Radar and Surface Data Assimilation for Heavy Rainfall Prediction

JI-HYUN HA, DONG-KYOU LEE and DAE-YONG EOM
School of Earth and Environmental Sciences, Seoul National University, Seoul, Korea

In this study, the effects of the assimilation of multiple-Doppler radar and surface automatic weather stations (AWS) data to the prediction of heavy rainfall over the Korean Peninsula are investigated. The experiments with/without the data assimilation (RADAR, AWS, CNTL) are conducted for heavy rainfall cases in recent years (2006-2007) using the Weather Research and Forecasting (WRF) model and its three-dimensional variational data assimilation systems (WRF-3DVAR) on 3-km horizontal grid mesh.

The data assimilation using RADAR and AWS data (RADAR+AWS) improves the location of the maximum rainfall with better equivalent threat scores (ETS), compared to CNTL without data assimilation. The location error of the maximum rainfall in RADAR+AWS (121.9 km) decreases by approximately 26 percents as compared to that in CNTL (165.2 km). ETS for the threshold of 25 mm in RADAR+AWS is 0.25 while that in CNTL is 0.15. The improved forecast skill resulted from the data assimilation experiments is characterized by the enhanced development of convective storms by radar data assimilation and the intensified low-level winds by AWS data.

The tuning of the scale length in the 3DVAR for surface AWS data are made by calculating the observation minus background difference (O-B) correlation as a function of AWS station distance. The tuned scale-length in the AWS data assimilation results in further improved forecast skill of heavy rainfall in terms of rainfall distribution.