



9th NOAA TBPG Workshop

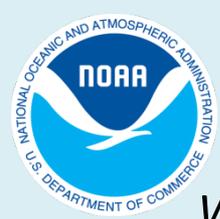
Kansas City, MO

April 10-11, 2018

Roundup Presentation

Hazardous Weather Testbed

Kodi Berry (CIMMS/NSSL), Alan Gerard (NSSL), Israel Jirak (SPC), and Steven Weiss (SPC)



Hazardous Weather Testbed

Where practitioners and researchers work together to enhance community collaboration and accelerate the transfer of research to operations...



Local NWS Forecast Office (OUN):
Regional responsibility

NCEP Storm Prediction Center (SPC):
Nationwide Responsibility

Warning
Research

Forecasting
Research

Satellite-based
Research



Experimental
Warning
Program



Experimental
Forecast
Program

Detection/prediction of hazardous weather events up to several hours in advance

Prediction of hazardous weather events from a few hours to a week in advance

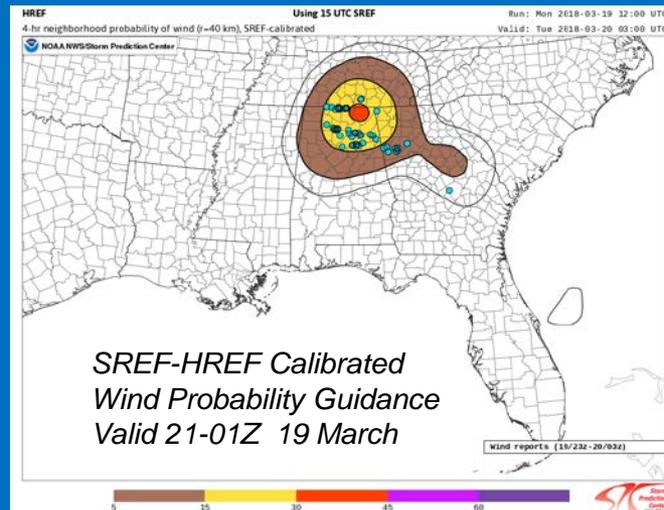
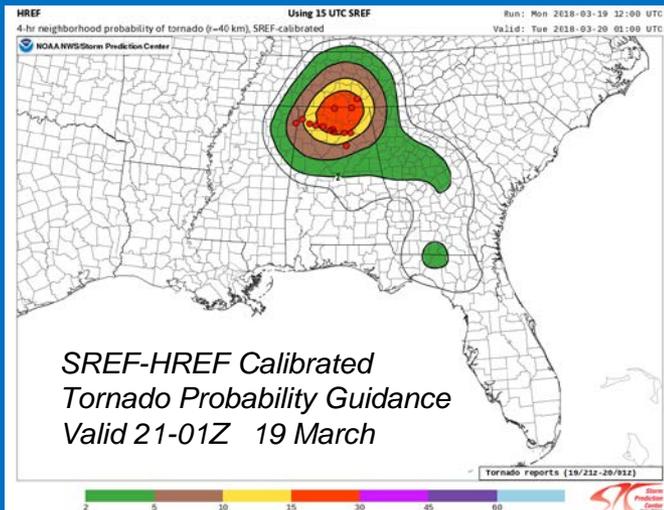




FY17 Highlights

HWT Experimental Forecast Program

- EFP Spring Forecasting Program ran 1 May-2 June 2017
- Developed and tested multi-model and multi-ensemble based calibrated probabilistic hazard guidance for high-temporal resolution severe storm outlooks
 - SREF-SSEO environment/storm attribute fields (hail, wind, tornado)
 - Temporal disaggregation technique (hail, wind, tornado)
 - RAP-HRRR hourly forecasts (tornado)

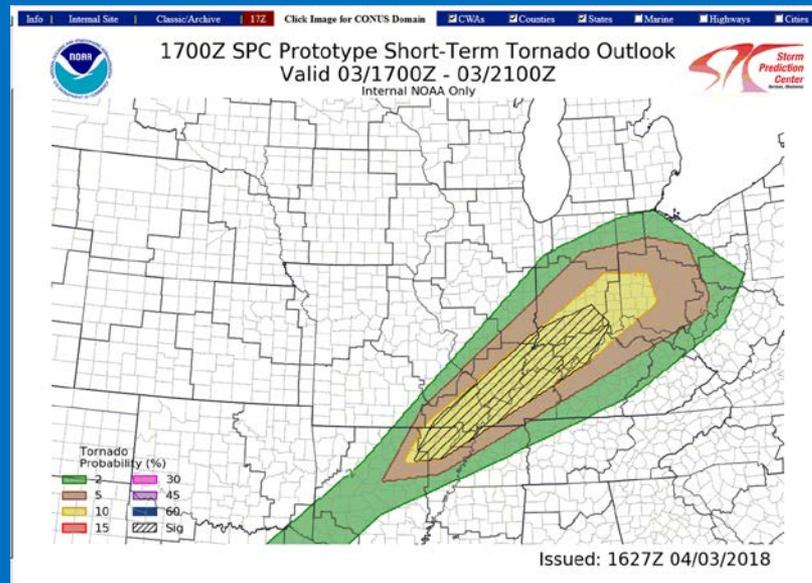




FY17 Highlights

HWT Experimental Forecast Program

- EFP Spring Forecasting Program ran 1 May-2 June 2017
- Provided proof-of-concept validation for experimental SPC short-term frequently updated outlooks
 - FACETs Pathfinder experiment March 20-June 29, 2018
 - SPC currently producing experimental short-term (0-4 h) probabilistic tornado outlooks issued 17, 19, 21, and 23Z





FY17 Highlights

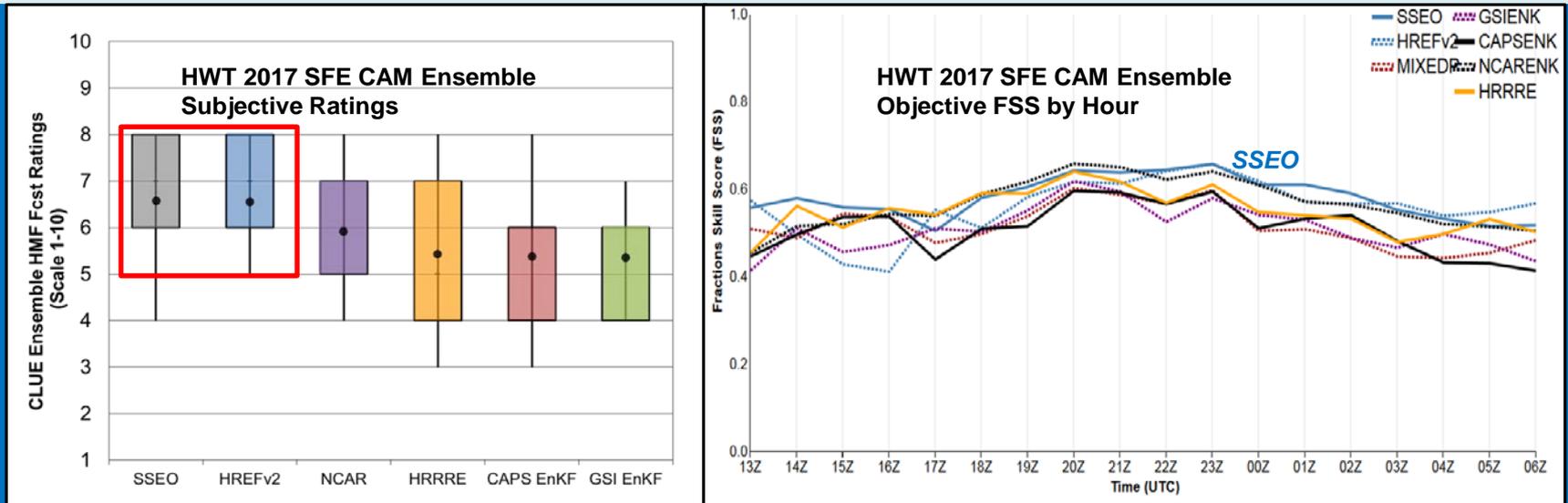
HWT Experimental Forecast Program

- Updated Community Leveraged Unified Ensemble (CLUE) to inform NOAA/EMC convection-allowing model (CAM) ensemble system design (UMAC recommendation)
- 75 members contributed by OU/CAPS, NSSL, NCAR, SPC, GSD, GFDL, OU/MAP with assistance from EMC and DTC
- CLUE provided effective framework for testing/evaluating CAM ensemble configuration and design
 - HREFv2 performed similarly to SSEO
 - For severe weather guidance, SSEO and HREFv2 received higher scores from participants and objective metrics
 - HREFv2 implemented operationally by EMC in November 2017
 - Baseline for next-generation CAM ensemble comparison



FY17 Highlights

HWT Experimental Forecast Program



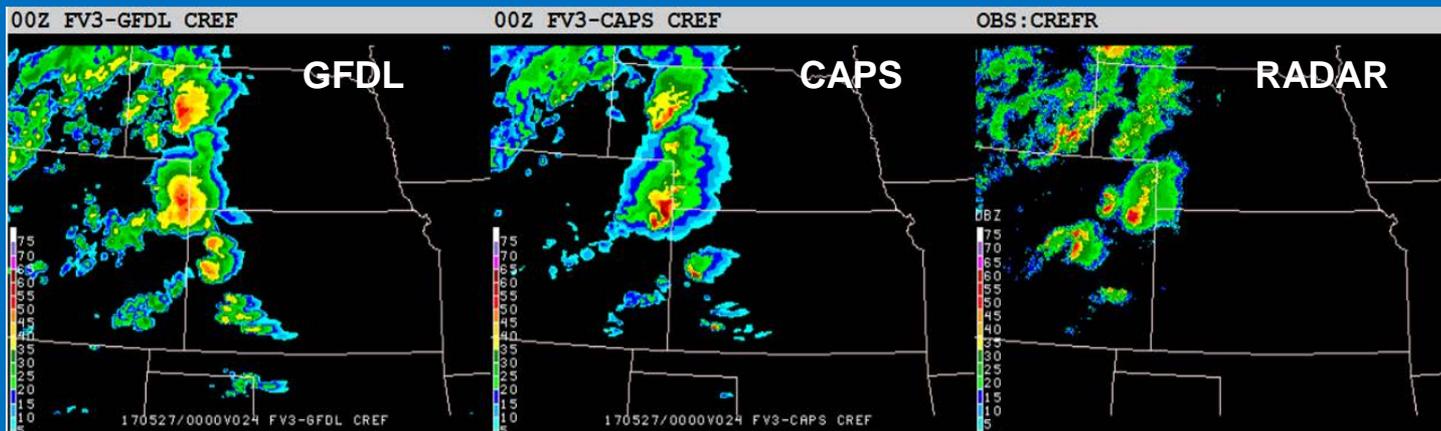
- **CLUE provided effective framework for testing/evaluating CAM ensemble configuration and design**
 - HREFv2 performed similarly to SSEO
 - For severe weather guidance, SSEO and HREFv2 received higher scores from participants and objective metrics
 - **HREFv2 implemented operationally by EMC in November 2017**
 - Baseline for next-generation CAM ensemble comparison



FY17 Highlights

HWT Experimental Forecast Program

- **Examined real-time 3 km FV3 runs for first time**
 - Subjective ratings indicated FV3-CAM simulated reflectivity forecasts were comparable to operational CAMs
 - FV3 exhibited lower skill using UH-surrogate severe method compared to NSSL-WRF
 - Initial testing showed promise to develop FV3 for multi-scale NWP applications



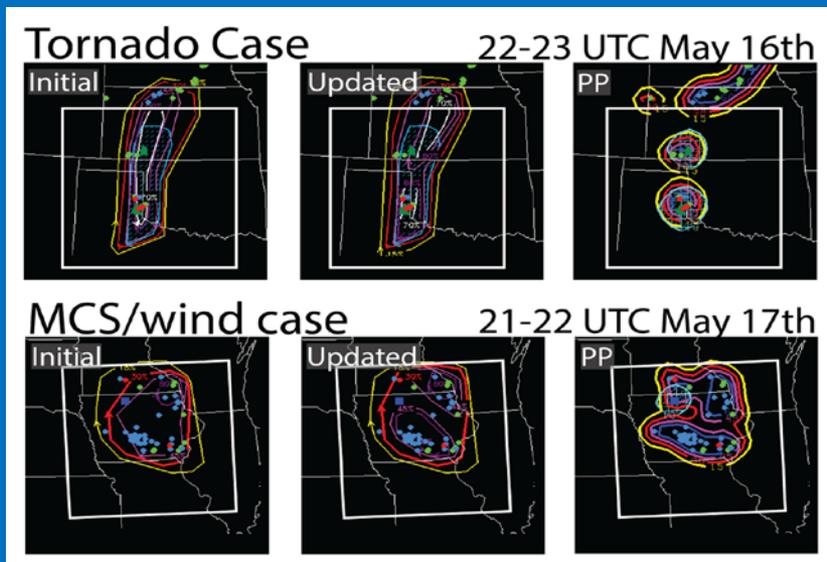
24-h Forecasts of 3 km FV3 Simulated Reflectivity valid 00Z 27 May 2017



FY17 Highlights

HWT Experimental Forecast Program

- Tested a real-time prototype Warn-on-Forecast short-term NWP system for first time in EFP (NEWS-e)
 - The WoF system and forecast process evolved during the 5-week EFP
 - Used 19Z 4-hr forecast and 20Z 3-hr forecast in late afternoon for experimental 1-hr severe weather forecasts
 - Supercell (UH) forecasts highly accurate for selected events



Example cases of 1-hr severe probability forecasts formulated using WoF guidance

Initial forecast based on 19Z WoF guidance and Updated forecast utilized 20Z guidance

Severe reports denoted by color dots



FY17 Transition Metrics

HWT Experimental Forecast Program

Major Tests Conducted	Transitioned to Operations (RL9)	Recommended for Transition to Operations (RL9)	Advanced To Experimental Testing (RL8)	Further Demonstration/ Development (RL 5-7)	Rejected For Further Testing
Updated 4-hr Outlooks for Individual Severe Hazards		X			
Severe Risk Timing Information: Isochrone Graphics				X	
Calibrated Probabilistic Hazard Guidance (Hail, Wind, Tornado)				X	
Community Leveraged Unified Ensemble (CLUE)			X		
CLUE Result: SSEO/HREF Performance	X				
CLUE Result: FV3 at CAM scale				X	
Prototype WoF System				X	
Totals	1	1	1	4	0



FY18 Highlights: Update and Plans

HWT Experimental Forecast Program

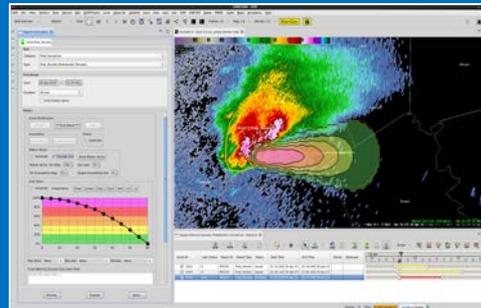
- **Spring Forecasting Experiment: Apr 30 - Jun 1, 2018 (5 weeks)**
- **Continued focus on evaluation, data extraction, PHI, and utilization of cutting-edge CAMs and CAM ensembles**
 - Create experimental high-temporal resolution severe weather outlooks (FACETs, WoF, Weather-Ready Nation)
- **CLUE-based controlled experiments with ~70 runs at 00Z contributed by community collaborators**
- **Key goal: Inform configuration of future EMC HREF versions**
 - HREFv3 configuration experiments (HRRR inclusion)
 - Data assimilation experiments
 - Three HRRRE systems (GSD, NCAR, OU/MAP)
 - FV3-CAM experiments
 - Focused on physics sensitivity
 - GFDL, NSSL, OU/CAPS (up to 10 members)
 - Stochastic physics ensemble experiments
 - Single-, multi-, and stochastic-physics comparisons



FY17 Highlights

HWT Experimental Warning Program

- **Hazard Services - Probabilistic Hazard Information**
 - Involved NWS forecasters, NSSL, GSD, MDL, WDTD, and Human Factors experts (Univ. Akron)
- **Probabilistic Hazard Information - Prototype**
 - Included IWT: NWS Forecasters, Emergency Managers, & Broadcast Meteorologists
 - Diverse group of researchers included social scientists (OU, Univ. Akron, Howard Univ.)
 - Importance of timing and continuous flow of information





FY17 Transition Metrics

HWT Experimental Warning Program

Major Tests Conducted	Transitioned to Operations (RL9)	Recommended for Transition to Operations (RL9)	Advanced To Experimental Testing (RL8)	Further Demonstration/Development (RL 5-7)	Rejected For Further Testing
Probabilistic Hazard Information Prototype				X	
Probabilistic Lightning Information				X	
CIMSS ProbSevere Guidance		X			
Hazard Services - PHI				X	
Totals	0	1	0	3	0



FY18 Highlights: Update and Plans

HWT Experimental Warning Program

- **Hazard Services - Probabilistic Hazard Information**
 - March 12-16, April 2-6, April 9-13
 - 2 NWS Forecasters each week
- **GOES-R and JPSS Proving Ground Experiment**
 - April 30 - May 4, May 7-11, May 14-18, May 21-25
 - 3 NWS Forecasters, 1 Broadcaster each week
- **PHI Emergency Managers**
 - May 7-11, May 14-18
 - 4 EMs each week
- **PHI Broadcast Meteorologists**
 - June 4-8, June 18-22, June 25-29
 - 2 Broadcasters each week



Questions

Hazardous Weather Testbed

Points of Contact

HWT Executive Officer: Kodi Berry (CIMMS/NSSL)

Experimental Warning Program: Alan Gerard (NSSL)

Experimental Forecast Program: Steve Weiss (SPC)

<https://hwt.nssl.noaa.gov>



Supplemental Slides



Funded Proposals Integrated into SFE2018

HWT Experimental Forecast Program

- (1) Jamie Wolff and Isidora Jankov (GSD/DTC), *Evaluating stochastic physics approaches within select Convection Allowing Model (CAM) members included in the Community Leveraged Unified Ensemble (CLUE) during the Hazardous Weather Testbed (HWT) Spring Experiment, 2017-2019 (OWAQ).*
- (2) Tara Jensen (DTC), *Developing an objective evaluation scorecard for storm scale prediction, 2017-2019 (OWAQ).*
- (3) Glen Romine (NCAR), *Demonstration of a Rapid Update Convection-Permitting Ensemble Forecast System to Improve Hazardous Weather Prediction, 2017-2019 (OWAQ).*
- (4) Xuguang Wang (MAP/OU), *Improving NWS Convection Allowing Hazardous Weather Ensemble Forecasts through Optimizing Multi-Scale Initial Condition (IC) Perturbations, 2017-19 (OWAQ).*
- (5) Ming Xue (CAPS/OU), *Development and Optimization of Radar-Assimilating Ensemble-Based Data Assimilation for Storm-Scale Ensemble Prediction in Support of HWT Spring Experiments, 2017-19 (OWAQ).*
- (6) Aaron Johnson (MAP/OU), *Improving the design and utility to severe weather forecasters of convection permitting ensembles through application of a probabilistic object-based post-processing and verification technique, 2017-19 (OWAQ).*
- (7) Ming Xue (CAPS/OU), *A Partnership to Develop and Evaluate Optimized Realtime Convective-Scale Ensemble Data Assimilation and Prediction Systems for Hazardous Weather, 2016-19 (CSTAR).*
- (8) Nathan Snook (CAPS/OU) and David Gagne (NCAR), *Development and Implementation of Probabilistic Hail Forecast Products using Multi-moment Microphysics and Machine Learning Algorithms, 2016-18 (JTII).*
- (9) Brian Ancell (Texas Tech), *Ensemble sub-setting within optimized ensembles to improve probabilistic prediction of severe convection, 2017-20 (CSTAR).*



FY17 Highlights

HWT Experimental Forecast Program

