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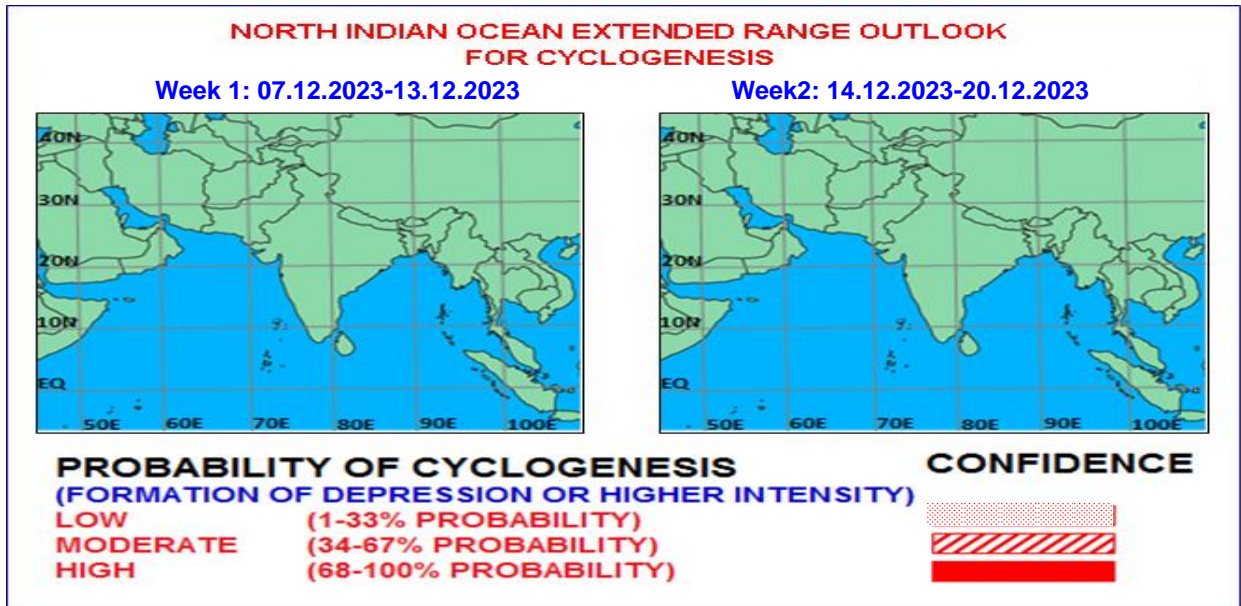


Fig. 1: Graphical Cyclogenesis over north Indian Ocean during next two weeks

I. Environmental features:

Madden Julian Oscillation (MJO) index is currently in phase 4 and progressing eastward uniformly with amplitude greater than 1. The MJO is likely to enter into phase 5 during next 1-2 days. Both GEFS and ECMWF ensembles are in good agreement that the MJO will remain amplified (greater than 1) and propagate eastward across the Maritime Continent (phase 5) and Western Pacific (phase 6 & 7) during the next 2 weeks. GEFS forecasts suggest a bit quick eastward movement of the MJO index entering phase 7 at the end of week 1 whereas ECMWF indicate rather slow propagation. The GEFS ensembles indicate a wide range of uncertainty during the whole forecast period. But ECMWF ensemble members have comparatively lower spread and high confidence during week 1. Thus, MJO is likely to be neutral for the cyclogenesis over both Arabian Sea (AS) and Bay of Bengal (BoB) during the entire forecast period.

NCICS based CFS forecast for zonal wind indicates westerly winds over entire BoB with speed (5-7 mps) over central & north BOB along & off east coast of India during next 3 days of week 1. Westerly wind (1-3 mps) is also likely to prevail over south and adjoining central AS during the same period. The forecasts indicate weakening of westerly winds over entire BoB & AS with maxima over central BoB during later half of week 1. In the forecasts, the westerly winds are gradually replaced by the easterly winds over the southern parts of BoB and AS and adjoining North Equatorial Indian Ocean (NEIO) from later part of week 1 till the end of week 2. The CFS forecast indicates Equatorial Rossby Waves (ERW) activity over north Andaman Sea, north and adjoining central BoB during week 1. The ERW is also visible over westcentral AS and west & northwest India during week 2. Eastward moving Kelvin wave activity is indicated over central BoB and Andaman Sea during 1st half of week 1. The kelvin wave activity again enters the region over north AS during 2nd half of week 1 and exist over westcentral AS, central and east India and adjoining north BoB during week 2. Thus, circulation pattern and equatorial waves are likely to support convective activity over southeast & adjoining eastcentral AS during week 1 only and over Andaman Sea, eastcentral & adjoining north BoB during week 1 and first half of week 2.

II. Model Guidance:

Most of the models including IMD GFS, GEFS, NCUM, ECMWF, ECMWF ensemble, MME are not indicating any significant development of low pressure system over BoB within the forecast range of 10 days. ECMWF, NCEP-GFS and WRF indicate a prevailing cyclonic circulation over southeast AS on 7th and under its influence a low pressure area is likely to form over eastcentral AS on 8th December. It would move west-northwestwards and lay over eastcentral AS on 9th without further intensification. The models also indicate that thereafter the system is likely to move west-southwestwards and lay over eastcentral AS on 10th and continue to move in same direction to become less marked over southwest and adjoining westcentral AS. No significant zone of GPP is found during next 7 days. The extended range model IMD CFS V2 is indicating easterly wind over south BoB and AS with anticyclonic anomaly over southwest BoB during week 1 which gradually move eastwards over Andaman Sea during week 2. The model also shows 20-30% probability of cyclogenesis over southeast AS and southeast BoB during week 1. There is no significant area of cyclogenesis except over Comorin area (20-30 %) during week 2. The ECMWF ERFs indicates less than 10 % probability of cyclogenesis over southeast AS during week 1 and no cyclogenesis over entire BoB and AS 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, GPP: Genesis Potential Parameter, National Centre for Environment Prediction (NCEP) GFS, ECMWF: ECMWF multi model, GEFS: GFS ensemble, NEPS: NCUM ensemble prediction system, CNCUM: Coupled NCUM, CPC: Climate Prediction Center, NWS: National Weather Service.

III. Inference:

Considering all environmental conditions and model guidance, it is inferred that there is no probability of cyclogenesis over North Indian Ocean during the entire forecast period. However, under the influence of existing cyclonic circulation over Southeast Arabian Sea a low pressure area is likely to form over the same region during next 2-3 days. It is likely to move initially west-northwestwards and then westwards during week 1.

IV. Verification of forecast issued during last two weeks:

The first information about likely cyclogenesis i.e., the formation of depression over Bay of Bengal was issued in the extended range outlook for week 2 (24.11.2023-30.11.2023) issued on 16th November. The extended range outlook issued on 23rd November declared likely formation of depression over southeast & adjoining southwest BoB during week 1. The movement of the system towards Andhra Pradesh coast was also indicated with high confidence (76-100%) about 8 days ahead of formation of depression and 12 days ahead of landfall over Andhra Pradesh. The extended range outlook issued on 30th November indicated detail about the movement and further intensification of the system into a cyclonic storm over southwest BoB around 3rd December along with probable track to reach near North Tamil Nadu and South Andhra Pradesh coasts around early morning of 4th December.

Actually, a low pressure area lay over South Andaman Sea on 27th November. It moved west-northwestwards and intensified into a depression over southeast BoB in the early morning (0530 hours IST) of 1st December, into a deep depression in the early morning (0530 hours IST) of 2nd December, into the cyclonic storm "Michaung" in the early morning (0530 hours IST) of 3rd December and into a severe cyclonic storm in the noon (1130 hours IST) of 4th

December. It crossed Andhra Pradesh coast between Nellore and Machilipatnam, close to south of Bapatla during 1230-1430 hours IST, as a severe cyclonic storm with wind speed of 90-100 kmph gusting 110 kmph.

Thus, the cyclogenesis over the south Bay of Bengal region were correctly predicted 2 weeks (15 days) in advance. Further intensification and movement of the system was also indicated correctly one week ahead with high confidence.

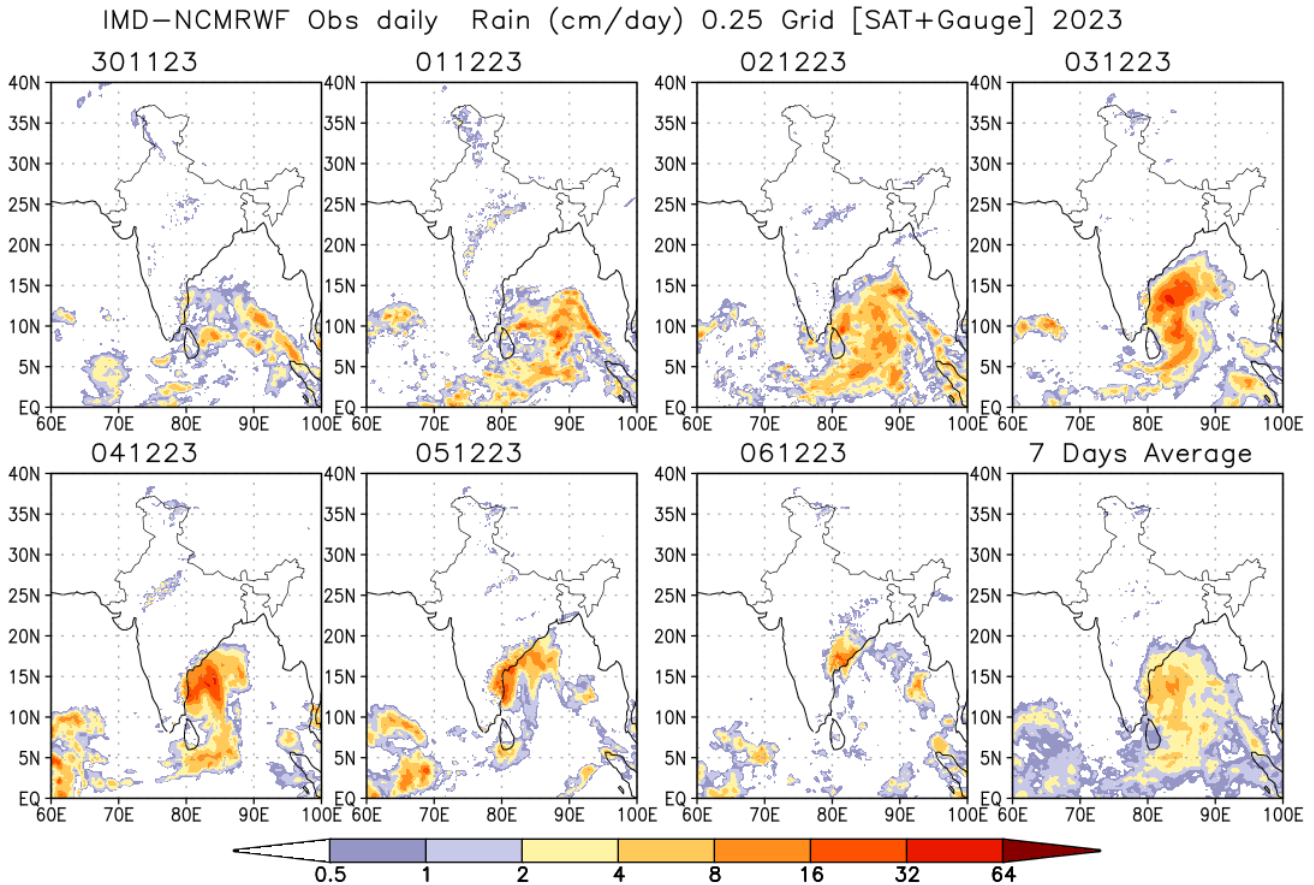


Fig.2: NCMRWF-IMD satellite gauge merged data plots of 24 hours accumulated realized rainfall during 30th November to 6th December, 2023.

Next update: 14.12.2023