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

Tropical Cyclone Forecast Programme
Report Dated 21th November, 2022

Time of Issue: 1200 UTC

Synoptic features (based on 0600 UTC analysis):

The Depression over Southwest Bay of Bengal moved northwestwards with a speed of 20 kmph during past 6 hours and lay centred at 1130 hours IST/ 0600 UTC of today, the 21st November, 2022 over the same region, near latitude 12.6° N and longitude 83.4°E, about 350 km east-southeast of Chennai, 420 km east-southeast of Nellore, 470 km south-southeast of Machilipatnam and 500 km northeast of Jaffna (Sri Lanka).

It is likely to move northwestwards till 21st November evening and then west-northwestwards maintaining the intensity of depression till mid-night. Thereafter, it would continue to move west-northwestwards towards south Andhra Pradesh-North Tamilnadu-Puducherry coasts and weaken gradually into a well-marked low pressure area around 22nd morning.

Dynamical and thermo-dynamical features

Parameter	Bay of Bengal (BoB)	Arabian Sea (AS)
Sea Surface Temperature (SST) ºC	About 28-29°C over the system and major parts of BoB, 29-30°C along south Sri Lanka coast.	About 29-30°C over the southeast AS and adjoining southwest, eastcentral AS, off south Gujarat and Maharashtra coasts, 26-28°C over eastcentral and adjoining north AS, adjoining southwest AS, less than 24°C over southwest AS off Oman and Yemen coasts and adjoining sea areas.
Tropical Cyclone Heat Potential (TCHP) kJ/cm^2	>110 over south Andaman sea & eastcentral BoB, 70-80 over north Andaman Sea, north parts of southwest BoB and adjoining westcentral BoB, off Sri Lanka, north BoB, and less than 40 over westcentral BoB, along and off Tamil Nadu and Andhra Pradesh coasts, west coast of SriLanka, Gulf of Mannar, some parts of southwest BoB.	70-90 over southeast and adjoining eastcentral and adjoining southwest AS, Maldives & adjoining EIO, and less than 40 over remaining AS and also off west coast of India, Comorin area.

Cyclonic Relative vorticity ($X10^{-6}s^{-1}$)	50-100 x10-6 s^{-1} over the system, 50-60 x10-6 s^{-1} over eastern parts of westcentral BoB and adjoining southwest BoB	50-60x10-6s^{-1} over south parts of southwest AS and adjoining EIO & some parts of eastcentral and southeast AS.
Low Level convergence ($X10^{-5}$ s^{-1})	05 $x10^{-5}$ s^{-1}-$10x10^{-5}$ s^{-1} over the current system over the BoB.	$05x10^{-5}$ s^{-1} over the some parts of southwest AS.
Upper Level divergence ($X10^{-5}$ s^{-1})	$10x10^{-5}$ s^{-1} to the northwest of the system, along and off NE Sri Lanka.	$05x10^{-5}$ s^{-1} over the north parts of southwest & adjoining westcentral AS.
Vertical Wind Shear (VWS knots)	05-10 over the current system. 40-50 over the south BoB and adjoining EIO, 30-40 over the north BoB.	5-10 over southwest and adjoining west central AS, 25-30 over southeast, 20-30 over north parts of central AS and 40-50 over north AS.
Wind Shear Tendency (knots)	Decreasing over system centre.	Increasing over most parts of AS and adjoining EIO, decreasing over the central parts of southwest AS and adjoining sestcentral AS.
Upper tropospheric Ridge	Along 18.0°N over the BoB.	Along 14.0°N over the AS.
Trough in westerlies	No significant trough	

Satellite observations based on INSAT imagery (0900 UTC):

a) Over the BoB & Andaman Sea:-

Scattered to broken low and medium clouds with embedded intense to very intense convection lay over westcentral & adjoining southwest Bay of Bengal. Scattered low and medium clouds with embedded moderate to intense convection lay over northwest Bay of Bengal, south Bay of Bengal and Andaman sea.

b) Over the Arabian Sea:-

Scattered low and medium clouds with embedded moderate to intense convection lay over central and south AS and Comorin area.

M.J.O. Index:

MJO index is currently in phase 6 with amplitude greater than 1, it will be in same phase for next four days and will move to phase 7.

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

At 0600 UTC of 21th November, a Depression lies near 11.1N/113.1E. The associated maximum wind speed is 25 kt gusting to 35 kt.

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

MODEL GUIDANCE	BoB	AS
IMD-GFS	Well marked low pressure area (WML) over southwest and adjoining westcentral BoB on 21st, WML over same region on 22nd, LPA over westcentral BoB on 23rd, LPA over westcentral BoB off North Tamil Nadu on 24th, cycir over South Tamil Nadu on 25th. A cycir to emerge into North Andaman Sea on 24th, to move northwestwards and lie as an LPA over North Andaman Sea on 25th and extended low over North Andaman Sea & adjoining eastcentral BoB on 26th. Thereafter, it would move northwards and lie as an LPA over eastcentral BoB on 27th & 28th and become less marked thereafter.	No significant system
IMD-GEFS	Depression over southwest BoB on 21st, WML over southwest BoB on 22nd, LPA over southwest & adjoining westcentral BoB on 23r & 24th, less marked on 25th. A fresh low pressure area is expected over north Andaman Sea on 25th. To move initially northwestwards & then northwards towards north BoB till 27th.	No significant system
GEFS Probablistic guidance	Most of the member models (70-90% probability) are indicating the system would reach North Tamil Nadu coast.50-70% probability that the system would cross North Tamil Nadu coast.	Not available
IMD WRF	LPA over southwest & adjoining westcentral BoB on 21st, WML over southwest BoB on 22nd, depression over westcentral BoB on 23rd, crossing North Tamil Nadu coast near Chennai on 24th November.	No significant system
NCMRWF-NCUM	Depression over southwest & adjoining westcentral BoB on 21st, WML over westcentral BoB on 22nd, LPA over westcentral BoB on 23rd, Crossing as a cycir over Chennai on 24th. Fresh cycir to emerge into south Andaman Sea on 24th, LPA over south Andaman Sea on 25th, becoming less marked on 27th.	No significant system
NCMRWF-NEPS	Depression over westcentral BoB on 21st, depression over westcentral BoB on 22nd, LPA over westcentral BoB off North Tamil Nadu on 23rd, becoming less marked thereafter. Fresh LPA over North Andaman Sea on 24th Nov. to initially move northwestwards and then northwards, becoming less marked on 27th.	No significant system
NCMRWF-UM (Regional)	Depression over westcentral BoB on 21st, depression over westcentral BoB on 22nd, LPA over westcentral BoB off North Tamil Nadu on 23rd, becoming less marked thereafter. Fresh LPA over North Andaman Sea on 24th Nov. to move northwestwards and lie as an LPA over eastcentral BoB on 25th.	No significant system

ECMWF	Depression over southwest BoB on 21st , depression over southwest BoB on 22nd, LPA over southwest & adjoining westcentral BoB on 22/1200 UTC, cycir over westcentral BoB on 23rd, crossing SouthTamil Nadu coast at 0600 UTC of 23rd, cycir over south Tamil Nadu at0900 UTC of 23rd. Fresh low pressure area over North Andaman Sea on 24th, to move initially westwards and then northwards without any intensification, against yesterday's forecast that the LPA would concentrate into a depression on 25th & 26th.	No significant system
ECMWF ensemble	No significant system	No significant system
NCEP-GFS	LPA over southwest & adjoining westcentral BoB on 21st, to move west-northwestwards toward north TN coast without significant intensification till 23rd, becoming less marked thereafter. Fresh cycir to emerge into south Andaman Sea on 24th.	No significant system
IMD MME		No significant system
IMD HWRF	Available during cyclonic disturbance period only	No significant system
IMD-Genesis Potential Parameter	A potential zone over westcentral and adjoining southwest BoB on 20th, westcentral BoB on 21st, westcentral BoB off AP coast on 22st-24th.	No potential zone over Arabian Sea

Summary and conclusion:

- Most of the models are indicating that the existing depression over southwest Bay of Bengal would maintain the intensity of depression till 22nd /0000 UTC. NCEP GFS is indicating the system to move towards North Tamil Nadu as a low pressure area only till 23rd. All the models are indicating slow west-northwestwards movement of the system towards North Tamil Nadu-South Andhra Pradesh coasts during 21st-22nd November with weakening before reaching coast.

- Most of the models are indicating that a fresh cyclonic circulation/ low pressure is likely to emerge over central Andaman Sea on 24th with initial northwestwards movement followed by northwards movement towards North Bay of Bengal and no significant intensification.

In view of all the above, it is inferred that

1. For the Bay of Bengal:

(a) The depression over southwest Bay of Bengal is very likely to move northwestwards till 21st November evening (1200 UTC) and then west-northwestwards maintaining the intensity of depression till mid-night. Thereafter, it would continue to move west-northwestwards towards south Andhra Pradesh-North Tamilnadu-Puducherry coasts and weaken gradually into a well-marked low pressure area around 22nd morning

(b) A Fresh cycir/low pressure is also likely to emerge into Andaman Sea on 24th without any significant intensification. The evolution and intensification of this system need to be monitored critically.

2. For the Arabian Sea:

No significant system.

Probability of cyclogenesis (formation of depression and above intensity systems) over the BAY OF BENGAL 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

"-" indicates already depression has formed and is expected to continue over BoB during next 48 hours.

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

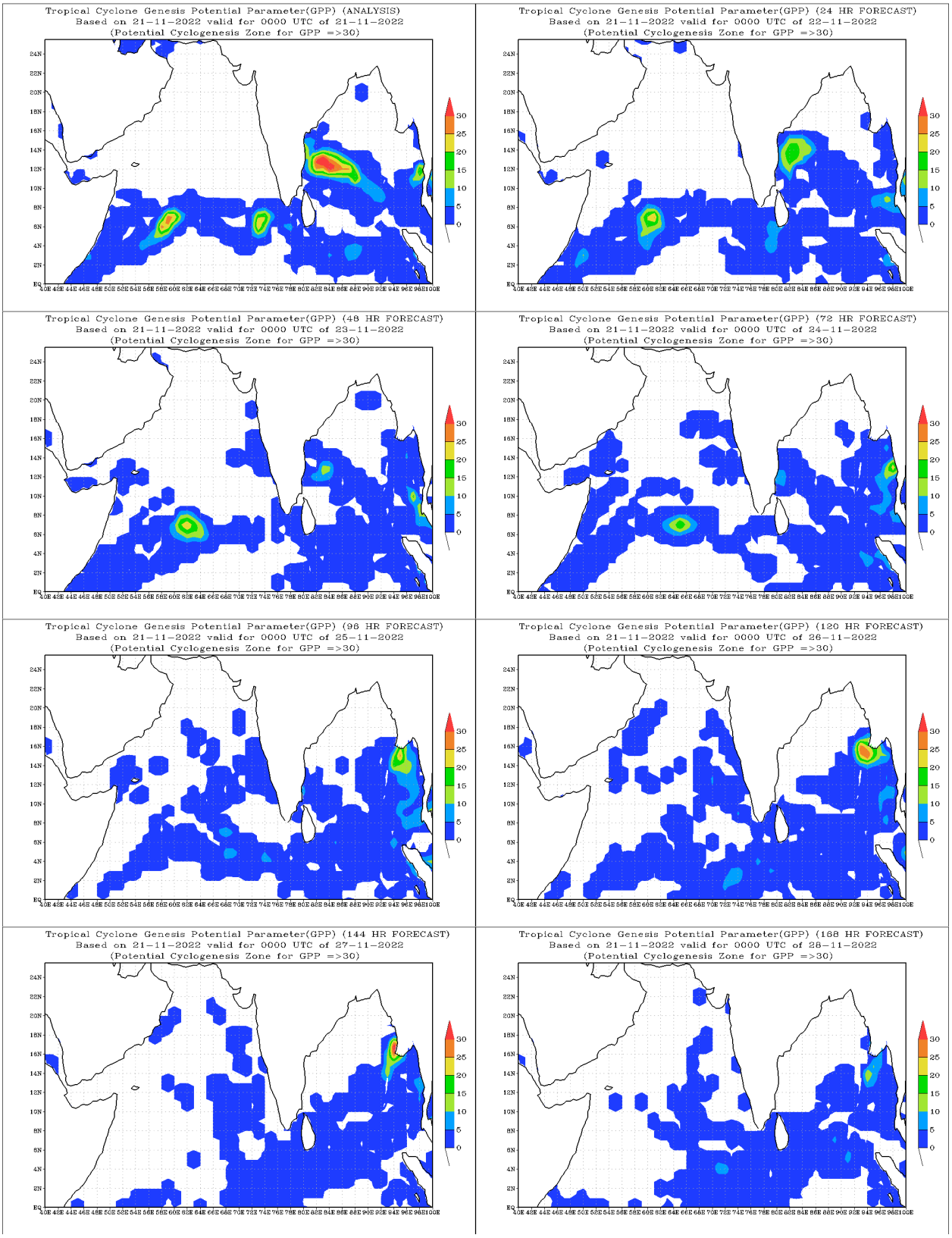
24 HOURS	24-48 HOURS	48-72 HOURS	72-96 HOURS	96-120 HOURS	120-144 HOURS	144-168 HOURS
NIL	NIL	NIL	NIL	NIL	NIL	NIL

Advisory:

The emergence and intensification of cycir/low pressure into Andaman Sea on 24th need to be monitored critically.

IOP: Sri Lanka, Tamil Nadu-Puducherry and Andhra Pradesh coasts for 21st & 22nd .

Annexure


Tropical Cyclone Genesis Potential Parameter(GPP) (ANALYSIS)
Based on 21-11-2022 valid for 0000 UTC of 21-11-2022
(Potential Cyclogenesis Zone for GPP =>30)
Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 21-11-2022 valid for 0000 UTC of 22-11-2022
(Potential Cyclogenesis Zone for GPP =>30)
Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
Based on 21-11-2022 valid for 0000 UTC of 23-11-2022
(Potential Cyclogenesis Zone for GPP =>30)
Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 21-11-2022 valid for 0000 UTC of 24-11-2022
(Potential Cyclogenesis Zone for GPP =>30)
Tropical Cyclone Genesis Potential Parameter(GPP) (96 HR FORECAST)
Based on 21-11-2022 valid for 0000 UTC of 25-11-2022
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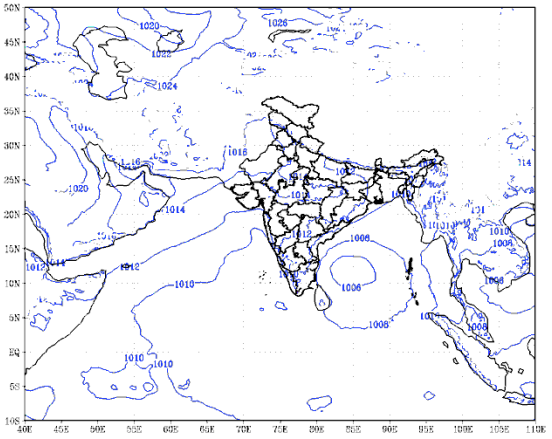
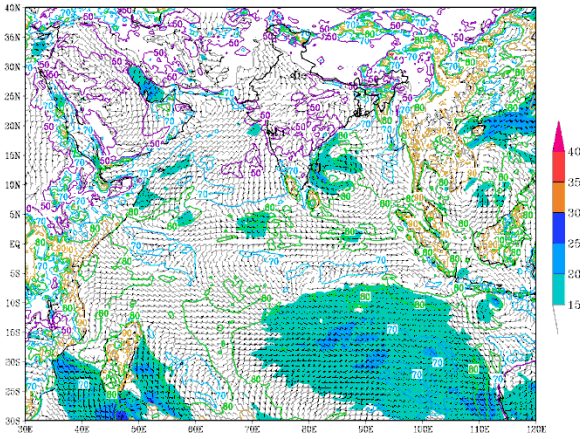
Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 21-11-2022 valid for 0000 UTC of 26-11-2022
(Potential Cyclogenesis Zone for GPP =>30)
Tropical Cyclone Genesis Potential Parameter(GPP) (144 HR FORECAST)
Based on 21-11-2022 valid for 0000 UTC of 27-11-2022
(Potential Cyclogenesis Zone for GPP =>30)
Tropical Cyclone Genesis Potential Parameter(GPP) (168 HR FORECAST)
Based on 21-11-2022 valid for 0000 UTC of 28-11-2022
(Potential Cyclogenesis Zone for GPP =>30)

IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (00 HR)
based on 00 UTC of 21-11-2022 valid for 00 UTC of 21-11-2022



IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (00 HR)
based on 00 UTC of 21-11-2022 valid for 00 UTC of 21-11-2022



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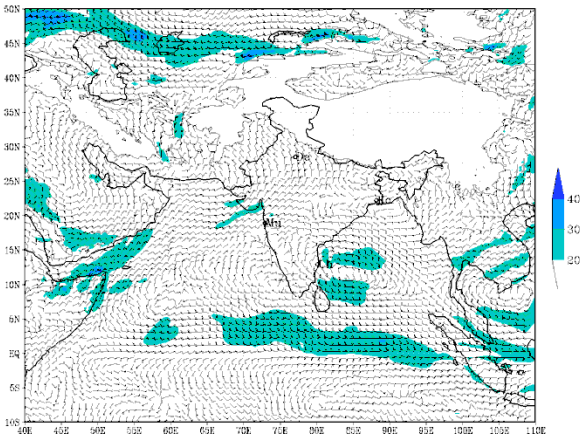

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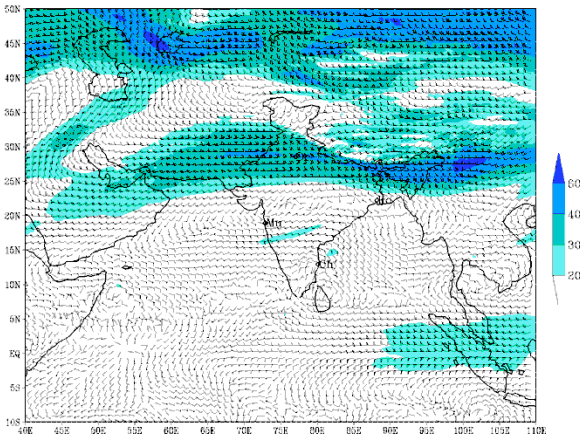

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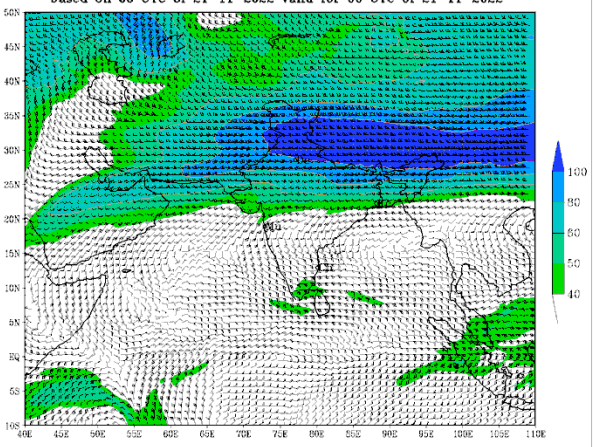

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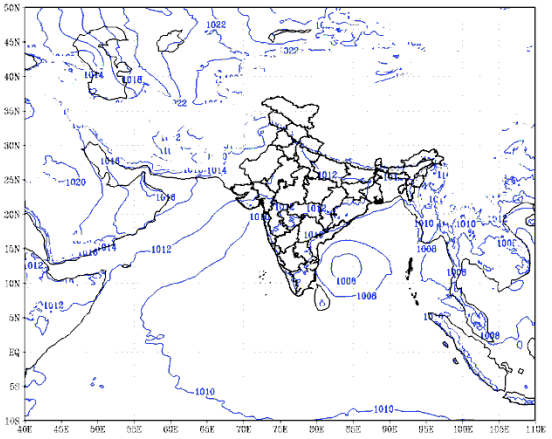

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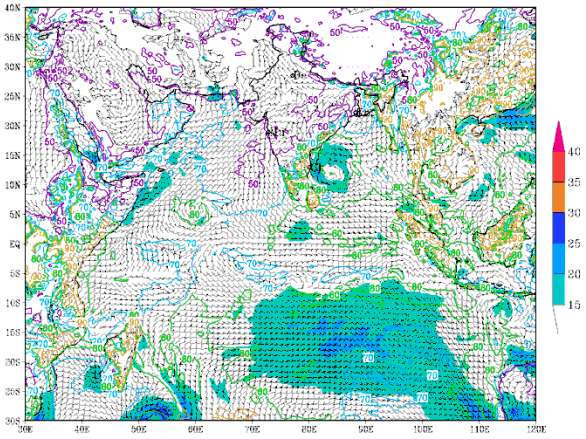

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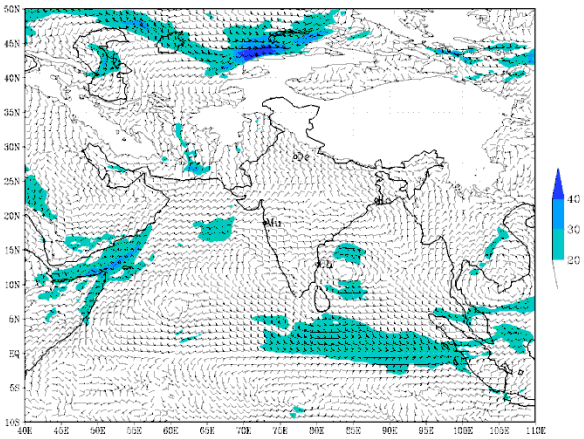

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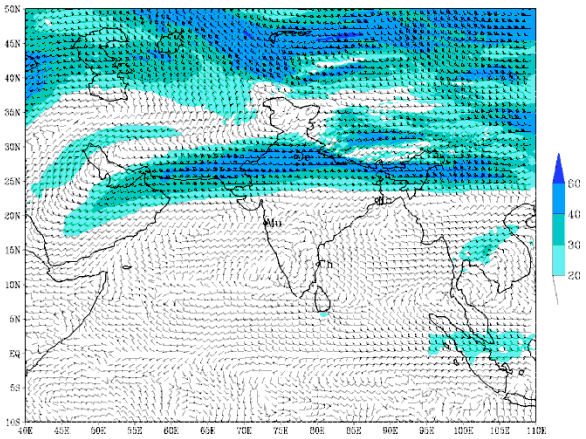

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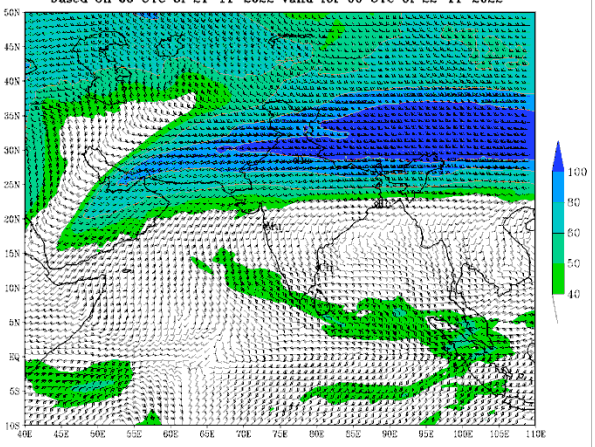
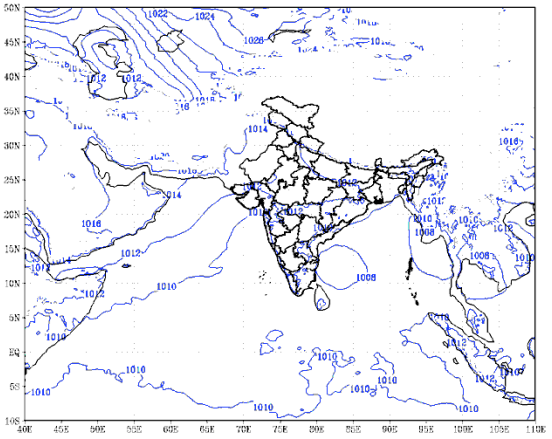
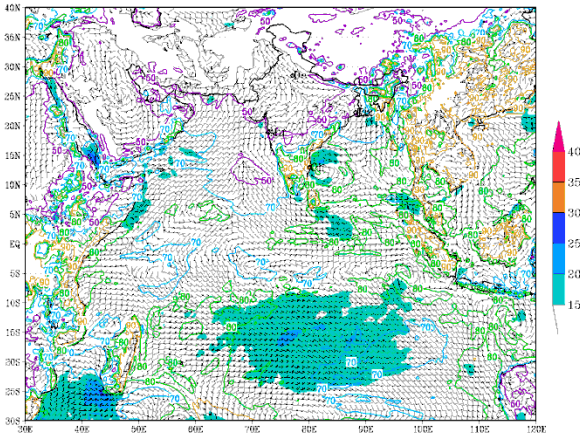


IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 21-11-2022 valid for 00 UTC of 23-11-2022



(Background does not depict political boundary)

IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (48 HR)
based on 00 UTC of 21-11-2022 valid for 00 UTC of 23-11-2022



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IMD:GFS MODEL(12 Km) 850 hPa WIND (kt) FORECAST (48 HR)
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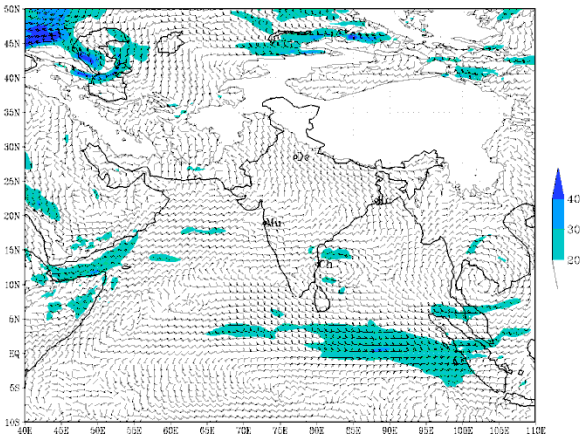

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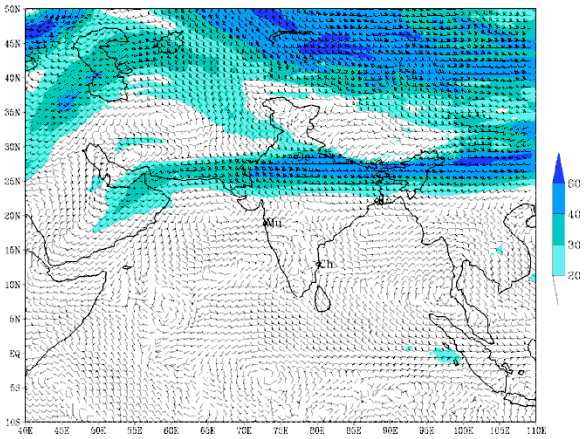

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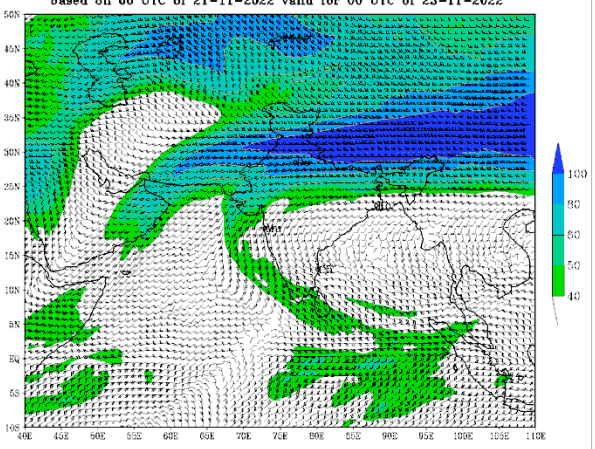
based on 00 UTC of 21-11-2022 valid for 00 UTC of 23-11-2022



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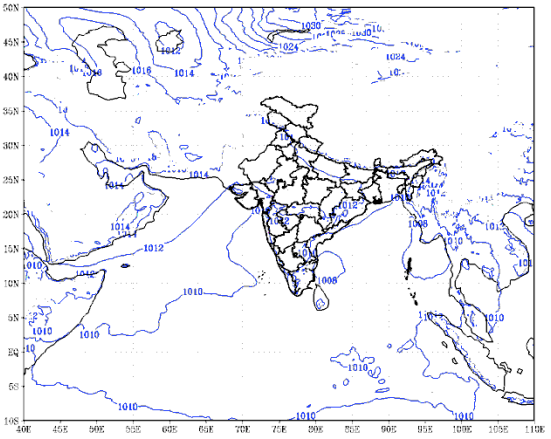
based on 00 UTC of 21-11-2022 valid for 00 UTC of 24-11-2022



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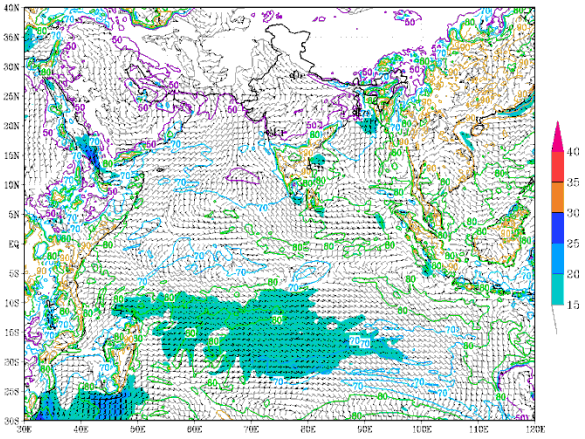
IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (72 HR)
based on 00 UTC of 21-11-2022 valid for 00 UTC of 24-11-2022



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IMD:GFS MODEL(12 Km) 850 hPa WIND (kt) FORECAST (72 HR)
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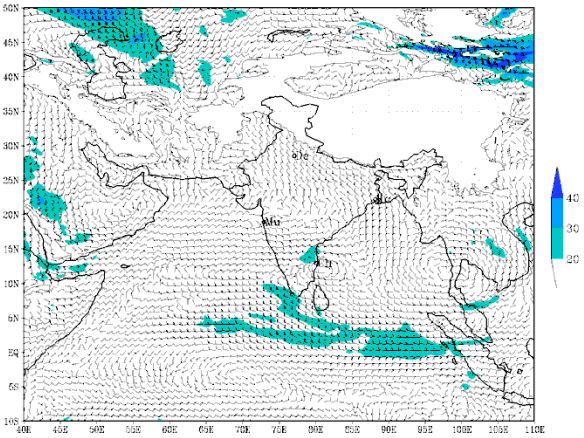

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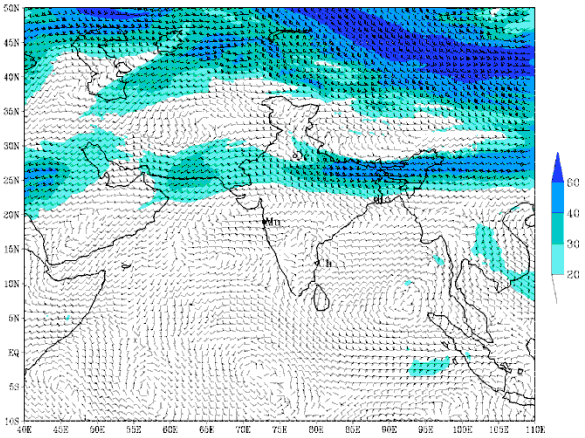

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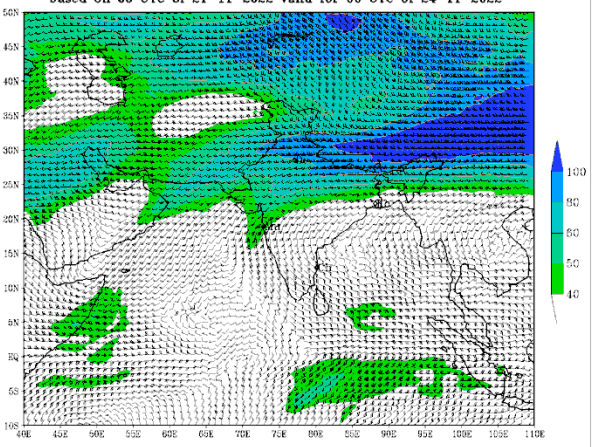

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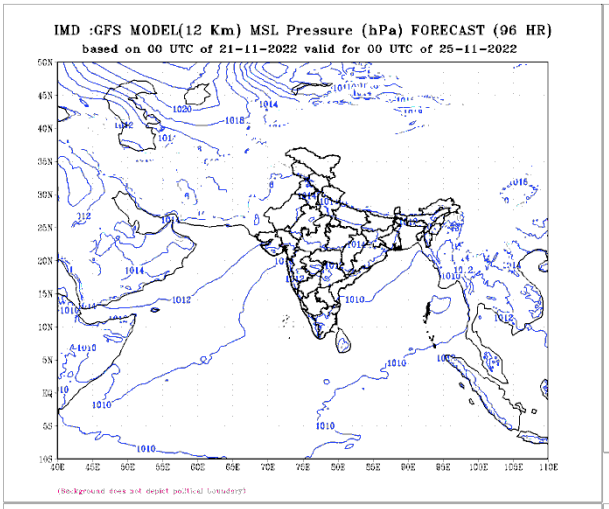
IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 21-11-2022 valid for 00 UTC of 25-11-2022
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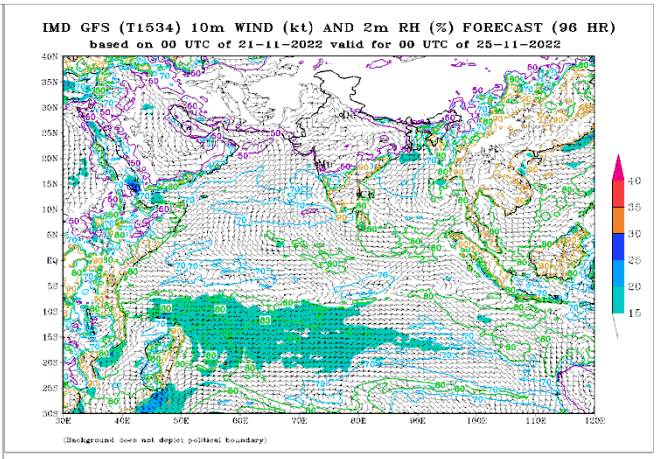
IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (96 HR)
based on 00 UTC of 21-11-2022 valid for 00 UTC of 25-11-2022
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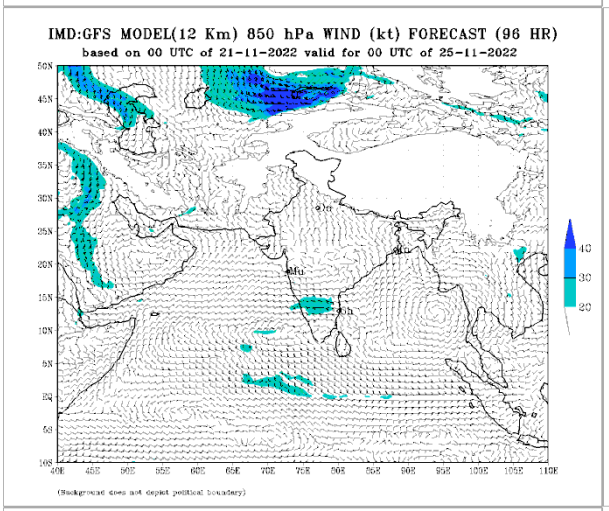
IMD:GFS MODEL(12 Km) 850 hPa WIND (kt) FORECAST (96 HR)
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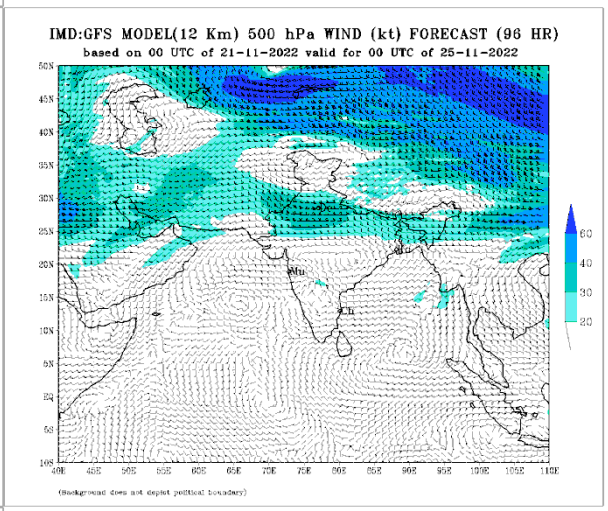
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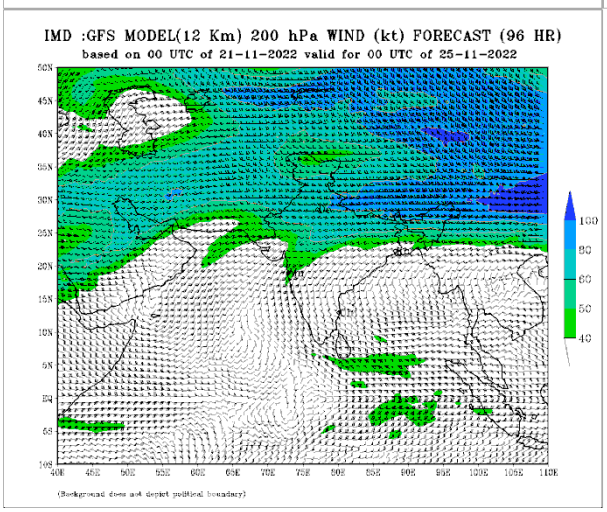
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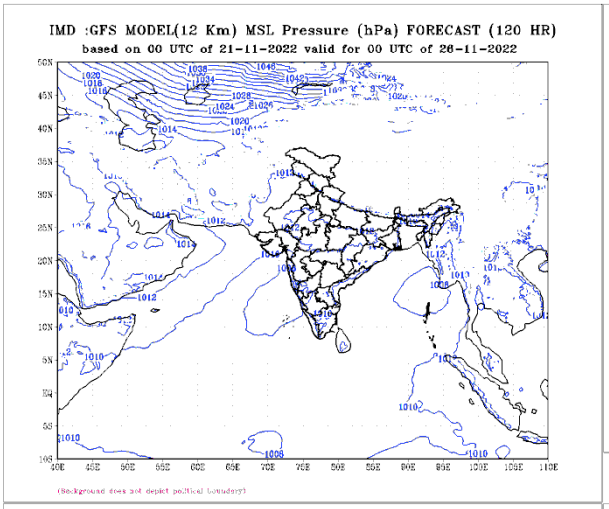
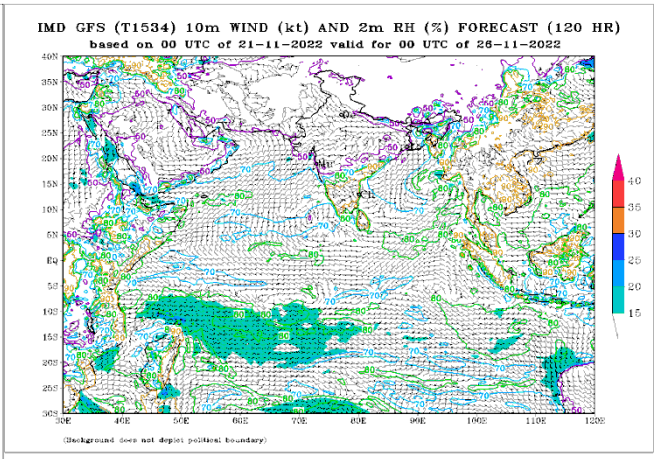
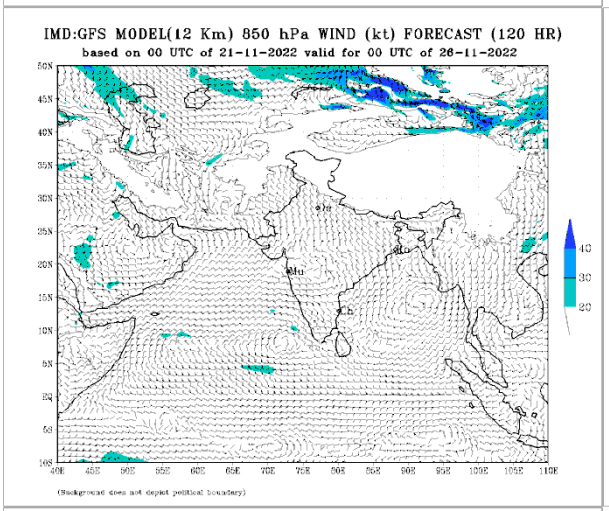
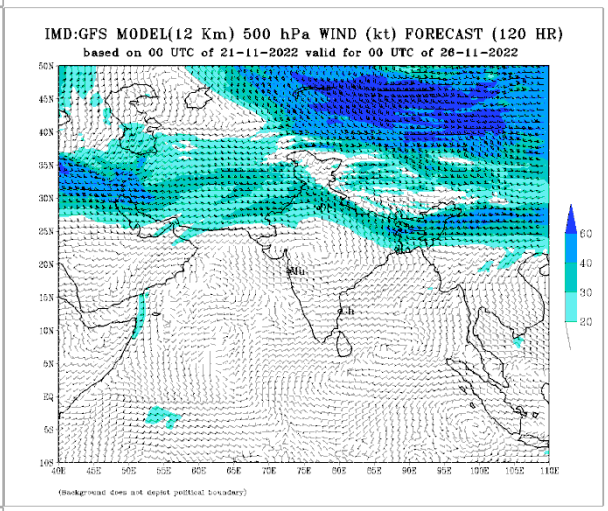
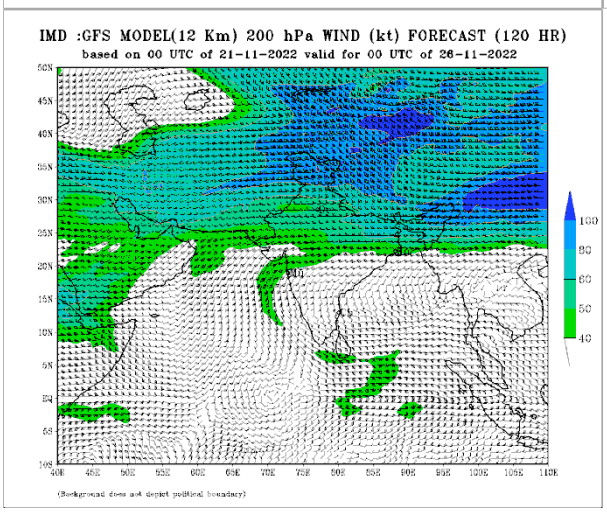
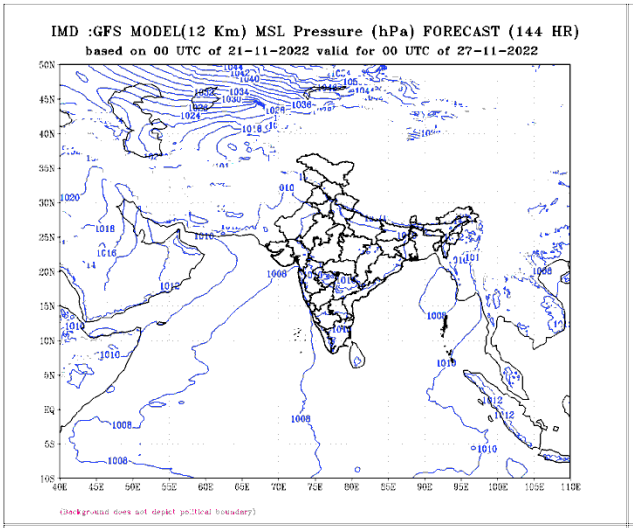

IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 21-11-2022 valid for 00 UTC of 26-11-2022
(Background does not depict political boundary)

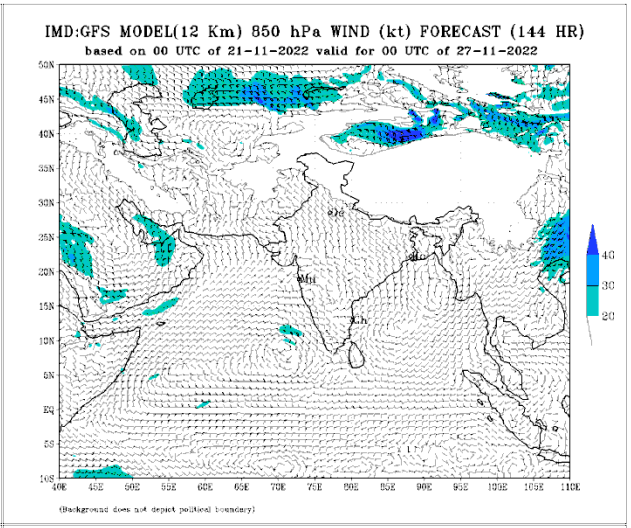

IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (120 HR)
based on 00 UTC of 21-11-2022 valid for 00 UTC of 26-11-2022
(Background does not depict political boundary)


IMD:GFS MODEL(12 Km) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 21-11-2022 valid for 00 UTC of 26-11-2022
(Background does not depict political boundary)


IMD:GFS MODEL(12 Km) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 21-11-2022 valid for 00 UTC of 26-11-2022
(Background does not depict political boundary)


IMD :GFS MODEL(12 Km) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 21-11-2022 valid for 00 UTC of 26-11-2022
(Background does not depict political boundary)


IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (144 HR)
based on 00 UTC of 21-11-2022 valid for 00 UTC of 27-11-2022
(Background does not depict political boundary)


IMD:GFS MODEL(12 Km) 850 hPa WIND (kt) FORECAST (144 HR)
based on 00 UTC of 21-11-2022 valid for 00 UTC of 27-11-2022
40
30
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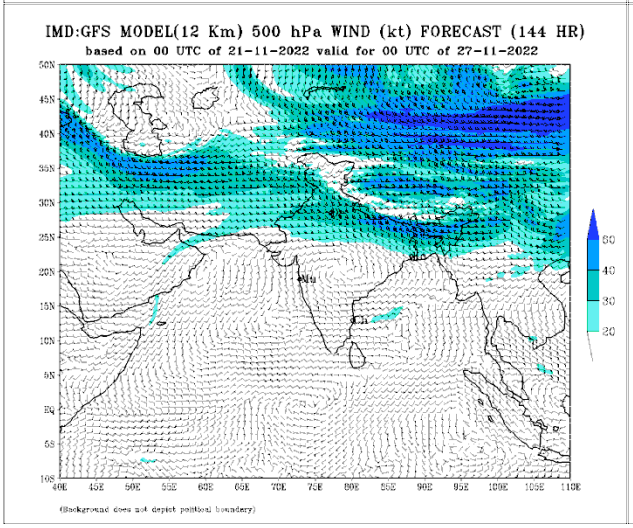
(Background does not depict political boundary)


IMD:GFS MODEL(12 Km) 500 hPa WIND (kt) FORECAST (144 HR)
based on 00 UTC of 21-11-2022 valid for 00 UTC of 27-11-2022
60
40
30
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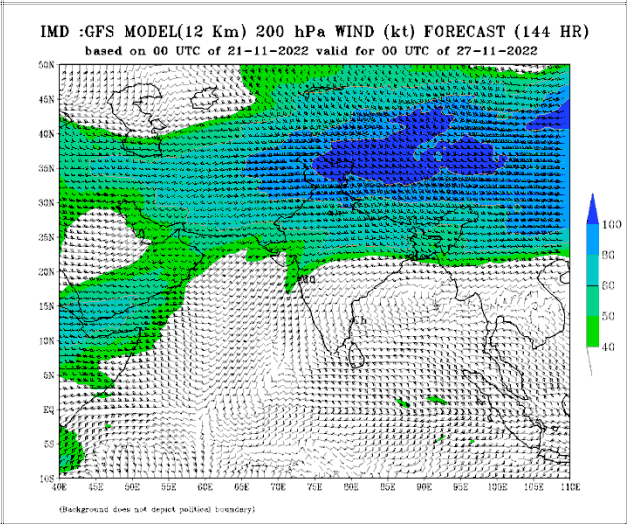
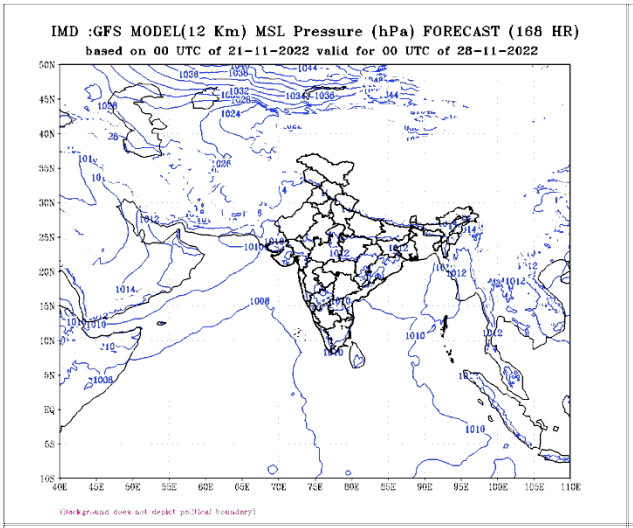
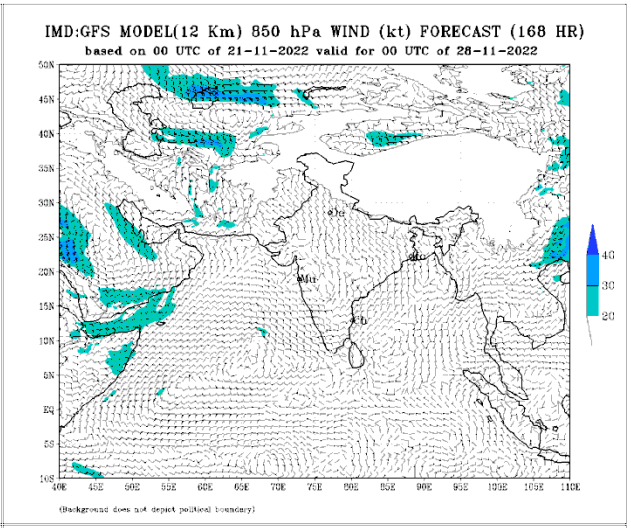
(Background does not depict political boundary)


IMD :GFS MODEL(12 Km) 200 hPa WIND (kt) FORECAST (144 HR)
based on 00 UTC of 21-11-2022 valid for 00 UTC of 27-11-2022
100
80
60
50
40
(Background does not depict political boundary)


IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (168 HR)
based on 00 UTC of 21-11-2022 valid for 00 UTC of 28-11-2022
(Background does not depict political boundary)


IMD:GFS MODEL(12 Km) 850 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 21-11-2022 valid for 00 UTC of 28-11-2022
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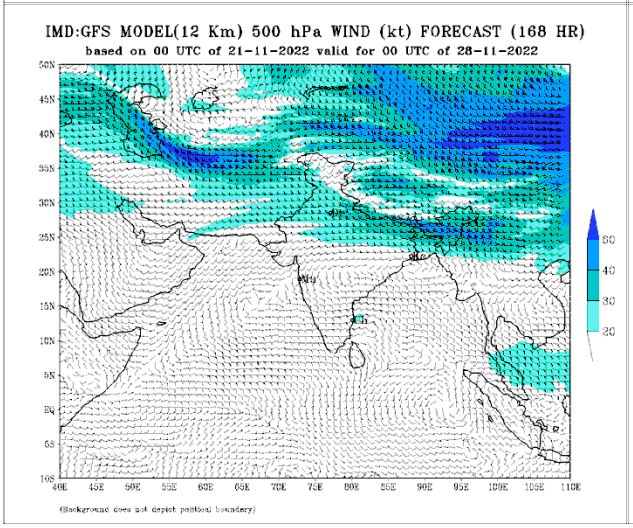
(Background does not depict political boundary)


IMD:GFS MODEL(12 Km) 500 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 21-11-2022 valid for 00 UTC of 28-11-2022
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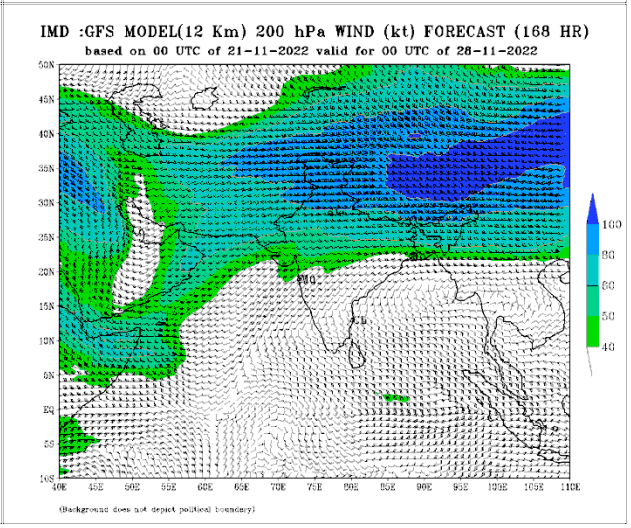
(Background does not depict political boundary)


IMD :GFS MODEL(12 Km) 200 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 21-11-2022 valid for 00 UTC of 28-11-2022
100
80
60
50
40
(Background does not depict political boundary)