

Global 7-km mesh nonhydrostatic Model Intercomparison Project for improving TYphoon forecast (TYMIP-G7)

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The Global 7-km mesh nonhydrostatic Model Intercomparison Project for improving TYphoon forecast (TYMIP-G7; Nakano et al. 2016) is designed to understand and statistically quantify the advantage of high-resolution nonhydrostatic global atmospheric models for improvement of tropical cyclone (TC) prediction. The 137 sets of 5-day simulations using three next-generation nonhydrostatic global models with horizontal resolution 7 km, and conventional hydrostatic global model with horizontal resolution 20 km are run on the Earth Simulator. The three 7-km mesh nonhydrostatic models are the nonhydrostatic global spectral atmospheric Model using Double Fourier Series (DFSM; Yoshimura, 2012), Multi-Scale Simulator for the Geoenvironment (MSSG; Takahashi et al., 2006, 2013), and Nonhydrostatic ICosahedral Atmospheric Model (NICAM; Satoh et al. 2014). The 20-km mesh hydrostatic model is the operational Global Spectral Model (GSM; Japan Meteorological Agency, 2013) of the Japan Meteorological Agency. Compared with the 20-km mesh GSM, the 7-km mesh models reduce systematic errors in the TC track, intensity and wind radii predictions. The benefits of the multi-model ensemble method were confirmed for the 7-km mesh nonhydrostatic global models. While the three 7-km mesh models reproduce the typical axisymmetric mean inner-core structure, including the primary and secondary circulations, the simulated TC structures and their intensities in each case are very different for each model. In addition, the simulated track is not consistently better than that of the 20-km mesh GSM. These results suggest that the development of more sophisticated initialization techniques and model physics is needed to further improve the TC prediction.

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