Simulation of Tropical Cyclone Seasonality over the Western North Pacific in a Regional Climate Model

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In this study, the simulated formation and development of tropical cyclones (TCs) over the western North Pacific using the Advanced Research Weather Research and Forecasting Model (WRF-ARW) with 30 km horizontal grid mesh were investigated. The model was run for the main TC season (June 18–September 18, 2002) over a domain covering most of the western North Pacific using the initial and boundary conditions obtained from the National Center for Environmental Prediction (NCEP) Final (FNL) Operational Global analysis data (CTL).

The CTL simulation revealed not only significantly overestimated frequency but also unrealistic TC tracks and seasonal mean fields of precipitation and low-level circulations. The ACE indices also showed higher values compared to the observation. To address the erroneous results, a spectral nudging method (SN; Miguez-Macho et al., 2004) and a simple slab ocean model (SOM; Davis et al., 2008) were implemented into the WRF model. The cooling effect resulted by the coupling of SOM played a role to reduce the in-coming energy such as latent heat flux from the bottom of tropical disturbance. Thus, SOM played a certain degree positive role to reduce the strengthened tendency and overestimated frequency of CTL-simulated TCs, but it could not improve the TC tracks. SN significantly improved the overestimated frequency and erroneous track of the TCs simulated in CTL with desirable reproduction of TC strengths. The overestimated TC frequency in CTL could be attributed to erroneously increased wind speed which was mainly modulated by large-scale flows due to lack of scale-interactions between model-internal disturbances and the large-scale flows greater than 1000 km which were provided from the lateral boundaries.

References

[1] Davis, C., and Coauthors, 2008: Prediction of landfalling hurricanes with the advanced hurricane WRF model. *Mon. Wea. Rev.*, **136**, 1990-2005.

[2] Miguez-Macho, G., G. L. Stenchikov, and A. Robock, 2004: Spectral nudging to eliminate the effects of domain position and geometry in regional climate model simulations. *J. Geophys. Res.*, **109**, D13104, doi:10.1029/2003JD004495.