



Looking Back at the 2022 Atlantic and East Pacific Hurricane Seasons...

...and What's New from NHC in 2023

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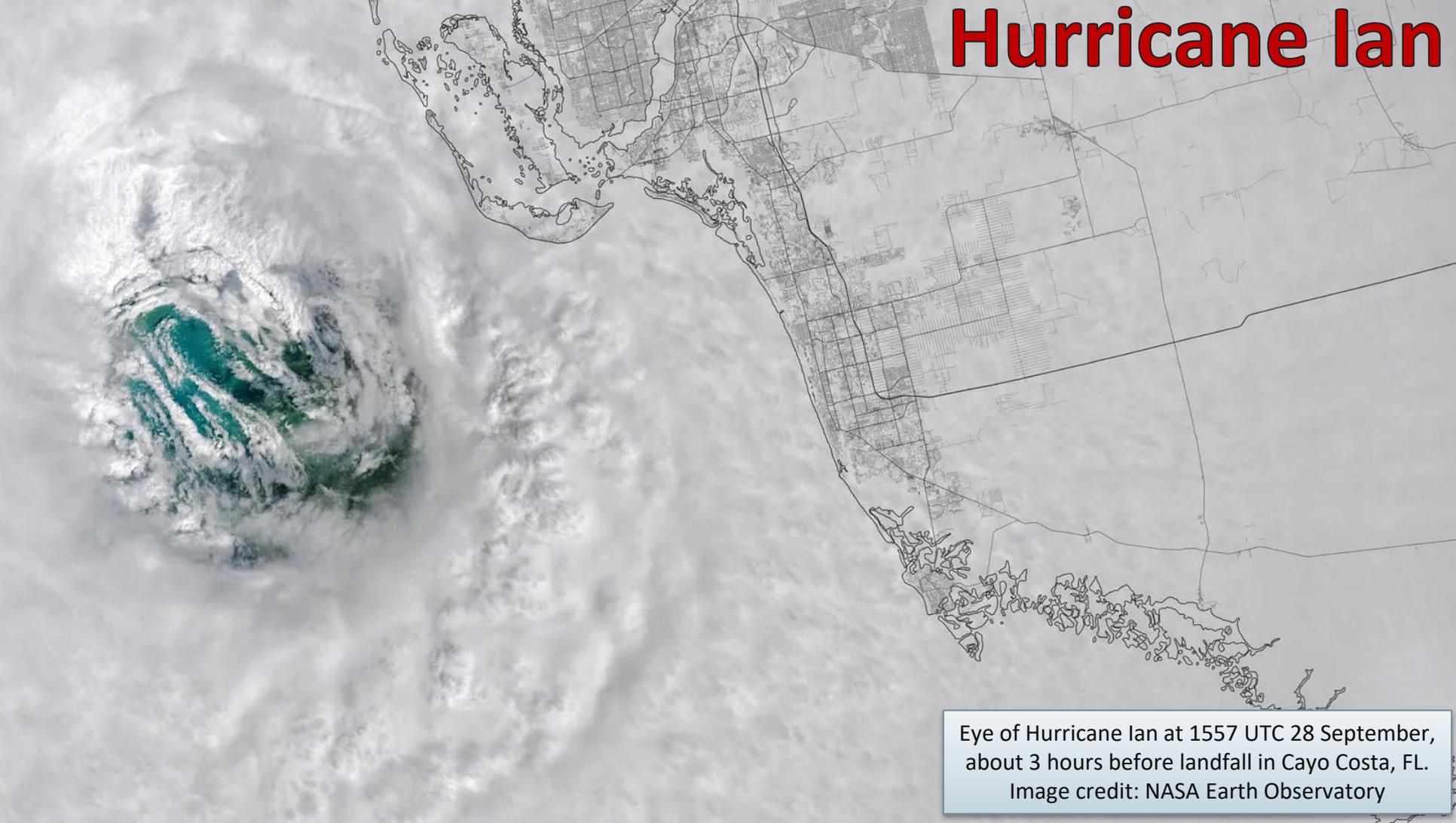
Senior Hurricane Specialist

National Hurricane Center

2023 TCORF/Interdepartmental Hurricane Conference

March 8, 2023

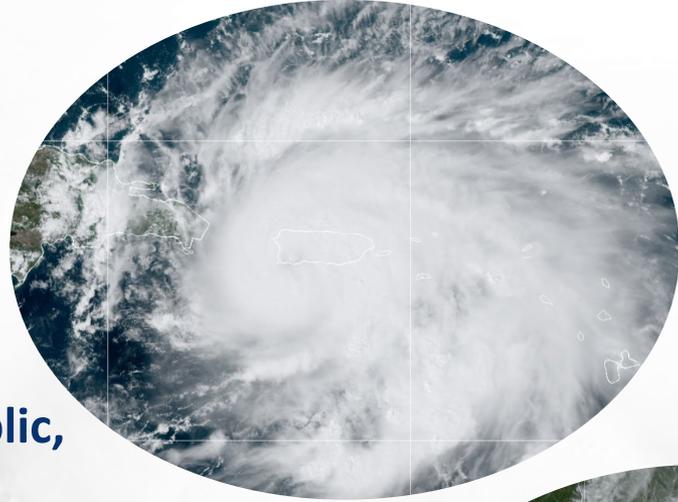
Hurricane Ian



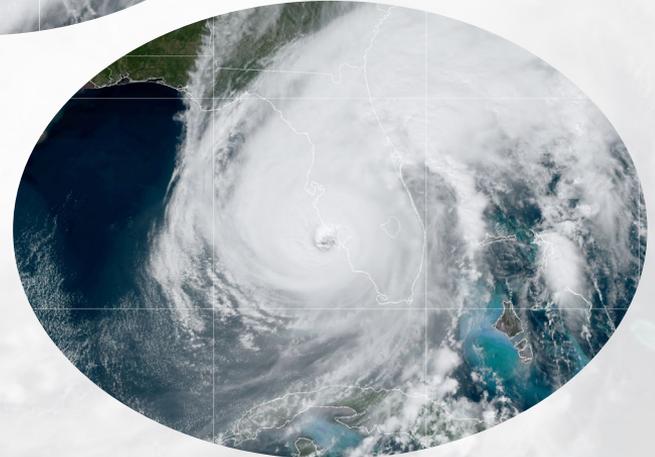
Eye of Hurricane Ian at 1557 UTC 28 September,
about 3 hours before landfall in Cayo Costa, FL.
Image credit: NASA Earth Observatory

2022 Atlantic Season Summary

- 14 named storms (Avg. 14)
- 8 hurricanes (**2 major**) (Avg. 7, 3)
- Impacts
 - TS Bonnie (Nicaragua)
 - TS Colin (U.S.)
 - H Fiona (PR, Dominican Republic, Turks & Caicos, Canada)
 - MH Ian (Cuba and U.S.)
 - H Julia (Nicaragua)
 - H Lisa (Belize)
 - H Nicole (Bahamas and U.S.)



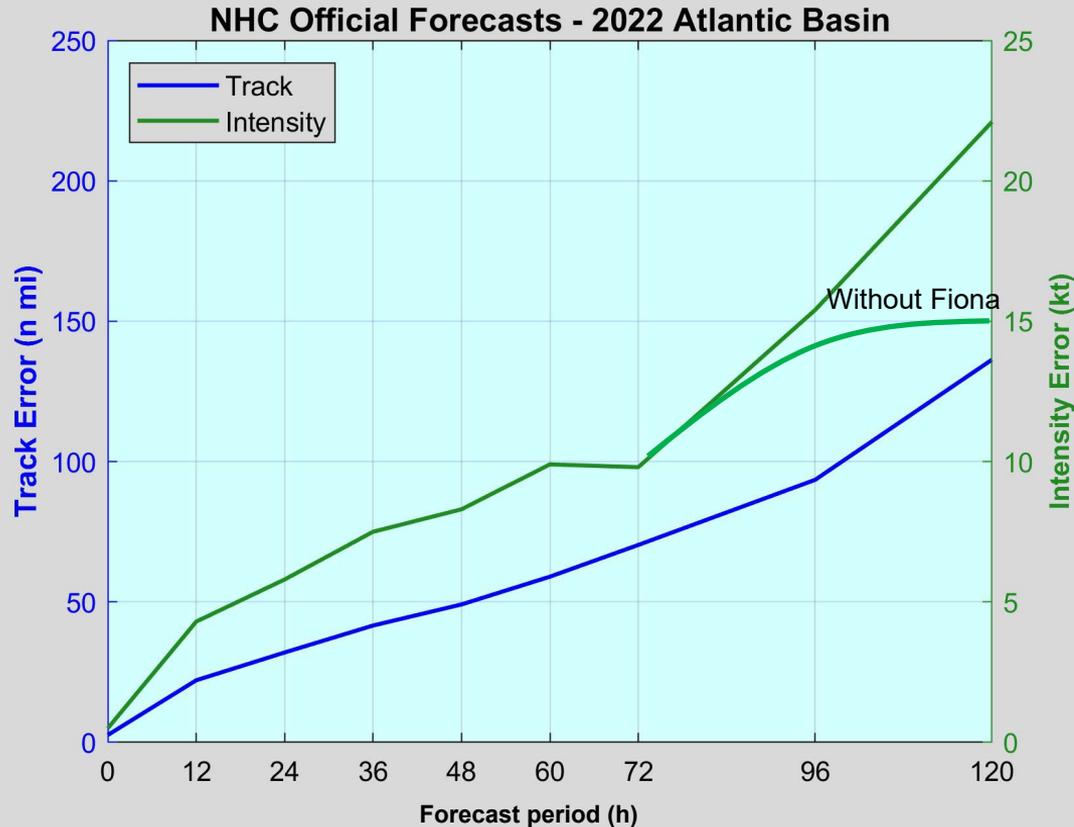
**Hurricane
Fiona**



**Hurricane
Ian**

2022 Atlantic Verification

Numerous Accuracy Records Broken



| Time (h) | N | Track (n mi) | Intensity (kt) |
|----------|-----|--------------|----------------|
| 000 | 234 | 2.6 | 0.5 |
| 012 | 205 | 22.5 | <u>4.3</u> |
| 024 | 176 | 33.3 | <u>5.8</u> |
| 036 | 151 | <u>41.6</u> | <u>7.5</u> |
| 048 | 130 | <u>49.1</u> | <u>8.3</u> |
| 060 | 112 | <u>59.0</u> | <u>9.9</u> |
| 072 | 96 | <u>70.3</u> | 9.8 |
| 096 | 73 | <u>93.5</u> | 15.4 |
| 120 | 53 | <u>136.3</u> | 22.1 |

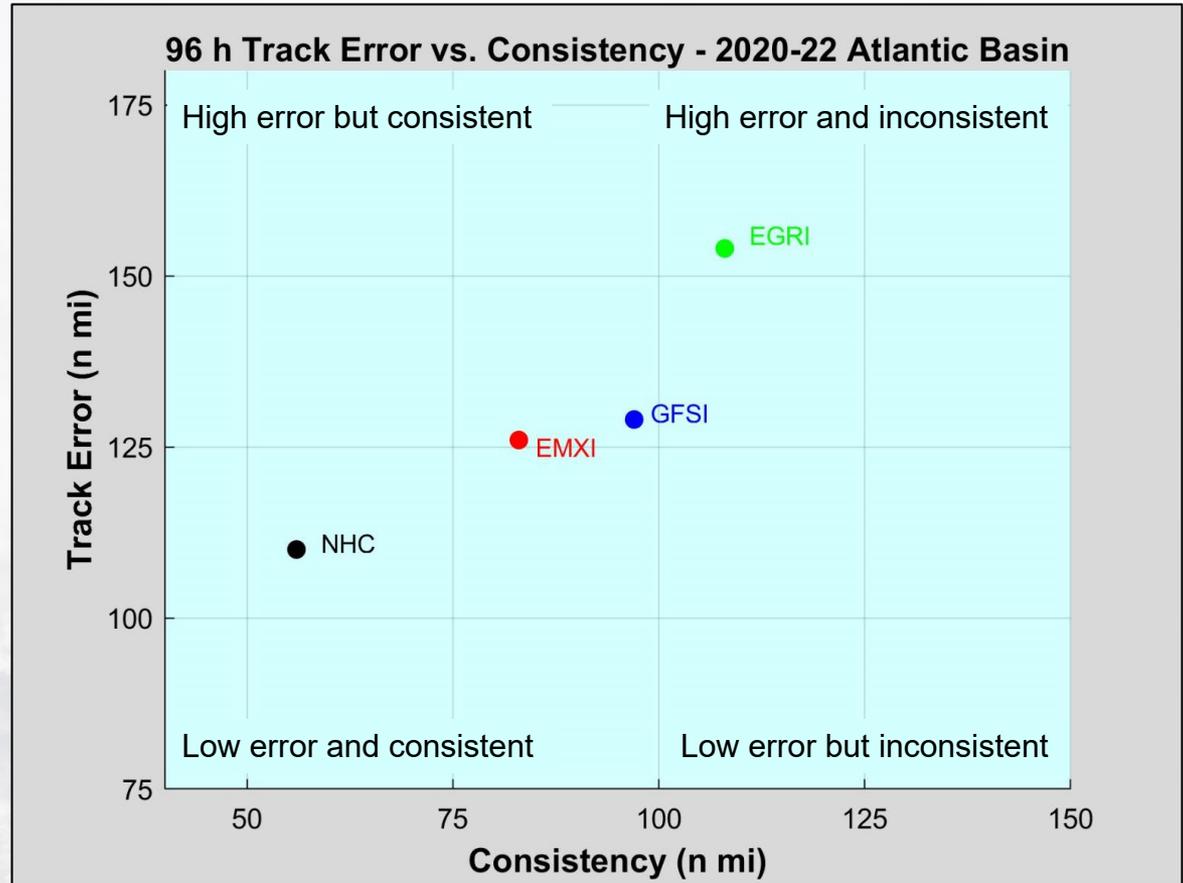
Track and intensity records for accuracy broken in 2022

NHC Forecast Verification

NHC's track forecast has a **lower average error** *and is more consistent* than any individual model overall

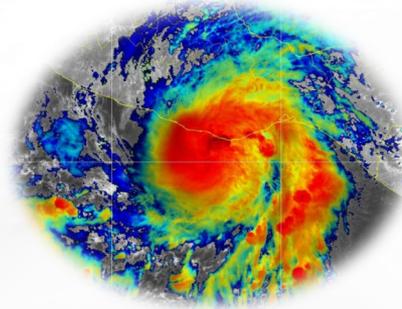
2022:

- Record low track errors from 36–120 h
- Record low intensity errors from 12–60 h

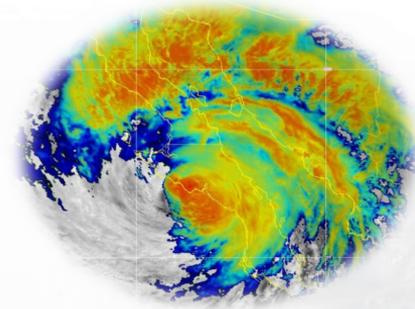


2022 East Pacific Season Summary

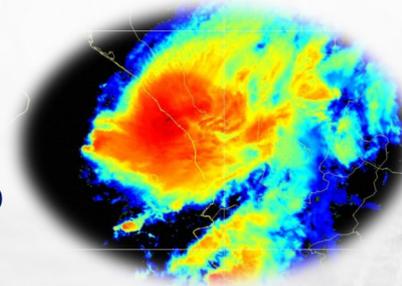
- 17 named storms (Avg. 15 Named Storms)
- 10 hurricanes (4 major) – (Avg. 8 H, 4 MH)
- Mexico Impacts
 - 4 hurricane landfalls: Agatha (Oaxaca), Kay (Baja California Sur), Orlene (Sinaloa), Roslyn (Nayarit)
- 2 Atlantic storms moved from the Caribbean across Central America and into the Pacific (Bonnie & Julia)
- Kay brought impacts to southern California



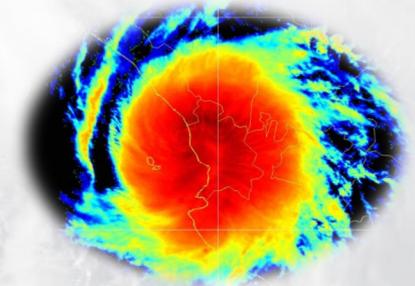
Agatha



Kay



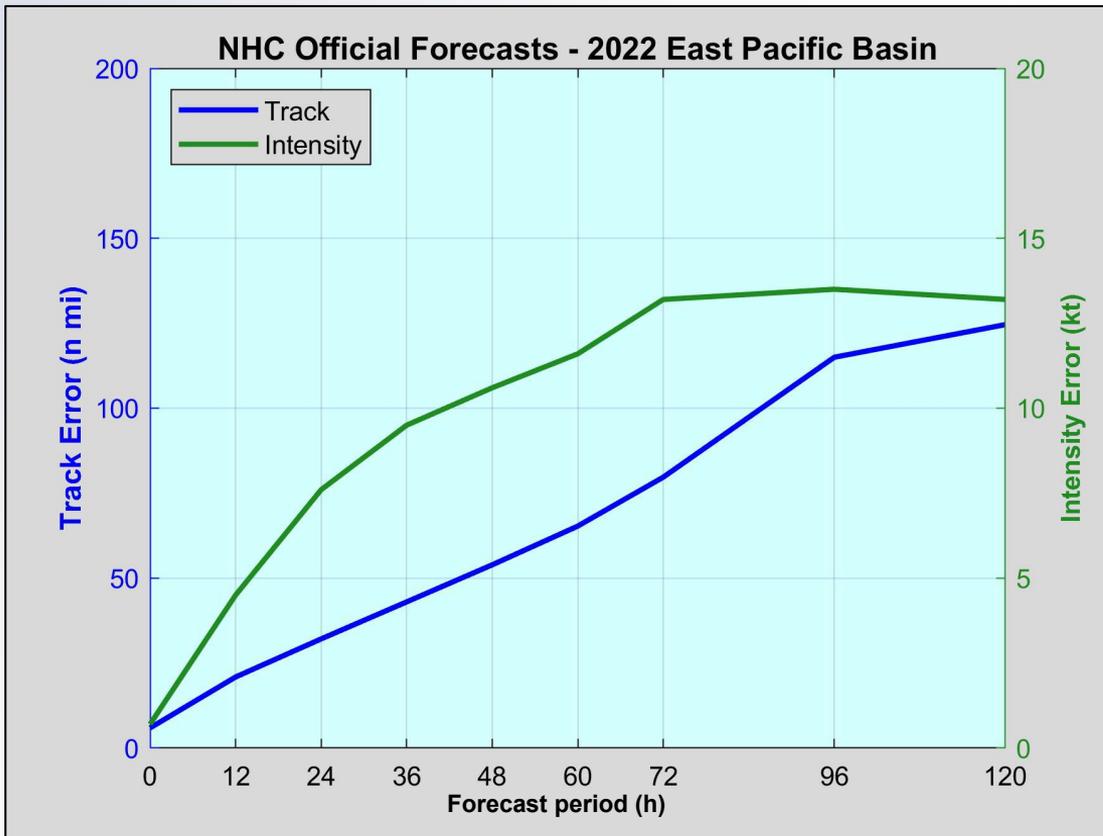
Orlene



Roslyn

2022 East Pacific Verification

Some Short-Term Intensity Accuracy Records Set



| VT (h) | NT | TRACK (n mi) | IN (kt) |
|-----------|-----|-----------------|------------|
| 000 | 322 | 5.9 | 0.7 |
| 012 | 294 | 20.9 | <u>4.5</u> |
| 024 | 266 | 32.1 | <u>7.6</u> |
| 036 | 238 | 43.0 | 9.5 |
| 048 | 211 | 53.9 | 10.6 |
| 060 | 185 | 65.3 | 11.6 |
| 072 | 160 | 79.7 | 13.2 |
| 096 | 113 | 115.0 | 13.5 |
| 120 | 70 | 124.6 | 13.2 |

Records set in 2022

Forecast Challenge

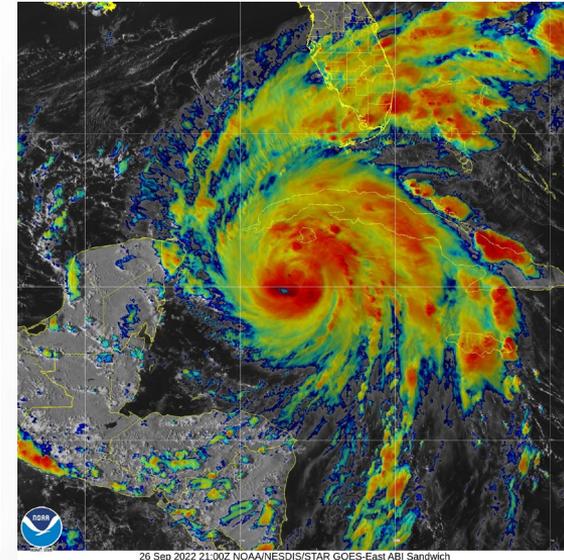
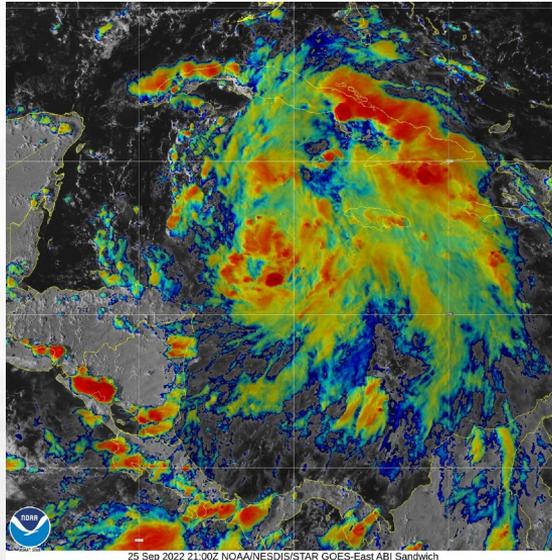
Rapid Intensification

Atlantic (max 24-h change)

- Ian: 40 kt (40 -> 80 kt)

E. Pacific (max 24-h change)

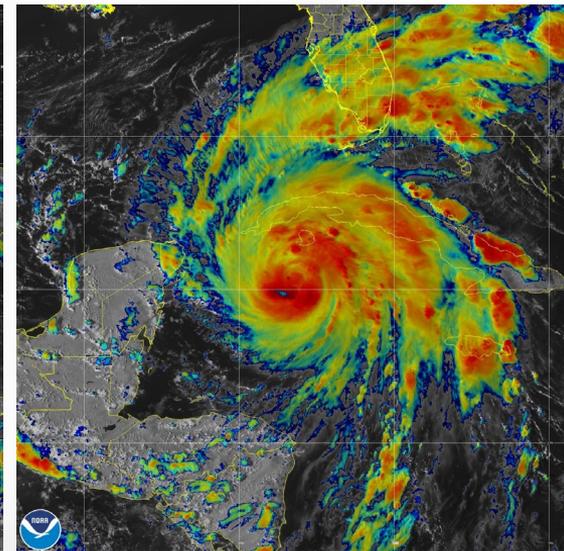
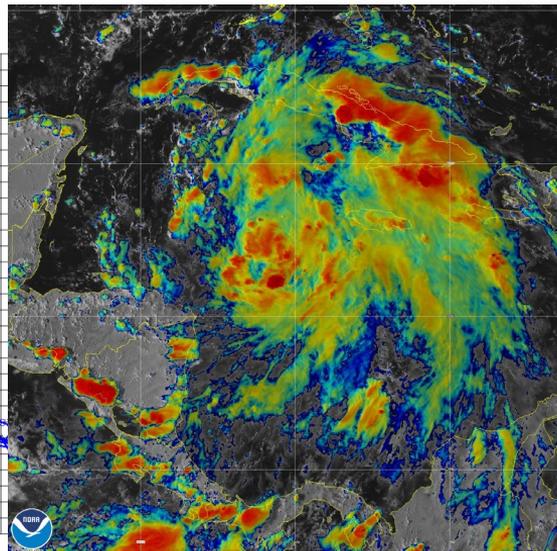
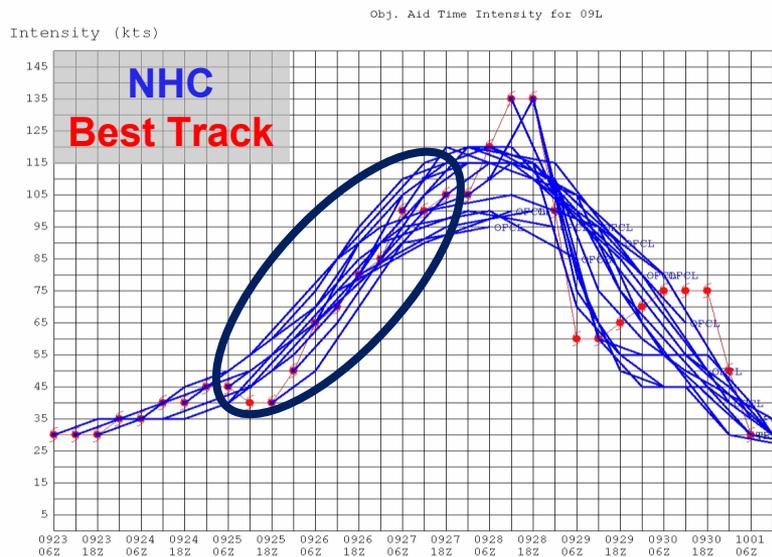
- Agatha: 45 kt (50 -> 95 kt)
- Blas: 30 kt (45 -> 75 kt)
- Darby: 60 kt (55 -> 115 kt)
- Howard: 35 kt (35 -> 70 kt)
- Kay: 35 kt (35 -> 70 kt)
- Orlene: 55 kt (60 -> 115 kt)
- Roslyn: 55 kt (55 -> 110 kt)



Hurricane Ian
2100 UTC 25-26 Sep, 2022

Hurricane Ian

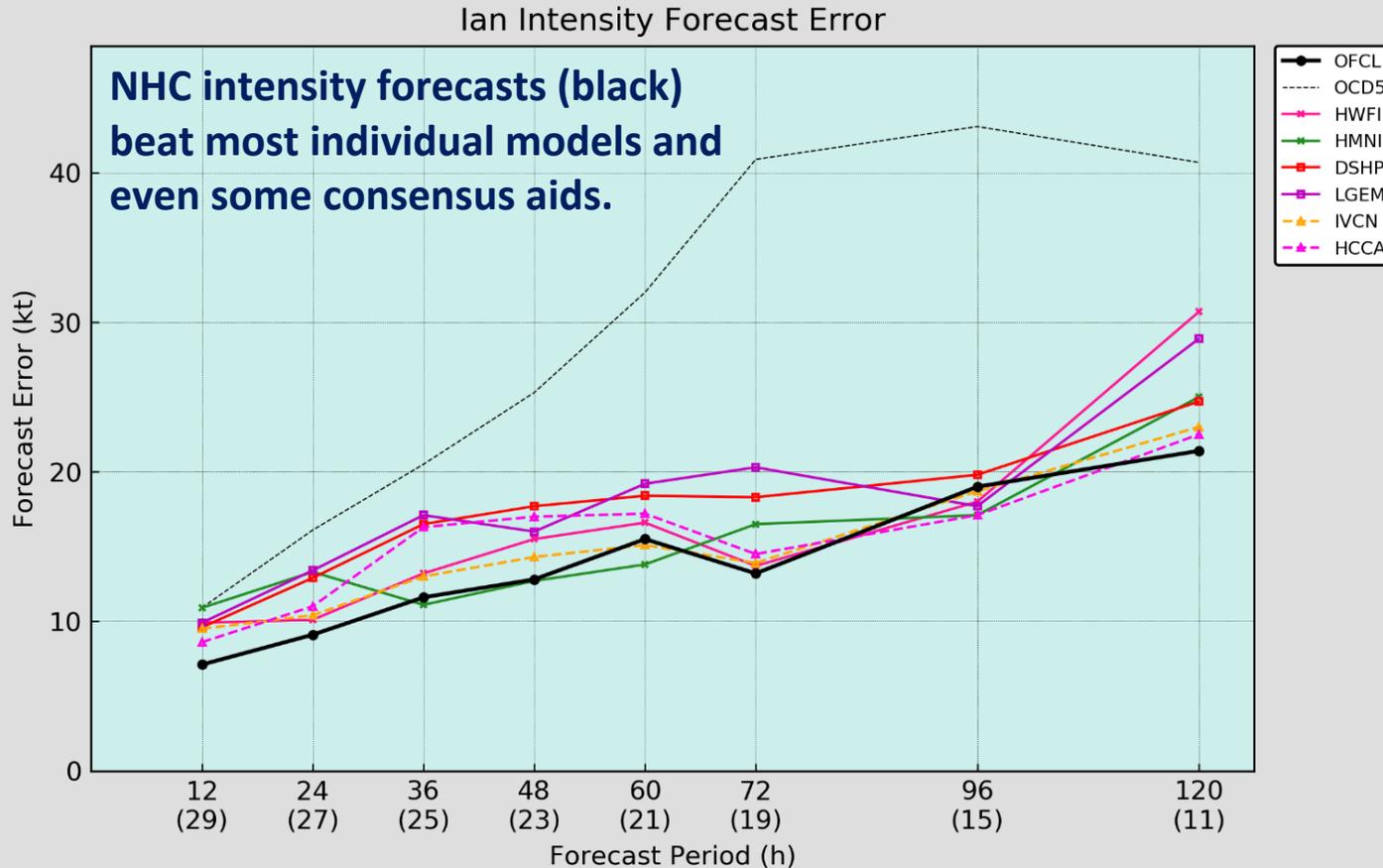
NHC explicitly forecast Ian's 1st rapid intensification



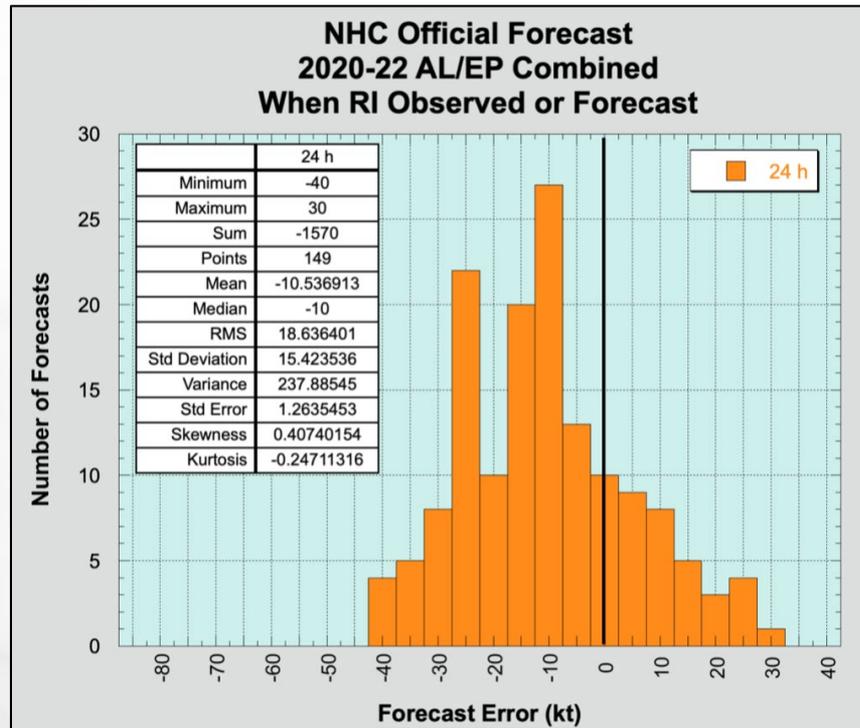
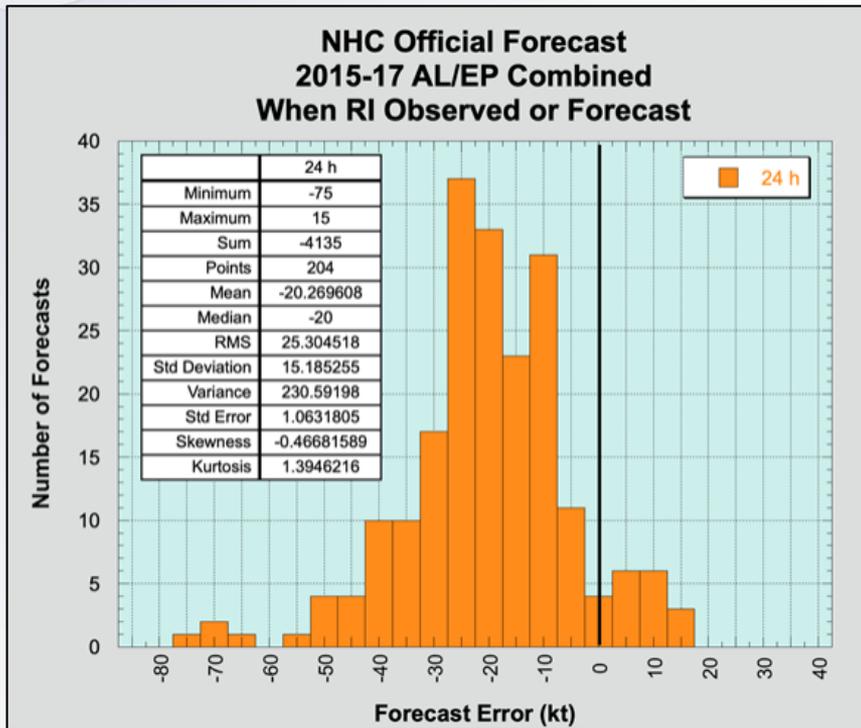
50 mph in 24 hr

NHC's average intensity forecast errors were 10-25% lower than the intensity consensus from 12 through 48 h, and more than 30% lower than consensus at 72 h

Hurricane Ian – Intensity Forecasts



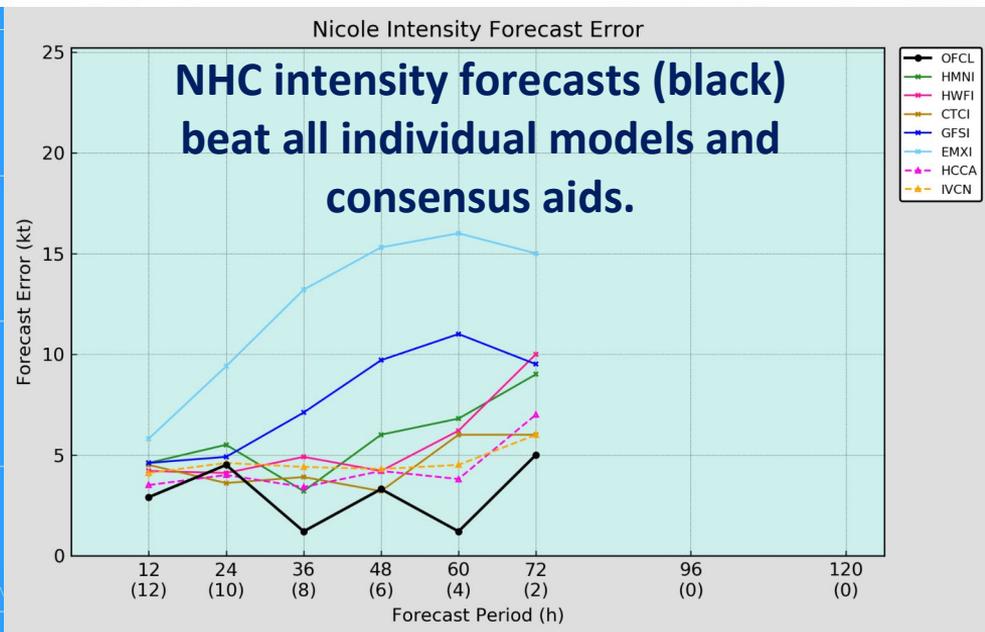
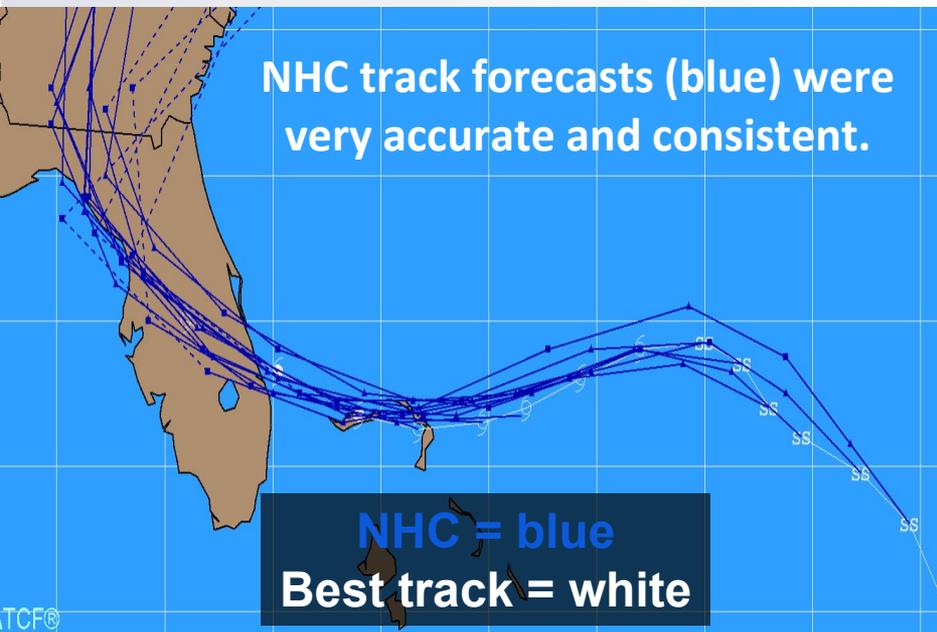
Progress in Forecasting Rapid Intensification



- **NHC's 24-h intensity error during rapid intensification events has been cut in half since 2017 – 10 kt compared to 20 kt**
- **Largest under-forecast error reduced by 46% (40 kt compared to 75 kt)**

Late-Season Hurricane Nicole

Successful Track and Intensity Forecasts



Extension of the Tropical Weather Outlook to 7 Days - New for 2023

- The period covered by the Tropical Weather Outlook will expand to 7 days in 2023
- The Outlook will provide 2-day and 7-day probabilities of tropical cyclone formation
 - 7-day probabilities replace 5-day
- The 7-day genesis area will be depicted on the Graphical Tropical Weather Outlook



NATIONAL HURRICANE CENTER
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

TROPICAL WEATHER OUTLOOK
NWS NATIONAL HURRICANE CENTER MIAMI FL
800 PM EDT MON OCT 20 2023

For the North Atlantic...Caribbean Sea and the Gulf of Mexico:

Southwest Gulf of Mexico (AL92):
Showers and thunderstorms associated with an area of low pressure located over the southwestern Bay of Campeche have changed little in organization since this afternoon. This system has the potential to become a tropical cyclone during the next couple of days while it moves slowly eastward across the southern Bay of Campeche. Later in the week, the low is forecast to interact and possibly merge with a frontal system over the southeastern Gulf of Mexico or northwestern Caribbean Sea. An Air Force Reserve reconnaissance aircraft is scheduled to investigate the disturbance tomorrow afternoon, if necessary. Interests in the Yucatan Peninsula should monitor the progress of this system.

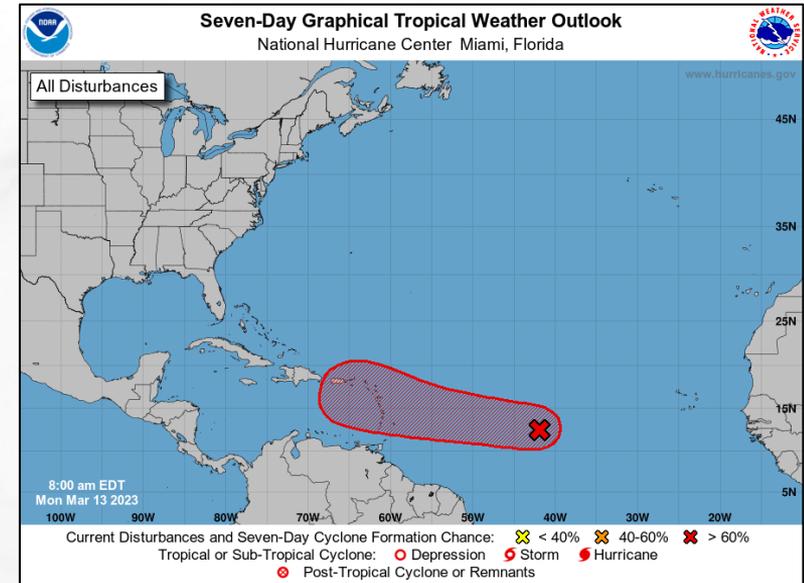
* Formation chance through 48 hours...medium...50 percent.
• Formation chance through 7 days...medium...60 percent.

Forecaster Brown

7-Day Graphical Tropical Weather Outlook

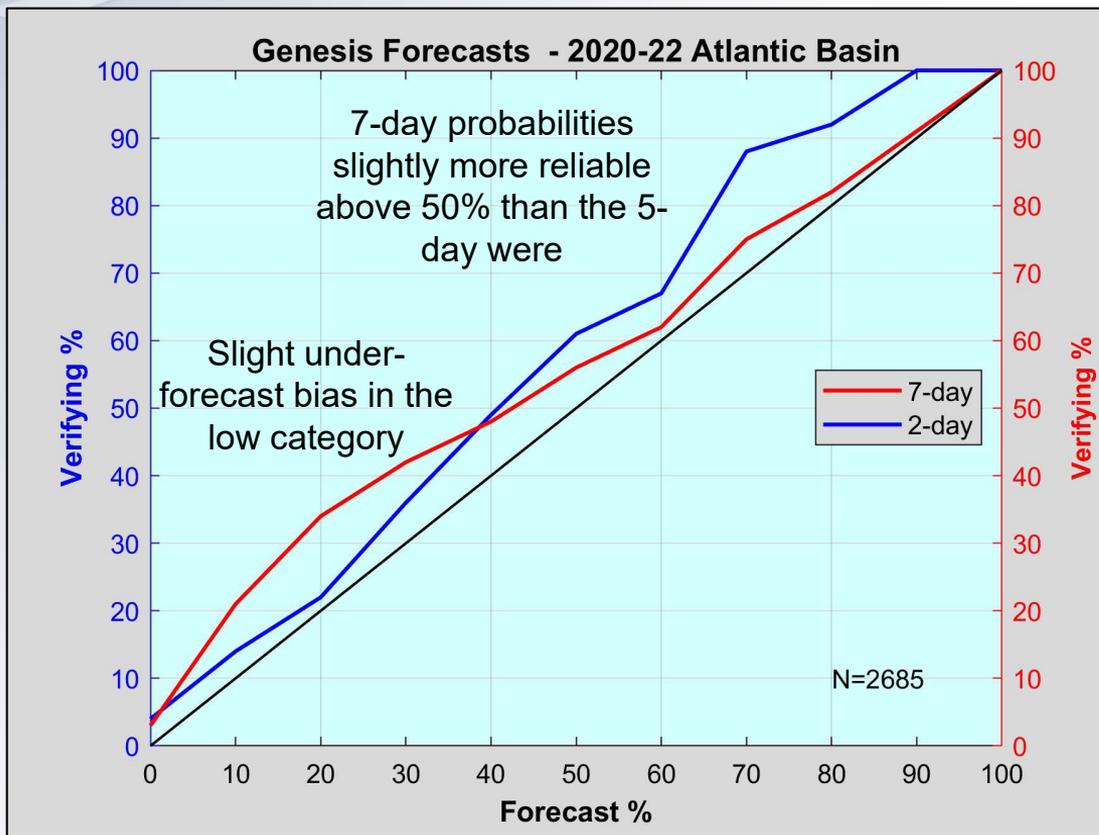
- What does a 7-day Tropical Weather Outlook mean for messaging pre-genesis disturbances?

- Systems likely to be introduced into the TWO sooner
- Systems likely to move into the medium and high categories earlier, producing longer lead times
- Genesis areas are likely to be larger, especially for systems with a fast forward speed and uncertain formation timing



Example of a Seven-Day Graphical Tropical Weather Outlook

Why Extend to 7 Days?



Three-year sample of 7-day in-house probabilities have proven to be quite reliable.

- NHC's 7-day genesis probabilities are just as reliable as 2- and 5-day genesis probabilities
- Fills gap between NHC's current 5-day forecasts and CPC's Week 2 forecasts
- Increases customer situational awareness of potential TC formation

Outlook Now Includes Invest Numbers* Appended to Geographical Descriptors

Tropical Weather Outlook
NWS National Hurricane Center Miami FL
200 AM EDT Fri Sep 2 2022

For the North Atlantic...Caribbean Sea and the Gulf of Mexico:

Active Systems:

The National Hurricane Center is issuing advisories on Tropical Storm Danielle, located about 925 miles west of the Azores.

East of the Leeward Islands (AL91):

Satellite imagery indicates there has been little change in the organization of the area of low pressure located several hundred miles east of the Leeward Islands during the past several hours. Although environmental conditions remain only marginally conducive, any additional development of the system over the next few days would lead to the formation of a tropical depression. The disturbance is expected to move slowly west-northwestward, toward the adjacent waters of the northern Leeward Islands. Regardless of development, locally heavy rains may occur over portions of the Leeward Islands during the next couple of days, and interests in that area should monitor the progress of the system. An Air Force Reserve Hurricane Hunter aircraft is scheduled to investigate the system this afternoon, if necessary. Additional information on this system can be found in High Seas Forecasts issued by the National Weather Service.

* Formation chance through 48 hours...medium...50 percent.

* Formation chance through 7 days...high...70 percent.

Eastern Tropical Atlantic:

Shower activity associated with a broad area of low pressure located just northwest of the Cabo Verde Islands has increased some over the last several hours, but remains poorly organized. This system is moving into an area of less favorable environmental conditions, and significant development is not anticipated.

* Formation chance through 48 hours...low...10 percent.

* Formation chance through 7 days...low...10 percent.

- In 2022, geographic headers were added for disturbances
- Beginning in 2023, invest numbers (AL90-99, EP90-99, & CP90-99) will be included when there is an active invest open in association with the disturbance
- These changes should:
 - Make the text product more readable and scannable
 - Minimizes confusion between multiple systems, especially when it's busy

Note: Headers will likely not be bold in the actual product

*New for 2023 and when available

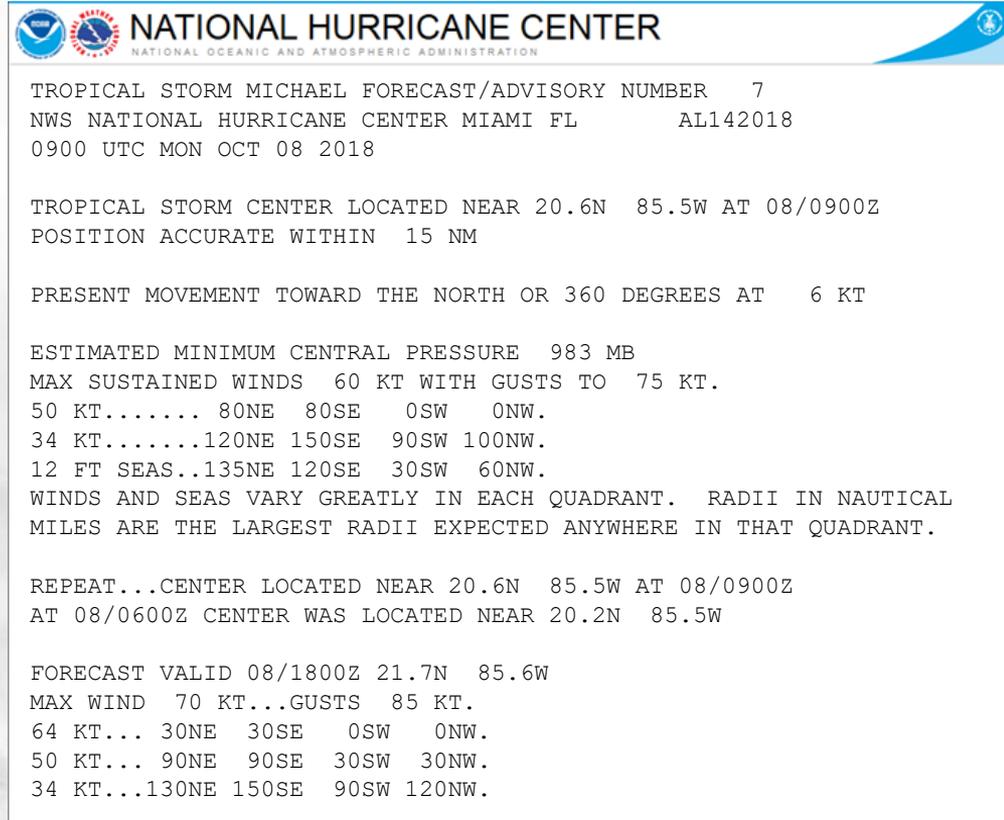
Removal of Watches & Warnings from the Forecast/Advisory

- To *expedite* the issuance of the Forecast/Advisory, *watch and warning information will be removed beginning in 2023*

- Watch and Warning information is available in the *Public Advisory*

- Forecast/Advisory is a data product that contains all the forecast information

- Generally used by parsing software to read the forecast



The image shows a screenshot of a National Hurricane Center (NHC) forecast advisory for Tropical Storm Michael. The header includes the NHC logo and the text "NATIONAL HURRICANE CENTER" and "NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION". The main body of the text provides details about the storm's forecast number (7), the issuing office (Miami, FL), and the time (0900 UTC on October 8, 2018). It also includes information about the storm's current position (near 20.6N, 85.5W) and movement (toward the north at 6 kt). The advisory lists estimated minimum central pressure (983 mb) and maximum sustained winds (60 kt with gusts to 75 kt). It also provides a forecast valid from 08/1800Z to 08/2100Z, with maximum wind speeds of 70 kt and gusts of 85 kt. The forecast lists wind speeds in four quadrants: 64 kt in the northeast, 50 kt in the east, 34 kt in the southwest, and 30 kt in the northwest.

NATIONAL HURRICANE CENTER
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

TROPICAL STORM MICHAEL FORECAST/ADVISORY NUMBER 7
NWS NATIONAL HURRICANE CENTER MIAMI FL AL142018
0900 UTC MON OCT 08 2018

TROPICAL STORM CENTER LOCATED NEAR 20.6N 85.5W AT 08/0900Z
POSITION ACCURATE WITHIN 15 NM

PRESENT MOVEMENT TOWARD THE NORTH OR 360 DEGREES AT 6 KT

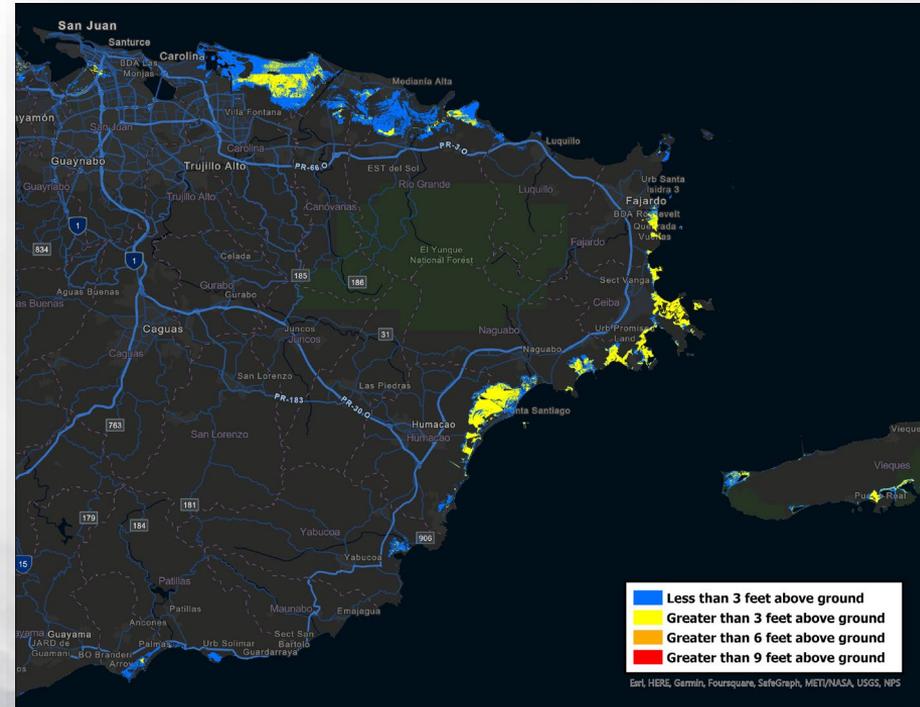
ESTIMATED MINIMUM CENTRAL PRESSURE 983 MB
MAX SUSTAINED WINDS 60 KT WITH GUSTS TO 75 KT.
50 KT..... 80NE 80SE 0SW 0NW.
34 KT.....120NE 150SE 90SW 100NW.
12 FT SEAS..135NE 120SE 30SW 60NW.
WINDS AND SEAS VARY GREATLY IN EACH QUADRANT. RADII IN NAUTICAL
MILES ARE THE LARGEST RADII EXPECTED ANYWHERE IN THAT QUADRANT.

REPEAT...CENTER LOCATED NEAR 20.6N 85.5W AT 08/0900Z
AT 08/0600Z CENTER WAS LOCATED NEAR 20.2N 85.5W

FORECAST VALID 08/1800Z 21.7N 85.6W
MAX WIND 70 KT...GUSTS 85 KT.
64 KT... 30NE 30SE 0SW 0NW.
50 KT... 90NE 90SE 30SW 30NW.
34 KT...130NE 150SE 90SW 120NW.

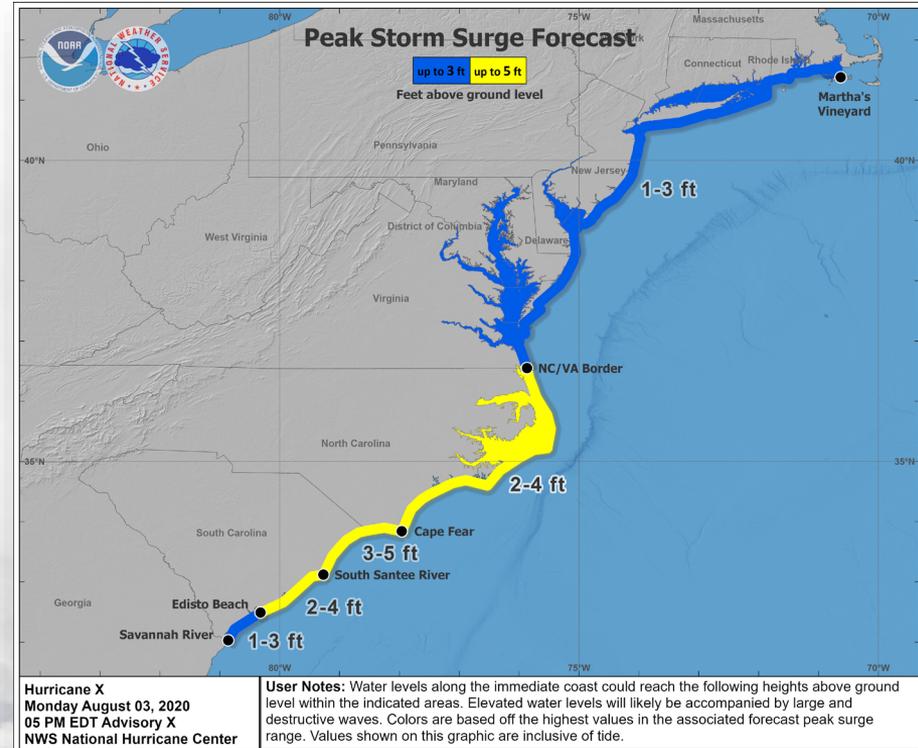
Expansion of Potential Storm Surge Flooding Map to Puerto Rico and the U.S. Virgin Islands

- Potential Storm Surge Flooding Map will now be available for Puerto Rico and the U.S. Virgin Islands
- Available:
 - Every 6 hours whenever a Storm Surge or Hurricane Watch or Warning is in effect or as conditions warrant
- Provides a *reasonable worst-case scenario* for storm surge flooding
 - Wave action taken into account for Puerto Rico and U.S. Virgin Islands

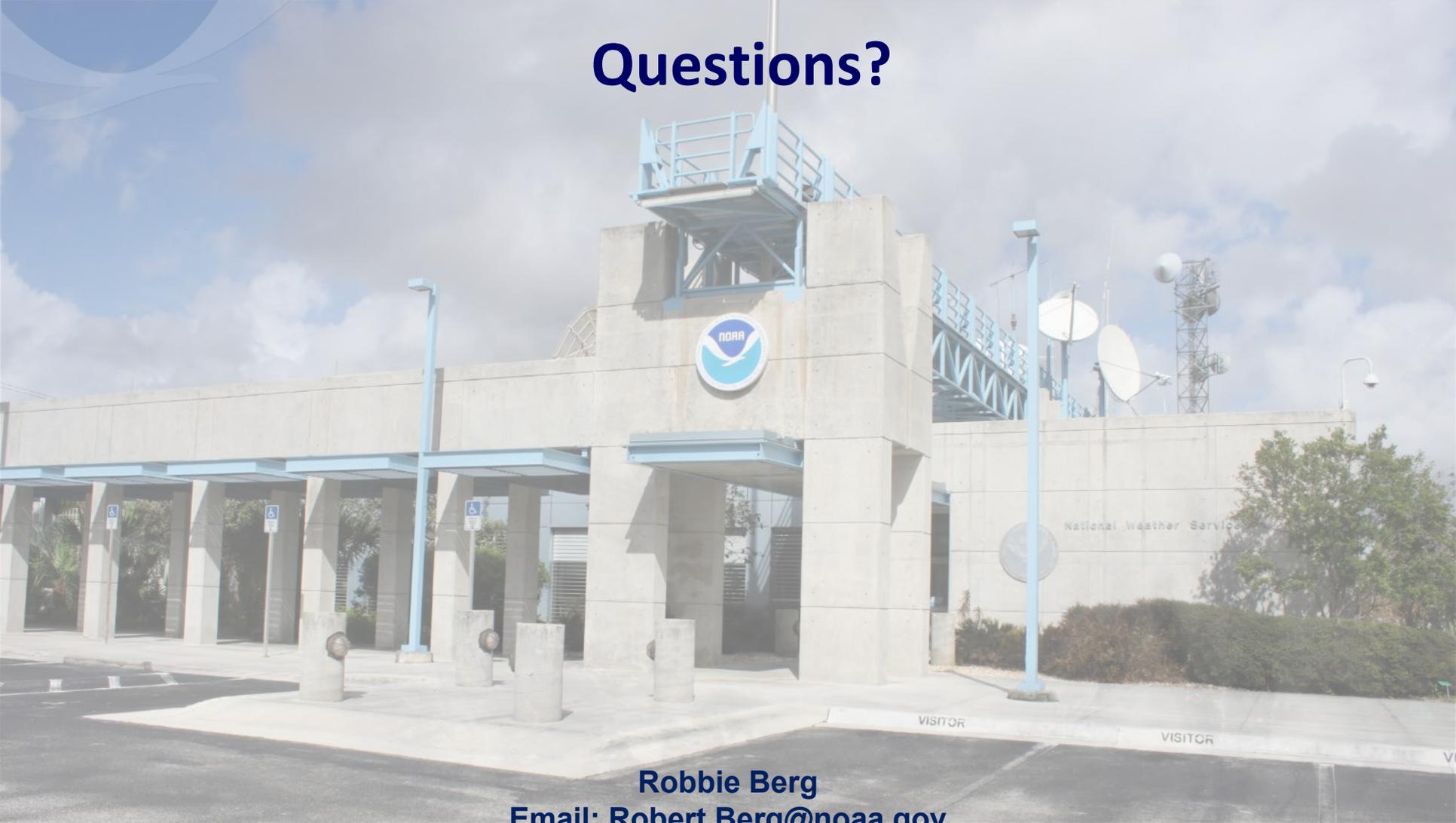


Peak Storm Surge Forecast Graphic Becomes Operational

- Peak Storm Surge Forecast Map will become operational in 2023
- The graphic depicts the expected peak storm surge inundation values over a region for the U.S. Gulf and Atlantic coasts, Puerto Rico, and the U.S. Virgin Islands
- Values match what is shown in the NHC Public Advisory



Questions?



Robbie Berg

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