IOOS Coastal and Ocean Modeling Testbed (COMT)

- SLOSH's local meshes fail to capture regional processes.

    o Response characteristics of a storm surge model influenced by domain size and boundary conditions (Blain et al. 1994).

    o Large domains important for correctly capturing regional processes and improving model solutions.

- Shortcomings also associated with poor mesh resolution.

    o SLOSH is a structured model which limits its degree of localized resolution.

- Developing larger basins with higher resolution to improve surge representation and accuracy.

- Includes latest topography/bathymetry data for improved representation of coastline and explicit features (e.g., levees, barriers, gaps, passes, and other local features).

- Explicitly model the impacts of waves in regions of steep-sloped environments (i.e., Puerto Rico/U.S. Virgin Islands surge and wave inundation model testbed).
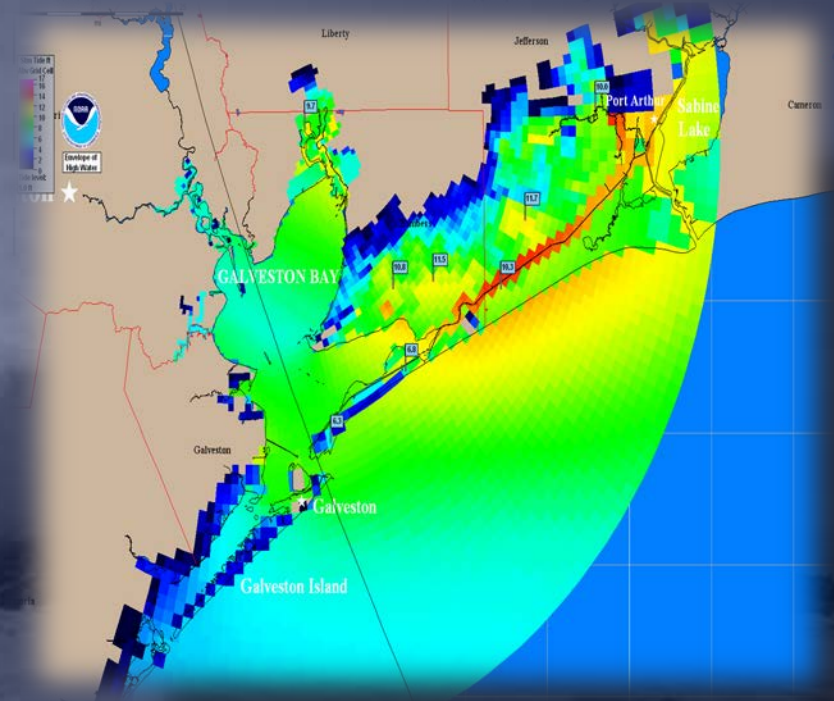
Hurricane Ike (2008)

Operational Storm Surge Basins
for the Sea, Lake, and Overland Surges from Hurricanes (SLOSH) Model
Updated: June 1, 2014

Basin Name	File Name
Penobscot Bay	pn2
Providence/Boston	pv2
New York	ny3
Delaware Bay	de3
Chesapeake Bay	cp5
Norfolk	or3
Cape Hatteras/Pamlico Sound	ht3
Wilmington/Myrtle Beach	il3
Charleston Harbor	ch2
Savannah/Hilton Head	sv4
Jacksonville	jx3
Cape Canaveral	co2
Palm Beach	pb3
Lake Okeechobee	ok3
Biscayne Bay	mi3
Florida Bay	ke2
Fort Myers	fm2
Tampa Bay	tp3
Cedar Key	cd2
Apalachicola Bay	ap3
Panama City	pa2
Pensacola Bay	pn3
New Orleans	ms8
Sabine Lake	bp3
Galveston Bay	gl3
Matagorda Bay	ps2
Corpus Christi Bay	cr3
Laguna Madre	br3
Bahamas	bha
Puerto Rico	sju
Virgin Islands	vi2

Puerto Rico

0 50 100   200   300   400
Miles
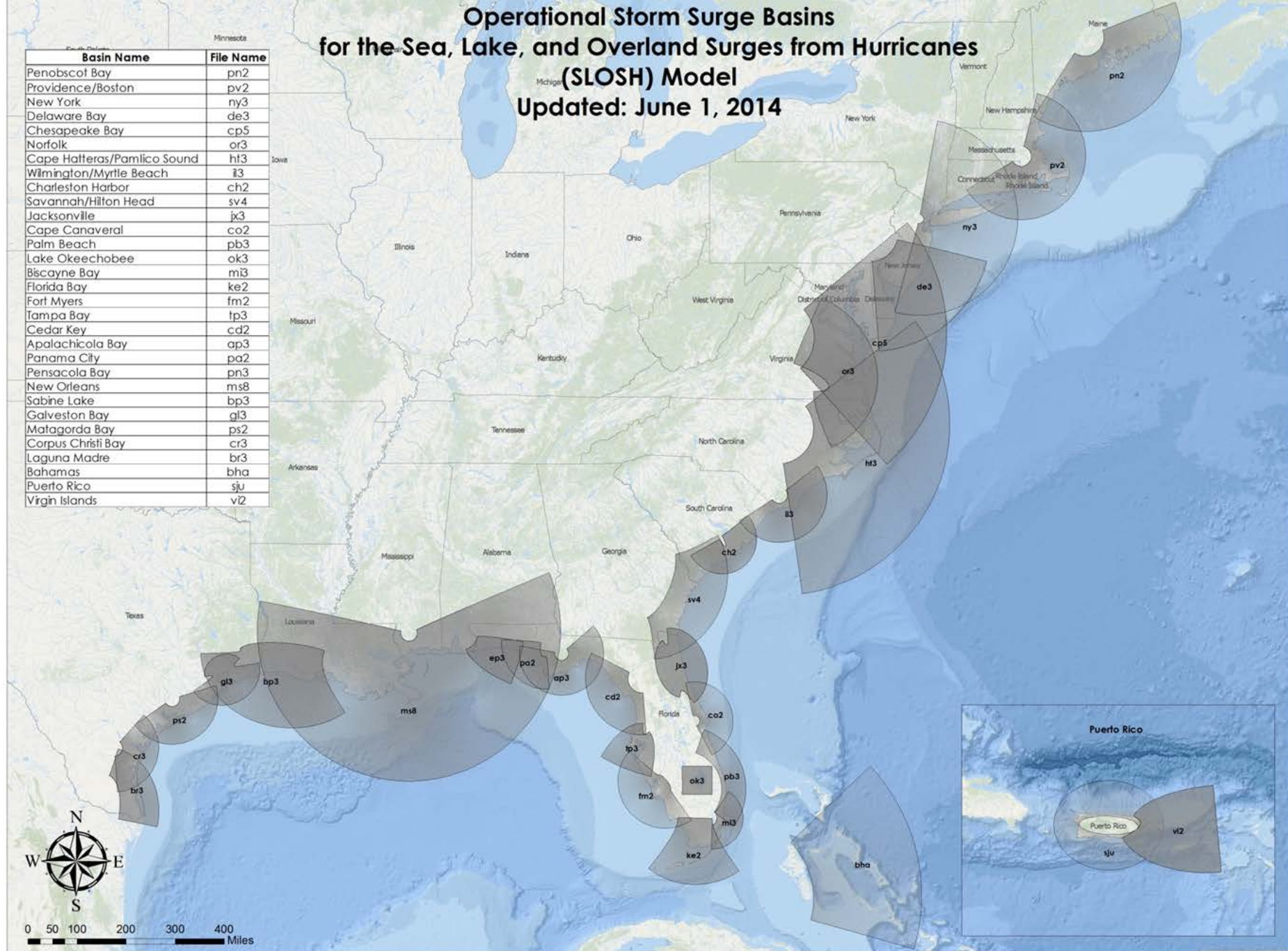
SLOSH Grid Updates

MS7 Grid (175X189)
33,075 Cells

MS8 Grid (655X852)
558,060 Cells

GULF OF MEXICO

GULF OF MEXICO
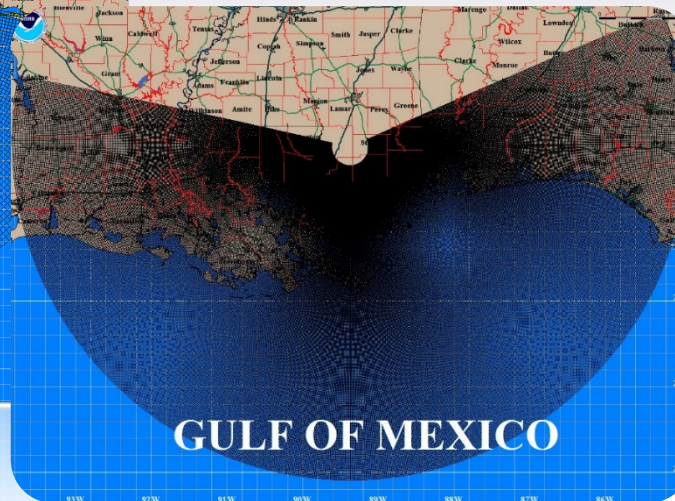
Grids being updated…

1. U.S. Virgin Islands
2. Texas
3. Hawaii
4. South Florida

Metairie

New Orleans

New Orleans
- MS8
- MS7
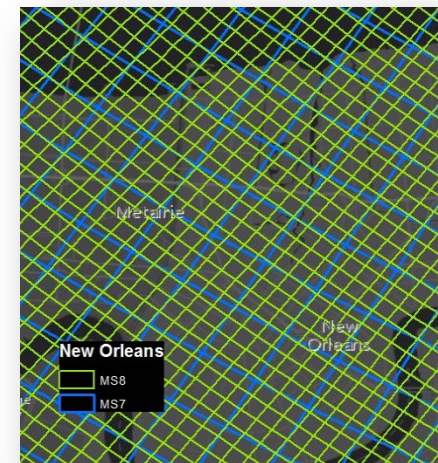
New South Florida Basin

- Replaces several existing SLOSH grids providing improved (seamless) results over Florida.

- Improves resolution, especially over greater Miami area.

- Captures coastally trapped kelvin waves.

SLOSH Grid Updates

U.S. Virgin Islands Grid (999X1100) 1,098,900 Cells

South Florida (424X1500) 636,000 Cells

Oahu(382X1100) 420,200 Cells
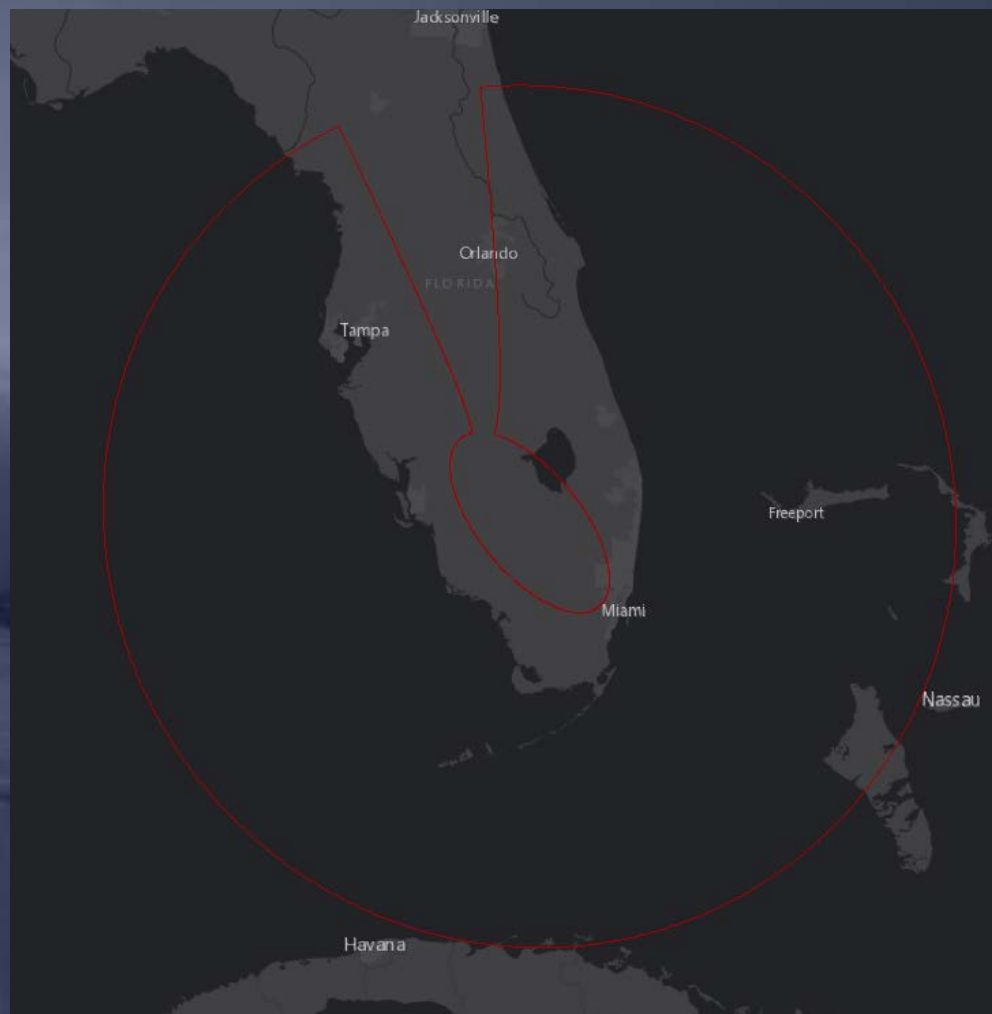
Oahu(818X705) 576,690 Cells
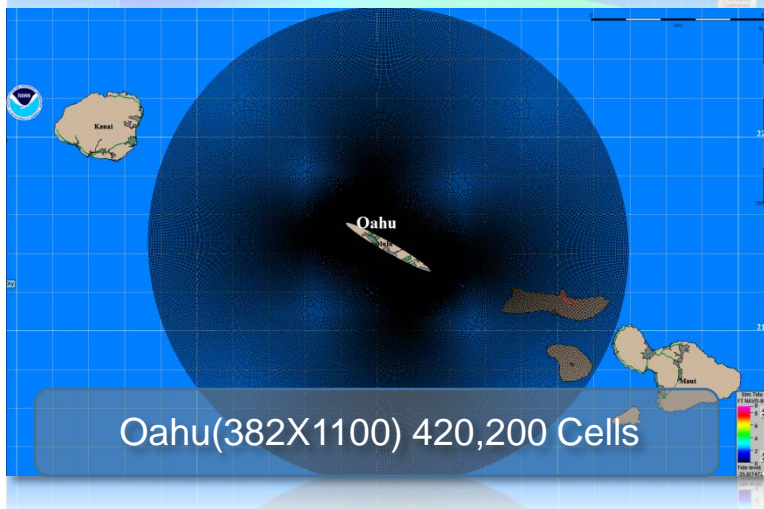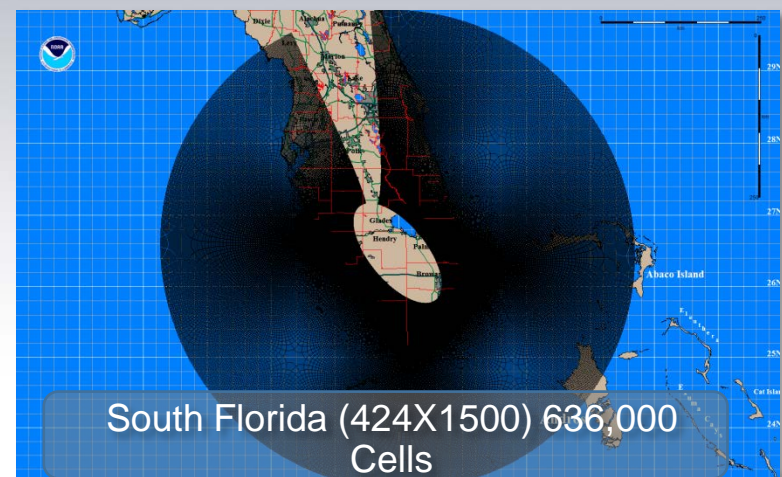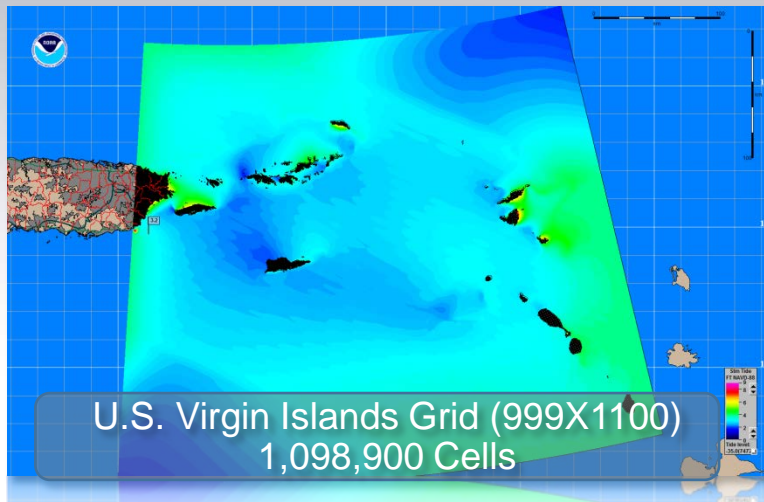
Developing Basin Masks

- Current techniques
  - Utilize SLOSH basin building and surge modeling expertise at NHC/MDL to refine the grids
  - Retain regions for which the basins were designed to cover based on hurricane evacuation studies (HES)
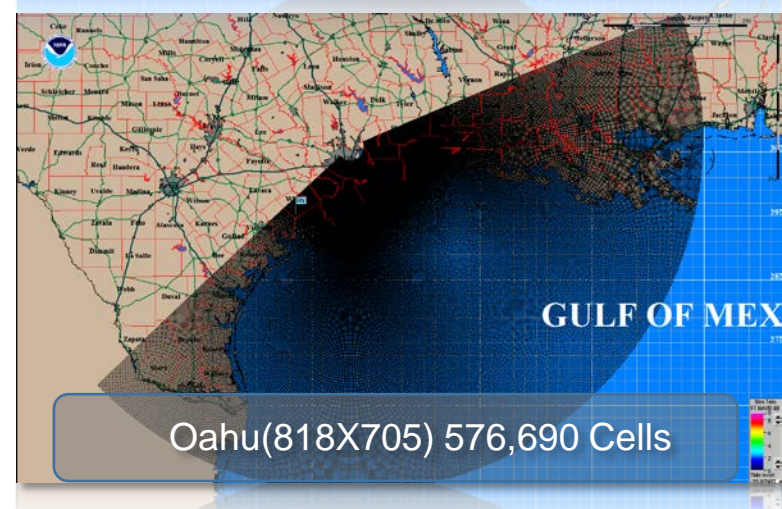 - Minimize unnecessary overlap and use the high-resolution / center portion of grids
  - Edit on a cell-by-cell basis to retain key features

- Future work
  - Version 2 (2016): incorporate new SLOSH basins, full data dissemination (NHC website), updated DEM, etc.
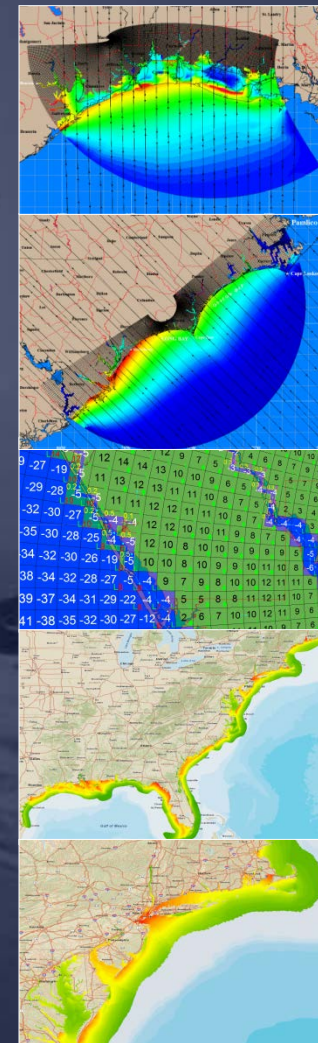
Example GIS Processing
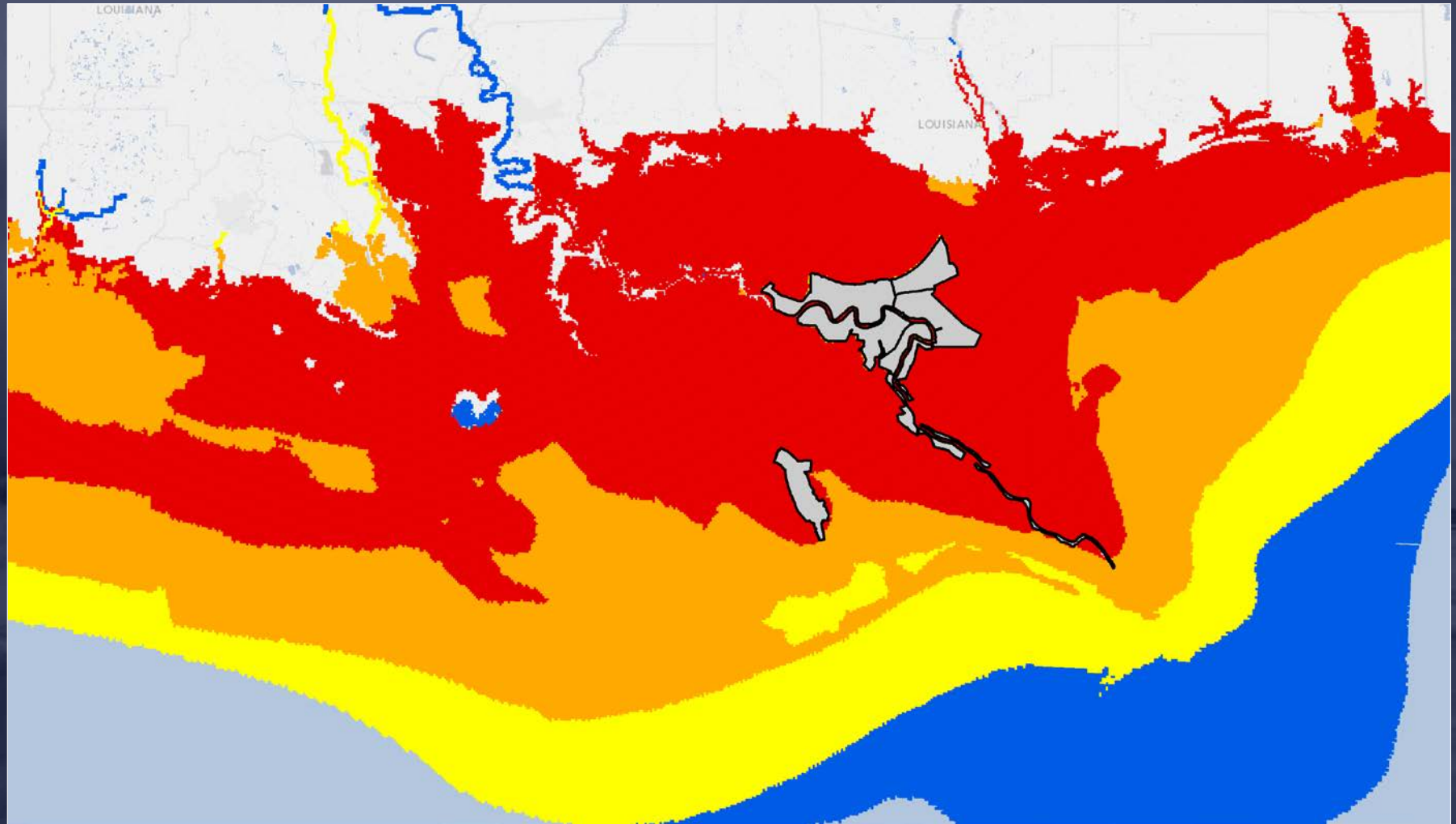
Storm Surge Inundation

Storm Surge Inundation (SLOSH Maximum of Maximums)

This web map displays a seamless national map of near worst case storm surge flooding (inundation) scenarios using the National Weather Service (NWS) SLOSH model maximum of maximums (MOMs) product for different hurricane wind categories at a high tide.

| Category 1 | Category 2 | Category 3 | Category 4 | Category 5 |

Category 2 Storm Surge Inundation (SLOSH Maximum of Maximums)

With this education and awareness tool, anyone living in hurricane-prone coastal areas along the U.S. East and Gulf Coasts can now evaluate their own unique risk to storm surge. This map makes it clear that storm surge is not just a beachfront problem, with the risk of storm surge extending several miles from the immediate coastline in some areas. "You don't have to think very hard about it, just look at your location on the national map to find out if you are in an area at risk for storm surge from a future tropical storm or hurricane", said Brian Zachry, Ph.D., NHC storm surge specialist.
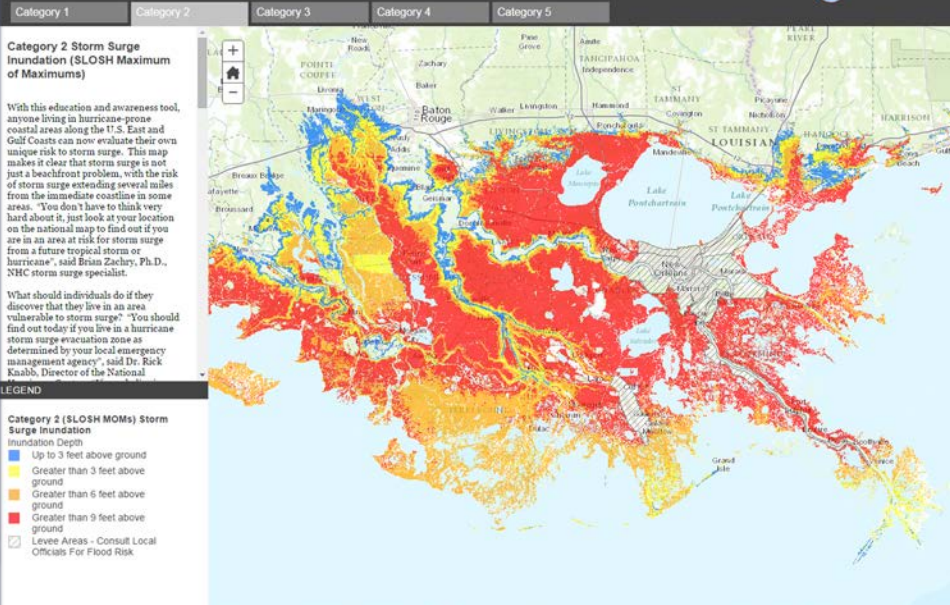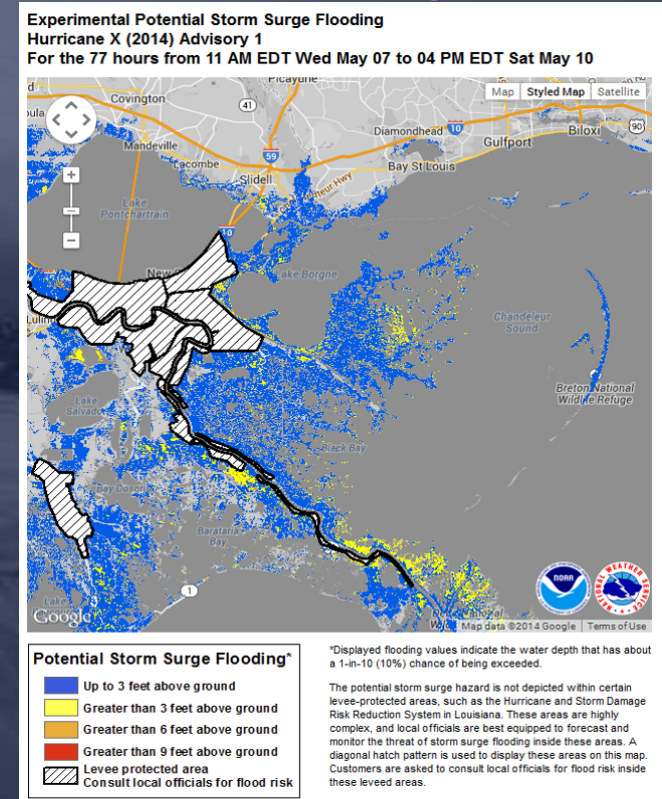
What should individuals do if they discover that they live in an area vulnerable to storm surge? "You should find out today if you live in a hurricane storm surge evacuation zone as determined by your local emergency management agency", said Dr. Rick Knabb, Director of the National

LEGEND

Category 2 (SLOSH MOMs) Storm Surge Inundation
Inundation Depth
- Up to 3 feet above ground
- Greater than 3 feet above ground
- Greater than 6 feet above ground
- Greater than 9 feet above ground
- Levee Areas - Consult Local Officials For Flood Risk

Experimental Inundation Graphic:

Potential storm surge flooding for a given storm.

Experimental Potential Storm Surge Flooding
Hurricane X (2014) Advisory 1
For the 77 hours from 11 AM EDT Wed May 07 to 04 PM EDT Sat May 10

Potential Storm Surge Flooding*
- Up to 3 feet above ground
- Greater than 3 feet above ground
- Greater than 6 feet above ground
- Greater than 9 feet above ground
- Levee protected area Consult local officials for flood risk

*Displayed flooding values indicate the water depth that has about a 1-in-10 (10%) chance of being exceeded.

The potential storm surge hazard is not depicted within certain levee-protected areas, such as the Hurricane and Storm Damage Risk Reduction System in Louisiana. These areas are highly complex, and local officials are best equipped to forecast and monitor the threat of storm surge flooding inside these areas. A diagonal hatch pattern is used to display these areas on this map. Customers are asked to consult local officials for flood risk inside these leveed areas.

SLOSH Maximum of Maximums:

Education and awareness tool for anyone living in hurricane-prone coastal areas along the U.S. East and Gulf Coasts. Shows near worst case storm surge flooding (inundation) scenarios.
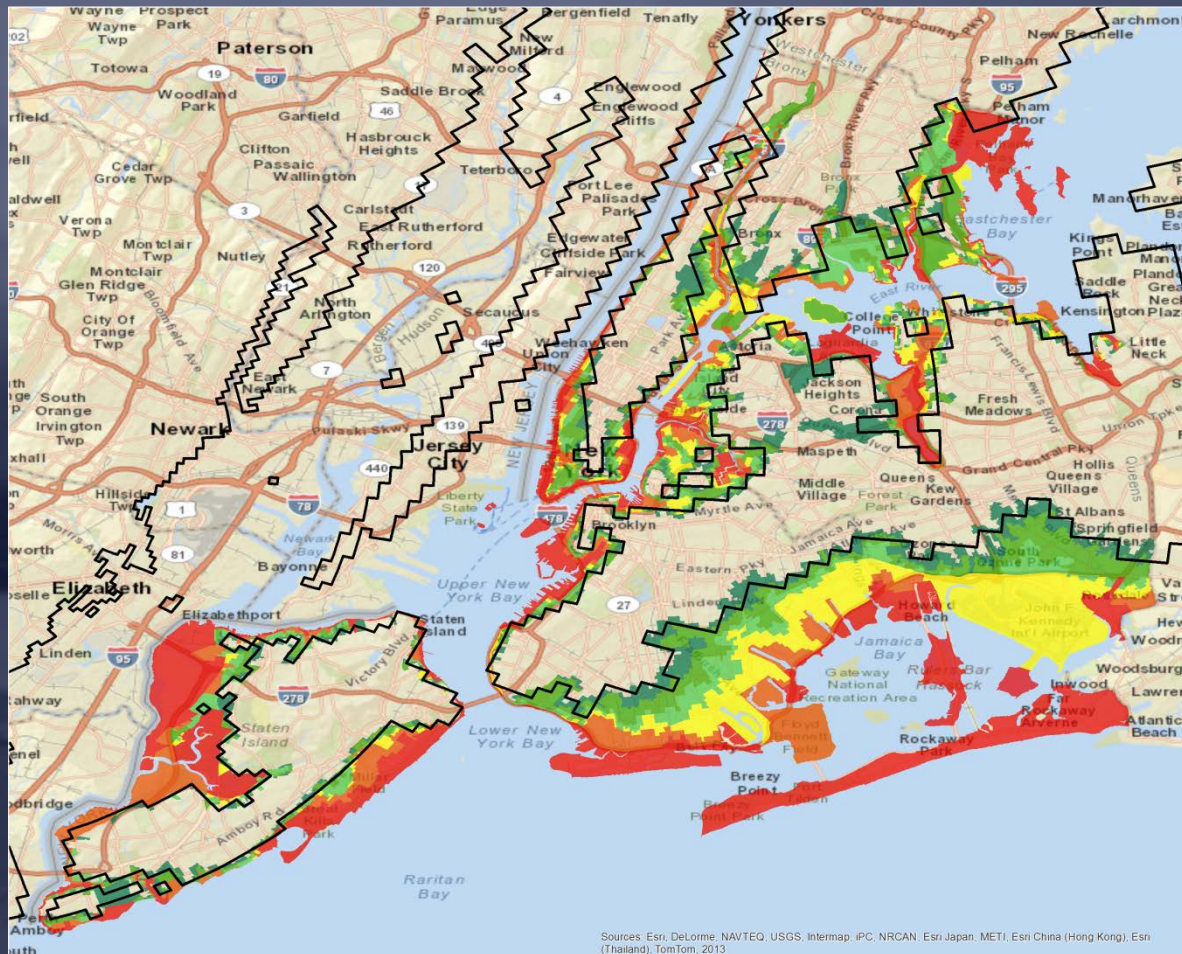
NYC Evacuation Zones / Category 4, High Tide, Fast, Storm Tide Anomaly

Evacuation	
Zone 1	
Zone 2	
Zone 3	
Zone 4	
Zone 5	
Zone 6	

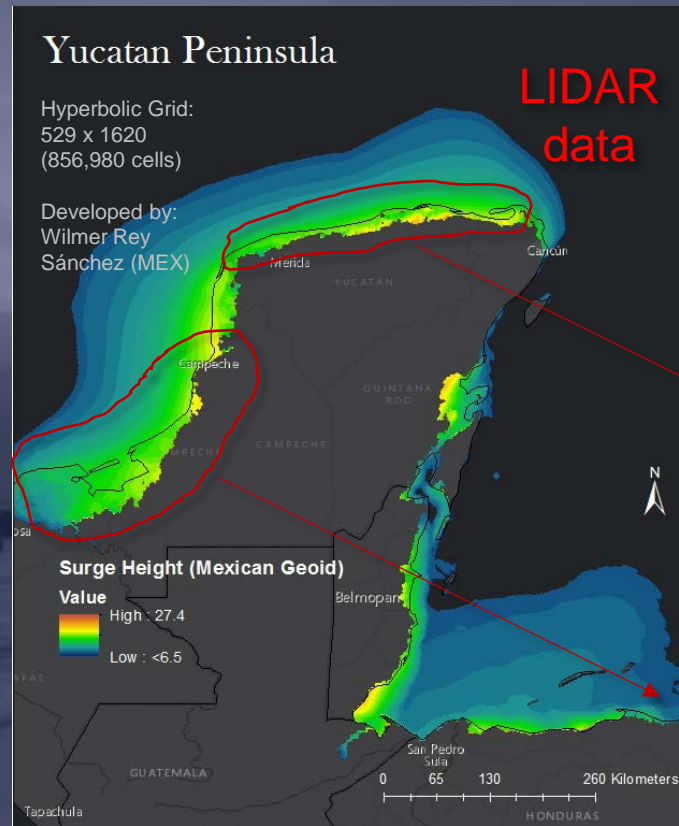| 2010 Population	
Zone 1	370,000
Zone 1+2	620,000
Zone 1+2+3	1,020,000
Zone 1+2+3+4	1,470,000
Zone 1+2+3+4+5	2,230,000
Zone 1+2+3+4+5+6	2,990,000

Mexico Storm Surge Demonstration Project

o Explore the feasibility of using SLOSH within WMO RA-IV:
  - o Initial scoping project in the Yucatan Peninsula due to data availability

o Collaboration between RSMC-Miami, Florida International University, and the Coastal Processes and Engineering Laboratory of the Sisal Academic Unit of the Engineering Institute of the UNAM

o Establish a technical foundation for the CIFDP-C

o Establish a framework for sharing storm surge modeling expertise and data between RSMC Miami and RA-IV member nations
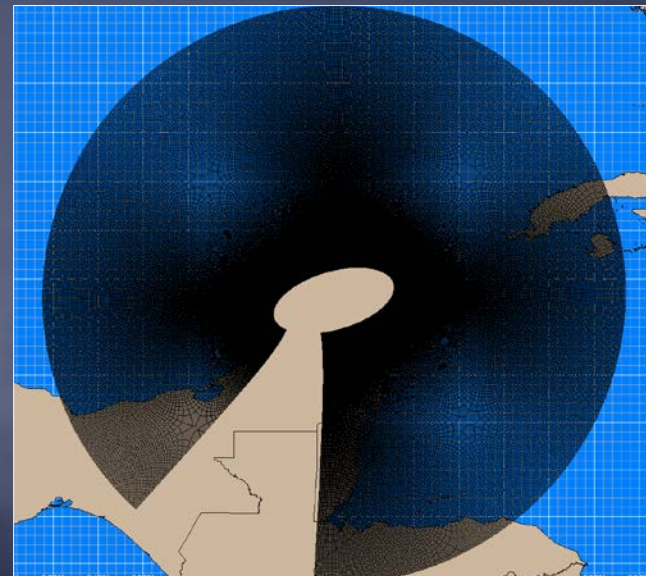
SLOSH Basin for Yucatan Peninsula

- Grid expansion into international waters.

- First ever SLOSH basin for the Yucatan Peninsula.

- Working to understand IT requirements and data necessary to develop SLOSH within Mexico.

Yucatan Peninsula

Hyperbolic Grid:
529 x 1620
(856,980 cells)

Developed by:
Wilmer Rey
Sánchez (MEX)

LIDAR data

Surge Height (Mexican Geoid)
Value
High : 27.4
Low : <6.5

0   65   130   260 Kilometers

Thank you!

Cody Fritz and Jamie Rhome

National Hurricane Center
Storm Surge Unit

14th International Workshop on Wave Hindcasting and Forecasting
5th Coastal Hazard Symposium
November 12th, 20