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Ministry of Earth Sciences
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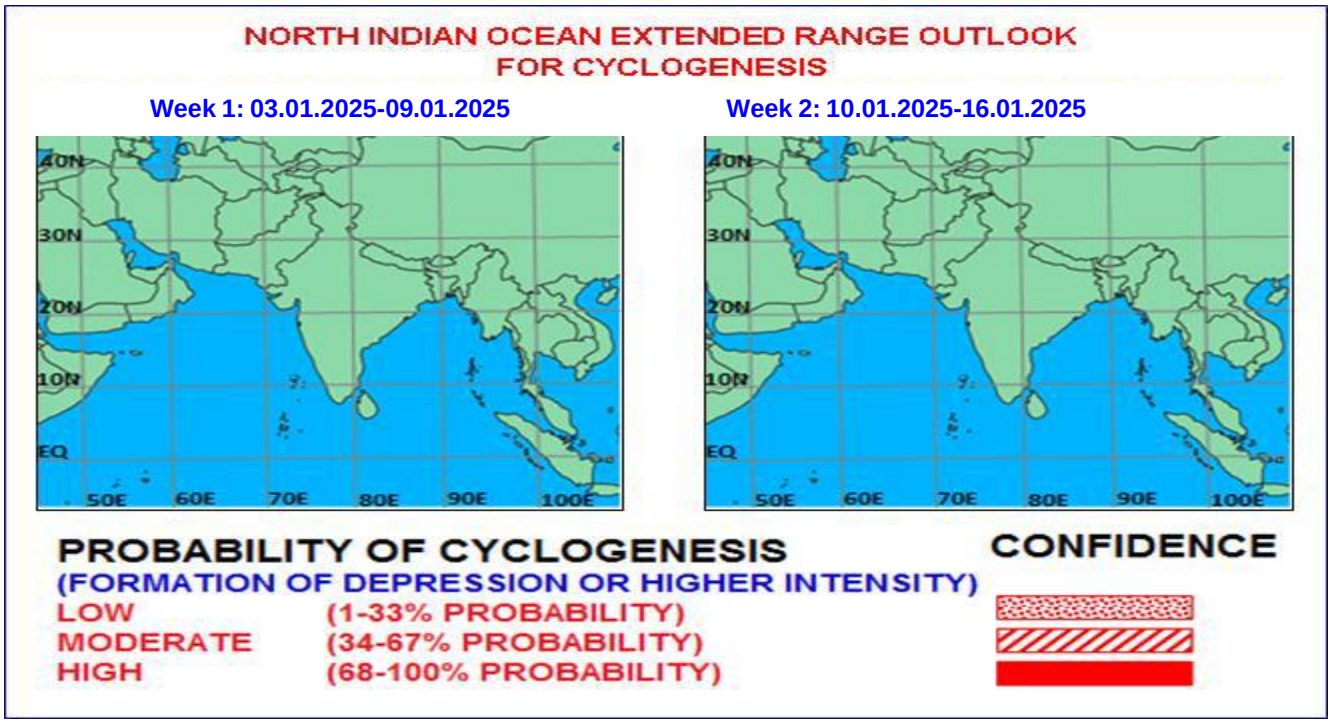

Fig. 1: Graphical Cyclogenesis over the north Indian Ocean during next two weeks

I. Environmental features:

According to continuous monitoring of the Madden Julian Oscillations (MJO), it is noticed that the MJO index in the phase diagram is currently entering into phase 8 with an amplitude slightly less than 1. The forecasts of various dynamical models suggest a consensus about the eastward movement of the MJO with a gradual decrease in amplitude up to less than ½ during next 2-3 days and it enters into phase 1. Thereafter, the amplitude of the MJO signal indicates a steep increase reaching a value greater than 1 from the middle of the first week till end of the week. During the week 2, the MJO signal propagates eastwards uniformly within phase 1 without much variation in amplitude. The models along with their ensemble members do not show a fair agreement for GEFS and CFS group of models during week 2. However, the ECMF & ECMM group of models suggesting much synchronized slower eastward movement compared to the GEFS and CFS group of models. The ECMF & ECMM models suggest that the MJO may not enter into phase 2 by the end of week 2. But, the GEFS and CFS models suggest that the MJO is likely enter into phase 2 at the end of week 2. It is inferred that from the later part of week 1, the MJO is likely to support the convective activity over North Indian Ocean (NIO) region i.e., over Arabian Sea (AS) during week 1 and gradually over both Arabian Sea and Bay of Bengal (BoB) during week 2.

The CFS-NCICS model-based forecast indicates easterly wind anomaly (1-5 mps) is predominant over northeast and central AS. During first half of the week 1, weak westerly anomaly (1-3 mps) is seen over Andaman Sea and adjoining south BoB close to Equatorial Indian Ocean (EIO). The westerly wind anomaly gradually strengthens (5-7 mps) over south AS & entire south BoB and adjoining EIO during later part of the week 1. However, weak easterly (1-3 mps) over central AS and northern parts of BoB is likely to prevail throughout the week 1.

The Kelvin waves are likely over south & central BoB during first half of week 1 whereas in the later half Equatorial Rossby Waves (ERW) are likely to south & central BoB. Thereafter, the Kelvin waves are likely to move eastwards away from the NIO region. The westerly wind anomaly (3-5 mps) is likely to persist over south AS and BoB in the beginning of second week and even extend over central & northwest AS which is likely to weaken (1-3 mps) gradually during later part of week 2. The westerly wind anomaly (3-5 mps) over south BoB also weakens in similar way in the second half of week 2. The easterly wind anomaly (3-5 mps) over northern and central BoB is likely to establish over north & central BoB by the end of week 2. The ERW over south BoB is likely to persist and propagate westward over southeast and adjoining southwest AS during the first half of week 2. However, during second half of week 2 it disappears from the above-mentioned region except over southwest AS. The low frequency waves are likely to prevail over south BoB and AS during entire week 1 and week 2.

Considering MJO, zonal wind characteristics along with equatorial wave activities over NIO region, it is inferred that the convective activities over south AS will be supported and enhanced during week 1 and over south BoB during first half of the week 2.

II. Model Guidance:

Most of the models (GFS, NCEP GFS and NCUM Global and ECMWF) are indicating a cyclonic circulation and asscoaited with a trough of low in easterlies over southeast AS and adjoining Lakshadweep and EOI region. The system is likely to persist over the region for next 2-3 days. Another cyclonic circulation along with a trough in easterlies is likely over southeast Bay of Bengal and adjoining EOI around 4th January and likely to move westwards across south BoB. Under the influence of this cyclonic circulation a low pressure area (LPA) is likely to form over southwest and adjoining equatorial Indian Ocean around 8th January at the end of week 1. The different models provide different forecasts about the formation of a LPA and its evolution & movement with time. The IMD GFS model suggests the formation of a weak LPA over southwest BoB and adjoining EOI around 7th which is likely to persists over the same region with westwards movement towards south Sri Lanka coast around 10th January. The NCEP GFS model indicates similar formation of LPA over southeast BoB and adjoining EOI around 8th and subsequent west-northwestwards movement with an intensification into a depression over southwest BoB off south Sri Lanka coast around 11th January. It is likely to intensify further into a deep depression over the same region and moving northwestwards it is likely to cross north Sri Lanka coast around 12th January. The system is likely to lay over the southwest BoB and adjoining north Siri Lanka-south Tamil Nadu region for subsequent 2-3 days before it moves further westwards over southeast AS on 17th January. The NCUM global model indicates the formation of low pressure area on 6th over central parts of south BoB. The system is likely move initially northwestwards and become a depression on 7th over the same region. Thereafter, moving nearly northwards, its is likely to concentrate into a deep depression on 8th January over central parts of south BoB and adjoining westcentral BoB. It is likely to intensify further into cyclonic storm around 10th January, 2025 and reach over southwest and adjoining westcentral BoB off north Tamil Nadu and adjoining south Andhra Pradesh coasts by 11th January. The ECMWF model does not indicate any clear formation of a low pressure area along with its further intensification over south BoB during the same time. However, it suggests a cyclonic circulation over southeast BoB around 8th and its westwards movement along southwest BoB reaching south Sri Lanka around 11th January. NCEP GFS and ECMWF indicate another fresh cyclonic circulation is likely to form over southeast BoB and adjoining EOI around 16th January.

The GPP guidance products for next 7 days indicate that a zone of significant values of GPP (>25) is prevailing over southeast AS and adjoining EOI which is likely to persist over the region for next 2 days before it become weaker. Another zone of significant values of GPP is likely to appear over southeast BoB and adjoining EOI on 5th which advances west-northwestwards and reach over central parts of south BoB on 9th January indicating a prominent probability of cyclogenesis over the region.

The 850 hPa mean wind field of the IMD ERF Model indicates easterly winds over southern and central parts of Bay of Bengal dominated by an anticyclone over central India. An east-west trough extending from southwest BoB up to southeast AS across south Sri Lanka and Comorin area is likely to prevail along with an embedded cyclonic circulation over southwest BoB off south South Sri Lanka coast during week 1. The forecast for week 2 also indicates nearly similar features with the anticyclone shifted a bit eastward. The wind anomaly indicates easterly/northeasterly wind over the south and central parts of AS in week 1. The model indicates a cyclonic circulation over central parts of south AS and adjoining EOI region during the first week. The wind anomaly during in week 2 forecast indicates southeasterly/southerly winds prevails over entire BoB and AS except easterly over south BoB & AS.

The IMD ERF model also indicates a low probability (20-30 %) of cyclogenesis southwest BoB, whereas, moderate to high probability (60 to 70%) of cyclogenesis over southeast AS and adjoining EOI during week 1. There is a very low probability (20 to 30%) of cyclogenesis over southwest BoB during week 2. The ECMWF ensemble forecasts for week 1 indicates a moderate to high probability (70-80%) of cyclogenesis over southeast AS and adjoining EOI during middle of the week. However, it suggests a moderate probability (40-50%) over southwest BoB at the end of week 1 and beginning of week 2.

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/GEFS/CFS: National Centre for Environment Prediction GFS/GEFSv12/CFSv2, IMD-GEFS: GFS ensemble forecast system of IMD, 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 cyclogenesis over the North Indian Ocean region during the entire forecast period. However, there is a likelihood for the formation of a low pressure area over central parts of south Bay of Bengal around 8th January at the end of week 1. The system is likely to move westwards during subsequent 3-4 days across southwest Bay of Bengal and south Sri Lanka during week 2.

IV. Verification of forecast issued during last two weeks:

The forecast issued on 19th December for week 2 (27 Dec, 2024-02 Jan, 2025) indicated no probability of cyclogenesis during week 2. The forecast issued on 26th December for week 1 (27 Dec, 2024-02 Jan, 2025) indicated no probability of cyclogenesis during week 1.

Actually, no cyclogenesis occurred over North Indian Ocean region during 27 Dec, 2024 to 02 Jan, 2025. However, as mentioned in the extended-range outlook on 26th December, a cyclonic circulation formed over south Bay of Bengal and adjoining equatorial Indian Ocean on 30th December. The cyclonic circulation moved westwards and reach up to Comorin area till 1st January, 2025. Hence, non-occurrence of cyclogenesis was correctly predicted 2 weeks in advance.

NCMRWF-IMD satellite gauge merged data plots of realized 24 hours accumulated rainfall from, 25th December, 2024 to 1st January, 2025 are presented in **Fig. 2**.

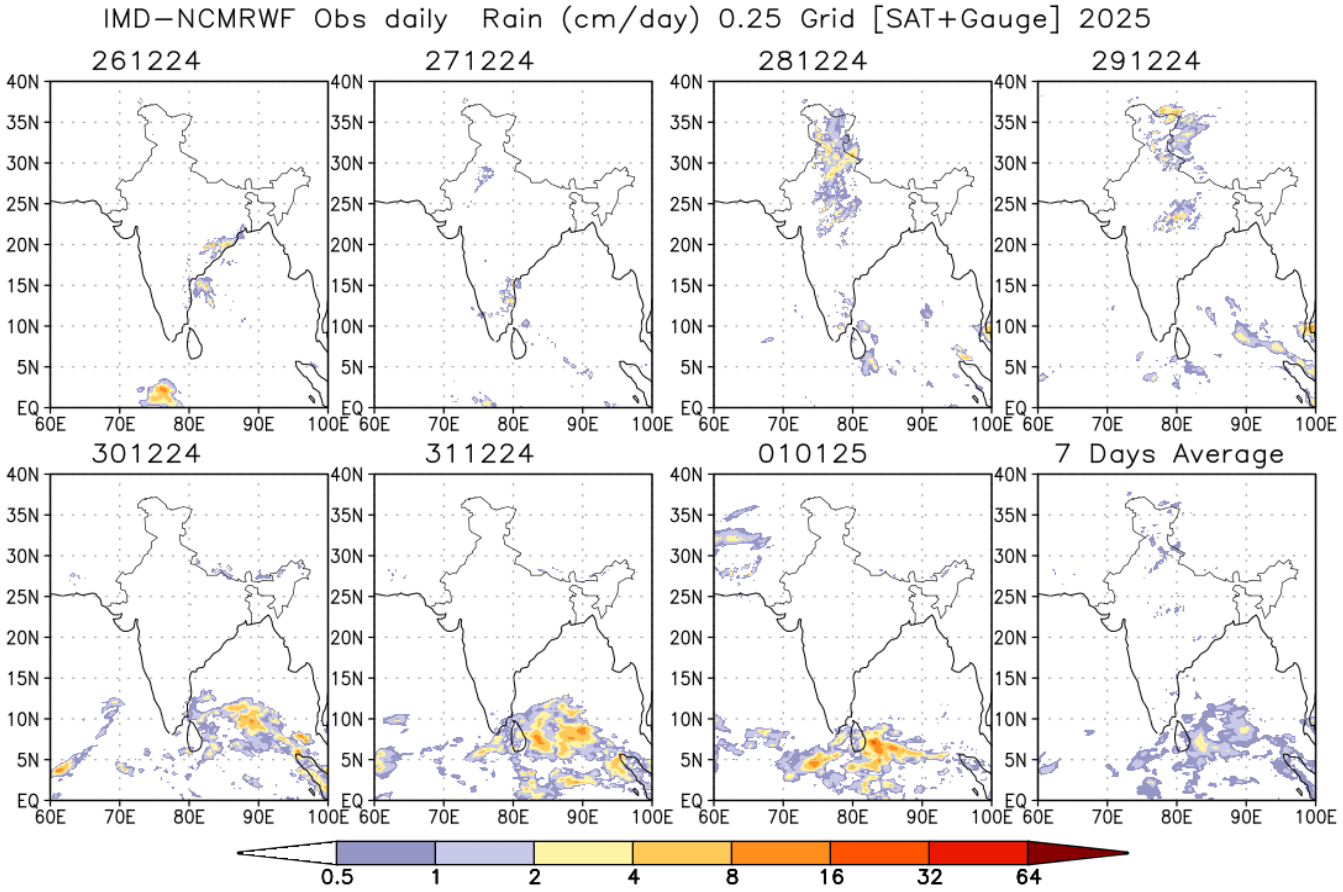

Fig.2: NCMRWF-IMD satellite gauge merged data plots of realized 24 hours accumulated rainfall from 25th December, 2024 to 1st January, 2025.

Next update: 09.01.2025

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