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Implementation of the Generalized Double-Moment Normalization Method in the Cloud Microphysics Scheme

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Cloud microphysics parameterizations are generally divided into two categories: bin models that explicitly calculate the evolution of the drop size distribution (DSD) and bulk models that represent the DSD with a specific function. The Weather Research and Forecasting (WRF) Double-Moment 6-class (WDM6) scheme is one of the bulk microphysics options in the WRF model and is widely utilized for both research and operational purposes. In WDM6 scheme, the gamma form with a single static shape parameter is applied for the DSD of rain. This study adopts a generalized double-moment normalization method for the rain DSD in WDM6 scheme. Previous study mentions that the advantage of the generalized double-moment normalization method lies in its ability to singnificantly reduce the observed DSD scatter. Therefore, it can concisely represent the DSD with appropriate shape parameters, c and μ. The modified WDM6 is evaluated through simulations of an idealized 2D squall line and a summer precipitation case over the Korean peninsula. Based on similar experimental results from the original WDM6 and the modified WDM6 schemes, we can confirm that the generalized double-moment normalization method in the WDM6 scheme is properly implemented. We further collected the observed shape parameters suitable for the generalized double-moment DSD of rain over a two-year summer period (2018, 2019). The modified WDM6, with the observed shape parameters, simulates a more comparable spatial distribution of acummulated precipitation that occurred on 6 August 2013 with the observation, compared to the original WDM6. More detailed simulation results will be presented at the conference.

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