



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



FDP (Cyclone) NOC Report Dated 16 October, 2019

Time of Issue: 1200 UTC

**Synoptic features:**

- The Southwest monsoon has withdrawn from the entire country and simultaneously Northeast monsoon rains have commenced over Tamilnadu and adjoining areas of Andhra Pradesh, Karnataka and Kerala.
- A cyclonic circulation lies over eastcentral Arabian sea off south Karnataka coast and extends upto 0.9 km above mean seal level.
- A trough at mean sea level runs from north Srilanka coast to above cyclonic circulation and extends upto 1.5 km above mean sea level.
- A trough in easterlies runs from southwest Bay of Bengal off south Tamilnadu coast to west central Bay of Bengal between 1.5 and 2.1 km above mean seal level .

**Dynamical and thermodynamical features**

**Surface Temperature (SST):**

SST is around 29-30°C over entire BOB with higher values over most parts of central BOB around 30-31°C.

SST is more than 28°C over most parts of westcentral Arabian Sea and western parts of southwest Arabian Sea, except over small areas over western parts of southwest and westcentral Arabian Sea . It is around 29-30°C to the east of 63°E.

**Tropical Cyclone Heat Potential (TCHP):**

TCHP is around 70-90 kJ/cm<sup>2</sup> over entire BoB, except some pockets in central and south BOB, and north Andaman Sea where it is more than 100 kJ/cm<sup>2</sup>. It is less than 50 kJ/cm<sup>2</sup> over extreme northern parts of north Bay of Bengal and along the coastal belt.

TCHP is below 50kJ/cm<sup>2</sup> over northwest and most parts of westcentral and adjoining southwest Arabian Sea. It is 70-80 kJ/cm<sup>2</sup>over remaining parts of AS. A small area of value more than 100 kJ/cm<sup>2</sup> is seen over western part of southwest Arabian Sea.

**Relative Vorticity:**

There are no significant zones of relative vorticity at 850 hPa is 50X10<sup>-6</sup>s<sup>-1</sup> over BoB and Andaman sea. The vorticity is positive over some parts of south and westcentral BoB.

It is positive and around 25X10<sup>-5</sup>s<sup>-1</sup> over most parts of southwest AS and also off Maharashtra coast. It is negative over most parts of north as well as central Arabian Sea.

**Convergence:**

Lower level convergence of about 5 x 10<sup>-5</sup>s<sup>-1</sup> is seen over westcentral BoB off Andhra Pradesh coast and also over southern parts of southwest BOB.

An elongated area of lower level convergence of 5-10 x 10<sup>-5</sup>s<sup>-1</sup> lies over west coast of India. Another small areas with value 5x 10<sup>-5</sup>s<sup>-1</sup> lies over southwest AS.

**Divergence:**

Upper level divergence area with values around 5-10x10<sup>-5</sup> s<sup>-1</sup> lies over western parts of southwest and westcentral BoB.

A zone of positive upper level divergence of  $5-10 \times 10^{-5} \text{ s}^{-1}$  is seen over central parts of south Arabian Sea. Another circular areas of positive upper level divergence of  $10-20 \times 10^{-5} \text{ s}^{-1}$  is seen over westcentral Arabian Sea.

#### **Wind Shear:**

Wind shear is 5-10 knots over central & south BoB and Andaman Sea and is increasing towards north.

Wind shear is 5-10 knots over central and adjoining south AS and is increasing towards southern and northern parts of AS.

#### **Wind Shear Tendency:**

The wind shear tendency is positive or neutral over most parts BOB and Andaman Sea.

The shear tendency is decreasing over northwest, west central and adjoining southwest AS. It is increasing or neutral over remaining parts of AS.

#### **Upper tropospheric ridge:**

The upper tropospheric ridge at 200 hPa runs along  $18.0^\circ\text{N}$  over Indian Region.

### **Satellite observations based on INSAT imagery:**

#### **Bay of Bengal & Andaman Sea:-**

According to 0900 UTC satellite imagery, scattered low/medium clouds with embedded intense to very intense convection is seen over southwest and westcentral BOB off Odisha- Andhra Pradesh coast and also over south Tenasserim coast. Scattered low/medium clouds with embedded moderate to intense convection is also seen northwest and southeast BOB and also over south Andaman Sea.

#### **Arabian Sea:-**

According to satellite imagery, scattered low/medium clouds with embedded intense to very intense convection is seen over southeast and westcentral Arabian Sea and Comorin Area. Scattered low/medium clouds with embedded moderate to intense convection lies over eastcentral Arabian Sea.

### **Large scale features**

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

MJO index is in Phase 8 with amplitude more than 1. It will continue in same phase with amplitude greater than 1 for next 3-4 days.

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

### **NWP Input for FDP Cyclone based on 0000 UTC**

#### **IMD-GFS**

The analysis of IMD-GFS T-1534 model charts based on 0000 UTC of 16<sup>th</sup> October, 2019 shows an extended low pressure area on 18<sup>th</sup> and 19<sup>th</sup> over southeast Arabian sea, which is seen as a low pressure area till 22<sup>nd</sup> over eastcentral Arabian Sea. It becomes well marked low pressure area on 23<sup>rd</sup> close to north Maharashtra- south Gujarat coast. Thereafter it weakens into a low pressure area on 24<sup>th</sup> and moves away westwards.

#### **IMD-GEFS**

The analysis of IMD-GEFS model charts based on 0000 UTC of 16<sup>th</sup> October, 2019 shows a low pressure area over Lakshadweep and adjoining eastcentral Arabian Sea on 18<sup>th</sup>, which is seen as a well marked low over eastcentral and adjoining northeast Arabian till 23<sup>rd</sup>. It weakened thereafter.

#### **IMD-WRF**

The WRF model forecasts based on 15/00 analysis shows development of no low pressure area (LOPAR) over till 19<sup>th</sup>.

**NCMRWF-NCUM:** The analysis of model forecast charts based on 0000 UTC of 16<sup>th</sup> October, 2019 shows a low pressure area on 20<sup>th</sup> over eastcentral Arabian Sea, which moving in a northward direction becomes a depression on 23<sup>th</sup>, close to north Maharashtra-south Gujarat coasts. It further intensifies into a cyclonic storm on 24<sup>th</sup> over the same area and further into a Severe cyclonic storm by 25<sup>th</sup>.

**NCMRWF-UM-Regional Model:** The 00UTC forecast based on 00/16 UTC analysis indicate formation of a low pressure area over SE and adjoining EC Arabian Sea on 19<sup>th</sup>.

**NEPS Model:** The analysis of model forecast charts based on 0000 UTC of 16<sup>th</sup> October, 2019 shows an extended low pressure area on 18<sup>th</sup> over eastcentral and adjoining southeast Arabian Sea, which becomes a LOPAR on 19<sup>th</sup>, well marked low pressure area (WML) over eastcentral Arabian Sea on 20<sup>th</sup>, a depression (D/DD) on 22<sup>th</sup>, and a cyclonic storm on 23<sup>rd</sup> close to north Maharashtra-south Gujarat coasts. Thereafter it is seen as a Severe Cyclonic Storm (SCS) on 25<sup>th</sup> and 26<sup>th</sup> over eastcentral Arabian Sea.

**ECMWF:** ECMWF forecast gives indication of a low pressure systems during 21<sup>st</sup> to 23<sup>rd</sup> over eastcentral AS, which become less marked thereafter without any intensification.

**NCEP-GFS :** Model suggests a low pressure area over central Arabian Sea on 22<sup>nd</sup> and 23<sup>rd</sup> October, which is becomes less marked on 24<sup>th</sup> .

**ARP-Meteo France ARP:** Model indicates an extended low pressure area over southeast and adjoining eastcentral Arabian Sea on 18<sup>th</sup> which is seen as a LOPAR over eastcentral Arabian Sea on 19<sup>th</sup>.

### **Dynamical statistical models**

#### **IMD Genesis Potential Parameter (GPP):**

The Genesis Potential Parameter (GPP) analysis and forecasts based on 0000 UTC of 16<sup>th</sup> October 2019 shows a significant GPP zone developing over southeast Arabian Sea off Karnataka coast, which becomes significant while moving in a nearly northward direction to reach northern parts of eastcentral Arabian Sea on 21<sup>st</sup>. It becomes less marked on 22<sup>nd</sup>.

#### **IMD NWP products are available at:**

<http://nwp.imd.gov.in/bias/gfsproducts.php>

<http://nwp.imd.gov.in/bias/wrf27pro.php>

[http://www.rsmcnewdelhi.imd.gov.in/NWP\\_CYC/Analysis.htm](http://www.rsmcnewdelhi.imd.gov.in/NWP_CYC/Analysis.htm) or

[http://www.rsmcnewdelhi.imd.gov.in/NWP\\_CYC/<HH> hrs.htm](http://www.rsmcnewdelhi.imd.gov.in/NWP_CYC/<HH> hrs.htm)

<HH> are forecast hours i.e. 24, 48, 72 and etc.

#### **Summary and Conclusion:**

Majority of the numerical models except ECMWF, and NCEP GFS suggest formation of low pressure area (LPA) over southeast and adjoining eastcentral AS on 18<sup>th</sup> October. ECMWF, and NCEP GFS suggest presence of low pressure area to be during 21<sup>st</sup> to 23<sup>rd</sup> . NCUM and its ensemble models suggest that the system would concentrate into a depression and move nearly northwards towards south Gujarat- North Maharashtra coast. Further, they indicate the system to intensify into a cyclonic storm on 23<sup>rd</sup> and further into a Severe Cyclonic storm by 25<sup>th</sup>. No other model indicates the intensification of the system beyond well marked low pressure area. The genesis potential parameter index also indicates a potential zone for cyclogenesis over southeast & eastcentral AS during 18<sup>th</sup> -21<sup>st</sup> October 2019.

Considering the above, the development of a low pressure area over Arabian Sea around 18<sup>th</sup> October and any possible intensification needs to be monitored.

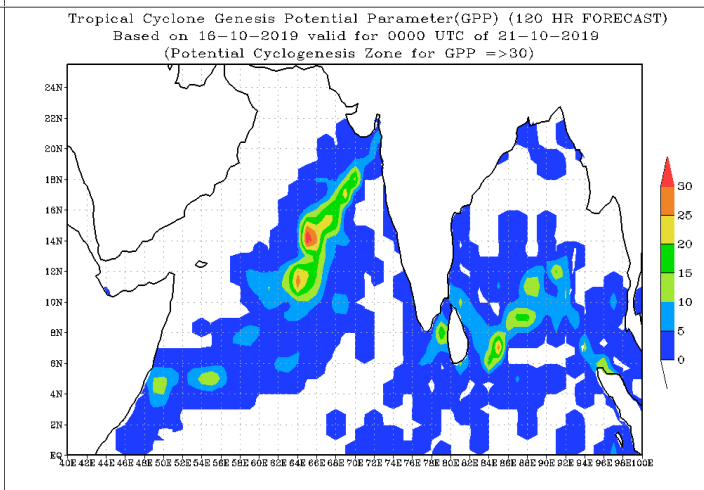
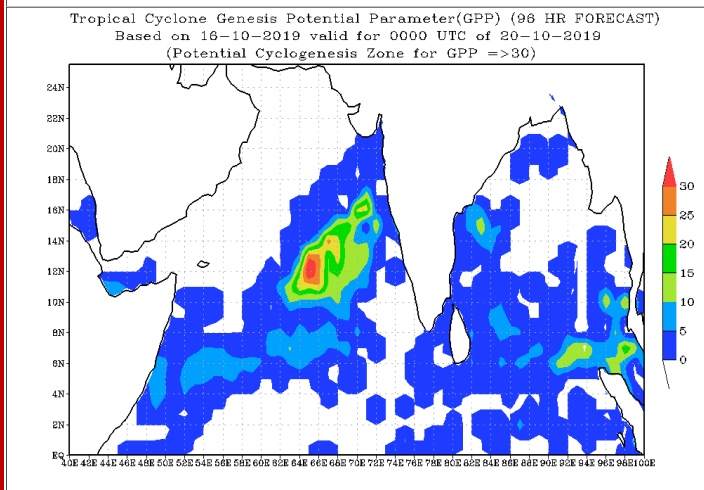
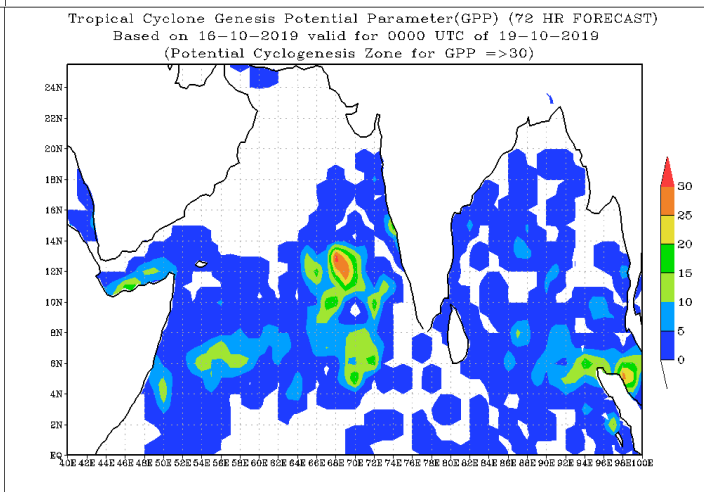
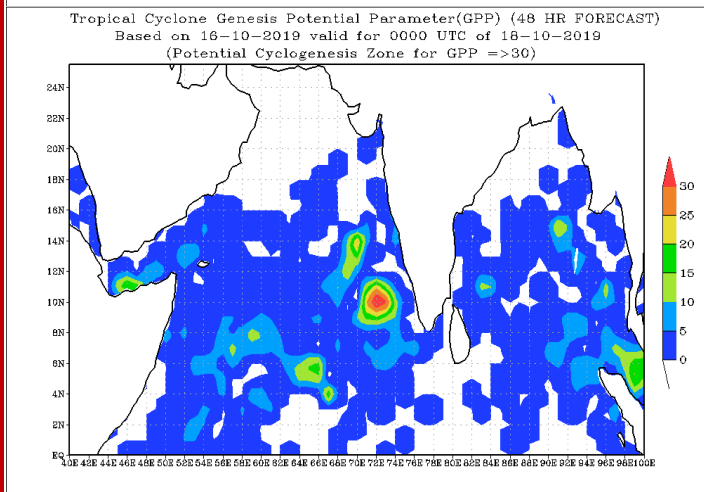
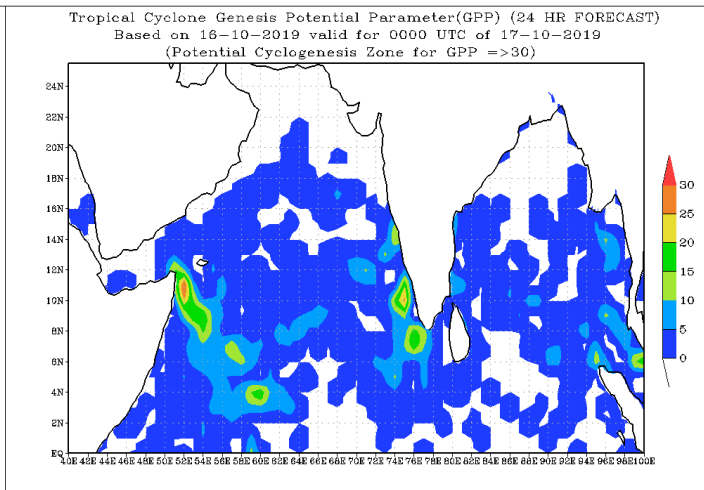
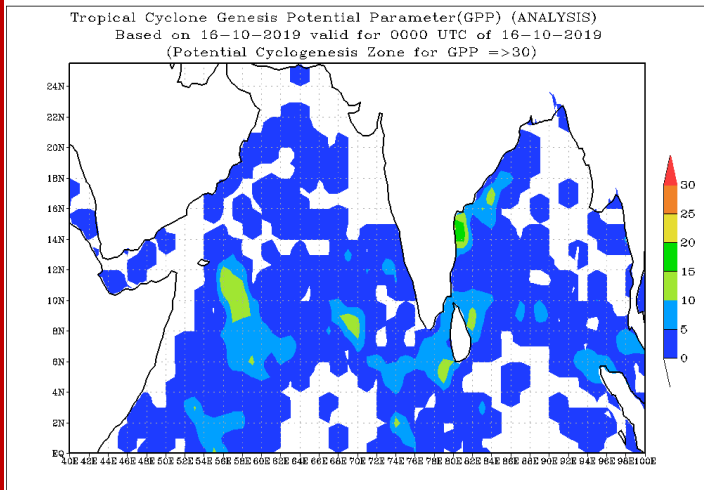
**Probability of cyclogenesis over Bay of Bengal and Andaman Sea during next 120 hours:**

24 HOURS	24-48 HOURS	48-72 HOURS	72-96 HOURS	96-120 HOURS
Nil	Nil	Nil	Nil	Nil

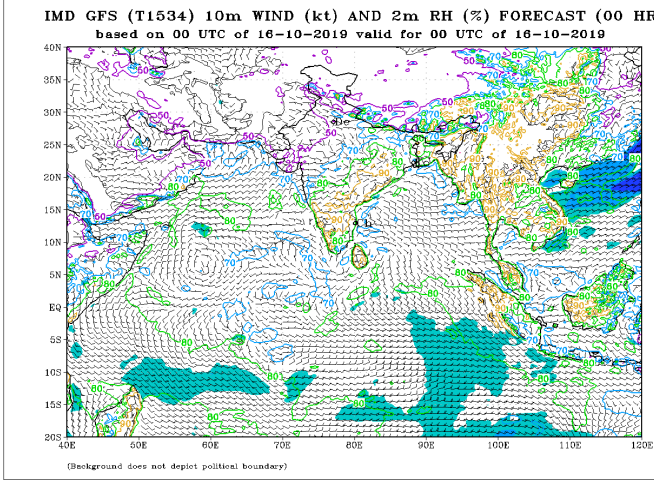
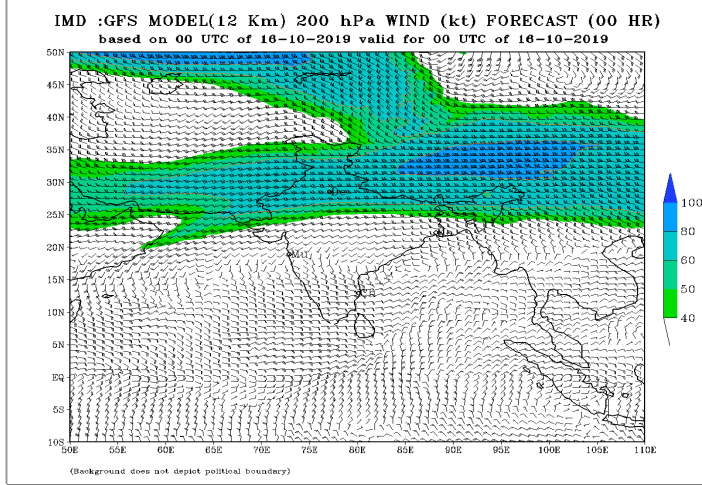
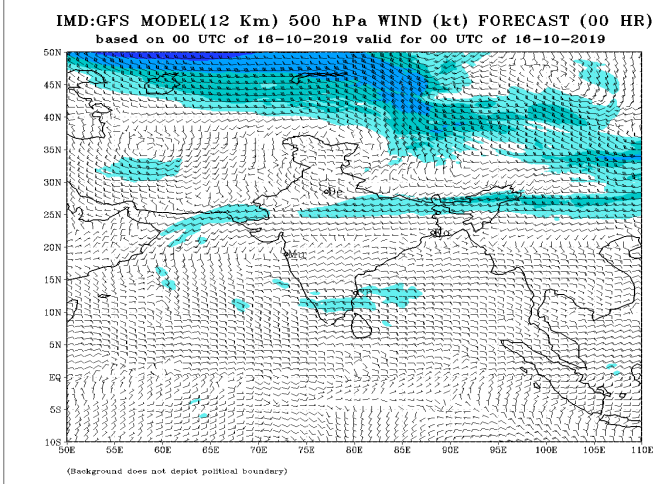
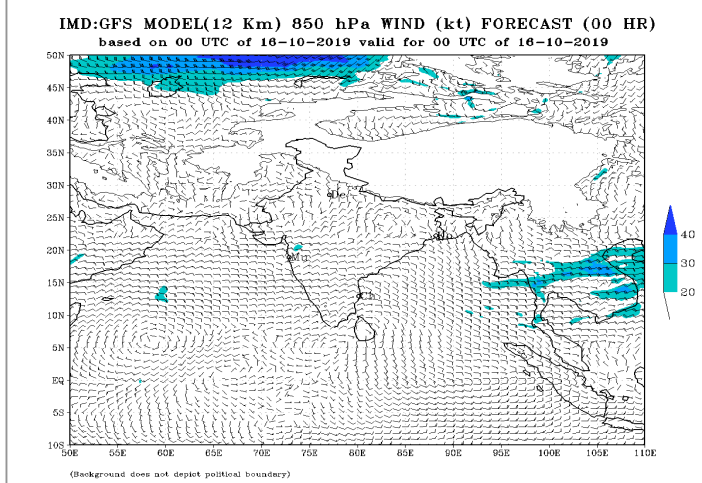
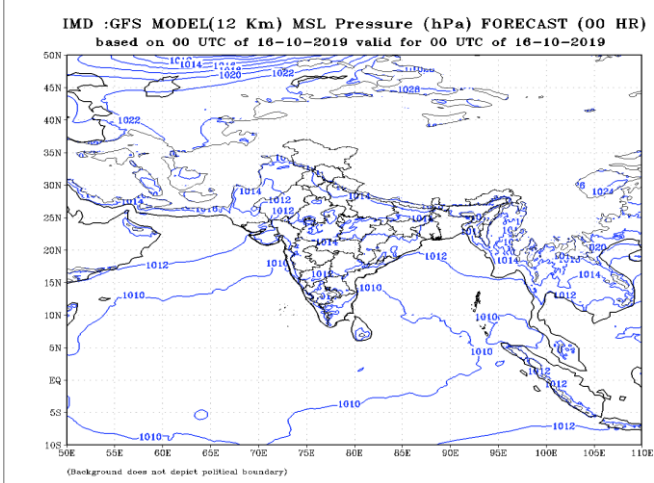
**Probability of cyclogenesis over Arabian Sea during next 120 hours:**

24 HOURS	24-48 HOURS	48-72 HOURS	72-96 HOURS	96-120 HOURS
Nil	Nil	Nil	Nil	Nil

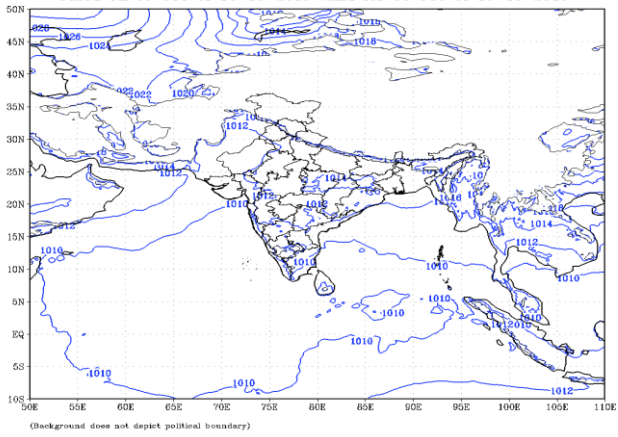
**Advisory: No IOP area for the next 5 days.**



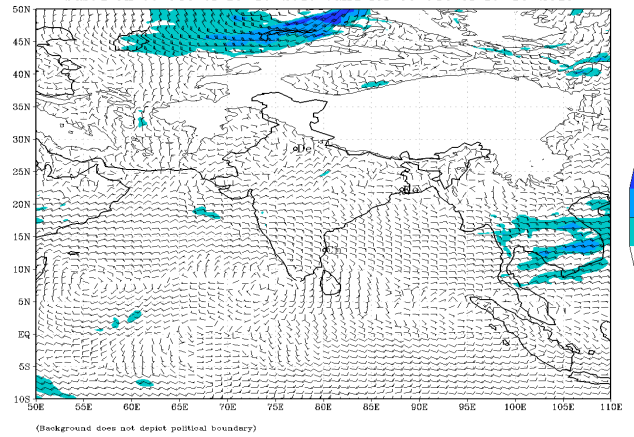




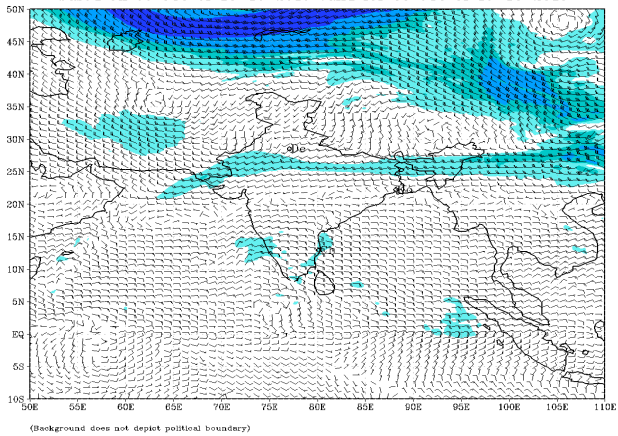
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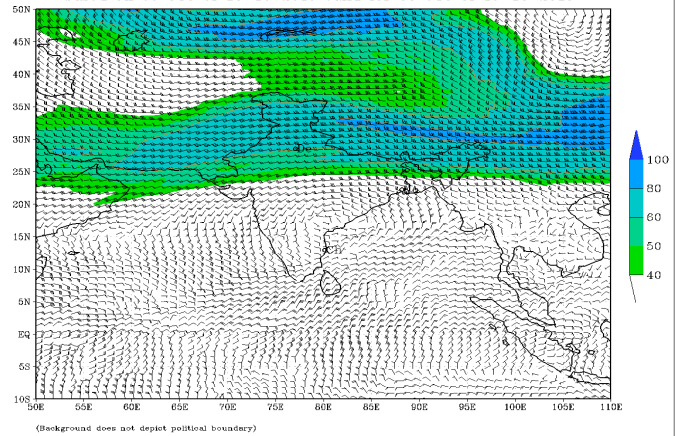
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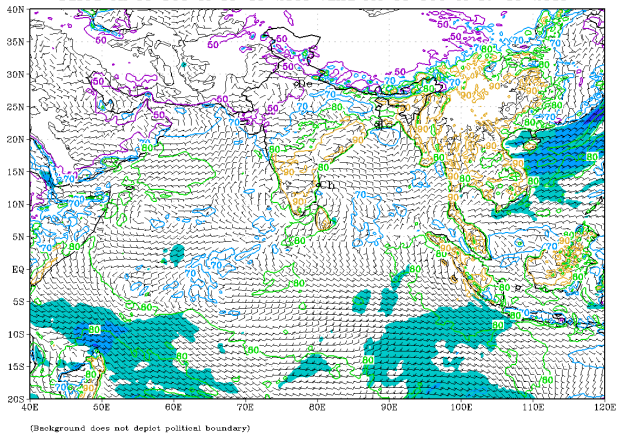
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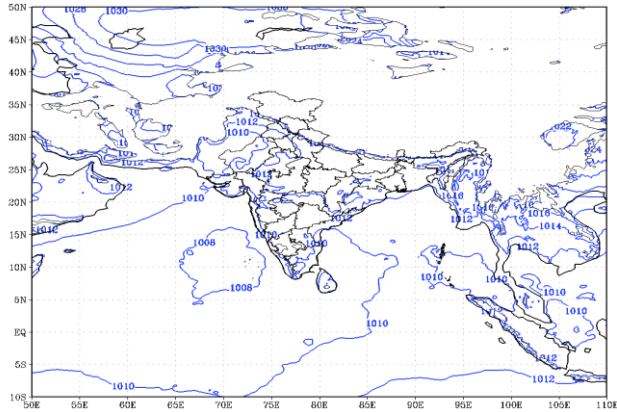
IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (24 HR)  
based on 00 UTC of 16-10-2019 valid for 00 UTC of 17-10-2019





IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (48 HR)

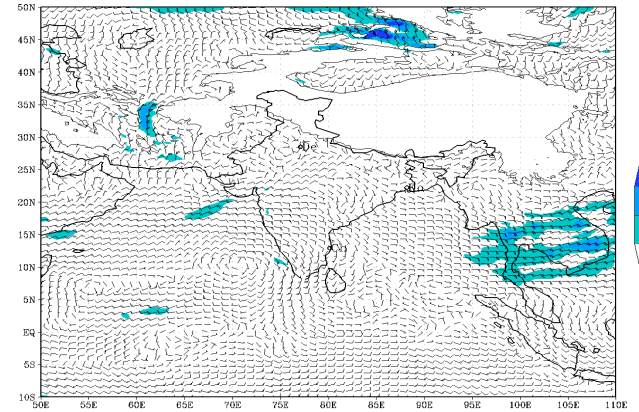
based on 00 UTC of 16-10-2019 valid for 00 UTC of 18-10-2019



(Background does not depict political boundary)

IMD:GFS MODEL(12 Km) 850 hPa WIND (kt) FORECAST (48 HR)

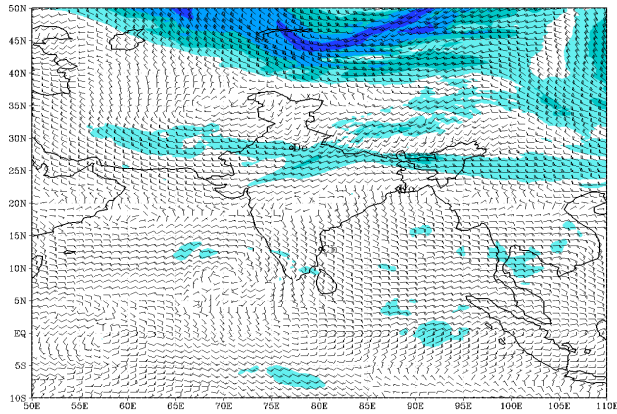
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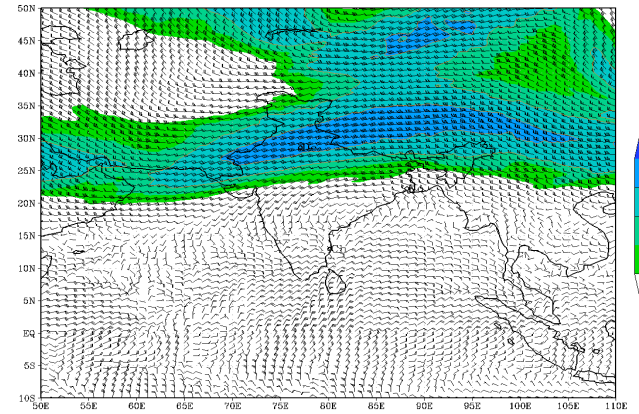
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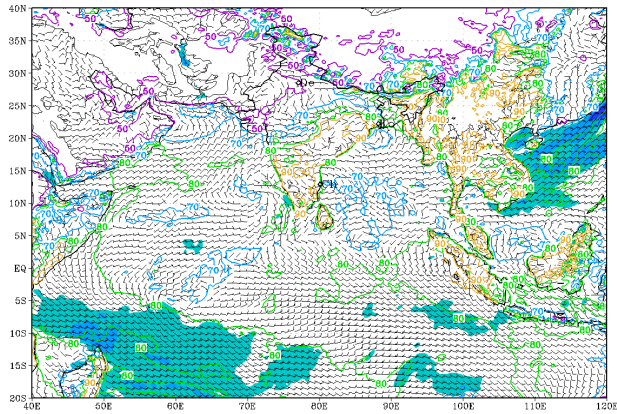
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IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (48 HR)

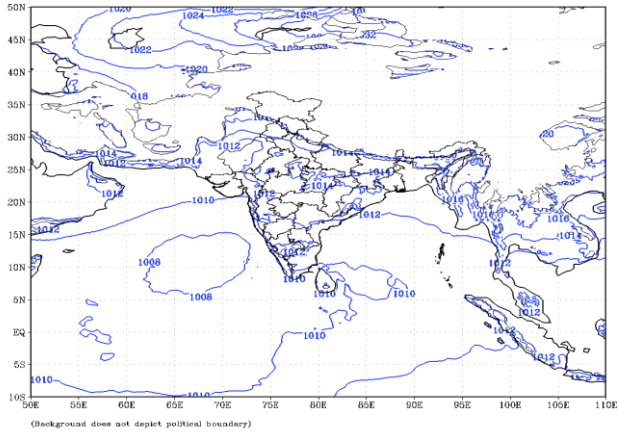
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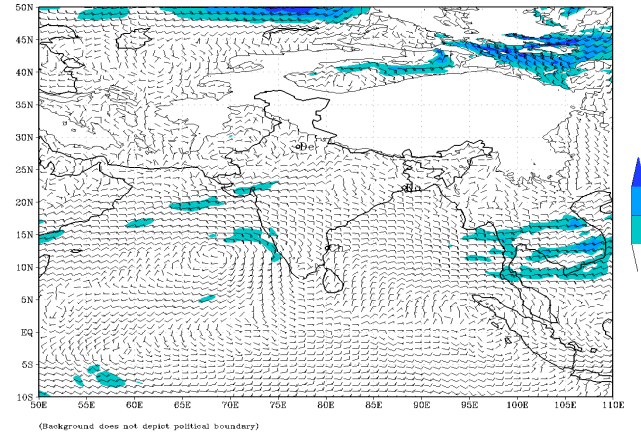
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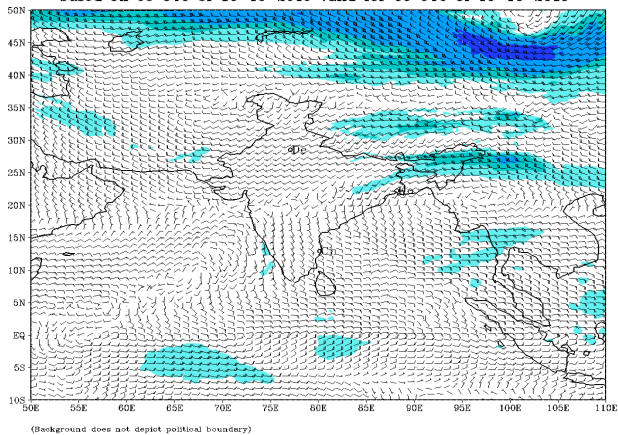
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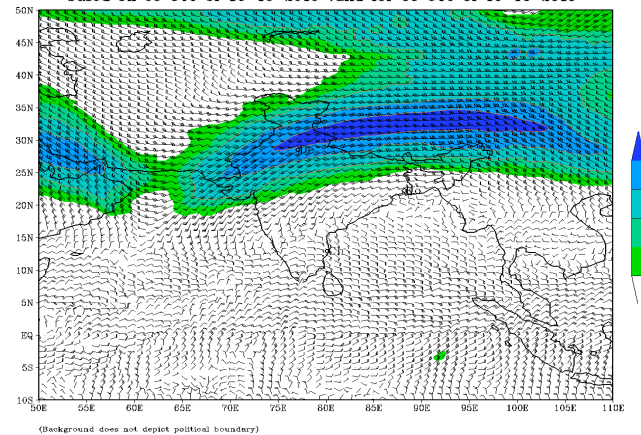
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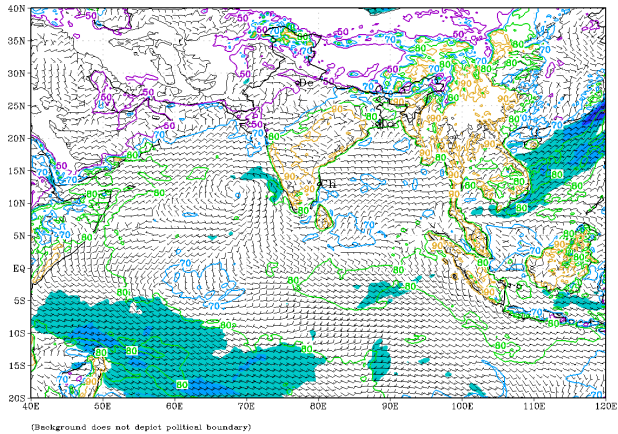
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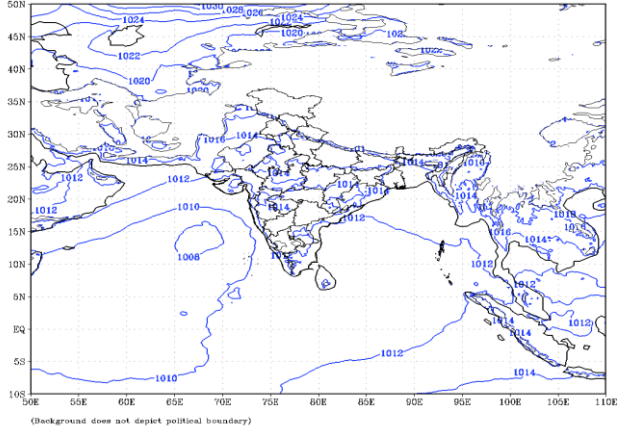
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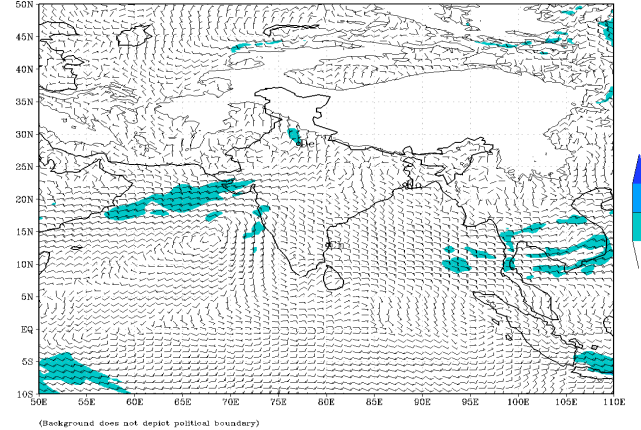
**IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (72 HR)**  
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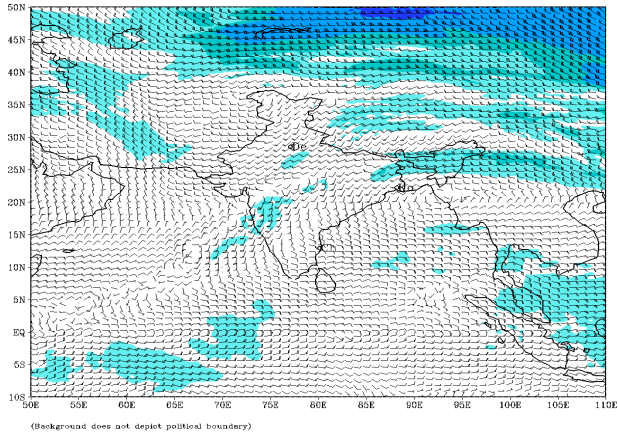
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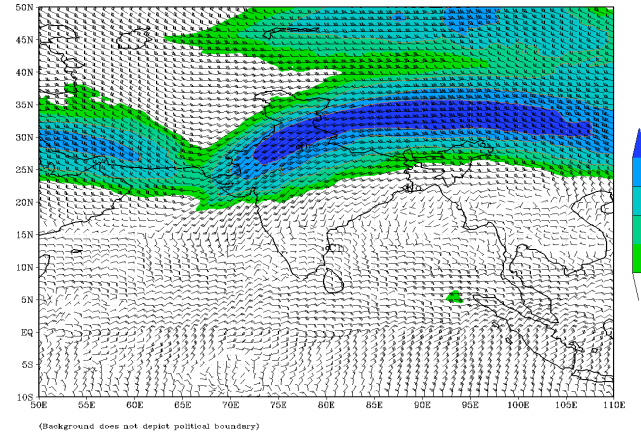
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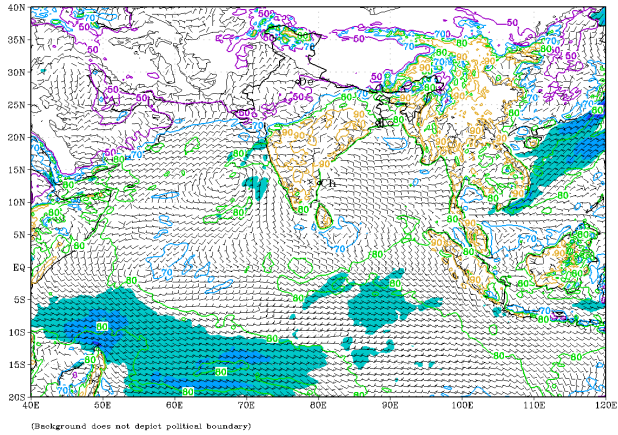
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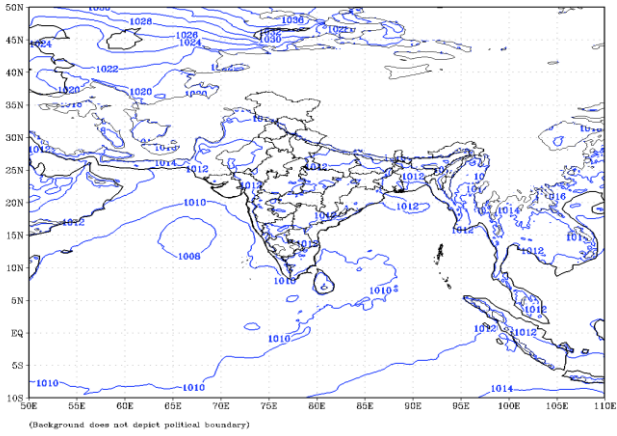


IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (96 HR)  
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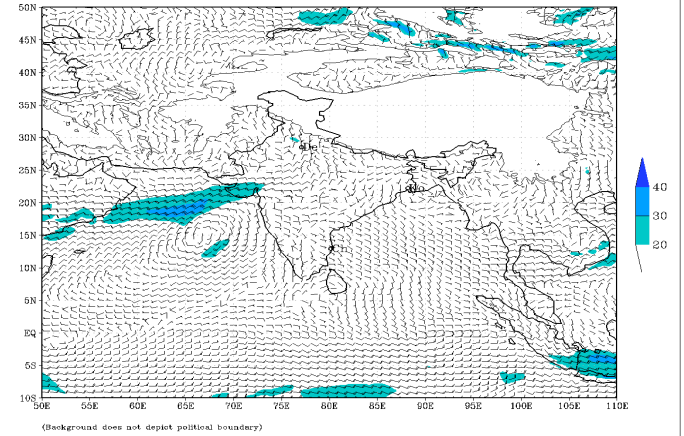




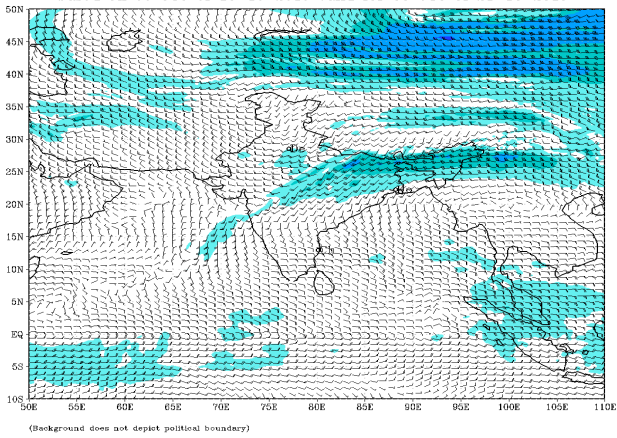
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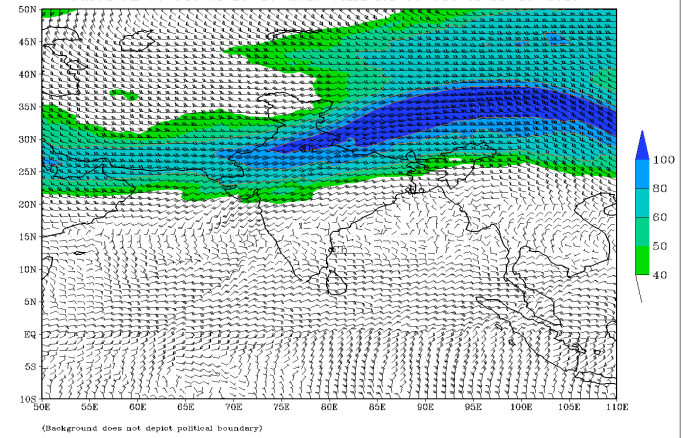
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based on 00 UTC of 16-10-2019 valid for 00 UTC of 21-10-2019



IMD :GFS MODEL(12 Km) 200 hPa WIND (kt) FORECAST (120 HR)  
based on 00 UTC of 16-10-2019 valid for 00 UTC of 21-10-2019



IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (120 HR)  
based on 00 UTC of 16-10-2019 valid for 00 UTC of 21-10-2019

