

# **HPC Powered Real Time Model Guidance with National Impact**

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[stormsurge.live](http://stormsurge.live)

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Carlos del-Castillo-Negrete, TACC

Gordon Wells, UT CSR and Texas SOC

# Origin Story: Interim Gated Structures



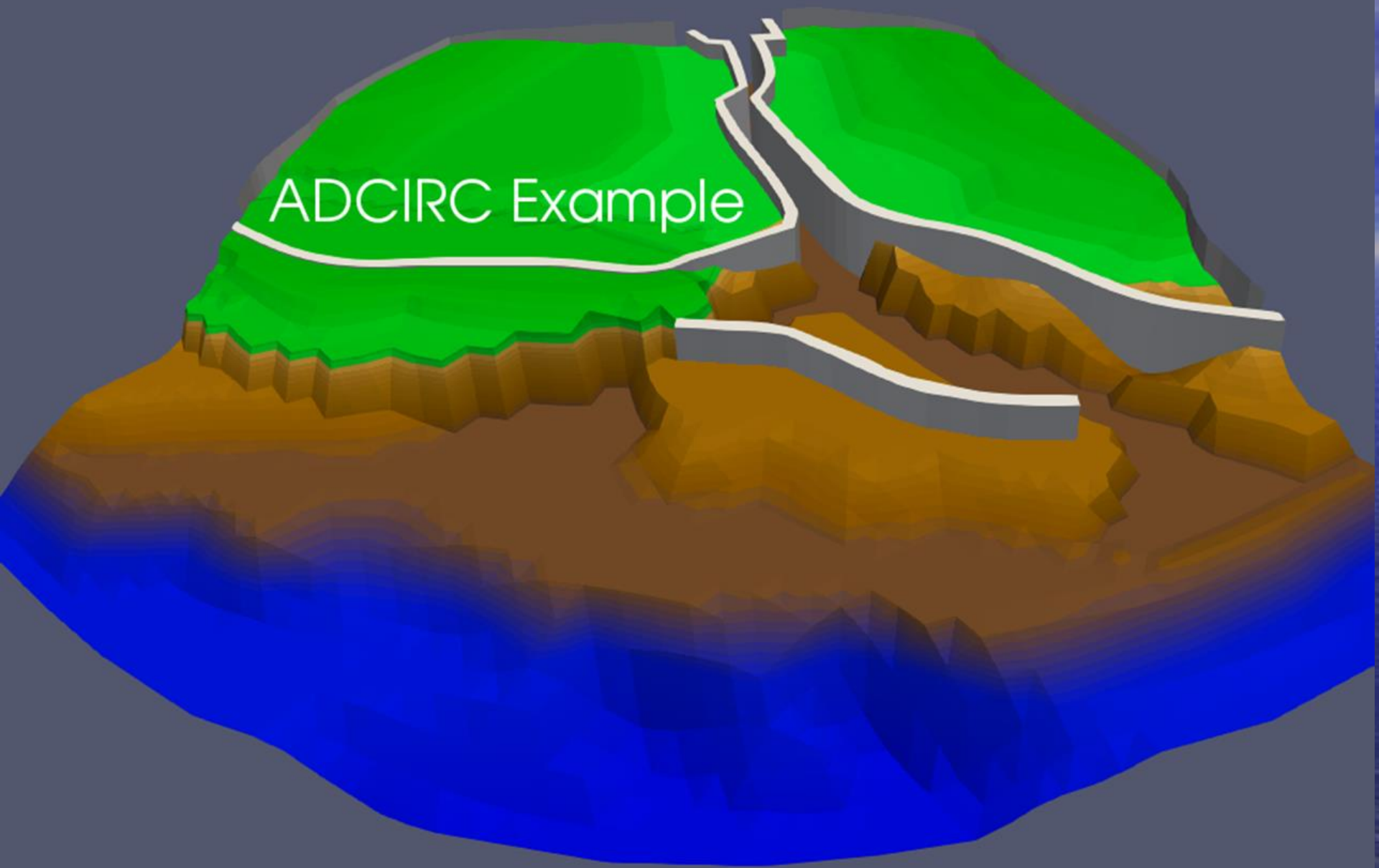
# Coastal Physics

- $F=ma$  (force)=(mass)\*(acceleration)
  - Gravity
  - Wind and Atmospheric Pressure
  - Friction

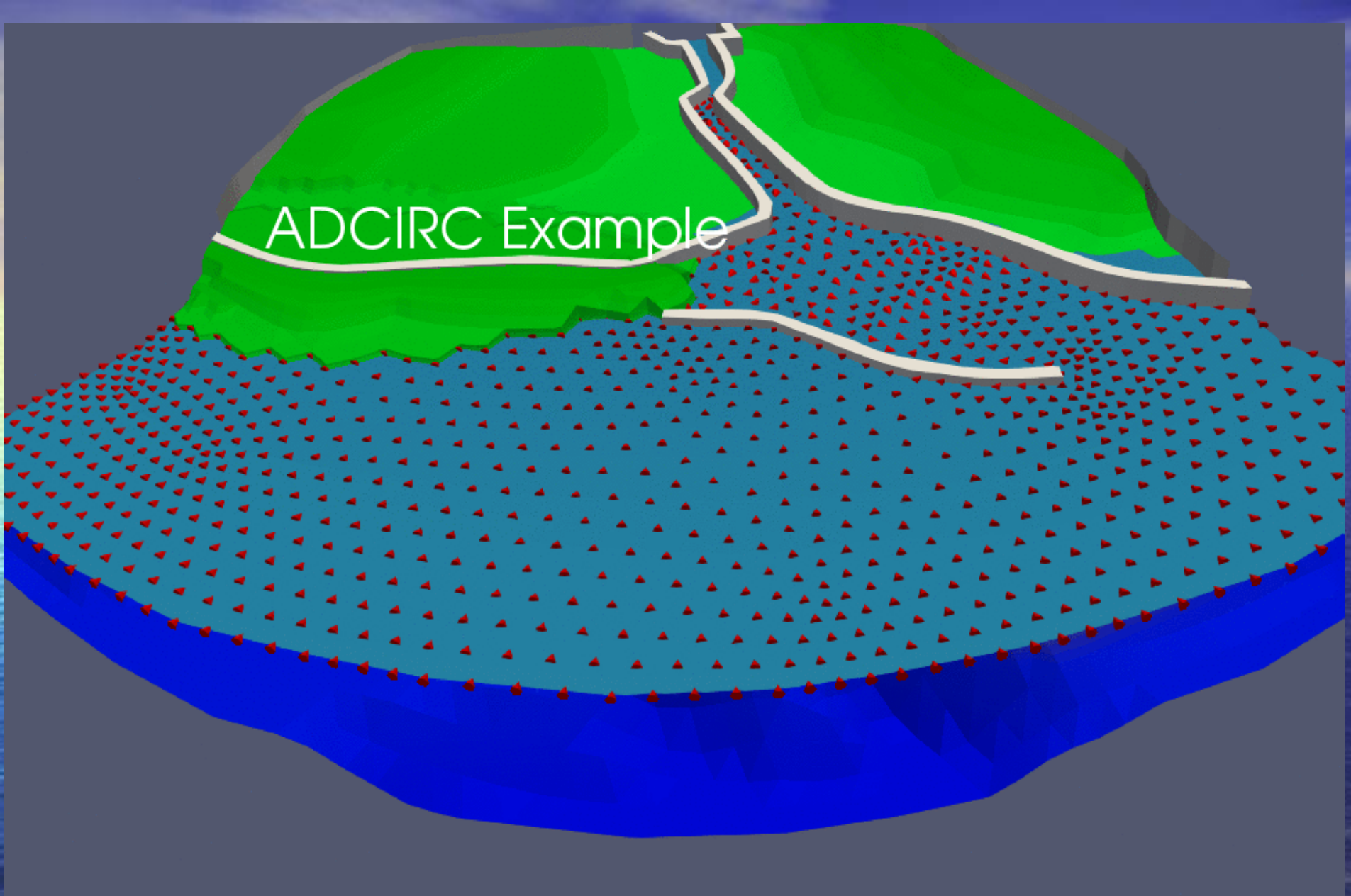
For the coastal ocean, we apply the ADCIRC finite element code

- Continuous Galerkin method for the 2D shallow water equations
  - Irregular triangular mesh
  - Highly scalable

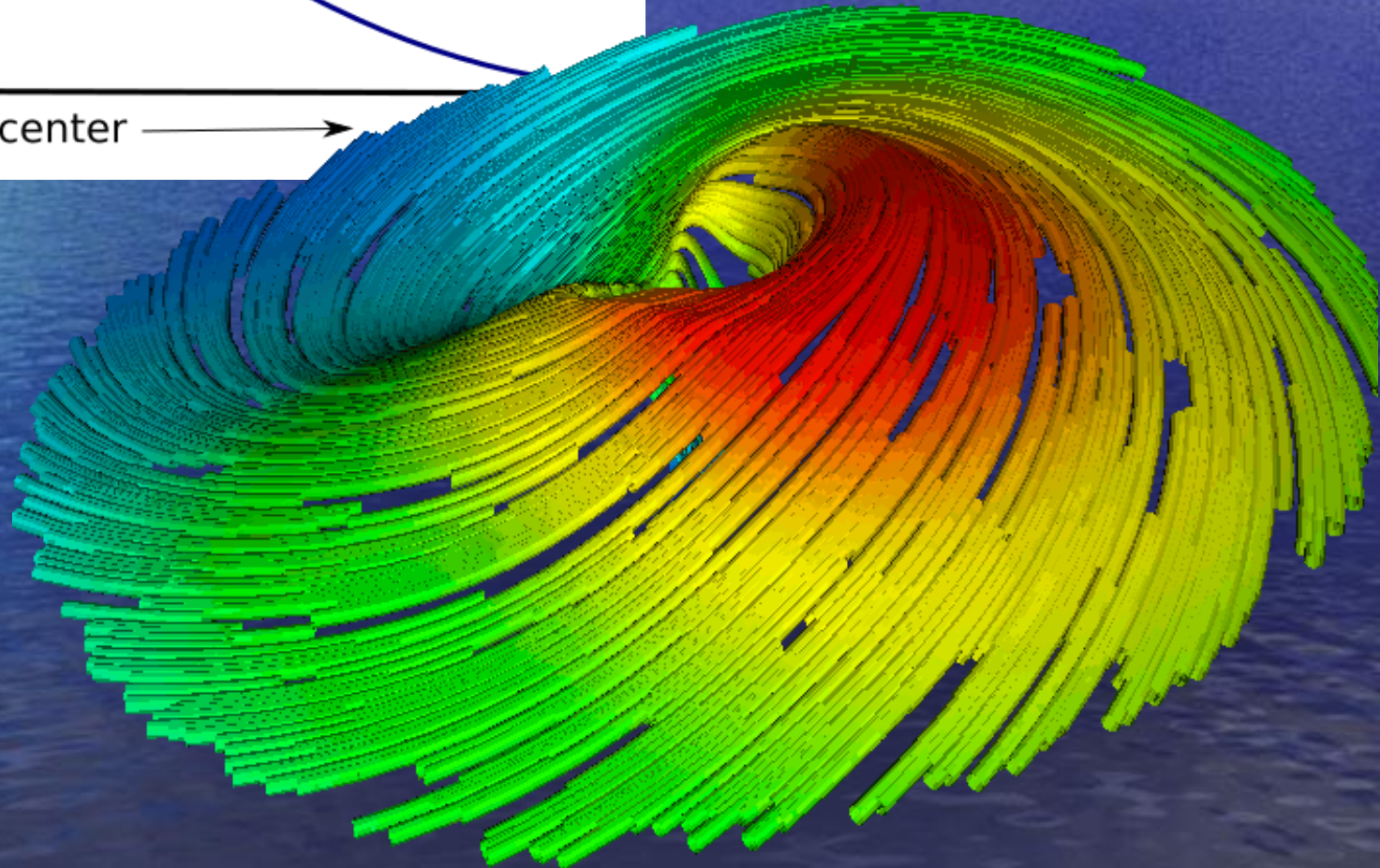
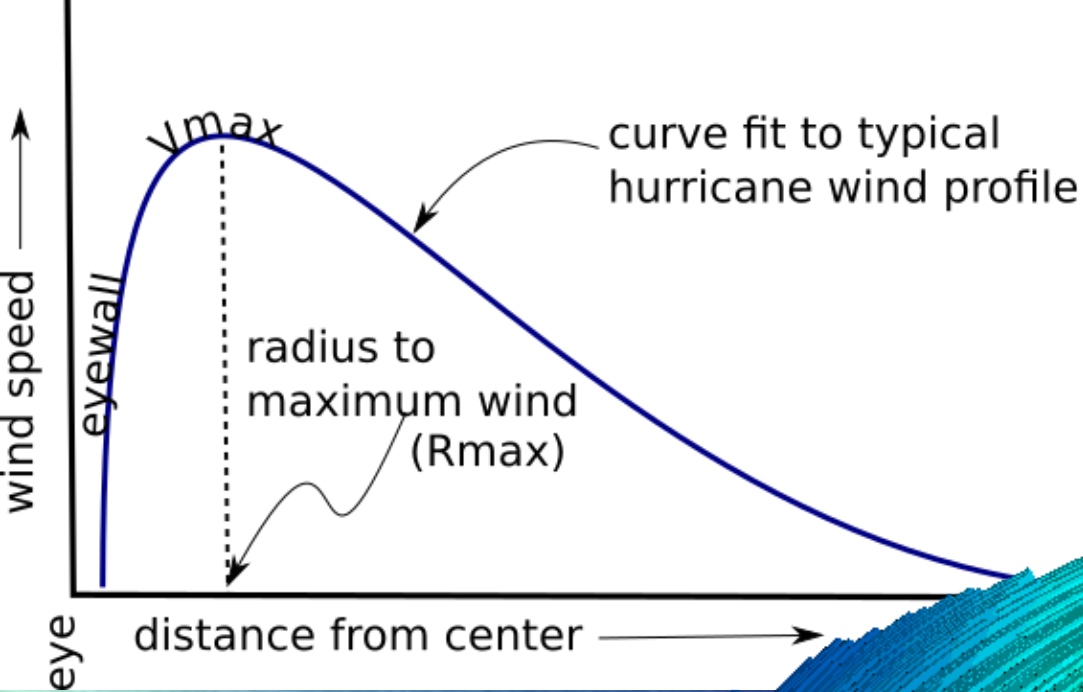
ADCIRC Example



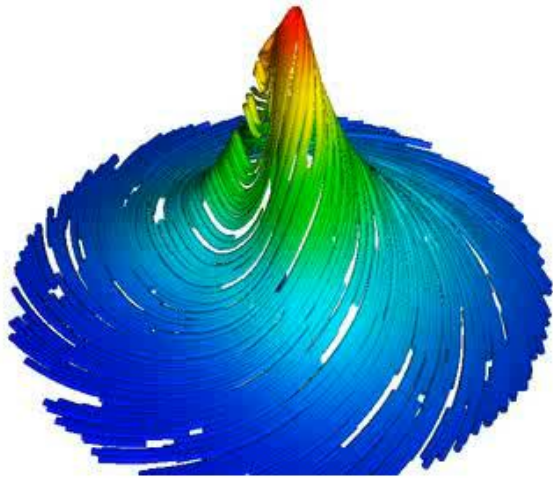
ADCIRC Example



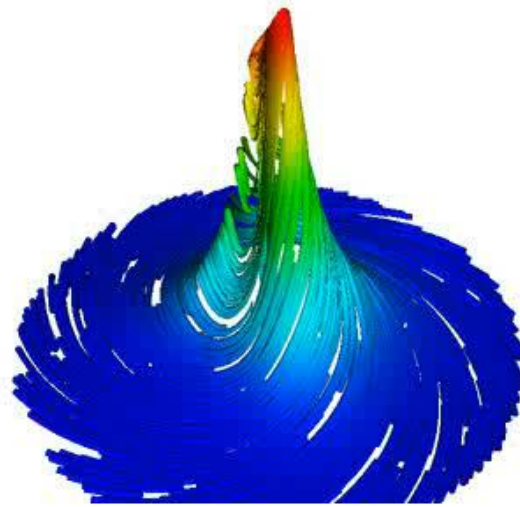
# Parametric Vortex Model



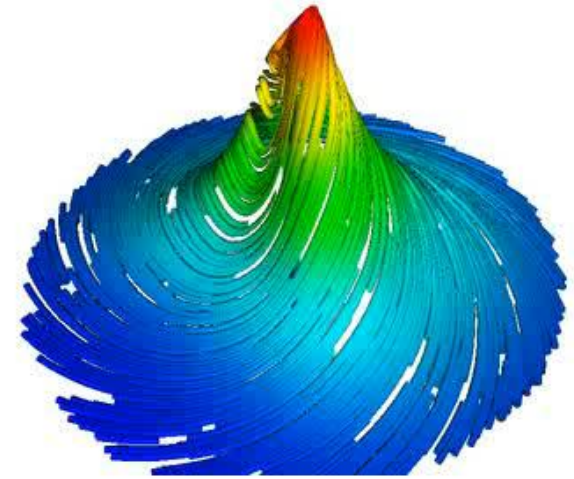
# NHC Consensus



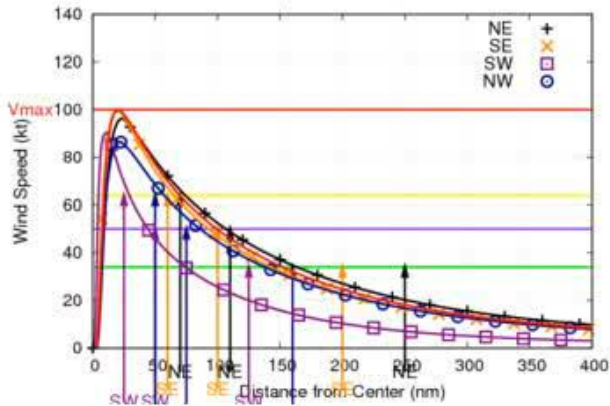
# Wind Speed +20%



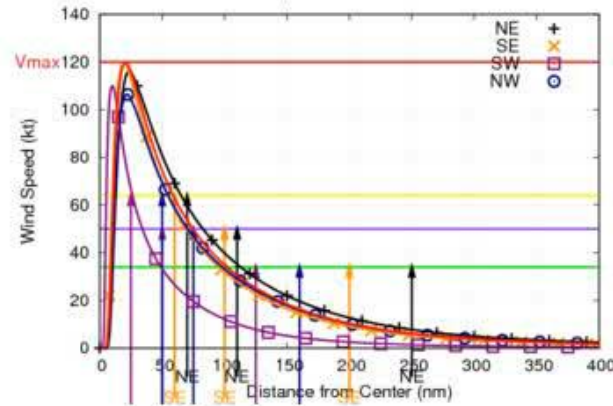
# Rmax +20%



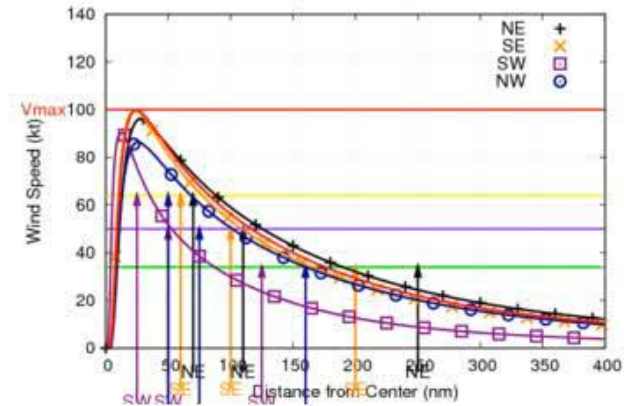
## Wind Speed in Each Quadrant



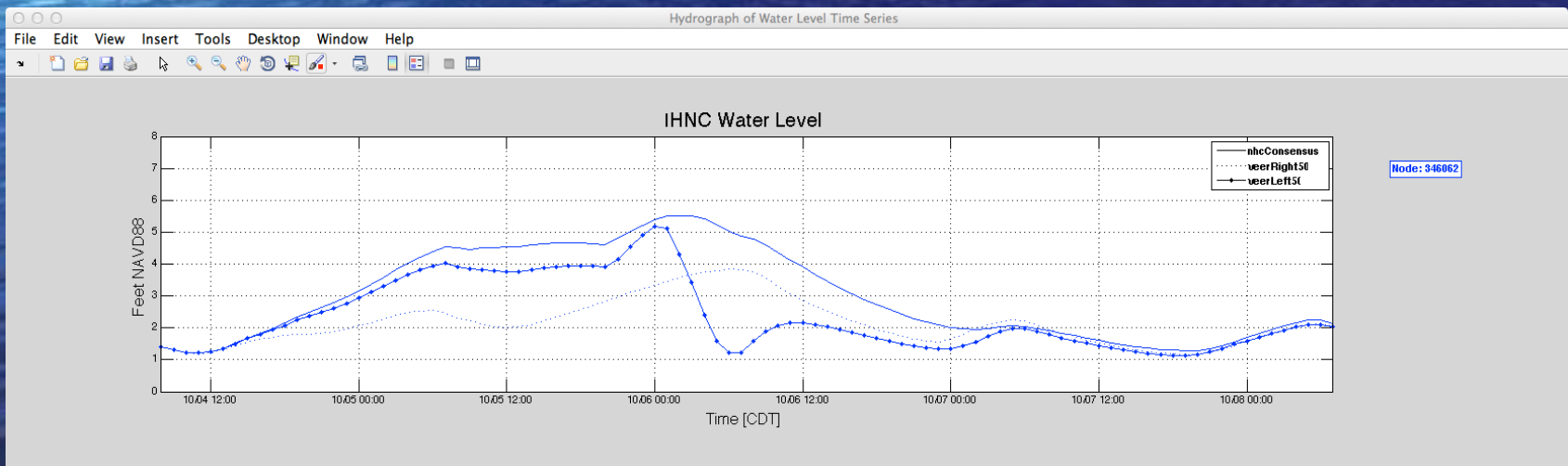
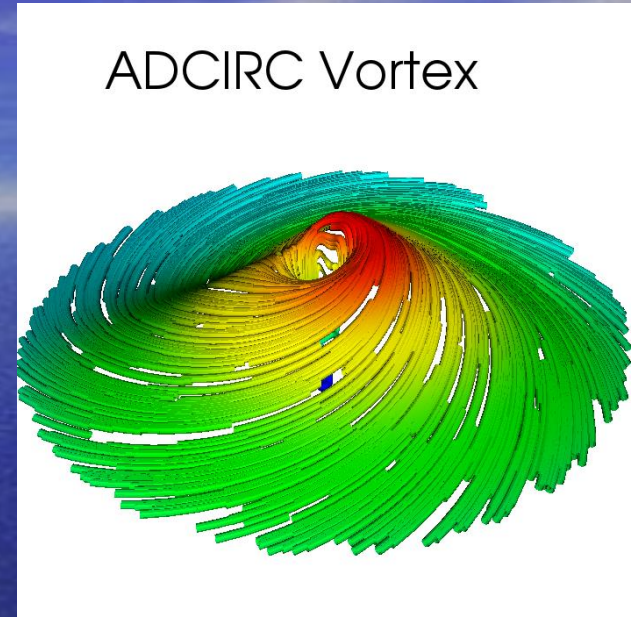
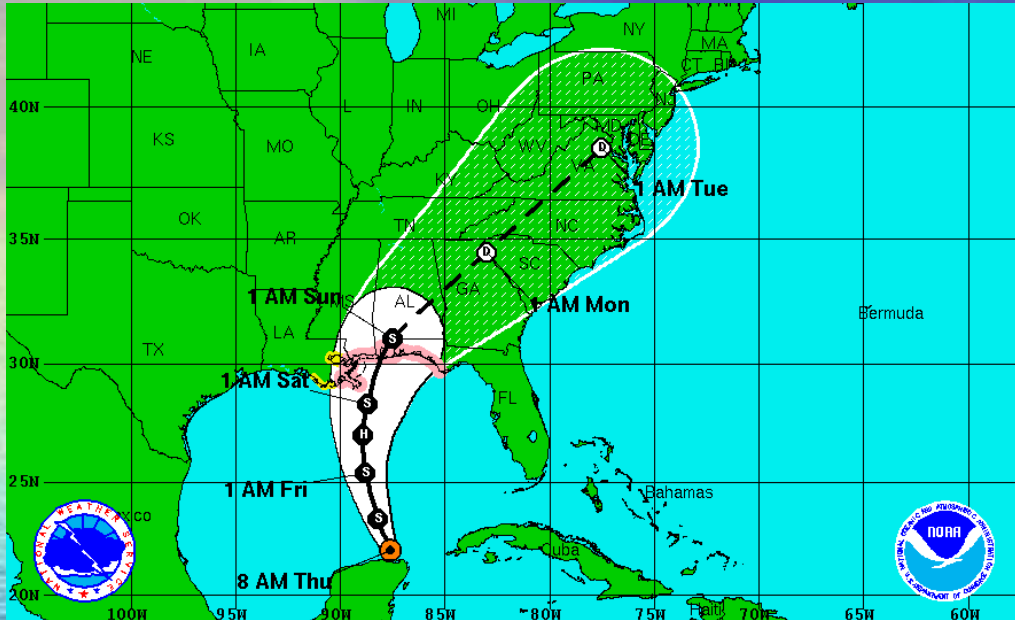
## Wind Speed in Each Quadrant



## Wind Speed in Each Quadrant



<https://github.com/stormsurgelive/asgs>





### Maximum Water Inundation Depth (History)

Hindcast Time Range: Sun, 26-Aug-2012, 7 AM CDT - Thu, 30-Aug-2012, 1 AM CDT



Storm **ISAAC**, NHC hindcast  
16-Aug - 30-Aug 2012

Map Tools

**Storm Track**

storm track

TD TS H1 H2 H3 H4 H5

● outside model hindcast

Click any track point on the colored track line to display the time series map for the selected track point time.

Water Height above NAVD88

Inundation Depth above Ground

Colors over land mean water height above ground. Colors over water mean water height above Mean Sea Level.

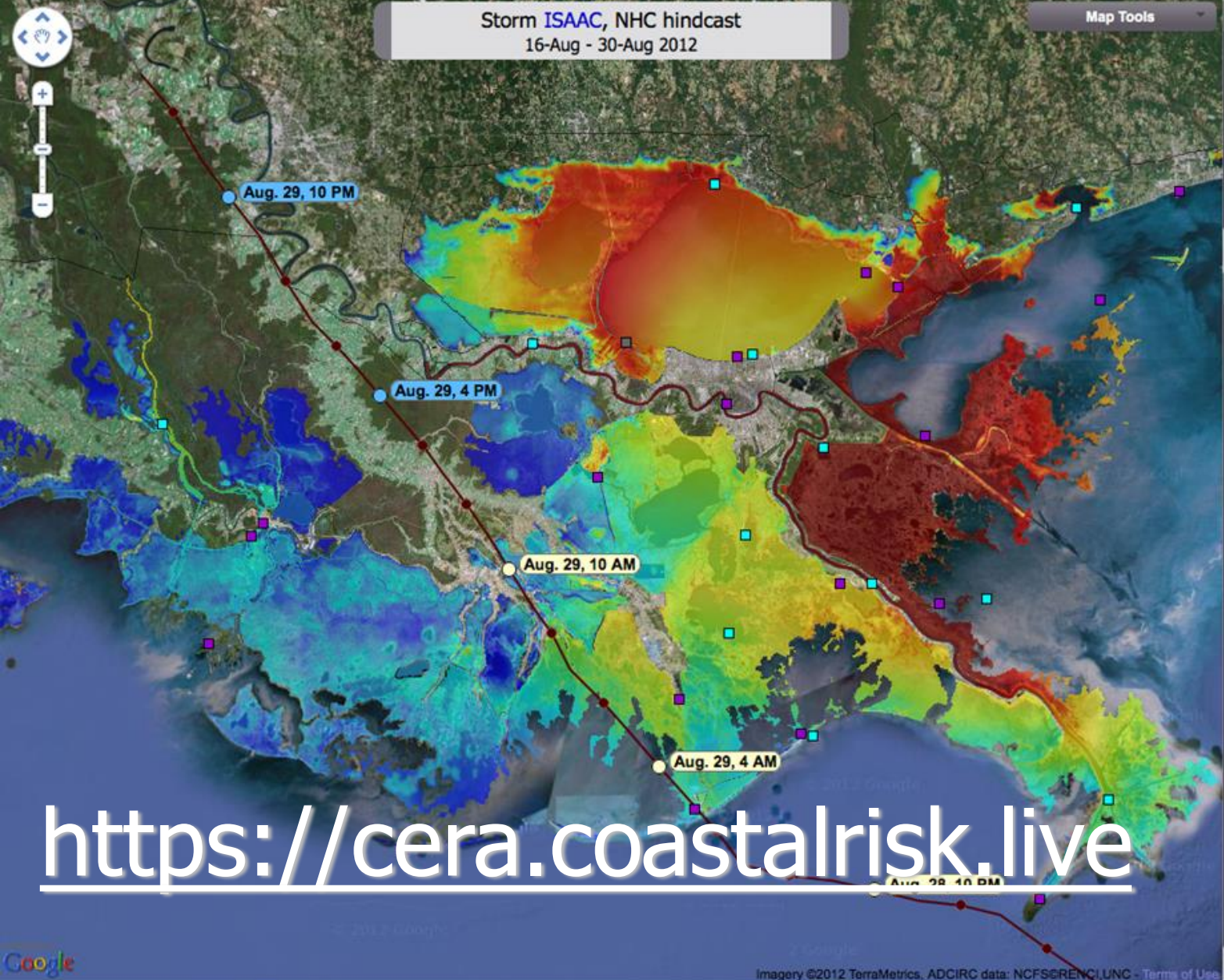
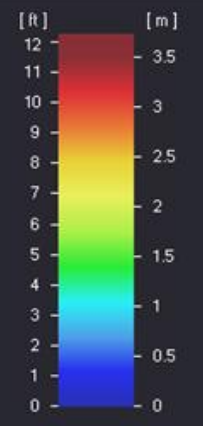
maximum inundation depth (storm history)

The highest inundation depth during the model hindcast.  
08/26 7AM - 09/30 1AM CDT

inundation depth time series

The inundation depth at a specific time during the model hindcast.  
select a date and time:

29-Aug-2012 12 AM CDT



<https://cera.coastalrisk.live>

Wind Speed

# Seahorse Coastal Consulting Key Activities

## Code Development



## Daily Operations



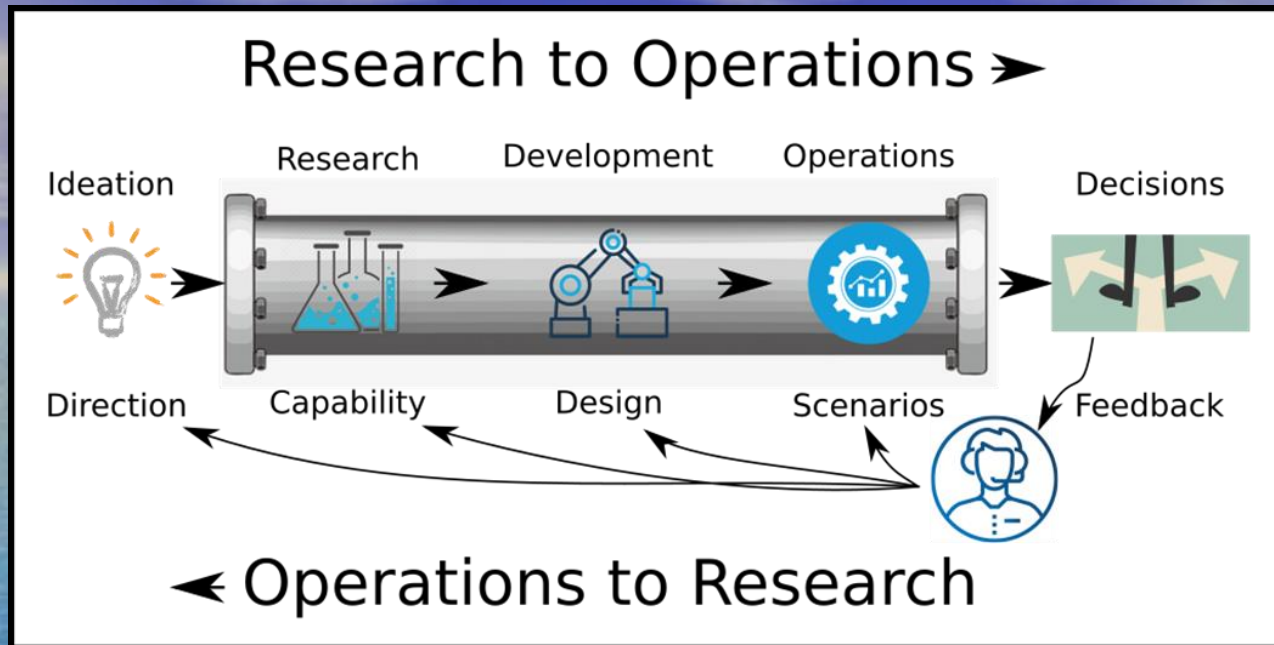
## Outreach and Training



## Decision Support

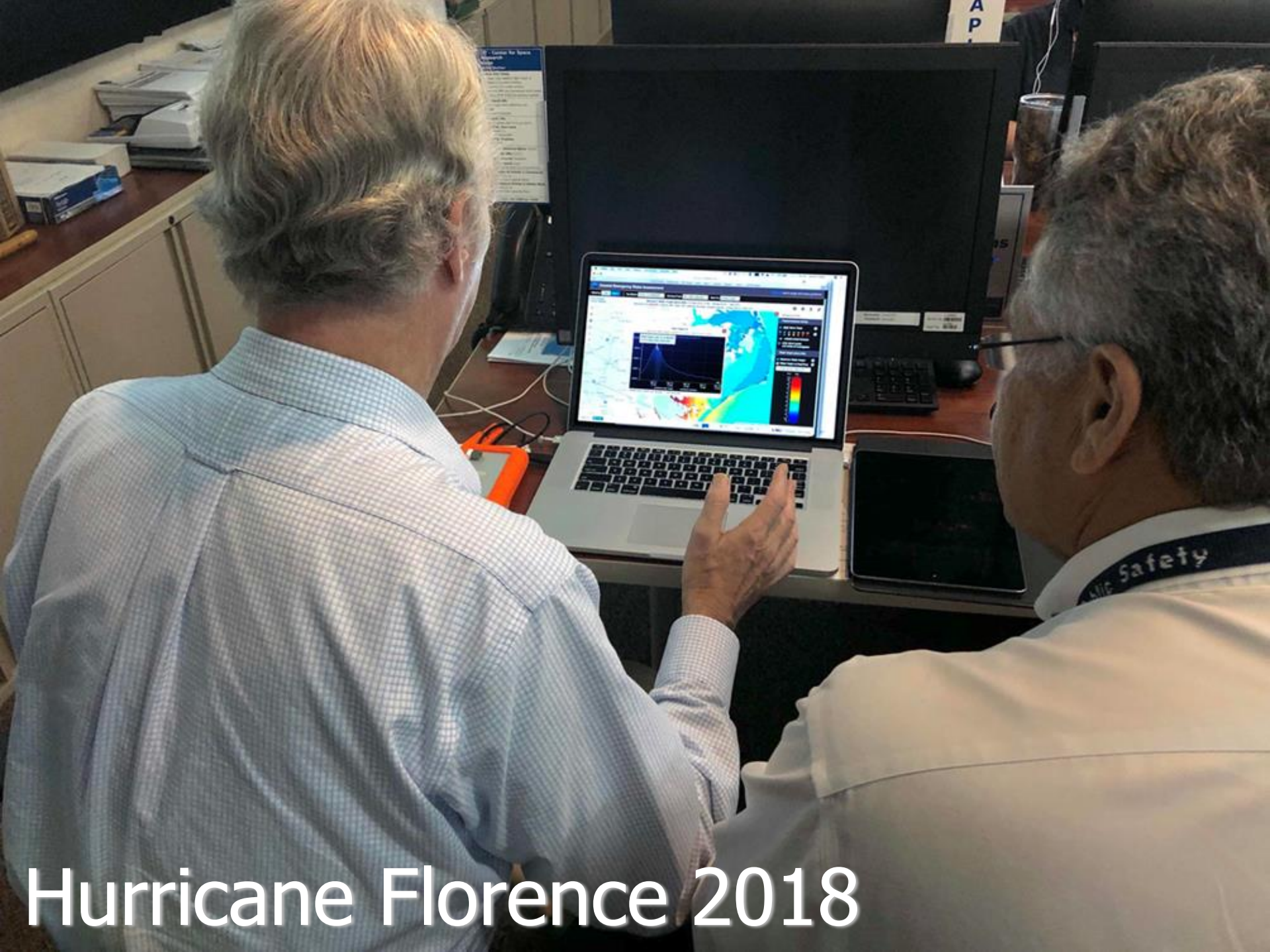


# Collaboration





Hurricane Matthew 2016



Hurricane Florence 2018

# 2020 Hurricane Season

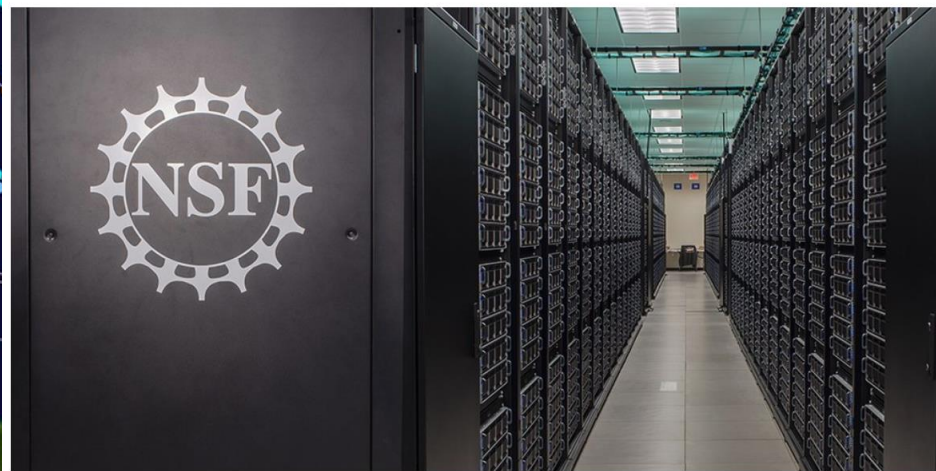
Press Release NOV. 17, 2020

## FRONTERA EXPANSION TO SUPPORT URGENT COMPUTING

National Science Foundation and Dell Technologies contribute to supercomputer to provide capacity for emergency response

Aaron Dubrow

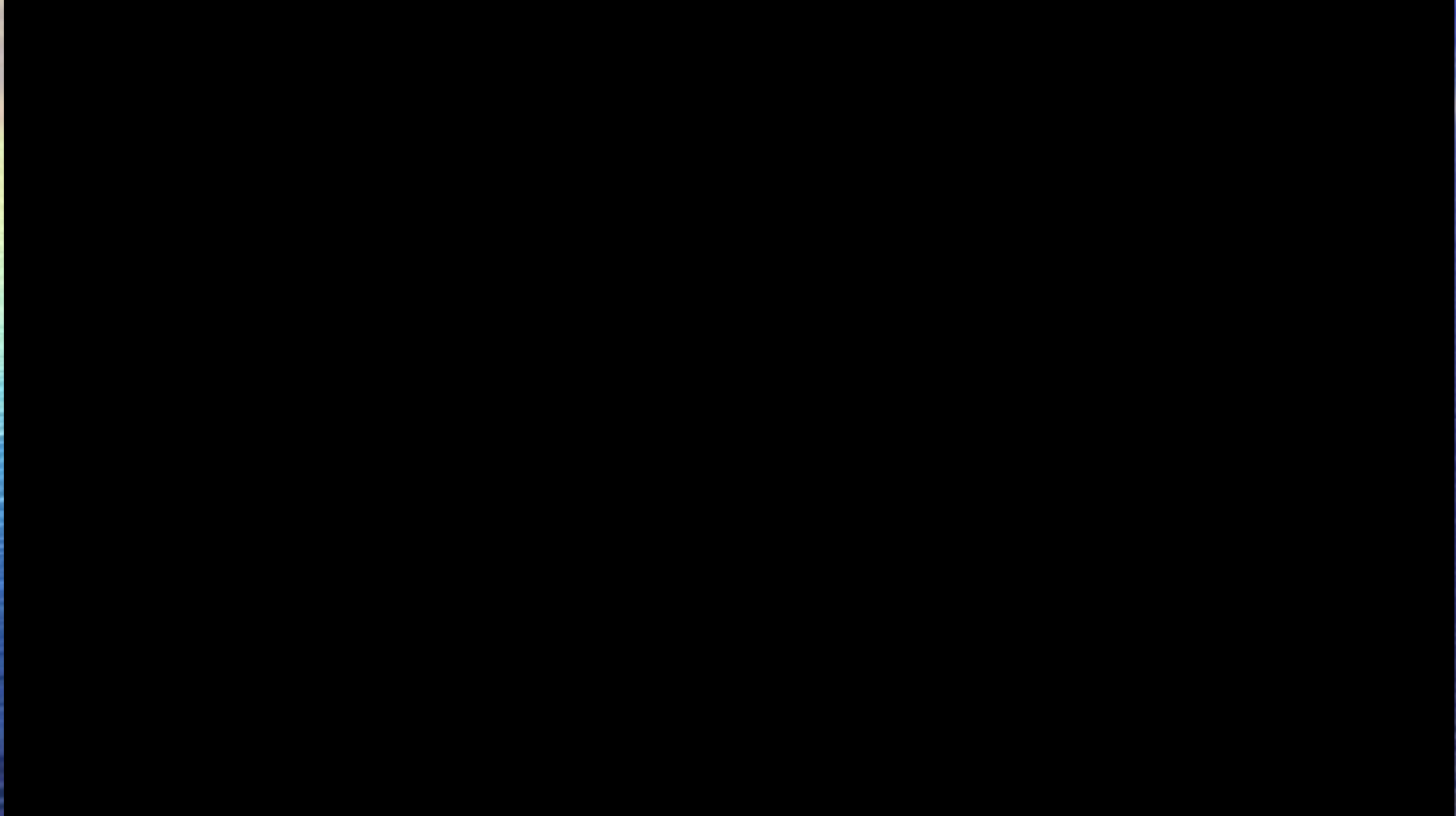
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Hurricane Ida 2021

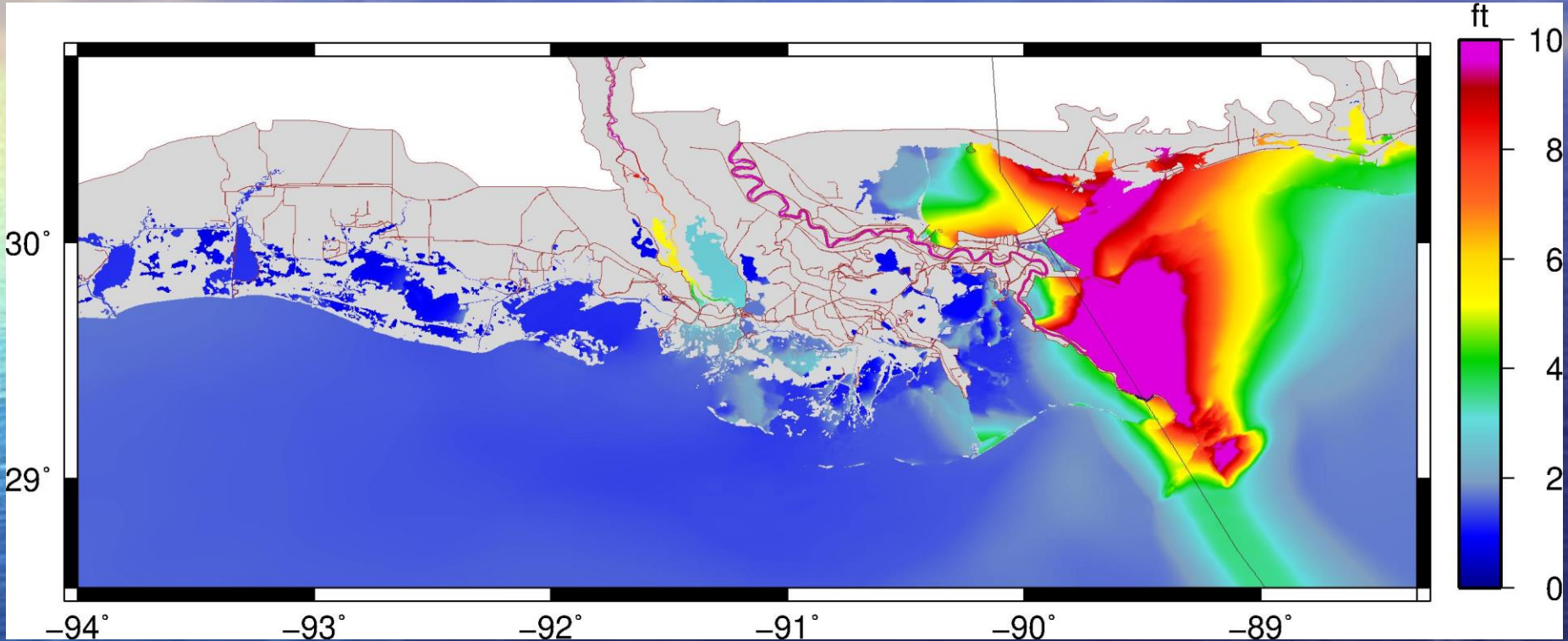
THANK YOU FRONTERA





# NHC Advisory 11 NHC Veer Right 100 Scenario

Simulated peak water levels (ft, NAVD88)



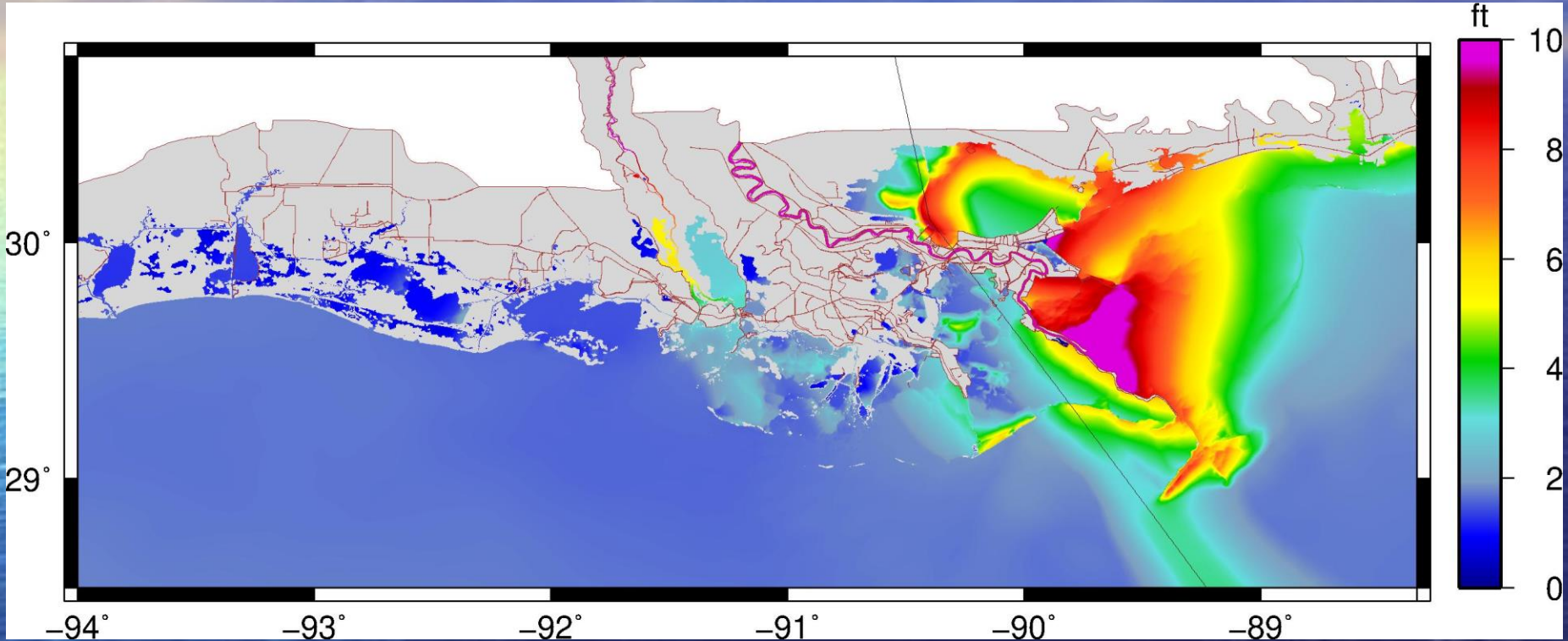
*For Official Use Only. Not For Release.*

*Model results were produced by the ADCIRC Surge Guidance System (ASGS) and are based on the National Hurricane Center (NHC) forecast track.*

*ADCIRC-developed hydrographs are an operational planning tool for emergency-response personnel and are not a replacement for National Weather Service (NWS) forecasts.*

# NHC Advisory 11 NHC Veer Right 50 Scenario

Simulated peak water levels (ft, NAVD88)



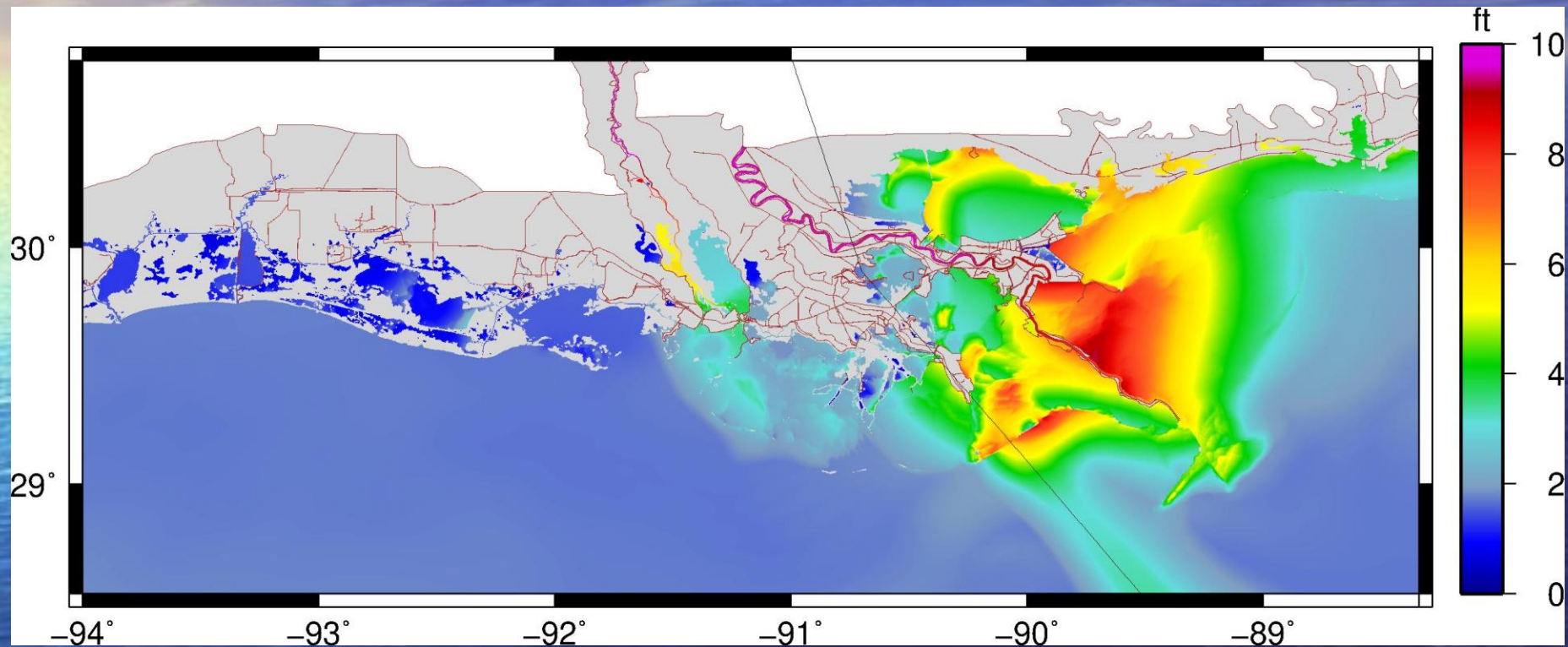
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# NHC Advisory 11 NHC Official Track Scenario

Simulated peak water levels (ft, NAVD88)



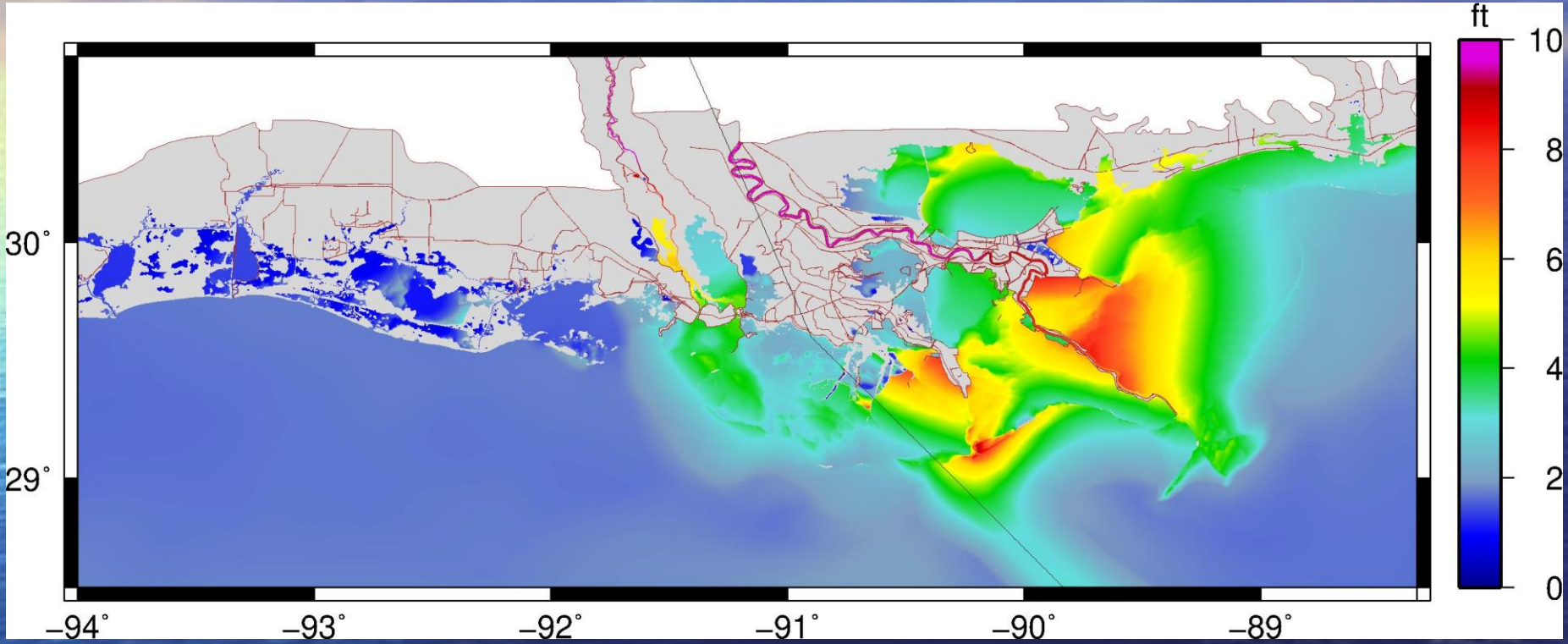
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Simulated peak water levels (ft, NAVD88)



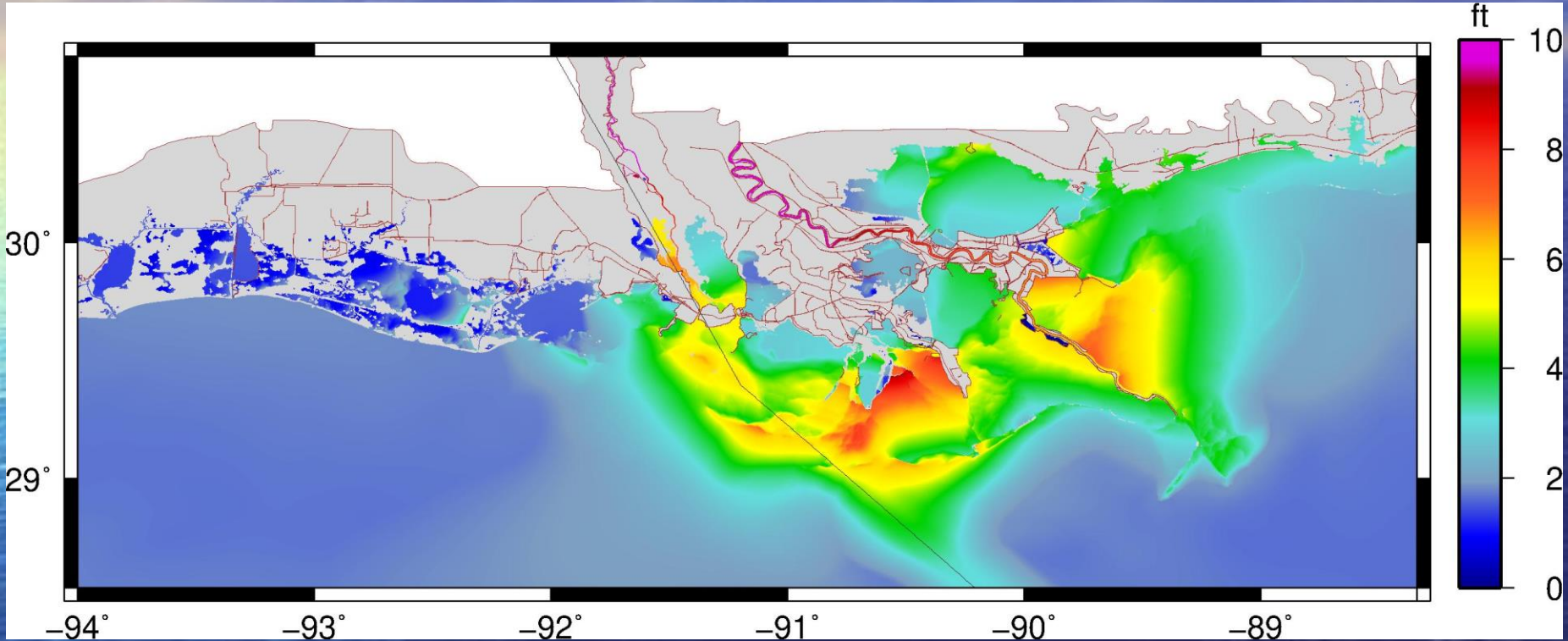
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