



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



**FDP (Cyclone) NOC Report Dated 05<sup>th</sup> December, 2019**

**Time of Issue: 1200 UTC**

**Synoptic features:**

- The Deep Depression over southwest Arabian Sea moved nearly northwards and intensified into the cyclonic storm "PAWAN" (pronounced as PAVAN) at 0000 of 5th December, 2019 over the same region. It moved west-northwestwards with a speed of 15 kmph during past 06 hours and lay centred at 0900 UTC of 05th December, 2019 near latitude 9.5°N and longitude 55.6°E over Southwest Arabian Sea, about 390 km south-southeast of Socotra (Yemen) and 730 km east-southeast of Bosaso (Somalia). It is very likely to maintain its intensity as a Cyclonic Storm till 0000 UTC of 6<sup>th</sup> and weaken gradually thereafter. It is very likely to move west-southwestwards during next 36 hours and cross Somalia coast as a Depression between Latitudes 07° & 08°N during 07th December morning.
- The Deep Depression over Eastcentral Arabian Sea moved west-northwestwards and weakened into a depression at 0000 UTC of 5th December, 2019 over the same region. Moving further northwestwards, it lay centred at 0900 UTC of 05th December, 2019, over Eastcentral Arabian Sea, near latitude 15.5°N and longitude 66.9°E about 750 km west-southwest of Mumbai (Maharashtra) and 740 km of west of Panjim (Goa). It is very likely to move west-northwestwards and weaken into a well marked low pressure area during next 03 hours.
- The trough in easterlies extending upto 1.5 Km above mean sea level over Comorin area and adjoining equatorial Indian Ocean persists. Under its influence, a Low Pressure Area is likely to form over Maldives-Comorin areas during next 24 hours. It is likely to become more marked during subsequent 24 hours.

**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. It is around 29-30°C over the system area in eastcentral Arabian Sea.

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

Tropical Cyclone Heat Potential (TCHP) is 30-40 kJ/cm<sup>2</sup> over the southwest Arabian Sea. It is around 80-90 kJ/cm<sup>2</sup> over southeast Arabian Sea.

There are areas of values more than 100 kJ/cm<sup>2</sup> over southeast Arabian Sea, off Kerala coast & Lakshadweep area and also over equatorial Indian Ocean.

**Relative Vorticity:**

Cyclonic relative vorticity of value 150x10<sup>-5</sup> s<sup>-1</sup> seen to the south of the system centre over southwest Arabian Sea. Cyclonic relative vorticity of value 50x10<sup>-5</sup> s<sup>-1</sup> seen to the southeast of the centre of the depression over eastcentral Arabian Sea.

**Low level Convergence:**

Positive lower level convergence of value 10x10<sup>-5</sup> s<sup>-1</sup> is seen over the cyclonic storm area; it is around 15x10<sup>-5</sup> s<sup>-1</sup> to the northeast of the centre of the depression over EC Arabian Sea.

An area of positive lower level convergence of value 10x10<sup>-5</sup> s<sup>-1</sup> is seen over Comorin area.

**Upper level Divergence:**

Positive upper level divergence of value  $40 \times 10^{-5} \text{ s}^{-1}$  is seen to the northeast of the centre of the cyclonic storm over southwest Arabian Sea;  $10 \times 10^{-5} \text{ s}^{-1}$  around the centre of the depression over eastcentral Arabian Sea;  $20 \times 10^{-5} \text{ s}^{-1}$  over Comorin area and adjoining equatorial Indian Ocean.

**Wind Shear:**

Wind shear is moderate to high over southwest Arabian Sea and low to moderate over rest Arabian Sea.

Wind shear is low to moderate over north BoB.

**Wind Shear Tendency:**

The wind shear tendency is negative or neutral over north BoB.

It is positive or neutral over northeast, and eastcentral Arabian Sea. It is positive over the rest area.

**Upper tropospheric ridge:**

The upper tropospheric ridge at 200 hPa runs roughly along  $13^\circ\text{N}$  over BoB and Arabian Sea.

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

As per the satellite imagery at 0900 UTC of 5<sup>th</sup> 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  $5.5^\circ\text{N}$  to  $16.5^\circ\text{N}$  and longitude  $54^\circ\text{E}$  to  $62.0^\circ\text{E}$ . Minimum Cloud Top Temperature (CTT) is minus 93 deg C.

Broken low/med clouds with embedded intense to very intense convection is seen between latitude  $12.0^\circ\text{N}$  to  $17.0^\circ\text{N}$  long  $68.5^\circ\text{E}$  to  $72.0^\circ\text{E}$  in association with vortex over eastcentral Arabian Sea. Minimum Cloud Top Temperature (CTT) is minus 76 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 (02S) located near  $6.7^\circ\text{S}/50.9^\circ\text{E}$  at 0600 UTC of 5<sup>th</sup> with a maximum sustained wind speed of 40 knots. It is likely to move south-southwestwards with gradual intensification towards Mozambique for the next 5 days.
- (ii) Tropical Cyclone (Ambali) located near  $8.6^\circ\text{S}/63.2^\circ\text{E}$  at 0600 UTC of 5<sup>th</sup> with a maximum sustained wind speed of 50 knots. It is likely to move south-southwestwards with gradual intensification for the next 24 hours and will start to weaken thereafter.

**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 night of 6<sup>th</sup> December and is seen as a LOPAR at 0000 UTC of 7<sup>th</sup> December over coastal areas of Somalia.
- (ii) The LOPAR over eastcentral Arabian Sea becomes less marked by 7<sup>th</sup> December.

(iii) Another LOPAR/WML forms on 7<sup>th</sup> over southeast Arabian Sea which moving in a near westward direction becomes a LOPAR on 8<sup>th</sup> and becomes less marked on 9<sup>th</sup>.

**IMD-GEFS:**

(i) Indicates a CS over southwest Arabian Sea (AS) which moving west-northwestwards reaches north Somali coast on 6<sup>th</sup> as a depression; cross coast and then becomes less marked thereafter.

(ii) LOPAR over eastcentral Arabian Sea becomes less marked on 6<sup>th</sup>.

(iii) Another LOPAR is seen over southeast Arabian Sea on 7<sup>th</sup> December which becomes less marked by 9<sup>th</sup>.

**IMD-WRF:**

(i) Indicates a CS over southwest Arabian Sea which is seen moving in a west-northwest and cross Somali coast in the night of 6<sup>th</sup>.

(ii) The LOPAR over eastcentral Arabian Sea becomes less marked on 7<sup>th</sup>.

**NCMRWF-NCUM:**

(i) The CS over southwest Arabian Sea is seen moving towards Somali coast and makes landfall in the early hours of 7<sup>th</sup>.

(ii) This model is not indicating any more system in NIO region.

**NCMRWF-UM-Regional Model:** Indicates low pressure area on 8<sup>th</sup> over southwest Arabian Sea.

**NEPS Model:**

(i) The CS over SW Arabian Sea seen to cross Somali coast in the early hours of 7<sup>th</sup> December.

(ii) The LOPAR over EC Arabian Sea becomes less marked on 6<sup>th</sup>.

**ECMWF:**

(i) The depression over southwest Arabian Sea moves nearly westwards; cross Somali coast in the night of 06<sup>th</sup> December.

(ii) Indicates a LOPAR over eastcentral Arabian Sea which becomes less marked by 0000 UTC of 7<sup>th</sup>.

(iii) A third LOPAR forms over Maldives and adjoining southeast Arabian Sea on 6<sup>th</sup> which moving in westward direction becomes a depression on 7<sup>th</sup>. Further it moves towards Somalia coast and weakens becomes less marked on 11<sup>th</sup>.

**NCEP-GFS:**

(i) The on 05<sup>th</sup> December over southwest Arabian Sea, moves northwestwards weakens into a depression and cross Somali coast by 6<sup>th</sup> December and weakens thereafter.

(ii) This model indicates a LOPAR over EC Arabian Sea. It is seen to become less marked on 6<sup>th</sup>.

(iii) A third LOPAR is forecast to form over Comorin-Maldives areas on 5<sup>th</sup> which is seen to move west-northwestwards and becomes less marked on 10<sup>th</sup>.

**ARP-Meteo France :**

**Dynamical statistical models**

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

An area of significant zone of GPP is seen over southwest Arabian Sea which is seen to move westwards slowly and crosses Somali coast on 07<sup>th</sup> December. Another significant GPP zone is seen over eastcentral Arabian Sea which moving in a north-northwest direction and becomes less marked on 06<sup>th</sup> December. A third zone is seen to develop over southeast Arabian Sea on 7<sup>th</sup> which moving in a near westward direction becomes insignificant by 9<sup>th</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:**

- (i) With regard to the environmental conditions over southwest Arabian Sea, total precipitable water vapour imageries indicate warm air advection to the system centre. The low level relative vorticity is about  $150 \times 10^{-5} \text{sec}^{-1}$  around the system centre. Positive vorticity is extending upto 200 hPa level. The lower level convergence has increased and is about  $10 \times 10^{-5} \text{s}^{-1}$  to the north of the system centre and the upper level divergence has decreased and is about  $30 \times 10^{-5} \text{s}^{-1}$  to the northeast of the system centre. The vertical wind shear is moderate to high (15-25 knots) over the system. The upper tropospheric ridge runs along  $13^\circ \text{N}$ . Sea surface temperature is about  $26-27^\circ \text{C}$  and tropical cyclone heat potential is  $30-40 \text{ kJ/cm}^2$  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 gradually before crossing Somalia coast, as the system will encounter dry air incursion and also due to low TCHP values.
- (ii) In respect of the depression over eastcentral Arabian Sea, the low level relative vorticity is about  $50 \times 10^{-5} \text{sec}^{-1}$  around the system centre. There is no significant lower level convergence and upper level divergence is about minus 5 to the east of the system. The vertical wind shear is moderate to high (20-30 knots) over the system area. The upper tropospheric ridge runs along  $13^\circ \text{N}$ . Sea surface temperature over the system area is  $29-30^\circ \text{C}$  and decreases westward. Tropical cyclone heat potential is  $80-90 \text{ kJ/cm}^2$  over the system area and decreases northwestward. As the system is lying in an unfavourable environment with increasing wind shear, there is a possibility of its further weakening into a well marked low pressure area during next 03 hours. Most of the global models are in agreement with the above prognosis.
- (iii) Possible formation and intensification of the third system over southeast Arabian Sea around 6<sup>th</sup> December needs to be monitored.

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















