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

FDP (Cyclone) NOC Report Dated 30th November, 2021

Time of Issue: 1200 UTC

Synoptic features (based on 0900 UTC analysis):

- A Low Pressure Area lay over South Thailand & neighbourhood. The associated cyclonic circulation extends upto mid tropospheric level. It is likely to emerge into Andaman Sea during next 12 hours. It is likely to move west-northwestwards and concentrate into a Depression by 2nd December and further intensify into a cyclonic storm over Central Bay of Bengal during subsequent 24 hours. It likely to move northwestwards, intensify further and reach north Andhra Pradesh - Odisha coasts by the morning of 04th December, 2021.
- Yesterday's cyclonic circulation over Comorin area & adjoining Sri Lanka coast lay over Southeast Arabian sea & adjoining Lakshadweep area and extended upto 5.8 km above mean sea level. Under its influence, a Low Pressure Area is likely to form over Eastcentral Arabian sea off Maharashtra coast during next 24 hours.
- The trough at mean sea level now runs from the above cyclonic circulation over Southeast Arabian Sea & adjoining Lakshadweep area to north Maharashtra coast across Eastcentral Arabian sea and extends upto 0.9 km above mean sea level.

Dynamical and thermodynamical features

Parameter	Bay of Bengal (BoB)	Arabian Sea (AS)
Sea Surface Temperature (SST) ºC	29-30°C over major parts of west BoB and higher off south Andhra Pradesh-north Tamil Nadu coasts. Slightly less 27-28°C over north BoB and Andaman Sea.	28-29°C over major parts of AS. 29-308°C over eastcentral AS off Kerala coast.
Tropical Cyclone Heat Potential (TCHP) kJ/cm^2	100-120 over Gulf of Thailand. 110-120 over parts of south Andaman Sea as well as over the eastern equatorial Indian Ocean. 80-90 over central and north BoB.	70-80 over southeast & parts of eastcentral AS. 50-60 over central AS. Less than 50 over major parts of west AS.
Cyclonic Relative vorticity (X10^{-6}s^{-1})	50 to the south of system centre over south Thailand with vertical extension upto 500 hPa.	40 to 50 over southeast AS and also over southwest AS and adjoining Equatorial Indian Ocean with vertical extension upto 500 hPa.
Low Level	Large extended zone of positive	05-10 north-south oriented

convergence ($X10^{-5}$ s^{-1})	divergence 05-10 over Gulf of Thailand, Andaman Sea and adjoining southeast BoB & equatorial Indian Ocean.	extended zone over southwest AS.
Upper Level divergence ($X10^{-5}$ s^{-1})	Extended zone of 05-10 over south BoB and adjoining Equatorial Indian Ocean. 05-10 over southern Peninsular Region.	05-10 north-south oriented extended zone over southwest AS. Also another east-west oriented zone of 05-10 over south AS.
Vertical Wind Shear (VWS Knots)	Low to moderate (05-20) over Gulf of Thailand, south Thailand and adjoining north Andaman Sea. Low to moderate (05-20) over major parts of central and adjoining south BoB.	Low to Moderate (05-20) over southeast & adjoininmg eastcentral AS and southwest AS.
Wind Shear Tendency (knots)	Decreasing over Thailand and eastcentral BoB.	Decreasing over small pocket over southeast and adjoining eastcentral AS.
Upper tropospheric Ridge	Along 15.0°N over the central BoB.	Along 15.0ºN.
Trough in Westerlies		A trough lies near 10^0N/55^0E over southwest AS.

Satellite observations based on INSAT imagery (0900 UTC):

(a) Bay of Bengal & Andaman Sea:

At 0900 UTC, scattered low & medium clouds with embedded intense to very intense convection lay over south Thailand and south Andaman Sea. Convection has organized over the region during past 24 hours. Minimum cloud top temperature is minus 82 deg C. Scattered low & medium clouds with embedded moderate to intense convection lay over central and south BoB. The multi-satellite winds at 0900 UTC indicate strong winds in the northwest sector about 15-20 knots.

(b) Arabian Sea

At 0900 UTC, scattered to broken low & medium clouds with embedded intense to very intense convection lay over southeast and eastcentral AS and neighbourhood. Minimum cloud top temperature is minus 78 deg C.

M.J.O. Index:

MJO index is currently in Phase 5 with amplitude more than 1. It will remain in same phase during next 1 day. Thereafter, it will move to phase 6 with amplitude remaining more than 1 from 2nd December onwards. Thus, MJO phase is conducive for enhancement of convective activity and hence cyclogenesis over BoB during next 2-3 days.

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

The invest zone is located near 9.8N/99.5E. The convection has organized over the region during past 24 hours.

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

Model	BoB	AS
IMD-GFS	Indicates an LPA over Thailand and neighbourhood on 30th November early morning (00UTC), over south Andaman Sea at 1800 UTC of 30th, its rapid intensification into	Indicates an LPA over southeast AS off Lakshadweep area on 30th November, as a

	a **Depression** over Andaman Sea at 00 UTC of 1st December, as a **Severe Cyclonic Storm** (SCS) over Andaman Islands at 1200 UTC of 1st, as a Very Severe Cyclonic Storm (VSCS) over southeast & adjoining east-central BoB at 00 UTC of 2nd December, as an Extremely Severe Cyclonic Storm (ESCS) over central BoB at 1200 UTC of 2nd, over west-central BoB at 00 UTC of 3rd, over west-central & adjoining northwest BoB off north Andhra Pradesh –south Odisha coasts at 1800 UTC of 3rd, over northwest & adjoining west-central BoB off south Odisha – north Andhra Pradesh coasts at 00 UTC of 4th, close to south Odisha coast at 06 UTC of 4th and over coastal Odisha as an ESCS at 1200 UTC of 4th and further northeastward movement along the coasts of Odisha & West Bengal with gradual weakening upto 1200 UTC of 6th December.	broad-scale Low over southeast & adjoining east-central AS on 1st December and weakening on 2nd.
IMD-GEFS	Same as above upto 3rd December. However, at 00 UTC of 4th December, the system is predicted as an ESCS located very close to south Odisha – north Andhra Pradesh coasts and further skirting the coast & rapidly weakening into an LPA over northwest BoB & adjoining Odisha coast is indicated at 00 UTC of 5th December. Whereas the deterministic GFS is still continuing the system as an SCS north coastal Odisha and adjoining West Bengal at 00 UTC of 5th.	Same as above
IMD-WRF	LPA over Gulf of Thailand on 30th November, over south Andaman Sea on 1st December, a Depression over southeast BoB on 2nd & rapid intensification into an SCS over southeast & adjoining southwest & central BoB on 3rd.	An extended Low over southeast AS and adjoining Lakshadweep area on 30th November, moving westwards and as an LPA over central parts of south AS on 2nd December and weakening on 3rd.
NCMRWF-NCUM(Global)	Indicates an LPA over south Andaman Sea on 1st December, a Depression over southeast BoB on 2nd, CS over central BoB on 3rd, VSCS over west-central & adjoining northwest BoB off north Andhra Pradesh – south Odisha coasts on 4th, crossing as VSCS near Lat 20.1 N & Long. 86 E) at 00 UTC of 5th and as a Well Marked Low (WML) over Bangladesh & adjoining West Bengal at 00 UTC of 6th.	Indicates a broad-scale Low over east-central & adjoining southeast AS on 1st December, as an LPA over east-central AS on 2nd and weakening on 3rd.
NCMRWF-NEPS	Similar to NCUM-G	Similar to NCUM-G
NCMRWF-UM (Regional)	Similar to NCUM (G) upto 3rd December, but with higher intensity (Peak intensity of 54 knots is predicted at 00 UTC of 3rd December).	Similar to NCUM (G) upto 3rd December
ECMWF	An LPA emerging into Andaman Sea around 1800 UTC of 30th November, an LPA over Andaman Sea on 1st December, as a WML	Indicates an extended Low over southeast & adjoining east-central

	over southeast & adjoining east-central BoB on 2nd, as a Depression over central BoB at 1800 UTC of 2nd, as a Deep Depression (DD) over west-central BoB at 1800 UTC of 3rd , as a CS over west-central BoB off north Andhra Pradesh coast at 00 UTC of 4th, close to north Andhra Pradesh coast at 03 UTC of 4th, maintains the CS intensity upto 06 UTC of 4th, weakens into A Depression very close to north Andhra Pradesh south Odisha coasts at 09 UTC of 4th and crossing south Odisha – north Andhra Pradesh coasts at 12 UTC of 4th as a Depression. Further it indicates very slow northeastward movement along the coast upto West Bengal coast with gradual weakening until 6th morning (0300 UTC).	AS on 30th November, as an LPA over east-central AS off north Maharashtra coast on 1st & 2nd December and weakening on 3rd.
ECMWF-EPS	90-100 % probability of cyclogenesis / strike over Andaman Sea, southeast & west-central BoB on 3rd, 90-100 % over southeast & central BoB and 70-80% over north coastal Andhra Pradesh on 4th and 90-100 % over west-central BoB and 80-90% over south coastal Odisha on 5th.	80-90% genesis & strike probability over east-central AS off Maharashtra coast on 3rd December, 60-70 % over east-central & northeast AS and north Maharashtra – south Gujarat coasts on 4th.
NCEP-GFS	Indicates an LPA over Andaman Sea on 1st December, a Depression over southeast BoB on 2nd, an SCS over central BoB on 3rd, an ESCS over west-central & adjoining northwest BoB off north Andhra Pradesh – south Odisha coasts on 4th, an ESCS over northwest BoB off Odisha –West Bengal coasts on 5th, moving along & off West Bengal coast with gradual weakening upto 00 UTC of 6th and further weakening into an LPA over south coastal Bangladesh at 06 UTC of 6th.	Indicates a broad-scale Low over east-central & adjoining southeast AS on 1st December and weakening on 2nd.
IMD-GPP	Potential zone over south Andaman Sea on 1st December, over southeast BoB & adjoining Andaman Sea on 2nd , over east-central BoB on 3rd, over west-central & adjoining northwest BoB on 4th and over northwest BoB off north Odisha – West Bengal coasts on 5th.	NIL

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

Summary and Conclusion:

It may thus be concluded that,

1. The Low Pressure Area currently located over South Thailand & neighbourhood is likely to emerge into Andaman Sea during next 06 hours. It is likely to move west-northwestwards and concentrate into a Depression by 2nd December and further intensify into a cyclonic storm over Central Bay of Bengal during subsequent 24 hours. It likely to move northwestwards, intensify further and reach north Andhra Pradesh - Odisha coasts by the morning of 04th December, 2021.

2. No significant development is likely over the Arabian Sea apart from the likely formation of a Low Pressure Area over east-central Arabian Sea off Maharashtra coast during next 24 hours.

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	MODERATE	HIGH	HIGH	HIGH	LOW	NIL

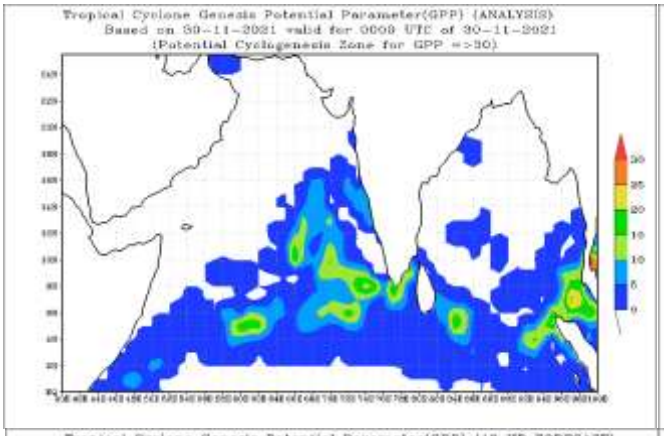
Probability of cyclogenesis (formation of depression and above intensity systems) over the Arabian Sea during next 168 hours:

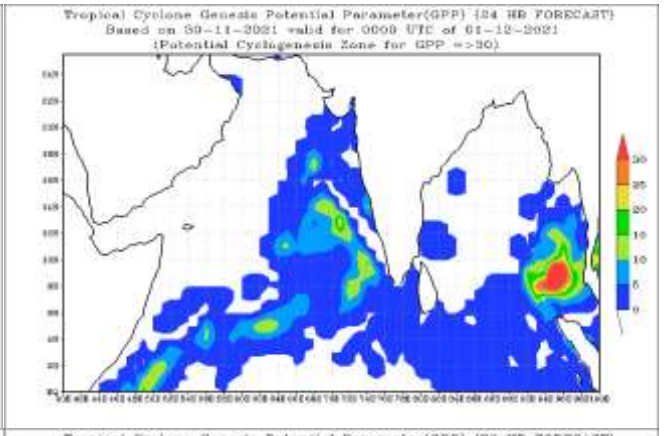
24 HOURS	24-48 HOURS	48-72 HOURS	72-96 HOURS	96-120 HOURS	120-144 HOURS	144-168 HOURS
NIL	NIL	NIL	NIL	NIL	NIL	NIL

Advisory: The emergence of a Low pressure system from Thailand to Andaman Sea as a Low pressure area during next 06 hours and it's subsequent intensification and movement to be monitored regularly.

IOP is suggested for Andaman & Nicobar Islands on 1st & 2nd December, for Andhra Pradesh – Odisha coasts on 4th December and for West Bengal coast on 5th December.

Annexure


Tropical Cyclone Genesis Potential Parameter(GPP) (ANALYSIS)
Based on 30-11-2021 valid for 0000 UTC of 30-11-2021
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
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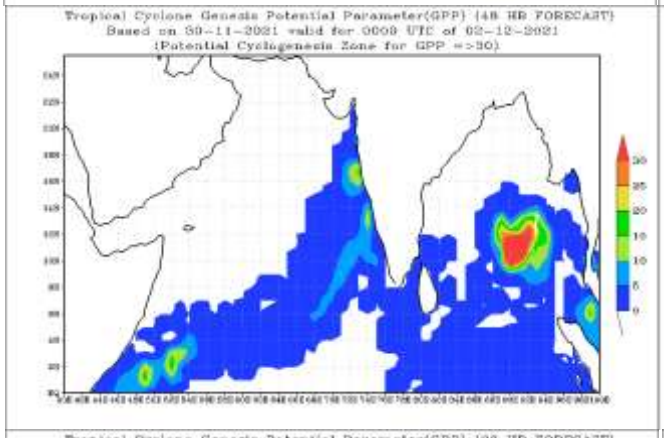
Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
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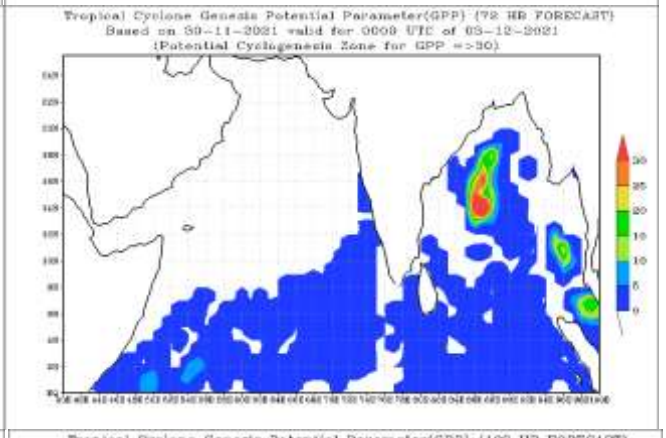
Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
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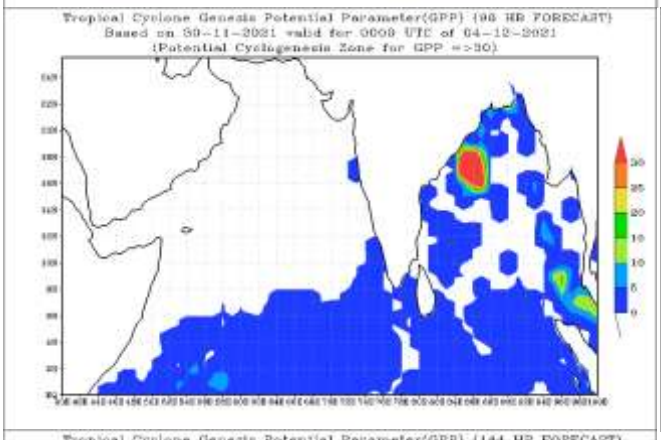
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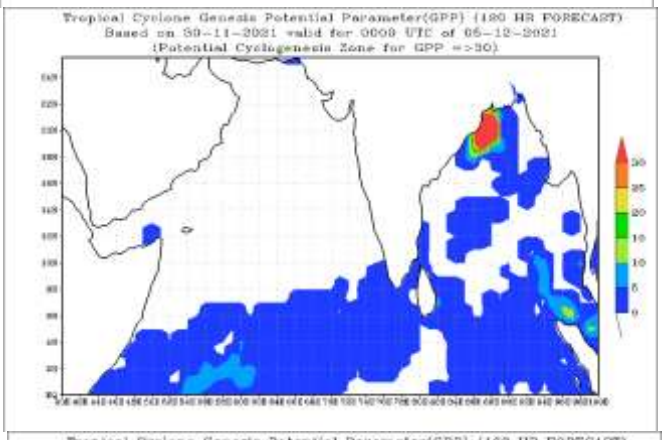
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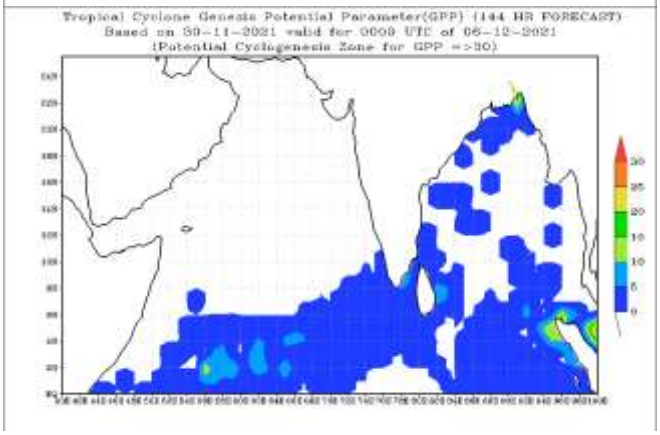
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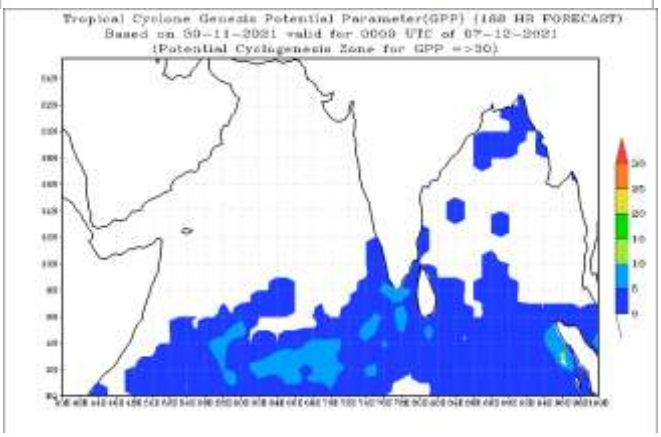
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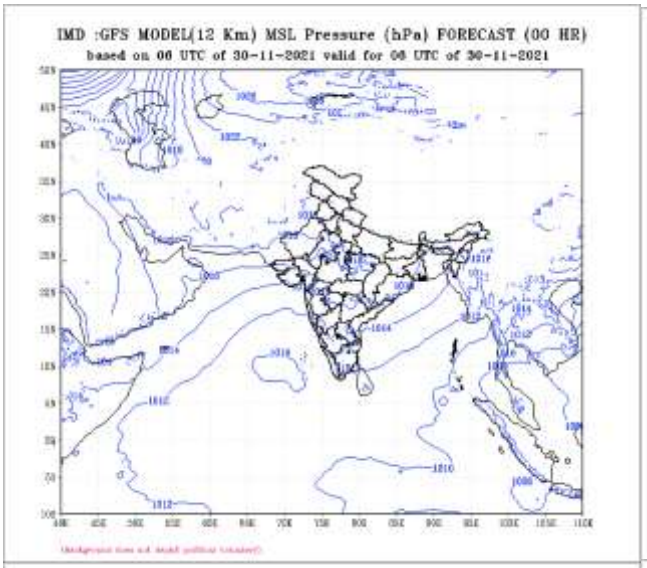
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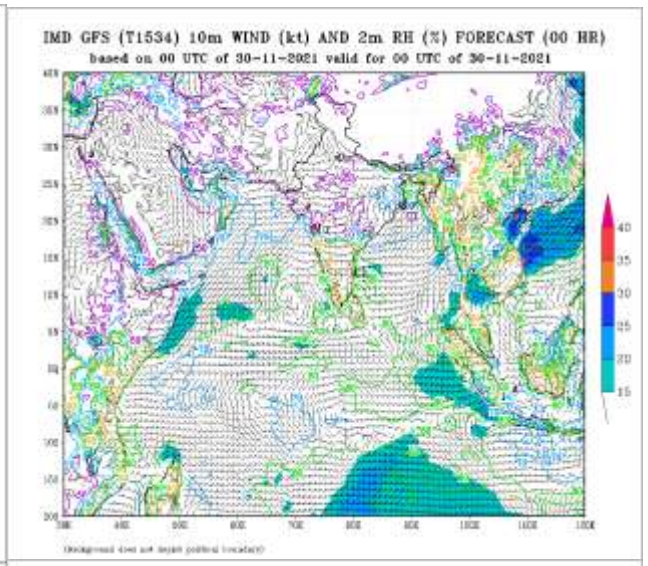
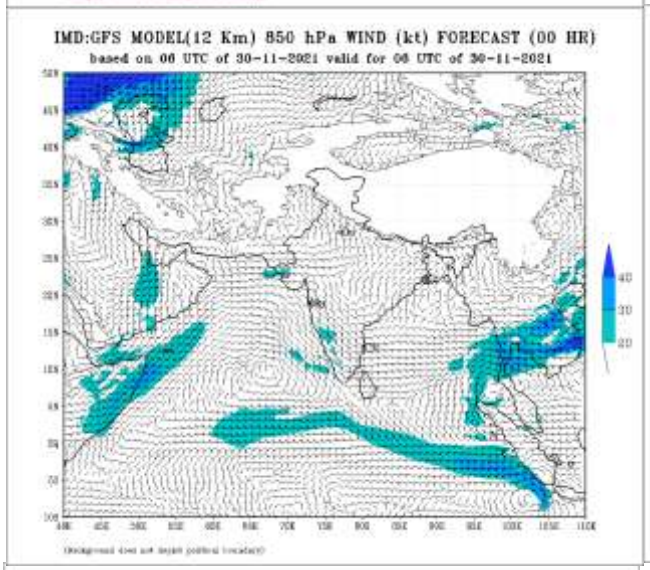
based on 00 UTC of 30-11-2021 valid for 00 UTC of 30-11-2021


IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (00 HR)
based on 00 UTC of 30-11-2021 valid for 00 UTC of 30-11-2021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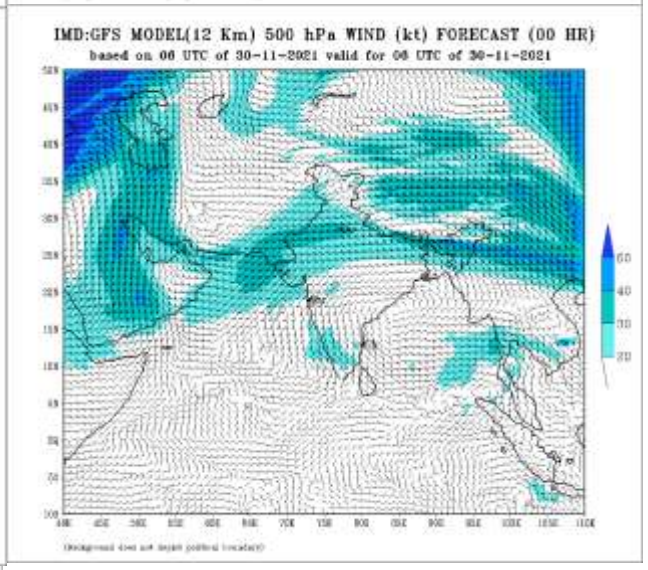
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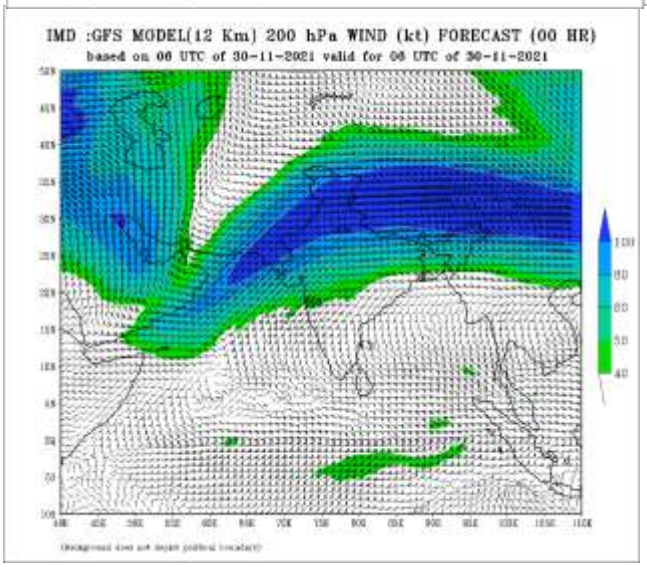
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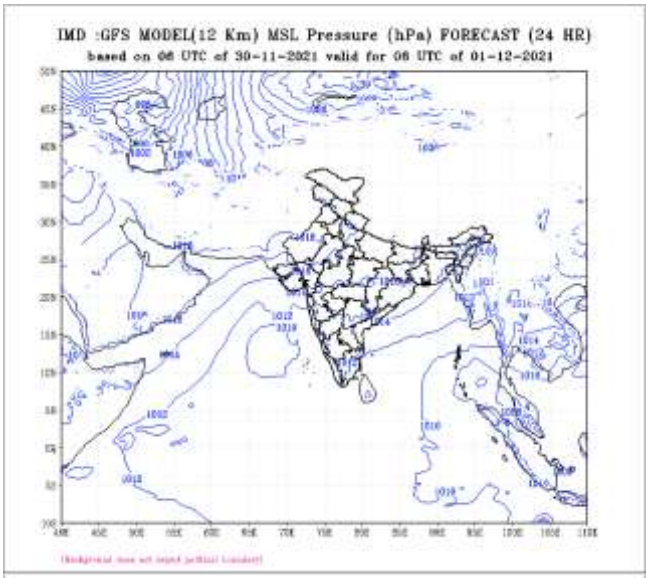
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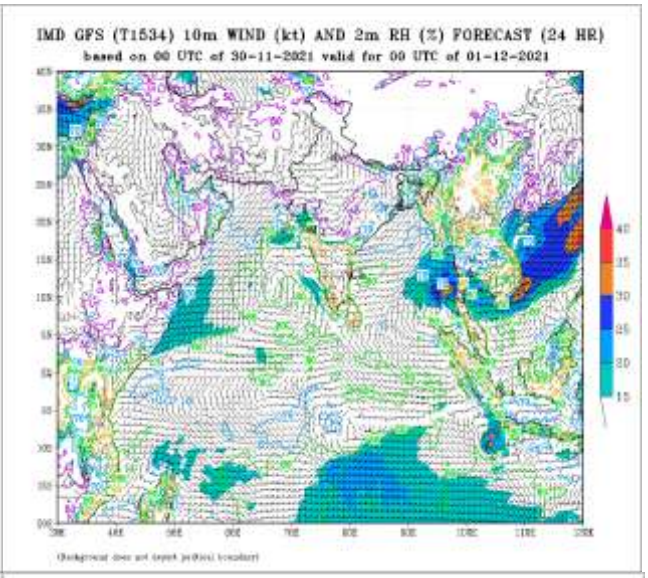
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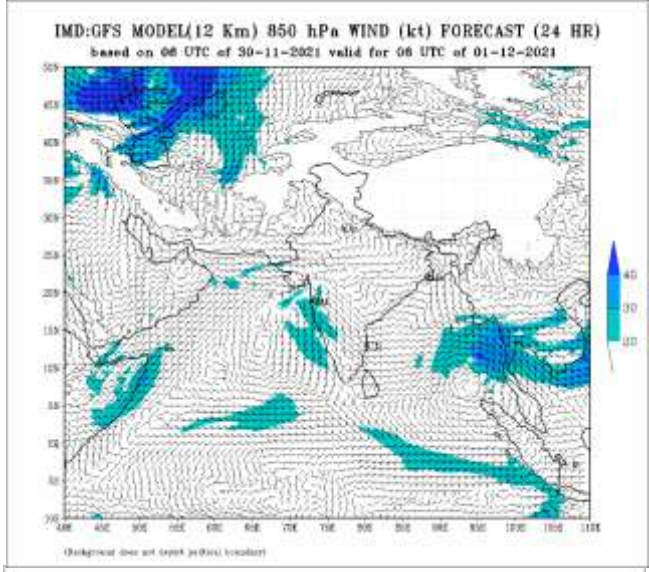
based on 00 UTC of 30-11-2021 valid for 00 UTC of 01-12-2021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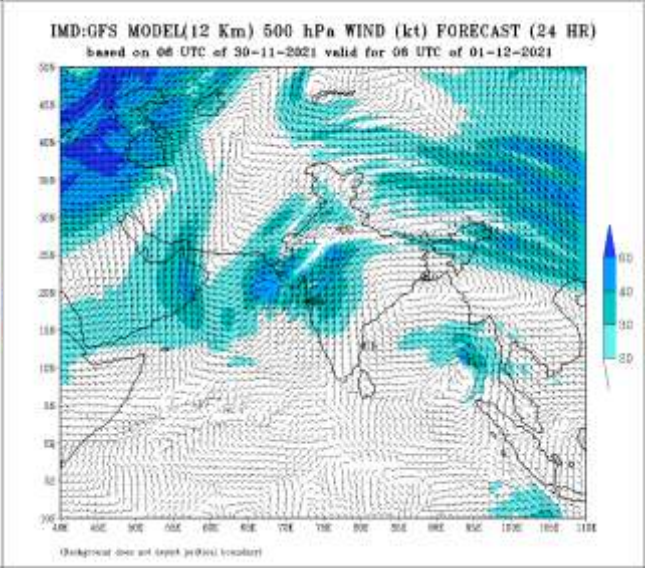
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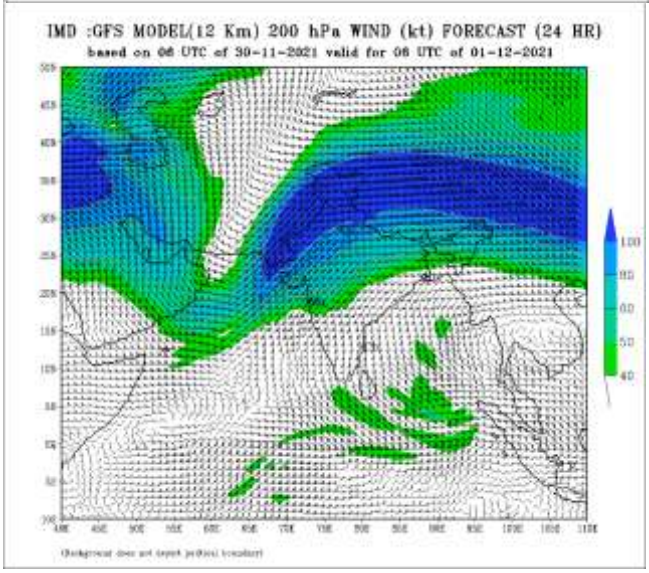
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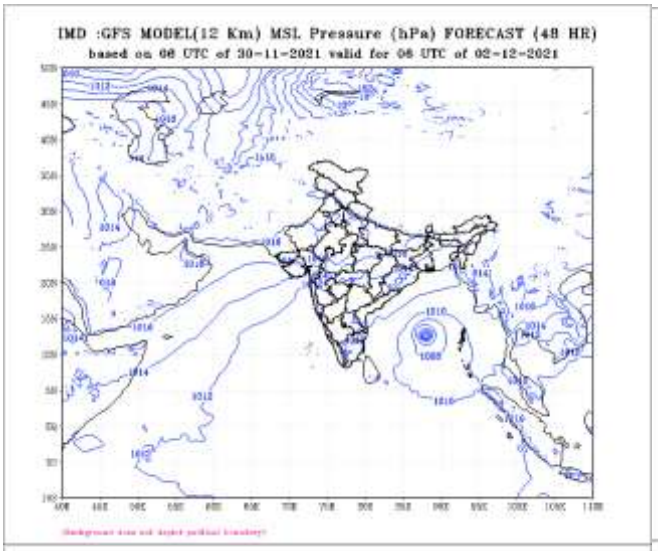
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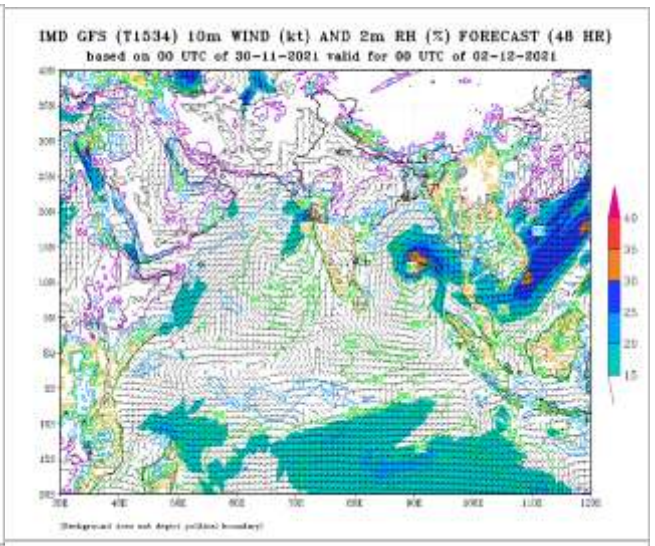
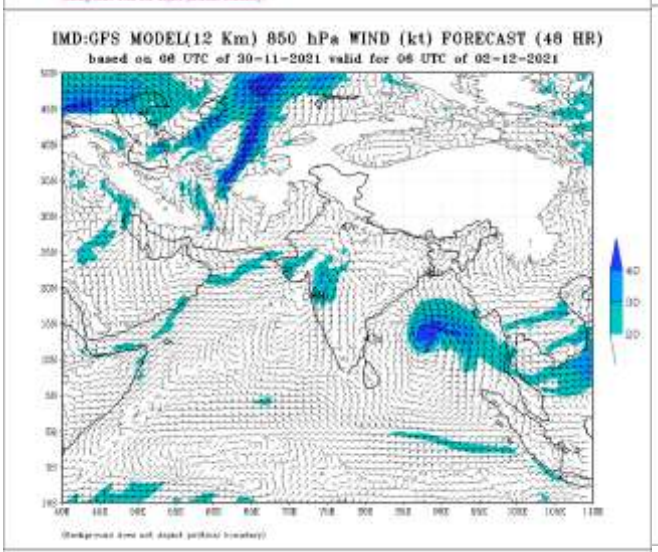
based on 00 UTC of 30-11-2021 valid for 00 UTC of 02-12-2021


IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (48 HR)
based on 00 UTC of 30-11-2021 valid for 00 UTC of 02-12-2021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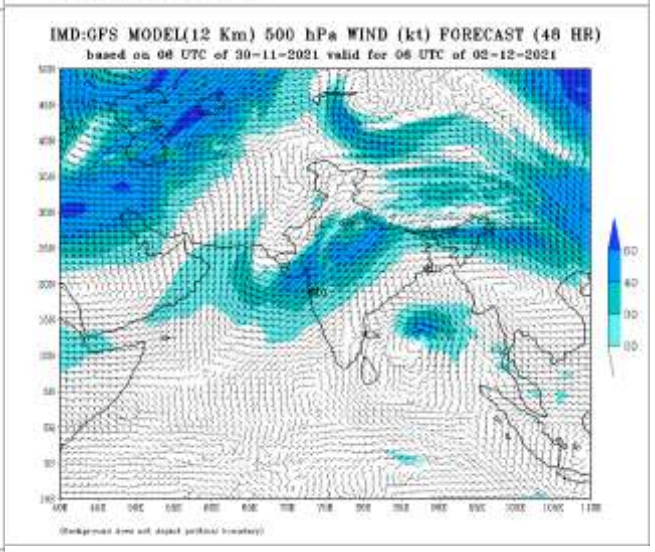
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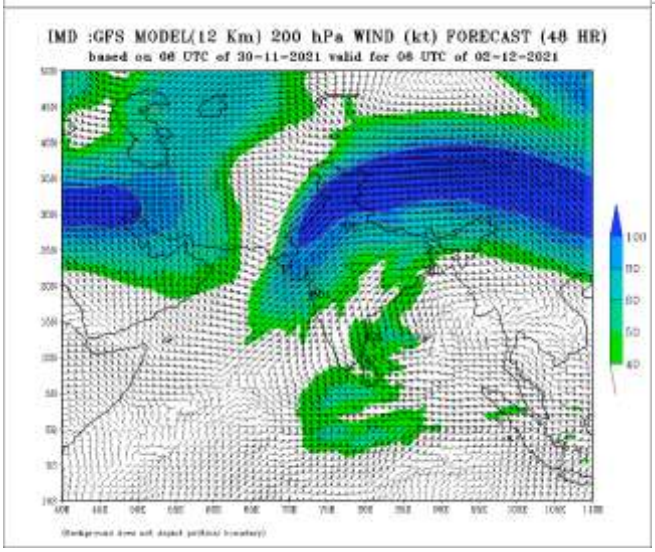
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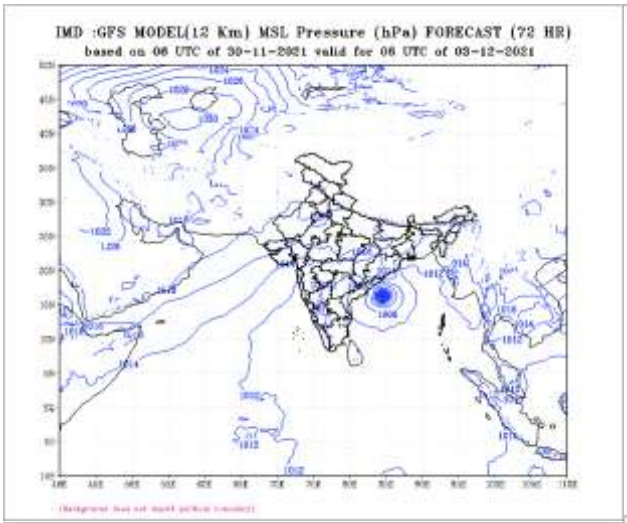
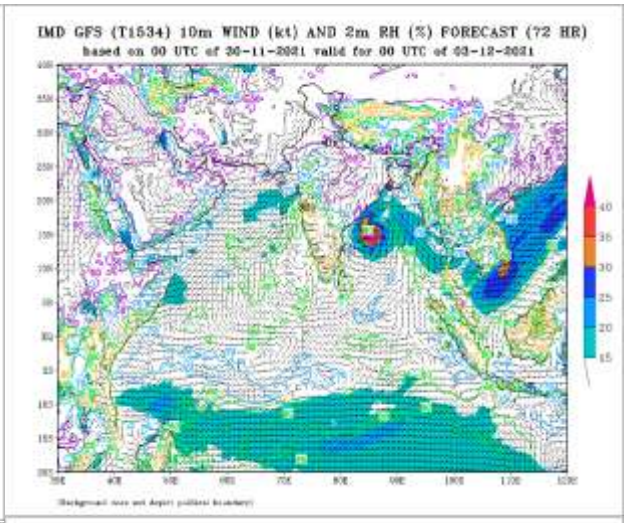

IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (72 HR)
based on 06 UTC of 30-11-2021 valid for 06 UTC of 03-12-2021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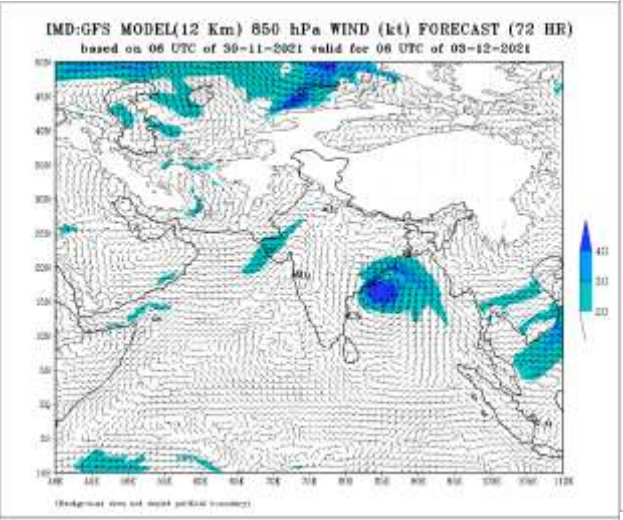
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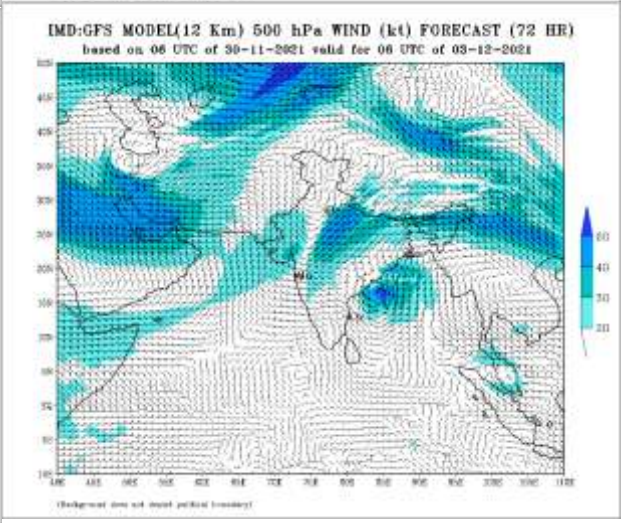
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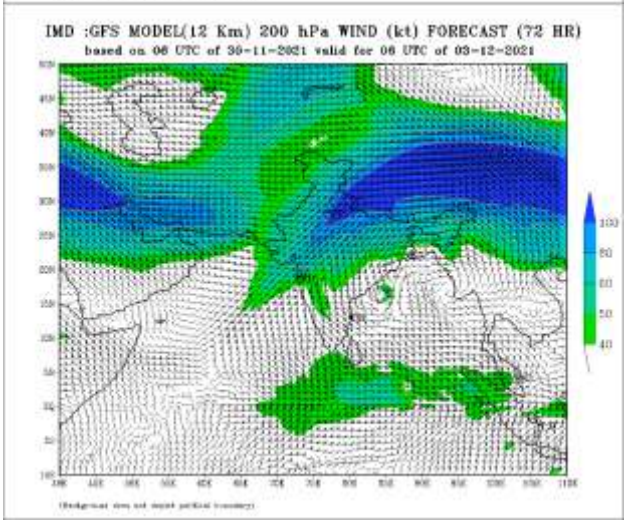
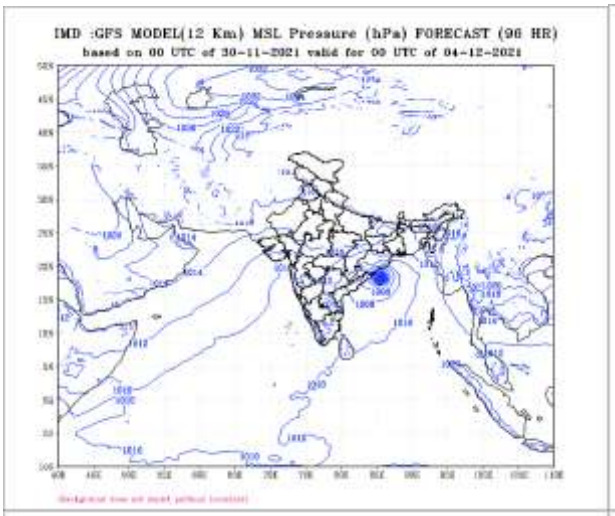
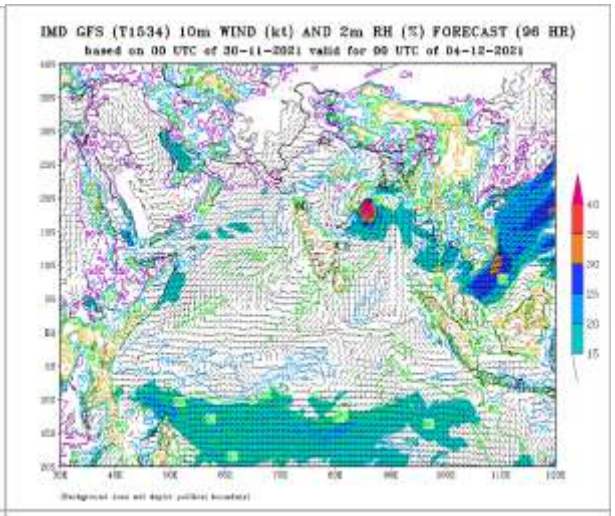
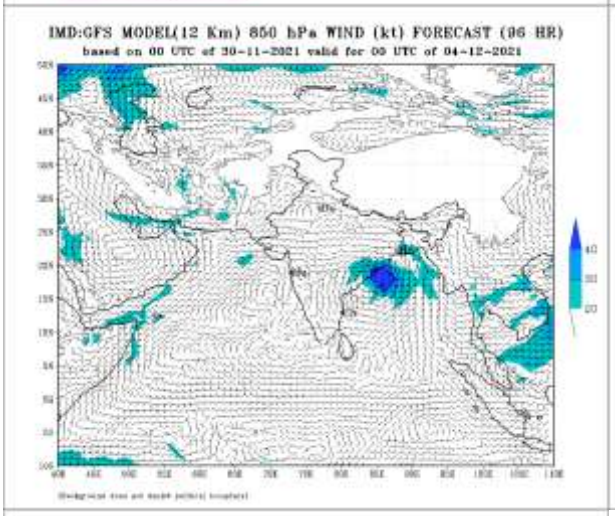
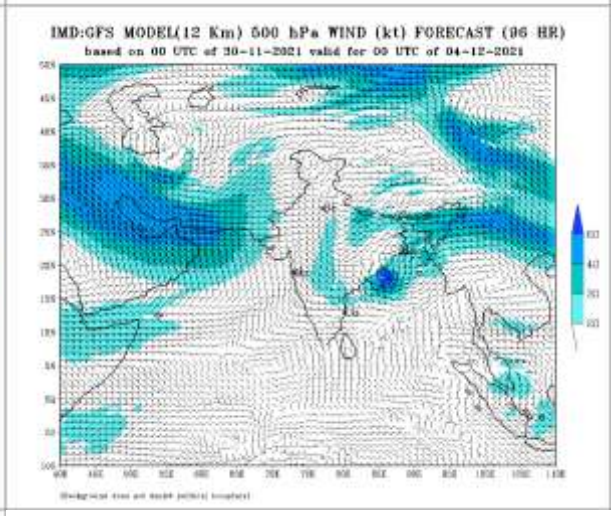
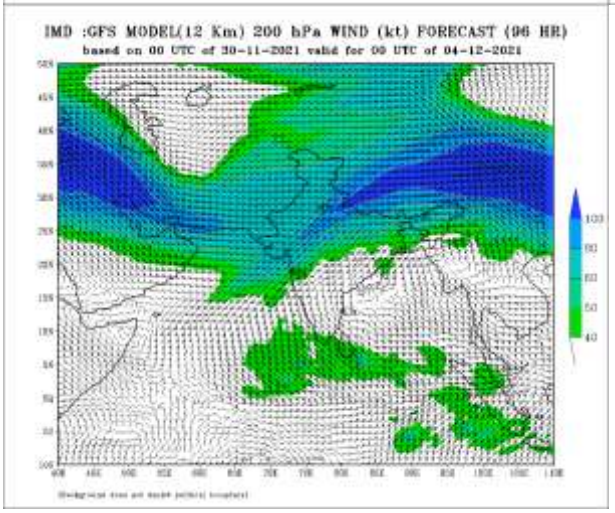

IMD :GFS MODEL(12 Km) 200 hPa WIND (kt) FORECAST (72 HR)
based on 06 UTC of 30-11-2021 valid for 06 UTC of 03-12-2021

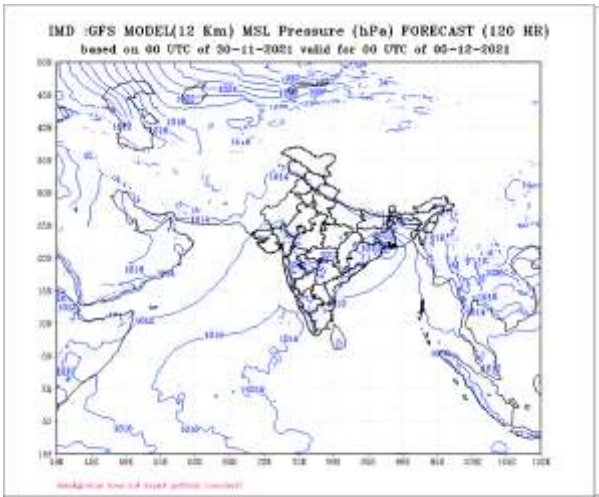

IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 30-11-2021 valid for 00 UTC of 04-12-2021

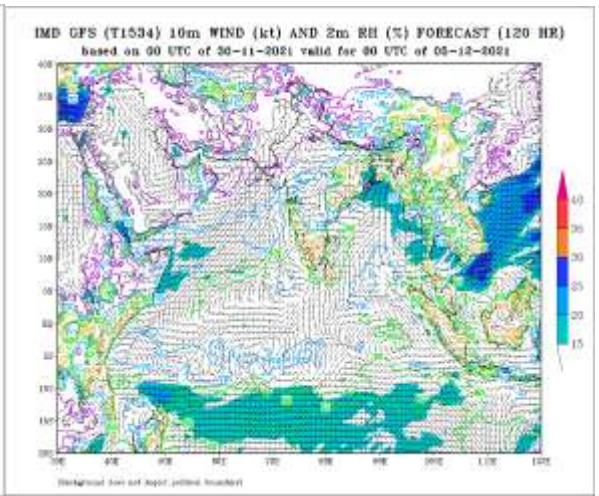

IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (96 HR)
based on 00 UTC of 30-11-2021 valid for 00 UTC of 04-12-2021

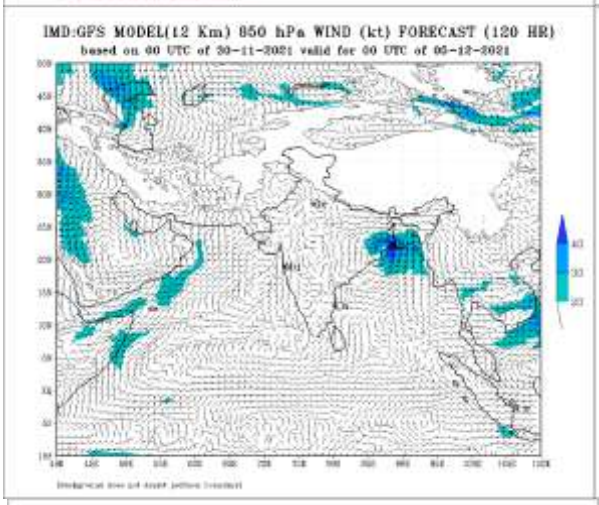

IMD:GFS MODEL(12 Km) 850 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 30-11-2021 valid for 00 UTC of 04-12-2021

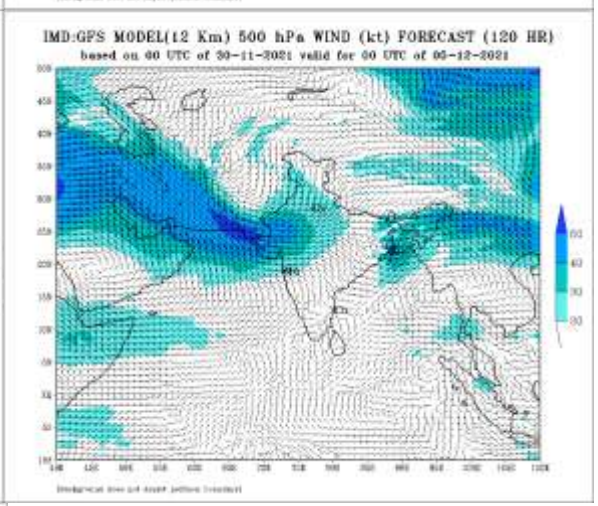

IMD:GFS MODEL(12 Km) 500 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 30-11-2021 valid for 00 UTC of 04-12-2021

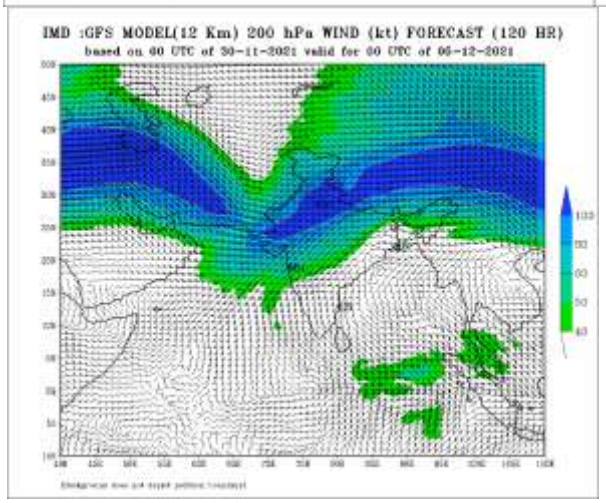

IMD :GFS MODEL(12 Km) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 30-11-2021 valid for 00 UTC of 04-12-2021

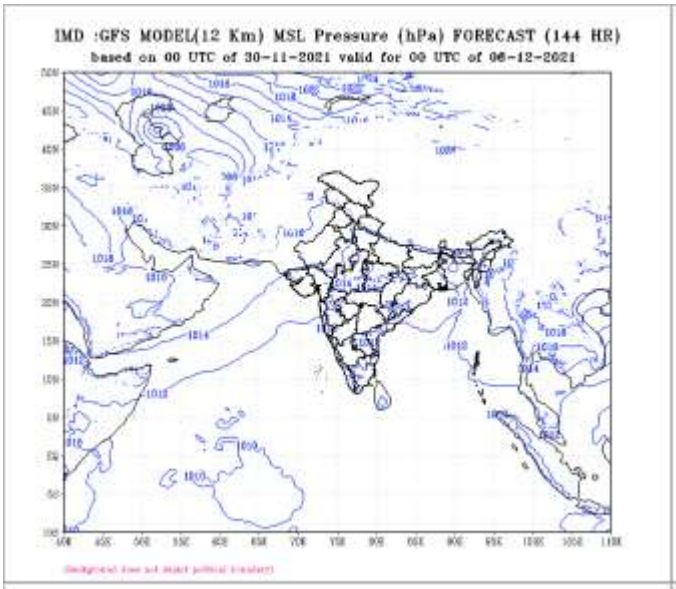

IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 30-11-2021 valid for 00 UTC of 05-12-2021

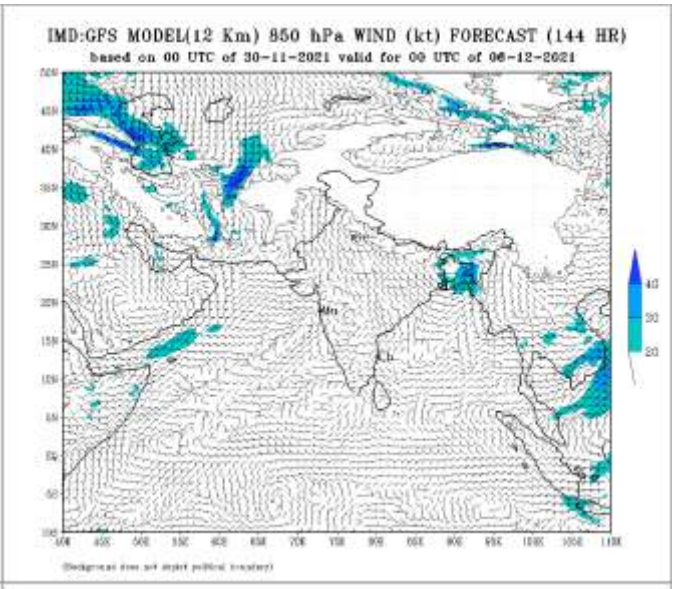

IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (120 HR)
based on 00 UTC of 30-11-2021 valid for 00 UTC of 05-12-2021

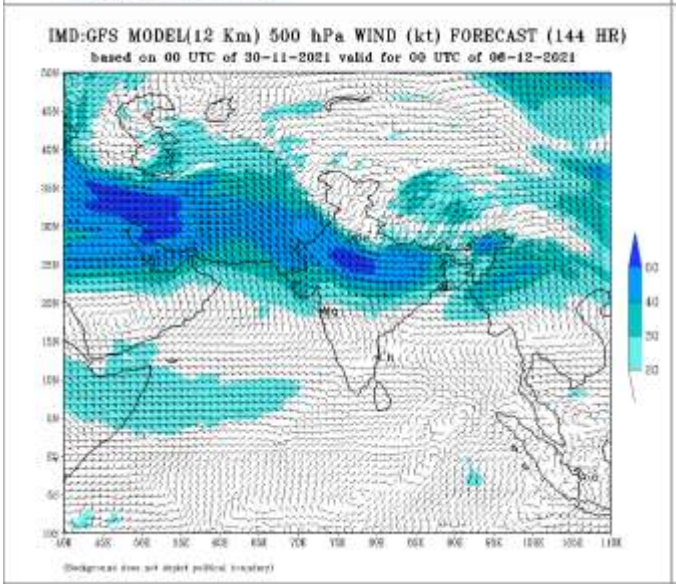

IMD:GPS MODEL(12 Km) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 30-11-2021 valid for 00 UTC of 05-12-2021

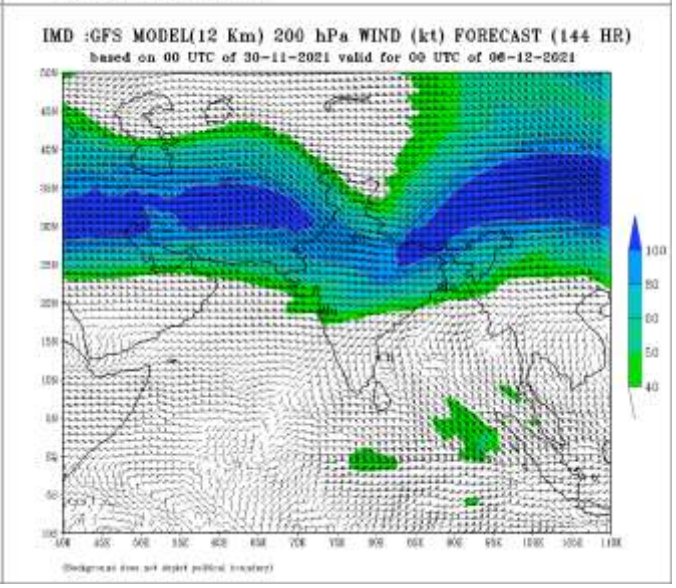

IMD:GPS MODEL(12 Km) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 30-11-2021 valid for 00 UTC of 05-12-2021

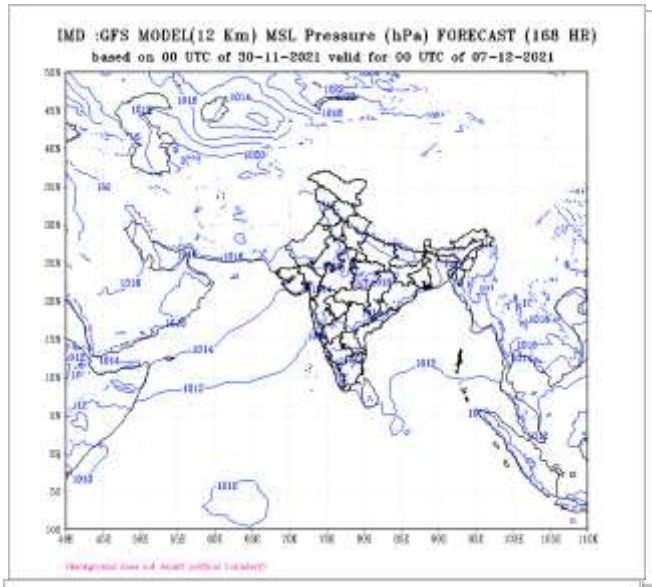

IMD :GFS MODEL(12 Km) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 30-11-2021 valid for 00 UTC of 05-12-2021

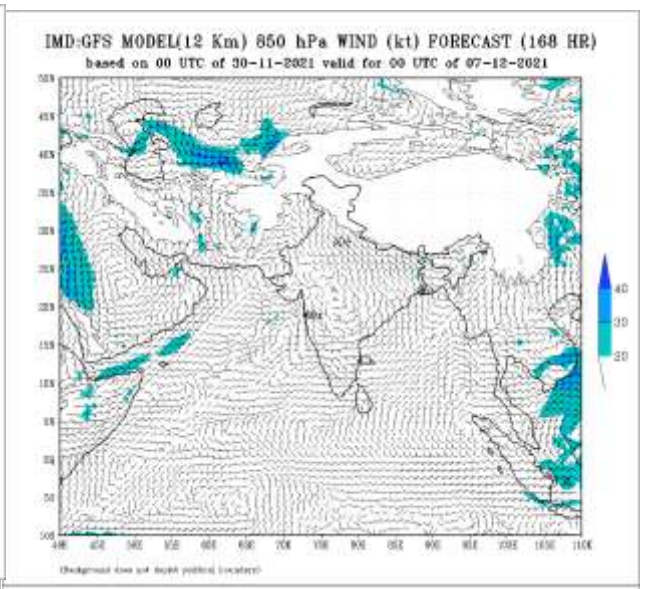

IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (144 HR)
based on 00 UTC of 30-11-2021 valid for 00 UTC of 06-12-2021

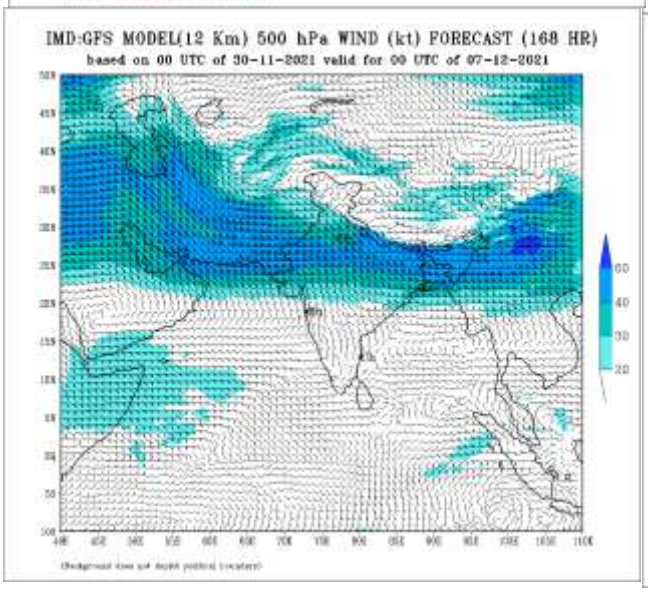

IMD:GFS MODEL(12 Km) 850 hPa WIND (kt) FORECAST (144 HR)
based on 00 UTC of 30-11-2021 valid for 00 UTC of 06-12-2021

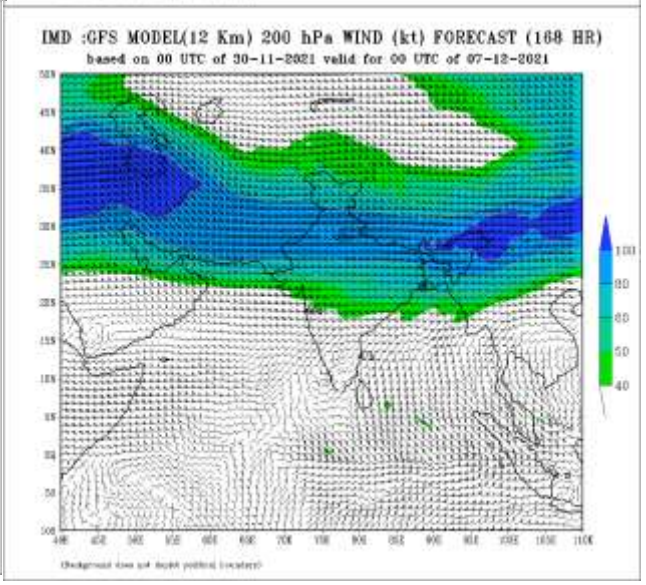

IMD:GFS MODEL(12 Km) 500 hPa WIND (kt) FORECAST (144 HR)
based on 00 UTC of 30-11-2021 valid for 00 UTC of 06-12-2021


IMD :GFS MODEL(12 Km) 200 hPa WIND (kt) FORECAST (144 HR)
based on 00 UTC of 30-11-2021 valid for 00 UTC of 06-12-2021


IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (168 HR)
based on 00 UTC of 30-11-2021 valid for 00 UTC of 07-12-2021


IMD:GFS MODEL(12 Km) 850 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 30-11-2021 valid for 00 UTC of 07-12-2021


IMD:GFS MODEL(12 Km) 500 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 30-11-2021 valid for 00 UTC of 07-12-2021


IMD :GFS MODEL(12 Km) 200 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 30-11-2021 valid for 00 UTC of 07-12-2021