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

FDP (Cyclone) NOC Report Dated 08th November, 2019

Time of Issue: 1200 UTC

Synoptic features:

- The cyclonic storm "BULBUL" (pronounced as Bul bul) intensified into a severe cyclonic storm at 1200 UTC of 7th November over westcentral & adjoining eastcentral Bay of Bengal. It moved nearly north-northwestwards and intensified into a Very Severe Cyclonic Storm (VSCS) over the same region at 0000 UTC of 8th November, 2019. Further it moved northwards and lay centred at 0900 UTC of today, the 8th November 2019, over westcentral & adjoining eastcentral Bay of Bengal, near Lat.18.1°N and Long. 87.6°E about 260 km south-southeast of Paradip (Odisha), 390 km south-southwest of Sagar Islands (West Bengal) and 510 km south-southwest of Khepupara (Bangladesh) . It is very likely to intensify further till 0000UTC of 9th November. It is very likely to move nearly northwards till 9th November morning. Thereafter, it is very likely to re-curve northeastwards and cross West Bengal - Bangladesh Coasts between Sagar Islands (West Bengal) and Khepupara (Bangladesh), across Sunderban delta by 1800 UTC of 9th November as a Severe Cyclonic Storm with maximum sustained wind speed of 110-120 Kmph gusting to 135 Kmph
- The deep depression over eastcentral & adjoining northeast Arabian Sea weakened into a depression around 0600 UTC on 7th and into a well marked low pressure area (WML) over northeast Arabian Sea and adjoining south Gujarat coast by 1200 UTC of 07th November, 2019.
- A cyclonic circulation lies over Sri Lanka & neighbourhood between 1.5 & 3.1 km above mean sea level.

Dynamical and thermodynamical features

Sea Surface Temperature (SST):

Sea Surface Temperature is around 25-26°C over a small area in Arabian Sea roughly along 20° N which increases to 28-30°C over north Arabian Sea and south Arabian Sea.

SST is 28 - 30ºC over most parts of the BOB with higher values over central BoB. However, it is around 27-28 ºC over some parts of north BoB.

Tropical Cyclone Heat Potential (TCHP):

Tropical Cyclone Heat Potential (TCHP) is 20-40 kJ/cm^2 over most parts of central Arabian Sea and north Arabian sea. There is a narrow strip of value 50-70 kJ/cm^2 off west coast of India. It is around 80-100 kJ/cm^2 over south Arabian Sea.

TCHP is 100-120 kJ/cm^2 over a small area in southwest BOB and is 80-100 kJ/cm^2 over the system area and also over rest of the BOB. It decreases to value less than 50 kJ/cm^2 over northern parts of north BoB.

Relative Vorticity:

Cyclonic relative vorticity at 850 hPa of value 250 X10^{-6}s-1 is seen around the centre of Very Severe Cyclonic Storm Bul bul over EC BoB.

Cyclonic relative vorticity at 850 hPa of value 20-30 X10^{-6}s-1 is seen over the eastcentral Arabian Sea off Maharashtra coast.

Low level Convergence:

An area of lower level convergence about 30 x 10^{-5}s^{-1} is seen to the north of the centre of VSCS Bul bul over EC BoB.

No positive lower level convergence area is seen over Arabian Sea.

Upper level Divergence:

Upper level divergence of value 30x10^{-5} s-1 to the northeast of VSCS Bul bul over EC SE BoB.

There is no area of positive upper level divergence over Arabian Sea.

Wind Shear:
Wind shear is high over north and central Arabian Sea. It is low to moderate over south AS.

Wind shear is moderate to high over the system area and is increasing in the forecast direction of the system.

Wind Shear Tendency:
The wind shear tendency is positive over Andaman Sea and adjoining southeast BoB. It is negative or neutral elsewhere.
It is negative over some parts of southeast Arabian Sea and Comorin area and also over north Arabian Sea. It is positive or neutral over rest Arabian Sea.

Upper tropospheric ridge:
The upper tropospheric ridge at 200 hPa runs roughly along 19°N over BoB.

Satellite observations based on INSAT imagery:

Arabian Sea:-

As per the satellite imagery at 0900 UTC of 08th November, 2019, scattered low to medium clouds with embedded isolated weak to moderate convection lies over Gulf of Cambay and adjoin south Gujarat coast and extreme north Maharashtra in association with a low level circulation over the area.

Bay of Bengal & Andaman Sea:-

According to 0900 UTC satellite imagery, the intensity of the system (VSCS Bul bul) is T4.0. Associated broken low/medium clouds with embedded intense to very intense convection lies over WC and adjoining EC BoB between Lat 16.5^0N to 20.0^0N and Long 86.5^0E to 90.0^0E. The minimum CTT is minus 93^0C.

Large scale features

M.J.O. Index:
MJO index is in Phase 6 with amplitude more than 1. It is likely to remain there for next 2 days and move to phase 7 thereafter.

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

a) At 0600 UTC on 08 Nov 2019, Typhoon "Halong" was located near 28.5°N 156.6°E, approximately 293 NM west-southwest of Minami Tori Shima. Maximum sustained surface winds were estimated at 75 knots. It is expected to continue to move northeastwards with gradual weakening to become a Tropical Cyclone by 1800 UTC on 9th.

b) The Tropical Storm "NAKRI" is located at 0600 UTC of 08th near 12.7°N 116.7°E, approximately 275 NM west-southwest of Manila. Maximum sustained surface winds were estimated at 65 knots. The system is likely to move nearly westwards with marginal intensification and cross Vietnam coast around 13.2^0 N by 1800 UTC on 10th November as a cyclonic storm.

NWP Input for FDP Cyclone based on 0000 UTC of today

IMD-GFS T-1534

(i) The VSCS on 8th over WC BoB moves in a north-northeast direction and crosses West Bengal coast on in the late night of 9th.

IMD-GEFS

(i) The VSCS over EC BoB on 8th November moving north-northeastwards cross West Bengal coast on 9th night and is seen as a CS over coastal regions on 10th and gradually weakens thereafter.

IMD-WRF

(i) The VSCS over westcentral BoB on 8th while moving in a north-northwest direction reaches over WC BoB off Odisha coast on 9th and weakens over the same area without crossing coast.

NCMRWF-NCUM:

(i) The VSCS over eastcentral BOB on 8th November is seen to move in a nearly northward direction and cross West Bengal- Bangladesh coasts on 10th November.

NCMRWF-UM-Regional Model:

(i) The VSCS over EC BoB on 8th moves nearly northwards and crosses North Odisha- West Bengal coasts on 10th.

NEPS Model:

(i) The VSCS over WC BoB is seen to move in a north-northeast direction and cross West Bengal- Bangladesh coasts in the early hours of 10th November and weaken rapidly after making landfall.

ECMWF:

i) The VSCS over EC BoB on 8th moving in a near north direction crosses West Bengal-Bangladesh coast in the late hours of 9th and becomes unimportant by 11th.

NCEP-GFS:

(i) The VSCS over WC BoB on 8th November is seen to move north-northwestwards and crosses West Bengal- Bangladesh coasts in the late hours on 9th and weaken thereafter.

ARP-Meteo France : NIL

Dynamical statistical models

IMD Genesis Potential Parameter (GPP):

(i) The significant zone of GPP seen over C BoB on 8th November, is seen to move in north-northeast direction and cross West Bengal-Bangladesh coasts in the early hours of 10th.

IMD NWP products are available at:

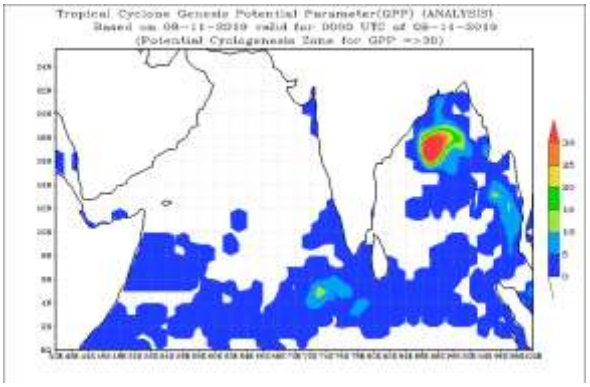
http://nwp.imd.gov.in/bias/gfsproducts.php
http://nwp.imd.gov.in/bias/wrf27pro.php
http://www.rsmcnewdelhi.imd.gov.in/NWP_CYC/Analysis.htm or
http://www.rsmcnewdelhi.imd.gov.in/NWP_CYC/<HH> hrs.htm
<HH> are forecast hours i.e. 24, 48, 72 and etc.

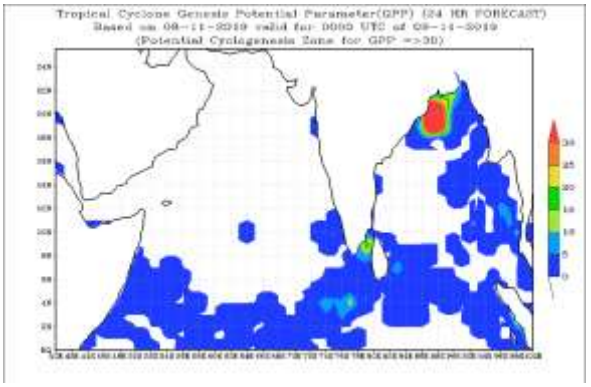
Summary and Conclusion:

A) The low level relative vorticity is around 250 $x10^{-5}$ sec^{-1} around the system centre. The lower level convergence is about 30 $x10^{-5}$ s^{-1} to the north of the system centre and the upper level divergence is also about 30 $x10^{-5}$ s^{-1} to the north of the system centre. The vertical wind shear is moderate over the system area and is increasing along the forecast track and becoming high along west Bengal – Bangladesh coasts. The ridge runs roughly along 19°N over Bay of Bengal region. Tropical cyclone heat potential of 80-110 kJ/cm^2 around the system center. Sea surface temperature between 29-30°C around the system. The system is continued to being steered by an upper tropospheric anticylonic circulation centered over north Thailand and the system lies in the southwestern periphery of above anticylone. As a result , it is moving north-northwestwards. The upper tropospheric ridge lies along 19° N. Hence the system is expected to move north-northwestwards for some time and recurve northeastwards thereafter. At the same time, an upper tropospheric trough in westerlies is also likely to approach towards the system. As a result, from 9th onwards, the system will be in the field of stronger upper tropospheric winds and hence it will experience high vertical wind shear. Also, SST is cooler over the north Bay of Bengal. The system is expected to weaken rapidly while moving northeastwards from 9th onwards. Majority of the NWP models are in agreement with the above analysis.

Advisory: IOP for North Odisha- West Bengal coasts on 9th and 10th November 2019.

Annexure-1


Tropical Cyclone Genesis Potential Parameter(GPP) (ANALYSIS)
(Potential Cyclogenesis Zone for GPP =>30)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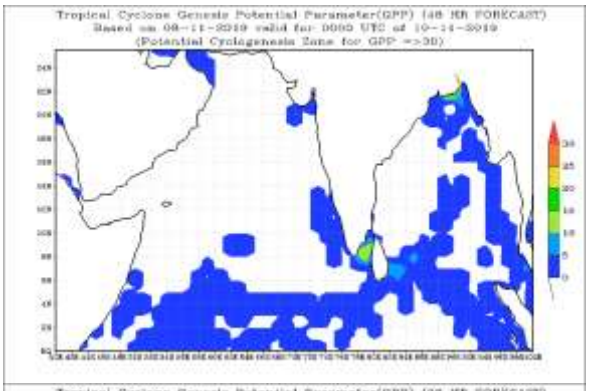
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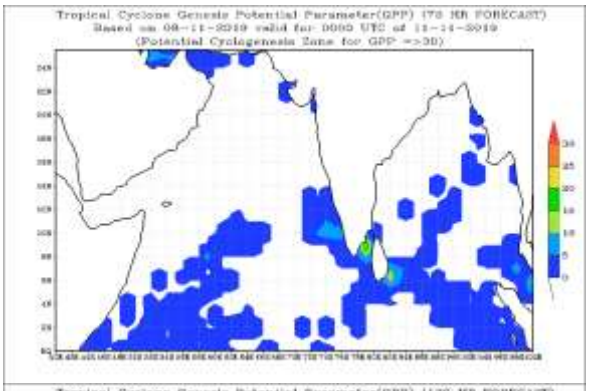
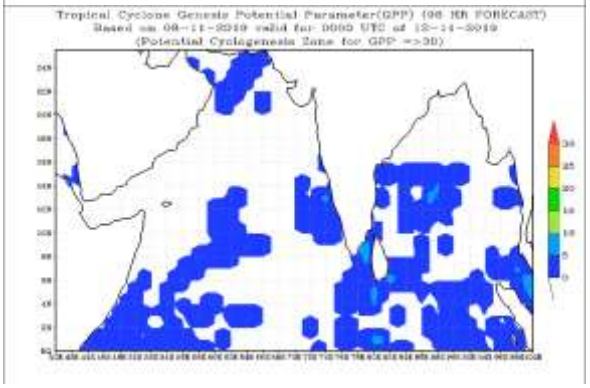

Tropical Cyclone Genesis Potential Parameter(GPP) (72 HR FORECAST)
(Potential Cyclogenesis Zone for GPP =>30)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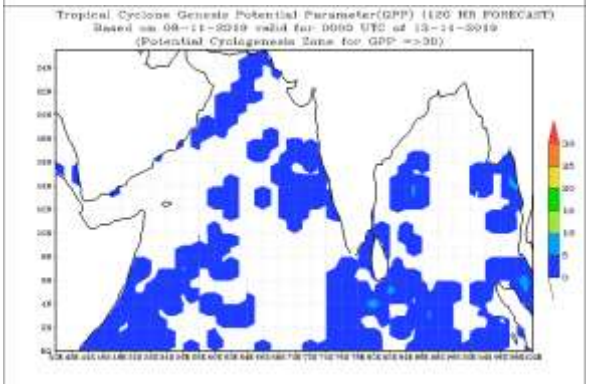
Tropical Cyclone Genesis Potential Parameter(GPP) (120 HR FORECAST)
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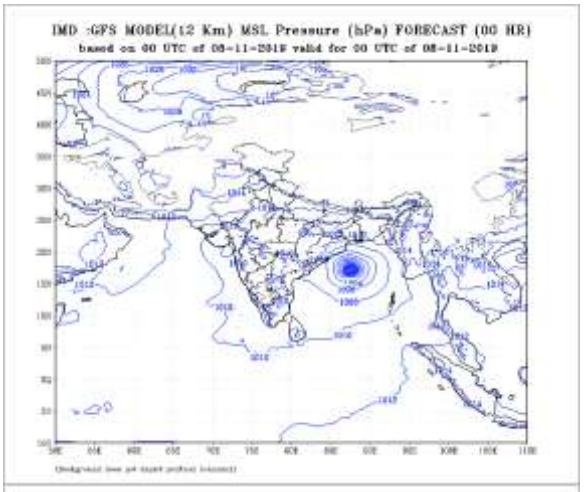
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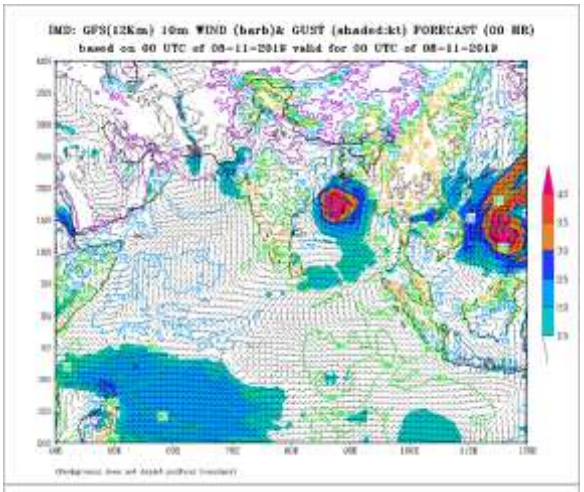
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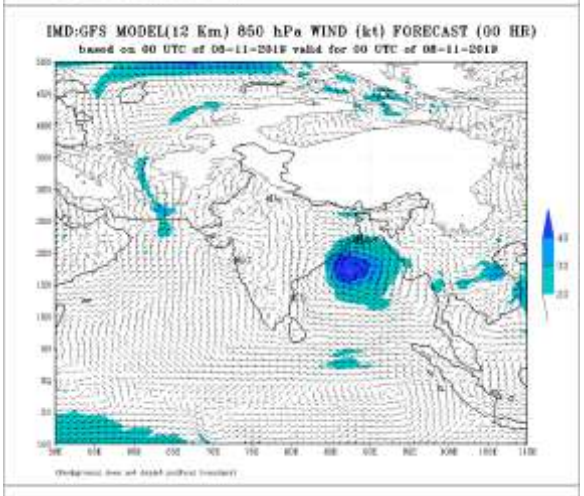
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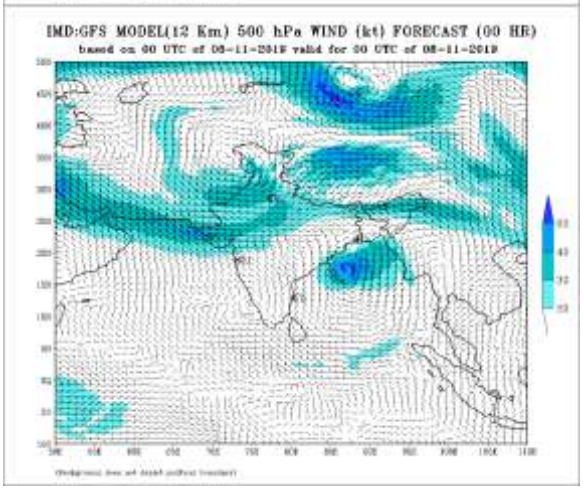
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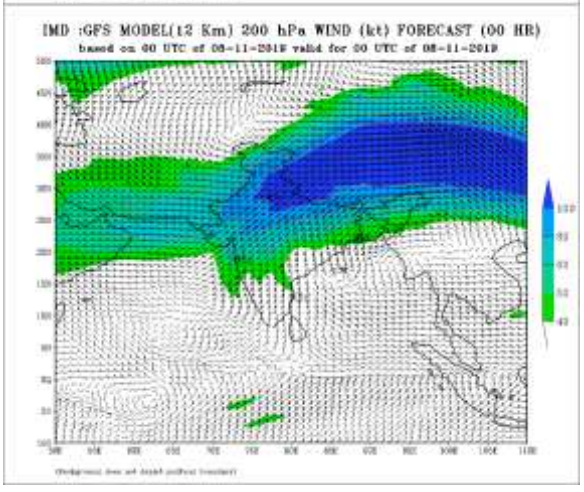
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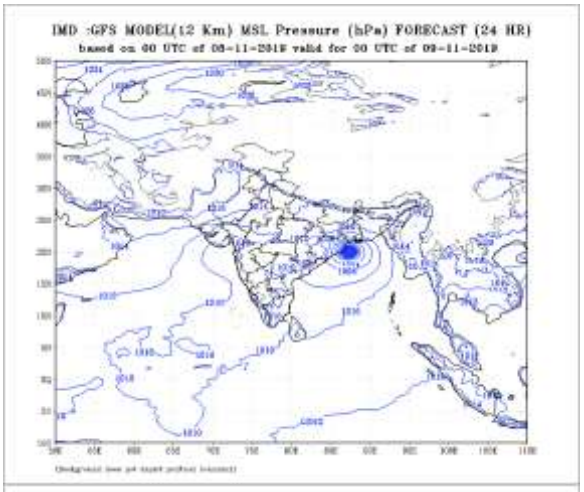
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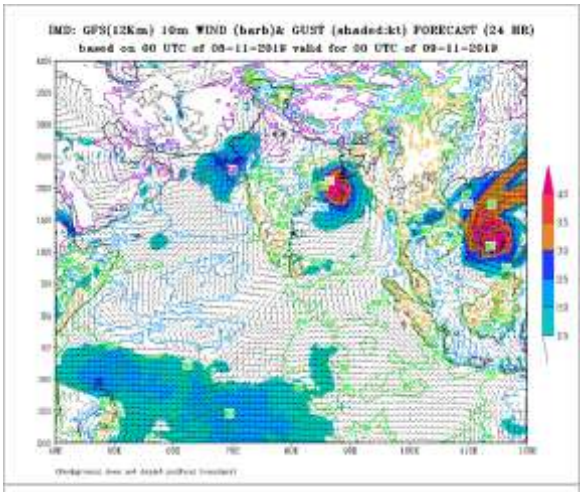
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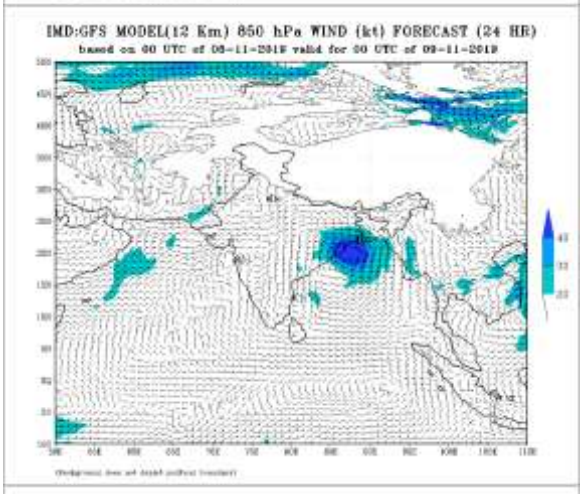
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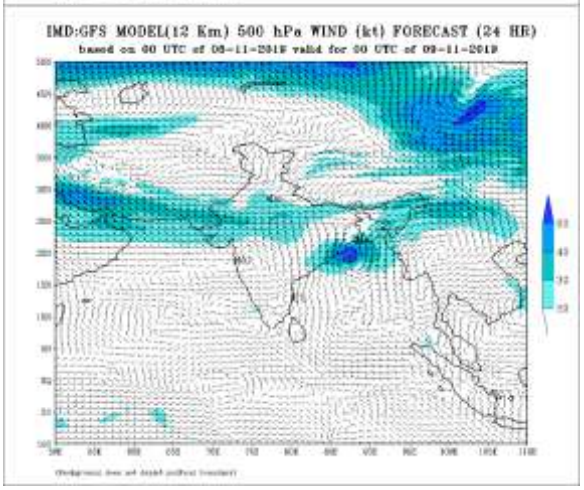
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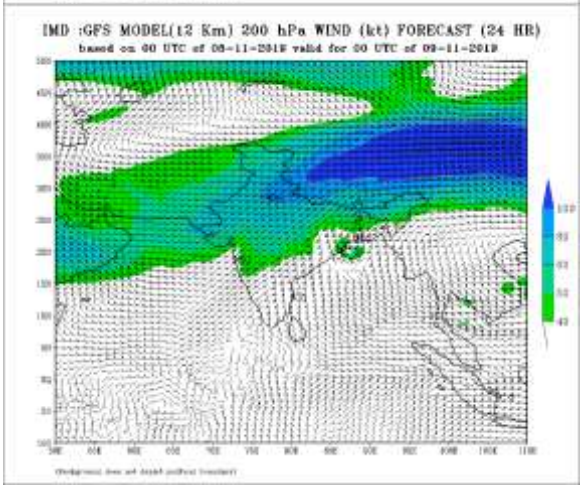
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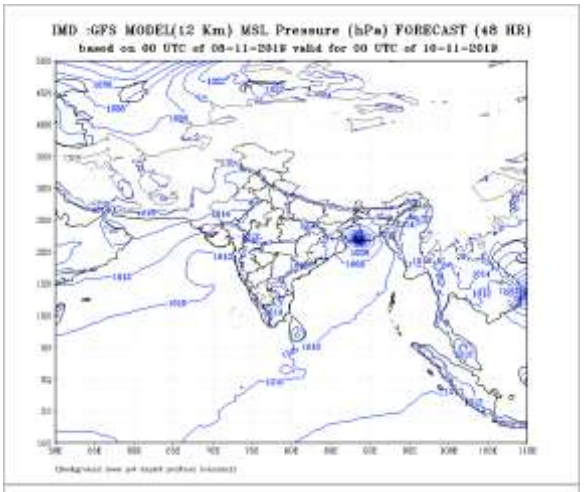
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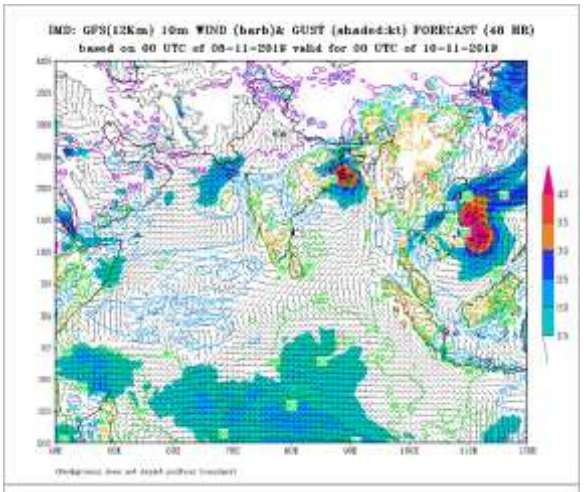
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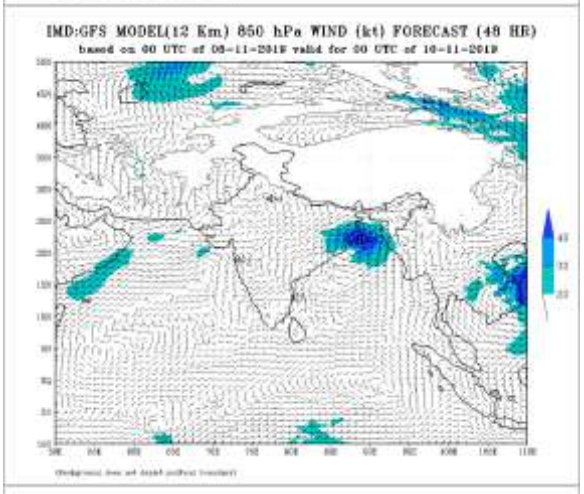
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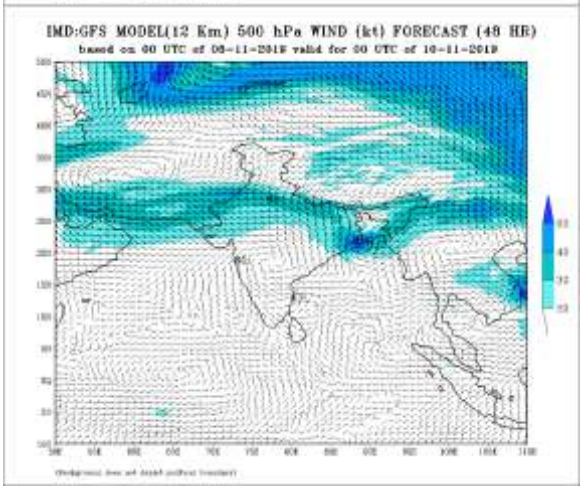
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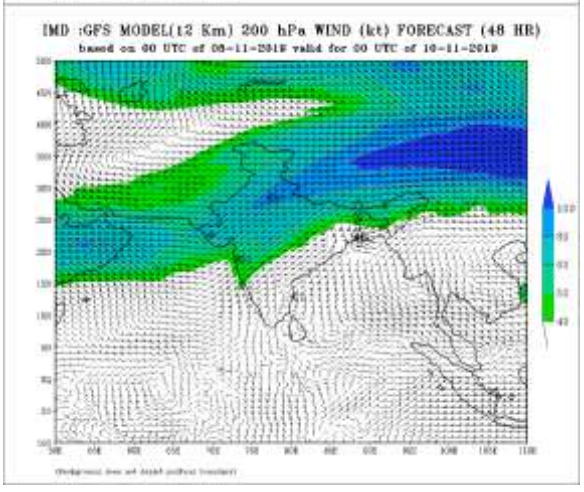
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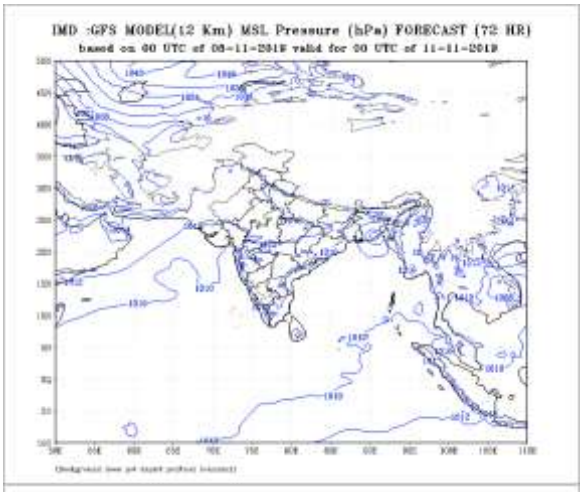
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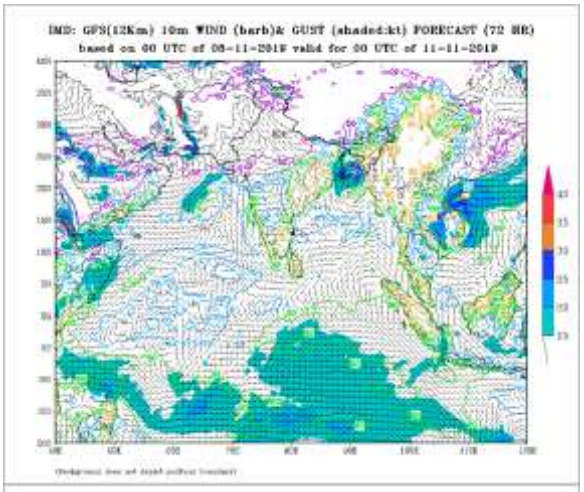
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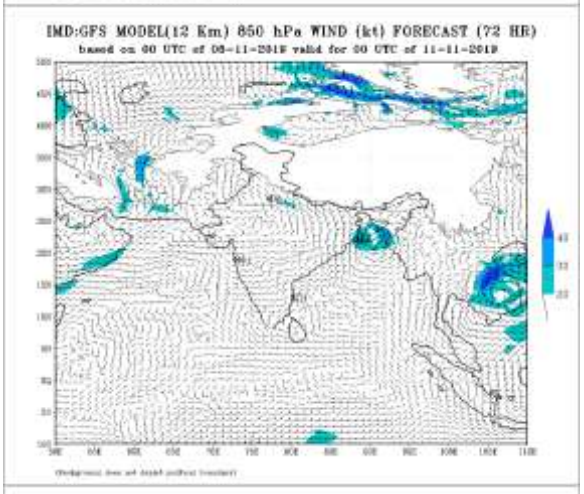
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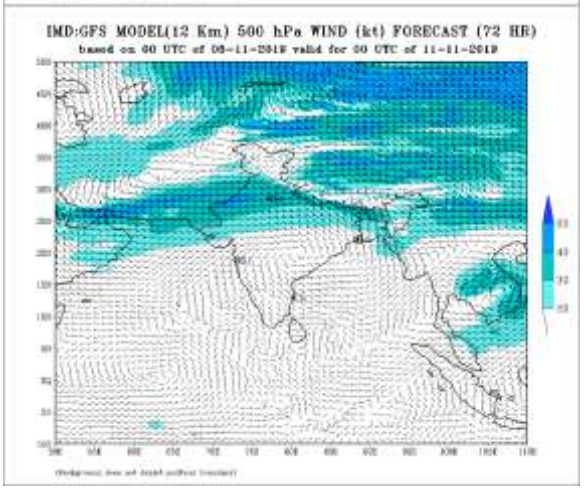
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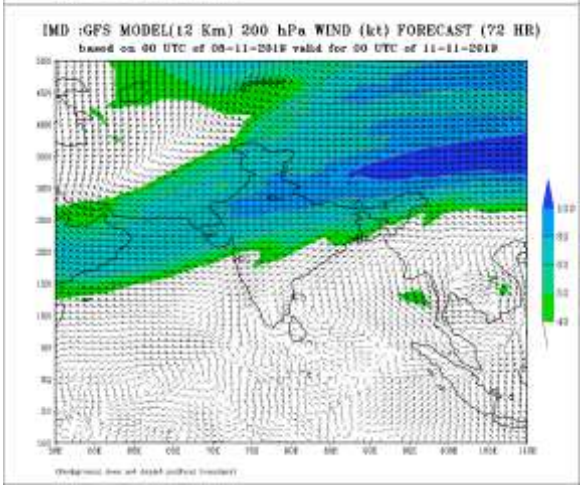
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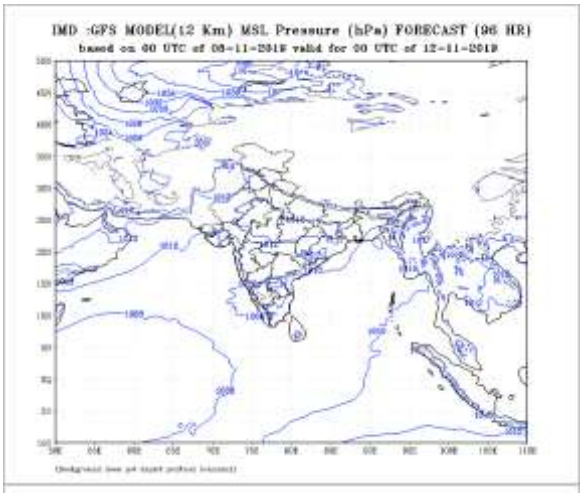
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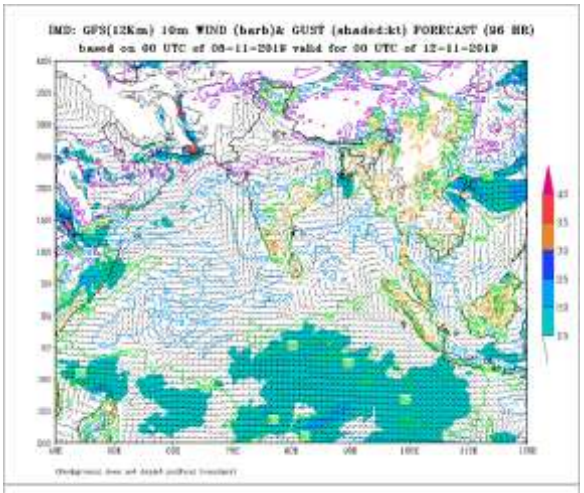
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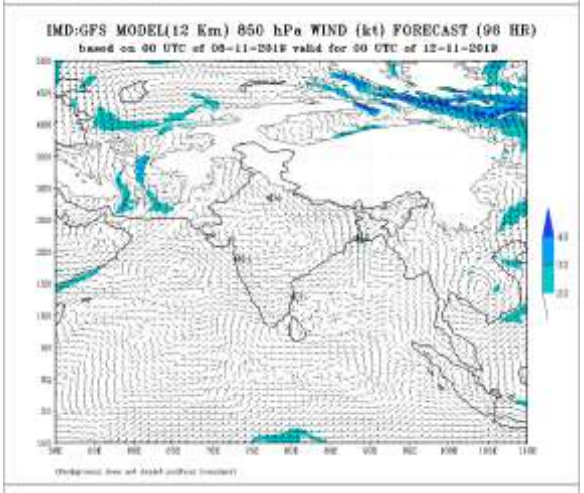
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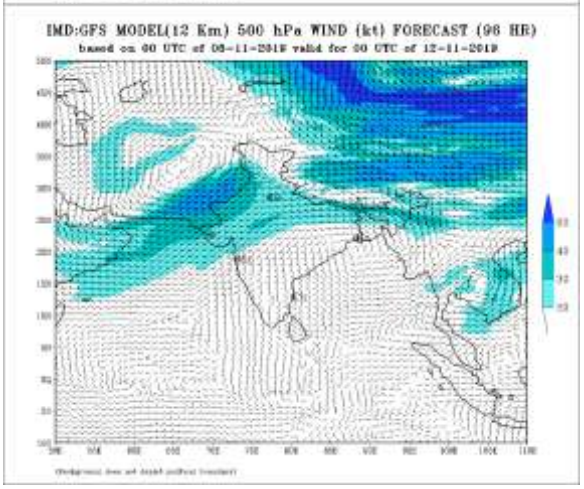
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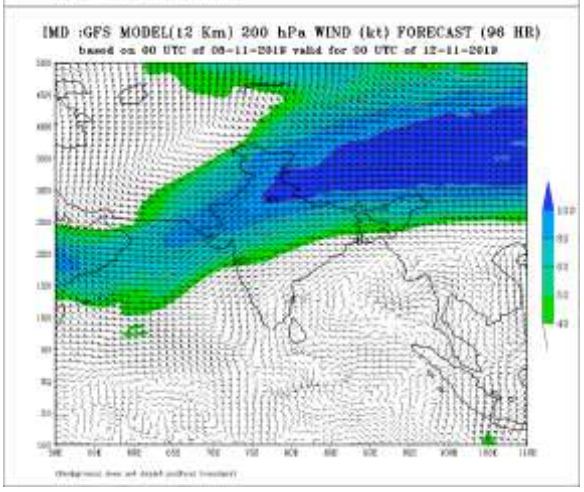
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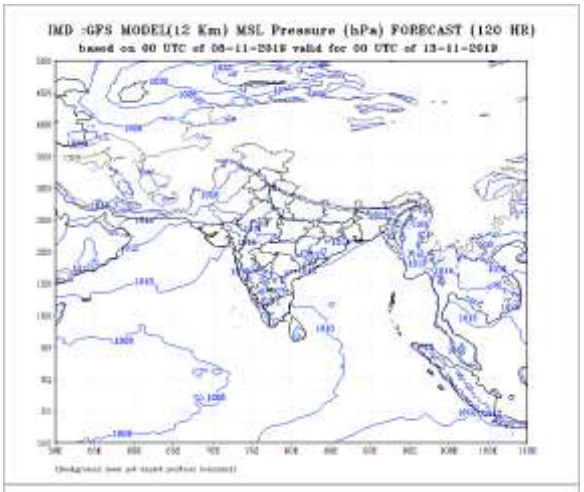
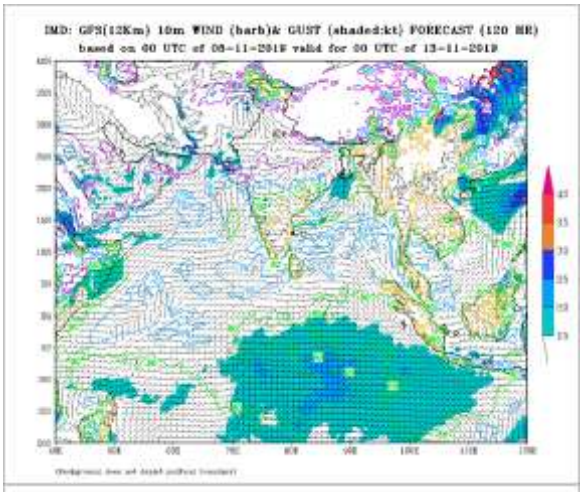
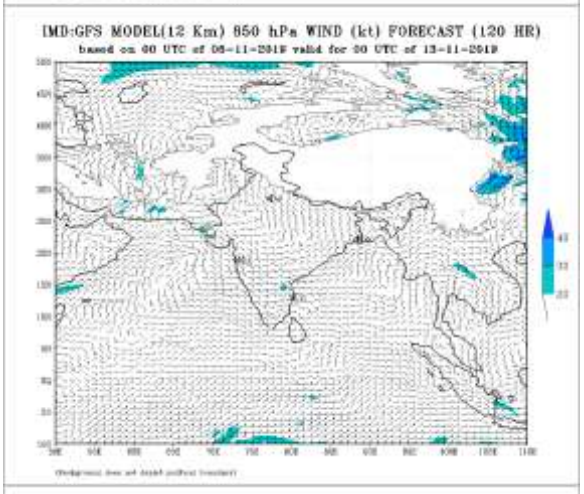
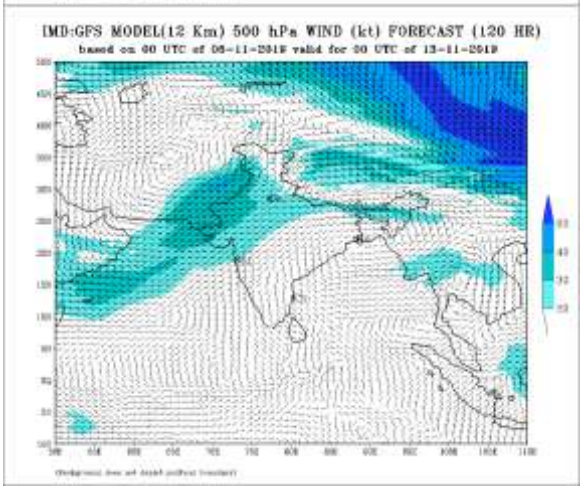
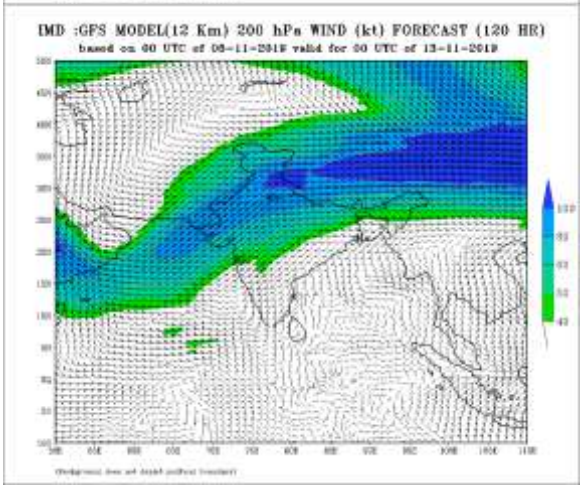

IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (120 HR)
based on 00 UTC of 08-11-2018 valid for 00 UTC of 13-11-2018


IMD: GFS(12Km) 10m WIND (barb)& GUST (shaded:kt) FORECAST (120 HR)
based on 00 UTC of 08-11-2018 valid for 00 UTC of 13-11-2018


IMD:GFS MODEL(12 Km) 850 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 08-11-2018 valid for 00 UTC of 13-11-2018


IMD:GFS MODEL(12 Km) 500 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 08-11-2018 valid for 00 UTC of 13-11-2018


IMD :GFS MODEL(12 Km) 200 hPa WIND (kt) FORECAST (120 HR)
based on 00 UTC of 08-11-2018 valid for 00 UTC of 13-11-2018