# Mapping and modeling wetland processes and stability

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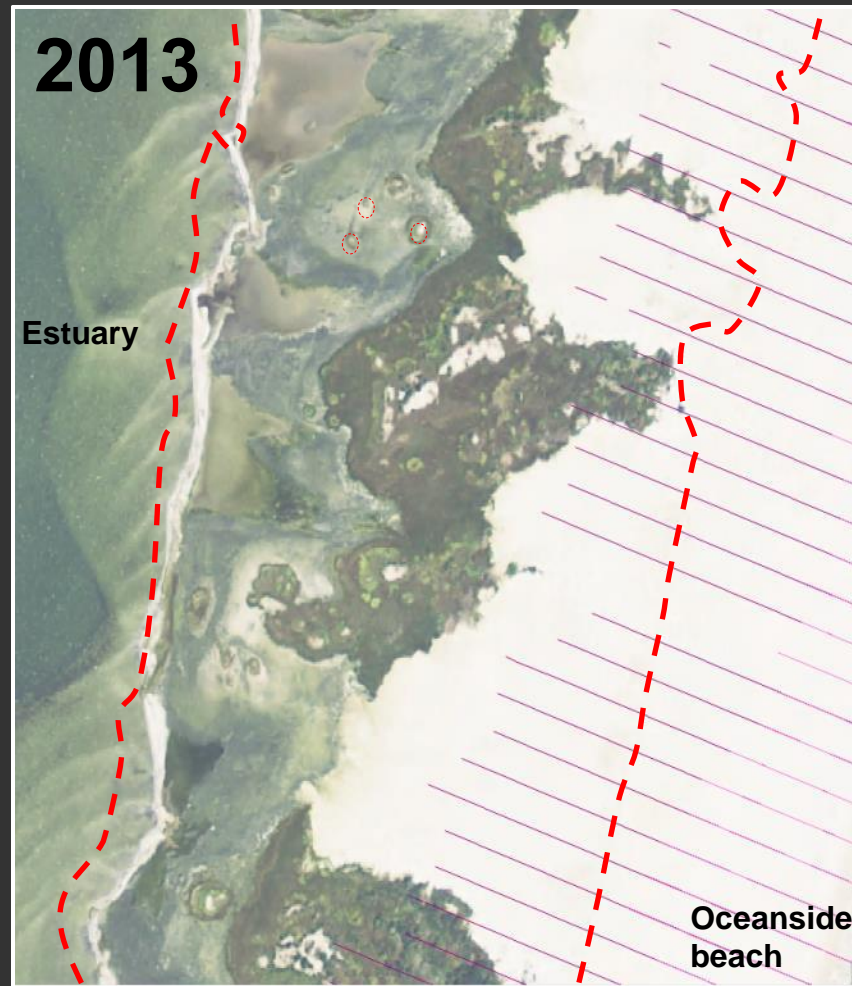# Three-dimensional wetland processes

- Mapping horizontal wetland change

- Modeling wave thrust on marsh face

- Modeling feedbacks between vegetation and hydrodynamics

- Developing high-resolution, realistic models with in-situ data

- Influence of storms on wetland deposition

# Tidal wetland change: a 3D process

## How do storms modify wetland and estuarine morphology?



Small waves impacting marsh shoreline of Forsythe NWR, New Jersey
USGS Woods Hole Coastal and Marine Science Center, July 2014

≈USGS

# Building a comprehensive data set of wetland change



2013

Estuary

Oceanside beach

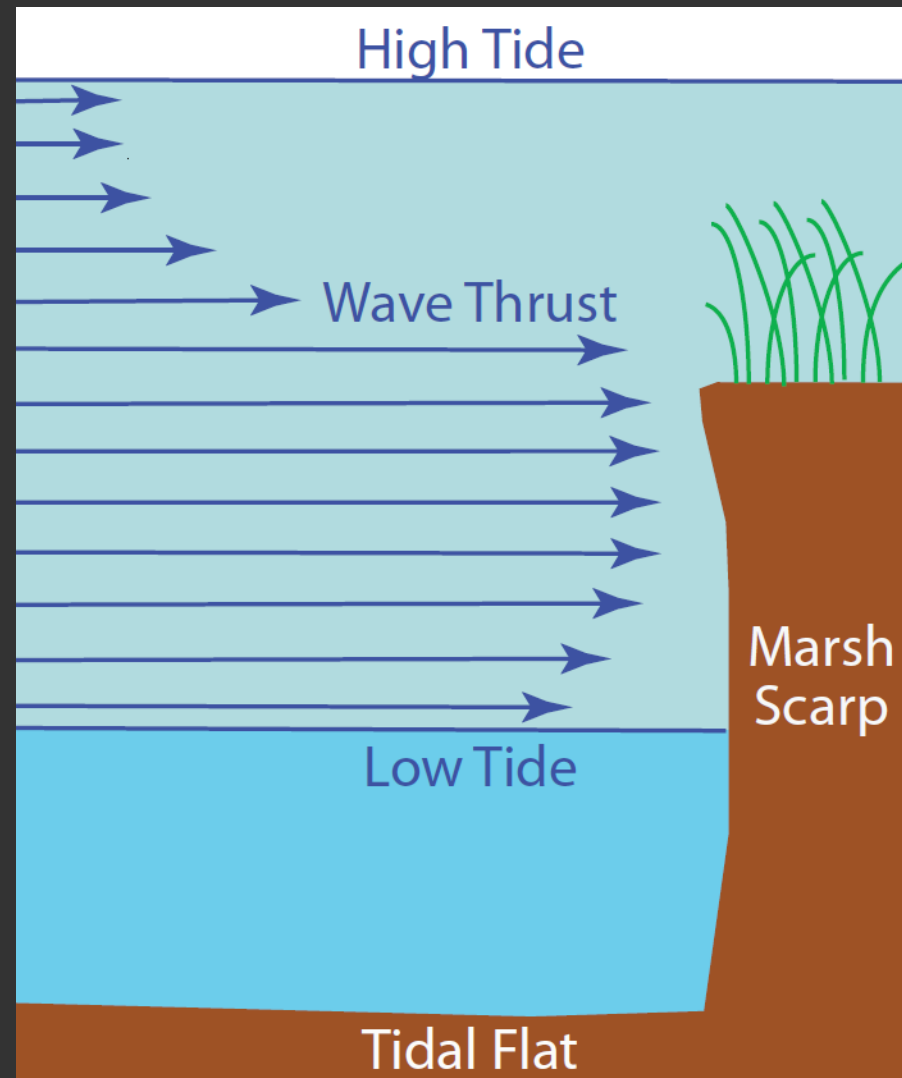*Assateague Island National Seashore, MD*

300 feet

≋USGS

# Modeling wetland retreat: wave attack

**WAVES CONTROL EROSION**

Along Marsh Boundaries

**INHERENTLY UNSTABLE**

Horizontal Direction



High Tide

Wave Thrust

Low Tide
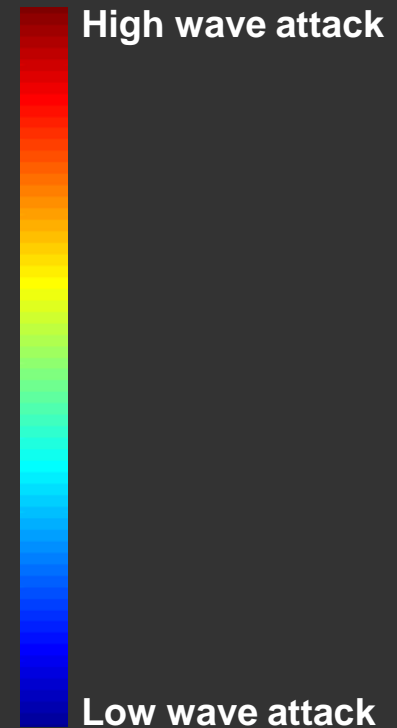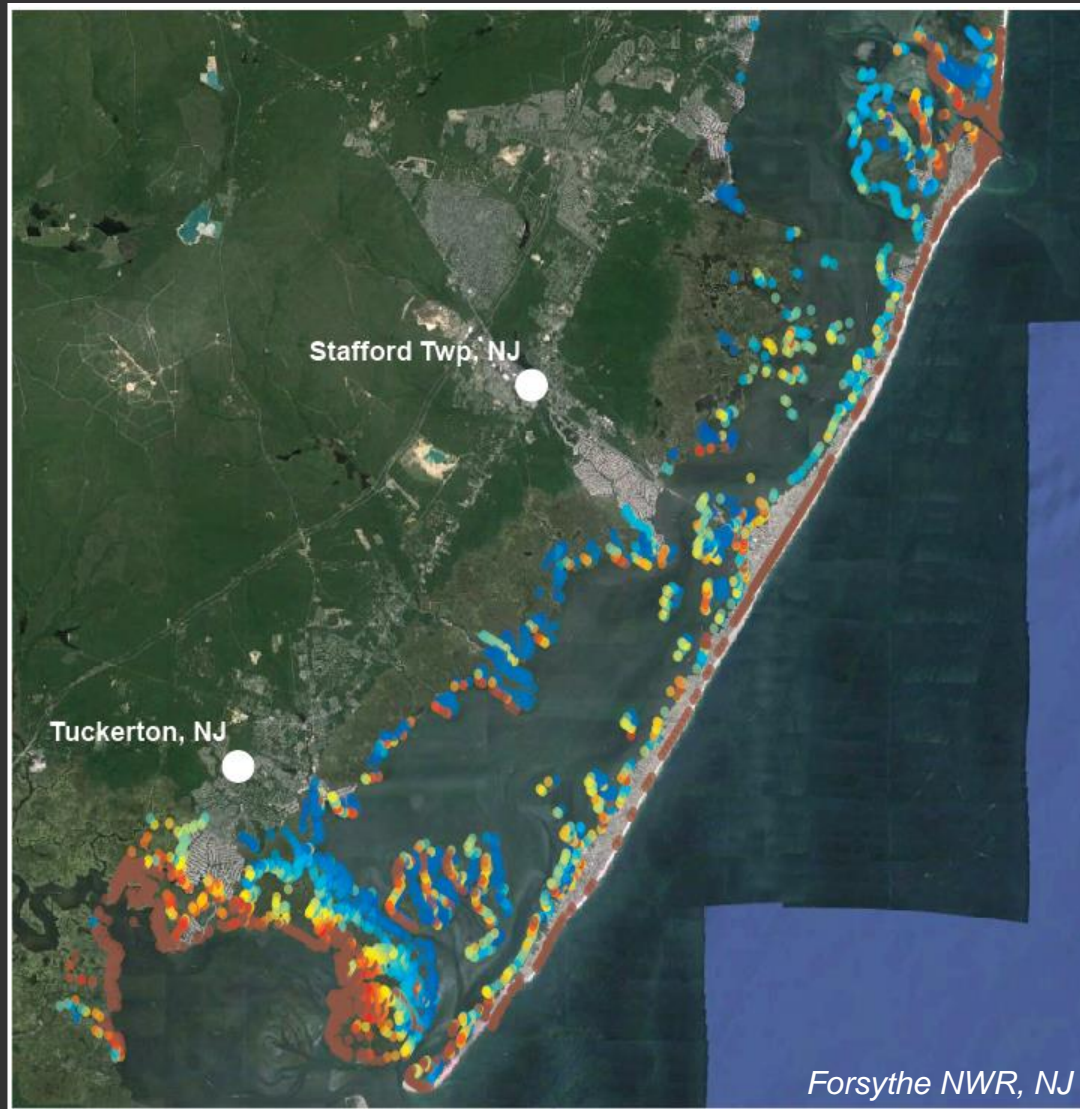
Marsh Scarp

Tidal Flat

*Modified after Tonelli et al. (2010)*

USGS

# Modeling wetland retreat: wave attack

## Assessment of shoreline during Sandy using COAWST* model

*Coupled
Ocean
Atmosphere
Wave
Sediment
Transport
Model



High wave attack

Low wave attack

Stafford Twp, NJ

Tuckerton, NJ

*Forsythe NWR, NJ*

5 miles

USGS

# Modeling wetland retreat: elevation

## Assessment of deposition during Sandy using COAWST* model

*Coupled
Ocean
Atmosphere
Wave
Sediment
Transport
Model



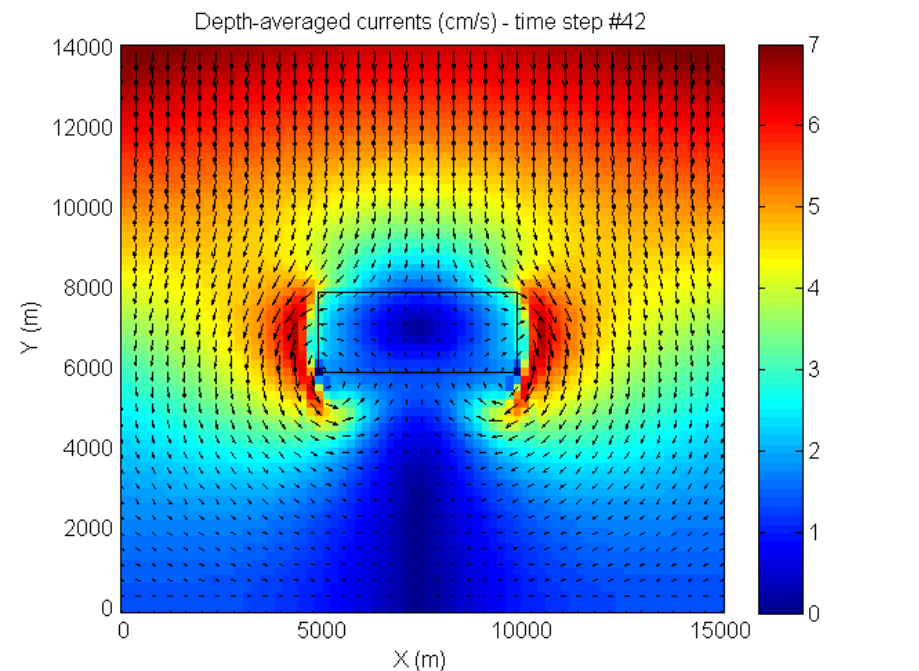Change in bed thickness due to storm (mm)
28-Oct-2012
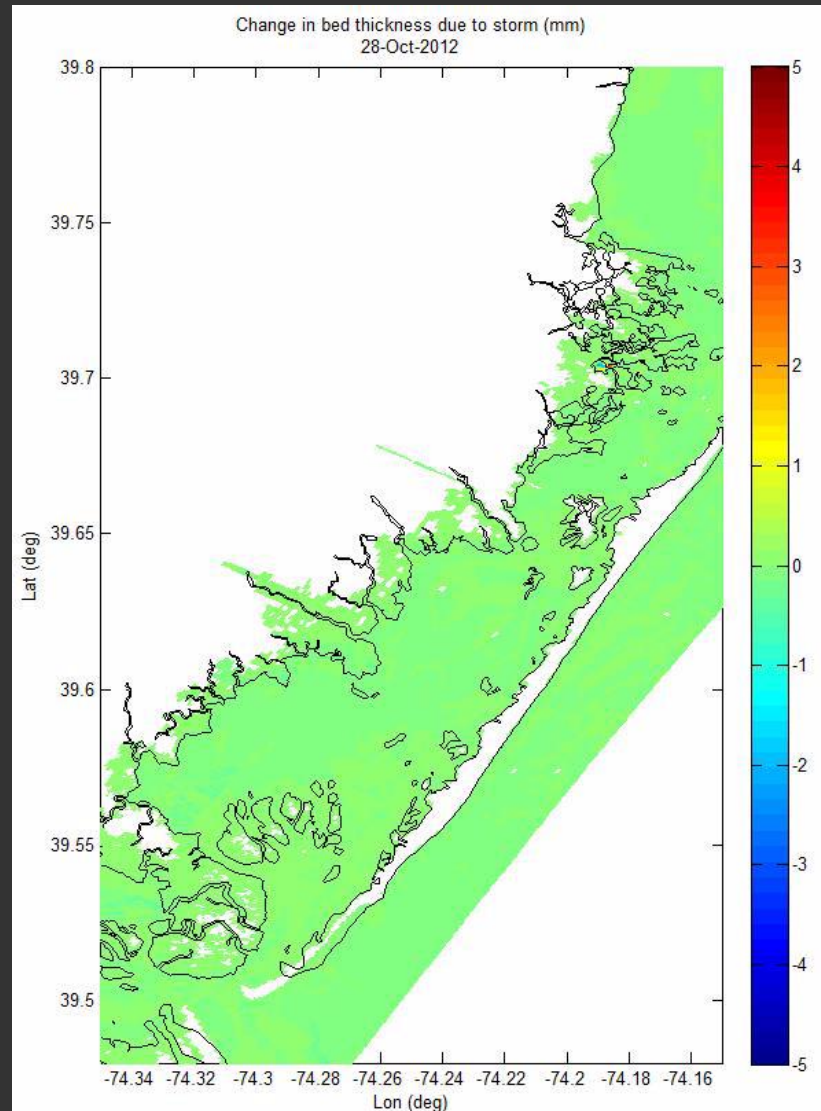
# Modeling feedback between vegetation and hydrodynamics

**Extract momentum and generate turbulent dissipation vertically
In the water column, depending on stem density, number, and height**
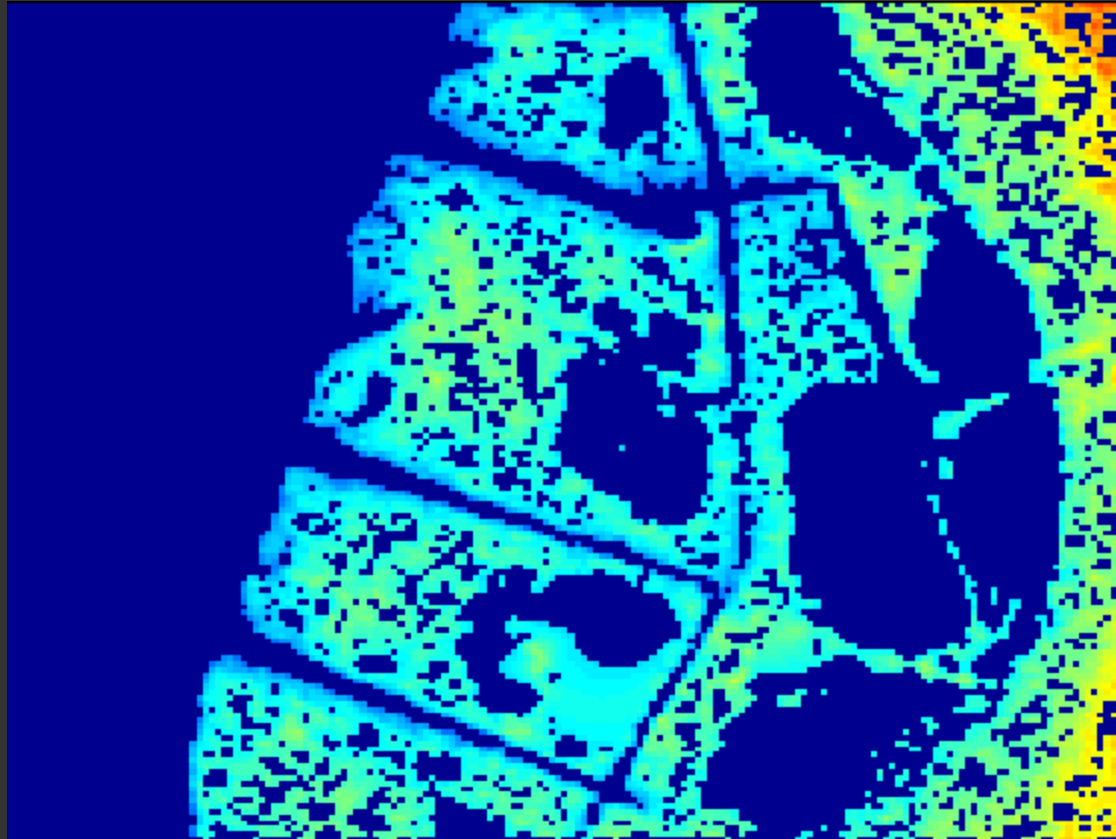
### Currents without vegetation
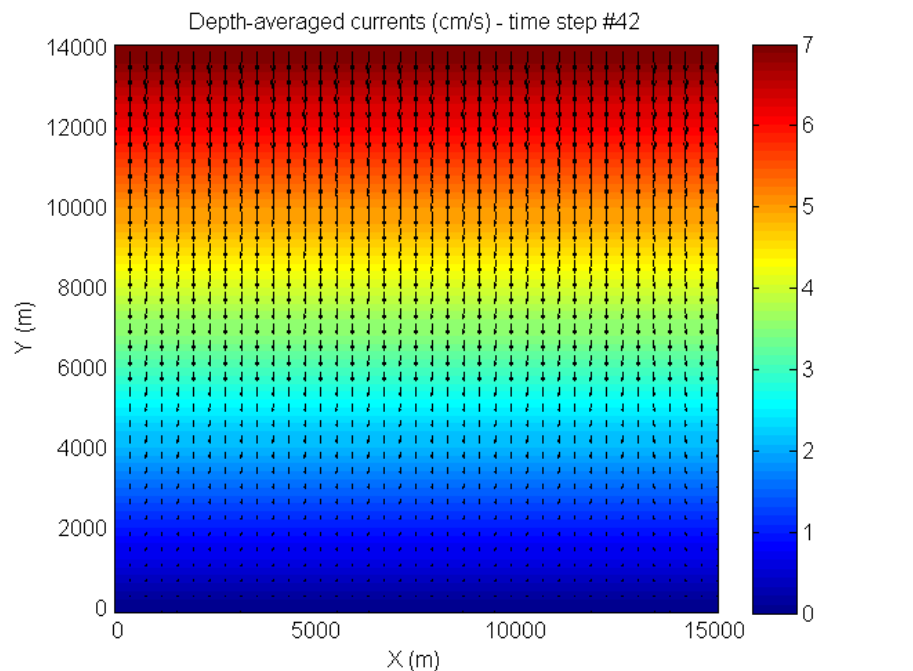
### Currents with vegetation

# High-resolution wetland modeling

## Assessment of flow path, inundation frequency

# Potential for collaboration

• Data and model output will be publicly served

• Model routines will be integrated into source distribution
  of COAWST model

• Opportunity to collaborate at specific sites or idealized test cases

• Regional locations
    - Jamaica Bay, NY
    - Barnegat Bay, NJ
    - Chincoteague Bay, MD/VA