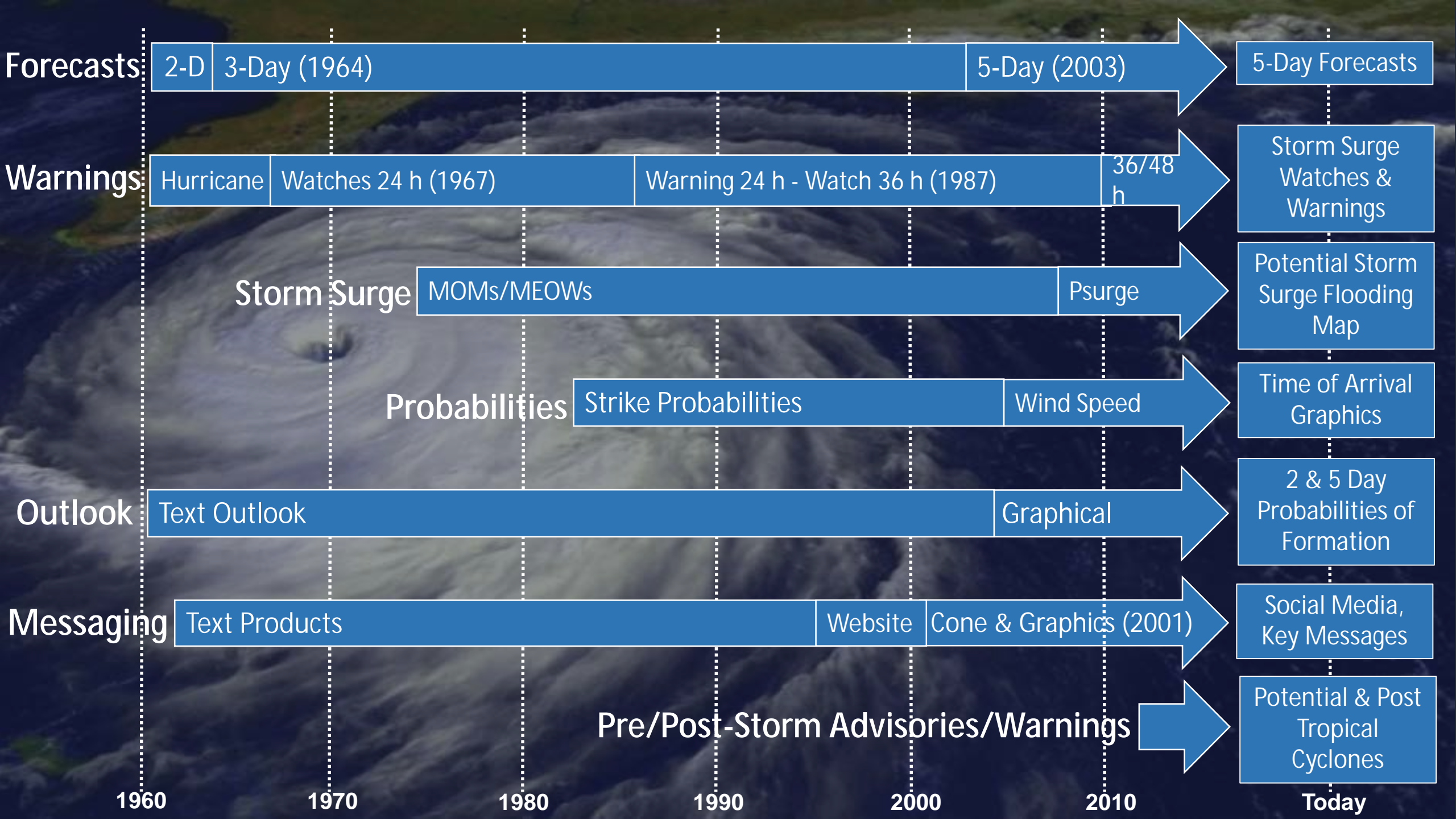




# Ideas for Future NWS/NHC Tropical Cyclone Products and Services

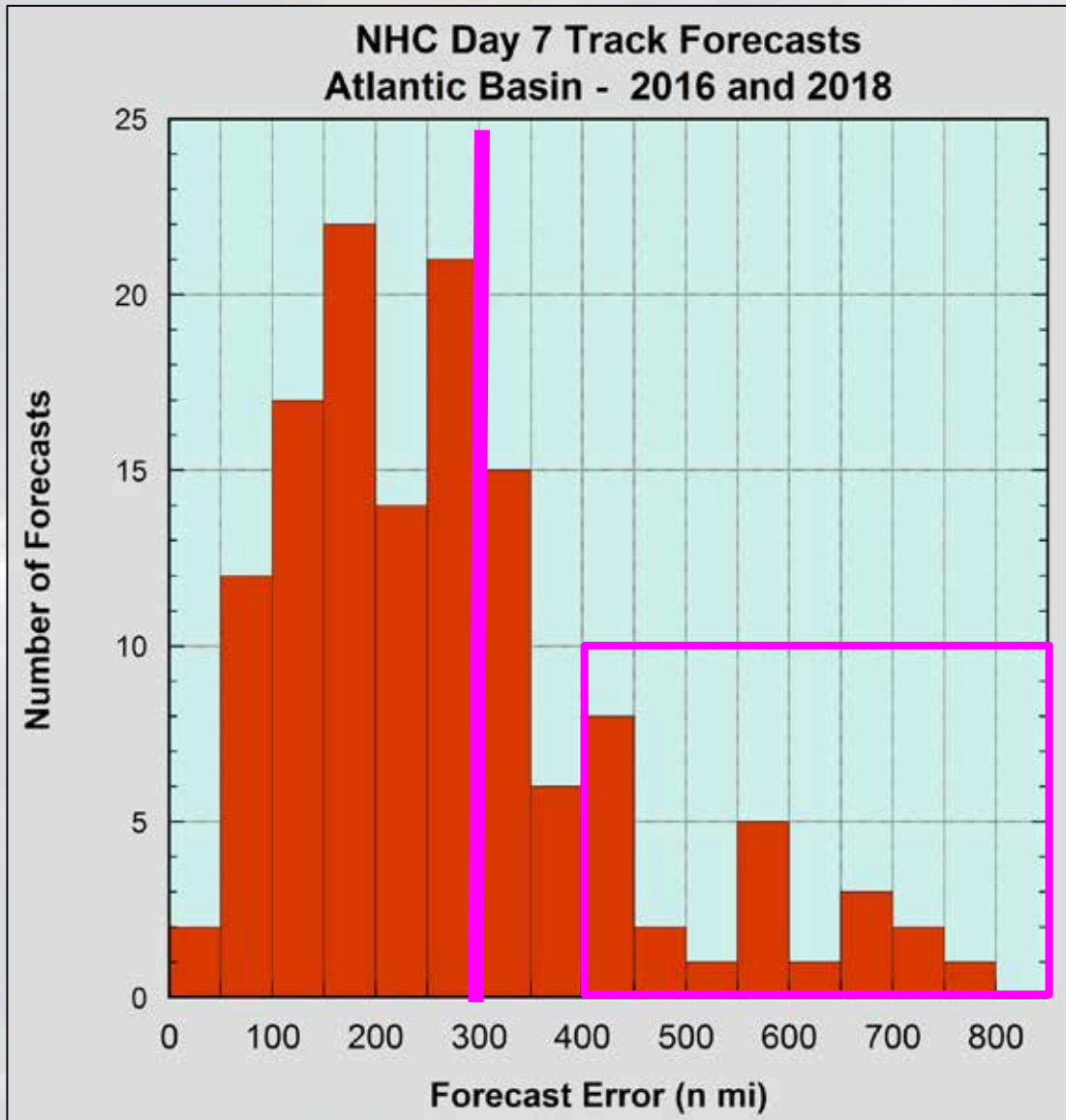
**Daniel Brown & Mike Brennan**  
**National Hurricane Center**



# Background

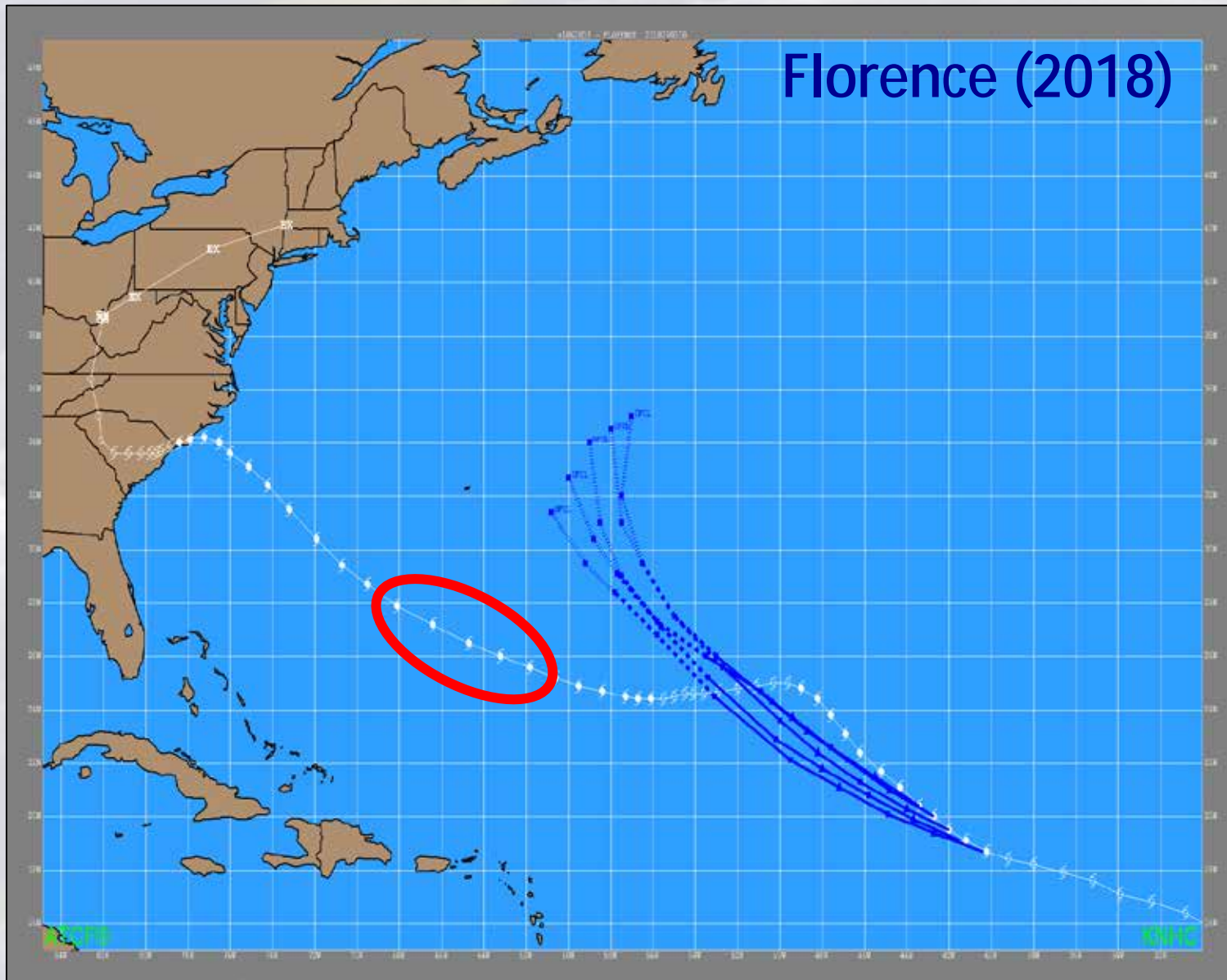
- NHC has moved toward hazard-specific probabilistic-based products during the past decade or so.
- What should be the next advances in NWS/NHC tropical cyclone products and services over the next decade?
  - Longer lead time products?
  - New graphics to help communicate risk?
  - Evaluation of products and warning products/communication?
- NHC began by collecting ideas from staff and core partners
- New social science projects are designed to help guide the process – more on that later in this session

# Extension of Track & Intensity Forecasts



- Day 6-7 track and intensity forecasts
  - Perhaps only do 6-7 day forecasts for tropical storms and hurricanes initially
  - Intermediate tropical cyclone forecast points beyond 48 h
- Average day 7 error around 300 n mi, but long tail in the distribution
- About 1 in 6 forecasts had errors greater than 400 n mi and about 5% had errors greater than 600 n mi

# Extension of Track & Intensity Forecasts

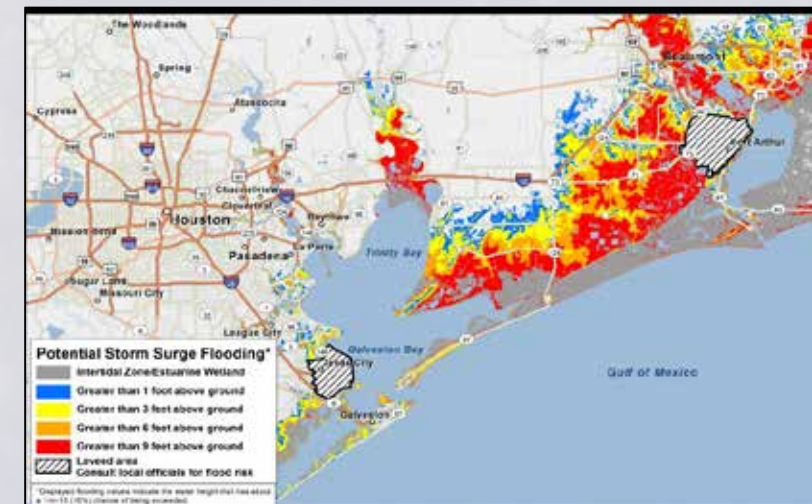
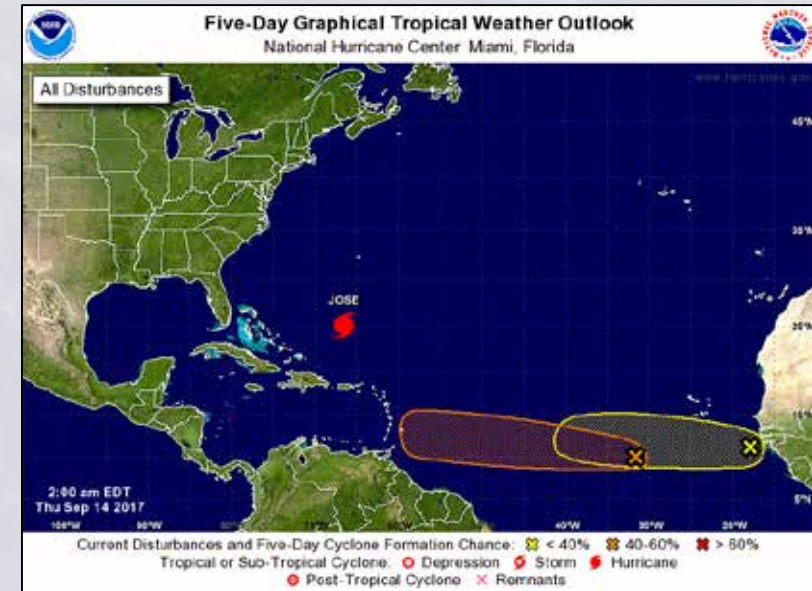


- About a day's work of Florence forecasts suggested that the storm would re-curve east of Bermuda.
- Most deterministic guidance and ensemble means showed re-curvature during this time
- If this forecast was public, how might it have affected the perception of Florence's eventual threat to the U.S. East Coast?



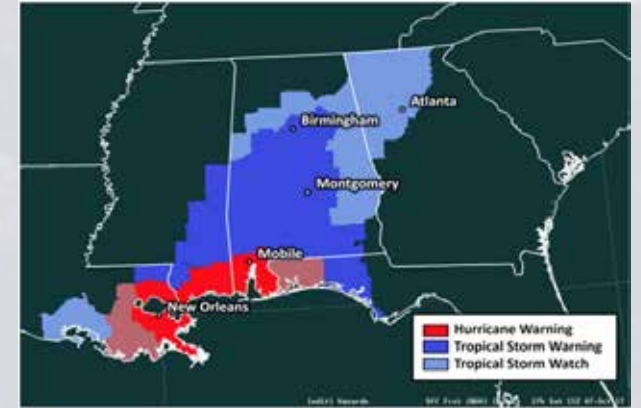
# Extension of Genesis and Storm Surge Products

- 7-day genesis forecasts (currently 5 days)
- Issuance of pre-genesis Tropical Storm & Hurricane Watches/Warnings for marine areas
  - NHC began providing this service to land areas in 2017
- Extend real-time storm surge guidance availability to 72 h prior to arrival of hazards (currently 48 h)



# Potential Enhancement to Graphical Products

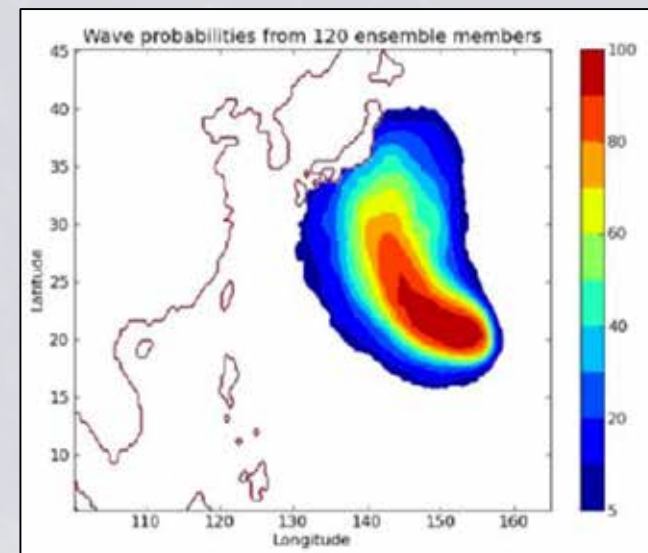
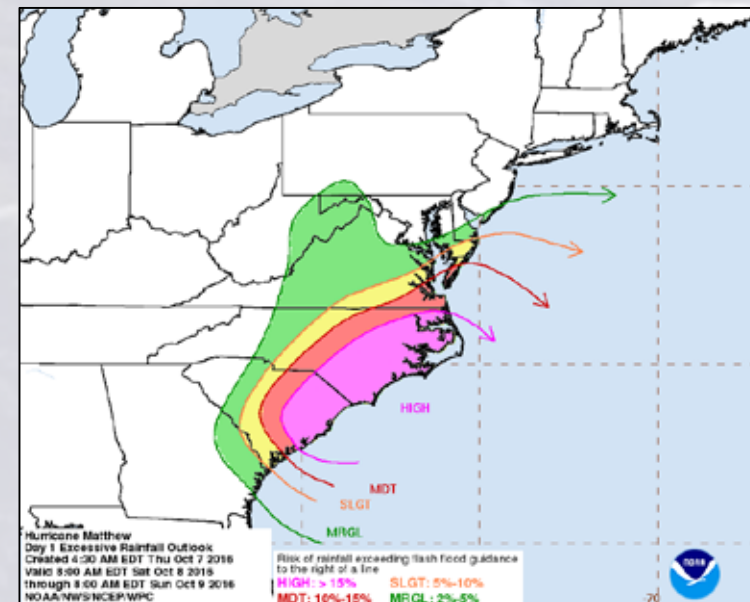
- Graphic to show all Tropical Storm/Hurricane/Storm Surge Watches/Warnings – coastal and inland
- Graphical representation of all hurricane hazards, include rip current threat
- Graphic to display storm surge forecast inundation values included in the Public Advisory





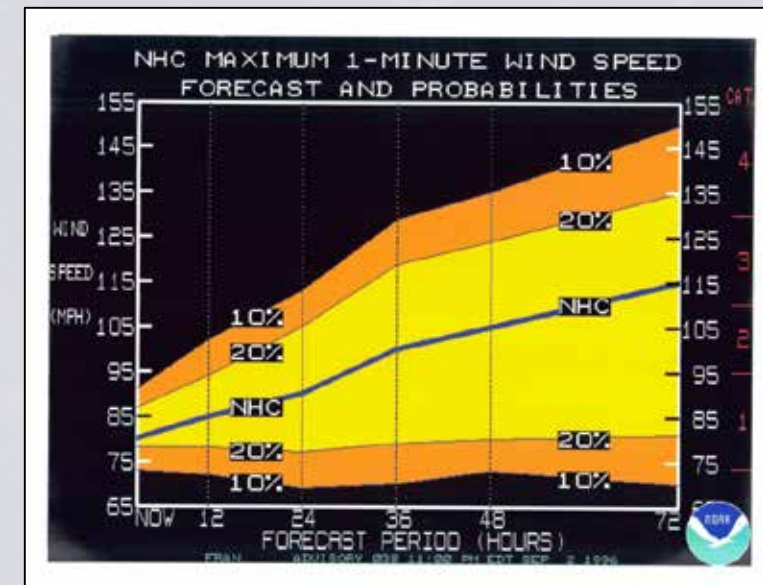
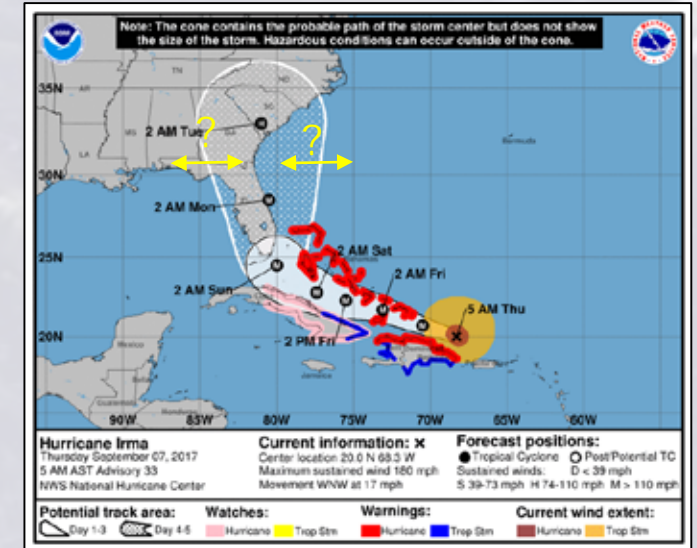
# Potential Enhancement to Graphical Products

- Improve communication of inland flood threat through new graphics or probabilistic products from WPC
- Probabilistic wave height information



# Enhancements to Communicating Uncertainty

- Dynamic track uncertainty cone based on model spread & synoptic situation instead of climatological errors
  - Replace cone with a more hazard-based product
- New product to convey bulk measure of forecast uncertainty (track, intensity, size)
- Intensity forecast “cone” or probabilistic landfall intensity information



# Other Forecasters Tools and Enhancements

- Ensemble-based tools to provide guidance for targeting supplemental observations (G-IV, raobs, satellite) to improve TC predictability
- Compiling post-storm data into a GIS database that could become part of the cyclone's permanent archive that users could download

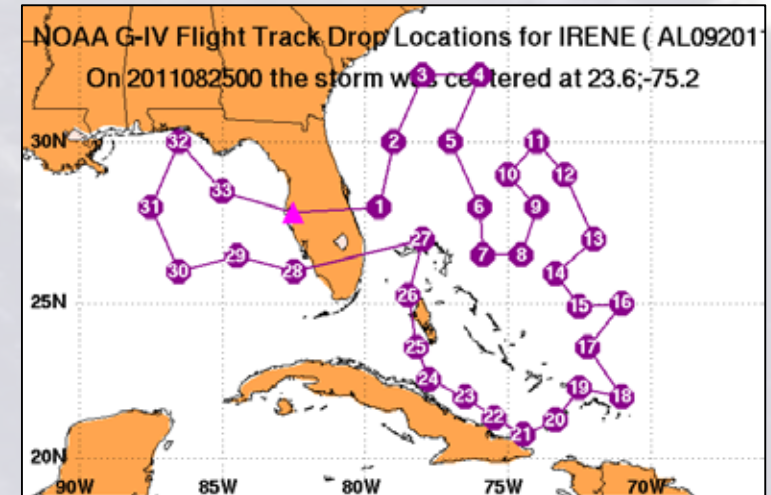


Table 4. Selected surface observations for Hurricane Maria, 16–30 September 2017.

Location	Minimum Sea Level Pressure		Maximum Surface Wind Speed		Storm surge (ft)	Storm tide (ft)	Estimated inundation (ft)	Total rain (in)
	Date/ time (UTC)	Pres. (mb)	Date/ time (UTC)	Sustained (kt)				
<b>Antigua and Barbuda</b>								
<b>Automated Weather Observation Systems (AWOS) Sites</b>								
Antigua (17.14 N, 81.73 W)			19/0900	37	45 (10 mi)			
<b>National Ocean Service (NOS) Sites</b>								
Barbuda (BARA9) (17.50 N, 81.82 W)		19/1718	1005.8		0.65	0.7		
<b>Dominica</b>								
<b>International Civil Aviation Organization (ICAO) Sites</b>								
Canefield Airport (TDCF) (15.34 N, 61.39 W)	19/0210	948	19/0140	73 (10 min)	116			17.8
Douglas-Charles Airport (TDFD) (15.52 N, 61.39 W)	19/0240	960	19/0240	130 (10 min)				2.4
<b>Gosford</b>								
Wat Area Belles	19/0230	953	19/0200	66 (10 min)	73			22.0
Salisbury (15.44 N, 61.44 W)								18.5
Pond Casse								14.5
Milton Estate								3.9
<b>Dominican Republic</b>								
<b>ICAO Sites</b>								
Anoyo Barril (MDAB) (18.20 N, 69.43 W)	21/1000	995.8	21/1500	40	74 (5 mi)			12.2
Sacana El Catez (MDCY) (19.27 N, 69.72 W)	21/0900	992.8	21/1500	34	65 (20 mi)			5.9

# Externally Submitted Ideas

- Issue Potential Tropical Cyclone advisories before the watch time period
- Information on time of departure of tropical-storm-force winds
  - Concern about public false sense of safety if other hazards still ongoing – not an all-clear time!
- Enhancements to hazard communication
  - More Key Messages, technical briefings for media partners, integrated public advisory with graphics, visuals to show threat/risk



**Key Messages for Hurricane Michael**  
 Advisory 8: 11:00 AM EDT Mon Oct 06, 2018

1. Michael is forecast to be a dangerous major hurricane when it reaches the northeastern Gulf Coast on Wednesday, and life-threatening storm surge is possible along portions of the Florida Gulf Coast regardless of the storm's exact track or intensity. Residents in the storm surge and hurricane watch areas should follow any advice given by local officials, as storm surge and hurricane warnings will likely be issued later today.
2. Heavy rainfall from Michael could produce life-threatening flash flooding from the Florida Panhandle and Big Bend region into portions of the Carolinas through Thursday.
3. Hurricane conditions will spread over portions of western Cuba this afternoon, where a hurricane warning is now in effect. Tropical storm conditions are expected over the northeastern Yucatan Peninsula and the Isle of Youth today.
4. Michael is expected to produce heavy rainfall and flash flooding over portions of western Cuba and the northeastern Yucatan Peninsula of Mexico during the next couple of days.

For more information go to [hurricanes.gov](http://hurricanes.gov)





Forecasts

5-Day Forecasts

6- & 7-Day Forecasts?

Warnings

36/48 h - Storm Surge W/W

Additional Lead Time ?

Storm Surge

Real-Time Products

Real-Time Products Beyond 48 h?

Probabilities

Wind, Surge, & Arrival

Other Hazards ?

Outlook

Graphical 5 Day

7 Day Outlook ?

Messaging

Social Media, Key Messages

New Graphics & Messaging

Pre-Formation

Potential TCs and W/Ws

More lead time before formation?

2000

2010

2018

Future

