A Comparison of Forecast Performance between GFDL and Thompson Microphysics schemes in FV3GFS

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Abstract

Central Weather Bureau (CWB) has cultivated the technique for numerical weather prediction since 1983. According to NCEP's report in the 2nd Taiwan West Pacific Global Forecast System Development Workshop in 2017, the Finite Volume Cubed-Sphere Dynamical Core (FV3) global model has been planned to be NCEP Global Forecast System (NCEPGFS). CWB started to implement FV3 as the operating global model in high-performance computing (HPC) environment. In the past three years, CWB had successfully built FV3GFS global model with C384T (25-km resolution) in HPC and a nested domain (4.8-km resolution) around Taiwan. Through a cooperation with Environmental Modeling Center (EMC) in NCEP, this study focuses on the forecast performance of FV3GFS in August 2019 by using two different microphysics schemes, i.e., GFDL and Thompson. Six species, including vaper, cloud water, rain, cloud ice, snow, and grauple, are predicted and compared in detail. The five-day forecasting experiments indicate that more amount of cloud water and rain are induced by using GFDL scheme. Ice-phase species, on the contrary, are significant by using Thompson scheme in FV3GFS. Nevertheless, total precipitation in the two experiments are similar. Since the model capability of typhoon forecast, e.g., typhoon intensity and tracking error, may affect the whole-month performance, five typhoons in August 2019 are analyzed. More experiments should be programed for clarifying the choose and adjustment of microphysics scheme in FV3GFS, especially cases in winter.

Keywords: FV3GFS, numerical weather prediction, microphysics, GFDL scheme, Thompson scheme