India Meteorological Department
Ministry of Earth Sciences
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**Issued on 30.05.2024**

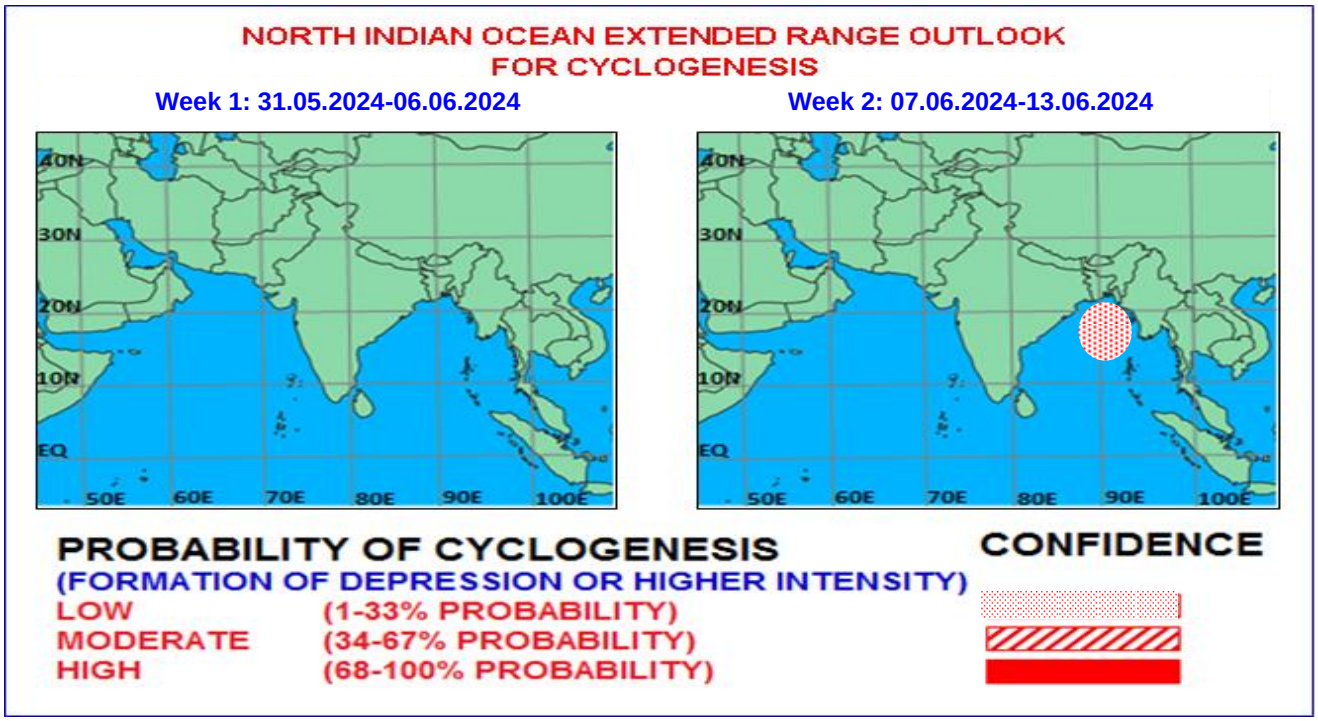


**Fig. 1: Graphical Cyclogenesis over north Indian Ocean during next two weeks**

## I. Environmental features:

Madden Julian Oscillation (MJO) index is currently in Phase 4 with amplitude more than 1. It is very likely to move eastward and enter into phase 5 during next 1-2 days. With a decreasing trend in amplitude MJO signal is likely to propagate quickly through phase 5 and reach up to phase 6 at the end of first week. Thereafter, the MJO index is likely to continue its eastward slow migration inside phase 7 throughout the week 2. Thus MJO, phase and amplitude are favourable for enhancement of convective activity over the north Bay of Bengal during the first week only.

The NCICS based forecasts for zonal winds indicate strong westerly winds (5 to 9 mps) over southern & adjoining central parts of both Arabian Sea (AS) with its peak speed over southeast AS & adjoining Equatorial Indian Ocean during first week. Simultaneously, similar westerly wind is likely over south Bay of Bengal (BoB) and extending over eastcentral BoB during first week. During second week, the westerly wind is likely to cover nearly entire AS but the strength of the westerly (3 - 5 mps) is likely to decrease a little. The south & eastern parts of BoB and entire Andaman Sea are indicating strong westerlies (5-9 mps) during the same period. In addition, Equatorial Rossby Waves (ERW) are also likely over central & north BoB and adjoining Andaman Sea. The Kelvin waves are likely to propagate gradually eastward across south & central parts of BoB during the forecast period.

High sea surface temperatures (~30°C) are prevailing over south and central BoB and AS, thereby creating a very conducive environment for cyclogenesis over the region. The guidance from INCOIS HYCOM model indicates, tropical cyclone heat potential of the order of 100-120 KJ/cm$^2$ over southeast AS and adjoining areas of eastcentral & Equatorial Indian Ocean (EIO). Above environmental conditions are likely to support convective activity over southeast AS, south BoB and adjoining Andaman Sea during first week.

The climatology (1961-2023) of cyclonic disturbances (CDs) over North Indian Ocean region suggest that a total of 81CDs formed over the region. The probability of cyclogenesis is higher over central adjoining north BoB and eastcentral AS compared to other regions of NIO.

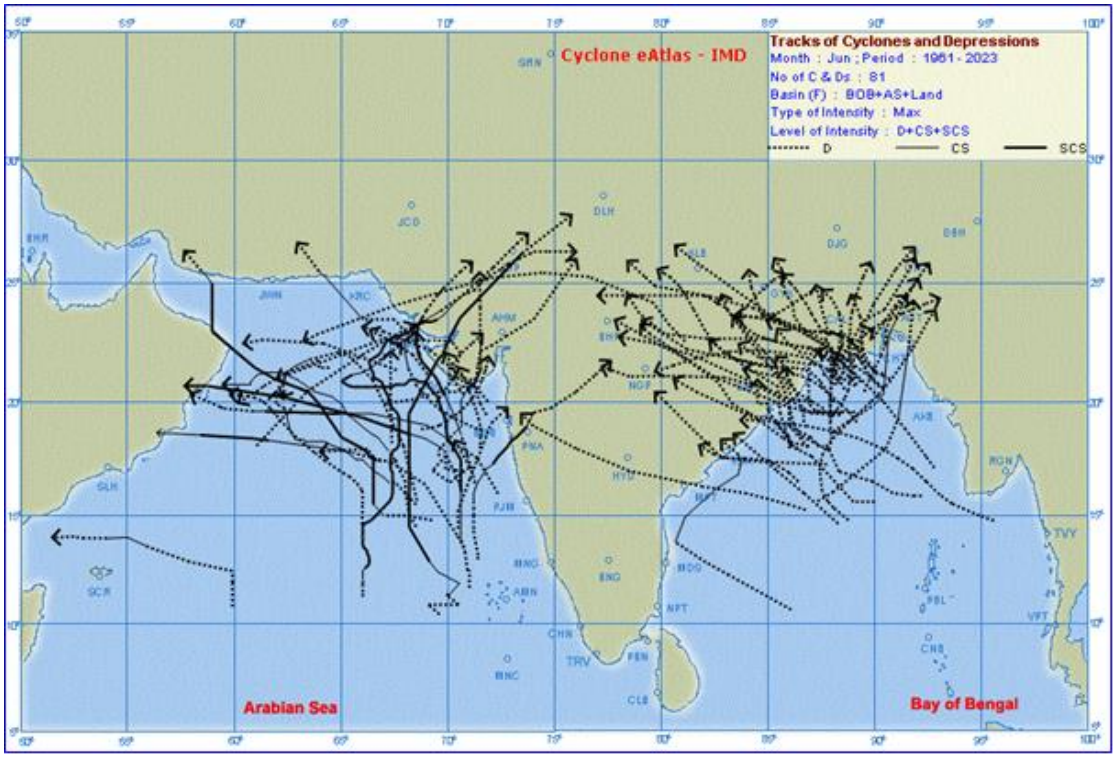


**Fig. 2: Tracks of cyclonic disturbances over the North Indian Ocean in the month of June during 1961-2023**

## II. Model Guidance:

Various models (GFS group of models, ECMWF, NCUMG) are indicating the establishment of monsoonal wind flow pattern over entire BoB as southwesterly winds (> 10 mps) are strengthening over the region. Low level southwesterly winds over southwest & westcentral AS are also indicating similar increase in wind speed. The forecasts show that the strong westerly winds over south AS are likely to persist during next 3-4 days and gradually weaken thereafter till 7$^{th}$ June. Subsequently, there is a sign of revival of strong westerly over south & adjoining central AS. However, the strong southwesterly winds are likely to prevail over entire BoB during next 10 days. Although, generic features of wind characteristics in all model forecast are similar, there is slight variations in temporal variation of strong westerly over AS. All models do not indicate any cyclogenesis during next 10 days over BoB & AS.

ECMM model indicates low probability (30-40%) of formation of depression over central BoB during first half of second week. IMD extended range model CFS V2 is indicating enhanced southwesterly flow over entire BoB along with 850 hPa wind anomaly field furnishing a cyclonic circulation over south BoB during first week. The model is also indicating 10-20 % probability of cyclogenesis over eastcentral BoB during the same period. During week 2, a zone of cyclogenesis is indicated over eastcentral AS with 10-20 % probability. ECMWF extended range model is indicating low probability of cyclogenesis over North BoB during week 2.

**Legends**: 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, European Centre for Medium Range Weather Forecasting (ECMWF), GPP: Genesis

Potential Parameter, National Centre for Environment Prediction (NCEP) GFS, ECMM: ECMWF multi model, GEFS: GFS ensemble, 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 there is no probability of cyclogenesis during the first week. However, there is a low probability of cyclogenesis over eastcentral and adjoining northeast Bay of Bengal during first half of second week.

## IV. Verification of forecast issued during last two weeks:

Forecast issued on 16th May for second week (24.05.2024-30.05.2024) indicated about formation of a low pressure area over southeast BoB & adjoining Andaman Sea around 23rd May with a moderate probability of cyclogenesis in the beginning of second week.

The forecast issued on 23th May for first week (24.05.2024-30.05.2024) indicated that the existing weel-marked low pressure area over westcentral and adjoining south BoB is likely to more northeastwards initially and concentrate into a depression over central part of BoB on 24th, further intensification into cyclonic storm over eastcentral BoB on 25th May. Thereafter, the system is likely to move nearly northwards and reach near Bangladesh & West Bengal coasts by evening of 26th May as severe cyclonic storm.

Actually, the low pressure area formed on 22nd May over southwest & adjoining westcentral BoB off north Tamil Nadu-South Andhra Pradesh coasts moved northeastwards and lay as a Well Marked Low Pressure Area over Westcentral & adjoining South BoB on 23rd May. Continuing to move further northeastwards, it lay as a depression over central BoB on 24th May. Thereafter, it moved north-northeastwards and intensified into a deep depression over Eastcentral BoB in the early morning (0530 hours IST) of 25th May. Thereafter, it moved nearly northwards and intensified into a Cyclonic Storm “Remal” (pronounced as “Re-Mal”) over the North & adjoining Eastcentral BoB near latitude 18.8°N and longitude 89.5°E in the evening (1730 hours IST) of 25th May and into a Severe Cyclonic Storm over North BoB near latitude 19.8°N and longitude 89.3°E in the early morning (0530 hours IST) of 26th May. Continuing to move further northwards, it crossed Bangladesh and adjoining West Bengal coasts between Sagar Island and Khepupara close to southwest of Mongla (Bangladesh) near latitude 21.75°N and longitude 89.20°E between 2230 hrs IST of 26th May & 0030 hrs IST of 27th May 2024 as a Severe Cyclonic Storm with wind speed of 110 to 120 kmph gusting to 135 kmph. Further moving northwards, it weakened into a Cyclonic Storm over Coastal Bangladesh and adjoining Coastal West Bengal in the early morning (0530 hours IST) of 27th May, 2024. It moved nearly northwards till evening (1730 hours IST) of 27th May and gradually recurved northeastwards thereafter. It then weakened into a deep depression in the midnight (2330 hours IST of 27th May) over East Bangladesh. Continuing to move further northeastwards, it weakened into a depression over East Bangladesh in the early morning (0530 hours IST) of 28th May, 2024. Further moving northeastwards, it weakened into a Well Marked Low Pressure Area over northeast Assam & neighbourhood in the evening (1730 hours IST) of 28th May, 2024 and into a Low Pressure Area over the same region in the early morning (0530 hours IST) of 29th May, 2024. Thereafter, it continued to weaken further and lay as an upper air cyclonic circulation over northeast Assam & neighbourhood in the morning (0830 hours IST) of 29th May, 2024. **Fig. 3** is depicting the graphical representation of the extended range forecast verification during past 2 weeks.

| (a) Extended Range forecast issued on 16th May for week 2 | (b) Extended Range forecast issued on 23rd May for week 1 |
|---|---|
| Week 2: 24.05.2024-30.05.2024 | Week 1: 24.05.2024-30.05.2024 |

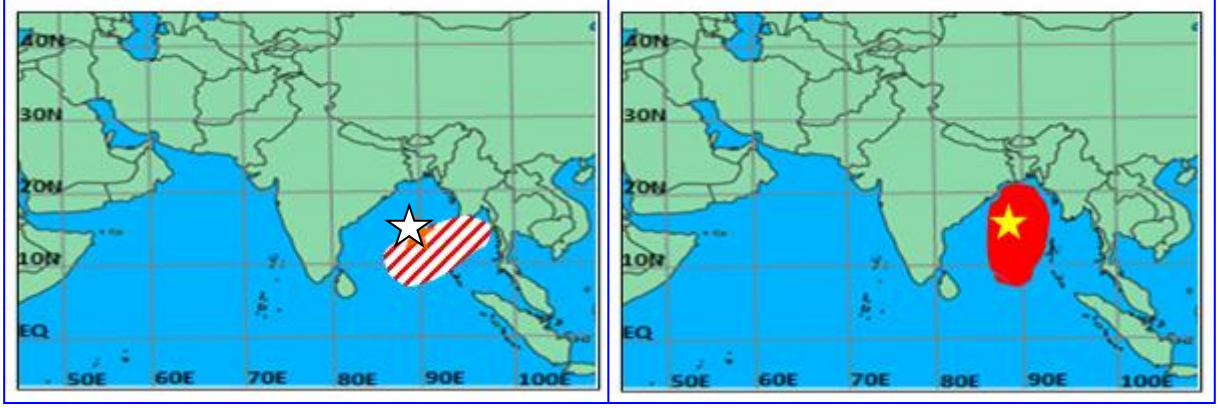


**Fig.3: The graphics showing forecast area of genesis in the extended range outlook issued on (a) 16th May and (b) 23rd May alongwith actual location of system. (Star represents the actual location of depression)**

NCMRWF-IMD satellite gauge merged data plots of 24 hours accumulated realized rainfall during 23rd May to 29th May, 2024 are presented in **Fig. 4**.

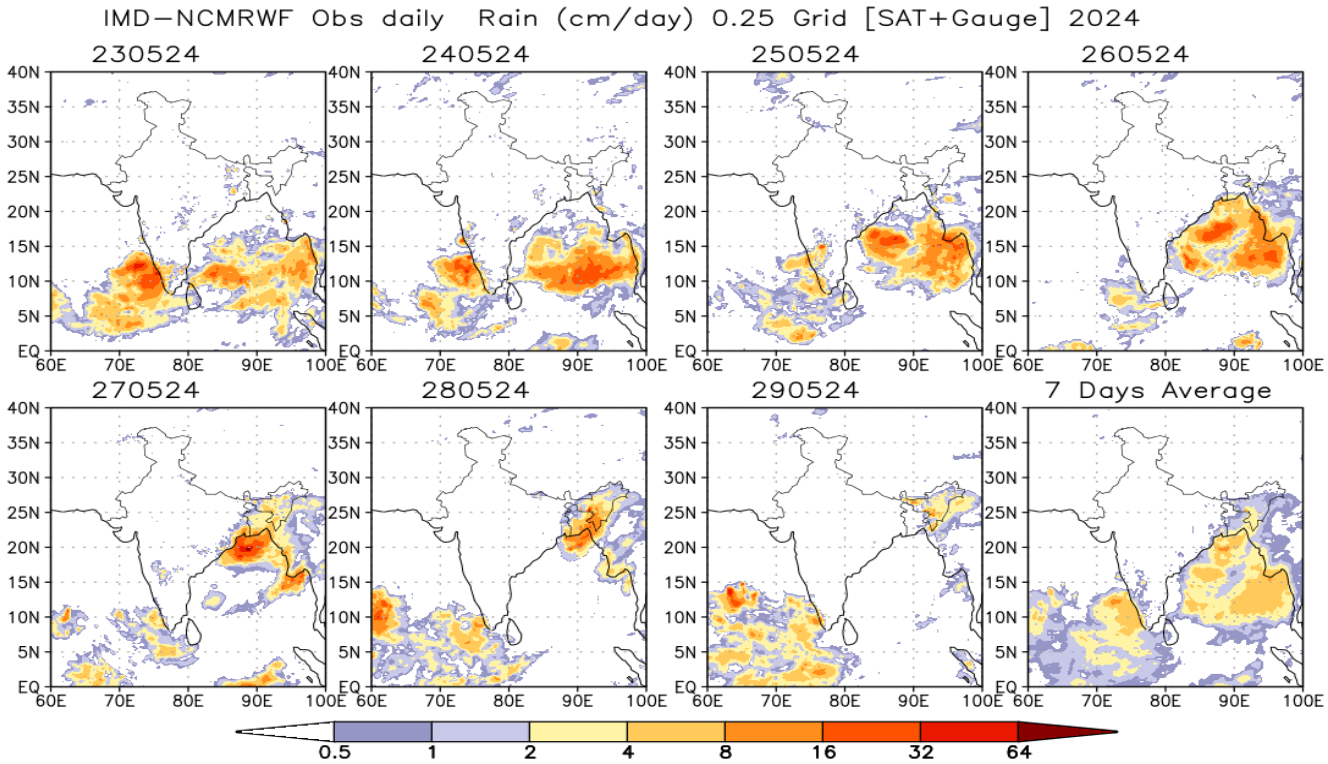


**Fig.4: NCMRWF-IMD satellite gauge merged data plots of 24 hours accumulated realized rainfall during 23rd May to 29th May, 2024.**

**Next update: 06.06.2024**