

# Towards models for barotropic and baroclinic circulation in the Choctawhatchee Bay and River System

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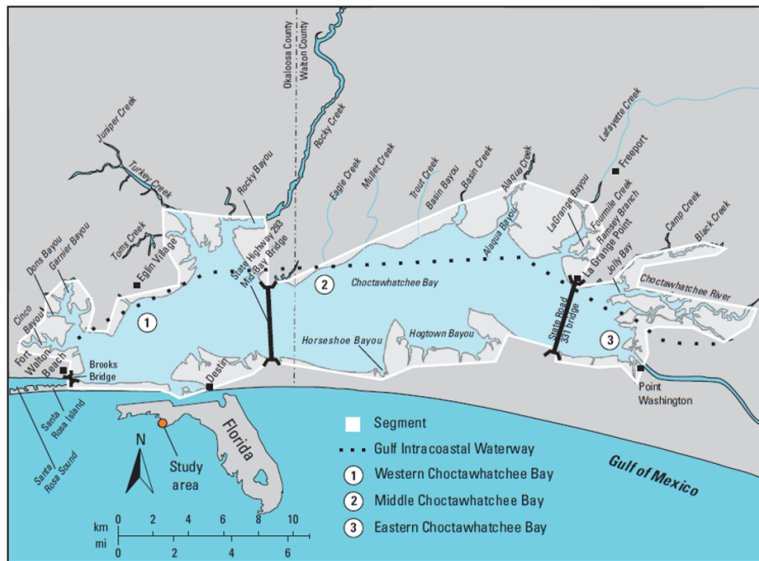
## Outline

- Observations at Destin Inlet
- Model Development
- Model Validation: Water levels
- Model Results: Currents
- Ongoing Work



# Observations at Destin Inlet

## Study Area: Choctawhatchee Bay and River System



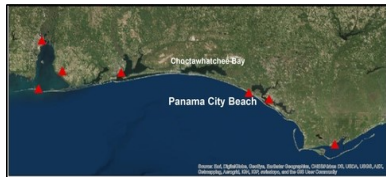
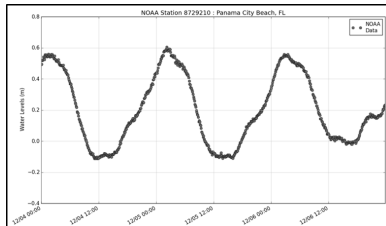
# Observations at Destin Inlet

## Surfzone Coastal Oil Pathways Experiment (SCOPE)

12/05/2013 11:34:19



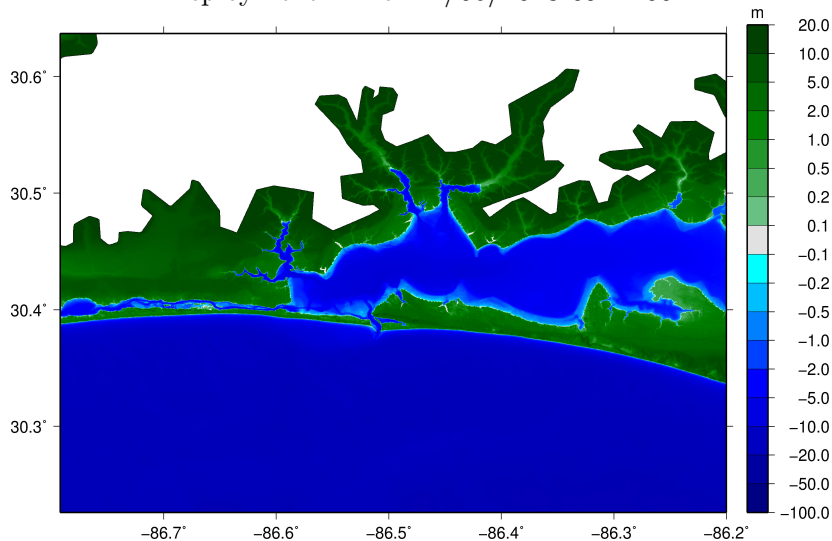
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# Surfzone Coastal Oil Pathways Experiment (SCOPE)

## Drifter Deployment

Deployment Time: 12/06/2013 09:11:00



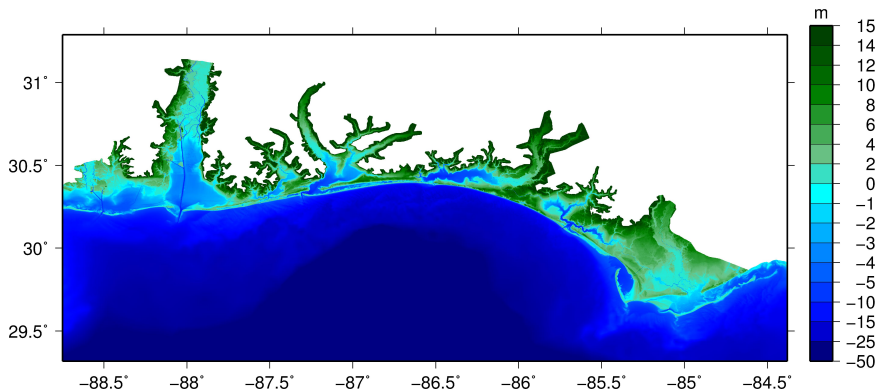
# Model Development

## ADCIRC

- Finite element near shore ocean circulation model
- Uses large unstructured grids that can represent complicated coastlines and flood plains with triangular elements
- ADCIRC 2D-Depth Integrated model is used extensively for modeling tides and storm surge
- Current study applies ADCIRC 3D baroclinic to study the hydrodynamics of the Choctawhatchee Bay and River System

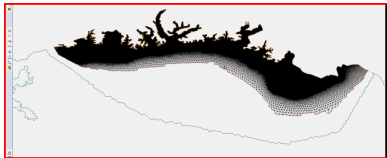
## Model Development

### Florida Panhandle ADCIRC mesh

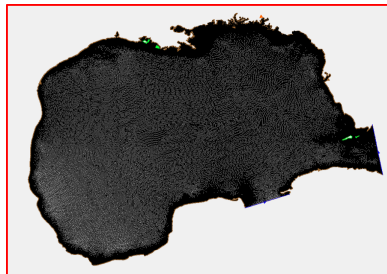


## Model Development

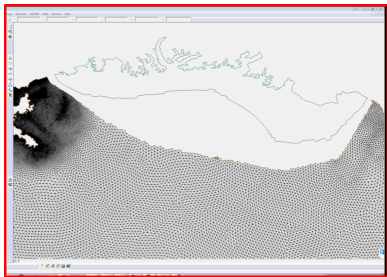
Mesh Editing: Adding resolution in the open ocean



Original mesh with highly resolved flood plains



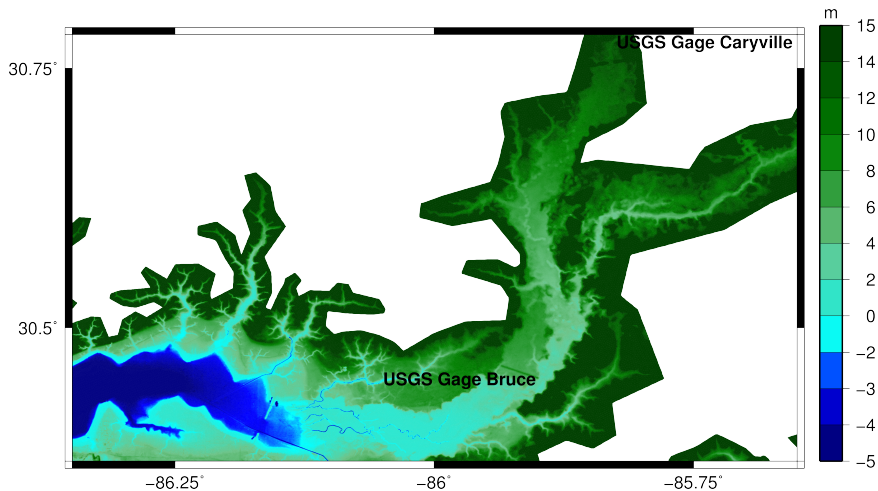
Combined mesh maintaining resolution in the flood plains with enhanced resolution in the open ocean



Mesh with greater open ocean resolution ( 6km)

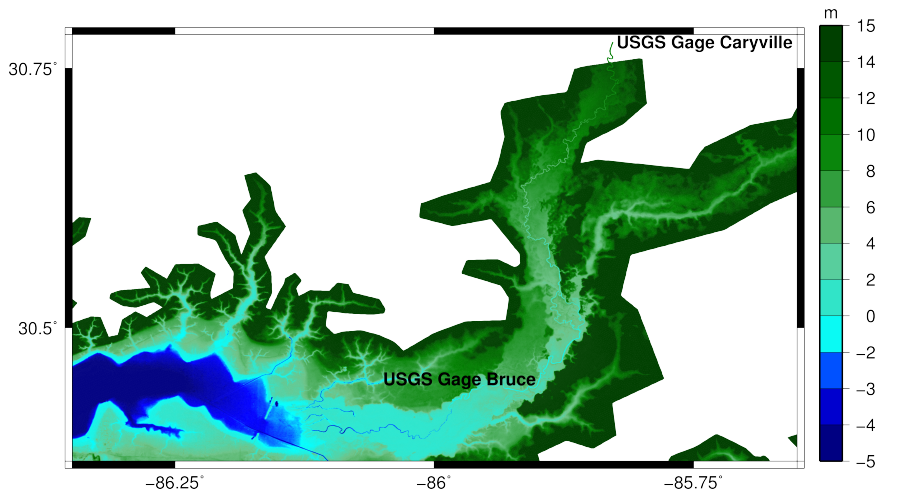
# Model Development

## Identifying USGS gauges



## Model Development

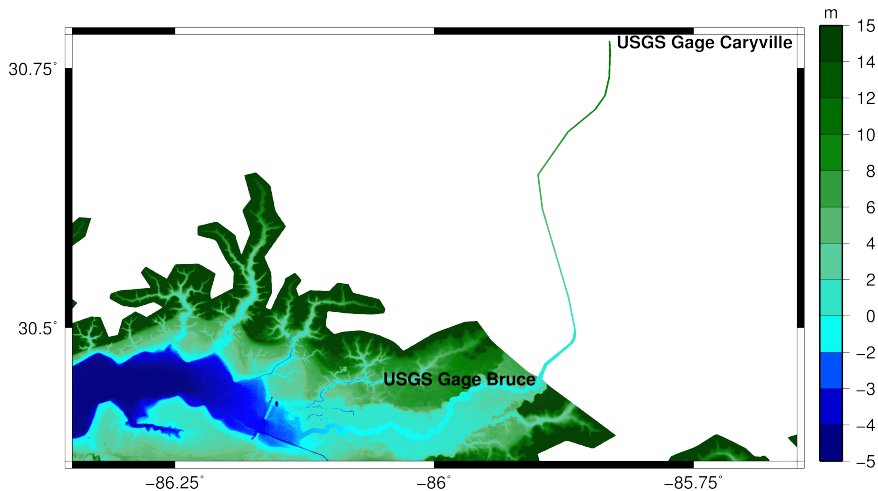
Mesh Editing: Adding resolution along Choctawhatchee River





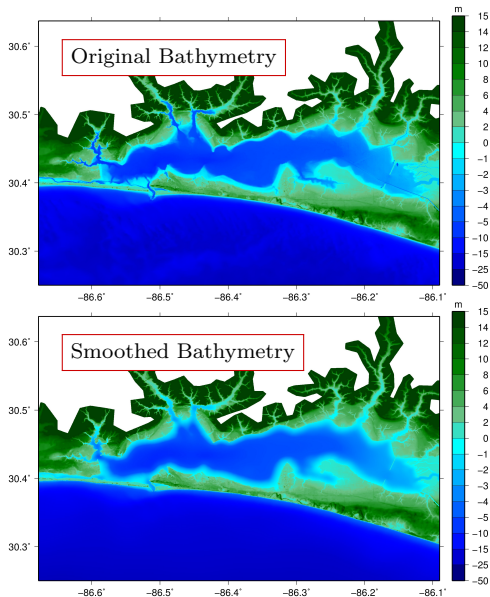
## Model Development

Mesh Editing: Developing synthetic channel



# Model Development

## Mesh Editing: Bathymetry Smoothing



### Bathymetry Smoothing

- Regions of steep bathymetric gradient introduced instability

- Smoothing Indicators (rx0, rx1) were computed

- Smoothing approach similar to that used by Sikiric et. al. (2009)

## Model Validation: Water levels

Stage-discharge comparisons

### USGS gage at Bruce, FL

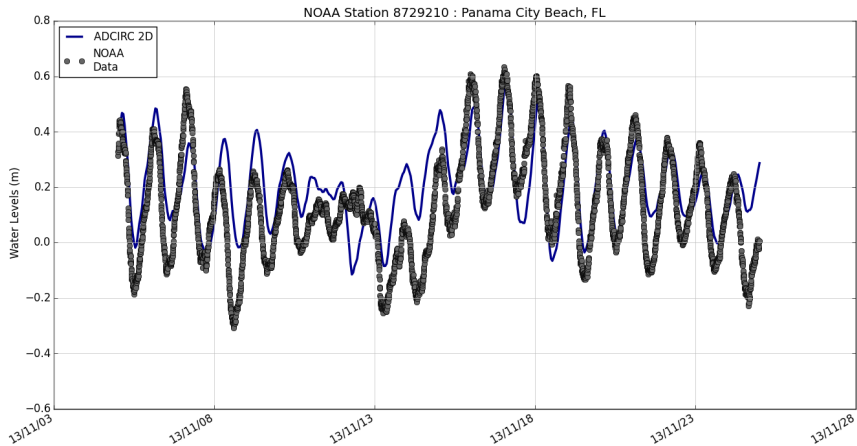
Discharge (cms)	Observed Stage (m)	ADCIRC water levels (m)
100	2.16	0.63
200	2.19	1.1
300	3.45	1.42
1000	5.0	3.1

### USGS gage at Caryville, FL

Discharge (cms)	Observed Stage (m)	ADCIRC water levels (m)
100	13.6	13.33
200	14.67	13.85
300	15.08	14.28
1000	16.37	16.35

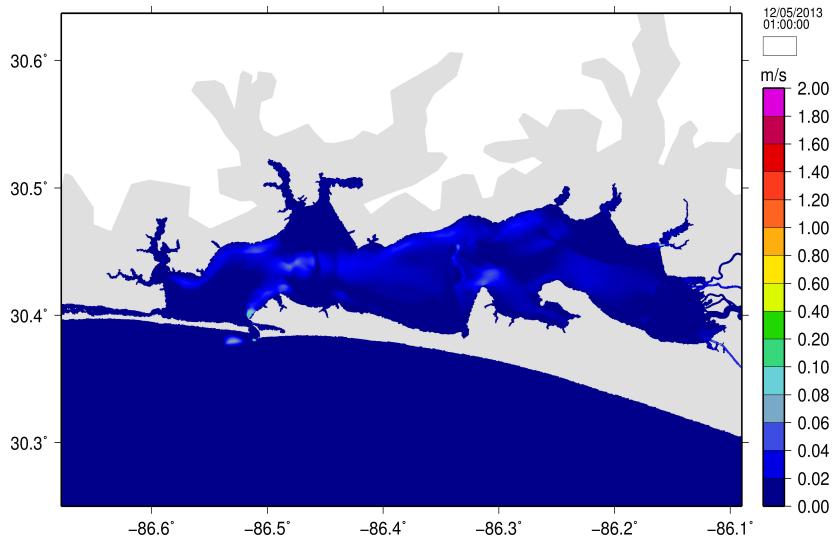
# Model Validation: Water Levels

Time series at NOAA gauges



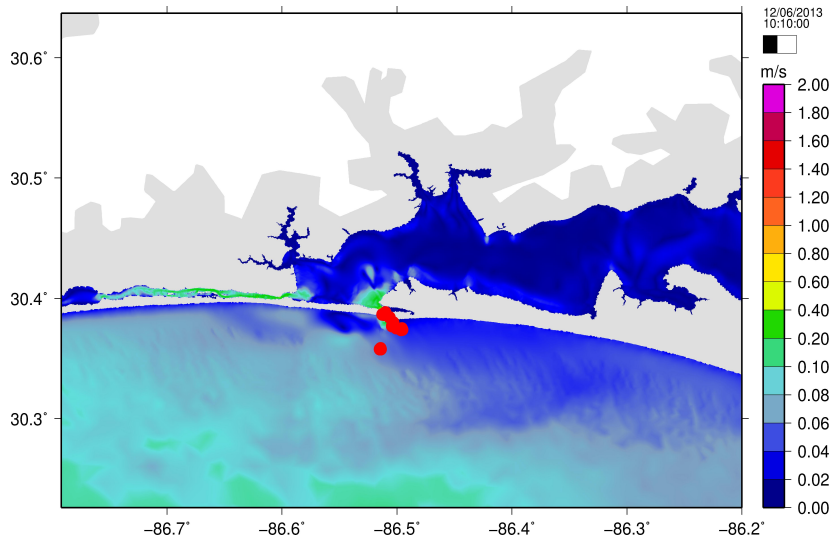
## Model Results: Currents

### Baroclinic Currents in the Choctawhatchee Bay



# Model Validation: Currents

Comparison to real drifters



# Ongoing Work

## Model Development

- Implement realistic channel profile
- Improve bathymetry smoothing approach
- Increase duration of baroclinic simulation

## Model Validation

- Stage/discharge curves at USGS gages
- SCOPE drifter trajectories
- Satellite Imagery
- NOAA gauges