Comparison of the HRRR Time-Lagged Ensemble to Formal CAM Ensembles during the 2018 HWT Spring Forecasting Experiment

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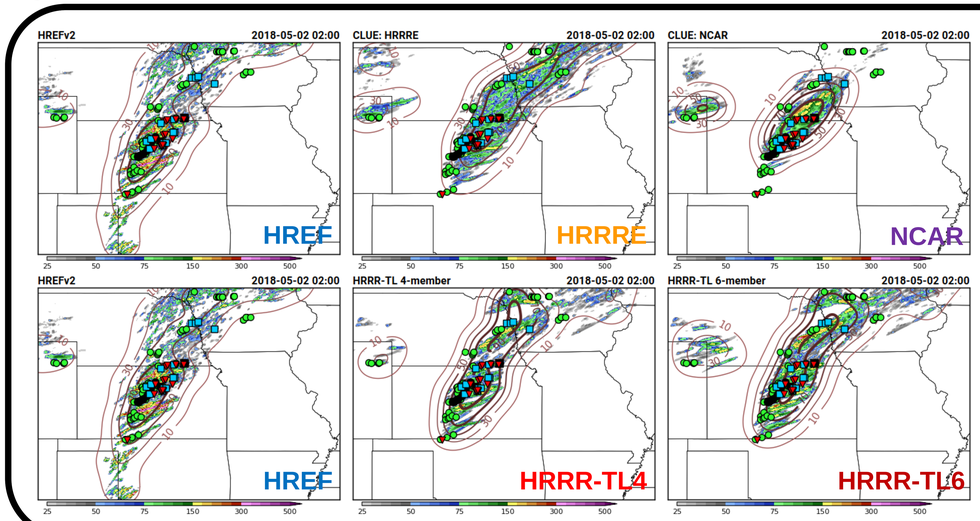
Introduction

- Three convection-allowing model (CAM) ensembles were compared to time-lagged ensembles generated from the High Resolution Rapid Refresh (HRRRv3) during the 2018 NOAA HWT Spring Forecasting Experiment (SFE2018) from 30 April – 1 June: the operational High Resolution Ensemble Forecast (HREF) system, the HRRR ensemble (HRRRE), and the National Center for Atmospheric Research (NCAR) ensemble
- These 12Z CAM ensembles were evaluated subjectively on hourly maximum field (HMF) forecasts (e.g., updraft helicity – UH) for severe weather guidance.

12Z CAM Ensembles Evaluated during SFE2018

- HREFv2: 8-member multi-model (WRF-ARW &NMMB); multi-physics; multi-initial conditions (NAM & RAP, four 12-h time-lagged members)
- HRRRE: 9-member single-model (WRF-ARW); single-physics; multi-initial conditions (from 36-member 3-km EnKF data assimilation system with hourly cycling from 03Z initialization)
- NCAR: 10-member single-model (WRF-ARW); single-physics; multi-initial conditions (from 80-member 15-km DART EnKF data assimilation system with continuous hourly cycling)
- HRRR-TL: 4- or 6-member single-model (HRRRv3); single-physics; multi-initial conditions (four 1-h time-lagged members; plus 6- and 12-h time-lagged members for HRRR-TL6)



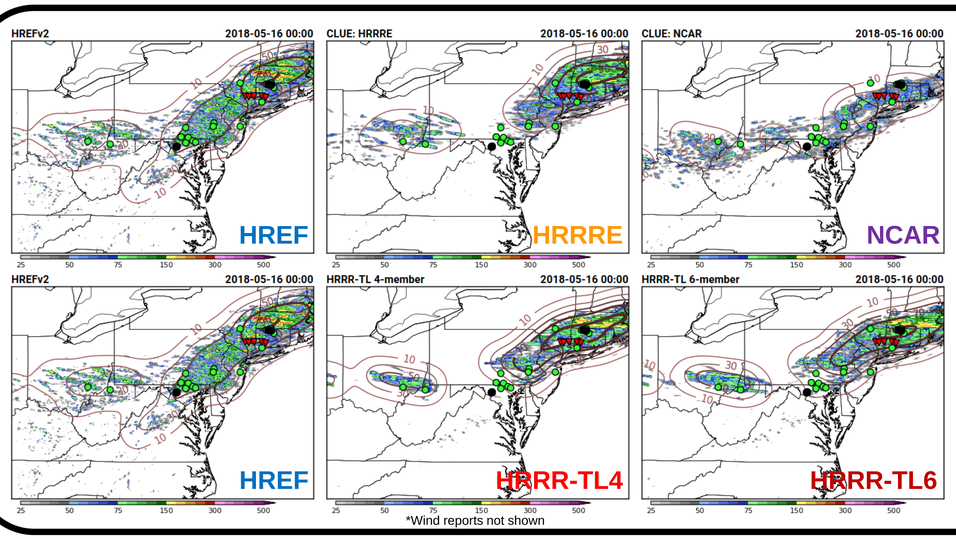
1 May 2018
22-02Z
Moderate Risk over central KS

HREF focuses highest UH probs over proper region

HRRRE UH probs are elongated too far to the NE

NCAR forecast is underdispersive

HRRR-TL also overconfident, but UH probs nicely capture reports



15 May 2018
20-00Z
Moderate Risk over Northeast

HREF UH max slightly displaced, but broadest probs

HRRRE UH prob max is located too far to the north

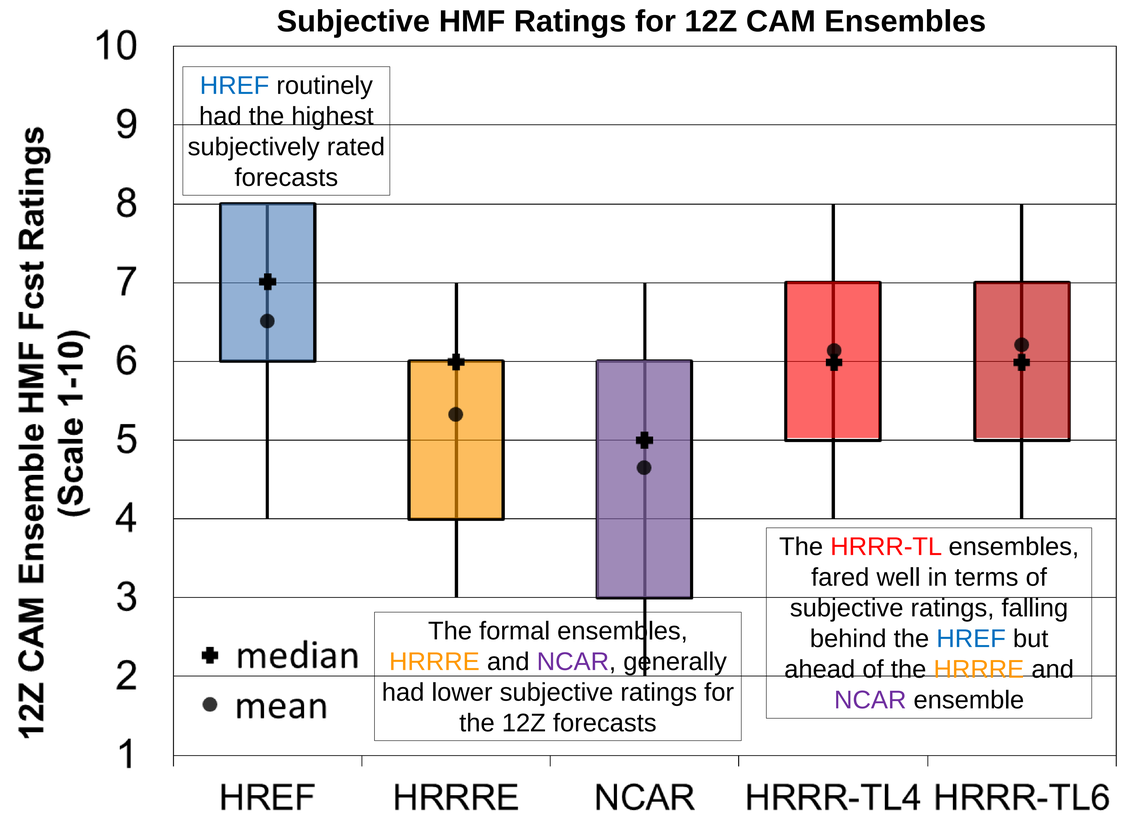
NCAR forecast lowest UH probs

HRRR-TL generates perhaps the best location of UH probs

*Wind reports not shown

Results of Subjective Ensemble Forecast Evaluation

- Ensemble maximum and neighborhood probabilities of HMF fields (typically UH and 10-m wind speed) were subjectively evaluated by SFE2018 participants for correspondence with severe weather reports from 16-03Z and assigned a rating on a scale of 1-10, with 10 being best.



Summary and Conclusions

- Three CAM ensembles were compared for severe weather events to 4- and 6- member HRRR-TL ensembles during the five-week HWT SFE2018: HREF, HRRRE, and NCAR
- The HREF was the highest subjectively rated 12Z ensemble during SFE2018, likely owing to a more diverse ensemble forecast represented by broader probabilistic fields.
- The HRRR-TL ensembles fared well in subjective ratings, commonly outperforming the HRRRE, a formal initial-condition ensemble with ensemble DA, using the same model configuration.
- These results suggest that HRRR-TL ensembles are an ***underutilized resource*** in NWS severe weather operations, given that the data (i.e., HRRR output) already exist operationally and are updated on an hourly basis.

Acknowledgements

- Earth System Research Laboratory (ESRL)/Global Systems Division (GSD): Curtis Alexander, David Dowell
- National Center for Atmospheric Research (NCAR): Glen Romine, Craig Schwartz, Ryan Sobash