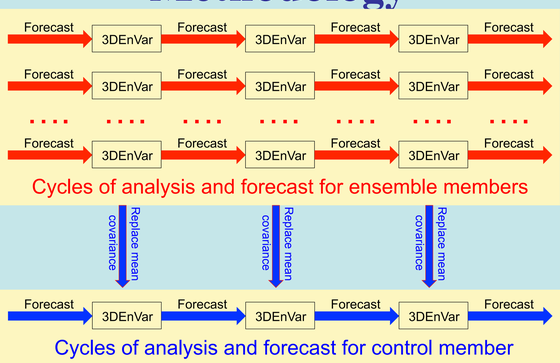
The Development of an Ensemble of 3DEnVar System for Severe Convective Weather with WRF Model Interface

Sijie Pan[1,2], Jidong Gao[2], Xuguang Wang[1] and David J. Stensrud[3]
[1]School of Meteorology, University of Oklahoma, Norman, OK 73072
[2]National Severe Storm Laboratory, NOAA, Norman OK 73072
[3]Department of Meteorology, Pennsylvania State University, University Park, PA 16802

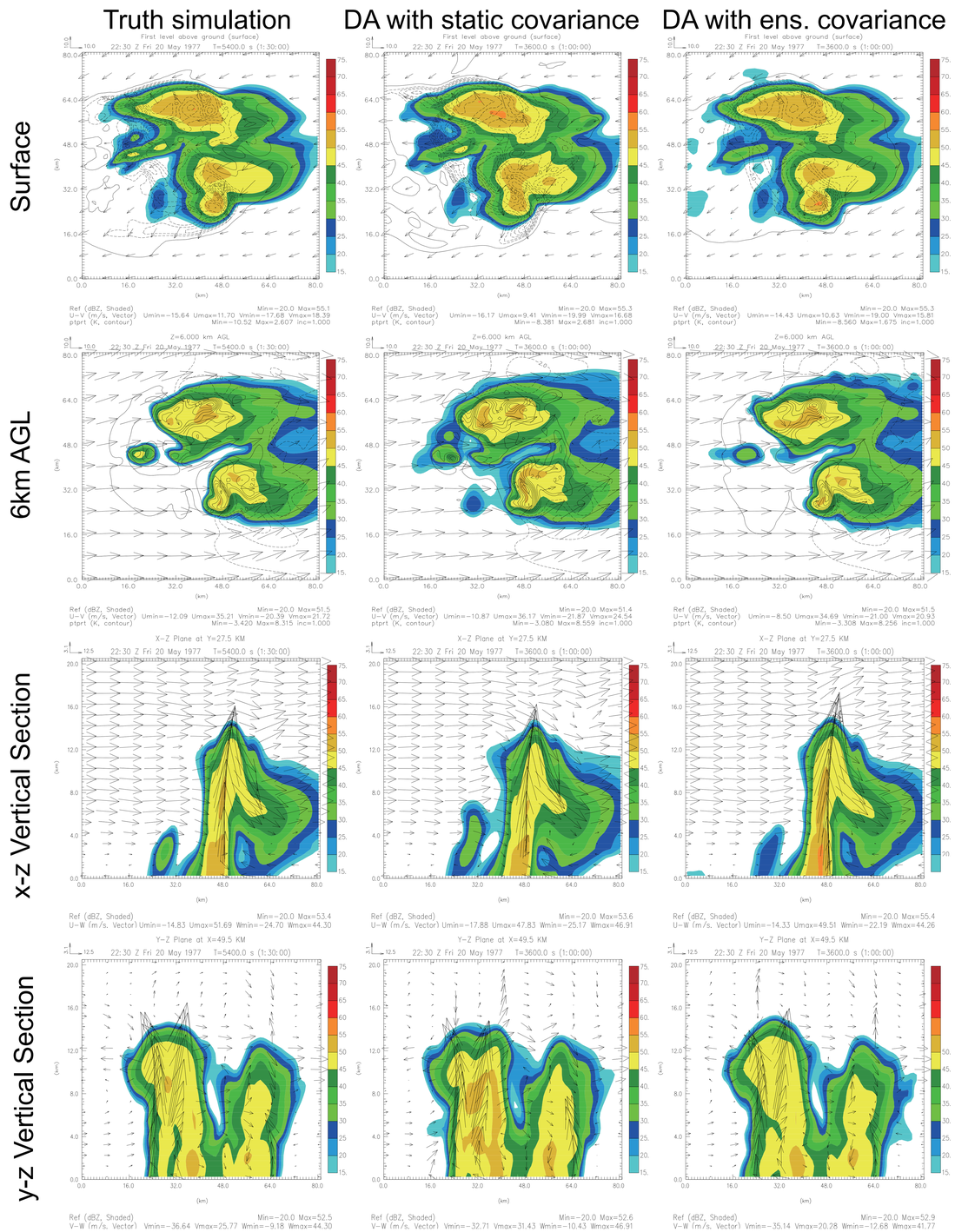
Research Objectives

Develop an ensemble of 3DEnVar system which uses ensemble information in a three-dimensional variational data assimilation system which is suitable for severe convective storms.

Methodology



- Obs.: simulated radial winds and reflectivity
  Bkg.: background ensemble is from previous ensemble forecasts
- WRF 3D quarter-circle shear supercell si mulation with 1km horizontal resolution dx=dy=1km, and 0.5km vertical resolution dz=0.5km.
  6 category water/ice microphysics of Lin et al.
- A nature truth simulation is started from an environmental sounding.
- The simulated observations are obtained periodically (every 5 min) from a 2-hour truth run.
- Two Types of experiments are performed, one with a static covariance and another with a ensemble covariance respectively. Each type contains 13 analysis-forecast loop.
- The variations of RMS errors of wind field, potential temperature and composite reflectivity with the time are plotted here to show the quality of analysis.



Summary

✓ In this study, an ensemble of 3DEnVar system for WRF model has been developed.

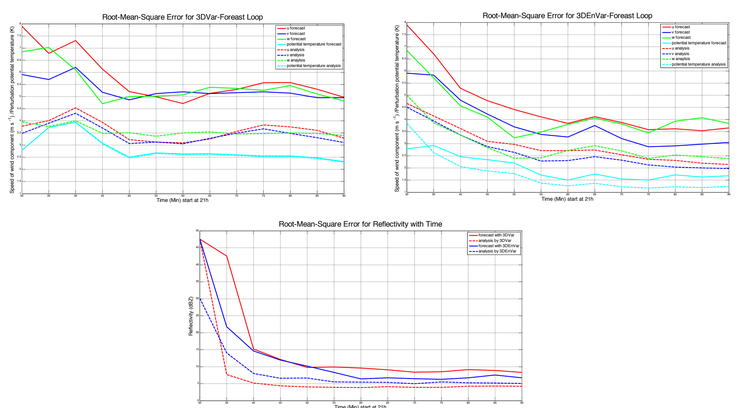
✓ The flow-dependent covariances derived from ensemble of model forecasts are used in the ensemble of 3DEnVAR analyses.

✓ It is shown that the flow-dependent ensemble covariances derived from this ensemble 3dvar system is effective in producing quality analysis for the WRF model.

✓ Most important features of the simulated storm including low-level cold pool and convergence, middle-level mesocyclone are well analyzed.

Future work

- Add the assimilation of cloud water path derived from satellite (GOES).
- Apply this method to real data cases.



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