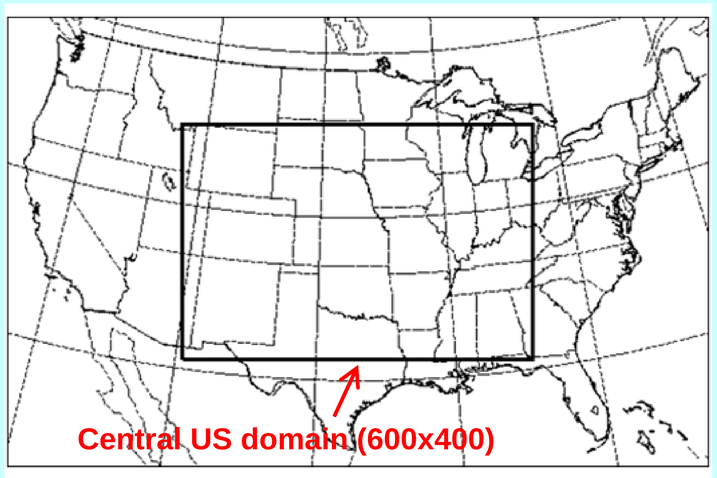
CAPS Storm-Scale Ensemble Forecasting for the NOAA HWT 2013 Spring Experiment

Fanyou Kong[1], Ming Xue[1,2], Kevin W. Thomas[1], Yunheng Wang[1], Keith Brewster[1], Xuguang Wang[1,2], Youngsun Jung[1]
Adam Clark[4], I. L. Jirak[3], Mike Coniglio[4], J. Correia Jr[3], Steve J. Weiss[3], P. Marsh[4], John Kain[4]
[1]Center for Analysis and Prediction of Storms and [2]School of Meteorology, the University of Oklahoma, Norman, OK 73072
[3]NOAA/Storm Prediction Center, Norman, OK [4]NOAA/National Severe Storm Lab, Norman, OK

In support of the NOAA Hazardous Weather Testbed (HWT) 2013 Spring Experiment, the Center for Analysis and Prediction of Storms (CAPS) produced multi-model storm-scale ensemble forecasts (SSEF) in realtime from 6 May through 7 June 2013. 30-member 48-h ensemble forecasts, consisting of 26 WRF-ARW members, 1 ARPS, and 3 COAMPS members, were performed over the entire CONUS domain at 4-km grid spacing on weekdays and selected weekend days, all initiated at 0000 UTC. An 8-member 18-h ensemble forecast was initialted at 12 UTC.

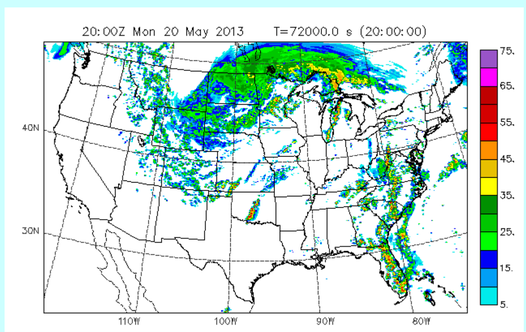
This work is primarily funded by the NOAA CSTAR program, leveraged by other grants

CONUS domain (1200x867)



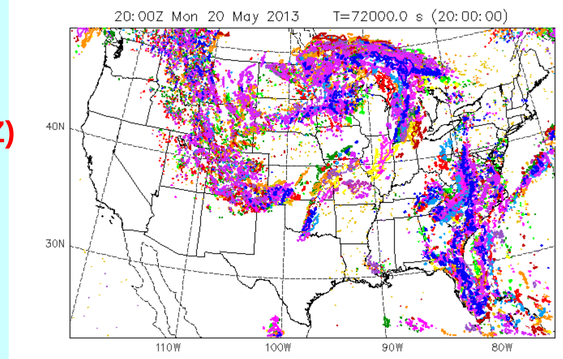
Forecast domain for the 2013 HWT Spring Experiment. The inner box is for the experimental EnKF forecasting runs.

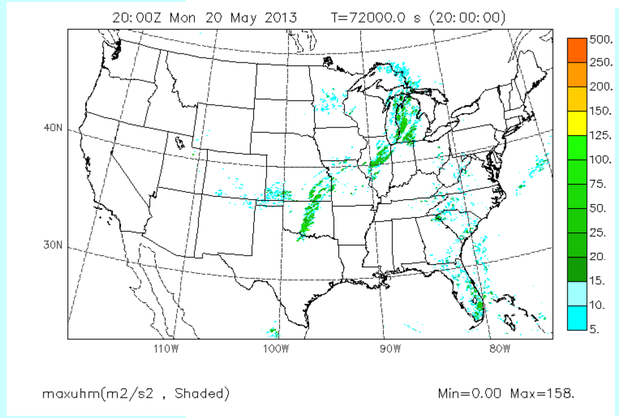
Moore, OK Tornado Case (May 20, 2013)



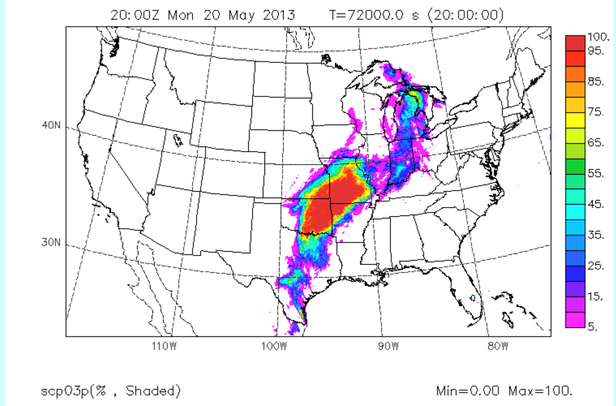
Composite reflectivity 20-h forecast

Spaghetti Chart (35dBZ)



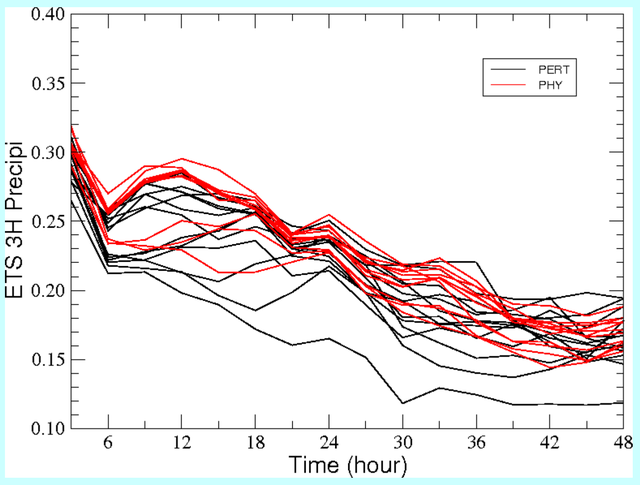


max UH

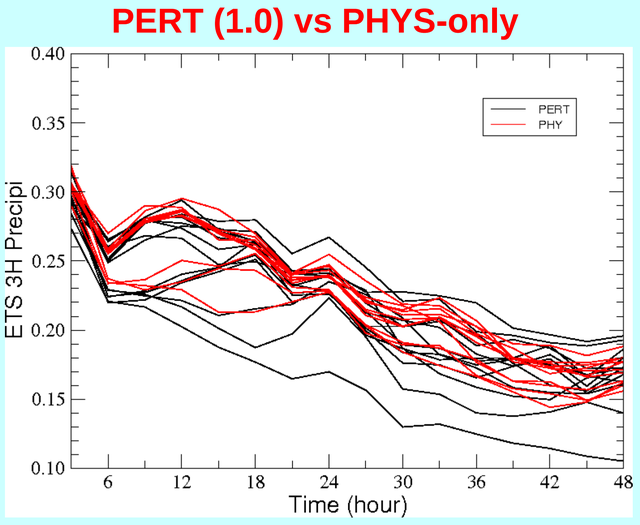


Significant Tornado Parameter >=3

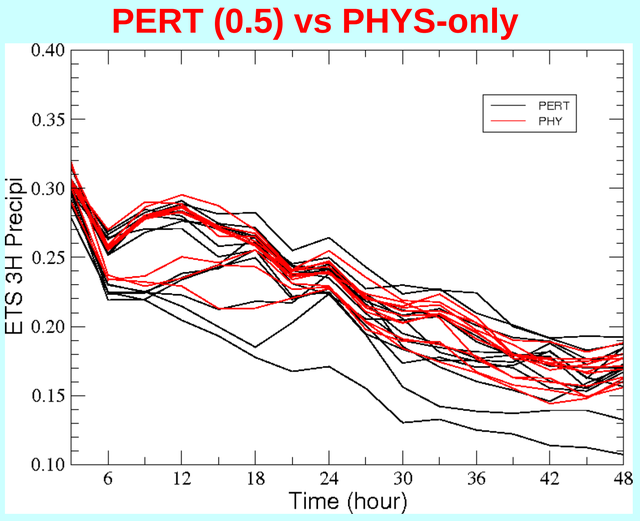
PERT (2.0) vs PHYS-only



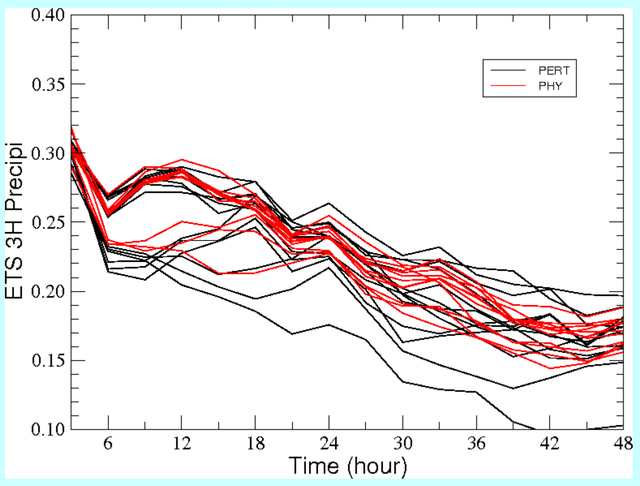
PERT (1.0) vs PHYS-only



PERT (0.5) vs PHYS-only

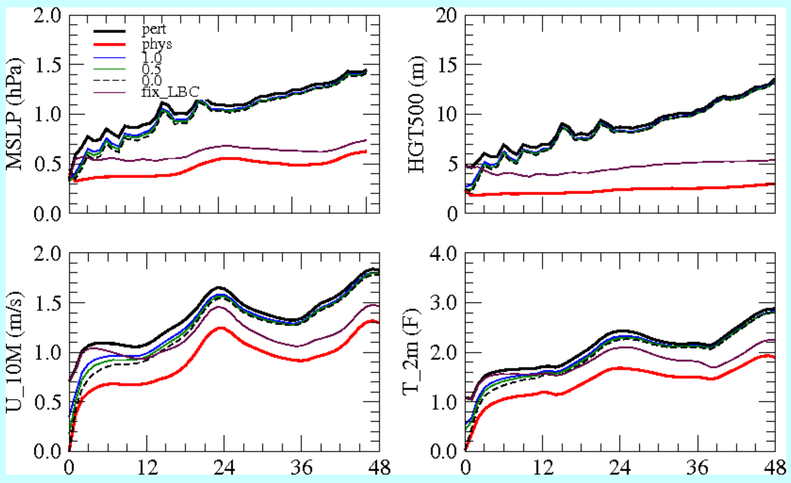


PERT (0.0) vs PHYS-only



Perturbation Experiments

IC pert 2.0	SREF LBC
IC pert 1.0	SREF LBC
IC pert 0.5	SREF LBC
IC pert 0.0	SREF LBC
IC pert 2.0	NAM LBC

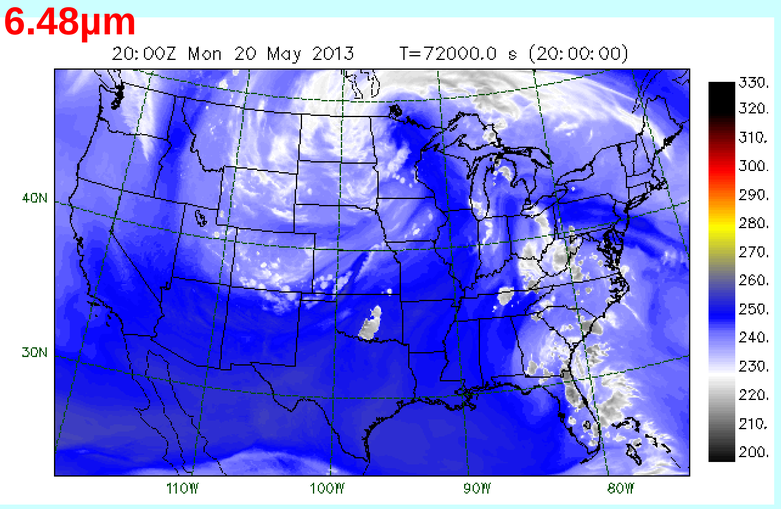


Ensemble domain-mean spread: Perturbed ensembles have much larger spread than physics-only ensemble. LBC perturbation play key role in larger spread.

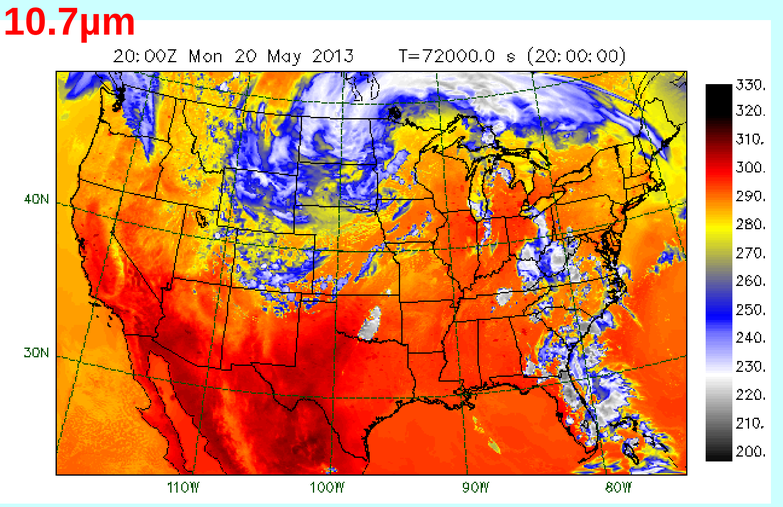
New SSEF Forecast products

Synthetic GOES IR Brightness Temperature

6.48μm

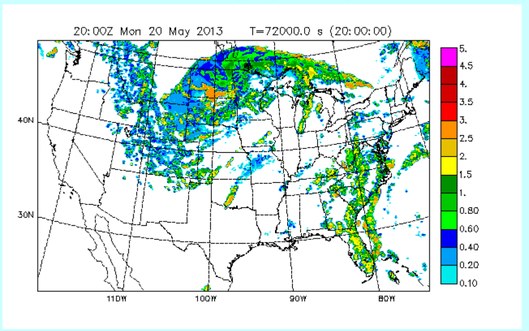


10.7μm

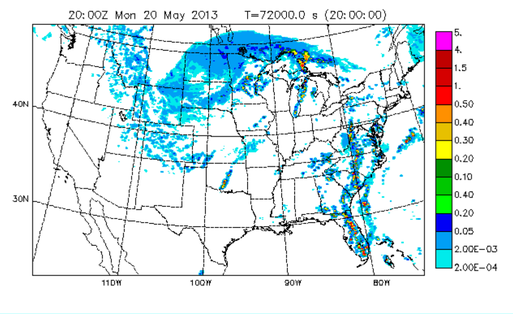


Simulated dual-polarmetric radar parameters

Simulated differential reflectivity (ZDR) – dB



Simulated specific differential Phase (KDP) – deg/km



- **Storm-scale ensemble could provide crucial guidance for severe high-impact weather such as tornado and thunderstorms**
- **Ensembles with IC (initial condition) and LBC (lateral boundary condition) perturbations derived from regional or global ensemble have much larger spread than physics-only ensembles**
- **LBC perturbations play key role in larger ensemble spread**
- **Lower IC perturbation amplitude can help having improved QPF skill scores. High IC perturbation amplitude have negative impact to the skill, even though with larger spead.**