

A Real-Time, Virtual Spring Forecasting Experiment to Advance Severe Weather Prediction

Adam J. Clark, Israel L. Jirak, Burkely T. Gallo, Brett Roberts, Andrew R. Dean, Kent H. Knopfmeier, Louis J. Wicker, Makenzie Krocak, Patrick S. Skinner, Pamela L. Heinselman, Katie A. Wilson, Jake Vancil, Kimberly A. Hoogewind, Nathan A. Dahl, Gerald J. Creager, Thomas A. Jones, Jidong Gao, Yunheng Wang, Eric D. Loken, Montgomery Flora, Christopher A. Kerr, Nusrat Yussouf, Scott R. Dembek, William Miller, Joshua Martin, Jorge Guerra, Brian Matilla, David Jahn, David Harrison, David Imy, and Michael C. Coniglio

The 2020 NOAA Hazardous Weather Testbed Spring Forecasting Experiment

What: Severe weather research and forecasting experts convened virtually to evaluate convection-allowing modeling strategies and test short-term forecasting applications of a prototype Warn-on-Forecast System within a simulated, real-time forecasting environment.

When: 27 April–29 May 2020

Where: Norman, Oklahoma

KEYWORDS: Ensembles; Forecasting; Numerical weather prediction/forecasting; Operational forecasting; Short-range prediction; Model evaluation/performance

<https://doi.org/10.1175/BAMS-D-20-0268.1>

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

In final form 30 September 2020

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AFFILIATIONS: Clark, Wicker, Heinselman, and Coniglio—NOAA/OAR/National Severe Storms Laboratory, and School of Meteorology, University of Oklahoma, Norman, Oklahoma; Jirak, Dean, and Gao—NOAA/NWS/NCEP/Storm Prediction Center, Norman, Oklahoma; Gallo, Vancil, Dahl, Jahn, and Harrison—NOAA/NWS/NCEP/Storm Prediction Center, and Cooperative Institute for Mesoscale Meteorological Studies, University of Oklahoma, Norman, Oklahoma; Roberts—NOAA/NWS/NCEP/Storm Prediction Center, and NOAA/OAR/National Severe Storms Laboratory, and Cooperative Institute for Mesoscale Meteorological Studies, University of Oklahoma, Norman, Oklahoma; Knopfmeier, Skinner, Wilson, Hoogewind, Creager, Jones, Wang, Kerr, Yussouf, Dembek, Miller, Martin, Guerra, and Matilla—NOAA/OAR/National Severe Storms Laboratory, and Cooperative Institute for Mesoscale Meteorological Studies, University of Oklahoma, Norman, Oklahoma; Krocak—NOAA/NWS/NCEP/Storm Prediction Center, and Cooperative Institute for Mesoscale Meteorological Studies, and Center for Risk and Crisis Management, University of Oklahoma, Norman, Oklahoma; Loken and Flora—NOAA/OAR/National Severe Storms Laboratory, and Cooperative Institute for Mesoscale Meteorological Studies, and School of Meteorology, University of Oklahoma, Norman, Oklahoma; Imy—NOAA/OAR/National Severe Storms Laboratory, Norman, Oklahoma

The NWS/Storm Prediction Center (SPC) and OAR/National Severe Storms Laboratory (NSSL) co-led the 2020 NOAA Hazardous Weather Testbed Spring Forecasting Experiment (2020 SFE) virtually to evaluate new convection-allowing models (CAMs) and ensembles, post-processing strategies, and severe weather prediction tools for accelerated transition to operations. SFE 2020 included worldwide participation from about 100 forecasters, researchers, and students. Gathering these different parts of the community facilitates research-to-operations and operations-to-research pathways that allow forecasters to interact and learn from researchers, and researchers to better understand forecaster needs and challenges.

SFE 2020 was truly unique. By late March, it was clear that COVID-19-related restrictions would preclude an in-person experiment, so organizers shifted to a virtual format (i.e., Google Meet). Compared to previous SFEs, model evaluation activities consumed a much larger proportion of activities, with all participants conducting evaluations through the morning. These evaluations mostly used subsets of the 41-member Community Leveraged Unified Ensemble (CLUE; Clark et al. 2018), a framework through which SFE collaborators contribute CAM guidance for use in controlled experiments. The 2020 CLUE enabled evaluation of different time-lagged and multimodel CAM ensemble configurations, diagnosis of forecast skill and sensitivities in versions of the Finite Volume Cubed Sphere Limited Area Model (FV3-LAM), examination of forecast sensitivity to different initial conditions and model cores, and evaluation of lightning data assimilation impacts at 0–12-h forecast lead times. In the afternoon, virtual activities were conducted by a small internal group with a few NWS forecasters, focused on short-term forecasting applications of NSSL's prototype Warn-on-Forecast System (WoFS; e.g., Jones et al. 2020).

Highlights of the 2020 SFE

The NOAA/Global Systems Laboratory and U.K. Met Office contributed nine-member CAM ensembles initialized at 1800 and 0000 UTC to the CLUE. Various combinations of these members comprised single-model, single-model + time-lagged, and multimodel + time-lagged ensembles based at 0000 UTC, which were compared to the operational High-Resolution Ensemble Forecast (HREF) system. Results showed that none of the configurations reached the skill of HREF, but that time-lagging did not degrade forecast skill, which suggests that time-lagging could be used to better optimize computational resources. In another time-lagging experiment (1200 UTC based), it was found that a multiphysics ensemble with each member initialized at a different time received notably higher subjective ratings compared

to two other time-lagging configurations, indicating a potentially useful single-model CAM ensemble configuration strategy.

One component of the afternoon forecasting activity involved generating 1- and 4-h time-window severe hazard probabilities. One group of participants used WoFS guidance to generate these outlooks, while it was withheld for the other group. At times, access to WoFS dramatically improved the outlooks, and WoFS generally increased forecaster confidence.

More information on the 2020 SFE

Transition of the 2020 SFE to a virtual format allowed continuation of progress in key areas of research to accelerate research-to-operations for models and tools that improve operational severe weather forecasts for the Unified Forecast System in support of a Weather-Ready Nation. A full report of 2020 SFE findings is found at https://hwt.nssl.noaa.gov/sfe/2020/docs/HWT_SFE_2020_Prelim_Findings_FINAL.pdf.

Acknowledgments. The 2020 SFE was made possible by dedicated participants and support staff at SPC and NSSL. Work was completed as part of regular duties at the federally funded NOAA/NSSL for Clark, Wicker, Heinselman, Gao, Imy, and Coniglio, and NOAA/SPC for Jirak and Dean. Gallo, Roberts, Knopfmeier, Krocak, Skinner, Wilson, Vancil, Hoogewind, Dahl, Creager, Jones, Wang, Loken, Flora, Kerr, Yussouf, Dembek, Miller, Martin, Guerra, Matilla, Jahn, and Harrison were funded by NOAA/Office of Oceanic and Atmospheric Research under NOAA-University of Oklahoma Cooperative Agreement NA11OAR4320072, U.S. Department of Commerce.

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