Engagement of Customers, Stakeholders, and Users

Collaborative Research Environments

Alan Gerard, Chief, WRDD




Collaborative Research Environments enable...

Dynamic interactions between researchers and practitioners that support a true iterative R&D environment

Various Efforts

- Lead and operate NOAA's Hazardous Weather Testbed (in partnership with NWS)
- Strong partnerships and relationships with other NOAA testbeds (AWC, HMT, OPG)
- Collaborative relationships with NWS at **all** levels of the organization (NWSH, regions, field offices)

NOAA's Hazardous Weather Testbed

Experimental Warning Program

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

Warning Research

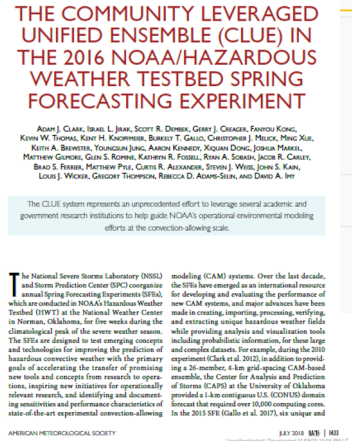
Forecasting Research

Satellite-based Research

Experimental Forecast Program

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

HWT in the Literature



THE COMMUNITY LEVERAGED UNIFIED ENSEMBLE (CLUE) IN THE 2016 NOAA/HAZARDOUS WEATHER TESTBED SPRING FORECASTING EXPERIMENT

Adam J. Clark, Israel L. Jirak, Scott R. Dembek, Gerry J. Creager, Fanyou Kong, Kevin W. Thomas, Kent H. Knopfmeier, Burkely T. Gallo, Christopher J. Melick, Ming Xue, Keith A. Brewster, Youngsun Jung, Aaron Kennedy, Xiquan Dong, Joshua Markel, Matthew Gilmore, Glen S. Romine, Kathryn R. Fossell, Ryan A. Sobash, Jacob R. Carley, Brad S. Ferrier, Matthew Pyle, Curtis R. Alexander, Steven J. Weiss, John S. Kain, Louis J. Wicker, Gregory Thompson, Rebecca D. Adams-Selin, and David A. Ivy

The CLUE system represents an unprecedented effort to leverage several academic and government research institutions to help guide NOAA's operational environmental modeling efforts at the convection-allowing scale.

The National Severe Storms Laboratory (NSSL) and Storm Prediction Center (SPC) coorganize annual Spring Forecasting Experiments (SFEs), which are conducted in NOAA's Hazardous Weather Testbed (HWT) at the National Weather Center in Norman, Oklahoma, for five weeks during the climatological peak of the severe weather season. The SFEs are designed to test emerging concepts and technologies for improving the prediction of hazardous convective weather with the primary goals of accelerating the transfer of promising new tools and concepts from research to operations, inspiring new initiatives for operationally relevant research, and identifying and documenting sensitivities and performance characteristics of state-of-the-art experimental convection-allowing modeling (CAM) systems. Over the last decade, the SFEs have emerged as an international resource for developing and evaluating the performance of new CAM systems, and major advances have been made in creating, importing, processing, verifying, and extracting unique hazardous weather fields while providing analysis and visualization tools including probabilistic information, for these large and complex datasets. For example, during the 2010 experiment (Clark et al. 2012), in addition to providing a 26-member, 4-km grid-spacing CAM-based ensemble, the Center for Analysis and Prediction of Storms (CAPS) at the University of Oklahoma provided a 1-km contiguous U.S. (CONUS) domain forecast that required over 10,000 computing cores. In the 2015 SFE (Gallo et al. 2017), six unique and

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Abstract/Excerpt | Full Text | PDF

Abstract

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Forecasters' Cognitive Task Analysis and Mental Workload Analysis of Issuing Probabilistic Hazard Information (PHI) during FACETs PHI Prototype Experiment

JOSEPH J. J. JAMES AND CHEN LING
University of Akron, Akron, Ohio
CHRISTOPHER D. KARSTENS
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KRISTIN CALHOUN, TIFFANY MEYER, AND DAPHNE LADUE
NOAA/OAR/National Severe Storms Laboratory, Norman, Oklahoma

(Manuscript received 7 October 2019, in final form 12 May 2020)

ABSTRACT

During spring 2016 the Probabilistic Hazard Information (PHI) prototype experiment was run in the National Oceanic and Atmospheric Administration (NOAA) Hazardous Weather Testbed (HWT) as part of the Forecasting a Continuum of Environmental Threats (FACETS) program. Nine National Weather Service forecasters were trained to use the web-based PHI prototype tool to produce dynamic PHI for severe weather threats. Archived and real-time weather scenarios were used to test this new paradigm of issuing probabilistic information, rather than deterministic information. The forecasters' mental workload was evaluated after each scenario using the NASA-Task Load Index (TLX) questionnaire. This study summarizes the analysis results of mental workload experienced by forecasters while using the PHI prototype. Six subdimensions of mental workload: mental demand, physical demand, temporal demand, performance, effort, and frustration were analyzed to derive top contributing factors to workload. Average mental workload was 46.6 (out of 100, standard deviation: 19, range 76.8). Top contributing factors to workload included using automated guidance, PHI object quantity, multiple displays, and formulating probabilities in the new paradigm. Automated guidance provided support to forecasters in maintaining situational awareness and managing increased quantities of threats. The results of this study provided understanding of forecasters' mental workload and task strategies and develope dinsights to improve usability of the PHI prototype tool.

1. Introduction

The severe convective weather warning system in the United States has maintained the same weather warning paradigm since the first successful issuance of a tornado warning in 1948 (Meyer 2003), comprising watches, warnings, and advisories. The current warning system comprises 122 National Weather Service (NWS) offices, and their affiliated national centers, continuously analyzing radar, satellite, lightning, surface observations, and model data to produce watches and warnings for severe thunderstorms, tornadoes, floods, hail, and other extreme weather phenomena (Friday 1994). The current warning paradigm is static and conveys the location of a threat via a graphical polygon and city-town location text. Polygons can be trimmed as threats evolve until expiration of duration, and current directives and practice indicate that at least a few updates should be issued (Stern 2020).

The advancement of the weather warning methods requires a new means to graphically represent and communicate threat information to users. The Probabilistic

Corresponding author: Joseph J. J. James, jj270@zips.uakron.edu

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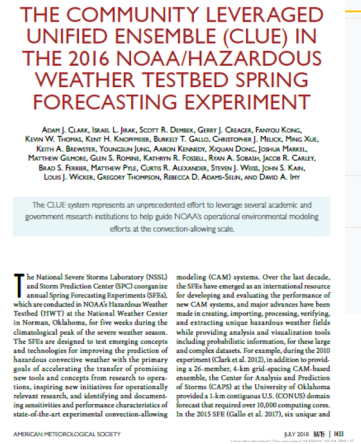
HWT in the Literature

102 peer reviewed publications since 2016



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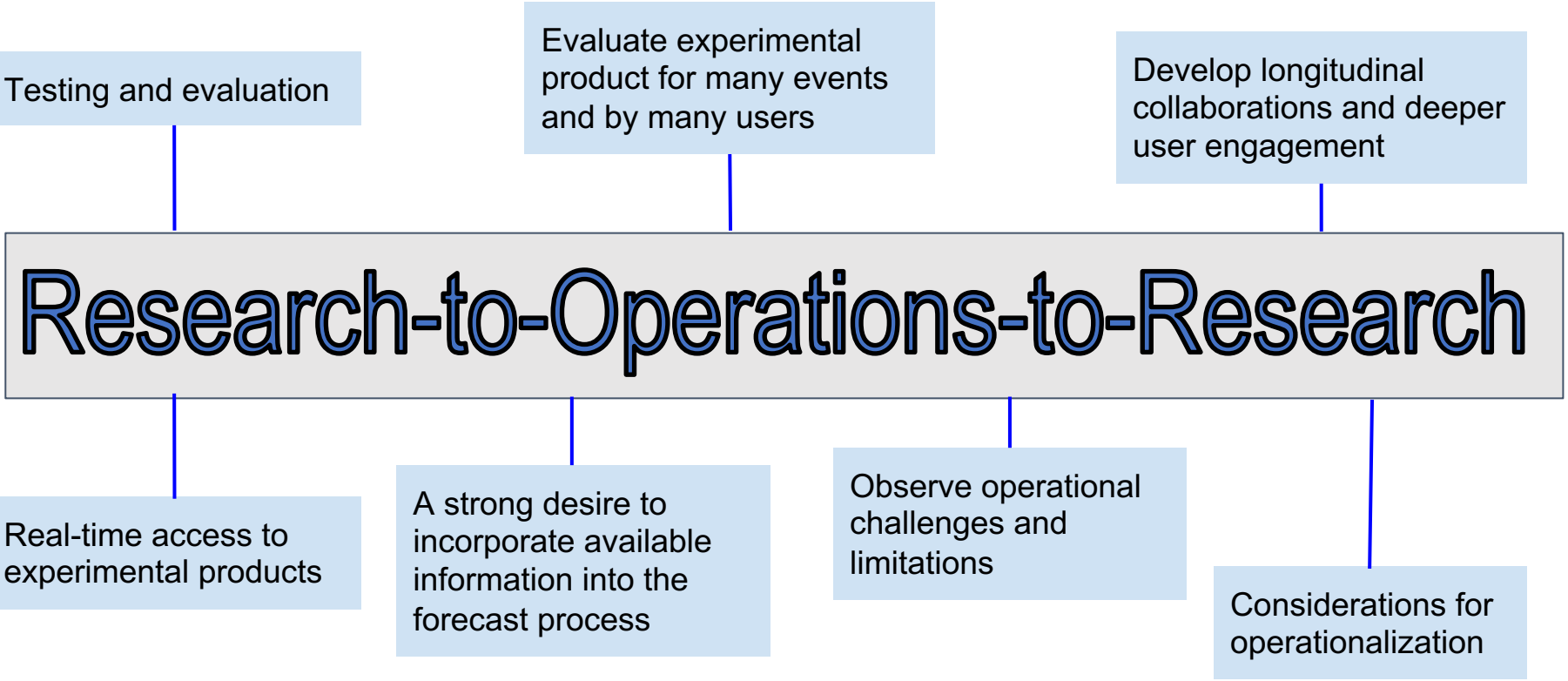
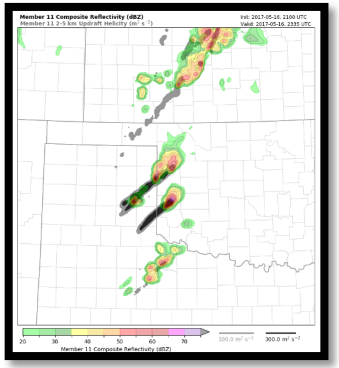
WARNING DECISION TRAINING DIVISION
WDTD
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
AWC
AVIATION WEATHER CENTER
DEPARTMENT OF DEFENSE
UNITED STATES OF AMERICA
NATIONAL SEVERE STORMS LABORATORY
U.S. DEPARTMENT of COMMERCE
NATIONAL OCEANIC and ATMOSPHERIC ADMINISTRATION
FEDERAL AVIATION ADMINISTRATION
DEPARTMENT OF TRANSPORTATION
UNITED STATES OF AMERICA
EM
bts
opg
NOAA
Storm Prediction Center
Norman, Oklahoma

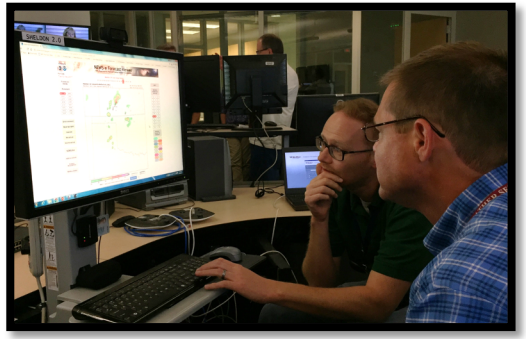
Why is Research in the Naturalistic Environment Important?



An Example: Warn-on-Forecast in Operations

- Co-location of NSSL/OU CIWRO with the Norman Forecast Office
- Warn-on-Forecast guidance is available during the real-time run season
- Impromptu science support during weather events
- Learning *together* about the real-time applications of Warn-on-Forecast guidance



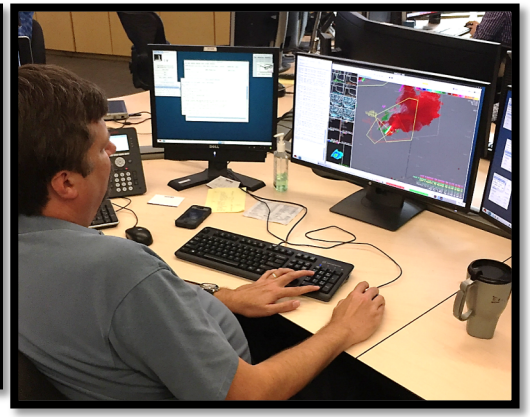


...SIGNIFICANT WEATHER ADVISORY FOR northwestern Harmon... southwestern Roger Mills...western Beckham and northwestern Greer Counties Until 545 PM CDT...

Storms capable of producing tornadoes were located in the Texas panhandle. One storm was located southwest of Wheeler and the other located northwest of Wellington at 515 pm. The storms were moving northeast at 35 MPH. These storms will move into western Oklahoma before 6 PM. Severe weather is likely with these storms as they move into Oklahoma and there is a high probability that tornado warnings will be issued.

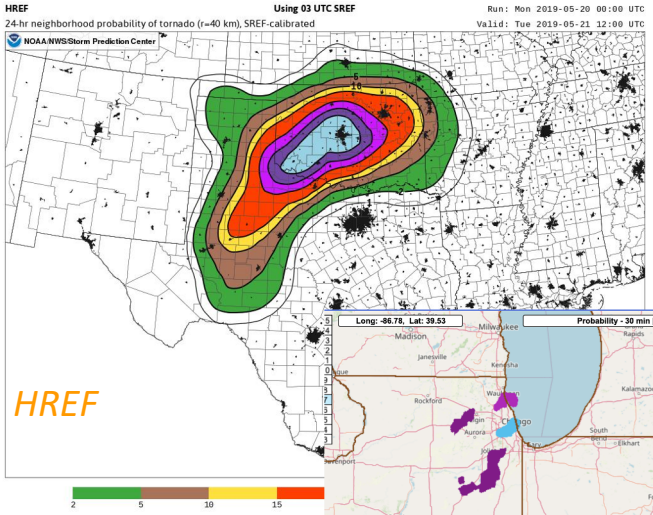
PRECAUTIONARY/PREPAREDNESS ACTIONS...

Monitor the situation closely. Be ready to act quickly if a warning is issued or if storms threaten you.



Images courtesy of WFO Norman

Impacts and successes...



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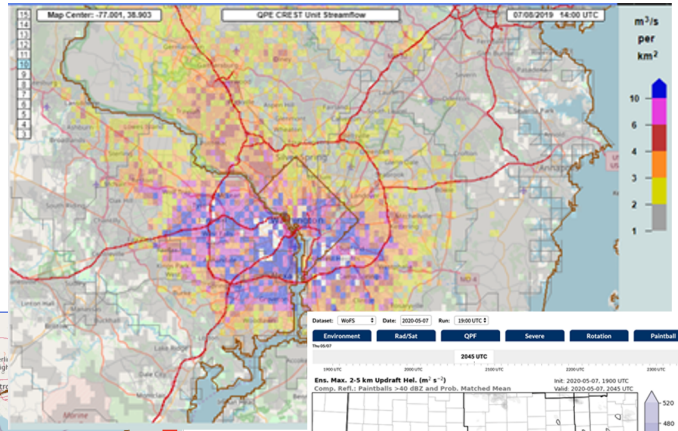

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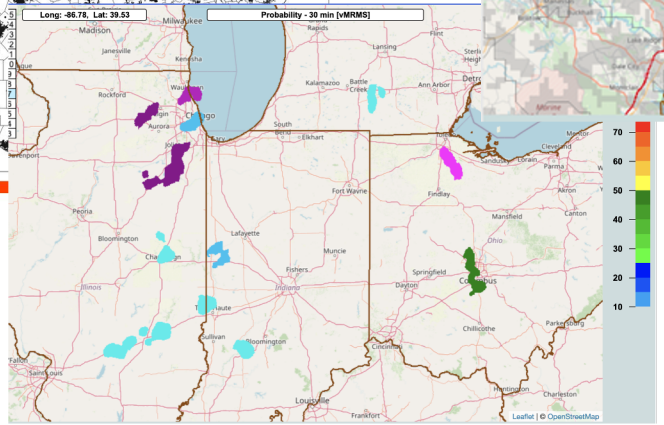
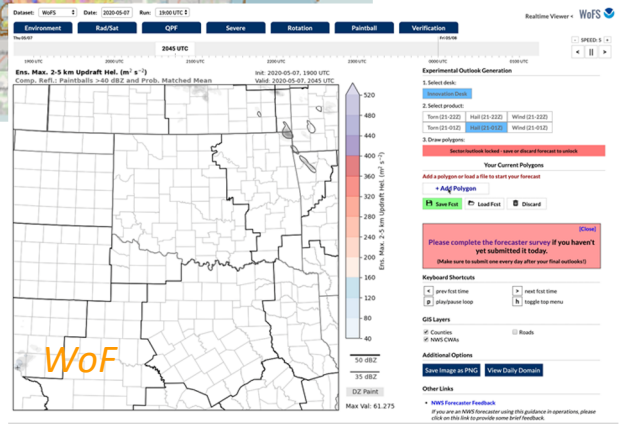


ProbCGLightning



WoF

Heather Reeves

Kodi Berry

Adam Clark

Katie Wilson

Pam Heinselman

Kristin Calhoun

Brett Roberts

Kim Klockow-McClain

Eric Loken

Questions for the panel?