Prediction of Cyclogenesis based on observations of 0300 UTC of 6th and 7th October 2014 – Case Study of Hudhud

Cyclone Warning Division, RSMC New Delhi

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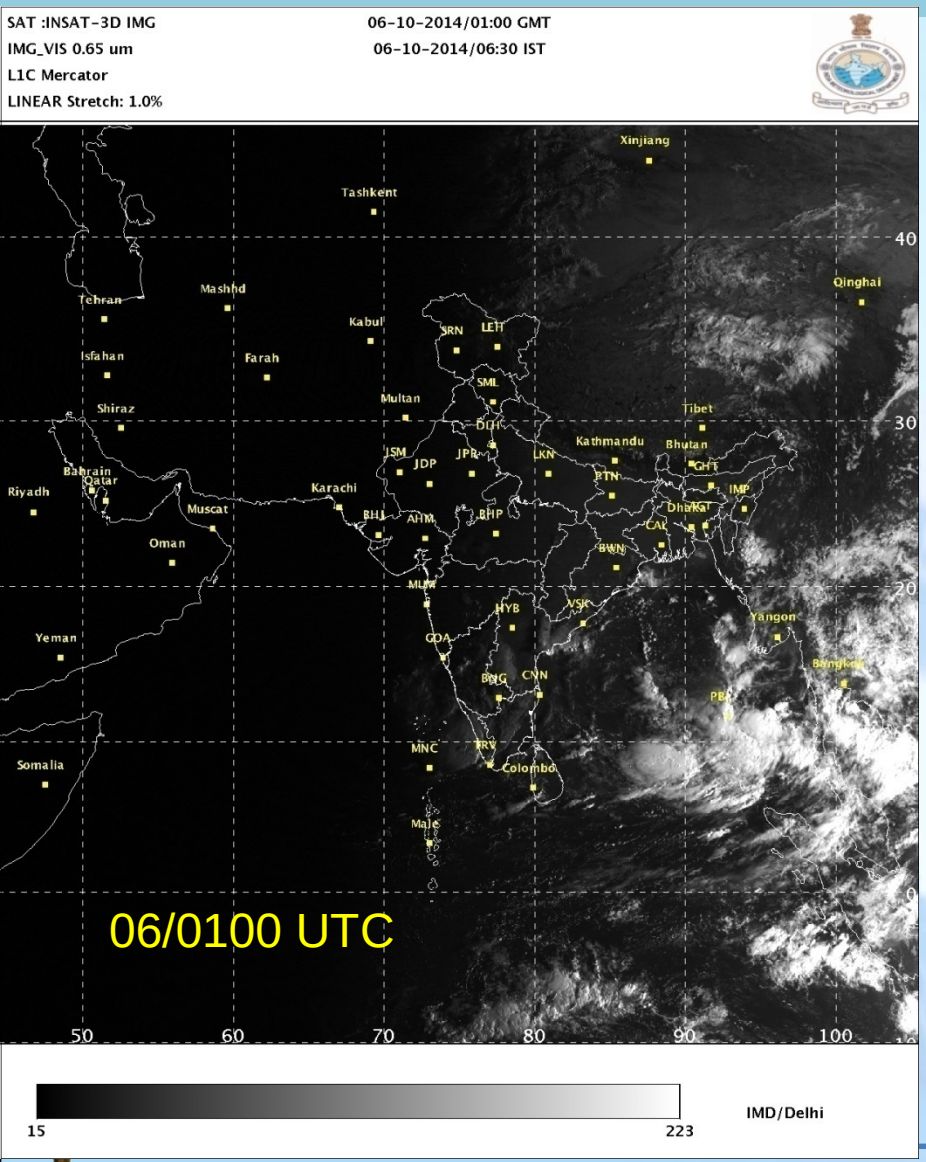
INDIA METEOROLOGICAL DEPARTMENT

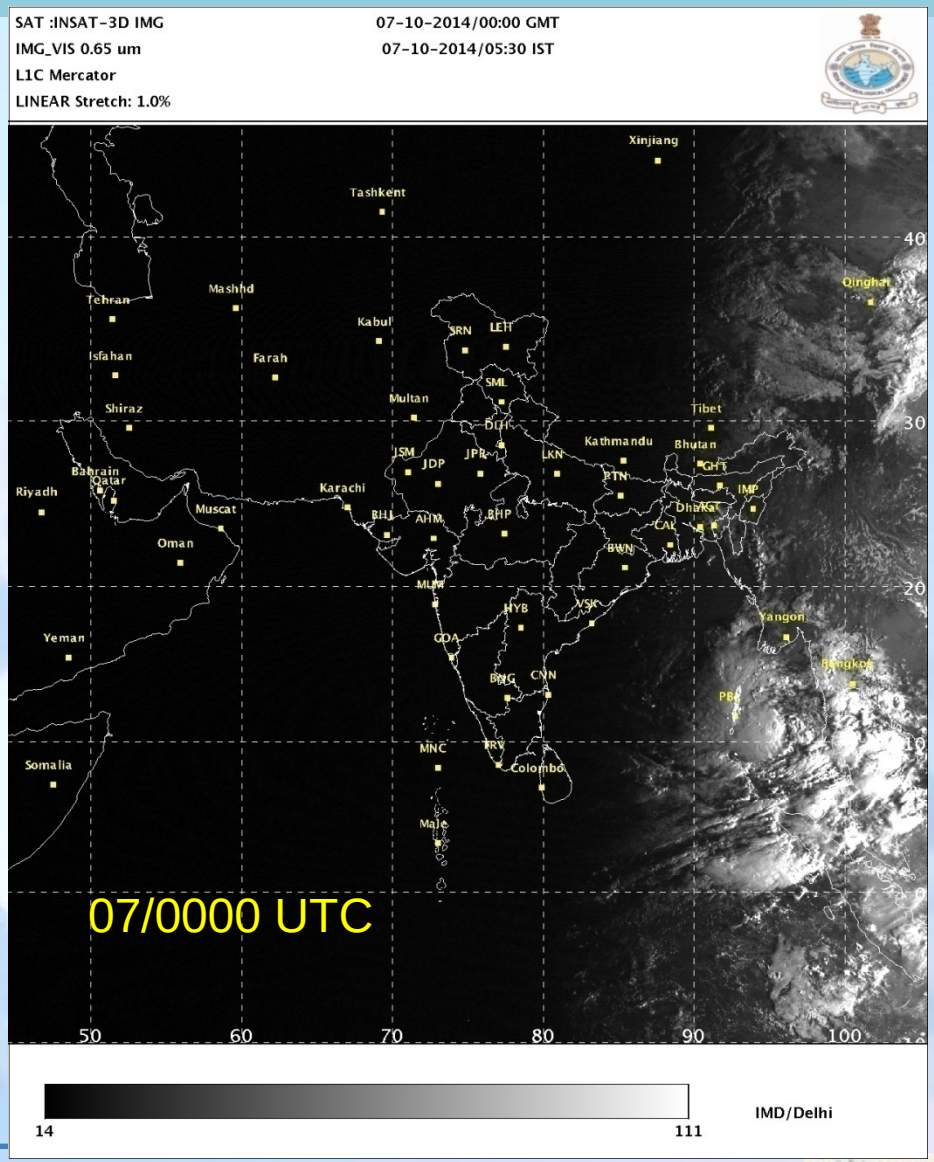
Activity

To analyse the various prognostic and diagnostic features to predict the possible cyclogenesis.

If cyclogenesis is predicted what will be the predicted track and intensity forecast for next five days

Satellite Pictures (visible)





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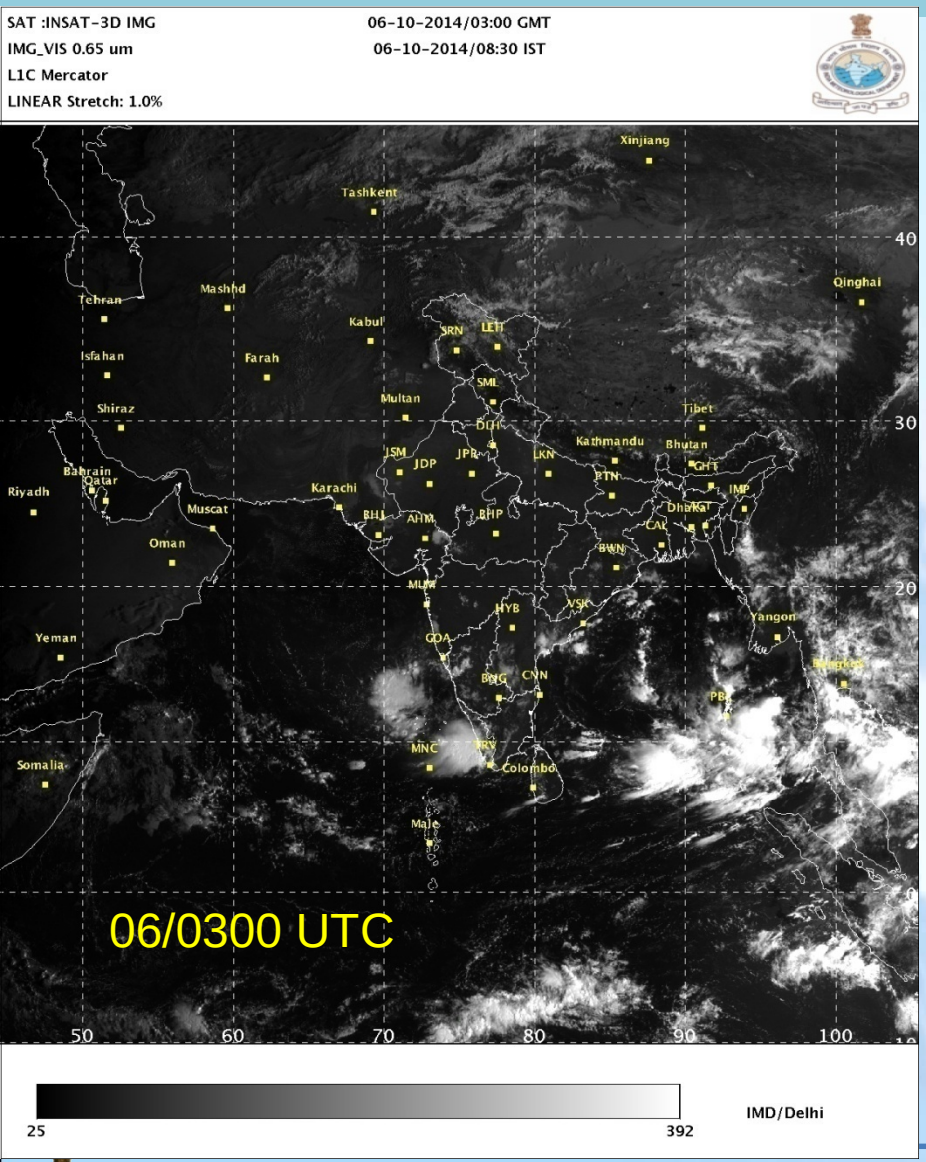

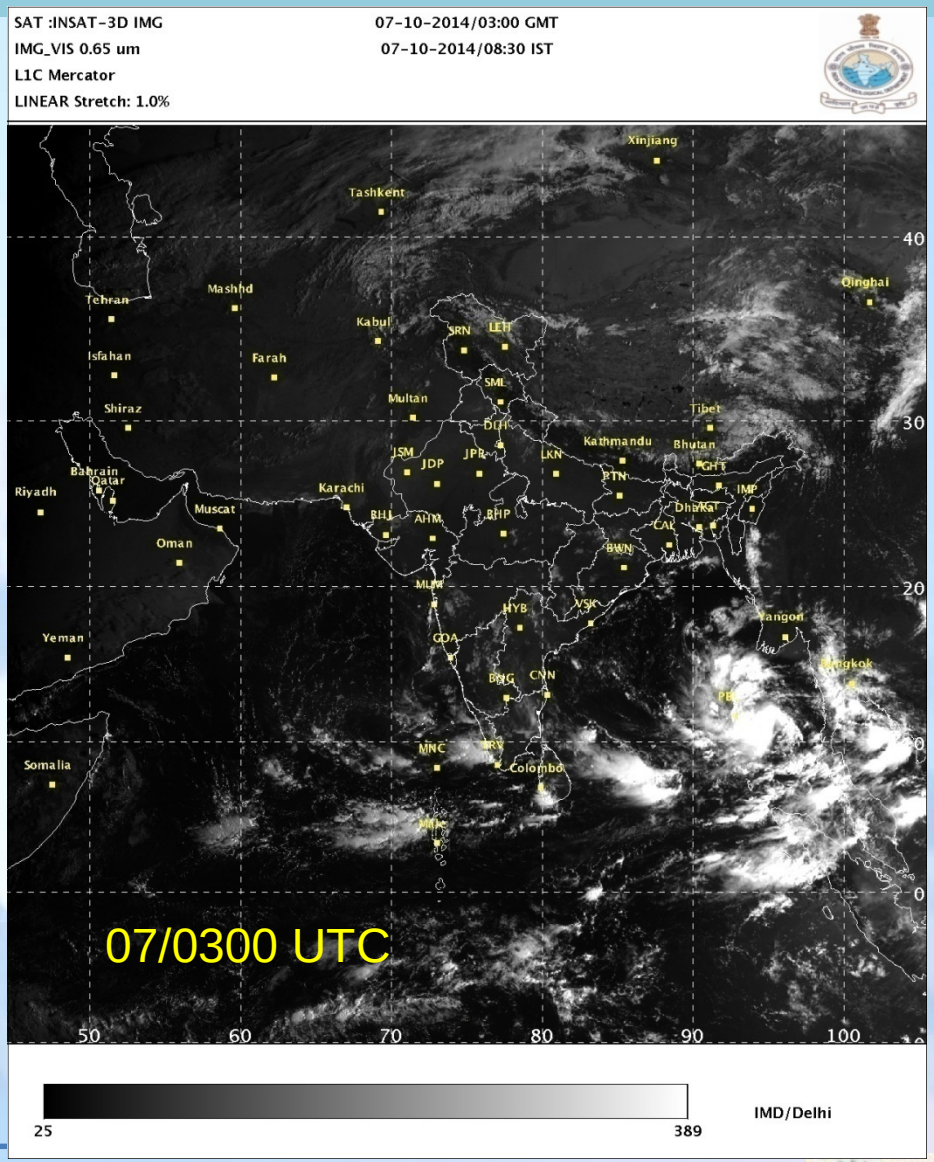

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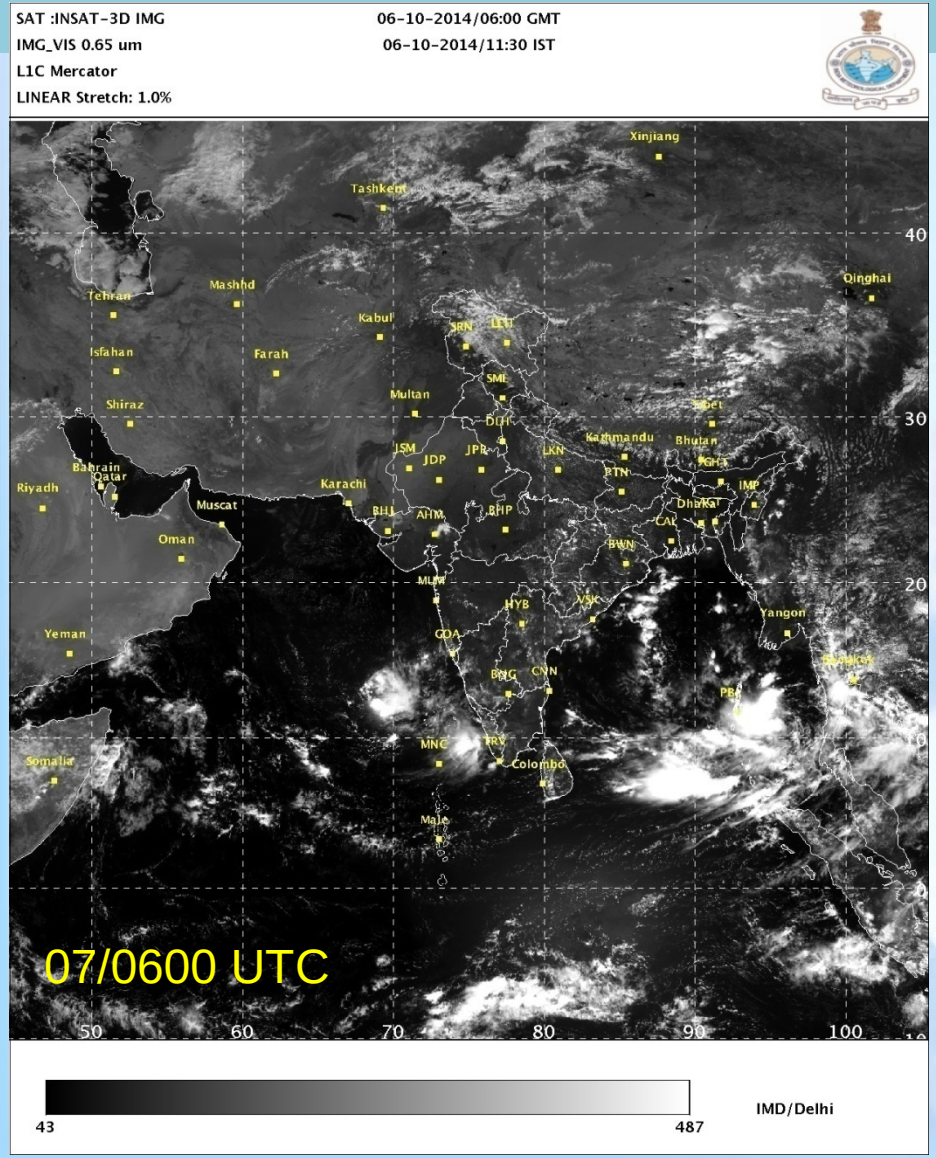
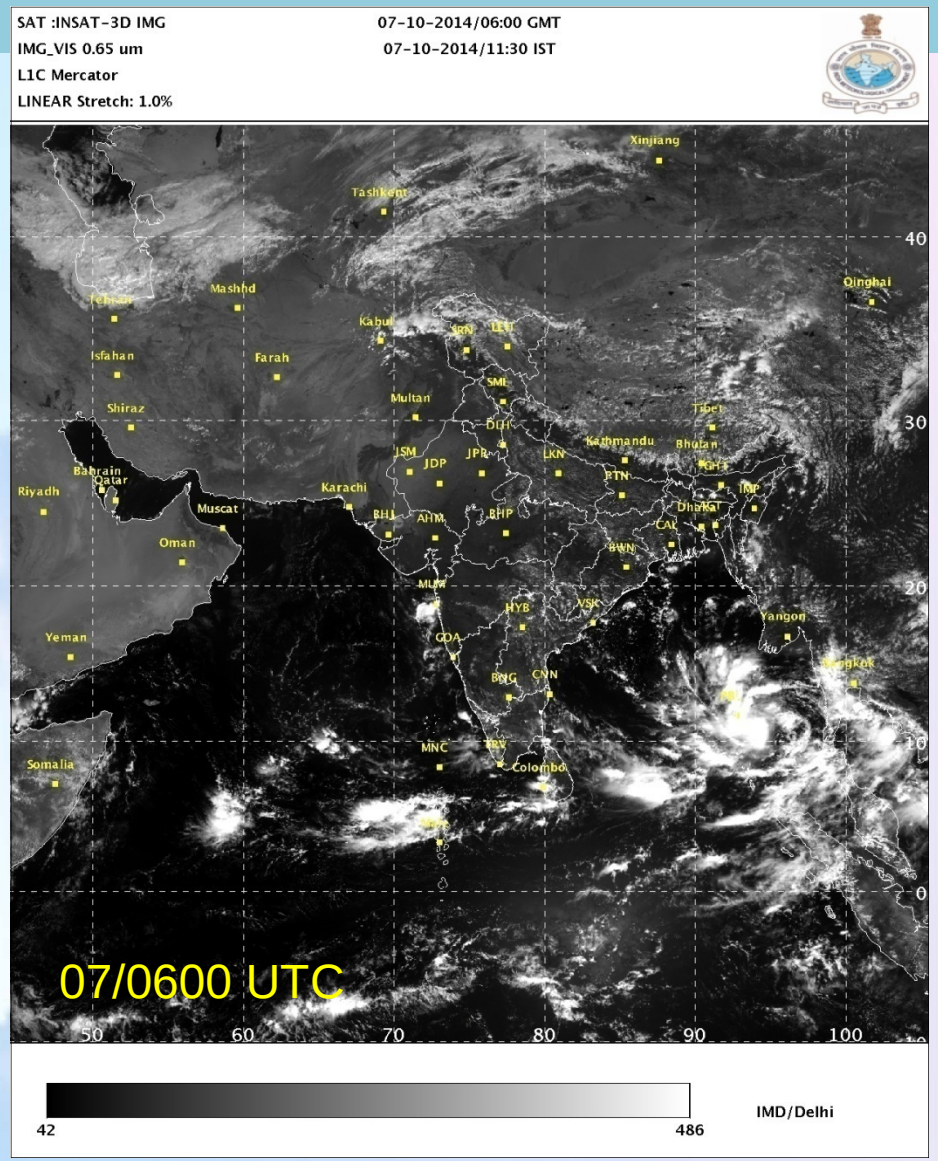
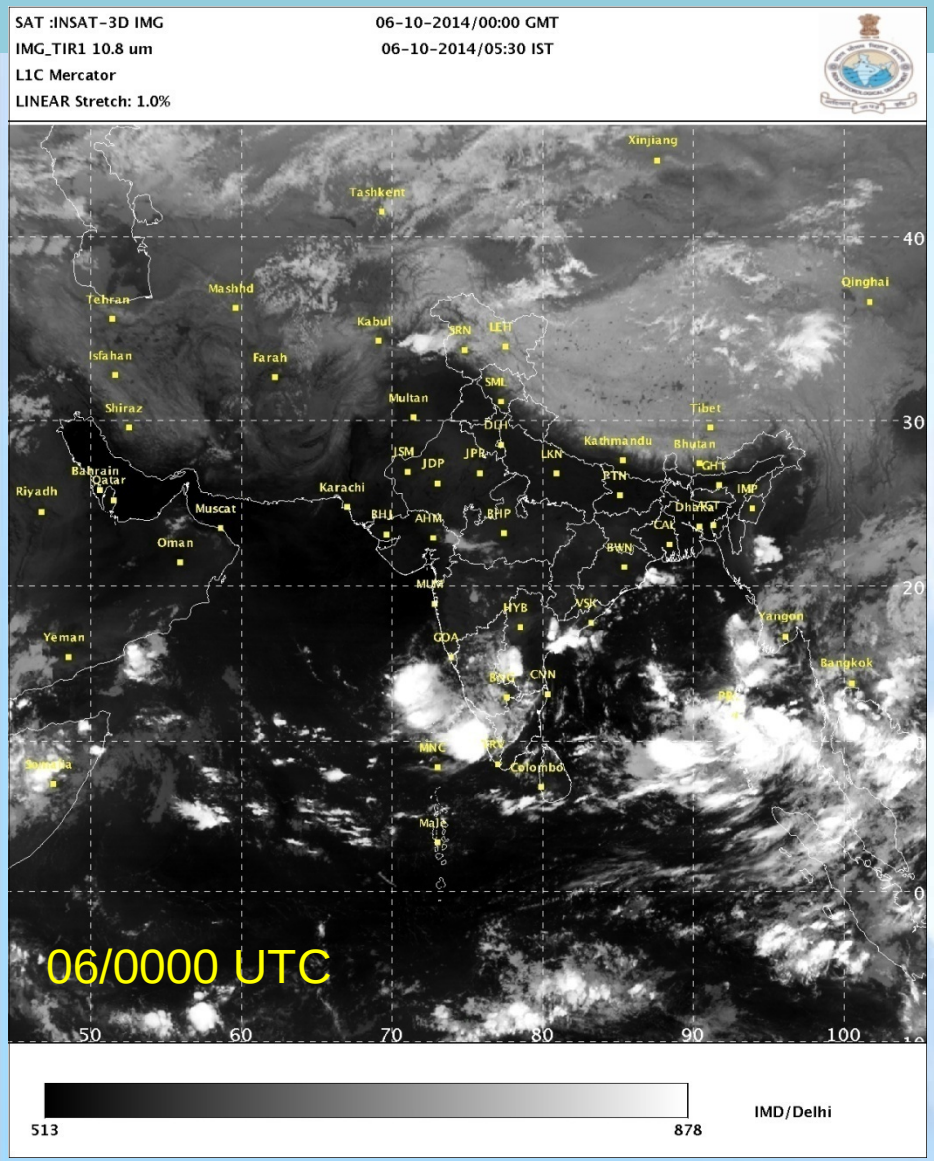
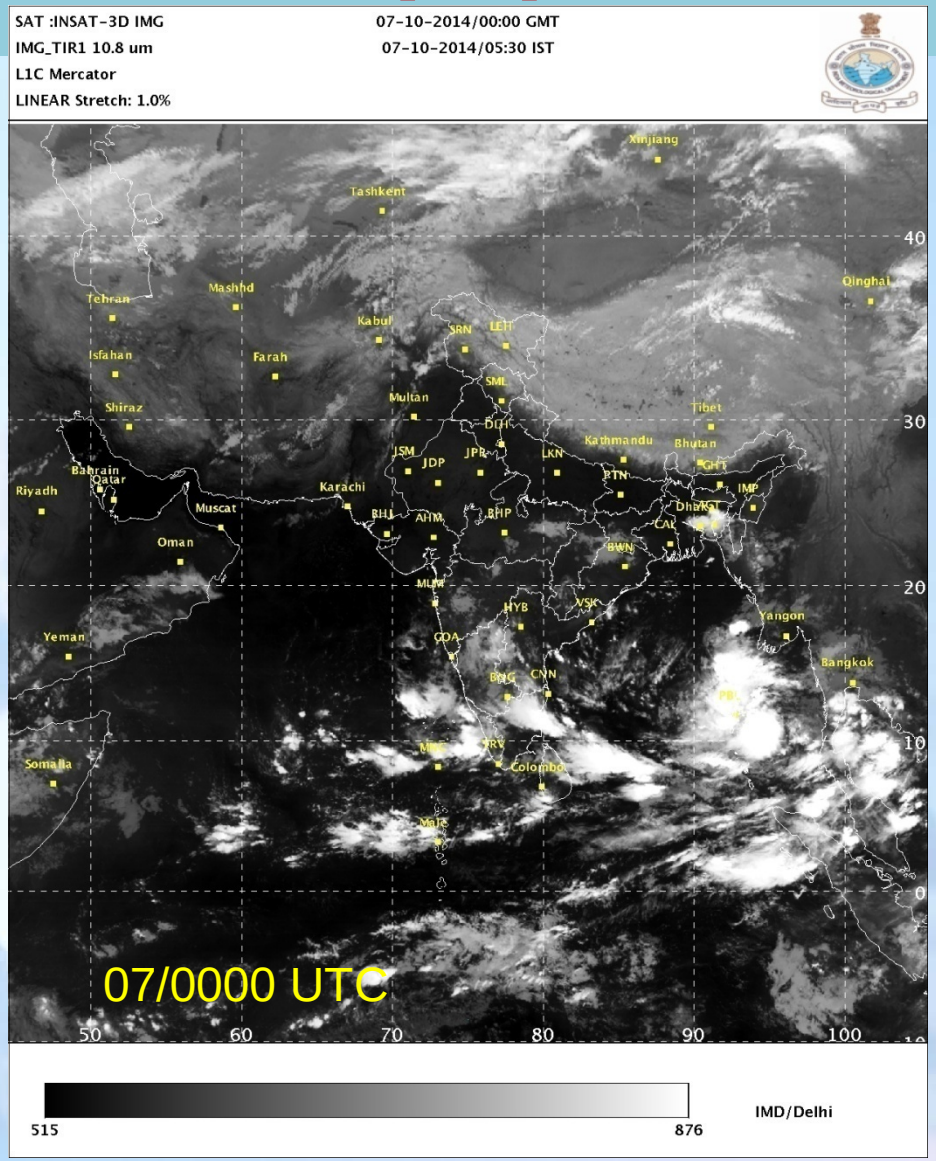




Satellite Pictures (IR)





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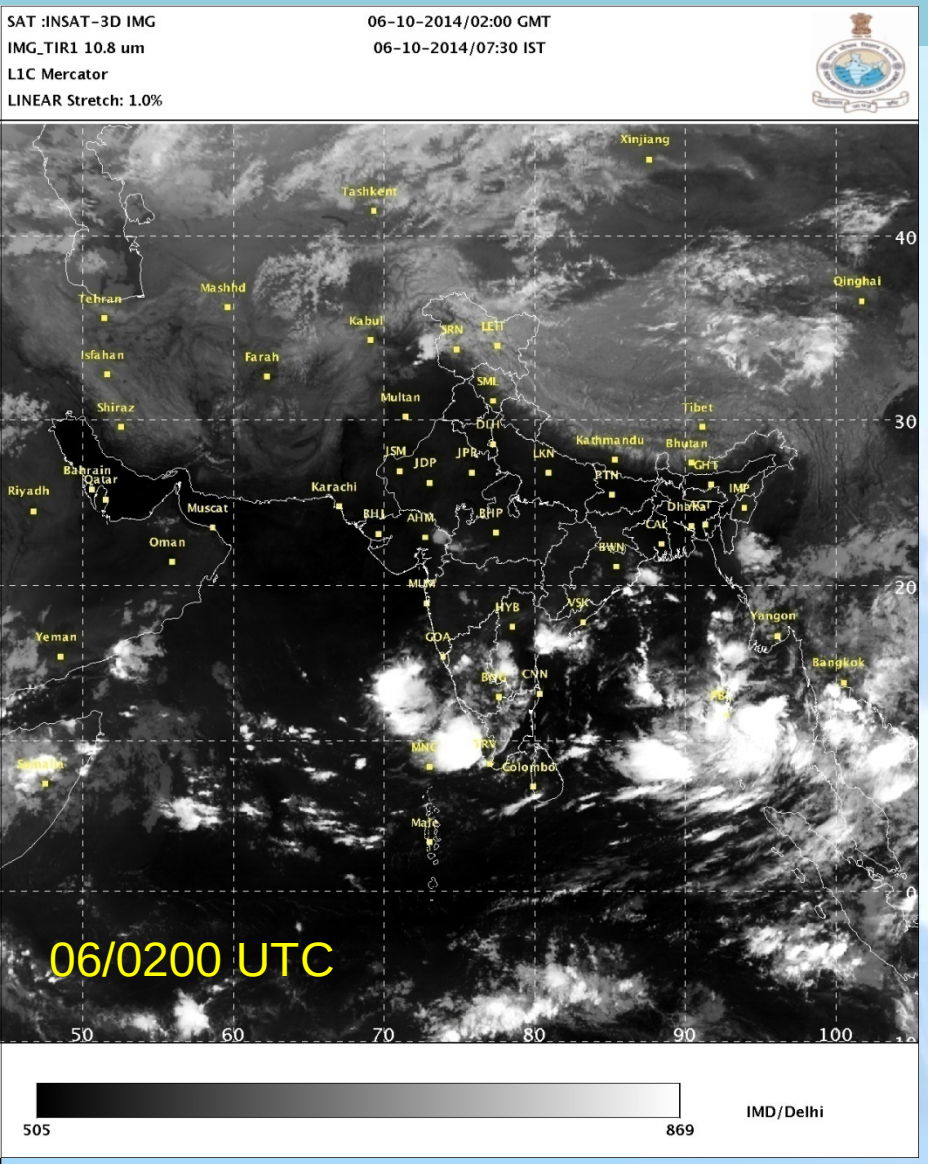

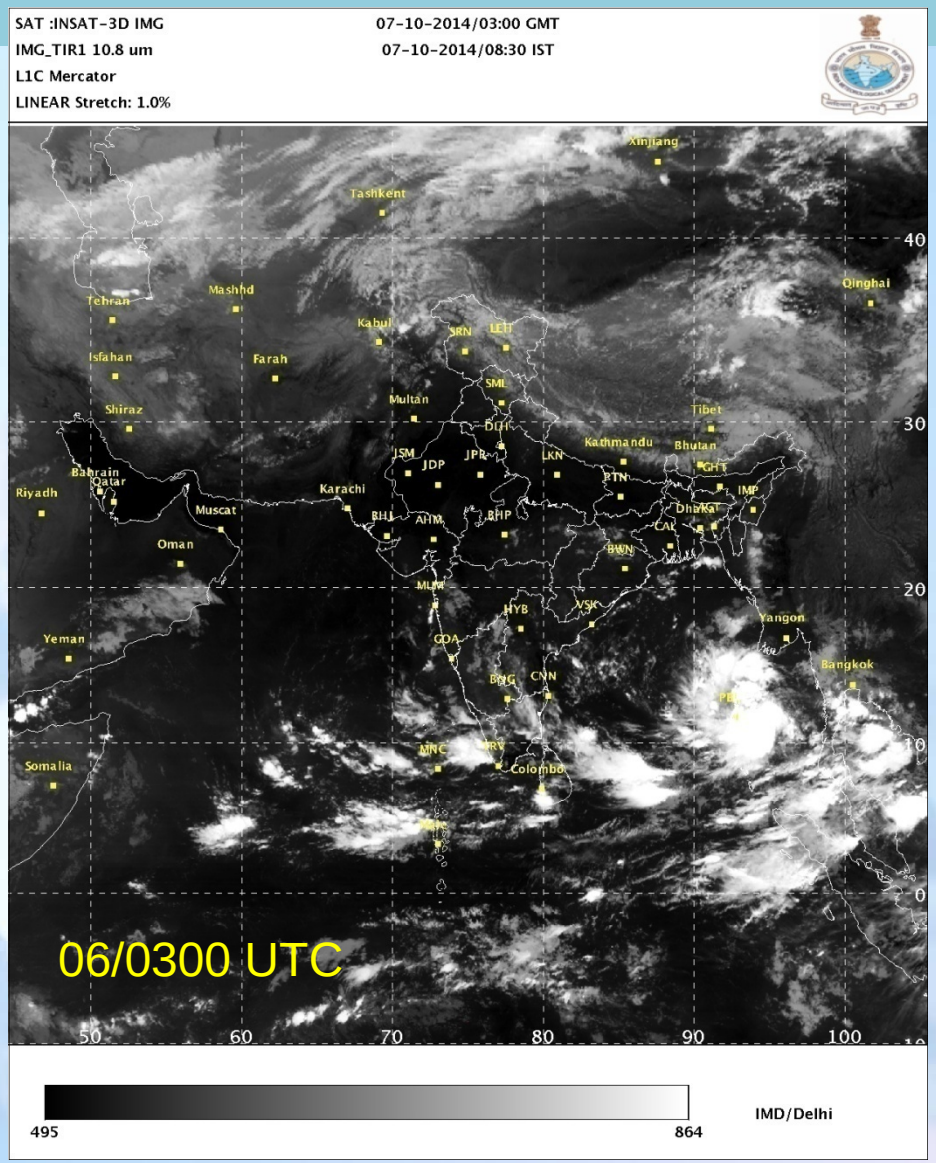

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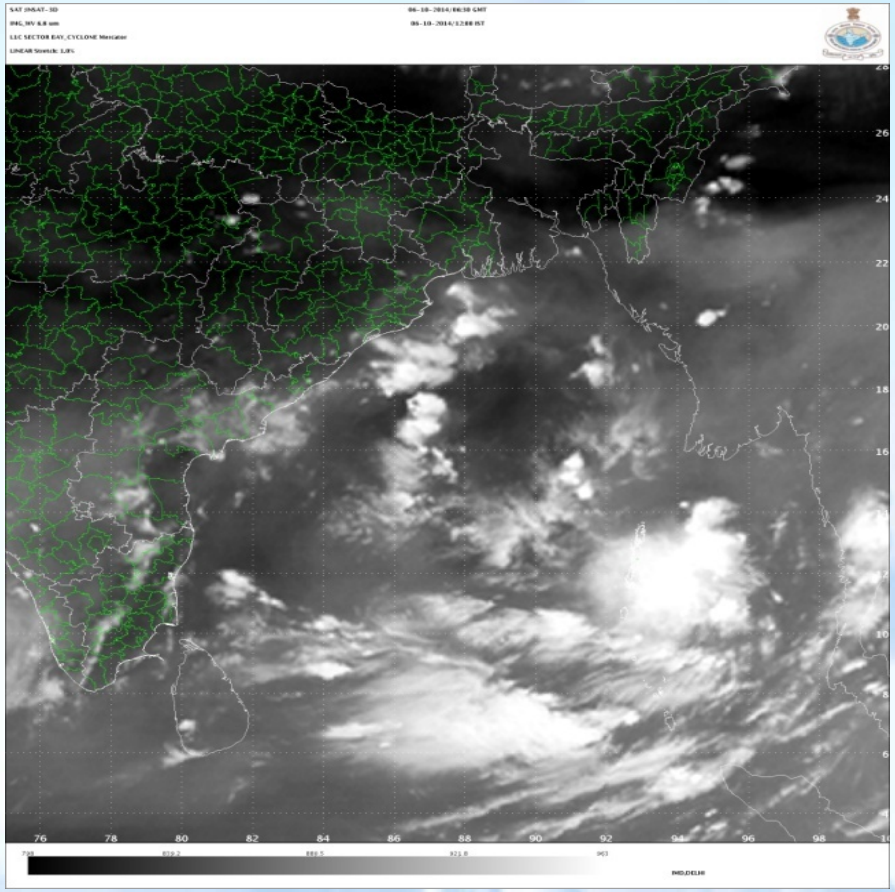
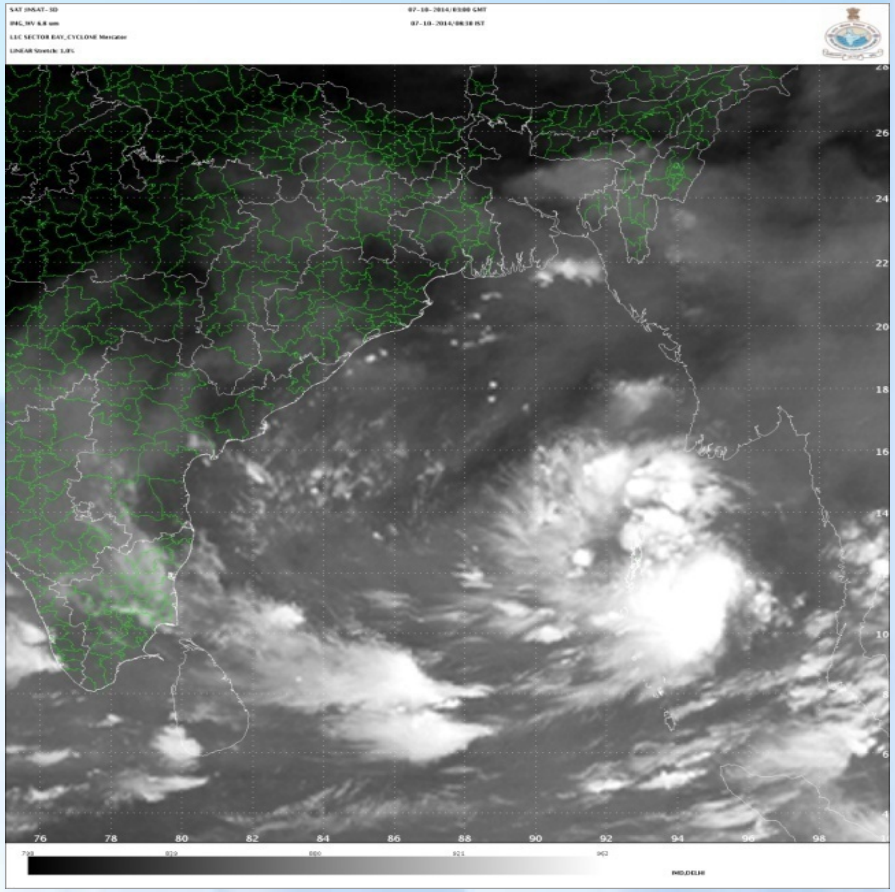
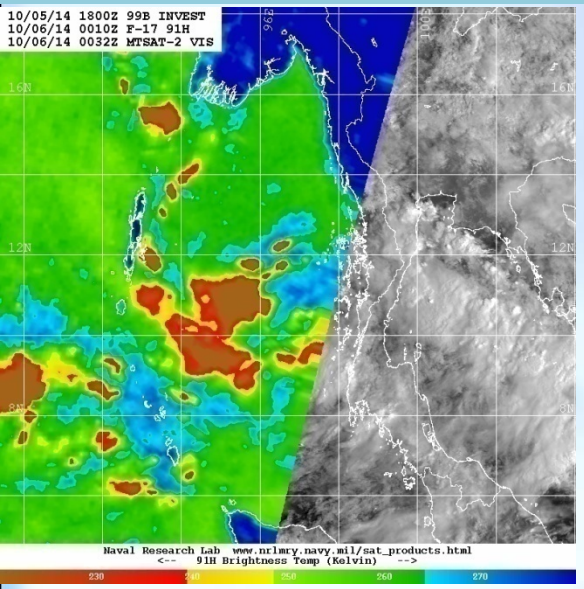


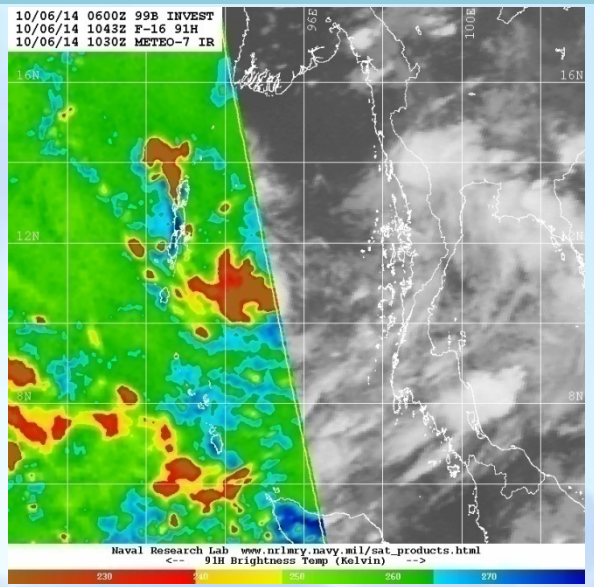


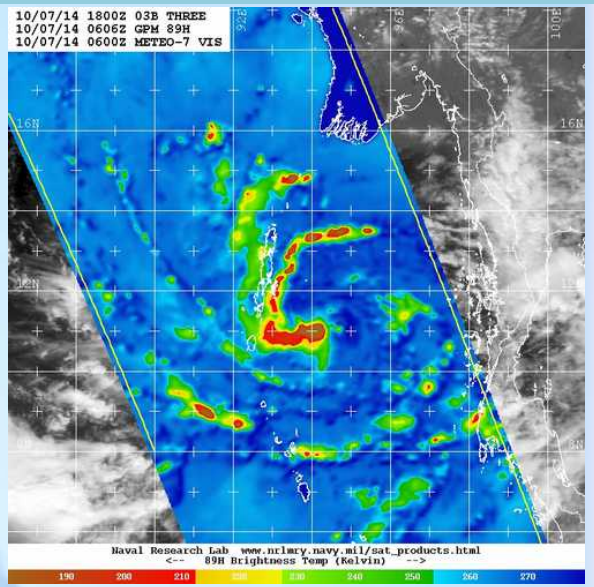
Water Vapour imageries 06/0630 and 07/0300 UTC

Satellite Pictures

06/0000 and 1030 UTC and 07/0600 UTC

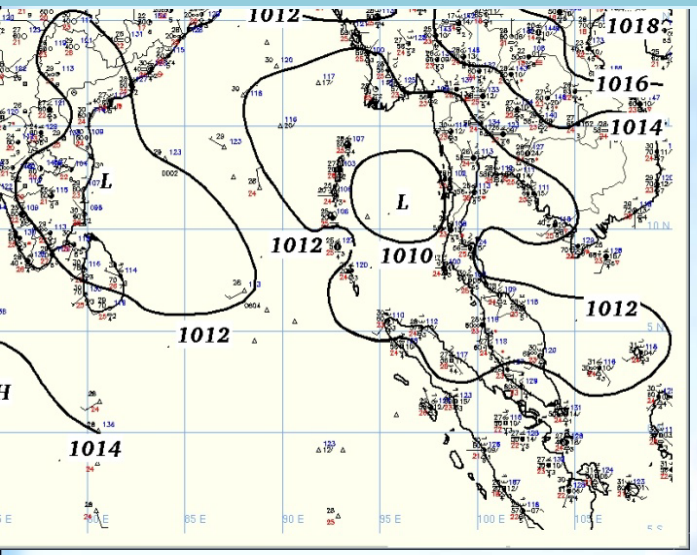




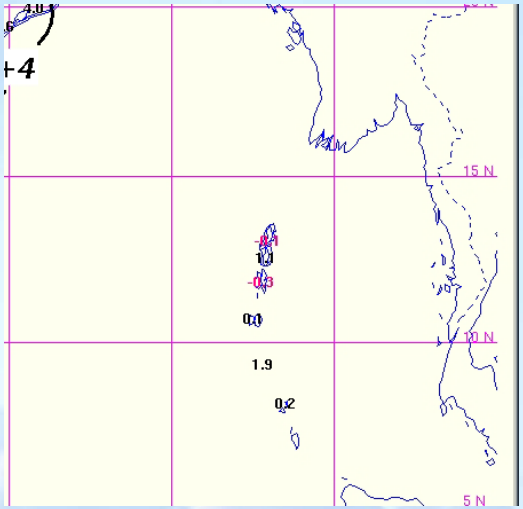


Observations

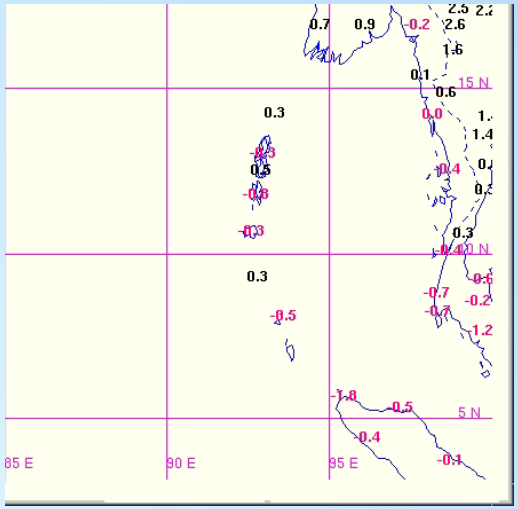
06/0300 UTC



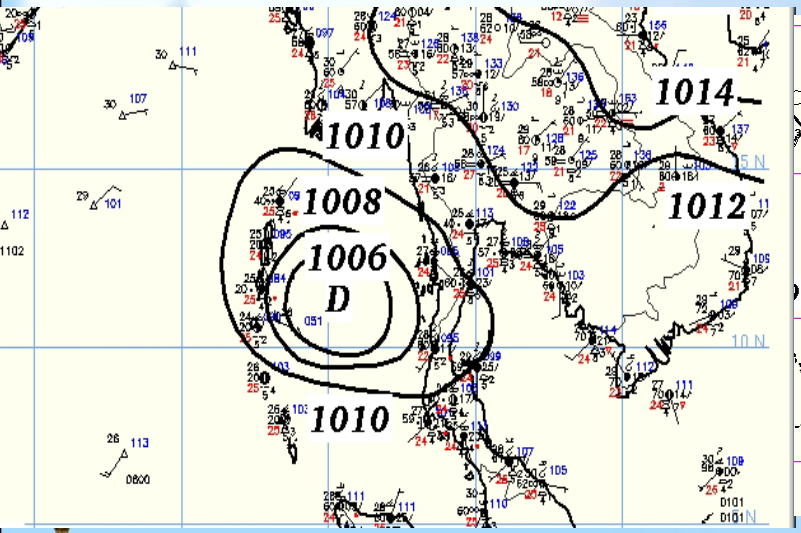
Surface Chart

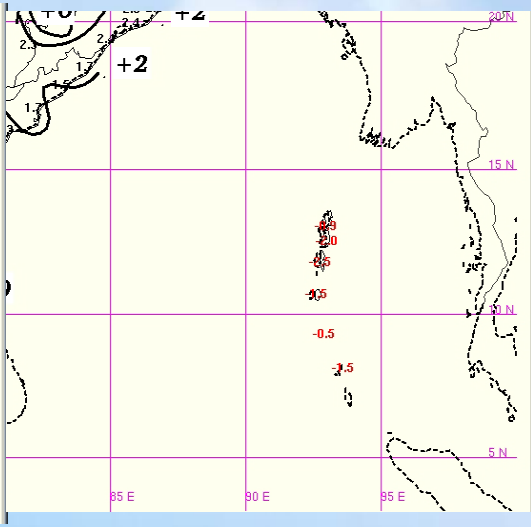


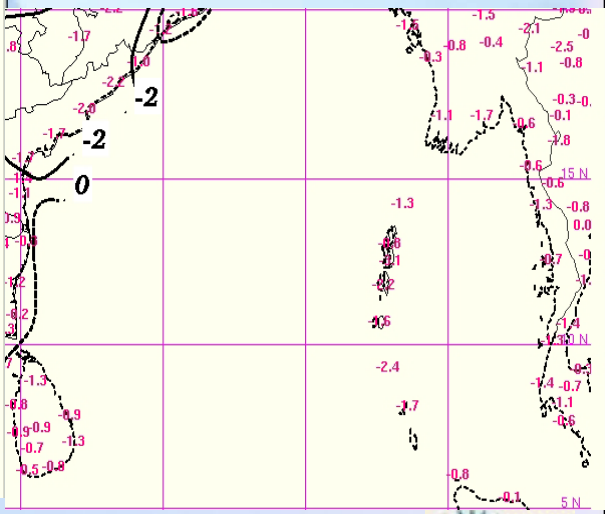
MSLP Departure



MSLP Tendency







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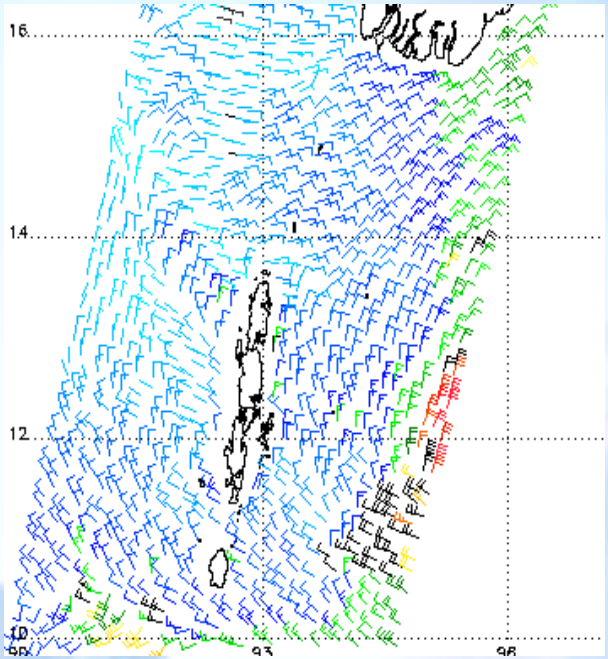
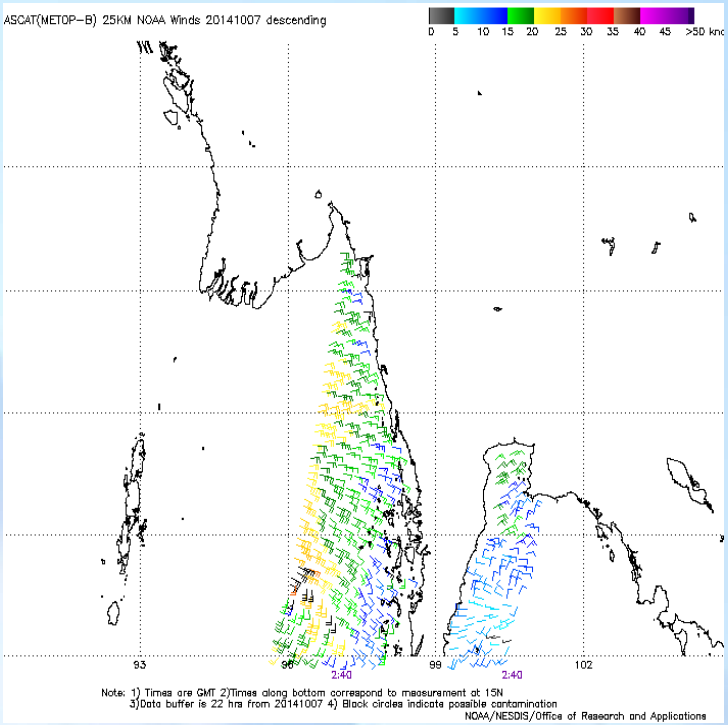
Observations

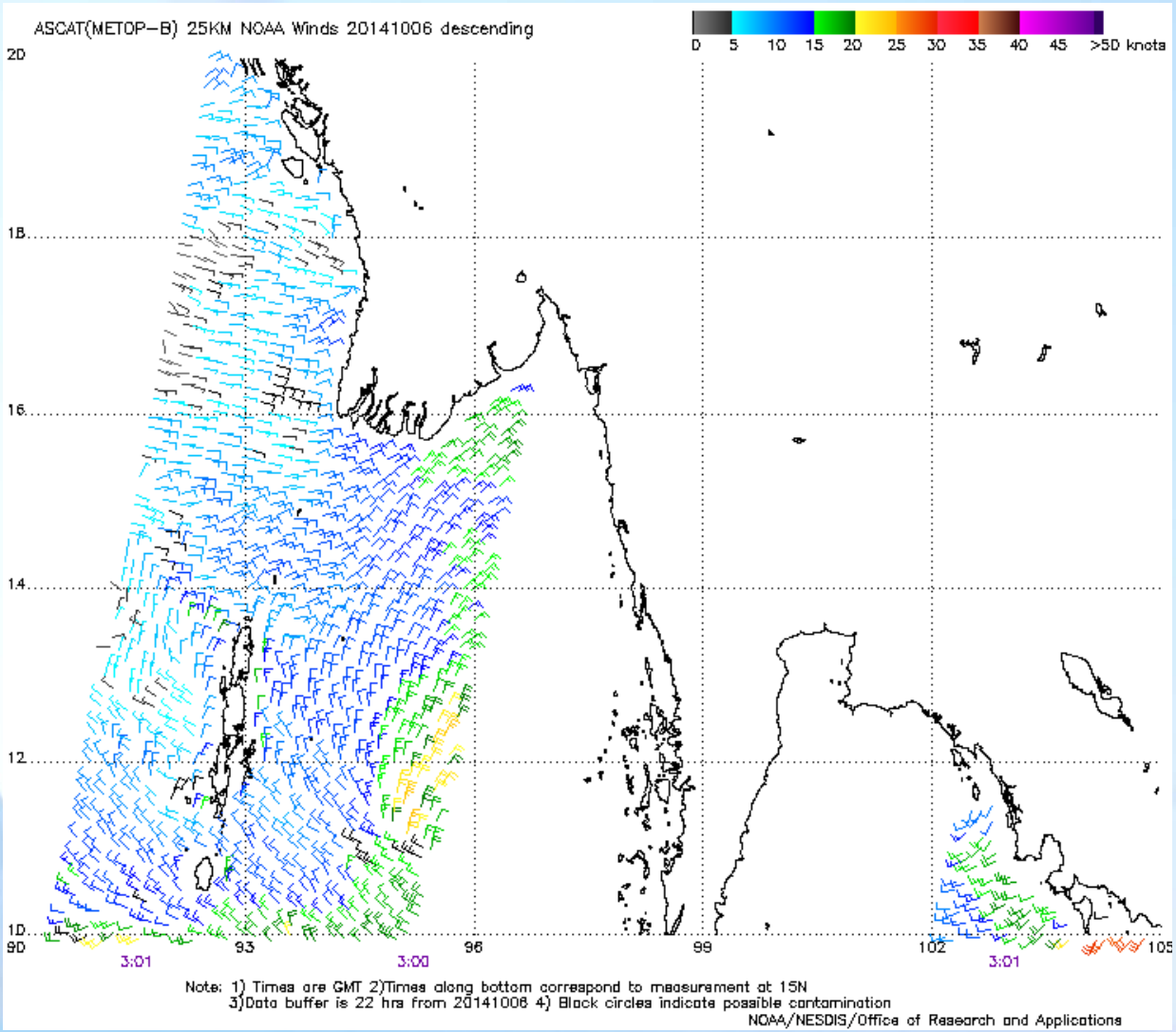


ASCAT winds 0328 UTC (Descending)
6th October 2014

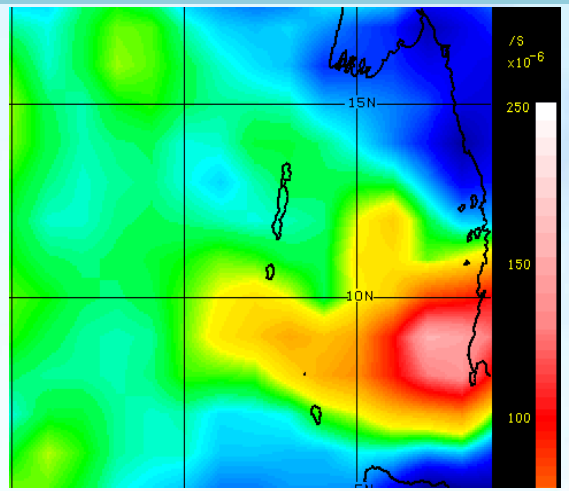


ASCAT winds 0328 UTC (Descending)
7th October 2014

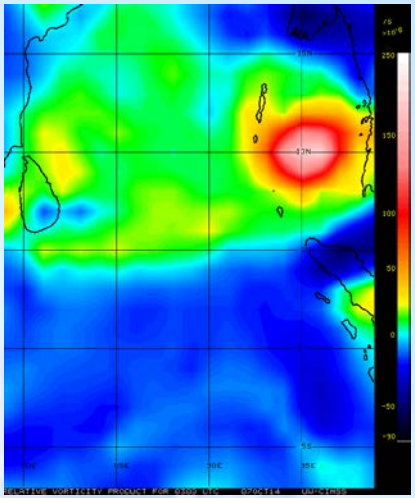
Observations



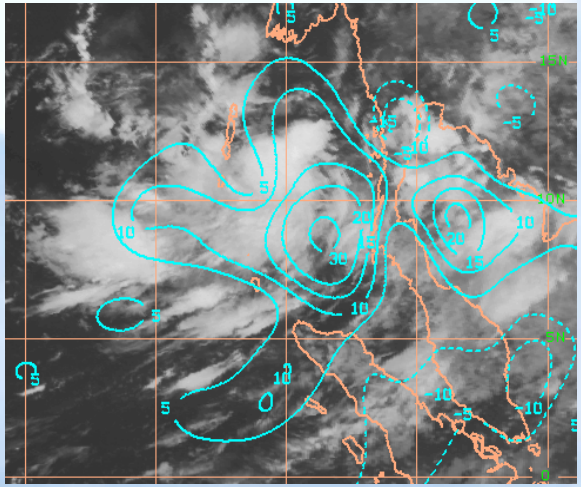
Observations (Environmental features – 6th Oct. and 7th October 2014)



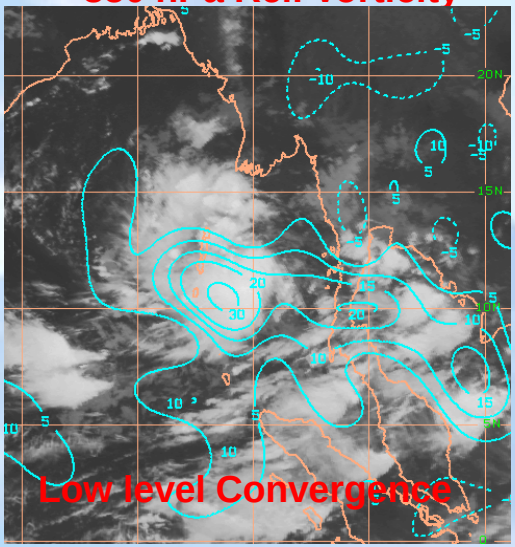
850 hPa Rel. Vorticity



850 hPa Rel. Vorticity

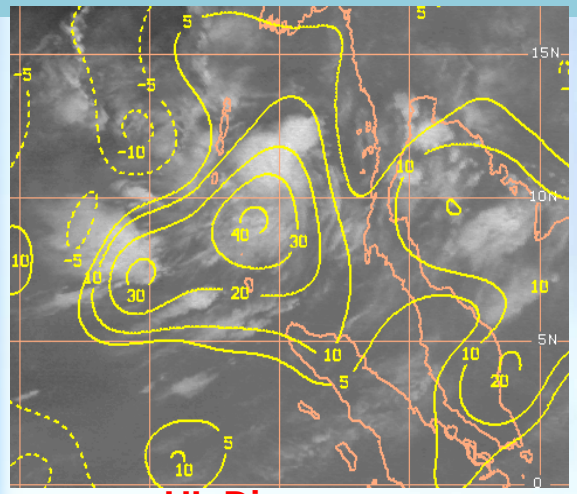


Low level Convergence

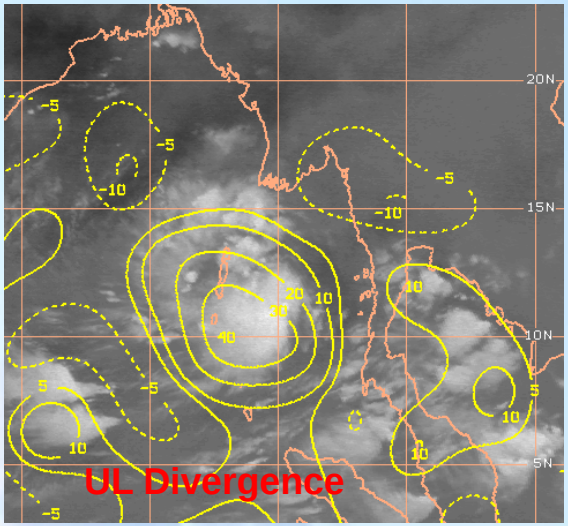


Low level Convergence

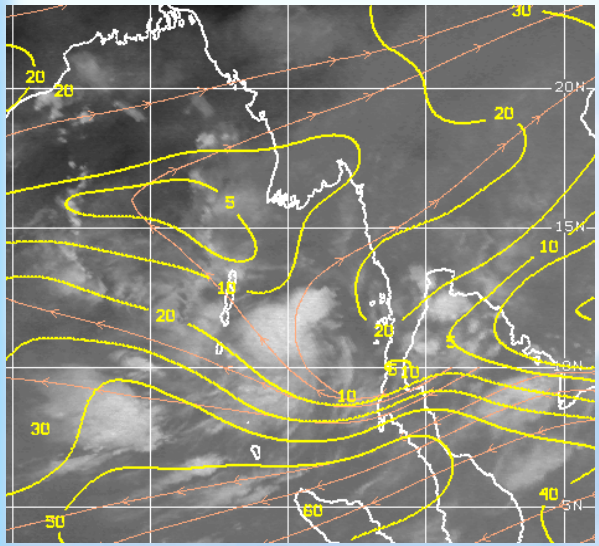
Observations (Environmental features – 6th Oct. and 7th October 2014)



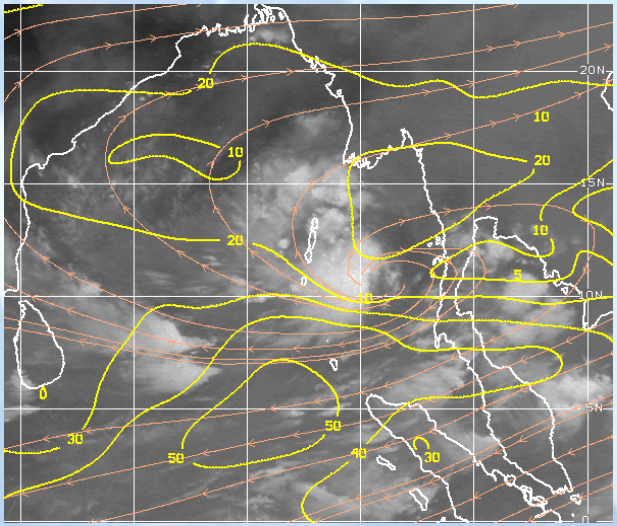
UL Divergence



UL Divergence

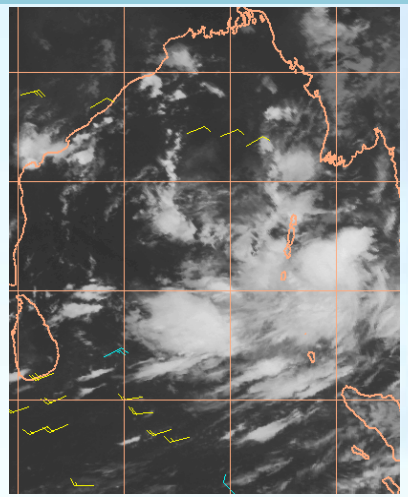


Wind shear

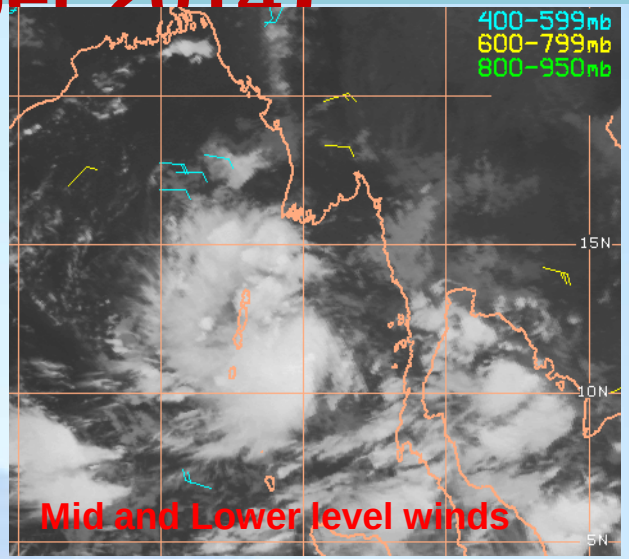


Wind shear

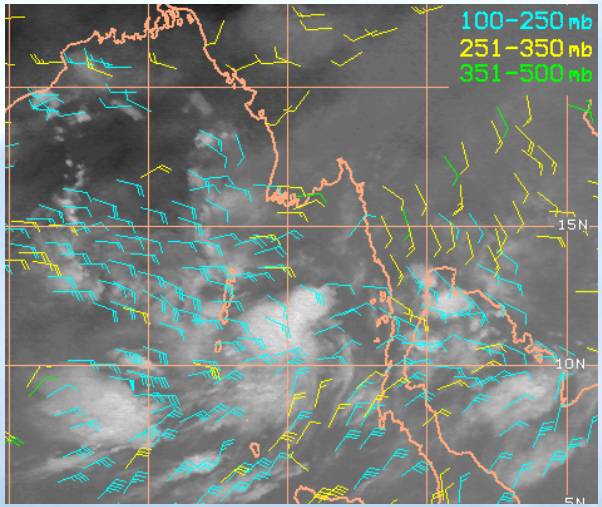
Observations (Environmental features – 6th Oct. and 7th October 2014)



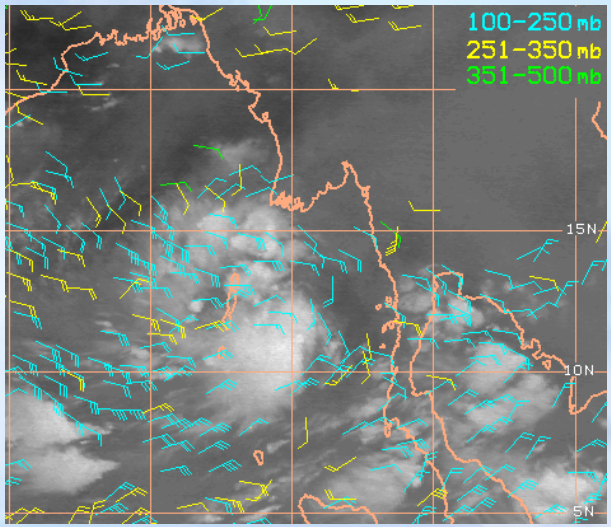
Mid and Lower level winds



Mid and Lower level winds

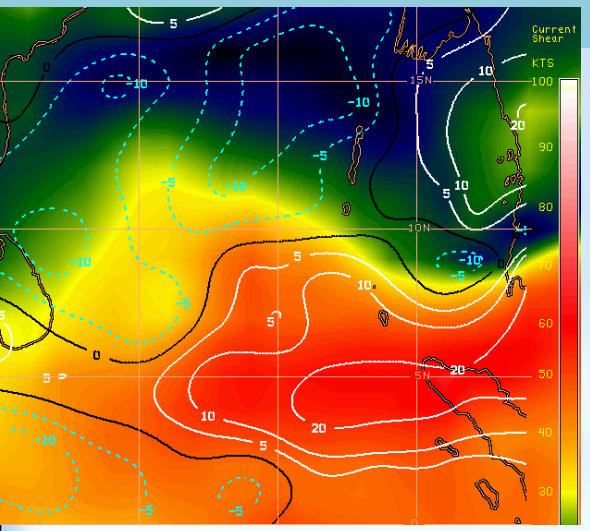


Mid and upper level winds

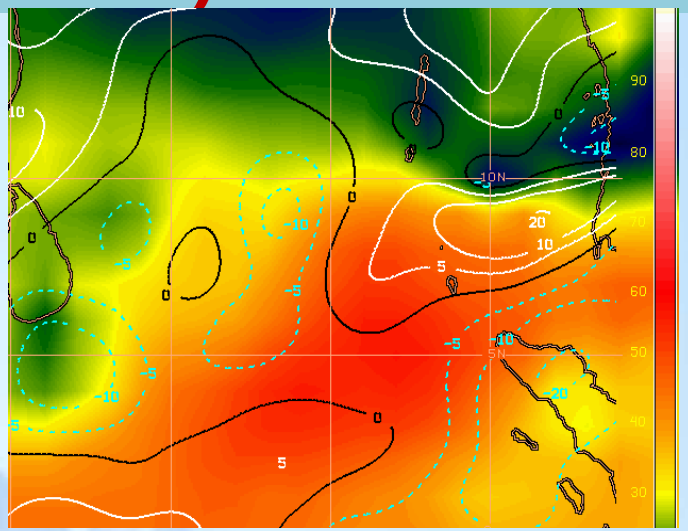


Mid and upper level winds

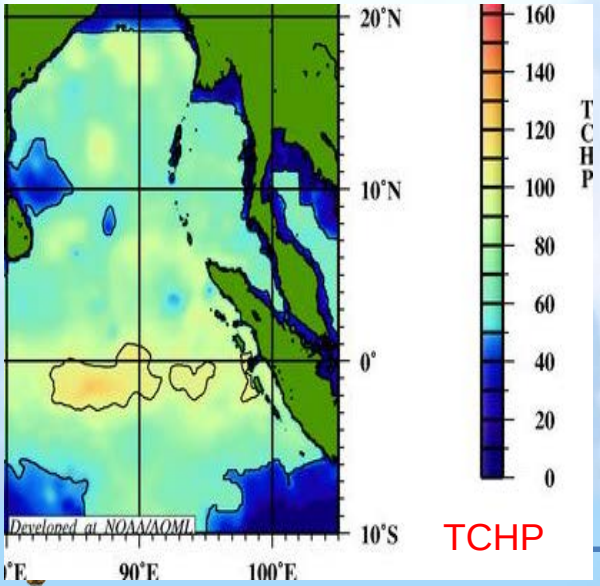
Observations (Environmental features – 6th Oct. and 7th October 2014)



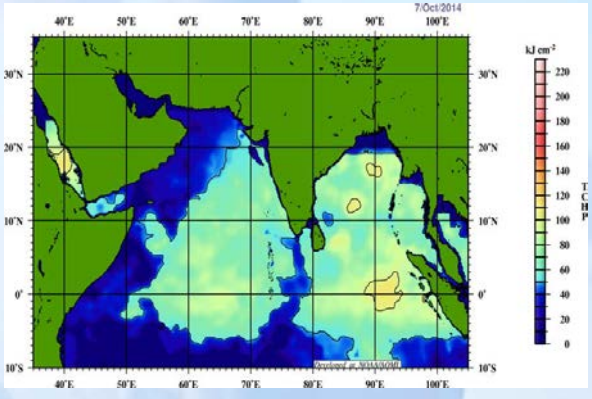
Wind shear tendency



Wind shear tendency

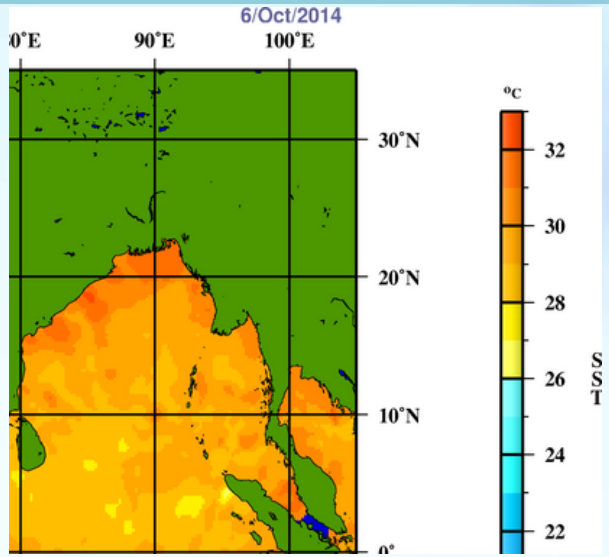


TCHP

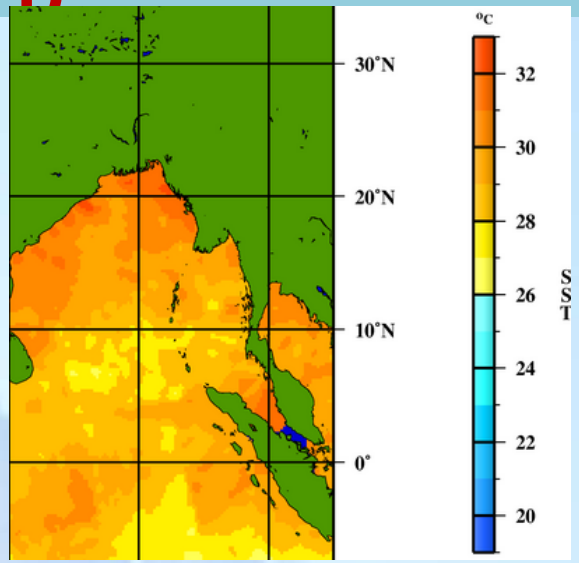


TCHP

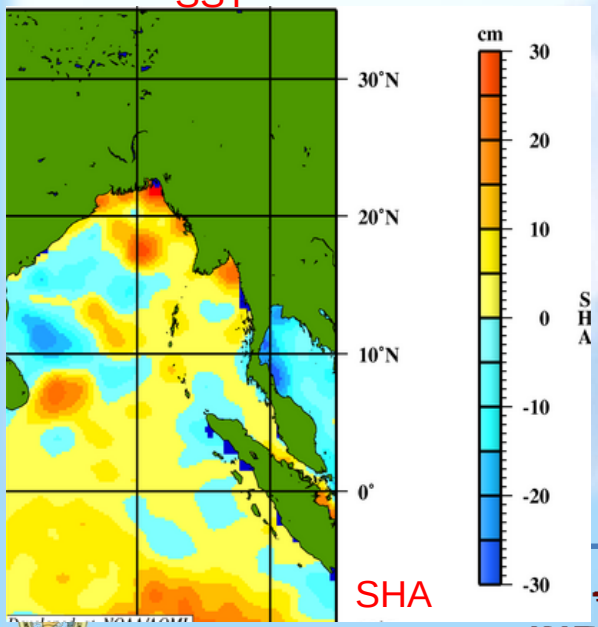
Observations (Environmental features – 6th Oct. 2014)



SST



SST



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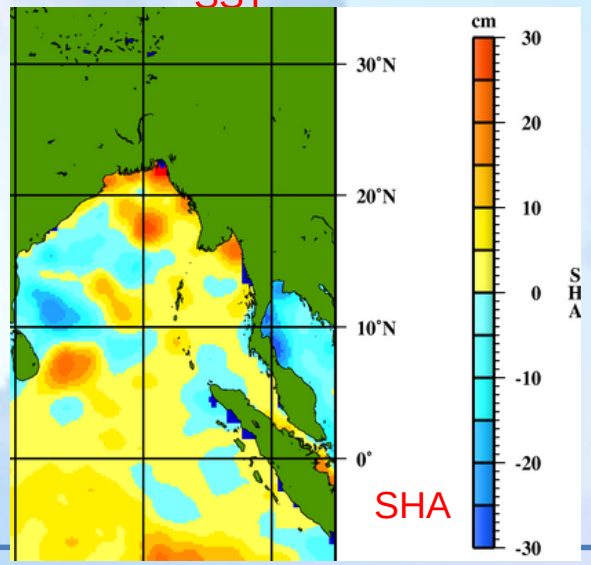
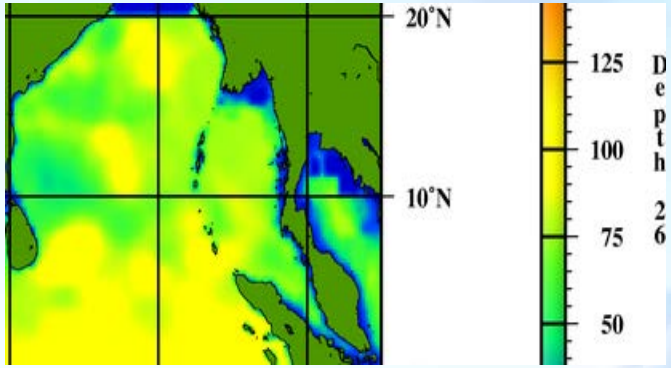
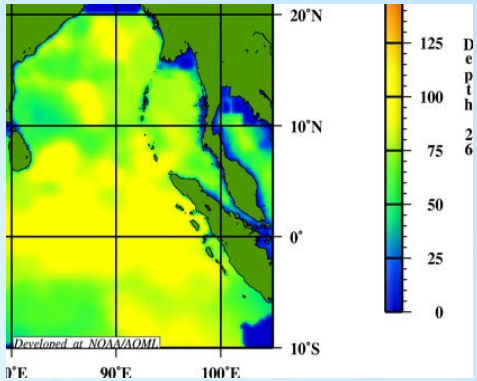


SHA

Observations (Environmental features – 6th Oct. and 7th October 2014)

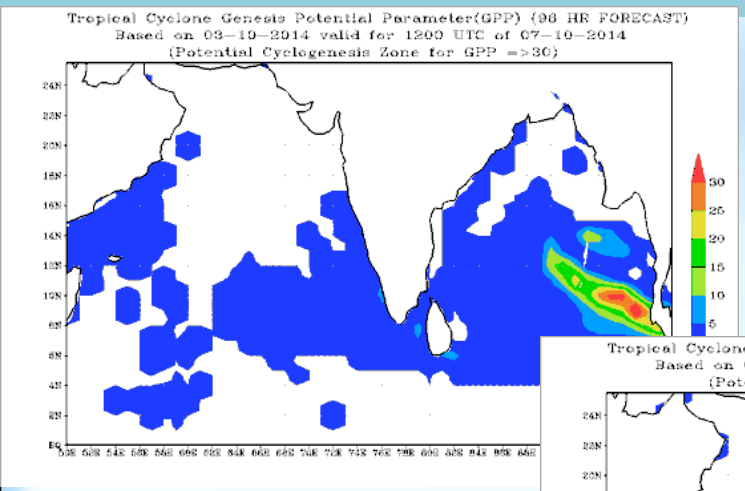


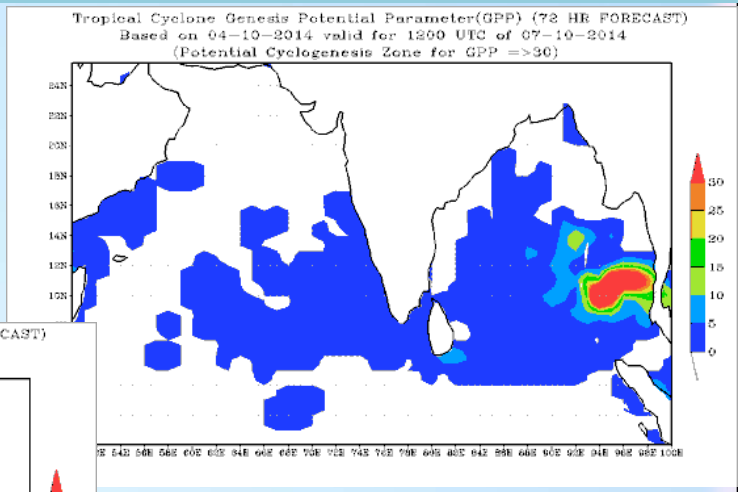
Depth 26°C

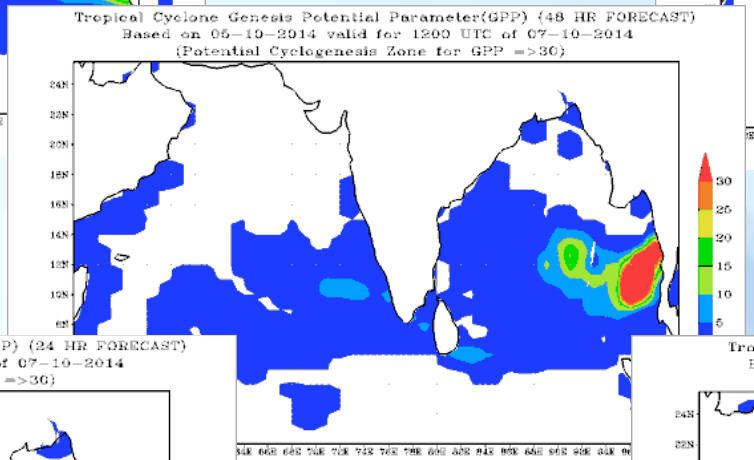


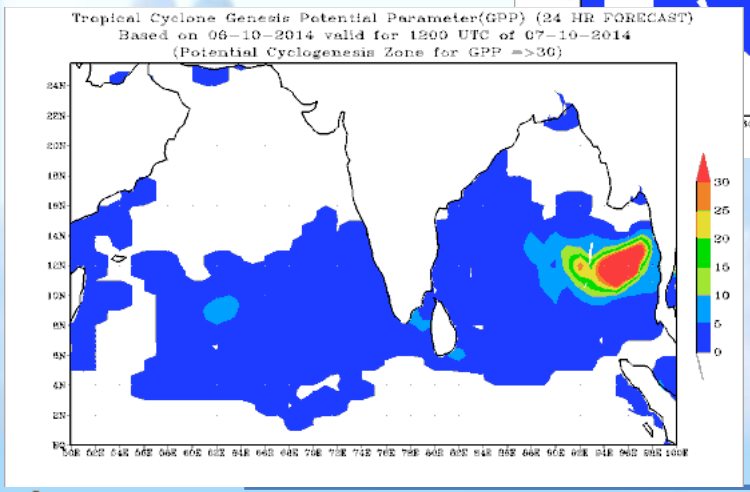
Depth 26°C

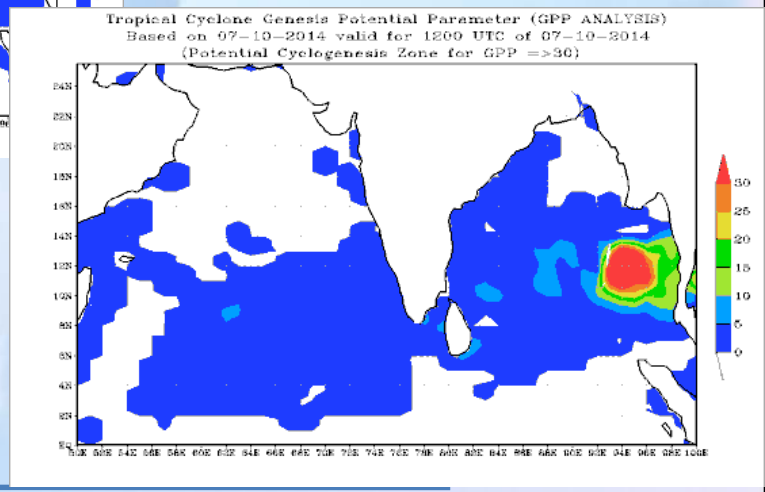
Genesis Potential Parameter











Summary of observations

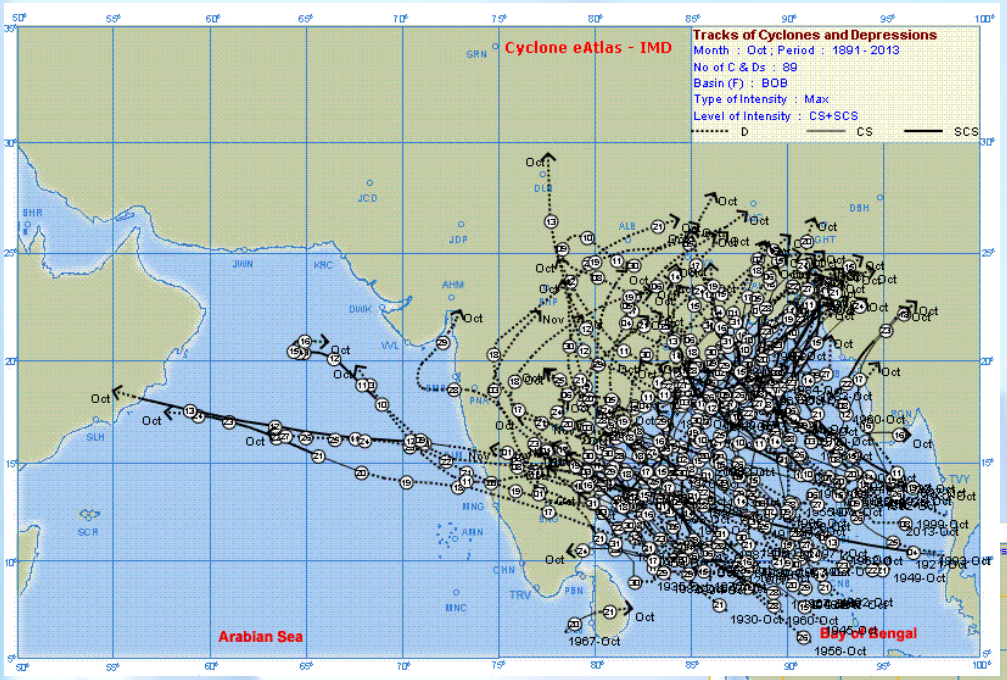
INSAT 3D Positions

Date	Time (UTC)	Lat (°N)	Long (°E)	Intensity
06.10.2014	0600			LLC
	1200	11.5	95.5	1.0
	1500	11.5	95.5	1.0
	1700	11.5	95.5	1.0
	2100	11.5	95.5	1.0
07.10.2014	0000	11.5	95.2	1.0
	0300	11.5	95.0	1.0
	0600	11.5	94.7	1.5

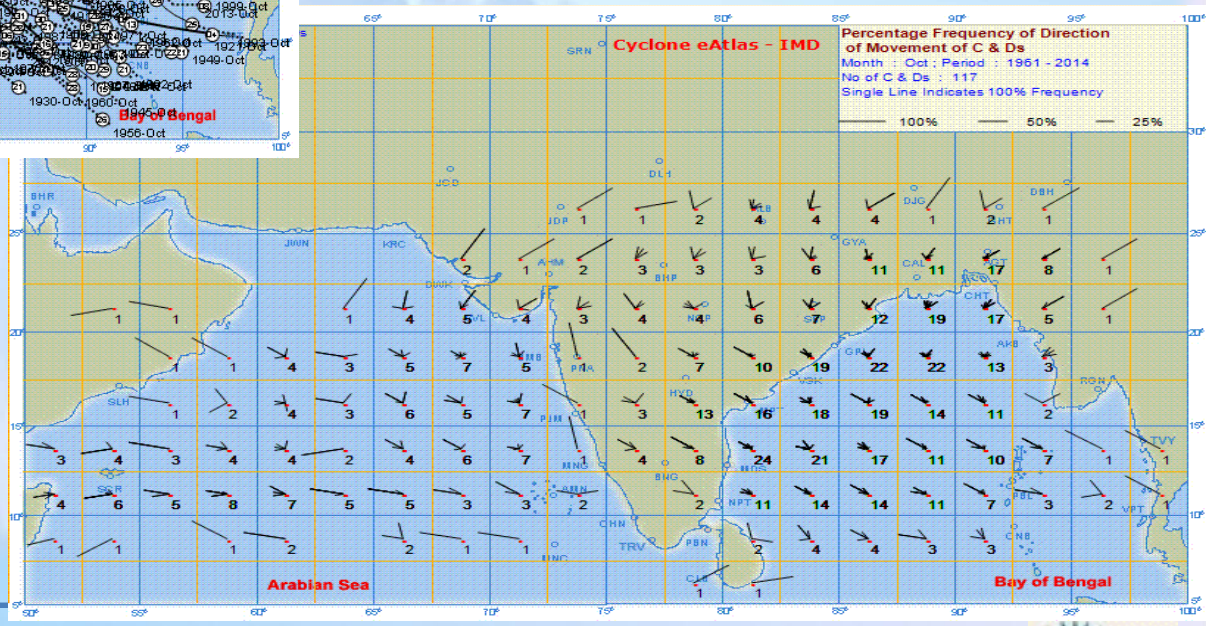
Position and intensity of all available satellite positions

DATE/ TIME UTC	**INSAT-3D Position**	**JTWC Position**	**NOAA Position**	**IMD Positions/ Intensity (Real Time)**
07/0000 UTC	11.5/95.2, T1.0	11.3/95.3	11.5/95.0, T1.0	
07/0300 UTC	11.5/95.0 T1.0	11.5/95.1	11.2/94.8, T1.5	11.5/95.0 **D**

Climatology

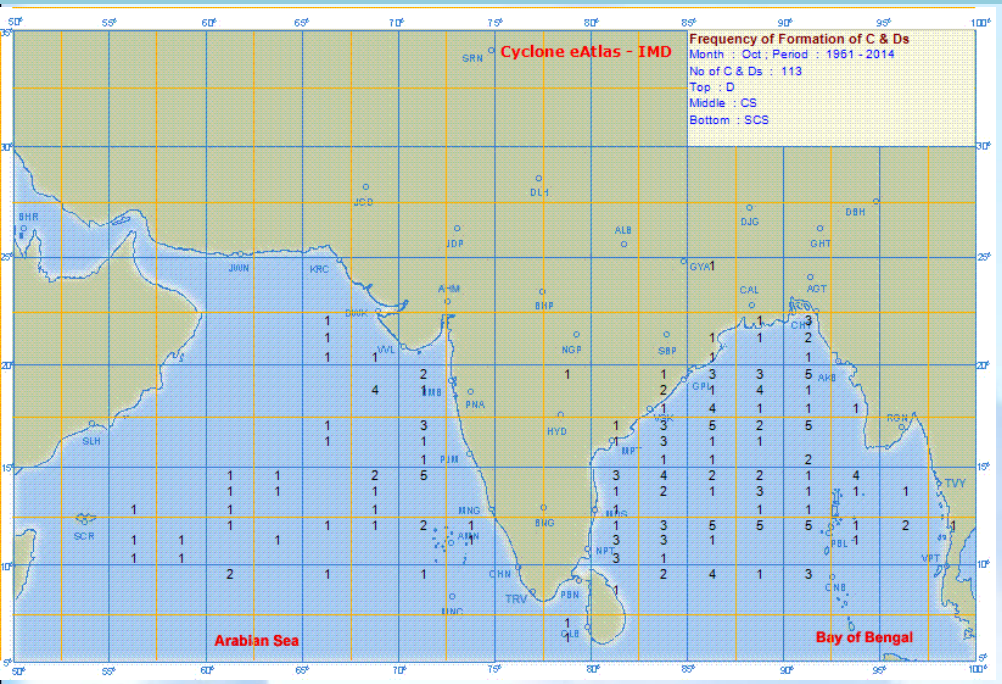


Number of D, CS and SCS formed in the month of October (1961-2014)

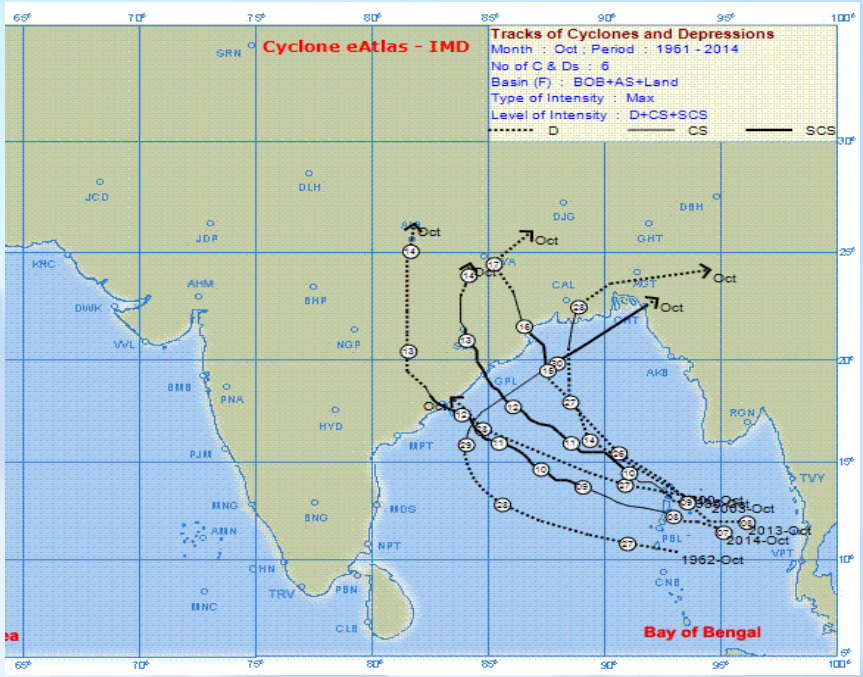


Direction of Movement in the month of October

Climatology

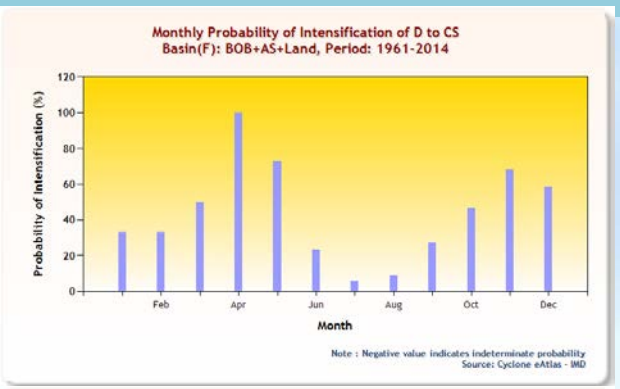


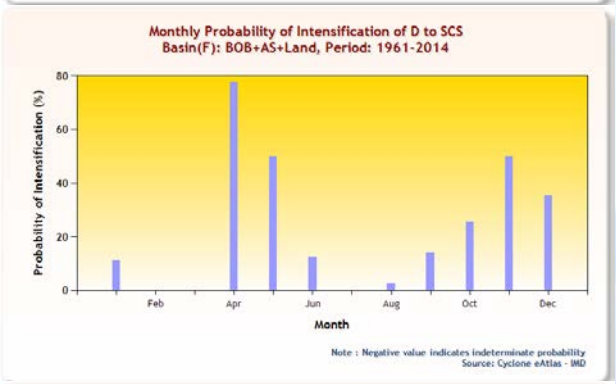
Frequency of D, CS and SCS during the month of October

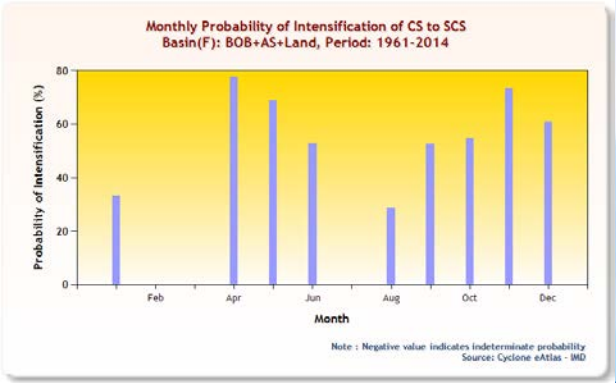


Tracks of Cyclonic Storms and Depressions during the month of October with genesis area (in the grid 2.5 X 2.5°) same as that of Hudhud (9-14°N /93-97°E)

Climatology







Probability of

1. Depression intensifying into Cyclonic Storm

(NIO:46.4 BOB:45.1)

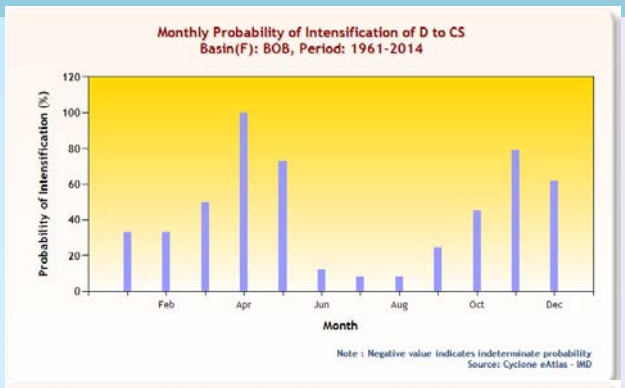
1. Depression intensifying into Severe Cyclonic Storm

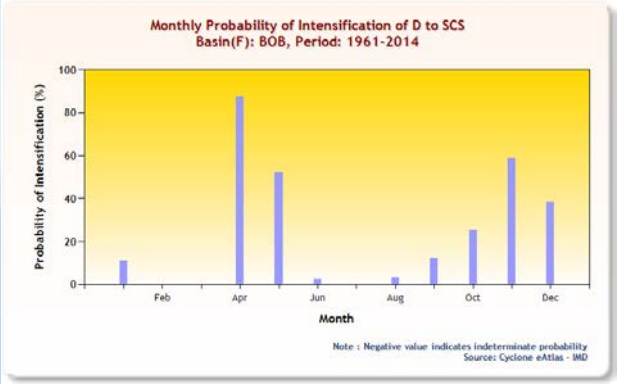
(NIO: 25.5 BOB: 25.6)

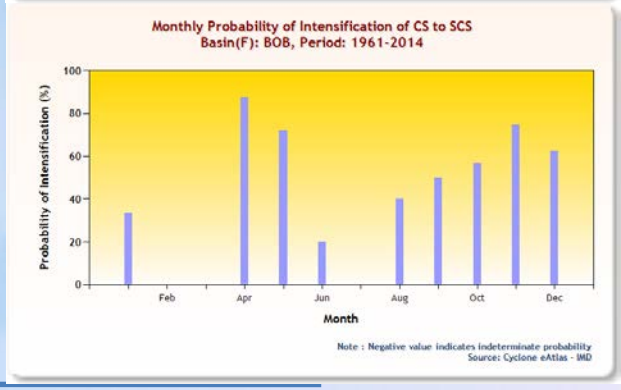
1. Cyclonic Storm intensifying into Severe Cyclonic Storm

(NIO: 54.9 BOB: 56.8)

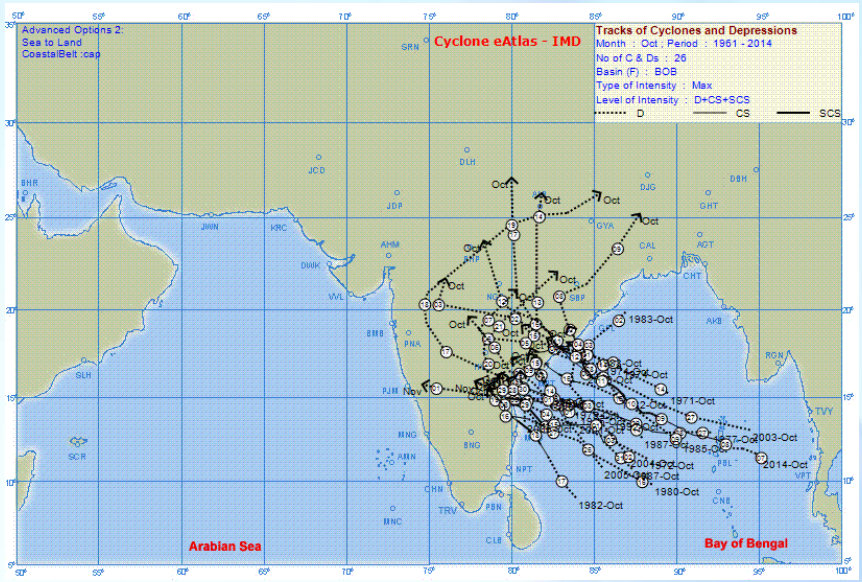
Over Indian Ocean and Bay of Bengal



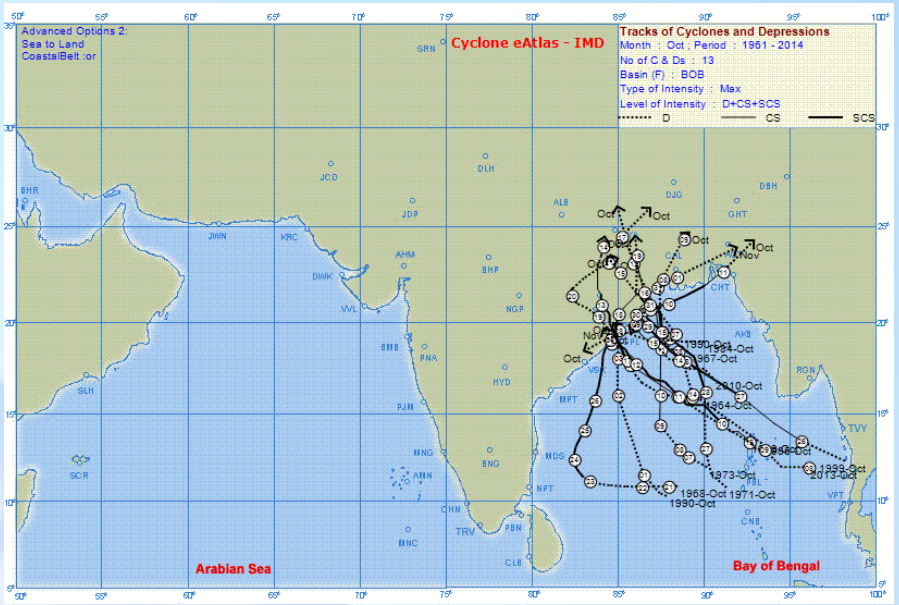




Climatology

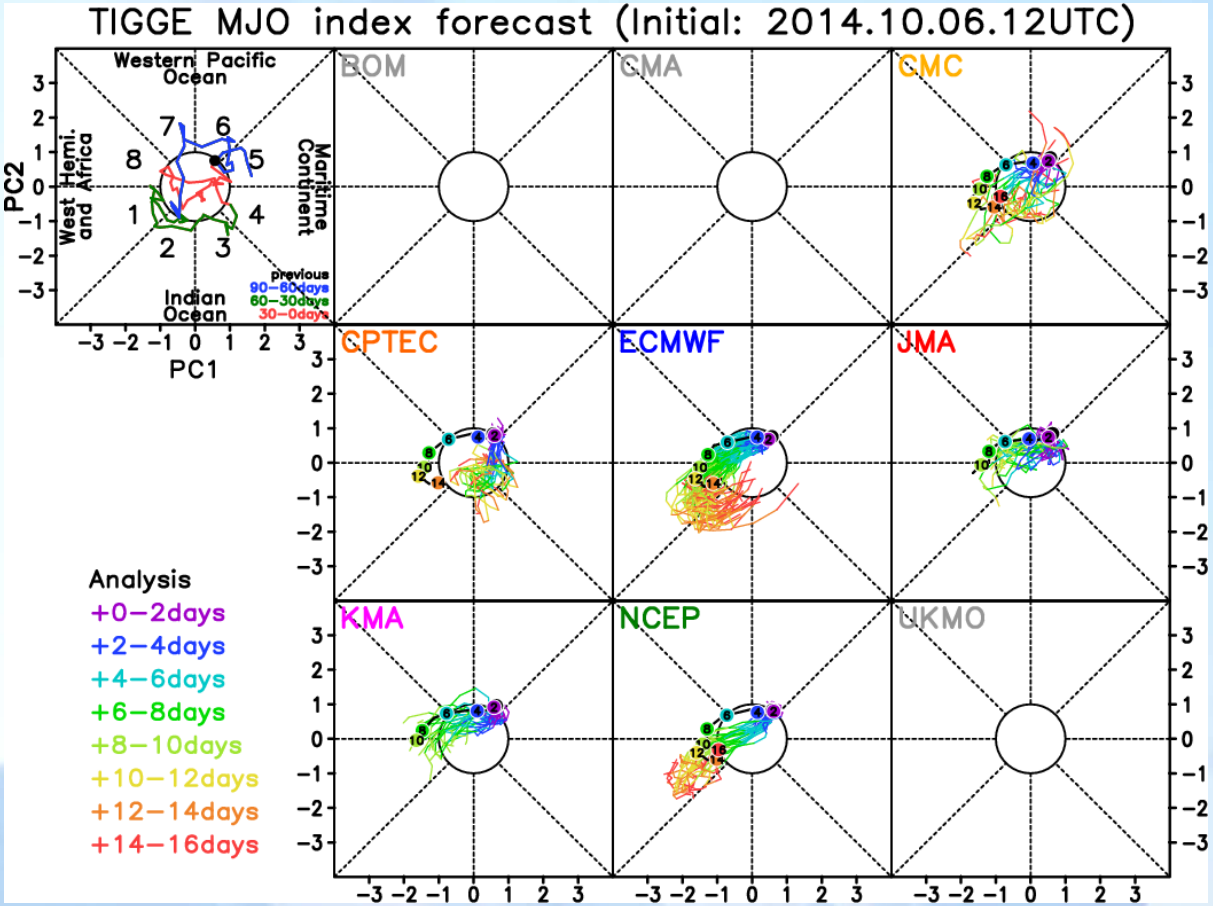


Systems that crossed Andhra Pradesh(26) during the month of October 1961-2014

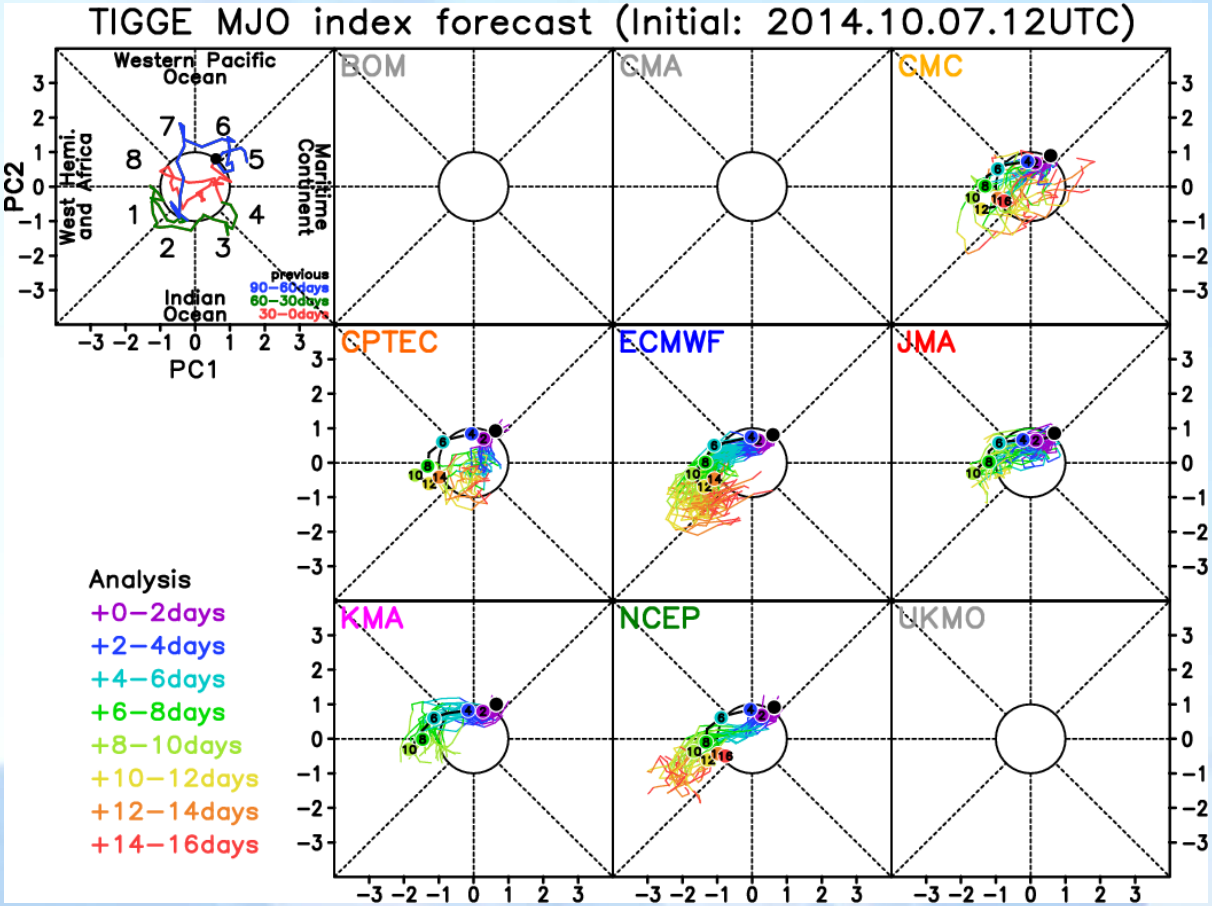


Systems that crossed Odisha (13) during the month of October 1961-2014

MJO


TIGGE MJO index forecast (Initial: 2014.10.06.12UTC)
Western Pacific Ocean
Maritime Continent
West Hemi. and Africa
Indian Ocean
PC1
PC2
previous
90–60days
60–30days
30–0days
BOM
CMA
CMC
CPTEC
ECMWF
JMA
KMA
NCEP
UKMO
Analysis
+0–2days
+2–4days
+4–6days
+6–8days
+8–10days
+10–12days
+12–14days
+14–16days

MJO


TIGGE MJO index forecast (Initial: 2014.10.07.12UTC)
Western Pacific Ocean
Maritime Continent
West Hemi. and Africa
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BOM
CMA
CMC
CPTEC
ECMWF
JMA
KMA
NCEP
UKMO
Analysis
+0–2days
+2–4days
+4–6days
+6–8days
+8–10days
+10–12days
+12–14days
+14–16days

Summary of observations

- Satellite observations indicates pre-existing low pressure area
- Environmental features are favourable for further intensification of the low pressure area
- MJO is in Phase 6 which is favourable for intensification of the system over Bay of Bengal

Extended Range Prediction based on 1200 UTC of 6th OCtober

OmniCast | NIO Tropical Cyclone Dashboard | Graphics | Reset

Z Date & Time 2014/10/07 03:38

Tropical Cyclone Alert Level

Risk & Alert Level Legend

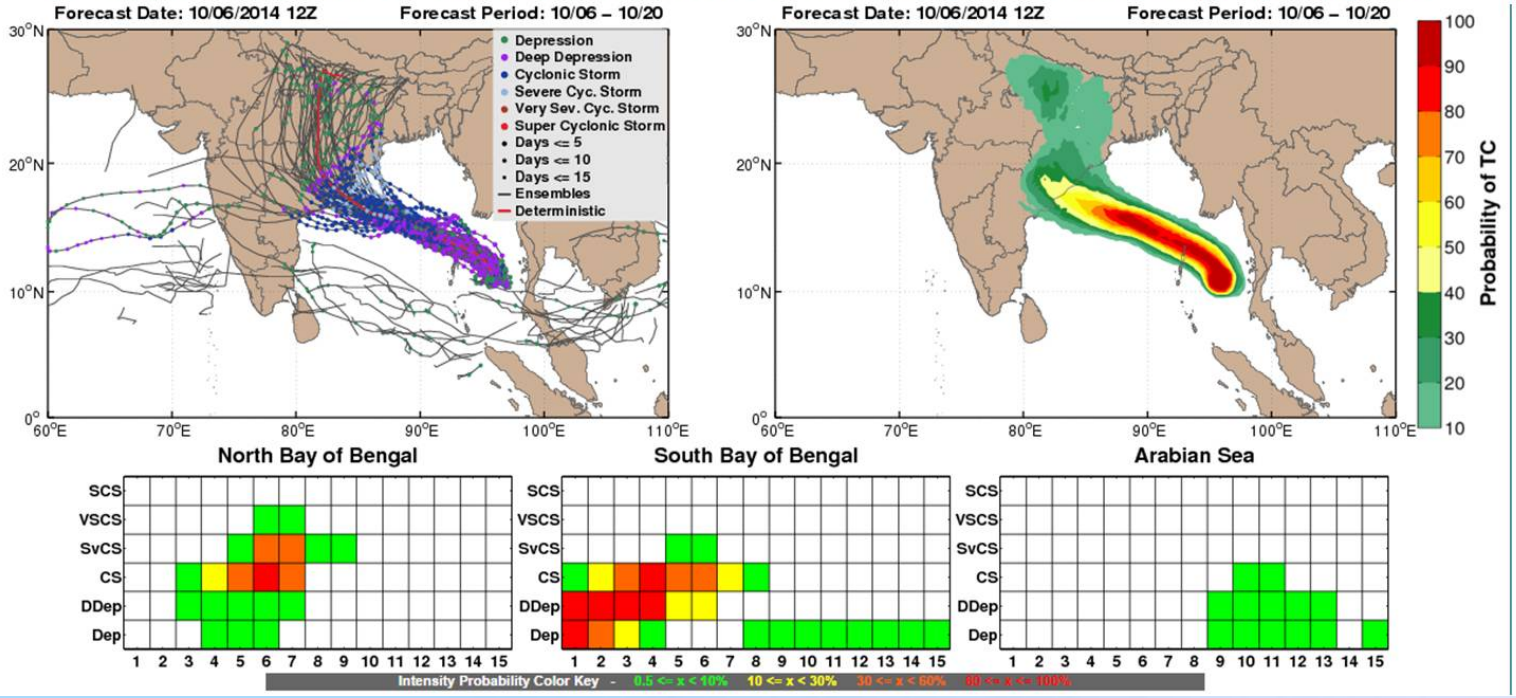
- High Risk >60%
- Moderate Risk 30-60%
- Low Risk 10-30%
- Minimal Risk <10%

CFAN TC Probabilities << (2014-10-06-12Z) >>

Region \ Time Span >	Days 1-2	Days 3-5	Days 6-10	Days 11-15
North Bay of Bengal	Minimal	Moderate	High	Minimal
South Bay of Bengal	High	High	Moderate	Low
Arabian Sea	Minimal	Minimal	Minimal	Minimal

NIO Regions

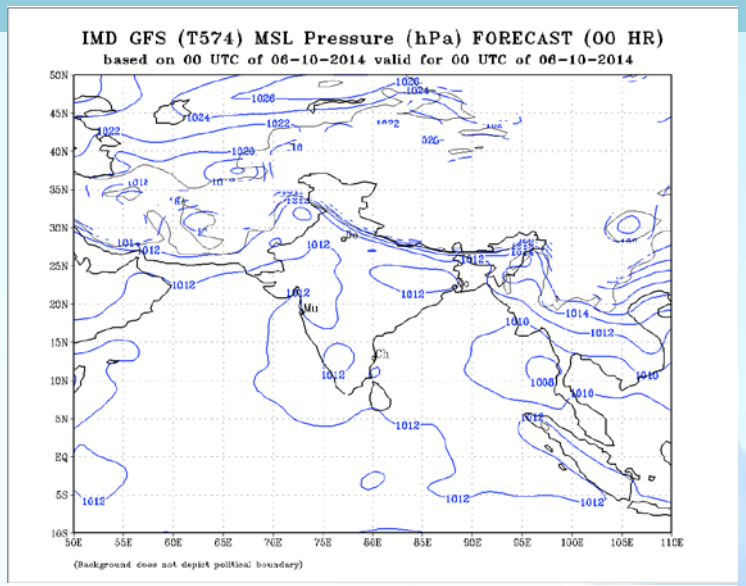
Well marked Low Pressure Area lies over North Andaman Sea (11.5N 95.1E)

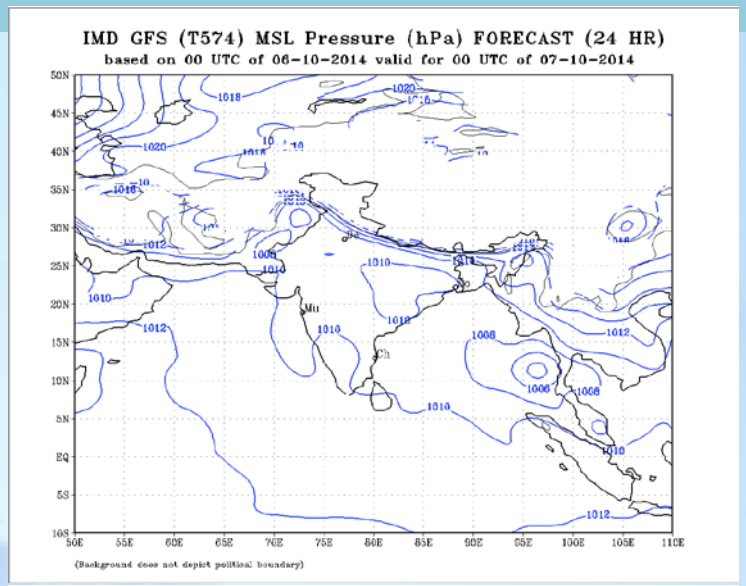


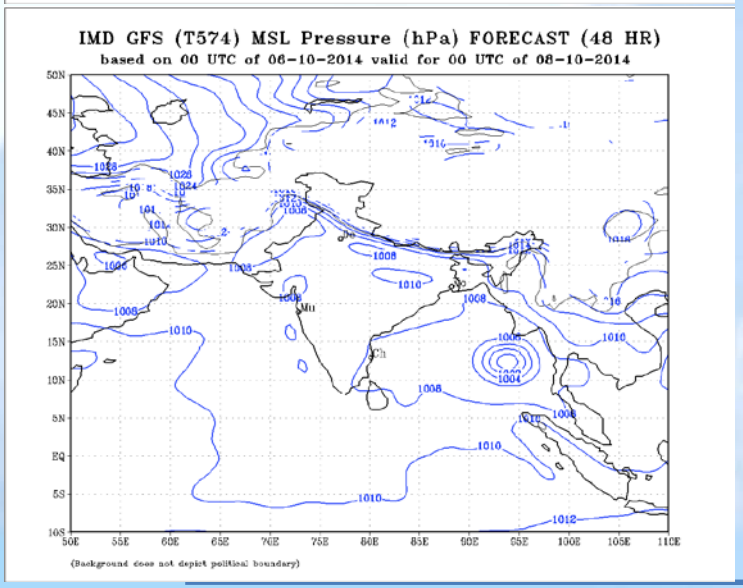
भारत मौसम विज्ञान विभाग

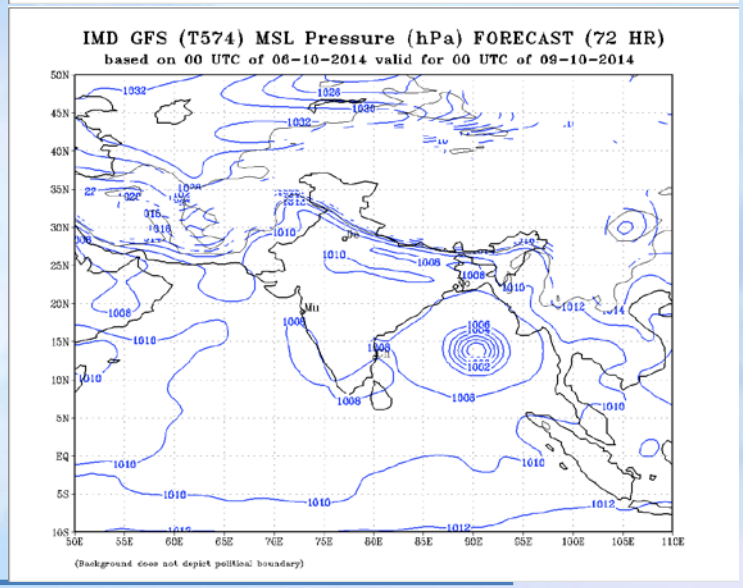
INDIA METEOROLOGICAL DEPARTMENT

NWP Guidance









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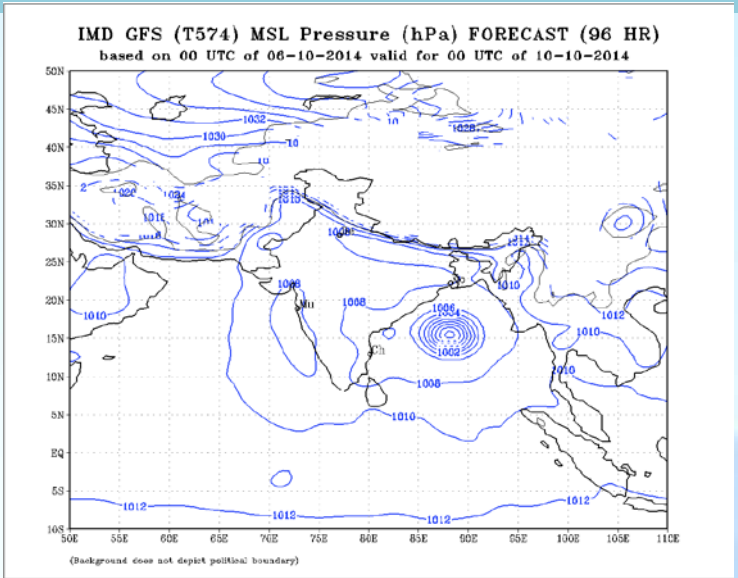

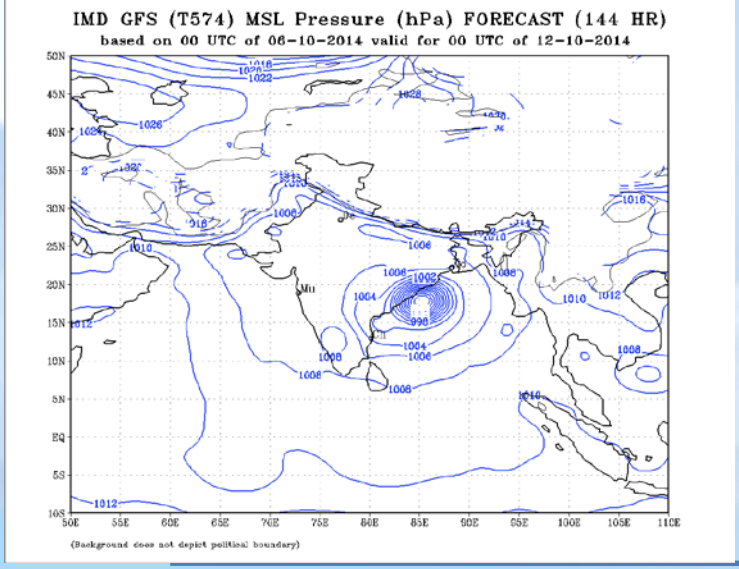

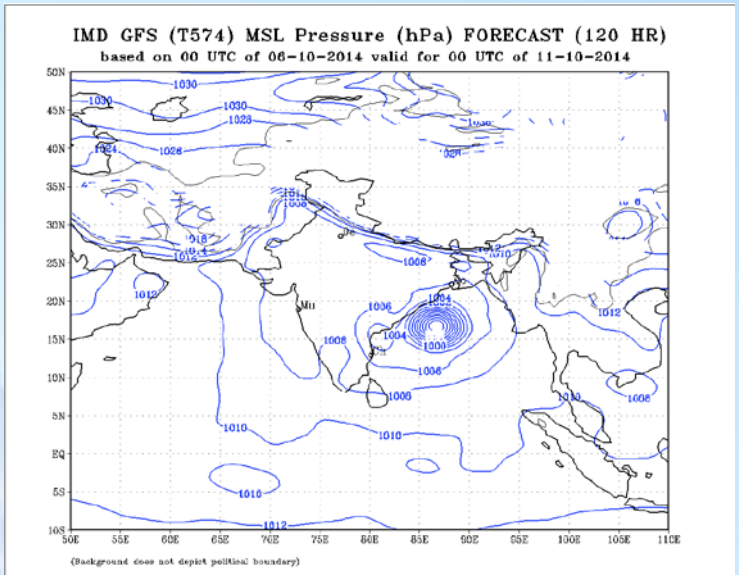

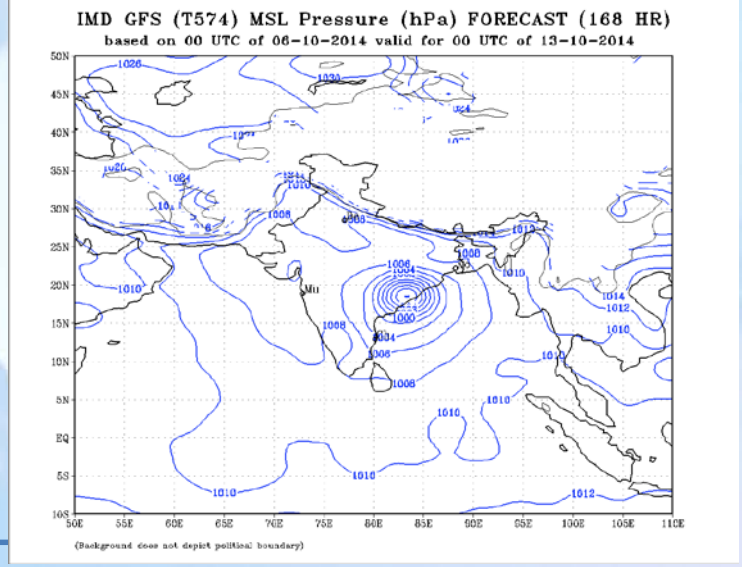

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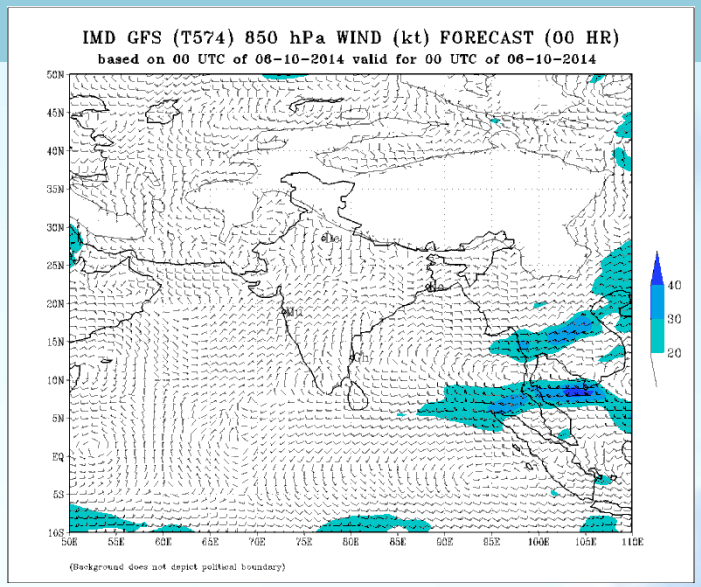

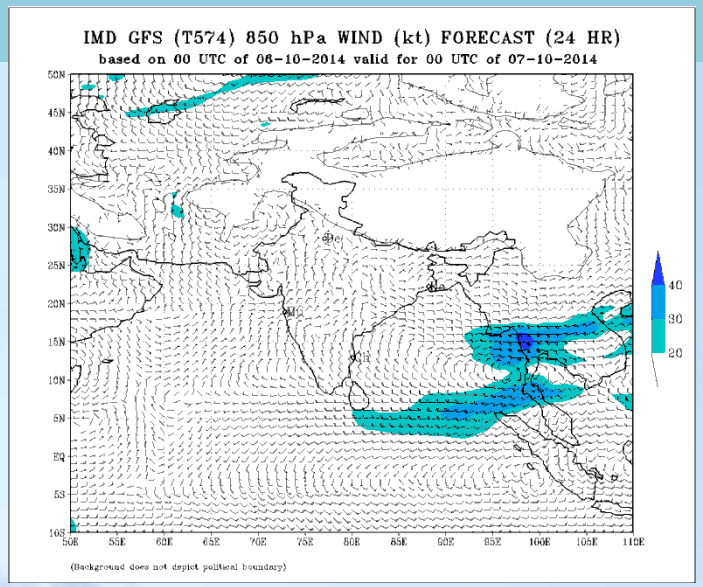

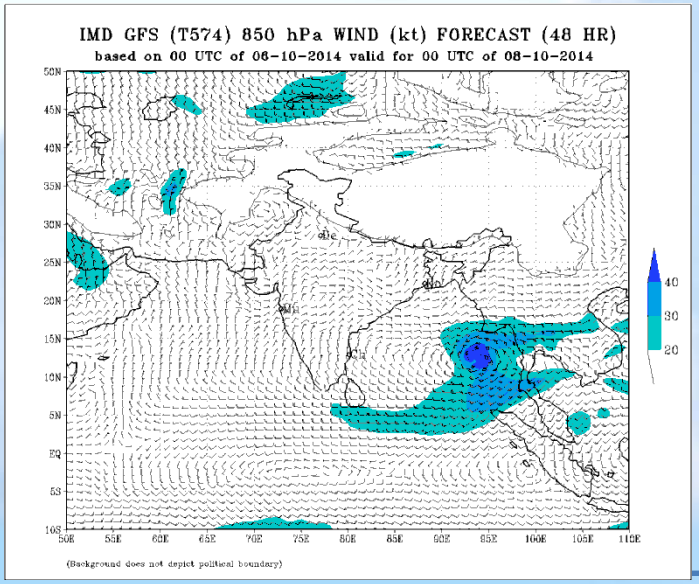

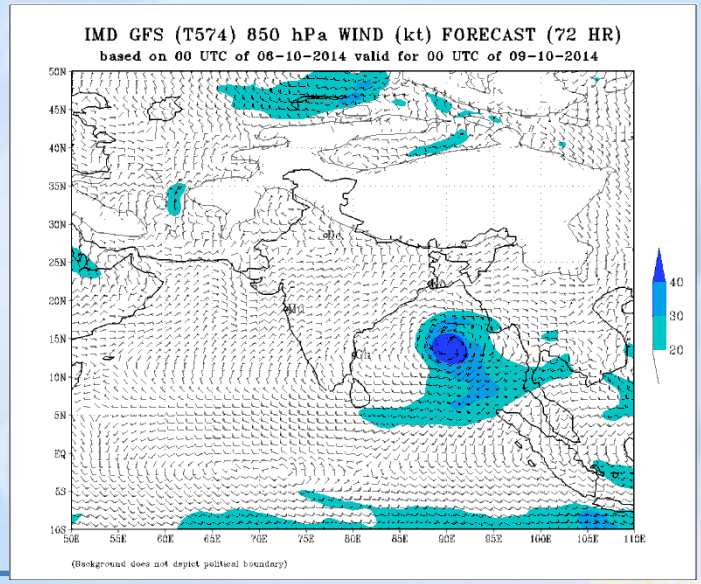

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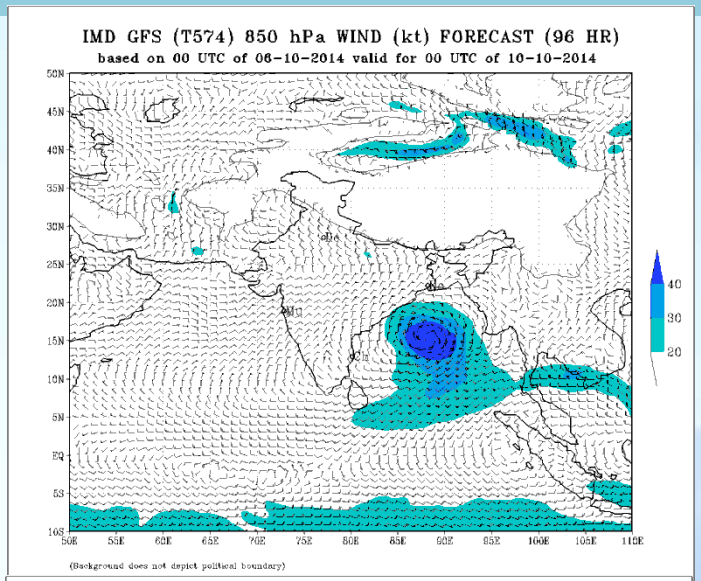

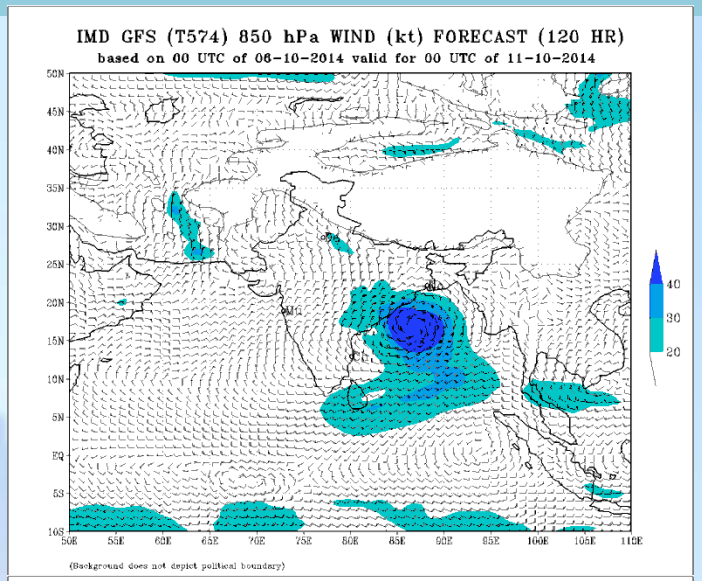

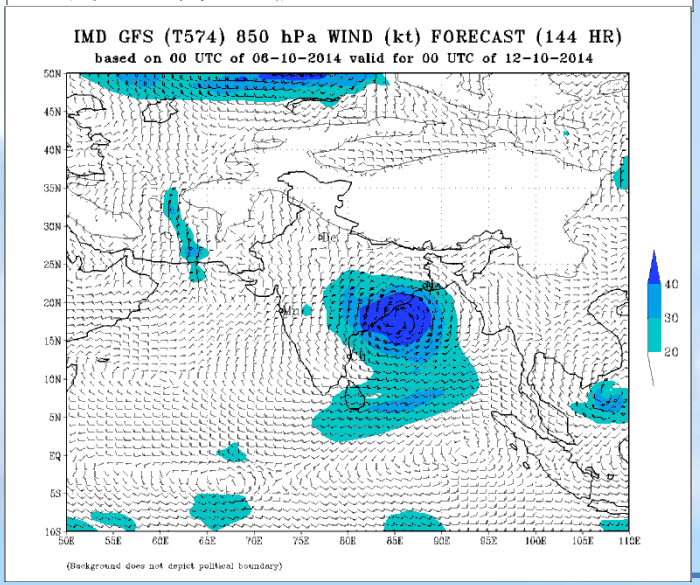

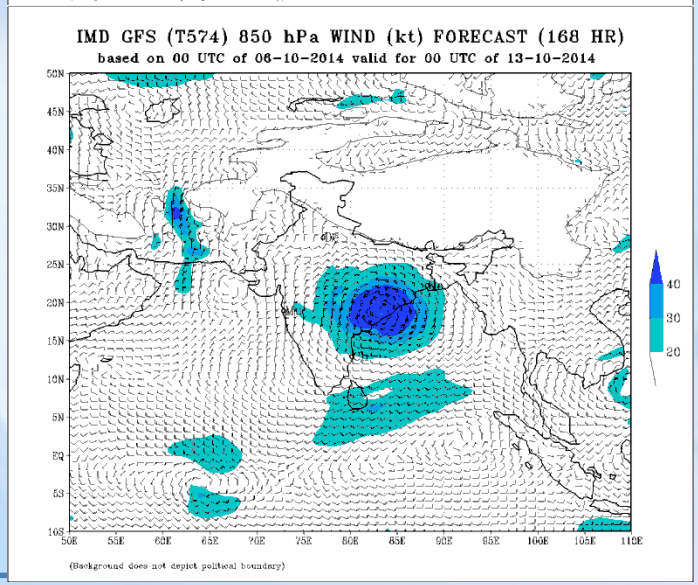

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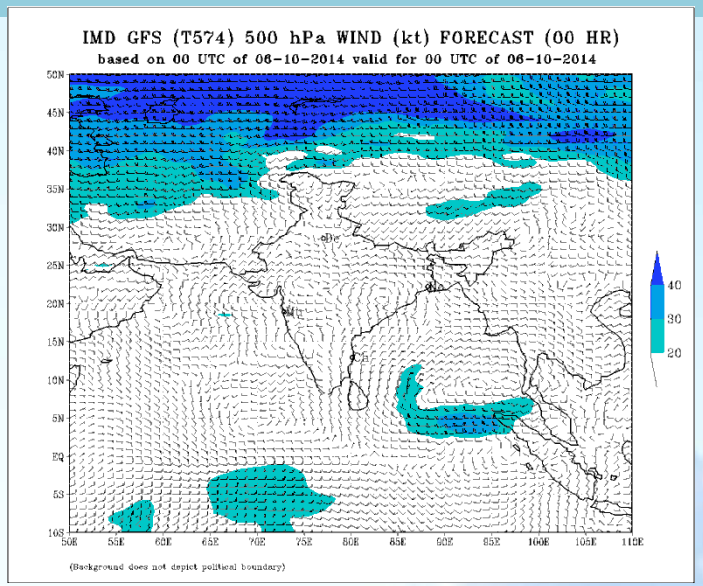

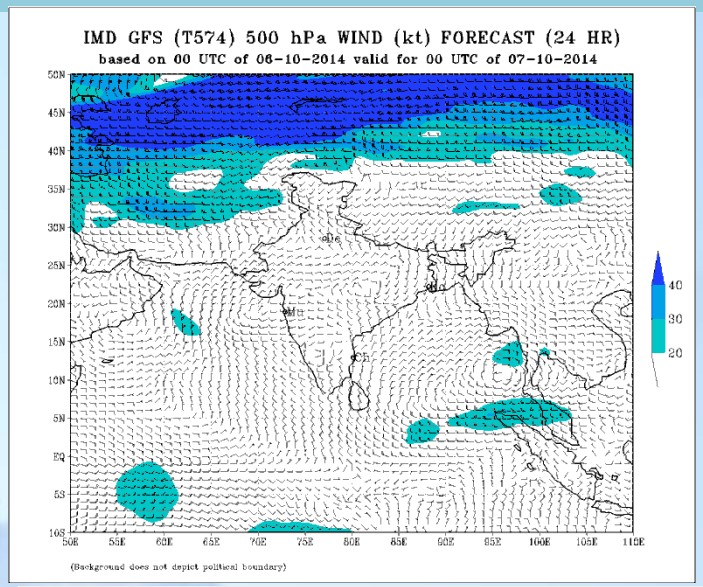

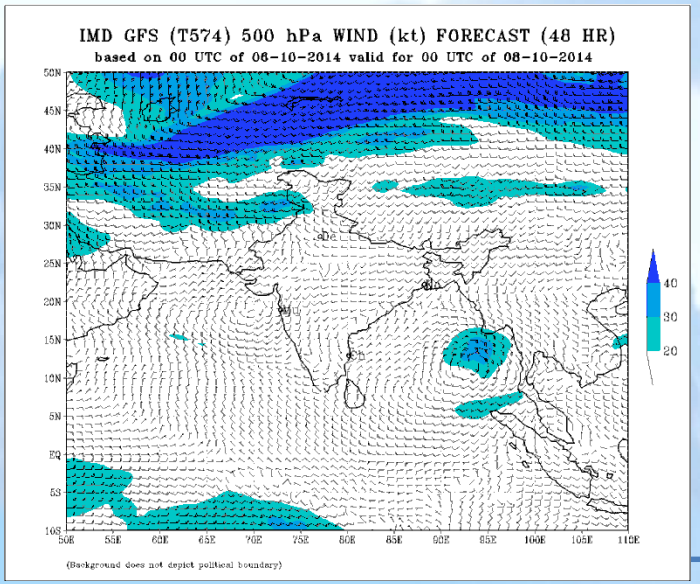

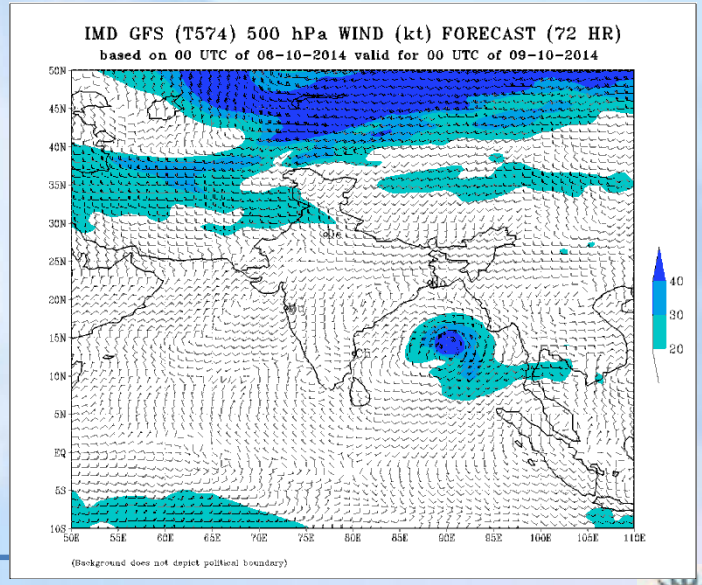

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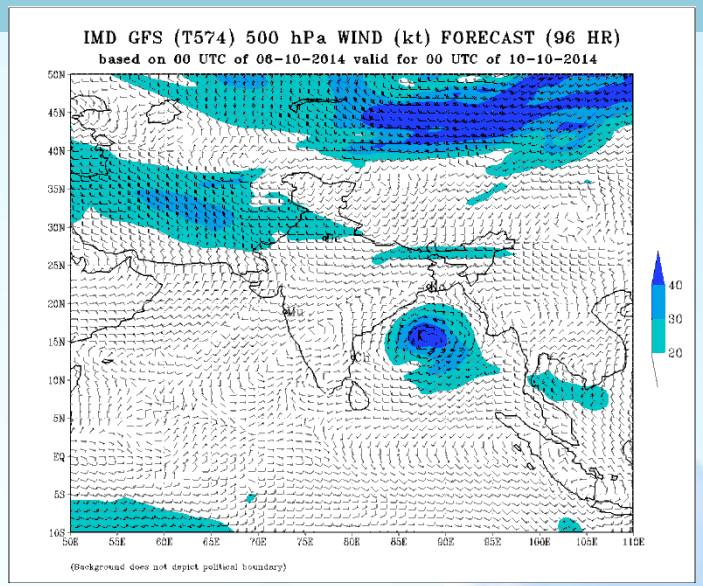

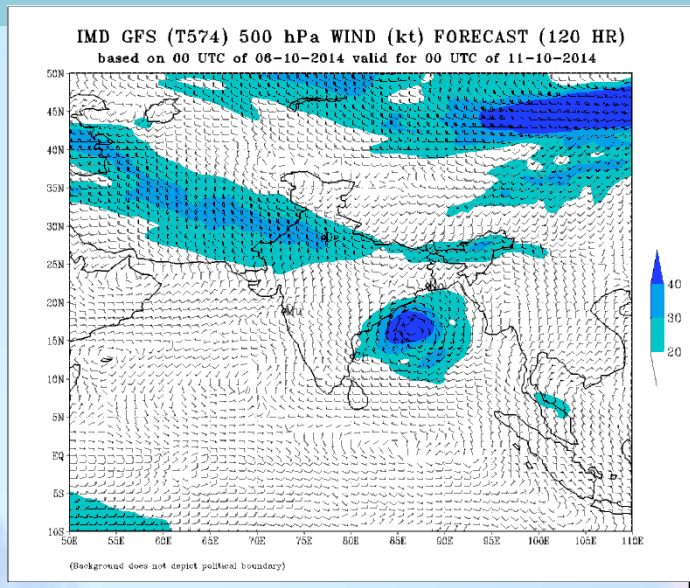

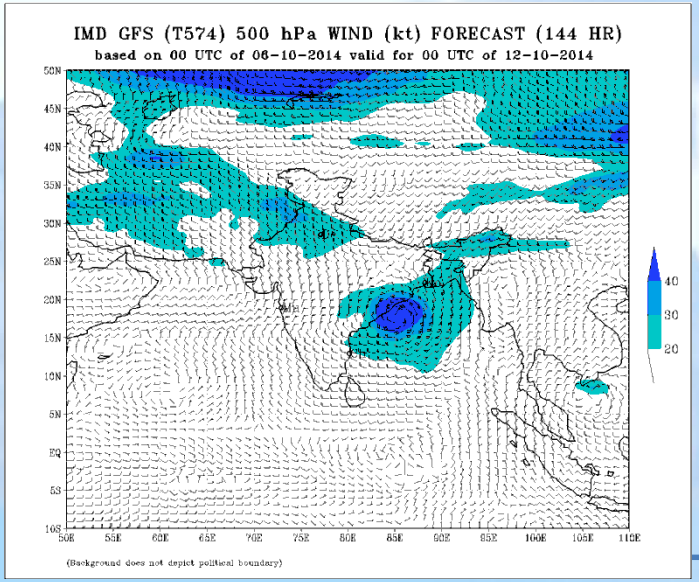

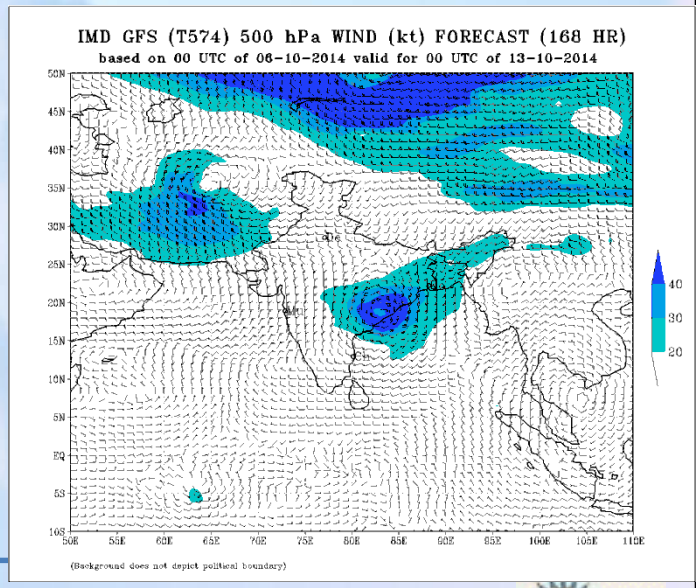

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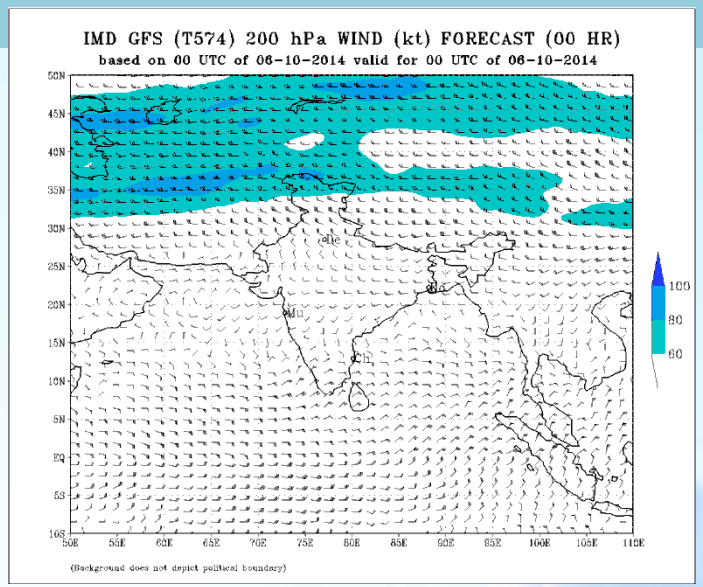

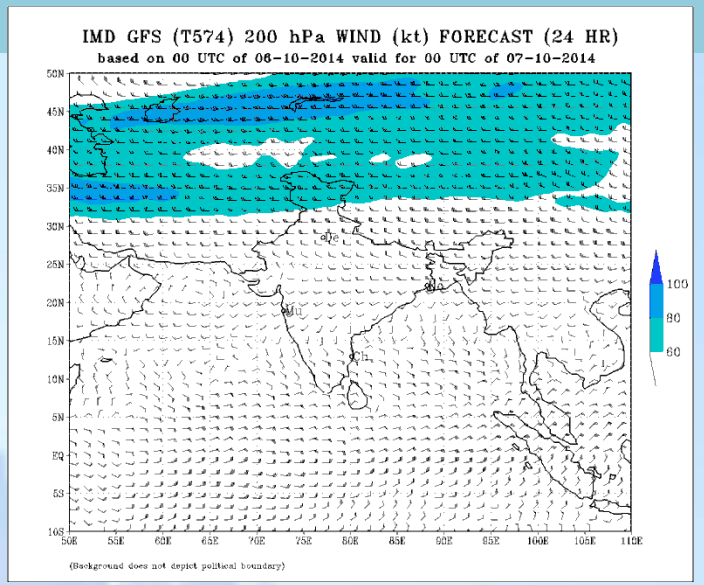

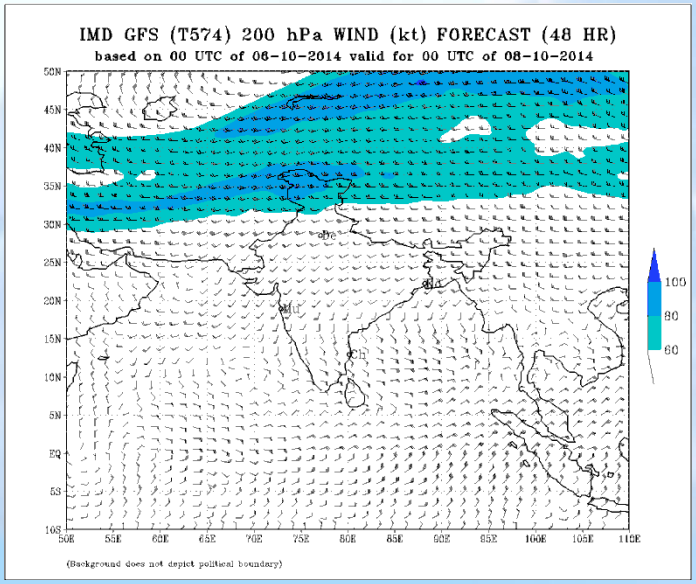

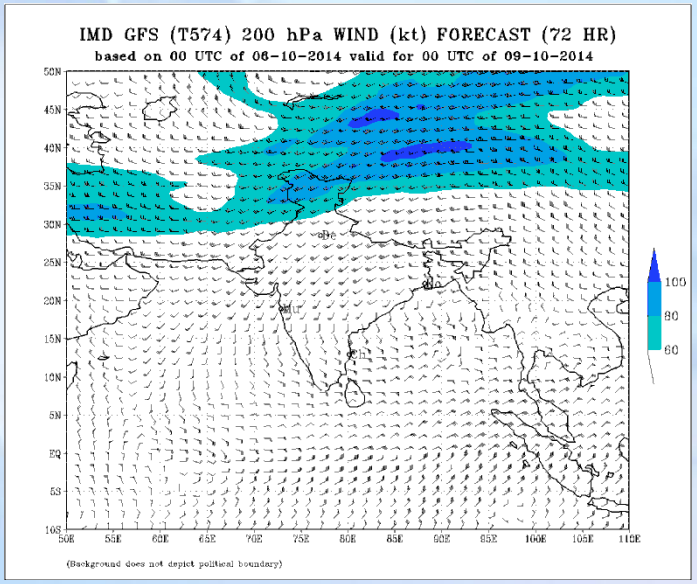

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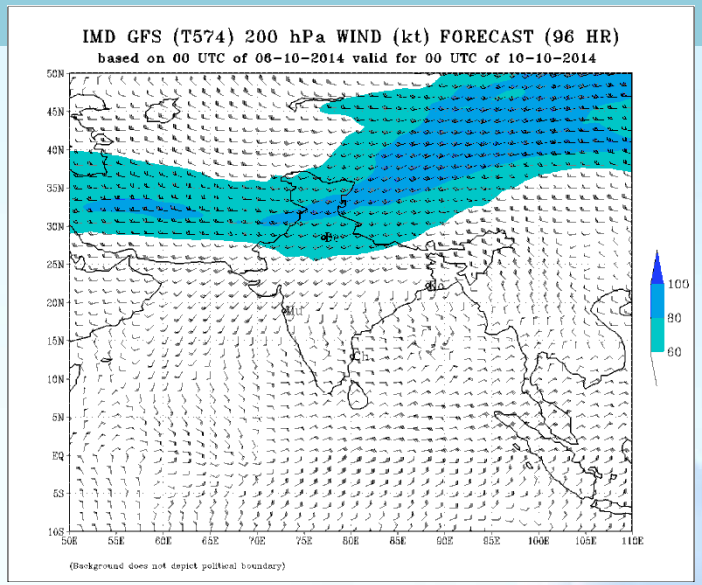

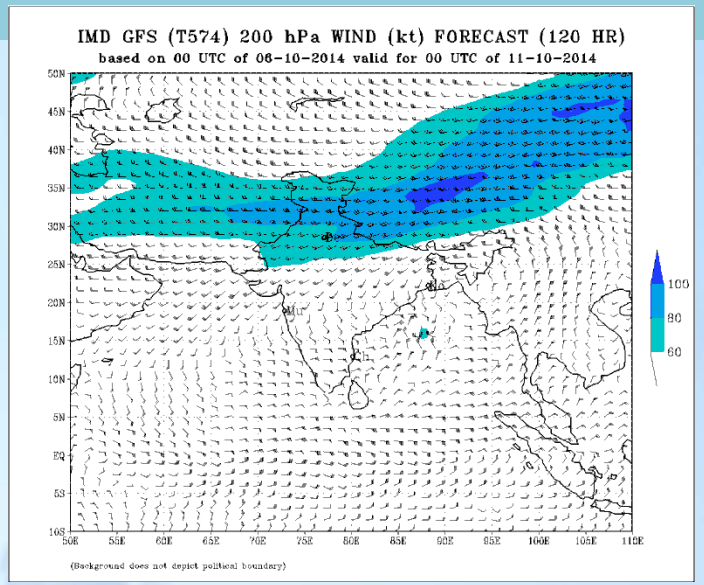

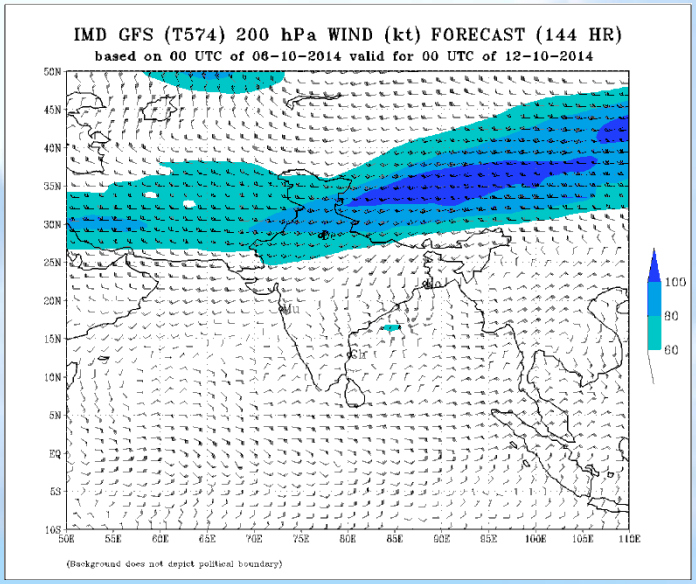

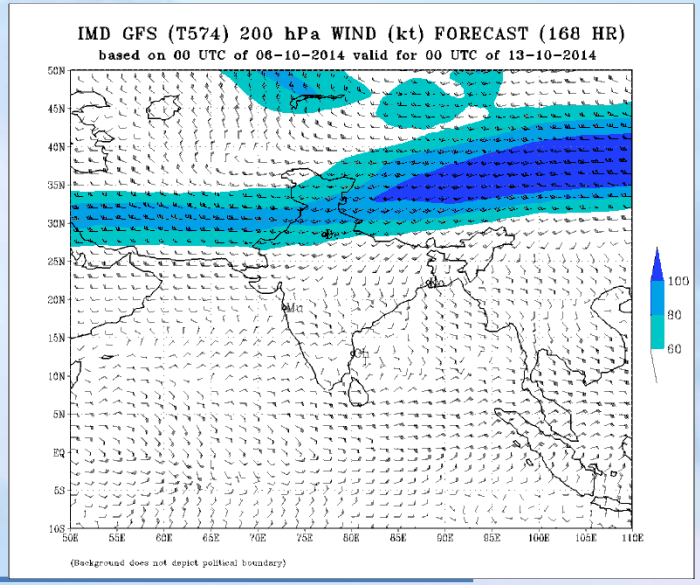

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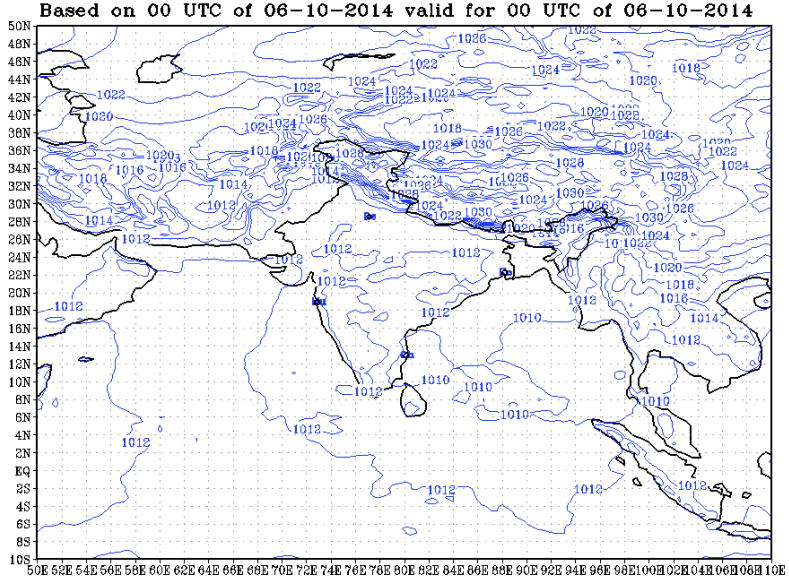

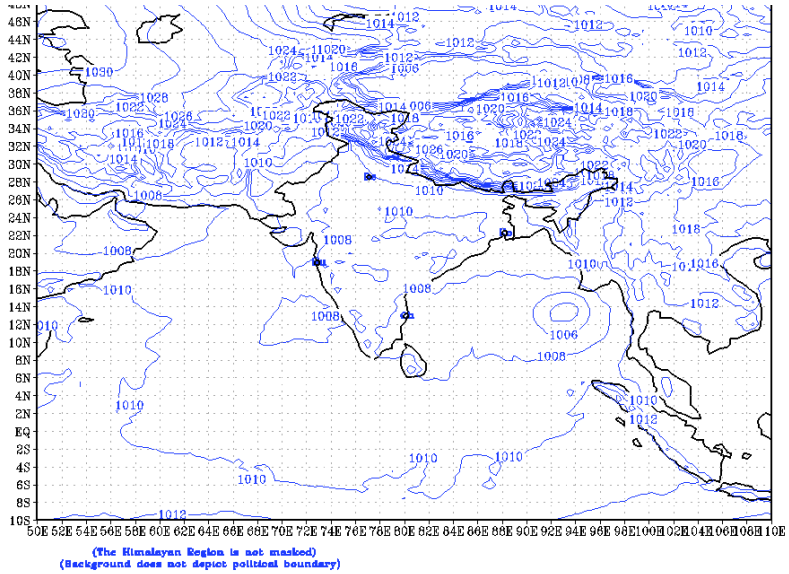

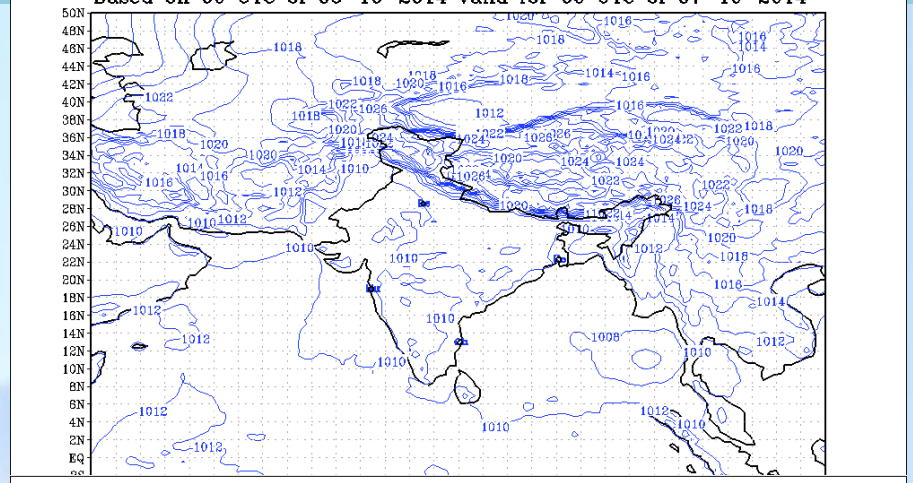

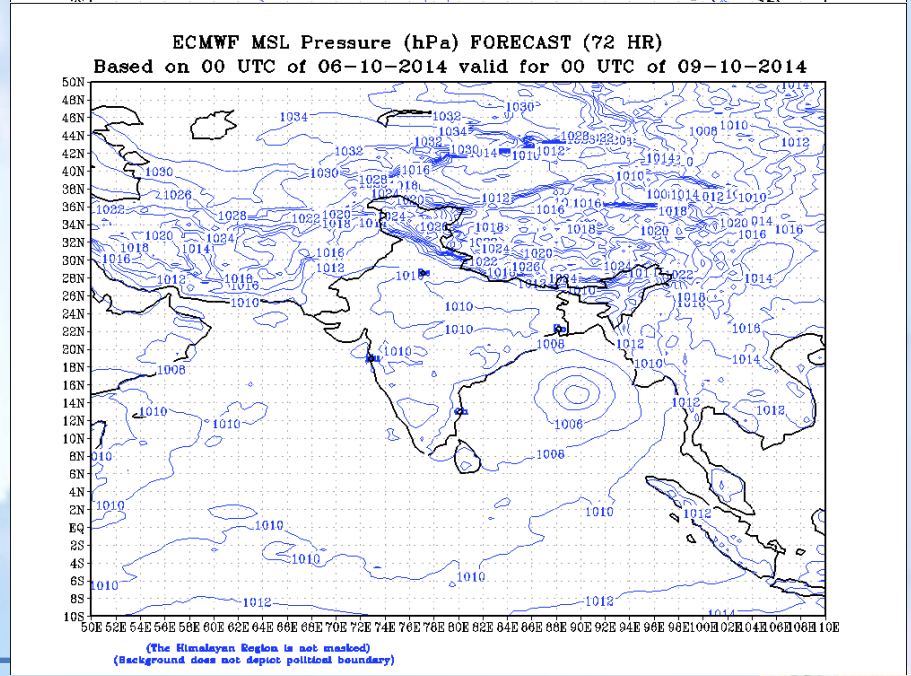

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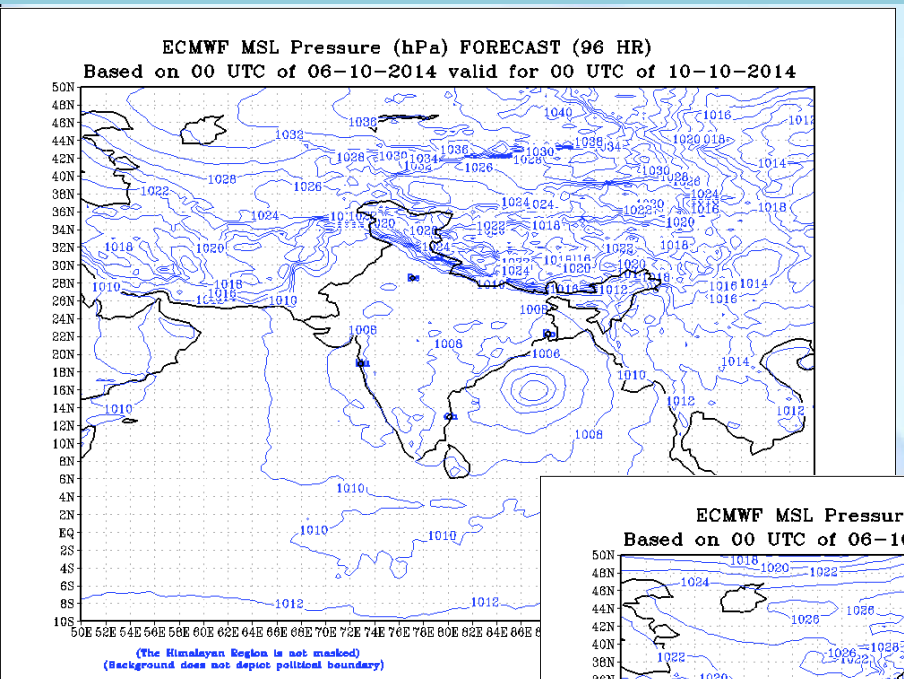
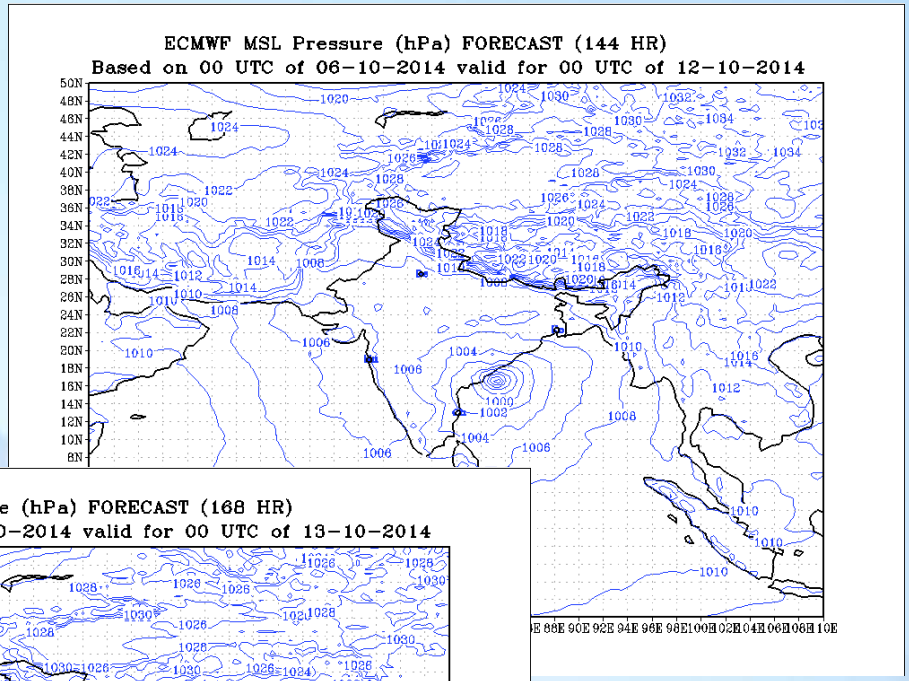
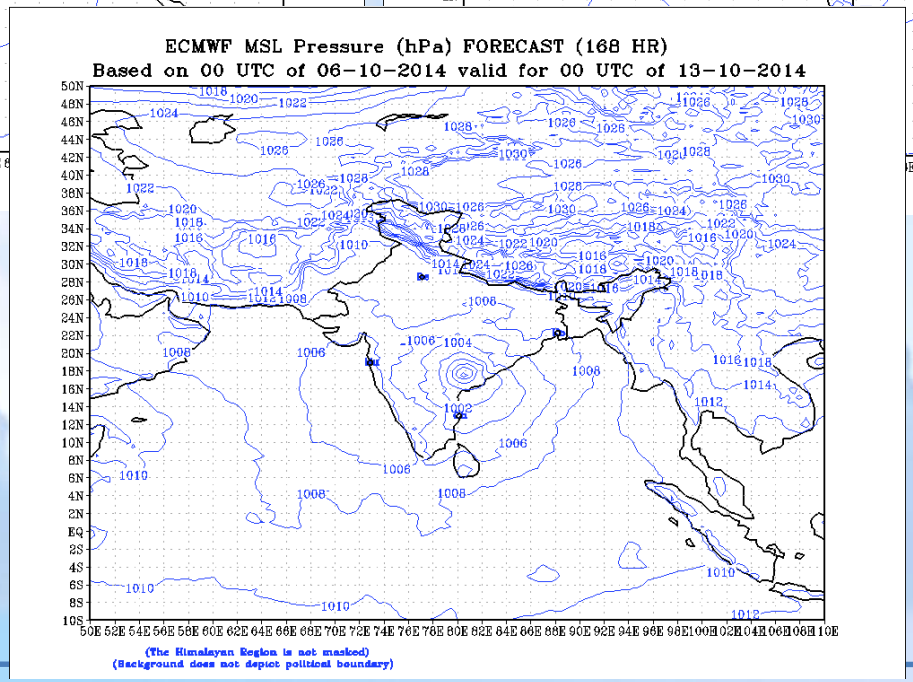
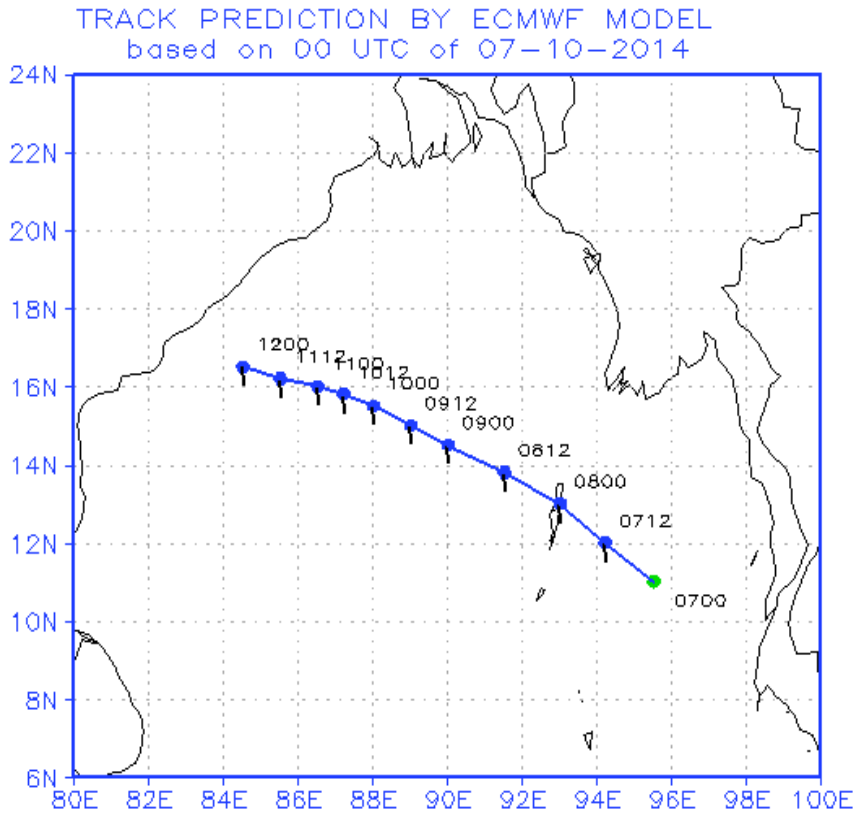
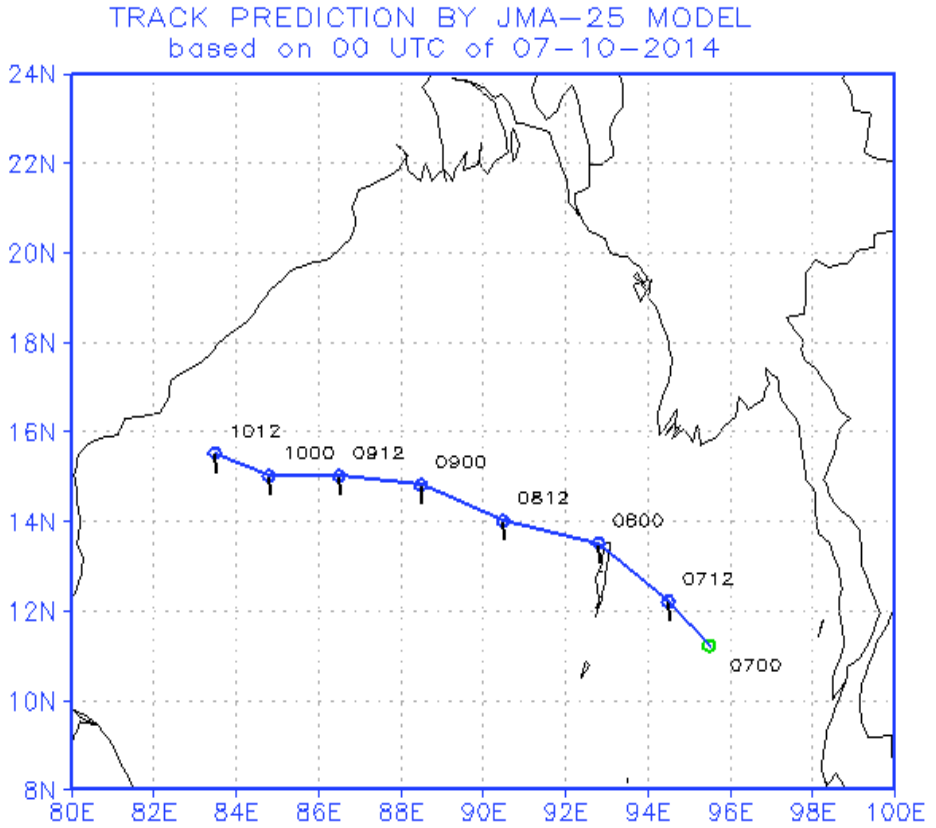




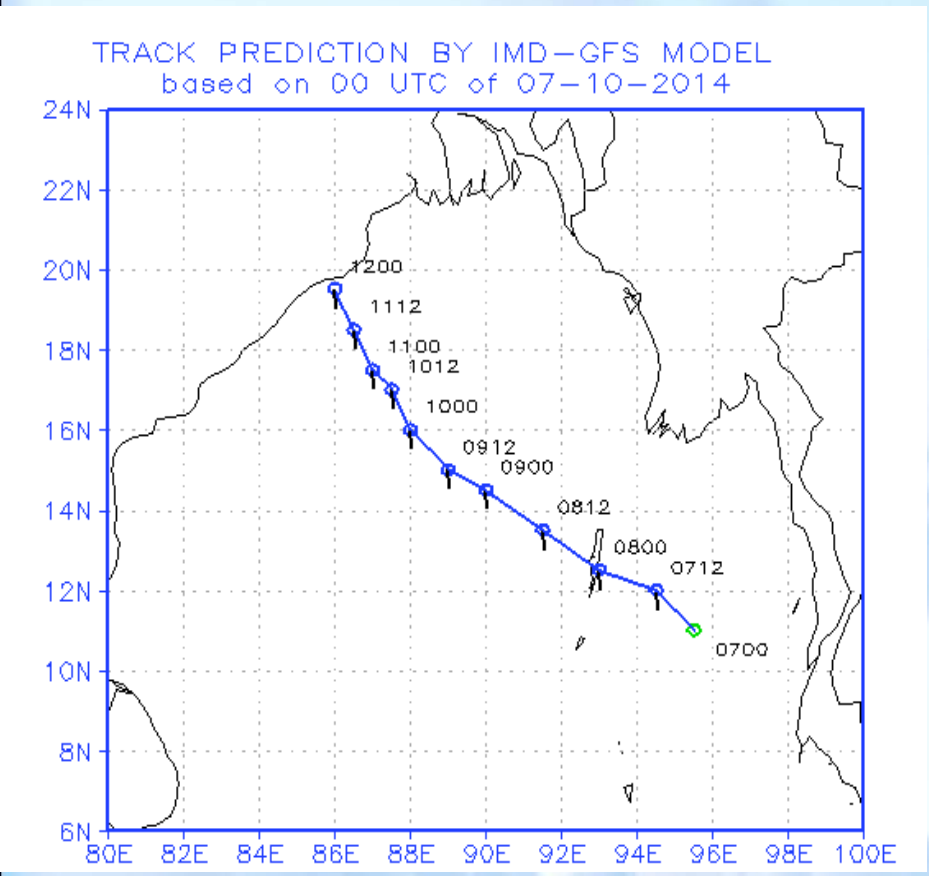


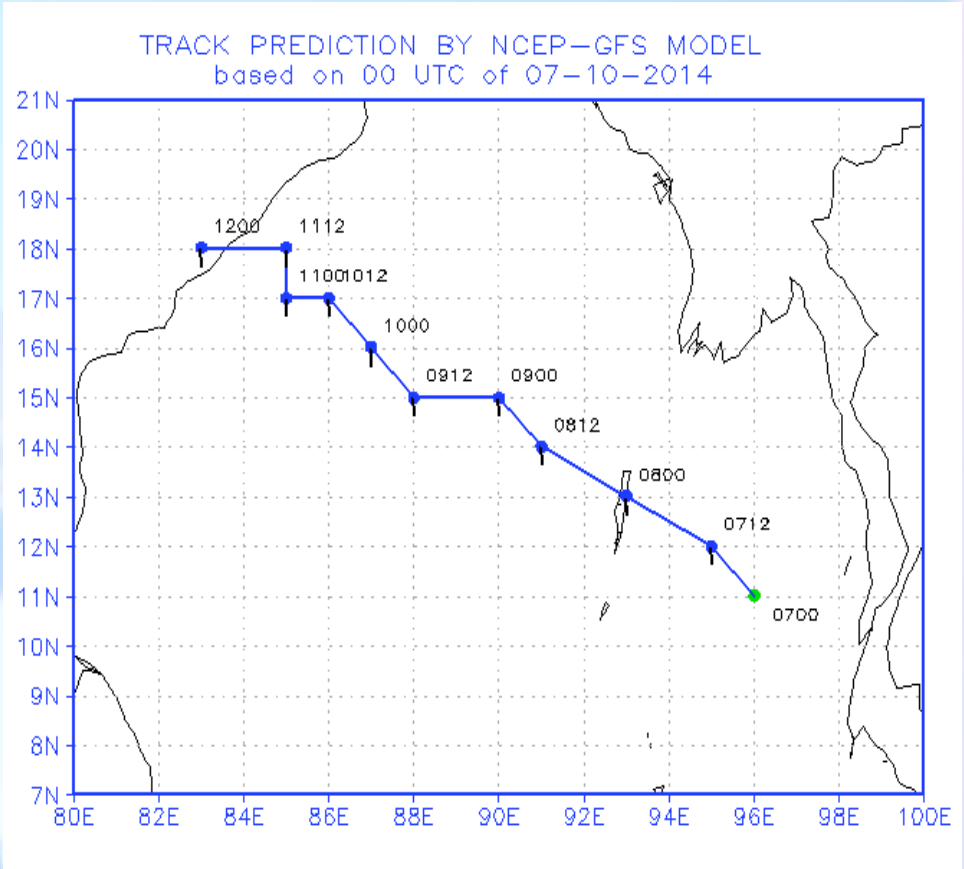
Track forecast



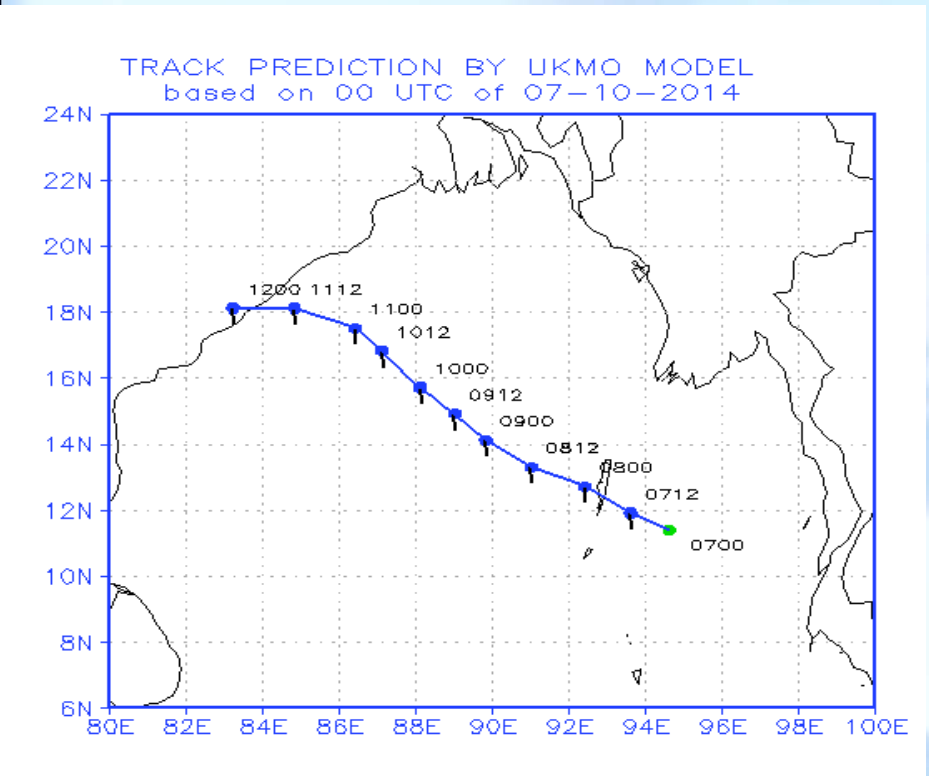


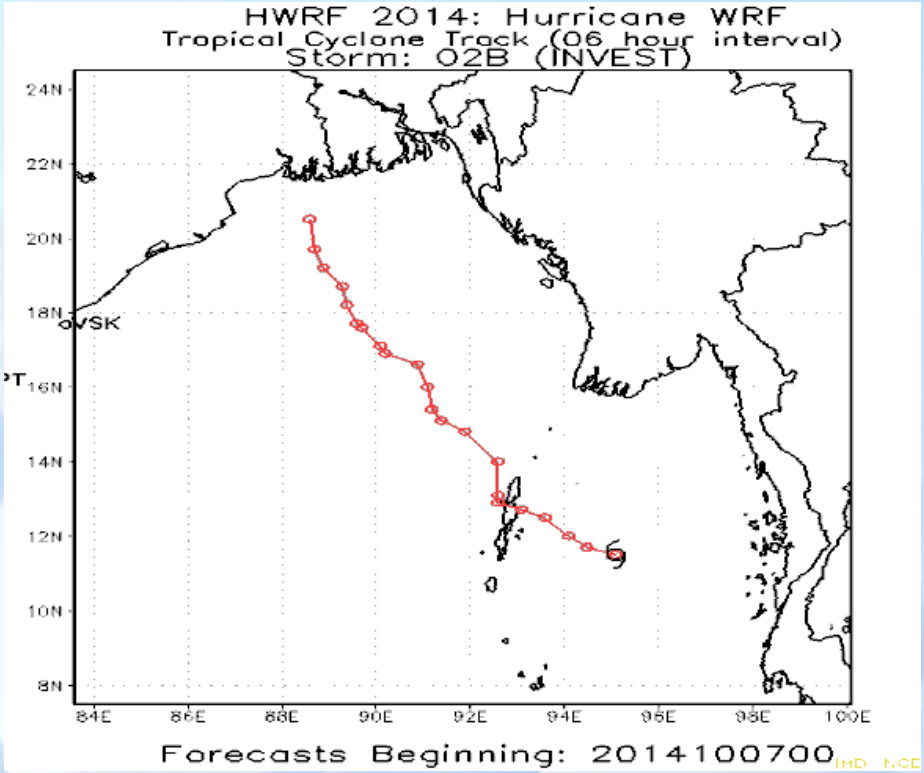
Track forecast





Track forecast





Track forecast

TRACK PREDICTION BY IMD MULTIMODEL ENSEMBLE(MME)
based on 00 UTC of 07-10-2014

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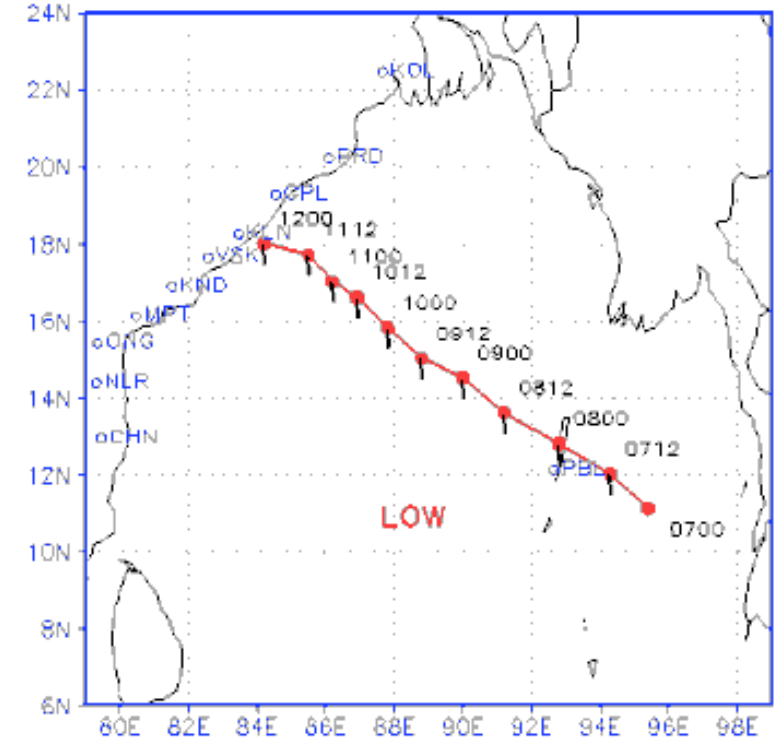
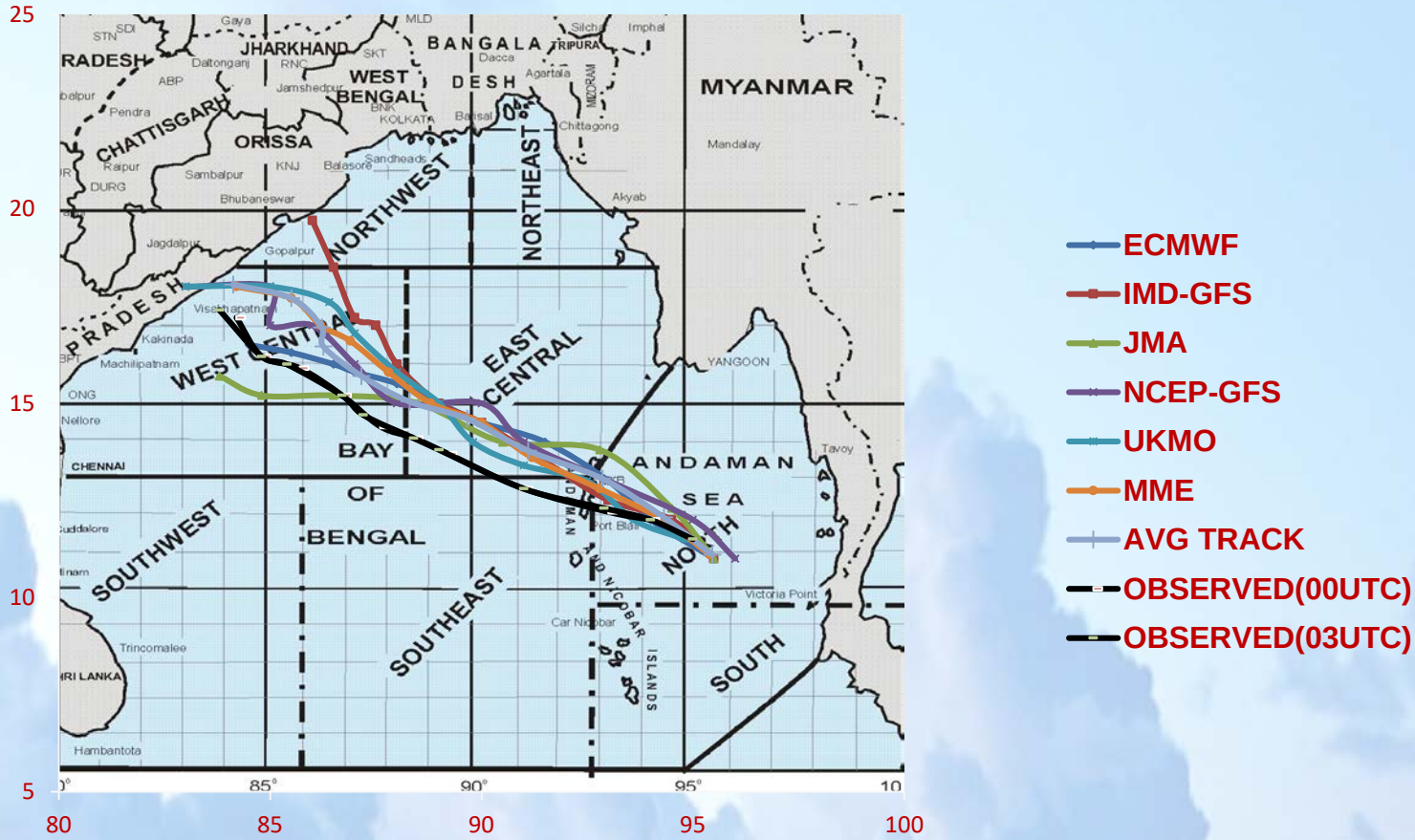
FORECAST HOUR	LAT	LON
2014100700	11.1	95.4
2014100712	12.0	94.3
2014100800	12.8	92.8
2014100812	13.6	91.2
2014100900	14.5	90.0
2014100912	15.0	88.6
2014101000	15.8	87.6
2014101012	16.6	86.9
2014101100	17.0	86.2
2014101112	17.7	85.5
2014101200	18.0	84.2



Probability of Rapid Intensification(RI)(Intensity increase by 30 kts or more in next 24 hr)=9.4%
INFERENCE: RI probability VERY LOW

Consolidated tracks of all NWP outputs with observed track at 070000 UTC



SPECIAL TROPICAL WEATHER OUTLOOK

DEMS–RSMC TROPICAL CYCLONES NEW DELHI 07-10-2014 TROPICAL WEATHER OUTLOOK FOR NORTH INDIAN OCEAN (THE BAY OF BENGAL AND ARABIAN SEA) VALID FOR NEXT 24 HOURS ISSUED AT 0600 UTC OF 07th OCTOBER, 2014 BASED ON 0300 UTC OF 07 OCTOBER, 2014.

LATEST OBSERVATIONS INDICATE THAT A DEPRESSION HAS FORMED OVER NORTH ANDAMAN SEA AND LAY CENTRED AT 0300 UTC OF TODAY, THE 7TH OCOBER 2014 NEAR LATITUDE 11.5° NORTH AND LONGITUDE 95.0° EAST, ABOUT 250 KM EAST-SOUTHEAST OF LONG ISLAND (43310). IT WOULD MOVE WEST-NORTHWESTWARDS AND INTENSIFY INTO A DEEP DEPRESSION WITHIN NEXT 24 HRS AND SUBSEQUENTLY INTO A CYCLONIC STORM. IT WOULD CROSS ANDAMAN AND NICOBAR ISLANDS CLOSE TO LONG ISLAND BY TOMORROW FORENOON. THEREAFTER, THE SYSTEM WOULD CONTINUE TO MOVE WEST-NORTHWESTWARDS FOR SOME MORETIME AND THEN NORTHWESTWARDS TOWARDS NORTH ANDHRA PRADESH AND ODISHA COAST DURING SUBSEQUENT 72 HOURS.

ACCORDING TO SATELLITE IMAGERIES, THE INTENSITY OF THE SYSTEM IS T 1.5. THE ASSOCIATED INTENSE TO VERY INTENSE CONVECTION LIES OVER BAY ISLANDS, ANDAMAN SEA AND OVER BAY BETWEEN LATITUDE 9.0° NORTH TO 16.0° NORTH AND EAST OF LONGITUDE 90.0° EAST. THE ASSOCIATED CONVECTION HAS INCREASED GRADUALLY WITH RESPECT TO HEIGHT AND ORGANISATION DURING PAST 24 HRS. THE LOWEST CLOUD TOP TEMPERATURE (CTT) IS ABOUT – 60 °C.

MAXIMUM SUSTAINED SURFACE WIND SPEED IS ESTIMATED TO BE ABOUT 25 KNOTS GUSTING TO 35 KNOTS AROUND THE SYSTEM CENTRE. THE STATE OF THE SEA IS ROUGH TO VERY ROUGH AROUND THE SYSTEM CENTRE. THE ESTIMATED CENTRAL PRESSURE IS ABOUT 1004 HPA.

REMARKS: SCATTEROMETRY DATA INDICATES THE CYCLONIC CIRCULATION OVER THE REGION AND ASSOCIATED WIND SPEED TO BE ABOUT 25-35 KNOTS WIND SPEED IS RELATIVELY HIGHER IN NORTHERN SECTOR. BUOY LOCATED NEAR 10.5 °NORTH AND 93.9 ° EAST REPORTS MEAN SEA LEVEL PRESSURE OF 1005.1 HPA AND SURFACE WIND OF SOUTHWESTERLY 25 KNOTS. THE UPPER TROPOSPHERIC RIDGE RUNS ALONG 19°N AND IS PROVIDING POLEWARD OUT FLOW IN ASSOCIATION WITH THE ANTICYCLONIC CIRCULATION TO THE NORTHEAST OF THE SYSTEM CENTRE. HENCE UPPER LEVEL DIVERGENCE IS FAVOURABLE FOR INTENSIFICATION. THE LOW LEVEL CONVERGENCE ALONG WITH LOW LEVEL RELATIVE VORTICITY HAS INCREASED FURTHER IN PAST 24 HRS. THE SEA SURFACE TEMPERATURE IS ABOUT 30-32°C AND OCEAN THERMAL ENERGY IS ABOUT 60-80 KJ/CM2 . THE VERTICAL WIND SHEAR OF HORIZONTAL WIND HAS DECREASED AND IS ABOUT 10-20 KNOTS (LOW TO MODERATE). THE MADDEN JULLIAN OSCILLATION (MJO) INDEX LIES OVER PHASE 6 WITH AMPLITUDE LESS THAN 1. NWP MODELS SUGGEST THAT MJO WOULD CONTINUE IN PHASE 6 DURING NEXT 3 DAYS. MOST OF THE NWP MODELS SUGGEST WEST-NORTHWESTWARD TO NORTHWESTWARD MOVEMENT OF THE SYSTEM AND INTENSIFICATION DURING NEXT 72 HRS.

Thank you