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CPRA

THE WATER INSTITUTE OF THE GULF

IMPACTS TO STORM SURGE AND WAVES DUE TO THE 2017 COASTAL MASTER PLAN

Zach Cobell

05/30/2018

Contents

- ADCIRC+SWAN Modeling System
- Model performance
- Future scenarios
- Implementation of Master Plan projects
- Impacts to surge/waves

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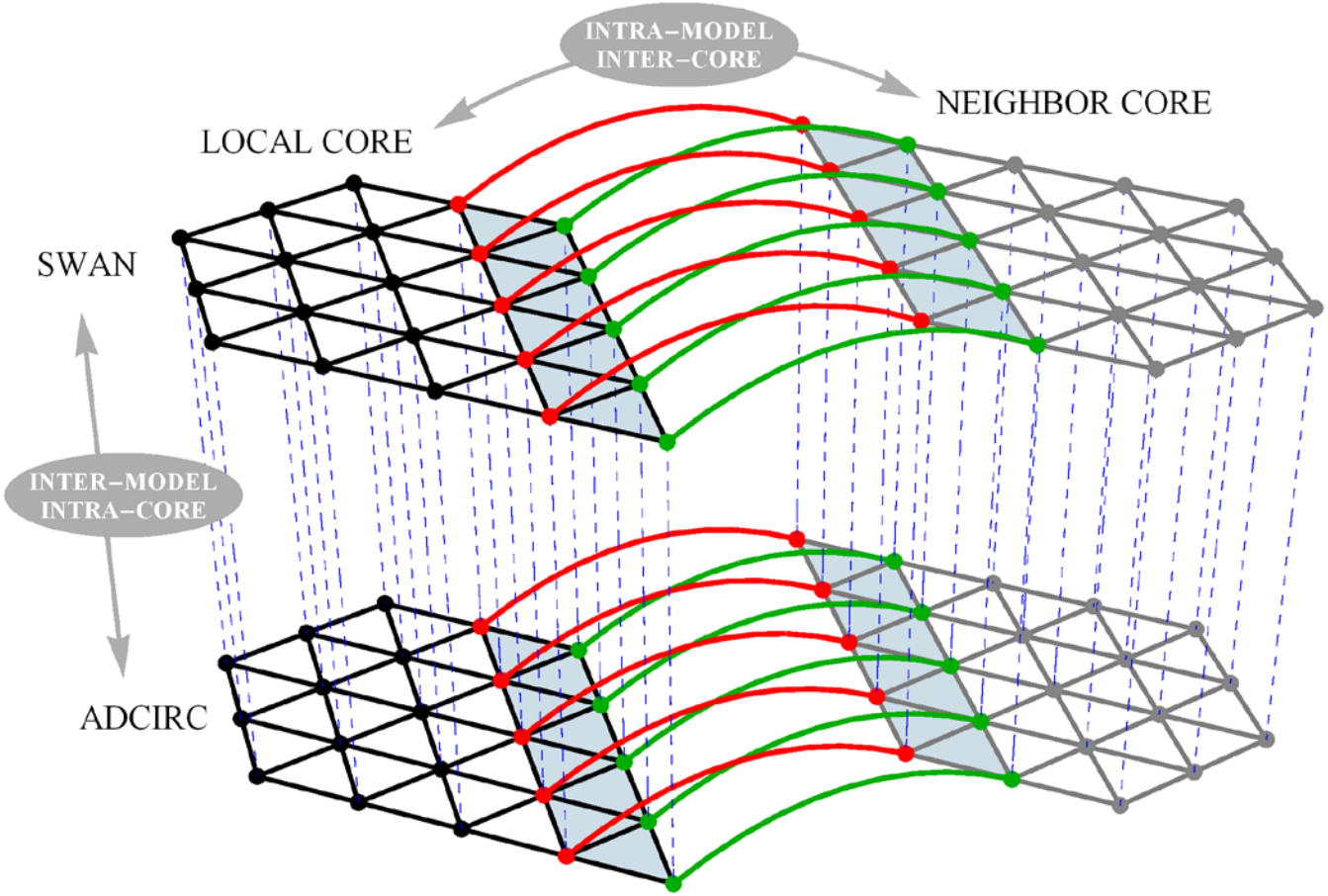
Modeling System

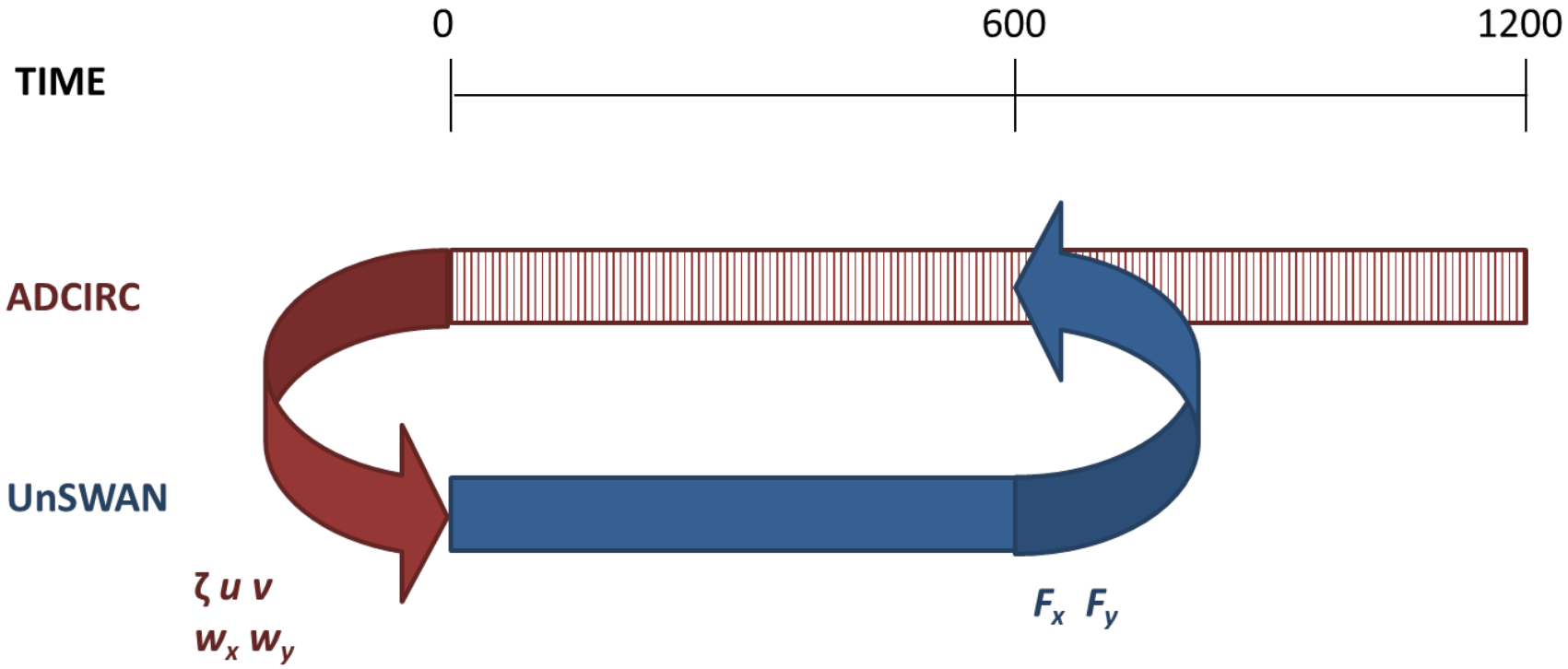
Modeling System

- ADCIRC
  - Simulates tide and wind driven circulation
  - Shallow Water Equations
  - Unstructured mesh efficiency
- SWAN
  - Spectral wave model
  - Uses identical unstructured mesh as ADCIRC
  - Tightly coupled interaction with ADCIRC

Modeling System

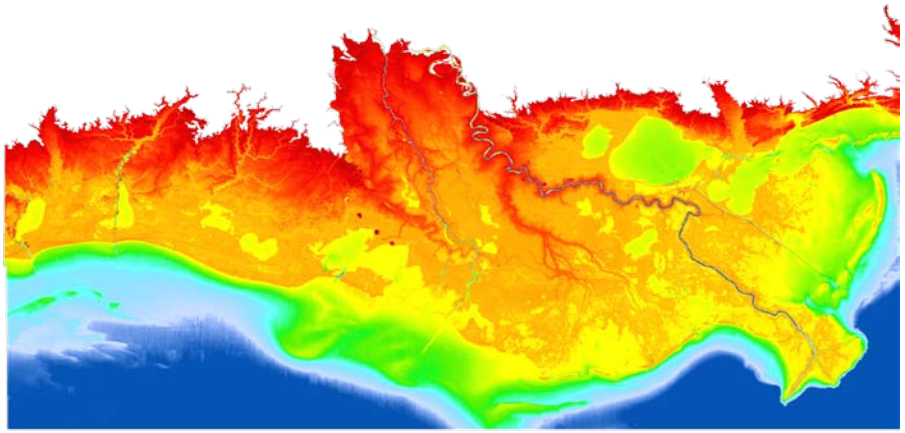


Modeling System

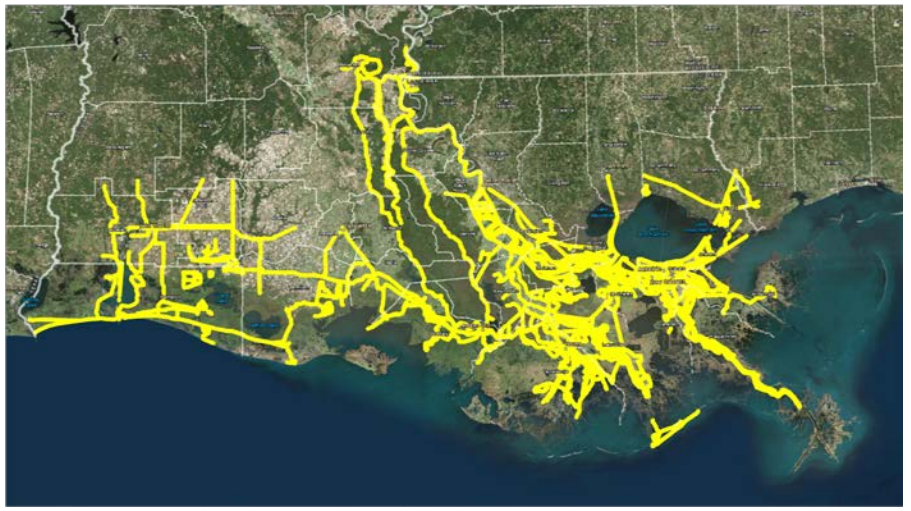


Model Input

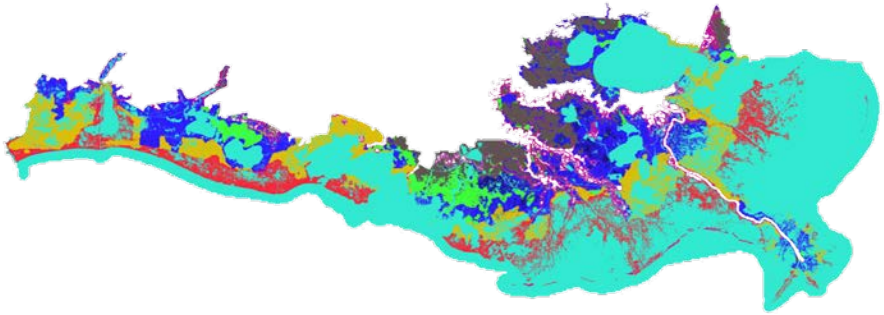
Topography



Levees



Land Use



Land/Water

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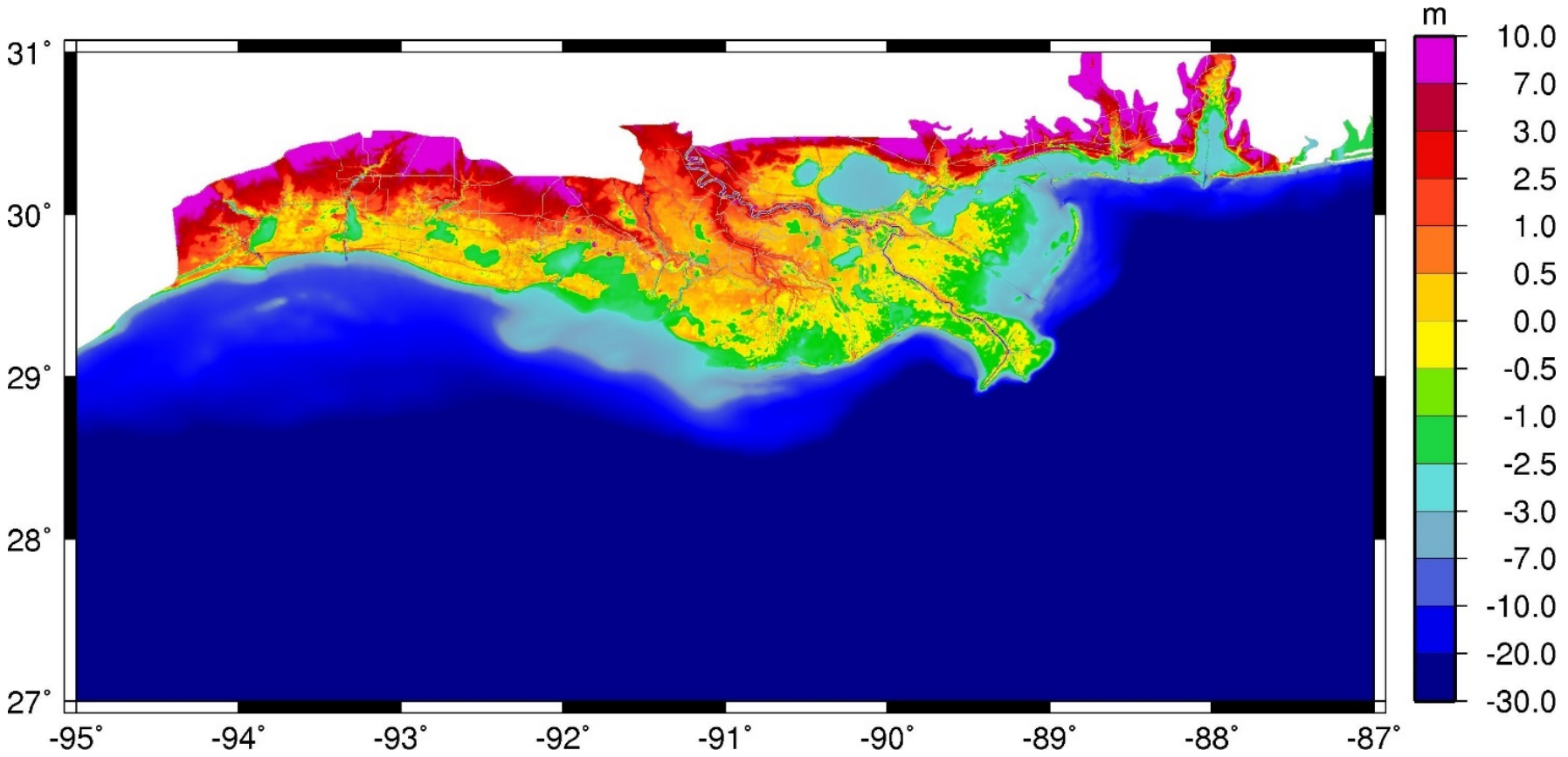
Topography/Bathymetry



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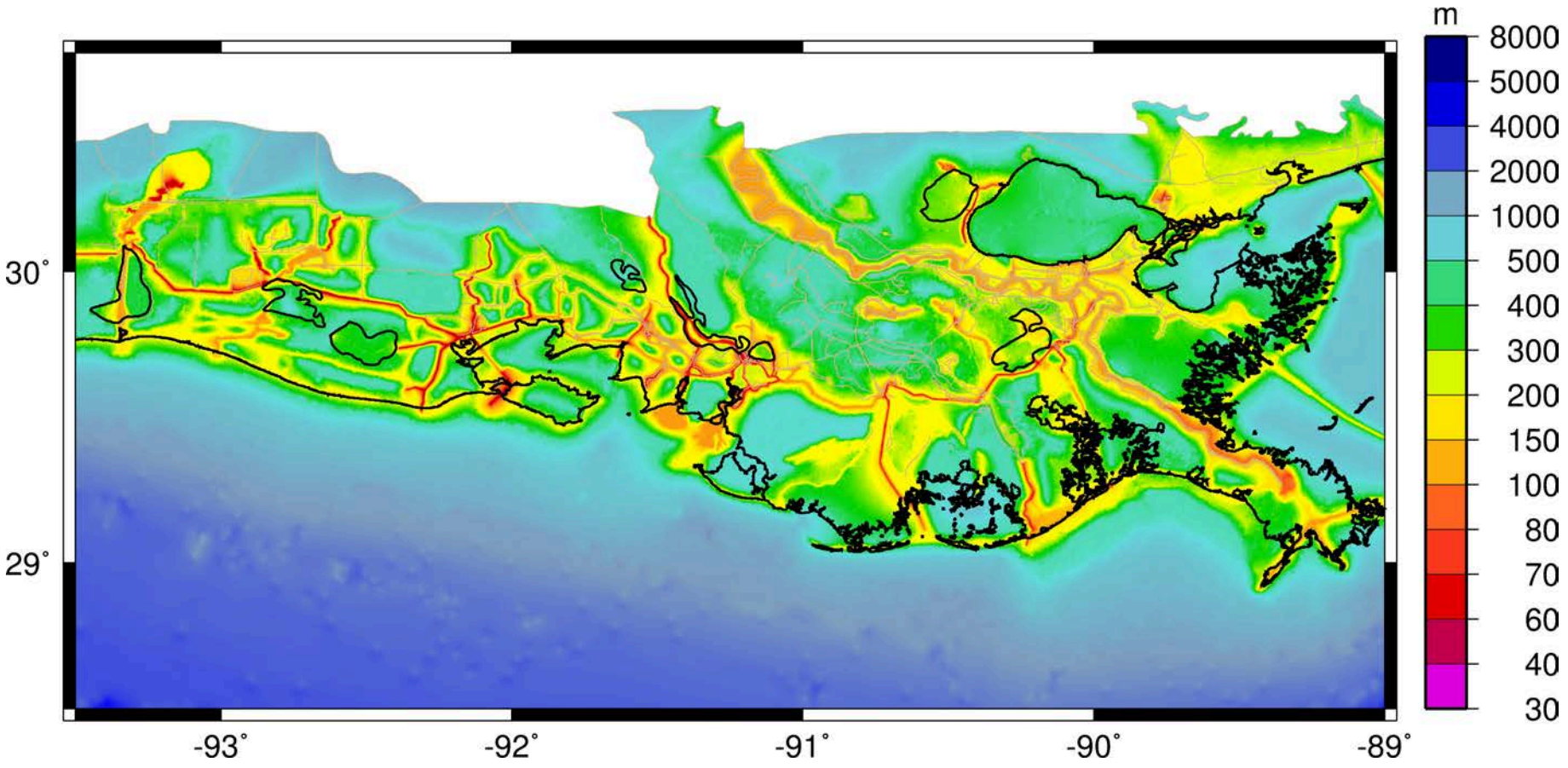
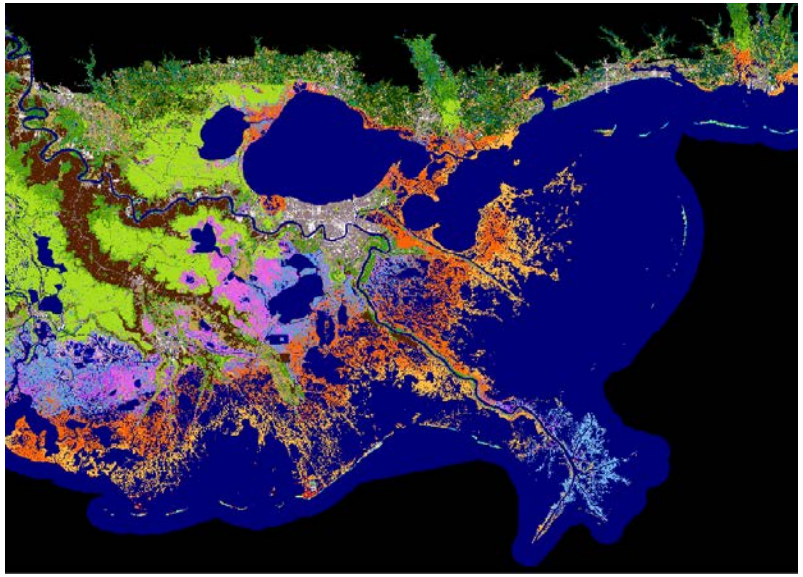
Model Resolution

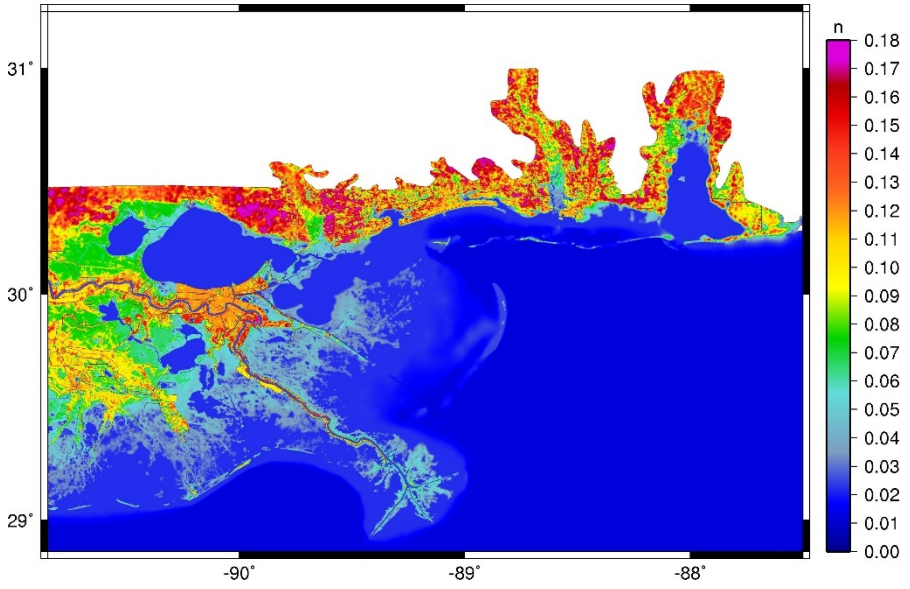


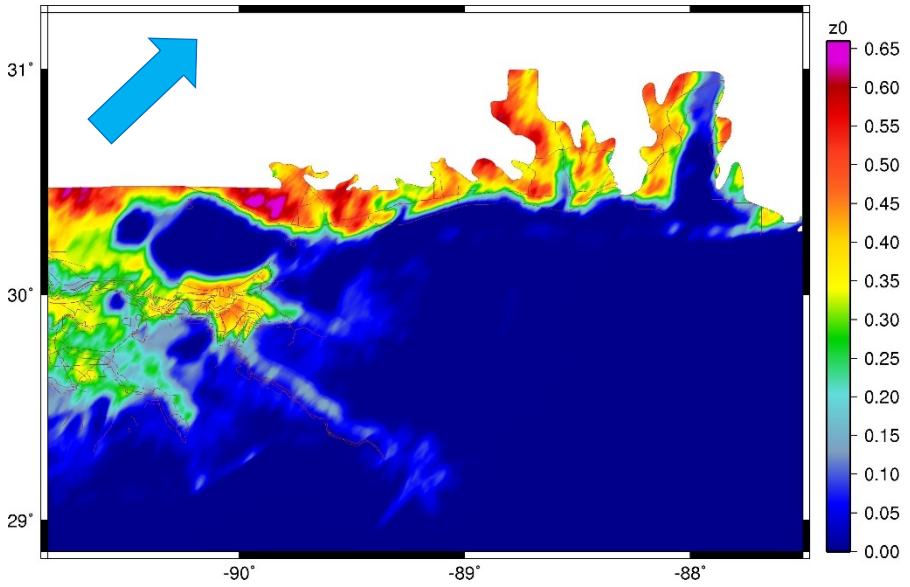
CPRA2017

Model Input

- Land Use Data
  - Determines model roughness
  - Directional based wind drag coefficients







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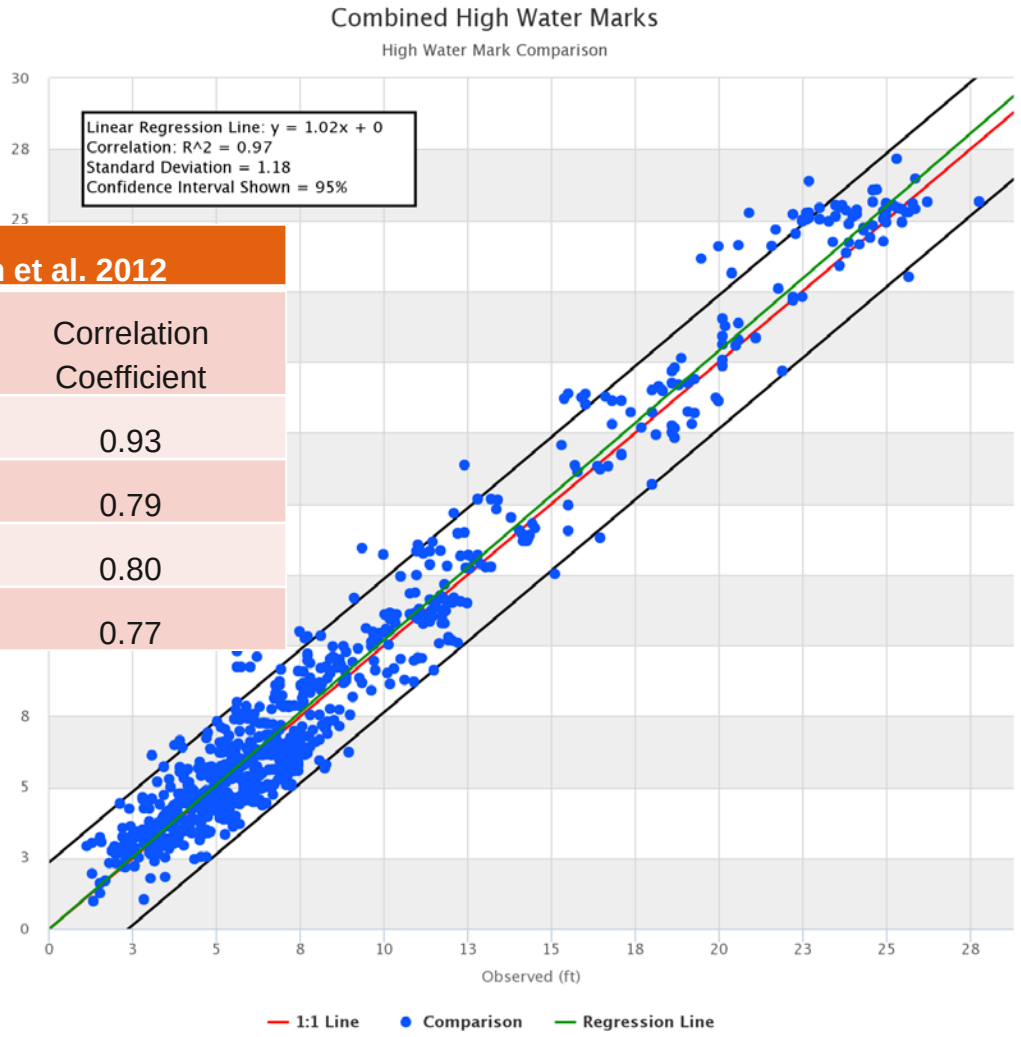
Model Validation

Model Validation

- Validation to recent events
  - Katrina
  - Rita
  - Gustav
  - Ike
- Compare model to high resolution models

Model Validation

	CPRA2017		Dietrich et al. 2012	
Storm	Regression Slope	Correlation Coefficient	Regression Slope	Correlation Coefficient
Katrina	1.04	0.96	1.00	0.93
Rita	1.06	0.73	1.08	0.79
Gustav	0.98	0.77	0.95	0.80
Ike*	0.94	0.78	0.93	0.77



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Future Conditions

Simulation Setup

- Modeling 10, 25, and 50 years into future
- Data provided by ICM
  - Future vegetation
  - Morphology
- Other Scenario Parameters
  - Subsidence
  - Sea level rise
  - Levee subsidence/lifts

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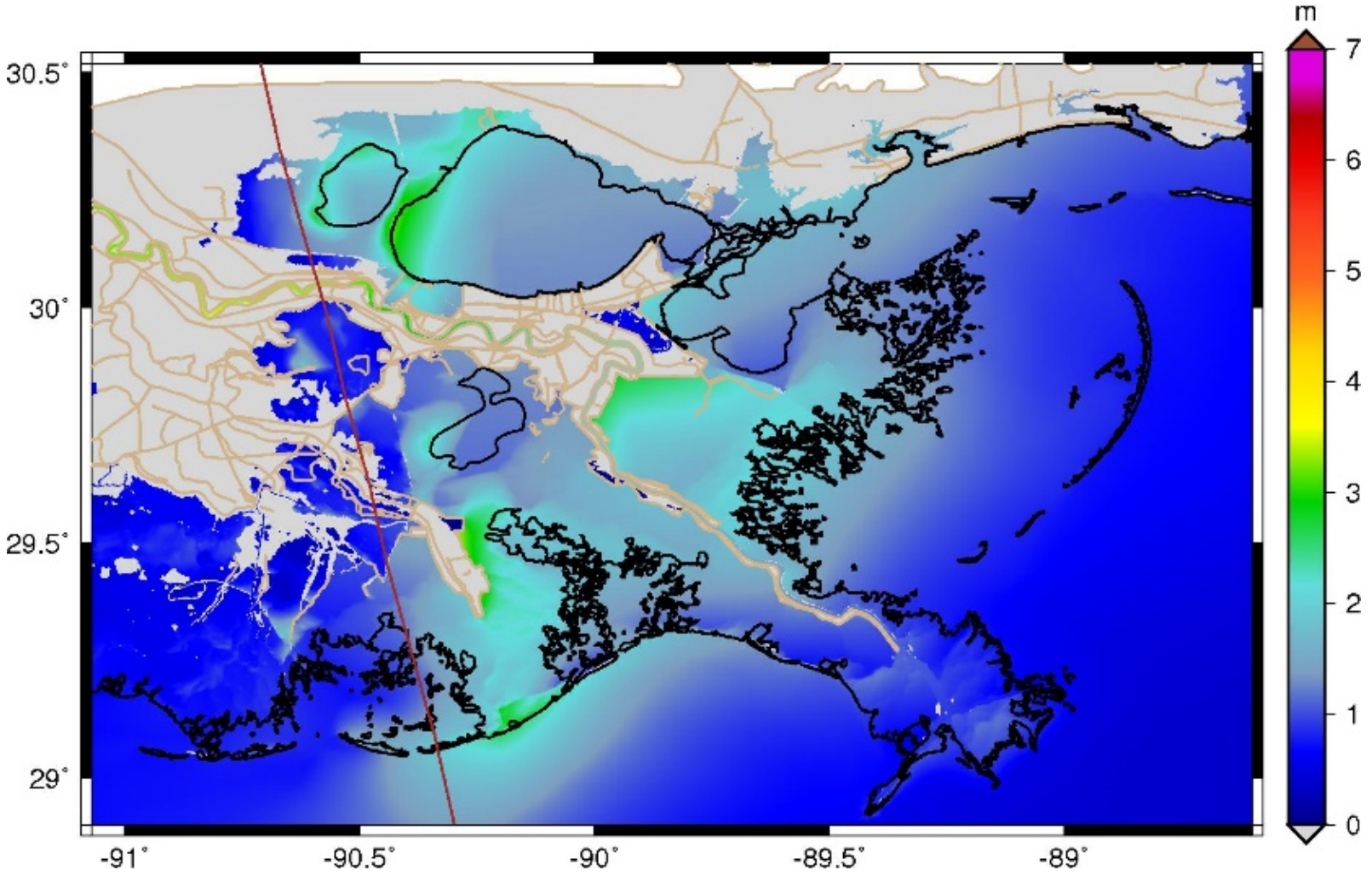
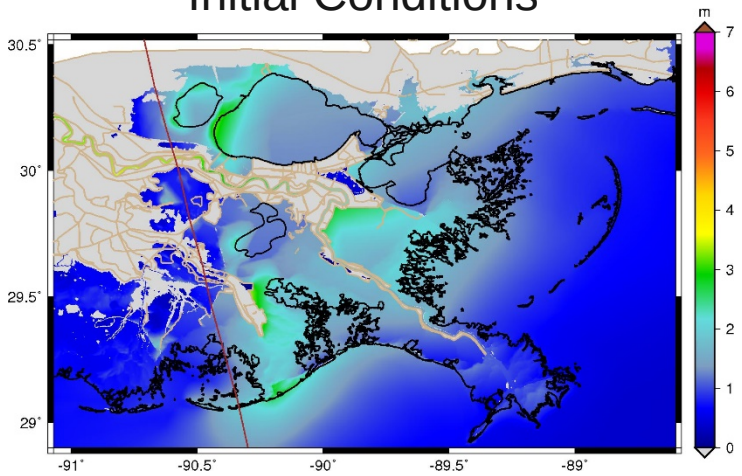
Future Without Action

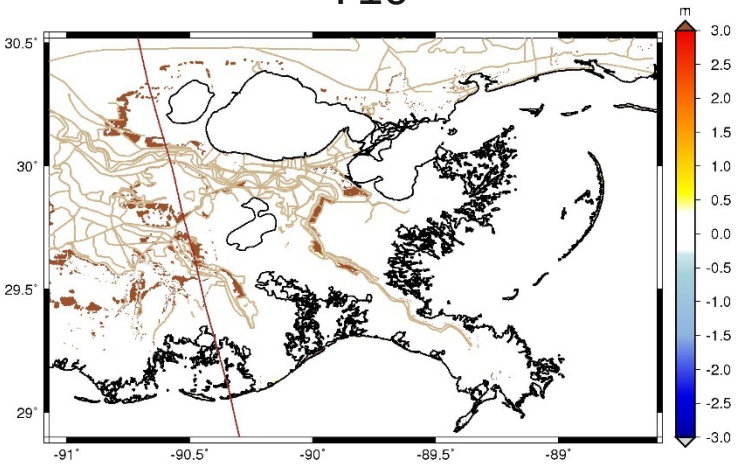


Future Without Action

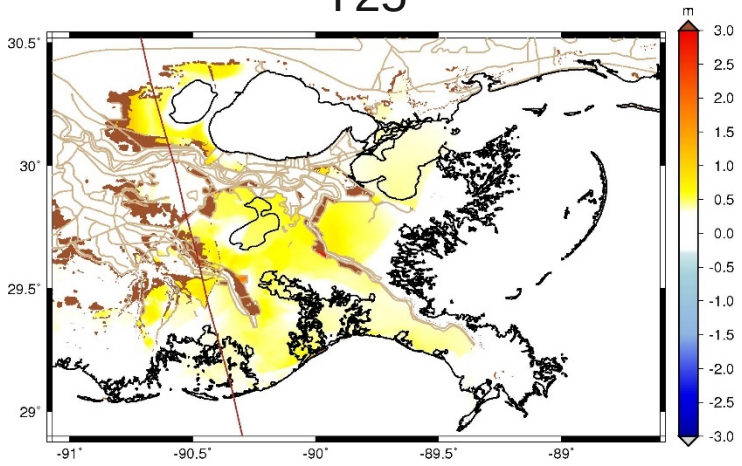
Initial Conditions



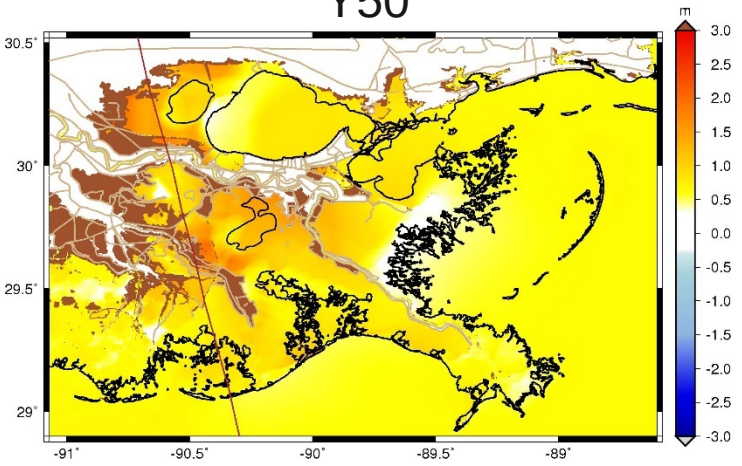
Y10



Y25



Y50



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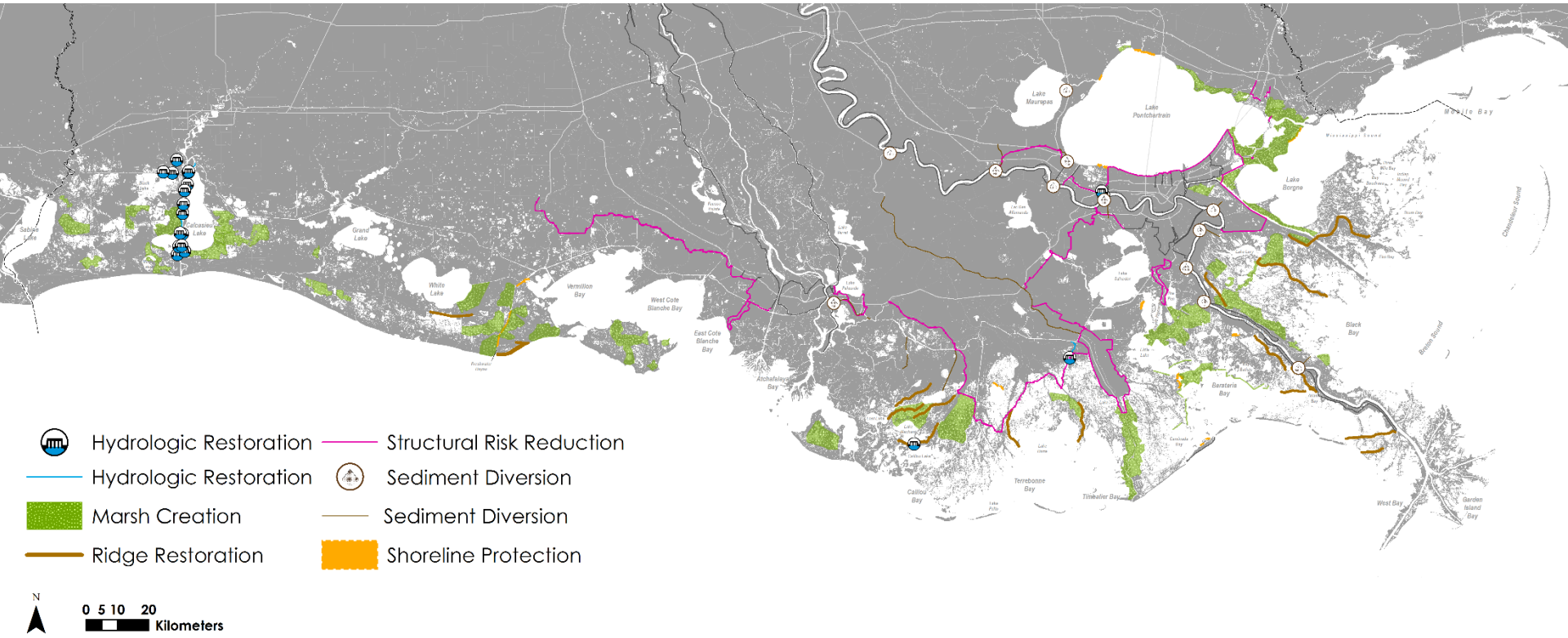
Project Implementation

Project Implementation

- Alternatives
  - Alternative 301: Structural Risk Reduction + Restoration
  - Alternative 303: Structural Risk Reduction Only

Alternative 301



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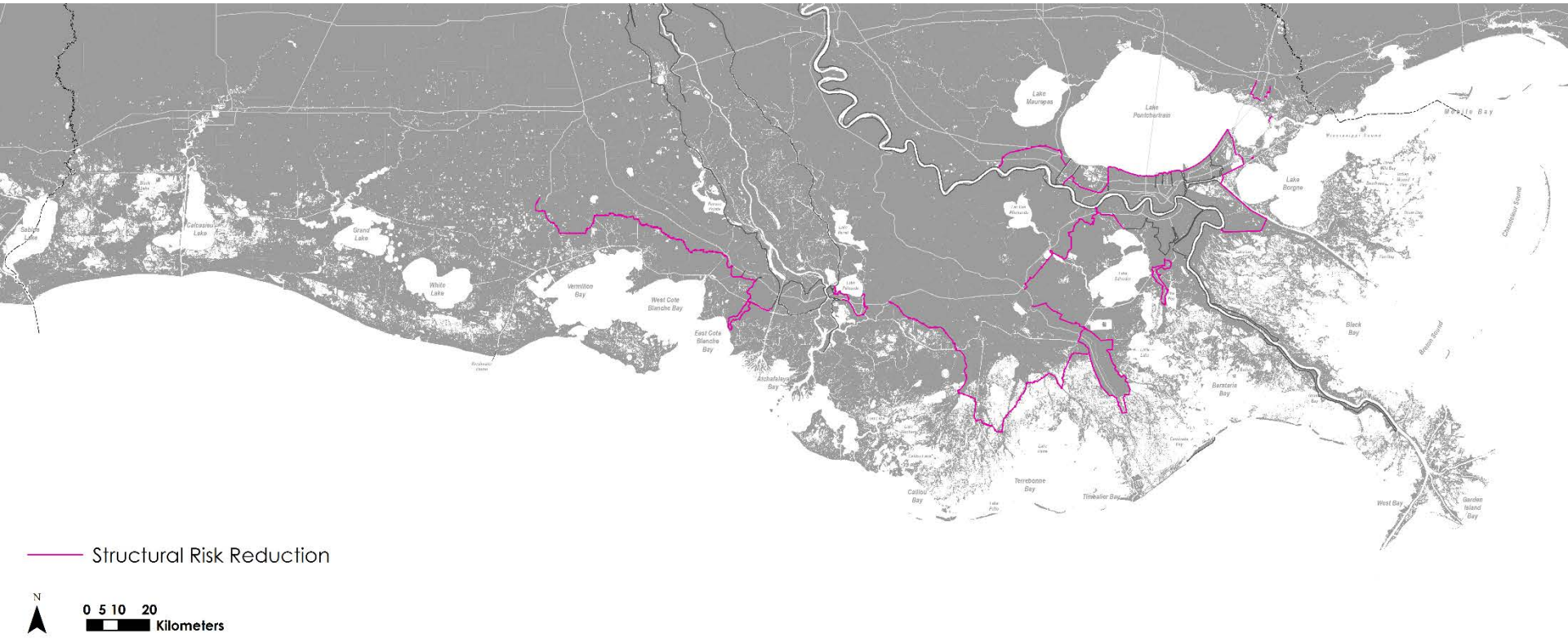
Alternative 303

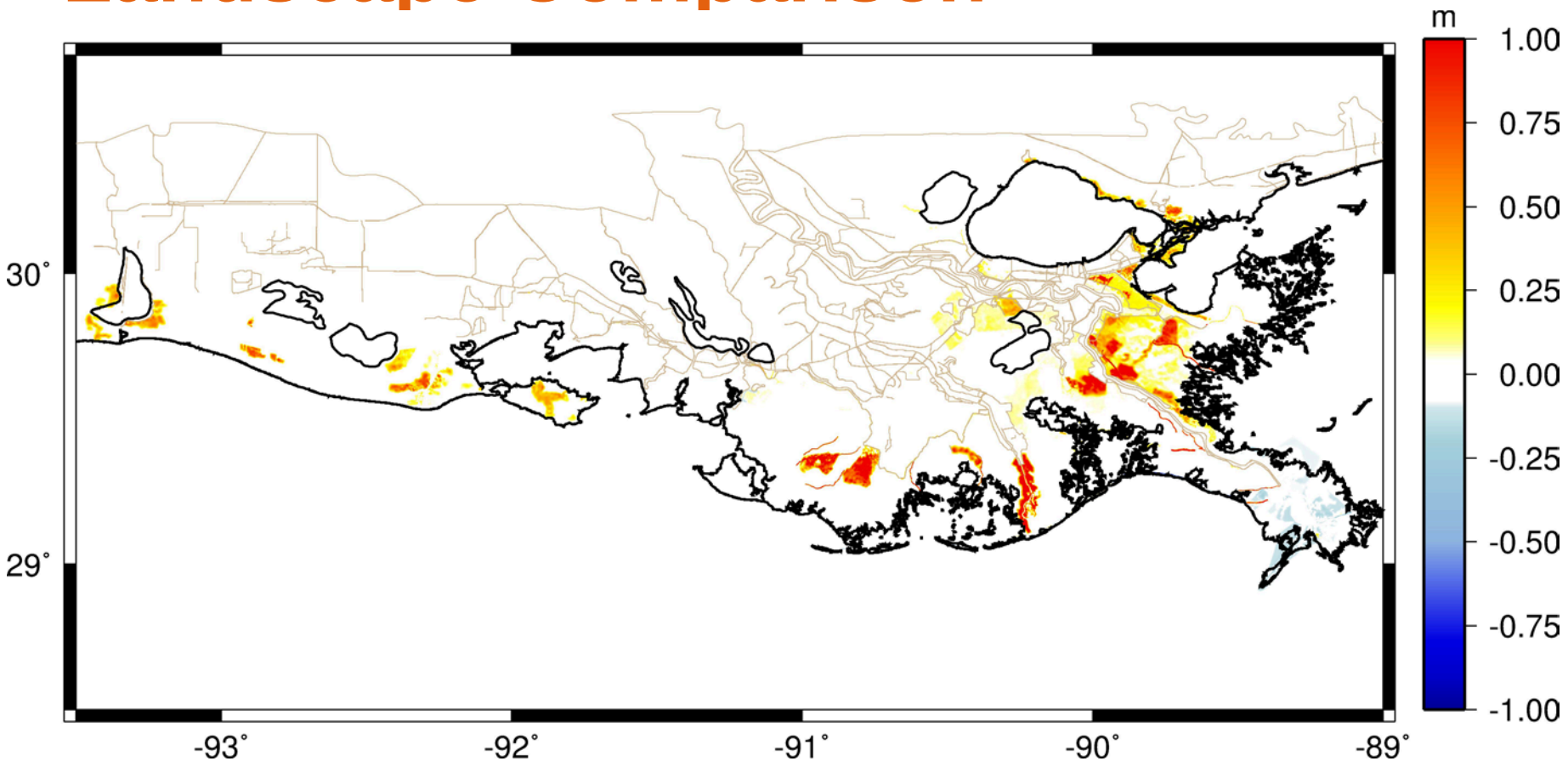


Structural Risk Reduction

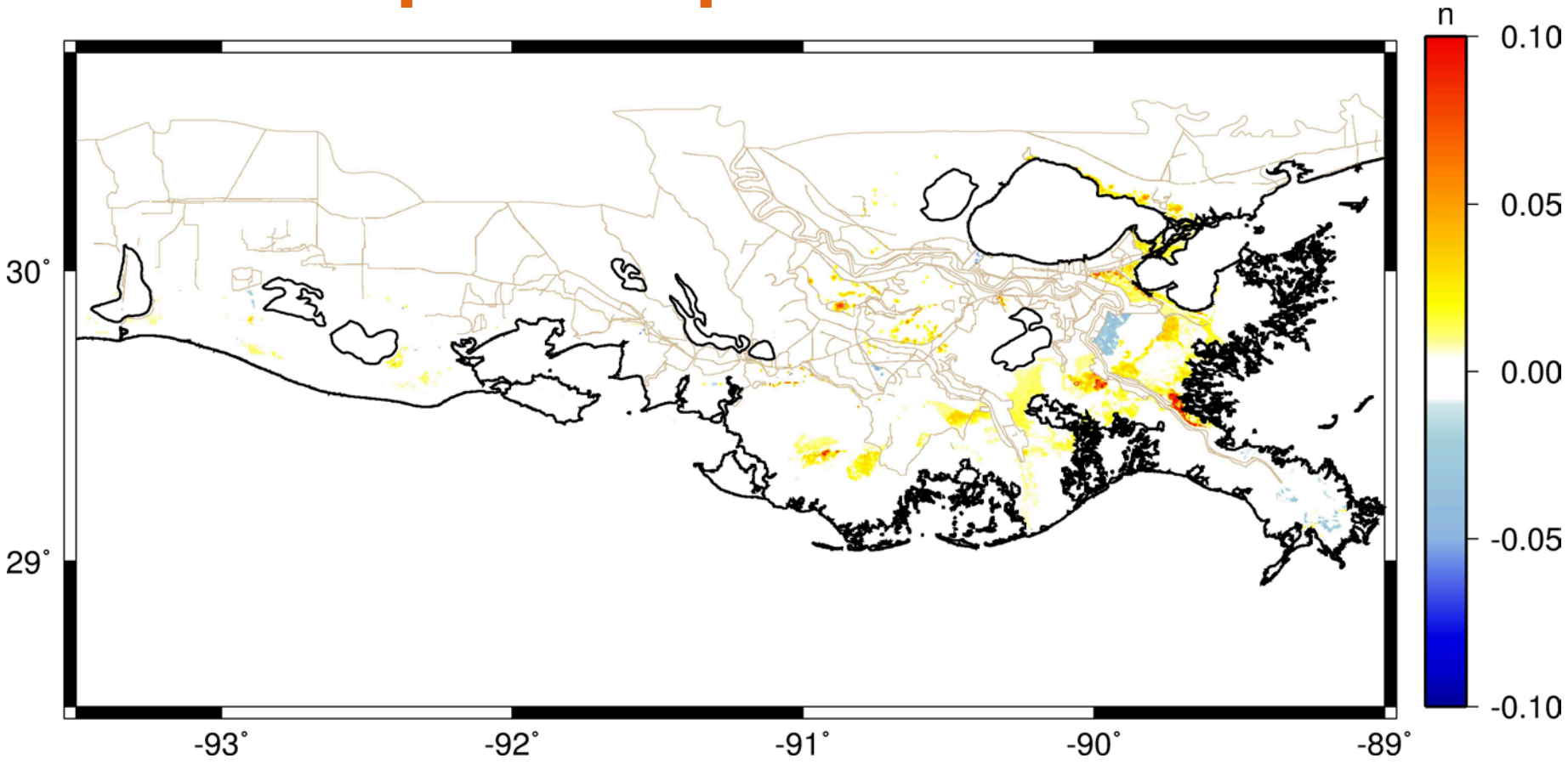
N

0 5 10 20
Kilometers

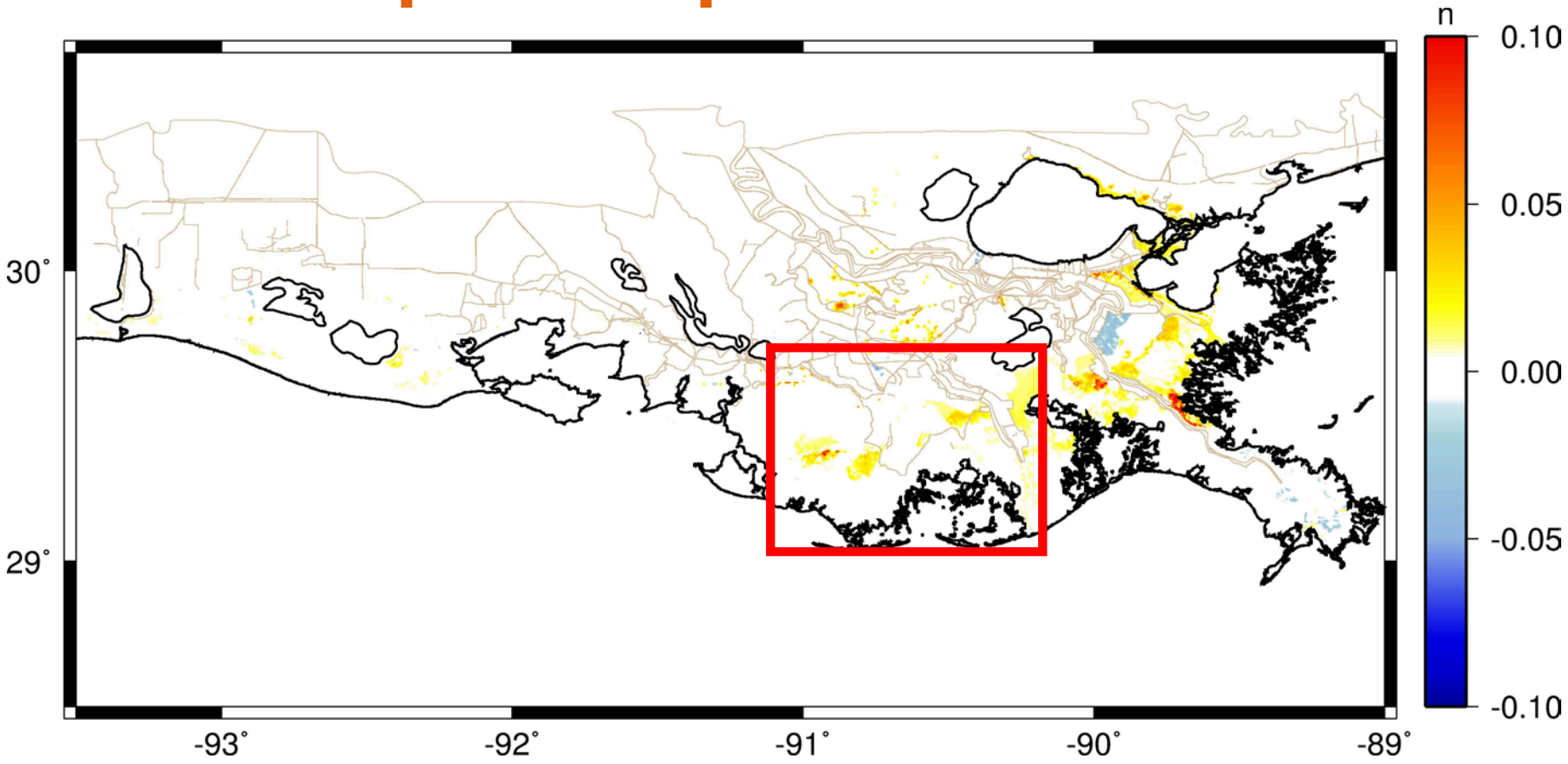
Landscape Comparison



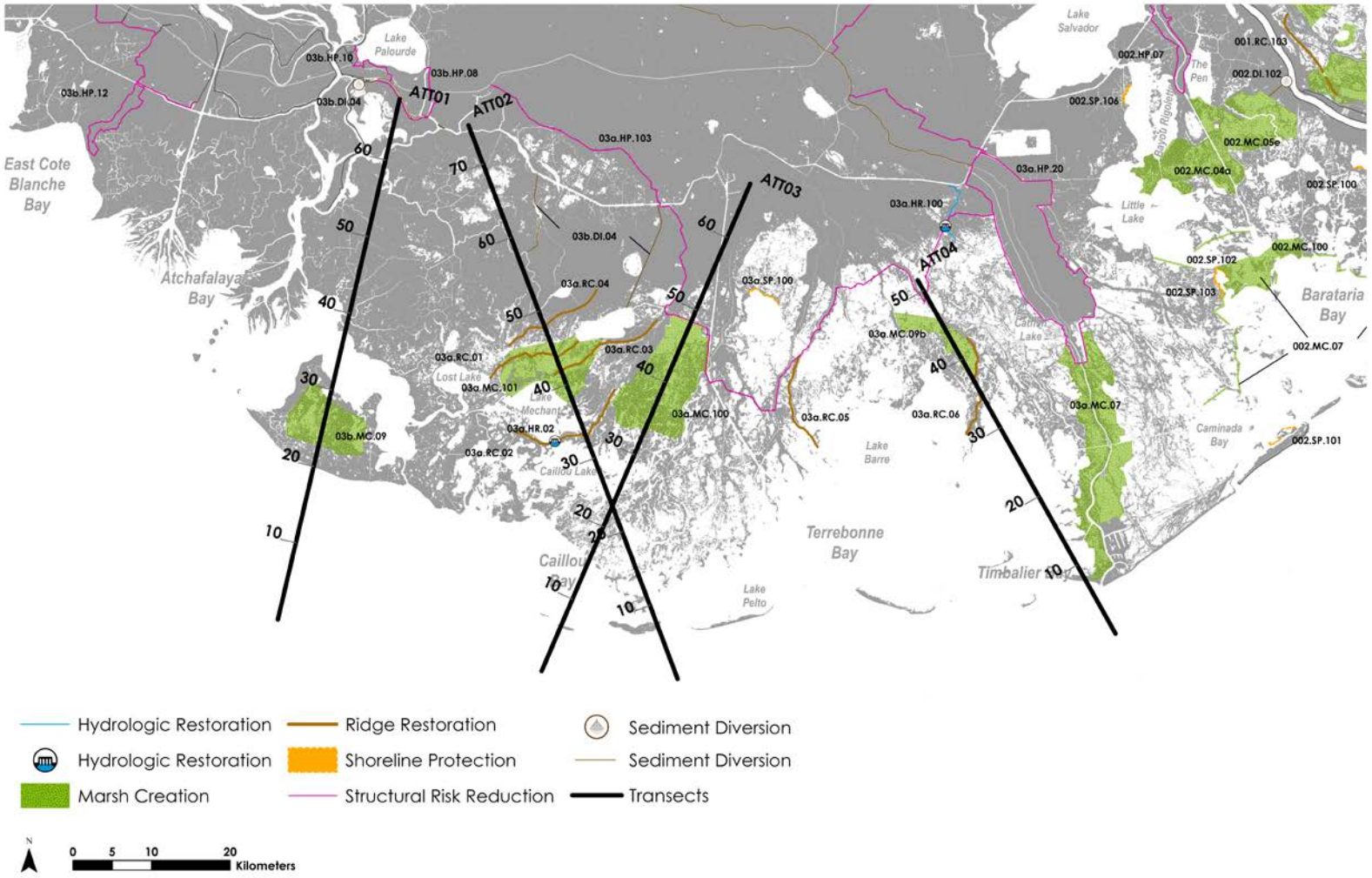
Landscape Comparison



Landscape Comparison

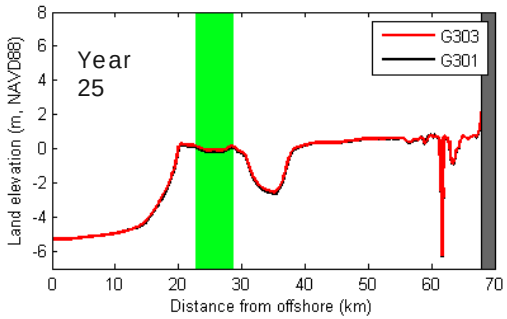


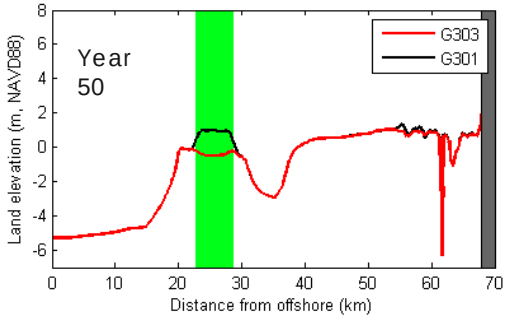
Transect Locations



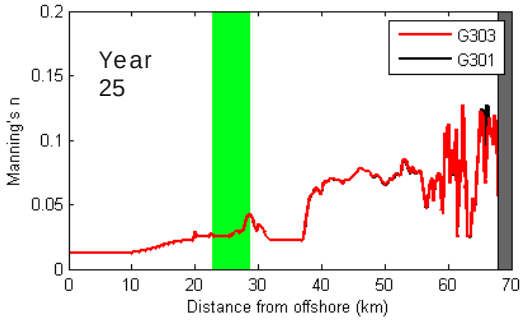
Landscape Comparison

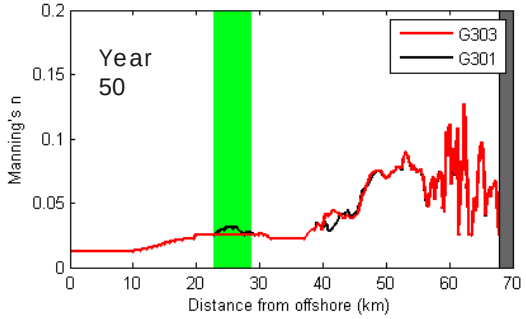
Land Elevation

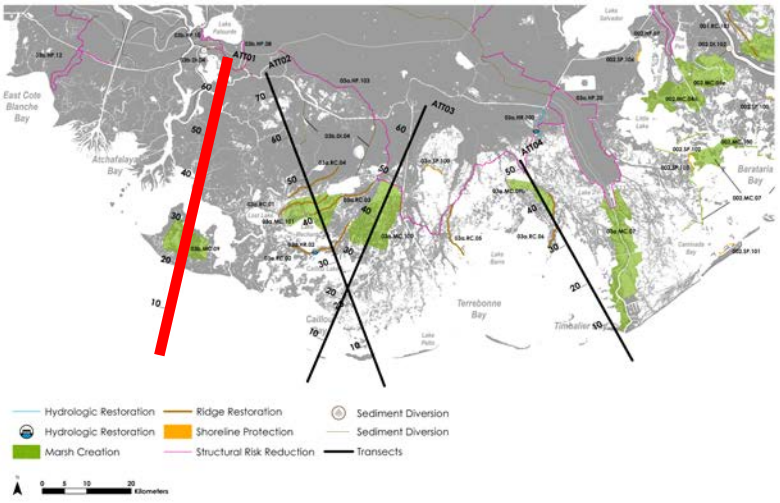




Manning's n

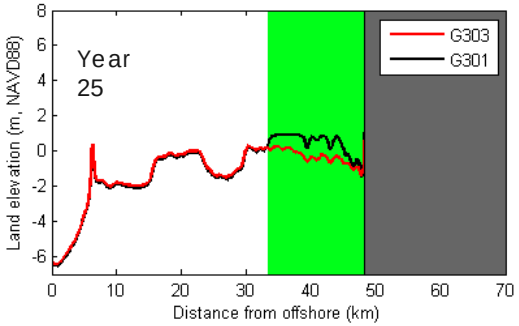


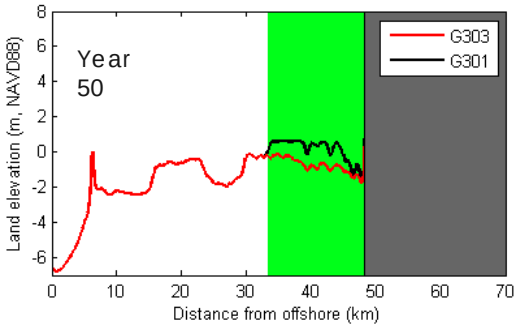




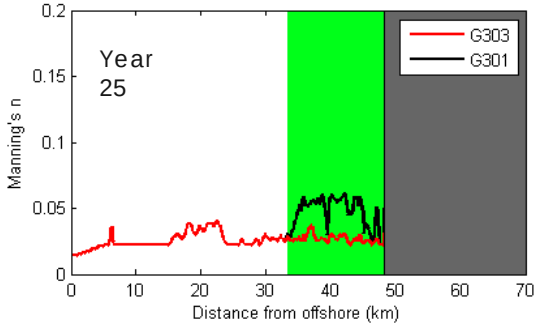
Landscape comparison

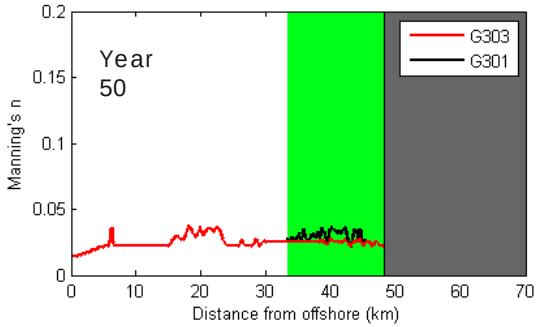
Land Elevation

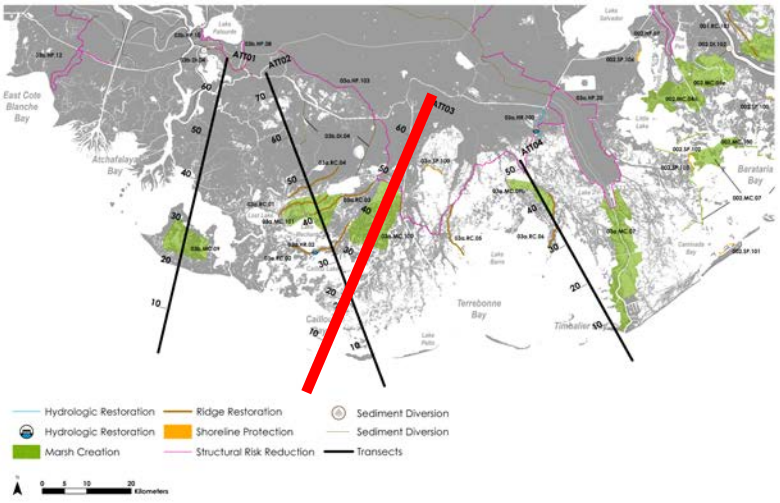




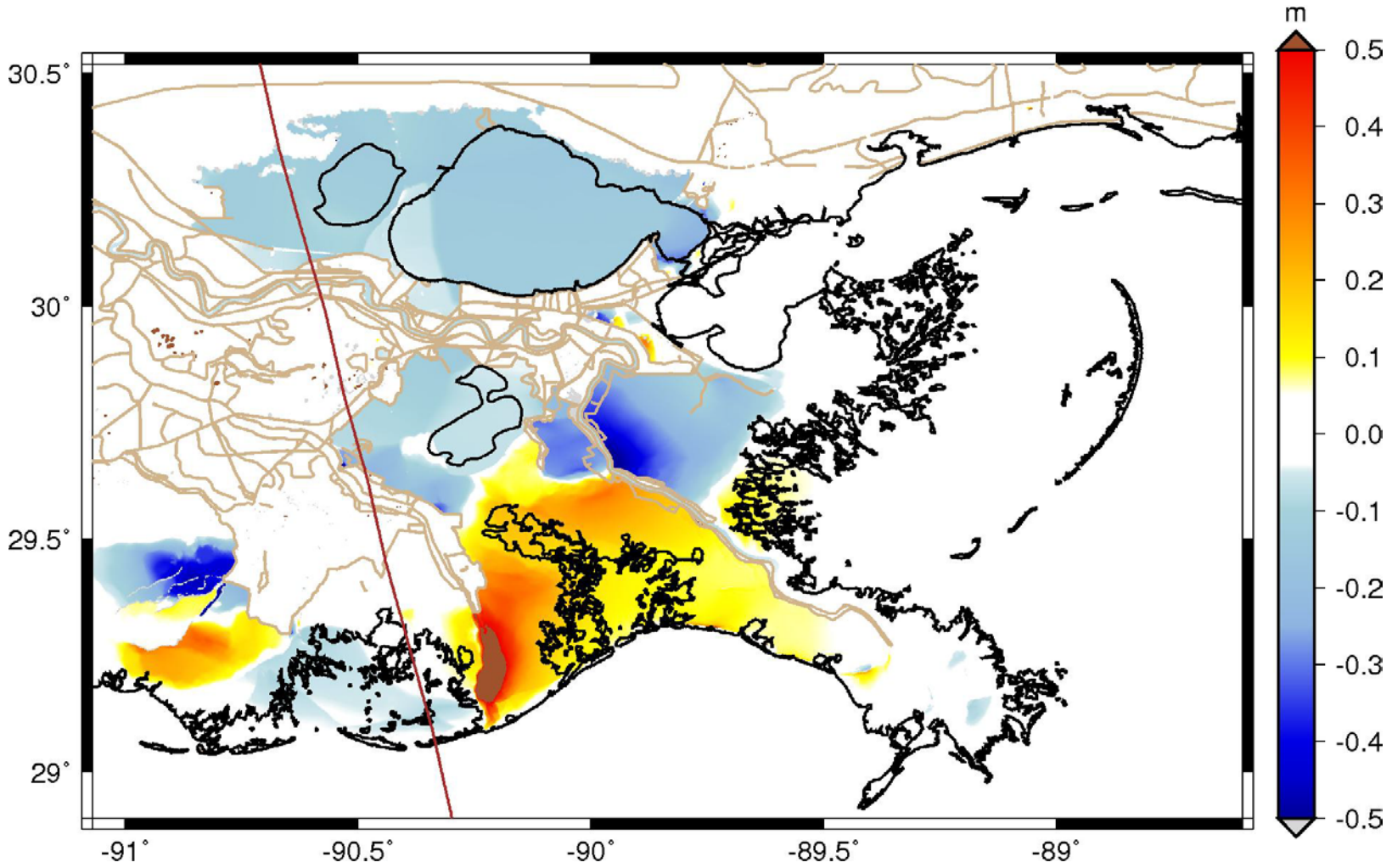
Manning's n



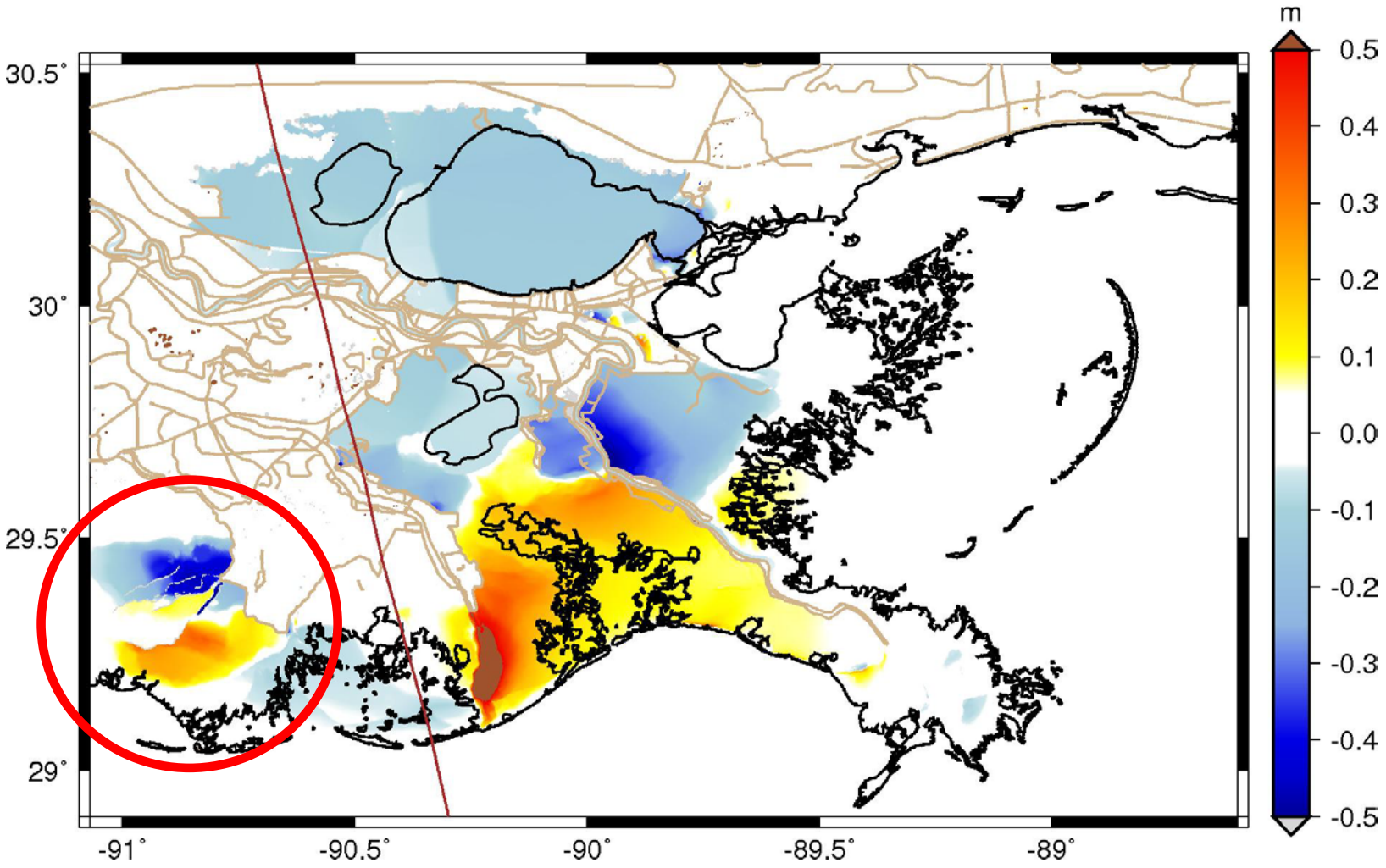




Water surface elevation impact



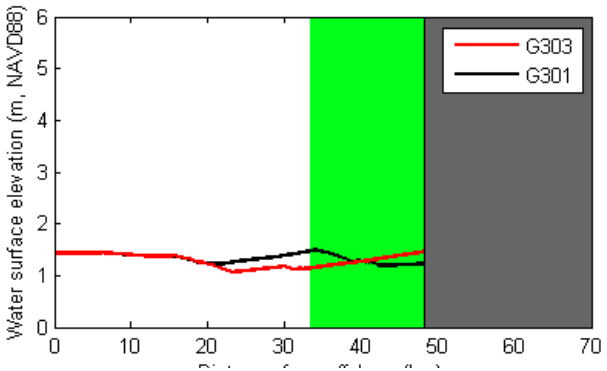
Water surface elevation impact

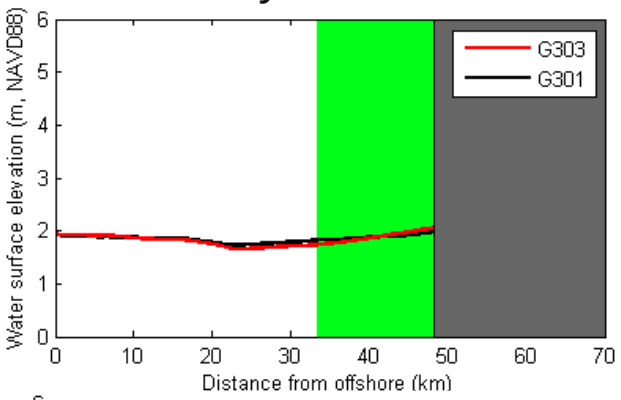


Restoration Impact

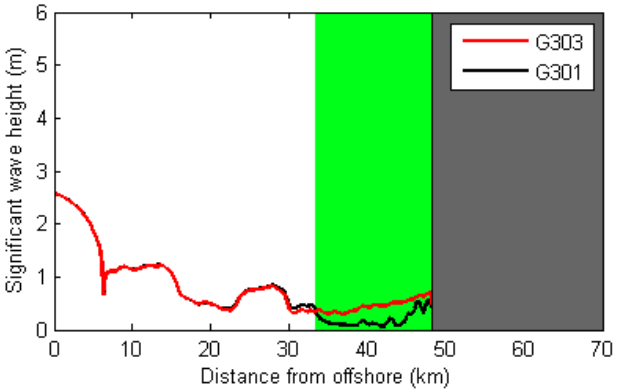
y25 | y50

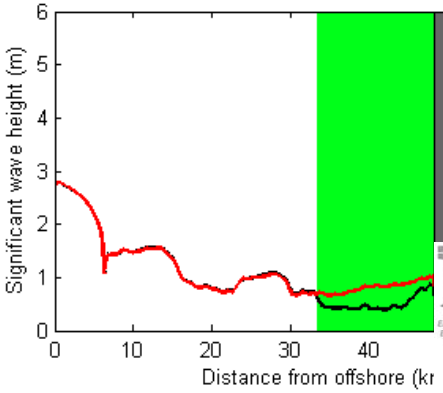
Surge

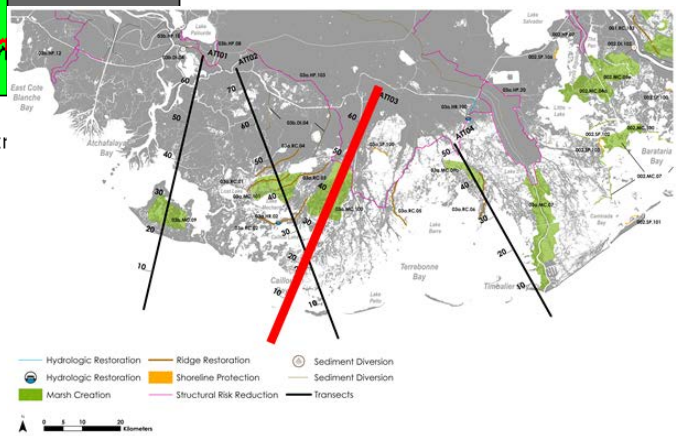




Waves







w/ Restoration

w/o Restoration

Conclusions

Important to account for restoration when conducting levee design

- Both increases and decreases in water levels/waves
- Storm track and basin geometry dependent

Benefits due to restoration projects decrease over time

- Greater sea level rise begins to change extent of marshes created and overwhelm linear features

Apply systems approach to new and existing projects

- Value to long term planning for coastal communities

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Questions