Impact Study of Dual-Polarimetric Radar Data Assimilation with Two-moment Microphysics Schemes for a Severe Rainfall Event in Taipei

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A better description of hydrometeor particle size distribution is important to improve the quantitative precipitation forecast (QPF) in the cloud-resolving numerical model. In the two-moment bulk microphysics scheme, the particle size distribution is determined by the hydrometeor water mixing ratio and the total number concentration of particles. The initial conditions of the above two variables could be estimated via assimilating the radar reflectivity, differential reflectivity (ZDR), specific differential phase (KDP) observations. On the other hand, the model performance could be distinct different due to the different design of the particle size distribution in the microphysical process. Therefore, the microphysics schemes which contribute to the first guess, are also play important roles on the data assimilation performance.

This study will focus on a short-duration extreme rainfall case with 100 mm in 60 minutes in the Taipei Basin of Taiwan on 8 September 2018. Dual-Polarimetric radar data assimilation experiments based on different two-moment microphysics schemes are used to investigate the role of assimilation radar reflectivity, KDP, and ZDR, and the different microphysics schemes on the impacts of the model initial condition and QPF.

Keywords:data assimilation, dual-polarimetric radar, particle size distribution