Simulated Tropical Cyclone Intensity and Structure using high-resolution nonhydrostatic global model

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Tropical cyclone (TC) prediction is important to mitigate a disaster associated with heavy precipitation and high wind. High-resolution global model simulations using three nonhydrostatic models have been conducted to evaluate to what degree TC intensity and structure under JAMSTEC Earth Simulator Strategic Project. Three models are Double Fourier Series (DFS), Multi-Scale Simulator for the Geoenvironment (MSSG), and Nonhydrostatic ICosahedral Atmospheric Model (NICAM). DFS incorporates cumulus parametrization scheme but MSSG and NICAM use explicit microphysics scheme only. SST is given from initial condition in the DFS and MSSG. NICAM uses a simple mixed-layer ocean model. The number of 5-day simulation experiments with 7-km grid spacing is 52, which covers 10 TCs on September-October 2013. All three models simulate TCs stronger than JMA operational global model (approximately 20-km grid spacing). Although three models use almost same horizontal grid spacing, there are significant differences in intensification and structure of TCs. On average, DFS produces TCs with largest intensification rate and compact radius of maximum wind (RMW). A start timing of intensification is the quickest at MSSG among three models and the height of maximum wind by MSSG tends to become a higher than others. In NICAM, the intensification rate is the smallest and the widest variability of RMW among three models. These results will provide scientific knowledge for improving TC intensity and structure prediction.

Keywords: tropical cyclone, nonhydrostatic global model

