

Fig. 1: Graphical Cyclogenesis over north Indian Ocean during next two weeks

I. Environmental features:

The Madden Julian Oscillation (MJO) index is currently in Phase 5 with an amplitude close to 1. It is likely to continue to move in phase 5 during first half of week 1 with a gradual increase in amplitude becoming more than 1. All the models indicate a fair agreement about its eastward propagation thereafter to enter into phase 6 and propagate across phase 6 with amplitude remaining more than 1 during later part of the first week. The ECMWF model predicted very systematic eastward progress of the MJO index in the phase diagram keeping amplitude intact during second week across phase 7 to reach phase 8. But GEFS model indicates asynchronous eastward movement within phase 6 only with amplitude increasing during second half first week and decreasing thereafter during second week. Thus, MJO phase and amplitude is favourable towards enhancement of convective activity over the Bay of Bengal during week 1 and neutral during second week.

The NCICS based forecast indicates during first half of the first week the strong westerly winds (7-9 mps) over south & central parts of Arabian Sea (AS) & Bay of Bengal (BoB) and over peninsular India between both sub-basins. The easterly winds (5-7 mps) are simultaneously noticed over northern parts of BoB & north Indian Plains during first half and thereafter over northern parts of BoB & adjoining Plains during later half of the first week. Equatorial Rossby Waves (ERW) are indicated in superposition with the zone of westerly winds during first week. The eastward propagating Kelvin Waves are predicted across northern India during the same period. During week 2, westerly winds (3-5 mps) over south & central parts of BoB & AS and easterly winds (3-5 mps) became gradually weaker over the region. ERW activities are indicated only over southeast AS and adjoining areas during first half of the second week.

The sea surface temperature over the BoB is 28-30°C and SST is around 28-30°C over eastern & northern parts of AS. Sea is colder (SST<26°C) over westcentral AS) & southwest AS. Tropical Cyclone Heat Potential (TCHP) is high (>100 KJ/cm²) over westcentral BoB and around 50 KJ/cm² over eastcentral, major parts of North BoB. In case of Arabian Sea, it is less than <50 KJ/cm² over major parts except over southwest AS and adjoining areas.

Considering all the environmental features, it is inferred that the conditions are very much favourable in the development of cyclonic disturbances over BoB during first week. The conditions are likely to become less favourable during second week over the region.

II. Model Guidance:

Most of the models (ECMWF, IMD GFS, NCEP GFS, NCUM) are indicating the formation of a low pressure area over north Bay of Bengal off Bangladesh coast with a west-northwestward movement to reach northwest Bay of Bengal off south Gangetic West Bengal & adjoining Odisha coasts is likely to move along the east coast of India nearly northwards and become more marked by 14th evening over north and adjoining central BoB. The GFS and NCUM models indicate that the system is likely to intensify further and move across north Odisha and adjoining Gangetic West Bengal coasts during the subsequent 2 days. The maximum intensification is seen over land as it moves west-north-westwards across Gangetic West Bengal, Odisha, Jharkhand and central India. ECMWF model predicts more intensified and comparatively faster movement towards northward crossing land earlier than other models.

As per the models forecast, it can be inferred that the existing low pressure area over westcentral & adjoining northwest BoB is likely to move west-northwestward and become more marked during next 48 hours. Thereafter, there are moderate to high probability for further intensification into a depression while reaching West Bengal and adjoining north Odisha coasts during next 2 days. Thereafter, it is likely to maintain its intensity for subsequent two days and of moving west-northwestward across north Odisha & adjoining West Bengal, Jharkhand and north Chhattisgarh.

The 850 hPa mean wind field of IMD CFS V2 system indicates a well established monsoon trough embedded with a cyclonic circulation over Uttar Pradesh and another over northwest BoB and adjoining Odisha & West Bengal coasts during first week. The anomaly wind field also imitates similar wind circulation features during week 1. But anomaly wind field for second week shows an anticyclone over southeast AS. A cyclonic circulation is predicted over westcentral BoB off Andhra Pradesh-Odisha coasts during second week. However, the wind anomaly field indicates an anticyclone over interior Odisha during week 2. The model indicates moderate to high (40-80%) probability of cyclogenesis over North BoB with peak values over northwest BoB and west Uttar Pradesh during first week. The model also indicates low probability (20-30%) over north and adjoins eastcentral BoB during week 2. The ECMWF ensemble forecast Model also indicates moderate to high (40-60%) probability over region extending from north BoB to Jharkhand area and low probability (10-20%) of cyclogenesis over North BoB during week 1 and week 2 respectively.

Legends: MJO: Madden Julian Oscillation, ERW: Equatorial Rossby Waves, KW: Kelvin Waves, NCICS: North Carolina Institute for Climate Studies (for Equatorial waves Forecast), IMD GFS: India Meteorological Department Global Forecast System, NCUM: National Centre for Medium Range Weather Forecasting Centre (NCMRWF) Unified Model, ECMWF: European Centre for Medium Range Weather Forecasting, ECMF: ECMWF-Ensemble System, ECMM: ECMWF-Ensemble System Bias Corrected, GPP: Genesis Potential Parameter, NCEP GFS: National Centre for Environment Prediction GFS, GEFS: GFS ensemble forecast system, NEPS: NCUM ensemble prediction system, CNCUM: Coupled NCUM, CPC: Climate Prediction Centre, NWS: National Weather Service, INCOIS: Indian National Centre for Ocean Information Services.

III. Inference:

Considering various environmental conditions and model guidance, it is inferred that:

(i) The existing depression over Southwest Uttar Pradesh and neighbourhood is likely to continue to move east-northeastwards and maintain its intensity today, the 12th September and weaken gradually thereafter from tomorrow, the 13th September.

(ii) Under the influence of an upper-air cyclonic circulation over southeast Bangladesh and neighbourhood at 1200 utc of today, the 12th September, a low pressure area is likely to

form over coastal Bangladesh and adjoining north Bay of Bengal during next 24 hours. Thereafter, it is likely to move slowly west-northwestwards and concentrate into a depression over coastal West Bengal and adjoining northwest Bay of Bengal during subsequent 48 hours.

(iii) A cyclonic circulation is likely to develop over north & adjoining central BoB during second week.

IV. Impact Expected over North Bay of Bengal and Eastern & central parts of the country (including Odisha, Gangetic West Bengal, north Chhattisgarh, Jharkhand, Madhya Pradesh and Uttar Pradesh) during week 1

- Above normal rainfall is likely over eastern & adjoining central parts of the country leading to localized flooding and inundation due to heavy to extremely heavy rainfall.
- Sea condition is likely to be rough over westcentral and northwest Bay of Bengal during week 1.

V. Action Suggested for stakeholders in North Bay of Bengal and Eastern & central parts of the country (including Andhra Pradesh, Odisha, Gangetic West Bengal, Chhattisgarh, Jharkhand, Madhya Pradesh and Uttar Pradesh) during week 1.

- Fishermen are advised to be cautious while venturing into westcentral and northwest BoB during first week.
- Judicious regulation of surface transports including railways and roadways.
- Check for traffic congestion on your route before leaving for your destination.
- Follow any traffic advisories that are issued in this regard.
- Avoid going to areas that face water logging problems often.
- Avoid staying in vulnerable structures.

VI. Verification of forecast issued during last two weeks:

(i) **Week 2 updated forecast issued on 29th August for the second week(06.09.2024-12.09.2024)** indicated:

There is moderate probability of formation of a low pressure over North Bay of Bengal during first half of week 2.

(ii) **Week 1 forecast issued on 5th September for first week (06.09.2024-12.09.2024)** indicated:

The existing low pressure area over westcentral & adjoining northwest Bay of Bengal off north Andhra Pradesh & south Odisha coasts is very likely to move slowly northwards and become more marked over northwest Bay of Bengal during next 24 hours and likely to intensify further into a depression over northwest Bay of Bengal and adjoining north Odisha-West Bengal coasts during the subsequent two days. Thereafter, it is likely to maintain its intensity and move west-northwestwards across east and central India till the beginning of the second week.

(iii) Realised:

A low pressure area formed over Westcentral& adjoining Northwest Bay of Bengal off north Andhra Pradesh & adjoining south Odisha coasts in the morning (0830 hours IST/0300 UTC) of 5th September, 2024. It lay as a Well Marked Low Pressure Area over the northwest and adjoining central Bay of Bengal in the morning (0830 hours IST/0300 UTC) of 7th September, 2024. It concentrated into a depression at 0530 hours IST of 8th September, 2024 over westcentral and adjoining northwest Bay of Bengal. It moved slowly north-northwestwards with a speed of 13 kmph during past 3 hours and lay centered in the morning (0830 hours IST/ 0300 UTC) of 8th September, 2024 about 280 km east of Kalingapatnam (Andhra Pradesh), 230 km east-southeast of Gopalpur(Odisha), 260 km southsoutheast of Paradip (Odisha) and 390 km south of Digha (West Bengal). It further intensified into a Deep Depression in the same mid-night (2330 hours IST) of 8th September, 2024 over the same region. It moved north-northwestwards, crossed Odisha coast close to Puri near 19.85N/86.0E between 1030- 1130 hours IST and lay centered at 1130 hours IST of 9th September, 2024 over coastal Odisha about 30 km northeast of Puri (Odisha), 30 km south-southeast

of Bhubaneswar (Odisha) and 270 km southeast of Sambalpur (Odisha). It moved northwestwards and weakened into a Depression in the same mid-night (2330 hours IST) of 9th September, 2024 over interior Odisha. It then moved west-northwestwards and lay centered at 0830 hours IST of 10th September, 2024 over North Chhattisgarh about 70 km east-southeast of Bilaspur (Chhattisgarh), 140 km northeast of Raipur (Chhattisgarh) and 220 km east of Malanjkhand (East Madhya Pradesh). Then it moved northwestwards and weakened into a well marked low pressure area over Northeast Madhya Pradesh and neighbourhood in the same evening (1730 hours IST) of 10th September. It moved nearly north-northwestwards and re-intensified into a depression over Northeast Madhya Pradesh in the morning (0830 hours IST) and lay centred at 1130 hours IST of 11th September over the same region about 60 km northeast of Damoh (Madhya Pradesh), 90 km south of Khajuraho (Madhya Pradesh), 100 km west-southwest of Satna (Madhya Pradesh) and 190 km southeast of Jhansi (Uttar Pradesh). Then it moved north-northwestwards and lay centred at 0830 hours IST of 12th September over Southwest Uttar Pradesh and neighbourhood about 50 km east-southeast of Agra (Uttar Pradesh), 90 km north-northeast of Gwalior (Madhya Pradesh), 110 km south-southeast of Aligarh (Uttar Pradesh) and 180 km south-southwest of Bareilly (Uttar Pradesh).

The observed satellite-gauge merged analysis of 24 hours accumulated rainfall from 05th September to 11th September, 2024 is shown in **Fig. 2**.

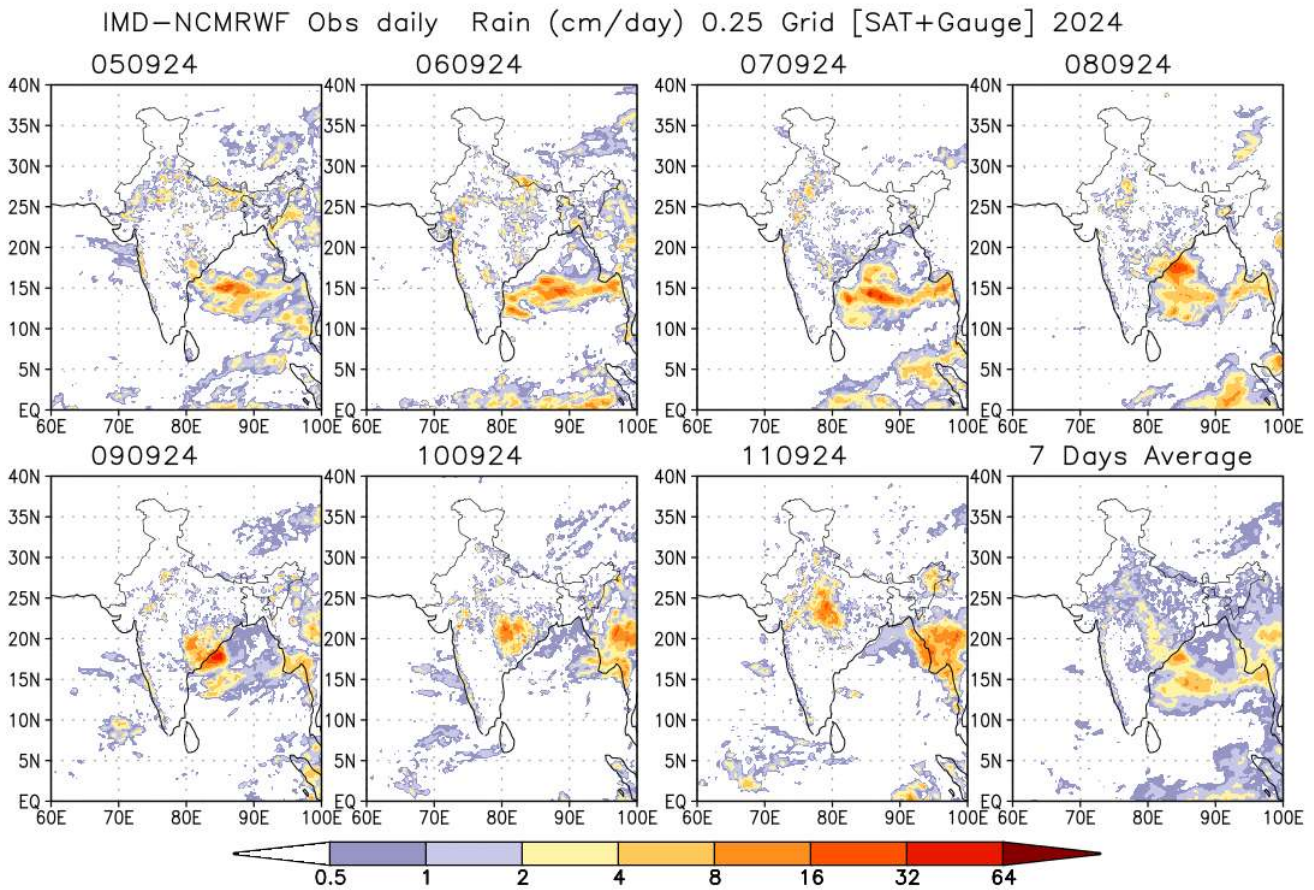


Fig. 3: NCMRWF-IMD satellite gauge merged data plots of realized 24 hours accumulated rainfall from 05th September to 11th September, 2024.

Next update: 19.09.2024