Ministry of Earth Sciences
India Meteorological Department
Cyclone Warning Division, New Delhi

Tropical Cyclone Forecast Programme
Report Dated 13TH November, 2023

Time of Issue: 1230 UTC

Synoptic features (based on 0300 UTC analysis):

- The upper air cyclonic circulation over South Andaman Sea extending up to middle tropospheric levels tilting southwestwards with height persists. Under its influence, a Low Pressure Area is likely to form over Southeast Bay of Bengal during next 24 hours. It is likely to move west-northwestwards and intensify into a depression over westcentral Bay of Bengal around 16th November, 2023.

- The upper air cyclonic circulation over Southwest Bay of Bengal persists and now extends up to middle tropospheric levels.

- The upper air cyclonic circulation over Southwest & adjoining westcentral Arabian Sea extending up to 1.5 km above mean sea level has become less marked.

Dynamical and thermo-dynamical features

Parameter	Bay of Bengal (BoB)	Arabian Sea (AS)
Sea Surface Temperature (SST) ºC	29-31ºC over major parts of BoB, South Andaman Sea, Gulf of Mannar, 26-28ºC over parts of southwest BoB.	29-31ºC over southeast, adjoining southwest and adjoining eastcentral AS, north AS, along and off south Gujarat, Maharashtra coasts, 26-28ºC over central, adjoining north AS, southwest AS, along and off Kerala and Karnataka coasts. Less than 24 along and off Yemen-Oman & Somalia coasts and adjoining sea areas.
Tropical Cyclone Heat Potential (TCHP) kJ/cm^2	120-130 over eastcentral BoB adjoining southeast BoB and adjoining southeast BoB. 80-100 over parts of westcentral BoB and Andaman Sea.	100-110 over southeast and adjoining eastcentral AS, adjoining westcentral AS, less than 20 over westcentral, southwest and north AS, less than 10 over along and off Yemen-Oman coast.
Cyclonic Relative vorticity (X10^{-6}s^{-1})	60-70 over south Andman Sea, 50-60 over southwest BoB off Sri Lanka coast, 20-30 over major parts of BoB.	20-30 over major parts of AS, 40-50 over parts of southwest AS close to Somalia coast, around 40 over parts of northwest AS.
Low Level convergence (X10^{-5} s^{-1})	5-10 over south BoB and Andaman Sea, Gulf of Mannar,	5 over central parts of south AS and parts of central and north AS.

	Comorin area.	
Upper Level divergence ($X10^{-5}$ s^{-1})	5-10 over southwest and adjoining southeast BoB, adjoining westcentral BoB, Gulf of Mannar, Comorin area, 10-15 over Andaman Sea.	5-10 over southeast AS adjoining to Comorin area, northeast AS, 10-15 over southwest AS close to Somalia coast.
Vertical Wind Shear (VWS knots) **Low: 05-10 knots** **Moderate: 10-20 knots** **High: >20 knots**	5-10 over southeast and adjoining southwest BoB, adjoining eastcentral BoB, 10-15 over Andaman Sea, 20 over central and adjoining southwest BoB, High (> 20 knots) over remaining parts of BoB.	5-15 over southwest and adjoining southeast AS, 20 over south part of central AS, along and off Kerala coast, southeast AS adjoining to Comorin area, High (>20 knots) over remaining parts of AS.
Wind Shear Tendency (knots)	Decreasing over northwest BoB, increasing over southern parts of south BoB.	Decreasing over westcentral AS, increasing over eastcentral and adjoining southeast AS.
Upper Tropospheric Ridge	Along 15°N over BoB.	Along 12°N over AS.

Satellite observations based on INSAT imagery (0300 UTC):

(a) Over the BoB & Andaman Sea:-
Scattered to broken low and medium clouds with embedded intense to very intense convection lay over south & central Bay of Bengal, Andaman Sea and Tenasserim coast.
(b) Over the Arabian Sea:-
Scattered low and medium clouds with embedded intense to very intense convection lay over southwest Arabian Sea. Scattered low and medium clouds with embedded moderate to intense convection lay over central & southeast Arabian Sea and Comorin area and weak to moderate convection lay over north Arabian Sea.
(c) Convection outside India:-
Scattered low/med clouds with embedded moderate to intense convection over Sri Lanka Palk Strait, Gulf of Mannar, Maldives, Tibet, China, Thailand, Gulf of Thailand, Cambodia, Laos, Vietnam, Sumatra, Strait of Malacca, Malaysia, Borneo, South China Sea, Java islands & Sea, Celebes islands & Sea, Philippines, North Madagascar and over Indian Ocean between equator to lat 5.0N, long 50.0E to 100.0E and between lat 20.0S to 35.0S long 70.0E to 80.0E.

M.J.O. Index:
MJO index is currently in Phase 7 with amplitude close to 1. It will be in phase 8 with amplitude greater than 1 on 14th November, and remain in same phase with amplitude greater than 1 till 17th November. It will be in phase 1 on 18th November with amplitude greater than 1 and will remain there for next few days.

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

Input for FDP Cyclone based on 0000 UTC for the next 7 days

MODEL GUIDANCE	Bay of Bengal (BoB)	Arabian Sea (AS)
IMD-GFS	Cycir over South Andaman Sea as on today i.e., 13th Nov. To move west-northwestwards as an extended low on 14th. Thereafter, model indicates very fast movement and rapid intensification into cyclonic storm over westcentral BoB on 15th Nov. System is seen as a severe cyclonic storm on 16th Nov	No significant system during next 7 days

	over westcentral & adjoining northwest BoB, it moves then northeastward and intensify further into severe cyclonic storm over northwest and adjoining westcentral BoB on 17th Nov, Thereafter, the system is indicated to weaken gradually and move northeastwards skirting the southeast Bangladesh coast as a low pressure area on 18th Nov.	
IMD-GEFS	An extended cycir over southwest BoB on 13th Nov. To move initially west-northwestwards and then north-northeastwards. Depression on 15th Nov over westcentral BoB, weaken thereafter.	No significant system during next 7 days
IMD-WRF	No significant system during next 3 days	No significant system during next 3 days
NCMRWF-NCUM	An extended cycir over southwest BoB on 13th Nov, to move westnorthwestward and lay as LPA over westcentral BoB on 17th Nov, to move further in the same direction and lay over same region on 18th Nov.	No significant system during next 7 days
NCMRWF-NEPS	An extended LPA over southwest BoB on 14th Nov, to move westnorthwestward and lay over southwest BoB as LPA on 15th Nov, depression over westcentral and adjoining southwest BoB on 17th, lay close to north Andhra Pradesh coast as LPA on 19th.	No significant system during next 7 days
NCMRWF-UM (Regional)	LPA over westcentral BoB on 14th Nov, moves northnorthwestward and becomes depression over the westcentral BoB on 15th Nov.	No significant system during next 7 days
ECMWF	Cycir over south Andaman Sea on 13th. LPA over southeast BoB on 14th. To move northwestwards and intensify into a depression over westcentral BoB on 16th. Therafter weakening is indicated. The system is predicted to reach Odisha coast as a low pressure area on 18th Nov.	No significant system during next 7 days.
NCEP-GFS	Cycir over South Andaman Sea on 13th Nov. Low pressure area over southeast BoB on 14th. Depression over westcentral BoB on 15th Nov. To intensify into a cyclonic storm over westcentral BoB on 16th Nov. To move northwestwards till 16th and recurve northeastwards thereafter as a severe cyclonic storm, reaching southeast Bangladesh coast on 17th Nov as an intense storm. Thereafter, weakening rapidly and crossing Bangladesh coast as a low pressure area.	No significant system.
IMD-Genesis Potential Parameter	GPP is indicating a potential zone over South Andaman Sea and adjoining southeast BoB as on today, the 13th Nov Nov, it moves northwestward and lay over westcentral BoB and adjoining southwest BoB by 15th Nov, over westcentral BoB on 16th to 19th Nov.	No potential zone over AS for next 7 days.

Summary and conclusion:

1. **For Bay of Bengal**:

The guidance from various models is indicating the formation of low pressure area (LPA) around 14th (IMD GFS indicating an extended low during 14th & 15th Nov over southwest & westcentral Bay of Bengal (BoB), NCUM is showing extended low over southwest BoB off Sri Lanka-Tamil Nadu coasts on 15th & 16th with a northward movement to reach over westcentral BoB as LPA on 17th Nov, NCEP GFS, ECMWF & GEFS on 14th over southeast BoB). Further indication about the intensification of this system into a depression has large variation in time amongst the models (IMD GFS on 14th/15th Nov, GEFS on 15th Nov, NCEP-GFS on 16th Nov & ECMWF on 16th Nov over westcentral BoB). Therefore, there is a consensus about the system to become depression over westcentral BoB. Some of the models are indicating further

intensification (IMD GFS: into a cyclonic storm on 15th Nov, into a very severe cyclonic storm on 16th Nov, and weakening thereafter; NCUM: during 20th-22nd Nov into deep depression; NCEP-GFS: into a cyclonic storm and further into a severe cyclonic storm on 16th Nov). There is also variation w.r.t landfall point (IMD GFS & NCEP-GFS is indicating landfall over southeast Bangladesh coast as LPA, NCUM is indicating that the system remain over the sea till 22nd Nov, ECMWF is indicating movement along Odisha & West Bengal coasts as an LPA on 17th Nov).

Considering all the above, it is inferred that yesterday's upper air circulation over Gulf of Thailand moved westward and lay over South Andaman Sea by 0830 IST of today i.e., 13th November, 2023. Under its influence, an LPA is likely to form over the Southeast BoB during next 24 hours. It is likely to move west-northwestwards and intensify into a depression over westcentral BoB around 16th Nov, 2023. Considering all the model guidance the movement and further intensification of the system after it become depression is not obvious but, there is a little consensus about the re-curvature of the system towards northeastward direction.

Probability of Cyclogenesis (formation of depression and above intensity systems) over Bay of Bengal and Andaman Sea during next 168 hours:

24 HOURS	24-48 HOURS	48-72 HOURS	72-96 HOURS	96-120 HOURS	120-144 HOURS	144-168 HOURS
NIL	**NIL**	**LOW**	**MOD**	**HIGH**	-	-

2. **For the Arabian Sea**:

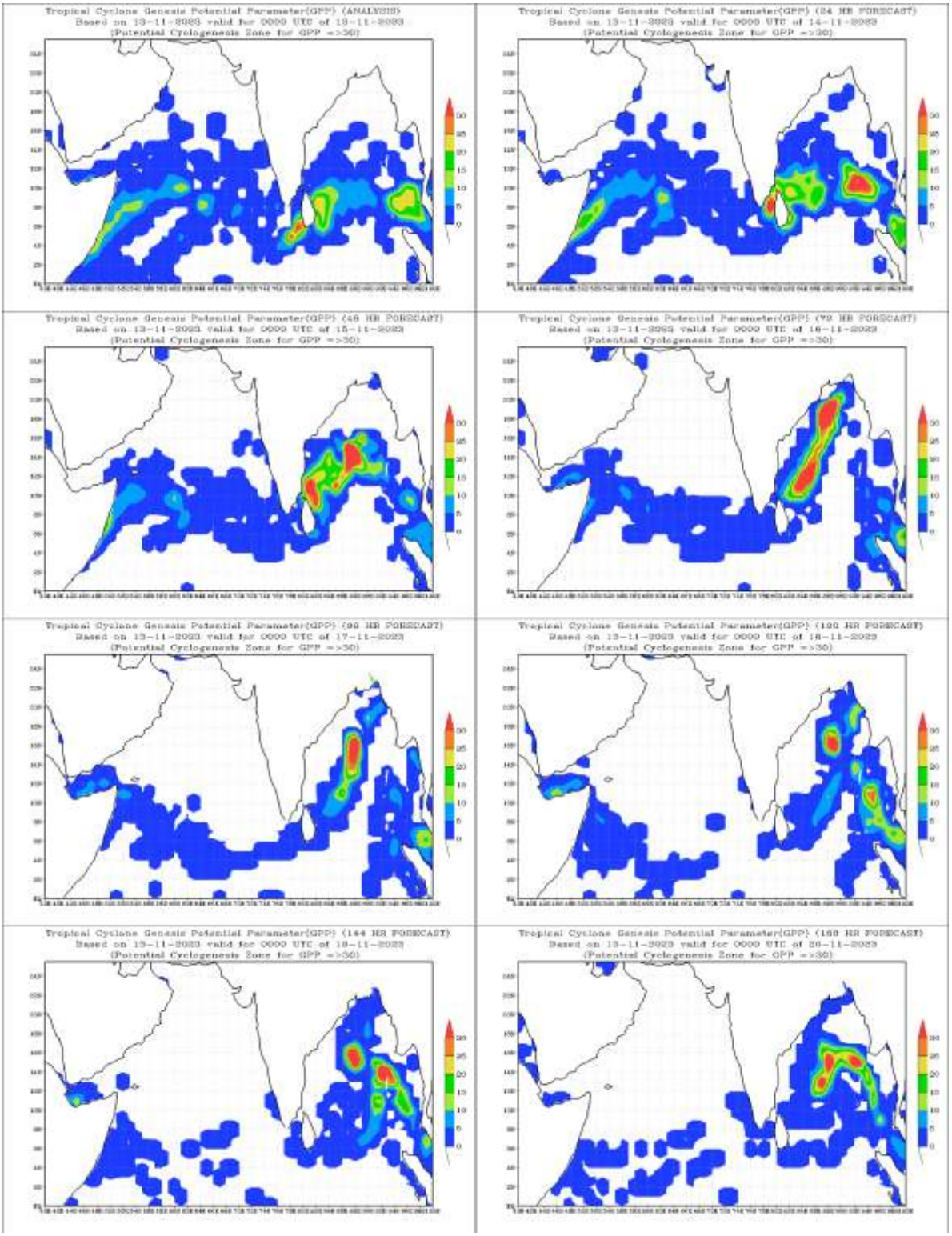
Most of the models are indicating that there will be no significant system for the next seven days.

Probability of Cyclogenesis (formation of depression and above intensity systems) over the Arabian Sea during next 168 hours:

24 HOURS	24-48 HOURS	48-72 HOURS	72-96 HOURS	96-120 HOURS	120-144 HOURS	144-168 HOURS
NIL	**NIL**	**NIL**	**NIL**	**NIL**	**NIL**	**NIL**

IOP: Andaman Islands during 13th to 15th November, 2023.

Annexure


Tropical Cyclone Genesis Potential Parameter(GPP) (ANALYSIS)
Based on 13-11-2023 valid for 0000 UTC of 13-11-2023
(Potential Cyclogenesis Zone for GPP =>30)
Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 13-11-2023 valid for 0000 UTC of 14-11-2023
(Potential Cyclogenesis Zone for GPP =>30)
Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
Based on 13-11-2023 valid for 0000 UTC of 15-11-2023
(Potential Cyclogenesis Zone for GPP =>30)
Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 13-11-2023 valid for 0000 UTC of 16-11-2023
(Potential Cyclogenesis Zone for GPP =>30)
Tropical Cyclone Genesis Potential Parameter(GPP) (96 HR FORECAST)
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Based on 13-11-2023 valid for 0000 UTC of 18-11-2023
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Tropical Cyclone Genesis Potential Parameter(GPP) (144 HR FORECAST)
Based on 13-11-2023 valid for 0000 UTC of 19-11-2023
(Potential Cyclogenesis Zone for GPP =>30)
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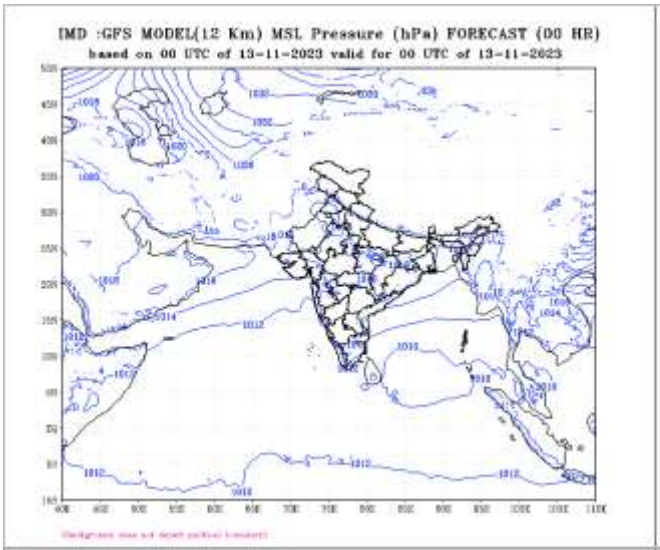
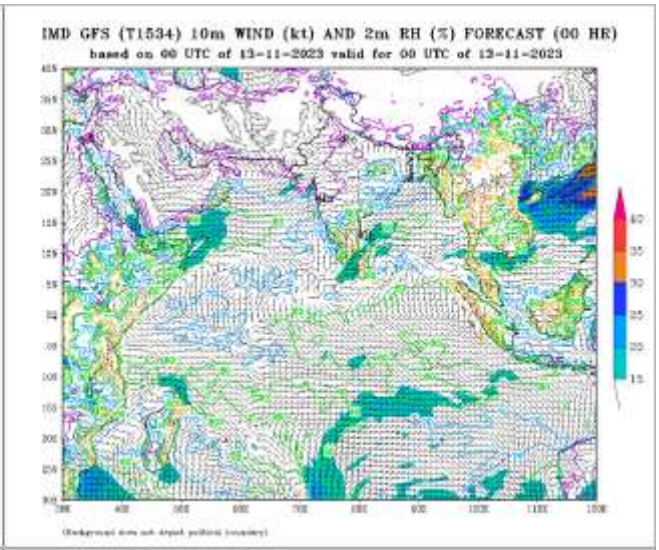
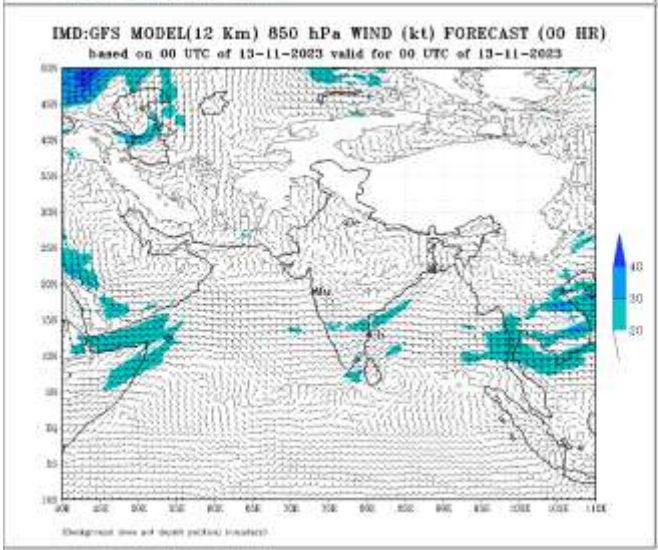
(Potential Cyclogenesis Zone for GPP =>30)


IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (00 HR)
based on 00 UTC of 13-11-2023 valid for 00 UTC of 13-11-2023


IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (00 HR)
based on 00 UTC of 13-11-2023 valid for 00 UTC of 13-11-2023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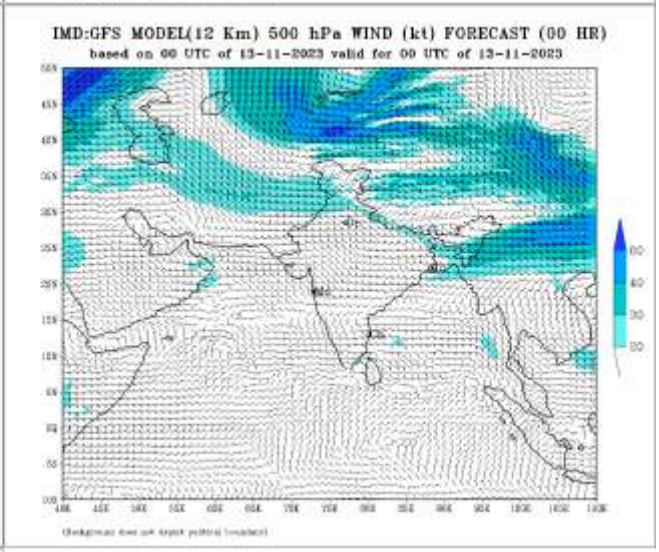
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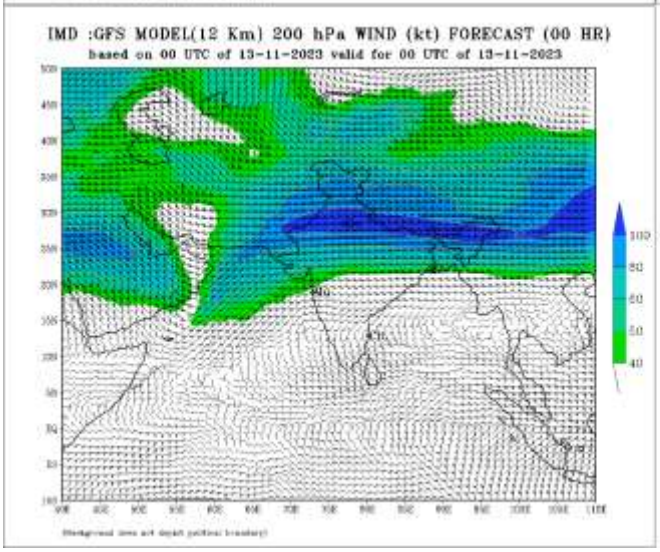
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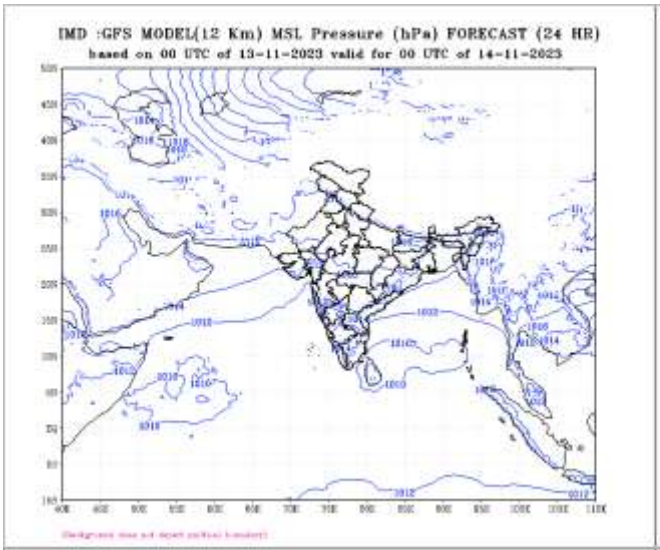
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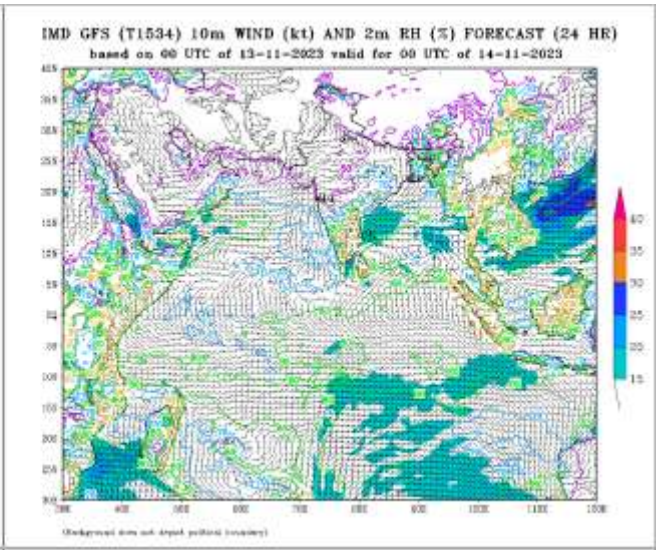
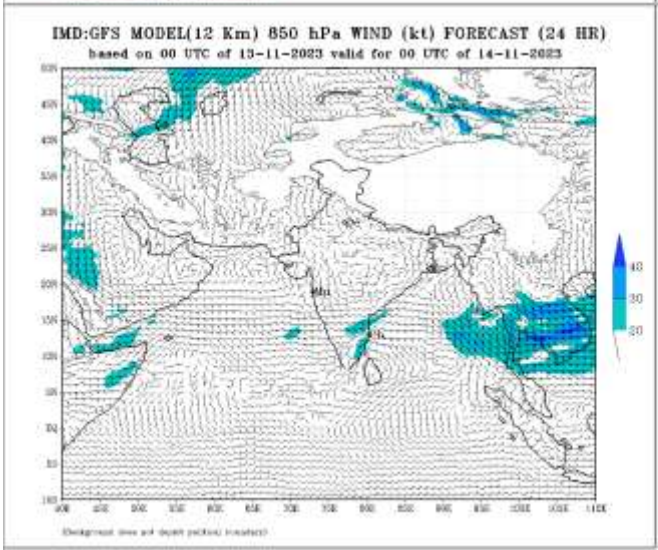

IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (24 HR)
based on 00 UTC of 13-11-2023 valid for 00 UTC of 14-11-2023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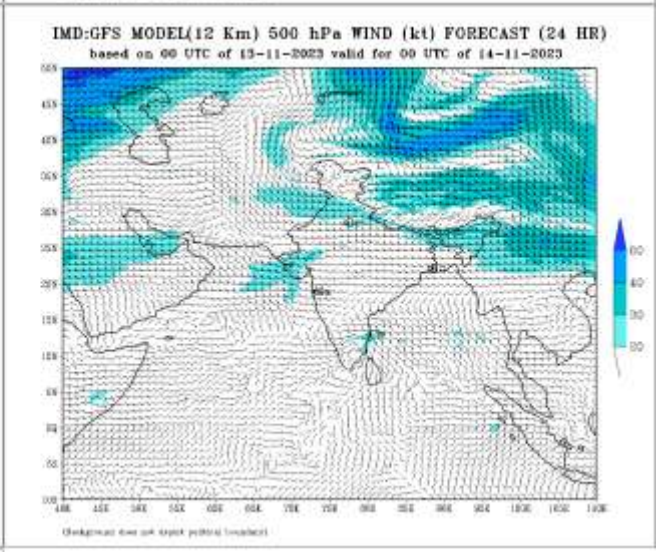
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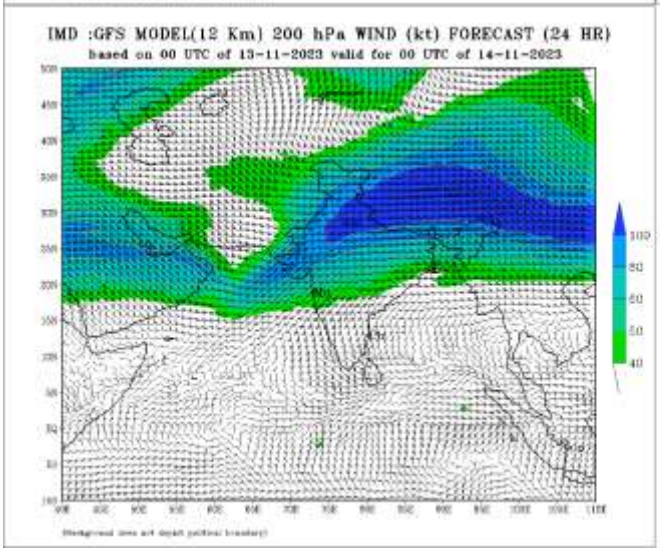
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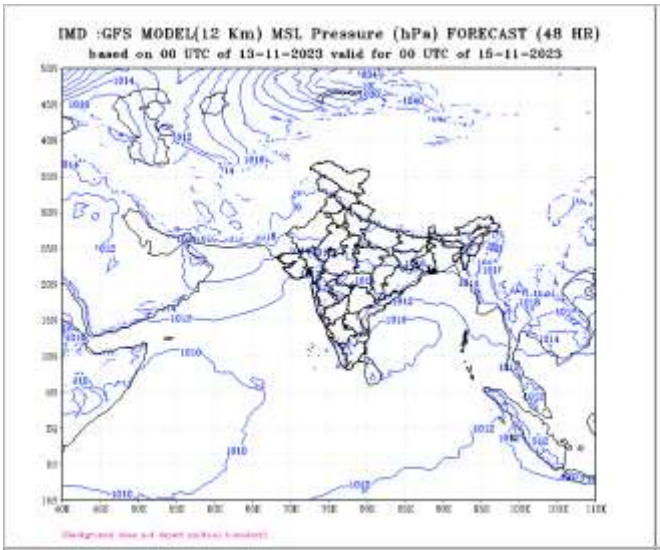
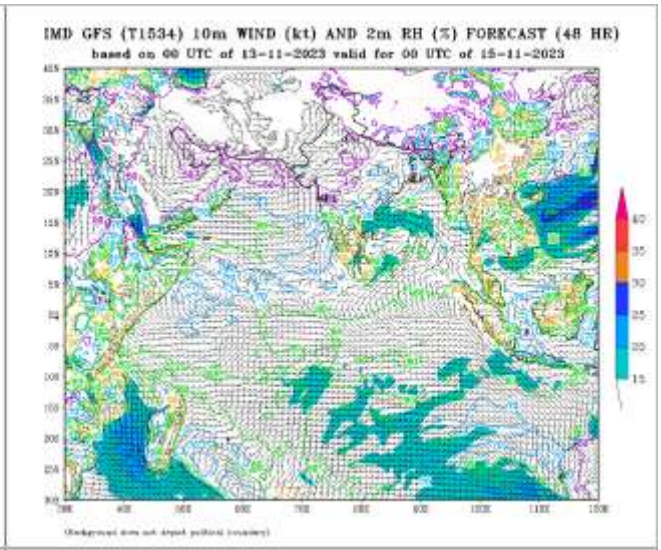
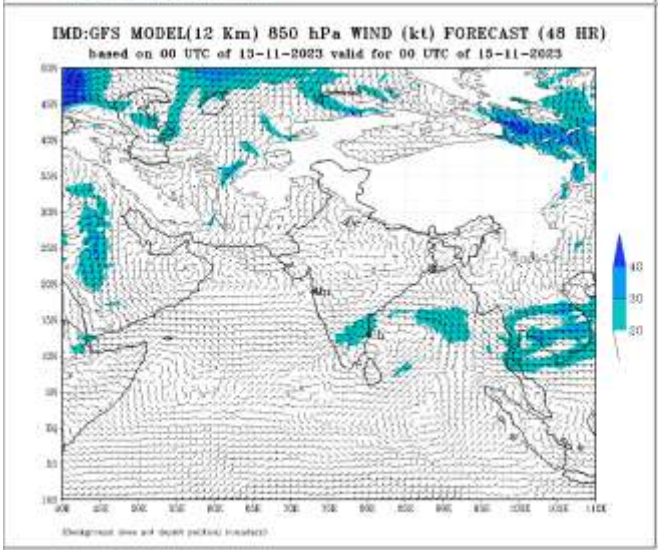

IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 13-11-2023 valid for 00 UTC of 15-11-2023


IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (48 HR)
based on 00 UTC of 13-11-2023 valid for 00 UTC of 15-11-2023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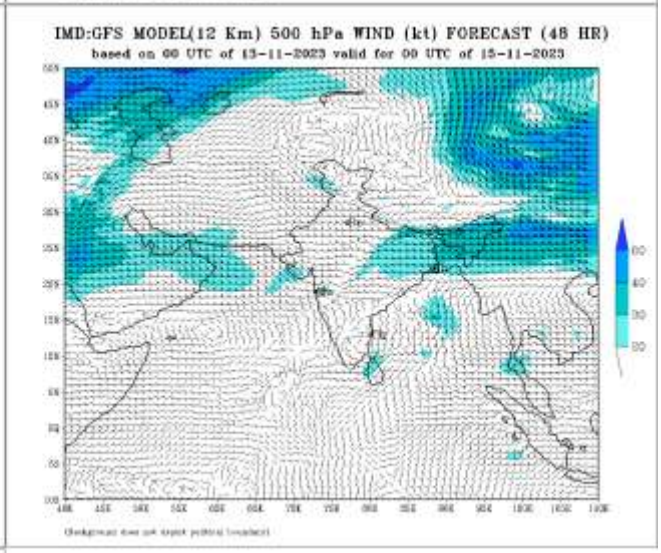
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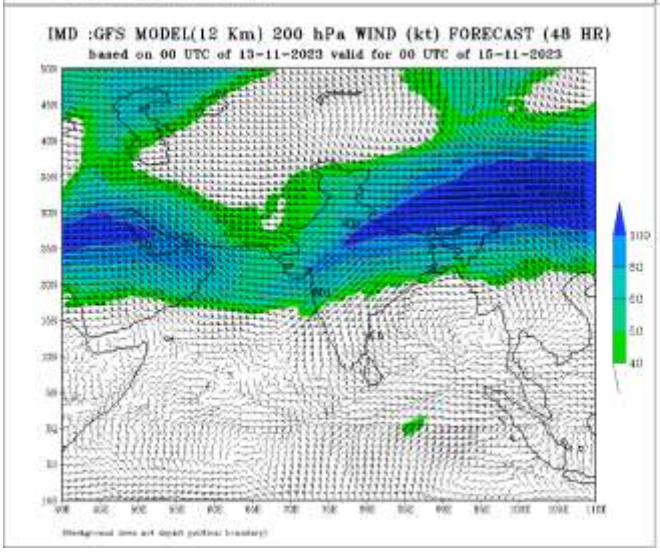
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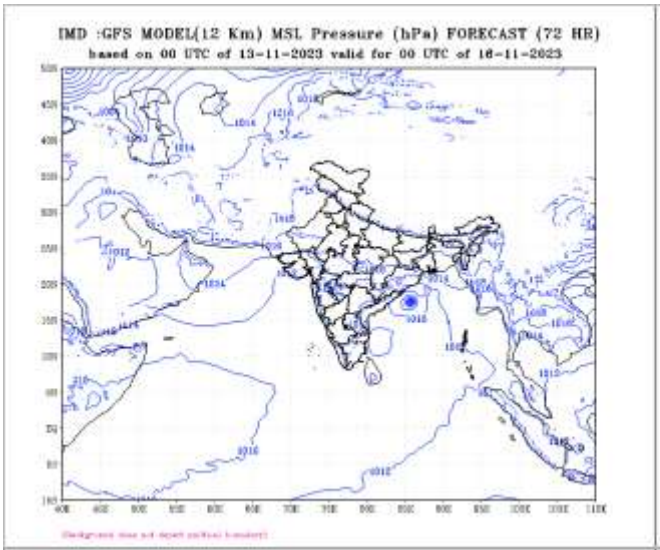
IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (72 HR)
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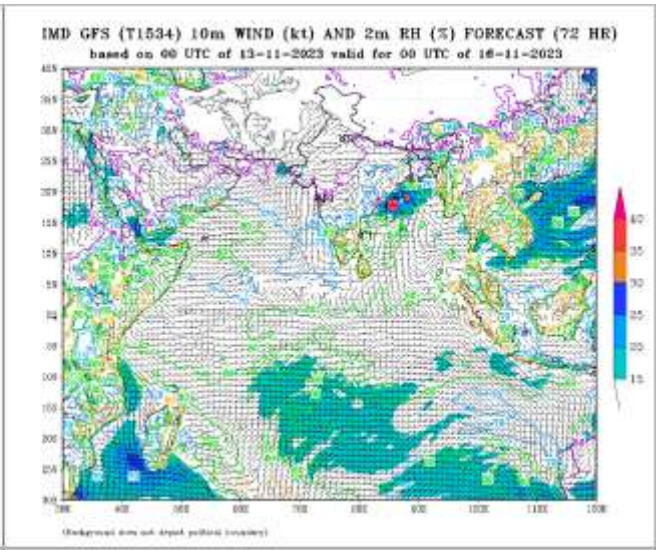
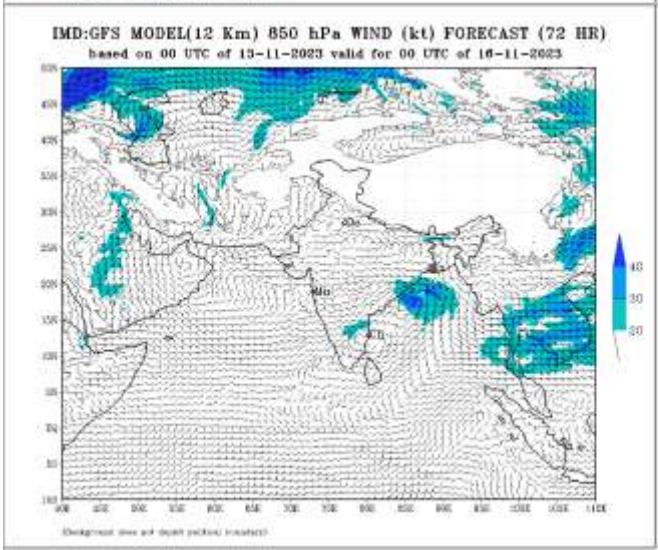

IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (72 HR)
based on 00 UTC of 13-11-2023 valid for 00 UTC of 16-11-2023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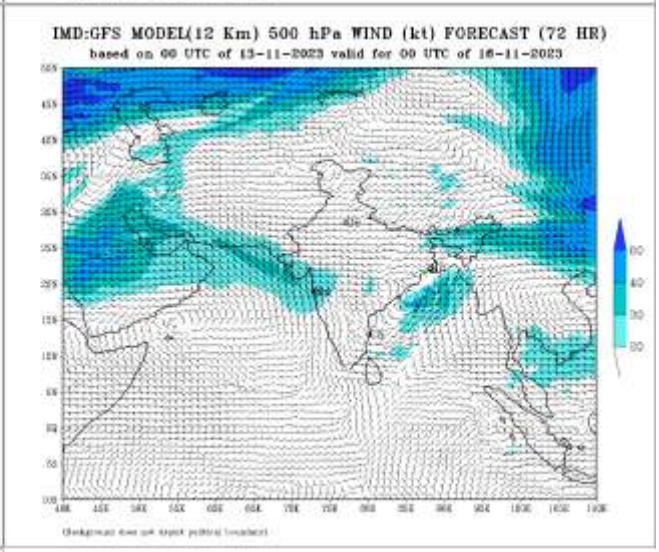
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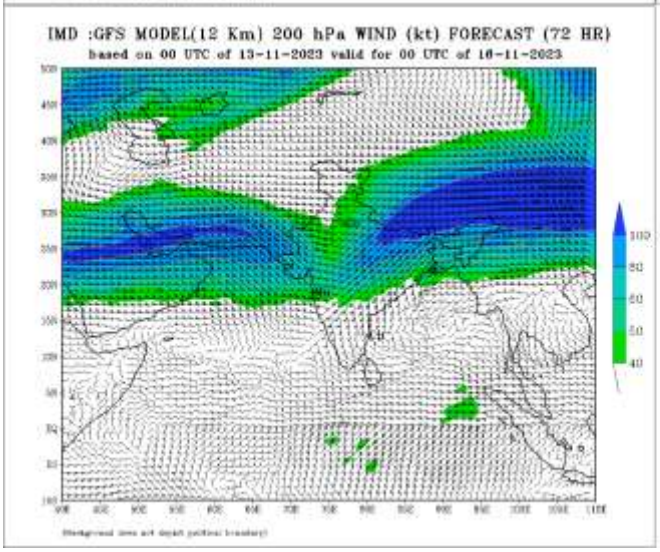
based on 00 UTC of 13-11-2023 valid for 00 UTC of 16-11-2023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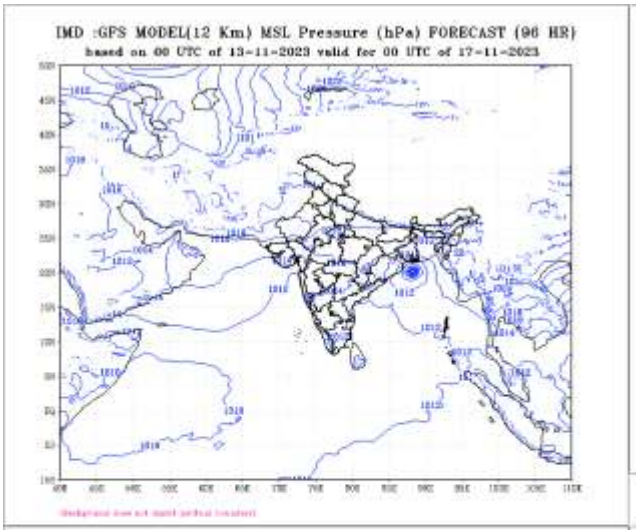
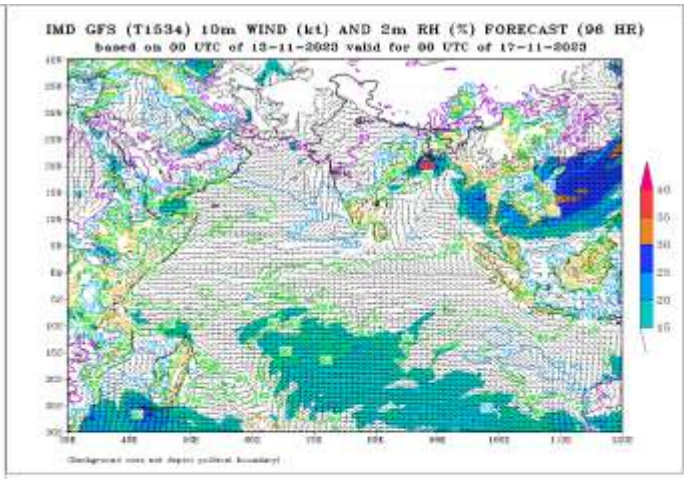
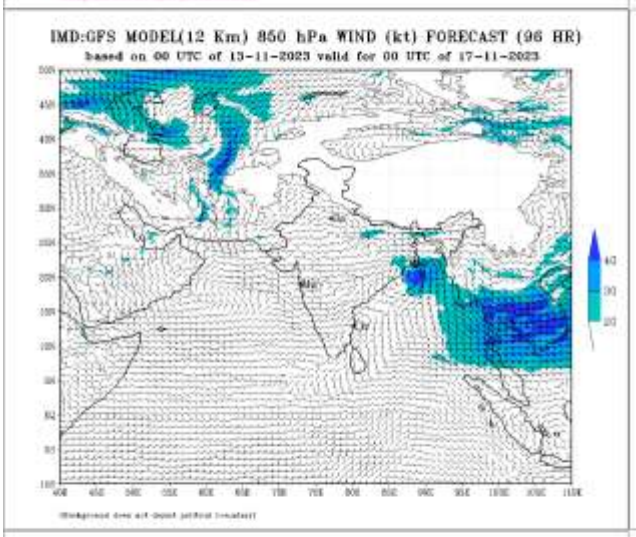
based on 00 UTC of 13-11-2023 valid for 00 UTC of 16-11-2023


IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 13-11-2023 valid for 00 UTC of 17-11-2023


IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (96 HR)
based on 00 UTC of 13-11-2023 valid for 00 UTC of 17-11-2023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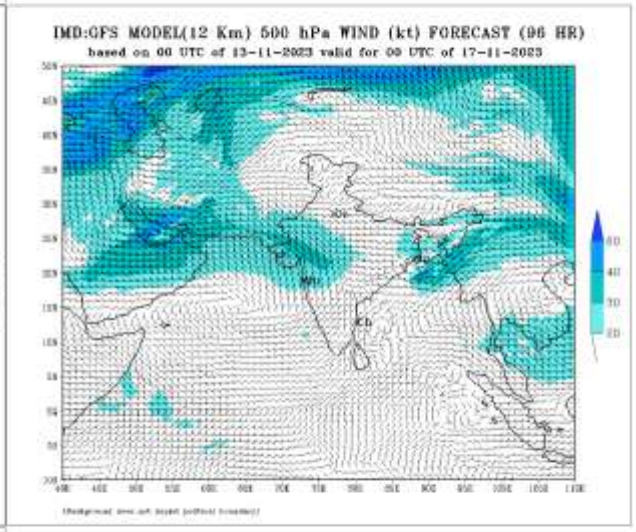
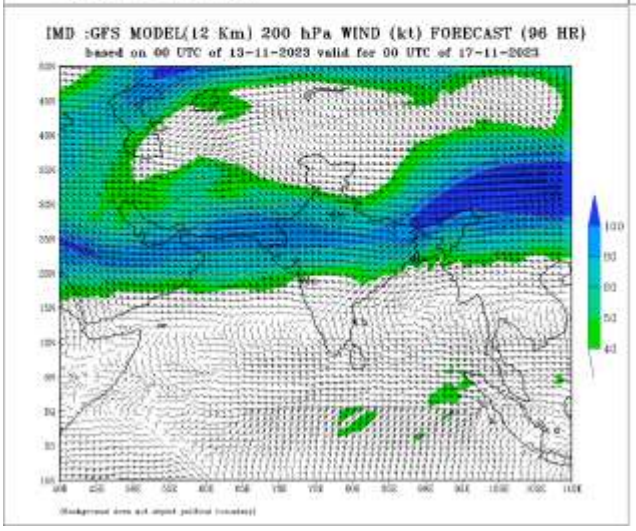
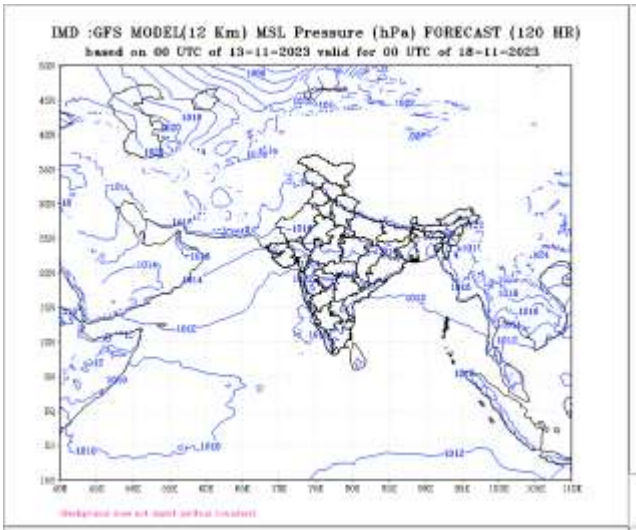
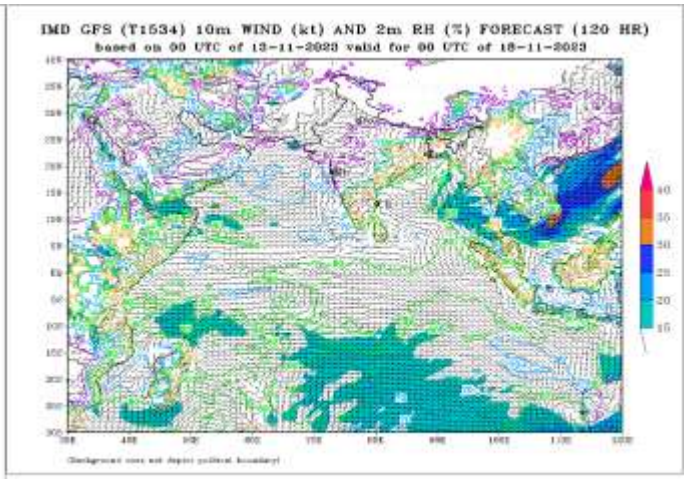
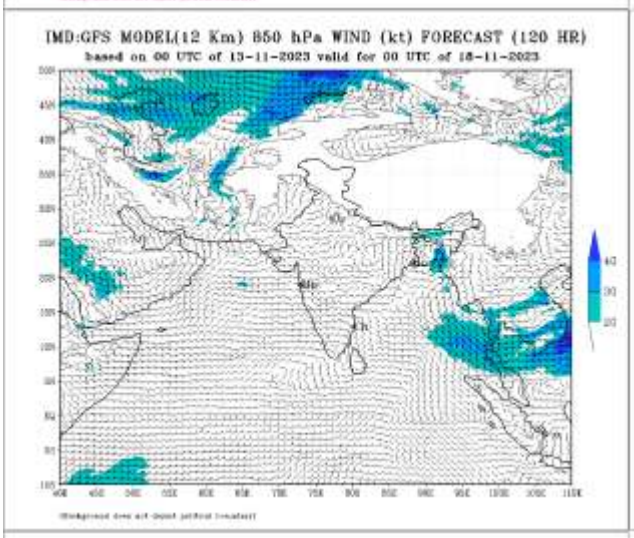
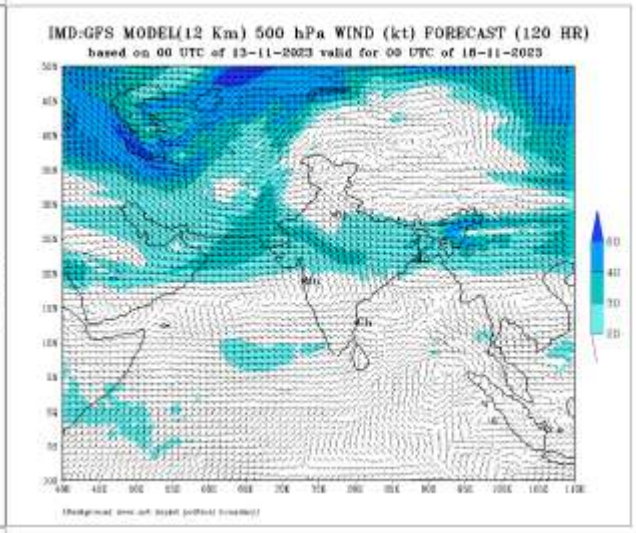

IMD:GFS MODEL(12 Km) 500 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 13-11-2023 valid for 00 UTC of 17-11-2023

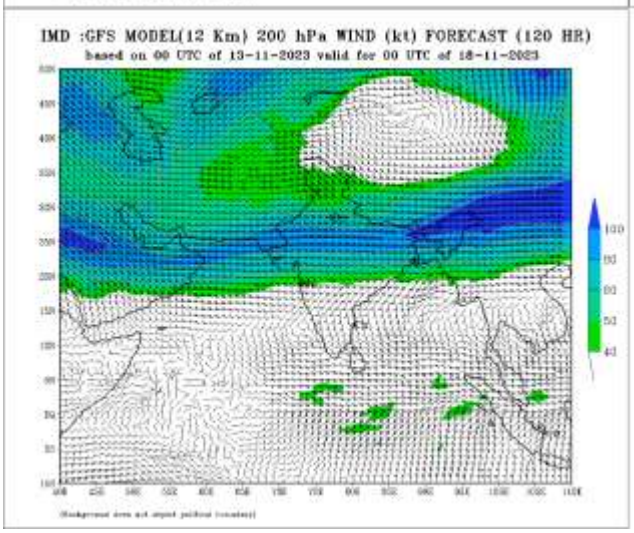

IMD :GFS MODEL(12 Km) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 13-11-2023 valid for 00 UTC of 17-11-2023

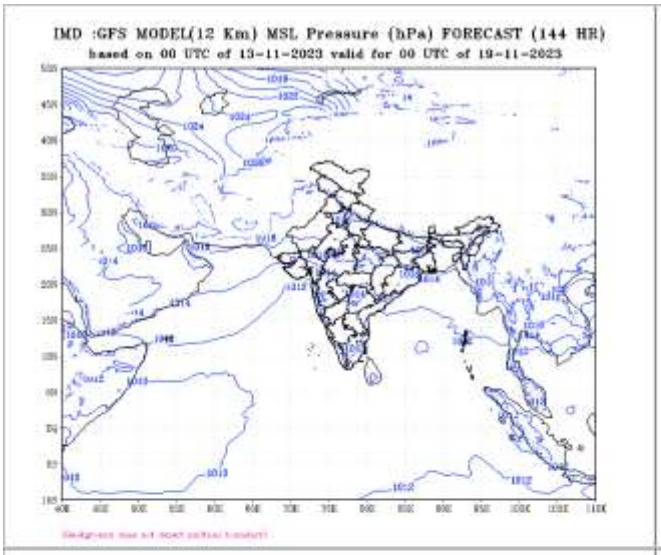

IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 13-11-2023 valid for 00 UTC of 18-11-2023

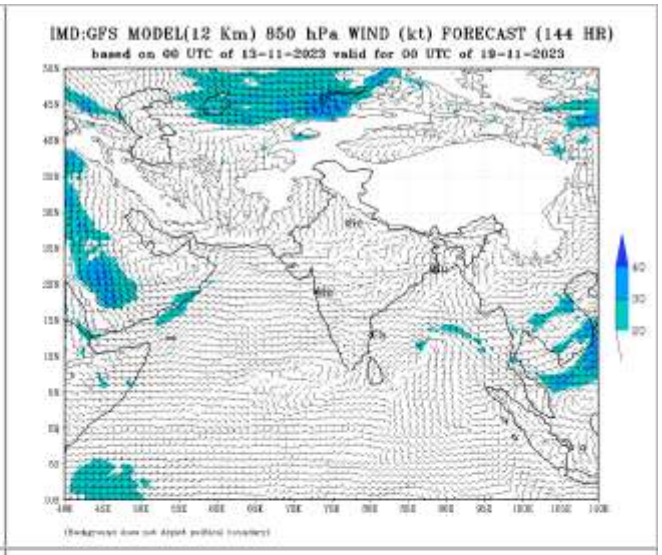

IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (120 HR)
based on 00 UTC of 13-11-2023 valid for 00 UTC of 18-11-2023

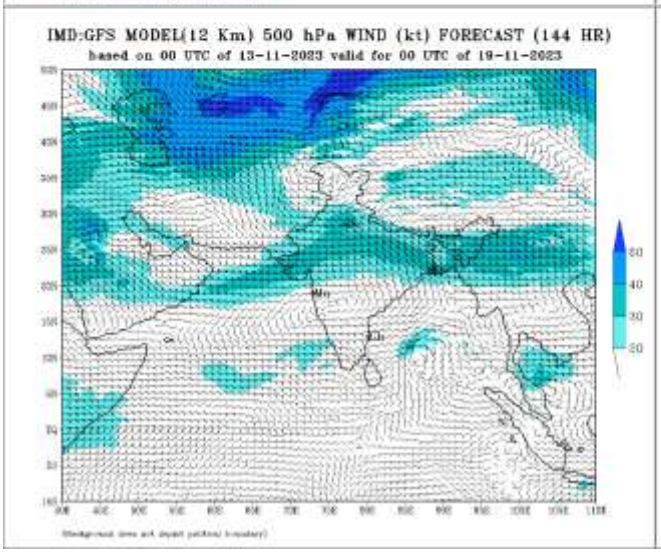

IMD:GFS MODEL(12 Km) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 13-11-2023 valid for 00 UTC of 18-11-2023

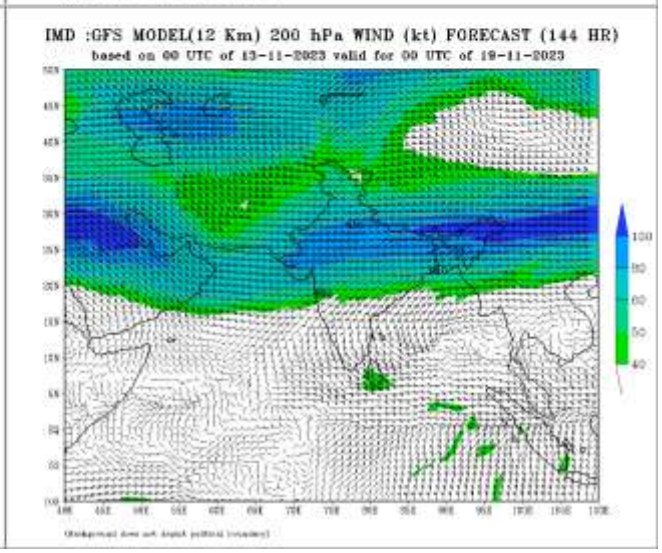

IMD:GFS MODEL(12 Km) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 13-11-2023 valid for 00 UTC of 18-11-2023

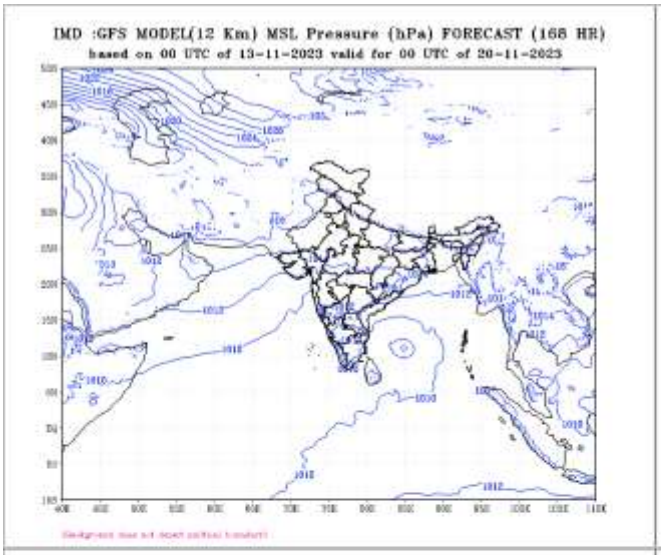

IMD :GFS MODEL(12 Km) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 13-11-2023 valid for 00 UTC of 18-11-2023

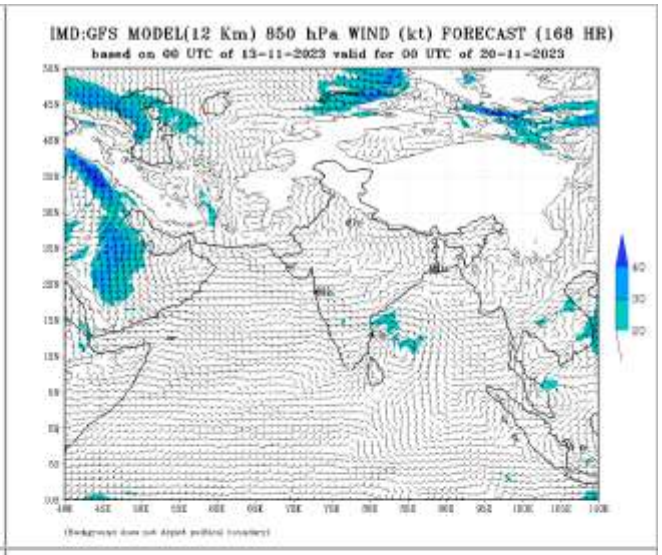

IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (144 HR)
based on 00 UTC of 13-11-2023 valid for 00 UTC of 19-11-2023

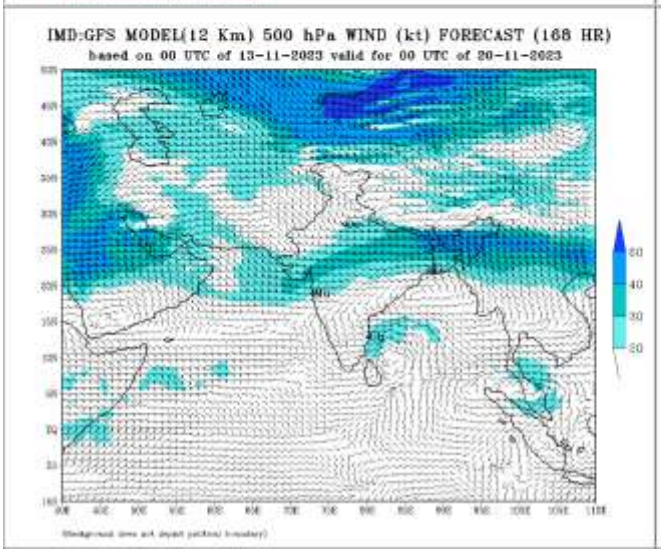

IMD:GFS MODEL(12 Km) 850 hPa WIND (kt) FORECAST (144 HR)
based on 00 UTC of 13-11-2023 valid for 00 UTC of 19-11-2023

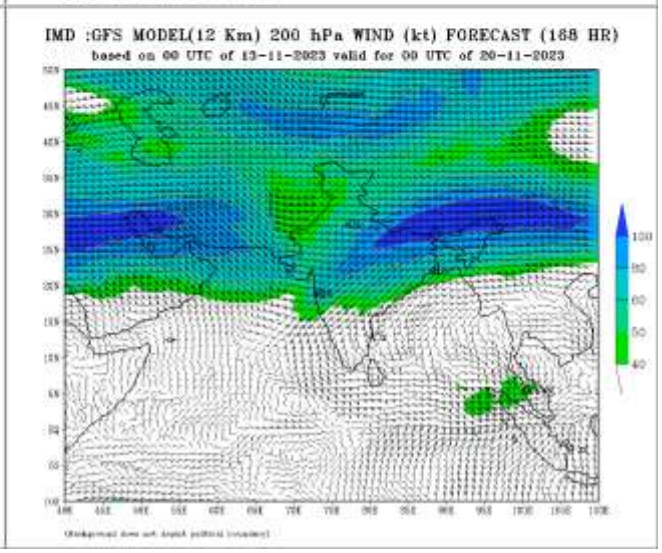

IMD:GFS MODEL(12 Km) 500 hPa WIND (kt) FORECAST (144 HR)
based on 00 UTC of 13-11-2023 valid for 00 UTC of 19-11-2023


IMD :GFS MODEL(12 Km) 200 hPa WIND (kt) FORECAST (144 HR)
based on 00 UTC of 13-11-2023 valid for 00 UTC of 19-11-2023


IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (168 HR)
based on 00 UTC of 13-11-2023 valid for 00 UTC of 20-11-2023


IMD:GFS MODEL(12 Km) 850 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 13-11-2023 valid for 00 UTC of 20-11-2023


IMD:GFS MODEL(12 Km) 500 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 13-11-2023 valid for 00 UTC of 20-11-2023


IMD :GFS MODEL(12 Km) 200 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 13-11-2023 valid for 00 UTC of 20-11-2023