

Real-time Track Prediction of Tropical Cyclones over the North Indian Ocean using the ARW model

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Abstract

The performance of the Advanced Research version of the Weather Research and Forecasting (ARW) model in real-time prediction of tropical cyclones (TCs) over the north Indian Ocean (NIO) at 27-km resolution is evaluated on the basis of 100 forecasts for 17 TCs during 2007–11. The analyses are carried out with respect to 1) basins of formation, 2) straight-moving and recurving TCs, 3) TC intensity at model initialization, and 4) season of occurrence. The impact of high resolution (18 and 9 km) on TC prediction is also studied. Model results at 27-km resolution indicate that the mean track forecast errors (skill with reference to persistence track) over the NIO were found to vary from 113 to 375km (7%–51%) for a 12–72-h forecast. The model showed a right/eastward and slow bias in TC movement. The model is more skillful in track prediction when initialized at the intensity stage of severe cyclone or greater than at the intensity stage of cyclone or lower. The model is more efficient in predicting landfall location than landfall time. The higher-resolution (18 and 9 km) predictions yield an improvement in mean track error for the NIO Basin by about 4%–10% and 8%–24%, respectively. The 9-km predictions were found to be more accurate for recurving TC track predictions by 13%–28% and 5%–15% when compared with the 27- and 18-km runs, respectively. The 9-km runs improve the intensity prediction by 15%–40% over the 18-km predictions. This study highlights the capabilities of the operational ARW model over the Indian monsoon region and the continued need for operational forecasts from high-resolution models.