



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

**FDP (Cyclone) NOC Report Dated 16<sup>th</sup> November, 2021**

**Time of Issue: 1200 UTC**

**Synoptic features (based on 0900 UTC analysis):**

- ❖ Yesterday's Low Pressure Area (LPA) over north Andaman Sea & neighbourhood moved westwards and lay over southeast Bay of Bengal (BoB) and adjoining north Andaman Sea at 0000 UTC of today, the 16<sup>th</sup> November. It lay over southeast BoB at 0300 UTC and persisted over the same region at 0900 UTC of today. Associated cyclonic circulation extended upto 5.8 km above mean sea level. It is likely to move nearly westwards and reach west-central & adjoining southwest BoB off south Andhra Pradesh and adjoining north Tamil Nadu coasts on 18<sup>th</sup> November, 2021.
- ❖ Under the influence of yesterday's cyclonic circulation over east-central and adjoining southeast Arabian Sea (AS) off Karnataka-Kerala coasts, a Low Pressure Area (LPA) formed which lay over east-central AS at 0000 UTC of today, the 16<sup>th</sup> November 2021. It persisted over the same region at 0900 UTC. Associated cyclonic circulation extended upto 5.8 km above mean sea level. It is likely to move west-northwestwards and become more marked during next 48 hours.
- ❖ Yesterday's north-south trough ran from the cyclonic circulation associated with the LPA over east-central Arabian Sea off Karnataka coast to north Konkan across south Maharashtra - Goa coasts and extended upto at 0.9 km above mean sea level.
- ❖ Yesterday's east-west trough ran from the cyclonic circulation over east-central Arabian Sea to the other LPA over southeast Bay of Bengal and extended upto 4.5 km above mean sea level.

**Dynamical and thermo-dynamical features**

Parameter	Bay of Bengal (BoB)	Arabian Sea (AS)
<b>Sea Surface Temperature (SST) °C</b>	29-31°C over entire BoB region.	28-29°C over eastern parts of AS. 26-28°C over western parts of AS off Somalia, Yemen & Oman coasts.
<b>Tropical Cyclone Heat Potential (TCHP) kJ/cm<sup>2</sup></b>	(a) 70-90 over most parts of BoB, (b) 100 – 110 along Tamil Nadu – Sri Lanka coasts & north Myanmar coast. (c) 100-120 over eastern equatorial Indian Ocean and adjoining south Andaman Sea & southeast BoB.	(a) 60-80 over east-central & adjoining southeast AS and also over adjoining southwest AS. (b) It is less than 50 over western parts of AS.
<b>Cyclonic Relative vorticity (X10<sup>-6</sup>s<sup>-1</sup>)</b>	(a) Positive vorticity is about 40-50 over south Andaman Sea and adjoining southeast BoB with vertical extension upto	30-40 (decreased compared to yesterday) over east-central AS with vertical extension upto 500 hPa level. Vorticity at 500 hPa

	500 hPa level.	level is higher than that at 850 hPa level indicating greater availability of latent heat of condensation for intensification of this system. However, the vertical gradient of relative vorticity has reduced during past 24 hours.
<b>Low Level convergence (X10<sup>5</sup> s<sup>-1</sup>)</b>	05 -10 over southeast BoB Andaman Sea and adjoining equatorial Indian Ocean.	An elongated north –south oriented belt of 05-10 over east-central AS off Karnataka- Goa-Maharashtra coasts.
<b>Upper Level divergence (X10<sup>-5</sup> s<sup>-1</sup>)</b>	10-20 over southeast BoB and adjoining Andaman Sea.	Increased to 20-30 over east-central AS off Karnataka coast, during past 24 hours.
<b>Vertical Wind Shear (VWS knots)</b>	Low (05-10) over central and adjoining south BoB & Andaman Sea. High (>25) over extreme north BoB and extreme south BoB.	Low (5-10) over over eastcentral & adjoining southeast AS. Also Moderate (15-20) over southwest AS off Somalia coast. High (>25) over remaining parts of AS.
<b>Wind Shear Tendency (knots)</b>	Increasing over east-central BoB & adjoining North Andaman Sea.	Decreasing over east-central AS.
<b>Upper tropospheric Ridge</b>	Along 17.5°N in association with anti-cyclonic circulation over northern parts of Myanmar.	Along 18°N

### **Satellite observations based on INSAT imagery (0900 UTC):**

#### **(a) Over the BoB**

At 0900 UTC, scattered to broken low & medium clouds with embedded intense to very intense convection lay over southeast BoB and neighbourhood in association with the LPA. Minimum Cloud Top Temperature (CTT) was minus 93°C. Scattered to broken low and medium clouds with embedded intense to intense very intense convection also lay over central & south BoB and over Andaman Sea. Minimum CTT was minus 93°C here as well.

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

At 0900 UTC, scattered to broken low and medium clouds with embedded intense to very intense convection lay over east-central AS between Lat. 12.0 ° N – 16.0°N & Long. 68.0°E – 73.0°E.. Minimum CTT was minus 93°C. Scattered to broken low and medium clouds with embedded moderate to intense convection lay over southeast As off Kerala coast, rest of the south AS and Comorin area.

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

MJO index is currently in Phase 4 with amplitude close to 1. It will continue in same phase for next 7 days with amplitude close to 1.

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

No storm / depression prevails over these Sea areas as on today.

### **NWP Input for FDP Cyclone based on 0000 UTC for the next 7 days**

<b>Model</b>	<b>BoB</b>	<b>AS</b>
<b>IMD-GFS</b>	Indicates a Low Pressure Area (LPA) over southeast BoB and adjoining north Andaman Sea on 16 <sup>th</sup> , over southeast BoB on 17 <sup>th</sup> , over southwest	Indicates a trough of Low from southeast AS off north Kerala coast to east-central AS off north Maharashtra coast on

	& adjoining west-central BoB on 18 <sup>th</sup> , as an extended Low over southwest & adjoining west-central BoB off Tamil Nadu – south Andhra Pradesh coasts on 19 <sup>th</sup> , weakening into a trough of Low over the same region on 20 <sup>th</sup> , and as a broad scale Low over the same region on 21 <sup>st</sup> & 22 <sup>nd</sup> .	16 <sup>th</sup> , as an extended LPA over east-central AS and adjoining Goa – south Maharashtra coasts on 17 <sup>th</sup> , northwestward movement and as a Well Marked Low (WML) over east-central AS on 18 <sup>th</sup> , again as an extended LPA over east-central AS off Maharashtra – Goa coasts on 19 <sup>th</sup> , as an LPA over east-central and adjoining southeast AS on 20 <sup>th</sup> & 21 <sup>st</sup> and as a broad-scale Low over the same region on 22 <sup>nd</sup>
<b>IMD-GEFS</b>	Indicates an LPA over southeast BoB on 16 <sup>th</sup> , over southeast & adjoining southwest BoB on 17 <sup>th</sup> , over southwest BoB off north Tamil Nadu coast on 18 <sup>th</sup> , as an extended Low over southwest & adjoining west-central BoB and north coastal Tamil Nadu on 19 <sup>th</sup> & 20 <sup>th</sup> , further weakening into a trough of Low over the same region on 21 <sup>st</sup> and dissipation on 22 <sup>nd</sup> .	Indicates an extended Low over east-central AS and adjoining Karnataka – Goa-south Maharashtra coasts on 17 <sup>th</sup> , as an LPA over east-central AS on 18 <sup>th</sup> , as an extended Low over southeast AS off Karnataka – Goa – Maharashtra coasts on 19 <sup>th</sup> , again as an LPA over east-central and adjoining southeast AS on 20 <sup>th</sup> & 21 <sup>st</sup> and as a broad-scale Low over the same region on 22 <sup>nd</sup> .
<b>IMD-WRF</b>	Indicates an LPA over southeast BoB on 16 <sup>th</sup> , over southeast & adjoining southwest BoB on 17 <sup>th</sup> , over southwest BoB off north Tamil Nadu coast on 18 <sup>th</sup> and as a WML over west-central & adjoining southwest BoB off south Andhra Pradesh– north Tamil Nadu coasts on 19 <sup>th</sup> .	Indicates a trough of Low over east-central AS off Maharashtra – Goa-Karnataka coasts on 16 <sup>th</sup> & 17 <sup>th</sup> , an LPA over east-central & adjoining southeast AS on 18 <sup>th</sup> and over southeast AS on 19 <sup>th</sup> .
<b>NCMRWF-NCUM</b>	Indicates an LPA over southwest & adjoining west-central BoB off north Tamil Nadu – south Andhra Pradesh coasts on 18 <sup>th</sup> and weakening on 19 <sup>th</sup> .	Indicates an LPA over east-central AS off Karnataka coast on 16 <sup>th</sup> , as a WML over east-central AS on 17 <sup>th</sup> , as a Depression over the same region with gradual northwestward movement on 19 <sup>th</sup> & 20 <sup>th</sup> , as a WML over east-central AS on 21 <sup>st</sup> and over central parts of the AS on 22 <sup>nd</sup> .
<b>NCMRWF-NEPS</b>	-Do-	-Do-
<b>NCMRWF-UM (Regional)</b>	Indicates an LPA over southwest & adjoining west-central BoB off north Tamil Nadu – south Andhra Pradesh coasts on 18 <sup>th</sup> and as a WML over north coastal Tamil Nadu and adjoining south coastal Andhra Pradesh on 19 <sup>th</sup> .	Indicates a WML over east-central AS on 17 <sup>th</sup> , a Depression over east-central AS on 18 <sup>th</sup> and 19 <sup>th</sup> (with slight northwestward movement).
<b>ECMWF</b>	Indicates an LPA over southeast BoB	Indicates an LPA over east-

	on 16 <sup>th</sup> , over central & adjoining south BoB on 17 <sup>th</sup> , over west-central & adjoining southwest BoB on 18 <sup>th</sup> morning (00UTC) and over southwest & adjoining west-central BoB off north Tamil Nadu – south Andhra Pradesh coasts on 18 <sup>th</sup> evening (12 UTC), as an extended Low over the same region on 19 <sup>th</sup> , further weakening on 20 <sup>th</sup> and dissipation on 21 <sup>st</sup> .	central AS off Karnataka coast on 16 <sup>th</sup> , a WML over east-central AS off south Maharashtra - Goa coasts on 17 <sup>th</sup> , moving west-northwestwards and over east-central AS on 18 <sup>th</sup> , again as an LPA over east-central and adjoining northeast AS off north Maharashtra – south Gujarat coasts on 19 <sup>th</sup> , its persistence over the same region on 20 <sup>th</sup> & 21 <sup>st</sup> and dissipation on 22 <sup>nd</sup> .
<b>ECMWF-EPS</b>	Shows genesis & strike probability 05-10 % over west-central BoB and north Tamil Nadu – south Andhra Pradesh coasts on 19 <sup>th</sup> & 20 <sup>th</sup> .	Genesis & strike probability NIL.
<b>NCEP-GFS</b>	Indicates an LPA over southeast BoB on 17 <sup>th</sup> , over southwest & adjoining west-central BoB off north Tamil Nadu - south Andhra Pradesh coasts on 18 <sup>th</sup> & 19 <sup>th</sup> , over west-central BoB off south Andhra Pradesh coast on 20 <sup>th</sup> and weakening on 21 <sup>st</sup> .	Indicates an LPA over east-central AS off south Maharashtra coast on 16 <sup>th</sup> , over east-central AS on 17 <sup>th</sup> & 18 <sup>th</sup> , over central parts of the AS on 19 <sup>th</sup> and over central parts of south AS on 20 <sup>th</sup> & 21 <sup>st</sup> .
<b>IMD-GPP</b>	A Potential zone over southwest BoB off north Tamil Nadu coast on 18 <sup>th</sup> , over west-central BoB off Andhra Pradesh coast on 19 <sup>th</sup> & 20 <sup>th</sup> .	Potential zone over east-central AS off Karnataka coast on 16 <sup>th</sup> , over east-central AS during 17 <sup>th</sup> – 19 <sup>th</sup> and over east-central and adjoining southeast AS during 20 <sup>th</sup> – 22 <sup>nd</sup> .

**GPP- Genesis Potential Parameter based on Dynamical Statistical model developed by IMD.**

**Summary and Conclusion:**

- 1. For the Bay of Bengal:** None of the models analysed above are indicating intensification to Depression stage of the present Low Pressure Area lying over southeast Bay of Bengal during the forecast period. All of them predict it's near westward movement, with no significant intensification and reaching either southwest or southwest & adjoining west-central BoB off north Tamil Nadu – south Andhra Pradesh coasts during 17<sup>th</sup> – 18<sup>th</sup> November.
- 2. For the Arabian Sea:** Most of the models indicate the presence of a Low Pressure Area over east-central Arabian Sea off Karnataka coast on 16<sup>th</sup>, except a few like IMD GFS & WRF which simulate the system as an extended trough of Low along the west coast in their 00 UTC analysis of 16<sup>th</sup>. All of them indicate gradual northwest / west-northwestward movement with inconsistent but marginal intensification. Only the NCUM group (NCUM, NEPS & NCUM (R)) indicate intensification into a Depression over the same region on 19<sup>th</sup> November.

**It may thus be concluded that,**

- (1) The Low Pressure Area over southeast Bay of Bengal is likely to move nearly westwards and reach west-central & adjoining southwest BoB off south Andhra Pradesh and adjoining north Tamil Nadu coasts on 18<sup>th</sup> November, 2021.

(2) The other Low Pressure Area over east-central Arabian Sea off Karnataka coast is likely to move west-northwestwards and become more marked during next 48 hours

**Probability of cyclogenesis (formation of depression and above intensity systems) over the 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

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

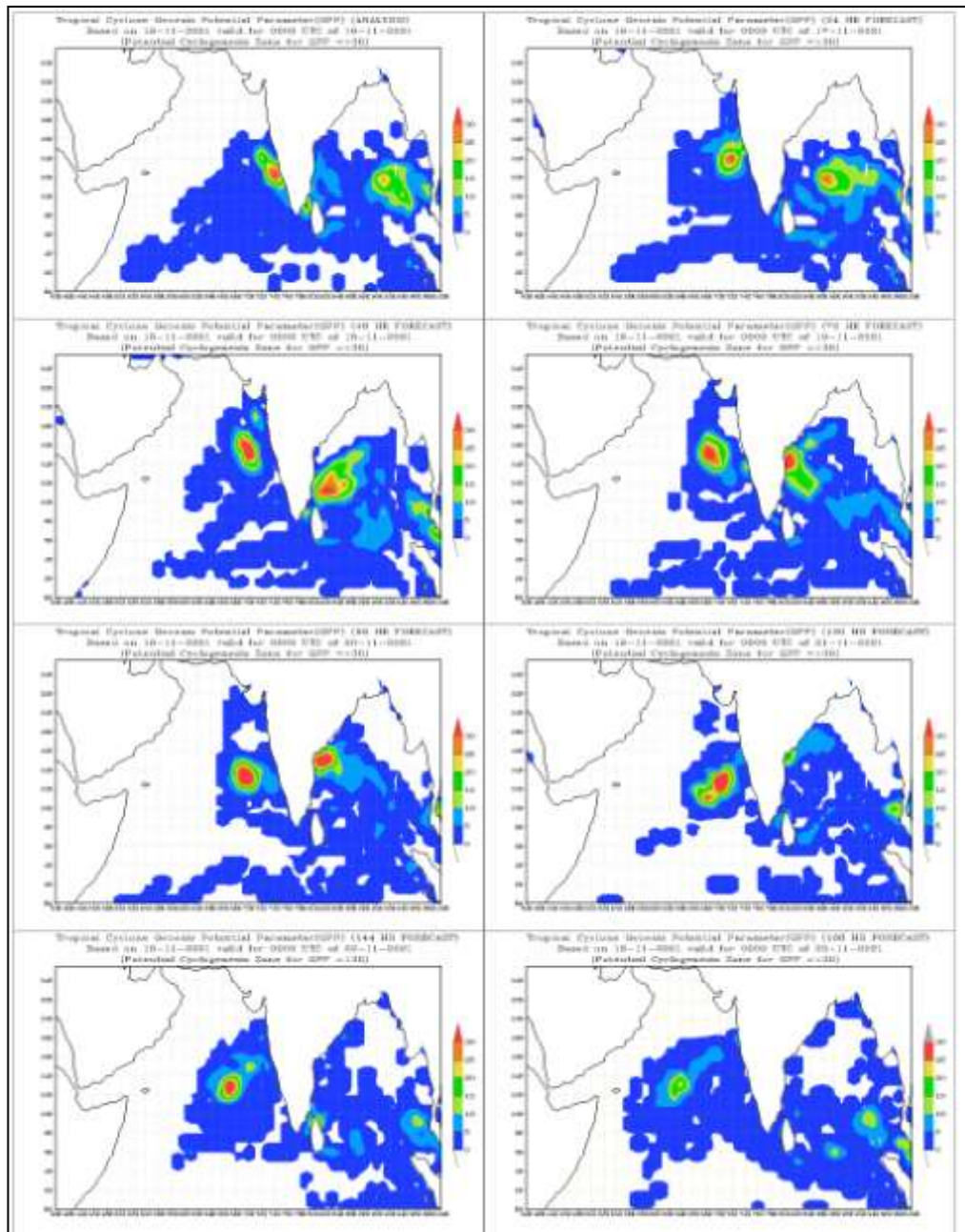
24 HOURS	24-48 HOURS	48-72 HOURS	72-96 HOURS	96-120 HOURS	120-144 HOURS	144-168 HOURS
NIL	NIL	LOW	LOW	NIL	NIL	NIL

**Advisory:**

(1) Likely intensification & movement of Low pressure Area over southeast Bay of Bengal needs to be monitored. (2) Likely intensification & movement of Low pressure Area over east-central Arabian Sea off Karnataka coast also needs to be monitored.

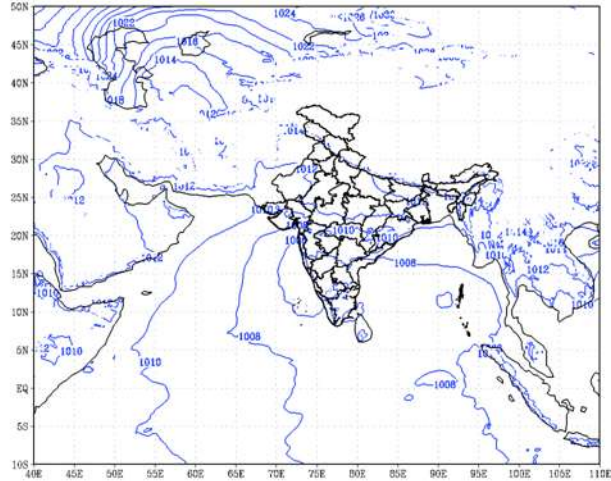
**IOP is suggested for south Andhra Pradesh – north Tamil Nadu coasts on 17<sup>th</sup> & 18<sup>th</sup> November.**





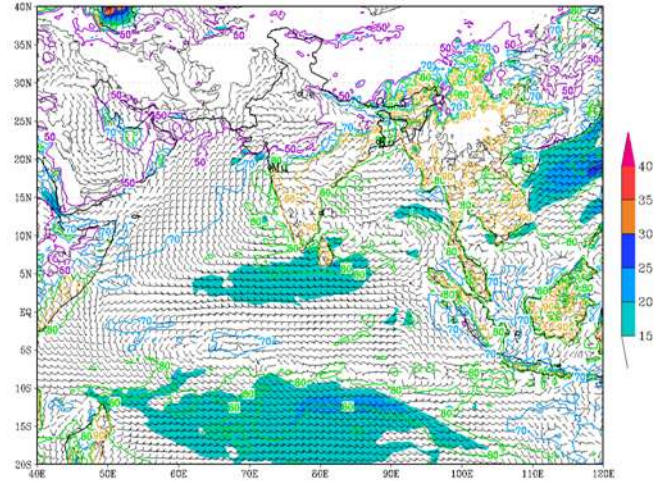


IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (00 HR)  
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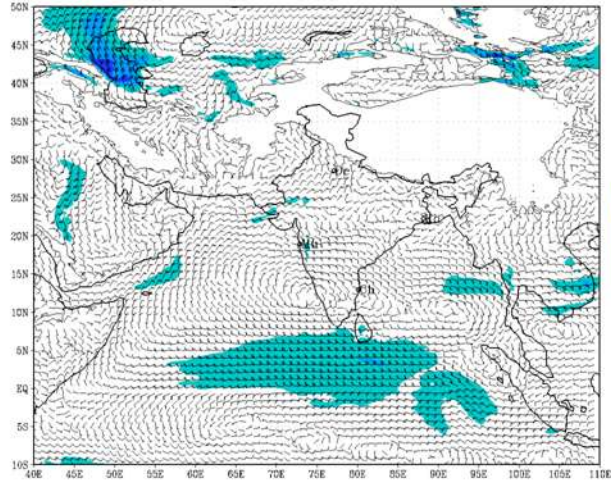
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IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (00 HR)  
based on 00 UTC of 16-11-2021 valid for 00 UTC of 16-11-2021



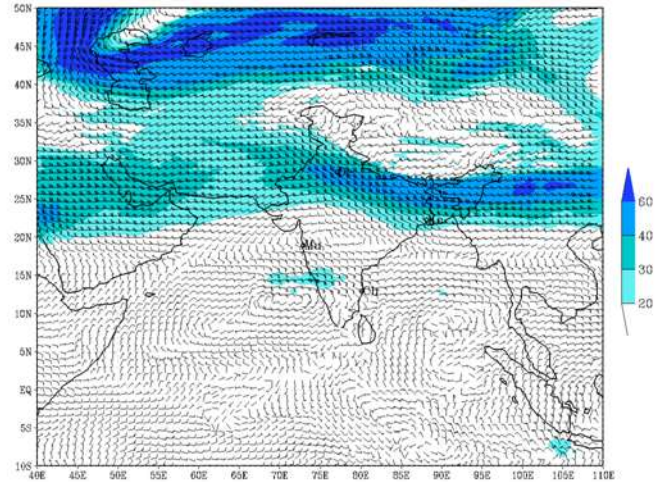
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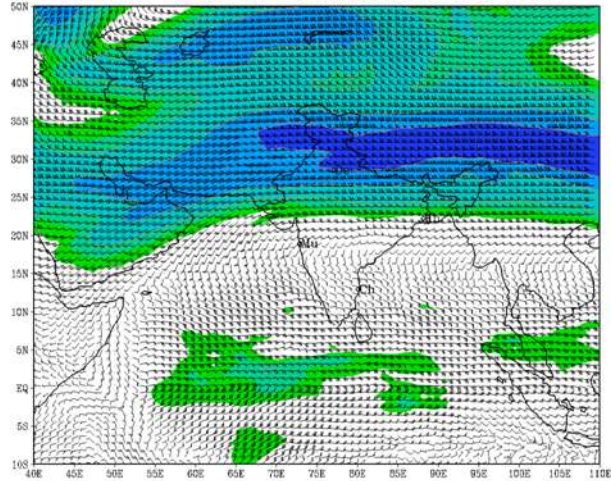
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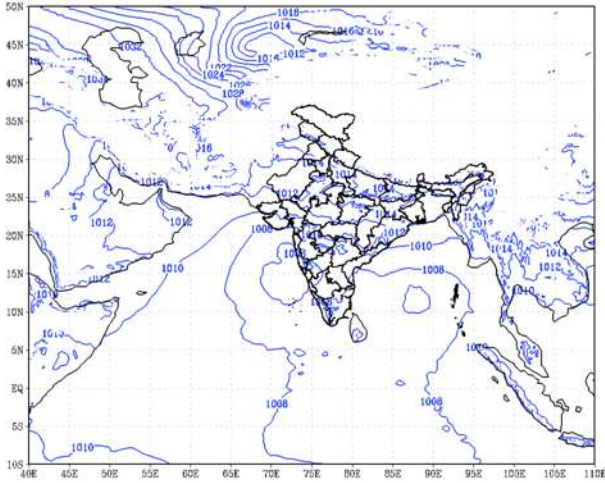
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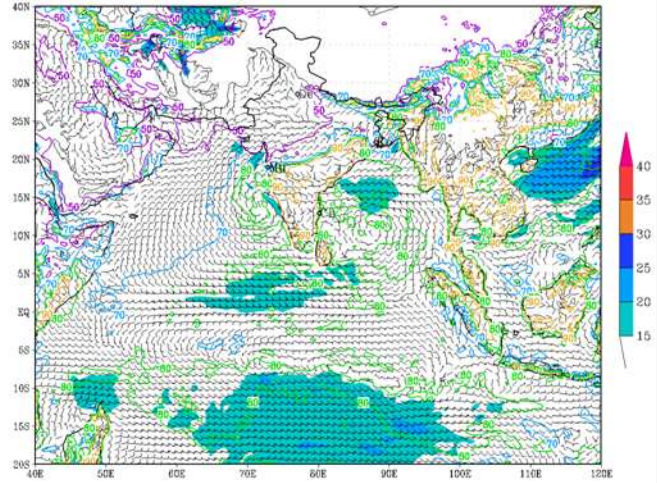


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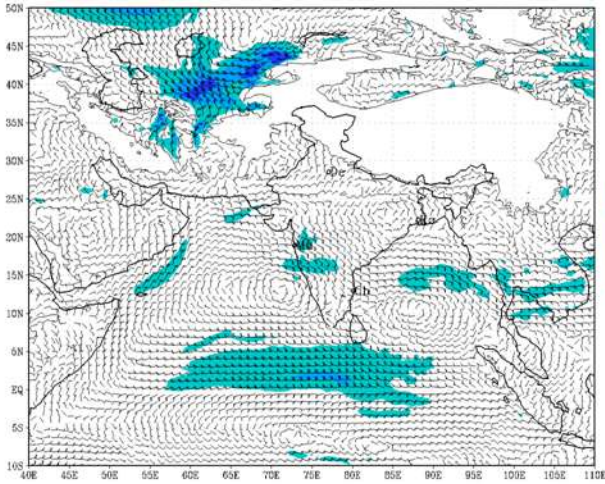
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IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (24 HR)  
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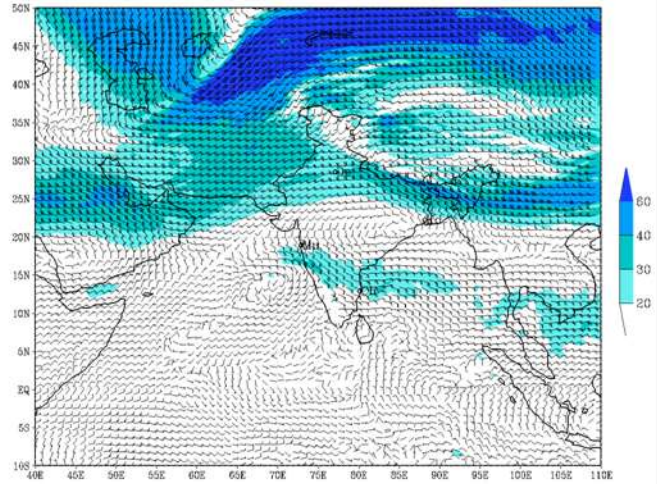
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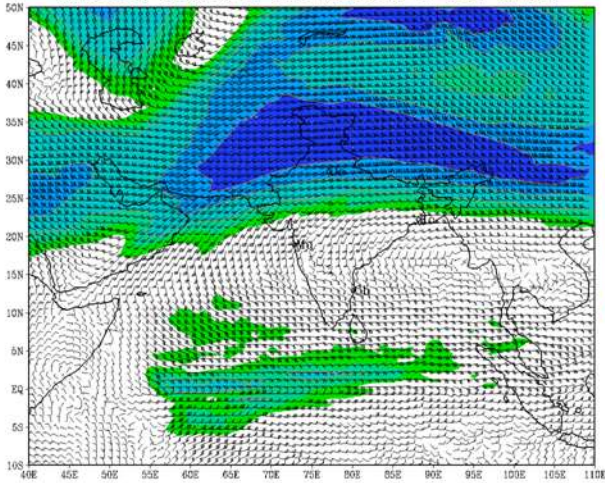
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IMD :GFS MODEL(12 Km) 200 hPa WIND (kt) FORECAST (24 HR)  
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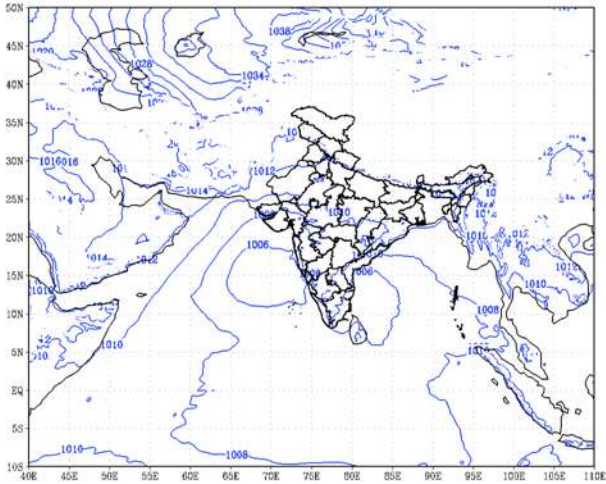
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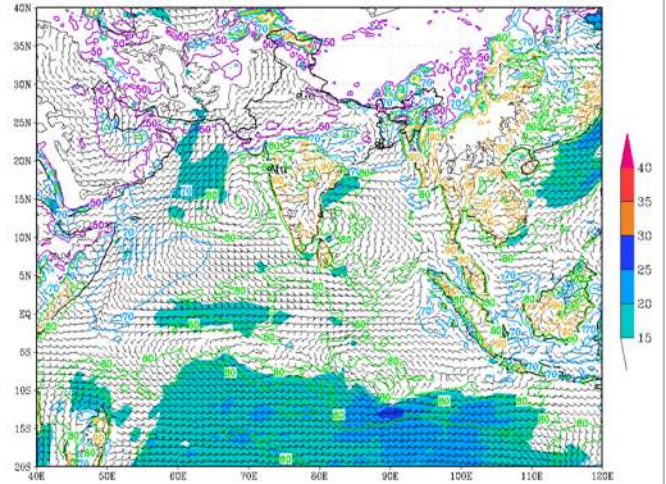


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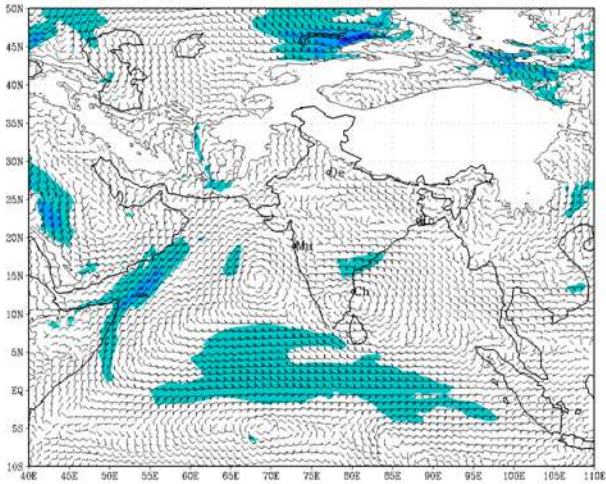
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IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (72 HR)  
based on 00 UTC of 16-11-2021 valid for 00 UTC of 19-11-2021



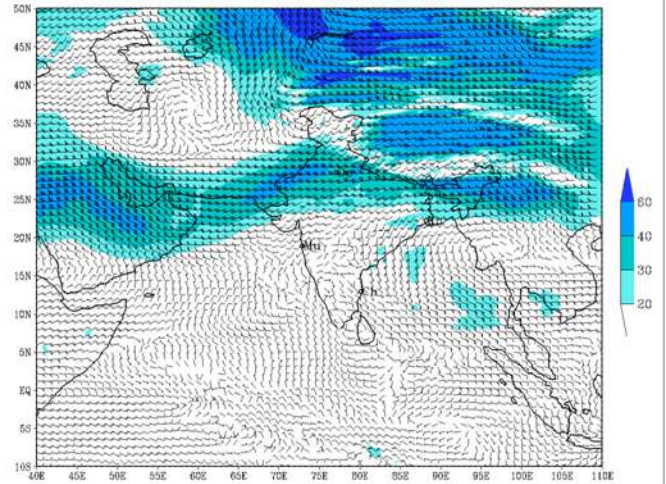
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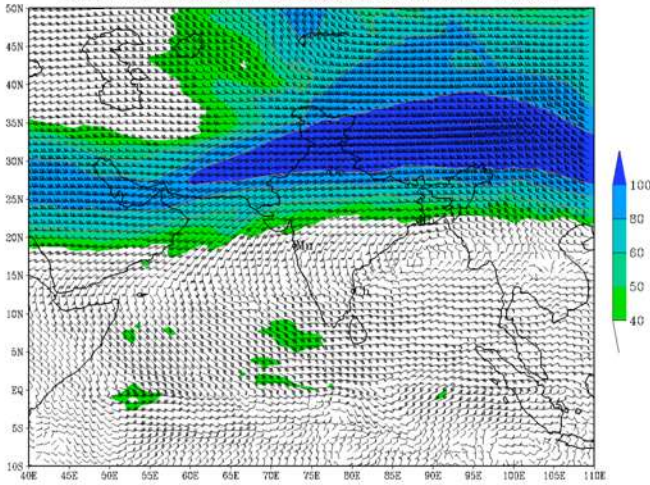
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IMD:GFS MODEL(12 Km) 500 hPa WIND (kt) FORECAST (72 HR)  
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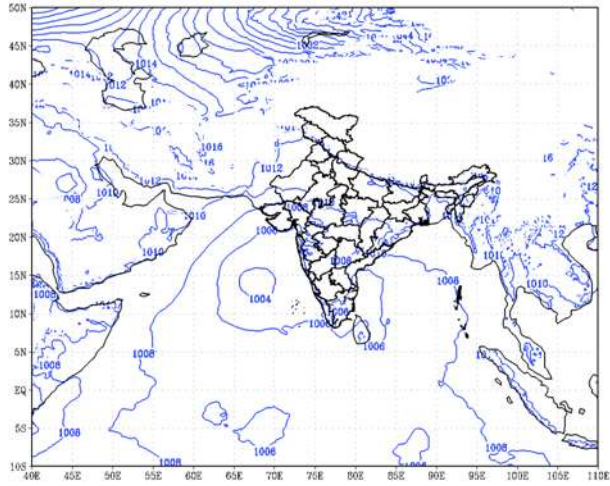
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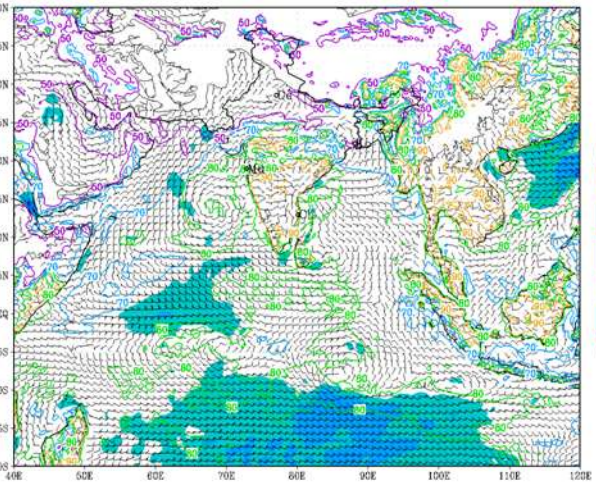


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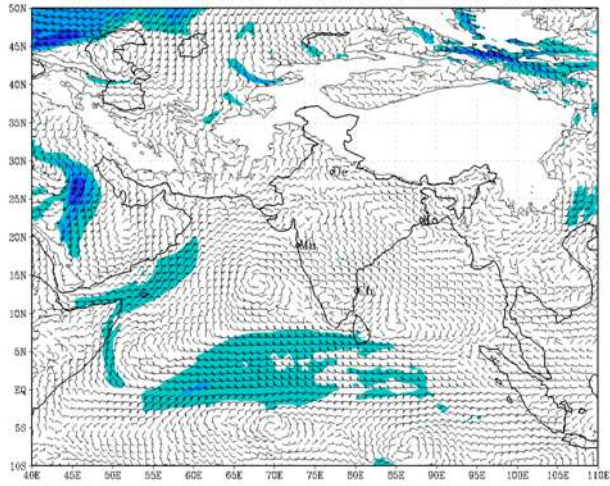
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IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (96 HR)  
based on 00 UTC of 16-11-2021 valid for 00 UTC of 20-11-2021



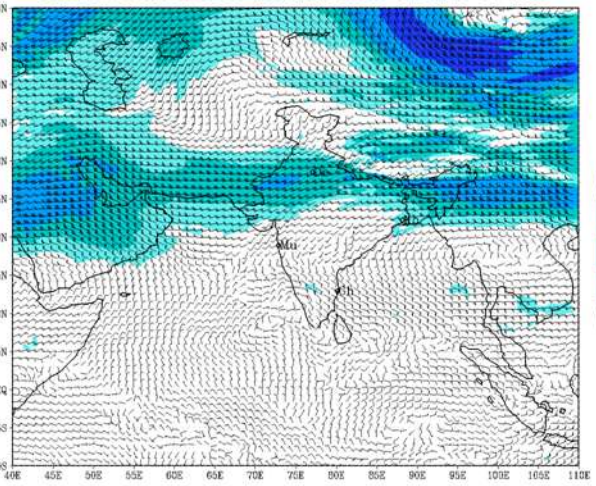
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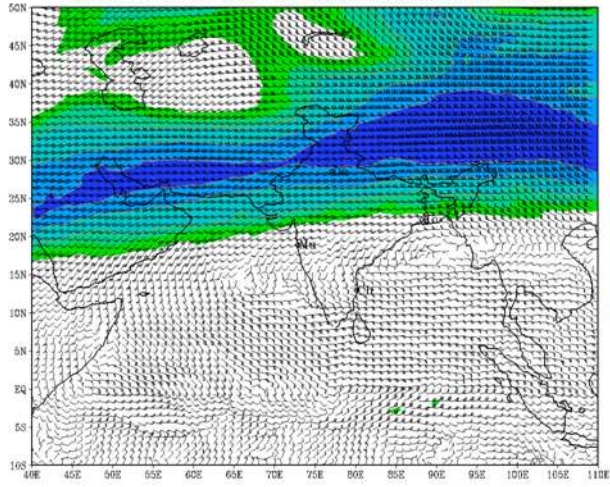
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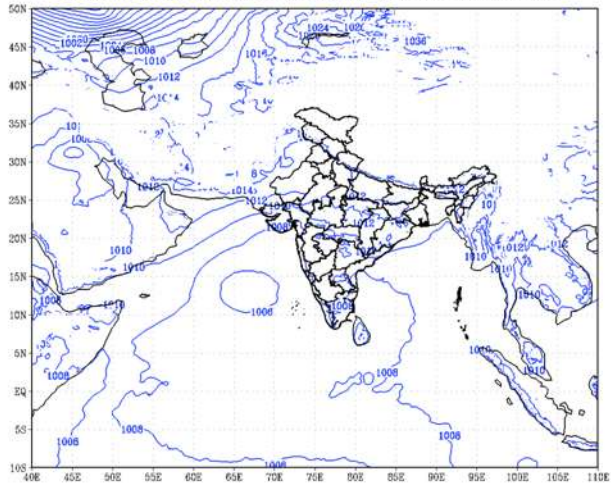
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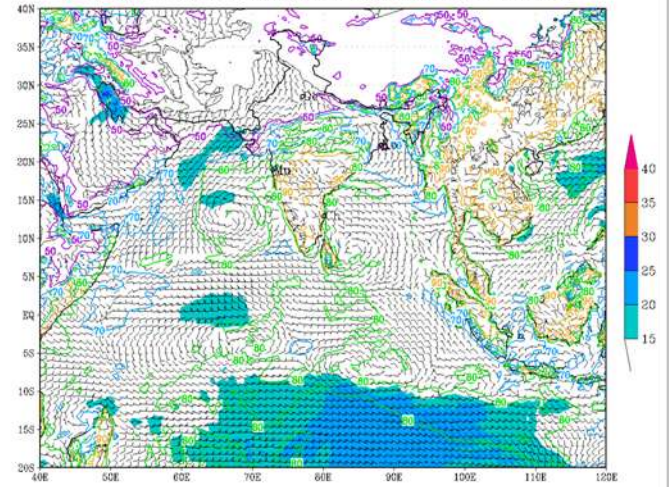


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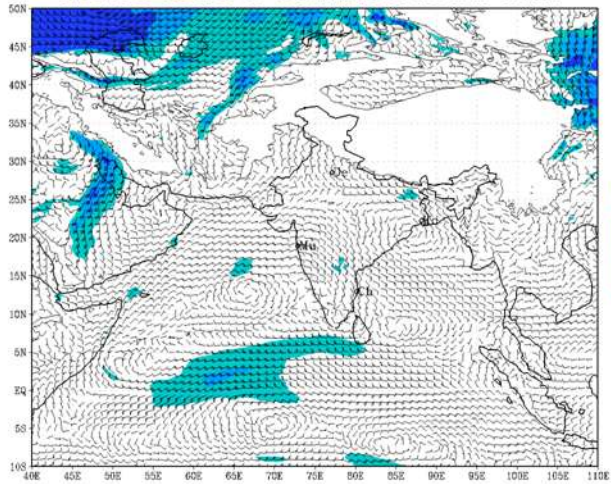
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IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (120 HR)  
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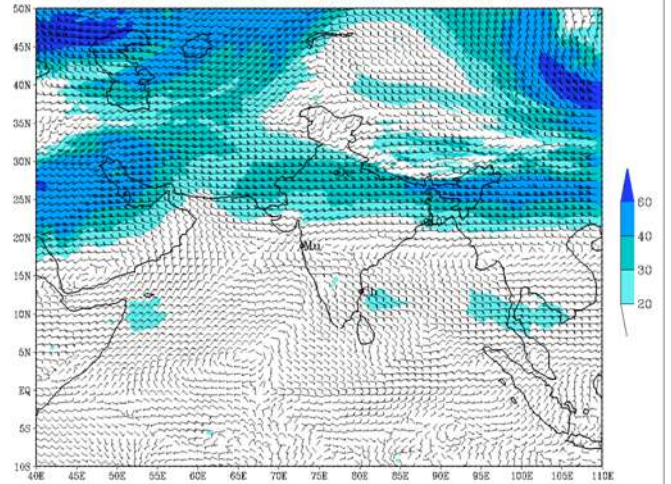
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based on 00 UTC of 16-11-2021 valid for 00 UTC of 21-11-2021



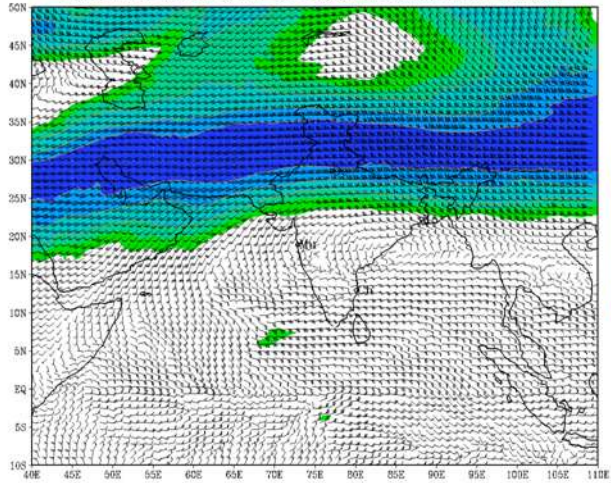
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IMD:GFS MODEL(12 Km) 500 hPa WIND (kt) FORECAST (120 HR)  
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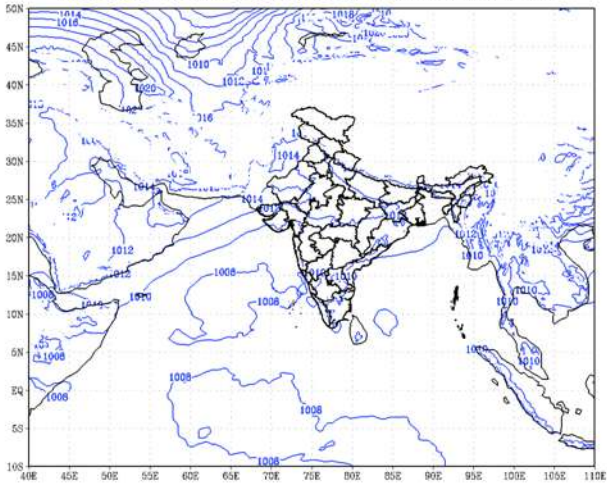
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based on 00 UTC of 16-11-2021 valid for 00 UTC of 21-11-2021



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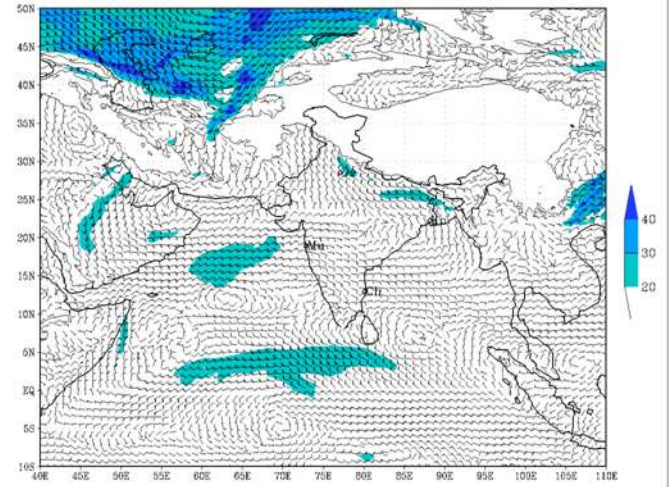


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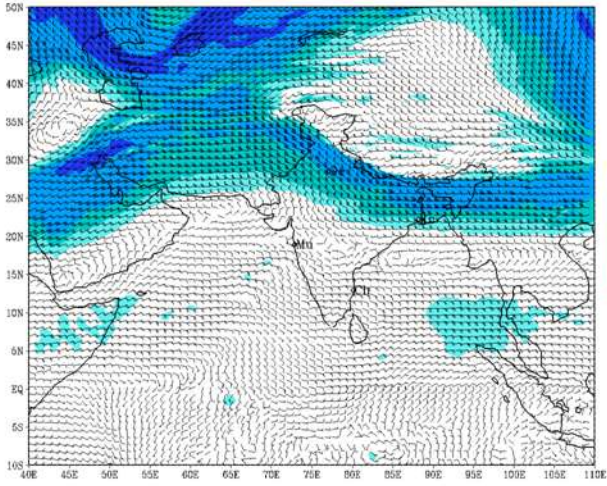
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IMD:GFS MODEL(12 Km) 850 hPa WIND (kt) FORECAST (144 HR)  
based on 00 UTC of 16-11-2021 valid for 00 UTC of 22-11-2021



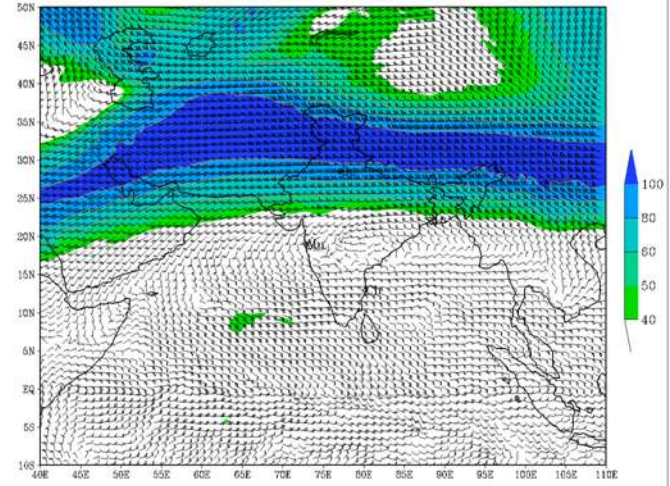
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IMD:GFS MODEL(12 Km) 500 hPa WIND (kt) FORECAST (144 HR)  
based on 00 UTC of 16-11-2021 valid for 00 UTC of 22-11-2021



(Background does not depict political boundary)

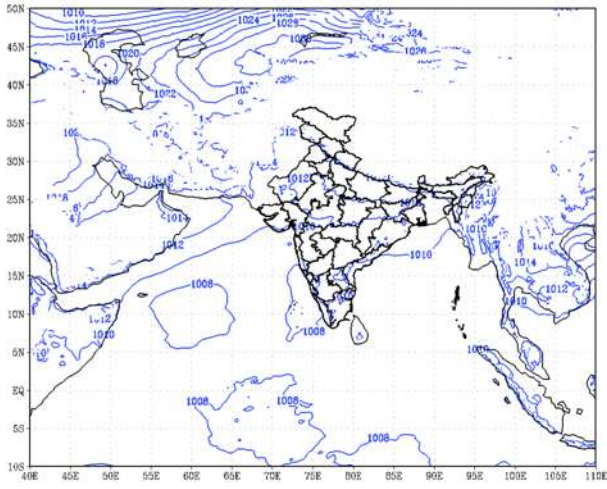
IMD :GFS MODEL(12 Km) 200 hPa WIND (kt) FORECAST (144 HR)  
based on 00 UTC of 16-11-2021 valid for 00 UTC of 22-11-2021



(Background does not depict political boundary)

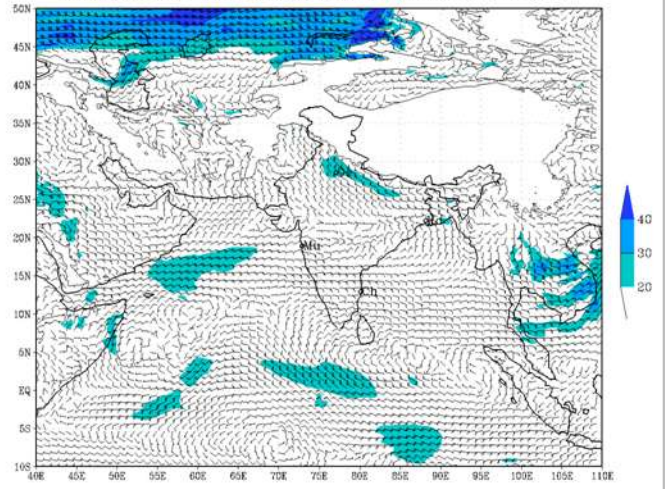


IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (168 HR)  
based on 00 UTC of 16-11-2021 valid for 00 UTC of 23-11-2021



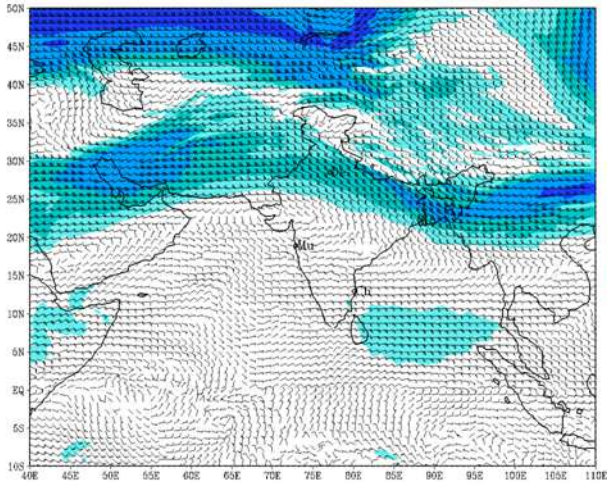
(Background does not depict political boundary)

IMD:GFS MODEL(12 Km) 850 hPa WIND (kt) FORECAST (168 HR)  
based on 00 UTC of 16-11-2021 valid for 00 UTC of 23-11-2021



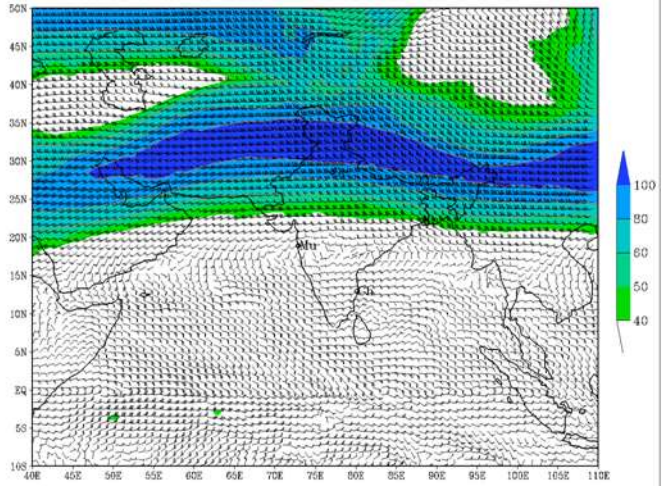
(Background does not depict political boundary)

IMD:GFS MODEL(12 Km) 500 hPa WIND (kt) FORECAST (168 HR)  
based on 00 UTC of 16-11-2021 valid for 00 UTC of 23-11-2021



(Background does not depict political boundary)

IMD :GFS MODEL(12 Km) 200 hPa WIND (kt) FORECAST (168 HR)  
based on 00 UTC of 16-11-2021 valid for 00 UTC of 23-11-2021



(Background does not depict political boundary)