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

Tropical Cyclone Forecast Programme
Report Dated 05th December, 2023

Time of Issue: 1200 UTC

Synoptic features (based on 0900 UTC analysis):

The Severe Cyclonic Storm "Michaung" (pronounced as Migjaum) over westcentral Bay of Bengal near south Andhra Pradesh coast moved northwards with a speed of 11 kmph during past 06 hours and crossed south Andhra Pradesh coast close to south of Baptla during 1230 to 1430 hours ist of today, the 5th December 2023 as a Severe Cyclonic Storm with maximum sustained wind speed of 90-100 kmph. It lay centered at 1430 hours IST of today, the 5th December, 2023 over south coastal Andhra Pradesh near latitude 15.8°N and longitude 80.3°E, about 15 km southwest of Baptla and 40 km northeast of Ongole.

The system is likely to move nearly northwards and weaken into a cyclonic storm during next 2 hours.

Dynamical and thermo-dynamical features (0600 UTC)

Parameter	Bay of Bengal (BoB)	Arabian Sea (AS)
Sea Surface Temperature (SST) ºC	28-29 over the system and its surroundings, also over its forecasted path. 27 over along and off Andhra Pradesh coast north of 14^0N, south Odisha coast.	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^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 parts of eastcentral AS. Less than 40 over westcentral AS along and off Yemen-Oman coast, north AS.
Cyclonic Relative vorticity (X10^{-6}s^{-1})	150-200 over the system. 100-150 around the system. 25 over Comorin area.	20-30 over central parts of south AS. 10-20 over most parts of AS.
Low Level convergence (X10^{-5} s^{-1})	10 over the northeast of the system, 5 over westcentral BoB.	5 to10 over parts of south BoB. -5 over most parts of westcentral AS.
Upper Level divergence (X10^{-5} s^{-1})	20 over the northeast of the system, 5-10 over westcentral and adjoining southwest BoB.	5-10 over eastcentral and adjoining southeast AS, along and off Karnataka and north Kerala coasts. -5 over most parts of central and north

		AS.
Vertical Wind Shear (VWS knots) **Low: 05-10 knots** **Moderate:10-20 knots** **High: >20 knots**	5-10 over the central and adjoining south BoB, north Andaman Sea. 20 over the central parts of south BoB, Gulf of Mannar, south Andaman Sea. High (>20knots) over rest of BoB.	10-20 over southeast and parts of southwest AS. High (>20knots) over rest of AS.
Wind Shear Tendency (knots)	Decreasing over central BoB, north Andaman Sea. Increasing over north and south BoB, south Andaman Sea, Gulf of Mannar.	Decreasing over southeast AS, along and off Kerala coast, central parts of south AS adjoining to EIO. Increasing over rest of the AS.
Upper Tropospheric Ridge	Along 15^{o}N over BoB.	Along 14^{o}N over AS.

Satellite observations based on INSAT imagery (0600 UTC):

(a) Over the Bay of Bengal & Andaman Sea:-
Scattered to broken low/med clouds with embedded intense to very intense convection over westcentral bay. Scattered low/med clouds with embedded moderate to intense convection over rest bay Andaman Sea.

(b) Over the Arabian Sea:-
Scattered low/med clouds with embedded moderate to intense convection over south Arabian Sea Lakshadweep islands area, Comorin area and weak to moderate convection over central Arabian Sea.

(c) Convection outside India:-
Scattered low/med clouds with embedded moderate to intense convection over Maldives, Tibet, China, north Myanmar, Thailand, Gulf of Thailand, Sumatra, Strait of Malacca, Malaysia, Borneo, South China Sea, Java islands & Sea, Celebes islands & Sea, East China Sea, Mozambique channel and over Indian Ocean between lat 5.0N to 10.0S long 40.0E to 110.0E and between lat 23.0S to 35.0S long 60.0E to 110.0E.

M.J.O. Index:
MJO index is currently in Phase 4 with amplitude greater than 1, it will be in same phase till 7th Dec. It will then move to phase 5 on 8th Dec with amplitude greater than 1, it remains in same phase and with amplitude greater than 1 till 10th Dec. Later on 11th Dec its amplitude will be less than 1 but in the same phase.

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	SCS over westcentral BoB (WCB) to cross the south Andhra Pradesh (AP) coast (14.7N/80.0E) as on today i.e., 5th Dec. It will lay over land as WML/D on 6th Dec and weaken thereafter.	No significant circulation for the next 7 days.
IMD-GEFS	SCS over westcentral BoB (WCB) to cross the south Andhra Pradesh (AP) coast (14.7N/80.0E) as on today i.e.,	No significant circulation for the next 7 days.

	5th Dec. It will lay over land as D/DD on 6th Dec and weaken thereafter.	
IMD-WRF	SCS over westcentral BoB (WCB) to cross the south Andhra Pradesh (AP) coast (14.9N/80.0E) as on today i.e., 5th Dec. It will lay over land as D/DD on 6th Dec and weaken thereafter.	No significant system during next 3 days.
NCMRWF-NCUM	SCS over westcentral BoB (WCB) to cross the south Andhra Pradesh (AP) coast (14.7N/80.0E) as on today i.e., 5th Dec. It will lay over land as DD/CS on 6th Dec and weaken thereafter.	An LPA over southeast AS on 8th Dec having northeastward movement and lay as depression over southeast and adjoining eastcentral AS (12.5N/72E) as depression on 10th Dec. It will then move northwestward and lay over eastcentral AS (15N/70E) with same intensity on 11th Dec. Continue moving in same direction and lay over eastcentral AS (16N/69E) with same intensity. Model shows slight weakening thereafter.
NCMRWF-NEPS	SCS over westcentral BoB (WCB) to cross the south Andhra Pradesh (AP) coast (14.7N/80.0E) as on today i.e., 5th Dec. It will lay over land as DD/CS on 6th Dec and weaken thereafter.	An LPA over southeast AS (11N/71E) on 8th Dec having northeastward movement and lay as depression over southeast and adjoining eastcentral AS (13N/72E) as depression on 10th Dec. It will then move northwestward and lay over eastcentral AS (15N/70E) with same intensity on 11th Dec. Continue moving in same direction and lay over eastcentral AS (16N/69E) with same intensity. Model shows slight weakening thereafter.
NCMRWF-UM (Regional)	CS/SCS over westcentral BoB (WCB) to cross the south Andhra Pradesh (AP) coast (14.8N/80.0E) as on today i.e., 5th Dec. It will lay over land as depression on 6th Dec and weaken thereafter.	An LPA over southeast and adjoining southwest AS (7N/66E) on 7th Dec having northeastward movement and lay as DD/CS over southeast and adjoining eastcentral AS (10.0N/70E) on 8th Dec.
ECMWF	SCS over westcentral BoB (WCB) to cross the south Andhra Pradesh (AP) coast (14.7N/80.0E) as on today i.e., 5th Dec 06 UTC. It will lay over land as WML/D on 6th Dec 00 UTC and weaken thereafter.	An LPA over southeast (9.1N/73.1E) AS on 12 UTC of 9th Dec having northwestward movement. It lay over southeast AS (9.9N/71.7E) as a depression on 12 UTC of 10th Dec. Continue moving in same direction and lay over the same region (10.5N/66.2E) with further intensification.
NCEP-GFS	SCS over westcentral BoB (WCB) to cross the south Andhra Pradesh (AP) coast (15N/80.0E) as on today i.e., 5th Dec 06 UTC. It will lay over land as WML/D on 6th Dec 00 UTC and weaken thereafter.	An LPA over southeast (9.8N/68.9E) AS on 12 UTC of 10th Dec having northwestward movement. It lay over southeast and adjoining southwest AS (10.1N/67.8E) as a depression on 06 UTC of 11th Dec. It will continue moving in same direction.
IMD-Genesis Potential Parameter	Potential zone over WCB along and off south Andhra Pradesh coast as on today i.e., 5th Dec.	Potential zone over southeast Arabian Sea on 8th Dec having its northwestward movement and lay over southeast and adjoining southwest Arabian Sea on 12th Dec.

Summary and conclusion:

1. **For the Bay of Bengal**:

The guidance from various numerical models (IMD-GFS, IMD-GEFS, IMD-WRF, NCUM, NCEP-GFS, ECMWF AND IMD-MME) and environmental features suggest that the severe cyclonic storm "Michaung" is continue to move northnortheastwards and south Andhra Pradesh coast today i.e., 5th December, 2023. The landfall point is varying between latitude 14.8-15.50N/80.0-80.30E, landfall time is varying between 5th/0000 UTC to 5th/0900 UTC.

Considering these, it is inferred that the system crossed south Andhra Pradesh coast close to south of Baptla (43220), during 0700 to 0900 UTC of today, the 5th December 2023 as a severe cyclonic storm with maximum sustained wind speed of 90-100 kmph.

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
NIL	NIL	NIL	NIL	NIL	NIL	NIL

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

2. **For the Arabian Sea**:

The IMD-GFS and IMD-GEFS models are not indicating any significant system for the next seven days. However, the NUCM models are indicating a low pressure area (LPA) over southeast Arabian Sea on 8th Dec having northeastward movement and will depression on 10th/11th Dec. NCEP-GFS and ECMWF models are indicating an LPA over southeast Arabian Sea on 9th Dec. Both the models are indicating its northeastward movement with further intensification into depression (ECMWF is showing on 10th, NCEP-GFS is showing on 11th Dec). These models are also suggesting its further intensification on the subsequent days. Hence, there is a low probability for the cyclogenesis over the Arabian Sea on day 4, and moderate probability from day 5 to day 7.

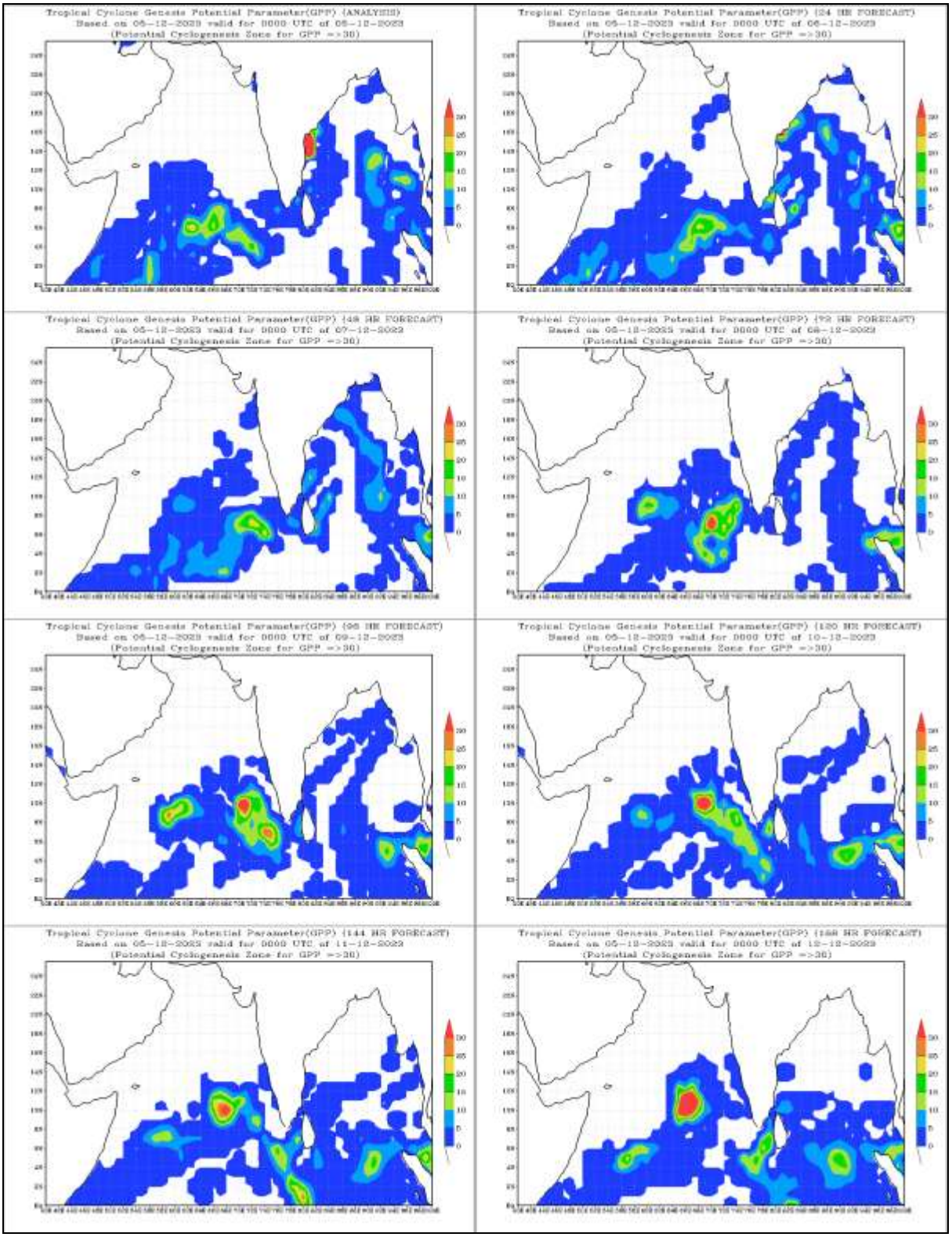
Probability of Cyclogenesis (formation of depression and above intensity systems) over the Arabian Sea during next 168 hours:

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

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

IOP: Nil.

ANNEXURE


Tropical Cyclone Genesis Potential Parameter(GPP) (ANALYSIS)
Based on 05-12-2023 valid for 0000 UTC of 05-12-2023
(Potential Cyclogenesis Zone for GPP =>30)
Tropical Cyclone Genesis Potential Parameter(GPP) (24 HR FORECAST)
Based on 05-12-2023 valid for 0000 UTC of 06-12-2023
(Potential Cyclogenesis Zone for GPP =>30)
Tropical Cyclone Genesis Potential Parameter(GPP) (48 HR FORECAST)
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Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
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Based on 05-12-2023 valid for 0000 UTC of 09-12-2023
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Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
Based on 05-12-2023 valid for 0000 UTC of 10-12-2023
(Potential Cyclogenesis Zone for GPP =>30)
Tropical Cyclone Genesis Potential Parameter(GPP) (144 HR FORECAST)
Based on 05-12-2023 valid for 0000 UTC of 11-12-2023
(Potential Cyclogenesis Zone for GPP =>30)
Tropical Cyclone Genesis Potential Parameter(GPP) (168 HR FORECAST)
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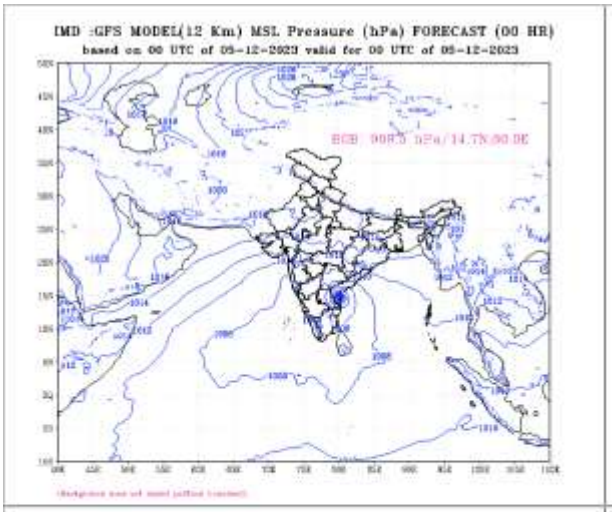
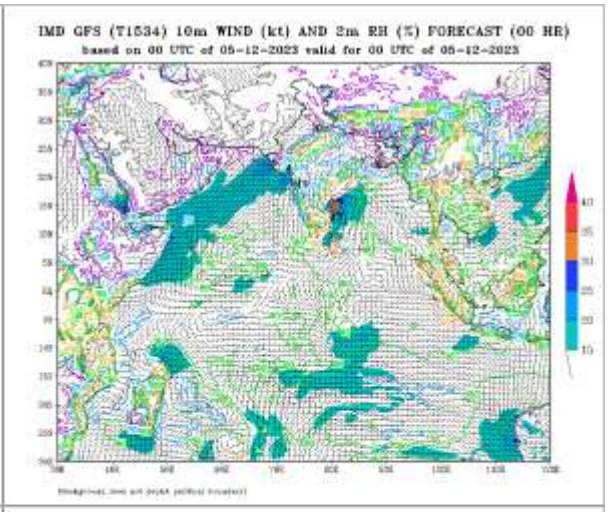
(Potential Cyclogenesis Zone for GPP =>30)


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


IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (00 HR)
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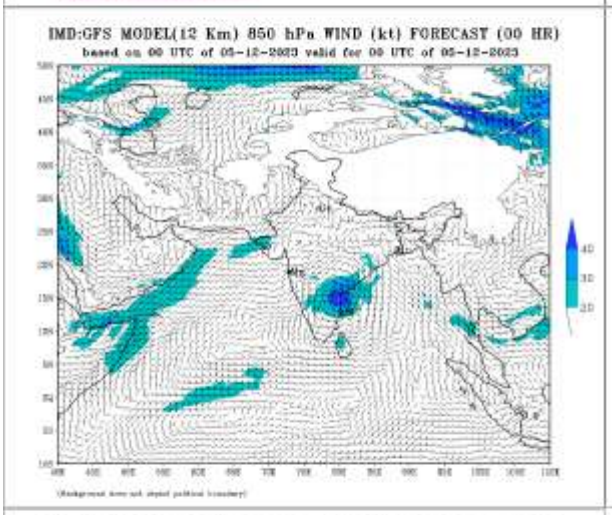
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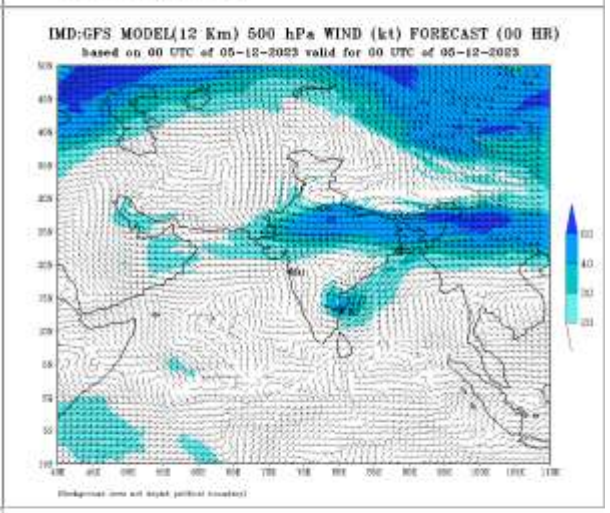
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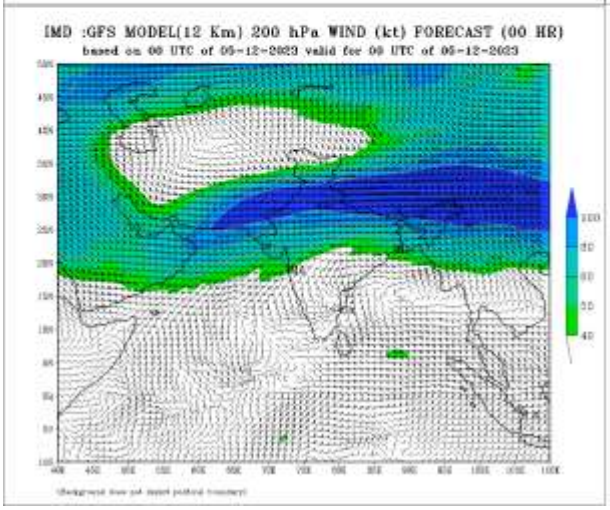
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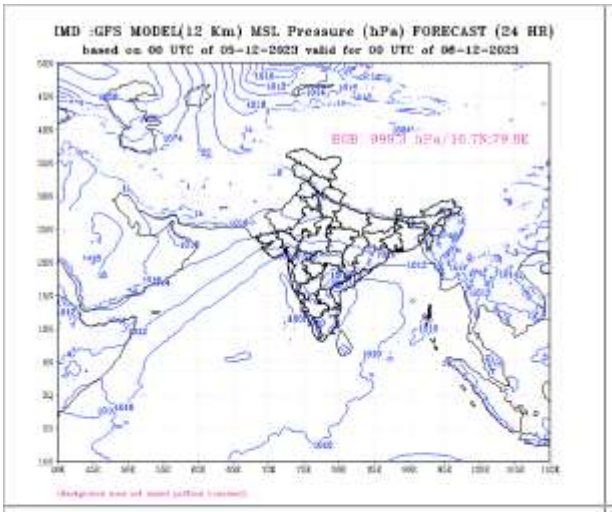
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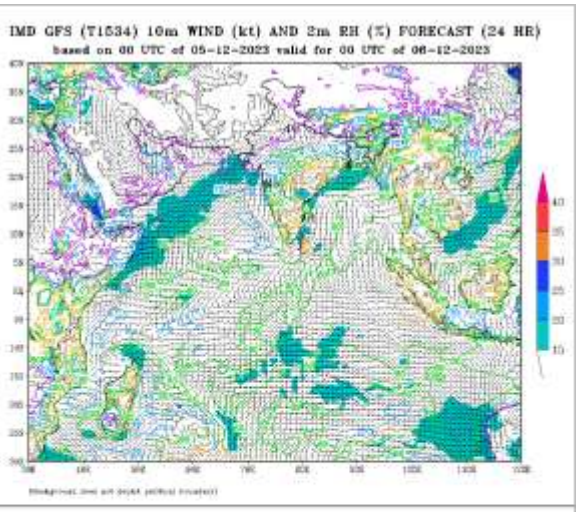
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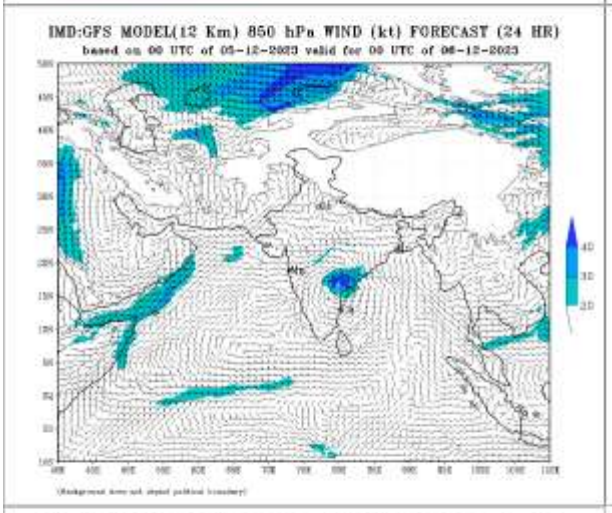
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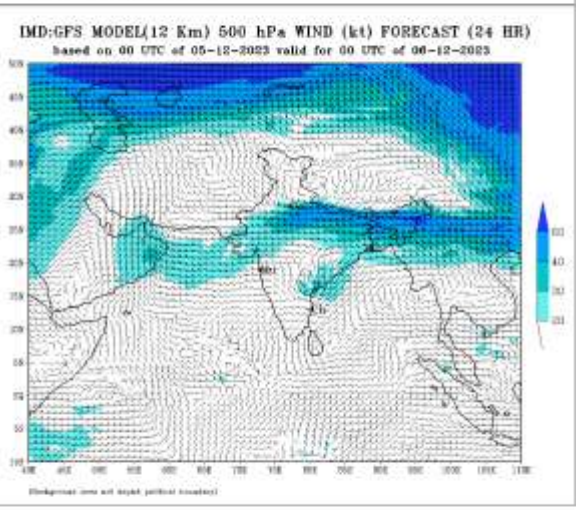
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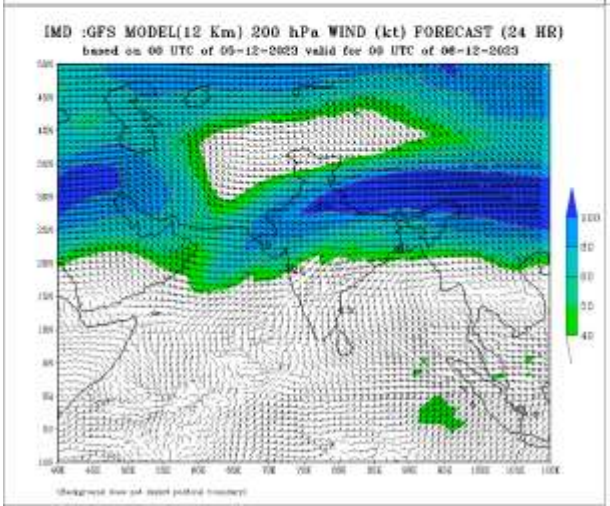
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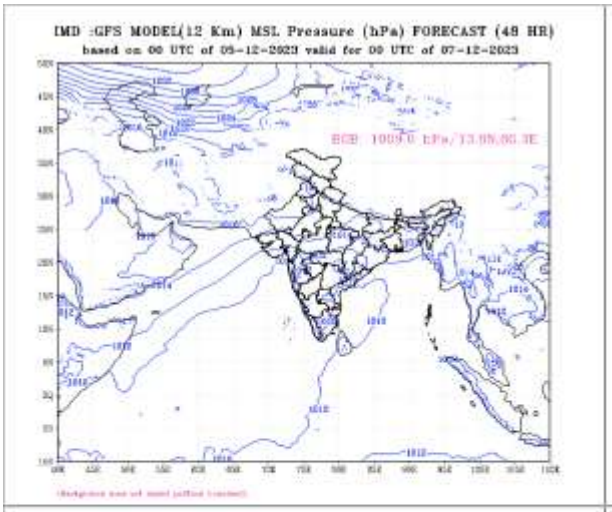
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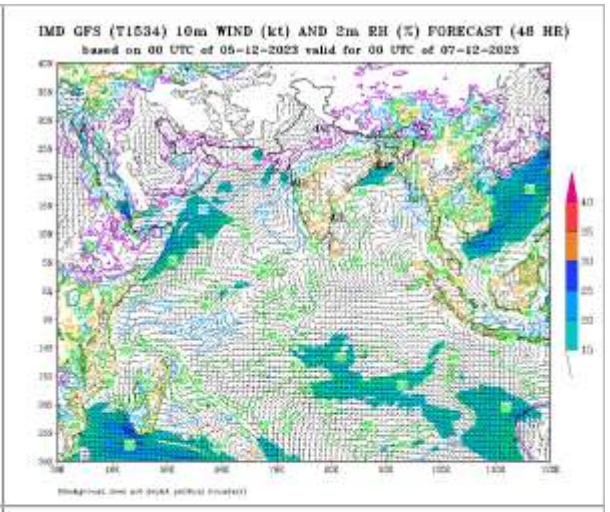
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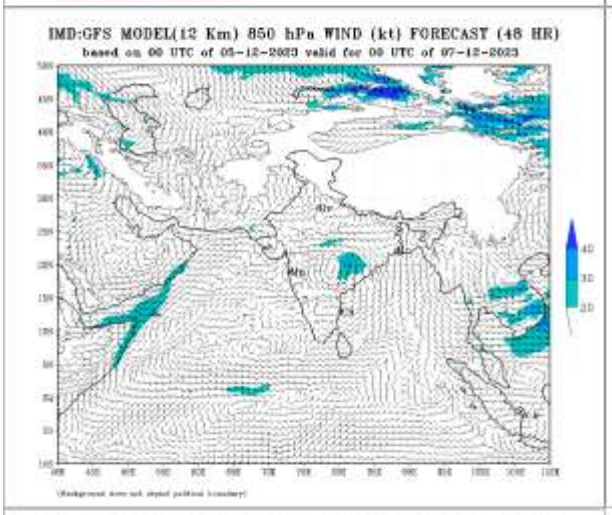
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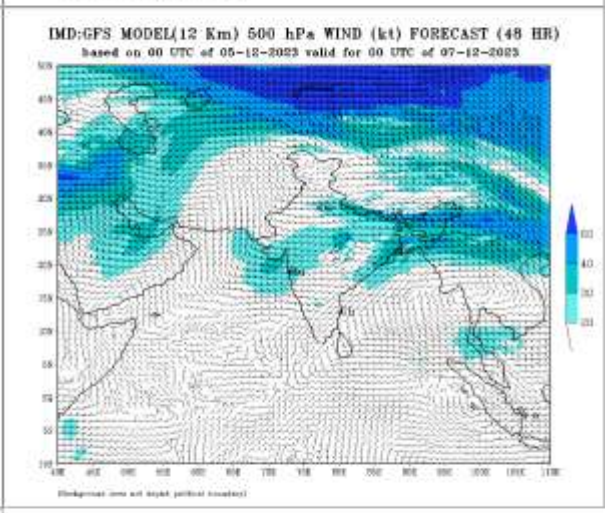
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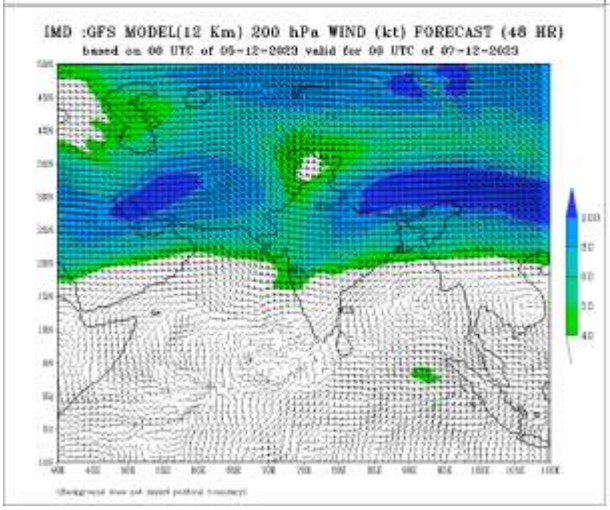
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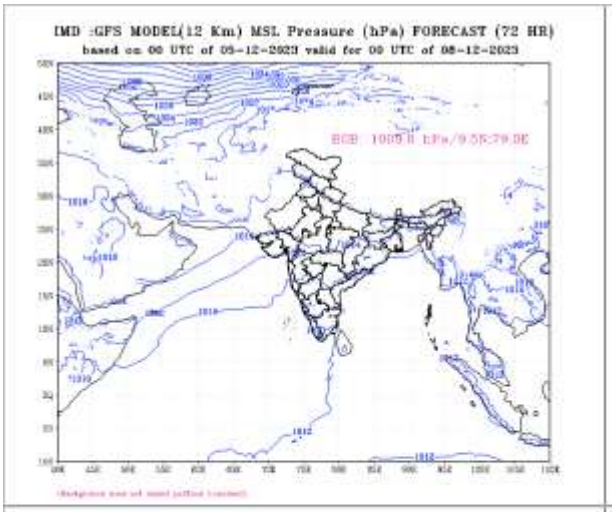
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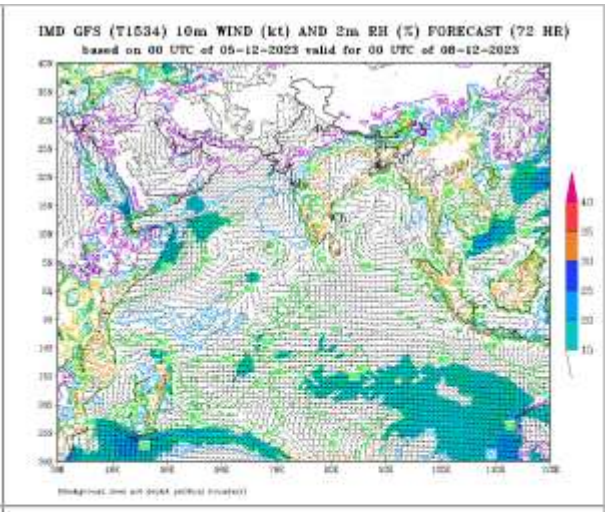
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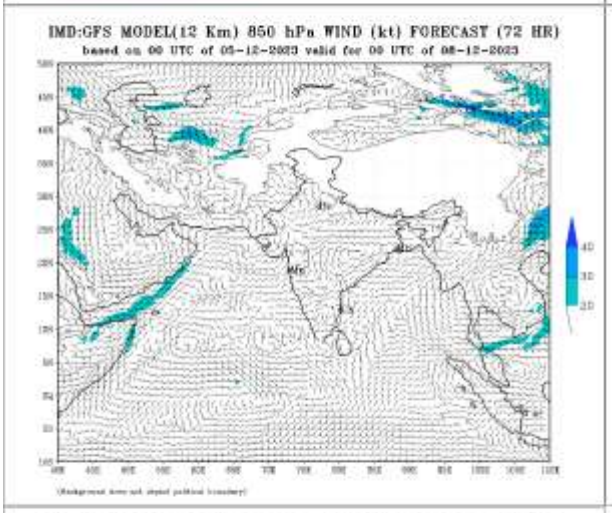
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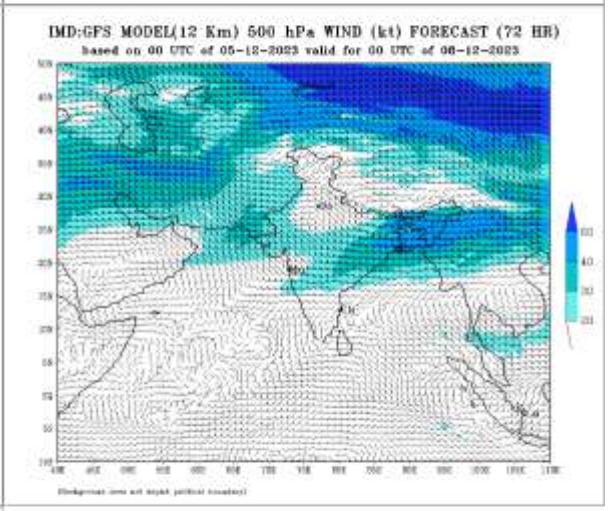
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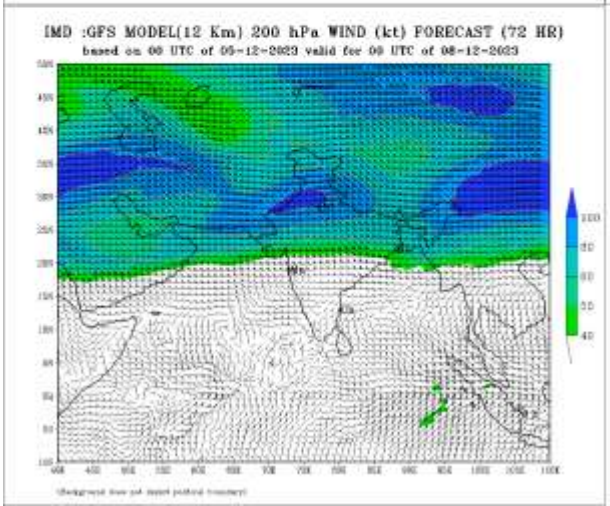
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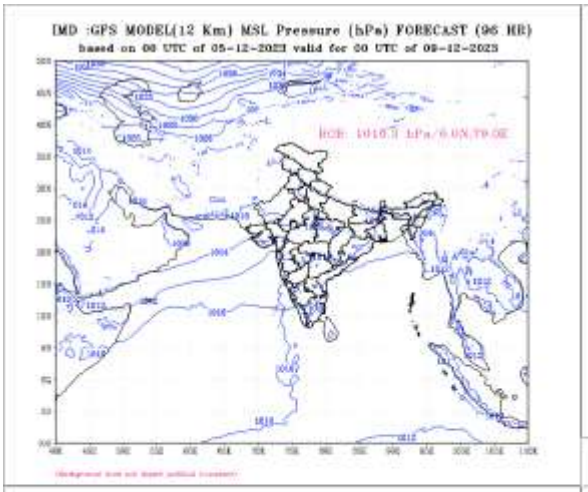
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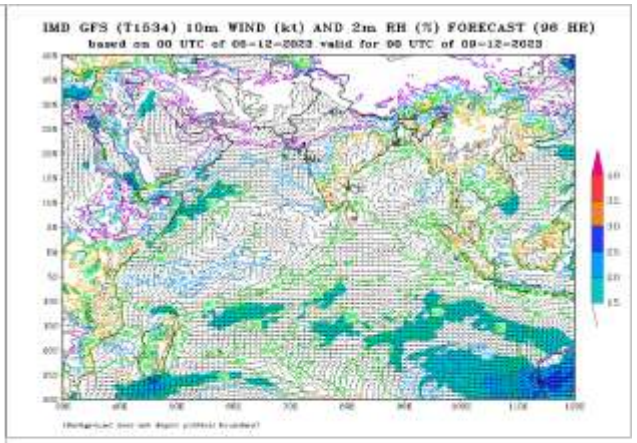
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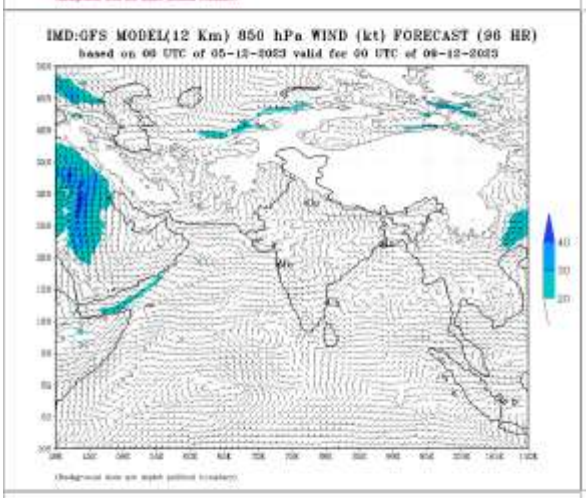
based on 00 UTC of 05-12-2023 valid for 00 UTC of 09-12-2023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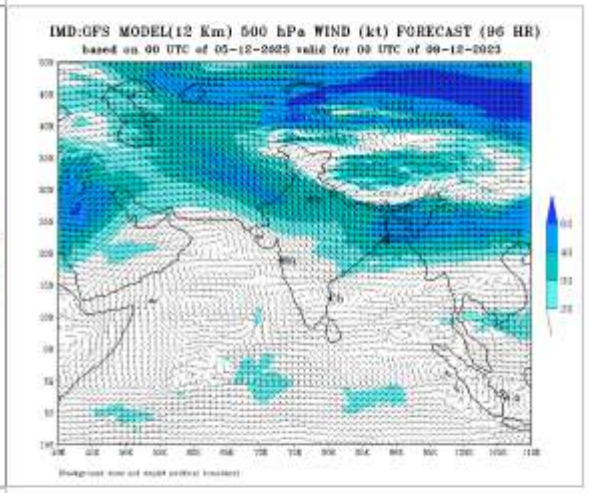
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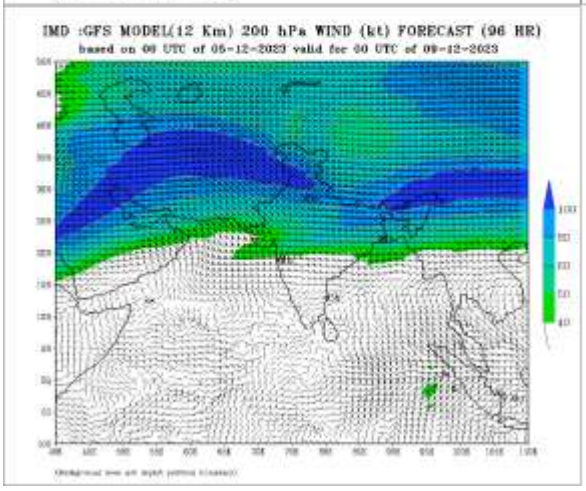
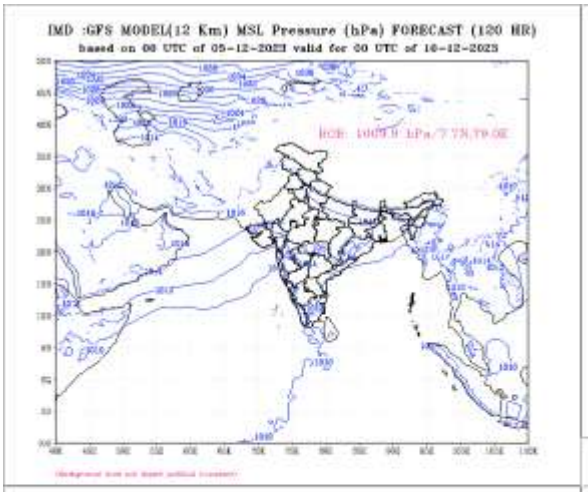
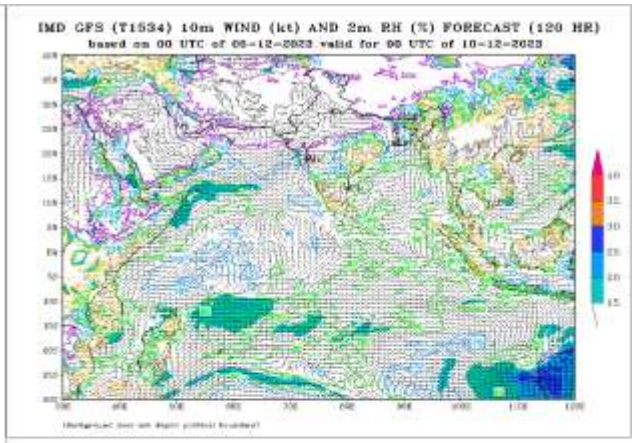
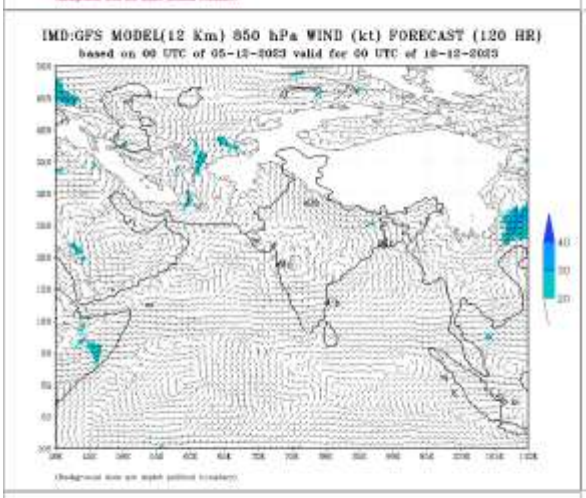
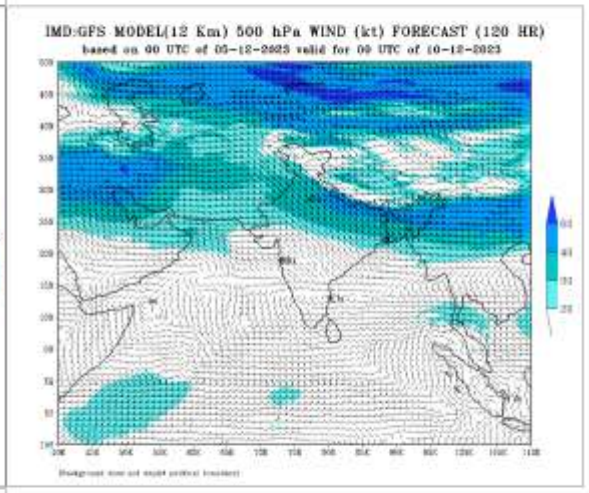
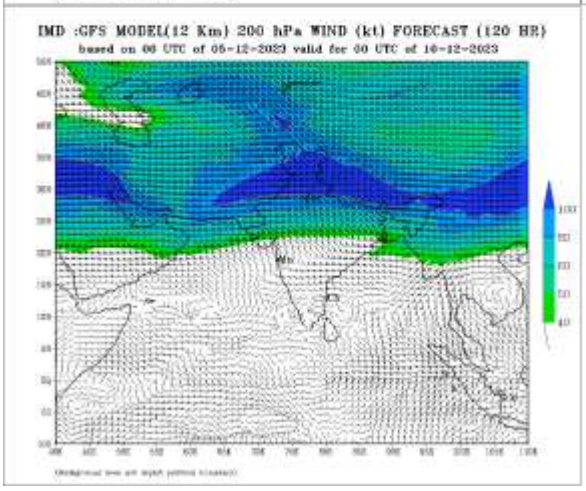

IMD :GFS MODEL(12 Km) 200 hPa WIND (kt) FORECAST (96 HR)
based on 00 UTC of 05-12-2023 valid for 00 UTC of 09-12-2023

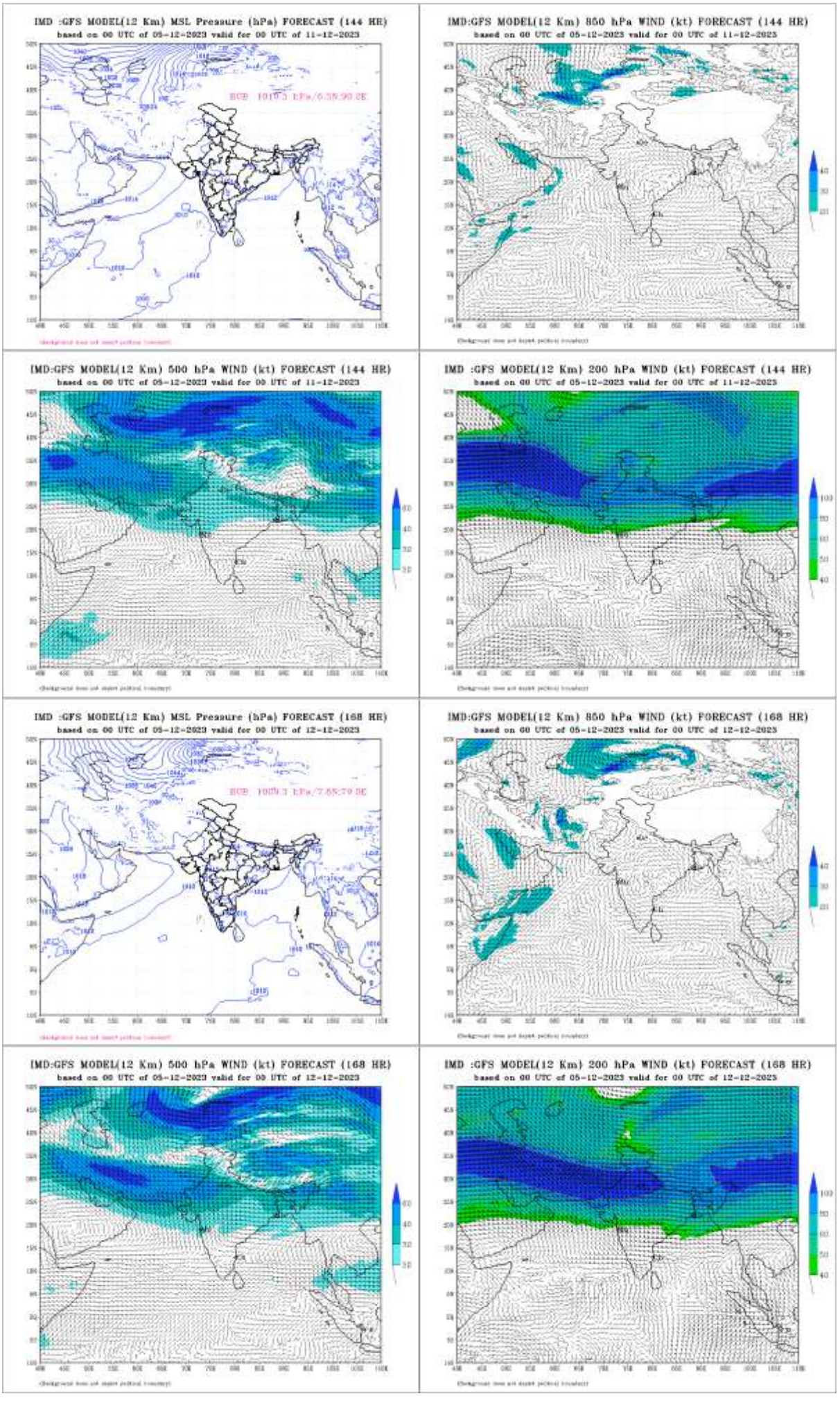

IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 05-12-2023 valid for 00 UTC of 10-12-2023


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


IMD:GFS MODEL(12 Km) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 05-12-2023 valid for 00 UTC of 10-12-2023


IMD:GFS MODEL(12 Km) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 05-12-2023 valid for 00 UTC of 10-12-2023


IMD :GFS MODEL(12 Km) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 05-12-2023 valid for 00 UTC of 10-12-2023


IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (144 HR)
based on 00 UTC of 05-12-2023 valid for 00 UTC of 11-12-2023
IMD:GFS MODEL(12 Km) 850 hPa WIND (kt) FORECAST (144 HR)
based on 00 UTC of 05-12-2023 valid for 00 UTC of 11-12-2023
IMD:GFS MODEL(12 Km) 500 hPa WIND (kt) FORECAST (144 HR)
based on 00 UTC of 05-12-2023 valid for 00 UTC of 11-12-2023
IMD :GFS MODEL(12 Km) 200 hPa WIND (kt) FORECAST (144 HR)
based on 00 UTC of 05-12-2023 valid for 00 UTC of 11-12-2023
IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (168 HR)
based on 00 UTC of 05-12-2023 valid for 00 UTC of 12-12-2023
IMD:GFS MODEL(12 Km) 850 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 05-12-2023 valid for 00 UTC of 12-12-2023
IMD:GFS MODEL(12 Km) 500 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 05-12-2023 valid for 00 UTC of 12-12-2023
IMD :GFS MODEL(12 Km) 200 hPa WIND (kt) FORECAST (168 HR)
based on 00 UTC of 05-12-2023 valid for 00 UTC of 12-12-2023