

Development of an optimized tide and hurricane storm surge model for the west coast of FL for use with the ADCIRC surge guidance system

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Co-Principal Investigator: Stephen C. Medeiros

University of Central Florida

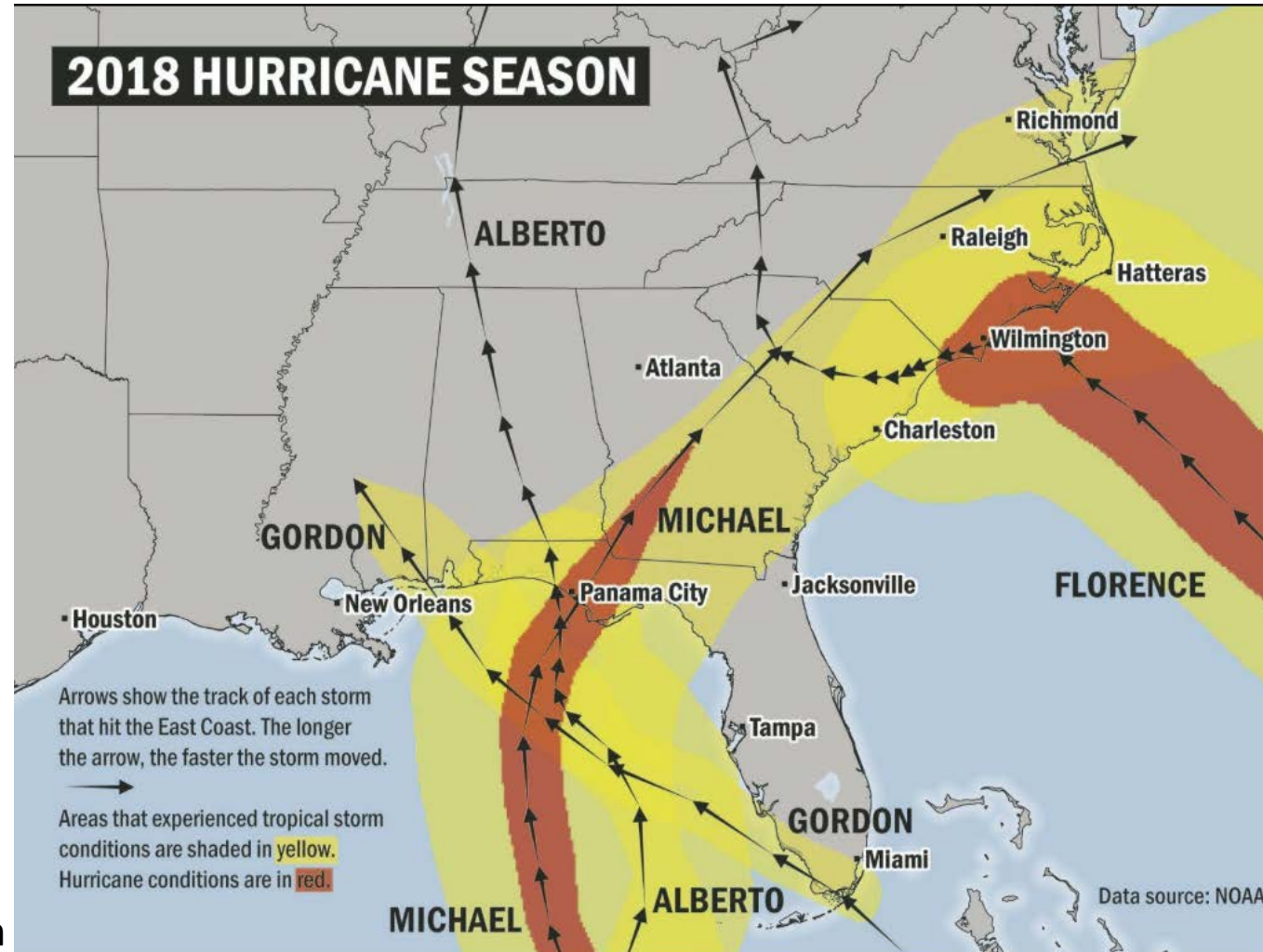
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Outline

- 2018 Hurricane Season
- Project Overview
- Research Activities and Milestones
- End User Engagement
- Transition Activities
- Anticipate Project Impact

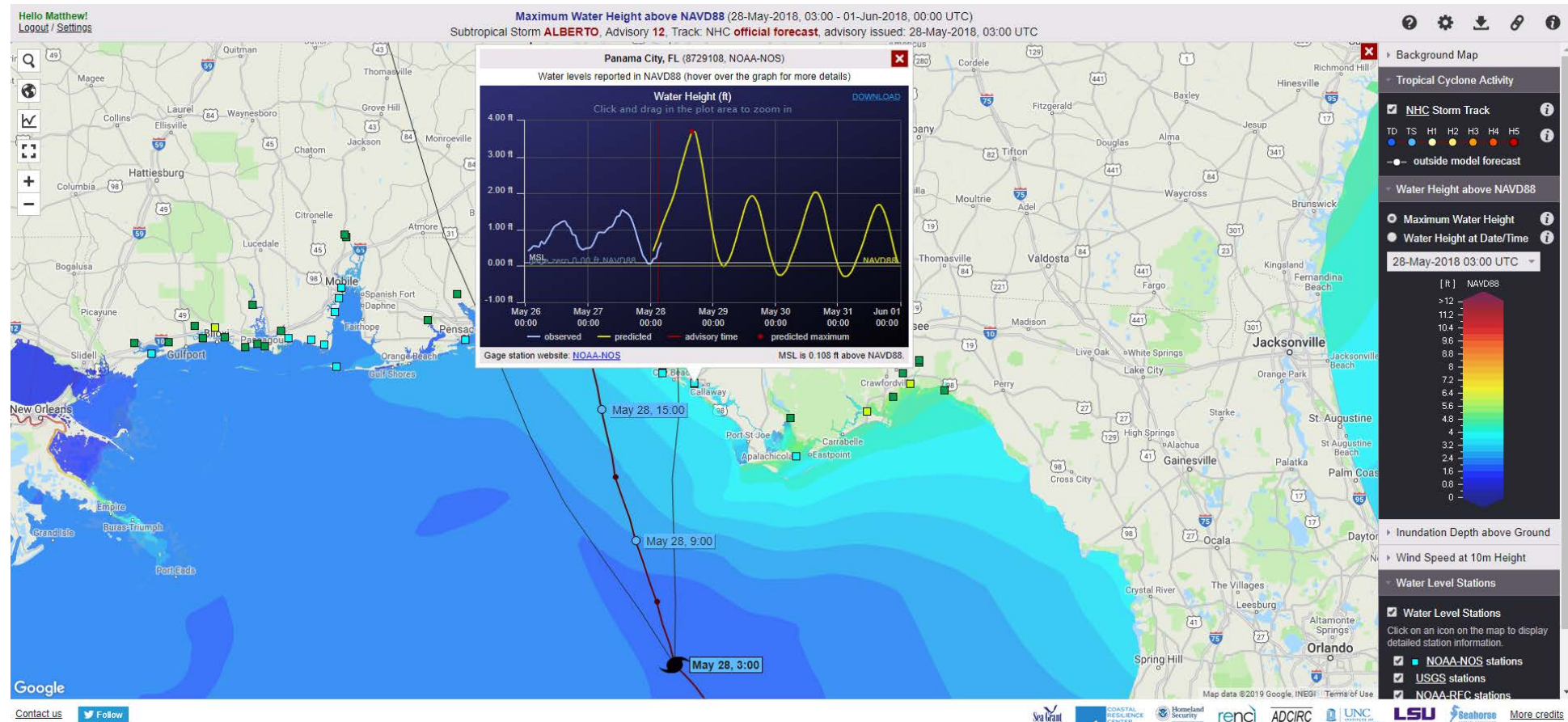
2018 Hurricane Season



Source: John Boyer
Richmond Times-Dispatch

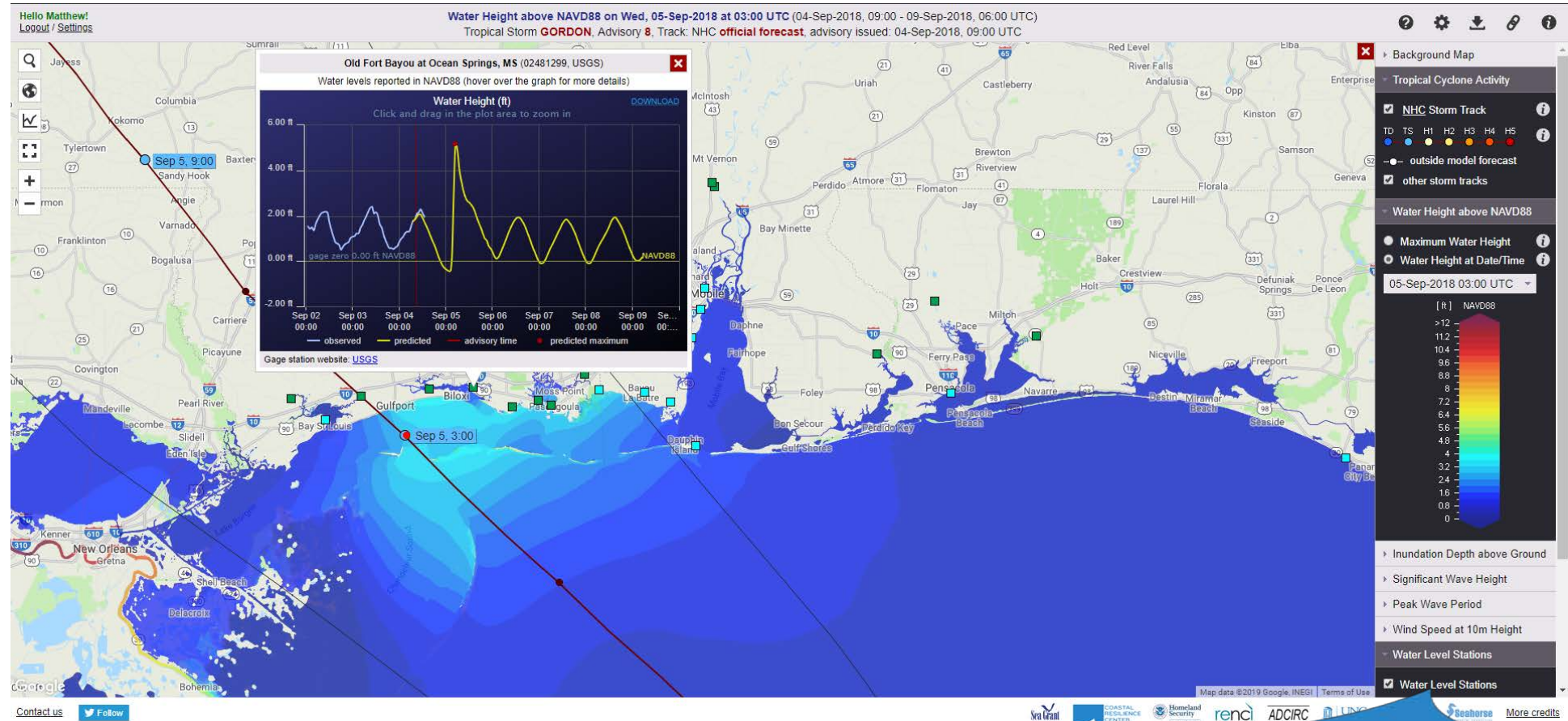
Subtropical Storm Alberto in Real-Time

The ADCIRC model developed during Years 1-3 was used in real-time production for the 2018 hurricane season.



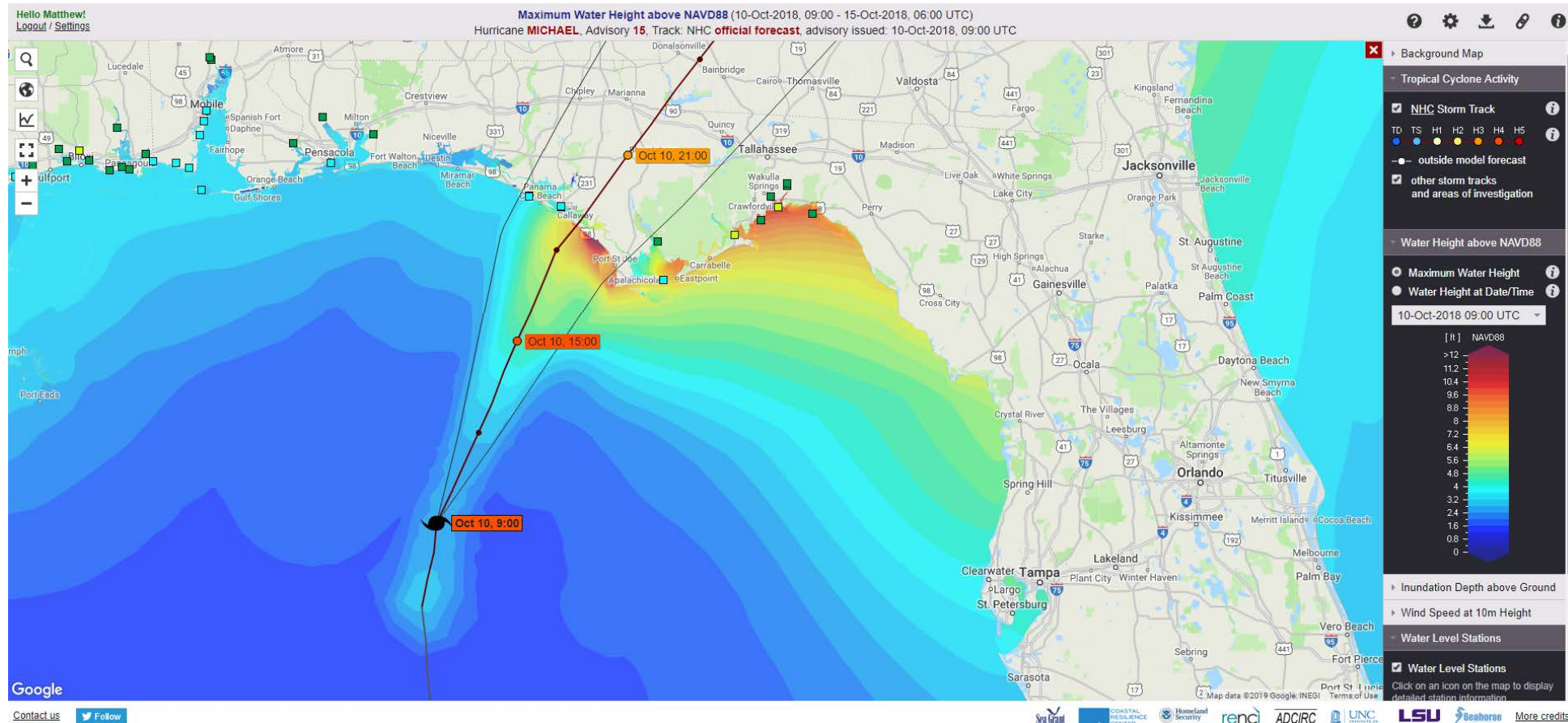
Tropical Storm Gordon in Real-Time

The ADCIRC model developed during Years 1-3 was used in real-time production for the 2018 hurricane season.

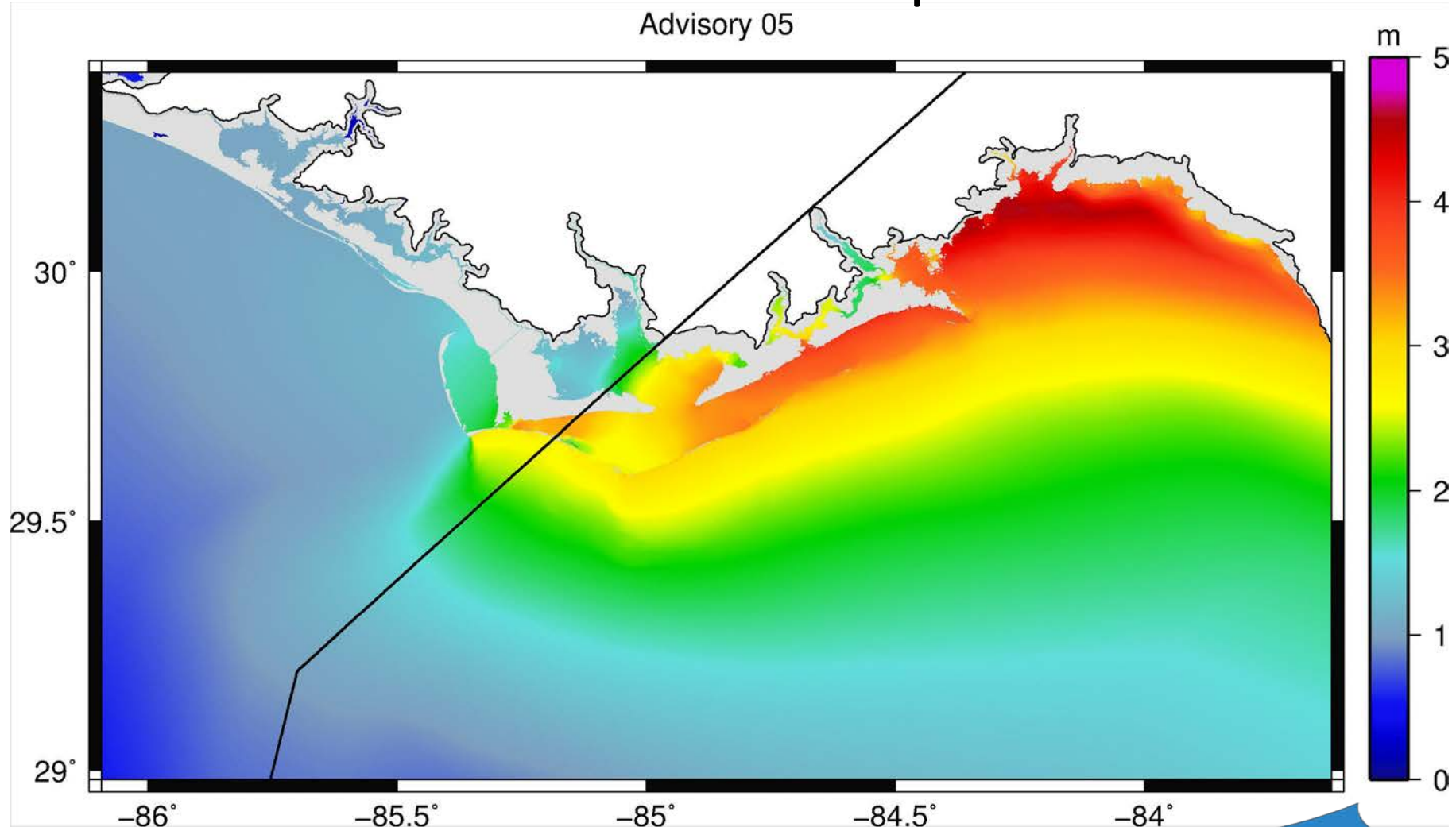


Hurricane Michael in Real-Time

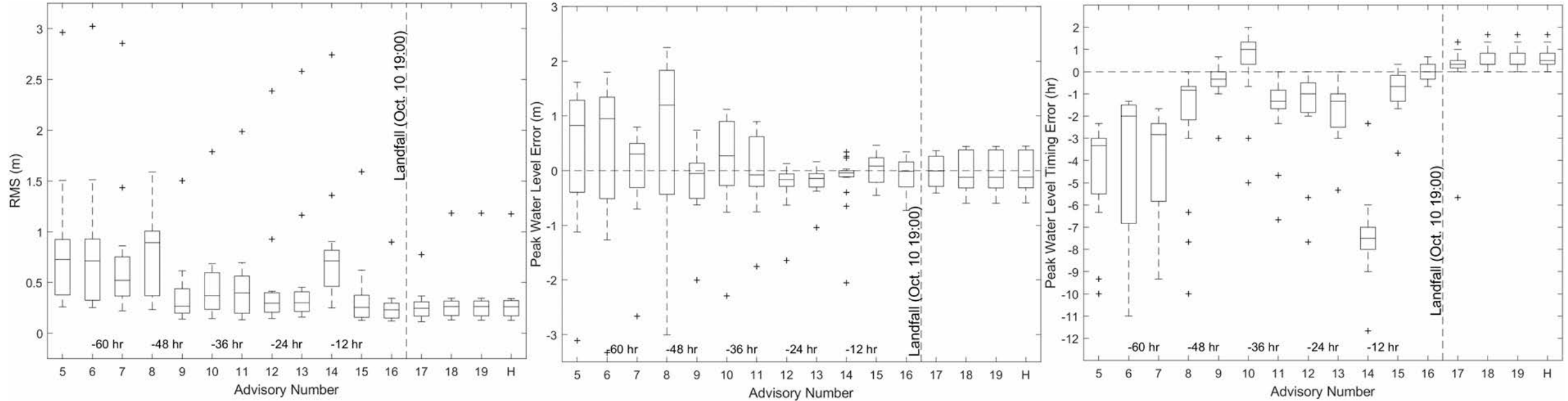
The default view on CERA were the results of the NGOM real-time model during Hurricane Michael.



Hurricane Michael advisories peak water level



Water Level Forecast Errors for Hurricane Michael

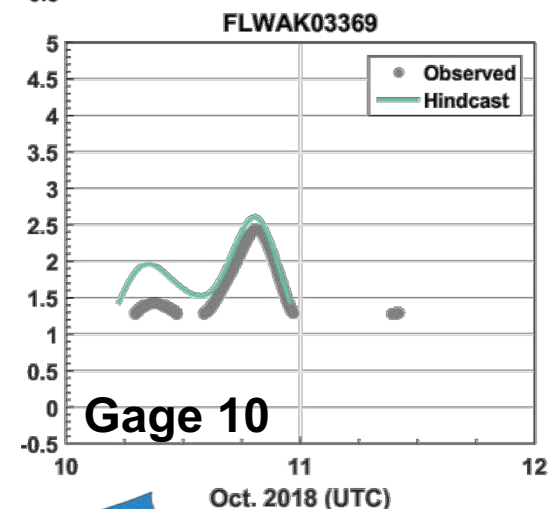
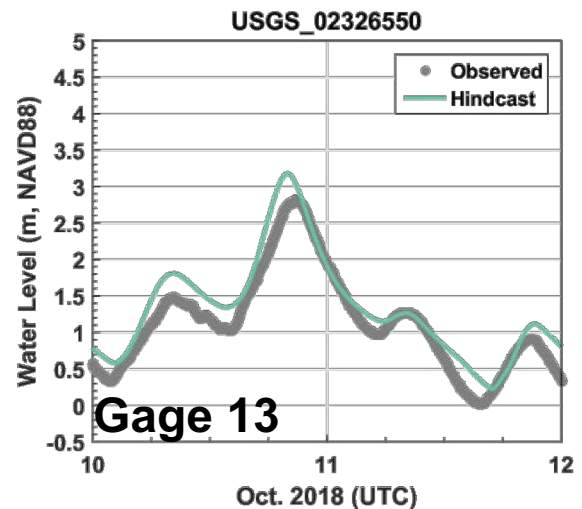
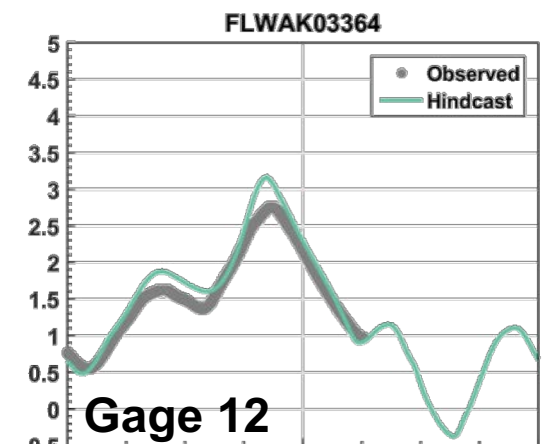
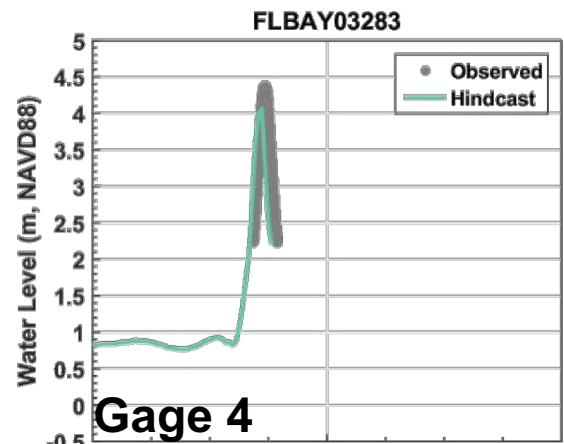
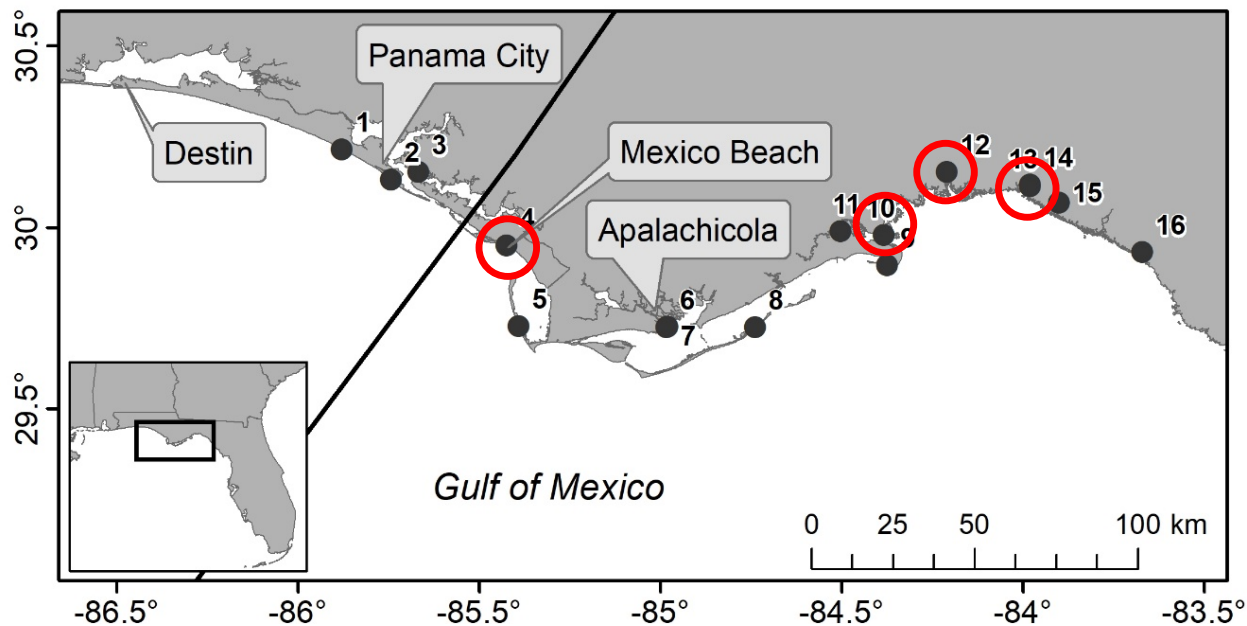


M.V. Bilskie, T.A. Asher, J.G. Fleming, S. C. Hagen, C. Kaiser, R.A. Luettich Jr., R. Twilley

Real-Time Storm Surge Predictions during Hurricane Michael.

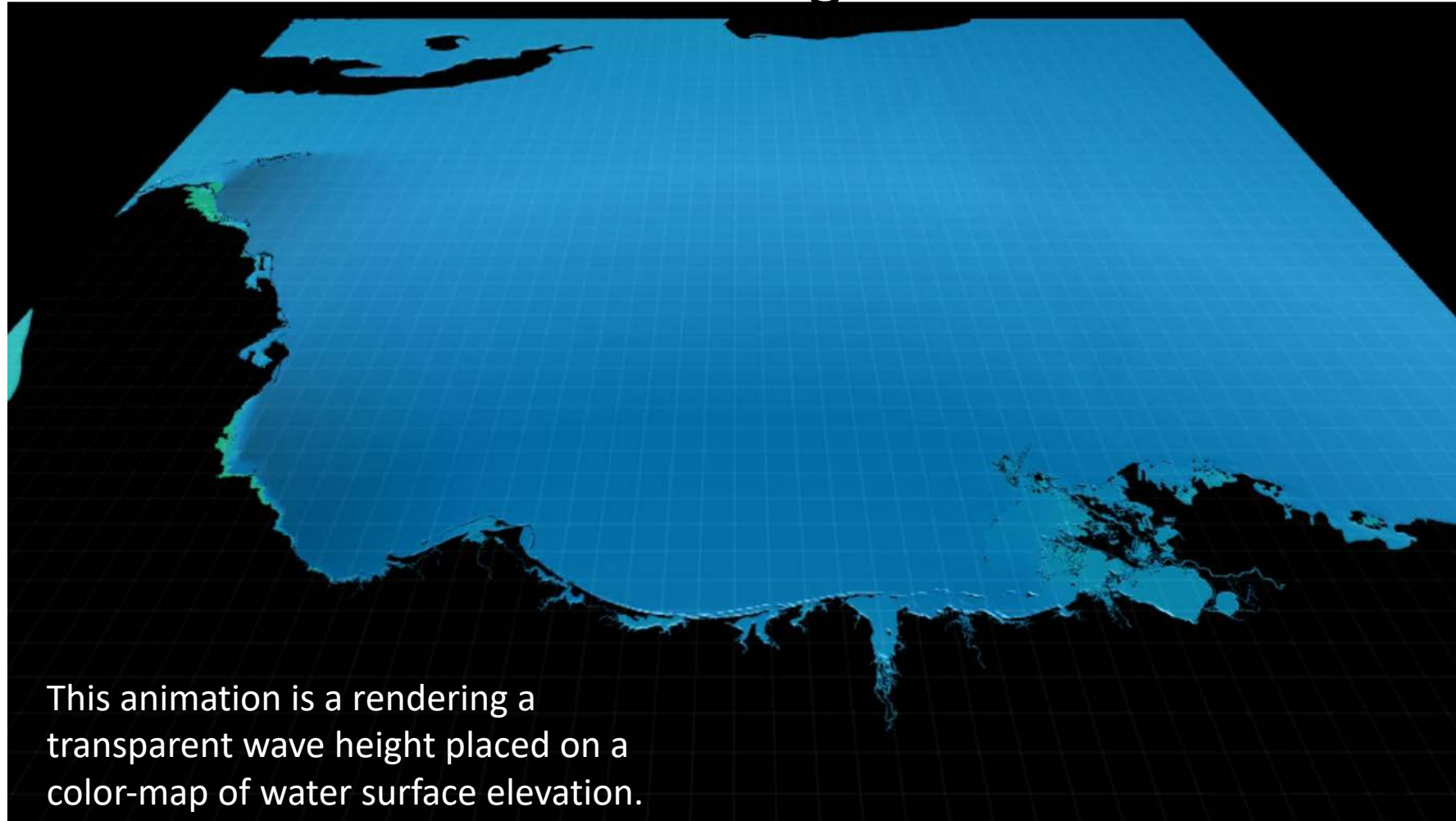
To be submitted to: *Geophysical Research Letters* in March 2019.

Hurricane Michael – Preliminary Validation



M.V. Bilskie, T.A. Asher, J.G. Fleming, S. C. Hagen, C. Kaiser, R.A. Luettich Jr., R. Twilley
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Advanced rendering of ADCIRC model results



XSEDE

Extreme Science and Engineering
Discovery Environment

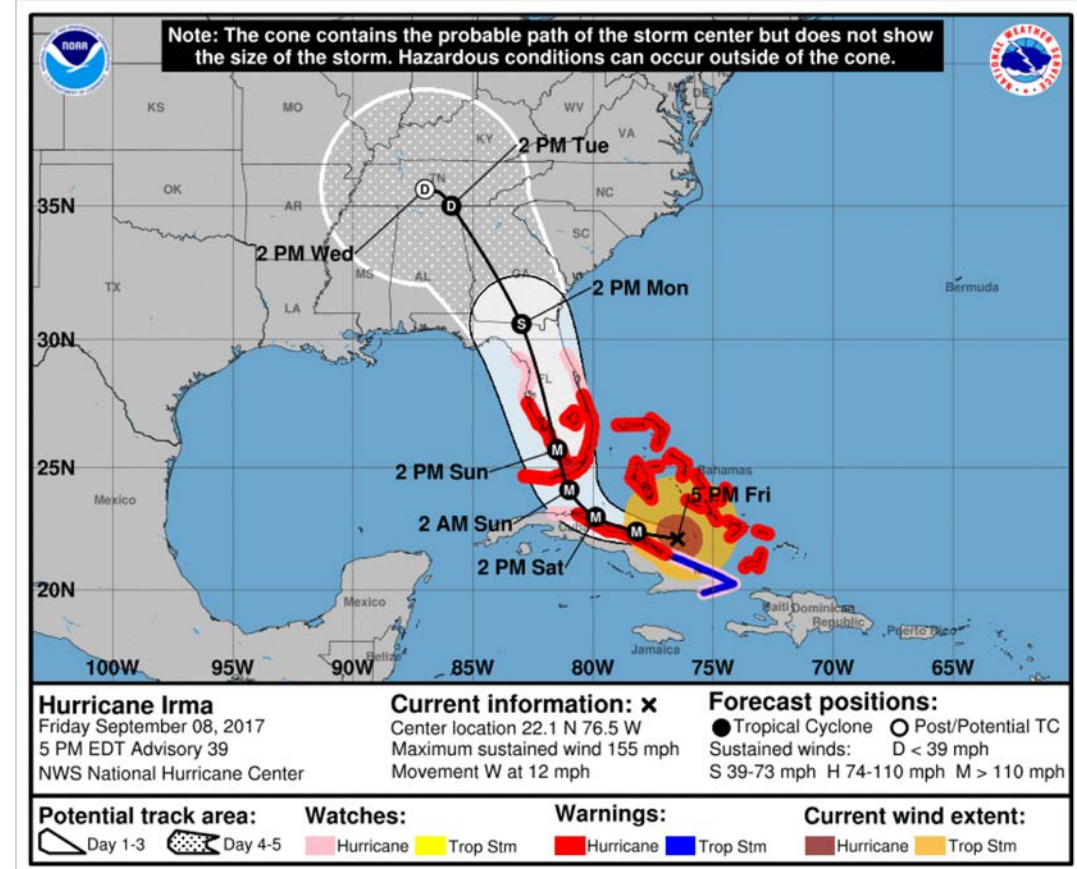
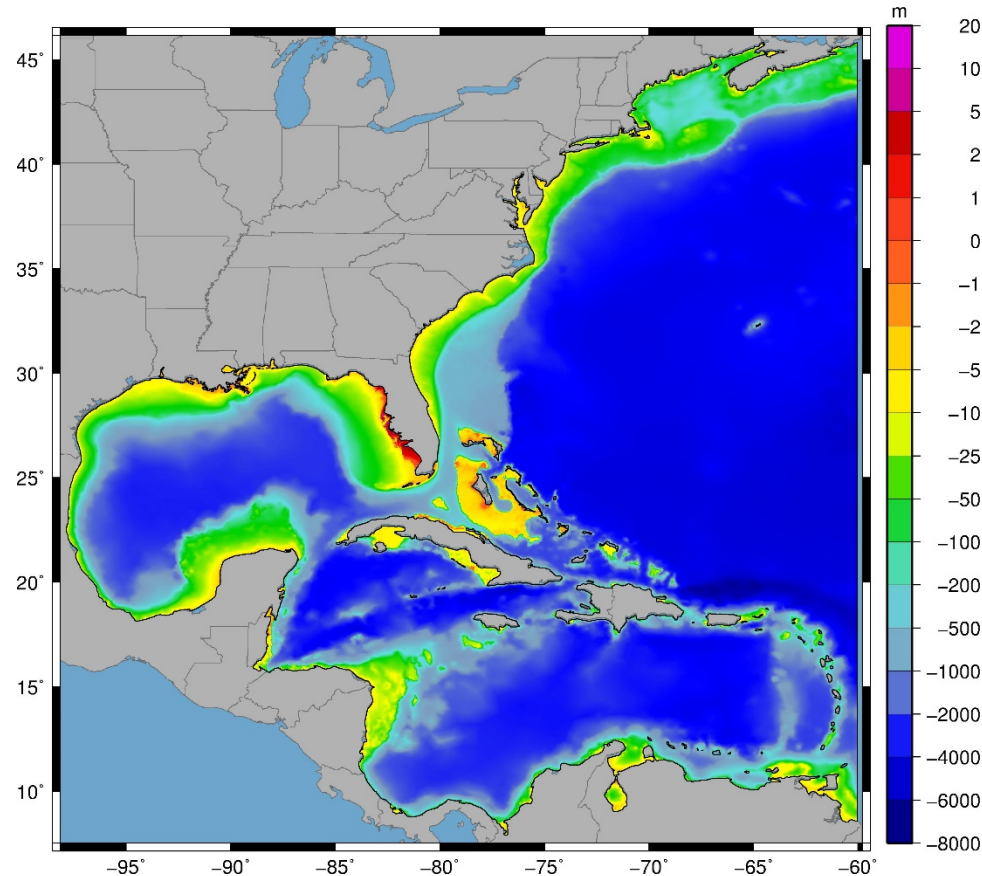
Extended Collaborative
Support Services (ECSS)

David Bock
University of Illinois



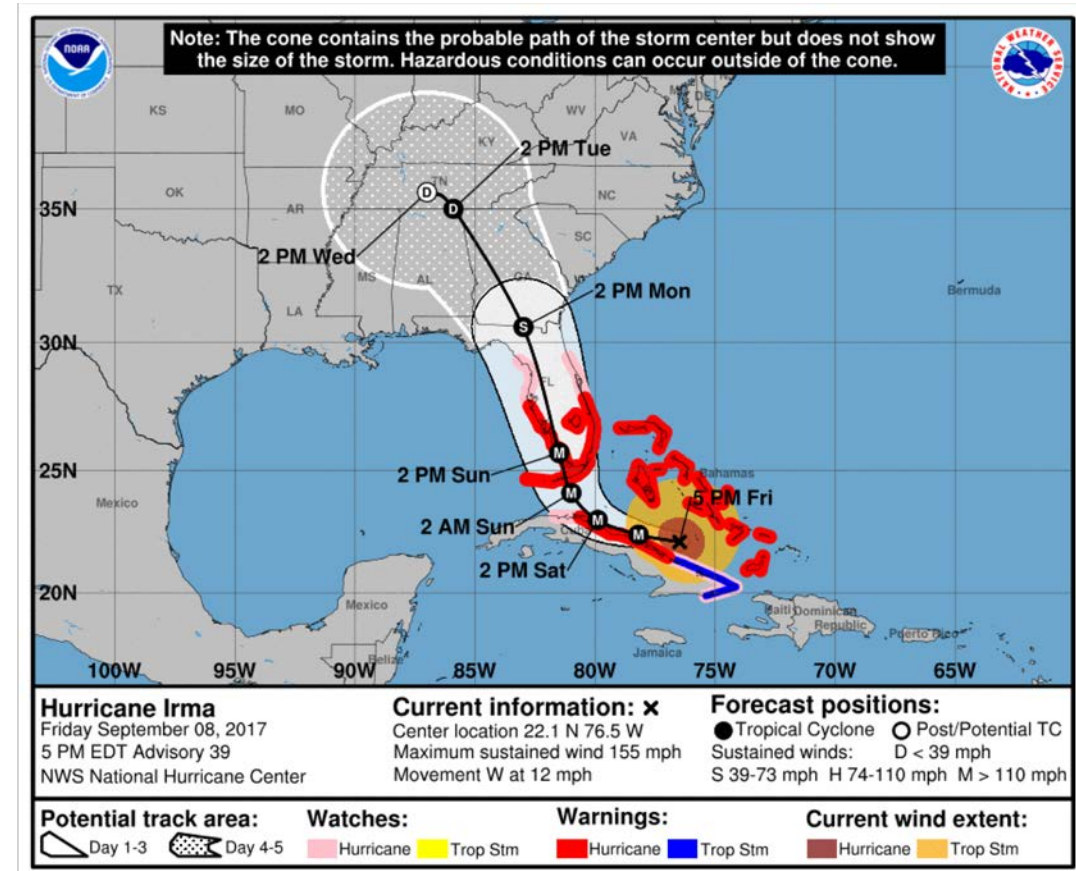
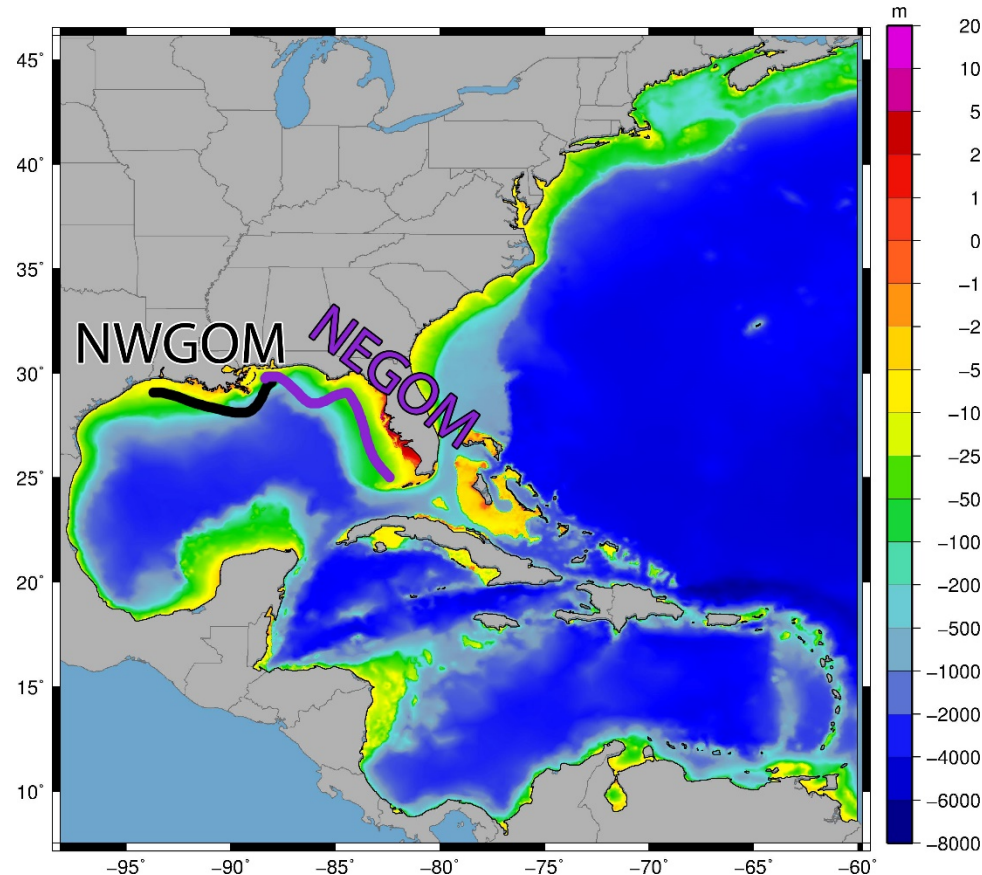
Project Overview

Optimize the FEMA ADCIRC meshes of west Florida
to reduce wall-clock simulation time

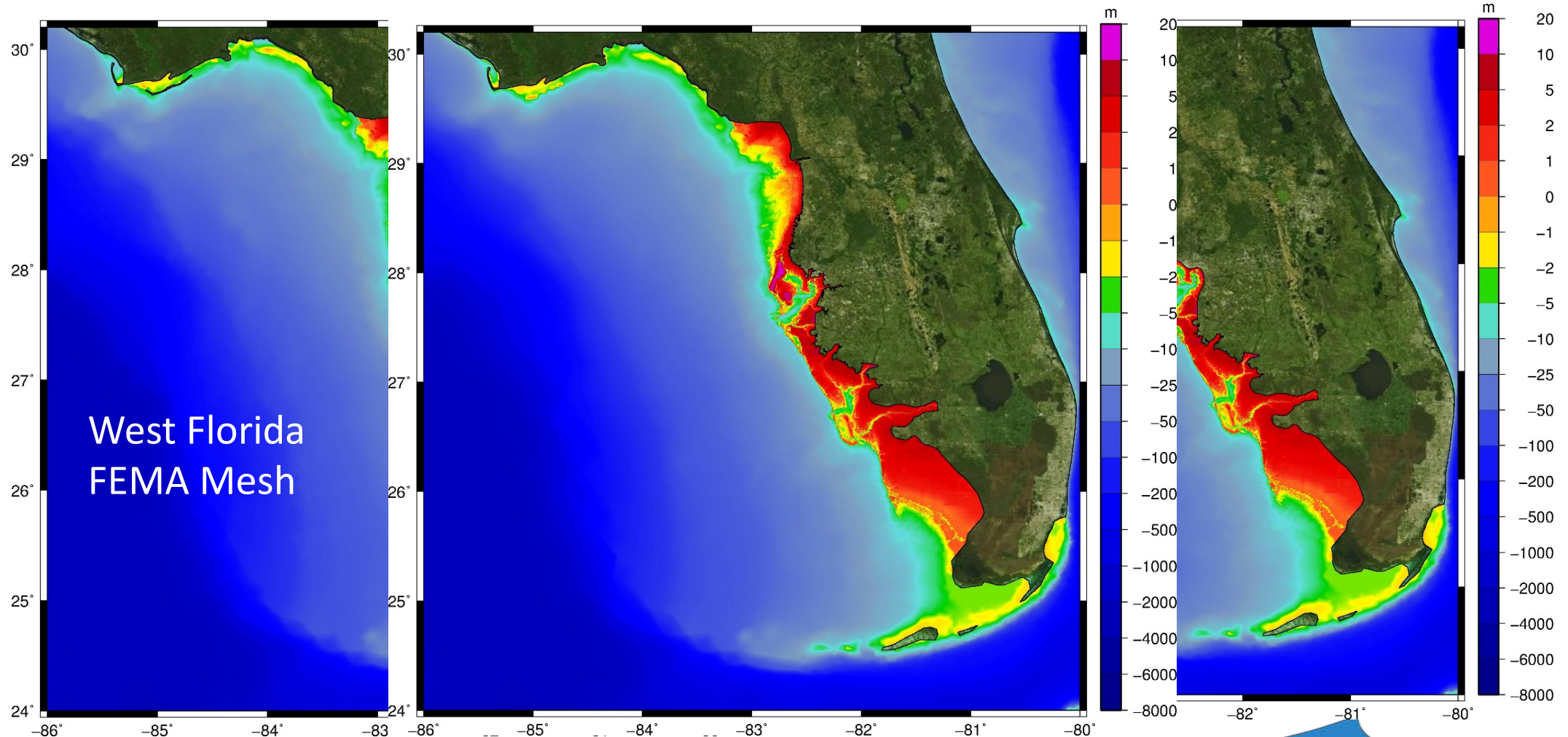


Project Overview

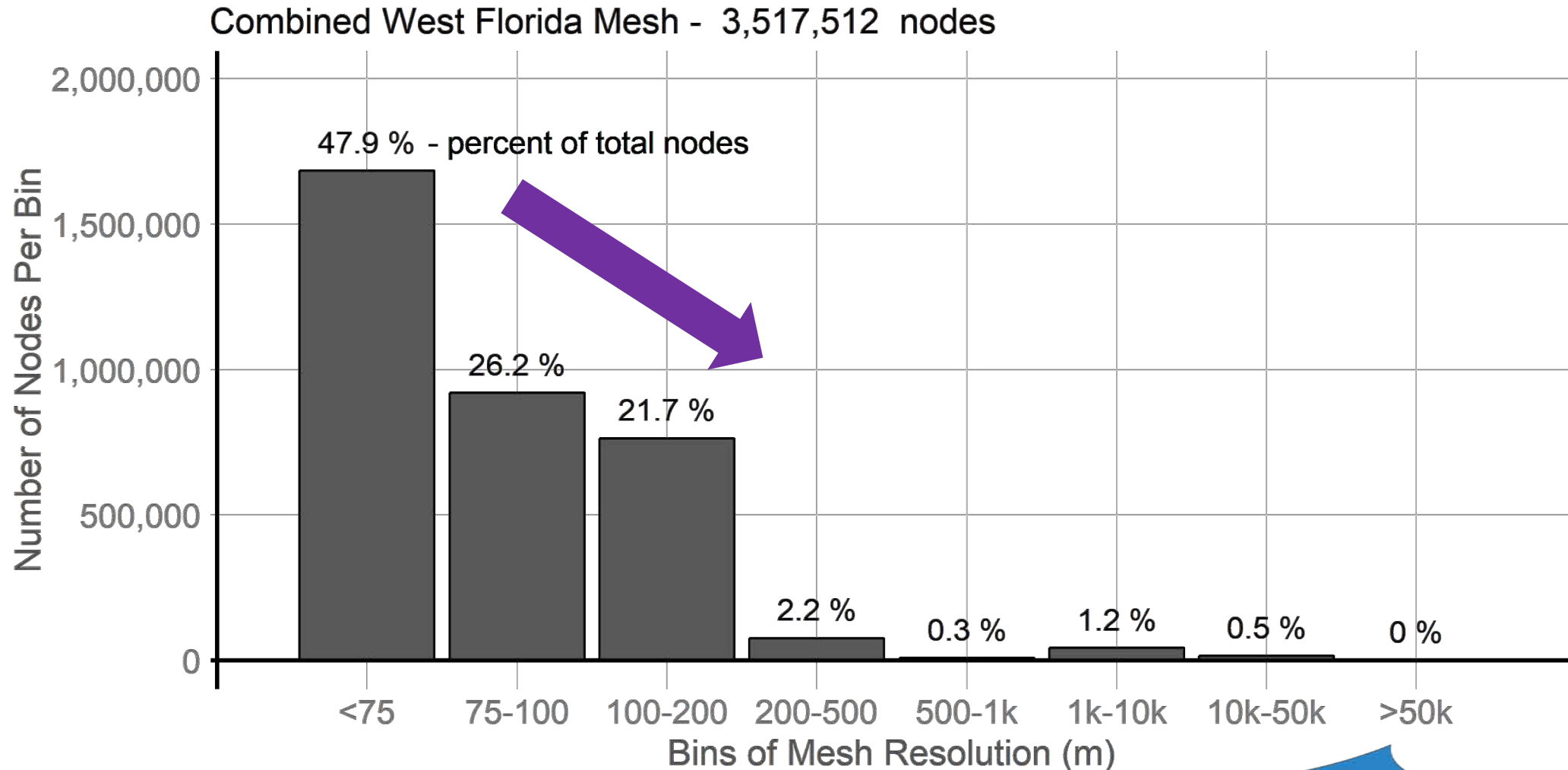
Optimize the FEMA ADCIRC meshes of west Florida to reduce wall-clock simulation time



Research Work and Accomplishments



Mesh Size Distribution



Major Research Activities

October 2018

- Obtain FEMA ADCIRC meshes for the FL west coast

March 2019

- Submission of manuscript on Hurricane Michael forecast errors
- Initial optimization of the FEMA ADCIRC meshes

May 2019

- Test real-time west Florida ADCIRC model on the UCF STOKES HPC system

December 2019

- Edit west FL mesh in response to end user local knowledge

March 2020

- Refactor northeastern Gulf of Mexico ADCIRC meshes

Major Research Milestones

June 2019

- West Florida model connected to CERA (developers only)

June 2019

- Submission of manuscript on model development

June 2020

- The real-time NWGOM and NEGOM will be connected to CERA

July 2020

- SUMREX

June 2020

- Submission of manuscript on final model system validation

End User:

NOAA Northern Gulf of Mexico Sentinel Site Cooperative (NGOMSSC)

Contacts: Renee Collini

INTERACTIONS:

- Dr. Hagen is in regular contact with Renee Collini.
 - **OUTCOME:** The NGOM_CERA will be shared with the NGOMSSC throughout the 2019 hurricane season.
 - **ACTION ITEM:** Coordinate with Renee Collini in April/May 2019 to compile an email list of NGOMSSC stakeholders for distribution of CERA link prior to hurricane season and prior to each named storm (if necessary).

End User:

Federal Emergency Management Agency (FEMA) Region IV

INTERACTIONS:

- Drs. Hagen and Bilskie have been in regular contact.
 - **OUTCOME:** Florida West Coast FEMA mesh was obtained in October 2018.
 - **ACTION ITEM:** Brief Region IV in late May 2019 regarding status of model development and CERA integration prior to hurricane season.

End User:

Florida Division of Emergency Management (FDEM)

Contacts: Jason Ray, GIS Administrator; Richard Butgereit, Chief Information Officer

INTERACTIONS:

- Dr. Medeiros met briefly with Mr. Ray in June 2018.
 - **OUTCOME:** FDEM is interested in learning more about the tool.
 - **ACTION ITEM:** Follow up with Mr. Ray in April 2019 and present a research update focusing on the two mesh plan.

End User:

Florida Department of Transportation (FDOT)

Contact: John Hatfield, PE (District 5 Maintenance Engineer)

INTERACTIONS:

- Initiated contact with Mr. Hatfield in October 2018
 - **OUTCOME:** CERA added to FDOTs emergency management toolset
 - **QUOTE:** *“The CERA Coastal Emergency Risk Assessment Tool, that you sent me, is more specific for storm surge heights corresponding to the actual track and intensity of the approaching hurricane. The FDOT GEMS Tool does not take the storm track into account, but it does estimate the max storm surge height for a given category strength of hurricane. ... We have added the CERA Coastal Emergency Risk Assessment Tool website link to the DECO Secure EM websites list. Thanks for sharing this tool.”*
 - **ACTION ITEM:** Coordinate with Mr. Hatfield in April 2019 to get an introduction to his counterpart in Districts 1, 2, 3, 6, and 7.

End User:

South Florida Water Management District (SFWMD)

Contacts: Matahel Ansar, Tibebe Dessalegne, Rama Rani, Jie Zheng

INTERACTIONS:

- Regular email contact from July through November 2018, conference call on July 9, 2018
 - **OUTCOME:** SFWMD provided coordinates for flood control infrastructure on Florida's West Coast where they would like surge forecasts. Dr. Bilskie integrated these as output stations in the model so we will be able to provide targeted hydrographs in 2019 via email and eventually through CERA.
 - **ACTION ITEM:** Schedule a brief webinar to determine if their infrastructure locations warrant additional model resolution and to inquire about any ground truth data they may have.

Major Transition Activities from Workplan

December 2018

- **Develop training program for identified end users in west Florida**

March 2019

- **Finalize CERA training materials**

June 2019

- **Deliver CERA training to initial set of end users**

December 2019

- **Technical presentation / webinar on model development to end users with knowledge of domain**

March 2020

- **Revise CERA training based on initial feedback**

June 2020

- **Deliver CERA training to final set of end users, aim to capture at least 1 more user from each initially identified agency**

Major Transition Activities - Updated

December 2018

- Identify key areas in domain from at least one end user

June 2019

- UCF research assistant complete CERA tutorial & provide feedback

June 2019

- Pre-Season check-in with end users, refer them to CERA Tutorial

August 2019

- Mid-season check in with end users including at least 1 new end user

December 2019

- Presentation on model development to end users w/ domain knowledge

March 2020

- Cultivate at least 1 new end user

June 2020

- Pre-Season check in with end users, refer them to CERA tutorial

Major Transition Milestones - Updated

June 2019

- CERA Tutorial tested by undergraduate research assistant

June 2019

- CERA Tutorial sent to 5 end users

August 2019

- Custom hydrograph output for at least 1 end user

March 2020

- Models tangibly incorporate local domain knowledge

June 2020

- CERA Tutorial sent to 10 end users

Anticipated Project Impact

Using the NGOMSSC distribution channels, those most affected by coastal hazards are informed about ASGS and CERA

Coastal resource managers and stakeholders are informed about surge guidance methodology and advances in model development

Accurate, local surge forecasts enable NGOMSSC, SFWMD, FDEM, & FDOT personnel to secure assets prior to event and guide assessment efforts after

LSU and UCF coordinate computing resources to back each other up in the event of an impending hurricane so that ASGS continues to provide forecasts visible on CERA

Coastal hazards community (DHS, NOAA, Local Government, and University partners) receive talented & trained personnel via research assistantships under the Research and Education PIs



atmosphere

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Storm Surge Modeling – Capturing the Wind

Guest Editor:

Dr. Stephen C. Medeiros
Department of Civil,
Environmental, and Construction
Engineering, University of Central
Florida, Orlando, FL, USA
Stephen.Medeiros@ucf.edu

Deadline for manuscript
submissions:

30 November 2019

Message from the Guest Editor

We specifically encourage submissions involving the following topics:

- Boundary layer interactions including momentum transfer, wind drag, and aerodynamic roughness characterization;
- Quantification of the uncertainty associated with air/sea interaction;
- Computational methods for wind-driven surge simulation including advances to high performance distributed computing architecture, data assimilation, and machine learning;
- Parameterization and validation techniques based on in-situ sensor measurements, remote sensing, photogrammetry, etc.;
- Innovative metrics to assess model performance.



mdpi.com/si/20143

COASTAL RESILIENCE CENTER

A U.S. Department of Homeland Security Center of Excellence



UNIVERSITY OF CENTRAL FLORIDA

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Anticipated Project Impact

When it's done, what difference will your project make:

- to end users
- to the profession/discipline?