



USING MIKE TO MODEL COASTAL CATASTROPHE RISK

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SUMMARY

- About RMS
 - Who are we and what do we do?
 - How do we use MIKE in our workflow?
- Case study: Mapping coastal risk in Texas
 - A more detailed look at a recent project
 - Real time and post event modelling

RISK MANAGEMENT SOLUTIONS



AGRICULTURE



CYBER



EARTHQUAKE



FLOOD



HWIND



LIFERISKS



MARINE
CARGO



SEVERE
CONVECTIVE
STORM



TERRORISM



TROPICAL
CYCLONE



TSUNAMI



WILDFIRE

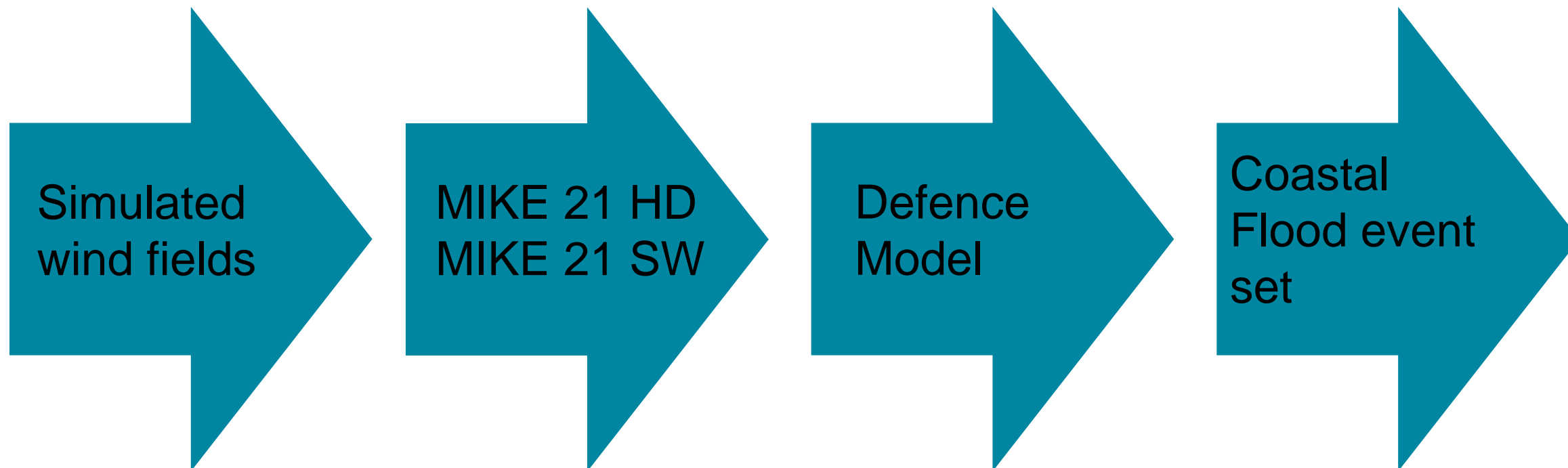


WINDSTORM



WINTER
STORM

MIKE IN OUR WORKFLOW – EXAMPLE



TEXAS



https://coast.noaa.gov/hurricanes/

Historical Hurricane Tracks

Search Hurricanes By

Location	Name/Year	Ocean Basin
State of Texas (Civil), TX		

65 Nautical Miles Show search area

Refine Search

Search through the storms below

Results (18) Selected My Storms (0)

Sort By Name (A - Z)

+ IKE 2008	Sep 01, 2008 to Sep 15, 2008
+ RITA 2005	Sep 18, 2005 to Sep 26, 2005
+ UNNAMED 1880	Aug 04, 1880 to Aug 14, 1880
+ UNNAMED 1886	Aug 12, 1886 to Aug 21, 1886
+ UNNAMED 1900	Aug 27, 1900 to Sep 15, 1900
+ UNNAMED 1909	Jul 13, 1909 to Jul 22, 1909
+ UNNAMED 1915	Aug 05, 1915 to Aug 23, 1915
+ UNNAMED 1916	Aug 12, 1916 to Aug 20, 1916
+ UNNAMED 1918	Aug 01, 1918 to Aug 07, 1918
+ UNNAMED 1919	Sep 02, 1919 to Sep 16, 1919
+ UNNAMED 1932	Aug 12, 1932 to Aug 15, 1932
+ UNNAMED 1933	Aug 22, 1933 to Sep 05, 1933
+ UNNAMED 1942	Aug 23, 1942 to Sep 01, 1942

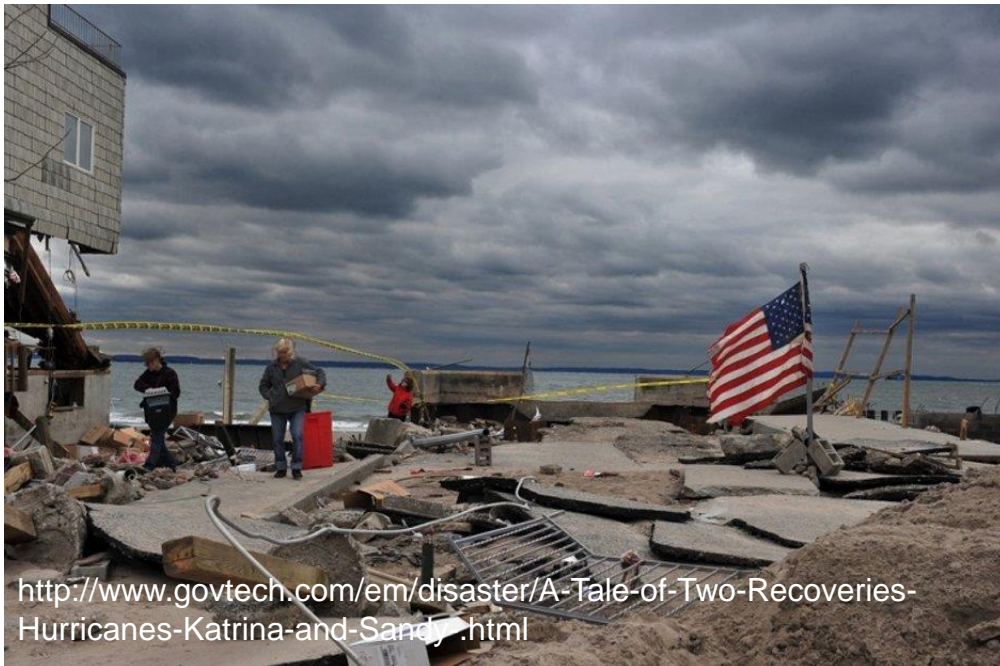
Pos: -9.62, -69.87 Search Center: 31.25, -99.25

United States Department of Commerce | National Oceanic and Atmospheric Administration | National Ocean Service | Website owner: Office for Coastal Management | Last Modified: 28/06/2018

TEXAS HURRICANES

Notable Hurricanes:

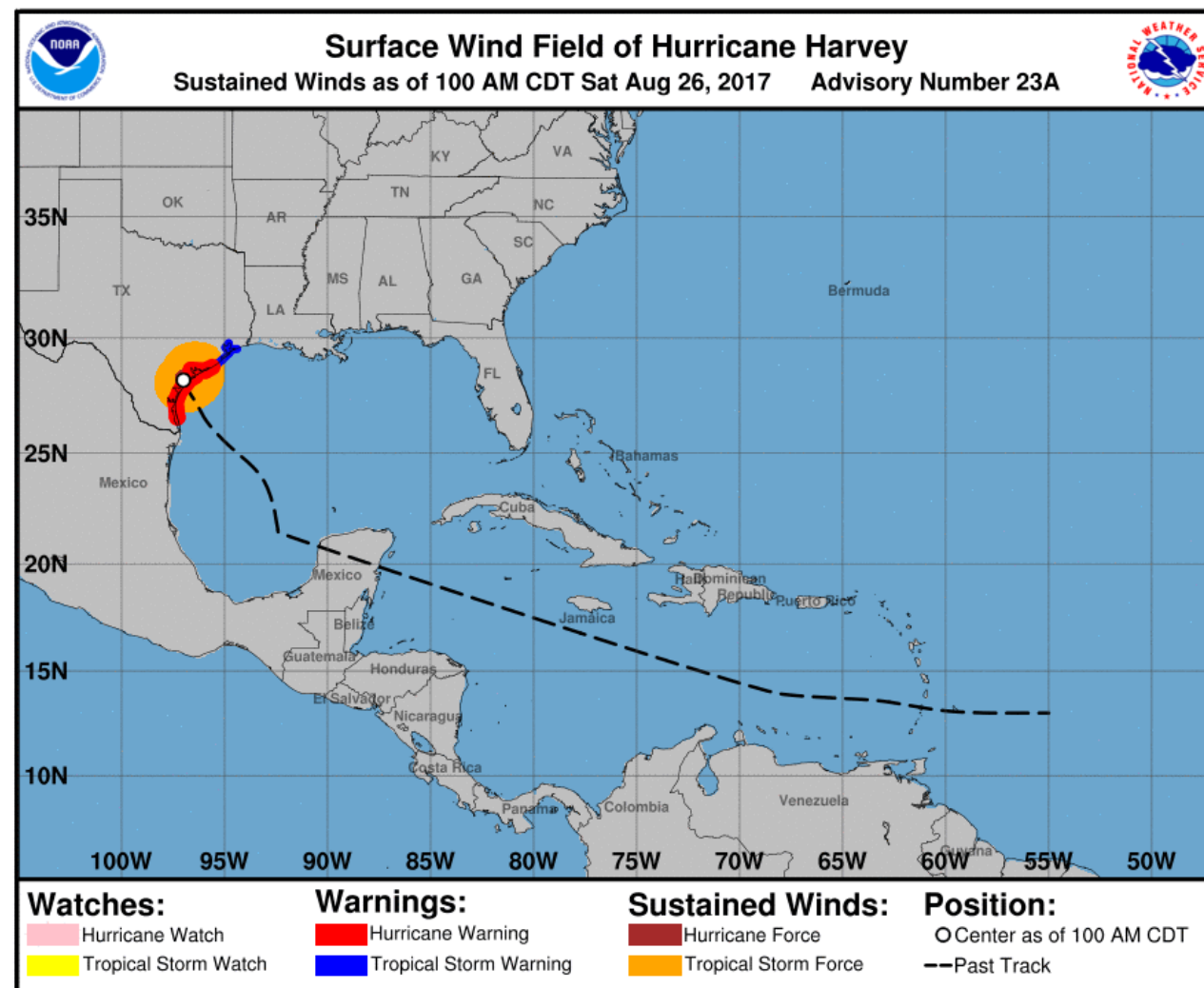
- Harvey 2017
- Ike 2008
- Rita 2005
- Allison 2001
- Alicia 1983



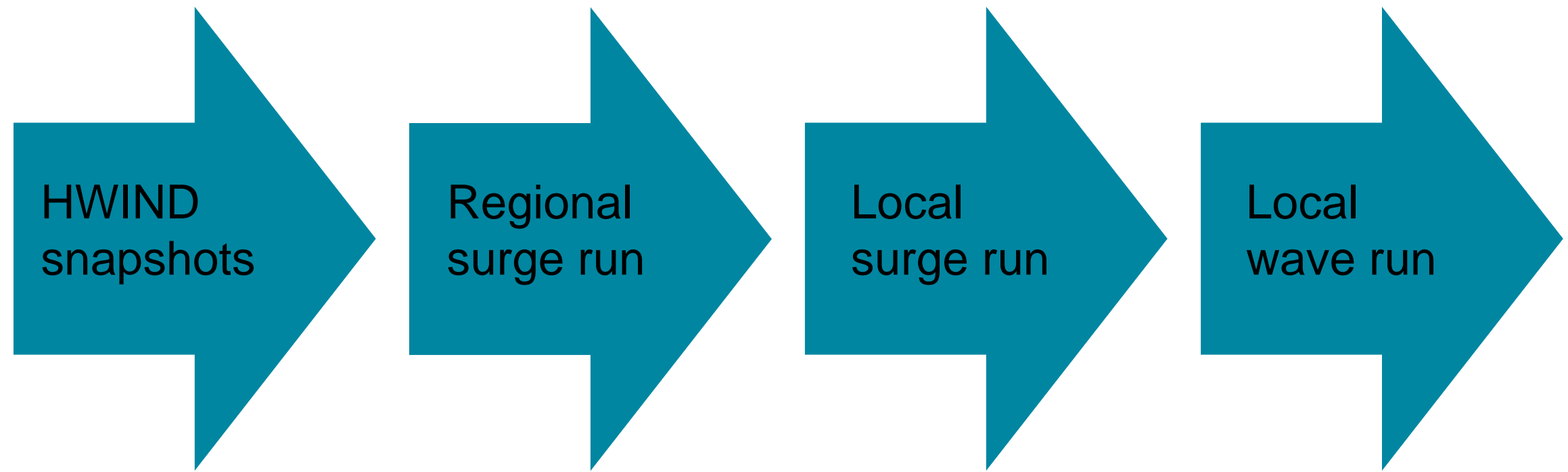
THE CHALLENGE

When a hurricane makes landfall:

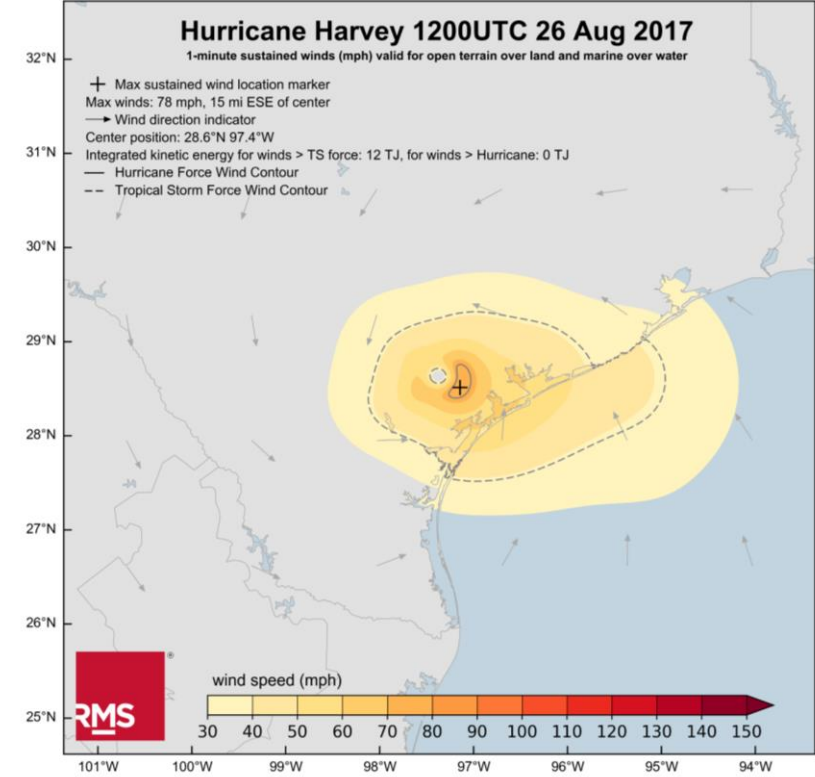
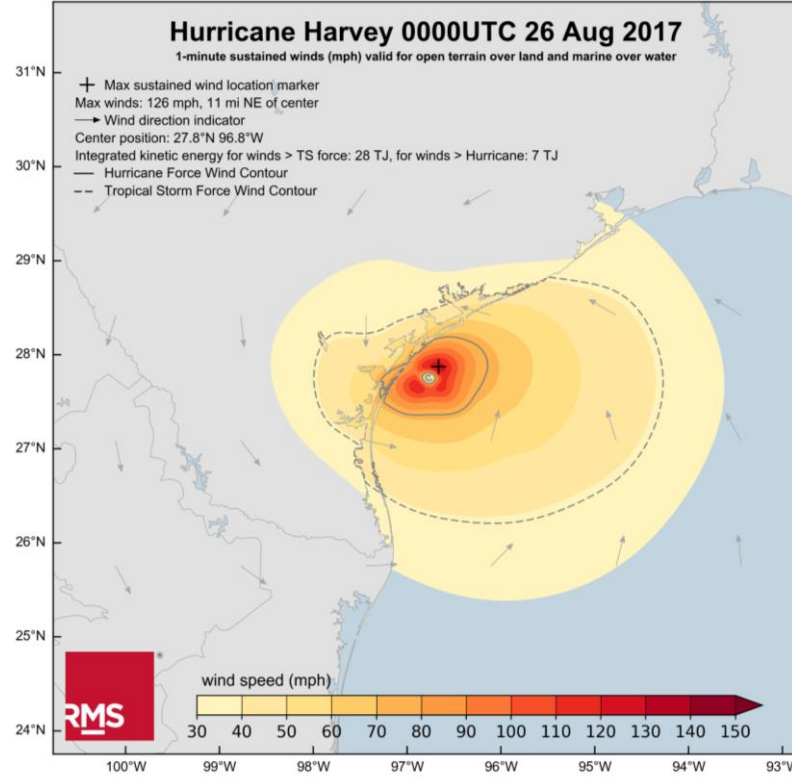
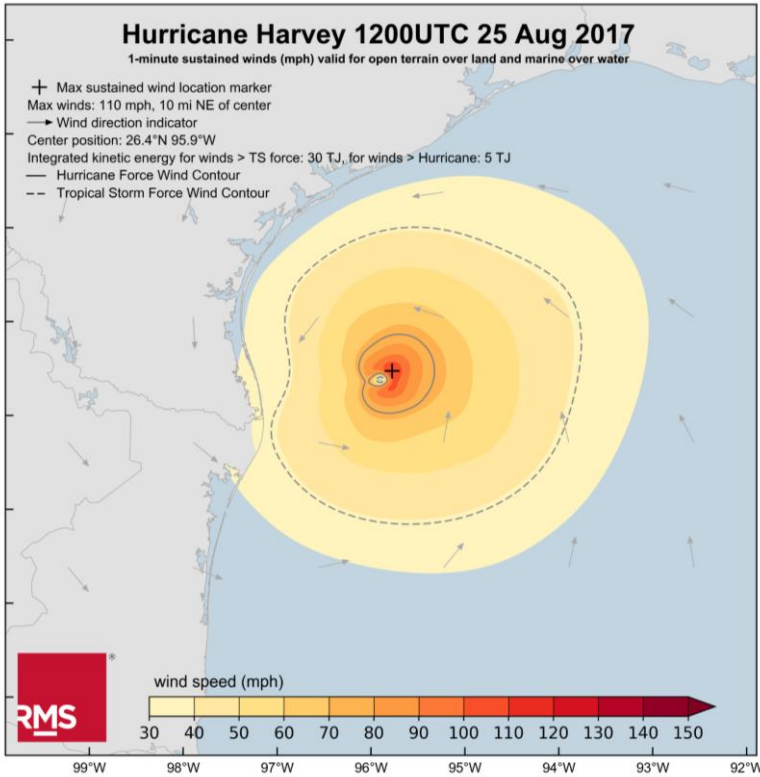
- Model inundation depths from storm surge and significant wave height along the Texas coastline
- 1st deliverable required 2 days after landfall
- 2nd deliverable required 42 days after landfall
- Key locations require minimum 50m horizontal resolution



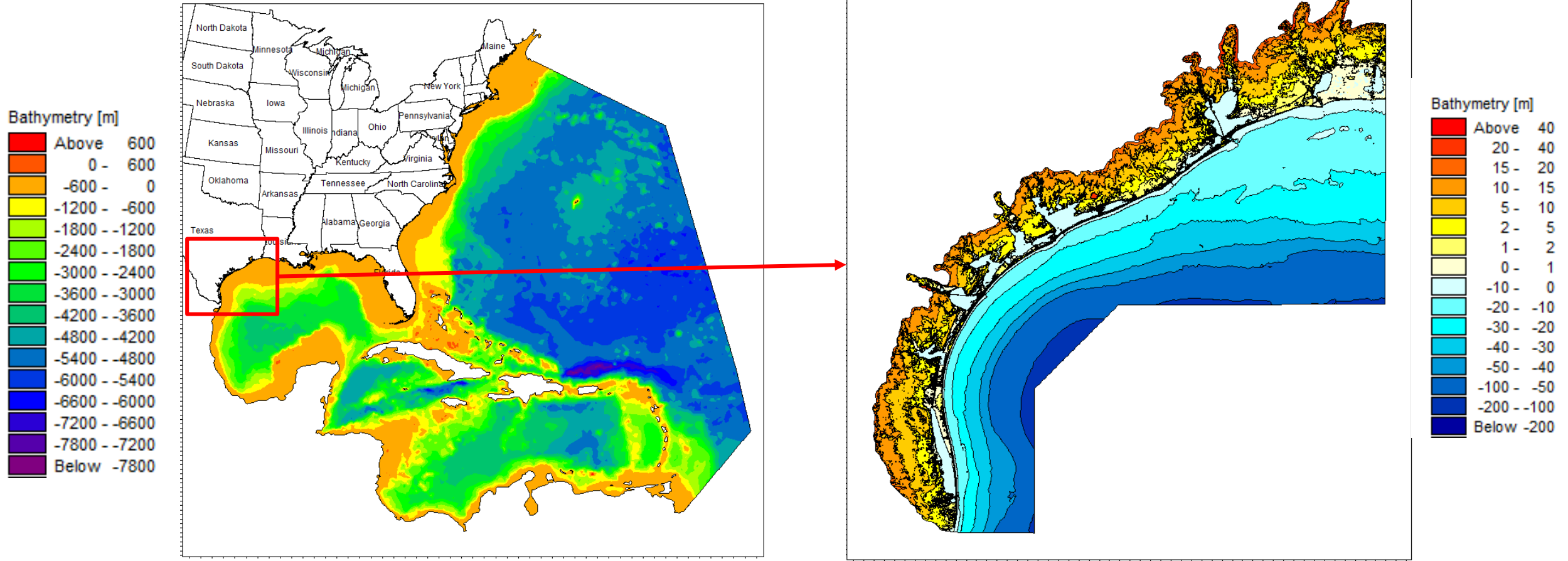
MODEL OVERVIEW



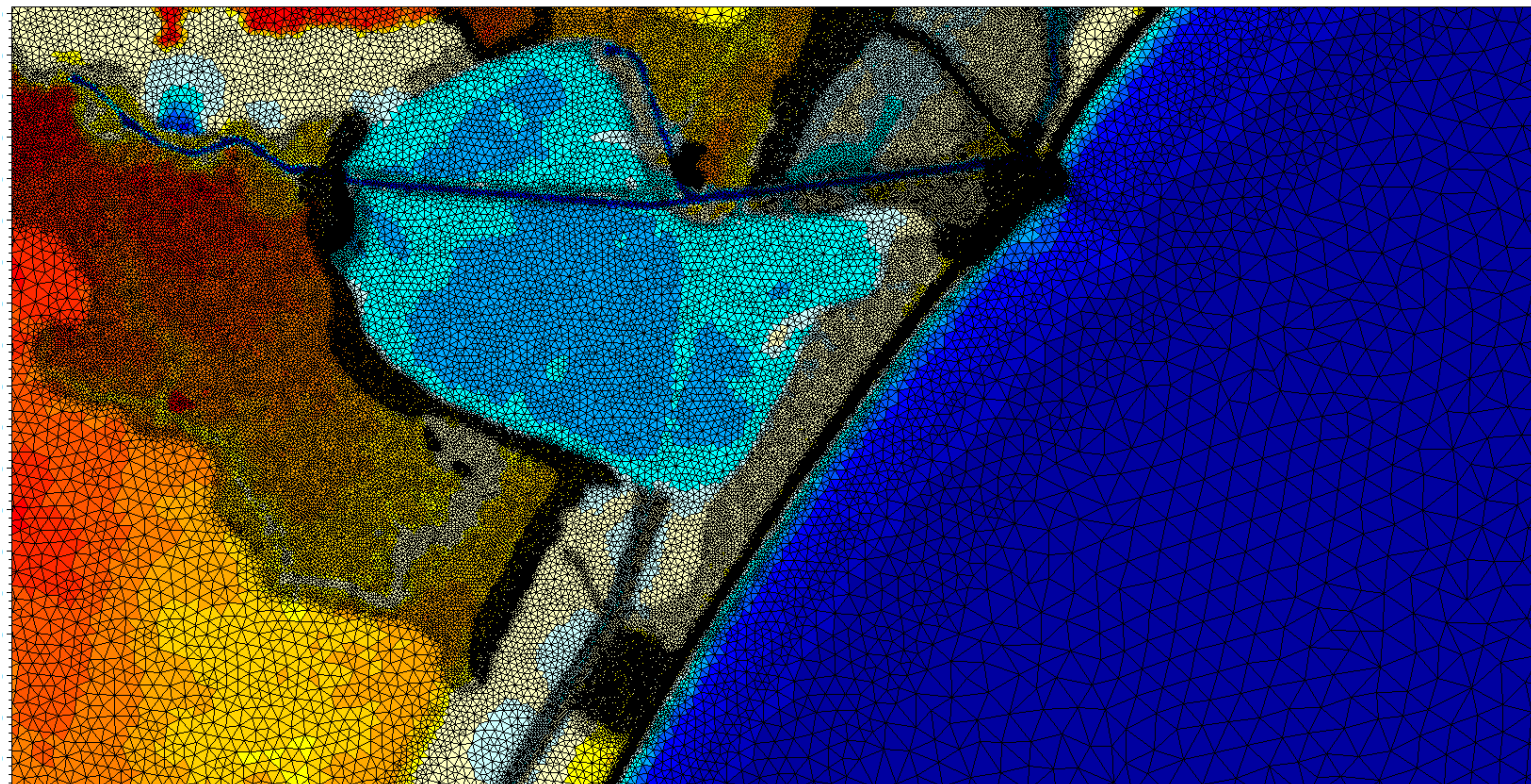
RMS HWIND



MESHES



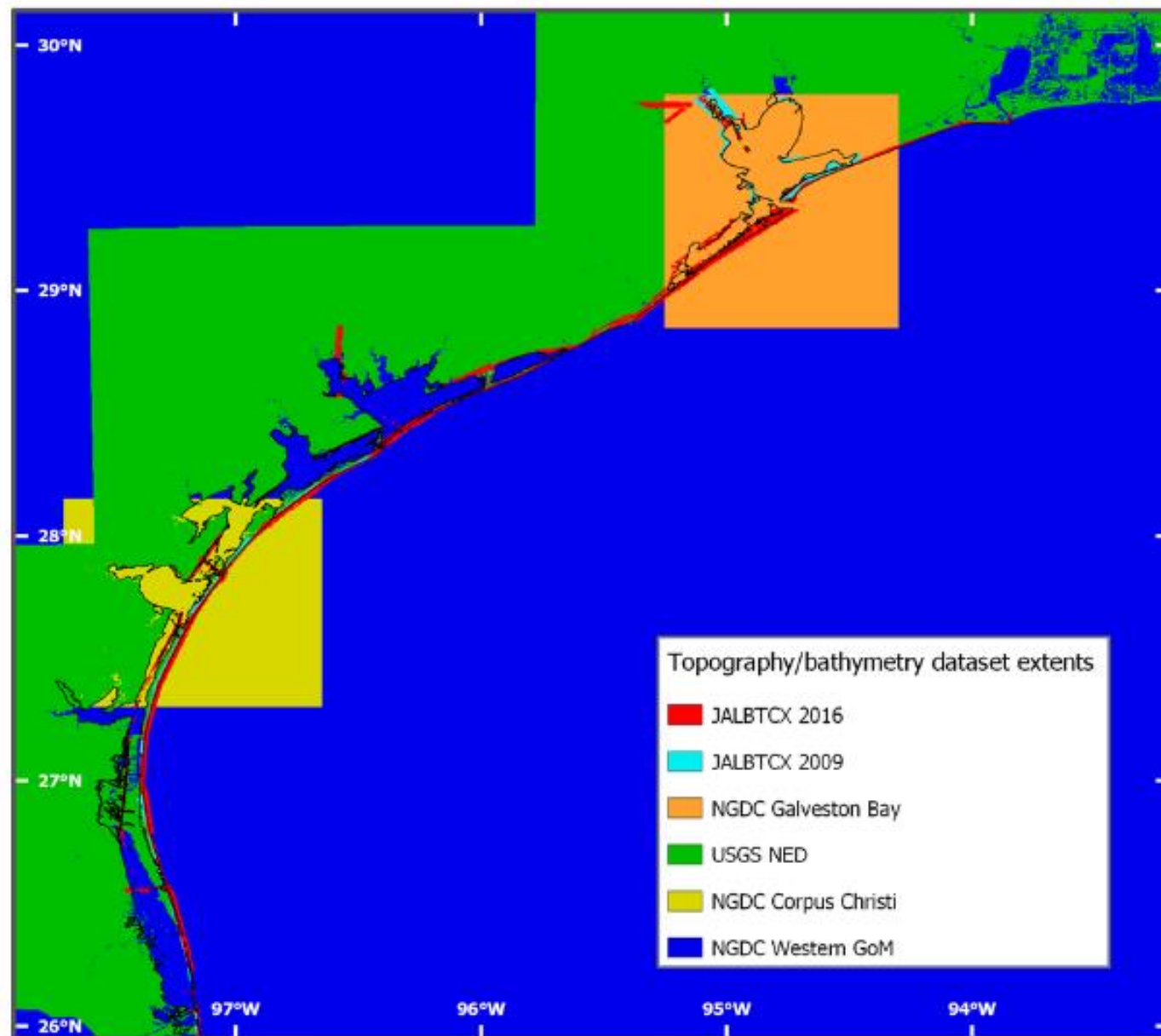
LOCAL MESH



- High resolution mesh developed to model inland inundation and wave impacts as accurately as possible
- Highest resolution is 50m – used to resolve important features such as canals, passages into bays or lagoons and sand dunes.
- Bathymetry data from various sources e.g. LIDAR, National Geophysical Data Center coastal DEMs and U.S. Geological Survey National elevation dataset

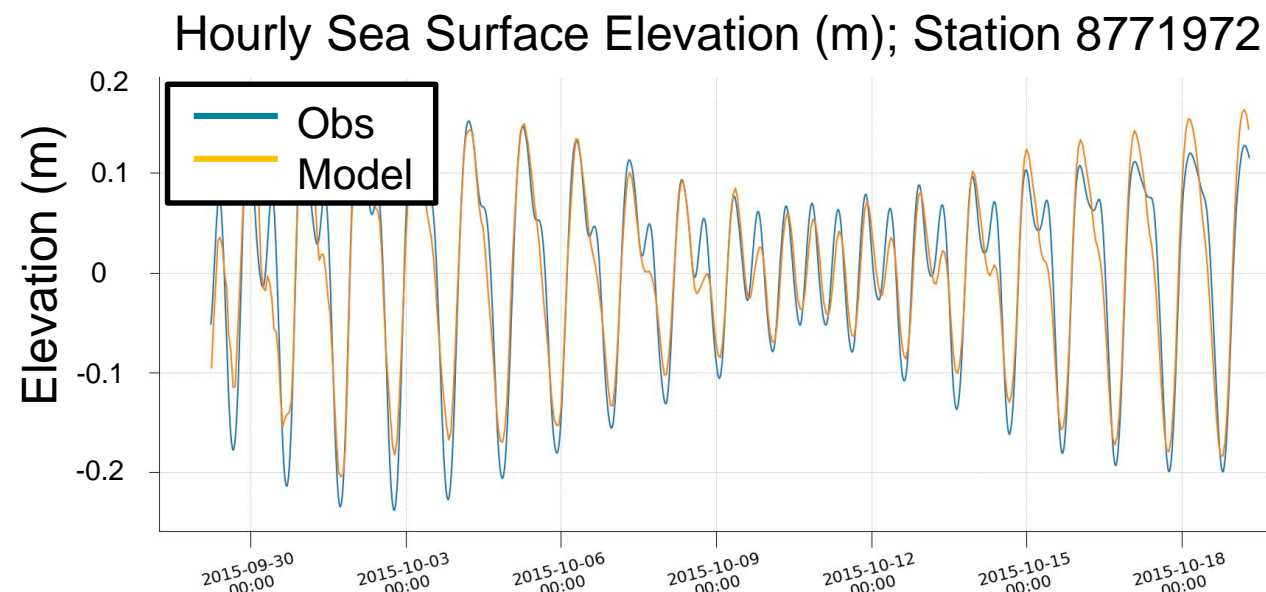
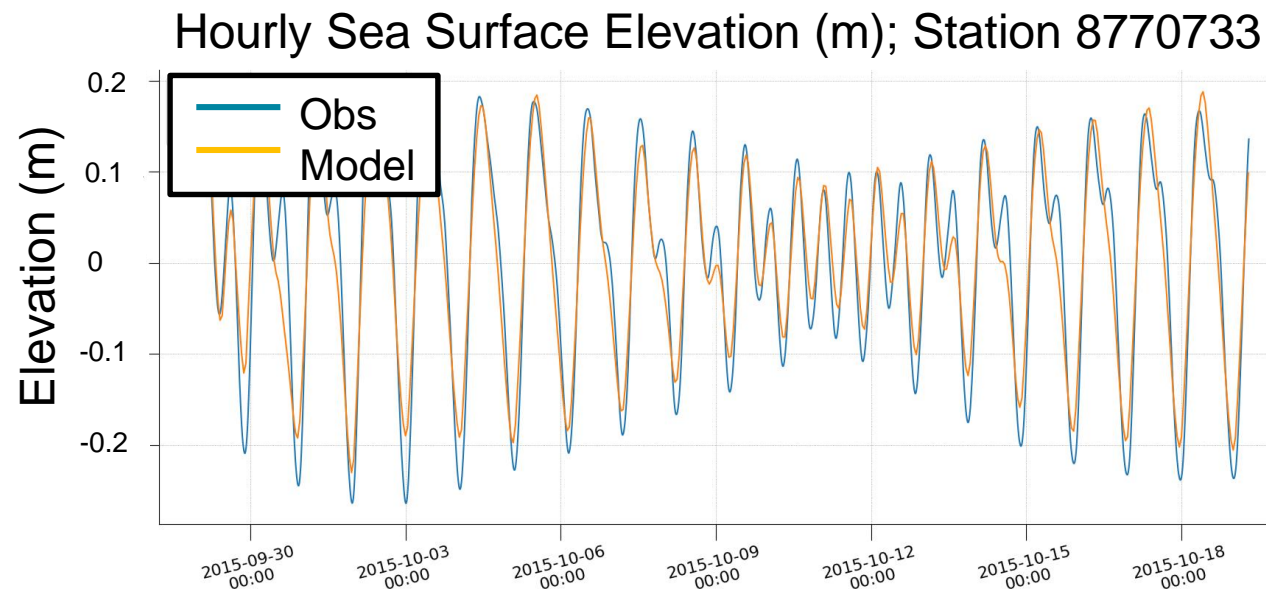
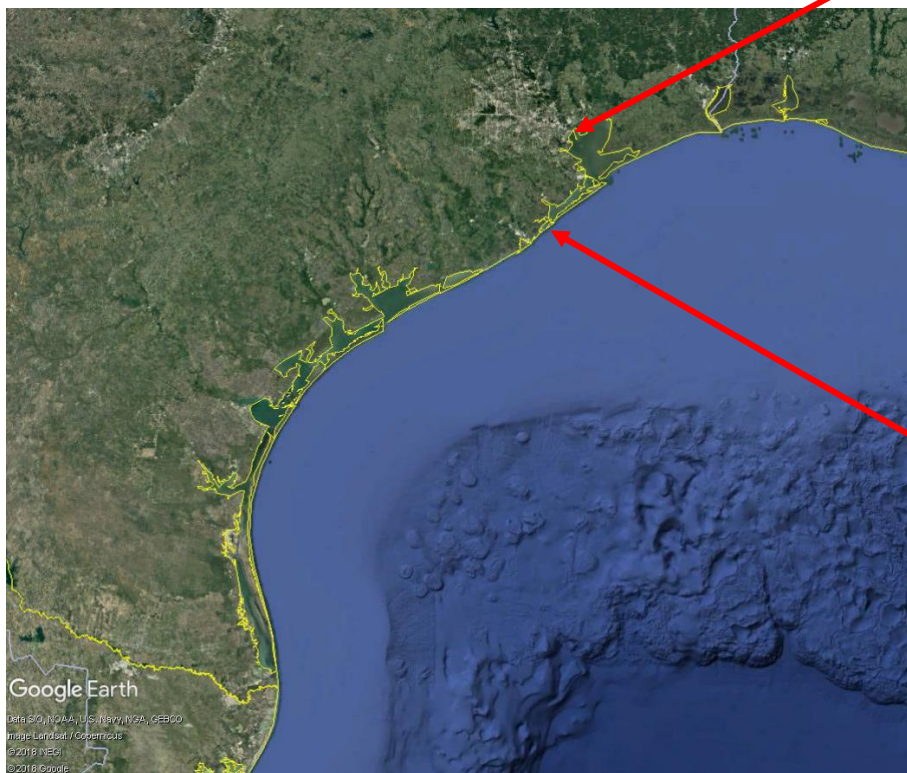
BATHYMETRY/TOPOGRAPHY

- Preference given to datasets based on accuracy, vintage and level of detail
- Manually add important features not captured using NOAA nautical charts e.g. Intra-Coastal Waterway



CALIBRATION

- First: minimise tidal water level errors at ocean-facing tide gauges
- Second: minimize errors in protected water bodies

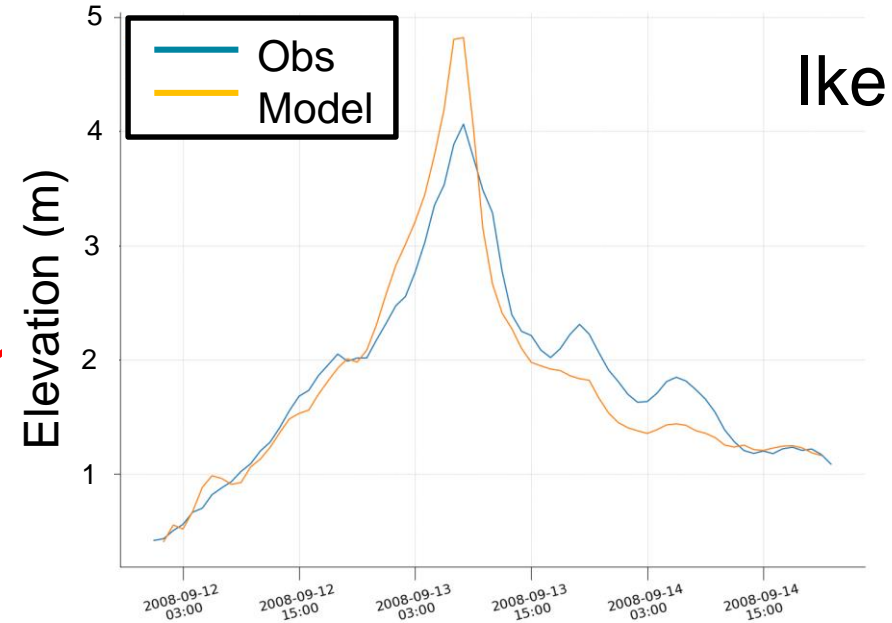


CALIBRATION

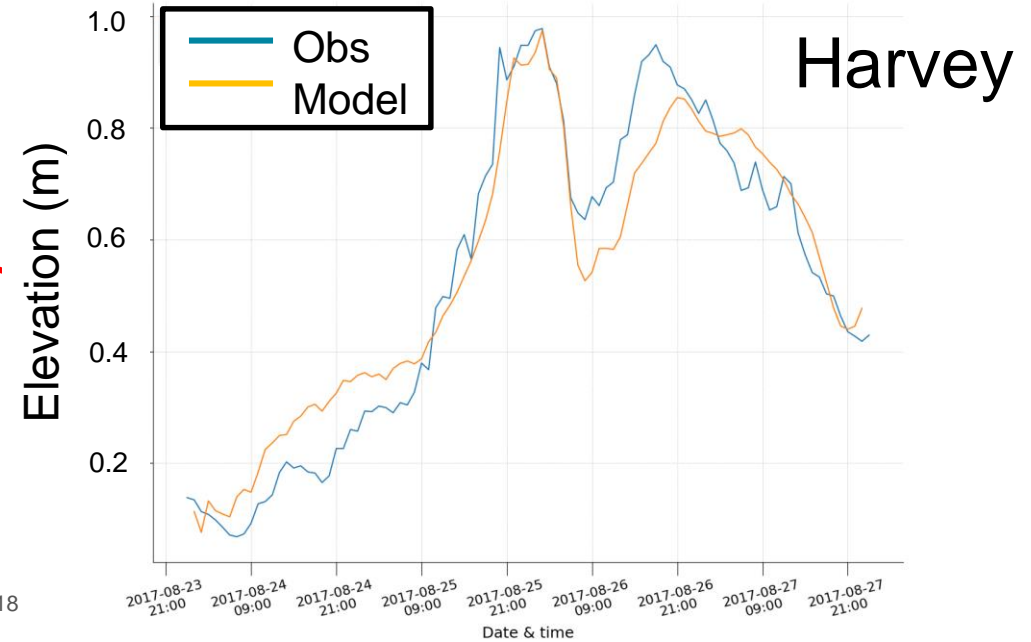
- Third: minimize errors at all gauge and high-water mark locations for historical storm events



Hourly Sea Surface Elevation (m); Station 8770570



Hourly Sea Surface Elevation (m); Station 8773701

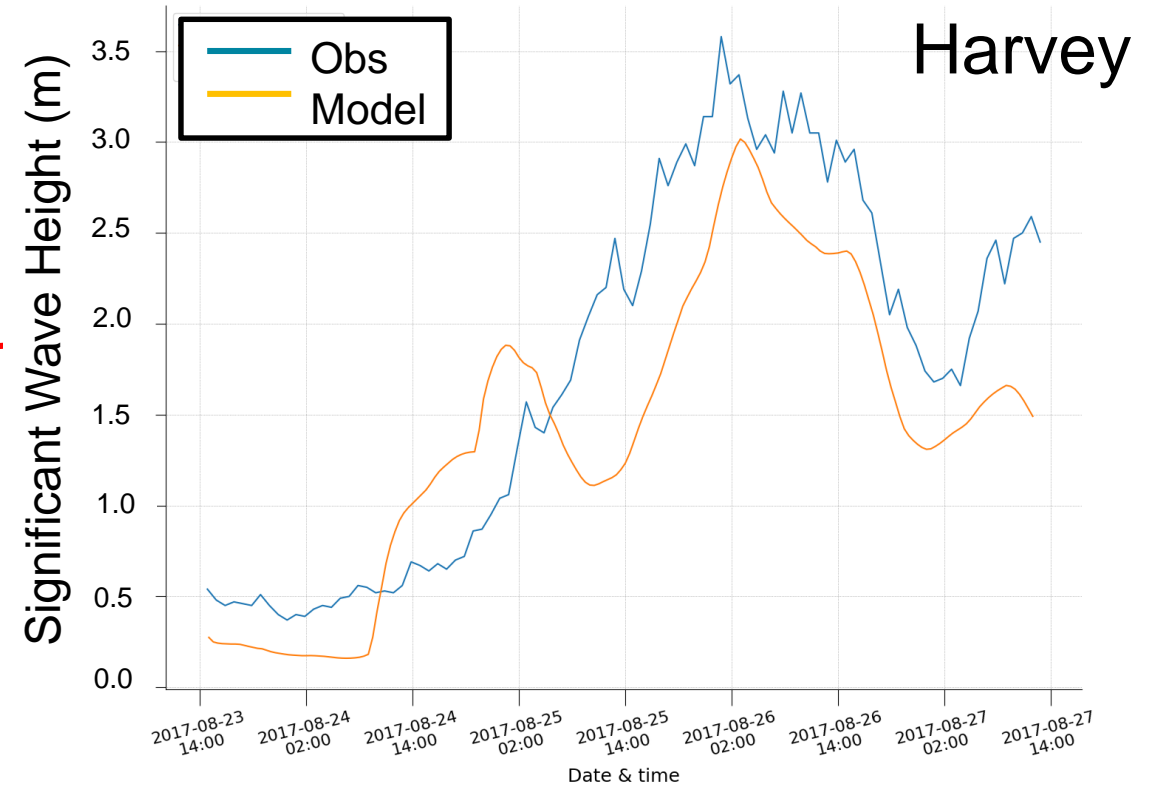


CALIBRATION

- Fourth: minimize errors in the wave model

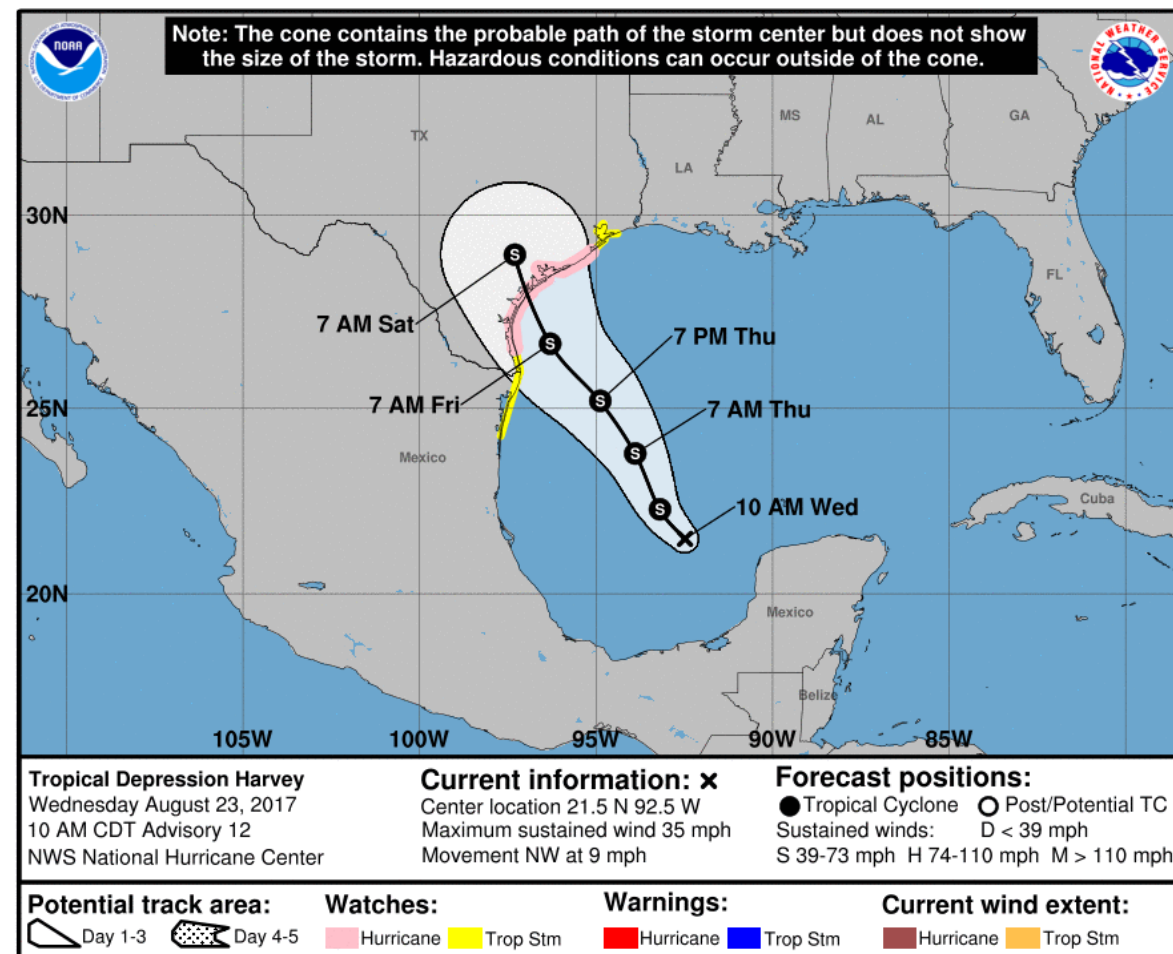


Significant Wave Height (m); NDBC Buoy 42035



DURING AN EVENT

- Storm enters the region
- We monitor the event and produce forecasts prior to landfall (using different lower-res model)
- Given that the storm is strong enough to cause significant damage along the Texas coastline in the form of slab claims:
 - At landfall:
 - Launch the regional model (with several days spin-up)
 - Launch the local model
 - Launch the wave model
 - Produce error analysis and statistics



AFTER AN EVENT

- Collection of observational surge and wave data
 - Including USGS Rapid Deployment Gauges, High Water Mark Surveys and NDBC wave buoys
- New LIDAR DEM data collected
 - Update model mesh incorporating new data
- Update inputs, parameters and model settings as required to re-run the models to provide the best estimate of water depth and significant wave height in region of interest.





ABOUT RMS

RMS is the world's leading provider of products, services, and expertise for the quantification and management of catastrophe risk. More than 400 leading insurers, reinsurers, trading companies, and other financial institutions rely on RMS models to quantify, manage, and transfer risk. As an established provider of risk modeling to companies across all market segments, RMS provides solutions that can be trusted as reliable benchmarks for strategic pricing, risk management, and risk transfer decisions.

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