India Meteorological Department
Ministry of Earth Sciences
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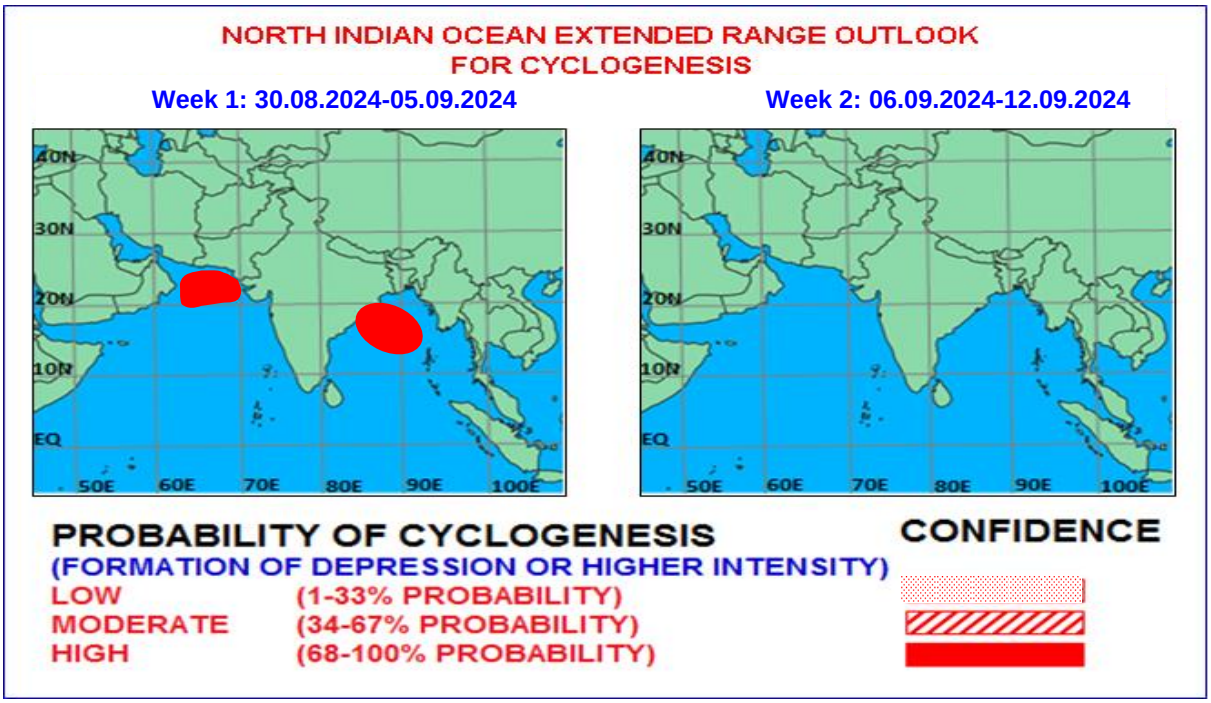

Fig. 1: Graphical Cyclogenesis over north Indian Ocean during next two weeks

I. Environmental features:

The Madden Julian Oscillation (MJO) index is currently in Phase 4 and would move to phase 5 from 30th August with amplitude greater than 1. It will move across the same phase during next 2 weeks with amplitude remaining higher than 1 throughout. MJO phase and amplitude is highly favourable for enhancement of convective activity over the Bay of Bengal.

The NCICS forecasts indicate MJO wave moving eastwards and is seen over entire south Arabian Sea (AS), Southern Peninsular India and South Bay of Bengal during week 1. Westerly winds (1-3 mps) over South AS and higher winds (3-5 mps) over south BoB alongwith strong easterly winds (3-5 mps) over North BoB and Eastern states of India are also seen during week 1. Over the Eastern parts of India Rossby are also seen propagating westwards. These features indicate a conducive environment for cyclogenesis over BoB. The deep depression over the Saurashtra & Kachchh region will also get enhanced moisture feed back from Arabian Sea during week 1.

During week 2, similar features are seen over the BoB. Presence of Rossby waves, MJO, strong westerly winds (5-7 mps) over south BoB and easterly winds (3-5mps) over North BoB and adjoining Eastern States of India. These features indicate favourable environment for cyclogenesis over the BoB during week 2 as well.

Neutral ENSO conditions are currently prevailing with declining EL Nino over central Pacific. Neutral Indian Ocean Dipole conditions are prevailing with slight positive Dipole Mode Index. These features are favourable for Indian Summer Monsoon and may support development of low pressure systems over BoB during both the weeks.

Considering the existing environmental conditions, the sea surface temperature over the BoB is 28-30^{0}C and over Arabian Sea SST is around 27-28^{0}C. It is colder (<26^{0}C) over westcentral AS) and very warm (>32^{0}C) over Gulf of Aden. Tropical Cyclone Heat Potential (TCHP) is high (>100 KJ/cm^2) over central BoB and less (<50 KJ/cm^2) over north & adjoining central AS. Sea conditions indicate that the deep depression over Saurashtra & Kachchh will encounter colder sea conditions in AS and hence would not intensify significantly.

The low level vorticity is 200X10^{-5} s^{-1} near system area over the Saurashtra & Kachchh region. Low level convergence is 20X10^{-5} s^{-1} over system centre and upper level divergence is also 20X10^{-5} s^{-1} over system area extending upto westcentral AS. Wind shear is moderate to high over Saurashtra & Kachchh and adjoining northeast AS. These features indicate that the deep depression over Saurashtra & Kachchh is in a moderately favourable environment and only marginal intensification of this system is likely. The upper tropospheric ridge is near 27^{0}N in association with anticyclonic circulation over coastal Iran. A westerly trough is approaching the Indian region and is currently extending upto 30^0 N along 60^0 E. The system is thus tracking slowly nearly west-southwestwards.

Over the BoB, the low level vorticity is positive and is around 100X10^{-5} s^{-1} over central BoB with extension upto mid tropospheric levels. Low level convergence is 20X10^{-5} s^{-1} to the south of low pressure area and upper level divergence is also 20X10^{-5} s^{-1} to the southwest of system area extending upto southwest BoB. Wind shear is low to moderate over central and North BoB. Lower level winds indicate broadscale circulation developing over the central BoB. These features indicate a highly favourable environment for development of depression over the BoB.

II. Climatological Guidance with respect to formation of cyclonic storms (≥ 34 knots or 63 kmph) during 1891-2023 (132 years)

Development of cyclonic storms in the month of August over the Arabian Sea is a rare activity. However, during 1891-2023, 3 cyclonic storms developed over the AS (1976, 1964, 1944). The cyclone in 1976 developed over Odisha, moved west-northwestwards, emerged into Arabian Sea, made a looping track and weakened over northwest Arabian Sea near Oman coast. 1944 cyclone also intensified after emerging into Arabian Sea and weakened over Sea. Another short cyclone developed near South Gujarat coast and weakened near coast in 1964 (Fig. 2a). Similarly over the BoB during last 132 years, there have been a total of 28 such systems in the month of August.

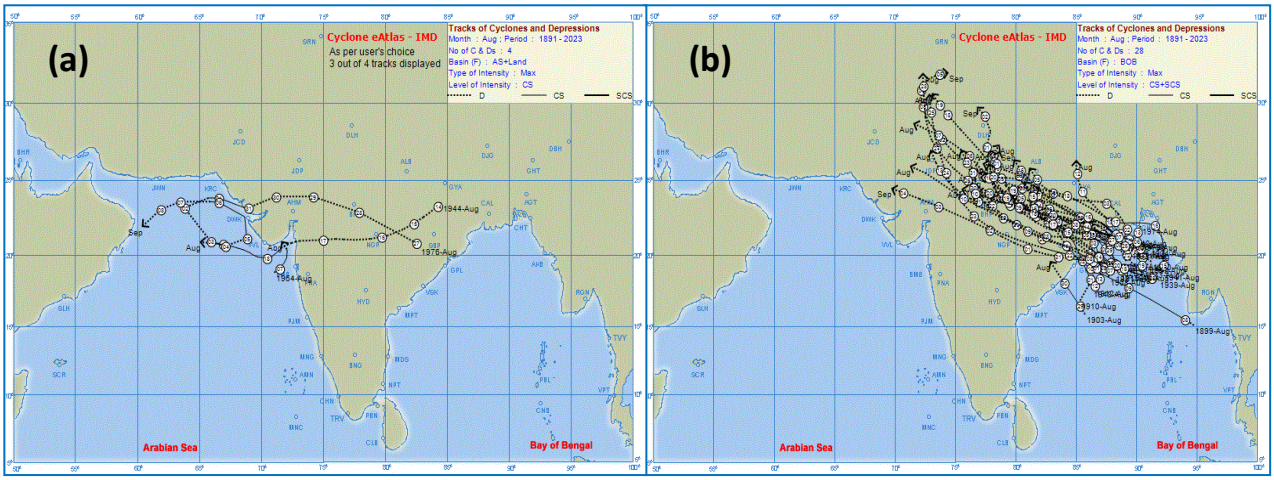

Fig. 2: Tracks of cyclonic storms (≥ 34 knots or 63 kmph) in the month of August during 1891-2023 over the (a) Arabian Sea and (b) Bay of Bengal

III. Model Guidance:

Most of the models (ECMWF, IMD GFS, NCEP GFS, GEFS, NCUM R, IMD MME) are indicating that the deep depression over Saurashtra and Kachchh would move nearly westwards and emerge into the AS on 30th. Thereafter, it would gradually & marginally intensify into a cyclonic storm. There is good consensus among various models that the system would move towards northwest Arabian Sea and weaken near Oman coast around 2nd August.

Most of the numerical models (ECMWF, IMD GEFS, NCUM, UKMO, IMD MME) are indicating that existing low pressure area over central & adjoining north BoB is likely to move west-northwestwards and intensify into a depression over westcentral and adjoining northwest BoB around

1st September. ECMM is also indicating formation of depression over north Bay of Bengal around 1st September. However, most of the models are suggesting peak intensity upto depression stage only.

Further models (IMD GFS, GEFS, NCUM, ECMWF) are also indicating likely formation of another low pressure area over North BoB during beginning of week 2. The 850 hPa wind anomaly field in IMD CFS V2 is indicating a cyclonic circulation in week 1 over central BoB and another cyclonic circulation over Northeast BoB in week 2. The model is also indicating 70-80% probability of formation of depression over over North BoB during week 1 and 20-30 % probability of formation of depression over North BoB during week 2. CNCUM Model is also indicating back to back cyclonic circulations over North BoB during both the weeks.

Legends: MJO: Madden Julian Oscillation, ERW: Equatorial Rossby Waves, KW: Kelwin 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.

IV. Inference:

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

(i) The deep depression over Saurashtra & Kachchh is likely to move west-southwestwards, emerge into northeast Arabian Sea off Kachchh and adjoining Saurashtra & Pakistan coasts and intensify into a Cyclonic Storm on 30th August. Thereafter, it would continue to move nearly west-southwestwards over northeast Arabian Sea away from Indian coast during subsequent 2 days.

(ii) The low pressure area over central and adjoining north Bay of Bengal is likely to move west-northwestwards and become more marked over westcentral and adjoining northwest Bay of Bengal by 30th August. It is likely to move towards north Andhra Pradesh and adjoining south Odisha coasts and intensify into a depression over westcentral and adjoining northwest Bay of Bengal by 1st September.

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

V. Impact Expected

- Localized Flooding of roads, water logging in low lying areas and closure of underpasses mainly in urban areas of the above region.
- Occasional reduction in visibility due to heavy rainfall.
- Reduction of visibility over sea area due to sea spray induced by strong wind and heavy rainfall.
- Disruption of traffic in major cities due to water logging in roads leading to increased travel time.
- Minor damage to kutcha roads.
- Possibilities of damage to vulnerable structure.
- Localized Landslides/Mudslides/landslips/mud slips/land sinks/mud sinks.
- Damage to horticulture and standing crops in some areas due to inundation.
- It may lead to riverine flooding in some river catchments (for riverine flooding please visit Web page of CWC)

VI. Action Suggested

- Fishermen are advised not venture into

- ❖ Northeast & adjoining Eastcentral Arabian Sea and along & off Gujarat & adjoining Pakistan and north Maharashtra Coasts till 31st August.
- ❖ Northwest & adjoining westcentral Arabian Sea and along & off Pakistan and southeast Iran coasts from 31st August till 2nd September.
- ❖ Westcentral & adjoining northwest Bay of Bengal from 29th till 31st August and along & off south Odisha and north Andhra Pradesh Coasts on 31st August.

- ➢ Judicious regulation of offshore/onshore Operations
- ➢ 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 the water logging problems often.
- ➢ Avoid staying in vulnerable structure.

VII. Verification of forecast issued during last two weeks:

Week 1 Forecast issued on 15th August for second week (23.08.2024-29.08.2024) indicated (a) likely formation of a low pressure area around 16th August with moderate probability of intensification into a depression & nearly westwards movement during subsequent 2-3 days. (b) It also indicated likely formation of a cyclonic circulation or low pressure area over the north Bay of Bengal during second week (around 23rd August).

Week 2 updated forecast issued on 24th August for first week (23.08.2024-29.08.2024) indicated (a) The well marked low pressure area over central parts of north Madhya Pradesh would move nearly west-southwestwards, intensify into a depression over west Madhya Pradesh on 25th and further into a deep depression over south Rajasthan and adjoining north Gujarat by 27th August. Thereafter, it will continue to move nearly west-southwestwards and emerge into northeast Arabian sea off Saurashtra & Kachchh and south Pakistan coasts around 29th August. High probability of formation of depression was indicated. (b)It also indicated likely formation of another cyclonic circulation or low pressure area over the central and adjoining north Bay of Bengal around 29th August.

Realised:

(1) Deep Depression over Saurashtra & Kachchh: A low pressure area formed over northwest Bay of Bengal and adjoining areas of West Bengal & Bangladesh in the morning (0530 hrs IST) of 16th August, 2024. It moved across Bangladesh, West Bengal & Jharkhand and lay as a well marked low pressure area over southeast Uttar Pradesh & adjoining northeast Madhya Pradesh in the morning (0830 hrs IST) of 24th August 2024. Moving further westwards, it concentrated into a depression over northwest Madhya Pradesh and neighbourhood in the morning (0530 hours IST) of 25th August, 2024. It intensified into a deep depression in the morning (0530 hours IST) of 26th August over East Rajasthan & neighbourhood. It moved nearly westwards across Gujarat region and lay over Saurashtra & Kachchh on 29th August.

(2) Low Pressure Area over South Bangladesh: Under the influence of cyclonic circulation over south Bangladesh & neighbourhood, a low pressure area formed over the same region in the noon (1130 hrs IST) of today, the 25th August 2024. It became a Well Marked Low Pressure Area over Gangetic West Bengal in the early morning (0530 hours IST) of 26th August. It lay as a low pressure area over Jharkhand and neighbourhood in the early morning (0530 hours IST) of 27th August over northwest Jharkhand & neighbourhood. It moved west-northwestwards and became less marked in the early morning (0530 hours IST) of today, the 28th August, 2024 over northern parts of central Madhya Pradesh and adjoining South Uttar Pradesh

(3) Low Pressure Area over Bay of Bengal: Under the influence of the cyclonic circulation over eastcentral Bay of Bengal & neighbourhood, a low pressure area formed over central and adjoining

north Bay of Bengal in the morning (0830 hours IST) of today, the 29th August, 2024.

The observed satellite-gauge merged analysis of 24 hours accumulated rainfall from 22nd to 28th August, 2024 is shown in **Fig. 3.**

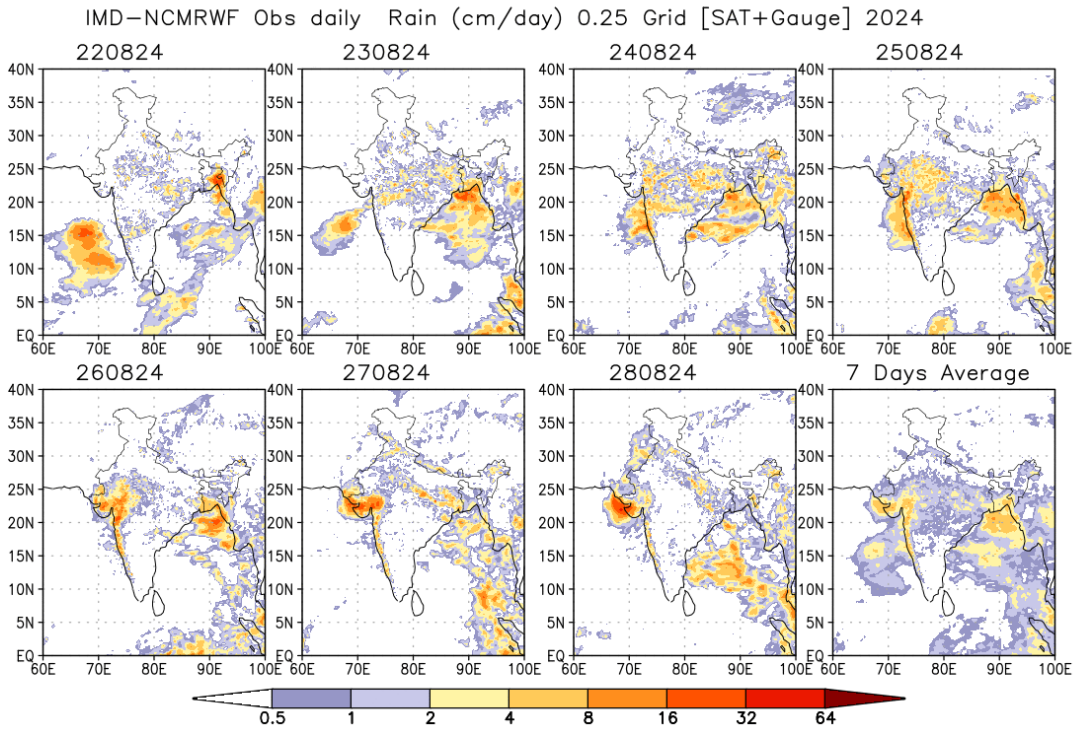

Fig. 3: NCMRWF-IMD satellite gauge merged data plots of realized 24 hours accumulated rainfall from 22nd to 28th August, 2024.

Next update: 05.09.2024