



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



FDP (Cyclone) NOC Report Dated 26th October, 2019

Time of Issue: 1200 UTC

Synoptic features:

- The Severe Cyclonic Storm (SCS) over east-central Arabian Sea (AS) moved west-northwestwards, intensified further into a **Very Severe Cyclonic Storm (VSCS)** and lay centred at 0000 UTC of today, the 26th October, 2019 near latitude 16.5°N and longitude 70.8°E over eastcentral Arabian Sea. Further moving west-northwestwards, it lay over east-central AS, near latitude 16.6°N and longitude 69.8°E about 380 km west-southwest of Ratnagiri (Maharashtra), 425 km southwest of Mumbai (Maharashtra) and 1670 km east-southeast of Salalah (Oman). It is very likely to move west-northwestwards towards Oman coast during next 5 days. It is very likely to intensify into an Extremely Severe Cyclonic Storm (ESCS) during next 12 hours.

Dynamical and thermodynamical features

Surface Temperature (SST):

SST is 29-30°C over east-central & southeast Arabian Sea (AS) and Gulf of Oman, 28-29°C over rest AS, except over west central & southwest AS off Oman and Somalia coasts where it is 26- 27°C.

SST is 30 - 32°C over north and adjoining east-central Bay of Bengal (BOB) & Myanmar coast and 29- 30°C over the rest of BOB.

Tropical Cyclone Heat Potential (TCHP):

TCHP is 80-100 kJ/cm² over southeast & adjoining central AS, 100-110 kJ/cm² over west equatorial Indian Ocean (IO). It is < 40 kJ/cm² over most parts of north & west-central AS and Oman – Yemen coasts.

TCHP is 110-130 kJ/cm² over west-central & southwest BOB, 100-110 kJ/cm² over north Andaman Sea and east-central BOB and 60-80 kJ/cm² elsewhere over the BOB.

Relative Vorticity:

An area of cyclonic relative vorticity at 850 hPa of 250 X10⁻⁶s⁻¹ is seen over east-central AS around the centre of the VSCS, 25 -50 X10⁻⁶s⁻¹ over central parts of south AS. It is anti-cyclonic over north and west-central AS.

Cyclonic relative vorticity at 850 hPa 25 - 50 X10⁻⁶s⁻¹ over east equatorial Indian Ocean (IO), to the east of Sri Lanka and anti-cyclonic over the rest of the Bay of (BOB).

Low level Convergence:

Lower level convergence is about 15 – 20 x 10⁻⁵s⁻¹ over east-central AS around the centre of the VSCS.

Lower level convergence of about 05-10 x 10⁻⁵s⁻¹ is seen over east equatorial IO.

Upper level Divergence:

A zone of upper level divergence of 10 - 20x10⁻⁵ s⁻¹ is seen over east-central and adjoining northeast AS and convergence of 05 - 10 x10⁻⁵ s⁻¹ over rest of north AS.

Upper level divergence of 05 - 10x10⁻⁵ s⁻¹ is seen over east equatorial IO.

Wind Shear:

Wind shear is 05-10 knots over central AS, and increasing to the north as well as to the south.
Wind shear is 05-10 knots over entire BOB.

Wind Shear Tendency:

The wind shear is in decreasing tendency over southwest and northwest AS and neutral over the rest of AS.

It is increasing over southwest & west-central BOB.

Upper tropospheric ridge:

The upper tropospheric ridge at 200 hPa runs roughly along 18°N over the north IO.

Satellite observations based on INSAT imagery:**Arabian Sea:-**

According to 0900 UTC satellite imagery, vortex (Kyarr) over east-central AS & neighbourhood is centered near 16.6N/69.9 E with intensity T 4.5 Banding eye is visible. Tightly wrapped curved bands seen with 1.35 wrap on 10 deg. Log spiral. Centre clearly exposed in microwave imagery. Associated broken low / medium clouds with embedded intense to very intense convection prevails over east-central AS between Lat 13.0N to 18.0N and Long 67.5E to 72.0E (minimum CTT is minus 93 deg C).

Bay of Bengal & Andaman Sea:-

According to 0900 UTC satellite imagery, scattered low/medium clouds with embedded intense to very intense convection prevails over southwest, north-central BOB and south Andaman Sea and moderate to intense convection over extreme northwest and east-central BOB.

Large scale features**M.J.O. Index:**

MJO index is in Phase 2 (western Indian Ocean) with amplitude more than 1. It will continue in same phase with reduction in amplitude for one more day and enter into Phase 3 (eastern Indian Ocean) with subdued amplitude thereafter.

Storms and Depression over South China Sea/ South Indian Ocean: None over south China Sea and over south Indian Ocean.

Typhoon 22W "Bualoi" over Pacific Ocean has transformed into an extra tropical cyclone.

NWP Input for FDP Cyclone based on 0000 UTC of today**IMD-GFS T-1534**

- (i) Indicates : ESCS over east-central AS on 26th, ESCS over east-central & adjoining west-central AS on 27th, ESCS over northern parts of central AS on 28th, ESCS over west-central and adjoining northwest AS on 29th, 30th, 31st October & 1st November, ESCS over northern parts of west-central AS on 2nd November (with slight eastward movement), ESCS over northern parts of west-central AS on 3rd November.
- (ii) Indicates: Low pressure area (Lopar) over east equatorial IO and adjoining southwest BOB on 27th and becoming less marked thereafter.

IMD-GEFS

- (i) Indicates: VSCS over east-central AS off south Maharashtra coast on 26th, ESCS over east

central AS on 27th, ESCS over east-central AS on 27th, ESCS over central AS on 28th, VSCS over west-central AS on 29th, VSCS over northern parts of central AS on 30th, VSCS over west-central AS off Oman coast on 31st October, CS over west-central AS on 1st November, Deep Depression (DD) over west-central AS on 2nd November, D over west-central AS on 3rd November.

- (ii) Indicates: Lopar over southwest BOB on 27th becomes less marked on 28th, a fresh Lopar over east-central BOB and adjoining north Andaman Sea on 2nd November.

IMD-WRF

- (i) Indicates: ESCS over east-central AS on 26th & 27th, ESCS over central AS on 28th, ESCS over west-central and adjoining east-central AS on 29th October.
- (ii) Indicates: Lopar over southwest BOB and adjoining equatorial IO on 28th and Lopar over southwest BOB off south Tamil Nadu- Sri Lanka coasts on 29th October.

NCMRWF-NCUM:

- (i) Indicates: VSCS over east-central AS off Maharashtra coast on 26th, ESCS over east-central AS on 27th, ESCS over east-central and adjoining west-central AS on 28th, ECSC over central AS on 29th, ESCS over west-central AS on 30th, SCS over west-central AS on 31st October & 1st November, Cyclonic Storm (CS) over southwest AS on 2nd November and SCS over southwest AS on 3rd November.
- (ii) Indicates: Lopar over east equatorial IO and adjoining southwest BOB off Sri Lanka coast on 28th, well marked Lopar (WML) over Sri Lanka and neighbourhood on 29th, Lopar over south Kerala and neighbourhood on 30th, D over east-central and adjoining southeast AS off Karnataka coast on 31st October, SCS / CS over east-central AS on 1st November, SCS over northeast AS off south Gujarat coast on 2nd and CS over south Rajasthan on 3rd November.

NCMRWF-UM-Regional Model:

- (i) Indicates: ESCS over east-central AS off Maharashtra coast on 26th, ESCS over east-central AS on 27th, ESCS over east-central and adjoining west-central AS on 28th, ESCS over central AS on 29th October.

NEPS Model:

- (i) Indicates : ESCS over east central AS off Maharashtra Coast on 26th, ESCS over east-central AS on 27th, ESCS over central AS on 28th, ESCS over west-central and adjoining east-central AS on 29th, ESCS over west-central AS on 30th, VSCS over west-central AS on 31st October & 1st November.
- (ii) Indicates: Lopar over southwest BOB and adjoining equatorial IO off Sri Lanka coast on 28th, WML over Sri Lanka and neighbourhood on 29th, D over central Kerala and neighbourhood on 30th, SCS over east-central AS off Kerala coast on 31st October, VSCS over southwest AS on 1st & 2nd November.
- (iii) It also indicates an SCS from south China Sea crossing Thailand on 31st October, CS over Thailand on 1st November.

ECMWF:

- (i)Indicates : ESCS over east-central AS on 26th & 27th, ESCS over central AS on 28th, ESCS over west central AS on 29th, VSCS over west-central AS on 30th, CS over west-central AS off Oman coast on 31st October, D over west central AS off south Oman coast on 1st November and less marked on 2nd November.
- (ii) Indicates: Lopar over southeast AS on 31st October, DD over east-central and adjoining southeast AS on 1st November, CS over east-central AS on 2nd, CS over west-central AS on 3rd, SCS over west-central AS on 4th and SCS over Gulf of Oman – off Yemen coast on 4th November.
- (iii) It also indicates formation of a Lopar over east-central BOB and adjoining north Andaman Sea on 4th November and D over east-central BOB on 5th November.

NCEP-GFS :

- (i) Indicates : ESCS over east central AS on 27th, ESCS over central AS on 28th, 29th & 30th, VSCS over central AS on 31st October, SCS over central AS on 1st November, D over west-central AS on 2nd and D / WML over west-central AS on 3rd November.

ARP-Meteo France :

- (i) Indicates: ESCS over east-central AS off south Maharashtra coast on 26th, Super CS (SuCS) over east-central AS on 27th, 28th & 29th October.

Dynamical statistical models**IMD Genesis Potential Parameter (GPP):**

- (i) Significant zone of GPP seen over east central AS off south Maharashtra coast on 26th, over east-central AS on 27th, over central AS on 28th & 29th and over north AS on 30th, & 31st October, a smaller area over north AS on 1st November and again over east-central AS off Maharashtra coast on 2nd November.
- (ii) Significant zone of GPP seen over east equatorial IO and adjoining south Andaman Sea on 29th October.

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 or

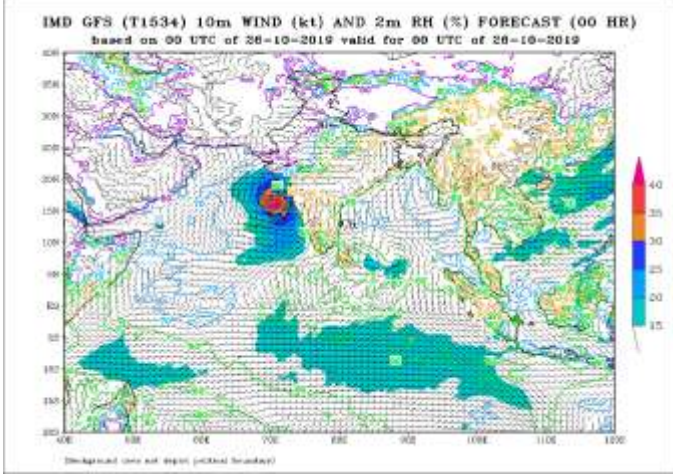
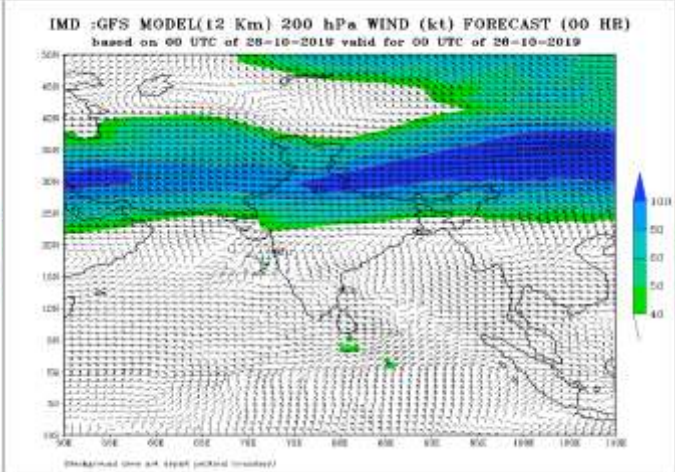
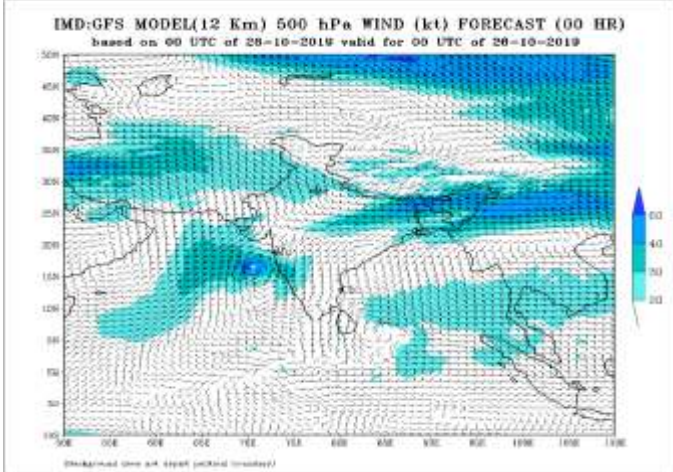
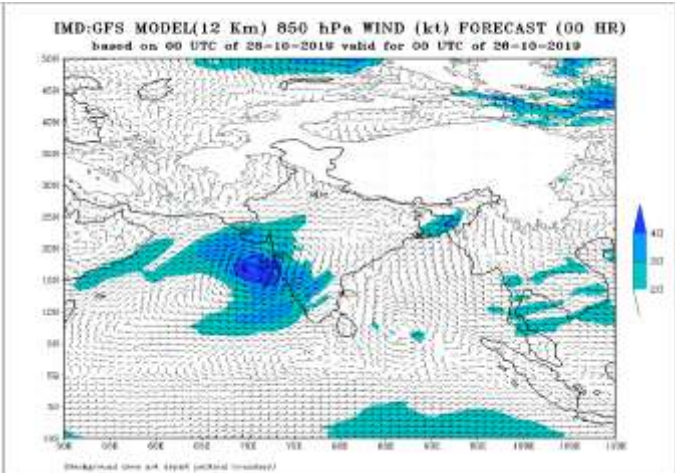
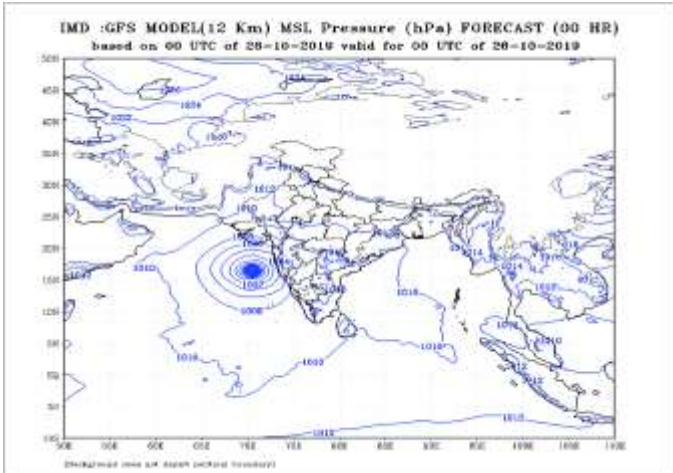
http://www.rsmcnewdelhi.imd.gov.in/NWP_CYC/<HH>hrs.htm

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

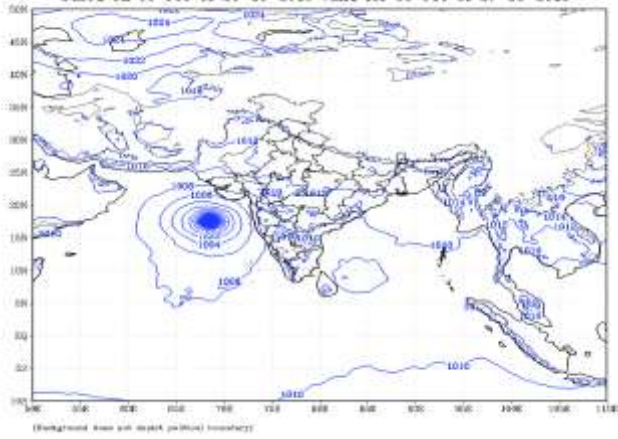
Summary and Conclusion:

- The VSCS over east central Arabian Sea is very likely to intensify further and move west-northwestwards towards Oman coast with gradual intensification during next 5 days.
- The MJO lies in the phase 2 with amplitude greater than 1. It will remain in the same phase during next 2 days with diminishing amplitude and move over to phase 3 thereafter. Positive Indian Ocean Dipole and overall sea surface temperature > 29°C and TCHP > 80 kJ/cm⁻² over major parts of south & central AS & BOB are favourable factors for cyclogenesis as well as further intensification of systems over north IO at present.
- IMD GFS and GPP as against its forecast, yesterday, is not indicating the fresh cyclogenesis today. NCUM & NEPS however suggest probable formation of a CS over east-central and adjoining southeast AS on 1st November and two intense systems over the AS simultaneously during the initial week of November. ECMWF predicts formation of a D over AS on 1st November and its northwestward movement and further intensification into CS on 2nd November. It also indicates a fresh cyclogenesis over the Bay of Bengal by 5th November.

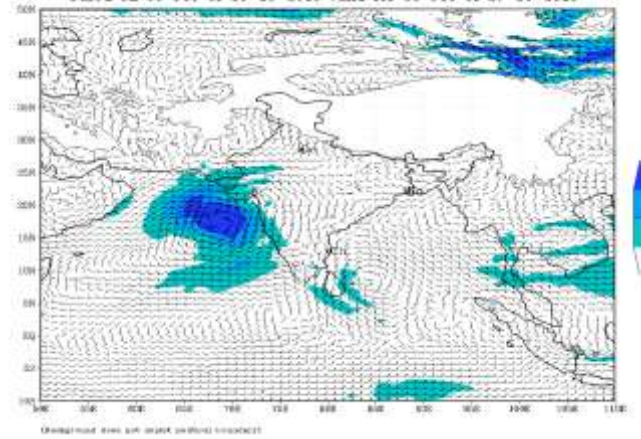
Advisory: No IOP for next 5 days.



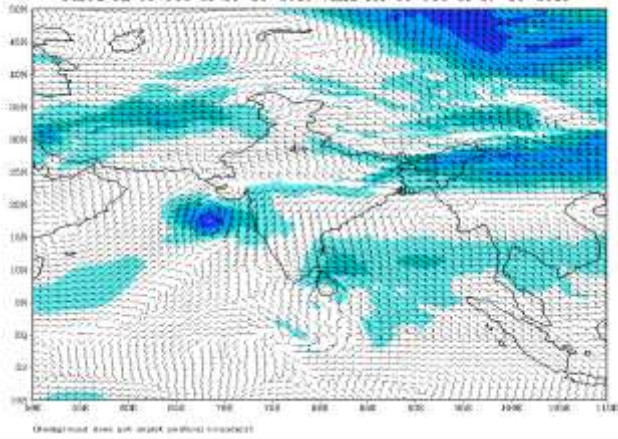
IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (24 HR)
based on 00 UTC of 26-10-2018 valid for 00 UTC of 27-10-2019



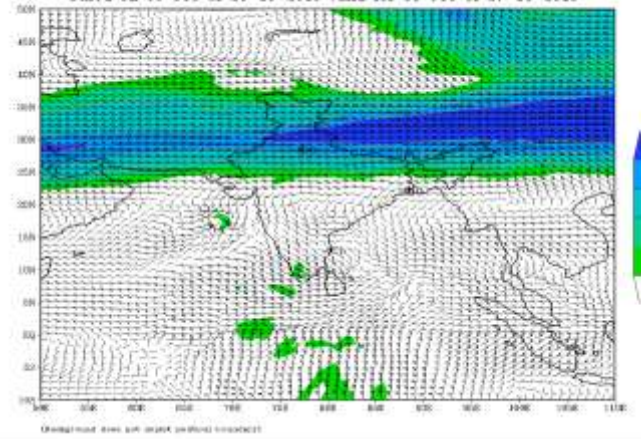
IMD:GFS MODEL(12 Km) 850 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 26-10-2018 valid for 00 UTC of 27-10-2019



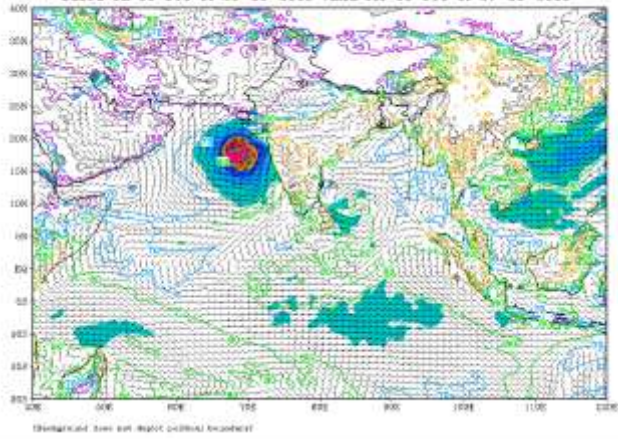
IMD:GFS MODEL(12 Km) 500 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 26-10-2018 valid for 00 UTC of 27-10-2019



IMD :GFS MODEL(12 Km) 200 hPa WIND (kt) FORECAST (24 HR)
based on 00 UTC of 26-10-2018 valid for 00 UTC of 27-10-2019

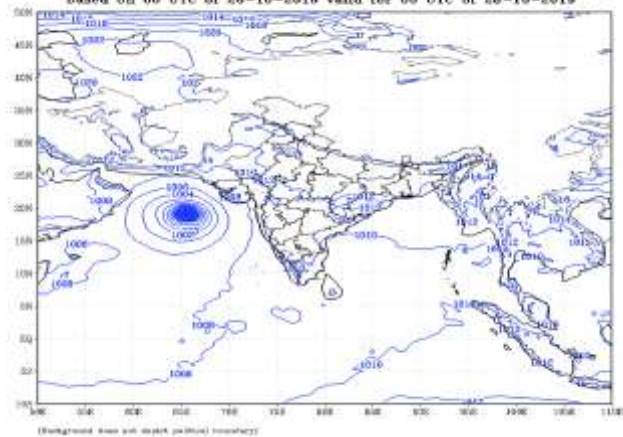


IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (24 HR)
based on 00 UTC of 26-10-2018 valid for 00 UTC of 27-10-2019



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

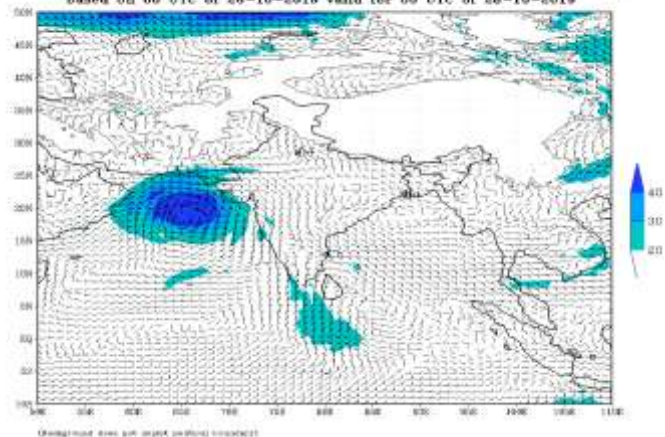
based on 00 UTC of 28-10-2018 valid for 00 UTC of 28-10-2019



(Background data are from ERA-Interim reanalysis)

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

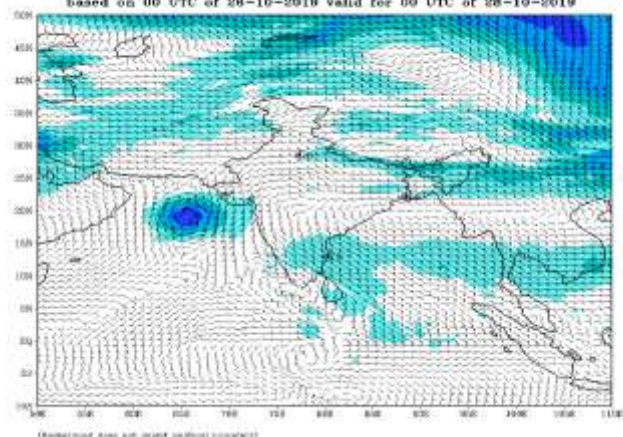
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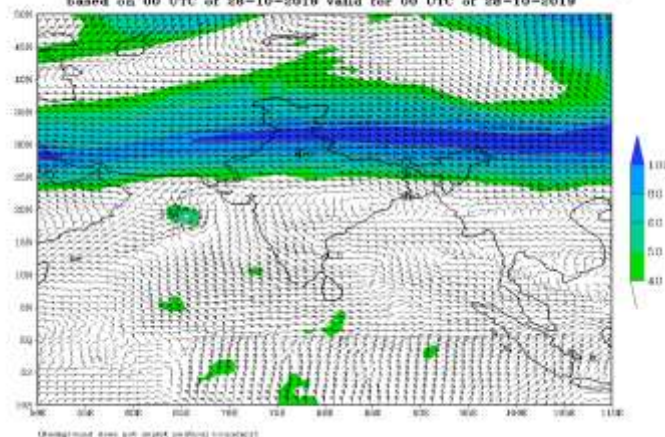
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(Background data are from ERA-Interim reanalysis)

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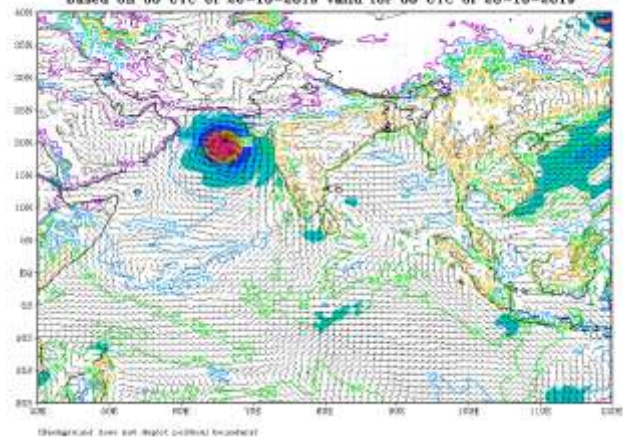
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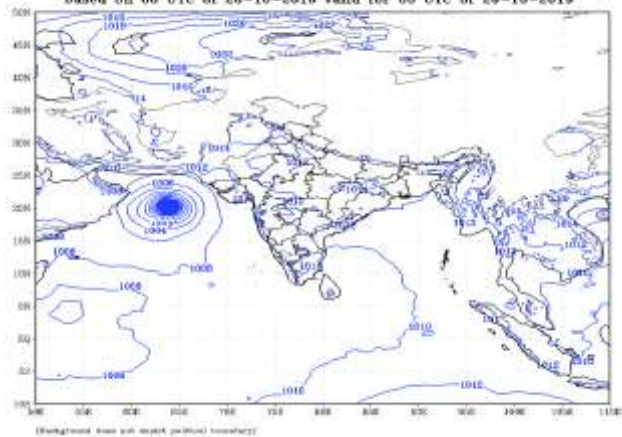
IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (48 HR)

based on 00 UTC of 28-10-2018 valid for 00 UTC of 28-10-2019

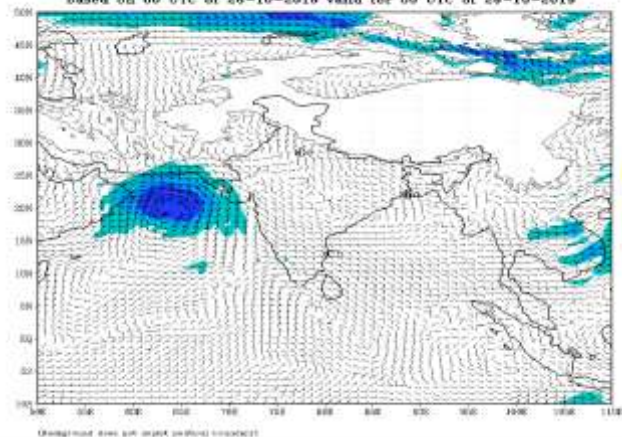


(Background data are from ERA-Interim reanalysis)

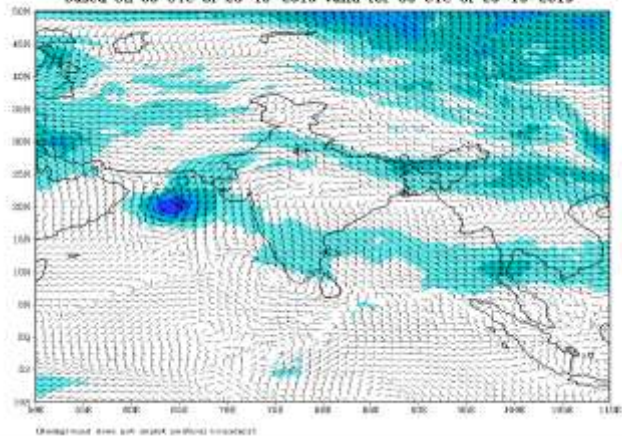
IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (72 HR)
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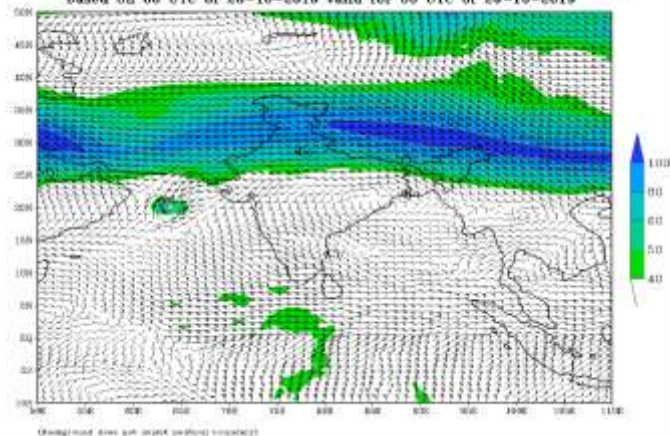
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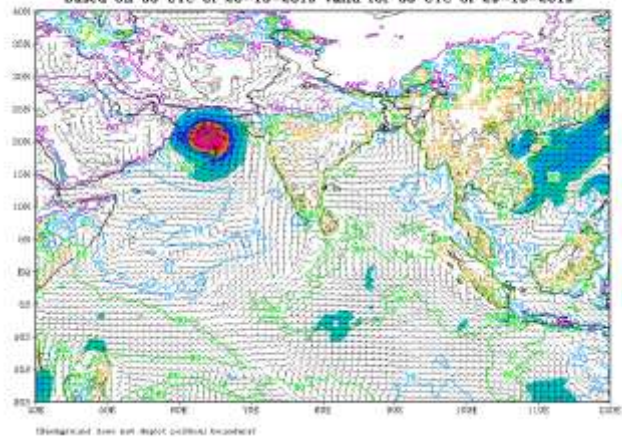
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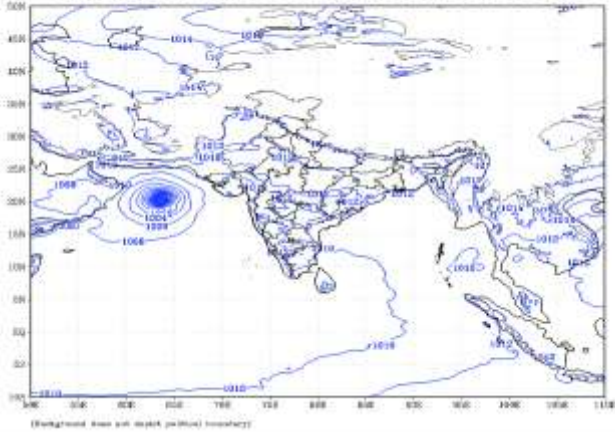
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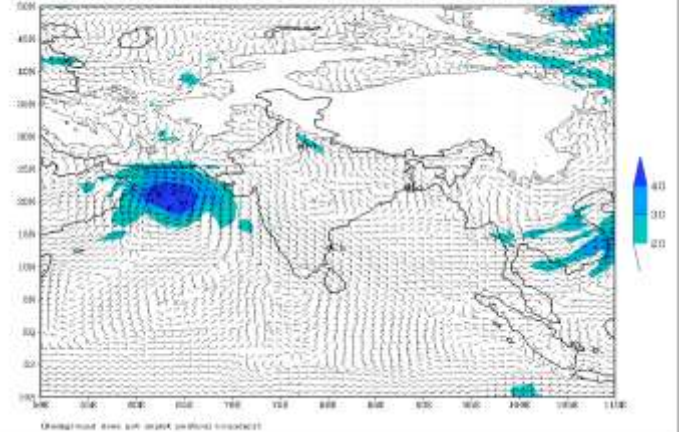
IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (72 HR)
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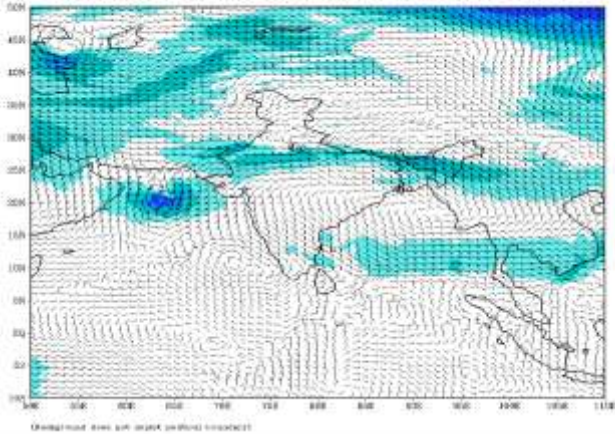
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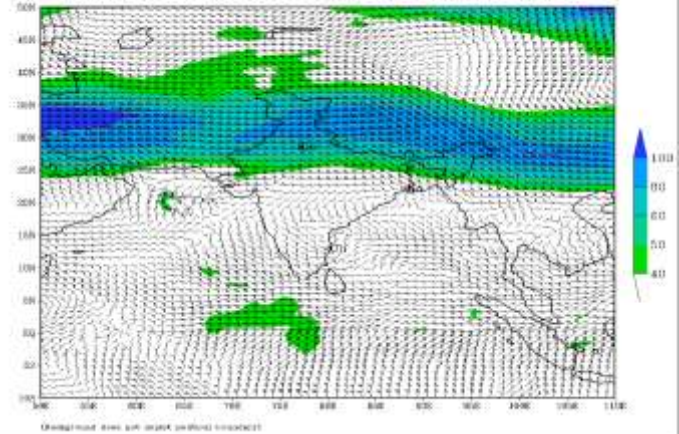
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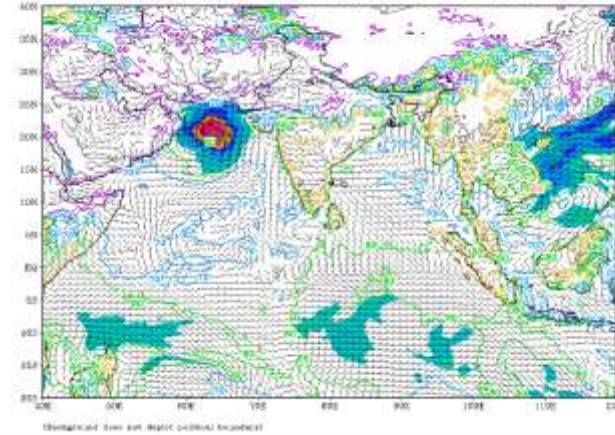
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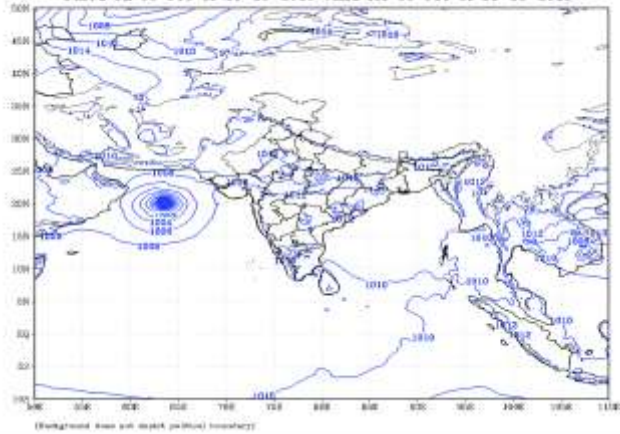
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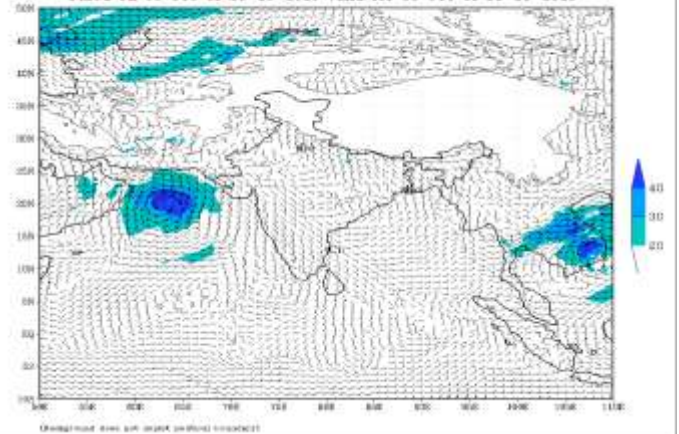
IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (96 HR)
based on 00 UTC of 28-10-2018 valid for 00 UTC of 30-10-2019



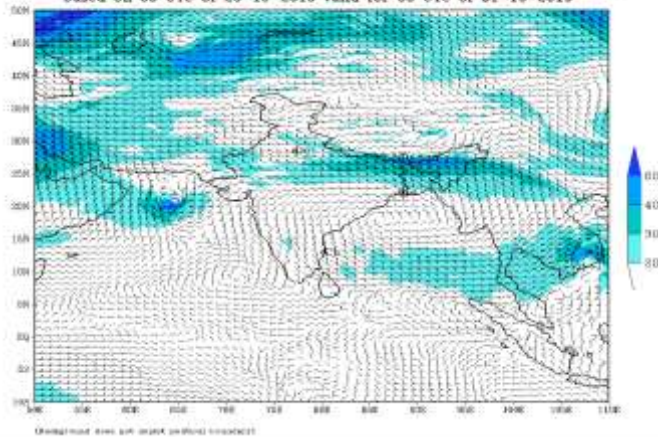
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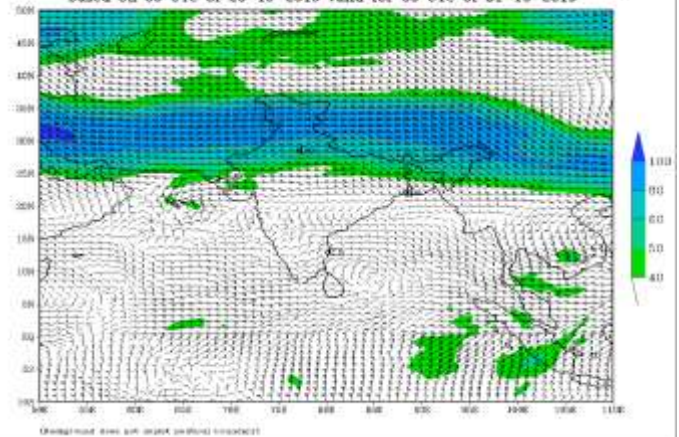
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based on 00 UTC of 28-10-2018 valid for 00 UTC of 31-10-2019



IMD:GFS MODEL(12 Km) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 28-10-2018 valid for 00 UTC of 31-10-2019



IMD :GFS MODEL(12 Km) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 28-10-2018 valid for 00 UTC of 31-10-2019



IMD GFS (T1534) 10m WIND (kt) AND 2m RH (%) FORECAST (120 HR)
based on 00 UTC of 28-10-2018 valid for 00 UTC of 31-10-2019

