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

FDP (Cyclone) NOC Report Dated 21th November, 2021

Time of Issue: 1200 UTC

Synoptic features (based on 0900 UTC analysis):

- Yesterday's well marked low pressure area over eastcentral Arabian Sea (AS) moved gradually west-southwestwards and persisted over the same region at 0900 UTC of today, the 21st November. It is likely to move west-southwestwards during next 2-3 days and weaken gradually.
- A trough from the cyclonic circulation associated with the above Well Marked Low Pressure Area over Eastcentral AS now runs to Maharashtra coast and extends upto 1.5 km above mean sea level.
- A cyclonic circulation formed over south Andaman Sea & neighbourhood at 0300 UTC of today, the 21st November. Vertically, it extended upto 3.1 km above mean sea level. It persisted over the same region at 0900 UTC of today.
- Yesterday's cyclonic circulation over south interior Karnataka became less marked at 0830 hrs IST of today, the 21st November 2021.

Dynamical and thermo-dynamical features

Parameter	Bay of Bengal (BoB)	Arabian Sea (AS)
Sea Surface Temperature (SST) ºC	29-31°C over entire BoB region.	28-29°C over eastern parts of AS. 26-27°C over western parts of AS off Somalia, Yemen & Oman coasts.
Tropical Cyclone Heat Potential (TCHP) kJ/cm^2	(a) 50-60 over southwest BoB, (b) 60-80 over major parts of central & north BoB (c) 100-120 over eastern equatorial Indian Ocean and adjoining south Andaman Sea & southeast BoB.	(a) 50-60 over eastern parts of central & north AS (b) 60-80 over south AS. (c) It is less than 50 over western parts of AS.
Cyclonic Relative vorticity (X10^{-6}s^{-1})	40-60 over south Andaman Sea and adjoining southeast BoB with vertical extension upto 500 hPa level.	100 over central parts of south AS to the southwest of vortex with vertical extension upto 500 hPa level and oriented northeast to southwest. 40-60 over Comorin area.
Low Level convergence (X10^{-5} s^{-1})	05-10 over southeast BoB Another convergence zone of 05 over south Andaman Sea.	Small zone of 05 over eastcentral AS to the north of vortex. Another zone of 05-10 over southwest AS to the southwest of system

		centre. Another zone og 05 over southeast AS off Kerala coast.
Upper Level divergence ($X10^{-5}$ s^{-1})	A large extended zone 05-10 over southeast Bay and adjoining east Equatorial Indian Ocean.	A large extended zone 05-10 over central AS upto Maharashtra coast over the system area.
Vertical Wind Shear (VWS knots)	Low to Moderate (05-20) over major parts of BoB and Andaman Sea. High to the south of 8^0N.	Moderate (15-20 kt) over the vortex area and high to the west & southwest of vortex along the expected movement of system. High over all other parts of AS.
Wind Shear Tendency (knots)	Decreasing over major parts of BoB and Andaman Sea.	Decreasing over the vortex area. And expected track of system.
Upper tropospheric Ridge	Along 20.5°N.	Along 19.0°N.

Satellite observations based on INSAT imagery (0600 UTC):

(a) Associated with well marked low pressure area over eastcentral Arabian Sea

At 0600 UTC, the vortex over eastcentral AS is characterized with intensity of T 1.0 and is centred near 12.8N and 66.8 E. The associated convection has decreased and disorganised during past 03 hrs. Scattered to broken low & medium clouds with embedded intense to very intense convection lay over central and adjoining south AS between latitude 10.0N & 16.0N and longitude 61.0E & 67.0E. Minimum cloud top temperature has reduced significantly and is minus 83^0C at 0900 UTC, indicating decrease in depth of convection .

(b) Associated with convection over Bay of Bengal

At 0600 UTC, scattered low & medium clouds with embedded intense to very intense convection lay over central & southwest BoB and south Andaman Sea.

(a) Associated with convection over Arabian Sea

At 0600 UTC, scattered low & medium clouds with embedded intense to very intense convection lay over central & adjoining south AS between latitude 10.0N & 18.0N and longitude 60.0E & 70.0E.

M.J.O. Index:

MJO index is currently in Phase 4 with amplitude less than 1. It will continue in same phase for next 7 days with amplitude less than 1.

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

An invest area is located near 11.5^0S/106.0^0E with associated maximum sustained wind speed of 20 kts.

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

Model	BoB	AS
IMD-GFS	No cyclogenesis is indicated over the BoB region during next 7 days.	Indicates a well marked low pressure area over eastcentral AS with west-southwestwards movement during 21st-22nd becoming low pressure area over southwest AS on 23rd-and reaching close to Somalia on 24th. Becoming less marked thereafter.

IMD-GEFS	No cyclogenesis is indicated over the BoB region during next 7 days.	Indicates a low pressure area over eastcentral AS on 21st moving west-southwestwards, reaching southwest AS on 22nd and becoming less marked thereafter.
IMD-WRF	A trough over south BoB on 21st, LPA over southeast BoB on 22nd and 23rd with west-northwestwards movement. Seen as and LPA over southwest BoB off north Sri Lanka coast on 24th.	Indicates a well marked low pressure area over eastcentral AS on 21st, LPA over southwest AS during 22nd & 23rd , becoming less marked near North Somalia coast on 24th.
NCMRWF-NCUM	A cyclonic circulation over southeast BoB and adjoining south Andaman Sea on 21st moving west-northwestwards towards Sri Lanka by 25th.	Indicates a WML over eastcentral AS on 21st & 22nd with west southwestwards movement towards southwest AS upto Somalia during 23rd to 24th and becoming less marked thereafter.
NCMRWF-NEPS	-Do-	Indicating similar trends in movement of system as other models. However, this model is also indicating slight intensification during 23rd to 25th over southwest AS. Further, it is also indicating system to reach Somalia coast on 26th as an LPA. Becoming less marked thereafter.
NCMRWF-UM (Regional)	-Do-	Similar trends as NCUM
ECMWF	Indicates Cyclonic Circulation/LPA over south Andaman Sea on 21st, southeast BoB on 22nd, southwest BoB on 23rd, close to Sri Lanka on 24th with overall west-northwestwards movement.	Indicates WML over east-central AS on 20th till 21st with west-southwestward movement and gradual weakening from 22nd onwards becoming insignificant on 24th.
ECMWF-EPS	Not available	Not available
NCEP-GFS	No significant cyclogenesis zone over BoB	Similar trends as IMD GFS.
IMD-GPP	A small potential zone of cyclogenesis over south Andaman Sea on 24th and feeble potential zone over southwest BoB off Tamil Nadu coast on 27th & 28th.	No significant potential zone for cyclogenesis over AS during next 7 days.

GPP- Genesis Potential Parameter based on Dynamical Statistical model developed by IMD.

Summary and Conclusion:

1. **For the Bay of Bengal**: Majority of the models indicate no cyclogenesis during next seven days. Models are also indicating development of low pressure area over southeast BoB during next 48 hours with subsequent west-northwestwards movement towards North SriLanka coast and no significant intensification.
2. **For the Arabian Sea**: Most of models indicate that the well marked low pressure area would move west-southwestwards for next 4-5 days towards southwest AS off Somalia coast.

It may thus be concluded that,

1. No cyclogenesis is expected over the BoB and AS region during next 7 days.
2. The Well Marked Low Pressure Area over eastcentral Arabian Sea would move west-southwestwards for next 2-3 days and weaken gradually. The movement and intensification of the system is being continuously monitored.
3. The movement and intensification of cyclonic circulation over South Andaman Sea is being monitored.

Probability of cyclogenesis (formation of depression and above intensity systems) over the 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	NIL	NIL	NIL	NIL	NIL

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

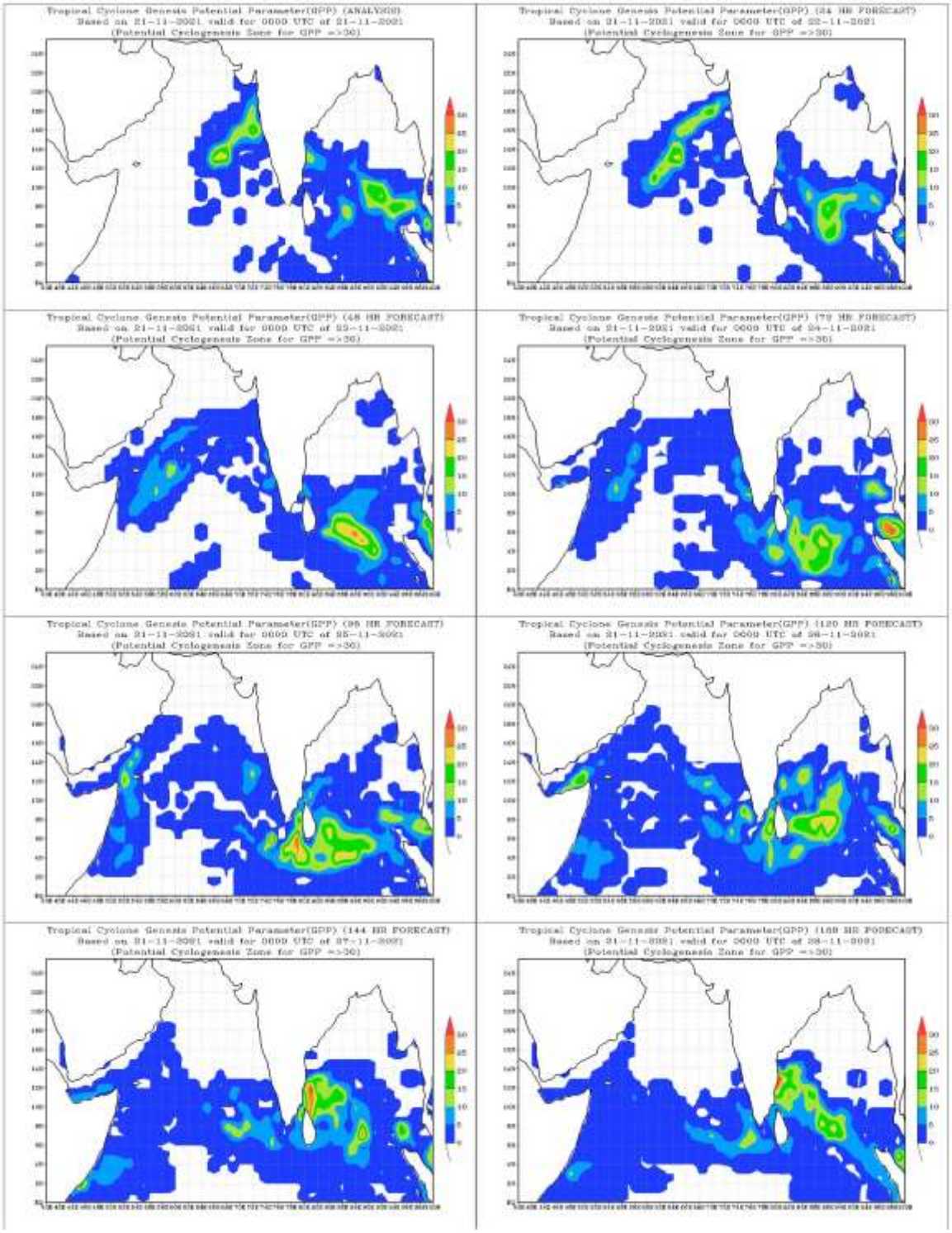
24 HOURS	24-48 HOURS	48-72 HOURS	72-96 HOURS	96-120 HOURS	120-144 HOURS	144-168 HOURS
NIL	NIL	NIL	NIL	NIL	NIL	NIL

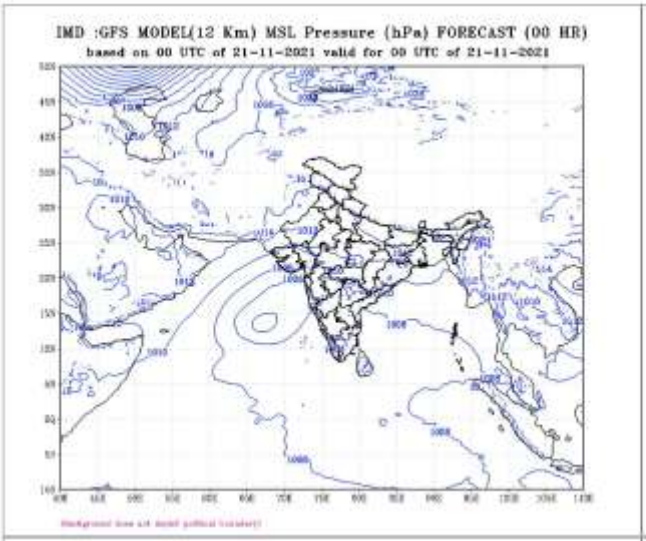
Advisory:

1. The Well Marked Low Pressure Area over eastcentral Arabian Sea would move west-southwestwards for next 2-3 days and weaken gradually. Continuous monitoring of the movement and intensification of the system required.
2. Continuous monitoring of the movement and intensification of cyclonic circulation over South Andaman Sea is required.

No IOP is suggested for next 24 hours.

Annexure


Tropical Cyclone Genesis Potential Parameter(GPP) (ANALYSIS)
Based on 21-11-2021 valid for 0000 UTC of 21-11-2021
(Potential Cyclogenesis Zone for GPP =>30)
Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 21-11-2021 valid for 0000 UTC of 22-11-2021
(Potential Cyclogenesis Zone for GPP =>30)
Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
Based on 21-11-2021 valid for 0000 UTC of 23-11-2021
(Potential Cyclogenesis Zone for GPP =>30)
Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 21-11-2021 valid for 0000 UTC of 24-11-2021
(Potential Cyclogenesis Zone for GPP =>30)
Tropical Cyclone Genesis Potential Parameter(GPP) (96 HR FORECAST)
Based on 21-11-2021 valid for 0000 UTC of 25-11-2021
(Potential Cyclogenesis Zone for GPP =>30)
Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 21-11-2021 valid for 0000 UTC of 26-11-2021
(Potential Cyclogenesis Zone for GPP =>30)
Tropical Cyclone Genesis Potential Parameter(GPP) (144 HR FORECAST)
Based on 21-11-2021 valid for 0000 UTC of 27-11-2021
(Potential Cyclogenesis Zone for GPP =>30)
Tropical Cyclone Genesis Potential Parameter(GPP) (168 HR FORECAST)
Based on 21-11-2021 valid for 0000 UTC of 28-11-2021
(Potential Cyclogenesis Zone for GPP =>30)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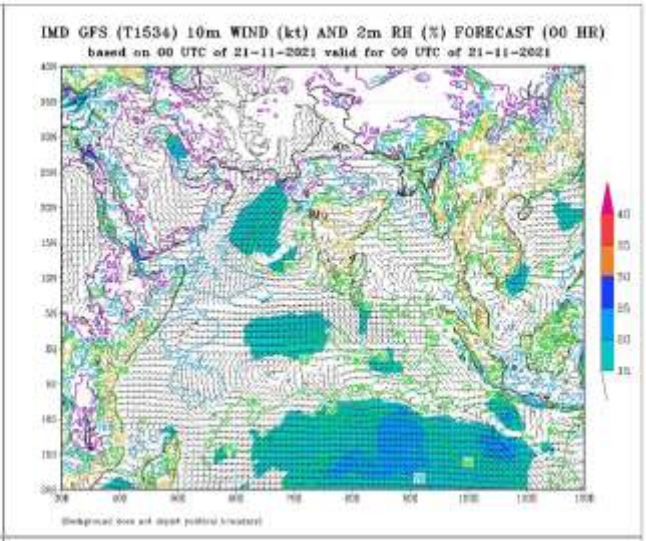
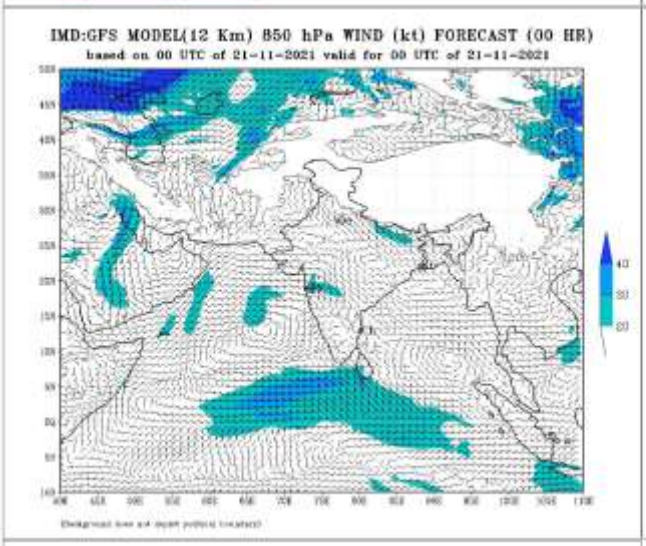
based on 00 UTC of 21-11-2021 valid for 00 UTC of 21-11-2021


IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (00 HR)
based on 00 UTC of 21-11-2021 valid for 00 UTC of 21-11-2021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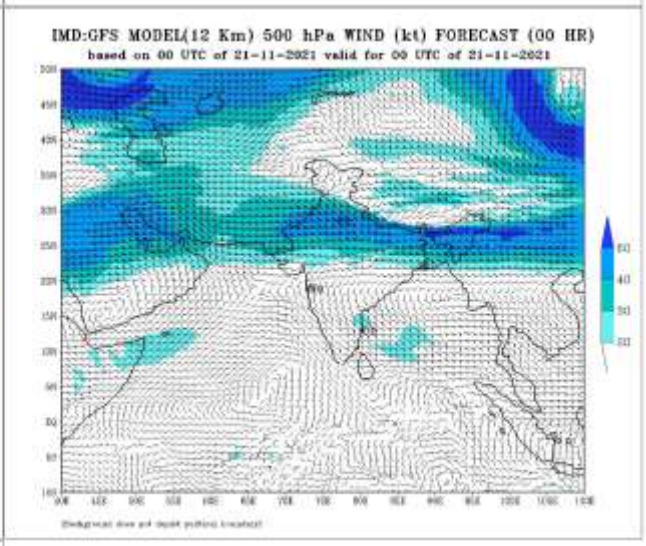
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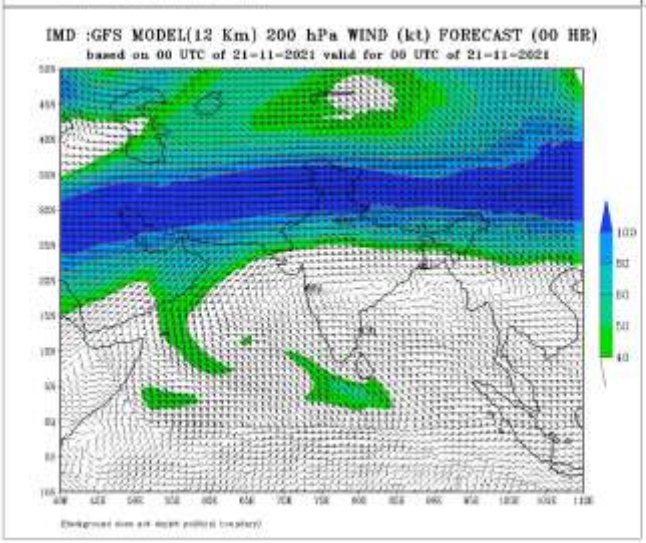
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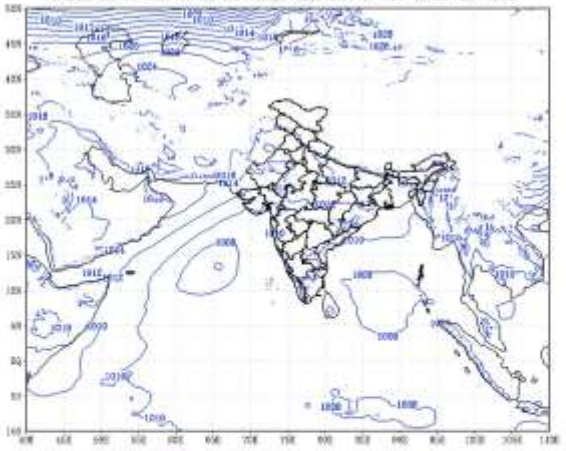
IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 21-11-2021 valid for 00 UTC of 22-11-2021



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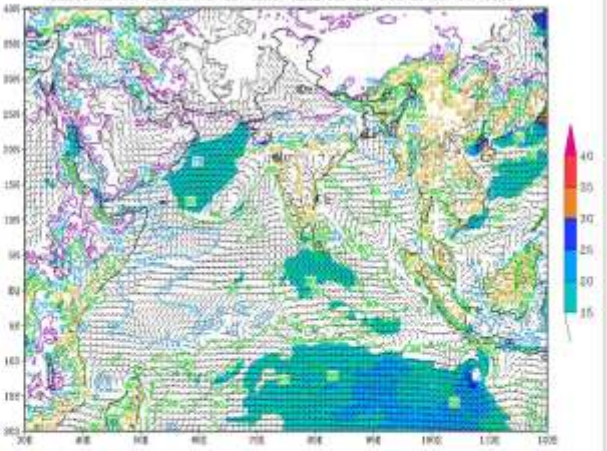

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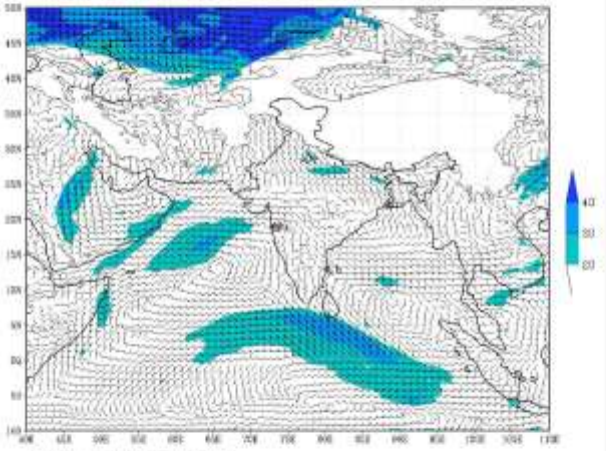

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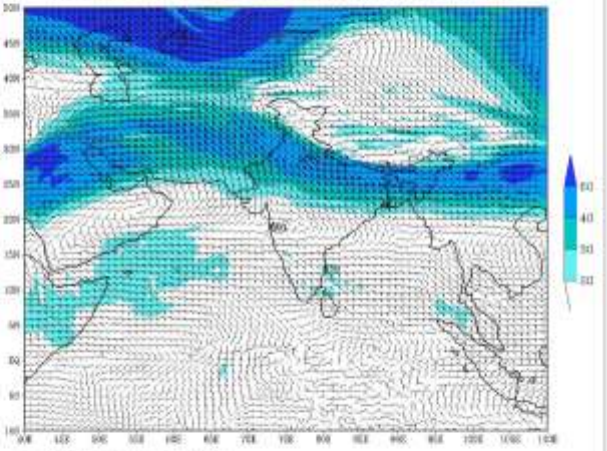

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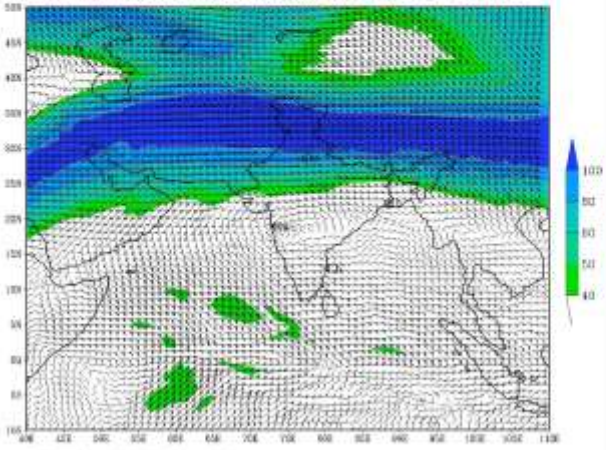
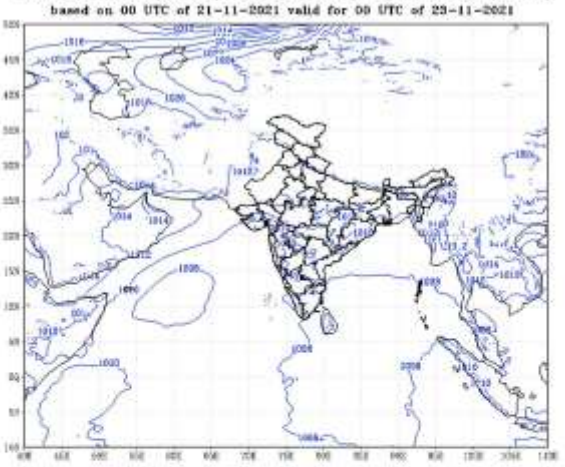
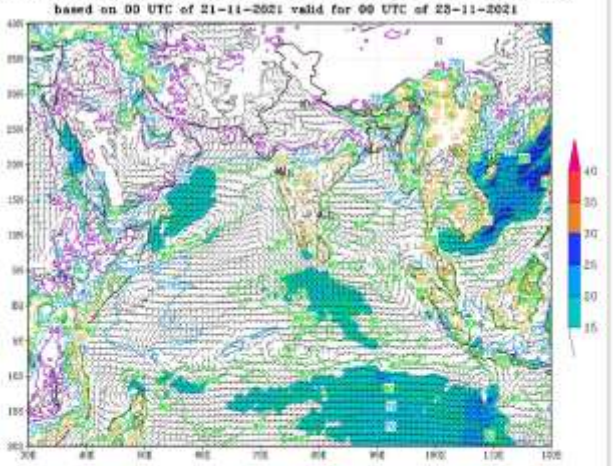


IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 21-11-2021 valid for 00 UTC of 23-11-2021



IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (48 HR)
based on 00 UTC of 21-11-2021 valid for 00 UTC of 23-11-2021



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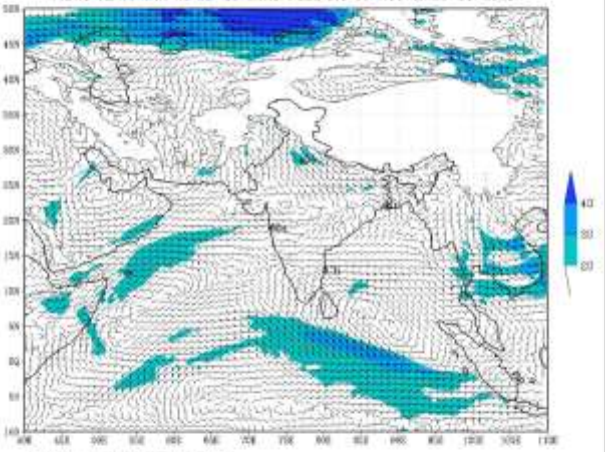

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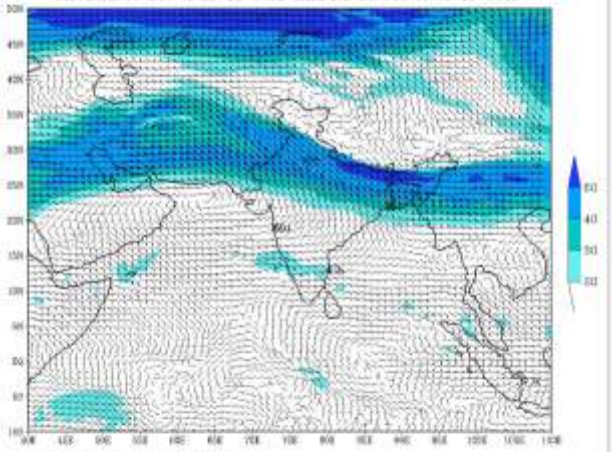

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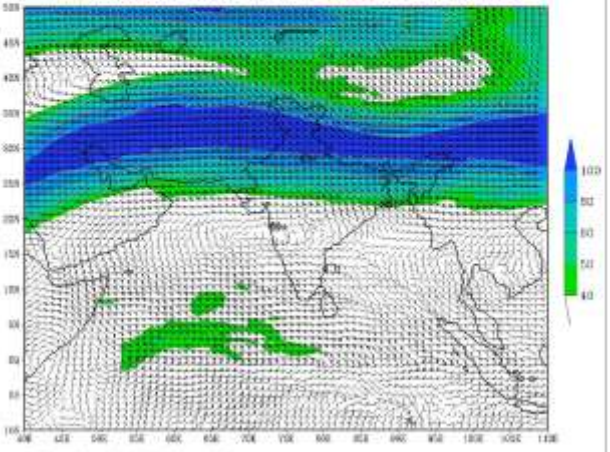
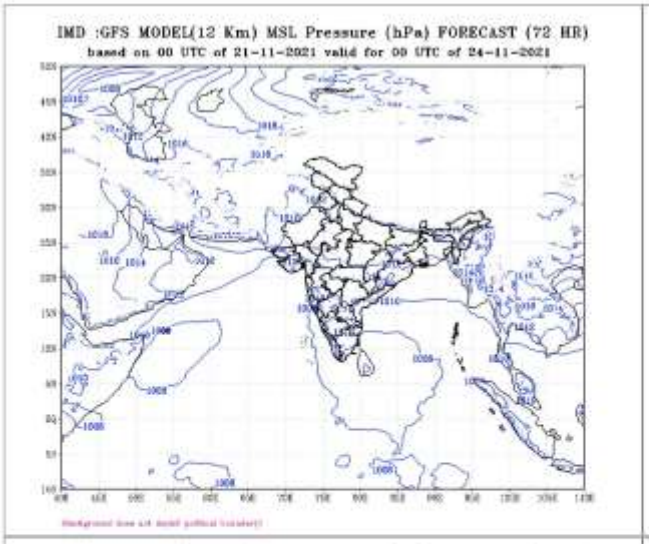
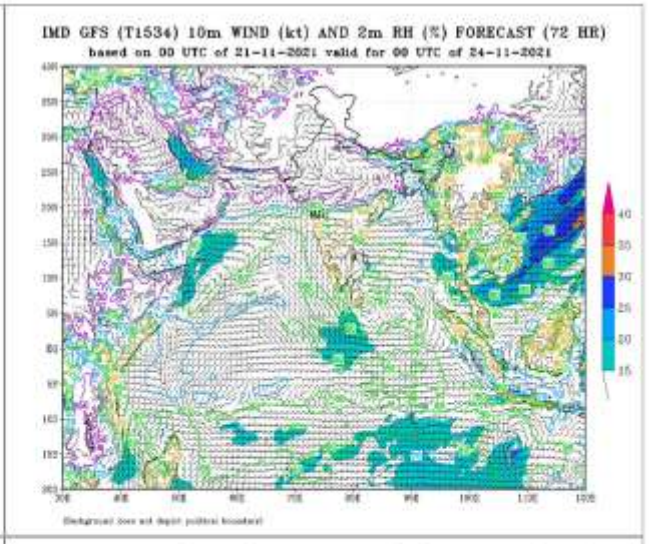
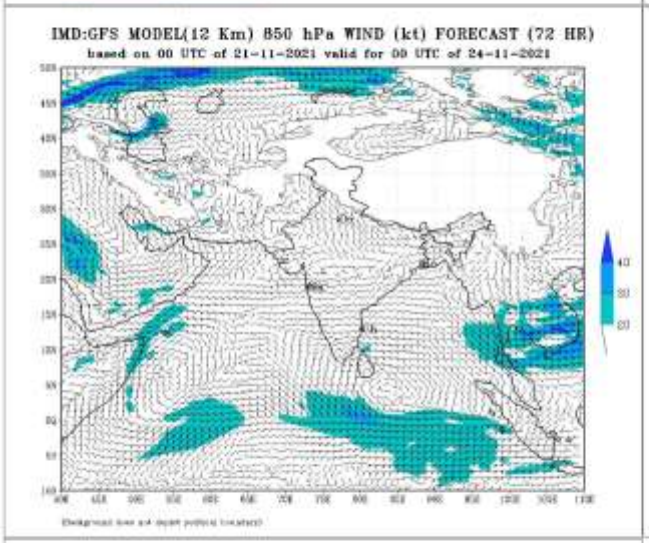



IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 21-11-2021 valid for 00 UTC of 24-11-2021


IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (72 HR)
based on 00 UTC of 21-11-2021 valid for 00 UTC of 24-11-2021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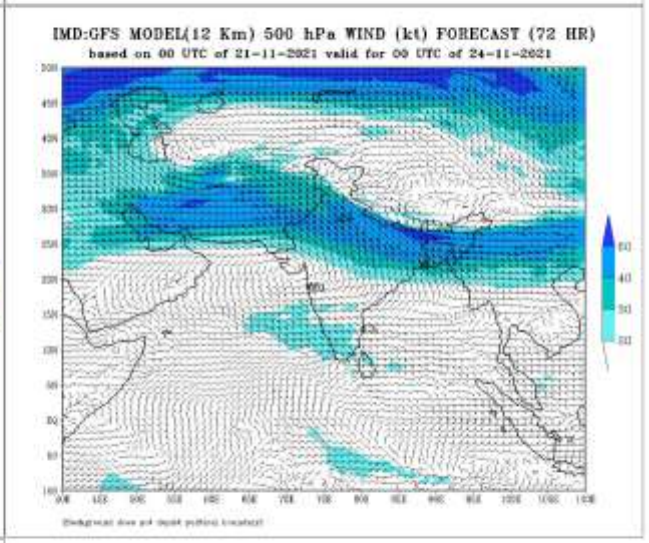
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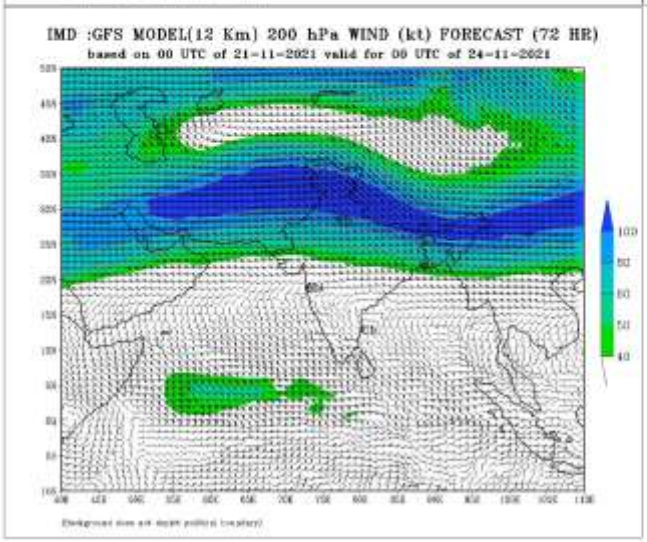
IMD :GFS MODEL(12 Km) 200 hPa WIND (kt) FORECAST (72 HR)
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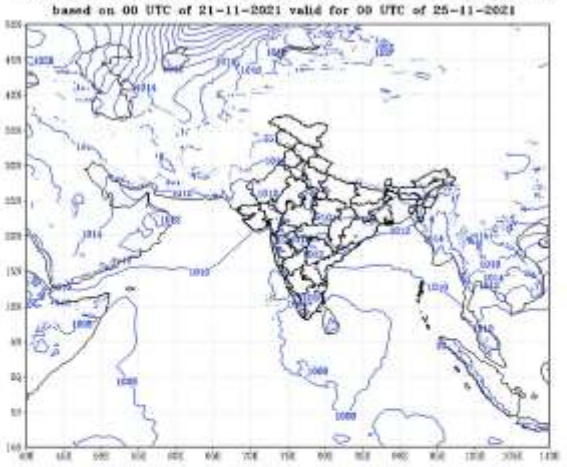
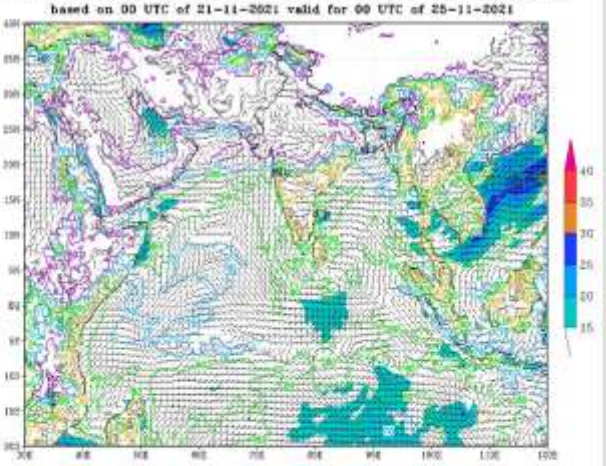
IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 21-11-2021 valid for 00 UTC of 25-11-2021



IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (96 HR)
based on 00 UTC of 21-11-2021 valid for 00 UTC of 25-11-2021



IMD:GFS MODEL(12 Km) 850 hPa WIND (kt) FORECAST (96 HR)
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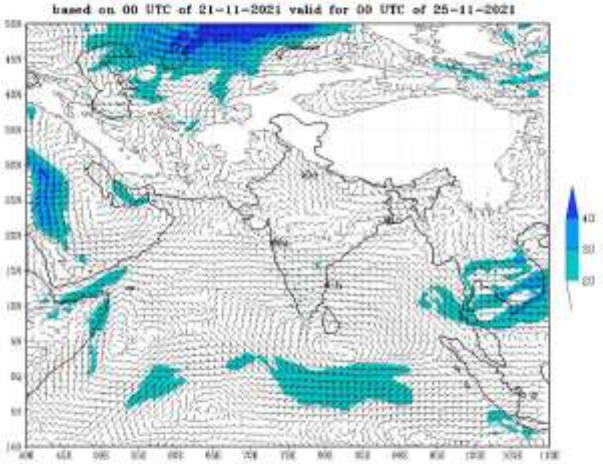

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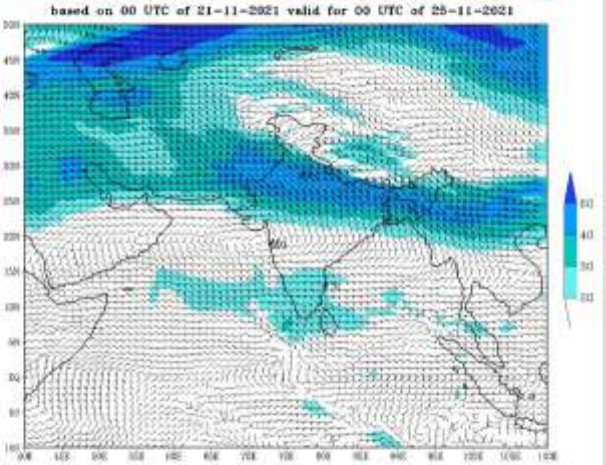
based on 00 UTC of 21-11-2021 valid for 00 UTC of 25-11-2021



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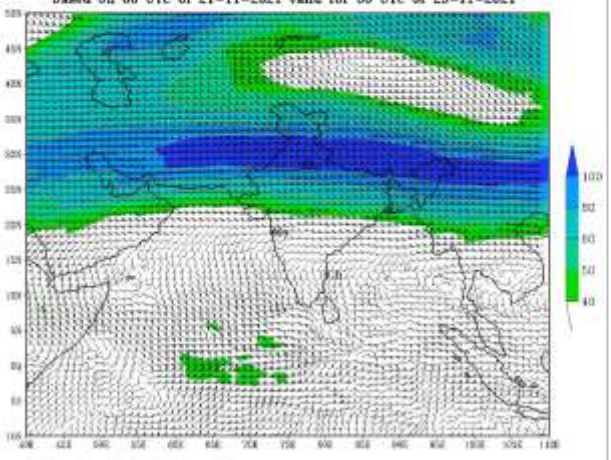

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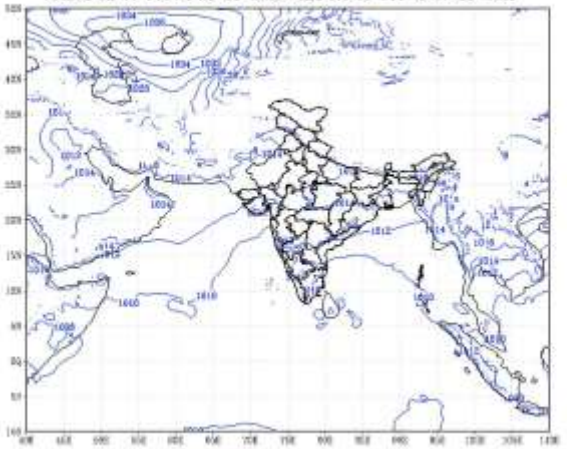

IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (120 HR)
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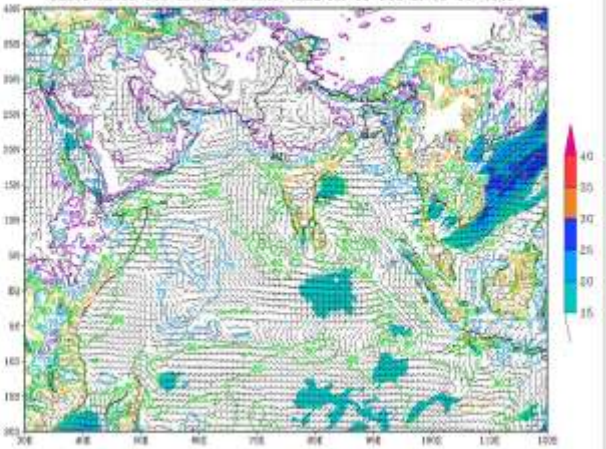

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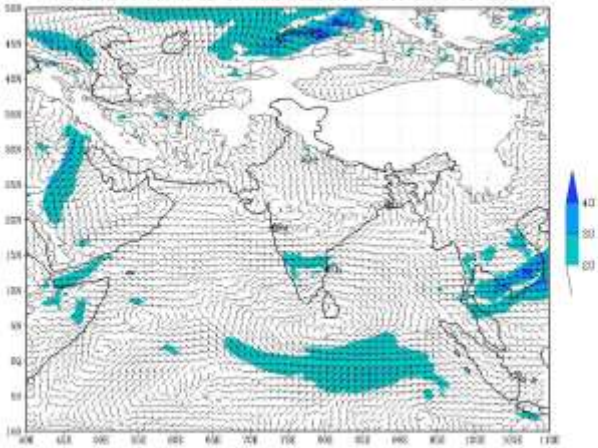

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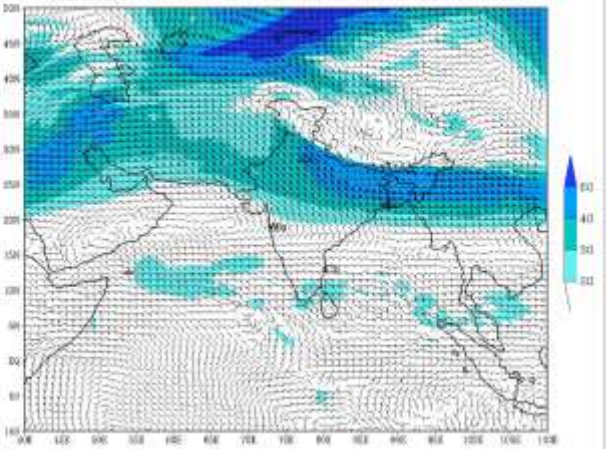
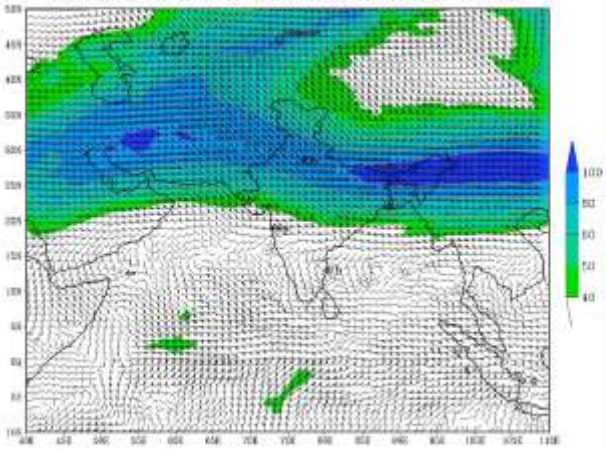
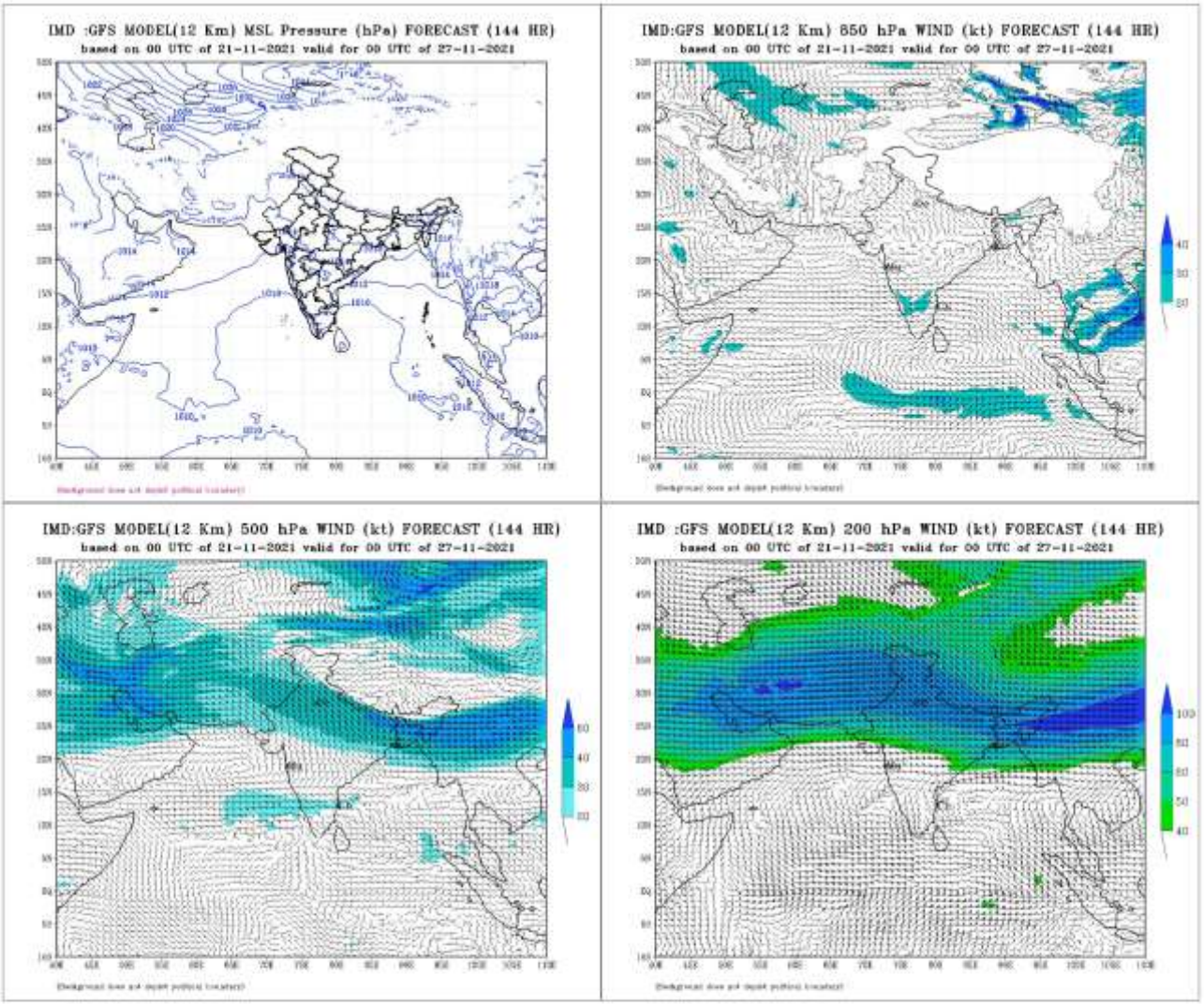
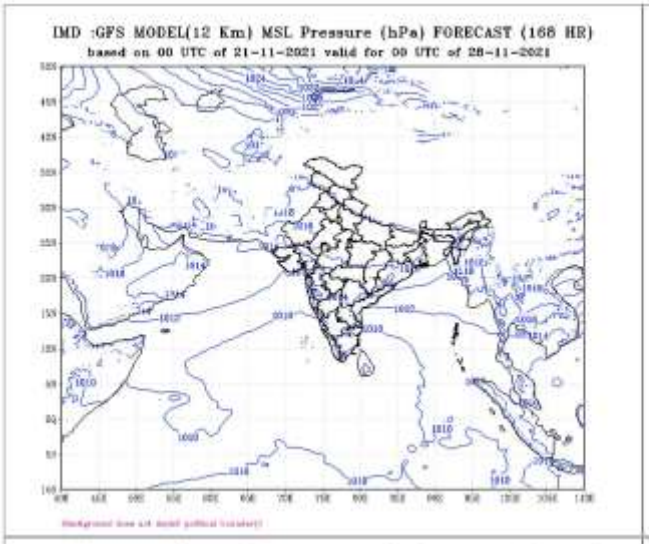
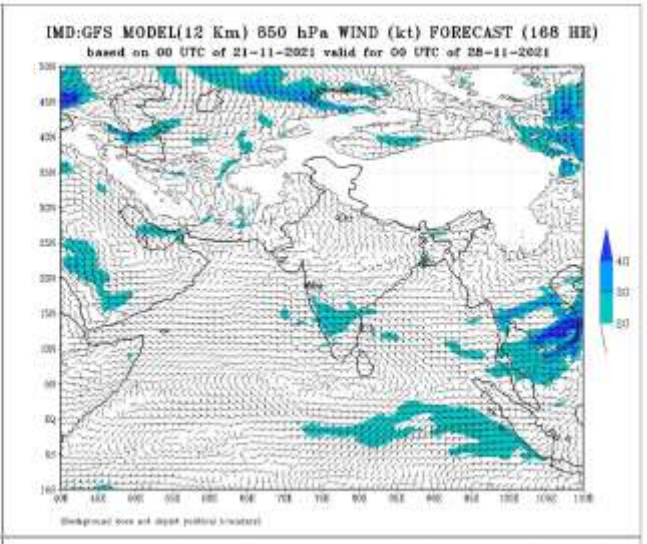


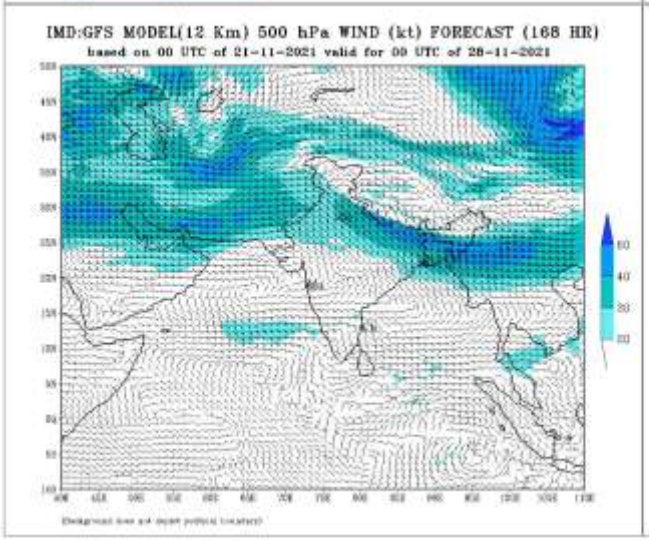
IMD :GFS MODEL(12 Km) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 21-11-2021 valid for 00 UTC of 26-11-2021

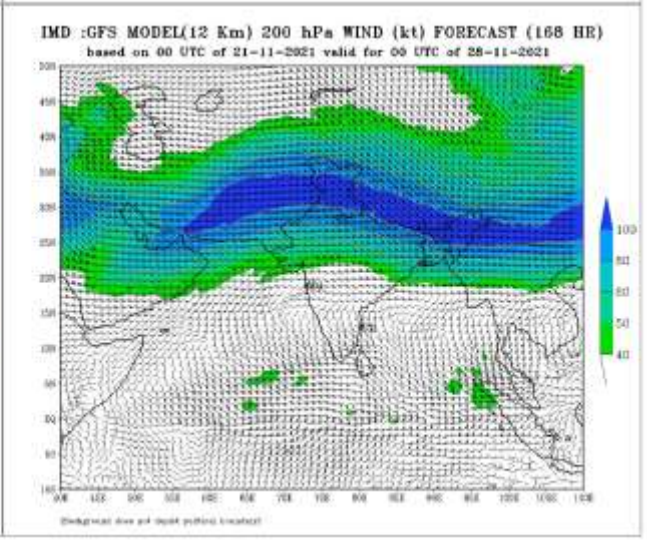



IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (144 HR)
based on 00 UTC of 21-11-2021 valid for 00 UTC of 27-11-2021
IMD:GFS MODEL(12 Km) 850 hPa WIND (kt) FORECAST (144 HR)
based on 00 UTC of 21-11-2021 valid for 00 UTC of 27-11-2021
IMD:GFS MODEL(12 Km) 500 hPa WIND (kt) FORECAST (144 HR)
based on 00 UTC of 21-11-2021 valid for 00 UTC of 27-11-2021
IMD :GFS MODEL(12 Km) 200 hPa WIND (kt) FORECAST (144 HR)
based on 00 UTC of 21-11-2021 valid for 00 UTC of 27-11-2021


IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (168 HR)
based on 00 UTC of 21-11-2021 valid for 00 UTC of 28-11-2021


IMD:GFS MODEL(12 Km) 850 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 21-11-2021 valid for 00 UTC of 28-11-2021


IMD:GFS MODEL(12 Km) 500 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 21-11-2021 valid for 00 UTC of 28-11-2021


IMD :GFS MODEL(12 Km) 200 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 21-11-2021 valid for 00 UTC of 28-11-2021