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An operational mesoscale ensemble data assimilation and prediction system: E-RTFDDA

Y. Liu, T. Hopson, G. Roux, J. Hacker, M. Xu, T. Warner, and S. Swerdlin

National Center for Atmospheric Research, Research Application Lab, Boulder, United States (yliu@ucar.edu)

Mesoscale (2-2000 km) meteorological processes differ from synoptic circulations in that mesoscale weather changes rapidly in space and time, and physics processes that are parameterized in NWP models play a great role. Complex interactions of synoptic circulations, regional and local terrain, land-surface heterogeneity, and associated physical properties, and the physical processes of radiative transfer, cloud and precipitation and boundary layer mixing, are crucial in shaping regional weather and climate. Mesoscale ensemble analysis and prediction should sample the uncertainties of mesoscale modeling systems in representing these factors. An innovative mesoscale Ensemble Real-Time Four Dimensional Data Assimilation (E-RTFDDA) and forecasting system has been developed at NCAR. E-RTFDDA contains diverse ensemble perturbation approaches that consider uncertainties in all major system components to produce multi-scale continuously-cycling probabilistic data assimilation and forecasting. A 30-member E-RTFDDA system with three nested domains with grid sizes of 30, 10 and 3.33 km has been running on a Department of Defense high-performance computing platform since September 2007. It has been applied at two very different US geographical locations; one in the western inter-mountain area and the other in the northeastern states, producing 6 hour analyses and 48 hour forecasts, with 4 forecast cycles a day. The operational model outputs are analyzed to a) assess overall ensemble performance and properties, b) study terrain effect on mesoscale predictability, c) quantify the contribution of different ensemble perturbation approaches to the overall forecast skill, and d) assess the additional contributed skill from an ensemble calibration process based on a quantile-regression algorithm. The system and the results will be reported at the meeting.