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

Tropical Cyclone Forecast Programme
Report Dated 16th November, 2022

Time of Issue: 1200 UTC

Synoptic features (based on 0600 UTC analysis):

Yesterday's cyclonic circulation over south Andaman Sea & neighbourhood extending upto 5.8 km above mean sea level persists. Under its influence, a Low pressure area is likely to form over Southeast Bay of Bengal & adjoining Andaman Sea during next 24 hours. It is likely to move west-northwestwards and gradually concentrate into a Depression over central parts of South Bay of Bengal during subsequent 48 hours.

Dynamical and thermo-dynamical features

Parameter	Bay of Bengal (BoB)	Arabian Sea (AS)
Sea Surface Temperature (SST) ºC	About 28-29°C over major parts of BoB and 29-30°C over gulf of Thailand and off Thailand, Tamilnadu and Sri Lanka coast.	About 28-29°C over major parts of AS and 29-30°C over small parts of southeast AS, Karnataka coast and Kerala coast.
Tropical Cyclone Heat Potential (TCHP) kJ/cm^2	>110 over eastcentral BoB and adjoining southeast BoB and gulf of Thailand, 90-100 over remaining central BoB, 70-80 over north BoB & south Andaman Sea and less than 40 over westcentral and southwest BoB and east coast of India.	90-100 over parts of Maldives & adjoining EIO, 70-80 over southeast AS & adjoining eastcentral AS, adjoining north AS and less than 30 over remaining AS and also off west coast of India.
Cyclonic Relative vorticity (X10^{-6}s^{-1})	Positive vorticity of 40-50 over south Andaman Sea & adjoining southeast BoB, southwest BoB & adjoining EIO, 20-30 over southwest & adjoin westcentral and northwest BoB, off Sri Lanka coast.	Positive vorticity of 40-50 over southeast AS, 20-30 over central & adjoining southeast AS.
Low Level convergence (X10^{-5} s^{-1})	About 05-10 over Sumatra coast, 5 over south Andaman Sea & Sri Lanka coast.	Small zones of 5 over Lakshadweep, Maldives and southwest AS.
Upper Level divergence (X10^{-5} s^{-1})	05-20 over Sumatra coast, 5-10 over Andaman sea & adjoining Gulf of Thailand and northeast BoB.	5-10 over southeast AS.

Vertical Wind Shear (VWS knots)	05-15 knots over east central & adjoining southeast BoB and Andaman sea.	10-15 over southeast & adjoining eastcentral AS and Lakshadweep area, 5-10 over westcentral and adjoining southwest AS and over off Somalia & Yemen coasts. 30-40 over north AS.
Wind Shear Tendency (knots)	Decreasing over south BoB and south Andaman Sea. Increasing over southeast BoB and adjoining EIO.	Decreasing over EIO region. Increasing over most parts of AS and off Yemen and Oman coast.
Upper tropospheric Ridge	Along 16.0°N over the BoB.	Along 15.0°N over the AS.
Trough in westerlies		

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 central & southeast Bay of Bengal and Andaman sea. Scattered low and medium clouds with embedded moderate to intense convection lay over southwest Bay of Bengal. Scattered low and medium clouds with embedded weak to moderate convection lay over north Bay of Bengal.

(b) Over the Arabian Sea:-

Scattered low and medium clouds with embedded intense to very intense convection lay over central & south Arabian sea and Comorin area.

M.J.O. Index:

MJO index is currently in Phase 5 with amplitude more than 1. It will continue in same phase for next 4 days. Thereafter, it would move to phase 6 with amplitude remaining more than 1.

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	BoB	AS
IMD-GFS	LPA over Andaman Sea on 16th, extended low over southeast BoB & adjoining Andaman Sea on 17th, well marked low pressure area (WML) over southeast & adjoining southwest BoB on 18th, WML over southwest BoB on 19th, depression over southwest BoB on 20th, WML over southwest BoB on 21st, LPA over southwest BoB off North Tamil nadu-South Odisha coast on 22nd, crossing North Tamil Nadu-South Andhra Pradesh coast as an LPA on 21st/0600 UTC near 16N/80E. Yesterday IMD GFS was indicating the system to intensify into a severe cyclonic storm (SCS) and cross coast as an SCS.	No significant system

	A fresh low pressure area is expected over south Andaman Sea on 24th.	
IMD-GEFS	Circulation over Andaman Sea & adjoining southeast BoB on 17th, WML over southeast BoB on 18th, WML over southwest BoB on 19th, depression over southwest BoB on 20th, depression over southwest BoB on 21st, LPA off TN coast on 22nd, cycir over southwest BoB off TN coast-Palk Strait on 23rd, Comorin area on 24th as a cycir. A fresh low pressure area is expected over south Andaman Sea on 23rd .	No significant system
GEFS Probablistic guidance	Not available	Not available
IMD WRF	A cycir over south Andaman Sea & adjoining southeast BoB on 16th, extended cycir over Andaman Sea & adjoining southeast BoB on 17th, LPA over southeast BoB on 18th, over southwest BoB on 19th	No significant system
NCMRWF-NCUM	Cycir over south Andaman Sea on 16th, to move west-northwestwards, cycir over eastcentral & adjoining southeast BoB on 17th, LPA over southeast BoB on 18th, depression over southwest BoB on 19th, depession over southwest & adjoining westcentral BoB on 20th, depression over westcentral BoB on 21st, crossing to the north of Chennai around 21st/0600 UTC as a depression, becoming less marked on 22nd. A fresh LPA over south Andaman Sea on 23rd to move northwards towards central parts of north BoB till 26th.	No significant system
NCMRWF-NEPS	Cycir over south Andaman Sea on 16th, LPA over southeast BoB & adjoining Andaman Sea on 17th, LPA over southeast BoB on 18th, WML over southeast & adjoining eastcentral BoB on 19th, depression over southwest BoB on 20th, depression over westcentral & adjoining southwest BoB on 20th, depression over westcentral BoB off North TN coast on 21st , crossing North TN-South AP coasts around 21st/0000 UTC as depression and becoming less marked thereafter.	No significant system
NCMRWF-UM (Regional)	Cycir over south Andaman Sea on 16th, to move west-northwestwards, cycir over eastcentral & adjoining southeast BoB on 17th, LPA over southeast BoB on 18th, depression over southwest BoB on 19th, depession over southwest & adjoining westcentral BoB on 20th.	No significant system
ECMWF	Depression over central parts of south BoB during 0300 UTC -1800 UTC of 19th, becoming WML on 20th over southwest BoB, hovering over southwest BoB as LPA till	No significant system

	22/0600 UTC and becoming less marked thereafter.	
ECMWF ensemble	30-40% probability of cyclogenesis over south BoB during 18th-20th.	No significant system
NCEP-GFS	Extended circulation over Andaman Sea & adjoining eastcentral & southeast BoB on 17th , LPA over eastcentral and adjoining westcentral & southwest BoB on 18th, WML over southwest BoB on 19th, depression over southwest BoB on 20th, depression over westcentral BoB off south AP coast on 21st, crossing coast on 21/1200 UTC as an LPA near 17N/80E.	The cycir over SE AS would move west northwestward till 20th.
IMD MME	LPA on 16th over south Andaman Sea, to intensify into a depression on 19th over southeast BoB, to move northwestwards and cross south Andhra Pradesh coast as an LPA around 21/1800 UTC.	No significant system
IMD HWRF	Available during cyclonic disturbance period only	Available during cyclonic disturbance period only.
IMD-Genesis Potential Parameter	A potential zone over Andaman Sea on 16th Nov, over south BoB & another over south Andaman Sea on 17th, over southeast & adjoining eastcentral BoB on 18th, eastcentral BoB on 19th, westcentral BoB on 20th, westcentral BoB off AP coast on 21st	No potential zone over Arabian Sea

Summary and conclusion:

- Most of models are indicating the cyclonic circulation over south Andaman Sea to concentrate into a low pressure area over southeast BoB and adjoining Andaman Sea around 16th. But further intensification is delayed today. Models are indicating likely development into a depression during 19th-20th (IMD GFS, NCEP GFS & GEFS on 20th, IMD MME, NCUM & NEPS on 19th, ECMWF not indicating intensification into depression). Models are also indicating west-northwestwards movement of the system towards North Tamil Nadu-South Andhra Pradesh coasts. IMD GFS is indicating the system to cross as an LPA around 21/0600 UTC near South AP coast. NCUM & NEPS are indicating the system to cross North TN-South AP coasts as a depression around 21/0300 UTC.

- A Fresh low pressure is also likely over central Andaman Sea on 23rd/24th.

In view of all the above, it is inferred that

1. For the Bay of Bengal:

- Under the influence of cyclonic circulation over south Andaman Sea and adjoining southeast Bay of Bengal, a low pressure area is likely to form over Southeast Bay of Bengal & adjoining Andaman Sea around 17th November. It is likely to move west-northwestwards and gradually concentrate into a Depression over central parts of South Bay of Bengal during subsequent 48 hours. Further intensification and movement of this system need to be monitored critically.

- **A Fresh low pressure is also likely over central Andaman Sea on 23rd/24th.**

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	LOW	LOW	MOD	MOD	NIL

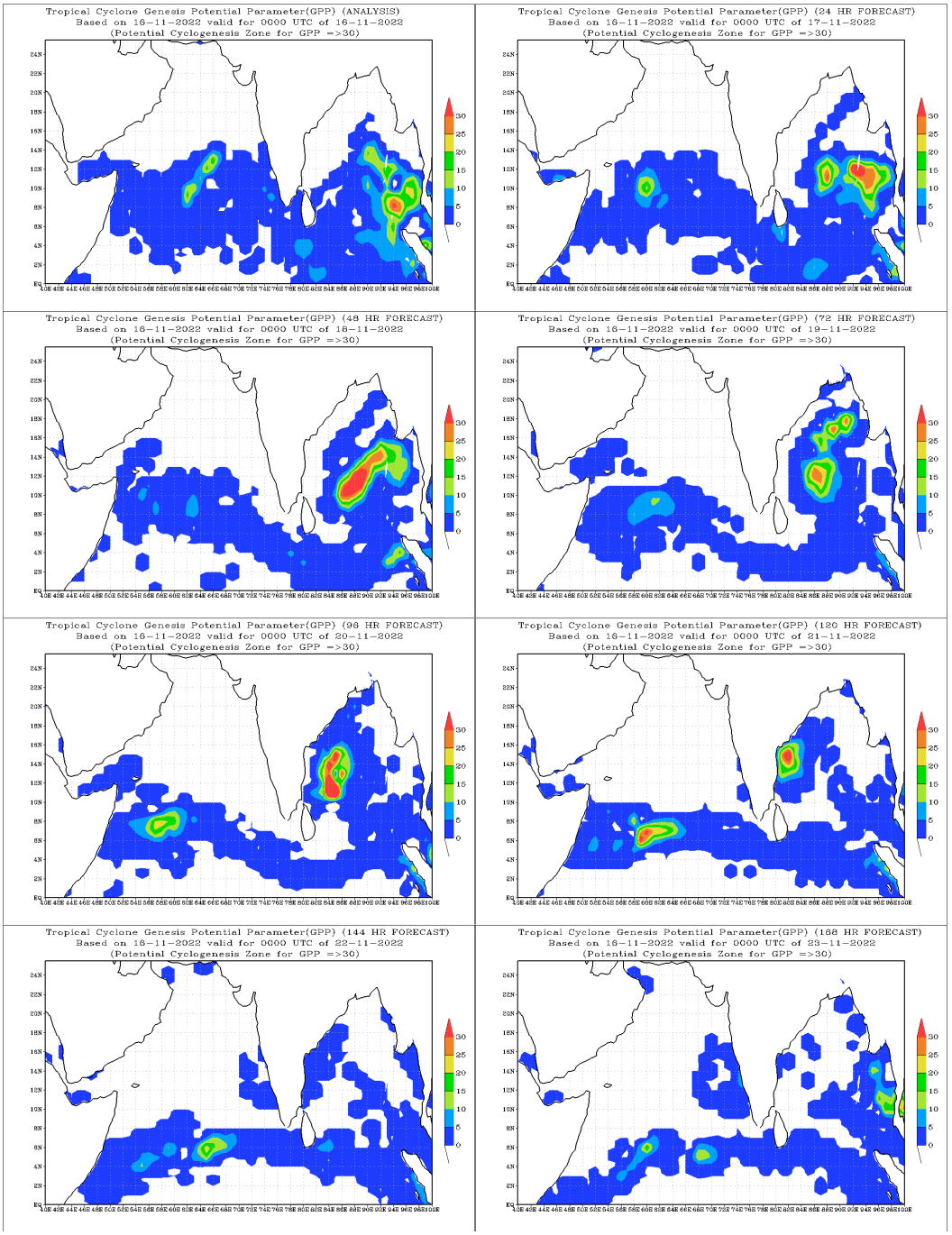
Probability of cyclogenesis (formation of depression and above intensity systems) over the Arabian Sea during next 168 hours:

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:
The possible cyclogenesis as indicated above needs to be watched and monitored.

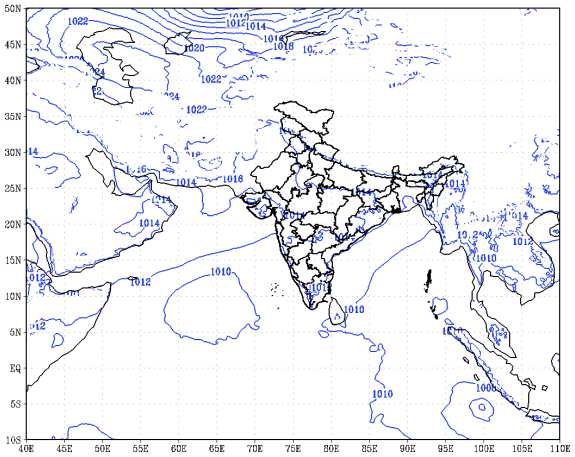
IOP: Andaman Sea for 16th & 17th, Sri Lanka for 18th & 19th, Tamil Nadu-Puducherry and adjoining Andhra Pradesh coasts on 20th & 21st.

Annexure


Tropical Cyclone Genesis Potential Parameter(GPP) (ANALYSIS)
Based on 16-11-2022 valid for 0000 UTC of 16-11-2022
(Potential Cyclogenesis Zone for GPP =>30)
Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 16-11-2022 valid for 0000 UTC of 17-11-2022
(Potential Cyclogenesis Zone for GPP =>30)
Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
Based on 16-11-2022 valid for 0000 UTC of 18-11-2022
(Potential Cyclogenesis Zone for GPP =>30)
Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 16-11-2022 valid for 0000 UTC of 19-11-2022
(Potential Cyclogenesis Zone for GPP =>30)
Tropical Cyclone Genesis Potential Parameter(GPP) (96 HR FORECAST)
Based on 16-11-2022 valid for 0000 UTC of 20-11-2022
(Potential Cyclogenesis Zone for GPP =>30)
Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 16-11-2022 valid for 0000 UTC of 21-11-2022
(Potential Cyclogenesis Zone for GPP =>30)
Tropical Cyclone Genesis Potential Parameter(GPP) (144 HR FORECAST)
Based on 16-11-2022 valid for 0000 UTC of 22-11-2022
(Potential Cyclogenesis Zone for GPP =>30)
Tropical Cyclone Genesis Potential Parameter(GPP) (168 HR FORECAST)
Based on 16-11-2022 valid for 0000 UTC of 23-11-2022
(Potential Cyclogenesis Zone for GPP =>30)

IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (00 HR)

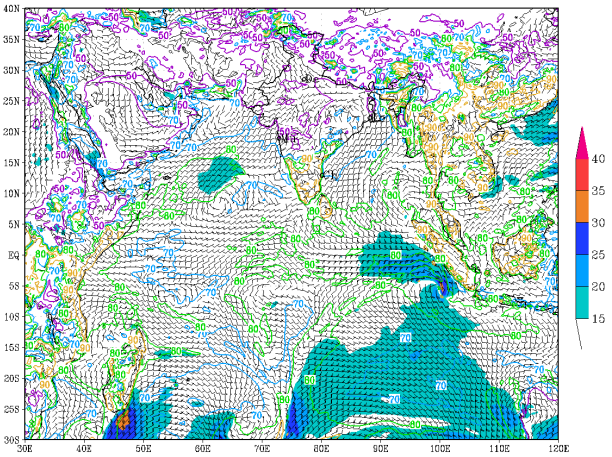
based on 00 UTC of 16-11-2022 valid for 00 UTC of 16-11-2022



(Background does not depict political boundary)

IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (00 HR)

based on 00 UTC of 16-11-2022 valid for 00 UTC of 16-11-2022



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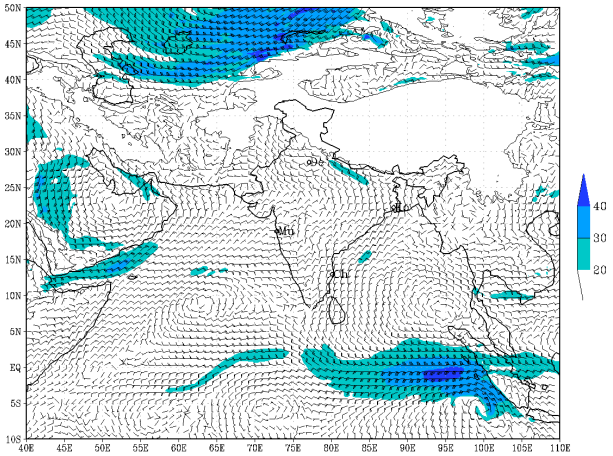

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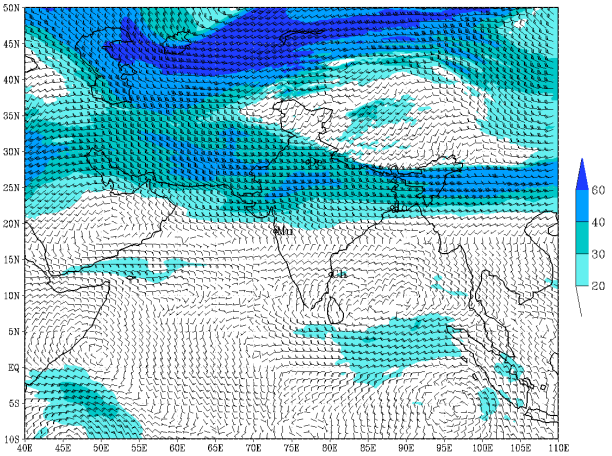

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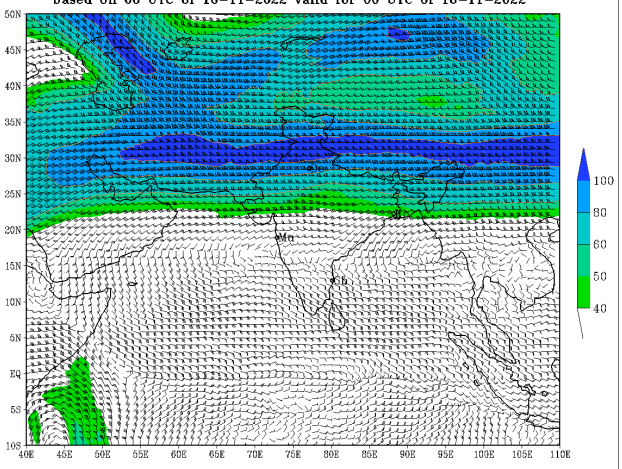

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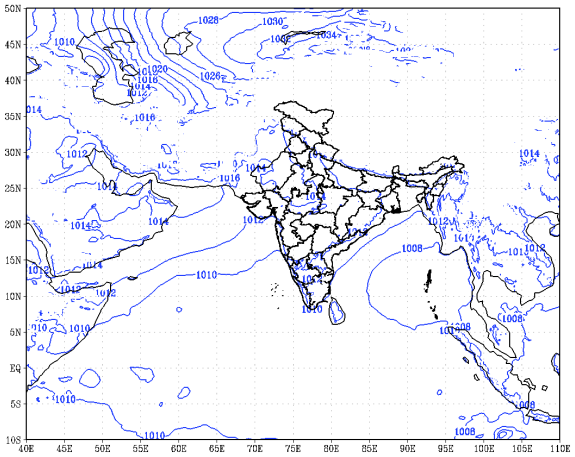
IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 16-11-2022 valid for 00 UTC of 17-11-2022



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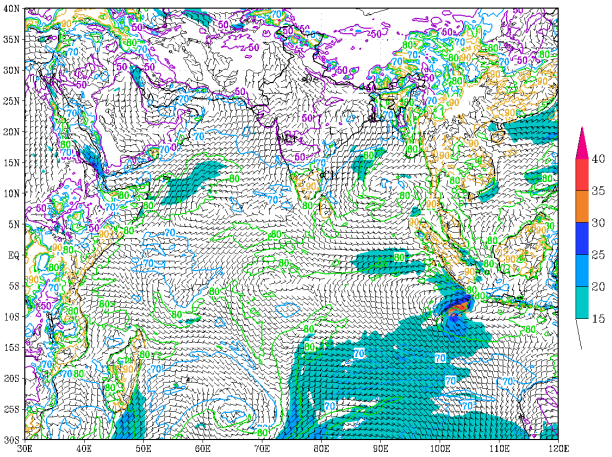
IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (24 HR)
based on 00 UTC of 16-11-2022 valid for 00 UTC of 17-11-2022



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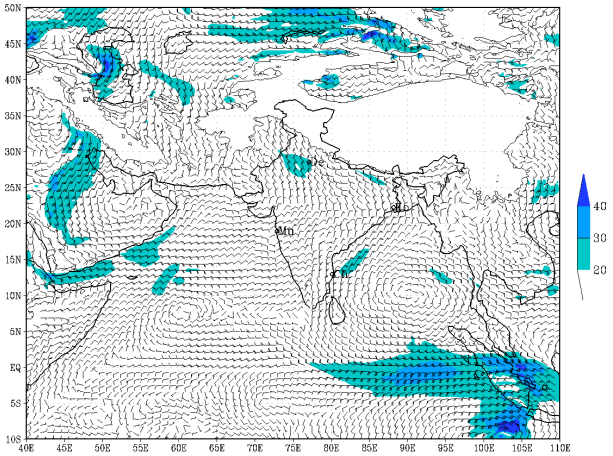

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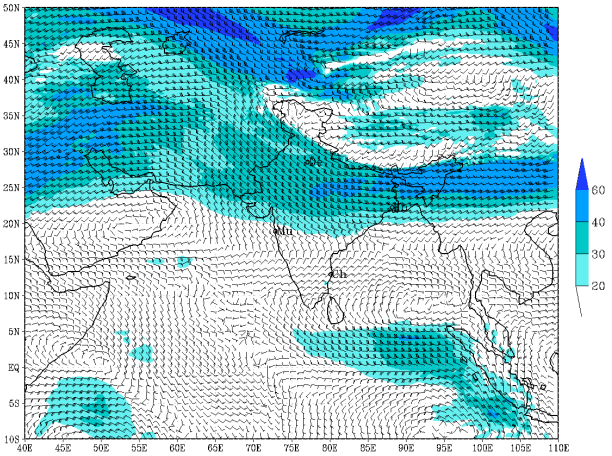
IMD:GFS MODEL(12 Km) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 16-11-2022 valid for 00 UTC of 17-11-2022



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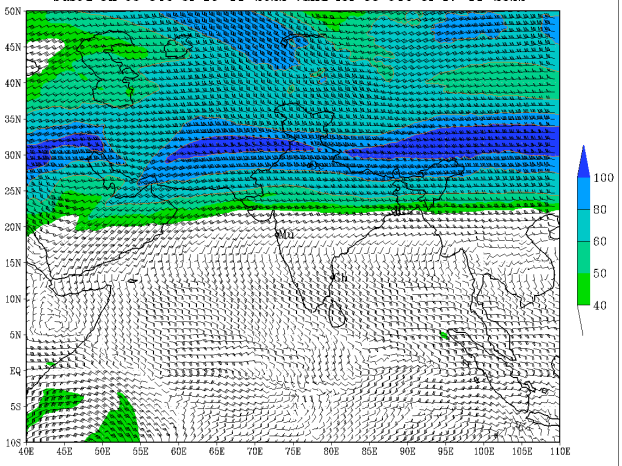
based on 00 UTC of 16-11-2022 valid for 00 UTC of 17-11-2022



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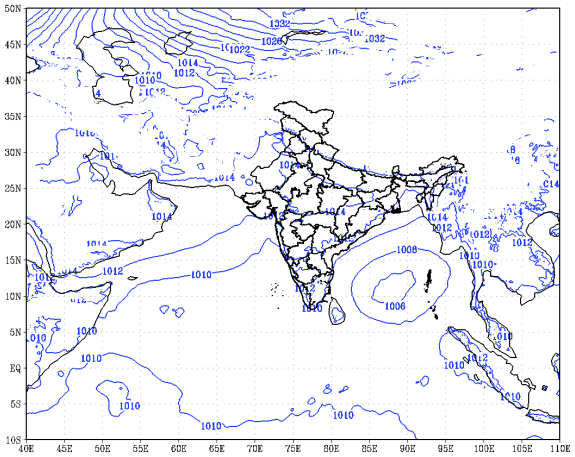
IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 16-11-2022 valid for 00 UTC of 18-11-2022



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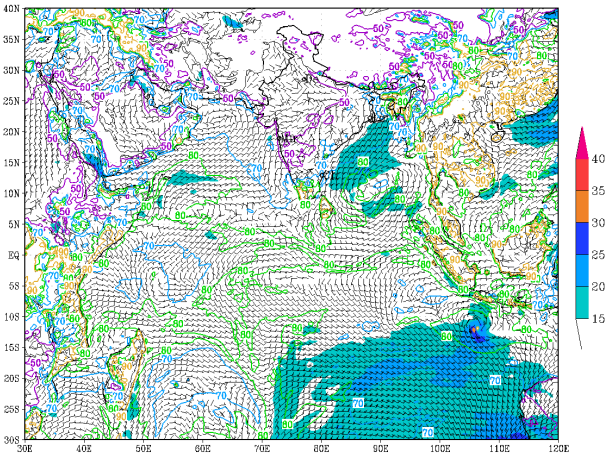
IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (48 HR)
based on 00 UTC of 16-11-2022 valid for 00 UTC of 18-11-2022



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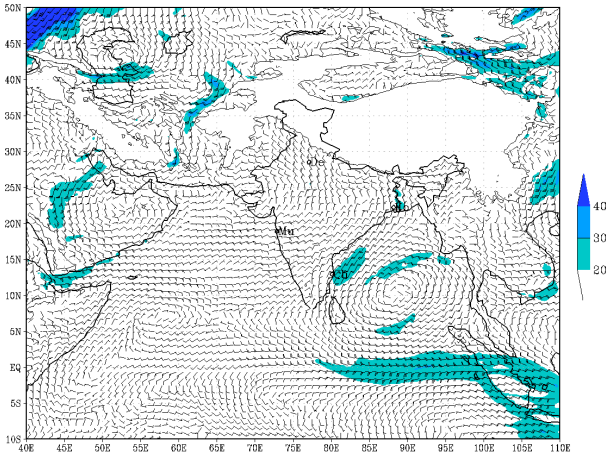

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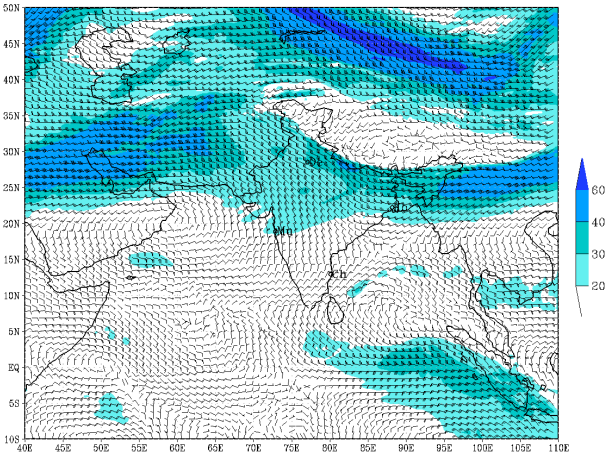

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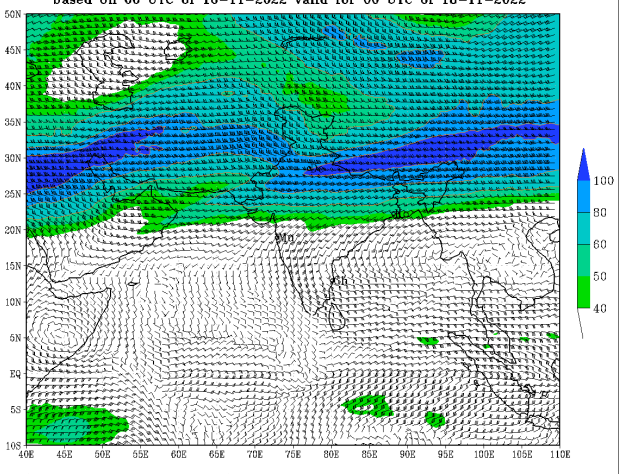

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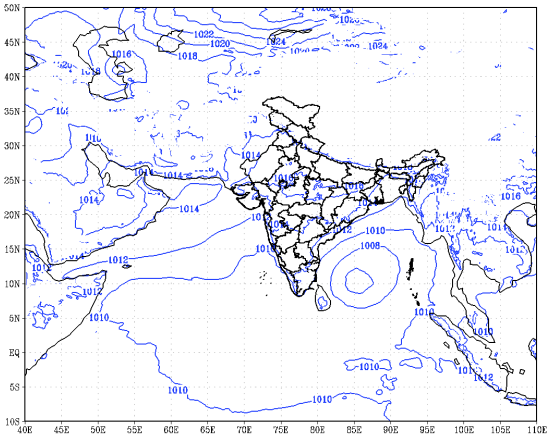
IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 16-11-2022 valid for 00 UTC of 19-11-2022



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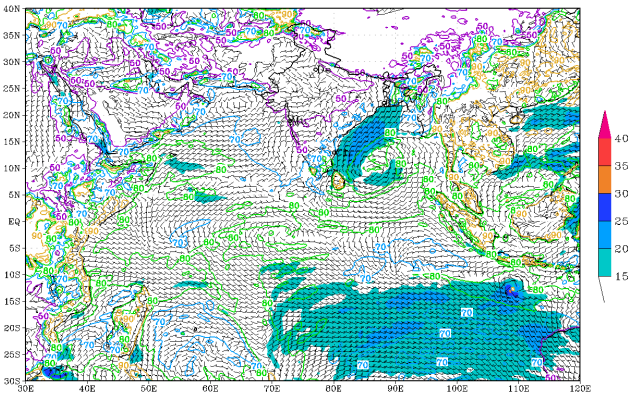
IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (72 HR)
based on 00 UTC of 16-11-2022 valid for 00 UTC of 19-11-2022



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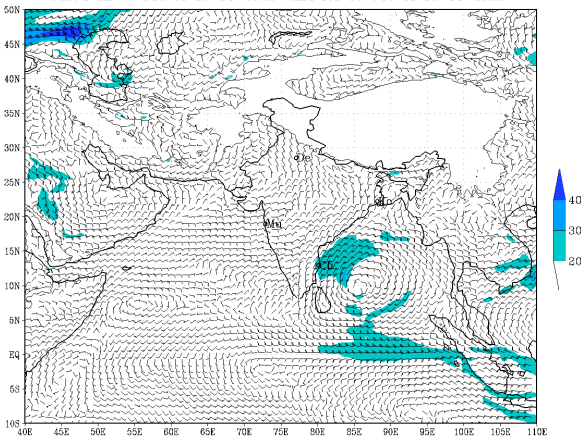
IMD:GFS MODEL(12 Km) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 16-11-2022 valid for 00 UTC of 19-11-2022



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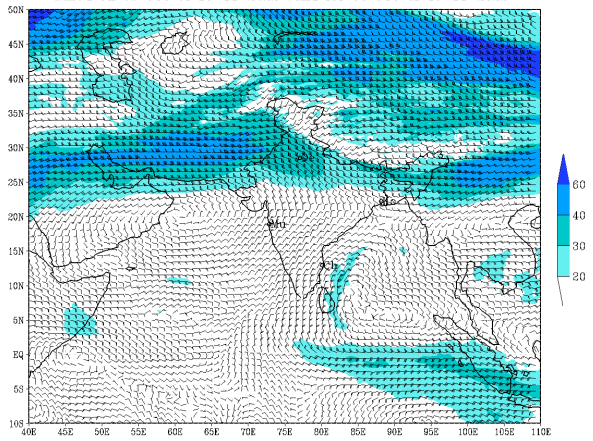
IMD:GFS MODEL(12 Km) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 16-11-2022 valid for 00 UTC of 19-11-2022



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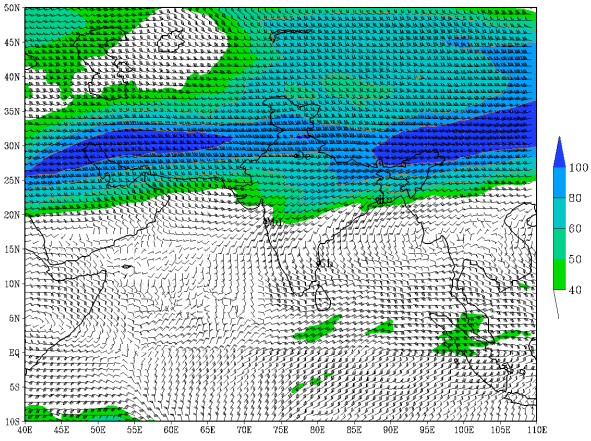
IMD :GFS MODEL(12 Km) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 16-11-2022 valid for 00 UTC of 19-11-2022



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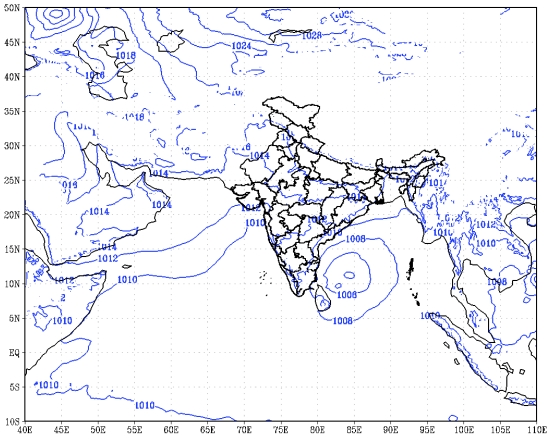
IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 16-11-2022 valid for 00 UTC of 20-11-2022



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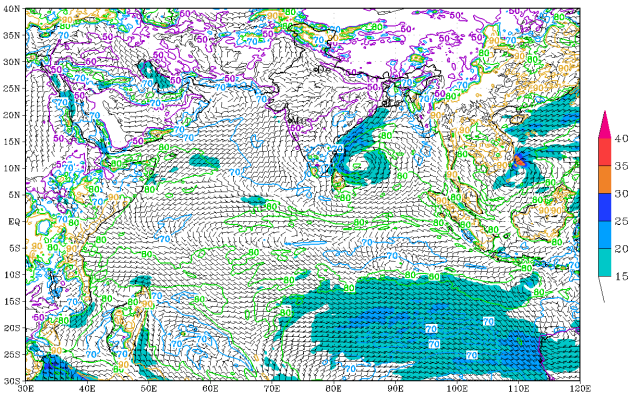
IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (96 HR)
based on 00 UTC of 16-11-2022 valid for 00 UTC of 20-11-2022



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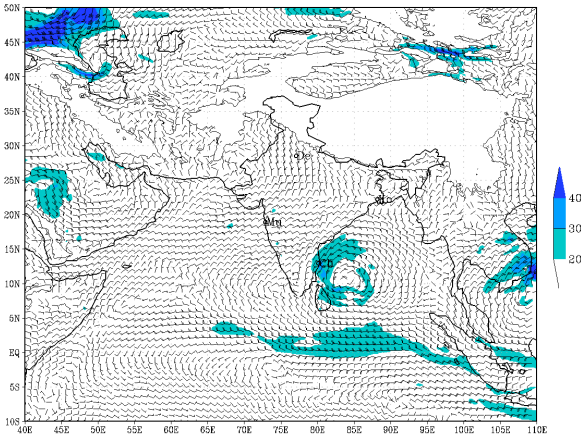
IMD:GFS MODEL(12 Km) 850 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 16-11-2022 valid for 00 UTC of 20-11-2022



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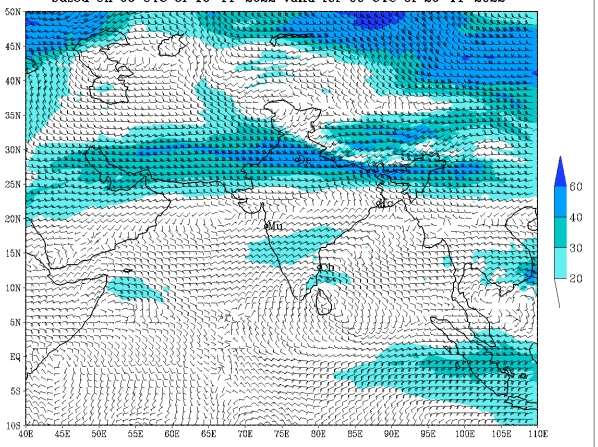
IMD:GFS MODEL(12 Km) 500 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 16-11-2022 valid for 00 UTC of 20-11-2022



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IMD :GFS MODEL(12 Km) 200 hPa WIND (kt) FORECAST (96 HR)
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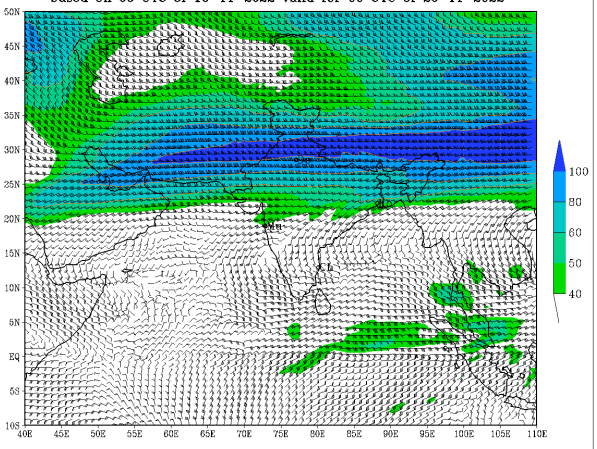
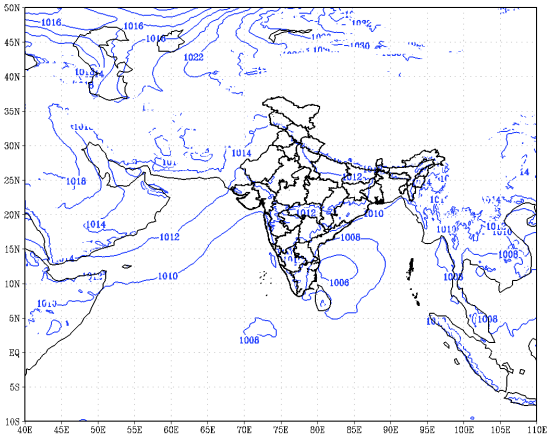


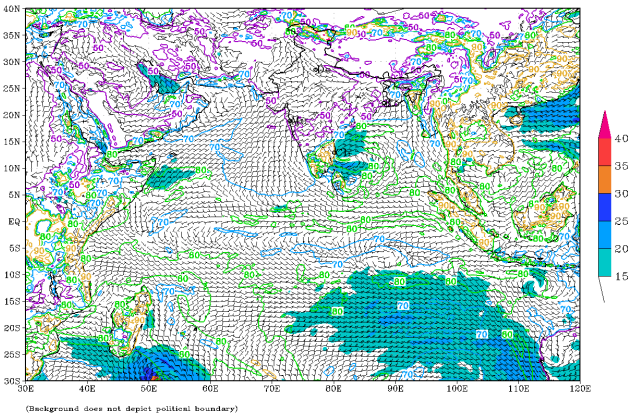
(Background does not depict political boundary)

IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 16-11-2022 valid for 00 UTC of 21-11-2022



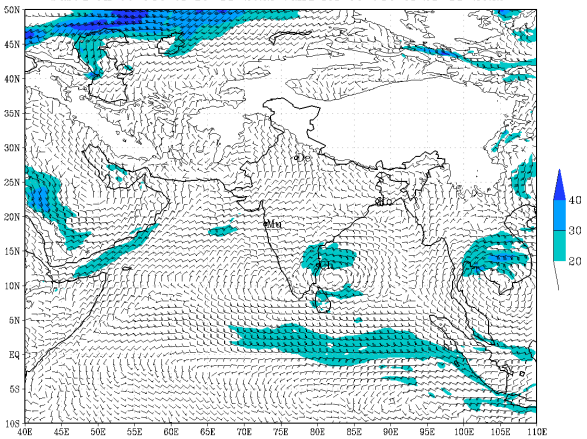
(Background does not depict political boundary)

IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (120 HR)
based on 00 UTC of 16-11-2022 valid for 00 UTC of 21-11-2022



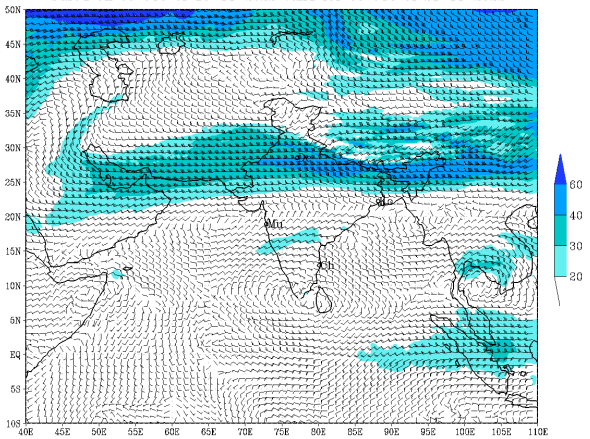
(Background does not depict political boundary)

IMD:GFS MODEL(12 Km) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 16-11-2022 valid for 00 UTC of 21-11-2022



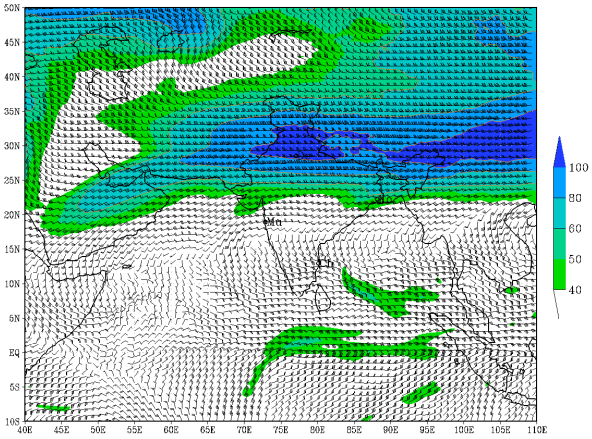
(Background does not depict political boundary)

IMD:GFS MODEL(12 Km) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 16-11-2022 valid for 00 UTC of 21-11-2022



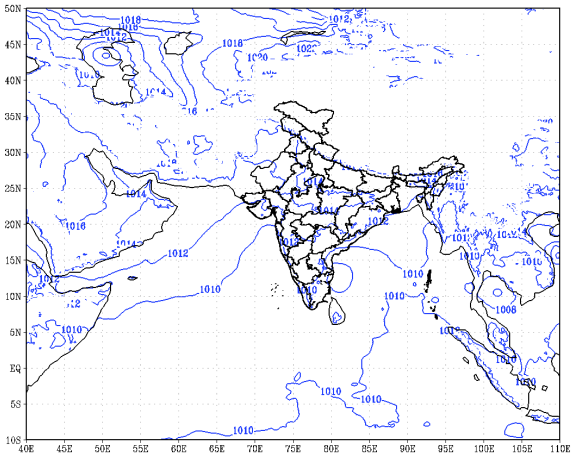
(Background does not depict political boundary)

IMD :GFS MODEL(12 Km) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 16-11-2022 valid for 00 UTC of 21-11-2022



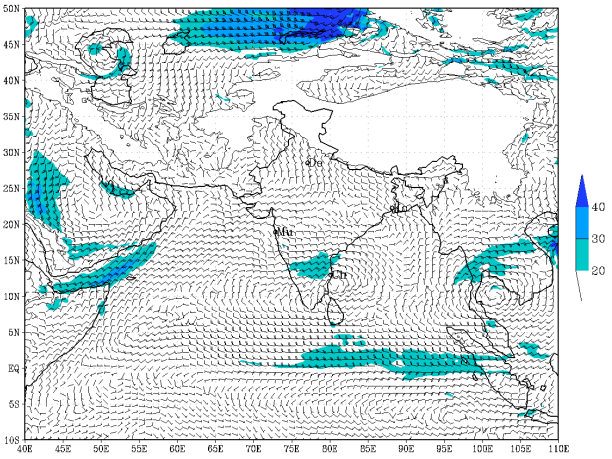
(Background does not depict political boundary)

IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (144 HR)
based on 00 UTC of 16-11-2022 valid for 00 UTC of 22-11-2022



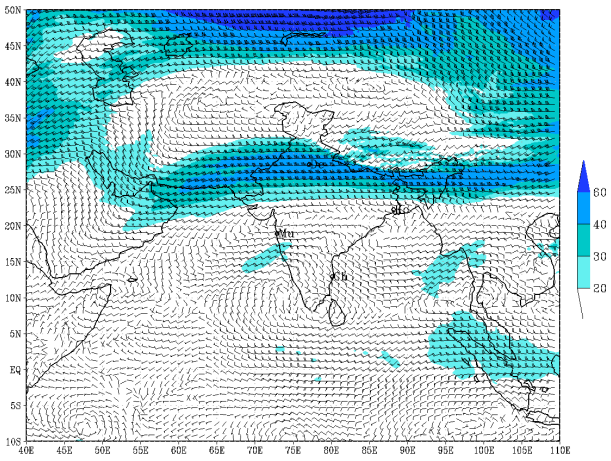
(Background does not depict political boundary)

IMD:GFS MODEL(12 Km) 850 hPa WIND (kt) FORECAST (144 HR)
based on 00 UTC of 16-11-2022 valid for 00 UTC of 22-11-2022



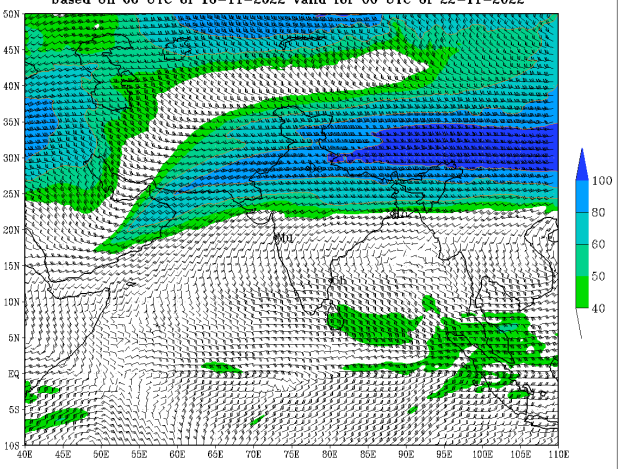
(Background does not depict political boundary)

IMD:GFS MODEL(12 Km) 500 hPa WIND (kt) FORECAST (144 HR)
based on 00 UTC of 16-11-2022 valid for 00 UTC of 22-11-2022

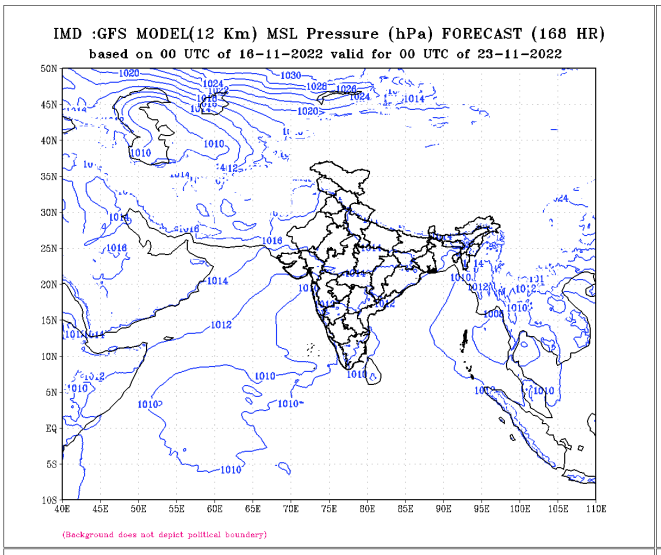


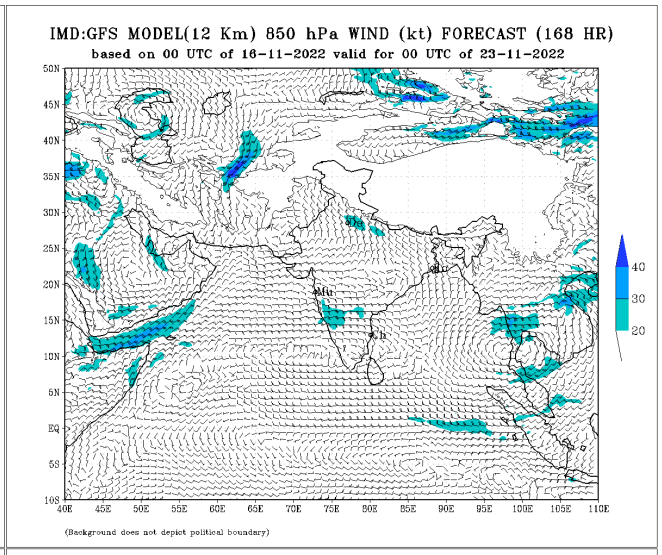
(Background does not depict political boundary)

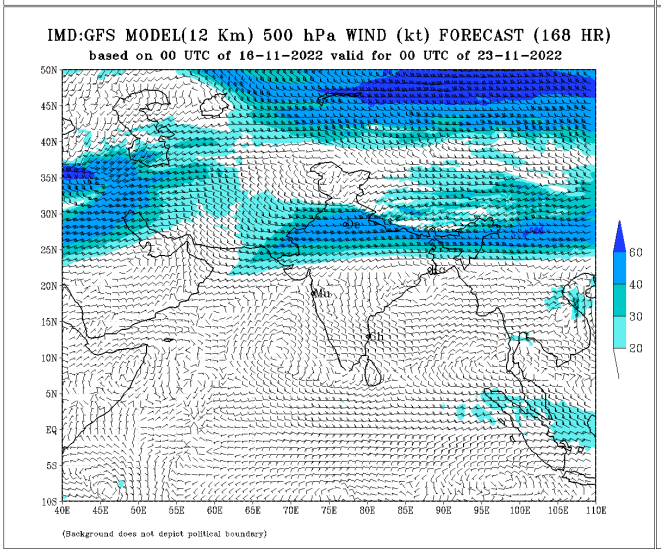
IMD :GFS MODEL(12 Km) 200 hPa WIND (kt) FORECAST (144 HR)
based on 00 UTC of 16-11-2022 valid for 00 UTC of 22-11-2022

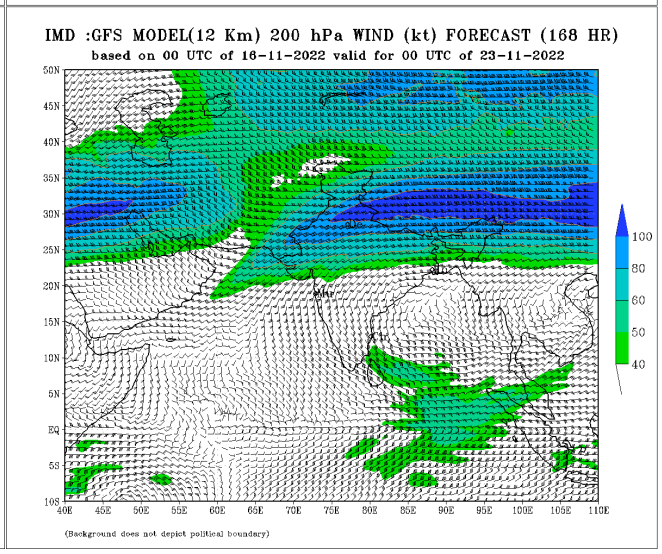


(Background does not depict political boundary)


IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (168 HR)
based on 00 UTC of 16-11-2022 valid for 00 UTC of 23-11-2022
(Background does not depict political boundary)


IMD:GFS MODEL(12 Km) 850 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 16-11-2022 valid for 00 UTC of 23-11-2022
40
30
20
(Background does not depict political boundary)


IMD:GFS MODEL(12 Km) 500 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 16-11-2022 valid for 00 UTC of 23-11-2022
60
40
30
20
(Background does not depict political boundary)


IMD :GFS MODEL(12 Km) 200 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 16-11-2022 valid for 00 UTC of 23-11-2022
100
80
60
50
40
(Background does not depict political boundary)