Impact of Vortex Initialization in Prediction of Tropical Cyclones over Bay of Bengal with NCUM Model

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Abstract: The present study evaluates the impact of vortex initialization (VI) scheme within the NCMRWF Global Unified model (NCUM-G) for prediction of tropical cyclones (TCs) formed over Bay of Bengal (BoB). For this purpose, two numerical experiments such as control simulation (CNTL) without using VI scheme and VOTX simulation using the VI scheme in the NCUM-G are performed by considering four landfalling TCs formed over BoB basin during the year 2016–17. The results suggest that even though TCs are large synoptic systems, the introduction of VI scheme has a positive impact on the prediction of the location, movement, intensity and development of rain bands associated with the TCs. The initial vortex position and landfall position errors are reduced by ~64% and ~39% in VOTX simulations over CNTL, respectively. The mean track errors of all the four TCs are reasonably improved by ~58% in VOTX over CNTL. The equitable threat score (ETS) and frequency bias are significantly improved in the VOTX for all the TC cases as compared to CNTL. Study results provide a positive proof of concept that the VI scheme within the NCUM-G can help to improve the simulation of track and intensity of TCs over BoB.

Keywords: Equitable threat score, frequency bias, tropical cyclones, unified model, vortex initialization