



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



FDP (Cyclone) NOC Report Dated 06th December, 2019

Time of Issue: 1200 UTC

Synoptic features:

- The **Cyclonic storm 'Pawan' (Pronounced as 'Pavan')** over Southwest Arabian Sea moved west-southwestwards with a speed of 08 kmph during past 06 hours and lay centered at 0900 UTC of 06th December, 2019 near latitude 7.9°N and longitude 52.6°E over Southwest Arabian Sea, about 540 km south-southwest of Socotra (Yemen) and 530 km southeast of Bosaso (Somalia). It is very likely to maintain its intensity as a Cyclonic Storm during next 12 hours and weaken gradually thereafter. It is very likely to move west-southwestwards during next 24 hours and cross Somalia coast as a Deep Depression with maximum sustained wind speed of 55-65 Kmph gusting to 75 Kmph close to Latitude 07°N (around Garacad, Mudug) during 0000 UTC -0300 UTC of 07th December.
- The depression over eastcentral Arabian Sea moved west-northwestwards and weakened into a well marked low pressure area over the same region at 1200 UTC of 05th December 2019. It further weakened into a low pressure area at 0000 UTC of 6th over the same region and became less marked by 0300 UTC of 6th December, 2019.
- A trough is seen in lower tropospheric easterlies over Maldives area & adjoining equatorial Indian ocean with an embedded cyclonic circulation. Under its influence, a Low Pressure Area is likely to form over Maldives area during next 24 hours. It is likely to become more marked subsequently.

Dynamical and thermodynamical features

Sea Surface Temperature (SST):

Sea Surface Temperature is around 26-27°C over the system area in westcentral Arabian Sea and along the forecast track.

Tropical Cyclone Heat Potential (TCHP):

Tropical Cyclone Heat Potential (TCHP) is 30-40 kJ/cm² over the southwest Arabian Sea.

Relative Vorticity:

Cyclonic relative vorticity of value $150 \times 10^{-5} \text{ s}^{-1}$ seen to the south of the system centre over southwest Arabian Sea.

Low level Convergence:

Positive lower level convergence of value $5-10 \times 10^{-5} \text{ s}^{-1}$ is seen over the cyclonic storm area.

Upper level Divergence:

Positive upper level divergence of value $30 \times 10^{-5} \text{ s}^{-1}$ is seen around the centre of the cyclonic storm over southwest Arabian Sea.

Wind Shear:

Wind shear is low (10-15 knots) over system area.

Wind Shear Tendency:

The wind shear tendency is negative southwest Arabian Sea.

Upper tropospheric ridge:

The upper tropospheric ridge at 200 hPa runs roughly along 13°N over BoB and Arabian Sea.

Satellite observations based on INSAT imagery:

Arabian Sea:-

As per the satellite imagery at 0900 UTC of 6th December, 2019, the intensity of the system over southwest Arabian Sea is T 2.5. Associated broken low to medium clouds with embedded intense to very intense convection lies between latitude 4.5°N to 13.0°N and longitude 49°E to 56.5°E. Minimum Cloud Top Temperature (CTT) is minus 93 deg C.

Bay of Bengal & Andaman Sea:

According to 0900 UTC satellite imagery, scattered low/medium clouds with embedded moderate to intense convection lies over southwest BoB.

Large scale features

M.J.O. Index:

MJO index is in Phase 2 with amplitude near to 1. It is likely to remain in the same phase for next 5-6 days with increasing amplitude.

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

- (i) Tropical Cyclone (Belna) located near 7.9°S/48.7°E at 0600 UTC of 5th with a maximum sustained wind speed of 65 knots. It is likely to move south-southwestwards with gradual intensification and reach maximum intensity of 90 knots by 0600 UTC of 8th and cross west coast of Mozambique and weaken gradually.
- (ii) Tropical Cyclone (Ambali) located near 10.5°S/62.2°E at 0000 UTC of 6th with a maximum sustained wind speed of 135 knots. It is likely to move south-southwestwards with gradual weakening and will become insignificant by 0000 UTC of 11th.

NWP Input for FDP Cyclone based on 0000 UTC of today

IMD-GFS T-1534:

- (i) Indicates the CS over southwest Arabian Sea, which moving in a west-southwest direction crosses north Somali coast in the morning of 7th December.
- (ii) The LOPAR over eastcentral Arabian Sea becomes less marked on 7th December.
- (iii) Another LOPAR seen over central parts of south Arabian Sea on 7th and 8th and becomes less marked on 9th.

IMD-GEFS:

- (i) Indicates a CS over southwest Arabian Sea (AS) which becomes less marked by 0000 UTC of 7th after crossing north Somali coast.
- (ii) LOPAR over eastcentral Arabian Sea becomes less marked on 7th.
- (iii) Another LOPAR is seen over southeast Arabian Sea on 7th and 8th December which becomes less marked by 9th.

IMD-WRF:

- (i) Indicates a CS over southwest Arabian Sea which is seen moving in a west-northwest and cross Somali coast.
- (ii) The LOPAR over eastcentral Arabian Sea becomes less marked on 7th.
- (iii) A small LOPAR is seen over southeast Arabian Sea on 7th and 8th which becomes less marked on 9th.

NCMRWF-NCUM:

- (i) The CS over southwest Arabian Sea is seen moving towards Somali coast and makes landfall in the early hours of 7th.
- (ii) This model is not indicating any more system in NIO region.

NCMRWF-UM-Regional Model: Indicates no low pressure system in its domain for next 3days Sea.

NEPS Model:

- (i) The CS over SW Arabian Sea seen to cross Somali coast in the early hours of 7th December.
- (ii) This model is not indicating any more system in the NIO region during the forecast period.

ECMWF:

- (i) The depression over southwest Arabian Sea moves nearly westwards; cross Somali coast in the early hours of 07th December and becomes less marked by 8th.
- (ii) A LOPAR forms over southeast Arabian Sea on 7th and 8th; becomes less marked on 11th.

NCEP-GFS:

- (i) The CS over southwest Arabian Sea, moves southwestwards weakens after crossing Somali coast.
- (ii) This model indicates a LOPAR over EC Arabian Sea. It is seen to become less marked on 7th.
- (iii) A third LOPAR is forecast to form over southeast Arabian Sea on 07th; seen as depression till 10th and becomes less marked on 11th.

ARP-Meteo France : A depression is seen close to Somali coast on 6th and over coastal areas of Somalia on 7th; which becomes less marked on 8th.

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

The area of significant zone of GPP over southwest Arabian Sea is seen to cross Somali coast in the early hours of 07th December. Another significant GPP zone is seen over eastcentral Arabian Sea on 7th and 8th which in a near westward direction becomes insignificant by 9th.

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:

- (i) With regard to the environmental conditions over southwest Arabian Sea, the MJO lies in phase 2 with amplitude more than 1. It will remain in the same phase during next 5-6 days with increasing amplitude. Considering the environmental conditions, total precipitable water vapour imageries indicate warm air advection to the system centre. The low level relative vorticity is about $150 \times 10^{-5} \text{sec}^{-1}$ to the south of the system centre. The lower level convergence is about $5-10 \times 10^{-5} \text{s}^{-1}$ over the system centre and the upper level divergence is about $30 \times 10^{-5} \text{s}^{-1}$ around the system centre. The vertical wind shear decreased and is low (10-15 knots) over the system. The upper tropospheric ridge runs along 13° N. Sea surface temperature is about 26-27°C and tropical cyclone heat potential is 30-40 kJ/cm² over the region. As system is lying over a moderately favourable environmental conditions, it is likely to maintain the intensity of a cyclonic storm for next 12 hours and weaken slightly before crossing Somalia coast, due to land interaction and also due to low TCHP values. The system is likely to move west-southwestwards under the influence of the anticyclone to the west of Somalia. It will cross Somalia coast as a deep depression around latitude 07°N during 0000-0300 UTC of 07th December. Majority of numerical models agree with the above analysis.
- (ii) Possible formation and intensification of the LOPAR over southeast Arabian Sea around 7th December needs to be monitored.

Advisory: No IOP area for the next 5 days













