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Storm-Scale Ensemble Forecasts for the 2015 NOAA HWT Spring Forecasting Experiment: Comparison between Cycled EnKF and 3DVAR Ensembles

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The Center for Analysis and Prediction of Storms (CAPS) produced 2015 Storm-Scale Ensemble Forecast (SSEF) from late April through early June 2015, encompassing the NOAA HWT 2015 Spring Experiment that is officially between 04 May and 05 June. Different from past years, the 2015 SSEF CONUS domain is changed from 4-km to 3-km horizontal grid spacing, resulting in 2.1 times more grid points and covering 18% more area than in 2014 season. There are two suites of SSEF runs. One is the 3-km ensembles initiated from a single time 3DVAR analysis at 0000 UTC; consisting of 20 WRF-ARW members, with the forecast lead time of 60 hours. The second suite is a newly implemented realtime EnKF based forecasting that includes a one hour EnKF cycling at 15 min interval from 2300 UTC to 0000 UTC following a 5-h 40-member ensemble forecast initiated from 1800 UTC, over the same CONUS domain. In order to provide an ensemble background for EnKF, a separate 3-km ensemble of 5-h forecasts, starting at 1800 UTC, with 40 WRF-ARW members is produced over the same CONUS domain. This ensemble is configured with initial perturbations and mixed physics options to provide input for EnKF analysis. Each member uses WSM6 microphysics with different parameter settings. No radar data is analyzed for this set of runs. All members also include random perturbations with recursive filtering of $\sim$20 km horizontal correlations scales, with relatively small perturbations (0.5K for potential temperature and 5% for relative humidity). EnKF analysis (cycling), with radar data and other conventional data, is performed from 23 to 00 UTC every 15 min over the CONUS domain, using as background the 40-member ensemble. A 12-member ensemble forecast (60h) follows using the last EnKF analyses at 0000 UTC.
WRF-ARW V3.6.1 was used, with different microphysics and PBL schemes assigned for different members. In addition to Thompson, Milbrandt-Yau, and Morrison microphysics schemes, two newly developed P3 (Predicted Particle Properties) microphysics by Morrison and Milbrandt, one with a single ice category and another with two ice categories, are implemented and included in 2015 SSEF ARW ensemble members. A Thompson scheme addressing fractional cloudiness is also included. Model simulated radar reflectivity is computed within each individual microphysics algorithm. PBL schemes used include MYJ, MYNN, QNSE, YSU, as well as a modified YSU by Greg Thompson in an attempt to correct the overly dry and warm PBL issue of YSU. Preliminary examination and comparison of the ensemble forecast results from both suites will be presented.