Geophysical Research Abstracts,
Vol. 11, EGU2009-12868, 2009
EGU General Assembly 2009

A multi-case assessment of the ensemble Kalman filter for assimilation of radar observations

A. Aksoy (1), D. Dowell (2), and C. Snyder (2)

(1) Hurricane Research Division, NOAA/AOML, Miami, United States (altug.aksoy@noaa.gov), (2) Mesoscale and Microscale Meteorology Division, NCAR, Boulder, United States

The ensemble Kalman filter (EnKF) is an appealing data-assimilation technique for severe storms and convective-scale motions in general. This is because of the difficulty with most other approaches of constructing multivariate covariance models for such flows and because of the importance of sophisticated physical parameterizations in the forecast model, especially for microphysics.

We test the EnKF for assimilating Doppler-radar observations at convective scales for multiple cases whose behaviors span supercellular, linear, and multicellular organization. The assimilation system combines the parallel EnKF algorithm of the Data Assimilation Research Testbed with the Weather Research and Forecasting model at 2-km horizontal grid spacing. In each case, reflectivity and radial velocity measurements from a single operational radar are assimilated every 2 minutes for a duration of 60 minutes. De-aliasing of folded radial-velocity observations occurs within the EnKF during the assimilation step.

The EnKF performs with robust results across all the cases: the rms prior fits to observations in each case are 3–6 $\mathrm{m\,s^{-1}}$ and 7–10 dBZ for radial velocity and reflectivity, respectively. A critical aspect of the assimilation system is the representation of mesoscale uncertainty, albeit in the simplest form of perturbations to the initial environmental sounding, which increases the ensemble spread and improves filter performance. Assimilation of "no-precipitation" observations (that is, reflectivity observations with values small enough to indicate the absence of precipitation) is also beneficial, especially for the multicell case, as it serves to suppress spurious convection in ensemble members. Longer, 30-min forecasts proceed smoothly from the EnKF analyses, without obvious shocks or spurious decay of convection, and have reasonable skill.