

## Characterization and Prediction of Coastal Hazards

JC Dietrich<sup>1</sup>

<sup>1</sup>Dep't of Civil, Construction, and Environmental Engineering, NC State Univ

NC State Lightning Presentations  
Southeast CASC Coastal Resiliency Working Group  
Virtual Meeting, 30 Sep 2020

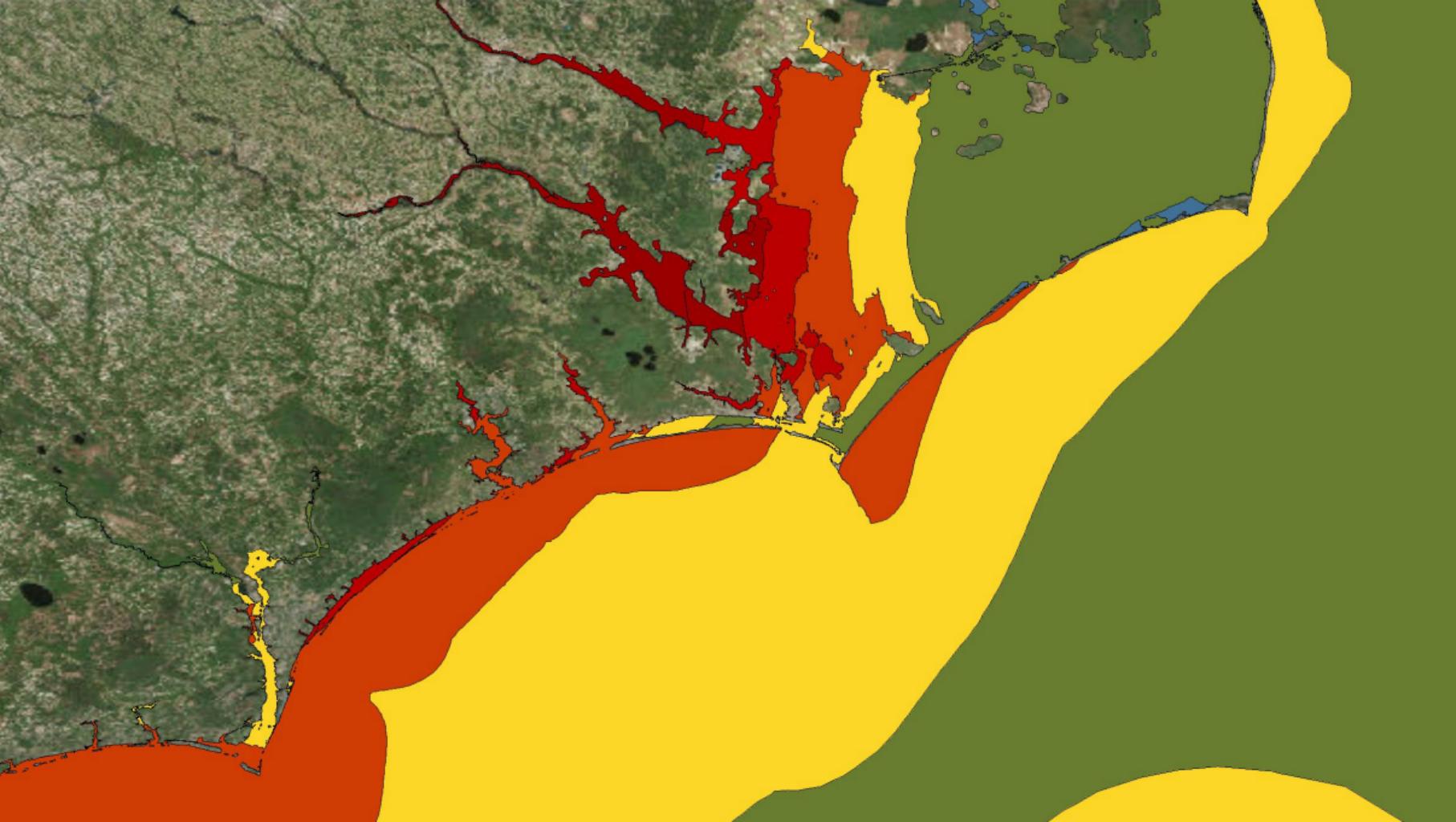


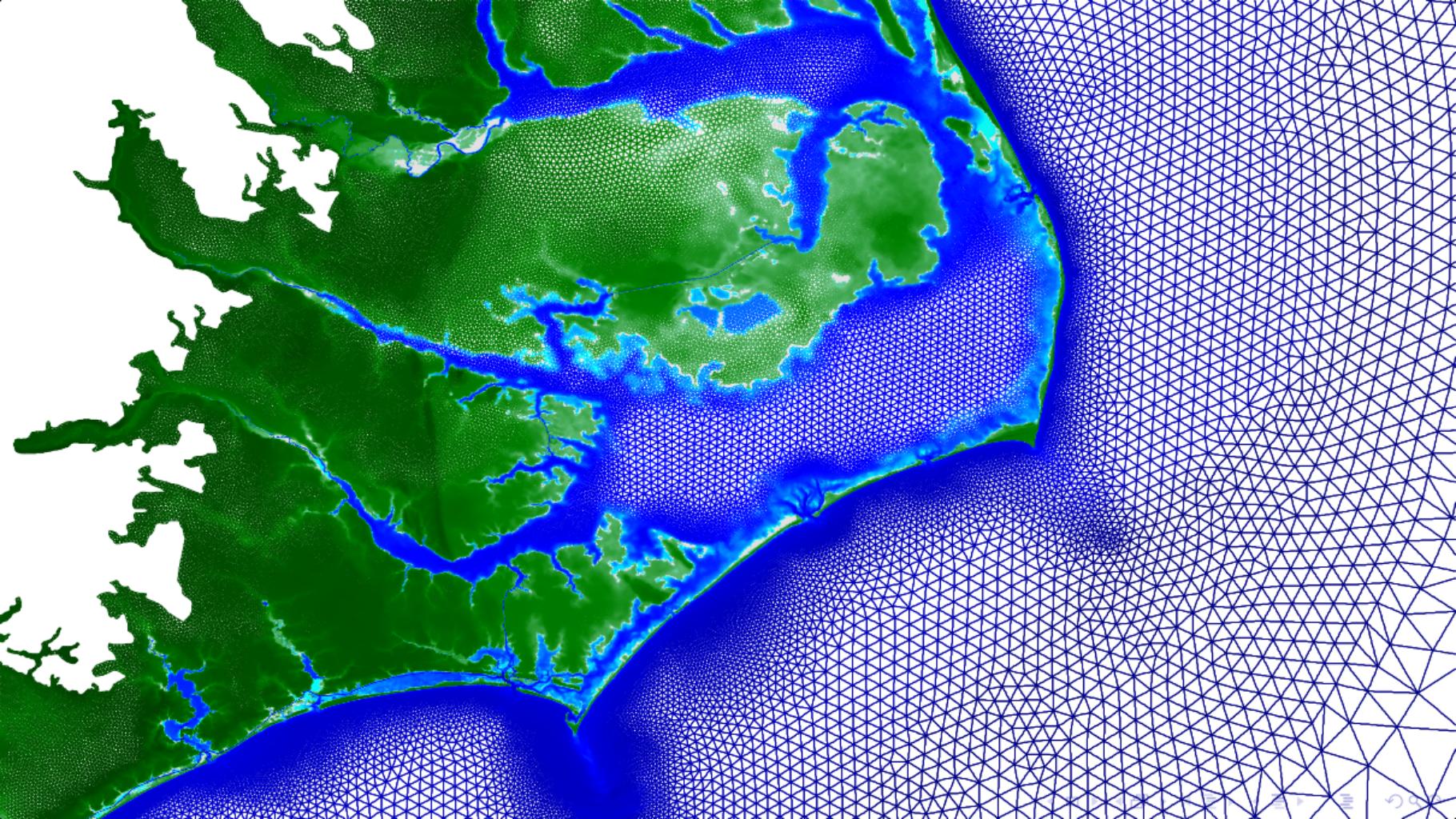
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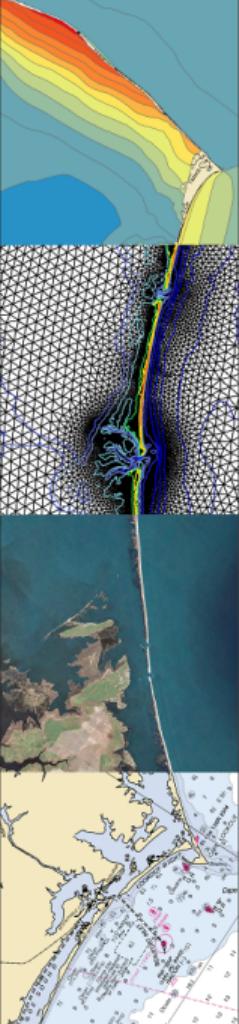


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## Increasing Efficiency of Coastal Flooding Models

1. Dynamic Load Balancing
2. Sub-Grid Corrections

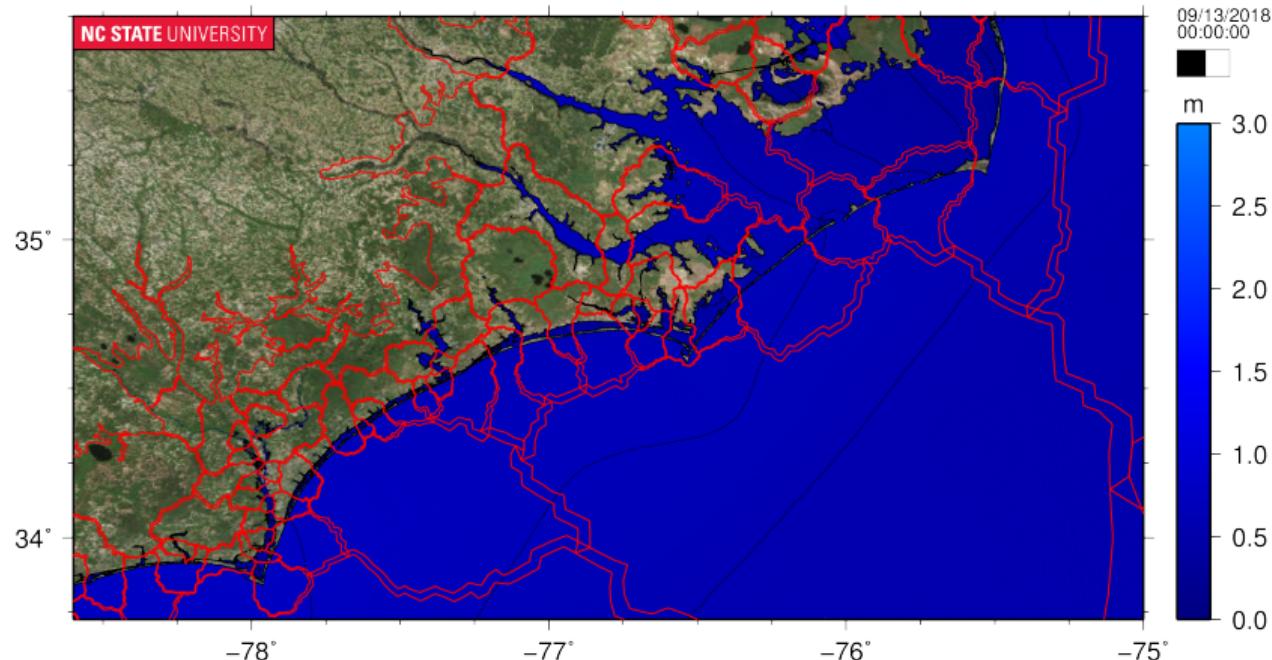
## Improving Representation of Coastal Processes

3. Density-Driven Estuarine Flows
4. Storm-Driven Erosion and Island Breaching

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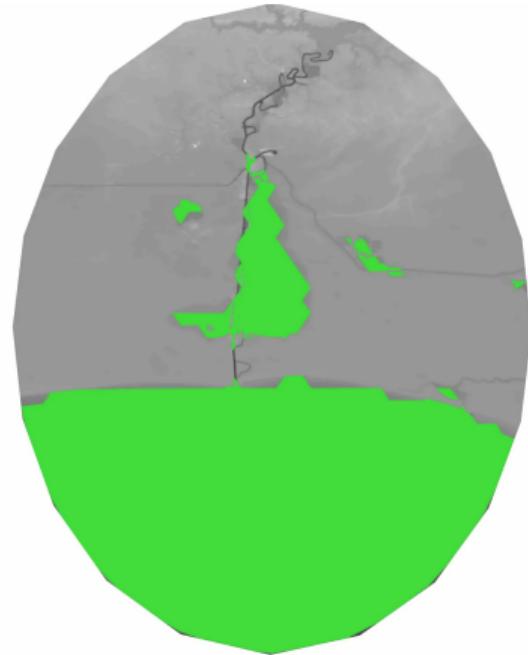
## 1. Dynamic Load Balancing

- Reallocate computational resources to optimize workload on CPUs
  - Speed-ups of 20 percent, with no sacrifice in accuracy



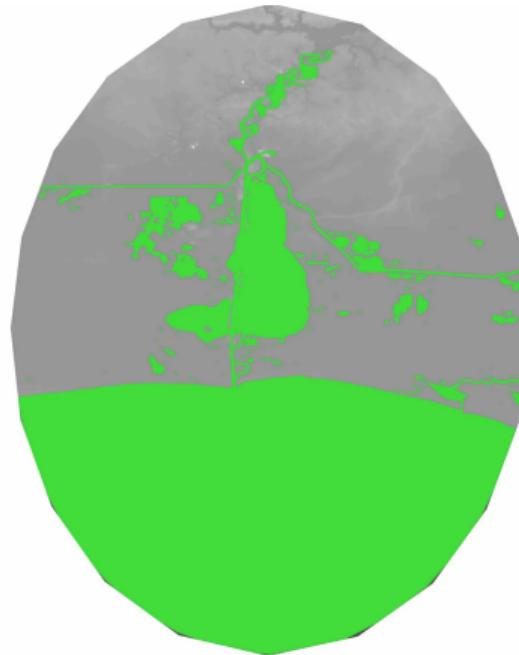
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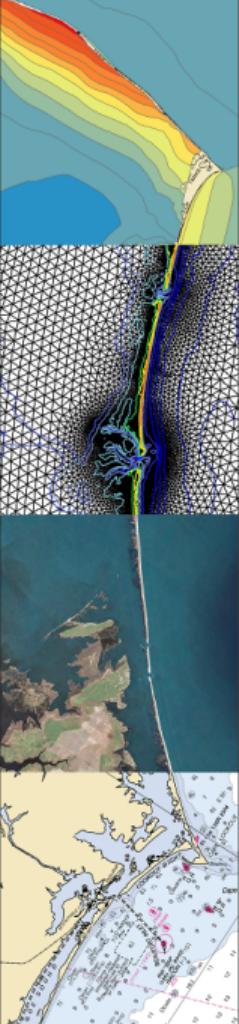
- Average the governing equations over the grid/mesh scale
- Identify closures to upscale information from higher-resolution data sets (e.g. DEMs)



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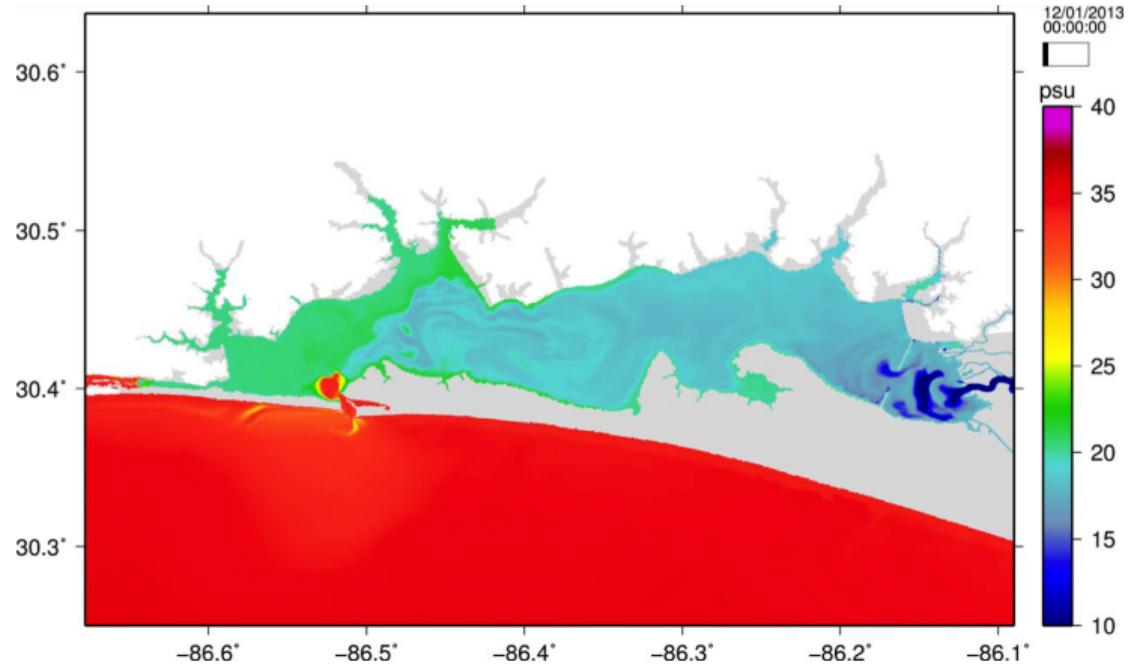
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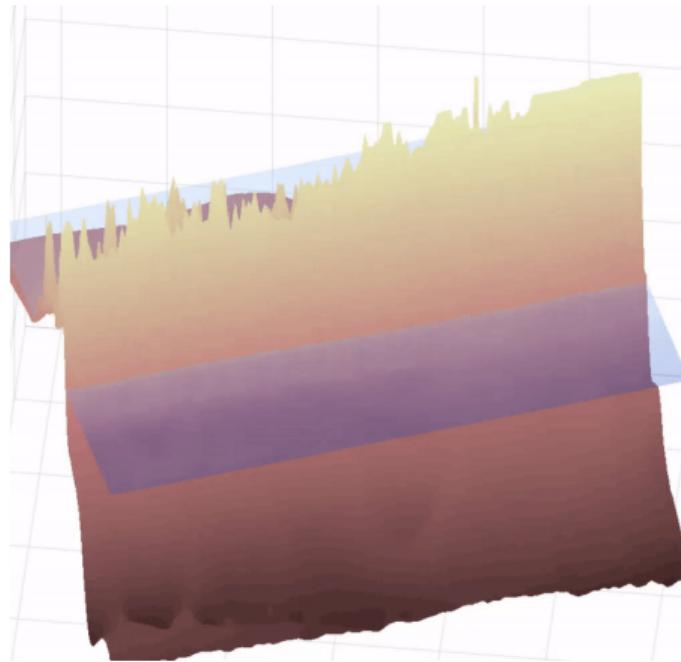
### 3. Density-Driven Estuarine Flows

- Three-dimensional circulation and transport
  - Simulation of mixing in Choctawhatchee Bay, Florida, during Dec 2013



## 4. Storm-Driven Erosion and Island Breaching

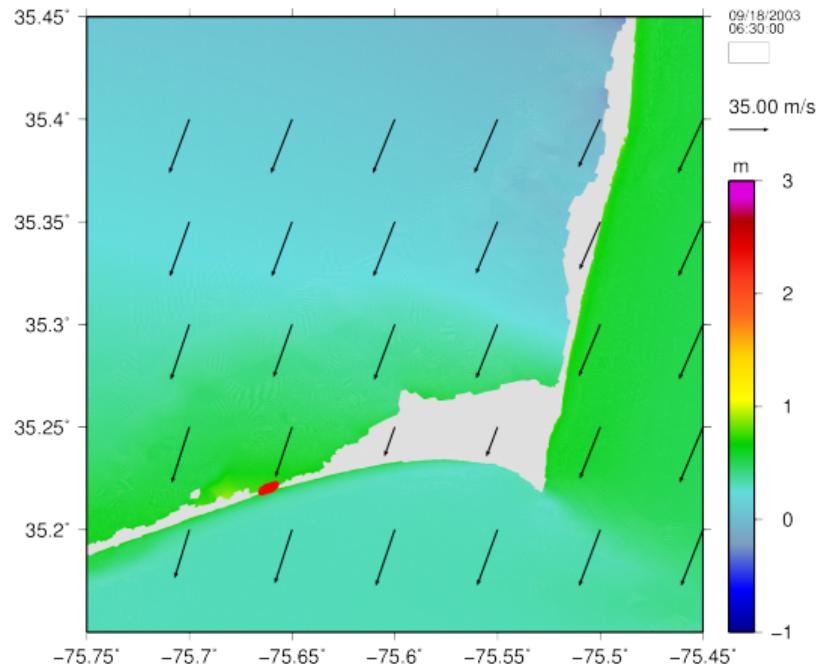
- Predict erosion at island-scales, then map back to flooding at region-scales
- Simulation of 'Isabel Inlet' on Hatteras Island

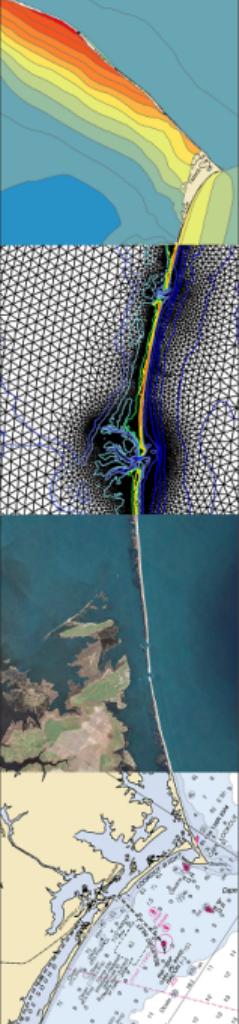


A Gharagozlu\*, JC Dietrich, et al. (in preparation), *Estuarine, Coastal, and Shelf Science*.

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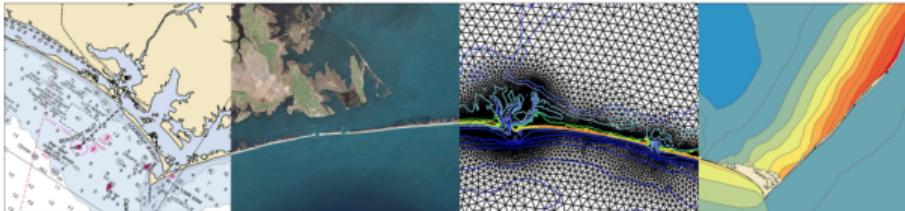
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## Coastal & Computational Hydraulics Team



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Welcome to the CCHT! We develop computational models for wind waves and coastal circulation, and then apply these models to high-resolution simulations of ocean behavior. Our goals are to understand how coastlines are threatened during storms, how materials are transported in the coastal environment, and how to communicate these hazard risks for use in decision support. Our research spans the disciplines of coastal engineering, numerical methods, computational mathematics, and high-performance computing.



### MEET OUR TEAM

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[Christie Stokes](#)

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jcdietrich@ncsu.edu