Prediction High Impact Weather:

The Weather Ready Nation approach

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Content

- Weather Ready Nation
  - Slides adapted from Louis W. Uccellini, Director, NWS
- FACETs
  - Slides adapted from Lans P. Rothfusz, Acting Deputy Director, NSSL
- Link to modeling, yesterday's presentation

Part 1:

WEATHER READY NATION

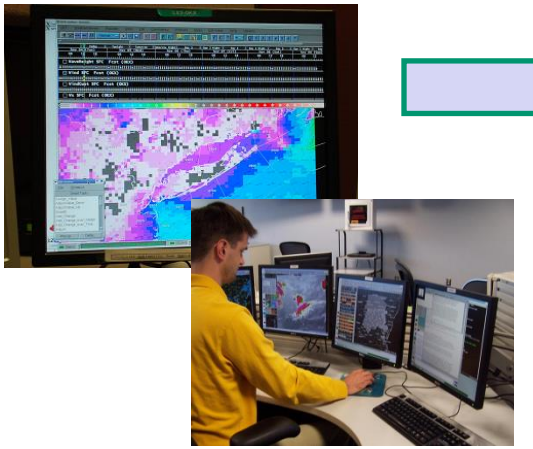
Building a Weather-Ready Nation

Building a WRN Requires NWS to Evolve

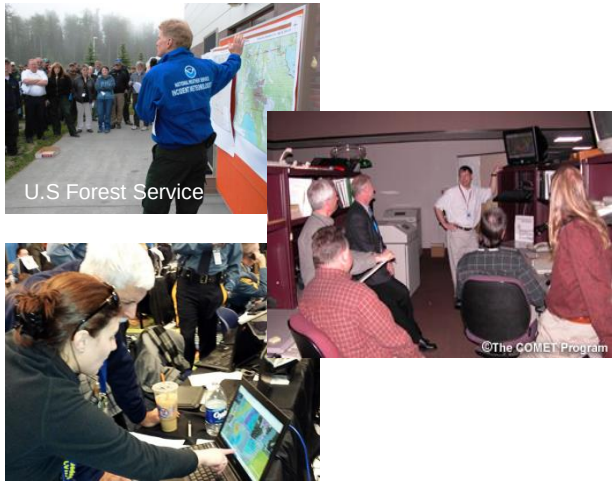
from just generating forecasts and warnings to

Connecting those forecasts/warnings to

impact-based Decision Support Services



Forecast Products



Impact Based Decision Support

Ready

Responsive

Resilient

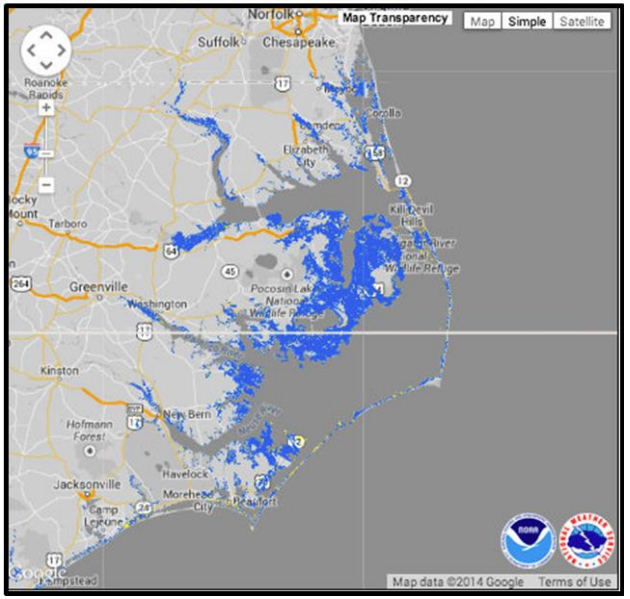
Building a Weather-Ready Nation

Building a Weather Ready Nation will change the way we work– and change the nature of our products:

- **Social Science - to ensure message delivered = message received for desired outcomes (e.g. How to describe and display "storm surge?")**
- **Understanding decision makers and their "shifting risk preferences" before/during/after an event**
  - *"Organized" – Government*
  - *"Loosely Coupled" – Social Organizations*
  - *"Organic" – Individuals*
- **Connecting forecasts/warnings to "Key Decision Points" in all service areas**
- How we measure success: determining intrinsic value

Hurricane Arthur
Potential Storm Surge Mapping
'Best Guess, Worst Case Scenario'

NHC Experimental Potential Storm Surge Flooding Map
Tropical Storm ARTHUR (2014) Advisory 7
From 11 AM EDT Wednesday July 02 to 04 PM EDT Saturday July 05



The NWS must evolve to complete these goals

Science Issues Related to The Spectrum of IDSS

- **Linking observations, forecasts & warnings to IDSS**
- **Observe → Forecast → Warn → Communicate → Respond**
- **Desired Outcomes**
  - **Sustain situational awareness**
  - **Relate/connect weather and water predictions to key decision points**

Multiple questions/issues on how to sustain, relate and connect to ensure desired outcomes

People's Reaction to Risk

From the "Biology of Risk"

by John Coates; New York Times Sunday Review (8 June 2014)

"Most models in economics and finance assume that risk preferences are a stable trait, much like your height. But this assumption, as our studies suggest, is misleading. Humans are designed with shifting risk preferences. They are an integral part of our response to stress or challenges."

The "shifting risk preference" poses *enormous* challenges to linking predictions to IDSS and represents an important foundation for FACETS

Additional Challenges for IDSS

The shifting risk preferences are compounded by the *"spectrum of decision makers"

- **Organized – government agencies**
- **Loosely Coupled – e.g. social/religious organizations**
- **Organic – personal – cell phone!**

This spectrum also drives the communication strategies

* ***As described by William Wittel of Hall County Georgia, WMO international conference - AMS Annual Meeting in Atlanta, GA***

Challenges to Successful IDSS

- Organizations and individuals will shop around for confirmation – risk assessment
  - [multiple dissemination ↔ multiple choices] poses challenges to consistent messaging
- Risk preferences will shift as the event approaches
- The recognition of, and response to, risks are a function of the:
  - The spectrum of decision makers (organized, loosely coupled, individual)
  - The extent that they 'have a plan'
  - The extent that plan suits their 'risk management' AND addresses 'shifting risk preferences'

The role of social science & successful partnerships looms large!

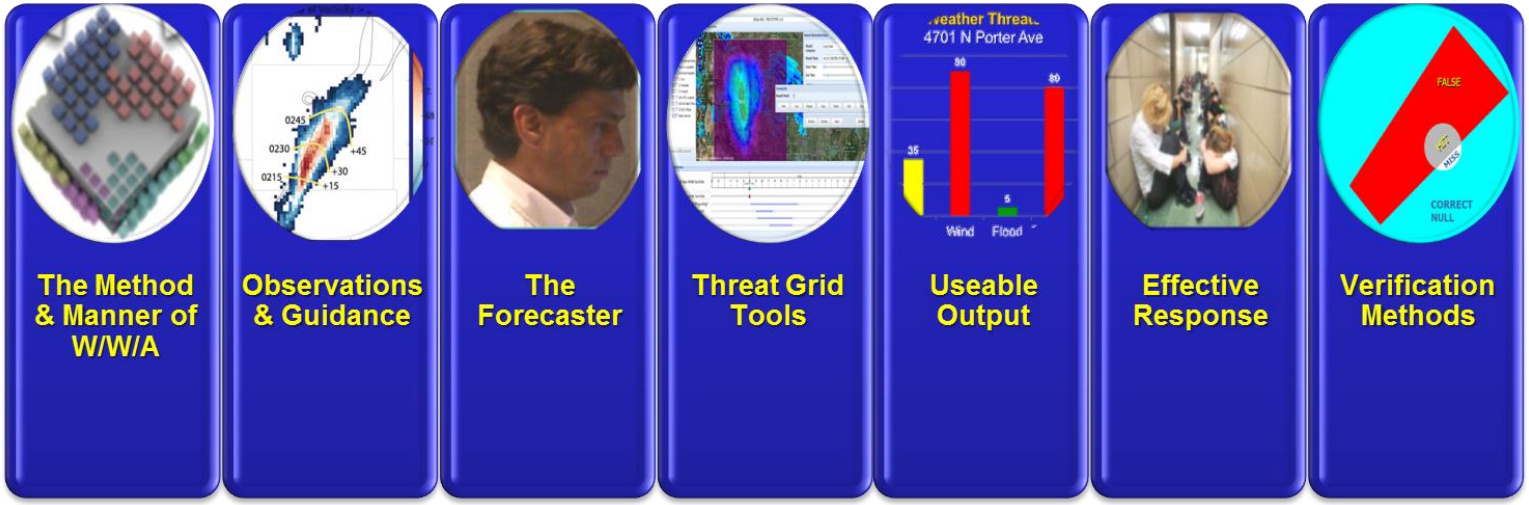
Forecasting a Continuum of Environmental Threats (FACETs):

A Proposed Next-Generation Hazardous Watch/Warning Paradigm

PART 2

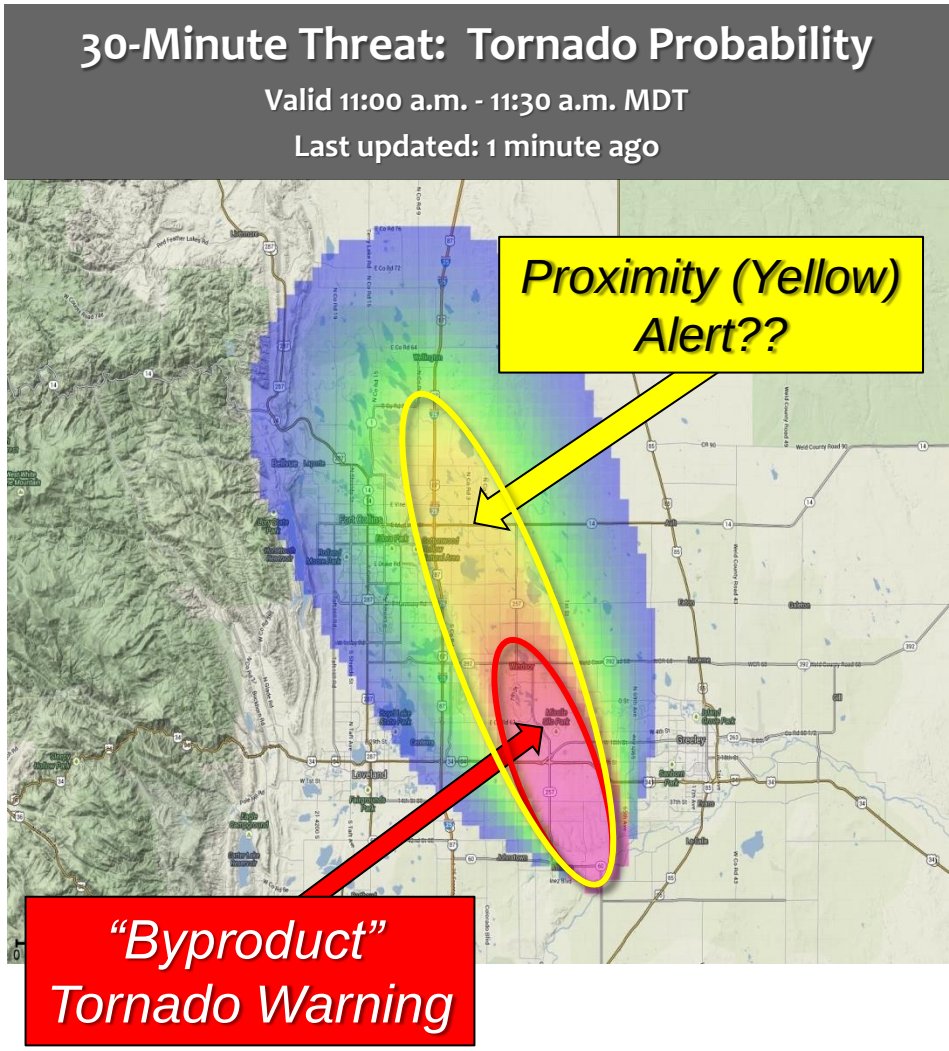
FACETs is…

- A proposed modernization of the NWS's teletype-era, deterministic, product-centric, WWA paradigm.
- A product of NOAA's Weather Ready Nation and a means of achieving WRN goals.
- An organizing framework for R2O.



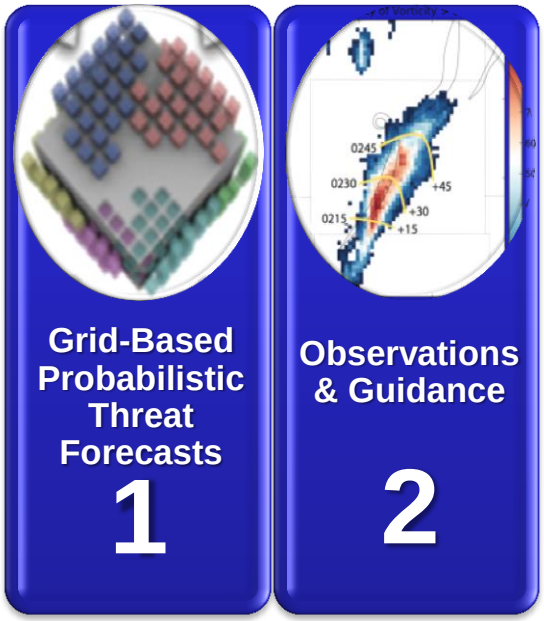
Facet #1: Changing the Starting Point

- Move from “binary” polygons to Probabilistic Hazard Information (PHI)
  - Grid-based threat probabilities.
    - Legacy warnings “fall out.”
    - New messages possible.
  - Not only for tornadoes.
    - Winter weather, hail, lightning, flooding, aviation, etc.



Facet #2: Obs & Guidance

- What forecasters use to make decisions.
  - Radar, satellites, models, observations, other forecasters, etc.



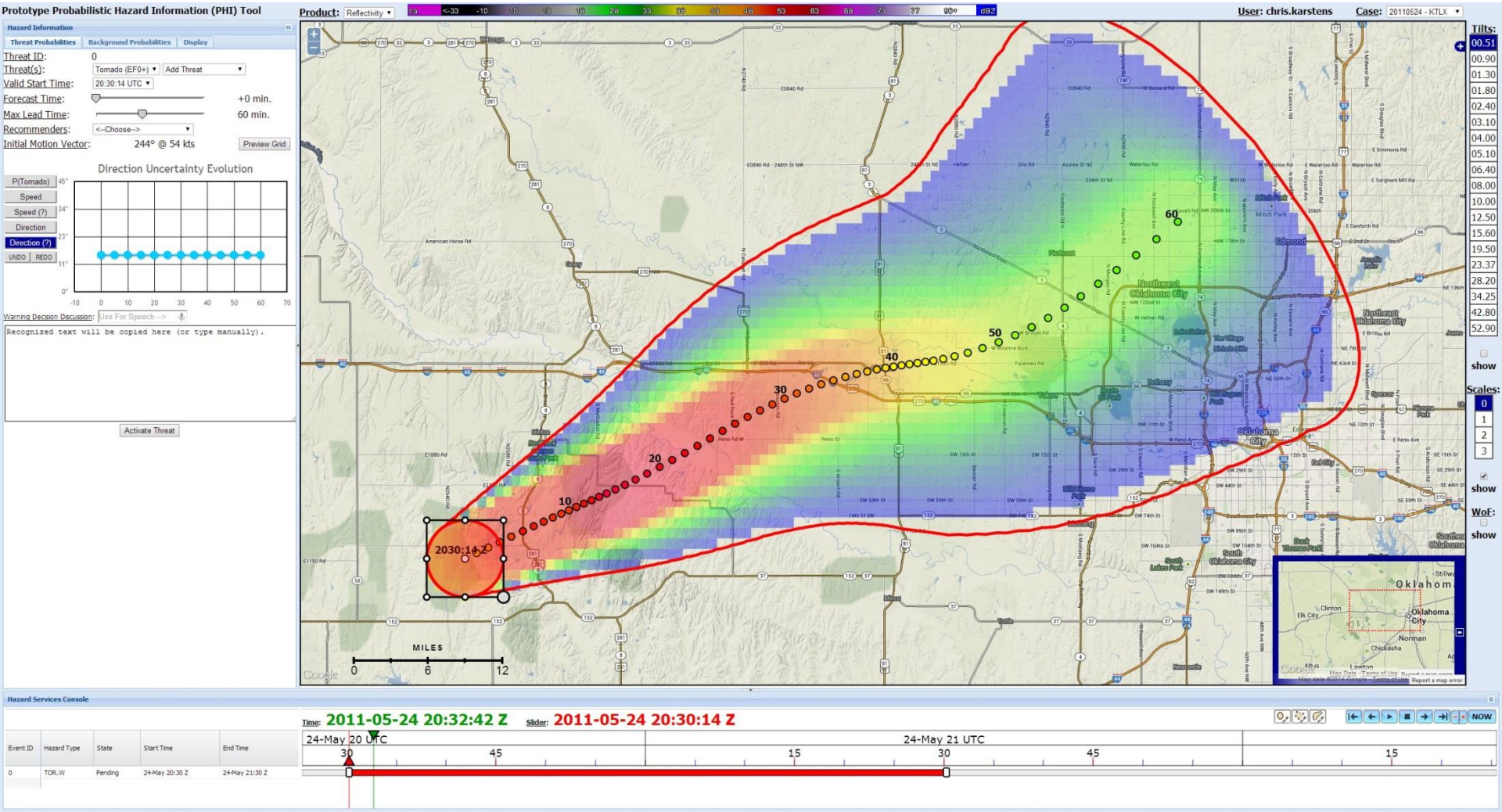
Facet #3: The Forecaster

- The person making the watch/warning decisions.
  - Knowledge, skills and abilities.
  - The human brain (wetware).

Facet #4: Threat Grid Tools

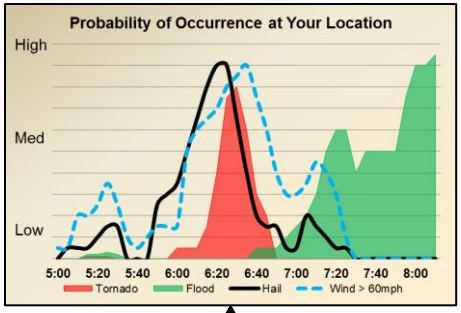
- What forecasters use to create the hazard information.
  - Hardware & software.
  - Hazard Services from OAR/GSD.

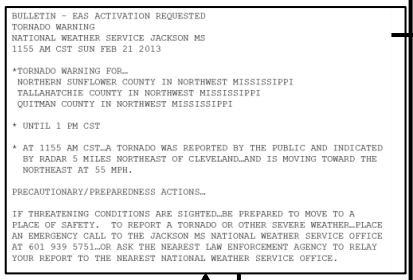
Facet #4: Threat Grid Tools

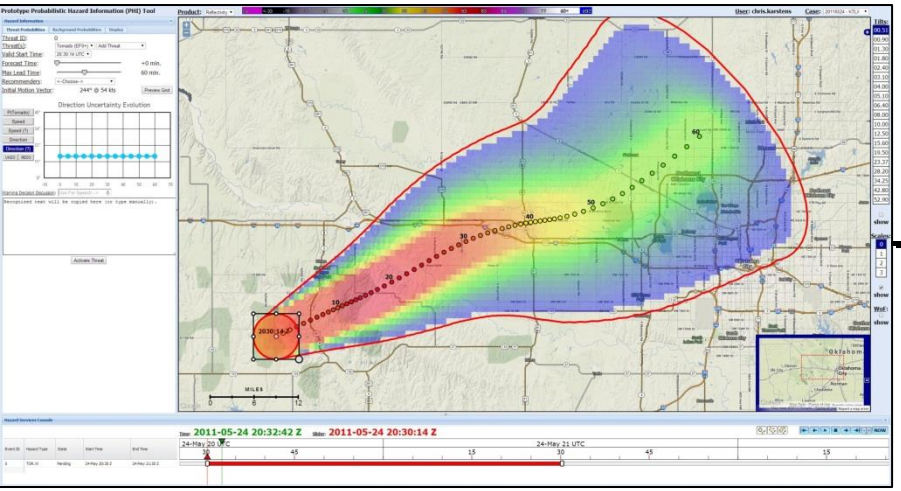


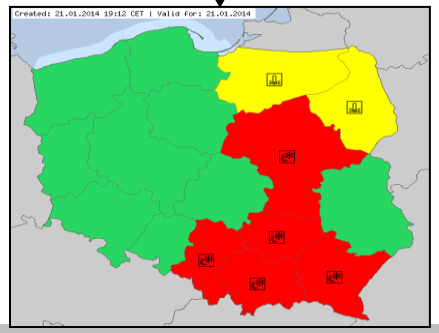
FACETs is…

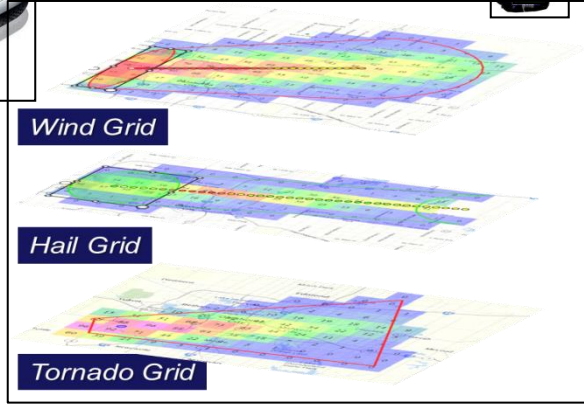
- **Multimedia, multi-point enabling.**









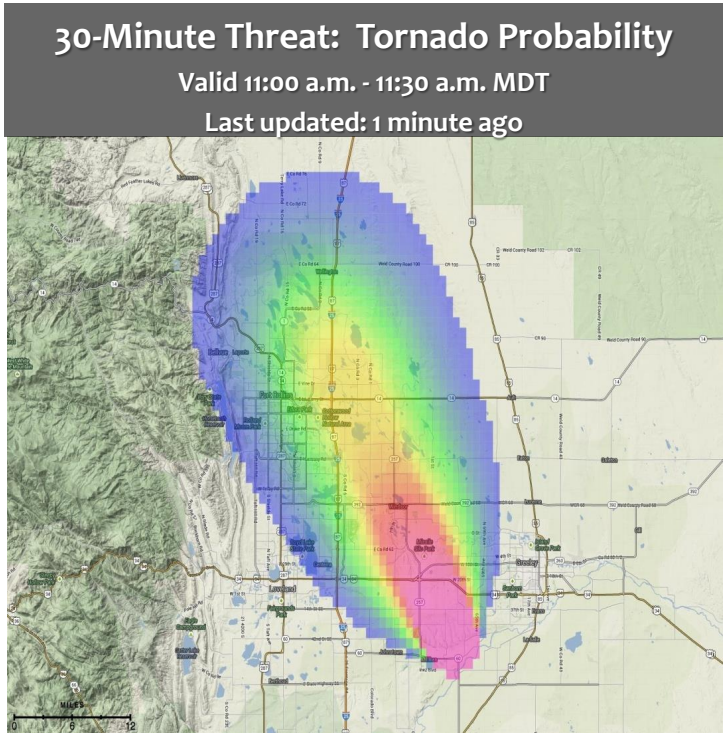


Facet #5: Useful Output

- What the end user sees and hears.
  - Graphical, textual, auditory, digital, etc.

Facet #5: Useful Output

- Watches & warnings, yes.
  - Smaller, phenomenon-specific areas.
  - User-specifiable thresholds.
  - Longer (non-warning) lead time.
  - New opportunities for private sector.
- Impact-focused, with new information.
  - Urgency, confidence, range of possibilities, etc.

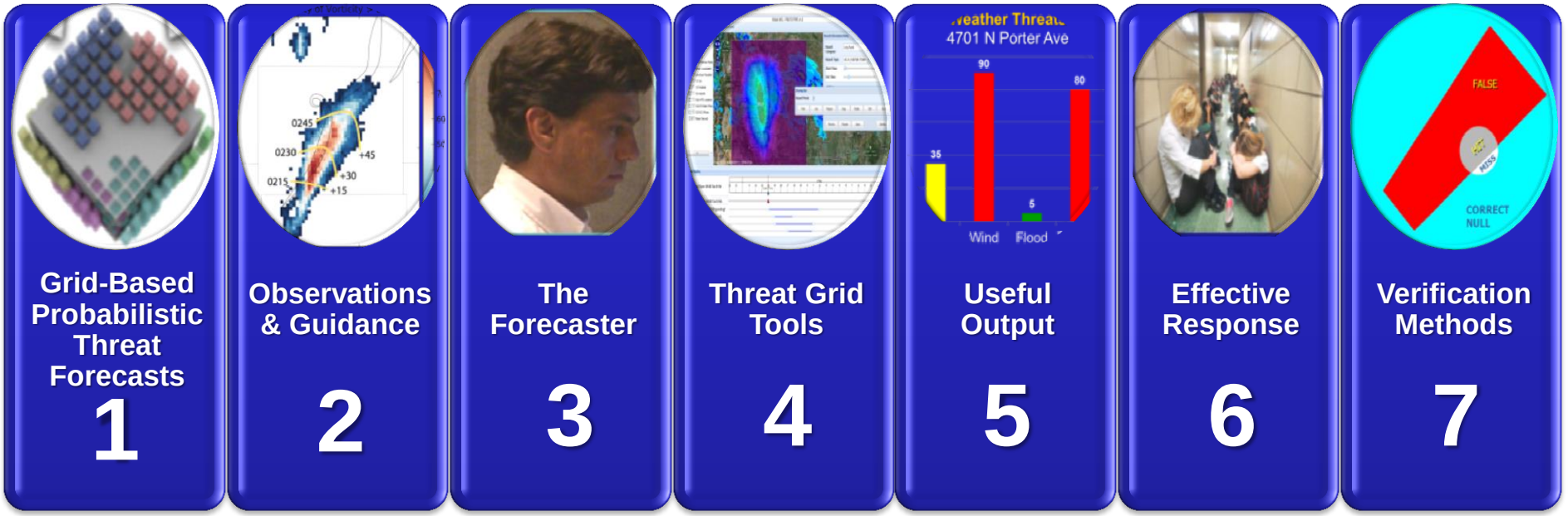


Facet #6: Effective Response

- What the end user does.
  - The science/human interface.
  - The most important facet.
  - Where social/behavioral sciences pay off.

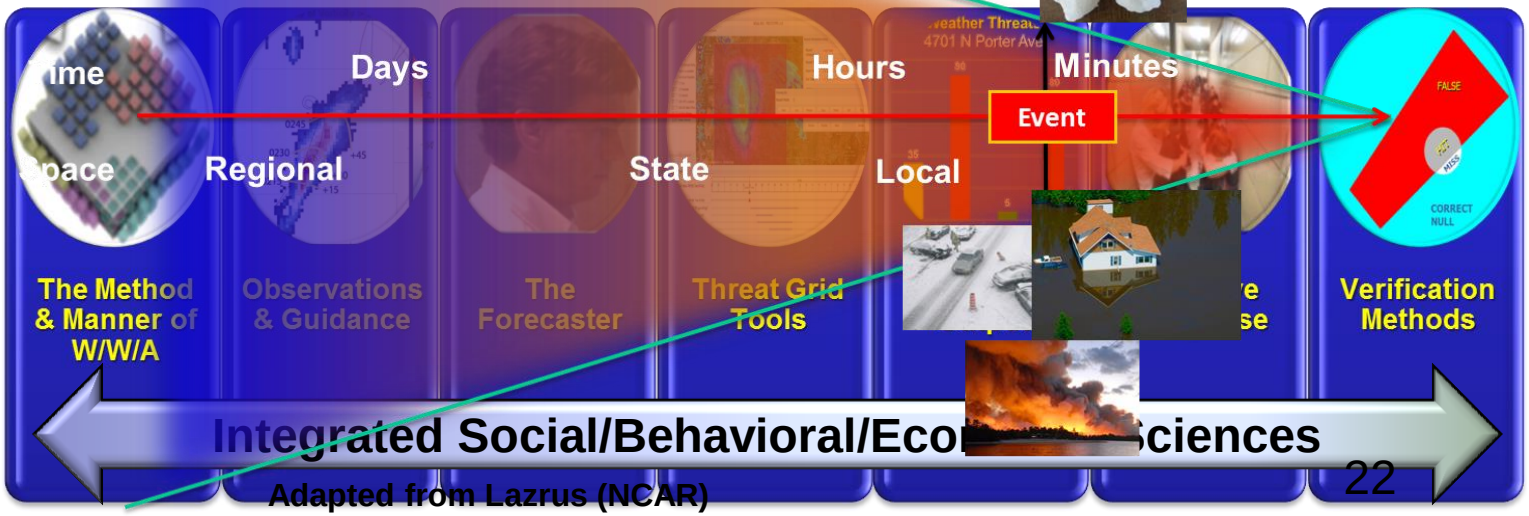
Facet #7: Verification

- Evaluating system effectiveness.
  - Measuring more than just forecast skill…
  - …measure the response, too!



FACETs is…

- A science-driven paradigm delivering a continuous stream of high-res, probabilistic hazard information extending from days to within minutes of event.
- Optimized for user-specific decision-making through comprehensive integration of social/behavioral sciences.



The FACETs Master Plan

- June 2014 Workshop
  - What will it take to get from present system to FACETs?

BULLETIN - EAS ACTIVATION REQUESTED
TORNADO WARNING
NATIONAL WEATHER SERVICE JACKSON MS
1155 AM CST SUN FEB 21 2013

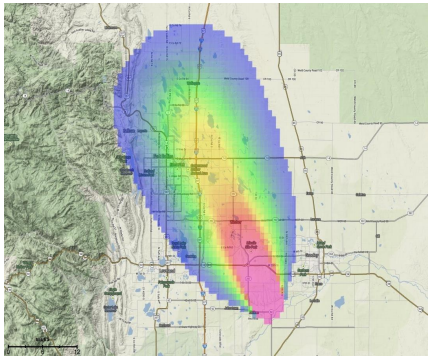
*TORNADO WARNING FOR…
NORTHERN SUNFLOWER COUNTY IN NORTHWEST MISSISSIPPI
TALLAHATCHIE COUNTY IN NORTHWEST MISSISSIPPI
QUITMAN COUNTY IN NORTHWEST MISSISSIPPI

* UNTIL 1 PM CST

* AT 1155 AM CST…A TORNADO WAS REPORTED BY THE PUBLIC AND INDICATED BY RADAR 5 MILES NORTHEAST OF CLEVELAND…AND IS MOVING TOWARD THE NORTHEAST AT 55 MPH.

PRECAUTIONARY/PREPAREDNESS ACTIONS…

IF THREATENING CONDITIONS ARE SIGHTED…BE PREPARED TO MOVE TO A PLACE OF SAFETY. TO REPORT A TORNADO OR OTHER SEVERE WEATHER…PLACE AN EMERGENCY CALL TO THE JACKSON MS NATIONAL WEATHER SERVICE OFFICE AT 601 939 5751…OR ASK THE NEAREST LAW ENFORCEMENT AGENCY TO RELAY YOUR REPORT TO THE NEAREST NATIONAL WEATHER SERVICE OFFICE.



- Result: 46 distinct projects identified.
  - 16 physical science
  - 14 software development
  - 23 social/behavioral/economic science
  - 3 training and outreach
  - (4 WRN Projects)

Part 3:

BACK TO MODELING

What could this mean for weather products ?

Range				Day	Hour
Target			m range ther	Convection resolving	Warn On Forecast
Pres models			NAM / SREF / RAP / HWRF	HRRR / NAM nest / HiresW	none
Cadence	(is 6h)	6-24h (is 6h)	6h	1h	5-15m
Range	9-15 mo global	35-45d	Up to 10d	18-24h	3h
Updates	4y				
Reanalysis	1979-present	20-25y	3y	???	???
Where	???	WCOSS	WCOSS	WCOSS	???

Shift from focus on compute resources to products, communications, social sciences ?

shift in use of compute resources ?

foundational

traditional outlook “IDSS”

new IDSS / FACETS


Thank You!