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

FDP (Cyclone) NOC Report Dated 27th November, 2021

Time of Issue: 1200 UTC

Synoptic features (based on 0900 UTC analysis):

- Yesterday's cyclonic circulation over Comorin area & adjoining Sri Lanka coast, extending upto 1.5 km above mean sea level persisted over the same region at 0900 UTC of today, the 27th November.
- A Low Pressure Area (LPA) is likely to form over south Andaman Sea around 29th November, 2021. It is likely to become more marked and move west-northwestwards during subsequent 48 hours.

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) 120-130 over eastern equatorial Indian Ocean and adjoining south Andaman Sea & southeast BoB. (b) 80-100 over major parts of central & north BoB (c) Less than 50 over southwest BoB to the east of Sri Lanka	(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 and along & off Oman, adjoining Yemen & Somalia coasts.
Cyclonic Relative vorticity at 850 hPa (X10^{-6}s^{-1})	40-50 over equatorial Indian Ocean to the south of Sri Lanka and Comorin area with vertical extension upto 500 hPa level. 40-50 over southern parts of Gulf of Thailand with vertical extension upto 500 hPa level.	10-20 over central parts of south AS, extending upto 700 hPa.
Low Level convergence (X10^{-5} s^{-1})	05-10 over southwest off Sri Lanka coast. 05 over south Andaman Sea.	05 over southeast AS off Kerala coast. 05 over central parts of south AS.
Upper Level divergence (X10^{-5} s^{-1})	05-10 over southwest BoB and adjoining eastcentral BoB. 10-20 over Comorin area and adjoining equatorial Indian Ocean.	05-10 over southwest and adjoining southeast AS.

Vertical Wind Shear (VWS knots)	Low (05-20) over south and adjoining central BoB and Andaman Sea.	15-20 over south AS.
Wind Shear Tendency (knots)	Decreasing over eastcentral BoB and also over south & adjoining Equatorial Indian Ocean.	Decreasing over southeast AS & adjoining Equatorial Indian Ocean.
Upper tropospheric Ridge	Along 15.0°N with an anti-cyclone over west-central BoB	Along 13.0°N.

Satellite observations based on INSAT imagery (0900 UTC):

(a) Bay of Bengal & Andaman Sea:
At 0900 UTC, scattered to broken low & medium clouds with embedded intense to very intense convection lay over central BoB and adjoining south BoB and south Andaman Sea. The convection has slightly increased over southwest BoB off north TamilNadu & adjoining south Andhra Pradesh coasts.

(b) Arabian Sea
At 0900 UTC, scattered to broken low & medium clouds with embedded intense to very intense convection lay over south AS and Comorin area

M.J.O. Index:
MJO index is currently in Phase 4 with amplitude close to 1. Thereafter, it will move to phase 5 with amplitude remaining close to 1 for subsequent 3 days and further propagate eastwards into Phase 6 from 1st December onwards.

Storms and Depression over South China Sea/ South Indian Ocean:
No Strom or Depression prevails over these areas as on today.

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

Model	BoB	AS
IMD-GFS	Indicates an LPA over Sri Lanka on 27th & 28th and its weakening & westward movement on 29th. It is also indicating a **Depression** over Gulf of Thailand & adjoining Thailand coast on 29th, its emergence over south Andaman Sea and intensification into a Cyclonic Storm (CS) on 30th, its rapid intensification into an Extremely Severe Cyclonic Storm (ESCS) over southeast BoB and adjoining Andaman Sea on 1st December, its west-northwestward movement over to east-central BoB on 2nd December and over west-central BoB very close to north Andhra Pradesh coast on 3rd December early morning (00 UTC).	Indicates a broad-scale low over southeast AS & Lakshadweep – Maldives area on 29th November, getting amplified as a trough in easterlies from southeast to east-central AS on 30th November and further upto northeast AS on 1st December.
IMD-GEFS	Same as above	Same as above
IMD-WRF	An extended Low over southwest BoB off Sri Lanka coast on 27th, gradual west-ward movement as an LPA across Comorin area during 28th – 29th and merging with the extended Low over southeast AS & Lakshadweep area on 30th November.	An extended Low over southeast AS and Lakshadweep area on 29th & 30th November.
NCMRWF	Indicates an extended Low over	An extended Low over

NCUM(Global)	southwest BoB, Sri Lanka off south Tamil Nadu coast on 27th, over Comorin area & adjoining Gulf of Mannar on 28th and its westward movement over to southeast AS on 29th. Also indicates an LPA over Gulf of Thailand on 30th, over south Andaman Sea off Thailand coast on 1st December, as a Well Marked Low (WML) over southeast BoB & adjoining south Andaman Sea on 2nd and adjoining southeast BoB on 2nd and over central & adjoining south BoB on 3rd. (It is not predicting the Depression intensity, unlike previous runs)	southeast AS and Lakshadweep area on 29th, over southeast AS & Maldives area on 30th November & 1st December and weakening into a trough of Low over east-central & southeast AS on 2nd.
NCMRWF-NEPS	Similar to NCUM-G	Similar to NCUM-G
NCMRWF-UM (Regional)	Similar to NCUM-G upto 30th November.	Similar to NCUM-G upto 30th November.
ECMWF	An LPA emerging over Andaman Sea & adjoining Thailand coast from Gulf of Thailand by 1800 UTC of 30th November, its west-northwestward movement over to southeast BoB with further organization by 2nd December, getting concentrated into a Depression over southwest & adjoining southeast BoB by the midnight (1800 UTC) of 2nd December, as a CS over west-central & adjoining southwest BoB at 1200 UTC of 3rd.	Indicates an extended Low over southeast AS and Lakshadweep area during 29th November – 1st December, its amplification upto east-central & northeast AS / south Gujarat region on 2nd, followed by weakening on 3rd.
ECMWF-EPS	10-20 % probability of cyclogenesis / strike over south Andaman Sea & southeast BoB on 1st Decemner, over southeast & east-central BoB on 2nd and 20-30 % over west-central BoB & adjoining Andhra Pradesh coast on 3rd.	20-30% genesis & strike probability over east-central & northeast AS during 1st – 3rd December.
NCEP-GFS	Indicates an LPA over Sri Lanka coast on 28th, its westward movement and weakening on 29th. A Fresh LPA over east coast of Thailand on 29th, over Gulf of Thailand on 30th November, as a Well Marked Low over Andaman & Nicobar Islands on 1st Dec., as a Depression over southeast BoB on 2nd December and as a CS over west-central BoB on 3rd, early morning, crossing north coastal Andhra Pradesh around 2100 UTC of 3rd December, followed by rapid weakening.	Indicates an extended Low over southeast AS & Lakshadweep area on 29th & 30th Nov. – 1st Dec. and over southeast & adjoining east-central AS on 1st December and weakening on 2nd Dec.
IMD-GPP	Potential zone (very small) over equatorial Indian Ocean off Sumatra coast on 29th, over south Andaman Sea off Thailand coast on 30th November, over south Andaman Sea	NIL

	& adjoining southeast BoB on 1st December, over southeast & adjoining east-central BoB on 2nd and over west-central BoB on 3rd.	

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 formation of a Low Pressure Area (emergence of a Low Pressure system from Gulf of Thailand) over south Andaman Sea around 30th (delayed by 24 hours, when compared to the previous model runs) with initial west-northwestward movement, deepening into a Depression around 3rd December, and continued west-northwestward movement towards west-central Bay of Bengal. However, NCUM group of models are deviating from their previous runs by down grading the probable cyclogenesis during the entire forecast period. All of them also indicate further intensification of this system into a cyclonic storm during the subsequent 24-48 hours time span and reaching near north / central coast of Andhra Pradesh. However, still there is large diversity in the temporal phase of intensification as well as the speed of movement.
2. **For the Arabian Sea**: No cyclogenesis is indicated buy any of the models during next 7 days.

It may thus be concluded that,

1. Emergence of a Low pressure system from Gulf of Thailand into south Andaman Sea is likely around 30th November. It is likely to move west-northwestwards with gradual intensification during 1st & 2nd December. Further it could continue to move west-northwestwards and concentrate into a Depression over central & adjoining south Bay of Bengal during the night (1500 UTC) of 2nd – evening (1200 UTC) of 3rd December. Owing to the temporal variation in the period of formation of the Depression by different models, we are assigning a 'LOW' probability for the 96-120 hrs, 'moderate' for 120-144 hr & 'high' probability during the 144-168 hr forecast periods.
2. No significant development is likely over the Arabian Sea, apart from the probable amplification of a trough of Low along the west coast of India during 30th November – 2nd December.

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	LOW	MODERATE	HIGH

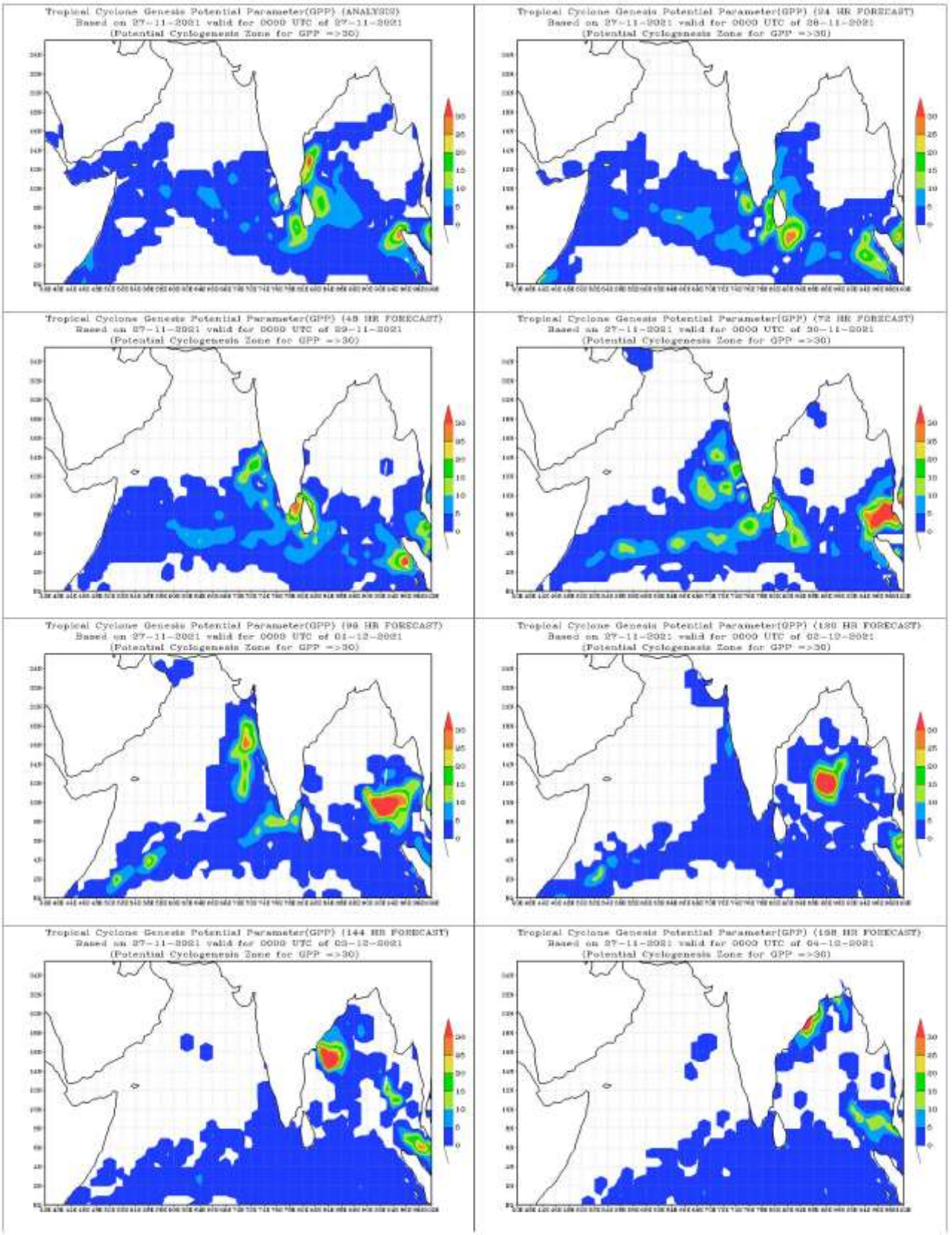
Probability of cyclogenesis (formation of depression and above intensity systems) over the Arabian Sea during next 168 hours:

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 Gulf of Thailand to Andaman Sea as a Low pressure area around 30th November and it's subsequent intensification and movement to be monitored regularly.

IOP is suggested for Andaman & Nicobar Islands on 30th November & 1st December.

Annexure


Tropical Cyclone Genesis Potential Parameter(GPP) (ANALYSIS)
Based on 27-11-2021 valid for 0000 UTC of 27-11-2021
(Potential Cyclogenesis Zone for GPP =>30)
Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 27-11-2021 valid for 0000 UTC of 28-11-2021
(Potential Cyclogenesis Zone for GPP =>30)
Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
Based on 27-11-2021 valid for 0000 UTC of 29-11-2021
(Potential Cyclogenesis Zone for GPP =>30)
Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 27-11-2021 valid for 0000 UTC of 30-11-2021
(Potential Cyclogenesis Zone for GPP =>30)
Tropical Cyclone Genesis Potential Parameter(GPP) (96 HR FORECAST)
Based on 27-11-2021 valid for 0000 UTC of 01-12-2021
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Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
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Tropical Cyclone Genesis Potential Parameter(GPP) (144 HR FORECAST)
Based on 27-11-2021 valid for 0000 UTC of 03-12-2021
(Potential Cyclogenesis Zone for GPP =>30)
Tropical Cyclone Genesis Potential Parameter(GPP) (168 HR FORECAST)
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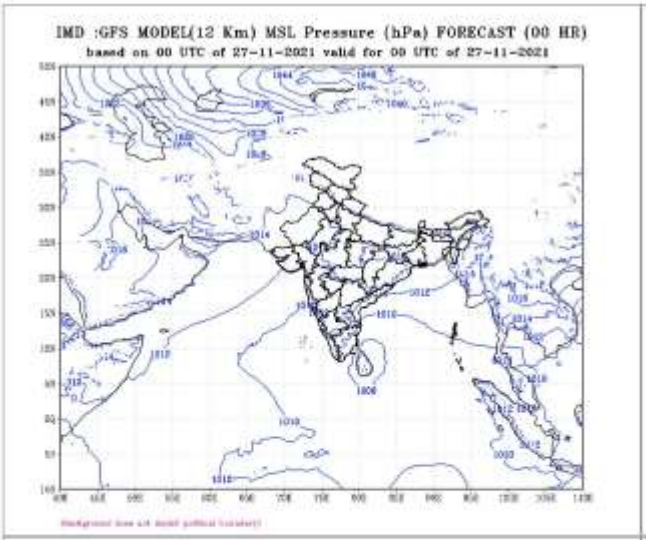
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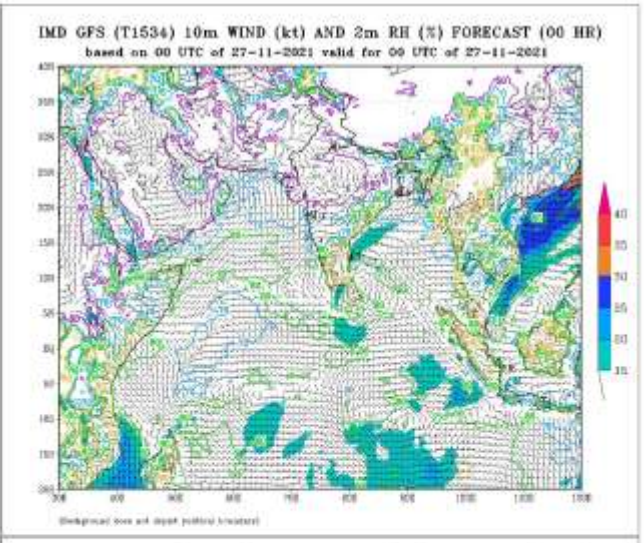
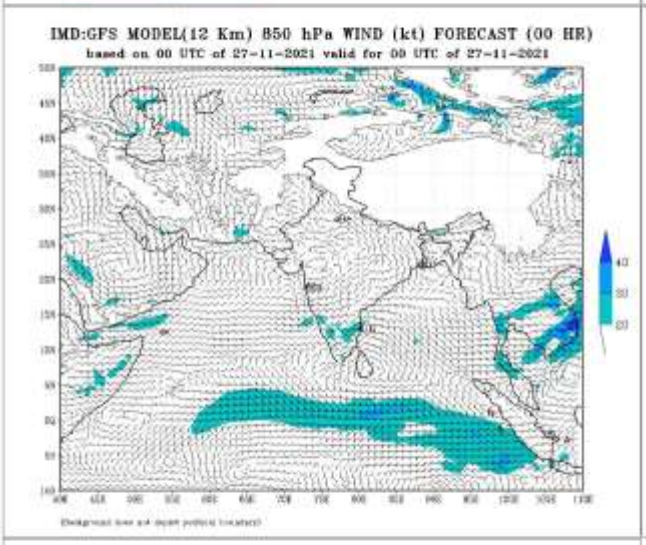
based on 00 UTC of 27-11-2021 valid for 00 UTC of 27-11-2021


IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (00 HR)
based on 00 UTC of 27-11-2021 valid for 00 UTC of 27-11-2021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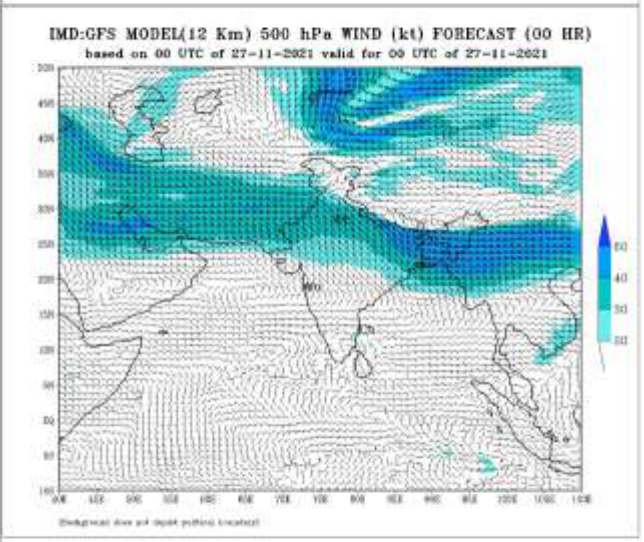
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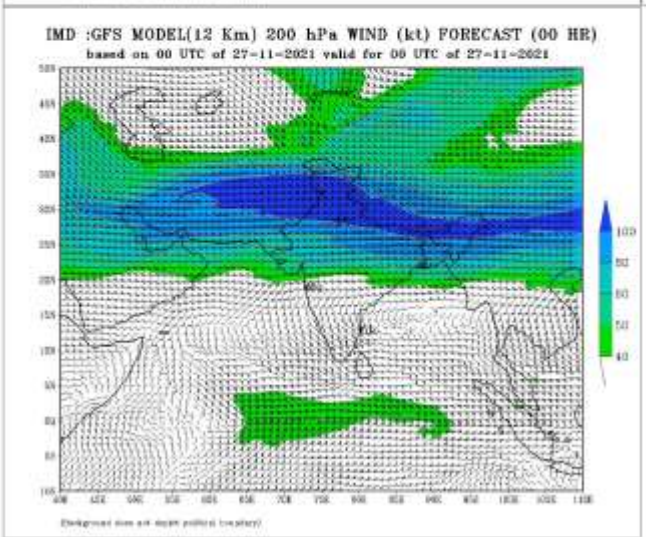
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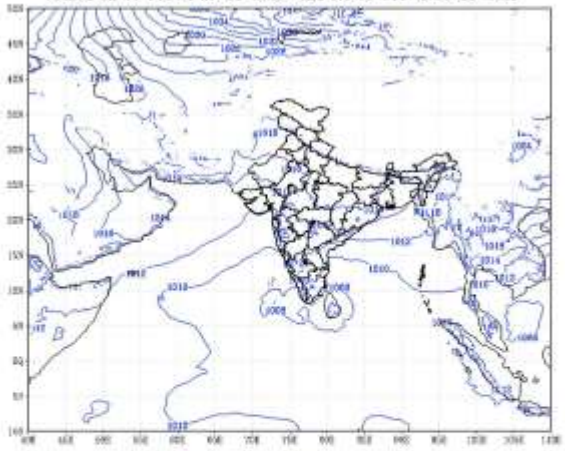
based on 00 UTC of 27-11-2021 valid for 00 UTC of 28-11-2021



IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (24 HR)
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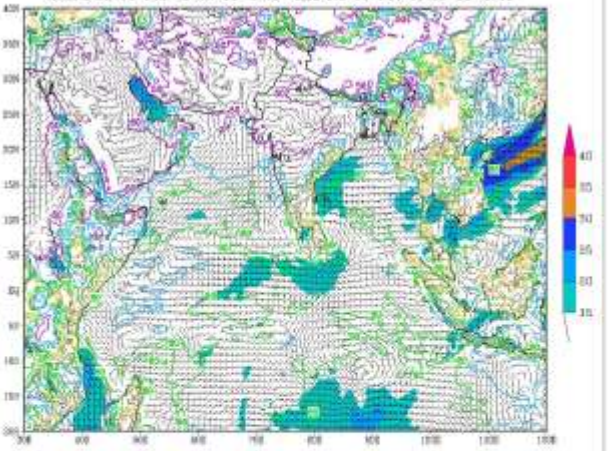

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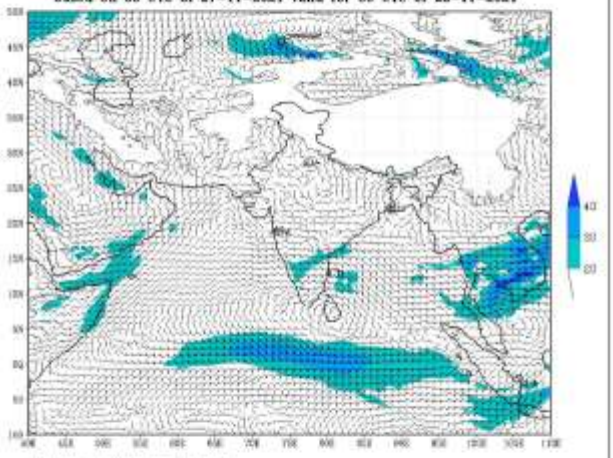

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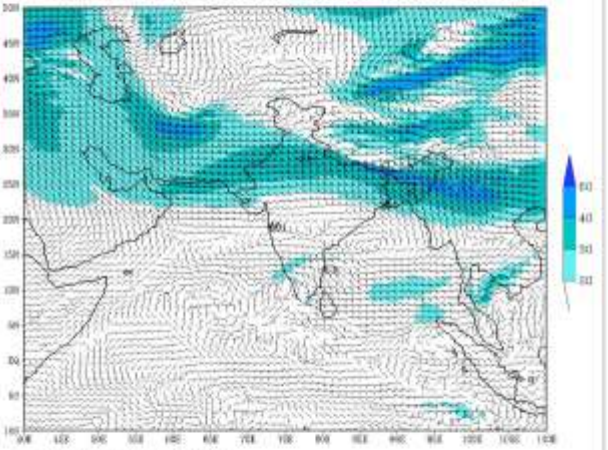

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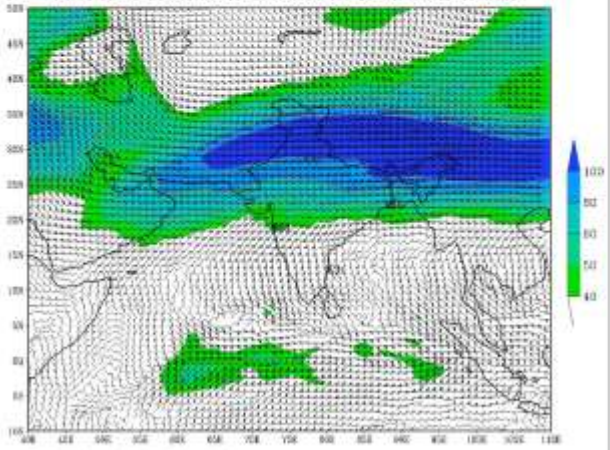
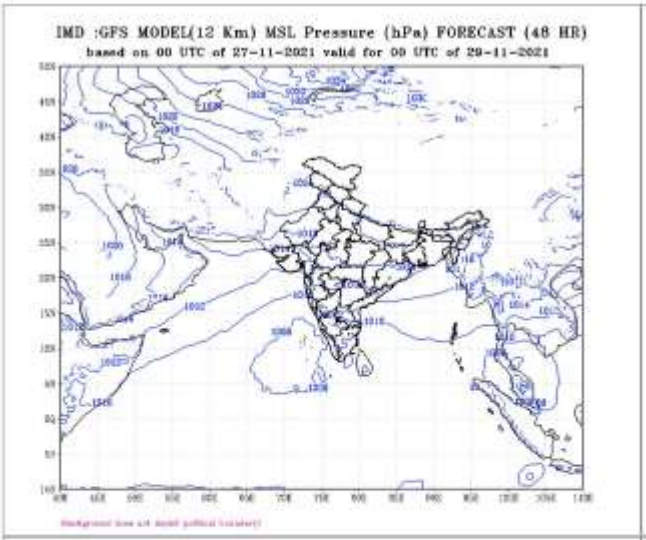
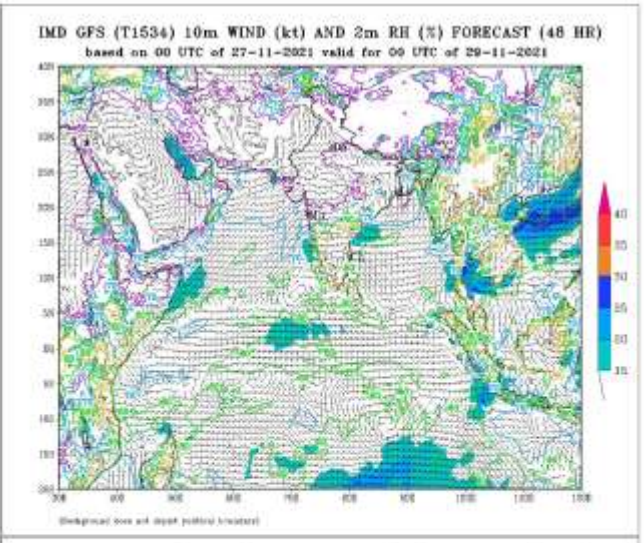
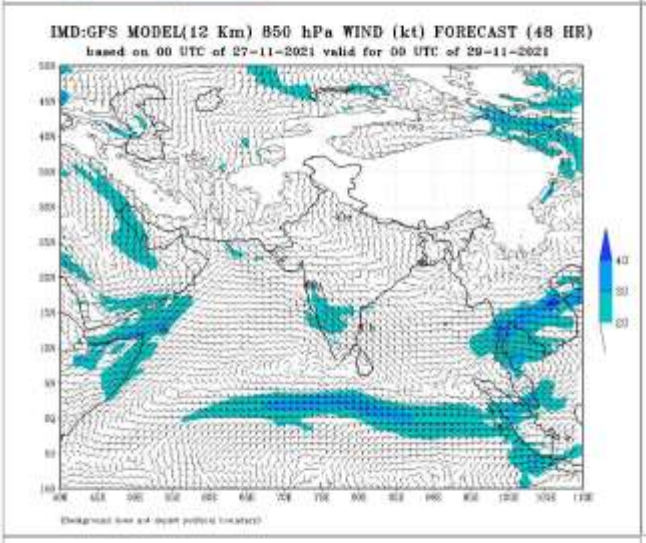



IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 27-11-2021 valid for 00 UTC of 29-11-2021


IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (48 HR)
based on 00 UTC of 27-11-2021 valid for 00 UTC of 29-11-2021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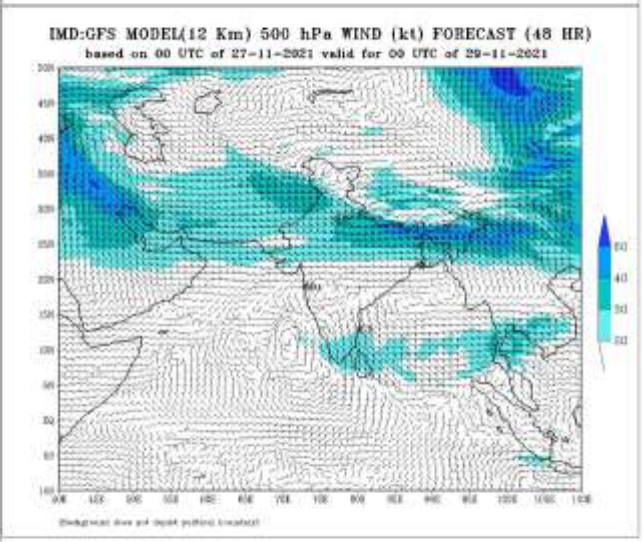
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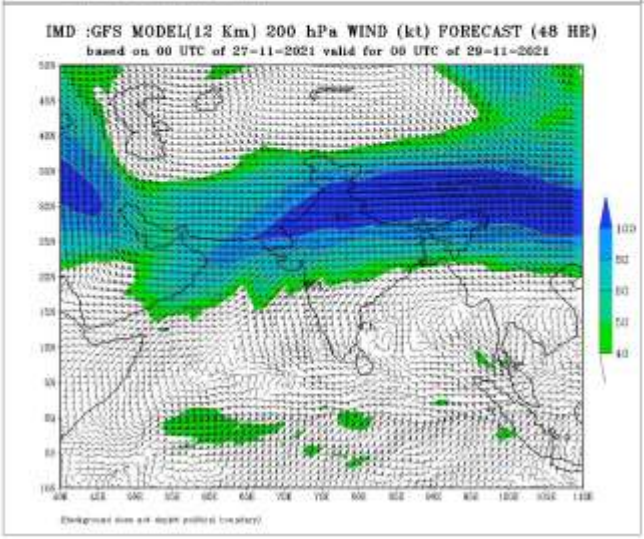
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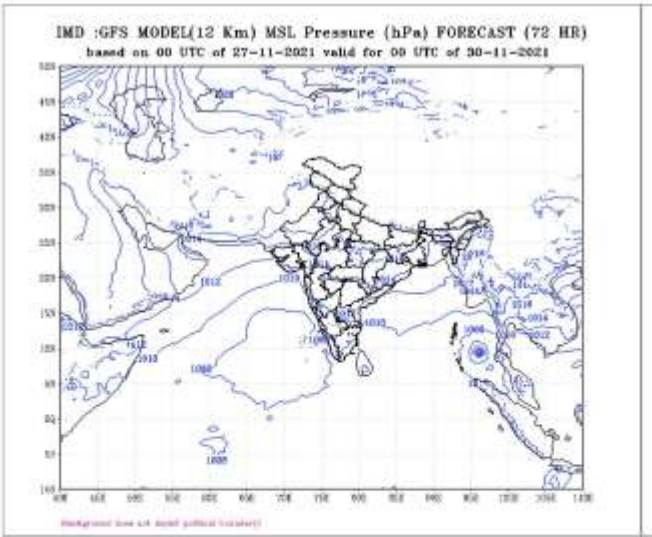
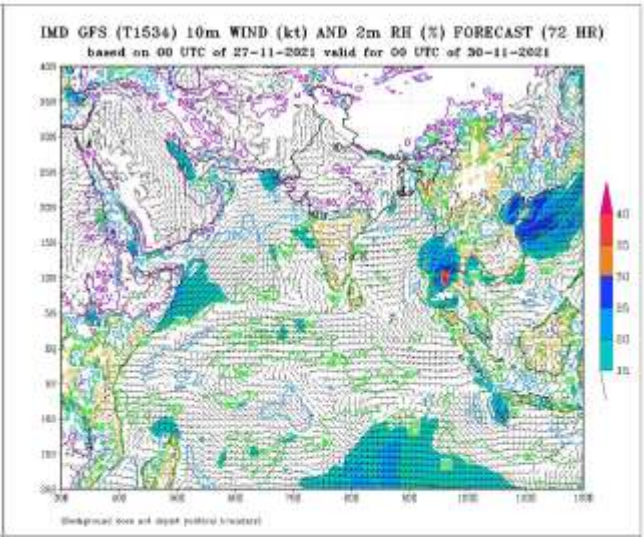

IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 27-11-2021 valid for 00 UTC of 30-11-2021


IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (72 HR)
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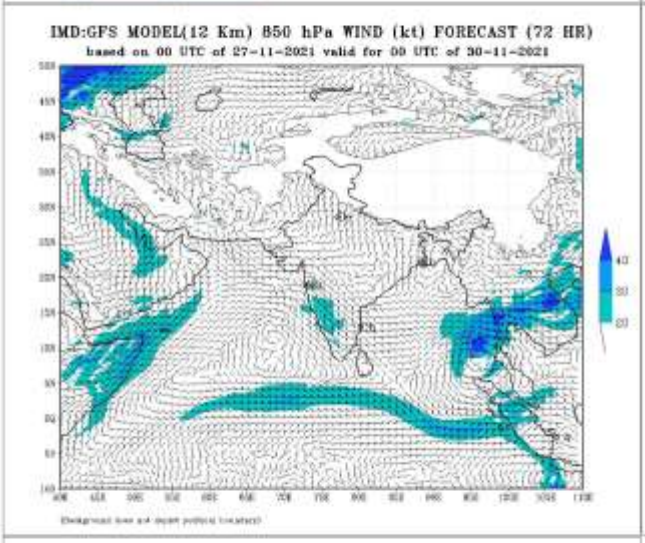
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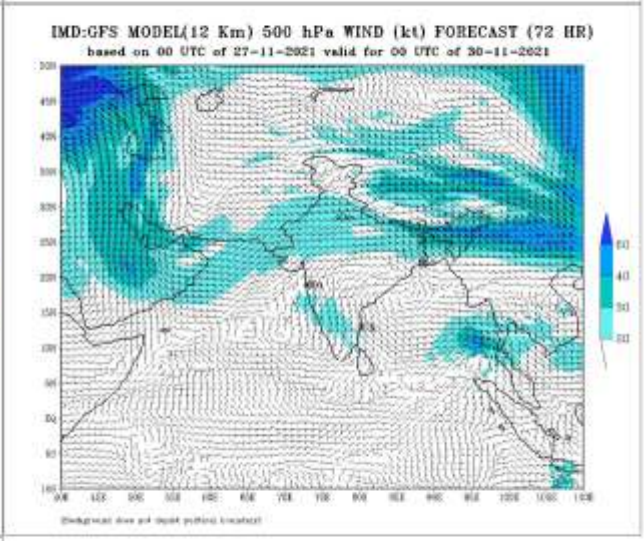
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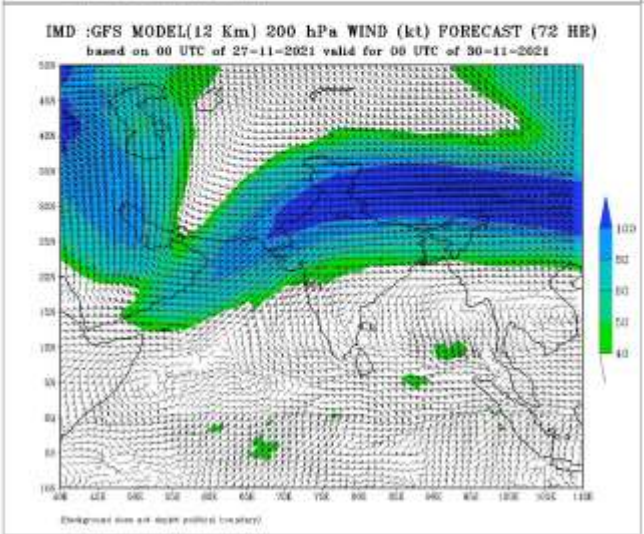
IMD :GFS MODEL(12 Km) 200 hPa WIND (kt) FORECAST (72 HR)
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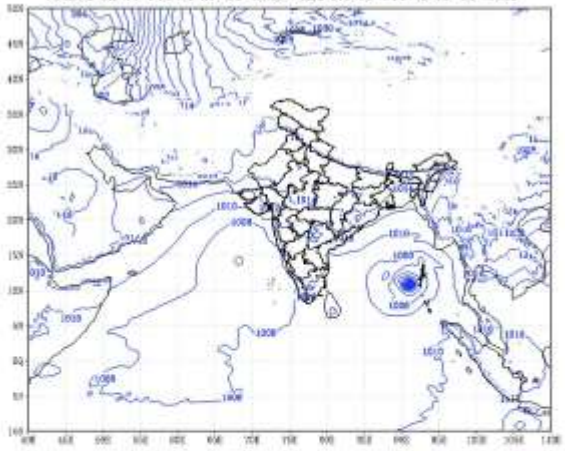
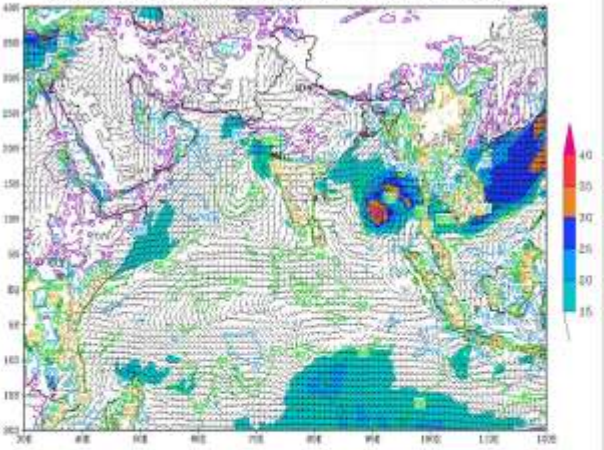
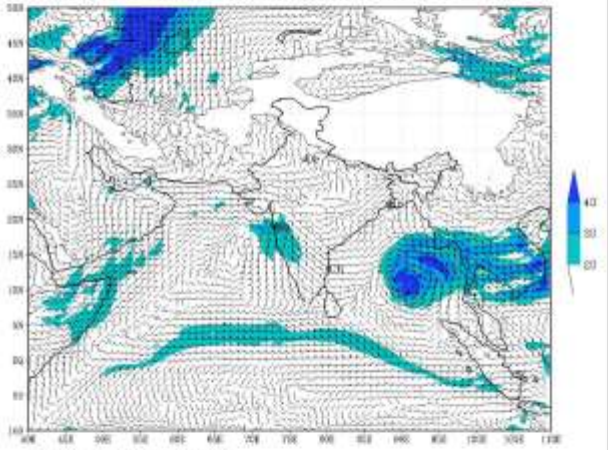
IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 27-11-2021 valid for 00 UTC of 01-12-2021



IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (96 HR)
based on 00 UTC of 27-11-2021 valid for 00 UTC of 01-12-2021



IMD:GFS MODEL(12 Km) 850 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 27-11-2021 valid for 00 UTC of 01-12-2021



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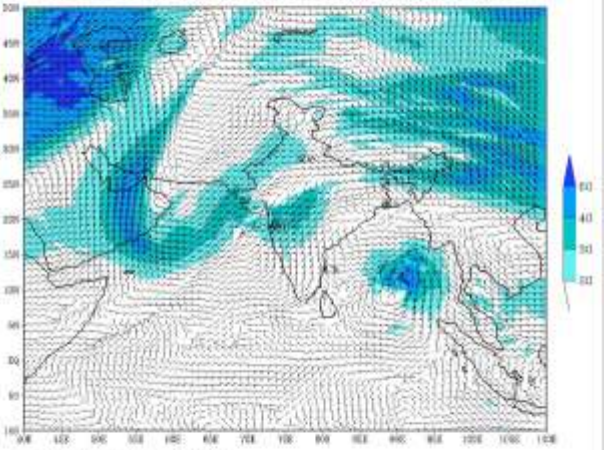

IMD :GFS MODEL(12 Km) 200 hPa WIND (kt) FORECAST (96 HR)
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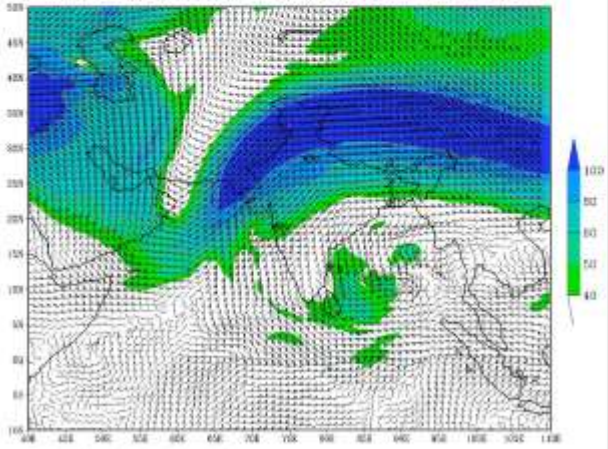

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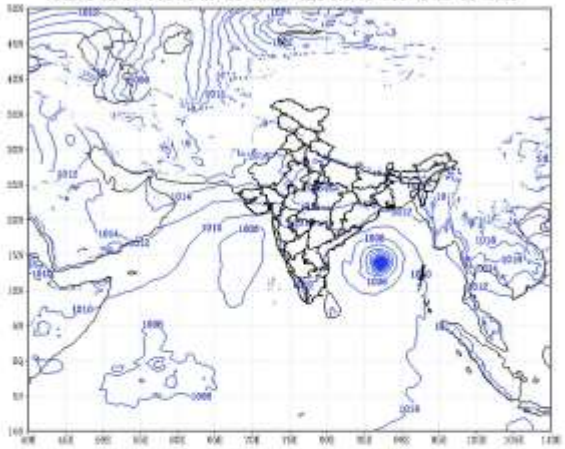

IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (120 HR)
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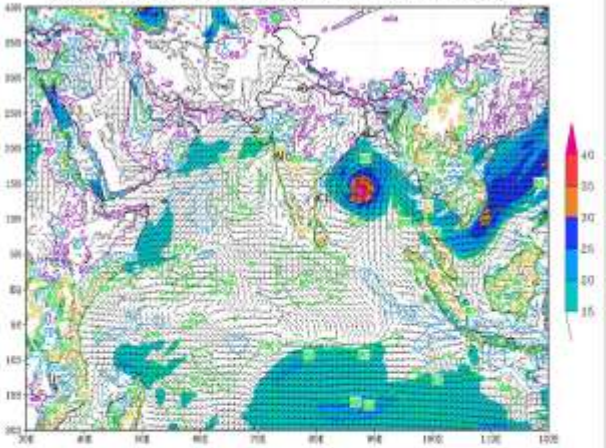
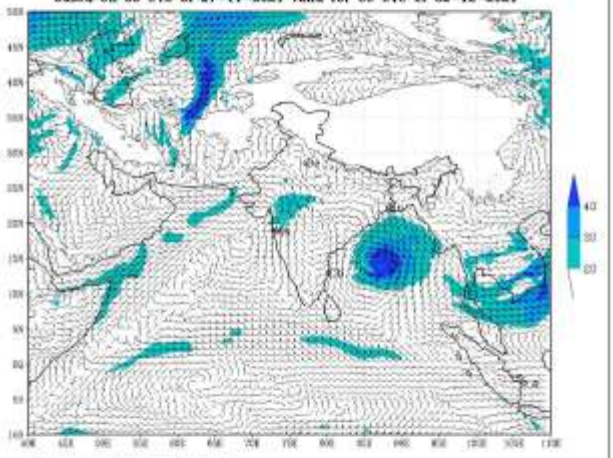
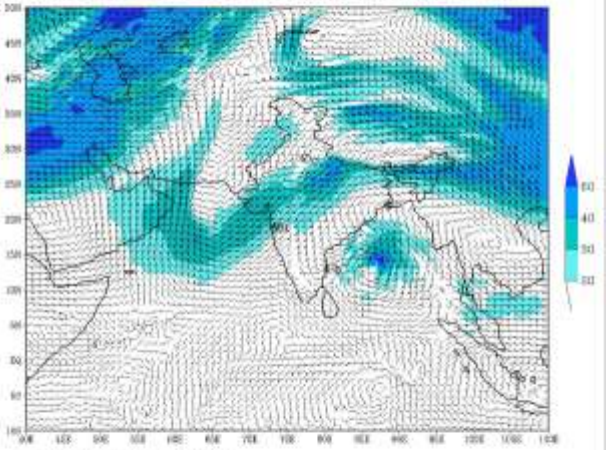


IMD:GFS MODEL(12 Km) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 27-11-2021 valid for 00 UTC of 02-12-2021



IMD:GFS MODEL(12 Km) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 27-11-2021 valid for 00 UTC of 02-12-2021



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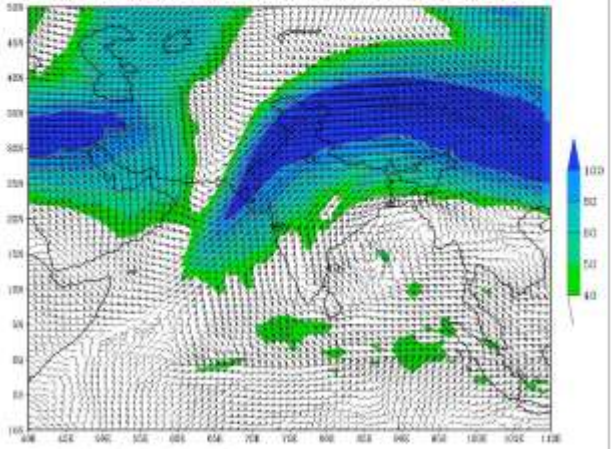
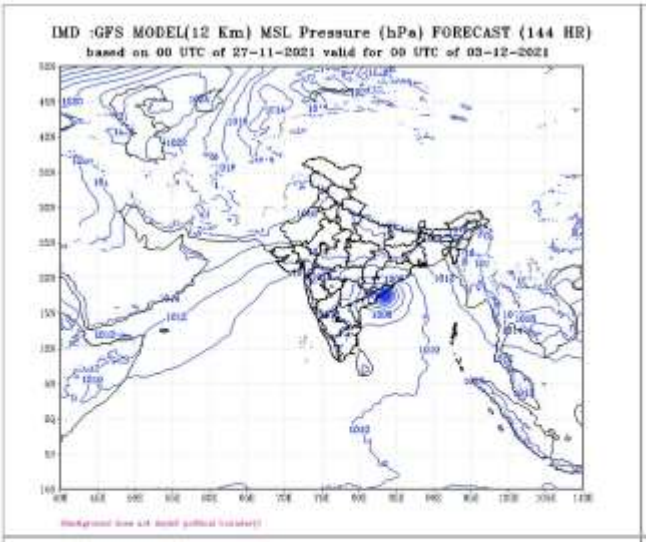
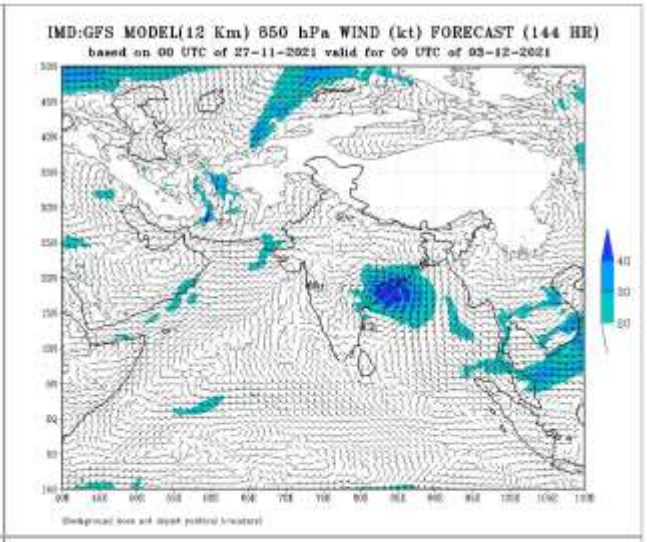
based on 00 UTC of 27-11-2021 valid for 00 UTC of 02-12-2021




IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (144 HR)
based on 00 UTC of 27-11-2021 valid for 00 UTC of 03-12-2021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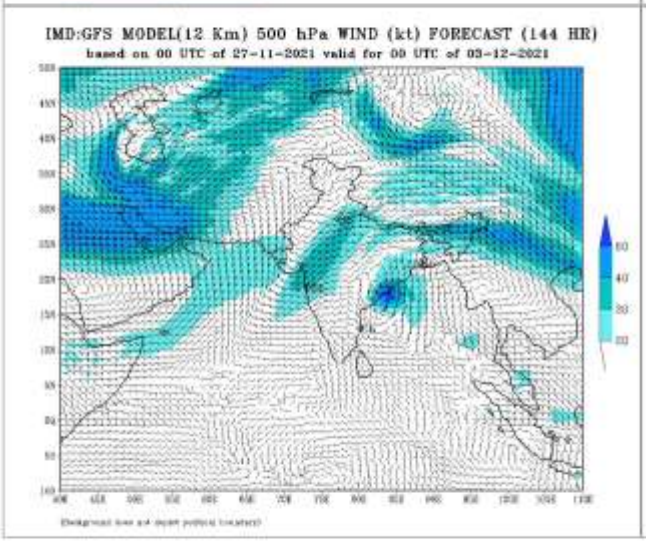
based on 00 UTC of 27-11-2021 valid for 00 UTC of 03-12-2021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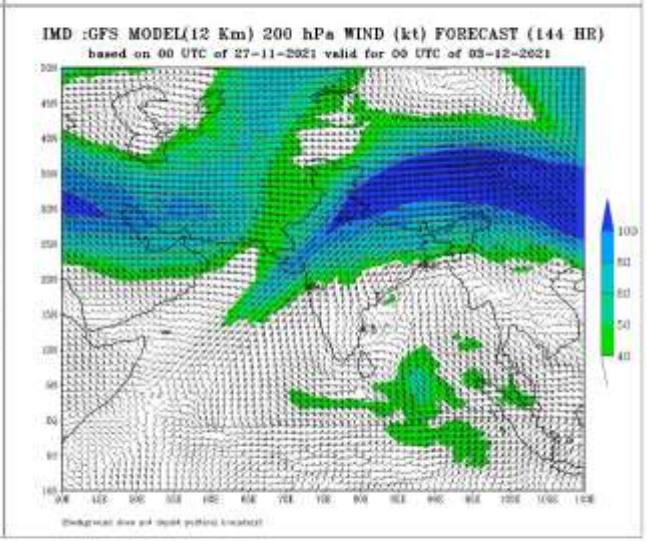
based on 00 UTC of 27-11-2021 valid for 00 UTC of 03-12-2021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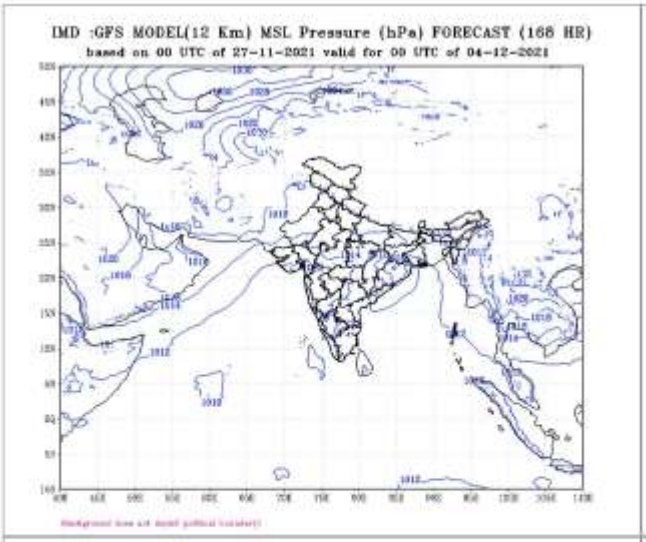
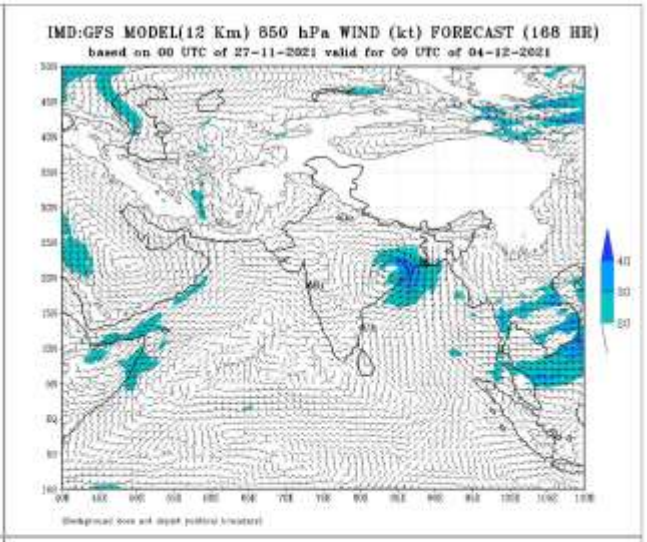
based on 00 UTC of 27-11-2021 valid for 00 UTC of 03-12-2021


IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (168 HR)
based on 00 UTC of 27-11-2021 valid for 00 UTC of 04-12-2021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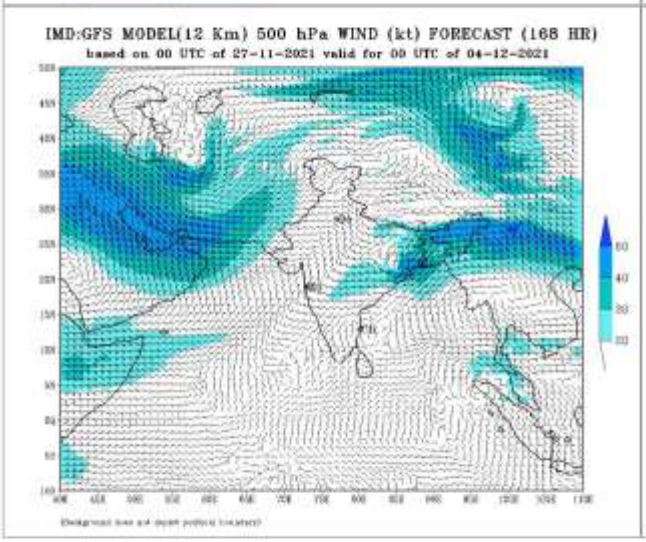
based on 00 UTC of 27-11-2021 valid for 00 UTC of 04-12-2021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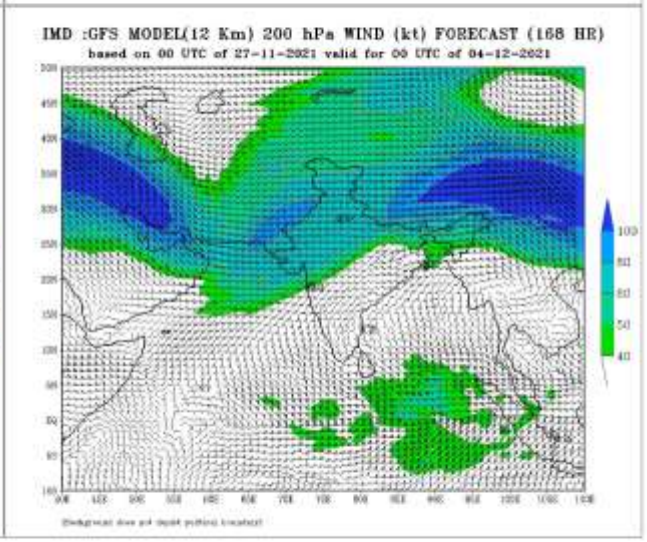
based on 00 UTC of 27-11-2021 valid for 00 UTC of 04-12-2021


IMD :GFS MODEL(12 Km) 200 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 27-11-2021 valid for 00 UTC of 04-12-2021