

5.16 ENSEMBLE KALMAN FILTER ASSIMILATION OF SIMULATED POLARIMETRIC RADAR DATA FOR A TWO-MOMENT BULK MICROPHYSICS SCHEME: OSS EXPERIMENTS

KEFENG ZHU¹, MING XUE^{1,2}, KUN ZHAO¹

¹ Key Laboratory of Mesoscale Severe Weather/Ministry of Education and School of Atmospheric Sciences, Nanjing University, Nanjing, 210093, China

² Center for Analysis and Prediction of Storms and School of Meteorology, University of Oklahoma 73072, United States
kefeng@nju.edu.cn

Dual polarization radar observations is the only observation that could provide three dimensional in-cloud information. The United States has already upgraded all the Doppler radar to polarimetric radar. In China, Doppler radar will also be upgraded to dual polarimetric propriety in the 13th Five-Year planning. How to effectively use the dual Doppler radar data are very important to the future use of dual Doppler radar observations in the operational forecast application.

In this study, the impact of polarimetric variables including Z_{dr} and K_{dp} are examined within Advanced Regional Prediction System Ensemble Kalmar Filter (ARPSEnKF) package for a ideal super storm case. The horizontal grid spacing is 1 km. The microphysical processes are parameterized using double-moment scheme of Milbrandt and Yau. It was found that the optimal horizontal and vertical radius were 4 km and 2 km for both Z_{dr} and K_{dp} . The optimal assimilation threshold of Z_{dr} is 0.3 dB while 0.6 for K_{dp} . Both Z_{dr} and K_{dp} assimilation have reduced analysis and forecast error. The experiment with Z_{dr} assimilation performs better than that of K_{dp} . A series of experiments have also been carried out for the selection of analysis variables for Z_{dr} and K_{dp} assimilation. It was found the optimal combination of analysis variables for Z_{dr} are the vertical velocity, potential temperature, water vapor, hail mixing ratio and number concentration of all species. To our surprise, the adjustment of rain mixing ratio (q_r) does not improve the forecast as expected. In turn, the upgradation of q_r make the forecast worse. For K_{dp} , the upgradation of all analysis variables are the best. Finally, for the assimilation of both Z_{dr} and K_{dp} , experiment with optimal analysis variables combination performs better than experiment without the selection of analysis variables.
