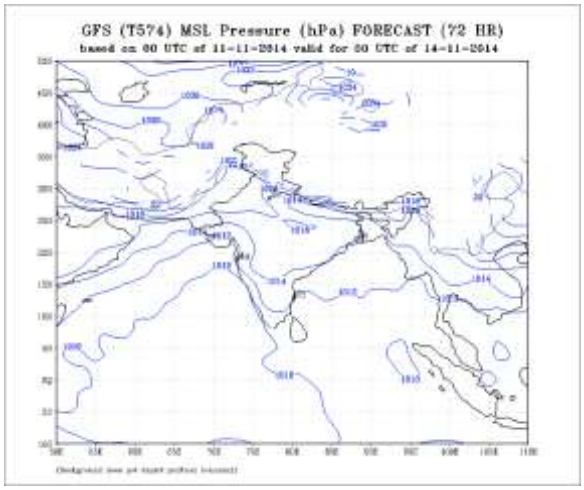
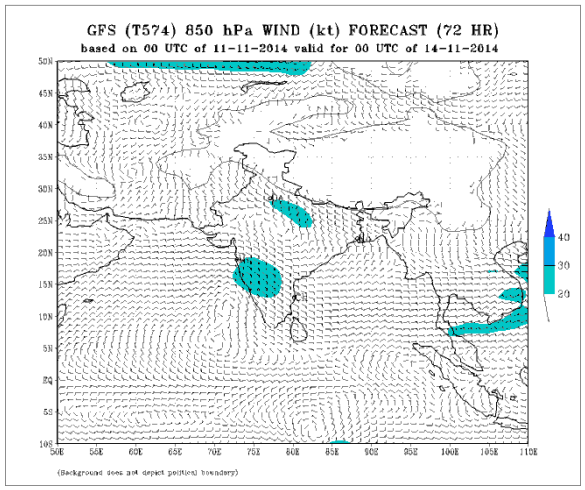

GFS (T574) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 11-11-2014 valid for 00 UTC of 14-11-2014


GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 11-11-2014 valid for 00 UTC of 14-11-2014
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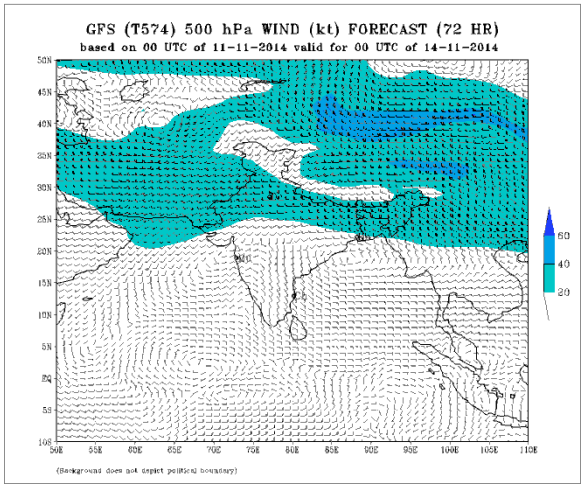
GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 11-11-2014 valid for 00 UTC of 14-11-2014
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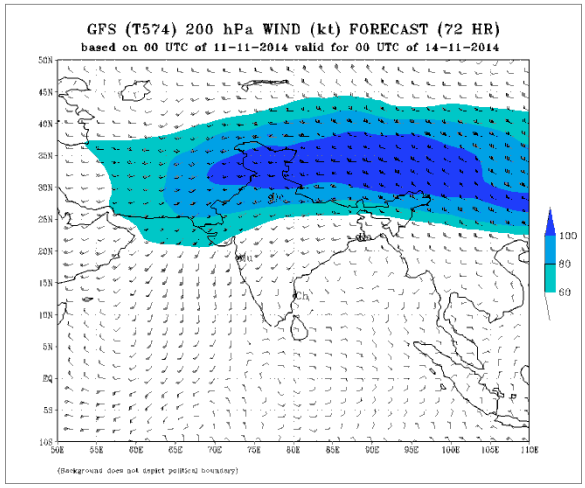
GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 11-11-2014 valid for 00 UTC of 14-11-2014
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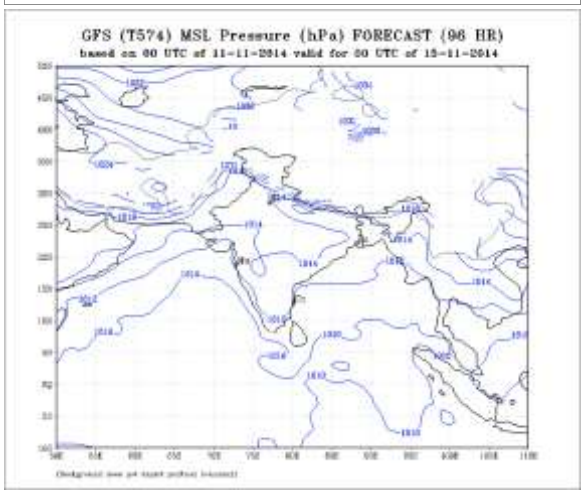
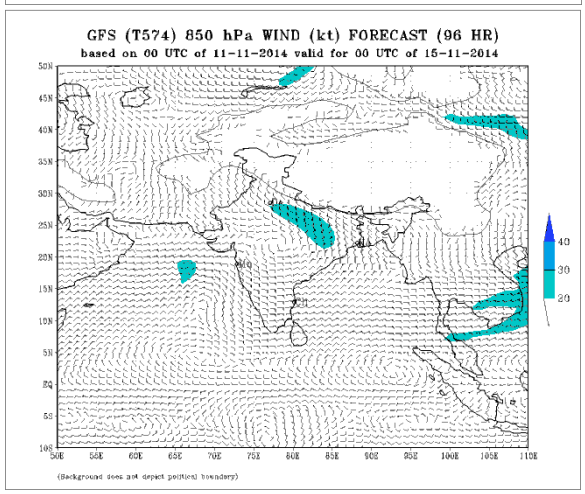

GFS (T574) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 11-11-2014 valid for 00 UTC of 15-11-2014


GFS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 11-11-2014 valid for 00 UTC of 15-11-2014
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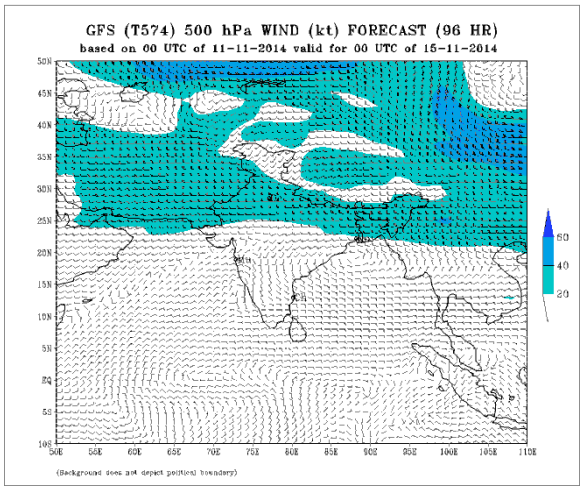
GFS (T574) 500 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 11-11-2014 valid for 00 UTC of 15-11-2014
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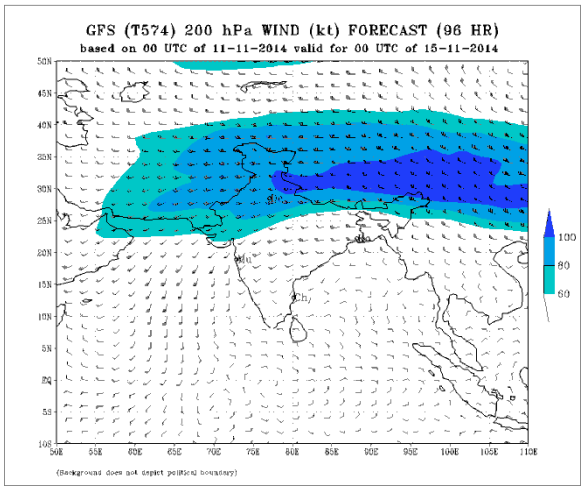
(Background does not depict political boundary)


GFS (T574) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 11-11-2014 valid for 00 UTC of 15-11-2014
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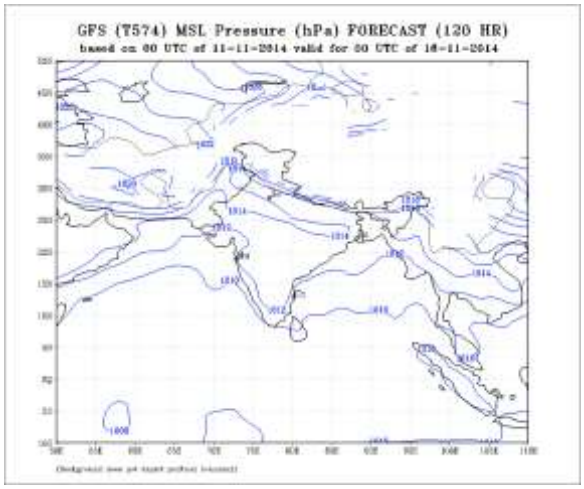
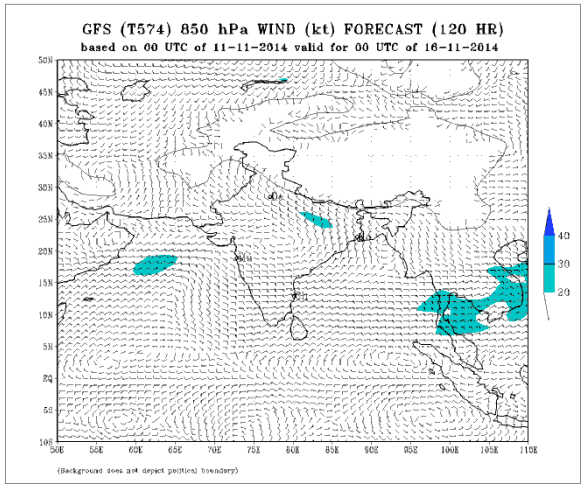
(Background does not depict political boundary)


GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 11-11-2014 valid for 00 UTC of 16-11-2014


GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 11-11-2014 valid for 00 UTC of 16-11-2014
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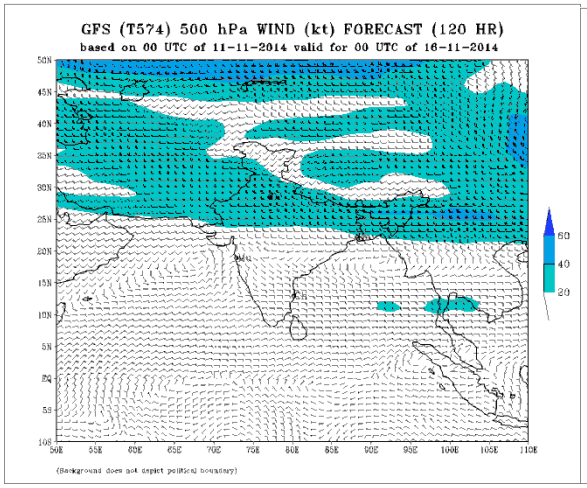
(Background does not depict political boundary)


GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 11-11-2014 valid for 00 UTC of 16-11-2014
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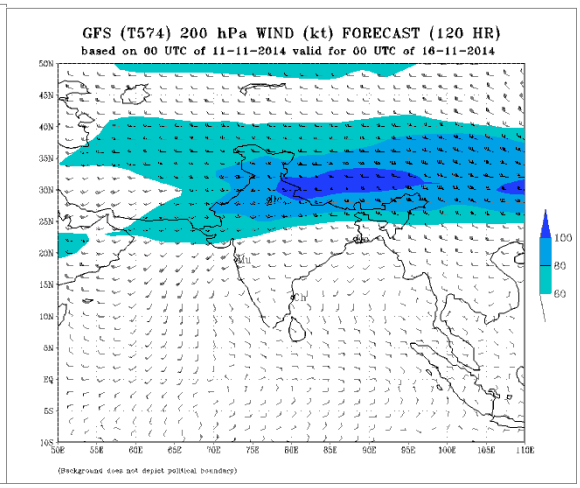
(Background does not depict political boundary)


GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 11-11-2014 valid for 00 UTC of 16-11-2014
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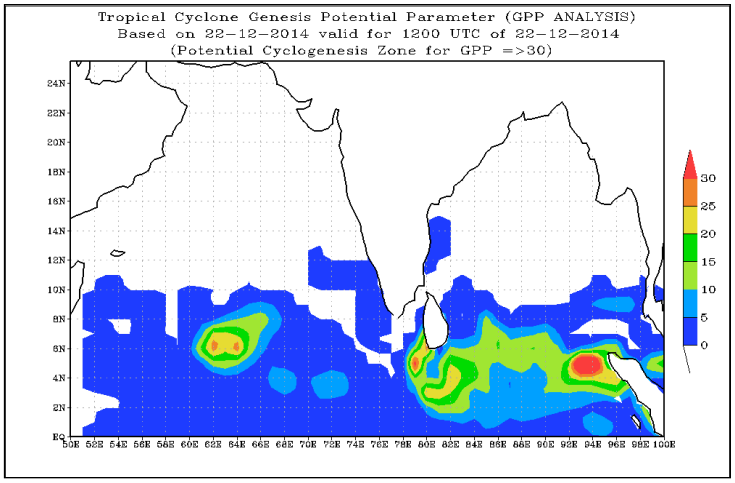
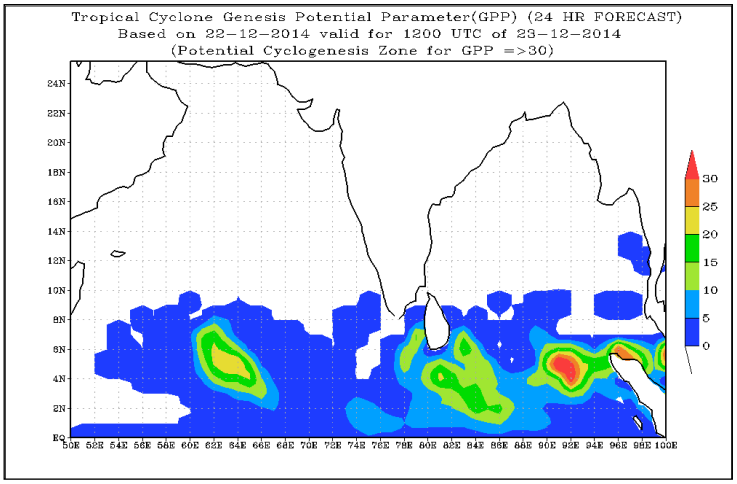
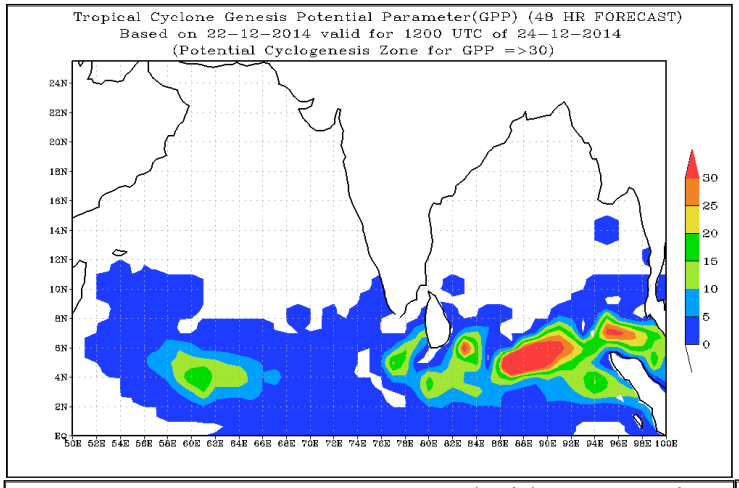
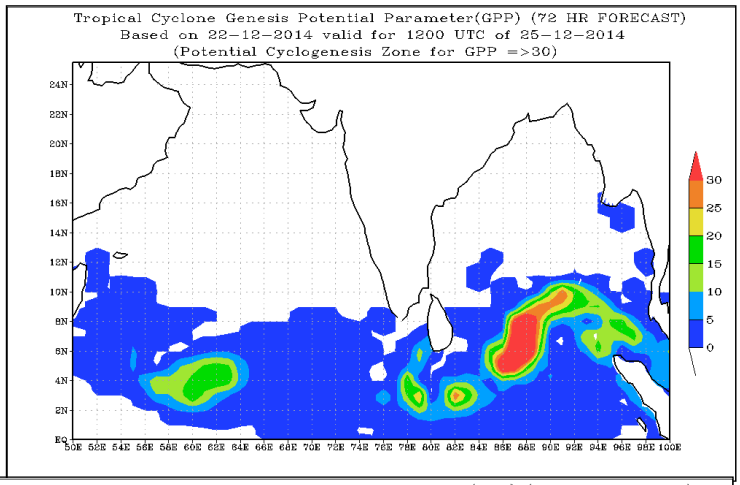
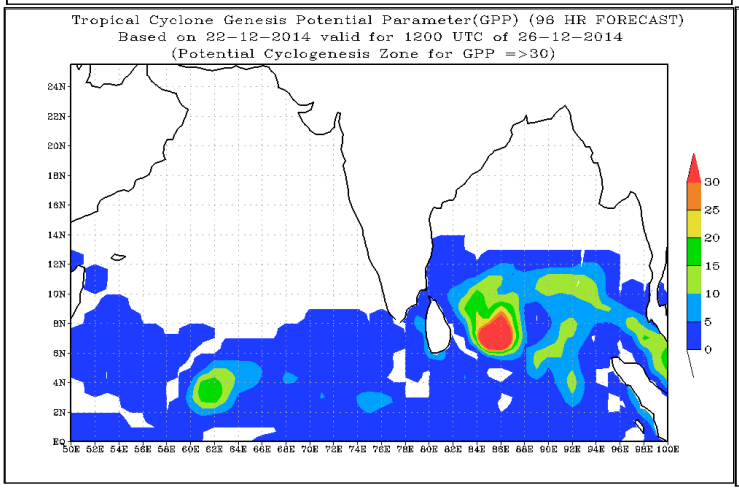
(Background does not depict political boundary)

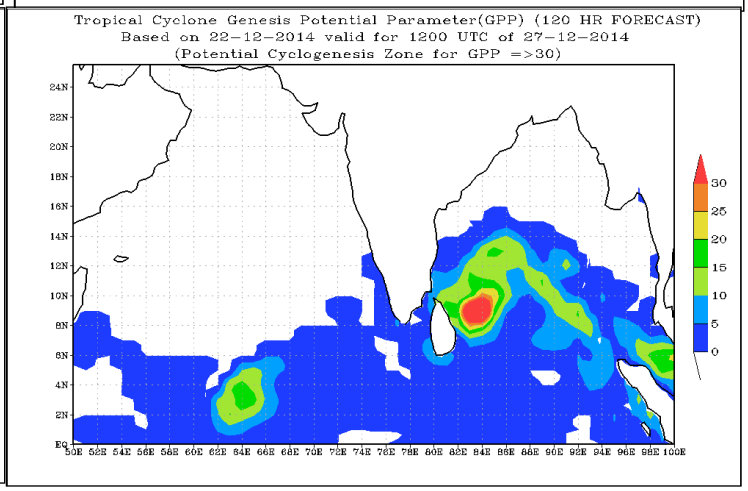

Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 22-12-2014 valid for 1200 UTC of 22-12-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 22-12-2014 valid for 1200 UTC of 23-12-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
Based on 22-12-2014 valid for 1200 UTC of 24-12-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 22-12-2014 valid for 1200 UTC of 25-12-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (96 HR FORECAST)
Based on 22-12-2014 valid for 1200 UTC of 26-12-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 22-12-2014 valid for 1200 UTC of 27-12-2014
(Potential Cyclogenesis Zone for GPP =>30)

FDP (Cyclone) NOC Report Dated 12 November, 2014

Synoptic features based on 0300 UTC of today:

- Yesterday's low pressure area over southeast Bay of Bengal now lies over southwest Bay of Bengal & neighbourhood. Associated upper air cyclonic circulation extends upto mid-tropospheric levels.
- The trough in easterlies from Comorin area to Maharashtra coast now runs from Comorin area to south Gujarat coast across roughly along west coast 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 between 26-28^{0}C over westcentral Bay of Bengal and adjoining parts of southwest Bay. It is > 30^{0}C over Andaman Sea.

Tropical Cyclone Heat Potential (TCHP):

- The ocean thermal energy is < 40kJ/cm^2 over westcentral and southwest Bay of Bengal and parts of southeast Bay of Bengal. It is 60-80 kJ/cm^2 over Andaman Sea

Relative Vorticity:

- Relative vorticity at 850 hPa is positive (20-40 *10^{-5} s^{-1}) over the region of low pressure area in the southwest Bay of Bengal & neighbourhood

Convergence:

- Lower level convergence is positive (10*10^{-5} s^{-1}) over the region of low pressure area in the southwest Bay of Bengal & neighbourhood

Divergence:

- Upper level divergence is positive of the order of 20 *10^{-5} s^{-1} over the region of low pressure area in southwest Bay of Bengal & neighbourhood**.** It is 5-10 *10^{-5} s^{-1} over northeast Arabian Sea off Gujarat coast and off south Konkan coast.

Wind Shear:

- Wind Shear is 05-10 knots over the region of low pressure area in the southwest Bay of Bengal and also over Andaman Sea.

Wind Shear Tendency:

- The vertical wind shear tendency is decreasing and is of the order of -5 to-10 knots over the region of low pressure area in the southwest Bay of Bengal & neighbourhood. There is no change over Anadaman Sea and rise over remaining parts of south Bay and adjoining central Bay.

Upper tropospheric ridge:

- The upper tropospheric **ridge** at 200 hPa passes through 15.0°N latitude in association with anti-cyclonic circulation over central Bay of Bengal.

M.J.O. Index:

- Located in phase 1 with amplitude greater than 1.0. As per forecast by dynamical and statistical models, it would be in phase 1 during next 5 days.

Storms and Depression over South China Sea:

- There is currently no Tropical Storm/Depression over South China Sea.

Status of observational system:

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

Satellite:

Inference based on INSAT imagery of 110900 UTC:

Bay of Bengal & Andaman Sea:-

Vortex over southwest Bay & neighbourhood centred within half a degree of latitude 10.4°N and longitude 84.0°E. Intensity of convection is T1.0. Associated broken low and medium clouds with embedded intense to very intense convection is seen over Bay of Bengal between latitude 8.5°N to 17.5°N and long 80.0°E to 90.0°E.

Scattered low and medium clouds with embedded moderate to intense convection over rest Bay of Bengal south of latitude 20.0°N and west of long 91.0°E extending upto south Andaman Sea.

Arabian Sea:-

Broken low and medium clouds with embedded moderate to intense convection over Arabian Sea between latitude 5.0°N to 16.0°N and long 71.0°E to 75.0°E.

NWP Analysis

- The analysis of IMD-GFS model on 0000 UTC of 12th November 2014 shows a low over southwest BOB and associated cyclonic circulation in the lower tropospheric levels extends up to 700 hPa. The low is moving westward along with easterly wave and emerges over Arabian Sea near Lakshadweep region in 24 hours forecast. The trough in easterlies along Maharashtra coast extending up to Gujarat coast persists in next 48 hours and diminishes thereafter.
- The WRF model analysis also shows a low pressure area over southwest Bay of Bengal along with associated cyclonic circulation in the lower levels of the troposphere which moves westward towards east coast and over inland in 24 hours forecast and dissipates thereafter. The trough in easterlies also been shown along Maharashtra coast extending up to Gujarat which persists in next 48 hours and disappears in day 3 forecast.
- The Genesis Potential Parameter (GPP) forecasts based on 0000 UTC of 12th November 2014 shows a weak cyclogenesis zone over the southwest BOB and likely to move westward and emerges over Arabian Sea in the next 2 days forecasts. However, the zone is likely to de-organize in 72 hour 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

- **ECMWF** NO significant system expected during the next 7 days.
- **NCMRWF-UKMO** model also suggests west-northwestward movement of the low pressure area oversouthwest Bay to Arabian Sea during next next 7 days and reaches Gulf of Aden and adjoining Somalia on 18th Nov. A fresh low may develop over southeast Bay on 20th/21st.
- **NCMRWF-GFS** model also suggests west-northwestward movement of the low pressure area over southwest Bay of Bengal towards cental Arabian Sea and becomes less marked on 16th Nov.

- **ECMWF Model** : A well marked low pressutre area may develop over southeast Arabian Sea on 14 Nov and become less marked on 16 Nov. A feeble low lies over Andaman Sea which will move west ward and become less marked on 14 Nov.

ARP MoteoFrance and JMA : It shows similar behaviour to GFS during next 72 hrs

Summary and Conclusion:

The low pressure area over southwest Bay of Bengal would move west-northwestward and may emerge into southeast Arabian Sea as a cyclonic circulation/ low pressure area by 14 November. The probability of its further intensification over Arabian Sea is very low as the environmental factors are not favourable

The development of a feeble low pressure area over South Andaman Sea and adjoining southeast Bay and Malay Peninsula may be watched

Advisory:

- No IOP for next three days.

Annexure-I

Status of Observation system:

Synoptic observation:

Region	Date/Time (UTC)		
	11/12	12/00	12/03
India	44	30	43
Coastal stations			
WB	8	3	7
Odisha	7	6	6
AP	12	12	12
Tamil Nadu	10	7	11
Puducherry	1	1	1
A & N	6	1	6
Bangladesh	11	11	11
Myanmar	11	11	11
Thailand	2	2	2
Sri Lanka	8	8	8

AWS Observations:

Region	Date/Time (UTC)		
	11/12	12/00	12/03
India	59	62	50
Coastal stations			
WB	8	9	10
Odisha	3	3	5
AP	24	26	26
Tamil Nadu	23	23	23
Puducherry	1	1	1
A & N	-	-	-

- **RS/RW** (12Z) of 11/11/2014 **-1/39**
- **No. of Ascents reaching 250 hPa level: 3-, MISDA: 38**
- **RS/RW** (00Z) of 12/11/2014-21**/39**
- **No. of Ascents reaching 250 hPa level: 7, MISDA: 18**

No. of PILOT Ascents

11/12Z	12/00Z
10	11

Buoy Data

11/12Z	12/00Z	12/03Z
12	14	13

FOC CHENNAI: STATUS OF OBSERVATION

Date→	**11.11.2014**							
UTC→	**00**	**03**	**06**	**09**	**12**	**15**	**18**	**21**
Chennai Region (Coasts of AP & TN)	**28**	**21**	**20**	**20**	**22**	**20**	**20**	**20**

No. of RS/RW Ascents

00Z /11.11.2014 : 1

No. of Ascents reaching 250 hPa level = 1

MISDA : 7

12Z /11.11.2014 : --

No. of Ascents reaching 250 hPa level = --

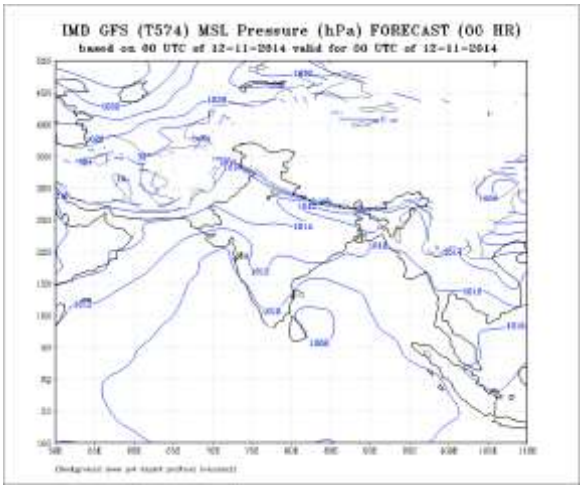
MISDA : 8

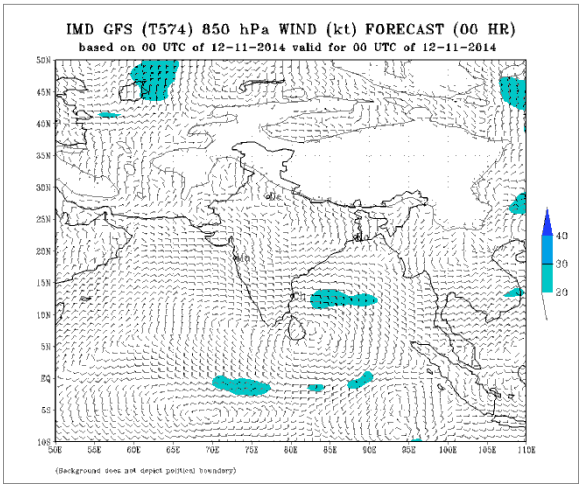
No. of PILOT Ascents:

11.11.2014

06Z	18Z
4	4

Annexure-II


IMD GFS (T574) MSL Pressure (hPa) FORECAST (00 HR)
based on 00 UTC of 12-11-2014 valid for 00 UTC of 12-11-2014


IMD GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 12-11-2014 valid for 00 UTC of 12-11-2014
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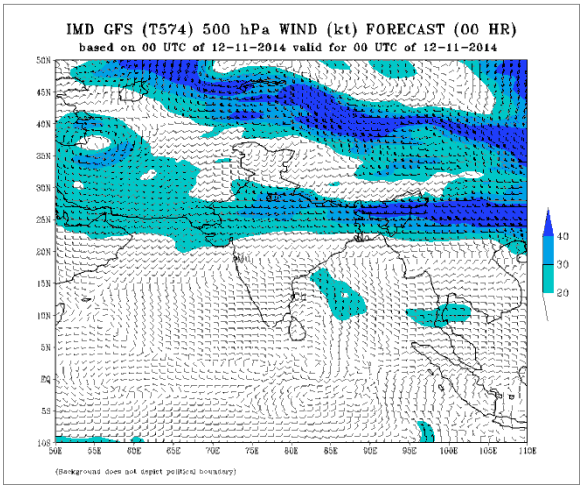
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based on 00 UTC of 12-11-2014 valid for 00 UTC of 12-11-2014
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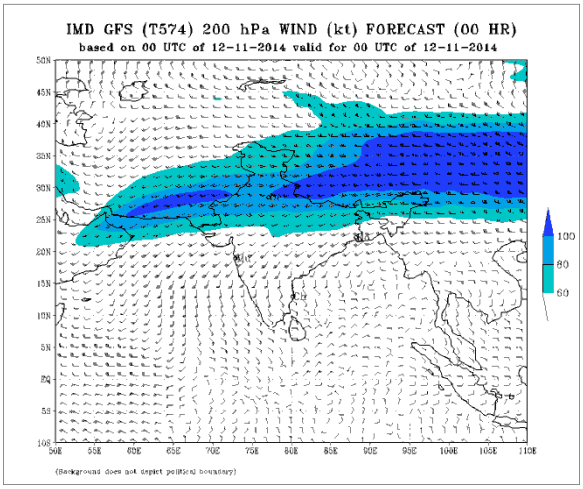
IMD GFS (T574) 200 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 12-11-2014 valid for 00 UTC of 12-11-2014
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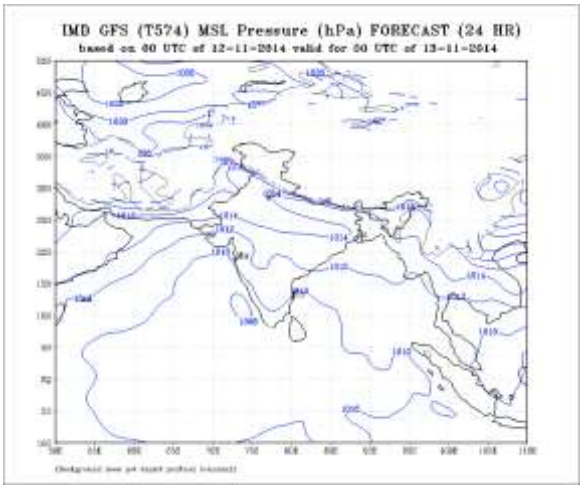
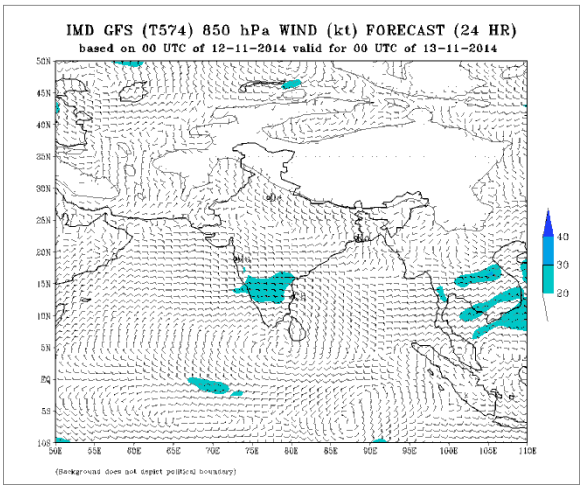

IMD GFS (T574) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 12-11-2014 valid for 00 UTC of 13-11-2014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based on 00 UTC of 12-11-2014 valid for 00 UTC of 13-11-2014
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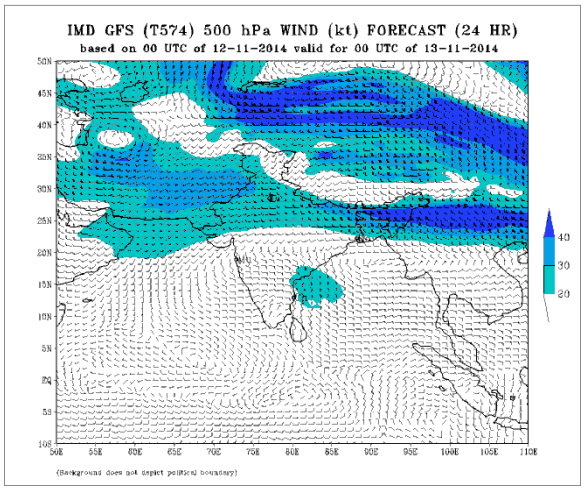
IMD GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 12-11-2014 valid for 00 UTC of 13-11-2014
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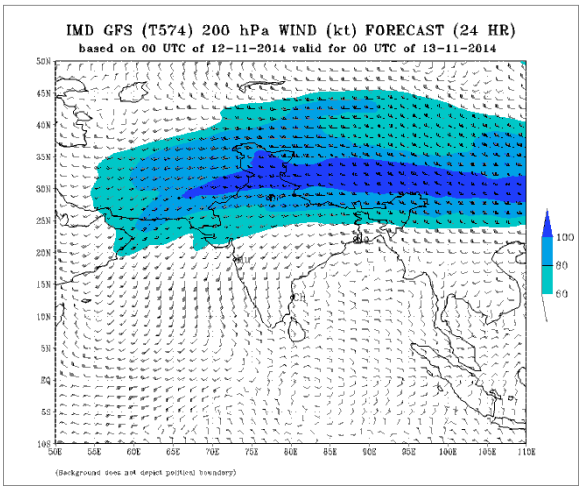
(Background does not depict political boundary)


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 12-11-2014 valid for 00 UTC of 13-11-2014
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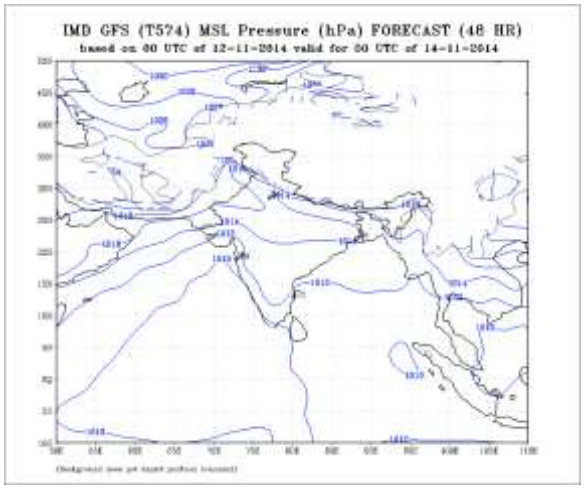
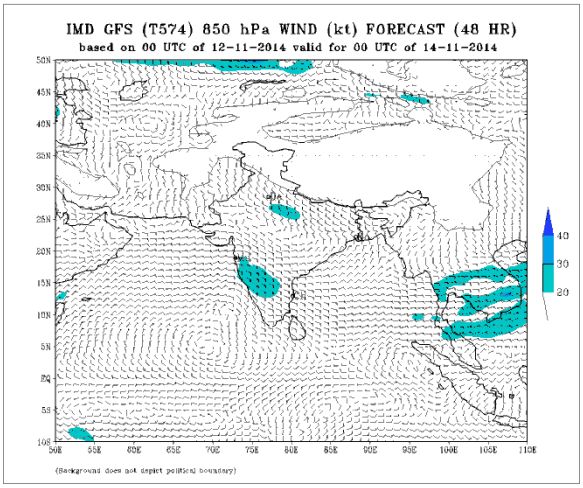
(Background does not depict political boundary)


IMD GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 12-11-2014 valid for 00 UTC of 14-11-2014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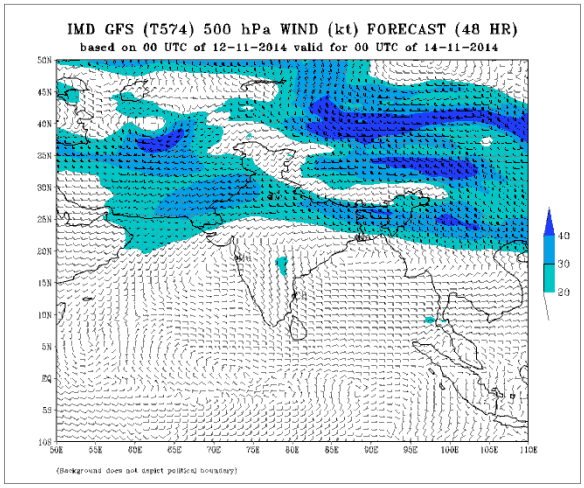
IMD GFS (T574) 500 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 12-11-2014 valid for 00 UTC of 14-11-2014
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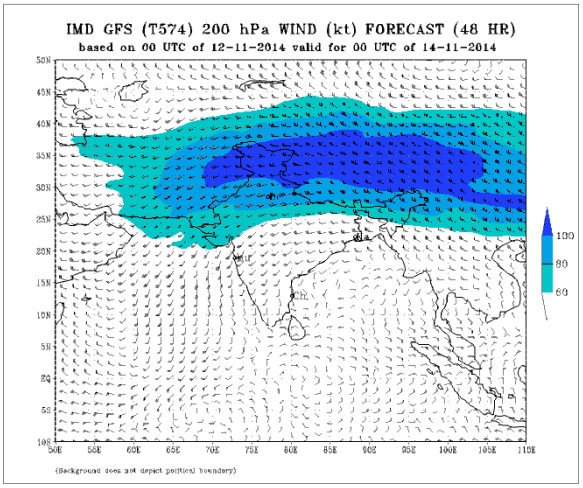
IMD GFS (T574) 200 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 12-11-2014 valid for 00 UTC of 14-11-2014
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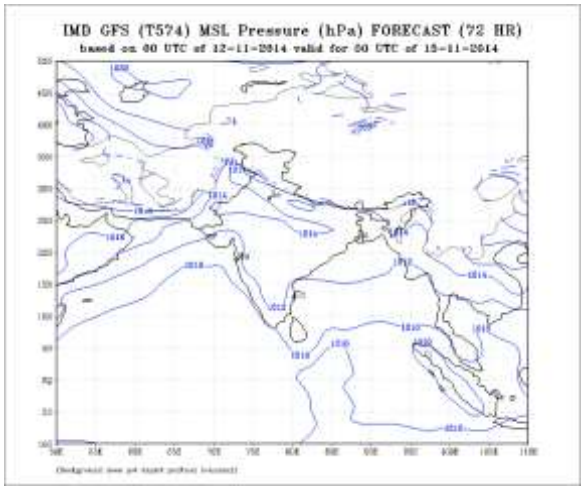
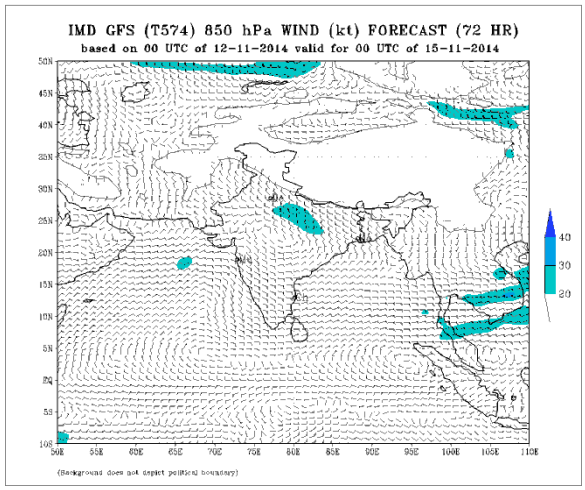
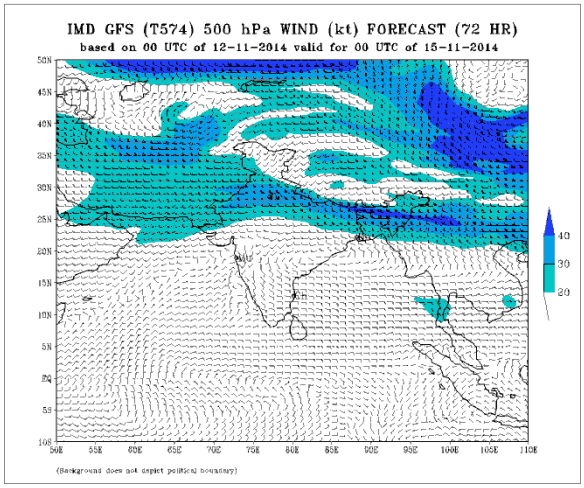
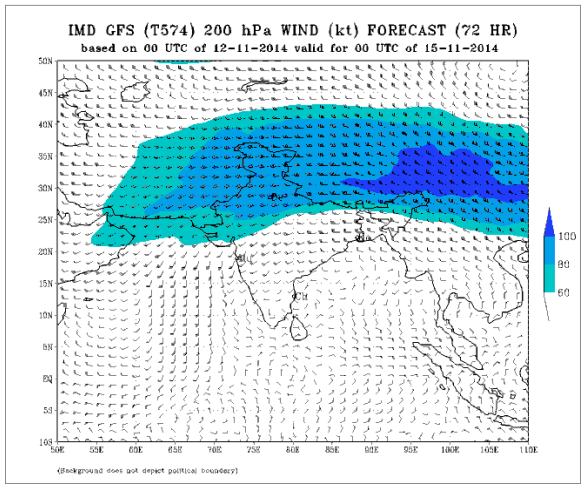
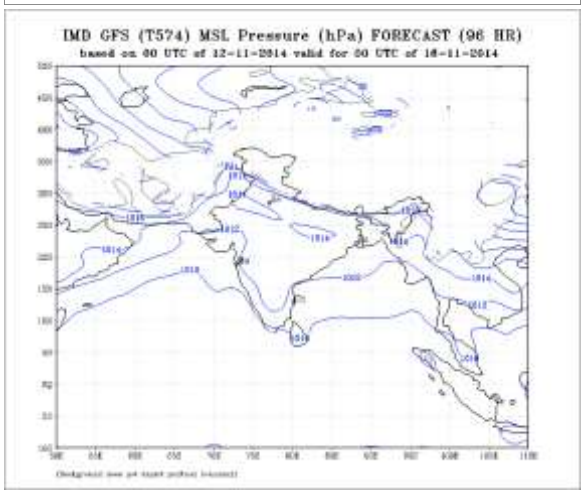
(Background does not depict political boundary)

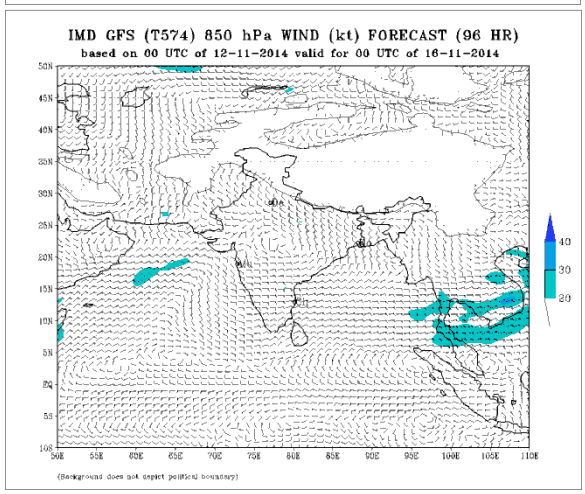

IMD GFS (T574) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 12-11-2014 valid for 00 UTC of 15-11-2014

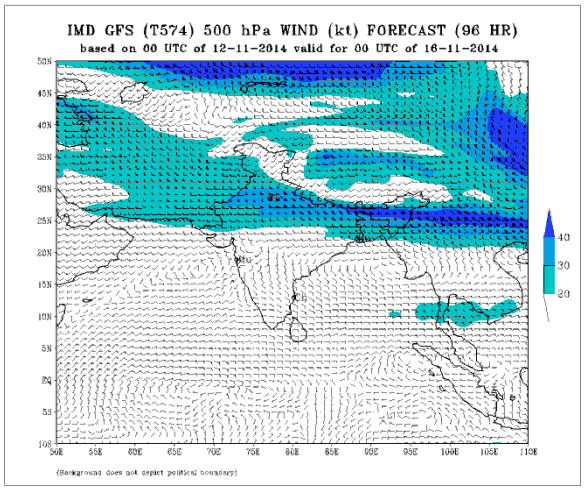

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 12-11-2014 valid for 00 UTC of 15-11-2014


IMD GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 12-11-2014 valid for 00 UTC of 15-11-2014


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 12-11-2014 valid for 00 UTC of 15-11-2014


IMD GFS (T574) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 12-11-2014 valid for 00 UTC of 16-11-2014


IMD GFS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 12-11-2014 valid for 00 UTC of 16-11-2014


IMD GFS (T574) 500 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 12-11-2014 valid for 00 UTC of 16-11-2014
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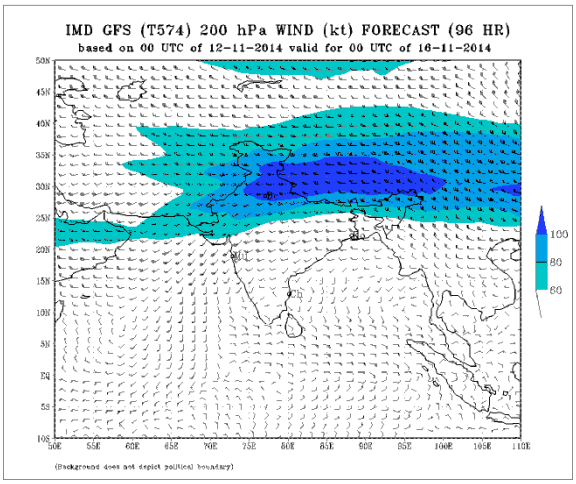
(Background does not depict political boundary)


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 12-11-2014 valid for 00 UTC of 16-11-2014
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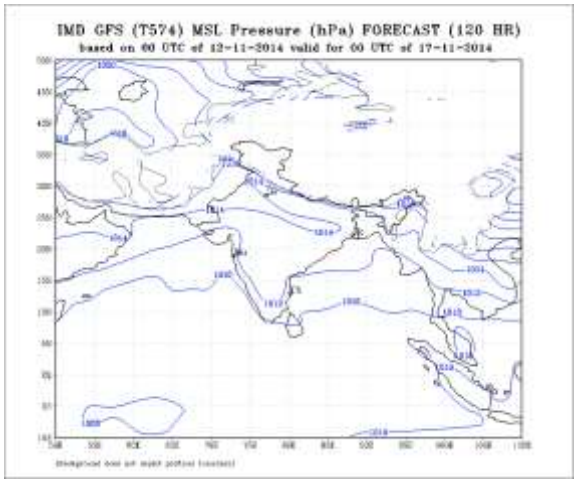
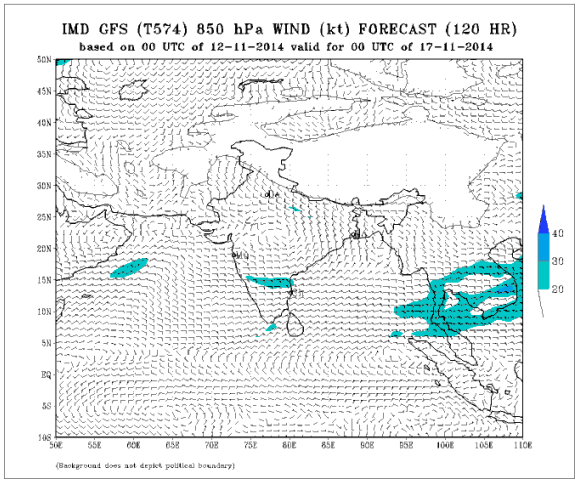
(Background does not depict political boundary)


IMD GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 12-11-2014 valid for 00 UTC of 17-11-2014


IMD GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 12-11-2014 valid for 00 UTC of 17-11-2014
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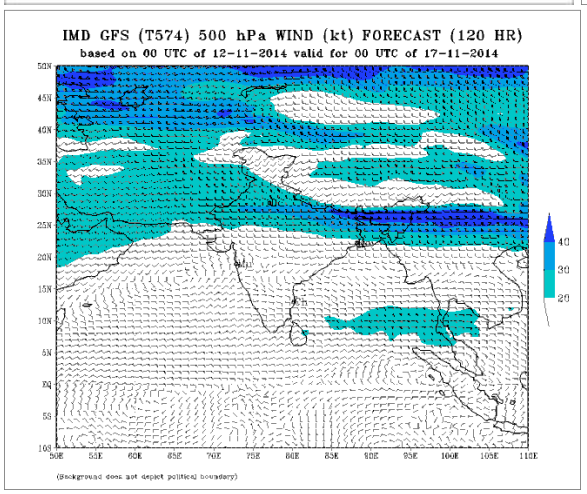
(Background does not depict political boundary)


IMD GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
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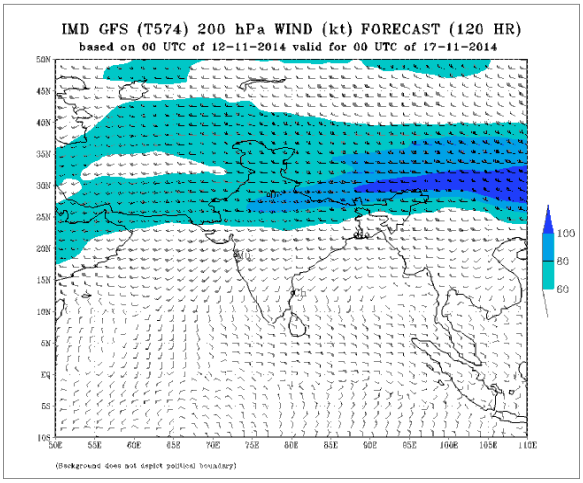
(Background does not depict political boundary)


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 12-11-2014 valid for 00 UTC of 17-11-2014
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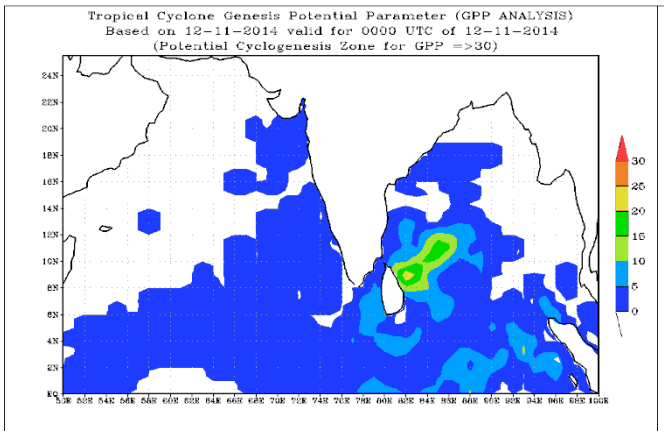
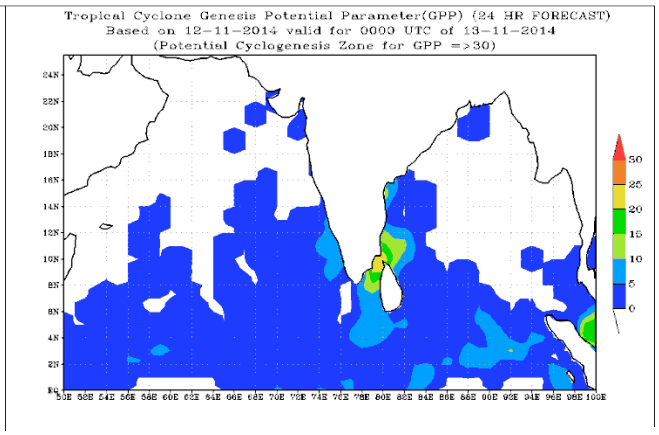
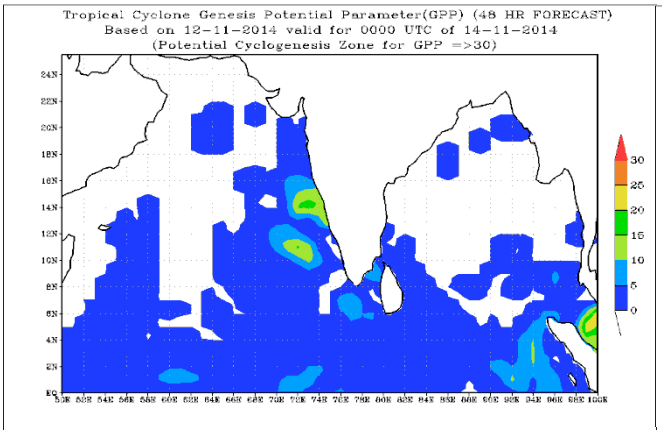
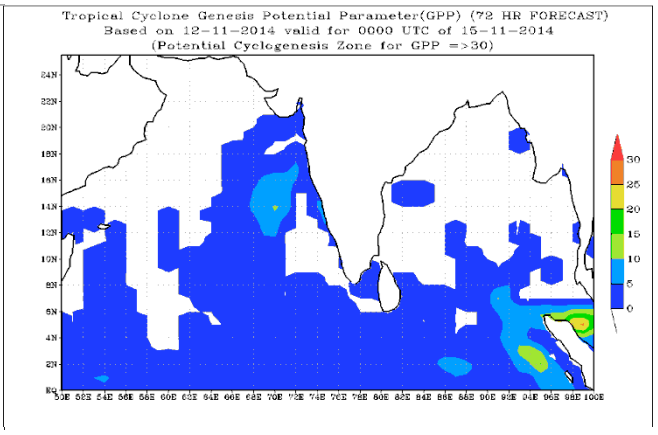
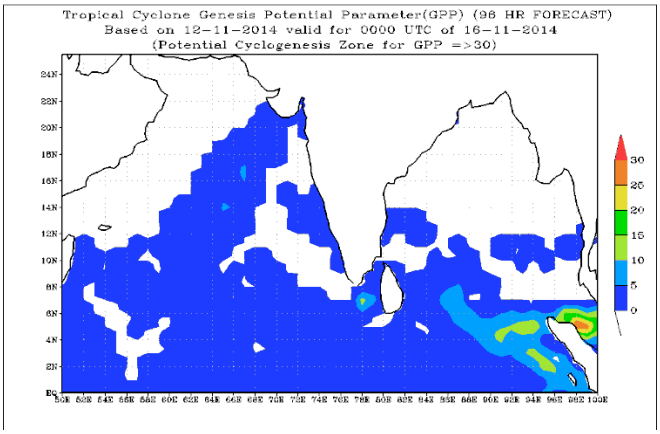
(Background does not depict political boundary)

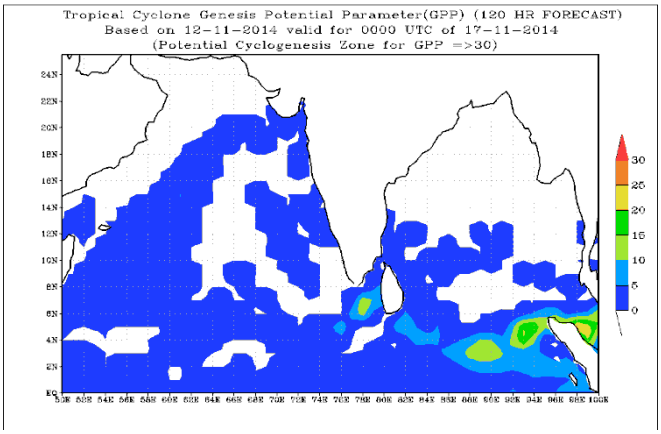

Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 12-11-2014 valid for 0000 UTC of 12-11-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 12-11-2014 valid for 0000 UTC of 13-11-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
Based on 12-11-2014 valid for 0000 UTC of 14-11-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 12-11-2014 valid for 0000 UTC of 15-11-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (96 HR FORECAST)
Based on 12-11-2014 valid for 0000 UTC of 16-11-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 12-11-2014 valid for 0000 UTC of 17-11-2014
(Potential Cyclogenesis Zone for GPP =>30)

FDP (Cyclone) NOC Report Dated 13 November, 2014

Synoptic features based on 0300 UTC of today:

- Yesterday's low pressure area over southwest Bay of Bengal & neighbourhood now lies over Gulf of Mannar & adjoining areas of south Tamilnadu and Sri Lanka. Associated upper air cyclonic circulation extends upto 3.1 km above mean Sea level.
- Yesterday's trough in easterlies from Comorin area to south Gujarat coast now runs from Lakshadweep area to south Gujarat coast 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 between 28-30^{0}C over Bay of Bengal and Andaman Sea, except westcentral Bay, where it is 27-28^{0}C.

Tropical Cyclone Heat Potential (TCHP):

- The ocean thermal energy is < 40kJ/cm^2 over north, westcentral and south Bay of Bengal and parts of southeast Bay of Bengal. It is 50-60 kJ/cm^2 over rest Bay of Bengal and north Andaman Sea and > 100 kJ/cm^2 over south Andaman Sea. It is 60-80 kJ/cm^2 over southeast Arabian Sea.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive (20-40 *10^{-5} s^{-1}) over the region of low pressure area over Gulf of Mannar & adjoining areas of south Tamilnadu and Sri Lanka.

Convergence:

- Lower level convergence is positive (5-10*10^{-5} s^{-1}) over the region of low pressure area over Gulf of Mannar & adjoining areas of south Tamilnadu and Sri Lanka.

Divergence:

- Upper level divergence is positive of the order of 5-10 *10^{-5} s^{-1} over the region of low pressure area in Gulf of Mannar & adjoining areas of south Tamilnadu and Sri Lanka**.**

Wind Shear:

- Wind Shear is 05-10 knots over the region of low pressure over Gulf of Mannar & adjoining areas of south Tamilnadu and Sri Lanka and 10-20 knots over Andaman Sea

Wind Shear Tendency:

- The vertical wind shear tendency is decreasing and is of the order of -5 knots over the region of over Gulf of Mannar & adjoining areas of south Tamilnadu and Sri Lanka. The vertical wind shear tendency is increasing over southwest Bay of Bengal, north Anadaman Sea andjoining areas of southeast Bay and rise over remaining parts of southeast Bay.

Upper tropospheric ridge:

- The upper tropospheric **ridge** at 200 hPa passes through 15.0°N latitude in association with anti-cyclonic circulation over central Bay of Bengal.

M.J.O. Index:

- Located in phase 1 with amplitude greater than 1.0. As per forecast by dynamical and statistical models, it would continue be in phase 1 during next 5 days.

Storms and Depression over South China Sea:

- There is currently no Tropical Storm/Depression over South China Sea.

Status of observational system:

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

Satellite:

Inference based on INSAT imagery of 110900 UTC:

Bay of Bengal & Andaman Sea:-

Broken low and medium clouds with embedded moderate to intense convection are seen over southwest Bay of Bengal and adjoining westcentral Bay of Bengal between latitude 9.5°N to 18.5°N and west of longitude 85.0°E, coastal Tamilnadu and coastal Andhra Pradesh in association with low level circulation over the area.

Scattered low and medium clouds with embedded moderate to intense convection over south Andaman Sea and extending up to northwest Andaman Sea.

Arabian Sea:-

Broken low and medium clouds with embedded moderate to intense convection over southeast Arabian Sea between latitude 6.5°N to 20.0°N and east of longitude 70.0°E.

NWP Analysis

- The analysis of IMD-GFS model on 0000 UTC of 13th November 2014 shows a feeble low over Gulf of Mannar and adjoining Sri Lanka and the associated cyclonic circulation in the lower tropospheric levels extends up to 700 hPa. The low is moving westward and dissipating alongwith easterly wave in 24 hours forecast. The trough in easterlies along Maharashtra coast extending up to Gujarat coast persists in next 48 hours and diminishes thereafter.
- The WRF model analysis also shows a feeble low pressure area over Gulf of Mannar and adjoining area which dissipates moving westward over the tip of the peninsular India in 24 hours forecast.. The trough in easterlies also been shown along Maharashtra coast extending up to Gujarat which persists in next 48 hours.
- The Genesis Potential Parameter (GPP) forecasts based on 0000 UTC of 13th November 2014 shows a prominent GPP zone over Gulf of Mannar & adjoining areas of south Tamilnadu and Sri Lanka and likely to weaken and move westward to emerge over Arabian Sea in the 24 hour forecast. However, the zone will fully dissipate in next 72 hour 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-UKMO** model also suggests cyclir over Gulf of Mannar on 13th. It would move west-northwestward to Arabian Sea and reach west central Arabian Sea near Gulf of Aden on 18th and become less marked on 20th. A fresh cycir will form near Malay Paeninsula on 14th and would move westwards to central part of south Bay on 17th and become less marked on 18th.
- **NCMRWF-GFS** model also suggests west-northwestward movement of the low pressure area over Gulf of Mannar towards southeast and adjoining east central Arabian Sea as a cycir on 1th and continue to move in same direction upto 16th over central abian Sea and becomes less marked on 17th Nov. A fresh cycir will form near Malay Paeninsula on

15th and would move westwards to central part of south Bay on 17th and become less marked on 18th.

- **ECMWF Model**: A well marked low pressure area may develop over southeast Arabian Sea on 14 and 15 Nov and become feeble low less marked on 16 Nov over central Arabian Sea and becomes less marked on 17th. A feeble low/ cycir lies over Andaman Sea which will become less marked on 14th.
- **ARP MoteoFrance**: It shows trough of low over Gulf of Mannar on 13th. It would be extended low over southeast Arabian Sea on 14th, over east central and adjoining southeast Arabian Sea on 15th and less marked on 16th.
- **JMA :** Feeble low over Gulf of Mannar on 13th. It would be extended low over southeast Arabian Sea on 14th, over central part of south Arabian Sea on 15th and less marked on 16th.

Summary and Conclusion:

The low pressure area over south west Bay of Bengal now lies over Gulf of Mannar and adjoining areas of south Tamilnadu and Sri Lanka. It would move west-northwestward and may emerge into southeast Arabian Sea as a cyclonic circulation/ low pressure area by 14 November and become less marked by 15th Nov as the environmental factors are not favourable

The development of a feeble low pressure area/cycir over South Andaman Sea and adjoining southeast Bay and Malay Peninsula may be watched

Advisory: No IOP for next five days.

Annexure-I

Status of Observation system:

Synoptic observation:

Region	Date/Time (UTC)		
	12/12	13/00	13/03
India	44	34	43
Coastal stations			
WB	8	5	7
Odisha	7	6	6
AP	12	12	12
Tamil Nadu	10	7	11
Puducherry	1	1	1
A & N	6	4	6
Bangladesh	8	9	8
Myanmar	11	11	11
Thailand	2	2	2
Sri Lanka	8	8	8

AWS Observations:

Region	Date/Time (UTC)		
	12/12	13/00	13/03
India	59	62	50
Coastal stations			
WB	8	9	10
Odisha	3	3	5
AP	24	26	26
Tamil Nadu	23	23	23
Puducherry	1	1	1
A & N	-	-	-

- **RS/RW** (12Z) of 12/11/2014 **-1/39**
- **No. of Ascents reaching 250 hPa level: 3-, MISDA: 38**
- **RS/RW** (00Z) of 13/11/2014-21**/39**
- **No. of Ascents reaching 250 hPa level: 7, MISDA: 18**

No. of PILOT Ascents

12/12Z	13/00Z
6	5

Buoy Data

12/12Z	13/00Z	13/03Z
12	14	13

FOC CHENNAI: STATUS OF OBSERVATION

Date→	**12.11.2014**							
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 /12.11.2014 : 1

No. of Ascents reaching 250 hPa level = 1

MISDA : 7

12Z /12.11.2014 : --

No. of Ascents reaching 250 hPa level = --

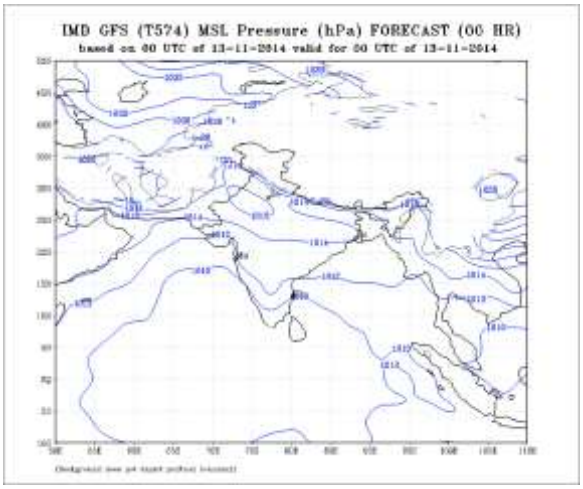
MISDA : 8

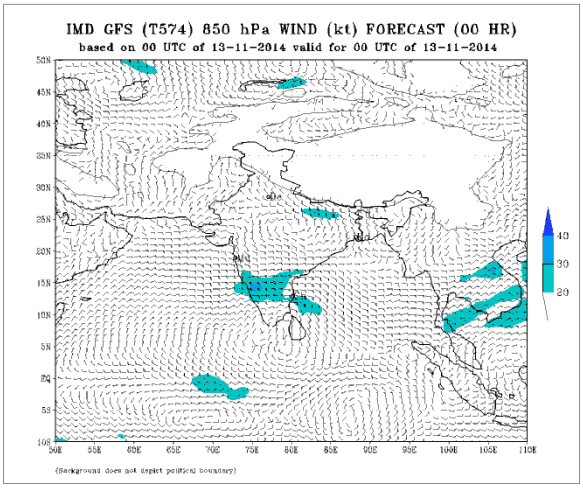
No. of PILOT Ascents:

12.11.2014

06Z	18Z
4	-

Annexure-II


IMD GFS (T574) MSL Pressure (hPa) FORECAST (00 HR)
based on 00 UTC of 13-11-2014 valid for 00 UTC of 13-11-2014


IMD GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 13-11-2014 valid for 00 UTC of 13-11-2014
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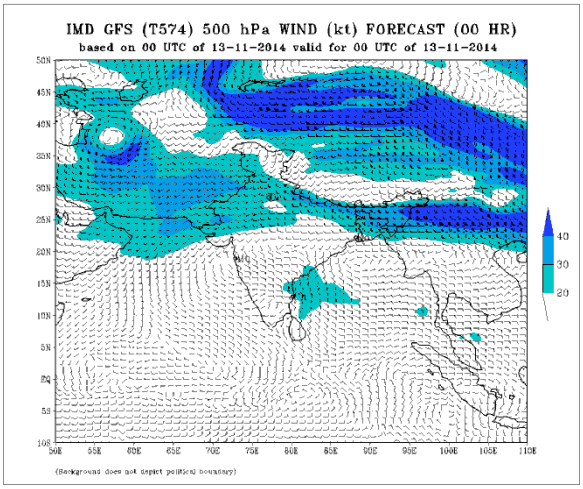
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based on 00 UTC of 13-11-2014 valid for 00 UTC of 13-11-2014
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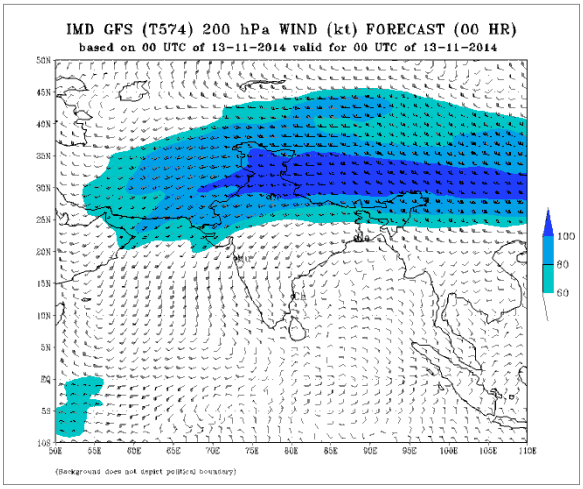
IMD GFS (T574) 200 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 13-11-2014 valid for 00 UTC of 13-11-2014
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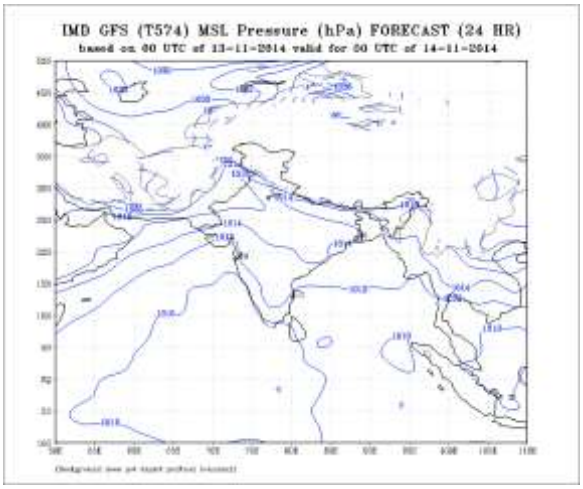
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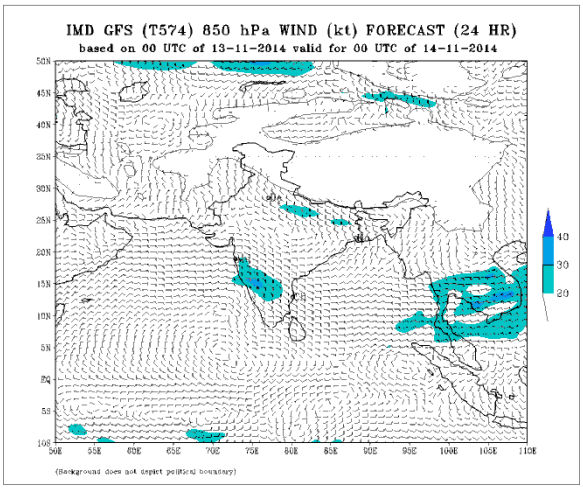
based on 00 UTC of 13-11-2014 valid for 00 UTC of 14-11-2014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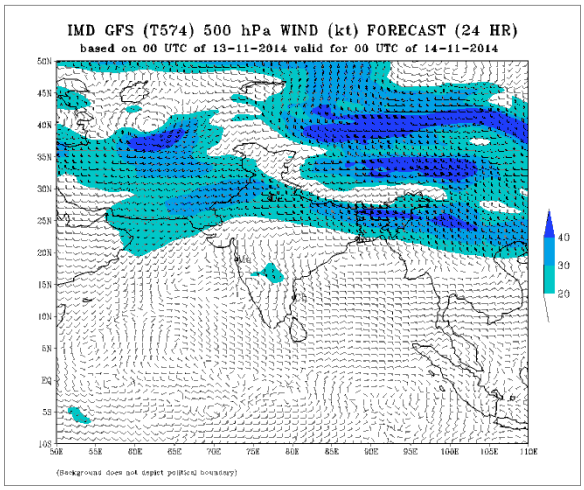
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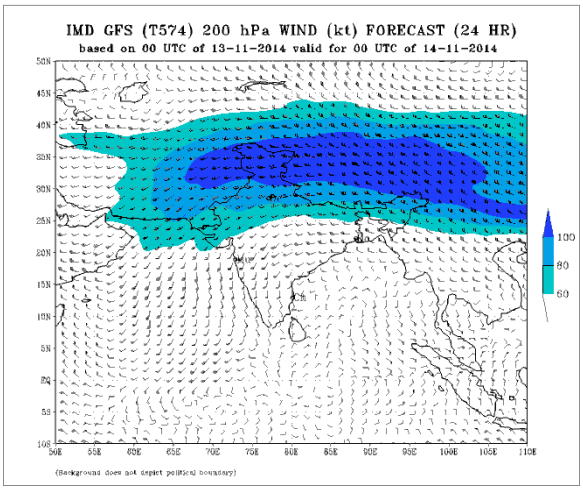
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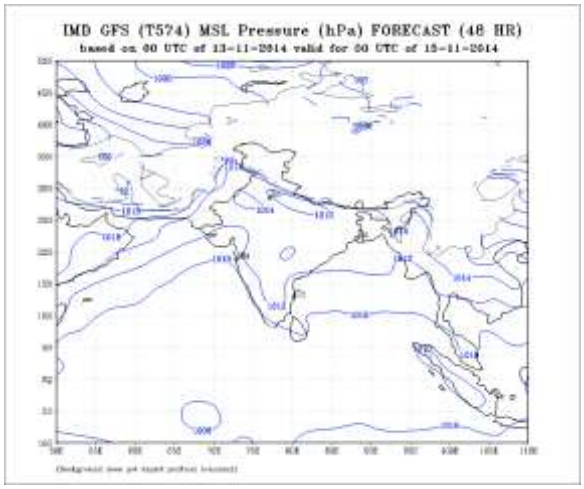
IMD GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
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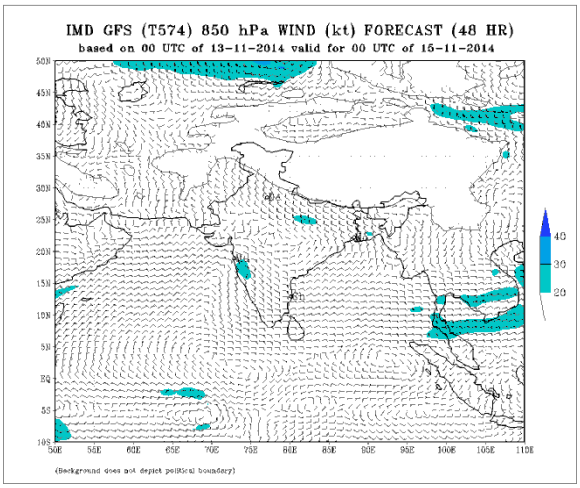
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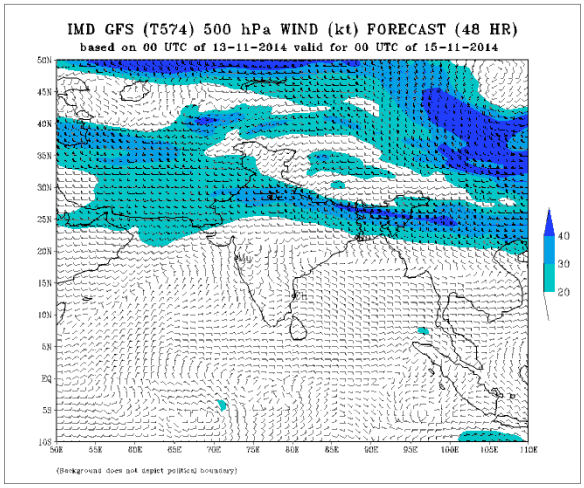
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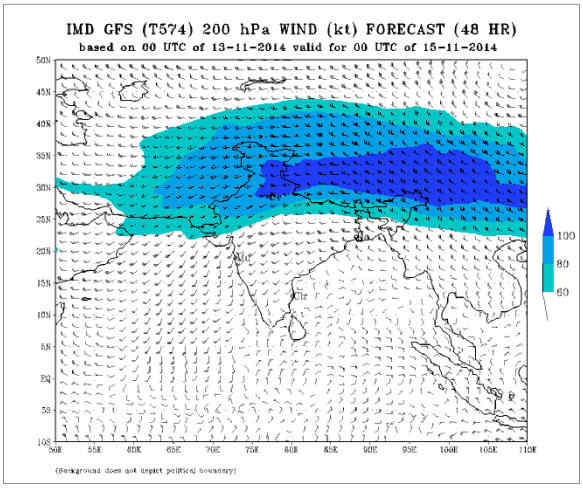
IMD GFS (T574) 200 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 13-11-2014 valid for 00 UTC of 15-11-2014
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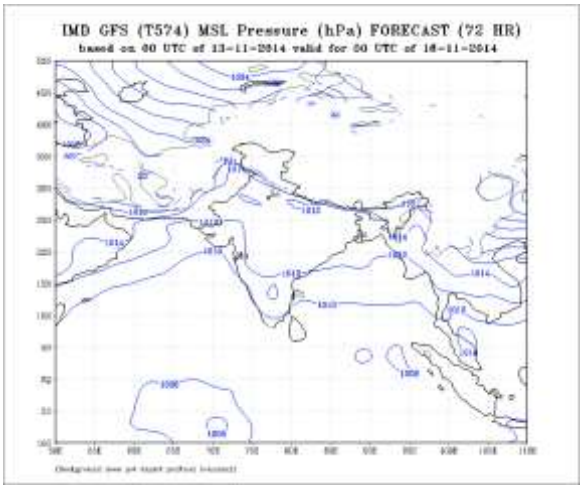
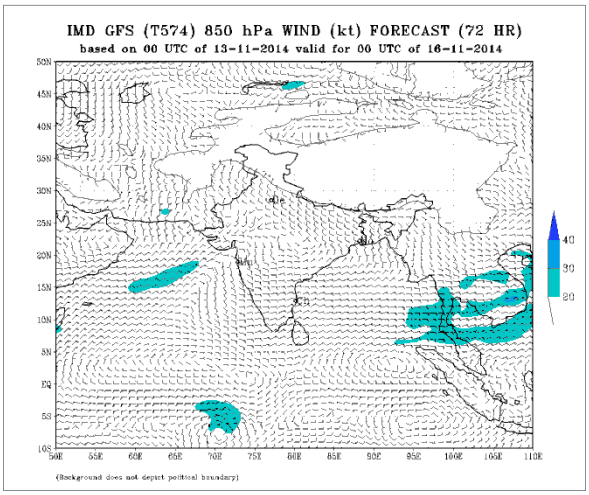
(Background does not depict political boundary)


IMD GFS (T574) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 13-11-2014 valid for 00 UTC of 16-11-2014


IMD GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 13-11-2014 valid for 00 UTC of 16-11-2014
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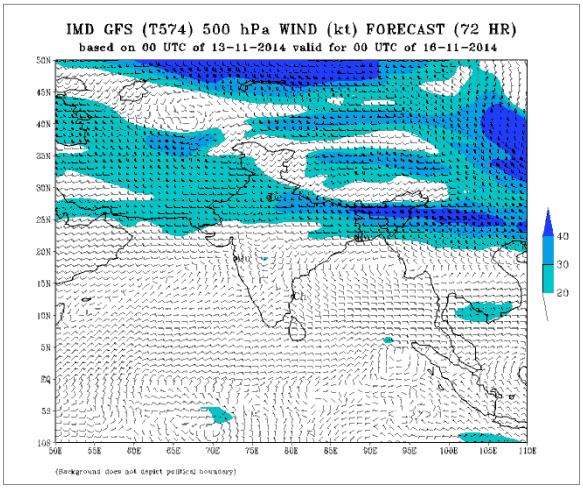
IMD GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 13-11-2014 valid for 00 UTC of 16-11-2014
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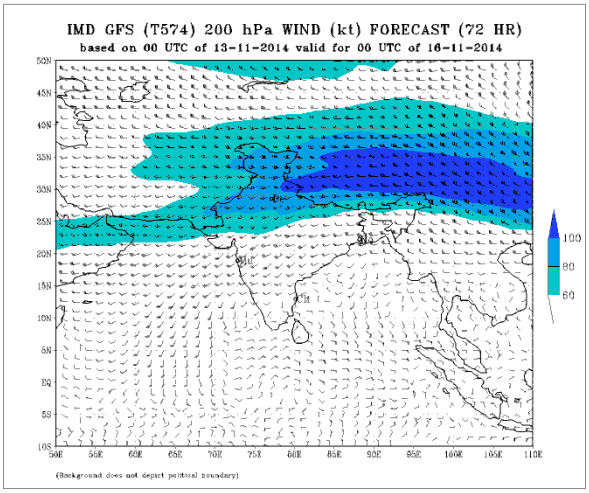
IMD GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 13-11-2014 valid for 00 UTC of 16-11-2014
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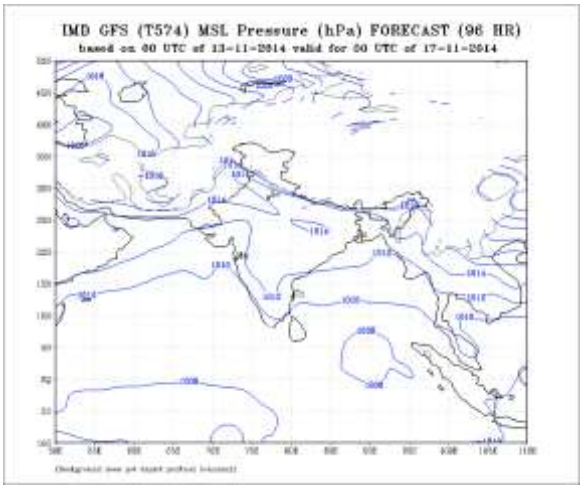
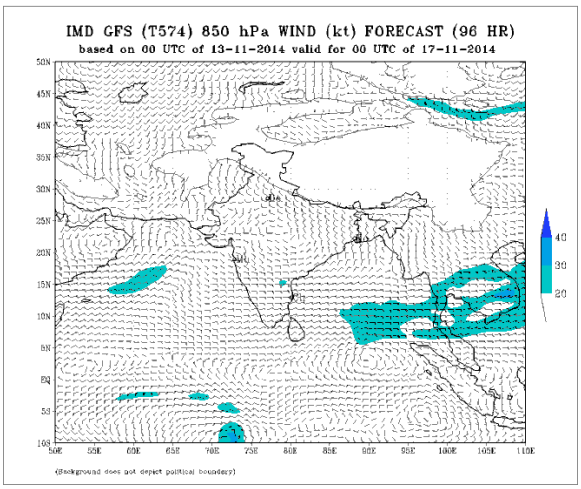

IMD GFS (T574) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 13-11-2014 valid for 00 UTC of 17-11-2014


IMD GFS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 13-11-2014 valid for 00 UTC of 17-11-2014
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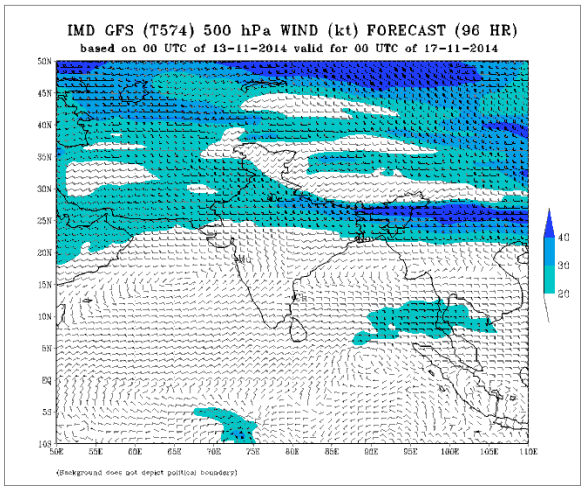
IMD GFS (T574) 500 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 13-11-2014 valid for 00 UTC of 17-11-2014
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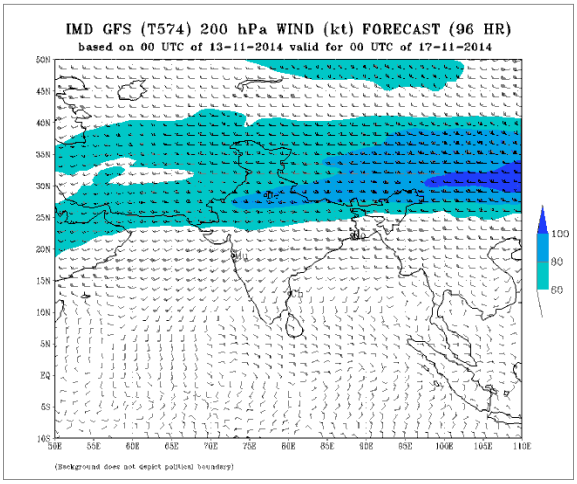
(Background does not depict political boundary)


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 13-11-2014 valid for 00 UTC of 17-11-2014
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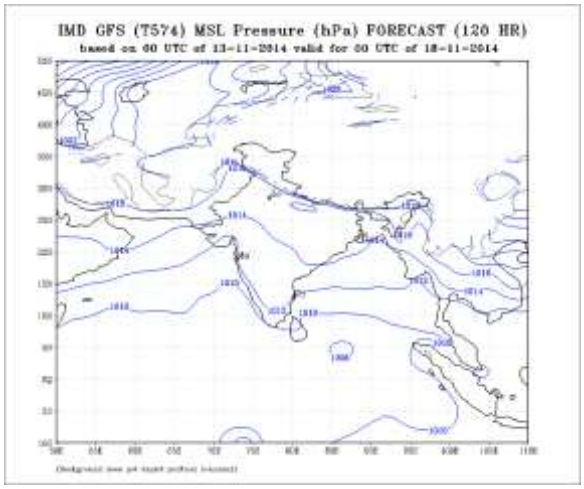
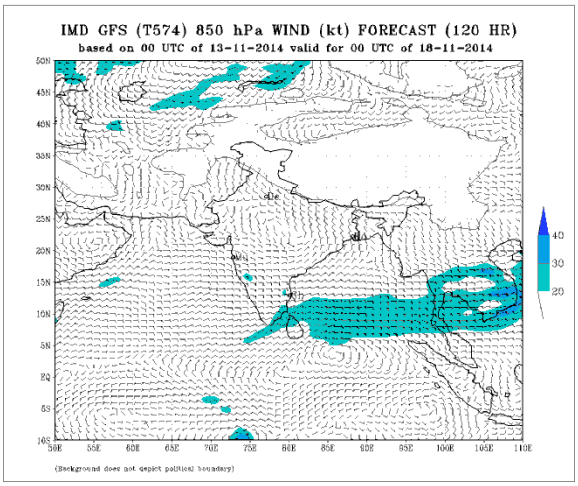
(Background does not depict political boundary)


IMD GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 13-11-2014 valid for 00 UTC of 18-11-2014


IMD GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 13-11-2014 valid for 00 UTC of 18-11-2014
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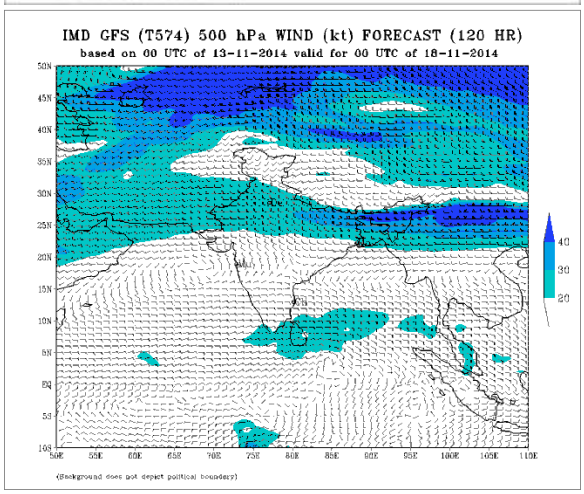
(Background does not depict political boundary)


IMD GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 13-11-2014 valid for 00 UTC of 18-11-2014
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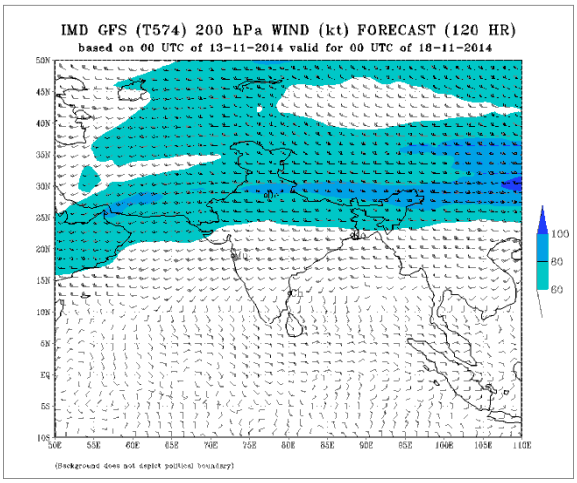
(Background does not depict political boundary)


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 13-11-2014 valid for 00 UTC of 18-11-2014
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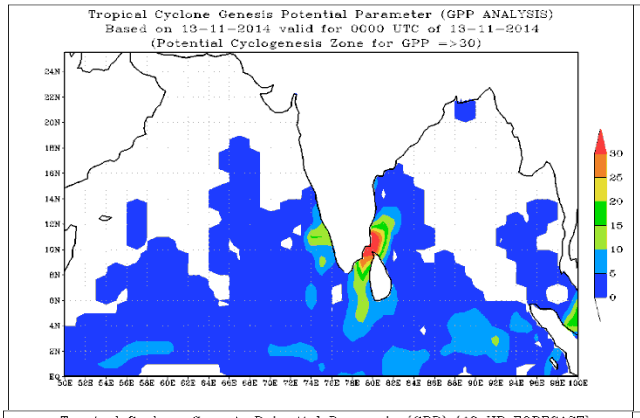
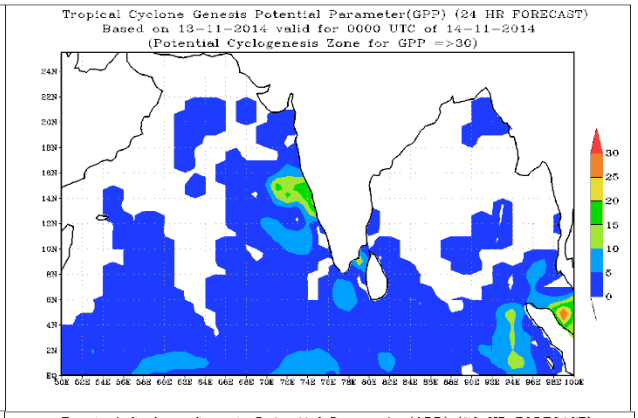
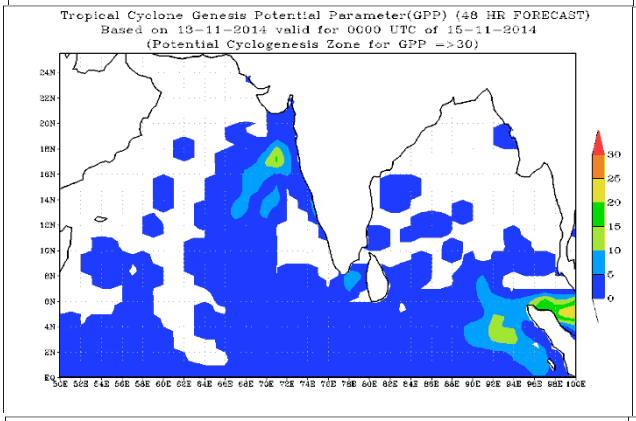
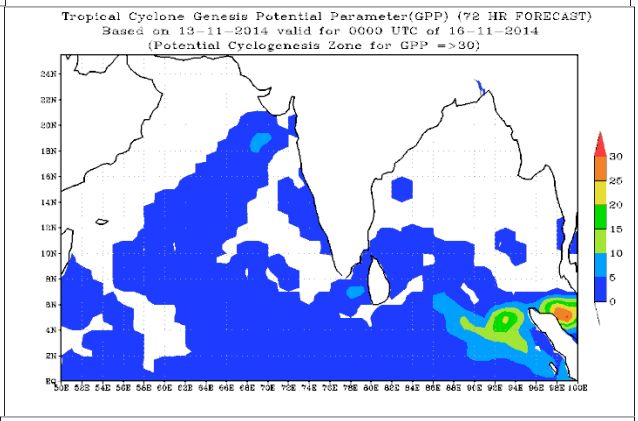
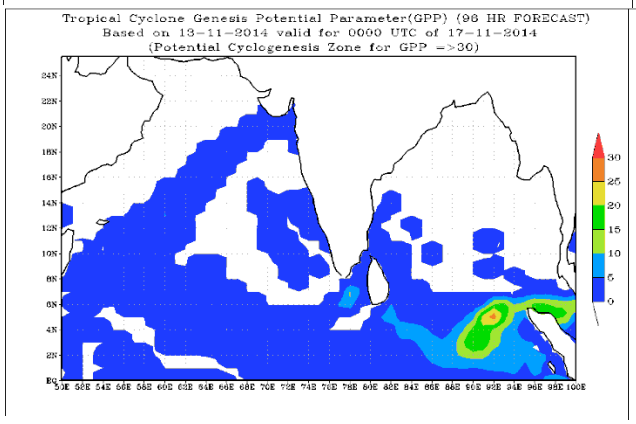
(Background does not depict political boundary)

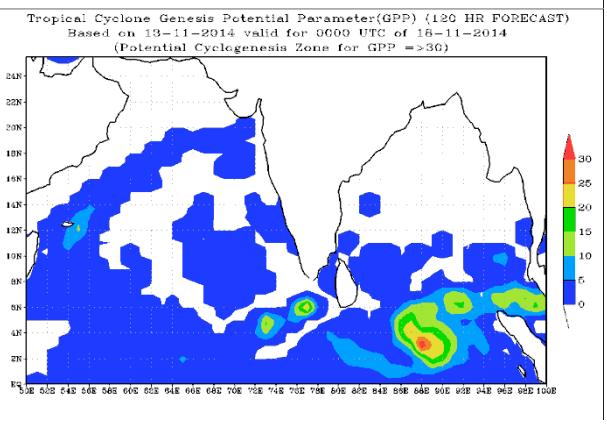

Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 13-11-2014 valid for 0000 UTC of 13-11-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 13-11-2014 valid for 0000 UTC of 14-11-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
Based on 13-11-2014 valid for 0000 UTC of 15-11-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 13-11-2014 valid for 0000 UTC of 16-11-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (96 HR FORECAST)
Based on 13-11-2014 valid for 0000 UTC of 17-11-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 13-11-2014 valid for 0000 UTC of 18-11-2014
(Potential Cyclogenesis Zone for GPP =>30)

FDP (Cyclone) NOC Report Dated 14 November, 2014

Synoptic features based on 0300 UTC of today:

- Yesterday's trough in easterlies from Lakshadweep area to south Gujarat coast now extends upto 3.1 km above mean Sea level.

Environmental features based on 0300 UTC of today:

Sea Surface Temperature:

- Sea Surface Temperature is between 28-30^{0}C over Bay of Bengal and Andaman Sea, except westcentral Bay, where it is 27-29^{0}C.

Tropical Cyclone Heat Potential (TCHP):

- The ocean thermal energy is 40-60kJ/cm^2 over Bay of Bengal and Andaman Sea except over the extreme southeastern parts where it around 100kJ/cm^2.
- It is 40-60kJ/cm^2 over Arabian Sea.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive (20-40*10^{-5} s^{-1}) over the extreme southeastern parts of Bay of Bengal and Andaman Sea.
- It is negative (-20 to -10 *10^{-5} s^{-1}) over rest of Bay of Bengal and Andaman Sea.

Convergence:

- Lower level convergence is positive (5-10*10^{-5} s^{-1}) over extreme southeastern parts of Bay of Bengal and Andaman Sea as well as off Sri Lanka and Kerala coasts.

Divergence:

- Upper level divergence is positive of the order of 10 *10^{-5} s^{-1} over southeastern parts of Bay of Bengal and Andaman Sea and off Sri Lanka and Kerala coasts.

Wind Shear:

- Wind Shear is 05-10 knots over the southern parts of Bay of Bengal. It is 10-30 knots over the northern Bay of Bengal.

Wind Shear Tendency:

- The vertical wind shear tendency is decreasing and is of the order of -5 to -10 knots over the southwest and southeast Bay of Bengal. It is increasing and is of the order of 5-10 knots over the southcentral Bay of Bengal.

Upper tropospheric ridge:

- The upper tropospheric **ridge** at 200 hPa passes through 16.0°N.

M.J.O. Index:

- Located in phase 1 with amplitude greater than 1.0. As per forecast by dynamical and statistical models, it would continue be in phase 1 during next 3 days.

Storms and Depression over South China Sea:

- There is currently no Tropical Storm/Depression over South China Sea.

Status of observational system:

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

Satellite:

Inference based on INSAT imagery of 140900 UTC:

Bay of Bengal & Andaman Sea:-

- Scattered low and medium clouds with embedded isolated moderate to intense convection over southeast Bay of Bengal east of longitude 90.0°E, south Andaman Sea and South Tenasserim coast.

Arabian Sea:-

- Scattered low and medium clouds with embedded moderate to intense convection over Arabian Sea between latitude 5.0°N to 20.0°N and east of longitude 66.5°E.

NWP Analysis

- The analysis of IMD-GFS model on 0000 UTC of 14th November 2014 shows trough in easterlies along Maharashtra coast extending up to Gujarat coast persists in next 48 hours and diminishes thereafter. An extended cyclonic circulation over Tripura, NNMT and adjoining area and associated trough in lower levels extending up to 700 hPa persists for three days in the forecasts. A Seasonal anticyclone exists over central India in forecasts hours up to 72 hours.
- The WRF model analysis also shows a feeble trough in easterlies along Maharashtra coast extending up to Gujarat which persists in next 48 hours which thereafter exists near equator as a part of easterly waves. A cyclonic circulation over Tripura and NNMT region persists for three days in lower levels of the troposphere which moves a bit southward over Bangladesh in 72 hours forecast.
- The Genesis Potential Parameter (GPP) analysis and forecasts based on 0000 UTC of 14th November 2014 does not show any significant GPP zone over Indian Seas. In day two forecast, a weak zone of GPP appears over Gulf of Mannar and adjoining area which disappears in day 3 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

- **CMRWF-UKMO** model does not suggest any cyclogenesis over Bay of Bengal during the next 5 days.
- **NCMRWF-GFS** model does not suggest any cyclogenesis over Bay of Bengal during the next 5 days.
- **ECMWF Model** does not suggest any cyclogenesis over Bay of Bengal during the next 5 days.

Summary and Conclusion:

Yesterday's trough in easterlies from Lakshadweep area to south Gujarat coast now extends upto 3.1 km above mean Sea level.

Advisory: No IOP for next five days.

Annexure-I

Status of Observation system:

Synoptic observation:

Region	Date/Time (UTC)		
	13/12	**14/00**	**14/03**
India	47	36	46
Coastal stations			
WB	8	3	8
Odisha	7	5	7
AP	13	12	12
Tamil Nadu	11	10	11
Puducherry	2	2	2
A & N	6	4	6
Bangladesh	11	11	10
Myanmar	11	11	11
Thailand	0	0	0
Sri Lanka	8	8	8

AWS Observations:

Region	Date/Time (UTC)		
	13/12	**14/00**	**14/03**
India	67	65	78
Coastal stations			
WB	7	9	12
Odisha	5	6	13
AP	28	27	29
Tamil Nadu	26	25	24
Puducherry	1	0	1
A & N	-	-	-

- **RS/RW** (12Z) of 13/11/2014 **-1/39**
- **No. of Ascents reaching 250 hPa level: 1, MISDA: 38**
- **RS/RW** (00Z) of 14/11/2014-6**/39**
- **No. of Ascents reaching 250 hPa level: 4, MISDA: 33**

No. of PILOT Ascents

13/12Z	14/00Z
8	10

Buoy Data

13/12Z	14/00Z	14/03Z
15	11	15

FOC CHENNAI: STATUS OF OBSERVATION

Date→				**13.11.2014**				
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 /13.11.2014 : 2

No. of Ascents reaching 250 hPa level = 2

MISDA : 6

12Z /13.11.2014 : --

No. of Ascents reaching 250 hPa level = --

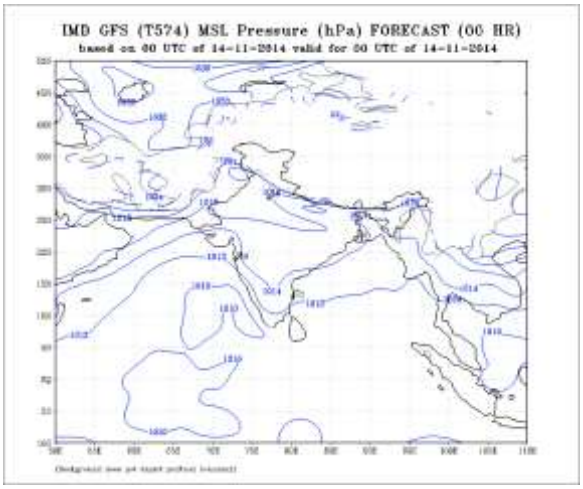
MISDA : 8

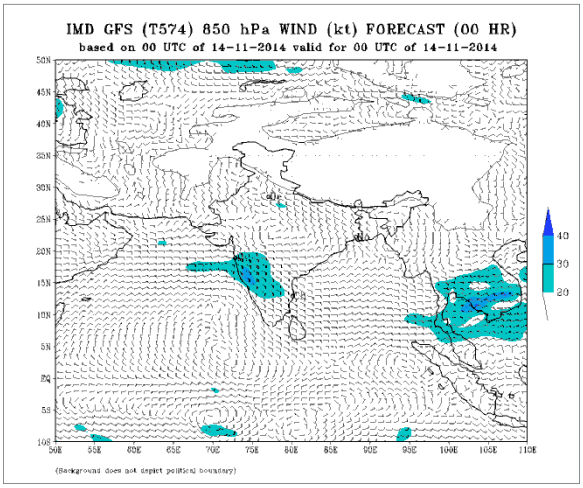
No. of PILOT Ascents:

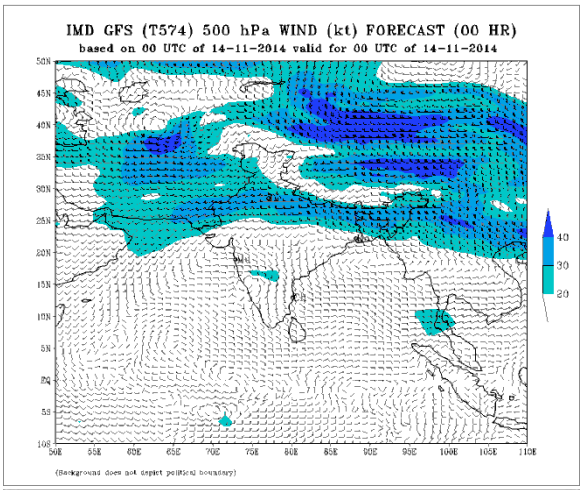
13.11.2014

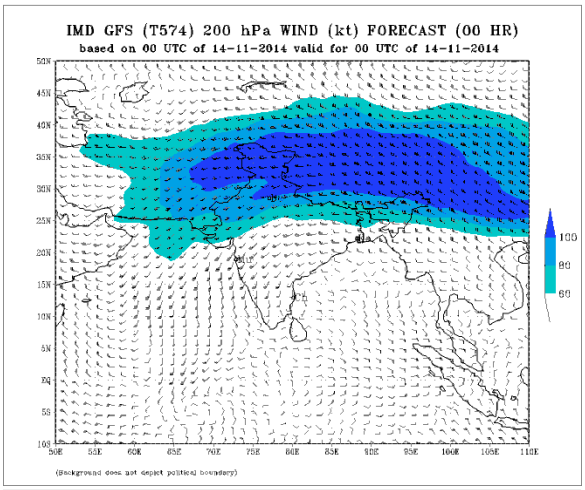
06Z	18Z
2	2

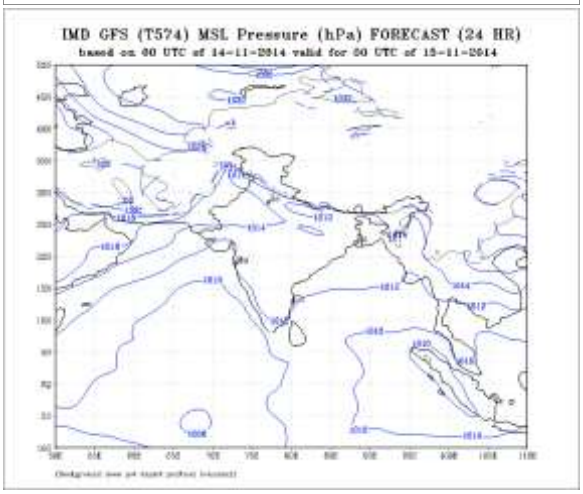
Annexure-II

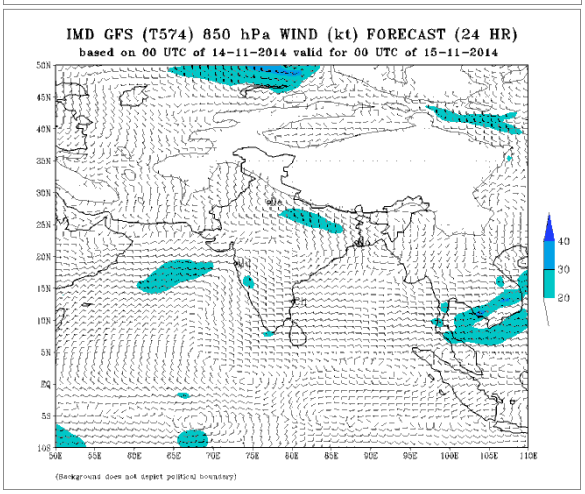

IMD GFS (T574) MSL Pressure (hPa) FORECAST (00 HR)
based on 00 UTC of 14-11-2014 valid for 00 UTC of 14-11-2014


IMD GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 14-11-2014 valid for 00 UTC of 14-11-2014


IMD GFS (T574) 500 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 14-11-2014 valid for 00 UTC of 14-11-2014


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 14-11-2014 valid for 00 UTC of 14-11-2014


IMD GFS (T574) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 14-11-2014 valid for 00 UTC of 15-11-2014


IMD GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
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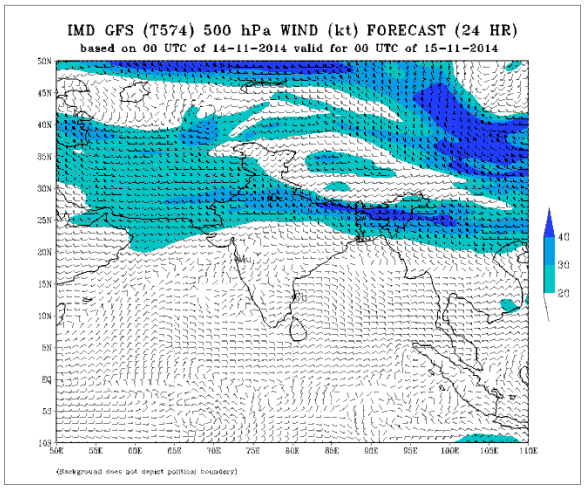
IMD GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
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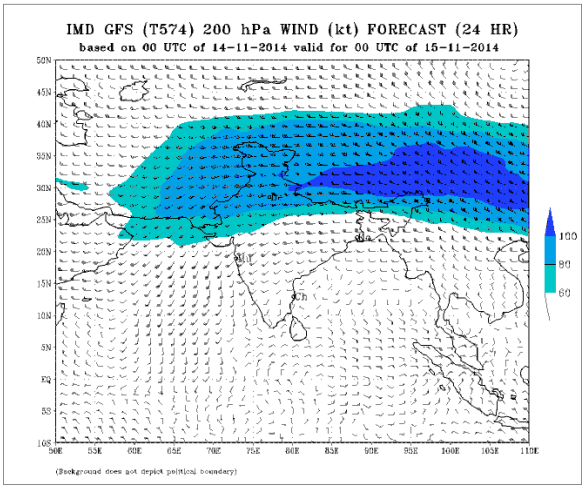
IMD GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 14-11-2014 valid for 00 UTC of 15-11-2014
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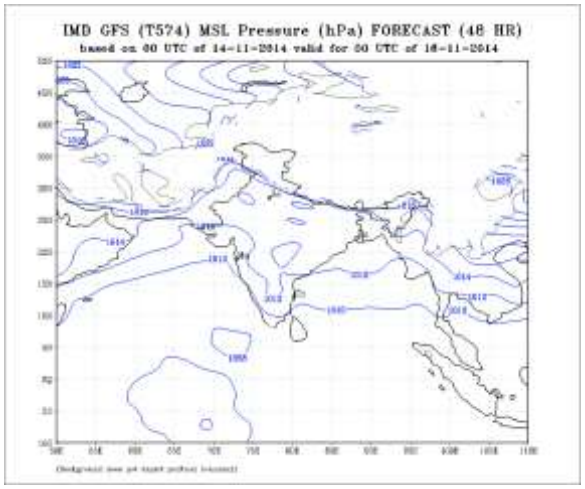
IMD GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
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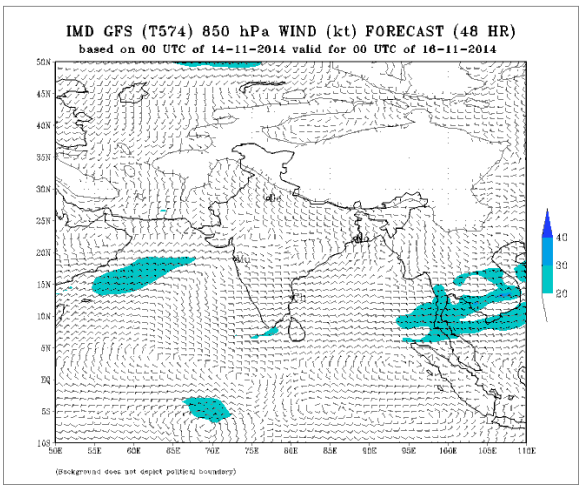
IMD GFS (T574) 850 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 14-11-2014 valid for 00 UTC of 16-11-2014
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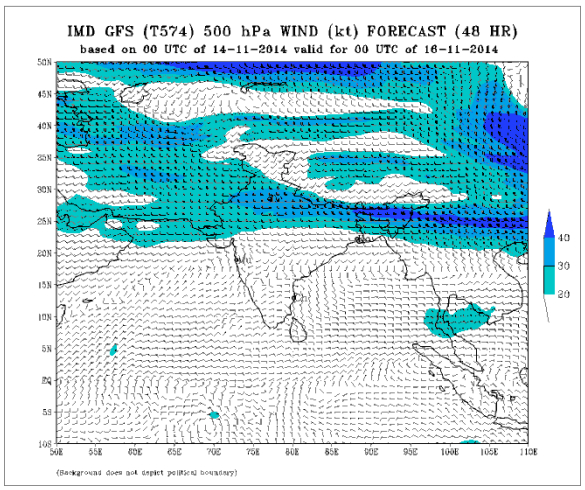
(Background does not depict political boundary)


IMD GFS (T574) 500 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 14-11-2014 valid for 00 UTC of 16-11-2014
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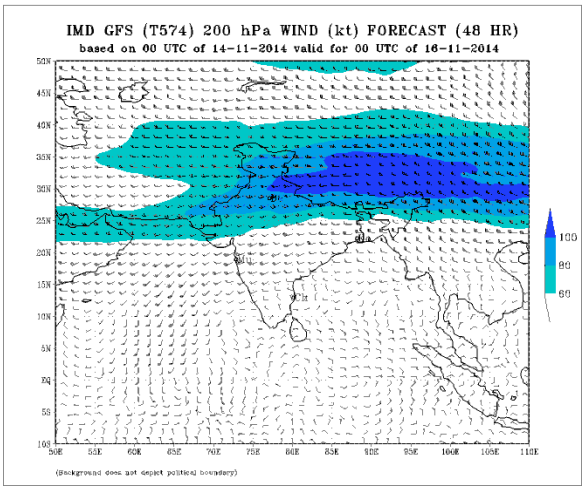
(Background does not depict political boundary)


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 14-11-2014 valid for 00 UTC of 16-11-2014
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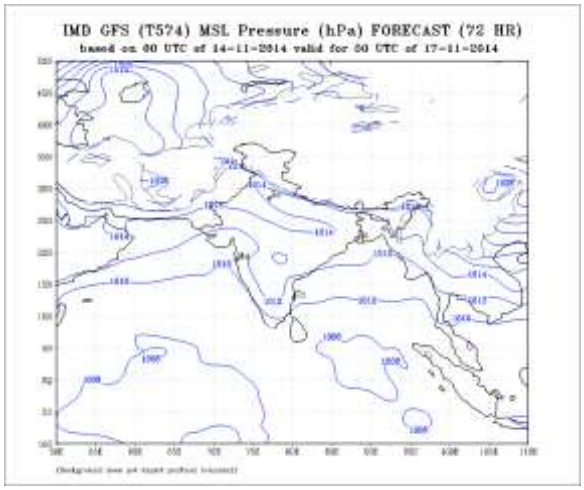
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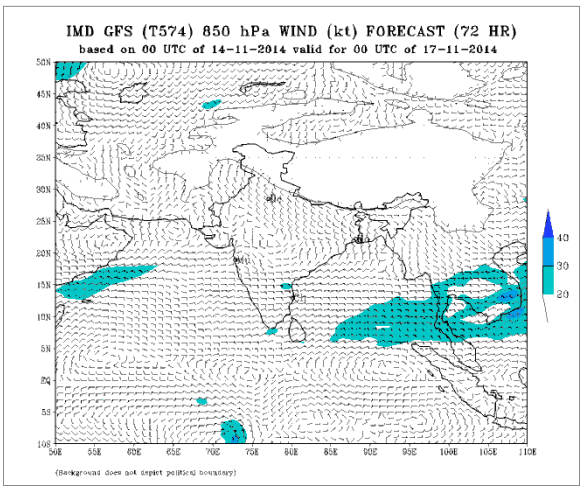
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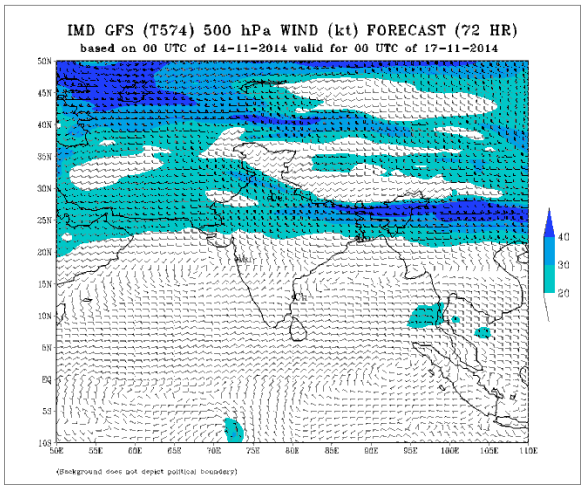
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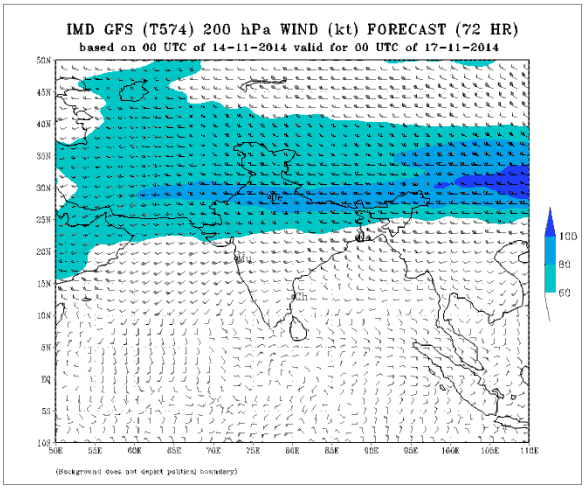
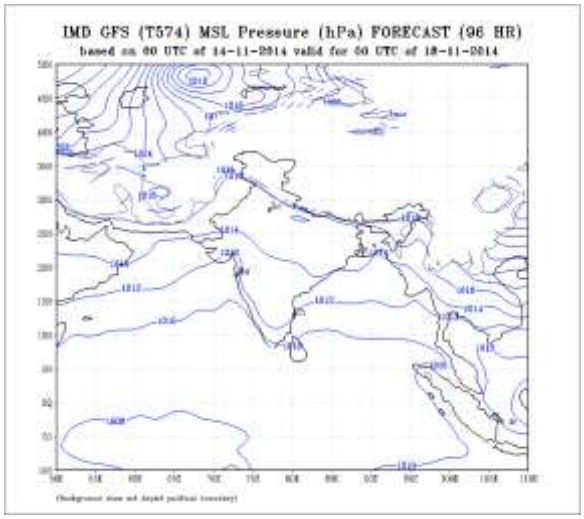
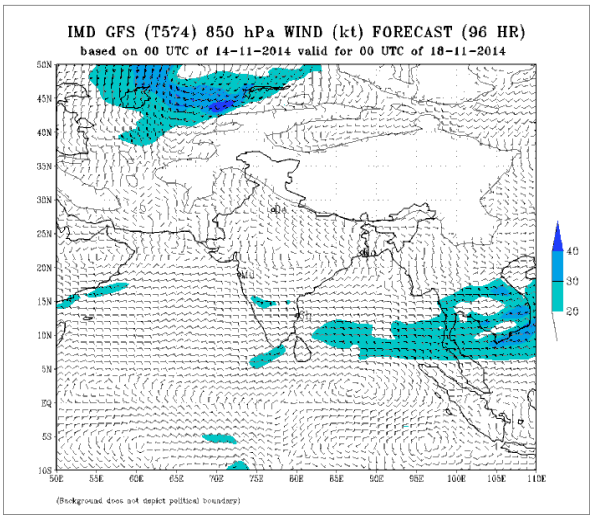
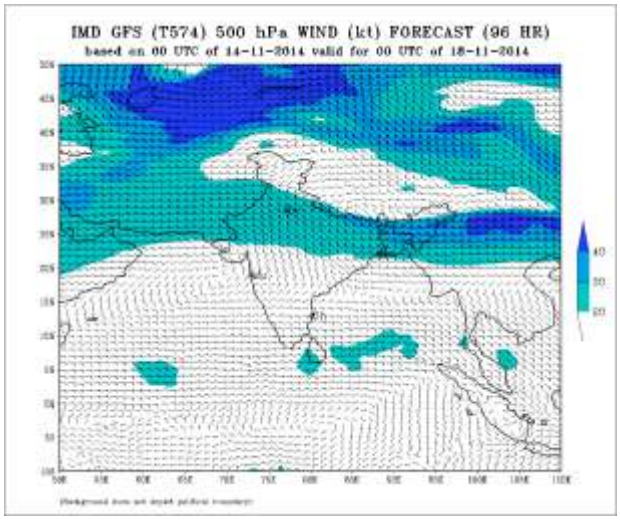
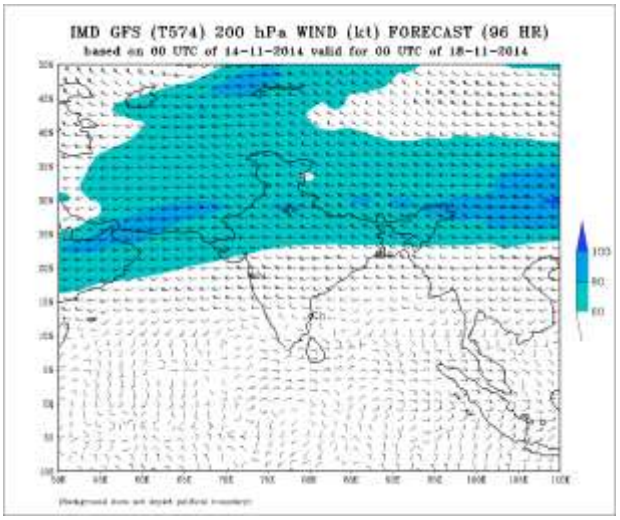
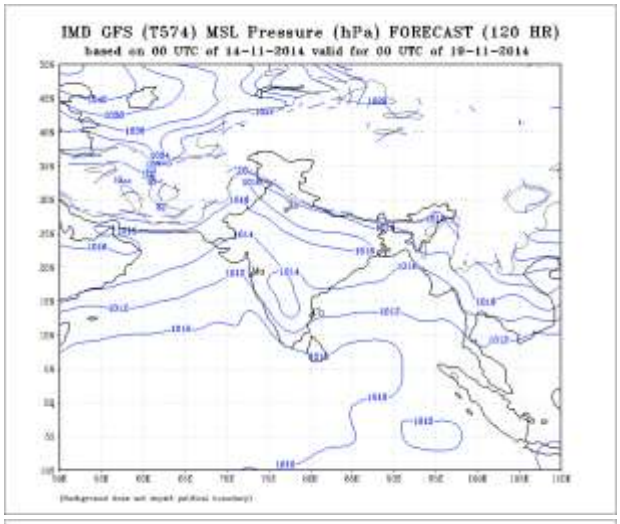

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 14-11-2014 valid for 00 UTC of 17-11-2014

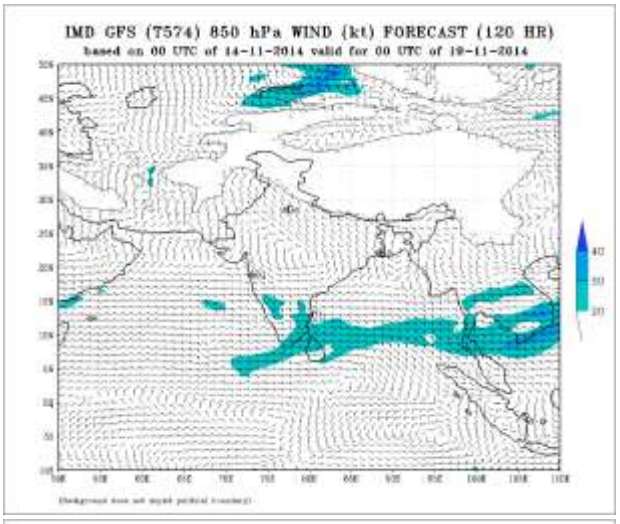

IMD GFS (T574) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 14-11-2014 valid for 00 UTC of 18-11-2014

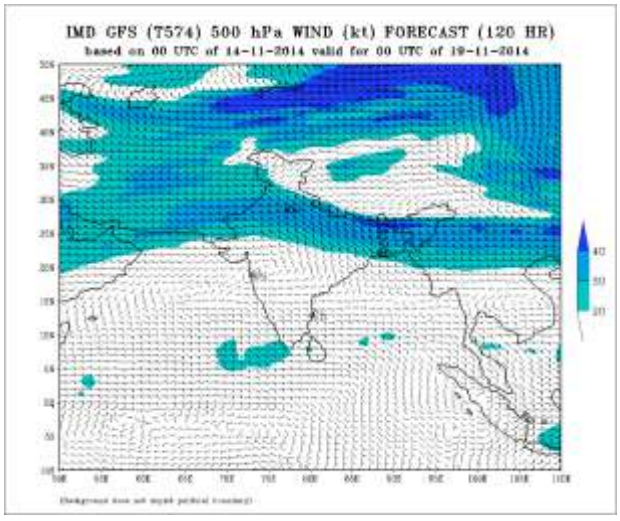

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 14-11-2014 valid for 00 UTC of 18-11-2014

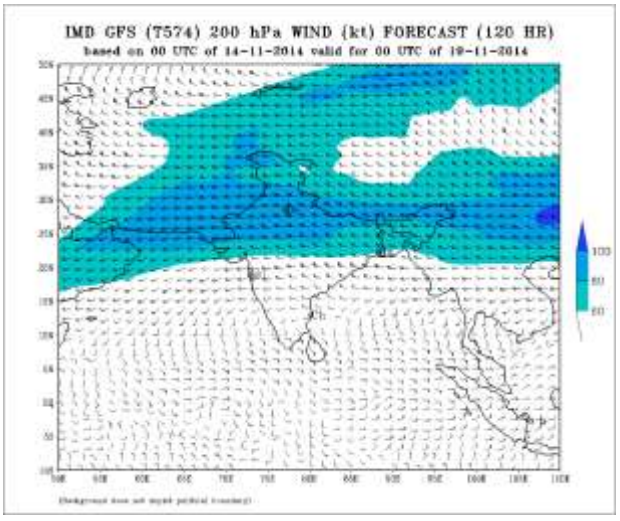

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 14-11-2014 valid for 00 UTC of 18-11-2014

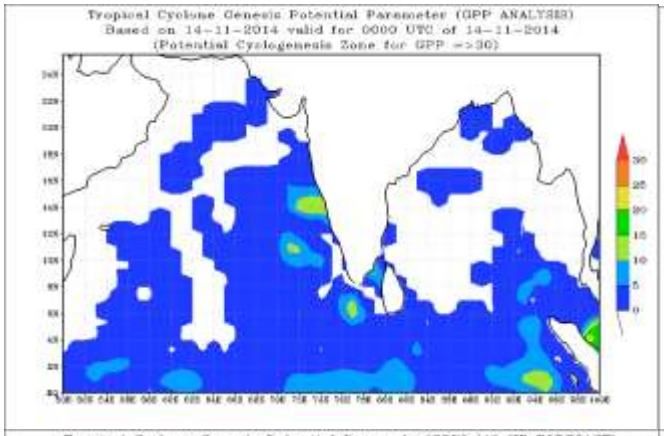

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 14-11-2014 valid for 00 UTC of 18-11-2014

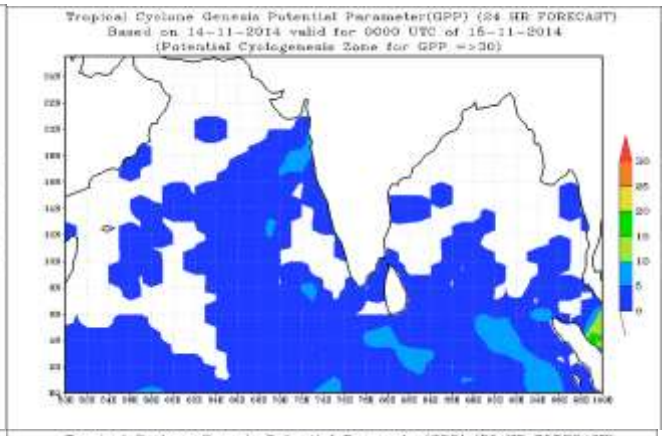

IMD GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 14-11-2014 valid for 00 UTC of 19-11-2014

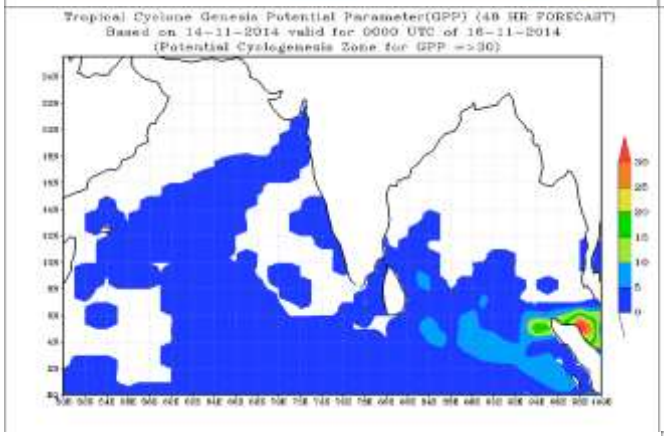

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 14-11-2014 valid for 00 UTC of 19-11-2014

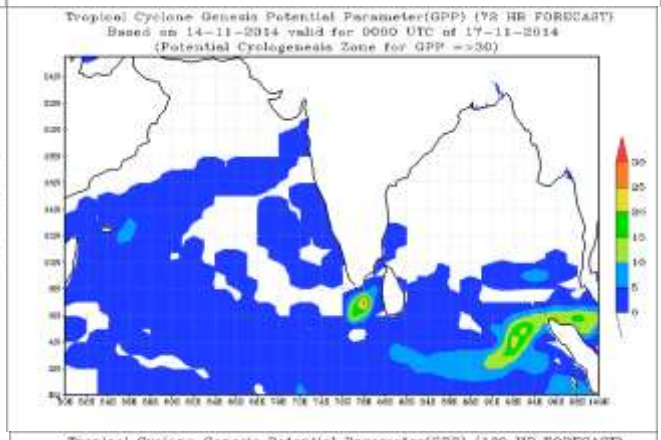

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 14-11-2014 valid for 00 UTC of 19-11-2014

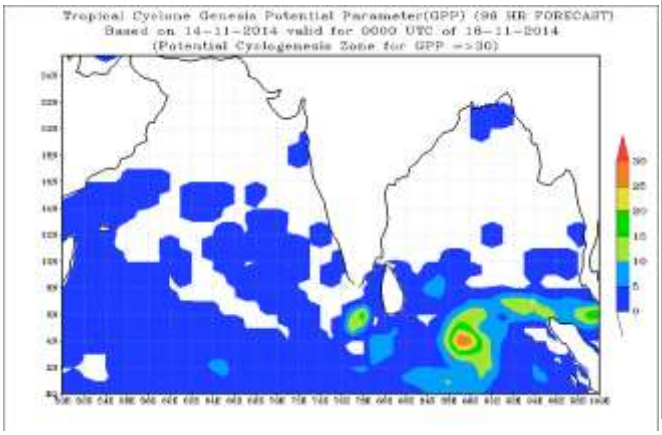

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 14-11-2014 valid for 00 UTC of 19-11-2014

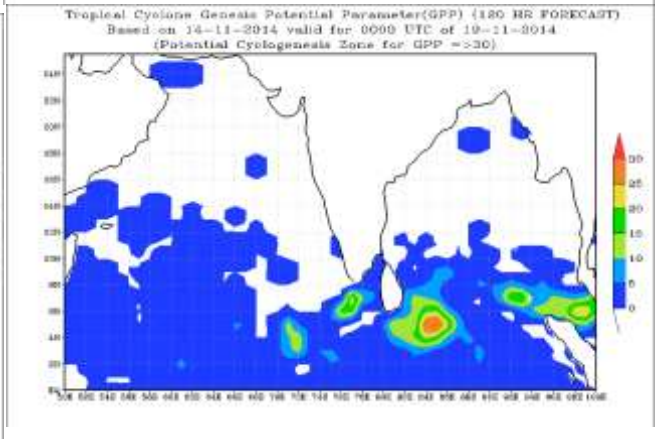

Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 14-11-2014 valid for 0000 UTC of 14-11-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 14-11-2014 valid for 0000 UTC of 15-11-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
Based on 14-11-2014 valid for 0000 UTC of 16-11-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 14-11-2014 valid for 0000 UTC of 17-11-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (96 HR FORECAST)
Based on 14-11-2014 valid for 0000 UTC of 18-11-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 14-11-2014 valid for 0000 UTC of 19-11-2014
(Potential Cyclogenesis Zone for GPP =>30)

FDP (Cyclone) NOC Report Dated 15 November, 2014

Synoptic features based on 0300 UTC of today:

- The trough in easterlies from Lakshadweep area to south Gujarat coast, now runs from southeast Arabian Sea to south Gujarat coast across eastcentral Arabian Sea in lower levels.

Environmental features based on 0300 UTC of today:

Sea Surface Temperature:

- Sea Surface Temperature is between 28-30^{0}C over Bay of Bengal and Andaman Sea, except westcentral Bay, where it is 27-29^{0}C.

Tropical Cyclone Heat Potential (TCHP):

- The ocean thermal energy is 40-60kJ/cm^2 over Bay of Bengal and Andaman Sea except over the extreme southeastern parts where it around 100kJ/cm^2.
- It is 40-60kJ/cm^2 over Arabian Sea.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive (20-30*10^{-5} s^{-1}) over the extreme southern parts of Southeast Bay of Bengal and Tenasserim coast.
- It is is positive (20-30*10^{-5} s^{-1}) over the east central Arabian Sea off M coast.

Convergence:

- Lower level convergence is positive (5-10*10^{-5} s^{-1}) over eastcentral Arabian Sea and parts of southeast Bay of Bengal.

Divergence:

- Upper level divergence is positive over eastcentral Arabian Sea off Konkan and Goa coast (10-20*10^{-5} s^{-1}) and it is 5-10*10^{-5} s^{-1} over extreme southeastern parts of Bay of Bengal and Andaman Sea.

Wind Shear:

- Wind Shear is 10-20 knots over the southern parts of Bay of Bengal. It is 10-30 knots over the northern Bay of Bengal.

Wind Shear Tendency:

- The vertical wind shear tendency is decreasing and is of the order of -5 to -10 knots over the southwest and southeast Bay of Bengal. It is increasing and is of the order of 5-10 knots over the westcentral Bay of Bengal.

Upper tropospheric ridge:

- The upper tropospheric **ridge** at 200 hPa passes through 14.0°N.

M.J.O. Index:

- Located in phase 1 with amplitude greater than 1.0. As per forecast by dynamical and statistical models, it would continue be in phase 1 during next 3 days.

Storms and Depression over South China Sea:

- There is currently no Tropical Storm/Depression over South China Sea.

Status of observational system:

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

Satellite:
Inference based on INSAT imagery of 150900 UTC:
Bay of Bengal & Andaman Sea:-

Scattered low and medium clouds with embedded moderate to intense convection over southeast Bay of Bengal south of latitude 11.0°N and south of Andaman Sea.
Arabian Sea:-
Scattered low and medium clouds with embedded moderate to intense convection over Arabian Sea between latitude 5.0°N to 20.0°N east of longitude 67.0° E and gulf of Cambay.
NWP Analysis

- The analysis of IMD-GFS model on 0000 UTC of 15th November 2014 shows trough in easterlies along Goa and Maharashtra coast extending up to Gujarat coast exists in next 48 hours and persists thereafter. An extended cyclonic circulation over Tripura, NNMT and adjoining area and associated trough in lower levels extending up to 700 hPa persists for three days in the forecasts. A Seasonal anticyclone exists over central India in forecasts hours up to 72 hours.
- The WRF model analysis also shows the feeble trough in easterlies lies off west coast extending up to Gujarat coast in next 48 hours which merges with easterly waves. A cyclonic circulation over Tripura adjoining area persists for three days in lower levels of the troposphere which moves eastward over Bangladesh in 72 hours forecast.
- The Genesis Potential Parameter (GPP) analysis and forecasts based on 0000 UTC of 15th November 2014 does not show any significant GPP zone over Indian Seas except in 72 hours forecast, a zone of moderate GPP appears over Indian Ocean near equator around 4°N latitude which may be due to easterly waves.

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 5 days.
- **NCMRWF-GFS** model does not suggest any cyclogenesis over Bay of Bengal during the next 5 days.
- **ECMWF Model** does not suggest any cyclogenesis over Bay of Bengal during the next 5 days.

Summary and Conclusion:

The trough in easterlies from Lakshadweep area to south Gujarat coast, now runs from southeast Arabian Sea to south Gujarat coast across eastcentral Arabian Sea in lower levels.

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	48	31	46
Coastal stations			
WB	9	3	8
Odisha	7	5	7
AP	13	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	0	0	0
Sri Lanka	8	8	8

AWS Observations:

Region	Date/Time (UTC)		
	14/12	**15/00**	**15/03**
India	64	63	74
Coastal stations			
WB	7	7	11
Odisha	7	5	11
AP	26	27	27
Tamil Nadu	24	24	24
Puducherry	1	1	1
A & N	-	-	-

- **RS/RW** (12Z) of 14/11/2014 **-1/39**
- **No. of Ascents reaching 250 hPa level: 1, MISDA: 38**
- **RS/RW** (00Z) of 15/11/2014-9**/39**
- **No. of Ascents reaching 250 hPa level: 7, MISDA: 30**

No. of PILOT Ascents

14/12Z	15/00Z
15	15

Buoy Data

14/12Z	15/00Z	15/03Z
9	7	9

FOC CHENNAI: STATUS OF OBSERVATION

Date→	**14.11.2014**							
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 /14.11.2014 : 1

No. of Ascents reaching 250 hPa level = 1

MISDA : 7

12Z /14.11.2014 : --

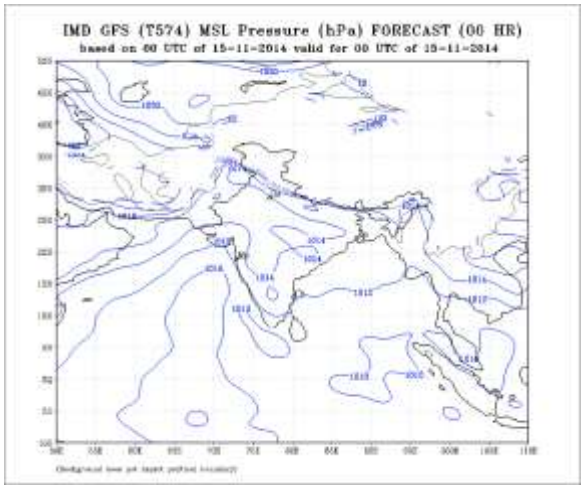
No. of Ascents reaching 250 hPa level = --

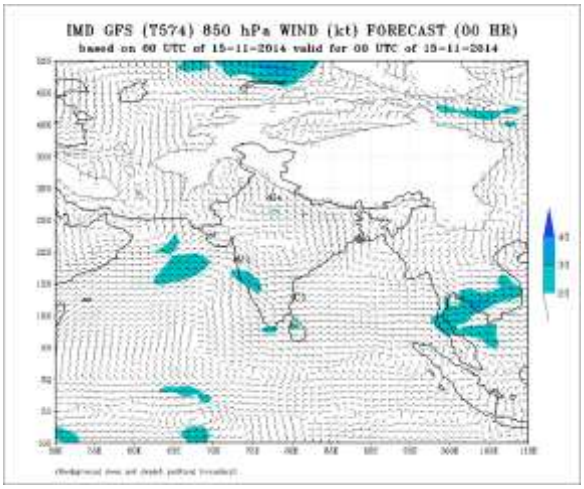
MISDA : 8

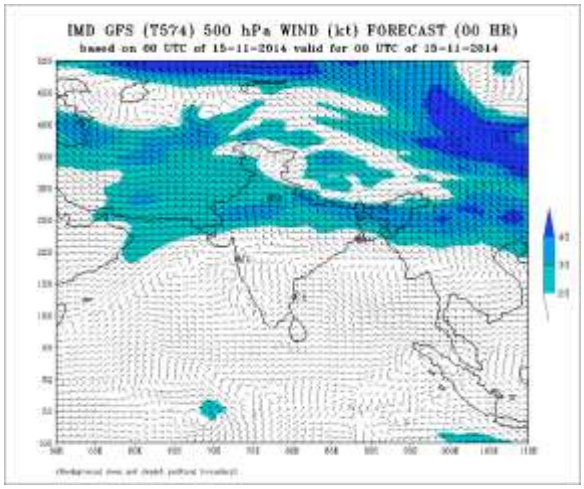
No. of PILOT Ascents:

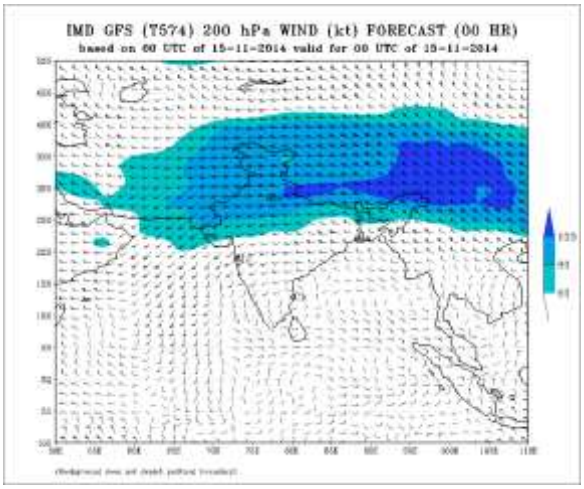
14.11.2014	
06Z	18Z
4	4

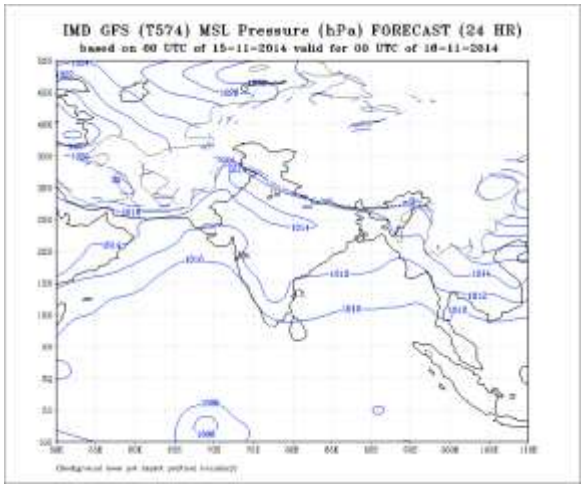
Annexure-II

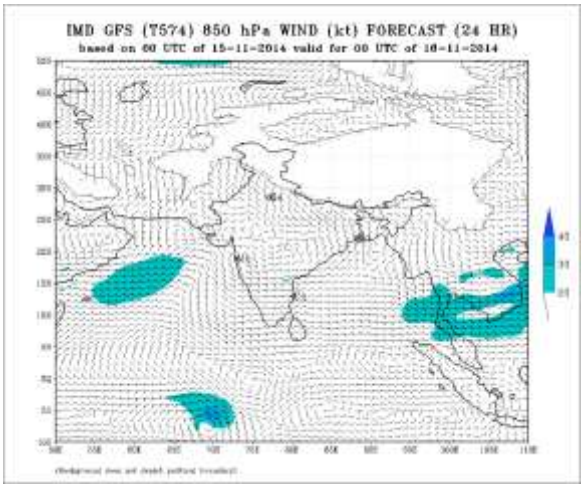

IMD GFS (T574) MSL Pressure (hPa) FORECAST (00 HR)
based on 00 UTC of 15-11-2014 valid for 00 UTC of 15-11-2014


IMD GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 15-11-2014 valid for 00 UTC of 15-11-2014


IMD GFS (T574) 500 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 15-11-2014 valid for 00 UTC of 15-11-2014


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 15-11-2014 valid for 00 UTC of 15-11-2014


IMD GFS (T574) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 15-11-2014 valid for 00 UTC of 16-11-2014


IMD GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
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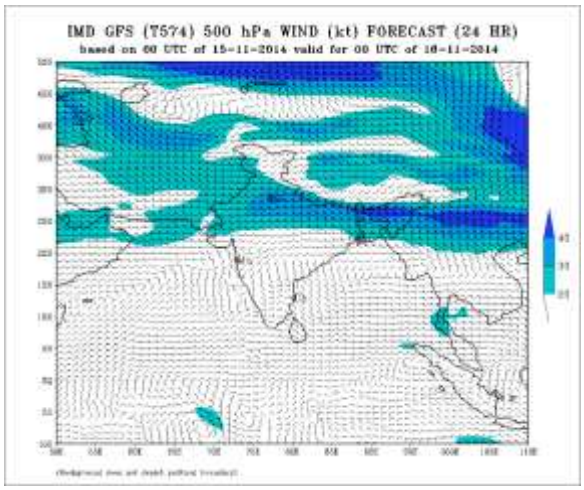
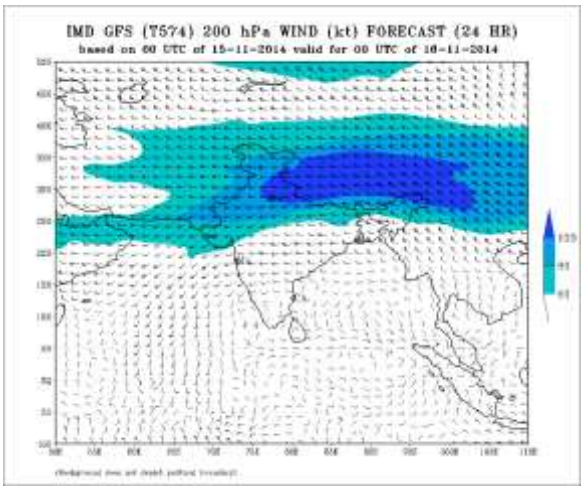
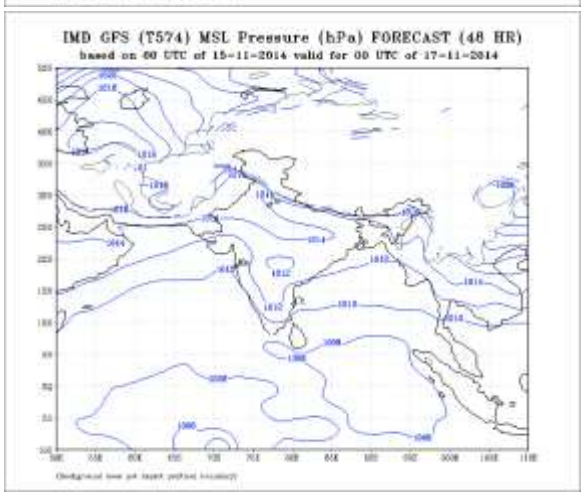
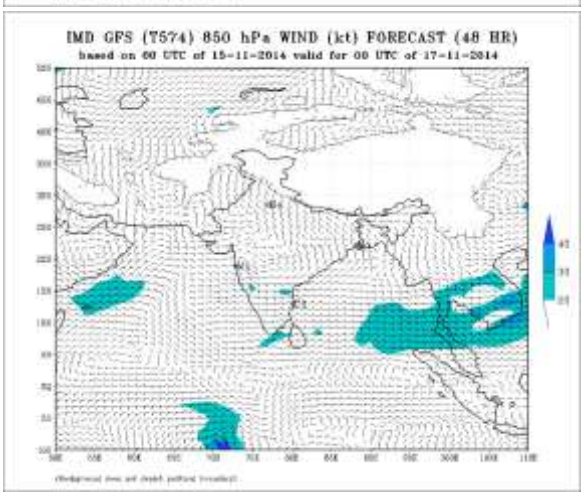

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 15-11-2014 valid for 00 UTC of 16-11-2014


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 15-11-2014 valid for 00 UTC of 16-11-2014


IMD GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 15-11-2014 valid for 00 UTC of 17-11-2014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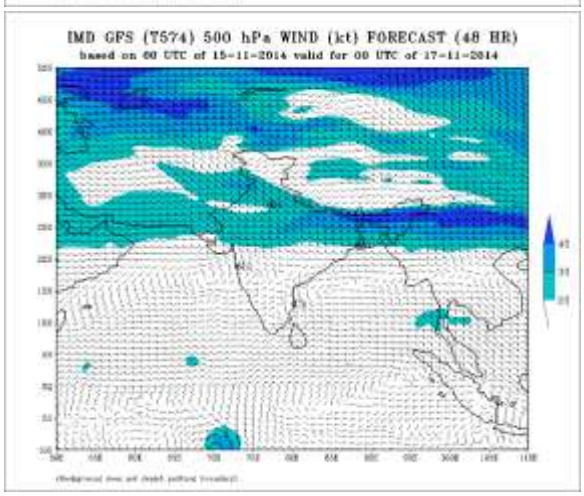
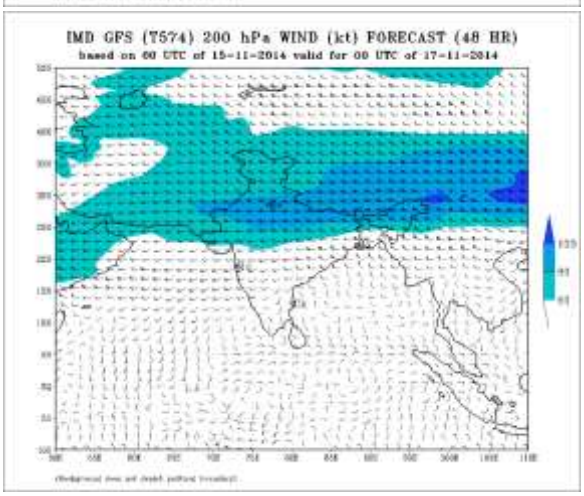
based on 00 UTC of 15-11-2014 valid for 00 UTC of 17-11-2014


IMD GFS (T574) 500 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 15-11-2014 valid for 00 UTC of 17-11-2014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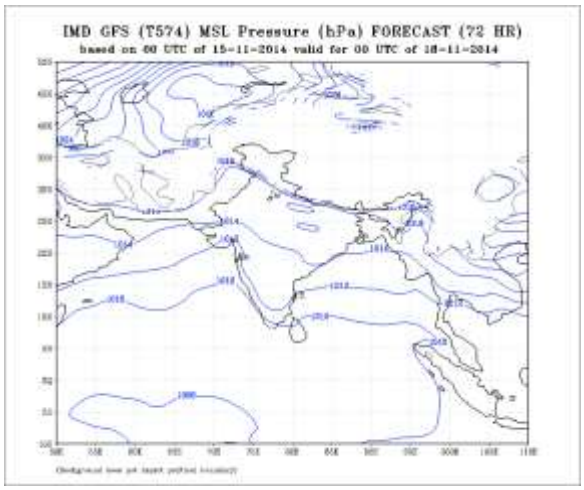
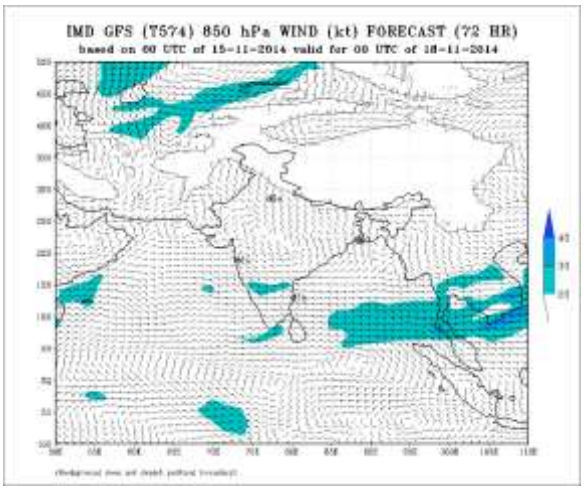
based on 00 UTC of 15-11-2014 valid for 00 UTC of 17-11-2014


IMD GFS (T574) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 15-11-2014 valid for 00 UTC of 18-11-2014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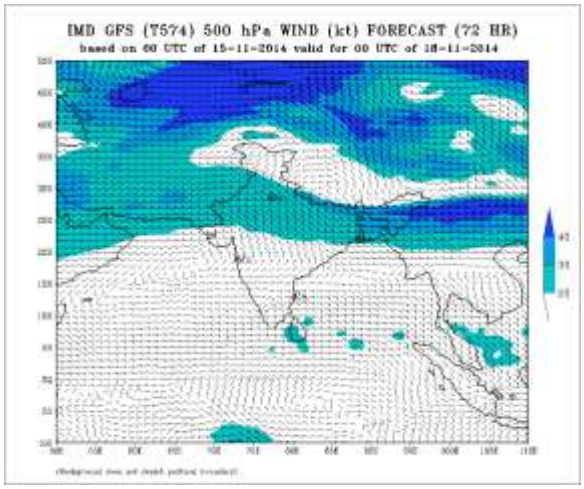
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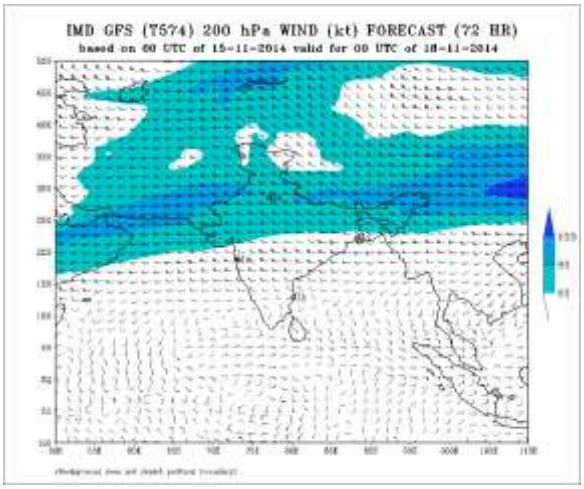
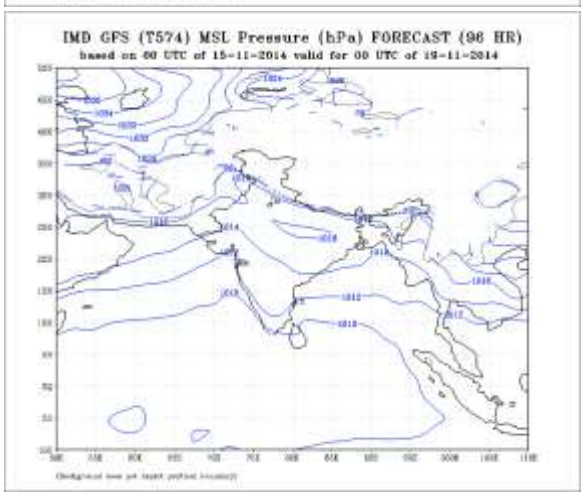

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 15-11-2014 valid for 00 UTC of 18-11-2014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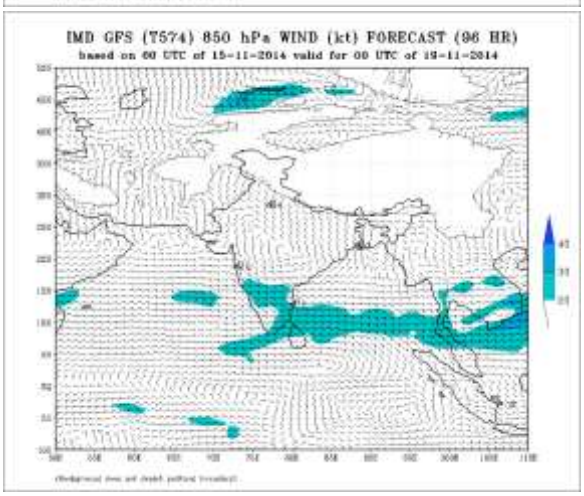
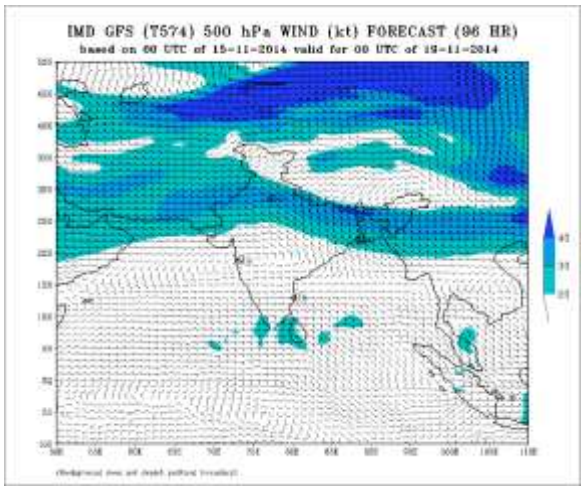
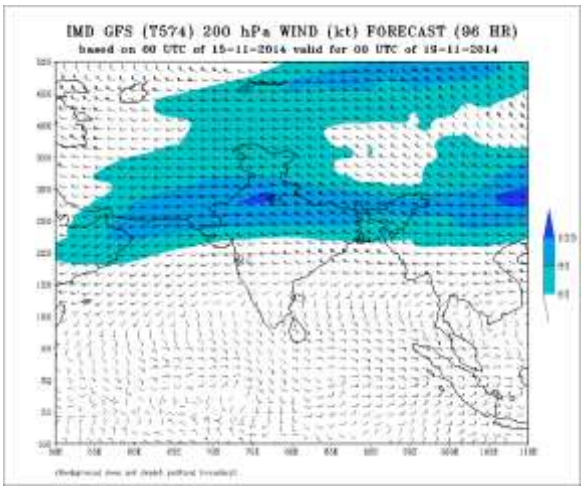
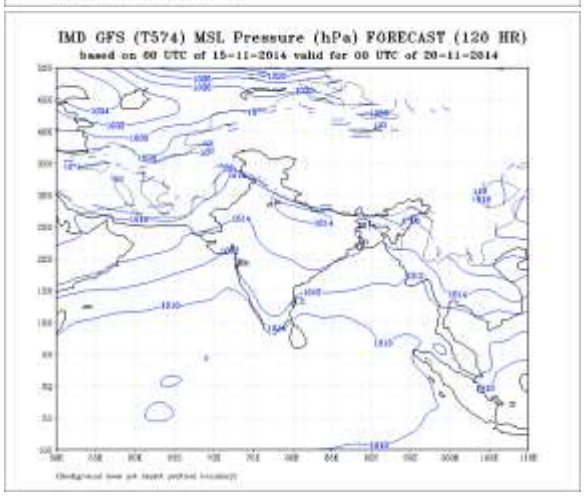
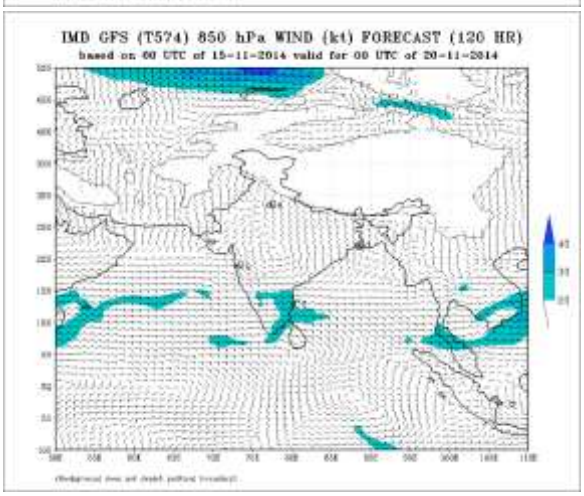
based on 00 UTC of 15-11-2014 valid for 00 UTC of 19-11-2014

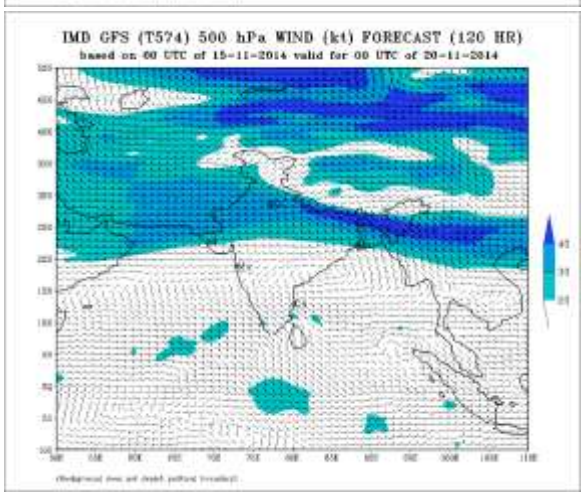

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 15-11-2014 valid for 00 UTC of 19-11-2014

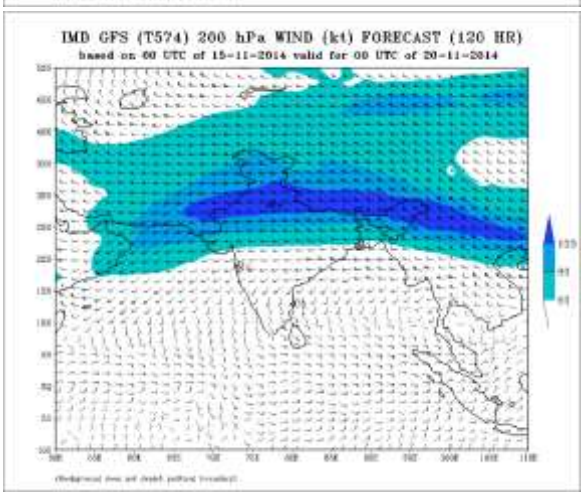

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 15-11-2014 valid for 00 UTC of 19-11-2014


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 15-11-2014 valid for 00 UTC of 19-11-2014


IMD GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 15-11-2014 valid for 00 UTC of 20-11-2014


IMD GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 15-11-2014 valid for 00 UTC of 20-11-2014


IMD GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 15-11-2014 valid for 00 UTC of 20-11-2014


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 15-11-2014 valid for 00 UTC of 20-11-2014

FDP (Cyclone) NOC Report Dated 16 November, 2014

Synoptic features based on 0300 UTC of today:

- The trough in easterlies from southeast Arabian Sea to south Gujarat coast across eastcentral Arabian Sea is moving westwards.

Environmental features based on 0300 UTC of today:

Sea Surface Temperature:

- Sea Surface Temperature is 27-29^{0}C over Bay of Bengal and Andaman Sea.

Tropical Cyclone Heat Potential (TCHP):

- The ocean thermal energy is 40-60kJ/cm^2 over Bay of Bengal and Andaman Sea except over the extreme southeastern parts where it around 100kJ/cm^2.
- It is around 60kJ/cm^2 over southeast and eastcentral Arabian Sea. It is 40-60kJ/cm^{2}over rest of Arabian Sea.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive (30-50*10^{-5} s^{-1}) over the equatorial region of extreme southeast Bay of Bengal and Andaman Sea .
- It is positive (20-30*10^{-5} s^{-1}) over the east central Arabian Sea off Maharashtra coast.

Convergence:

- Lower level convergence is positive (5-10*10^{-5} s^{-1}) over eastcentral Arabian Sea and parts of south Bay of Bengal.

Divergence:

- Upper level divergence is positive over eastcentral Arabian Sea off Konkan and Goa coast (5-10*10^{-5} s^{-1}) and over extreme southeastern parts of Bay of Bengal and Andaman Sea.

Wind Shear:

- Wind Shear is 20-30 knots over the north and parts westcentral of Bay of Bengal. It is5-20 knots over the rest of Bay of Bengal.**Wind Shear Tendency:**

- The vertical wind shear tendency is decreasing and is of the order of -5 to -10 knots over parts of southeast and eastcentral Arabian Sea.

Upper tropospheric ridge:

- The upper tropospheric **ridge** at 200 hPa passes through 13.0°N.

M.J.O. Index:

- Located in phase 1 with amplitude greater than 1.0. As per forecast by dynamical and statistical models, it would continue be in phase 1 during next 2 days.

Storms and Depression over South China Sea:

- There is currently no Tropical Storm/Depression over South China Sea.

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:-

Scattered low and medium clouds with embedded moderate to intense convection over southeast Bay of Bengal south of latitude 12.0°N and southwest Andaman Sea.

Arabian Sea:-

Scattered low and medium clouds with embedded moderate to intense convection over Arabian Sea between latitude 5.0°N to 20.0°N and east of longitude 66.0°E

NWP Analysis

- The analysis of IMD-GFS model on 0000 UTC of 16th November 2014 shows trough in easterlies at the surface extending up to 850 hPa lies off Goa and Maharashtra coast extending up to Gujarat coast which persists up to 72 hours. An extended cyclonic circulation south of Tripura, NNMT and adjoining area and associated north-south trough in lower levels extending up to 700 hPa persists for three days in the forecasts. A Seasonal extended anticyclone exists over central India in forecasts hours up to 72 hours. The WRF model analysis also shows the feeble trough in easterlies lies over Arabian Sea off Maharashtra coast extending up to Gujarat coast in next 48 hours which merges with easterly waves in 72 hours. A cyclonic circulation over Tripura adjoining area persists for three days in lower levels of the troposphere extending up to 850 hPa which persists over the region in next three days.
- The Genesis Potential Parameter (GPP) analysis and forecasts based on 0000 UTC of 16th November 2014 does not show any significant GPP zone over Indian Seas except in 48 hours forecast, a zone of moderate GPP appears over Indian Ocean southeast of Sri Lanka near equator around 4^{o}N latitude which moves westward in 72 hour 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-UKMO** model does not suggest any cyclogenesis over Bay of Bengal during the next 5 days.
- **NCMRWF-GFS** model does not suggest any cyclogenesis over Bay of Bengal during the next 5 days.
- **ECMWF Model** does not suggest any cyclogenesis over Bay of Bengal during the next 5 days.

Summary and Conclusion:

The trough in easterlies from southeast Arabian Sea to south Gujarat coast across eastcentral Arabian Sea is moving westwards.

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	33	46
Coastal stations			
WB	8	3	8
Odisha	7	5	7
AP	12	12	12
Tamil Nadu	11	10	11
Puducherry	2	2	2
A & N	6	1	6
Bangladesh	11	11	8
Myanmar	11	11	11
Thailand	0	0	0
Sri Lanka	8	8	8

AWS Observations:

Region	Date/Time (UTC)		
	15/12	**16/00**	**16/03**
India	61	68	80
Coastal stations			
WB	8	8	11
Odisha	5	6	12
AP	25	28	29
Tamil Nadu	22	25	27
Puducherry	1	1	1
A & N	-	-	-

- **RS/RW** (12Z) of 15/11/2014 **-0/39**
- **No. of Ascents reaching 250 hPa level: 0, MISDA: 39**
- **RS/RW** (00Z) of 16/11/2014-13**/39**
- **No. of Ascents reaching 250 hPa level: 8, MISDA: 26**

No. of PILOT Ascents

15/12Z	**16/00Z**
23	36

Buoy Data

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

FOC CHENNAI: STATUS OF OBSERVATION

Date→	**15.11.2014**							
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 /15.11.2014 : 1

No. of Ascents reaching 250 hPa level = 1

MISDA : 7

12Z /15.11.2014 : --

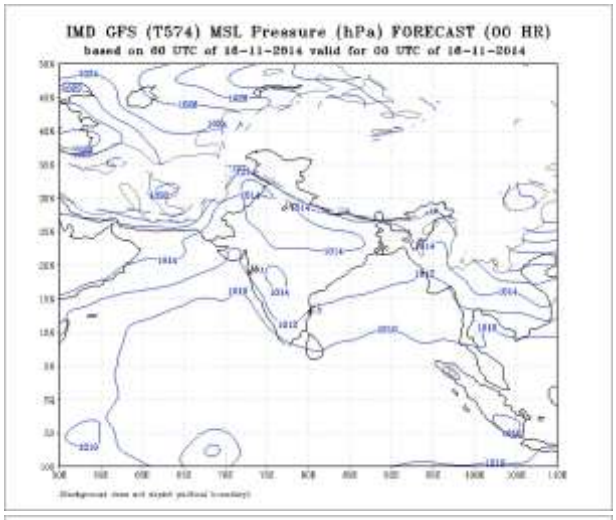
No. of Ascents reaching 250 hPa level = --

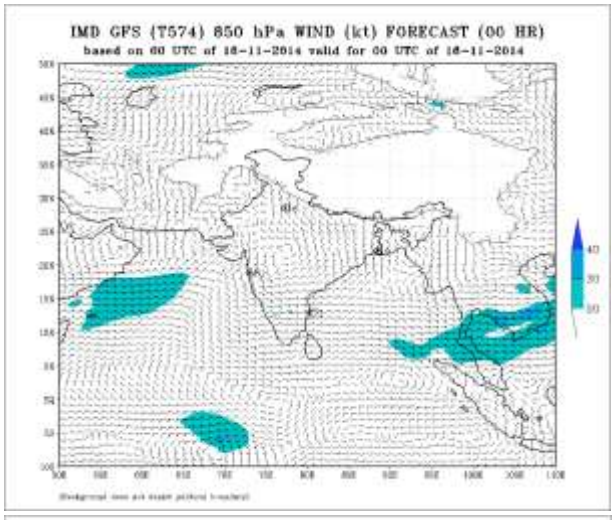
MISDA : 8

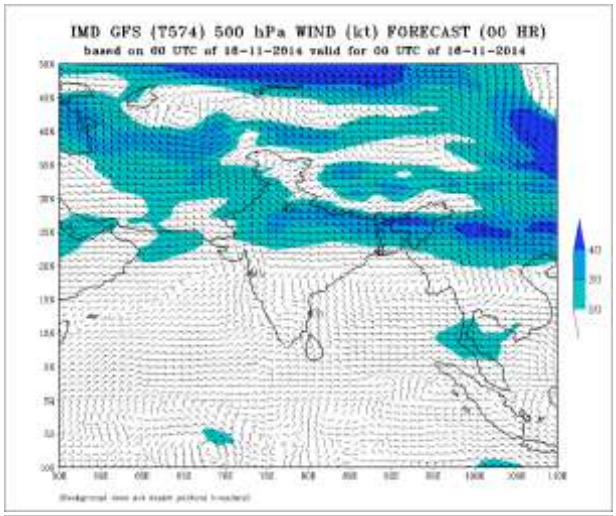
No. of PILOT Ascents:

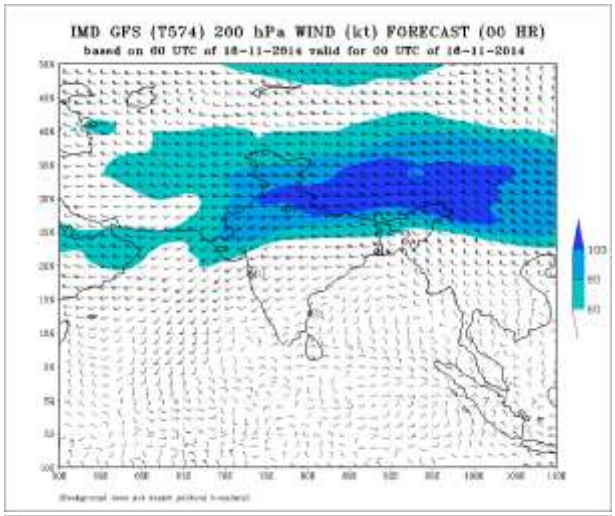
15.11.2014	
06Z	18Z
4	5

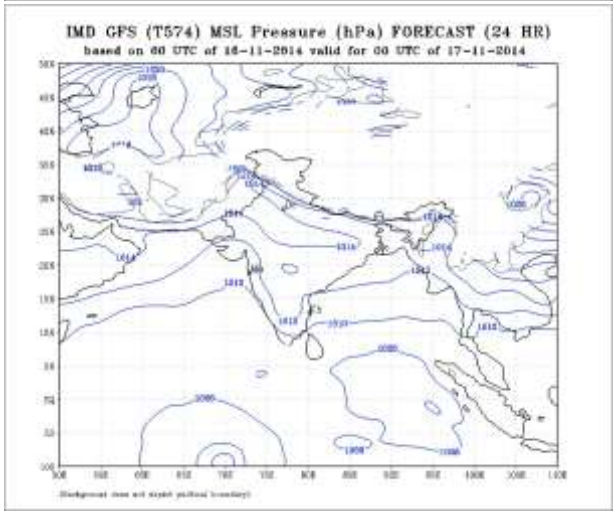
Annexure-II

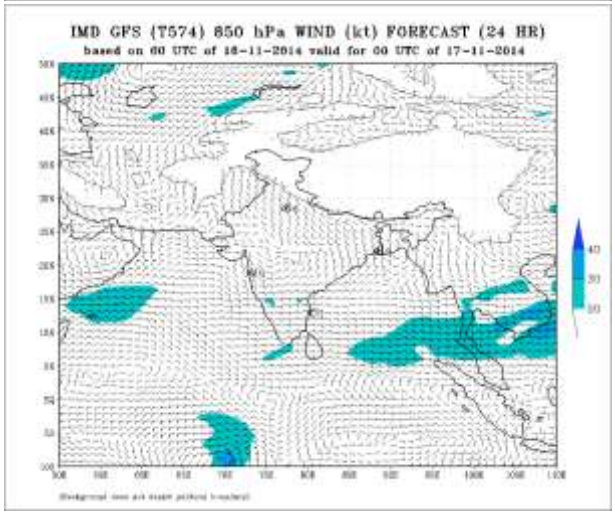

IMD GFS (T574) MSL Pressure (hPa) FORECAST (00 HR)
based on 00 UTC of 16-11-2014 valid for 00 UTC of 16-11-2014

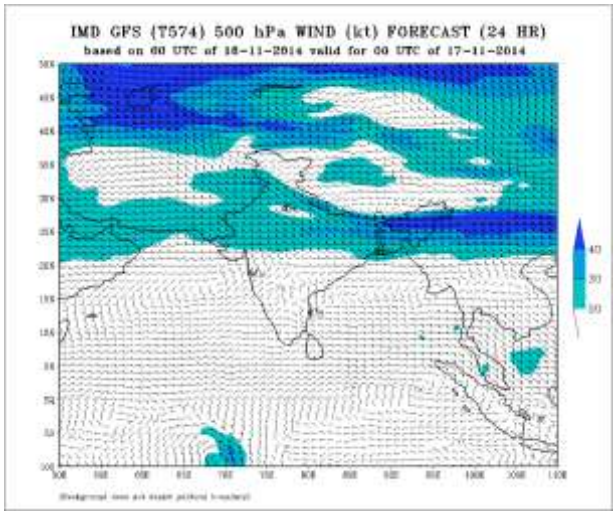

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 16-11-2014 valid for 00 UTC of 16-11-2014

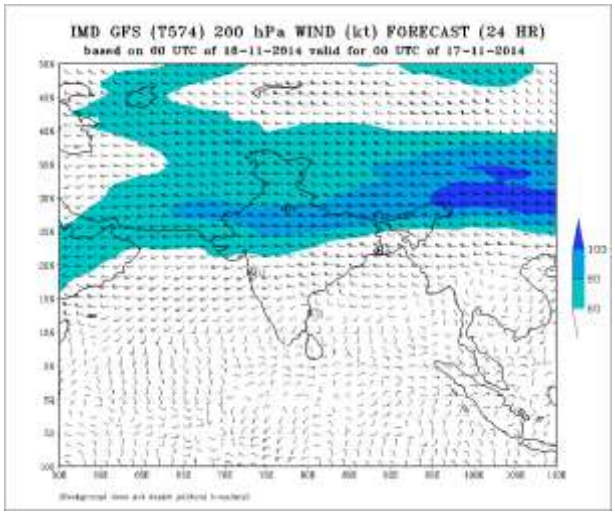

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 16-11-2014 valid for 00 UTC of 16-11-2014

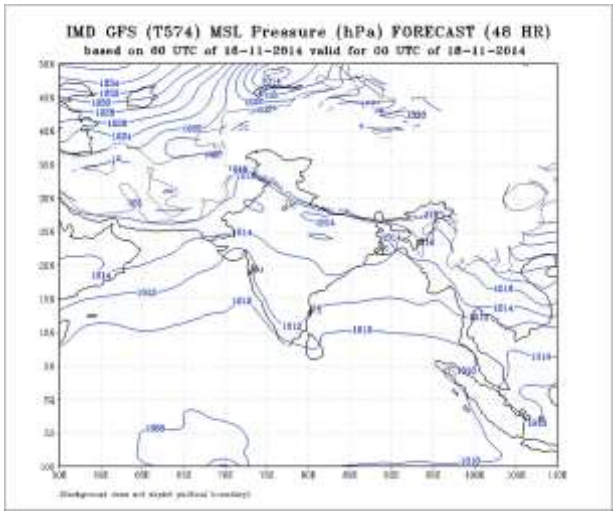

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 16-11-2014 valid for 00 UTC of 16-11-2014

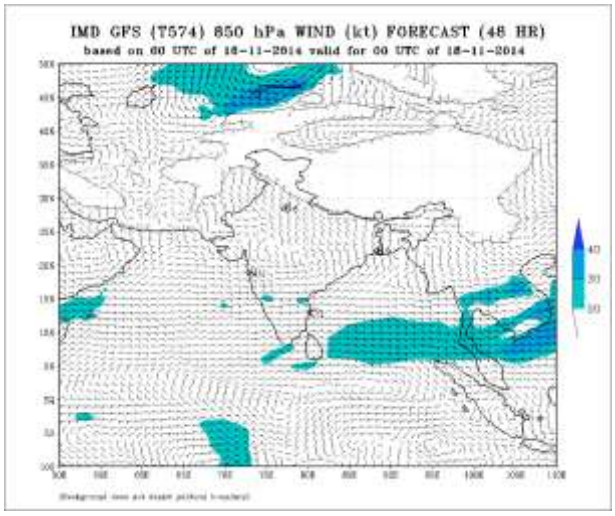

IMD GFS (T574) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 16-11-2014 valid for 00 UTC of 17-11-2014

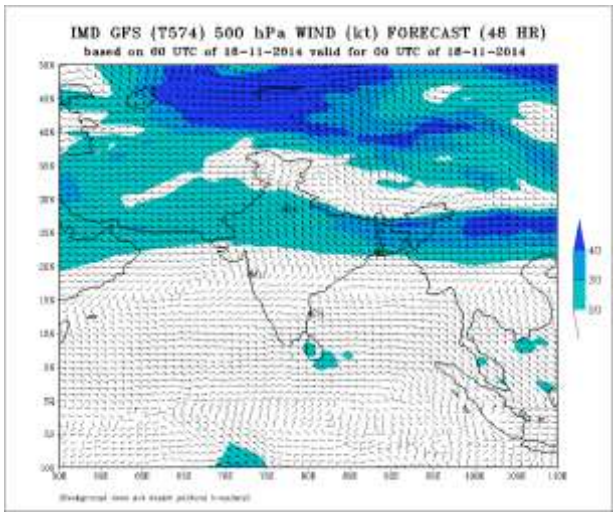

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 16-11-2014 valid for 00 UTC of 17-11-2014

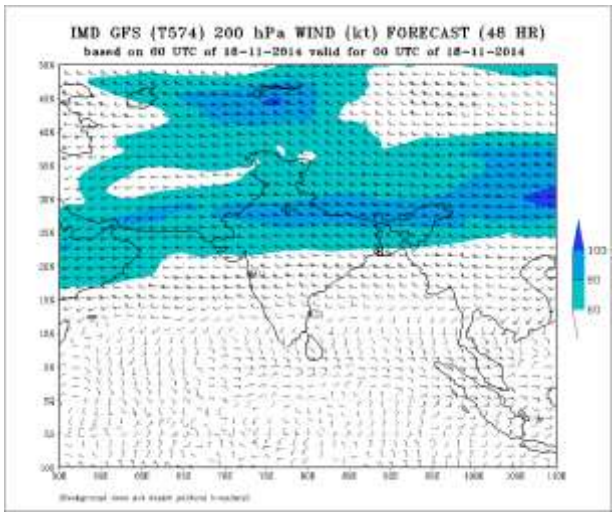

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 16-11-2014 valid for 00 UTC of 17-11-2014

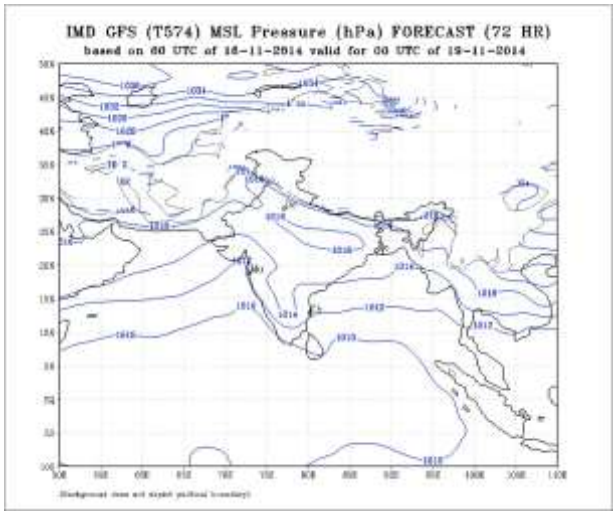

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 16-11-2014 valid for 00 UTC of 17-11-2014

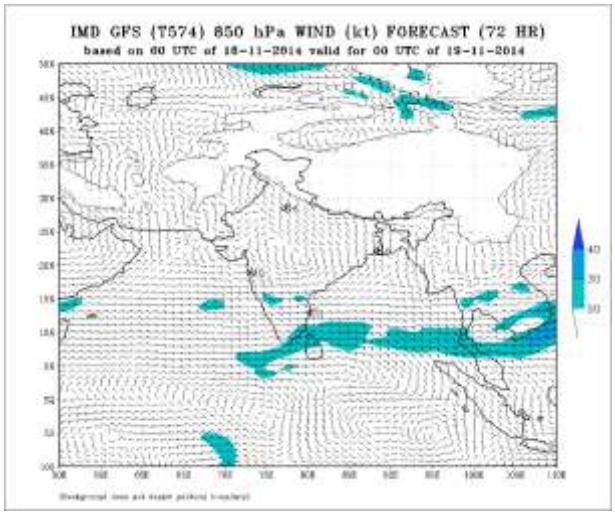

IMD GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 16-11-2014 valid for 00 UTC of 18-11-2014

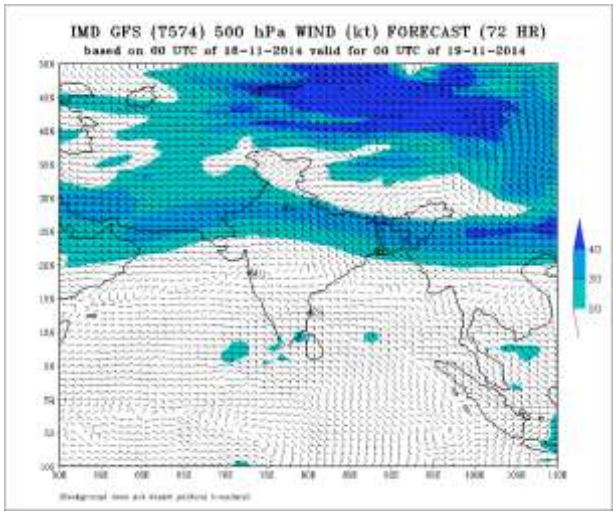

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 16-11-2014 valid for 00 UTC of 18-11-2014

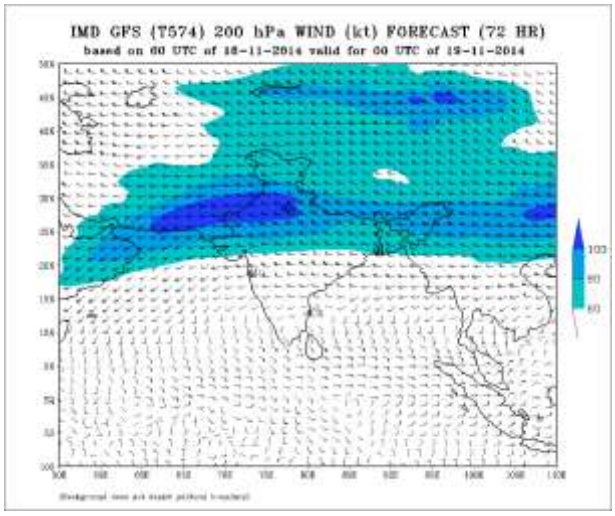

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 16-11-2014 valid for 00 UTC of 18-11-2014


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 16-11-2014 valid for 00 UTC of 18-11-2014


IMD GFS (T574) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 16-11-2014 valid for 00 UTC of 19-11-2014


IMD GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 16-11-2014 valid for 00 UTC of 19-11-2014


IMD GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 16-11-2014 valid for 00 UTC of 19-11-2014


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
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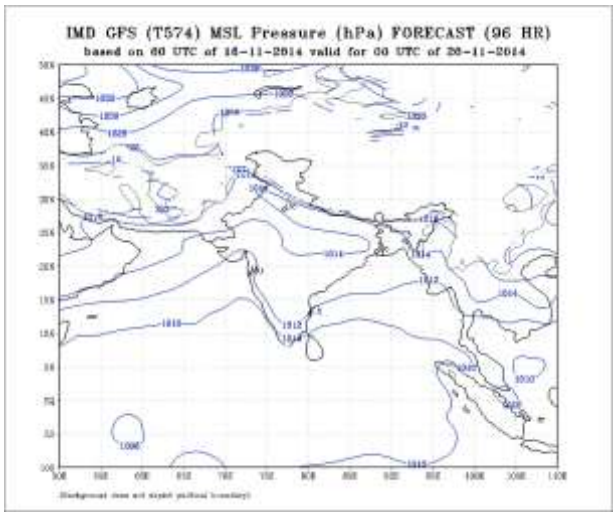
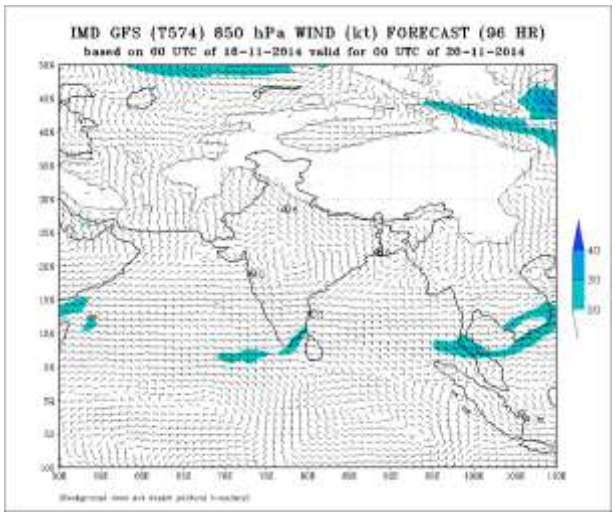
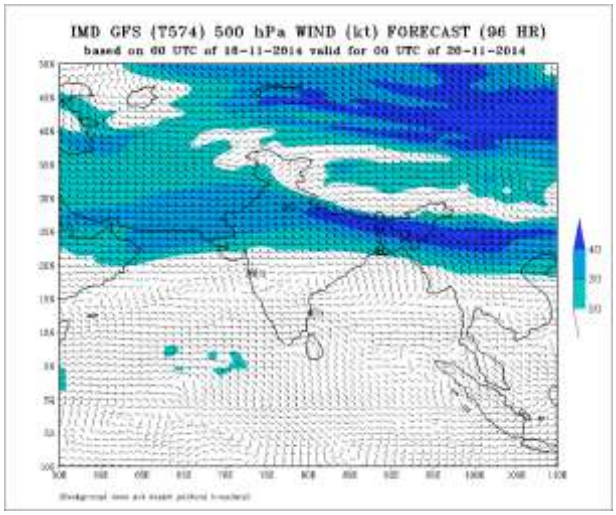
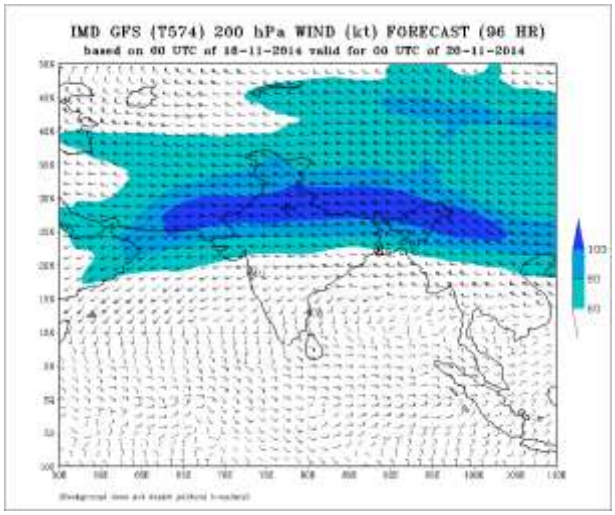
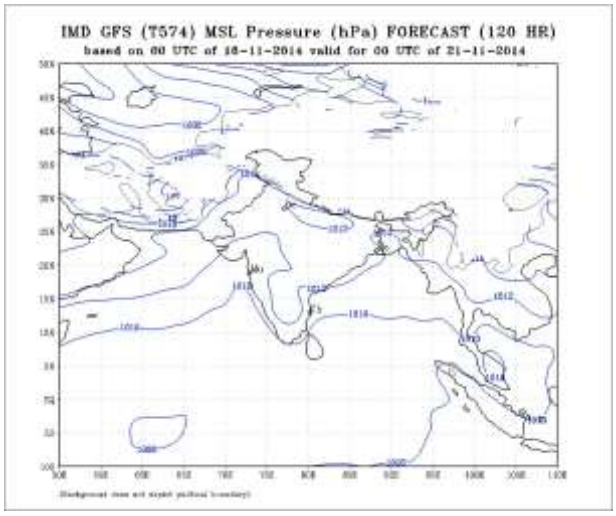
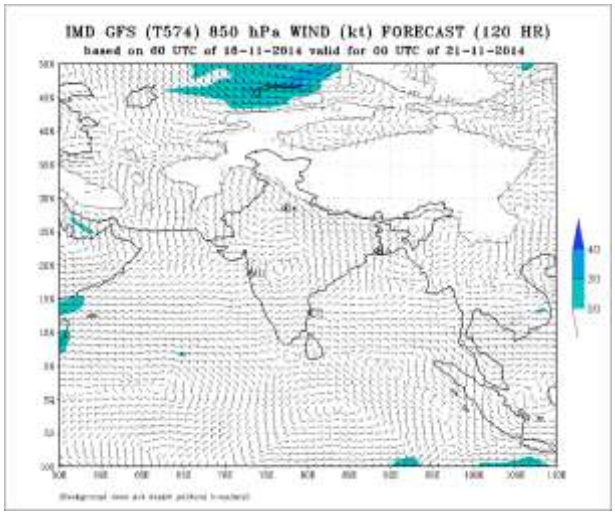

IMD GFS (T574) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 16-11-2014 valid for 00 UTC of 20-11-2014

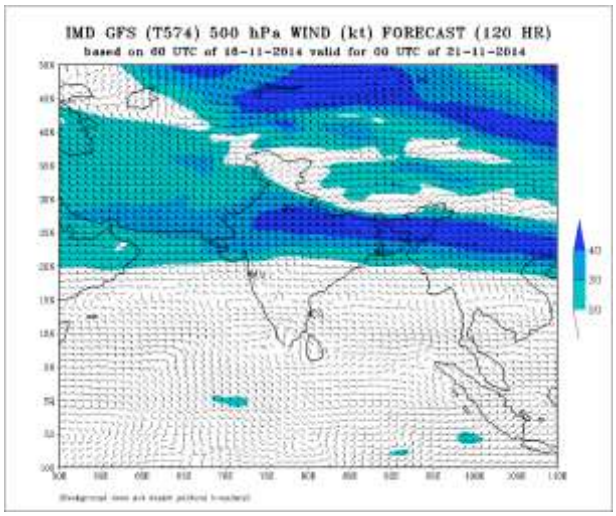

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 16-11-2014 valid for 00 UTC of 20-11-2014

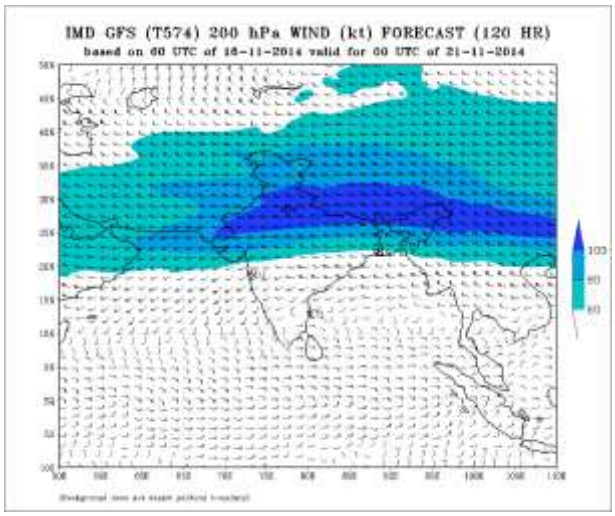

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 18-11-2014 valid for 00 UTC of 20-11-2014

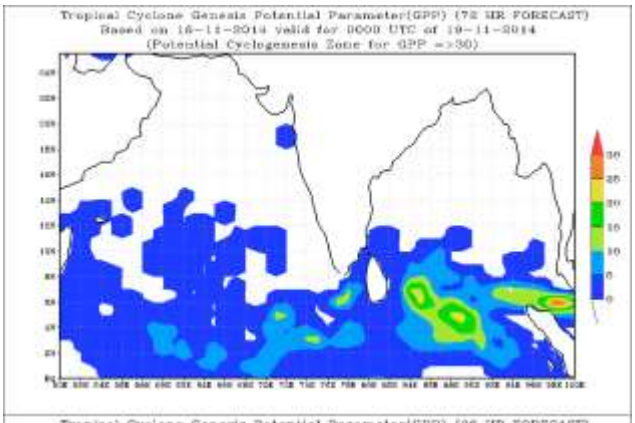

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 18-11-2014 valid for 00 UTC of 20-11-2014

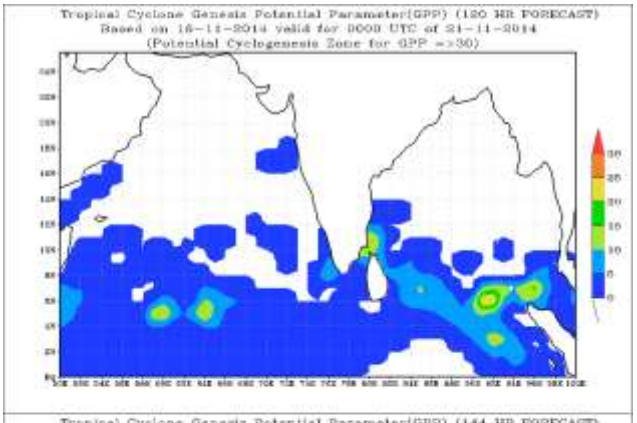

IMD GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 18-11-2014 valid for 00 UTC of 21-11-2014

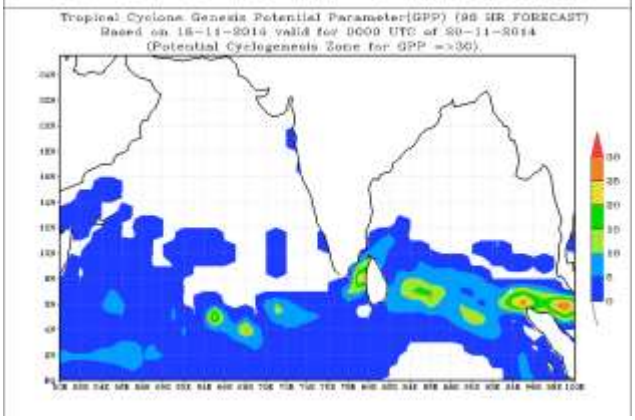

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 18-11-2014 valid for 00 UTC of 21-11-2014

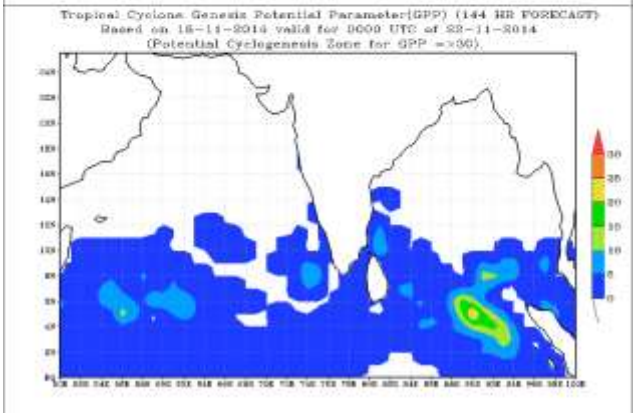

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 18-11-2014 valid for 00 UTC of 21-11-2014


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 18-11-2014 valid for 00 UTC of 21-11-2014


Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 16-11-2014 valid for 0000 UTC of 19-11-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 16-11-2014 valid for 0000 UTC of 21-11-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (96 HR FORECAST)
Based on 16-11-2014 valid for 0000 UTC of 20-11-2014
(Potential Cyclogenesis Zone for GPP =>30).


Tropical Cyclone Genesis Potential Parameter(GPP) (144 HR FORECAST)
Based on 16-11-2014 valid for 0000 UTC of 22-11-2014
(Potential Cyclogenesis Zone for GPP =>30).

FDP (Cyclone) NOC Report Dated 18 November, 2014

Synoptic features based on 0300 UTC of today:

- Yesterday's upper air cyclonic circulation over Kutch & neighbourhood has become less marked.
- An upper air cyclonic circulation lies over Lakshadweep area & neighbourhood and extends upto 0.9 km above mean Sea level.
- A trough of low at mean Sea level over south Andaman Sea & neighbourhood persists.

Environmental features based on 0300 UTC of today:

Sea Surface Temperature:

- Sea Surface Temperature is 28-30^{0}C over southeast Bay of Bengal and Andaman Sea and 26-27^{0}C over parts of northwest and westcentral Bay of Bengal.

Tropical Cyclone Heat Potential (TCHP):

- The ocean thermal energy is 100-120kJ/cm^2 over Malay Peninsula and parts of south Andaman Sea.
- It is around 60-80KJ/cm^2 over southeast and eastcentral Arabian Sea. It is around 40kJ/cm^2 over rest of Arabian Sea.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive (20-40*10^{-5} s^{-1}) over the equatorial region of Bay of Bengal, extreme south Andaman Sea and Malay Peninsular region.

Convergence:

- Lower level convergence is positive (5-10*10^{-5} s^{-1}) over Malay Peninsula, parts of southwest Bay of Bengal and southeast Arabian Sea.

Divergence:

- Upper level divergence has increased (10-20*10^{-5} s^{-1}) over parts of southeast Bay of Bengal and Andaman Sea.

Wind Shear:

- Wind Shear is low (5-10 Kts) over the Southeast Bay of Bengal and Andaman Sea.

Wind Shear Tendency:

- The vertical wind shear tendency is decreasing (-5 knots) over the southern parts ofBay of Bengal and Andaman Sea.

Upper tropospheric ridge:

- The upper tropospheric **ridge** at 200 hPa passes through 12.0°N.

M.J.O. Index:

- Located in phase 1 with amplitude greater than 1.0. As per forecast by dynamical and statistical models, it would move to phase 2 during the subsequent 2 days.

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

- Tropical Cyclone "Adjali" has formed over South.Indian Ocean and lay near 10.9˚S and 69.8˚E at 0600 UTC
- There is currently no Tropical Storm/Depression over South China Sea.

Status of observational system:

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

Satellite:

Inference based on INSAT imagery of 180900 UTC:

Bay of Bengal & Andaman Sea:-

Scattered low and medium clouds with embedded moderate to intense convection is seen over south Bay of Bengal south of latitude 11.5°N and south Andaman Sea.

Arabian Sea:-

Scattered low and medium clouds with embedded moderate to intense convection over Arabian Sea between latitude 10.0°N to 13.0°N & longitude 60.0°E to 66.0°E and between latitude 5.0°N to 9.0°N & east of longitude 65.0°E

NWP Analysis

- The analysis of IMD-GFS model on 0000 UTC of 18th November 2014 shows a feeble trough in easterlies in the lower levels of the atmosphere from surface to 925 hPa, which situates over Arabian Sea from Lakshadweep area up to Gujarat coast. The trough persists for three days in the forecasts. An extended cyclonic circulation over northeast BOB and adjoining coastal area up to 850 hPa persist for three days which moves gradually northward over Assam and Meghalaya in the forecasts. A Seasonal anticyclone exists over central India in forecasts hours up to72 hours which extends up to Orissa after 48 hours.
- The WRF model analysis also shows the feeble trough in easterlies lies over Arabian Sea off west coast. A cyclonic circulation in lower levels of the troposphere extending up to 850 hPa over coastal Bangladesh and adjoining area persists and it moves slowly northward over Assam, Meghalaya and adjoin NNMT region.
- The Genesis Potential Parameter (GPP) analysis and forecasts based on 0000 UTC of 18th November 2014 shows a moderate GPP zone over north Indian Ocean, southeast of Sri Lanka near equator around 4^{O}N latitude in 24 hours forecast, moves north-westward in 48 hour and crosses over Sri Lanka in 72 hour forecast along with the propagation of easterly wave.

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-GFS** model does not suggest any low pressure area over Bay of Bengal during the next 5 days.
- **ECMWF Model** does not suggest any low pressure area over Bay of Bengal during the next 5 days.
- **JMA Model** does not suggest any low pressure area over Bay of Bengal during the next 3days.
- **ARP (METEOFRANCE) Model** does not suggest any low pressure area over Bay of
- Bengal during the next 3 days.
- **NCMRWF-UKMO** model (based on 0000 UTC of 17th) does not suggest any low pressure area over Bay of Bengal during the next 5 days.

Summary and Conclusion:

- An upper air cyclonic circulation lies over Lakshadweep area & neighbourhood and extends upto 0.9 km above mean Sea level.
- A trough of low at mean Sea level lies over south Andaman Sea & neighbourhood persists.
- Low wind shear over southeast Bay of Bengal and south Andaman Sea (5-10 knots), positive low level convergence and upper level divergence over the southeast Bay of Bengal and Andaman Sea (of the order of 10x10^{-5}sec^{-1}) and moderate-high ocean thermal energy over this area (100kJ/cm^2) are favourable for formation of low pressure area.
- However, there is no pre-existing disturbance over the region except scattered convection over the Malay peninsular region.

Advisory: No IOP for next five days.

Annexure-I

Status of Observation system:

Synoptic observation:

Region	Date/Time (UTC)		
	17/12	**18/00**	**18/03**
India	44	32	44
Coastal stations			
WB	8	5	8
Odisha	7	5	7
AP	12	10	11
Tamil Nadu	9	8	10
Puducherry	2	2	2
A & N	6	2	6
Bangladesh	10	10	11
Myanmar	11	10	11
Thailand	2	2	2
Sri Lanka	8	8	8

AWS Observations:

Region	Date/Time (UTC)		
	17/12	**18/00**	**18/03**
India	61	58	62
Coastal stations			
WB	8	7	10
Odisha	3	3	4
AP	27	25	23
Tamil Nadu	22	22	24
Puducherry	1	1	1
A & N	-	-	-

- **RS/RW** (12Z) of 17/11/2014 **-23/39**
- **No. of Ascents reaching 250 hPa level: 22, MISDA: 16**
- **RS/RW** (00Z) of 18/11/2014-19**/39**
- **No. of Ascents reaching 250 hPa level: 5, MISDA: 10**

No. of PILOT Ascents

17/12Z	**18/00Z**
10	11

Buoy Data

17/12Z	**18/00Z**	**18/03Z**
12	12	7

FOC CHENNAI: STATUS OF OBSERVATION

Date→	**17.11.2014**							
UTC→	**00**	**03**	**06**	**09**	**12**	**15**	**18**	**21**
Chennai Region (Coasts of AP & TN)	**19**	**22**	**20**	**20**	**22**	**20**	**20**	**20**

No. of RS/RW Ascents

00Z /17.11.2014 : 3
No. of Ascents reaching 250 hPa level = 3

MISDA : 5
12Z /17.11.2014 : --

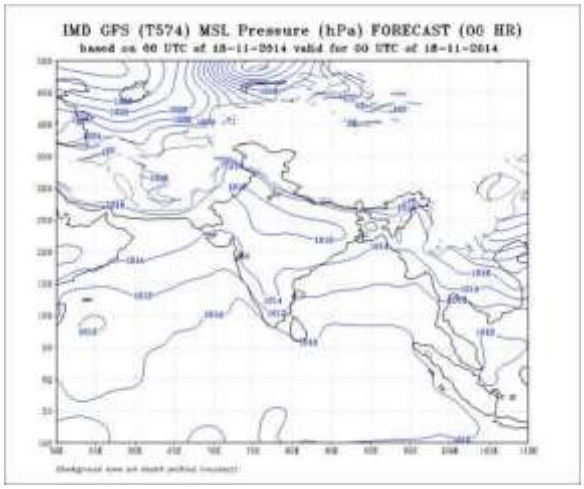
No. of Ascents reaching 250 hPa level = --

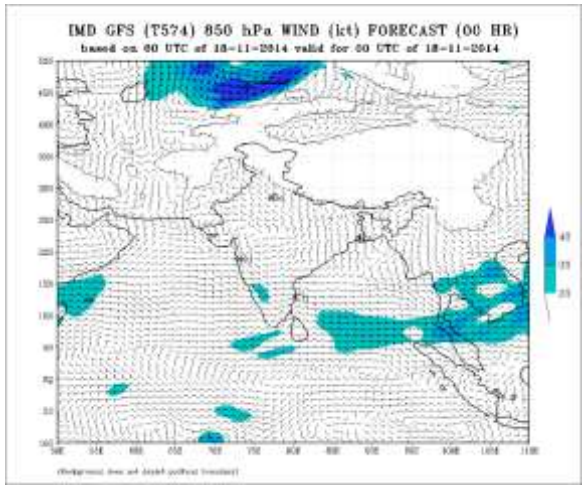
MISDA : 8

No. of PILOT Ascents:

17.11.2014	
06Z	18Z
4	4

Annexure-II


IMD GFS (T574) MSL Pressure (hPa) FORECAST (00 HR)
based on 00 UTC of 18-11-2014 valid for 00 UTC of 18-11-2014


IMD GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
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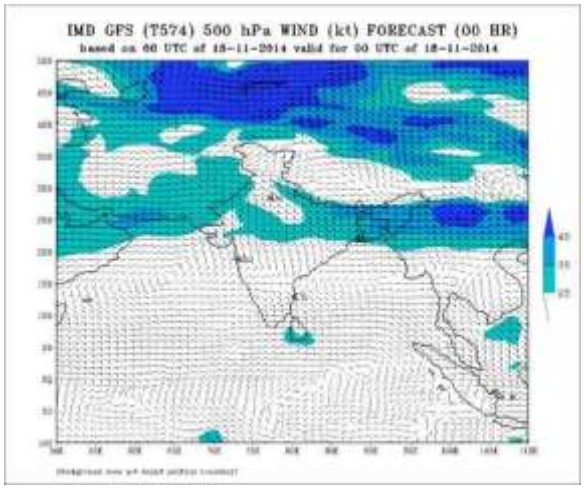
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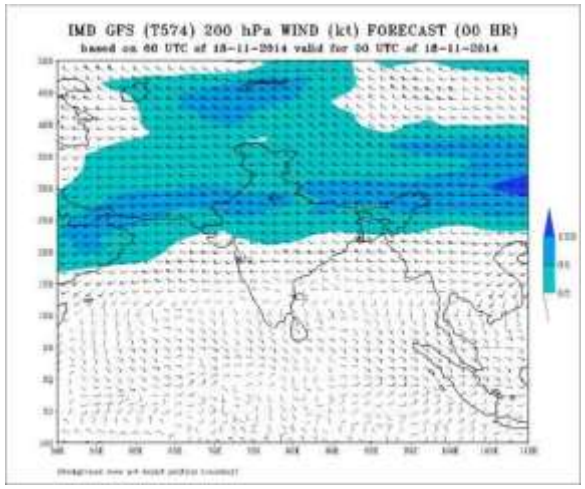
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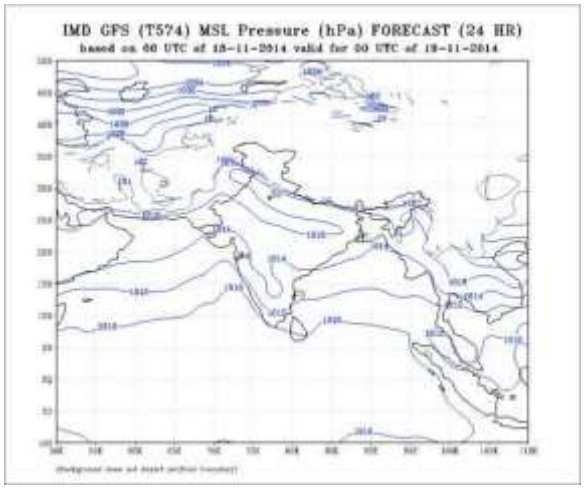
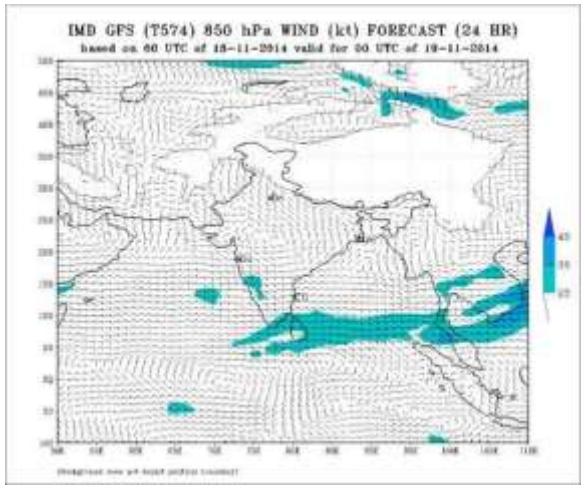
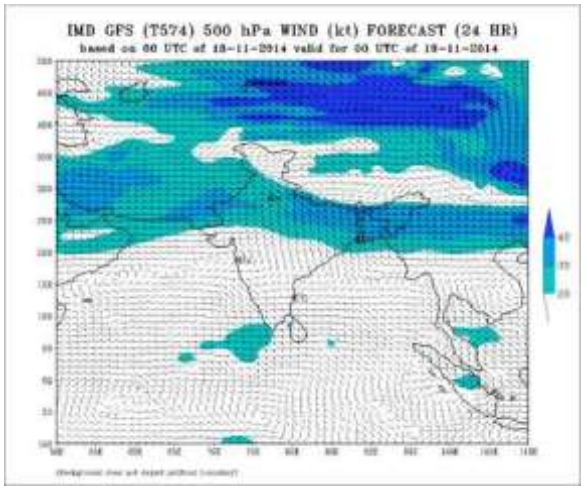
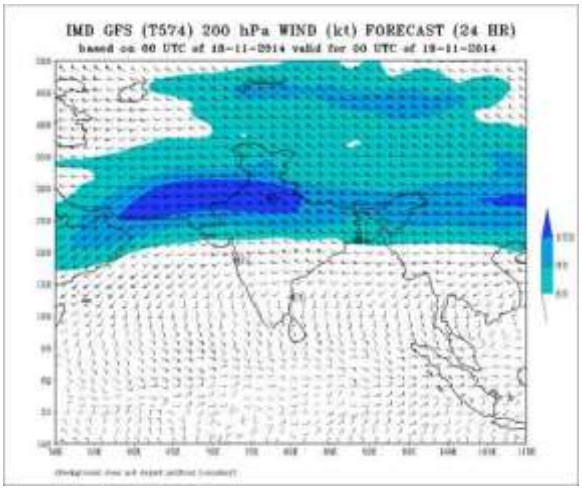
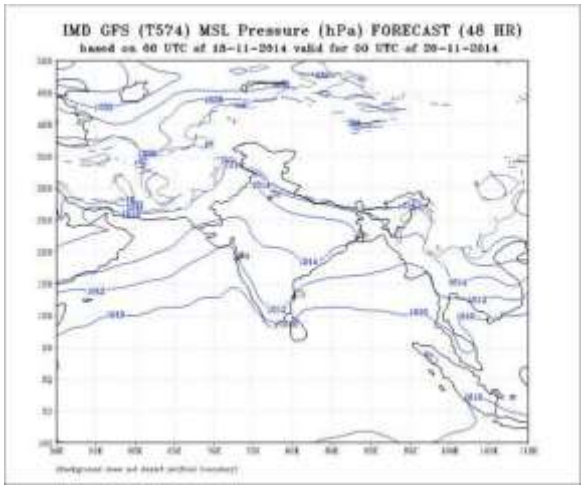

IMD GFS (T574) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 18-11-2014 valid for 00 UTC of 19-11-2014


IMD GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 18-11-2014 valid for 00 UTC of 19-11-2014


IMD GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 18-11-2014 valid for 00 UTC of 19-11-2014


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 18-11-2014 valid for 00 UTC of 19-11-2014


IMD GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
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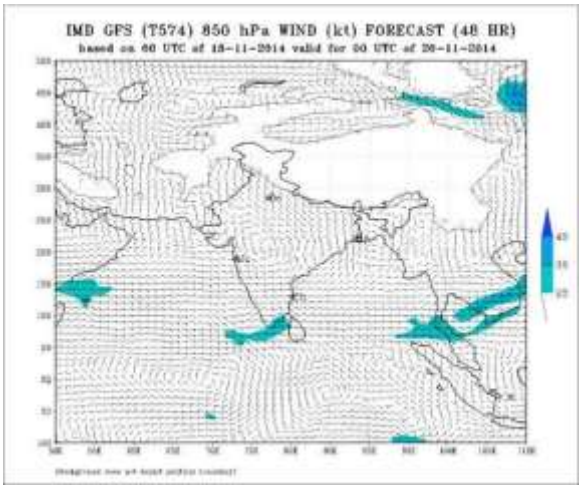
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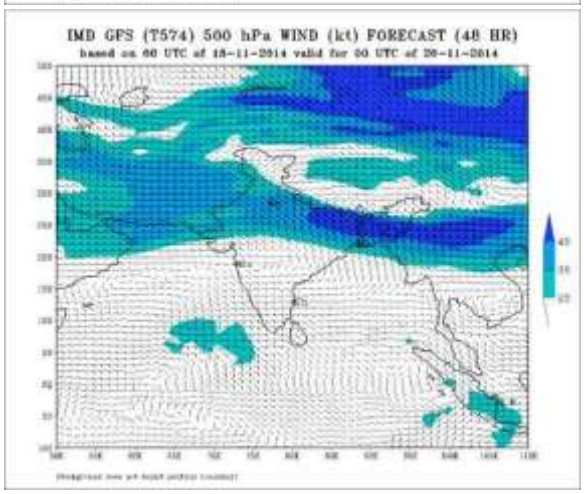
based on 00 UTC of 18-11-2014 valid for 00 UTC of 20-11-2014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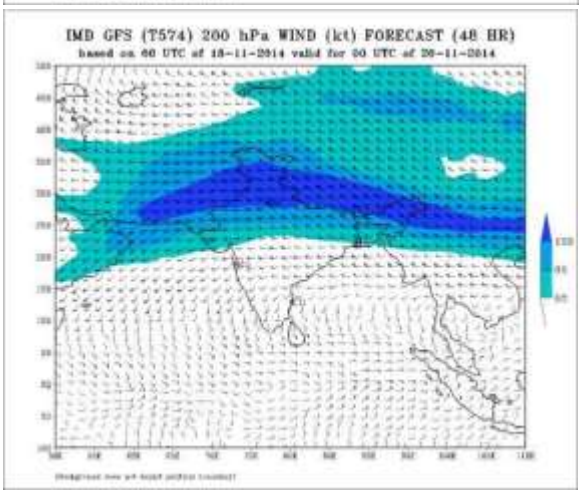
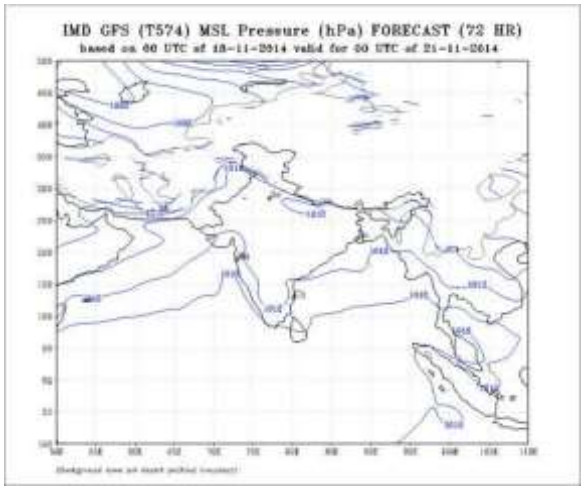
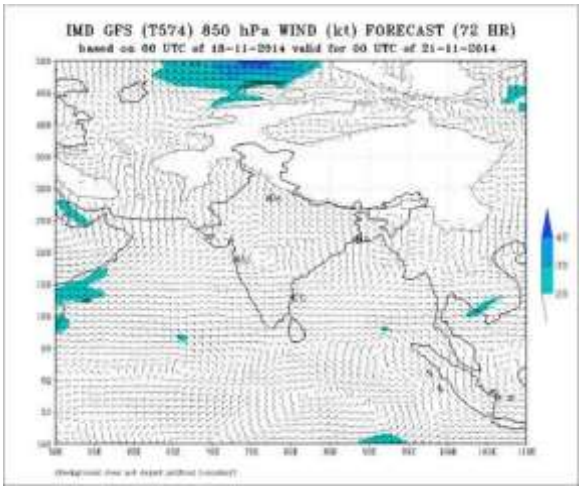
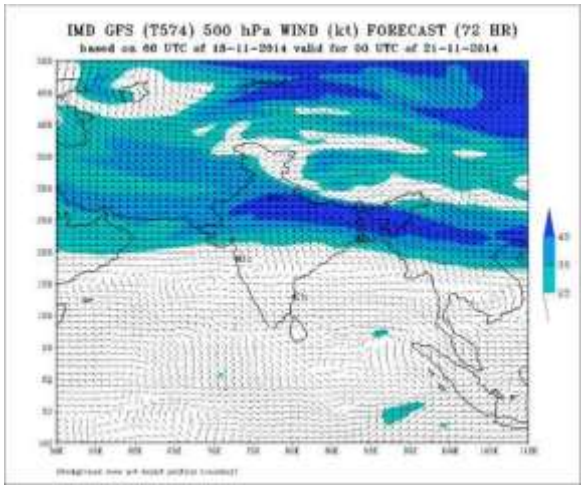
based on 00 UTC of 18-11-2014 valid for 00 UTC of 20-11-2014


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 18-11-2014 valid for 00 UTC of 20-11-2014


IMD GFS (T574) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 18-11-2014 valid for 00 UTC of 21-11-2014


IMD GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 18-11-2014 valid for 00 UTC of 21-11-2014


IMD GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
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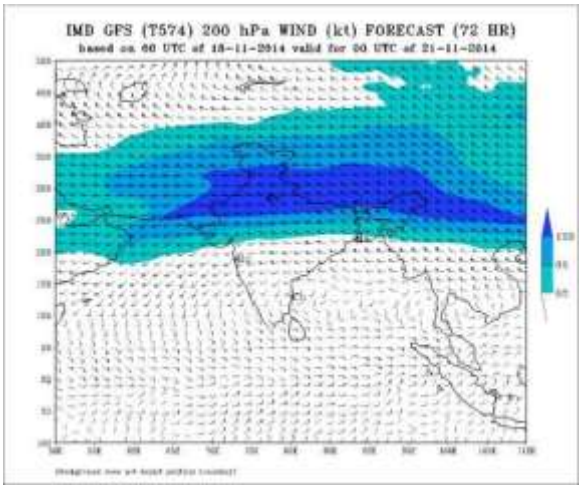
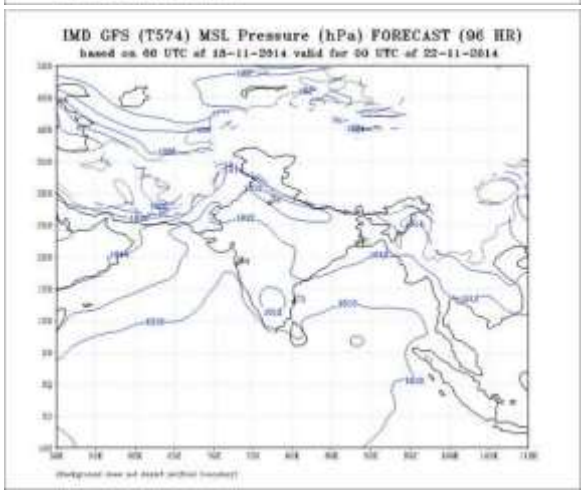

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 18-11-2014 valid for 00 UTC of 21-11-2014


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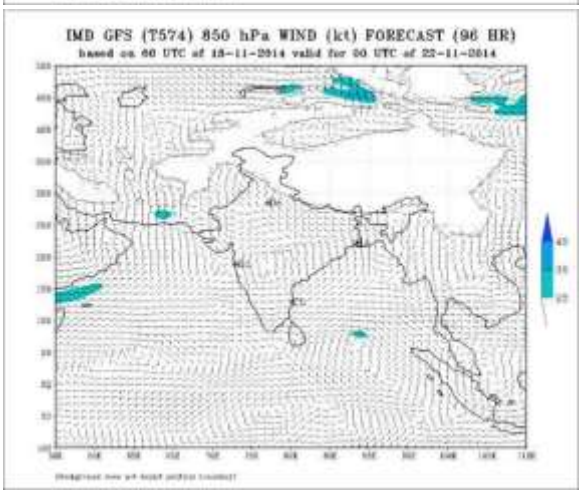
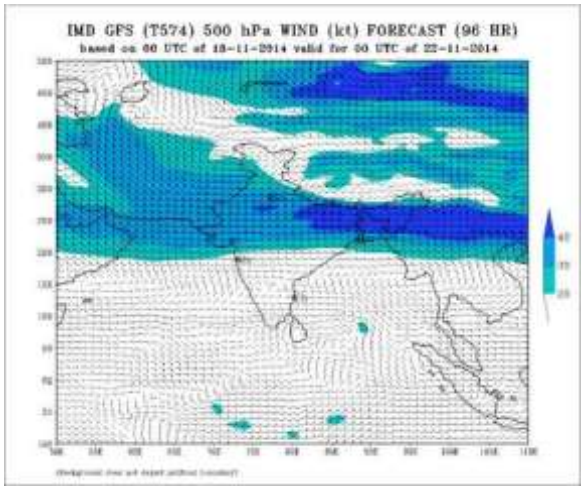

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 18-11-2014 valid for 00 UTC of 22-11-2014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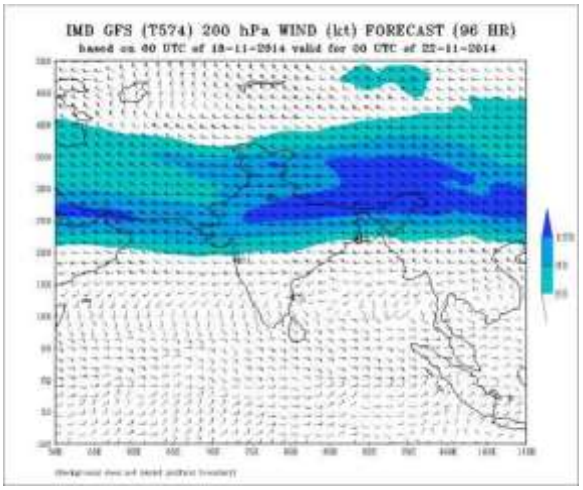
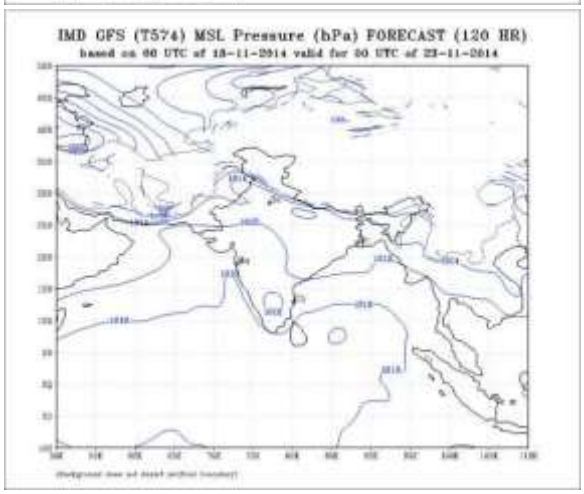
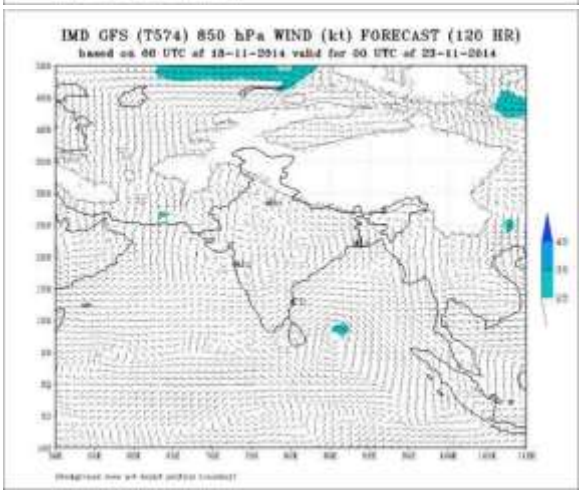
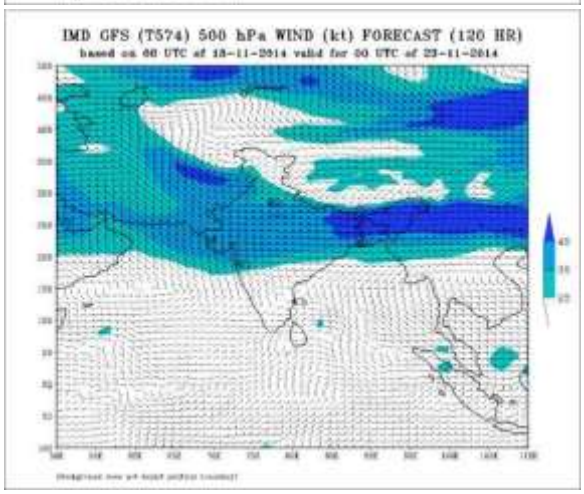
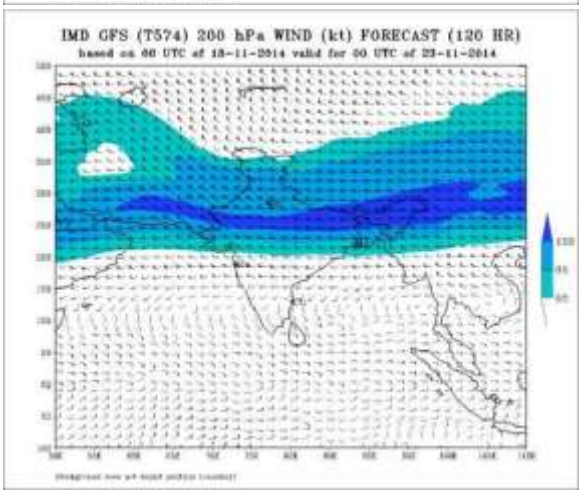
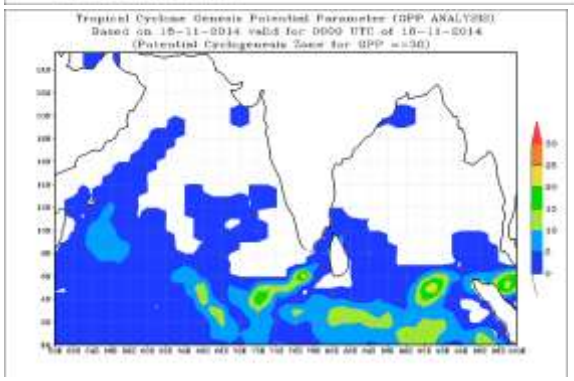

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 18-11-2014 valid for 00 UTC of 22-11-2014

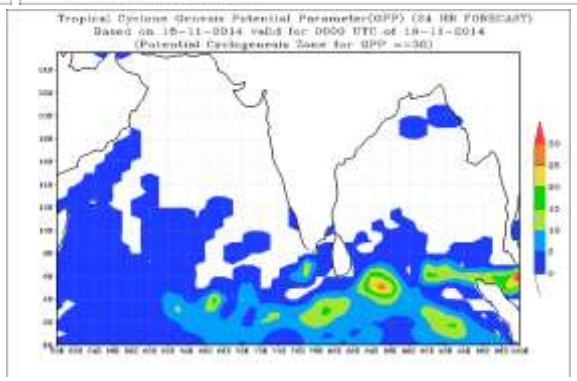

IMD GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 18-11-2014 valid for 00 UTC of 23-11-2014

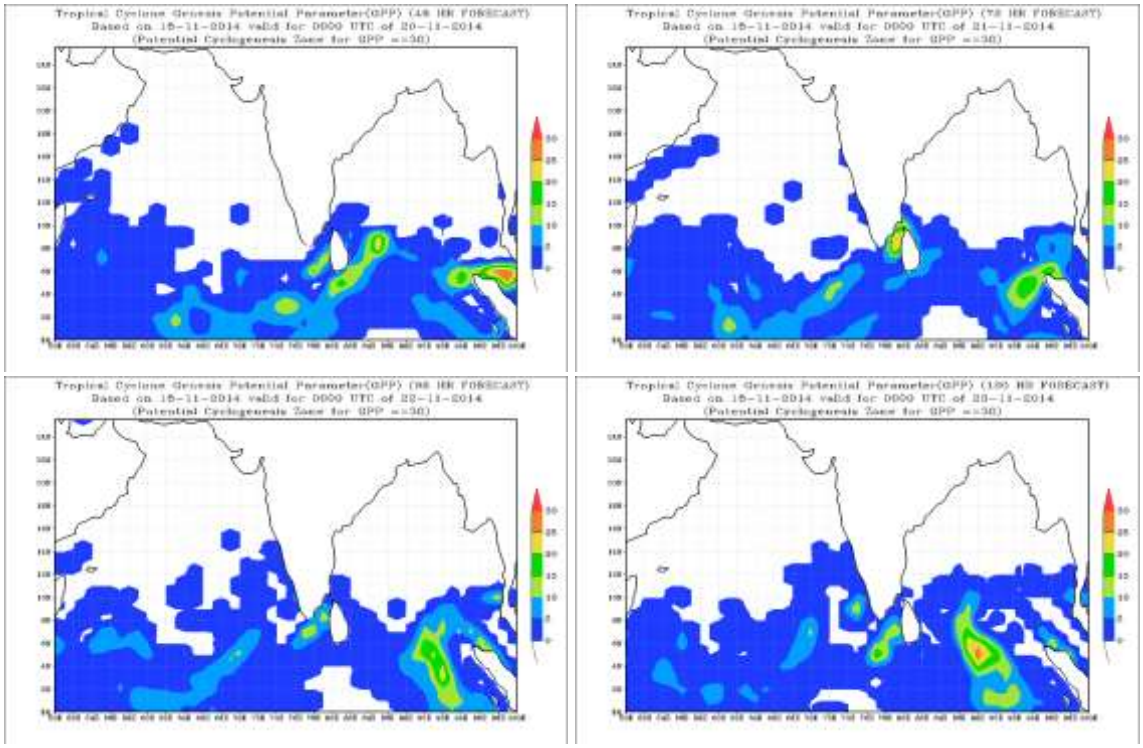

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 18-11-2014 valid for 00 UTC of 23-11-2014


IMD GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 18-11-2014 valid for 00 UTC of 23-11-2014


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 18-11-2014 valid for 00 UTC of 23-11-2014


Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 18-11-2014 valid for 0000 UTC of 18-11-2014
(Potential Cyclogenesis Zone for GPP >=30)


Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 18-11-2014 valid for 0000 UTC of 19-11-2014
(Potential Cyclogenesis Zone for GPP >=30)



FDP (Cyclone) NOC Report Dated 19 November, 2014

Synoptic features based on 0300 UTC of today:

- The trough of low at mean Sea level over south Andaman Sea & neighbourhood now lies over equatorial Indian ocean and adjoining southeast Bay of Bengal.
- The upper air cyclonic circulation over Lakshadweep area & neighbourhood now lies as a trough of low at mean Sea level over Lakshadweep area and neighbourhood.

Environmental features based on 0300 UTC of today:

Sea Surface Temperature:

- Sea Surface Temperature is between 29-31^{0}C over south Andaman Sea, Tenasserim coast. It is around 31-32 ^{0}C over south Gujrat coast.

Tropical Cyclone Heat Potential (TCHP):

- The ocean thermal energy is 110-120 kJ/cm^2 over Malay peninsula region and parts of South Andaman Sea

Relative Vorticity:

- Relative vorticity at 850 hPa is positive (50-60*10^{-5} s^{-1}) over the southern parts of Southwest Bay of Bengal .It is positive (30-40*10^{-5} s^{-1}) over the Malay Peninsula region.

Convergence:

- Lower level convergence is positive (10-15*10^{-5} s^{-1}) over south Bay of Bengal and Malay Peninsula region.

Divergence:

- Upper level divergence is positive 10-20*10^{-5} s^{-1} over southern parts of 10˚N. It is 20-30 over Malaya peninsular region.

Wind Shear:

- Wind Shear is 05-10 knots over the southern parts of Bay of Bengal and Malaya peninsular region.

Wind Shear Tendency:

- The vertical wind shear tendency is decreasing and is of the order of -5 to -10 knots over the southwest Bay of Bengal. It is increasing and is of the order of 5-10 knots over the extreme southern parts of Bay of Bengal and Malay peninsula region

Upper tropospheric ridge:

- The upper tropospheric **ridge** at 200 hPa passes through 15.0°N.

M.J.O. Index:

- Located in phase 2 with amplitude greater than 1.0. As per forecast by dynamical and statistical models, it would continue be in phase 2 during next 3 days.

Storms and Depression over South China Sea:

Tropical cyclone (ADJALI) over south Indian ocean was located near latitude 13.0 ˚S longitude 70.5˚E, at 1100 UTC of 19th Nov 2014. Maximum Sustained surface winds were estimated at 55knots gusting to 75 Knots.
There is no Tropical Storm/ Depression over South China Sea.

<u>Status of observational system:</u>

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

Satellite:

Inference based on INSAT imagery of 190900 UTC:
Bay of Bengal & Andaman Sea:-
Scattered low and medium clouds with embedded moderate to intense convection over south Bay of Bengal south of latitude 12.0°N and south of Andaman Sea.

Arabian Sea:-
Scattered low and medium clouds with embedded moderate to intense convection over south Arabian Sea south of latitude 10.0°N east of longitude 53.0° E and northwest parts of west central Arabian Sea.

NWP Analysis

- The analysis of IMD-GFST574 model charts based on 0000 UTC of 19th November 2014 show a feeble trough in easterlies in the lower levels of the atmosphere lies over Arabian Sea extending from Lakshadweep area to Gujarat coast. The forecast shows that the trough may persist during next three days with eastward movement. An extended cyclonic circulation lies over northeast Bay of Bengal and adjoining areas extending up to 850 hPa level and likely to move gradually north-northeast ward during next three days. Seasonal anticyclonic flow exists over central India during next 72 hours.
- The WRF model analysis also shows the feeble trough in easterlies lies over Arabian Sea off west coast and likely to persists during next three days. A cyclonic circulation lies over Bangladesh and adjoining areas extending up to 850 hPa level and likely to move slowly northward during next three days.
- The Genesis Potential Parameter (GPP) analysis and forecasts based on 0000 UTC of 19th November 2014 shows a moderate GPP zone over north Indian Ocean, southeast of Sri Lanka near equator around 5^{O}N latitude. The area of moderate GPP zone likely to move in a north-westward direction during next 48 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-UKMO** model does not suggest any low pressure area over Bay of Bengal during the next 5 days.
- **NCMRWF-GFS** model does not suggest any low pressure area over Bay of Bengal during the next 5 days.
- **ECMWF Model** does not suggest any low pressure area over Bay of Bengal during the next 5 days.

Summary and Conclusion:

- The trough of low at mean Sea level over south Andaman Sea & neighbourhood now lies over equatorial Indian Ocean and adjoining southeast Bay of Bengal.
- The upper air cyclonic circulation over Lakshadweep area & neighbourhood now lies as a trough of low at mean Sea level over Lakshadweep area and neighbourhood.
- There is no possibility of cyclogenesis during next 5 days.

Advisory: No IOP for next five days.

Annexure-I

Status of Observation system:

Synoptic observation:

Region	Date/Time (UTC)		
	18/12	**19/00**	**19/03**
India	44	30	44
Coastal stations			
WB	8	3	8
Odisha	7	6	6
AP	12	12	12
Tamil Nadu	10	7	10
Puducherry	1	1	1
A & N	6	1	6
Bangladesh	10	11	11
Myanmar	11	11	10
Thailand	2	2	2
Sri Lanka	8	8	8

AWS Observations:

Region	Date/Time (UTC)		
	18/12	**19/00**	**19/03**
India	64	63	74
Coastal stations			
WB	7	9	7
Odisha	2	2	6
AP	17	19	19
Tamil Nadu	16	16	14
Puducherry	-	-	-
A & N	-	-	-

- **RS/RW** (12Z) of 18/11/2014 **-1/39**
- **No. of Ascents reaching 250 hPa level: 1, MISDA: 38**
- **RS/RW** (00Z) of 19/11/2014-16**/39**
- **No. of Ascents reaching 250 hPa level: 7, MISDA: 23**

No. of PILOT Ascents

18/12Z	**19/00Z**
11	11

Buoy Data

1812Z	**19/00Z**	**19/03Z**
8	8	8

FOC CHENNAI: STATUS OF OBSERVATION

Date→	**18.11.2014**							
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 /19.11.2014 : 4

No. of Ascents reaching 250 hPa level = 3

MISDA : 4

12Z /18.11.2014 : --

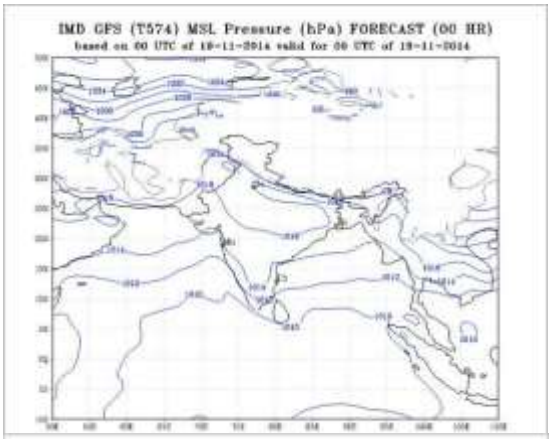
No. of Ascents reaching 250 hPa level = --

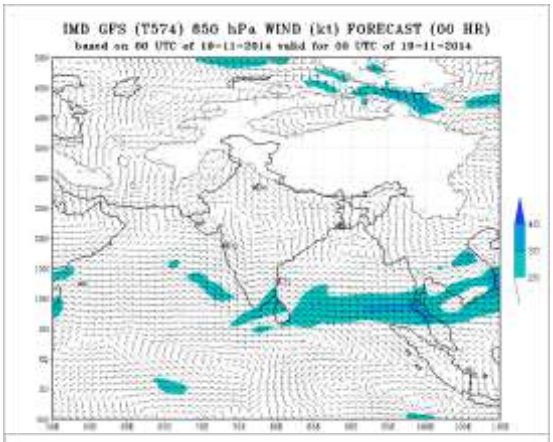
MISDA : 8

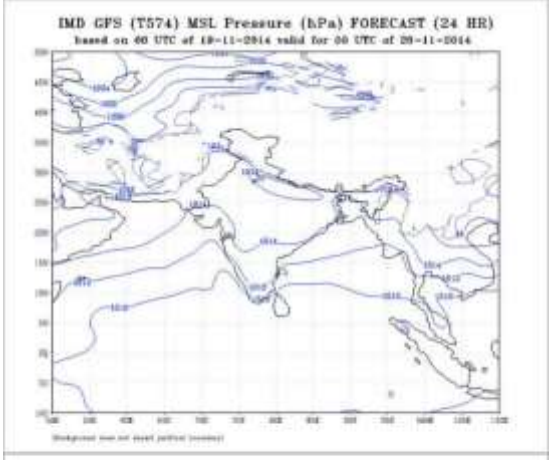
No. of PILOT Ascents:

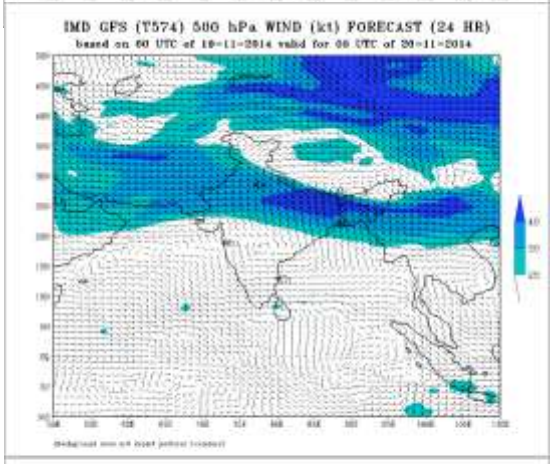
18.11.2014	
06Z	18Z
3	2

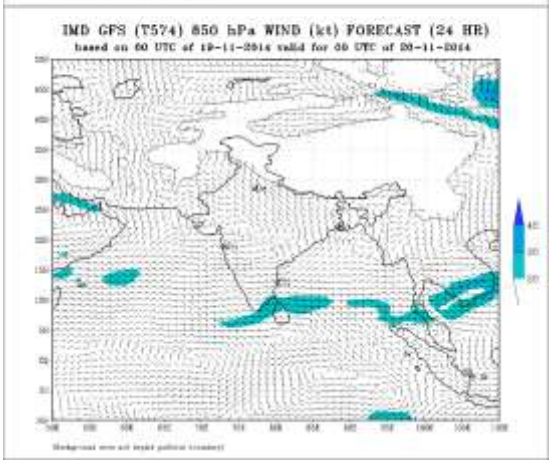
Annexure-II

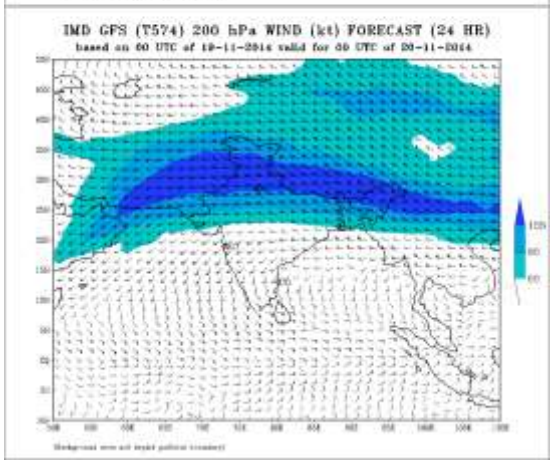

IMD GFS (T574) MSL Pressure (hPa) FORECAST (00 HR)
based on 00 UTC of 19-11-2014 valid for 00 UTC of 19-11-2014


IMD GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 19-11-2014 valid for 00 UTC of 19-11-2014


IMD GFS (T574) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 19-11-2014 valid for 00 UTC of 20-11-2014


IMD GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 19-11-2014 valid for 00 UTC of 20-11-2014


IMD GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 19-11-2014 valid for 00 UTC of 20-11-2014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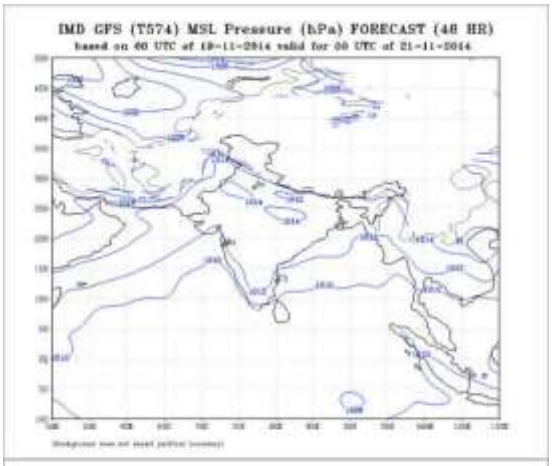
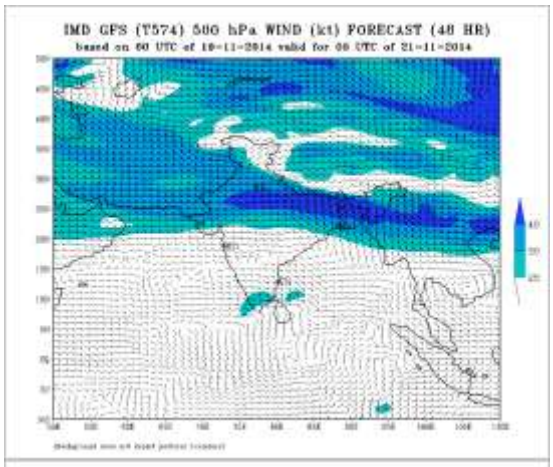

IMD GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 19-11-2014 valid for 00 UTC of 21-11-2014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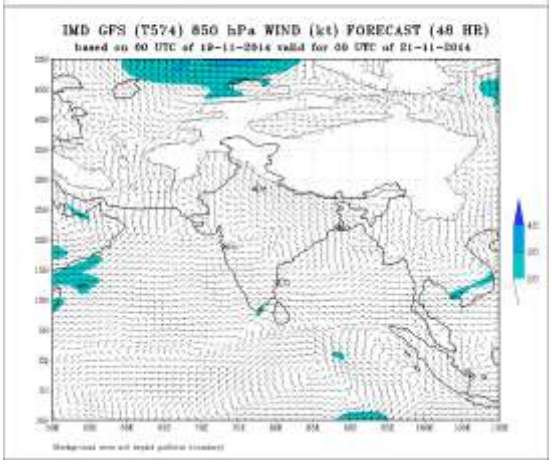
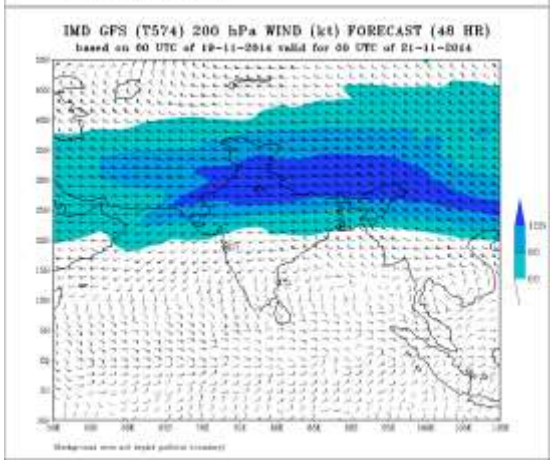
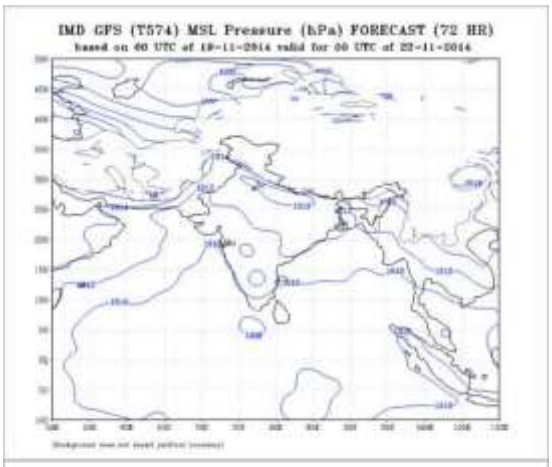
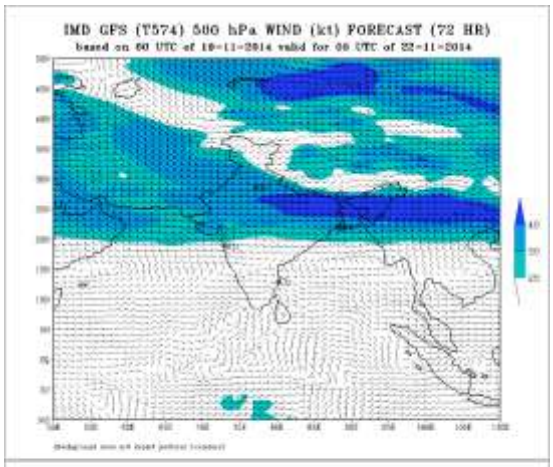
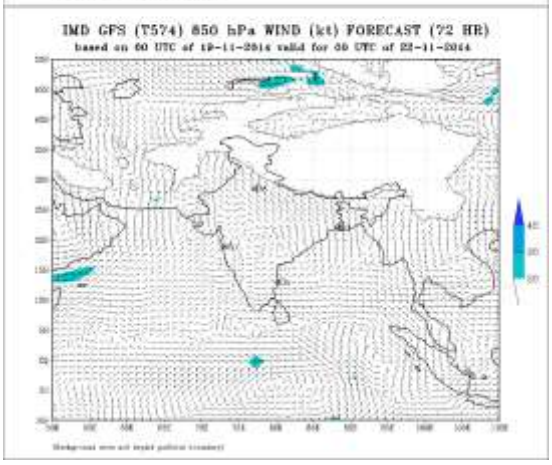

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 19-11-2014 valid for 00 UTC of 21-11-2014


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 19-11-2014 valid for 00 UTC of 21-11-2014


IMD GFS (T574) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 19-11-2014 valid for 00 UTC of 22-11-2014


IMD GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 19-11-2014 valid for 00 UTC of 22-11-2014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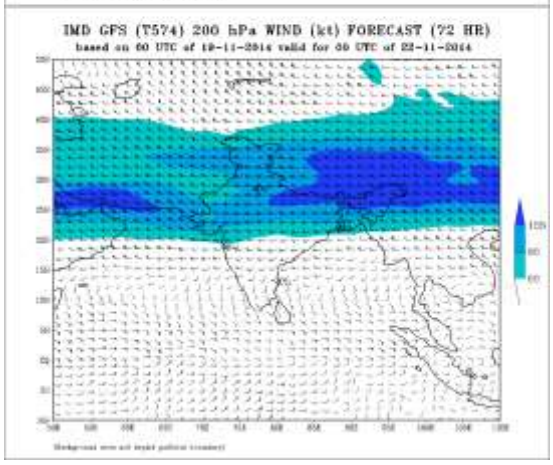
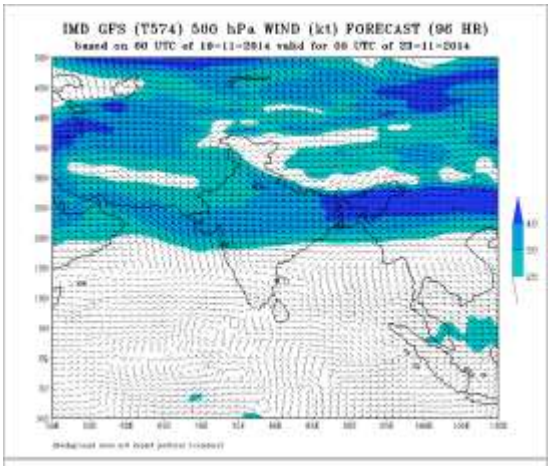
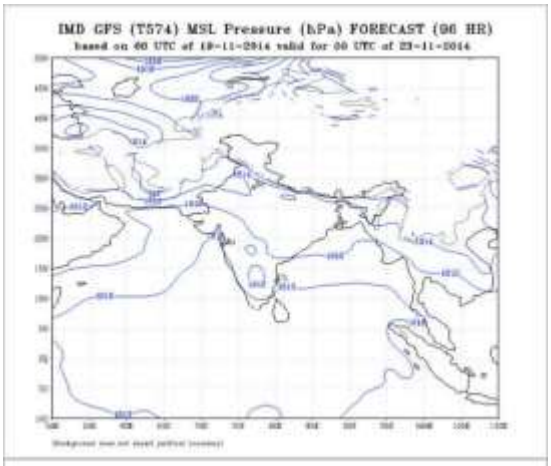
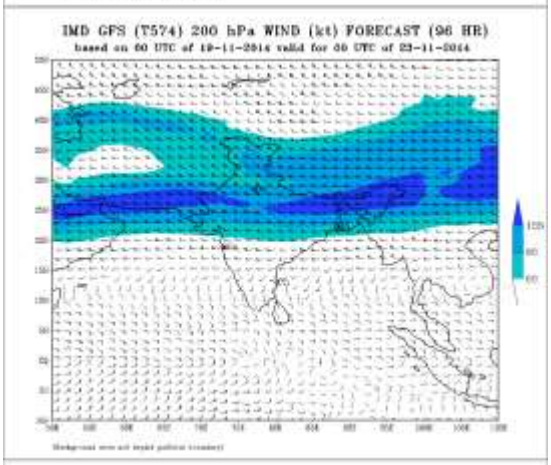
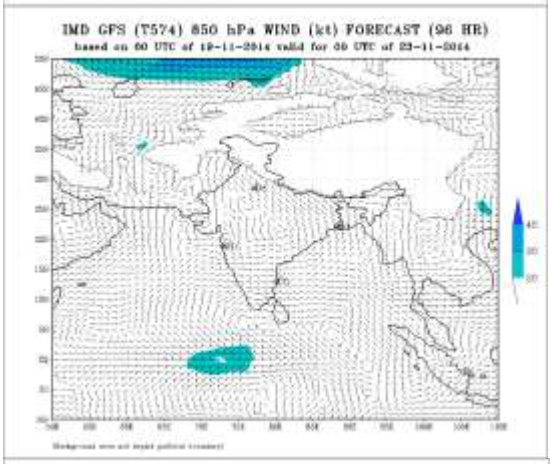
based on 00 UTC of 19-11-2014 valid for 00 UTC of 22-11-2014

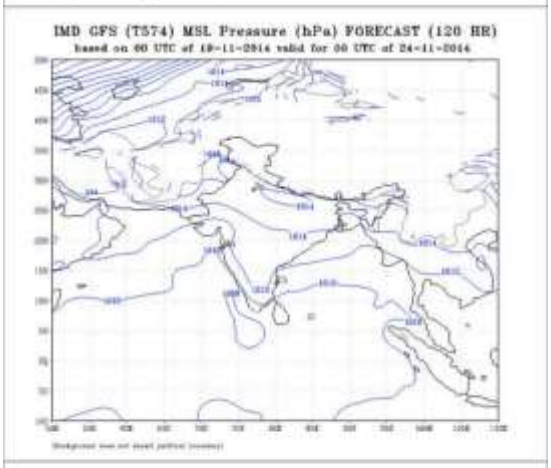

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 19-11-2014 valid for 00 UTC of 22-11-2014

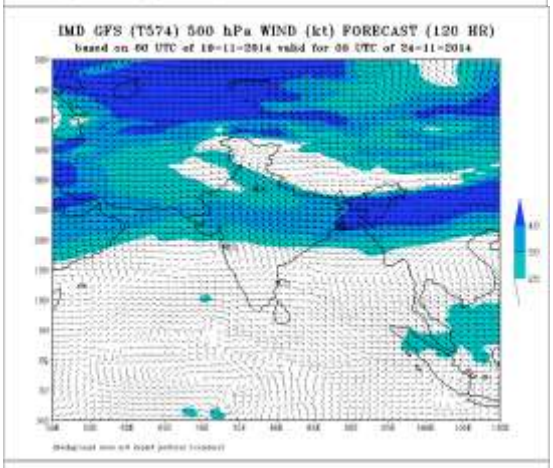

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 19-11-2014 valid for 00 UTC of 23-11-2014

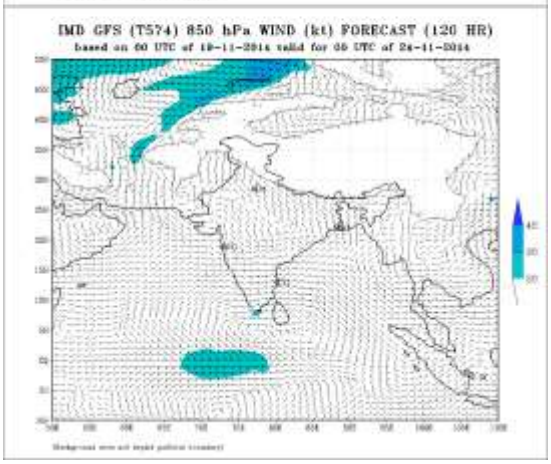

IMD GFS (T574) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 19-11-2014 valid for 00 UTC of 23-11-2014

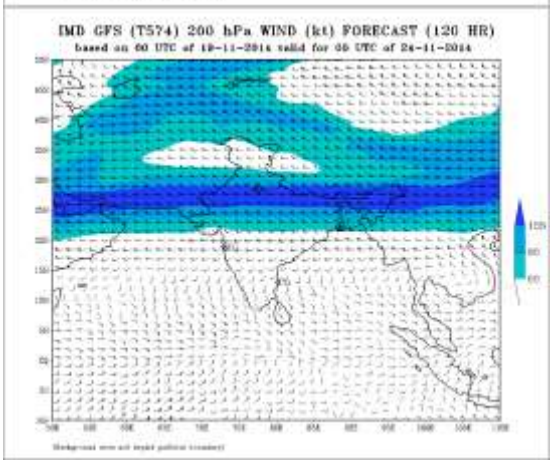

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 19-11-2014 valid for 00 UTC of 23-11-2014

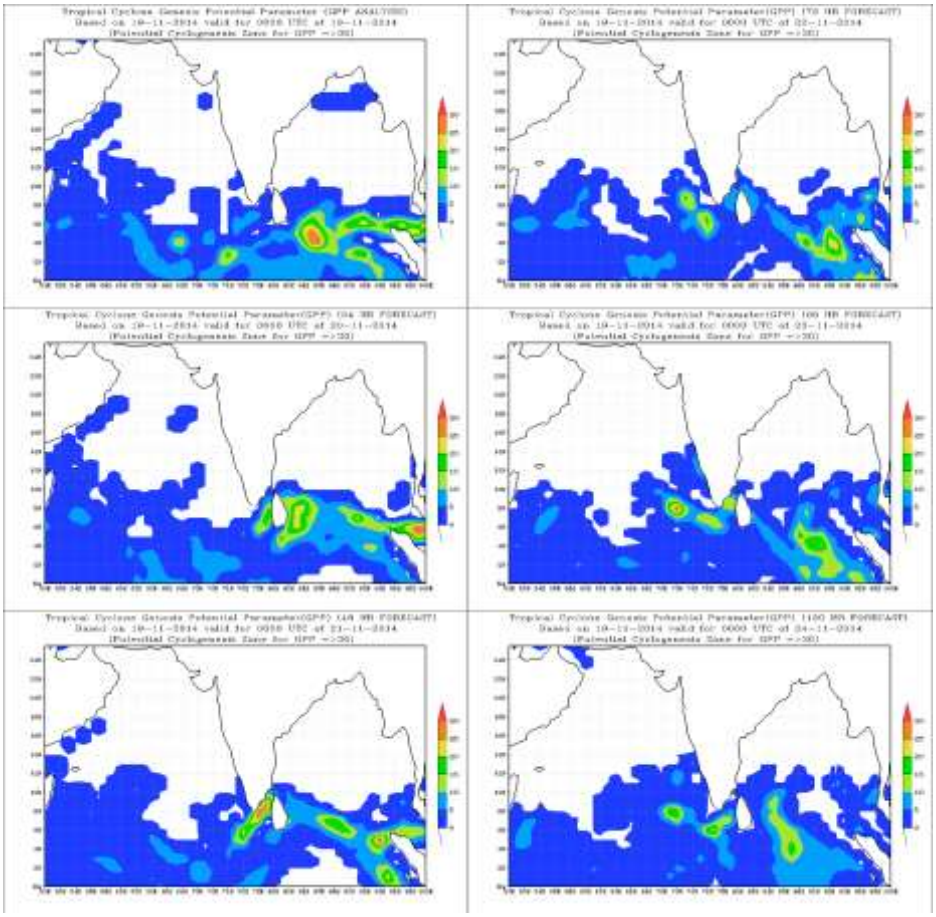

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 19-11-2014 valid for 00 UTC of 23-11-2014


IMD GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 19-11-2014 valid for 00 UTC of 24-11-2014


IMD GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 19-11-2014 valid for 00 UTC of 24-11-2014


IMD GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 19-11-2014 valid for 00 UTC of 24-11-2014


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 19-11-2014 valid for 00 UTC of 24-11-2014



FDP (Cyclone) NOC Report Dated 20 November, 2014

Synoptic features based on 0300 UTC of today:

- Yesterday's trough of low at mean Sea level over equatorial Indian ocean and adjoining southeast Bay of Bengal now lies over equatorial Indian ocean & adjoining central parts of south Bay of Bengal.
- Yesterday's upper air cyclonic circulation over Lakshadweep area and neighbourhood now lies over southeast Arabian Sea & adjoining Lakshadweep area.

Environmental features based on 0300 UTC of today:

Sea Surface Temperature:

- Sea Surface Temperature is between 29-31^{0}C over south Bay of Bengal and Andaman Sea. It is around 31-32 ^{0}C over south Gujarat coast.

Tropical Cyclone Heat Potential (TCHP):

- The ocean thermal energy is 110-120 kJ/cm^2 over Malay Peninsula region and parts of South Andaman Sea.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive (30-40*10^{-5} s^{-1}) over parts of south Bay of Bengal and south Andaman Sea.

Convergence:

- Lower level convergence is positive (5-10*10^{-5} s^{-1}) over south Bay of Bengal and Malay Peninsula region.

Divergence:

- Upper level divergence is positive 10-20*10^{-5} s^{-1} over Malay Peninsula region and adjoining south Andaman Sea.

Wind Shear:

- Wind Shear is 05-10 knots over Malay Peninsula region and parts of south Arabian Sea.

Wind Shear Tendency:

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

Upper tropospheric ridge:

- The upper tropospheric **ridge** at 200 hPa passes through 12.0°N.

M.J.O. Index:

- Located in phase 2 with amplitude greater than 1.0. As per forecast by dynamical and statistical models, it would continue be in phase 2 during next 3 days.

Storms and Depression over South China Sea:

- There is currently no Tropical Storm/Depression over South China Sea.
- Tropical cyclone “Adjali” over south Indian Ocean has weakened.

<u>Status of observational system:</u>

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

Satellite:

Inference based on INSAT imagery of 200900 UTC:

Bay of Bengal & Andaman Sea:-

Scattered low and medium clouds with embedded moderate to intense convection over westcentral, south Bay of Bengal and south of Andaman Sea.

Arabian Sea:-

Scattered low and medium clouds with embedded moderate to intense convection over south Arabian Sea south of latitude 10.0°N.

NWP Analysis

- The analysis of IMD-GFST574 model charts based on 0000 UTC of 20th November 2014 show a feeble trough in easterlies in the lower levels of the atmosphere lies over Arabian Sea off west coast. The forecast shows that the trough may persist during next three days. A cyclonic circulation lies over northeast Bay of Bengal and adjoining areas extending up to 850 hPa level and likely to persist during next 24 hours. Seasonal anticyclonic flow exists over central India during next 72 hours.
- The WRF model analysis also shows the feeble trough in easterlies over Arabian Sea off west coast in the lower level and likely to persists during next three days. A cyclonic circulation lies over northern parts of Bangladesh and adjoining areas extending up to 850 hPa level and likely to persist during next 24 hours. Seasonal anticyclonic flow exists over central India during next 72 hours.
- The Genesis Potential Parameter (GPP) analysis and forecasts based on 0000 UTC of 20th November 2014 shows a moderate GPP zone over north Indian Ocean near equator around 5°N latitude. The area of moderate GPP zone likely to move in a westward direction during next 48 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-UKMO** model does not suggest any low pressure area over Bay of Bengal during the next 5 days.
- **NCMRWF-GFS** model does not suggest any low pressure area over Bay of Bengal during the next 5 days.
- **JMA Model** does not suggest any low pressure area over Bay of Bengal during the next 3days.
- **ARP (METEOFRANCE) Model** does not suggest any low pressure area over Bay of Bengal during the next 3 days.
- **ECMWF Model** does not suggest low pressure area over Bay of Bengal during the next 5 days.

Summary and Conclusion:

The trough of low at mean Sea level now lies over equatorial Indian Ocean and adjoining central parts of south Bay of Bengal.

The upper air cyclonic circulation now lies over lies over southeast Arabian Sea & adjoining Lakshadweep area.

There is no possibility of cyclogenesis during next 5 days.

Advisory: No IOP for next five days.

Annexure-I

Status of Observation system:

Synoptic observation:

Region	Date/Time (UTC)		
	19/12	20/00	20/03
India	44	30	44
Coastal stations			
WB	8	3	8
Odisha	7	6	6
AP	12	12	12
Tamil Nadu	10	7	10
Puducherry	1	1	1
A & N	6	1	6
Bangladesh	7	11	9
Myanmar	10	9	11
Thailand	2	2	2
Sri Lanka	8	8	8

AWS Observations:

Region	Date/Time (UTC)		
	19/12	20/00	20/03
India	64	63	74
Coastal stations			
WB	7	9	7
Odisha	2	2	6
AP	17	19	19
Tamil Nadu	16	16	14
Puducherry	-	-	-
A & N	-	-	-

- **RS/RW** (12Z) of 19/11/2014 **-1/39**
- **No. of Ascents reaching 250 hPa level: 1, MISDA: 21**
- **RS/RW** (00Z) of 20/11/2014-8**/39**
- **No. of Ascents reaching 250 hPa level: 7, MISDA: 21**

No. of PILOT Ascents

19/12Z	20/00Z
10	10

Buoy Data

19/12Z	20/00Z	20/03Z
8	8	8

FOC CHENNAI: STATUS OF OBSERVATION

Date→	**19.11.2014**							
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 /19.11.2014 : 1

No. of Ascents reaching 250 hPa level = 1

MISDA : 7

12Z /19.11.2014 : --

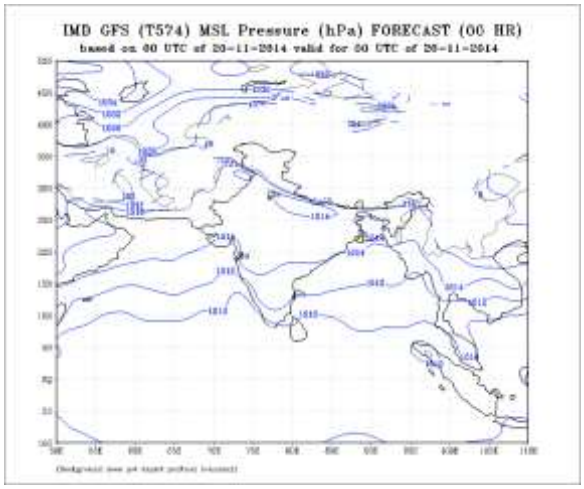
No. of Ascents reaching 250 hPa level = --

MISDA : 8

No. of PILOT Ascents:

19.11.2014	
06Z	18Z
4	3

Annexure-II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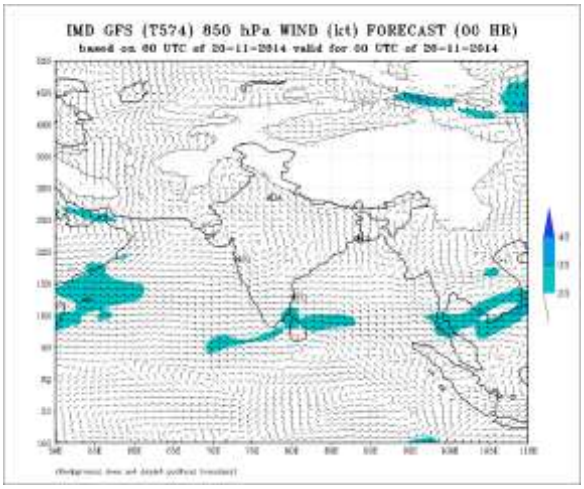
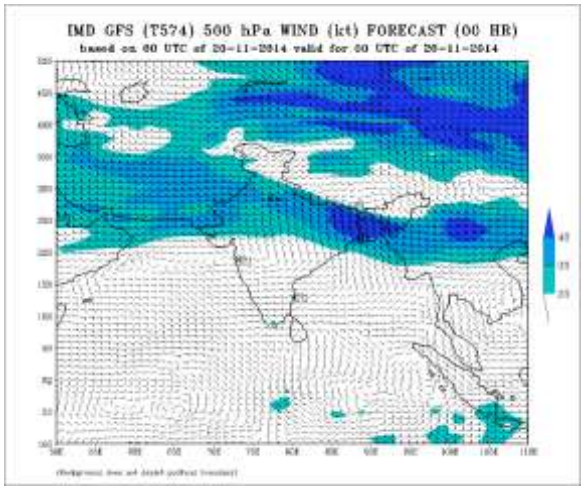

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 20-11-2014 valid for 00 UTC of 20-11-2014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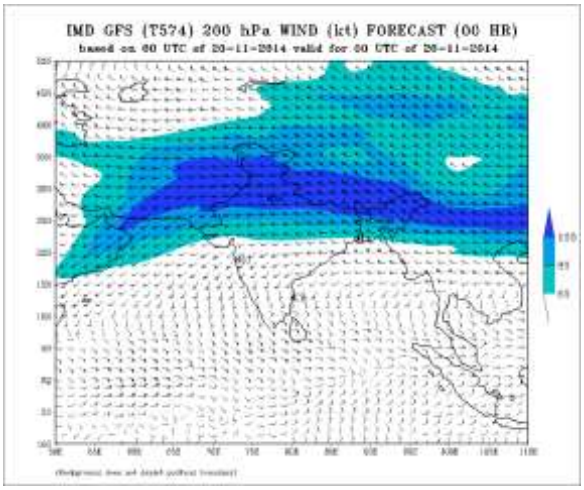
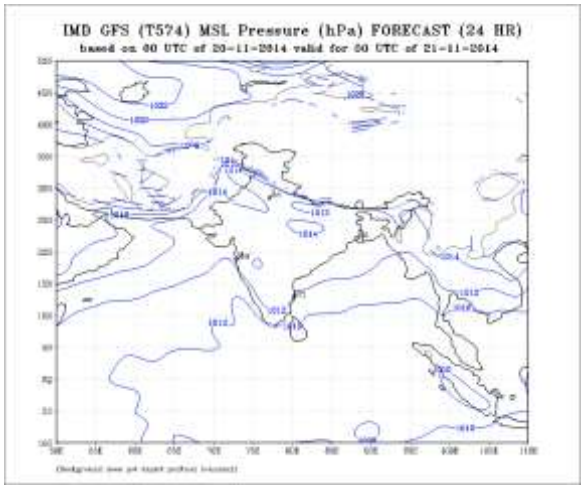

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 20-11-2014 valid for 00 UTC of 20-11-2014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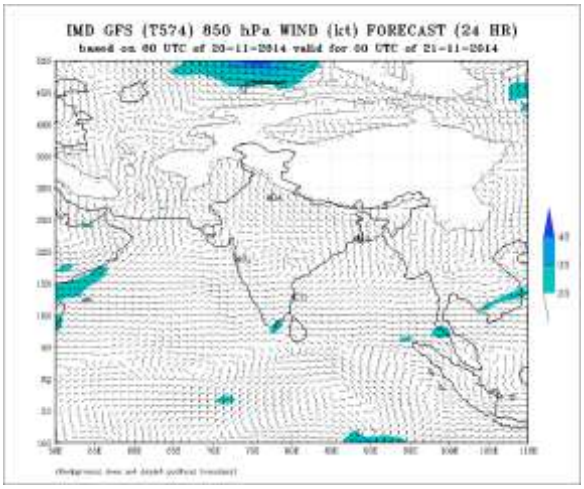
based on 00 UTC of 20-11-2014 valid for 00 UTC of 21-11-2014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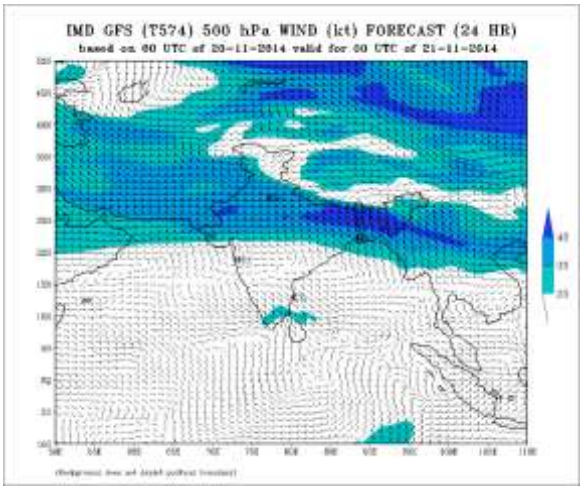
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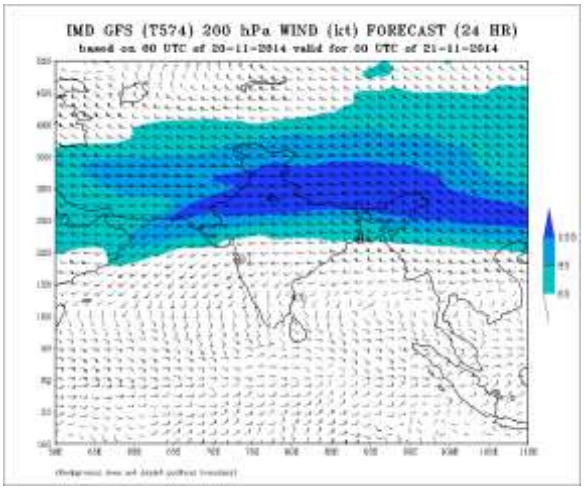
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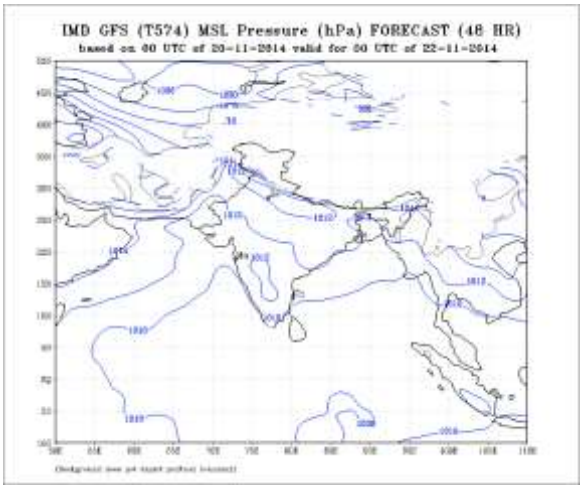
IMD GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
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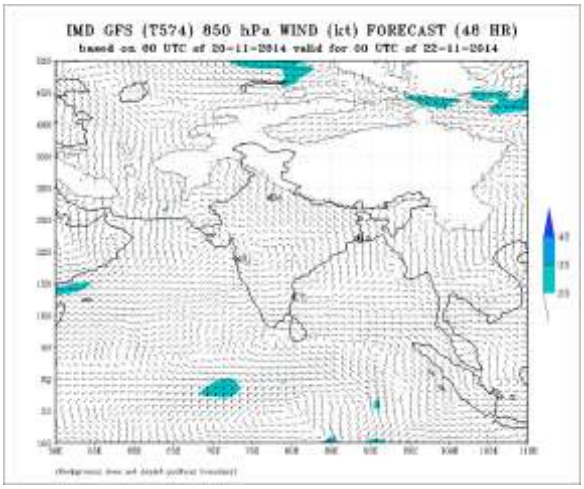
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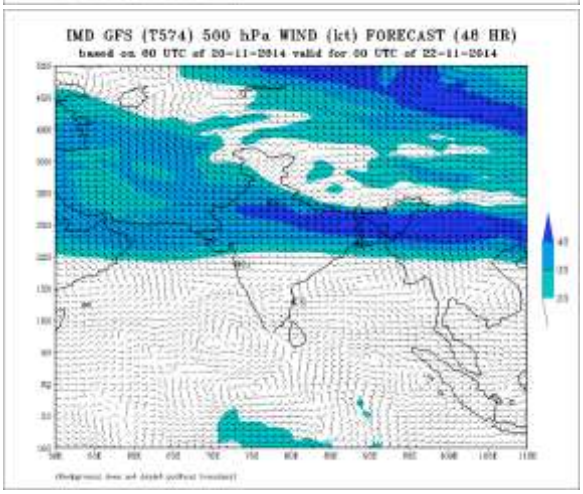
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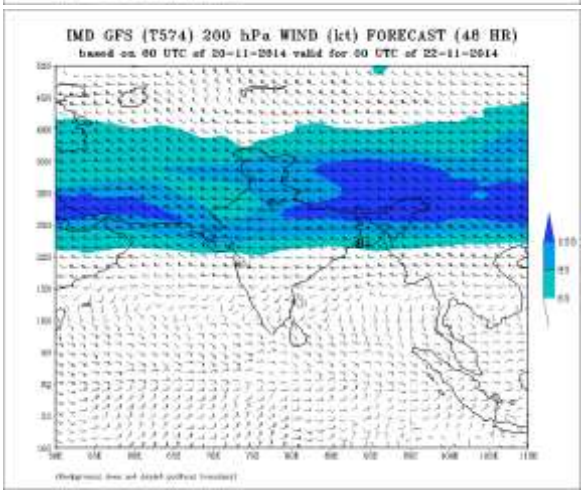
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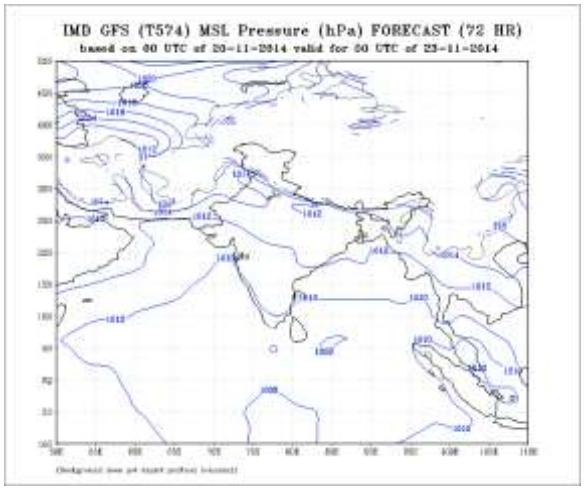
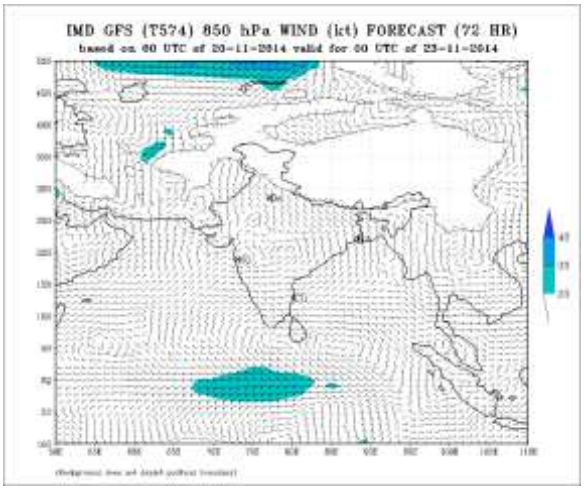
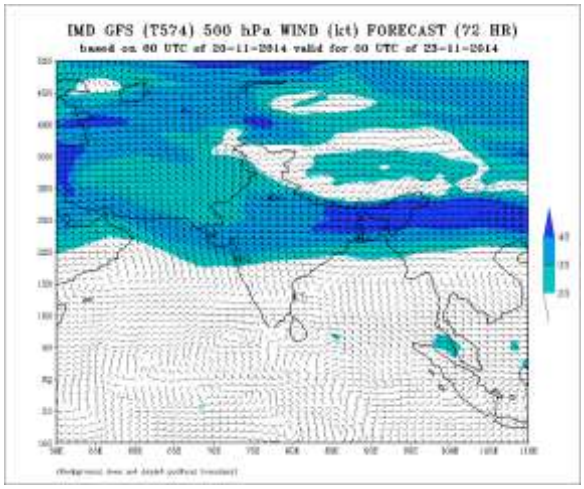
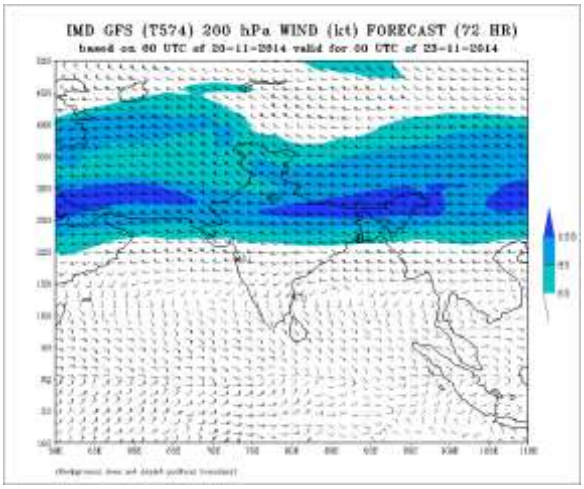
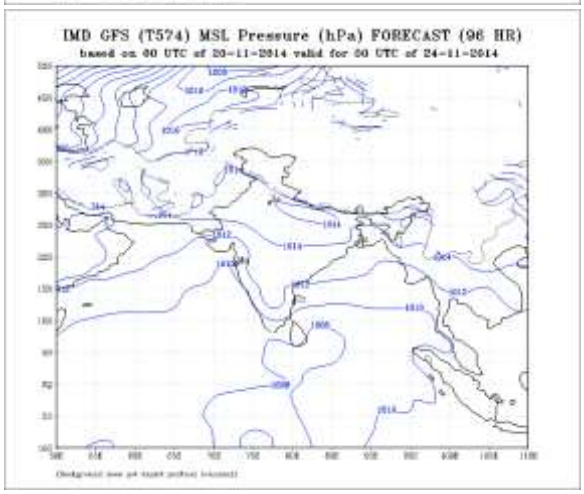
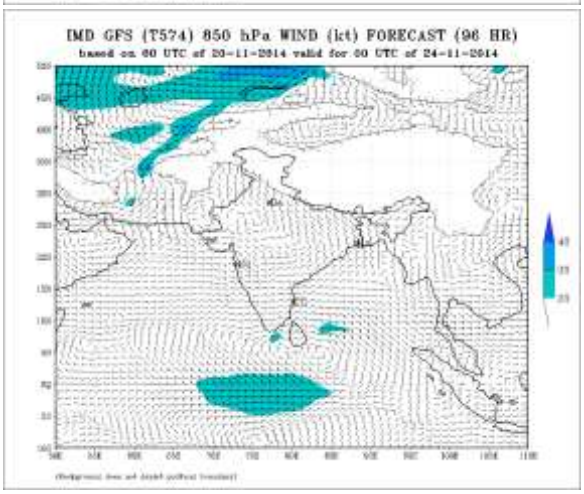

IMD GFS (T574) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 20-11-2014 valid for 00 UTC of 23-11-2014

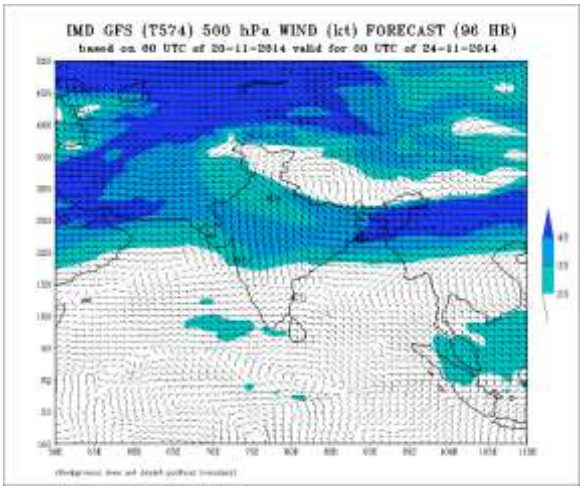

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 20-11-2014 valid for 00 UTC of 23-11-2014

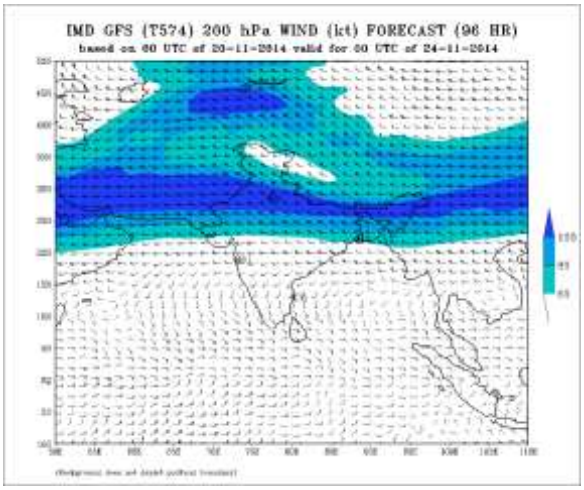

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 20-11-2014 valid for 00 UTC of 23-11-2014

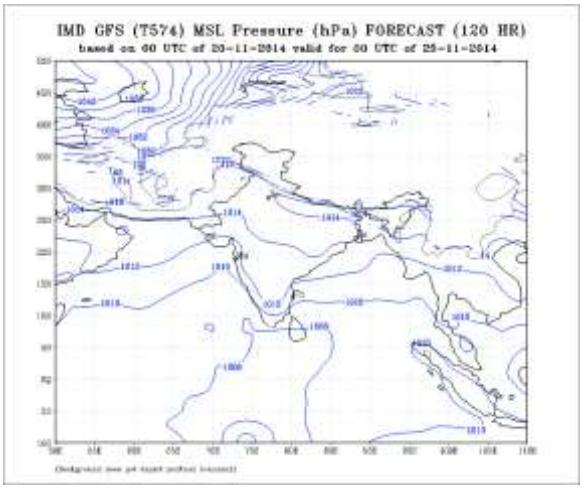

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 20-11-2014 valid for 00 UTC of 23-11-2014

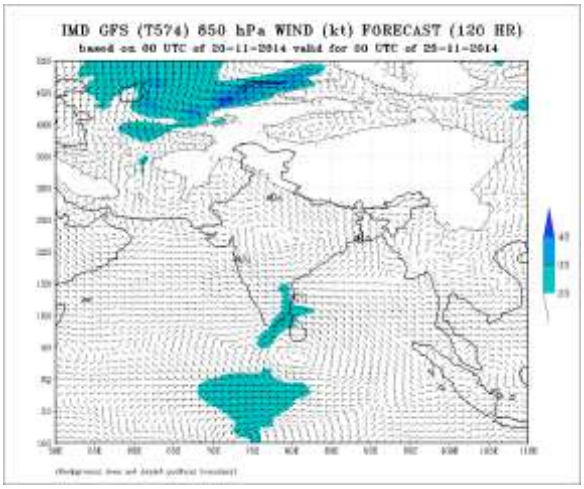

IMD GFS (T574) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 20-11-2014 valid for 00 UTC of 24-11-2014

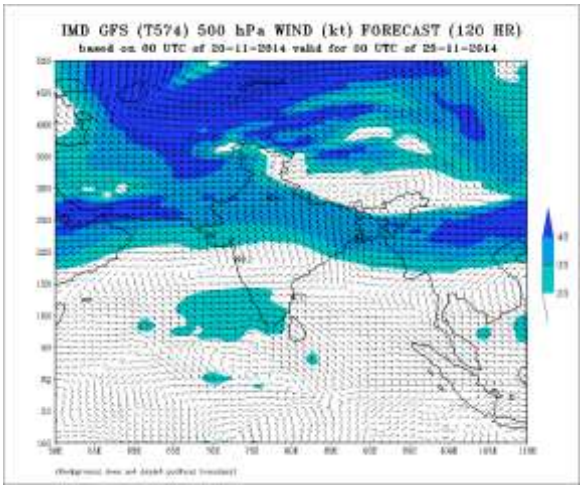

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 20-11-2014 valid for 00 UTC of 24-11-2014

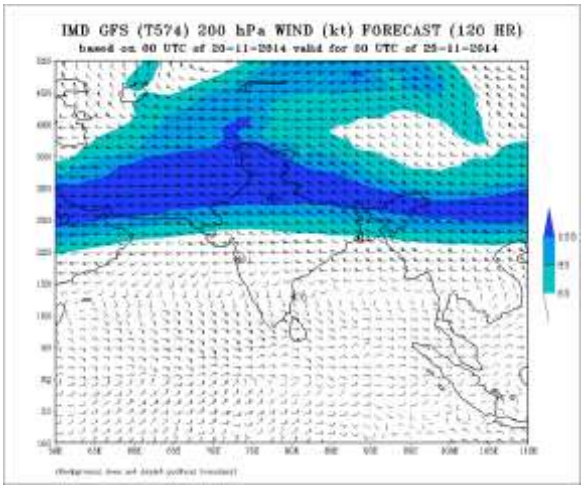

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 20-11-2014 valid for 00 UTC of 24-11-2014

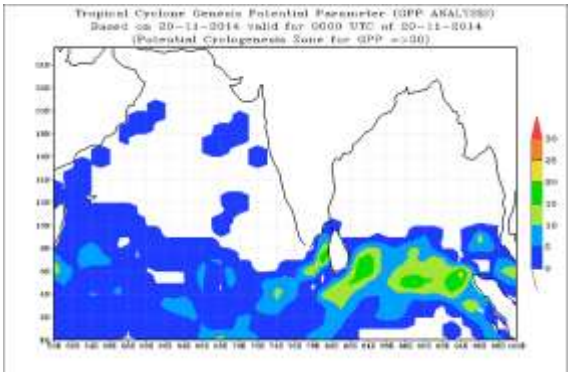

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 20-11-2014 valid for 00 UTC of 24-11-2014

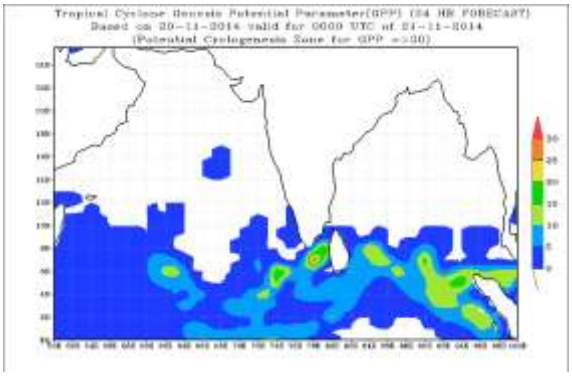

IMD GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 20-11-2014 valid for 00 UTC of 25-11-2014

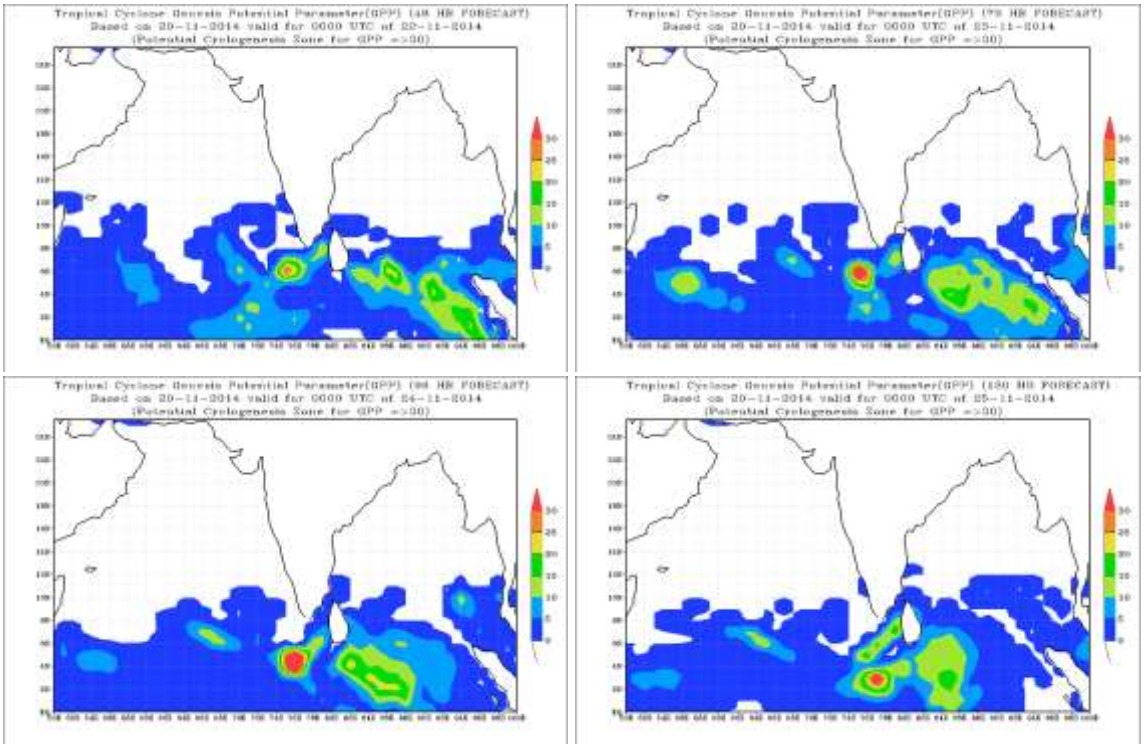

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 20-11-2014 valid for 00 UTC of 25-11-2014


IMD GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 20-11-2014 valid for 00 UTC of 25-11-2014


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 20-11-2014 valid for 00 UTC of 25-11-2014


Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 20-11-2014 valid for 0000 UTC of 20-11-2014
(Potential Cyclogenesis Zone for GPP >=30)


Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 20-11-2014 valid for 0000 UTC of 21-11-2014
(Potential Cyclogenesis Zone for GPP >=30)



FDP (Cyclone) NOC Report Dated 21 November, 2014

Synoptic features based on 0300 UTC of today:

- The upper air cyclonic circulation over southwest Bay of Bengal off Sri Lanka coast extending upto0.9 km above mean Sea level persists.
- A trough of low at mean Sea level lies over southeast Arabian Sea & neighbourhood

Environmental features based on 0300 UTC of today:

Sea Surface Temperature:

- Sea Surface Temperature is between 29-31^{0}C over south Andaman Sea, Tenasserim coast.

Tropical Cyclone Heat Potential (TCHP):

- The ocean thermal energy is 110-120 kJ/cm^2 over Malay peninsula regaion and parts of South Andaman Sea

Relative Vorticity:

- Relative vorticity at 850 hPa is positive (30-40*10^{-5} s^{-1}) over the many parts over south of 10°N.

Convergence:

- Lower level convergence is positive (5-10*10^{-5} s^{-1}) over south Bay of Bengal and Malay peninsular region and many parts south of 10°N. .

Divergence:

- Upper level divergence is positive 10-20*10^{-5} s^{-1} over southern parts of Bay of Bengal and Arabian Sea. It is negative 5*10^{-5} s^{-1} over Malaya peninsular region and central Bay of Bengal.

Wind Shear:

- Wind Shear is 05-10 knots over the southeast bay adjoining Andaman Sea and southern parts of Bay of Bengal and Malaya peninsular region.

Wind Shear Tendency:

- The vertical wind shear tendency is increasing of order 5 to 10 knots over the southwest Bay of Bengal. It is decreasing of order 5-10 knots over the extreme southern parts of Bay of Bengal and Malay peninsular region

Upper tropospheric ridge:

- The upper tropospheric **ridge** at 200 hPa passes through 12.0°N.

M.J.O. Index:

- Located in phase 2 with amplitude greater than 1.0. It would continue in phase 2 during next 3 days.

Storms and Depression over South China Sea:

- There is currently no Tropical Storm/Depression over South China Sea.

Status of observational system:

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

Satellite:

Inference based on INSAT imagery of 210900 UTC:

Bay of Bengal & Andaman Sea:-

- Scattered low/medium clouds with embedded moderate to intense convection over southwest bay southeast bay south of Lat 10.0°N. Scattered low/medium clouds with embedded isolated weak to moderate convection over Andaman Sea.

Arabian Sea:-

- Scattered low/medium clouds with embedded moderate to intense convection over south Arabian Sea.

NWP Analysis

- The analysis of IMD-GFST574 model charts based on 0000 UTC of 21st November 2014 show a feeble trough in easterlies in the lower levels of the atmosphere lies over Arabian Sea off west coast. The forecast shows that the trough may persist during next three days. A cyclonic circulation lies over northeast Bay of Bengal and adjoining areas extending up to 850 hPa level and likely to persist during next 24 hours.
- The WRF model analysis also shows the feeble trough in easterlies over Arabian Sea off west coast in the lower level and likely to persists during next 48 hours. A cyclonic circulation lies over northern parts of Bangladesh and adjoining areas of Assam

extending up to 850 hPa level and likely to persist during next 24 hours. Anotherupper air cyclonic circulation lies over southwest Bay of Bengal off Sri Lanka coast extending up to 850 hPa level and likely to move in a west ward direction during next three days.

- The Genesis Potential Parameter (GPP) analysis and forecasts based on 0000 UTC of 21st November 2014 shows a moderate GPP zone over north Indian Ocean near equator around 6^{o}N latitude off Sri Lanka coast. The GPP zone likely to intensify and move in a westward direction during next 24 hours and then south west ward direction during next three 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-UKMO** model does not suggest any cyclogenesis over Bay of Bengal during the next 5 days.
- **NCMRWF-GFS** model does not suggest any cyclogenesis over Bay of Bengal during the next 5 days.
- **ECMWF Model** does not suggest any cyclogenesis over Bay of Bengal during the next 5 days.

Summary and Conclusion:
There is no significant low pressure system over north Indian Ocean

Advisory: No IOP for next five days.

Annexure-I

Status of Observation system:

Synoptic observation:

Region	Date/Time (UTC)		
	20/12	**21/00**	**21/03**
India	44	32	44
Coastal stations			
WB	8	5	8
Odisha	7	6	6
AP	12	12	12
Tamil Nadu	10	7	10
Puducherry	1	1	1
A & N	6	1	6
Bangladesh	11	10	10
Myanmar	11	9	11
Thailand	2	2	2
Sri Lanka	8	8	8

AWS Observations:

Region	Date/Time (UTC)		
	20/12	**21/00**	**21/03**
India	64	63	74
Coastal stations			
WB	7	9	7
Odisha	2	2	6
AP	17	19	19
Tamil Nadu	16	16	14
Puducherry	-	-	-
A & N	-	-	-

- **RS/RW** (12Z) of 20/11/2014 **-1/39**
- **No. of Ascents reaching 250 hPa level: 1, MISDA: 38**
- **RS/RW** (00Z) of 21/11/2014-21**/39**
- **No. of Ascents reaching 250 hPa level: 3, MISDA: 13**

No. of PILOT Ascents

20/12Z	21/00Z
10	11

Buoy Data

2012Z	21/00Z	21/03Z
17	18	17

FOC CHENNAI: STATUS OF OBSERVATION No. of Synop data

Date→	**20.11.2014**							
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

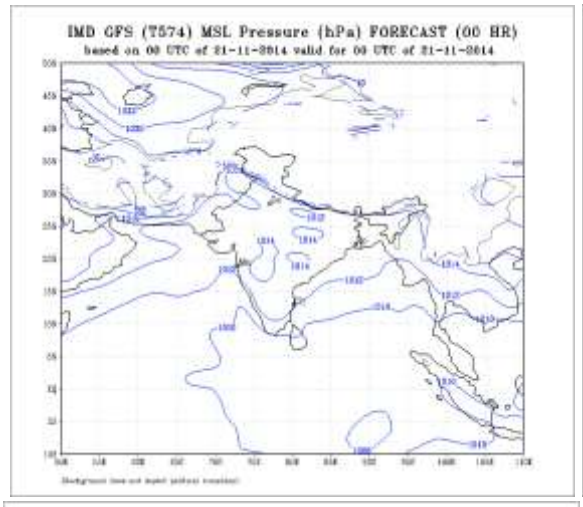
00Z /20.11.2014 : 1
No. of Ascents reaching 250 hPa level = 1
MISDA : 7

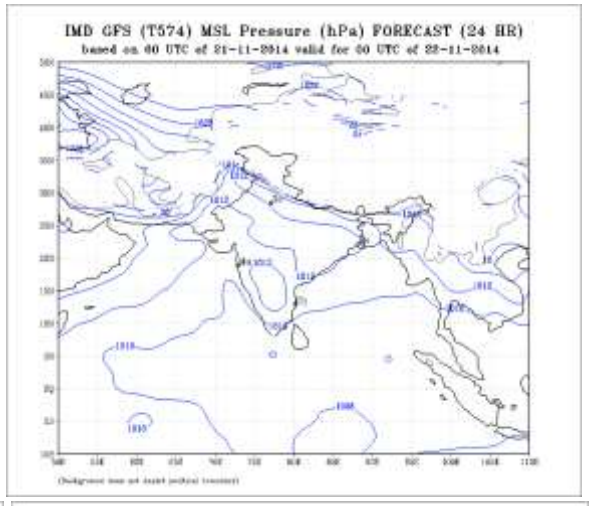
12Z /20.11.2014 : --
No. of Ascents reaching 250 hPa level = --
MISDA : 8

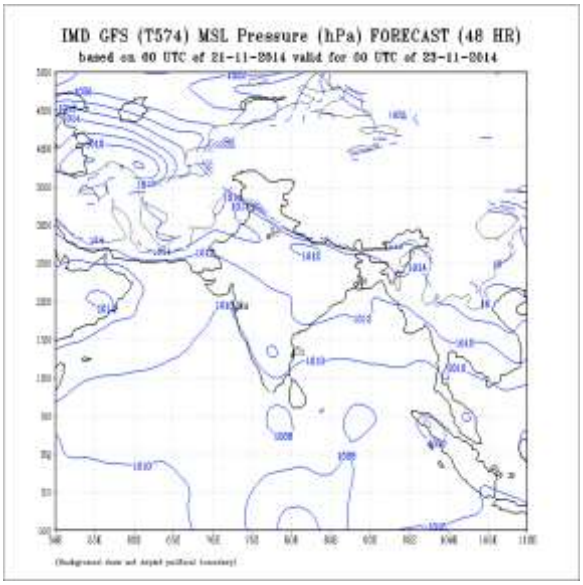
No. of PILOT Ascents:

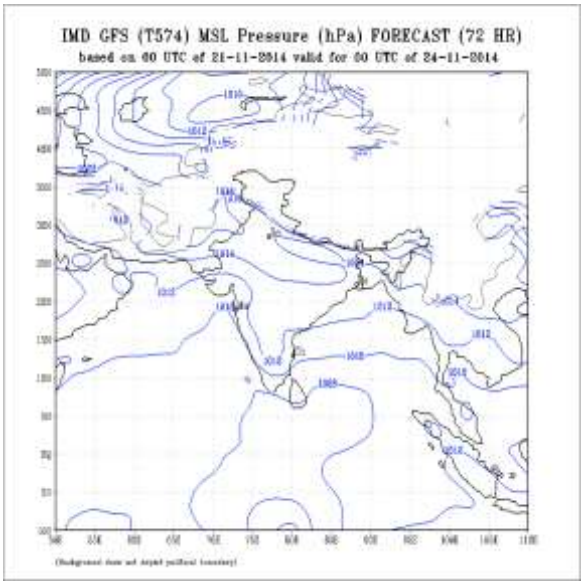
20.11.2014	
06Z	18Z
4	3

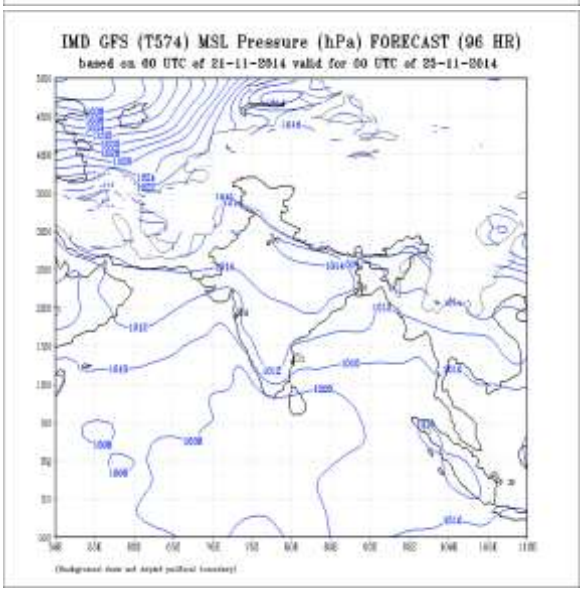
Annexure-II

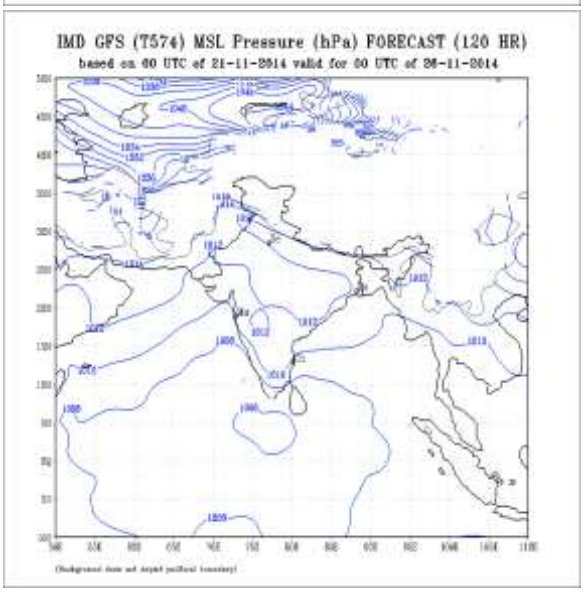

IMD GFS (T574) MSL Pressure (hPa) FORECAST (00 HR)
based on 00 UTC of 21-11-2014 valid for 00 UTC of 21-11-2014

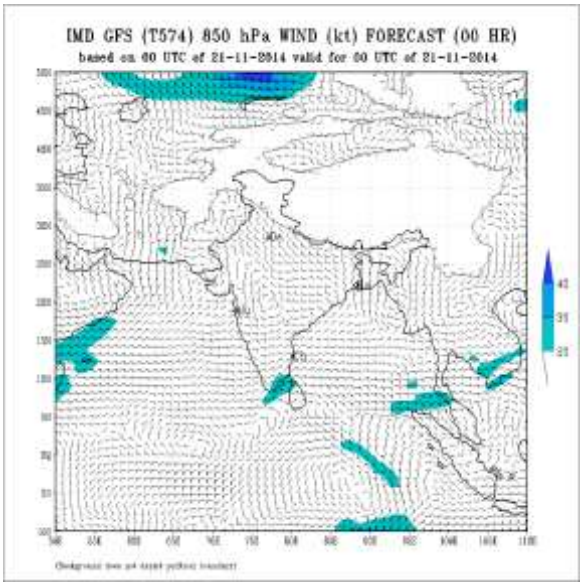

IMD GFS (T574) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 21-11-2014 valid for 00 UTC of 22-11-2014

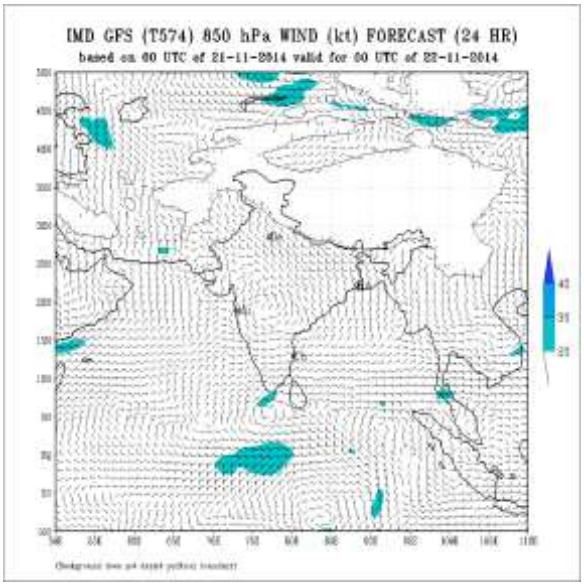

IMD GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 21-11-2014 valid for 00 UTC of 23-11-2014

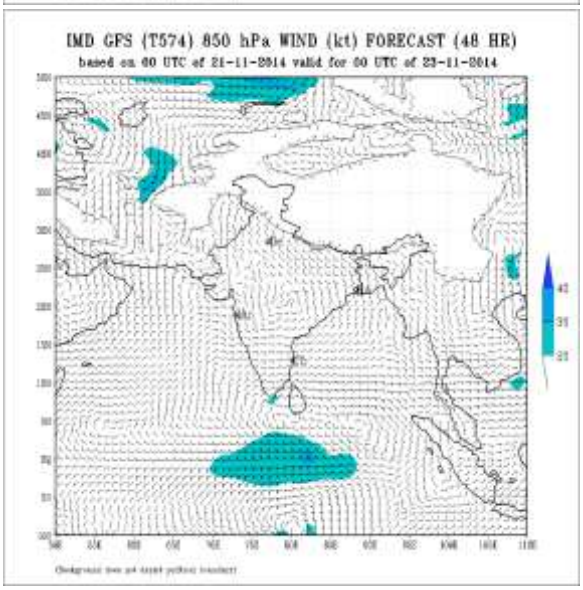

IMD GFS (T574) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 21-11-2014 valid for 00 UTC of 24-11-2014

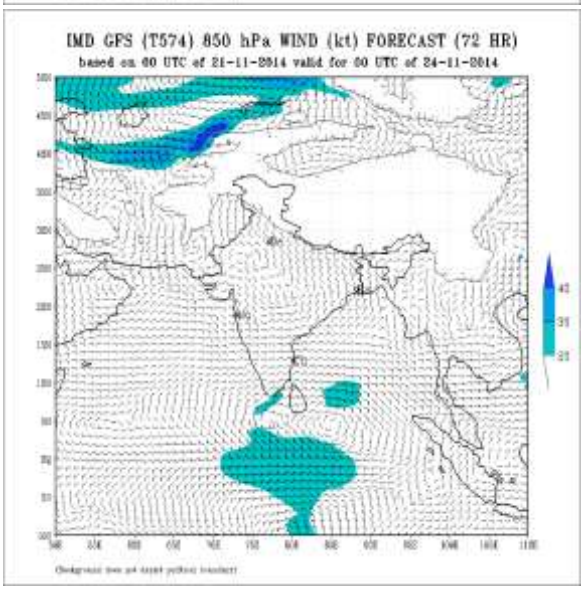

IMD GFS (T574) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 21-11-2014 valid for 00 UTC of 25-11-2014

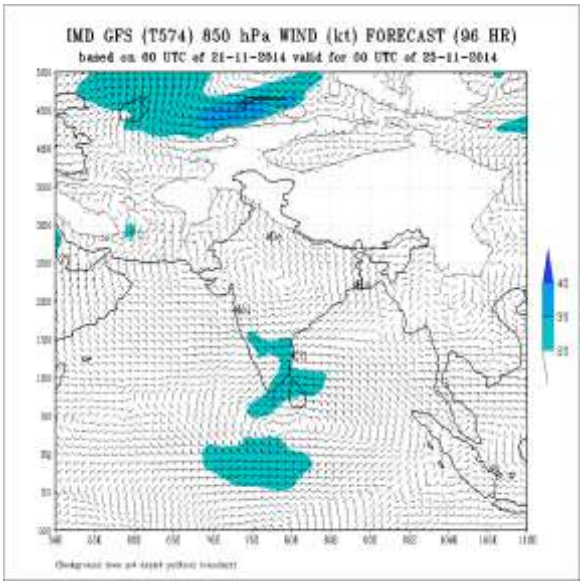

IMD GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 21-11-2014 valid for 00 UTC of 26-11-2014

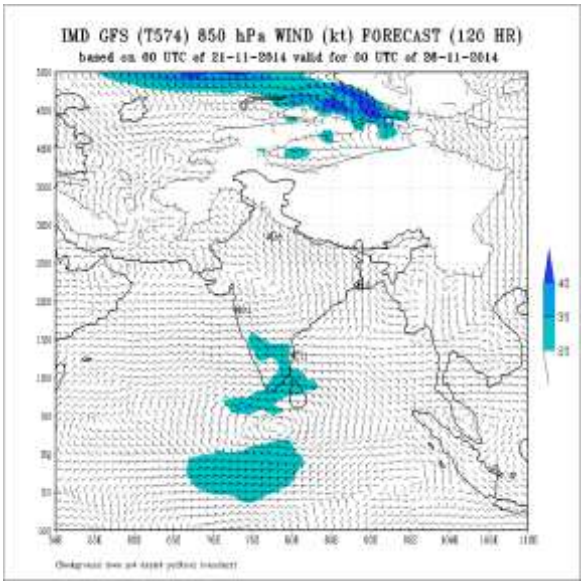

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 21-11-2014 valid for 00 UTC of 21-11-2014

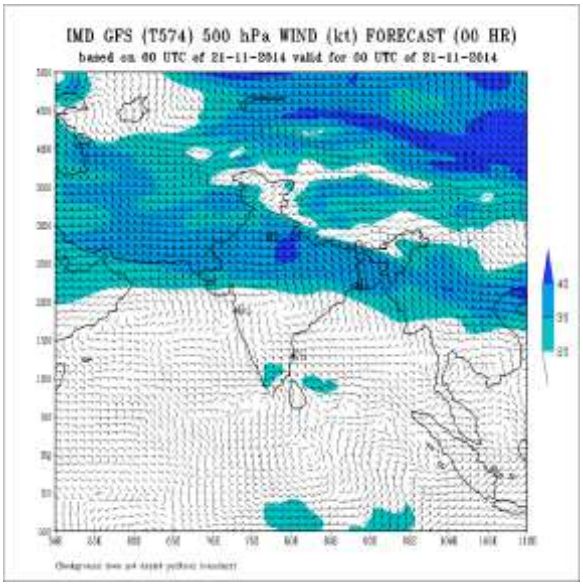

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 21-11-2014 valid for 00 UTC of 22-11-2014

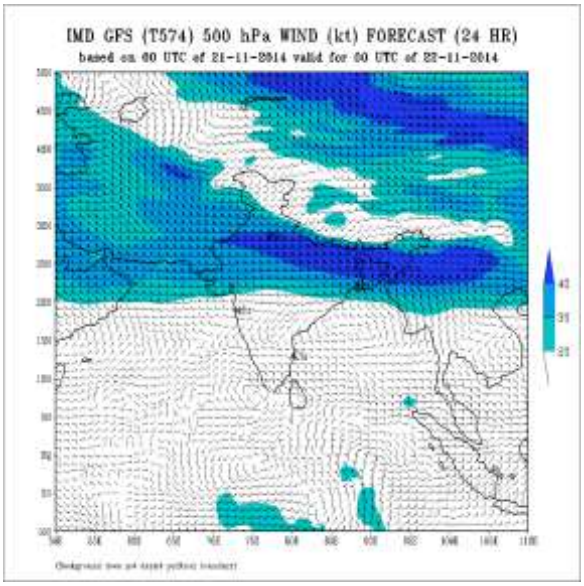

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 21-11-2014 valid for 00 UTC of 23-11-2014

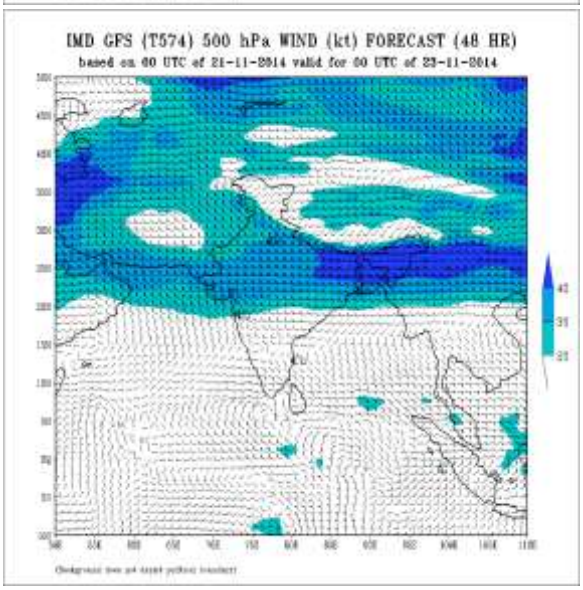

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 21-11-2014 valid for 00 UTC of 24-11-2014

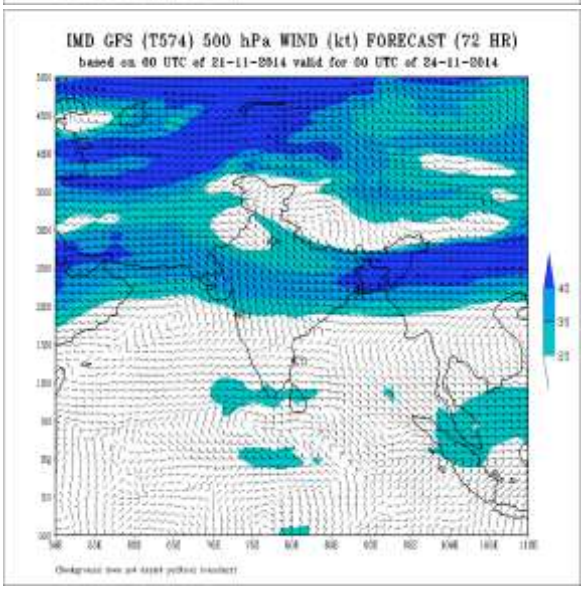

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 21-11-2014 valid for 00 UTC of 25-11-2014

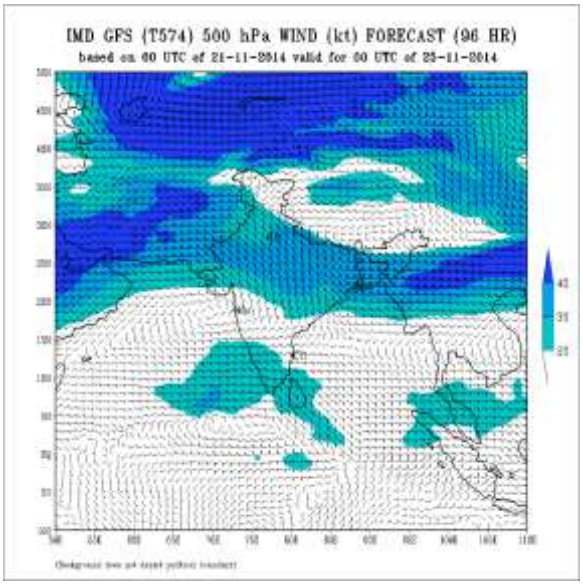

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 21-11-2014 valid for 00 UTC of 26-11-2014

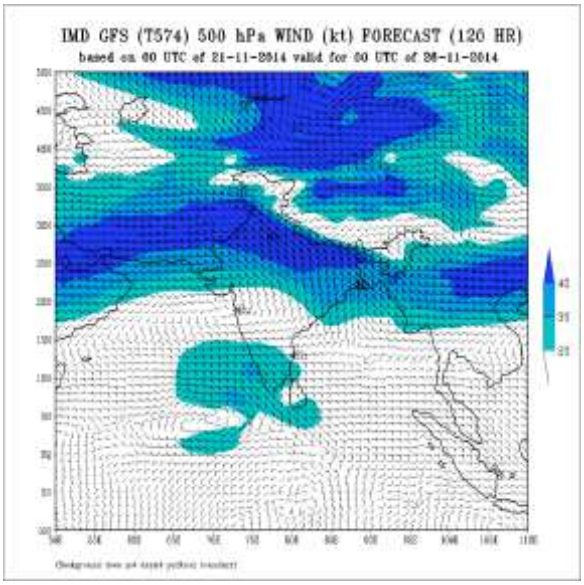

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 21-11-2014 valid for 00 UTC of 21-11-2014

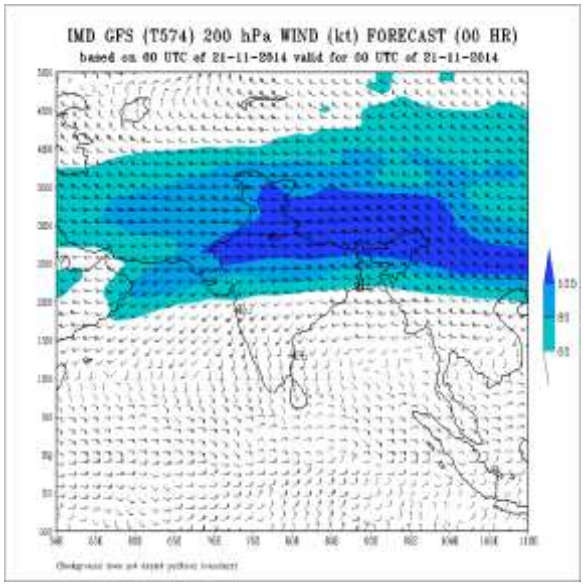

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 21-11-2014 valid for 00 UTC of 22-11-2014

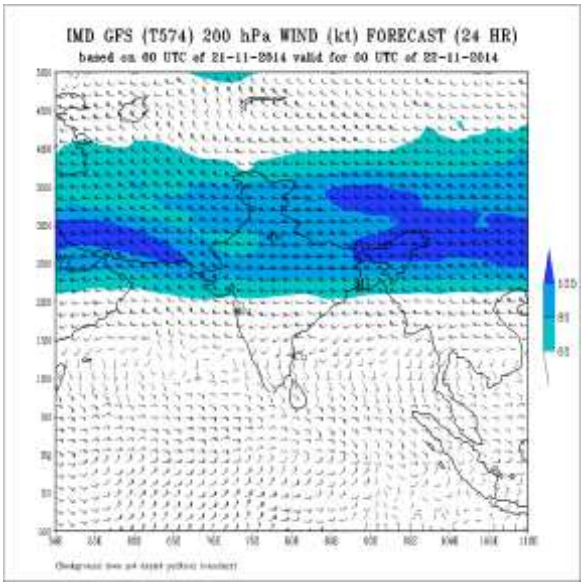

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 21-11-2014 valid for 00 UTC of 23-11-2014

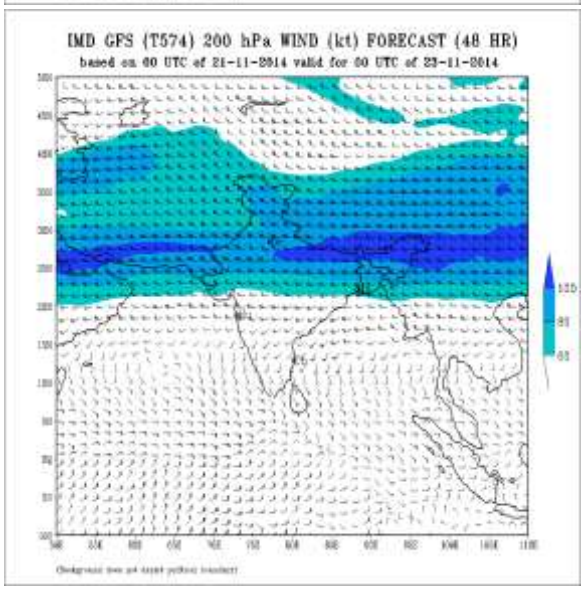

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 21-11-2014 valid for 00 UTC of 24-11-2014

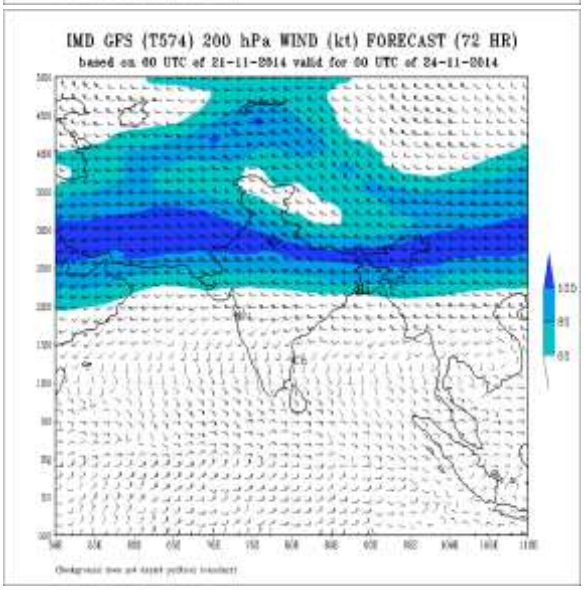

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 21-11-2014 valid for 00 UTC of 25-11-2014

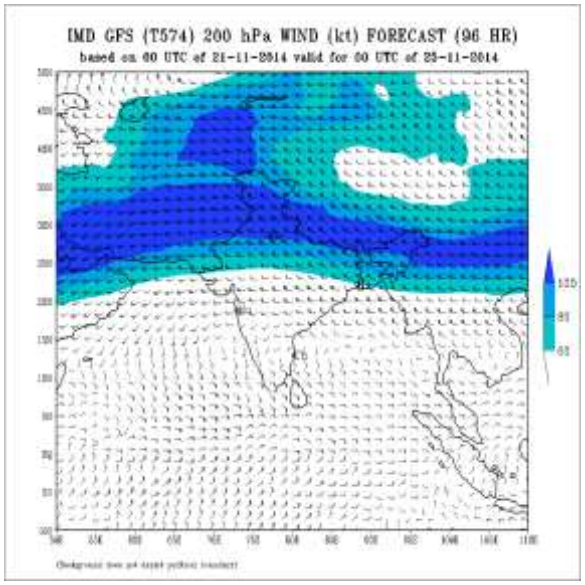

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 21-11-2014 valid for 00 UTC of 26-11-2014

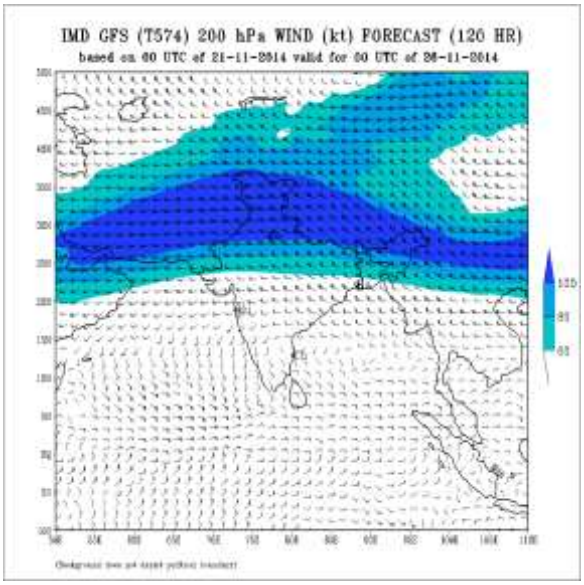

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 21-11-2014 valid for 00 UTC of 21-11-2014

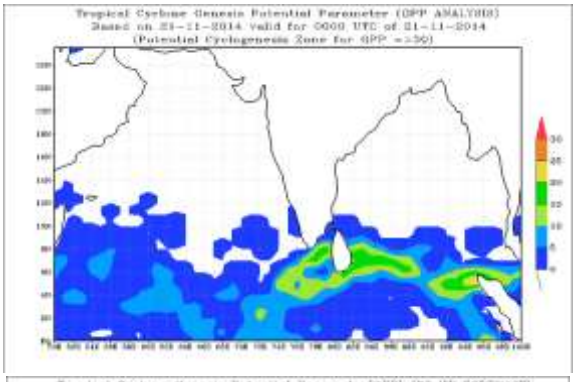
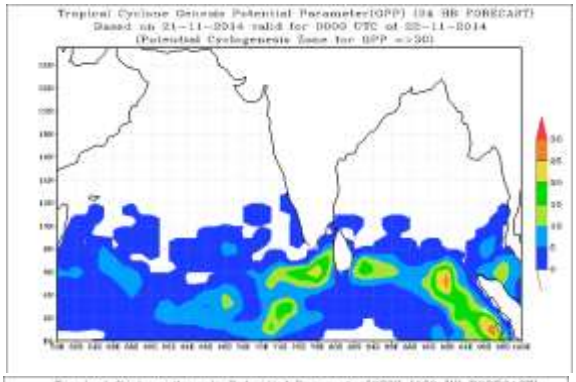
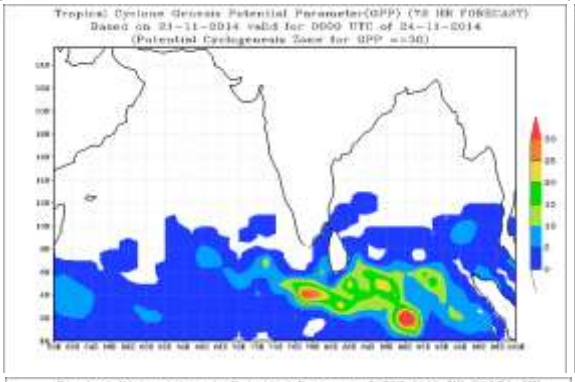
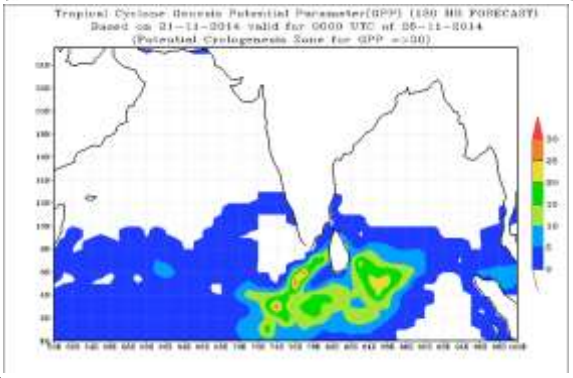
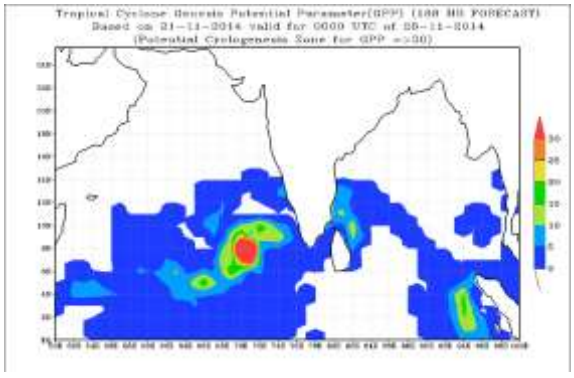

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 21-11-2014 valid for 00 UTC of 22-11-2014


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 21-11-2014 valid for 00 UTC of 23-11-2014


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 21-11-2014 valid for 00 UTC of 24-11-2014


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 21-11-2014 valid for 00 UTC of 25-11-2014


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 21-11-2014 valid for 00 UTC of 26-11-2014

FDP (Cyclone) NOC Report Dated 22 November, 2014

Synoptic features based on 0300 UTC of today:

- The trough of low at mean Sea level over southeast Arabian Sea & neighbourhood Persists
- The upper air cyclonic circulation over southwest Bay of Bengal off Sri Lanka coast now lies over Comorian area and extends up to 0.9 km above mean Sea level.

Environmental features based on 0300 UTC of today:

Sea Surface Temperature:

- Sea Surface Temperature is between 29-31^{0}C over the large parts of the Bay of Bengal, south Andaman Sea, Tenasserim coast and Arabian Sea.

Tropical Cyclone Heat Potential (TCHP):

- The ocean thermal energy is 110-120 kJ/cm^2 over Malay peninsula region and many of parts of South Bay of Bengal adjoining Andaman Sea

Relative Vorticity:

- Relative vorticity at 850 hPa is positive (25-50*10^{-5} s^{-1}) over Kerala coast Lakshadweep and south east Arabian Sea.

Convergence:

- Lower level convergence is positive (5-15*10^{-5} s^{-1}) over south of Latitude 10°N and negative over east of Andaman Sea and east central Arabian Sea.

Divergence:

- Upper level divergence is negative 05-10*10^{-5} s^{-1} over southwest bay adjoining west central Bay of Bengal and west central Arabian Sea. It is positive 5-20*10^{-5} s^{-1} over Malaya peninsular region and most parts of the south Bay of Bengal.

Wind Shear:

- Wind Shear is 05-20 knots over southern parts of Bay of Bengal adjoining Andaman Sea and Malaya peninsular region.

Wind Shear Tendency:

- The vertical wind shear tendency is increasing of order 5 to 10 knots over the most parts of the Bay of Bengal, Malay peninsular region and south parts of Arabian Sea. It is decreasing of order 5-10 knots over the westcentral Bay of Bengal.

Upper tropospheric ridge:

- The upper tropospheric **ridge** at 200 hPa passes through 10.0°N.

M.J.O. Index:

- Located in phase 3 with amplitude greater than 1.0. It would continue in phase 3 during next 3 days.

Storms and Depression over South China Sea:

- There is currently no Tropical Storm/Depression over South China Sea.

Status of observational system:

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

Satellite:
Inference based on INSAT imagery of 220900 UTC:

Bay of Bengal & Andaman Sea:-

- Scattered low/medium clouds with embedded moderate to intense convection over Bay south of Lat 11.0°N south Andaman Sea.

Arabian Sea:-

- Scattered low/medium clouds with embedded moderate to intense convection over south Arabian Sea south of Lat 11.0°N.

NWP Analysis

- The analysis of IMD-GFST574 model charts based on 0000 UTC of 22nd November 2014 show a trough in easterlies in the lower level lies over Arabian Sea off west coast. The trough may persist during next three days. A feeble cyclonic circulation lies over northeast Bay of Bengal and adjoining areas extending up to 850 hPa level and likely to move in a northward direction during next 72 hours. Another cyclonic circulation lies over comorin area & neighbourhood and extends up to 850 hPa level and likely to persist during next 48 hours. A cyclonic circulation extending up to 850 hPa level likely to form over south west Bay of Bengal during next 48 hours. Seasonal anticyclonic flow persists over central India during next 72 hours
- The WRF model analysis also shows a trough in easterlies over Arabian Sea off west coast in the lower level, the system likely to persist during next 48 hours. A cyclonic circulation lies over Bangladesh and adjoining areas of Assam extending up to 850 hPa level and likely to persist during next 72 hours. Another upper air cyclonic circulation lies over Comorin area & neighborhood and extends up to 850 hPa level and likely to persist during next three days.
- The Genesis Potential Parameter (GPP) analysis and forecasts based on 0000 UTC of 22nd November 2014 shows a moderate GPP zone over north Indian Ocean around 6°N latitude and south west of Sri Lanka coast. The GPP zone likely to intensify and persist over the same area during next 24 hours and thereafter moves in a south east ward direction during next 72 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-UKMO** model does not suggest any cyclogenesis over Bay of Bengal during the next 5 days.
- **NCMRWF-GFS** model does not suggest any cyclogenesis over Bay of Bengal during the next 5 days.
- **ECMWF Model** does not suggest any cyclogenesis over Bay of Bengal during the next 5 days.

Summary and Conclusion:
There is no cyclogenesis expected over north Indian Ocean during next five days.

Advisory: No IOP for next five days.

Annexure-I

Status of Observation system:

Synoptic observation:

Region	Date/Time (UTC)		
	21/12	**22/00**	**22/03**
India	41	30	41
Coastal stations			
WB	6	3	6
Odisha	6	5	6
AP	12	12	12
Tamil Nadu	9	7	9
Puducherry	2	2	2
A & N	6	1	6
Bangladesh	11	7	11
Myanmar	10	10	9
Thailand	2	2	2
Sri Lanka	8	8	8

AWS Observations:

Region	Date/Time (UTC)		
	21/12	**22/00**	**22/03**
India	63	61	68
Coastal stations			
WB	9	8	9
Odisha	6	4	9
AP	25	26	27
Tamil Nadu	22	22	22
Puducherry	1	1	1
A & N	-	-	-

- **RS/RW** (12Z) of 21/11/2014 **-1/39**
- **No. of Ascents reaching 250 hPa level: 1, MISDA: 38**
- **RS/RW** (00Z) of 22/11/2014-19**/39**
- **No. of Ascents reaching 250 hPa level: 8, MISDA: 10**

No. of PILOT Ascents

21/12Z	22/00Z
2	0

Buoy Data

2112Z	22/00Z	22/03Z
18	18	18

FOC CHENNAI: STATUS OF OBSERVATION

No. of Synop data

Date→	**21.11.2014**							
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 /21.11.2014 : 2

No. of Ascents reaching 250 hPa level = 2

MISDA : 6

12Z /21.11.2014 : --

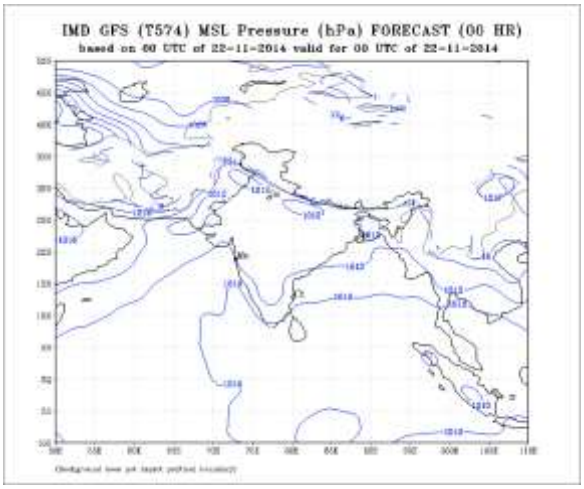
No. of Ascents reaching 250 hPa level = --

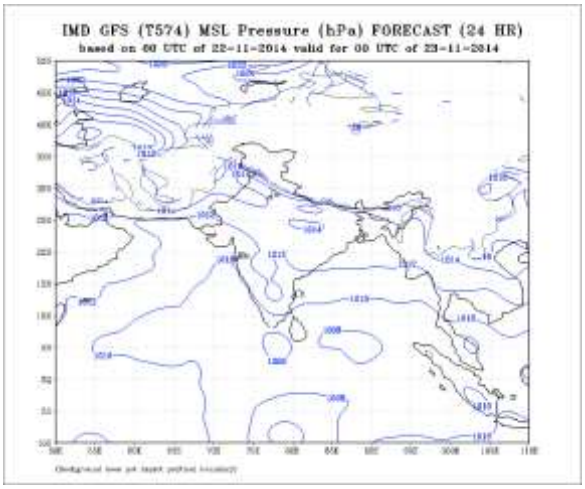
MISDA : 8

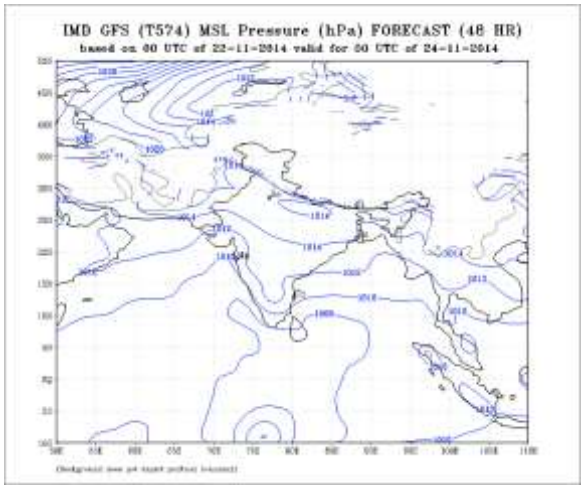
No. of PILOT Ascents:

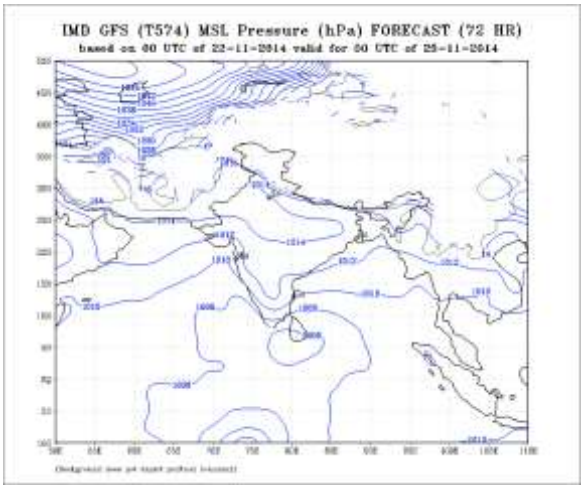
21.11.2014	
06Z	18Z
3	3

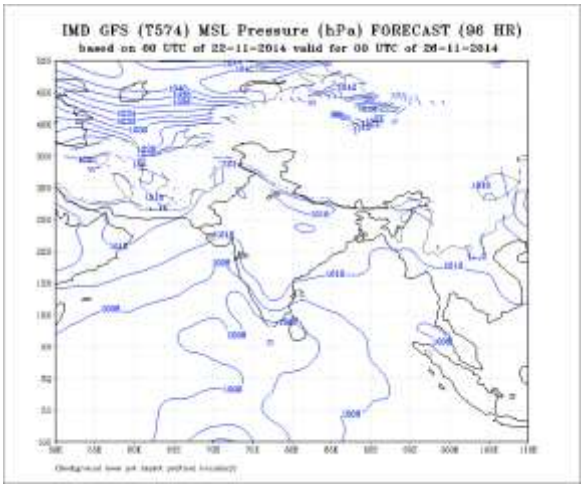
Annexure-II

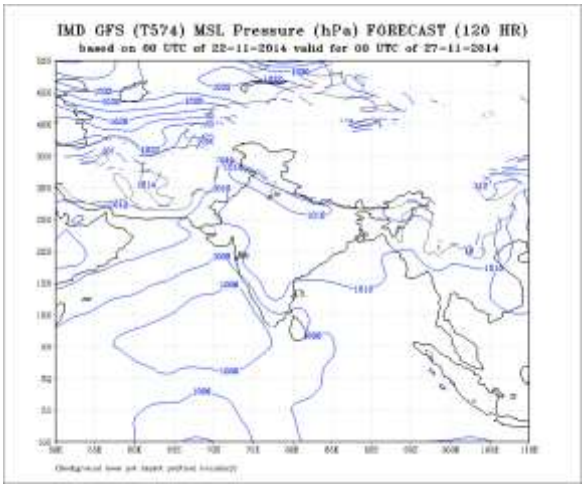

IMD GFS (T574) MSL Pressure (hPa) FORECAST (00 HR)
based on 00 UTC of 22-11-2014 valid for 00 UTC of 22-11-2014

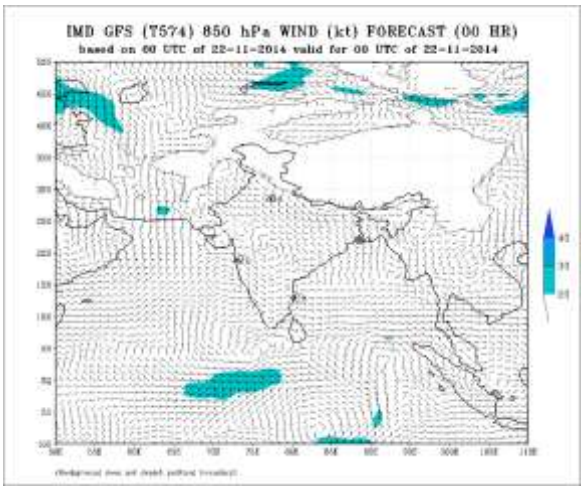

IMD GFS (T574) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 22-11-2014 valid for 00 UTC of 23-11-2014

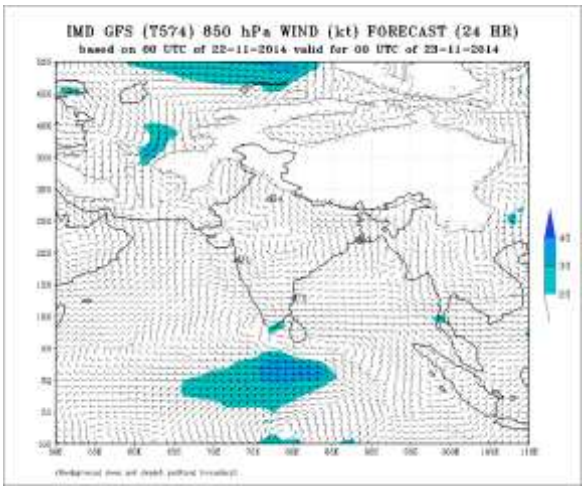

IMD GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 22-11-2014 valid for 00 UTC of 24-11-2014

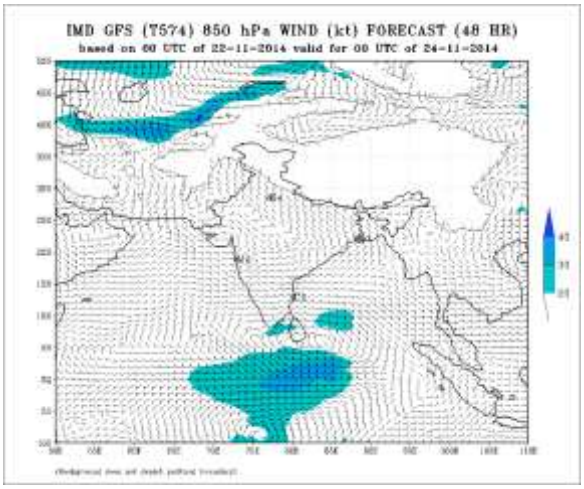

IMD GFS (T574) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 22-11-2014 valid for 00 UTC of 25-11-2014

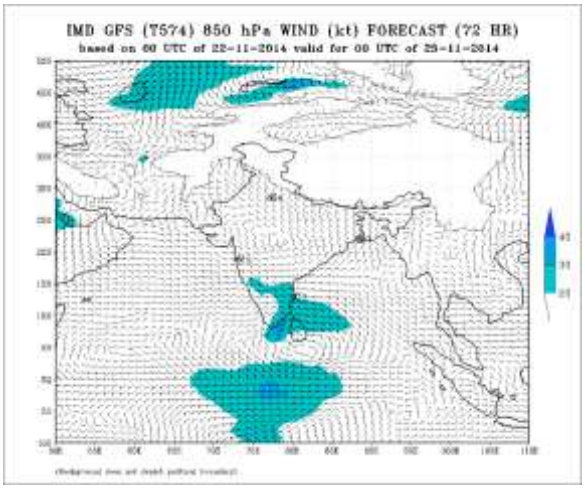

IMD GFS (T574) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 22-11-2014 valid for 00 UTC of 26-11-2014

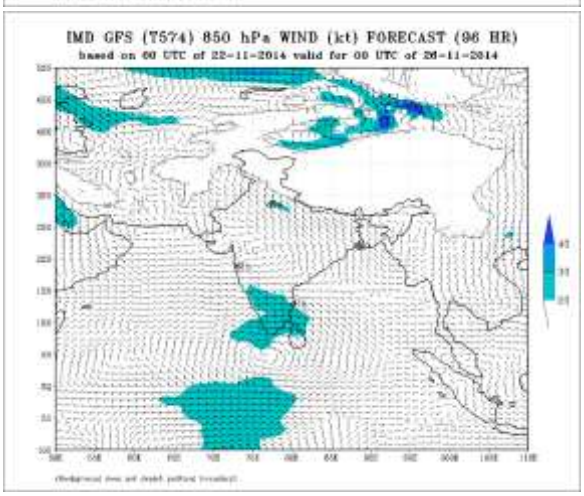

IMD GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 22-11-2014 valid for 00 UTC of 27-11-2014

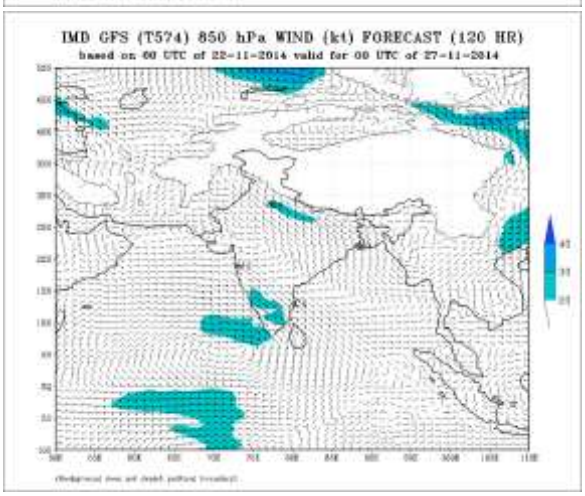

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 22-11-2014 valid for 00 UTC of 22-11-2014

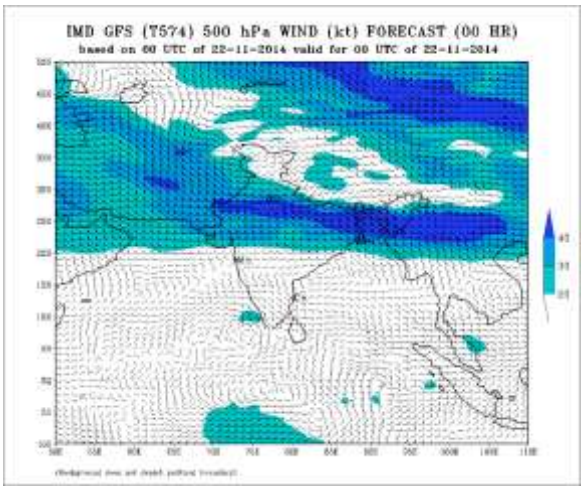

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 22-11-2014 valid for 00 UTC of 23-11-2014

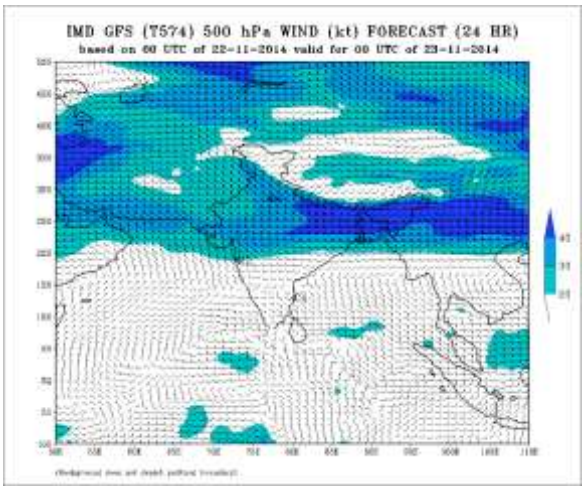

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 22-11-2014 valid for 00 UTC of 24-11-2014

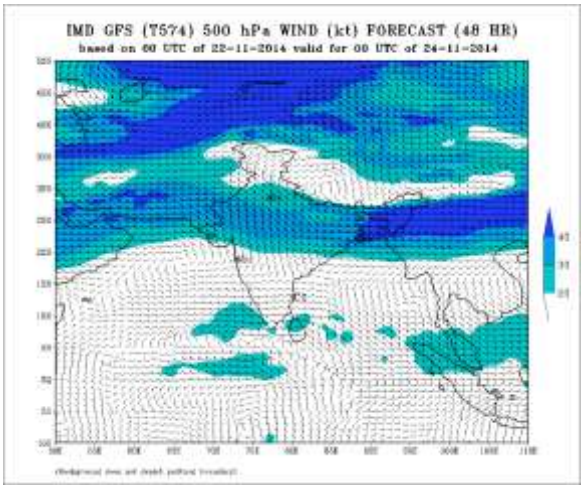

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 22-11-2014 valid for 00 UTC of 25-11-2014

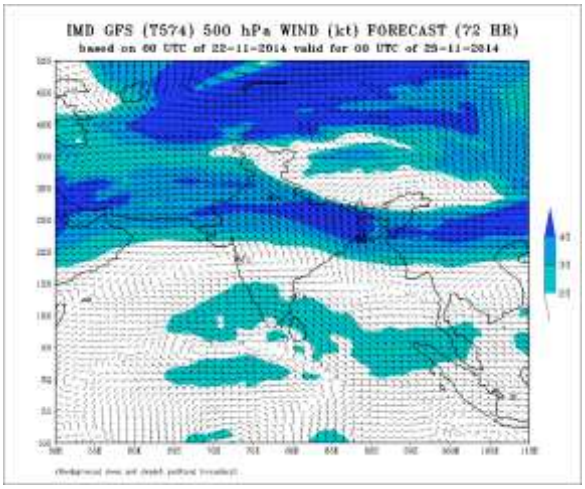

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 22-11-2014 valid for 00 UTC of 26-11-2014

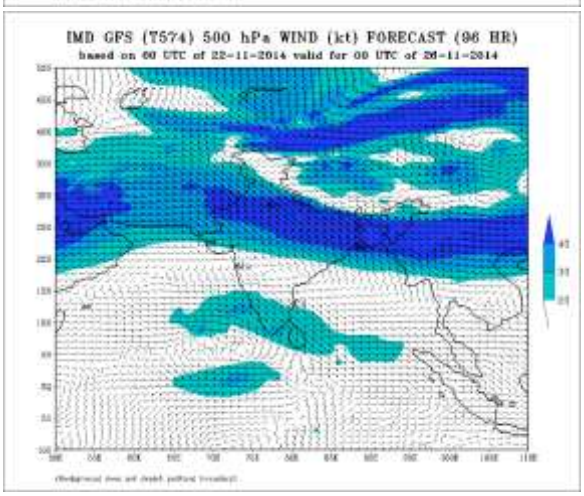

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 22-11-2014 valid for 00 UTC of 27-11-2014

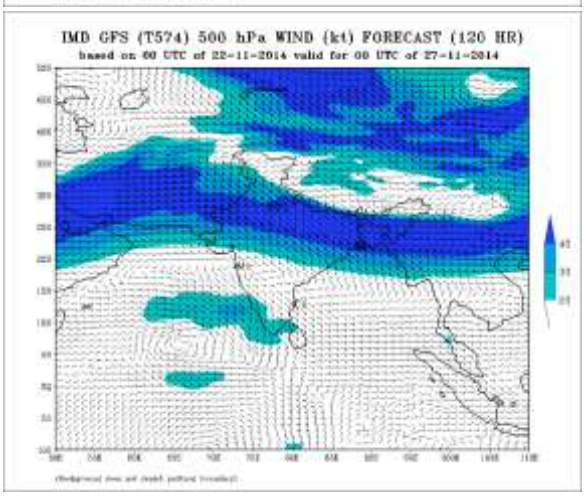

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 22-11-2014 valid for 00 UTC of 22-11-2014

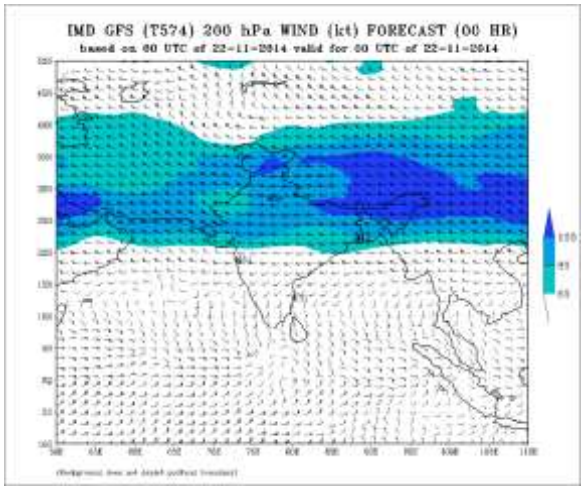

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 22-11-2014 valid for 00 UTC of 23-11-2014

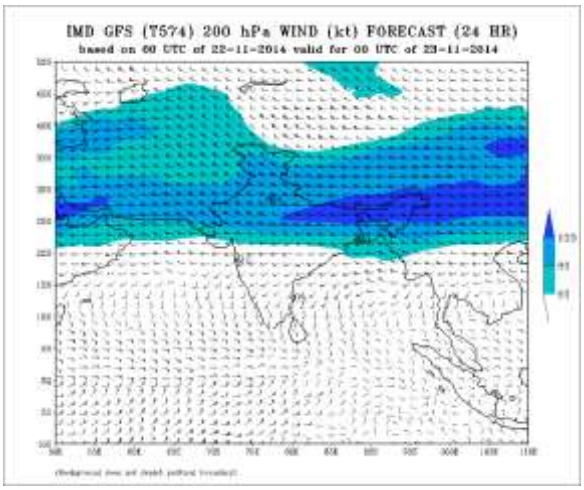

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 22-11-2014 valid for 00 UTC of 24-11-2014

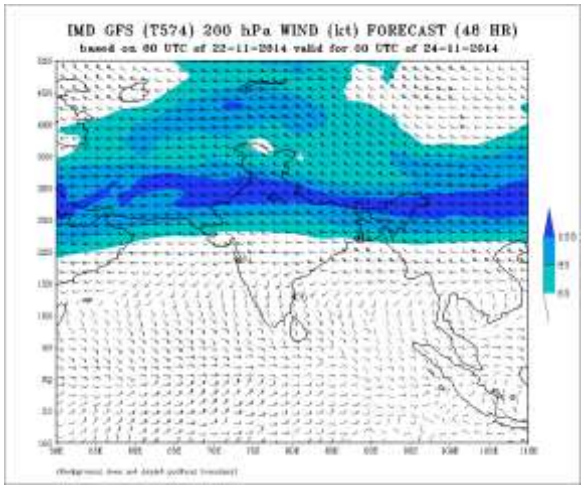

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 22-11-2014 valid for 00 UTC of 25-11-2014

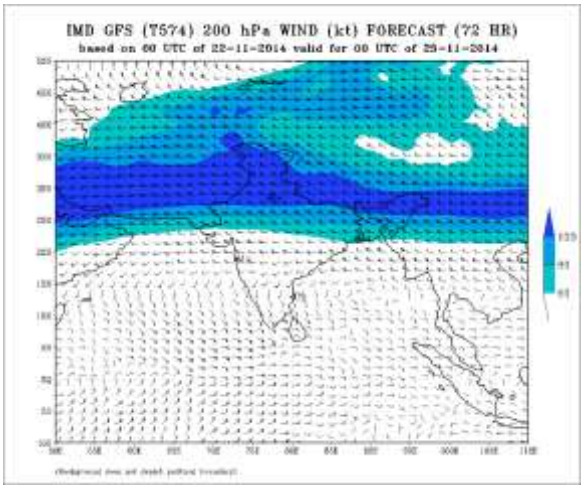

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 22-11-2014 valid for 00 UTC of 26-11-2014

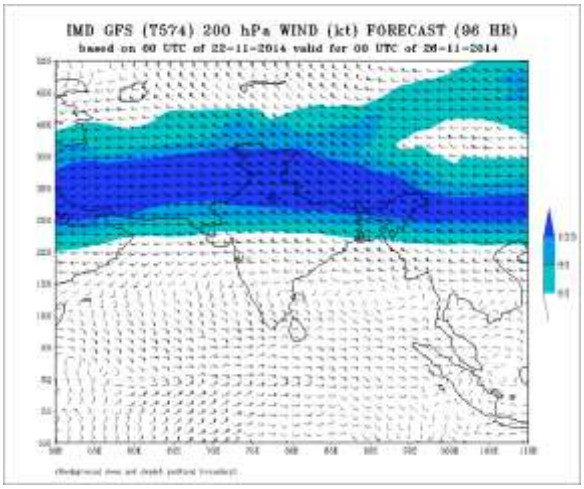

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 22-11-2014 valid for 00 UTC of 27-11-2014

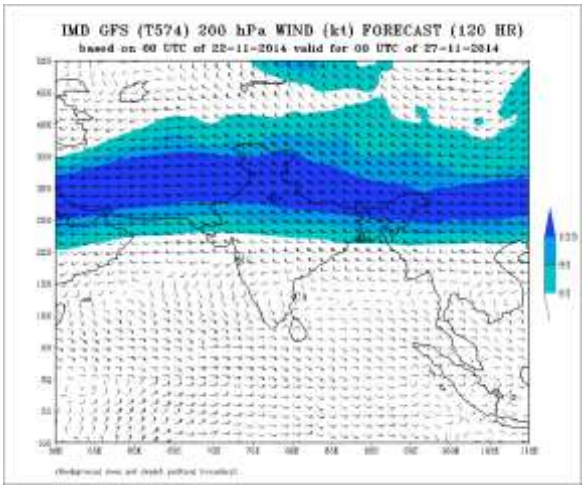

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 22-11-2014 valid for 00 UTC of 22-11-2014

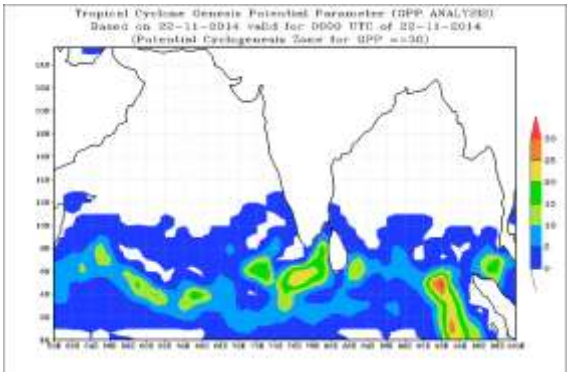

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 22-11-2014 valid for 00 UTC of 23-11-2014

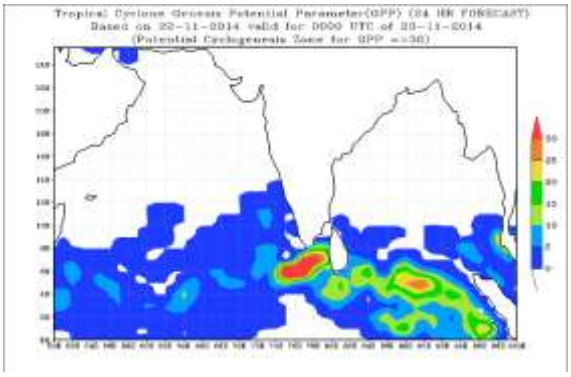

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 22-11-2014 valid for 00 UTC of 24-11-2014

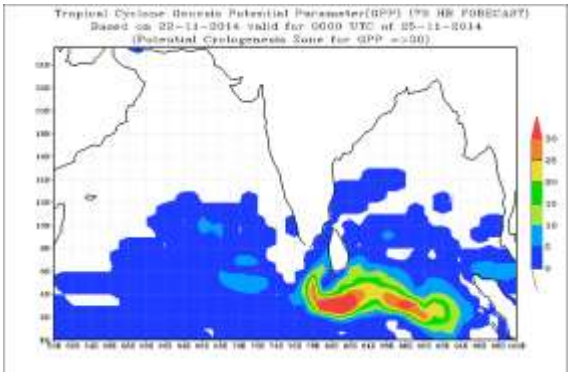
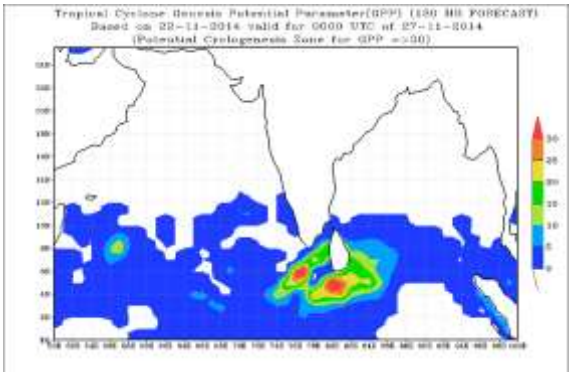
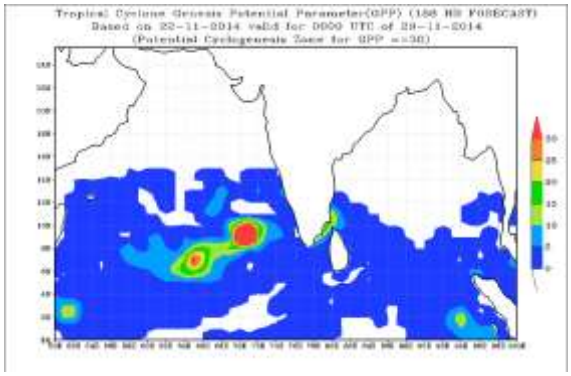

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 22-11-2014 valid for 00 UTC of 25-11-2014


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 22-11-2014 valid for 00 UTC of 26-11-2014


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 22-11-2014 valid for 00 UTC of 27-11-2014


Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 22-11-2014 valid for 0000 UTC of 22-11-2014
(Potential Cyclogenesis Zone for GPP >=30)


Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 22-11-2014 valid for 0000 UTC of 23-11-2014
(Potential Cyclogenesis Zone for GPP >=30)

FDP (Cyclone) NOC Report Dated 23 November, 2014

Synoptic features based on 0300 UTC of today:

- The trough of low at mean Sea level over southeast Arabian Sea & neighbourhood persists.
- The upper air cyclonic circulation over Comorin area & neighbourhood now lies over Lakshadweep area & neighbourhood and extends upto 0.9 km above mean Sea level.
- An upper air cyclonic circulation lies over south Andaman Sea & adjoining southeast Bay of Bengal and extends upto 1.5 km above mean Sea level. Under its influence a low pressure area may form over southwest Bay of Bengal around 25th November.

Environmental features based on 0300 UTC of today:

Sea Surface Temperature:

- Sea Surface Temperature is between 27-29^{0}C over most parts of the Bay of Bengal and Andaman Sea.

- It is between 28-29^{0}C over eastern parts of Arabian Sea and 26-28 ^{0}C over the western parts of Arabian Sea.

Tropical Cyclone Heat Potential (TCHP):

- The ocean thermal energy is around 100 kJ/cm^2 over extreme southeast Bay of Bengal and Andaman Sea adjoining Malay peninsula region . It is 40-60 kJ/cm^2 over the rest of the Bay of Bengal and Andaman Sea.
- It is 40-60 kJ/cm^2 over western parts of Arabian Sea and 60-80 kJ/cm^2 over the eastern parts of the Arabian Sea.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive over the equatorial parts of the Bay of Bengal (30-50*10^{-5} s^{-1}) and Arabian Sea (20-40*10^{-5} s^{-1}).

Convergence:

- Lower level convergence is positive (10-20 *10^{-5} s^{-1}) over southwest Bay of Bengal.It is 5-10*10^{-5} s^{-1} over parts of southeast Bay of Bengal and southeast Arabian Sea.

Divergence:

- Upper level divergence is positive 10-20*10^{-5} s^{-1} over southwest Bay of Bengal and extreme southeast Arabian Sea.

Wind Shear:

- Wind Shear is 10-20 knots over southern Bay of Bengal and Arabian Sea. It is 30-50 knots in the northern parts of Bay of Bengal and Arabian Sea.

Wind Shear Tendency:

- The vertical wind shear tendency is negative (-5 to -10 knots) over eastcentral Bay ofBengal. It is positive over the southeast Arabian Sea (10-20 knots).

Upper tropospheric ridge:

- The upper tropospheric **ridge** at 200 hPa passes through 12.0°N.

M.J.O. Index:

- Located in phase 3 with amplitude greater than 1.0. It would move to phase 2 during the next 2-3 days.

Storms and Depression over South China Sea:

- There is currently no Tropical Storm/Depression over South China Sea.

Status of observational system:

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

Satellite:

Inference based on INSAT imagery of 230900 UTC:

Bay of Bengal & Andaman Sea:-

- Broken low and medium clouds with embedded moderate to intense convection over south Bay of Bengal south of latitude 10.0°N and south Andaman Sea.

Arabian Sea:-

- Broken low and medium clouds with embedded moderate to intense convection over southeast Arabian Sea between latitude 6.0°N to 13.0°N and longitude 68.0°E to 74.5°E and Lakshadweep in association with low level convergence over the area.
- No significant clouds over rest of the Arabian Sea.

NWP Analysis

- The analysis of IMD-GFST574 model charts based on 0000 UTC of 23rd November 2014 show a feeble trough in easterlies in the lower level lies over Arabian Sea off west coast. The trough may persist during next 24 hours. A cyclonic circulation lies over south east Arabian Sea and adjoining areas extending up to 850 hPa level and likely to persist during next 24 hours. Another cyclonic circulation extending up to 850 hPa level lies over southwest Bay of Bengal and likely to persist during next 72 hours . Seasonal anticyclonic flow persists over central India during next72 hours
- The WRF model analysis also shows a feeble trough in easterlies over Arabian Sea off west coast in the lower level, the system likely to persist during next 24 hours. A cyclonic circulation lies over comorin area & neighbourhood extending up to 850 hPa level and likely to persist during next 24 hours. Another cyclonic circulation extending up to 850 hPa level lies over southwest Bay of Bengal and adjoining areas, the system likely to persist during next 72 hours. Seasonal anticyclonic flow persists over central India during next72 hours.
- The Genesis Potential Parameter (GPP) analysis and forecasts based on 0000 UTC of 23rd November 2014 shows a moderate GPP zone over north Indian Ocean centred around 6°N latitude and 76°E longitude. The GPP zone likely to move in a southeast ward direction during next 72 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-UKMO** model does not suggest any cyclogenesis over Bay of Bengal during the next 5 days.
- **NCMRWF-GFS** model does not suggest any cyclogenesis over Bay of Bengal during the next 5 days.
- **ECMWF Model** does not suggest any cyclogenesis over Bay of Bengal during the next 5 days.

Summary and Conclusion:

There is no cyclogenesis expected over north Indian Ocean during next five days.

Advisory: No IOP for next five days.

Annexure-I

Status of Observation system:

Synoptic observation:

Region	Date/Time (UTC)		
	22/12	**23/00**	**23/03**
India	45	36	46
Coastal stations			
WB	7	3	8
Odisha	7	5	7
AP	12	12	12
Tamil Nadu	11	9	11
Puducherry	2	2	2
A & N	6	5	6
Bangladesh	11	0	11
Myanmar	10	11	10
Thailand	0	0	0
Sri Lanka	8	7	8

AWS Observations:

Region	Date/Time (UTC)		
	22/12	**23/00**	**23/03**
India	65	68	76
Coastal stations			
WB	7	8	11
Odisha	6	6	12
AP	28	30	29
Tamil Nadu	24	23	23
Puducherry	1	1	1
A & N	-	-	-

- **RS/RW** (12Z) of 22/11/2014 **-1/39**
- **No. of Ascents reaching 250 hPa level: 1, MISDA: 38**
- **RS/RW** (00Z) of 23/11/2014-9**/39**
- **No. of Ascents reaching 250 hPa level: 7, MISDA: 30**

No. of PILOT Ascents

22/12Z	**23/00Z**
25	25

Buoy Data

2212Z	**23/00Z**	**23/03Z**
9	9	10

FOC CHENNAI: STATUS OF OBSERVATION

No. of Synop data

Date→	**22.11.2014**							
UTC→	**00**	**03**	**06**	**09**	**12**	**15**	**18**	**21**
Chennai Region (Coasts of AP & TN)	**20**	**22**	**19**	**20**	**22**	**20**	**20**	**20**

No. of RS/RW Ascents

00Z /22.11.2014 : 2

No. of Ascents reaching 250 hPa level = 2

MISDA : 6

12Z /22.11.2014 : --

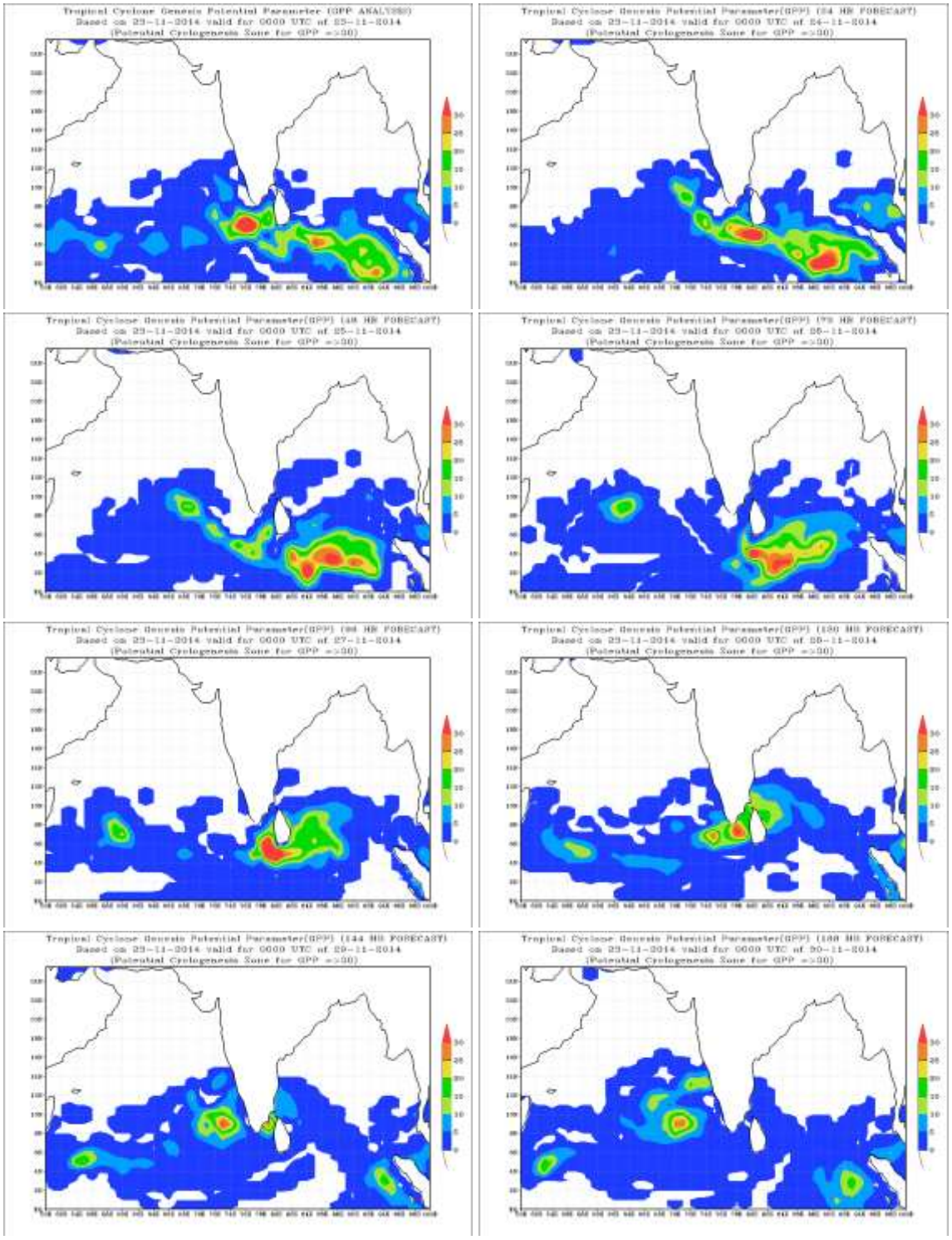
No. of Ascents reaching 250 hPa level = --

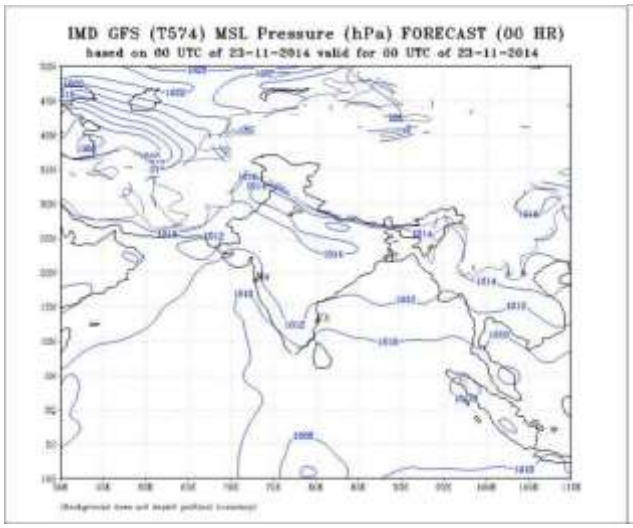
MISDA : 8

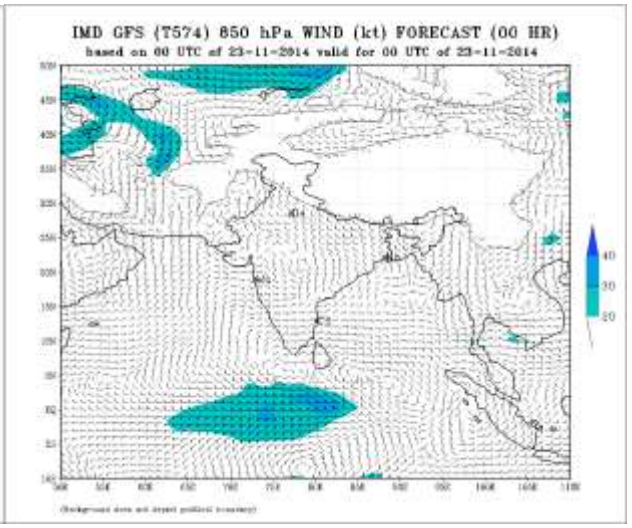
No. of PILOT Ascents:

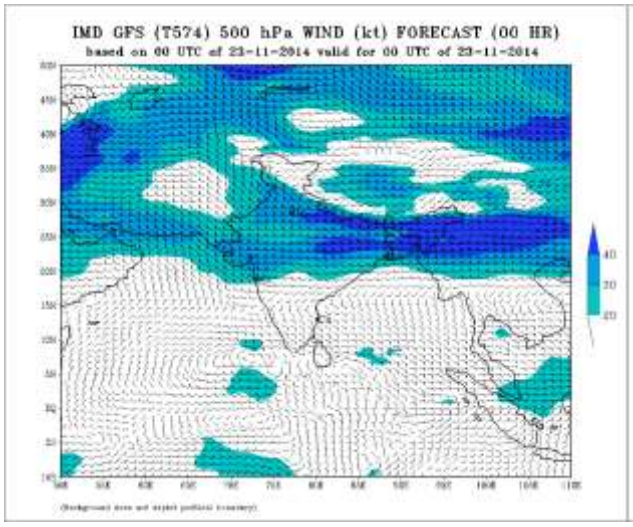
22.11.2014	
06Z	18Z
3	4

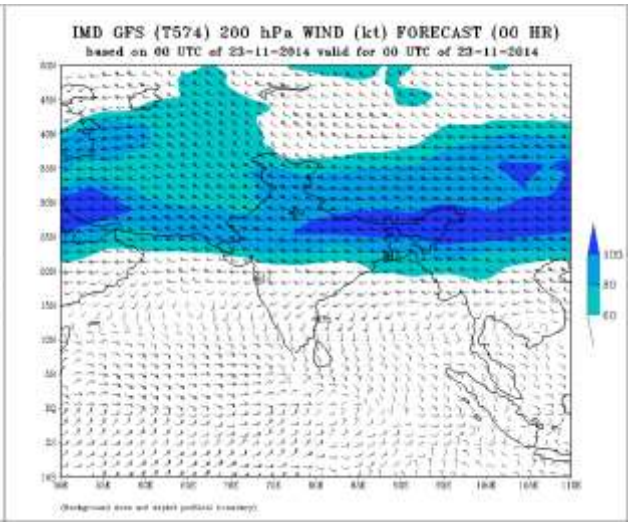
Annexure-II




IMD GFS (T574) MSL Pressure (hPa) FORECAST (00 HR)
based on 00 UTC of 23-11-2014 valid for 00 UTC of 23-11-2014


IMD GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 23-11-2014 valid for 00 UTC of 23-11-2014


IMD GFS (T574) 500 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 23-11-2014 valid for 00 UTC of 23-11-2014


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (00 HR)
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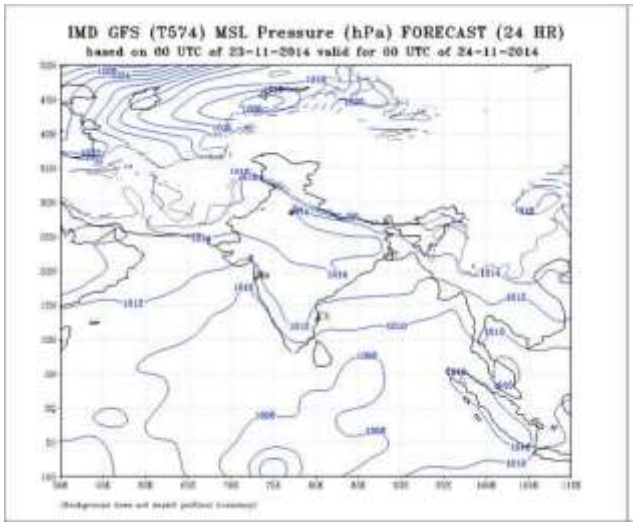
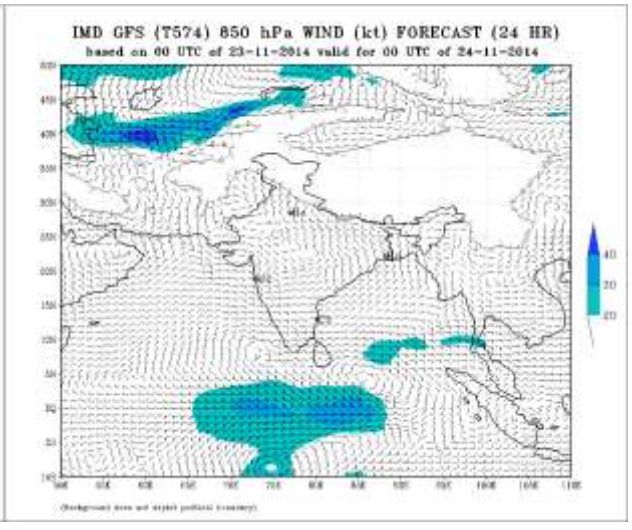
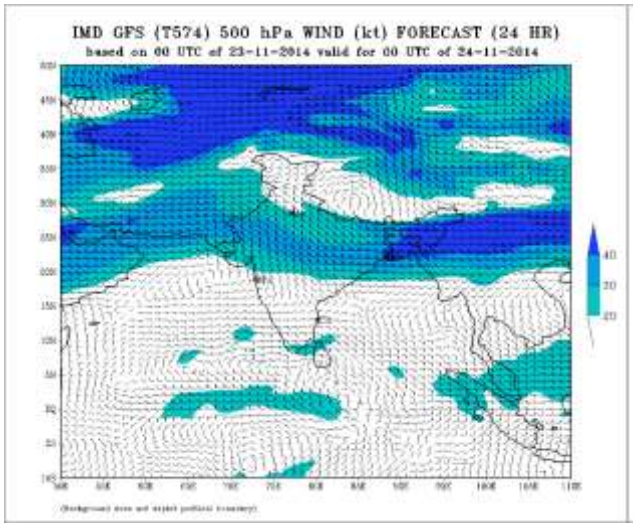

IMD GFS (T574) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 23-11-2014 valid for 00 UTC of 24-11-2014


IMD GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 23-11-2014 valid for 00 UTC of 24-11-2014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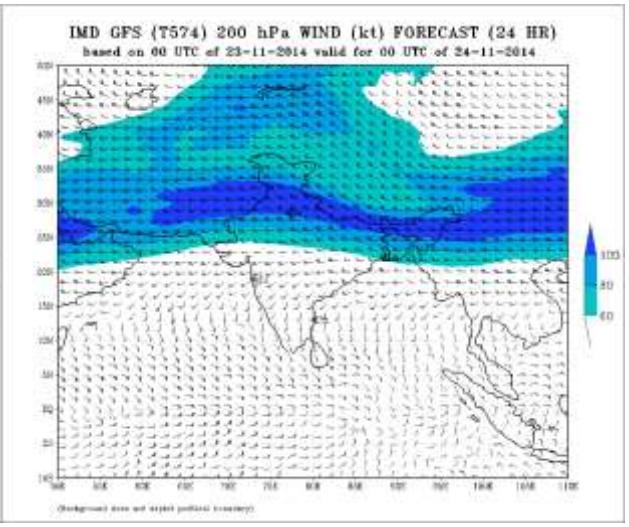
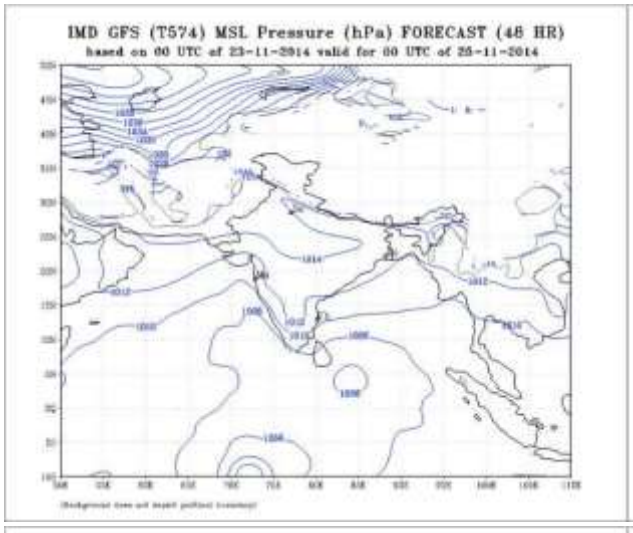
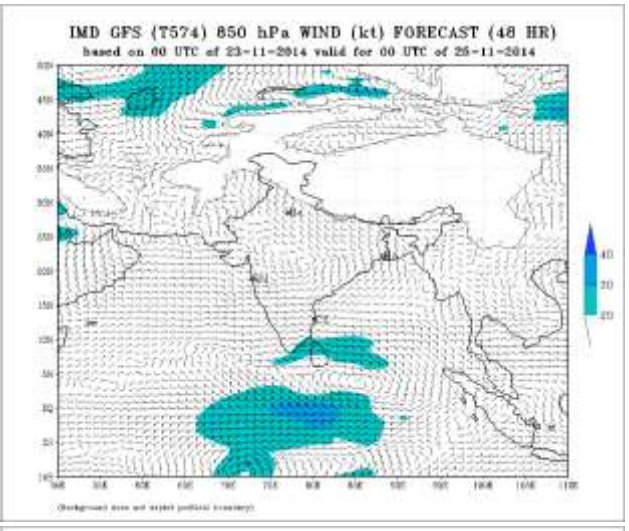
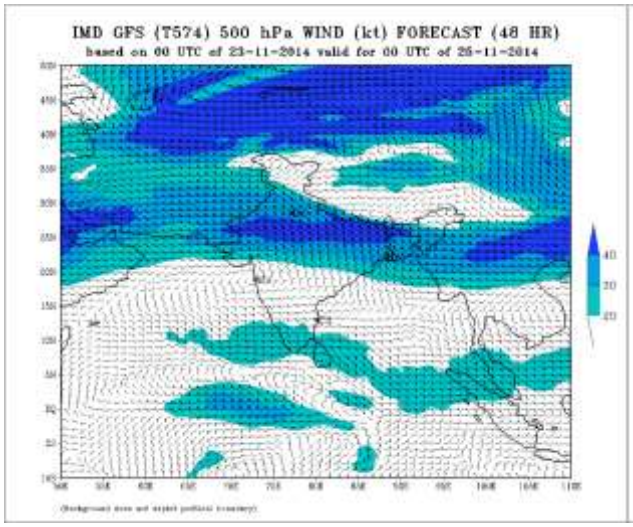
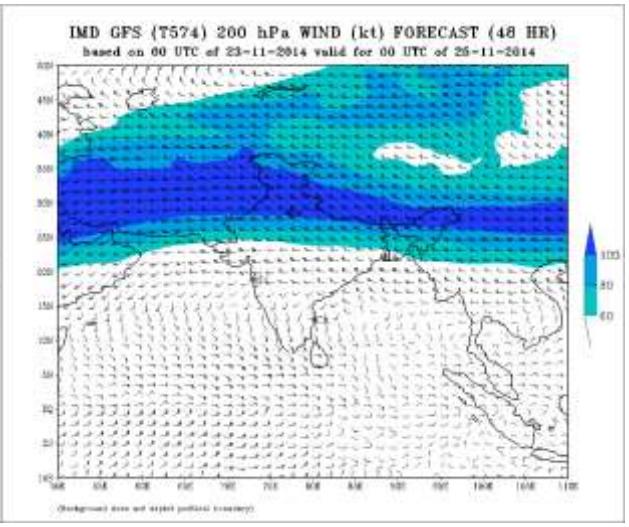
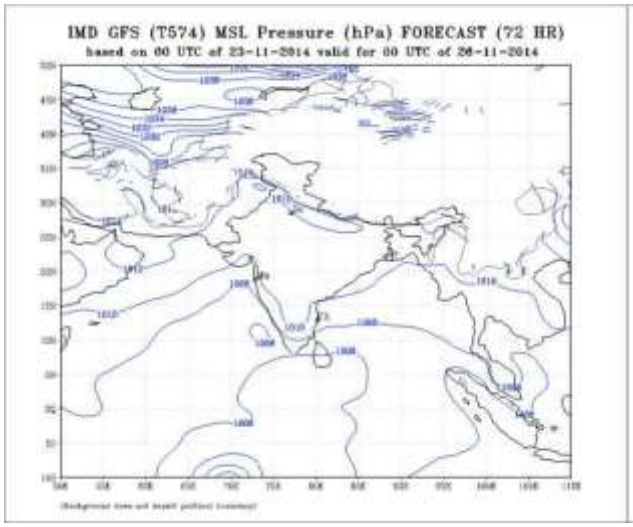

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 23-11-2014 valid for 00 UTC of 24-11-2014

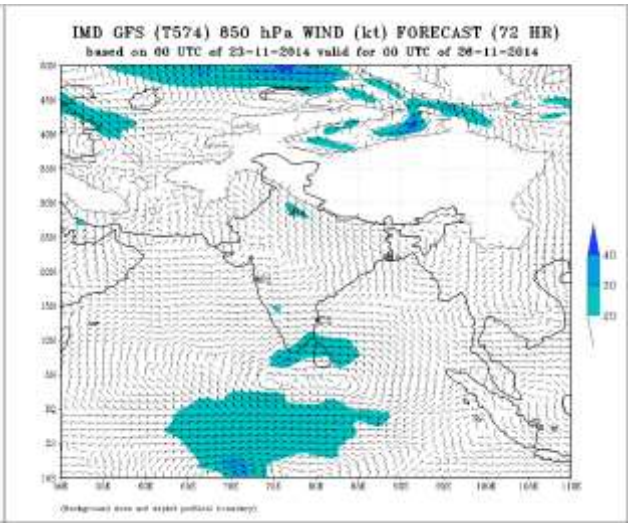

IMD GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 23-11-2014 valid for 00 UTC of 25-11-2014

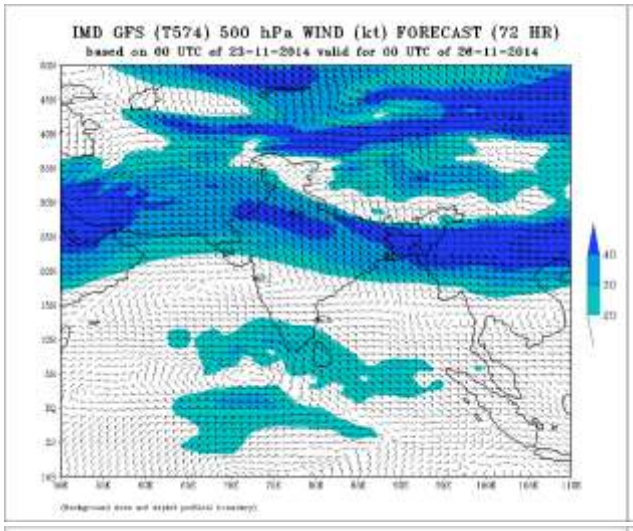

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 23-11-2014 valid for 00 UTC of 25-11-2014

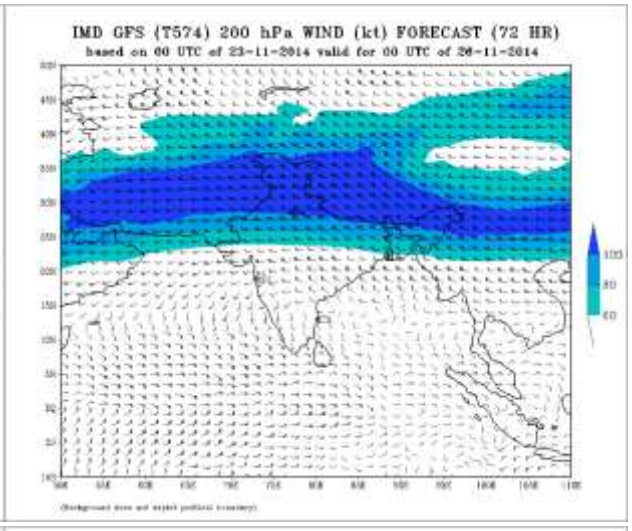

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 23-11-2014 valid for 00 UTC of 25-11-2014

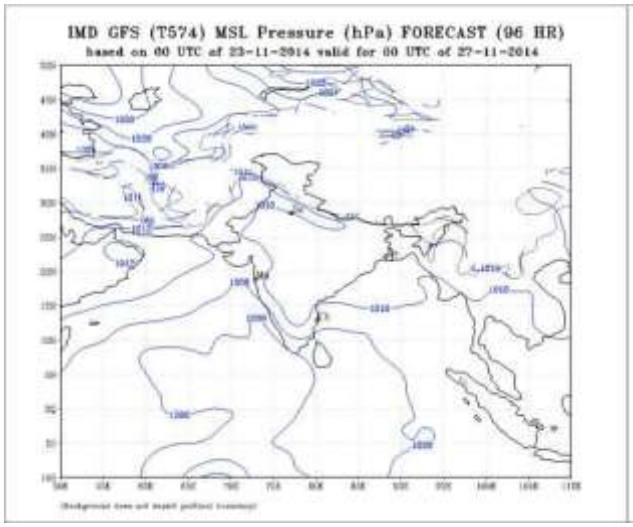

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 23-11-2014 valid for 00 UTC of 25-11-2014

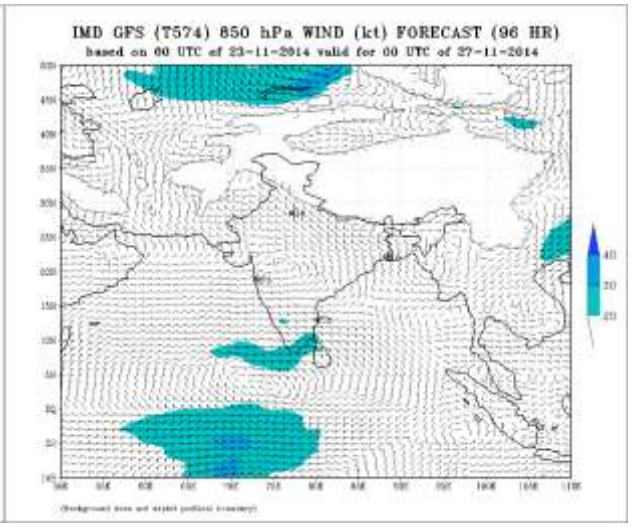

IMD GFS (T574) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 23-11-2014 valid for 00 UTC of 26-11-2014

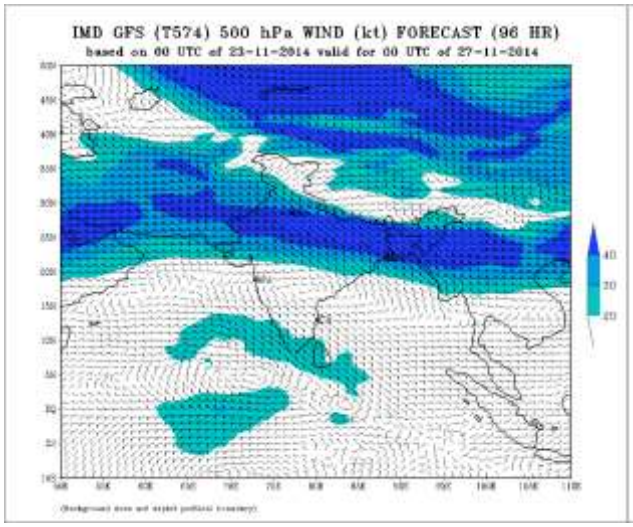

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 23-11-2014 valid for 00 UTC of 26-11-2014


IMD GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 23-11-2014 valid for 00 UTC of 26-11-2014


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 23-11-2014 valid for 00 UTC of 26-11-2014


IMD GFS (T574) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 23-11-2014 valid for 00 UTC of 27-11-2014


IMD GFS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 23-11-2014 valid for 00 UTC of 27-11-2014


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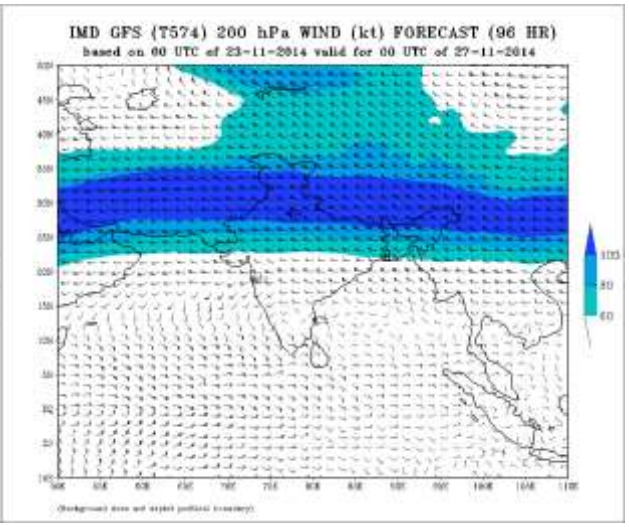
IMD GFS (T574) 200 hPa WIND (kt) FORECAST (96 HR)
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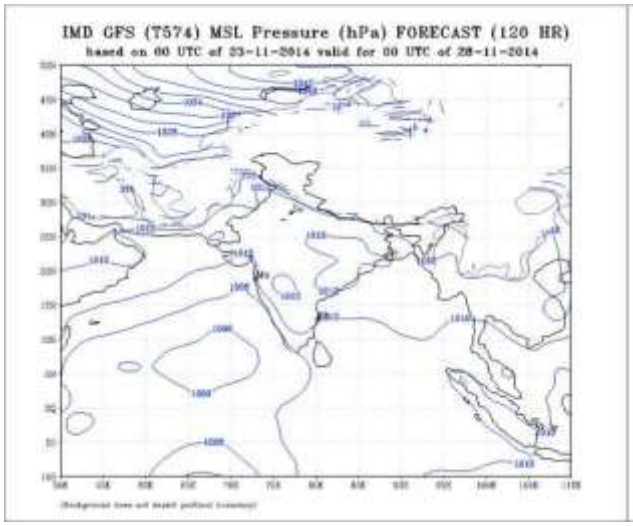
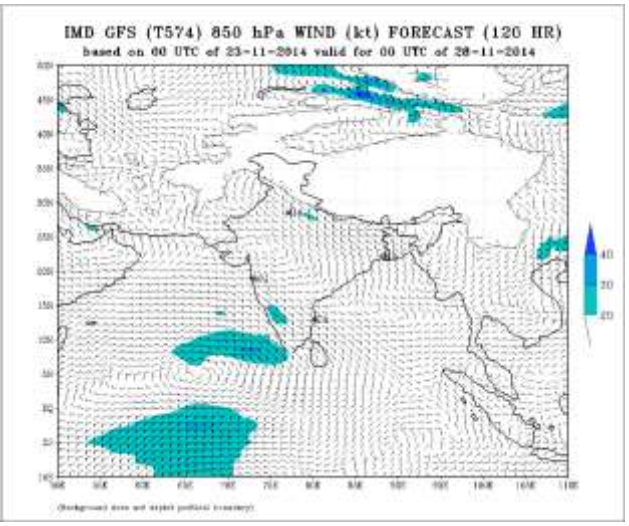
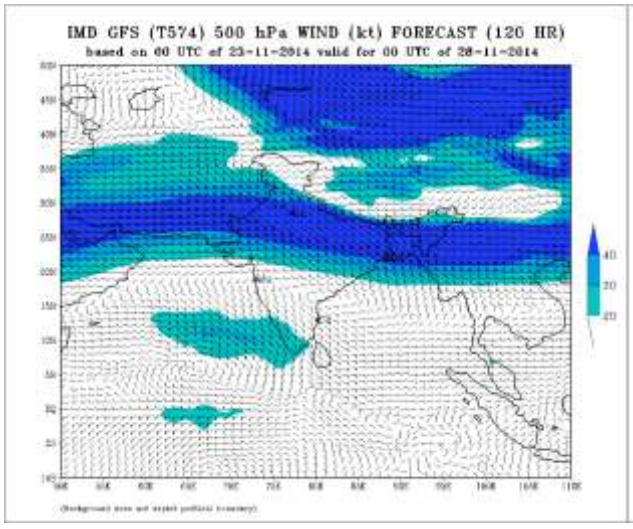
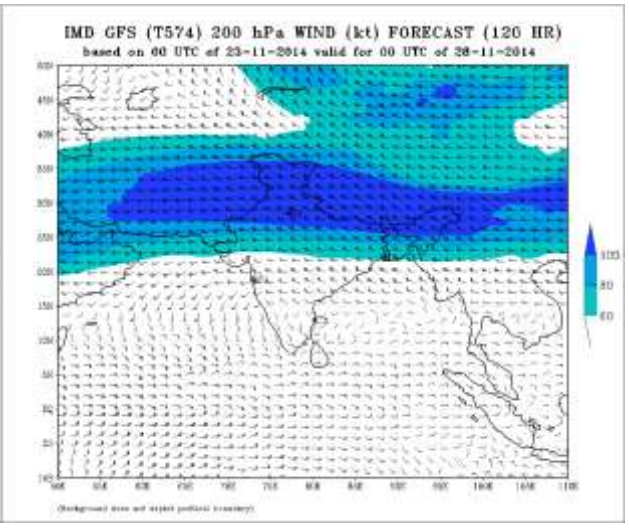

IMD GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 23-11-2014 valid for 00 UTC of 28-11-2014


IMD GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 23-11-2014 valid for 00 UTC of 28-11-2014


IMD GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 23-11-2014 valid for 00 UTC of 28-11-2014


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 23-11-2014 valid for 00 UTC of 28-11-2014

FDP (Cyclone) NOC Report Dated 24 November, 2014

Synoptic features based on 0300 UTC of today:

- The trough of low at mean Sea level over southeast Arabian Sea & neighbourhood persists.
- The upper air cyclonic circulation over Lakshadweep area & neighbourhood extending upto 0.9 km above mean Sea level persists.
- The upper air cyclonic circulation over south Andaman Sea & adjoining southeast Bay of Bengal now lies over Equatorial Indian Ocean and adjoining southeast Bay of Bengal and extends upto 1.5 km above mean Sea level. Under its influence, a low pressure area may form over southwest Bay of Bengal around 25th November.

Environmental features based on 0300 UTC of today:

Sea Surface Temperature:

- Sea Surface Temperature is between 27-29^{0}C over most parts of the Bay of Bengal and Andaman Sea.
- It is between 28-29^{0}C over eastern parts of Arabian Sea and 26-28 ^{0}C over the western parts of Arabian Sea.

Tropical Cyclone Heat Potential (TCHP):

- The ocean thermal energy is around 100 kJ/cm^2 over extreme southeast Bay of Bengal and Andaman Sea adjoining Malay peninsula region . It is 40-60 kJ/cm^2 over the rest of the Bay of Bengal and Andaman Sea.
- It is 40-60 kJ/cm^2 over western parts of Arabian Sea and 60-80 kJ/cm^2 over the eastern parts of the Arabian Sea.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive over the equatorial parts of the Bay of Bengal (30-50*10^{-5} s^{-1}) and Arabian Sea (20-30*10^{-5} s^{-1}).

Convergence:

- Lower level convergence is positive (5-10 *10^{-5} s^{-1}) over southwest Bay of Bengal between longitudes 85°E and 90°E and latitudes 4°N-8°N and southeast Arabian Sea off Kerala coast.

Divergence:

- Upper level divergence is positive (5-10*10^{-5} s^{-1}) over southwest Bay of Bengal between longitudes 80°E and 90°E and latitudes 4°N-11°N. It is 10-20*10^{-5} s^{-1} over southeast Arabian Sea off Kerala coast.

Wind Shear:

- Wind Shear is 10-20 knots over southwest Bay of Bengal. It is 20-30 knots over extreme southeast Arabian Sea.

Wind Shear Tendency:

- There is no change in the vertical wind shear over most parts of Bay of Bengal and Arabian Sea during the last 24 hours.

Upper tropospheric ridge:

- The upper tropospheric **ridge** at 200 hPa passes through 12.0°N.

M.J.O. Index:

- Located in phase 3 with amplitude greater than 1.0. It would continue to be in phase 3 with amplitude greater than 1.0 during the next 2-3 days.

Storms and Depression over South China Sea:

- There is currently no Tropical Storm/Depression over South China Sea.

Status of observational system:

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

Satellite:

Inference based on INSAT imagery of 240900 UTC:

Bay of Bengal & Andaman Sea:-

Broken low and medium clouds with embedded moderate to intense convection over south Bay of Bengal south of latitude 13.0°N and south Andaman Sea.

Arabian Sea:-

Broken low and medium clouds with embedded moderate to intense convection over southeast Arabian Sea between latitude 6.0°N to 13.0°N and longitude 67.5°E to 75.0°E and Lakshadweep in association with feeble low level circulation over the area.

NWP Analysis

- The analysis of IMD-GFST574 model charts based on 0000 UTC of 24thNovember 2014 show a feeble trough in easterlies in the lower level lies over Arabian Sea extending from Lakshadweep to Gujarat coast. The trough may persist during next 72 hours. A cyclonic circulation extending up to 850 hPa level lies over south east Bay of Bengal and adjoining areas and likely move in a west south west ward direction during next 72 hours. Seasonal anticyclonic flow persists over central India during next72 hours.
- The WRF model analysis also shows a feeble trough in easterlies over Arabian Sea off west coast in the lower level, the system likely to persist during next 24 hours. A cyclonic circulation extending up to 850 hPa level lies over south east Bay of Bengal and adjoining areas, the system likely to move in a west ward direction during next 72 hours. Seasonal anticyclonic flow persists over central India during next72 hours.
- The Genesis Potential Parameter (GPP) analysis and forecasts based on 0000 UTC of 24th November, 2014 shows two moderate to high GPP zones over north Indian Ocean centred around 5°N/79°E and 3°N/91°E respectively . The 24, 48 and 72 hour forecasts show the centre of moderate to high GPP zone at and around 3°N/83°E, 3°N/85°E and 5°N/77°E respectively.

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-GFS** model suggests formation of a low pressure area over southwest Bay of Bengal on 25th. It would move northwestwards across Sri Lanka, south Tamilnadu and Kerala during the next 48 hours and weaken.
- **NCMRWF-UKMO** model (based on 22nd/00 UTC) suggests formation of a low pressure area over southwest Bay of Bengal on 25th. It would move northwestwards across Sri Lanka, during the next 24 hours and weaken.
- **ECMWF Model** does not suggest any cyclogenesis over Bay of Bengal during the next 5 days.
- **ARP-METEOFRANCE** model shows a low pressure area over southwest Bay of Bengal on 24th. It becomes well-marked on 26th and moves westward across Sri Lanka during the next 24 hours.
- **JMA** model suggests formation of a low pressure area over southwest Bay of Bengal on 25th. It moves westwards during the next 48 hours.

Summary and Conclusion:

There is no cyclogenesis expected over north Indian Ocean during next five days.

Advisory: No IOP for next five days.

Annexure-I

Status of Observation system:
Synoptic observation:

Region	Date/Time (UTC)		
	23/12	24/00	24/03
India	46	32	46
Coastal stations			
WB	8	3	8
Odisha	7	5	7
AP	12	12	12
Tamil Nadu	11	9	11
Puducherry	2	2	2
A & N	6	1	6
Bangladesh	11	10	11
Myanmar	11	11	10
Thailand	1	1	0
Sri Lanka	8	7	8

AWS Observations:

Region	Date/Time (UTC)		
	23/12	24/00	24/03
India	68	66	77
Coastal stations			
WB	8	7	10
Odisha	7	6	11
AP	28	28	29
Tamil Nadu	24	24	26
Puducherry	1	1	1
A & N	-	-	-

- **RS/RW** (12Z) of 23/11/2014 **-0/39**
- **No. of Ascents reaching 250 hPa level: 0, MISDA: 39**
- **RS/RW** (00Z) of 24/11/2014-8**/39**
- **No. of Ascents reaching 250 hPa level: 6, MISDA: 31**

No. of PILOT Ascents

23/12Z	24/00Z
19	11

Buoy Data

23/12Z	24/00Z	24/03Z
12	12	8

FOC CHENNAI: STATUS OF OBSERVATION

No. of Synop data

Date→	23.11.2014							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	20	22	20	20	22	20	20	20

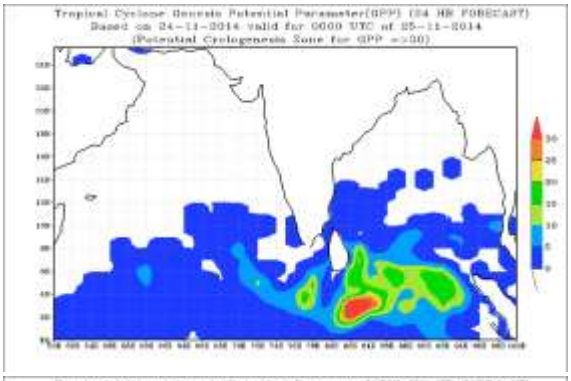
No. of RS/RW Ascents

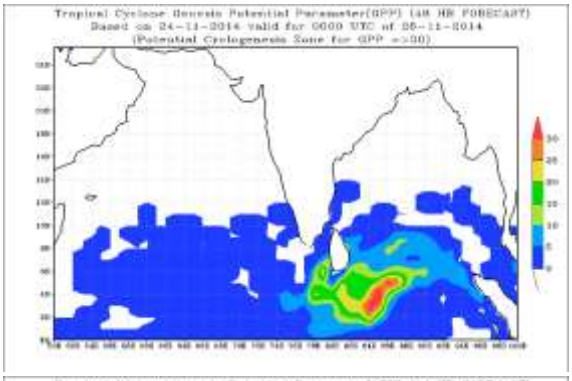
00Z /23.11.2014 : 1
No. of Ascents reaching 250 hPa level = 1
MISDA : 7
12Z /23.11.2014 : --
No. of Ascents reaching 250 hPa level = --
MISDA : 8

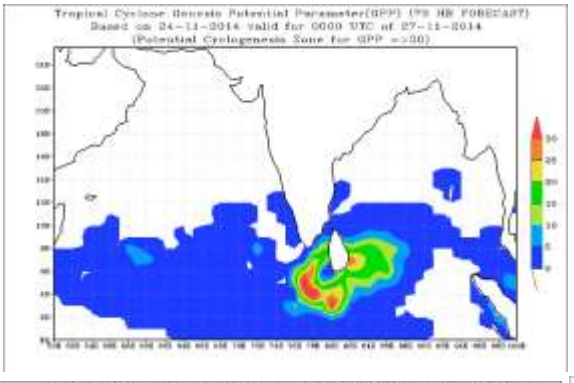
No. of PILOT Ascents:

23.11.2014	
06Z	18Z
4	4

Annexure-II


Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 24-11-2014 valid for 0000 UTC of 25-11-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
Based on 24-11-2014 valid for 0000 UTC of 26-11-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
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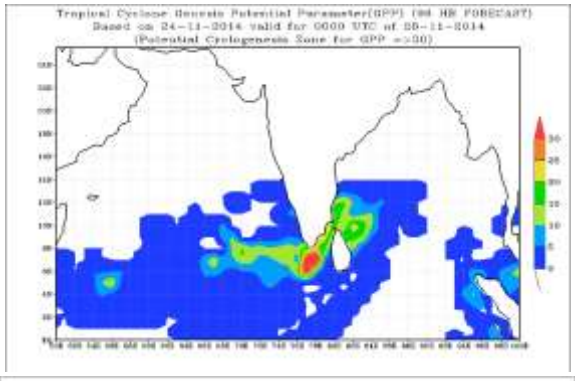
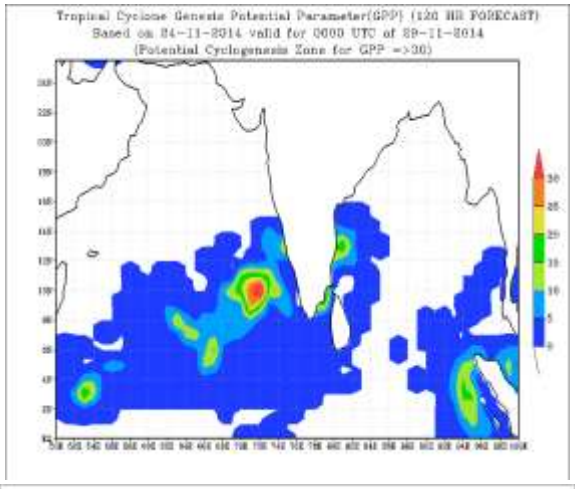
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (96 HR FORECAST)
Based on 24-11-2014 valid for 0000 UTC of 28-11-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
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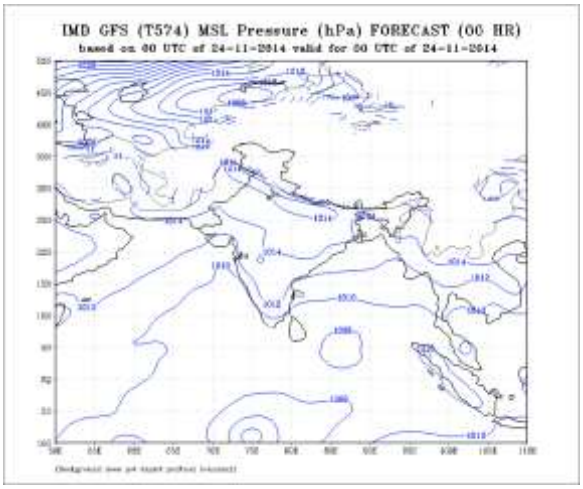
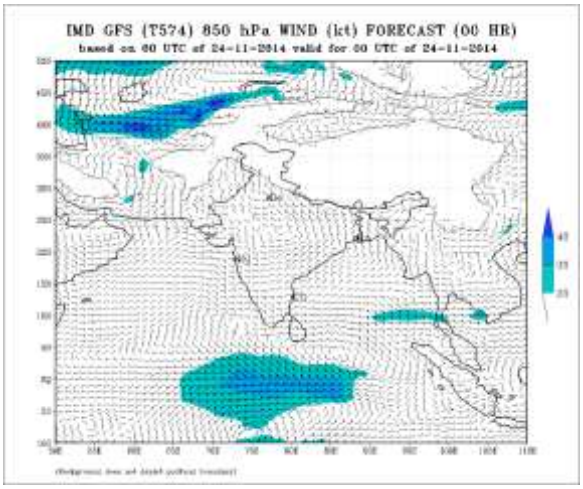
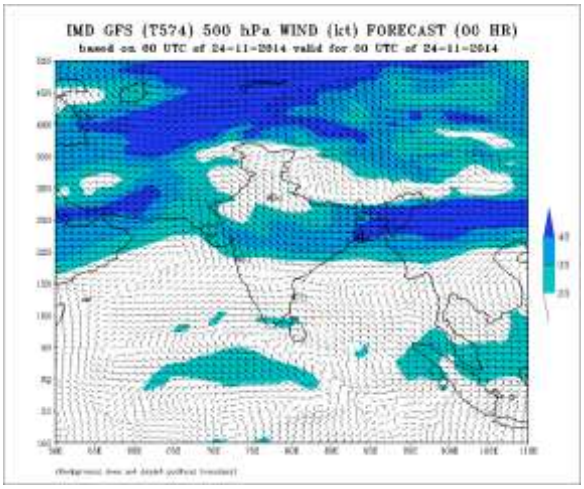
(Potential Cyclogenesis Zone for GPP =>30)


IMD GFS (T574) MSL Pressure (hPa) FORECAST (00 HR)
based on 00 UTC of 24-11-2014 valid for 00 UTC of 24-11-2014


IMD GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 24-11-2014 valid for 00 UTC of 24-11-2014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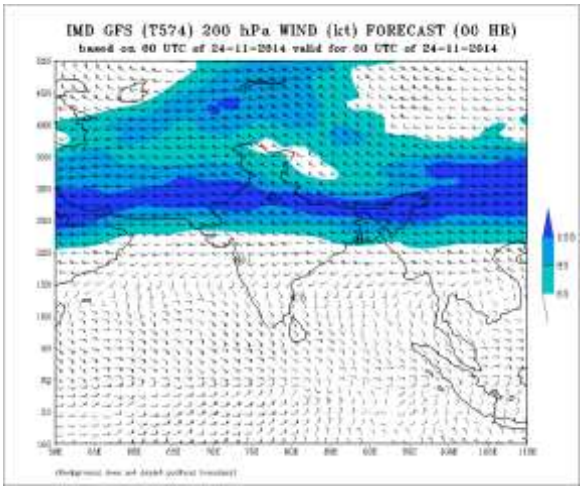
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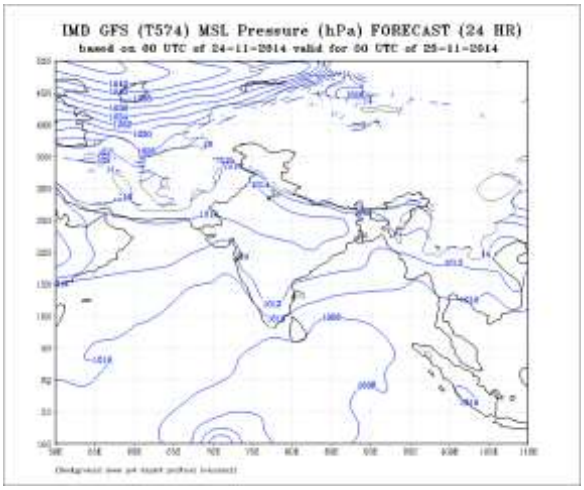
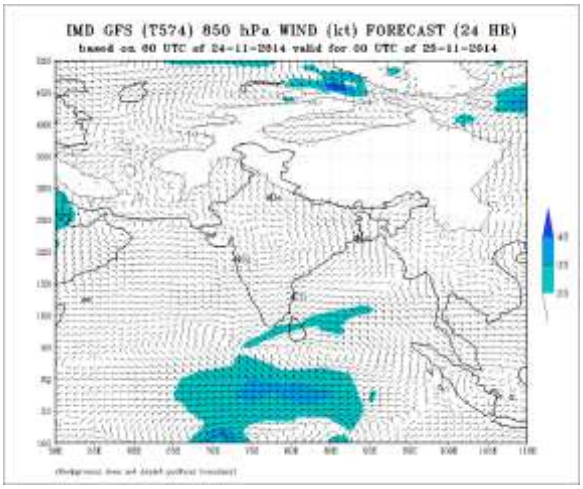
based on 00 UTC of 24-11-2014 valid for 00 UTC of 24-11-2014


IMD GFS (T574) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 24-11-2014 valid for 00 UTC of 25-11-2014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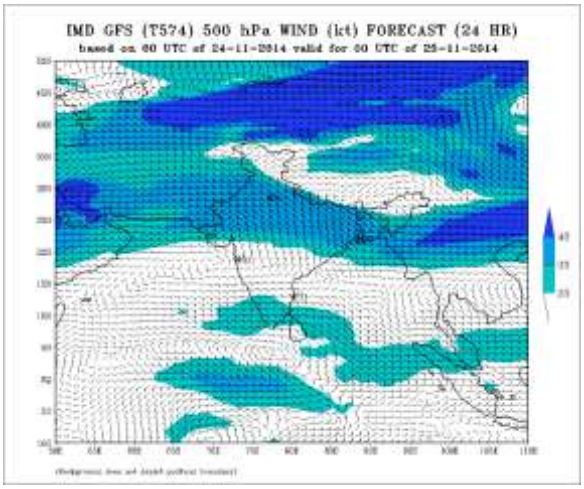
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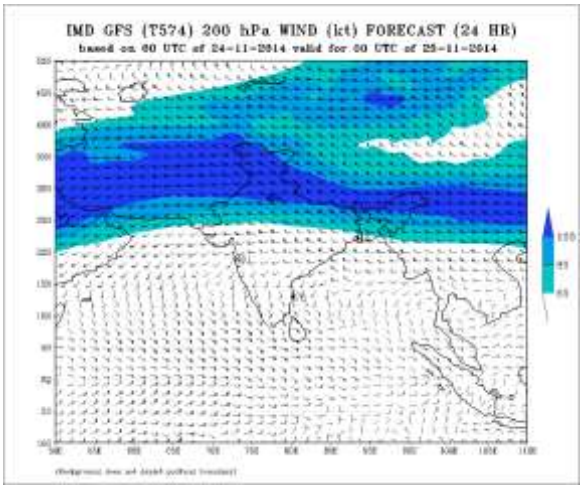
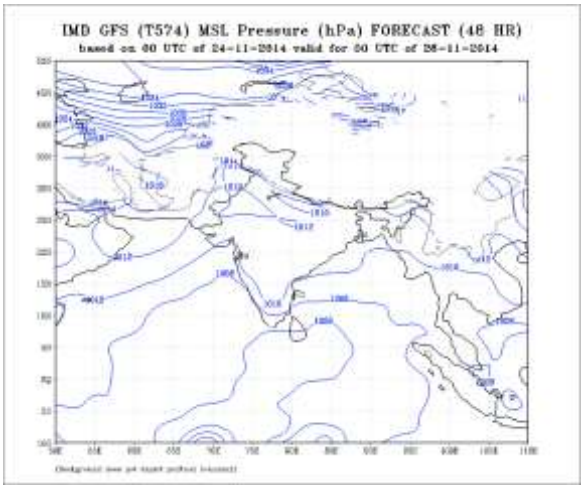
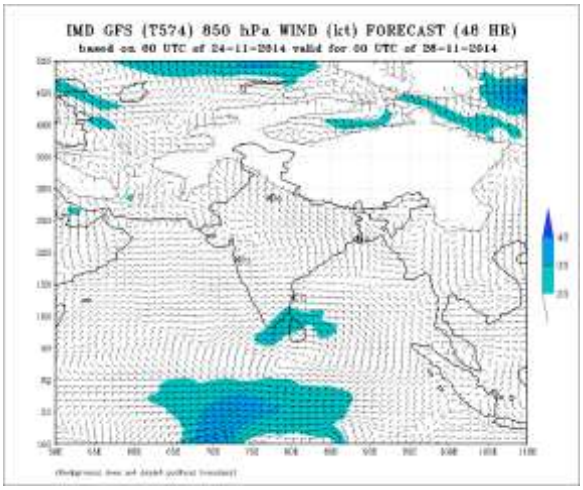
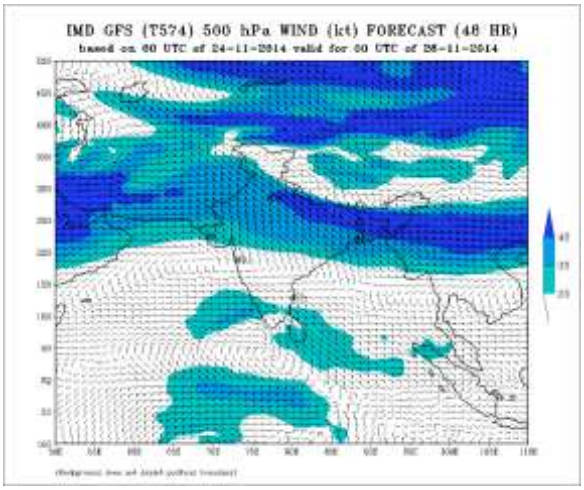
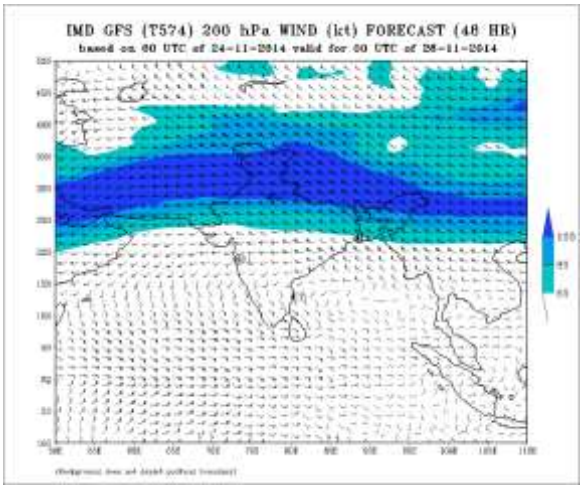
based on 00 UTC of 24-11-2014 valid for 00 UTC of 25-11-2014

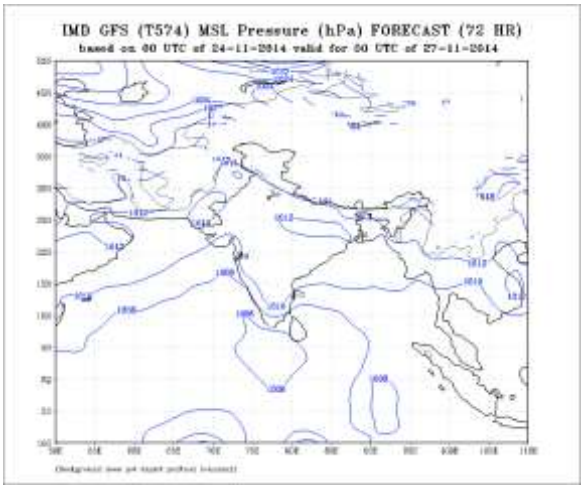

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 24-11-2014 valid for 00 UTC of 25-11-2014

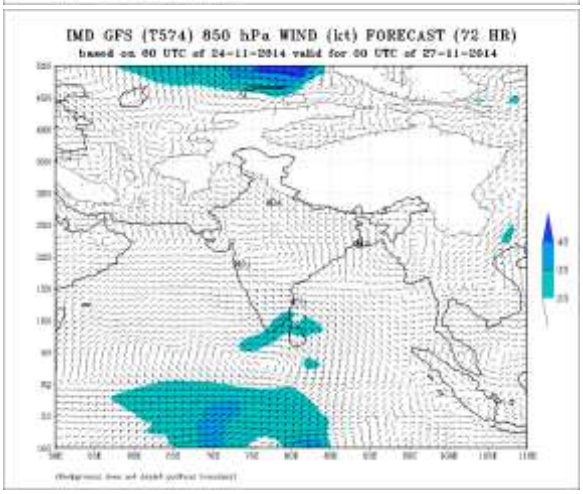

IMD GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 24-11-2014 valid for 00 UTC of 26-11-2014

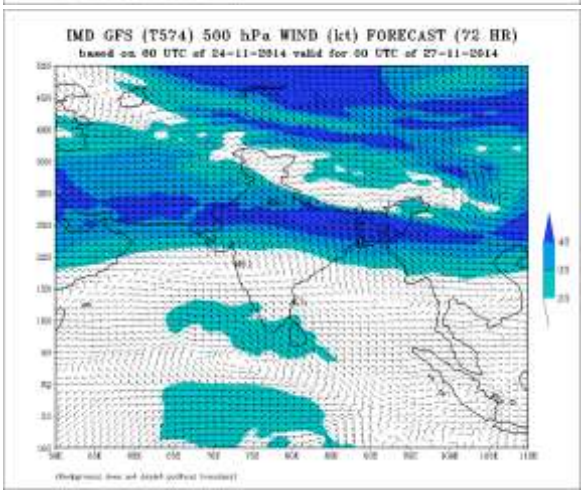

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 24-11-2014 valid for 00 UTC of 26-11-2014

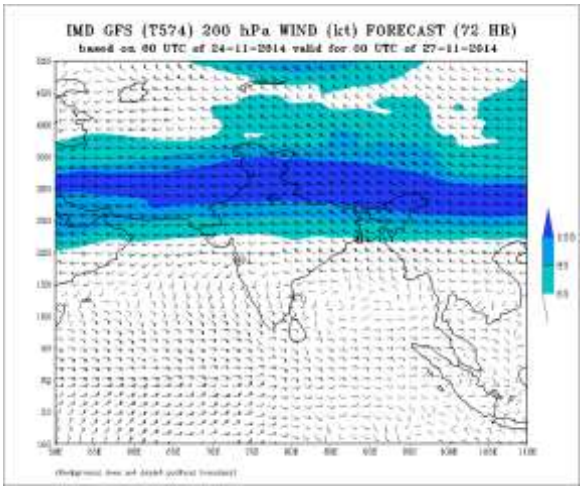

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 24-11-2014 valid for 00 UTC of 26-11-2014

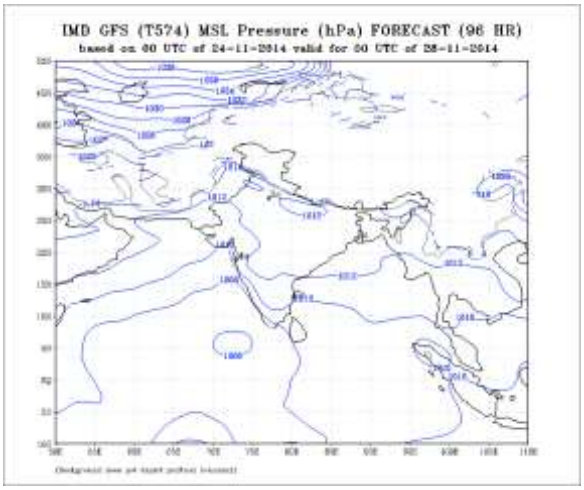

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 24-11-2014 valid for 00 UTC of 26-11-2014

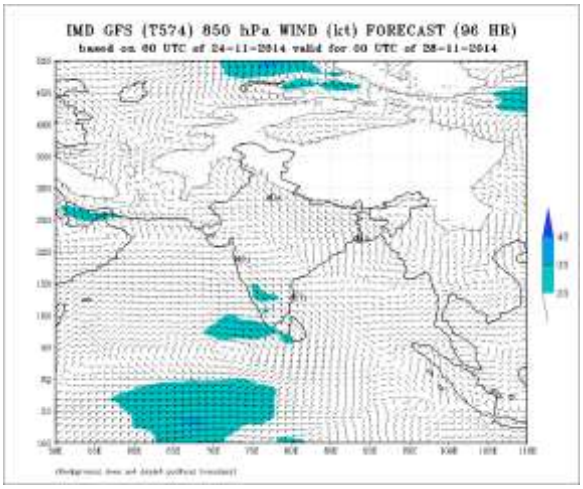

IMD GFS (T574) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 24-11-2014 valid for 00 UTC of 27-11-2014

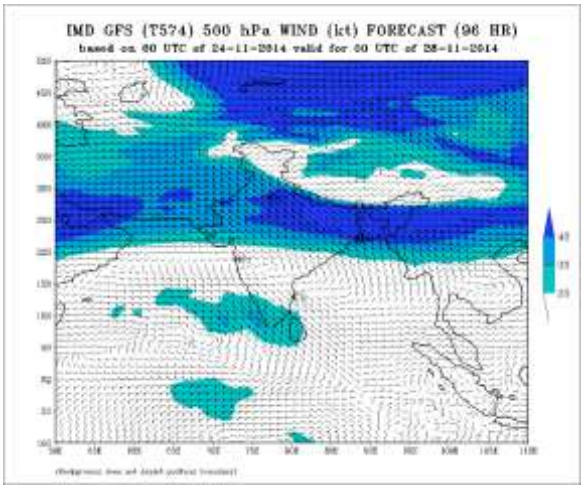

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 24-11-2014 valid for 00 UTC of 27-11-2014

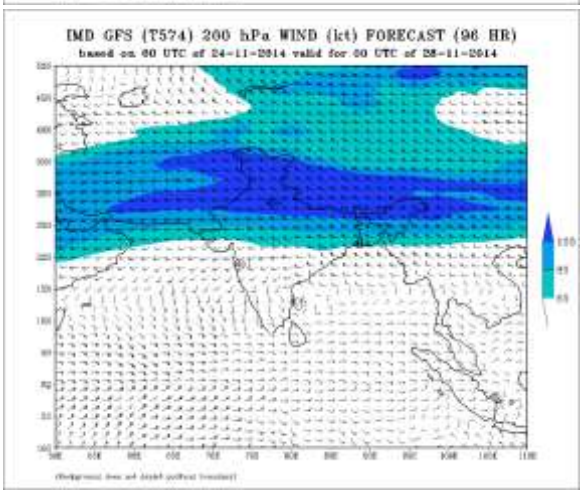

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 24-11-2014 valid for 00 UTC of 27-11-2014

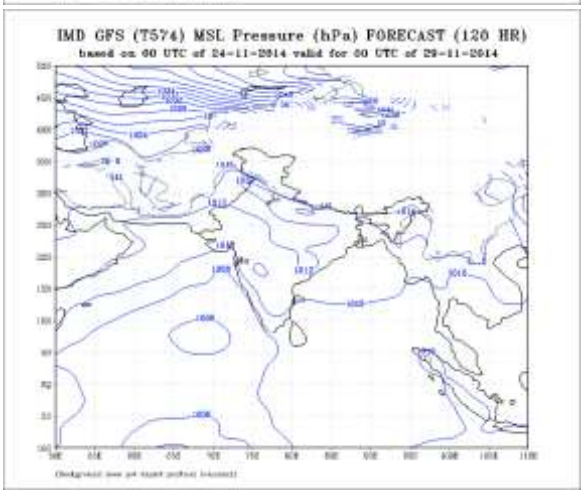

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 24-11-2014 valid for 00 UTC of 27-11-2014

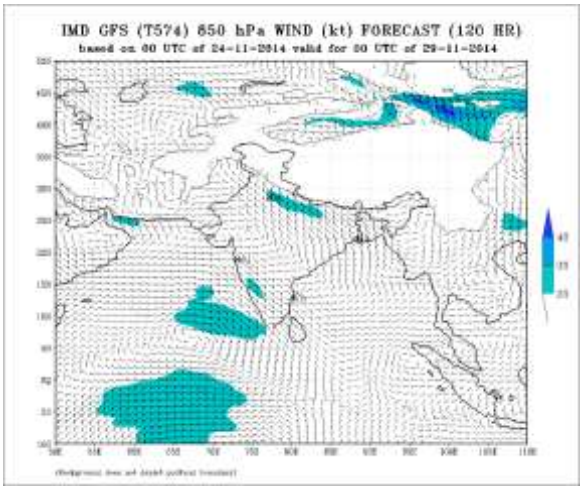

IMD GFS (T574) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 24-11-2014 valid for 00 UTC of 28-11-2014

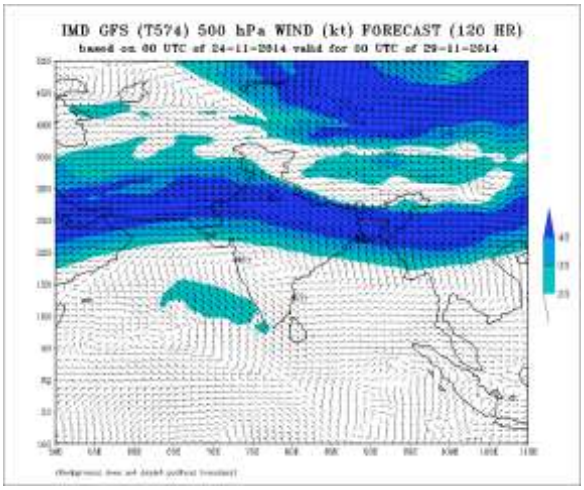

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 24-11-2014 valid for 00 UTC of 28-11-2014

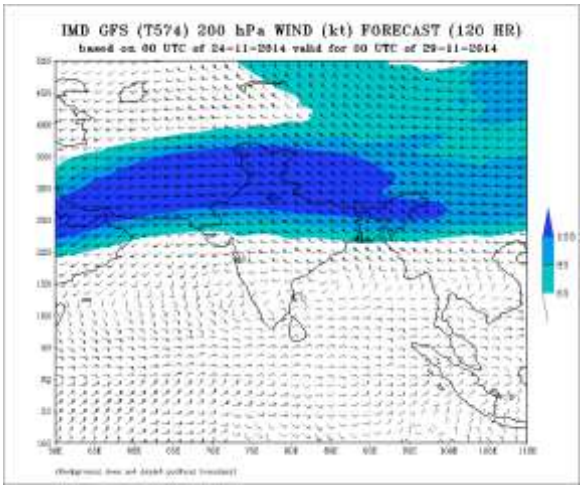

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 24-11-2014 valid for 00 UTC of 28-11-2014


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 24-11-2014 valid for 00 UTC of 28-11-2014


IMD GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 24-11-2014 valid for 00 UTC of 29-11-2014







FDP (Cyclone) NOC Report Dated 25 November, 2014

Synoptic features based on 0300 UTC of today:

- The trough of low at mean Sea level over southeast Arabian Sea & neighbourhood persists.
- The upper air cyclonic circulation over Lakshadweep area & neighbourhood extending upto 0.9 km above mean Sea level persists.
- Under the influence of upper air cyclonic circulation over equatorial Indian Ocean and adjoining southeast Bay of Bengal, a low pressure area has formed over southwest Bay of Bengal and adjoining equatorial Indian Ocean. Associated upper air cyclonic circulation extends upto 2.1 km above mean Sea level.

Environmental features based on 0300 UTC of today: Sea Surface Temperature:

- Sea Surface Temperature is between 28-30^{0}C over most parts of the Bay of Bengal and Andaman Sea except over central Bay of Bengal.
- It is between 28-30^{0}C over eastern parts of Arabian Sea and 26-28 ^{0}C over the western parts of Arabian Sea.

Tropical Cyclone Heat Potential (TCHP):

- The ocean thermal energy is around 100-120kJ/cm^2 over extreme southeast Bay of Bengal and south Andaman Sea and adjoining Malay peninsula region and it is less than 40kJ/cm^2 over southwest Bay of Bengal

Relative Vorticity:

- Relative vorticity at 850 hPa is positive over the equatorial parts of the southwest Bay of Bengal and southeast Arabian Sea (30-50*10^{-5} s^{-1}).

Convergence:

- Lower level convergence is positive (10-15 *10^{-5} s^{-1}) over southwest Bay of Bengal and parts of southeast Arabian Sea.

Divergence:

- Upper level divergence is positive (20-30*10^{-5} s^{-1}) over southwest Bay of Bengal off Sri Lanka coast.

Wind Shear:

- Wind Shear is 10-20 knots over south Arabian Sea and 15-25 knots southwest Bay of Bengal. It is 05-10 knots over southeast Bay of Bengal, South Andaman Sea and adjoining Malay Peninsular region.

Wind Shear Tendency:

- The vertical wind shear has increased by 05-10 knot over the parts of southeast Arabian Sea, adjoining Lakshadweep and Maldives area during the last 24 hours.
- No change over south west Bay of Bengal during past 24 hours

Upper tropospheric ridge:

- The upper tropospheric **ridge** at 200 hPa passes through 12.0°N.

M.J.O. Index:

- Located in phase 3 with amplitude greater than 1.0. It would continue to be in phase3 with amplitude greater than 1.0 during the next 2-3 days.

Storms and Depression over South China Sea:

The area of convection is located near latitude 9.9˚S Longitude 70.3˚E. Satellite imagery depicts a partially-exposed low-level circulation center (LLCC) with a large area of persistent deep convection sheared west of the center. Maximum sustained surface winds are estimated at 25 to 30 knots. Minimum Sea level pressure is estimated to be near 1002 mb. The potential for the development of a significant tropical Cyclone within the next 24 hours is upgraded to medium.

<u>Status of observational system:</u>

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

Satellite:
Inference based on INSAT imagery of 250900 UTC:

Bay of Bengal & Andaman Sea:-
Broken low and medium clouds with embedded moderate to intense convection over south Bay Andaman Sea.

Arabian Sea:-
Scattered low and medium clouds with embedded isolated weak to moderate convection over south Arabian Sea east of longitude 59.0˚ E.

NWP Analysis

- The analysis of IMD-GFST574 model charts based on 0000 UTC of 25th November 2014 show a feeble trough in easterlies in the lower level lies over south east Arabian Sea and adjoining areas. The trough may persist during next 72 hours. A cyclonic circulation extending up to 850 hPa level lies over south west Bay of Bengal and adjoining areas andlikely to move in a west-southwest direction during next 72 hours. Seasonal anticyclonic flow persists over central India during next72 hours.
- The WRF model analysis also shows a feeble trough in easterlies over Arabian Sea off west coast in the lower level, the system likely to persist during next 48 hours. A cyclonic circulation extending up to 850 hPa level lies over south west Bay of Bengal and adjoining areas, the system likely to move in a westward direction during next 72 hours. Seasonal anticyclonic flow persists over central India during next72 hours.
- The Genesis Potential Parameter (GPP) analysis and forecasts based on 0000UTC of 25th November, 2014 shows a moderate GPP zone over north Indian Ocean centred near 3 ˚N/83 ˚E. The 24 hour forecast shows two zones of moderate to high GPP centred around 4˚N/81˚E and 5˚N/86˚E respectively. The 48 hour forecast also shows two moderate to high GPP zones over North Indian Ocean centred around 6˚N/78˚E and 6 ˚ N/82 ˚ E respectively. The 72 hour forecast shows high GPP zone over south west Bay of Bengal along east coast extending from latitude 6˚N to 12˚ N.

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-GFS model shows formation of a low pressure area over southwest Bay of Bengal on 25th. It would move northwestwards across Sri Lanka, south Tamil Nadu and Kerala during the next 48 hours and weaken.
NCMRWF-UKMO model shows formation of a low pressure area over southwest Bay of Bengal on 25th. It would move northwestwards across Sri Lanka, during the next 24 hours and weaken.
ECMWF Model does not suggest any low pressure area over Bay of Bengal during the next 5 days.

ARP-METEOFRANCE model shows a low pressure area over southwest Bay of Bengal on 25th. It becomes well-marked on 26th and moves westward across Sri Lanka during the next 24 hours.

JMA model suggests formation of a low pressure area over southwest Bay of Bengal on 25th. It moves westwards during the next 48 hours.

Summary and Conclusion:

Most of the NWP models have captured the formation of low pressure area over the southwest Bay of Bengal. However, no model suggests further intensification into a depression. Rather, it would move west-northwestwards to southeast Arabian Sea across north Sri Lanka and adjoining south Peninsula and weaken after 48 hrs. The environmental features are supportive except the fact that Ocean thermal energy is less than 50 kJ/cm^2, the vertical wind shear is moderate to high. Further, the system is close to land surface.

Advisory:

- Possible intensification if any needs to be watched.
- No IOP for next five days.

Annexure-I

Status of Observation system:
Synoptic observation:

Region	Date/Time (UTC)		
	24/12	**25/00**	**25/03**
India	44	31	44
Coastal stations			
WB	8	3	8
Odisha	7	6	7
AP	12	12	12
Tamil Nadu	10	8	11
Puducherry	1	1	1
A & N	6	1	6
Bangladesh	8	8	8
Myanmar	10	7	11
Thailand	2	2	2
Sri Lanka	8	8	8

AWS Observations:

Region	Date/Time (UTC)		
	24/12	**25/00**	**25/03**
India	62	68	73
Coastal stations			
WB	10	8	10
Odisha	4	7	7
AP	28	28	29
Tamil Nadu	24	24	26
Puducherry	1	1	1
A & N	-	-	-

- **RS/RW** (12Z) of 24/11/2014 **-20/39**
- **No. of Ascents reaching 250 hPa level: 0, MISDA: 19**
- **RS/RW** (00Z) of 25/11/2014-11**/39**
- **No. of Ascents reaching 250 hPa level: 6, MISDA: 18**

No. of PILOT Ascents

24/12Z	**25/00Z**
09	10

Buoy Data

24/12Z	**25/00Z**	**25/03Z**
12	14	13

FOC CHENNAI: STATUS OF OBSERVATION

No. of Synop data

Date→	**24.11.2014**							
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

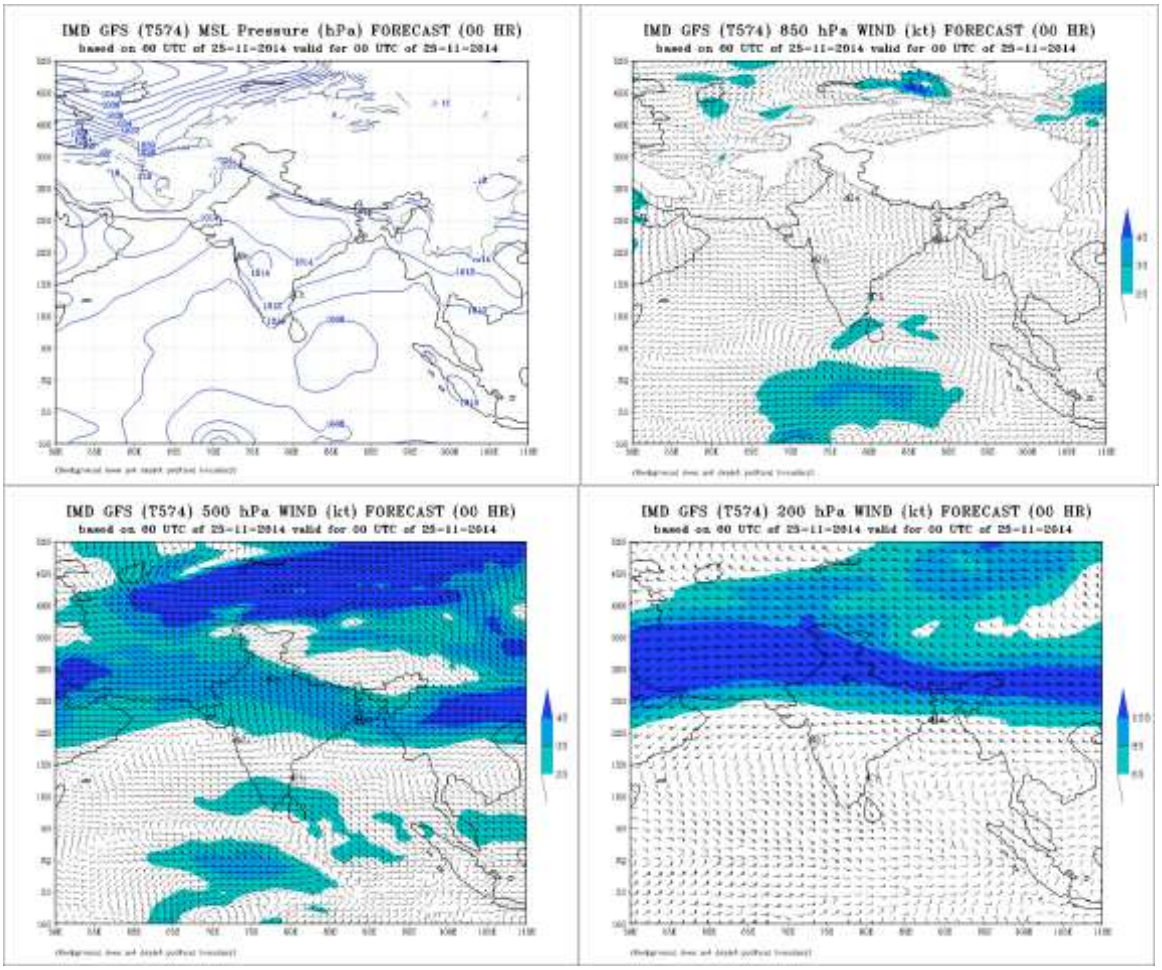
00Z /24.11.2014 : 3
No. of Ascents reaching 250 hPa level = 2
MISDA : 5
12Z /24.11.2014 : --
No. of Ascents reaching 250 hPa level = --

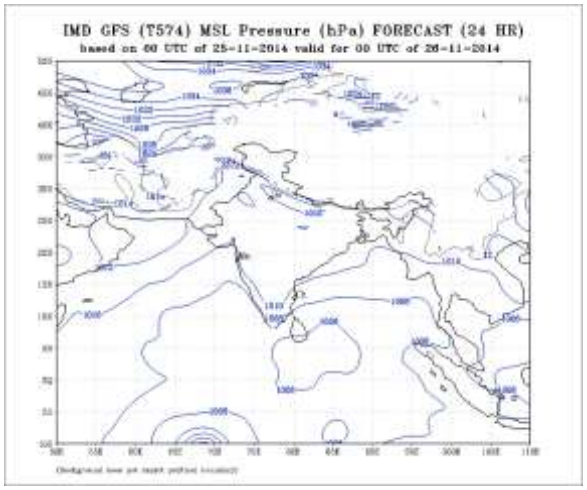
MISDA : 8

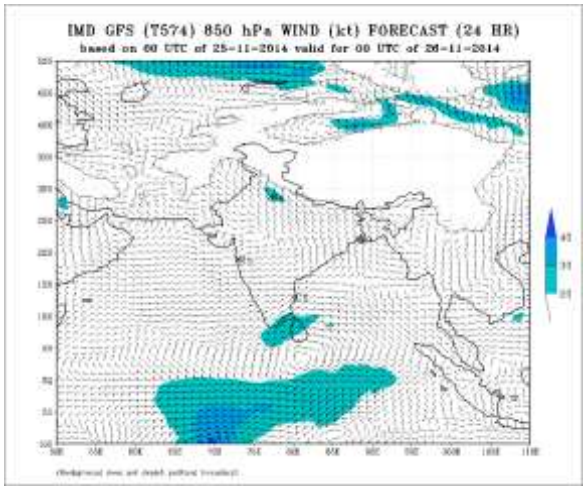
No. of PILOT Ascents:

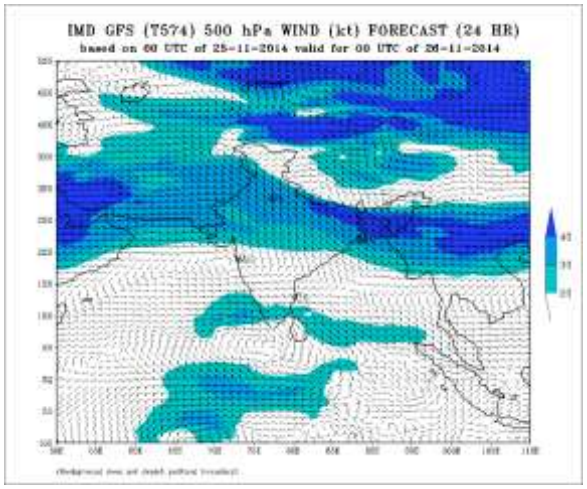
24.11.2014	
06Z	18Z
3	4

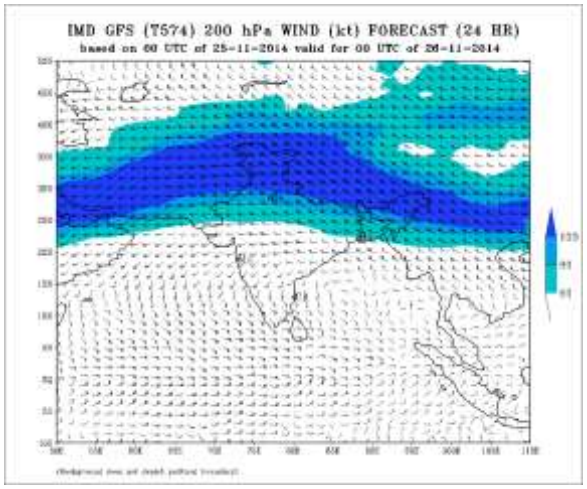
Annexure-II

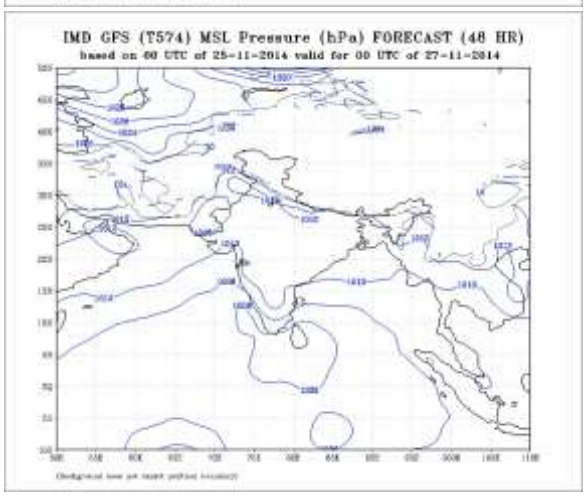

IMD GFS (T574) MSL Pressure (hPa) FORECAST (00 HR)
based on 00 UTC of 25-11-2014 valid for 00 UTC of 25-11-2014
IMD GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 25-11-2014 valid for 00 UTC of 25-11-2014
IMD GFS (T574) 500 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 25-11-2014 valid for 00 UTC of 25-11-2014
IMD GFS (T574) 200 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 25-11-2014 valid for 00 UTC of 25-11-2014

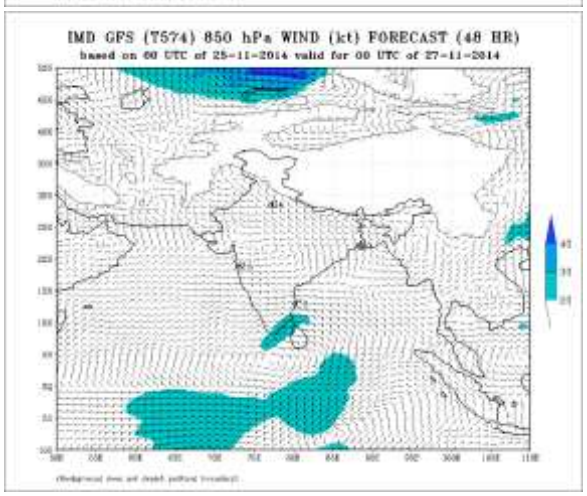

IMD GFS (T574) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 25-11-2014 valid for 00 UTC of 26-11-2014

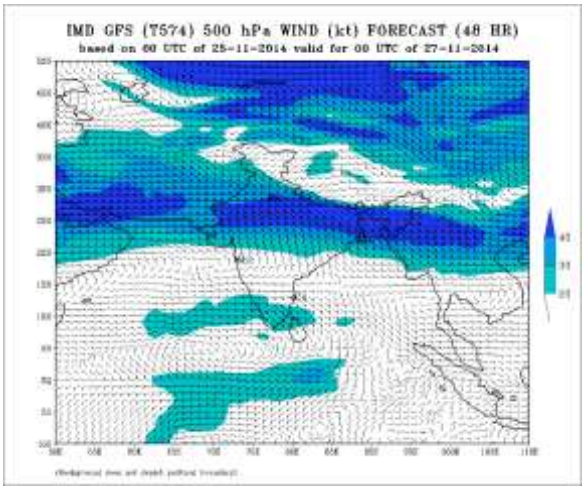

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 25-11-2014 valid for 00 UTC of 26-11-2014

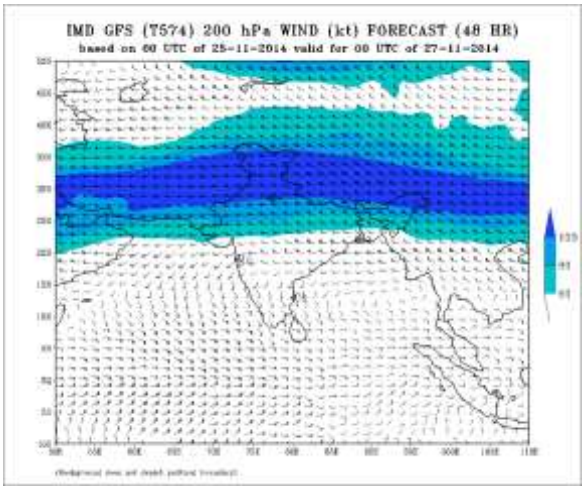

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 25-11-2014 valid for 00 UTC of 26-11-2014

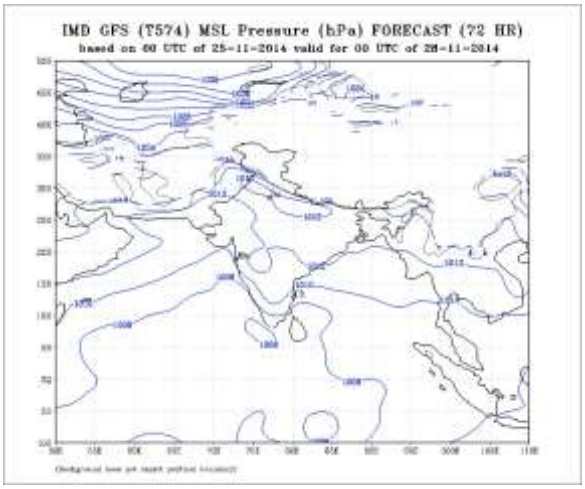

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 25-11-2014 valid for 00 UTC of 26-11-2014

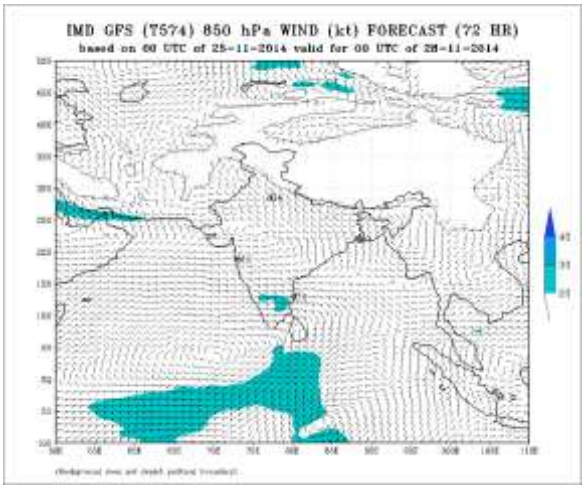

IMD GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 25-11-2014 valid for 00 UTC of 27-11-2014

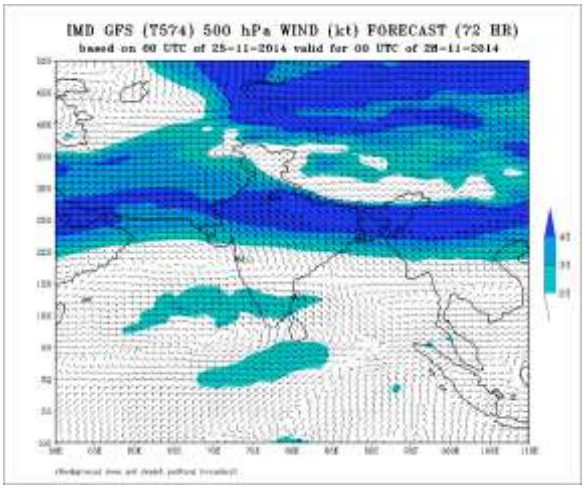

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 25-11-2014 valid for 00 UTC of 27-11-2014

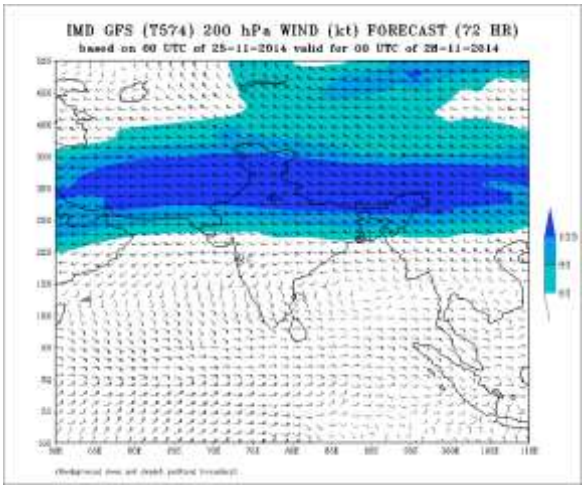

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 25-11-2014 valid for 00 UTC of 27-11-2014

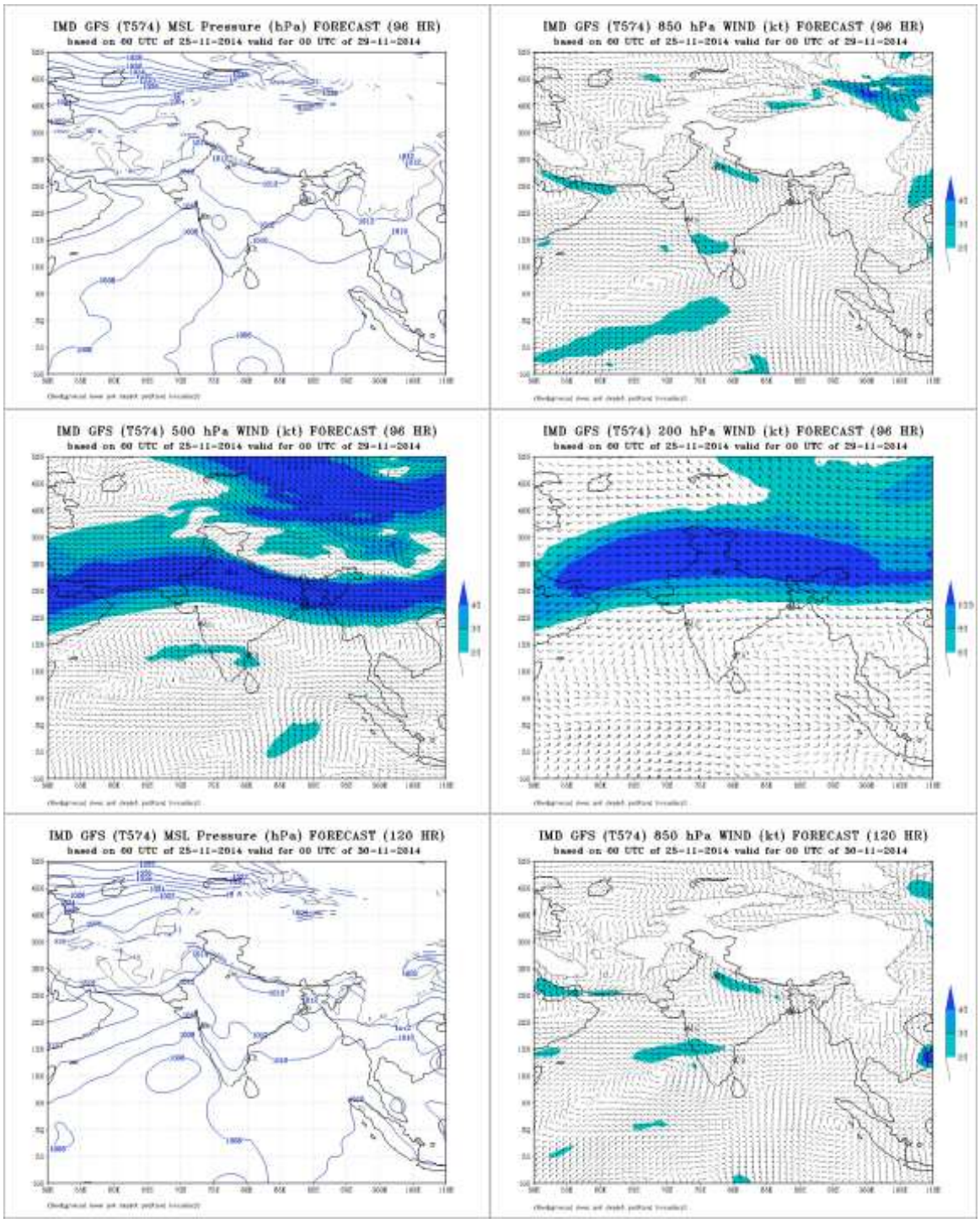

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 25-11-2014 valid for 00 UTC of 27-11-2014

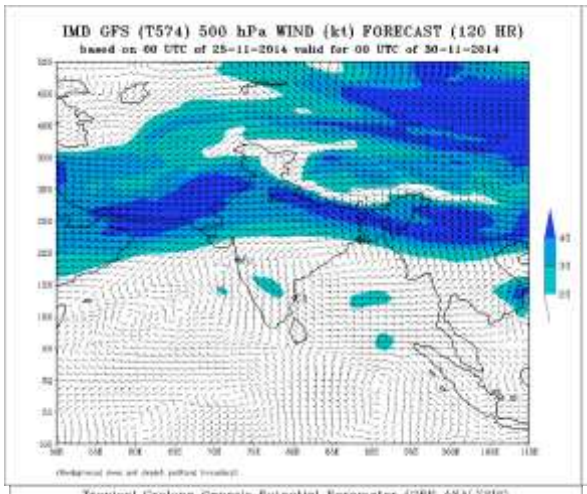

IMD GFS (T574) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 25-11-2014 valid for 00 UTC of 28-11-2014

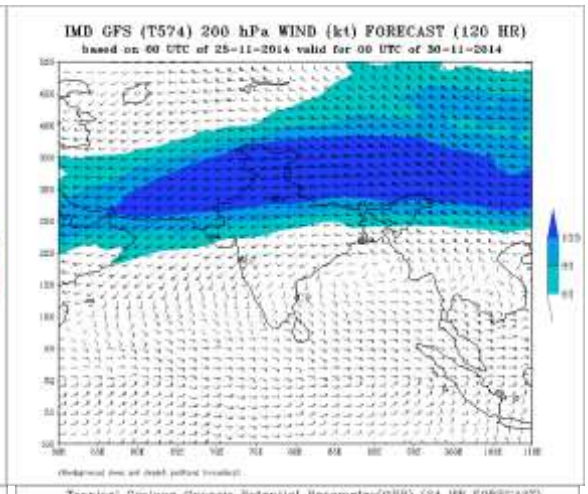

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 25-11-2014 valid for 00 UTC of 28-11-2014

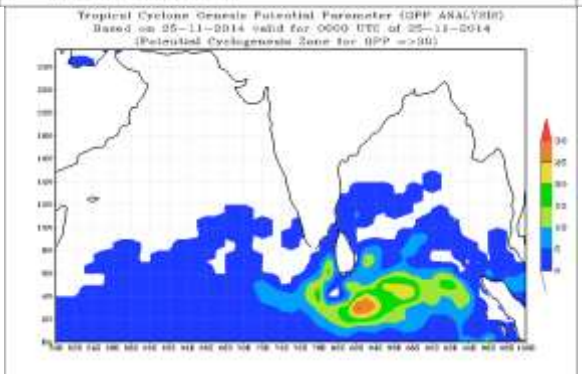

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 25-11-2014 valid for 00 UTC of 28-11-2014

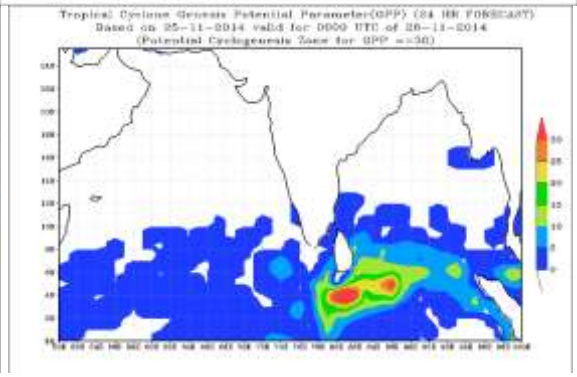

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 25-11-2014 valid for 00 UTC of 28-11-2014

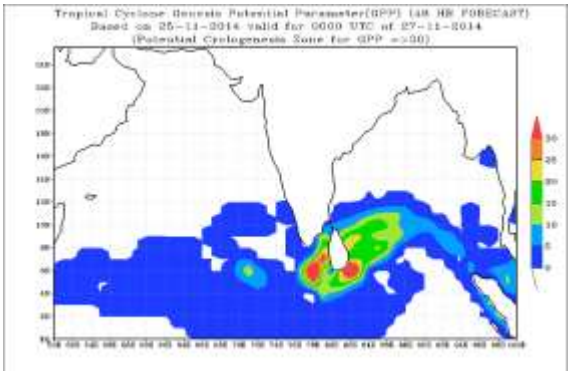

IMD GFS (T574) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 25-11-2014 valid for 00 UTC of 29-11-2014
IMD GFS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 25-11-2014 valid for 00 UTC of 29-11-2014
IMD GFS (T574) 500 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 25-11-2014 valid for 00 UTC of 29-11-2014
IMD GFS (T574) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 25-11-2014 valid for 00 UTC of 29-11-2014
IMD GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 25-11-2014 valid for 00 UTC of 30-11-2014
IMD GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 25-11-2014 valid for 00 UTC of 30-11-2014

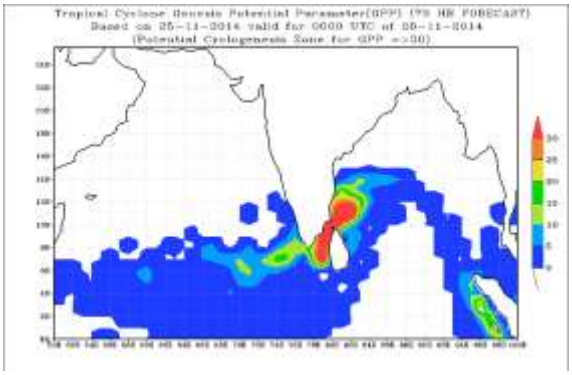

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 25-11-2014 valid for 00 UTC of 30-11-2014

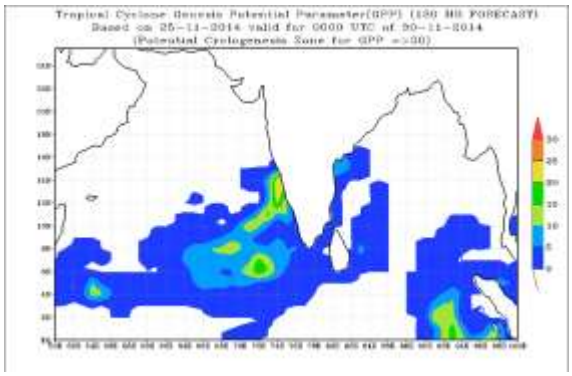

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 25-11-2014 valid for 00 UTC of 30-11-2014


Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 25-11-2014 valid for 0000 UTC of 25-11-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 25-11-2014 valid for 0000 UTC of 26-11-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
Based on 25-11-2014 valid for 0000 UTC of 27-11-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 25-11-2014 valid for 0000 UTC of 28-11-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 25-11-2014 valid for 0000 UTC of 30-11-2014
(Potential Cyclogenesis Zone for GPP =>30)

FDP (Cyclone) NOC Report Dated 26 November, 2014

Synoptic features based on 0300 UTC of today:

- Yesterday's trough of low at mean Sea level over southeast Arabian Sea & neighbourhood persists.
- Yesterday's upper air cyclonic circulation over Lakshadweep area & neighbourhood extending upto 0.9 km above mean Sea level persists.
- Yesterday's low pressure area over southwest Bay of Bengal and adjoining equatorial Indian Ocean now lies over southwest Bay of Bengal and adjoining areas of Sri Lanka & Equatorial Indian Ocean. Associated upper air cyclonic circulation extends upto 2.1 km above mean Sea level.

Environmental features based on 0300 UTC of today:

Sea Surface Temperature:

- Sea Surface Temperature is between 28-30^{0}C over most parts of the Bay of Bengal and Andaman Sea except over central Bay of Bengal and some parts of southwest Bay of Bengal and south Andaman Sea where it is 26-27^{0}C.
- It is between 28-30^{0}C over eastern parts of Arabian Sea and 26-27 ^{0}C over the western parts of Arabian Sea.

Tropical Cyclone Heat Potential (TCHP):

- The ocean thermal energy is around 60-8kJ/cm^2 over most parts of Bay of Bengal and Andaman Sea outside many parts of southwest and west central Bay of Bengal where it is less than 40kJ/cm^2.

Relative Vorticity:

- Relative vorticity at 850 hPa is negative over entire Bay of Bengal and Andaman Sea except over some parts of the southwest Bay of Bengal and adjoining equatorial Indian Ocean (30-50*10^{-5} s^{-1}).

Convergence:

- Lower level convergence is positive (15 *10^{-5} s^{-1}) over parts of southwest Bay of Bengal off Sri Lanka coast and parts of south Andaman Sea.

Divergence:

- Upper level divergence is positive (20*10^{-5} s^{-1}) over southwest Bay of Bengal off Sri Lanka coast.

Wind Shear:

- Wind Shear is 10-20 knots over parts of southwest Bay of Bengal off Sri Lanka coast. It is 05-10 knots over southeast Bay of Bengal, South Andaman Sea and adjoining Malay Peninsular region.

Wind Shear Tendency:

- Wind shear tendency is -5 to-10 KTs over parts of over southwest Bay of Bengal and adjoining southeast Arabian Sea off Sri Lanka coast and over Malay Peninsular region.

Upper tropospheric ridge:

- The upper tropospheric **ridge** at 200 hPa passes through 13.0°N.

M.J.O. Index:

- Located in phase 3 with amplitude greater than 1.0. It would continue to be in phase 3 with amplitude greater than 1.0 during the next 2-3 days.

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

Satellite imagery depicts a vortex over south Indian Ocean located near latitude 12.0˚S and longitude 67.5˚E. Maximum sustained surface winds are estimated at 25 to 30 knots. The potential for the development of a significant tropical Cyclone within the next 24 hours is medium.

Status of observational system:

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

Satellite:

Inference based on INSAT imagery of 260900 UTC:

Bay of Bengal & Andaman Sea:-

Scattered low and medium clouds with embedded moderate to intense convection over south Bay of Bengal and south Andaman Sea.

Arabian Sea:-

Broken low and medium clouds with embedded moderate to intense convection over southeast Arabian Sea east of longitude 55.0˚ E.

NWP Analysis

- The analysis of IMD-GFST574 model charts based on 0000 UTC of 26th November 2014 show a low pressure area lies over south west Bay of Bengal adjoining south off Sri Lanka coast. Forecasts of the model show weakening of the system during next 48 hours and likely to move in a westward direction during next 72 hours.
- The WRF model analysis and forecasts also show a low pressure area lies over south west Bay of Bengal adjoining south off Sri Lanka coast and weakening of the system during next 48 hours.
- The Genesis Potential Parameter (GPP) analysis and forecasts based on 0000 UTC of 26th November, 2014 shows a moderate GPP zone over south west Bay of Bengal and no intensification during next 96 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-GFS** model shows low pressure area over southwest Bay of Bengal persists over the same region on 26th and moving westwards it would weaken during the next 48 hours.

- **NCMRWF-UKMO** model shows a low pressure area over southwest Bay of Bengal It would move northwestwards across Sri Lanka, during the next 24 hours and weaken.
- **ECMWF Model** does not suggest any low pressure area over Bay of Bengal during the next 5 days.
- **ARP-METEOFRANCE** model shows a low pressure area over southwest Bay of Bengal. It would move northwestwards during the next 72 hours.
- **JMA** model shows low pressure area over equatorial region of north Indian Ocean. It would move westwards during the next 72 hours.

Summary and Conclusion:

Most of the NWP models have captured the low pressure area over the southwest Bay of Bengal. However, no model suggests further intensification into a depression. Rather, it would move west-northwestwards to southeast Arabian Sea across north Sri Lanka and adjoining south Peninsula and weaken after 48 hrs. The environmental features are supportive except the fact that Ocean thermal energy is less than 50 kJ/cm^2, the vertical wind shear is moderate to high. Further, the system is close to land surface.

Advisory:

- Possible intensification if any needs to be watched.
- No IOP for next five days.

Annexure-I

Status of Observation system:

Synoptic observation:

Region	Date/Time (UTC)		
	25/12	**26/00**	**26/03**
India	41	30	44
Coastal stations			
WB	7	3	8
Odisha	7	5	7
AP	11	12	12
Tamil Nadu	9	8	11
Puducherry	1	1	1
A & N	6	1	6
Bangladesh	11	11	11
Myanmar	11	11	10
Thailand	2	2	2
Sri Lanka	8	8	8

AWS Observations:

Region	Date/Time (UTC)		
	25/12	**26/00**	**26/03**
India	68	63	77
Coastal stations			
WB	10	8	10
Odisha	7	3	6
AP	27	27	26
Tamil Nadu	23	24	24
Puducherry	1	1	1
A & N	-	-	-

- **RS/RW** (12Z) of 25/11/2014 **-10/39**
- **No. of Ascents reaching 250 hPa level: 0, MISDA: 18**
- **RS/RW** (00Z) of 26/11/2014-20**/39**
- **No. of Ascents reaching 250 hPa level: 8, MISDA: 19**

No. of PILOT Ascents

25/12Z	26/00Z
11	10

Buoy Data

25/12Z	26/00Z	26/03Z
3	5	5

FOC CHENNAI: STATUS OF OBSERVATION

No. of Synop data

Date→	**25.11.2014**							
UTC→	**00**	**03**	**06**	**09**	**12**	**15**	**18**	**21**
Chennai Region (Coasts of AP & TN)	**20**	**22**	**20**	**20**	**22**	**19**	**20**	**20**

No. of RS/RW Ascents

00Z /25.11.2014 : 2

No. of Ascents reaching 250 hPa level = 2

MISDA : 6

12Z /25.11.2014 : --

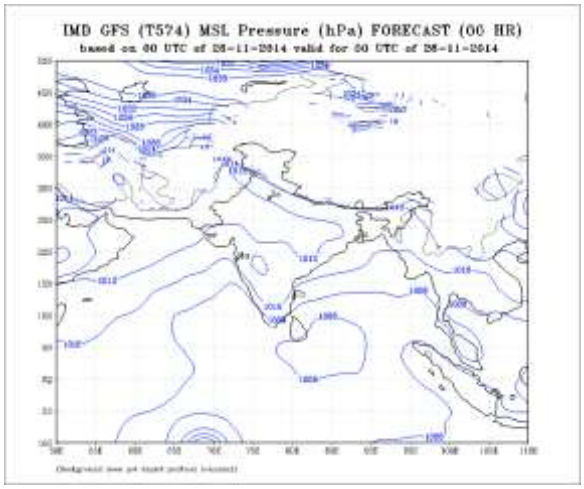
No. of Ascents reaching 250 hPa level = --

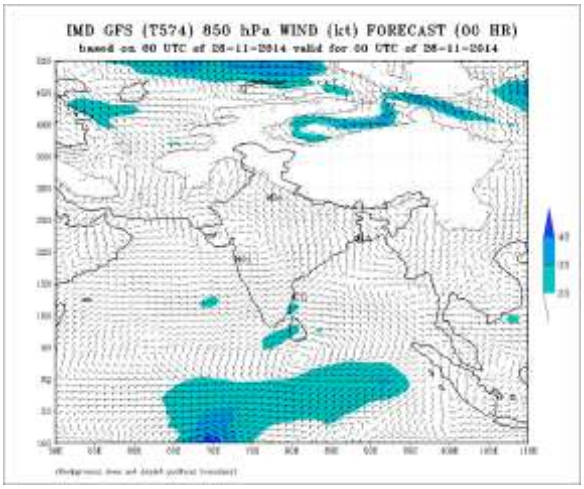
MISDA : 8

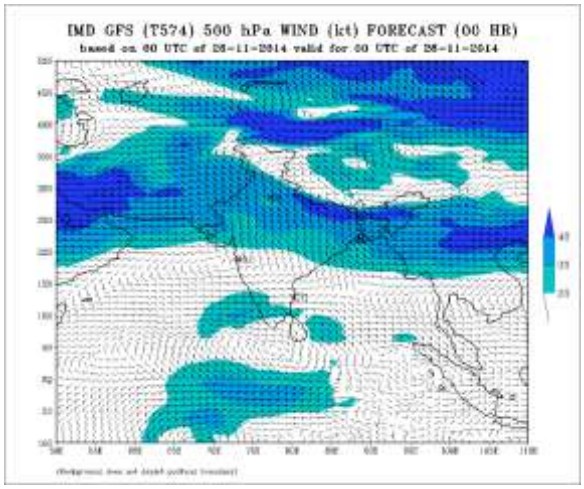
No. of PILOT Ascents:

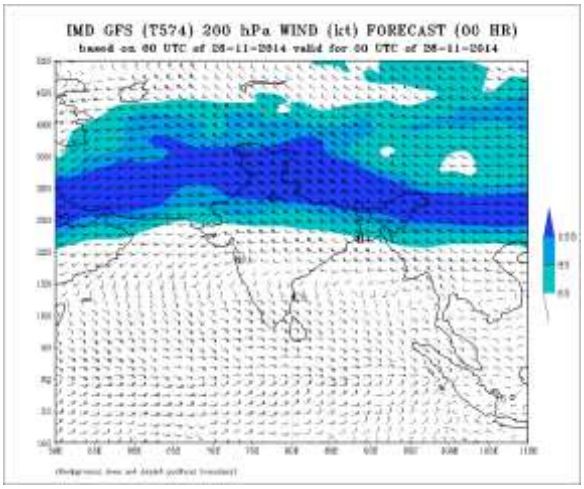
25.11.2014	
06Z	18Z
4	3

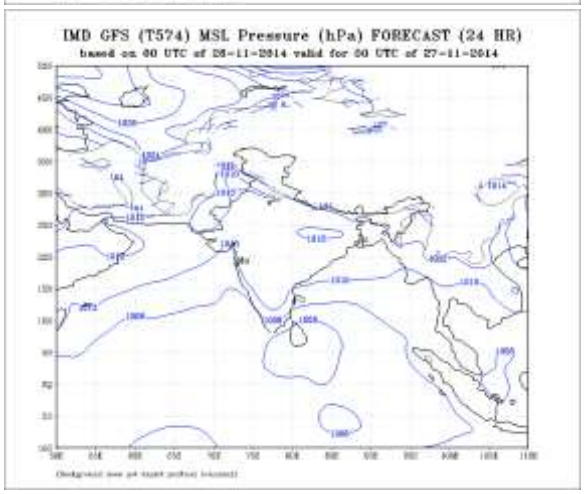
Annexure-II

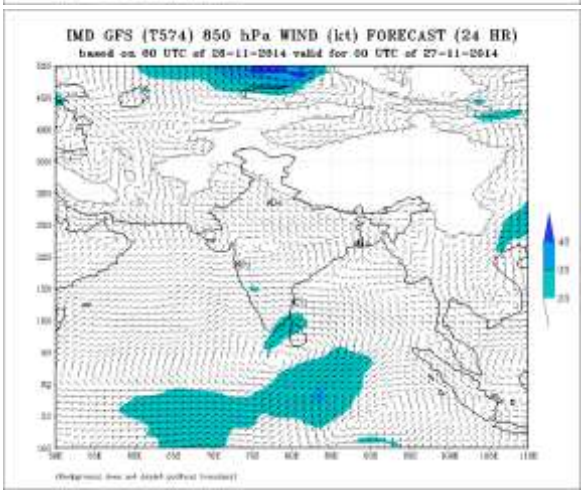

IMD GFS (T574) MSL Pressure (hPa) FORECAST (00 HR)
based on 00 UTC of 26-11-2014 valid for 00 UTC of 26-11-2014

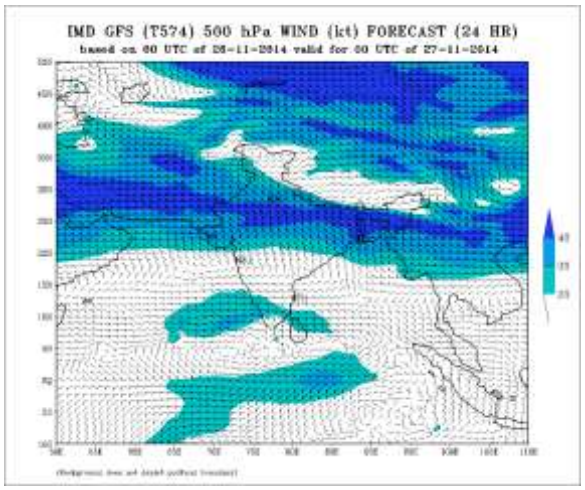

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 26-11-2014 valid for 00 UTC of 26-11-2014

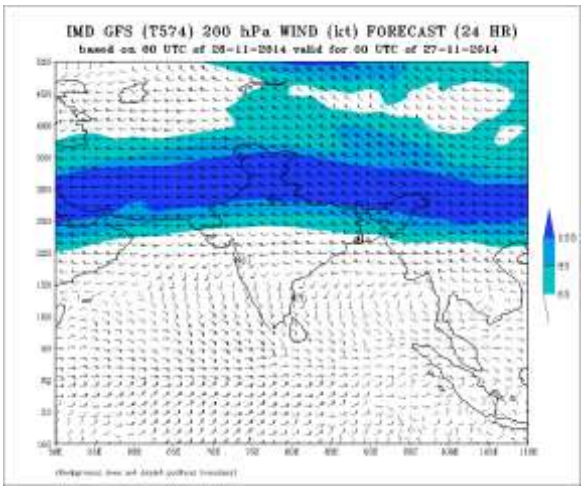

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 26-11-2014 valid for 00 UTC of 26-11-2014

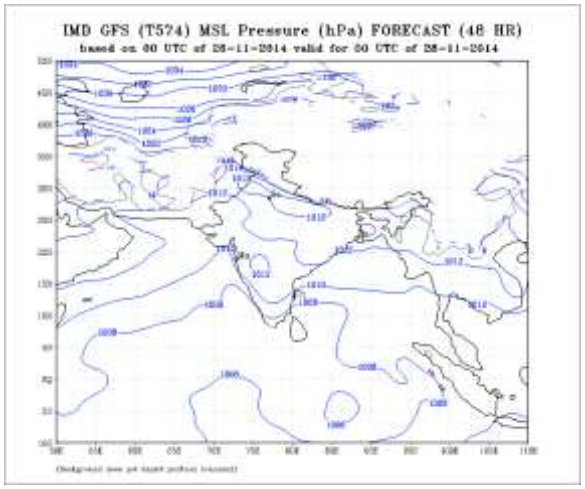

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 26-11-2014 valid for 00 UTC of 26-11-2014

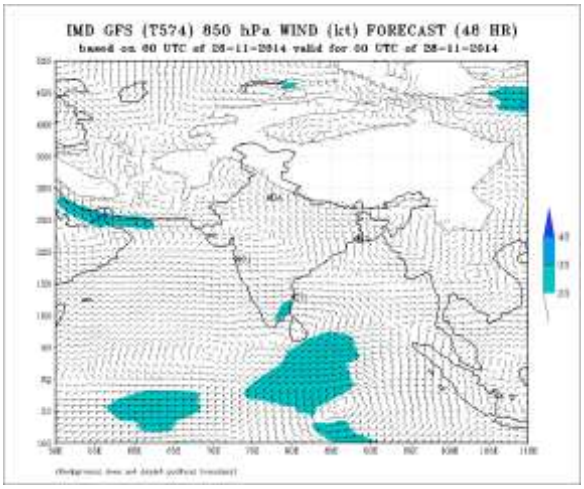

IMD GFS (T574) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 26-11-2014 valid for 00 UTC of 27-11-2014

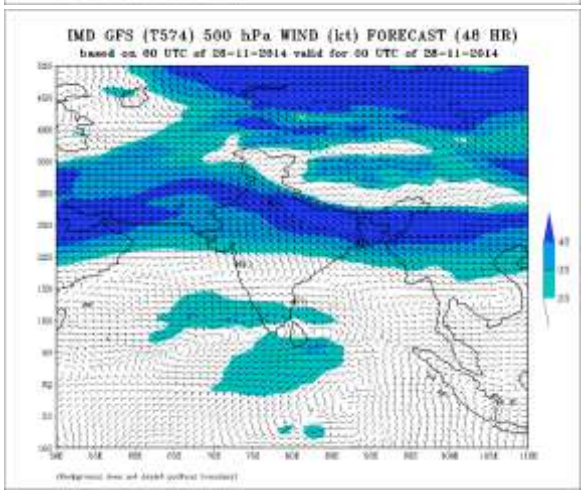

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 26-11-2014 valid for 00 UTC of 27-11-2014

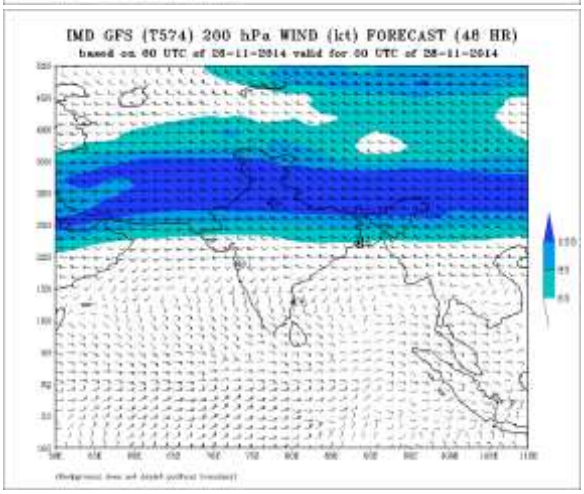

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 26-11-2014 valid for 00 UTC of 27-11-2014

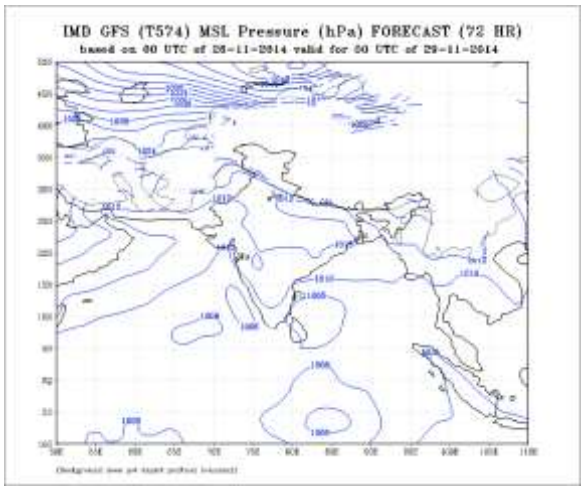

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 26-11-2014 valid for 00 UTC of 27-11-2014

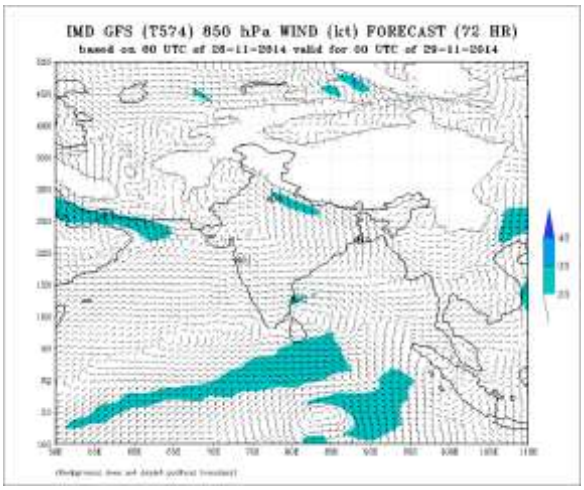

IMD GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 26-11-2014 valid for 00 UTC of 28-11-2014

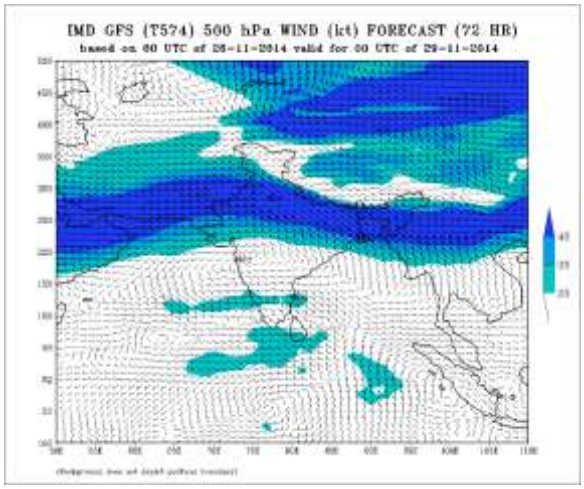

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 26-11-2014 valid for 00 UTC of 28-11-2014

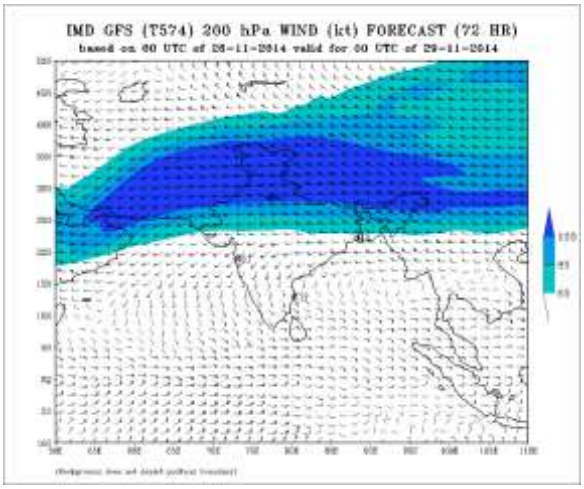

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 26-11-2014 valid for 00 UTC of 28-11-2014


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 26-11-2014 valid for 00 UTC of 28-11-2014


IMD GFS (T574) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 26-11-2014 valid for 00 UTC of 29-11-2014


IMD GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 26-11-2014 valid for 00 UTC of 29-11-2014


IMD GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 26-11-2014 valid for 00 UTC of 29-11-2014


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
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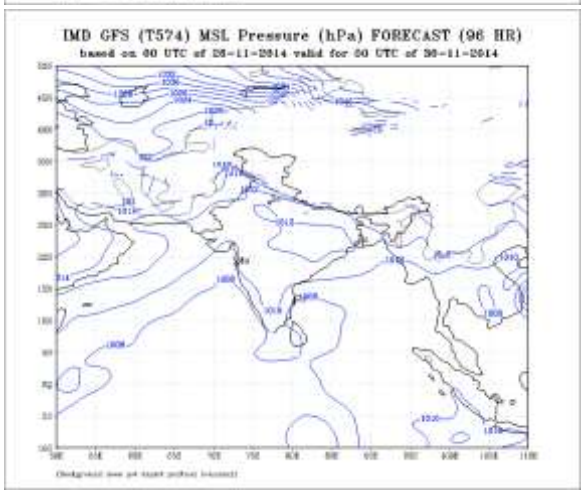
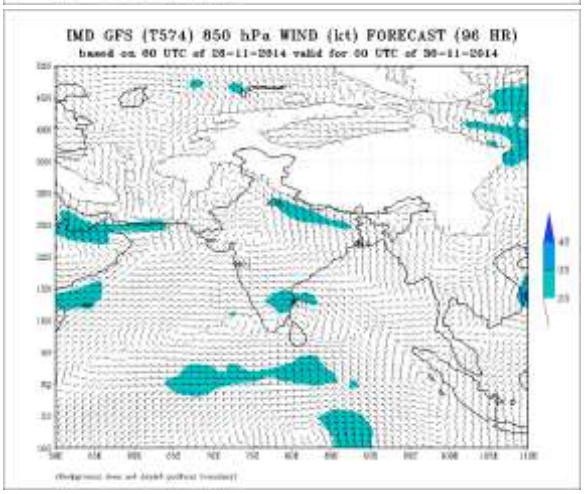
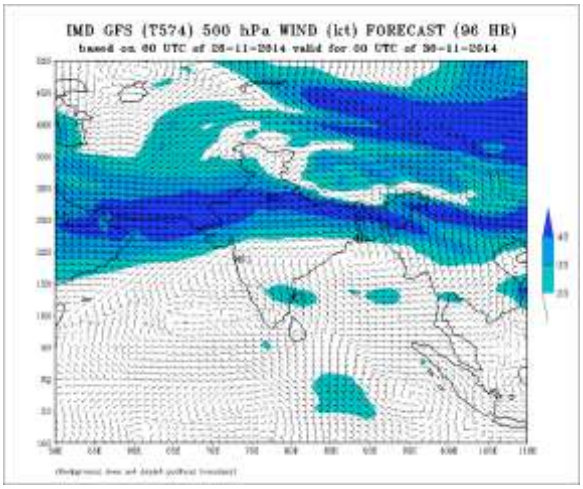
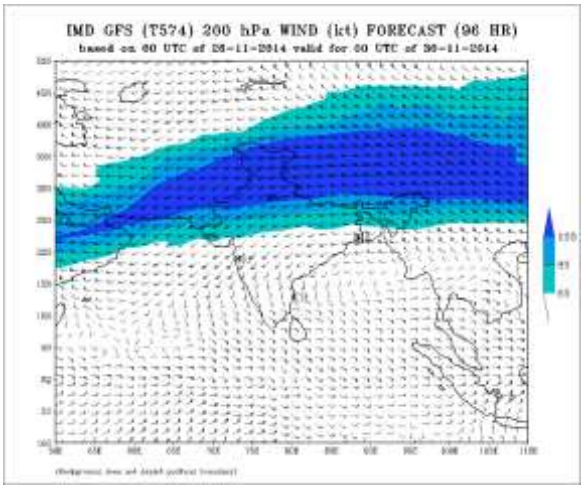
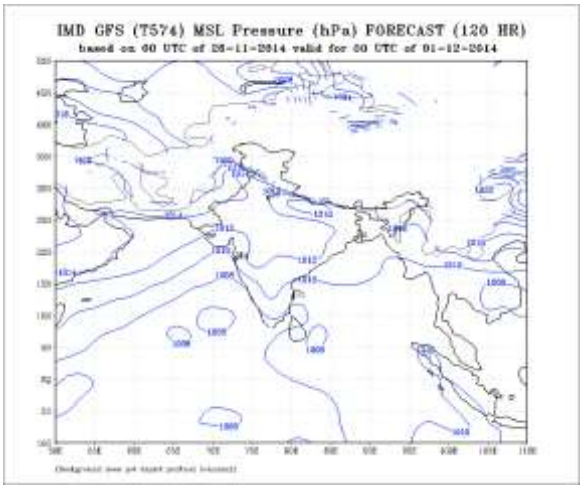
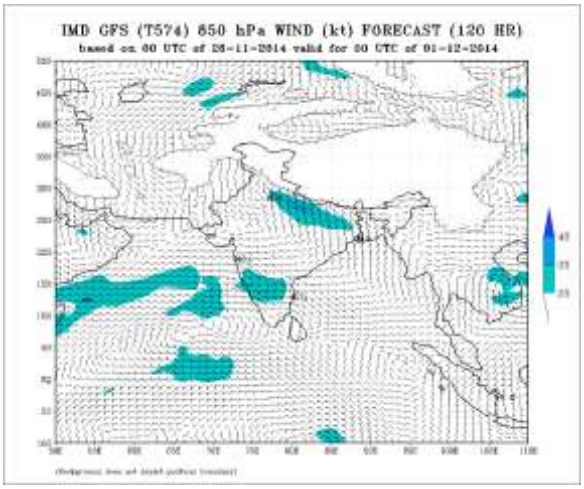

IMD GFS (T574) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 26-11-2014 valid for 00 UTC of 30-11-2014

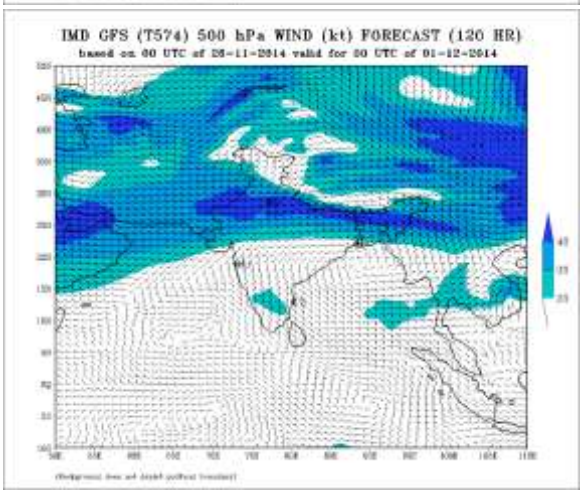

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 26-11-2014 valid for 00 UTC of 30-11-2014

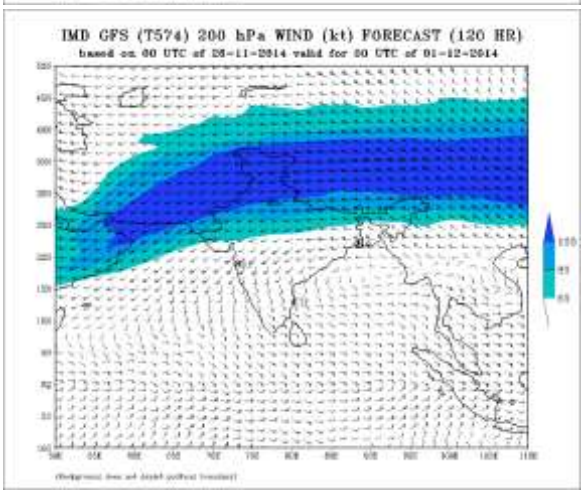

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 28-11-2014 valid for 00 UTC of 30-11-2014


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 28-11-2014 valid for 00 UTC of 30-11-2014


IMD GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 28-11-2014 valid for 00 UTC of 01-12-2014


IMD GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 28-11-2014 valid for 00 UTC of 01-12-2014


IMD GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 28-11-2014 valid for 00 UTC of 01-12-2014


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
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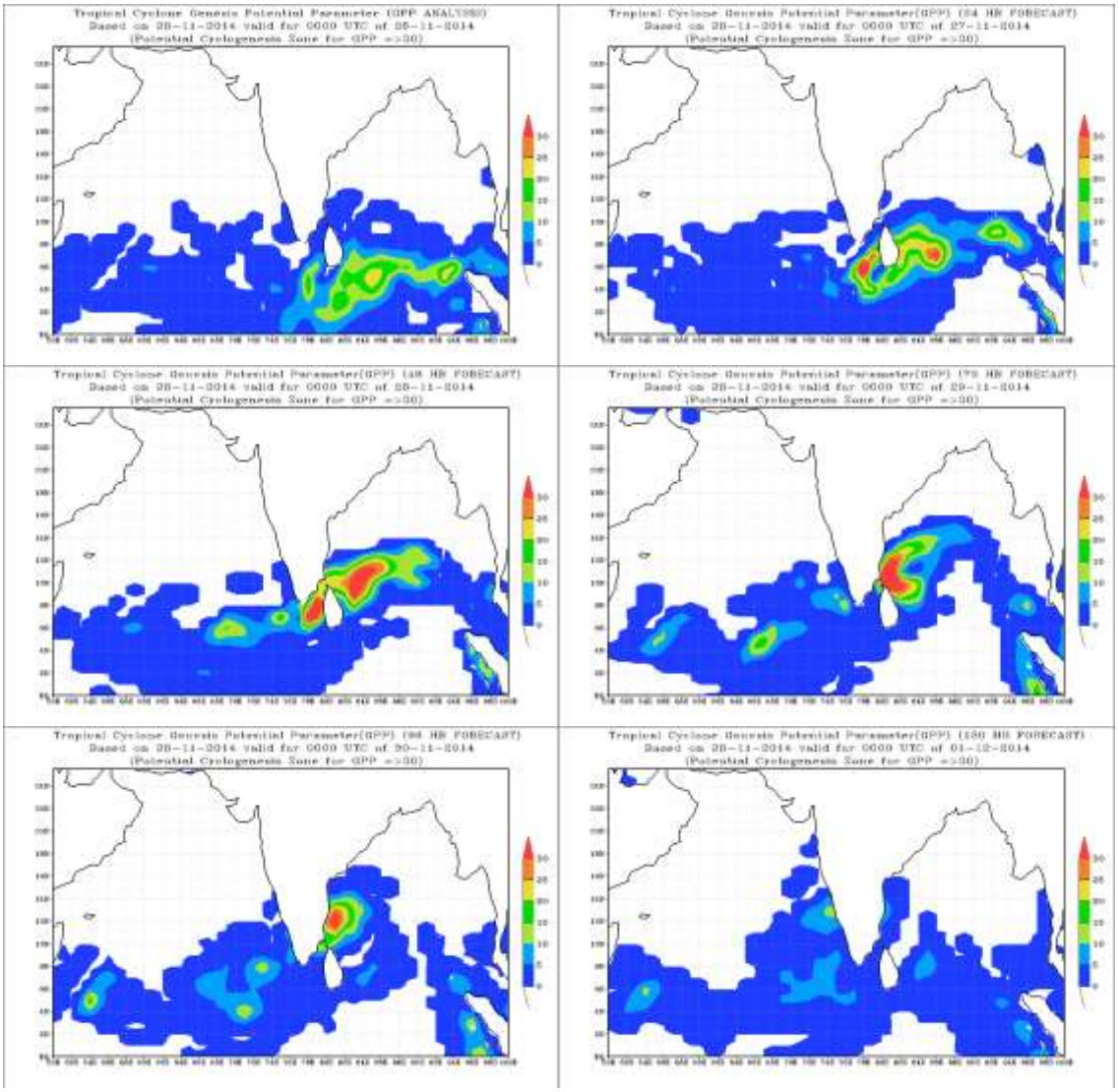


FDP (Cyclone) NOC Report Dated 27 November, 2014

Synoptic features based on 0300 UTC of today:

- The trough of low at mean Sea level over southeast Arabian Sea & neighbourhood persists.
- The low pressure area over south Sri Lanka and adjoining areas of southwest Bay of Bengal & Equatorial Indian Ocean persists. Associated upper air cyclonic circulation extending upto 3.1 km above mean Sea level also persists.

Environmental features based on 0300 UTC of today:

Sea Surface Temperature:

- Sea Surface Temperature is 28-30^{0}C over most parts of the Bay of Bengal and Andaman Sea except over central Bay of Bengal and some parts of southwest Bay of Bengal and south Andaman Sea where it is 26-27^{0}C.
- It is between 28-30^{0}C over eastern parts of Arabian Sea and 26-27^{0}C over the western parts of Arabian Sea.

Tropical Cyclone Heat Potential (TCHP):

- The ocean thermal energy is around 100-130kJ/cm^2 over south of latitude 10.0°N, northeast bay of Bengal and eastcentral arabian Sea off Goa coast and less than 40kJ/cm^2 over most parts of Bay of Bengal and Andaman Sea.

Relative Vorticity:

- Relative vorticity at 850 hPa is negative over entire Bay of Bengal and Andaman Sea except over some parts of the southwest Bay of Bengal off Sri lanka coast and adjoining equatorial Indian Ocean (30-50*10^{-5} s^{-1}).

Convergence:

- Lower level convergence is positive (5-20*10^{-5} s^{-1}) over southwest Bay of Bengal off Sri Lanka coast and negative 5 over Andaman Sea and some parts of the Arabian Sea.

Divergence:

- Upper level divergence is positive (5-15 *10^{-5} s^{-1}) over parts of southwest Bay of Bengal off Sri Lanka coast adjoining southeast Arabian Sea.

Wind Shear:

- Wind Shear is 20-30 knots over parts of southwest Bay of Bengal off Sri Lanka coast. It is 05-10 knots over many parts of the Bay of Bengal, Andaman Sea and adjoining Malay Peninsular region.

Wind Shear Tendency:

- Wind shear tendency is 5-20 KTs over parts of over south of latitude 10.0°N Bay of Bengal and 5-10 KT over east central Arabian Sea adjoining southeast Arabian Sea off Sri Lanka coast.

Upper tropospheric ridge:

- The upper tropospheric **ridge** at 200 hPa passes through 15.0°N.

M.J.O. Index:

- Located in phase 3 with amplitude greater than 1.0. It would continue in phase 3 next 2-3 days.

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

As per satellite imagery, the vortex over south Indian ocean centered near 13.9S/64.0E associated broken low/medium clouds with embedded intense to very intense convection over the area between lat 12.0S to 18.0S long 60.0E to 65.0E.

Another vortex over south Philippines & neighborhood centered near 10.2N/120.0E. associated broken low/medium clouds with embedded moderate to intense convection over the area Philippines Mindanao Sulu Sea.

Status of observational system:

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

Satellite:

Inference based on INSAT imagery of 270900 UTC:

Bay of Bengal & Andaman Sea:-

Scattered low and medium clouds with embedded moderate to intense convection over south Bay of Bengal east central parts of east central bay of Bengal and north Andaman Sea.

Arabian Sea:-

Broken low and medium clouds with embedded moderate to intense convection over south of Latitude 10.0°N east of longitude 57.0˚ E.

NWP Analysis

- The analysis of IMD-GFST574 model charts based on 0000 UTC of 27th November 2014 show weakening of the yesterdays low pressure area over south west Bay of Bengal adjoining south off Sri Lanka coast. Forecasts of the model show little organisation of the system at 48 hours and 72 hours over the south west Bay of Bengal adjoining north off Sri Lanka coast and likely to move thereafter in a westward direction and cross Tamilnadu coast during after 72 hours.
- The WRF model analysis and forecasts also show yesterdays low pressure area over south west Bay of Bengal adjoining south off Sri Lanka coast likely to remain quasi-stationary over the south Tamilnadu coast during next 72 hours.
- The Genesis Potential Parameter (GPP) analysis and forecasts based on 0000 UTC of 27th November, 2014 shows no intensification during next 96 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-GFS** model shows low pressure area over southwest Bay of Bengal persists over the same region on 27th Nov and moving westwards it would weaken during the next 48 hours.
- **NCMRWF-UKMO** model shows a low pressure area over southwest Bay of Bengal It would move northwestwards across Sri Lanka, during the next 24 hours and weaken.
- **ECMWF Model** does not suggest any low pressure area over Bay of Bengal during the next 5 days.

- **ARP-METEOFRANCE** model shows a low pressure area over southwest Bay of Bengal. It would move northwestwards during the next 72 hours.
- **JMA** model shows low pressure area over southwest Bay of Bengal and it would move northwestwards and weaken on 29th Nov.

Summary and Conclusion:

Most of the NWP models suggested that the low pressure area over the southwest Bay of Bengal moves northwest wards and weaken, no further intensification will be thereafter during next five days.

Advisory:

- the intensification may be watched.
- No IOP for next five days.

Annexure-I

Status of Observation system:
Synoptic Observation:

Region	Date/Time (UTC)		
	26/12	**27/00**	**27/03**
India	41	30	44
Coastal stations			
WB	7	3	8
Odisha	7	5	7
AP	11	12	12
Tamil Nadu	9	8	11
Puducherry	1	1	1
A & N	6	1	6
Bangladesh	11	9	11
Myanmar	11	10	10
Thailand	2	2	2
Sri Lanka	8	8	8

AWS Observations:

Region	Date/Time (UTC)		
	26/12	**27/00**	**27/03**
India	67	63	67
Coastal stations			
WB	10	8	10
Odisha	7	3	6
AP	27	27	26
Tamil Nadu	22	24	24
Puducherry	1	1	1
A & N	-	-	-

- **RS/RW** (12Z) of 26/11/2014 **-10/39**
- **No. of Ascents reaching 250 hPa level: 0, MISDA: 18**
- **RS/RW** (00Z) of 27/11/2014-18**/39**
- **No. of Ascents reaching 250 hPa level: 5, MISDA: 11**

No. of PILOT Ascents

26/12Z	**27/00Z**
11	10

Buoy Data

26/12Z	**27/00Z**	**27/03Z**
3	5	5

FOC CHENNAI: STATUS OF OBSERVATION

No. of Synop data

Date→	**26.11.2014**							
UTC→	**00**	**03**	**06**	**09**	**12**	**15**	**18**	**21**
Chennai Region (Coasts of AP & TN)	**20**	**22**	**20**	**20**	**22**	**20**	**20**	**20**

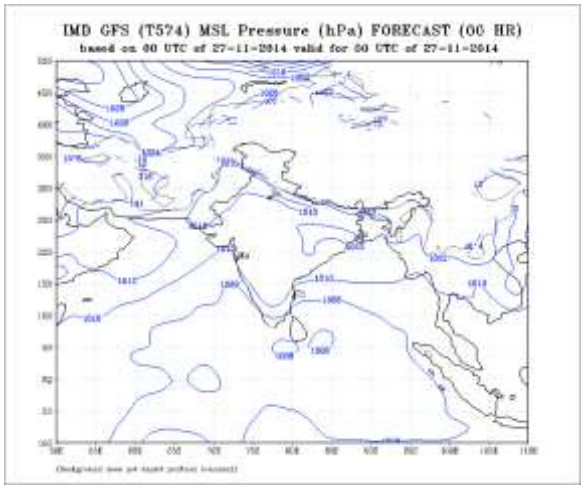
No. of RS/RW Ascents

00Z /26.11.2014 : 3
No. of Ascents reaching 250 hPa level = 2
MISDA : 5
12Z /26.11.2014 : --
No. of Ascents reaching 250 hPa level = --
MISDA : 8

No. of PILOT Ascents:

26.11.2014	
06Z	18Z
1	3

Annexure-II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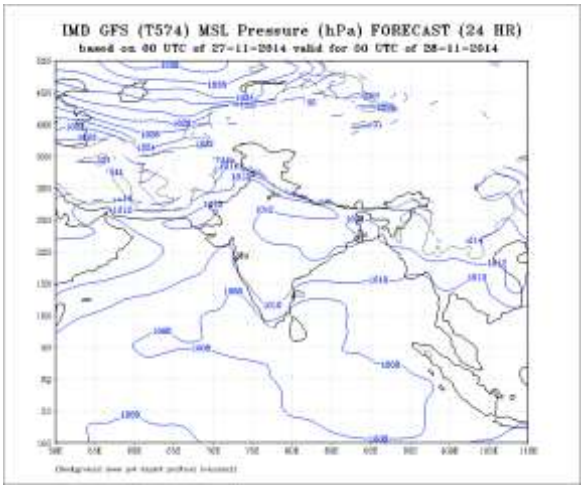
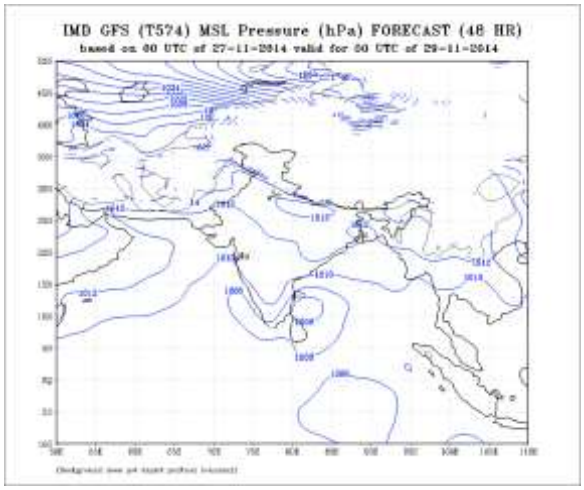
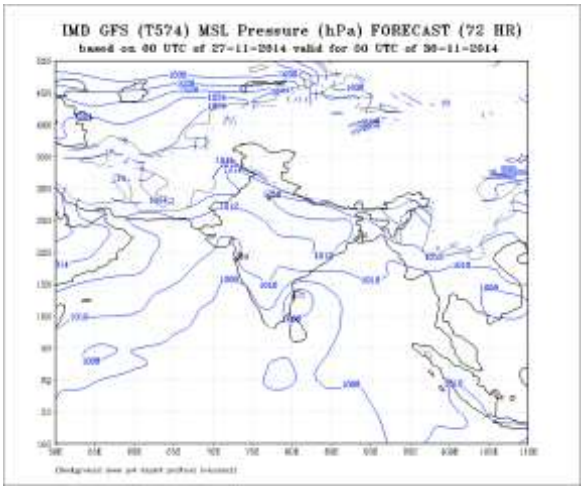
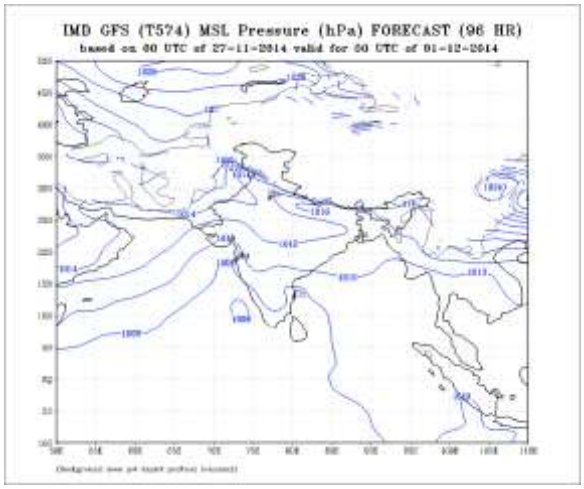
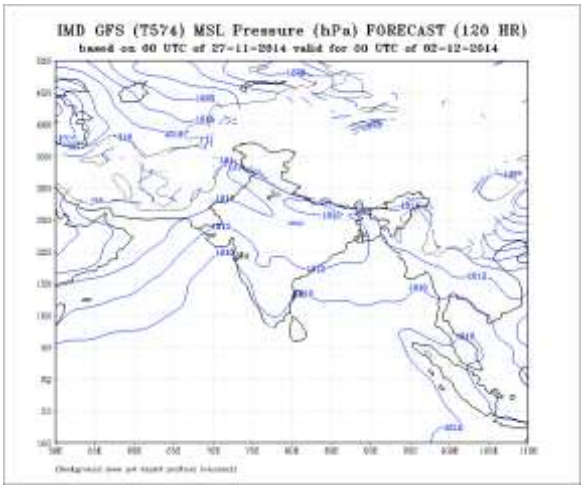
based on 00 UTC of 27-11-2014 valid for 00 UTC of 27-11-2014

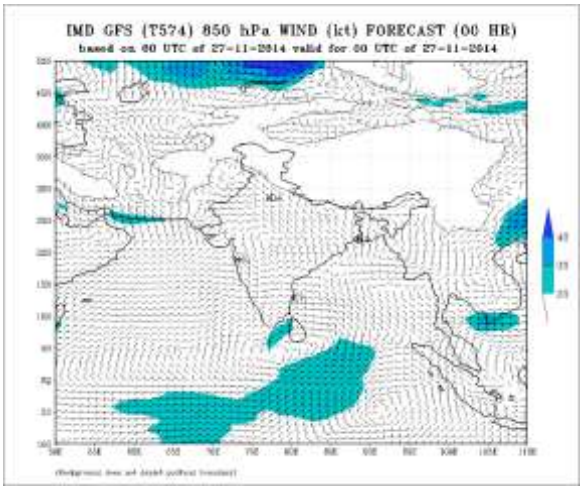

IMD GFS (T574) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 27-11-2014 valid for 00 UTC of 28-11-2014

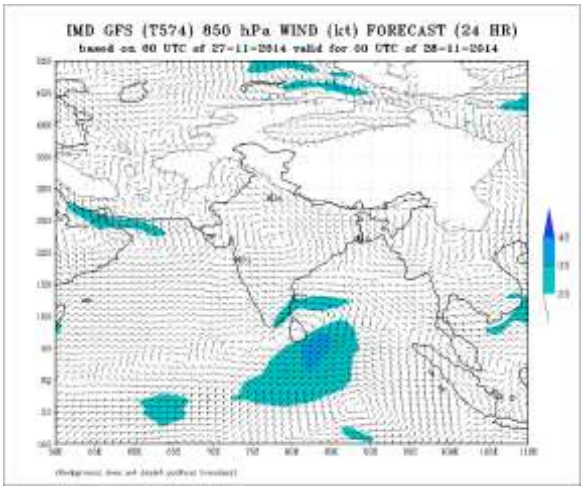

IMD GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 27-11-2014 valid for 00 UTC of 29-11-2014

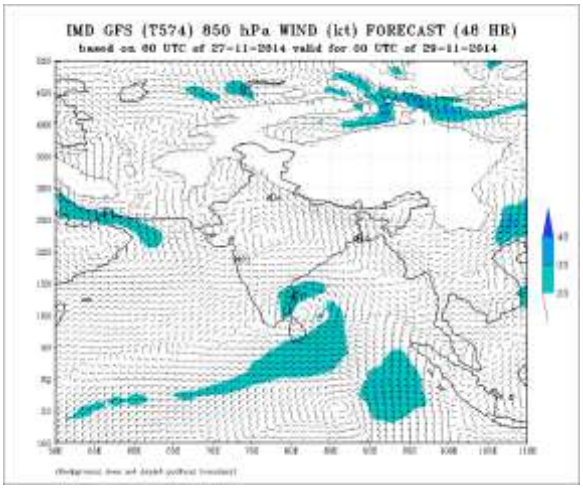

IMD GFS (T574) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 27-11-2014 valid for 00 UTC of 30-11-2014


IMD GFS (T574) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 27-11-2014 valid for 00 UTC of 01-12-2014


IMD GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 27-11-2014 valid for 00 UTC of 02-12-2014


IMD GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 27-11-2014 valid for 00 UTC of 27-11-2014


IMD GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 27-11-2014 valid for 00 UTC of 28-11-2014


IMD GFS (T574) 850 hPa WIND (kt) FORECAST (48 HR)
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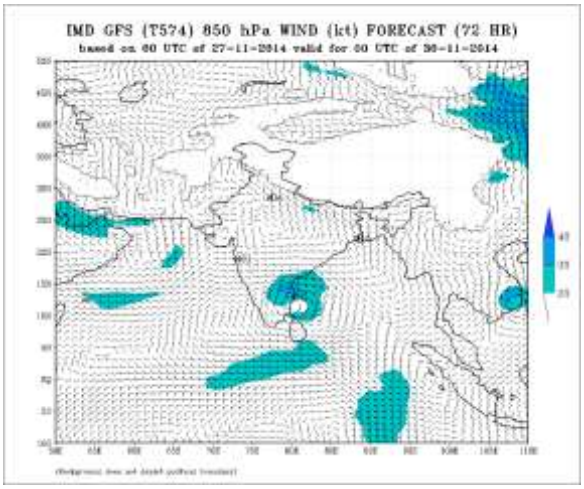
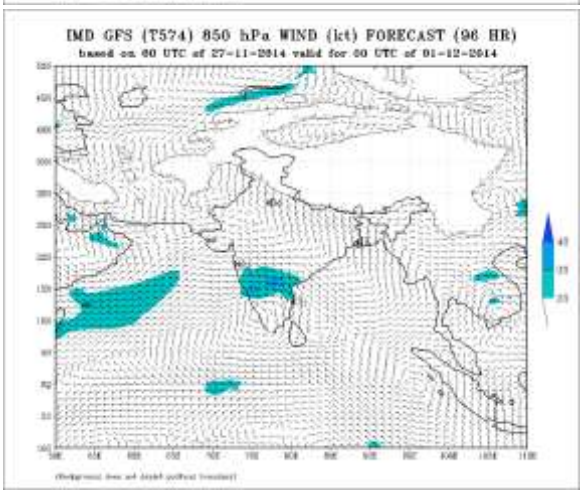
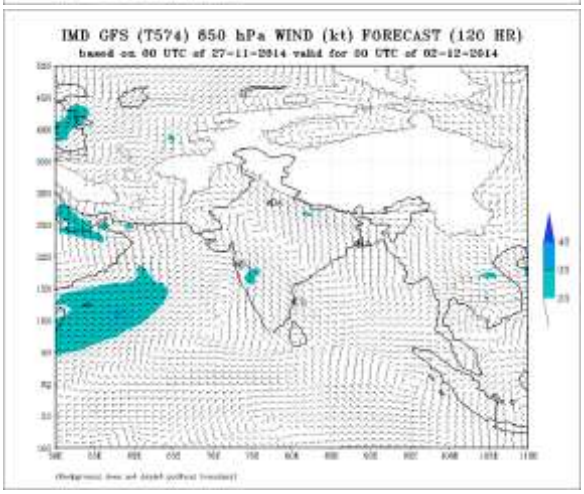

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 27-11-2014 valid for 00 UTC of 30-11-2014


IMD GFS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 27-11-2014 valid for 00 UTC of 01-12-2014


IMD GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
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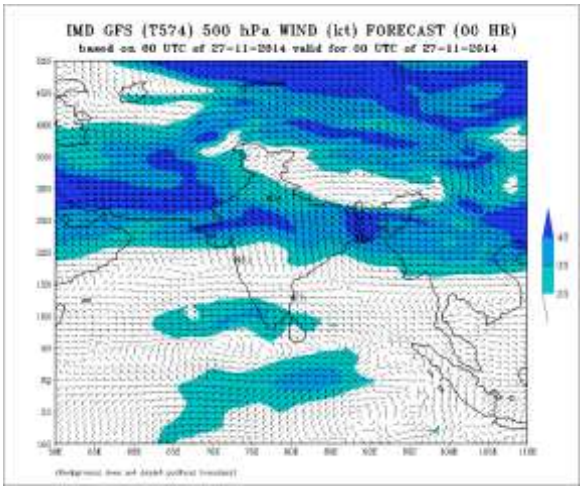
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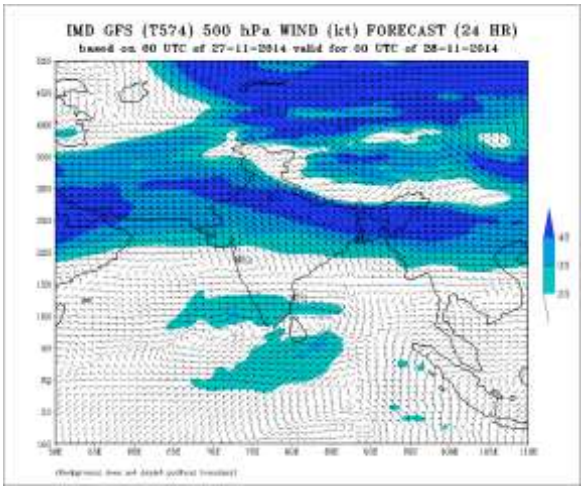
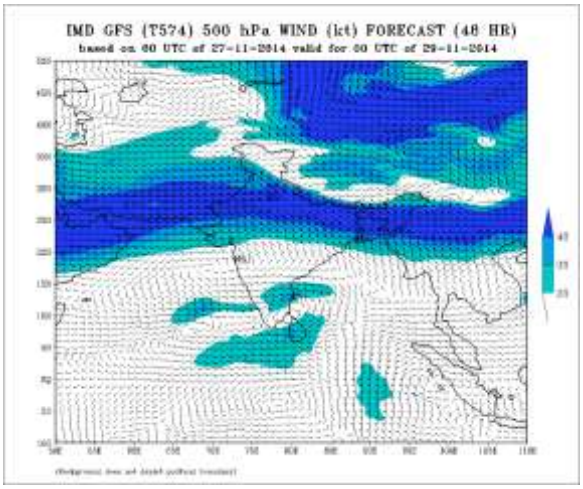

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 27-11-2014 valid for 00 UTC of 28-11-2014


IMD GFS (T574) 500 hPa WIND (kt) FORECAST (48 HR)
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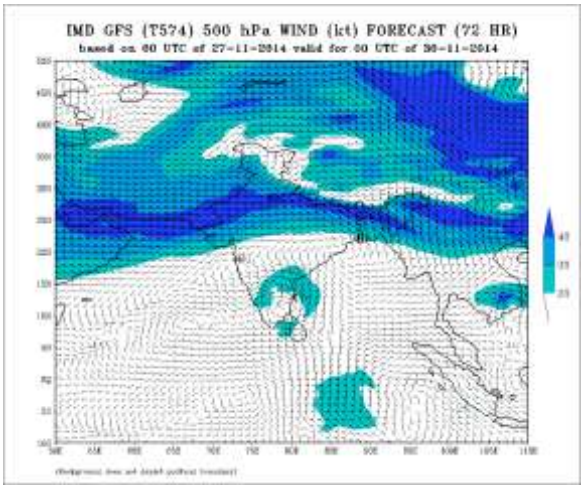
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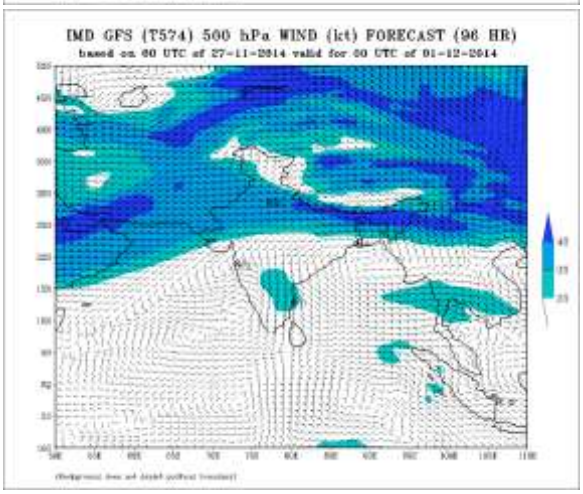
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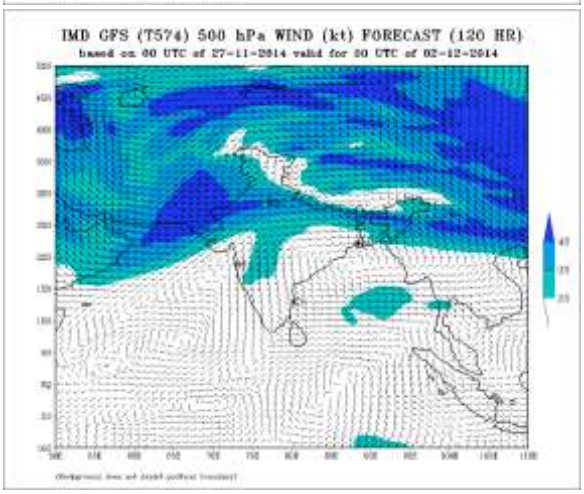
IMD GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
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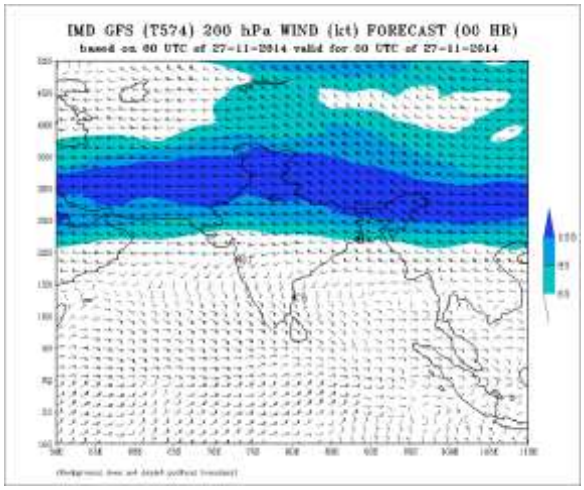
IMD GFS (T574) 200 hPa WIND (kt) FORECAST (00 HR)
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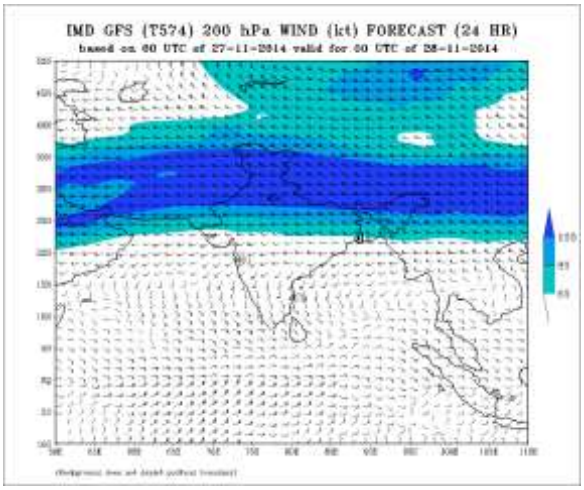
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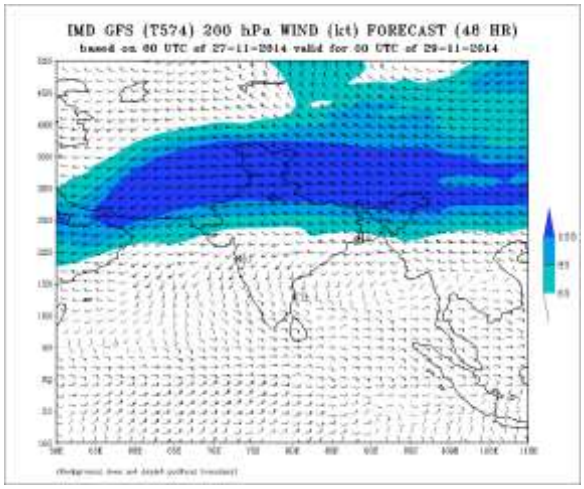
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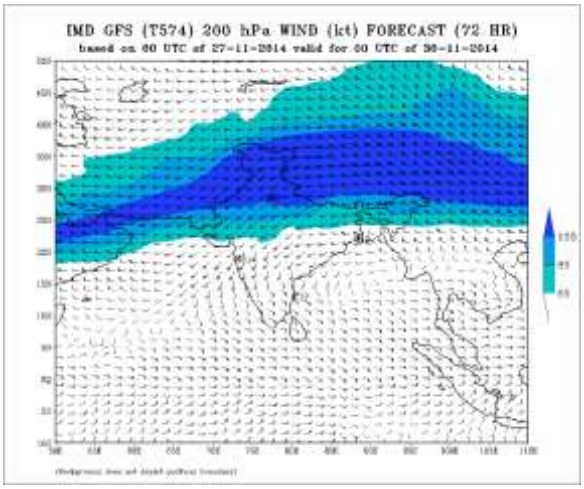
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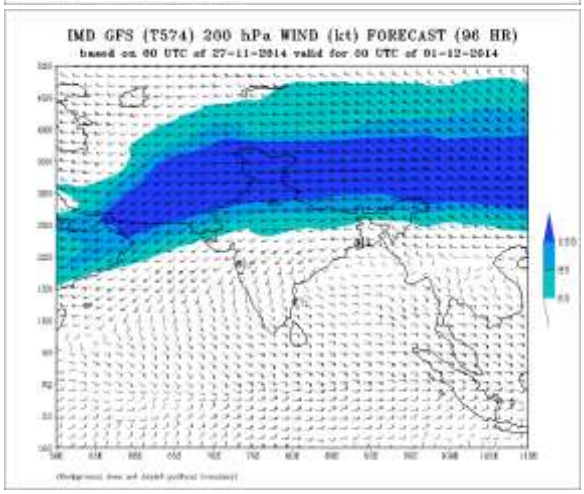
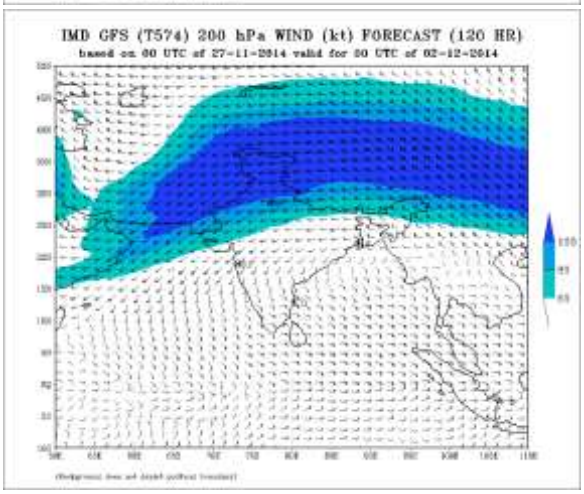

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 27-11-2014 valid for 00 UTC of 01-12-2014


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 27-11-2014 valid for 00 UTC of 02-12-2014

FDP (Cyclone) NOC Report Dated 28 November, 2014

Synoptic features based on 0300 UTC of today:

- Yesterday's trough of low at mean Sea level over southeast Arabian Sea & neighbourhood persists.
- Yesterday's low pressure area over south Sri Lanka and adjoining areas of southwest Bay of Bengal & Equatorial Indian Ocean now lies over Sri Lanka and adjoining areas of Gulf of Mannar & southwest Bay of Bengal . Associated upper air cyclonic circulation extends upto upto 3.1 km above mean Sea level also persists. It may become well marked low pressure area during next 24 hours.

Environmental features based on 0300 UTC of today:

Sea Surface Temperature:

- Sea Surface Temperature is 28-30^{0}C over most parts of the Bay of Bengal and Andaman Sea except over central Bay of Bengal and some parts of southwest Bay of Bengal and south Andaman Sea where it is 26-27^{0}C. It is between 28-30^{0}C over eastern parts of Arabian Sea and 26-27^{0}C over the western parts of Arabian Sea.

Tropical Cyclone Heat Potential (TCHP):

- The ocean thermal energy is around 100-120kJ/cm^2 off Sri Lanka coast and adjoining areas of Gulf of Mannar & southwest Bay of Bengal, part of northeast Bay of Bengal and east Arabian Sea and less than 40kJ/cm^2 over most parts of Bay of Bengal and Andaman Sea.

Relative Vorticity:

- Relative vorticity at 850 hPa is negative over entire Bay of Bengal and Andaman Sea except over Sri Lanka, parts of southwest Bay of Bengal and adjoining equatorial Indian Ocean (40-$_{-5}$ -$_1$60*10s)

Convergence:

- Lower level convergence is positive (5-15 *10^{-5} s^{-1}) over Sri Lanka, parts of southwest Bay of Bengal and adjoining equatorial Indian Ocean.

Divergence:

- Upper level divergence is positive (10-30*10^{-5} s^{-1}) over Sri Lanka, parts of southwest Bay of Bengal and adjoining equatorial Indian Ocean.

Wind Shear:

- Wind Shear is 20 KTs over Sri Lanka, parts of southwest Bay of Bengal and adjoining equatorial Indian Ocean.

Wind Shear Tendency:

- Wind shear tendency is -5 to -10 KTs over Sri Lanka, parts of southwest Bay of Bengal and adjoining equatorial Indian Ocean.

Upper tropospheric ridge:

- The upper tropospheric **ridge** at 200 hPa passes through 13.0°N.

M.J.O. Index:

- Located in phase 3 with amplitude greater than 1.0. It would continue in phase 3 next 2 days.

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

As per satellite imagery, Vortex over south Indian Ocean centered near latitude 15.6˚ S longitude 62.2 ˚E, with Intensity T1.5 .Associated broken low and medium clouds with embedded intense to very intense convection over the area between latitude 14.5 ˚S to 19.0 ˚S longitude 58.0 ˚E to 65.0 ˚E.

Another Vortex over South East China Sea & neighbourhood centered near 11.6 ˚N Longitude 115.2 ˚E with intensity T 2.0. Associated broken low and medium clouds with embedded moderate to intense convection over east South China Sea between latitude 6.5 ˚N to 15.0 ˚N longitude 112.0 ˚E to 119.5 ˚E near Palawan.

Status of observational system:

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

Satellite:

Inference based on INSAT imagery of 280900 UTC:

Bay of Bengal & Andaman Sea:-

Scattered low and medium clouds with embedded moderate to intense convection over rest south Bay of Bengal and east central Bay of Bengal and south Andaman Sea.

Arabian Sea:-

Broken low and medium clouds with embedded moderate to intense convection over south Arabian Sea south of latitude 11.5°N and east of longitude 67.0˚ E and between latitude 6.0°N to 6.0°N and longitude 58.0°E to 64.0°E.

NWP Analysis

- The analysis and forecasts of IMD-GFST574 model based on 0000 UTC of 28th November 2014 show little organisation of the low pressure system at 24 hours and 48 hours over the south west Bay of Bengal adjoining off Tamilnadu coast and likely to move in a westward direction and cross Tamilnadu coast after 48 hours.
- The WRF model analysis and forecasts also show little organization of the low pressure area over south west Bay of Bengal adjoining off Tamilnadu coast during next 48 hours and likely to move in a westward direction and weaken thereafter.
- The Genesis Potential Parameter (GPP) analysis and forecasts based on 0000 UTC of 28th November, 2014 shows no potential zone for cyclogenesis during next 120 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-GFS** model shows little organisation of the low pressure system during next 2 days over south west Bay of Bengal adjoining off Tamilnadu coast and likely to move in a westward direction and cross Tamilnadu coast thereafter.
- **NCMRWF-UKMO** model shows westward movement of the low pressure area over southwest Bay of Bengal during the next 2 days and thereafter weakening of the system.
- **ECMWF Model** does not suggest intensification of the present low pressure area over southwest Bay of Bengal and formation of any low pressure area over Bay of Bengal during the next 5 days.
- **ARP-METEOFRANCE** model suggest the low pressure system would persist over the same area for next 2 days thereafter weakening of the system.
- **JMA** model shows initial movement in westward direction in westward direction in next 2 days and thereafter weakening of the system.

Summary and Conclusion:

Most of the NWP models suggested that the low pressure area over the southwest Bay of Bengal moves west wards in next 2 days and weakens thereafter. Only **GFS** model shows little organisation of the low pressure system during next 2 days over south west Bay of Bengal adjoining off Tamilnadu coast and likely to move in a westward direction and cross Tamilnadu coast thereafter.

Advisory:

The intensification may be watched. No IOP for next five days.

Annexure-I

Status of Observation system:

Synoptic Observation:

Region	Date/Time (UTC)		
	27/12	**28/00**	**28/03**
India	42	31	45
Coastal stations			
WB	8	4	8
Odisha	7	5	7
AP	12	12	12
Tamil Nadu	8	8	11
Puducherry	1	1	1
A & N	6	1	6
Bangladesh	11	11	11
Myanmar	11	11	11
Thailand	2	2	2
Sri Lanka	8	8	8

AWS Observations:

Region	Date/Time (UTC)		
	27/12	**28/00**	**28/03**
India	67	63	67
Coastal stations			
WB	10	8	10
Odisha	7	4	6
AP	27	27	26
Tamil Nadu	22	23	24
Puducherry	1	1	1
A & N	-	-	-

- **RS/RW** (12Z) of 27/11/2014 **-1/39**
- **No. of Ascents reaching 250 hPa level: 1, MISDA: 38**
- **RS/RW** (00Z) of 28/11/2014-19**/39**
- **No. of Ascents reaching 250 hPa level: 4, MISDA: 9**

No. of PILOT Ascents

27/12Z	28/00Z
10	8

Buoy Data

27/12Z	28/00Z	28/03Z
8	9	9

FOC CHENNAI: STATUS OF OBSERVATION

No. of Synop data

Date→	**27.11.2014**							
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

No. of RS/RW Ascents

00Z /27.11.2014 : 3

No. of Ascents reaching 250 hPa level = 2

MISDA : 5

12Z /27.11.2014 : --

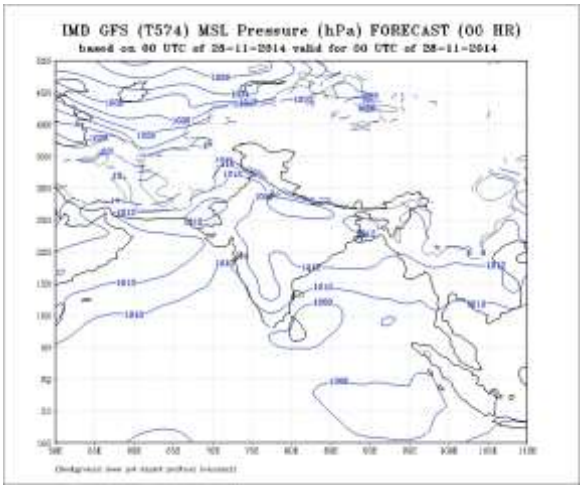
No. of Ascents reaching 250 hPa level = --

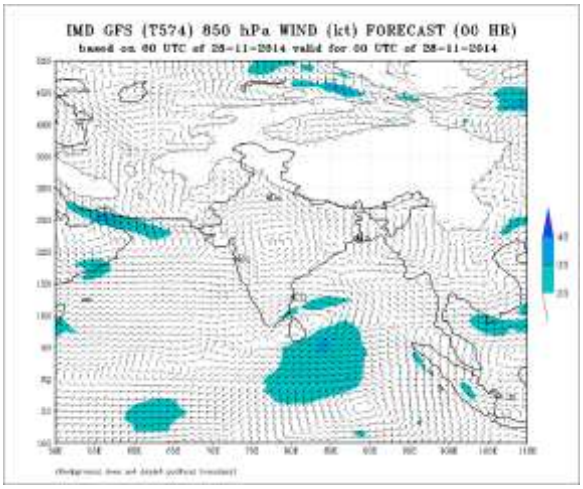
MISDA : 8

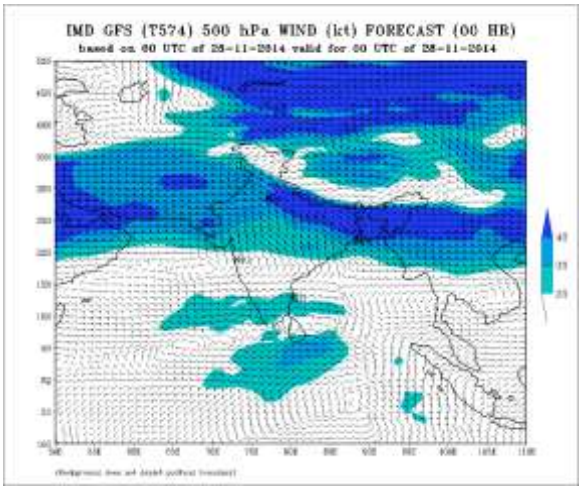
No. of PILOT Ascents:

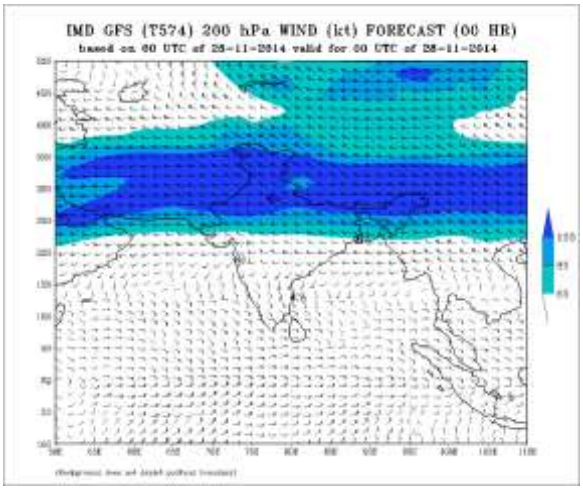
27.11.2014	
06Z	18Z
4	4

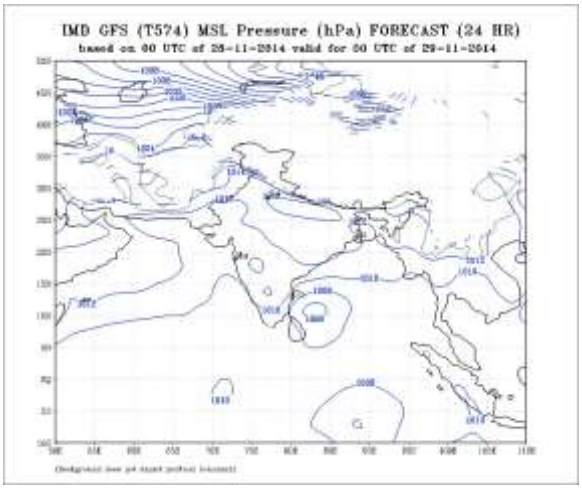
Annexure-II

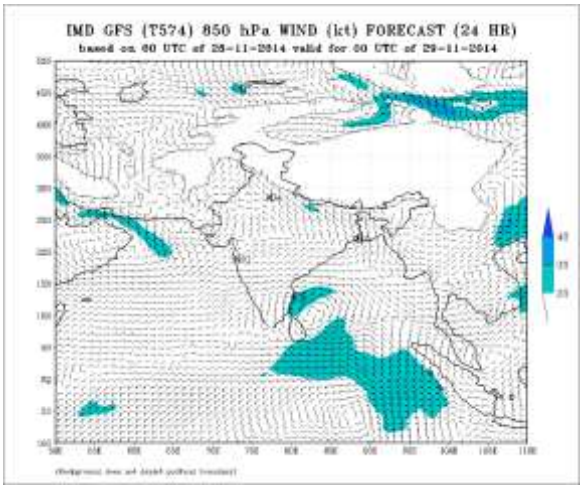

IMD GFS (T574) MSL Pressure (hPa) FORECAST (00 HR)
based on 00 UTC of 28-11-2014 valid for 00 UTC of 28-11-2014

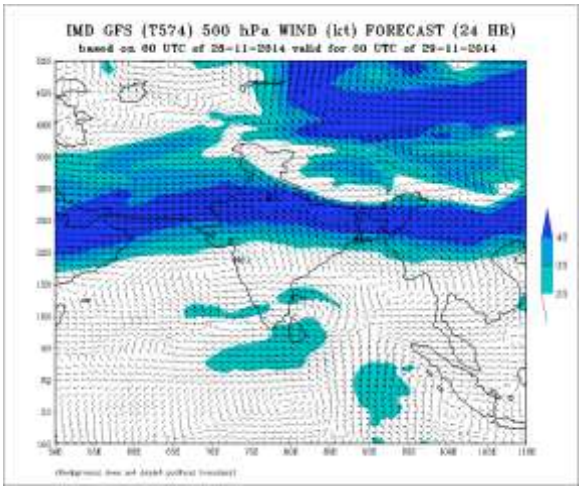

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 28-11-2014 valid for 00 UTC of 28-11-2014

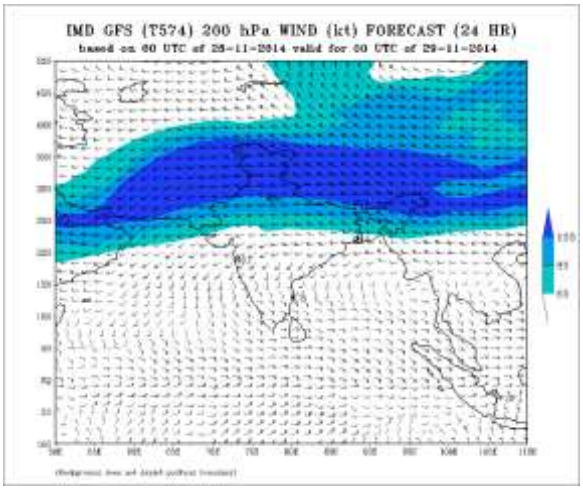

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 28-11-2014 valid for 00 UTC of 28-11-2014

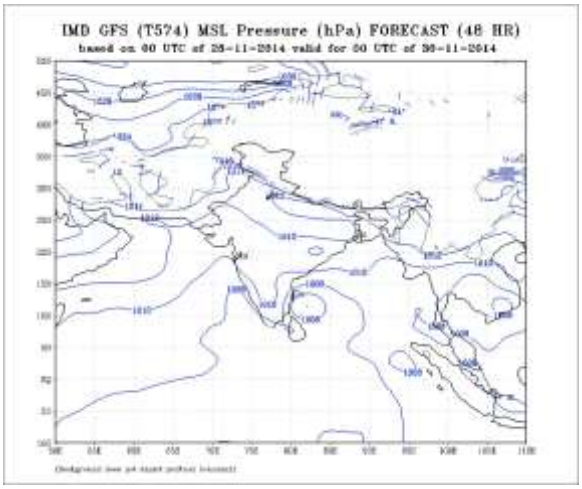

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 28-11-2014 valid for 00 UTC of 28-11-2014

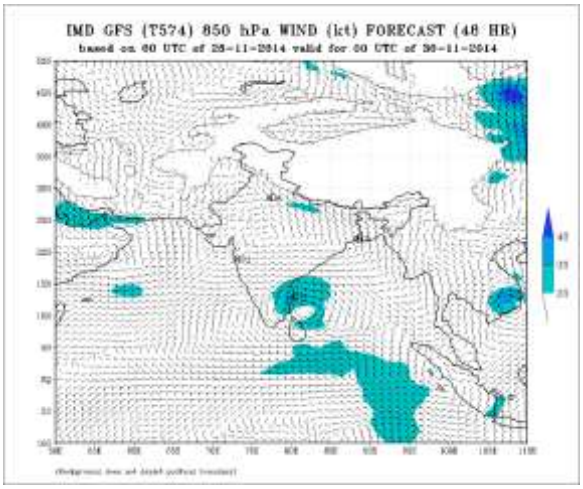

IMD GFS (T574) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 28-11-2014 valid for 00 UTC of 29-11-2014

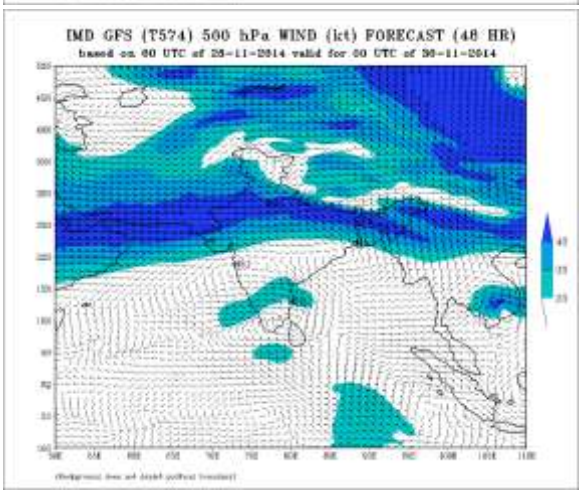

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 28-11-2014 valid for 00 UTC of 29-11-2014

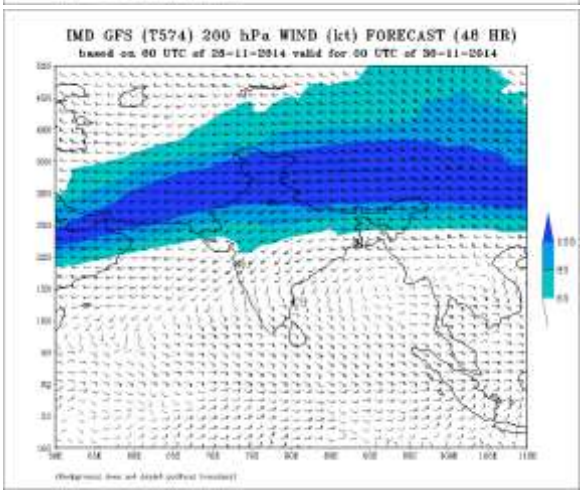

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 28-11-2014 valid for 00 UTC of 29-11-2014

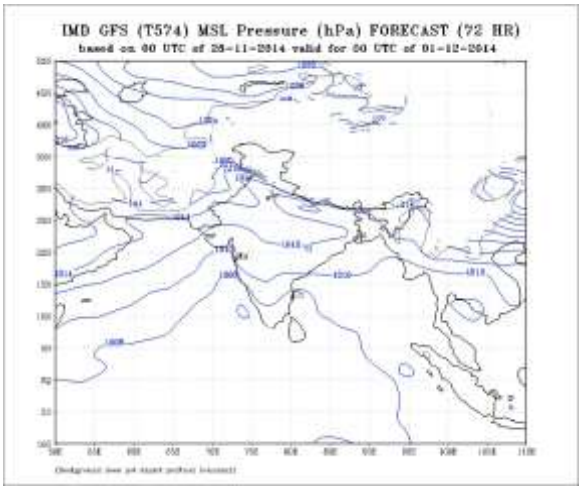

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 28-11-2014 valid for 00 UTC of 29-11-2014

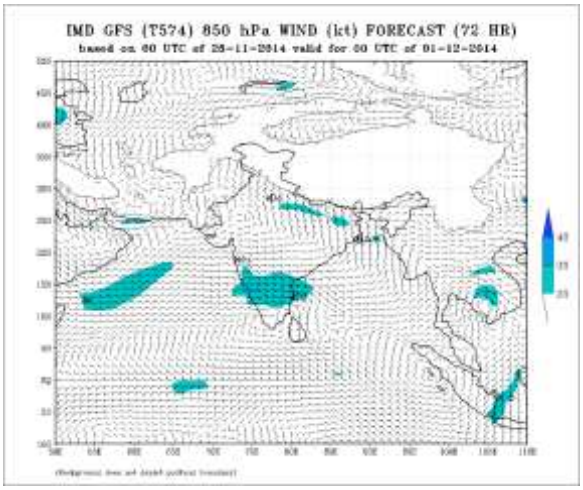

IMD GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 28-11-2014 valid for 00 UTC of 30-11-2014

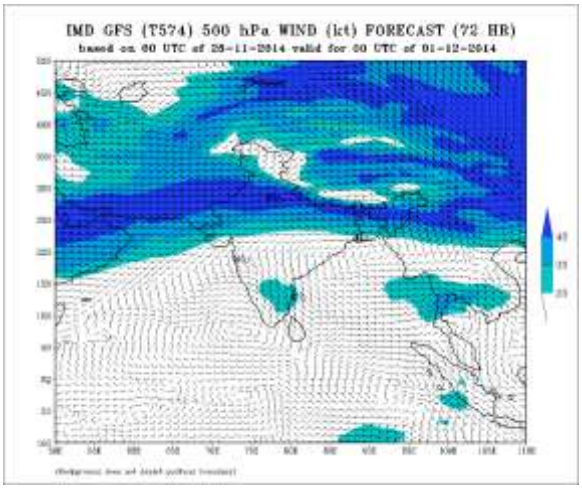

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 28-11-2014 valid for 00 UTC of 30-11-2014

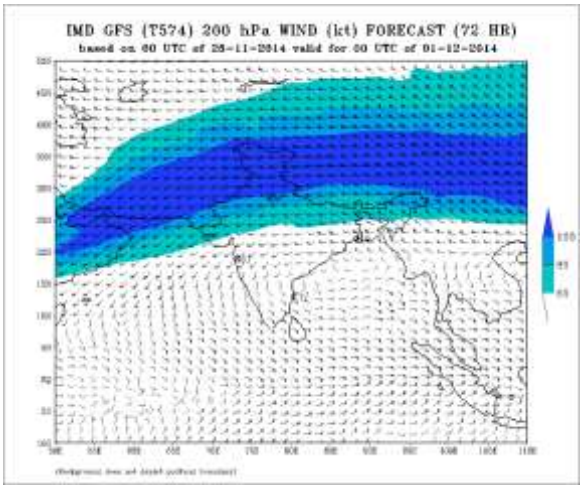

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 28-11-2014 valid for 00 UTC of 30-11-2014

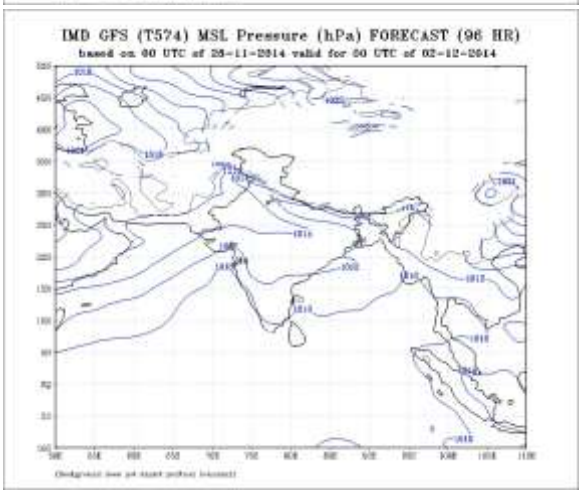

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 28-11-2014 valid for 00 UTC of 30-11-2014

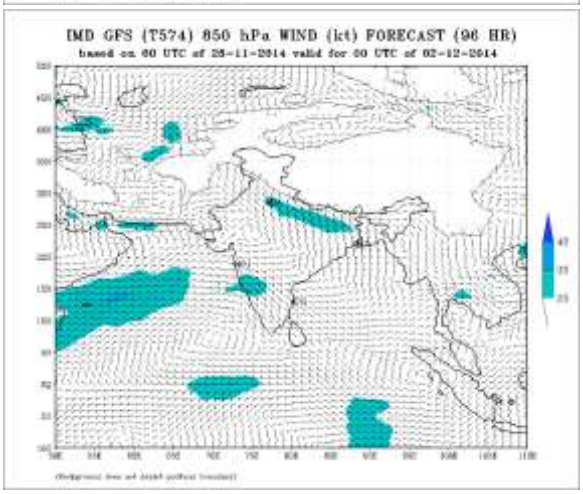

IMD GFS (T574) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 28-11-2014 valid for 00 UTC of 01-12-2014

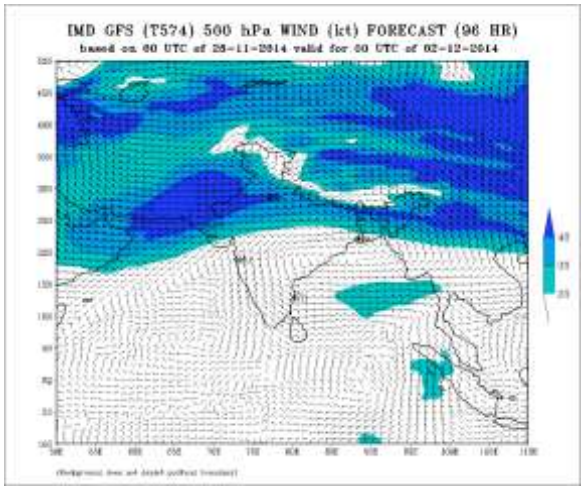

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 28-11-2014 valid for 00 UTC of 01-12-2014

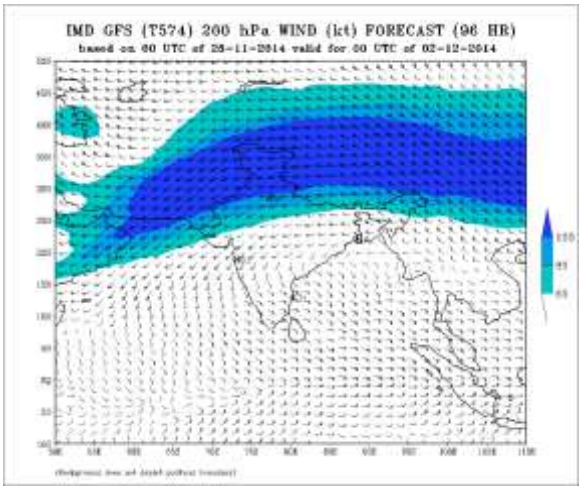

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 28-11-2014 valid for 00 UTC of 01-12-2014

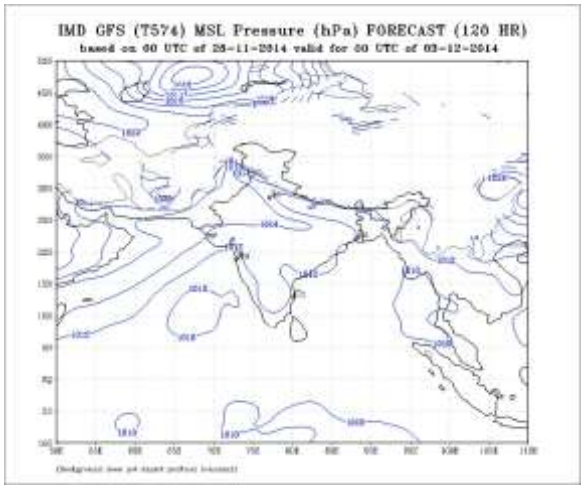

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 28-11-2014 valid for 00 UTC of 01-12-2014

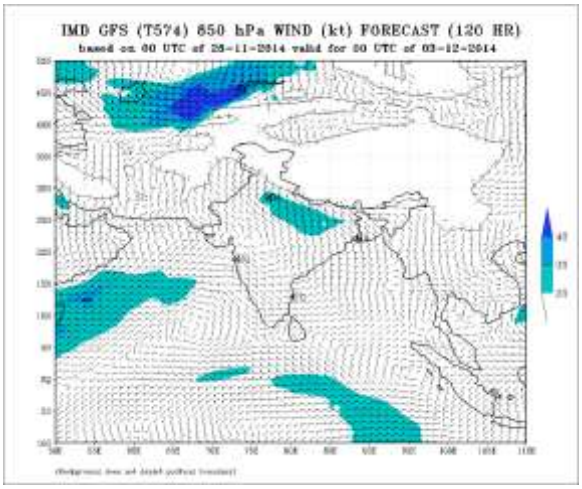

IMD GFS (T574) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 28-11-2014 valid for 00 UTC of 02-12-2014

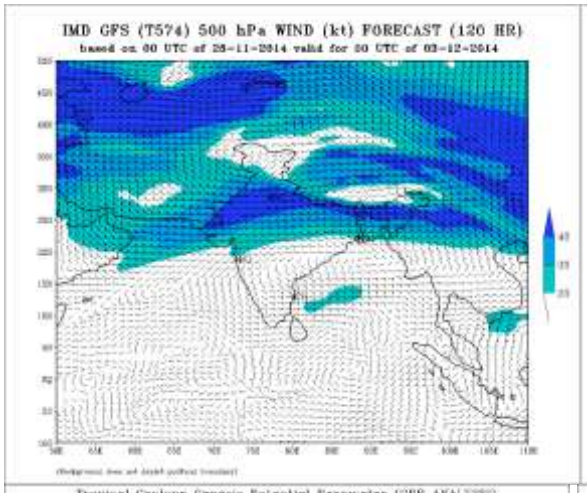

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 28-11-2014 valid for 00 UTC of 02-12-2014

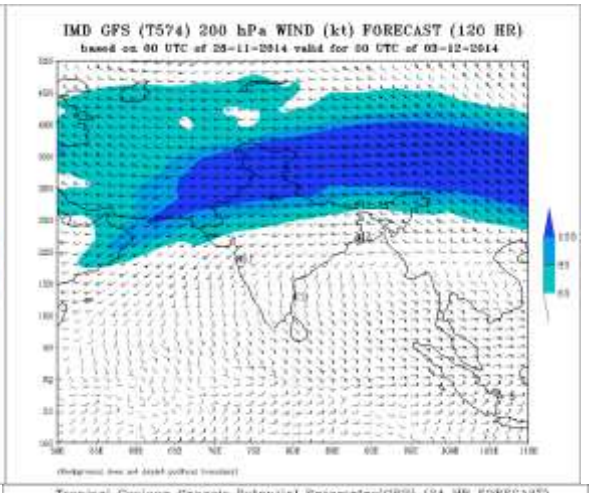

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 28-11-2014 valid for 00 UTC of 02-12-2014

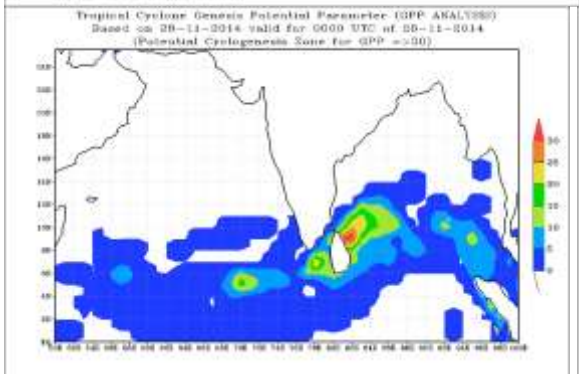

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 28-11-2014 valid for 00 UTC of 02-12-2014

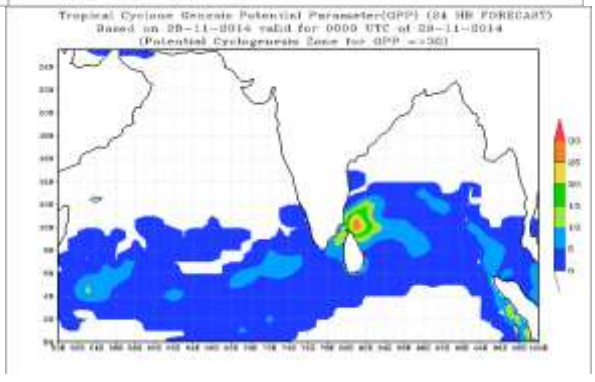

IMD GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 28-11-2014 valid for 00 UTC of 03-12-2014

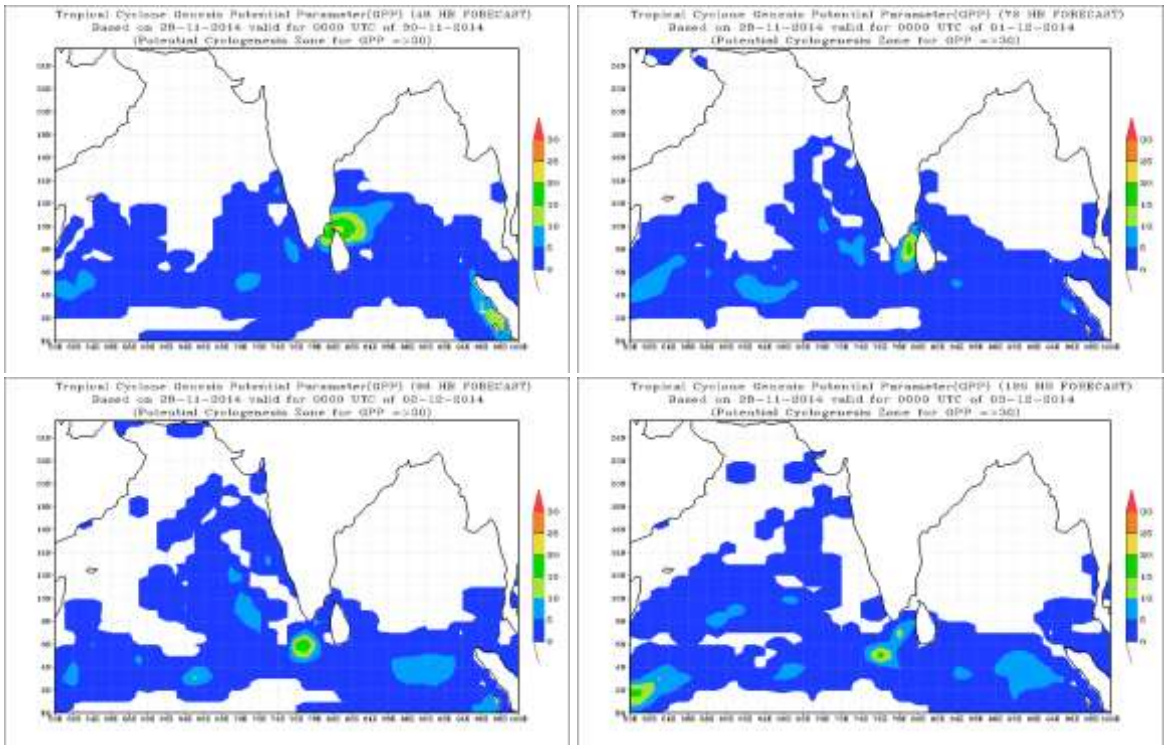

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 28-11-2014 valid for 00 UTC of 03-12-2014


IMD GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 28-11-2014 valid for 00 UTC of 03-12-2014


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 28-11-2014 valid for 00 UTC of 03-12-2014


Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 28-11-2014 valid for 0000 UTC of 28-11-2014
(Potential Cyclogenesis Zone for GPP >=30)


Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 28-11-2014 valid for 0000 UTC of 28-11-2014
(Potential Cyclogenesis Zone for GPP >=30)



FDP (Cyclone) NOC Report Dated 29 November, 2014

Synoptic features based on 0300 UTC of today:

- Yesterday's low pressure area over Sri Lanka and adjoining areas of Gulf of Mannar and southwest Bay of Bengal now lies over southwest Bay of Bengal off north Tamil Nadu coast. Associated upper air cyclonic circulation extends upto 3.1 km above mean Sea level.

Environmental features based on 0300 UTC of today:

Sea Surface Temperature:

- Sea Surface Temperature is around 27-28^{0}C over most parts of the Bay of Bengal and Andaman Sea except over extreme southeast Bay of Bengal and south Andaman Sea where it is 28-29^{0}C.

Tropical Cyclone Heat Potential (TCHP):

- The ocean thermal energy is around 40-60 kJ/cm^2 over most parts of Bay of Bengal and Andaman Sea except over extreme southeast Bay of Bengal where it is around 100 kJ/cm^2.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive (50-70*10^{-5} s^{-1}) over parts of the southwest Bay of Bengal off Sri Lanka and Tamil Nadu coasts.

Convergence:

- Lower level convergence is positive (5-10 $*10^{-5}$ s^{-1}) over parts of southwest Bay of Bengal off Sri Lanka and Tamil Nadu coasts.

Divergence:

- Upper level divergence is positive ($20*10^{-5}$ s^{-1}) over southwest Bay of Bengal off Sri Lanka coast.

Wind Shear:

- Wind Shear is 10-20 knots over Bay of Bengal and Andaman Sea.

Wind Shear Tendency:

- Wind shear tendency is increasing over southern parts of Bay of Bengal and the Arabian Sea. It is decreasing over the northern Bay of Bengal.

Upper tropospheric ridge:

- The upper tropospheric **ridge** at 200 hPa passes through 15.0°N.

M.J.O. Index:

- Located in phase 4 with amplitude greater than 1.0. It would move to phase 5 with amplitude greater than 1.0 during the next 3 days.

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

- Tropical Cyclone (Sinlaku) over South China Sea & neighbourhood and is centered near 13.4°N/110.2°E with intensity T2.5. Associated broken low and medium clouds with embedded intense to very intense convection over South China Sea between latitude 11.0°N to 17.0°N and west of longitude 114.5°E adjoining Vietnam.
- Satellite imageries suggest a vortex over South Indian Ocean centered near 17.8°S/60.2°E with intensity T1.5. Associated broken low and medium clouds with embedded moderate to intense convection over the area between latitude 18.0°S to 23.0°S and longitude 60.0°E to 63.5°E.

<u>Status of observational system:</u>

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

Satellite:

Inference based on INSAT imagery of 290900 UTC:

Bay of Bengal & Andaman Sea:-

Scattered low and medium clouds with embedded moderate to intense convection over between latitude 11.5^0 N to 14.0^0N and longitude 90^0 E, southwest Bay of Bengal and south Andaman Sea.

Arabian Sea:-

Broken low and medium clouds with embedded moderate to intense convection over south Arabian Sea south of latitude 9.5^0 N. Scattered low and medium clouds with embedded isolated weak to moderate convection over Arabian Sea between latitude 13.0^0 N to 18.0^0 N and longitude 67.0˚ E to 72.0˚ .

NWP Analysis

NWP Input for FDP Cyclone based on 0000 UTC of 29.11.2014

NWP Analysis

- The analysis and forecasts of IMD-GFST574 model based on 0000 UTC of 29th November 2014 show weakening of the low pressure system during next 48 hours over the south west Bay of Bengal adjoining off Tamilnadu coast.
- The WRF model analysis and forecasts also show weakening of the low pressure system over south west Bay of Bengal adjoining off Tamilnadu coast during next 48 hours.
- The Genesis Potential Parameter (GPP) analysis and forecasts based on 0000 UTC of 29th November, 2014 shows no potential zone for cyclogenesis during next 120 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-GFS** model shows low pressure area over southwest Bay of Bengal off Sri Lanka and Tamil Nadu coasts which moves westwards over adjoining southeast Arabian Sea during the next 24 hours.
- **NCMRWF-UKMO** model shows a low pressure area over southwest Bay of Bengal off Sri Lanka and Tamil Nadu coast which persists for next 24 hours.
- **ECMWF Model** does not suggest any cyclogenesis over Bay of Bengal during the next 5 days.
- **ARPS model** shows a low pressure area over southwest Bay of Bengal off Sri Lanka and Tamil Nadu coast for next 24 hours.

Summary and Conclusion:

Yesterday's low pressure area over Sri Lanka and adjoining areas of Gulf of Mannar and southwest Bay of Bengal now lies over southwest Bay of Bengal off north Tamil Nadu coast. Associated upper air cyclonic circulation extends upto 3.1 km above mean Sea level.

NWP models do not suggest any cyclogenesis during the next 5 days.

Advisory:

- No IOP for next 2 days.

Annexure-I

Status of Observation system:

Synoptic observation:

Region	Date/Time (UTC)		
	28/12	**29/00**	**29/03**
India	43	31	44
Coastal stations			
WB	6	3	7
Odisha	7	5	7
AP	12	12	12
Tamil Nadu	10	8	10
Puducherry	2	2	2
A & N	6	1	6
Bangladesh	4	10	10
Myanmar	11	11	11
Thailand	2	2	2
Sri Lanka	8	8	8

AWS Observations:

Region	Date/Time (UTC)		
	28/12	**29/00**	**29/03**
India	68	19	64
Coastal stations			
WB	8	2	7
Odisha	7	1	7
AP	28	8	27
Tamil Nadu	24	7	22
Puducherry	1	1	1
A & N	-	-	-

- **RS/RW** (12Z) of 28/11/2014 **-2/39**
- **No. of Ascents reaching 250 hPa level: 1, MISDA: 37**
- **RS/RW** (00Z) of 29/11/2014-20**/39**
- **No. of Ascents reaching 250 hPa level: 9, MISDA: 19**

No. of PILOT Ascents

28/12Z	29/00Z
0	0

Buoy Data

28/12Z	29/00Z	29/03Z
14	12	14

FOC CHENNAI: STATUS OF OBSERVATION

No. of Synop data

Date→	**28.11.2014**							
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 /28.11.2014 : 2

No. of Ascents reaching 250 hPa level = 2

MISDA : 6

12Z /28.11.2014 : --

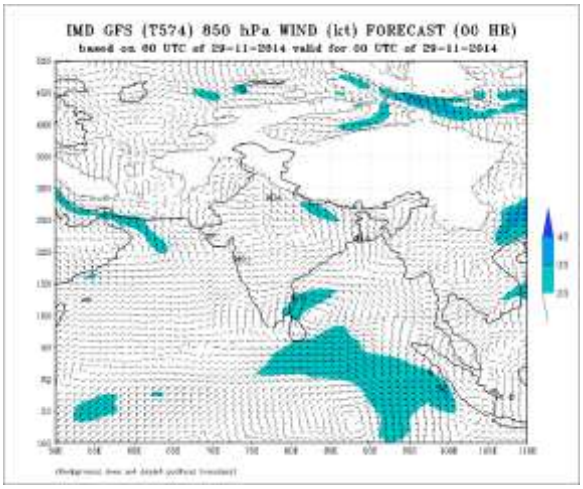
No. of Ascents reaching 250 hPa level = --

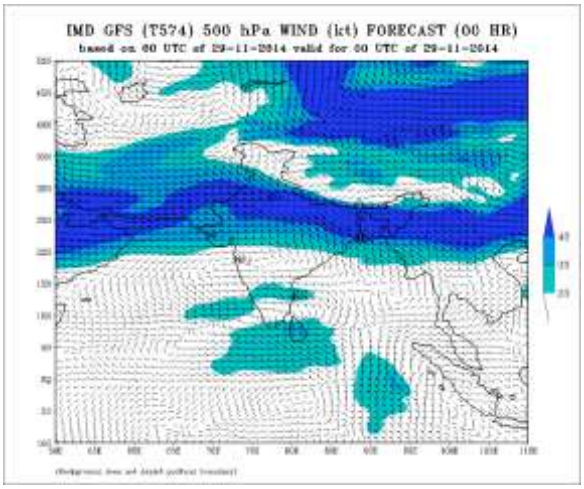
MISDA : 8

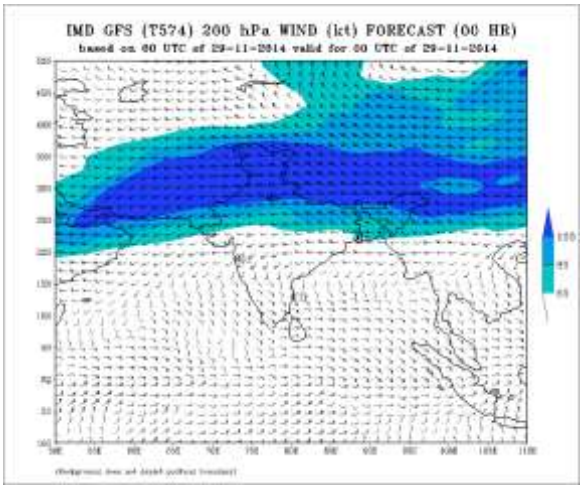
No. of PILOT Ascents:

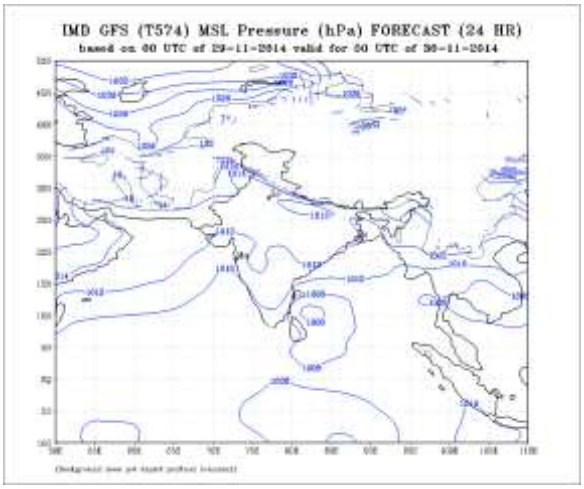
28.11.2014	
06Z	18Z
3	3

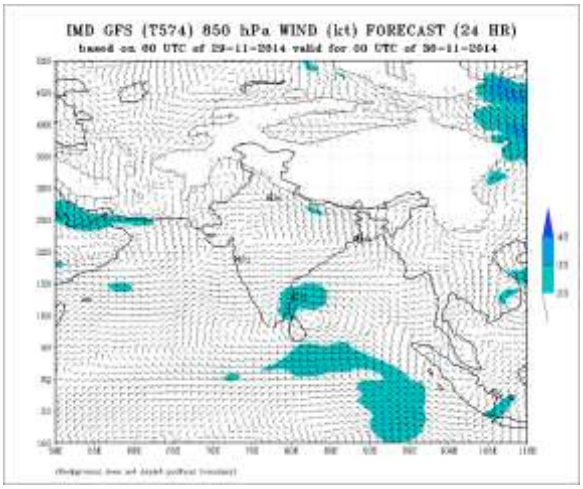
Annexure-II

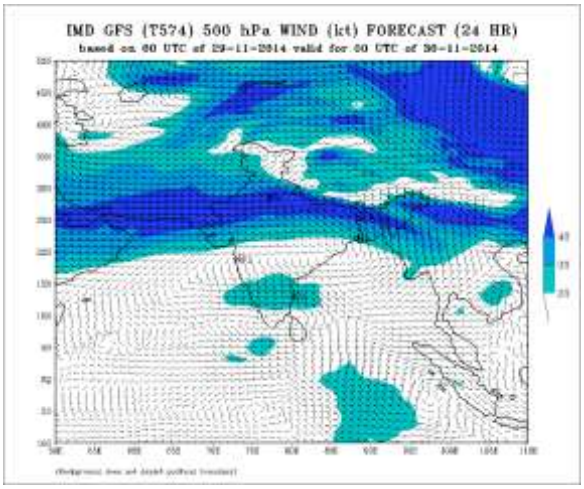

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 29-11-2014 valid for 00 UTC of 29-11-2014

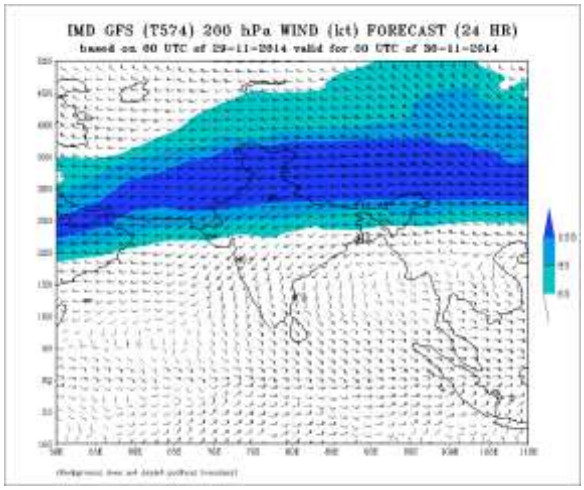

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 29-11-2014 valid for 00 UTC of 29-11-2014

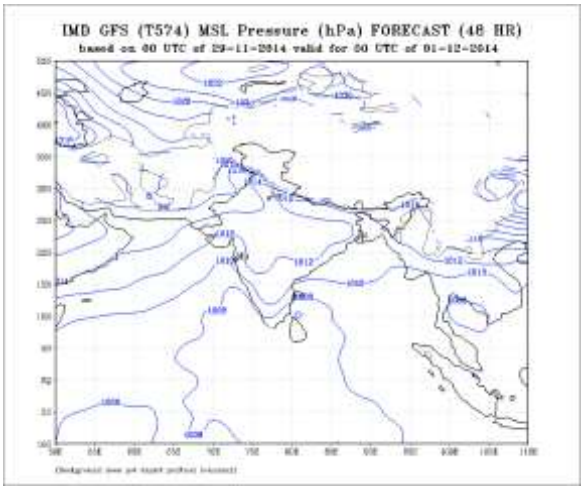

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 29-11-2014 valid for 00 UTC of 29-11-2014

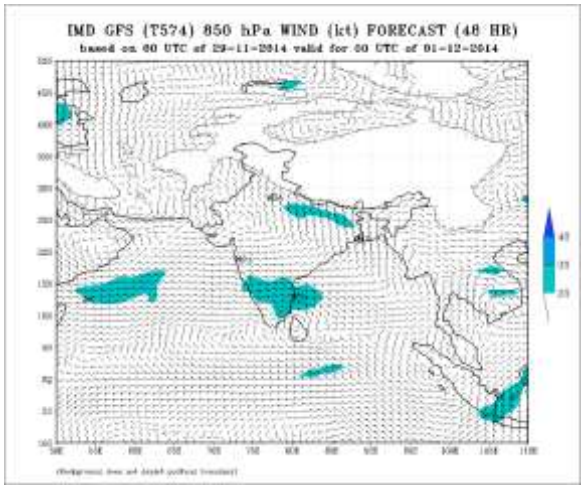

IMD GFS (T574) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 29-11-2014 valid for 00 UTC of 30-11-2014

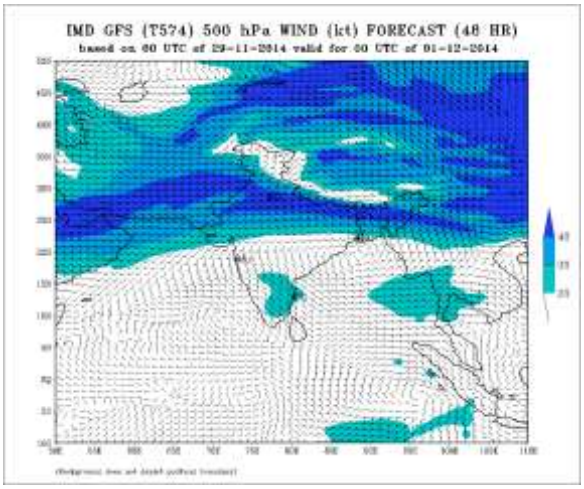

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 29-11-2014 valid for 00 UTC of 30-11-2014

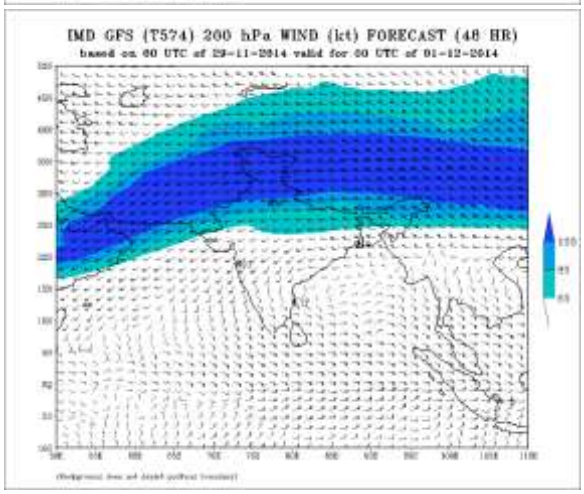

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 29-11-2014 valid for 00 UTC of 30-11-2014

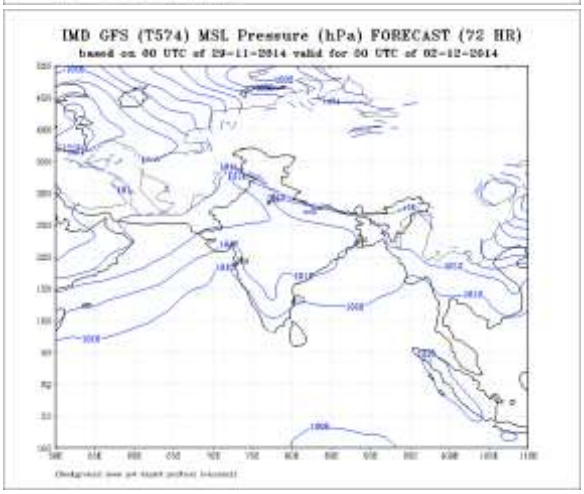

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 29-11-2014 valid for 00 UTC of 30-11-2014

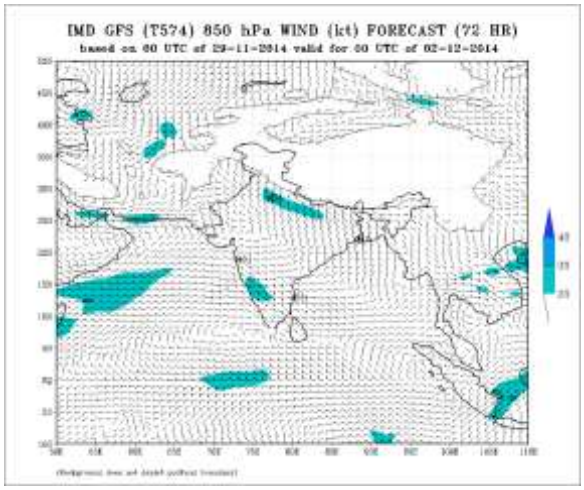

IMD GFS (T574) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 29-11-2014 valid for 00 UTC of 01-12-2014

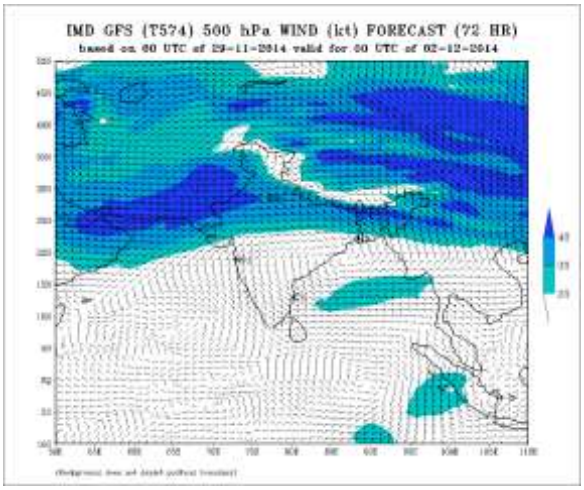

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 29-11-2014 valid for 00 UTC of 01-12-2014

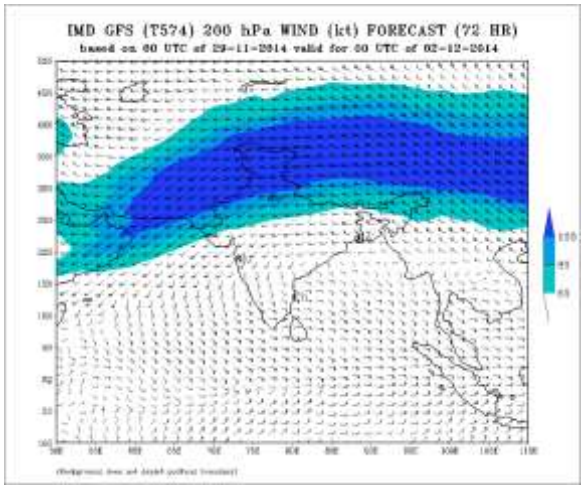

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 29-11-2014 valid for 00 UTC of 01-12-2014

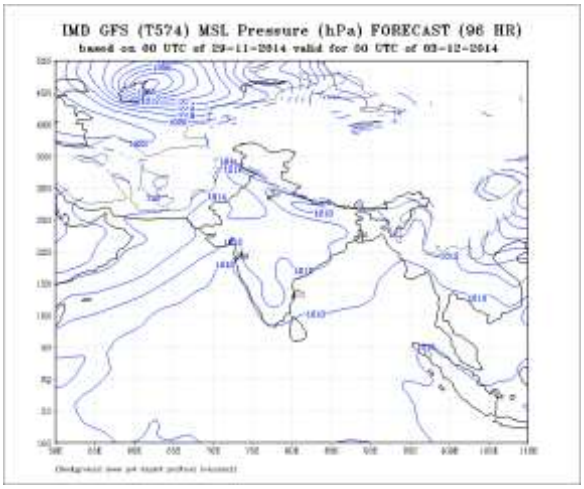

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 29-11-2014 valid for 00 UTC of 01-12-2014

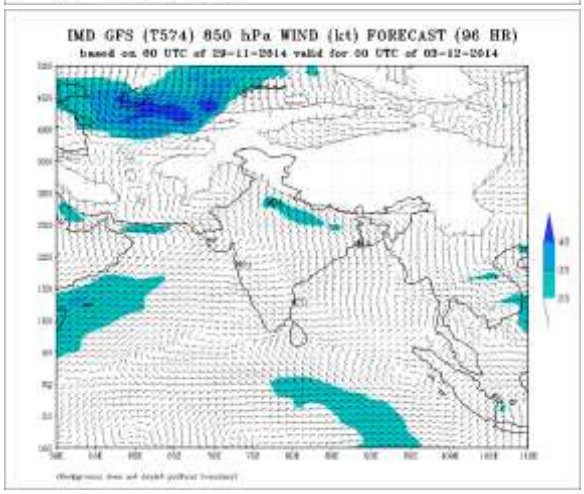

IMD GFS (T574) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 29-11-2014 valid for 00 UTC of 02-12-2014

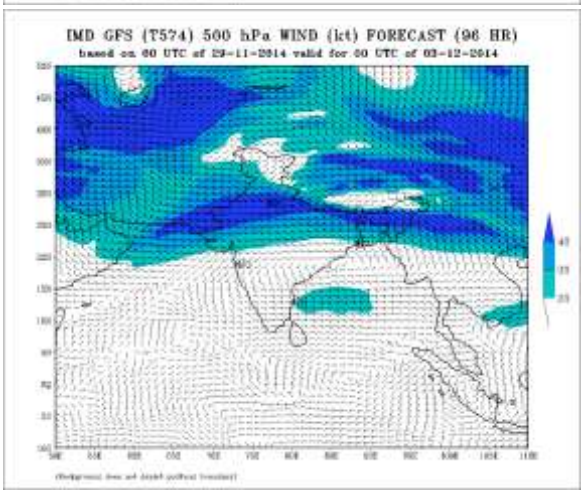

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 29-11-2014 valid for 00 UTC of 02-12-2014

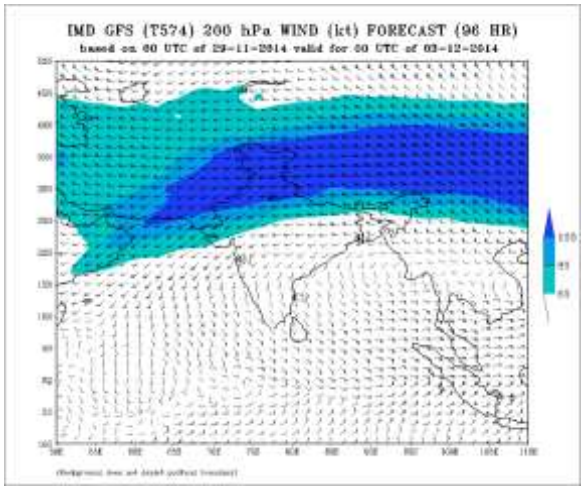

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 29-11-2014 valid for 00 UTC of 02-12-2014

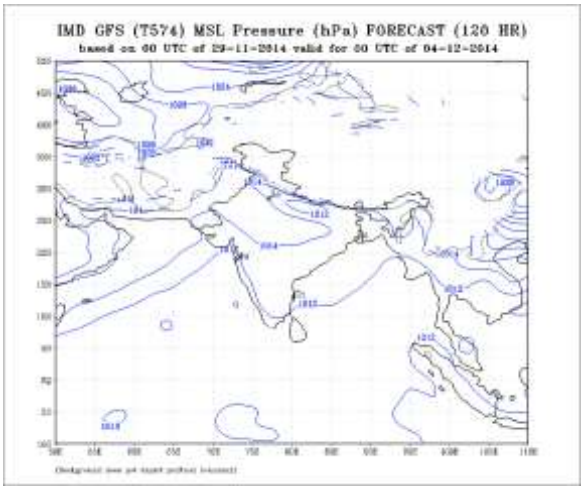

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 29-11-2014 valid for 00 UTC of 02-12-2014

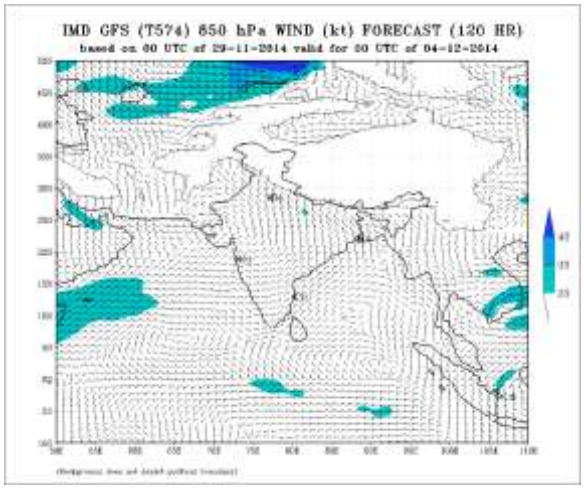

IMD GFS (T574) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 29-11-2014 valid for 00 UTC of 03-12-2014

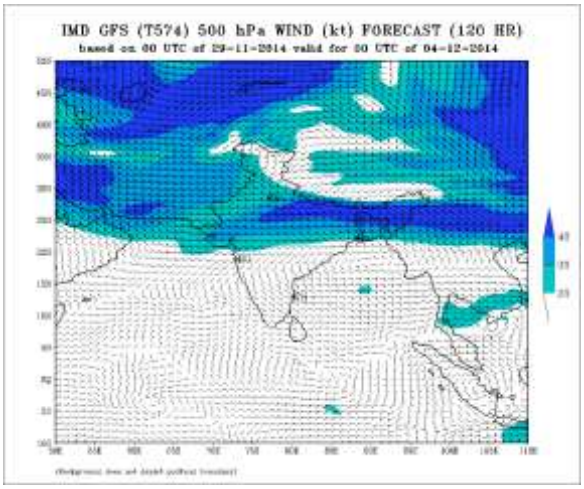

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 29-11-2014 valid for 00 UTC of 03-12-2014

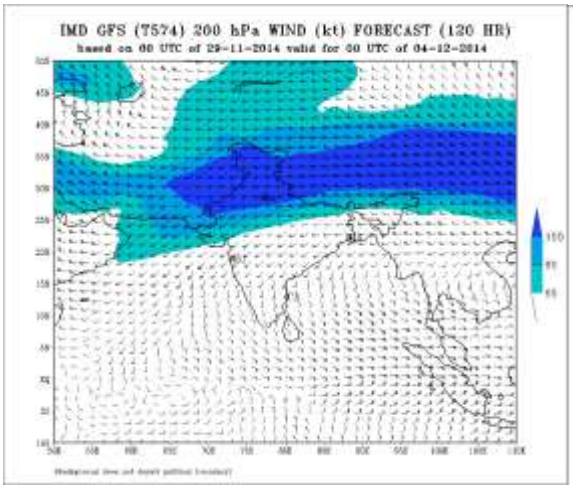

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 29-11-2014 valid for 00 UTC of 03-12-2014

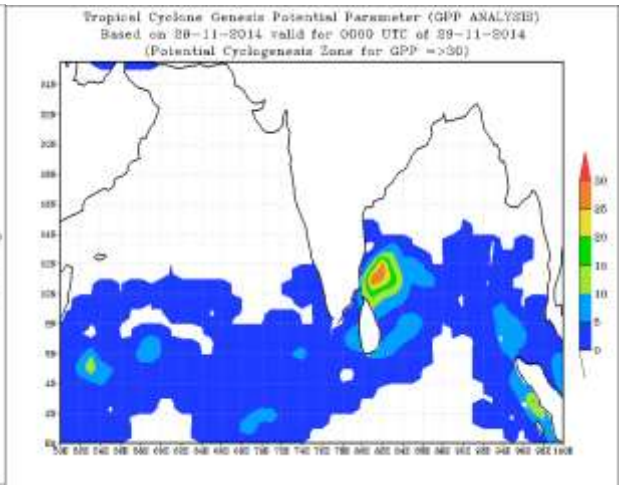

IMD GFS (T574) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 29-11-2014 valid for 00 UTC of 03-12-2014

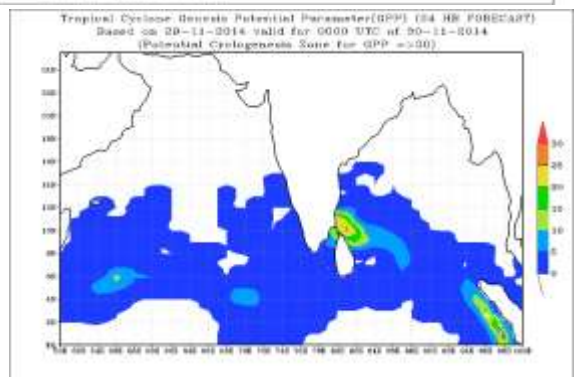

IMD GFS (T574) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 29-11-2014 valid for 00 UTC of 04-12-2014

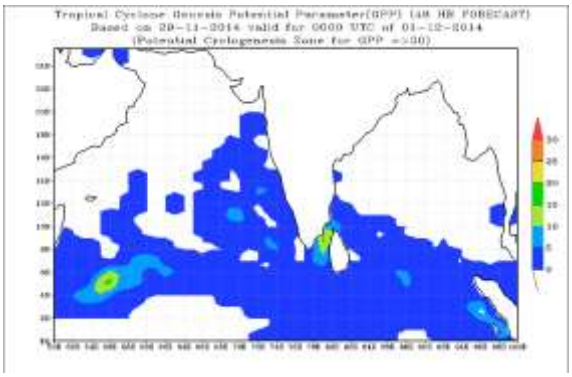

IMD GFS (T574) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 29-11-2014 valid for 00 UTC of 04-12-2014

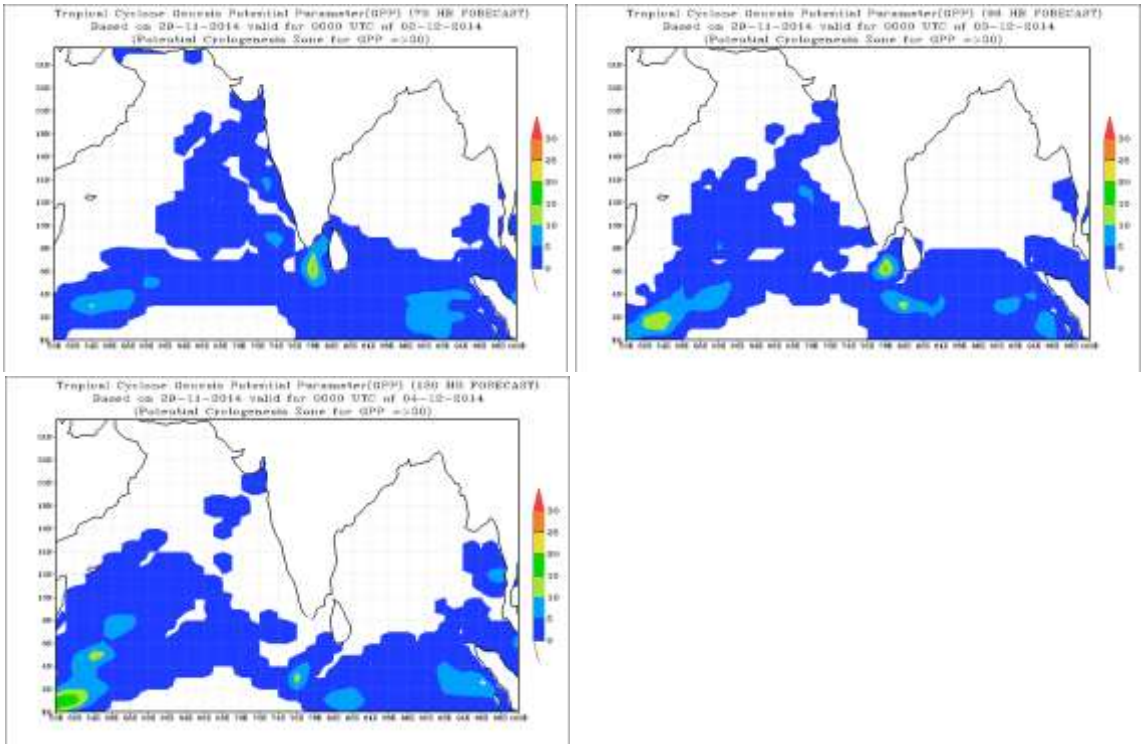

IMD GFS (T574) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 29-11-2014 valid for 00 UTC of 04-12-2014


IMD GFS (T574) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 29-11-2014 valid for 00 UTC of 04-12-2014


Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 28-11-2014 valid for 0000 UTC of 29-11-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 28-11-2014 valid for 0000 UTC of 30-11-2014
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
Based on 28-11-2014 valid for 0000 UTC of 01-12-2014
(Potential Cyclogenesis Zone for GPP =>30)



FDP (Cyclone) NOC Report Dated 30 November, 2014

Synoptic features based on 0300 UTC of today:

- Yesterday's low pressure area over southwest Bay of Bengal off north Tamil Nadu coast and neighbourhood now lies over southwest Bay of Bengal and neighbourhood. Associated upper air cyclonic circulation extends upto 2.1 km above mean Sea level.

Environmental features based on 0300 UTC of today:

Sea Surface Temperature:

- Sea Surface Temperature is around 27-28^{0}C over most parts of the Bay of Bengal and Andaman Sea except over extreme southeast Bay of Bengal and south Andaman Sea where it is 28-29^{0}C.

Tropical Cyclone Heat Potential (TCHP):

- The ocean thermal energy is around 40-60 kJ/cm^2 over most parts of Bay of Bengal and Andaman Sea except over extreme southeast Bay of Bengal where it is around 100 kJ/cm^2.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive (30-50*10^{-5} s^{-1}) over parts of the southwest Bay of Bengal off Sri Lanka coast.

Convergence:

- Lower level convergence is positive (5-10 *10^{-5} s^{-1}) over parts of southwest Bay of Bengal off Sri Lanka and north Tamil Nadu coasts.

Divergence:

- Upper level divergence is positive (10-20*10^{-5} s^{-1}) over parts of southwest Bay of Bengal off Sri Lanka and north Tamil Nadu coasts.

Wind Shear:

- Wind Shear is 20-30 knots over most parts of Bay of Bengal and Andaman Sea.

Wind Shear Tendency:

- Wind shear tendency is decreasing over parts of south Bay of Bengal south of 10°N.

Upper tropospheric ridge:

- The upper tropospheric **ridge** at 200 hPa passes through 15.0°N.

M.J.O. Index:

- Located in phase 4 with amplitude greater than 1.0. It would move to phase 5 with amplitude greater than 1.0 during the next 2 days.

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

Tropical Cyclone (Sinlaku) over South China Sea has crossed Vietnam coast and weakened over land.

Status of observational system:

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

Satellite:

Inference based on INSAT imagery of 300900 UTC:

Bay of Bengal & Andaman Sea:-

Broken low and medium clouds with embedded moderate to intense convection over parts of southwest Bay of Bengal and neighbourhood in association with low level circulation over the area.Scattered low and medium clouds with embedded moderate to intense convection over rest of southwest Bay of Bengal and adjoining westcentral Bay of Bengal between latitude 10.0°N to 16.0°N and west of longitude 87.5°E.

Arabian Sea:-

Broken low and medium clouds with embedded moderate to intense convection over south Arabian Sea south of latitude 8.0°N and east of longitude 52.0°E.

NWP Analysis

NWP Input for FDP Cyclone based on 0000 UTC of 30.11.2014

- The analysis and forecasts of IMD-GFST574 model based on 0000 UTC of 30th November 2014 show weakening of the low pressure system over the southwest Bay of Bengal adjoining off Tamilnadu and Sri Lanka coast during next 48 hours.
- The WRF model analysis and forecasts also show weakening of the low pressure system over south west Bay of Bengal adjoining off Tamilnadu and Sri Lanka coast during next 48 hours.
- The Genesis Potential Parameter (GPP) analysis and forecasts based on 0000 UTC of 30th November, 2014 shows no potential zone for cyclogenesis during next 120 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-GFS** model does not suggest any cyclogenesis during next 5 days.
- **NCMRWF-UKMO** model does not suggest any cyclogenesis during next 5 days.
- **ECMWF Model** does not suggest any cyclogenesis over Bay of Bengal during the next 5 days.
- **ARPS model** does not suggest any cyclogenesis over Bay of Bengal during the next 3 days.
- **JMA model** does not suggest any cyclogenesis over Bay of Bengal during the next 3 days.

Summary and Conclusion:

Yesterday's low pressure area over southwest Bay of Bengal off north Tamil Nadu coast and neighbourhood now lies over southwest Bay of Bengal and neighbourhood. Associated upper air cyclonic circulation extends upto 2.1 km above mean Sea level.
NWP models do not suggest any cyclogenesis during the next 3 days.

Advisory:

- No IOP declared.

Annexure-I

Status of Observation system:

Synoptic observation:

Region	Date/Time (UTC)		
	29/12	**30/00**	**30/03**
India	42	31	44
Coastal stations			
WB	6	3	7
Odisha	7	5	7
AP	11	12	12
Tamil Nadu	10	8	10
Puducherry	2	2	2
A & N	6	1	6
Bangladesh	11	10	11
Myanmar	11	9	10
Thailand	2	2	2
Sri Lanka	8	7	8

AWS Observations:

Region	Date/Time (UTC)		
	29/12	**30/00**	**30/03**
India	64	65	69
Coastal stations			
WB	8	8	8
Odisha	8	7	9
AP	27	26	27
Tamil Nadu	23	23	24
Puducherry	1	1	1
A & N	-	-	-

- **RS/RW** (12Z) of 29/11/2014 **-0/39**
- **No. of Ascents reaching 250 hPa level: 0, MISDA: 39**
- **RS/RW** (00Z) of 30/11/2014-12**/39**
- **No. of Ascents reaching 250 hPa level: 8, MISDA: 27**

No. of PILOT Ascents

29/12Z	**30/00Z**
2	0

Buoy Data

29/12Z	**30/00Z**	**30/03Z**
17	17	16

FOC CHENNAI: STATUS OF OBSERVATION

No. of Synop data

Date→	**29.11.2014**							
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 /29.11.2014 : 3

No. of Ascents reaching 250 hPa level = 3

MISDA : 5

12Z /29.11.2014 : --

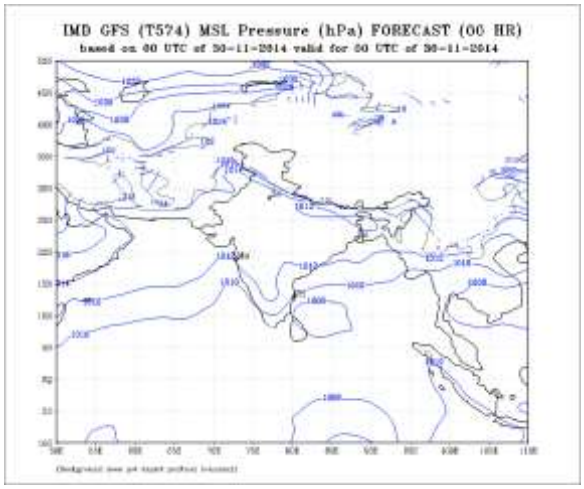
No. of Ascents reaching 250 hPa level = --

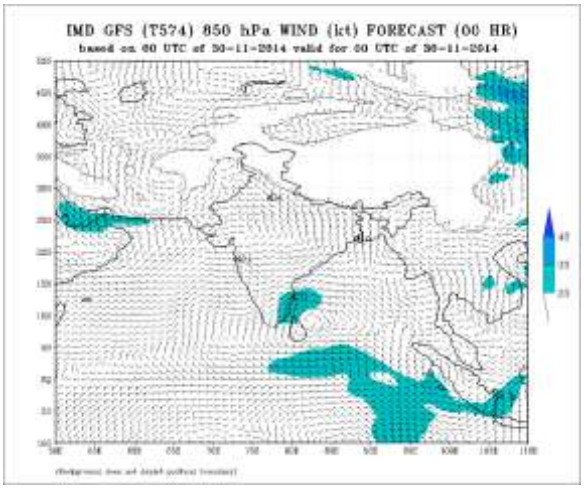
MISDA : 8

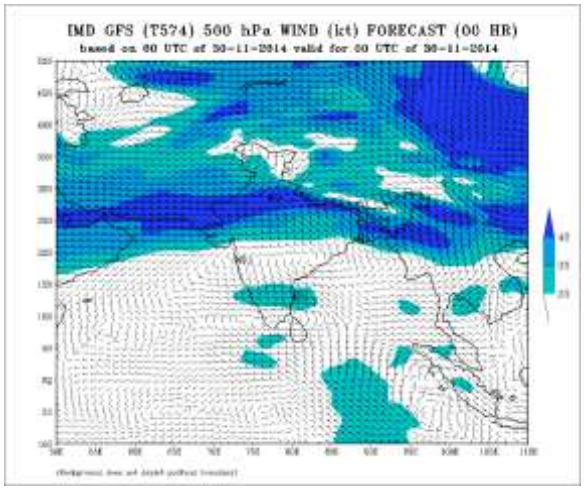
No. of PILOT Ascents:

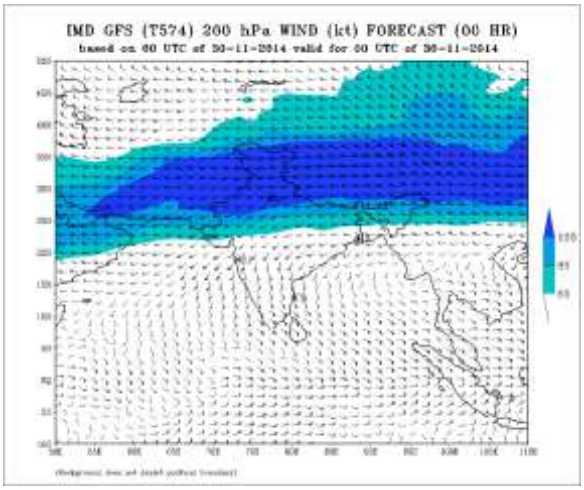
29.11.2014	
06Z	18Z
3	3

Annexure-II


IMD GFS (T574) MSL Pressure (hPa) FORECAST (00 HR)
based on 00 UTC of 30-11-2014 valid for 00 UTC of 30-11-2014


IMD GFS (T574) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 30-11-2014 valid for 00 UTC of 30-11-2014


IMD GFS (T574) 500 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 30-11-2014 valid for 00 UTC of 30-11-2014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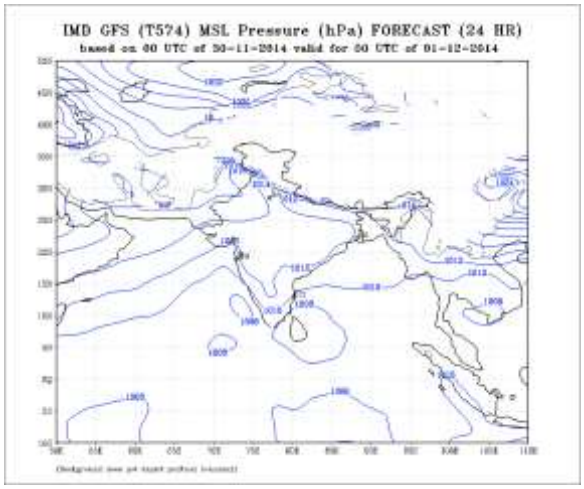
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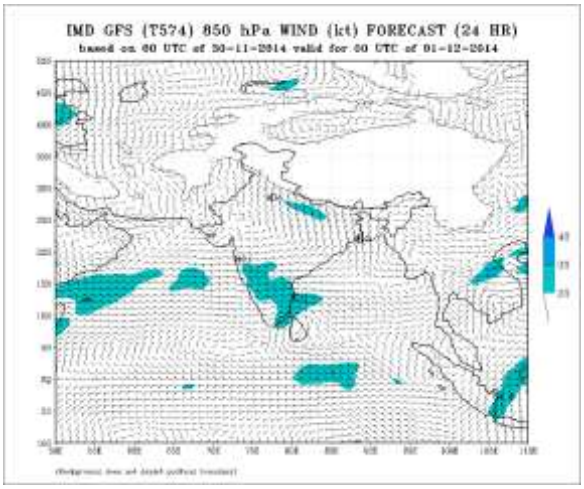
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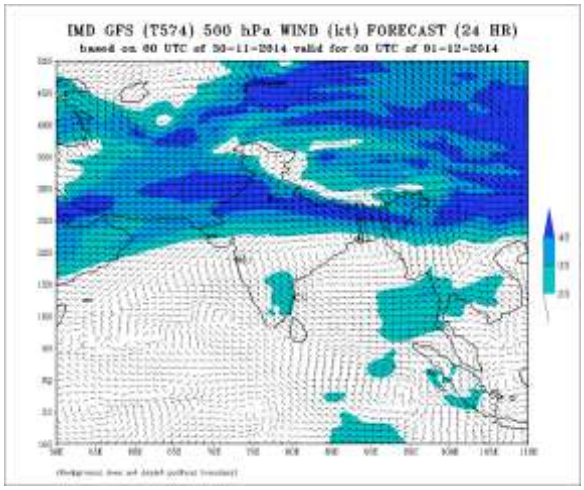
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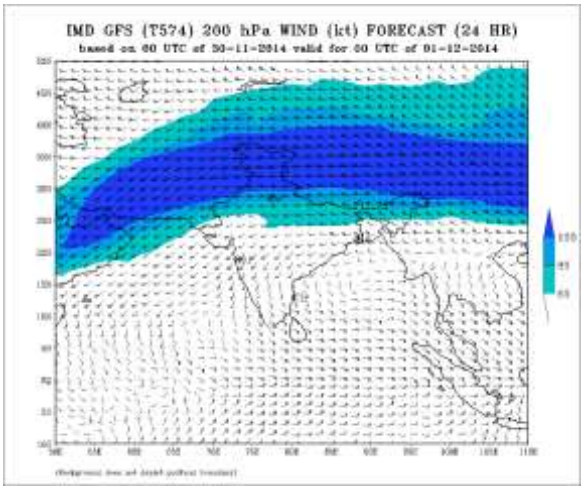
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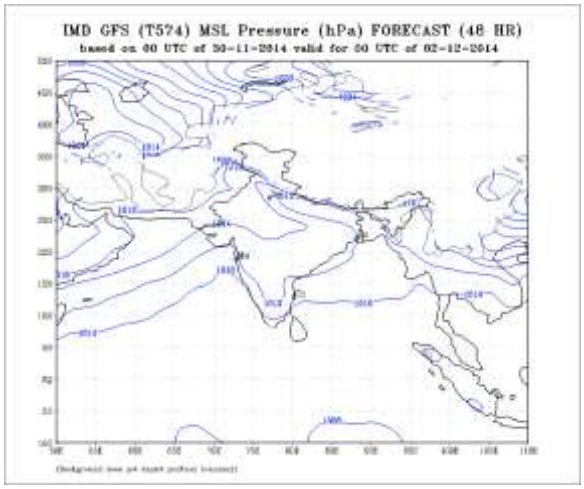
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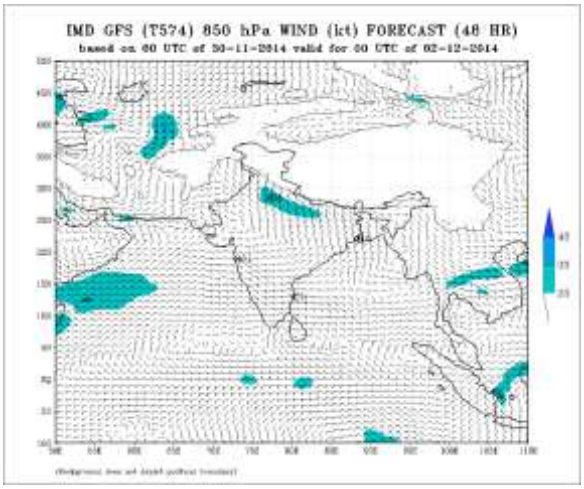
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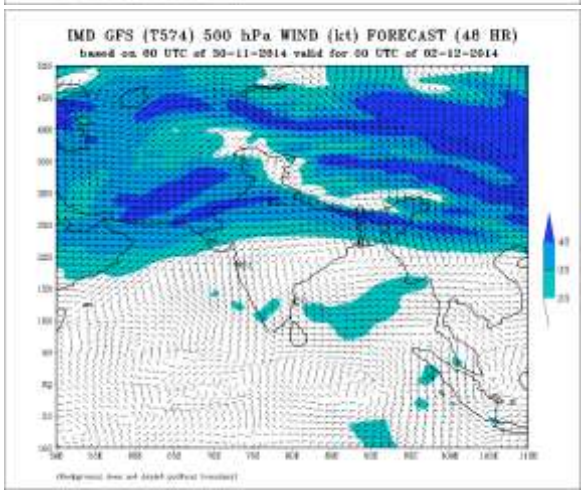
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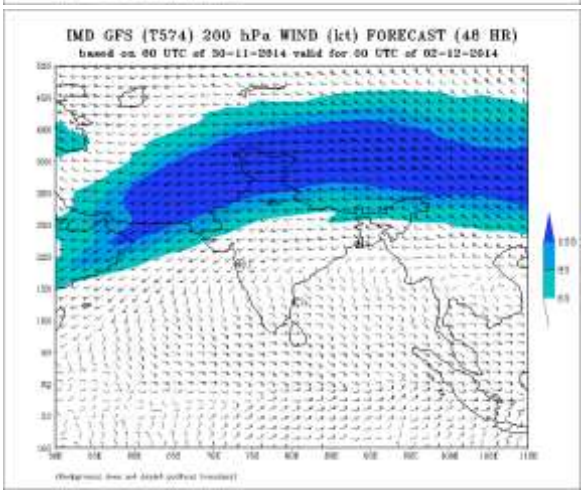
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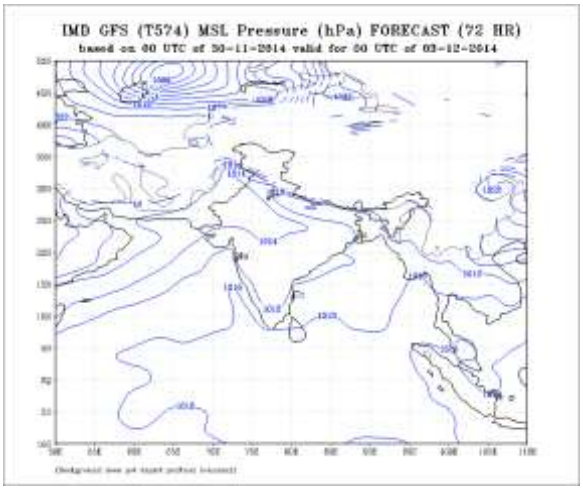
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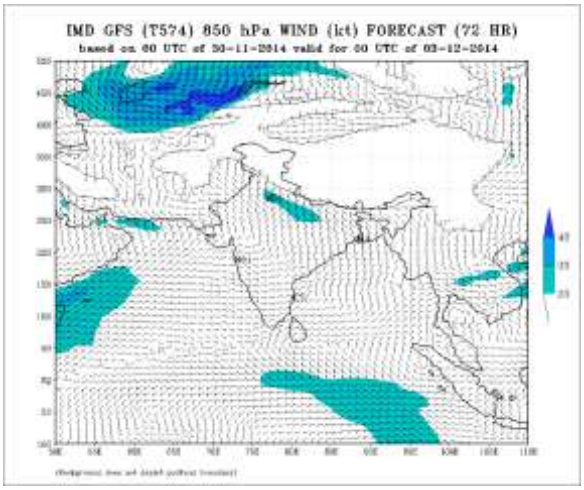
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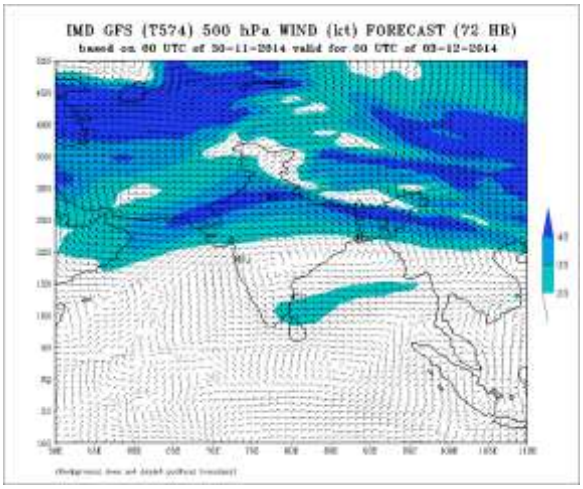
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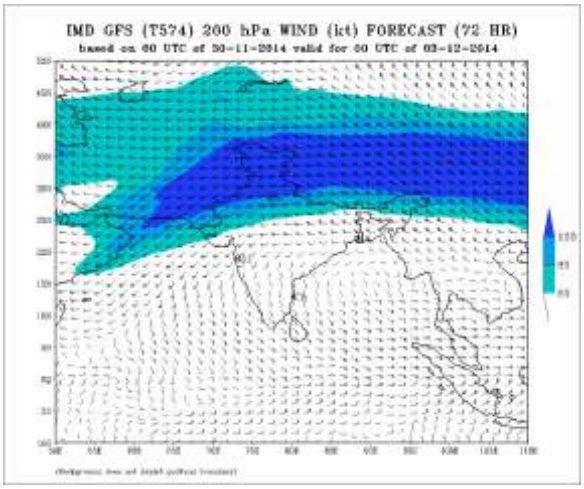
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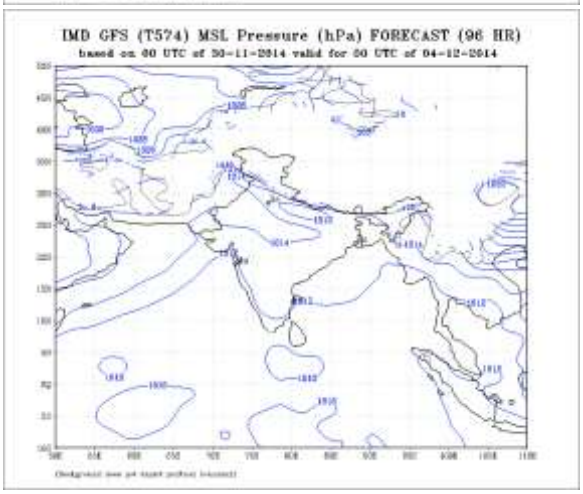
IMD GFS (T574) MSL Pressure (hPa) FORECAST (96 HR)
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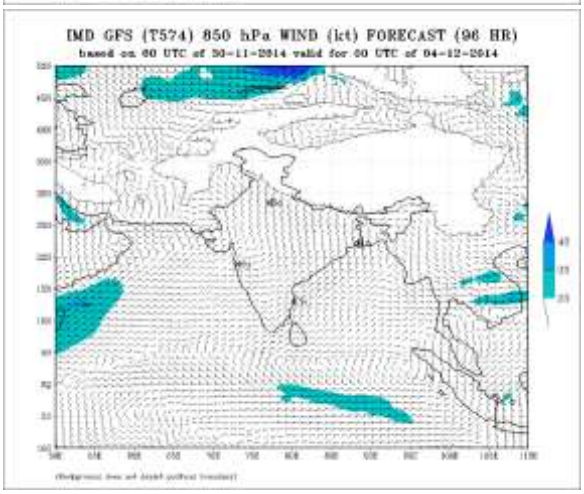
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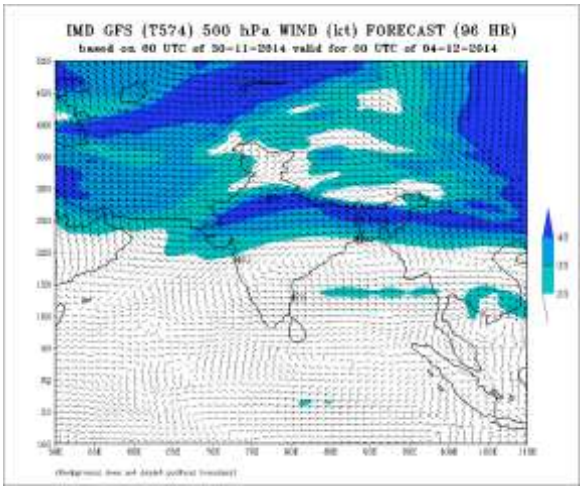
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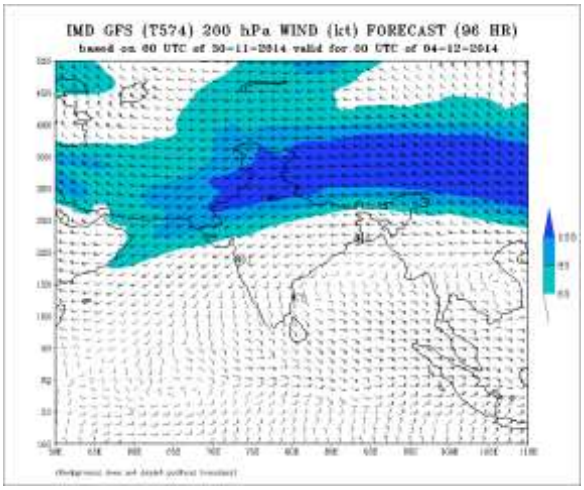
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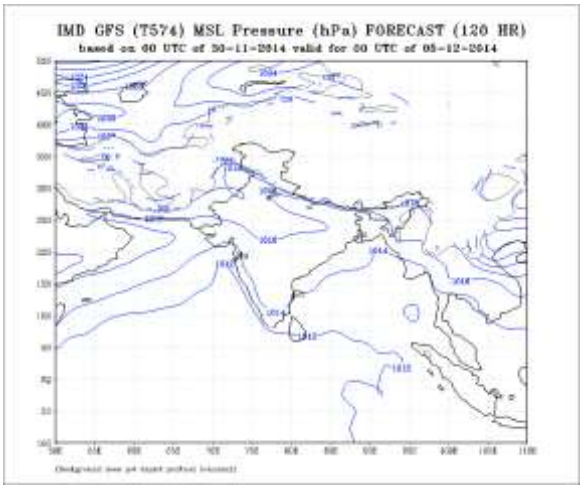
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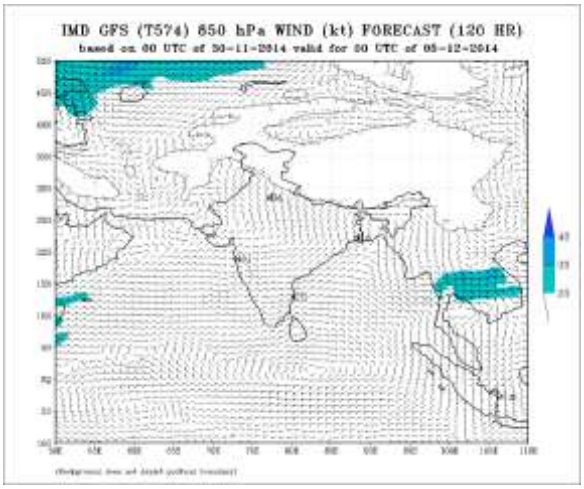
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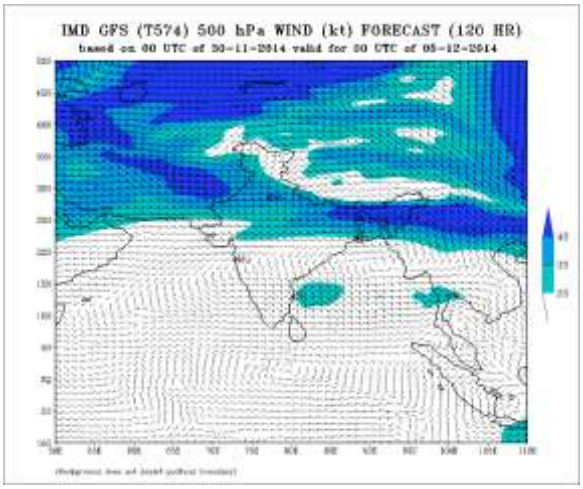
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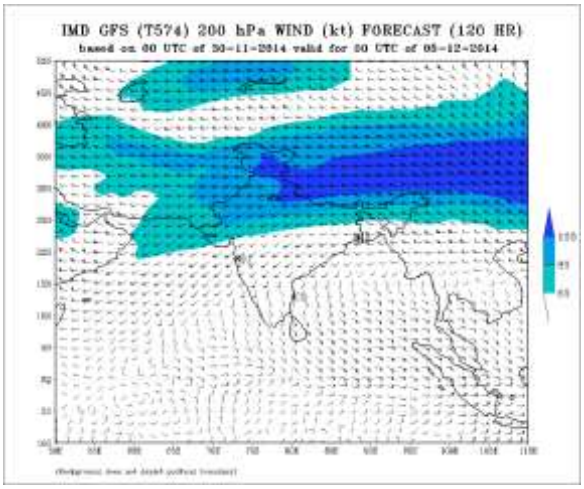
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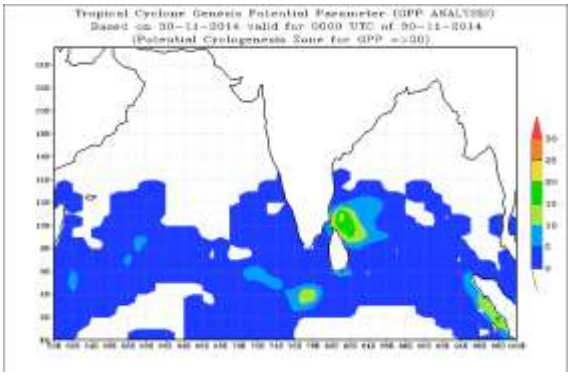
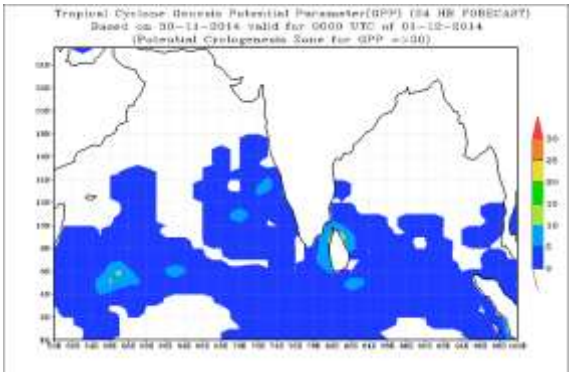

Tropical Cyclone Genesis Potential Parameter (GPP ANALYSIS)
Based on 30-11-2014 valid for 0000 UTC of 30-11-2014
(Potential Cyclogenesis Zone for GPP >=30)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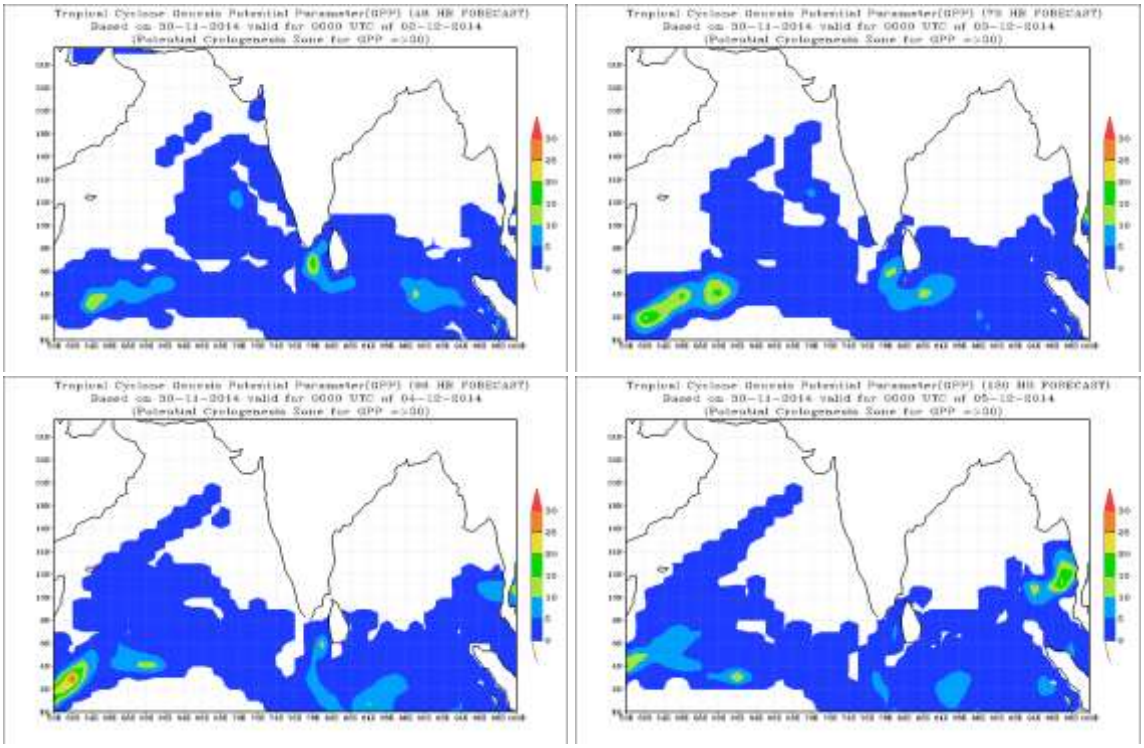
Based on 30-11-2014 valid for 0000 UTC of 01-12-2014
(Potential Cyclogenesis Zone for GPP >=30)


Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
Based on 30-11-2014 valid for 0000 UTC of 02-12-2014
(Potential Cyclogenesis Zone for GPP =>30)
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Based on 30-11-2014 valid for 0000 UTC of 03-12-2014
(Potential Cyclogenesis Zone for GPP =>30)
Tropical Cyclone Genesis Potential Parameter(GPP) (96 HR FORECAST)
Based on 30-11-2014 valid for 0000 UTC of 04-12-2014
(Potential Cyclogenesis Zone for GPP =>30)
Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 30-11-2014 valid for 0000 UTC of 05-12-2014
(Potential Cyclogenesis Zone for GPP =>30)

CHAPTER-VI

Lessons learnt from FDP-2014

IOP was declared for 5 days in view of very severe cyclonic strom, Nilofar (25-31 October, 2014)-3 days over Arabian Sea and Deep Depression (05-08 Nov.2014)-2 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. It indicates that ocean thermal energy is not the only factor intensification/weakening

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 from existing 18 buoys over entire north Indian Ocean.
2. Conventional ship observations under IVOF scheme are very less. Only a few ship observations were received during cyclonic disturbance period. Hence deployment of Sagar Kanya or Sagar Nidhi cruise could have been very useful for cyclone forecast. Inspite of several attempts it could not be organized during 2014. Attempt should be made for future campaign.
3. Augmentation of more High Wind Speed recorders(HWSR) should be carried out along the coasts
4. 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
5. As Oceansat-II has been defunct, ISRO should plan for its replacement as Sea surface wind for such satellite is very useful over the data sparse NIO region. As Meteosat is expected to cease working in 2016 derived products of Meteosat may generated from INSAT-3D (vorticity, divergence, convergence, wind shear, shear tendency etc.). ISRO (SAC) may take necessary action.
6. 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.
7. 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.
8. Increase in lead period with demonstrated accuracy level helps in motivating the Disaster Managers to initiate action. Success of Phailin helped in building confidence in case of cyclones in 2014 including Hudhud.
9. 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
10. Pre-Storm exercise: The meeting conducted within the IMD under the Chairmanship of DGM as and development of 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. For example: Upgradation of Internet Lease Line Bandwidth from 60 mpbs to 100 mpbs during HUDHUD' for failure free accessibility IMD website was one of the outcomes of Pre-Storm Meeting and as a result the HUDHUD was one of the top ten searched news event in in India in Google search in 2014.

11. Triggering Media and General Public with the following helps in better management of cyclone
    - Daily Press release
    - Holding of press conference
    - Hourly update on the day of Landfall
    - 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
12. Triggering Vulnerability Group like (i) Fishermen and (ii) Farmer
13. 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 there is a need for developing Synergised SOP with the Authorities.
    - There is a need for Hydrometeorological models to be integrated with river run off + past 24 hour rainfall + predicted rainfall.
    - There is also need for location specific probabilistic forecast of rainfall /wind/storm surge for major cities.

14 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.

15. Intensity forecast especially rapid intensification and rapid weakening before landfall is still challenging. R&D group should make coordinated effort to develop a technique for forecasting rapid weakening of TC.

16. 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 in 12th five year plan.

CHAPTER-VII

Summary and Conclusions

The Pilot Phase of FDP on landfalling cyclones over the Bay of Bengal was conducted during 15th October to 13th December, 2014 as per the implementation plan. IOP was declared for 5 days in view of very severe cyclonic strom, Nilofar (25-31 October, 2014)-3 days over Arabian Sea and Deep Depression (05-08 Nov.2014)-2 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 2014 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 of cyclone.

As a result of above, the cyclone track forecast errors reduced in 2014 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 2014 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.

Acknowledgements

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