Surface data assimilation using an ensemble Kalman filter: Forecast results from spring 2007

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I. INTRODUCTION

Surface observations provide a wealth of information on mesoscale features such as mesohighs, mesolows, drylines, frontal boundaries, sea breezes, and heat islands. Forecasters depend upon these observations for making decisions regarding convective development. States and private companies are deploying surface observing sites to monitor road conditions and provide local support for a wide variety of activities, leading to an ever-increasing number of surface observations. Yet the value of surface observations for short-range mesoscale numerical weather prediction remains uncertain, perhaps due to the methods by which these observations are assimilated into models.

II. ASSIMILATION PROCEDURE

As part of the NOAA Storm Prediction Center 2007 Spring Forecasting Experiment, a 30-member short-range ensemble forecasting system using the Weather Research and Forecasting (WRF) model is being developed that explores the use of surface observations in mesoscale ensemble forecasts. The forecast domain covers the contiguous 48 states and has a horizontal grid spacing of 30 km. Daily forecasts will be made from 15 March through 1 June 2007.

Routine hourly surface observations of 2-m temperature, 2-m dewpoint temperature, and 10-m winds are assimilated into the ensemble from 1200 to 1800 UTC and followed by a 42-h forecast. The data assimilation is conducted using the Data Assimilation Research Testbed (DART) square-root ensemble Kalman filter. In addition, each ensemble member has a different set of model physical process parameterization schemes and the ensemble initial and boundary conditions are perturbed following Torn et al. (2006). Thus, the ensemble represents both initial condition and model physics uncertainties as also configured in Fujita et al. (2007). Results from this ensemble will be compared against an ensemble without data assimilation started at 1800 UTC to document any improvements to the forecasts due to the assimilation of the surface observations during the first half of the daytime diurnal heating cycle. Particular attention will be paid to mesoscale features, such as drylines and cold pools, incorporated into the model through the surface data assimilation that are not present in the runs without surface data assimilation.

III. RESULTS AND CONCLUSIONS

Initial results available at the time of abstract submission suggest that the ensemble Kalman filter approach is providing improved analyses of mesoscale features and probabilistic forecasts of deep convection. Results will continue to be analyzed as the Spring Forecasting Experiment evolves and will be presented at the conference.

IV. AKNOWLEDGMENTS

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V. REFERENCES

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