Use of Radar Observations to Evaluate WRF Cloud Microphysics Scheme

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The increase in spatial-temporal resolution of numerical mesoscale models is making possible of direct comparison between model simulated radar reflectivity with that of weather radar. In this talk, we will discuss about evaluating mesoscale model's cloud microphysics scheme using radar data. In particular, we compare Weather Research and Forecasting (WRF) model single moment 6 scheme (WSM6) and WRF Double Moment 6 scheme (WDM6) cloud microphysics with Korean Meteorological Agency S-band radar. Comparison of contoured frequency by altitude diagram (CFAD), time-height cross section, and vertical profile of hydrometeors are utilized to assess the two schemes in simulating summer monsoon and convective precipitation cases of 2011 in Korea.

The results show that for monsoon cases, WSM6 shows a systemic bias of simulating smaller reflectivity values beneath the melting layer when compared to radar data, while WDM6 has a tendency to simulate higher reflectivity. For convective cases, there are still rooms for improvement in the height of melting layer, hydrometeor types, and various precipitation aspects (timing, location, and intensity etc.) of model simulations. Overall, this study shows the possibility of utilizing radar data to validate mesoscale model's output and cloud microphysics scheme in detail. The results obtained herein can fine tune the cloud microphysical schemes and eventually improve numerical weather prediction model's performance and accuracy.