MEANDER
Meteorology and Environmental Rhetoric

BAMS
Our New Century

IN BOX
INSIGHTS and INNOVATIONS

Improving Visual Communication of Weather Forecasts with Rhetoric

K. M. Lambrecht, B. J. Hatchett, L. C. Walsh, M. Collins, and Z. Tolby

Effective communication of weather forecasts and related hazards, particularly levels of forecast confidence, to the general public represents a continual challenge for operational meteorologists. The approach to communication of high-impact weather events has immediate implications for life and property as well as developing longer-term community resilience to extreme events. Building on research that suggests that bringing together multiple types of expertise is important to science communication (e.g., Fischhoff 2013), we sought an interdisciplinary approach, combining the work of meteorology and rhetoric to strengthen communication with public audiences. Using a rhetorical framework reveals how we can build trust with the public by 1) inviting audience participation, 2) providing a way for users to distribute weather information to others, and 3) encouraging interactions that increase solidarity with the public. Our initial results suggest that visual communication incorporating the rhetorical concept of "commonplaces" used by the public can support effective National Weather Service communication.

Commonplaces are the expressions of beliefs, values, and norms that construct community attitudes toward subjects like weather or natural hazard forecasts (Locke 1999; Prelli 1990). For example, the decision to change driving routes to avoid hazardous snow communicates a value of keeping oneself safe, a commonplace that is shared across many members of the community. Understanding community values and using those commonplaces in forecasting is a way to build what Earle (2010) would call "relational trust" because using shared language in weather communication builds a foundation of resilience between meteorologists and the public, helping to sustain the relationship through moments of uncertainty.

The National Weather Service (NWS) has experienced a rapid evolution of forecast communication since it began disseminating forecasts, warnings, and advisories on social media in 2011 as part of the "Weather Ready Nation" initiative. This initiative furthers previous research that suggests that encouraging public involvement is important in science communication (National Academies of Sciences, Engineering, and Medicine 2017) and that science is communicated within a larger network of social concerns (Maynard and Scheufele 2016). In addition to using outlets such as Facebook (FB) and Twitter to

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Article

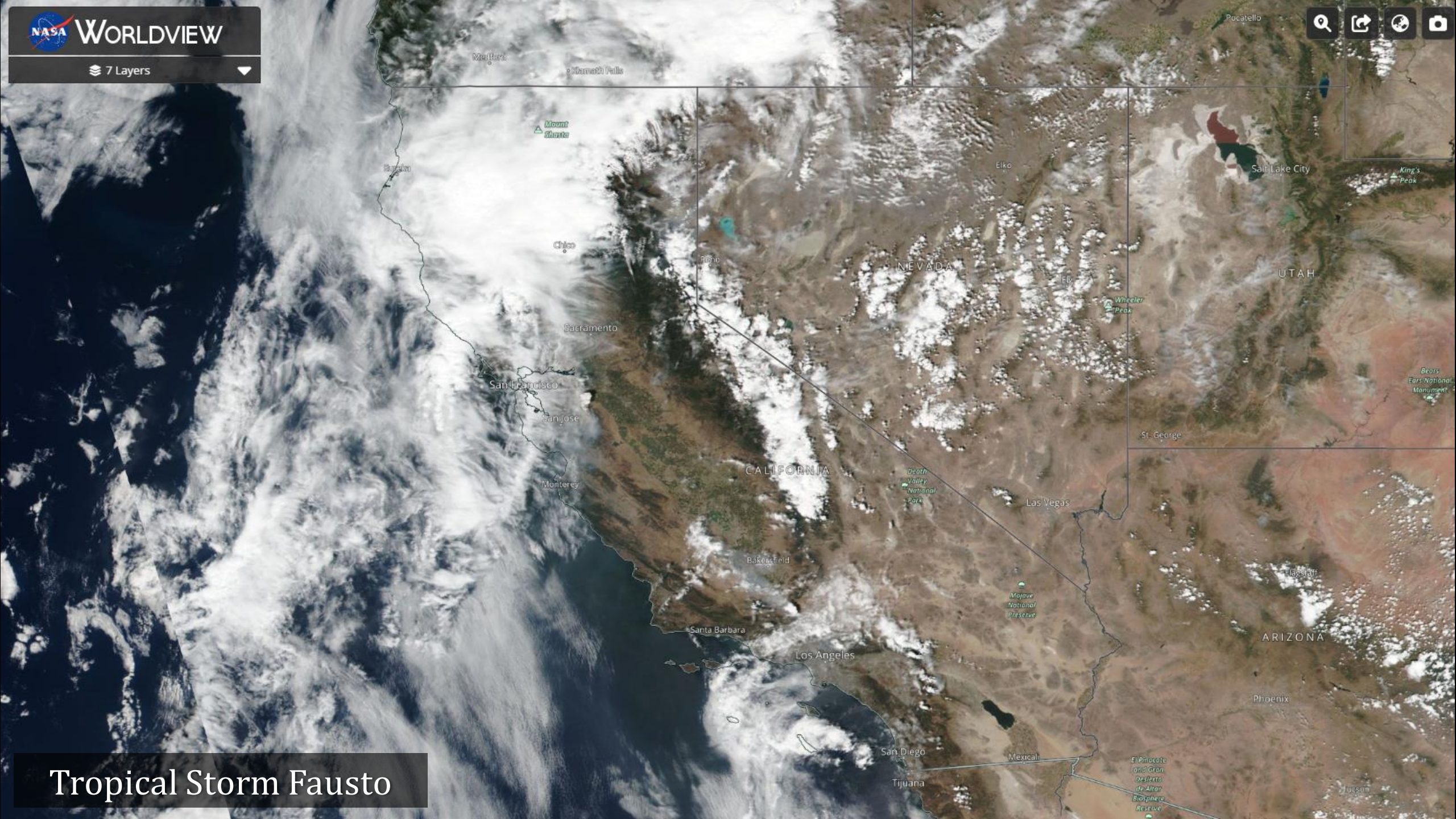
Visual Communication of Probabilistic Information to Enhance Decision Support

Anne Heggli, Benjamin Hatchett, Zach Tolby, Kathryn Lambrecht, Meghan Collins, Lynda Olman, and Matthew Jeglum

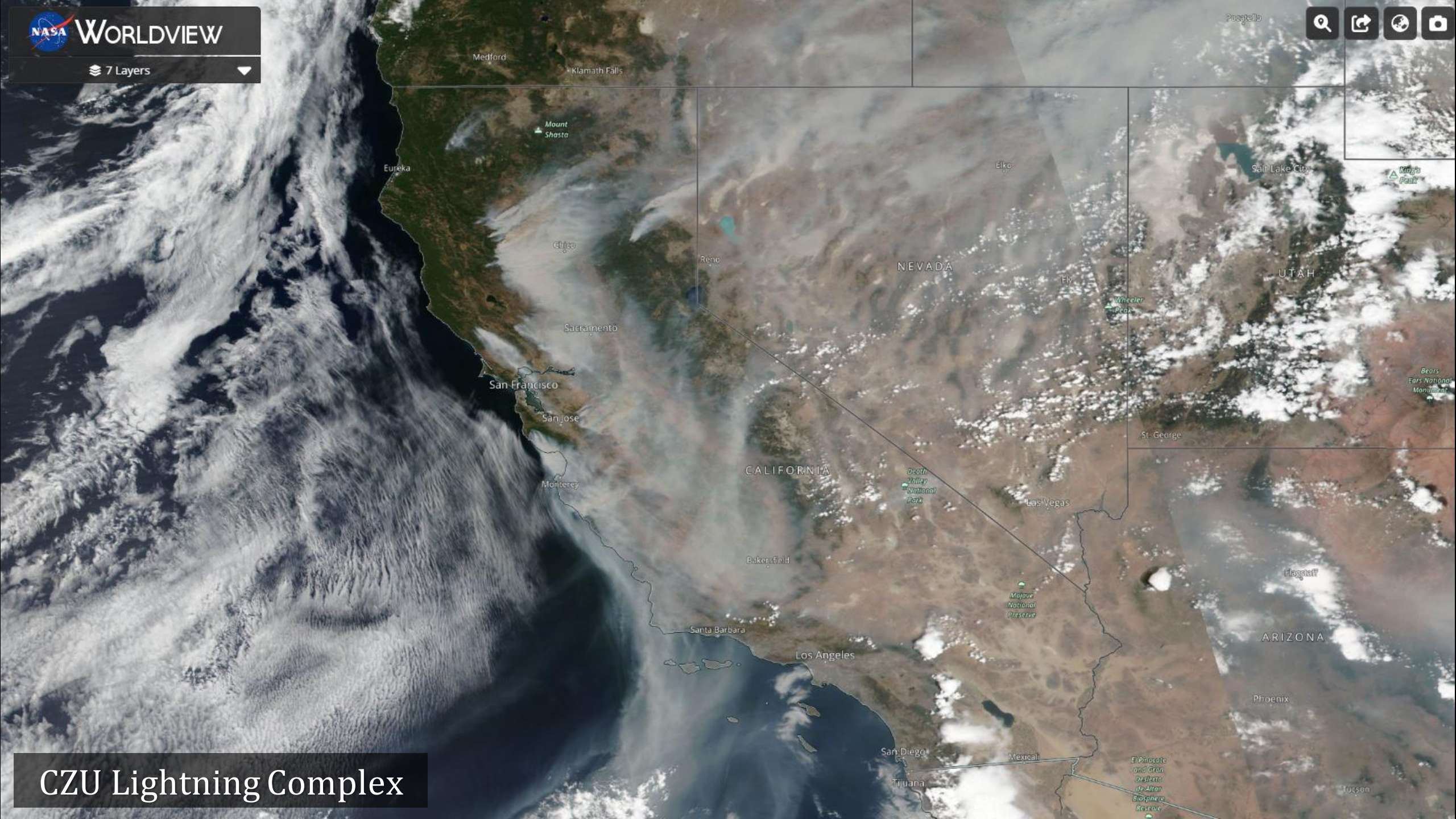
KEYWORDS:
North America; Probability forecasts/models/distribution; Communications/decision making; Decision making; Decision support

ABSTRACT: When hazardous weather is forecast, communicating probabilistic information (PI) can improve trust, confidence, and understanding of forecast information, resulting in improved decision-making by emergency managers and public audiences. With probabilistic forecast tools modernizing forecast operations, the National Weather Service is calling on regional offices to increase the use of PI. However, communicating PI can be challenging since the information is intrinsically more complex than single-value deterministic forecasts that do not include a measure of uncertainty. We suggest that effective PI visualization not only includes the PI graphic but also communicates potential impacts and issues preventative guidance to limit exposure to weather-related hazards. Decision support tools like PI benefit from, if not require, effective visual communication that capitalizes on the efficiency of the visual system to extract information, decrease the time to interpret information, and increase the understanding of uncertainties. Furthermore, PI visuals need to be accessible to disabled and neurodivergent audiences. To enhance the visual communication of PI, we synthesize literature from graphic design and social science to identify guiding principles for effective visual communication and provide a one-page printout quick guide. To showcase how forecasters can incorporate guiding principles in the local context, we provide examples built from readily usable templates to demonstrate how probabilistic forecast information extracted from tools like the National Blend of Models can be used to enhance the visual communication of PI to support more informed decision-making.

NASA WORLDVIEW
7 Layers
Medford
Klamath Falls
Pocatello
Mount Shasta
Eureka
Elko
Salt Lake City
Chico
Reno
NEVADA
UTAH
Ely
Wheeler Peak
Sacramento
San Francisco
San Jose
Monterey
CALIFORNIA
Death Valley National Park
Las Vegas
St. George
Bakersfield
Mojave National Preserve
Flagstaff
Santa Barbara
Los Angeles
ARIZONA
Phoenix
San Diego
Tijuana
Mexicali
August 2020



Tropical Storm Fausto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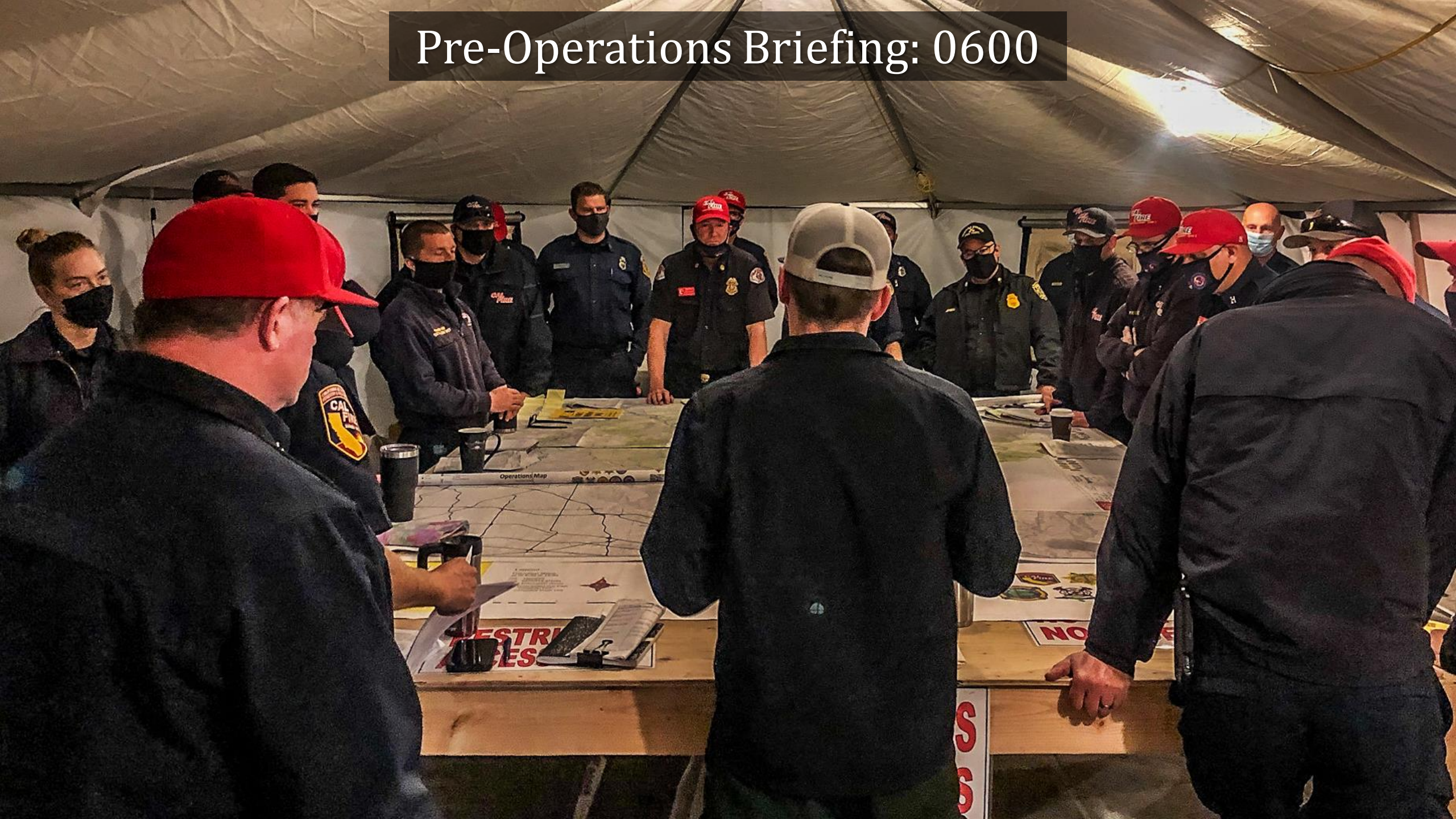
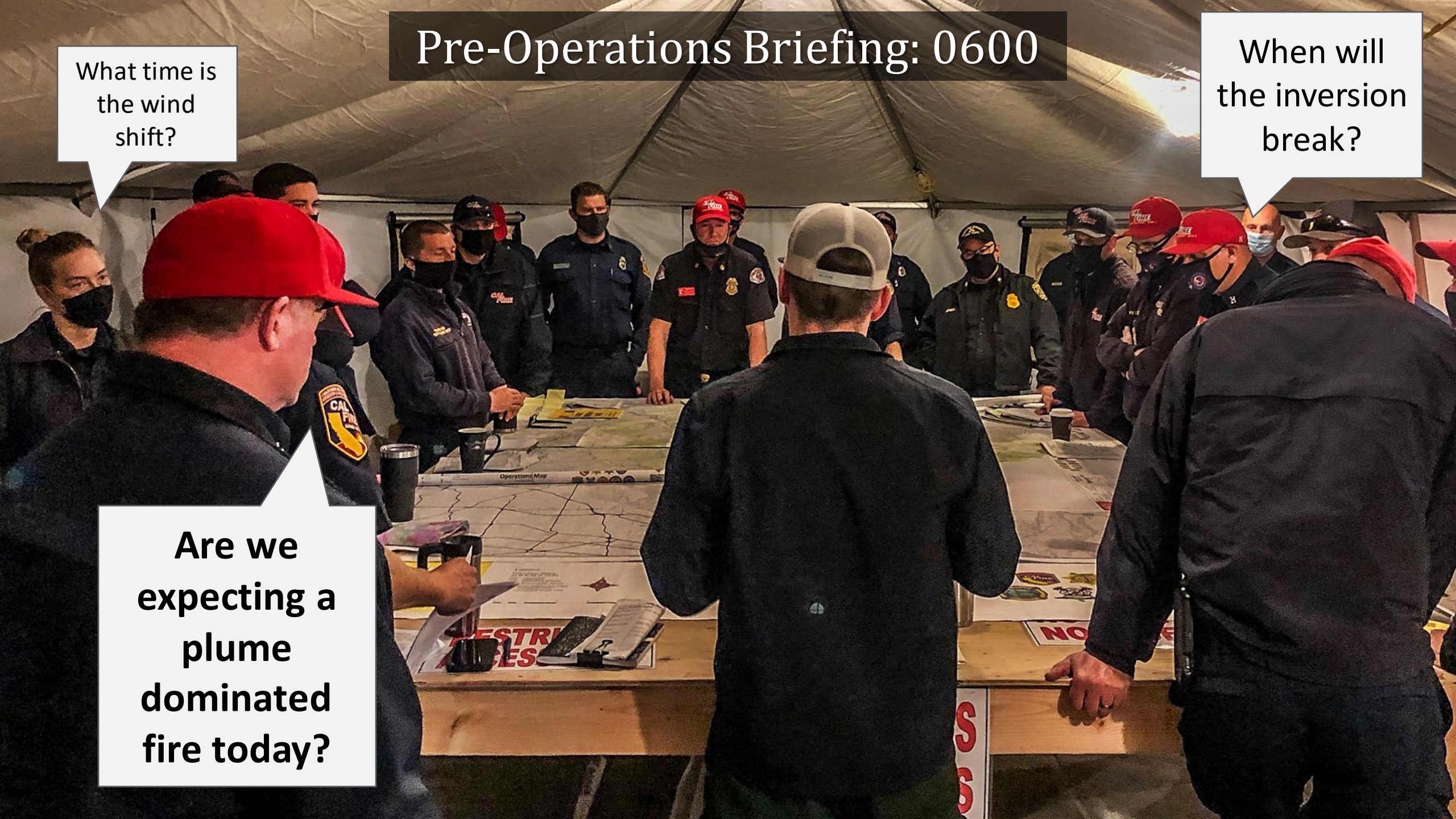
Flagstaff
CZU Lightning Complex

Pre-Operations Briefing: 0600



Pre-Operations Briefing: 0600



Those tough questions…. Deserve good answers

We DO NOT currently have the necessary tools & technology to provide GOOD ANSWERS

FWT

FIRE WEATHER TESTBED

Zach Tolby

Manager & Lead Scientist

A collaborative effort:

NOAA SATELLITES

NOAA Powered by Global Systems Laboratory

NATIONAL WEATHER SERVICE

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FIRE WEATHER TESTBED

Our #1 mission is to move advanced technologies and applications to operational platforms as quickly as possible

A collaborative effort:

NOAA SATELLITES

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NATIONAL WEATHER SERVICE

TESTBEDS

Research Meets Operations in the Test Environment

Arctic Testbed

Aviation Weather Testbed

Climate Testbed

Coastal and Ocean Modeling

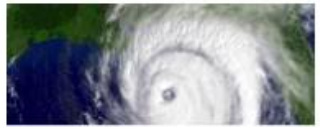
Developmental Testbed

Satellite Proving Ground

Hazardous Weather Testbed

Hydrometeorology Testbed

Joint Center for Satellite Data Assimilation



Joint Hurricane Testbed

Operations Proving Ground

Space Weather Prediction Testbed

NEW!

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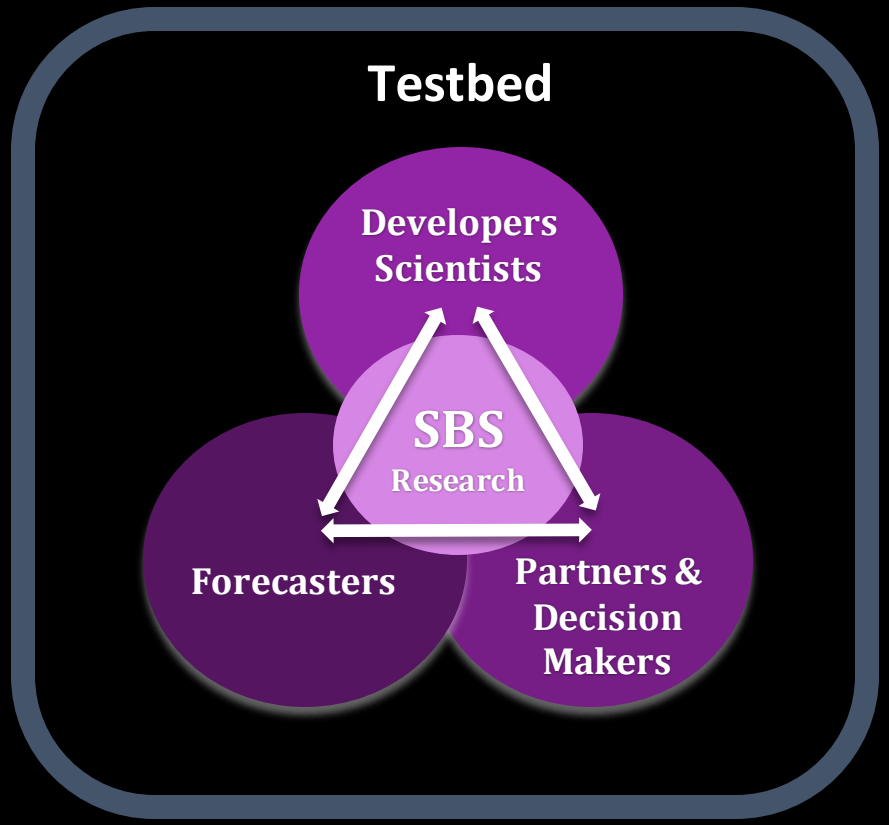
FIRE WEATHER TESTBED

What is a Testbed?

Why do we need them?

- Critical component of R&D / R2O-O2R
- Transition Research into Operations
- Engage Users "**Early and Often**"

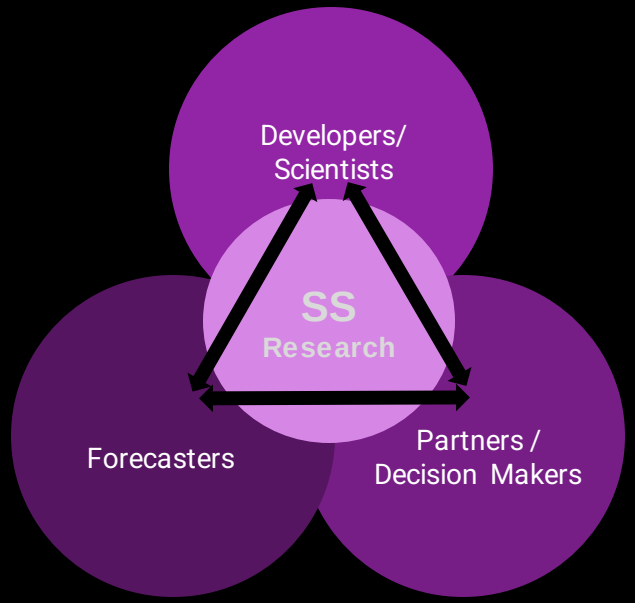


NOAA Social Science Iceberg
Understandability and actionability of products & services
Decision Making
Culture Change
Technology adoption
Societal Outcomes
Evolving the NWS
Hiring for the Future
Collaboration
WIDE LOAD

User Needs Assessment

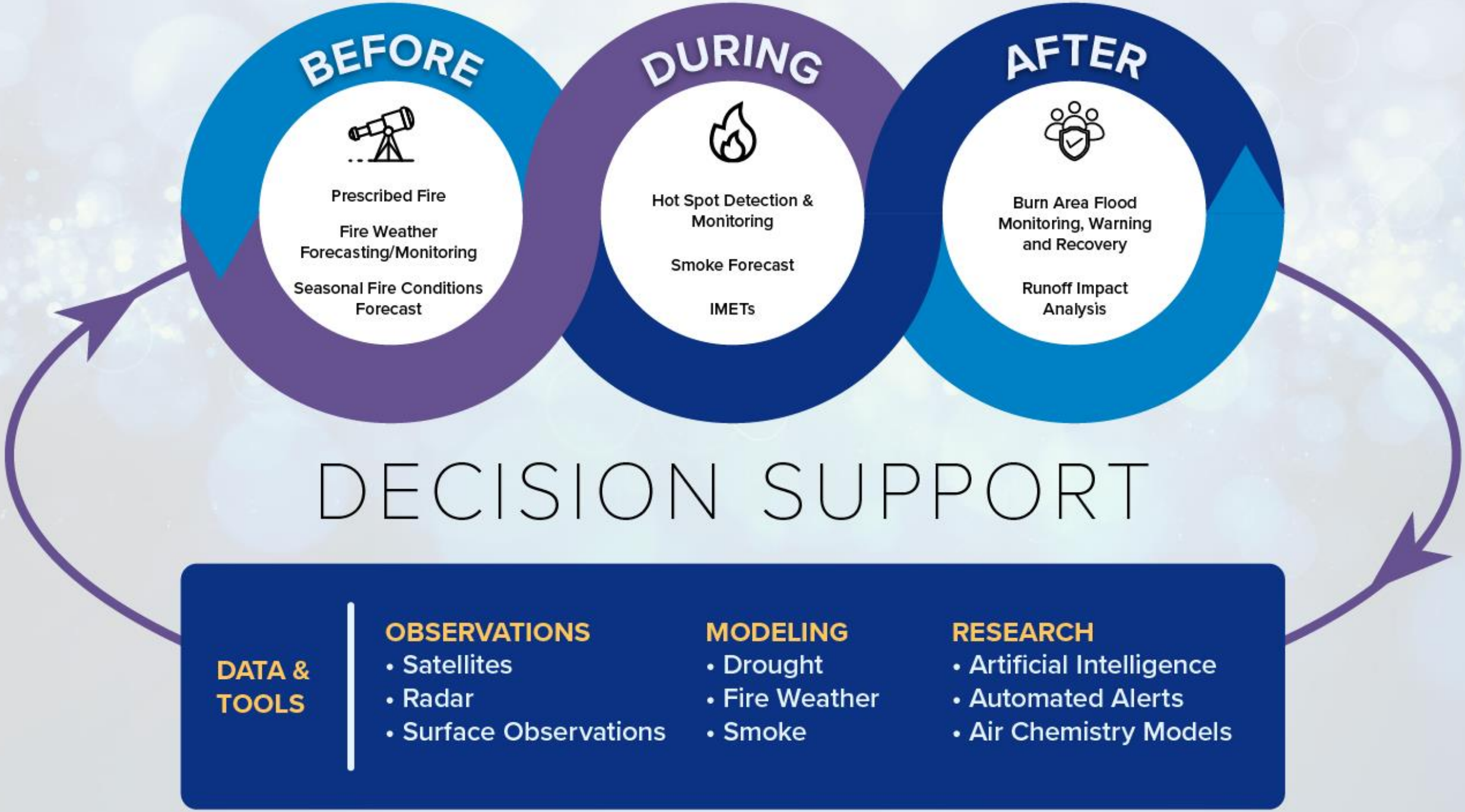
What Do Testbeds Look Like?

NOAA Hydro-meteorological Testbed

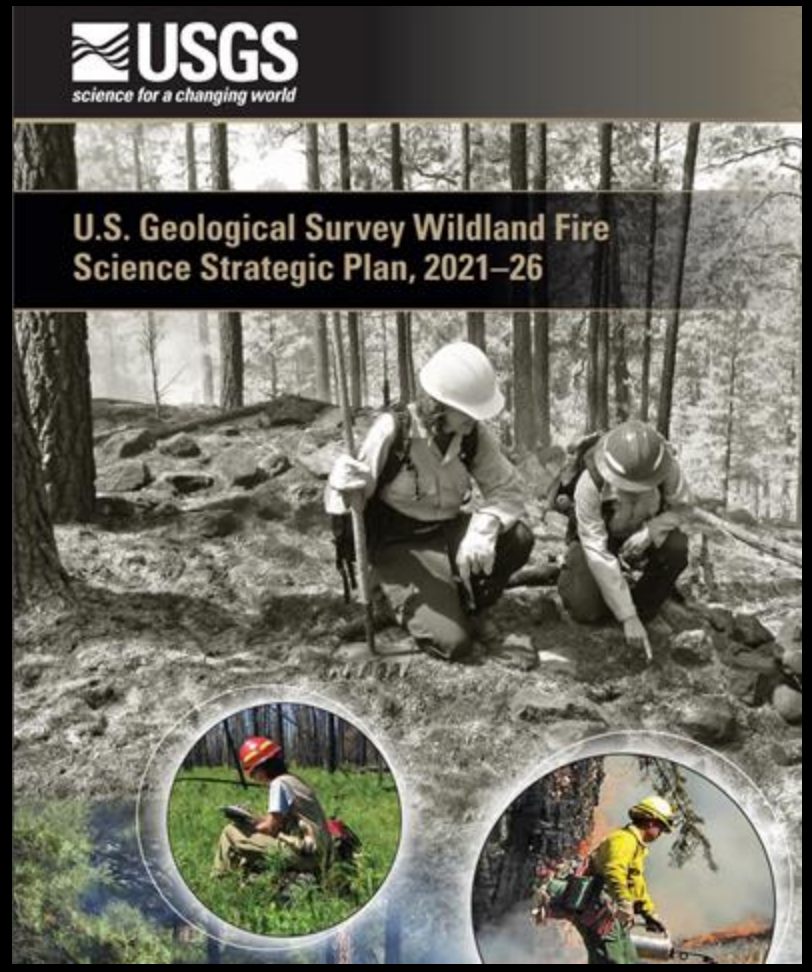


NOAA Hazardous Weather Testbed

DOE Atmospheric Radiation
Measurement
Research Facility


BEFORE
Prescribed Fire
Fire Weather Forecasting/Monitoring
Seasonal Fire Conditions Forecast
DURING
Hot Spot Detection & Monitoring
Smoke Forecast
IMETs
AFTER
Burn Area Flood Monitoring, Warning and Recovery
Runoff Impact Analysis
DECISION SUPPORT
DATA & TOOLS
OBSERVATIONS
• Satellites
• Radar
• Surface Observations
MODELING
• Drought
• Fire Weather
• Smoke
RESEARCH
• Artificial Intelligence
• Automated Alerts
• Air Chemistry Models

Much Bigger than NOAA



Who Benefits from a Fire Weather Testbed?

And who may be a participant?

Forecasters: NWS WFOs, IMETs, SPC
GACC Meteorologists, FBANs and others

Who Benefits from a Fire Weather Testbed?

And who may be a participant?

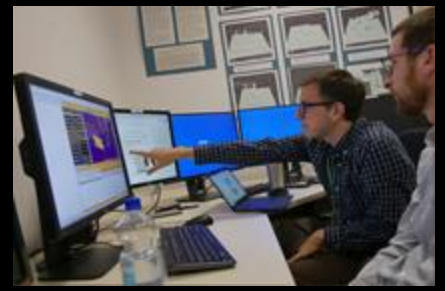
Incident Commanders / EMs / Local Govt. Officials

Everyone working the fire!

Who Benefits from a Fire Weather Testbed?

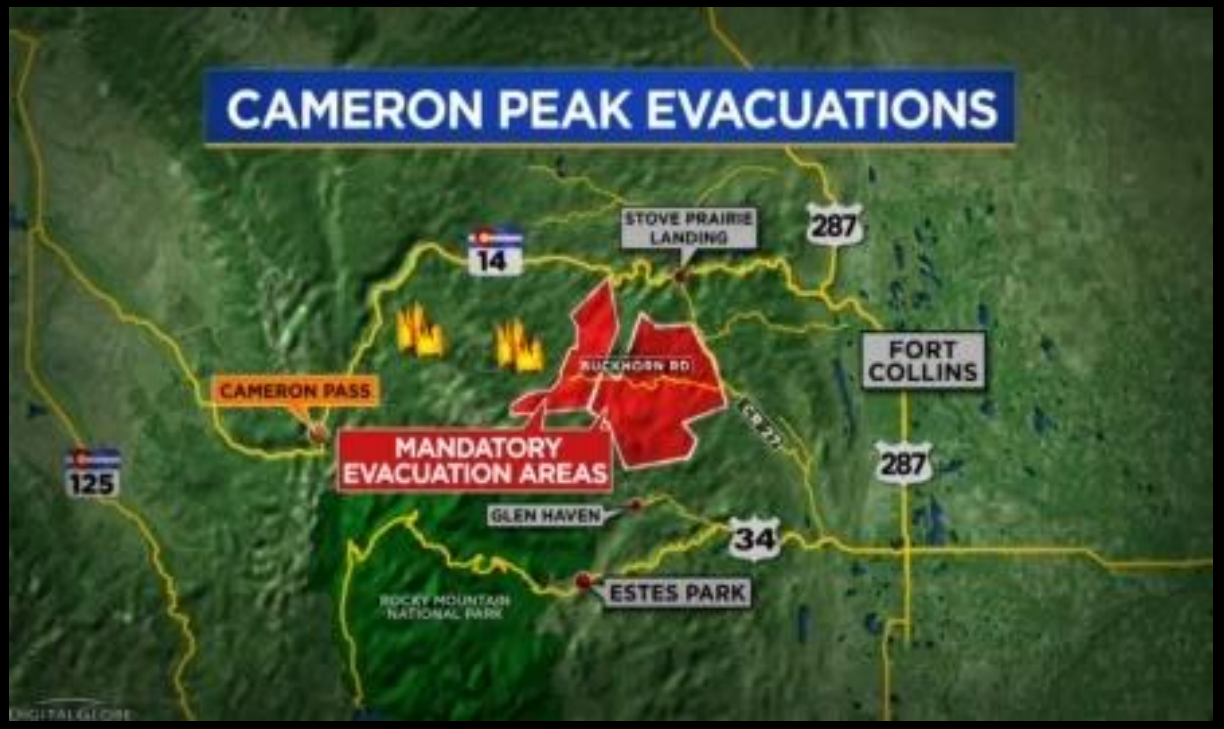
And who may be a participant?

R & D Community: Federal/State Labs, Academic Institutions, other investigators



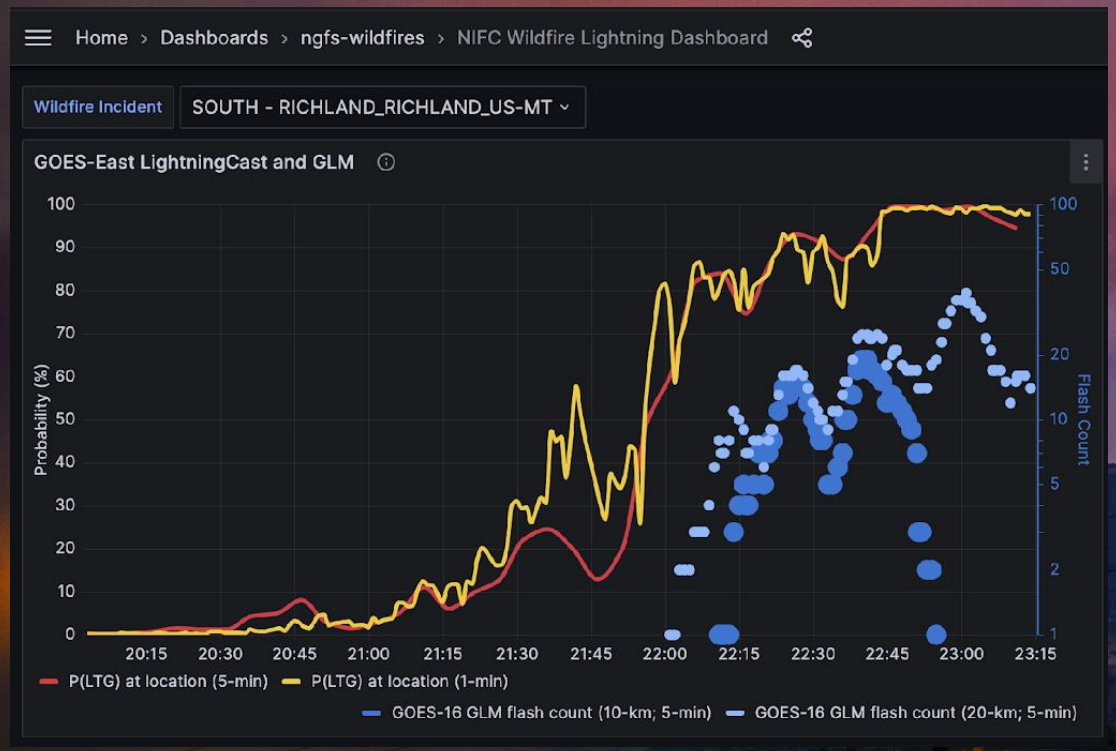
Who Benefits from a Fire Weather Testbed?

Society – a safer society is the bottom line



What Will Be Evaluated?

LightningCast



CIMSS

0100 UTC 0200 UTC 0300 UTC 0400 UTC

nit: 2023-10-30, 2200 UTC
Valid: 2023-10-30, 2345 UTC

Vertically Integrated Smoke (mg m^{-2})
1000
500
250
175
100
75
50
40
30
25
20
15
10
5

Keyboard Shortcuts

<	prev fcst time	>	next fcst time
p	play/pause loop	h	toggle top menu
n	prev ens member*	m	next ens member*
o	toggle obs*	v	toggle sounding links
b	last run (hold down)		

*if available for current product

GIS Overlays

- ☐ Counties
- ☐ NWS CWAs
- ☐ Burn Scars
- ☑ Roads
- ☐ NWS CWSUs

WoFS Overlays

- ☐ WoFS dBZ Paintball
- ☐ WoFS 0-2 km UH Paintball
- ☑ WoFS Fire Rad. Pwr.
- ☐ WoFS dBZ PMM
- ☐ WoFS 2-5 km UH Paintball

Verification

- ☐ MRMS >= 40 dBZ Paintball
- ☐ MRMS 2-5 km Az. Shear Tracks
- ☐ MRMS 0-2 km Az. Shear Tracks
- ☐ MRMS >=1 in. MESH Paintball

Local Storm Reports

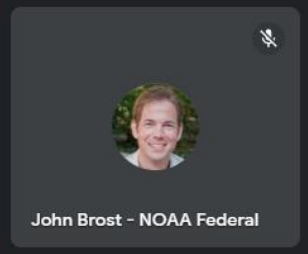
- ☐ 30-min Hail
- ☐ 30-min Tornado
- ☐ Accum. Wind
- ☐ Tornado Warning
- ☐ Flash Flood Warning
- ☐ 30-min Wind
- ☐ Accum. Hail
- ☐ Accum. Tornado
- ☐ Svr. Tstm. Warning

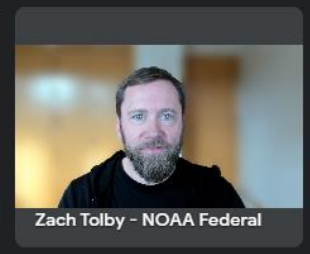
Additional Options

Save Image as PNG | Toggle Sounding Links

Other Links

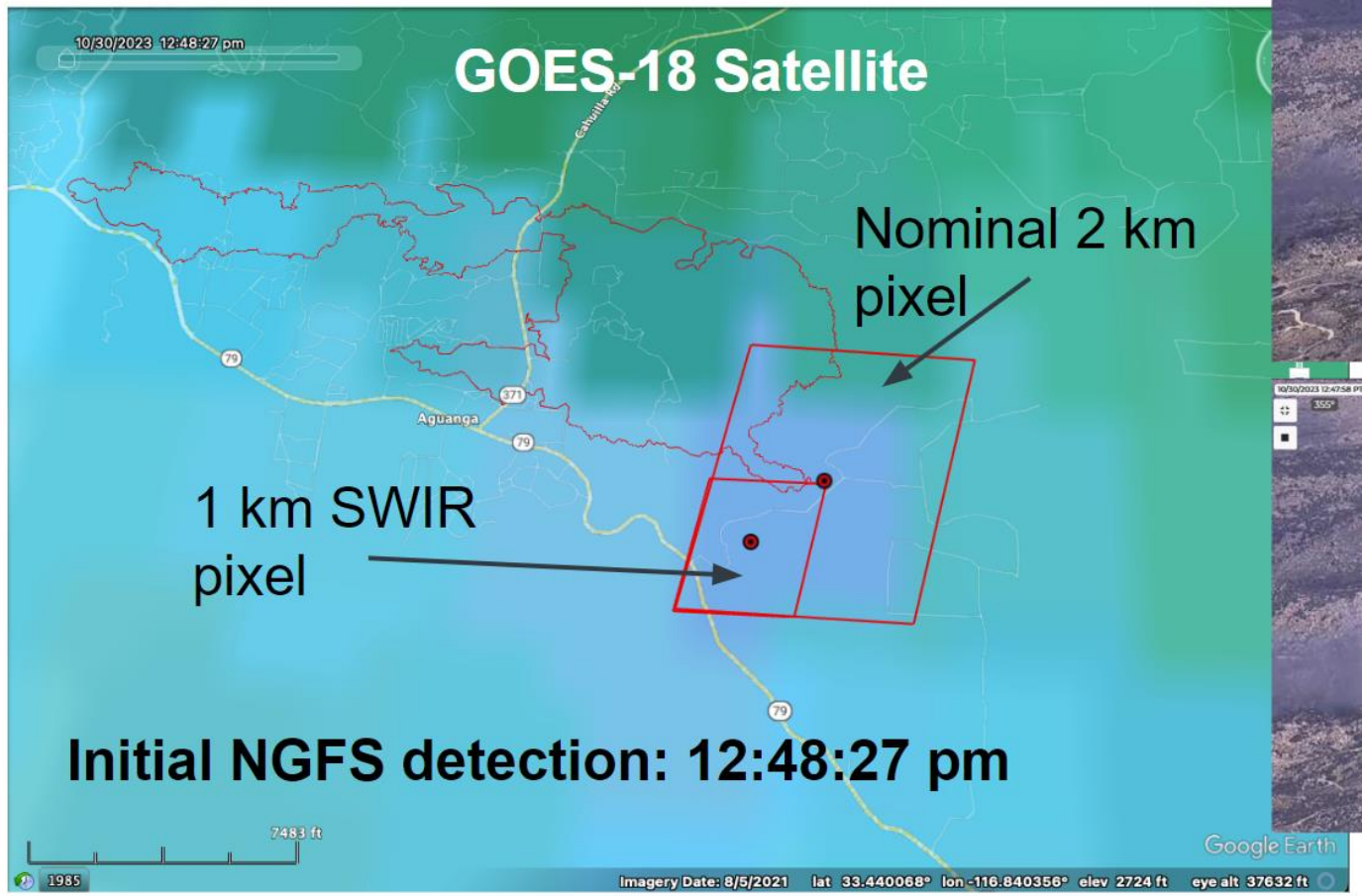
- NWS Forecaster Feedback
  If you are an NWS forecaster using this guidance in operations, please click on this link to provide some brief feedback.
- WoFS Viewer Video Overview

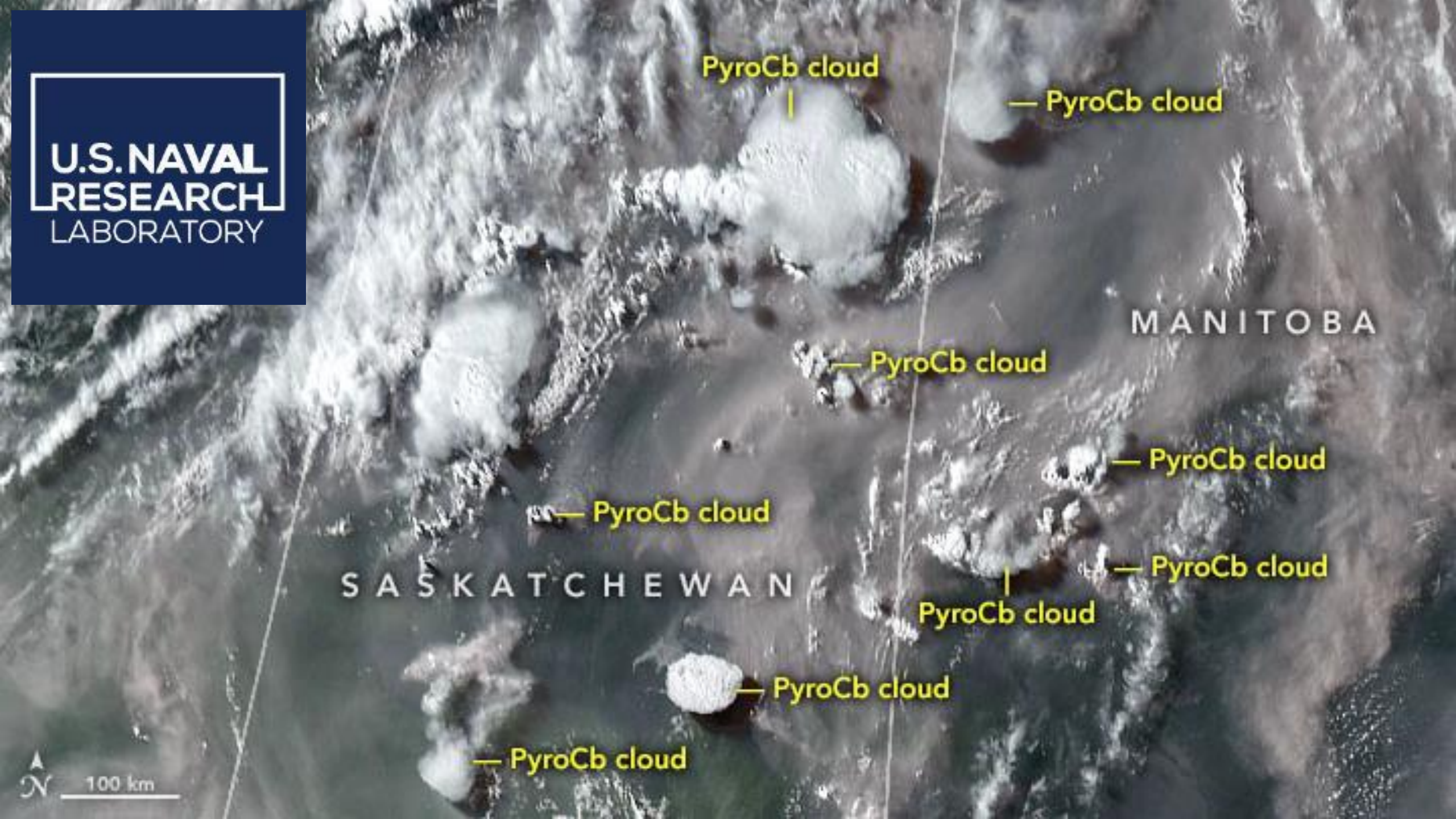




NESDIS Next Generation Fire System (NGFS)

Highland Incident - Riverside County - Oct 30, 2023




U.S. NAVAL RESEARCH LABORATORY
PyroCb cloud
PyroCb cloud
MANITOBA
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SASKATCHEWAN
PyroCb cloud
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100 km

FWT

FIRE WEATHER TESTBED

- User Needs Assessment Team
  - Meteorologist
  - SBS Researcher
- Evaluations Team
  - Evaluation Scientist
  - Verification Meteorologist
  - Test & Evaluation Meteorologist
- IT Support Team
  - IT Specialist
  - Cloud Specialist
- Coordinator

Dr. Ben Hatchett

Dr. Emily Wells

Kyle Thiem

Bernadette Pfau

FIRE WEATHER TESTBED
GSL • NWS • NESDIS

The Fire Weather Testbed plans to bring the wildfire community together

Scientists, researchers, developers, partners, operational meteorologists, decision makers, firefighters and the public.

To ensure advances in wildfire and smoke-related science result in better-informed decisions

AND

Ultimately reduce loss of life, and protect property.

NOAA SATELLITES

NATIONAL WEATHER SERVICE

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Thank You

Questions?

Contact:
zach.tolby@noaa.gov

bit.ly/fireweathertestbed

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