



Storm-Scale Ensemble Forecasts for the NOAA HWT Spring Forecasting Experiment and HMT FFaIR Experiment

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The Center for Analysis and Prediction of Storms (CAPS) produced Storm-Scale Ensemble Forecast (SSEF) from late April through July in 2016, and will do in 2017, encompassing the NOAA HWT Spring Forecasting Experiment in May and the HMT Flash Flood and Intense Rainfall Experiment (FFaIR) in June and July, with a 3-km horizontal grid spacing over the continental US domain. The CAPS SSEF is a large part of a Community Leveraged Unified Ensemble (CLUE) “grant ensemble” for the HWT SFE2016 and SFE2017, coordinated among various groups including NSSL, SPC, CAPS, NCAR, UND, EMC, GSD, and DTC, in an effort to provide guidance to the design of near-future operational SSEF systems for EMC. There are two suites of SSEF runs in 2016 season for HWT. One is the 3-km ensembles initiated from a single time 3DVAR analysis at 0000 UTC, utilizing ARPS 3DVAR and Cloud Analysis to analyze all Doppler Weather Radar data and MADIS with Mesonet1 data feed; consisting of 19 WRF-ARW members and 6 NMMB members, with the forecast lead time of 60 hours (36 hours for NMMB and single physics ARW members). The second suite is an experimental realtime GSI+EnKF based forecasting that includes a five hour GSI hourly cycling from 1800 to 2300 UTC followed with a one hour EnKF cycling at 15 min interval from 2300 UTC to 0000 UTC. The total 6 hour cycling is carried out with a 40-member WRF-ARW ensemble forecast initiated from 1800 UTC over the same CONUS domain. This ensemble is configured with initial perturbations and mixed physics options to provide input for GSI and EnKF analysis. A 12-member ensemble forecast (60h) follows using the last EnKF analyses at 0000 UTC.

QPF verification shows that the single physics ARW sub-ensemble have comparable ETS and ROC scores to the mixed sub-ensemble; While NMMB members generally score lower in terms of QPF ETS scores. For the light rain threshold, the GSI+EnKF based SSEF scores higher than or comparable to the 3DVAR based SSEF until 12 hours into the forecast, are nearly identical for forecast hours 15–18 and are trailing afterward. The SSEF initialized with 3DVAR performs better at all forecast periods for higher threshold.

CAPS contributes into the FFaIR Summer Experiment in the hydrometeorological Testbed (HMT) by producing probabilistic QPF and Exceedances of Flash Flood guidance (FFG) and Recurrence Intervals (RIs) in a neighborhood framework (with a 40-km radius) from a 15-member SSEF of ARW and NMMB members. Among FFaIR product suites, the CAPS SSEF was evaluated by FFaIR participants as one of top performer in terms of Day 1 and Day 2 QPF forecast.