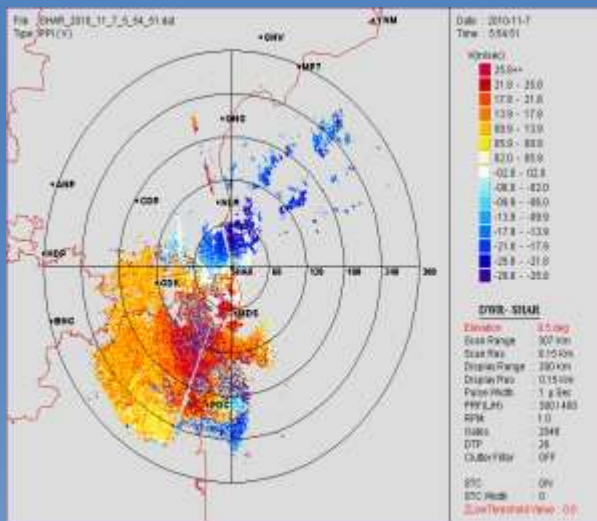




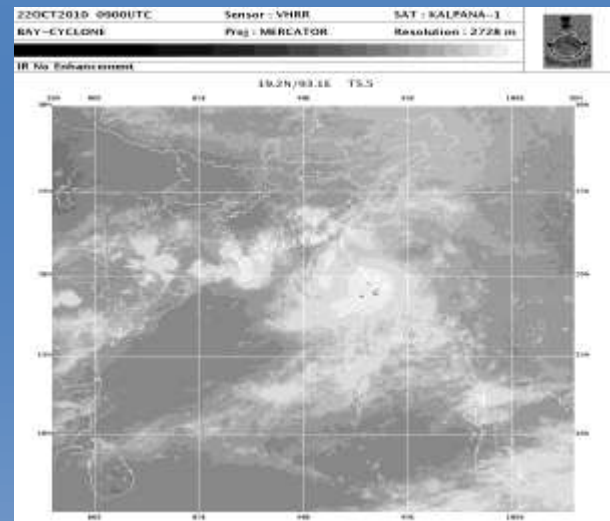
INDIA METEOROLOGICAL DEPARTMENT

Report No.: FDP/TCR/1/2011

Forecast Demonstration Project (FDP) for Improving Track, Intensity and Landfall of Bay of Bengal Tropical Cyclones Implementation of Pilot Phase, 2010: A Report



DWR Imagery of Cyclone JAL



Satellite imagery of Cyclone GIRI

M.Mohapatra, T.N.Jha, Suman Goyal, Charan Singh, Naresh Kumar, S.D.Kotal, K.Nagaratna, C.S.Tomar, S.Balachandran, Osuri Krishna, Ajit Tyagi, B.K.Bandyopadhyay, O.P.Singh, U.C.Mohanty, D.R.Sikka, Kusuma G.Rao, E.N.Rajagopal

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

Implementation of Pilot Phase, 2010: A Report (15 October-30 November, 2010)

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CONTENTS

	PAGE
Preface	i
ABSTRACT	1
CHAPTER –I INTRODUCTION	2-3
CHAPTER –II IMPLEMENTATION PLAN FOR FDP -2010	4-19
CHAPTER – III IMPLEMENTATION OF FDP-2010	20-43
CHAPTER –IV CYCLONIC ACTIVITIES OVER THE BAY OF BENGAL DURING 2010	45-73
CHAPTER –V WEATHER SUMMARY AND ADVISORIES ISSUED during FDP-2010	74-351
CHAPTER- VI LESSONS LEARNT FROM FDP-2010	352-354
CHAPTER –VII SUMMARY AND CONCLUSIONS	355

Preface

World wide 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). FDP Programme is scheduled to be implemented in three phases. 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. FDP Programme is scheduled to be implemented in three phases. This report deals with implementation programme, salient features of the systems developed, weather summaries issued and the lessons learnt during the pilot phase, 2010 (15 October – 30 November).

The Pilot Phase of FDP on landfalling cyclones over the Bay of Bengal was conducted during 15th October to 30th November, 2010 as per the implementation plan. The IOP was declared for 11 days in association with a Deep Depression (13-16 Oct., 2010), VSCS GIRI (20-23 Oct., 2010) and SCS JAL (4-8 Nov., 2010). 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 the pilot phase included the data collected for SagarKanya cruise, enhanced AWS network of the coast, five activated buoy observations from the Bay of Bengal, Oceansat-II observations and microwave imagery products. The Tropical Cyclone module recently installed in Synergie System was also used for monitoring and prediction of cyclone. Various lessons were also learnt during the campaign.

As a result of above, the cyclone track forecast errors reduced in 2010 compared to previous FDP campaigns. It helped in refining the Standard Operation Procedure and strengthening the multi-institutional mechanism which will further improve the FDP campaign in future .

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, Indian Institute of Science, Indian National Centre for Ocean Information Services, National Institute of Ocean Technology, Indian National Centre for Ocean & Atmospheric Research and Cyclone Warning Division at India Meteorological Department Head Quarter, which are highly appreciated and duly acknowledged. I also thank to Mr. M.G. Mittal, Mr. Kalu Ram, Mr. R. P. Sharma, Mr. D. P. Nayak and Mrs. Monica Sharma of Cyclone Warning Division for their valuable contribution to bring out this report on “Pilot Phase of Forecast Demonstration Project -2010”.

Ajit Tyagi

Director General of Meteorology

May 2011

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 in collaboration with USA resulting in planning of the Forecast Demonstration Project (FDP) over Bay of Bengal.

FDP programme is aimed to demonstrate the improvement in cyclo genesis, intensification and movement of cyclones over the north Indian ocean with enhanced observations over the data sparse region. FDP Programme is scheduled to be implemented in three phases. Several national institutions participated for joint observational, communicational & NWP activities during pre-pilot phase. This report deals with implementation programme, salient features of the systems developed, weather summaries issued and the lessons learnt during the pilot phase .

The Pilot Phase of FDP on landfalling cyclones over the Bay of Bengal was conducted during 15th October to 30th November, 2010 as per the implementation plan. The IOP was declared for 11 days in association with a Deep Depression (13-16 Oct., 2010), VSCS GIRI (20-23 Oct.,2010) and SCS JAL(4-8 Nov.,2010). 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.

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As a result of above, the cyclone track forecast errors reduced in 2010 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 2010, 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, better data reception from the coastal stations of all WMO/ESCAP Panel countries on real time basis, improved buoy network, improved NWP model guidance, objective analysis of various cyclogenesis, intensification and track forecast parameters by preparing a check list, threshold values of various NWP products for genesis, intensification and movement, structured satellite and radar bulletin and DWR data with uniform scanning strategy for mosaicing and NWP modeling.

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(T-254), regional(LAM and QLM), and meso-scale(MM5, ETA, WRF/HWRF) models for generating short(up to 48-72hrs in advance) and medium range (3-7 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.

Extensive performance evaluation and numerical experimentation studies carried out by the operational, R & D and academic groups on tropical cyclone forecasting over the Indian seas of Bay of Bengal and Arabian Sea have concluded that the large tropical cyclone track and intensity forecast errors 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.

The past few years elsewhere in the world have seen huge technological advancements to observe the inner core, both through in situ means, and by remote sensing. During 2005, delegation level meetings from India working in the field of meteorology and atmospheric science to NCAR, USA have identified six themes for Indo-US collaboration. Out of these themes evolution, evolving a programme on prediction of track of tropical cyclones over the Bay of Bengal was marked as the top priority item and the NCMRWF was asked to lead the joint programme from India side. Advanced high resolution global and meso-scale assimilation-forecast systems have been implemented. Capabilities to assimilate data from non-conventional observational platforms (satellite, radar) have been developed.

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 has come out with an overall science plan. Keeping in mind the nature and scale of the programme that needs to be supported with adequate funding, an appropriate project management structure is put in place to ensure the deliverables to get fully integrated with the operational cyclone forecast systems.

1.2. Key Scientific Objectives and Goals for FDP

- 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

A FDP on landfalling tropical cyclones over the Bay of Bengal has been taken up. It will help us in minimizing the error in prediction of tropical cyclone track and intensity forecasts. The programme has been divided into three phases :

- (i) Pre- pilot phase : Oct-Nov. 2008, 2009
- (ii) Pilot phase : Oct-Nov. 2010, 2011
- (iii) Final phase : Oct-Nov. 2012

During pilot phase (**15 Oct - 30 Nov, 2010**), several national institutions participated for joint observational, communicational & NWP activities like that during 2008.

The detailed implementation programme is presented in Chapter II. The salient features of cyclone season 2010 are presented and discussed in Chapter III.. Daily weather summary and advisory issued during FDP-2010 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-2010

2.1. Introduction

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. 2010. 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.

2.2. 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. (Temporary contact: e-mail cwdhq2008@gmail.com, Phone no. 011-24652484, 24631913 Mobil: 9868623475, Fax No. 011-24643128).

2.3. Field Operational Centre (FOC):

The FOC, Chennai will work in unison with the NOC coordinating all activities of every institution during the IOP. (Temporary contact: yearaj@gmail.com, Phone No. 044-28276752, Fax No. 044-28276752)

2.4. 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 KHARAGPUR
- 7) IIT DELHI
- 8) INDIAN INSTITUTE OF SCIENCE
- 9) NIOT
- 10) INCOIS
- 11) INCOAR
- 12) NPOL
- 13) DRDO

2.5. Targeted FDP Requirements for the Pilot FDP Campaign of October-November 2010

2.5.1. Observational program:-

(I)AWS:

Operational meso-scale AWS network of IMD along the east coast of India available for pilot phase and expansion programme for next two years is shown below.

S. No.	State	Existing No. of AWS Stations	Proposed No. of AWS Stations	Total after Phase-I of Modernisation
1	West Bengal	10	17	27
2	Orissa	37	-	37
3	Andhra Pradesh	35	-	35
4	Tamilnadu and Puducherry	25	14	39
5	Andaman & Nicobar	1	6	7
6	Lakshadweep	1	2	3
7	Kerala	5	11	16
8	Karnataka	5	21	26
9	Goa	2	-	2
10	Maharashtra	48	-	48
11	Gujarat, Daman & Diu and Dadra Nagar & Haveli	37	-	37
12	East coast + A&N Islands	108	37	145
13	West coast + Lakshadweep	98	34	132

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(Telecom) Delhi in GTS mobile synop format. DDGM(SI) will submit status report by 10th October 2010 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).
- SAC Ahmedabad to intimate DDGM(Sat. Met) to 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 S. Bhatia, Project Director (Instrumentation) and Dr S.K. Roy Bhowmik, Scientist F NWP unit of IMD by first 10th October 2010. On finalisation the process of converting ISRO AWS data into mobile synop (GTS) format need to be automated in liaison with DDGM(Telecom) prior to the FDP-2010 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 10th October 2010.
- Real time collection of AWS data over NE India
- 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 first week of 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

S. No.	State	Existing No. of AWS Stations	Proposed No. of AWS Stations	Total after Phase-I of Modernisation
1	Assam	1	19	20
2	Meghalaya	-	7	7
3	Nagaland	3	12	15
4	Arunachal Pradesh	9	6	15
5	Tripura	-	5	5
6	Manipur	-	10	10
7	Mizoram	-	7	7
8	Sikkim	1	5	6

(II) Synop

- Synoptic observatories of IMD network (Fig.3 and Fig.4) over the peninsular/east India under the RMCs of Chennai, 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 National Operational Centre and Field Operation centres. 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 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

- 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 seven HWSRs along the coast of India in the operational conditions as mentioned below.

Digha : West Bengal
 Visakhapatnam : AndhraPradesh
 Machilipatnam : AndhraPradesh
 Nellore : AndhraPradesh
 Chennai : Tamil Nadu
 Karaikal : Puducherry
 Mumbai. : Maharashtra

The following four stations are likely to be operational during next 2-3 months

Puri : Orissa
 Paradip : Orissa
 Gopalpur : Orissa
 Veraval : 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.

(V) Upper air:

- Augmentation of coastal/peninsular upper air measurements (Fig.5)
- Upper air RS/RW data from IMD stations (Guwahati, Kolkata, Portblair, Bhubaneswar, Visakhapatnam, Machilipatnam, Hyderabad, Chennai, Karaikal, Minicoy/Amini Divi, Trivendrum) will be collected 12hrly for normal days of FDP period. However, during the IOP phase of FDP, 6hrly 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 10th October 2010.
- Additional GPS Sonde soundings will be taken at Balasore, Gopalpur, Kalingapatnam, Ongole/Bapatla and Pamban with the support of ISRO.
- DDGM, Chennai 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 to 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. Shri S. Bhatia, Project Director (Instrumentation) shall liaise with DNOM and ensure real time data transfer for the FDP period.
- Upper air data from GPS Sonde network of ISRO at Gadanki, SHAR, Arakkonam, Kochi etc. shall become available through E-Mail for the IOP Phase of FDP as intimated by the FOC. DDGM, Chennai shall liaise with VSSC, Trivendrum to ensure commissioning of equipment along with training to IMD staff to operate during the IOP phase.
- ITR, Chandipur (DRDO) shall operate GPS sonde flights for the IOP phase of FDP. Director MC Bhubaneswar shall liaise with ITR for organizing necessary logistics to receive upper air data accordingly by 10th October, 2010.
- Due arrangements are to be made by DDGM (UI) to receive all available Pilot Balloon data sets for the FDP 2010 period.
- Arrangements have to be made by Project Director (Instrumentation) 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 2010 period. Project Director (Instrumentation) shall liaison with IAF to receive GTS coded data.
- NWP Division of IMD shall ensure the synchronization of data formats and collection at the NHAC/Telecom 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. Project Manager will request ISRO (Dr Kusuma G Rao, 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, Visakhapatnam, Machillipatnam SHAR, and Chennai with uniform storm scanning strategy be ensured prior to the FDP-2010. DDGM(UI) shall make due arrangements to receive the DWR data in real time to DDGM (Telecom) for the FDP 2010.

(VII) Sagar Kanya Cruise

Sagar Kanya cruise scheduled in October 2010 over the Bay of Bengal will be utilized for taking ship based marine surface and upper air soundings for the FDP 2010 phase. APEC, IMD, New Delhi will coordinate and take necessary steps for cruise observations during FDP. DDGM(UI) shall arrange provision of consumables etc. to the ship. The expected voyage route of Sagar Kanya ship is given at Fig.7 and approximate positions of the cruise are given in table 4.

(VIII) Satellite Observations

DDG(Sat Met) shall make all available satellite derived products (high resolution AMVs; rapid scan winds; OLR; Oceansat 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 2010 period.

2.5.2. Telecommunication

- i. DDG(Telecom) shall take all necessary steps so as to receive the observational data at the National Operations Centre (NHAC) and filed operations centers from all identified sources both from FDP partners and the regional countries (Bangladesh, Myanmar, Malaysia, Thailand and Indonesia, Sri Lanka) in real time. ISSD and NWP division shall continuously monitor the data reception at NHAC/Telecom and ensure the timely data reception and onward transmission of data to NWP Division and NCMRWF throughout the FDP 2010 period.
- ii. ISSD, IMD shall establish FDP Web Page on IMD (linked at NCMRWF as well). The existing FDP e-mail group may 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(Telecom), IT cell will take necessary action in this regard.

2.5.3. NWP analysis and prediction

(a) NWP Division shall make all necessary arrangements for the generation of global and regional analysis fields by using special FDP 2010 data at 4 analysis times (00, 06, 12, 18 UTC) for the whole of FDP 2010 period. Arrangements are also to be made to keep FDP 2010 analyses fields and forecast boundary fields up to 72hrs on ftp servers of NCMRWF and IMD for their utilization by FDP partners in India. Efforts will be made to bring out the Model forecast within three hours of the observation time.

(b) 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 2010 period.

2.5.4. 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.

2.5.5. FDP Operation Centre

Project Manager shall establish a National FDP Operations Center at NHAC and a FDP Weather Monitoring and Advisory Group will be constituted to identify the IOP phases during FDP 2010 period.

2.5.6. FDP Weather Monitoring and Advisory Group(WMAG)

1. DGM Chairman
2. All members of FDP Project Team
3. DDGM (Satmet), DDGM (DM), DDGM(S), DDGM (UI), Scientist-E (S)
4. Head ,NCMRWF
5. Prof. U.C. Mohanty
6. Shri D.R. Sikka
7. Representatives from IAF, Indian Navy.

The WMAG shall meet daily at 1500 hrs (including holidays) during the period 15 Oct.- 30 Nov., 2010 at NWFC Meeting Room IIInd floor to review the FDP activity regularly and decide on IOP declaration. Weather summaries and current information will be presented by Project Scientist, FDP.

2.5.7. Implementation Strategy

- Preparatory Phase for the FDP Pilot 2010: 1-15 October 2010
(Actions to be completed as mentioned above)
- FDP-2010 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 Center 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 2010 pilot observational campaign.
- FDP Data Centre: All special observations collected by the FDP project partners shall be archived alongwith meso-scale analysis and forecast fields at IMD and NCMRWF computing centers.

Post Experiment Phase :

1. Preparation of weather summary 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.

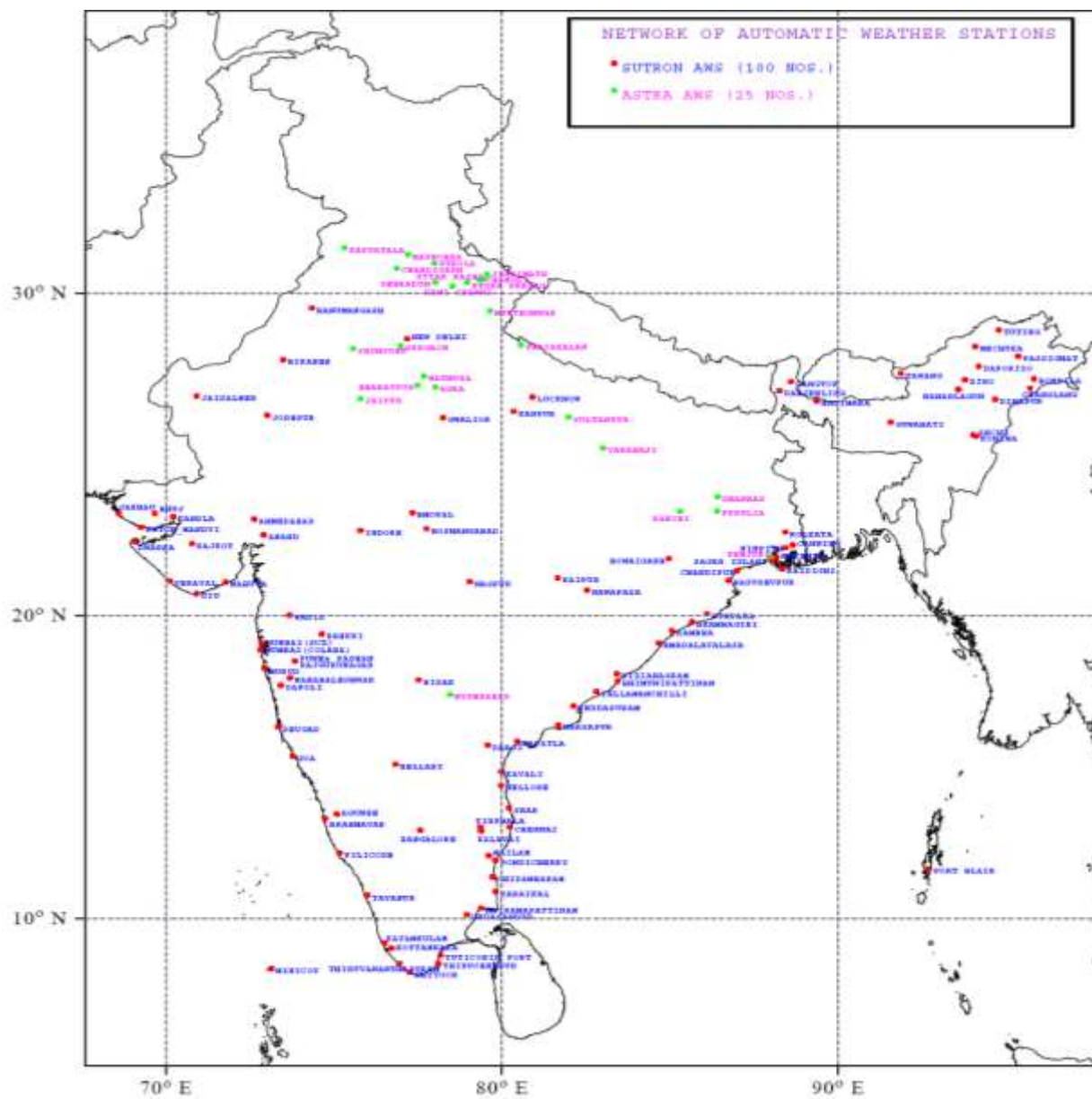


Fig.1(a). Old 125 AWS network of IMD

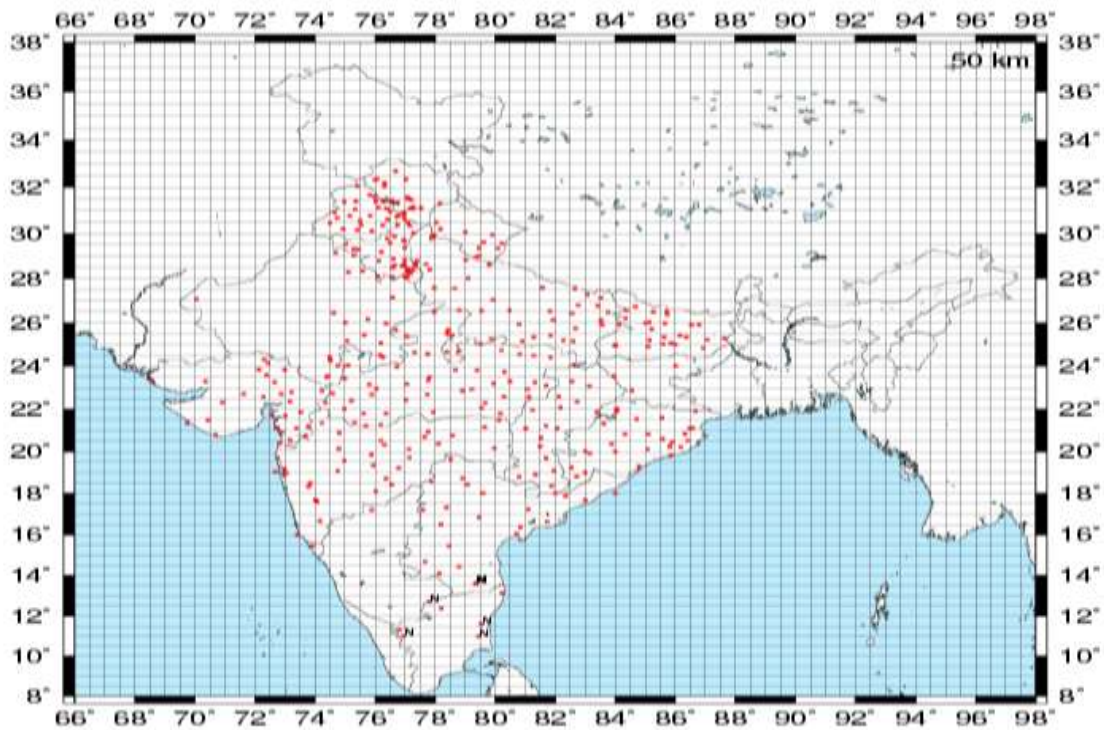


Fig.1(b). New AWS network of IMD as on 30th September 2010

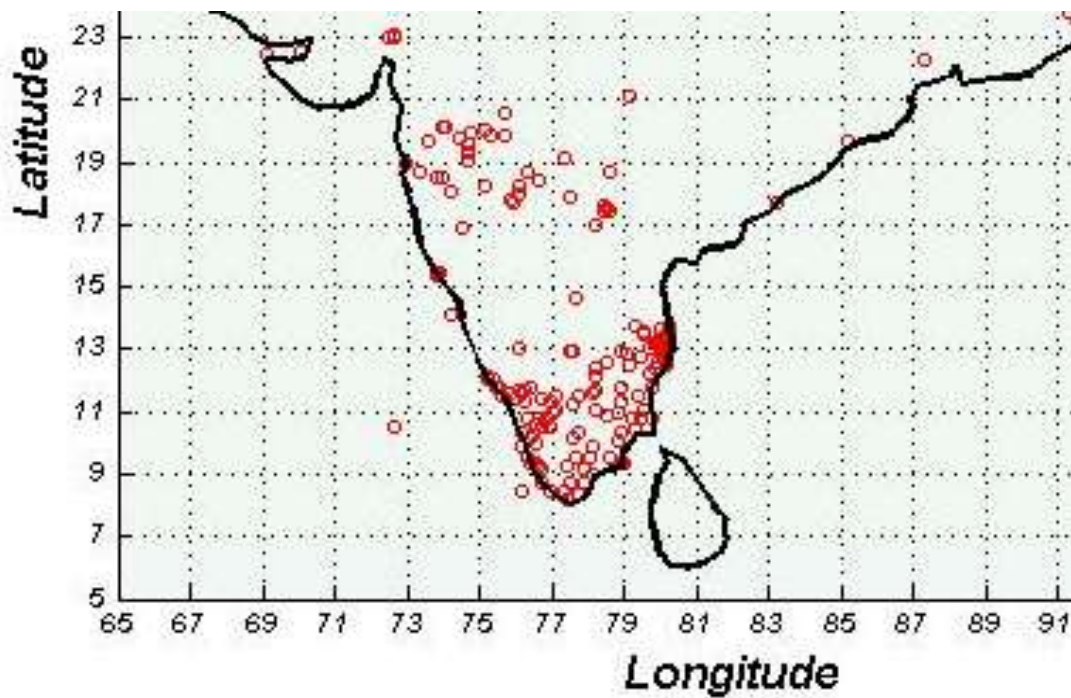


Fig.2. ISRO AWS stations under PRWONAM project.

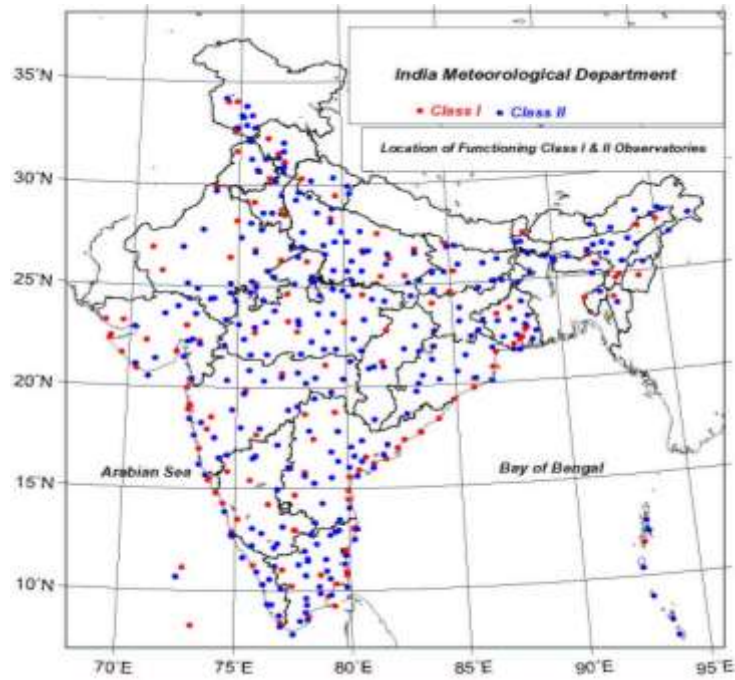


Fig.3. Synoptic stations of IMD

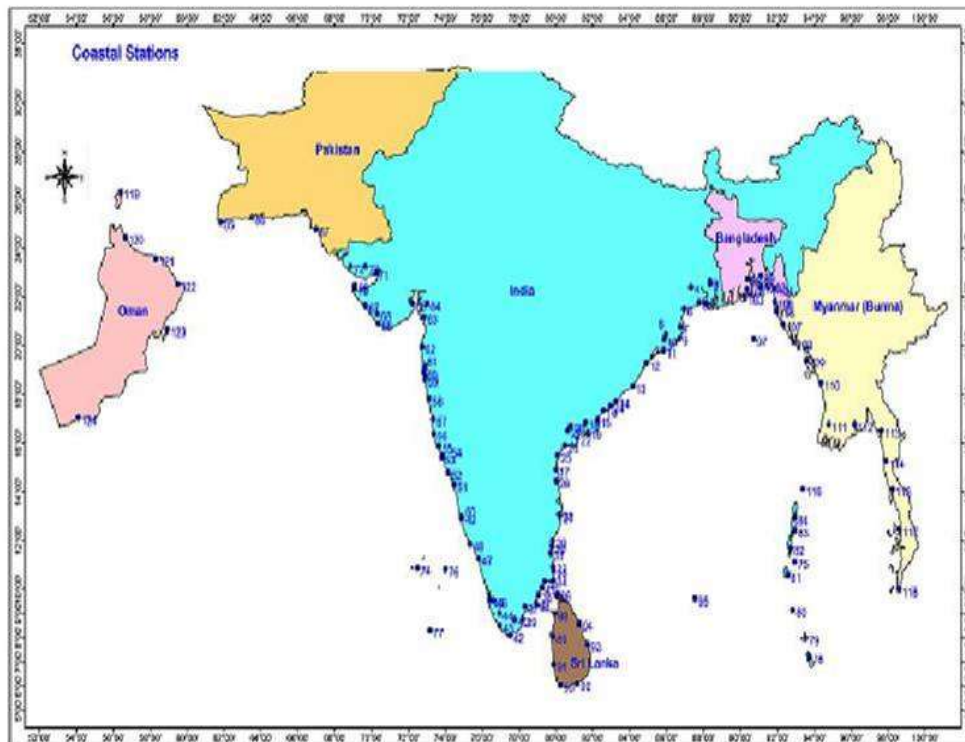


Fig.4. Coastal synoptic stations

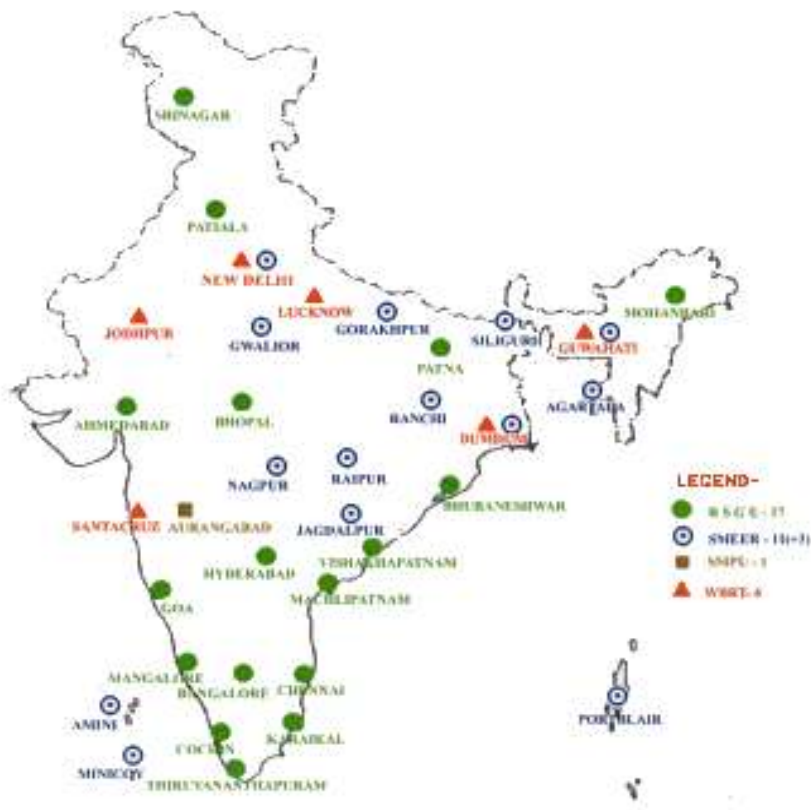
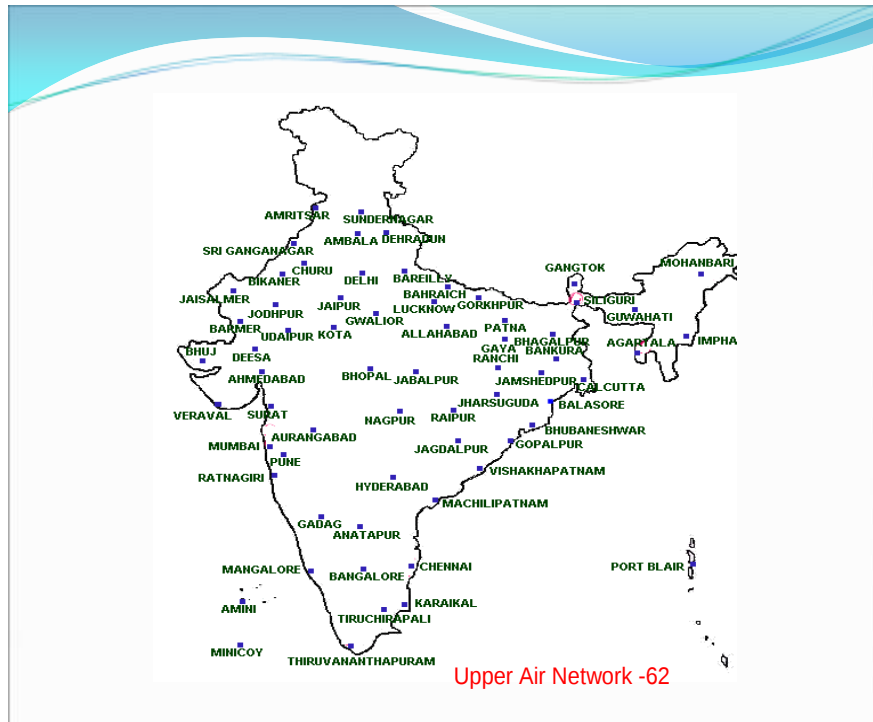


Fig.5. The pilot balloon and RS/RW network of IMD

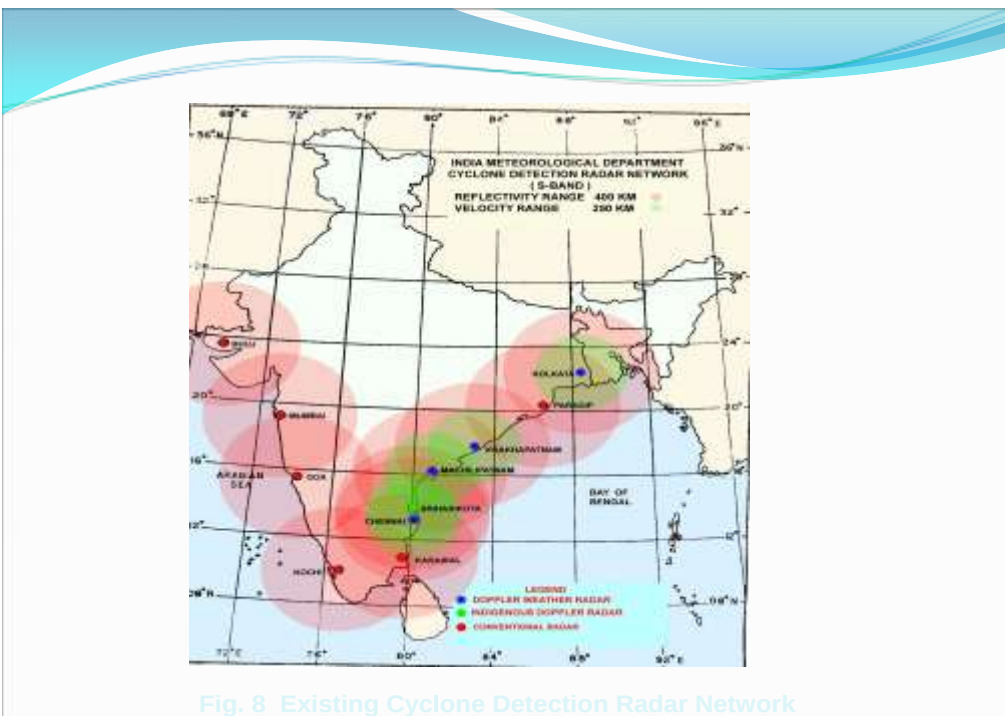
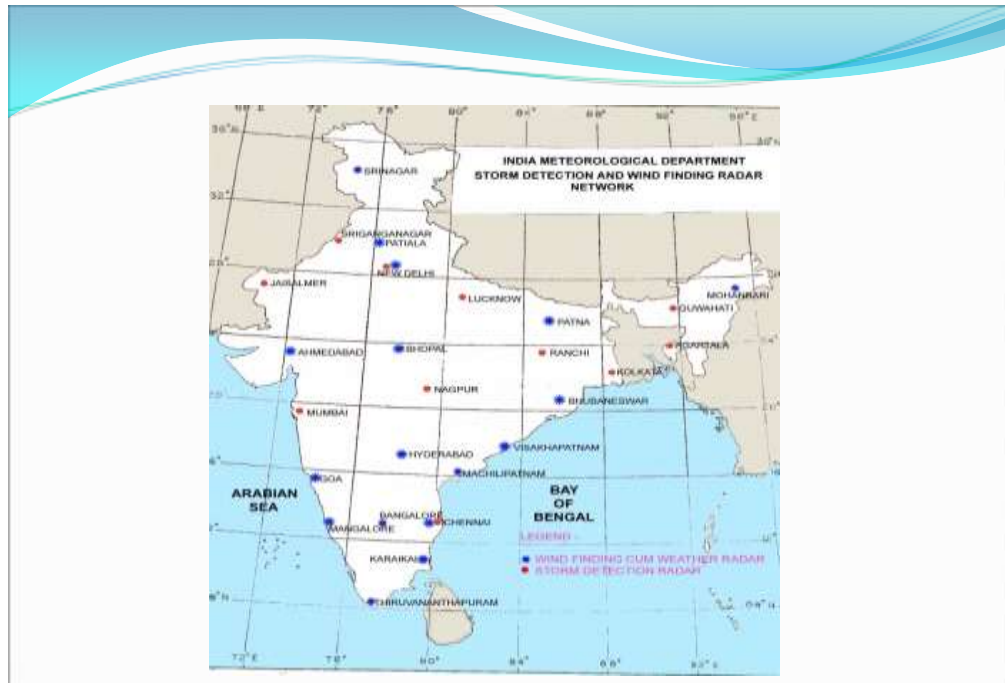


Fig. 8 Existing Cyclone Detection Radar Network

Fig.6. DWR Network of IMD

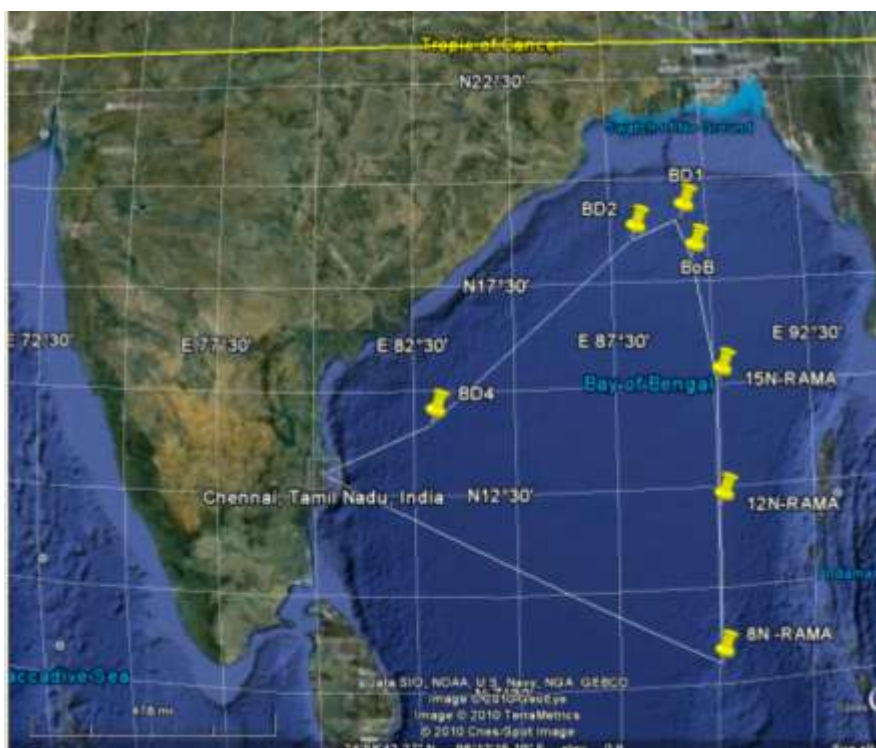


Fig.7 Voyage Route of Sagar Kanya Ship

Table 1. List of East Coast stations in India

Station	Index	Latitude	Longitude	Class	00Z	03Z	06Z	09Z	12Z	15Z	18Z	21Z
Kolkata(Alipore)	42807	22 32N	88 20E	I	X	X	X	X	X	X	X	X
Kolkata(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
Bubaneswar	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	IO	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
SRILANKA											
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	0
Galle	43495	06 02N	80 13E	X	X	X	X	X	0	X	X
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	0
Jaffna	43404	09 39N	88 01E	X	X	X	X	X	0	X	0
BAGLADESH											
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	X
Yangon	48097	16 46N	96 10E	X	X	X	X	X	X	X	0
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	

**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				
1	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

Table4: Approximate positions of the Sagar Kanya ship during cruise SK-277 over BoB

Date	Position
23 Oct.,2010	80.3, 13.1
24 Oct.,2010	82.0, 12.0
25 Oct.,2010	84.3, 12.7
26 Oct.,2010	87.0, 9.1
27 Oct.,2010	89.0, 8.0
29 Oct.,2010	90.0, 12.0
30 Oct.,2010	90.0, 12.8
31 Oct.,2010	90.0, 15.0
1 Nov.,2010	89.8, 16.0
2 Nov.,2010	89.5, 18.0
3 Nov.,2010	89.2, 18.8
4 Nov.,2010	88.6, 18.8
5 Nov.,2010	88.0, 18.5
6 Nov.,2010	86.9, 17.6
7 Nov.,2010	85.3, 16.3
8 Nov.,2010	83.7, 15.1
9 Nov.,2010	82.9, 14.5
10 Nov.,2010	81.0, 13.4
11 Nov.,2010	80.3, 13.1

CHAPTER – III

IMPLEMENTATION OF FDP – 2010

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.2009. There was no Intensive Observational Phases (IOP) within this period as there was no cyclonic disturbances over the Bay of Bengal during this period.

The overall campaign was monitored and guided by a Weather Monitoring and Advisory Group (WMAG) at National Operation Centre (NOC) in NHAC, 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.

The institutions involved in the program are as follows:-

1. IMD
2. NCMRWF
3. ISRO
4. IAF
5. INDIAN NAVY
6. IIT KHARAGPUR
7. IIT DELHI
8. INDIAN INSTITUTE OF SCIENCE
9. NIOT
10. INCOIS
11. INCOAR
12. NPOL

The detailed observational programme is presented in Sec. 3.2.

3.2. Observational program

The observational programme was taken up as per the project implementation plan prepared by NOC. However, the buoy data improved with five such stations in Bay of Bengal during November 2010.

IMD has augmented AWS network under its modernisation programme. The number of AWS/ Automatic Rain Gauge (ARG) stations in the country exceeds 400 by the end of 2010. The AWS data including wind and pressure could very well help in monitoring the genesis, intensity, structure and movement of the landfalling cyclonic disturbances. A few examples are shown in Fig.3.1.

Availability of hourly observations without an observer's need at the site helped immensely the monitoring and prediction of cyclonic disturbances.

Ten GPS sonde stations at Thiruvananthapuram, Mohanbari, Chennai, Portblair, Minicoy, Goa, Hyderabad, Visakhapatnam, Patna, Srinagar helped in improving the initial conditions of the NWP models resulting in forecast also.

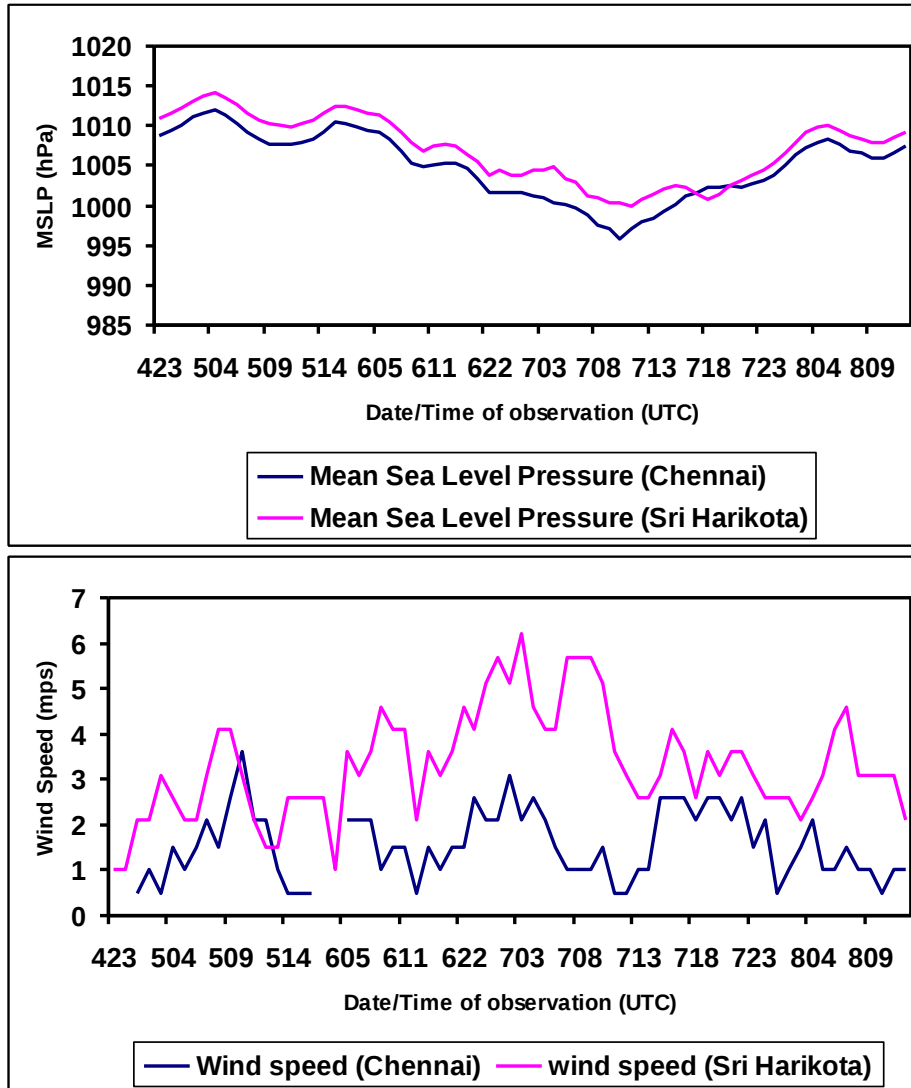


Fig.3.1. MSLP and wind speed measured by AWS from 2300 UTC of 04 November to 1200 UTC of 08 November 2010 during severe cyclonic storm, JAL

3.3. Operation Management

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. 2010. The overall campaign was monitored and guided by a Weather Monitoring and Advisory Group (WMAG) at National Operation Centre (NOC) in NHAC, IMD. In addition, communication conferencing and data exchange were facilitated from this nodal cell. The announcement of IOP 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 2010

- IOP: 15-16 October, 2010 (2 Days) : (Deep Depression 13-16 Oct, 2010)

- IOP: 21-22 October, 2010 (2 Days) : (GIRI, VSCS 20-23 Oct., 2010)
- IOP: 02-08 November, 2010 (7 Days) : (JAL, SCS : 04-08 Nov., 2010)

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

Track forecasting :

- i) Methods based on climatology (Analogues)
- ii) Methods based on Persistence & Climatology
- iii) Synoptic Techniques – Empirical Techniques
- iv) Satellite Techniques (Microwave)
- v) Statistical Techniques (CLIPER, Chaos theory and Generic Algorithm method)
- vi) Analogue Techniques
- vii) NWP Models
 - MME based on Tropical Cyclone Module (TCM)
 - Climatology and persistence based on TCM
 - ARPs Model of meteoFrance
- viii) Operational (Consensus) forecast

Intensity forecast :

Here was no change in methodology. We used dynamical statistical model and satellite and other conventional inputs for intensity monitoring and forecasting. However, microwave imagery in TCM was made available and used for the first time.

Various NWP systems used in FDP 2010 included the following.

- Global Forecast System (GFS T-382): 7 days
- Regional Forecast System (WRF): 3 days
- Mesoscale Forecasting System (WRF, ARPS) : 48 hours
- Nowcasting: Processing of DWR observations

Apart from model in IMD, the models from IIT, Delhi, NCMRWF, ECMWF, UKMO, ARPEGE (France), JMA were also used.

3.4. Achievements

3.4.1. Official forecast

The official landfall forecast errors during FDP-2010 are shown in Table 3.1. For comparison , the landfall forecast errors during FDP-2008 are shown in Table 3.2. It is found that the error has decreased over the years. There were no cyclonic disturbances during FDP-2009 and hence could not be compared. The track forecast errors during 2010 as shown in Table 3.3 were also less and the skill score during FDP-2010 as shown in Table 3.4 was higher.

Table 3.1. Official landfall forecast errors (km) of IMD during FDP-2010

System	Lead Time (hours)					
	12	24	36	48	60	72
GIRI	55	55	55	--	--	--
JAL	35	25	33	44	22	101
MEAN	45	40	44	44	22	101

Table 3.2. Official landfall forecast errors (km) of IMD during FDP-2008

<i>System</i>	<i>Error (km)</i>
<i>RASHMI</i>	<i>21</i>
<i>KHAIMUK</i>	<i>150</i>
<i>NISHA</i>	<i>100</i>
<i>MEAN</i>	<i>90</i>

Table 3.3. Official track forecast errors (km) of IMD during FDP-2010

System	Lead Time (Hrs)					
	12	24	36	48	60	72
GIRI	45(7)	73(5)	68(3)	117(1)	-	-
JAL	41(11)	78(9)	56(7)	83(5)	54(3)	54(01)

Figures inside parenthesis indicate the number of forecasts verified.

Table 3.4. Official track forecast skill scores of IMD during FDP-2010 compared to CLIPPER forecast

System	Lead Time (hrs)					
	12 hr	24hr	36hr	48hr	60hr	72hr
GIRI	15.1	57.1	78.8	82.1	-	-
JAL	43.0	32.0	45.0	43.0	69.0	77.0

Mean landfall forecast has been less than the long period average and has decreased. Track forecast has been issued upto 72 hrs lead period during 2010. However, track and landfall error can be further reduced. Intensity error is still very large. We could not collect observation from the inner core due to absence of aircraft reconnaissance.

3.4.2 NWP Model Performance

3.4.2.1 Very Severe Cyclonic Storm “GIRI” (20 – 23 October 2010)

a) Genesis

Analysis of GPP values computed for this cyclone on the basis of real time model analysis fields along with the GPP values for Developing Systems and Non-Developing Systems are shown in Table 3.5. The higher GPP values (> 8.0, the threshold value) at early stages of development (T.No. 1.5) have clearly indicated

that the cyclone “GIRI” had enough potential to intensify into a developing system (>35 knots).

Table 3.5 GPP($\times 10^{-5}$) for Developing System, Non-Developing System and Cyclone “GIRI”

Date/Time	21.10.2010/0000 UTC
T.No.	1.5
Developing	11.1
Non-Developing	3.4
Cyclone GIRI	15.89

No NWP model except ECMWRF could predict genesis and intensification of cyclone Giri. It was observed as a low or cyclonic circulation by these models . Moreover ECMWRF model could predict genesis , intensity and movement with reasonable accuracy.

b) Track and Landfall:

Fig. 3.2(a-b) display the forecast tracks of the cyclone, “GIRI” by various NWP models (ECMWF, IMD-GFS, NCEP-GFS, JMA, WRF, and MME) with the initial conditions of 0000 UTC of 21 and 22 October 2010 respectively. It is noted that all models showed northeastward movement of cyclonic storm “GIRI” towards Myanmar coast with of course large variations except JMA, NCEP-GFS and WRF models which showed northwestward movement towards Bangladesh coast, but MME could predict landfall near north Myanmar coast to the north of actual landfall point.

The forecast errors of member models based on different initial conditions and the corresponding MME are summarized in Table 3.6(a-e). The tables show that MME forecasts could provide useful guidance under the circumstances of wide variations of individual model forecasts.

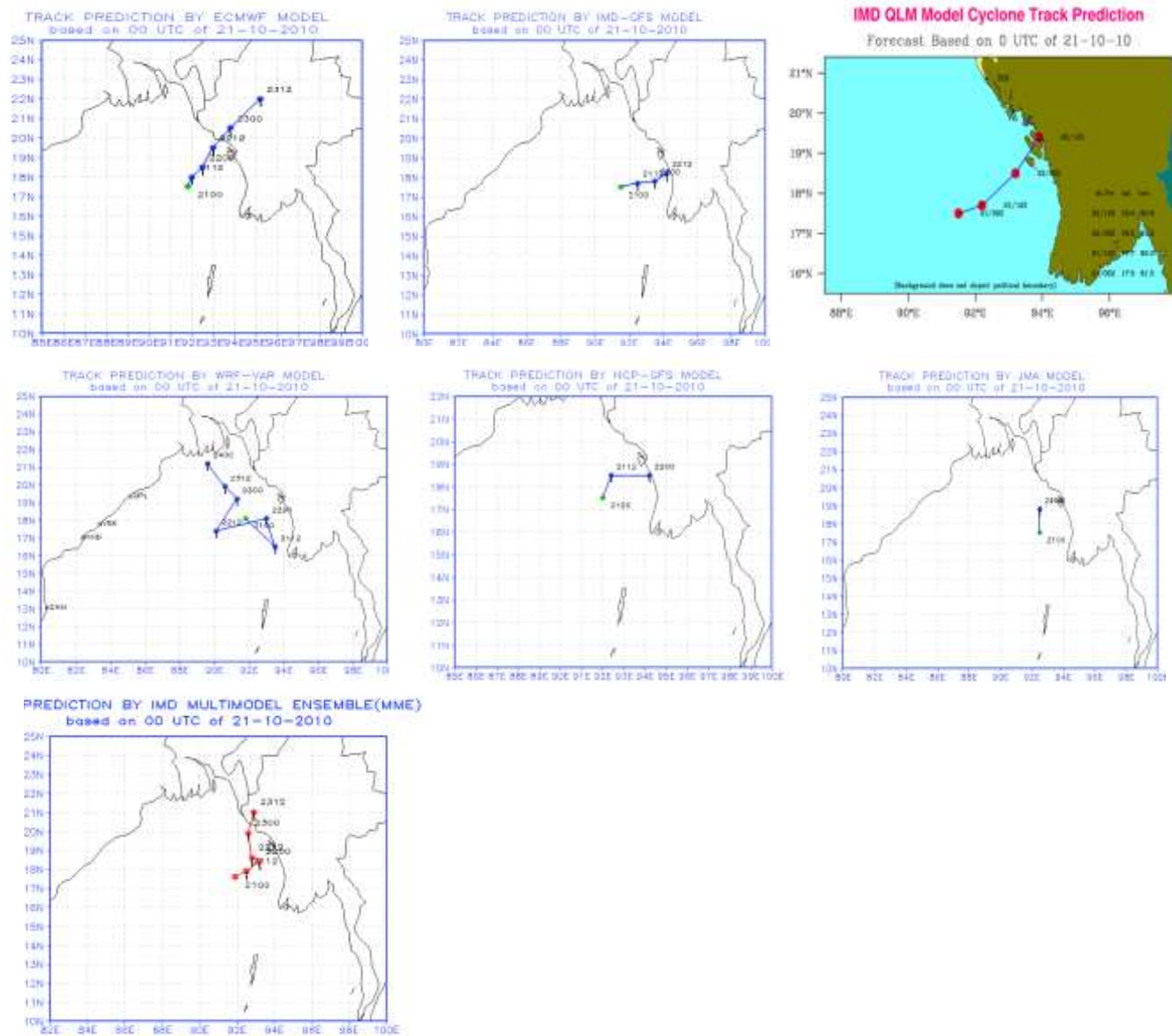


Fig.3.2(a) Track forecasts of multi-model ensemble and its member models based on 0000 UTC of 21.10.2010

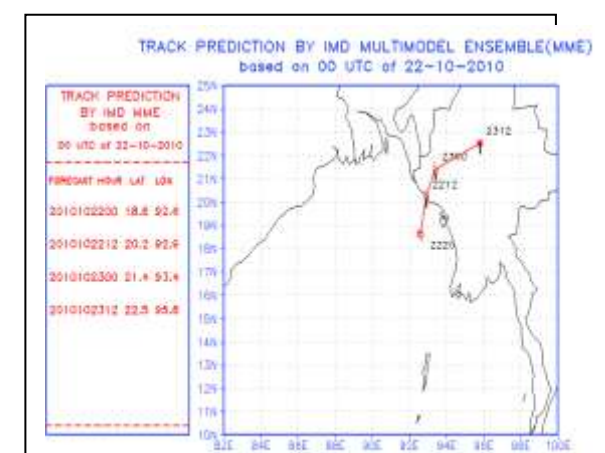
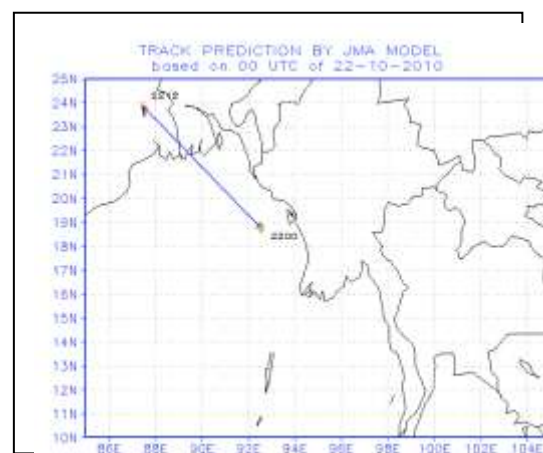
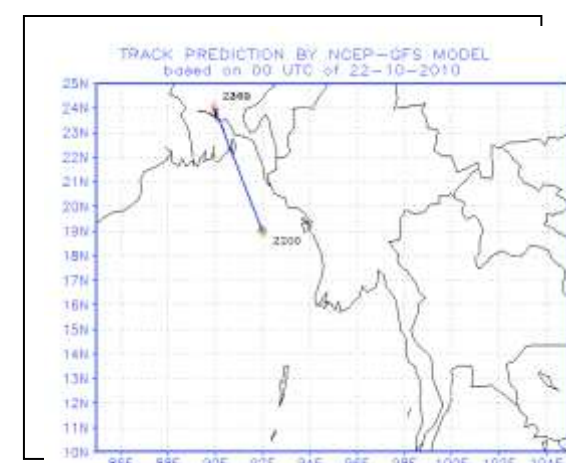
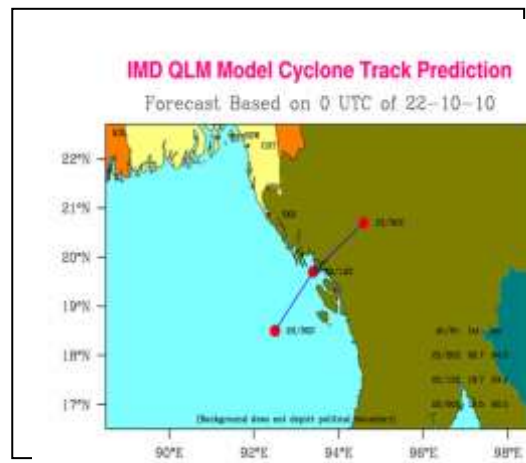
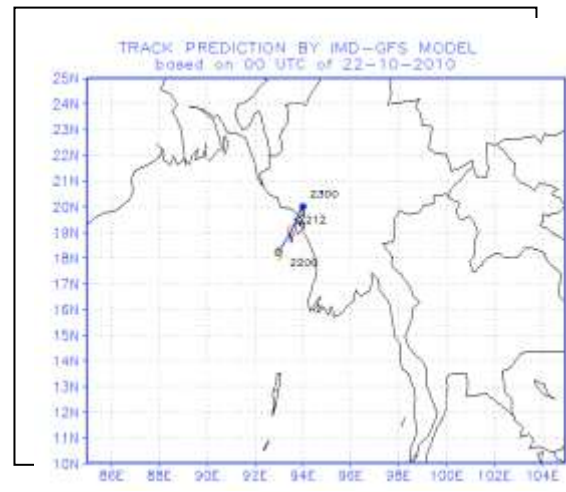
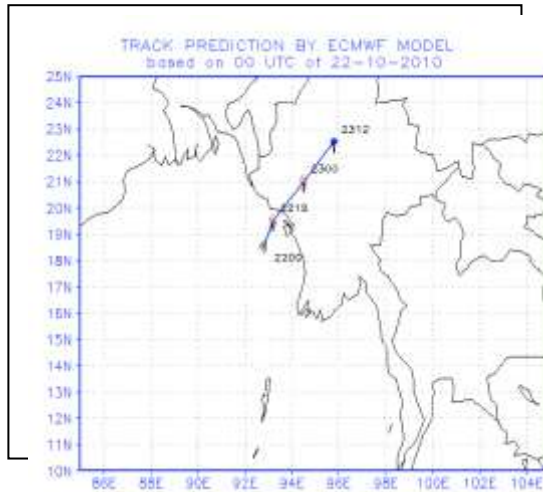


Fig.3 **el ens**
based on 0000 UTC of 22.10.2010

Table 3.6 (a) Initial position error (km) with respect to landfall time

Lead time (hrs)	ECMWF	GFS (NCEP)	JMA	QLM (IMD)	GFS (IMD)	WRF (IMD)	MME (IMD)
12 (14hrs)	32	77	33	**	62	-	15
36 (38 hrs)	32	53	106	**	01	74	44

**** Initial position taken from observed field.**

Table 3.6 (b) Average track forecast errors (Direct position error in Km)

	Lead time →					
Models	12 hr	24 hr	36 hr	48 hr	-	-
ECMWF	23	01	62	92	-	-
GFS (NCEP)	330	285	-	-	-	-
JMA	433	33	-	-	-	-
QLM(IMD)	27	54	61	-	-	-
GFS (IMD)	76	121	192	-	-	-
WRF(IMD)	230	69	446	389	-	-
MME(IMD)	65	98	152	233	-	-
IMD (WRF-NMM)	-	-	-	-	-	-
IITD (WRF-ARW)	135	195	250	366	-	-

Table 3.6 (c) Genesis : (formation of Depression) Forecast errors (km)

	Lead time →		
Models	24 hours	48 hours	72 hours
ECMWF	53	119	127
GFS (NCEP)	169	77	271
JMA	106	238	27
GFS (IMD)	No Detection	53	No Detection
WRF(IMD)	63	423	437

Table 3.6 (d) Landfall forecast error (km) in respect of MYANMAR Coast

Lead Time (hr) →	12 (14:00) hr based on 22.10.2010	36 (38:00) hr based on 21.10.2010
Model	F/C	F/C
ECMWF	15	10
GFS (NCEP)	372	No L/F
JMA	480	No L/F
QLM(IMD)	35	100
GFS (IMD)	46	No L/F
WRF(IMD)	No Plot	No L/F
MME(IMD)	25	85

F/C - Forecast; L/F-Landfall

Table 3.6 (e) Landfall time error (in hr) at Myanmar; (E: Early; D: Delayed)

Lead Time (hr) →	12 (14:00) based on 22.10.2010	36 (38:00) based on 21.10.2010
Model	F/C	F/C
ECMWF	01:00 D	03:00 D
GFS (NCEP)	06:00 E	No L/F
JMA	06:00 E	No L/F
QLM(IMD)	02:00 E	06:00 E
GFS (IMD)	05:00 E	No L/F
WRF(IMD)	No Plot	No L/F
MME	02:00 E	15:00 D

c) Forecast issued by IIT Delhi

The six hourly vector displacement errors issued by IIT Delhi with different initial conditions are discussed in Table 3.7

Table 3.7: Vector displacement errors of VSCS Giri (Bay of Bengal) during 20-22 October 2010 with different initial conditions

Time	IC: 2012	IC: 2100	IC: 2112	IC: 2200	Mean
0		72	66	36	58
6	126	157	70	99	113
12	151	111	112	167	135
18	126	182	148	191	162
24	129	205	263	181	195
30	192	284	248		241
36	220	300	229		250
42	294	334			314
48	318	414			366

3.4.2.2 Cyclonic Storm “JAL” (4-7 November 2010)

a) Genesis

Analysis of GPP values computed for this cyclone on the basis of real time model analysis fields along with the GPP values for Developing Systems and Non-Developing Systems are shown in Table 3.8 The higher GPP values (> 8.0, the threshold value) at early stages of development (T.No. 1.5, 2.0) have clearly indicated that the cyclone “JAL” had enough potential to intensify into a developing system (>35 knots).

Table 3.8 GPP ($\times 10^{-5}$) for Developing System, Non-Developing System and Cyclone “JAL”

Date/Time	04.11.2010/0000 UTC	05.11.2010/0000 UTC
T.No. □	1.5	2.0
Developing	11.1	13.3
Non-Developing	3.4	4.6
Cyclone JAL	13.5	17.4

Genesis and intensification of the system was picked up by many models especially ECMWF. However the weakening of the system before landfall to a depression could not be predicted by many models. Similarly many models predicted further intensification of the system in emergence over the Arabian sea which did not occur.

b) Track and Landfall:

Fig. 3.3(a-d) display the forecast tracks of the cyclone, “JAL” by various NWP models with the initial conditions of 0000 UTC of 4, 5, 6 and 7 November 2010 respectively. It is encouraging to note that all models showed northwestward movement of cyclonic storm “JAL” towards north Tamilnadu and south Andhra Pradesh coast.

The forecast errors of member models based on different initial conditions and the corresponding consensus forecasts (MME) are summarized in Table 3.9 (a-e).

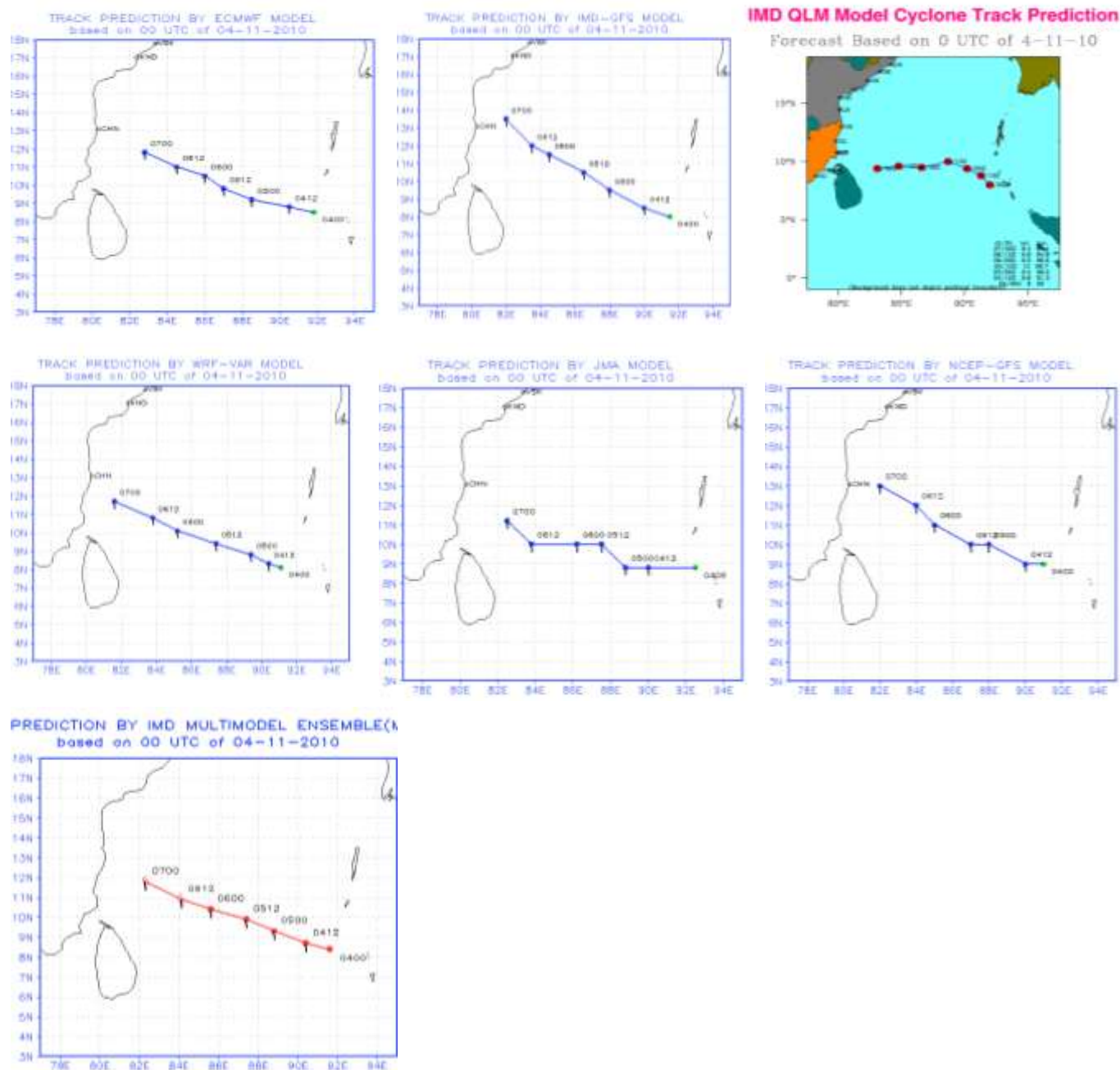
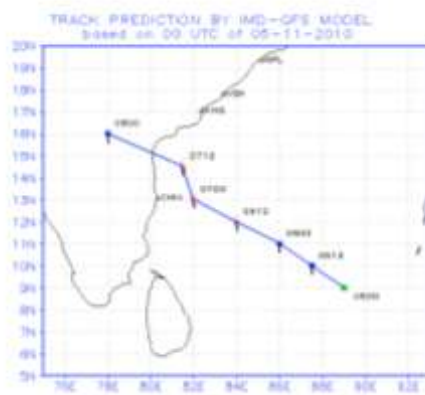
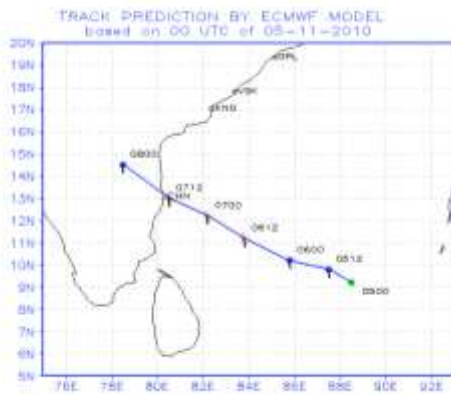
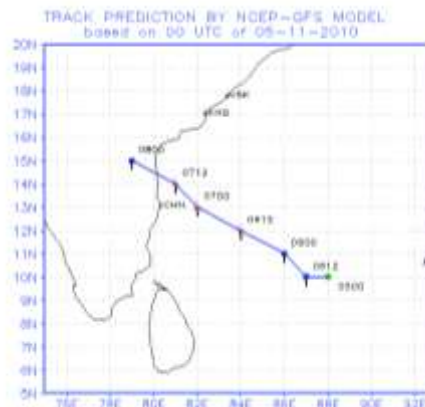
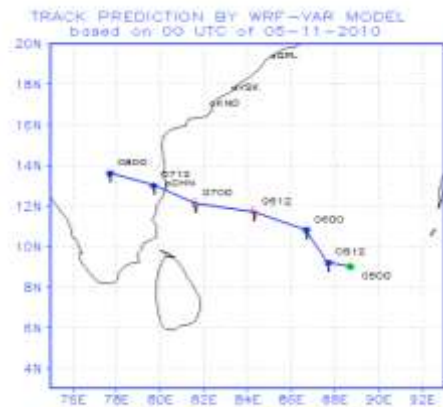
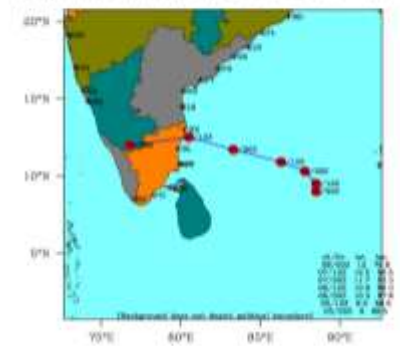


Fig.3.3(a). Track forecasts of multi-model ensemble and its member models based on 0000 UTC of 04.11.2010



IMD QLM Model Cyclone Track Prediction

Forecast Based on 0 UTC of 5-11-10



PREDICTION BY IMD MULTIMODEL ENSEMBLE(M)
based on 00 UTC of 05-11-2010

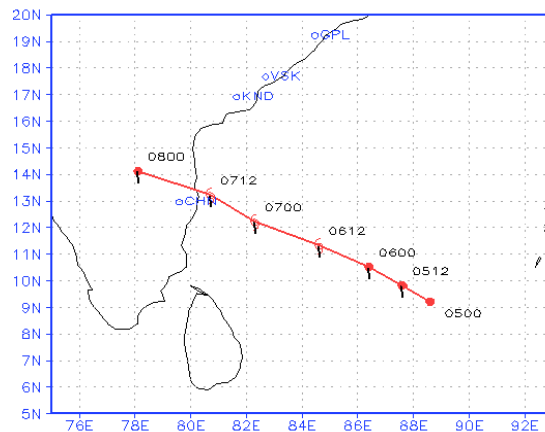


Fig. 3.3(b). Track forecasts of multi-model ensemble and its member models based on 0000 UTC of 05.11.2010

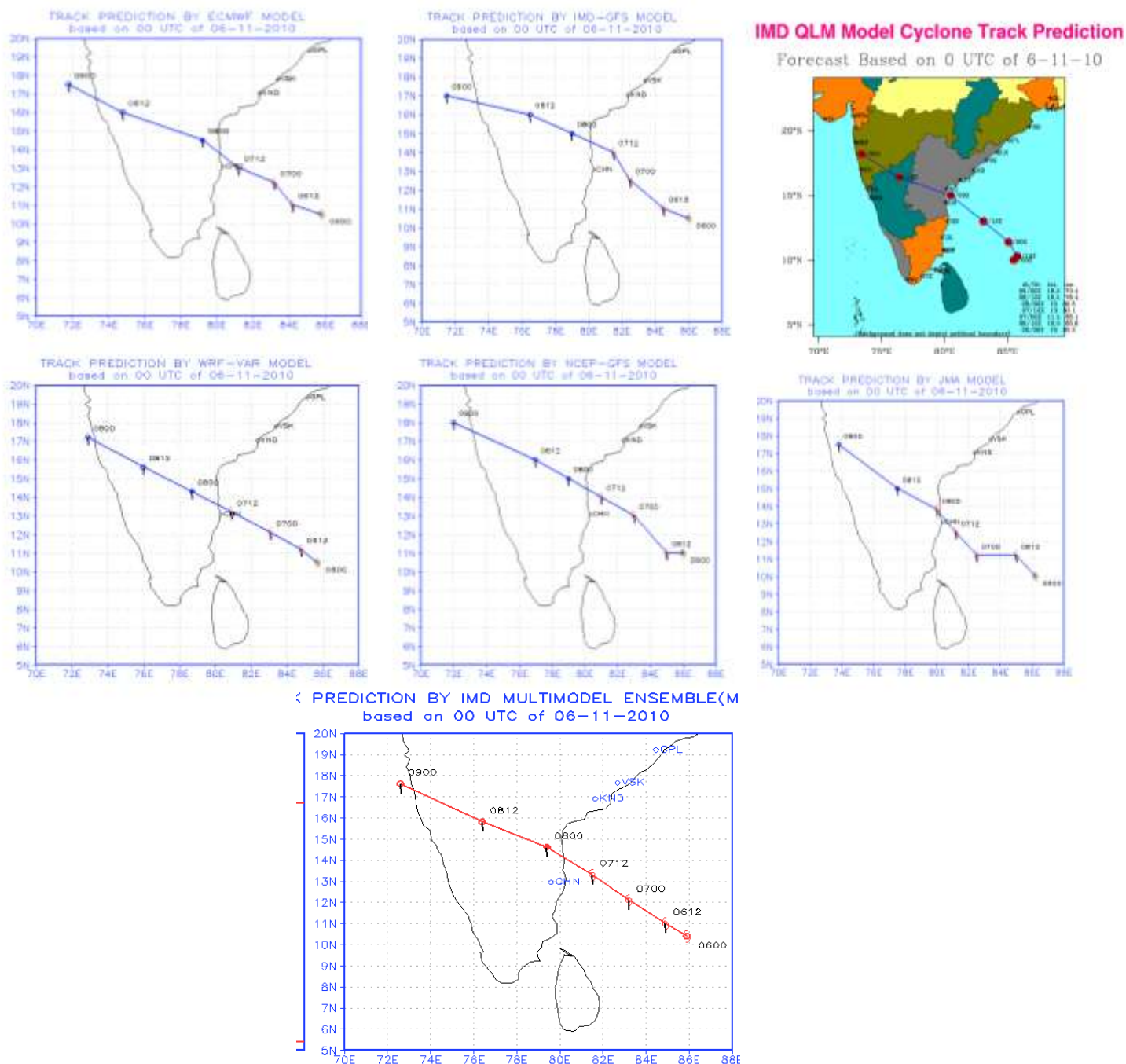
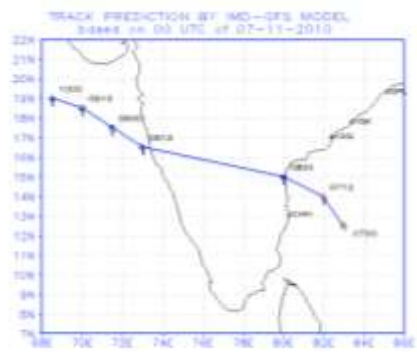
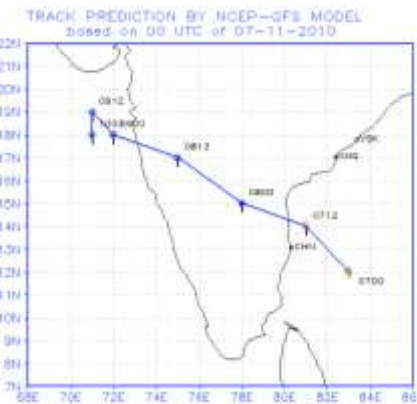
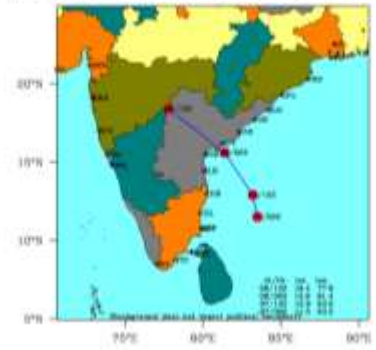


Fig. 3.3(c). Track forecasts of multi-model ensemble and its member models based on 0000 UTC of 06.11.2010



IMD QLM Model Cyclone Track Prediction

Forecast Based on 0 UTC of 7-11-10



PREDICTION BY IMD MULTIMODEL ENSEMBLE(M) based on 00 UTC of 07-11-2010

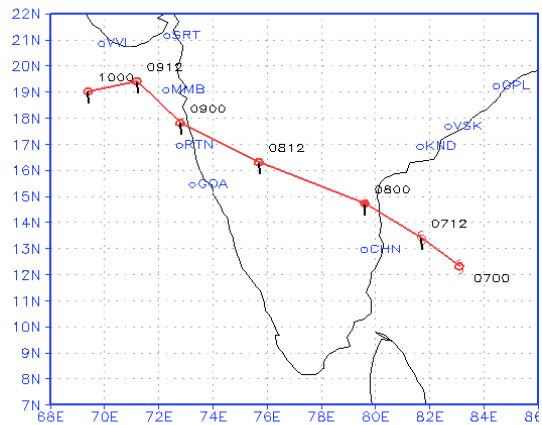


Fig. 3.3(d). Track forecasts of multi-model ensemble and its member models based on 0000 UTC of 07.11.2010

Table 3.9(a) Initial position error (km) in respect of landfall time at Tamil Nadu-Andhra Coast:

Lead time (hrs)	ECMWF	GFS (NCEP)	JMA	QLM (IMD)	GFS (IMD)	WRF (IMD)	MME (IMD)
12 (16hrs)	135	78	116	**	124	174	99
36 (40 hrs)	65	124	77	**	78	60	62
60(64hrs)	22	124	40	**	55	22	25

**** Initial position taken from observed field.**

Table 3.9(b) Average track forecast errors (Direct position error in km)

Models	Lead time →					
	12 hr	24 hr	36 hr	48 hr	60 hr	72 hr
ECMWF	46	49	45	120	27	83
GFS (NCEP)	69	141	97	178	117	233
JMA	57	77	87	95	97	114
QLM(IMD)	178	207	206	82	118	237
GFS (IMD)	59	119	124	216	165	275
WRF(IMD)	66	113	50	126	110	208
MME(IMD)	64	78	54	99	42	135
WRF-NMM(IMD)	63	68	105	156	213	304
WRF-ARD(IITD)	53	72	66	99	159	179

Table 3.9(c) Genesis : (formation of Depression) Forecast errors (km)

Models	Lead time →		
	24 hours	48 hours	72 hours
ECMWF	92	104	111
GFS (NCEP)	156	156	312
JMA	105	335	217
GFS (IMD)	156	246	431
WRF(IMD)	45	197	70

Table 3.9(d): Landfall forecast error (km)

Lead Time (hr)/Model	12 (16:00) Hr based on 07.11.2010	36 (40:00) Hr based on 06.11.2010	60 (64:00) Hr based on 05.11.2010
ECMWF	46	56	22
GFS (NCEP)	111	133	133
JMA	33	45	35
QLM(IMD)	291	189	90
GFS (IMD)	189	144	200
WRF (IMD)	111	33	57
MME (IMD)	123	90	11

Table 3.9(e): Landfall time error (in hour)

Lead Time (hr)/Model	12 (16:00) hr based on 07.11.2010	36 (40:00) hr based on 06.11.2010	60 (64:00) hr based on 05.11.2010
ECMWF	02:30 E	04:00 D	01:00 D
GFS (NCEP)	00	04:00 D	04:00 D
JMA	01:30 D	07:00 D	01:30 D
QLM(IND)	09:00 D	09:30 D	02:30 E
GFS (IND)	07:30 D	02:00 D	01:30 D
WRF(IND)	11:00 D	01:00 D	07:00 E
MME (IND)	05:00 D	04:00 D	01:00 E

c) Forecast issued by IIT Delhi

The six hourly vector displacement errors issued by IIT Delhi with different initial conditions are discussed in Table 3.10

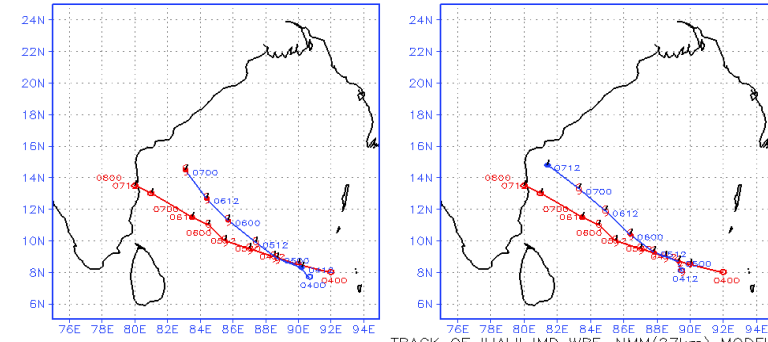
Table3.10 : Vector displacement errors of VSCS Jal (Bay of Bengal) during 3-7 November 2010 with different initial conditions

	300	312	400	412	500	512	600	612	700	Mean
0				17	86	36	69	42	93	57
6			17	31	65	42	41	52	13	37
12			17	58	36	66	28	97	65	53
18		29	43	95	11	67	83	70	38	55
24		43	33	95	73	28	130	89	84	72
30	105	74	51	37	31	77	85	87		68
36	67	39	36	73	50	99	65	97		66
42	74	73	11	67	107	98	99			75
48	86	70	69	52	160	172	84			99
54	145	33	80	128	128	265				130
60	128	115	119	149	165	280				159
66	139	131	141	141	159					142
72	190	189	218	165	133					179

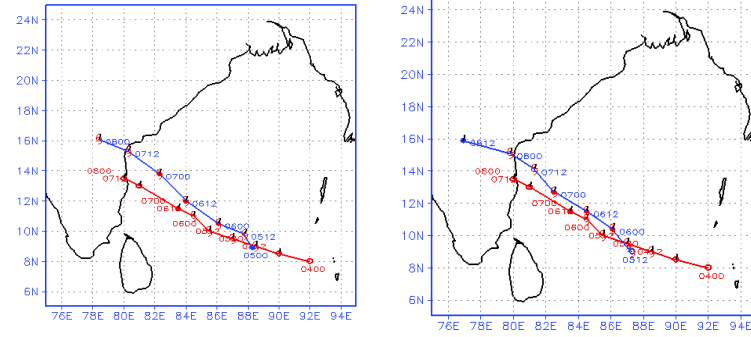
d) Performance of WRF-NMM model during cyclone 'JAL'

Track of cyclone JAL based on 00&12 UTC of 4th -7th Nov.,2010 has been given in Fig.3.4. Initial position error, average track forecast error, intensity forecast error with lead time of 72 hrs., forecast error at Genesis and landfall forecast error in position and time have been given in Table 3.11(a-e).

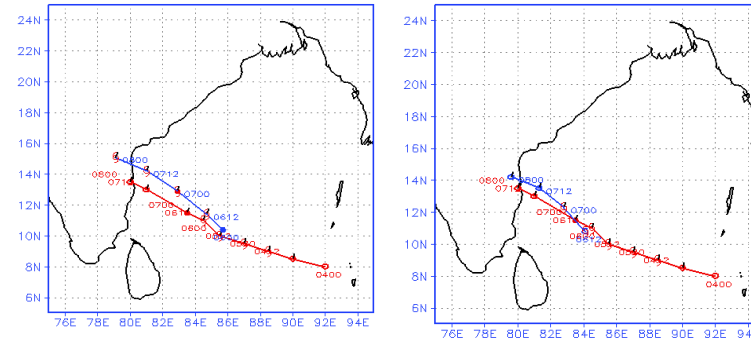
TRACK OF "JAL" IMD WRF-NMM(27km) MODEL TRACK OF "JAL" IMD WRF-NMM(27km) MODEL
based on 00 UTC of 04-11-2010 based on 12 UTC of 04-11-2010



TRACK OF "JAL" IMD WRF-NMM(27km) MODEL TRACK OF "JAL" IMD WRF-NMM(27km) MODEL
based on 00 UTC of 05-11-2010 based on 12 UTC of 05-11-2010



TRACK OF "JAL" IMD WRF-NMM(27km) MODEL TRACK OF "JAL" IMD WRF-NMM(27km) MODEL
based on 00 UTC of 06-11-2010 based on 12 UTC of 06-11-2010



TRACK OF "JAL" IMD WRF-NMM(27km) MODEL
based on 00 UTC of 07-11-2010

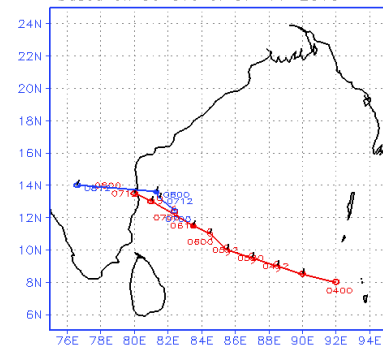


Fig.3.4 Track of cyclone JAL based on 00&12 UTC of 4th -7th Nov.,2011

Table 3.11(a)Initial position error (km)

Lead time (hrs)	Landfall (km)
12	157
24	49
36	49
48	64
60	24
72	124
Mean	77.83

Table 3.11(b)Average Track forecast errors (Direct position error in Km)

Models	12 hours	24 hours	36 hours	48 hours	60 hours	72 hours
Mean	63	68	105	156	213	304

Table 3.11(c)Average intensity forecast error (F- O) CSP(hPa) and Wind(kts)

Models	12 hours	24 hours	36 hours	48 hours	60 hours	72 hours
Mean wind at 10m	-10	-13	-15	-13	-12	-15

Table 3.11(d)Genesis : (formation of Depression) Forecast errors (Location & time)

	Lead time		
Models	12 hours	24 hours	36 hours
Forecast error	166km	45km	160km
Location	93.5/7.9	91.6/8.1	93.2/7.2
Time / Time error	03 November 2010 12 UTC /12 hours early	03 November 2010 00 UTC /24 hours early	04 November 2010 00 UTC / 00 hours

Table 3.11(e)Landfall forecast error of cyclone, 'JAL'

Lead Time (hrs)	Landfall point error(km)			Landfall time error(hrs)		
	Forecast	Actual	Error(km)	Forecast	Actual	Error(hrs)
12	15.1 ⁰ N /79.8 ⁰ E	13.3 ⁰ N /80.3 ⁰ E	207km	07/1200 UTC	07/1600 UTC	4 hours early
24	14.9 ⁰ N /80.1 ⁰ E	13.3 ⁰ N /80.3 ⁰ E	179km	07/1800 UTC	07/1600 UTC	2 hours delay
36	14.2 ⁰ N /80.2 ⁰ E	13.3 ⁰ N /80.3 ⁰ E	100km	07/2100 UTC	07/1600 UTC	5 hours delay

48	14.2 ⁰ N /80.1 ⁰ E	13.3 ⁰ N /80.3 ⁰ E	102km	07/1800 UTC	07/1600 UTC	2 hours delay
60	12.6 ⁰ N /80.4 ⁰ E	13.3 ⁰ N /80.3 ⁰ E	78km	08/0000 UTC	07/1600 UTC	8 hours delay
72	No landfall	13.3 ⁰ N /80.3 ⁰ E	---	---	07/1600 UTC	---

3.4.3 Intensity

The 12 hourly intensity forecasts by SCIP model valid up to 72 hours (Table 3.12(a-e)) show that mean model forecast errors for this cyclone varies between 5 knots to 18 knots.

Table 3.12(a). Model (SCIP) performance based on 0000 UTC of 04.11.2010

Forecasts hours	00 hr	12 hr	24 hr	36 hr	48 hr	60 hr	72 hr
Observed (knots)	25	25	30	45	55	60	60
Forecasts (knots)	25	29	31	34	32	36	51
Error (knots)	0	4	1	-11	-23	-24	-9

Table 3.12(b) Model (SCIP) performance based on 0000 UTC of 05.11.2010

Forecasts hours	00 hr	12 hr	24 hr	36 hr	48 hr	60 hr	72 hr
Observed (knots)	30	45	55	60	60	35	-
Forecasts (knots)	30	35	40	42	48	37	-
Error (knots)	0	-10	-15	-18	-12	2	-

Table 3.12(c) Model (SCIP) performance based on 0000 UTC of 06.11.2010

Forecasts hours	00 hr	12 hr	24 hr	36 hr	48 hr	60 hr	72 hr
Observed (knots)	55	60	60	35	-	-	-
Forecasts (knots)	55	57	55	55	-	-	-
Error (knots)	0	-3	-5	20	-	-	-

Table 3.12(d). Model (SCIP) performance based on 0000 UTC of 07.11.2010

Forecasts hours	00 hr	12 hr	24 hr	36 hr	48 hr	60 hr	72 hr
Observed (knots)	60	35	-	-	-	-	-
Forecasts (knots)	55	55	-	-	-	-	-
Error (knots)	-5	20	-	-	-	-	-

Table 3.12(e). Mean intensity forecast error (JAL)

Forecasts hours	12 hr	24 hr	36 hr	48 hr	60 hr	72 hr
AAE (KNOTS)	5	10	16	18	13	9

3.4.4 Mean Track forecast errors of NWP models for cyclones during 2010

The average NWP model forecast errors during 2010 are shown in Table 3.13. It is evident that the performance of ECMWF model was the best among various NWP models for all time scales upto 48 hrs. In 60 and 72 hr forecast time scale, the IMD MME is slightly better than ECMWF model.

Table 3.13 Mean Track forecast errors of NWP models for cyclones during 2010

AVERAGE	12 hours	24 hours	36 hours	48 hours	60 hours	72 hours
ECMWF	54	71	102	170	202	246
NCEP-GFS	158	178	177	236	253	334
JMA	195	96	176	203	232	268
IMD-MM5	118	141	241	350	363	356
IMD-QLM	103	144	167	181	256	311
IMD-MME	72	104	140	205	190	244
IMD-T382	94	124	164	212	246	290
IMD-WRF-VAR	155	137	236	253	234	265

3.4.5 Sagar Kanya Expedition:

The Sagar Kanya Ship left Chennai Port on 23.10.2010 (morning) and after successfully taking observations on board finally arrived at Chennai Port on 15.11.2010. The actual cruise track is shown in Fig. 3.5. The data collected is given in Appendix-A

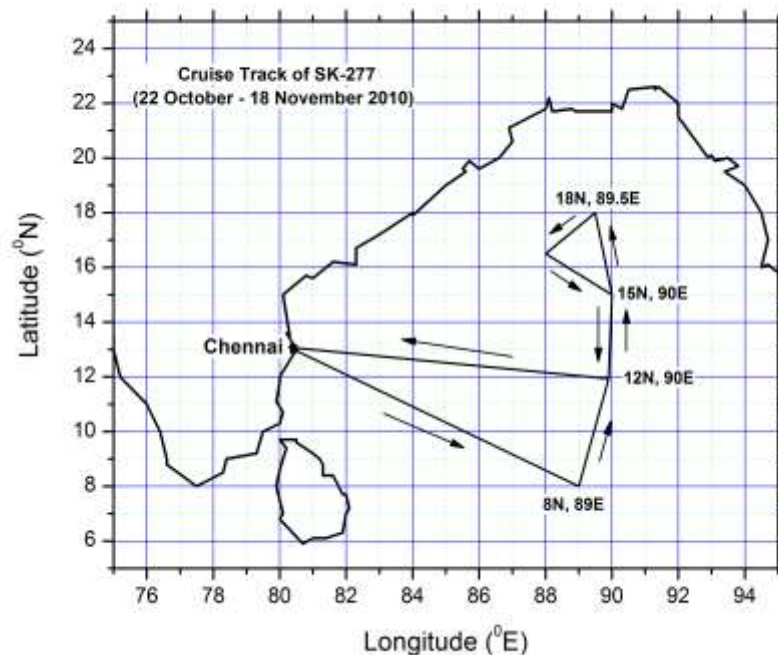


Fig.3.5 Cruise Track of Sagar Kanya Ship

Appendix-A

Data collected by SK-277 during 28.10.10-15.11.10

(A) Surface observations

October

OBS METEO WEATHER

BBXX VTJR 28004 99129 10809 41596 70313 10280 20249 40080 70322
85330 22232 00293 333 83695 83895 81996 83099=

OBS METEO WEATHER

BBXX VTJR 28064 99124 10816 41596 70714 10288 20242 40090 52005
70522 84330 22232 00295 333 83695 81995 85399=

OBS METEO WEATHER

BBXX VTJR 28124 99119 10823 41595 80915 10272 20237 40073 57017
75062 8532/ 22231 00290 333 85695 81996 88499=

OBS METEO WEATHER

BBXX VTJR 28184 99114 10821 41596 70303 10268 20230 40077 52004
70296 85330 22200 00297 333 83696 81996 87399=

OBS METEO WEATHER

BBXX VTJR 29004 99115 10830 41595 72106 10268 20235 40073 57002
70252 85330 22200 00296 333 85695 81996 87399=

OBS METEO WEATHER

BBXX VTJR 29064 99112 10835 41596 70615 10278 20237 40072 54000
70222 84330 22232 00297 333 83695 81996 87399=

November

OBS METEO WEATHER

BBXX VTJR 03184 99119 10898 41595 81610 10280 20239 40079 57001
76162 8532/ 22200 00284 333 84695 81996 88499=

OBS METEO WEATHER

BBXX VTJR 06124 99168 10897 41595 80827 10286 20237 40062 57004
70222 =

OBS METEO WEATHER

BBXX VTJR 06184 99170 10896 41595 80924 10286 20246 40077 52008
70222 8532/ 22281 00280 333 84695 81996 88499=

BBXX VTJR 07004 99177 10895 41595 81525 10286 20243 40077 54000
76162 8532/ 22281 00277 333 84695 81996 88499=

OBS METEO WEATHER

BBXX VTJR 07064 99180 10895 41595 80614 10250 20223 40103 52013
76162 8532/ 22200 00282 333 84695 81996 88499=

BBXX VTJR 07124 99180 10895 41595 80922 10278 20230 40087 57016
72162 8532/ 22200 00286 333 84695 81996 88499=

OBS METEO WEATHER

BBXX VTJR 08184 99180 10896 41695 30510 10282 20239 40132 52011
70510 83500 22251 00286 333 83696=

OBS METEO WEATHER

BBXX VTJR 09004 99179 10897 41696 50215 10280 20239 40116 57008
70510 83530 22231 00285 333 83696 84399=

OBS METEO WEATHER

BBXX VTJR 09064 99179 10897 41696 30407 10292 20240 40126 52005
70500 83500 22200 00289 333 83696=

OBS METEO WEATHER

BBXX VTJR 09124 99181 10896 41696 20312 10244 20222 40114 57006
70500 82500 22252 00289 333 82696=

OBS METEO WEATHER

BBXX VTJR 09184 99179 10895 41696 20109 10284 20219 40129 52007
70500 82500 22200 00286 333 82696=

OBS METEO WEATHER COR

BBXX VTJR 09124 99181 10896 41696 20312 10290 20222 40114 57006
70500=

OBS METEO WEATHER

BBXX VTJR 10004 99180 10895 41996 32107 10284 20205 40120 57004
70500 83030 22200 00285 333 83399=

OBS METEO WEATHER

BBXX VTJR 10064 99180 10895 41996 30210 10286 20203 40126 52003
70500 83030 22200 00287 333 83399=

OBS METEO WEATHER

BBXX VTJR 10124 99180 10895 41996 33504 10282 20220 40097 57015
70500 83030 22200 00286 333 83399=

BBXX VTJR 10184 99178 10893 41996 20904 10278 20219 40107 52005
70500 82030 22252 00284 333 82399=

OBS METEO WEATHER

BBXX VTJR 11004 99172 10887 41996 20303 10274 20221 40102 57001
70500 82030 22252 00272 333 82399=

OBS METEO WEATHER

BBXX VTJR 11064 99166 10881 41996 21502 10298 20218 40104 52001
70500 82030 22252 00278 333 82399=

OBS METEO WEATHER

BBXX VTJR 11124 99163 10880 41696 40305 10282 20216 40090 57007
70500 82530 22200 00278 333 82696 83399=

OBS METEO WEATHER

BBXX VTJR 12124 99150 10900 41996 20103 10278 20215 40067 57004
70510 82030 22242 00285 333 82399

OBS METEO WEATHER

BBXX VTJR 16184 99129 10827 41596 61315 10278 20240 40092 52015
70522 85330 22262 00276 333 84695 81996 85399=

BBXX VTJR 17004 99129 10819 41596 62708 10278 20231 40073 57010
70522 85330 22262 00274 333 84695 81996 85399=

(B) Upper Air Observation

October, 2010

UXIN90 VTJR

TTAA 2800/ Misda due to Tx. failure AAA

November, 2010

UXIN90 VTJR 061200

UUAA 5612/ 99168 10897 Misda due to near gale wind exceeding 25kt.

UXIN90 VTJR 070000

UUAA 5700/ 99177 10895 Misda due to near gale wind exceeding 25kt.

UUAA 5712/ 99180 10895

99008 28642 34005 00123 31228 ///// 92812 25018 88999 77999 =

UKIN VTJR 071200
UUBB 5712/ 99180 10895 00008 28642 11960 28245 22942 26630 33931
25423 44919 20856 21212 00008 34005 41414 35530=

UXIN VTJR 091200
UUAA 5912/ 99181 10896 99011 29057 09005 00156 26456 ///// 88999 77999=

UXIN VTJR 091200
UUBB 5912/ 99181 10896 00011 29057 11989 24063 22977 20067 33963
21464 44950 22866 55949 228// 21212 00011 09005 41414 25501=

UXIN VTJR 100000
UUAA 6000/ 99180 10894 MISDA DUE COMPILATION ERROR.

USIN VTJR 101200
UUAA 6012/ 99180 10895 99010 28256 24003 00140 28258 ///// 92815 16456
85530 15250 70161 12858 88999 77999=

UKIN VTJR 101200
UUBB 6012/ 99180 10895 00010 28256 11985 25450 22955 21458 33939
19040 44805 14276 55691 12258 66607 09481 77600 08060 88549 02688
21212 00010 24003 41414 15600

ZCZC 001
USIN VTJR 111200
UUAA 6112/ 99164 10880 99008 28256 04507 00128 29058 ///// 92808 22461
85531 16461 70165 13256 50596 06259 88999 77999=

UKIN VTJR 111200
UUBB 6112/ 99164 10880
00008 28256 11989 28458 22977 27057 33965 25856 44954 23458 55932
21459 66899 20663 77875 18456 88835 16063 99762 12856 11729 13863
22659 12458 33600 10456 44539 08856 55521 07257 66487 04860 77478
03659 21212 00008 04507 41414 25600=

USIN VTJR 121200
UUAA 6212/ 99150 10900
99006 27856 13505 00111 28847 ///// 92793 22225 85521 18061 88999 77999=

UKIN VTJR 121200
UUBB 6212/ 99150 10900 00006 27856 11962 25636 22949 23623 33888
21263 44869 19659 55847 17860 21212 00006 13505 41414 25630=

USIN VTJR 170000

UUAA 6700/ 99129 10819

99007 27846 26505 00120 29841 ///// 92809 27037 85548 23456 88999 77999=

UKIN VTJR 170000

UUBB 6700/ 99129 10819 00007 27846 11887 25245 22825 22050 33715
15250 21212 00007 26505 41414 25530=

CHAPTER –IV

CYCLONIC ACTIVITIES OVER THE BAY OF BENGAL DURING PRE-PILOT PHASE - 2010

4.1. Introduction

The north Indian Ocean witnessed the formation of eight cyclonic disturbances during 2010 as given in Table 4.1. Out of eight disturbances six cyclonic disturbances formed over the Bay of Bengal and two over the Arabian Sea. Out of the six cyclonic disturbances over the Bay of Bengal, one intensified upto the stage of very severe cyclonic storm (GIRI), two upto the stage of severe cyclonic storm (LAILA & JAL), one upto the stage of deep depression and rest two upto the stage of depression. Out of two cyclonic disturbances formed over the Arabian Sea, one intensified upto the stage of very severe cyclonic storm (PHET) and the other upto the stage of cyclonic storm (BANDU). Tracks of the cyclonic disturbances formed over the north Indian Ocean during the period is shown in Fig 4.1.

During the pre pilot phase-2010 a deep depression, cyclone 'GIRI' & 'JAL' formed over the Bay of Bengal. The salient features of these are discussed in section 4.2.

Table 4.1: Cyclonic disturbances formed over north Indian Ocean and adjoining land areas during 2010

1.	Severe Cyclonic Storm, 'LAILA' over the Bay of Bengal 17-21 May 2010.
2.	Cyclonic Storm, 'BANDU' over the Arabian Sea 19-23 May, 2010
3.	Very Severe Cyclonic Storm 'PHET' over the Arabian Sea 31 May -07 June, 2010
4.	Depression over the Bay of Bengal 7-9 October 2010
5.	Deep Depression over the Bay of Bengal 13-16 October 2010
6.	Very Severe Cyclonic Storm ' GIRI ' over the Bay of Bengal 20-23 October, 2010
7.	Severe Cyclonic Storm, ' JAL ' over the Bay of Bengal 04-08 November, 2010
8.	Depression over the Bay of Bengal 7-8 December 2010

4.2 Salient features of the systems formed during FDP Phase

4.2.1 Deep depression over the Bay of Bengal(13-16 Oct. 2010)

4.2.1.1 Introduction

A deep depression formed over the west central Bay of Bengal on 13 October, 2010. It moved west-northwestwards and crossed Orissa coast near Gopalpur on 15 October. It caused heavy rainfall over south Orissa leading to flood.

4.2.1.2 Genesis:

Animated infrared Satellite imageries indicated that flaring deep convection associated with a broad low level circulation centre developed over the central Bay of Bengal on 12 October 2010. It concentrated into a low pressure area over eastcentral Bay of Bengal with T 1.0 at 0900 UTC of 12 October. The system lay equatorward of

sub-tropical ridge along 22° N in an area of upper level of divergence and moderate vertical wind shear (10-20 knots).

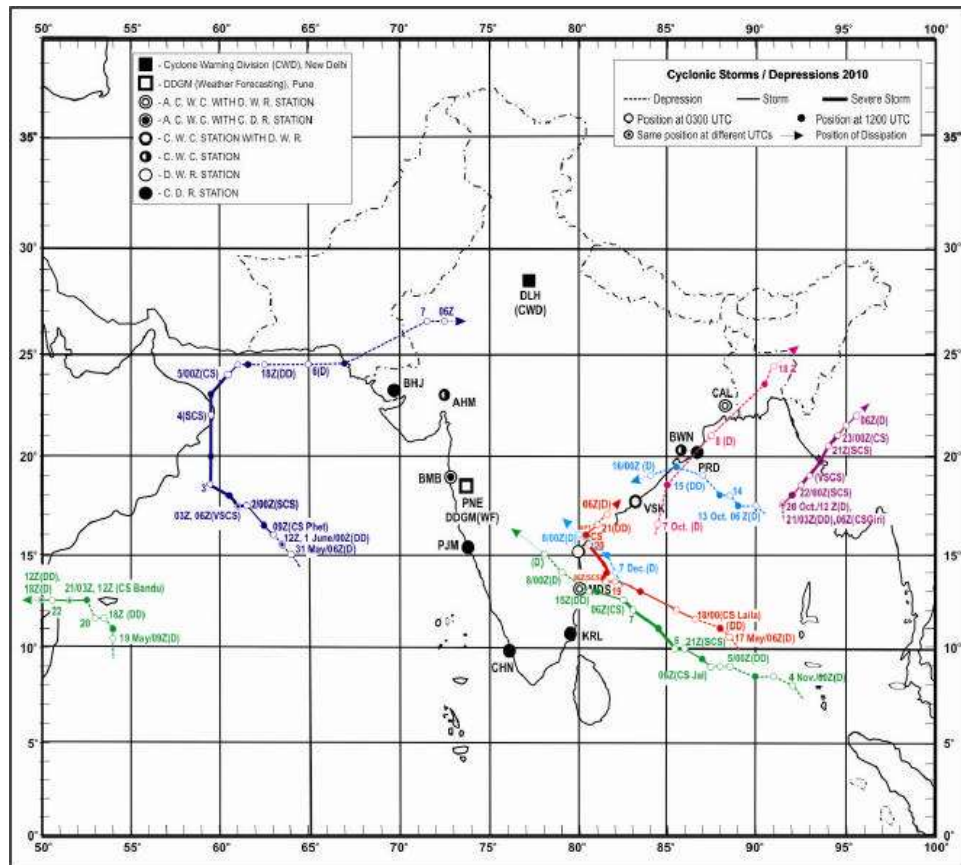


Fig. 4.1 Tracks of the cyclonic disturbances formed over the north Indian Ocean during the year, 2010.

The sea surface temperature (SST) was about $28-32^{\circ}$ C over the central and north Bay of Bengal. The Ocean heat content was $80-100 \text{ KJ/cm}^2$ over the region which was favourable for intensification. Under this scenario, the low pressure area concentrated into a depression and lay centred at 0600 UTC of 13 October over eastcentral Bay of Bengal near lat. 17.5° N and long. 90.0° E, about 550 km southeast of Gopalpur (43049).

4.2.1.3 Intensification and movement:

In association with above mentioned favorable conditions and further decrease in wind shear to 5-10 knots, the depression over eastcentral Bay of Bengal moved northwestwards, intensified into a deep depression and lay centred at 0300 UTC of 15 October over northwest Bay of Bengal near lat. 19.0° N and long. 87.0° E. It then moved west-northwestwards and crossed Orissa coast near Gopalpur (43049) between 1500 and 1600 UTC of 15 October. After the landfall, it moved west-southwestwards and weakened into a depression and lay centred at 0000 UTC of 16 October over south Orissa near lat. 19.0° N and long. 84.0° E, about 100 km west-southwest of Gopalpur. It further weakened into a well marked low pressure area over south Orissa and adjoining Chhattisgarh and north Andhra Pradesh at 0300 UTC of the same day.

The track of the system is shown in Fig. 4.1. The best track parameters are shown in Table 4.2. The typical satellite imageries of the system are shown in Fig. 4.2.

The Estimated lowest Central Pressure (ECP) was 995.0 hPa at 1200 UTC of 15 October. The estimated maximum wind speed was 30 kts during the period 0300 UTC to 2300 UTC of 15 October. As per the hourly observation from Orissa, Gopalpur recorded the lowest pressure of 994.6 hPa (wind 340°/10 kts) at 1000 UTC of 15 October, which is very close to the estimated central pressure. Puri reported maximum wind speed of 25 kts from 1600 UTC to 1800 UTC of 15 October.

The system was tracked initially with the help of satellite cloud imageries. As per satellite observations, the system crossed south Orissa coast around 1800 UTC of 15 and lay over land with centre near Lat. 19.0° N/Long. 84.7° E. From 0000 UTC of 13 October onwards, it was also tracked by DWR. Hourly coastal observations and AWS observations of Andhra Pradesh were also recorded after 0000 of 13.

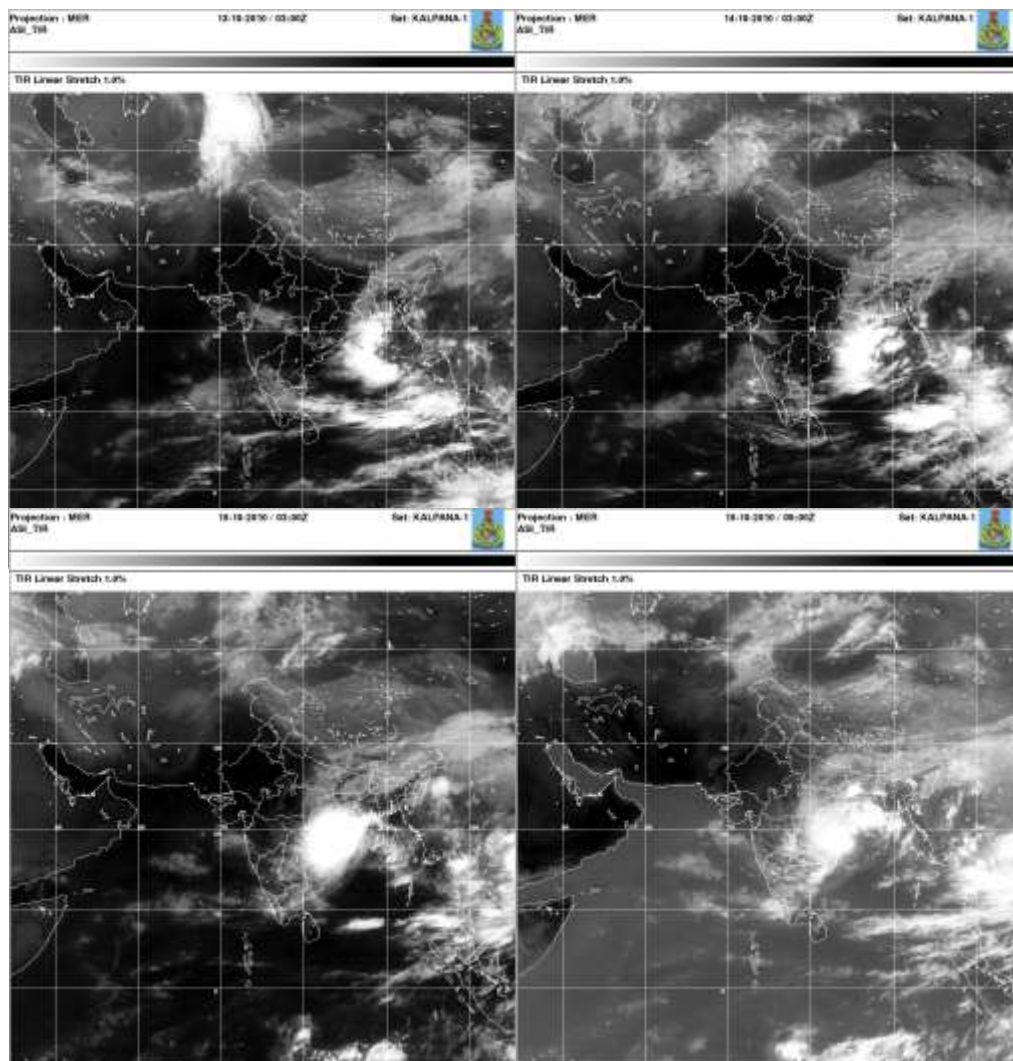


Fig.4.2 Kalpana imageries of deep depression over the Bay of Bengal at 0300UTC of 13, 14 and 15 October 2010 and 0900 UTC of 15 October 2010

Table 4.2. Best track Positions and other parameters for deep depression over Bay of Bengal during 13-16 October 2010

Date	Time (UTC)	Centre lat. ^o N/ long. ^o E	C.I. NO.	Estimated Central Pressure (hPa)	Estimated Maximum Sustained Surface Wind (kt)	Estimated Pressure drop at the Centre (hPa)	Grade
13.10.2010	0600	17.5/90.0	1.5	1002	25	4	D
	1200	17.5/89.0	1.5	998	25	4	D
	1800	18.0/88.5	1.5	998	25	4	D
14.10.2010	0000	18.0/88.5	1.5	998	25	4	D
	0300	18.0/88.5	1.5	998	25	4	D
	0600	18.0/88.5	1.5	998	25	4	D
	1200	18.0/88.0	1.5	996	25	4	D
	1800	18.0/88.0	1.5	996	25	4	D
15.10.2010	0000	18.5/87.5	1.5	996	25	4	D
	0300	19.0/87.0	2.0	996	30	5	DD
	0600	19.5/86.0	2.0	996	30	5	DD
	1200	19.5/85.5	2.0	995	30	5	DD
	The system crossed the Orissa coast near Gopalpur (43049) between 1500 & 1600 UTC.						
	1800	19.0/84.5	--	996	30	5	DD
16.10.2010	0000	19.0/84.0	--	998	25	4	D
	0300	The system weakened into a well marked low pressure area over south Orissa and adjoining Chhattisgarh and north Andhra Pradesh at 0300 UT					

4.2.1.4. Realized Weather:

Under the influence of the system, widespread rainfall with isolated to scattered heavy to very heavy falls occurred over coastal and south Orissa and south Chhattisgarh. Fairly widespread rainfall also occurred over adjoining areas of north Andhra Pradesh. The chief amounts of rainfall (≥ 7 cm) are as follows:

15.10.2010

Andhra Pradesh: Palasa-8

Orissa: Paradip-14, Patamundai-9, Chandbali, Bhadarak, Khandapada, Pipili, Kendrapada & Rajkanika-8 each, Alipingal, Nimapada & Mahendragarh-7,

Gangetic West Bengal: Basirhat 11, Uluberia 8.

16.10.2010

Orissa: Kosagumda-24, Umarkote & Junagarh-15 each, Jaipatna-14, R. Udaygiri-13, Soro-12, Nawarangpur & Paralakhemundi-11, Kalinga & Jeypur-9, Daringibadi & Bhawanipatna-8, Raygada & Koraput-7

Chhattisgarh: Jagadalpur 11, Narayanpur & Kondagaon 8 each.

4.2.1.5 Damage: No damage was reported in Orissa and Andhra Pradesh.

4.2.2 Very severe cyclonic storm, GIRI over the Bay of Bengal (20-23 October 2010)

4.2.2.1. Introduction

A very severe cyclonic storm, 'GIRI' formed over the Bay of Bengal on 20 October 2010 moving in a northeasterly direction, it crossed Myanmar coast between Sittwe and Kyakpyu around 1400 UTC of 22 October, 2010 with estimated sustained maximum wind speed of about 190 kmph (105 knots). It caused damage to life and property of Myanmar. The salient features of this system are given below.

(i) Cyclone, Giri rapidly intensified from associated sustained maximum wind speed of 45 knots at 1200 UTC of 21 to 105 knots at 0900 UTC of 22 October, 2010.

(ii) No severe cyclone crossed Arakan coast prior to cyclone, GIRI during the month of October, as evident from the data of 1891-2009.

(iii) The genesis and intensification of the system could be predicted by ECMWF model to a large extent. It predicted lowest estimated central pressure of 970 hPa well in advance with landfall near lat. 20°N and long. 93°E between 1200 and 1800 UTC of 22^d October 2010 well in advance against the lowest estimated central pressure of 950 hPa and landfall near lat. 20°N and long. 93.5°E around 1400 UTC of 22 October 2010.

4.2.2.2 Genesis

A low pressure area formed over the east central Bay of Bengal on 19 October. It concentrated into a depression at 1200 UTC on 20 October over the same area near lat. 17.5°N and lat. 91.5°E . The dynamical parameters like upper level divergence, lower level relative vorticity and vertical wind shear at 0000 UTC of 20 October 2010 (Fig.4.3) were favourable for intensification of the system. The wind shear was low to moderate (10-15 knots). The sea surface temperature was $28-32^{\circ}\text{C}$ over the region. The ocean heat content over the central Bay of Bengal was also favourable for intensification. The system lay close to the upper tropospheric ridge, which roughly run along 17.5°N (Fig.4.3) in association with anticyclonic circulation.

4.2.2.3. Intensification and movement

Remaining practically stationary, it intensified into a deep depression at 0300 UTC of 21 October and into a cyclonic storm, **GIRI** at 0600 UTC of the same day. It then moved slowly northeastwards and intensified into a severe cyclonic storm at 0000 UTC of 22 October and into a very severe cyclonic storm at 0300 UTC of the same day. It then moved relatively faster in the same direction and crossed Myanmar coast between Sittwe and Kyakpyu around 1400 UTC of 22 October 2010 with estimated sustained maximum wind speed of about 190 kmph (105 knots). After the landfall, it continued to move northeastwards and weakened gradually. The best track parameters of cyclone GIRI are shown in Table 4.3. The track of the system is shown in Fig.4.1. The typical satellite imageries of the system are shown in Fig.4.4. The lowest ECP was estimated as 950 hPa with pressure drop of 52 hPa. Kyakpyu reported lowest pressure of 990.7 hPa with surface wind southerly to southeasterly 35 knots and 24 hrs pressure fall of 11.9 hPa at 0900 UTC of 22 October 2010 when system was located 50 km west of Kyakpyu.

Table4.3. Best track positions and other parameters of the severe cyclonic storm “GIRI” over the Bay of Bengal during 20-23 October, 2010

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
20-10-2010	1200	17.5/91.5	1.5	1002	25	4	D
	1800	17.5/91.5	1.5	1002	25	4	D
21-10-2010	0000	17.5/91.5	1.5	1002	25	4	D
	0300	17.5/91.5	2.0	1000	30	5	DD
	0600	17.5/91.5	2.5	998	35	6	CS
	0900	17.5/91.5	2.5	996	40	8	CS
	1200	18.0/92.0	3.0	990	45	10	CS
	1500	18.0/92.0	3.0	990	45	10	CS
	1800	18.0/92.0	3.0	988	50	12	CS
	2100	18.5/92.5	3.0	984	55	16	CS
	0000	18.5/92.5	3.5	980	60	20	SCS
22-10-2010	0300	19.0/93.0	4.5	974	80	30	VSCS
	0600	19.0/93.0	5.0	964	90	40	VSCS
	0900	19.5/93.5	5.5	950	105	52	VSCS
	1200	19.8/93.5	5.5	950	105	52	VSCS
	The system crossed Myanmar coast near lat. 20.0 ⁰ N long. 93.5 ⁰ E about 70 km east-southeast of Sittwe around 1400 UTC.						
	1500	20.0/93.5	--	966	80	36	VSCS
	1800	20.5/94.0	--	976	70	26	VSCS
	2100	20.5/94.0	--	986	55	16	SCS
	0000	21.0/94.5	--	992	45	10	CS
23-10-2010	0300	21.5/95.0	--	996	35	8	CS
	0600	22.0/95.5	--	998	25	4	D
	1200	The system weakened into a well marked low pressure area over central parts of Myanmar.					

Considering the environmental parameters, the low to moderate vertical wind shear continued throughout the life of the system (Fig.4.5-4.6). The warmer SST continued however with Ocean heat content becoming less than 100 KJ/cm². It seems vertical wind shear played a major role than the Ocean heat content for rapid intensification of the system on 21-22 October 2010. As the system moved to the north of the ridge gradually the system recurved north-northeastwards.

4.2.2.4. Structure and other parameters

The system was tracked with the help of satellite cloud imageries from 0600 UTC of 20 to 1400 UTC of 22 October. The maximum intensity of T. No. 5.5 was reported from 0900 of 20 October till it crossed Myanmar coast. The Estimated Lowest Central Pressure (ECP) was 950 hPa from 0900 UTC till the system crossed Myanmar coast. The estimated maximum wind speed was 105 kts.

At 0900 UTC of 22, the cloud pattern indicated sharp improvement in organization and convection around the vortex centre and also decrease in diameter of EYE, which is indicative of explosive intensification.

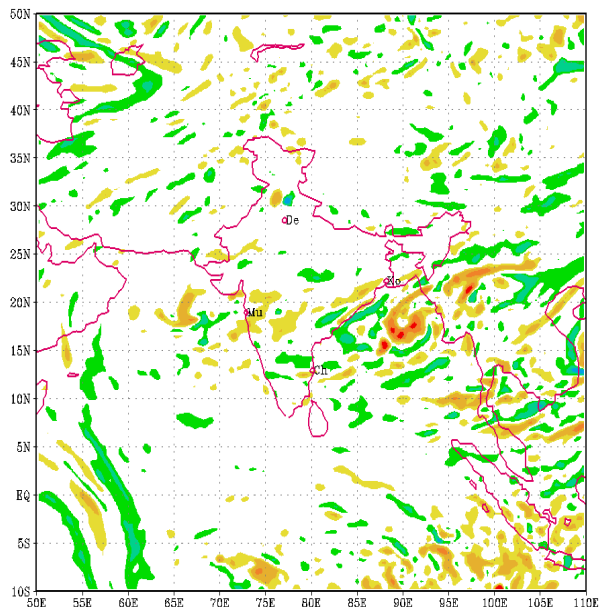
Continued development took place as convection consolidated around the system and banding features formed along the western side of the low. Situated in an area of weak wind shear, further development was anticipated over the following days. Cyclone 'GIRI' was seen clearly by the Tropical Rainfall Measuring Mission (TRMM) satellite twice on Oct. 21. The first good view was at 1534 UTC when TRMM data showed a very well organized storm with heavy rainfall south of Giri's partially formed eye. The heaviest rainfall was falling at about 2 inches per hour, south of Giri's eye. The second TRMM orbit at 2347 UTC captured Giri's rainfall. The wind speed increased to 80 knots at 0300 UTC of 22 October. The second TRMM image showed that Giri had developed a closed eye surrounded by powerful thunderstorms dropping heavy rainfall. Satellite imagery depicted a well-defined 46 km (29 mi) wide eye surrounded by deep convection. Accompanied by strong poleward outflow, additional strengthening took place despite Giri's proximity to land.

With the development of very intense convection, estimated lowest cloud top temperature was between -70 and -80 °C. Explosive intensification which took place with cyclone GIRI, is a more extreme case of rapid deepening that involves a tropical cyclone deepening at a rate of at least 2.5 hPa per hour for a minimum of 12 hours. Explosive intensification is rather rare, as conditions must be exceedingly favorable for cyclone intensification. Explosive intensification occurs regularly in the West Pacific basin, with the greatest frequency off the north coast of Australia; however, it has occurred numerous times in the Atlantic basin. It is rare in the North Indian Ocean, but Cyclone Giri is a good example of a storm going through explosive intensification in this basin.

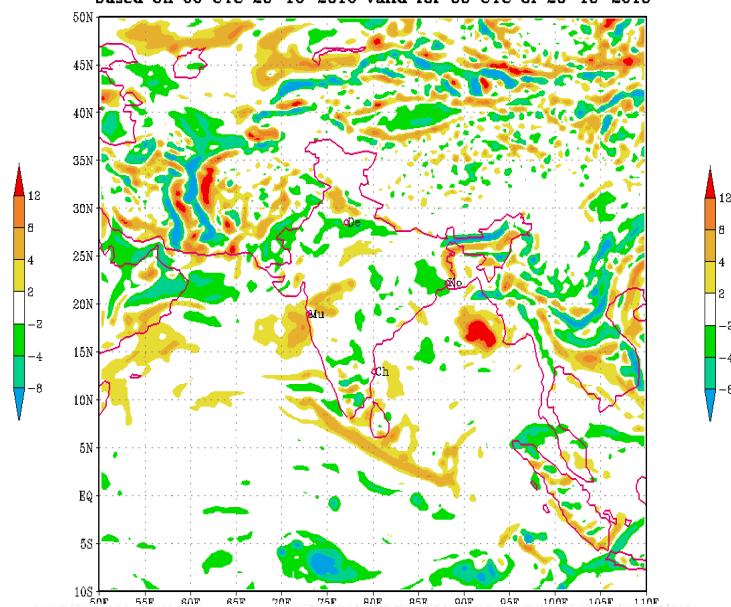
4.2.2.5. Damage:

157 fatalities had been confirmed as a result of Cyclone Giri. Damage from the storm amounted to 2.34 billion kyat (US\$359 million). Myebon Township was the hardest-hit area in the country. Several villages were completely destroyed by the storm and many others were severely damaged. According to the United Nations, roughly 15,000 homes were destroyed by the storm throughout Arakan State. According to the United Nations Food and Agriculture Organization, 16,187 hectares (40,000 acres) of rice paddies were destroyed and another 40,468 hectares (100,000 acres) were damaged.

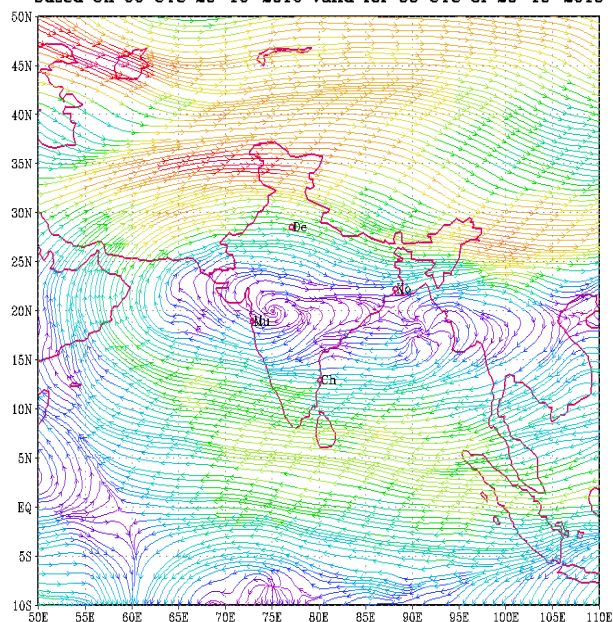
Divergence ($1e5 \text{ s}^{-1}$) at 200 hPa ECMWF Forecast (0 hr.)
based on 00 UTC 20-10-2010 valid for 00 UTC of 20-10-2010



Vorticity ($1e5 \text{ s}^{-1}$) at 850 hPa ECMWF Forecast (0 hr.)
based on 00 UTC 20-10-2010 valid for 00 UTC of 20-10-2010



200 hPa WIND ECMWF FORECAST (0 Hr.)
based on 00 UTC 20-10-2010 valid for 00 UTC of 20-10-2010



Wind Shear between 200 & 850 hPa ECMWF FORECAST (0 Hr.)
based on 00 UTC 20-10-2010 valid for 00 UTC of 20-10-2010

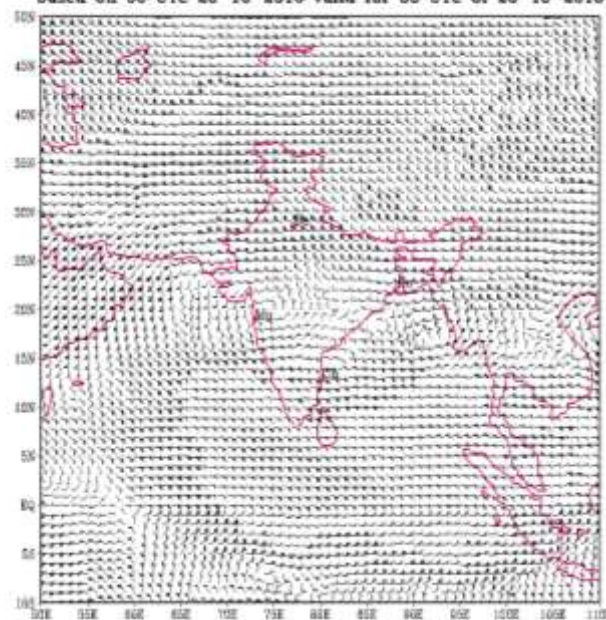


Fig.4.3 ECMWF analysis (a) Divergence at 200 hPa level, (b) Vorticity at 850 hPa level, (c) wind at 200 hPa level and (d) Vertical wind shear between 200 and 850 hPa level at 0000 UTC of 20 October 2010

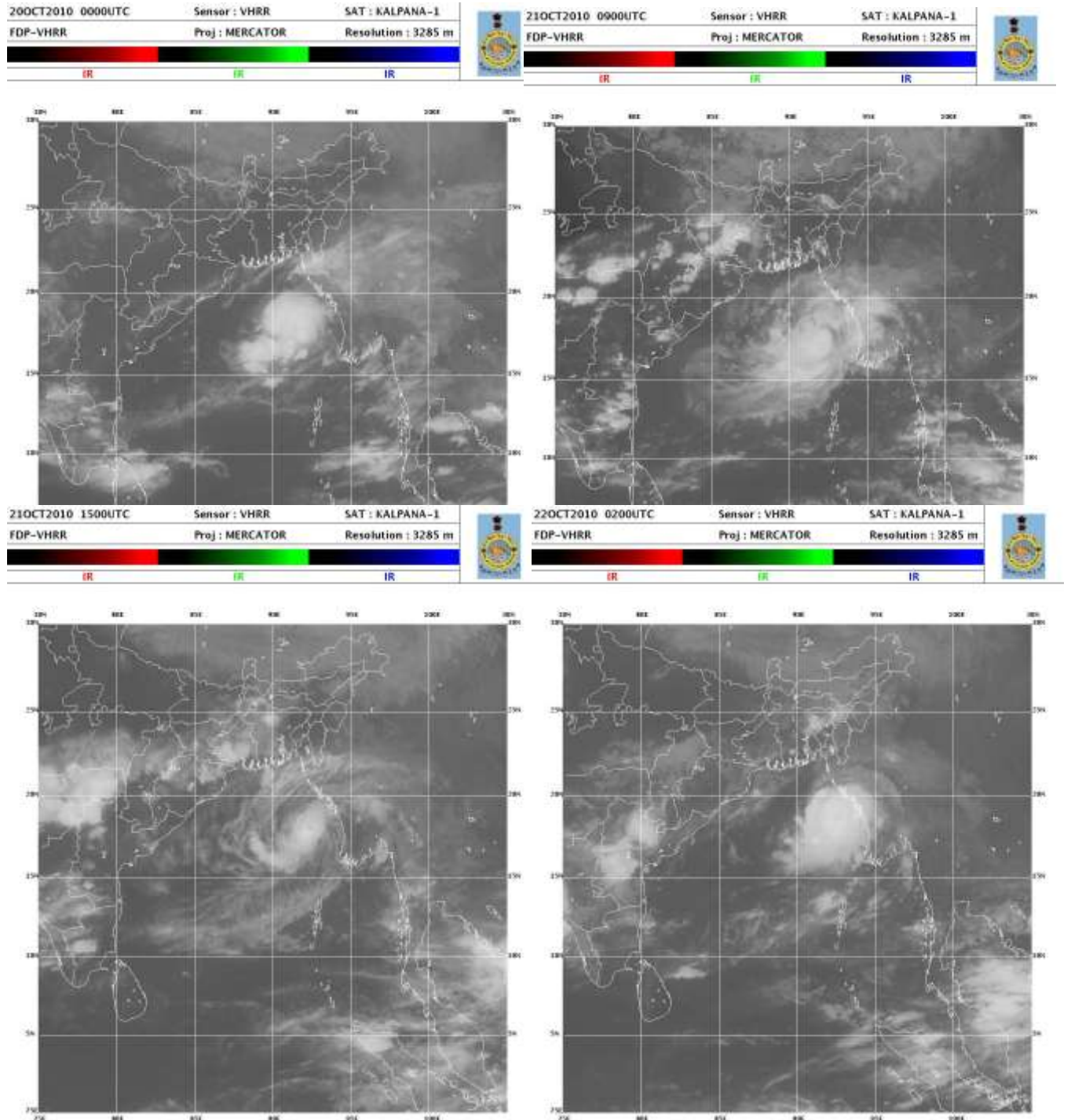


Fig.4.4.Kalpana imageries of cyclone GIRI over the Bay of Bengal 0000, 0900, 1500 and 0200 UTC of 20, 21 and 22 October 2010.

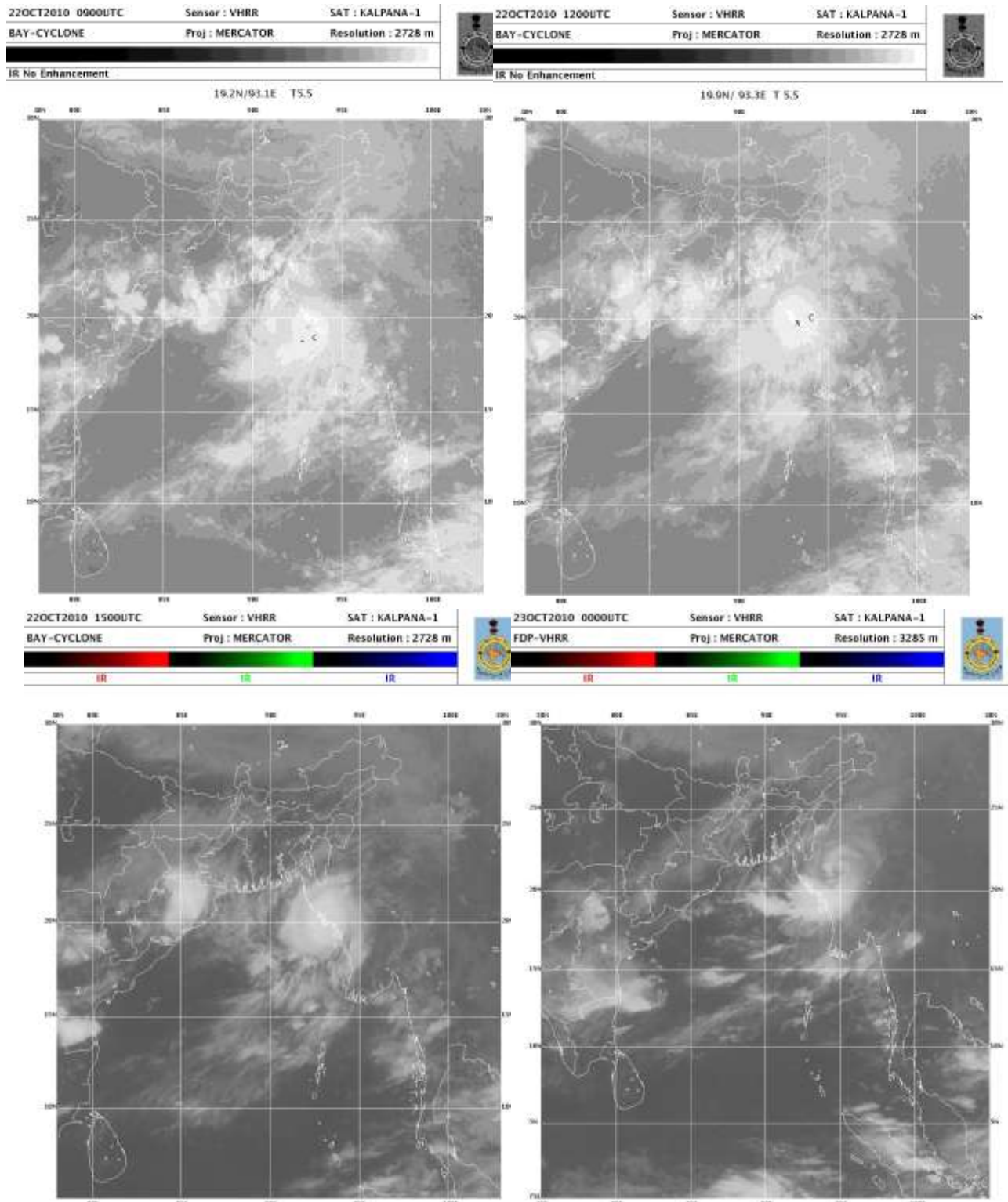
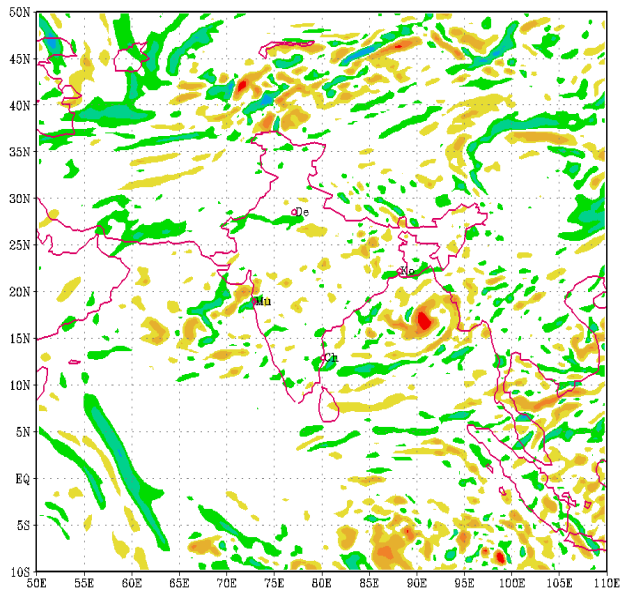
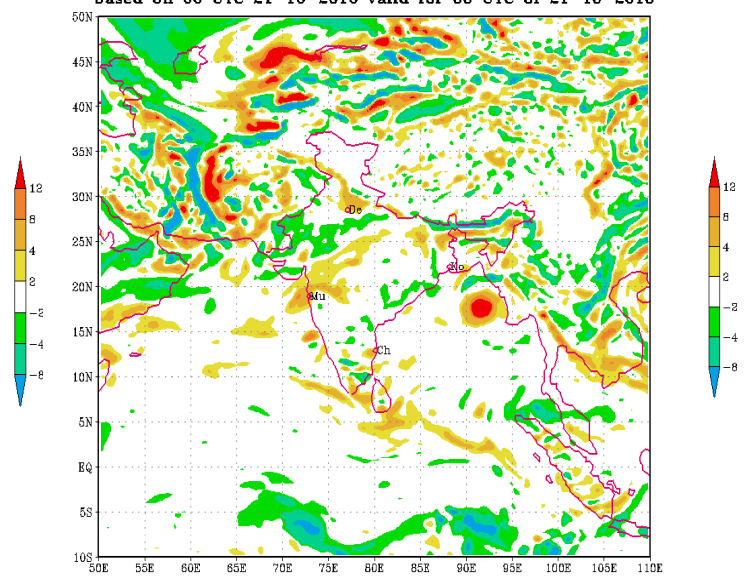


Fig.4.4 (contd.) Kalpana imageries of cyclone 'GRI' over the Bay of Bengal 0900, 1200, 1500 UTC of 22 October 2010 and 0000 UTC of 23 October 2010.

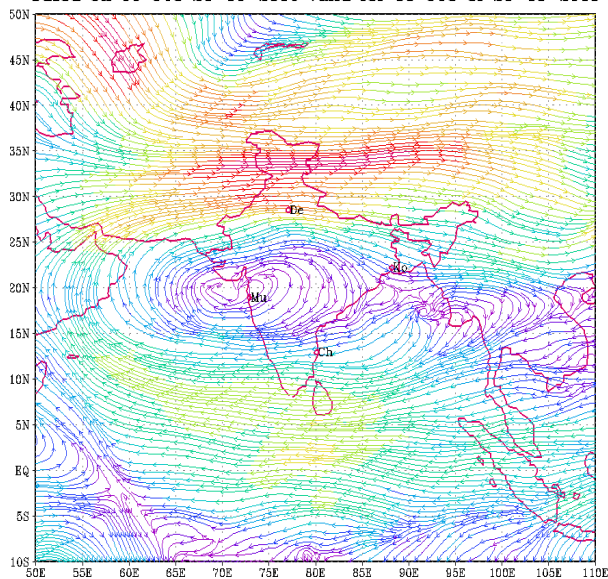
Divergence ($1e5 \text{ s}^{-1}$) at 200 hPa ECMWF Forecast (0 hr.)
based on 00 UTC 21-10-2010 valid for 00 UTC of 21-10-2010



Vorticity ($1e5 \text{ s}^{-1}$) at 850 hPa ECMWF Forecast (0 hr.)
based on 00 UTC 21-10-2010 valid for 00 UTC of 21-10-2010



200 hPa WIND ECMWF FORECAST (0 Hr.)
based on 00 UTC 21-10-2010 valid for 00 UTC of 21-10-2010



Wind Shear between 200 & 850 hPa ECMWF FORECAST
based on 00 UTC 21-10-2010 valid for 00 UTC of 21-10-2010

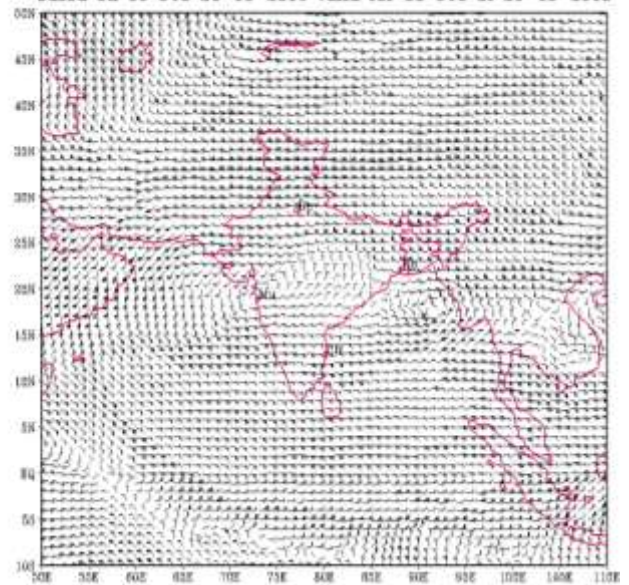
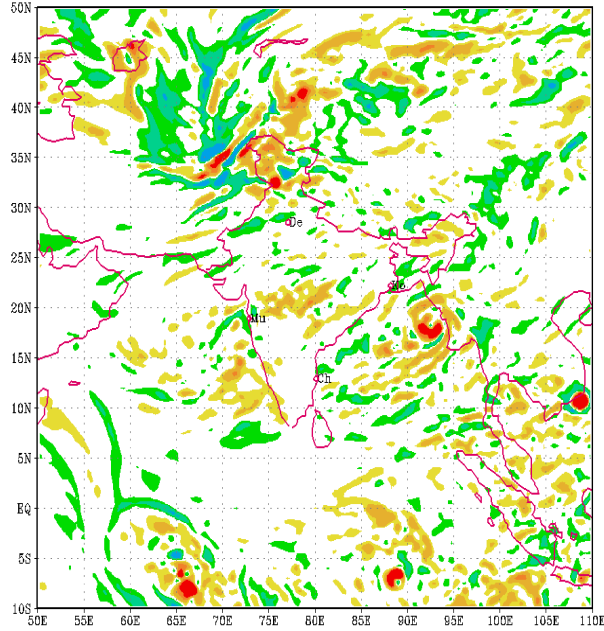


Fig.4.5 ECMWF analysis (a) Divergence at 200 hPa level, (b) Vorticity at 850 hPa level, (c) wind at 200 hPa level and (d) Vertical wind shear between 200 and 850 hPa level at 0000 UTC of 21 October 2010

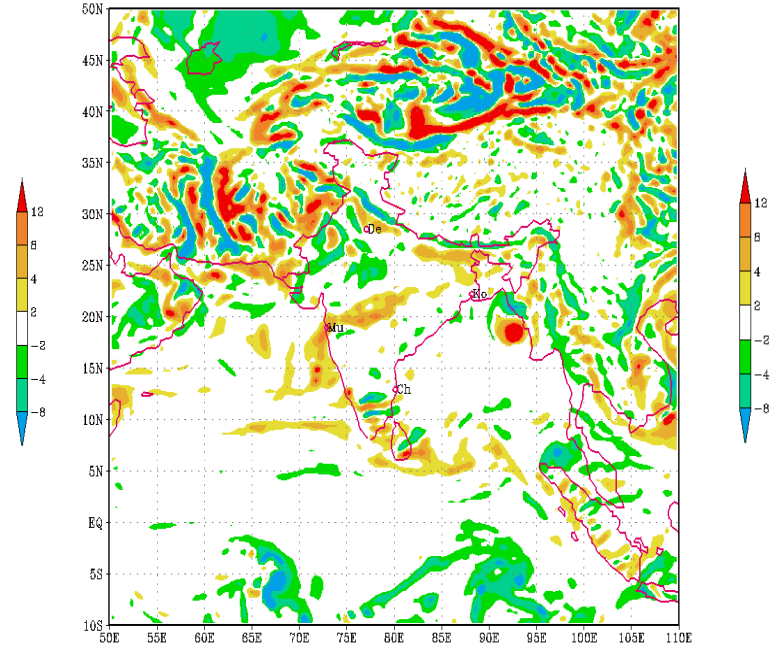
4.2.2.6. Realised weather :

According to local media, Cyclone Giri brought a [storm surge](#) up to 3.7 m (12 ft), along with waves up to 8 m (26 ft). In Kyaukphyu, much of the city was left more than 1.2 m (3.9 ft) under water by the storm.

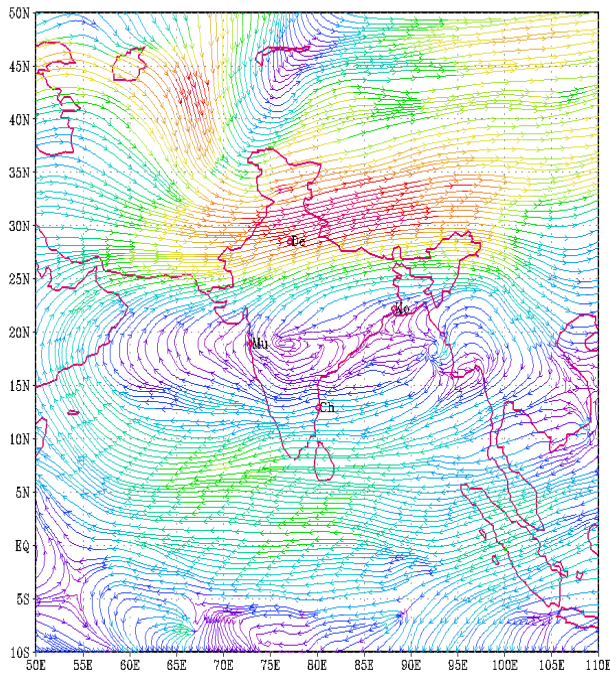
Divergence ($1e5 \text{ s}^{-1}$) at 200 hPa ECMWF Forecast (0 hr.)
based on 00 UTC 22-10-2010 valid for 00 UTC of 22-10-2010



vorticity ($1e5 \text{ s}^{-1}$) at 850 hPa ECMWF Forecast (0 hr.)
based on 00 UTC 22-10-2010 valid for 00 UTC of 22-10-2010



200 hPa WIND ECMWF FORECAST (0 Hr.)
based on 00 UTC 22-10-2010 valid for 00 UTC of 22-10-2010



Wind Shear between 200 & 850 hPa ECMWF FORECAST
based on 00 UTC 22-10-2010 valid for 00 UTC of 22-10-2010

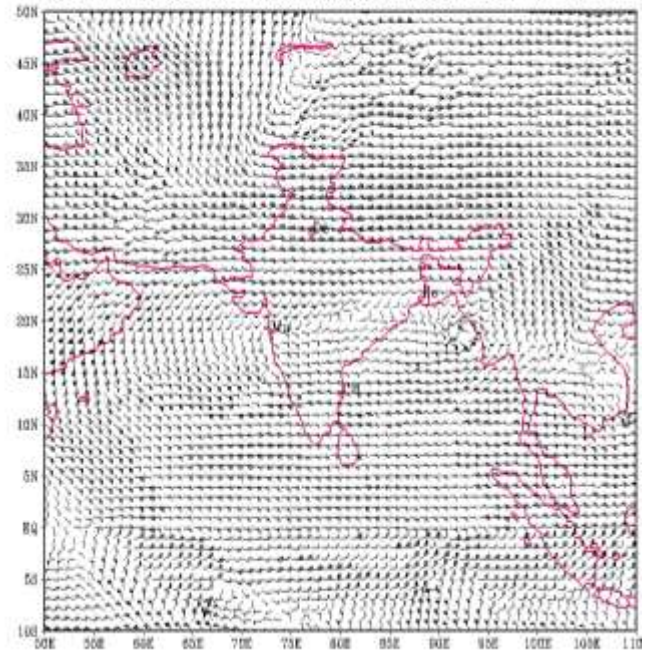


Fig.4.6. ECMWF analysis (a) Divergence at 200 hPa level, (b) Vorticity at 850 hPa level, (c) wind at 200 hPa level and (d) Vertical wind shear between 200 and 850 hPa level at 0000 UTC of 22 October 2010

4.2.3 Cyclone ‘JAL’ over the Bay of Bengal (04-08 November 2010)

4.2.3.1. Introduction

A severe cyclonic storm, JAL developed over the Bay of Bengal from the remnant of a depression which moved from northwest Pacific Ocean to the Bay of Bengal across southern Thailand. It moved west-northwestwards and intensified upto severe cyclonic storm on 6 November, 2010. However due to lower ocean thermal energy and moderate to high vertical wind shear, the severe cyclonic storm, JAL weakened gradually into a deep depression and crossed north Tamilnadu – south Andhra Pradesh coast, close to the north of Chennai near 13.3°N and 80.3°E around 1600 UTC of 07 November 2010. Its salient features are as follows.

- The severe cyclonic storm, JAL weakened into a deep depression over the Sea before the landfall.
- The convective clouds were sheared to the west to a large extent on the date of landfall (7 November 2010). As a result, more rainfall occurred over the interior parts than over the coastal regions.

4.2.3.2. Genesis

A depression formed over the West Pacific Ocean on 31 October, 2010 in association with an active Inter-Tropical Convergence Zone (ITCZ). It moved west-northwestwards across southern Thailand and emerged as a low pressure area over the south Andaman Sea on 2 November. Animated imageries indicated merging of mesoscale convective clusters along with increase in deep convection from 3 to 4 October 2010. Further there was improvement in convecting band. As a result, the well marked low pressure area continued to move west-northwestwards and concentrated into a depression at 0000 UTC of 4 November 2010 over southeast Bay of Bengal near lat. 8.0°N and 92.0°E. The track of the system is shown below in Fig.4.1. The best track parameters of the system are shown in Table 4.4.

The environmental conditions were favourable with higher SST (30-32°C), higher Ocean heat content (>100 KJ/cm²), increased low level relative vorticity and upper level divergence and low vertical wind shear (Fig.4.7.)

4.2.3.3 Intensification and movement

The system intensified into a Deep Depression in the early morning of 5 November and into a Cyclonic Storm ‘JAL’ at 0600 UTC of the same day with centre near lat. 9.0°N and long. 87.5°E, about 900 km east-southeast of Chennai. The cyclonic storm ‘JAL’ over southeast Bay of Bengal continued to move west-northwestwards and intensified further into a severe cyclonic storm in the early hours of 6 November. However as the severe cyclonic storm, JAL moved to the southwest Bay of Bengal closer to India coast, it entered into a region of lower ocean thermal energy and moderate to high vertical wind shear in association with the strong easterlies in the upper tropospheric level. The high wind shear led to westward shearing of the convective clouds from the system centre and lower Ocean thermal energy led to unsustainability of convection over the region. Due to these two factors, the severe cyclonic storm, JAL weakened into a cyclonic storm at 0600 UTC of 7 November 2010 over southwest Bay of Bengal with centre near lat. 12.5°N and long. 82.5°E, about 250 km east-southeast of Chennai. It weakened further into a deep depression and crossed north Tamilnadu – south Andhra Pradesh coast, close to the north of Chennai near 13.3°N and 80.3°E around 1600 UTC of 07 November 2010. It continued to move west-northwestwards, further weakened into a depression at 0300 UTC and into a well marked low pressure area over Rayalaseema and adjoining south interior

Karnataka at 0600 UTC of today, the 8 November 2010. The environmental condition supporting the intensification, weakening and movement of the system are shown in Fig.4.8. The weakening of the system before landfall could be attributed to lower Ocean heat content, though the SST was higher than threshold

It emerged into the east central Arabian Sea on 9 November. It then moved initially northwestwards towards Saurashtra & Kutch and adjoining Pakistan coast during 9-11 November. It then moved northeastwards across Saurashtra & Kutch and adjoining Pakistan and became less marked on 12 November 2010. The typical satellite imageries of the system are shown in Fig.4.9

4.2.3.4. Structure and other parameters

The system was tracked by Satellite from 0600 UTC of 2 Nov. till the landfall. The maximum intensity of T 3.5 was reported from 2100 UTC of 5 to 0500 UTC of 7 November. The Estimated lowest Central Pressure (ECP) observed was 988 hPa. The estimated maximum wind speed was 60 kts. As per DWR Chennai and DWR SHAR reports, the system started weakening from 0300 UTC of 7 November, while continuing its northwesterly track and crossed the coast as deep depression north of Chennai, close to SHAR around 1800 UTC.

The cyclone 'Jal' formed in the south Bay of Bengal was well captured by the 3 data buoys viz. BD6, BD07_Omni & BD06_Omni, which are deployed in the Bay of Bengal; out of which 2 are equipped with sub-surface oceanographical instruments upto 500 meters depth which were deployed on 24 & 26 October 2010 and third buoy BD06 has an indigenize CPU. [The Buoys (i) BD06_OMNI (Lat. 9.9° N / Long. 88.4° E) Met Sub-Surface Ocean upto 500 meters depth (ii) BD07_OMNI (Lat. 8° N / Long. 88.5° E) Met. Sub-Surface Ocean upto 500 meters depth & Wave and (iii) BD6 (Lat. 17.989o N, Long. 88.089o E) Met and Sea Surface Current were recently deployed by NIOT.] The passage of the JAL was along these newly deployed Buoys. Among these Buoys, the BD07_OMNI buoy recorded maximum wind speed of 16 mps on 5 November around 2000 UTC.

DWR at Sriharikota recorded hourly observation from 0300 UTC of 6 November. It was observed that the Cyclonic Storm started moving towards the coast in a west-northwesterly direction. The structure/eye of the cyclone was not so well defined as the RADAR echoes did not have the required properties of a cyclone eye. A few typical DWR imageries of DWR, Sriharikota are shown in Fig.4.10.

The cloud heights were about 5 to 6 kms; the reflectivity in the wall cloud region was about 35-45 dBz maximum. General maximum velocities recorded are about 20-23 mps. The likely cloud center locations of the system are presented below along with related description. Arrangement of cloud, radial velocity diagrams are taken in to consideration while trying to fix the Cyclonic system center. DWR Chennai tracked from 0400 to 1800 UTC of 7 November. The vertical wind shear had detrimental effect on weakening the system at sea level. The centre of mass of dense convection area crossed north Cuddalore by about 0600 UTC of 7 November. Surface wind speed associated with the weak vortex was not more than 25 kts at any time.

4.2.3.5 Realised Weather

(a) Rainfall

Rainfall occurred at most places with heavy to very heavy fall at a few places over north Tamil Nadu, Puducherry, coastal Andhra Pradesh, Rayalaseema, south Interior

Karnataka and coastal Karnataka. Chief amount of 24 hrs accumulated rainfall (≥ 7 cm) as recorded at 0300 UTC of 8 and 9 November 2010 are as follows.

08.11.2010

Andhra Pradesh

Palasa-27, Sompeta-14, Itchhapuram-12, Puttur-11, Kalingapatnam, Rayacholi and Kuppam-10 each, Tekkali-9, Vempalli & Bhimunipatnam-8 each, Thambalapalli, Madakasira, Kadiri, Hindupur, Nellore, Anakapalli, Mandasa and Kandukur - 7 each.

Tamil Nadu and Puducherry

Gingee - 16, Panruti -15, Ambur- 13, Vaniyambadi- 12, Tiruvannamalai and Alangayam - 11 each, Tindivanam, Villupuram, Puducherry Airport 10 each, Cuddalore, Vanur and Thali- 9 each, Chengalpattu, Polur and Krishnagiri -8 each, Dharmapuri, Palacode, Tirukoilur, Vandavasi, Arakonam, Gudiyatham, Sholingur, Tirupattur and Vellore 7 each.

South Interior Karnataka

Lakkavalli 11; Chitradurga 10; Hesaraghatta, B Durga, YN Hoskote 8 each; Bangalore HAL AP, Hoskote, Holalkere, Bargur, Pavagada, Thondebhavi, Gowribidanur, Ramanagara 7 each

09.11.2010:

Coastal Karnataka:

Karwar 21; Ankola 11; Kota 10; Kumta 9; Honavar 8;

North Interior Karnataka:

Ramdurga, Ron 7 each;

(b) Wind

Squally winds with maximum speed reaching upto 60 kmph has been reported from the observatory stations of IMD along north Tamil Nadu – south Andhra Pradesh coast. Ennore Port in Tamil Nadu reported 33 knots (61 kmph) in the forenoon of 7 October 2010. The wind speed decreased at the time of landfall, as the system weakened gradually and crossed as a deep depression.

4.2.3.6. Damage:

Andhra Pradesh:

Eleven people died in Andhra Pradesh, Hundreds of houses were damaged and crops over about 15000 hectares were destroyed. A loss of about 83 crores was estimated.

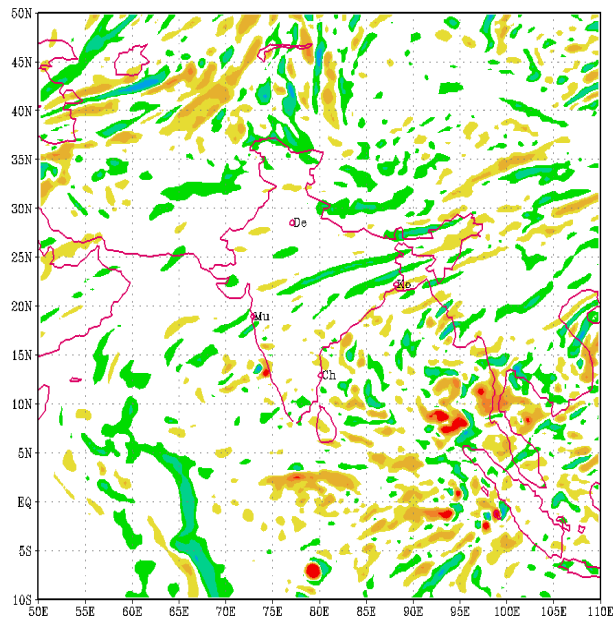
Tamil Nadu:

Five persons lost their lives. About 100 pucca/kutcha houses were either fully or partially damaged. May boats were damaged and some were also missing due to floods. Rail, road and air transports were affected due to heavy rain. Sea water inundated low lying areas.

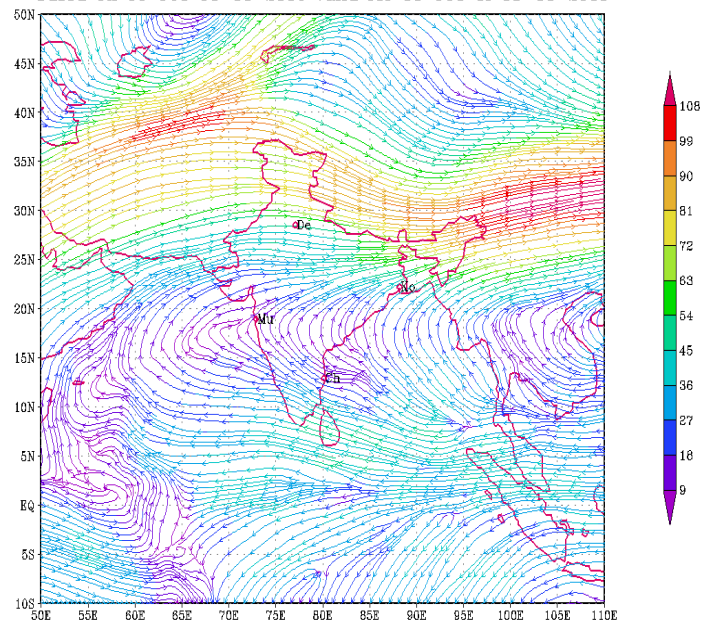
Table4.4. Best track positions and other parameters of the severe cyclonic storm “ JAL’ over the Bay of Bengal during 04-07 NOV, 2010

Date	Time (UTC)	Centre lat. ^o N/ long. ^o E	C.I. NO.	Estimated Central Pressure (hPa)	Estimated Maximum Sustained Surface Wind (kt)	Estimated Pressure drop at the Centre (hPa)	Grade
04.11.10	0000	8.0/92.0	1.5	1002	25	3	D
	0300	8.5/91.0	1.5	1002	25	3	D
	0600	8.5/90.5	1.5	1002	25	3	D
	1200	8.5/90.0	1.5	1002	25	3	D
	1800	8.5/89.5	1.5	1002	25	4	D
05.11.10	0000	9.0/88.5	2.0	1000	30	5	DD
	0300	9.0/88.0	2.0	1000	30	5	DD
	0600	9.0/87.5	2.5	998	35	6	CS
	0900	9.0/87.5	2.5	996	40	8	CS
	1200	9.5/87.0	2.5	994	45	10	CS
	1500	9.5/87.0	3.0	994	45	10	CS
	1800	10.0/86.5	3.0	992	50	12	CS
	2100	10.0/86.0	3.5	990	55	16	SCS
06.11.10	0000	10.0/85.5	3.5	990	55	16	SCS
	0300	10.0/85.5	3.5	990	55	16	SCS
	0600	10.5/85.0	3.5	990	55	16	SCS
	0900	10.5/85.0	3.5	990	55	16	SCS
	1200	11.0/84.5	3.5	988	60	18	SCS
	1500	11.0/84.5	3.5	988	60	18	SCS
	1800	11.0/84.0	3.5	988	60	18	SCS
	2100	11.0/84.0	3.5	988	60	18	SCS
07.11.10	0000	11.5/83.5	3.5	988	60	18	SCS
	0300	12.0/83.0	3.5	990	55	16	SCS
	0600	12.5/82.5	3.0	992	45	12	CS
	0900	12.5/81.5	2.5	994	40	8	CS
	1200	13.0/81.0	2.0	996	30	6	DD
	1500	13.0/80.5	2.0	998	30	5	DD
	The system crossed north Tamilnadu and south Andhra Pradesh coast close to north Chennai (43279) near 13.3 ^o N and 80.2 ^o E around 1600 UTC.						
	1800	13.5/80.0	--	1000	30	5	DD
08.11.10	0000	14.0/79.0	--	1002	25	4	D
	0300	15.0/78.0	--	1004	25	3	D
	0600	The system weakened into a low pressure area over Rayalaseema and adjoining south interior Karnataka.					

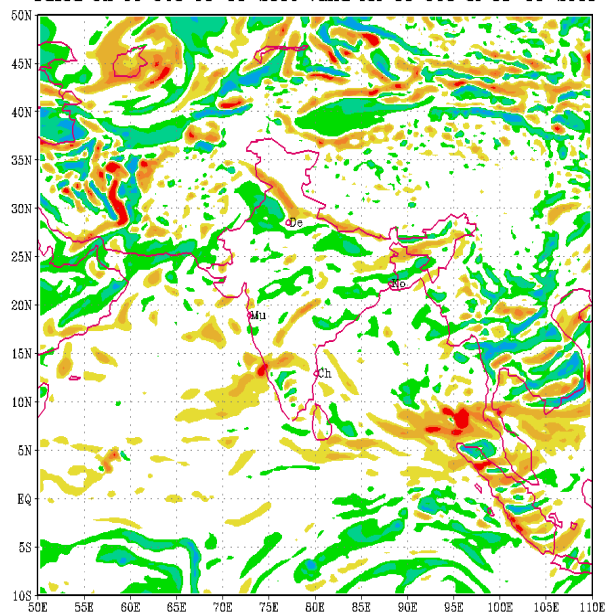
Divergence ($1e5 \text{ s}^{-1}$) at 200 hPa ECMWF Forecast (0 hr.)
based on 00 UTC 03-11-2010 valid for 00 UTC of 03-11-2010



200 hPa WIND ECMWF FORECAST (0 Hr.)
based on 00 UTC 03-11-2010 valid for 00 UTC of 03-11-2010



Vorticity ($1e5 \text{ s}^{-1}$) at 850 hPa ECMWF Forecast (0 hr.)
based on 00 UTC 03-11-2010 valid for 00 UTC of 03-11-2010



Wind Shear between 200 & 850 hPa ECMWF FORECAST (0 hr.)
based on 00 UTC 03-11-2010 valid for 00 UTC of 03-11-2010

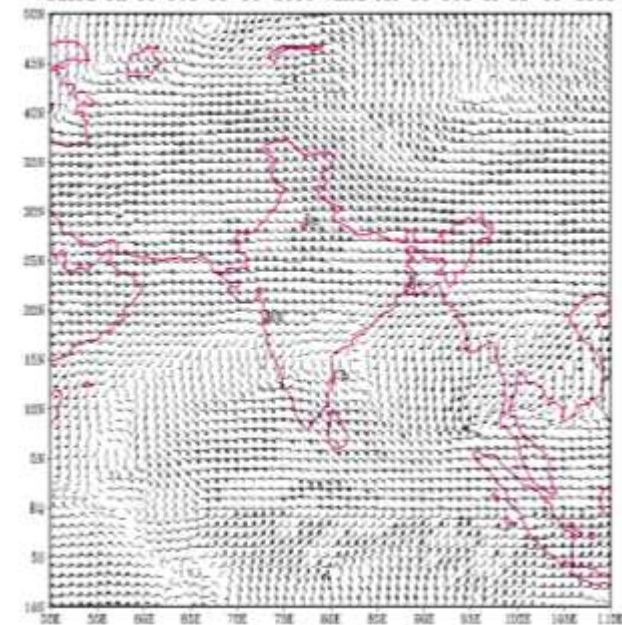
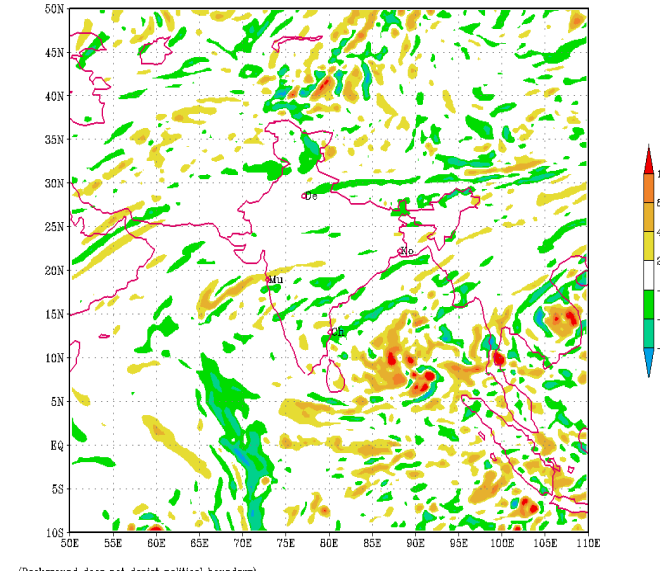
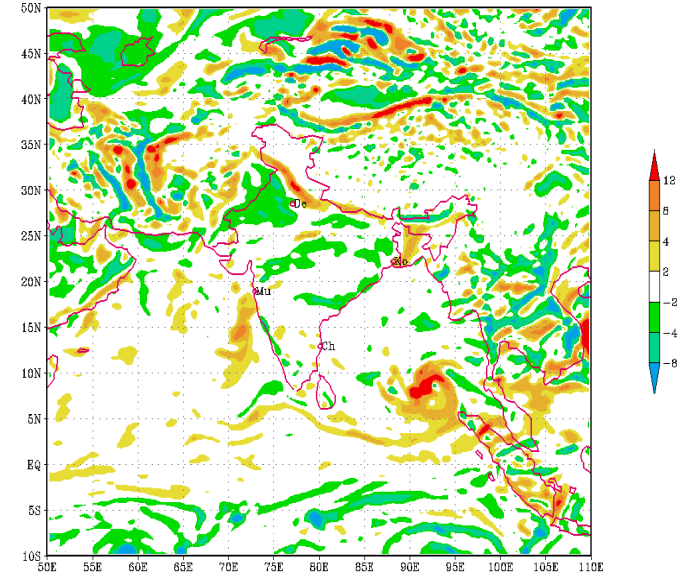


Fig.4.7(a).ECMWF analysis (a) Divergence at 200 hPa level, (b) Vorticity at 850 hPa level, (c) wind at 200 hPa level and (d) Vertical wind shear between 200 and 850 hPa level at 0000 UTC of 03 November 2010

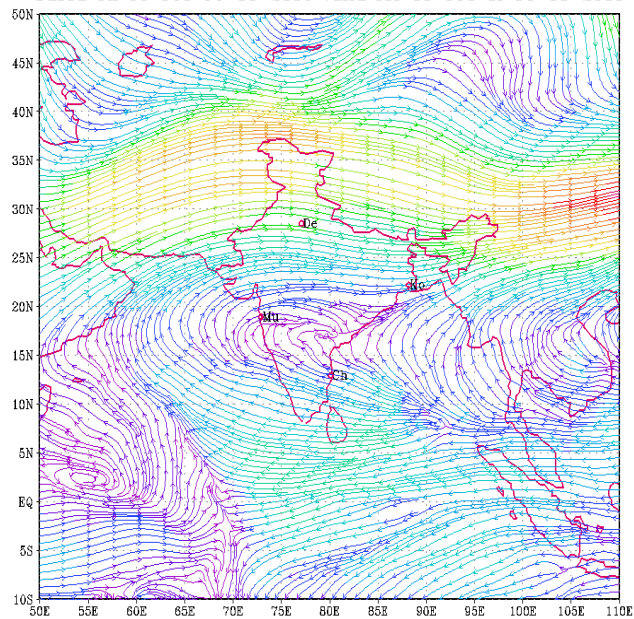
Divergence ($1e5 \text{ s}^{-1}$) at 200 hPa ECMWF Forecast (0 hr.)
based on 00 UTC 04-11-2010 valid for 00 UTC of 04-11-2010



Vorticity ($1e5 \text{ s}^{-1}$) at 850 hPa ECMWF Forecast (0 hr.)
based on 00 UTC 04-11-2010 valid for 00 UTC of 04-11-2010



200 hPa WIND ECMWF FORECAST (0 Hr.)
based on 00 UTC 04-11-2010 valid for 00 UTC of 04-11-2010



Wind Shear between 200 & 850 hPa ECMWF FORECAST
based on 00 UTC 04-11-2010 valid for 00 UTC of 04-11-2010

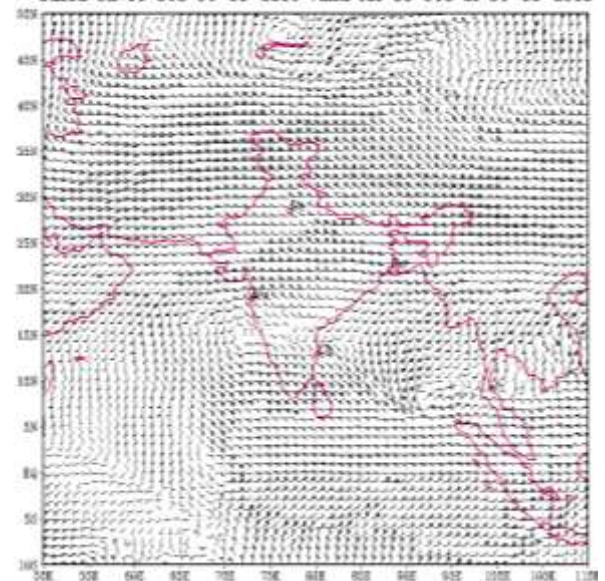
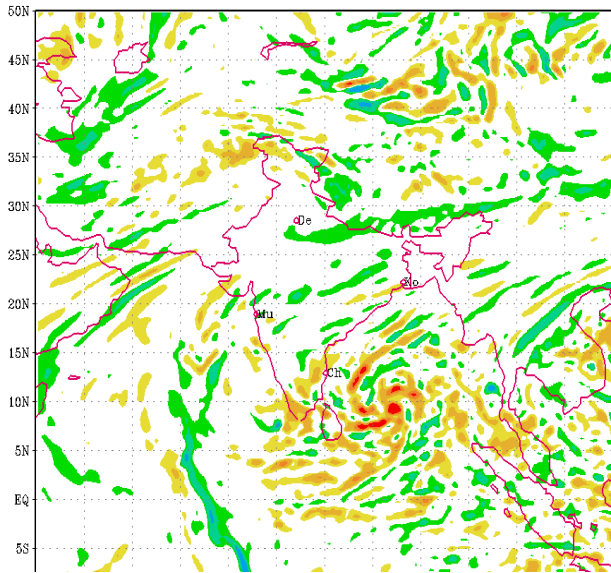


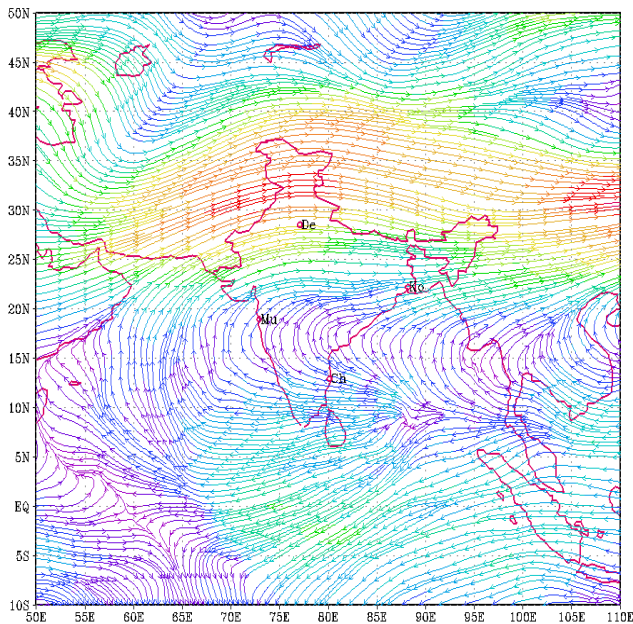
Fig.4.7(b). ECMWF analysis (a) Divergence at 200 hPa level, (b) Vorticity at 850 hPa level, (c) wind at 200 hPa level and (d) Vertical wind shear between 200 and 850 hPa level at 0000 UTC of 04 November 2010

Divergence ($1e5 \text{ s}^{-1}$) at 200 hPa ECMWF Forecast (0 hr.)
based on 00 UTC 05-11-2010 valid for 00 UTC of 05-11-2010

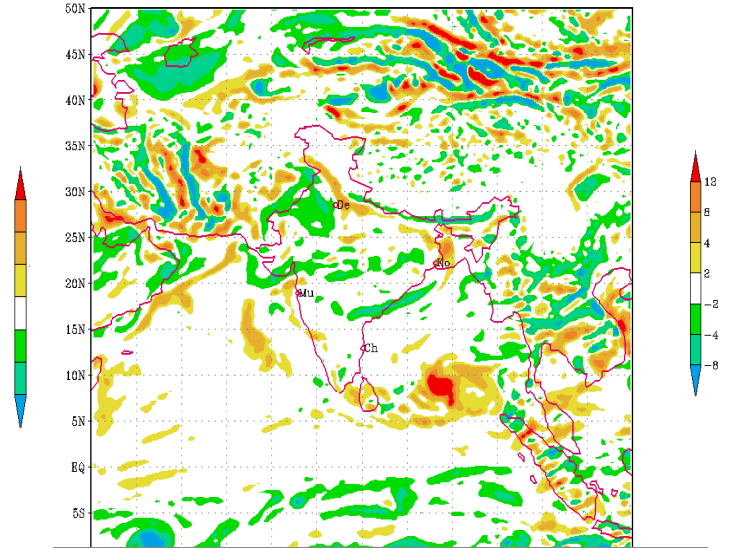


200 hPa WIND ECMWF FORECAST (0 Hr.)

based on 00 UTC 05-11-2010 valid for 00 UTC of 05-11-2010



Vorticity ($1e5 \text{ s}^{-1}$) at 850 hPa ECMWF Forecast (0 hr.)
based on 00 UTC 05-11-2010 valid for 00 UTC of 05-11-2010



Wind Shear between 200 & 850 hPa ECMWF FORECAST

based on 00 UTC 05-11-2010 valid for 00 UTC of 05-11-2010

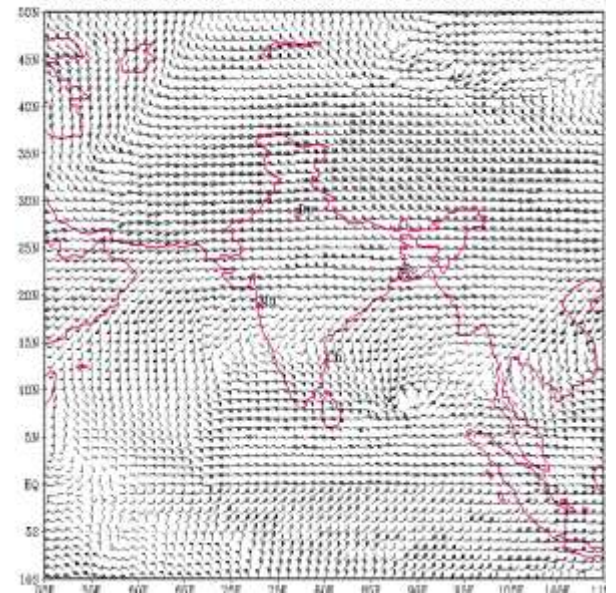
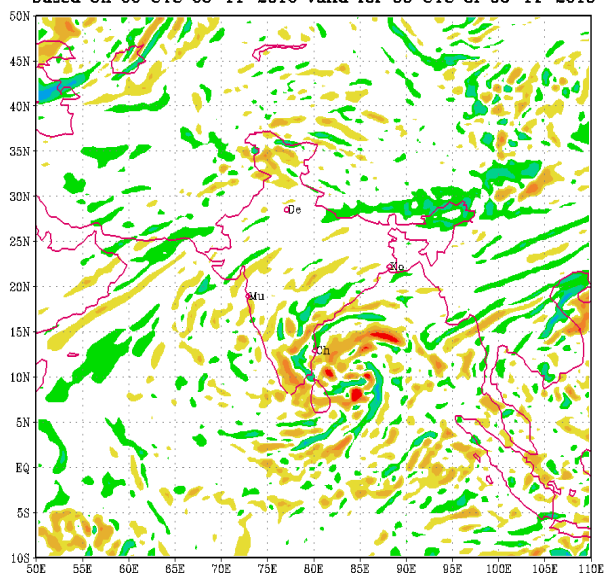
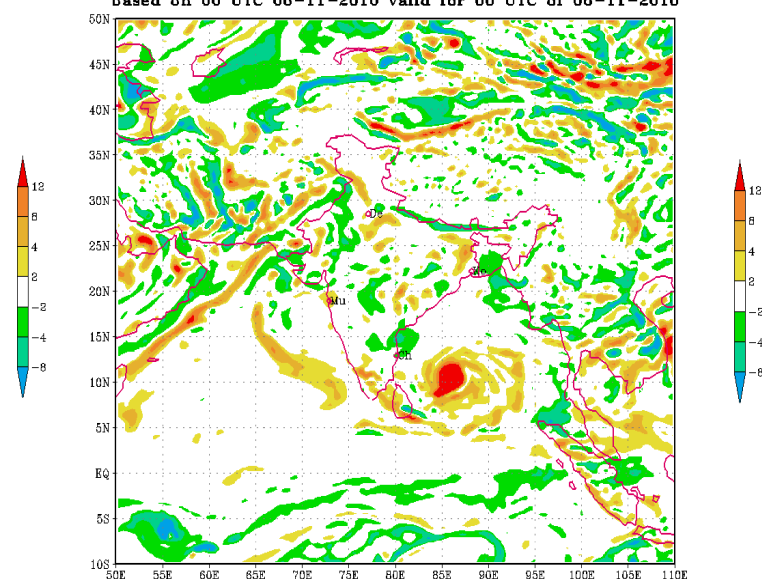


Fig.4.7 (c). ECMWF analysis (a) Divergence at 200 hPa level, (b) Vorticity at 850 hPa level, (c) wind at 200 hPa level and (d) Vertical wind shear between 200 and 850 hPa level at 0000 UTC of 05 November 2010

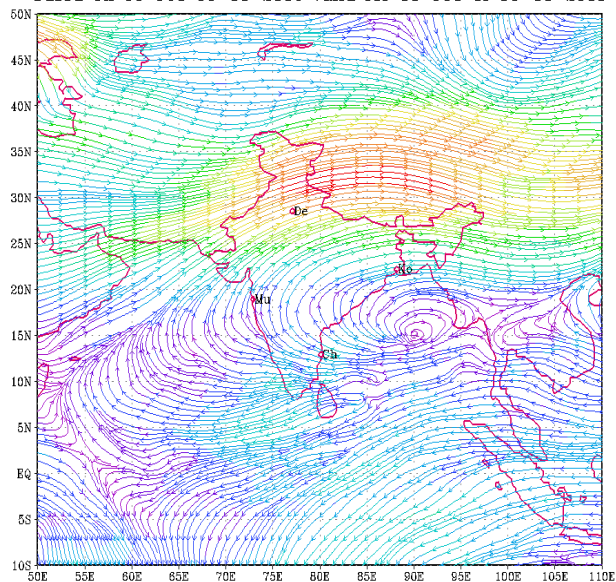
Divergence ($1e5 \text{ s}^{-1}$) at 200 hPa ECMWF Forecast (0 hr.)
based on 00 UTC 06-11-2010 valid for 00 UTC of 06-11-2010



Vorticity ($1e5 \text{ s}^{-1}$) at 850 hPa ECMWF Forecast (0 hr.)
based on 00 UTC 06-11-2010 valid for 00 UTC of 06-11-2010



200 hPa WIND ECMWF FORECAST (0 Hr.)
based on 00 UTC 06-11-2010 valid for 00 UTC of 06-11-2010



Wind Shear between 200 & 850 hPa ECMWF FORECAST (0)
based on 00 UTC 06-11-2010 valid for 00 UTC of 06-11-2010

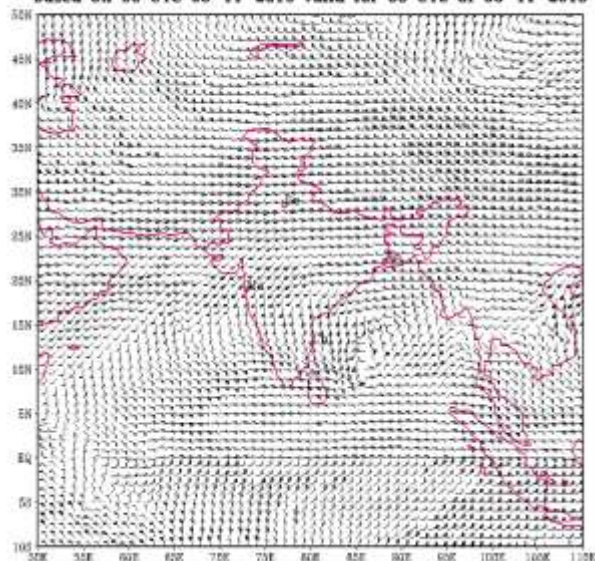
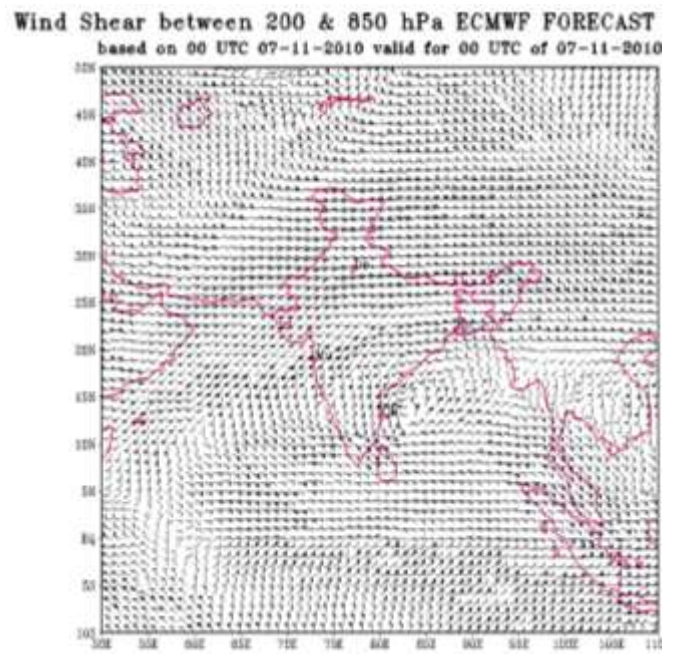
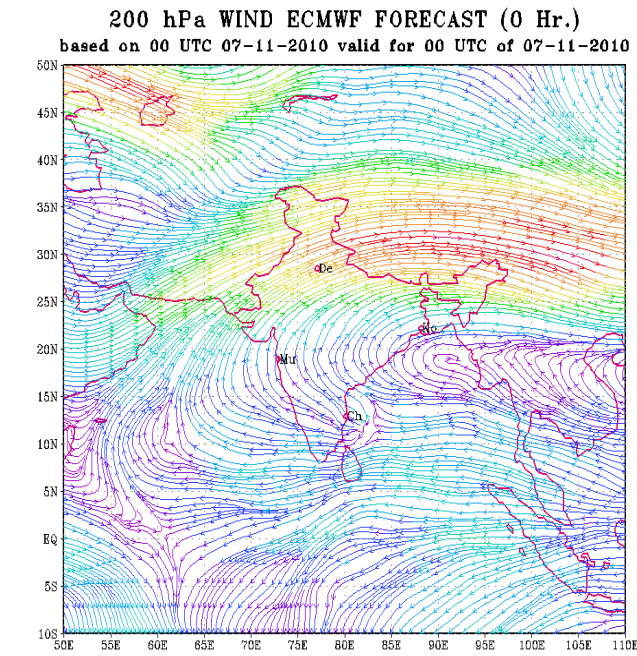
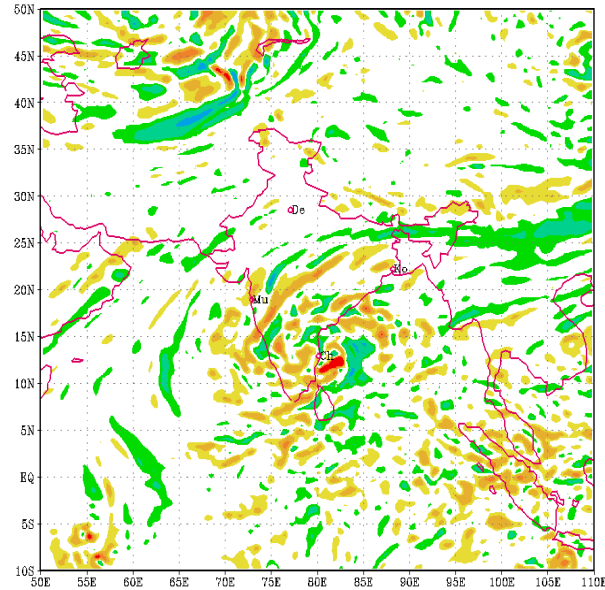


Fig.4.7 (d). ECMWF analysis (a) Divergence at 200 hPa level, (b) Vorticity at 850 hPa level, (c) wind at 200 hPa level and (d) Vertical wind shear between 200 and 850 hPa level at 0000 UTC of 06 November 2010



Divergence ($1e5 \text{ s}^{-1}$) at 200 hPa ECMWF Forecast (0 hr.)
based on 00 UTC 07-11-2010 valid for 00 UTC of 07-11-2010



Vorticity ($1e5 \text{ s}^{-1}$) at 850 hPa ECMWF Forecast (0 hr.)
based on 00 UTC 07-11-2010 valid for 00 UTC of 07-11-2010

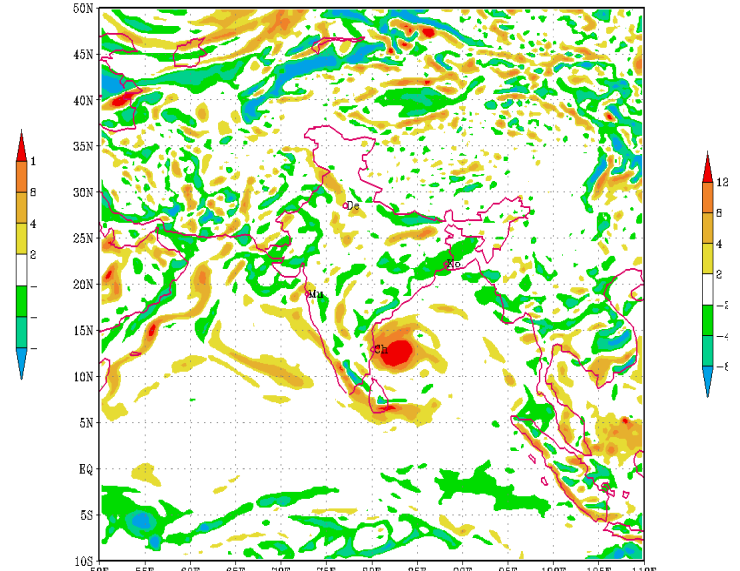


Fig.4.7 (e). ECMWF analysis (a) Divergence at 200 hPa level, (b) Vorticity at 850 hPa level, (c) wind at 200 hPa level and (d) Vertical wind shear between 200 and 850 hPa level at 0000 UTC of 07 November 2010

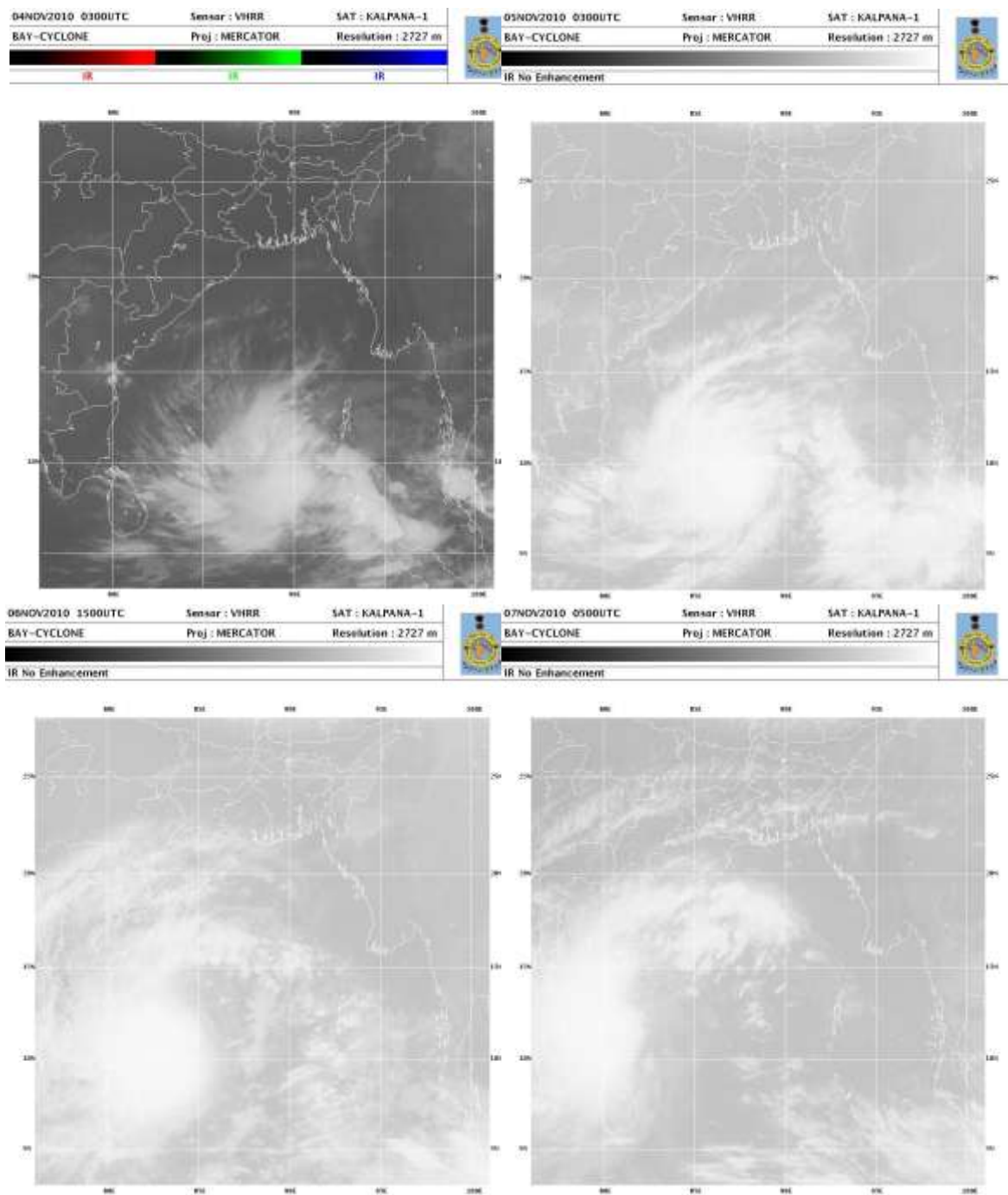


Fig.4.8 Kalpana imageries of the cyclone, JAL at different stages on intensity

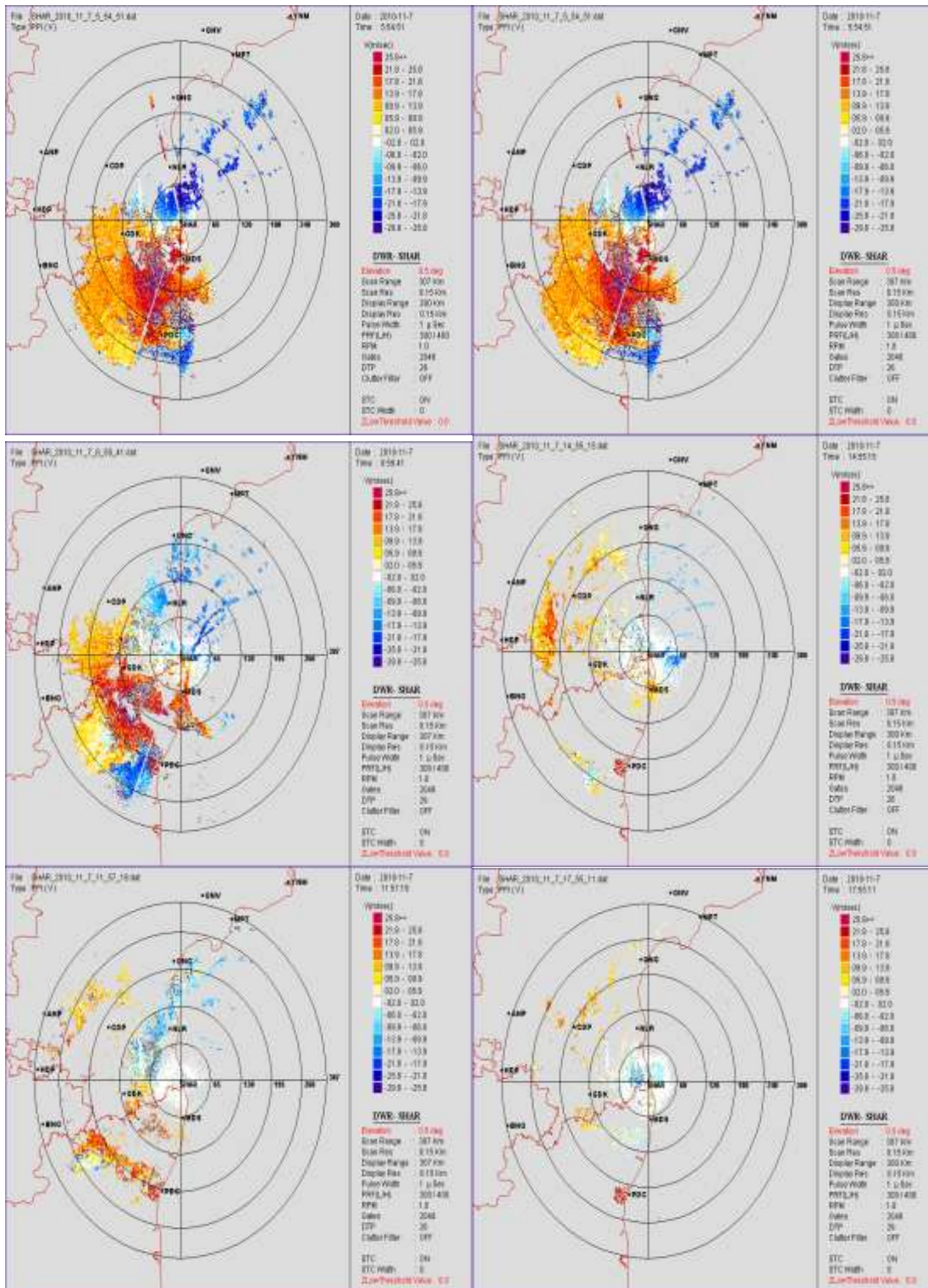


Fig.4.9(b). DWR images of cyclone JAL for 0300,0600,0900,1200,1500,1800 UTC of 07-11-10

4.3 Performance of Meteorological Buoys during FDP-2010

The cyclone JAL formed in the south Bay of Bengal during 5th November, 2010 is well captured by the 3 data buoys deployed in the Bay of Bengal out which two are equipped with sub surface oceanographic instruments up to 500m depth deployed on 24th and 26th October 2010 and third buoy BD06 has an indigenous CPU.

- BD06 OMNI 9.9N & 88.4E Met Sub-Surface Ocean up to 500m depth .
- BD07 OMNI 8N & 88.5E Met, Sub-Surface Ocean up to 500m depth & Wave
- BD 06 17.989oN, 88.089oE Met and Sea Surface Current

These buoys were located along the passage of the cyclone JAL, very clear from the buoy location plot (Fig.4.10) and from the INSAT picture (Fig.4.11)(ref IMD web site).

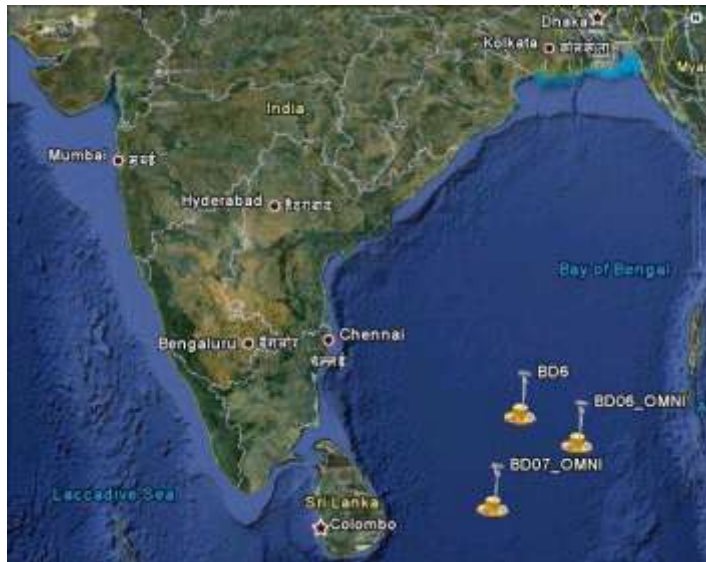


Fig.4.10 Bouy Network

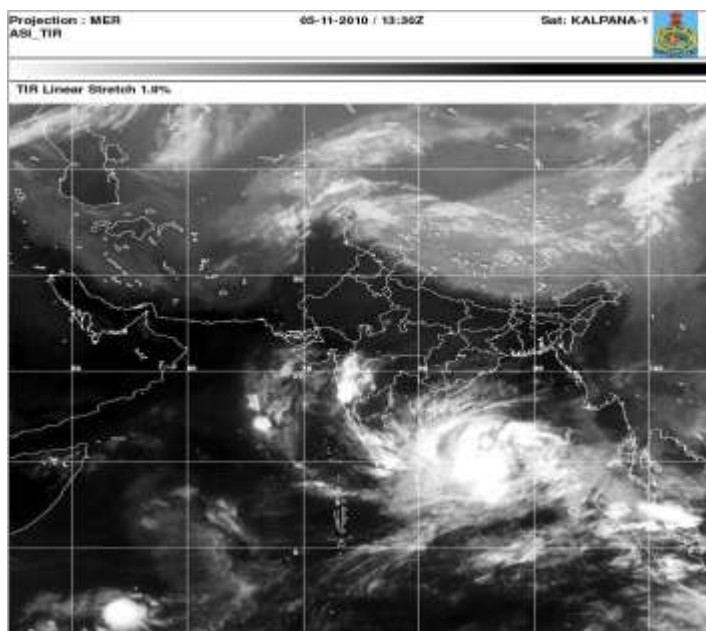


Fig. 4.11 Insat Picture of Cyclone 'JAL'

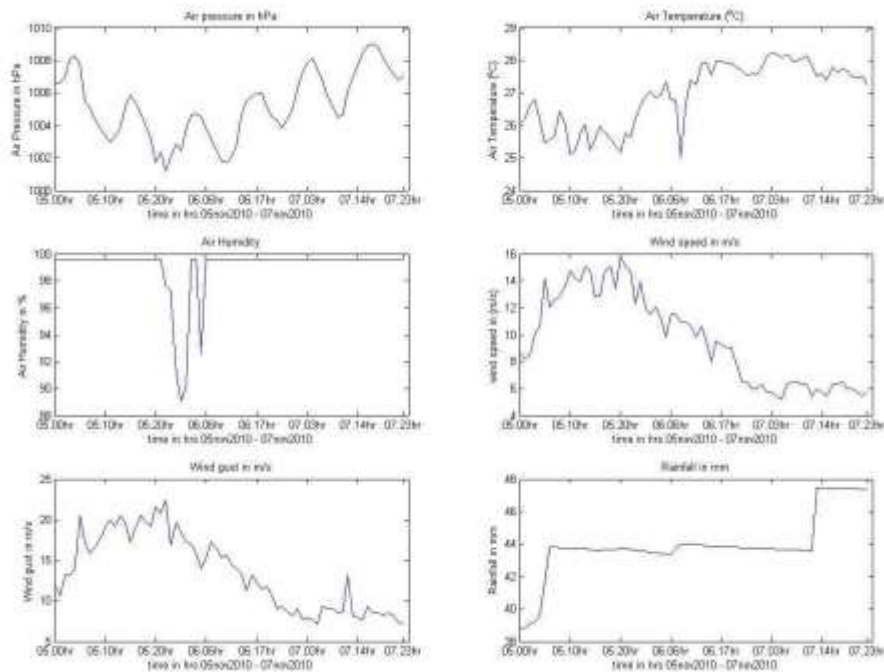
4.3.1 Observations

The response of the cyclone was very well captured by all the parameters. The dip in air pressure is the first response of the cyclone that is captured by the two OMNI buoys. The wind gust has crossed 20m/s. The surface current speed (1.2m) has reached 41cm/s at the BD07 location, whereas the current speed has gone beyond the maximum range 100cm/s at the BD06 buoy location. The current speed of the surface layer up to 30m depth has increased. The response of the cyclone on the met parameters such as air pressure, air temperature, humidity, wind speed, wind gust and rainfall is very well correlated. As the cyclone passes the air temperature dips by around 2°C and corresponding dip in humidity is also observed. The rainfall has increased at both the buoy locations. The cooling of surface layer of the ocean due to the exchange of heat with the atmosphere and mixing up of cool water from below is very well observed in the BD07 subsurface temperature measurement

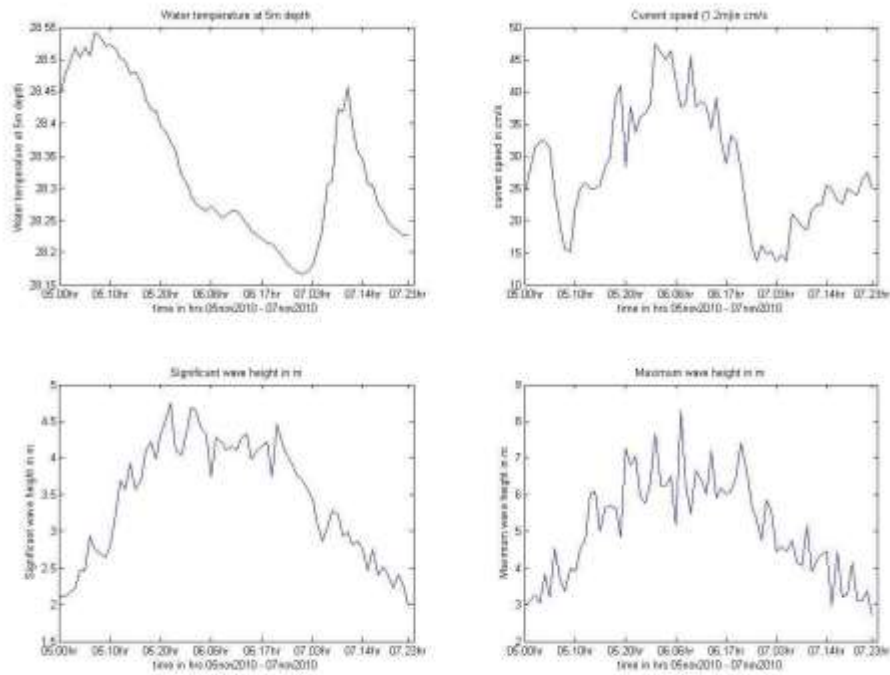
RESPONSE OF THE JAL CYCLONE

BD07 OMNI [8N & 88.5E]

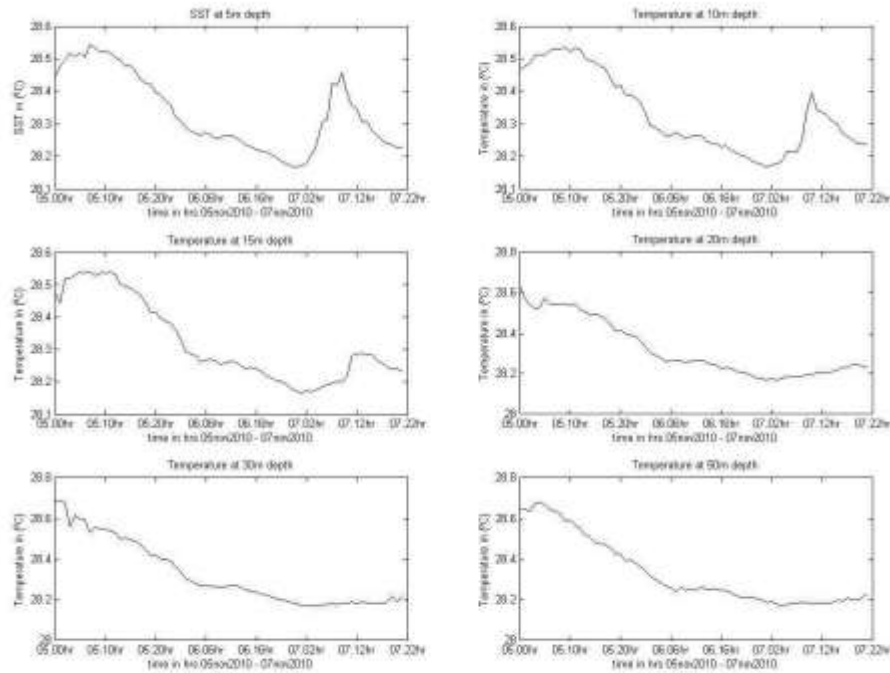
MET PARAMETERS



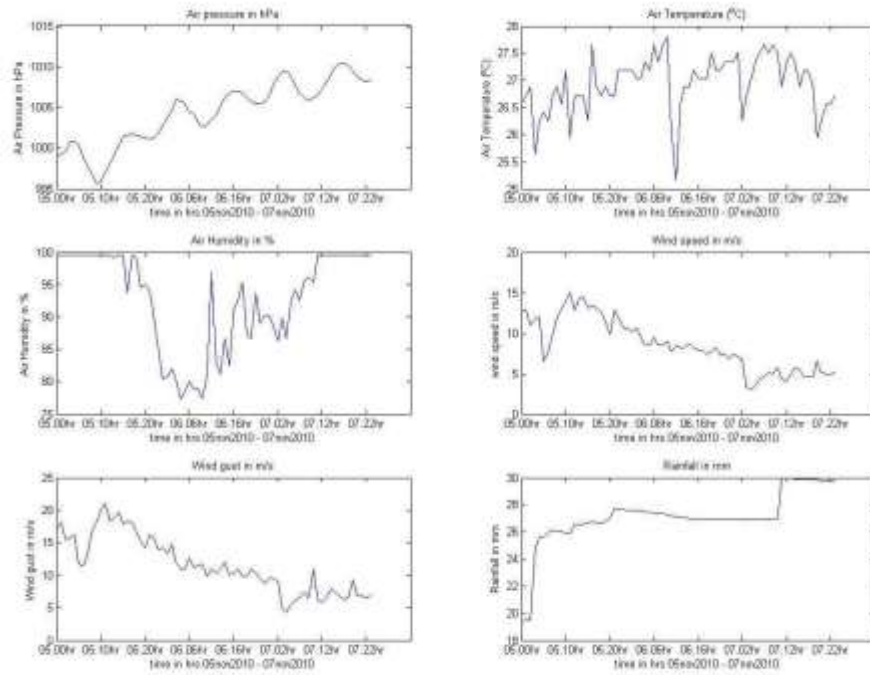
BD07 OMNI [8N &88.5E] OCEAN PARAMETERS



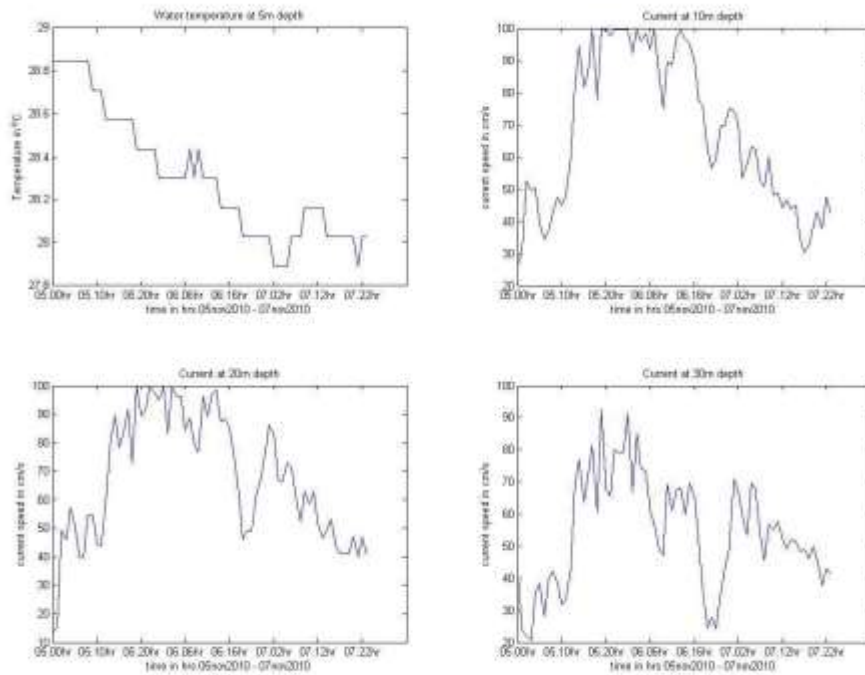
BD07 OMNI [8N &88.5E] OCEAN SUBSURFACE PARAMETERS



BD06 OMNI [9.9N & 88.4E] MET PARAMETERS

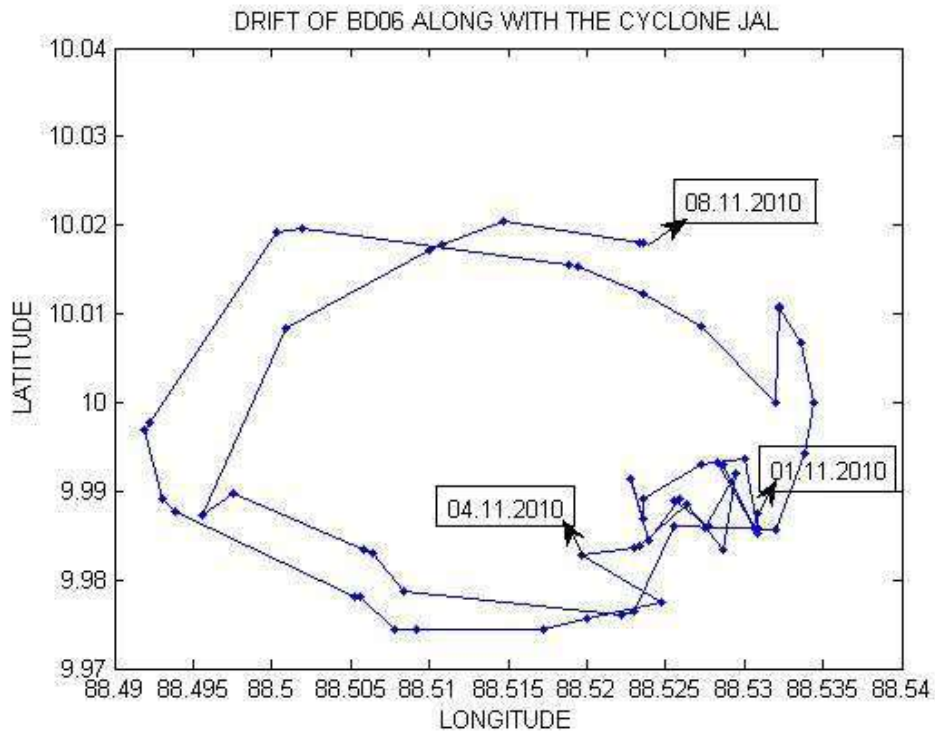


BD06 OMNI [9.9N & 88.4E] OCEAN SUBSURFACE PARAMETERS



4.3.2 Surface Drift of the buoy - GPS locations

The moored data buoy BD06 deployed in the Southern BoB provided significant information of the cyclone. The inertial oscillations were observed at the buoy site for a period of four weeks starting from 5th October 2010. The effect of the cyclone as well as the inertial oscillation on the buoy is clearly seen in the time series plot of buoy location from 1st to 8th Nov. 2010. Due to the passage of cyclone, the buoy started moving in circular path and it shows the severity of the cyclone as well as the inertial oscillation. This data is very important in designing the mooring system. And to understand load being experienced by the buoy and mooring system



4.3.3 Observations from 3 data buoys in BoB during November 2010 cyclone passage

The time series observations clearly exhibit the importance of the proximity of the location to the cyclone track. The maximum wind speed observed at a location is indicative of the severity of the cyclone. Among the two buoys the BD07 OMNI buoy has recorded maximum wind speed of 16 m/s on 5th November 2010. The correlation of three data buoys are very clearly seen in the time series plots of air pressure and wind speed obtained from the all the three buoys

Time series plot of wind observations during the passage of cyclone

CHAPTER V

Weather summary and advisories issued during FDP-2010

FDP-2010 was conducted during the period 15 Oct.-30 Nov.,2010. NOC,Delhi and FOC,Chennai worked in liaison with other ACWCs & CWCs for observation, collection and transmission of data during the period. The details of the Weather Summaries & Advisories issued during the period are discussed below:

FDP (cyclone) NOC Report Dated 15 Oct.. 2010, 1500 hours

Weather Briefing:

Synoptic features

The deep depression over northwest Bay of Bengal moved west-northwestwards and lay centred at 1130 hrs IST of today, the 15th October 2010 over northwest Bay of Bengal near latitude 19.5°N and longitude 86.0°E, about 60 km southeast of Puri (Orissa) and 120 km east-northeast of Gopalpur (Orissa).

The current environmental conditions and numerical weather prediction (NWP) models suggest that the system would move west-northwestward and cross Orissa coast between Gopalpur and Paradip near Puri by 15th October 2010 evening.

Satellite

Vortex over Bay of Bengal lay centred at 18.5°N and 85.7°E with intensity T2.0 at 1000 UTC of 15th October 2010. Associated broken intense to very intense convection lies over northwest Bay , adjoining westcentral Bay, Orissa adjoining Jharkhand, north coastal Andhra Pradesh, south Gangetic West Bengal and Chhatisgarh.

(See <ftp://192.168.12.75/imd/satmet>
<http://www.imd.gov.in/section/satmet/dynamic/insat.htm>)

NWP

ECMWF model analysis shows a deep depression with center of pressure less than 996 hPa persists off the Orissa coast .The forecast fields *indicates that* the deep depression would move northwestward and cross Orissa coast between Gopalpur and Paradip before by 00 UTC of 16 October 2010 and become less marked thereafter.

GFS model analysis shows a deep depression with center of pressure of less than 1000 hPa persists off the Orissa coast between 17 -18N.The model forecast fields *indicates that* the deep depression would move northwestward and cross Orissa coast between 17 -18N before by 00 UTC of 16 October 2010 and become less marked thereafter.

WRF model analysis shows a deep depression with center of pressure of less than 998hPa persists off the Orissa coast between 18 -19N.The model forecast fields *indicates that* the deep depression would move northwestward and cross Orissa coast between 18-19N before by 00 UTC of 16 October 2010 and become less marked thereafter.

- (See <http://www.imd.gov.in/section/nhac/dynamic/welcome.htm>)
- See ftp://ftp.ncmrwf.gov.in/pub/outgoing/TC_FDP/

Advisory

- The Deep Depression is likely to cross Orissa coast during next 3 to 6 hours between Gopalpur and Puri. Satellite shows convection in the forward sector of the

Deep Depression. Heavy rain is expected to occur within 100 km in next 24 hours. Intensive Observational Period (IOP) has been declared. IOP will be conducted from 15th to 16th October 2010 which are as follows:

- Balasore, Gopalpur, Bhubaneswar, Visakhapatnam and Kolkata may take upper air observation at 151800, 160000, 160600 and 161200 UTC.
- Satellite Division may archive pictures related with the system from 13.10.2010 (0600 UTC) to 16.10.2010 (1200 UTC) including microwave imageries and the same may be forwarded to CWD.
- NWP unit may provide 12 to 72 hours forecast commencing from 13.10.2010 (0600 UTC) to 16.10.2010 (1200 UTC) of all models in IMD including ECMWF, NCEP, JMA.
- NCMRWF may provide forecast verification from 12 to 72 hours forecast commencing from 13.10.2010 (0600 UTC) to 16.10.2010 (1200 UTC) of their model as well as UK unified system.
- Cyclone Warning Division may prepare brief report of the system.

FDP (cyclone) NOC Report Dated 16 October, 2010, 1500 hours**Status of Observation system:****Synop** ← 15-10-2010 →← 16-10-2010 →

Region	09	12	15	18	21	00	03	06
KOL	34	66	28	28	26	32	55	38
CHN	41	72	36	36	31	40	84	45
MUM	37	75	30	30	29	30	80	41

AWS

← 15-10-2010 →← 16-10-2010 →

UTC	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07
Nos	462	461	462	469	496	472	458	452	451	457	452	456	458	455	455	457	459	471	469	471	472	480	485	421

RS/RW (12Z) 15-10-2010: 35/35 (MISDA-16: SRN, GRK, DBH, SLG, GHT, RNC, AGT, GWL, BHP, NGP, RPR, JGD, AHM, AUG, PNJ & AMN)

(00Z) 16-10-2010: 36/36 (MISDA -04: SRN, AHM, PNJ & AMN)

Buoy Data

15-10-2010					16-10-2010		
09Z	12Z	15Z	18Z	21Z	00Z	03Z	06Z
1	1	1	1	1	1	1	1

No. of PILOT Ascents

15-10-2010		16-10-2010	
12Z	18Z	00Z	06Z
35	03	32	07

GPS: 12Z (15-10-2010) –

00Z (16-10-2010) – 03 (HYD, MNB & PBL)

Weather Briefing:**Synoptic features**

Yesterday's deep depression over northwest Bay of Bengal moved westwards, crossed Orissa coast near Gopalpur (Orissa) between 1600- 1700 UTC on yesterday, 15th October 2010. It further moved westwards and weakened into depression at 0000 UTC of today, 16th October 2010 over south Orissa and adjoining areas of Chhattisgarh & north Andhra Pradesh about 50 km west of Gopalpur. It further moved westwards and weakened into a well marked low pressure area over south Orissa and adjoining Chhattisgarh and north Andhra Pradesh at 0300 UTC of today. The track of the Deep Depression is given below:

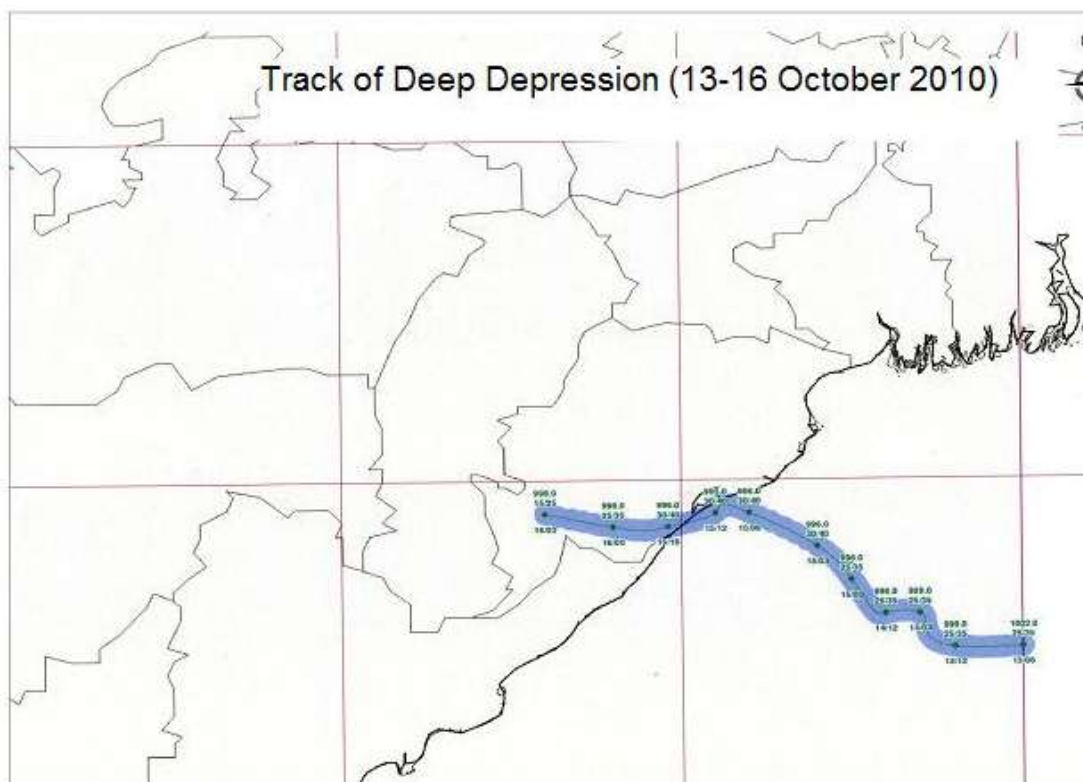
Based on 0600 UTC analysis, the position of ridge over Bay of Bengal (BOB) is near 22° N. Wind shear is more than 30 knots over most of the region of BOB. Upper level divergence is also negative over most of the region of BOB.

Satellite

Broken low/medium clouds with embedded moderate to intense convective clouds over southeast BOB adjoining east central Bay. Scattered low/med clouds with embedded isolated weak to moderate convection over westcentral BOB north of lat 15.0°N rest eastcentral BOB and rest southeast BOB.

(See <ftp://192.168.12.75/imd/satmet>

<http://www.imd.gov.in/section/satmet/dynamic/insat.htm>)



NWP

- **ECMWF** model analysis of 00UTC of today (16 OCT 2010) shows that the depression over south Orissa & adjoining areas of north Andhra Pradesh weakened with center of pressure less than 1000 hPa and 4 closed isobars. The forecast fields indicates that the depression weaken further and become well marked low pressure area over the same region thereafter
- **GFS** model analysis of 00UTC of today (16 OCT 2010) shows that the depression over south Orissa & adjoining areas of Andhra Pradesh weakened with center of pressure less than 1002 hPa and 3 closed isobars. The forecast fields indicates that the depression weaken further and become well marked low pressure area over the same region thereafter
- **WRF** model analysis of 00UTC of today (16 OCT 2010) shows that the depression over south Orissa & adjoining areas of Andhra Pradesh weakened with center of pressure less than 1000 hPa. The forecast fields indicates that the depression weaken further and become well marked low pressure area over Andhra Pradesh and adjoining areas thereafter

(See <http://www.imd.gov.in/section/nhac/dynamic/welcome.htm>)

See ftp://ftp.ncmrwf.gov.in/pub/outgoing/TC_FDP/

Advisory

No IOP during next 3 days.

FDP (cyclone) NOC Report Dated 17 October, 2010, 1500 hours

Status of Observation system:

Synop ← 16-10-2010 →← 17-10-2010 →

Region	09	12	15	18	21	00	03	06
KOL	34	65	21	22	16	39	50	42
CHN	41	70	29	29	29	29	54	70
MUM	33	75	18	18	18	17	06	-

AWS

2010 → 16-10-2010 →← 17-10-

UTC	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07
Nos	521	616	526	520	428	451	450	454	459	455	455	456	455	460	457	455	456	453	-	-	-	-	-	-

RS/RW (12Z) 16-10-2010 :-

(00Z) 17-10-2010 :-

Buoy Data

16-10-2010					17-10-2010		
09Z	12Z	15Z	18Z	21Z	00Z	03Z	06Z
1	1	-	-	-	-	-	-

No. of PILOT Ascents

16-10-2010		17-10-2010	
12Z	18Z	00Z	06Z
28	23	18	09

GPS:

12Z (16-10-2010) - -

00Z (17-10-2010)- -

Weather Briefing:

Synoptic features:

- Yesterdays well marked low pressure area over south Orissa and adjoining Chhatisgarh and north Andhra Pradesh now lies over north Telengana & adjoining Vidarbha with associated cyclonic circulation extending upto 4.5 km asl.

Upper tropospheric ridge:

- A ridge line roughly runs along 21°N at 200 hPa level.

Divergence

- Upper air positive divergence ($20 \times 10^{-5} \text{ s}^{-1}$) prevails over east central Bay and negative divergence over rest Bay of Bengal.

Convergence

- Lower level positive convergence ($5 \times 10^{-5} \text{ s}^{-1}$) prevails over east central Bay of Bengal and negative convergence over rest Bay of Bengal.

Wind Shear:

- The wind Shear about 20-30 knots over central Bay of Bengal.

Wind Shear Tendency:

- Negative wind shear tendency in past 24 hours (-10 knots) is prevailing over central and north Bay of Bengal and positive wind shear tendency (05 knots) over south Bay of Bengal.

Relative Vorticity:

- Relative vorticity at 850 hPa is negative over Bay of Bengal.

Sea Surface Temperature:

- SST around 25-27°C over Bay of Bengal.

Thermal energy:

- Ocean thermal energy is below 100 KJ cm⁻² over Bay of Bengal.

Satellite

Broken low/medium clouds with embedded moderate to intense convective clouds over east-central Bay adjoining south-east Bay and east central Arabian sea adjoining south east Arabian sea(.) scattered low/med clouds with embedded isolated weak to moderate convection over west central Bay adjoining south west Bay and south parts of north east Bay (.).

(See <ftp://192.168.12.75/imd/satmet>

<http://www.imd.gov.in/section/satmet/dynamic/insat.htm>)

NWP

Numerical weather prediction guidance indicate that a low pressure may form over east central Bay of Bengal during next 48 hours.

Advisory

No IOP during next 2 days.

FDP (cyclone) NOC Report Dated 18 October, 2010, 1500 hours

Weather Briefing:

Synoptic features:

- Yesterday's low pressure area over Telangana and adjoining Vidarbha now lies over Marthawada and neighbourhood with associated cyclonic circulation extending upto 5.8 km asl.
- Another low pressure area has formed over eastcentral Bay of Bengal and adjoining area of Arakan coast.

Upper tropospheric ridge:

- A ridge line roughly runs along 21°N at 200 hPa level.

Divergence

- Upper air positive divergence ($10 \times 10^{-5} \text{ s}^{-1}$) prevails over the low pressure area of eastcentral Bay.

Convergence

- Lower level positive convergence ($5 \times 10^{-5} \text{ s}^{-1}$) prevails over east central Bay of Bengal.

Wind Shear:

- The wind Shear about 10-20 knots prevails over eastcentral Bay of Bengal.

Wind Shear Tendency:

- Negative wind shear tendency in past 24 hours (-5 knots) is prevailing over eastcentral Bay of Bengal.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive over Bay of Bengal of the order and magnitude $5 \times 10^{-5} \text{ s}^{-1}$.

Sea Surface Temperature:

- SST around 29-30°C over central and north Bay of Bengal.

M.J.O. Index

- Located over phase-6 (Western Pacific Ocean).
- Statistical forecast:- MJO moves through phase 6,7 & 8 during next 15 days.
- Dynamical forecast:- MJO remains in phase 6 with decreasing amplitude.

Ocean thermal energy:

- Ocean thermal energy is below 100 KJ cm⁻² over central Bay of Bengal.

Status of observational system :

Details of the status of observational system are given in Annexure 1.

Satellite

Low/medium clouds at many places with embedded moderate to intense convective clouds at a few places over eastcentral and adjoining north-east Bay (Cloud Top Temp. minus 69 deg c) North Andaman Sea, south-east Bay between Lat 07.0°N to 09.5 °N east of Long 88.0 °E and Bay Islands.

(See <ftp://192.168.12.75/imd/satmet>
<http://www.imd.gov.in/section/satmet/dynamic/insat.htm>)

NWP

- **ECMWF** model analysis of 00UTC of today (18 OCT 2010) shows that a low pressure system over north Andaman & adjoining areas of Mayanmar coast with center of pressure 1008 hPa and 1 closed isobar. The cyclonic circulation associated with the low pressure system is extended upto 500 hPa. The forecast fields indicate no

intensification of the system and moving northwestward initially it recurves northeastwards and cross the north Myanmar coast on 23rd as cyclonic circulation.

- **GFS** model analysis of 00UTC of today (18 OCT 2010) shows that a low pressure system over north Andaman & adjoining areas of Myanmar coast with center of pressure 1008 hPa and 1 closed isobar. The cyclonic circulation associated with the low pressure system is extended upto 500 hPa. The forecast fields indicate no intensification of the system and moving northwestward it cross the Bangladesh on 25th as cyclonic circulation.

- **WRF** model analysis of 00UTC of today (18 OCT 2010) shows that a low pressure system over north Andaman & adjoining areas of Myanmar coast with center of pressure 1008 hPa and 1 closed isobar. The cyclonic circulation associated with the low pressure system is extended upto 500 hPa. The forecast fields indicate further intensification of the system to Deep Depression and moving west northwestward it lies over west central Bay of Bengal off Orissa coast on 21st as Deep Depression.

- **ARP** model shows no intensification till 20th 0000UTC in respect of the above low and becoming well marked low over eastcentral Bay of Bengal

(See <http://www.imd.gov.in/section/nhac/dynamic/welcome.htm>)

See ftp://ftp.ncmrwf.gov.in/pub/outgoing/TC_FDP/

FOC Report

Detailed report of FOC, Chennai is given in Annexure 2.

Advisory

1. Current environmental conditions and NWP models suggest that the low pressure area over eastcentral Bay of Bengal would not intensify into a depression. **Hence, no IOP will be conducted till 20-10-2010.**
2. Observation taken during IOP should be documented and hard and soft copy should be sent to Cyclone Warning Division, HQ, New Delhi.
3. Officer-in Charge of APEC, IMD should participate in NOC meeting. Details of the ship observation like ship route, contact point (Telephone No.), parameters of observations etc. should be documented.
4. NCMRWF model products should be available by 1400 hrs. IST daily based on initial condition of 0000UTC of that day.
5. SATMET division may take necessary action to prepare 24 hrs MOSAIC of OCEANSAT wind and sent to NOC.

Annexure-1

Status of Observation system:

Synop	← 17-10-2010					→← 18-10-2010				→
Region	09	12	15	18	21	00	03	06		
KOL	21	21	17	18	05	17	62	38		
CHN	26	33	-	24	-	25	47	44		
MUM	14	13	-	12	-	10	26	39		

AWS

17-10-2010

→← 18-10-2010

UTC	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07
Nos	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	450	477	478	445	480	476	340	478

RS/RW (12Z) 17-10-2010: - 34/35

No. of Ascents reaching 250 hPa levels:

MISDA:- SRN, PTL, DBH, SLG, PTN, RNC, AGT, GWL, BHP, NGP, RPR, JGD, AHM, AUG, PNJ

(00Z) 18-10-2010: -35/36

No. of Ascents reaching 250 hPa levels:

MISDA:- SLG, PNG, HYD

Buoy Data

17-10-2010					18-10-2010		
09Z	12Z	15Z	18Z	21Z	00Z	03Z	06Z
-	-	1	1	1	1	-	-

No. of PILOT Ascents

17-10-2010		18-10-2010	
12Z	18Z	00Z	06Z
31	22	29	20

GPL : GPS observation was taken 4 times a day during last IOP

BLS : Observation could not be taken due to technical problems

Remark

Line was unserviceable from 170800 UTC to 172300 UTC for reception of AWS data

Annexure-2



India Meteorological Department

REGIONAL METEOROLOGICAL CENTRE, CHENNAI

FDP (Cyclone) FOC Chennai Report Dated 18 OCT 2010, 1400 hrs

PART – A: STATUS OF OBSERVATION SYSTEM

No of Synop data

Date→	17.10.2010							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	19	20	20	18	15	19	19	19

No. of RS/RW Ascents**00Z / 17.10.2010 : 5**

No. of Ascents reaching 250 hpa level =5

MISDA : 2**12Z / 17.10.2010 : 5**

No. of Ascents reaching 250 hpa level =5

MISDA : 2**No. of PILOT Ascents:**

17.10.2010	
06Z	18Z
5	3

Status of AWS data is given in FDP/NOC report.**PART – B: RMC CHENNAI INFERENCE****CHENNAI MORNING INF DATED 18.10.2010**

BAY INF AURORA AAA Y'S TRH OF LOW PRESSURE EXTENDING FROM WC BAY TO NORTH ADMN SEA ACROSS EC BAY PERSISTS AAA MON GEN MOD TO STG OVER SW BAY AND GEN MOD OVER REST BAY AND SOUTH ADMN SEA AAA ARSEA INF AURORA AAA Y'S TRH OF LOW PRESSURE OVER E ARSEA OFF GOA-KKA-KRL COT PERSIST AAA MON MOD TO STG OVER REST SOUTH ARSEA AND GEN MOD OVER REST ARSEA SOUTH OF LAT 21 DEG NORTH AAA WX SSL ELSEWHERE ARSEA AAA

REGN INF AAA SW MON HAS BEEN VIGROUS OVER NIK AAA A TRH ON SLC RUNS FROM TLGN TO EXTREME S PENINSULA ACROSS CAP AND CTN AAA AN UA CYCIR LIES OVER VIDARBHA AND N'HOOD AND EXTNDS UPTO 3.6 KM ASL Y'S TRH OF LOW PRESSURE OVER E ARSEA OFF GOA-KKA-KRL COT PERSIST AAA

TUTICORIN AND PALAYAMKOTTAI RECORDED THE HIGHEST MAX TEMP OF 37 DEG C IN THE REGION AND KHAMMAM RECORDED THE LOWEST MIN TEMPERATURE OF 18 DEG C IN THE PLAINS OF THE REGION AAA

FCST AAA RA/TSH WOULD OCCUR AT MANY PLACES OVER NIK , TLGN, CK AND KER AND AT A FEW PLACES OVER SIK,CAP AAA ISOL RA/TSH MAY OCCUR OVER TN/PDC, LKDP AND RYLSM AAA

HEAVY RAINFALL WARNING: ISOL XX RA WOULD OCCUR OVER NIK AND KER DURING NEXT 48 HOURS AAA
ENDS AAA

=====

L/FCST AAA

FOR NEXT 24 HRS AAA THE SKY CONDITIONS MAY BE PARTLY CLOUDY AAA RAIN/TSH MAY OCCUR IN SOME AREAS AAA MAX AND MIN TEMP WOULD BE

AROUND 34 AND 26 DEG C RESPECTIVELY AAA FOR NEXT 48 HRS AAA THE SKY CONDITIONS MAY BE PARTLY CLOUDY AAA RAIN/TSH MAY OCCUR IN SOME AREAS AAA MAX AND MIN TEMP WOULD BE AROUND 34 AND 26 DEG C RESPECTIVELY AAA

ENDS AAA

PART – C: UPPER AIR WINDS FORECAST OVER CHENNAI

WRF – MODEL OUTPUT INDICATES MAINLY SOUTHWESTERLY TO SOUTHERLY WINDS OF THE ORDER OF 5 KNOTS UPTO 900 hPa AND MAINLY WESTERLY WINDS OF THE ORDER OF 10 KNOTS FROM 900 hPa TO 700 hPa FOR NEXT 24 HOURS ENDING 00Z 19.10.2010

FDP (cyclone) NOC Report Dated 19 October, 2010, 1500 hours

Weather Briefing:

Synoptic features:

- Yesterday's low pressure area over Marthawada and neighbourhood now lies over eastcentral Arabian sea and neighbourhood with associated cyclonic circulation extending upto 3.1 km asl.
- Yesterday's low pressure area over eastcentral Bay of Bengal and adjoining area of Arakan coast now lies over eastcentral Bay and neighbourhood.

Upper tropospheric ridge:

- A ridge line roughly runs along 20°N at 200 hPa level.

Divergence

- Upper air positive divergence ($20 \times 10^{-5} \text{ s}^{-1}$) prevails over the low pressure area of eastcentral Bay.

Convergence

- Lower level positive convergence ($10 \times 10^{-5} \text{ s}^{-1}$) prevails over east central Bay of Bengal.

Wind Shear:

- The wind Shear about 5-10 knots prevails over eastcentral Bay of Bengal.

Wind Shear Tendency:

- Negative wind shear tendency in past 24 hours (-10 knots) is prevailing over eastcentral Bay of Bengal.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive over Bay of Bengal of the order and magnitude $10 \times 10^{-5} \text{ s}^{-1}$.

Sea Surface Temperature:

- SST around 29-31°C over central and north Bay of Bengal.

M.J.O. Index

- Located over phase-6 (Western Pacific Ocean).
- Statistical forecast:- MJO moves through phase 6,7 & 8 during next 15 days.
- Dynamical forecast:- MJO remains in phase 6 with decreasing amplitude.

Ocean thermal energy:

- Ocean thermal energy is below 100 KJ cm⁻² over central Bay of Bengal.

Status of observational system :

Details of the status of observational system are given in Annexure 1.

Satellite

Broken Intense to very intense convection over Bay of Bengal North of Lat 13.5N East of Long 86.0E Arakan coast in association with Low Level Circulation over the area (.) scattered Low/ Medium Clouds with embedded isolated weak convection over North Andaman Sea and rest Bay of Bengal North of Lat 11.5N (.)

(See <ftp://192.168.12.75/imd/satmet>
<http://www.imd.gov.in/section/satmet/dynamic/insat.htm>)

NWP

- **ECMWF** model analysis of 00UTC of today (19 OCT 2010) shows that a low pressure system over north Andaman & adjoining areas of Myanmar coast with center of pressure 1008 hPa and 1 closed isobar. The cyclonic circulation associated with the low

pressure system is extended upto 500 hPa. The forecast fields indicate no intensification of the system and moving northwestward initially it recurves northeastwards and cross the north Mayanamar coast on 23rd as cyclonic circulation.

- **IMDGFS** model analysis of 00UTC of today (19 OCT 2010) shows that yesterday's low pressure system over north Andaman & adjoining areas of Mayanamar coast with center of pressure 1008 hPa and 1 closed isobar. The cyclonic circulation associated with the low pressure system is extended upto 500 hPa. The forecast fields indicate no intensification of the system and moving northwestward initially and thereafter northeastward and crossing north mayanamar and adjoining Bangladesh coast on 23rd as cyclonic circulation.

- **WRF-ARW** model analysis of 00UTC of today (19 OCT 2010) shows that a low pressure system over north Andaman & adjoining areas of Mayanamar coast with center of pressure 1008 hPa and 1 closed isobar. The cyclonic circulation associated with the low pressure system is extended upto 500 hPa. The forecast fields indicate further intensification of the system to Deep Depression and moving west northwestward it lies over west central Bay of Bengal off Orissa coast on 21st as Deep Depression.

- **WRF-NMM** model analysis of 00UTC of today (19 OCT 2010) shows that a low pressure system lies over north Andaman & adjoining areas of Mayanamar coast. The cyclonic circulation associated with low pressure system is extended upto 500hPa. The forecast fields indicate further intensification of the system to depression and initially moving northwestward to Eastcentral Bay and thereafter northeastward towards the Mayanamar coast on 23rd as deep depression.

- **USGFS** The low pressure area over eastcentral Bay likely to move north-northwestwards during next 48 hours then northeastwards towards Mayanamar coast.

- **NCMRWF** The low pressure area over eastcentral Bay likely to move northwestwards as a low pressure area.

- **UK MET OFFICE** The low pressure area over eastcentral Bay is associated with cyclonic circulation over east central Bay near to Mayanamar coast .It is likely to move north-northwestwards as low.

- **JMA** PROUCT NOT AVAILABLE IN SYNERGIE.

(See <http://www.imd.gov.in/section/nhac/dynamic/welcome.htm>)

See ftp://ftp.ncmrwf.gov.in/pub/outgoing/TC_FDP/

FOC Report

Detailed report of FOC, Chennai is given in Annexure 2.

Advisory

Current environmental conditions and NWP models suggest that the low pressure area over eastcentral Bay of Bengal would be well marked during next 48 hours. **No IOP will be conducted till 20-10-2010.**

Annexure-1

Status of Observation system:

Synop	← 18-10-2010					→ 19-10-2010 →			
Region	09	12	15	18	21	00	03	06	
KOL	31	67	26	28	25	29	57	35	
CHN	40	39	36	38	35	37	86	45	
MUM	38	78	27	31	28	33	87	40	

AWS

18-10-2010														→	← 19-10-2010										→
UTC	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	
Nos	430	526	425	-	-	-	-	-	-	-	503	523	528	512	499	525	521	505	504	536	517	520	443	504	

RSRW (12Z) 18-10-2010: - 18/10

No. of Ascents reaching 250 hPa levels: 17

MISDA:- SRN, LKN, GRK, DBH, SLG, PTN, RNC, AGT, GWL, BHP, NAG, RPR, JGD, AHM, AUG, PNJ, VSK, AMN (18)

(00Z) 19-10-2010: -35/36

No. of Ascents reaching 250 hPa levels: 26

MISDA:- SRN, DBH, HYD, AMN (4)

Buoy Data

18-10-2010					19-10-2010		
09Z	12Z	15Z	18Z	21Z	00Z	03Z	05Z
-	-	01	01	01	01	-	01

No. of PILOT Ascents

18-10-2010		19-10-2010	
12Z	18Z	00Z	06Z
32	15	34	29

GPS:

12Z (18-10-2010) 01(HYD)

00Z (19-10-2010) 01 (DBH)

Remark

Line was unserviceable from 181100 UTC to 181700 UTC for reception of AWS data



India Meteorological Department

REGIONAL METEOROLOGICAL CENTRE, CHENNAI

FDP (Cyclone) FOC Chennai Report Dated 19 OCT 2010, 1400 hrs

PART – A: STATUS OF OBSERVATION SYSTEM

No of Synop data

Date→	18.10.2010							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	19	20	20	20	22	19	19	18

No. of RS/RW Ascents

00Z / 18.10.2010 : 6

No. of Ascents reaching 250 hpa level =6

MISDA : 1

12Z /18.10.2010 : 6

No. of Ascents reaching 250 hpa level =6

MISDA : 1

No. of PILOT Ascents:

18.10.2010	
06Z	18Z
5	5

Status of AWS data is given in FDPNOC report.

PART – B: RMC CHENNAI INFERENCE

CHENNAI MORNING INF DATED 19.10.2010

BAY INF AURORA AAA A TRH OF LOW PRESSURE EXTDS FROM NW BAY TO N ADMN SEA ACROSS EC BAY AAA MON MOD TO STG OVER SW BAY AND GEN MOD OVER REST BAY AND SOUTH ADMN SEA AAA

ARSEA INF AURORA AAA Y'S TRH OF LOW PRESSURE OVER E ARSEA OFF GOA-KKA-KRL COT PERSISTS AAA MON MOD TO STG OVER REST SOUTH ARSEA AND GEN MOD OVER REST ARSEA SOUTH OF LAT 21 DEG NORTH AAA WX SSL ELSEWHERE ARSEA AAA

REGN INF AAA Y'S TRH OF LOW PRESSURE OVER E ARSEA OFF GOA-KKA-KRL COT PERSISTS AAA AN U/A CYCIR LIES OVER MADHYA MAHA AND N/HOOD AND EXTNDS UPTO LOWER TROPOSPHERIC LEVELS AAA

TTC RECORDED THE HIGHEST MAX TEMP OF 37 DEG C IN THE REGION AND KHAMMAM RECORDED THE LOWEST MIN TEMPERATURE OF 18 DEG C IN THE PLAINS OF THE REGION AAA

FCST AAA RA/TSH WOULD OCCUR AT MOST PLACES OVER KRL/LKDWP, CK AT MANY PLACES OVER NIK AND AT A FEW PLACES OVER TN/PDC,SIK,CAP AND TLGN AAA ISOL RA/TSH MAY OCCUR OVER RYLSM AAA

HRW AAA ISOL XX RA WOULD OCCUR OVER NIK DURING NEXT 48 HOURS AAA

ENDS AAA

L/FCST AAA

FOR NEXT 24 HRS AAA THE SKY CONDITIONS MAY BE GENERALLY CLOUDY AAA RA/TSH MAY OCCUR IN SOME AREAS AAA MAX AND MIN TEMP WOULD BE AROUND 35 AND 26 DEG C RESPECTIVELY AAA

FOR NEXT 48 HRS AAA THE SKY CONDITIONS MAY BE GENERALLY CLOUDY AAA RA/TSH MAY OCCUR IN SOME AREAS AAA MAX AND MIN TEMP WOULD BE AROUND 35 AND 26 DEG C RESPECTIVELY AAA

ENDS

=====

PART – C: UPPER AIR WINDS FORECAST OVER CHENNAI

WRF – MODEL OUTPUT INDICATES MAINLY SOUTHRLY TO SOUTHERLY WINDS OF THE ORDER OF 5 KNOTS UPTO 900 hPa AND EASTERLY WINDS OF THE ORDER OF 5 KNOTS FROM 900 hPa TO 500 hPa FOR NEXT 24 HOURS ENDING 00Z 20.10.2010

FDP (Cyclone) NOC Report Dated 20 October, 2010, 1500 hours

Weather Briefing:

Synoptic features:

- Yesterday's low pressure area over eastcentral Arabian Sea and neighbourhood has become less marked.
- Yesterday's low pressure area over eastcentral Bay and neighbourhood has become well marked over the same area. It is likely to intensify into a depression during next 24 hours.

Upper tropospheric ridge:

- A ridge line roughly runs along 21°N at 200 hPa level.

Divergence:

- Upper air positive divergence ($15 \times 10^{-5} \text{ s}^{-1}$) prevails over the low pressure area of eastcentral Bay.

Convergence:

- Lower level positive convergence ($10 \times 10^{-5} \text{ s}^{-1}$) prevails over east central Bay of Bengal.

Wind Shear:

- The wind Shear about 10-15 knots prevails over eastcentral Bay of Bengal.

Wind Shear Tendency:

- Negative wind shear tendency in past 24 hours (-5 to -10 knots) is prevailing over southwest of the system (westcentral Bay of Bengal).

Relative Vorticity:

- Relative vorticity at 850 hPa is positive over Bay of Bengal of the order and magnitude $8-10 \times 10^{-5} \text{ s}^{-1}$.

Sea Surface Temperature:

- SST around $30-31^{\circ}\text{C}$ over eastcentral Bay of Bengal and $28-29^{\circ}\text{C}$ over west central and adjoining south Bay of Bengal.

M.J.O. Index:

- Located over phase-6, likely to move to 7 and 8 during next 15 days.
- Statistical forecast:- MJO moves through phase 6,7 & 8 during next 15 days.
- Dynamical forecast:- MJO remains in phase 6 but with reduced amplitude during next 15 days.

Ocean thermal energy:

- Ocean thermal energy is below 100 KJ cm^{-2} over central Bay of Bengal.

Status of observational system:

Details of the status of observational system are given in Annexure 1.

Satellite

Broken intense to very intense convection over Bay between lat. 15.5°N to 19.5°N East of long 87.5°E and Arakan coast with Low Level Circulation over the area (.) Broken low/medium clouds with embedded isolated moderate to intense convection over rest Bay between lat 12.5°N to 20.5°N East of Long 86.5°E (.) Scattered low/medium clouds with embedded isolated weak convection over Andaman Sea.

(See <ftp://192.168.12.75/imd/satmet>
<http://www.imd.gov.in/section/satmet/dynamic/insat.htm>)

NWP

ECMWF model analysis of 00UTC of today (20 OCT 2010) shows that yesterday's a low pressure system developed into well marked low pressure area of 1006 hPa and 2 closed isobars lying over eastcentral Bay off the Myanmar coast. The cyclonic circulation associated with the low pressure system is extended upto 500 hPa. The forecast fields show the intensification of the system and moving northwestward initially then it recurves northeastwards and cross the north Myanmar coast on 23rd as a cyclonic storm.

IMDGFS model analysis of 00UTC of today (20 OCT 2010) shows an extended low pressure system over East central Bay & adjoining areas of Myanmar with center of pressure 1006 hPa. The cyclonic circulation associated with the low pressure system is extended upto 500 hPa. The forecast fields indicate no intensification of the system and moving northwestward initially and thereafter northeastward and crossing north Myanmar and adjoining Bangladesh coast on 23rd as cyclonic circulation.

WRF-ARW model analysis of 00UTC of today (20 OCT 2010) shows that an extended low pressure system of 1006hPa lies over East central Bay & adjoining areas of Myanmar. The cyclonic circulation associated with the low pressure system is extended upto 500 hPa. The forecast fields indicate further intensification of the system to depression and moving west northwestward it lies over west central Bay of Bengal off Bangladesh coast on 23rd as Depression.

WRF-NMM model analysis of 00UTC of today (20 OCT 2010) shows that an extended low pressure area lies over north Andaman & adjoining areas of Myanmar coast. The cyclonic circulation associated with low pressure system is extended upto 500hPa. The forecast fields indicate further intensification of the system to depression and moving initially northwestward to Eastcentral Bay and thereafter northeastward crossing the north Myanmar coast by 23rd as a depression.

(See <http://www.imd.gov.in/section/nhac/dynamic/welcome.htm>)

See ftp://ftp.ncmrwf.gov.in/pub/outgoing/TC_FDP/

FOC Report

Detailed report of FOC, Chennai is given in Annexure 2.

Advisory

Current environmental conditions and NWP models suggest that the well marked low pressure area over eastcentral Bay of Bengal would intensify further into a depression during next 24 hours.

IOP will be conducted Bhubaneswar (Orissa) and Kolkata (WB) for 0600 UTC on 21-10-2010.

Annexure-1

Status of Observation system:

Synop ← 19-10-2010 →← 20-10-2010 →

Region	09	12	15	18	21	00	03	06
KOL	34	21	22	22	16	19	21	19
CHN	41	25	35	38	31	23	25	25
MUM	38	24	19	18	16	24	13	12

AWS

19-10-2010														→←	20-10-2010										→
UTC	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	
Nos	504	503	505	505	504	504	449	457	453	452	458	456	457	450	454	455	453	505	507	515	506	505	502	500	

RSRW (12Z) 19-10-2010: - 31/36

No. of Ascents reaching 250 hPa levels:

MISDA:- GRK, DBH, SLG, RNC, GWL, BHP, NAG, RPR, JGD, AHM, AUG, PNJ, VSK, AMN (14)

(00Z) 19-10-2010: -36/36

No. of Ascents reaching 250 hPa levels: 26

MISDA:- SRN, JPR, DBH, SCZ, AMN, CHN (6)

Buoy Data

18-10-2010					19-10-2010		
09Z	12Z	15Z	18Z	21Z	00Z	03Z	05Z
01	01	-	-	-	01	01	01

No. of PILOT Ascents

18-10-2010		19-10-2010	
12Z	18Z	00Z	06Z
32	29	32	16

GPS:

12Z (19-10-2010) 01(HYD)

00Z (20-10-2010) NIL

Remark: Nil



India Meteorological Department

REGIONAL METEOROLOGICAL CENTRE, CHENNAI

FDP (Cyclone) FOC Chennai Report Dated 20 OCT 2010, 1400 hrs

PART – A: STATUS OF OBSERVATION SYSTEM

No of Synop data

Date→	19.10.2010							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	19	22	20	20	20	19	19	18

No. of RS/RW Ascents

00Z / 19.10.2010 : 4

No. of Ascents reaching 250 hpa level =4

MISDA : 3

12Z /19.10.2010 : 3

No. of Ascents reaching 250 hpa level =3

MISDA : 4

No. of PILOT Ascents:

19.10.2010	
06Z	18Z
4	3

Status of AWS data is given in FDPNOC report.

PART – B: RMC CHENNAI INFERENCE

CHENNAI MORNING INF DATED 20.10.2010

BAY INF AURORA AAA Y'S LOPAR OVER EC BAY AND N/HOOD PERSTS AND MAY BECOME MORE MARKED AAA MON GEN MOD OVER SOUTH BAY AND WK TO MOD OVER ELSEWHERE BAY AND SOUTH ADMN SEA AAA

ARSEA INF AURORA AAA Y'S LOPAR OVER EC ARSEA OFF MAHA COT PERSTS AAA A TRH FROM THIS SYSTEM OVER E ARSEA OFF GOA - KKA -KRL COT PERSTS AAA MON GEN MOD OVER ELSEWHERE ARSEA SOUTH OF LAT 21 DEG NORTH AAA WX SSL ELSEWHERE ARSEA AAA

REGN INF AAA SW MON HAS BEEN ACTIVE OVER KRL AAA Y'S TRH OF LOW PRESSURE OVER E ARSEA OFF GOA - KKA -KRL COT PERSTS AAA AN U/A CYCIR LIES OVER NTN AND N/HOOD AND EXTDS UPTO 0.9 KM ASL AAA TIRUTTANI RECORDED THE HIGHEST MAX TEMP OF 38 DEG C IN THE REGION AND KMT,ADL AND BLG(AP)RECORDED THE LOWEST MIN TEMPERATURE OF 19 DEG C IN THE PLAINS OF THE REGION AAA

FCST AAA RA/TSH WOULD OCCUR AT MANY PLACES OVER KRL AND CK AND AT A FEW PLACES OVER CAP AND TN/PDC AAA ISOL RA/TSH MAY OCCUR OVER TLGN, RYLS,IK AND LKD AAA

HRW AAA ISOL XX RA WOULD OCCUR OVER KRL AND CK DURING NEXT 48 HOURS AAA

PART – C: UPPER AIR WINDS FORECAST OVER CHENNAI

WRF – MODEL OUTPUT INDICATES MAINLY SOUTHERLY WINDS OF THE ORDER OF 5 KNOTS UPTO 925 hPa AND MAINLY EASTERLY WINDS OF THE ORDER OF 5 KNOTS FROM 925 hPa TO 600 hPa NEXT 24 HOURS ENDING 00Z 21.10.2010

FDP (Cyclone) NOC Report Dated 21 October, 2010, 1500 hours

Weather Briefing:

Synoptic features:

- The well marked low pressure area over eastcentral Bay of Bengal intensified into a depression and lay centred at 1200 UTC of yesterday, the 20th October 2010 over the same area near lat. 17.5°N and long 91.5°E. Remaining practically stationary, it further intensified into a deep depression at 0300 UTC and cyclonic storm at 0600 UTC of today 21st October 2010 over the same area.
- The current environmental conditions and numerical weather prediction (NWP) models suggest that the system would intensify further into a severe cyclonic storm. It would move northwards initially and then north-northeastwards and cross north Myanmar and adjoining Bangladesh coasts by tomorrow, the 22nd October 2010 evening between Teknaf (Bangladesh) and Kyaukpyu (Myanmar) near Sittwe (Myanmar).
- Based on latest analysis with NWP models and other conventional techniques, estimated track and intensity of the system are given in the Table below:

Date/Time(IST)	Position (lat. °N/ long. °E)	Sustained maximum surface wind speed (kmph)
21-10-2010/1130	17.5/91.5	65-75 gusting to 85
21-10-2010/1730	18.0/91.5	75-85 gusting to 95
21-10-2010/2330	18.5/92.0	85-95 gusting to 105
22-10-2010/0530	19.0/92.5	95-105 gusting to 115
22-10-2010/1130	19.5/92.5	115-125 gusting to 135
22-10-2010/2330	20.5/93.5	95-105 gusting to 115
23-10-2010/1130	21.5/94.5	55-65 gusting to 75
23-10-2010/2330	22.5/95.5	35-45 gusting to 55

Track of the cyclone GIRI is shown in figure 1

Upper tropospheric ridge:

- A ridge line roughly runs along 18°N at 200 hPa level.

Divergence:

- Upper air positive divergence ($15 \times 10^{-5} \text{ s}^{-1}$) prevails around system centre

Convergence:

- Lower level positive convergence ($10 \times 10^{-5} \text{ s}^{-1}$) prevails over east central Bay of Bengal.

Wind Shear:

- The wind Shear about 5-15 knots prevails over eastcentral Bay of Bengal.

Wind Shear Tendency:

- No significant change.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive over Bay of Bengal of the order and magnitude $15 \times 10^{-5} \text{ s}^{-1}$.

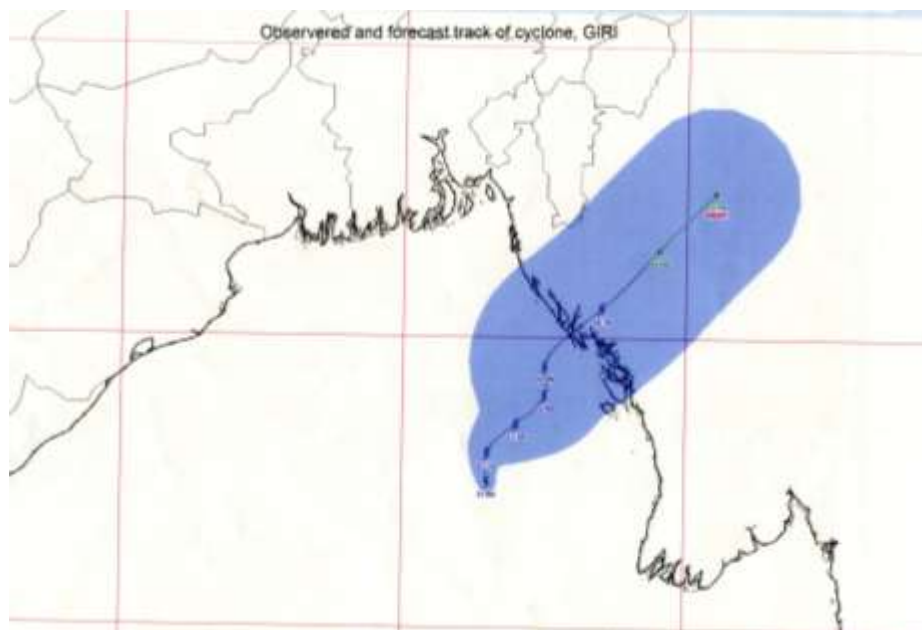


Figure 1. Track of the cyclone GIRI

Sea Surface Temperature:

- SST around 29-31⁰C over eastcentral Bay of Bengal and 28-29 ⁰C over west central and adjoining south Bay of Bengal.

M.J.O. Index:

- Located over phase-6.
- Statistical forecast:- MJO moves through phase 6,7 & 8 during next 15 days.
- Dynamical forecast:- MJO remains in phase 6 but with reduced amplitude during next 15 days.

Ocean thermal energy:

- Ocean thermal energy is below 100 KJ cm⁻² over central Bay of Bengal.

Status of observational system:

Details of the status of observational system are given in Annexure 1.

Satellite

Vortex over east central bay centered near lat 17.5N/91.8E (.) intensity T 2.5 (.) Associates broken intense to very intense convection over Bay between latitude 14.0N to 20.0N east of longitude 88.0E and Arakan coast (.) Scattered low/medium clouds with embedded isolated weak to moderate convection over south-east bay Andaman sea gulf of Martaban and Tenasserim coast (.)

(See <ftp://192.168.12.75/imd/satmet>
<http://www.imd.gov.in/section/satmet/dynamic/insat.htm>)

NWP

• **ECMWF** model analysis of 00UTC of today (21 OCT 2010) shows that yesterday's a low pressure system developed into well marked low pressure area of 1004 hPa and 4 closed isobars lying over eastcentral Bay of the Myanmar coast. The cyclonic circulation associated with the low pressure system is extended upto 500 hPa. It remains low for tomorrow (22 OCT 2010) too. The forecast fields indicates intensification of the

system and movement towards northeastward Burma coast. This low pressure system is hitting the Burma coast after 48 hours (23 OCT 2010) as a tropical cyclone. On 18 Oct. 2010 this low pressure system was covering Myanmar coast.

- **IMDGFS** model analysis of 00UTC of today (21 OCT 2010) shows that there is an extended low pressure system over East central Bay & adjoining areas of Myanmar with center of pressure 1006 hPa. The cyclonic circulation associated with the low pressure system is extended upto 700 hPa. IMDGFS could not pick up the analysis field. The forecast fields indicate no intensification of the system. After 48 hours (23 OCT 2010), there no structure. There is no intensification in winds at 850 hPa.

- **WRF-ARW** model analysis of 00UTC of today (21 OCT 2010) shows that an extended low pressure system of 1006hPa lies over East central Bay & adjoining areas of Myanmar. The forecast fields indicate further intensification of the system to 1004 hPa with 1 closed isobar and moving towards adjacent areas of Orissa coast and Bangladesh. After 48 hrs (23 Oct 2010), it remains as extended low. Earlier based on (19 OCT 2010), this low pressure system was moving west northwestward and it was lying over west central Bay of Benga off Orissa coast on 21st as Deep Depression. On 20 Oct this low pressure system was further intensifying into deep depression and moving towards Bangladesh.

- **WRF-NMM** model analysis of 00UTC of today (21 OCT 2010) shows that an extended low pressure area lies over north Andaman & adjoining areas of Myanmar coast. The cyclonic circulation associated with low pressure system is extended upto 500 hPa. The forecast fields indicate further intensification of the system to depression and moving initially northwestward to Eastcentral Bay and thereafter northeastward. Based on 20 Oct 2010, it was moving north eastward to east central Bay as depression.

- **UKMET** model analysis of 00UTC of today (21 OCT 2010) shows that a depression is lying near Bangladesh. The forecast fields indicate that it will dissipate in next 24 hrs (22 Oct 2010). There is no structure after 72 hrs. Based on 20 Oct 2010, it was indicating intensification and movement towards west northwestward till 23 OCT 2010.

- **NCEP-GFS** Based on yesterday's model analysis of (20 OCT 2010) shows that an extended low pressure system and there is no intensification. In the forecast, by 21 Oct 2010, it is moving towards Orissa as a low.

- **NCMRWF-GFS** Based on yesterday's (20 OCT 2010 00 UTC) shows that a low pressure system lies over eastcentral bay of the Myanmar coast.

- **JMA-GFS** Based on today (21 Oct 2010) shows that a low pressure system lies at 17.5°N 93.1°E (center). In the forecast, It is crossing 20.5°N 92.5°E as a low pressure system. Based on yesterday's model analysis (20 OCT 2010), it showed that there is low pressure system and there is no intensification after 48 hours.

- **ARPEGE** Based on 00 UTC of today (21 Oct 2010) shows that there is a low pressure system in the eastcentral bay near Myanmar coast moving northeastward. In the forecast, on 22 Oct 2010 at 00 UTC, it is becoming less marked over central bay.

Conclusions

There is no area which is likely to intensify in the numerical weather prediction except ECMWF model, which shows the system intensify upto very severe cyclonic storm with ECP of 975 hPa and crossing Myanmar coast near about 20.0° N around 1200 UTC of 22nd October, 2010 .

(See <http://www.imd.gov.in/section/nhac/dynamic/welcome.htm>)

See ftp://ftp.ncmrwf.gov.in/pub/outgoing/TC_FDP/

FOC Report

Detailed report of FOC, Chennai is given in Annexure 2.

Advisory

The current environmental conditions and numerical weather prediction (NWP) models suggest that the system would intensify further into a severe cyclonic storm. It would move northwards initially and then north-northeastwards and cross north Myanmar and adjoining Bangladesh coasts by tomorrow, the 22nd October 2010 evening between Teknaf (Bangladesh) and Kyaukpyu (Myanmar) near Sittwe (Myanmar).

IOP will be conducted with RS/RW or GPS Sonde upper air observations from Bhubaneswar (Orissa), Gopal pur, Balasore and Kolkata (WB) for 0600, 1200, 1800 and 0000 UTC upto 12 UTC of 22-10-2010.

Annexure-1

Status of Observation system:

Synop	← 20-10-2010					→← 21-10-2010			→
Region	09	12	15	18	21	00	03	06	
KOL	25	75	28	30	26	31	68	37	
CHN	41	71	34	34	35	30	81	44	
MUM	38	74	30	31	30	40	58	39	

AWS

20-10-2010													→←		21-10-2010								→	
UTC	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07
Nos	507	519	524	520	525	459	455	454	441	447	454	449	456	452	449	446	446	449	455	450	452	458	446	455

RSRW (12Z) 20-10-2010: - 35/35

No. of Ascents reaching 250 hPa levels:

MISDA:- SRN, LKN, GRK, DBH, SLG, RNC, AGT, GWL, BHP, NAG, RPR, JGD, AHM, AUG, PNJ, VSK, AMN (17)

No. of Ascents reaching 250 hPa levels: 00

MISDA:- SRN, NAG, PNJ, AMN, MNC, (5)

Buoy Data

20-10-2010					21-10-2010		
09Z	12Z	15Z	18Z	21Z	00Z	03Z	05Z
01	01	01	01	01	01	01	01

No. of PILOT Ascents

20-10-2010		21-10-2010	
12Z	18Z	00Z	06Z
32	51	31	29

GPS:

12Z (19-10-2010) 01(HYD)

00Z (20-10-2010) NIL

Remark: Nil

Annexure-2



India Meteorological Department

REGIONAL METEOROLOGICAL CENTRE, CHENNAI

FDP (Cyclone) FOC Chennai Report Dated 21 OCT 2010, 1400 hrs

PART – A: STATUS OF OBSERVATION SYSTEM

No of Synop data

Date→	20.10.2010							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	19	22	20	20	18	18	18	18

No. of RS/RW Ascents

00Z /20.10.2010 : 7

No. of Ascents reaching 250 hpa level =7

MISDA : 0

12Z /20.10.2010 : 6

No. of Ascents reaching 250 hpa level =6

MISDA : 1

No. of PILOT Ascents:

20.10.2010	
06Z	18Z
5	4

Status of AWS data is given in FDPNOC report.

PART – B: RMC CHENNAI INFERENCE

CHENNAI MORNING INF DATED 21.10.2010

BAY INF AURORA AAA LATEST SATELLITE CLOUD IMAGERIES AND SYNOPTIC OBSERVATIONS INDICATE THAT Y'DAY'S DEPRESSION OVER EC BAY FURTHER INTENSIFIED INTO A DEEP DEPRESSION AND LAY CENTRED AT 0300 UTC/21 OCT 2010 OVER THE SAME AREA NEAR LATITUDE 17.5 DEG N AND LONGITUDE 91.5 DEG E AT RPT 17.5 DEG N/91.5 DEG E ABOUT 650 KM SE OF DIGHA AAA IT

IS LIKELY TO INTENSIFY FURTHER AND MOVE INITIALLY IN NORTHRLY
DIRECTION AND THEN NORTHEASTWARDS TOWARDS MYANMAR COT AAA
MON GEN MOD OVER REST BAY AND ADMN SEA AAA

ARSEA INF AURORA AAA Y'DAY'S TRH OF LOW PRESSURE OVER EAST ARSEA
OFF GOA - KKA -KRL COT PERSTS AAA MON GEN MOD OVER REST ARSEA
SOUTH OF LAT 21 DEG NORTH AAA WX SSL ELSEWHERE ARSEA AAA

REGN INF AAA Y'DAY'S TRH OF LOW PRESSURE OVER EAST ARSEA OFF GOA-
KKA-KRL COT PERSTS AAA A TRH ON SLC RUNS FROM CAP TO EXTREME
SOUTH PENINSULA ACROSS CTN AAA

PALAYAMKOTTAI RECORDED THE HIGHEST MAX TEMP OF 39 DEG C IN THE
REGION AND ADL RECORDED THE LOWEST MIN TEMPERATURE OF 19 DEG C IN
THE PLAINS OF THE REGION AAA

FCST AAA RA/TSH WOULD OCCUR AT MANY PLACES OVER KRL AND CK AND AT
A FEW PLACES OVER CAP,TN/PDC,IK,RYLS AND LKD AAA ISOL RA/TSH MAY
OCCUR OVER TLGN AAA

ENDS AAA

=====

L/FCST AAA

FOR NEXT 24 HRS AAA THE SKY CONDITIONS MAY BE PARTLY CLOUDY AAA
RAIN/TSH MAY OCCUR IN SOME AREAS AAA MAX AND MIN TEMP WOULD BE
AROUND 34 AND 26 DEG C RESPECTIVELY AAA
FOR NEXT 48 HRS AAA THE SKY CONDITIONS MAY BE PARTLY CLOUDY AAA
RAIN/TSH MAY OCCUR IN SOME AREAS AAA MAX AND MIN TEMP WOULD BE
AROUND 34 AND 26 DEG C RESPECTIVELY AAA

ENDS AAA

=====

PART – C: UPPER AIR WINDS FORECAST OVER CHENNAI

WRF – MODEL OUTPUT INDICATES MAINLY WESTERLY WINDS OF THE ORDER
OF 5 KNOTS UPTO 900 hPa AND MAINLY EASTERLY WINDS OF THE ORDER OF
5 KNOTS FROM 900 hPa TO 500 hPa NEXT 24 HOURS ENDING 00Z 22.10.2010

FDP (Cyclone) NOC Report Dated 22 October, 2010, 1500 hours

Weather Briefing:

Synoptic features:

Yesterday's cyclonic storm, GIRI intensified further into a very severe cyclonic storm at 0600 UTC of today and moved northeastwards. It lay centered at 0900 UTC of today near lat 19.5 deg. N and long. 93.5 deg. E.

Sustained maximum surface wind speed is estimated to be about 90 knots gusting to 105 knots. The state of the sea is phenomenal around the system centre. The estimated central pressure is about 950 hpa. Satellite imagery indicates eye pattern with further organisation. The eye diameter has decreased further from 15 km at 0600UTC to 08 km at 0900 UTC of today indicating further intensification. The intensity of the system is t 5.5. Associated broken to solid intense to very intense convection is seen over eastcentral and adjoining northeast Bay of Bengal between latitude 16.0° n and 21.0°n and longitude east of 90.0° e. the lowest cloud top temperature (ctt) due to convection is around (-80°C) in association with the system. Kyaukpyu reported lowest pressure of 990.7 hpa and surface wind of south-southeasterly 35 knots and 24 hours pressure change of minus 11.9 hPa at 0900 utc.

The current environmental conditions and numerical weather prediction (NWP) models suggest that the system would intensify further and move northeastwards and cross myanmar coast between sittwe (48062) and kyaukpyu (48071) by today, the 22nd october 2010 between 1200 and 1500 utc. Sustained maximum wind speed of 200-210 kmph gusting to 230 kmph would occur along and off above coast at the time of landfall.

Based on latest analysis with nwp models and other conventional techniques, estimated track and intensity of the system are given in the table below:

Date/time(utc)	Position (lat. °n/ long. °e)	Sustained maximum surface wind speed (kmph)
22-10-2010/0900	19.5/93.5	190-200 gusting to 220
22-10-2010/1200	19.5/93.5	200-210 gusting to 230
22-10-2010/1800	20.0/94.0	160-170 gusting to 190
23-10-2010/0000	20.5/94.5	100-110 gusting to 125
23-10-2010/1200	22.0/95.5	55-65 gusting to 75
24-10-2010/0000	23.0/96.5	30-40 gusting to 50

Storm surge guidance

Storm surge of about 2.5-3.5 metres above the astronomical tide is expected at the time of landfall near the landfall point.

Track of the cyclone GIRI is shown in figure 1. And wind is shown in figure 2.

Upper tropospheric ridge:

▪ The upper tropospheric ridge roughly runs along 21°n at 200 hpa level. There is an anticyclonic circulation and associated ridge to the southeast of the system and is expected to influence the movement of the system towards the northeast direction.

Divergence:

- Upper air positive divergence ($10 \times 10^{-5} \text{ s}^{-1}$) prevails around system centre

Convergence:

- Lower level positive convergence ($40 \times 10^{-5} \text{ s}^{-1}$) prevails over east central Bay of Bengal.

Wind Shear:

- The wind Shear about 5-15 knots prevails over eastcentral Bay of Bengal.

Wind Shear Tendency:

- Negative wind shear tendency to the forward sector of the system.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive over Bay of Bengal of the order and magnitude $25 \times 10^{-5} \text{ s}^{-1}$.

Sea Surface Temperature:

- SST around $29-31^{\circ}\text{C}$ over eastcentral Bay of Bengal and $28-29^{\circ}\text{C}$ over west central and adjoining south Bay of Bengal.

M.J.O. Index:

- Located over phase-6.
- Statistical forecast:- MJO moves through phase 6,7 & 8 during next 15 days.
- Dynamical forecast:- MJO remains in phase 6 but with reduced amplitude during next 15 days.

Ocean thermal energy:

- Ocean thermal energy is below 100 KJ cm^{-2} over central Bay of Bengal.

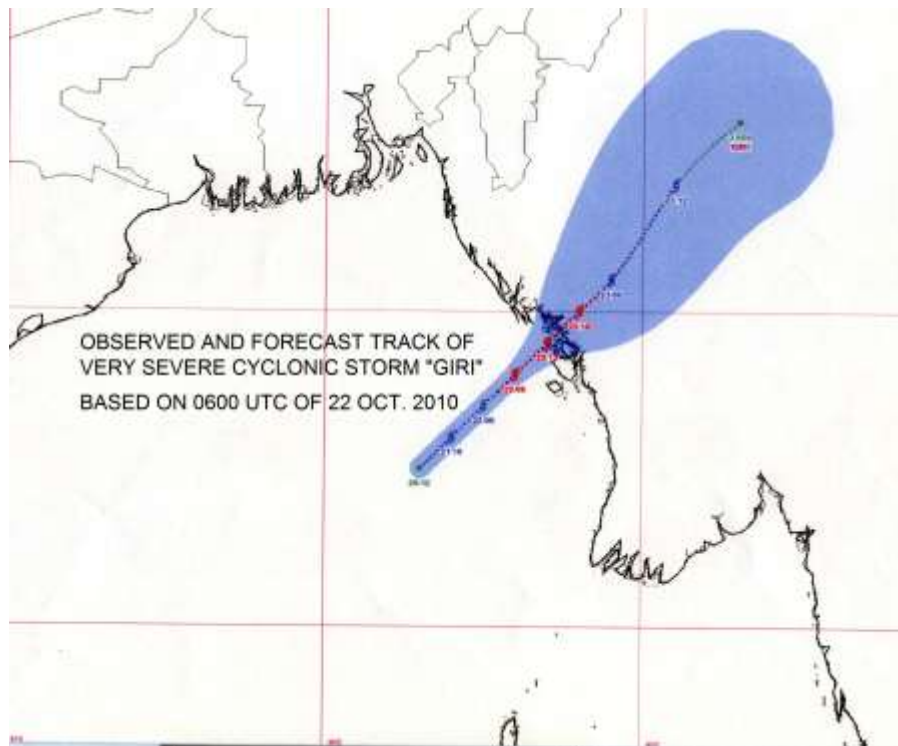


Figure 1. Track of the cyclone GIRI

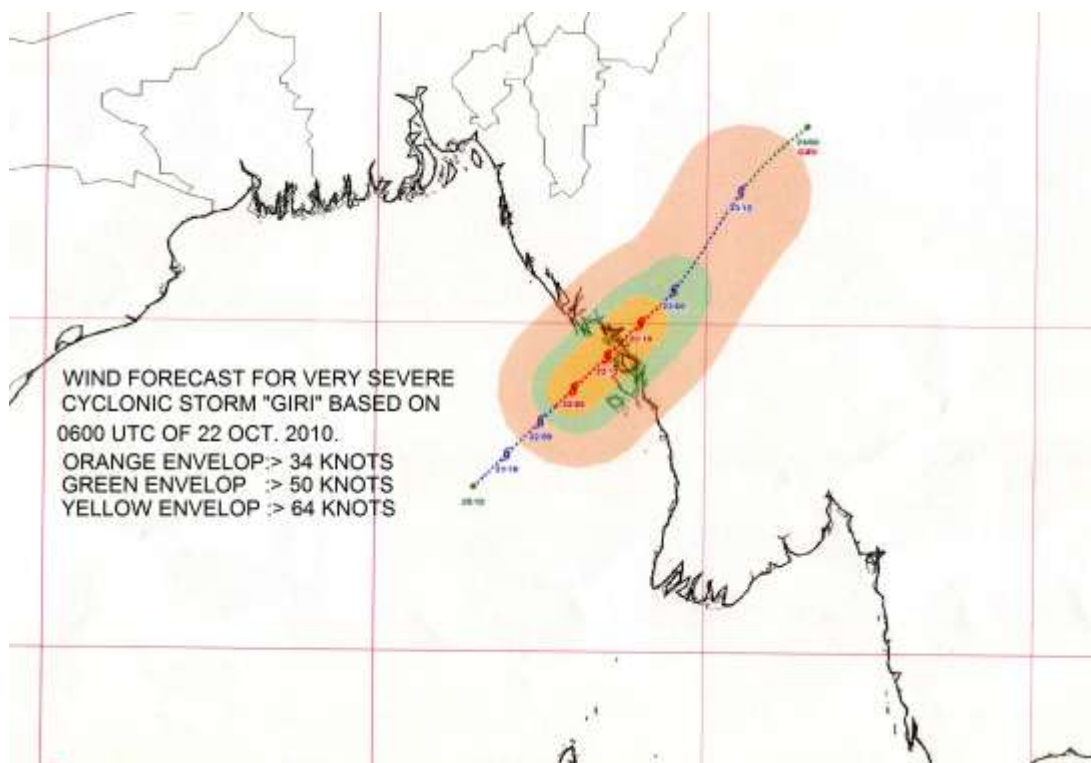


Fig.2. Wind forecast issued by IMD in connection with cyclone GIRI

Status of observational system:

Details of the status of observational system are given in Annexure 1.

Satellite

Vortex over East Central adjoining North-East bay of bengal centred at 19.2degN/93.1degE (.) Intensity T 5.5 (.) Associated Broken solid intense to very intense convection over bay of bengal between latitude 16.0degN to 21.0degN East of longitude 90.0degE (.) Scattered low/medium clouds with embedded moderate to intense convection over rest east central bay rest north bay and south bay north of latitude 8.5degN and weak to moderate convection over rest south bay (.)

(See <ftp://192.168.12.75/imd/satmet>

<http://www.imd.gov.in/section/satmet/dynamic/insat.htm>)

NWP

- **ECMWF** model analysis of 00UTC of today (22 OCT 2010) shows that yesterday's a deep depression become a severe cyclonic storm of 975 near Burma coast. In the forecast, It will be going to cross the Myanmar coast in next 24 hrs (15UTC of 22 Oct 2010). It is extended upto 500 hpa.

- **IMDGFS** model analysis of 00UTC of today (22 OCT 2010) shows that there is an extended low pressure system in Bay of Bengal. The forecast show no intensification of the system. However the circulation features indicate the system is likely to cross the Myanmar coast around 22 October 18UTC.

- **WRF-ARW** model analysis of 00UTC of today (22 OCT 2010) shows that an extended low pressure system of 1004 hPa lies over central Bay. The forecast fields indicate no further intensification of the system.

- **WRF-NMM** model analysis of 00UTC of today (22 OCT 2010) shows that a low pressure area lies over Burma coast. In the forecast, It will be going to hit Burma coast at 12UTC.
- **UKMET** model analysis of 00UTC of today (22 OCT 2010) shows that there is feeble cyclonic circulation at 850 hPa in the Bay of Bengal.
- **NCEP-GFS** Based on 22 Oct 2010 model analysis at 00 UTC, there is a low pressure area adjacent to Burma coast. In the forecast, It is moving towards India as an extended low in the next 24 hrs (23 Oct 2010).
- **NCMRWF-GFS** Based on 22 Oct 2010 00 UTC there is a low pressure are near Burma coast.
- **JMA-GFS** Based on 22 Oct 2010 model anaylysis at 00 UTC, there is a low pressure area near Mayanmar coast in the Eastcentral bay. In the forecast, there is no structure in the next 48 hrs.
- **ARPEGE** Based on 22 Oct 2010 model analysis at 00 UTC, there is a low pressure area adjacent to Burma coast. In the forecast, It is dissipating in the next 24 hrs (23 Oct 2010).

Conclusions

ECMWF model shows the system intensified to very severe cyclonic storm with CSP of 975 hPa and crossing Myanmar coast near about 20.0° N around 1500 UTC of 22nd October, 2010 .

(See <http://www.imd.gov.in/section/nhac/dynamic/welcome.htm>)

See ftp://ftp.ncmrwf.gov.in/pub/outgoing/TC_FDP/

FOC Report

Detailed report of FOC, Chennai is given in Annexure 2.

Advisory

The current environmental conditions and numerical weather prediction (NWP) models suggest that the very severe cyclonic storm, GIRI would cross Myanmar coast between Sittwe and Kyaukpyu between 1200 and 1500 UTC of 22 October 2010.

There is no likelihood of fresh cyclogenesis during next 3 days. Hence there will be no IOP till 25th October 2010.

Annexure-1

Status of Observation system:

Synop	←	21-10-2010					→←	22-10-2010			→
Region	09	12	15	18	21	00	03	06			
KOL	29	63	23	21	21	19	21	17			
CHN	35	45	33	32	36	25	25	30			
MUM	23	42	24	17	24	12	13	18			

AWS

20-10-2010													↔	21-10-2010							→			
UTC	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07
Nos	518	452	449	461	436	514	502	457	560	514	540	542	535	541	534	542	546	457	455	451	458	462	459	458

RSRW (12Z) 21-10-2010: - 35/35

No. of Ascents reaching 250 hPa levels:

MISDA:- SRN, PTL, JDP, LKN, GRK, DBH, SLG, PTN, RNC, AGT, GWL, BHP, NAG, RPR, JGD, BOM, AHM, AUG, PNJ, VSK, AMN (21)

No. of Ascents reaching 250 hPa levels: 00

MISDA:- SRN, GWL, AMN (3)

Buoy Data

20-10-2010					21-10-2010		
09Z	12Z	15Z	18Z	21Z	00Z	03Z	05Z
01	01	01	01	01	01	01	01

No. of PILOT Ascents

20-10-2010		21-10-2010	
12Z	18Z	00Z	06Z
36	36	31	11

GPS:

12Z (21-10-2010) 02(HYD, CHN)

00Z (21-10-2010) (CHN)

Remark: Nil

Annexure-2



India Meteorological Department

REGIONAL METEOROLOGICAL CENTRE, CHENNAI

FDP (Cyclone) FOC Chennai Report Dated 21 OCT 2010, 1400 hrs

PART – A: STATUS OF OBSERVATION SYSTEM

No of Synop data

Date→	21.10.2010							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	19	22	20	20	21	18	19	18

No. of RS/RW Ascents

00Z / 21.10.2010 : 3

No. of Ascents reaching 250 hpa level =3

MISDA : 4

12Z /21.10.2010 : 3

No. of Ascents reaching 250 hpa level =3

MISDA : 4

No. of PILOT Ascents:

21.10.2010	
06Z	18Z
4	4

Status of AWS data is given in FDPNOC report.

PART – B: RMC CHENNAI INFERENCE

CHENNAI MORNING INF DATED 22.10.2010

BAY INF AURORA AAA LATEST SATELLITE CLOUD IMAGERIES AND SYNOPTIC OBSERVATIONS INDICATE THAT THE CYCLONIC STORM "GIRI" OVER EC AND ADJ NE BAY FURTHER INTENSIFIED INTO A SEVERE CYCLONIC STORM OVER THE SAME AREA AROUND 0000 UTC OF 22ND OCT 2010 AND FURTHER INTENSIFIED INTO A VERY SEVERE CYCLONIC STORM AND MOVED NE-WARDS AND LAY CENTRED AT 0300 UTC OF 22ND OCT 2010 OVER NE BAY NEAR LATITUDE 19.0 DEGREE NORTH AND LONGITUDE 93.0 DEGREE EAST RPT LAT 19.0 DEG N/LONG 93.0 DEG E AT ABOUT 650 KM SE OF DIGHA (WEST BENGAL) THE SYSTEM WOULD INTENSIFY FURTHER AND MOVE NE-WARDS AND CROSS MYANMAR COT BETWEEN SITTWE AND KYAUKPYU (MYANMAR) BY TODAY THE 22ND OCTOBER 2010 EVENING/NIGHT AAA MON GEN MOD OVER SOUTH BAY AND SOUTH ADMN SEA AND GEN STG OVER REST BAY AND NORTH ADMN SEA AAA

ARSEA INF AURORA AAA Y'DAY'S TRH OF LOW PRESSURE OVER EAST ARSEA OFF GOA - KKA -KRL COT PERSTS AAA MON MOD TO STG OVER RESTCENTRAL AND SOUTH ARSEA AND GEN MOD ELSEWHERE ARSEA SOUTH OF LAT 21 DEG NORTH AAA WX SSL ELSEWHERE ARSEA AAA

REGN INF AAA SW MON HAS BEEN VIGROUS OVER CK AND ACTIVE OVER KRL AAA Y'DAY'S TRH OF LOW PRESSURE OVER EAST ARSEA OFF GOA-KKA-KRL COT PERSTS AAA Y'DAY'S TRH ON SLC NOW RUNS FROM SCAP TO GULF OF MANNAR ACROSS CTN AAA
PALAYAMKOTTAI AND TUNI RECORDED THE HIGHEST MAX TEMP OF 37 DEG C IN THE REGION AND ADL RECORDED THE LOWEST MIN TEMPERATURE OF 19 DEG C IN THE PLAINS OF THE REGION AAA

FCST AAA RA/TSH WOULD OCCUR AT MOST PLACES OVER KRL AND CK,AT MANY PLACES OVER SIK AND LKD AND AT A FEW PLACES OVER TN/PDC,RYLS AND TLGN AAA ISOL RA/TSH MAY OCCUR OVER CAP AND NIK AAA HRW AAA ISOL XX RA WOULD OCCUR OVER CK,KRL AND GHAT AREAS OF SIK DURING NEXT 48 HOURS AAA

PART – C: UPPER AIR WINDS FORECAST OVER CHENNAI

WRF – MODEL OUTPUT INDICATES MAINLY WESTERLY WINDS OF THE ORDER OF 5 KNOTS UPTO 700 hPa AND FROM 700 hPa LIGHT WIND BACKING WITH HEIGHT UPTO 450 hPa AND FROM 450 hPa TO 200 hPa EASTERLY WINDS OF THE ORDER OF 5-10 KNOTS FOR NEXT 24 HOURS ENDING 00Z 24.10.2010

FDP (Cyclone) NOC Report Dated 23 October, 2010, 1500 hours
Weather Briefing:

Synoptic features:

Yesterday's very severe cyclonic storm 'GIRI' over northeast Bay of Bengal continued to move northwards and crossed Myanmar coast about 70 km east-southeast of Sittwe (Myanmar) between 1900 to 2100 hours IST of 22nd October, 2010. It moved further northeastwards and weakened into a severe cyclonic storm at 0230 hours IST, cyclonic storm at 0530 hours IST and into a depression at 1130 hours IST of today the 23rd October, 2010 and lay centered near lat 22.0°N and long. 95.0°E over northeast Myanmar. The system is likely to move northeastwards and weaken further into a well marked low pressure area.

Track of the cyclone GIRI is shown in figure 1

Upper tropospheric ridge:

- The upper tropospheric ridge line roughly runs along 19.0°N at 200 hpa level.

Divergence:

- Upper air positive divergence ($5-10 \times 10^{-5} \text{ s}^{-1}$) prevails over north and central Bay of Bengal.

Convergence:

- Lower level positive convergence ($10 \times 10^{-5} \text{ s}^{-1}$) prevails over north and central Bay of Bengal.

Wind Shear:

- The wind Shear about 10-20 knots prevails over Bay of Bengal.

Wind Shear Tendency:

- Negative wind shear tendency over parts of southeast, central and adjoining northwest Bay of Bengal.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive over Bay of Bengal of the order and magnitude $0-20 \times 10^{-5} \text{ s}^{-1}$.

Sea Surface Temperature:

- SST around 30°C over northwest, westcentral and southwest Bay of Bengal and 28-29 °C over eastcentral and southeast Bay of Bengal.

M.J.O. Index:

- Located over phase-6.
- Statistical forecast:- MJO moves through phase 6,7 & 8 during next 15 days.
- Dynamical forecast:- MJO remains in phase 6 but with reduced amplitude during next 15 days.

Ocean thermal energy:

- Ocean thermal energy is below 100-130 KJ cm⁻² over southeast and adjoining eastcentral Bay of Bengal.



INDIA
METEOROLOGICAL DEPARTMENT



Observed and Forecast Track

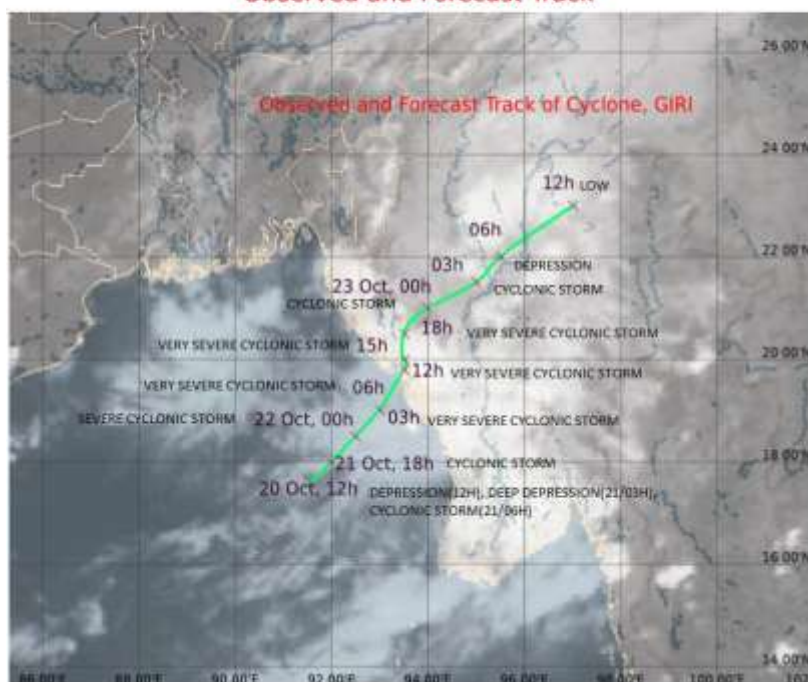


Figure 1. Track of the cyclone GIRI

Status of observational system:

Details of the status of observational system are given in Annexure 1.

Satellite

Broken low/med clouds with embedded moderate to intense convection over Bay of Bengal North of Lat 18.0°N East of Long 88.5°E eastcentral Bay Gulf of Martaban (.)
Scattered low/med clouds with embedded isolated weak to moderate convection over Bay of Bengal North of lat 11.5°N(.)

(See <ftp://192.168.12.75/imd/satmet>

<http://www.imd.gov.in/section/satmet/dynamic/insat.htm>)

NWP

- **ECMWF** model analysis of 00UTC of today (23 OCT 2010) shows that a depression lies over Burma region. The system is likely to weaken in the next 24hours. During next 48 hours there is no likely development of any system.

- **IMDGFS** model analysis of 00UTC of today (23 OCT 2010) shows a feeble cyclonic circulation lying off the Chennai coast.

- **WRF-ARW** model analysis of 00UTC of today (23 OCT 2010) shows a feeble cyclonic circulation near to Chennai region.

Conclusions:

The NWP models suggest that during next 72 hours there is no likely development of systems either in the Bay of Bengal or Arabian Sea.

(See <http://www.imd.gov.in/section/nhac/dynamic/welcome.htm>)

See ftp://ftp.ncmrwf.gov.in/pub/outgoing/TC_FDP/

FOC Report

Detailed report of FOC, Chennai is given in Annexure 2.

Advisory

The current environmental conditions and numerical weather prediction (NWP) models suggest that there is no likelihood of fresh cyclogenesis during next 3 days. Hence there will be no IOP till 25th October 2010.

Annexure-1

Status of Observation system:

Synop ← 22-10-2010 →← 23-10-2010 →

Region	09	12	15	18	21	00	03	06
KOL	34	68	26	28	27	32	70	37
CHN	45	69	37	35	35	39	78	45
MUM	36	70	13	23	10	30	85	40

AWS

21-10-2010													↔	22-10-2010										→
UTC	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07
Nos	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	--	-	-	-	-	-	-

RSRW (12Z) 22-10-2010: - 35/35

No. of Ascents reaching 250 hPa levels: 16

MISDA:- SRN, PTL, JDP, LKN, GRK, DBH, SLG, PTN, RNC, AGT, GWL, NAG, RPR, AHM, AUG, PNJ, VSK, AMN (18)

RSRW (00Z) 23-10-2010: - 36/36

No. of Ascents reaching 250 hPa levels: 25

MISDA:- GHT, MUM, HYD, MNG, BNG, AMN (6)

Buoy Data

21-10-2010					22-10-2010		
09Z	12Z	15Z	18Z	21Z	00Z	03Z	05Z
01	01	01	01	01	01	01	01

No. of PILOT Ascents

21-10-2010		22-10-2010	
12Z	18Z	00Z	06Z
62	19	68	15

GPS:

12Z (22-10-2010) (nil)

00Z (22-10-2010) (nil)

Remark: Nil



India Meteorological Department

REGIONAL METEOROLOGICAL CENTRE, CHENNAI

FDP (Cyclone) FOC Chennai Report Dated 23 OCT 2010, 1400 hrs

PART – A: STATUS OF OBSERVATION SYSTEM

No of Synop data

Date→	22.10.2010							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	19	22	20	20	22	19	19	18

No. of RS/RW Ascents

00Z / 22.10.2010 : 4

No. of Ascents reaching 250 hpa level =3

MISDA : 3

12Z / 22.10.2010 : 3

No. of Ascents reaching 250 hpa level =3

MISDA : 4

No. of PILOT Ascents:

22.10.2010	
06Z	18Z
3	4

Status of AWS data is given in FDPNOC report.

PART – B: RMC CHENNAI INFERENCE

CHENNAI MORNING INF DATED 23.10.2010

BAY INF AURORA AAA MON GEN MOD OVER BAY AND ADMN SEA AAA
ARSEA INF AURORA AAA Y'DAY'S TRH OF LOW PRESSURE OVER EAST ARSEA
FF GOA - KKA -KRL COT PERSTS AAA MON GEN MOD OVER REST ARSEA
SOUTH OF LAT 21 DEG NORTH AAA WX SSL ELSEWHERE ARSEA AAA

REGN INF AAA SW MON HAS BEEN VIGROUS OVER CK, TLGN AND ACTIVE OVER
KRL AAA Y'DAY'S TRH OF LOW PRESSURE OVER EAST ARSEA OFF GOA - KKA -
KRL COT PERSTS AAA Y'DAY'S TRH ON SLC NOW RUNS FROM CAP TO EXT
STN ACROSS CTN AAA

KHAMMAM RECORDED THE HIGHEST MAX TEMP OF 39 DEG C IN THE REGION
AND ADL CHAMRAJNAGAR AND MANDYA RECORDED THE LOWEST MIN
TEMPERATURE OF 19 DEG C IN THE PLAINS OF THE REGION AAA

FCST AAA RATSH WOULD OCCUR AT MOST PLACES OVER CK,AT MANY
PLACES OVER KER SIK AND AT A FEW PLACES OVER NIK TN/PDC, AP AND LKD
AAA

HRW AAA ISOL XX RA WOULD OCCUR OVER CK,KRL AND GHAT AREAS OF SIK
DURING NEXT 48 HOURS AAA

=====

L/FCST FOR CHENNAI AAA

FOR NEXT 24 HRS AAA THE SKY CONDITIONS MAY BE GENERALLY CLOUDY AAA
RAIN/TSH MAY OCCUR IN SOME AREAS AAA MAX AND MIN TEMP WOULD BE
AROUND 34 AND 26 DEG C RESPECTIVELY AAA FOR NEXT 48 HRS AAA THE
SKY CONDITIONS MAY BE GENERALLY CLOUDY AAA RAIN/TSH MAY OCCUR IN
SOME AREAS AAA MAX AND MIN TEMP WOULD BE AROUND 34 AND 26 DEG
C RESPECTIVELY AAA

PART – C: UPPER AIR WINDS FORECAST OVER CHENNAI

WRF – MODEL OUTPUT INDICATES MAINLY WESTERLY WINDS OF THE ORDER
OF 5 KNOTS FROM 925 hPa TO 450 hPa AND LIGHT WIND BACKING WITH
HEIGHT FROM 450 hPa BECOMING EASTERLY 5 KNOTS UPTO 100 hPa FOR
NEXT 24 HOURS ENDING 00Z 24.10.2010.

FDP (Cyclone) NOC Report Dated 24 October, 2010, 1500 hours
Weather Briefing:

Synoptic features:

Yesterday's depression lay over Myanmar at 1130 hours IST further moved northeastwards and weakened into a well marked low pressure area at 1730 hours IST of 23rd October, 2010 over central parts of Myanmar.

An upper air cyclonic circulation lies over south Andhra Pradesh and adjoining northTamilnadu and westcentral Bay of Bengal.

Upper tropospheric ridge:

- The upper tropospheric ridge line roughly runs along 17.0°N at 200 hpa level.

Divergence:

- Upper air positive divergence ($5 \times 10^{-5} \text{ s}^{-1}$) prevails over most parts of Bay of Bengal.

Convergence:

- Lower level positive convergence ($5 \times 10^{-5} \text{ s}^{-1}$) prevails over north and central Bay of Bengal.

Wind Shear:

- The wind Shear about 5-10 knots over westcentral Bay of Bengal and 10-20 knots over rest Bay of Bengal..

Wind Shear Tendency:

- Negative wind shear (5 knots) tendency over westcentral Bay of Bengal and 5-10 knots over southeast Bay of Bengal.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive over westcentral Bay of Bengal of the order and magnitude $10\text{-}40 \times 10^{-5} \text{ s}^{-1}$ and negative over Andaman sea and southeast Bay of Bengal (-10 to $-30 \times 10^{-5} \text{ s}^{-1}$)

Sea Surface Temperature:

- SST around 30°C over northwest, westcentral and southwest Bay of Bengal and 28-29 °C over eastcentral and southeast Bay of Bengal.

M.J.O. Index:

- Located over phase-5.
- Statistical forecast:- MJO moves through phase 5,7 & 8 during next 15 days.
- Dynamical forecast:- MJO remains in phase 5 & 6 but with reduced amplitude during next 15 days.

Ocean thermal energy:

- Ocean thermal energy is below 100-130 KJ cm⁻² over southeast Bay of Bengal.

Status of observational system:

Details of the status of observational system are given in Annexure 1.

Satellite

Scattered low/med clouds with embedded moderate to intense convection over Bay of Bengal North of Lat 10.5°N and over Arakan coast (.) Scattered low/med clouds with embedded weak to moderate convection at one/two places over Andaman Sea.(.)

(See <ftp://192.168.12.75/imd/satmet>
<http://www.imd.gov.in/section/satmet/dynamic/insat.htm>)

NWP

ECMWF model analysis of 00UTC of today (24 OCT 2010) shows the upper air cyclonic circulation over south Andhra Pradesh and north Tamilnadu and adjoining westcentral Bay of Bengal emerge over westcentral Bay of Bengal.

Another fresh upper air cyclonic circulation form over southeast Bay of Bengal around 27 October, 2010.

Conclusions:

The NWP model suggest that during next 48 hours there is no likely development of systems either in the Bay of Bengal or Arabian Sea.

(See <http://www.imd.gov.in/section/nhac/dynamic/welcome.htm>)

See ftp://ftp.ncmrwf.gov.in/pub/outgoing/TC_FDP/

FOC Report

Detailed report of FOC, Chennai is given in Annexure 2.

Advisory

The current environmental conditions and numerical weather prediction (NWP) models suggest that there is no likelihood of fresh cyclogenesis during next 2 days.

Hence there will be no IOP till 25th October 2010.

Annexure-1

Status of Observation system:

Synop ← 23-10-2010 →← 24-10-2010 →

Region	09	12	15	18	21	00	03	06
KOL	33	21	22	24	22	19	20	20
CHN	40	25	34	26	32	25	25	21
MUM	13	12	11	15	16	12	13	12

AWS

21-10-2010 →← 22-10-2010 →

UTC	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07
Nos	-	-	-	-	445	455	459	452	447	445	447	456	446	450	455	438	455	--	-	-	-	-	-	-

RSRW (12Z) 23-10-2010: -

No. of Ascents reaching 250 hPa levels: 34/35

MISDA:- PTL, JDP, LKN, GRK, DBH, SLG, PTN, RNC, AGT, GWL, BHP, RPR, JGD, AHM, AUG, PNJ, VSK, MPT, MNG, AMN (20)

RSRW (00Z) 24-10-2010: - 36/36

No. of Ascents reaching 250 hPa levels:

MISDA:- 36/36 PTL, GHT, PNG, MNG (4)

Buoy Data

21-10-2010					22-10-2010		
09Z	12Z	15Z	18Z	21Z	00Z	03Z	06Z
-	-	01	01	01	01	01	-

No. of PILOT Ascents

21-10-2010		22-10-2010	
12Z	18Z	00Z	06Z
21	39	30	19

GPS:

12Z (22-10-2010) (nil)

00Z (22-10-2010) (nil)

Remark: Nil

Annexure-2



India Meteorological Department

REGIONAL METEOROLOGICAL CENTRE, CHENNAI

FDP (Cyclone) FOC Chennai Report Dated 24 OCT 2010, 1400 hrs

PART – A: STATUS OF OBSERVATION SYSTEM

No of Synop data

Date→	23.10.2010							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	19	22	20	20	21	19	19	18

No. of RS/RW Ascents

00Z / 23.10.2010 : 4

No. of Ascents reaching 250 hpa level =3

MISDA : 0

12Z /23.10.2010 : 4
 No. of Ascents reaching 250 hpa level =3
MISDA : 0
No. of PILOT Ascents:

23.10.2010	
06Z	18Z
1	4

Status of AWS data is given in FDPNOC report.

PART – B: RMC CHENNAI INFERENCE

CHENNAI MORNING INF DATED 24.10.2010

BAY INF AURORA AAA A TRH OF LOW PRESSURE EXTDS FROM NW BAY TO NORTH ANDMN SEA ACROSS CENTRAL BAY AAA MON MOD TO STG OVER WC BAY AND GEN MOD OVER REST BAY AND S ANDMN SEA AAA

ARSEA INF AURORA AAA Y'S TRH OF LOW PRESSURE OVER EAST ARSEA OFF GOA - KKA -KRL COT PERSTS AAA MON GEN MOD OVER REST ARSEA SOUTH OF LAT 21 DEG NORTH AAA WX SSL ELSEWHERE ARSEA AAA

REGN INF AAA SW MON HAS BEEN VIGORUS OVER TLGN AND ACTIVE OVER CAP AND NIK AAA Y'S TRH OF LOW PRESSURE OVER EAST ARSEA OFF GOA - KKA - KRL COT PERSTS AAA Y'S TRH ON SLC NOW RUNS FROM SCAP TO EXTREME SOUTH PENINSULA ACROSS ITN AAA AN U/A CYCIR LIES OVER CAP AND N/HOOD EXTDS UP TO 2.1 KM ASL AAA

TUNI,PLM RECORDED THE HIGHEST MAX TEMP OF 37 DEG C IN THE REGION AND BLG AP RECORDED THE LOWEST MIN TEMPERATURE OF 19 DEG C IN THE PLAINS OF THE REGION AAA

FCST AAA RA/TSH WOULD OCCUR AT MOST PLACES OVER CK, AT MANY PLACES OVER KRL, LKD, IK, CAP AND TLGN AND AT A FEW PLACES OVER TN/PDC AAA

HRW AAA ISOL XX RA WOULD OCCUR OVER CK,KRL,TLGN,CAP AND GHAT AREAS OF SIK DURING NEXT 48 HOURS AAA

PART – C: UPPER AIR WINDS FORECAST OVER CHENNAI

WRF – MODEL OUTPUT INDICATES MAINLY WESTERLY WINDS OF THE ORDER OF 5 KNOTS FROM 950 hPa TO 400 hPa AND FROM 400 hPa LIGHT WESTERLY WINDS BACKING WITH HEIGHT AND BECOMING EASTERLY OF THE ORDER OF 5-10 KNOTS UPTO 250 hPa AND MAINLY EASTERLY WIND OF THE ORDER OF 15-25 KTS FROM THERE TO 100hPa FOR NEXT 24 HOURS ENDING 00Z 25.10.2010

FDP (Cyclone) NOC Report Dated 25 October, 2010, 1500 hours
Weather Briefing:

Synoptic features:

The upper air cyclonic circulation over westcentral Bay of Bengal and adjoining coastal Andhra Pradesh persists extending upto 2.1 km above mean sea level.

Upper tropospheric ridge:

- The upper tropospheric ridge line roughly runs along 16.0°N at 200 hPa level.

Divergence:

- Upper air positive divergence ($5-10 \times 10^{-5} \text{ s}^{-1}$) prevails over westcentral and adjoining southwest of Bay of Bengal.

Convergence:

- Lower level positive convergence ($5-10 \times 10^{-5} \text{ s}^{-1}$) prevails westcentral Bay of Bengal.

Wind Shear:

- The wind Shear low to moderate (upto 20 knots) over central Bay of Bengal and high over rest Bay of Bengal.

Wind Shear Tendency:

- Negative wind shear (5 knots) tendency over south and adjoining central Bay of Bengal and 5-10 knots rise over north coastal Andhra Pradesh and adjoining Bay of Bengal.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive over westcentral Bay of Bengal of the order and magnitude $20-50 \times 10^{-5} \text{ s}^{-1}$.

All the above indicate that the cyclonic circulation over westcentral Bay of Bengal may lead to formation of a low pressure area during next 24 hours.

Sea Surface Temperature:

- SST around 29-31°C over northwest, westcentral and southwest Bay of Bengal and 28-29 °C over eastcentral and southeast Bay of Bengal.

M.J.O. Index:

- Located over phase-5 with amplitude slightly more than 1.
- Statistical forecast:- MJO moves through phase 5, 6, 7 & 8 during next 15 days.
- Dynamical forecast:- MJO remains in phase 5 & 6 but with reduced amplitude during next 15 days.

Ocean thermal energy:

- Ocean thermal energy is below 100 KJ cm⁻² over Bay of Bengal except westcentral Bay where it is approx. 100 KJ cm⁻².

Status of observational system:

Details of the status of observational system are given in Annexure 1.

Satellite

Broken Low/Medium clouds with embedded moderate to intense convection over west-central adjoining northwest Bay of Bengal between Lat 13.0N to 19.5N west of Long 86.0E (CTT MINUS 67 DEG C) south coastal Orissa and coastal Andhra Pradesh. Clouds are persisting over this region from last (24th) evening but there are negligible chances for development of a system as convection is very close to the coast.

(See <ftp://192.168.12.75/imd/satmet>

<http://www.imd.gov.in/section/satmet/dynamic/insat.htm>)

NWP

- **ECMWF** model analysis of 00UTC of today (25 OCT 2010) shows that a cyclonic circulation over west central Bay of Bengal off Andhra Pradesh coast and formation of another fresh cyclonic circulation over southeast Bay of Bengal around 27 October, 2010. The forecast fields indicate no intensification of both the systems.
- **GFS** model analysis of 00UTC of today (25 OCT 2010) shows that a cyclonic circulation over west central Bay of Bengal off Andhra Pradesh coast and extended upto 700 hPa. The forecast fields indicate no intensification of the system.
- **WRF** model analysis of 00UTC of today (25 OCT 2010) shows that a cyclonic circulation over west central Bay of Bengal off Andhra Pradesh coast. The forecast fields indicate no intensification of the system and formation of another fresh cyclonic circulation over southeast Bay of Bengal around 28 October, 2010.

Conclusions:

NWP models suggest that during next 72 hours there is no likely development of system in the Bay of Bengal.

(See <http://www.imd.gov.in/section/nhac/dynamic/welcome.htm>)

See ftp://ftp.ncmrwf.gov.in/pub/outgoing/TC_FDP/

FOC Report

Detailed report of FOC, Chennai is given in Annexure 2.

Advisory

The current environmental conditions and numerical weather prediction (NWP) models suggest **that a low pressure may form over westcentral Bay of Bengal. However, it is expected to intensify further.**

Hence there will be no IOP till 27th October 2010.

Annexure-1

Status of Observation system:

Synop ← 24-10-2010 → ← 25-10-2010 →

Region	09	12	15	18	21	00	03	06
KOL	61	79	36	27	19	28	-	-
CHN	60	108	40	41	43	43	-	-
MUM	79	-	87	40	37	31	-	-

AWS

24-10-2010 → ← 25-10-2010 →

UTC	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07
Nos	500	502	330	515	418	335/ 203	427/ 279	414/ 240	337/ 293	324/ 201	428/ 208	404/ 202	420/ 212	478/ 275	420/ 213	415/ 212	505/ 278	492	490	553	317	452	508	521

RSRW (12Z) 24-10-2010: -

No. of Ascents reaching 250 hPa levels 12: 34/36

MISDA:- PTL, JDP, JPR, LKN, DBH, SLG, GHT, PTN, RNC, AGT, GWL, BHP, NGP, RPR, JGD, BOM, PNJ, VSK, MNG, AMN (20)

RSRW (00Z) 25-10-2010: - 35/37

No. of Ascents reaching 250 hPa levels 20: (36/36)

MISDA:- SRN, PTL, GHT, GWL, MNG, AMN (6)

Buoy Data

24-10-2010					25-10-2010		
09Z	12Z	15Z	18Z	21Z	00Z	03Z	06Z
-	-	-	-	-	-	-	-

No. of PILOT Ascents

24-10-2010		25-10-2010	
12Z	18Z	00Z	06Z
33	19	32	-

GPS:

12Z (24-10-2010) (nil)

00Z (25-10-2010) (nil)

Remark: Nil

Annexure-2



India Meteorological Department

REGIONAL METEOROLOGICAL CENTRE, CHENNAI

FDP (Cyclone) FOC Chennai Report Dated 25 OCT 2010, 1400 hrs

PART – A: STATUS OF OBSERVATION SYSTEM

No of Synop data

Date→	24.10.2010							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	19	22	19	20	22	19	19	18

No. of RS/RW Ascents

00Z / 24.10.2010 : 3

No. of Ascents reaching 250 hpa level =3

MISDA : 0

12Z /24.10.2010 : 3

No. of Ascents reaching 250 hpa level =3

MISDA : 0

No. of PILOT Ascents:

24.10.2010	
06Z	18Z
2	2

Status of AWS data is given in FDPNOC report.

PART – B: RMC CHENNAI INFERENCE

CHENNAI MORNING INF DATED 25.10.2010

BAY INF AURORA AAA A TRH OF LOW PRESSURE LIES OVER WC BAY TO ADMN SEA AAA MON MOD TO STG OVER WC BAY AND GEN MOD OVER REST BAY ADMN SEA AAA

ARSEA INF AURORA AAA Y'DAY'S TRH OF LOW PRESSURE OVER EAST ARSEA OFF GOA-KKA-KRL COT NOW LIES OVER LKD AND N/HOOD AND IS FEEBLE AAA MON GEN MOD OVER REST ARSEA SOUTH OF LAT 21 DEG NORTH AAA WX SSL ELSEWHERE ARSEA AAA

REGN INF AAA SW MON HAS BEEN ACTIVE OVER CAP AAA Y'DAY'S TRH OF LOW PRESSURE OVER EAST ARSEA OFF GOA-KKA-KRL COT NOW LIES OVER LKD AND N/HOOD AND IS FEEBLE AAA Y'DAY'S TRH ON SLC NOW RUNS FROM SCAP TO

EXTREME SOUTH PENINSULA ACROSS CTN AAA Y'DAY'S U/A CYCIR NOW LIES OVER WC BAY AND ADJ ANDHRA COT AND EXTDS UP TO 4.5 KM ASL AAA

PLM RECORDED THE HIGHEST MAX TEMP OF 38 DEG C IN THE REGION AND CHAMRAJNAGAR RECORDED THE LOWEST MIN TEMPERATURE OF 17 DEG C IN THE PLAINS OF THE REGION AAA

FCST AAA RA/TSH WOULD OCCUR AT MANY PLACES OVER CAP AND AT A FEW PLACES OVER RYLS,TN/PDC,KKA AND LKD AAA ISOL RA/THRS MAY OCCUR OVER TLGN AND KRL AAA

HRW AAA ISOL XX RA WOULD OCCUR OVER CAP DURING NEXT 48 HOURS AAA

ENDS AAA

PART – C: UPPER AIR WINDS FORECAST OVER CHENNAI

WRF – MODEL OUTPUT INDICATES WESTERLY WINDS OF THE ORDER OF 5 KNOTS VEERING TO NORTHERLY / NORTHWESTERLY (5-10 KNOTS) FROM 925 TO 600 hPa AND MAINLY EASTERLY WIND OF THE ORDER OF 15-25 KTS FROM 400 TO 100hPa FOR NEXT 24 HOURS ENDING 00Z 26.10.2010

FDP (Cyclone) NOC Report Dated 26 October, 2010, 1500 hours
Weather Briefing:

Synoptic features:

The upper air cyclonic circulation over westcentral Bay of Bengal and neighbourhood persists extending upto 2.1 km above mean sea level.

The shear zone at 1.5 km above mean sea level 13.0° North.

Upper tropospheric ridge:

- The upper tropospheric ridge line roughly runs along 17.0°N at 200 hPa level.

Divergence:

- Upper air positive divergence ($10 \times 10^{-5} \text{ s}^{-1}$) prevails over westcentral Bay of Bengal along off coastal Andhra Pradesh.

Convergence:

- Lower level positive convergence ($5-10 \times 10^{-5} \text{ s}^{-1}$) prevails over westcentral Bay of Bengal along off coastal Andhra Pradesh.

Wind Shear:

- The wind Shear moderate (5-10 knots) over central Bay of Bengal and high over north Bay of Bengal (about 20 knots).

Wind Shear Tendency:

- Negative wind shear tendency (5-10 knots) over eastcentral Bay of Bengal.
- **Relative Vorticity:**
- Relative vorticity at 850 hPa is positive over westcentral Bay of Bengal of the order and magnitude $40 \times 10^{-5} \text{ s}^{-1}$.

Sea Surface Temperature:

- SST around 29-30°C over westcentral and southwest Bay of Bengal and 30-31°C over southeast Bay of Bengal and Andaman Sea.

M.J.O. Index:

- Located over phase 5 with amplitude more than 1.
- Statistical forecast:- MJO moves through phase 5, 6, 7 & 8 during next 15 days.
- Dynamical forecast:- MJO remains in phase 5 & 6 but with reduced amplitude during next 15 days.

Ocean thermal energy:

- Ocean thermal energy is below 100 KJ cm^{-2} over Bay of Bengal.

Status of observational system:

Details of the status of observational system are given in Annexure 1.

Satellite

Broken Low/Medium clouds with embedded moderate to intense convection over west-central adjoining northwest Bay of Bengal between Lat 13.0N to 20.5N west of Long 88.5E (CTT MINUS 64 DEG C) north coastal Andhra Pradesh adjoining coastal Orissa, central Andaman Sea, and south parts of southwest Bay. Clouds are persisting over west-central Bay from 24th evening so there are chances of development of a low level circulation over. Scattered Low/Medium clouds with embedded isolated weak to moderate convection over southeast Bay of Bengal.

(See <ftp://192.168.12.75/imd/satmet>

<http://www.imd.gov.in/section/satmet/dynamic/insat.htm>)

NWP

- **ECMWF** model analysis of 00UTC of today (26 OCT 2010) shows that there is a cyclonic circulation near Southern coast of Andhra Pradesh which shows no intensification in the next 24 hours. In the next 48 hours, it will be less marked in the Bay

of Bengal. In the forecast, after 72 hours (29 Oct 2010 at 00UTC), there is a low pressure area in the central part of south Bay of Bengal which is becoming a depression and will cross the coast at 15.5°N 80.0°E on 31 Oct 2010 12 UTC.

- **IMDGFS** model forecast of 00UTC of today (26 OCT 2010) shows that there is no structure in the Bay of Bengal at 00 H. In the forecast, after 24 hours (27 Oct 2010) there is a low pressure area at the Southern coast of Andhra Pradesh and an extended low in the Southeast Bay of Bengal. There is low pressure area near Southern coast of Shri Lanka. But there is no structure after 48 hours.

- **WRF-ARW** model analysis of 00UTC of today (26 OCT 2010) shows that there is no low pressure area in the Bay of Bengal. In the forecast, after 48 hours (28 Oct 2010) there is an extended low pressure system of 1008 hPa lies over South Bay of Bengal . The forecast fields indicates no further intensification of the system.

- **UKMET** model analysis of 00UTC of today (26 OCT 2010) shows that there is no cyclonic circulation at 00H forecast. There is a cyclonic circulation near South coast of Andhra Pradesh and persisting over same area for the next 24 hours.

- **NCEP-GFS** model analysis shows that there is a low pressure area near Southern Andhra Pradesh coast in the Southwest Bay of Bengal at 00 UTC of today (26 Oct 2010). There is no structure after 24 hours. A fresh low pressure will develop on 29 Oct 2010 06 UTC. Afterwards there is no product.

- **NCMRWF-GFS** data not available for today. Based on 25 Oct 2010 00 UTC, it shows a low pressure area Southeast Bay of Bengal and on 25 Oct 2010 at 12 UTC, it becomes less marked on in the next 12 hours. After that no forecast product available.

- **JMA-GFS** Based on 26 Oct 2010 model forecast, shows at 06 UTC on 27 Oct 2010, there is a low pressure area over Shri Lanka. At 12 UTC of 27 Oct 2010, it becomes less marked. It again reappears at 28 Oct 2010 at 00 UTC, it will persists till 12 UTC of 28 Oct 2010.

- **ARPEGE** Based on 26 Oct 2010 model analysis at 00 UTC, there is no low pressure area. in the Bay of Bengal. There is a low pressure area over Shri Lanka, which is moving towards North-Northeast to Southwest Bay of Bengal at 06 UTC (26 Oct 2010). Again, it remains low at 18 UTC, then becomes less marked. It reappears at 12 UTC of 27 Oct 2010 over the same area and persists upto 29 Oct 2010 00UTC. Same as JMA.

(See <http://www.imd.gov.in/section/nhac/dynamic/welcome.htm>)

See ftp://ftp.ncmrwf.gov.in/pub/outgoing/TC_FDP/

FOC Report

Detailed report of FOC, Chennai is given in Annexure 2.

Advisory

The current environmental conditions and numerical weather prediction (NWP) models suggest that the cyclonic circulation over westcentral Bay of Bengal and neighbourhood is not likely to intensify and is likely to become less marked.

Hence there will be no IOP till 28th October 2010.

Annexure-1

Status of Observation system:

Synop ← 25-10-2010 →← 26-10-2010 →

Region	09	12	15	18	21	00	03	06
KOL	30	67	25	20	20	25	54	33
CHN	34	59	25	25	25	25	62	28
MUM	18	43	17	12	12	19	43	18

AWS

25-10-2010												→	← 26-10-2010												→
UTC	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	
Nos	459	463	455	460	458	500	504	501	504	509	504	508	501	504	506	515	501	455	457	459	446	463	464	-	

RSRW (12Z) 25-10-2010: -

No. of Ascents reaching 250 hPa levels 12: 35/35

MISDA:- PTL, JDP, LKN, GRK, DBH, SLG, PTN, RNC, AGT, GWL, BHP, NGP, RPR, JGD, AHM, AUG, PNJ, VSK, MNG, AMN (20)

RSRW (00Z) 26-10-2010: - 36/36

No. of Ascents reaching 250 hPa levels 20: (36/36)

MISDA:- SRN, PTL, MNG, AMN (4)

Buoy Data

25-10-2010					26-10-2010		
09Z	12Z	15Z	18Z	21Z	00Z	03Z	06Z
01	-	-	-	01	01	01	01

No. of PILOT Ascents

25-10-2010		26-10-2010	
12Z	18Z	00Z	06Z
33	27	32	26

GPS:

12Z (25-10-2010) (nil)

00Z (26-10-2010) (nil)

Remark: Reception of Buoys data is poor.



India Meteorological Department

REGIONAL METEOROLOGICAL CENTRE, CHENNAI

FDP (Cyclone) FOC Chennai Report Dated 26 OCT 2010, 1400 hrs

PART – A: STATUS OF OBSERVATION SYSTEM

No of Synop data

Date→	25.10.2010							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	19	23	20	20	22	19	18	17

No. of RS/RW Ascents

00Z / 25.10.2010 : 4

No. of Ascents reaching 250 hpa level =4

MISDA : 0

12Z /25.10.2010 : 4

No. of Ascents reaching 250 hpa level =3

MISDA : 1

No. of PILOT Ascents:

25.10.2010	
06Z	18Z
2	1

Status of AWS data is given in FDPNOC report.

PART – B: RMC CHENNAI INFERENCE

CHENNAI MORNING INF DATED 26.10.2010

BAY INF AURORA AAA A TRH OF LOW PRESSURE EXTDS FROM WC BAY TO GULF OF MANNAR ACROSS SW BAY OFF TN COT AAA ANOTHER TRH EXTDS

FDP (Cyclone) NOC Report Dated 27 October, 2010, 1500 hours
Weather Briefing:

Synoptic features:

- Yesterday's upper air cyclonic circulation over westcentral Bay of Bengal and neighbourhood extending upto 2.1 km above mean sea level persists.
- A trough in sea level runs from the south Andaman Sea to east central Bay of Bengal.

Upper tropospheric ridge:

- The upper tropospheric ridge line roughly runs along 18.0°N at 200 hPa level.

Divergence:

- Upper air positive divergence ($10 \times 10^{-5} \text{ s}^{-1}$) prevails over south Bay of Bengal and Andaman Sea.

Convergence:

- Lower level positive convergence ($5 \times 10^{-5} \text{ s}^{-1}$) prevails over southeast Bay of Bengal and Andaman Sea.

Wind Shear:

- The wind Shear moderate (5-10 knots) over southeast & central Bay of Bengal and Andaman Sea.

Wind Shear Tendency:

- Negative wind shear tendency (5-10 knots) over southeast & eastcentral Bay of Bengal and Andaman Sea.
- **Relative Vorticity:**
- Relative vorticity at 850 hPa is positive over westcentral Bay of Bengal of the order and magnitude $25 \times 10^{-5} \text{ s}^{-1}$.

Sea Surface Temperature:

- SST around 29-31°C over entire Bay of Bengal and Andaman Sea.

M.J.O. Index:

- Located over phase 5 with amplitude less than 1.
- Statistical forecast:- MJO moves through phase 5, 6, 7 & 8 during next 15 days.
- Dynamical forecast:- MJO remains in phase 5 & 6 but with reduced amplitude during next 10 days. Thereafter goes into phase 4.

Ocean thermal energy:

- Ocean thermal energy is below 100 KJ cm^{-2} over Bay of Bengal.

Considering all the above, the existing cyclonic circulation is not likely to intensify further. Environmental parameters are favourable for genesis of a low pressure area over the southeast Bay of Bengal and adjoining Andaman Sea.

Status of observational system:

Details of the status of observational system are given in Annexure 1.

Satellite

Broken intense to very intense convective clouds seen over south Andaman Sea and southeast Bay of Bengal since 1700 UTC of 26th Oct 2010. Minimum Cloud Top Temperature (CTT) at 0930 UTC of 27th October is minus 72 deg Cel. Clouds may further organize over south Andaman Sea. Low/medium clouds with embedded moderate to intense convective clouds also seen over rest south Bay.

(See <ftp://192.168.12.75/imd/satmet>
<http://www.imd.gov.in/section/satmet/dynamic/insat.htm>)

NWP

•**ECMWF** model analysis of 00UTC of today (27 OCT 2010) indicates pressure of 1010hPa the Bay of Bengal and Arabian Sea. However there is likely drop of pressure in the next 72 hours in the southeast Bay of Bengal. The forecast fields show formation of cyclonic circulation in next 48hour and thereafter the system is likely develop and move northwestward cross south Andhra coast.

•**IMDGFS** model analysis of 00UTC of today (27 OCT 2010) shows an extended pressure of 1010 hPa over the Bay of Bengal. The upper air analysis indicates formation of cyclonic circulation in the southeast Bay of Bengal. In the next 72 hours the cyclonic circulation is likely to move westwards towards south of Chennai coast.

•**WRF-ARW** model analysis of 00UTC of today (27 OCT 2010) shows that low pressure system of 1008 hPa lies over southeast Bay. The forecast fields indicate further extending of the low pressure system in the Southeast and southwest Bay of Bengal and likely to move south of the Chennai coast.

•**WRF-NMM** model analysis of 00UTC of today (27 OCT 2010) shows an pressure area of 1010 hPa over South Bay. The forecast fields indicate further development of the system and likely to move westwards off the Chennai coast.

•**UKMET** N/A

•**NCEP-GFS** model analysis shows that there is a low pressure area near Southern Andhra Pradesh coast in the Southwest Bay of Bengal at 00 UTC of today (27 Oct 2010). A fresh low pressure will develop on 29 Oct 2010 06 UTC.

•**NCMRWF-GFS** N/A in SYNERGIE

•**JMA-GFS** N/A in SYNERGIE

•**ARPEGE** Based on 27 Oct 2010 model analysis at 00 UTC, there is no low pressure area. in the Bay of Bengal. There is a low pressure area over Shri Lanka, which is moving towards North-Northeast to Southwest Bay of Bengal.

(See <http://www.imd.gov.in/section/nhac/dynamic/welcome.htm>)

See ftp://ftp.ncmrwf.gov.in/pub/outgoing/TC_FDP/

FOC Report

Detailed report of FOC, Chennai is given in Annexure 2.

Advisory

- The current environmental conditions and numerical weather prediction (NWP) models suggest that there is no significant circulation over Bay of Bengal. ECMWF Model indicates that a low pressure area may form over southeast Bay of Bengal on 29th October, 2010.

- Satellite imagery shows that from 26th October cloud mass is getting organized over southeast Bay of Bengal with increasing areal coverage and CTT values have decreased and is minus 72 deg Cel at 0930 UTC of 27th October.

- Considering all the above, watch will be maintain for possible development of the low pressure area over the southeast Bay of Bengal.

- **There will be no IOP till 29th October 2010.**

- DGM(UI) may take necessary action to ensure that all upper air stations take 0000 UTC and reports thereof containing maximum height, winds upto which level etc. should be sent to NOC by e-mail (cwdhq2008@gmail.com) positively by 1200 hours IST.

- NWFC may monitor model output availability in synergy and report in NOC meeting.

- Similar monitoring will be carried out by NWP division and report will be submitted in NOC meeting.

Annexure-1

Status of Observation system:

Synop ← 26-10-2010 →← 27-10-2010 →

Region	09	12	15	18	21	00	03	06
KOL	31	56	25	25	24	30	59	37
CHN	43	68	37	38	39	41	70	46
MUM	32	74	29	31	31	31	81	39

AWS

→ 26-10-2010 →← 27-10-2010

UTC	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07
Nos	455	463	460	458	454	502	516	508	507	499	-	-	-	-	-	-	504	448	455	430	458	458	457	448

RSRW (12Z) 26-10-2010: -

No. of Ascents reaching 250 hPa levels 12: 33/35

MISDA:- PTL, JDP, LKN, GRK, DBH, SLG, PTN, RNC, AGT, GWL, BHP, NGP, RPR, AHM, AUG, PNJ, VSK, MNG, AMN (19)

RSRW (00Z) 27-10-2010: - 35/36

No. of Ascents reaching 250 hPa levels 31: (36/36)

MISDA:- PTL, HYD, AMN (3)

Buoy Data

26-10-2010					27-10-2010		
09Z	12Z	15Z	18Z	21Z	00Z	03Z	06Z
01	-	-	-	-	01	01	-

No. of PILOT Ascents

26-10-2010		27-10-2010	
12Z	18Z	00Z	06Z
35	21	34	32

Remark: Reception of Buoys data is poor.



India Meteorological Department

REGIONAL METEOROLOGICAL CENTRE, CHENNAI

FDP (Cyclone) FOC Chennai Report Dated 27 OCT 2010, 1400 hrs

PART – A: STATUS OF OBSERVATION SYSTEM

No of Synop data

Date→	27.10.2010							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	19	22	20	20	22	19	19	19

No. of RS/RW Ascents

00Z / 27.10.2010 : 4

No. of Ascents reaching 250 hpa level =4

MISDA : 0

12Z /27.10.2010 : 4

No. of Ascents reaching 250 hpa level =2

MISDA : 1

No. of PILOT Ascents:

27.10.2010	
06Z	18Z
1	2

Status of AWS data is given in FDPNOC report.

PART – B: RMC CHENNAI INFERENCE

CHENNAI MNG INF DATED 27.10.2010.AAABAY INF AURORA AAA MON GEN MOD
OVER BAY AND ADMN SEA AAA

ARSEA INF AURORA AAA Y'S FEEBLE TRH OF LOW PRESSURE OVER LKD AREA
AND N/HOOD PERSTS AAA MON GEN MOD OVER REST ARSEA SOUTH OF LAT
17 DEG NORTH AAA WX SSL ELSEWHERE ARSEA AAA

REGN INF AAA SW MON HAS BEEN ACTIVE OVER CK AAA Y'S FEEBLE TRH OF
LOW PRESSURE OVER LKD AREA AND N/HOOD PERSTS AAA AN EAST-WEST
SHEAR LINE RUNS ROUGHLY ALONG LAT 11.0 DEG NORTH AND EXTDS UPTO
1.5 KM ASL ACROSS PENINSULA AAA

PLM RECORDED THE HIGHEST MAX TEMP OF 38 DEG C IN THE REGION AND
ADL AND RCH RECORDED THE LOWEST MIN TEMPERATURE OF 17 DEG C IN
THE PLAINS OF THE REGION AAA

FCST AAA RA/TSH WOULD OCCUR AT MANY PLACES OVER TN/PDC, KRL,CK, SIK.
CAP AND AT A FEW PLACES OVER RYLSM, NIK AND LKDWP AAA ISOL RA/THRS
MAY OCCUR OVER TLGN AAA

HRW AAA ISOL XX RA WOULD OCCUR OVER KRL, CK AND GHAT AREAS OF SIK
DURING THE NEXT 48 HOURS AAA

ENDS AAA

=====

L/FCST AAA

FOR NEXT 24 HRS AAA THE SKY CONDITIONS MAY BE GENERALLY CLOUDY
AAA

RAIN/TSH WOULD OCCUR IN SOME AREAS AAA MAX AND MIN TEMP WOULD BE
AROUND 34 AND 26 DEG C RESPECTIVELY AAA

FOR NEXT 48 HRS AAA THE SKY CONDITIONS MAY BE GENERALLY CLOUDY
AAA

RAIN/TSH WOULD OCCUR IN SOME AREAS AAA MAX AND MIN TEMP WOULD BE
AROUND 34 AND 26 DEG C RESPECTIVELY AAA

ENDS

=====

PART – C: UPPER AIR WINDS FORECAST OVER CHENNAI

WRF – MODEL OUTPUT INDICATES NORTHERLY TO NORTH EASTERLY WINDS
OF THE ORDER OF 5 KNOTS UPTO 500 hPa FOR NEXT 24 HOURS ENDING 00Z
28.10.2010

FDP (Cyclone) NOC Report Dated 28 October, 2010, 1500 hours
Weather Briefing:

Synoptic features:

- Yesterday's upper air cyclonic circulation over westcentral Bay of Bengal and neighbourhood extending upto 2.1 km above mean sea level persists.

Upper tropospheric ridge:

- The upper tropospheric ridge line roughly runs along 19.0°N at 200 hPa level.

Divergence:

- Upper air positive divergence ($10\text{-}20 \times 10^{-5} \text{ s}^{-1}$) prevails over south Bay of Bengal and Andaman Sea.

Convergence:

- Lower level positive convergence ($5\text{-}10 \times 10^{-5} \text{ s}^{-1}$) prevails over southeast Bay of Bengal.

Wind Shear:

- The wind Shear moderate (5-10 knots) over southeast & eastcentral Bay of Bengal.

Wind Shear Tendency:

- Negative wind shear tendency (5-10 knots) over eastcentral & southwest Bay of Bengal off Sri Lanka coast.

- **Relative Vorticity:**

- Relative vorticity at 850 hPa is positive over southeast Bay of Bengal of the order and magnitude $25 \times 10^{-5} \text{ s}^{-1}$.

Sea Surface Temperature:

- SST around 30.0-32.0°C over southeast & eastcentral Bay of Bengal and Andaman Sea and 29.0-30.0°C over remaining many parts of Bay of Bengal.

M.J.O. Index:

- Located over phase 5 with amplitude less than 1.
- Statistical forecast:- MJO moves through phase 5, 6, 7 & 8 during next 15 days.
- Dynamical forecast:- MJO remains in phase 6 but with reduced amplitude during next 5 days. Thereafter goes into phase 7.

Ocean thermal energy:

- Ocean thermal energy is 120-140 KJ cm⁻² over southeast Bay of Bengal and below 100 KJ cm⁻² over remaining parts of Bay of Bengal.

Considering all the above, the existing cyclonic circulation is not likely to intensify further. Environmental parameters are favourable for genesis of a low pressure area over the southwest Bay of Bengal during next 48 hours.

Status of observational system:

Details of the status of observational system are given in Annexure 1.

Satellite

Satellite imagery 280900 UTC shows broken intense to very intense convection over southwest Bay between lat 7.0N to 14.0N west of long 87.0E (CTT MINUS 73 DEG C) (.) Broken low/medium clouds with embedded moderate to intensive convention over south Bay south of lat 7.0N and east central Bay (.) Clouds are persisting over west-central Bay so there are chances of development of a low level circulation over the area (.)

(See <ftp://192.168.12.75/imd/satmet>

<http://www.imd.gov.in/section/satmet/dynamic/insat.htm>)

28 Oct' 2010

NWP Analysis

- **ECMWF** model analysis of 00UTC of today (28 OCT 2010) shows that there is a low pressure area over Southern Sri Lanka. It will persist for the next 168 hours. There is cyclonic circulation at 5°N 90°E. After 24 hours (29 Oct 2010 at 00 UTC), this low pressure circulation is moving towards southwest Bay of Bengal. It will cross Shrilanka on 29 Oct 2010 at 12 UTC. There is no low pressure area in the Bay of Bengal at 48H and 72H forecast. After 144 hours (03 Nov 2010), there is a cyclonic circulation which is coming from South China Sea, crossing Northern Malasiya. It is becoming intense on 04 Nov 2010. In the forecast, after 120 hours (02 Nov 2010 at 00UTC), there is a low pressure area in the south of the Andaman Sea, which is becoming well marked depression on 03 Nov 2010 and moving towards westward. On 04 Nov 2010, It will move west - westnorthward as a cyclone.

- **IMDGFS** model analysis of today (28 OCT 2010) shows that there is an extended low pressure area over Northern Sumatra in Southeast Bay of Bengal which will persist for the next 24 hours as a low. There is cyclonic circulation in the south Bay of Bengal and over Shrilanka. After 24 hours (29 Oct 2010) there is no intensification. After 48 hours (30 Oct 2010), it is less marked. After 72 hours (31 Oct 2010), there is an extended low pressure area over South Indian region. It will remain as a low on 1 Nov 2010 (At 96 hours forecast). On 1 Nov 2010, there a low pressure area in the southeast bay of Bengal coming from South China Sea crossing Malasiya. On 2 Nov 2010 (At 120 hour forecast), it is becoming well marked and on 3 Nov 2010 (at 144 hour forecast) it will become intense and move towards westward. On 4 Nov 2010 (168 hour forecast) it will move towards west - westnorthward as a cyclone.

- **WRF-ARW** model analysis of 00UTC of today (28 OCT 2010) shows that there is a low pressure area over Shrilanka and over Sumatra. After 24 hours (29 Oct 2010) there is an extended low pressure area, after 48 hours it will move towards Shrilanka and tamilnadu coast. It will remain as a low at 72 hours forecast.

- **UKMET** model forecast of 00UTC for tomorrow (28 OCT 2010) shows that there is a weak cyclonic circulation in the South bay of Bengal which move west in the next 24 hours (29 Oct 2010) but shows no intensification. It will remain there till 2 Nov 2010 (120H forecast). On 2 Nov 2010 (at 120H forecast) there is a cyclonic circulation crossing Malasiya from South China Sea.

- **NCEP-GFS** Based on 28 Oct model forecast shows that there is a low pressure area South Bay of Bengal at 00 UTC of 28 Oct 2010, which is moving towards Shrilanka in the next 24 hours (29 Oct 2010). At 48 hours, there is a trough only. At 72 hours, there is an extended low pressure area over South India region.

- **NCMRWF-GFS** Based on 28 Oct 2010 00 UTC model analysis, it shows a weak cyclonic circulation in the South Bay of Bengal. There is no intensification in the next 24 hours (29 Oct 2010 00 UTC) forecast. It is moving towards Southern Indian Ocean with no intensification. There is a cyclonic circulation likely to develop after 72 hours in the southeast bay of Bengal near southern coast of Malasiya.

- **JMA-GFS** Based on 28 Oct 2010 model forecast, shows at 00 UTC on 28 Oct 2010, there is a trough in the Bay of Bengal. At 12 UTC of 29 Oct 2010, there is a low pressure area over Shrilanka, which remain low at 48 hours (30 Oct 2010).

- **ARPEGE** Based on 28 Oct 2010 model analysis at 00 UTC, there is a low pressure area near North Tamilnadu coast. At 24 hour forecast, it becomes less marked. There is a low pressure area at 06 UTC on 29 Oct 2010, it remain as a low for the next 48 hour forecast (30 Oct 2010). It will become less marked after 72 hours.

Conclusion

Model forecast suggests the low pressure area over Sri Lanka which is not going to intensify in the next 24 hours.

(See <http://www.imd.gov.in/section/nhac/dynamic/welcome.htm>)

See ftp://ftp.ncmrwf.gov.in/pub/outgoing/TC_FDP/

FOC Report

Detailed report of FOC, Chennai is given in Annexure 2.

Advisory

No IOP next 24 hours.

Annexure-1

Status of Observation system:

Synop ← 27-10-2010 → ← 28-10-2010 →

Region	09	12	15	18	21	00	03	06
KOL	-	-	21	22	16	25	21	14
CHN	-	-	34	26	35	27	25	25
MUM	-	-	15	18	15	18	13	12

AWS

27-10-2010														← 28-10-2010 →													
UTC	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07			
Nos	527	534	526	512	442	428	452	451	452	454	455	454	452	451	445	450	452	452	510	515	502	512	517	498			

RSRW (12Z) 27-10-2010: - 33/35

No. of Ascents reaching 250 hPa levels:

MISDA:-PTL, JDP, LKN, GRK, DBH, SLG, RNC, GWL, BHP, NGP, RPR, JGD, AHM, AUG, PNJ, VSK, AMN (17)

RSRW (00Z) 28-10-2010: - 36/36

No. of Ascents reaching 250 hPa levels: PTN, AMN

MISDA:-Nil.

Buoy Data

27-10-2010					28-10-2010		
09Z	12Z	15Z	18Z	21Z	00Z	03Z	06Z
-	-	01	01	01	-	-	-

No. of PILOT Ascents

27-10-2010		28-10-2010	
12Z	18Z	00Z	06Z
31	42	33	-

Remark: Reception of Buoys data is poor.



India Meteorological Department

REGIONAL METEOROLOGICAL CENTRE, CHENNAI

FDP (Cyclone) FOC Chennai Report Dated 28 OCT 2010, 1400 hrs

PART – A: STATUS OF OBSERVATION SYSTEM

No of Synop data

Date→	27.10.2010							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	19	22	20	19	15	19	19	19

No. of RS/RW Ascents

00Z / 27.10.2010 : 4

No. of Ascents reaching 250 hpa level =4

MISDA : 0

12Z /27.10.2010 : 4

No. of Ascents reaching 250 hpa level =2

MISDA : 2

No. of PILOT Ascents:

27.10.2010	
06Z	18Z
4	2

Status of AWS data is given in FDPNOC report.

PART – B: RMC CHENNAI INFERENCE

CHENNAI MNG INF DATED 28.10.2010.AAA

BAY INF AURORA AAA SW MONSOON HAS WITHDRAWN FROM PARTS OF WC AND NORTH BAY AAA Y'S TRH OF LOW PRESSURE NOW LIES OVER SW BAY OFF TN COT AAA MON GEN MOD OVER SW BAY, EC BAY, ADMN SEA AND REMAINING PARTS OF WC BAY, REST NORTH BAY AAA WX SSL ELSEWHERE BAYAAA

ARSEA INF AURORA AAA SW MONSOON HAS FURTHER WITHDRAWN OVER EC ARSEA NORTH OF 15 DEG N AAA Y'DAY'S TRH OF LOW PRESSURE OVER LKDP AREA AND N/H PERSISTS AAA MON GEN MOD OVER REST ARSEA SOUTH OF LAT 15 DEG NORTH AAA WX SSL ELSEWHERE ARSEA AAA

REGN INF AAA SW MON HAS BEEN ACTIVE OVER KRL AAA SW MONSOON HAS WITHDRAWN FROM TLGN, MOST PARTS OF CAP, MOST PARTS OF NIK, SOME PARTS OF RYLM AAA CONDITIONS ARE FAVORABLE FOR COMMENCEMENT OF NORTHEAST MONSOON RAINS OVER TN/PDC, AND ADJ AREAS OF SCAP, SIK AND KRL WITHIN 48 HOURS AAA

Y'S TRH OF LOW PRESSURE NOW LIES OVER SW BAY OFF TN COT AAA ASSTD U/A CYCIR EXTDS UPTO 2.1 KM ASL AAA Y'DAY'S TRH OF LOW PRESSURE OVER LKDP AREA AND N/H PERSISTS AAA

PLM RECORDED THE HIGHEST MAX TEMP OF 35 DEG C IN THE REGION AND ADL AND MDK RECORDED THE LOWEST MIN TEMPERATURE OF 15 DEG C IN THE PLAINS OF THE REGION AAA

FCST AAA RA/TSH WOULD OCCUR AT MOST PLACES OVER CK, AT MANY PLACES OVER TN/PDC, KRL, SCAP AND SIK AND AT A FEW PLACES OVER RYLM AND NCAP AAA ISOL RA/THRS MAY OCCUR OVER TLGN ,NIK AND LKD AAA

HRW AAA ISOL XX RA WOULD OCCUR OVER TN/PDC, CK, KRL, SCAP AND GHAT AREAS OF SIK DURING NEXT 48 HOURS AAA

ENDS AAA

=====

PART – C: UPPER AIR WINDS FORECAST OVER CHENNAI

WRF – MODEL OUTPUT INDICATES NORTHERLY TO NORTH EASTERLY WINDS OF THE ORDER OF 5 KNOTS UPTO 900 hPa AND EASTERLY WINDS OF THE ORDER OF 5 TO 10 KNOTS UPTO 500 hPa FOR NEXT 24 HOURS ENDING 00Z 29.10.2010

.....

FDP (Cyclone) NOC Report Dated 29 October, 2010, 1500 hours
Weather Briefing:

Synoptic features:

- Yesterday's upper air cyclonic circulation now lies over westcentral and adjoining southwest Bay of Bengal off south Andhra Pradesh and north Tamil nadu coast extending upto mid-tropospheric level and tilting southwestward with height.

Upper tropospheric ridge:

- The upper tropospheric ridge line roughly runs along 20.0°N at 200 hPa level.

Divergence:

- Upper air positive divergence ($10\text{-}20 \times 10^{-5} \text{ s}^{-1}$) prevails over westcentral & south Bay of Bengal and Andaman Sea.

Convergence:

- Lower level positive convergence ($5\text{-}10 \times 10^{-5} \text{ s}^{-1}$) prevails over southeast Bay of Bengal.

Wind Shear:

- The wind Shear moderate (5-10 knots) over southeast & eastcentral Bay of Bengal and Andaman Sea.

Wind Shear Tendency:

- Negative wind shear tendency (5-10 knots) over southeast Bay of Bengal and Andaman Sea.

- **Relative Vorticity:**

- Relative vorticity at 850 hPa is positive over southeast Bay of Bengal and Andaman Sea of the order and magnitude $30 \times 10^{-5} \text{ s}^{-1}$.

Sea Surface Temperature:

- SST around 30.0-32.0°C over southwest & westcentral Bay of Bengal and Andaman Sea and 29.0-30.0°C over remaining many parts of Bay of Bengal.

M.J.O. Index:

- Located over phase 6 with amplitude less than 1.
- Statistical forecast:- MJO moves through phase 6, 7, 8 & 1 during next 15 days.
- Dynamical forecast:- MJO remains in phase 6 but with reduced amplitude during next 5 days. Thereafter goes into phase 7.

Ocean thermal energy:

- Ocean thermal energy is 120-140 KJ cm⁻² over southeast Bay of Bengal and Andaman Sea below 100 KJ cm⁻² over remaining parts of Bay of Bengal.

Considering all the above, the existing cyclonic circulation is not likely to intensify further. Environmental parameters are not favourable for genesis of a low pressure area over the Bay of Bengal during next 48 hours.

Status of observational system:

Details of the status of observational system are given in Annexure 1.

Satellite

Broken intense to very intense convection over west central bay bet lat 15.5n to 18.0n west of long 84.5E (CTT MINUS 60 DEG C) adjoining coastal Andhra Pradesh and Broken low/medium clouds with embedded moderate to intense convtn over rest bay south of lat 15.5N in association with low level circulation over the area (.)

(See <ftp://192.168.12.75/imd/satmet>

<http://www.imd.gov.in/section/satmet/dynamic/insat.htm>)

29 Oct' 2010

NWP Analysis

- **ECMWF** model 0 hr forecast of today (29 OCT 2010) shows that there is a low pressure area over Southern Sri Lanka. It will persist for the next 168 hours with no intensification. There is a low pressure likely to develop in the Southeast Bay of Bengal at 120 hr (03 Nov 2010) forecast, which is moving west westnorthward at 144 hr forecast (04 Nov 2010) and becoming well marked depression at 168 hr forecast (05 Nov 2010). There is a circulation in the Southwest Bay of Bengal, which is crossing Shrilanka at 24 hr (30 Oct 2010 00 UTC). At 48 hr (31 Oct 2010 00 UTC), It is crossing chennai coast, and will persist there till 144 hr (04 Nov 2010) forecast. After 168 hr, it is less marked. There is circulation system coming from Soth China Sea to Bay of Bengal after crossing Malasiya at 120 hr forcast and will move towards west-westnorthward.

- **IMDGFS** model analysis of today (29 OCT 2010 00UTC) shows that there is an extended low pressure area over Southwest Bay of Bengal and a cyclonic circulation (at 850 hPa) in the southwest Bay of Bengal. There are pressure trough at 24 hr forecast (30 Oct 2010 00UTC). There is no intensification at 48 hr forecast (31 Oct 2010 00UTC). There is a fresh development of low pressure area and cyclonic circulation near Southern Malasiyan coast at 72 hr forecast (01 Nov 2010 00UTC) which is becoming well marked at 120 hr (03 Nov 2010 00UTC) forecast and moving west -westnorthward. At 144 hr (04 Nov 2010 00UTC), it is becoming intense and moving moving west - westnorthward. At 168 hr (05 Nov 2010 00UTC) forecast, it is more intense and moving towards South Andhra coast.

- **WRF-ARW** model analysis of 00UTC of today (29 OCT 2010) shows that there is a trough in the south bay of Bengal. In the forecast, there is no intensification.

- **WRF-NMM** model forecast at 0h Based on 00UTC of today (29 Oct 2010) shows that there is a low pressure area Southern Tamilnadu coast. It will remain low at 24 hr forecast. It will move northward at 48 hr forecast. At 72 hr , it is becoming intense.

- **NCMRWF-GFS** Based on 29 Oct 2010 00 UTC model analysis that there a feeble circulation in the Southwest Bay of Bengal which is crossing Shrilanka with no intensification in the next 24 hours (30 Oct 2010 00 UTC) forecast. There is a cyclonic circulation likely to develop after 72 hours (01 Nov 2010 00UTC) in the southeast bay of Bengal near southern coast of Malasiya which will intensify and move towards west – westnorthward.

- **UKMET** Not Available for today (29 Oct 2010) at the time of meeting (start)

- **NCEP-GFS** Based on 29 Oct 2010 model analysis there is an extended low pressure area in the Bay of Bengal, which is not going to intensify in the forecast.

- **JMA-GFS** Based on 29 Oct 2010 model 0H forecast, there is a pressure trough in the Bay of Bengal. It remains as trough in the forecast.

- **ARPEGE** Based on 29 Oct 2010 model analysis, there is no low pressure area in the Bay of Bengal. There is a low pressure area in the western side of Srilanka. At 18 UTC there is a low over Srilanka. At 24 hr forecast (30 Oct 2010 00 UTC), there is a low in the eastern side of Srilanka in the southwest Bay of Bengal. At 48 hr forecast there is a low over Srilanka. At 72 hr forecast, there is a low pressure area in the southeast of Srilanka.

Conclusion

There is no significant pressure system in the Bay of Bengal.

(See <http://www.imd.gov.in/section/nhac/dynamic/welcome.htm>)

See ftp://ftp.ncmrwf.gov.in/pub/outgoing/TC_FDP/

FOC Report

Detailed report of FOC, Chennai is given in Annexure 2.

Advisory

- The cyclonic circulation extending upto lower levels over the southeast Bay of Bengal and adjoining Andaman Sea on 27th October moved west-northwestwards and now lies as cyclonic circulation over westcentral and adjoining southwest Bay of Bengal extending upto mid-tropospheric level and tilting southwestward with height.
- Satellite imagery also shows that cloud mass present in southeast Bay of Bengal on 27th October 2010 moved north-northwestwards and organized as semi-circular clusters over southwest Bay of Bengal on 28th October. Modis Aqua also shows same cloud mass organization as stated above on 28th October along Tamilnadu and adjoining Kerala coast. Today picture shows that cloud mass has disorganized. Convective clouds over southwest Bay of Bengal appeared to have decreased.
- NWP Models show that extended low pressure area in Bay of Bengal is not likely to intensify and become less marked during next 48 hours.
- Hence No IOP will be conducted till 1st November 2010.

Forecast for Sagarkanya ship:

Convective clouds over South Bay of Bengal and adjoining Sri Lanka and Tamilnadu may persist till 31st October 2010. In a medium term perspective, a cyclonic circulation in Andaman Sea may develop into a Depression near 9 deg North and 91 deg East by 4th November, 2010, within 300 km of your ship position as per model predictions. We shall send forecast as further development takes place.

Annexure-1

Status of Observation system:

Synop ← 28-10-2010 →← 29-10-2010 →

Region	09	12	15	18	21	00	03	06
KOL	34	74	-	-	-	29	-	-
CHN	44	78	-	-	-	41	72	-
MUM	39	78	-	-	-	31	92	-

AWS

28-10-2010

→← 29-10-2010

→

UTC	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07
Nos	525	514	522	506	420	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

RSRW (12Z) 28-10-2010: - 35/35

No. of Ascents reaching 250 hPa levels:13

MISDA:-PTL, JDP, LKN, GRK, DBH, SLG, GHT, PTN, RNC, AGT, GWL, BHP, NGP, RPR, JGD, AHM, AUG, PNJ, HYD, VSK, AMN (21)

RSRW (00Z) 29-10-2010: - 36/36

No. of Ascents reaching 250 hPa levels: 28

MISDA:-BOM, AMN.

Buoy Data

27-10-2010					28-10-2010		
09Z	12Z	15Z	18Z	21Z	00Z	03Z	06Z
-	01	-	-	01	01	01	-

No. of PILOT Ascents

28-10-2010		29-10-2010	
12Z	18Z	00Z	06Z
35	-	35	-

List of stations of neighbouring countries**DATE 28-10-2010**

Country	Total No. of station	Hours of observations (UTC)							
		00	03	06	09	12	15	18	21
Sri Lanka	8	5	5	5	5	7	7	7	6
Bangladesh	11	4	4	4	0	5	4	1	4
Myanmar	10	7	7	0	7	6	1	6	1
Thailand	1	1	1	1	1	1	1	1	1

Remark: Reception of AWS and Buoys data is poor.**Annexure-2**

India Meteorological Department

REGIONAL METEOROLOGICAL CENTRE, CHENNAI

FDP (Cyclone) FOC Chennai Report Dated 29 OCT 2010, 1400 hrs**PART – A: STATUS OF OBSERVATION SYSTEM****No of Synop data**

Date→	28.10.2010							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	19	22	20	21	22	19	19	19

No. of RS/RW Ascents**00Z / 28.10.2010 : 4**

No. of Ascents reaching 250 hpa level =4

MISDA : 0**12Z / 28.10.2010 : 4**

No. of Ascents reaching 250 hpa level =3

MISDA : 1**No. of PILOT Ascents:**

28.10.2010	
06Z	18Z
0	1

Status of AWS data is given in FDPNOC report.

PART – B: RMC CHENNAI INFERENCE

CHENNAI MNG INF DATED 29.10.2010.AAA

BAY INF AURORA AAA SW MONSOON HAS WITHDRAWN FROM THE REMAINING PARTS OF BAY AND ADMN SEA AAA Y'DAY'S TRH OF LOW PRESSURE NOW LIES OVER SW BAY OFF SRILANKA-TN COT AAA WX SSL ELSEWHERE BAY AND ADMN SEA AAA

ARSEA INF AURORA AAA SW MONSOON HAS WITHDRAWN FROM THE REMAINING PARTS OF ARSEA AAA Y'DAY'S TRH OF LOW PRESSURE OVER LKD AREA AND N/H PERSTS AAA WX SSL ELSEWHERE ARSEA AAA

REGN INF AAA SW MONSOON HAS WITHDRAWN FROM THE REMAINING PARTS OF THE REGION AAA SIMULTANEOUSLY NE MONSOON RAINS HAVE COMMENCED OVER TN/PDC AND ADJ AREAS OF SCAP,RYLS,SIK, AND KRL AAA NE MONSOON HAS BEEN IGROUS OVER TN AAA Y'DAY'S TRH OF LOW PRESSURE NOW LIES OVER SW BAY OFF SRILANKA-TN COT AAA ASSTD U/A CYCIR EXTDS UPTO 3.1 KM ASL AAA Y'DAY'S TRH OF LOW PRESSURE OVER LKD AREA AND N/H PERSTS AAA

KWR RECORDED THE HIGHEST MAX TEMP OF 35 DEG C IN THE REGION AND DHARWAD RECORDED THE LOWEST MIN TEMPERATURE OF 13 DEG C IN THE PLAINS OF THE REGION AAA

FCST AAA RA/TSH WOULD OCCUR AT MANY PLACES OVER TN/PDC,KRL,CAP AND LKD AND AT A FEW PLACES OVER RYLS,CK AND SIK AAA ISOL RA/THRS MAY OCCUR OVER TLGN AND NIK AAA

HRW AAA ISOL XX RA WOULD OCCUR OVER TN/PDC,CK,KRL AND CAP DURING NEXT 48 HOURS AAA

ENDS AAA

PART – C: UPPER AIR WINDS FORECAST OVER CHENNAI

WRF – MODEL OUTPUT INDICATES NORTHERLY TO NORTH EASTERLY WINDS OF THE ORDER OF 5 TO 10 KNOTS UPTO 900 hPa AND SOUTH EASTERLY WINDS OF THE ORDER OF 5 TO 10 KNOTS UPTO 500 hPa FOR NEXT 24 HOURS ENDING 00Z 30.10.2010

FDP (Cyclone) NOC Report Dated 30 October, 2010, 1500 hours
Weather Briefing:

Synoptic features:

- Yesterday's upper air cyclonic circulation over westcentral and adjoining southwest Bay of Bengal off south Andhra Pradesh and north Tamil Nadu coast now lies over southwest Bay of Bengal off Tamil Nadu and Sri Lanka coasts extending upto mid-tropospheric level.

Upper tropospheric ridge:

- The upper tropospheric ridge line roughly runs along 19.0°N at 200 hPa level.

Divergence:

- Upper air positive divergence ($10\text{-}20 \times 10^{-5} \text{ s}^{-1}$) prevails over westcentral and south Bay of Bengal.

Convergence:

- Lower level positive convergence ($5\text{-}10 \times 10^{-5} \text{ s}^{-1}$) prevails over westcentral Bay of Bengal.

Wind Shear:

- The wind Shear moderate (5-10 knots) over central Bay of Bengal and Andaman Sea.

Wind Shear Tendency:

- Negative wind shear tendency (around 5 knots) over central Bay of Bengal and Andaman Sea.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive over westcentral & southeast Bay of Bengal and Andaman Sea of the order and magnitude $30 \times 10^{-5} \text{ s}^{-1}$.

Sea Surface Temperature:

- SST around 30.0-32.0°C over southwest & westcentral Bay of Bengal and Andaman Sea and 29.0-30.0°C over remaining many parts of Bay of Bengal.

M.J.O. Index:

- Located over phase 6 with amplitude less than 1.
- Statistical forecast:- MJO moves through phase 6, 7, 8 & 1 during next 15 days.
- Dynamical forecast:- MJO remains in phase 6 but with reduced amplitude during next 5 days. Thereafter goes into phase 7.

Ocean thermal energy:

- Ocean thermal energy is 120-140 KJ cm⁻² over southeast Bay of Bengal and Andaman Sea below 100 KJ cm⁻² over remaining parts of Bay of Bengal.

Considering all the above, the existing cyclonic circulation is not likely to intensify further. Environmental parameters are not favourable for genesis of a low pressure area over the Bay of Bengal during next 48 hours.

Status of observational system:

Details of the status of observational system are given in Annexure 1.

Satellite

Broken intense to very intense convection over west central adjoining southwest Bay of Bengal (CTT MINUS 74 DEG C) Andhra Pradesh adjoining Tamil Nadu south Orissa in association with low-level circulation over the area. This circulation is persisting for more than 30 hours. Wind shear is less than 20 knots and shear tendency is also decreasing (5-10kts). Chances of further intensification are less due to land proximity of the system.

(See <ftp://192.168.12.75/imd/satmet>
<http://www.imd.gov.in/section/satmet/dynamic/insat.htm>)

NWP

- **ECMWF** model analysis of 00UTC of today (30 OCT 2010) shows a single closed isobar of 1008 hPa over South TamilNadu coast. The associated cyclonic circulation exists over south TamilNadu region and it likely to move slightly northward. The 120-hr forecast shows a new low pressure system lies over south Andaman sea and is further likely to move north-westward and is likely to develop into a depression.

- **IMDGFS** model analysis based on of 00UTC of today (30 OCT 2010) shows closed isobar of 1010 hPa extended over SW Bay of Bengal, Comorin, Maldives, Lakshadweep and Minicoy islands. The forecast fields show an associated trough along TamilNadu coast and moving westward. The 72-hr forecast indicates formation of a new low pressure system in the south Andaman sea and associated cyclonic circulation extending upto 500 hPa. Subsequent F/C fields show likely intensification of the system.

- **WRF-ARW** model analysis of 00UTC of today (30 OCT 2010) indicates low pressure of 1008 hPa, one closed isobar near south TamilNadu region. The forecast fields indicates that there is lightly extension of the trough in the region of south Tamil Nadu, south peninsula, and south Kerala coast. The 72-hr f/c shows the formation of a new cyclonic system over south Anandman Sea.

- **UKMET** model analysis of 00UTC of today (30 OCT 2010) shows that a circulation extending over TamilNadu, Comorin, and south Kerala coast. This circulation is likely to move northward off TamilNadu coast during next 24hrs. The 96hr forecast shows a cyclone over south Anandman sea and it is likely to intensify and move north-westward.

- **NCMRWF-GFS** model analysis of 00 UTC of today (30 OCT 2010) shows a trough extending over south TamilNadu coast and Comorin region. The 72-hr F/C shows the formation of a cyclonic circulation over south Anandman sea and it is likely to intensify into a cyclonic storm during the subsequent 72-hrs.

- **JMA-GFS** N/A

Conclusion

NWP models show an extended cyclonic circulation over south Tamil Nadu region and land region. This likely to shift slightly north and hence cause rainfall over the TamilNadu and adjoining areas of Andhra coast.

In the next 72 hours a new low pressure system is likely over the south Andaman Sea and this likely to intensify into a cyclonic storm.

(See <http://www.imd.gov.in/section/nhac/dynamic/welcome.htm>)

See ftp://ftp.ncmrwf.gov.in/pub/outgoing/TC_FDP/

FOC Report

Detailed report of FOC, Chennai is given in Annexure 2.

Advisory

- The cyclonic circulation extending upto lower levels over westcentral and adjoining southwest Bay of Bengal off south Andhra Pradesh and north Tamil Nadu coast now lies over southwest Bay of Bengal off Tamil Nadu and Sri Lanka coasts extending upto mid-tropospheric level.

- Satellite imagery shows broken intense to very intense convection over west central adjoining southwest Bay of Bengal Andhra Pradesh adjoining Tamil Nadu south Orissa in association with low-level circulation over the area. Chances of further intensification are less due to land proximity of the system.

- NWP models show an extended cyclonic circulation over south Tamil Nadu region and land region is not likely to intensify and become less marked during next 24 hours.
- Hence No IOP will be conducted till 1st November 2010.

Forecast for Sagarkanya ship:

Convective clouds over South Bay of Bengal and adjoining Sri Lanka and Tamil Nadu may persist till tomorrow, the 31st October 2010. In a medium term perspective, a cyclonic circulation in Andaman Sea may develop into a Depression near 9° N and 93° E by 5th November, 2010 as per model predictions. We shall send forecast as further development takes place.

Annexure-1

Status of Observation system:

Synop

← 29-10-2010 →← 30-10-2010 →

Region	09	12	15	18	21	00	03	06
KOL	29	25	25	19	18	29	61	35
CHN	34	31	31	24	24	28	77	29
MUM	18	39	18	11	10	19	35	23

AWS

29-10-2010

→

← 30-10-2010

→

UTC	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07
Nos	456	461	455	453	450	462	496	487	490	498	496	498	500	497	496	495	445	454	455	457	456	457	451	457

RSRW (12Z) 28-10-2010: - 35/35

No. of Ascents reaching 250 hPa levels:

MISDA:-PTL, JDP, LKN, GRK, DBH, SLG, GHT, PTN, RNC, AGT, GWL, BHP, NGP, RPR, JGD, AHM, AGD, PNJ, HYD, VSK, AMN (21)

RSRW (00Z) 29-10-2010: - 36/36

No. of Ascents reaching 250 hPa levels:

MISDA:-AHM.

Buoy Data

29-10-2010					30-10-2010		
09Z	12Z	15Z	18Z	21Z	00Z	03Z	06Z
02	02	02	02	01	02	02	02

No. of PILOT Ascents

29-10-2010		30-10-2010	
12Z	18Z	00Z	06Z
34	36	35	29

List of stations of neighbouring countries
DATE 29-10-2010

Country	Total No. of station	Hours of observations (UTC)							
		00	03	06	09	12	15	18	21
Sri Lanka	8	8	8	8	8	8	8	6	6
Bangladesh	11	7	5	5	7	7	6	1	3
Myanmar	10	8	0	8	8	8	2	8	2
Thailand	1	1	1	1	1	1	1	1	1

Remark: Reception of AWS and Buoys data is poor.

Annexure-II



India Meteorological Department

REGIONAL METEOROLOGICAL CENTRE, CHENNAI

FDP (Cyclone) FOC Chennai Report Dated 30 OCT 2010, 1400 hrs

PART – A: STATUS OF OBSERVATION SYSTEM

No of Synop data

Date→	29.10.2010							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	19	22	20	19	22	19	17	19

No. of RS/RW Ascents

00Z / 29.10.2010 : 4

No. of Ascents reaching 250 hpa level =4

MISDA : 0

12Z /29.10.2010 : 4

No. of Ascents reaching 250 hpa level =3

2MISDA : 1

No. of PILOT Ascents:

29.10.2010	
06Z	18Z
2	0

Status of AWS data is given in FDPNOC report.

PART – B: RMC CHENNAI INFERENCE

CHENNAI MNG INF DATED 30.10.2010.AAA

BAY INF AURORA AAA Y'S TRH OF LOW PRESS OVER SW BAY OFF SRILANKA TN COT NOW LIES OVER SW AND ADJ WC BAY OFF SRILANKA - TN- S AP COT AAA WX SSL ELSEWHERE BAY AND ADMN SEA AAA

ARSEA INF AURORA AAA Y'S TRH OF LOW PRESSURE OVER LKD AREA AND N/H PERSISTS AAA WX SSL ELSEWHERE ARSEA AAA REGN INF AAA NE MON HAS BEEN VIG OVER CAP AND ACT OVER KRL AND CTN AAA

Y'S TRH OF LOW PRESS OVER SW BAY OFF SRILANKA TN COT NOW LIES OVER SW AND ADJ WC BAY OFF SRILANKA - TN- SAP COT AAA AN UA CYCIR OVER SRILANKA AND ADJ COMMORIN AREA EXTNG UPTO 5.8 KM ASL AAA Y'S TRH OF LOW PRESSURE OVER LKDP AREA AND N/H PERSISTS AAA ASSTD UA CYCIR EXTNS UPTO 0.9 KM ASL AAA

PLM RECORDED THE HIGHEST MAX TEMP OF 34 DEG C IN THE REGION AND ADL RECORDED THE LOWEST MIN TEMPERATURE OF 15 DEG C IN THE PLAINS OF THE REGION AAA

FCST AAA RA/TSH WOULD OCCUR AT MOST PLACES OVER CTN/PDC AND CAP, AT MANY PLACES OVER ITN, RYLS AND KRL AND AT A FEW PLACES OVER CK , SIK AND TLGN AAA ISOL RA/THRS MAY OCCUR OVER NIK AND LKDP AAA

HRW AAA ISOL XX TO VERY XX RA WOULD OCCUR OVER CTN/PDC,AND CAP AND ISOL XX RA WOULD ALSO OCCUR OVER ITN , RYLS AND KER DURING NEXT 48 HOURS AAA

ENDS AAA

=====

L/FCST AAA

FOR NEXT 24 HRS AAA THE SKY CONDITIONS WOULD BE GENERALLY CLOUDY AAFAEW SPELLS OF RAIN/TSH WOULD OCCUR AND ONE OR TWO MAY BE HEAVY AAAMAX AND MIN TEMP WOULD BE AROUND 27 AND 24 DEG C RESPECTIVELY AAAPOR NEXT 48 HRS AAA HE SKY CONDITIONS WOULD BE GENERALLY CLOUDY AAFAEW SPELLS OF RAIN/TSH WOULD OCCUR AND ONE OR TWO MAY BE HEAVY AAAMAX AND MIN TEMP WOULD BE AROUND 27 AND 24 DEG C RESPECTIVELY AAA

ENDS AAA

=====

PART – C: UPPER AIR WINDS FORECAST OVER CHENNAI

WRF – MODEL OUTPUT INDICATES MAINLY NORTHERLY TO NORTHEASTERLY WINDS OF THE ORDER OF 5 KNOTS TO 10 KNOTS UPTO 900 hPa AND SOUTHEASTERLY TO SOUTHERLY WINDS OF THE ORDER OF 5 KNOTS TO 10 KNOTS OVER CHENNAI FOR NEXT 24 HOURS ENDING 00Z 31.10.2010

FDP (Cyclone) NOC Report Dated 31 October, 2010, 1500 hours
Weather Briefing:

Synoptic features:

- A trough of low pressure area on sea level chart runs from northwest Bay of Bengal to south coastal Tamilnadu across westcentral Bay of Bengal with associated upper air cyclonic circulation over south coastal Andhra Pradesh and north coastal Tamil Nadu and adjoining area of westcentral Bay of Bengal extending upto mid-tropospheric level tilting southwestward with height.

Upper tropospheric ridge:

- The upper tropospheric ridge line roughly runs along 19.0°N at 200 hPa level.

Divergence:

- Upper air positive divergence ($10\text{-}20 \times 10^{-5} \text{ s}^{-1}$) prevails over westcentral, south Bay of Bengal and Andaman Sea.

Convergence:

- Lower level positive convergence ($10\text{-}15 \times 10^{-5} \text{ s}^{-1}$) prevails over westcentral, south Bay of Bengal and Andaman Sea.

- **Wind Shear:**

- The wind Shear moderate (5-10 knots) over westcentral Bay of Bengal and Andaman Sea.

Wind Shear Tendency:

- Negative wind shear tendency (around 5-10 knots) over westcentral Bay of Bengal and Andaman Sea.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive over south coastal Andhra Pradesh and north coastal Tamilnadu and adjoining area of westcentral & south Bay of Bengal and Andaman Sea of the order and magnitude $25 \times 10^{-5} \text{ s}^{-1}$.

Sea Surface Temperature:

- SST around 30.0-32.0°C over south and westcentral Bay of Bengal and Andaman Sea and 28.0-30.0°C over remaining parts of Bay of Bengal.

M.J.O. Index:

- Located over phase 6 with amplitude less than 1.0.
- Statistical forecast:- MJO moves through phase 6, 7 & 8 during next 15 days.
- Dynamical forecast:- MJO remains in phase 5 but with reduced amplitude less than 1.0 and no change in phase during next 5 days.

Ocean thermal energy:

- Ocean thermal energy is $120\text{-}140 \text{ KJ cm}^{-2}$ over southeast Bay of Bengal and Andaman Sea below 100 KJ cm^{-2} over remaining parts of Bay of Bengal.

Considering all the above, the existing cyclonic circulation is not likely to intensify further and will become less marked during 48 hours. Environmental parameters are favourable for genesis of a low pressure area over southeast Bay of Bengal and Andaman Sea during next 72 hours.

Status of observational system:

Details of the status of observational system are given in Annexure 1.

Satellite

Based on Insat picture of 310900 UTC broken low/med clouds with embedded moderate to intense convection over Bay north of lat 10.0N west of long 89.0E. (.) Broken low/med clouds with embedded moderate to intense convection over rest south Bay south of lat 10.0N west of long 90.0E south Andaman Sea (.) Broken low/med clouds with

embedded isolated weak to moderate convection over rest south Bay and Andaman Sea (.)

(See <ftp://192.168.12.75/imd/satmet>
<http://www.imd.gov.in/section/satmet/dynamic/insat.htm>)

NWP

- **ECMWF** model analysis of 00UTC of today (31 OCT 2010) shows a single closed isobar of 1010 hPa over Southwest Bay of Bengal, TamilNadu coast, Comorin, Maldives, Lakshadweep, Minicoy, Kerala and Karnataka coast. The 48 hr forecast shows formation of a cyclonic circulation over south Andaman sea and further forecast shows intensification and north-west movement of the system.

- **IMDGFS** model analysis based on of 00UTC of today (31 OCT 2010) shows closed isobar of 1010 hPa extended over SW Bay of Bengal, coastal Tamil Nadu and extending upto coastal karnataka and Kerala. The forecast wind field shows an associated trough along TamilNadu coast and moving westward. The 48 hr forecast indicates formation of a new low pressure system in the south Andaman sea and associated cyclonic circulation extending upto 500 hPa. Subsequent F/C fields show likely intensification of the system.

- **WRF-ARW** model analysis of 00UTC of today (31 OCT 2010) indicates low pressure of 1010 hPa, one closed isobar near southwest Bay of Bengal near TamilNadu coast extending upto Comorin, Kerala, Karnataka coast, Lakshadweep and Minicoy islands. The forecast fields indicates the movement of this low pressure system to westward. The 48 hr f/c shows the formation of a new cyclonic system over south Andaman sea and the 72 hr forecast shows intensification and northwest movement of the system.

- **UKMET** N/A

- **NCMRWF-GFS** model analysis of 00 UTC of today (31 OCT 2010) shows a low pressure over north TamilNadu coast extending to Kerala and Karnataka coast. The wind field of 24 hr F/C shows the formation of a low pressure over south Andaman sea and it is likely to intensify into a cyclonic storm and move in a north westerly direction.

- **JMA-GFS** N/A

(See <http://www.imd.gov.in/section/nhac/dynamic/welcome.htm>)

See ftp://ftp.ncmrwf.gov.in/pub/outgoing/TC_FDP/

FOC Report

Detailed report of FOC, Chennai is given in Annexure 2.

Advisory

- The current synoptic and NWP models indicate that the circulation over south coastal Andhra Pradesh and north coastal Tamil Nadu and adjoining area of westcentral Bay of Bengal is not likely to intensify further and become less marked during next 48 hours.

- Hence No IOP will be conducted till 2nd November 2010.

Forecast for Sagarkanya ship:

Convective clouds over South Bay of Bengal and adjoining westcentral Bay and Tamil Nadu may persist till 2nd November, 2010. In a medium term perspective, a low pressure area in Andaman Sea and southeast Bay of Bengal may form and intensify into a Depression by 3rd November, 2010 as per model predictions. We shall send forecast as further development takes place.

Annexure-1

Status of Observation system:

Synop ← 30-10-2010 →← 31-10-2010 →

Region	09	12	15	18	21	00	03	06
KOL	43	76	26	25	26	35	76	35
CHN	53	84	39	38	36	44	87	44
MUM	43	89	30	31	30	32	68	60

AWS

30-10-2010

→

← 31-10-2010

→

UTC	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07
Nos	-	455	-	-	448	513	509	512	515	509	332	501	507	511	499	419	520	402	505	536	430	523	346	531

RSRW (12Z) 30-10-2010: - 35/35

No. of Ascents reaching 250 hPa levels: 14

MISDA:-PTL, JDP, LKN, GRK, DBH, SLG, GHT, PTN, RNC, AGT, GWL, BHP, NGP, RPR, JGD, AHM, AGD, PNJ, HYD, VSK, AMN (21)

RSRW (00Z) 31-10-2010: - 36/36

No. of Ascents reaching 250 hPa levels: 28

MISDA:- SRN, JDP, GHT, GWL, AMN (5)

Buoy Data

30-10-2010					31-10-2010		
09Z	12Z	15Z	18Z	21Z	00Z	03Z	06Z
01	02	02	01	03	02	02	02

No. of PILOT Ascents

30-10-2010		31-10-2010	
12Z	18Z	00Z	06Z
35	50	35	26

List of stations of neighbouring countries

DATE 30-10-2010

Country	Total No. of station	Hours of observations (UTC)							
		00	03	06	09	12	15	18	21
Sri Lanka	8	8	8	8	8	8	8	6	6
Bangladesh	11	6	9	9	9	6	6	6	9
Myanmar	10	7	7	7	7	7	1	6	0
Thailand	1	1	1	1	1	1	1	1	1

Remark: Reception of Buoys data is satisfactory.



India Meteorological Department

REGIONAL METEOROLOGICAL CENTRE, CHENNAI

FDP (Cyclone) FOC Chennai Report Dated 31 OCT 2010, 1400 hrs

PART – A: STATUS OF OBSERVATION SYSTEM

No of Synop data

Date→	30.10.2010							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	19	22	20	20	22	19	19	18

No. of RS/RW Ascents

00Z / 30.10.2010 : 4

No. of Ascents reaching 250 hpa level =3

MISDA : 1

12Z /30.10.2010 : 4

No. of Ascents reaching 250 hpa level =3

2MISDA : 1

No. of PILOT Ascents:

30.10.2010	
06Z	18Z
0	0

Status of AWS data is given in FDPNOC report.

PART – B: RMC CHENNAI INFERENCE

CHENNAI MNG INF DATED 31.10.2010.AAA

BAY INF AURORA AAA Y'S TRH OF LOW PRESSURE NOW LIES OVER WC AND ADJ SW BAY OFF TN-SOUTH ANDHRA COT AAA WX SSL ELSEWHERE BAY AND ADMN SEA AAA

ARSEA INF AURORA AAA Y'S TRH OF LOW PRESSURE OVER LKD AREA AND N/HOOD PERSTS AAA WX SSL ELSEWHERE ARSEA AAA

REGN INF AAA NE MON HAS BEEN VIG OVER CAP AND ACT OVER KRL,RYLS AND ITN AAA Y'S TRH OF LOW PRESSURE NOW LIES OVER WC AND ADJ SW BAY OFF
TN-SOUTH ANDHRA COT AAA ASSTD U/A CYCIR EXTDS UPTO MTL AAA Y'S TRH OF LOW PRESSURE OVER LKD AREA AND N/HOOD PERSISTS AAA

KWR RECORDED THE HIGHEST MAX TEMP OF 35 DEG C IN THE REGION AND KMT,ARV AND GNV RECORDED THE LOWEST MIN TEMPERATURE OF 19 DEG C IN THE PLAINS OF THE REGION AAA

FCST AAA RA/TSH WOULD OCCUR AT MOST PLACES OVER CAP AND KRL, AT MANY PLACES OVER RYLS,TLGN AND CK AND AT A FEW PLACES OVER IK AND TN/PDC AAA ISOL RA/THRS MAY OCCUR OVER LKD AAA

HRW AAA ISOL XX TO VERY XX RA WOULD OCCUR OVER RYLS AND TLGN DURING NEXT 48 HOURS AND ISOL XX RAIN WOULD ALSO OCCUR OVER CAP,KRL AND TN/PDC
DURING THE SAME PERIOD AAA

ENDS AAA

=====

L/FCST AAA

FOR NEXT 24 HRS AAA THE SKY CONDITIONS MAY BE GENERALLY CLOUDY
AAA RAIN/TSH MAY OCCUR IN SOME AREAS AAA MAX AND MIN TEMP WOULD BE AROUND 31 AND 23 DEG C RESPECTIVELY AAA

FOR NEXT 48 HRS AAA THE SKY CONDITIONS MAY BE GENERALLY CLOUDY
AAA

RAIN/TSH MAY OCCUR IN SOME AREAS AAA MAX AND MIN TEMP WOULD BE AROUND 31 AND 23 DEG C RESPECTIVELY AAA

ENDS AAA

PART – C: UPPER AIR WINDS FORECAST OVER CHENNAI

WRF – MODEL OUTPUT INDICATES LIGHT VARIABLE WINDS UPTO 900 hPa AND MAINLY SOUTHWESTERLY WINDS OF THE ORDER OF 5 KNOTS FROM 900 hPa TO 500 hPa OVER CHENNAI FOR NEXT 24 HOURS ENDING 00Z 01.11.2010

FDP (Cyclone) NOC Report Dated 1 November, 2010, 1500 hours
Weather Briefing:

Synoptic features:

- A depression lies over Gulf of Thailand near 6 deg. N and 102 deg. E. It is likely to move west-northwestwards and emerge into south Andaman Sea by tomorrow, the 2nd November 2010. It would then continue to move west-northwestwards and intensify into a deep depression on 3rd November.
- There is fall of MSLP by 3-4 hPa over Thailand and Nicobar Islands during past 24 hrs.

Upper tropospheric ridge:

- The upper tropospheric ridge line roughly runs along 16.0°N at 200 hPa level.

Divergence:

- Upper air positive divergence ($20 \times 10^{-5} \text{ s}^{-1}$) prevails over the depression region and adjoining Andaman Sea.

Convergence:

- Lower level positive convergence ($30 \times 10^{-5} \text{ s}^{-1}$) prevails over the depression region and area of convergence is oriented in the east west direction.

Wind Shear:

- The wind Shear moderate (10-20 knots) over over the depression region and adjoining Andaman Sea.

Wind Shear Tendency:

- No significant change in past 24 hrs

Relative Vorticity:

- Relative vorticity at 850 hPa is positive over the depression region and is oriented from east-southeast to west-northwest direction. The maximum value is and magnitude $10 \times 10^{-5} \text{ s}^{-1}$.

Sea Surface Temperature:

- SST around 30.0-32.0°C over south and westcentral Bay of Bengal and Andaman Sea.

Ocean thermal energy:

- Ocean thermal energy is 120-140 KJ cm⁻² over southeast Bay of Bengal and Andaman Sea below 80 KJ cm⁻² over south and west central Bay of Bengal.

M.J.O. Index:

- Located over phase 5 with amplitude less than 1.0.
- Statistical forecast:- MJO moves through phase 6, 7 & 8 during next 15 days.
- Dynamical forecast:- MJO remains in phase 5 but with amplitude less than 1.0 and it would remain in phase 5 and 4 in next 10 days suggesting intensification of the system.

Considering all the above, the depression over the Gulf of Thailand would move west-northwest ward and intensify gradually till it is within southeast bay of Bengal. It then likely to weaken gradually as it moves towards southwest bay of Bengal.

Status of observational system:

Details of the status of observational system are given in Annexure 1.

Satellite

Inference based on Insat picture of 011100 UTC:

A vortex lies over southwest Gulf of Thailand centered near 7.7 deg. N/101.0 deg. E Intensity T 1.5 Associated intense to very intense thunder cloud over north Malay peninsular adjoining State of Malacca, Gulf of Thailand between lat 5.0 deg. N to 9.5 deg.

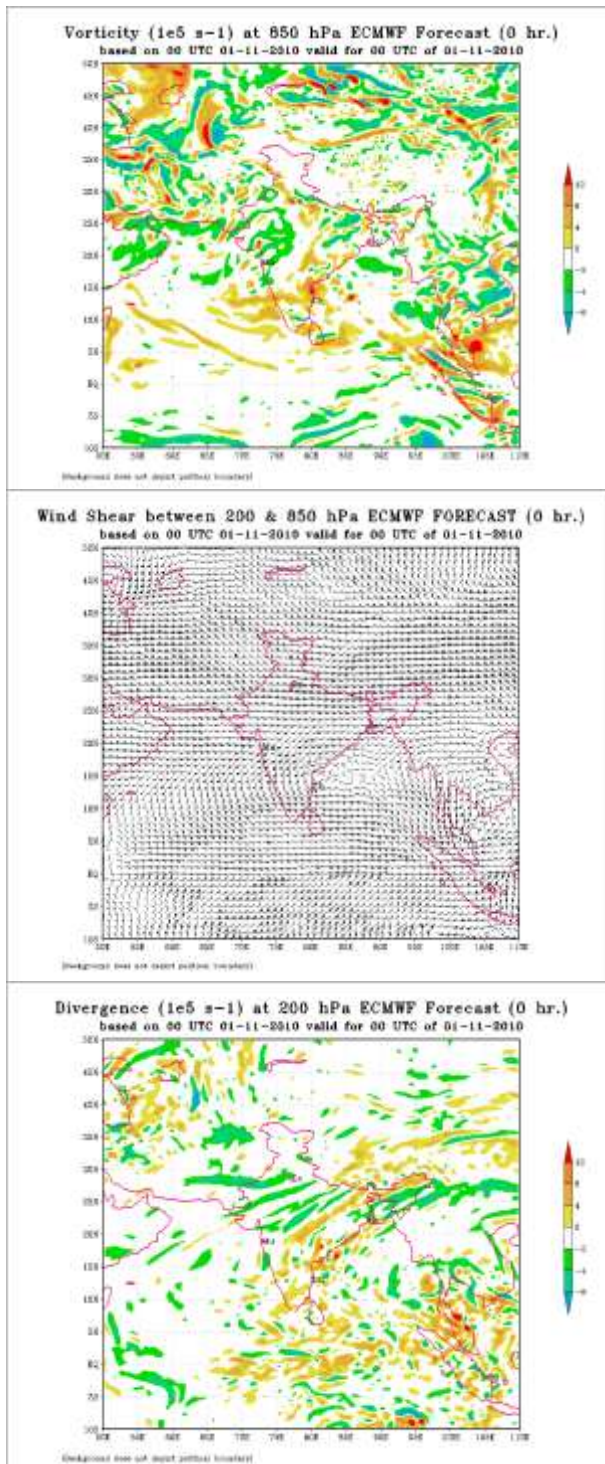
N and long 98.5 deg. E to 102.0 deg. E. The cloud mass is moving west-northwesterly direction (·)

(See <ftp://192.168.12.75/imd/satmet>
<http://www.imd.gov.in/section/satmet/dynamic/insat.htm>)

NWP

- **IMD-GFS** model analysis based on 00UTC of today (01 NOV 2010) shows closed isobar of 1008 hPa extended over SW Bay of Bengal adjoining coastal Tamil Nadu and extending upto coastal Karnataka and Kerala. The forecast wind field shows that the associated cyclonic circulation moving westward but no intensification. The 24 hr forecast field indicates a new system emerged into the south Andaman Sea as Depression. Subsequent F/C fields show likely intensification of the system into cyclonic storm on 4th November and moving west northwestwards it is likely to cross the south Andhra Pradesh and adjoining north Tamilnadu coast on 6th November.
- **IMD WRF-ARW** model analysis of 00UTC of today (01 NOV 2010) indicates a low pressure of 1008 hPa, over southwest Bay of Bengal near TamilNadu coast extending upto Comorin, Kerala, Karnataka coast, Lakshadweep and Minicoy islands. The forecast fields indicate the movement of this low pressure system to westward direction. The 24 hr f/c shows a new system emerged into the south Andaman Sea as Depression. and the 72 hr forecast shows intensification into cyclonic storm and west northwestward movement of the system.
- **IMD WRF-NMM** model analysis of 00UTC of today (01 NOV 2010) indicates a low pressure of 1008 hPa, over southwest Bay of Bengal near TamilNadu coast extending upto Comorin, Kerala, Karnataka coast, Lakshadweep and Minicoy islands. The 24 hr f/c shows the formation of a new low pressure system over south Andaman Sea and the 48 hr forecast shows intensification into cyclonic storm and west northwestward movement of the system.
- **NCMRWF-GFS** model analysis of 00UTC of today (01 NOV 2010) shows a cyclonic circulation over TamilNadu coast. The 24 hr forecast shows formation of a new cyclonic circulation over south Andaman Sea and forecast fields show intensification of the system and moving west northwestward direction the system likely to cross the north Tamilnadu coast on 6th November.
- **ECMWF-GFS** model analysis of 00UTC of today (01 NOV 2010) shows a closed isobar of 1006 hPa over Southwest Bay of Bengal off TamilNadu coast. The 24 hr f/c shows a new system emerged into the south Andaman Sea as Depression and forecast fields show intensification of the system into cyclonic storm on 4th November and moving west northwestward direction the system is likely to cross the north Tamilnadu coast on 8th November.
- **UKMO-GFS** model analysis of 00UTC of today (01 NOV 2010) shows a cyclonic circulation over Southwest Bay of Bengal off TamilNadu coast. The 24 hr forecast shows formation of a new low pressure system over south Andaman Sea and forecast fields show intensification of the system and moving west northwestward direction the system lies over Southwest Bay of Bengal on 6th November.

Analysis Field of cyclogenesis parameters



(See <http://www.imd.gov.in/section/nhac/dynamic/welcome.htm>)

See ftp://ftp.ncmrwf.gov.in/pub/outgoing/TC_FDP/

Detailed report of FOC, Chennai is given in Annexure 2.

■ A depression lay over Gulf of Thailand near 6 deg. N and 102 deg. E at 0600 UTC. It is likely to move west-northwestwards and emerge into south Andaman Sea by tomorrow, the 2nd November 2010. It would then continue to move west-northwestwards and intensify into a deep depression on 3rd and into a cyclonic storm on 4th November 2010 over the southeast Bay of Bengal. Continuing its west northwestward movement, it is expected to move towards north Tamil Nadu – south Andhra Pradesh coast during 4-8th November. NWP models suggest landfall of the system near Chennai.

- ### Forecast for Sagar Kanya ship:

- A depression lies over Gulf of Thailand near 6 deg. N and 102 deg. E. It is likely to move west-northwestwards and emerge into south Andaman Sea by tomorrow, the 2nd November 2010. It would then continue to move west-northwestwards and intensify into a deep depression on 3rd and into a cyclonic storm on 4th November 2010 over the southeast Bay of Bengal. Continuing its west northwestward movement, it is expected to move towards north Tamil Nadu – south Andhra Pradesh coast during 4-8th
- Convective clouds over Gulf of Thailand would emerge into south Andaman Sea by tomorrow.
- **RS/RW observations 4 times a day and hourly observations will be taken from Sagar Kanya during 3-5th November along the ship route.**

Status of Observation system:

Synop ← 31-10-2010 →← 1-11-2010 →

Region	09	12	15	18	21	00	03	06
KOL	30	61	18	21	16	18	21	21
CHN	34	71	21	25	29	24	25	25
MUM	17	43	16	20	16	13	14	15

← 31-10-2010 →← 1-11-2010

UTC	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07
Nos	458	461	458	457	453	413 /21 6	511/ 284	504	505	506	504	504	504	503	408	504	507	449	450	456	454	458	458	460

RSRW (12Z) 31-10-2010: - 35/35

No. of Ascents reaching 250 hPa levels: 14

MISDA:-PTL, JDP, LKN, GRK, DBH, SLG, GHT, PTN, RNC, AGT, GWL, BHP, NGP, RPR, JGD, AHM, AGD, PNJ, HYD, VSK, AMN (21)

RSRW (00Z) 1-11-2010: - 36/36

No. of Ascents reaching 250 hPa levels: 28

MISDA:- GHT, AMN (2)

Buoy Data

31-10-2010					1-11-2010		
09Z	12Z	15Z	18Z	21Z	00Z	03Z	06Z
02	02	01	02	02	01	02	02

No. of PILOT Ascents

31-10-2010		1-11-2010	
12Z	18Z	00Z	06Z
34	32	32	31

Status of RS/RW observations

STATION Index	STATION Name	RS last level		Wind last level
		mb	Km	mb
42410	GHT			
42809	CAL	10.8	30.8	10
43333	PBL	11.6	30	12
42971	BWN	24.2	25.3	38
43150	VSK	477	6.1	922
43185	MPT	78.1	17.9	249
43128	HYD	4.3	36.8	4
43279	CHN	7	33.4	7
43346	KRK	139	14.6	697
43371	TRV	44.5	21.5	250
43192	GOA	277	10.2	NIL
43003	MUM	152	13.9	150
43285	MNC	169	13.4	573
42647	AHM	17.5	27.5	112
43369	MNC	5.4	35.1	5
43353	KOCHI	62.4	19.1	NIL
42724	AGT	30.7	23.7	112

List of stations of neighbouring countries
DATE 31-10-2010

Country	Total No. of station	Hours of observations (UTC)							
		00	03	06	09	12	15	18	21
Sri Lanka	8	6	8	8	8	8	6	6	6
Bangladesh	11	9	9	9	5	9	9	8	9
Myanmar	10	7	7	7	7	7	1	6	1
Thailand	1	1	1	1	1	1	1	1	1

Remark: Reception of Buoys data is satisfactory.



Annexure-2

India Meteorological Department

REGIONAL METEOROLOGICAL CENTRE, CHENNAI

FDP (Cyclone) FOC Chennai Report Dated 01 NOV 2010, 1400 hrs

PART – A: STATUS OF OBSERVATION SYSTEM

No of Synop data

Date→	31.10.2010							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	19	22	20	20	22	19	19	19

No. of RS/RW Ascents

00Z / 31.10.2010 : 4

No. of Ascents reaching 250 hpa level =4

MISDA : 0

12Z /31.10.2010 : 4

No. of Ascents reaching 250 hpa level =3

MISDA : 1

No. of PILOT Ascents:

31.10.2010	
06Z	18Z
1	0

Status of AWS data is given in FDPNOC report.

PART – B: RMC CHENNAI INFERENCE

CHENNAI MNG INF DATED 01.11.2010.AAA

BAY INF AURORA AAA Y'S TRH OF LOW PRESSURE NOW EXTDS FROM GULF OF MANNAR TO WC BAY ACROSS SW BAY OFF TN-SCAP COAST AAA WX SSL ELSEWHERE BAY AND ANDMN SEA AAA

ARSEA INF AURORA AAA Y'S TRH OF LOW PRESSURE OVER LKD AREA AND N/HOOD PERSTS AAA WX SSL ELSEWHERE ARSEA AAA

REGN INF AAA NE MON HAS BEEN VIG OVER SCAP AND ACT OVER SIK, RYLS AND ITN AAA Y'S TRH OF LOW PRESSURE NOW EXTDS FROM GULF OF MANNAR TO WC BAY ACROSS SW BAY OFF TN-SCAP COAST AAA

AN E-W SHEAR LINE RUNS ROUGHLY ALONG LAT 13 DEG N ACROSS PENINSULA IN THE LTL ,WITH AN EMBEDDED CYCIR OVER WC BAY AND ADJ SCAP COAST AND EXTDS UPTO MTL AAA Y'S TRH OF LOW PRESSURE OVER LKD AREA AND N/HOOD PERSTS AAA

ADL RECORDED THE LOWEST MIN TEMPERATURE OF 15 DEG C IN THE PLAINS OF THE REGION AAA

FCST AAA RA/TSH WOULD OCCUR AT MOST PLACES OVER CAP, AT MANY PLACES OVER TN/PDC, TLGN, RYLSM, CK, SIK, KRL AND AT A FEW PLACES OVER NIK AND LKD AAA

HRW AAA ISOL XX TO VERY XX RA WOULD OCCUR OVER CAP DURING NEXT 48 HOURS AND ISOL XX RAIN WOULD ALSO OCCUR OVER TN/PDC, TLGN AND RYLSM DURING THE SAME PERIOD AAA

ENDS AAA

L/FCST AAA

FOR NEXT 24 HRS AAA THE SKY CONDITIONS WOULD BE GENERALLY CLOUDY AAA ONE OR TWO SPELLS OF RAIN/TSH WOULD OCCUR IN SOME AREAS AAA MIN TEMP WOULD BE AROUND 24 DEG C AAA

FOR NEXT 48 HRS AAA THE SKY CONDITIONS WOULD BE GENERALLY CLOUDY AAA ONE OR TWO SPELLS OF RAIN/TSH WOULD OCCUR IN SOME AREAS AAA MIN TEMP WOULD BE AROUND 24 DEG C AAA

ENDS AAA

PART – C: UPPER AIR WINDS FORECAST OVER CHENNAI

WRF – MODEL OUTPUT INDICATES SOUTHWESTERLY TO SOUTHERLY WINDS OF THE ORDER OF 5 KNOTS UPTO 800 hPa AND SOUTHERLY TO SOUTHEASTERLY WINDS OF THE ORDER OF 5 KNOTS FROM 800 TO 500 hPa FOR NEXT 24 HOURS ENDING 00Z 02.11.2010

FDP (Cyclone) NOC Report Dated 2 November, 2010, 1500 hours
Weather Briefing:

Synoptic features:

- The depression over Gulf of Thailand moved west-northwestwards and emerged into south Andaman Sea at 020900UTC as a low pressure area. The system is likely to concentrate into a depression over the same area during next 24 hours. It is likely to intensify further into a cyclonic storm and to move west-northwestwards towards north Tamil Nadu and south Andhra Pradesh coast.

Upper tropospheric ridge:

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

Divergence:

- Upper air positive divergence ($10\text{-}20 \times 10^{-5} \text{ s}^{-1}$) prevails over the low pressure area and southeast Bay of Bengal.

Convergence:

- Lower level positive convergence ($20\text{-}30 \times 10^{-5} \text{ s}^{-1}$) prevails over the low pressure area and southeast Bay of Bengal.

Wind Shear:

- The wind Shear is weak (5-10 knots) over the low pressure region, adjoining Andaman Sea and southeast Bay of Bengal.

Wind Shear Tendency:

- Decreasing wind shear tendency (-5 to -10 knots) over low pressure area and Andaman Sea.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive over low pressure region with magnitude of $10 \times 10^{-5} \text{ s}^{-1}$.

Sea Surface Temperature:

- SST around 30.0-32.0°C over south and westcentral Bay of Bengal and Andaman Sea.

Ocean thermal energy:

- Ocean thermal energy is 120-140 KJ cm⁻² over southeast Bay of Bengal and Andaman Sea below 80 KJ cm⁻² over southwest and west central Bay of Bengal.

M.J.O. Index:

- Located over phase 5 with amplitude less than 1.0.
- Statistical forecast:- MJO moves through phase 6, 7 & 8 during next 15 days.
- Dynamical forecast:- MJO remains in phase 5 but with amplitude less than 1.0 and it would remain in phase 5 and 4 in next 10 days suggesting intensification of the system.

Considering all the above, the low pressure area over south Andaman Sea is likely to intensify into a depression during next 24 hours and move west-northwestwards and intensify further..

Status of observational system:

Details of the status of observational system are given in Annexure 1.

Satellite

Inference based on insat picture 020900 UTC (.)

Broken intense to very intense convection over south Tenasserim coast south adjoining north Andaman sea and Nicobar island in association with vortex over extreme south Thailand centered within a half degree of latitude 9.0N/99.0E(.) Broken

low/medium clouds with embedded moderate to intense convection over south and west central Bay of Bengal west of longitude 86.0 E eastcentral Bay south of latitude 16.0N east of longitude 91.0E (.) Broken low/medium clouds with embedded isolated weak to moderate convection over rest central bay and north west bay gulf of Martaban rest Andaman sea

(.)

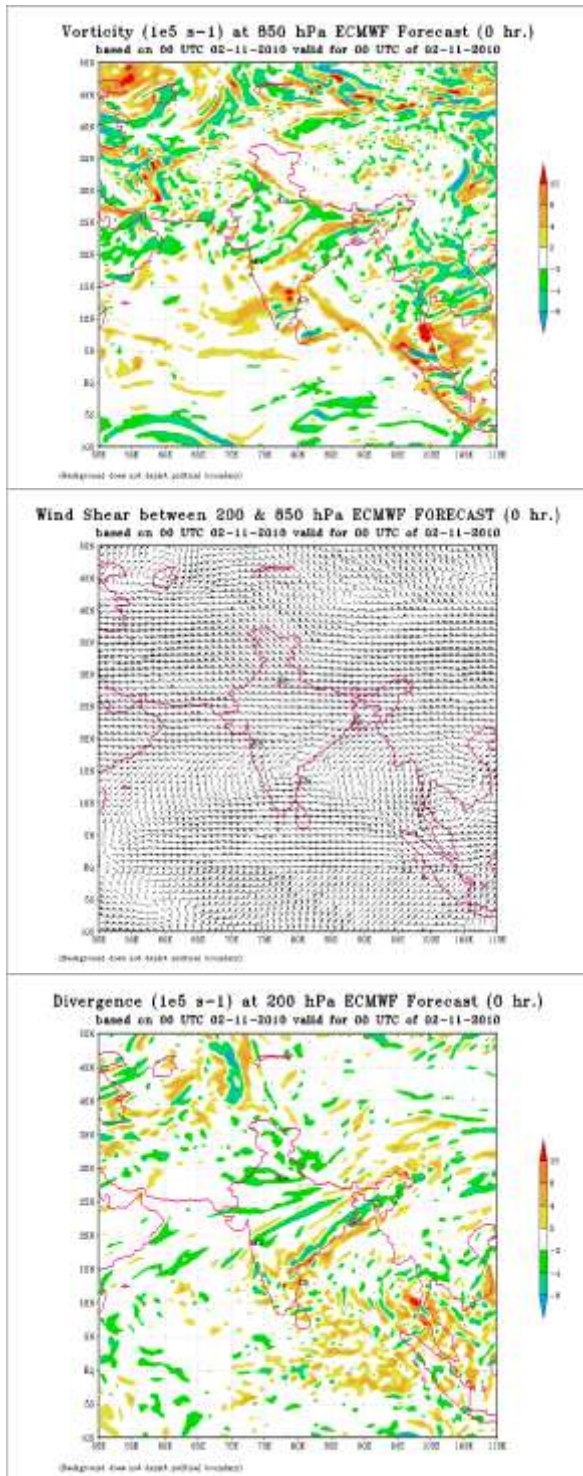
(See <ftp://192.168.12.75/imd/satmet>

<http://www.imd.gov.in/section/satmet/dynamic/insat.htm>)

NWP

- **ECMWF** model analysis of 00UTC of today (02 Nov.2010) shows formation of a cyclonic circulation over south Andaman sea and further the forecasts show that the system is likely to intensify into a Severe cyclonic storm and likely to move in a north-westward direction .
- **IMDGFS** model analysis based on of 00UTC of today (02 Nov.2010) indicates formation of a low pressure system in the south Andaman sea and subsequent F/C fields show intensification of the system into a Severe cyclonic storm and likely to move in a west-north-westerly direction.
- **IMD WRF-ARW** model analysis of 00UTC of today (02 Nov.2010) indicates formation of a low pressure system over south Andaman sea and the forecast fields during next 72 hours show intensification of the system into a severe cyclonic storm and moving in a northwesterly direction .
- **IMD WRF_NMM** model analysis of today (02 Nov.2010) shows a cyclonic circulation over south Anandman sea. The 24 hour forecast indicates formation into depression. The 48 hr forecast indicates intensification of the sysystem into a severe cyclonic storm and is likely to move in a west-north-west direction. 72 hr forecast shows the sysytem likely to move in north-westerly direction.
- **UKMET** model analysis of 00UTC of today (02 Nov.2010) indicates a low pressure system is approaching over south Andman sea. During next 48 hours the forecast fields show that the system is likely to develop into depression to severe cyclonic storm and likely to move in north-westerly direction into southwest Bay of Bengal
- **NCMRWF-GFS** model analysis of 00 UTC of today (02 Nov. 2010) shows a low pressure over south Andaman sea. The 24 hour forecast show westerly movement and it is likely to intensify further into a severe cyclonic storm by 5th Nov.,and move in a west-north-west direction.The system is likely to cross the south Andhra coast by around 6th Nov.
- **JMA-GFS** model analysis of of 00UTC of today (02 Nov. 2010) shows a low pressure over south Andaman sea. During next 24 hours it is likely to become a deep depression and further it is likely to intensify into a cyclonic storm and move northwestwards.
- **ARPEGE** model analysis indicates a low pressure over south Andaman Sea and likely to become a depression in the next 24 hours. Subsequently the system is likely to intensify and move further west-north-westward.

Analysis Field of cyclogenesis parameters: Vorticity(850hPa), windshear(850hPa) and the upper level divergence(200hPa) are :



(See <http://www.imd.gov.in/section/nhac/dynamic/welcome.htm>)
See ftp://ftp.ncmrwf.gov.in/pub/outgoing/TC_FDP/

FOC Report

Detailed report of FOC, Chennai is given in Annexure 2.

Advisory

- The depression over Gulf of Thailand emerged into south Andaman Sea as a low pressure area. The system is likely to intensify into depression during next 24 hours and move west-northwestwards.
- Considering all the above, the **IOP will be conducted for Andaman & Nicobar Islands during 2nd 3rd November. Hourly surface observations will be taken by the observatory stations and RS/RW observation will be taken up four times a day during this period by MO Port Blair.**
- **RS/RW observations 4 times a day and hourly observations will also be taken from Sagar Kanya during 3-5th November along the ship route.**
- **Close watch of the system will be maintained and FOC Chennai will make preparations for IOP over south Andhra Pradesh and Tamil Nadu coast during 5-8th November 2010.**

Forecast for Sagar Kanya ship:

- The depression over Gulf of Thailand emerged into south Andaman Sea as a low pressure area. The system is likely to intensify into depression during next 24 hours and move west-northwestwards.
- Broken intense to very intense convection over south Tenasserim coast adjoining north and south Andaman sea and Nicobar island.
- **RS/RW observations 4 times a day and hourly observations will be taken from Sagar Kanya during 3-5th November along the ship route.**

Annexure-1

Status of Observation system:

Synop	←	1-11-2010				→←	2-11-2010		→
Region		09	12	15	18	21	00	03	06
KOL		34	69	38	36	20	34	75	38
CHN		44	85	46	37	40	43	85	45
MUM		36	70	35	42	31	32	78	41

AWS

← 1-11-2010 →← 2-11-2010																								
UTC	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07
Nos	530	519	510	523	517	332	506	447	508	510	321	519	511	447	512	504	328	509	514	449	459	457	455	455

RSRW (12Z) 1-11-2010: - 35/35

No. of Ascents reaching 250 hPa levels: 12

MISDA 23:-PTL, JDP, LKN, GRK, DBH, GHT, PTN, RNC, AGT, GWL, BHP, NGP, RPR, JGD, AHM, AUG, PNJ, HYD, VSK, AMN, CHN (21)

RSRW (00Z) 2-11-2010: - 36/36

No. of Ascents reaching 250 hPa levels:

MISDA:-

Buoy Data

1-11-2010					2-11-2010		
09Z	12Z	15Z	18Z	21Z	00Z	03Z	06Z
03	02	03	02	02	02	02	02

No. of PILOT Ascents

1-11-2010		2-11-2010	
12Z	18Z	00Z	06Z
28	50	31	29

List of stations of neighbouring countries**DATE 1-11-2010**

Country	Total No. of station	Hours of observations (UTC)							
		00	03	06	09	12	15	18	21
Sri Lanka	8	8	8	8	8	8	6	6	6
Bangladesh	11	6	8	9	8	8	4	4	8
Myanmar	10	7	8	8	8	8	3	8	3
Thailand	1	1	1	1	1	1	1	1	1

Remark: Reception of Buoys data is satisfactory.**Annexure-2****India Meteorological Department****REGIONAL METEOROLOGICAL CENTRE, CHENNAI****FDP (Cyclone) FOC Chennai Report Dated 02 NOV 2010, 1400 hrs****PART – A: STATUS OF OBSERVATION SYSTEM****No of Synop data**

Date→	01.11.2010							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	19	21	20	20	21	19	19	19

No. of RS/RW Ascents**00Z / 01.11.2010 : 4**

No. of Ascents reaching 250 hpa level =2

MISDA : 1**12Z /01.11.2010 : 4**

No. of Ascents reaching 250 hpa level =3

MISDA : 1

No. of PILOT Ascents:

01.11.2010	
06Z	18Z
0	0

Status of AWS data is given in FDPNOC report.

PART – B: RMC CHENNAI INFERENCE

CHENNAI MNG INF DATED 02.11.2010.AAA

BAY INF AURORA AAA Y'S TRH OF LOW PRESSURE EXTDG FROM GULF OF MANNAR TO WC BAY ACROSS SW BAY OFF TN-SCAP COAST PERSTS AAA WX SSL ELSEWHERE BAY AND ADMN SEA AAA

ARSEA INF AURORA AAA Y'S TRH OF LOW PRESSURE OVER LKD AREA AND N/HOOD PERSTS AAA WX SSL ELSEWHERE ARSEA AAA

REGN INF AAA NE MON HAS BEEN VIG OVER SIK,CAP AND RYLS AND ACT OVER NTN AAA Y'S TRH OF LOW PRESSURE EXTDG FROM GULF OF MANNAR TO WC BAY ACROSS SW BAY OFF TN-SCAP COAST PERSTS AAA Y'S E-W SHEAR LINE RUNNING ROUGHLY ALONG LAT 13 DEG N ACROSS PENINSULA IN LTL WITH AN EMBEDDED CYCIR OVER IK AND N/HOOD AND EXTDG BETWEEN 1.5 AND 3.1 KMS ASL AAA Y'S TRH OF LOW PRESSURE OVER LKD AREA AND N/HOOD PERSTS AAA

ADL RECORDED THE LOWEST MIN TEMPERATURE OF 16 DEG C IN THE PLAINS OF THE REGION AAA

FCST AAA RA/TSH WOULD OCCUR AT MANY PLACES OVER CAP,KKA,KRL AND LKD AND AT A FEW PLACES OVER TN/PDC,RYLS AND TLGN AAA

HRW AAA ISOL XX RAIN/TSH WOULD OCCUR OVER TN/PDC,CAP,KRL AND KKA DURING NEXT 48 HOURS AAA

ENDS AAA

=====

PART – C: UPPER AIR WINDS FORECAST OVER CHENNAI

WRF – MODEL OUTPUT INDICATES SOUTHERLY TO SOUTHWESTERLY WINDS OF THE ORDER OF 5 KNOTS UPTO 800 hPa AND SOUTHEASTERLY WINDS OF THE ORDER OF 5 - 10 KNOTS FROM 800 TO 500 hPa FOR NEXT 24 HOURS ENDING 00Z 03.11.2010

FDP (Cyclone) NOC Report Dated 3 November, 2010, 1500 hours
Weather Briefing:

Synoptic features:

- Yesterday's low pressure area over south Andaman Sea and neighbourhood has become well marked low pressure area over the same region. The system is likely to move west-northwestwards and concentrate into a depression during next 24 hours

Upper tropospheric ridge:

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

Divergence:

- Upper air positive divergence ($20-30 \times 10^{-5} \text{ s}^{-1}$) prevails over the low pressure area and southeast Bay of Bengal.

Convergence:

- Lower level positive convergence ($10-15 \times 10^{-5} \text{ s}^{-1}$) prevails over the low pressure area and southeast Bay of Bengal.

Wind Shear:

- The wind Shear is strong (20-30 knots) over the low pressure region, adjoining Andaman Sea and southeast Bay of Bengal.

Wind Shear Tendency:

- Decreasing wind shear tendency (-10 to -20 knots) over low pressure area and Andaman Sea.
- Increasing wind shear tendency (5-10 knots) over southwest and southeast Bay of Bengal.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive over low pressure region and adjoining southeast Bay of Bengal with magnitude of $10 \times 10^{-5} \text{ s}^{-1}$.

Sea Surface Temperature:

- SST around 31.0-32.0°C over southeast Bay of Bengal and Andaman Sea and 29.0°C over westcentral Bay of Bengal.

Ocean thermal energy:

- Ocean thermal energy is 120-140 KJ cm⁻² over southeast Bay of Bengal and south Andaman Sea and below 80 KJ cm⁻² elsewhere over Bay of Bengal.

M.J.O. Index:

- Located over phase 4 with amplitude less than 1.0.
- Statistical forecast:- MJO moves through phase 5, 6 & 7 during next 15 days.
- Dynamical forecast:- MJO remains in phase 5 with amplitude more than 1.0. It moves through phase 4 and 6 during next 15 days.

Considering all the above, the low pressure area over south Andaman Sea is likely to intensify gradually into a depression during next 24 hours and move west-northwestwards.

Status of observational system:

Details of the status of observational system are given in Annexure 1.

Satellite

Inference based on insat picture 030900 utc (.)

Broken intense to very intense convection over South east Bay Andaman sea Andaman and Nicobar Island south Tenasserim coast in association with vortex(T=1.0) over Andaman sea centered within a half degree of latitude 8.5N/94.0E(.) Broken low/medium clouds with embedded moderate to intense convection over south west Bay south parts of east central bay (.) Broken low/medium clouds with embedded isolated weak to

moderate convection over rest central bay and south west parts of northwest Bay gulf of Martaban (.)

(See <ftp://192.168.12.75/imd/satmet>

<http://www.imd.gov.in/section/satmet/dynamic/insat.htm>)

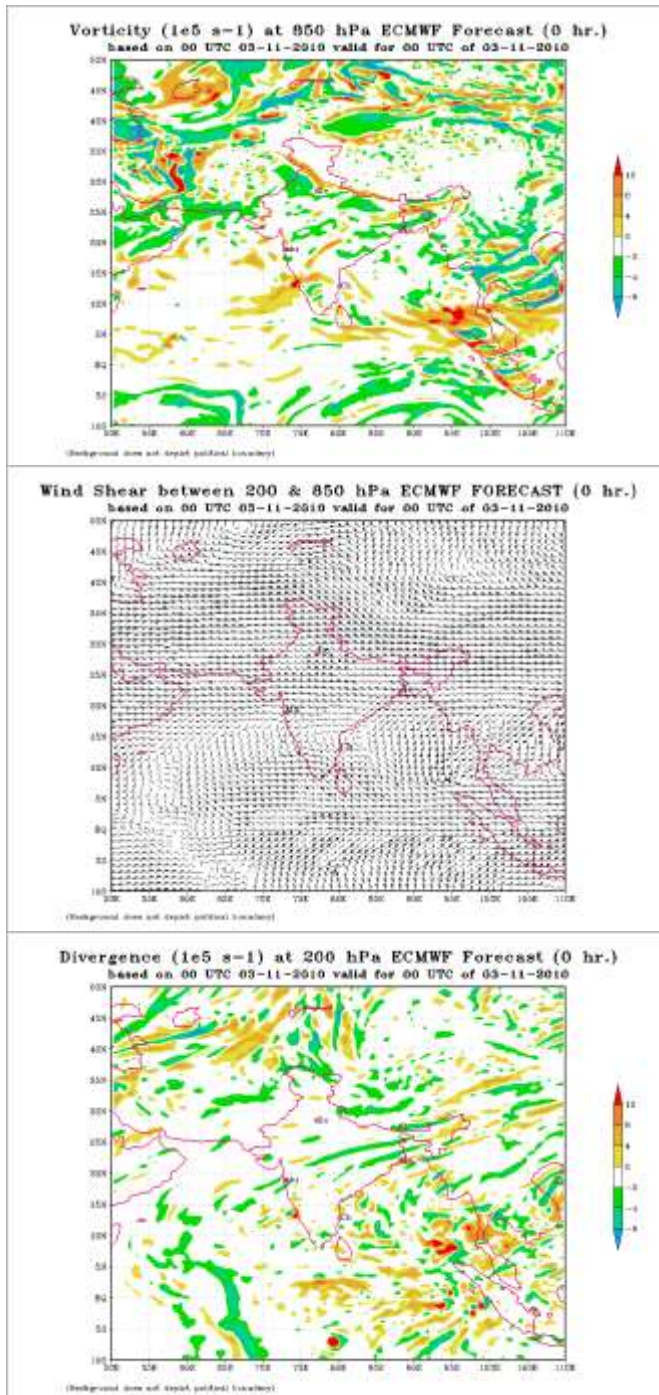
NWP

- **ECMWF** model analysis of 00UTC of today (03 Nov.2010) shows a low pressure area over south Andaman sea and its associated cyclonic circulation in the 860hPa wind field. Further the forecasts show that the system is likely to intensify in the next 48 hours into a Severe cyclonic storm and is likely to move in a north-westward direction. The system is likely to cross the south Andhra coast on 8th November 2010.
- **IMDGFS** model analysis based on of 00UTC of today (03 Nov.2010) indicates a low pressure system in the south Andaman sea and its associated circulation is seen in 850 hPa wind field. The forecast fields show that the system is likely to intensify to depression and later to a cyclone and severe cyclonic storm. The system is likely to move faster in west-northwestward and later move northwestward and likely to hit south Andhra coast 7th November 2010.
- **IMD WRF-ARW** model analysis of 00UTC of today (03 Nov.2010) indicates a low pressure system lies over south Andaman sea and the forecast fields during next 72 hours show intensification of the system into a severe cyclonic storm and moving in a northwesterly direction and likely to lay off the south TamilNadu coast on 6th November 2010. The model shows more intensification than other models.
- **IMD WRF_NMM** model analysis of today (03 Nov.2010) shows a low pressure lies over south Andaman sea. The 24 hour forecast indicates formation into cyclone. The 48 hr forecast indicates intensification of the system into a severe cyclonic storm and is likely to move in a north-west direction. 72 hr forecast shows the system likely to move in north-westerly direction and lay off the Andhra coast on 6th November 2010.
- **UKMET** N/A
- **NCMRWF-GFS** model analysis of 00 UTC of today (03 Nov. 2010) shows a low pressure lying over south Andaman sea. The 24 hour forecast show westerly movement of the cyclone and it is likely to intensify further into a cyclonic storm by 4th November and move in a north-west direction. The system is likely to cross the south Andhra coast by around 7th November and is fairly strong at the time of landfall compared to IMD-GFS.
- **JMA-GFS** N/A

Summary:

Most of the NWP models indicate that the low pressure lying over the south Andaman Sea is likely to become deep depression in the 24 hours and further likely to intensify to cyclone in the subsequent 48 hours.

Analysis parameters: Vorticity(850hPa),windshear(850hPa) and the upper level divergence(200hPa) based on ECMWF



(See <http://www.imd.gov.in/section/nhac/dynamic/welcome.htm>)

See ftp://ftp.ncmrwf.gov.in/pub/outgoing/TC_FDP/

FOC Report

Detailed report of FOC, Chennai is given in Annexure 2.

- Considering all the model inferences, the well marked low pressure area over south Andaman Sea and neighbourhood is likely to concentrate into a depression during next 24 hours and move west-northwestwards.

- ### Forecast for Sagar Kanya ship:

- ## IMPORTANT NOTICE

Annexure-1

Synop ← 2-11-2010 →← 3-11-2010 →

AWS

← 2-11-2010 →← 3-11-2010

RSRW (12Z) 2-11-2010: - 35/35

166

MISDA 23:-PTL, JDP, LKN, GRK, DBH, SLG, GHT, PTN, RNC, AGT, GWL, BHP, NGP, RPR, JGD, AHM, AUG, PNJ, HYD, VSK, AMN, MNC (22)

RSRW (00Z) 3-11-2010: - 36/36

No. of Ascents reaching 250 hPa levels:

MISDA:- GHT, AMN (2)

No. of PILOT Ascents

2-11-2010		3-11-2010	
12Z	18Z	00Z	06Z
32	32	34	22

Buoy Data

2-11-2010					3-11-2010		
09Z	12Z	15Z	18Z	21Z	00Z	03Z	06Z
02	02	-	-	-	02	02	02

Upper air Observations

		01-11-2010			02-11-2010			03-11-2010		
STATION Index	STATION Name	RS last level		Wind last level	RS last level		Wind last level	RS last level		Wind last level
		mb	Km	mb	mb	Km	mb	mb	Km	mb
42410	GHT	GET			GET			GET		
42809	CAL	10.8	30.8	10	17.3	27.6	20	6	35	10
43333	PBL	11.6	30	12	64.8	19	688	11.9	30	12
42971	BWN	24.2	25.3	38	49.7	20.8	50	7.4	33	10
43150	VSK	477	6.1	922	635	3.9	875	74.3	18.3	75
43185	MPT	78.1	17.9	249	40.4	22	42	78.2	18.2	84
43128	HYD	4.3	36.8	4	37.9	22.3	38	6	34.5	6
43279	CHN	7	33.4	7	39.5	22.1	40	3.3	38.8	3
43346	KRK	139	14.6	697	58.6	19.7	578	106	16.1	168
43371	TRV	44.5	21.5	250	100	16.5	500	94.3	16.8	nil
43192	GOA	277	10.2	NIL	178	13.1	NIL	125	15.2	NIL
43003	MUM	152	13.9	150	600	4.3	700	69.6	18.5	70
43285	MNC	169	13.4	573	572	4.7	575	139	14.5	700
42647	AHM	17.5	27.5	112	277	10.2	624	42.9	21.9	44
43369	MNC	5.4	35.1	5				6.5	34.3	642
43353	KOCHI	62.4	19.1	NIL	100	16.2	NIL	56.6	19.7	NIL
42724	AGT	30.7	23.7	112	6	34	110	6	34.3	7

List of stations of neighbouring countries
DATE 1-11-2010

Country	Total No. of station	Hours of observations (UTC)							
		00	03	06	09	12	15	18	21
Sri Lanka	8	8	8	8	8	8	8	8	8
Bangladesh	11	7	8	8	3	6	6	6	5
Myanmar	10	6	5	5	5	5	1	3	2
Thailand	1	1	1	1	1	1	1	1	1

Remark: Reception of Buoys data is satisfactory.

Annexure-II



India Meteorological Department

REGIONAL METEOROLOGICAL CENTRE, CHENNAI

FDP (Cyclone) FOC Chennai Report Dated 03 NOV 2010, 1400 hrs

PART – A: STATUS OF OBSERVATION SYSTEM

No of Synop data

Date→	02.11.2010							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	19	22	20	19	22	19	19	18

No. of RS/RW Ascents

00Z / 01.11.2010 : 4

No. of Ascents reaching 250 hpa level =2

MISDA : 1

12Z /01.11.2010 : 4

No. of Ascents reaching 250 hpa level =3

MISDA : 1

No. of PILOT Ascents:

01.11.2010	
06Z	18Z
2	1

Status of AWS data is given in FDPNOC report.

PART – B: RMC CHENNAI INFERENCE

CHENNAI MNG INF DATED 03.11.2010.AAA

BAY INF AURORA AAA Y'S LOPAR OVER SOUTH ANDMN SEA PERSTS AND IS WELL ARKED AAA IT MAY CONCENTRATE INTO A DEPRESSION AAA WX SSL ELSEWHERE BAY AND NORTH ANDMN SEA AAA

ARSEA INF AURORA AAA Y'S TRH OF LOW PRESSURE OVER LKD AREA AND N/HOOD PERSTS AAA WX SSL ELSEWHERE ARSEA AAA

REGN INF AAA NE MON HAS BEEN VIG OVER RYLS AND SIK AND ACT OVER CAP AAA

Y'S TRH OF LOW PRESSURE OVER LKD AREA AND N/HOOD PERSTS AAA Y'S E-W SHEAR LINE NOW RUNS ROUGHLY ALONG LAT 12 DEG N ACROSS PENINSULA IN LTL WITH AN EMBEDDED CYCIR/TRH OVER EAST ARSEA OFF KKA-KRL COT EXTDG UPTO MTL AAA A TRH ON SLC RUNS FROM COMORIN AREA TO RYLS ACROSS ITN AAA

ADL RECORDED THE LOWEST MIN TEMPERATURE OF 16 DEG C IN THE PLAINS OF THE REGION AAA

FCST AAA RA/TSH WOULD OCCUR AT MANY PLACES OVER CAP,CK AND KRL AND AT A FEW PLACES OVER TN/PDC,RYLS,TLGN,LKD AND IK AAA

HRW AAA ISOL XX RAIN WOULD OCCUR OVER CAP DURING NEXT 48 HOURS AAA

ENDS AAA

=====

PART – C: UPPER AIR WINDS FORECAST OVER CHENNAI

WRF – MODEL OUTPUT INDICATES EASTERLY WINDS OF THE ORDER OF 5 KNOTS UPTO 500 hPa FOR NEXT 24 HOURS ENDING 00Z 04.11.2010

FDP (Cyclone) NOC Report Dated 4 November, 2010, 1500 hours

Weather Briefing:

Synoptic features:

The depression over southeast Bay of Bengal moved westwards and lay centred at 1130 hrs IST of 4th November 2010 near lat. 8.5°N and long. 90.5°E about 1000 km east of Batticaloa (Sri Lanka), 1250 km east-southeast of Chennai and 1300 km southeast of Visakhapatnam. It would intensify gradually into a cyclonic storm and move west-northwestwards and cross north Tamil Nadu and south Andhra Pradesh coast between Chennai and Ongole by 7th November 2010 evening/night.

Upper tropospheric ridge:

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

Divergence:

- Upper air positive divergence ($20\text{-}30 \times 10^{-5} \text{ s}^{-1}$) prevails over the depression area and southwest Bay of Bengal and northcentral Bay of Bengal.

Convergence:

- Lower level positive convergence ($10\text{-}15 \times 10^{-5} \text{ s}^{-1}$) prevails over the depression area and southwest Bay of Bengal.

Wind Shear:

- The wind Shear is strong (20-30 knots) over the depression area and southwest Bay of Bengal

Wind Shear Tendency:

- Decreasing wind shear tendency (-5 to -10 knots) over the depression area and southwest Bay of Bengal

Relative Vorticity:

- Relative vorticity at 850 hPa is positive over the depression area and adjoining southwest Bay of Bengal with magnitude of $10\text{-}15 \times 10^{-5} \text{ s}^{-1}$.

Sea Surface Temperature:

- SST around $29.0\text{-}31.0^{\circ}\text{C}$ over south Bay of Bengal and Andaman Sea and 29.0°C over westcentral Bay of Bengal.

Ocean thermal energy:

- Ocean thermal energy is $120\text{-}140 \text{ KJ cm}^{-2}$ over southeast Bay of Bengal and south Andaman Sea and below 80 KJ cm^{-2} elsewhere over Bay of Bengal.

M.J.O. Index:

- Located over phase 4 with amplitude less than 1.0.
- Statistical forecast:- MJO moves through phase 5, 6, 7 & 8 during next 15 days.
- Dynamical forecast:- MJO remains in phase 5 with amplitude less than 1.0. It moves through phase 5, 6, 7 & 8 during next 15 days.

Considering all the above, the depression over southeast Bay of Bengal and neighbourhood intensify gradually into a cyclonic storm and move west-northwestwards and cross north Tamil Nadu and south Andhra Pradesh coast between Chennai and Ongole by 7th November 2010 evening/night.

Status of observational system:

Details of the status of observational system are given in Annexure 1.

Satellite

Vortex over SE Bay at 040900 UTC now centered within half a degree of $8.5\text{N}/90.5\text{E}$. Intensity T1.5 Associated broken intense to very intense thunder clouds over SE Bay adjoining SW Bay between Lat 5.0N to 12.0N east of long 83.0E Bay islands Andaman Sea. Intensification features of the system were observed from 2100

UTC of 3rd November and hence intensity was increased at 0000 UTC of 4th November from T1.0 to T1.5.

(See <ftp://192.168.12.75/imd/satmet>

<http://www.imd.gov.in/section/satmet/dynamic/insat.htm>)

NWP Analysis

- **ECMWF** model 0 hr forecast of today (04 Nov 2010) shows that there is a well marked low pressure area at 8°N 92°E. It will be more intensify and move towards west-westnorthward (10°N 88°E) in the next 24 hours (05 Nov 2010). At 48 hours (06 Nov 2010 00UTC), it will be at 10° N 86°E. After 72 hr (07 Nov 2010), It will be move near to tamilnadu coast (12°N 83°E). On 8 Nov 2010 00UTC, It is likely to hit tamilnadu coast.

- **IMDGFS** model analysis of today (04 Nov 00UTC) shows that there is a low pressure area over Southeast Bay of Bengal with 1 closed isobar. In the next 24 hour forecast (05 Nov 2010), it will get intensify and move west-westnorthward (position at 10°N 88°E). After 48 hours (06 Nov 2010 00UTC), it will move near Tamilnadu coast (12°N 85°E) with more intensification. At 72 hour forecast (07 Nov 2010 00UTC), It is likely to hit the Tamilnadu coast. In IMDGFS forecast, the movement of low pressure area is faster than ECMWF. It is likely to hit the Tamilnadu coast before 1 day than ECMWF forecast.

- **WRF-ARW** model analysis of 00UTC of today (04 Nov 2010) shows that there is a low pressure area in the southeast bay of Bengal. It is likely to intensify and move towards west-westnorthward (8°N 89°E) in the next 24 hours (05 Nov 2010). After 48 hr (06 Nov 2010 00UTC), It will be more intensity and will be at 10°N 85°E. It is likely to hit the ta

- **WRF-NMM** model forecast at 0h Based on 00UTC of today (04 Nov 2010) shows that there is a cyclonic circulation at 8°N 90°E. It is likely to intensify and move west-westnorthward (10°N 88°E) in the next 24 hr forecast (05 Nov 2010). At 48 hr (06 Nov 2010 00UTC), It will be more intense and will be at 12°N 85°E. It is likely to hit South Andhra coast on 07 Nov 2010 as a cyclonic storm.

- **NCMRWF-GFS** Based on 04 Nov 2010 00 UTC model analysis that there a cyclonic circulation at 8°N 90°E. It will be more intensify and move towards west-westnorthward (10°N 88°E) in the next 24 hours (05 Nov 2010). At 48 hr forecast (06 Nov 2010 00UTC), it will be more intensify and will be at 10°N 85°E. It is likely to hit the coast on 07 Nov 2010 at 00UTC as a cyclonic storm.

- **NCEP-GFS** Based on 04 Nov 2010 model analysis there is a well marked low pressure area at 8°N 91°E. It is likely to intensify (998 hPa) and move towards west-westnorthward (9°N 88°E) in the next 24 hours (05 Nov 2010 00UTC). At 48 hours (06 Nov 2010), it will get more intensify (993 hPa) and will be at 11°N 84°E. At 48 hours (07 Nov 2010), it will have pressure (991 hPa) and location at 12°N 81°E. It is likely to hit the North Tamilnadu coast (13°N 80°E) on 07 Nov 2010 at 06 UTC.

- **JMA-GFS** Based on 04 Nov 2010 model 0H forecast, There is a low pressure area (999 hPa) at 8°N 92°E. It is likely to intensify (988 hPa) and will move towards west-westnorthward (9°N 89°E) in the next 24 hours (05 Nov 2010 00UTC). At 48 hours (06 Nov 2010 0UTC), It will be more intensity and will be located at 9°N 85°E. AT 72 hr forecast (07 Nov 2010 00UTC), it will be more intense (970 hPa) and will be located at 10°N 81°E. It is likely to hit the Tamilnadu coast at 11°N 80°E as 980 hPa.

- **UKMET** Based on 04 Nov 2010 model forecast, there is a cyclonic circulation at 8°N 90°E on 04 Nov 2010 at 06 UTC. It is likely to move west-westnorthward (9°N 89°E) in the next 24 hours (05 Nov 2010). On 05 Nov 2010 at 12 UTC, it will be at 10°N 87°E.

- **ARPEGE** Not Available

Conclusion

There is a low pressure area in the southeast Bay of Bengal (8°N 91°E), which is likely to intensify and move towards west-westnorthward in the next 24 Hours. After 48 hours it will be more intensify and move near to Tamilnadu coast (10°N 85°E). After 72 hours (07 Nov 2010), It is likely to hit the Tamilnadu Coast.

FOC Report

Detailed report of FOC, Chennai is given in Annexure 2.

Advisory

.Considering all the above, No IOP will be conducted for Andaman & Nicobar Islands.

- RS/RW observations 4 times a day and hourly observations will be taken from Sagar Kanya during 3-8th November along the ship route.

- IOP will be conducted for Andhra Pradesh and Tamil Nadu coast from 0000 UTC of 5th to 8th November 2010.

Forecast for Sagar Kanya ship:

Yesterday's well marked low pressure area over south Andaman Sea and neighbourhood has concentrated into depression and lay centred at 1130 hrs IST of 4th November 2010 near lat. 8.5°N and long. 90.5°E about 1000 km east of Batticaloa (Sri Lanka), 1250 km east-southeast of Chennai and 1300 km southeast of Visakhapatnam. It would intensify gradually into a cyclonic storm and move west-northwestwards and cross north Tamil Nadu and south Andhra Pradesh coast between Chennai and Ongole by 7th November 2010 evening/night.

- RS/RW observations 4 times a day and hourly observations will be continued from Sagar Kanya during 3-8th November along the ship route.

Annexure-1

Status of Observation system:

Synop	←	3-11-2010					→	←	4-11-2010			→
Region		09	12	15	18	21		00	03	06		
KOL		30	80	25	25	24		38	76	41		
CHN		49	80	38	38	38		49	81	35		
MUM		46	77	30	31	30		43	75	33		

AWS

	← 3-11-2010															→← 4-11-2010									
UTC	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	
Nos	-	-	-	-	-	510	498	511	509	517	342	514	506	513	511	420	423	422	455	439	462	466	372	-	

RSRW (12Z) 2-11-2010: - 35/34

No. of Ascents reaching 250 hPa levels: 10

MISDA:-PTL, JDP, LKN, GRK, DBH, SLG, GHT, PTN, RNC, AGT, GWL, BHP, NGP, RPR, JGD, AHM, AUG, PNJ, HYD, VSK, MDS, MNG, AMN, MNC (24)

RSRW (00Z) 3-11-2010: - 36/36

No. of Ascents reaching 250 hPa levels: (29)

MISDA:- GHT, AMN (2)

No. of PILOT Ascents

3-11-2010		4-11-2010	
12Z	18Z	00Z	06Z
33	47	31	43

Buoy Data

2-11-2010					3-11-2010		
09Z	12Z	15Z	18Z	21Z	00Z	03Z	06Z
03	02	-	01	01	-	03	03

List of stations of neighbouring countries**DATE 3-11-2010**

Country	Total No. of station	Hours of observations (UTC)							
		00	03	06	09	12	15	18	21
Sri Lanka	8	8	8	8	8	8	8	6	6
Bangladesh	11	8	9	8	8	7	7	3	6
Myanmar	10	7	7	7	7	5	1	6	1
Thailand	1	1	1	1	1	1	1	1	1

Status of RS/RW Observation

		03-11-2010 00UTC			04-11-2010 00UTC		
		RS last level		Wind last level	RS last level		Wind last level
STATION Index	STATION Name	mb	Km	mb	mb	Km	mb
42410	GHT	GET			GET		
42809	CAL	6	35	10	18.9	27.4	20
43333	PBL	11.9	30	12	28.2	24.2	29
42971	BWN	7.4	33	10	16.8	27.8	18
43150	VSK	74.3	18.3	75	50	20.8	100
43185	MPT	78.2	18.2	84	46.2	21.5	66
43128	HYD	6	34.5	6.2	6.2	34.3	6
43279	CHN	3.3	38.8	3	3.3	38.8	3
43346	KRK	106	16.1	168	678	3.4	nil
43371	TRV	94.3	16.8	nil	123	15.3	nil
43192	GOA	125	15.2	NIL	206	12.1	NIL
43003	MUM	69.6	18.5	70			
43285	MNC	139	14.5	700	109	16	166
42647	AHM	42.9	21.9	44	100	16.3	nil
43369	MNC	6.5	34.3	642	145	14.5	146
43353	KOCHI	56.6	19.7	NIL	100	16.1	NIL
42724	AGT	6	34.3	7	186	12.8	188

Remark: Reception of Buoys data is satisfactory.



India Meteorological Department

REGIONAL METEOROLOGICAL CENTRE, CHENNAI

FDP (Cyclone) FOC Chennai Report Dated 04 NOV 2010, 1400 hrs

PART – A: STATUS OF OBSERVATION SYSTEM

No of Synop data

Date→	03.11.2010							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	19	22	20	20	22	19	19	18

No. of RS/RW Ascents

00Z / 03.11.2010 : 4

No. of Ascents reaching 250 hpa level =4

MISDA : 0

12Z /03.11.2010 : 4

No. of Ascents reaching 250 hpa level =2

MISDA : 2

No. of PILOT Ascents:

03.11.2010	
06Z	18Z
3	2

Status of AWS data is given in FDPNOC report.

PART – B: RMC CHENNAI INFERENCE

CHENNAI MNG INF DATED 04.11.2010.AAA (COR)

BAY INF AURORA AAA Y'S WML OVER S ADMN SEA HAS CONCENTRATED INTO A DEPRESSION AT 0000 HOURS UTC ON 04TH NOVEMBER 2010 AND LAY CENTRED OVER SE BAY AT 0300 HOURS UTC NEAR LAT 8.5 DEG N AND LONG 91.0 DEG EAST AT ABOUT 1300 KMS ESE OF CHENNAI AAA THE SYSTEM WOULD INTENSIFY GRADUALLY INTO A CYCLONIC STORM AND MOVE IN A WNW-LY

DIRECTION AND CROSS NTN AND S ANDHRA COAST BETWN CNI AND ONG BY 07TH EVENIN OR NIGHT AAA WX SSL REST BAY AND ANDMN SEA AAA

ARSEA INF AURORA AAA Y'S TRH OF LOW PRESSURE OVER LKD AREA AND N/HOOD PERSTS AAA WX SSL ELSEWHERE ARSEA AAA

REGN INF AAA NE MON HAS BEEN ACT OVER RYLM AAA Y'S E-W SHEAR LINE RUNNING ROUGHLY ALONG LAT 12 DEG N ACROSS PENINSULA AND NOW EXTDS UPTO 3.6 KMS ASL WITH AN EMBEDDED CYCIR OVER LKD AREA AND N/HOOD EXTDS UPTO MTL AAA

ADL RECORDED THE LOWEST MIN TEMPERATURE OF 16 DEG C IN THE PLAINS OF THE REGION AAA

FCST AAA RA/TSH WOULD OCCUR AT MANY PLACES OVER TN/PDC, RYLM, KRL AND CK AND AT A FEW PLACES OVER LKDP, IK AND CAP AAA ISOL RA/TSH MAY OCCUR OVER TLGN AAA

HRW AAA ISOL XX RAIN WOULD OCCUR OVER TN/PDC AND KRL DURING NEXT 48 HOURS AAA

ENDS AAA

=====

L/FCST AAA

FOR NEXT 24 HRS AAA THE SKY CONDITIONS WOULD BE GENERALLY CLOUDY AAA ONE OR TWO SPELLS OF RAIN/TSH WOULD OCCUR WITH HEAVY RAIN IN SOME AREAS AAA MIN TEMP WOULD BE AROUND 23 DEG C AAA

FOR NEXT 48 HRS AAA THE SKY CONDITIONS WOULD BE GENERALLY CLOUDY AAA ONE OR TWO SPELLS OF RAIN/TSH WOULD OCCUR WITH HEAVY RAIN IN SOME AREAS AAA MIN TEMP WOULD BE AROUND 23 DEG C AAA

ENDS AAA

PART – C: UPPER AIR WINDS FORECAST OVER CHENNAI

WRF – MODEL OUTPUT INDICATES NORTHEASTERLY WINDS OF THE ORDER OF 5 TO 10 KNOTS UPTO 600 hPa FOR NEXT 24 HOURS ENDING 00Z 05.11.2010

FDP (Cyclone) NOC Report Dated 5 November, 2010, 1500 hours
Weather Briefing:

Synoptic features:

The deep depression over southeast Bay of Bengal moved westwards, intensified into a cyclonic storm 'JAL' and lay centered at 1130 hrs IST of today, the 5th November 2010, near lat. 9.0°N and long. 87.5°E about 700 km east of Trincomalee (Sri Lanka), 900 km east-southeast of Chennai and 1100 km southeast of Visakhapatnam. It would intensify further into a severe cyclonic storm. The system would move west-northwestwards and cross north Tamil Nadu and south Andhra Pradesh coasts between Puducherry and Nellore close to Chennai by 7th November 2010 evening/night.

Based on latest analysis with NWP models and other conventional techniques, estimated track and intensity of the system are given in the Table below:

Date/Time(IST)	Position (lat. °N/ long. °E)	Sustained maximum surface wind speed (kmph)
05-11-2010/1130	9.0/87.5	65-75 gusting to 85
05-11-2010/1730	9.5/87.0	75-85 gusting to 95
05-11-2010/2330	9.5/86.5	85-95 gusting 105
06-11-2010/0530	10.0/86.0	100-110 gusting 120
06-11-2010/1130	10.5/85.5	110-120 gusting 130
06-11-2010/2330	11.5/83.5	120-130 gusting 140
07-11-2010/1130	12.5/81.5	120-130 gusting 140
07-11-2010/2330	13.5/79.5	80-90 gusting 100
08-11-2010/1130	14.5/77.5	50-60 gusting 70

Under its influence, rain/thundershower would occur at most places with isolated heavy to very heavy falls over north coastal Tamil Nadu, Puducherry and south coastal Andhra Pradesh from morning of 6th November 2010. The intensity would increase with heavy to very heavy falls at a few places and isolated extremely heavy falls (≥ 25 cm) over north Tamil Nadu, Puducherry, south coastal Andhra Pradesh and Rayalaseema from morning of 7th November 2010.

Squally winds speed reaching 55-65 kmph gusting to 75 kmph would commence along and off North Tamil Nadu, Puducherry and south Andhra Pradesh coast from morning of 6th November 2010. It may increase upto 120-130 kmph gusting to 140 kmph at the time of landfall. Sea conditions will be very rough to high, along and off these coasts becoming phenomenal at the time of landfall.

Damage expected:

Extensive damage to thatched roofs and huts. Minor damage to power and communication lines due to uprooting of large avenue trees. Flooding of escape routes.

Action suggested:

Total suspension of fishing operations. Fishermen are advised not to venture into the sea. Coastal hutment dwellers to be moved to safer places. People in affected areas to remain indoors.

The system is under constant surveillance and concerned state Govts. are being informed.

Upper tropospheric ridge:

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

Divergence:

- Upper air positive divergence ($20-30 \times 10^{-5} \text{ s}^{-1}$) prevails over the depression area and southwest Bay of Bengal and northcentral Bay of Bengal.

Convergence:

- Lower level positive convergence ($10-15 \times 10^{-5} \text{ s}^{-1}$) prevails over the depression area and southwest Bay of Bengal.

Wind Shear:

- The wind Shear is strong (20-30 knots) over the depression area and southwest Bay of Bengal

- **Wind Shear Tendency:**

- Decreasing wind shear tendency (-5 to -10 knots) over the depression area and southwest Bay of Bengal

Relative Vorticity:

- Relative vorticity at 850 hPa is positive over the depression area and adjoining southwest Bay of Bengal with magnitude of $10-15 \times 10^{-5} \text{ s}^{-1}$.

Sea Surface Temperature:

- SST around 29.0-31.0°C over south Bay of Bengal and Andaman Sea and 29.0°C over westcentral Bay of Bengal.

Ocean thermal energy:

- Ocean thermal energy is $120-140 \text{ KJ cm}^{-2}$ over southeast Bay of Bengal and south Andaman Sea and below 80 KJ cm^{-2} elsewhere over Bay of Bengal.

M.J.O. Index:

- Located over phase 4 with amplitude less than 1.0.
- Statistical forecast:- MJO moves through phase 5, 6, 7 & 8 during next 15 days.
- Dynamical forecast:- MJO remains in phase 5 with amplitude less than 1.0. It moves through phase 5, 6, 7 & 8 during next 15 days.

Status of observational system:

Details of the status of observational system are given in Annexure 1.

Satellite

VORTEX OVER SE BAY CENTRED NEAR 9.2N/87.5E (.) INTENSITY T2.5 (.)
ASSTD BKN INT TO V INT CONVTN OVER BAY BET LAT 5.5N TO 13.5N LONG
83.0E TO 88.5E (.) BKN M/LAYERED CLOUDS OVER J&K N PAK E AFGN AND OVER
AREA BET LAT 37.0N TO 43.0N LONG 65.5E TO 77.5E AND N TIBET ADJ CHINA IN
ASSW WD OVER THE AREA (.)

(See <ftp://192.168.12.75/imd/satmet>

<http://www.imd.gov.in/section/satmet/dynamic/insat.htm>)

NWP Analysis

- **ECMWF** model analysis of 00UTC of today (05 Nov 2010) shows a cyclonic storm over south Bay of Bengal. The forecast field shows intensification of this system and moving in a northwesterly direction and crosses the land as a severe cyclonic storm near Chennai by 7th/8th Nov.

- **IMDGFS** model analysis of 00UTC of today (05 Nov 2010) shows intensification of yesterday's depression over south Bay of Bengal into a deep depression. The forecast wind fields show further intensification into a cyclonic storm and moving in a north-

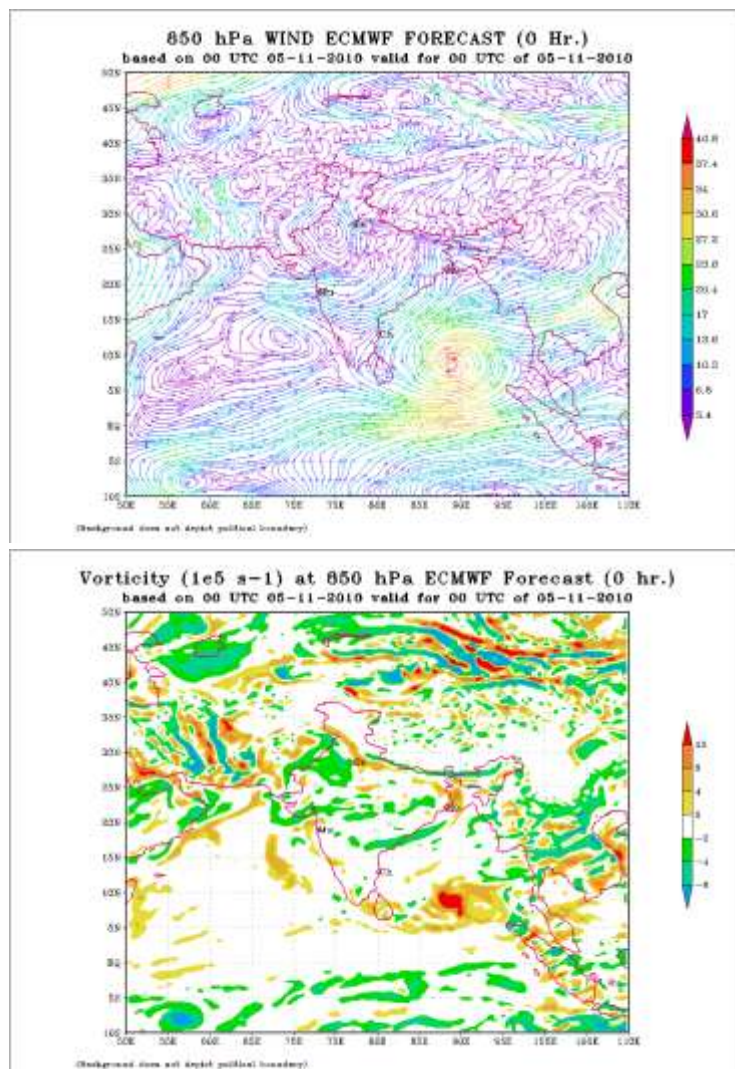
westerly direction. The 48-hr wind field forecast indicates the system crosses the land north of Chennai by 7th/8th Nov.

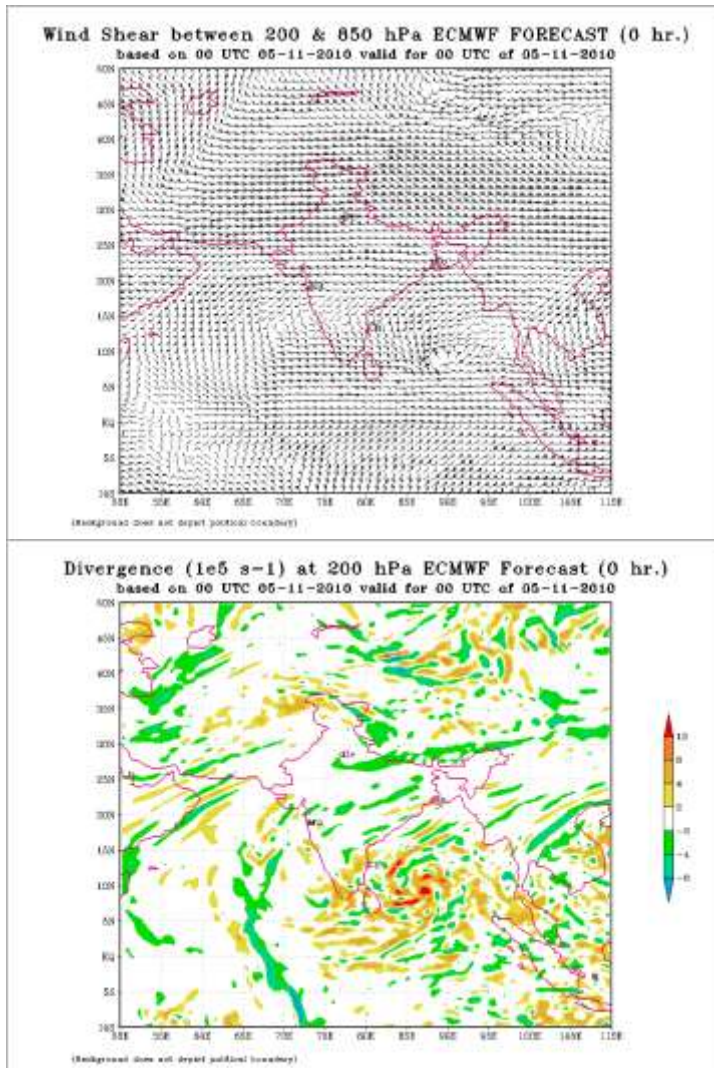
- **WRF-ARW** model analysis of 00UTC of today (05 Nov 2010) shows the deep depression over south Bay of Bengal. 24-hr forecast indicates intensification into a severe cyclonic storm and moving in north-westerly direction and crossing the land near Chennai by 7th/8th Nov, 2010.

- **UKMET** N/A

- **NCMRWF-GFS.** Model analysis of 00UTC today (05 No, 2010) shows a depression over South Bay of Bengal. . The forecast wind fields show further intensification into a cyclonic storm and moving in a north-westerly direction and crosses the land north of Chennai by 7th/8th Nov.

Analysis of Genesis Parameter





(See <http://www.imd.gov.in/section/nhac/dynamic/welcome.htm>)
 See ftp://ftp.ncmrwf.gov.in/pub/outgoing/TC_FDP/

FOC Report

Detailed report of FOC, Chennai is given in Annexure 2.

Advisory.

- Considering all the above,
- **RS/RW observations 4 times a day and hourly observations will be taken from Sagar Kanya during 3-8th November along the ship route.**
- **IOP will be conducted for Andhra Pradesh and Tamil Nadu coast from 0000 UTC of 5th to 8th November 2010.**
-

Forecast for Sagar Kanya ship:

Kindly see the forecast given under Synoptic features in this report.

- **RS/RW observations 4 times a day and hourly observations will be continued from Sagar Kanya during 3-8th November along the ship route.**

Annexure-1

Status of Observation system:

Synop ← 3-11-2010 →← 4-11-2010 →

Region	09	12	15	18	21	00	03	06
KOL	30	80	25	25	24	38	76	41
CHN	49	80	38	38	38	49	81	35
MUM	46	77	30	31	30	43	75	33

AWS

← 3-11-2010															→← 4-11-2010									
UTC	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07
Nos	-	-	-	-	-	510	498	511	509	517	342	514	506	513	511	420	423	422	455	439	462	466	372	-

RSRW (12Z) 2-11-2010: - 35/34

No. of Ascents reaching 250 hPa levels: 10

MISDA:-PTL, JDP, LKN, GRK, DBH, SLG, GHT, PTN, RNC, AGT, GWL, BHP, NGP, RPR, JGD, AHM, AUG, PNJ, HYD, VSK, MDS, MNG, AMN, MNC (24)

RSRW (00Z) 3-11-2010: - 36/36

No. of Ascents reaching 250 hPa levels: (29)

MISDA:- GHT, AMN (2)

No. of PILOT Ascents

3-11-2010				4-11-2010			
12Z		18Z		00Z		06Z	
33		47		31		43	

Buoy Data

2-11-2010					3-11-2010		
09Z	12Z	15Z	18Z	21Z	00Z	03Z	06Z
03	02	-	01	01	-	03	03

List of stations of neighbouring countries

DATE 3-11-2010

Country	Total No. of station	Hours of observations (UTC)							
		00	03	06	09	12	15	18	21
Sri Lanka	8	8	8	8	8	8	8	6	6
Bangladesh	11	8	9	8	8	7	7	3	6
Myanmar	10	7	7	7	7	5	1	6	1
Thailand	1	1	1	1	1	1	1	1	1

Status of RS/RW Observations

		03-11-2010		00UTC	04-11-2010		00UTC
		RS last level		Wind last level	RS last level		Wind last level
STATION Index	STATION Name	mb	Km	mb	mb	Km	mb
42410	GHT	GET			GET		
42809	CAL	6	35	10	18.9	27.4	20
43333	PBL	11.9	30	12	28.2	24.2	29
42971	BWN	7.4	33	10	16.8	27.8	18
43150	VSK	74.3	18.3	75	50	20.8	100
43185	MPT	78.2	18.2	84	46.2	21.5	66
43128	HYD	6	34.5	6.2	6.2	34.3	6
43279	CHN	3.3	38.8	3	3.3	38.8	3
43346	KRK	106	16.1	168	678	3.4	nil
43371	TRV	94.3	16.8	nil	123	15.3	nil
43192	GOA	125	15.2	NIL	206	12.1	NIL
43003	MUM	69.6	18.5	70			
43285	MNC	139	14.5	700	109	16	166
42647	AHM	42.9	21.9	44	100	16.3	nil
43369	MNC	6.5	34.3	642	145	14.5	146
43353	KOCHI	56.6	19.7	NIL	100	16.1	NIL
42724	AGT	6	34.3	7	186	12.8	188

Remark: Reception of Buoys data is satisfactory.

Annexure-2



India Meteorological Department

REGIONAL METEOROLOGICAL CENTRE, CHENNAI

FDP (Cyclone) FOC Chennai Report Dated 05 NOV 2010, 1400 hrs

PART – A: STATUS OF OBSERVATION SYSTEM

No of Synop data

Date→	04.11.2010							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	19	22	20	20	22	19	19	18

No. of RS/RW Ascents**00Z / 04.11.2010 : 4**

No. of Ascents reaching 250 hpa level =2

MISDA : 1**12Z /04.11.2010 : 4**

No. of Ascents reaching 250 hpa level =3

MISDA : 1**No. of PILOT Ascents:**

04.11.2010	
06Z	18Z
2	1

Status of AWS data is given in FDPNOC report.**PART – B: RMC CHENNAI INFERENCE****CHENNAI MNG INF DATED 05.11.2010 AAA**

BAY INF AURORA AAA Y'S DEPRESSION OVER SOUTHEAST BAY OF BENGAL CONCENTRATED INTO A DEEP DEPRESSION AT 0000 UTC OF TODAY THE 05TH NOVEMBER 2010 AND MOVE WNW-WARDS AND LAY CENTRED AT 0300 UTC OVER SE BAY NEAR LATITUDE 9.0 DEG N AND LONGITUDE 88.0 DEG E RPT 9.0N/88.0 E AT ABOUT 950 KM EAST-SOUTHEAST OF CHENNAI AAA

THE SYSTEM WOULD INTENSIFY FURTHER INTO A CYCLONIC STORM AND MOVE WEST-NORTHWEST WARDS AND CROSS NORTH TAMILNADU AND SOUTH ANDHRA PRADESH COAST BETWEEN PUDUCHERRY AND NELLORE CLOSE TO CHENNAI BY 07TH NOVEMBER EVENING OR NIGHT AAA WX SSL REST BAY AND ANDMN SEA AAA

ARSEA INF AURORA AAA Y'S TRH OF LOW PRESSURE OVER LKD AREA AND N/HOOD PERSTS AAA WX SSL ELSEWHERE ARSEA AAA

REGN INF AAA NE MON HAS BEEN VIGOROUS OVER SIK AND ACTIVE OVER ITN AAA

Y'S TRH OF LOW PRESSURE OVER LKD AREA AND N/HOOD PERSTS AAA Y'S E-W SHEAR LINE NOW RUNS ROUGHLY ALONG LAT 13 DEG N ACROSS PENINSULA AND EXTDS UPTO 3.1 KMS ASL WITH AN EMBEDDED CYCIR OVER SW BAY AND N/HOOD AND EXTDS UPTO 4.5 KM ASL AAA

KHAMMAM RECORDED THE LOWEST MIN TEMP OF 17 DEG C IN THE PLAINS OF THE REGION AAA

FCST AAA RA/TSH WOULD OCCUR AT MANY PLACES OVER TN/PDC,SCAP,KRL, CK AND SIK AND AT A FEW PLACES OVER LKDP, RYLSM AND NCAP AAA ISOL RA/THRS MAY OCCUR OVER TLGN AND NIK AAA

HRW AAA ISOL XX RAIN WOULD OCCUR OVER TN/PDC, KRL, CK AND SCAP
DURING NEXT 48 HOURS AAA
ENDS AAA

=====

PART – C: UPPER AIR WINDS FORECAST OVER CHENNAI

WRF – MODEL OUTPUT INDICATES MAINLY NORTHERLY TO NORTHEASTERLY WINDS OF THE ORDER OF 5 KNOTS TO 10 KNOTS UPTO 700 hPa AND NORTHEASTERLY WINDS OF THE ORDER OF 10 TO 15 KNOTS FROM 700hPa TO 400 hPa FOR NEXT 24 HOURS ENDING 00Z 06.11.2010



**Regional Meteorological Centre, Kolkata
ACWC Kolkata**

FDP Cyclone-2010 (Status of daily observation)

No of Synop data

Date→	04.11.10							
UTC→	00	03	06	09	12	15	18	21
Coasts of WB & ORS	9	11	10	10	11	9	9	9

No. of RS/RW Ascents

00Z / 04.11.2010 : 3

No. of Ascents reaching 250 hpa level =3

MISDA : 0

12Z /04.11.2010 : 3

No. of Ascents reaching 250 hpa level =3

MISDA : 0

PORT BLAIR (43333) Additional RS/RW Ascent 06Z , 18Z

No. of PILOT Ascents:

04.10.2010			
00Z	06Z	12Z	18Z
2	2	2	4

FDP (Cyclone) NOC Report Dated 6 November, 2010, 1500 hours
Weather Briefing:

Synoptic features:

Yesterday's cyclonic storm, 'JAL' over the southeast Bay of Bengal moved west-northwestwards and further intensified into a Severe cyclonic storm, 'JAL' in the early hours of today. It then continued to move west-northwestwards and lay centered at 1430 hrs IST of today, the 6th November 2010, over southwest Bay of Bengal near lat.10.5°N and long. 85.0°E about 450 km east-northeast of Trincomalee (Sri Lanka), 550 km east-southeast of Chennai and 700 km southeast of Nellore. It would intensify further, move west-northwestwards and cross north Tamil Nadu and south Andhra Pradesh coasts between Puducherry and Nellore close to Chennai by 7th November 2010 night.

Based on latest analysis with NWP models and other conventional techniques, estimated track and intensity of the system are given in the Table below:

Date/Time(IST)	Position (lat. °N/ long. °E)	Sustained maximum surface wind speed (kmph)	Intensity
06-11- 2010/1130	10.5/85.0	100-110 gusting 120	Severe Cyclonic Storm
06-11- 2010/1730	11.0/84.5	110-120 gusting 130	Severe Cyclonic Storm
06-11- 2010/2330	11.0/84.0	120-130 gusting 140	Very Severe Cyclonic Storm
07-11- 2010/0530	11.5/83.5	120-130 gusting 140	Very Severe Cyclonic Storm
07-11- 2010/1130	12.0/82.5	120-130 gusting 140	Very Severe Cyclonic Storm
07-11- 2010/2330	13.0/80.5	120-130 gusting 140	Very Severe Cyclonic Storm
08-11- 2010/1130	14.0/78.5	70-80 gusting 90	Cyclonic Storm
08-11- 2010/2330	15.0/76.5	40-50 gusting 60	Depression
09-11- 2010/1130	16.0/74.5	40-50 gusting 60	Depression

Under its influence, rain/thundershower would occur at most places with isolated heavy to very heavy falls over north coastal Tamil Nadu, Puducherry and south coastal Andhra Pradesh during next 24 hours and fairly widespread rain would occur over south coastal Tamilnadu during next 48 hours with isolated heavy to very heavy falls.. Thereafter the intensity would increase with heavy to very heavy falls at a few places and isolated extremely heavy falls (≥ 25 cm) over north Tamil Nadu, Puducherry, south coastal Andhra Pradesh and Rayalaseema..

Gale winds speed reaching 60-70 kmph gusting to 80 kmph would prevail along and off North Tamil Nadu, Puducherry and south Andhra Pradesh coasts from today night It may increase upto 120-130 kmph gusting to 140 kmph at the time of

landfall. Sea conditions will be very rough to high, along and off these coasts becoming phenomenal at the time of landfall.

Storm surge of about 1-2 metres above the astronomical tide may inundate the low lying areas of Nellore & Prakasam districts of Andhra Pradesh and Tiruvallur, Chennai & Kanchipuram districts at the time of landfall.

Damage expected:

Extensive damage to thatched roofs and huts. Minor damage to power and communication lines due to uprooting of large avenue trees. Flooding of escape routes.

Action suggested:

Total suspension of fishing operations. Fishermen are advised not to venture into the sea. Coastal hutment dwellers to be moved to safer places. People in affected areas to remain indoors.

The system is under constant surveillance and concerned state Govts. are being informed.

Upper tropospheric ridge:

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

Divergence:

- Upper air positive divergence ($20-30 \times 10^{-5} \text{ s}^{-1}$) prevails over the cyclone area.

Convergence:

- Lower level positive convergence ($10-15 \times 10^{-5} \text{ s}^{-1}$) prevails over the cyclone area.

Wind Shear:

- The wind shear is strong (20-30 knots) over the cyclone area and southwest Bay of Bengal

- **Wind Shear Tendency:**

- Increasing wind shear tendency (-5 to -10 knots) over the cyclone area.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive over the cyclone area with magnitude of $15-20 \times 10^{-5} \text{ s}^{-1}$.

Sea Surface Temperature:

- SST around 29.0-31.0°C over south Bay of Bengal and Andaman Sea and 29.0°C over west central Bay of Bengal.

Ocean thermal energy:

- Ocean thermal energy is 120-140 KJ cm⁻² over southeast Bay of Bengal and south Andaman Sea and below 80 KJ cm⁻² elsewhere over Bay of Bengal.

M.J.O. Index:

- Located over phase 5 with amplitude less than 1.0.
- Statistical forecast:- MJO moves through phase 5, 6, 7 & 8 during next 15 days.
- Dynamical forecast:- MJO remains in phase 5 with amplitude less than 1.0. It moves through phase 5, 6, 7 & 8 during next 15 days.

Status of observational system:

Details of the status of observational system are given in Annexure 1.

Satellite

VORTEX (JAL) OVER SW BAY CENTRED NEAR 10.7N/85.3E (.) INTENSITY T3.5
(.) ASSTD BKN INT TO V INT CONVTN OVER BAY BET LAT 7.0N TO 16.0N WEST

OF LONG 86.0E SRILANKA GULF OF MANNAR PALK STR AND BKN LOW/MED CLOUDS WITH EMBDD MOD TO INT CONVTN OVER REST WC BAY ADJ EC BAY AND TN (.)

SCT M/LAYERED CLOUDS OVER J&K EXT NE PAK ADJ NE AFGN AND OVER AREA BET LAT 37.0N TO 43.0N LONG 68.0E TO 90.0E IN ASSW WD OVER THE AREA (.)<ftp://192.168.12.75/imd/satmet>

<http://www.imd.gov.in/section/satmet/dynamic/insat.htm>)

NWP Analysis

- **ECMWF** model analysis of 00UTC of today (06 Nov 2010) shows the very severe cyclonic storm over south bay of Bengal and moving west-north-westerly direction and crossing the land north of Chennai after 12UTC of 7th Nov., 2010.

- **IMDGFS** model forecast of 00UTC of today (06 Nov 2010) shows the cyclonic storm over south bay of Bengal and the forecast indicates the movement of the system in west-north-west direction and crossing the land over north of Chennai after 12UTC of 7th nov, 2010 night.

- **WRF-ARW** model analysis of 00UTC of today (06 Nov 2010) shows the severe cyclonic storm over south bay of Bengal . The forecast fields indicates the system moves in a west-north-westerly direction and crossing the coast near Ongole in south Andhra Pradesh by 18UTC, the 7th Nov., 2010.

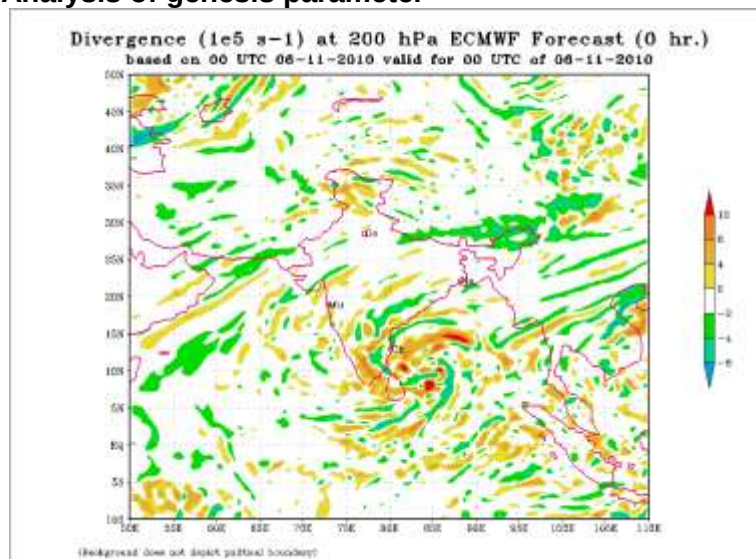
- **WRF-NMM** model analysis of 00 UTC of today (06 Nov,2010) shows a severe cyclonic storm over south bay of Bengal and the forecast fields indicate the system is likely to persist as severe cyclonic storm during next 24-hrs and move in north-west direction towards south Andhra coast. It is likely to hit the coast around 7th Nov. 2010, 18 UTC near to Nellore.

- **UKMET** N/A.

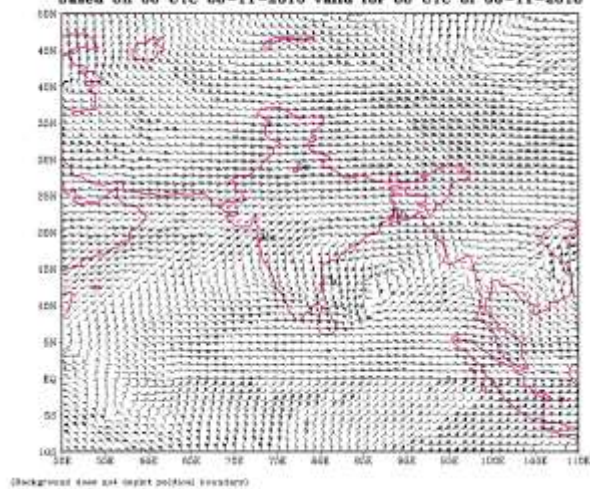
- **NCMRWF-GFS model** Based on 6th Nov., 2010 00 UTC, shows the cyclonic storm over south bay of Bengal moving west-north-westerly direction and crossing the land north of Chennai around 12UTC of 07 Nov, 2010.

- **JMA model** based on 00 UTC of today (6th Nov.2010) shows the cyclonic storm over south Bay of Bengal is likely to move in a west north westerly direction and cross the land near Chennai by the night of 7th Nov.

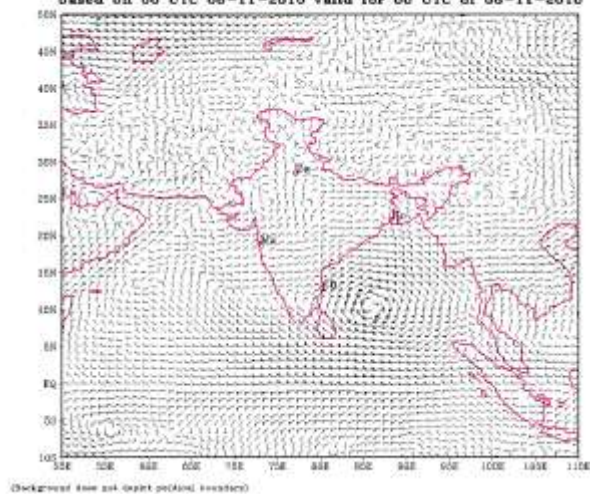
Analysis of genesis parameter



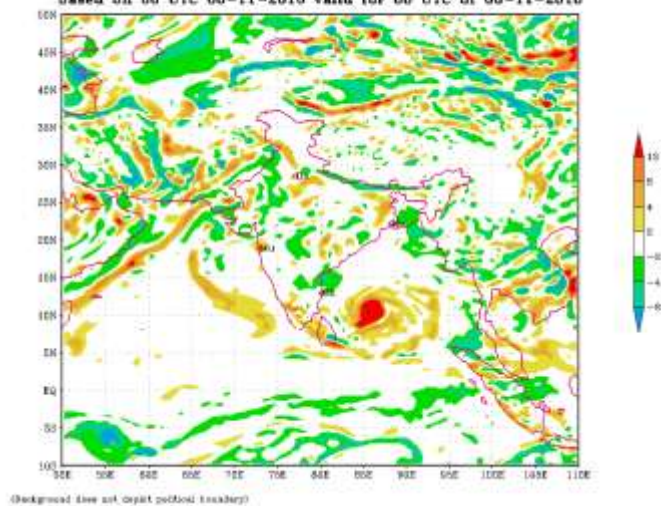
Wind Shear between 200 & 850 hPa ECMWF FORECAST (0 hr.)
 based on 00 UTC 06-11-2010 valid for 00 UTC of 06-11-2010



850 hPa WIND ECMWF FORECAST (0 Hr.)
 based on 00 UTC 06-11-2010 valid for 00 UTC of 06-11-2010



Vorticity ($1e5 \text{ s}^{-1}$) at 850 hPa ECMWF Forecast (0 hr.)
 based on 00 UTC 06-11-2010 valid for 00 UTC of 06-11-2010



<http://www.imd.gov.in/section/nhac/dynamic/welcome.htm>)
ftp://ftp.ncmrwf.gov.in/pub/outgoing/TC_FDP/

FOC Report

Detailed report of FOC, Chennai is given in Annexure 2.

Advisory.

- Considering all the above,
- **RS/RW observations 4 times a day and hourly observations will be taken from Sagar Kanya till 8th November along the ship route.**
- **IOP will be continued for Andhra Pradesh and Tamil Nadu coast till 8th November 2010.**
-

Forecast for Sagar Kanya ship:

Kindly see the forecast given under Synoptic features in this report.

- **RS/RW observations 4 times a day and hourly observations will be continued from Sagar Kanya till 8th November along the ship route.**

Annexure-1

Status of Observation system:

Synop ← 5-11-2010 →← 6-11-2010 →

Region	09	12	15	18	21	00	03	06
KOL	43	88	33	30	20	39	60	51
CHN	51	76	38	32	39	43	79	68
MUM	40	83	26	38	30	40	58	41

AWS

← 5-11-2010 →← 6-11-2010

UTC	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07
Nos	537	525	531	529	508	524	508	516	499	453	450	343	--	--	--	--	--	--	--	--	--	93	521	523

RSRW (12Z) 5-11-2010: - 35/33

No. of Ascents reaching 250 hPa levels: 13

MISDA:-PTL, JDP, GRK, DBH, SLG, GHT, PTN, RNC, AGT, GWL, BHP, NGP, RPR, JGD, AHM, AUG, PNJ, HYD, , MNG, AMN, MNC

RSRW (00Z) 6-11-2010:

No. of Ascents reaching 250 hPa levels: (29)

MISDA:-

No. of PILOT Ascents

5-11-2010		6-11-2010	
12Z	18Z	00Z	06Z
31	44	33	32

Buoy Data

5-11-2010					6-11-2010		
09Z	12Z	15Z	18Z	21Z	00Z	03Z	06Z
		03	03				

List of stations of neighbouring countries**DATE 3-11-2010**

Country	Total No. of station	Hours of observations (UTC)							
		00	03	06	09	12	15	18	21
Sri Lanka	8	8	8	8	8	8	8	6	6
Bangladesh	11	8	9	8	8	7	7	3	6
Myanmar	10	7	7	7	7	5	1	6	1
Thailand	1	1	1	1	1	1	1	1	1

Upper air Observations

		03-11-2010 00UTC			04-11-2010 00UTC		
		RS last level		Wind last level	RS last level		Wind last level
STATION Index	STATION Name	mb	Km	mb	mb	Km	mb
42410	GHT	GET			GET		
42809	CAL	6	35	10	18.9	27.4	20
43333	PBL	11.9	30	12	28.2	24.2	29
42971	BWN	7.4	33	10	16.8	27.8	18
43150	VSK	74.3	18.3	75	50	20.8	100
43185	MPT	78.2	18.2	84	46.2	21.5	66
43128	HYD	6	34.5	6.2	6.2	34.3	6
43279	CHN	3.3	38.8	3	3.3	38.8	3
43346	KRK	106	16.1	168	678	3.4	nil
43371	TRV	94.3	16.8	nil	123	15.3	nil
43192	GOA	125	15.2	NIL	206	12.1	NIL
43003	MUM	69.6	18.5	70			
43285	MNC	139	14.5	700	109	16	166
42647	AHM	42.9	21.9	44	100	16.3	nil
43369	MNC	6.5	34.3	642	145	14.5	146
43353	KOCHI	56.6	19.7	NIL	100	16.1	NIL
42724	AGT	6	34.3	7	186	12.8	188

Remark: Reception of Buoys data is satisfactory.



India Meteorological Department

REGIONAL METEOROLOGICAL CENTRE, CHENNAI

No of Synop data

Date→	05.11.2010							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	19	22	19	20	22	19	16	19

No. of RS/RW Ascents

00Z / 05.11.2010 : 4

No. of Ascents reaching 250 hpa level =3

MISDA : 1

12Z /05.11.2010 : 4

No. of Ascents reaching 250 hpa level =4

MISDA : 0

No. of PILOT Ascents:

05.11.2010	
06Z	18Z
0	2

Status of AWS data is given in FDPNOC report.

FIRST IOP - STATUS OF SPECIAL OBSERVATIONS (Coastal Tamilnadu and Coastal Andhra Pradesh)

Time of Observation in UTC 05.11.2010 - 00 TO 23 UTC

→	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
→	19	13	10	22	7	11	19	8	16	20	15	8	22	11	15	19	7	8	16	8	11	19	13	14

No. of Observations

PART – B: RMC CHENNAI INFERENCE

CHENNAI MNG INF DATED 06.11.2010.AAA

BAY INF AURORA AAA THE LATEST SATELLITE CLOUD IMAGERIES AND OTHER AVAILABLE OBSERVATIONS INDICATES THAT THE SEVERE CYCLONIC STORM "JAL" REMAINED PRACTICALLY STATIONARY AND LAY CENTRED AT 06/0300 UTC OVER SOUTHWEST BAY OF BENGAL NEAR LAT 10.0 DEG N AND LONG 85.5 DEG E ABOUT 650 KM ESE OF CHENNAI AND 750 KM SE OF NLR AAA IT WOULD FURTHER INTENSIFY INTO A VERY SEVERE CYCLONIC STORM AND MOVE WEST- NORTHWEST WARDS AND CROSS NORTH TAMIL NADU AND SOUTH ANDHRA PRADESH COAST BETWEEN PUDUCHERRY AND NELLORE CLOSE TO CHENNAI BY 07TH NOV 2010 NIGHT AAA WX SSL REST BAY AND ANDMN SEA AAA

ARSEA INF AURORA AAA Y'S TRH OF LOW PRESSURE OVER LKD AREA AND N/HOOD PERSTS AAA WX SSL REST ARSEA AAA

REGN INF AAA NE MON HAS BEEN VIG OVER SIK AND ACT OVER ITN AND KER AAA

THE LATEST SATELLITE CLOUD IMAGERIES AND OTHER AVAILABLE OBSERVATIONS INDICATES THAT THE SEVERE CYCLONIC STORM "JAL" REMAINED PRACTICALLY STATIONARY AND LAY CENTRED AT 06/0300 UTC OVER SOUTHWEST BAY OF BENGAL NEAR LAT 10.0 DEG N AND LONG 85.5 DEG E ABOUT 650 KM ESE OF CHENNAI AND 750 KM SE OF NLR AAA IT WOULD FURTHER INTENSIFY INTO A VERY SEVERE CYCLONIC STORM AND MOVE WEST- NORTHWEST WARDS AND CROSS NORTH TAMIL NADU AND SOUTH ANDHRA PRADESH COAST BETWEEN PUDUCHERRY AND NELLORE CLOSE TO CHENNAI BY 07TH NOV 2010 ASSTD U/A CYCIR EXTDS UPTO 7.6 KM ASL AAA Y'S TRH OF LOW PRESSURE OVER LKD AREA AND N/HOOD PERSTS AAA

AN E-W SHEAR LINE RUNS ROUGHLY ALONG LAT 10.0 DEG N ACROSS PENINSULA AND EXTDS UPTO MTL AAA

ADL RECORDED THE LOWEST MIN TEMPERATURE OF 17 DEG C IN THE PLAINS OF THE REGION AAA

FCST AAA RA/TSH WOULD OCCUR AT MOST PLACES OVER TN /PDC ,SCAP AND RYSM AND AT MANY PLACES OVER KRL,LKDP, SIK,CK AND NCAP AND AT A FEW PLACES OVER NIKAND TLGN AAA

HRW AAA SCT XX WITH ISOL VERY XX RAIN WOULD OCCUR OVER TN/PDC ,SCAP, SIK,RYSM DURING NEXT 48 HOURS AAA ISOL EXTREMELY XX RAIN (=> 25 CM) OVER DISTRICTS OF KANCHIPURAM, TIRUVALLUR, CHENNAI DURING THE SAME PERIOD AAA

SQUALLY WX: SQUALLY WX WITH WIND SPEED REACHING 55-65 KMPH GUSTING TO 75 KMPH WOULD OCCUR ALONG OFF TN AND PDC AND AP COAST AAA

GALE WIND WARNING : GALE WINDS SPEED REACHING 60 -70 KMPH GUSTING TO 80 KMPH WOULD PREVAILED ALONG OFF NTN, PDC AND SAP COASTS

COMMENCING FROM TODAY EVENING AAA IT MAY INCREASE UPTO 120-130 KMPH GUSTING TO 140 KMPH AT THE TIME OF LANDFALL AAA

TIDAL WAVE WARNING : STORM SURGE OF ABOUT 1-2 M ABOVE THE ASTRONOMICAL TIDE MAY INUNDATE THE LOW LAYING COASTAL AREAS OF NLR , PRAKASAM DISTRICTS OF AP AND TVLR,CHN AND KNP DISTRICTS OF NTN AT THE TIME OF LANDFALL AAA

OUTLOOK : GRADUAL DECREASE IN RAINFALL AAA

ENDS AAA

=====

L/FCST AAA

FOR NEXT 24 HRS AAA OVERCAST SKY WITH INTERMITTANT RA /TSH HEAVY AT TIMES , SURFACE WINDS WILL BE STRONG ,GUSTY AT TIMES AAA

FOR NEXT 48 HRS AAA OVERCAST SKY WITH INTERMITTANT RA /TSH HEAVY AT TIMES , SURFACE WINDS WILL BE STRONG ,GUSTY AT TIMES AAA

ENDS AAA

=====

PART – C: UPPER AIR WINDS FORECAST OVER CHENNAI

WRF – MODEL OUTPUT INDICATES MAINLY NORTHERLY WINDS OF THE ORDER OF 15 KNOTS TO 25 KNOTS UPTO 700 hPa AND NORTHEASTERLY TO EASTERLY WINDS OF THE ORDER OF 10 TO 20 KNOTS FROM 700hPa TO 400 hPa FOR NEXT 24 HOURS ENDING 00Z 07.11.2010



Regional Meteorological Centre, Kolkata
ACWC Kolkata

FDP Cyclone-2010 (Status of daily observation)

No of Synop data

Date→	04.11.10							
UTC→	00	03	06	09	12	15	18	21
Coasts of WB & ORS	9	11	10	10	11	9	9	9

No. of RS/RW Ascents

00Z / 04.11.2010 : 3

No. of Ascents reaching 250 hpa level =3

MISDA : 0

12Z /04.11.2010 : 3

No. of Ascents reaching 250 hpa level =3

MISDA : 0

PORT BLAIR (43333) Additional RS/RW Ascent 06Z , 18Z

No. of PILOT Ascents:

04.10.2010			
00Z	06Z	12Z	18Z
2	2	2	4

FDP (Cyclone) NOC Report Dated 7 November, 2010, 1500 hours Weather Briefing:

Synoptic features:

The Severe cyclonic storm, 'JAL' moved northwestwards, weakened into a cyclonic storm and lay centered at 1130 hrs IST of today, the 7th November 2010, over southwest Bay of Bengal near lat.12.5°N and long. 82.5°E, about 250 km east-southeast of Chennai and 350 km south-southeast of Nellore, 450 km north-northeast of Trincomalee (Sri Lanka). It would move west-northwestwards, slightly weakened further and cross north Tamil Nadu and south Andhra Pradesh coasts between Chennai and Nellore as a cyclonic storm by today, the 7th November 2010 night.

Based on latest analysis with NWP models and other conventional techniques, estimated track and intensity of the system are given in the Table below:

Date/Time(IST)	Position (lat. °N/ long. °E)	Sustained maximum surface wind speed (kmph)	Intensity
07-11-10/1130	12.5/82.5	80-90 gusting 100	Cyclonic Storm
07-11-10/1730	13.0/81.5	80-90 gusting 100	Cyclonic Storm
07-11-10/2330	13.5/80.5	70-80 gusting 90	Cyclonic Storm
08-11-10/0530	14.0/79.5	60-70 gusting 80	Cyclonic Storm
08-11-10/1130	14.5/78.5	40-50 gusting 60	Depression
08-11-10/2330	15.5/76.5	30-40 gusting 50	Low pressure area

Under its influence, rain/thundershower would occur at most places with heavy to very heavy falls at a few places and isolated extremely heavy falls (≥ 25 cm) over north Tamil Nadu, Puducherry and south coastal Andhra Pradesh during next 48 hours and at most places with heavy to very heavy falls at a few places over Rayalaseema, south Tamil Nadu and South Interior Karnataka during the same period.

Gale winds speed reaching 60-70 kmph gusting to 80 kmph would prevail along and off North Tamil Nadu, Puducherry and south Andhra Pradesh coasts during next 12 hours. It may increase upto 110-120 kmph gusting to 130 kmph at the time of landfall. Sea conditions will be very rough to high, along and off these coasts becoming phenomenal at the time of landfall.

Storm surge of about 1-2 metres above the astronomical tide may inundate the low lying areas of Nellore & Prakasam districts of Andhra Pradesh and Tiruvallur and Chennai districts of Tamilnadu at the time of landfall.

Damage expected:

Extensive damage to thatched roofs and huts. Minor damage to power and communication lines due to uprooting of large avenue trees. Flooding of escape routes.

Action suggested:

Total suspension of fishing operations. Fishermen are advised not to venture into the sea. Coastal hutment dwellers to be moved to safer places. People of affected areas are advised to remain indoors. The system is under constant surveillance and concerned state Govts. are being informed.

Upper tropospheric ridge:

- The upper tropospheric ridge line roughly runs along 19.0°N at 200 hPa level.

Divergence:

- Upper air positive divergence ($10\text{-}20 \times 10^{-5} \text{ s}^{-1}$) prevails over the cyclone area.

Convergence:

- Lower level positive convergence ($15 \times 10^{-5} \text{ s}^{-1}$) prevails over the cyclone area.

Wind Shear:

- The wind Shear is strong (20-30 knots) over the cyclone area and southwest Bay of Bengal

- **Wind Shear Tendency:**

- Increasing wind shear tendency (-5 to -10 knots) over the cyclone area.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive over the cyclone area with magnitude of $15 \times 10^{-5} \text{ s}^{-1}$.

Sea Surface Temperature:

- SST around 30.0-32.0°C over cyclone area, southwest & westcentral Bay of Bengal.

Ocean thermal energy:

- Ocean thermal energy is 100-120 KJ cm⁻² over south Bay of Bengal and south Andaman Sea and below 80 KJ cm⁻² elsewhere over cyclone area.

M.J.O. Index:

- Located over phase 5 with amplitude less than 1.0.
- Statistical forecast:- MJO moves through phase 5, 6, 7 & 8 during next 15 days.
- Dynamical forecast:- MJO remains in phase 5 with amplitude less than 1.0. It moves through phase 5, 6, 7 & 8 during next 15 days.

Status of observational system:

Details of the status of observational system are given in Annexure 1.

Satellite

Satellite bulletin based on insat picture of 071000 UTC vortex (JAL) over southwest Bay centred near 12.7N/81.2E (.) Intensity T2.5/ci3.0 (.) Associated broken intense over bay between lat 10.0N to 14.0N west of long 81.0E over south Andhra Pradesh, Kerala, south Interior karnatar and moderate to intense convection over Bay between lat 9.0N to 15.0N long 81.0E to 84.0E rest Andhra Pradesh, rest Karnataka.(.) (.)

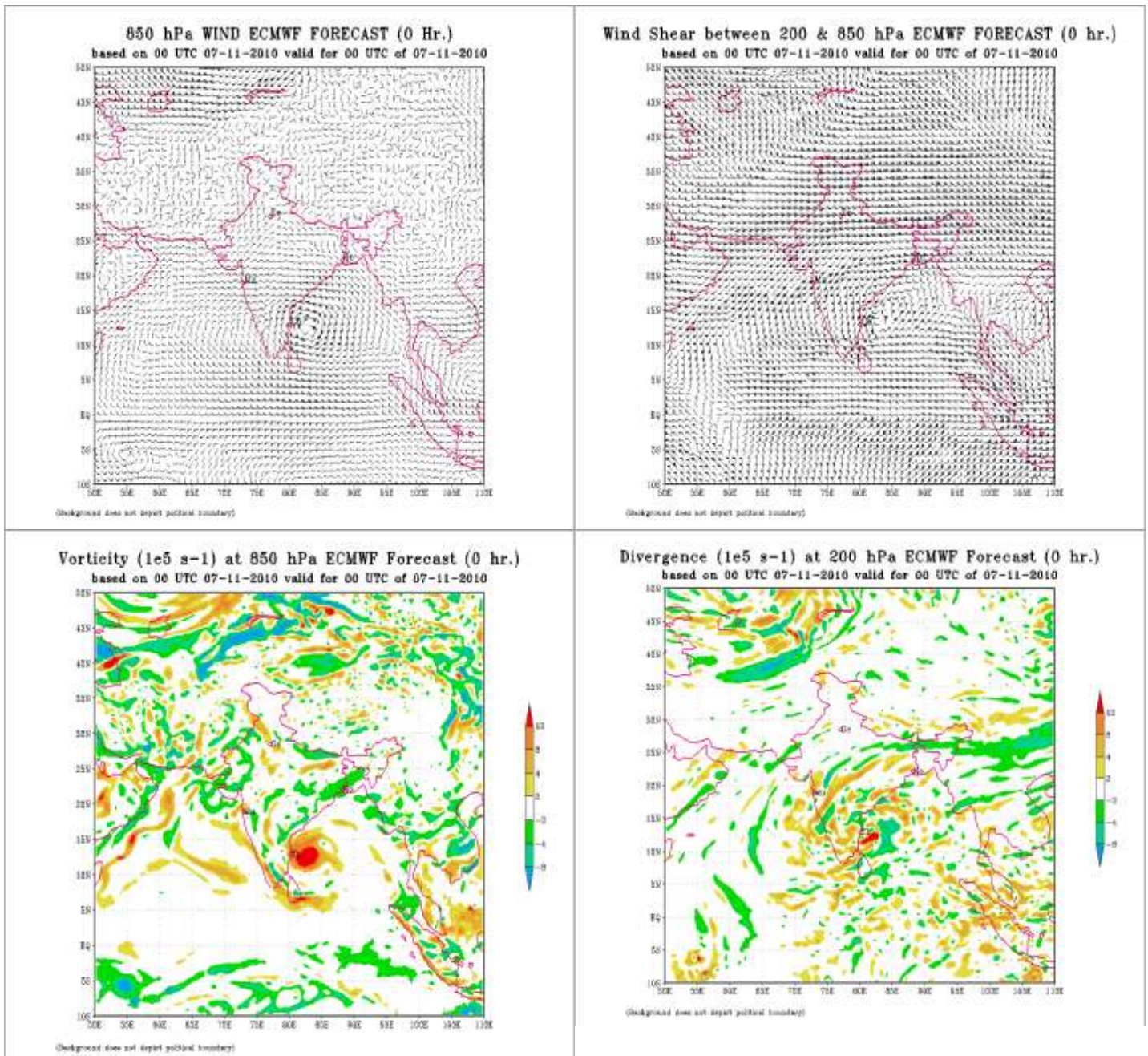
<ftp://192.168.12.75/imd/satmet>

<http://www.imd.gov.in/section/satmet/dynamic/insat.htm>

NWP Analysis

- **ECMWF** model analysis of 00UTC of today (07 Nov 2010) shows the severe cyclonic storm over south bay of Bengal and moving west-north-westerly direction and crossing the land north of Chennai after 12UTC of 7th Nov., 2010.
- **IMDGFS** model forecast of 00UTC of today (07 Nov 2010) shows the severe cyclonic storm over south bay of Bengal move in west-north-west direction and crossing the land over north of Chennai byr 12UTC/18UTC of 7th Nov, 2010. The 48-hr forecast indicates formation of another low pressure system over south Andaman sea and movement of this system in north-westerly direction.
- **WRF-ARW** model analysis of 00UTC of today (07 Nov 2010) indicates the severe cyclonic storm over south bay of Bengal moving in a west-north-westerly direction and crossing the coast north of Chennai by 18UTC/21 UTC of 7th Nov., 2010.
- **WRF-NMM** model of 00 UTC of today (07th Nov,2010) shows a severe cyclonic storm over south bay of Bengal and the forecast fields indicate the system is likely to move in north-west direction towards south Andhra coast. It is likely to hit the coast around 7th Nov. 2010, 18 UTC north of Chennai.
- **UKMET** N/A.

- **NCMRWF-GFS model** Based on 00 UTC of today (7th Nov., 2010) shows the severe cyclonic storm over south bay of Bengal moving west-north-westerly direction and crossing the land north of Chennai around 12UTC of 07 Nov, 2010.



<http://www.imd.gov.in/section/nhac/dynamic/welcome.htm>)

See ftp://ftp.ncmrwf.gov.in/pub/outgoing/TC_FDP/

FOC Report

Detailed report of FOC, Chennai is given in Annexure 2.

Advisory.

- Considering all the above, NWP and synoptic condition it is decided that IOP will be continued till 0000 UTC of 08-11-2011.

Forecast for Sagar Kanya ship:

Kindly see the forecast given under Synoptic features in this report.

Annexure-1**Status of Observation system:**

Synop ← 5-11-2010 →← 6-11-2010 →

Region	09	12	15	18	21	00	03	06
KOL	43	88	33	30	20	39	60	51
CHN	51	76	38	32	39	43	79	68
MUM	40	83	26	38	30	40	58	41

AWS

← 5-11-2010 →← 6-11-2010

UT C	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07
No s	537	525	531	529	508	524	508	516	499	453	450	343	--	--	--	--	--	--	--	--	--	93	521	523

RSRW (12Z) 5-11-2010: - 35/33

No. of Ascents reaching 250 hPa levels: 13

MISDA:-PTL, JDP, GRK, DBH, SLG, GHT, PTN, RNC, AGT, GWL, BHP, NGP, RPR, JGD, AHM, AUG, PNJ, HYD, , MNG, AMN, MNC

RSRW (00Z) 6-11-2010:

No. of Ascents reaching 250 hPa levels: (29)

MISDA:-

No. of PILOT Ascents

5-11-2010				6-11-2010			
12Z		18Z		00Z		06Z	
31		44		33		32	

Buoy Data

5-11-2010					6-11-2010		
09Z	12Z	15Z	18Z	21Z	00Z	03Z	06Z
		03	03				

Remark: Reception of Buoys data is satisfactory.



India Meteorological Department

FDP (Cyclone) FOC Chennai Report Dated 07 NOV 2010, 1400 hrs

PART – A: STATUS OF OBSERVATION SYSTEM

No of Synop data

Date→	06.11.2010							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	19	22	20	20	22	17	19	10

No. of RS/RW Ascents

00Z / 06.11.2010 : 4

No. of Ascents reaching 250 hpa level =4

MISDA : 0

12Z /06.11.2010 : 4

No. of Ascents reaching 250 hpa level =0

MISDA : 4

No. of PILOT Ascents:

06.11.2010	
06Z	18Z
2	0

Status of AWS data is given in FDPNOC report.

FIRST IOP - STATUS OF SPECIAL OBSERVATIONS (Coastal Tamilnadu and Coastal Andhra Pradesh)

Time of Observation in UTC 06.11.2010 - 00 TO 23 UTC

Time of Observation in UTC																								
→	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	2	2	2	2	
	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3
→	1	1	1	2	1	1	2	1	1	2	1	1	2	1	1	1	8	1	1	1	3	1	6	9
	9	9	5	2	7	7	0	6	5	0	4	8	2	8	7	7	8	0	9	1	0	0	6	9

No. of Observations

PART – B: RMC CHENNAI INFERENCE

CHENNAI MNG INF DATED 07.11.2010.AAA

BAY INF AURORA AAA THE LATEST SATELLITE CLOUD IMAGERIES AND OTHER AVAILABLE COASTAL OBSERVATIONS INDICATES THAT THE SEVERE CYCLONIC STORM "JAL" WITH ECP 994 HPA MOVED NORTHWEST-WARDS AND LAY CENTRED AT 07/0300 UTC OF TODAY THE 7TH NOVEMBER 2010 OVER SOUTHWEST BAY OF BENGAL NEAR LAT 12.0 DEG N AND LONG 83.0 DEG E RPT LAT 12.0 DEG N AND LONG 83.0 DEG E ABOUT 320 KM ESE OF CHENNAI AAA

IT WOULD MOVE WNW-WARDS AND CROSS NTN - SAP COT BETWEEN CNI – NLR BY TONIGHT 7TH NOVEMBER 2010. THE LATEST OBSN INDICATES THAT THE SYSTEM SHOWS THE SIGN OF WEEKENING AAA WX SSL ELSEWHERE BAY AND ANDMN SEA AAA

ARSEA INF AURORA AAA Y'S TRH OF LOW PRESSURE OVER SE ARSEA OFF LKD AREA AND N/HOOD PERSTS AAA WX SSL REST ARSEA AAA

REGN INF AAA THE LATEST SATELLITE CLOUD IMAGERIES AND OTHER AVAILABLE COASTAL OBSERVATIONS INDICATES THAT THE SEVERE CYCLONIC STORM "JAL" WITH ECP 994 HPA MOVED NORTHWEST-WARDS AND LAY CENTRED AT 07/0300 UTC OF TODAY THE 7TH NOVEMBER 2010 OVER SOUTHWEST BAY OF BENGAL NEAR LAT 12.0 DEG N AND LONG 83.0 DEG E RPT LAT 12.0 DEG N AND LONG 83.0 DEG E ABOUT 320 KM ESE OF CHENNAI AAA ASSTD U/A CYCIR EXTDS UPTO MTL AAA

Y'S TRH OF LOW PRESSURE OVER SE ARSEA OFF LKD AREA ANDN/HOOD ERSTS AAA

CHT RECORDED THE LOWEST MIN TEMPERATURE OF 16 DEG C IN THE PLAINS OF THE REGION AAA

FCST AAA RA/TSH WOULD OCCUR AT MANY PLACES OVER NTN /PDC , AP AND IK AND AT A FEW PLACES OVER STN, KRL, LKDP AND CK AAA

HRW AAA ISOL XX TO VERY XX RAIN WOULD OCCUR OVER NTN/PDC ,SCAP,IK, AND RYSM DURING NEXT 48 HOURS AAA

SQUALLY WX: SQUALLY WX WITH WIND SPEED REACHING 55-65 KMPH GUSTING TO 75 KMPH WOULD OCCUR ALONG OFF SCTN AND ANDHRA COAST DURING NEXT 12 HOURS AAA

GALE WIND WX : GALE WNDS WITH SPEED REACHING 60 -70 KMPH GUSTING TO 80 KMPH WOULD PREVAIL ALONG OFF NTN, PDC AND SAP COASTS AAA IT MAY INCREASE UPTO 120-130 KMPH GUSTING TO 140 KMPH AT THE TIME OF LANDFALL DURING NEXT 12 HOURS AAA

SEA CONDITION WOULD BE VERY ROUGH TO HIGH ALONG OFF THESE COASTS BECOMING PHENOMENAL AT THE TIME OF LAND FALL AAA

TIDAL WAVE WX : STORM SURGE OF ABOUT 1-2 M ABOVE THE ASTRONOMICAL TIDE MAY INUNDATE THE LOW LYING COASTAL AREAS OF NLR , PRAKASAM DISTRICTS OF AP AND TVLR,CHI AND KNP DISTRICTS OF NTN AT THE TIME OF LANDFALL AAA

OUTLOOK : DECREASE IN RAINFALL AAA

ENDS AAA

=====

L/FCST AAA

FOR NEXT 24 HRS AAA OVERCAST SKY WITH INTERMITTANT RA SPELLS , HEAVY AT TIMES AAA SURFACE WINDS WILL BE STRONG AND GUSTY AT TIMES AAA

FOR NEXT 48 HRS AAA THE SKY CONDITION WOULD BE GEN CLOUDY AAA ONE OR TWO SPELLS OF RA/ TSH WOULD OCCUR AAA

ENDS AAA

PART – C: UPPER AIR WINDS FORECAST OVER CHENNAI

WRF – MODEL OUTPUT INDICATES NORTHERLY WINDS OF THE ORDER OF 20 TO 40 KNOTS BACKING TO WESTERLY WINDS OF THE ORDER OF 20 TO 30 KNOTS UPTO 800 hPa,

NORTHEASTERLY WINDS OF THE ORDER OF 20 TO 35 KNOTS TO SOUTHERLY WINDS OF THE ORDER OF 15 TO 30 KNOTS FROM 800hPa TO 400 hPa AND

EASTERLY WINDS OF THE ORDER OF 25 TO 30 KNOTS TO SOUTHEASTERLY WINDS OF THE ORDER OF 15 TO 20 KNOTS FOR NEXT 24 HOURS ENDING 00Z 08.11.2010

FDP (Cyclone) NOC Report Dated 8 November, 2010, 1500 hours

Weather Briefing:

Synoptic features:

The cyclonic storm 'JAL' over southwest Bay of Bengal moved west-northwestwards weakened further into a deep depression and crossed north Tamilnadu – south Andhra Pradesh coast, close to the north of Chennai between 2230 and 2330 hrs IST of 07th November 2010. It continued to move west-northwestwards, further weakened into a depression at 0830 hrs IST and into a well marked low pressure area over Rayalaseema and adjoining south interior Karnataka at 1130 hrs IST of today, the 8th November 2010. Under its influence, rain/thundershower at most places with isolated heavy falls would occur over South Interior and Coastal Karnataka during next 24 hours.

Upper tropospheric ridge:

- The upper tropospheric ridge line roughly runs along 19.0°N at 200 hPa level.

Divergence:

- Upper air positive divergence ($5-10 \times 10^{-5} \text{ s}^{-1}$) prevails over west central Bay of Bengal and adjoining areas of northwest Bay. Negative divergence over south Bay of Bengal and Andaman sea.

Convergence:

- Lower level positive convergence ($5 \times 10^{-5} \text{ s}^{-1}$) prevails over southeast Bay of Bengal and adjoining Andaman sea.

Wind Shear:

- The wind Shear is weak (5-10 knots) over westcentral Bay of Bengal elsewhere moderate wind shear (10-20 knots).

Wind Shear Tendency:

- Decreasing wind shear tendency (-5 to -10 knots) over westcentral Bay of Bengal Bay and Andaman & Nicobar Islands.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive over t Bay of Bengal with magnitude of $5-10 \times 10^{-5} \text{ s}^{-1}$.

Sea Surface Temperature:

- SST around 26.0-28.0°C over south Bay of Bengal and 31.0-32.0°C over wescentral & north Bay of Bengal.

Ocean thermal energy:

- Ocean thermal energy is mainly 80-100 KJ cm⁻² over Bay of Bengal.

M.J.O. Index:

- Located over phase 5 with amplitude less than 1.0.
- Statistical forecast:- MJO moves through phase 5, 6, 7 & 8 during next 15 days.
- Dynamical forecast:- MJO remains in phase 5 with amplitude more than 1.0. It moves through phase 5, 6, 7 & 8 during next 15 days with reduced implitude.
- Synoptic, atmospheric and oceanic condition show that a low pressure area over Bay of Bengal will not develop during next 48 hours.

Status of observational system:

Details of the status of observational system are given in Annexure 1.

Satellite

Inference based on 070900 UTC

Arabian sea

Broken low / medium clouds at many places with embedded moderate to intense thunder clouds at a few places over east Arabian Sea between lat 14.0N to 20.5N east

of long 70.0E in association with vortex over north Karnataka. Broken low / medium at many places with embedded moderate to intense thunder clouds at a few places over south Arabian Sea between lat 7.0N to 10.0N east of long 64.5E.

Bay of Bengal.

Broken low/medium clouds at many places with embedded moderate to intense thunder clouds at a few places over northwest Bay north of lat 18.5N west of long 89.5E. and over south Andaman sea.

(See <ftp://192.168.12.75/imd/satmet>

<http://www.imd.gov.in/section/satmet/dynamic/insat.htm>)

NWP

- **IMD-GFS** model analysis based on of 00UTC of today (08 NOV 2010) shows closed isobar of 1004 hPa over NW of Chennai. The 24 hour forecast field shows that moving northwestward the system re-emerged into the east central Arabian. Thereafter initially moving northwestward and then northward the system intensified further into Deep Depression and cross the north Gujarat coast on 00 UTC on 12 November 2010. The 24 hour forecast also shows a fresh cyclonic circulation over Gulf of Myanmar emerging into South Andaman Sea and moving northwestward the system lies over southwest Bay of Bengal as Deep Depression on 15 November 2010.

- **IMD WRF-ARW** model analysis of 00UTC of today (08 NOV 2010) shows closed isobar of 1002 hPa over NW of Chennai. The forecast field shows that moving northwestward the system re-emerged into the east central Arabian and intensified further into Deep Depression and lies over east central Arabian Sea on 00 UTC on 11 November 2010.

- **IMD WRF-NMM** model analysis of 00UTC of today (08 NOV 2010) shows closed isobar of 1004 hPa over NW of Chennai. The forecast field shows that moving northwestward the system re-emerged into the east central Arabian and intensified further into Depression and lies over east central Arabian Sea on 00 UTC on 11 November 2010. A fresh low pressure system is found over Gulf of Myanmar on 11 November 2010.

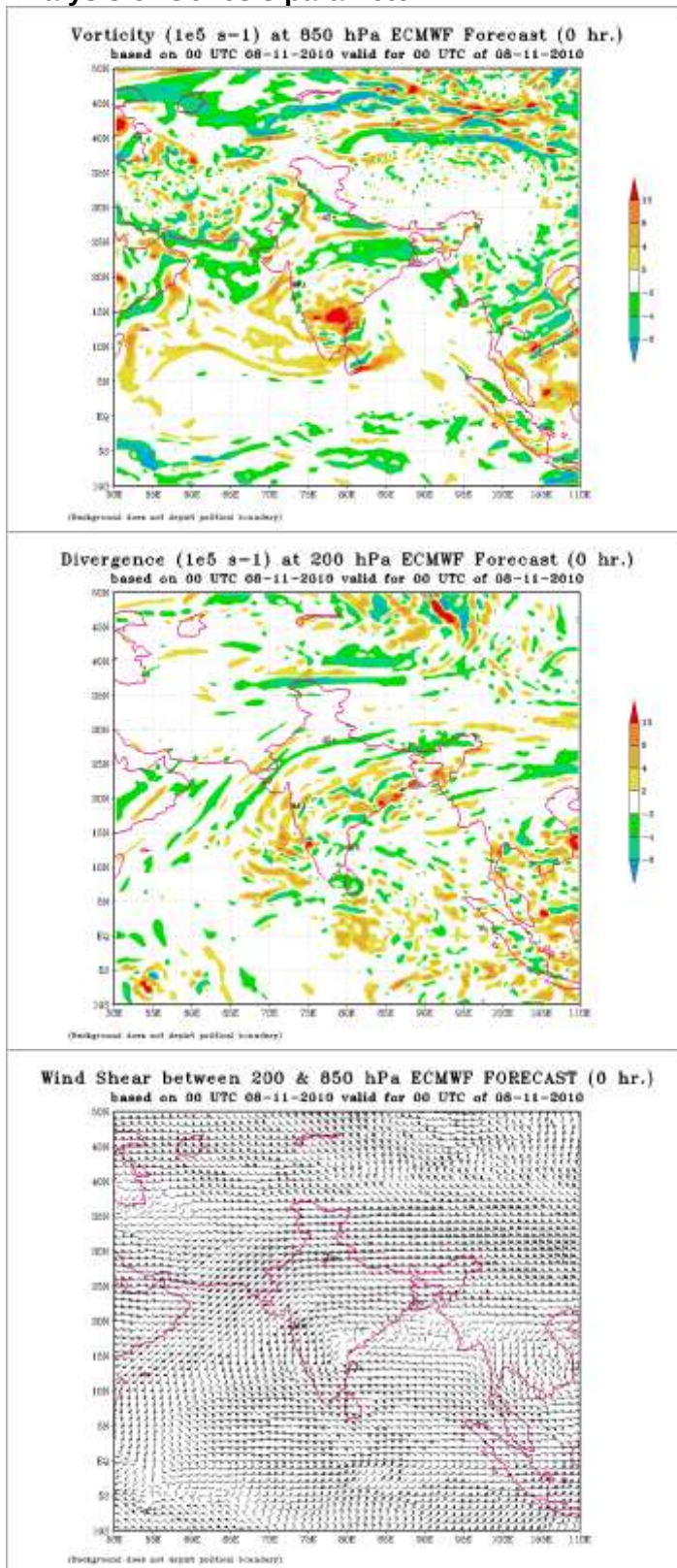
- **ECMWF-GFS** model analysis based on of 00UTC of today (08 NOV 2010) shows closed isobar of 1002 hPa over NW of Chennai. The 24 hour forecast field shows that moving northwestward the system re-emerged into the east central Arabian. Thereafter initially moving northwestward and then northward the system intensified further into Deep Depression and cross the north Gujarat coast on 00 UTC on 12 November 2010. The 24 hour forecast also shows a fresh cyclonic circulation over Gulf of Myanmar emerging into South Andaman Sea and moving northwestward the system lies over southeast Bay of Bengal as Low on 15 November 2010.

- **NCMRWF-GFS** model analysis based on of 00UTC of today (08 NOV 2010) shows cyclonic circulation associated with the Depression lies over NW of Chennai. The 24 hour forecast field shows that moving northwestward the system re-emerged into the east central Arabian. Thereafter initially moving northwestward and then northward the system intensified further and cross the north Gujarat coast on 00 UTC on 11 November 2010. The 24 hour forecast also shows a fresh cyclonic circulation over Gulf of Myanmar emerging into South Andaman Sea and moving northwestward the system lies over southwest Bay of Bengal on 15 November 2010.

(See <http://www.imd.gov.in/section/nhac/dynamic/welcome.htm>)

See ftp://ftp.ncmrwf.gov.in/pub/outgoing/TC_FDP/

Analysis of Genesis parameter



FOC Report

Detailed report of FOC, Chennai is given in Annexure 2.

Advisory.

▪ All the above NWP and synoptic conditions show a closed isobar of 1002 hPa over NW of Chennai. The 24 hour forecast shows that moving northwestward the system re-emerged into the east central Arabian. Thereafter initially moving northwestward and then northward the system intensified further into Deep Depression and cross the north Gujarat coast on 00 UTC on 12 November 2010. The 24 hour forecast also shows a fresh cyclonic circulation over Gulf of Myanmar emerging into South Andaman Sea and moving northwestward the system lies over southeast Bay of Bengal as Low on 15 November 2010.

▪ **NO IOP will be conducted till 10-11-2010.**

Forecast for Sagar Kanya ship:

▪ Broken low/medium clouds at many places with embedded moderate to intense thunder clouds at a few places over northwest Bay north of lat 18.5N west of long 89.5E. and over south Andaman Sea.

Annexure-1**Status of Observation system:**

Synop ← 7-11-2010 →← 8-11-2010 →

Region	09	12	15	18	21	00	03	06
KOL	34	70	28	25	23	36	70	28
CHN	45	70	39	39	37	44	68	39
MUM	39	86	31	31	29	35	38	30

AWS

← 7-11-2010 →← 8-11-2010

UTC	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07
Nos	459	454	457	456	452	521	524	512	332	329	509	509	516	502	496	416	503	352	452	457	458	459	452	456

RSRW (12Z) 2-11-2010: - 34/36

No. of Ascents reaching 250 hPa levels: 11

MISDA:-PTL, JDP, LKN, GRK, DBH, SLG, GHT, PTN, RNC, AGT, GWL, BHP, NGP, JGD, AHM, AUG, HYD, MNG, AMN, MNC (21)

RSRW (00Z) 3-11-2010: - 34/35

No. of Ascents reaching 250 hPa levels: (29)

MISDA:- LKN, PNJ, AMN (3)

No. of PILOT Ascents

7-11-2010				8-11-2010			
12Z		18Z		00Z		06Z	
34		47		33		20	

Buoy Data

7-11-2010					8-11-2010		
09Z	12Z	15Z	18Z	21Z	00Z	03Z	06Z
02	03	03	03	03	03	02	03

List of stations of neighbouring countries

DATE 7-11-2010

Country	Total No. of station	Hours of observations (UTC)							
		00	03	06	09	12	15	18	21
Sri Lanka	8	6	8	8	8	8	6	6	6
Bangladesh	11	5	8	8	8	5	6	5	7
Myanmar	10	0	0	0	0	0	1	6	1
Thailand	1	1	1	1	1	1	1	1	1

UPPER AIR OBSERVATIONS

		07-11-2010 00UTC		08-11-2010 00UTC	
		RS last level		Wind last level	
STATION Index	STATION Name	mb	Km	mb	mb
42410	GHT	250	10.9	250	400
42809	CAL	10.6	31.4	20	10
43333	PBL	93.1	16.7	578	31.6
42971	BWN	11.5	30.4	12	42.5
43150	VSK	147	14.1	854	213
43185	MPT	405	7.5	780	73
43128	HYD	2.7	40.3	3	119
43279	CHN	36.9	22.4	37	3.7
43346	KRK	240	11.1	831	22.4
43371	TRV	97.5	16.6	498	65.6
43192	GOA	NI/ GET		NI/ GET	
43003	MUM	DNA		573	4.7
43285	MNC	194	12.5	573	153
42647	AHM	105	16.1	799	12.3
43369	MNC	70	18.4	682	6.1
43353	KOCHI	165	13.6	NIL	44.5
42724	AGT	5.5	34.9	30	5.4

Remark: Reception of data from Myanmar is poor.



India Meteorological Department

REGIONAL METEOROLOGICAL CENTRE, CHENNAI

FDP (Cyclone) FOC Chennai Report Dated 08 NOV 2010, 1400 hrs

PART – A: STATUS OF OBSERVATION SYSTEM

No of Synop data

Date→	07.11.2010							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	12	18	19	20	22	19	19	19

No. of RS/RW Ascents

00Z / 07.11.2010 : 4

No. of Ascents reaching 250 hpa level =4

MISDA : 0

12Z /07.11.2010 : 3

No. of Ascents reaching 250 hpa level =2

MISDA : 1

No. of PILOT Ascents:

07.11.2010	
06Z	18Z
0	2

Status of AWS data is given in FDPNOC report.

FIRST IOP - STATUS OF SPECIAL COASTAL OBSERVATIONS (Coastal Tamilnadu and Coastal Andhra Pradesh)

Time of Observation in UTC **07.11.2010 - 00 TO 23 UTC**

	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
	12	10	9	18	5	9	19	16	10	20	16	13	22	15	9	19	11	11	19	--	--	19	--	--

No. of Observations

PART – B: RMC CHENNAI INFERENCE

CHENNAI MNG INF DATED 08.11.2010.AAA

BAY INF AURORA AAA THE LATEST SATELLITE CLOUD IMAGERIES AND SURFACE OBSERVATIONS INDICATE THAT THE CYCLONIC STORM "JAL" OVER SOUTHWEST BAY OF BENGAL WEAKENED INTO DEPRESSION AT 1500 UTC OF 7TH NOVEMBER 2010.MOVED WNW-WARDS AND CROSSED THE COAST NEAR NORTH CHENNAI AND NOW LIES AT 08/0300 UTC OVER RYLSM ABOUT 50 KM NE OF ANANTHAPUR AND IT WOULD MOVED NW-WARDS AND WEAKEN FURTHER GRADUALLY AAA WX SSL ELSEWHERE BAY AND ANDMN SEA AAA

ARSEA INF AURORA AAA Y'S TRH OF LOW PRESSURE OVER LKDP AREA AND N/HOOD PERSTS AND NOW IT IS FEEBLE AAA WX SSL ELSEWHERE ARSEA AAA REGN INF AAA NE MON HAS BEEN VIGOROUS OVER SCAP, RYLSM AND SIK AND ACTIVE OVER NTN AAA THE LATEST SATELLITE CLOUD IMAGERIES AND SURFACE OBSERVATIONS INDICATE THAT THE CYCLONIC STORM "JAL" OVER SOUTHWEST BAY OF BENGAL WEAKENED INTO DEPRESSION AT 1500 UTC OF 7TH NOVEMBER 2010 MOVED WNW-WARDS AND CROSSED THE COAST NEAR NORTH CHENNAI AND NOW LIES AT 08/0300 UTC OVER RYLSM ABOUT 50 KM NE OF ANANTHAPUR AND IT WOULD MOVED NW-WARDS AND WEAKEN FURTHER GRADUALLY AAA ASSTD U/A CYCIR EXTDS UPTO MTL AAA Y'S TRH OF LOW PRESSURE OVER LKDP AREA AND N/HOOD PERSTS AND NOW IT IS FEEBLE AAA ADL RECORDED THE LOWEST MIN TEMPERATURE OF 15 DEG C IN THE PLAINS OF THE REGION AAA

FCST AAA RA/TSH WOULD OCCUR AT MOST PLACES OVER KKA, RYLSM, AT MANY PLACES OVER SCAP AND AT A FEW PLACES OVER TN/PDC,KRL/LKDP, NCAP AND TLGN AAA

HRW AAA ISOL XX TO VERY XX RAIN WOULD OCCUR OVER KKA DURING NEXT 48 HOURS AAA ISOL XX RAIN ALSO WOULD OCCUR OVER RYLSM DURING THE SAME PERIOD AAA

=====
L/FCST AAA

FOR NEXT 24 HRS AAA THE SKY CONDITION WOULD BE PARTLY CLOUDY AAA RA/TSH WOULD OCCUR IN SOME AREAS AAA MAX AND MIN TEMP WOULD BE AROUND 33 AND 24 DEG C RESPECTIVELY AAA

FOR NEXT 48 HRS AAA THE SKY CONDITION WOULD BE PARTLY CLOUDY AAA RA/TSH WOULD OCCUR IN SOME AREAS AAA MAX AND MIN TEMP WOULD BE AROUND 33 AND 24 DEG C RESPECTIVELY AAA

=====

PART – C: UPPER AIR WINDS FORECAST OVER CHENNAI

WRF – MODEL OUTPUT INDICATES SOUTHERLY WINDS OF THE ORDER OF 10 UPTO 700 hPa AND SOUTHERLY TO SOUTHEASTERLY WINDS OF THE ORDER OF 10 TO 15 KNOTS FROM 700 TO 300 hPa OVER CHENNAI FOR THE NEXT 24 HOURS ENDING 00Z 09.11.2010

FDP (Cyclone) NOC Report Dated 9 November, 2010, 1500 hours
Weather Briefing:

Synoptic features:

Yesterday's cyclonic storm has weakened into well marked low pressure area and lay over eastcentral Arabian sea off south Maharashtra & Goa coast.

Upper tropospheric ridge:

- The upper tropospheric ridge line roughly runs along 20.0°N at 200 hPa level.

Divergence:

- Upper air positive divergence ($5-10 \times 10^{-5} \text{ s}^{-1}$) prevails over south Bay of Bengal and Andaman sea.

Convergence:

- Lower level positive convergence ($10-15 \times 10^{-5} \text{ s}^{-1}$) prevails over southeast Bay of Bengal and Andaman sea.

Wind Shear:

- The wind Shear is moderate (10-15 knots) over Bay of Bengal.

Wind Shear Tendency:

- Decreasing wind shear tendency (-10 to -20 knots) over southeast Bay of Bengal Bay and Andaman sea.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive over southeast Bay of Bengal and Andaman Sea with magnitude of $30 \times 10^{-5} \text{ s}^{-1}$.

Sea Surface Temperature:

- SST around 30.0-32.0°C over southeast & westcentral Bay of Bengal and Andaman Sea.

Ocean thermal energy:

- Ocean thermal energy is mainly 100-120 KJ cm⁻² over southeast Bay of Bengal and south Andaman Sea and below 100 KJ cm⁻² elsewhere over Bay of Bengal

M.J.O. Index:

- Located over phase 5 with amplitude more than 1.0.
- Statistical forecast:- MJO moves through phase 6, 7 & 8 during next 15 days.
- Dynamical forecast:- MJO remains in phase 5 with amplitude more than 1.0. It moves through phase 6, 7 & 8 during next 15 days with reduced amplitude.
- Synoptic and oceanic condition show that a low pressure area may form over south Andaman Sea and adjoining southeast Bay of Bengal during next 48 hours.

Status of observational system:

Details of the status of observational system are given in Annexure 1.

Satellite

Inference based on 090900 UTC

Broken low/medium clouds with embedded moderate to intense convection over southeast Bay of Bengal east of Long 89.0E Andaman sea adjoining Tenassarim coast and southwest adjoining westcentral Bay of Bengal between Lat 8.5 N To 13.5 N west of Long 82.5E (.) Scattered low/medium clouds with embedded isolated weak to moderate convection over rest Bay north of Lat 15.0 N and off south coastal Orissa rest Andaman sea (.)

(See <ftp://192.168.12.75/imd/satmet>

<http://www.imd.gov.in/section/satmet/dynamic/insat.htm>)

NWP Analysis

- **ECMWF** model analysis of 00UTC of today (09 Nov 2010) shows a trough of low pressure over south bay of Bengal and another feeble low pressure system over south Andaman sea. The forecast wind field shows the movement of this system in west-north-westerly direction.
- **IMDGFS** model analysis of 00UTC of today (09 Nov 2010) shows a trough of low pressure over south-west bay of Bengal near Tamil Nadu coast and another feeble trough over south-east bay of Bengal adjoining south Andaman sea. The 24-hr forecast indicates intensification of the system into a low pressure and moving in north-westerly direction.
- **WRF-ARW** model analysis of 00UTC of today (09 Nov 2010) indicates a low pressure system over south-east bay of Bengal and south Andaman sea and the forecast wind field shows slight intensification of this system and movement in a west-north-westerly direction .
- **UKMET** model analysis of 00UTC of today (09 Nov 2010) shows a trough of low pressure over south-west Bay of Bengal near Tamil Nadu coast and another feeble trough over south-east bay of Bengal and adjoining south Andaman sea. The 24-hr forecast indicates the system intensifies into a low pressure area. Further forecast shows this low pressure system moves northerly to north-west-north direction.
- **NCMRWF-GFS model** Based on 00 UTC of today (09 Nov., 2010) shows a trough of low pressure over south bay of Bengal. The 24-hr forecast shows arrival of a low pressure system from south China sea to south Andaman sea. The 48-hr forecast indicates this low pressure area over south Andaman sea and south-east bay of Bengal and further forecasts show its movement in a west-north-west direction over to south Andhra coast.

(See <http://www.imd.gov.in/section/nhac/dynamic/welcome.htm>)

See [ftp://ftp.ncmrwf.gov.in/pub/outgoing/TC FDP/](ftp://ftp.ncmrwf.gov.in/pub/outgoing/TC_FDP/)

FOC Report

Detailed report of FOC, Chennai is given in Annexure 2.

Advisory.

- All the above NWP and synoptic conditions show that a low pressure area may form over south Andaman Sea and adjoining southeast Bay during next 48 hours.
- **NO IOP will be conducted till 12-11-2010.**

Forecast for Sagar Kanya ship:

- Broken low/medium clouds with embedded moderate to intense convection over southeast Bay of Bengal and Andaman sea adjoining Tenassarim coast, southwest and adjoining westcentral Bay of Bengal.
- All the above NWP and synoptic conditions show that a low pressure area may form over south Andaman Sea and adjoining southeast Bay during next 48 hours.

Annexure-1

Status of Observation system:

Synop ← 8-11-2010 →← 9-11-2010 →

Region	09	12	15	18	21	00	03	06
KOL	33	55	24	23	16	26	71	35
CHN	44	63	33	25	32	28	73	47
MUM	22	40	17	19	17	19	39	26

AWS

←

8-11-2010

→←

9-11-2010

UTC	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07
Nos	449	451	442	450	432	456	449	451	451	452	452	451	453	451	446	447	447	450	449	450	451	450	449	448

RSRW (12Z) 8-11-2010: - 34/35**No. of Ascents reaching 250 hPa levels: 12****MISDA:-**PTL, JDP, LKN, GRK, DBH, SLG, PTN, RNC, AGT, GWL, BHP, NGP, RPR, JGD, AHM, AUG, PNJ, HYD, MNG, AMN, MNC (25)**RSRW (00Z) 9-11-2010: - 36/36****No. of Ascents reaching 250 hPa levels: (29)****MISDA:-** LKN, AMN (2)**No. of PILOT Ascents**

8-11-2010				9-11-2010			
12Z		18Z		00Z		06Z	
34		35		34		25	

Buoy Data

8-11-2010					9-11-2010		
09Z	12Z	15Z	18Z	21Z	00Z	03Z	06Z
03	02	02	02	02	02	04	03

List of stations of neighbouring countries**DATE 8-11-2010**

Country	Total No. of station	Hours of observations (UTC)							
		00	03	06	09	12	15	18	21
Sri Lanka	8	6	8	8	8	8	6	6	6
Bangladesh	11	5	9	10	7	7	8	3	4
Myanmar	10	7	8	7	7	8	1	7	1
Thailand	1	1	1	1	1	1	1	1	1

Remark: Upper air observation statistics not received.



Annexure-2

India Meteorological Department

REGIONAL METEOROLOGICAL CENTRE, CHENNAI

FDP (Cyclone) FOC Chennai Report Dated 09 NOV 2010, 1400 hrs

PART – A: STATUS OF OBSERVATION SYSTEM

No of Synop data

Date→	08.11.2010							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	19	23	20	20	20	19	19	19

No. of RS/RW Ascents

00Z / 08.11.2010 : 4

No. of Ascents reaching 250 hpa level =4

MISDA : 0

12Z /08.11.2010 : 4

No. of Ascents reaching 250 hpa level =4

MISDA : 0

No. of PILOT Ascents:

08.11.2010	
06Z	18Z
3	2

Status of AWS data is given in FDPNOC report.

PART – B: RMC CHENNAI INFERENCE

CHENNAI MNG INF DATED 09.11.2010.AAA

BAY INF AURORA AAA WX SSL BAY AND ANDMN SEA AAA

ARSEA INF AURORA AAA Y'S WML OVER RYMS AND N/HOOD EMERGED INTO

ARSEA AND NOW LIES OVER EC ARASEA AND N/HOOD AAA A TRH FROM THIS SYSTEM EXTDS UPTO LKD AREA AAA WX SSL ELSEWHERE ARSEA AAA

REGN INF AAA NE MON HAS BEEN VIG OVER CK AND NIK AAA

Y'S WML OVER RYMS AND N/HOOD EMERGED INTO ARSEA AND NOW LIES OVER EC ARASEA AND N/HOOD AAA A TRH FROM THIS SYSTEM EXTDS UPTO LKD AREA AAA

ASSTD U/A CYCIR/TRH EXTDS UPTO 5.8 KM ASL AAA

ADL RECORDED THE LOWEST MIN TEMPERATURE OF 15 DEG C IN THE PLAINS OF THE REGION AAA

FCST AAA RA/TSH WOULD OCCUR AT MANY PLACES OVER TN / PDC ,KKA,KRL ,LKD AND AT A FEW PLACES OVER CAP AND RYSM AAA ISOL RA/TSH MAY OCCUR OVER TLGN AAA

HRW AAA ISOL XX RAIN/TSH WOULD OCCUR OVER CK,KRL DURING NEXT 48 HOURS AAA

ENDS AAA

=====

PART – C: UPPER AIR WINDS FORECAST OVER CHENNAI

WRF – MODEL OUTPUT INDICATES SOUTHEASTERLY WINDS OF THE ORDER OF 5 KNOTS UPTO 500 hPa FOR NEXT 24 HOURS ENDING 00Z 10.11.2010

FDP (Cyclone) NOC Report Dated 10 November, 2010, 1500 hours
Weather Briefing:

Synoptic features:

An upper air cyclonic circulation extends upto mid-tropospheric level lies over south Andaman Sea. 24 hours Pressure change is negative over Andaman & Nicobar Islands.

Upper tropospheric ridge:

- The upper tropospheric ridge line roughly runs along 19.0°N at 200 hPa level.

Divergence:

- Upper air positive divergence ($10\text{-}20 \times 10^{-5} \text{ s}^{-1}$) prevails over south Bay of Bengal and Andaman sea.

Convergence:

- Lower level positive convergence ($10\text{-}20 \times 10^{-5} \text{ s}^{-1}$) prevails over southeast Bay of Bengal and Andaman sea.

Wind Shear:

- The wind Shear is moderate (10-15 knots) over Bay of Bengal.

Wind Shear Tendency:

- Decreasing wind shear tendency (-5 to -10 knots) over southeast Bay of Bengal Bay and Andaman sea.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive over southeast Bay of Bengal and Andaman Sea with magnitude of $30 \times 10^{-5} \text{ s}^{-1}$.

Sea Surface Temperature:

- SST around 30.0-32.0°C over southeast & westcentral Bay of Bengal and Andaman Sea and 28.0-30.0°C over rest Bay of Bengal.

Ocean thermal energy:

- Ocean thermal energy is mainly 100-120 KJ cm⁻² over southeast Bay of Bengal and south Andaman Sea and below 100 KJ cm⁻² elsewhere over Bay of Bengal

M.J.O. Index:

- Located over phase 6 with amplitude less than 1.0.
- Statistical forecast:- MJO moves through phase 6, 7, 8 & 1 during next 15 days.
- Dynamical forecast:- MJO remains in phase 6 with amplitude less than 1.0. It moves through phase 6, 7, 8 & 1 during next 15 days with reduced amplitude.
- Synoptic and oceanic condition show that a low pressure area may form over south Andaman Sea and adjoining southeast Bay of Bengal during next 48 hours.

Status of observational system:

Details of the status of observational system are given in Annexure 1.

Satellite

Arabian Sea:-

Low/medium clouds at many places with embedded moderate to intense thunderclouds at a few places over Arabian Sea between lat.18.0N to 22.0N east of long 65.0E Gulf of Cambay in association with a low level circulation over the area (.) Wind shear 20-30 kts (.) Low/medium clouds at many places with embedded moderate to intense thunderclouds at a few places over rest Arabian Sea south of Lat 8.0N east of long 63.0E (.) Low/medium clouds at many places with embedded weak to moderate tunderclouds at one or two places over Arabian Sea between lat 10.0N To 16.5N east of long 69.0E (.)

Bay of Bengal.& Andaman Sea

Low/medium clouds at many places with embedded moderate to intense thunder clouds at a few places over south Bay south Andaman Sea, adjoining Tenessarim coast southwest parts of west central Bay (.) Low/medium clouds at many places with embedded weak to moderate thunderclouds at one/two places over rest Andaman Sea (.)

A convective cloud band lies over south Bay of Bengal and south Andaman Sea with axis roughly running along 7° N.

(See <ftp://192.168.12.75/imd/satmet>

<http://www.imd.gov.in/section/satmet/dynamic/insat.htm>)

10 Nov' 2010

NWP Analysis

- **ECMWF** model analysis of 00UTC of today (10 Nov 2010) shows a low pressure area over east Arabian sea near south Gujarat-north Maharashtra coast moves north-west-northerly direction and becomes weak on 13 Nov.2010. Another trough of low pressure over south-east bay of Bengal becomes a low pressure system on 12th Nov. 2010 and moves west-north-west direction over to north Tamil Nadu coast.
- **IMDGFS** model analysis of 00UTC of today (10 Nov 2010) shows a trough of low pressure over south Andaman Sea. The forecast field shows this trough intensified into a low pressure system and move in north-westerly direction and weakening after 16th Nov., 2010. Another low pressure system is over east Arabian Sea , extending to Gujarat and Maharashtra coast is moving northerly direction and weakening on 14th Nov.,2010.
- **WRF-ARW** model analysis of 00UTC of today (10 Nov 2010) indicates a trough of low pressure system over south Andaman Sea and the forecast wind field shows slight intensification of this system into a low pressure area and moves north-west-north direction. Another low pressure system is over east Arabian sea near Gujarat-Maharashtra coast moves north-west-northerly direction and intensified to a deep depression near south Gujarat coast.
- **UKMET** N/A.
- **NCMRWF-GFS model** Based on 00 UTC of today (10 Nov., 2010) shows a trough of low pressure over south-east bay of Bengal. The forecast shows it develops into a low pressure system and moves in north-west-north direction. Another low pressure is over east Arabian sea near Gujarat-Maharashtra coast This system moves north-west-north direction and weakens after two days.

<http://www.imd.gov.in/section/nhac/dynamic/welcome.htm>)

ftp://ftp.ncmrwf.gov.in/pub/outgoing/TC_FDP/

FOC Report

Detailed report of FOC, Chennai is given in Annexure 2.

Advisory.

- Under the influence of the cyclonic circulation. a low pressure area may form over south Andaman Sea and adjoining southeast Bay during next 48 hours.
- **NO IOP will be conducted till 14-11-2010.**

Forecast for Sagar Kanya ship:

- A convective cloud band lies over south Bay of Bengal and south Andaman Sea with axis roughly running along 7° N.

- Under the influence of the cyclonic circulation. a low pressure area may form over south Andaman Sea and adjoining southeast Bay during next 48 hours.
- Low/medium clouds at many places with embedded moderate to intense thunder clouds at a few places over south Bay south Andaman Sea, adjoining Tenessarim coast southwest parts of west central Bay.

Annexure-1

Status of Observation system:

Synop ← 9-11-2010 → ← 10-11-2010 →

Region	09	12	15	18	21	00	03	06
KOL	34	69	36	59	37	31	73	36
CHN	45	72	53	61	40	40	72	45
MUM	42	101	47	44	23	30	85	38

AWS

← 9-11-2010 →← 10-11-2010

UTC	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07
Nos	465	497	456	453	451	455	452	455	451	455	450	453	450	450	450	451	507	504	516	516	523	524	516	531

RSRW (12Z) 8-11-2010: - 34/35

No. of Ascents reaching 250 hPa levels:02

MISDA:-PTL, JDP, LKN, GRK, DBH, SLG, PTN, RNC, AGT, GWL, BHP, NGP, RPR, JGD, AHM, AUG, PNJ, HYD, MNG, AMN, MNC (25)

RSRW (00Z) 9-11-2010: - 36/36

No. of Ascents reaching 250 hPa levels: (31)

MISDA:- AMN (1)

No. of PILOT Ascents

9-11-2010					10-11-2010			
12Z		18Z			00Z		06Z	
33		51			33		30	

Buoy Data

9-11-2010					10-11-2010		
09Z	12Z	15Z	18Z	21Z	00Z	03Z	06Z
03	06	03	-	03	03	03	03

List of stations of neighbouring countries

DATE 9-11-2010

Country	Total No. of station	Hours of observations (UTC)							
		00	03	06	09	12	15	18	21
Sri Lanka	8	8	8	8	8	8	8	6	6
Bangladesh	11	5	9	9	9	9	7	4	7
Myanmar	10	8	8	8	8	8	1	7	1
Thailand	1	1	1	1	1	1	1	1	1

Remark: Upper air observation statistics not received.

Status of RS/RW Observations

		08-11-2010 00UTC			09-11-2010 00UTC			10-11-2010 00UTC		
		RS last level		Wind last level	RS last level		Wind last level	RS last level		Wind last level
STATION Index	STATION Name	mb	Km	mb	mb	Km	mb	mb	Km	mb
42410	GHT	400	7.3	400	189	12.8	200	171	13.3	171
42809	CAL	10	30.8	50	14	29.4	14	16.2	28.5	20
43333	PBL	31.6	23.2	32	47.9	21	49.5	40	22.2	41
42971	BWN	42.5	21.8	44	10	30.9	10	39.5	22.5	40
43150	VSK	213	11.8	850	125	15.4	126	148	14.3	149
43185	MPT	73	18.8	115	20	26.5	91	113	15.6	130
43128	HYD	119	15.6	150	5.6	35.1	5.6	51.7	20.4	52
43279	CHN	3.7	38	8	6.5	34	6.5	112	15.6	150
43346	KRK	22.4	26.3	23	124	15.3	126	6	34.5	669
43371	TRV	65.6	18.1	nil	111	15.9	nil	57.6	19.8	308
43192	GOA	NI/ GET			285	10	nil	137	14.6	NIL
43003	MUM	573	4.7	625	214	11.9	250	692	3.2	873
43285	MNC	153	13.9	685	213	12	225	140	14.4	859
42647	AHM	12.3	29.7	13	398	7.5	nil	25.3	24.9	25
43369	MNC	6.1	34.1	568	465.3	6.4	808.4	71.7	18.8	464
43353	KOCHI	44.5	21.4	NIL	32	23.3	NIL	111	15.6	NIL
42724	AGT	5.4	35.1	6	5.5	34.3	12	11	30.7	11



Annexure-2

India Meteorological Department

REGIONAL METEOROLOGICAL CENTRE, CHENNAI

FDP (Cyclone) FOC Chennai Report Dated 10 NOV 2010, 1400 hrs

PART – A: STATUS OF OBSERVATION SYSTEM

No of Synop data

Date→	09.11.2010							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	19	22	20	20	23	19	19	18

No. of RS/RW Ascents

00Z / 09.11.2010 : 4

No. of Ascents reaching 250 hpa level =4

MISDA : 0

12Z /09.11.2010 : 4

No. of Ascents reaching 250 hpa level =3

MISDA : 1

No. of PILOT Ascents:

09.11.2010	
06Z	18Z
1	2

Status of AWS data is given in FDPNOC report.

PART – B: RMC CHENNAI INFERENCE

CHENNAI MNG INF DATED 10.11.2010.AAA

BAY INF AURORA AAA A TRH OF LOW PRESSURE LIES OVER SOUTH ADMN SEA
AND N/HOOD AAA WX SSL ELSEWHERE BAY AND NORTH ADMN SEA AAA

ARSEA INF AURORA AAA Y'S WELL MARKED LOPAR OVER EC AND ADJ NE

ARSEA NOW LIES OVER NE AND ADJ EC ARSEA OFF SOUTH GUJARAT-NORTH
MAHA COTS AAA

A TRH OF LOW PRESSURE LIES OVER LKD AREA AND N/HOOD AND IT IS
FEEBLE AAA

WX SSL ELSEWHERE ARSEA AAA

REGN INF AAA NE MON HAS BEEN VIG OVER ITN,SIK AND SCAP AND ACT
OVER KRL AAA A TRH OF LOW PRESSURE LIES OVER LKD AREA AND N/HOOD
AND IT IS FEEBLE AAA

ADL RECORDED THE LOWEST MIN TEMPERATURE OF 15 DEG C IN THE PLAINS
OF THE REGION AAA

FCST AAA RA/TSH WOULD OCCUR AT MANY PLACES OVER CK,SIK AND KRL
AND AT A FEW PLACES OVER TN/PDC,AP,NIK AND LKD AAA

HRW AAA ISOL XX RA/TSH WOULD OCCUR OVER CK AND KRL DURING NEXT 48
HOURS AAA

ENDS AAA

=====

PART – C: UPPER AIR WINDS FORECAST OVER CHENNAI

WRF – MODEL OUTPUT INDICATES EASTERLY TO NORTHEASTERLY WINDS OF
THE ORDER OF 5 – 10 KNOTS UPTO 500 hPa FOR NEXT 24 HOURS ENDING 00Z
11.11.2010



Regional Meteorological Centre, Kolkata
ACWC Kolkata

FDP Cyclone-2010 (Status of daily observation)

No of Synop data

Date→	09.11.10							
UTC→	00	03	06	09	12	15	18	21
Coasts of WB & ORS	9	11	10	10	11	9	9	9

No. of RS/RW Ascents

00Z / 09.11.2010 : 3

No. of Ascents reaching 250 hpa level =3

MISDA : 0

12Z /09.11.2010 : 3

No. of Ascents reaching 250 hpa level =3

MISDA : 0

No. of PILOT Ascents:

09.10.2010			
00Z	06Z	12Z	18Z
2	1	2	3

FDP (Cyclone) NOC Report Dated 11 November, 2010, 1500 hours
Weather Briefing:

Synoptic features:

Under the influence of yesterday's cyclonic circulation, a feeble low pressure area has formed over south Thailand and adjoining Andaman Sea. Associated upper air cyclonic circulation extends upto mid-tropospheric level.

Upper tropospheric ridge:

- The upper tropospheric ridge line roughly runs along 19.0°N at 200 hPa level.

Divergence:

- Upper air positive divergence ($5-10 \times 10^{-5} \text{ s}^{-1}$) prevails over south Bay of Bengal and Andaman sea.

Convergence:

- Lower level positive convergence ($10-15 \times 10^{-5} \text{ s}^{-1}$) prevails over southeast Bay of Bengal and Andaman sea.

Wind Shear:

- The wind Shear is moderate (5-10 knots) over Andaman Sea.

Wind Shear Tendency:

- Increasing wind shear tendency (10 to 20 knots) over south Bay of Bengal and Andaman sea.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive over southeast Bay of Bengal and Andaman Sea with magnitude of $40-50 \times 10^{-5} \text{ s}^{-1}$.

Sea Surface Temperature:

- SST around 30.0-32.0°C over south Andaman Sea and 28.0-30.0°C elsewhere over rest Bay of Bengal.

Ocean thermal energy:

- Ocean thermal energy is mainly 100-120 KJ cm⁻² over southeast Bay of Bengal and south Andaman Sea and below 100 KJ cm⁻² elsewhere over Bay of Bengal

M.J.O. Index:

- Located over phase 6 with amplitude less than 1.0.
- Statistical forecast:- MJO moves through phase 7, 8 & 1 during next 15 days.
- Dynamical forecast:- MJO remains in phase 6 with amplitude less than 1.0. It moves through phase 6, 7 & 8 during next 15 days with reduced amplitude.

Status of observational system:

Details of the status of observational system are given in Annexure 1.

Satellite

BASED ON INSAT PICTURE OF 110900 UTC

Bay of Bengal & Andaman sea:

Low/med clouds at many places with embedded moderate to intense thunder Clouds at few places over south Bay adjoining eastcentral Bay and Andaman Sea (.)

(See <ftp://192.168.12.75/imd/satmet>

<http://www.imd.gov.in/section/satmet/dynamic/insat.htm>)

NWP Analysis

- **ECMWF** model analysis of 00UTC of today (11 Nov 2010) shows that There no low pressure area in the Bay of Bengal. In the forecast at 24 hours (12 Nov 2010 00UTC), there an extended low pressure area in over North Andaman Sea. At 48 hr (13 Nov 2010), it remain as low. At 72 hr (14 Nov 2010), it remains as extended low in the South Bay of Bengal. There is a cyclonic circulation moving from Andaman Sea (12 Nov 2010) to the South Tamilnadu coast (17 Nov 2010 00UTC).

- **IMDGFS** model analysis of 00UTC of today (11 Nov 2010) shows that there is no low pressure area in the Bay of Bengal. In the 24 hr forecast (12 Nov 2010), it remains same. In the 48 hr forecast (13 Nov 2010 00UTC), there is low pressure lies over North Andaman Sea. After 72 hr forecast (14 Nov 2010 00UTC), it remains as low. There is a cyclonic circulation moving over Andaman Sea in 24 hr forecast (12 Nov 2010). After 48 hr (13 Nov 2010), it becomes organized. It is moving from North Andaman Sea to the North Tamilnadu coast (17 Nov 2010 00UTC).

- **WRF-ARW** model analysis of 00UTC of today (11 Nov 2010) shows that there is a low lying over Southeast Bay of Bengal. At 24 hr forecast (12 Nov 2010 00 UTC), it remains as low with 1 closed isobar. After 48 hr forecast (13 Nov 2010 00UTC), it remains as low with 2 closed isobar. After 72 hr forecast (14 Nov 2010), it becomes depression and moving towards west-westnorthward.

- **NCMRWF-GFS** Based on 00 UTC of today (11 Nov 2010) shows that a cyclonic circulation in the southeast Bay of Bengal. At 24 hr forecast (12 Nov 2010), it remains same. After 48 hr forecast (13 Nov 2010 00UTC), There is a cyclonic circulation over Andaman Sea, which is becoming organised at 72 hr forecast (14 Nov 2010). At 96 hr (15 Nov 2010), it is moving westward. It is reaching Tamilnadu Coast on 17 Nov 2010 at 00UTC same as ECMWF and IMDGFS.

- **JMA** Based on 00 UTC of today (11 Nov 2010) shows that there is a low lying over South Andaman Sea. At 24 hr (12 Nov 2010 00UTC), it remains as low. After 48 hr (13 Nov 2010 00UTC), there is a low pressure area over the Southwest Anadman Sea.

- **US_GFS** Not available for today

- **UKMET** Not available for today

- **ARPAGE** Not available for today

- **Conclusions**

There is no area which is likely to intensify in the numerical weather prediction.

(See <http://www.imd.gov.in/section/nhac/dynamic/welcome.htm>)

See ftp://ftp.ncmrwf.gov.in/pub/outgoing/TC_FDP/

FOC Report

Detailed report of FOC, Chennai is given in Annexure 2.

Advisory.

- Under the influence of yesterday's cyclonic circulation, a feeble low pressure area has formed over south Thailand and adjoining Andaman Sea. Associated upper air cyclonic circulation extends upto mid-tropospheric level.

- **NO IOP will be conducted till 13-11-2010.**

Forecast for Sagar Kanya ship:

- Low/med clouds at many places with embedded moderate to intense thunder Clouds at few places over south Bay adjoining eastcentral Bay and Andaman Sea.

- A feeble low pressure area has formed over south Thailand and adjoining Andaman Sea.

Annexure-1

Status of Observation system:

Synop ← 10-11-2010 →← 11-11-2010 →

Region	09	12	15	18	21	00	03	06
KOL	34	69	36	59	37	31	73	36
CHN	45	72	53	61	40	40	72	45
MUM	42	101	47	44	23	30	85	38

AWS

← 9-11-2010 →← 10-11-2010

UTC	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07
Nos	465	497	456	453	451	455	452	455	451	455	450	453	450	450	450	451	507	504	516	516	523	524	516	531

RSRW (12Z) 8-11-2010: - 34/35

No. of Ascents reaching 250 hPa levels:02

MISDA:-PTL, DLH, LKN, GRK, DBH, SLG, PTN, RNC, AGT, GWL, BHP, NGP, RPR, JGD, AHM, BOM, AUG, PNJ, HYD, VZK, MNG, AMN, MNC (23)

RSRW (00Z) 9-11-2010: - 36/36

No. of Ascents reaching 250 hPa levels: (31)

MISDA:- AMN (1)

No. of PILOT Ascents

9-11-2010				10-11-2010			
12Z		18Z		00Z		06Z	
33		51		33		30	

Buoy Data

9-11-2010					10-11-2010		
09Z	12Z	15Z	18Z	21Z	00Z	03Z	06Z
03	06	03	-	03	03	03	03

List of stations of neighbouring countries

DATE 10-11-2010

Country	Total No. of station	Hours of observations (UTC)							
		00	03	06	09	12	15	18	21
Sri Lanka	8	8	8	8	8	8	7	6	6
Bangladesh	11	7	9	8	7	8	9	3	9
Myanmar	10	8	8	8	8	8	3	8	1
Thailand	1	1	1	1	1	1	1	1	1

Remark: Upper air observation statistics not received.



Annexure-2

India Meteorological Department

REGIONAL METEOROLOGICAL CENTRE, CHENNAI

FDP (Cyclone) FOC Chennai Report Dated 11 NOV 2010, 1400 hrs

PART – A: STATUS OF OBSERVATION SYSTEM

No of Synop data

Date→	10.11.2010							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	19	23	20	20	23	19	19	19

No. of RS/RW Ascents

00Z / 10.11.2010 : 4

No. of Ascents reaching 250 hpa level =4

MISDA : 0

12Z /10.11.2010 : 3

No. of Ascents reaching 250 hpa level =3

MISDA : 1

No. of PILOT Ascents:

10.11.2010	
06Z	18Z
4	4

Status of AWS data is given in FDPNOC report.

PART – B: RMC CHENNAI INFERENCE

CHENNAI MNG INF DATED 11.11.2010.AAA

BAY INF AURORA AAA Y'S TRH OF LOW PRESSURE OVER SOUTH ADMN SEA
AND N/HOOD PERSTS AAA WX SSL ELSEWHERE BAY AND NORTH ADMN SEA
AAA

ARSEA INF AURORA AAA Y'S WELL MARKED LOPAR OVER NE AND ADJ
GUJARAT NOW LIES OVER NE ARSEA OFF SOURASHTRA-KUTCH COT AAA WX
SSL ELSEWHERE ARSEA AAA

REGN INF AAA NE MON HAS BEEN VIG OVER STN AND KRL AND ACT OVER SIK
AAA AN U/A CICIR OVER ITN AND N/HOOD EXTDS UPTO 0.9 KM ASL AAA

ADL AND KMT RECORDED THE LOWEST MIN TEMPERATURE OF 18 DEG C IN
THE PLAINS OF THE REGION AAA

FCST AAA RA/TSH WOULD OCCUR AT MANY PLACES OVER KRL,CK AND TN/PDC
AND AT A FEW PLACES OVER IK ,LKD AND CAP AAA ISOL RA/TSH OCCUR OVER
TLGN AND RYLS AAA

HRW AAA ISOL XX RA/TSH WOULD OCCUR OVER TN/PDC,CK AND KRL DURING
NEXT 48 HOURS AAA

ENDS AAA

=====

L/FCST AAA

FOR NEXT 24 HRS AAA THE SKY CONDITION WOULD BE GENERALLY CLOUDY
AAA

RA/TSH WOULD OCCUR IN SOME AREAS AAA MIN TEMP WOULD BE AROUND 24
DEG C AAA

FOR NEXT 48 HRS AAA THE SKY CONDITION WOULD BE GENERALLY CLOUDY
AAA

RA/TSH WOULD OCCUR IN SOME AREAS AAA MIN TEMP WOULD BE AROUND 24
DEG C AAA

PART – C: UPPER AIR WINDS FORECAST OVER CHENNAI

WRF – MODEL OUTPUT INDICATES EASTERLY TO NORTHEASTERLY WINDS OF
THE ORDER OF 5 – 10 KNOTS UPTO 500 hPa FOR NEXT 24 HOURS ENDING 00Z
11.11.2010



Regional Meteorological Centre, Kolkata
ACWC Kolkata

FDP Cyclone-2010 (Status of daily observation)

No of Synop data

Date→	10.11.10							
UTC→	00	03	06	09	12	15	18	21
Coasts of WB & ORS	10	11	10	9	11	10	10	10

No. of RS/RW Ascents

00Z / 10.11.2010 : 3

No. of Ascents reaching 250 hpa level =3

MISDA : 0

12Z /10.11.2010 : 3

No. of Ascents reaching 250 hpa level =3

MISDA : 0

No. of PILOT Ascents:

10.11.2010			
00Z	06Z	12Z	18Z
0	2	2	4

FDP (Cyclone) NOC Report Dated 12 November, 2010, 1500 hours
Weather Briefing:

Synoptic features:

Yesterday's feeble low pressure area has become less marked and seen as a upper air cyclonic circulation over south Andaman Sea and adjoining area in the lower level. 24 hours pressure change is negative (-1 to -3 hPa) over Andaman & Nicobar Islands and east coast.

Upper tropospheric ridge:

- The upper tropospheric ridge line roughly runs along 19.0°N at 200 hPa level.

Divergence:

- Upper air positive divergence ($10\text{-}20 \times 10^{-5} \text{ s}^{-1}$) prevails over south Bay of Bengal and Andaman sea.

Convergence:

- Lower level positive convergence ($5\text{-}10 \times 10^{-5} \text{ s}^{-1}$) prevails over southeast Bay of Bengal and Andaman sea.

Wind Shear:

- The wind Shear is moderate (5-10 knots) over central Bay of Bengal and 20-30 knots over south Bay of Bengal.

Wind Shear Tendency:

- Increasing wind shear tendency (5 to 10 knots) over south & central Bay of Bengal and Andaman sea.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive over southeast Bay of Bengal and Andaman Sea with magnitude of $5.0 \times 10^{-5} \text{ s}^{-1}$.

Sea Surface Temperature:

- SST around 30.0-32.0°C over south Andaman Sea and 28.0-30.0°C elsewhere over rest Bay of Bengal.

Ocean thermal energy:

- Ocean thermal energy is mainly 100-120 KJ cm⁻² over southeast Bay of Bengal and south Andaman Sea and below 100 KJ cm⁻² elsewhere over Bay of Bengal

M.J.O. Index:

- Located over phase 7 with amplitude less than 0.0.
- Statistical forecast:- MJO moves through phase 7, 8 & 1 during next 15 days.
- Dynamical forecast:- MJO remains in phase 7 with amplitude less than 0.0. It moves through phase 7, 8 & 1 during next 15 days with reduced amplitude.

Synoptic condition shows that no development of low pressure area during next 48 hours.

Status of observational system:

Details of the status of observational system are given in Annexure 1.

Satellite

BASED ON INSAT PICTURE OF 120900 UTC

Bay of Bengal & Andaman Sea: -

Broken low/med clouds with embedded moderate to intense convection over southeast bay and Andaman Sea (.) Broken low/med clouds with embedded isolated weak to moderate convection over south bay south of lat 7.5n (.) (.)

(See <ftp://192.168.12.75/imd/satmet>

<http://www.imd.gov.in/section/satmet/dynamic/insat.htm>)

NWP Analysis

- **ECMWF** model analysis of 00UTC of today (12 Nov 2010) shows that there is an extended low pressure area over North Andaman Sea. At 24 hr (13 Nov 2010), there is no low pressure area. At 48 hr (14 Nov 2010), there is a trough. At 72 hr (15 Nov 2010 00UTC), there is low over the central-south Bay of Bengal.

- **IMDGFS** model analysis of 00UTC of today (12 Nov 2010) shows that there is no low pressure area in the Bay of Bengal. In the 24 hr forecast (13 Nov 2010), there is an extended low pressure lies over North Andaman Sea. After 48 hr forecast (14 Nov 2010 00UTC), it remains as low.

- **WRF-ARW** model analysis of 00UTC of today (12 Nov 2010) shows that there is a low lying over Southeast Bay of Bengal. At 24 hr forecast (13 Nov 2010 00 UTC), it remains as low. After 48 hr forecast (14 Nov 2010 00UTC), it remains as low with 1 closed isobar. After 72 hr forecast (15 Nov 2010), it remains low with 2 closed isobar and moving towards west-westnorthward.

- **NCMRWF-GFS** Based on 00 UTC of today (12 Nov 2010) shows that there is a development of cyclonic circulation in the southeast Bay of Bengal. At 24 hr forecast (13 Nov 2010), it remains same. After 48 hr forecast (14 Nov 2010 00UTC), it is becoming organized. At 72 hr forecast (15 Nov 2010), it is moving westward with no intensity.

- **UKMET** Based on 00UTC of today (12 Nov 2010) shows that there is a cyclonic circulation at 10°N 94.5°E on 12 Nov 2010 06 UTC. At 24 hr forecast (13 Nov 2010 00 UTC), this cyclonic circulation is moving westward (9°N 94.5°E) with no intensity. At 36 hrs (13 Nov 2010 12 UTC), this system remains same.

- **JMA** Model 0 hr forecast, based on 00 UTC of today (12 Nov 2010) shows that there is an extended low pressure area lies over southeast Bay of Bengal. At 24 hr (13 Nov 2010), it remains same. At 48 hr (14 Nov 2010), there is a trough. At 72 hr (15 Nov 2010), there is an extended low pressure area in the Central South Bay of Bengal.

- **US-GFS** Not available today

- **ARPAGE** Not available today

Conclusions

There is no area which is likely to intensify in the numerical weather prediction.

(See <http://www.imd.gov.in/section/nhac/dynamic/welcome.htm>)

See ftp://ftp.ncmrwf.gov.in/pub/outgoing/TC_FDP/

FOC Report

Detailed report of FOC, Chennai is given in Annexure 2.

Advisory.

- Yesterday's low pressure area has weakened.
- **NO IOP will be conducted till 15-11-2010.**

Forecast for Sagar Kanya ship:

- Broken low/med clouds with embedded moderate to intense convection over southeast Bay and Andaman Sea.

Annexure-1

Status of Observation system:

Synop ← 11-11-2010 → ← 12-11-2010 →

Region	09	12	15	18	21	00	03	06
KOL	32	65	67	25	24	32	70	38
CHN	41	61	72	38	38	39	79	45
MUM	35	74	92	32	30	29	75	75

AWS

← 11-11-2010 →← 12-11-2010

UTC	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07
Nos	536	515	531	522	538	517	509	503	499	409	512	510	514	501	490	418	498	499	501	503	500	492	500	501

RSRW (12Z) 11-11-2010: - 35/35

No. of Ascents reaching 250 hPa levels:08

MISDA:-SRN, PTL, JDP, LKN, GRK, DBH, SLG, GHT, PTN, RNC, AGT, GWL, BHP, NGP, RPR, JGD, AHM, AUG, PNJ, HYD, VZK, MNG, BNG, AMN, MNC (25)

RSRW (00Z) 12-11-2010: - 36/36

No. of Ascents reaching 250 hPa levels: (25)

MISDA: (GHT, BOM, PNJ, AMN) (4)

No. of PILOT Ascents

11-11-2010				12-11-2010			
12Z		18Z		00Z		06Z	
32		47		46		14	

Buoy Data

11-11-2010					12-11-2010		
09Z	12Z	15Z	18Z	21Z	00Z	03Z	06Z
03	01	03	03	03	04	03	03

UPPER AIR OBSERVATION

		11-11-2010 00UTC			12-11-2010 00UTC		
		RS last level		Wind last level	RS last level		Wind last level
STATION Index	STATION Name	mb	Km	mb	mb	Km	mb
42410	GHT	248	10.5	250	Misda due to GET		
42809	CAL	47.4	21.1	50	24	25.6	24
43333	PBL	38.3	21.4	30	41.6	21.9	43
42971	BWN	25.9	25.1	26	46	21.3	98.9
43150	VSK	28.4	27.5	29	144	14.3	144

43185	MPT	47.5	20.8	110	27	24.7	65
43128	HYD	2.8	40	3	3.8	37.7	3.8
43279	CHN	10.2	30.9	10	115	15.7	115
43346	KRK	87.2	17.4	928	50.7	20.5	51
43371	TRV	97.9	16.5	nil	48	21	nil
43192	GOA	148	14.2	nil	Misda due to Met Element Fail		
43003	MUM	Misda due to Data doubtful			Misda due to Met Element Fail		
43285	MNG	168	13.4	550	Misda due to NI		
42647	AHM	Misda due to Met Element Fail			245	11	837
43369	MNC	139	14.8	nil	60.5	19.4	312.6
43353	KOCHI	146	14.3	nil	100	16.5	nil
42724	AGT	9.9	30.7	165	6.6	32.6	6.9

List of stations of neighbouring countries

DATE 11-11-2010

Country	Total No. of station	Hours of observations (UTC)							
		00	03	06	09	12	15	18	21
Sri Lanka	8	8	8	8	8	8	7	6	6
Bangladesh	11	8	7	8	9	9	5	4	6
Myanmar	10	7	7	8	8	8	0	7	1
Thailand	1	1	1	1	1	1	1	1	1

Remark: Nil.

Annexure-2



India Meteorological Department

REGIONAL METEOROLOGICAL CENTRE, CHENNAI

FDP (Cyclone) FOC Chennai Report Dated 12 NOV 2010, 1400 hrs

PART – A: STATUS OF OBSERVATION SYSTEM

No of Synop data

Date→	11.11.2010							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	19	23	20	20	23	19	19	19

No. of RS/RW Ascents**00Z / 11.11.2010 : 3**

No. of Ascents reaching 250 hpa level =3

MISDA : 1**12Z /11.11.2010 : 3**

No. of Ascents reaching 250 hpa level =3

MISDA : 1**No. of PILOT Ascents:**

11.11.2010	
06Z	18Z
2	0

Status of AWS data is given in FDPNOC report.**PART – B: RMC CHENNAI INFERENCE
CHENNAI MNG INF DATED 12.11.2010AAA**

BAY INF AURORA AAA Y'S TRH OF LOW PRESSURE OVER SOUTH ADMN SEA
AND N/HOOD PERSTS AAA WX SSL ELSEWHERE BAY AND NORTH ADMN SEA
AAA

ARSEA INF AURORA AAA Y'S FEEBLE TRH OF LOW PRESSURE OVER LKDWP
AREA AND N/HOOD PERSTS AAA WX SSL ELSEWHERE ARSEA AAA

REGN INF AAA NE MON HAS BEEN VIGOROUS OVER SIK AND ACTIVE OVER
KRL AAA AN EAST-WEST SHEAR LINE RUNS ROUGHLY ALONG 10 DEG NORTH
ACROSS THE SOUTH PENINSULA BETWEEN 1.5 AND 3.1 KM ASL AAA

ADL RECORDED THE LOWEST MIN TEMPERATURE OF 18 DEG C IN THE
PLAINS OF THE REGION AAA

FCST AAA RA/TSH WOULD OCCUR AT MANY PLACES OVER KRL,CK, SIK AND
AT A FEW PLACES OVER TN/PDC,LKDP, NIK AND AP AAA

HRW AAA ISOL XX RA WOULD OCCUR OVER KRL, CK AND GHAT AREAS OF SIK
DURING NEXT 48 HOURS AAA
ENDS AAA

L/FCST AAA

FOR NEXT 24 HRS AAA THE SKY CONDITION WOULD BE GENERALLY CLOUDY
AAA
RA/TSH WOULD OCCUR IN SOME AREAS AAA MIN TEMP WOULD BE AROUND 25
DEG C AAA

FOR NEXT 48 HRS AAA THE SKY CONDITION WOULD BE GENERALLY CLOUDY
AAA
RA/TSH WOULD OCCUR IN SOME AREAS AAA MIN TEMP WOULD BE AROUND 25
DEG C AAA

FDP (Cyclone) NOC Report Dated 13 November, 2010, 1500 hours
Weather Briefing:

Synoptic features:

Yesterday's upper air cyclonic circulation over south Andaman Sea and adjoining area in the lower level persists. 24 hours pressure change is negative (-1 to -2 hPa) over Nicobar Islands and east coast upto south Orissa coast.

Upper tropospheric ridge:

- The upper tropospheric ridge line roughly runs along 17.0°N at 200 hPa level.

Divergence:

- Upper air positive divergence ($5-10 \times 10^{-5} \text{ s}^{-1}$) prevails over Andaman sea.

Convergence:

- Lower level positive convergence ($5-10 \times 10^{-5} \text{ s}^{-1}$) prevails over southeast Bay of Bengal and Andaman sea.

Wind Shear:

- The wind Shear is moderate (5-10 knots) over south Bay of Bengal.

Wind Shear Tendency:

- Wind shear tendency over past 24 hours decreased by 5 to 10 knots over Andaman Sea.

Relative Vorticity:

- Relative vorticity at 850 hPa is negative over southwest and central Bay of Bengal with magnitude of $5.0 \times 10^{-5} \text{ s}^{-1}$.

Sea Surface Temperature:

- SST around 30.0-32.0°C over south Andaman Sea and 28.0-30.0°C elsewhere over rest Bay of Bengal.

Ocean thermal energy:

- Ocean thermal energy is mainly 100-120 KJ cm⁻² over southeast Bay of Bengal and south Andaman Sea and below 100 KJ cm⁻² elsewhere over Bay of Bengal

M.J.O. Index:

- Located over phase 7 with amplitude less than 0.0.
- Statistical forecast:- MJO moves through phase 7, 8 & 1 during next 15 days.
- Dynamical forecast:- MJO remains in phase 7 with amplitude less than 0.0. It moves through phase 7, 8 & 1 during next 15 days with reduced amplitude.

Synoptic condition shows that no development of low pressure area during next 48 hours.

Status of observational system:

Details of the status of observational system are given in Annexure 1.

Satellite

BASED ON INSAT PICTURE OF 130900 UTC

Bay of Bengal & Andaman Sea: -

Broken low/medium clouds with embedded moderate to intense convection over southeast Bay of Bengal south of Lat 10.0°N east of Long 89.0°E and over rest Bay between Lat 16.0°N to 17.0°N and Long 83.0°E to 84.5°E and south Andaman Sea(.)

(See <ftp://192.168.12.75/imd/satmet>

<http://www.imd.gov.in/section/satmet/dynamic/insat.htm>)

NWP Analysis

- **ECMWF** model analysis of 00UTC of today (13 Nov 2010) shows an extended low pressure region over Andaman Sea, south Bay of Bengal, Comoron, Maldives and east Arabian Sea. The 48-hr forecast indicates it slightly intensified over south-east Bay of Bengal and moving west-north-west direction and by 17th Nov. 2010 it is south-east of Chennai as a low pressure system over south-west Bay of Bengal.
- **IMDGFS** model forecast of 00UTC of today (13 Nov 2010) shows a low pressure system over south-east bay of Bengal extending to south Andaman Sea. Another low pressure over Tamil Nadu and Andhra coast and yet another low over east Arabian Sea, Gujarat and Maharashtra coast. The forecast shows these troughs mingles together and becomes an extended trough over these areas.
- **WRF-ARW** model analysis of 00UTC of today (13 Nov 2010) indicates a low pressure system over south bay of Bengal and south Andaman sea, another system over Andhra-Tamil Nadu coast extending to east Arabian sea. The 48-hr forecast shows slight intensification of the system over south-east Bay of Bengal and moving west-north-westerly direction and by 16th Nov., 2010 the system near south Tamil Nadu coast as a depression.
- **UKMET** N/A.
- **NCMRWF-GFS** model Based on 00 UTC of today (13th Nov., 2010) shows a feeble low pressure system over south Andaman sea and moving west-north-west direction and by 17th Nov. 2010 it crosses the Tamil Nadu coast near Chennai as a low pressure system.
- **JMA-GFS** model analysis of 00 UTC of today (13th NOV.,2010) shows a feeble low pressure system over south-east Andaman sea and the forecast shows it moves west-north-westerly direction to Tamil Nadu coast.

See <http://www.imd.gov.in/section/nhac/dynamic/welcome.htm>
ftp://ftp.ncmrwf.gov.in/pub/outgoing/TC_FDP/

FOC Report

Detailed report of FOC, Chennai is given in Annexure 2.

Advisory.

- **NO IOP will be conducted till 15-11-2010.**

Forecast for Sagar Kanya ship:

- Broken low/med clouds with embedded moderate to intense convection over southeast Bay and Nicobar Sea.

Annexure-1

Status of Observation system:

Synop ← 12-11-2010 → ← 13-11-2010 →

Region	09	12	15	18	21	00	03	06
KOL	32	55	26	33	24	30	67	36
CHN	43	74	39	39	40	52	75	44
MUM	38	72	31	37	31	32	31	40

AWS

←

12-11-2010

→←

13-11-2010

UTC	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07
Nos	498	497	496	496	521	505	524	514	511	511	505	518	514	509	507	419	506	454	453	458	458	455	452	502

RSRW (12Z) 12-11-2010: - 35/35**No. of Ascents reaching 250 hPa levels: 10****MISDA:-** PTL, JDP, GRK, DBH, SLG, GHT, PTN, RNC, AGT, GWL, BHP, NGP, RPR, JGD, AHM, AUG, PNJ, HYD, VSK, MNG, BNG, AMN, MNC (23)**RSRW (00Z) 13-11-2010: - 36/36****No. of Ascents reaching 250 hPa levels: 31****MISDA:** (GHT, GWL, NAG, MNG, AMN) (05)**No. of PILOT Ascents**

12-11-2010				13-11-2010			
12Z		18Z		00Z		06Z	
35		37		33		27	

Buoy Data

12-11-2010					13-11-2010		
09Z	12Z	15Z	18Z	21Z	00Z	03Z	06Z
02	03	03	03	03	04	03	02

Annexure-II**India Meteorological Department****REGIONAL METEOROLOGICAL CENTRE, CHENNAI**

FDP (Cyclone) FOC Chennai Report Dated 13 NOV 2010, 1400 hrs

PART – A: STATUS OF OBSERVATION SYSTEM**No of Synop data**

Date→	12.11.2010							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	19	22	20	20	22	19	19	19

No. of RS/RW Ascents

00Z / 12.11.2010 : 4

No. of Ascents reaching 250 hpa level =4

MISDA : 0

12Z /12.11.2010 : 3

No. of Ascents reaching 250 hpa level =3

MISDA : 1

No. of PILOT Ascents:

12.11.2010	
06Z	18Z
2	2

Status of AWS data is given in FDPNOC report.

**PART – B: RMC CHENNAI INFERENCE
CHENNAI MNG INF DATED 13.11.2010.AAA**

BAY INF AURORA AAA Y'S TRH OF LOW PRESSURE OVER SOUTH ADMN SEA
AND N/HOOD PERSTS AAA WX SSL ELSEWHERE BAY AND NORTH ADMN SEA
AAA

ARSEA INF AURORA AAA Y'S FEEBLE TRH OF LOW PRESSURE OVER LKD AND
N/HOOD PERSTS AAA WX SSL ELSEWHERE ARSEA AAA

REGN INF AAA Y'S FEEBLE TRH OF LOW PRESSURE OVER LKD AND N/HOOD
PERSTS AAA AN U/A CICIR LIES OVER EXTREME SOUTH TN AND N/HOOD AND
EXTDS UPTO 0.9 KM ASL AAA

ADL RECORDED THE LOWEST MIN TEMPERATURE OF 18 DEG C IN THE
PLAINS OF THE REGION AAA

FCST AAA RA/TSH WOULD OCCUR AT A FEW PLACES OVER TN/PDC, KRL,LKD
AND CAP AAA ISOL RA/TSH MAY OCCUR OVER KKA, TLGN AND RYLS AAA

ENDS AAA

=====

L/FCST AAA

FOR NEXT 24 HRS AAA THE SKY CONDITION MAY BE GENERALLY CLOUDY AAA
RA/TSH MAY OCCUR IN SOME AREAS AAA MIN TEMP WOULD BE AROUND 24
DEG C AAA

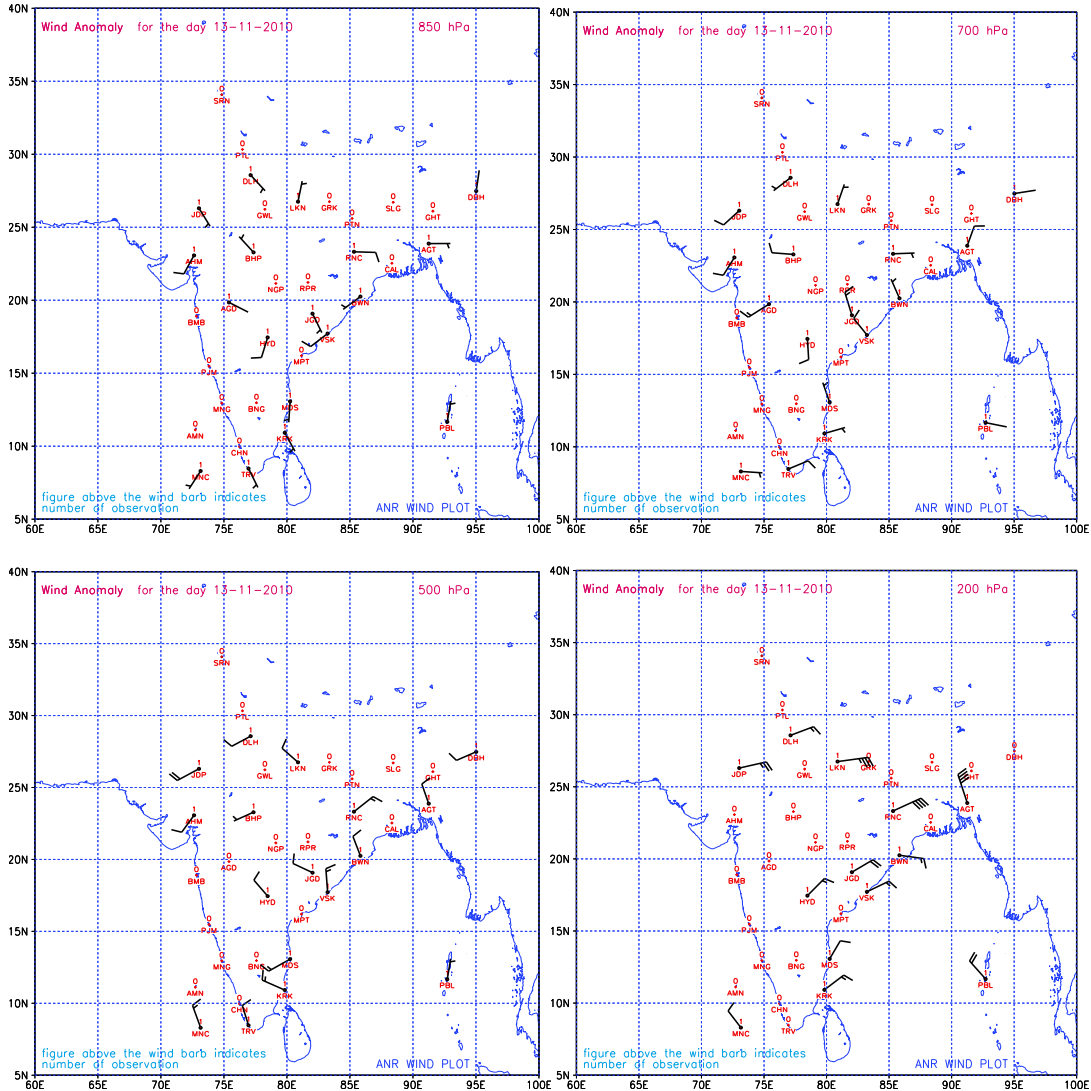
FOR NEXT 48 HRS AAA THE SKY CONDITION MAY BE GENERALLY CLOUDY AAA
RA/TSH MAY OCCUR IN SOME AREAS AAA MIN TEMP WOULD BE AROUND 24
DEG C AAA

ENDS AAA

=====

PART – C

UPPER AIR WIND ANOMALIES DATED 13-11-2010



PART – D: UPPER AIR WINDS FORECAST OVER CHENNAI

WRF – MODEL OUTPUT INDICATES LIGHT VARIABLE WINDS OF THE ORDER OF 5 KNOTS UPTO 900 hPa AND NORTHERLY TO NORTHEASTERLY WINDS OF THE ORDER OF 5 KNOTS FROM 900 TO 500 hPa OVER CHENNAI FOR NEXT 24 HOURS ENDING 00Z 14.11.2010

FDP (Cyclone) NOC Report Dated 14 November, 2010, 1500 hours
Weather Briefing:

Synoptic features:

Under the influence of yesterday's upper air cyclonic circulation a low pressure area has formed over south Andaman Sea and adjoining southeast Bay of Bengal associated upper air cyclonic circulation extending upto mid-tropospheric level. 24 hours pressure change is positive over Andaman & Nicobar Islands and east coast.

Upper tropospheric ridge:

- The upper tropospheric ridge line roughly runs along 17.0°N at 200 hPa level.

Divergence:

- Upper air positive divergence ($15-20 \times 10^{-5} \text{ s}^{-1}$) prevails over southeast Bay of Bengal.

Convergence:

- Lower level positive convergence ($5-10 \times 10^{-5} \text{ s}^{-1}$) prevails over southeast Bay of Bengal and Andaman sea.

Wind Shear:

- The wind Shear is moderate (10-20 knots) over southeast Bay of Bengal and Andaman sea.

Wind Shear Tendency:

- Increasing wind shear tendency (5 to 10 knots) over Andaman sea and adjoining southeast Bay of Bengal.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive over southeast Bay of Bengal and Andaman Sea with magnitude of $10.0 \times 10^{-5} \text{ s}^{-1}$.

Sea Surface Temperature:

- SST around 30.0-31.0°C over Andaman Sea and 28.0-30.0°C elsewhere over Bay of Bengal.

Ocean thermal energy:

- Ocean thermal energy is mainly 100-120 KJ cm⁻² over southeast Bay of Bengal and south Andaman Sea and below 100 KJ cm⁻² elsewhere over Bay of Bengal

M.J.O. Index:

- Located over phase 7 with amplitude less than 0.0.
- Statistical forecast:- MJO moves through phase 7, 8, 1 & 2 during next 15 days.
- Dynamical forecast:- MJO remains in phase 7 with amplitude less than 0.0. It moves through phase 7, 8 & 1 during next 15 days with reduced amplitude.

Synoptic and environmental conditions show that the low pressure area may intensify gradually to well mark low during next 24 hours.

Status of observational system:

Details of the status of observational system are given in Annexure 1.

Satellite

BASED ON INSAT PICTURE OF 140900 UTC

Bay of Bengal & Andaman sea: -

Broken low/med clouds with embedded mod to intense convection over south parts of north Andaman sea (.) Scattered low/med clouds with embedded isolated weak convection over westcentral Bay of Bengal and rest Andaman sea (.)

(See <ftp://192.168.12.75/imd/satmet>

<http://www.imd.gov.in/section/satmet/dynamic/insat.htm>)

NWP Analysis

- **ECMWF** model analysis of 00UTC of today (14 Nov 2010) shows an extended low pressure region over south Andaman sea, south bay of Bengal, Comoron, Maldives and east Arabian sea from Kerala to Gujarat coasts. The forecast indicates the system over south Andaman sea moving west-north-west direction and crosses the land over south Tamil Nadu coast on 17th Nov. 2010.
- **IMDGFS** model forecast of 00UTC of today (14 Nov 2010) shows a low pressure system over south-east bay of Bengal, south Andaman sea. Another low pressure over Tamil Nadu coast on south-west bay of Bengal extending to Comoron, Maldives, Kerala, and Karnataka coasts to Gujarat coast in east Arabian sea. The forecast shows the system over south-east bay of Bengal intensifies slightly and moves west-north-west direction and crosses the land near south Tamil Nadu coast by 17th Nov., 2010.
- **WRF-ARW** model analysis of 00UTC of today (14 Nov 2010) indicates an extended low pressure system from south Andaman sea, south-east bay of Bengal, south Tamil Nadu coast, Comoron, Maldives upto south Gujarat through Kerala, Karnataka and Maharashtra coasts. The forecast shows slight intensification of the system over south-east bay of Bengal and moving westerly direction and intensifies into a depression on 16th Nov., 2010 and crosses the land over south Tamil Nadu coast by 12 UTC of 16th Nov., 2010.
- **UKMET** N/A.
- **NCMRWF-GFS** model **analysis** based on 00 UTC of today (14th Nov., 2010) shows a low pressure system over south-east bay of Bengal over Andaman islands and the forecast shows it moves west-north-westerly direction and crosses the south Tamil Nadu coast by 17th Nov., 2010.
- **JMA-GFS** model analysis of 00 UTC of today (14th NOV., 2010) shows a low pressure system over south-east bay of Bengal over Andaman islands and the forecast shows it moves west-north-westerly direction and crosses the south Tamil Nadu coast by 17th Nov., 2010..

(See <http://www.imd.gov.in/section/nhac/dynamic/welcome.htm>)

See ftp://ftp.ncmrwf.gov.in/pub/outgoing/TC_FDP/

FOC Report

Detailed report of FOC, Chennai is given in Annexure 2.

Advisory.

- A low pressure area has formed over south Andaman Sea and adjoining southeast Bay of Bengal.
- **NO IOP will be conducted till 15-11-2010.**

Forecast for Sagar Kanya ship:

- Broken low/med clouds with embedded mod to intense convection over south parts of north Andaman Sea.

Annexure-1

Status of Observation system:

Synop	←	13-11-2010					→	←	14-11-2010		→
Region	09	12	15	18	21	00	03	06			
KOL	23	71	28	25	22	29	64	37			
CHN	44	73	47	38	38	42	77	48			
MUM	38	86	35	31	27	32	97	43			

AWS

←

13-11-2010

→← 14-11-2010

UTC	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07
Nos	510	533	516	519	537	458	455	457	459	456	453	455	454	455	450	451	449	449	503	539	532	523	343	342

RSRW (12Z) 13-11-2010: - 35/35**No. of Ascents reaching 250 hPa levels:10****MISDA:-SRN, PTL, JDP, LKN, GRK, DBH, SLG, GHT, PTN, RNC, AGT, GWL, BHP, NGP, RPR, JGD, AHM, AUG, PNJ, HYD, VZK, MNG, BNG, AMN, MNC (25)****RSRW (00Z) 14-11-2010: - 36/36****No. of Ascents reaching 250 hPa levels: (28)****MISDA: (PTL, GHT, MNC, AMN)****No. of PILOT Ascents**

13-11-2010				14-11-2010			
12Z		18Z		00Z		06Z	
33		49		34		31	

Buoy Data

13-11-2010					14-11-2010		
09Z	12Z	15Z	18Z	21Z	00Z	03Z	06Z
03	03	02	02	03	03	02	03

List of stations of neighbouring countries**DATE 13-11-2010**

Country	Total No. of station	Hours of observations (UTC)							
		00	03	06	09	12	15	18	21
Sri Lanka	8	8	8	8	8	8	8	6	5
Bangladesh	11	6	9	8	6	6	6	3	6
Myanmar	10	6	9	10	8	8	1	7	1
Thailand	1	1	1	1	1	1	1	1	1

Remark: Upper air data information from DDGM(UI) not received.



Annexure-2

India Meteorological Department

REGIONAL METEOROLOGICAL CENTRE, CHENNAI

FDP (Cyclone) FOC Chennai Report Dated 14 NOV 2010, 1400 hrs

PART – A: STATUS OF OBSERVATION SYSTEM

No of Synop data

Date→	13.11.2010							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	19	22	20	20	22	19	19	19

No. of RS/RW Ascents

00Z / 13.11.2010 : 4

No. of Ascents reaching 250 hpa level =4

MISDA : 0

12Z /13.11.2010 : 3

No. of Ascents reaching 250 hpa level =3

MISDA : 1

No. of PILOT Ascents:

13.11.2010	
06Z	18Z
4	1

Status of AWS data is given in FDPNOC report.

PART – B: RMC CHENNAI INFERENCE

CHENNAI MNG INF DATED 14.11.2010.AAA

BAY INF AURORA AAA Y'S TRH OF LOW PRESSURE NOW LIES OVER SE BAY
ANDADJ SOUTH ADMN SEA AAA WX SSL ELSEWHERE BAY AND NORTH ADMN
SEA AAA

ARSEA INF AURORA AAA Y'S FEEBLE TRH OF LOW PRESSURE OVER LKDP
AREAAND N/HOOD PERSTS AAA WX SSL ELSEWHERE ARSEA AAA

REGN INF AAA Y'S FEEBLE TRH OF LOW PRESSURE OVER LKDP AREA AND
N/HOOD PERSTS AAA

CHAMRAJNAGAR RECORDED THE LOWEST MIN TEMPERATURE OF 17 DEG C IN THE PLAINS OF THE REGION AAA

FCST AAA RA/TSH WOULD OCCUR AT A FEW PLACES OVER TN/PDC, KRL/LKD, CK AND CAP AAA ISOL RA/TSH MAY OCCUR OVER IK, TLGN AND RYLSM AAA

ENDS AAA

=====

L/FCST AAA

FOR NEXT 24 HRS AAA THE SKY CONDITION WOULD BE GENERALLY CLOUDY AAARA/TSH MAY OCCUR IN SOME AREAS AAA MIN TEMP WOULD BE AROUND 24 DEG C AAA

FOR NEXT 48 HRS AAA THE SKY CONDITION WOULD BE GENERALLY CLOUDY AAARA/TSH MAY OCCUR IN SOME AREAS AAA MIN TEMP WOULD BE AROUND 24 DEG C AAA

ENDS AAA

=====

PART – C: UPPER AIR WINDS FORECAST OVER CHENNAI

WRF – MODEL OUTPUT INDICATES MAINLY EASTERLY TO NORTHEASTERLY WINDS OF THE ORDER OF 5-10 KNOTS UPTO 500 hPa OVER CHENNAI FOR NEXT 24 HOURS ENDING 00Z 15.11.2010

FDP (Cyclone) NOC Report Dated 15 November, 2010, 1500 hours
Weather Briefing:

Synoptic features:

The low pressure area now lies over southeast Bay of Bengal with associated upper air cyclonic circulation extending upto mid-tropospheric level. 24 hours pressure change is positive along east coast.

Upper tropospheric ridge:

- The upper tropospheric ridge line roughly runs along 17.0°N at 200 hPa level.

Divergence:

- Upper air positive divergence ($10\text{-}20 \times 10^{-5} \text{ s}^{-1}$) prevails over south Bay of Bengal and west central Bay of Bengal.

Convergence:

- Lower level positive convergence ($5\text{-}10 \times 10^{-5} \text{ s}^{-1}$) prevails over southeast Bay of Bengal and Andaman sea.

Wind Shear:

- The wind Shear is moderate (10-20 knots) over southeast Bay of Bengal and Andaman sea.

Wind Shear Tendency:

- Increasing wind shear tendency increased by 5 to 10 knots over Andaman sea & southwest and west central Bay of Bengal.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive over southwest and adjoining west central Bay of Bengal with magnitude of $5.0 \times 10^{-5} \text{ s}^{-1}$.

Sea Surface Temperature:

- SST around 30.0-31.0°C over Andaman Sea and 29.0-31.0°C elsewhere over Bay of Bengal.

Ocean thermal energy:

- Ocean thermal energy is mainly 100-120 KJ cm⁻² over southeast Bay of Bengal and south Andaman Sea and below 100 KJ cm⁻² elsewhere over Bay of Bengal

M.J.O. Index:

- Located over phase 8 with amplitude greater than 1.0.
- Statistical forecast:- MJO moves through phase 8, 1 & 2 during next 15 days.
- Dynamical forecast:- Located in phase and moves through phase 7 & 8 during next 15 days

Synoptic and environmental conditions show that the low pressure area may intensify gradually to well mark low during next 24 hours.

Status of observational system:

Details of the status of observational system are given in Annexure 1.

Satellite

BASED ON INSAT PICTURE OF 150900 UTC

BAY OF BENGAL & ANDAMAN SEA: -

VORTEX OVER BAY CENTRED WITHIN HALF A DEGREE OF LAT 10.5N/88.0E.

INTENSITY T 1.0 . ASSOCIATED LOW/MED CLOUDS AT MANY PLACES WITH EMBEDDED INTENSE TO VERY INTENSE THUNDER CLOUDS AT MANY PLACES OVER BAY BET LAT 9.0N TO 17.0N LONG 82.0E TO 90.5E (.)

LOW/MED CLOUDS AT MANY PLACES WITH EMBEDDED MODERATE TO INTENSE THUNDER CLOUDS AT FEW PLACES OVER REST SOUTH BAY AND ANDAMAN

SEA SOUTH OF LAT.11.0N . LOW/MED CLOUDS AT FEW PLACES WITH EMBEDDED WEAK TO MODERATE THUNDER CLOUDS AT FEW PLACES OVER REST ANDAMAN SEA BET LAT 11.0N TO 14.0N.

(See <ftp://192.168.12.75/imd/satmet>

<http://www.imd.gov.in/section/satmet/dynamic/insat.htm>)

NWP Analysis

• **ECMWF** model analysis of 00UTC of today (15 Nov 2010) shows that there is a low pressure over southeast Bay of Bengal. 24 hr forecast shows that the low pressure area is moving westward and at 48 hour forecast it becomes less marked.

IMDGFS model analysis of 00UTC of today (15 Nov 2010) shows that there is a low pressure area over southeast Bay of Bengal. In the 24 hr forecast shows that the low pressure area is moving westward and at 48 hour forecast it lies over southwest Bay of Bengal off Tamilnadu coast.

• **WRF-ARW** model analysis of 00UTC of today (15 Nov 2010) shows that there is a low pressure area over southeast Bay of Bengal. In the 24 hr forecast shows that the low pressure area over southwest Bay of Bengal and at 48 hour forecast it becomes less marked.

• **NCMRWF-GFS** model analysis of 00UTC of today (15 Nov 2010) shows that there is a low pressure area over southeast Bay of Bengal. In the 24 hr forecast shows that the low pressure area over southwest Bay of Bengal and at 48 hour forecast it becomes less marked.

(See <http://www.imd.gov.in/section/nhac/dynamic/welcome.htm>)

See ftp://ftp.ncmrwf.gov.in/pub/outgoing/TC_FDP/

FOC Report

Detailed report of FOC, Chennai is given in Annexure 2.

Advisory.

▪ The low pressure area lies over southeast Bay of Bengal. It is not expected to intensify into a cyclonic disturbance.

▪ **NO IOP will be conducted till 17-11-2010.**

Forecast for Sagar Kanya ship:

• VORTEX OVER BAY CENTRED WITHIN HALF A DEGREE OF LAT 10.5N/88.0E. INTENSITY T 1.0 . ASSOCIATED LOW/MED CLOUDS AT MANY PLACES WITH EMBEDDED INTENSE TO VERY INTENSE THUNDER CLOUDS AT MANY PLACES OVER BAY BET LAT 9.0N TO 17.0N LONG 82.0E TO 90.5E (.).

Annexure-1

Status of Observation system:

Synop ← 14-11-2010 → ← 15-11-2010 →

Region	09	12	15	18	21	00	03	06
KOL	33	67	25	27	22	29	58	37
CHN	39	52	38	38	39	41	81	46
MUM	39	77	18	17	16	31	81	39

AWS

←

14-11-2010

→←

15-11-2010

UTC	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07
Nos	519	534	525	518	526	526	520	516	511	514	521	519	514	518	517	519	507	495	515	526	416	521	517	501

RSRW (12Z) 14-11-2010: - 35/35**No. of Ascents reaching 250 hPa levels:09****MISDA:-SRN, PTL, JDP, LKN, GRK, DBH, SLG, GHT, PTN, RNC, AGT, GWL, BHP, NGP, RPR, JGD, AHM, AUG, PNJ, HYD, VZK, MNG, BNG, AMN, MNC (25)****RSRW (00Z) 15-11-2010: - 36/36****No. of Ascents reaching 250 hPa levels: (29)****MISDA: (SRN, PTL, GHT, AHM, AUG, MNC, AMN)****No. of PILOT Ascents**

14-11-2010					15-11-2010				
12Z		18Z			00Z		06Z		
36		47			34		32		

Buoy Data

14-11-2010					15-11-2010		
09Z	12Z	15Z	18Z	21Z	00Z	03Z	06Z
03	03	02	02	04	05	03	03

List of stations of neighbouring countries**DATE 14-11-2010**

Country	Total No. of station	Hours of observations (UTC)							
		00	03	06	09	12	15	18	21
Sri Lanka	8	6	8	8	8	8	6	6	5
Bangladesh	11	7	3	6	6	6	5	1	6
Myanmar	10	6	7	7	7	7	1	5	1
Thailand	1	1	1	1	1	1	1	1	1

Remark: Upper air data information from DDGM(UI) not received.



Annexure-2

India Meteorological Department

REGIONAL METEOROLOGICAL CENTRE, CHENNAI

FDP (Cyclone) FOC Chennai Report Dated 15 NOV 2010, 1400 hrs

PART – A: STATUS OF OBSERVATION SYSTEM

No of Synop data

Date→	14.11.2010							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	19	23	20	20	23	19	19	19

No. of RS/RW Ascents

00Z / 14.11.2010 : 4

No. of Ascents reaching 250 hpa level =4

MISDA : 0

12Z /14.11.2010 : 3

No. of Ascents reaching 250 hpa level =3

MISDA : 1

No. of PILOT Ascents:

14.11.2010	
06Z	18Z
1	2

Status of AWS data is given in FDPNOC report.

PART – B: RMC CHENNAI INFERENCE

CHENNAI MNG INF DATED 15.11.2010.AAA

BAY INF AURORA AAA Y'S LOPAR OVER SE BAY PERSTS AND IS MORE MARKED AAA WX SSL ELSEWHERE BAY AND ADMN SEA AAA

ARSEA INF AURORA AAA Y'S FEEBLE TRH OF LOW PRESSURE OVER LKDP AREAAND N/HOOD PERSTS AAA WX SSL ELSEWHERE ARSEA AAA

REGN INF AAA Y'S FEEBLE TRH OF LOW PRESSURE OVER LKDP AREA AND
N/HOOD PERSTS AAA AN EAST-WEST SHEAR LINE RUNS ROUGHLY ACROSS
SRILANKA AND THROUGH THE CENTRE OF THE WELL MARKED LOPAR OVERSE
BAY AND EXTDS UPTO 3.1 KM ASL AAA

CHAMRAJNAGAR RECORDED THE LOWEST MIN TEMPERATURE OF 18 DEG C IN
THEPLAINS OF THE REGION AAA

FCST AAA RA/TSH WOULD OCCUR AT MANY PLACES OVER CTN/PDC,
RYLSM,SCAP, CK AND AT A FEW PLACES OVER ITN, IK,KRL/LKD,NCAP AND
TLGN AAA
ENDS=

HRW AAA ISOL XX RA WOULD OCCUR OVER NCTN/PDC, SCAP AND RYLSM
DURING NEXT 48 HOURS AAA
=====

L/FCST AAA

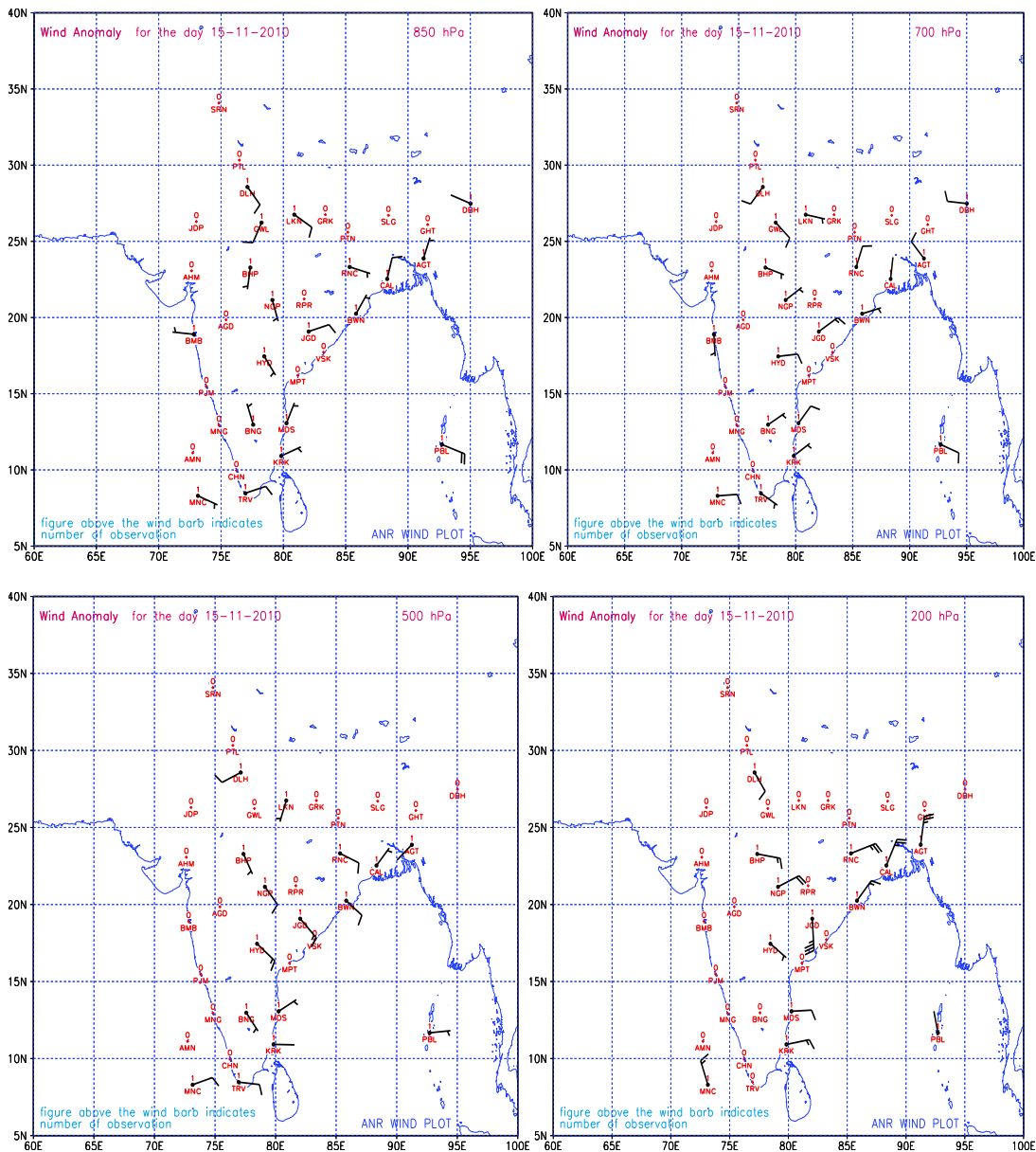
FOR NEXT 24 HRS AAA THE SKY CONDITION WOULD BE GENERALLY CLOUDY
AAA ONE OR TWO SPELLS OF RA/TSH WOULD OCCUR IN SOME AREAS AAA MIN
TEMP WOULD BE AROUND 25 DEG C AAA

FOR NEXT 48 HRS AAA THE SKY CONDITION WOULD BE GENERALLY CLOUDY
AAA ONE OR TWO SPELLS OF RA/TSH WOULD OCCUR IN SOME AREAS AAA MIN
TEMP WOULD BE AROUND 25 DEG C AAA

ENDS AAA

PART – C

UPPER AIR WIND ANOMALIES DATED 15-11-2010



PART – D: UPPER AIR WINDS FORECAST OVER CHENNAI

WRF – MODEL OUTPUT INDICATES LIGHT VARIABLE WINDS OF THE ORDER OF 5 KNOTS UPTO 900 hPa AND EASTERLY TO NORTHEASTERLY WINDS OF THE ORDER OF 5 TO 10 KNOTS FROM 900 TO 500 hPa OVER CHENNAI FOR NEXT 24 HOURS ENDING 00Z 16.11.2010



Regional Meteorological Centre, Kolkata
ACWC Kolkata

FDP Cyclone-2010 (Status of daily observation)

No of Synop data

Date→	14.11.10							
UTC→	00	03	06	09	12	15	18	21
Coasts of WB & ORS	10	11	10	10	11	10	10	10

No. of RS/RW Ascents

00Z / 14.11.2010 : 3

No. of Ascents reaching 250 hpa level =3

MISDA : 0

12Z /14.11.2010 : 3

No. of Ascents reaching 250 hpa level =3

MISDA : 0

No. of PILOT Ascents:

14.11.2010			
00Z	06Z	12Z	18Z
1	2	2	2

FDP (Cyclone) NOC Report Dated 16 November, 2010, 1500 hours
Weather Briefing:

Synoptic features:

Yesterday's low pressure area now lies as well marked low pressure area over southwest Bay of Bengal off south Andhra Pradesh and north Tamil Nadu coast with associated upper air cyclonic circulation extending upto mid-tropospheric level. 24 hours pressure change is negative (-2 to -3 hPa) along south Andhra Pradesh and north Tamil Nadu coast.

Upper tropospheric ridge:

- The upper tropospheric ridge line roughly runs along 17.0°N at 200 hPa level.

Divergence:

- Upper air positive divergence ($5-10 \times 10^{-5} \text{ s}^{-1}$) prevails over southwest Bay of Bengal.

Convergence:

- Lower level positive convergence ($5-10 \times 10^{-5} \text{ s}^{-1}$) prevails over southwest Bay of Bengal.

Wind Shear:

- The wind Shear is moderate (10-20 knots) over southwest Bay of Bengal and 5-10 knots over eastcentral Bay of Bengal.

Wind Shear Tendency:

- Decreasing wind shear tendency by 5 to 10 knots over central Bay of Bengal.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive over southwest Bay of Bengal and adjoining coastal Tamil Nadu with magnitude of $10.0 \times 10^{-5} \text{ s}^{-1}$.

Sea Surface Temperature:

- SST around 29.0 - 31.0°C over Bay of Bengal.

Ocean thermal energy:

- Ocean thermal energy is mainly 100-120 KJ cm⁻² over southeast Bay of Bengal and south Andaman Sea and below 100 KJ cm⁻² elsewhere over Bay of Bengal

M.J.O. Index:

- Located over phase 8 with amplitude greater than 1.0.
- Statistical forecast:- MJO moves through phase 8, 1, 2 & 3 during next 15 days.
- Dynamical forecast:- MJO located in phase 8 with amplitude greater than 1.0 and moves through phase 8, 1 & 2 during next 15 days

Synoptic and environmental conditions show that the well marked low pressure area may weaken gradually during next 24 hours.

Status of observational system:

Details of the status of observational system are given in Annexure 1.

Satellite

INFERENCE BASED ON 160900 UTC

VORTEX OVER BAY OF BENGAL CENTERED WITHIN HALF A DEGREE OF LAT 12.5N LONG 82.0E INTENSITY T1.0. ASSOCIATED BROKEN LOW/MEDIUM CLOUDS WITH EMBEDDED MODERATE TO INTENSE THUNDERCLOUDS OVER BAY BETWEEN LAT 10.0N TO 15.0N WEST OF LONG 83.0 E. BROKEN LOW/MEDIUM CLOUDS WITH EMBEDDED INTENSE CONVECTION OVER BAY BETWEEN LAT 15.0N TO 18.5N WEST OF LONG 86.5E. SCATTERED LOW/MEDIUM

CLOUDS WITH EMBEDDED ISOLATED WEAK TO MODERATE THUNDER CLOUDS OVER SOUTHEAST BAY ADJOINING EASTCENTRAL BAY AND ANDAMAN SEA.

(See <ftp://192.168.12.75/imd/satmet>
<http://www.imd.gov.in/section/satmet/dynamic/insat.htm>)

NWP Analysis

- **ECMWF** model analysis of 00UTC of today (16 Nov 2010) shows an extended trough of low pressure region over south Andaman sea, south bay of Bengal, Comoron, Maldives and east Arabian sea from Kerala to Goa coasts in east Arabian sea. Yesterday's low pressure over south bay of Bengal now lies south-east of Chennai on Tamil Nadu coast. The forecast indicates the system crosses the land south of Chennai by 17th Nov. 2010.
- **IMDGFS** model forecast of 00UTC of today (16 Nov 2010) shows an extended trough of low pressure system over south Andaman sea, south-east bay of Bengal, extending upto south-east Arabian sea. The low pressure over south-west bay of Bengal crosses the land south of Chennai by 17th Nov., 2010.
- **WRF-ARW** model analysis of 00UTC of today (16 Nov 2010) indicates an extended low pressure system from south Andaman sea, south bay of Bengal, through Kerala, Karnataka and Goa coasts. Yesterday's low pressure now lies south-east of Chennai and the forecast wind field shows this system crosses the land by 00 UTC of 17th Nov., 2010.
- **WRF-NMM** model analysis of 00UTC of today (16 Nov 2010) indicates a low pressure over south-west bay of Bengal and the forecast wind field indicates its crossing over the land south of Chennai by 00 UTC of 17th Nov., 2010 and it further moves to south Arabian sea in the next 72 hrs.
- **UKMET** model analysis of 00UTC of today (16 Nov 2010) indicates yesterday's low pressure now lies south-east of Chennai and the forecast wind field shows this system crosses the land by 18 UTC of 16th Nov., 2010.
- **NCMRWF-GFS** model based on 00 UTC of today (16th Nov., 2010) shows a low pressure system over south-west bay of Bengal crosses the land south of Chennai by 17th Nov., 2010.
- **JMA-GFS** model analysis of 00UTC of today (16 Nov 2010) indicates an extended low pressure system from south Andaman sea, south bay of Bengal, through Kerala, Karnataka and Goa coasts. Yesterday's low pressure now lies south-east of Chennai and the forecast wind field shows this system crosses the land by 00 UTC of 17th Nov., 2010.

See <http://www.imd.gov.in/section/nhac/dynamic/welcome.htm>)
ftp://ftp.ncmrwf.gov.in/pub/outgoing/TC_FDP/

FOC Report

Detailed report of FOC, Chennai is given in Annexure 2.

Advisory.

- The well marked low pressure area may weaken gradually during next 24 hours.
- **NO IOP will be conducted till 19-11-2010.**

Forecast for Sagar Kanya ship:

- VORTEX OVER BAY OF BENGAL CENTERED WITHIN HALF A DEGREE OF LAT 12.5N LONG 82.0E INTENSITY T1.0. ASSOCIATED BROKEN LOW/MEDIUM CLOUDS WITH EMBEDDED MODERATE TO INTENSE THUNDERCLOUDS OVER BAY BETWEEN LAT 10.0N TO 15.0N WEST OF LONG 83.0 E (.).

Annexure-1

Status of Observation system:

Synop	← 15-11-2010					→ 16-11-2010 →			
Region	09	12	15	18	21	00	03	06	
GHT/KOL	46	84	54	26	21	29	86	41	
CHN	55	85	37	39	40	43	89	54	
NAG/MUM	47	92	30	31	29	32	95	51	

AWS

	← 15-11-2010														→	← 16-11-2010								
UTC	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07
Nos	453	460	456	454	455	456	450	501	495	515	505	507	502	510	501	421	508	507	449	449	458	451	460	455

RSRW (12Z) 15-11-2010: - 35/36

No. of Ascents reaching 250 hPa levels:09

MISDA:-SRN, PTL, JDP, LKN, GRK, DBH, SLG, GHT, PTN, RNC, GWL, BHP, NGP, RPR, JGD, AHM, AUG, PNJ, HYD, VSK, MNG, BNG, AMN, MNC (25)

RSRW (00Z) 16-11-2010: - 36/36

No. of Ascents reaching 250 hPa levels: (25)

MISDA: (SRN, PTL, GHT, AGT, BOM, MDS, AMN)

No. of PILOT Ascents

15-11-2010				16-11-2010			
12Z		18Z		00Z		06Z	
34		44		31		36	

Buoy Data

15-11-2010					16-11-2010		
09Z	12Z	15Z	18Z	21Z	00Z	03Z	06Z
02	03	02	03	03	03	02	02

List of stations of neighbouring countries

DATE 15-11-2010

Country	Total No. of station	Hours of observations (UTC)							
		00	03	06	09	12	15	18	21
Sri Lanka	8	6	8	8	8	8	5	6	6
Bangladesh	11	6	7	8	7	8	8	2	7
Myanmar	10	7	7	7	7	7	1	7	1
Thailand	1	1	1	1	1	1	1	1	1

Upper Air Observations

		15-11-2010 00UTC			16-11-2010 00UTC		
		RS last level		Wind last level	RS last level		Wind last level
STATION Index	STATION Name	mb	Km	mb	mb	Km	mb
42410	GHT	Misda due to GET			Misda due to GET		
42809	CAL	20	27.2	20	26	25.4	26
43333	PBL	23	25.9	24.8	20.9	26.4	21
42971	BWN	68	19	68.2	28.2	24.4	31
43150	VSK	133	14.9	133	207	12.2	206
43185	MPT	52	20.5	69	29.6	24.9	102
43128	HYD	37.1	22.4	37.1	2.9	39.7	3
43279	CHN	77.8	18	77.8	Misda due to NI		
43346	KRK	6.5	33.6	50.3	21.2	26.1	552
43371	TRV	110	15.9	nil	61.1	19.5	87
43192	GOA	168	13.5	nil	77.6	17.7	nil
43003	MUM	646	3.8	646	Misda due to DU		
43285	MNG	Misda due to NI			227	11.5	277
42647	AHM				509	5.7	nil
43369	MNC	16.6	27.9	60.5	19.8	26.7	99
43353	KOCHI	25	24.4	nil	100	16.3	nil
42724	AGT	10.5	29.1	11	Misda due to MEF		



Annexure-2

India Meteorological Department

REGIONAL METEOROLOGICAL CENTRE, CHENNAI

FDP (Cyclone) FOC Chennai Report Dated 16 NOV 2010, 1400 hrs

PART – A: STATUS OF OBSERVATION SYSTEM

No of Synop data

Date→	15.11.2010							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	19	23	20	20	23	19	19	19

No. of RS/RW Ascents

00Z / 15.11.2010 : 1

No. of Ascents reaching 250 hpa level =1

MISDA : 3

12Z /15.11.2010 : 3

No. of Ascents reaching 250 hpa level =3

MISDA : 1

No. of PILOT Ascents:

15.11.2010	
06Z	18Z
2	2

Status of AWS data is given in FDPNOC report.

PART – B: RMC CHENNAI INFERENCE

CHENNAI MNG INF DATED 16.11.2010.AAA

BAY INF AURORA AAA Y'S WELL MARKED LOPAR OVER SE BAY AND N/HOOD
NOW LIES OVER SW BAY AAA WX SSL ELSEWHERE BAY AND ADMN SEA AAA

ARSEA INF AURORA AAA Y'S FEEBLE TRH OF LOW PRESSURE OVER LKDP
AREA AND N/HOOD PERSTS AAA WX SSL ELSEWHERE ARSEA AAA

REGN INF AAA Y'S WELL MARKED LOPAR OVER SE BAY AND N/HOOD NOW LIES
OVER SW BAY AAA ASSTD U/A CYCIR EXTDS UPTO MTL AAA Y'S FEEBLE TRH
OF LOW PRESSURE OVER LKDP AREA AND N/HOOD PERSTS AAA

RCH RECORDED THE LOWEST MIN TEMPERATURE OF 17 DEG C IN THE
PLAINS OF THE REGION AAA

FCST AAA RA/TSH WOULD OCCUR AT MOST PLACES OVER NCTN/PDC, SCAP,
AT MANY PLACES OVER NITN, NCAP,RYLSM,, KRL AND AT A FEW PLACES OVER
STN,LKDP,TLGN AND KKA AAA

HRW AAA ISOL XX TO VERY XX RA WOULD OCCUR OVER NCTN/PDC AND SCAP
DURING NEXT 48 HOURS AAA ISOL XX RA WOULD ALSO OCCUR OVER NITN,
RYLSM AND KRL DURING THE SAME PERIOD AAA

=====

L/FCST AAA

FOR NEXT 24 HRS AAA THE SKY CONDITIONS WOULD BE GENERALLY CLOUDY
AAA
FEW SPELLS OF RA/TSH WOULD OCCUR, ONE OR TWO SPELLS MAY BE HEAVY
AAA

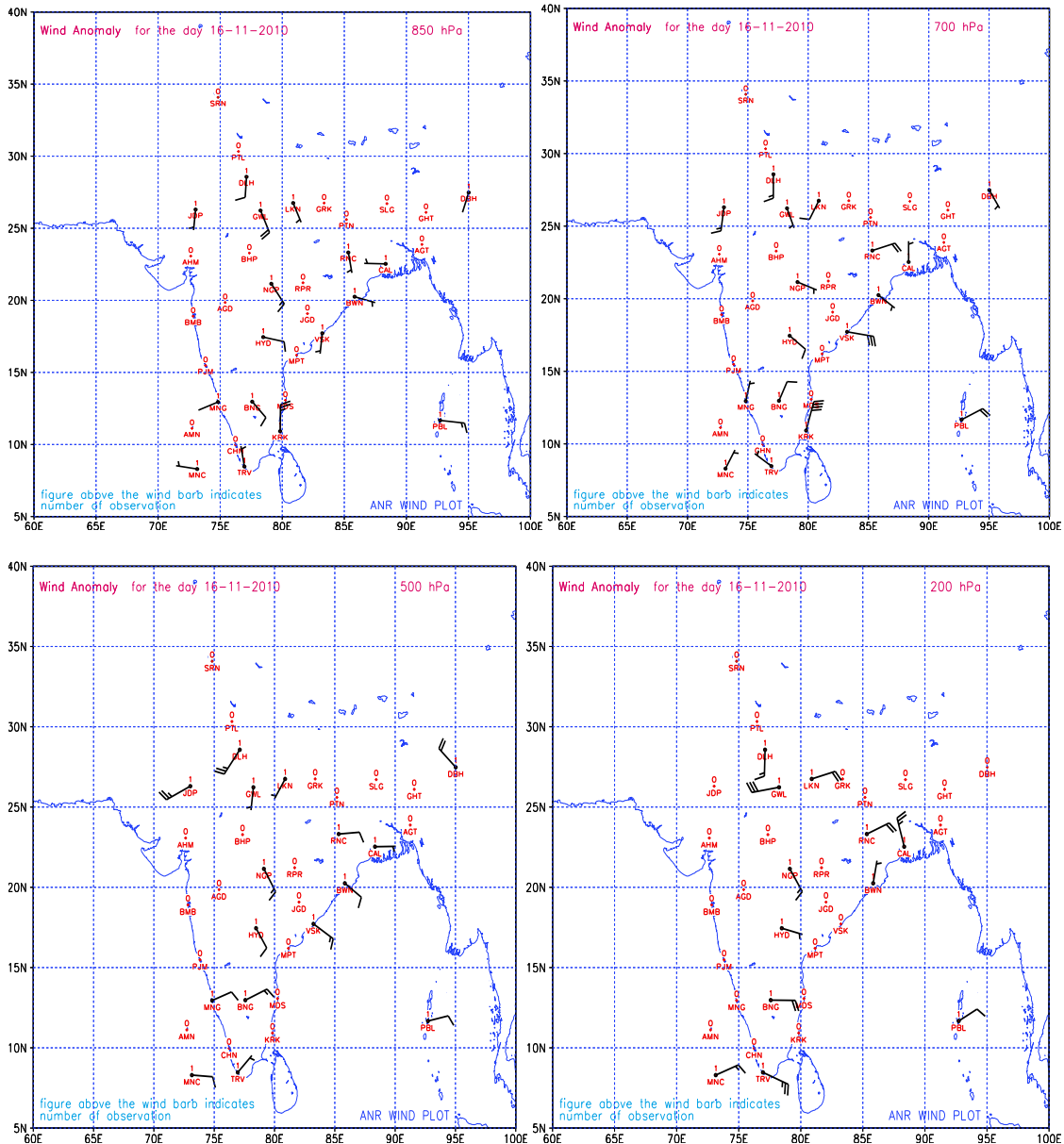
FOR NEXT 48 HRS AAA THE SKY CONDITION WOULD BE GENERALLY CLOUDY
AAA

ONE OR TWO SPELLS OF RA /TSH MAY OCCUR IN SOME AREAS AAA
ENDS AAA

=====

PART – C

UPPER AIR WIND ANOMALIES DATED 16-11-2010



PART – D: UPPER AIR WINDS FORECAST OVER CHENNAI

WRF – MODEL OUTPUT INDICATES NORTHEASTERLY WINDS OF THE ORDER OF 10 TO 20 KNOTS CHANGING TO SOUTHEASTERLY WINDS UPTO 500 hPa OVER CHENNAI FOR NEXT 24 HOURS ENDING 00Z 17.11.2010

FDP (Cyclone) NOC Report Dated 17 November, 2010, 1500 hours
Weather Briefing:

Synoptic features:

Yesterday's low pressure area has become less marked.

Upper tropospheric ridge:

- The upper tropospheric ridge line roughly runs along 17.0°N at 200 hPa level.

Divergence:

- Upper air positive divergence ($10 \times 10^{-5} \text{ s}^{-1}$) prevails over southeast Bay of Bengal and Andaman sea.

Convergence:

- Lower level positive convergence ($5 \times 10^{-5} \text{ s}^{-1}$) prevails over westcentral Bay of Bengal and south Andaman sea.

Wind Shear:

- The wind Shear is weak (5 -10 knots) over central Bay of Bengal.

Wind Shear Tendency:

- Decreasing wind shear tendency by 5 to 10 knots over westcentral & south west Bay of Bengal.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive over south Bay of Bengal with magnitude of $2.5 \times 10^{-5} \text{ s}^{-1}$.

Sea Surface Temperature:

- SST around 28.0 - 30.0°C over Bay of Bengal.

Ocean thermal energy:

- Ocean thermal energy is mainly 100-110 KJ cm⁻² over southeast Bay of Bengal and south Andaman Sea and below 100 KJ cm⁻² elsewhere over Bay of Bengal

M.J.O. Index:

- Located over phase 8 with amplitude greater than 1.0.
- Statistical forecast:- MJO moves through phase 1, 2 & 3 during next 15 days.
- Dynamical forecast:- MJO located in phase 8 with amplitude greater than 1.0 and moves through phase 8,1 & 2 during next 15 days

Status of observational system:

Details of the status of observational system are given in Annexure 1.

Satellite

INFERENCE BASED ON 170900 UTC

BAY OF BENGAL

Broken low/medium clouds with embedded moderate to intense thunder clouds over south Andaman Sea adjoining southeast Bay.

(See <ftp://192.168.12.75/imd/satmet>
<http://www.imd.gov.in/section/satmet/dynamic/insat.htm>)

NWP Analysis

- **ECMWF** model analysis of 00UTC of today (17 Nov 2010) shows a low pressure region over south Tamil Nadu coast, southern peninsular India and south Kerala coast. The forecast shows it becomes less intense and moving westerly direction over to south Arabian sea.

- **IMD-GFS** model analysis of 00UTC of today (17 Nov 2010) shows a low pressure over south Tamil Nadu coast, southern peninsular India and south Kerala coast. The forecast shows it becomes less intense and moving westerly direction over to south Arabian sea.
- **WRF-ARW** model analysis of 00UTC of today (17 Nov 2010) shows a low pressure region over south Tamil Nadu coast, southern peninsula and south Kerala coast. The forecast shows it becomes less intense and moving westerly direction over to south Arabian sea.
- **NCMRWF-GFS** model based on 00 UTC of today (17th Nov., 2010) shows a low pressure system over south Tamil Nadu coast, south peninsular India and south Kerala coast and moving westwards to south Arabian sea.

See <http://www.imd.gov.in/section/nhac/dynamic/welcome.htm>)
ftp://ftp.ncmrwf.gov.in/pub/outgoing/TC_FDP/

FOC Report

Detailed report of FOC, Chennai is given in Annexure 2.

Advisory.

- Yesterday's low pressure area has become less marked.
- **NO IOP will be conducted till 19-11-2010.**

Forecast for Sagar Kanya ship:

- Broken low/medium clouds with embedded moderate to intense thunder clouds over south Andaman Sea adjoining southeast Bay (.).

Annexure-1

Status of Observation system:

Synop ← 16-11-2010 →← 17-11-2010 →

Region	09	12	15	18	21	00	03	06
GHT/KOL	36	54	24	25	23	31	63	25
CHN	55	88	58	49	39	43	79	38
NAG/MUM	43	63	29	33	22	33	44	29

AWS

← 16-11-2010 →← 17-11-2010

UTC	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07
Nos	444	451	450	449	456	459	518	508	515	507	515	521	513	514	509	424	505	498	502	504	505	499	506	-

RSRW (12Z) 16-11-2010: - 35/36

No. of Ascents reaching 250 hPa levels:08

MISDA:-SRN, PTL, JDP, LKN, GRK, DBH, SLG, GHT, PTN, RNC, GWL, BHP, NAG, RPR, JGD, AHM, AUG, PNJ, HYD, VSK, MNG, MDS (25)

RSRW (00Z) 17-11-2010: - 35/37

No. of Ascents reaching 250 hPa levels: (27)

MISDA: (SRN, PTL, GHT, MDS, AMN)(5)

No. of PILOT Ascents

16-11-2010		17-11-2010	
12Z	18Z	00Z	06Z
32	24	33	29

Buoy Data

16-11-2010					17-11-2010		
09Z	12Z	15Z	18Z	21Z	00Z	03Z	06Z
02	02	02	02	02	02	01	-

List of stations of neighbouring countries**DATE 16-11-2010**

Country	Total No. of station	Hours of observations (UTC)							
		00	03	06	09	12	15	18	21
Sri Lanka	8	8	8	8	8	8	8	6	6
Bangladesh	11	7	7	8	6	7	7	2	5
Myanmar	10	8	8	8	8	8	1	8	1
Thailand	1	1	1	1	1	1	1	1	1

Remarks: (I) Upper air observations information not received from DDGM(UI) New Delhi.

(II) RMC KOLKATA: Please send latest observation information till 0000 UTC of date daily.

Annexure-2



India Meteorological Department

REGIONAL METEOROLOGICAL CENTRE, CHENNAI

FDP (Cyclone) FOC Chennai Report Dated 17 NOV 2010, 1400 hrs

PART – A: STATUS OF OBSERVATION SYSTEM

No of Synop data

Date→	16.11.2010							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	19	22	20	20	22	19	19	19

No. of RS/RW Ascents**00Z / 16.11.2010 : 2**

No. of Ascents reaching 250 hpa level =2

MISDA : 2**12Z /16.11.2010 : 2**

No. of Ascents reaching 250 hpa level =2

MISDA : 2**No. of PILOT Ascents:**

16.11.2010	
06Z	18Z
1	1

Status of AWS data is given in FDPNOC report.**PART – B: RMC CHENNAI INFERENCE****CHENNAI MNG INF DATED 17.11.2010.AAA**

BAY INF AURORA AAA Y'S LOPAR OVER SW BAY AND ADJ NCTN HAS MOVED FURTHER WEST WARDS AAA WX SSL BAY AND ANDMN SEA AAA

ARSEA INF AURORA AAA A TRH OF LOW PRESSURE LIES OVER S KKA ADJ E ARSEA AAA

Y'S FEEBLE TRH OF LOW PRESSURE OVER LKD AREA IS MERGED WITH THE ABOVE SYSTEM AAA A TRH OF LOW PRESSURE LIES OVE COMORIN AREA AND N/NOOD AAA

WX SSL ELSEWHERE ARSEA AAA

REGN INF AAA NE MON HAS BEEN VIG OVER TN /PDC AND SCAP,RYSM,KRL AND ACTIVE OVER SIK AAA

Y'S LOPAR OVER SW BAY AND ADJ NCTN HAS MOVED FURTHER WEST WARDS AND NOW LIES OVER S KKA AND ADJ E ARSEA AAA AN E-W SHEAR LINE RUNS ROUGHLY ALONG 12 DEG N ACORSS PENINSULA IN THE LTL AAA

Y'S FEEBLE TRH OF LOW PRESSURE OVER LKD AREA IS MERGED WITH THE ABOVE SYSTEM AAA A TRH OF LOW PRESSURE LIES OVE COMORIN AREA AND N/NOOD AAA

BLG AP AND RCH RECORDED THE LOWEST MIN TEMPERATURE OF 18 DEG C IN THE PLAINS OF THE REGION AAA

FCST AAA RA/TSH WOULD OCCUR AT MANY PLACES OVER TN /PDC ,SIK,CK,CAP, RYSM ,KRL AND AT FEW PLACES OVER TLGN,NIK AND LKD AAA

HRW AAA ISOL XX RA TO VERY XX RA WOULD OCCUR OVER TN/PDC, SIK,CK
DURING NEXT 48 HOURS AAA ISOL XX RA WOULD OCCUR OVER KRL,CAPAND
RYSM DURING THE SAME PERIOD AAA

ENDS AAA

=====

L/FCST AAA

FOR NEXT 24 HRS AAA THE SKY CONDITION WOULD BE GENERALLY CLOUDY
AAA

RA/TSH WOULD OCCUR IN SOME AREAS AAA MIN TEMP WOULD BE AROUND 24
DEG C AAA

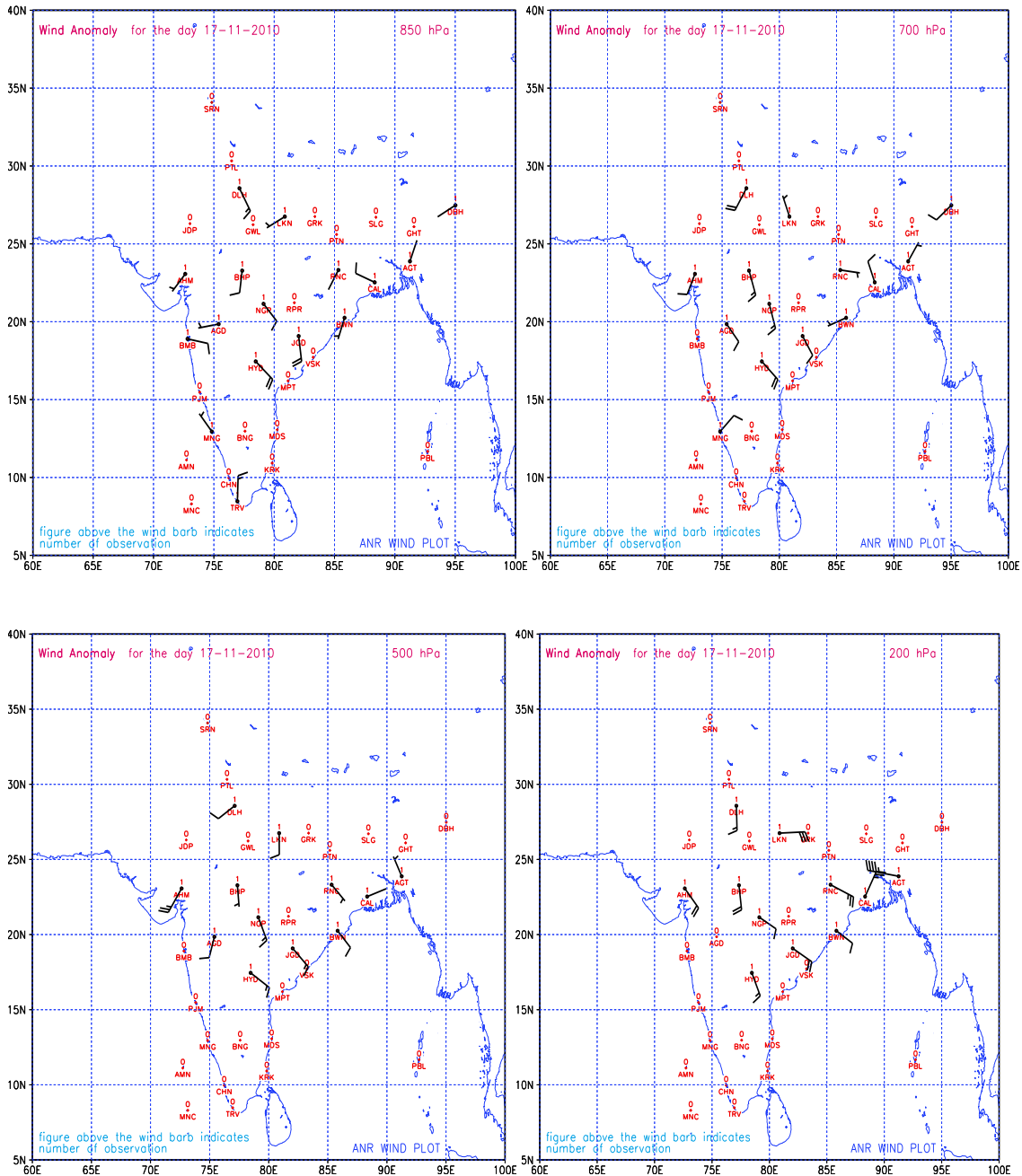
FOR NEXT 48 HRS AAA THE SKY CONDITION WOULD BE GENERALLY CLOUDY
AAA

RA/TSH WOULD OCCUR IN SOME AREAS AAA MIN TEMP WOULD BE AROUND 24
DEG C AAA

ENDS AAA

PART – C

UPPER AIR WIND ANOMALIES DATED 17-11-2010



PART – D: UPPER AIR WINDS FORECAST OVER CHENNAI

WRF – MODEL OUTPUT INDICATES SOUTHEASTERLY WINDS OF THE ORDER OF 10 TO 15 KNOTS UPTO 500 hPa OVER CHENNAI FOR NEXT 24 HOURS ENDING 00Z 18.11.2010

FDP (Cyclone) NOC Report Dated 18 November, 2010, 1500 hours
Weather Briefing:

Synoptic features:

There is no significant synoptic system over the Bay of Bengal. An upper air cyclonic circulation lies over southeast Arabian sea extending upto midtropospheric level.

Upper tropospheric ridge:

- The upper tropospheric ridge line roughly runs along 16.0°N at 200 hPa level.

Divergence:

- Upper air positive divergence ($5 \times 10^{-5} \text{ s}^{-1}$) prevails over Nicobar islands and neighbourhood

Convergence:

- Lower level positive convergence ($5-11 \times 10^{-5} \text{ s}^{-1}$) prevails over central part of south Bay of Bengal

Wind Shear:

- The wind Shear is low to moderate over central, south Bay of Bengal and Andaman sea.

Wind Shear Tendency:

- No significant change over central & south Bay of Bengal and Andaman sea

Relative Vorticity:

- Relative vorticity at 850 hPa is positive over central part south Bay of Bengal with magnitude of $2.5 \times 10^{-5} \text{ s}^{-1}$.

Sea Surface Temperature:

- SST around 28.0 - 30.0°C over Bay of Bengal.

Ocean thermal energy:

- Ocean thermal energy is mainly 100-110 KJ cm⁻² over southeast Bay of Bengal and south Andaman Sea and below 100 KJ cm⁻² elsewhere over Bay of Bengal

M.J.O. Index:

- Located over phase 8 with amplitude less than 1.0.
- Statistical forecast: - MJO moves through phase 1, 2 & 3 during next 15 days.
- Dynamical forecast:- MJO located in phase 8 with amplitude greater than 1.0 and moves through phase 6, 7 & 8 during next 15 days with amplitude less than 1.0.

Status of observational system:

Details of the status of observational system are given in Annexure 1.

Satellite

- Inference based on 170900 UTC
- Broken low/medium clouds with embedded moderate to intense convection over south bay. Scattered low/medium clouds with embedded isolated Weak to moderate convection over east central bay and Andaman sea .

(See <ftp://192.168.12.75/imd/satmet>
<http://www.imd.gov.in/section/satmet/dynamic/insat.htm>)

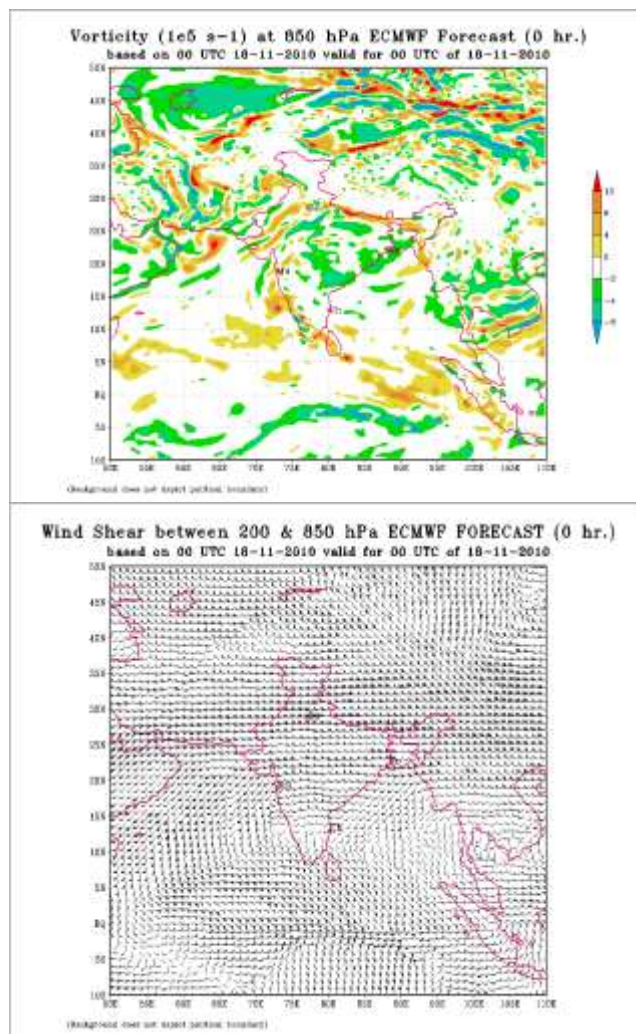
NWP Analysis

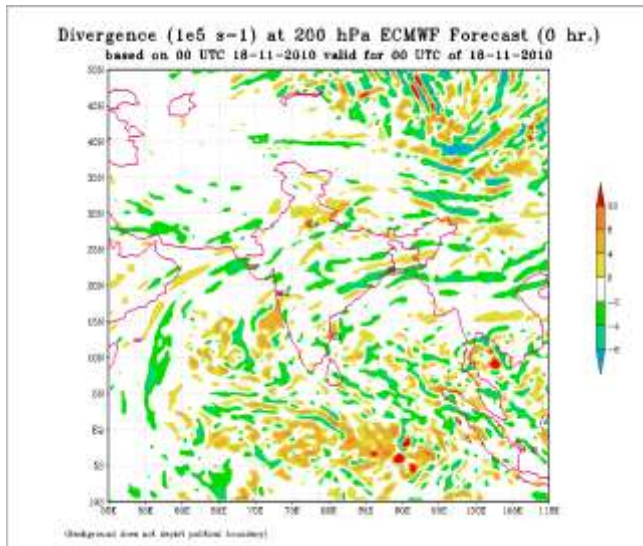
- **ECMWF** model analysis of 00UTC of today (18 Nov.2010) shows a pressure of 1010hPa extending over Bay of Bengal and Arabian Sea. The 48 hour forecast of upper air circulation indicates a low level cyclonic circulation over Maldives and Lakshadweep, Minicoy and Amini Divi Islands which likely to move into east central

Arabian Sea and cross the coast of North Gujarat around 24 November 2010 as feeble cyclonic circulation.

- **IMDGFS** N/A.
- **IMD WRF-ARW** N/A
- **UKMET model** analysis of 00 UTC of today (18 Nov. 2010) shows a weak cyclonic circulation lying in the southeast Arabian Sea. The system is likely to become a low pressure area and move in northward direction and cross the north Gujarat coast around 23 November 2010.
- **NCMRWF-GFS** model analysis of 00 UTC of today (18 Nov. 2010) shows a feeble cyclonic circulation in the southeast Arabian Sea. The forecast charts show that the circulation is likely to move northwards and likely to weaken on 23 November 2010 near to north Gujarat coast.
- **JMA-GFS** N/A

Analysis parameters Vorticity(850hPa), windshear(850hPa) and the upper level divergence(200hPa) **based on ECMWF**





Summary:

NWP models indicate that a low pressure area is likely to form in the southeast Arabian Sea and is likely to move northwards and then northeastwards. It is likely to cross the north Gujarat coast as a trough of low pressure around 23 November 2010.

NWP models do not show likely intensification of the cyclonic circulation. See

<http://www.imd.gov.in/section/nhac/dynamic/welcome.htm>)

See ftp://ftp.ncmrwf.gov.in/pub/outgoing/TC_FDP/

FOC Report

Detailed report of FOC, Chennai is given in Annexure 2.

Advisory.

▪ There is no significant synoptic system over the Bay of Bengal. No cyclogenesis is expected during next 3 days. .

▪ **NO IOP will be conducted till 21-11-2010.**

Forecast for Sagar Kanya ship:

• Broken low/medium clouds with embedded moderate to intense convection over south bay. Scattered low/medium clouds with embedded isolated Weak to moderate convection over east central bay and Andaman sea .

Annexure-1

Status of Observation system:

Synop ← 17-11-2010 →← 18-11-2010 →

Region	09	12	15	18	21	00	03	06
GHT/KOL	32	67	30	29	20	30	70	37
CHN	44	73	40	40	29	44	87	46
NAG/MUM	39	88	33	30	29	31	92	40

AWS

← 17-11-2010 → ← 18-11-2010

UTC	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07
Nos	459	458	452	455	378	328	458	451	456	456	452	453	451	445	452	455	445	455	453	467	457	455	456	-

RSRW (12Z) 16-11-2010: - 35/35

No. of Ascents reaching 250 hPa levels:08

MISDA:-SRN, PTL, JDP, LKN, GRK, DBH, SLG, GHT, PTN, RNC, AGT,GWL, BHP, NAG, RPR, JGD, AHM, AUG, PNJ, HYD, VSK, MNG, MDS , BNG, AMN AND MNC(26)

RSRW (00Z) 17-11-2010: - 35/36

No. of Ascents reaching 250 hPa levels: (26)

MISDA: (SRN, PTL, GHT, MDS, AMN)(5)

No. of PILOT Ascents

17-11-2010				18-11-2010			
12Z		18Z		00Z		06Z	
33		54		30		30	

Status of RS/RW ascents

STATION Index	STATION Name	17-11-2010		00UTC	18-11-2010		00UTC
		RS last level		Wind last level	RS last level		Wind last level
		mb	Km	mb	mb	Km	mb
42410	GHT	Misda due to GET			Misda due to GET		
42809	CAL	10	31.4	10	17	27.9	17
43333	PBL	92.3	16.9	98	213.3	12	213.3
42971	BWN	29.5	24.1	30	37	22.5	36.8
43150	VSK	10	30	nil	162	13.6	850
43185	MPT	89.6	17.2	166	94.2	16.8	96
43128	HYD	34.2	22.9	34	23.5	25.4	23.5
43279	CHN	Misda due to NI			Misda due to NI		
43346	KRK	9	31.7	892	169.3	13.3	426
43371	TRV	100	16.4	711	85.2	17.3	nil
43192	GOA	120	15.3	nil	187.9	12.9	nil
43003	MUM	296	9.7	817	92	16.9	790
43285	MNG	171	13.3	677	288	9.9	815
42647	AHM	24.7	25.1	25	18	27	18
43369	MNC	6.4	34	640	6.7	33	322
43353	KOCHI	191	12.6	nil	114	15.7	nil
42724	AGT	5.2	35.6	10	191.6	12.7	191.6

Buoy Data

17-11-2010					18-11-2010		
09Z	12Z	15Z	18Z	21Z	00Z	03Z	06Z
02	02	02	02	02	02	02	-

List of stations of neighbouring countries**DATE 17-11-2010**

Country	Total No. of station	Hours of observations (UTC)							
		00	03	06	09	12	15	18	21
Sri Lanka	8	8	8	8	8	8	8	6	6
Bangladesh	11	5	4	5	7	7	6	4	8
Myanmar	10	7	7	7	7	7	0	7	1
Thailand	1	1	1	1	1	1	1	1	1

(I)RMC KOLKATA: Please send latest observation information till 0000 UTC of date daily.

Annexure-2



India Meteorological Department

REGIONAL METEOROLOGICAL CENTRE, CHENNAI

FDP (Cyclone) FOC Chennai Report Dated 18 NOV 2010, 1400 hrs

PART – A: STATUS OF OBSERVATION SYSTEM

No of Synop data

Date→	17.11.2010							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	19	22	20	20	23	19	19	19

No. of RS/RW Ascents**00Z / 17.11.2010 : 3**

No. of Ascents reaching 250 hPa level =3

MISDA : 1**12Z /17.11.2010 : 2**

No. of Ascents reaching 250 hPa level =2

MISDA : 2

No. of PILOT Ascents:

17.11.2010	
06Z	18Z
2	1

Status of AWS data is given in FDPNOC report.

PART – B: RMC CHENNAI INFERENCE
CHENNAI MNG INF DATED 18.11.2010.AAA

BAY INF AURORA AAA A TRH OF LOW PRESSURE LIES OVER SOUTH ADMN SEA AND N/HOOD AAA WX SSL ELSEWHERE BAY AND NORTH ADMN SEA AAA

ARSEA INF AURORA AAA Y'S TRH OF LOW PRESSURE OVER LKDP AREA AND N/HOOD PERSTS AAA Y'S TRH OF LOW PRESSURE OVER COMORIN AREA AND N/HOOD IS LESS MARKED AAA WX SSL ELSEWHERE ARSEA AAA

REGN INF AAA NE MON HAS BEEN VIG OVER SCAP,SIK,RYLS AND KRL AND ACTIVE OVER TN AAA Y'S TRH OF LOW PRESSURE OVER LKDP AREA AND N/HOOD PERSTS AAA

AN E-W SHEAR LINE RUNS ACROSS OVER EXTREME SOUTH PENINSULA AND ADJ SRILANKA WITH AN EMBEDDED CYCIR OVER SRILANKA AND N/HOOD IN THE LTL AAA

CHAMRAJNAGAR RECORDED THE LOWEST MIN TEMPERATURE OF 18 DEG C IN THE PLAINS OF THE REGION AAA

FCST AAA RA/TSH WOULD OCCUR AT MANY PLACES OVER KRL,STN,CK AND SIK AND AT A FEW PLACES OVER NTN/PDC.CAP,RYLS AND LKD AAA ISOL RA/TSH MAY OCCUR OVER TLGN AND NIK AAA

HRW AAA ISOL XX RA WOULD OCCUR OVER KRL,STN AND CK DURING NEXT 48 HOURS AAA

ENDS AAA

=====

L/FCST AAA

FOR NEXT 24 HRS AAA THE SKY CONDITION WOULD BE PARTLY CLOUDY AAA RA/TSH WOULD OCCUR IN SOME AREAS AAA MIN TEMP WOULD BE AROUND 24 DEG C AAA

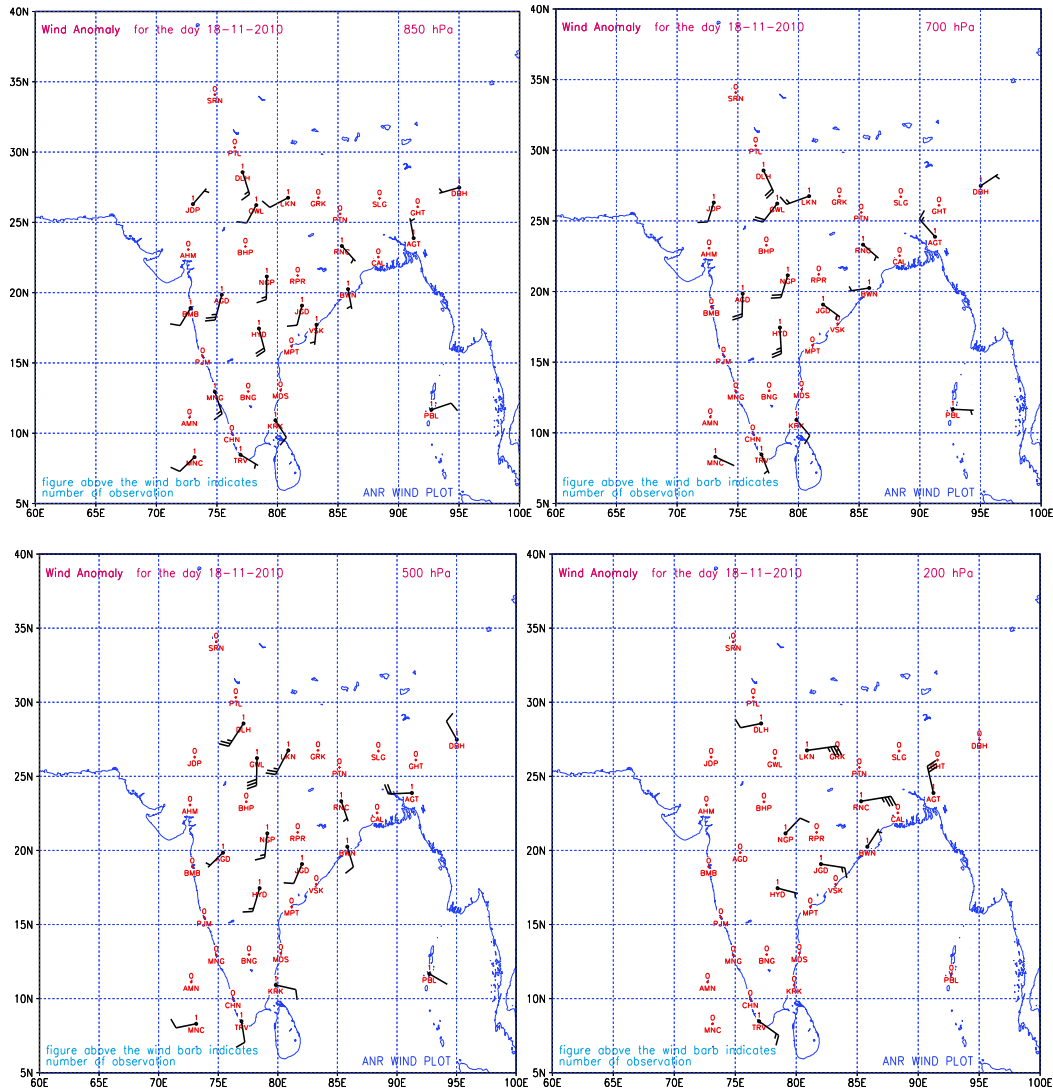
FOR NEXT 48 HRS AAA THE SKY CONDITION WOULD BE PARTLY CLOUDY AAA RA/TSH WOULD OCCUR IN SOME AREAS AAA MIN TEMP WOULD BE AROUND 25 DEG C AAA

ENDS AAA

=====

PART – C

UPPER AIR WIND ANOMALIES DATED 18-11-2010



PART – D: UPPER AIR WINDS FORECAST OVER CHENNAI

WRF – MODEL OUTPUT INDICATES SOUTHEASTERLY TO EASTERLY WINDS OF THE ORDER OF 5 TO 10 KNOTS UPTO 500 hPa OVER CHENNAI FOR NEXT 24 HOURS ENDING 00Z 19.11.2010

FDP (Cyclone) NOC Report Dated 19 November, 2010, 1500 hours
Weather Briefing:

Synoptic features:

There is no significant synoptic system over the Bay of Bengal. An upper air cyclonic circulation lies over eastcentral Arabian Sea and neighbourhood extending upto mid-tropospheric level.

Upper tropospheric ridge:

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

Divergence:

- Upper air positive divergence ($5-10 \times 10^{-5} \text{ s}^{-1}$) prevails over south Bay of Bengal and Andaman Sea.

Convergence:

- Lower level positive convergence ($5 \times 10^{-5} \text{ s}^{-1}$) prevails over southwest Bay of Bengal.

Wind Shear:

- Wind Shear is moderate (5-10 knots) over central, west & south Bay of Bengal and Andaman sea.

Wind Shear Tendency:

- Decreasing (-5 to 10 knots) over southwest Bay of Bengal.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive over southwest Bay of Bengal with magnitude of $2.5 \times 10^{-5} \text{ s}^{-1}$.

Sea Surface Temperature:

- SST around 28.0 - 30.0°C over Bay of Bengal.

Ocean thermal energy:

- Ocean thermal energy is mainly 100-110 KJ cm⁻² over southeast Bay of Bengal and south Andaman Sea and below 100 KJ cm⁻² elsewhere over Bay of Bengal

M.J.O. Index:

- Located over phase 7 with amplitude less than 1.0.
- Statistical forecast: - MJO moves through phase 1 & 2 during next 15 days.
- Dynamical forecast:- MJO located in phase 7 with amplitude less than 1.0 and moves through phase 8 & 1 during next 15 days.

Status of observational system:

Details of the status of observational system are given in Annexure 1.

Satellite

Satellite picture of 190900 UTC

Low/medium clouds at many places with embedded moderate to intense thunder clouds at few over south Bay westcentral Bay south of lat 15.5 N extreme north parts of northeast Bay and Andaman Sea south of lat 12.5N (.)

(See <ftp://192.168.12.75/imd/satmet>

<http://www.imd.gov.in/section/satmet/dynamic/insat.htm>)

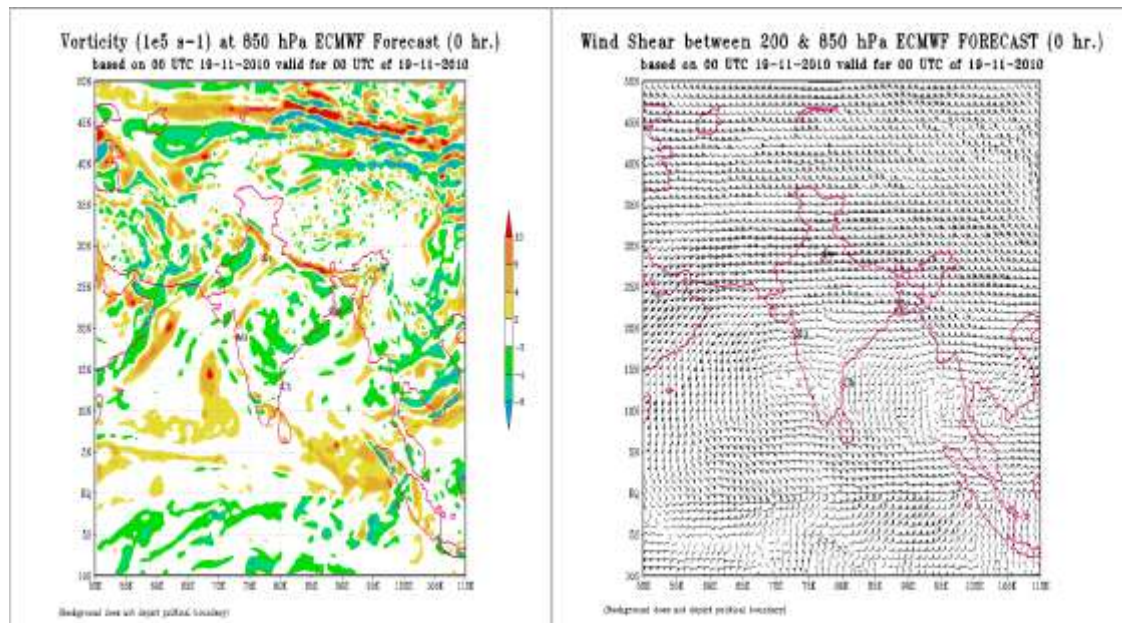
NWP

- **ECMWF** model analysis of 00UTC of today (19 Nov.2010) shows a pressure of 1010hPa extending over Bay of Bengal and Arabian Sea. The 24 hour forecast shows a low pressure system is likely to develop in the southeast Arabian sea and move in

northeast direction towards north Gujarat coast. The forecast fields do not show intensification of the system.

- **IMDGFS** model analysis of 00UTC of today (19 Nov.2010) shows a pressure of 1010hPa extending over Bay of Bengal and Arabian Sea. A cyclonic circulation lies off the Sri Lanka coast and another lies over the southeast Arabian Sea. The Forecast fields shows, the associated cyclonic circulation in the Arabian sea is likely to move in northeast direction towards Pakistan coast.
- **IMD WRF-ARW** model analysis of 00UTC of today (19 Nov.2010) shows a pressure of 1010hPa extending over Bay of Bengal and Arabian Sea. The 24 hours forecast field indicates formation of a low pressure in the southeast Arabian Sea and its associated cyclonic circulation. The system is likely to move northeastwards and not likely to intensify
- **UKMET model** analysis of 00 UTC of today (19 Nov. 2010) shows a weak cyclonic circulation lying in the southeast Arabian Sea. The system is likely to become a low pressure area and move in northward direction and cross the north Gujarat coast around 24 November 2010.
- **NCMRWF-GFS** model analysis of 00 UTC of today (19 Nov. 2010) shows a feeble cyclonic circulation in the southeast Arabian Sea. The forecast charts show that the circulation is likely to move northwards and likely to weaken on 24November 2010 near to north Gujarat coast.
- **JMA-GFS**

Analysis of Cyclogenesis Parameter



(See <http://www.imd.gov.in/section/nhac/dynamic/welcome.htm>)

See ftp://ftp.ncmrwf.gov.in/pub/outgoing/TC_FDP/

Summary:

NWP models indicate that a low pressure area is likely to form in the southeast Arabian Sea on 20 November 2010 and is likely to move northeastwards. It is likely to weaken

near north Gujarat coast as a trough of low pressure around 24 November 2010. NWP models do not show likely intensification of the cyclonic circulation.

See <http://www.imd.gov.in/section/nhac/dynamic/welcome.htm>)

See ftp://ftp.ncmrwf.gov.in/pub/outgoing/TC_FDP/

FOC Report

Detailed report of FOC, Chennai is given in Annexure 2.

Advisory.

▪ There is no significant synoptic system over the Bay of Bengal. No cyclogenesis is expected during next 48 hours. .

▪ **NO IOP will be conducted till 21-11-2010.**

Forecast for Sagar Kanya ship:

• Low/medium clouds at many places with embedded moderate to intense thunder clouds at few over south Bay westcentral Bay south of lat 15.5 N extreme north parts of northeast Bay and Andaman Sea south of lat 12.5N.

Annexure-1

Status of Observation system:

Synop ← 18-11-2010 →← 19-11-2010 →

Region	09	12	15	18	21	00	03	06
GHT/KOL	37	82	25	25	24	29	66	35
CHN	50	71	39	39	38	41	69	46
NAG/MUM	30	74	18	18	17	30	68	34

AWS

← 18-11-2010														→← 19-11-2010										
UTC	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07
Nos	515	510	460	513	519	504	498	498	336	90	503	508	371	427	425	502	511	514	522	537	523	518	518	522

RSRW (12Z) 18-11-2010: - 35/35

No. of Ascents reaching 250 hPa levels:08

MISDA:-SRN, PTL, JDP, LKN, GRK, DBH, SLG, GHT, PTN, RNC, AGT, GWL, BHP, NAG, RPR, JGD, BOM, AUG, PNJ, HYD, VSK, MNG, MDS , BNG, AMN AND MNC(26)

RSRW (00Z) 19-11-2010: - 35/37

No. of Ascents reaching 250 hPa levels: (25)

MISDA: (SRN, PTL, GHT, BWN, RPR, AUG, PNG, MDS, AMN)(5)

No. of PILOT Ascents

18-11-2010		19-11-2010	
12Z	18Z	00Z	06Z
32	30	30	32

Buoy Data

18-11-2010					19-11-2010		
09Z	12Z	15Z	18Z	21Z	00Z	03Z	06Z
01	03	02	01	01	01	-	-

Status of RS/RW ascents

		18-11-2010 00UTC			19-11-2010 00UTC		
		RS last level		Wind last level	RS last level		Wind last level
STATION Index	STATION Name	mb	Km	mb	mb	Km	mb
42410	GHT	Misda due to GET			Misda due to GET		
42809	CAL	17	27.9	17	15	28.6	15
43333	PBL	213.3	12	213.3	43.5	21.4	43.5
42971	BWN	37	22.5	36.8	Misda due to GET		
43150	VSK	162	13.6	850	171	13.3	228
43185	MPT	94.2	16.8	96	32	23.6	113
43128	HYD	23.5	25.4	23.5	3.5	38.2	3.5
43279	CHN	Misda due to NI			Misda due to NI		
43346	KRK	169.3	13.3	426	18.9	26.9	601
43371	TRV	85.2	17.3	nil	95	16.7	nil
43192	GOA	187.9	12.9	nil	Misda due to GET		
43003	MUM	92	16.9	790	395	7.6	872
43285	MNG	288	9.9	815	94	16.6	783
42647	AHM	18	27	18	109	15.9	nil
43369	MNC	6.7	33	322	109	16.3	647
43353	KOCHI	114	15.7	nil	365	8.2	nil
42724	AGT	191.6	12.7	191.6	19.3	26.7	21.5

List of stations of neighbouring countries**DATE 18-11-2010**

Country	Total No. of station	Hours of observations (UTC)							
		00	03	06	09	12	15	18	21
Sri Lanka	8	8	8	8	8	8	8	8	8
Bangladesh	11	4	4	6	6	6	4	1	4
Myanmar	10	7	7	7	7	7	1	7	1
Thailand	1	1	1	1	1	1	1	1	1

(I)RMC KOLKATA: Please send latest observation information till 0000 UTC of date daily.



Annexure-2

India Meteorological Department

REGIONAL METEOROLOGICAL CENTRE, CHENNAI

FDP (Cyclone) FOC Chennai Report Dated 19 NOV 2010, 1400 hrs

PART – A: STATUS OF OBSERVATION SYSTEM

No of Synop data

Date→	18.11.2010							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	19	23	20	20	23	19	19	19

No. of RS/RW Ascents

00Z / 18.11.2010 : 3

No. of Ascents reaching 250 hPa level =3

MISDA : 1

12Z /18.11.2010 : 2

No. of Ascents reaching 250 hPa level =2

MISDA : 2

No. of PILOT Ascents:

18.11.2010	
06Z	18Z
2	1

Status of AWS data is given in FDPNOC report.

PART – B: RMC CHENNAI INFERENCE

CHENNAI MNG INF DATED 19.11.2010.AAA

BAY INF AURORA AAA A TRH OF LOW PRESSURE LIES OVER SOUTERN PARTS OF SW BAY OFF SRILANKA COT AAA Y'DAYS TRH OF LOW PRESSURE OVER S

ADMN SEA AND NHOOD NOW LIES OVER S ADMN SEA AND ADJ SE BAY AAA WX
SSL ELSEWHERE BAY AND NORTH ADMN SEA AAA

ARSEA INF AURORA AAA Y'S TRH OF LOW PRESSURE OVER LKDP AREA AND
N/HOOD PERSTS AAA WX SSL ELSEWHERE ARSEA AAA

REGN INF AAA NE MON HAS BEEN ACTIVE OVER TN AND KRL A TRH OF LOW
PRESSURE LIES OVER SOUTERN PARTS OF SW BAY OFF SRILANKA COT
AAAY'S TRH OF LOW PRESSURE OVER LKDP AREA AND N/HOOD PERSTS AAA
Y'DAYS EW SHEAR LINE RUNNING ACROSS EXT SOUTH PENINSULA AND
SRILANKA WITH AN EMBEDDED CYCIR OVER SRILANKA AND NHOOD IN THE LTL
PERSISTS AAA

MANDYA RECORDED THE LOWEST MIN TEMPERATURE OF 18 DEG C IN THE
PLAINS OF THE REGION AAA

FCST AAA RA/TSH WOULD OCCUR AT MANY PLACES OVER TN /PDC AND KER
AND AT A FEW PLACES OVER CK, SIK AND LKD AAA ISOL RA/TSH MAY OCCUR
OVER AP AND NIK AAA

HRW AAA ISOL XX RA WOULD OCCUR OVER TN / PDC DURING NEXT 48 HOURS
AAA

ENDS AAA

=====

L/FCST AAA

FOR NEXT 24 HRS AAA THE SKY CONDITION MAY BE PARTLY CLOUDY AAA

RA/TSH WOULD OCCUR IN SOME AREAS AAA MIN TEMP WOULD BE AROUND 24
DEG C AAA

FOR NEXT 48 HRS AAA THE SKY CONDITION MAY BE PARTLY CLOUDY AAA

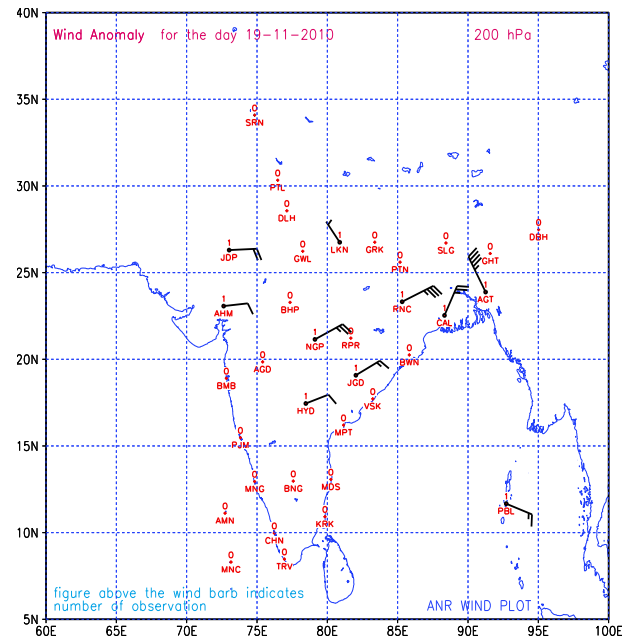
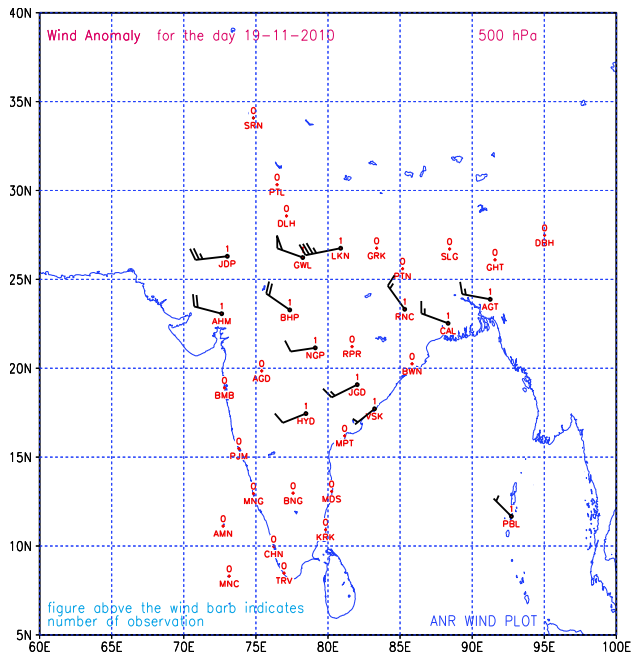
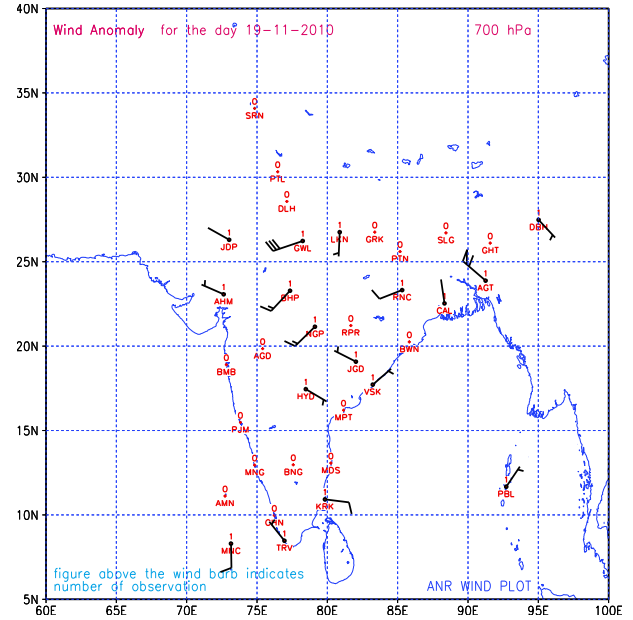
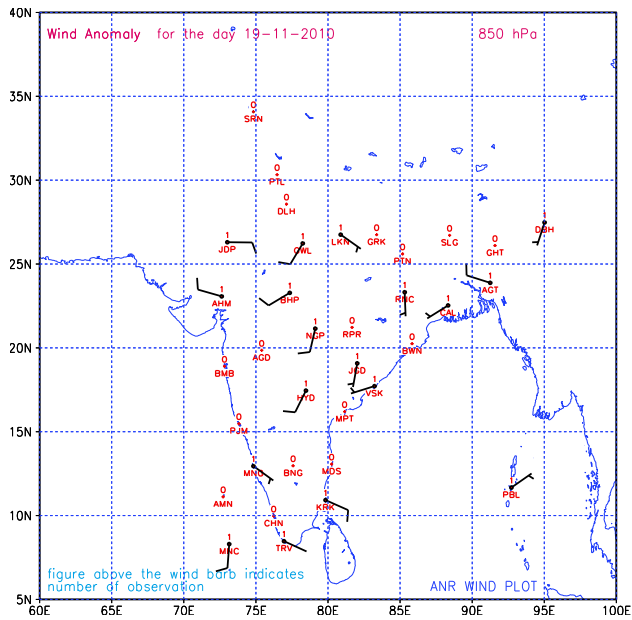
RA/TSH WOULD OCCUR IN SOME AREAS AAA MIN TEMP WOULD BE AROUND 24
DEG C AAA

ENDS AAA

=====

PART – C

UPPER AIR WIND ANOMALIES DATED 19-11-2010



PART – D: UPPER AIR WINDS FORECAST OVER CHENNAI

WRF – MODEL OUTPUT INDICATES NORTHERLY WINDS OF THE ORDER OF 5 KNOTS UPTO 900 hPa AND EASTERLY TO NORTHEASTERLY WINDS OF THE ORDER OF 5 TO 10 KNOTS FROM 900 TO 500 hPa OVER CHENNAI FOR NEXT 24 HOURS ENDING 00Z 20.11.2010



Regional Meteorological Centre, Kolkata
ACWC Kolkata

FDP Cyclone-2010 (Status of daily observation)

No of Synop data

Date→	18.11.10							
UTC→	00	03	06	09	12	15	18	21
Coasts of WB & ORS	10	11	10	10	11	10	10	10

No. of RS/RW Ascents

00Z / 18.11.2010 : 3

No. of Ascents reaching 250 hpa level =3

MISDA : 0

12Z /18.11.2010 : 3

No. of Ascents reaching 250 hpa level =3

MISDA : 0

No. of PILOT Ascents:

18.11.2010			
00Z	06Z	12Z	18Z
2	3	2	3

FDP (Cyclone) NOC Report Dated 20 November, 2010, 1500 hours
Weather Briefing:

Synoptic features:

There is no significant synoptic system over the Bay of Bengal. An upper air cyclonic circulation lies over eastcentral Arabian Sea and neighbourhood extending upto mid-tropospheric level.

Upper tropospheric ridge:

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

Divergence:

- Upper air positive divergence ($5-10 \times 10^{-5} \text{ s}^{-1}$) prevails over south Bay of Bengal and Andaman Sea.

Convergence:

- Lower level positive convergence ($5 \times 10^{-5} \text{ s}^{-1}$) prevails over southwest Bay of Bengal.

Wind Shear:

- Wind Shear is moderate (5-10 knots) over central, west & south Bay of Bengal and Andaman sea.

Wind Shear Tendency:

- Decreasing (-5 to 10 knots) over southwest Bay of Bengal.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive over southwest Bay of Bengal with magnitude of $2.5 \times 10^{-5} \text{ s}^{-1}$.

Sea Surface Temperature:

- SST around 28.0 - 30.0°C over Bay of Bengal.

Ocean thermal energy:

- Ocean thermal energy is mainly 100-110 KJ cm⁻² over southeast Bay of Bengal and south Andaman Sea and below 100 KJ cm⁻² elsewhere over Bay of Bengal

M.J.O. Index:

- Located over phase 7 with amplitude less than 1.0.
- Statistical forecast: - MJO moves through phase 1 & 2 during next 15 days.
- Dynamical forecast:- MJO located in phase 7 with amplitude less than 1.0 and moves through phase 8 & 1 during next 15 days.

Status of observational system:

Details of the status of observational system are given in Annexure 1.

Satellite

Satellite picture of 190900 UTC

Low/medium clouds at many places with embedded moderate to intense thunder clouds at few over south Bay westcentral Bay south of lat 15.5 N extreme north parts of northeast Bay and Andaman Sea south of lat 12.5N (.)

(See <ftp://192.168.12.75/imd/satmet>

<http://www.imd.gov.in/section/satmet/dynamic/insat.htm>)

NWP

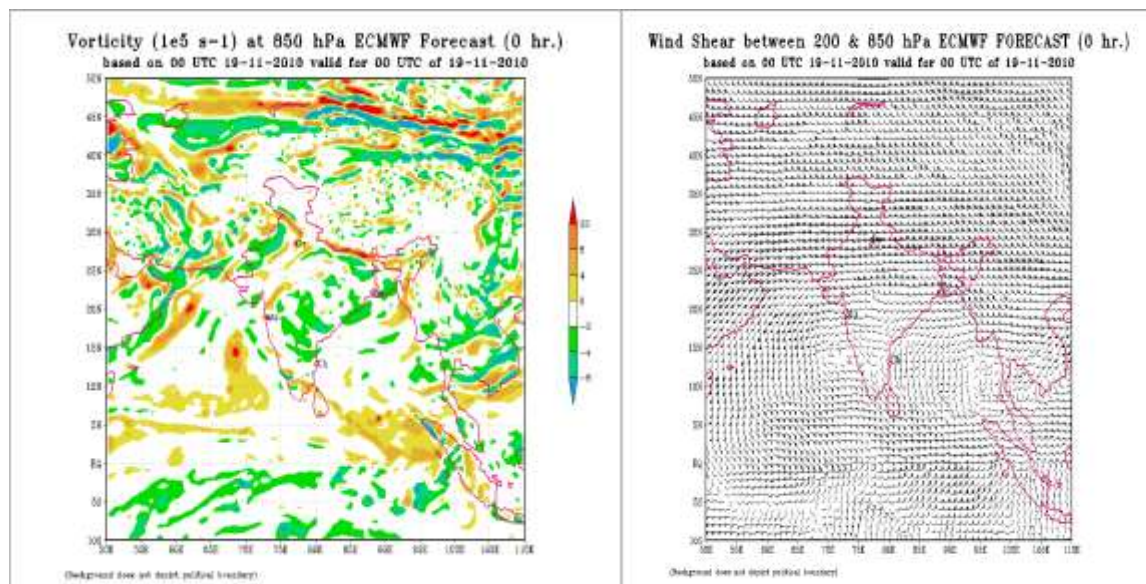
- **ECMWF** model analysis of 00UTC of today (19 Nov.2010) shows a pressure of 1010hPa extending over Bay of Bengal and Arabian Sea. The 24 hour forecast shows a low pressure system is likely to develop in the southeast Arabian sea and move in

northeast direction towards north Gujarat coast. The forecast fields do not show intensification of the system.

- **IMDGFS** model analysis of 00UTC of today (19 Nov.2010) shows a pressure of 1010hPa extending over Bay of Bengal and Arabian Sea. A cyclonic circulation lies off the Sri Lanka coast and another lies over the southeast Arabian Sea. The Forecast fields shows, the associated cyclonic circulation in the Arabian sea is likely to move in northeast direction towards Pakistan coast.
- **IMD WRF-ARW** model analysis of 00UTC of today (19 Nov.2010) shows a pressure of 1010hPa extending over Bay of Bengal and Arabian Sea. The 24 hours forecast field indicates formation of a low pressure in the southeast Arabian Sea and its associated cyclonic circulation. The system is likely to move northeastwards and not likely to intensify
- **UKMET model** analysis of 00 UTC of today (19 Nov. 2010) shows a weak cyclonic circulation lying in the southeast Arabian Sea. The system is likely to become a low pressure area and move in northward direction and cross the north Gujarat coast around 24 November 2010.
- **NCMRWF-GFS** model analysis of 00 UTC of today (19 Nov. 2010) shows a feeble cyclonic circulation in the southeast Arabian Sea. The forecast charts show that the circulation is likely to move northwards and likely to weaken on 24November 2010 near to north Gujarat coast.

• **JMA-GFS**

Analysis of cyclogenesis parameter



(See <http://www.imd.gov.in/section/nhac/dynamic/welcome.htm>)

See ftp://ftp.ncmrwf.gov.in/pub/outgoing/TC_FDP/

Summary:

NWP models indicate that a low pressure area is likely to form in the southeast Arabian Sea on 20 November 2010 and is likely to move northeastwards. It is likely to weaken near north Gujarat coast as a trough of low pressure around 24 November 2010. NWP models do not show likely intensification of the cyclonic circulation.

See <http://www.imd.gov.in/section/nhac/dynamic/welcome.htm>)

See ftp://ftp.ncmrwf.gov.in/pub/outgoing/TC_FDP/

FOC Report

Detailed report of FOC, Chennai is given in Annexure 2.

Advisory.

▪ There is no significant synoptic system over the Bay of Bengal. No cyclogenesis is expected during next 48 hours. .

▪ **NO IOP will be conducted till 21-11-2010.**

Forecast for Sagar Kanya ship:

• Low/medium clouds at many places with embedded moderate to intense thunder clouds at few over south Bay westcentral Bay south of lat 15.5 N extreme north parts of northeast Bay and Andaman Sea south of lat 12.5N.

Annexure-1

Status of Observation system:

Synop ← 18-11-2010 →← 19-11-2010 →

Region	09	12	15	18	21	00	03	06
GHT/KOL	37	82	25	25	24	29	66	35
CHN	50	71	39	39	38	41	69	46
NAG/MUM	30	74	18	18	17	30	68	34

AWS

← 18-11-2010 →← 19-11-2010

UTC	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07
Nos	515	510	460	513	519	504	498	498	336	90	503	508	371	427	425	502	511	514	522	537	523	518	518	522

RSRW (12Z) 18-11-2010: - 35/35

No. of Ascents reaching 250 hPa levels:08

MISDA:-SRN, PTL, JDP, LKN, GRK, DBH, SLG, GHT, PTN, RNC, AGT, GWL, BHP, NAG, RPR, JGD, BOM, AUG, PNJ, HYD, VSK, MNG, MDS , BNG, AMN AND MNC(26)

RSRW (00Z) 19-11-2010: - 35/37

No. of Ascents reaching 250 hPa levels: (25)

MISDA: (SRN, PTL, GHT, BWN, RPR, AUG, PNG, MDS, AMN)(5)

No. of PILOT Ascents

18-11-2010					19-11-2010			
12Z		18Z			00Z		06Z	
32		30			30		32	

Buoy Data

18-11-2010					19-11-2010		
09Z	12Z	15Z	18Z	21Z	00Z	03Z	06Z
01	03	02	01	01	01	-	-

Status of RS/RW ascents

		18-11-2010 00UTC			19-11-2010 00UTC		
		RS last level		Wind last level	RS last level		Wind last level
STATION Index	STATION Name	mb	Km	mb	mb	Km	mb
42410	GHT	Misda due to GET			Misda due to GET		
42809	CAL	17	27.9	17	15	28.6	15
43333	PBL	213.3	12	213.3	43.5	21.4	43.5
42971	BWN	37	22.5	36.8	Misda due to GET		
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43185	MPT	94.2	16.8	96	32	23.6	113
43128	HYD	23.5	25.4	23.5	3.5	38.2	3.5
43279	CHN	Misda due to NI			Misda due to NI		
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43285	MNG	288	9.9	815	94	16.6	783
42647	AHM	18	27	18	109	15.9	nil
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43353	KOCHI	114	15.7	nil	365	8.2	nil
42724	AGT	191.6	12.7	191.6	19.3	26.7	21.5

List of stations of neighbouring countries
DATE 19-11-2010

Country	Total No. of station	Hours of observations (UTC)							
		00	03	06	09	12	15	18	21
Sri Lanka	8	8	8	8	8	8	8	6	6
Bangladesh	11	5	6	6	6	6	7	2	8
Myanmar	10	8	8	8	8	8	1	8	1
Thailand	1	1	1	1	1	1	1	1	1

(I)RMC KOLKATA: Please send latest observation information till 0000 UTC of date daily.



Annexure-2

India Meteorological Department

REGIONAL METEOROLOGICAL CENTRE, CHENNAI

FDP (Cyclone) FOC Chennai Report Dated 19 NOV 2010, 1400 hrs

PART – A: STATUS OF OBSERVATION SYSTEM

No of Synop data

Date→	18.11.2010							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	19	23	20	20	23	19	19	19

No. of RS/RW Ascents

00Z / 18.11.2010 : 3

No. of Ascents reaching 250 hPa level =3

MISDA : 1

12Z /18.11.2010 : 2

No. of Ascents reaching 250 hPa level =2

MISDA : 2

No. of PILOT Ascents:

18.11.2010	
06Z	18Z
2	1

Status of AWS data is given in FDPNOC report.

PART – B: RMC CHENNAI INFERENCE

CHENNAI MNG INF DATED 19.11.2010

BAY INF AURORA AAA A TRH OF LOW PRESSURE LIES OVER SOUTERN PARTS OF SW BAY OFF SRILANKA COT AAA Y'DAYS TRH OF LOW PRESSURE OVER S

ADMN SEA AND NHOOD NOW LIES OVER S ADMN SEA AND ADJ SE BAY AAA WX
SSL ELSEWHERE BAY AND NORTH ADMN SEA AAA

ARSEA INF AURORA AAA Y'S TRH OF LOW PRESSURE OVER LKDP AREA AND
N/HOOD PERSTS AAA WX SSL ELSEWHERE ARSEA AAA

REGN INF AAA NE MON HAS BEEN ACTIVE OVER TN AND KRL A TRH OF LOW
PRESSURE LIES OVER SOUTERN PARTS OF SW BAY OFF SRILANKA COT
AAAY'S TRH OF LOW PRESSURE OVER LKDP AREA AND N/HOOD PERSTS AAA
Y'DAYS EW SHEAR LINE RUNNING ACROSS EXT SOUTH PENINSULA AND
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PERSISTS AAA

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OVER AP AND NIK AAA

HRW AAA ISOL XX RA WOULD OCCUR OVER TN / PDC DURING NEXT 48 HOURS
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ENDS AAA

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L/FCST AAA

FOR NEXT 24 HRS AAA THE SKY CONDITION MAY BE PARTLY CLOUDY AAA

RA/TSH WOULD OCCUR IN SOME AREAS AAA MIN TEMP WOULD BE AROUND 24
DEG C AAA

FOR NEXT 48 HRS AAA THE SKY CONDITION MAY BE PARTLY CLOUDY AAA

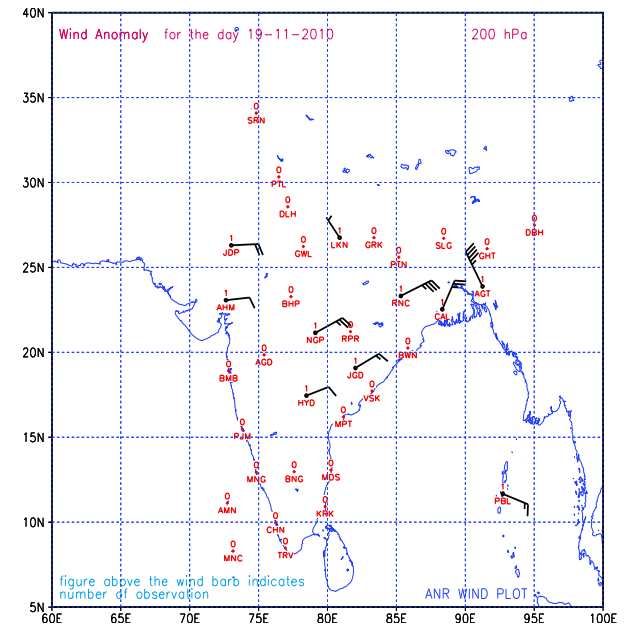
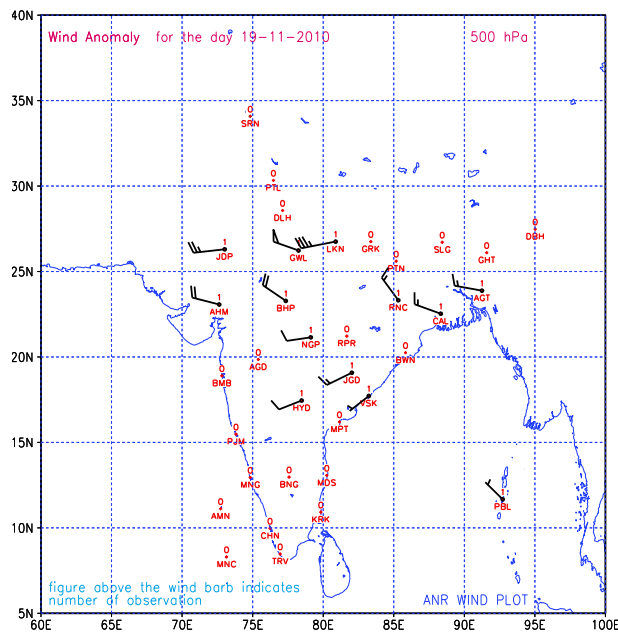
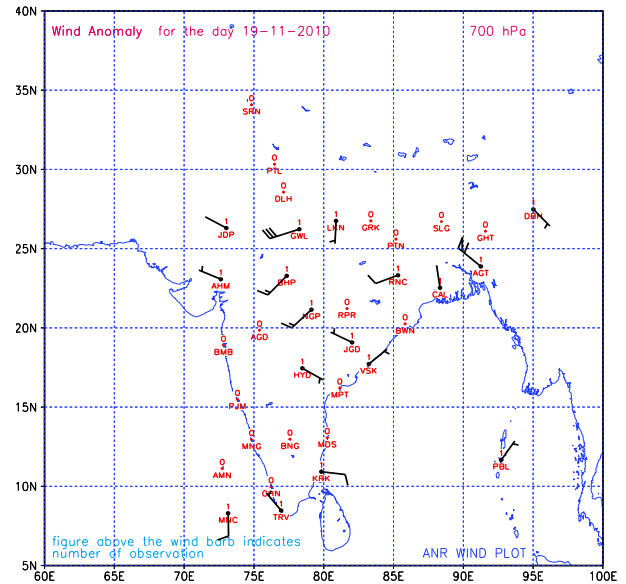
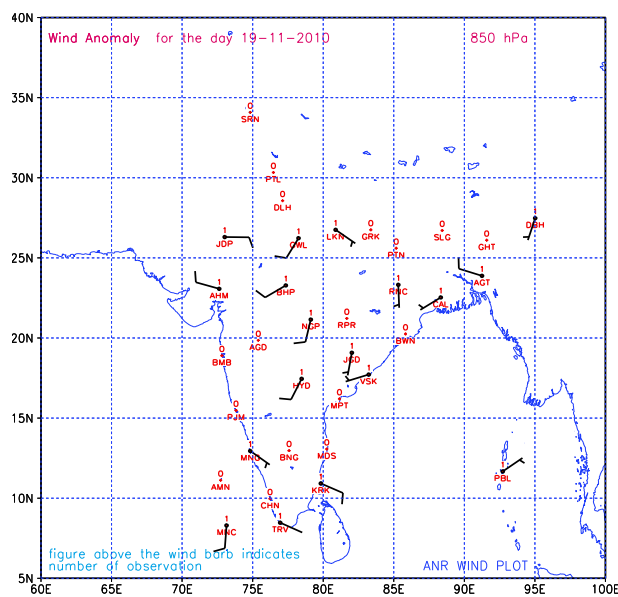
RA/TSH WOULD OCCUR IN SOME AREAS AAA MIN TEMP WOULD BE AROUND 24
DEG C AAA

ENDS AAA

=====

PART – C

UPPER AIR WIND ANOMALIES DATED 19-11-2010



PART – D: UPPER AIR WINDS FORECAST OVER CHENNAI

WRF – MODEL OUTPUT INDICATES NORTHERLY WINDS OF THE ORDER OF 5 KNOTS UPTO 900 hPa AND EASTERLY TO NORTHEASTERLY WINDS OF THE ORDER OF 5 TO 10 KNOTS FROM 900 TO 500 hPa OVER CHENNAI FOR NEXT 24 HOURS ENDING 00Z 20.11.2010



Regional Meteorological Centre, Kolkata
ACWC Kolkata

FDP Cyclone-2010 (Status of daily observation)

No of Synop data

Date→	18.11.10							
UTC→	00	03	06	09	12	15	18	21
Coasts of WB & ORS	10	11	10	10	11	10	10	10

No. of RS/RW Ascents

00Z / 18.11.2010 : 3

No. of Ascents reaching 250 hpa level =3

MISDA : 0

12Z /18.11.2010 : 3

No. of Ascents reaching 250 hpa level =3

MISDA : 0

No. of PILOT Ascents:

18.11.2010			
00Z	06Z	12Z	18Z
2	3	2	3

FDP (Cyclone) NOC Report Dated 21 November, 2010, 1500 hours
Weather Briefing:

Synoptic features:

Yesterday's low pressure area over central Arabian Sea now lies over eastcentral Arabian sea and adjoining area of northeast Arabian sea with associated upper air cyclonic circulation extending upto 3.1 km above mean sea level with trough aloft.

Upper tropospheric ridge:

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

Divergence:

- Upper air positive divergence ($5-10 \times 10^{-5} \text{ s}^{-1}$) prevails over Andaman Sea. and ($10-20 \times 10^{-5} \text{ s}^{-1}$) over eastcentral Arabian sea.

Convergence:

- Lower level positive convergence ($5-10 \times 10^{-5} \text{ s}^{-1}$) prevails over south Bay of Bengal. and ($5-10 \times 10^{-5} \text{ s}^{-1}$) over eastcentral Arabian sea.

Wind Shear:

- Wind Shear is weak (5-10 knots) over Bay of Bengal and eastcentral Arabian sea.

Wind Shear Tendency:

- Decreasing (-5 to -10 knots) over south & central Bay of Bengal and increasing (5 to 10 knots) over central Arabian sea.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive over south Bay of Bengal with magnitude of $2.5 \times 10^{-5} \text{ s}^{-1}$. and the same is $5.0 \times 10^{-5} \text{ s}^{-1}$ over eastcentral Arabian sea.

Sea Surface Temperature:

- SST around 28.0 - 30.0°C over Bay of Bengal and 30.0-31.0°C over central Arabian sea .

Ocean thermal energy:

- Ocean thermal energy is mainly 100-110 KJ cm⁻² over southeast Bay of Bengal and south Andaman Sea and below 100 KJ cm⁻² elsewhere over Bay of Bengal over central Arabian sea

M.J.O. Index:

- Located over phase 7 with amplitude less than 1.0.
- Statistical forecast: - MJO moves through phase 8, 1 & 2 during next 15 days.
- Dynamical forecast:- MJO located in phase 7 with amplitude less than 1.0 and moves through phase 7 & 8 during next 15 days.
- Synoptic and environmental conditions suggest that the low pressure over eastcentral Arabian sea is not likely to intensify during next 24 hours.

Status of observational system:

Details of the status of observational system are given in Annexure 1.

Satellite

Satellite picture of 210900 UTC

Bay of Bengal & Andaman Sea: -

Broken low/med clouds with embedded isolated moderate to intense convection over Bay south of lat 12.0 N and south Andaman Sea adjoining northwest Andaman Sea (.)

ARABIAN SEA: -

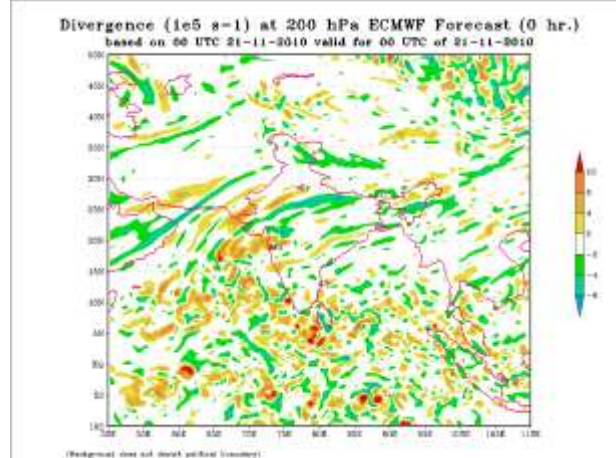
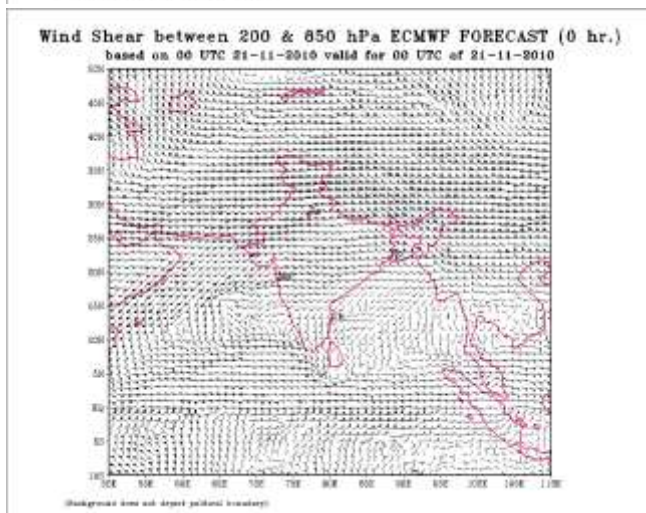
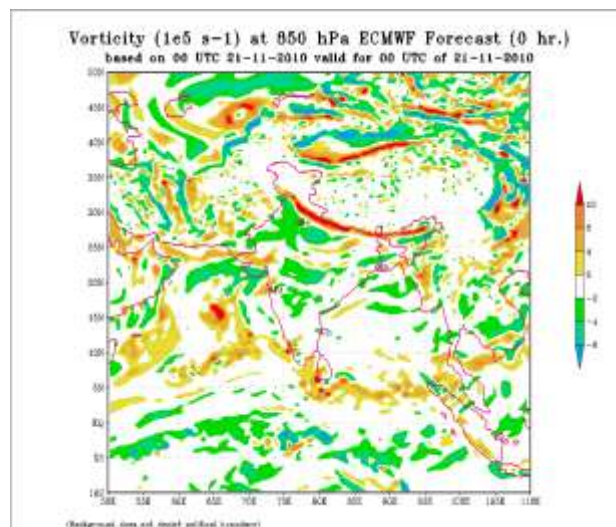
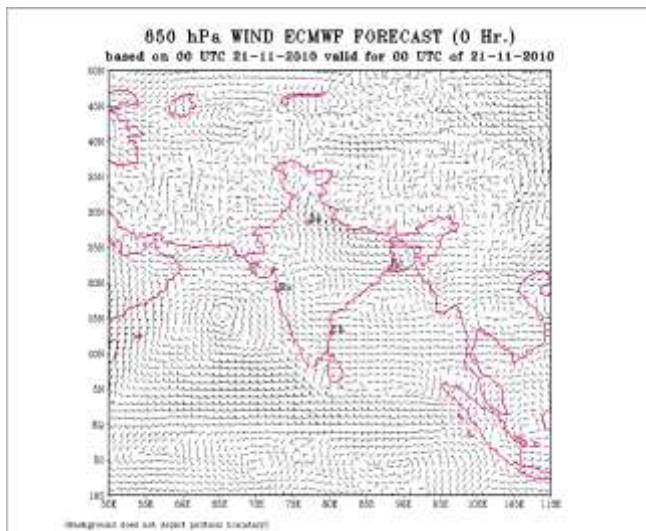
Broken low/med clouds with embedded moderate to intense convection over rest Arabian sea south of lat 14.5 N east of long 60.0.

(See <ftp://192.168.12.75/imd/satmet>

<http://www.imd.gov.in/section/satmet/dynamic/insat.htm>)

NWP Analysis

- **ECMWF** model of 00UTC of today (21Nov 2010) shows a well marked low pressure area over east-central Arabian sea and the forecast shows this system is moving in a north-east-north direction and the 72-hr forecast indicates it weakens into a trough of low pressure (on 24th Nov., 2010 over Gujarat coast). Another trough over south-west bay of Bengal is moving west-north-westward and intensifies into a well marked low pressure area over Tamil Nadu coast by 27th Nov.,2010 and it further moves westwards to south-east Arabian sea.
- **IMDGFS** model forecast of 00UTC of today (21 Nov 2010) shows the low pressure over east-central Arabian sea and is moving in north-east-north direction to Gujarat coast and becoming less intense. Another trough on easterly wave is lying over southwest Bay of Bengal and is moving west northwestward and will become a well marked low pressure over southwest Bay of Bengal, Comorin and Maldives region by 24th Nov. 2010. The 168-hr forecast shows the system will move in a northwest direction and will become a depression over east central Arabian sea by 28th Nov.
- **WRF-ARW** model analysis of 00UTC of today (21 Nov 2010) indicates the low pressure over east central and adjoining west central Arabian sea is moving northward and intensifying slightly. Another low pressure over southwest Bay of Bengal is also moving northwestwards and intensifying slightly.
- **UKMET** model analysis of 00UTC of today (21 Nov 2010) indicates a well marked low pressure area over east central Arabian sea and another low over southwest Bay of Bengal. The system over central Arabian sea is moving north-east-north and crossing Gujarat coast by 1200 UTC of 23.11.2010. The system over southwest Bay of Bengal crosses south Tamil Nadu coast by 1200 UTC of 26th Nov.
- **NCMRWF-GFS** model analysis based on 00 UTC of today (21st Nov. 2010) shows the low pressure over east central Arabian sea and adjoining west central Arabian sea and another low over south Bay of Bengal moving west ward. The 48 hour forecast shows the system over central Arabian sea crosses the Gujarat coast by 22nd evening/night as a low pressure. This system over south bay crosses the south peninsular region by 1200 UTC of 25th Nov. and moving westward to southeast Arabian sea.



(See <http://www.imd.gov.in/section/nhac/dynamic/welcome.htm>)
See ftp://ftp.ncmrwf.gov.in/pub/outgoing/TC_FDP/

FOC Report

Detailed report of FOC, Chennai is given in Annexure 2.

Advisory.

- The low pressure over eastcentral Arabian sea is not likely to intensify.
- **NO IOP will be conducted till 23-11-2010.**

Forecast for Sagar Kanya ship:

Bay of Bengal & Andaman Sea: -

Broken low/med clouds with embedded isolated moderate to intense convection over Bay south of lat 12.0 N and south Andaman Sea adjoining northwest Andaman Sea (.)

ARABIAN SEA: -

Broken low/med clouds with embedded moderate to intense convection over rest Arabian sea south Of lat 14.5 N east of long 60.0.

Annexure-1

Status of Observation system:

Synop ← 20-11-2010 →← 21-11-2010 →

Region	09	12	15	18	21	00	03	06
GHT/KOL	32	67	23	31	22	33	55	37
CHN	44	73	35	41	35	49	77	48
NAG/MUM	39	88	31	37	33	29	79	43

AWS

← 20-11-2010 →← 21-11-2010

UTC	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07
Nos	511	506	354	504	514	497	515	506	506	504	509	-	-	-	-	-	259	254	176	-	-	-	456	457

RSRW (12Z) 20-11-2010: - 35/35 (Minicoy not received)

No. of Ascents reaching 250 hPa levels:07

MISDA:-SRN, PTL, JDP, LKN, GRK, DBH, SLG, GHT, PTN, RNC, AGT, GWL, BHP, NAG, RPR, JGD, AMM, AUG, PNJ, HYD, VSK, MDS, MNG, BNG, AMN AND CHN(26)

RSRW (00Z) 21-11-2010: - 35/36 (Minicoy not received)

No. of Ascents reaching 250 hPa levels: (25)

MISDA: (SRN, PTL, GHT, MDS, BNG, AMN, CHN) (7)

No. of PILOT Ascents

20-11-2010				21-11-2010			
12Z		18Z		00Z		06Z	
34		32		35		39	

Buoy Data

20-11-2010					21-11-2010		
09Z	12Z	15Z	18Z	21Z	00Z	03Z	06Z
04	04	04	04	04	04	-	04

List of stations of neighbouring countries

DATE 21-11-2010

Country	Total No. of station	Hours of observations (UTC)							
		00	03	06	09	12	15	18	21
Sri Lanka	8	6	8	7	8	8	8	6	6
Bangladesh	11	7	6	3	8	7	8	6	6
Myanmar	10	7	7	5	7	4	1	6	1
Thailand	1	1	1	1	1	1	1	1	1

Remarks:

(I)AWS data reception is poor and missing.

(II)RMC KOLKATA: Please send latest observation information till 0000 UTC of date daily.

(III) Upper air data information from DDGM(UI) not received.



Annexure-2

India Meteorological Department

REGIONAL METEOROLOGICAL CENTRE, CHENNAI

FDP (Cyclone) FOC Chennai Report Dated 21 NOV 2010, 1400 hrs

PART – A: STATUS OF OBSERVATION SYSTEM

No of Synop data

Date→	20.11.2010							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	19	23	20	20	23	19	19	19

No. of RS/RW Ascents

00Z / 20.11.2010 : 3

No. of Ascents reaching 250 hPa level =3

MISDA : 1

12Z /20.11.2010 : 2

No. of Ascents reaching 250 hPa level =2

MISDA : 2

No. of PILOT Ascents:

20.11.2010	
06Z	18Z
2	1

Status of AWS data is given in FDPNOC report.

PART – B: RMC CHENNAI INFERENCE

CHENNAI MNG INF DATED 21.11.2010.

BAY INF AURORA AAA Y'S TRH OF LOW PRESSURE OVER GULF OF MANNAR IS LESS MARKED AAA A TRH OF LOW PRESSURE LIES OVER SW BAY OFF TN-SRILANKA COT AAAA TRH OF LOW PRESSURE OVER SOUTH ADMN SEA AND SE BAY PERSTS AAA WX SSLELSEWHERE BAY AND NORTH ADMN SEA AAA

ARSEA INF AURORA AAA Y'S TRH OF LOW PRESSURE OVER LKDP AREA AND N/HOOD PERSTS AAA WX SSL ELSEWHERE ARSEA AAA

REGN INF AAA NE MON HAS BEEN VIG OVER TN/PDC AND ACTIVE OVER KRL
AAA A TRH OF LOW PRESSURE LIES OVER SW BAY OFF TN-SRILANKA COT AAA
ASSTD U/A CYCIR EXTDG UPTO 0.9 KM ASL AAA Y'S TRH OF LOW PRESSURE
OVER LKDP AREA AND N/HOOD PERSTS AAA

MANDYA RECORDED THE LOWEST MIN TEMPERATURE OF 17 DEG C IN THE
PLAINS OF THE REGION AAA

FCST AAA RA/TSH WOULD OCCUR AT MANY PLACES OVER TN/PDC ,KRL AND
LKD AND AT A FEW PLACES OVER CK AND SIK AAA ISOL RA/TSH MAY OCCUR
OVER AP AND NIK AAA

HRW AAA ISOL XX RA WOULD OCCUR OVER TN/PDC AND KRL DURING NEXT 48
HOURS AAA

ENDS AAA

=====

L/FCST AAA

FOR NEXT 24 HRS AAA THE SKY CONDITION WOULD BE PARTLY CLOUDY AAA
RA/TSH MAY OCCUR IN SOME AREAS AAA MIN TEMP WOULD BE AROUND 23
DEG C AAA

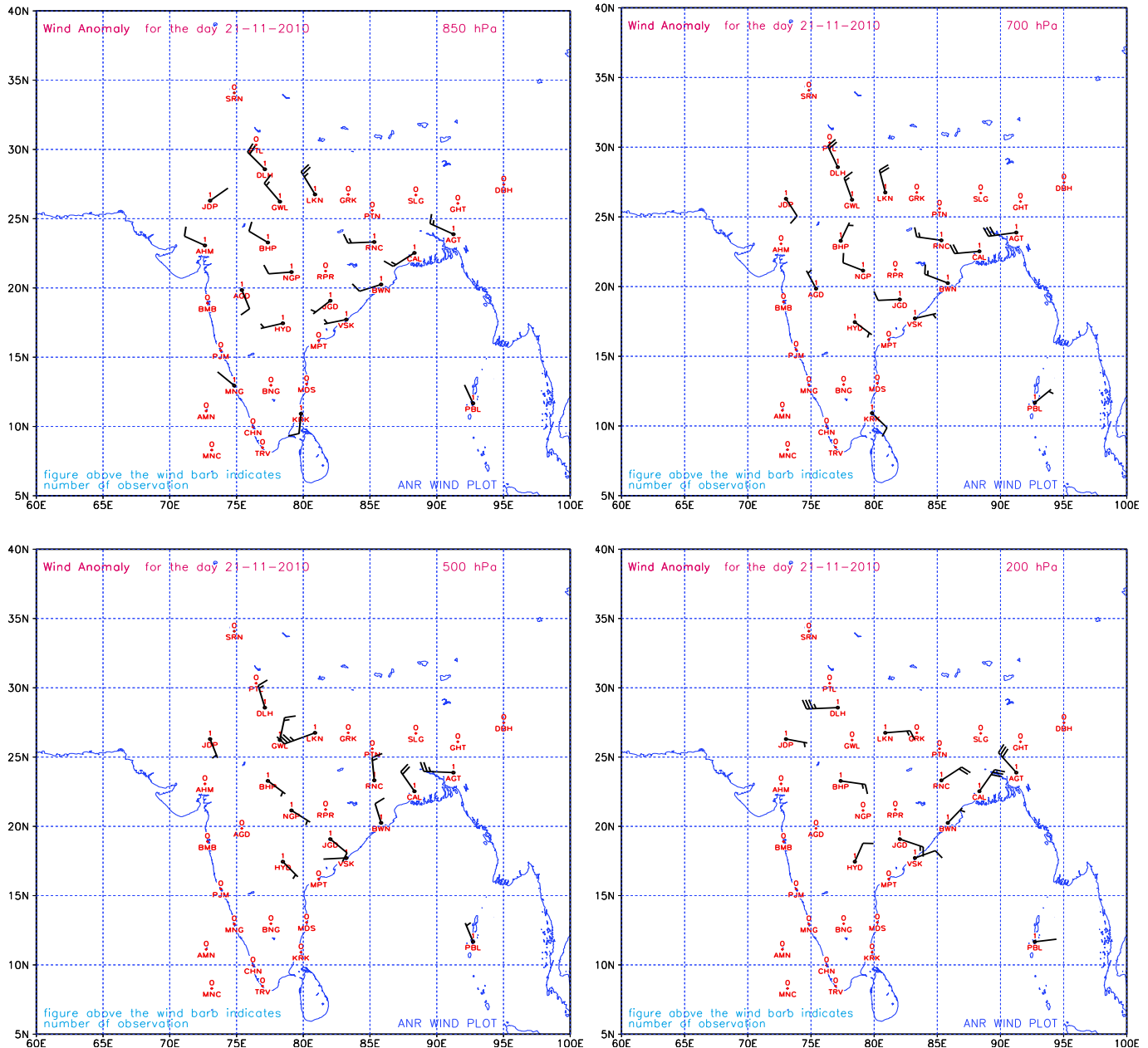
FOR NEXT 48 HRS AAA THE SKY CONDITION WOULD BE PARTLY CLOUDY AAA
RA/TSH MAY OCCUR IN SOME AREAS AAA MIN TEMP WOULD BE AROUND 24
DEG C AAA

ENDS AAA

=====

PART – C

UPPER AIR WIND ANOMALIES DATED 21-11-2010



PART – D: UPPER AIR WINDS FORECAST OVER CHENNAI

WRF – MODEL OUTPUT INDICATES VARIABLE TO NORTHEASTERLY WINDS OF THE ORDER OF 5 KNOTS UPTO 900 hPa, MAINLY EASTERLY TO NORTHEASTERLY WINDS OF THE ORDER OF 5 KNOTS FROM 900 TO 600 hPa AND MAINLY SOUTHEASTERLY WINDS OF THE ORDER OF 5 KNOTS FROM 600 TO 400 hPa OVER CHENNAI FOR NEXT 24 HOURS ENDING 00Z 22.11.2010

FDP (Cyclone) NOC Report Dated 22 November, 2010, 1500 hours IST
Weather Briefing:

Synoptic features:

Yesterday's low pressure area over eastcentral Arabian sea and adjoining area of northeast Arabian sea persist with associated upper air cyclonic circulation extending upto 3.1 km above mean sea level with trough aloft. 24 hours pressures changer is negative (-2 to -3 hPa) over coastal Gujrat.

Upper tropospheric ridge:

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

Divergence:

- Upper air positive divergence ($5-10 \times 10^{-5} \text{ s}^{-1}$) prevails over south Bay of Bengal and Andaman Sea. And the same is ($5 \times 10^{-5} \text{ s}^{-1}$) over eastcentral Arabian sea.

Convergence:

- Lower level positive convergence ($5-10 \times 10^{-5} \text{ s}^{-1}$) prevails over southeast Bay of Bengal and Andaman sea and ($5 \times 10^{-5} \text{ s}^{-1}$) over eastcentral Arabian sea.

Wind Shear:

- Wind Shear is moderate (10 knots) over Bay of Bengal and (5-10 knots) over eastcentral Arabian sea.

Wind Shear Tendency:

- Decreasing (-5 to -10 knots) over southeast Bay of Bengal and Andaman sea and the same is also decreasing (-5 to -10 knots) over central Arabian sea.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive over southwest Bay of Bengal with magnitude of $5 \times 10^{-5} \text{ s}^{-1}$. and the same is also $5.0 \times 10^{-5} \text{ s}^{-1}$ over eastcentral Arabian sea.

Sea Surface Temperature:

- SST around 30.0 - 32.0°C over Bay of Bengal and central Arabian sea .

Ocean thermal energy:

- Ocean thermal energy is mainly 100-120 KJ cm⁻² over south Bay of Bengal and south Andaman Sea and below 100 KJ cm⁻² elsewhere over Bay of Bengal over central Arabian sea

M.J.O. Index:

- Located over phase 7 with amplitude less than 1.0.
- Statistical forecast: - MJO moves through phase 8, 1 & 2 during next 15 days.
- Dynamical forecast:- MJO located in phase 7 with amplitude less than 1.0 and moves through phase 7 & 8 during next 15 days.

Synoptic and environmental conditions suggest that the low pressure over east central Arabian sea is likely to become more marked and move towards Gujrat coast during next 24 hours. Intra Tropical Convergence Zone is well marked over South Bay of Bengal

Status of observational system:

Details of the status of observational system are given in Annexure 1.

Satellite

Inference based on INSAT PICTURE of 220900 UTC

Arabian sea

Broken low/medium clouds with embedded moderate to intense thunder clouds over Arabian Sea North of lat 12.0N east of long 66.0E in association with low level circulation over the area. Also broken low/medium clouds with embedded moderate to intense

thunder clouds over Arabian sea bet lat 5.0N to 9.0N east of long 64.0E. Broken low/medium clouds with embedded weak to moderate thunderclouds over rest south Arabian sea east of long 60.0E.

Bay of Bengal

Broken low/medium clouds with embedded moderate to intense thunderclouds over south Bay and south Andaman Sea. Also broken low/medium clouds with embedded weak to moderate thunder clouds over rest Andaman sea south of lat 13.5N ..

(See <ftp://192.168.12.75/imd/satmet>

<http://www.imd.gov.in/section/satmet/dynamic/insat.htm>)

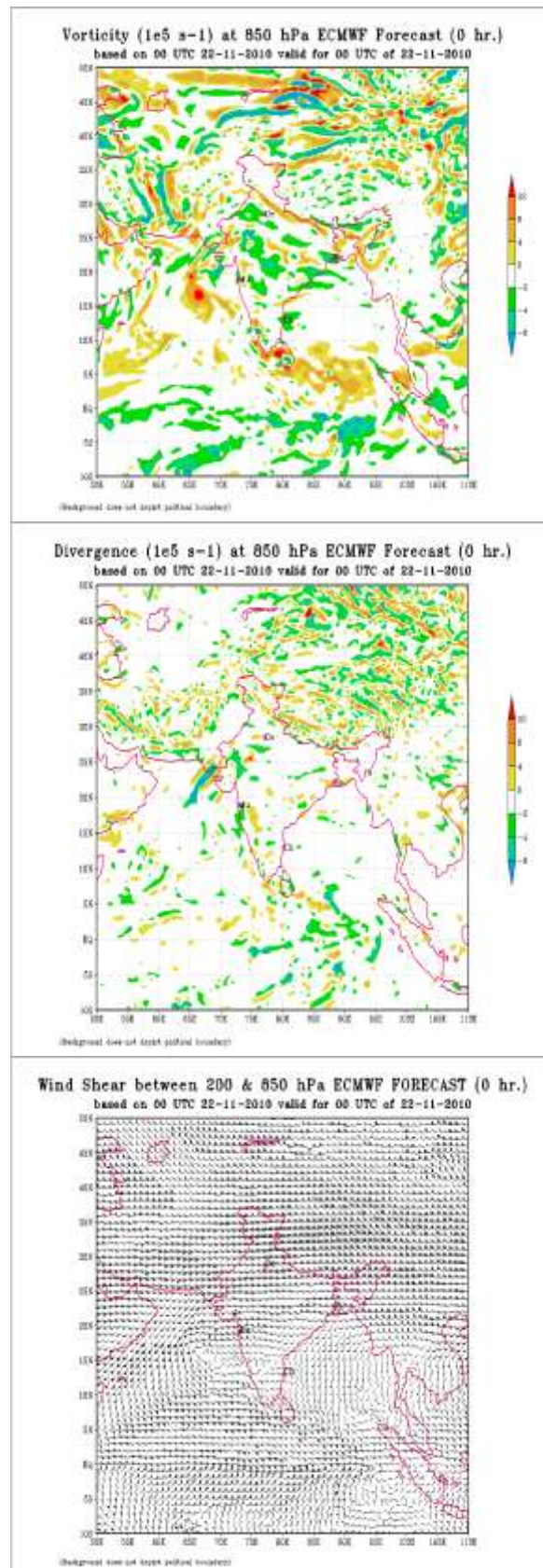
NWP Analysis

- **ECMWF** model of 00UTC of today (22Nov 2010) shows a well marked low pressure area over east-central Arabian sea and the forecast shows that the system is moving in a north-east direction and the 48-hr forecast indicates it weakens into a trough of low pressure (on 24th Nov., 2010 over Gujarat coast). 24 hour forecast field also shows formation of another low over south-west Bay of Bengal and moving westward direction it cross Tamil Nadu coast by 27th Nov' 2010 and re-emerged into south-east Arabian sea on 28th Nov'2010.
- **IMDGFS** model analysis of 00UTC of today (22 Nov 2010) shows the low pressure over east-central Arabian sea is persist as extended low. 24 hour forecast shows that the system becomes less marked. Another trough on easterly wave is lying over southwest Bay of Bengal and is moving westward and will become a low pressure over southwest Bay of Bengal on 23rd November 2010. The 168-hr forecast shows the system will move in a westward direction and will become a depression over east central Arabian Sea by 29th November 2010.
- **WRF-ARW** model analysis of 00UTC of today (22 Nov 2010) indicates the low pressure over east central and adjoining west central Arabian Sea. Forecast shows that the system is moving west northwestward but no intensification. Another low pressure over southwest Bay of Bengal is moving westwards with no intensification.
- **UKMET** model analysis of 00UTC of today (22 Nov 2010) indicates a cyclonic circulation over east central Arabian Sea and another cyclonic circulation over southwest Bay of Bengal. The system over central Arabian Sea is moving north-east-north and crossing Gujarat coast by 24.11.2010. The system over southwest Bay of Bengal crosses the Srilanka and south Tamil Nadu coast by 26th Nov.
- **NCMRWF-GFS** model analysis based on 00 UTC of today (22 Nov. 2010) shows that a cyclonic circulation over east central Arabian sea and adjoining west central Arabian sea. The 24 hour forecast shows the system moving northeastwards crosses the Gujarat coast by 23rd evening/night. Another cyclonic circulation over south Bay of Bengal moving westward emerged into southeast Arabian Sea on 26th November.

(See <http://www.imd.gov.in/section/nhac/dynamic/welcome.htm>)

See ftp://ftp.ncmrwf.gov.in/pub/outgoing/TC_FDP/

Analysis of Genesis parameter



FOC Report

Report of FOC, Chennai not received.

Advisory.

A low pressure area is expected to form during next 24 hours over southeast Bay of Bengal and adjoining south Andaman sea.

- **NO IOP will be conducted till 24-11-2010.**

Forecast for Sagar Kanya ship:

Broken low/medium clouds with embedded moderate to intense thunderclouds over south Bay and south Andaman Sea. Also broken low/medium clouds with embedded weak to moderate thunder clouds over rest Andaman sea south of lat 13.5N ..

Annexure-1**Status of Observation system:**

Synop ← 21-11-2010 →← 22-11-2010 →

Region	09	12	15	18	21	00	03	06
GHT/KOL	32	69	27	30	22	30	69	70
CHN	42	66	36	35	37	34	72	71
NAG/MUM	39	85	31	32	32	30	84	60

AWS

← 21-11-2010														→← 22-11-2010										
UTC	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07
Nos	456	447	449	443	375	362	452	447	444	447	450	451	449	447	450	449	447	450	440	464	456	452	445	362

RSRW (12Z) 21-11-2010: - 35/35 (Minicoy not received)

No. of Ascents reaching 250 hPa levels:07

MISDA:-SRN, PTL, JDP, LKN, GRK, DBH, SLG, GHT, PTN, RNC, AGT, GWL, BHP, NAG, RPR, JGD, AHM,BOM, AUG, PNJ, HYD, VSK, MDS, MNG, BNG, AMN,MNC AND CHN(28)

RSRW (00Z) 22-11-2010: - 36/36 (Minicoy not received)

No. of Ascents reaching 250 hPa levels: (23)

MISDA: (SRN, PTL, GHT,PTN, BOM, MDS, BNG, AMN, CHN AND TRV) (10)

No. of PILOT Ascents

21-11-2010				22-11-2010			
12Z		18Z		00Z		06Z	
34		49		35		33	

Buoy Data

21-11-2010					22-11-2010		
09Z	12Z	15Z	18Z	21Z	00Z	03Z	06Z
04	04	04	04	04	04	4	03

No. of GPS Data

12Z/ Date: 21.11.2010:- Nil

00Z/ date:22.11.2010:-5

List of stations of neighbouring countries

DATE 21-11-2010

Country	Total No. of station	Hours of observations (UTC)							
		00	03	06	09	12	15	18	21
Sri Lanka	8	6	8	8	8	8	6	6	6
Bangladesh	11	7	7	7	7	7	6	2	6
Myanmar	10	7	7	7	7	7	1	6	1
Thailand	1	1	1	1	1	1	1	1	1

Status of RS/RW Data

		21-11-2010 00UTC			22-11-2010 00UTC		
		RS last level		Wind last level	RS last level		Wind last level
STATION Index	STATION Name	mb	Km	mb	mb	Km	mb
42410	GHT				Misda due to GET		
42809	CAL				12	30.1	12
43333	PBL				30	24	32
42971	BWN				49	20.7	49
43150	VSK				131	14.8	395
43185	MPT				22	26	124
43128	HYD				4.4	36.5	4.4
43279	CHN				Misda due to NI		
43346	KRK				37.4	22.7	506
43371	TRV				Misda due to NI		
43192	GOA				555	5	nil
43003	MUM				Misda due to DU		
43285	MNG				91	16.9	590
42647	AHM				63	19.4	877
43369	MNC				27.7	24.9	436
43353	KOCHI				Misda due to NB		
42724	AGT				12.3	27.1	12.7

Remarks:

(I)RMC KOLKATA: Please send latest observation information till 0000 UTC of date daily.



Regional Meteorological Centre, Kolkata
ACWC Kolkata

FDP Cyclone-2010 (Status of daily observation)

No of Synop data

Date→	21.11.10							
UTC→	00	03	06	09	12	15	18	21
Coasts of WB & ORS	10	11	10	10	11	10	10	10

No. of RS/RW Ascents

00Z / 21.11.2010 : 3

No. of Ascents reaching 250 hpa level =3

MISDA : 0

12Z /21.11.2010 : 3

No. of Ascents reaching 250 hpa level =3

MISDA : 0

No. of PILOT Ascents:

21.11.2010			
00Z	06Z	12Z	18Z
2	1	2	3

FDP (Cyclone) NOC Report Dated 23 November, 2010, 1500 hours IST

Weather Briefing:

Synoptic features:

Yesterday's low pressure area over eastcentral and adjoining area of northeast Arabian sea now lies over northeast Arabian Sea and adjoining Gujarat with associated upper air cyclonic circulation extending upto 3.1 km above mean sea level with trough aloft. It is likely to move north-northeastwards and weaken gradually.

An active easterly wave is likely to affect south and adjoining central bay of Bengal and southern Peninsular India during next 72 hrs. However, no low pressure system is expected over the Bay of Bengal during this period.

Upper tropospheric ridge:

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

Divergence:

- Upper air positive divergence ($10\text{-}20 \times 10^{-5} \text{ s}^{-1}$) prevails over south Bay of Bengal and south Andaman Sea extending from southeast to northwest.

Convergence:

- Lower level positive convergence ($5\text{-}10 \times 10^{-5} \text{ s}^{-1}$) prevails over south Bay of Bengal and Andaman sea.

Wind Shear:

- Wind Shear is low to moderate 5-(10 knots) over southeast Bay of Bengal and Andaman Sea.

Wind Shear Tendency:

- Decreasing (-5 to -10 knots) over central part of south Bay of Bengal.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive over south Bay of Bengal with magnitude of $5 \times 10^{-5} \text{ s}^{-1}$.

Sea Surface Temperature:

- SST around 30.0 - 32.0°C over Bay of Bengal and central Arabian sea .

Ocean thermal energy:

- Ocean thermal energy is mainly 100-120 KJ cm⁻² over south Andaman Sea and adjoining southeast Bay of Bengal and below 100 KJ cm⁻² elsewhere over Bay of Bengal. It is less than 50 KJ cm⁻² over southwest bay of Bengal

M.J.O. Index:

- Located over phase 6 with amplitude less than 1.0.
- Statistical forecast: - MJO moves through phase 7, 8, & 1 during next 15 days.
- Dynamical forecast:- MJO located in phase 7 with amplitude less than 1.0 and moves through phase 5, 6, 7, 8, 1 & 2 during next 15 days.

Inter Tropical Convergence Zone is well marked over South Bay of Bengal with embedded trough in easterlies. An active easterly wave is likely to effect south and adjoining central bay of Bengal and southern Peninsular India during next 72 hrs. However, no low pressure system is expected over the Bay of Bengal during this period.

Status of observational system:

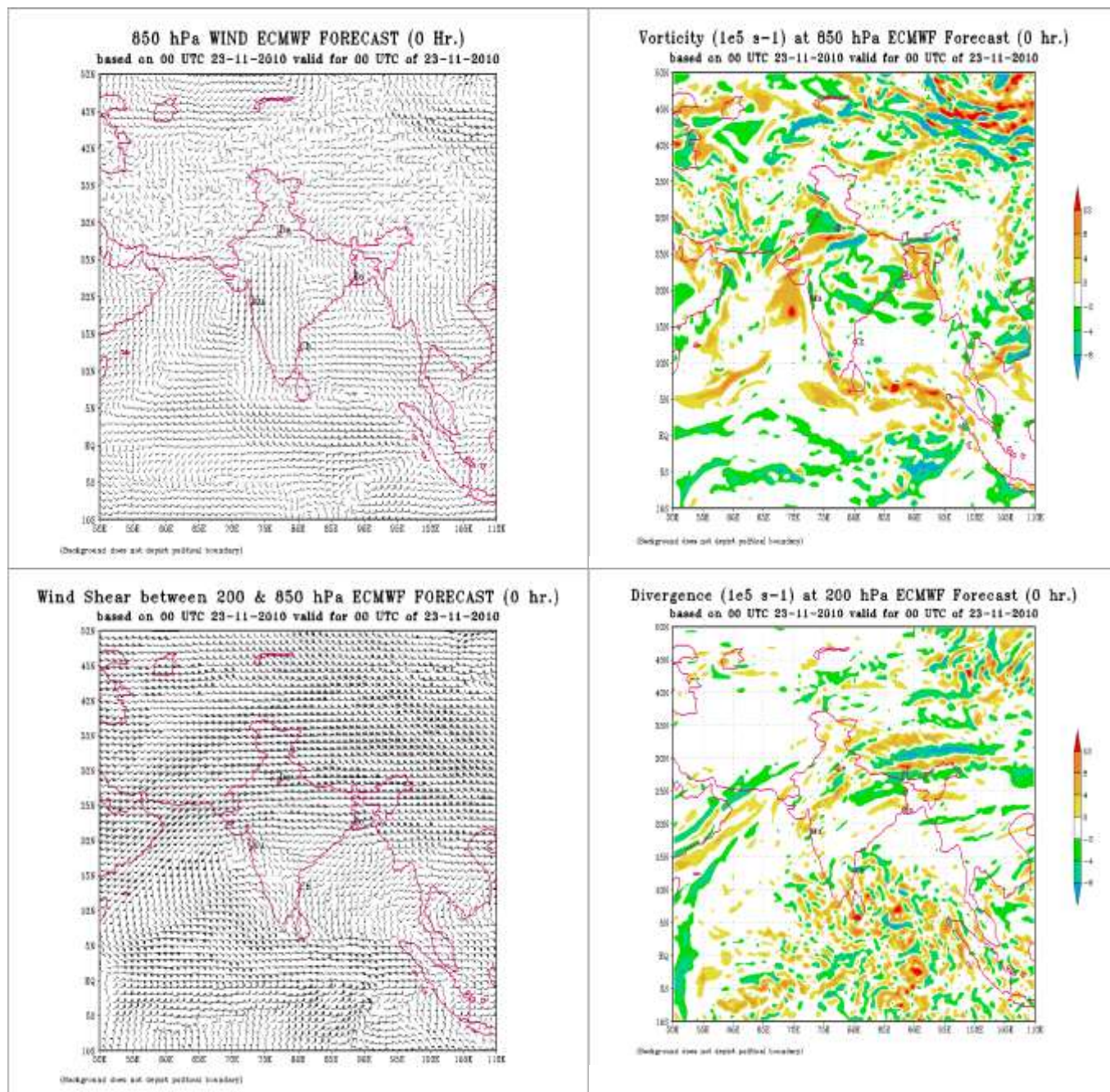
Details of the status of observational system are given in Annexure 1.

Satellite

Inference based on INSAT PICTURE of 230900 UTC

Arabian Sea

Broken low/medium clouds with embedded moderate to intense thunder clouds over east Arabian Sea North of lat 14.5N east of long 68.0E gulf of Cambay and s Gujarat in association with low level circulation over the area. Also broken low/medium clouds with



embedded moderate to intense thunder clouds over south east Arabian sea east of long 67.0E.

Bay of Bengal:-

Broken low/medium clouds with embedded intense to very intense thunder clouds over south Bay . Also broken low/medium clouds with embedded weak to moderate thunder clouds over west central Bay and south Andaman Sea .

(See <ftp://192.168.12.75/imd/satmet>

<http://www.imd.gov.in/section/satmet/dynamic/insat.htm>)

NWP Analysis

- **ECMWF** model of 00UTC of today (23 Nov 2010) shows a well marked low pressure area over east-central Arabian sea and the adjoining Gujarat and Maharashtra coasts. The 24-hr forecast shows this system is moving in north-east-north direction and crosses the Gujarat coast and becomes less intense. Another extended trough over south bay of Bengal to east Arabian sea persists. The 48-hr forecast shows this trough becomes a well marked low over south west bay of Bengal and Tamil Nadu coast and moves west-north-westward and becomes an extended trough over south-west bay, south peninsula, Comorin, Maldives and south-east Arabian sea.
- **IMDGFS** model of 00UTC of today (23 Nov 2010) shows the low pressure over east Arabian sea extending upto south Gujarat coast. The forecast shows this low moves north-west-north and becomes less intense. Another trough is over south bay moves west-north-westward and becomes a low pressure area and crossing south peninsular India and move to south-east Arabian sea over Lakshadweep and Kerala, Karnataka coasts on 28-11-10.
- **WRF-ARW** model analysis of 00UTC of today (23 Nov 2010) indicates the low pressure over east Arabian sea extending to Gujarat and moving north-west-north direction and becomes less intense. The 72-hr forecast indicates a low pressure over southwest Bay of Bengal, south Tamil Nadu coasts and Comorin and an extended trough from south Bay to southeast Arabian sea.
- **UKMET** model analysis of 00UTC of today (23 Nov 2010) indicates a well marked low pressure area over east Arabian sea and adjoining Gujarat and Maharashtra coasts. The forecast shows this system of low pressure moves in north-east-north direction and crossing the Gujarat coast by the evening of 24th Nov. A trough of low pressure lies over southwest Bay of Bengal moving westward and crosses the Tamil Nadu coast near Pamban on 27th evening and it further moves westward to southeast Arabian sea.
- **NCMRWF-GFS** model analysis based on 00 UTC of today (23rd Nov. 2010) shows the low pressure over east Arabian sea and adjoining Gujarat and Maharashtra coasts. The forecast shows the system crosses the Gujarat coast and weakens further. Another trough of low pressure lies over south Bay of Bengal. This system will intensify into a low pressure area and move west-northwestward and cross the Tamil Nadu coast near Pamban on 27th Nov. evening and further moves westward and become a well marked low pressure area over southeast Arabian sea on 29th Nov.

(See <http://www.imd.gov.in/section/nhac/dynamic/welcome.htm>)

See ftp://ftp.ncmrwf.gov.in/pub/outgoing/TC_FDP/

Advisory.

- An active easterly wave is likely to effect southern Peninsular India during next 72 hrs. However, no low pressure system is expected over the Bay of Bengal during this period.

▪ **NO IOP will be conducted till 24-11-2010.**

Forecast for Sagar Kanya ship:

Broken low/medium clouds with embedded intense to very intense thunder clouds over south Bay . Also broken low/medium clouds with embedded weak to moderate thunder clouds over west central Bay and south Andaman Sea .

An active easterly wave is likely to effect south and adjoining central bay of Bengal and southern Peninsular India during next 72 hrs. However, no low pressure system is expected over the Bay of Bengal during this period.

Annexure-1

Status of Observation system:

Synop ← 22-11-2010 →← 23-11-2010 →

Region	09	12	15	18	21	00	03	06
GHT/KOL	34	67	25	26	21	29	61	35
CHN	45	72	39	35	36	41	41	45
NAG/MUM	39	42	17	18	16	29	40	26

AWS

← 22-11-2010 →← 23-11-2010

UTC	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07
Nos	457	469	460	460	449	498	501	462	504	508	510	509	507	508	500	503	492	498	508	545	525	537	527	539

RSRW (12Z) 22-11-2010: - 35/35

No. of Ascents reaching 250 hPa levels:

MISDA:-SRN, PTL, JDP, LKN, GRK, DBH, SLG, GHT, PTN, RNC, AGT, GWL, BHP, NAG, RPR, JGD, AHM, AUG, PNJ, HYD, VSK, MDS, MNG, BNG, AMN, CHN, MNC AND TRV(28)

RSRW (00Z) 23-11-2010: - 36/36 (Minicoy not received)

No. of Ascents reaching 250 hPa levels:

MISDA: (SRN, PTL, GHT, PTN, NAG, BOM, MDS, BNG, AMN, CHN, MNC AND TRV) (12)

No. of PILOT Ascents

22-11-2010				23-11-2010			
12Z		18Z		00Z		06Z	
34		45		33		30	

Buoy Data

22-11-2010					23-11-2010		
09Z	12Z	15Z	18Z	21Z	00Z	03Z	06Z
-	04	04	04	04	04	04	03

No. of GPS Data

12Z/ Date: 22.11.2010:- Nil

00Z/ date:23.11.2010:- HYD, MNB (2)

List of stations of neighbouring countries

DATE 22-11-2010

Country	Total No. of station	Hours of observations (UTC)							
		00	03	06	09	12	15	18	21
Sri Lanka	8	8	8	8	8	8	8	8	8
Bangladesh	11	8	2	5	5	5	4	3	4
Myanmar	10	7	7	6	7	7	1	4	1
Thailand	1	1	1	1	1	1	1	1	1

Status of RS/RW Data

		22-11-2010 00UTC			23-11-2010 00UTC		
		RS last level		Wind last level	RS last level		Wind last level
STATION Index	STATION Name	mb	Km	mb	mb	Km	mb
42410	GHT	Misda due to GET			Misda due to GET		
42809	CAL	12	30.1	12	14.1	29.5	20
43333	PBL	30	24	32	38.8	21.6	39
42971	BWN	49	20.7	49	27.4	24.6	28
43150	VSK	131	14.8	395	775	2.2	nil
43185	MPT	22	26	124	32.9	23.5	131
43128	HYD	4.4	36.5	4.4	3.3	38.6	3
43279	CHN	Misda due to NI			Misda due to NI		
43346	KRK	37.4	22.7	506	37.4	22.7	528
43371	TRV	Misda due to NI			Misda due to NI		
43192	GOA	555	5	nil	137	14.7	nil
43003	MUM	Misda due to DU			Misda due to DU		
43285	MNG	91	16.9	590	153	13.9	200
42647	AHM	63	19.4	877	111	15.7	114
43369	MNC	27.7	24.9	436	149.2	14.2	nil
43353	KOCHI	Misda due to NB			Misda due to NB		
42724	AGT	12.3	27.1	12.7	30	24.1	50

Remarks:

(I)RMC KOLKATA: Please send latest observation information till 0000 UTC of date daily.



India Meteorological Department

REGIONAL METEOROLOGICAL CENTRE, CHENNAI

FDP (Cyclone) FOC Chennai Report Dated 23 NOV 2010, 1400 hrs

PART – A: STATUS OF OBSERVATION SYSTEM

No of Synop data

Date→	22.11.2010							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	19	23	20	20	23	19	19	19

No. of RS/RW Ascents

00Z / 22.11.2010 : 3

No. of Ascents reaching 250 hPa level =3

MISDA : 1

12Z / 22.11.2010 : 2

No. of Ascents reaching 250 hPa level =2

MISDA : 2

No. of PILOT Ascents:

22.11.2010	
06Z	18Z
2	2

Status of AWS data is given in FDPNOC report.

PART – B: RMC CHENNAI INFERENCE

CHENNAI MNG INF DATED 23.11.2010.AAA (CCN)

BAY INF AURORA AAA Y'S TRH OF LOW PRESSURE OVER SW BAY OFF SRILANKA-TN-SCAP COTS NOW LIES OVER SW BAY OFF SRILANKA COT AAA

ANOTHER TRH OF LOW PRESSURE OVER ADMN SEA AND N/HOOD ALSO PERSTS AAA

WX SSL ELSEWHERE BAY AAA

ARSEA INF AURORA AAA A LOPAR LIES OVER EC AND ADJ NE ARSEA AAA A TRH FROM THIS SYSTEM EXTDS UPTO LKDWP AREA AAA WX SSL ELSEWHERE ARSEA AAA

REGN INF AAA NE MON HAS BEEN VIGOROUS OVER KRL AND ACTIVE OVER TN AAA

Y'S TRH OF LOW PRESSURE OVER SW BAY OFF SRILANKA-TN-SCAP COTS NOW LIES OVER SW BAY OFF SRILANKA COT AAA A LOPAR LIES OVER EC AND ADJ NE ARSEA AAA A TRH FROM THIS SYSTEM EXTDS UPTO LKDWP AREA AAA

ASSTD U/A CYCIR EXTDS UPTO 1.5 KM ASL AAA

ADL RECORDED THE LOWEST MIN TEMPERATURE OF 16 DEG C IN THE PLAINS OF THE REGION AAA

FCST AAA RA/TSH WOULD OCCUR AT MANY PLACES OVER TN/PDC,KRL AND AT A FEW PLACES OVER KKA AND LKDWP AAA ISOL RA/TSH MAY OCCUR OVER AP AAA

HRW AAA ISOL XX RA WOULD OCCUR OVER TN/PDC AND KRL DURING NEXT 48 HOURS AAA

ENDS AAA

=====

L/FCST AAA

FOR NEXT 24 HRS AAA THE SKY CONDITION WOULD BE GENERALLY CLOUDY AAA

FEW SPELLS OF RA/TSH WOULD OCCUR AAA MIN TEMP WOULD BE AROUND 24 DEG C AAA

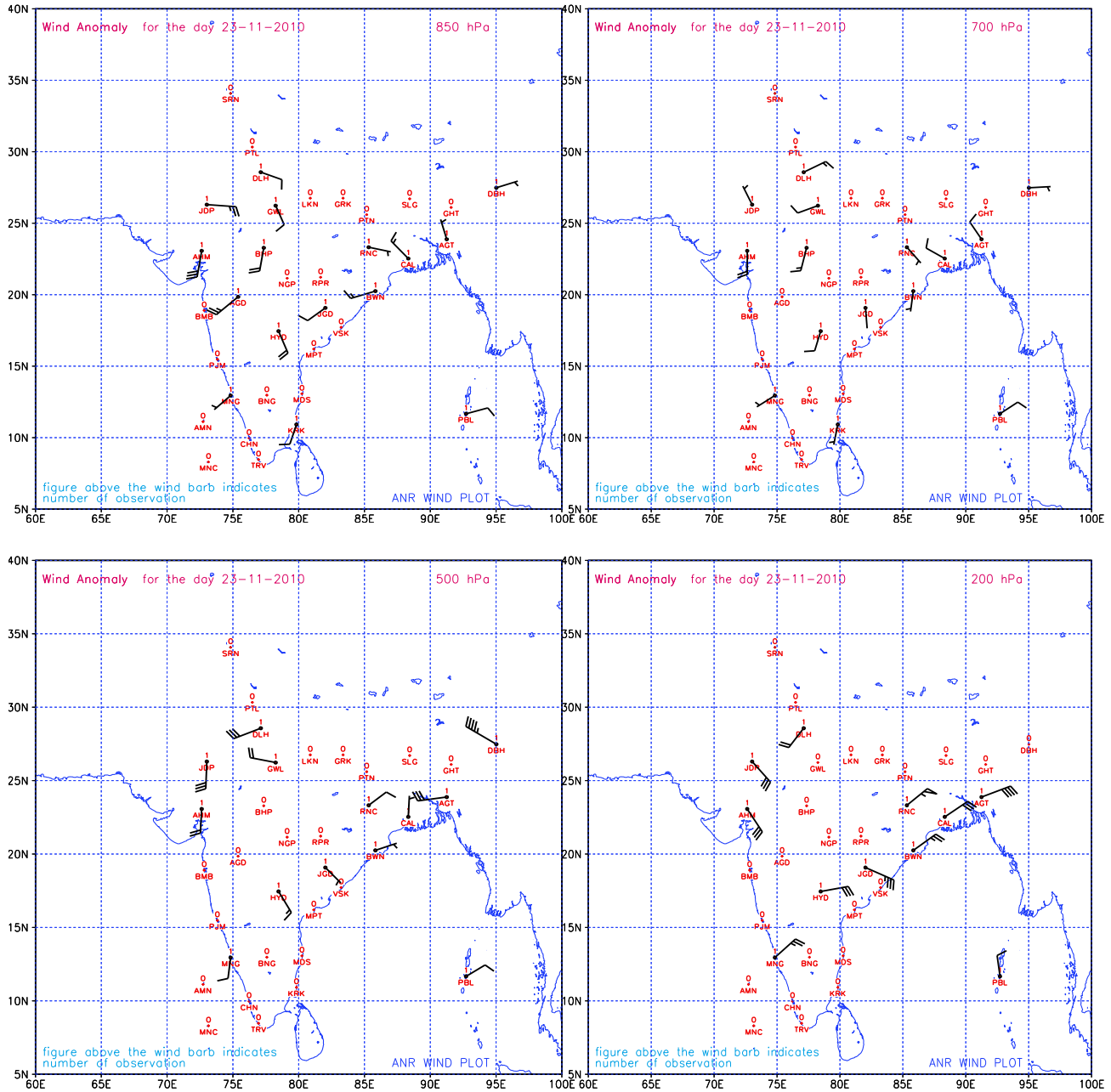
FOR NEXT 48 HRS AAA THE SKY CONDITION WOULD BE GENERALLY CLOUDY AAA

FEW SPELLS OF RA/TSH WOULD OCCUR AAA MIN TEMP WOULD BE AROUND 24 DEG C AAA

ENDS AAA

PART – C

UPPER AIR WIND ANOMALIES DATED 23-11-2010



PART – D: UPPER AIR WINDS FORECAST OVER CHENNAI

WRF – MODEL OUTPUT INDICATES EASTERLY TO NORTHEASTERLY WINDS OF THE ORDER OF 5 TO 10 KNOTS UPTO 800 hPa, AND SOUTHEASTERLY TO EASTERLY WINDS OF THE ORDER OF 5 KNOTS FROM 800 TO 500 hPa OVER CHENNAI FOR NEXT 24 HOURS ENDING 00Z 24.11.2010

FDP (Cyclone) NOC Report Dated 24 November, 2010, 1500 hours IST

Weather Briefing:

Synoptic features:

Yesterday's low pressure area over northeast Arabian Sea and adjoining coastal Gujarat has become less marked.

A trough of low pressure area runs from Myanmar coast to southwest Bay of Bengal across Andaman Sea associated upper air trough extending upto 2.1 km above sea level.

Upper tropospheric ridge:

The upper tropospheric ridge line roughly runs along 15.0°N at 200 hPa level.

Divergence:

- Upper air positive divergence ($5-10 \times 10^{-5} \text{ s}^{-1}$) prevails over south Bay of Bengal.

Convergence:

- Lower level positive convergence ($5-10 \times 10^{-5} \text{ s}^{-1}$) prevails over south Bay of Bengal and Andaman sea.

Wind Shear:

- Wind Shear is low to moderate (5-10 knots) over south Bay of Bengal and Andaman Sea.

Wind Shear Tendency:

- Decreasing (-5 knots) over south Bay of Bengal.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive over south Bay of Bengal with magnitude of $5.0 \times 10^{-5} \text{ s}^{-1}$.

Sea Surface Temperature:

- SST around 29.0 - 31.0°C over south Bay of Bengal.

Ocean thermal energy:

- Ocean thermal energy is mainly 100-120 KJ cm⁻² over south Andaman Sea and south Bay of Bengal and below 100 KJ cm⁻² elsewhere over Bay of Bengal. It is less than 50 KJ cm⁻² over westcentral Bay of Bengal

M.J.O. Index:

- Located over phase 6 with amplitude less than 1.0.
- Statistical forecast: - MJO moves through phase 6, 7, & 8 during next 15 days.
- Dynamical forecast:- MJO located in phase 6 with amplitude less than 1.0 and moves through phase 6, 7 & 8 during next 15 days.

Status of observational system:

Details of the status of observational system are given in Annexure 1.

Satellite

Inference based on INSAT PICTURE of 240900 UTC

Bay of Bengal:-

Scattered low/medium clouds with embedded isolated moderate to intense convection over south Bay of Bengal, south Tenasserim coast and adjoining Andaman Sea (.). scattered low/medium clouds with embedded isolated weak to moderate convection over westcentral Bay of Bengal and rest south Andaman Sea (.).

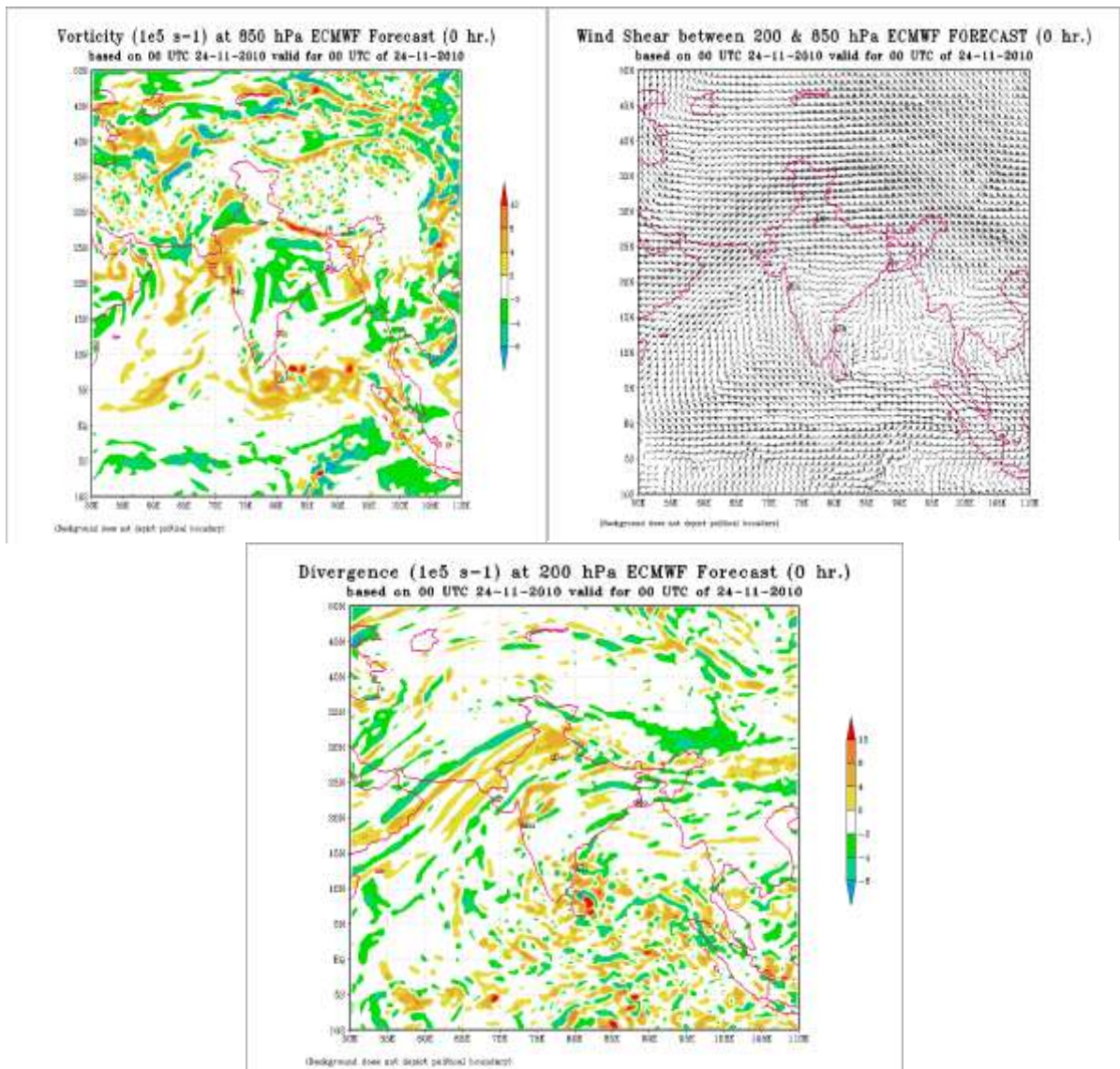
(See <ftp://192.168.12.75/imd/satmet>

<http://www.imd.gov.in/section/satmet/dynamic/insat.htm>)

NWP Analysis

- ECMWF model analysis of 00UTC of today (24 Nov.2010) shows low pressure of 1008hPa in the southwest Bay. The 24 hour forecast shows the low pressure system is likely to move towards the Sri Lankan coast and south Tamil nadu.

- **IMDGFS** model analysis of 00UTC of today (24 Nov.2010) shows a low pressure area lying off the Sri Lanka coast. The Forecast fields shows, the associated cyclonic circulation in the southwest Bay of Bengal is likely to move westward and likely to move over the Tamilnadu region.
 - **IMD WRF-ARW** model analysis of 00UTC of today (24 Nov.2010) shows pressure of 1008hPa lying over southwest Bay and southeast Arabian Sea. The 24 hours forecast field indicates associated circulation in the southwest Bay of Bengal.
 - **UKMET model** analysis of 00 UTC of today (24 Nov. 2010) shows a cyclonic circulation lying in the southwest Bay of Bengal. The system is likely to become a organised and move towards the south Tamilnadu coast.
 - **NCMRWF-GFS** model analysis of 00 UTC of today (24 Nov. 2010) shows a feeble cyclonic circulation in the southwest Bay. The forecast charts indicate that the circulation is likely to move westwards towards SriLanka and south Tamilnadu region.
- Analysis parameters Vorticity(850hPa), windshear(850hPa) and the upper level divergence(200hPa) based on ECMWF**



Summary:

NWP models indicate that a feeble cyclonic circulation is lying over the southwest Bay of Bengal on 24 November 2010 and is likely to move westwards towards Sri Lanka and south Tamil Nadu.

(See <http://www.imd.gov.in/section/nhac/dynamic/welcome.htm>)

See ftp://ftp.ncmrwf.gov.in/pub/outgoing/TC_FDP/

Advisory.

- A trough of low pressure area runs from Myanmar coast to southwest Bay of Bengal across Andaman Sea.
- **NO IOP will be conducted till 26-11-2010.**

Forecast for Sagar Kanya ship:

Scattered low/medium clouds with embedded isolated moderate to intense convection over south Bay of Bengal, south Tenasserim coast and adjoining Andaman Sea (.) scattered low/medium clouds with embedded isolated weak to moderate convection over westcentral Bay of Bengal and rest south Andaman Sea (.)

A trough of low pressure area runs from Myanmar coast to southwest Bay of Bengal across Andaman Sea associated with upper air trough extending upto 2.1 km above sea level. It is likely to move westwards towards Sri Lanka and south Tamil Nadu coast.

Annexure-1**Status of Observation system:**

Synop ← 23-11-2010 → ← 24-11-2010 →

Region	09	12	15	18	21	00	03	06
GHT/KOL	34	64	25	25	25	29	73	34
CHN	43	77	38	38	38	42	76	42
NAG/MUM	40	79	29	31	30	32	80	43

AWS

← 23-11-2010 →← 24-11-2010

UTC	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07
Nos	462	462	467	429	462	461	461	462	458	461	462	473	462	460	458	459	460	458	462	461	466	466	467	465

RSRW (12Z) 23-11-2010: - 35/35

No. of Ascents reaching 250 hPa levels: 7

MISDA:-SRN, PTL, JDP, LKN, GRK, DBH, SLG, GHT, PTN, RNC, AGT, GWL, BHP, NAG, RPR, JGD, AHM, AUG, PNJ, HYD, MDS, MNG, BNG, AMN, CHN, MNC & TRV(27)

RSRW (00Z) 24-11-2010: - 36/36 (Minicoy not received)

No. of Ascents reaching 250 hPa levels:

MISDA: (SRN, PTL, GHT, BOM, MDS, BNG, AMN, CHN & TRV) (9)

No. of PILOT Ascents

23-11-2010				24-11-2010			
12Z		18Z		00Z		06Z	
31		46		31		31	

Buoy Data

23-11-2010					24-11-2010		
09Z	12Z	15Z	18Z	21Z	00Z	03Z	06Z
-	04	05	03	05	-	05	06

No. of GPS Data

12Z/ Date: 23.11.2010:- Nil

00Z/ date:24.11.2010:- HYD, MNB (2)

List of stations of neighbouring countries**DATE 23-11-2010**

Country	Total No. of station	Hours of observations (UTC)							
		00	03	06	09	12	15	18	21
Sri Lanka	8	8	8	8	8	8	8	6	6
Bangladesh	11	6	7	7	6	6	3	3	6
Myanmar	10	5	6	0	7	7	0	6	1
Thailand	1	1	1	1	1	1	1	1	1

Remarks:

1. Upper air information from DDGM(UI) not received.
2. RMC KOLKATA: Please send latest observation information till 0000 UTC of date daily.

Annexure-II

India Meteorological Department

REGIONAL METEOROLOGICAL CENTRE, CHENNAI

FDP (Cyclone) FOC Chennai Report Dated 24 NOV 2010, 1400 hrs

PART – A: STATUS OF OBSERVATION SYSTEM

No of Synop data

Date→	23.11.2010							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	19	22	20	19	22	19	19	19

No. of RS/RW Ascents

00Z / 23.11.2010 : 3

No. of Ascents reaching 250 hPa level =2

MISDA : 1

12Z /23.11.2010 : 3

No. of Ascents reaching 250 hPa level =3

MISDA : 1

No. of PILOT Ascents:

23.11.2010	
06Z	18Z
1	1

Status of AWS data is given in FDPNOC report.

PART – B: RMC CHENNAI INFERENCE
CHENNAI MNG INF DATED 24.11.2010.AAA (CCN)

BAY INF AURORA AAA Y'S TRH OF LOW PRESSURE OVER SW BAY OFF SRILANKA COT PERSTS AAA ANOTHER TRH OF LOW PRESSURE OVER SOUTH ADMN SEA AND N/HOOD IS LESS MARKED AAA WX SSL ELSEWHERE BAY AND ADMN SEA AAA

ARSEA INF AURORA AAA Y'S LOPAR OVER NE ARSEA AND ADJ GUJ HAS BECOME LESS MARKED AAA THE TRH OF LOW PRESSURE OVER LKDWP AREA AND N/HOOD PERSTS AAA WX SSL ELSEWHERE ARSEA AAA

REGN INF AAA NE MON HAS BEEN VIGOROUS OVER SIK AND ACTIVE OVER TN AND KRL AAA Y'S TRH OF LOW PRESSURE OVER SW BAY OFF SRILANKA COT PERSTS AAA THE TRH OF LOW PRESSURE OVER LKDWP AREA AND N/HOOD PERSTS AAA AN EAST-WEST SHEAR LINE RUNS ROUGHLY ACROSS COMORIN AREA AND ADJ SRILANKA AND EXTDS UPTO 1.5 KM ASL AAA

ADL RECORDED THE LOWEST MIN TEMPERATURE OF 16 DEG C IN THE PLAINS OF THE REGION AAA

FCST AAA RA/TSH WOULD OCCUR AT MANY PLACES OVER TN/PDC,KRL, CK AND AT A FEW PLACES OVER IK, LKDWP AND CAP AAA ISOL RA/TSH MAY OCCUR OVER TLGN AND RYLSM AAA

HRW AAA ISOL XX RA WOULD OCCUR OVER TN/PDC AND KRL DURING NEXT 48 HOURS AAA

ENDS AAA

=====

L/FCST AAA

FOR NEXT 24 HRS AAA THE SKY CONDITION WOULD BE GENERALLY CLOUDY AAA

RA/TSH MAY OCCUR IN SOME AREAS AAA MIN TEMP WOULD BE AROUND 24 DEG C AAA

FOR NEXT 48 HRS AAA THE SKY CONDITION WOULD BE GENERALLY CLOUDY AAA

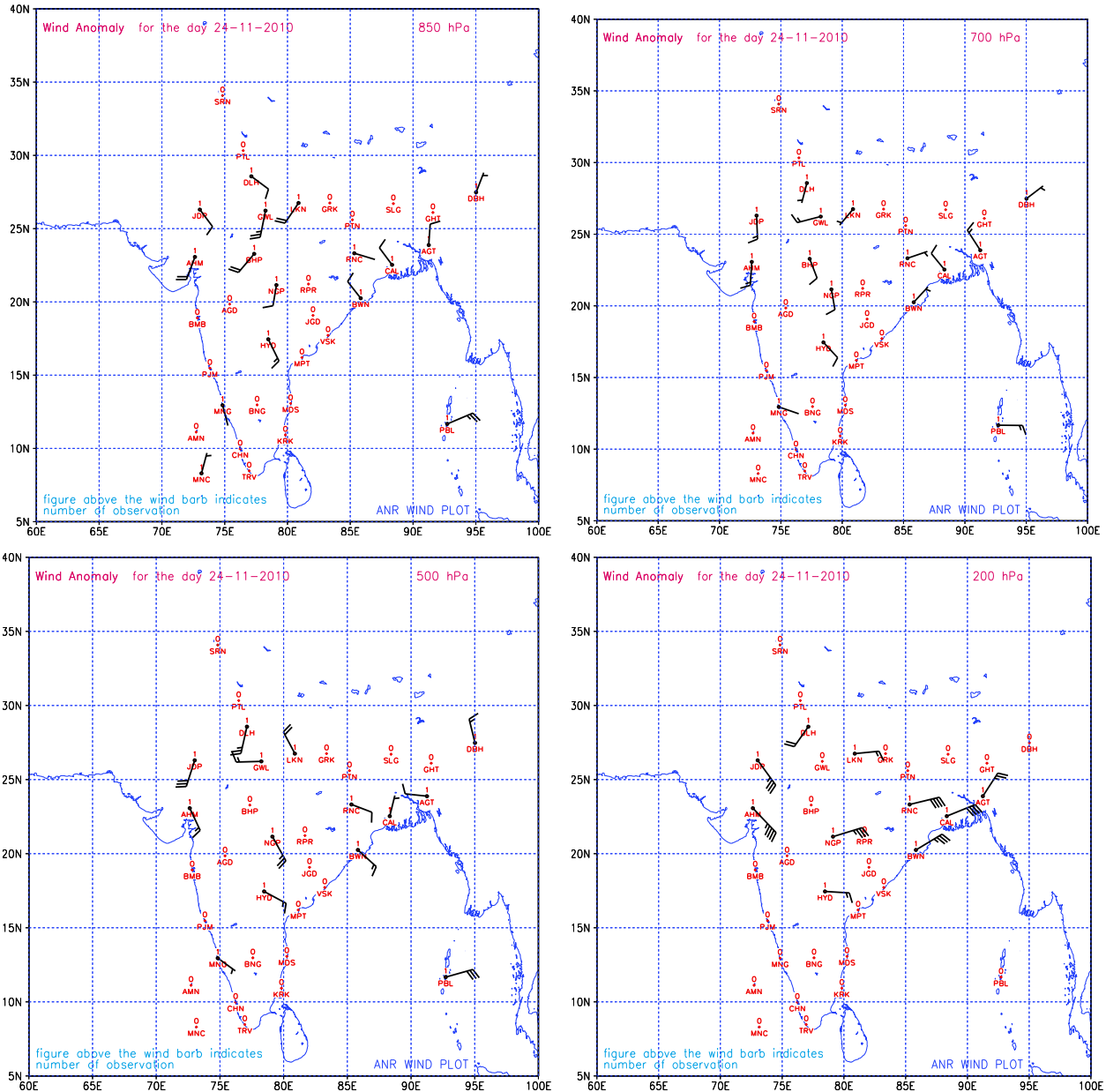
ONE OR TWO SPELLS RA/TSH WOULD OCCUR AAA MIN TEMP WOULD BE AROUND

23 DEG C AAA

ENDS AAA

PART – C

UPPER AIR WIND ANOMALIES DATED 24-11-2010



PART – D: UPPER AIR WINDS FORECAST OVER CHENNAI

WRF – MODEL OUTPUT INDICATES NORTHEASTERLY TO EASTERLY WINDS OF THE ORDER OF 5 TO 10 KNOTS UPTO 800 hPa, AND SOUTHEASTERLY TO EASTERLY WINDS OF THE ORDER OF 10 KNOTS FROM 800 TO 400 hPa OVER CHENNAI FOR NEXT 24 HOURS ENDING 00Z 25.11.2010 AAA

FDP (Cyclone) NOC Report Dated 25 November, 2010, 1500 hours IST

Weather Briefing:

Synoptic features:

Yesterday's trough of low pressure area now runs from north Andaman Sea to commorin area across south Bay of Bengal and Sri Lanka with embedded upper air cyclonic circulation over commorin and neighbourhood extending upto 2.1 km above mean sea level.

Upper tropospheric ridge:

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

Divergence:

- Upper air positive divergence ($10\text{-}20 \times 10^{-5} \text{ s}^{-1}$) prevails over commorin and coastal Sri Lanka.

Convergence:

- Lower level positive convergence ($5 \times 10^{-5} \text{ s}^{-1}$) prevails over over commorin and adjoining coastal Sri Lanka.

Wind Shear:

- Wind Shear is moderate (5-10 knots) over central Bay of Bengal and north Andaman Sea.

Wind Shear Tendency:

- Increasing (5-10 knots) over eastcentral Bay of Bengal.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive over commorin and southwest Bay of Bengal with magnitude of $2.5 \times 10^{-5} \text{ s}^{-1}$.

Sea Surface Temperature:

- SST around 29.0 - 31.0°C over southwest Bay of Bengal and commorin area.

Ocean thermal energy:

- Ocean thermal energy is mainly 100-110 KJ cm⁻² over south Bay of Bengal and commorin area and below 100 KJ cm⁻² elsewhere over Bay of Bengal.

M.J.O. Index:

- Located over phase 5 with amplitude less than 1.0.
- Statistical forecast: - MJO moves through phase 5, 6, & 7 during next 15 days.
- Dynamical forecast:- MJO located in phase 5 with amplitude less than 1.0 and moves through phase 5, 6, & 7 during next 15 days.

Status of observational system:

Details of the status of observational system are given in Annexure 1.

Satellite

Inference based on INSAT PICTURE of 250900 UTC

Bay of Bengal:-

Broken intense to very intense convection over southwest Bay of Bengal between Lat 10.0°N to 14.0°N west of Long 86.0°E (.) Scattered low/medium clouds with embedded isolated moderate to intense convection over rest south Bay of Bengal south of Lat 13.0°N and south Andaman Sea (.)

(See <ftp://192.168.12.75/imd/satmet>

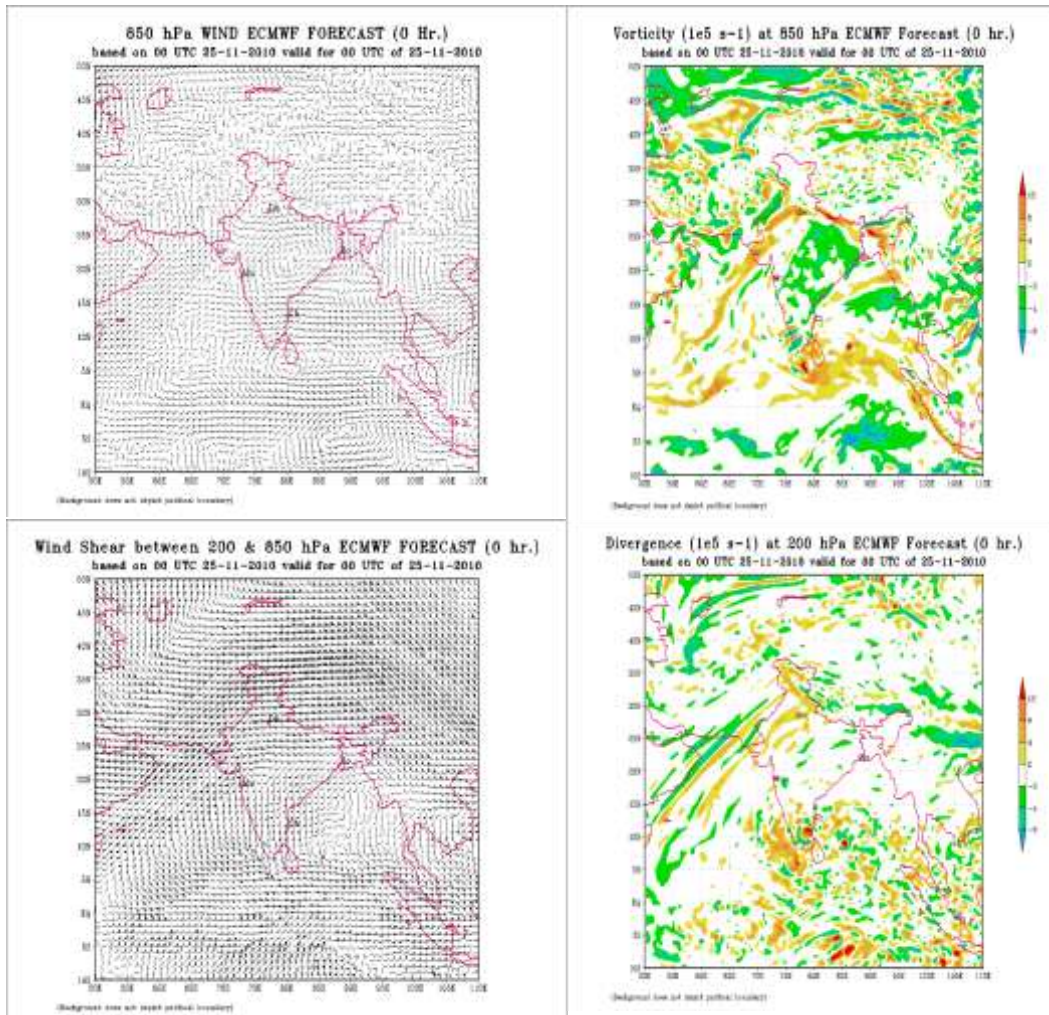
<http://www.imd.gov.in/section/satmet/dynamic/insat.htm>)

NWP Analysis

- **ECMWF** model of 00UTC of today (25 Nov 2010) shows a extended trough from south bay of Bengal to south-east Arabian sea upto Goa coast. The 96-hr forecast indicates the formation of a low pressure region over south-east Arabian sea and further forecast shows slight intensification of this system and moving westward.

- **IMD-GFS** model of 00UTC of today (25 Nov 2010) shows an extended trough of low pressure over south bay of Bengal to south-east Arabian sea. The 24-hr forecast shows this trough extending upto Konkan coast over east Arabian sea and to Tamil Nadu and south Andhra coasts over south-west bay of Bengal. The 96-hr forecast shows intensification of this system over south Arabian sea into a low pressure region near Maldives and extension of its trough upto south Gujarat coast. Further forecast indicates this low pressure system is moving in a west-north-west direction.
- **WRF-ARW** model analysis of 00UTC of today (25 Nov 2010) indicates an extended low pressure over south-west bay of Bengal, Comorin to east Arabian sea upto south Gujarat. This system slightly intensifies near south Tamil Nadu coast.
- **UKMET** model analysis of 00UTC of today (25 Nov 2010) indicates a low pressure area over south-west bay of Bengal and the forecast shows this system of low pressure moves in west-north-west direction over to south Arabian sea.
- **NCMRWF-GFS** model analysis based on 00 UTC of today (25 Nov. 2010) shows the low pressure over south-west bay of Bengal and this system is moving westward to south Arabian sea.

Cyclogenesis Parameter



See <http://www.imd.gov.in/section/nhac/dynamic/welcome.htm>)

See ftp://ftp.ncmrwf.gov.in/pub/outgoing/TC_FDP/

Advisory.

- A trough of low pressure area runs from north Andaman Sea to commorin area.

▪ **NO IOP will be conducted till 27-11-2010.**

Forecast for Sagar Kanya ship:

Yesterday's trough of low pressure area now runs from north Andaman Sea to commorin area across south Bay of Bengal and Sri Lanka with embedded upper air cyclonic circulation over commorin and neighbourhood extending upto 2.1 km above mean sea level. The system is likely to move westwards.

Annexure-1

Status of Observation system:

Synop ← 24-11-2010 →← 25-11-2010 →

Region	09	12	15	18	21	00	03	06
GHT/KOL	29	65	18	26	20	28	67	26
CHN	43	71	40	39	31	47	78	39
NAG/MUM	23	44	34	36	31	35	45	29

AWS

← 24-11-2010 →← 25-11-2010

UTC	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07
Nos	519	521	514	524	455	449	452	412	442	445	436	428	438	445	445	436	429	438	441	455	483	493	452	448

RSRW (12Z) 24-11-2010: - 35/35

No. of Ascents reaching 250 hPa levels: 07

MISDA:-SRN, PTL, JDP, LKN, GRK, DBH, SLG, GHT, PTN, RNC, GWL, BHP, NAG, RPR, JGD, AHM, BOM, AUG, PNJ, HYD, MDS, MNG, BNG, AMN, CHN, MNC, AGT & PTN(28)

RSRW (00Z) 25-11-2010: - 36/36 (Minicoy not received)

No. of Ascents reaching 250 hPa levels: 22

MISDA: (SRN, PTL, GHT, MDS, BNG, AMN & CHN) (7)

No. of PILOT Ascents

24-11-2010				25-11-2010			
12Z		18Z		00Z		06Z	
35		29		35		33	

Buoy Data

23-11-2010					24-11-2010		
09Z	12Z	15Z	18Z	21Z	00Z	03Z	06Z
05	05	05	05	05	07	04	04

No. of GPS Data

12Z/ Date: 24.11.2010:- Nil

00Z/ date:25.11.2010:- Nil

List of stations of neighbouring countries
DATE 24-11-2010

Country	Total No. of station	Hours of observations (UTC)							
		00	03	06	09	12	15	18	21
Sri Lanka	8	8	8	8	8	8	8	6	6
Bangladesh	11	6	6	6	5	6	6	1	5
Myanmar	10	8	5	6	6	7	1	6	1
Thailand	1	1	1	1	1	1	1	1	1

Remarks:

- 1 Upper air information from DDGM(UI) not received.
- 2 RMC KOLKATA: Please send latest observation information till 0000 UTC of date daily.

Annexure-II



India Meteorological Department

REGIONAL METEOROLOGICAL CENTRE, CHENNAI

FDP (Cyclone) FOC Chennai Report Dated 25 NOV 2010, 1400 hrs

PART – A: STATUS OF OBSERVATION SYSTEM

No of Synop data

Date→	24.11.2010							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	19	24	20	20	23	19	19	18

No. of RS/RW Ascents

00Z / 24.11.2010 : 3

No. of Ascents reaching 250 hPa level =2

MISDA : 1

12Z /24.11.2010 : 3
No. of Ascents reaching 250 hPa level =2
MISDA : 1

No. of PILOT Ascents:

24.11.2010	
06Z	18Z
1	1

Status of AWS data is given in FDPNOC report.

PART – B: RMC CHENNAI INFERENCE

CHENNAI MNG INF DATED 25.11.2010.AAA

BAY INF AURORA AAA Y'S TRH OF LOW PRESSURE OVER SW BAY OFF SRILANKA COT PERSTS AAA WX SSL ELSEWHERE BAY AND ADMN SEA AAA

ARSEA INF AURORA AAA Y'S TRH OF LOW PRESSURE OVER LKD AREA AND N/HOOD PERSTS AAA WX SSL ELSEWHERE ARSEA AAA

REGN INF AAA NE MON HAS BEEN ACTIVE OVER TN AND KRL AAA

Y'S TRH OF LOW PRESSURE OVER SW BAY OFF SRILANKA COT PERSTS AAA ASSTD U/A CYCIR/TRH EXTDS UPTO 1.5 KM ASL AAA Y'S TRH OF LOW PRESSURE OVER LKD AREA AND N/HOOD PERSTS AAA

BLG(AP)RECORDED THE LOWEST MIN TEMPERATURE OF 16 DEG C IN THE PLAINS OF THE REGION AAA

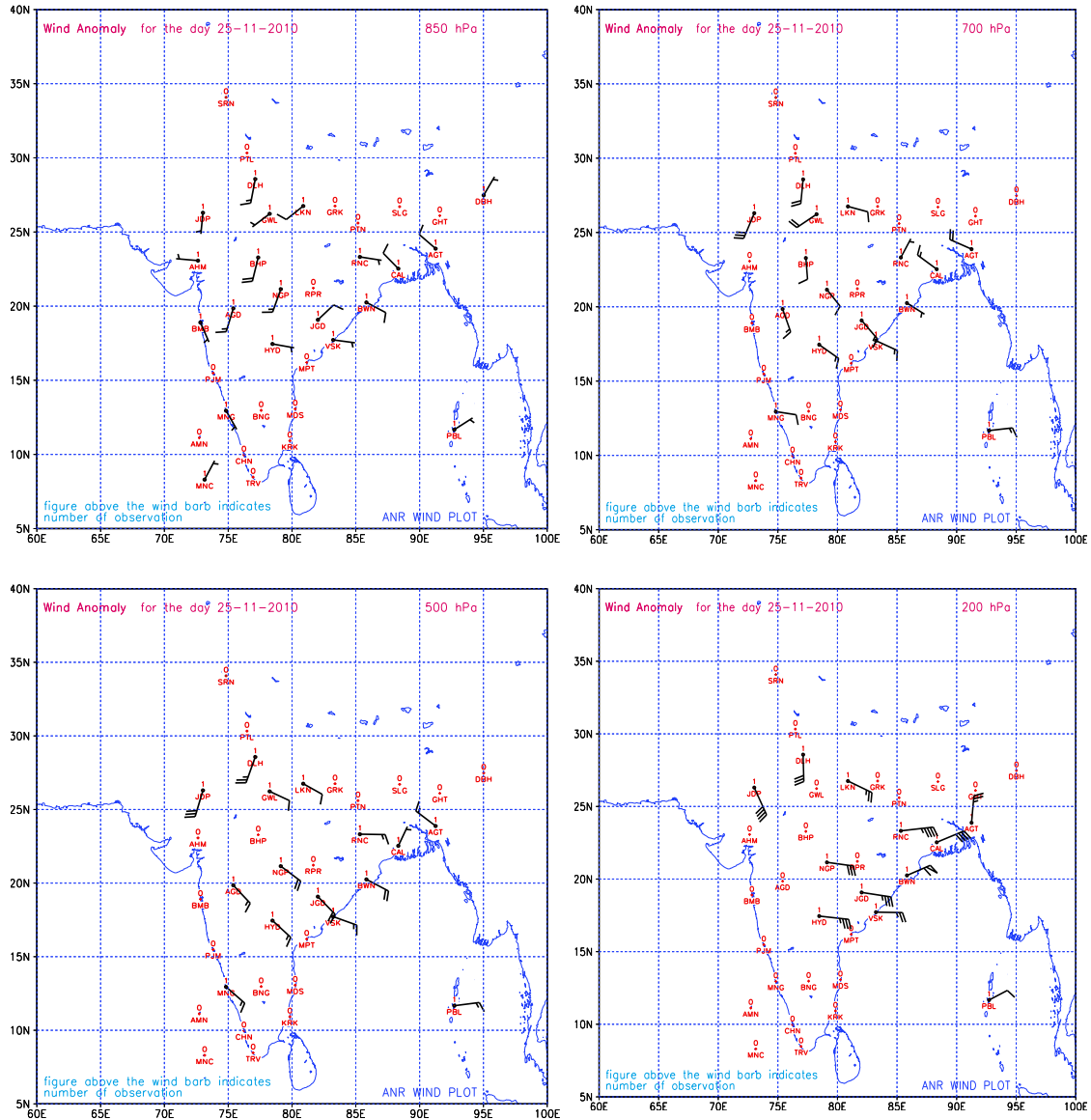
FCST AAA RA/TSH WOULD OCCUR AT MANY PLACES OVER TN/PDC AND KRL AND AT A FEW PLACES OVER CK AAA ISOL RA/TSH MAY OCCUR OVER IK,AP AND LKD AAA

HRW AAA ISOL XX TO VERY XX RA WOULD OCCUR OVER TN/PDC AND KRL DURING NEXT 48 HOURS AAA

ENDS AAA

PART – C

UPPER AIR WIND ANOMALIES DATED 25-11-2010



PART – D: UPPER AIR WINDS FORECAST OVER CHENNAI

WRF – MODEL OUTPUT INDICATES NORTHEASTERLY WINDS OF THE ORDER OF 10 KNOTS UPTO 800 hPa, AND SOUTHEASTERLY TO NORTHEASTERLY WINDS OF THE ORDER OF 10 TO 15 KNOTS FROM 800 TO 400 hPa OVER CHENNAI FOR NEXT 24 HOURS ENDING 00Z 26.11.2010 AAA



Regional Meteorological Centre, Kolkata
ACWC Kolkata

FDP Cyclone-2010 (Status of daily observation)

No of Synop data

Date→	24.11.10							
UTC→	00	03	06	09	12	15	18	21
Coasts of WB & ORS	10	11	10	10	11	10	10	10

No. of RS/RW Ascents

00Z / 24.11.2010 : 3

No. of Ascents reaching 250 hpa level =3

MISDA : 0

12Z /24.11.2010 : 3

No. of Ascents reaching 250 hpa level =3

MISDA : 0

No. of PILOT Ascents:

24.11.2010			
00Z	06Z	12Z	18Z
2	2	2	4

FDP (Cyclone) NOC Report Dated 26 November, 2010, 1500 hours IST

Weather Briefing:

Synoptic features:

Yesterday's trough of low pressure area from north Andaman Sea to commorin has become less marked.

Inter Tropical Convergent Zone (ITCZ) runs along Lat about 5.0N and convergence is active over south Bay of Bengal

Upper tropospheric ridge:

- The upper tropospheric ridge line roughly runs along Lat 14.0°N at 200 hPa level.

Divergence:

- Upper air positive divergence ($5\text{--}10 \times 10^{-5} \text{ s}^{-1}$) prevails over commorin area, adjoining coastal Sri Lanka and north Andaman Sea.

Convergence:

- Lower level positive convergence ($5 \times 10^{-5} \text{ s}^{-1}$) prevails over southeast Bay of Bengal and adjoining Andaman Sea.

Wind Shear:

- Wind Shear is moderate (5-10 knots) over southeast Bay of Bengal and Andaman Sea.

Wind Shear Tendency:

- Increasing (5-10 knots) over south Bay of Bengal.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive over south Bay of Bengal with magnitude of $2.5 \times 10^{-5} \text{ s}^{-1}$.

Sea Surface Temperature:

- SST around 29.0 - 31.0°C over south and westcentral Bay of Bengal.

Ocean thermal energy:

- Ocean thermal energy is mainly 100-110 KJ cm⁻² over south Bay of Bengal and commorin area and below 100 KJ cm⁻² elsewhere over Bay of Bengal.

M.J.O. Index:

- Located over phase 4 with amplitude less than 1.0.
- Statistical forecast: - MJO moves through phase 3, 1, & 1 during next 15 days.
- Dynamical forecast: - MJO located in phase 4 with amplitude less than 1.0 and moves through phase 3, 2, & 1 during next 15 days.

Status of observational system:

Details of the status of observational system are given in Annexure 1.

Satellite

Inference based on INSAT PICTURE of 260900 UTC

Bay of Bengal:-

Scattered low/medium clouds with embedded moderate to intense convection over Bay of Bengal between Lat 05.0N to 16.0N west of long 86.0E (.) Scattered low/medium clouds with embedded isolated weak to moderate convection over rest south Bay of Bengal and south Andaman Sea (.)

(See <ftp://192.168.12.75/imd/satmet>

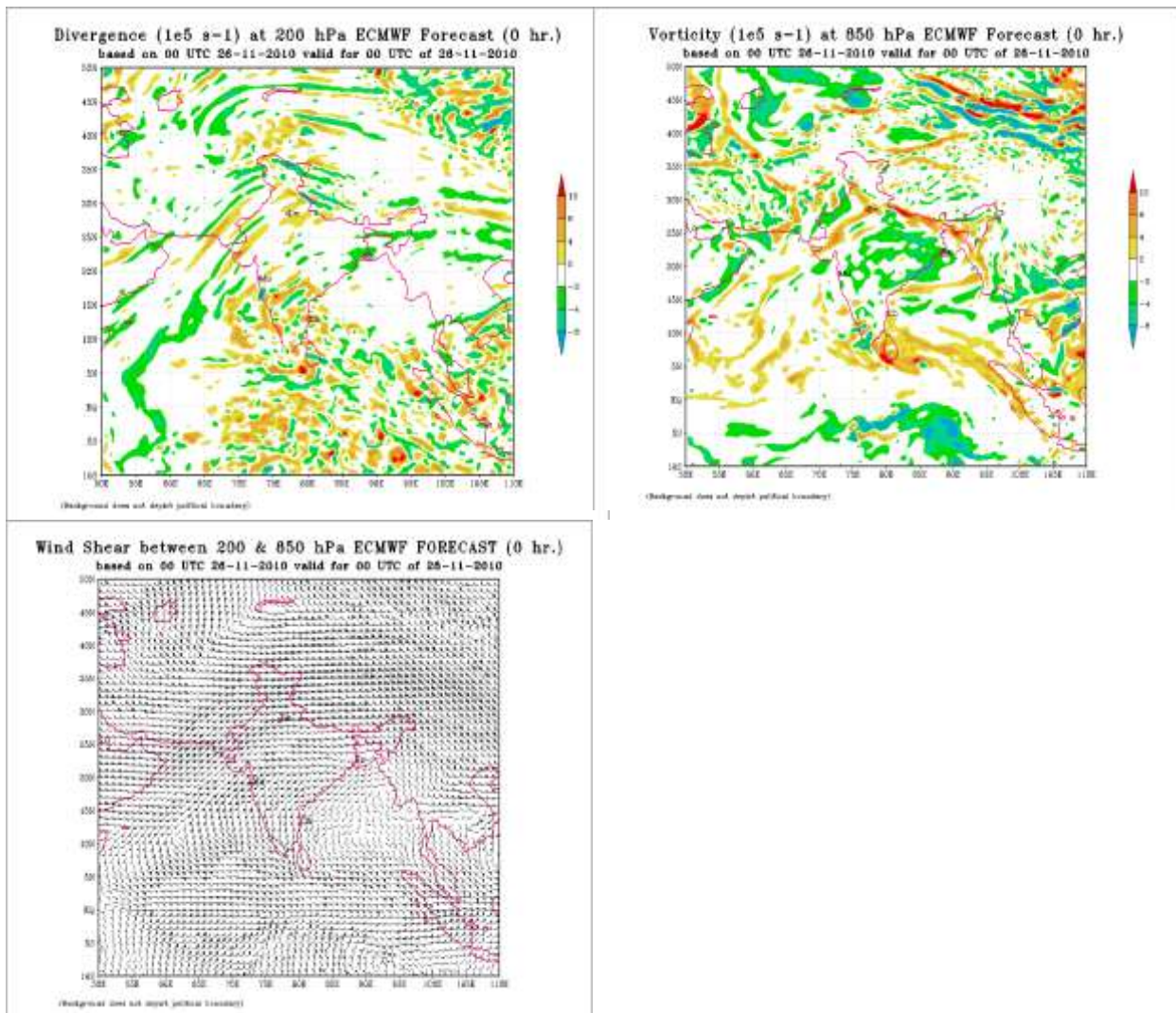
<http://www.imd.gov.in/section/satmet/dynamic/insat.htm>)

NWP Analysis

- **ECMWF** model analysis of 00UTC of today (26 Nov.2010) shows a cyclonic circulation off the Sri Lanka coast and is likely to move westwards and weaken in south Kerala coast.

- **IMDGFS** model analysis of 00UTC of today (26 Nov.2010) and forecast fields indicate that there would not be formation any cyclonic circulation either over Bay of Bengal or Arabian Sea during next 72 hours.
- **IMD WRF-ARW** model analysis of 00UTC of today (26 Nov.2010) and forecast fields also indicate that there would not be formation of cyclonic circulation either over Bay of Bengal or Arabian Sea.
- **UKMET model** analysis of 00 UTC of today (26 Nov. 2010) shows a cyclonic circulation lying near to Sri Lanka coast. The 72 hour forecast field indicates a cyclonic circulation off the South Andhra coast.
- **NCMRWF-GFS** model analysis of 00 UTC of today (26 Nov. 2010) shows a feeble cyclonic circulation near to south of Sri Lanka coast. The forecast charts indicate that the circulation is likely to move westwards during next 48 hours through tip of peninsular region and decay in the 72 hour forecast.

Analysis parameters Vorticity(850hPa), windshear(850hPa) and the upper level divergence(200hPa) **based on ECMWF**



Summary:

NWP models indicate that a feeble cyclonic circulation is lying south of Sri Lankan coast and is likely to move westwards and weaken in Arabian sea. There is no likelihood for formation of low pressure either in the Bay of Bengal or Arabian Sea.

See <http://www.imd.gov.in/section/nhac/dynamic/welcome.htm>)

See ftp://ftp.ncmrwf.gov.in/pub/outgoing/TC_FDP/

Advisory.

- The trough of low pressure area north Andaman Sea to commorin area has become less marked.
- **NO IOP will be conducted till 29-11-2010.**

Annexure-1**Status of Observation system:**

Synop	← 25-11-2010				→← 26-11-2010	→		
Region	09	12	15	18	21	00	03	06
GHT/KOL	28	67	25	26	24	28	69	36
CHN	43	71	38	32	38	43	83	47
NAG/MUM	33	84	29	30	29	33	88	41

AWS ← 25-11-2010														→← 26-11-2010													
UTC	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07			
Nos	439	439	374	470	474	472	473	471	470	474	474	473	470	470	465	471	465	467	459	472	471	469	467	395			

RSRW (12Z) 25-11-2010: - 35/35

No. of Ascents reaching 250 hPa levels: 07

MISDA:- PTL, JDP, LKN, GRK, DBH, SLG, GHT, PTN, RNC, AGT, PBL, GWL, BHP, NAG, RPR, JGD, AHM, BOM, AUG, PNJ, HYD, MDS, MNG, BNG, AMN, CHN & MNC (27)

RSRW (00Z) 26-11-2010: - 36/36 (Minicoy not received)

No. of Ascents reaching 250 hPa levels: 23

MISDA: (PTL, GHT, BPR, JGD, MDS, BNG, AMN & CHN) (8)

No. of PILOT Ascents

25-11-2010				26-11-2010			
12Z		18Z		00Z		06Z	
34		51		33		29	

Buoy Data

25-11-2010					26-11-2010		
09Z	12Z	15Z	18Z	21Z	00Z	03Z	06Z
-	-	04	03	04	05	-	04

No. of GPS Data

12Z/ Date: 25.11.2010:- Nil

00Z/ date:26.11.2010:- Nil

List of stations of neighbouring countries

DATE 25-11-2010

Country	Total No. of station	Hours of observations (UTC)							
		00	03	06	09	12	15	18	21
Sri Lanka	8	8	8	8	8	7	8	6	6
Bangladesh	11	6	5	5	6	5	4	3	4
Myanmar	10	7	7	7	7	7	1	7	1
Thailand	1	1	1	1	1	1	1	1	1

Status of RSRW Data

		25-11-2010 00UTC			26-11-2010 00UTC		
		RS last level		Wind last level	RS last level		Wind last level
STATION Index	STATION Name	mb	Km	mb	mb	Km	mb
42410	GHT	Misda due to GET			Misda due to GET		
42809	CAL	12.1	30.4	20	22	26.2	22
43333	PBL	56.8	19.3	58	Misda due to NI		
42971	BWN	28.6	24.4	114	16	27.3	62.5
43150	VSK	100	16.4	100	148	14.3	148
43185	MPT	29.4	24.3	169	35	22.9	167
43128	HYD	17.3	27.4	17	3.4	38.3	3.4
43279	CHN	Misda due to NI			Misda due to NI		
43346	KRK	13.4	29.1	nil	167	13.4	821
43371	TRV	95.2	16.7	nil	107	15.8	nil
43192	GOA	162	13.7	nil	196	12.4	nil
43003	MUM	832	1.6	836	328	9.1	753
43285	MNG	177	13	450	197	12.4	665
42647	AHM	20.6	26.2	770	29	24.3	29
43369	MNC	73.5	18.4	767	70	18.7	734
43353	KOCHI	Misda due to NB			Misda due to NB		
42724	AGT	18.5	27.2	19	21.8	26.1	22

Remarks:

3. RMC KOLKATA: Please send latest observation information till 0000 UTC of date daily.



India Meteorological Department

REGIONAL METEOROLOGICAL CENTRE, CHENNAI

FDP (Cyclone) FOC Chennai Report Dated 26 NOV 2010, 1400 hrs

PART – A: STATUS OF OBSERVATION SYSTEM

No of Synop data

Date→	25.11.2010							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	19	23	20	20	23	19	14	19

No. of RS/RW Ascents

00Z / 25.11.2010 : 3

No. of Ascents reaching 250 hPa level =3

MISDA : 1

12Z /25.11.2010 : 3

No. of Ascents reaching 250 hPa level =3

MISDA : 1

No. of PILOT Ascents:

25.11.2010	
06Z	18Z
2	1

Status of AWS data is given in FDPNOC report.

PART – B: RMC CHENNAI INFERENCE

CHENNAI MNG INF DATED 26.11.2010.AAA

BAY INF AURORA AAA Y'S TRH OF LOW PRESSURE OVER SW BAY OFF SRILANKA COT PERSTS AAA WX SSL ELSEWHERE BAY AND ADMN SEA AAA

ARSEA INF AURORA AAA Y'S TRH OF LOW PRESSURE OVER SE ARSEA OFF LKD AREA AND N/HOOD PERSTS AAA WX SSL ELSEWHERE ARSEA AAA

REGN INF AAA NE MON HAS BEEN ACTIVE OVER CTN AAA Y'S TRH OF LOW PRESSURE OVER SW BAY OFF SRILANKA COT PERSTS AAA AN U/A CYCIR/TRH LIES OVER SW BAY OFF SRILANKA COT AND N/HOOD AND EXTDS UPTO 3.6 KM ASL AAA Y'S TRH OF LOW PRESSURE OVER SE ARSEA OFF LKD AREA AND N/HOOD PERSTS AAA

AN EAST-WEST SHEAR LINE RUNS FROM SW BAY TO SE ARSEA ACROSS EXTREME SOUTH PENINSULA WITH AN EMBEDDED CYCIR OVER LKD AREA AND EXTDS UPTO 2.1 ASL AAA

ADL RECORDED THE LOWEST MIN TEMPERATURE OF 15 DEG C IN THE PLAINS OF THE REGION AAA

FCST AAA RA/TSH WOULD OCCUR AT MANY PLACES OVER TN/PDC ,KRL,LKD AND SIK AND AT A FEW PLACES OVER CK AND SCAP AAA ISOL RA/TSH MAY OCCUR OVER RYLS AAA MAINLY DRY WEATHER WILL PREVAIL OVER TLGN,NIK AND NCAP AAA

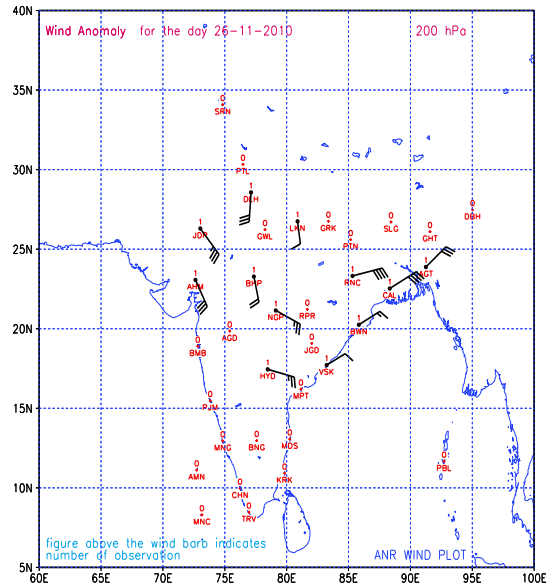
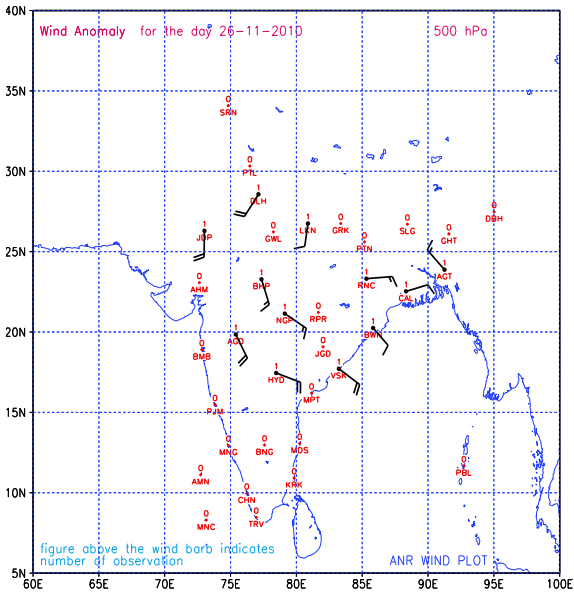
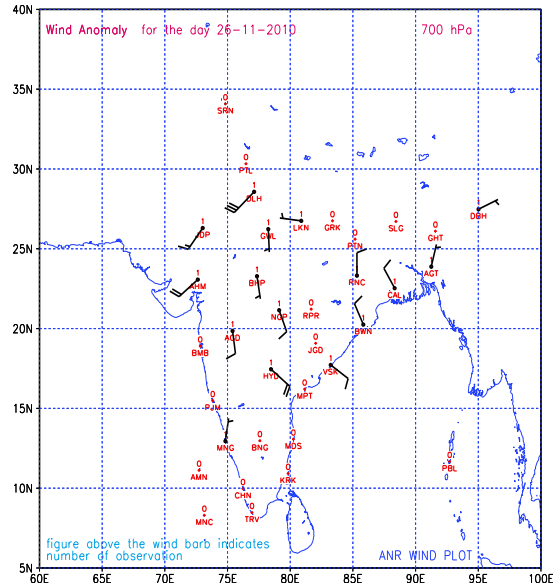
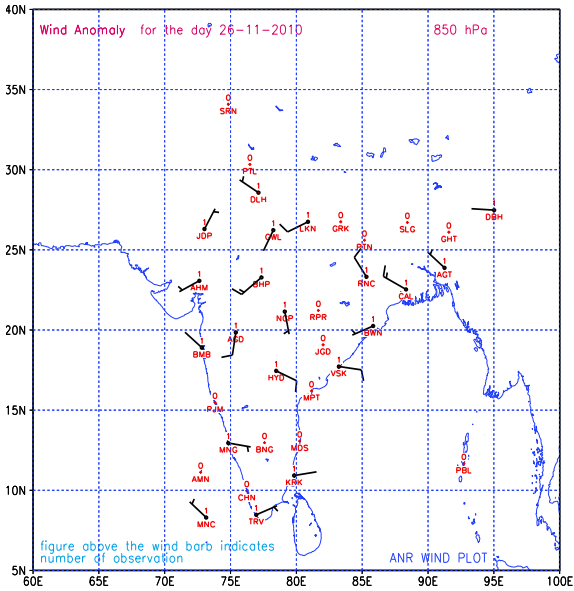
HRW AAA ISOL XX TO VERY XX RA WOULD OCCUR OVER TN/PDC DURING NEXT 48 HOURS AAA ISOL XX RA WOULD ALSO OCCUR OVER KRL AND GHAT AREAS OF SIK DURING THE SAME PERIOD AAA

ENDS AAA

=====

PART – C

UPPER AIR WIND ANOMALIES DATED 26-11-2010



PART – D: UPPER AIR WINDS FORECAST OVER CHENNAI

WRF – MODEL OUTPUT INDICATES NORTHERLY TO NORTHEASTERLY WINDS OF THE ORDER OF 10 TO 15 KNOTS UPTO 900 hPa, EASTERLY WINDS OF THE ORDER OF 15 KNOTS FROM 900hPa TO 600hPa, AND SOUTHEASTERLY TO SOUTHERLY WINDS OF THE ORDER OF 10 TO 15 KNOTS FROM 600 TO 400 hPa OVER CHENNAI FOR NEXT 24 HOURS ENDING 00Z 27.11.2010 AAA



Regional Meteorological Centre, Kolkata
ACWC Kolkata

FDP Cyclone-2010 (Status of daily observation)

No of Synop data

Date→	25.11.10							
UTC→	00	03	06	09	12	15	18	21
Coasts of WB & ORS	10	11	10	10	11	10	10	10

No. of RS/RW Ascents

00Z / 25.11.2010 : 3

No. of Ascents reaching 250 hpa level =3

MISDA : 0

12Z /25.11.2010 : 3

No. of Ascents reaching 250 hpa level =3

MISDA : 0

No. of PILOT Ascents:

25.11.2010			
00Z	06Z	12Z	18Z
0	2	1	4

FDP (Cyclone) NOC Report Dated 27 November, 2010, 1500 hours IST

Weather Briefing:

Synoptic features:

A cyclonic circulation lies over southwest Bay of Bengal and adjoining Sri Lanka at lower levels.

Inter Tropical Convergent Zone (ITCZ) runs along Lat about 5.0N and convergence is active over south Bay of Bengal

Upper tropospheric ridge:

- The upper tropospheric ridge line roughly runs along Lat 15.0°N at 200 hPa level.

Divergence:

- Upper air positive divergence ($5-10 \times 10^{-5} \text{ s}^{-1}$) prevails over commorin area, adjoining coastal Sri Lanka and north Andaman Sea.

Convergence:

- Lower level positive convergence ($5 \times 10^{-5} \text{ s}^{-1}$) prevails over southeast Bay of Bengal and adjoining Andaman Sea.

Wind Shear:

- Wind Shear is moderate (5-10 knots) over southeast Bay of Bengal and Andaman Sea.

Wind Shear Tendency:

- Increasing (5-10 knots) over Andaman Sea.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive over south Bay of Bengal with magnitude of $2.5 \times 10^{-5} \text{ s}^{-1}$.

Sea Surface Temperature:

- SST around 29.0 - 31.0°C over south and westcentral Bay of Bengal.

Ocean thermal energy:

- Ocean thermal energy is mainly 100-110 KJ cm⁻² over south Bay of Bengal and commorin area and below 100 KJ cm⁻² elsewhere over Bay of Bengal.

M.J.O. Index:

- Located over phase 4 with amplitude less than 1.0.
- Statistical forecast: - MJO moves through phase 3, 1, & 1 during next 15 days.
- Dynamical forecast: - MJO located in phase 4 with amplitude less than 1.0 and moves through phase 3, 2, & 1 during next 15 days.

Status of observational system:

Details of the status of observational system are given in Annexure 1.

Satellite

Inference based on INSAT PICTURE of 270900 UTC

Bay of Bengal:-

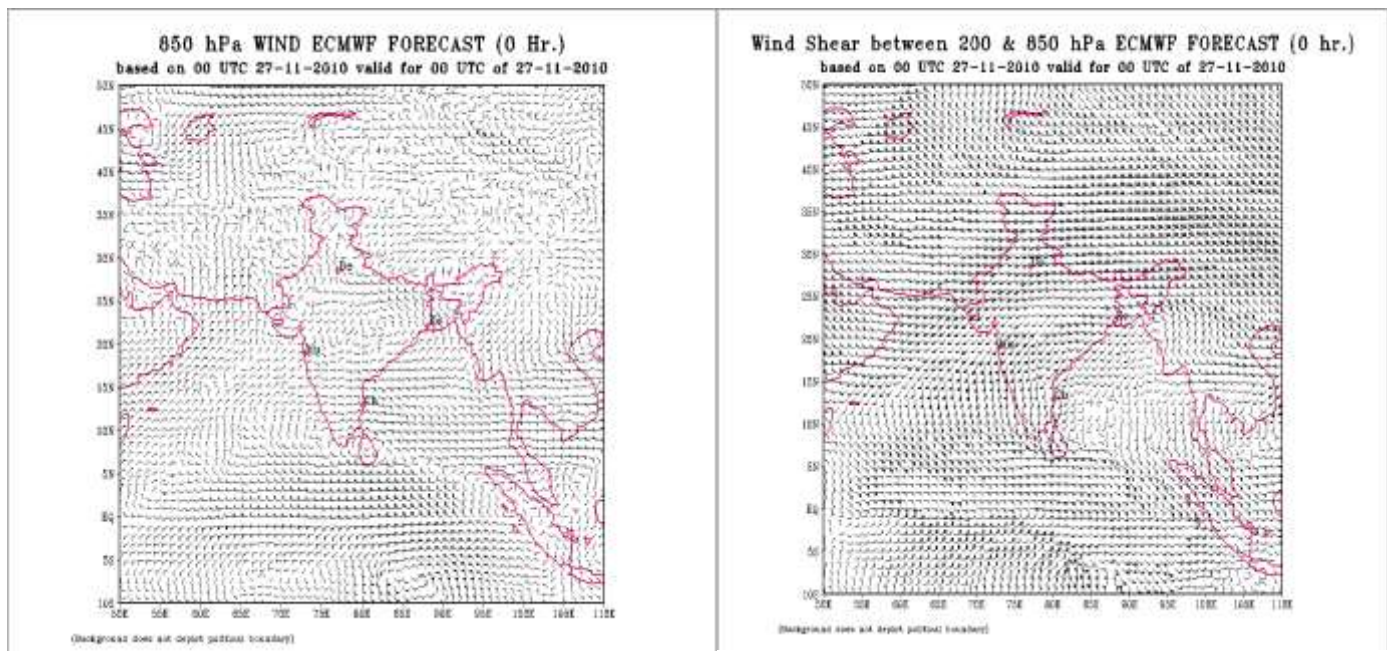
Low/medium clouds at many places with embedded moderate to intense thunder clouds at many places over bay south of lat 18.0°N west of long 85.0°E and south of lat 7.0° N and over extreme south Andaman Sea (.) Low/med clouds at many places with embedded weak to moderate thunder clouds at few places over rest south bay and rest south Andaman Sea (.)

(See <ftp://192.168.12.75/imd/satmet>
<http://www.imd.gov.in/section/satmet/dynamic/insat.htm>)

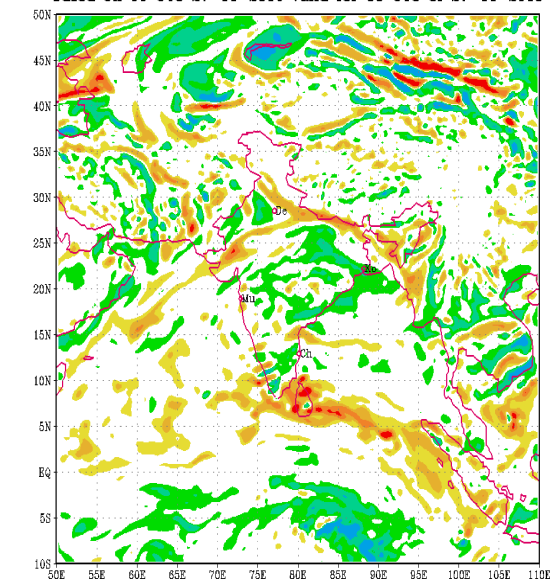
NWP Analysis

- **ECMWF** model of 00UTC of today (27 Nov 2010) shows a extended trough from south Andaman sea, south bay of Bengal to south-east Arabian sea upto Gujarat coast. The forecast indicates slight intensification of this trough of low pressure over south-east Arabian sea and moving in west-north-west direction. The 168-hr forecast shows formation of a low pressure over Ceylon and adjoining Tamil Nadu coast of south-west bay of Bengal on 4th Dec., 2010.
- **IMD-GFS** model of 00UTC of today (27 Nov 2010) shows an extended trough of low pressure over south Andaman sea, south bay of Bengal, Lakshdweep, Minicoy area upto Gujarat coast over east Arabian sea. Forecast shows slight intensification of this trough and extended upto Gujarat.
- **WRF-ARW** model analysis of 00UTC of today (27 Nov 2010) indicates an extended low pressure region over south Andaman sea, south bay of Bengal to north Maharastra coast on east Arabian sea. The 24-hr forecast shows formation of a low pressure area over Lakshadweep and Minicoy islands and further forecast shows slight intensification of this system and movement in west-north-west direction.
- **UKMET** model analysis of 00UTC of today (27 Nov 2010) indicates a feeble low pressure area over south-west bay of Bengal and the resulting trough upto south east Arabian sea.
- **NCMRWF-GFS** model analysis based on 00 UTC of today (27 Nov. 2010) shows a feeble low pressure over south-west bay of Bengal near Tamil Nadu coast and Sri Lanka and the resulting trough extends upto north Kerala coast over south-east Arabian sea. The forecast shows the system moving west-north-westward without much intensification.

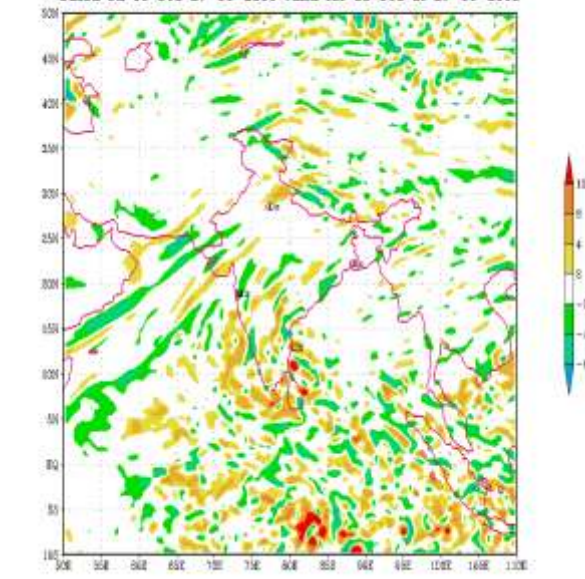
Analysis of Cyclogenesis Parameters



Vorticity ($1e5 \text{ s}^{-1}$) at 850 hPa ECMWF Forecast (0 hr.)
based on 00 UTC 27-11-2010 valid for 00 UTC of 27-11-2010



Divergence ($1e5 \text{ s}^{-1}$) at 200 hPa ECMWF Forecast (0 hr.)
based on 00 UTC 27-11-2010 valid for 00 UTC of 27-11-2010



<http://www.imd.gov.in/section/nhac/dynamic/welcome.htm>)

ftp://ftp.ncmrwf.gov.in/pub/outgoing/TC_FDP/

Advisory.

- NO IOP will be conducted till 29-11-2010.

Annexure-1

Status of Observation system:

Synop ← 26-11-2010 →← 27-11-2010 →

Region	09	12	15	18	21	00	03	06
GHT/KOL	29	83	25	24	25	26	49	39
CHN	35	79	39	37	39	39	59	46
NAG/MUM	19	41	21	18	19	21	40	36

AWS ← 26-11-2010 →← 27-11-2010

UTC	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07
Nos	468	469	471	473	446	520	514	506	506	513	506	511	514	514	511	505	519	467	467	485	476	476	477	476

RSRW (12Z) 26-11-2010: - 35/35

No. of Ascents reaching 250 hPa levels: 07

MISDA:- PTL, JDP, LKN, GRK, DBH, SLG, GHT, PTN, RNC, AGT, GWL, BHP, NAG, RPR, JGD, AHM, AUG, PNJ, HYD, MDS, MNG, BNG, AMN, CHN & MNC
(25)

RSRW (00Z) 27-11-2010: - 36/36 (Minicoy not received)

No. of Ascents reaching 250 hPa levels: 20

MISDA: (PTL, JDP, LKN, DBH, GHT, PNJ, MDS, BNG, AMN & CHN) (8)

No. of PILOT Ascents

26-11-2010		27-11-2010	
12Z	18Z	00Z	06Z
35	46	30	30

Buoy Data

26-11-2010					27-11-2010		
09Z	12Z	15Z	18Z	21Z	00Z	03Z	06Z
04	04	04	04	04	04	04	05

No. of GPS Data

12Z/ Date: 26.11.2010:- Nil

00Z/ date:27.11.2010:- Nil

List of stations of neighbouring countries

DATE 26-11-2010

Country	Total No. of station	Hours of observations (UTC)							
		00	03	06	09	12	15	18	21
Sri Lanka	8	8	8	8	8	8	8	6	6
Bangladesh	11	8	7	8	9	5	3	6	0
Myanmar	10	7	0	0	8	8	0	6	1
Thailand	1	1	1	1	1	1	1	1	1



India Meteorological Department

REGIONAL METEOROLOGICAL CENTRE, CHENNAI

FDP (Cyclone) FOC Chennai Report Dated 27 NOV 2010, 1400 hrs

PART – A: STATUS OF OBSERVATION SYSTEM

No of Synop data

Date→	26.11.2010							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	19	23	20	20	23	18	19	19

No. of RS/RW Ascents

00Z / 26.11.2010 : 3

No. of Ascents reaching 250 hPa level =3

MISDA : 1

12Z /26.11.2010 : 3

No. of Ascents reaching 250 hPa level =3

MISDA : 1

No. of PILOT Ascents:

26.11.2010	
06Z	18Z
1	1

Status of AWS data is given in FDPNOC report.

PART – B: RMC CHENNAI INFERENCE

CHENNAI MNG INF DATED 27.11.2010.AAA

BAY INF AURORA AAA Y'S TRH OF LOW PRESSURE OVER SW BAY OFF SRILANKA COT PERSTS AAA WX SSL ELSEWHERE BAY AND ADMN SEA AAA

ARSEA INF AURORA AAA Y'S TRH OF LOW PRESSURE OVER SE ARSEA OFF LKD AREA AND N/HOOD NOW LIES OVER LKDP AREA AND N/HOOD AAA
WX SSL ELSEWHERE ARSEA AAA

REGN INF AAA NE MON HAS BEEN VIG OVER TN AAA Y'S TRH OF LOW PRESSURE OVER SW BAY OFF SRILANKA COT PERSTS AAA Y'S TRH OF LOW PRESSURE OVER SE ARSEA OFF LKD AREA AND N/HOOD NOW LIES OVER LKDP AREA AND N/HOOD AAA AN EAST-WEST SHEAR LINE RUNS ROUGHLY ACROSS EXTREME SOUTH PENINSULA AND SRILANKA WITH EMBEDDED CYCIRS OVER LKD AREA AND N/HOOD AND OVER SRILANKA AND N/HOOD EXTDS UPTO 3.1 ASL AAA

RCH RECORDED THE LOWEST MIN TEMPERATURE OF 15 DEG C IN THE PLAINS OF THE REGION AAA

FCST AAA RA/TSH WOULD OCCUR AT MOST PLACES OVER CTN, PDC, AT MANY PLACES OVER ITN, KRL AND LKD AND AT A FEW PLACES OVER CK AND SIK AAA ISOL RA/TSH MAY OCCUR OVER RYLS AND SCAP AAA MAINLY DRY WEATHER MAY PREVAIL OVER NIK, TLGN AND NCAP AAA

HRW AAA ISOL XX TO VERY XX RA WOULD OCCUR OVER TN/PDC DURING NEXT 48 HOURS AAA ISOL XX RA WOULD ALSO OCCUR OVER KRL AND LKDP DURING THE SAME PERIOD AAA

ENDS AAA

=====

L/FCST AAA

FOR NEXT 24 HRS AAA THE SKY CONDITION WOULD BE GENERALLY CLOUDY AAA ONE OR TWO SPELLS OF RA/TSH WOULD OCCUR IN SOME AREAS AAA MIN TEMP WOULD BE AROUND 24 DEG C AAA

FOR NEXT 48 HRS AAA THE SKY CONDITION WOULD BE GENERALLY CLOUDY AAA ONE OR TWO SPELLS OF RA/TSH WOULD OCCUR IN SOME AREAS AAA MIN TEMP WOULD BE AROUND 24 DEG C AAA

ENDS AAA

FDP (Cyclone) NOC Report Dated 28 November, 2010, 1500 hours IST

Weather Briefing:

Synoptic features:

Inter Tropical Convergent Zone (ITCZ) runs along Lat about 6.0N.

Upper tropospheric ridge:

- The upper tropospheric ridge line roughly runs along Lat 15.0°N at 200 hPa level.

Divergence:

- Upper air positive divergence ($5-10 \times 10^{-5} \text{ s}^{-1}$) prevails over commorin area / coastal Sri Lanka, south Bay of Bengal and Andaman Sea.

Convergence:

- Lower level positive convergence ($5 \times 10^{-5} \text{ s}^{-1}$) prevails over southwest Bay of Bengal.

Wind Shear:

- Wind Shear is strong (20-30 knots) over Bay of Bengal and Andaman Sea.

Wind Shear Tendency:

- Increasing (5-10 knots) over Bay of Bengal and Andaman Sea.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive over commorin area and southwest Bay of Bengal with magnitude of $2.5 \times 10^{-5} \text{ s}^{-1}$.

Sea Surface Temperature:

- SST around 29.0 - 31.0°C over south and westcentral Bay of Bengal and 28.0 - 29.0°C elsewhere Bay of Bengal.

Ocean thermal energy:

- Ocean thermal energy is mainly 100-110 KJ cm⁻² over south Bay of Bengal and commorin area and below 100 KJ cm⁻² elsewhere over Bay of Bengal.

M.J.O. Index:

- Located over phase 5 with amplitude less than 1.0.
- Statistical forecast: - MJO moves through phase 5, 6, & 7 during next 15 days.
- Dynamical forecast: - MJO located in phase 5 with amplitude less than 1.0 and moves through phase 4, 3, 2, & 1 during next 15 days.

Status of observational system:

Details of the status of observational system are given in Annexure 1.

Satellite

Inference based on INSAT PICTURE of 280900 UTC

BAY OF BENGAL & ANDAMAN SEA: -

Broken low/med clouds with embedded intense to very intense convection over southeast Bay south of Lat 7.0° N adjoining south Andaman Sea (.) Broken low/med clouds with embedded moderate to intense convection over Bay south of lat 10. 0° N rest south Andaman Sea (.) Scattered Low/med clouds with embedded isolated weak to moderate convection over northwest, central Bay and central Andaman Sea (.)

(See <ftp://192.168.12.75/imd/satmet>

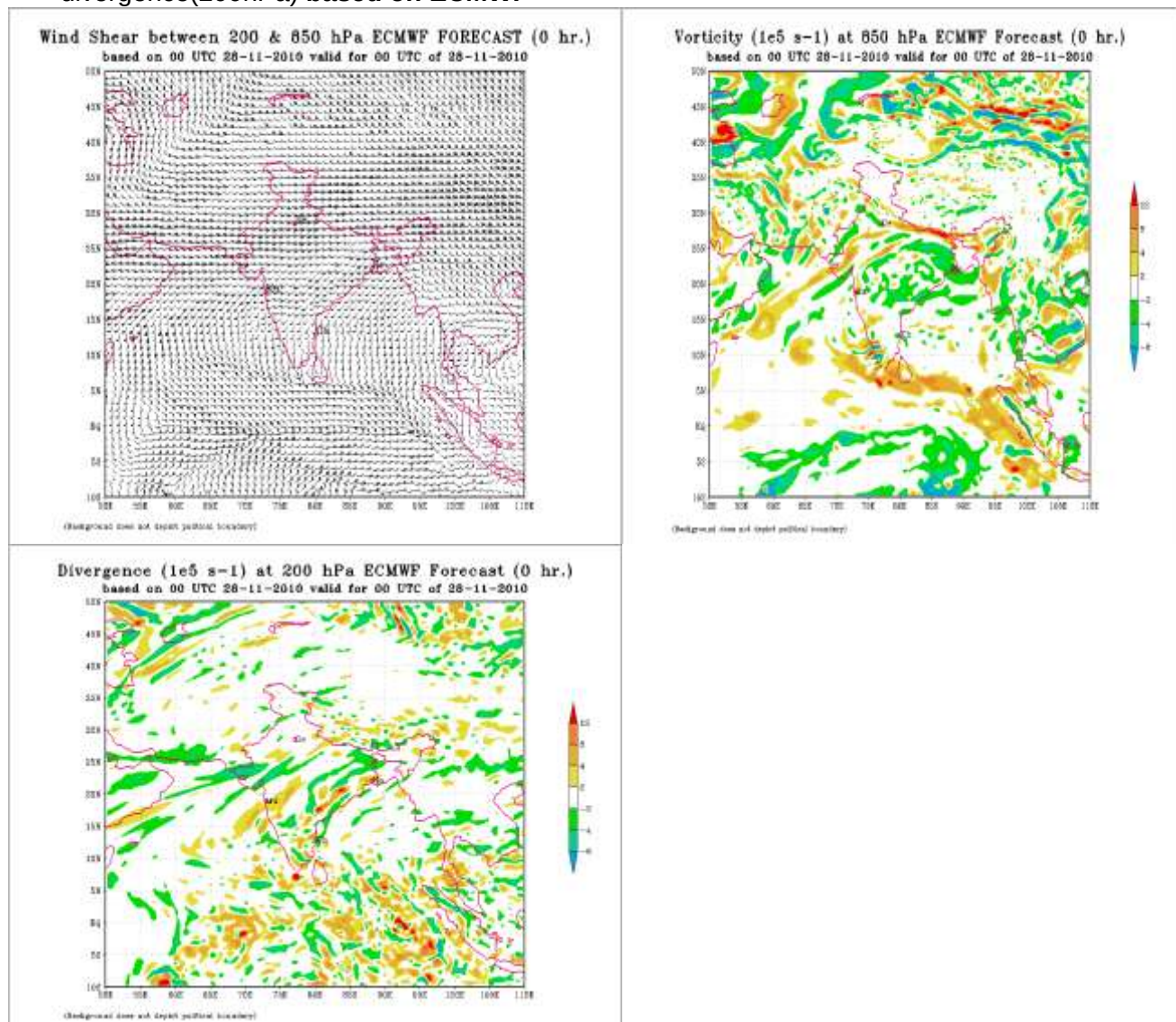
<http://www.imd.gov.in/section/satmet/dynamic/insat.htm>)

NWP

- **ECMWF** model analysis of 00UTC of today (28 Nov.2010) shows a trough of low pressure over Maldives and Comorin region.

- **IMDGFS** model analysis of 00UTC of today (28 Nov.2010) shows a trough of low pressure lying over Comorin region. The Forecast fields show, an associated cyclonic circulation in the southwest Bay of Bengal that is likely to move westward and likely to move over the Maldives region.
- **IMD WRF-ARW** model analysis of 00UTC of today (28 Nov.2010) shows a trough of low pressure lying over comorin region and moves westwards. The circulation is likely to intensify to a low pressure area in the next 72 hours.
- **UKMET** model analysis of 00 UTC of today (28 Nov. 2010) shows a feeble trough lying over Maldives and Comorin region
- **NCMRWF-GFS** model analysis of 00 UTC of today (28 Nov. 2010) shows a feeble cyclonic circulation over South Taminadu coast. The forecast charts indicate that the circulation is likely to move westwards and lie over south Kerala.

Analysis parameters Vorticity(850hPa), windshear(850hPa) and the upper level divergence(200hPa) **based on ECMWF**



(See <http://www.imd.gov.in/section/nhac/dynamic/welcome.htm>)
 See [ftp://ftp.ncmrwf.gov.in/pub/outgoing/TC FDP/](ftp://ftp.ncmrwf.gov.in/pub/outgoing/TC_FDP/)

Summary:

NWP models indicate that a feeble cyclonic circulation is lying over the Maldives and Commorin region on 28 November 2010. There is no likelihood of formation of system either in Bay of Bengal or Arabian Sea.

Advisory.

No significant weather system over Bay of Bengal.

- **NO IOP will be conducted till 30-11-2010.**

Annexure-1

Status of Observation system:

Synop ← 27-11-2010 →← 28-11-2010 →

Region	09	12	15	18	21	00	03	06
GHT/KOL	34	59	25	25	25	32	78	39
CHN	44	77	38	37	37	29	81	47
NAG/MUM	36	84	27	31	29	30	67	41

AWS ← 27-11-2010 →← 28-11-2010

UTC	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07
Nos	483	446	482	482	479	476	476	474	475	468	469	461	470	473	471	467	466	471	477	482	484	483	481	481

RSRW (12Z) 27-11-2010: - 35/35

No. of Ascents reaching 250 hPa levels: 09

MISDA:- PTL, JDP, LKN, GRK, DBH, SLG, GHT, PTN, RNC, AGT, GWL, BHP, NAG, RPR, JGD, AHM, AUG, PNJ, HYD, MDS, MNG, BNG, AMN, CHN & MNC (25)

RSRW (00Z) 28-11-2010: - 35/35

No. of Ascents reaching 250 hPa levels: 20

MISDA: (DLH, PTL, SLG, GHT, MDS, BNG, AMN & CHN) (8)

No. of PILOT Ascents

27-11-2010				28-11-2010			
12Z		18Z		00Z		06Z	
33		47		36		32	

Buoy Data

27-11-2010					28-11-2010		
09Z	12Z	15Z	18Z	21Z	00Z	03Z	06Z
04	01	04	04	04	04	06	04

No. of GPS Data

12Z/ Date: 27.11.2010:- Nil

00Z/ date:28.11.2010:- Nil

List of stations of neighbouring countries
DATE 27-11-2010

Country	Total No. of station	Hours of observations (UTC)							
		00	03	06	09	12	15	18	21
Sri Lanka	8	8	8	8	8	8	8	6	6
Bangladesh	11	0	10	10	6	8	8	4	0
Myanmar	10	6	8	8	0	8	1	0	0
Thailand	1	1	1	1	1	1	1	1	1



India Meteorological Department

REGIONAL METEOROLOGICAL CENTRE, CHENNAI

FDP (Cyclone) FOC Chennai Report Dated 28 NOV 2010, 1400 hrs

PART – A: STATUS OF OBSERVATION SYSTEM

No of Synop data

Date→	27.11.2010							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	19	23	20	20	23	19	19	19

No. of RS/RW Ascents

00Z / 27.11.2010 : 3

No. of Ascents reaching 250 hPa level =3

MISDA : 1

12Z / 27.11.2010 : 3

No. of Ascents reaching 250 hPa level =3

MISDA : 1

No. of PILOT Ascents:

27.11.2010	
06Z	18Z
1	0

Status of AWS data is given in FDPNOC report.

PART – B: RMC CHENNAI INFERENCE

CHENNAI MNG INF DATED 28.11.2010.AAA

BAY INF AURORA AAA Y'S TRH OF LOW PRESSURE OVER SW BAY OFF SRILANKA COT NOW RUNS FROM SRILANKA TO SW BAY OFF STN COT ACROSS GULF OF MANNAR AAA WX SSL ELSEWHERE BAY AND ADMN SEA AAA

ARSEA INF AURORA AAA Y'S TRH OF LOW PRESSURE OVER LKDP AREA AND N/HOOD PERSTS AAA WX SSL ELSEWHERE ARSEA AAA

REGN INF AAA NE MON HAS BEEN ACTIVE OVER CTN AAA Y'S TRH OF LOW PRESSURE OVER SW BAY OFF SRILANKA COT NOW RUNS FROM SRILANKA TO SW BAY OFF STN COT ACROSS GULF OF MANNAR AAA AN U/A CYCIR/TRH LIES OVER COMMORIN AREA AND N/HOOD EXTDS UP TO 2.1 KMS ASL AAA Y'S TRH OF LOW PRESSURE OVER LKDP AREA AND N/HOOD PERSTS AAA

BJP AND ADL RECORDED THE LOWEST MIN TEMPERATURE OF 15 DEG C IN THE PLAINS OF THE REGION AAA

FCST AAA RA/TSH WOULD OCCUR AT MANY PLACES OVER CTN, PDC, KRL AND LKD AND AT A FEW PLACES OVER ITN AAA ISOL RA/TSH MAY OCCUR OVER KKA AND AP

HRW AAA ISOL XX TO VERY XX RA WOULD OCCUR OVER CTN/PDC DURING NEXT 24 HOURS AAA ISOL XX RA WOULD ALSO OCCUR OVER ITN DURING THE SAME PERIOD AAA

ENDS AAA

=====

L/FCST AAA

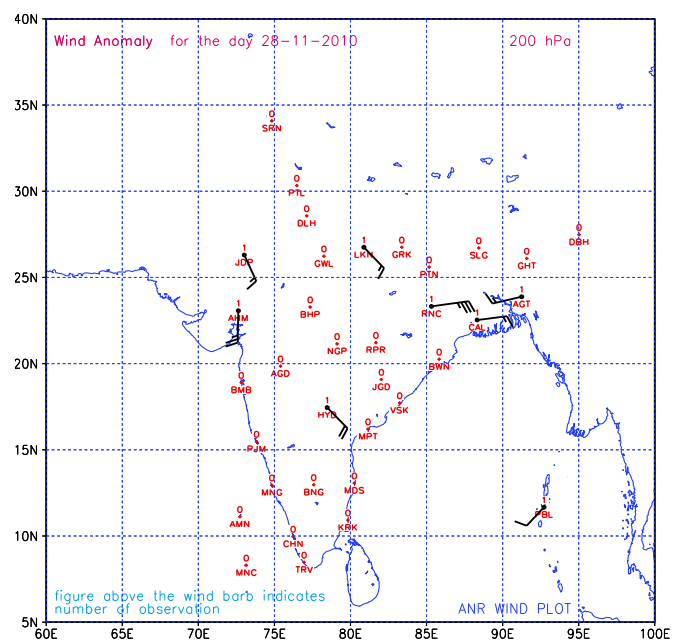
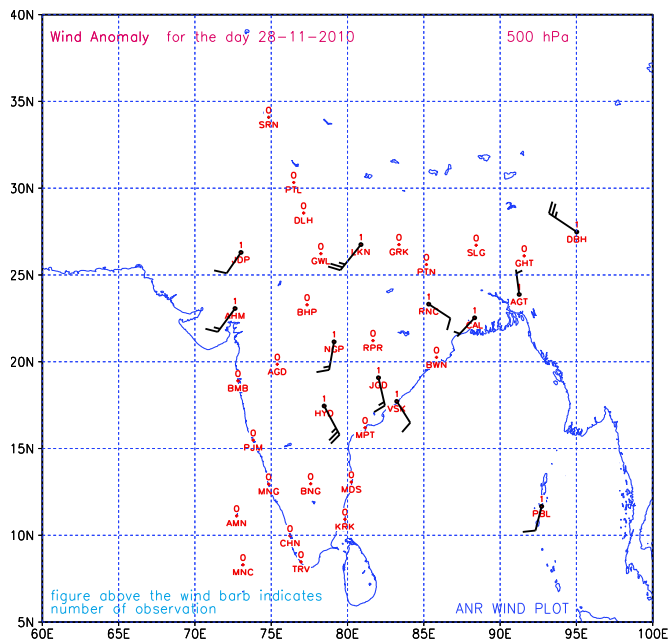
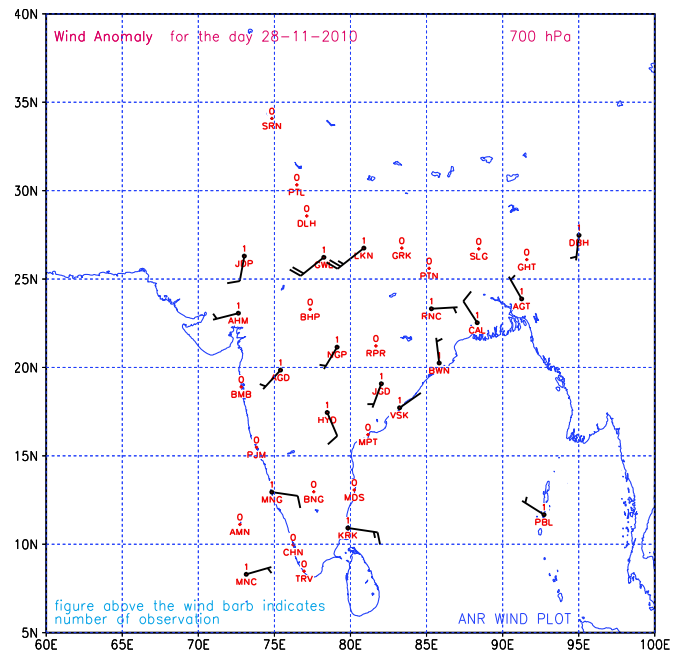
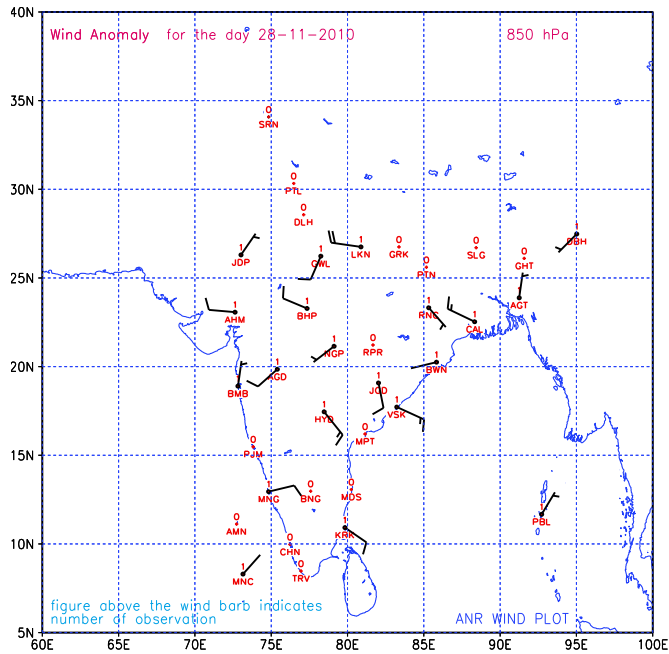
FOR NEXT 24 HRS AAA THE SKY CONDITION WOULD BE GENERALLY CLOUDY AAA RA/TSH MAY OCCUR IN SOME AREAS AAA MIN TEMP WOULD BE AROUND 24 DEG C AAA

FOR NEXT 48 HRS AAA THE SKY CONDITION WOULD BE GENERALLY CLOUDY AAA RA/TSH MAY OCCUR IN SOME AREAS AAA MIN TEMP WOULD BE AROUND 24 DEG C AAA

ENDS AAA

PART – C

UPPER AIR WIND ANOMALIES DATED 28-11-2010



PART – D: UPPER AIR WINDS FORECAST OVER CHENNAI

WRF – MODEL OUTPUT INDICATES MAINLY NORTHEASTERLY TO EASTERLY WINDS OF THE ORDER OF 10 KNOTS UPTO 700 hPa AND SOUTHEASTERLY TO SOUTHERLY WINDS OF THE ORDER OF 5 TO 10 KNOTS FROM 700 hPa TO 400 hPa FOR NEXT 24 HOURS ENDING 00Z 29.11.2010 AAA

FDP (Cyclone) NOC Report Dated 29 November, 2010, 1500 hours IST

Weather Briefing:

Synoptic features:

Inter Tropical Convergent Zone (ITCZ) runs along Lat about 5.0N and convergence is active over southeast Bay of Bengal and south Andaman Sea.

Upper tropospheric ridge:

- The upper tropospheric ridge line roughly runs along Lat 15.0°N at 200 hPa level.

Divergence:

- Upper air positive divergence ($5-10 \times 10^{-5} \text{ s}^{-1}$) prevails over southeast Bay of Bengal and south Andaman Sea.

Convergence:

- Lower level positive convergence ($5-10 \times 10^{-5} \text{ s}^{-1}$) prevails over southeast Bay of Bengal and south Andaman Sea.

Wind Shear:

- Wind Shear is strong (10-20 knots) over Bay of Bengal and Andaman Sea.

Wind Shear Tendency:

- Decreasing (-5 to -10 knots) over southeast Bay of Bengal and south Andaman Sea.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive over south Bay of Bengal and south Andaman Sea with magnitude of $2.5 \times 10^{-5} \text{ s}^{-1}$.

Sea Surface Temperature:

- SST around 29.0 - 31.0°C over south Bay of Bengal and Andaman Sea

Ocean thermal energy:

- Ocean thermal energy is mainly 110-120 KJ cm⁻² over southeast Bay of Bengal and south Andaman Sea and below 100 KJ cm⁻² elsewhere over Bay of Bengal.

M.J.O. Index:

- Located over phase 5 with amplitude less than 1.0.
- Statistical forecast: - MJO moves through phase 5, 6, & 7 during next 15 days.
- Dynamical forecast:- MJO located in phase 5 with amplitude less than 1.0 and moves through phase 5, 6, 7, & 8 during next 15 days.

Status of observational system:

Details of the status of observational system are given in Annexure 1.

Satellite

Inference based on INSAT PICTURE of 290900 UTC

BAY OF BENGAL & ANDAMAN SEA: -

Broken low/med clouds with embedded intense to very intense convection over south Bay between Lat 7.0° N to 12.0°N east of Long 88. 0° E (.) Broken low/med clouds with embedded moderate to intense convection over rest south Bay of Lat 13. 0°N South Andaman Sea and south Tenasserim Coast. (.) Scattered Low/med clouds with embedded isolated weak to moderate convection over rest Bay bet Lat 13. 0°N to 14. 0°N east of Long 87. 0°E and rest Andaman Sea (.)

(See <ftp://192.168.12.75/imd/satmet>

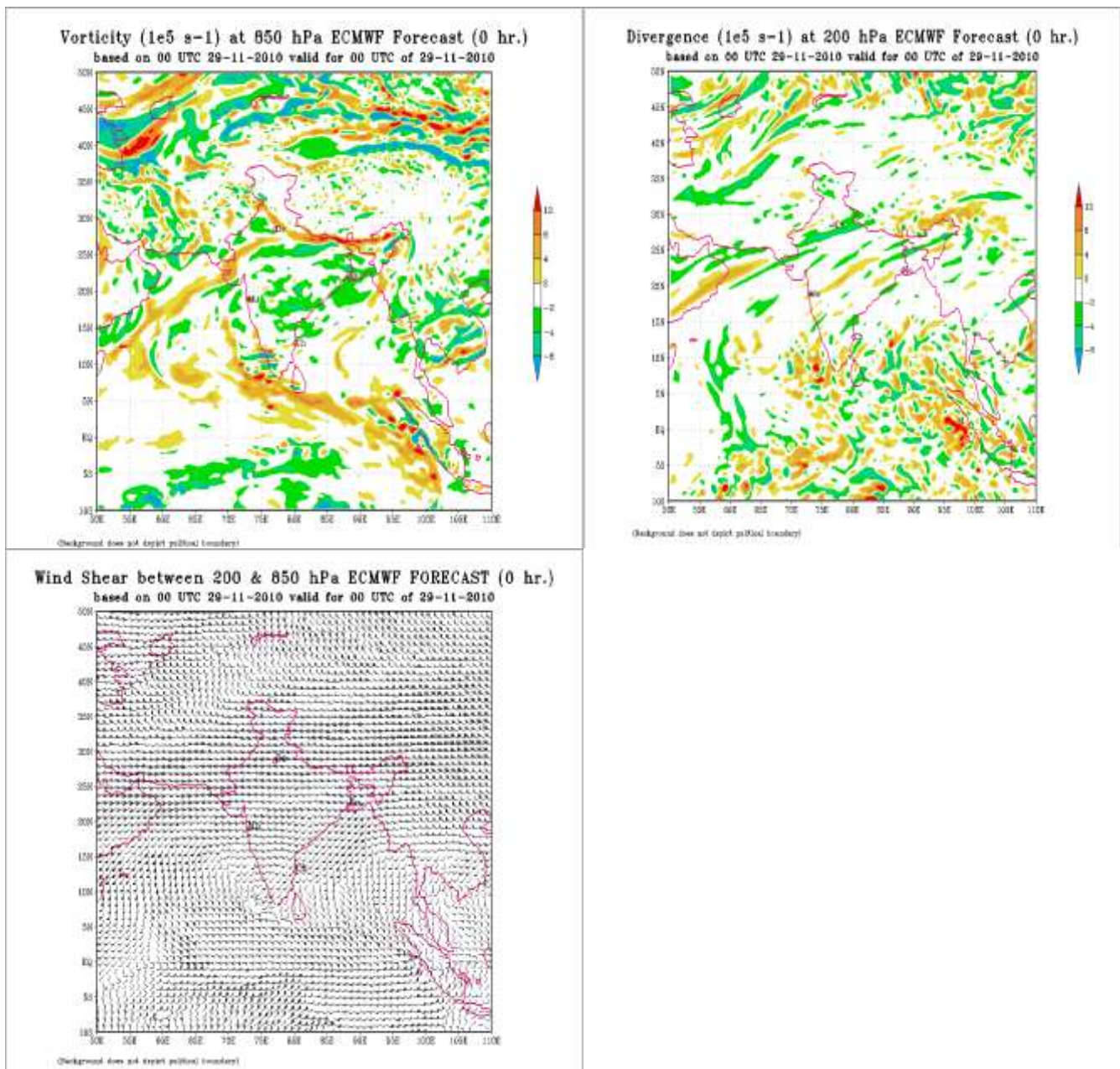
<http://www.imd.gov.in/section/satmet/dynamic/insat.htm>)

NWP

- ECMWF model analysis of 00UTC of today (29 Nov.2010) shows a feeble trough over Maldives region.

- **IMDGFS** model analysis of 00UTC of today (29 Nov.2010) shows a feeble lying over Comorin region. The 72 hour wind fields at 850 hPa show, a a weak cyclonic circulation over the Maldives region.
- **IMD WRF-ARW** model analysis of 00UTC of today (29 Nov.2010) shows a trough of low pressure lying south Kerala coast.
- **UKMET** model analysis of 00 UTC of today (29 Nov. 2010) do not show any significant changes in weather either over Bay of Bengal or Arabian Sea.
- **NCMRWF-GFS** model analysis of 00 UTC of today (29 Nov. 2010) also does not show any significant changes in weather either over Bay of Bengal or Arabian Sea.

Analysis parameters Vorticity(850hPa), windshear(850hPa) and the upper level divergence(200hPa) **based on ECMWF**



(See <http://www.imd.gov.in/section/nhac/dynamic/welcome.htm>)

See ftp://ftp.ncmrwf.gov.in/pub/outgoing/TC_FDP/

Summary:

NWP models indicate that a feeble cyclonic circulation is lying over the Maldives on 29 November 2010. There is no likelihood of formation of system either in Bay of Bengal or Arabian Sea.

Advisory.

No significant weather system over Bay of Bengal.

- **NO IOP will be conducted till 30-11-2010.**

Annexure-1

Status of Observation system:

Synop ← 28-11-2010 →← 29-11-2010 →

Region	09	12	15	18	21	00	03	06
GHT/KOL	26	47	29	31	21	27	48	26
CHN	39	63	37	36	33	41	79	36
NAG/MUM	35	54	24	27	36	29	83	30

AWS ← ← 28-11-2010 →← 29-11-2010

UTC	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07
Nos	557	562	555	545	540	558	560	553	469	472	471	467	472	472	472	471	470	511	520	520	519	518	522	521

RSRW (12Z) 28-11-2010: - 35/35

No. of Ascents reaching 250 hPa levels: 08

MISDA:- PTL, JDP, LKN, GRK, DBH, SLG, GHT, PTN, RNC, AGT, GWL, BHP, NAG, RPR, JGD, AHM, AUG, PNJ, HYD, MDS, MNG, BNG, AMN, CHN & MNC (25)

RSRW (00Z) 29-11-2010: - 35/35

No. of Ascents reaching 250 hPa levels: 20

MISDA: (PTL, SLG, GHT, GWL, NAG, PNJ, MDS, BNG, AMN, CHN (10)

No. of PILOT Ascents

28-11-2010				29-11-2010			
12Z		18Z		00Z		06Z	
34		44		36		30	

Buoy Data

28-11-2010					29-11-2010		
09Z	12Z	15Z	18Z	21Z	00Z	03Z	06Z
05	05	04	04	04	04	04	03

No. of GPS Data

12Z/ Date: 28.11.2010:- Nil

00Z/ date:29.11.2010:- Nil

List of stations of neighbouring countries
DATE 28-11-2010

Country	Total No. of station	Hours of observations (UTC)							
		00	03	06	09	12	15	18	21
Sri Lanka	8	6	8	8	8	8	6	6	6
Bangladesh	11	7	7	7	6	6	4	3	5
Myanmar	10	0	7	7	6	7	1	4	1
Thailand	1	1	1	1	1	1	1	1	1

Annexure-II



India Meteorological Department

REGIONAL METEOROLOGICAL CENTRE, CHENNAI

FDP (Cyclone) FOC Chennai Report Dated 29 NOV 2010, 1400 hrs

PART – A: STATUS OF OBSERVATION SYSTEM

No of Synop data

Date→	28.11.2010							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	19	23	20	20	23	19	19	19

No. of RS/RW Ascents

00Z / 28.11.2010 : 3

No. of Ascents reaching 250 hPa level =3

MISDA : 1

12Z / 28.11.2010 : 3

No. of Ascents reaching 250 hPa level =3

MISDA : 1

No. of PILOT Ascents:

28.11.2010	
06Z	18Z
1	1

Status of AWS data is given in FDPNOC report.

PART – B: RMC CHENNAI INFERENCE

CHENNAI MNG INF DATED 29.11.2010.AAA

BAY INF AURORA AAA Y'S TRH OF LOW PRESSURE EXTDG FROM SRILANKA TO SW BAY OFF TN COT ACROSS GULF OF MANNAR MOVED WESTWARDS AAA

WX SSL ELSEWHERE BAY AND ANDMN SEA AAA

ARSEA INF AURORA AAA Y'S TRH OF LOW PRESSURE OVER LKDP AREA AND N/HOOD PERSTS AAA WX SSL ELSEWHERE ARSEA AAA

REGN INF AAA NE MON HAS BEEN VIG OVER TN AND KRL AAA Y'S TRH OF LOW PRESSURE EXTDG FROM SRILANKA TO SW BAY OFF TN COT ACROSS GULF OF MANNAR MOVED WESTWARDS AAA Y'S TRH OF LOW PRESSURE OVER LKDP AREA AND N/HOOD PERSTS AAA

ADL RECORDED THE LOWEST MIN TEMPERATURE OF 15 DEG C IN THE PLAINS OF THE REGION AAA

FCST AAA RA/TSH WOULD OCCUR AT FEW PLACES OVER TN, PDC, KRL AND LKD AAA ISOL RA/TSH MAY OCCUR OVER CAP,SIK,CK AND RYSM AAA MAINLY DRY WX PREVAIL OVER NIK AND TLGN AAA

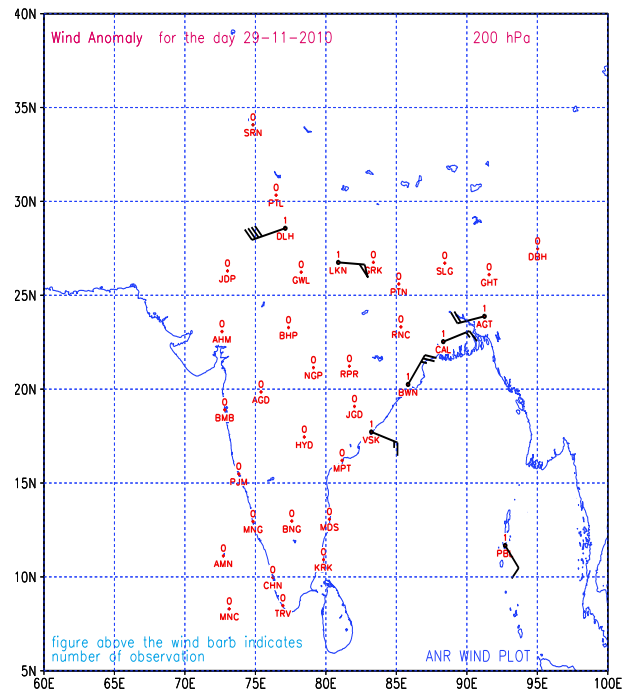
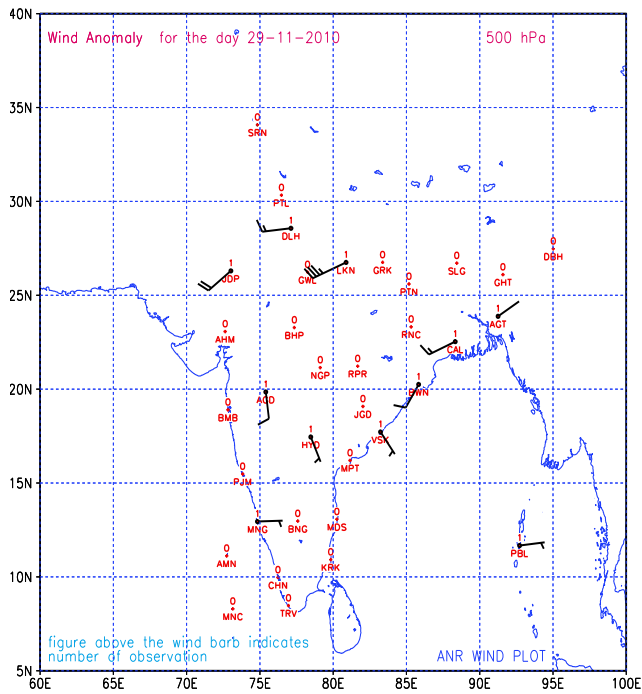
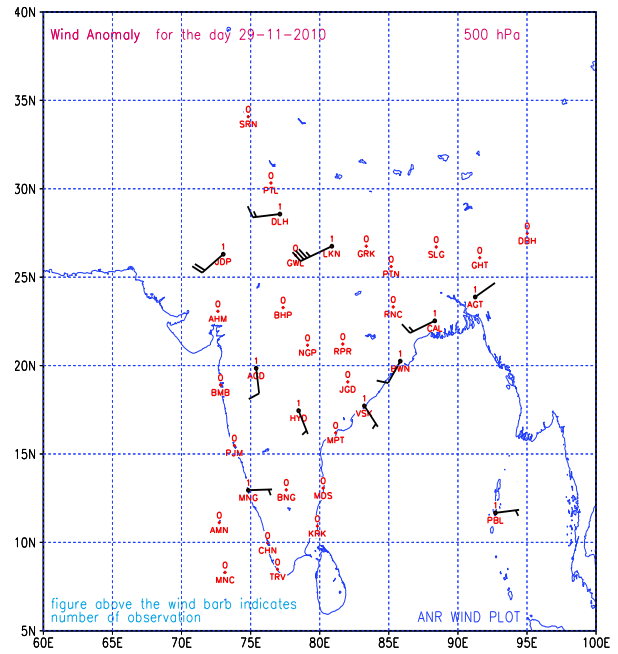
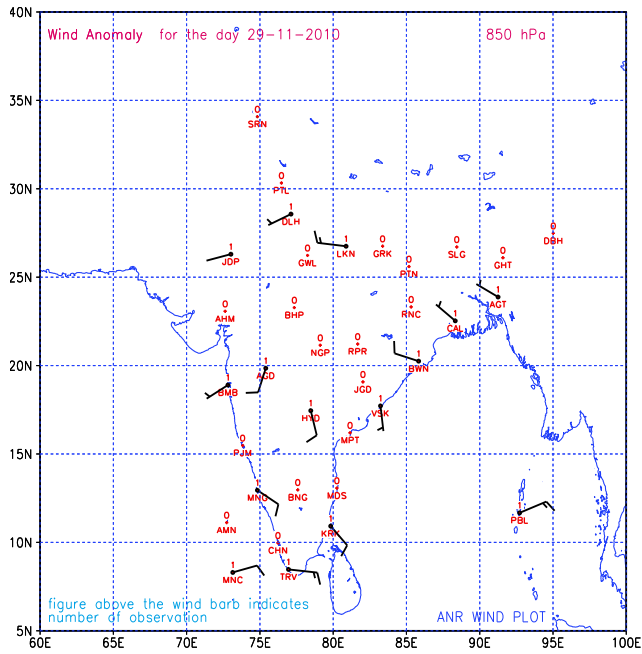
HRW AAA ISOL XX RA WOULD OCCUR OVER SCTN DURING NEXT 48 HOURS AAA

ENDS AAA

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PART – C

UPPER AIR WIND ANOMALIES DATED 29-11-2010



PART – D: UPPER AIR WINDS FORECAST OVER CHENNAI

WRF – MODEL OUTPUT INDICATES MAINLY NORTHEASTERLY WINDS OF THE ORDER OF 5 TO 10 KNOTS UPTO 800 hPa AND MAINLY EASTERLY WINDS OF THE ORDER OF 5 TO 10 KNOTS FROM 800 hPa TO 500 hPa FOR NEXT 24 HOURS ENDING 00Z 30.11.2010 AAA

FDP (Cyclone) NOC Report Dated 30 November, 2010, 1500 hours IST
Weather Briefing:

Synoptic features:

A trough of low pressure on sea level charts runs from southwest Bay of Bengal to westcentral Bay of Bengal associated upper air trough in the lower level.

Upper tropospheric ridge:

- The upper tropospheric ridge line roughly runs along Lat 14.0°N at 200 hPa level.

Divergence:

- Upper air positive divergence ($5-10 \times 10^{-5} \text{ s}^{-1}$) prevails over southwest & adjoining westcentral Bay of Bengal.

Convergence:

- Lower level positive convergence ($5-10 \times 10^{-5} \text{ s}^{-1}$) prevails over southwest & adjoining westcentral Bay of Bengal.

Wind Shear:

- Wind Shear is moderate (5-10 knots) over south Bay of Bengal and south Andaman Sea.

Wind Shear Tendency:

- Decreasing (-10 to -20 knots) over south Bay & adjoining westcentral Bay of Bengal.

Relative Vorticity:

- Relative vorticity at 850 hPa is positive over southwest Bay of Bengal off south Tamil Nadu coast with magnitude of $5.0 \times 10^{-5} \text{ s}^{-1}$.

Sea Surface Temperature:

- SST around 30.0 - 32.0°C over southwest Bay of Bengal off south Tamil Nadu coast and 28.0 - 30.0°C over elsewhere Bay of Bengal.

Ocean thermal energy:

- Ocean thermal energy is mainly 100-110 KJ cm⁻² over southeast Bay of Bengal and adjoining south Andaman Sea and below 50 KJ cm⁻² over southwest Bay & adjoining westcentral Bay of Bengal off north Tamil Nadu and south Andhra Pradesh coast.

M.J.O. Index:

- Located over phase 4 with amplitude less than 1.0.
- Statistical forecast: - MJO moves through phase 5, 6, & 7 during next 15 days.
- Dynamical forecast: - MJO located in phase 4 with amplitude less than 1.0 and moves through phase 4, 5 & 6 during next 15 days with higher amplitude.

Status of observational system:

Details of the status of observational system are given in Annexure 1.

Satellite

Inference based on INSAT PICTURE of 300900 UTC

BAY OF BENGAL & ANDAMAN SEA: -

Broken low/medium clouds with embedded intense to very intense convection over southwest Bay (minimum cloud top temperature minus 74 degree C) and Sri Lanka, and moderate to intense convection over rest south Bay, and weak to moderate convection over Andaman Sea adjoining east-central Bay (.)

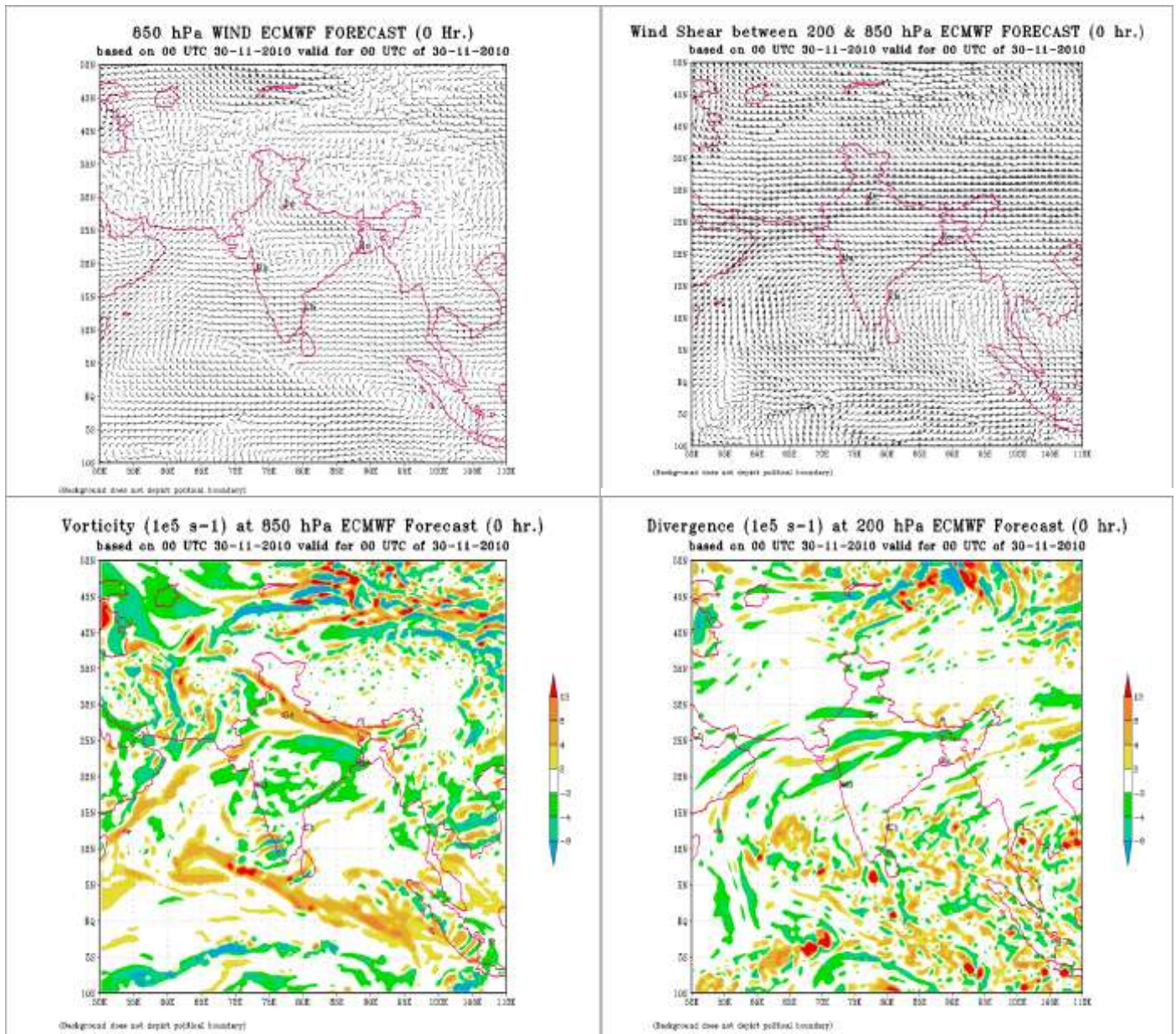
(See <ftp://192.168.12.75/imd/satmet>

<http://www.imd.gov.in/section/satmet/dynamic/insat.htm>)

NWP

- **ECMWF** model of 00UTC of today (30 Nov 2010) shows a extended trough from south bay of Bengal extending to south Andhra coast to east Arabian sea upto coastal Gujarat and a low pressure area over Lakshadweep and adjoining area. The 24-hr forecast indicates formation of a low pressure region over south-west of south-east Arabian sea and the 120-hr forecast shows formation of a low pressure area over south-west bay of Bengal and moving west-north-westward to coastal Tamil Nadu.
- **IMD-GFS** model of 00UTC of today (30 Nov 2010) shows an extended trough of a low pressure over south bay of Bengal extending upto south Andhra coast south-east and east Arabian sea upto Gujarat. 24 hr forecast shows formation of a low pressure over south-east Arabian sea and the 96-hr forecast indicates a low pressure over south-west bay of Bengal near south Tamil Nadu and Kerala coasts and the trough extends upto south Andhra coast over south Bay and to Gujarat coast over east Arabian sea and is existing upto 07-12-2010.
- **WRF-ARW** model analysis of 00UTC of today (30 Nov 2010) shows an extended trough of low pressure over south bay of Bengal extending upto south Andhra coast, south-east and east Arabian sea upto coastal Gujarat, The 24-hr forecast shows formation of a low pressure area over Lakshadweep and Minicoy islands and moving west northwestwards with slight intensification. The 48-hr forecast shows a low pressure formation over south bay of Bengal and 72-hr forecast shows the intensification of the low pressure over southwest Arabian sea into a depression.
- **UKMET** model analysis of 00UTC of today (30 Nov 2010) indicates a trough of low pressure area over south-west bay of Bengal and extending upto south Andhra Pradesh and southeast Arabian sea and extending upto Gujarat coast and a low pressure area over west of southeast Arabian sea. Forecast shows the low pressure area moves westwards and 120-hr forecast shows formation of a low pressure over Srilanka extending upto south Tamil Nadu and Comorin.
- **NCMRWF-GFS** model analysis based on 00 UTC of today (30 Nov. 2010) shows a trough of low pressure over south bay of Bengal, south and southeast Arabian sea upto south Gujarat. The 72-hr forecast shows the formation of a low pressure area over southwest Bay near south peninsula and Kerala coast, Maldives and Comorin. The 96-hr forecast shows this system will move in a west northwesterly direction to southeast Arabian sea.

Analysis of cyclogenesis parameter



<http://www.imd.gov.in/section/nhac/dynamic/welcome.htm>)

ftp://ftp.ncmrwf.gov.in/pub/outgoing/TC_FDP/

Advisory.

No significant weather system over Bay of Bengal.

- **NO IOP will be conducted till 30-11-2010.**

THIS IS THE LAST BULLETIN FOR FDP CAMPAIGN OF THIS YEAR.

Annexure-1

Status of Observation system:

Synop ← 29-11-2010 →← 30-11-2010 →

Region	09	12	15	18	21	00	03	06
GHT/KOL	32	67	27	25	22	25	68	26
CHN	42	74	37	37	36	40	74	46
NAG/MUM	49	88	29	27	31	28	91	43

AWS ← ← 29-11-2010 →← 30-11-2010

UTC	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07
Nos	479	483	481	478	462	478	478	479	479	479	474	479	477	472	474	475	474	474	475	463	479	476	465	475

RSRW (12Z) 29-11-2010: - 35/35

No. of Ascents reaching 250 hPa levels: 08

MISDA:- PTL, JDP, LKN, GRK, DBH, SLG, GHT, PTN, RNC, AGT, GWL, BHP, NAG, RPR, JGD, AHM, AUG, PNJ, HYD, MDS, MNG, BNG, AMN, CHN & MNC (25)

RSRW (00Z) 30-11-2010: - 35/35

No. of Ascents reaching 250 hPa levels: 20

MISDA: (PTL, SLG, GHT, BOM, HYD, MDS, AMN, CHN, MNC (10)

No. of PILOT Ascents

29-11-2010				30-11-2010			
12Z		18Z		00Z		06Z	
47		29		28		26	

Buoy Data

29-11-2010					30-11-2010		
09Z	12Z	15Z	18Z	21Z	00Z	03Z	06Z
05	05	04	05	04	05	05	-

No. of GPS Data

12Z/ Date: 29.11.2010:- Nil

00Z/ date:30.11.2010:- Nil

List of stations of neighbouring countries

DATE 29-11-2010

Country	Total No. of station	Hours of observations (UTC)							
		00	03	06	09	12	15	18	21
Sri Lanka	8	6	8	8	8	8	6	6	6
Bangladesh	11	6	2	4	6	6	5	4	7
Myanmar	10	7	6	6	1	7	1	5	1
Thailand	1	1	1	1	1	1	1	1	1



Annexure-2

India Meteorological Department

REGIONAL METEOROLOGICAL CENTRE, CHENNAI

FDP (Cyclone) FOC Chennai Report Dated 30 NOV 2010, 1400 hrs

PART – A: STATUS OF OBSERVATION SYSTEM

No of Synop data

Date→	29.11.2010							
UTC→	00	03	06	09	12	15	18	21
Chennai Region (Coasts of AP & TN)	19	22	20	20	23	19	19	18

No. of RS/RW Ascents

00Z / 29.11.2010 : 3

No. of Ascents reaching 250 hPa level =3

MISDA : 1

12Z /29.11.2010 : 3

No. of Ascents reaching 250 hPa level =2

MISDA : 1

No. of PILOT Ascents:

29.11.2010	
06Z	18Z
3	2

Status of AWS data is given in FDPNOC report.

PART – B: RMC CHENNAI INFERENCE

CHENNAI MNG INF DATED 30.11.2010.AAA

BAY INF AURORA AAA Y'S TRH OF LOW PRESSURE EXTDG FROM SW BAY TO SRILANKA COT TO WC BAY OF SCAP PERSISTS AAA WX SSL ELSEWHERE BAY AND ANDMN SEA AAA

ARSEA INF AURORA AAA Y'S TRH OF LOW PRESSURE OVER LKDP AREA AND
N/HOOD PERSTS AAA WX SSL ELSEWHERE ARSEA AAA

REGN INF AAA Y'S TRH OF LOW PRESSURE EXTDG FROM SW BAY TO
SRILANKA COT TO WC BAY OF SCAP PERSISTS AAA ASSTD U/A TRH EXTDS
UPTO 1.5 KM ASL AAA Y'S TRH OF LOW PRESSURE OVER LKDP AREA AND
N/HOOD PERSTS AAA ASSTD U/A TRH EXTDS UPTO 0.9 KM ASL AAA

ADL RECORDED THE LOWEST MIN TEMPERATURE OF 15 DEG C IN THE
PLAINS OF THE REGION AAA

FCST AAA RA/TSH WOULD OCCUR AT MANY PLACES OVER CTN/PDC AND AT
A FEW PLACES OVER ITN, KRL ,LKDP AAA ISOL RA/TSH MAY OCCUR OVER
RYSM ,SCAP AND SIK AAA MAINLY DRY WX PREVAIL OVER CK,NIK ,NCAP AND
TLGN AAA

HRW AAA ISOL XX RA WOULD OCCUR OVER CTN /PDC DURING NEXT 48
HOURS AAA

ENDS AAA

=====

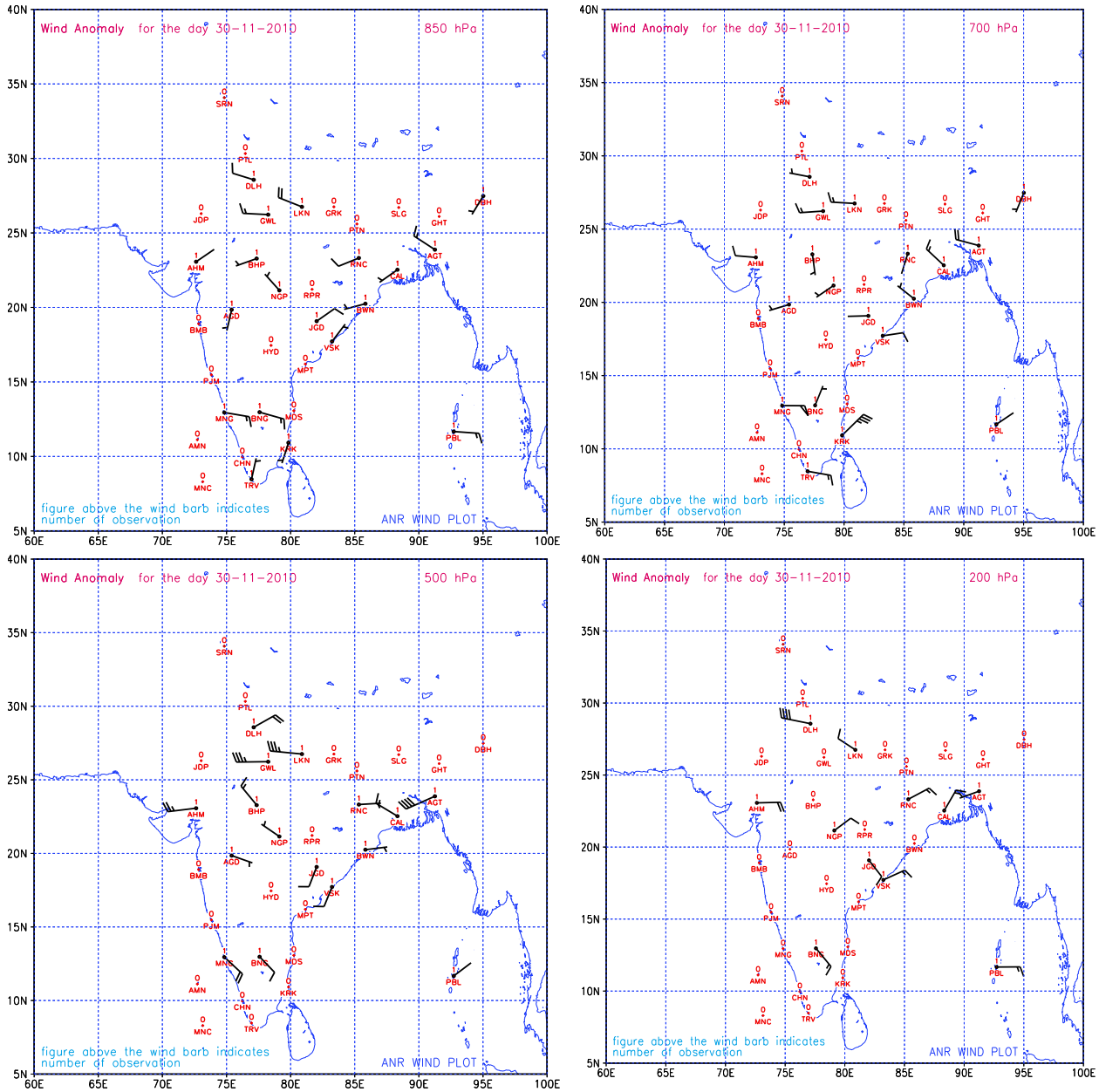
L/FCST AAA

FOR NEXT 24 HRS AAA THE SKY CONDITION WOULD BE PARTLY CLOUDY
DURING F/N THERE AFTER GENERALLY CLOUDY AAA A SH /TSH MAY OCCUR
IN SOME AREAS AAA MIN TEMP WOULD BE AROUND 24 DEG C AAA

FOR NEXT 48 HRS AAA THE SKY CONDITION WOULD BE GENERALLY CLOUDY
AAA ONE OR TWO SPELLS OF SH/TSH MAY OCCUR IN SOME AREAS AAA MIN
TEMP WOULD BE AROUND 24 DEG C AAA

PART – C

UPPER AIR WIND ANOMALIES DATED 30-11-2010



PART – D: UPPER AIR WINDS FORECAST OVER CHENNAI

WRF – MODEL OUTPUT INDICATES MAINLY NORTHEASTERLY WINDS OF THE ORDER OF 10 TO 15 KNOTS UPTO 800 hPa AND MAINLY EASTERLY TO NORTHEASTERLY WINDS OF THE ORDER OF 5 TO 10 KNOTS FROM 800 hPa TO 500 hPa FOR NEXT 24 HOURS ENDING 00Z 01.12.2010 AAA

Chapter VI

Lessons learnt

Success

- Mean landfall forecaster has been less than the long period average and has decreased.
- Track forecast has been issued upto 72 hrs lead period

Failure

- ❖ Track and Landfall error can be further reduced.
- ❖ Intensity error is still very large
- ❖ Could not collect observation from the inner core
- ❖ Lack of consumables
It was main problem during 2008, especially with balloons, hydrogen gas and Sonde. Availability of consumables to be ensured well in advance. Significantly improved in 2010.
- ❖ Availability of ships could not be ensured in 2008. Well in advance planning could solve this problem in 2010
- ❖ Buoy data were very meagre in 2008. It improved in Nov 2010
- ❖ Data reception from Myanmar, Bangladesh and Thailand on real time basis was not satisfactory in 2008. It has improved and ensured for real time reception during 2010 through international coordination. Hourly observations from these states could not be collected. Data from Sri Lanka could be collected through e-mail
- ❖ Radar imageries were available from Bangladesh
- ❖ All the analysed charts were presented in the NOC meeting with inference and forecast
- ❖ Inputs were also received from DDGM (WF) on regular basis through e-mail for NOC meeting in 2008 and 2009. Not received in 2010.
- ❖ Inputs from FOC were received in the form of Regional bulletins
- ❖ However, the synoptic analyses were not upto expectation on some occasions and needed re-analysis for 2008. It was mainly due to the fact that the charts analysed by operational unit of NHAC were not relooked and reanalysed for this specific purpose. Synergie system and Tropical Cyclone Module were used in 2010.
- ❖ The input by synoptic unit could be made more objective by preparing check list on various factors of genesis, intensification and track of cyclonic disturbances, Macros, Tropical Cyclone Module
- ❖ Various NWP charts were made available in ftp server and presented in NOC meeting
- ❖ Summary of analyses and predictions were also incorporated in the NOC reports. Report improved with inclusion of diagnostic products like vorticity, divergence and shear based on ECMWF in 2010
- ❖ Inputs on above parameters can be prepared in the form of a check list
- ❖ Threshold values of various NWP model based products like vorticity, divergence, convergence, wind shear need to be found out for genesis, intensification and track prediction.
- ❖ The number of models guidance increased in 2010. The model products were available for 00 and 12 UTC only. The MME was available for 00 and 12 UTC in 2010.
- ❖ All the satellite products were available in ftp server

- ❖ Subjective inputs were also made available in NOC meeting and report
- ❖ A structured satellite bulletin as per decision of last ACR-2011 with the steps of deriving T number should be issued.
- ❖ WWWV winds and CMVs need to be validated against observation or established observations like METEOSAT derived winds
- ❖ Threshold values of various satellite based products like vorticity, divergence, convergence, wind shear need to be found out for genesis and intensification
- ❖ DWR data to be made available with uniform scanning strategy
- ❖ CYREP/ plain language report (ACR 2011) should be made available by e-mail to NOC
- ❖ An expert from Radar division may be nominated to coordinate the monitoring, collection and dissemination of radar data and imageries
- ❖ DWR expert may join the NOC meeting for interpretation, guidance and avoidance of any difficulties in 2011 like that in 2010
- ❖ Google group set up by Telecom Division was very useful for teleconferencing and exchange of data and information
- ❖ AWS data collection was delayed by 1-2 hrs. Efforts may be made for same procedure as for CWG-2010.
- ❖ Special Coastal Hourly Observations could not be transmitted always by e-mail in addition to GTS and hence could not be stored and monitored properly about its availability
- ❖ Although data sources were accessed on near real time basis, responsibility could not be fixed for non-GTS data processing
- ❖ Data statistics though prepared, could not be done so on regular basis and presented in NOC meeting due to non-fixing of responsibility
- ❖ Post-FDP data management could not be planned properly for archival and sharing.
- ❖ Still the problem exists regarding the format of data to be adopted for sharing with research institutes. Data format could not be decided prior to FDP.
- ❖ NOC meetings were conducted daily at 1500 hrs IST
- ❖ NOC reports were uploaded in google group regularly by 1700 hrs
- ❖ However, due to shortage of man power, full assignment could not be made to officials
- ❖ Same people were involved with both day to day operational work and FDP activities
- ❖ Participation of experts from various groups was not satisfactory in the NOC meeting as very few people participated in the meeting on many occasions
- ❖ Preparation of FDP report has been completed for 2008 and 2009. Same for 2010 is in progress.
- ❖ FOC Chennai coordinated observation, collection and exchange of data
- ❖ Compiled data were also received from Chennai after the FDP period
- ❖ Problem was faced by FOC and ACWC, Kolkata and CWC, Bhubaneswar due to lack of computer and consumables. Computer did not work in Balasore for GPS Sonde. Infrastructure facilities to be ensured before FDP
- ❖ Man power management was a problem as sometimes the IOP was declared only one day in advance. This was a real problem on holidays. Hence there is need for declaration of IOP 48 hrs in advance.
- ❖ GPS from ISRO could not reach spot in time and location of GPS has to be changed from Ongole to Bapatla in 2008. Proper advance planning could avoid all these problems in 2010. However, the GPS sonde observation at Arakonam ISRO station could not be taken in 2010 due to non-receipt of information in time

- ❖ There was large variation in the genesis of systems both in space and time
- ❖ Similarly there was large variation in intensity forecast
- ❖ Objective verification of NWP model predictions and their comparison could not be done
 - 48 hr forecast error is still very high and there is a large spread in forecasts by different models
 - MME may be a better option for track prediction
 - Utility of data acquired during FDP has to be still established through simulation studies
 - All the NWP models are late Models except CLIPER and QLM (Early Models).
 - Interpolated model track prediction may be made for 2011 campaign in line with NHC, USA (GFSI, WRFI, ECMWF etc)

Chapter VII

Summary and Conclusions

The Pilot Phase of FDP on landfalling cyclones over the Bay of Bengal was conducted during 15th October to 30th November, 2010 as per the implementation plan. The IOP was declared for 11 days in association with a Deep Depression (13-16 Oct., 2010), VSCS GIRI (20-23 Oct., 2010) and SCS JAL(4-8 Nov., 2010). 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 2010 included the data collected for SagarKanya cruise, enhanced AWS network of the coast, five activated buoy observations from the bay of Bengal, Oceansat-II observations and microwave imagery products. The Tropical Cyclone module recently 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 2010 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 2010, 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,
- better data reception from the coastal stations of all WMO/ESCAP Panel countries on real time basis,
- improved buoy network
- improved NWP model guidance
- objective analysis of various cyclogenesis, intensification and track forecast parameters by preparing a check list,
- threshold values of various NWP products for genesis, intensification and movement
- structured satellite and radar bulletin
- DWR data with uniform scanning strategy for mosaicing and NWP modeling.

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