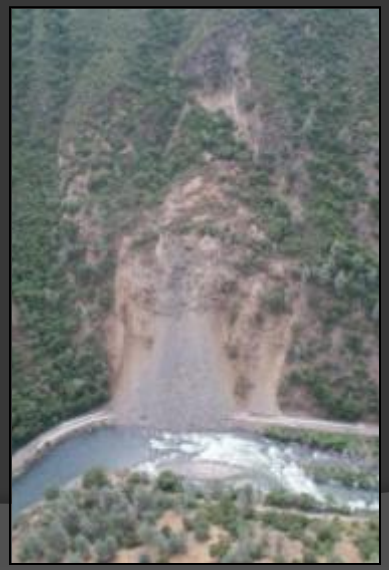
USGS Hurricane Sandy Science Plan:
Meeting the Nation's Science Needs in the Wake of Hurricane Sandy

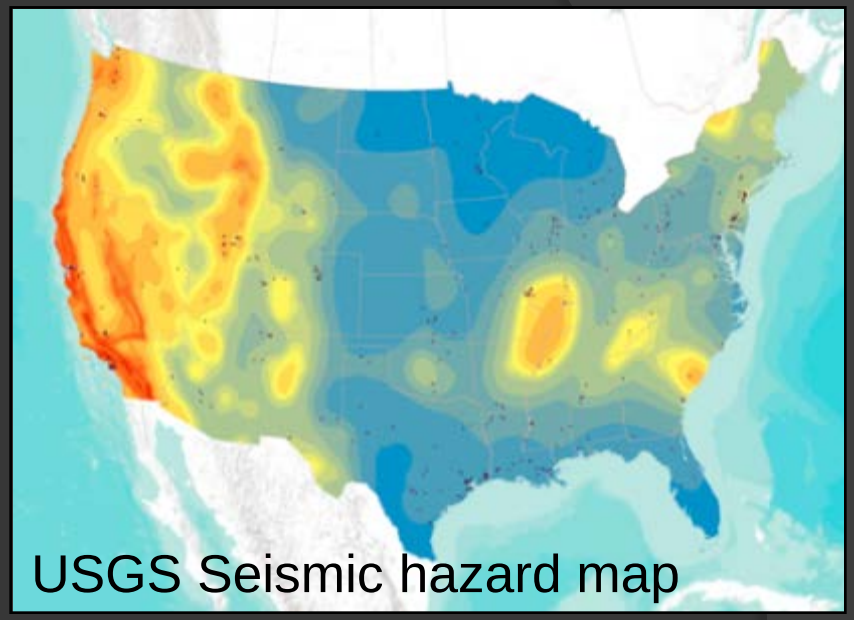
USGS Hurricane Sandy Science Team

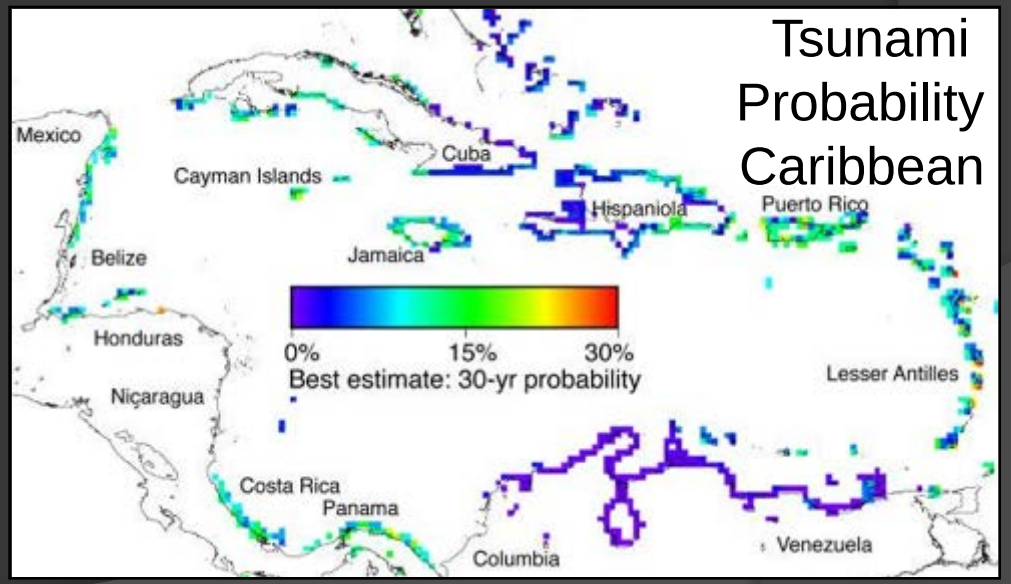
U.S. Department of the Interior
U.S. Geological Survey

USACE/USGS Quarterly Meeting
September 12, 2013

USGS Role in Disasters







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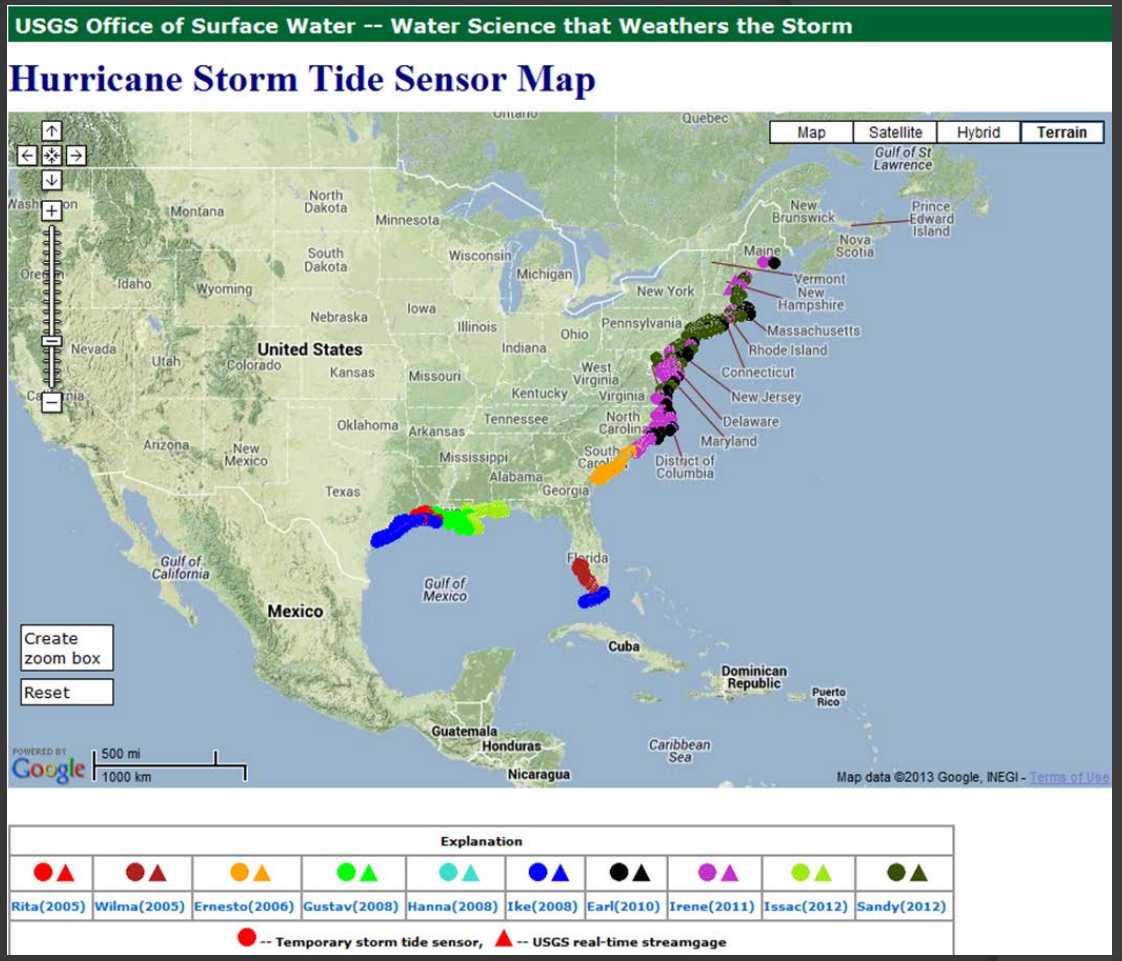
Hurricanes

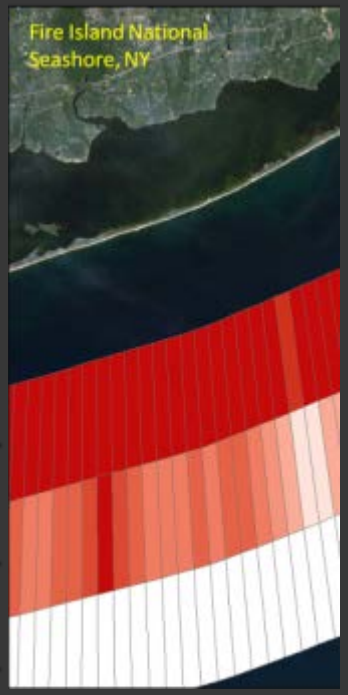


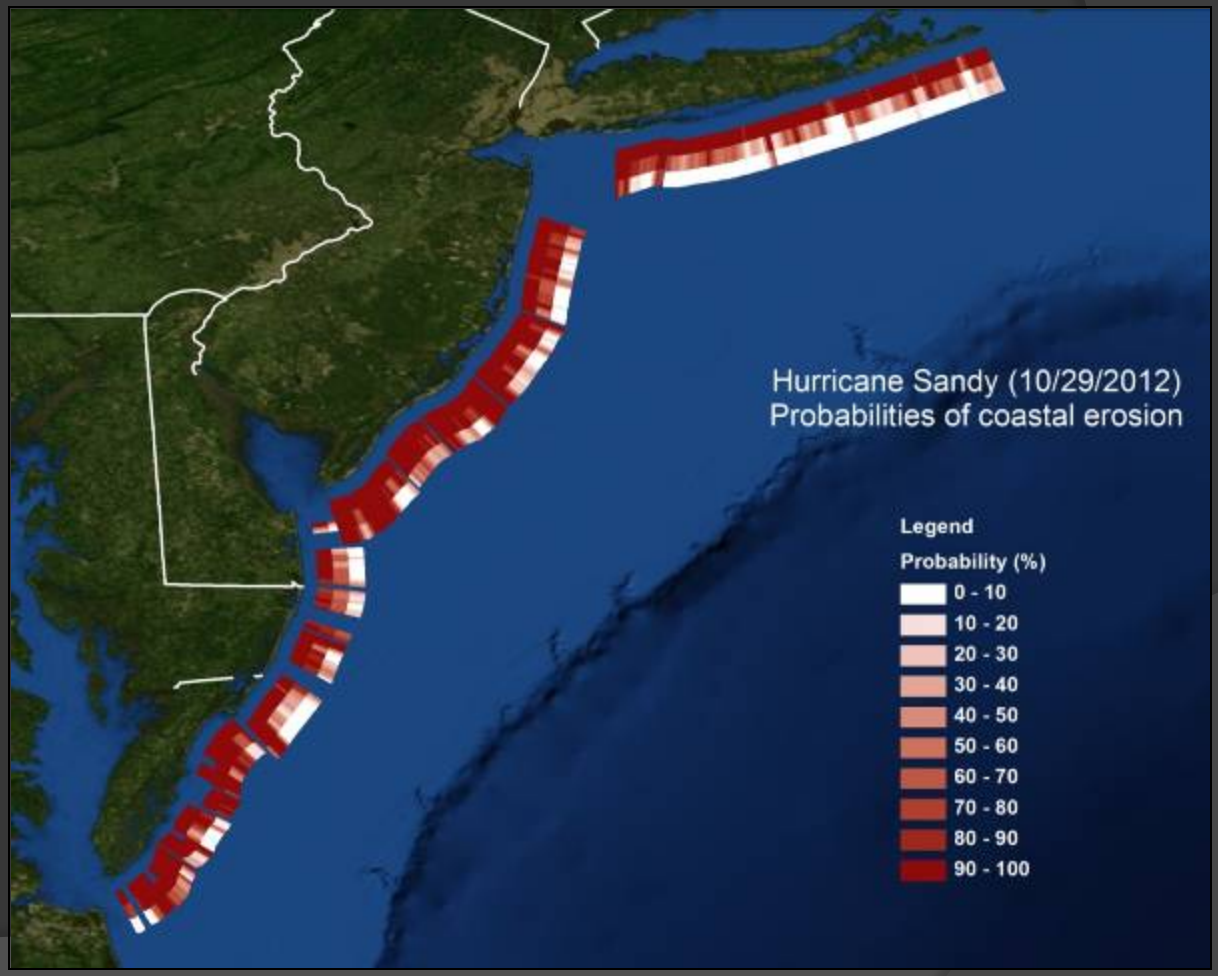
USGS has responded to every major storm for almost two decades.

USGS

USGS Pre-Storm Action

Forecasts of potential coastal change





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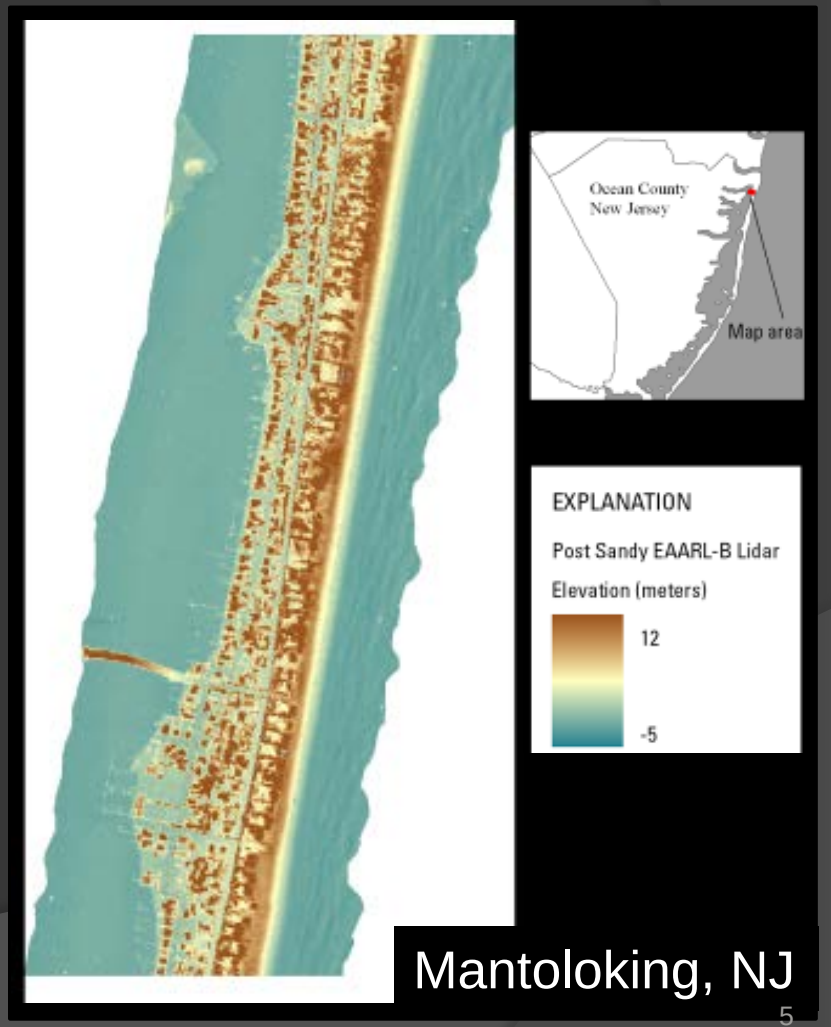
USGS Pre-Storm Action

- Oblique aerial photography of coastline
- LiDAR (aerial) topographic surveys of coastlines



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USGS Pre-Storm Action

Rapid-deployment Sensors:

- 143 storm tide
- 63 barometric pressure
- 9 wave height
- 8 stream gage (real time)

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USGS Post-Storm Rapid Response

Coastal/River Surveys and Aerial Photography

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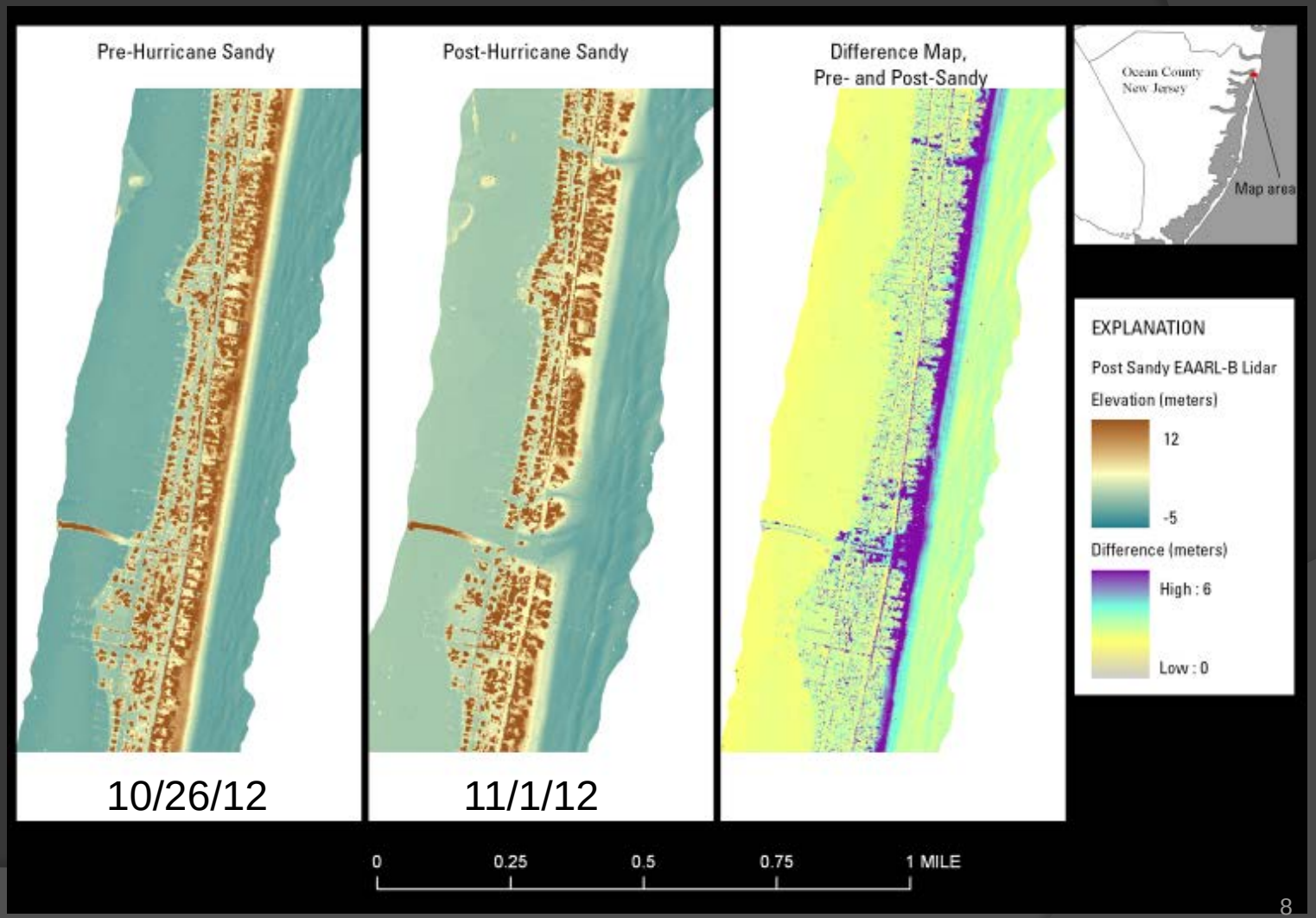
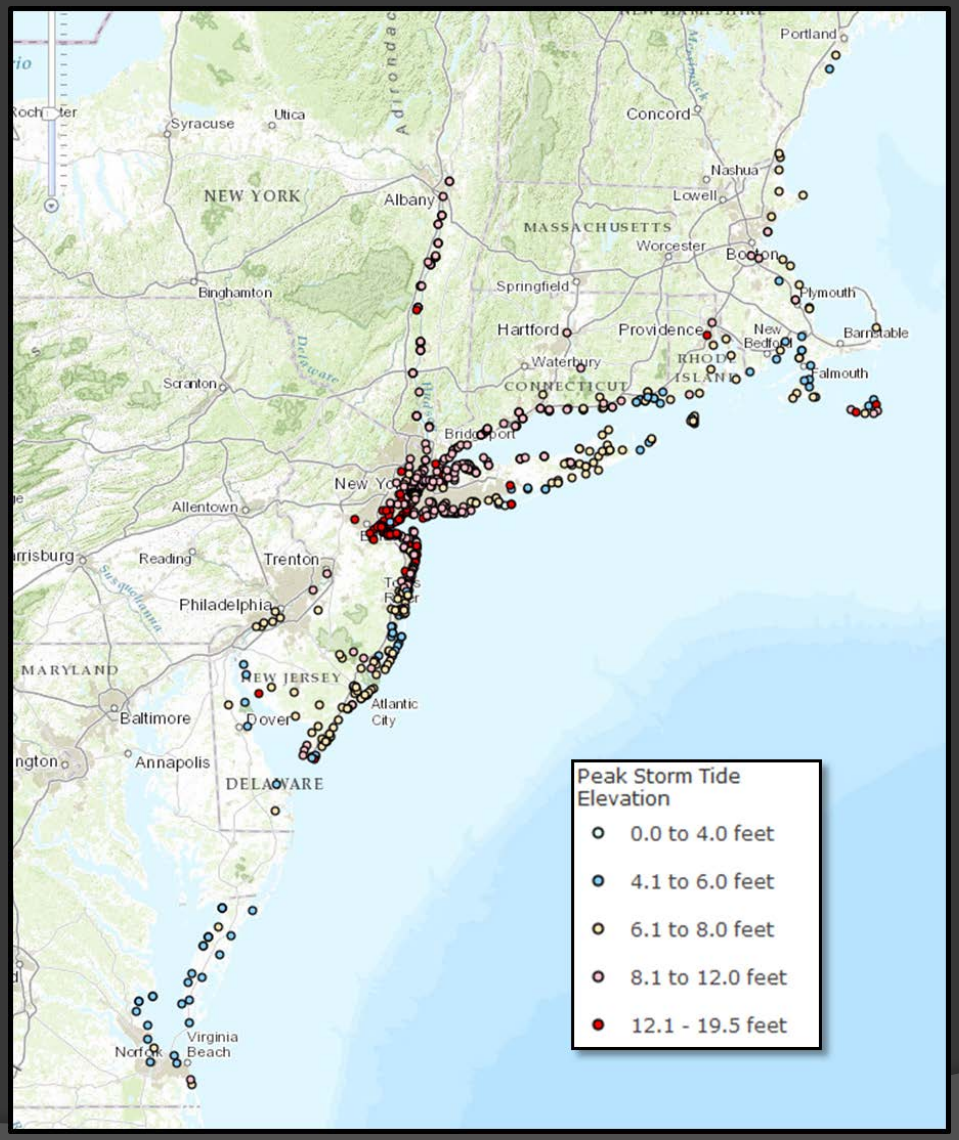
USGS Post-Storm Rapid Response

Post-Storm LiDAR Surveys



USGS Post-Storm Rapid Response



Display of Peak Storm Tide Elevation

USGS Post-Storm Rapid Response

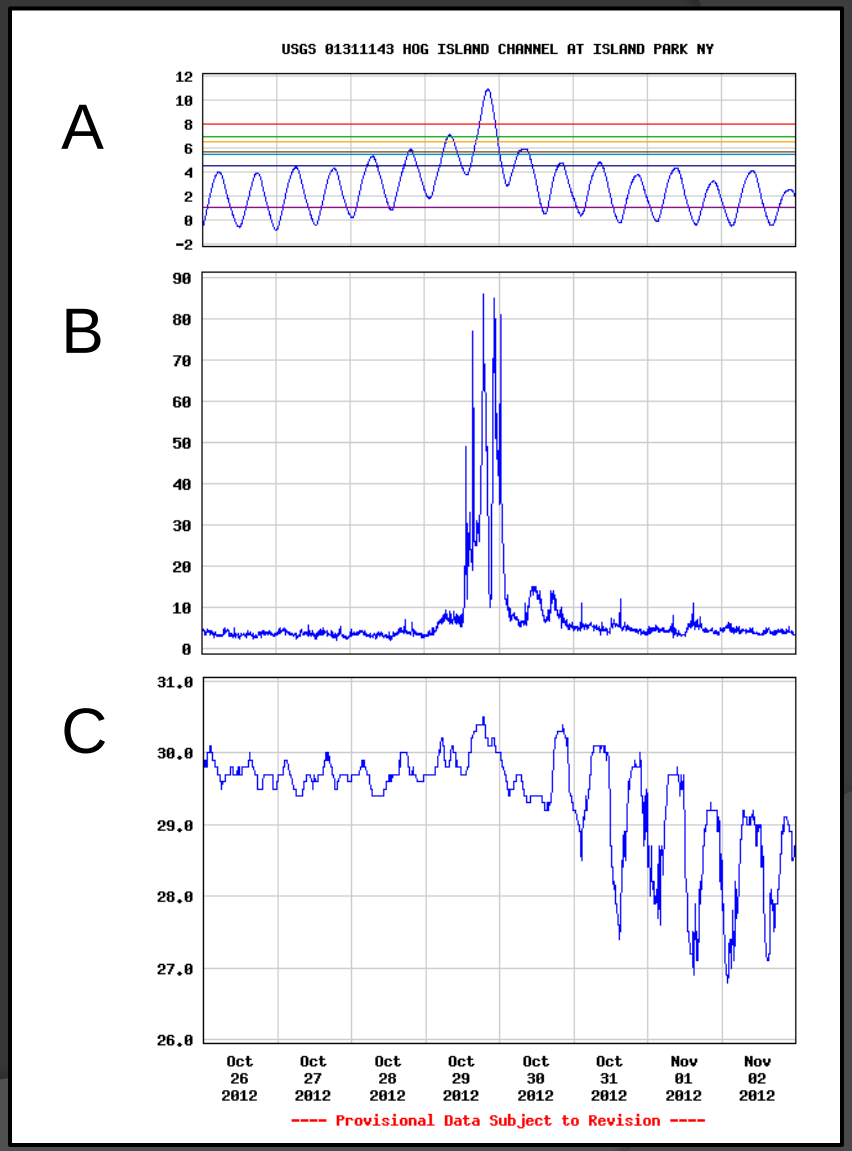
Real-time Monitors

Hog Island Channel, Jamaica Bay NY

A - Water Elevation

B - Turbidity

C - Salinity



USGS Science Planning Team

USGS role is to provide data, information and tools to guide Hurricane Sandy response and recovery efforts

Science Plan Goals:

- Further characterize and mitigate impacts,
- Restore impacted communities and ecosystems,
- Redevelop resilient coastal communities, and
- Improve preparedness and responsiveness to the next hurricane.

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Science Themes:

1. Coastal topographic and bathymetric data to support hurricane impact assessment & response.
2. Impacts to coastal beaches and barriers.
3. Impacts of storm surge, including disturbed estuarine and bay hydrology.
4. Impacts on environmental quality, including exposure to chemical and microbial contaminants.
5. Impacts to coastal ecosystems, habitats, and fish & wildlife, particularly for DOI lands and trust resources.

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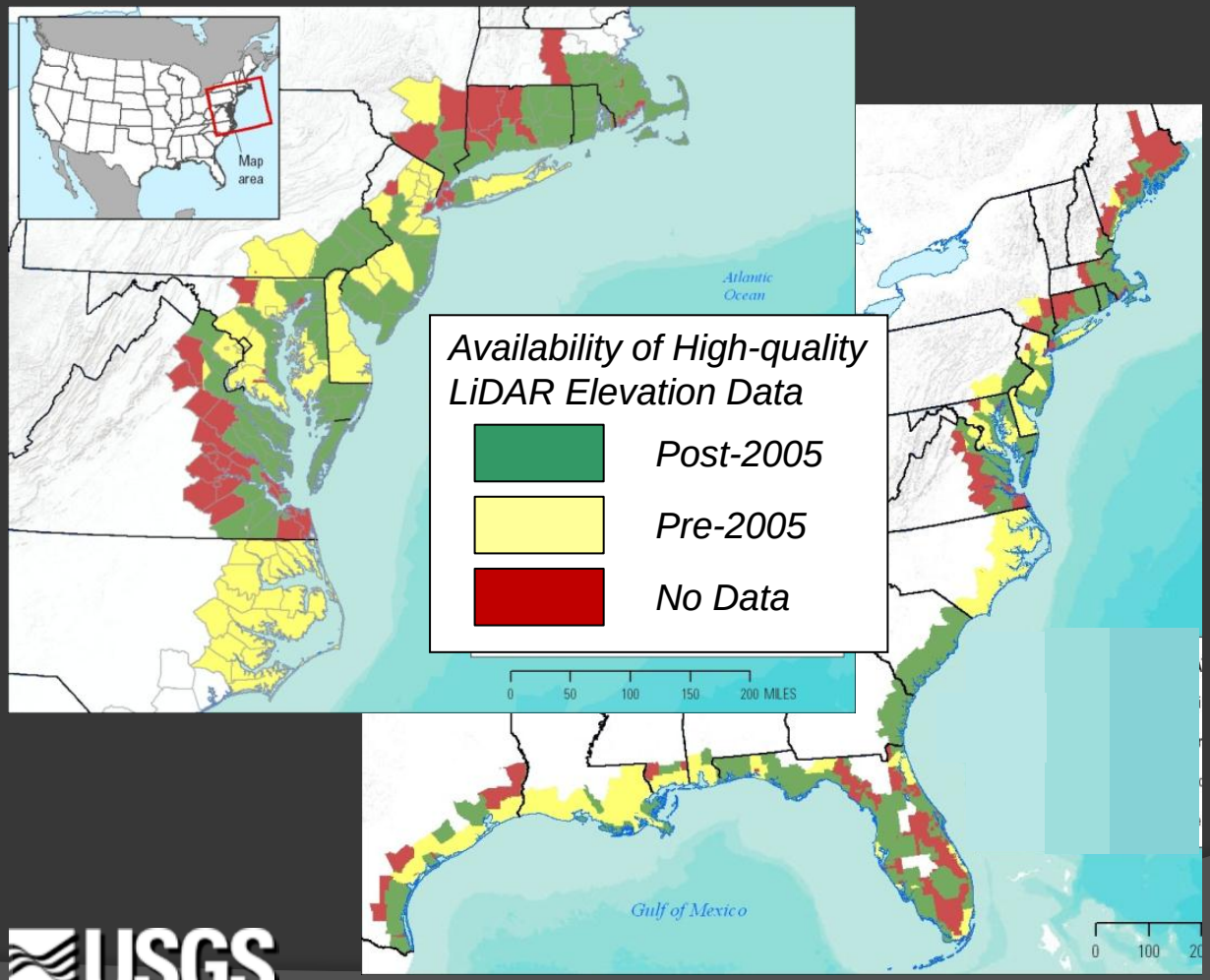
Theme 1. Data Collection Priorities

LiDAR (topography and Bathymetry) Availability:



- *Coastal Topography/ bathymetry*
- *Topography (within 25 miles of coast)*

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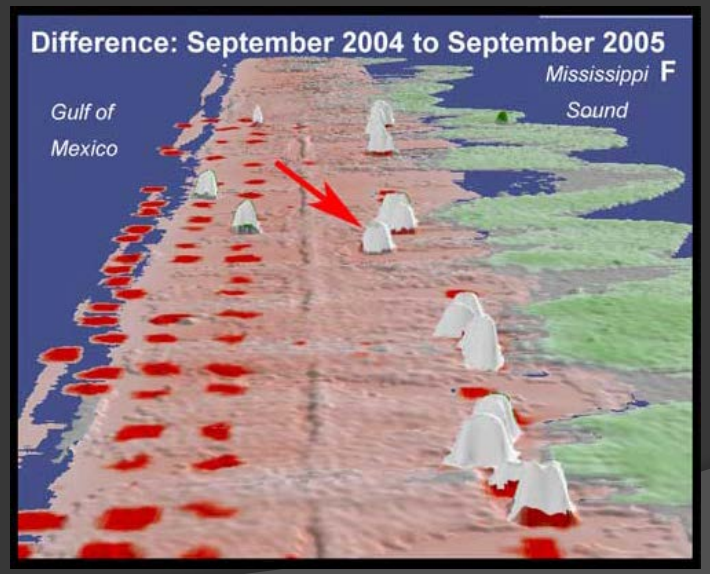
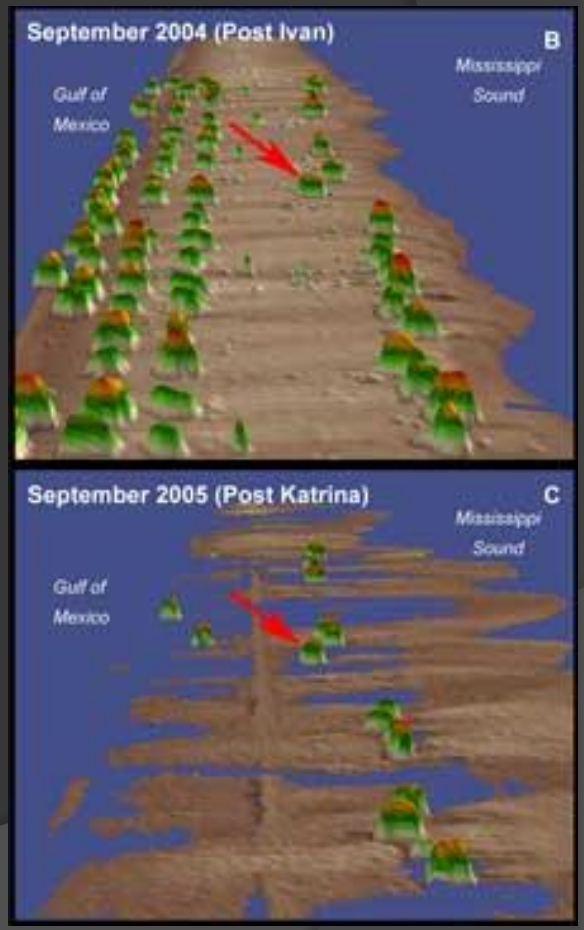
Theme 2. Coastal Impact Priorities

- Rapid, quantitative evaluation of coastal landform and bathymetry changes (including debris)
- Rapid update of models to forecast vulnerability to impending storms





Dauphin Island, AL, KATRINA (2005)

Theme 4. USGS Priorities

- Define occurrence and distribution of chemical & microbial contaminants released from the built environment.
- Define the processes that affect long-term human and ecological exposure to contaminants.

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Theme 5. Ecosystems Priorities

Evaluate wetland & coastal forest integrity/stability and wildlife health.

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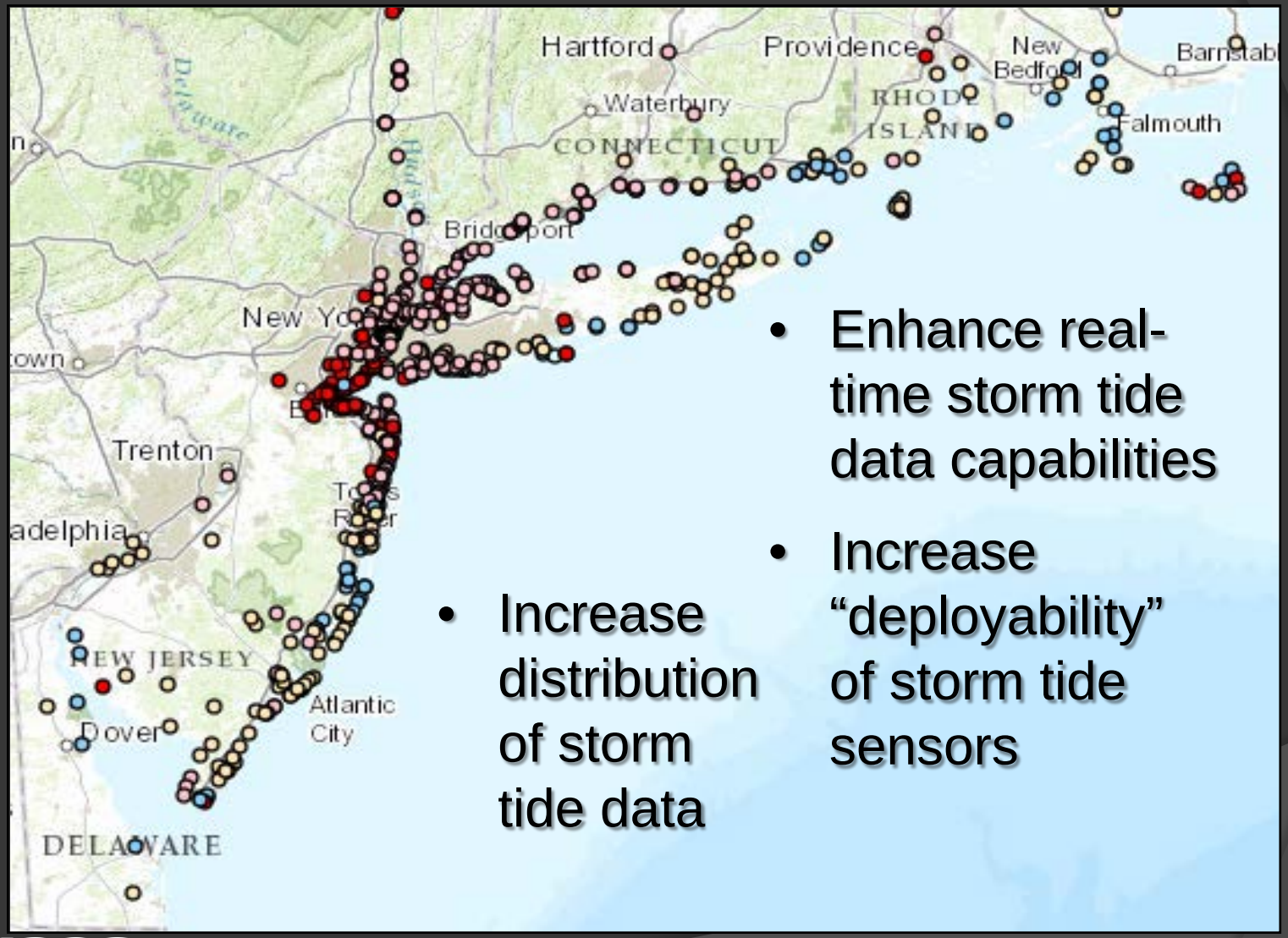
Theme 3. Storm Surge Monitoring Priorities



- Increase distribution of storm tide data
- Enhance real-time storm tide data capabilities
- Increase "deployability" of storm tide sensors

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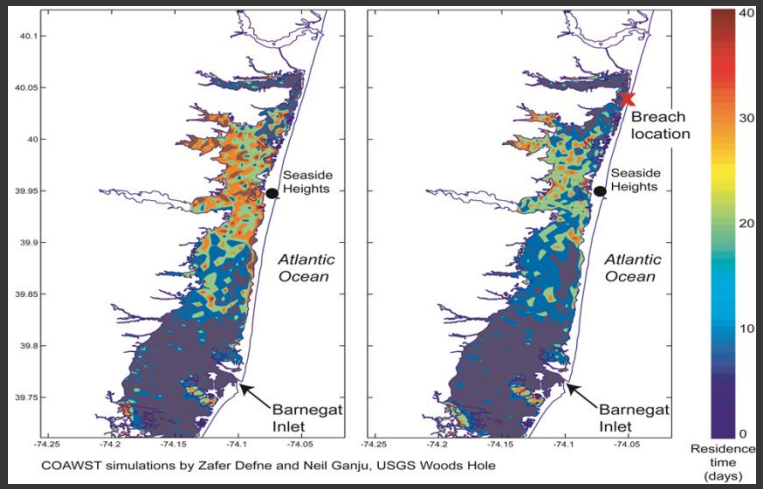
Theme 3. Targeted Surge Science Priorities

Increase targeted storm tide data focused on critical physical features



Quantify data needs based on model uncertainty

Define changes in bay, estuary, river, and wetland hydrodynamics

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Staging for Hydrology Tasks

	Storm Tide Monitoring	Storm Tide Data Display & Delivery	Fixed-Place Storm Tide Networks	Mobile Storm Tide Networks	Storm Surge Science	
First Round DOI Funding	(1) Establish a storm-surge operations center in the Northeast or Mid-Atlantic , (2) increase the number and mobility of surge and water-quality sensors in coastal staging areas, (3) expand real-time data transmission capabilities, (4) administer storm tide program	Improve the data delivery and display system and methods used to provide real-time and recovered data to rapidly transfer transmitted and recovered critical data.	Relate data availability and storm surge model uncertainty, design fixed-place and rapidly deployable storm tide networks, restore monitoring capability	Develop capability to deploy a network of sensors that would meet data needs during emergency and failure situations	Test and evaluate wave-height measurements	
			Pre-establish fixed-asset and rapidly deployable storm tide networks along the Atlantic coast and areas most vulnerable to storm surge.	Collect targeted storm surge data at or near land and sea features or infrastructure locations of high visibility and value to DOI to meet the needs of those attempting to explain and predict the impacts of storms.	Collect, analyze, and deliver water level, wave height, flow velocity, flow direction, and sediment transport data using traditional and emerging techniques in the area of breaches and damaged ecological areas, and along targeted coast to built environment transects	Proposed Second Round DOI Funding
	GPS surveying equipment, additional real-time sensors	Improve data by procuring software and rugged hardware to enhance field operations and recovery of non-real-time data.				

Moving Forward with Hydrology Activities

- Four Major Tasks:
  - Storm Tide Networks
  - Storm Tide Monitoring
  - Storm Tide Data Display and Delivery
  - Storm Surge Science Activities

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