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

Tropical Cyclone Forecast Programme
Report Dated 30th November, 2023

Time of Issue: 1230 UTC

Synoptic features (based on 0300 UTC analysis):

Yesterday's Well Marked Low Pressure Area over Southeast Bay of Bengal & adjoining South Andaman Sea moved west-northwestwards and lay over Southeast Bay of Bengal at 0830 hours IST of today, the 30th November, 2023.

It is likely to move west-northwestwards and intensify into a Depression over southeast Bay of Bengal during next 24 hours. Continuing to move further west-northwestwards, it would intensify gradually into a Cyclonic Storm over Southwest Bay of Bengal around 3rd December. Thereafter, it would move northwestwards and reach near North Tamil Nadu and South Andhra Pradesh coasts around early morning of 4th December as a cyclonic storm.

Dynamical and thermo-dynamical features (0600 UTC)

Parameter	Bay of Bengal (BoB)	Arabian Sea (AS)
Sea Surface Temperature (SST) ºC	27-28 over major parts of BoB, Andaman Sea. Around 27^{0}C over north and adjoining westcentral BoB.	29-30 over southeast and adjoining southwest AS, along and off Karnataka, north Kerala coasts. 26-28 over major parts of central and southwest AS, Around 26^{o}C over north and adjoining westcentral AS.
Tropical Cyclone Heat Potential (TCHP) kJ/cm^2	80-100 over parts of Andaman Sea, parts of eastcentral BoB, Gulf of Mannar, southwest BoB close to Sri Lanka coast.	100-110 over southeast and adjoining southwest AS. 80-100 over eastcentral AS. Less than 40 over westcentral AS along and off Yemen-Oman coast, north AS.
Cyclonic Relative vorticity (X10^{-6}s^{-1})	60-80 over SEB, 40-50 over southwest. 10-20 in adjoining areas of south BoB.	30-40 over southwest AS and adjoining eastcentral AS, eastcentral AS off Gujarat coast.
Low Level convergence (X10^{-5} s^{-1})	10-15 over major part of south BoB adjoining south Andaman Sea.	5-10 over southwest AS, adjoining southeast AS.
Upper Level divergence (X10^{-5} s^{-1})	20-30 over south BoB and south Andaman Sea.	10-20 over southwest and adjoining southeast AS.
Vertical Wind Shear (VWS knots) Low: 05-10 knots	5-10 over southern parts of south BoB and south Andaman Sea. 20 over rest of south BoB. High (>20knots) over central & north BoB.	5-10 over south AS, Comorin area, 20 over southern parts of central AS. High (>20knots) over rest of central & north AS.

Moderate:10-20 knots High: >20 knots		
Wind Shear Tendency (knots)	Decreasing over south and adjoining westcentral BoB and south Andaman Sea.	Decreasing over major areas of south, central AS. Increasing over southeast, north and adjoining westcentral AS.
Upper Tropospheric Ridge	Along 12^{o}N over BoB.	Along 12^{o}N over AS.

Satellite observations based on INSAT imagery (0600 UTC):

(a) Over the Bay of Bengal & Andaman Sea:-
Scattered to broken low and medium clouds with embedded intense to very intense convection lay over south Bay of Bengal and south Andaman Sea. Scattered low and medium clouds with embedded moderate to intense convection lay over central Bay of Bengal, north Andaman Sea and 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 south Arabian Sea, Comorin Area. Scattered low and medium clouds with embedded isolated moderate to intense convection lay over central Arabian Sea and Lakshadweep islands area.

(c)Convection outside India:-
Scattered low/med clouds with embedded moderate to intense convection over Sri Lanka, Palk Strait, Gulf of Mannar, Maldives, North Pakistan, Nepal, Tibet, China, Yellow Sea, adjoining east China Sea, Myanmar, Thailand, Gulf of Thailand, Cambodia, Laos, Vietnam, Sumatra, Strait of Malacca, Malaysia, Borneo, South China Sea, Java Islands and Sea, Celebes Islands & Sea, Philippines, Sulu Sea, Madagascar, Mozambique Channel and Over Indian Ocean Between Latitude 5.0N To 10.0S Longitude 45.0E To 120.0E And Between Latitude 10.0S To 20.0S Longitude 50.0E To 80.0E.

M.J.O. Index:
MJO index is currently in Phase 3 with amplitude greater than 1. It will be in phase 3 with amplitude greater than 1 till 4th Dec. It will then move to phase 4 on 5th Dec with amplitude greater than 1, remains same and in same phase till 7th Dec.

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	Bay of Bengal (BoB)	Arabian Sea (AS)
IMD-GFS	LPA over southwest BoB (SWB) (8^{0}N/86^{0}E) on 1st Dec. Moving westnorthwestward and lay over SWB (10.5^{0}N/83^{0}E) as WML on 2nd Dec. Moving northwestward and lay over SWB (11.5^{0}N/82^{0}E) as DD on 3rd Dec. Moving westnorthwestward and lay over SWB and adjoining westcentral BoB (WCB) close to the coast (13^{0}N/79^{0}E) as SCS on 4th Dec. It moves in northwestward and have its landfall along Andhra Pradesh coast (15^{0}N/78.5^{0}E) as CS/SCS.	No significant circulation for the next 7 days.
IMD-GEFS	LPA over SWB (8^{0}N/86^{0}E) on 1st Dec. Moving northwestward and lay over SWB (11.5^{0}N/84^{0}E) as WML on 2nd Dec. It lay over SWB	No significant circulation for the

	(12^0N/82^0E) as depression (D) on 3rd Dec. It lay over westcentral BoB (WCB) (15^0N/81^0E) as DD/CS on 4th Dec. It lay over coast near Mchilipattanam (16^0N/80.5^0E) as WML on 6th Dec.	next 7 days.
IMD-WRF	LPA over southeast BoB (SEB) and adjoining Andaman Sea (9^0N/93^0E) as on today i.e., 30th Nov. It lay over SWB (10^0N/87^0E) as WML on 1st Dec. It intensifies into CS over SWB and adjoining WCB (12.5^0N/82.5^0E) on 2nd Dec.	No significant system during next 3 days.
NCMRWF-NCUM	LPA over SWB (8^0N/86^0E) on 1st Dec. It lay over WCB and adjoining SWB (13^0N/81.5^0E) as WML on 3rd Dec. It moves northwestward and lay over WCB (14^0N/80^0E) as CS on 5th Dec. It then moves northeastward and lay over WCB (15^0N/81^0E) as SCS on 6th Dec.	No significant system during next 3 days.
NCMRWF-NEPS	LPA over SWB (8^0N/86^0E) on 1st Dec. It lay over WCB and adjoining SWB (13^0N/81.5^0E) as WML on 3rd Dec. It moves northwestward and lay over WCB (14^0N/80^0E) as CS on 5th Dec. It then moves northeastward and lay over WCB (15^0N/81^0E) as SCS on 6th Dec.	No significant circulation for the next 7 days.
NCMRWF-UM (Regional)	WML on 2nd Dec over WCB (10.5^0N/82^0E). It lay over WCB (11^0N/81^0E) as depression on 3rd Dec.	-
ECMWF	LPA over SWB and adjoining southeast BoB (SEB) (9.7^0N/87.3^0E) on 03 UTC of 1st Dec. It lay over SWB (10.8^0N/84.3^0E) as D/DD on 03 UTC of 2nd Dec. It lay over SWB and adjoining WCB (12.5^0N/81.3^0E) as CS on 18 UTC of 3rd Dec. It cross the AP coast (13.7^0N/80.1^0E) around 15 UTC of 4th Dec and move along the coast till 00 UTC of 6th Dec while weakening.	No significant circulation for the next 7 days.
NCEP-GFS	LPA over SEB and adjoining SWB (8^0N/89^0E) at 12 UTC of 30th Nov. It lay over SWB (11^0N/84^0E) as CS at 12 UTC of 2nd Dec. It becomes VSCS on 18 UTC of 3dr Dec over SWB (12.2^0N/83.1^0E). It then moves northeastward and becomes ESCS on 18 UTC of 4th Dec over WCB (14.9^0N/83.4^0E). It moves in same direction and lay over northwest BoB (NWB) (21.0^0N/88.4^0E) as SCS/VSCS at 18 UTC of 6th Dec. It will have its landfall along Bangladesh coast (22.2^0N/89.9^0E) at 00 UTC of 7th Dec.	No significant circulation for the next 7 days.
IMD-Genesis Potential Parameter	Potential zone over SEB on 1st Dec, over SEB and adjoining SWB on 2nd Dec. It lay over SWN and adjoining SWB on 3rd Dec & over WCB on 4th and 5th Dec. It lay over WCB and adjoining NWB on 6th Dec and over northeast BoB (NEB) on 7th Dec.	No potential zone of cyclogenesis over AS.

Summary and conclusion:

1. For the Bay of Bengal:

As per today's guidance, models are indicating delayed formation of depression. There is large variation among various models w.r.t. date of formation of depression with date varying between 1st December - 3rd December. However, most of the models are indicating initial westnorthwestwards movement, followed by northwestwards movement. Models are also indicating gradual north-northeastwards to northeastwards recurvature of the system after 4th December and movement along the east coast of India. There is also variation among various models w.r.t. point & time of recurvature and also peak intensification.

IMD GFS is indicating low pressure area over southeast Bay of Bengal (BoB) on 30th Nov, depression over southwest BoB on 2nd December/0000 UTC. It is indicating intensification upto

marginal cyclonic storm. It is showing northeastwards recurvature and movement along the east coast of India till 6th December as a weak system. ECMWF is indicating formation of depression on 2nd December/0000 UTC over southwest BoB and cyclonic storm on 4th December over southwest BoB. It is indicating crossing over south Andhra Pradesh - north Tamil Nadu coast on 4th December/0600 UTC as a depression. Similarly, NCUM is indicating formation of depression on 3rd December over southwest BoB. It is indicating very slow movement of the system near north Tamil Nadu coast during 3rd to 5th December with intensification and thereafter northeastwards recurvature is indicated. IMD multi model ensemble (MME) is indicating formation of depression around 1st December over southwest BoB & adjoining southeast bob. Thereafter, the system is indicated to intensify into a cyclonic storm on 3rd December over southwest BOB. It is indicating nearly north-northwestwards movement towards Andhra Pradesh coast and crossing over Andhra Pradesh around 6th December/0000 UTC as a deep depression.

Considering all the above, the well marked low-pressure area over southeast BoB is likely to move west-northwestwards and intensify into a depression over southeast BoB during next 24 hours. Continuing to move further west-northwestwards, it would intensify gradually into a cyclonic storm over southwest BoB around 3rd December. Thereafter, it would move northwestwards and reach near north Tamil Nadu and south Andhra Pradesh coasts around 0000 UTC of 4th December as a cyclonic storm.

Probability of Cyclogenesis (formation of depression and above intensity systems) over 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
MOD	HIGH	-	-	-	-	-

*Note: Every 24 hour forecast is valid upto 0300 UTC of the next day.

"-" Indicate that cyclogenesis has already occurred. The above table indicates probability of cyclogenesis only (formation of depression).

2. For the Arabian Sea:

No significant system over the Arabian Sea for the next 7 days.

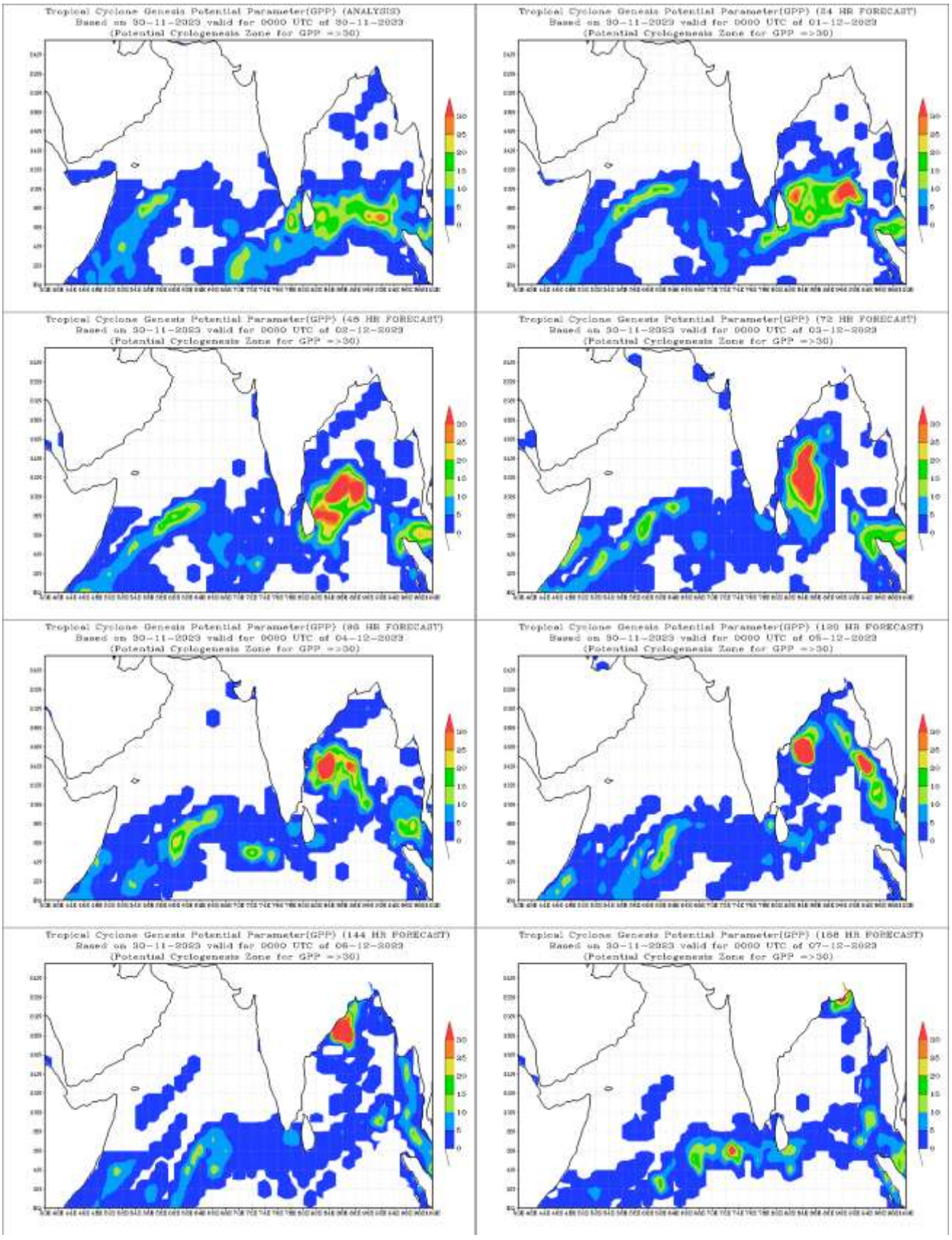
Probability of Cyclogenesis (formation of depression and above intensity systems) over the Arabian Sea during next 168 hours:

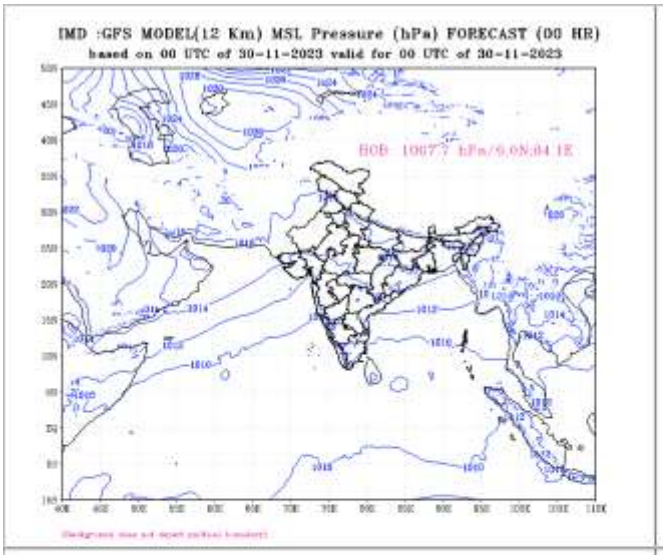
24 HOURS	24-48 HOURS	48-72 HOURS	72-96 HOURS	96-120 HOURS	120-144 HOURS	144-168 HOURS
NIL	NIL	NIL	NIL	NIL	NIL	NIL

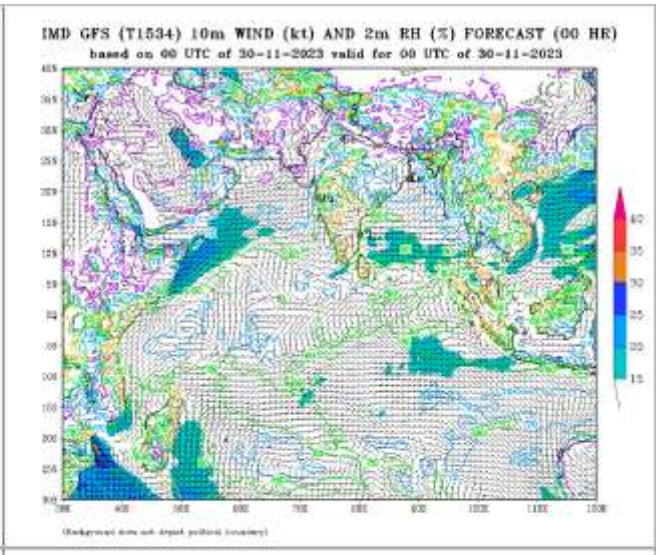
*Note: Every 24 hour forecast is valid upto 0300 UTC of the next day.

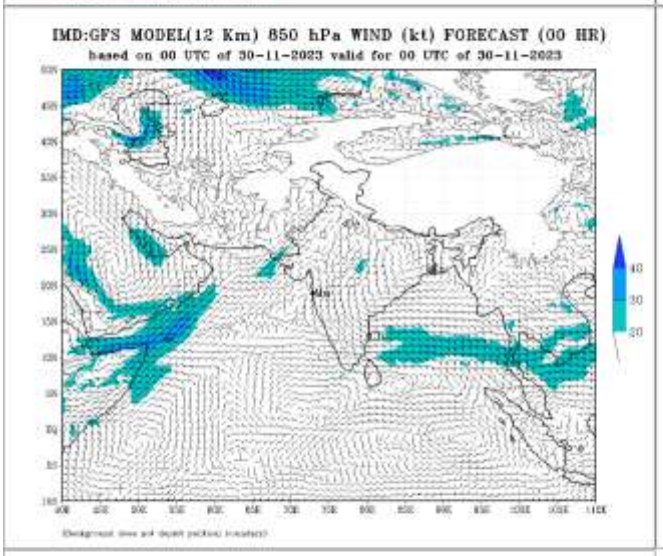
IOP: IOP for Andaman & Nicobar Islands for 30th November – 1st December.

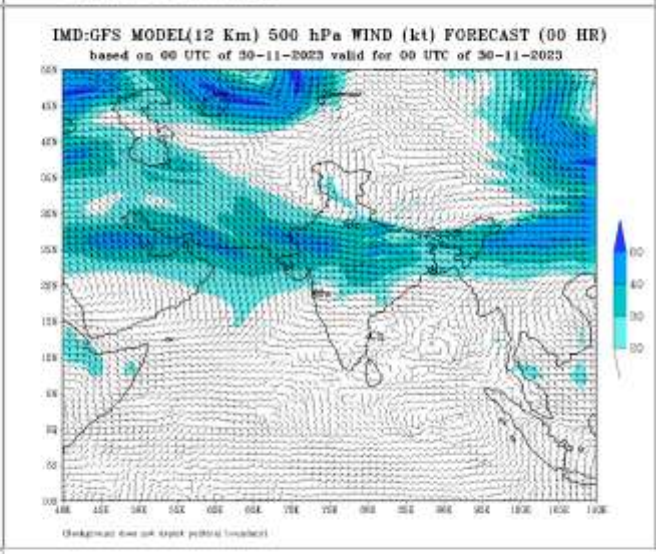
ANNEXURE

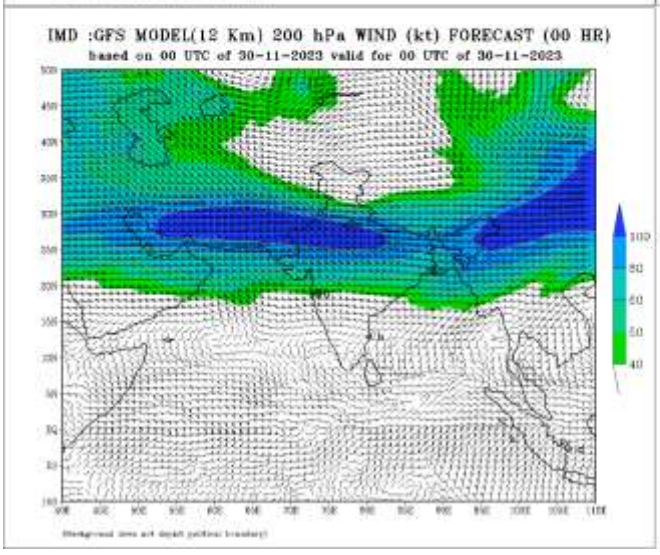

Tropical Cyclone Genesis Potential Parameter(GPP) (ANALYSIS)
Based on 30-11-2023 valid for 0000 UTC of 30-11-2023
(Potential Cyclogenesis Zone for GPP =>30)
Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 30-11-2023 valid for 0000 UTC of 01-12-2023
(Potential Cyclogenesis Zone for GPP =>30)
Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
Based on 30-11-2023 valid for 0000 UTC of 02-12-2023
(Potential Cyclogenesis Zone for GPP =>30)
Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
Based on 30-11-2023 valid for 0000 UTC of 03-12-2023
(Potential Cyclogenesis Zone for GPP =>30)
Tropical Cyclone Genesis Potential Parameter(GPP) (96 HR FORECAST)
Based on 30-11-2023 valid for 0000 UTC of 04-12-2023
(Potential Cyclogenesis Zone for GPP =>30)
Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 30-11-2023 valid for 0000 UTC of 05-12-2023
(Potential Cyclogenesis Zone for GPP =>30)
Tropical Cyclone Genesis Potential Parameter(GPP) (144 HR FORECAST)
Based on 30-11-2023 valid for 0000 UTC of 06-12-2023
(Potential Cyclogenesis Zone for GPP =>30)
Tropical Cyclone Genesis Potential Parameter(GPP) (168 HR FORECAST)
Based on 30-11-2023 valid for 0000 UTC of 07-12-2023
(Potential Cyclogenesis Zone for GPP =>30)

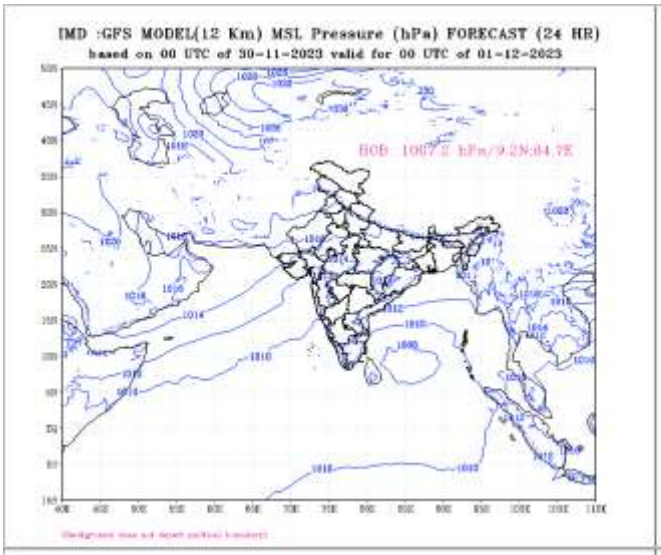

IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (00 HR)
based on 00 UTC of 30-11-2023 valid for 00 UTC of 30-11-2023

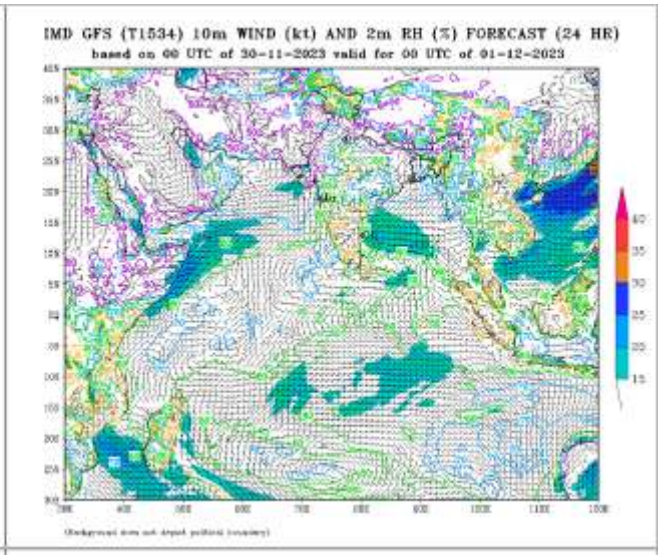

IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (00 HR)
based on 00 UTC of 30-11-2023 valid for 00 UTC of 30-11-2023

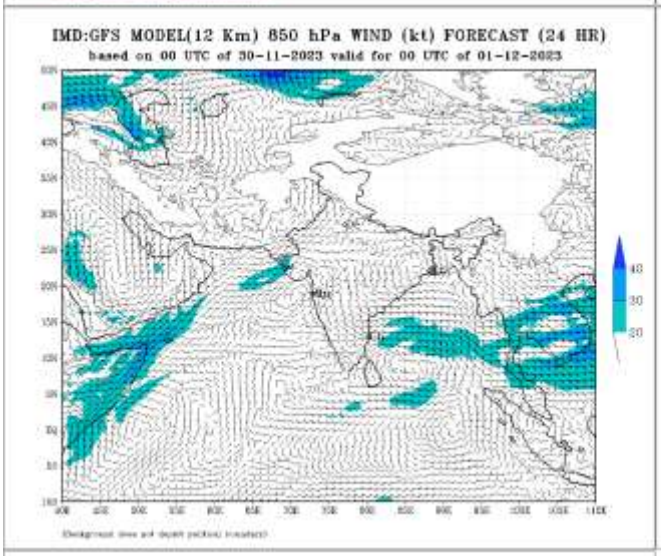

IMD:GFS MODEL(12 Km) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 30-11-2023 valid for 00 UTC of 30-11-2023

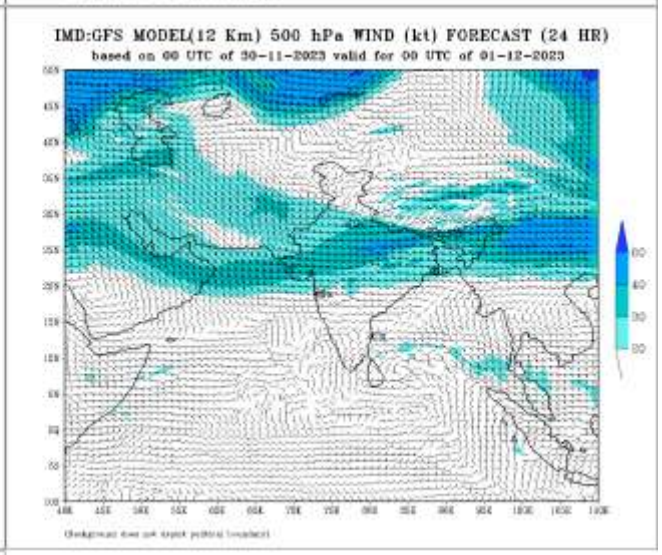

IMD:GFS MODEL(12 Km) 500 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 30-11-2023 valid for 00 UTC of 30-11-2023

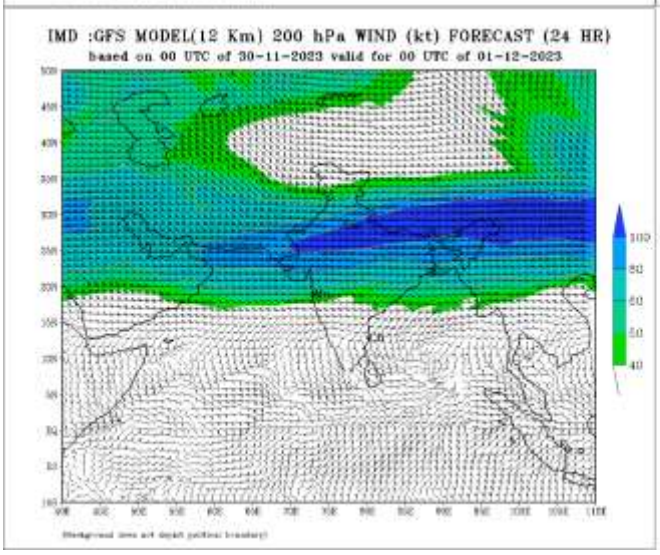

IMD :GFS MODEL(12 Km) 200 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 30-11-2023 valid for 00 UTC of 30-11-2023

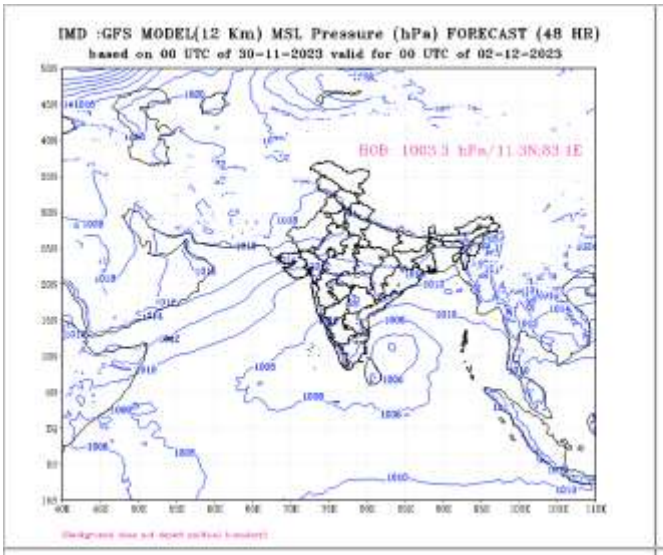

IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 30-11-2023 valid for 00 UTC of 01-12-2023
BOB 1007.2 hPa/9.2N:84.7E

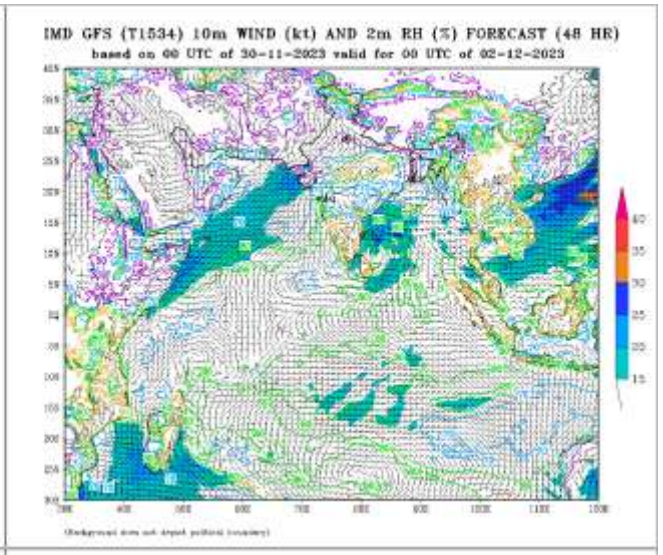

IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (24 HR)
based on 00 UTC of 30-11-2023 valid for 00 UTC of 01-12-2023

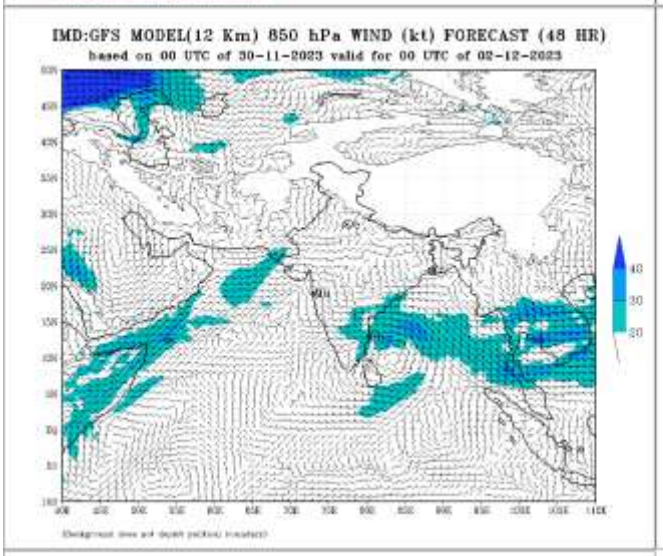

IMD:GFS MODEL(12 Km) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 30-11-2023 valid for 00 UTC of 01-12-2023

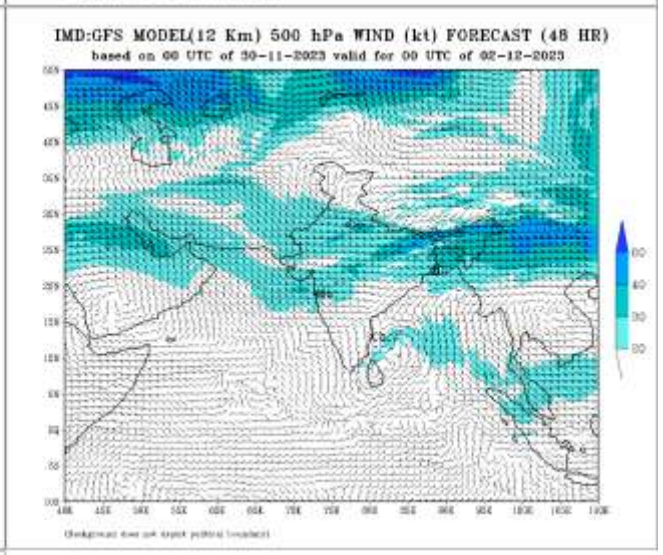

IMD:GFS MODEL(12 Km) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 30-11-2023 valid for 00 UTC of 01-12-2023

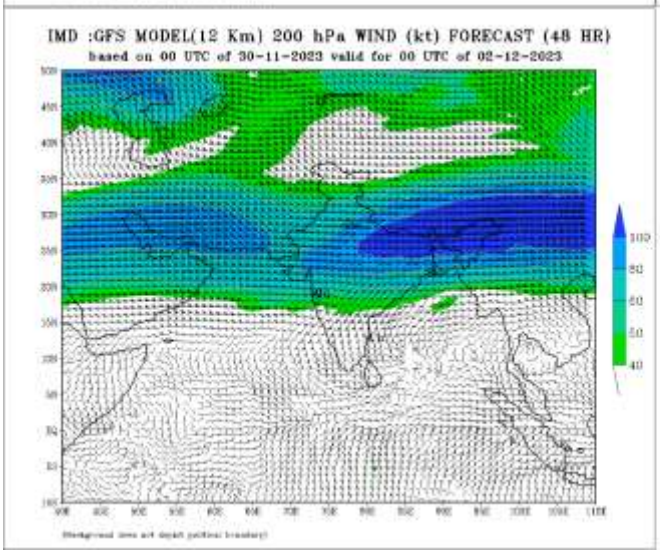

IMD :GFS MODEL(12 Km) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 30-11-2023 valid for 00 UTC of 01-12-2023

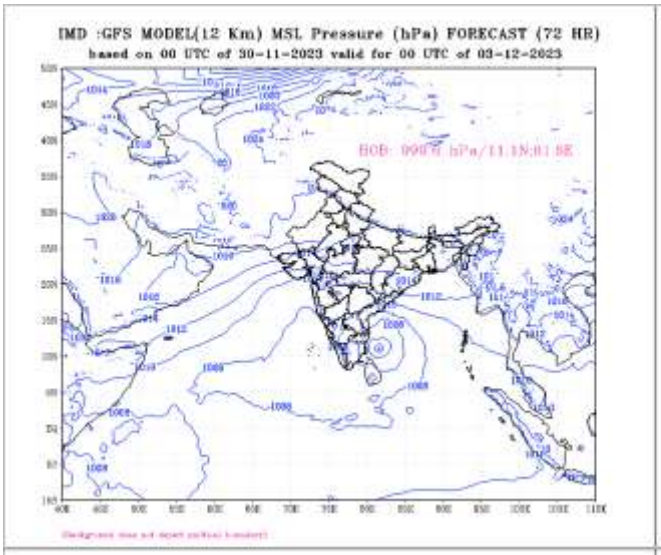

IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (48 HR)
based on 00 UTC of 30-11-2023 valid for 00 UTC of 02-12-2023
BOB 1003.3 hPa/11.3N,83.1E

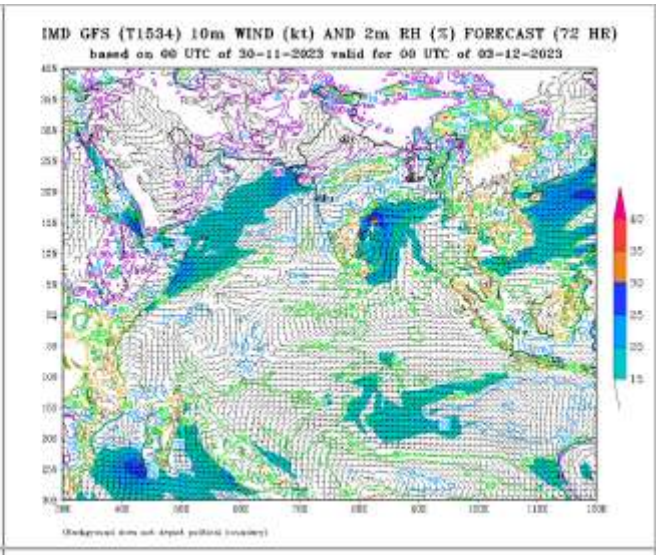

IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (48 HR)
based on 00 UTC of 30-11-2023 valid for 00 UTC of 02-12-2023

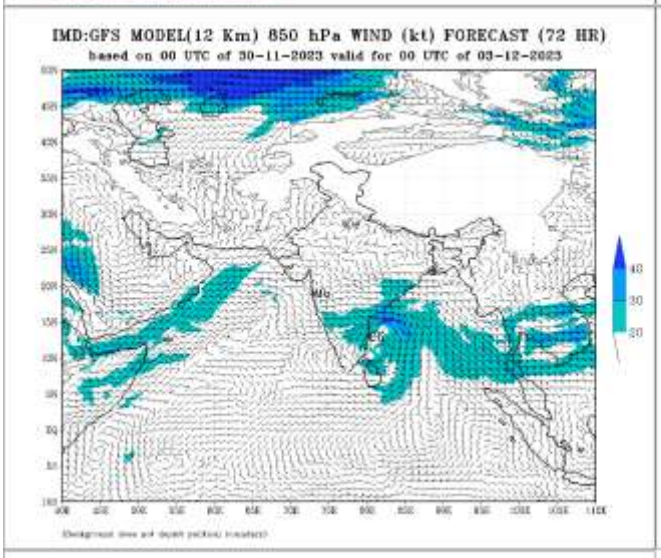

IMD:GFS MODEL(12 Km) 850 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 30-11-2023 valid for 00 UTC of 02-12-2023

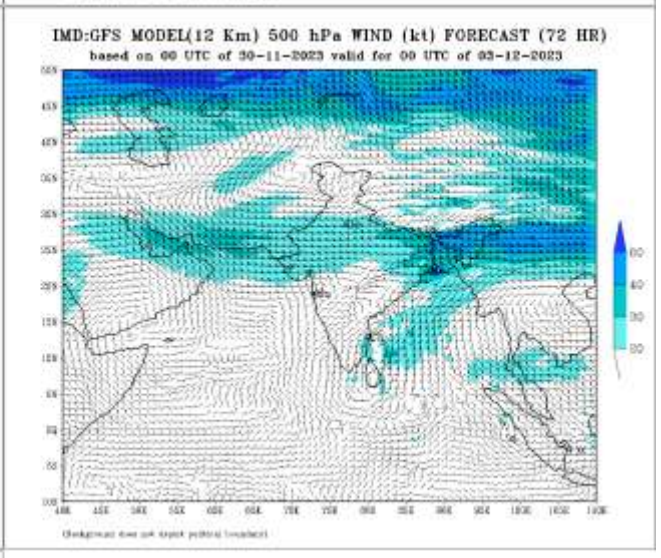

IMD:GFS MODEL(12 Km) 500 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 30-11-2023 valid for 00 UTC of 02-12-2023

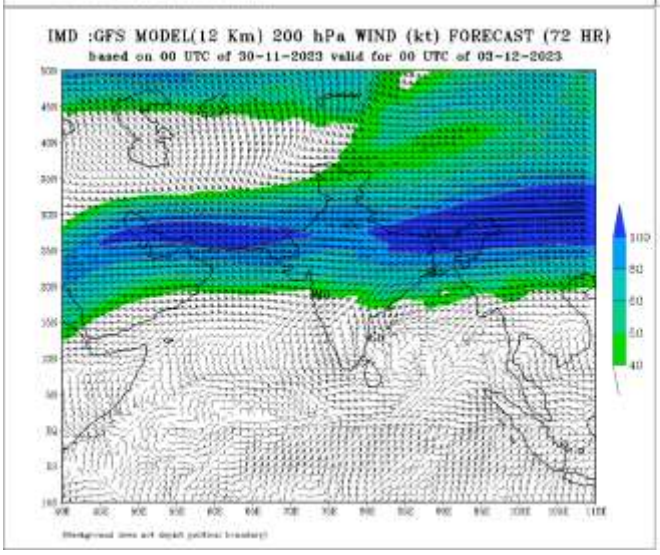

IMD :GFS MODEL(12 Km) 200 hPa WIND (kt) FORECAST (48 HR)
based on 00 UTC of 30-11-2023 valid for 00 UTC of 02-12-2023

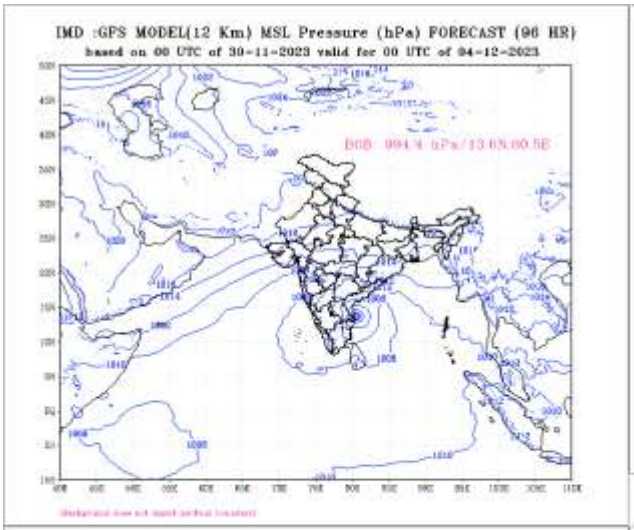

IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (72 HR)
based on 00 UTC of 30-11-2023 valid for 00 UTC of 03-12-2023

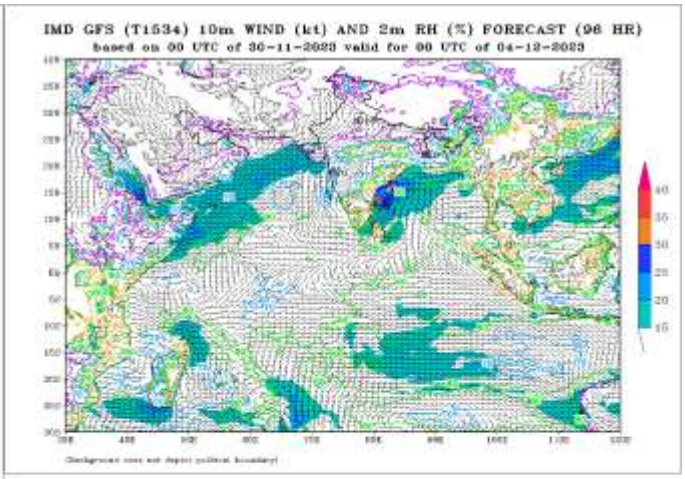

IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (72 HR)
based on 00 UTC of 30-11-2023 valid for 00 UTC of 03-12-2023

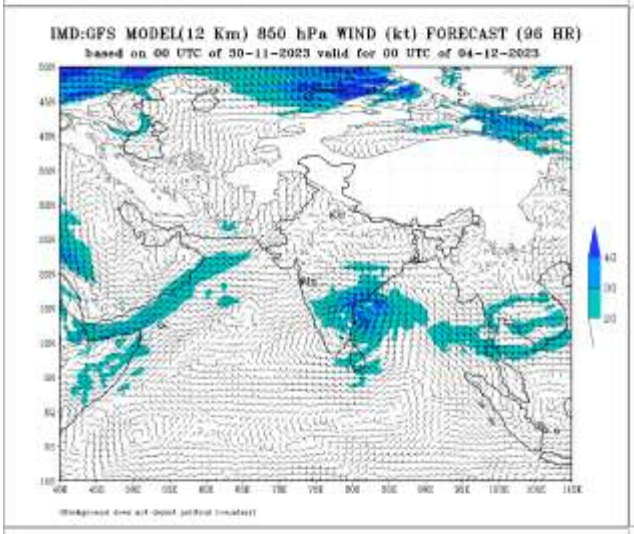

IMD:GFS MODEL(12 Km) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 30-11-2023 valid for 00 UTC of 03-12-2023

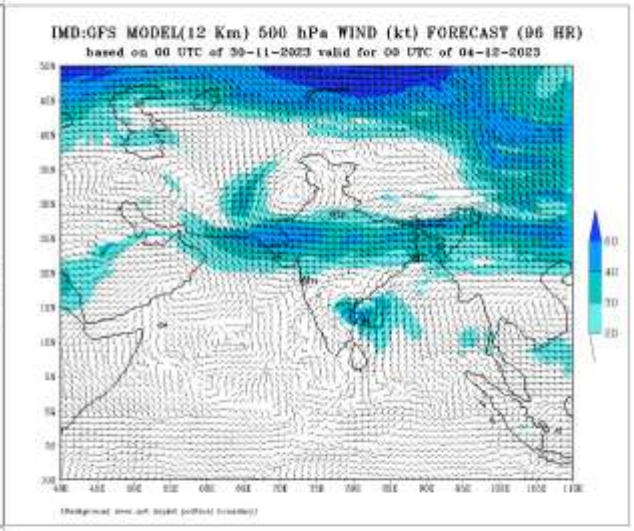

IMD:GFS MODEL(12 Km) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 30-11-2023 valid for 00 UTC of 03-12-2023

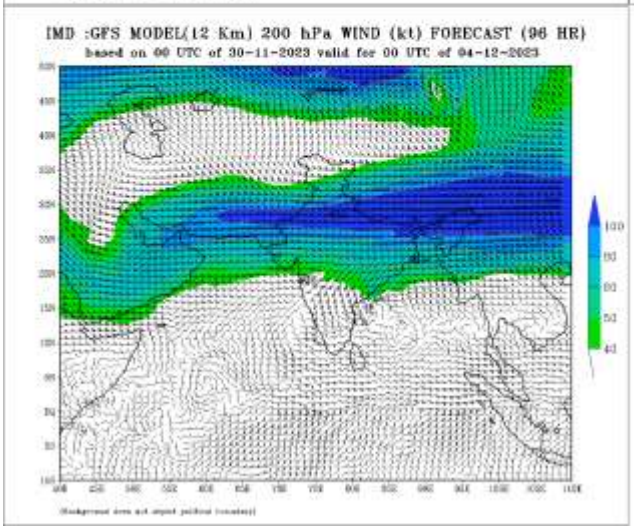

IMD :GFS MODEL(12 Km) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 30-11-2023 valid for 00 UTC of 03-12-2023

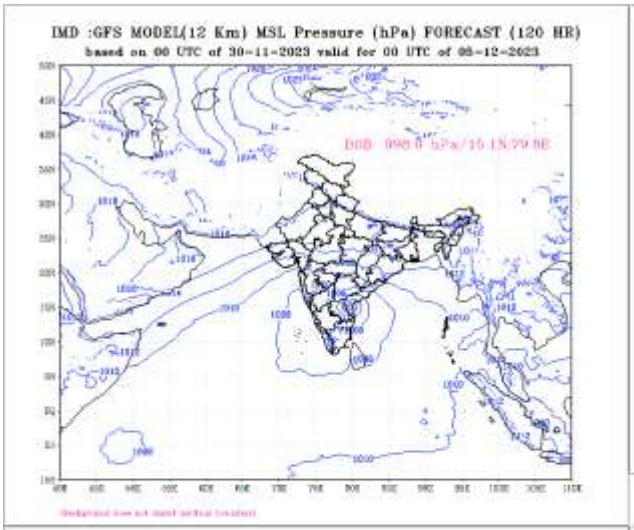

IMD :GPS MODEL(12 Km) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 30-11-2023 valid for 00 UTC of 04-12-2023

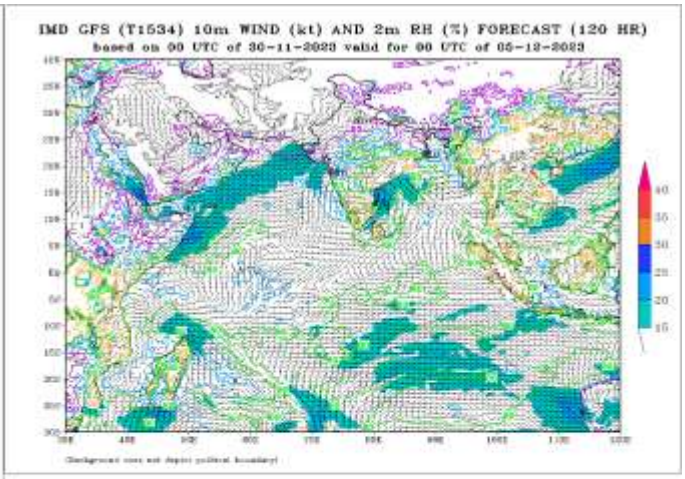

IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (96 HR)
based on 00 UTC of 30-11-2023 valid for 00 UTC of 04-12-2023

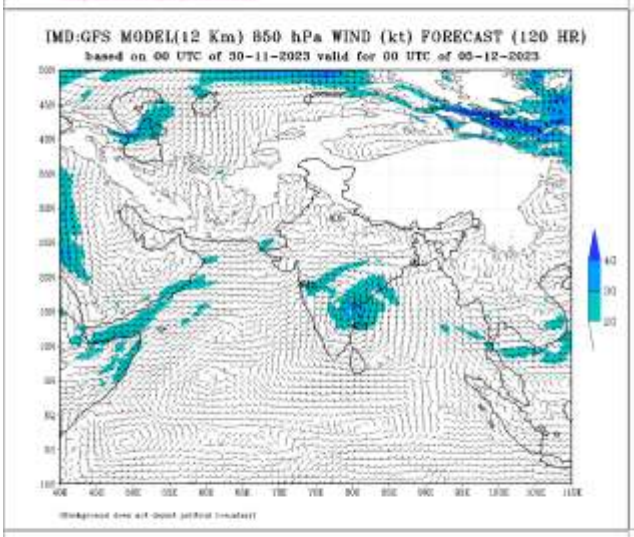

IMD:GFS MODEL(12 Km) 850 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 30-11-2023 valid for 00 UTC of 04-12-2023

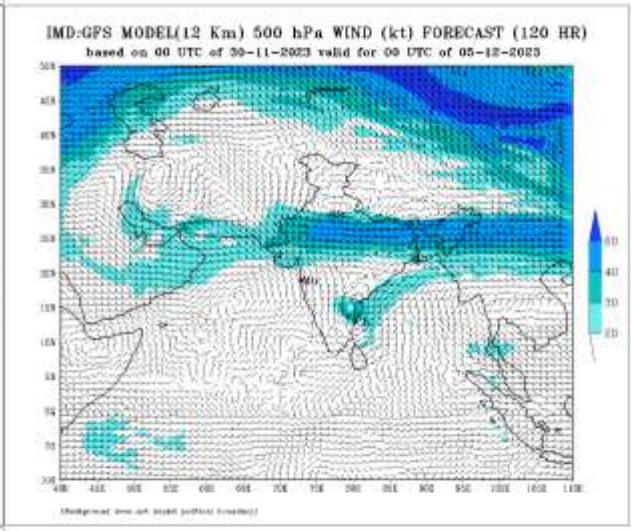

IMD:GFS MODEL(12 Km) 500 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 30-11-2023 valid for 00 UTC of 04-12-2023

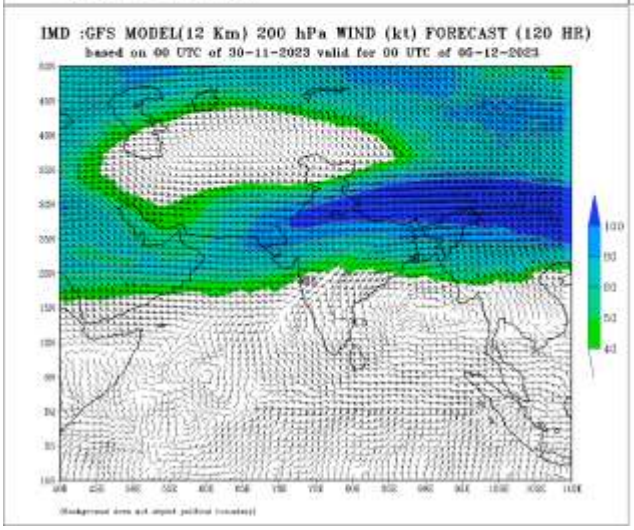

IMD :GFS MODEL(12 Km) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 30-11-2023 valid for 00 UTC of 04-12-2023

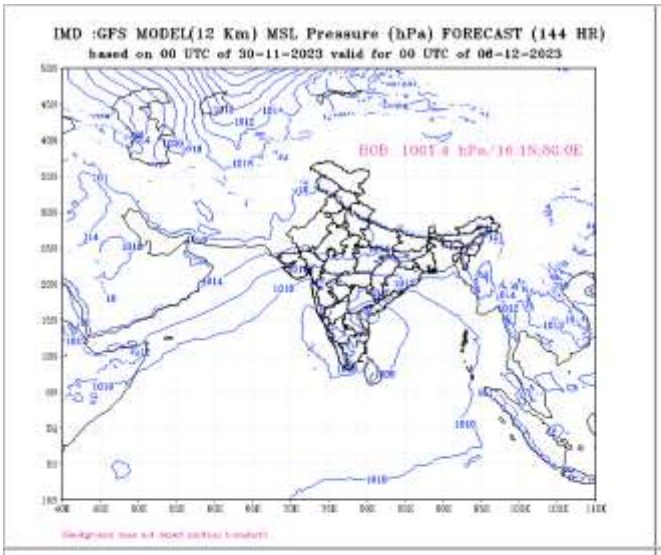

IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 30-11-2023 valid for 00 UTC of 05-12-2023

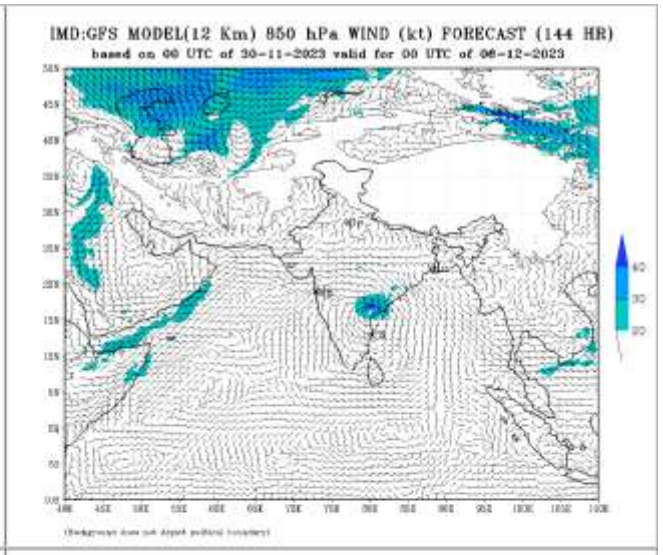

IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (120 HR)
based on 00 UTC of 30-11-2023 valid for 00 UTC of 05-12-2023

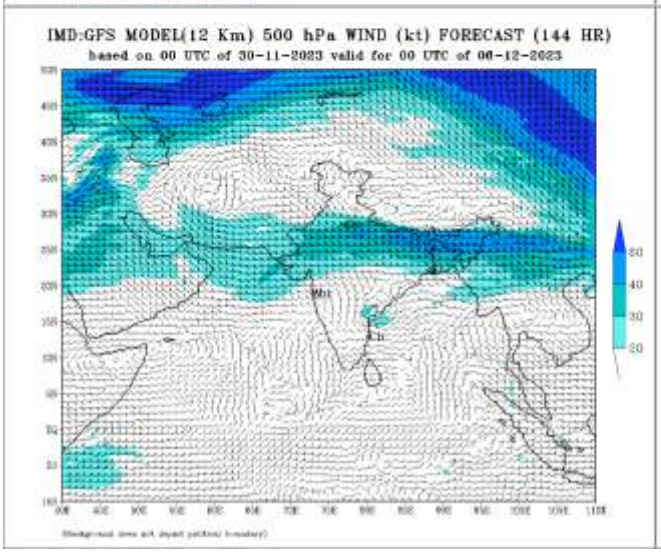

IMD:GFS MODEL(12 Km) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 30-11-2023 valid for 00 UTC of 05-12-2023

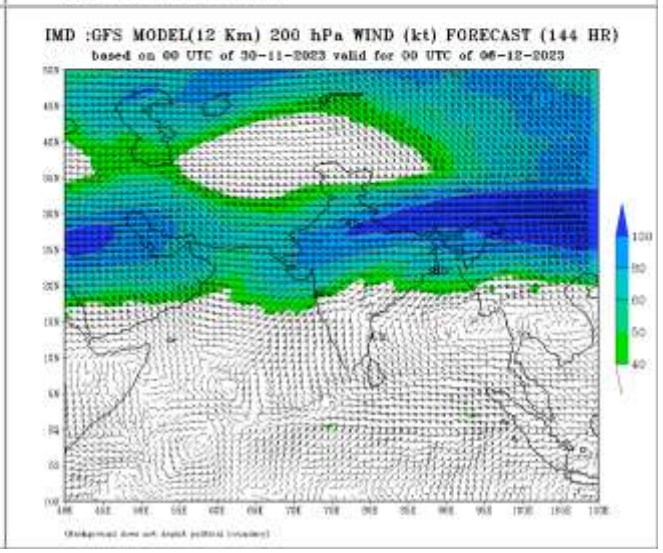

IMD:GFS MODEL(12 Km) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 30-11-2023 valid for 00 UTC of 05-12-2023

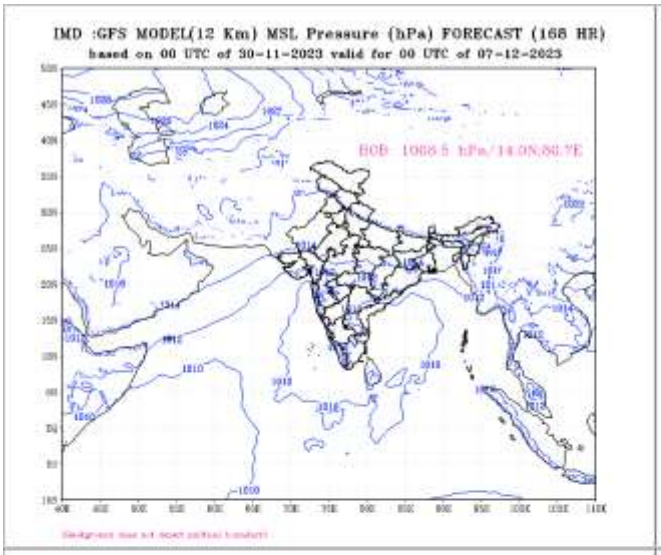

IMD :GFS MODEL(12 Km) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 30-11-2023 valid for 00 UTC of 05-12-2023

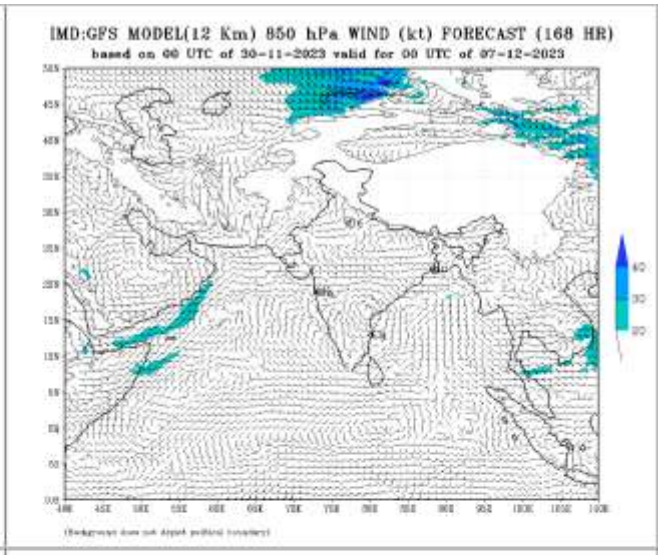

IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (144 HR)
based on 00 UTC of 30-11-2023 valid for 00 UTC of 06-12-2023

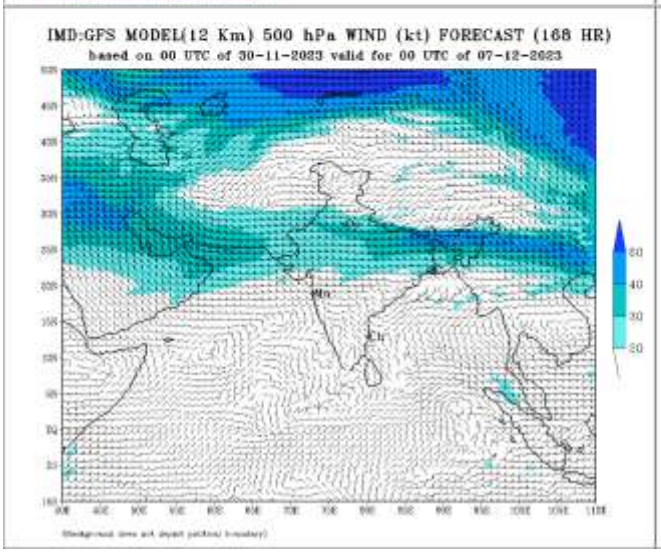

IMD:GFS MODEL(12 Km) 850 hPa WIND (kt) FORECAST (144 HR)
based on 00 UTC of 30-11-2023 valid for 00 UTC of 06-12-2023

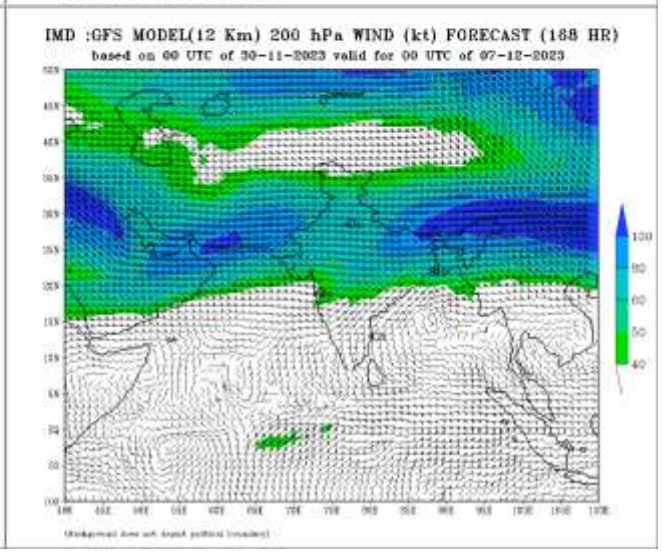

IMD:GFS MODEL(12 Km) 500 hPa WIND (kt) FORECAST (144 HR)
based on 00 UTC of 30-11-2023 valid for 00 UTC of 06-12-2023


IMD :GFS MODEL(12 Km) 200 hPa WIND (kt) FORECAST (144 HR)
based on 00 UTC of 30-11-2023 valid for 00 UTC of 06-12-2023


IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (168 HR)
based on 00 UTC of 30-11-2023 valid for 00 UTC of 07-12-2023
BOB 1008.5 hPa/14.0N,80.7E


IMD:GFS MODEL(12 Km) 850 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 30-11-2023 valid for 00 UTC of 07-12-2023


IMD:GFS MODEL(12 Km) 500 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 30-11-2023 valid for 00 UTC of 07-12-2023


IMD :GFS MODEL(12 Km) 200 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 30-11-2023 valid for 00 UTC of 07-12-2023