Improving Convective Forecast Skill via Ensemble Data Assimilation with WRF-DART

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Convective forecasts remain a considerable challenge [1, 2] and probabilistic forecasts provide a path toward better quantifying convective forecast uncertainty. Ensemble data assimilation systems can provide initial conditions to probabilistic forecasts. Where residual variance remains in the analysis, assimilation of supplemental observations in these regions can further reduce initial condition uncertainty and may lead to improvements in probabilistic forecast skill. During Spring 2013, the Mesoscale Predictability Experiment (MPEX) seeks to improve short-term (here 6-15 h) forecasts of convective weather episodes over the Great Plains. This will be achieved by increasing observation density in the vicinity of small-scale disturbances upstream of anticipated convective weather events where initial conditions are anticipated to be less certain and the assimilation of additional data could impact the subsequent forecast of convection. In addition, supplemental radiosondes will be released in the vicinity of the target region during the time convection is expected to develop. Realtime forecasts will be initialized from a continuously cycled WRF-DART ensemble data assimilation system, similar to past seasons [3] except in 2013 a 10- or 30-member 48 h convection permitting ensemble forecast will be made twice daily. Ensemble sensitivity analysis (ESA) [4] will offer guidance for realtime operations by identifying potential target regions for dropsondes and supplemental radiosondes.

In retrospective experiments the impact of the additional mesoscale spaced (~150 km) dropsonde data will be assessed through a set of data denial experiments (with and without supplemental dropsonde data). Verification of ensemble forecasts will be made against conventional observations, supplemental radiosondes, and Stage IV precipitation analysis. Moreover, we will also assess the relative utility of the ESA to identify a priori targeted observation locations for convection forecasts. At the workshop, we will provide a brief overview of MPEX, assess general performance characteristics the realtime WRF-DART analysis and forecast system, and preliminary results from retrospective case studies.

References

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