

Doppler Radar Data Assimilation in Heavy Rainfall Prediction

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The objective of this research is to investigate the improvement of heavy rainfall prediction using Doppler radar (WSR-88D) data for heavy rainfall cases accompanying mesoscale convective systems (MCSs) over the Korean Peninsula. The sensitivity experiments of radar data assimilation are conducted in the MM5 mesoscale model.

In the assimilation experiments of horizontal wind and rain water mixing ratio data, the effects of the assimilation reduce the spin-up time of precipitation for the initial time of model integration, and horizontal wind data contribute better to the improvement of heavy rainfall prediction than the rain water mixing ratio data. The patterns of precipitation in horizontal wind data assimilation experiments correspond to individual convective storms in MCSs appearing in radar observation. In the rain water data assimilation experiments and the experiment without radar data (control), only broad patterns of precipitation are resulted. Hence, in the radar data assimilation the use of both horizontal wind and rain water mixing ratio can improve the prediction of heavy rainfall over Korea. In the nudging experiments, the nudging parameters such as nudging coefficient, radius of influence, and time window are greatly sensitive to the improvement of heavy rainfall prediction. In the rapid update cycle experiments the effects of radar data assimilation are also significant in rain prediction, especially in MCSs development during the first 6 hours, but after that, the effects decrease as time elapses.

Keywords: Doppler radar, heavy rainfall, sensitivity experiment, wind, rain water mixing ratio, nudging, RUC