

Simulation of Tropical Cyclones over Bay of Bengal with NCMRWF Regional Unified Model

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Abstract: This study delineates the relative performance of the 12-km resolution NCMRWF regional Unified Model (NCUM-R) over the operational global NCUM (NCUM-G) model. Forecasts of four Bay of Bengal (BoB) landfalling tropical cyclones (TCs) using several different initial conditions (ICs) are used to compare the performance of two models. The position and intensity errors of the TCs are estimated with respect to the Indian Meteorological Department (IMD) and joint Typhoon Warning Centre (JTWC) best-track datasets and an inter-comparison study is also carried out between IMD and JTWC. The overall results suggest that the NCUM-R simulates the position and intensity of TCs more accurately compared to the NCUM-G. A majority of the TC tracks in the NCUM-G diverge more from the IMD track when compared to NCUM-R simulated tracks. It is also clearly noticed that both the models are more skillful in track prediction when initialized at intensity stages greater than “Cyclone” category. However, the mean position errors at different forecast hours and landfall errors of TCs are reduced by approximately 31 and 47% in the NCUM-R simulations compared to NCUM-G simulations, respectively. The mean gain in skill of the NCUM-R in cross track (CT) and along track (AT) error is around 29 and 24% over NCUM-G, respectively. The intensity errors are less in the NCUM-R simulations. The mean rainfall skill scores are considerably improved in the NCUM-R simulations in day-1 and day-2 as compared to the NCUM-G Simulations. It is noticed that the mean position errors of the TCs are approximately 8% lower when compared against the JTWC tracks than the IMD tracks. However, the intensity errors are higher against the JTWC than that of IMD most likely due to the averaging period of the wind speed.

Keywords: Tropical cyclone UM model best-track data skill scores cross track along track