BAMS
Meeting Summary

The Third Real-Time, Virtual Spring Forecasting Experiment to Advance Severe Weather Prediction Capabilities

Adam J. Clark, Israel L. Jirak, Burkely T. Gallo, Brett Roberts, Kent H. Knopfmeier, Jake Vancil, David Jahn, Makenzie Krocak, Christopher D. Karstens, Eric D. Loken, Nathan A. Dahl, David Harrison, David Imy, Andrew R. Wade, Jeffrey M. Milne, Kimberly A. Hoogewind, Montgomery Flora, Joshua Martin, Brian C. Matilla, Joseph C. Picca, Corey K. Potvin, Patrick S. Skinner, and Patrick Burke

The 2022 NOAA Hazardous Weather Testbed Spring Forecasting Experiment

What: Over 165 forecasters and researchers engaged in real-time, experimental severe weather forecasting activities, and evaluated convection-allowing models, including 1) several Unified Forecast System prototypes, 2) the Warn-on-Forecast System, and 3) innovative postprocessing strategies.

When: 2 May–3 June 2022

Where: Online

KEYWORDS: Ensembles; Forecasting techniques; Numerical weather prediction/forecasting; Operational forecasting; Short-range prediction

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Corresponding author: Adam J. Clark, adam.clark@noaa.gov

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AFFILIATIONS: Clark and Potvin—NOAA/OAR/National Severe Storms Laboratory, and School of Meteorology, University of Oklahoma, Norman, Oklahoma; **Jirak**—NOAA/NWS/NCEP/Storm Prediction Center, Norman, Oklahoma; **Gallo, Vancil, Jahn, Dahl, Harrison, Wade, and Picca**—NOAA/NWS/NCEP/Storm Prediction Center, and Cooperative Institute for Severe and High-Impact Weather Research and Operations, University of Oklahoma, Norman, Oklahoma; **Roberts**—NOAA/NWS/NCEP/Storm Prediction Center, and NOAA/OAR/National Severe Storms Laboratory, and Cooperative Institute for Severe and High-Impact Weather Research and Operations, University of Oklahoma, Norman, Oklahoma; **Knopfmeier, Loken, Hoogewind, Flora, Martin, Matilla, and Skinner**—NOAA/OAR/National Severe Storms Laboratory, and Cooperative Institute for Severe and High-Impact Weather Research and Operations, University of Oklahoma, Norman, Oklahoma; **Krocak**—NOAA/NWS/NCEP/Storm Prediction Center, and Cooperative Institute for Severe and High-Impact Weather Research and Operations, and Institute for Public Policy Research and Analysis, University of Oklahoma, Norman, Oklahoma; **Karstens**—NOAA/NWS/NCEP/Storm Prediction Center, and School of Meteorology, University of Oklahoma, Norman, Oklahoma; **Imy and Burke**—NOAA/OAR/National Severe Storms Laboratory, Norman, Oklahoma; **Milne**—NOAA/NWS/NCEP/Storm Prediction Center, and Cooperative Institute for Severe and High-Impact Weather Research and Operations, and School of Meteorology, University of Oklahoma, Norman, Oklahoma

The 2022 NOAA Hazardous Weather Testbed Spring Forecasting Experiment (2022 SFE) was held 2 May–3 June 2022, marking the third consecutive year of virtual SFEs. We expect this to be the last year of fully virtual experiments with a transition to hybrid formats (in person and virtual) in the future. SFEs are co-led by the NWS/Storm Prediction Center (SPC) and OAR/National Severe Storms Laboratory (NSSL) and aim to accelerate research-to-operations (R2O) by testing new prediction capabilities, studying how end users apply and interpret severe weather guidance, and conducting numerous model evaluation activities. The virtual environment allowed for over 165 forecasters, researchers, and students to participate from around the world, and the wide range of backgrounds provided many unique perspectives and opportunities for participants to learn from one another.

SFE 2022 forecasting activities emphasized using experimental calibrated and machine learning (ML)-based products, with two "data denial" experiments withholding this guidance from control groups. Model evaluations used the 61-member Community Leveraged Unified Ensemble (CLUE; Clark et al. 2018) and included examinations of deterministic and ensemble prototypes for the Rapid Refresh Forecast System (RRFS), evaluating data assimilation methodologies, comparing different Finite Volume Cubed Sphere model (FV3) physics packages, and analyzing resolution sensitivities in 1- and 3-km grid-spacing configurations of the Weather Research and Forecasting Model. Other model evaluations studied machine learning applications for severe weather, mesoscale analyses, NSSL's Warn-on-Forecast System (WoFS), and calibrated severe weather guidance from operational global and regional ensembles.

Some highlights of the 2022 SFE

For the first time in SFEs, subjective evaluations indicated that experimental RRFS prototypes performed as well as the operational High-Resolution Rapid Refresh (HRRR) and High-Resolution Ensemble Forecast (HREF) systems for severe weather forecasting applications. This is a major achievement for model developers working since 2017 on adapting

the FV3 for convection-allowing modeling as part of NOAA's Unified Forecast System (UFS; https://ufscommunity.org) initiative.

For SFE 2022, NSSL transferred all aspects of WoFS to Microsoft's Azure cloud computing platform. The WoFS "on-demand" capability makes it particularly well-suited for the cloud; 40 cases were successfully executed from March to early June. The WoFS-based forecasting activity involved participants issuing 1-h tornado, hail, and wind outlooks with or without WoFS-based ML guidance. For each hazard, outlooks generated by forecasters with access to the ML guidance were significantly improved. This marked the first time that ML guidance has been shown to add value to human-generated severe weather products based on WoFS.

For the second consecutive year, calibrated forecasts for thunder and severe weather from the Global Ensemble Forecast System (GEFS) were compared to the Short-Range Ensemble Forecast System (SREF). GEFS consistently provided improved calibrated probabilistic forecasts relative to SREF, which supports the move toward retiring the SREF from NCEP's modeling suite per NOAA's UFS initiative.

More information on the 2022 SFE

In the third virtual SFE, progress was made in key areas to accelerate R2O and assist evidence-based decision-making for models and tools that improve operational severe weather forecasts. The full 2022 SFE Summary Report is available at https://hwt.nssl.noaa.gov/sfe/2022/docs/HWT_SFE_2022_Prelim_Findings_FINAL.pdf.

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Reference

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