

National Advisory Committee on Windstorm Impact Reduction (NACWIR) NOAA Update

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NOAA Research

Weather Portfolio Advisor

Significant Contributions from:

- Shirley Murillo (NOAA AOML)
- Ted Mansell (NOAA NSSL)
- Fred Toepfer (NOAA NWS)



Outline

- NWS Weather Ready Nation
- Hurricane Research
 - HFIP
 - HWRF
 - IFEX
 - JHT
- Tornadoes, Thunderstorms, and Severe Weather Research
 - WoF
 - FACETs
 - VORTEX-SE
 - MPAR
 - HWT



NWS Strategic Outcome: *A Weather- and Water-Ready Nation*

WRN

“Ready, Responsive, Resilient”

Becoming a Weather-Ready Nation is about **building community resiliency in the face of increasing vulnerability to extreme weather, water and climate events**

Better forecasts and warnings

Consistent products and services

Actionable environmental intelligence

Connecting forecasts to decisions

Involves the entire US Weather, Water and Climate Enterprise WORKING TOGETHER

We have *5100+* WRN Ambassadors



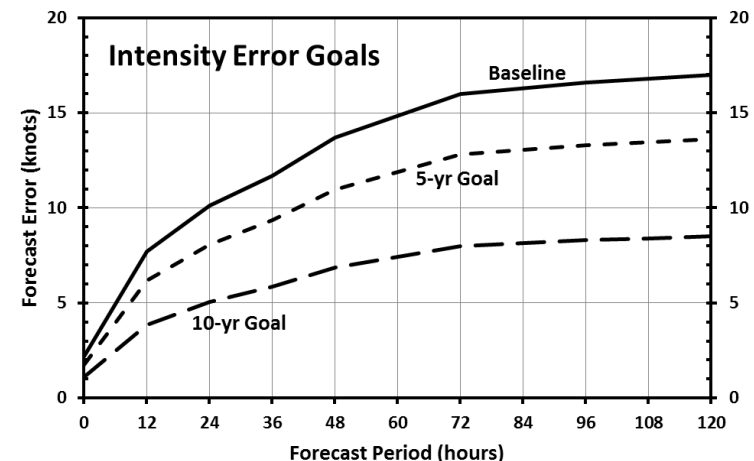
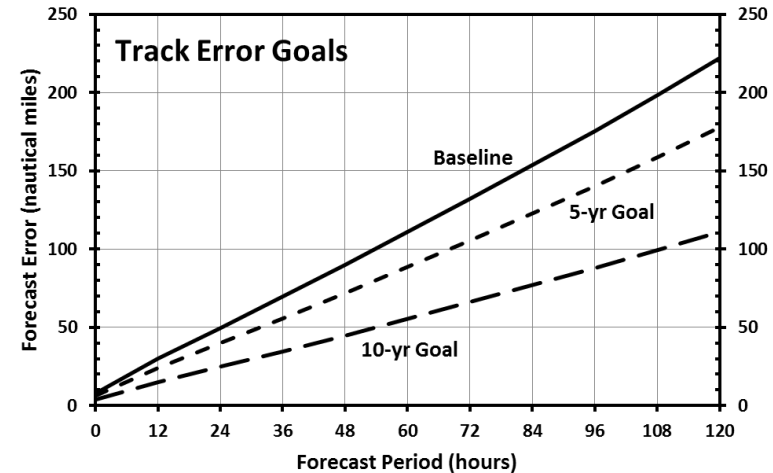
Hurricane Forecast Improvement Program (HFIP)

Vision

Organize the hurricane community to dramatically improve numerical forecast guidance to NHC in 5-10 years

Goals

- Reduce numerical forecast errors in track and intensity day 1 to day 5
 - 20% in 5 years,
 - 50% in 10 years
- Extend forecast guidance to 7 days with skill comparable to 5 days at project inception
- Increase probability of detection (POD) for rapid intensity change to 90% at day 1 decreasing linearly to 60% at day 5
- Decrease the false alarm ratio (FAR) for rapid intensity change to 10% for Day 1 increasing linearly to 30% at Day 5
- Improve storm surge prediction



Key to Success: Community Engagement with Accelerated Research to Operations

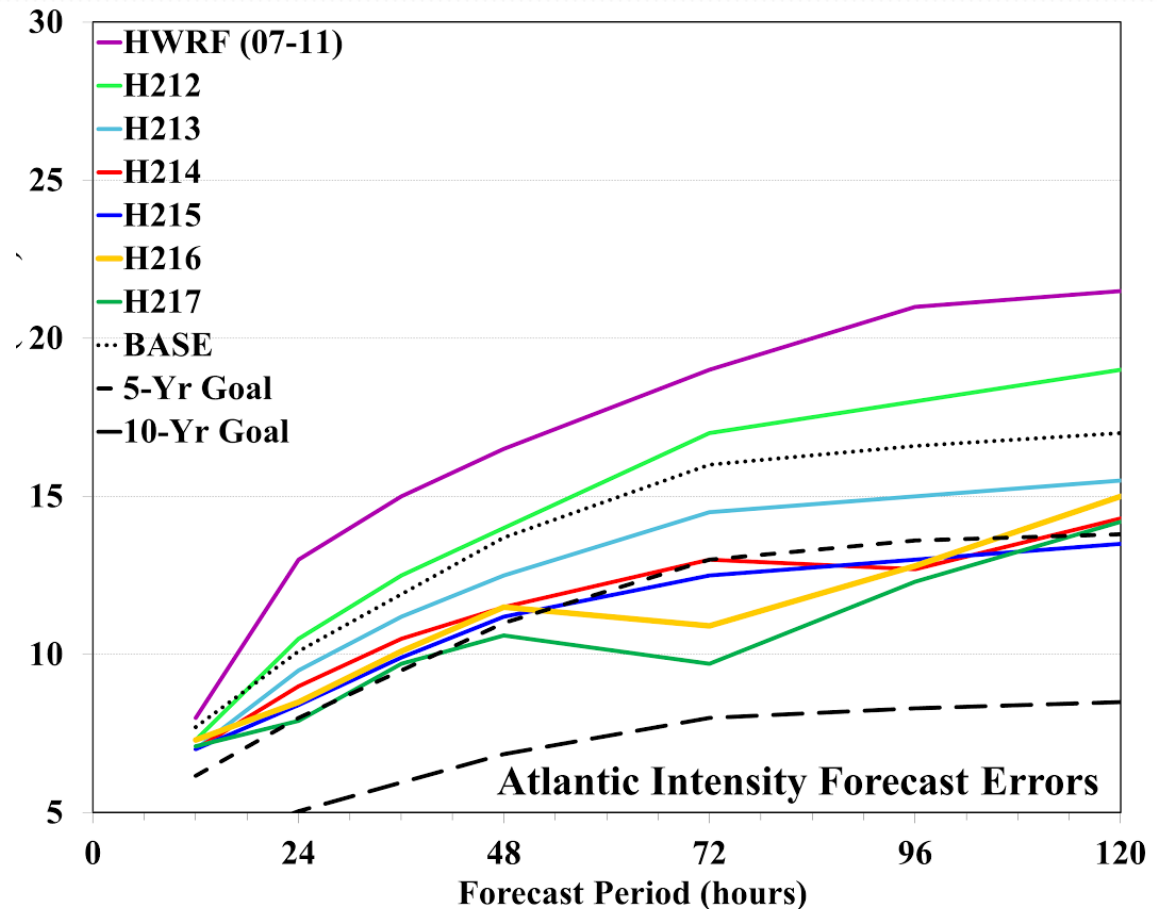


Hurricane Weather Research and Forecasting (HWRF) Model

**This marks 6th year in a row of demonstrating continuous improvements as measured through heterogeneous verification of multi-year retrospective runs.

HWRF Upgrades 2017-

- Upgrade to Dynamics and Physics
- Coupled to HYCOM Ocean Model
- Cycled Hybrid EnKF Data Assimilation





2017 Hurricane Field Program: Intensity Forecasting Experiment (IFEX)

Since 2005

- Improve prediction of tropical cyclone intensity **change by:**
 - Collect observations for model initialization and evaluation
 - Develop and refine measurement technologies
 - Improve understanding of intensity change processes
- 2017 IFEX science priorities
 - Test and transmit the newly upgraded airborne tail Doppler radar data (P-3 and G-IV jet)
 - Collect data during the strong intensification phase of hurricanes
 - Collect data in high winds with the Doppler Wind Lidar instrument
 - Test and launch the small unmanned aircraft: Coyote



NOAA P₃



Coyote UAS

IFEX is a partnership among many NOAA line offices (OAR, NWS, OMAO, and NESDIS)



Joint Hurricane Testbed (JHT)

Since 2001

- **Mission:** successfully transfer new technology, research results & observational advances from research groups to operational centers (NHC & EMC)
- JHT supported 89 projects, 52 implemented into operations (NHC/EMC)
- **Summer 2017**
 - Eight current projects will test during the 2017 hurricane season. Funding ends in Aug.
 - New projects are scheduled to begin July 1st.
 - Operational implementation decision made by NHC in Dec.

The JHT is funded by the US Weather Research Program in NOAA/OAR's Office of Weather and Air Quality

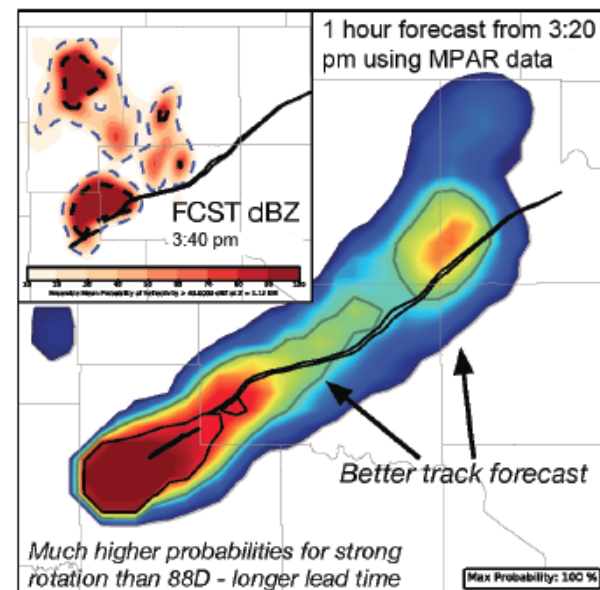
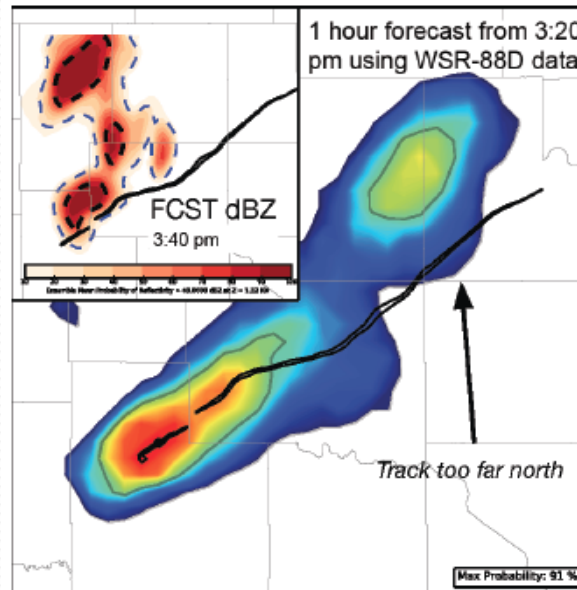
Severe Weather Research:

Warn-on-Forecast

- NOAA's **Warn-on-Forecast** research project aims to create computer-model projections that accurately predict storm-scale phenomena such as tornadoes, large hail, and extreme localized rainfall.
- If Warn-on-Forecast is successful, forecasters will be provided with reliable guidance for issuing tornado, severe thunderstorm, and flash flood warnings up to an hour before they strike.

El Reno, OK
EF-5 tornado

- Duration: 3:50-5:35 pm (1 hr 45 min)
- Distance traveled: 101 km
- Fatalities:9

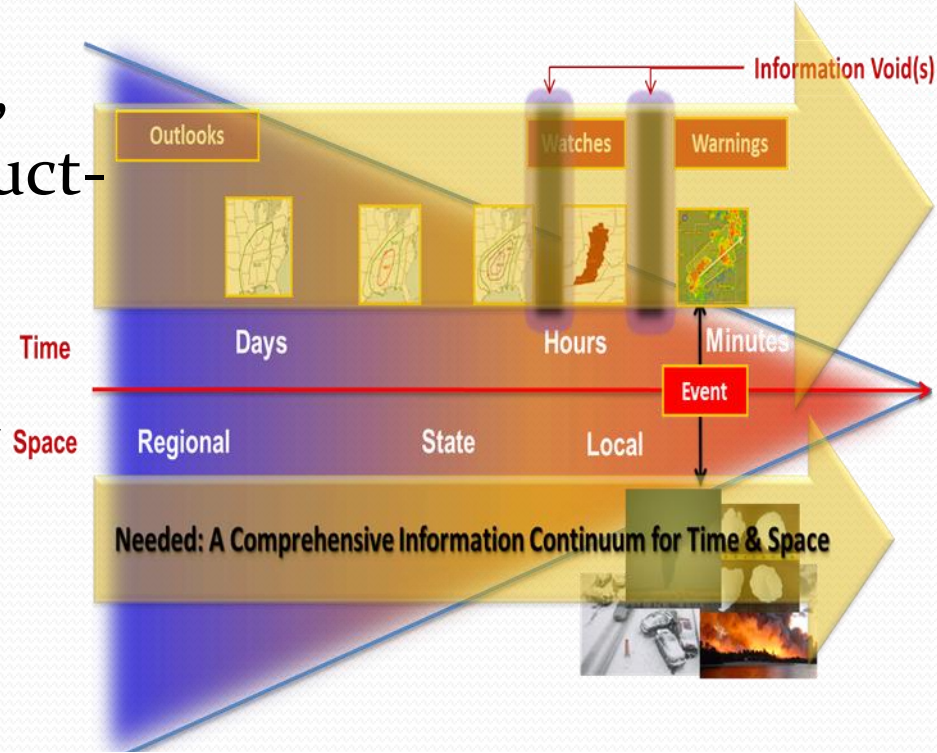




FACETS

- A **proposed reinvention** of NOAA's current teletype-era, deterministic (binary), product-centric paradigm.
- Borne out of NSSL/CIMMS research and Weather Ready Nation activities.
- Focused on entire forecast/warning process.

Adapted from Dr. Heather Lazrus (NCAR)



Grid-Based
Threat
Probabilities



Observations
& Guidance



The
Forecaster



Threat Grid
Tools



Usable
Output



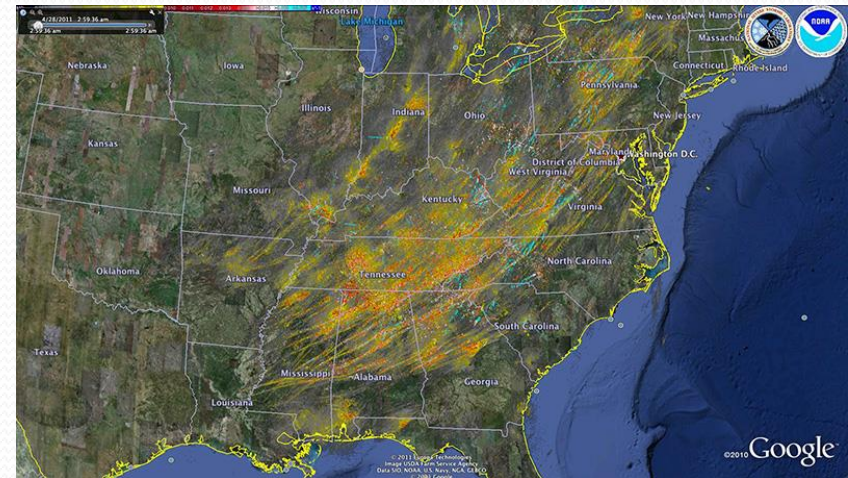
Effective
Response



Verification

VORTEX-SE

- The **Verification of the Origins of Rotation in Tornadoes EXperiment-Southeast (VORTEX-SE)** brings together meteorologists, researchers and social scientists to collaborate on a research program looking at the storms and conditions that produce tornadoes in the U.S. Southeast.
- VORTEX-SE is an effort to understand how environmental factors characteristic of the southeastern United States affect the formation, intensity, structure, and path of tornadoes in this region.





Multi-Function Phased Array Radar (MPAR)

- U.S. Navy SPY-1A phased array radar system was installed in 2003 at Norman, OK
 - 1970's technology used to demonstrate weather observations via electronic scanning with a passive array (vertical polarization only)
 - Demonstrated potential for improved severe weather warnings made possible by rapid update volumetric radar data
 - Dismantled in summer 2016



The Advanced Technology Demonstrator (ATD) is currently under development

Installation is scheduled to begin during fall 2017 at Norman, OK

Initial demonstration capability ready by summer 2018 following extensive test and calibration activities

Updated technology including an active array with dual polarization



Hazardous Weather Testbed (HWT)

- The NOAA Hazardous Weather Testbed (HWT) is a joint project of the [National Weather Service \(NWS\)](#) and the [National Severe Storms Laboratory \(NSSL\)](#). The HWT provides a conceptual framework and a physical space to foster collaboration between research and operations to test and evaluate emerging technologies and science for NWS operations.
- The HWT is designed to accelerate the transition of promising new meteorological insights and technologies into advances in forecasting and warning for hazardous mesoscale weather events throughout the United States.
- Two primary program @HWT:
 - HWT Experimental Forecast Program (EFP)
 - HWT Experimental Warning Program (EWP)
- Currently, HWT is hosting the 2017 Spring Experiment





Questions