Evaluation of operational Ensemble based Global Forecast System prediction for Tropical Cyclones over the North Indian Ocean

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The importance of accurate prediction of Tropical Cyclone (TC) genesis, rapid intensity changes, location and intensity during landfall is well known. Reliable prediction of these at 3-5 days lead time is crucial for disaster managing point of view. Bearing in mind the uncertainty in initial condition and model physics there was a need for high resolution ensemble based forecast system for region specific probabilistic prediction of weather over India. Considering this along with the existing Global Forecast System deterministic model (GFS T1534), the ensemble forecast system GEFS (T 1534) with 20 members is implemented and is in operation since June 2018 for the probabilistic prediction.

This paper evaluates the skill of operational high resolution (12.5 km) modelling system in predicting track and intensity of recent cases of TCs over North Indian Ocean at various lead time. Ensemble prediction of tracks of cyclones and its strike probability are evaluated. Ensemble mean track is better than the deterministic track particularly at longer lead time (figure 1). The vertical thermo-dynamic structure at the mature stage of the cyclone is well captured by the deterministic model. Evaluation of deterministic model (figure 2) specify average track error is ranging from < 100 km at Day 1 lead up to about 280 km at day 5 lead time and average error in intensity prediction is ranging from 10 kt –20 kts. In general model indicates early intensification and slightly overestimates the peak intensity in majority of the cases. It is challenging to predict the variation in the intensity. Skill in the prediction of genesis is also evaluated by calculating Genesis Potential Index (GPI). Further developments like improving the physics and dynamics of the model along with use of proper land use land cover data are underway.

Keywords: Tropical Cyclones, North Indian Ocean, High Resolution ensemble Prediction System
Figure 1: Ensemble prediction of tracks based on 6 Oct Initial Condition for the case of Luban (6-14 Oct 2018)

Figure 2: Deterministic model (GFS (T1534)) average Track and intensity error for NIO cyclones 2018