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

Tropical Cyclone Forecast Programme
Report Dated 08th December 2022

Time of Issue: 1200 UTC

Synoptic features (based on 0600 UTC analysis):

Yesterday's Deep Depression over Southwest & adjoining Southeast Bay of Bengal moved west-northwestwards and lay centred at 1730 hours IST of today, the 07th December, 2022 over Southwest and adjoining Southeast Bay of Bengal, near latitude 8.9°N and longitude 85.0°E. Thereafter, it moved nearly west-northwestwards, intensified into a cyclonic storm "Mandous" pronounced as "Man-Dous" over Southwest Bay of Bengal, near latitude 9.2°N and longitude 84.6°E around midnight (2330 hours IST) of 7th December. It then continued to move nearly west-northwestwards and lay centered in the morning (0830 hours IST) of 08th December 2022 over Southwest Bay of Bengal, near latitude 9.5°N and longitude 83.8°E, about 300 km east-northeast of Trincomalee (Sri Lanka), 420 km east-southeast of Jaffna (Sri Lanka), 460 km east-southeast of Karaikal and about 550 km southeast of Chennai.

Dynamical and thermo-dynamical features

Parameter	Bay of Bengal (BoB)	Arabian Sea (AS)
Sea Surface Temperature (SST) ºC	Around 28^{0}C over southwest and central BoB. It decreases to 27^{0}C over along and off north Tamil Nadu and adjoining Andhra Pradesh coasts.	About 28-29°C over the southeast and adjoining southwest AS along and off Karnataka and Kerala, 26-28°C over eastcentral and adjoining north AS, 25-26°C over south Gujarat coasts, southwest AS.
Tropical Cyclone Heat Potential (TCHP) kJ/cm^2	80-100 KJ/cm2 over southwest BoB and less than 50 KJ/cm2 over westcentral and southwest BoB along east coast of India.	70-90 over southeast and adjoining eastcentral and adjoining southwest AS, and less than 40 over remaining AS and also off west coast of India, Comorin area.
Cyclonic Relative vorticity (X10^{-6}s^{-1})	250 around system center.	10-20 over north AS, southeast AS & adjoining EIO.
Low Level convergence (X10^{-5} s^{-1})	60 to the west of system center.	Small pocket of 5 over southeast AS and adjoining EIO.
Upper Level divergence (X10^{-5} s^{-1})	50 to the north of system center.	20-30 over southeast AS, Lakshadweep, Maldives and Comorin area, 5-10 o9ver southeast AS.
Vertical Wind Shear (VWS knots)	Moderate 25-30 knots over and around system center and along	5-10 over parts of central AS, more than 25 over rest of AS.

	the expected track.	
Wind Shear Tendency (knots)	Decreasing over south Andaman Sea & adjoining southeast & westcentral BoB.	Decreasing over north AS.
Upper tropospheric Ridge	Along 15.0°N over the BoB.	Along 10.0°N over the AS.
Trough in westerlies	No significant trough	

Satellite observations based on INSAT imagery (0600 UTC):

a) Over the BoB & Andaman Sea: -

As per INSAT 3D Imagery, The Convection shows curved band pattern with intensity T3.0. The associated broken low and medium clouds with embedded intense to very intense convection lies over southwest Bay of Bengal between area latitude 6°N to 12.5°N and longitude between 81.0°E to 85.5°E. The cloud top temperature od -93°C. The maximum sustained surface wind speed is 40 knots gusting to 50 knots. The estimated central pressure is about 995 HPa. Sea condition is very rough to high over southwest Bay of Bengal and neighborhood.

b) Over the Arabian Sea: -

Associated scattered low and medium clouds with embedded intense to very intense convection lay over southwest Arabian Sea. Scattered low and medium clouds with embedded moderate to intense convection lay over eastcentral & southeast Arabian sea and Comorin area.

M.J.O. Index:

The Madden Julian Oscillation (MJO) Index is currently in Phase 3 with amplitude less than 1. It will continue in same phase for next 1 day. Thereafter, it will move to phase 4 and remain there for another 2 days.

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

NIL

Model guidance based on 0000 UTC for the next 7 days

MODEL GUIDANCE	Bay of Bengal (BoB)	Arabian Sea (AS)
IMD-GFS	The cyclonic storm (CS) over southwest BoB as on today 8th. It will intensify into severe cyclonic storm (SCS) over southwest BoB on 8th evening. It moves west-northwestward and weaken to CS over southwest BoB by 9th morning off north Tamil Nadu – south Andhra Pradesh coasts and further weaken at 0000UTC of 10th Dec as DD. It will make landfall along north Tamil Nadu – south Andhra Pradesh coasts between 1800UTC of 9th and 2100UTC of 9th Dec as a DD/CS (with MSD 32kts) near lat/lon of 12.8°N/80.2°E.	No significant system
IMD-GEFS	The severe cyclonic storm (SCS) over southwest BoB as on today, 8th Dec. It will move in west-northwest ward and lay as CS	No significant system

	over southwest BoB on 9th, and close to north Tamil Nadu – south Andhra Pradesh coast on 10th Dec morning as DD. It will make landfall along north Tamil Nadu – south Andhra Pradesh coasts between 1800UTC of 9th Dec. and 2100UTC of 9th Dec as a DD (with MSD 31kts) near lat/lon of 13.5°N/80.2°E.	
GEFS Probabilistic guidance	Based on the models guidance, 70-95 % probability is indicating that system to make landfall along north Tamil Nadu – south Andhra Pradesh coast as a DD between lat/lon 10.0°N/79.8°E to lat/lon 13.3°N/80.2°E with probability as 70-95% of MSD more than (with MSD 24 kts).	Not available
IMD WRF	The severe cyclonic storm (SCS) over southwest BoB on 8th, will move in west-northwest ward and will lay as SCS over southwest BoB on 0000 UTC 9th Dec. It weakens to CS and then will make landfall along north Tamil Nadu – south Andhra Pradesh coasts 0000 UTC of 10th Dec. as a CS (with MSD 40 kts) near lat/lon of 13.5°N/80.3°E.	No significant system within forecast duration.
NCMRWF-NCUM	The Cyclonic storm on 8th Dec. over southwest BoB, will move in west-northwestward direction intensify into SCS over SW BoB off north Tamil Nadu – south Andhra Pradesh coast on 0000 UTC of 9th Dec. It will make its landfall around 2100 UTC of 9th Dec as a CS (with MSD 42kts) near lat/lon 12.2°N/79.6°E	No significant system
NCMRWF-NEPS	It show as SCS over southwest BoB close to northeast of Sri Lanka coast at 0000 UTC on 8th, over SW BoB off north Tamil Nadu – south Andhra Pradesh coast. It remains as SCS on 9th Dec., and it weakens and then makes landfall as CS around 00UTC of 10th Dec as a CS (with MSD 40kts) near lat/lon 12.1°N/80.0°E	No significant system
NCMRWF-UM (Regional)	The CS over southwest BoB on 0000UTC of 8th Dec. intensify into SCS over southwest BoB close to Tamil Nadu - Puducherry coast by 8th Dec evening. It will move west-northwestwards and lay centred on 0000UTC of 9th Dec over SW BoB off north Tamil Nadu – south Andhra Pradesh coast as CS. It will make its landfall around 0000 UTC of 10th Dec as a CS (with MSD 41kts) near lat/lon 12.8°N/80.2°E.	No significant system
ECMWF	The Cyclonic Storm (CS) over southwest BoB moved west-northwestwards and further intensifies into SCS by night of 8th Dec. Then it maintains its intensity as SCS over SW BoB till 0600 UTC of 9th Dec. Models shows weakening to CS in the afternoon with west-northwestwards movement at 1200 UTC towards north Tamil Nadu – south Andhra Pradesh coasts. It will make landfall close to north Tamil Nadu – south Andhra Pradesh	No significant system

	coast on 9th between 1800 UTC and 2100 UTC as a CS (with MSD 35kts) near lat/lon 13.0°N/80.05°E	
ECMWF ensemble	The Cyclonic Storm over southwest BoB on the 8th morning moved west-northwestwards as CS with 70-90% probability on 9th Dec. and will reach north Tamil Nadu – south Andhra Pradesh coast on 12 UTC of 9th Dec. It will make landfall as DD (with MSD 32kts) near lat/lon 13.2°N/80.2°E	No significant system
NCEP-GFS	The CS over southwest BoB on 0000 UTC of 8th Dec. over southwest BoB. It will move west-northwestwards close to north Tamil Nadu – south Andhra Pradesh coast on 10th. It will make landfall close to north Tamil Nadu – south Andhra Pradesh coast between 12UTC-18UTC of 9th as a CS (with MSD 42kts) near lat/lon 12.2°N/80.0°E	No significant system
IMD MME	The CS over southwest BoB on 0000 UTC 8th Dec. intensify into SCS by 8th evening. It will then move northwestwards gradually decrease into CS on 00UTC of 9th Dec. it will then move west-northwestwards and will weaken into DD over southwest Bay close to north Tamil Nadu – south Andhra Pradesh coast on 10th. It will make landfall close to north Tamil Nadu – south Andhra Pradesh coast on 10th 0000 UTC as a DD (with MSD 27kts) near lat/lon 12.37°N/80.23°E	No significant system
IMD HWRF	The CS over southwest BoB on the 0000UTC of 8th Dec intensify into severe cyclonic storm (SCS) 1200 UTC of 8th Dec. It moves west northwestwards gradually decrease into CS on 00UTC of 9th Dec. It will make landfall close to north Tamil Nadu – south Andhra Pradesh coast around 10th 0000 UTC as a DD (with MSD 28kts) near lat/lon 12.7°N/80.6°E	No significant system
IMD-Genesis Potential Parameter	A significant potential zone over south-southeast BoB as on 8th Dec. having west-northwestwards movement.	No potential zone over Arabian Sea during next 7 days

Summary and conclusion:

Most of the NWP models are indicating the present Cyclonic Storm "Mandous" (pronounced as "Man-Dous") over Southwest Bay of Bengal likely to continue to move west-northwestwards and intensify further into severe cyclonic storm by evening of today. It will maintain its intensity of severe cyclonic storm till early morning of 9th Dec. and then weaken gradually into a cyclonic storm tomorrow.

It will have west-northwest ward movement. All the models are unanimously indicating its intensification into severe cyclonic storm by 1200 UTC of 8th Dec and west-northwestwards movement, except NCEP GFS which are indicating the system will remain as CS.

Table 1 shows summary of various models in terms of Landfall timing, location and intensity at the time of crossing coasts based upon MME-IMD, ECMWF, HWRF, NCUM, IMD-GFS, IMD-GEFS, NEPS, NEPS-R. Most of the models are indicating landfall by mid-

night of 9th Dec with intensity as CS with MSD as 40 kts (with a maximum sustained wind speed of 65-75 kmph gusting to 85 kmph) along north Tamil Nadu, Puducherry-south Andhra Pradesh coasts between 12°N to 13.0°N between Puducherry and Sriharikota near 12.6°N/79.0°E whereas, IMD-GFS are indicating its landfall around 10th Dec.

In view of all the above, it is inferred that

1. For the Bay of Bengal:

The cyclonic storm "Mandous" pronounced as "Man-Dous" over Southwest Bay of Bengal very likely to move west-northwestwards and intensify further into a Severe Cyclonic Storm during next 06 hours. It will maintain its intensity of Severe Cyclonic Storm till early morning of 9th December and then weaken gradually into a cyclonic storm tomorrow. It is very likely to cross north Tamilnadu, Puducherry and adjoining south Andhra Pradesh coasts between Puducherry and Sriharikota, around Mahabalipuram with a maximum sustained wind speed of 65-75 kmph gusting to 85 kmph around midnight of 09th December

2. For the Arabian Sea:
No significant system during next 7 days

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

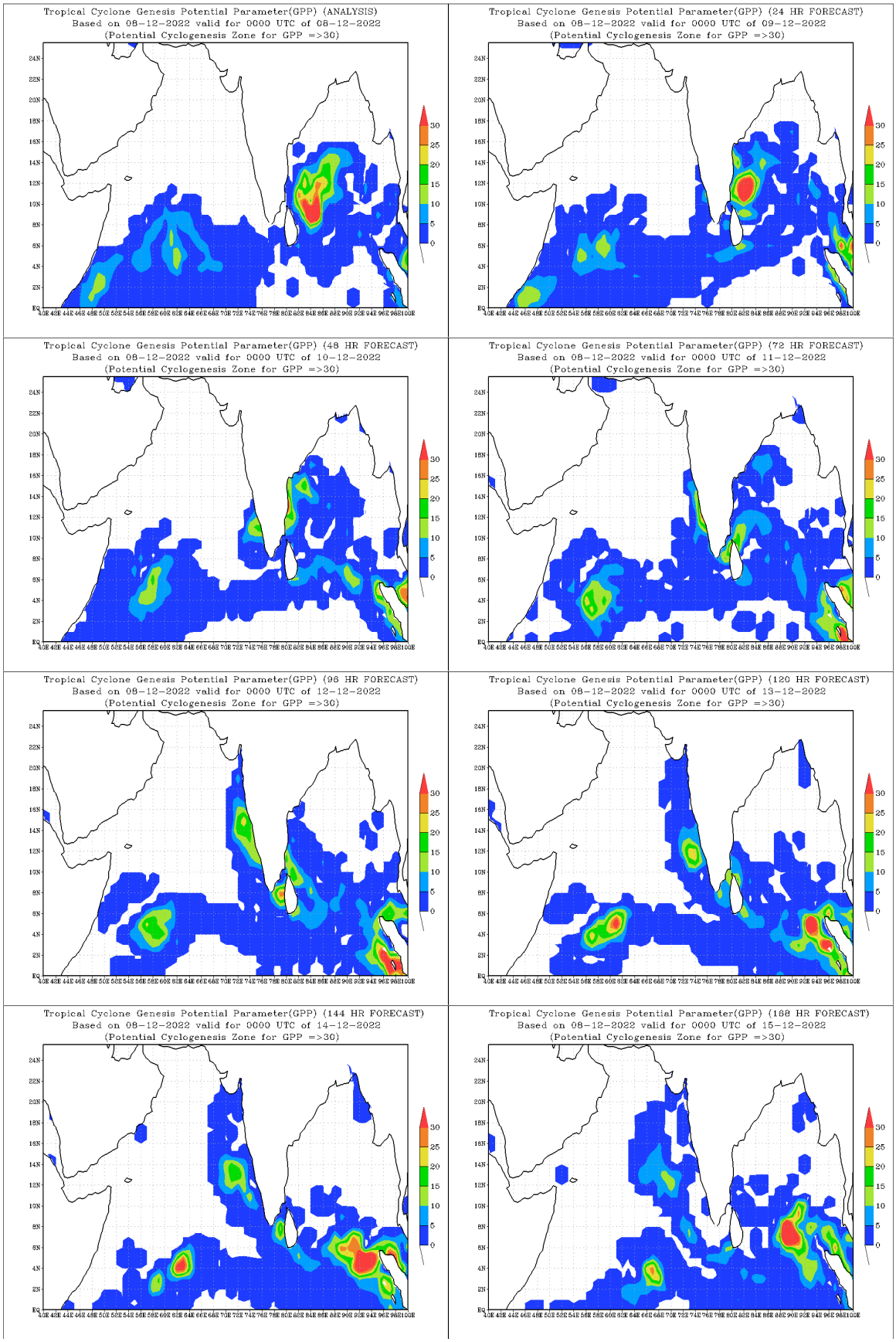
24 HOURS	24-48 HOURS	48-72 HOURS	72-96 HOURS	96-120 HOURS	120-144 HOURS	144-168 HOURS
NIL	NIL	NIL	NIL	NIL	NIL	NIL

Advisory:

System is under continuous surveillance

IOP: NIL

Annexure


Tropical Cyclone Genesis Potential Parameter(GPP) (ANALYSIS)
Based on 08-12-2022 valid for 0000 UTC of 08-12-2022
(Potential Cyclogenesis Zone for GPP =>30)
Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 08-12-2022 valid for 0000 UTC of 09-12-2022
(Potential Cyclogenesis Zone for GPP =>30)
Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
Based on 08-12-2022 valid for 0000 UTC of 10-12-2022
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Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
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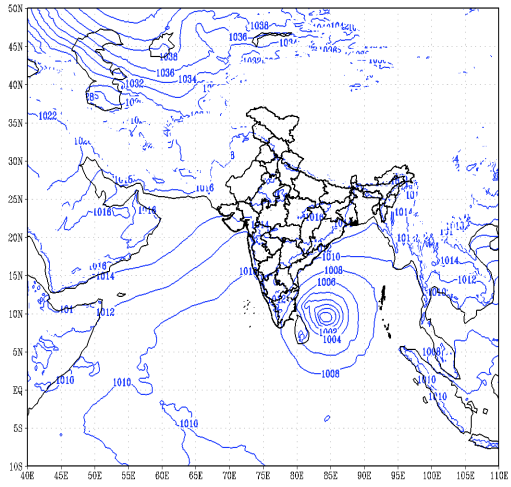
Tropical Cyclone Genesis Potential Parameter(GPP) (96 HR FORECAST)
Based on 08-12-2022 valid for 0000 UTC of 12-12-2022
(Potential Cyclogenesis Zone for GPP =>30)
Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 08-12-2022 valid for 0000 UTC of 13-12-2022
(Potential Cyclogenesis Zone for GPP =>30)
Tropical Cyclone Genesis Potential Parameter(GPP) (144 HR FORECAST)
Based on 08-12-2022 valid for 0000 UTC of 14-12-2022
(Potential Cyclogenesis Zone for GPP =>30)
Tropical Cyclone Genesis Potential Parameter(GPP) (168 HR FORECAST)
Based on 08-12-2022 valid for 0000 UTC of 15-12-2022
(Potential Cyclogenesis Zone for GPP =>30)

IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (00 HR)
based on 00 UTC of 08-12-2022 valid for 00 UTC of 08-12-2022



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IMD: GFS(12Km) 10m WIND (barb)& GUST (shaded:kt) FORECAST (00 HR)
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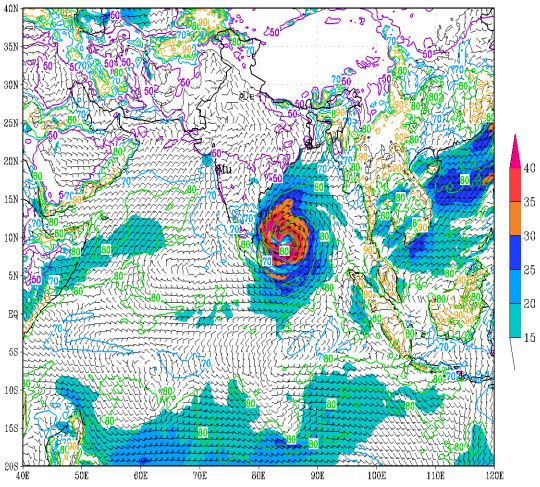

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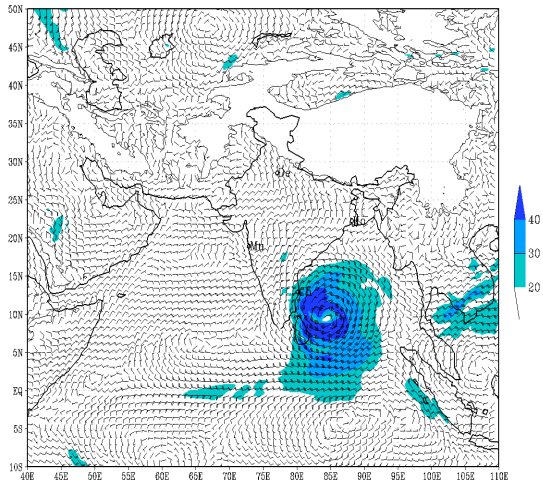

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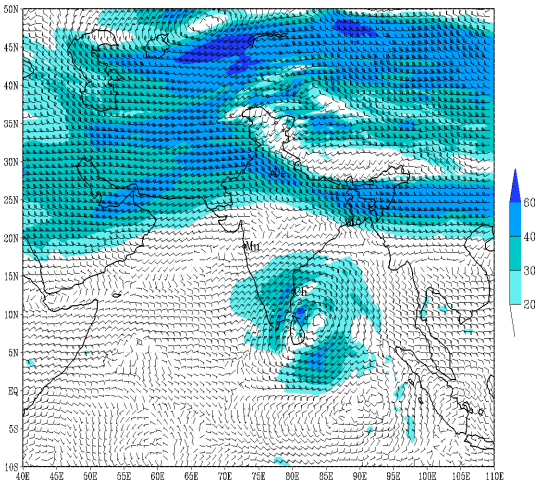

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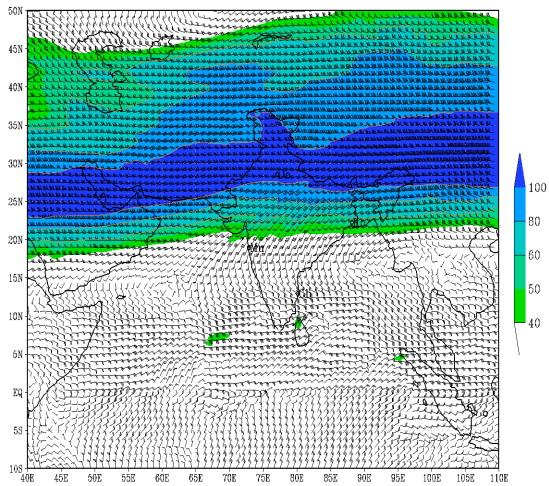

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IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (24 HR)
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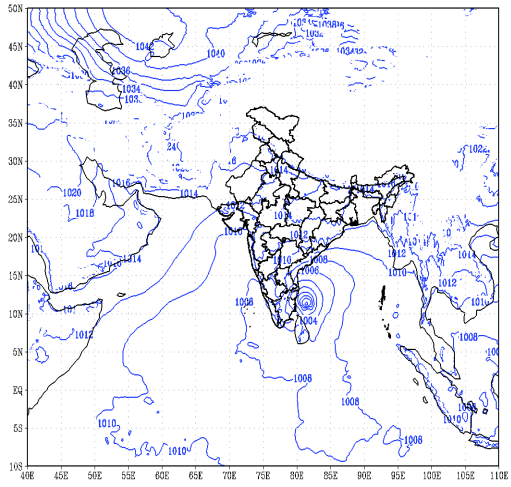

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IMD: GFS(12Km) 10m WIND (barb)& GUST (shaded:kt) FORECAST (24 HR)
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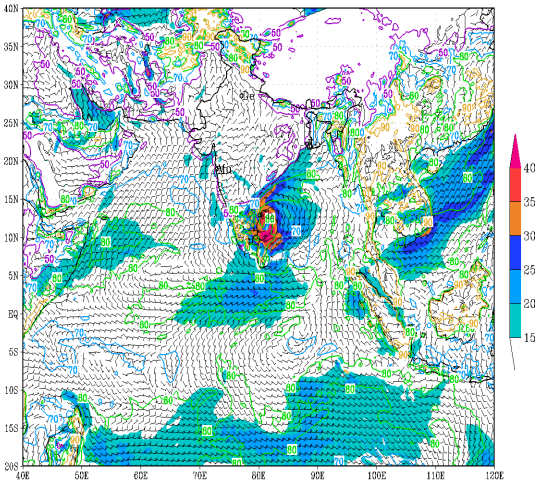

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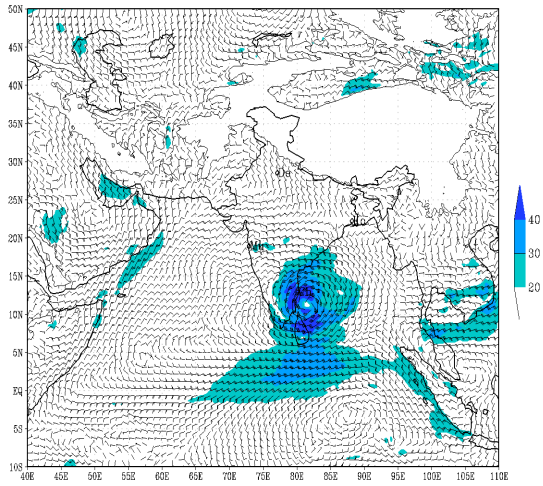

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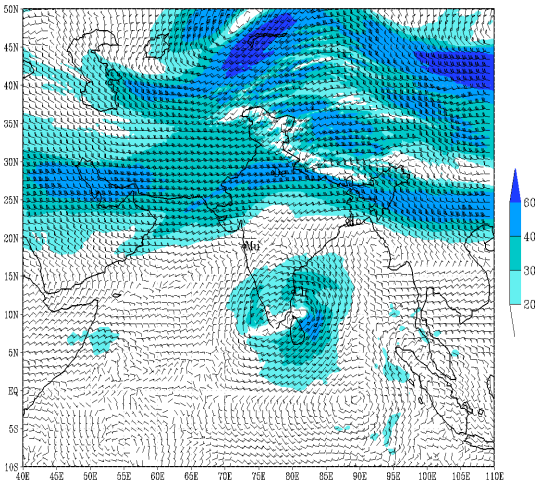

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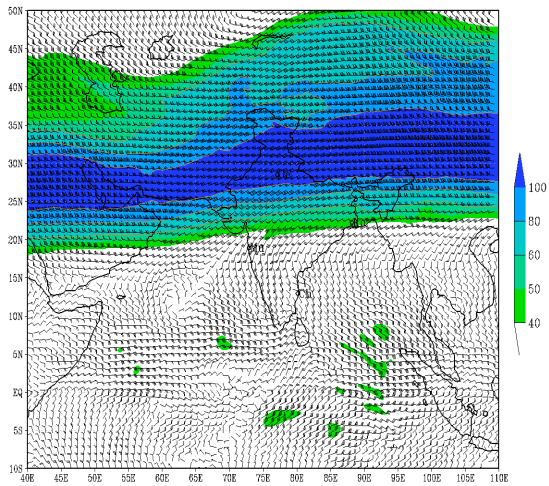

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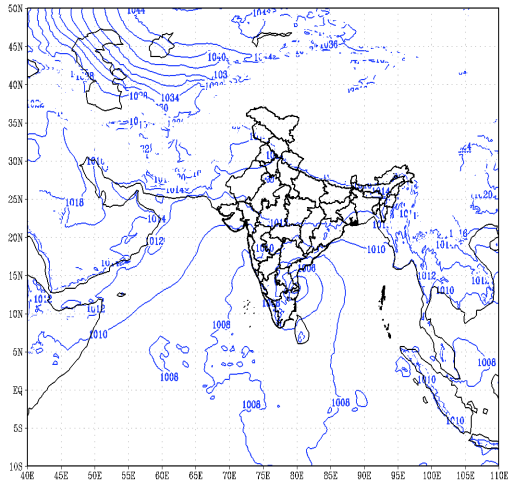
IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 08-12-2022 valid for 00 UTC of 10-12-2022



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IMD: GFS(12Km) 10m WIND (barb)& GUST (shaded:kt) FORECAST (48 HR)
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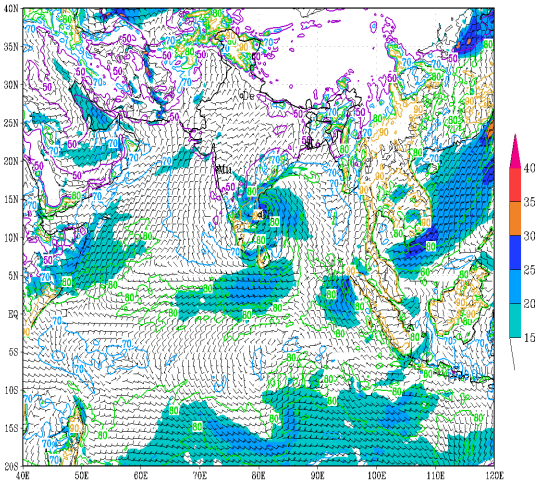

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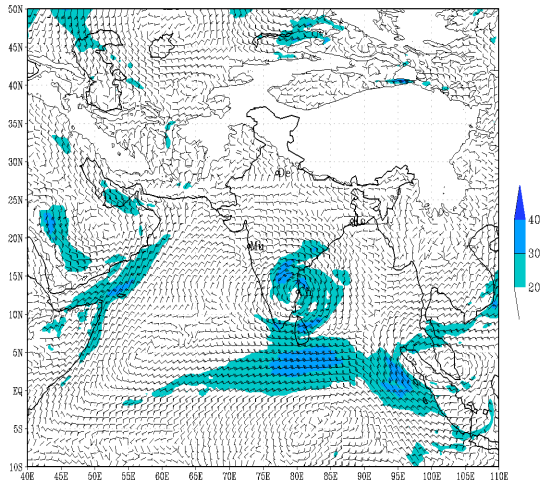

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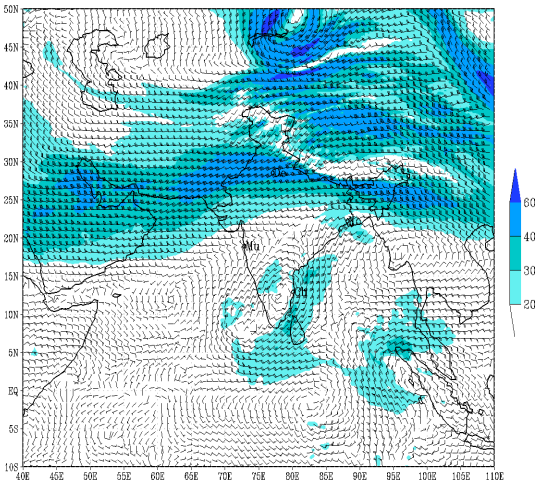

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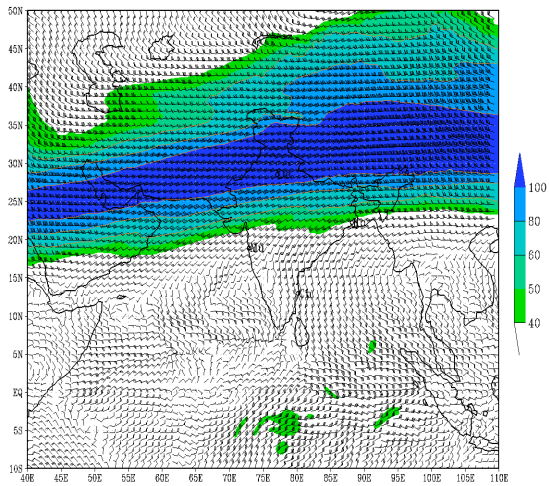

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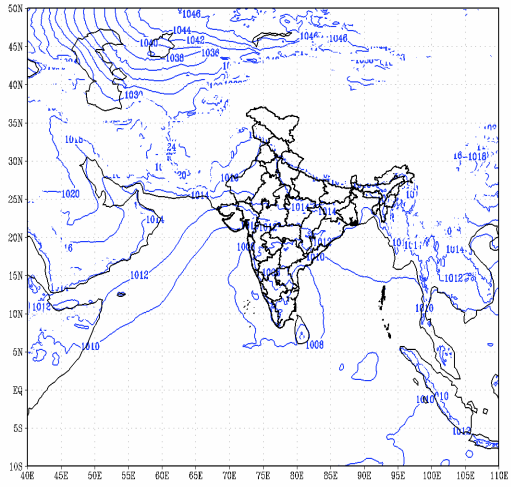

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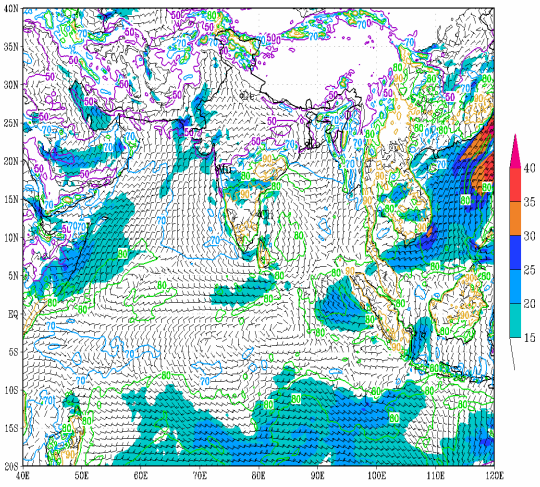
IMD: GFS(12Km) 10m WIND (barb)& GUST (shaded:kt) FORECAST (72 HR)
based on 00 UTC of 08-12-2022 valid for 00 UTC of 11-12-2022



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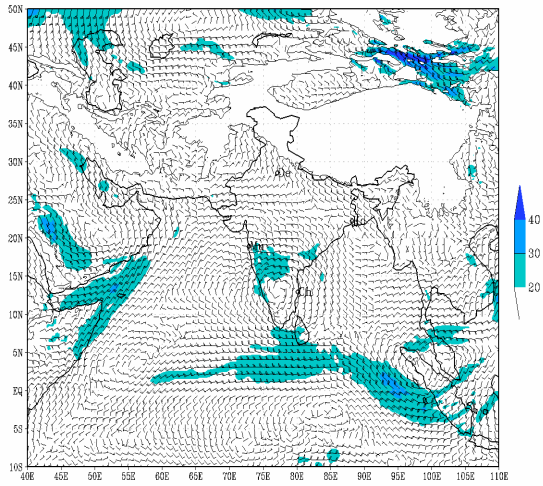

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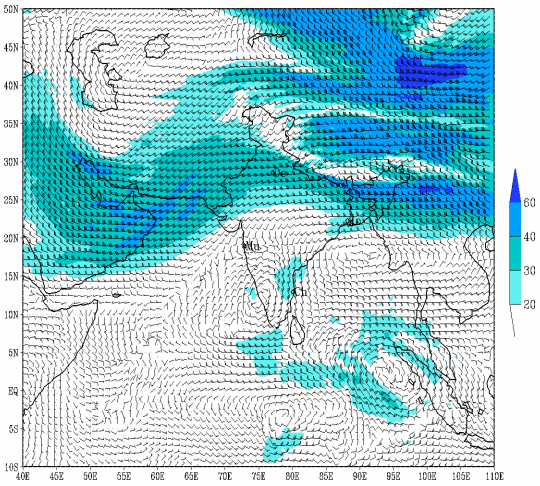
based on 00 UTC of 08-12-2022 valid for 00 UTC of 11-12-2022



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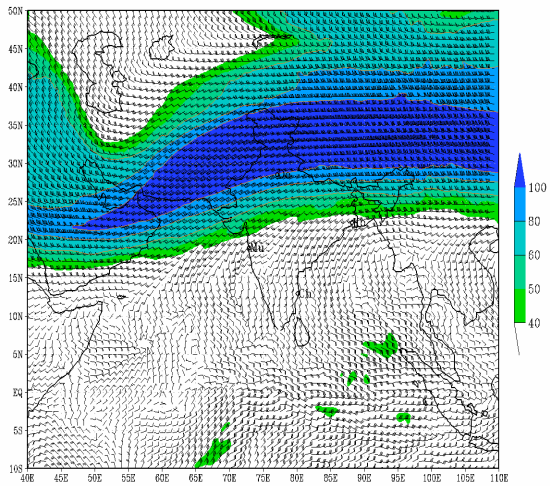
based on 00 UTC of 08-12-2022 valid for 00 UTC of 11-12-2022



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IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (96 HR)
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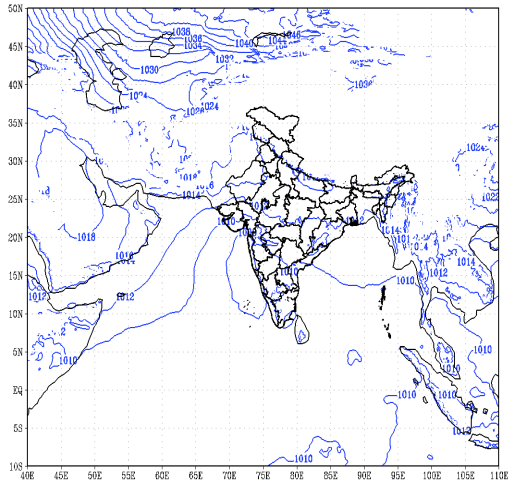

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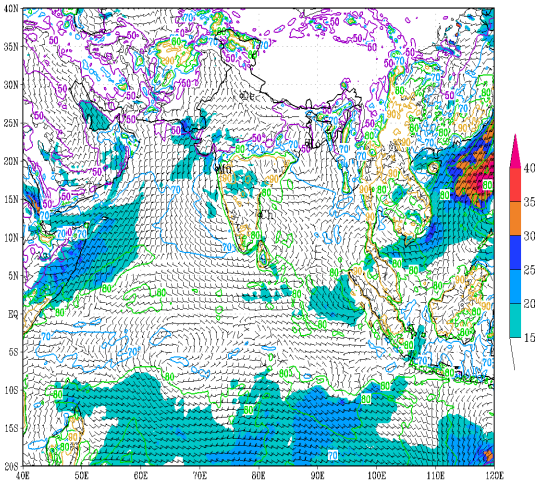
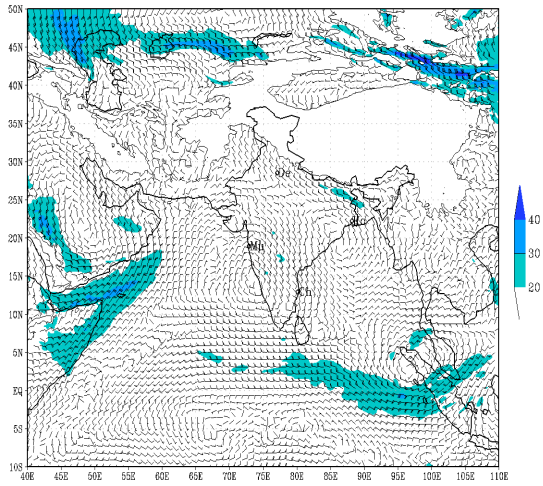
IMD: GFS(12Km) 10m WIND (barb)& GUST (shaded:kt) FORECAST (96 HR)
based on 00 UTC of 08-12-2022 valid for 00 UTC of 12-12-2022



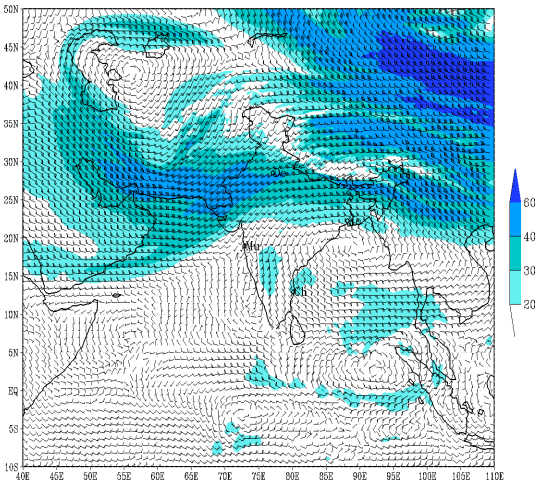
(Background does not depict political boundary)

IMD:GFS MODEL(12 Km) 850 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 08-12-2022 valid for 00 UTC of 12-12-2022



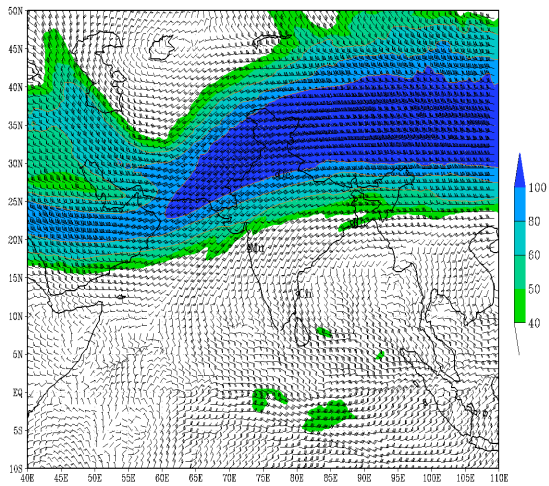
(Background does not depict political boundary)

IMD:GFS MODEL(12 Km) 500 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 08-12-2022 valid for 00 UTC of 12-12-2022



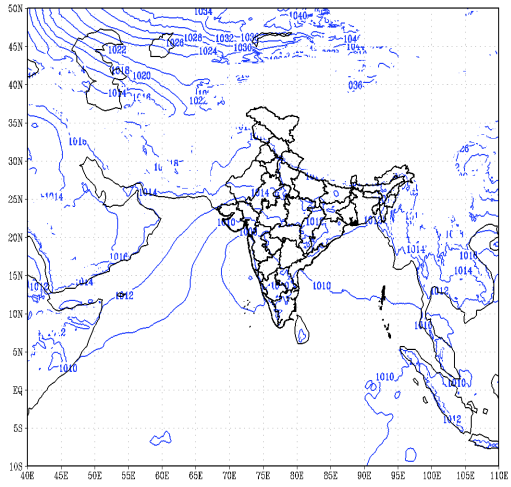
(Background does not depict political boundary)

IMD :GFS MODEL(12 Km) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 08-12-2022 valid for 00 UTC of 12-12-2022



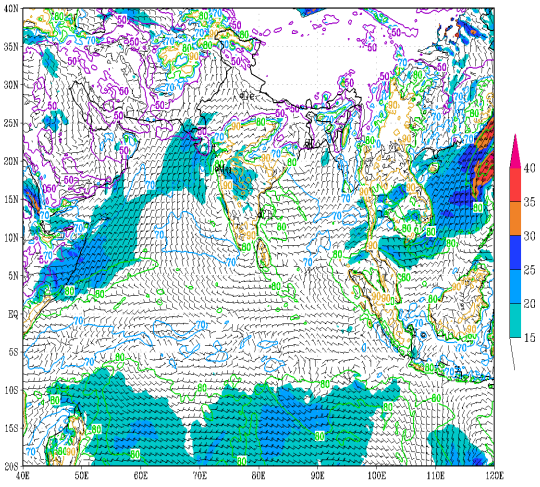
(Background does not depict political boundary)

IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 08-12-2022 valid for 00 UTC of 13-12-2022



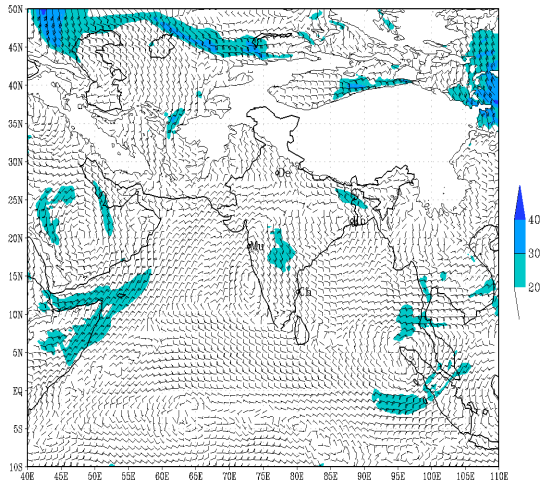
(Background does not depict political boundary)

IMD: GFS(12Km) 10m WIND (barb)& GUST (shaded:kt) FORECAST (120 HR)
based on 00 UTC of 08-12-2022 valid for 00 UTC of 13-12-2022



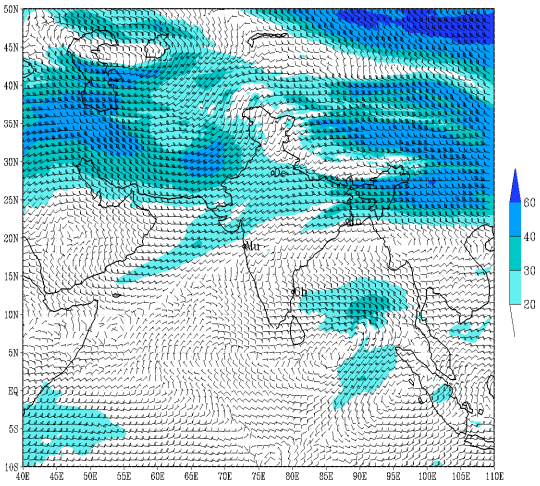
(Background does not depict political boundary)

IMD:GFS MODEL(12 Km) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 08-12-2022 valid for 00 UTC of 13-12-2022



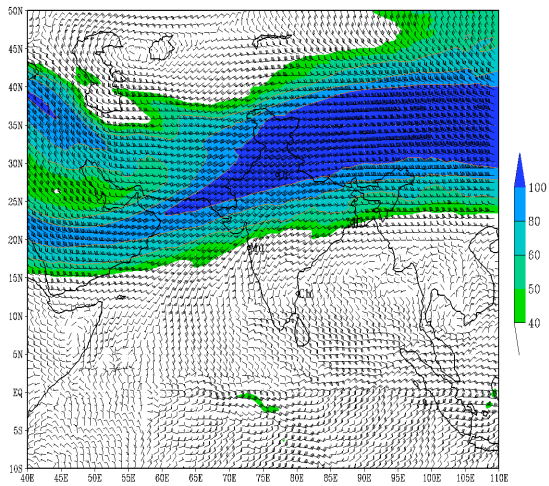
(Background does not depict political boundary)

IMD:GFS MODEL(12 Km) 500 hPa WIND (kt) FORECAST (144 HR)
based on 00 UTC of 08-12-2022 valid for 00 UTC of 14-12-2022

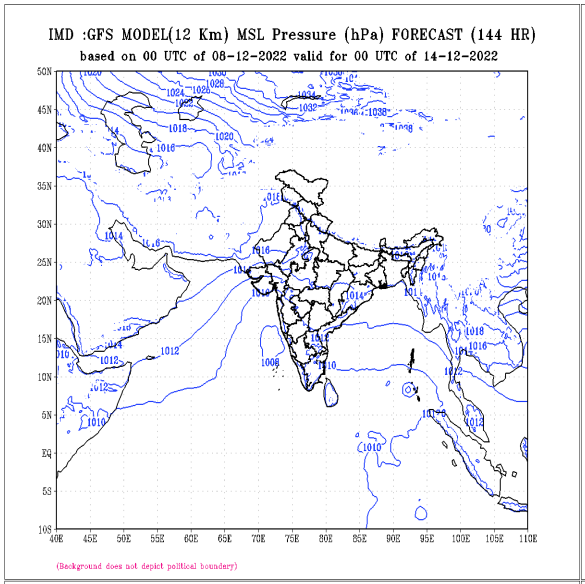


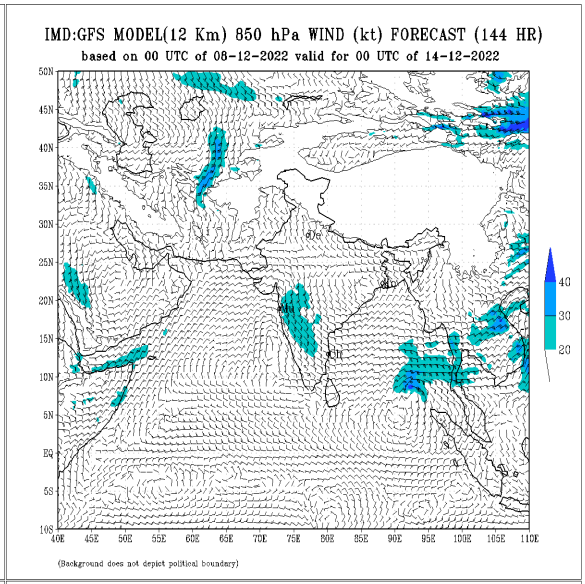
(Background does not depict political boundary)

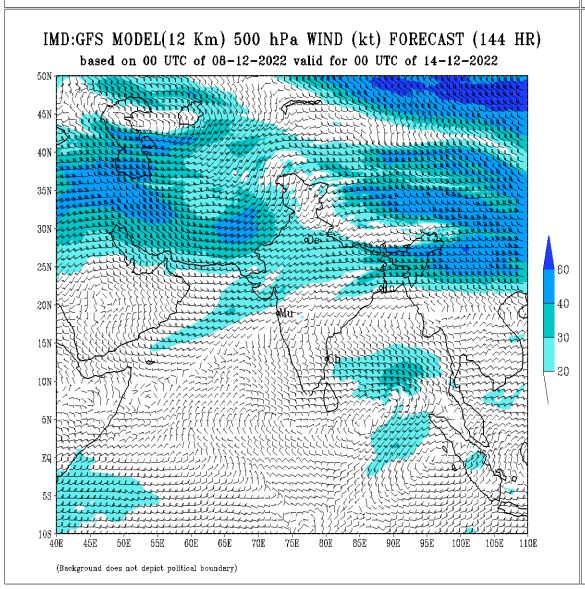
IMD :GFS MODEL(12 Km) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 08-12-2022 valid for 00 UTC of 13-12-2022

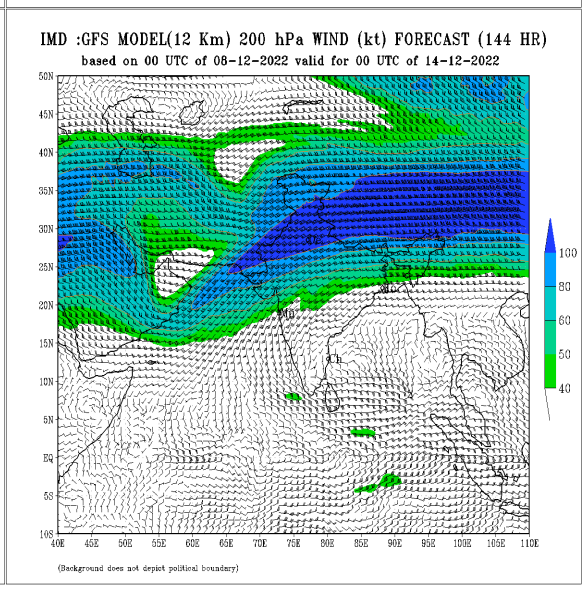


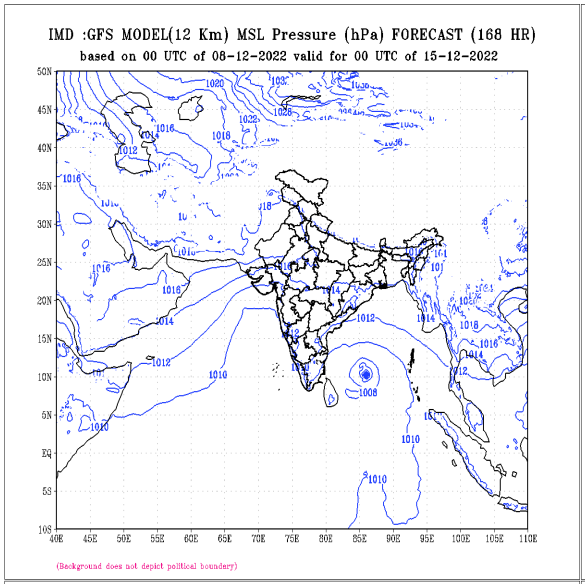
(Background does not depict political boundary)

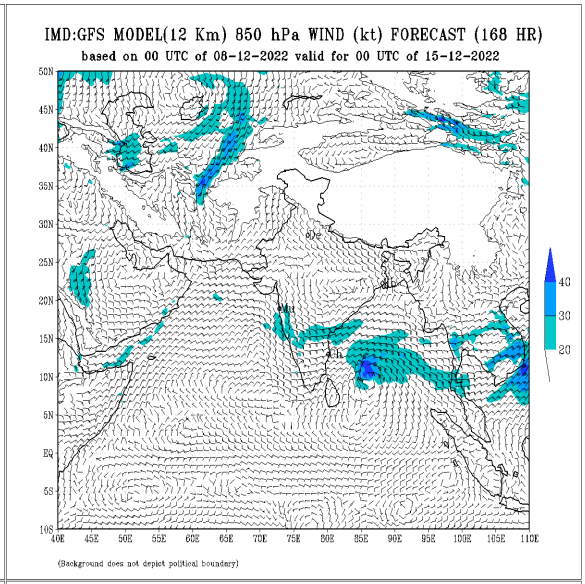

IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (144 HR)
based on 00 UTC of 08-12-2022 valid for 00 UTC of 14-12-2022
(Background does not depict political boundary)

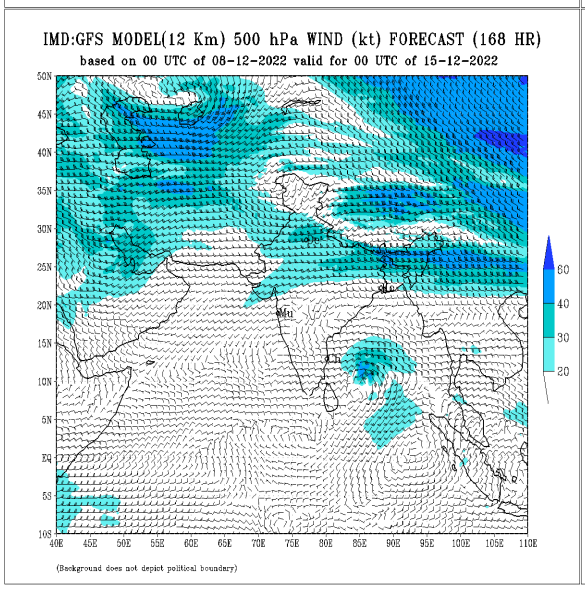

IMD:GFS MODEL(12 Km) 850 hPa WIND (kt) FORECAST (144 HR)
based on 00 UTC of 08-12-2022 valid for 00 UTC of 14-12-2022
40
30
20
(Background does not depict political boundary)

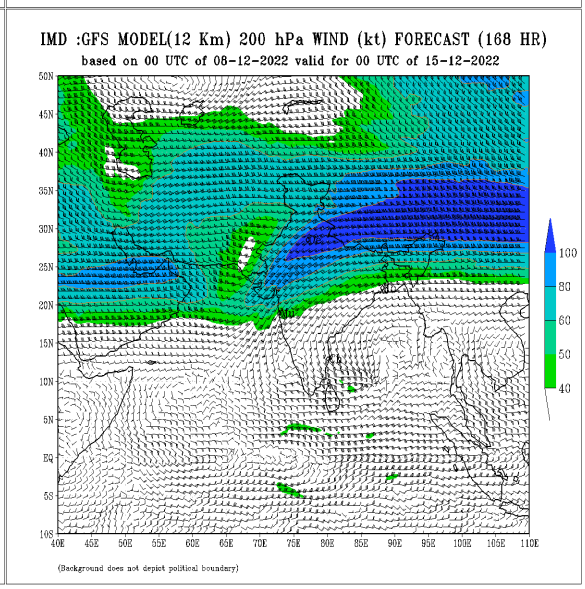

IMD:GFS MODEL(12 Km) 500 hPa WIND (kt) FORECAST (144 HR)
based on 00 UTC of 08-12-2022 valid for 00 UTC of 14-12-2022
60
40
30
20
(Background does not depict political boundary)


IMD :GFS MODEL(12 Km) 200 hPa WIND (kt) FORECAST (144 HR)
based on 00 UTC of 08-12-2022 valid for 00 UTC of 14-12-2022
100
80
60
50
40
(Background does not depict political boundary)

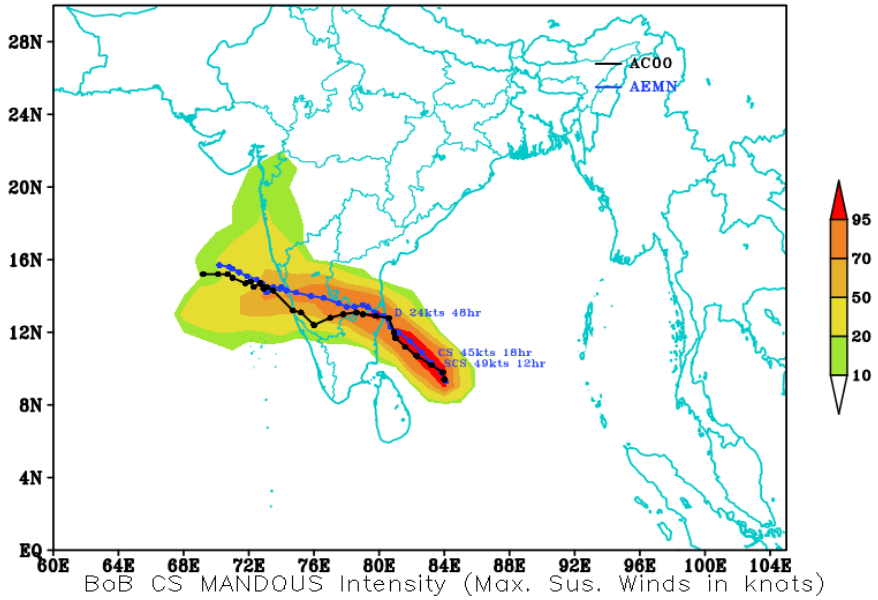

IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (168 HR)
based on 00 UTC of 08-12-2022 valid for 00 UTC of 15-12-2022
(Background does not depict political boundary)


IMD:GFS MODEL(12 Km) 850 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 08-12-2022 valid for 00 UTC of 15-12-2022
40
30
20
(Background does not depict political boundary)

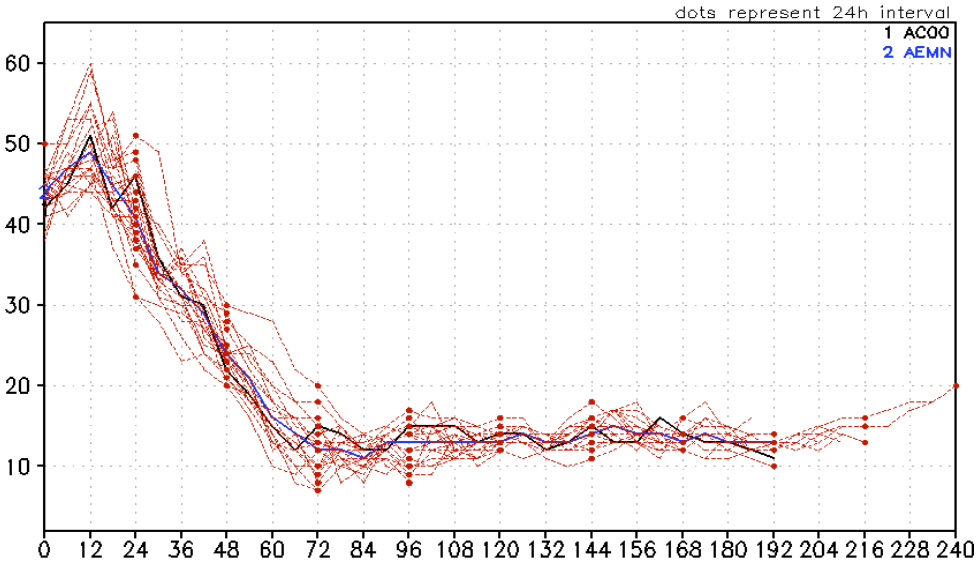

IMD:GFS MODEL(12 Km) 500 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 08-12-2022 valid for 00 UTC of 15-12-2022
60
40
30
20
(Background does not depict political boundary)


IMD :GFS MODEL(12 Km) 200 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 08-12-2022 valid for 00 UTC of 15-12-2022
100
80
60
50
40
(Background does not depict political boundary)

Probability (%) of BoB CS MANDOUS passing within 65nm during next 168hr

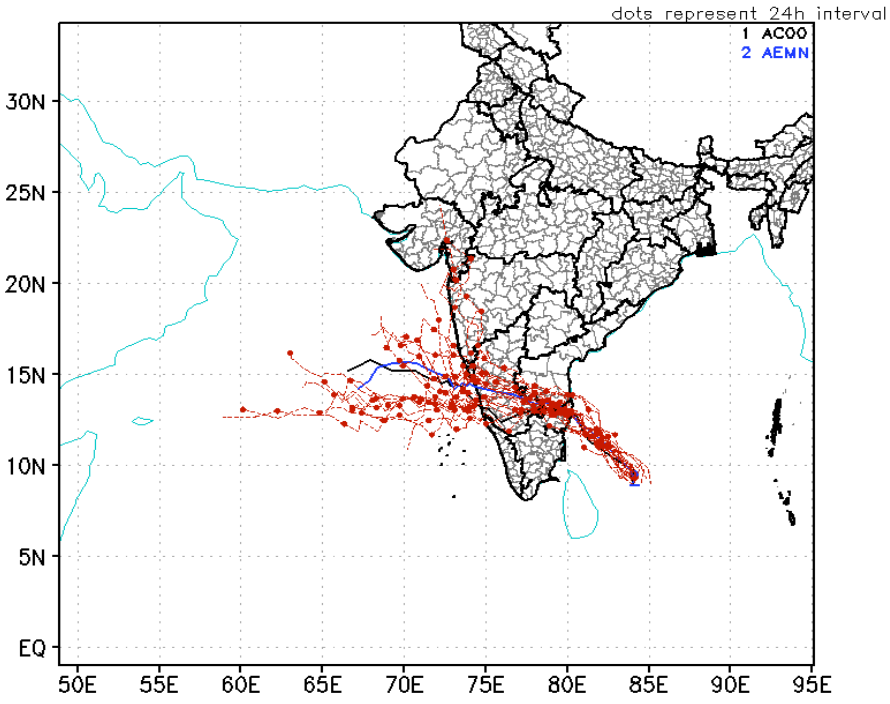


BoB CS MANDOUS Intensity (Max. Sus. Winds in knots)



Forecasts: Beginning 2022120800

Ensemble Tracks of BoB CS MANDOUS Dec 2022



Forecasts: Beginning 2022120800

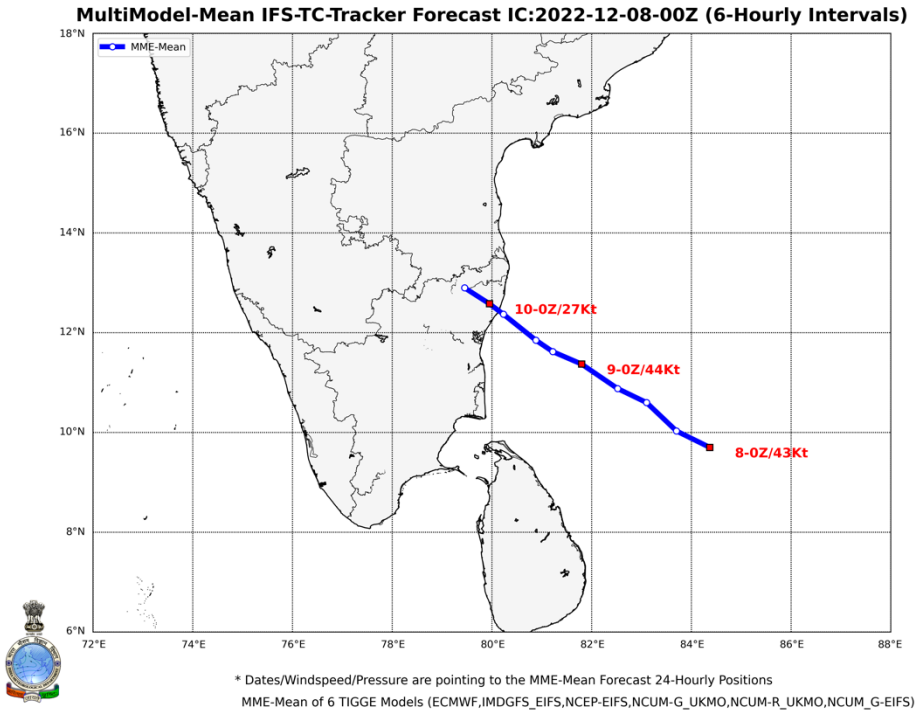


Table 1: Model summery in terms of Landfall timing, location and intensity at the time of crossing coasts based upon 1200 UTC for, MME NEW IMD, MME OLD IMD, ECMWF of 7th Dec, HWRF 06/18 UTC and 0000 UTC of 8th Dec

Model names	Landfall timing	Landfall point in LAT/LONG degree values	Likely MSD(Winds) in kts	Intensity of the system during landfall
IMD GFS	9th Dec/18-21UTC	12.8/80.2	32	DD
HWRF	10th Dec/00UTC	12.5/80	40	CS
ECMWF	9th Dec/18-21UTC	13.0/80.05	35	CS
NCEP GFS	9th Dec/12-18UTC	12.8/80.9	31	DD
NCUM	9th Dec/21UTC	12.2/79.6	42	CS
MME IMD NEW	9th Dec/15-18UTC	12.0/79.8	30	DD
MME IMD OLD	9th Dec/1800 UTC	12.0/80.0	32	DD
Average	**9th Dec around 2100 UTC**	**12.3/80.0**	**32**	**DD/CS**