



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

Tropical Cyclone Forecast Programme  
Report Dated 03<sup>rd</sup> December, 2023

Time of Issue: 1130 UTC

**Synoptic features (based on 0600 UTC analysis):**

The cyclonic storm “Michaung” (pronounced as “Migjaum”) over southwest Bay of Bengal moved northwestwards with a speed of 9 kmph during past 06 hours, and lay centered at 0600 UTC of today, the 3<sup>rd</sup> December, 2023 over the same region near latitude 11.8°N and longitude 82.2°E, about 260 km east-southeast of Puducherry (43331), 250 km southeast of Chennai (43279), 380 km south-southeast of Nellore (43245), 490 km south-southeast of Bapatla (43220) and 500 km south-southeast of Machilipatnam (43185).

It is likely to continue to move northwestwards, intensify further and reach westcentral Bay of Bengal off south Andhra Pradesh and adjoining north Tamilnadu coasts by 4<sup>th</sup> December forenoon. Thereafter, it would move nearly northwards almost parallel and close to south Andhra Pradesh coast and cross south Andhra Pradesh coast between Nellore and Machilipatnam during forenoon of 5<sup>th</sup> December as a **severe cyclonic storm** with a maximum sustained wind speed of 90-100 kmph gusting to 110 kmph.

**Dynamical and thermo-dynamical features (0600 UTC)**

Parameter	Bay of Bengal (BoB)	Arabian Sea (AS)
Sea Surface Temperature (SST) °C	28-29 over the system and its surroundings, also over its forecasted path. 27 over along and off Andhra Pradesh coast north of 14 <sup>0</sup> N, 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°C over north and adjoining westcentral AS.
Tropical Cyclone Heat Potential (TCHP) kJ/cm <sup>2</sup>	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 <sup>-6</sup> s <sup>-1</sup> )	150-200 over the system, 50-100 to its surroundings.	20-40 over most parts of southwest AS, and few parts of eastcentral AS. 10-20 over most parts of AS.
Low Level convergence (X10 <sup>-5</sup> s <sup>-1</sup> )	20-30 to the southeast of the system. 5-10 over it forecasted path and over southwest and adjoining southeast BoB.	10-20 over southwest AS, adjoining southeast AS. -5 over parts of central and north AS.

<b>Upper Level divergence (<math>\times 10^{-5} \text{ s}^{-1}</math>)</b>	20-30 to its northeast of the system, 5-10 over its forecasted path and over southwest and southeast BoB.	10-20 over central parts of south AS. 10-30 over southwest AS adjoining to EIO. -5 over parts of central AS.
<b>Vertical Shear (VWS knots)</b> Low: 05-10 knots Moderate: 10-20 knots High: >20 knots	10 over the system. 10-15 over the northern parts of south BoB. 20 over the southern parts of central BoB. High (>20knots) over rest of BoB.	10-20 over southeast and adjoining southwest AS.. High (>20knots) over rest of AS.
<b>Wind Shear Tendency (knots)</b>	Decreasing over westcentral and adjoining southwest BoB, north Andaman Sea and adjoining eastcentral BoB. Increasing over rest of the BoB and south Andaman Sea.	Decreasing over eastcentral and adjoining northeast AS, along and off Somalia coast. Increasing over rest of the AS.
<b>Upper Tropospheric Ridge</b>	Along 15°N over BoB.	Along 12°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 central & southwest bay. Scattered low/med clouds with embedded moderate to intense convection over rest of the bay, Andaman Sea.

#### **(b) Over the Arabian Sea:-**

Scattered to broken low/med clouds with embedded intense to very intense convection over south Arabian Sea and moderate to intense convection over Lakshadweep islands area & Comorin 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, Tibet, China, Thailand, Gulf of Thailand, Cambodia, Vietnam, Sumatra, Strait of Malacca, Malaysia, Borneo, South China Sea, Java islands & Sea, Celebes islands & Sea, Philippines, north Mozambique channel and over Indian Ocean between lat 5.0N to 10.0S long 50.0E to 100.0E and between lat 17.0S to 35.0S long 55.0E to 70.0E.

#### **M.J.O. Index:**

MJO index is currently in Phase 3 with amplitude greater than 1. It will then move to phase 4 on 4<sup>th</sup> Dec with amplitude greater than 1, its amplitude remains same and in same phase till 7<sup>th</sup> Dec. It will move to phase 5 on 8<sup>th</sup> Dec with amplitude close to 1, remain there till 10<sup>th</sup> Dec with amplitude close to 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**

<b>MODEL GUIDANCE</b>	<b>Bay of Bengal (BoB)</b>	<b>Arabian Sea (AS)</b>
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<b>IMD-GFS</b>	DD over southwest Bay (SWB) as on today i.e., 3 <sup>rd</sup> Dec. Moving northwestward and lay over SWB as SCS/VSCS on 4 <sup>th</sup> Dec. It will move in same direction and will made landfall along south Andhra Pradesh coast (16.2 <sup>o</sup> N/80.5 <sup>o</sup> E) as SCS/VSCS on 5 <sup>th</sup> Dec. Weaken gradually thereafter.	No significant circulation for the next 7 days.
<b>IMD-GEFS</b>	SCS over SWB as on today i.e., 4 <sup>th</sup> Dec. Moving northwestward and will made landfall along south Andhra Pradesh coast (16.2 <sup>o</sup> N/80.5 <sup>o</sup> E) on 5 <sup>th</sup> Dec. Less marked thereafter.	No significant circulation for the next 7 days.
<b>IMD-WRF</b>	DD/CS over SWB as on today i.e., 3 <sup>rd</sup> Dec. It will move northwestward and lay close to south Andhra Pradesh and adjoining Tamil Nadu coast as SCS on 4 <sup>th</sup> Dec. It will made landfall as CS along south Andhra Pradesh and north Tamil Nadu coast on 5 <sup>th</sup> Dec. It will become less marked thereafter.	No significant system during next 3 days.
<b>NCMRWF-NCUM</b>	WML over SWB as on today i.e., 3 <sup>rd</sup> Dec. Moving northwestward and lay over WCB as DD on 4 <sup>th</sup> Dec. It moves in the same direction and made landfall along south Andhra Pradesh coast (14.5 <sup>o</sup> N/80 <sup>o</sup> E) on 5 <sup>th</sup> Dec as CS. It lay over land as WML on 6 <sup>th</sup> Dec and weakens thereafter.	No significant system during next 3 days.
<b>NCMRWF-NEPS</b>	WML over SWB as on today i.e., 3 <sup>rd</sup> Dec. Moving northwestward and lay over WCB as DD on 4 <sup>th</sup> Dec. It moves in the same direction and made landfall along south Andhra Pradesh coast (14.5 <sup>o</sup> N/80 <sup>o</sup> E) on 5 <sup>th</sup> Dec as CS. It lay over land as WML on 6 <sup>th</sup> Dec and weakens thereafter.	No significant circulation for the next 7 days.
<b>NCMRWF-UM (Regional)</b>	WML over SWB as on today i.e., 3 <sup>rd</sup> Dec. Moving northwestward and lay over WCB as DD on 4 <sup>th</sup> Dec. It moves in the same direction and made landfall along south Andhra Pradesh coast (15 <sup>o</sup> N/80 <sup>o</sup> E) on 5 <sup>th</sup> Dec as CS. It lay over land as WML on 6 <sup>th</sup> Dec.	No significant circulation for the next 4 days.
<b>ECMWF</b>	CS over SWB as on today i.e., 3 <sup>rd</sup> Dec. Moving northwestward and lay over WCB as SCS on 4 <sup>th</sup> Dec 18 UTC. It moves in the same direction and made landfall along south Andhra Pradesh coast (16.2 <sup>o</sup> N/81.2 <sup>o</sup> E) on 5 <sup>th</sup> Dec 06 UTC as CS.	No significant system during next 3 days.
<b>NCEP-GFS</b>	CS over SWB as on today i.e., 3 <sup>rd</sup> Dec 03 UTC. Moving northwestward and lay over WCB and adjoining SWB as SCS on 4 <sup>th</sup> Dec 06 UTC. It moves in the same direction and made landfall along south Andhra Pradesh coast (15.6 <sup>o</sup> N/80.5 <sup>o</sup> E) on 5 <sup>th</sup> Dec 06 UTC as CS. It will weaken thereafter.	No significant system during next 7 days.
<b>IMD-Genesis Potential Parameter</b>	Potential zone over SWB and adjoining WCB as on today i.e., 3 <sup>rd</sup> Dec. It lay over WCB along and off north Tamil Nadu and adjoining south Andhra Pradesh coast on 4 <sup>th</sup> Dec. It lay over WCB, along and off south Andhra Pradesh coast on 5 <sup>th</sup> Dec.	Potential zone over southwest Arabian Sea (SWA) on 4 <sup>th</sup> to 6 <sup>th</sup> Dec, over SEA on 7 <sup>th</sup> & 8 <sup>th</sup> Dec.

### Summary and conclusion:

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

Most of the models are indicating initial northwestwards movement towards Andhra Pradesh coast. The landfall point is varying between latitude 15.1-15.7<sup>o</sup>N/80.0-80.3<sup>o</sup>E. The landfall time is varying between 5<sup>th</sup>/0000 UTC to 5<sup>th</sup>/0900 UTC.

Considering all the above, the cyclonic storm is likely to move northwestwards and reach westcentral Bay of Bengal off south Andhra Pradesh and adjoining north Tamilnadu coasts by 0600 UTC of 4<sup>th</sup> December. Thereafter, it would move nearly northwards almost parallel and close to

south Andhra Pradesh coast and cross south Andhra Pradesh coast between Nellore and Machilipatnam around 0600 UTC of 5<sup>th</sup> December as a **severe cyclonic storm** with a maximum sustained wind speed of 90-100 kmph gusting to 110 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

\*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:**

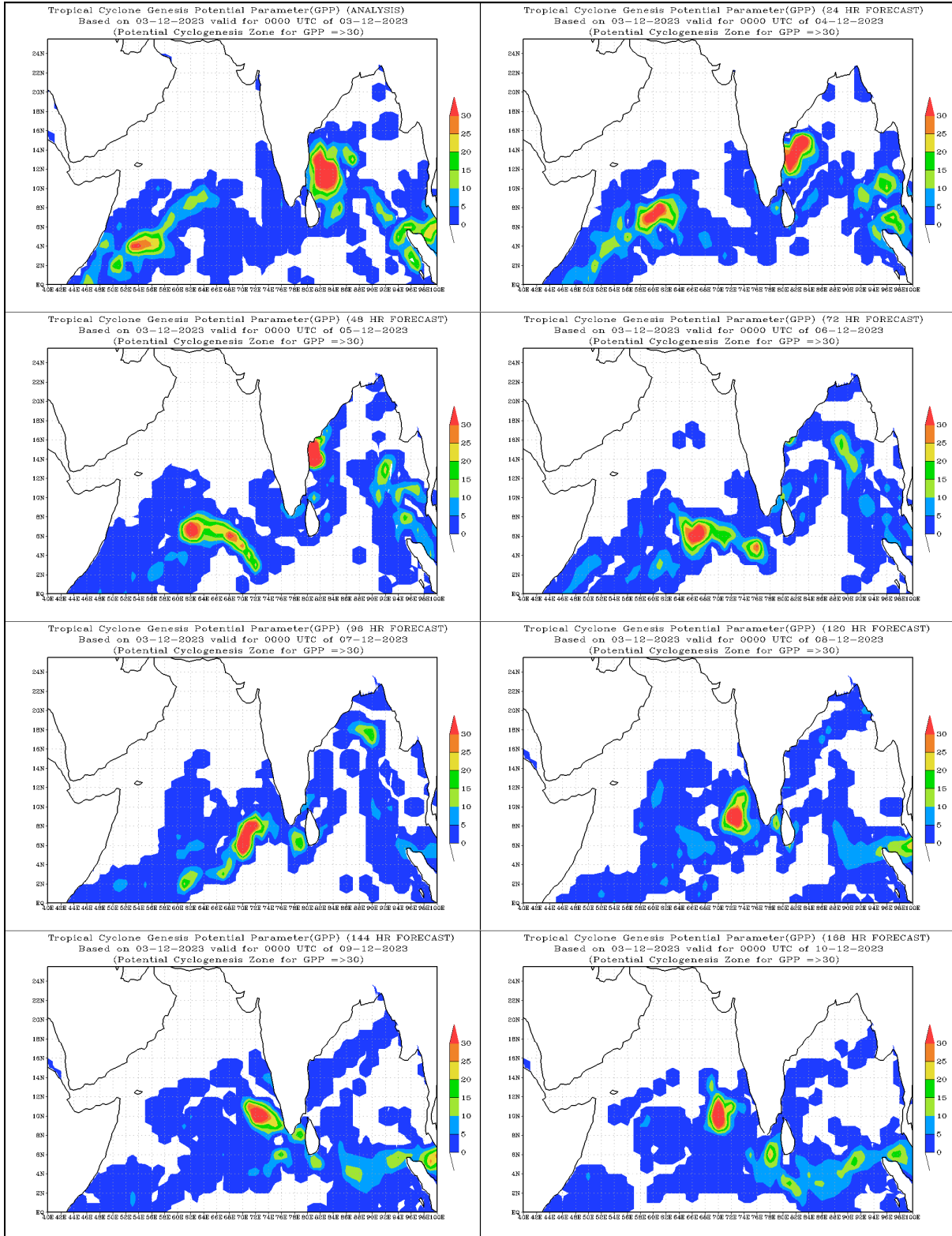
No significant system over the Arabian Sea for the next 7 days.

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

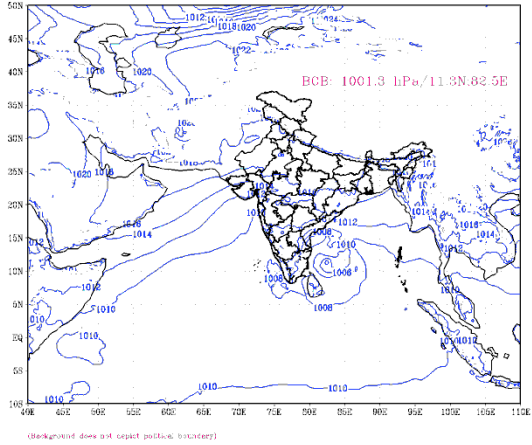
24 HOURS	24-48 HOURS	48-72 HOURS	72-96 HOURS	96-120 HOURS	120-144 HOURS	144-168 HOURS
NIL	NIL	NIL	NIL	NIL	NIL	NIL

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

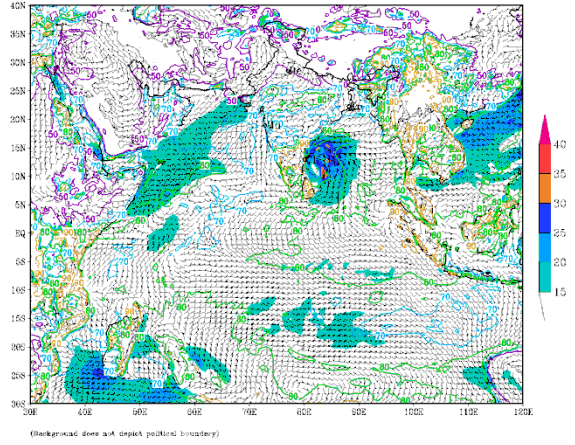
**IOP:** IOP for Tamil Nadu, Puducherry coasts 3<sup>rd</sup> to 4<sup>th</sup> Dec;  
IOP for Andhra Pradesh coast 3<sup>rd</sup> to 5<sup>th</sup> Dec.



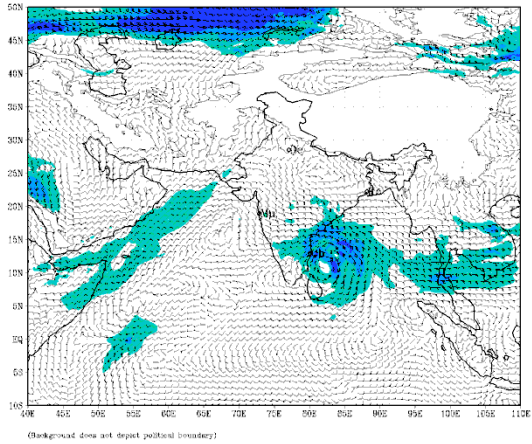
IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (00 HR)  
based on 00 UTC of 03-12-2023 valid for 00 UTC of 03-12-2023



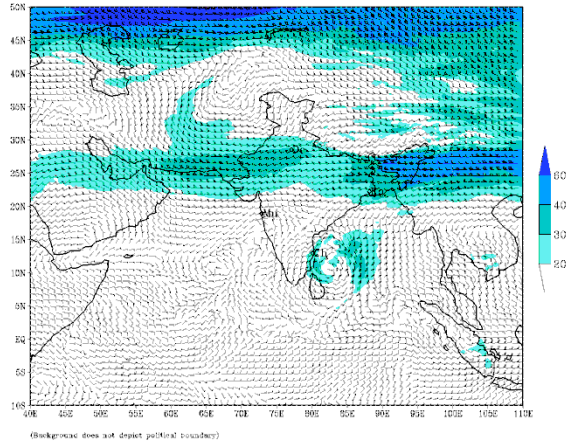
IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (00 HR)  
based on 00 UTC of 03-12-2023 valid for 00 UTC of 03-12-2023



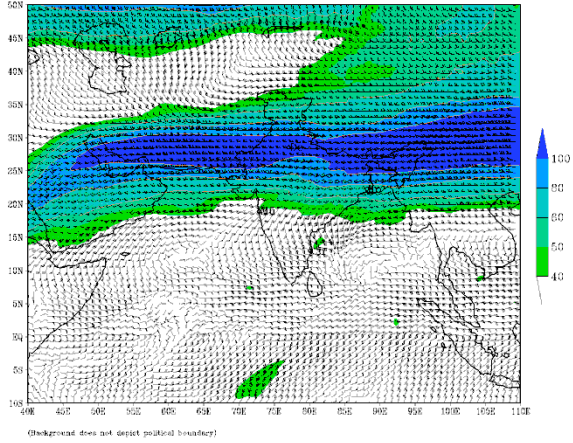
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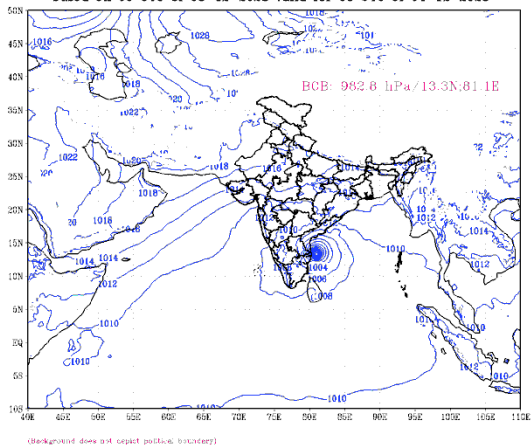
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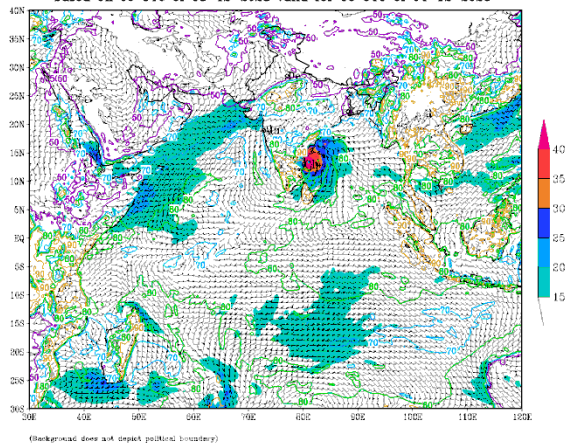
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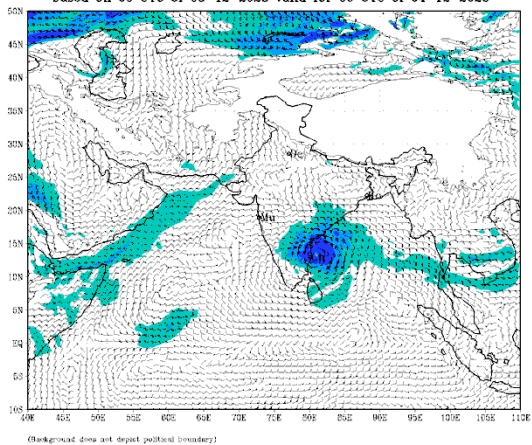
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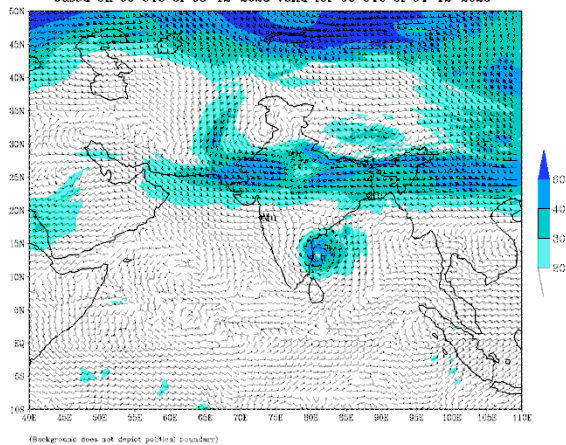
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 based on 00 UTC of 03-12-2023 valid for 00 UTC of 04-12-2023



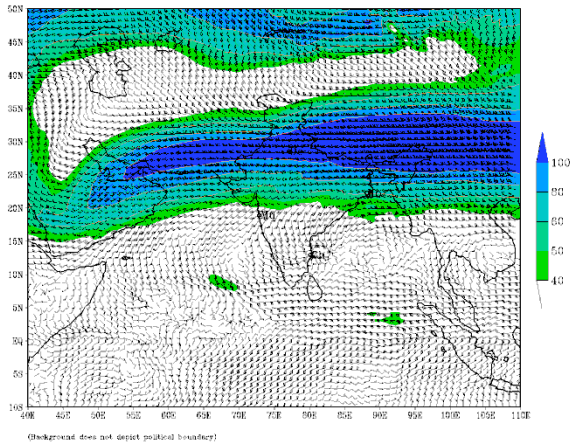
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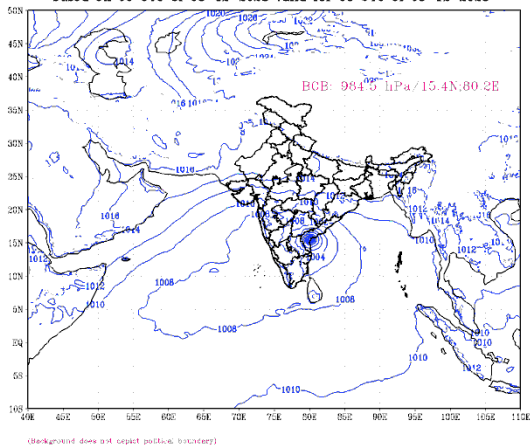
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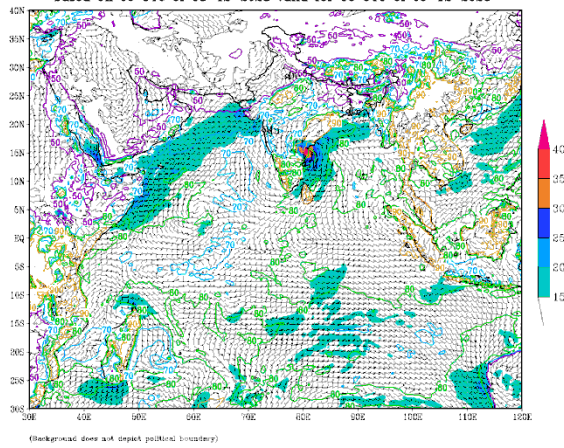
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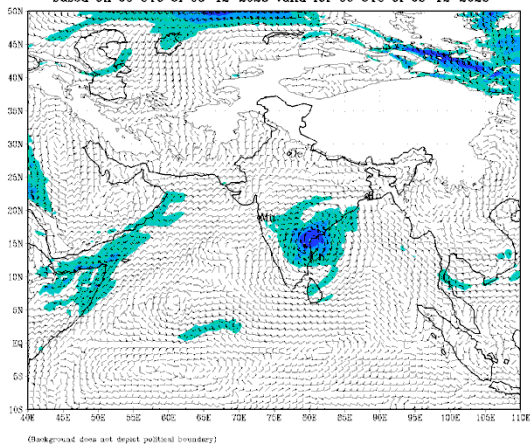
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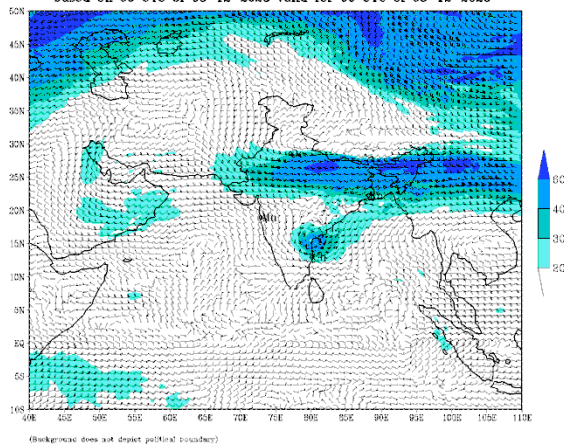
IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (48 HR)  
based on 00 UTC of 03-12-2023 valid for 00 UTC of 05-12-2023



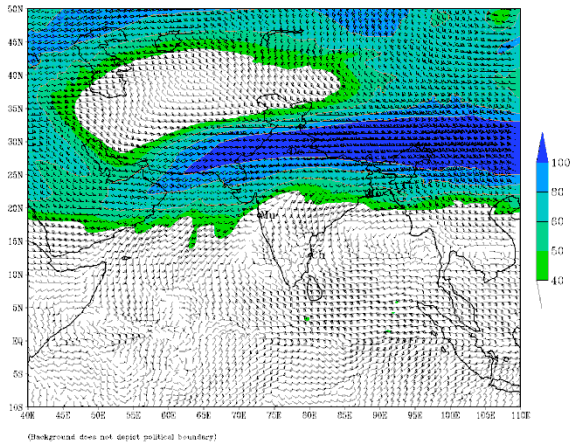
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based on 00 UTC of 03-12-2023 valid for 00 UTC of 05-12-2023



IMD:GFS MODEL(12 Km) 500 hPa WIND (kt) FORECAST (48 HR)  
based on 00 UTC of 03-12-2023 valid for 00 UTC of 05-12-2023

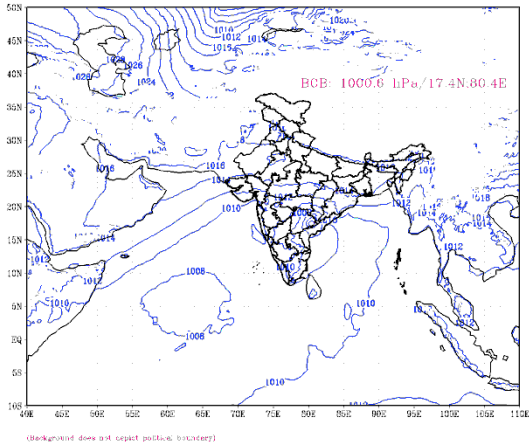


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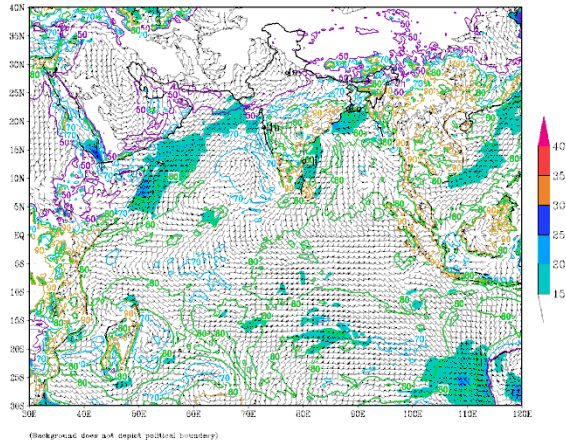




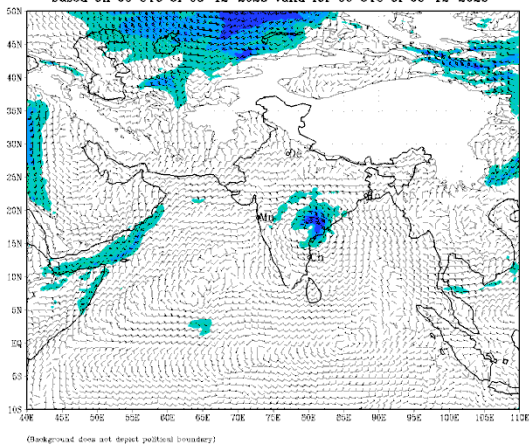
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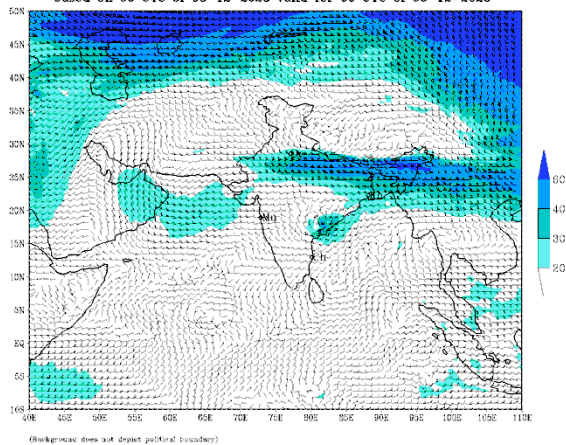
IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (72 HR)  
based on 00 UTC of 03-12-2023 valid for 00 UTC of 06-12-2023



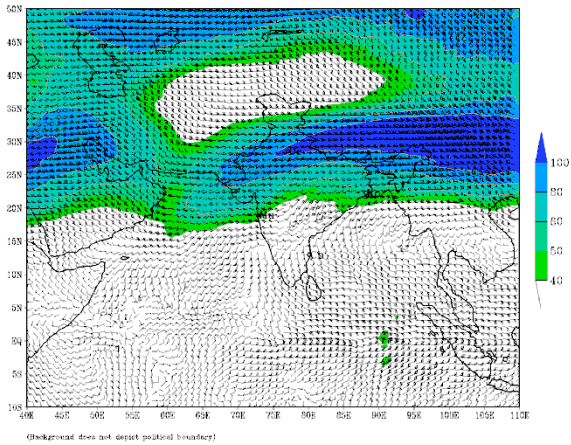
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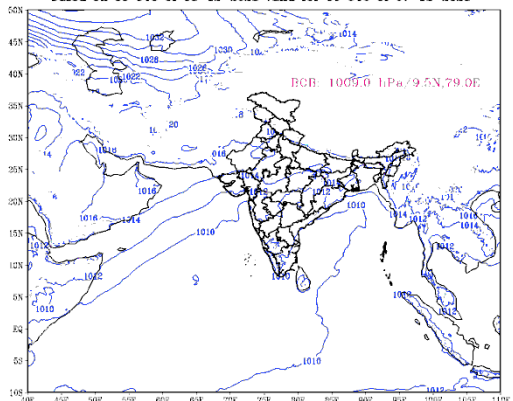
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based on 00 UTC of 03-12-2023 valid for 00 UTC of 06-12-2023



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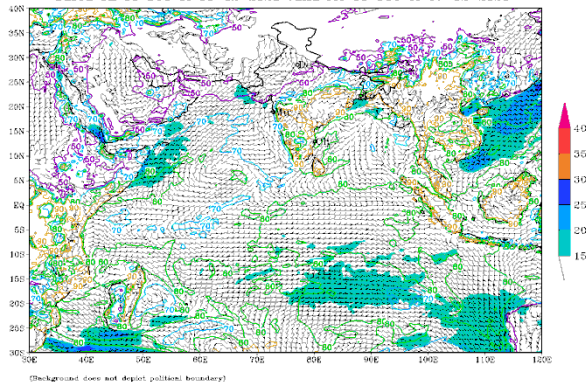


IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (96 HR)  
based on 00 UTC of 03-12-2023 valid for 00 UTC of 07-12-2023



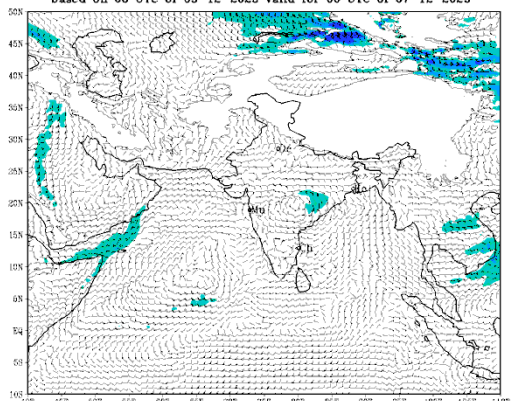
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IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (96 HR)  
based on 00 UTC of 03-12-2023 valid for 00 UTC of 07-12-2023



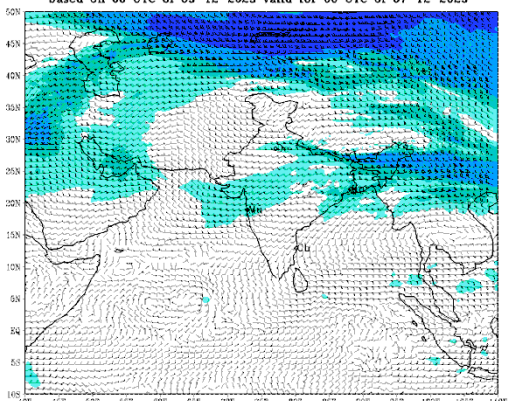
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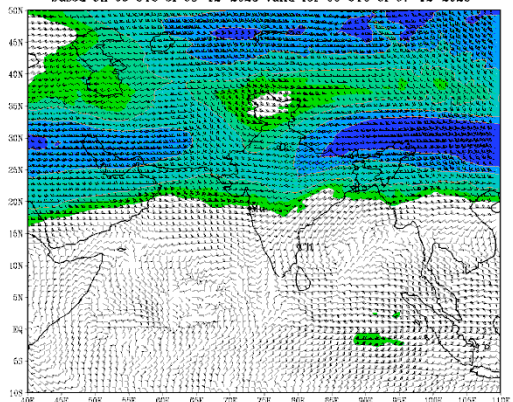
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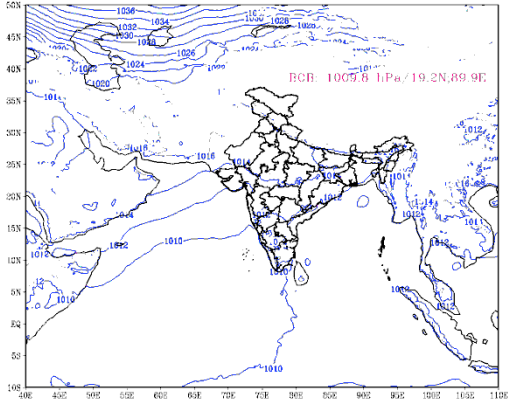
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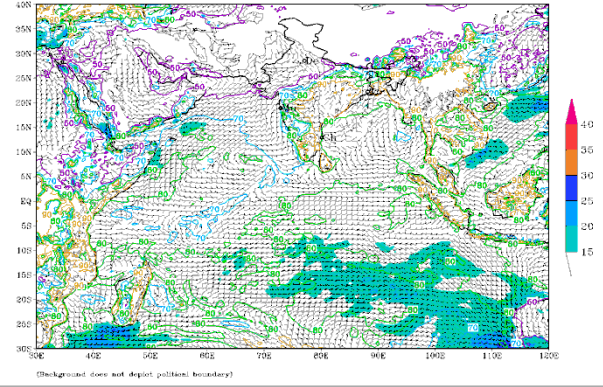
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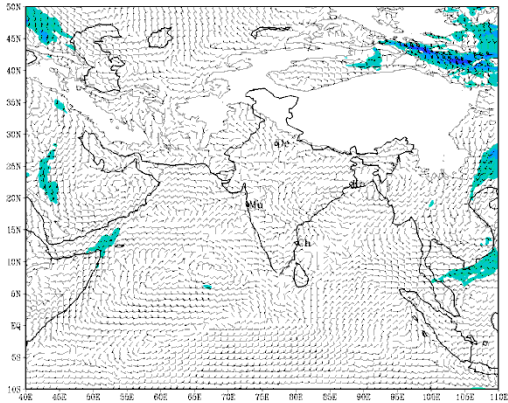
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IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (120 HR)  
based on 00 UTC of 03-12-2023 valid for 00 UTC of 08-12-2023



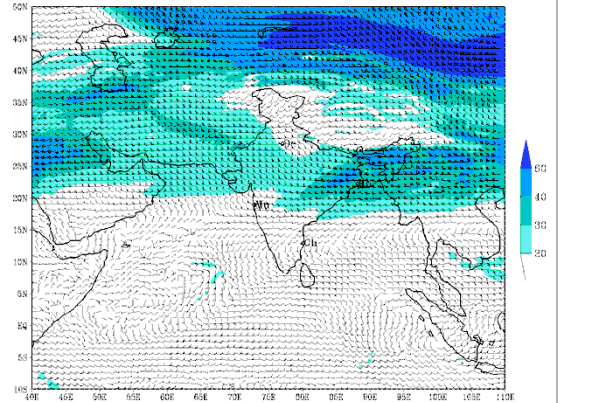
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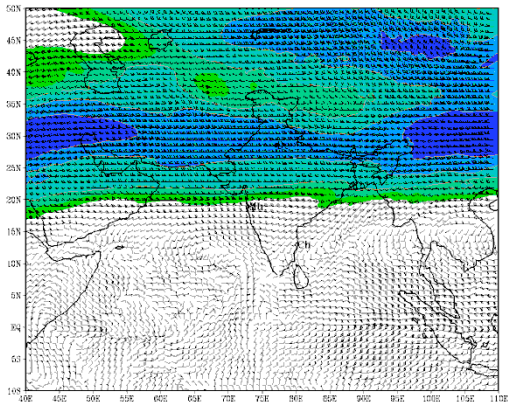
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IMD:GFS MODEL(12 Km) 500 hPa WIND (kt) FORECAST (120 HR)  
based on 00 UTC of 03-12-2023 valid for 00 UTC of 08-12-2023



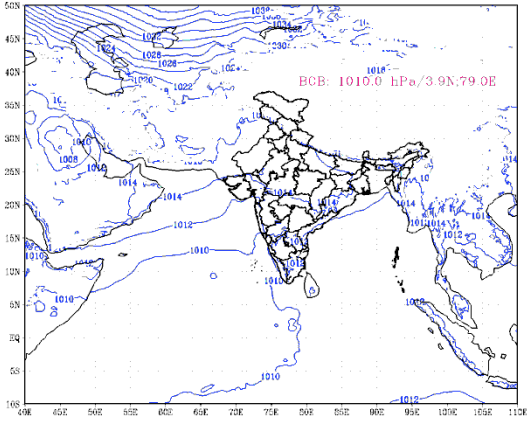
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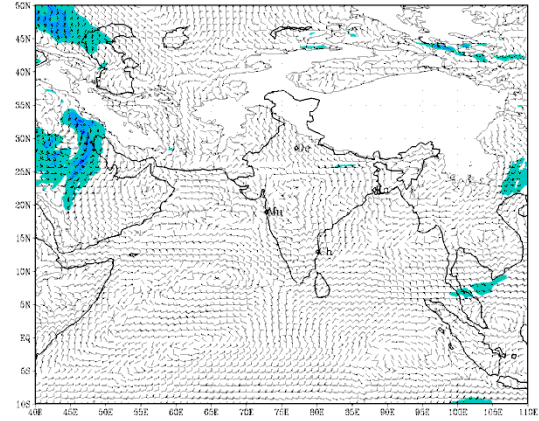
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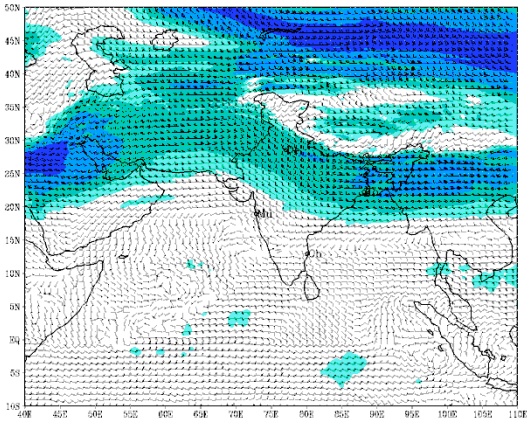
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IMD:GFS MODEL(12 Km) 850 hPa WIND (kt) FORECAST (144 HR)  
based on 00 UTC of 03-12-2023 valid for 00 UTC of 09-12-2023



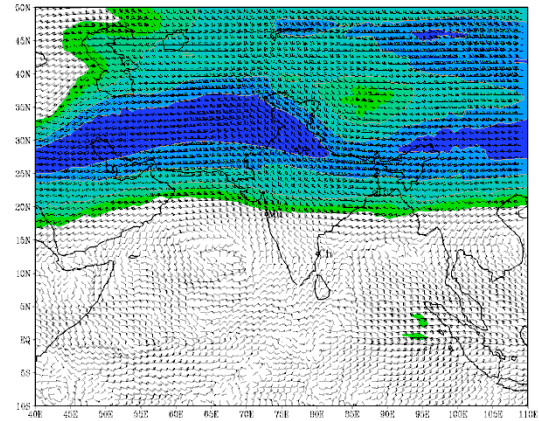
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IMD:GFS MODEL(12 Km) 500 hPa WIND (kt) FORECAST (144 HR)  
based on 00 UTC of 03-12-2023 valid for 00 UTC of 09-12-2023



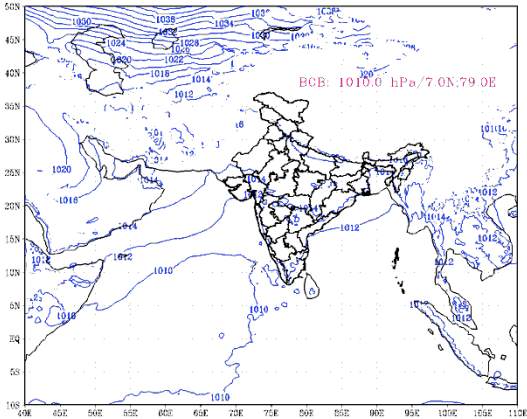
(Background does not depict political boundary)

IMD :GFS MODEL(12 Km) 200 hPa WIND (kt) FORECAST (144 HR)  
based on 00 UTC of 03-12-2023 valid for 00 UTC of 09-12-2023



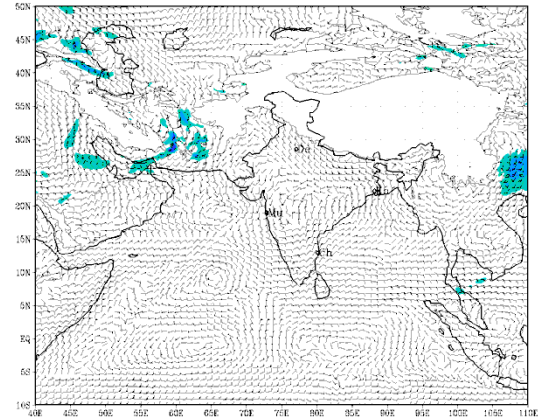
(Background does not depict political boundary)

IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (168 HR)  
based on 00 UTC of 03-12-2023 valid for 00 UTC of 10-12-2023



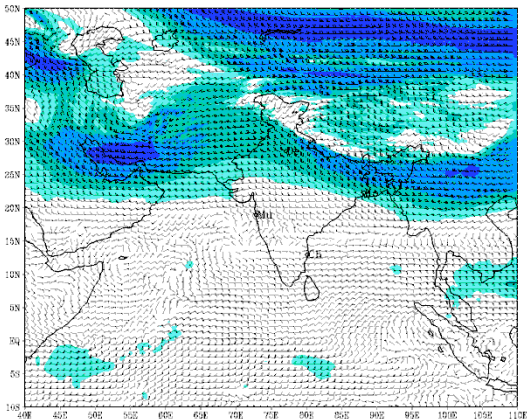
(Background does not depict political boundary)

IMD:GFS MODEL(12 Km) 850 hPa WIND (kt) FORECAST (168 HR)  
based on 00 UTC of 03-12-2023 valid for 00 UTC of 10-12-2023



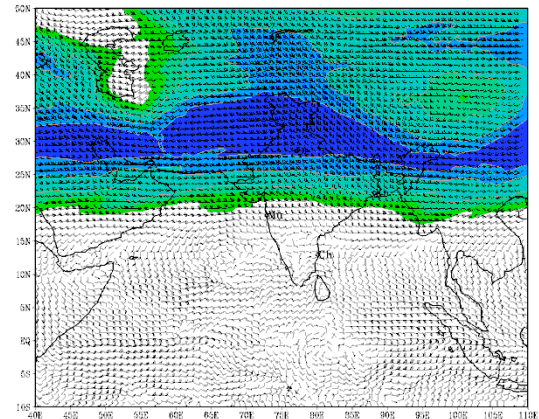
(Background does not depict political boundary)

IMD:GFS MODEL(12 Km) 500 hPa WIND (kt) FORECAST (168 HR)  
based on 00 UTC of 03-12-2023 valid for 00 UTC of 10-12-2023



(Background does not depict political boundary)

IMD :GFS MODEL(12 Km) 200 hPa WIND (kt) FORECAST (168 HR)  
based on 00 UTC of 03-12-2023 valid for 00 UTC of 10-12-2023



(Background does not depict political boundary)