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

Tropical Cyclone Forecast Programme
Report Dated 29th November, 2023

Time of Issue: 1400 UTC

Synoptic features (based on 0300 UTC analysis):

Yesterday's Low Pressure Area over south Andaman Sea & adjoining Southeast Bay of Bengal moved west-northwestwards and lay as a Well Marked Low Pressure Area over Southeast Bay of Bengal & adjoining South Andaman Sea at 0830 hours IST of today, the 29th November, 2023.

It is likely to move west-northwestwards and intensify into a Depression over southeast Bay of Bengal on 30th November, 2023. Thereafter, it is likely to move northwestwards and intensify gradually into a Cyclonic Storm over Southwest & adjoining Southeast Bay of Bengal around 2nd December.

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 26^0C over north and adjoining westcentral BoB.	29-30 over southeast and adjoining southwest AS, along and off Karnataka, Kerala coasts. 26-28 over major parts of central and southwest AS, Around 26^oC 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})	50-60 over southeast BoB, 10-20 over most parts of south BoB.	20-30 over southwest AS, eastcentral AS. 10-20 over most parts of central AS.
Low Level convergence (X10^{-5} s^{-1})	10 over south BoB and adjoining Andaman Sea, Comorin Area.	-5 over parts of central AS, 5-10 over southeast AS adjoining to EIO.
Upper Level divergence (X10^{-5} s^{-1})	10-20 over most parts of BoB, 5-10 over Andaman Sea.	-5 over most parts of AS and -10 over parts of eastcentral AS.
Vertical Wind Shear (VWS knots) **Low: 05-10 knots** **Moderate:10-20**	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.

knots High: >20 knots		
Wind Shear Tendency (knots)	Decreasing ove south and adjoining westcentral BoB. Increasing over parts of Andaman Sea and north BoB.	Decreasing over south and central AS. Increasing over north AS.
Upper Tropospheric Ridge	Along 12°N over BoB.	-

Satellite observations based on INSAT imagery (0600 UTC):

(a) Over the Bay of Bengal & Andaman Sea:-
Scattered low and medium clouds with embedded moderate to intense convection lay over westcentral Bay of Bengal and weak to moderate convection lay over north Andaman Sea.

Over the Arabian Sea:-
Scattered low and medium clouds with embedded moderate to intense convection lay over south & adjoining central Arabian Sea and Comorin area.

convection outside India:-
Scattered low/med clouds with embedded moderate to intense convection over Sri Lanka, Palk Strait, Gulf of Mannar, Maldives, Tibet, China, Yellow Sea, adjoining east China Sea, Mymanmar, Thailand, Gulf of Thailand, Cambodia, Laos, Vietnam, Sumatra, Strait of Malacca, Malaysia, Borneo, South China Sea, Java Islands & Sea, Celebes Islands & Sea, Philippines, Sulu Sea and over Indian Ocean between lat 5.0N to 10.0S long 45.0E to 120.0E and bet lat 10.0S to 17.0S long 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.

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 southeast BoB and adjoining south Andaman Sea (8°N/90°E) as on today i.e., 29th Nov. Moving westnorthwestward and lay over southeast BoB (10°N/87.5°E) on 1st Dec as LPA, moving in the same direction and lay over southwest BoB (11°N/83.5°E) as DD on 2nd Dec, moving then northwestward and lay over southwest BoB (12°N/82°E) as VSCS on 3rd Dec. Moving in the same direction and lay over westcentral and adjoining southwest BoB (13°N/81.5°E) as VSCS on 4th Dec. Moving in the same direction and having landfall along Andhra Pradesh coast (16.5°N/79.5°E) as VSCS on 5th Dec. Weakening thereafter over land.	No significant circulation for the next 7 days.
IMD-GEFS	LPA on 1st Dec over southwest BoB (9°N/85°E). Moving westnorthwestward and lay over southwest BoB (11°N/82°E) as WML on 2nd Dec. Moving then northwestward and lay over westcentral BoB (14°N/81°E) as WML on 3rd Dec. It moves then in northeastward and lay over westcentral BoB (17°N/83°E) as a	No significant circulation for the next 7 days.

	WML. It will then move along the coast while weakening.	
IMD-WRF	No significant system during next 3 days.	No significant system during next 3 days.
NCMRWF-NCUM	LPA over southeast BoB ($10^oN/90^oE$) as on today i.e., 1st Dec. Moving westnorthwestward and lay over southeast and adjoining southwest BoB ($10.5^oN/88^oE$) as WML on 2nd Dec. It lay over southwest BoB ($12^oN/85^oE$) as a DD on 3rd Dec. It lay as CS/SCS over westcentral BoB ($10^oN/90^oE$) on 4th Dec. It lay over westcentral BoB ($15^oN/82^oE$) as VSCS on 5th Dec. Moving in the northeast direction and lay over westcentral BoB ($17^oN/84^oE$) as VSCS on 6th Dec. It continue moving in the same direction and lay over northwest and adjoining westcentral BoB ($19^oN/87^oE$) as SCS on 7th Dec. It continues moving in same direction towards Bangladesh coast while weakening.	No significant system during next 3 days.
NCMRWF-NEPS	LPA over southeast BoB ($10^oN/90^oE$) as on today i.e., 1st Dec. Moving westnorthwestward and lay over southeast and adjoining southwest BoB ($10.5^oN/88^oE$) as WML on 2nd Dec. It lay over southwest BoB ($12^oN/85^oE$) as a DD on 3rd Dec. It lay as CS/SCS over westcentral BoB ($10^oN/90^oE$) on 4th Dec. It lay over westcentral BoB ($15^oN/82^oE$) as VSCS on 5th Dec. Moving in the northeast direction and lay over westcentral BoB ($17^oN/84^oE$) as VSCS on 6th Dec. It continues moving in the same direction and lay over northwest and adjoining westcentral BoB ($19^oN/87^oE$) as SCS on 7th Dec. It continues moving in same direction towards Bangladesh coast while weakening.	No significant circulation for the next 7 days.
NCMRWF-UM (Regional)	LPA over southwest BoB ($10^oN/87^oE$) on 1st Dec. Moving westnorthwestward and lay over southwest BoB ($12^oN/83^oE$) as a DD/CS on 2nd Dec.	-
ECMWF	LPA over southeast and adjoining south Andaman Sea ($7^oN/92^oE$) as on today i.e., 29th Nov. Moving in the westnorthwestward and lay over southwest and adjoining southeast BoB ($10^oN/86.2^oE$) as a depression around 1st Dec. Moving in the same direction and lay over southwest BoB ($11^oN/83^oE$) as a CS on 2nd Dec by 18 UTC. Moving northwestward then and lay over southwest BoB ($11.6^oN/82.4^oE$) as CS on 3rd Dec 09 UTC. Moving in the same direction and lay over southwest and adjoining westcentral BoB ($12.7^oN/81.2^oE$) as a CS on 4th Dec 06 UTC. Moving in the same direction and making landfall as DD/CS along south Andhra Pradesh coast ($14.9^oN/79.9^oE$).	No significant circulation for the next 7 days.
NCEP-GFS	LPA over southeast BoB and adjoining south Andaman Sea ($6^oN/92^oE$) s on today i.e., 29th Nov. It lay over southeast BoB ($9^oN/90^oE$) as a depression on 30th Nov. It moves in westnorthwestward and lay over southwest and adjoining southeast BoB ($11.2^oN/86.8^oE$) as DD/CS on 1st Dec. It moves in northwestward and lay over southwest and adjoining westcentral BoB ($12.6^oN/85.1^oE$) as CS on 2nd Dec by 18 UTC. It moves then northnortheastward and lay over westcentral BoB ($14^oN/85.6^oE$) as a VSCS on 3rd Dec 18 UTC. Moving in the same direction and lay over westcentral BoB ($17^oN/85.8^oE$) as a VSCS/ESCS on 4th Dec. It lay over northwest BoB ($20.1^oN/88.5^oE$) as ESCS on 5th Dec 1800 UTC. It will have its landfall as CS/SCS along Bangladesh coast ($22.9^oN/90.6^oE$) on 6th Dec.	No significant circulation for the next 7 days.
IMD-Genesis	Potential zone over south Andaman Sea and adjoining southeast BoB as on today i.e., 29th Nov. It moves westnorthwestward and	No potential zone of

Potential Parameter	lay over southeast BoB on 30th Nov and on 1st Dec. It lay over southeast and adjoining southwest BoB on 2nd Dec, and over westcentral BoB on 4th Dec. It lay over northwest BoB on 5th Dec and over northeast BoB on 6th Dec.	cyclogenesis over AS.

Summary and conclusion:

1. For 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 30th November- 2nd December. However, most of the models are indicating initial westnorthwestwards movement, followed by northwestwards movement. Models are also indicating northeastwards recurvature of the system. However, there is variation among various models w.r.t. point and time of recurvature. There is consensus among various models w.r.t. intensification into cyclonic storm or higher intensity storm.

IMD GFS is indicating low pressure area over southeast Bay of Bengal (BoB) on 29th, depression on 1st December/1200 UTC over southeast bob with rapid intensification into a very severe cyclonic storm on 3rd December over southwest BoB. It is indicating initial west-northwestwards movement followed by northwestwards movement and crossing over Andhra Pradesh coast on 5th December/0000 UTC. ECMWF is indicating formation of depression on 2nd December over southwest BoB and cyclonic storm on 3rd December over southwest BoB. It is indicating crossing over south Andhra Pradesh coast on 4th December/1200 UTC as a depression. Similarly, NCUM is indicating formation of depression on 2nd December over southwest BoB. It is also suggesting further intensification into a cyclonic storm on 4th December over westcentral & adjoining southwest BoB. Further intensification is also suggested till 5th December with weakening from 7th onwards over northwest BoB. It is indicating the system to recurve northeastwards and reach Bangladesh coast on 8th December. IMD multi model ensemble (MME) is indicating formation of depression around 30th November. Thereafter, the system is indicated to intensify into a cyclonic storm on 3rd December over southwest BoB. Model is indicating peak intensification upto severe cyclonic storm stage. It is indicating likely northeastwards recurvature thereafter along the coast of north Andhra-Pradesh and south Odisha. It is further indicating the system to emerge into northwest BoB on 7th December and move towards Bangladesh coast as a weaker system.

Considering all the above, the well marked low-pressure area over southeast BoB and adjoining Andaman Sea is likely to move westnorthwestwards and intensify into a depression over southeast BoB on 30th November, 2023. Thereafter, it is likely to move northwestwards and intensify gradually into a cyclonic storm over southwest & adjoining southeast BoB around 2nd December.

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
LOW	**MOD**	**HIGH**	**HIGH**	**HIGH**	**HIGH**	**HIGH**

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

2. For the Arabian Sea:

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

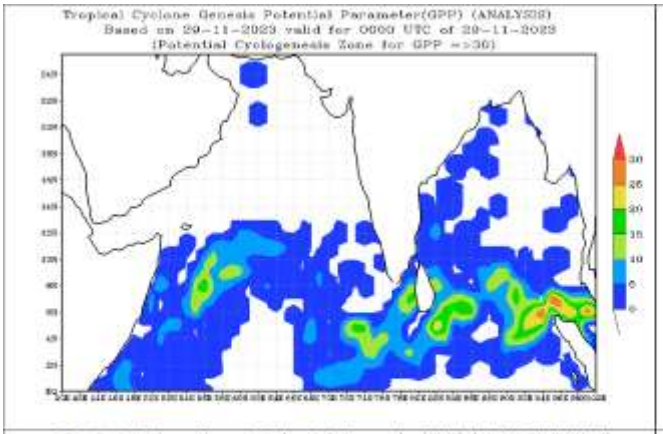
Probability of Cyclogenesis (formation of depression and above intensity systems) over the Arabian Sea during next 168 hours:

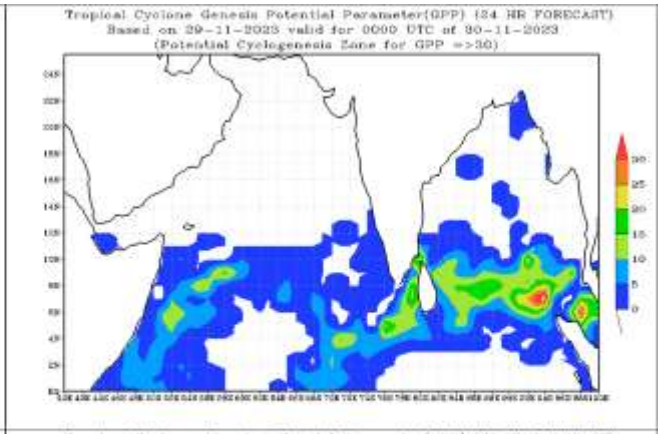
24 HOURS	24-48 HOURS	48-72 HOURS	72-96 HOURS	96-120 HOURS	120-144 HOURS	144-168 HOURS
NIL	NIL	NIL	NIL	NIL	NIL	NIL

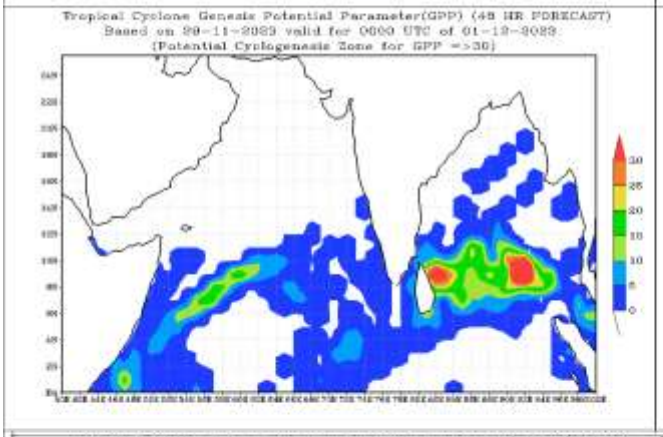
*Note: Every 24 hour forecast is valid upto 0300 UTC of the next day.

IOP: IOP for Andaman & Nicobar Islands for 29th - 30th November.

ANNEXURE


Tropical Cyclone Genesis Potential Parameter(GPP) (ANALYSIS)
Based on 29-11-2023 valid for 0000 UTC of 29-11-2023
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 29-11-2023 valid for 0000 UTC of 30-11-2023
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
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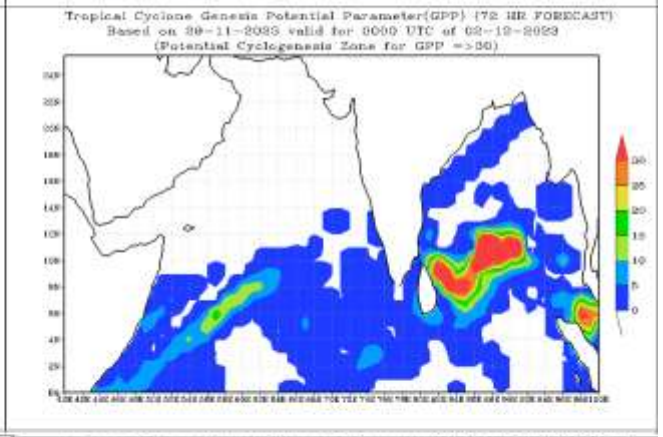
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
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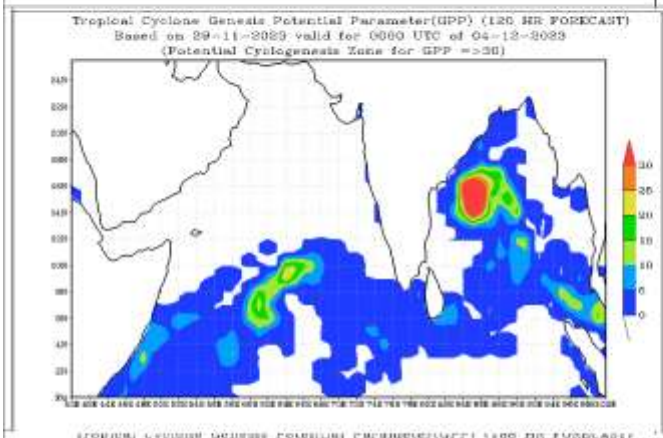
(Potential Cyclogenesis Zone for GPP =>30)


Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
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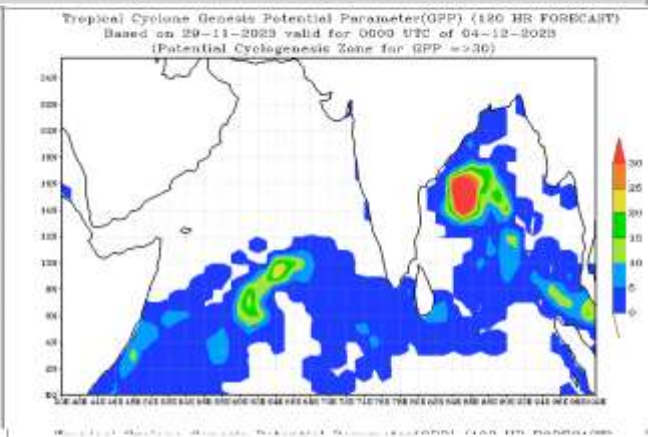
Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
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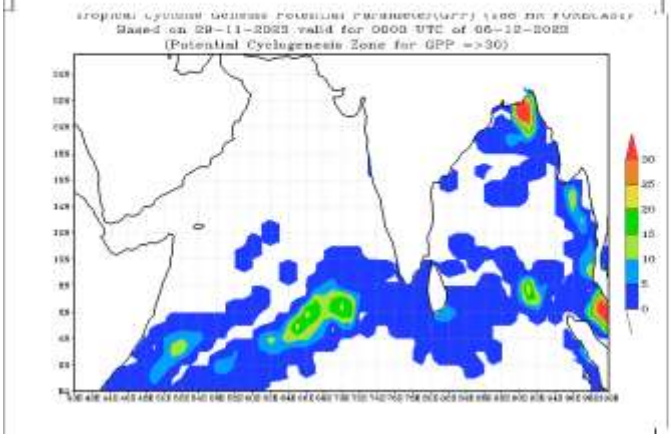
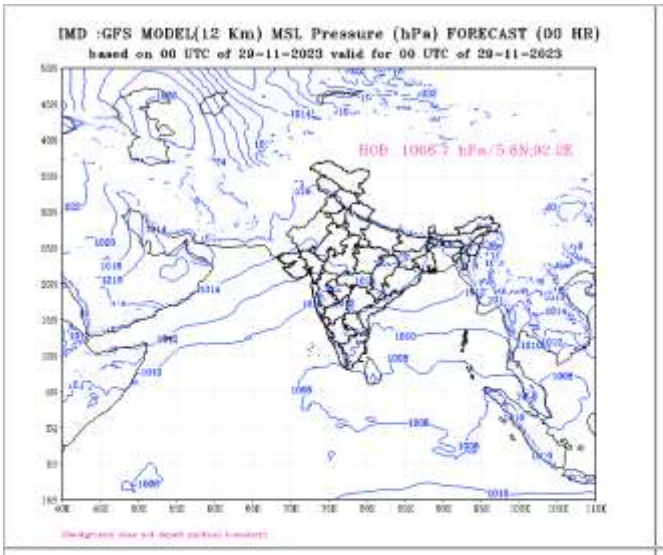
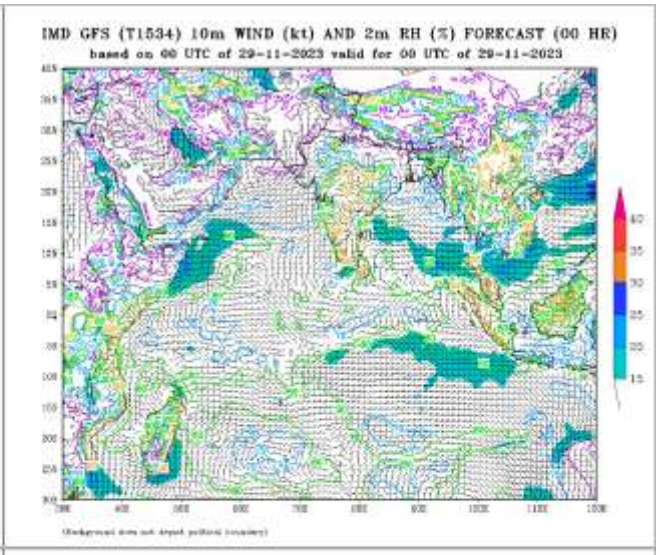
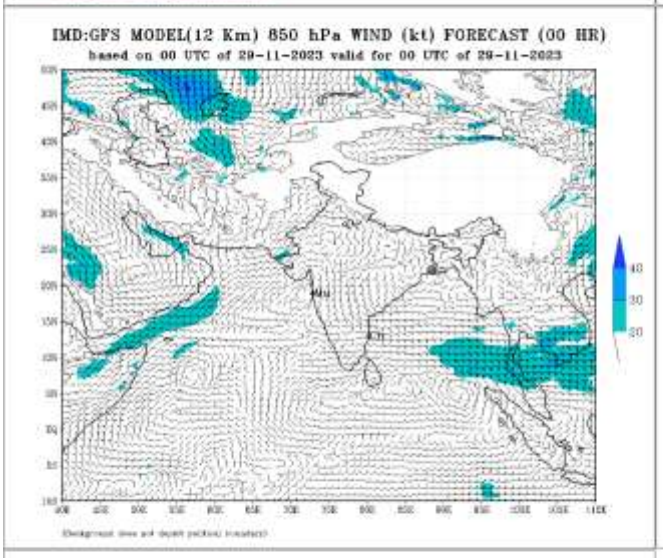
(Potential Cyclogenesis Zone for GPP =>30)


Based on 29-11-2023 valid for 0000 UTC of 06-12-2023
(Potential Cyclogenesis Zone for GPP =>30)


IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (00 HR)
based on 00 UTC of 29-11-2023 valid for 00 UTC of 29-11-2023
BOB 1006.7 hPa/5.8N/92.2E


IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (00 HR)
based on 00 UTC of 29-11-2023 valid for 00 UTC of 29-11-2023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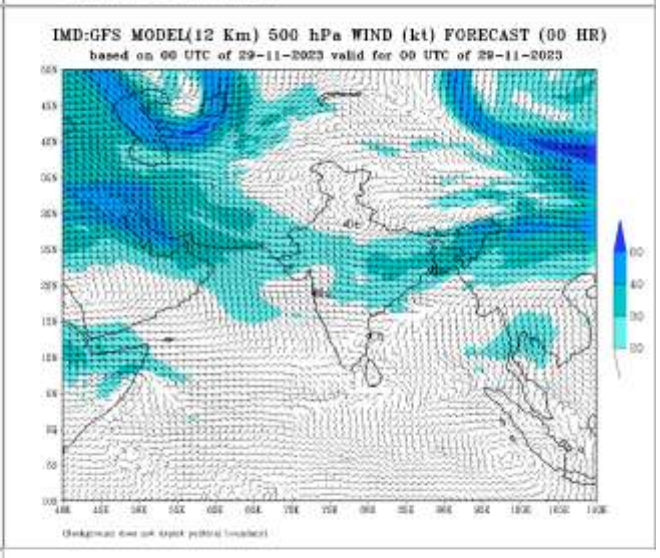
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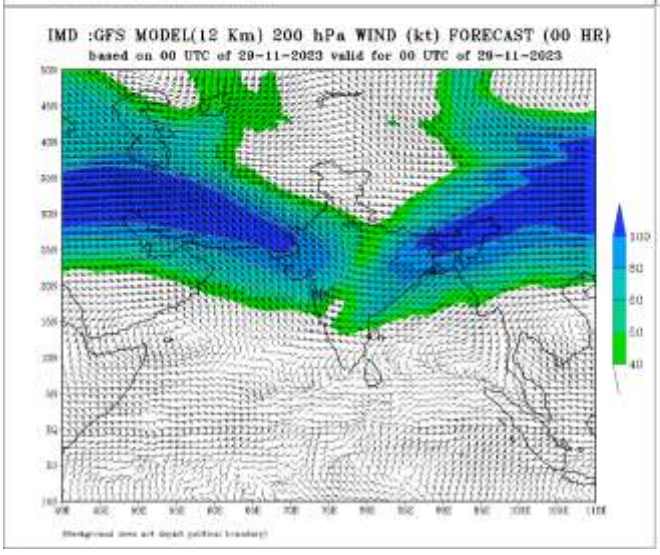
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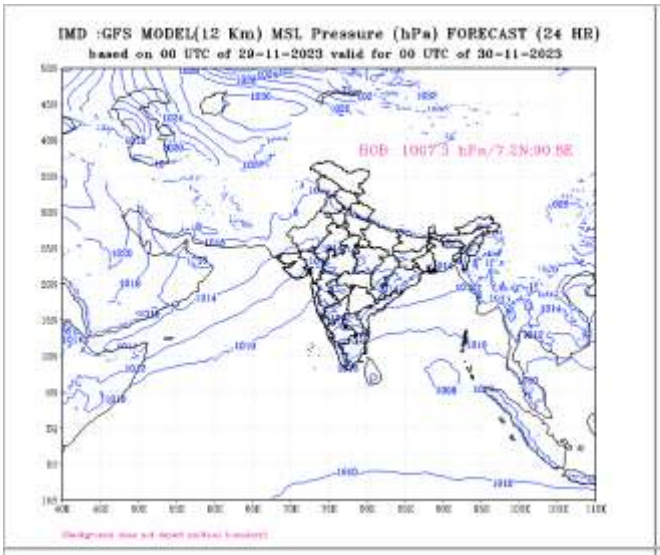
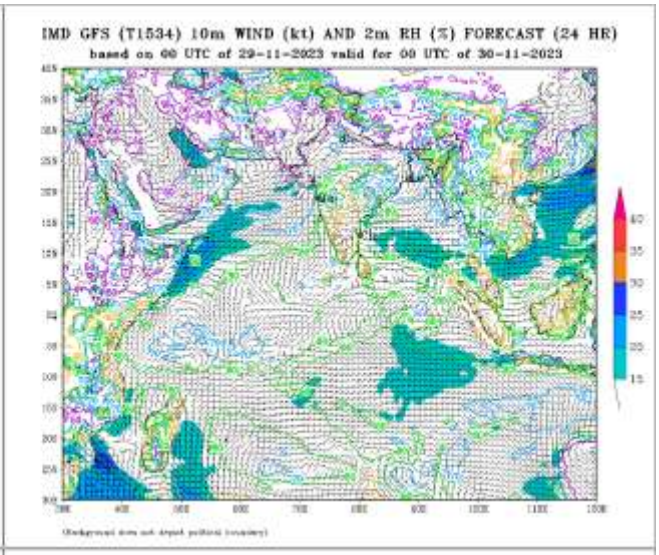
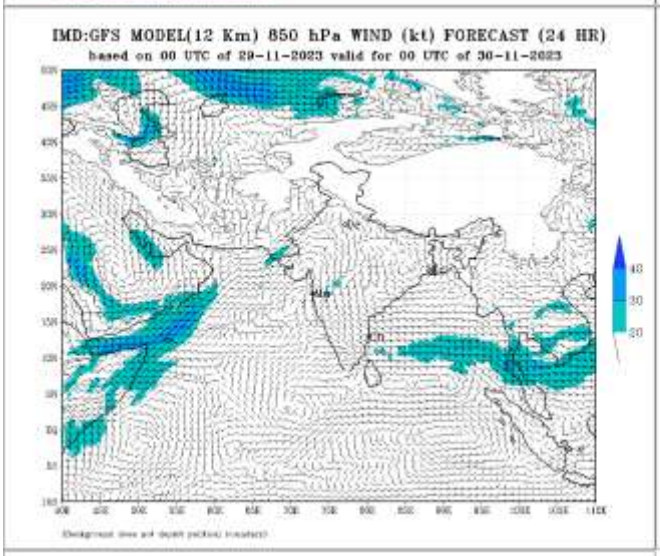

IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 29-11-2023 valid for 00 UTC of 30-11-2023


IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (24 HR)
based on 00 UTC of 29-11-2023 valid for 00 UTC of 30-11-2023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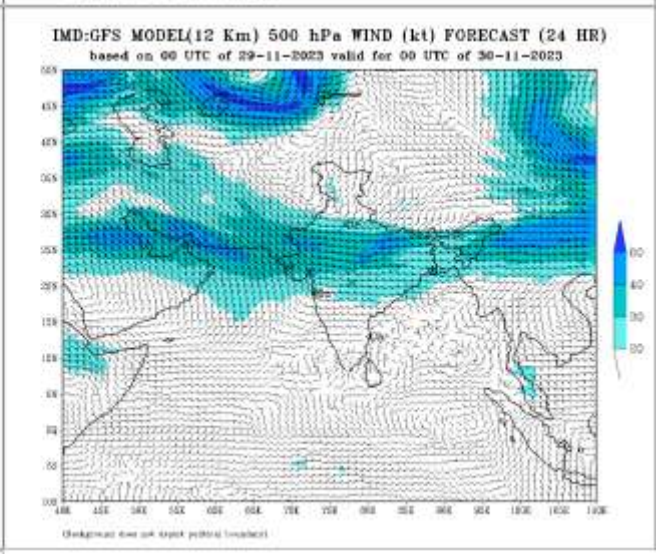
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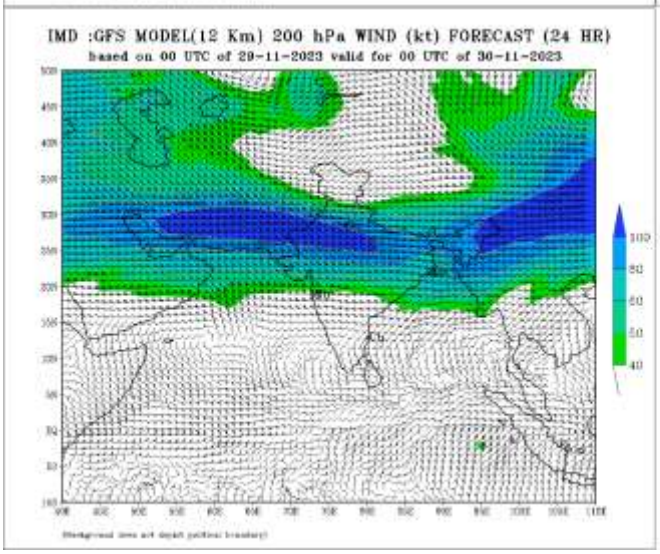
based on 00 UTC of 29-11-2023 valid for 00 UTC of 30-11-2023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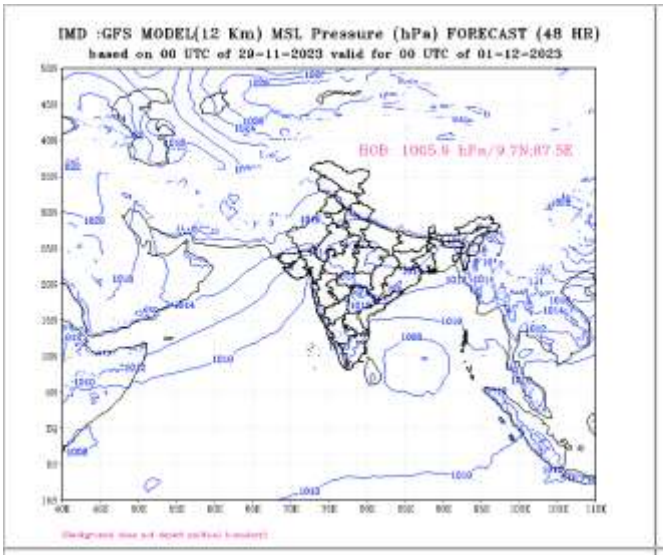
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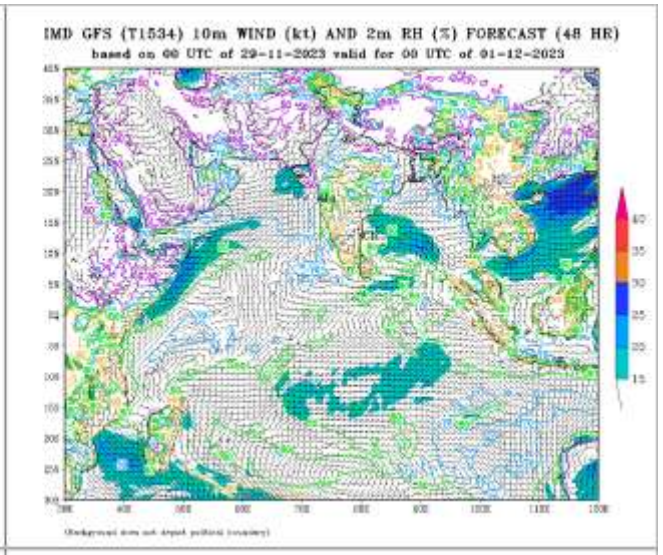
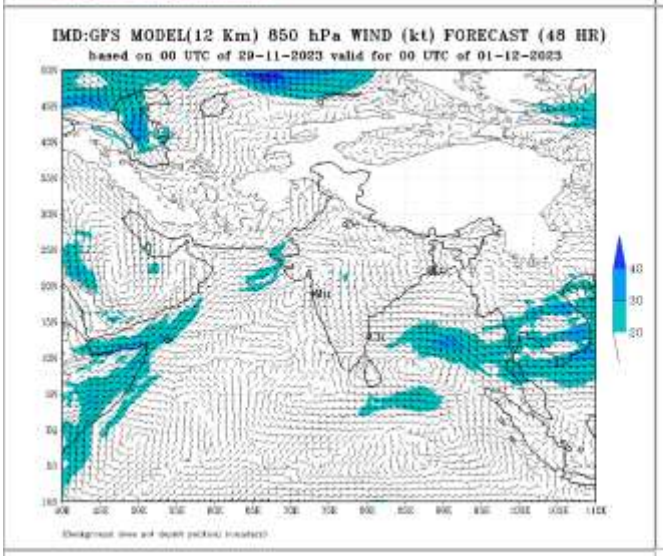
BOB 1005.9 hPa/9.7N:87.5E


IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (48 HR)
based on 00 UTC of 29-11-2023 valid for 00 UTC of 01-12-2023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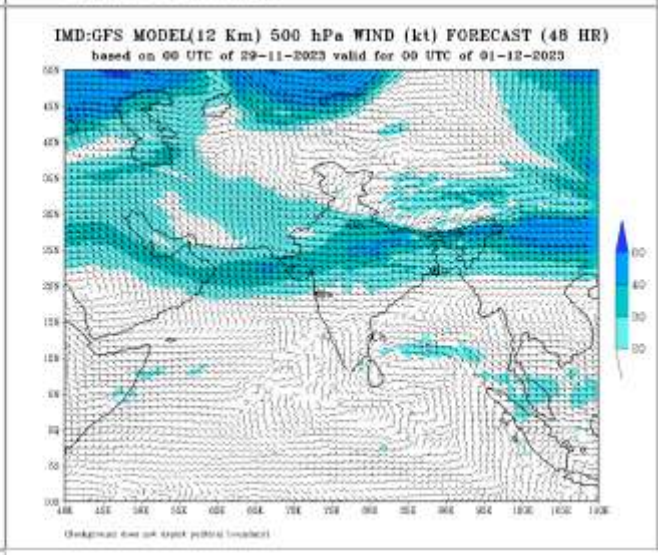
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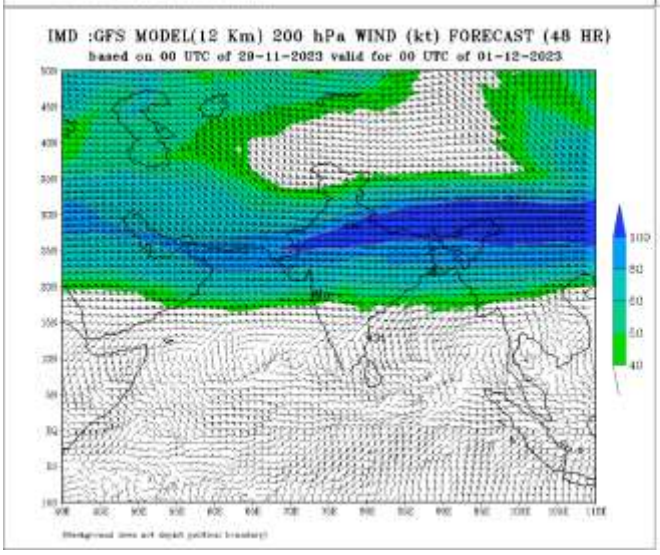
based on 00 UTC of 29-11-2023 valid for 00 UTC of 01-12-2023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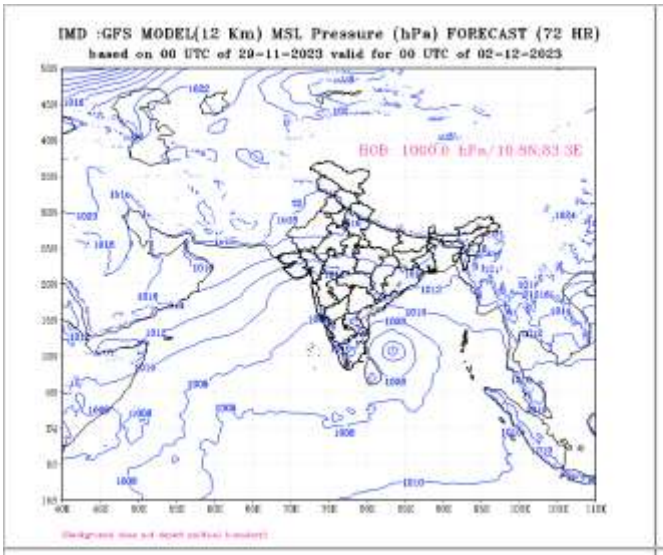
based on 00 UTC of 29-11-2023 valid for 00 UTC of 01-12-2023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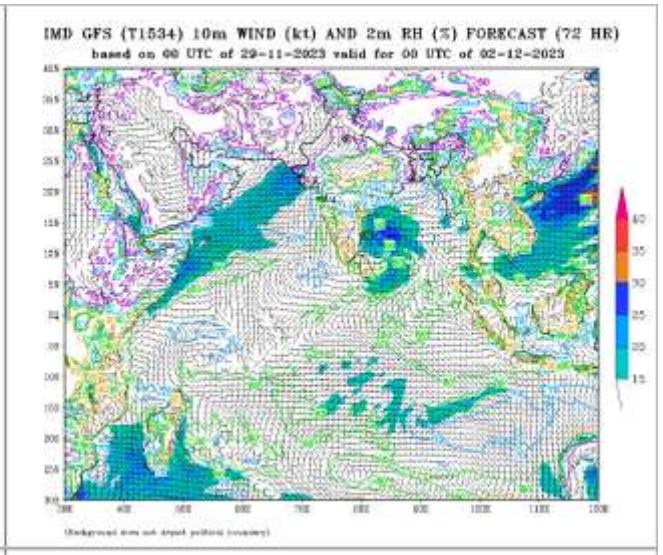
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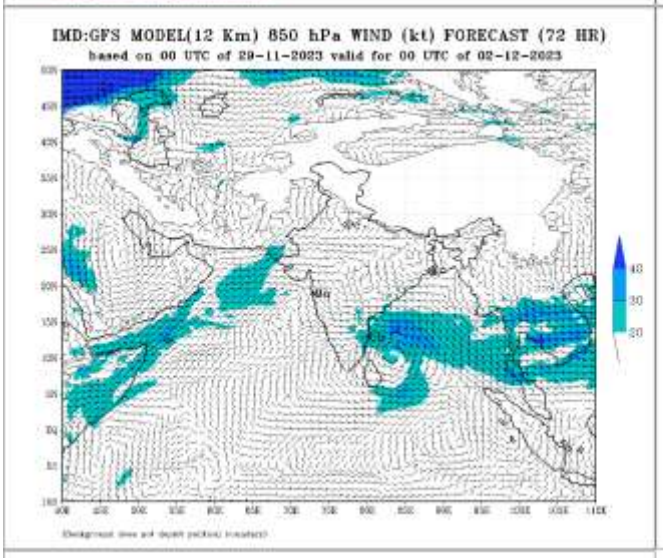
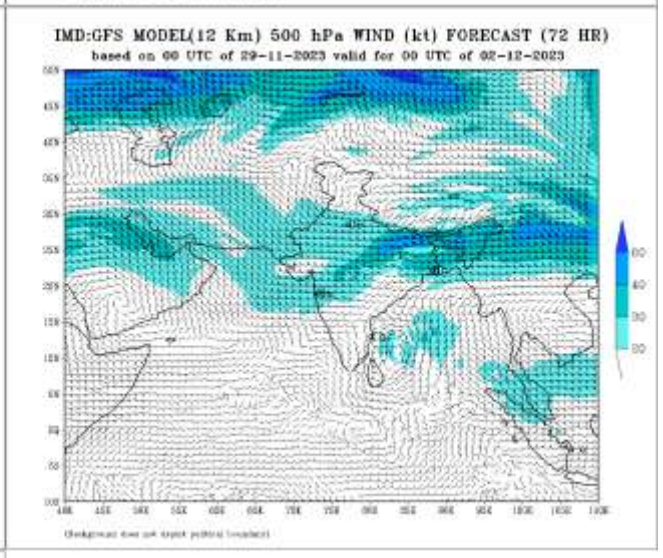
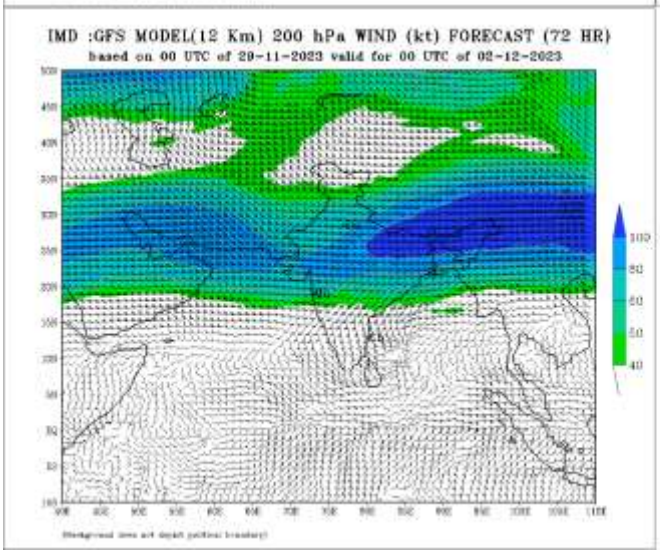
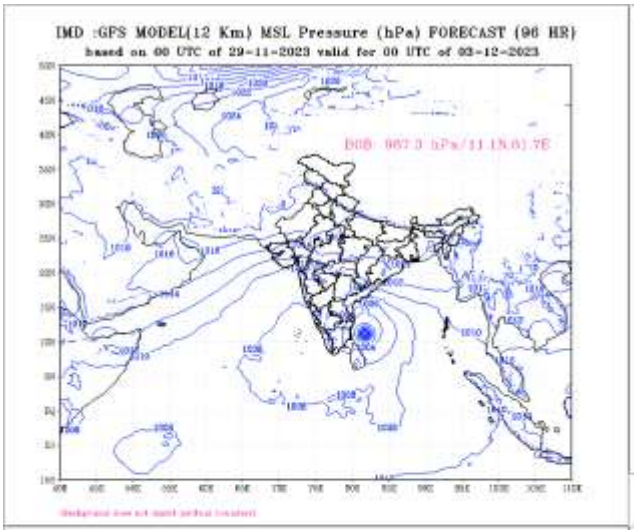
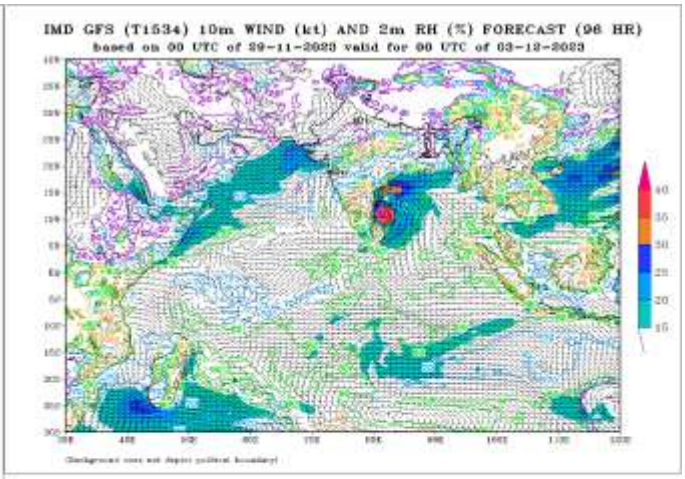
based on 00 UTC of 29-11-2023 valid for 00 UTC of 02-12-2023

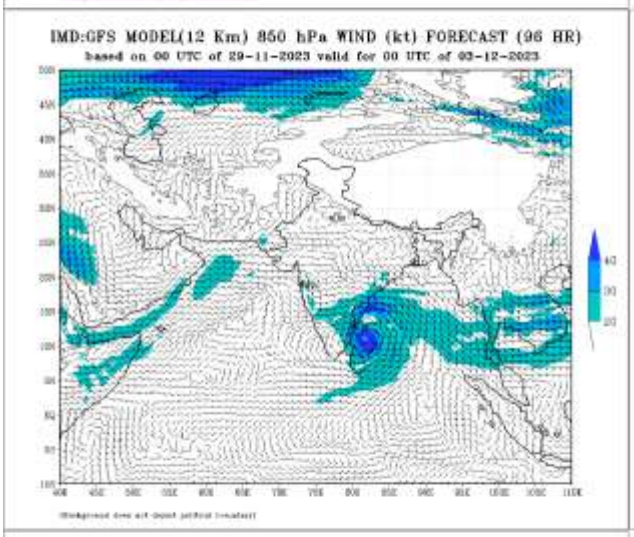

IMD:GFS MODEL(12 Km) 850 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 29-11-2023 valid for 00 UTC of 02-12-2023

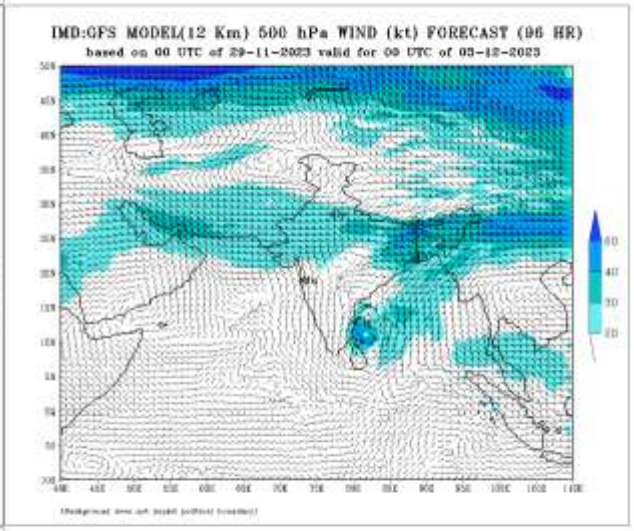

IMD:GFS MODEL(12 Km) 500 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 29-11-2023 valid for 00 UTC of 02-12-2023

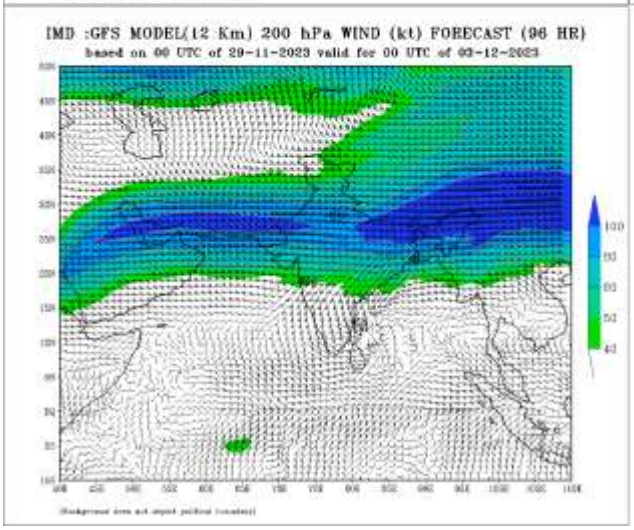

IMD :GFS MODEL(12 Km) 200 hPa WIND (kt) FORECAST (72 HR)
based on 00 UTC of 29-11-2023 valid for 00 UTC of 02-12-2023

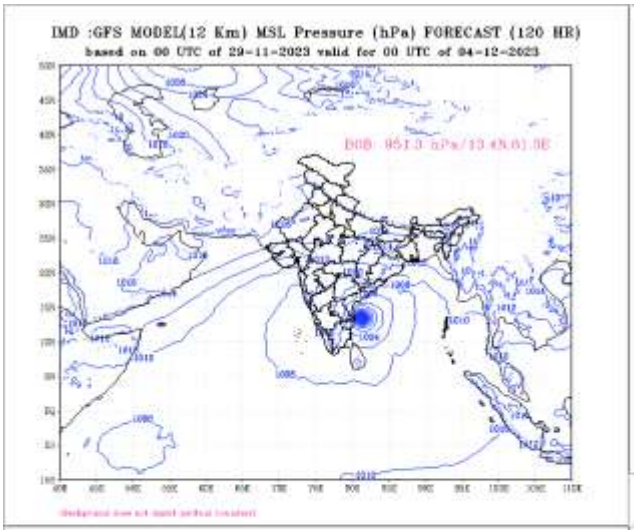

IMD :GPS MODEL(12 Km) MSL Pressure (hPa) FORECAST (96 HR)
based on 00 UTC of 29-11-2023 valid for 00 UTC of 03-12-2023

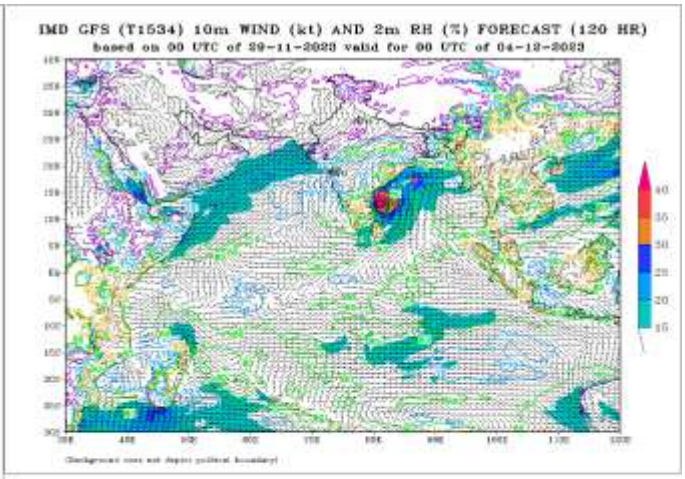

IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (96 HR)
based on 00 UTC of 29-11-2023 valid for 00 UTC of 03-12-2023

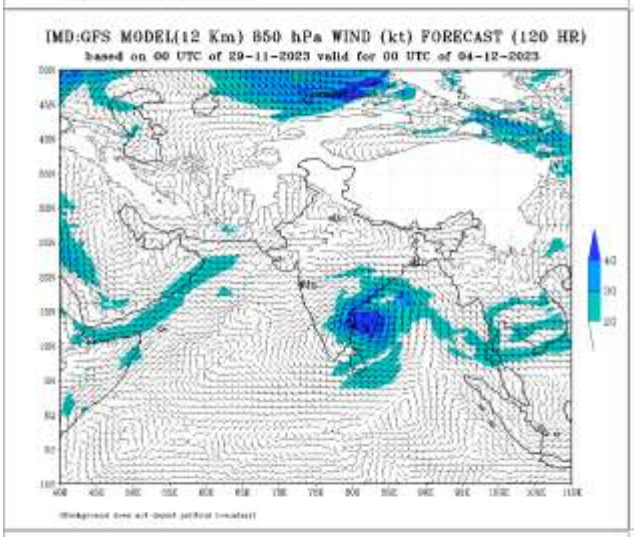

IMD:GFS MODEL(12 Km) 850 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 29-11-2023 valid for 00 UTC of 03-12-2023

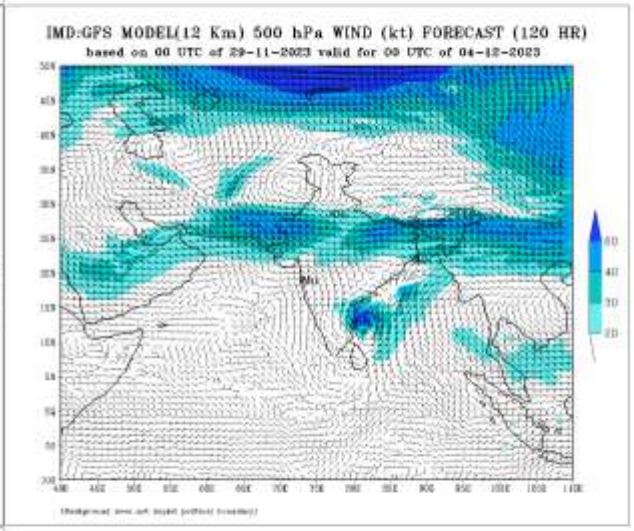

IMD:GFS MODEL(12 Km) 500 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 29-11-2023 valid for 00 UTC of 03-12-2023


IMD :GFS MODEL(12 Km) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 29-11-2023 valid for 00 UTC of 03-12-2023


IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 29-11-2023 valid for 00 UTC of 04-12-2023


IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (120 HR)
based on 00 UTC of 29-11-2023 valid for 00 UTC of 04-12-2023


IMD:GFS MODEL(12 Km) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 29-11-2023 valid for 00 UTC of 04-12-2023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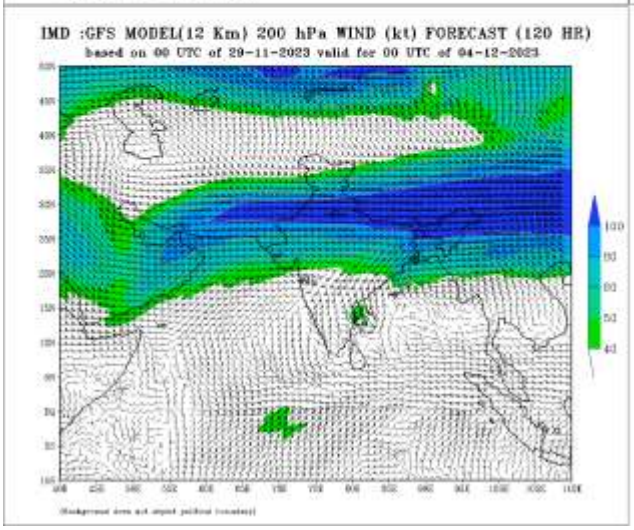
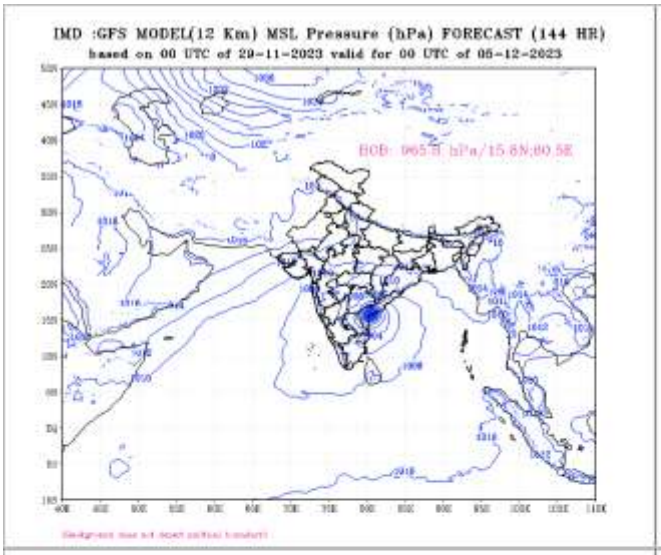
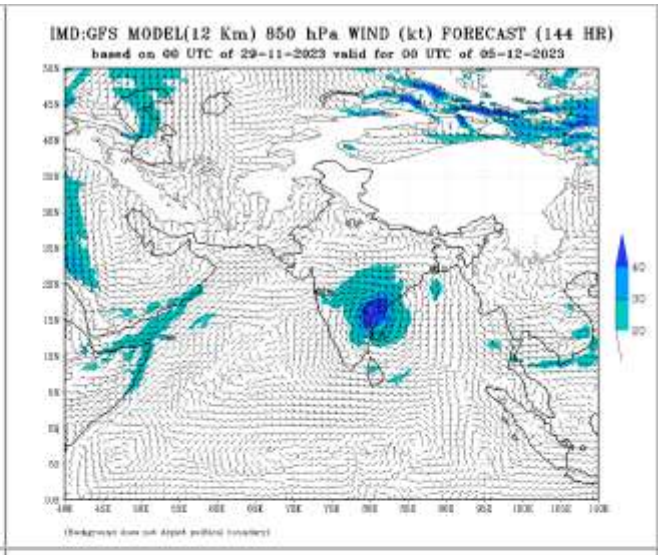
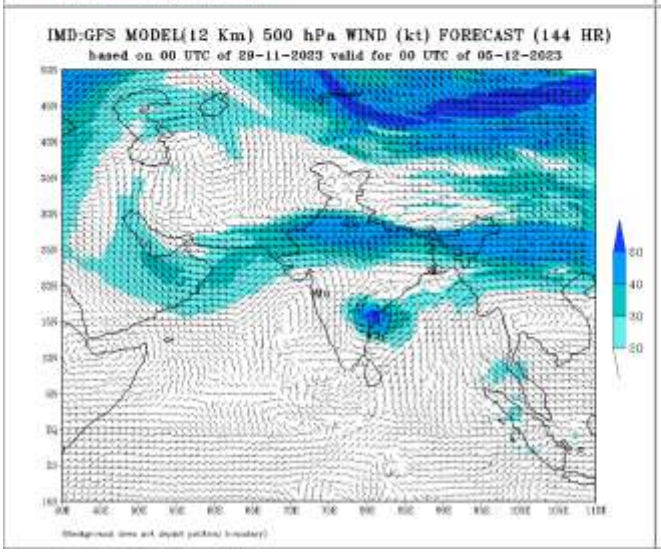
based on 00 UTC of 29-11-2023 valid for 00 UTC of 04-12-2023


IMD :GFS MODEL(12 Km) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 29-11-2023 valid for 00 UTC of 04-12-2023


IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (144 HR)
based on 00 UTC of 29-11-2023 valid for 00 UTC of 05-12-2023


IMD:GFS MODEL(12 Km) 850 hPa WIND (kt) FORECAST (144 HR)
based on 00 UTC of 29-11-2023 valid for 00 UTC of 05-12-2023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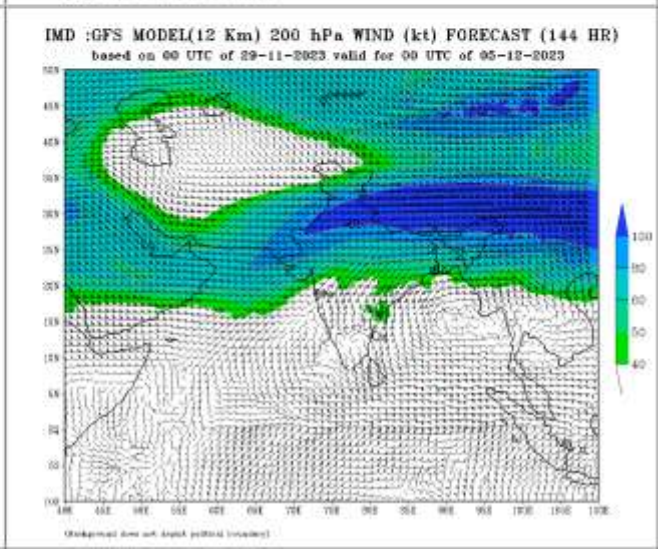
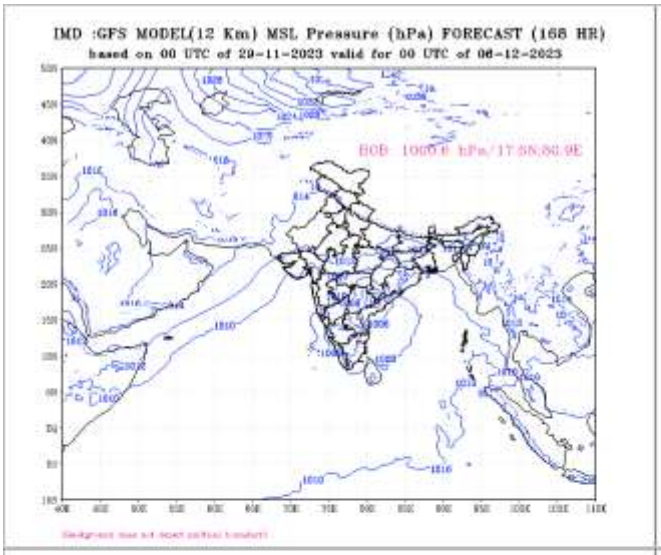
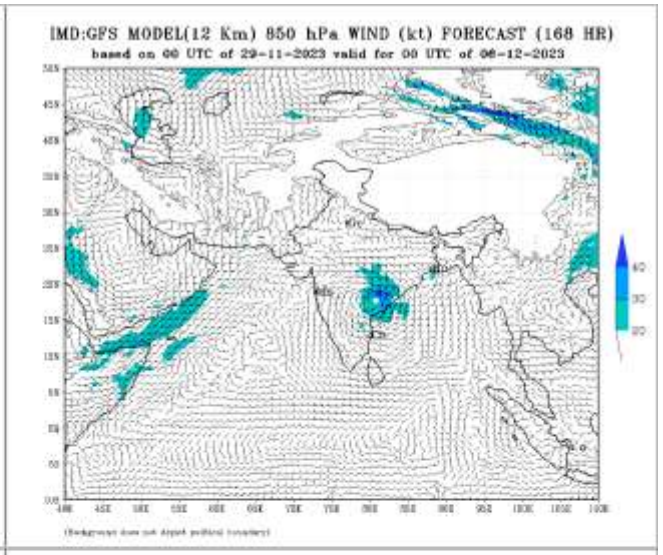
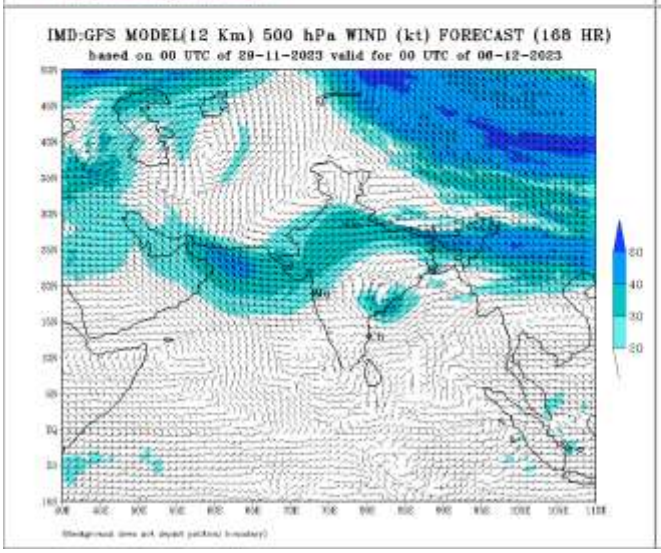
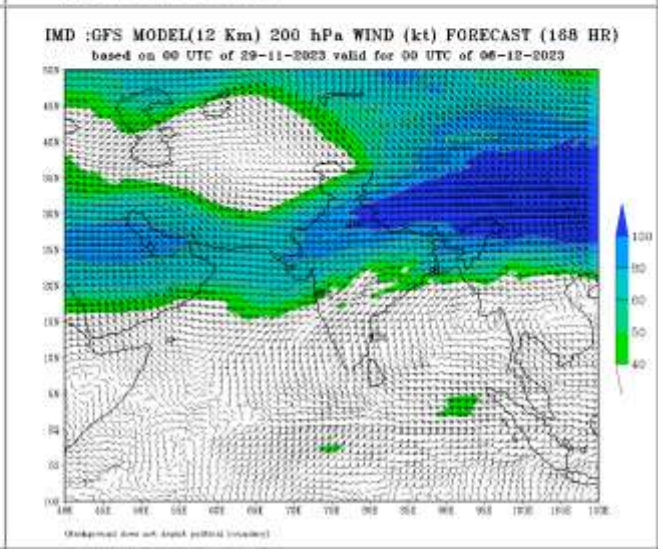
based on 00 UTC of 29-11-2023 valid for 00 UTC of 05-12-2023


IMD :GFS MODEL(12 Km) 200 hPa WIND (kt) FORECAST (144 HR)
based on 00 UTC of 29-11-2023 valid for 00 UTC of 05-12-2023


IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (168 HR)
based on 00 UTC of 29-11-2023 valid for 00 UTC of 06-12-2023


IMD:GFS MODEL(12 Km) 850 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 29-11-2023 valid for 00 UTC of 06-12-2023


IMD:GFS MODEL(12 Km) 500 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 29-11-2023 valid for 00 UTC of 06-12-2023


IMD :GFS MODEL(12 Km) 200 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 29-11-2023 valid for 00 UTC of 06-12-2023