

Modeling Mixed Sediment Transport in GIWW and West Galveston Bay, Texas

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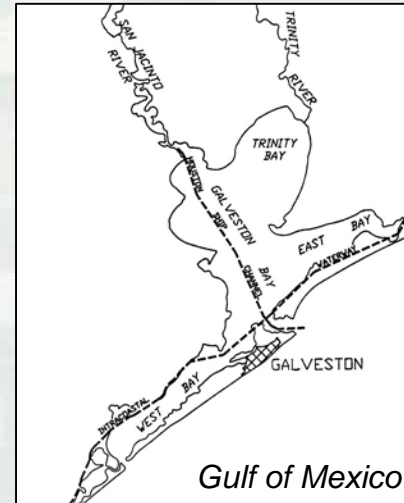




Outline



- Background & Objectives
- Numerical Models & Settings
- Hydro, Wave, and Sediment Transport Simulations
- Shoreline Protection Alternatives
- Summary & Conclusions



West Galveston Bay
(WGB)

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Background

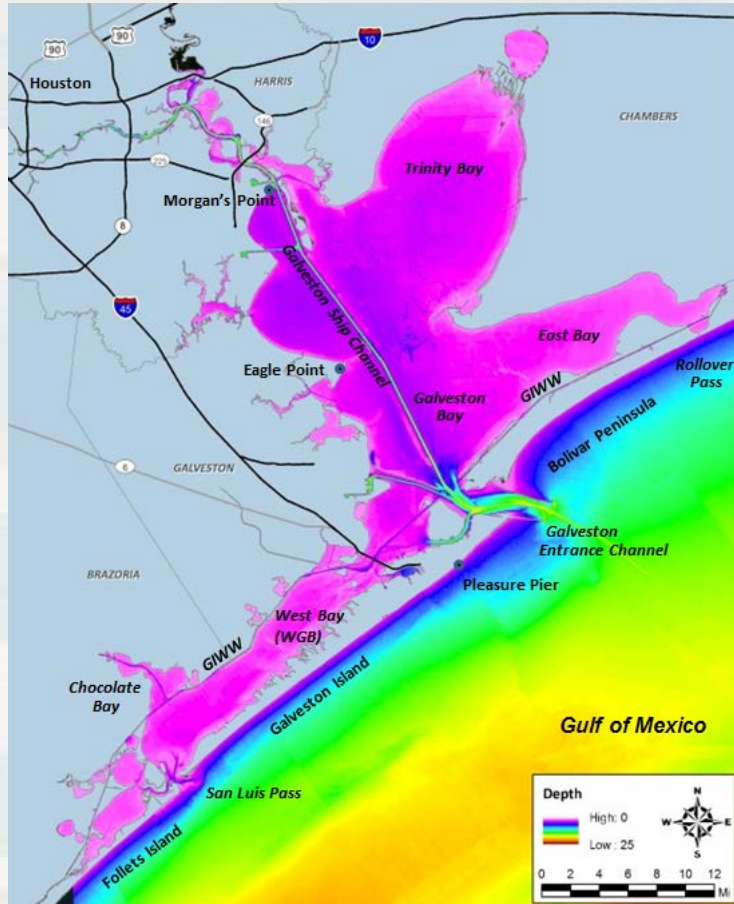


- The Gulf Intracoastal Waterways (GIWW), a light-draft inland channel mainly for barge transportation, runs along the west side of West Galveston Bay (WGB), Texas.
- Extensive shoaling in the WGB GIWW in recent years has resulted in the need for more frequent dredging.
- USACE Galveston District considered shoreline protection alternatives to reduce high shoaling rate in the GIWW.
- RSM and CIRP assisted in the studies.





Galveston Bay System



Multi-inlet system:

1. Galveston Bay Entrance
2. San Luis Pass
3. Rollover Pass

Four subbays:

1. Galveston Bay
2. Trinity Bay
3. East Bay
4. West Bay (WGB)

Two main channels:

1. GIWW
2. Houston Ship Channel (HSC)

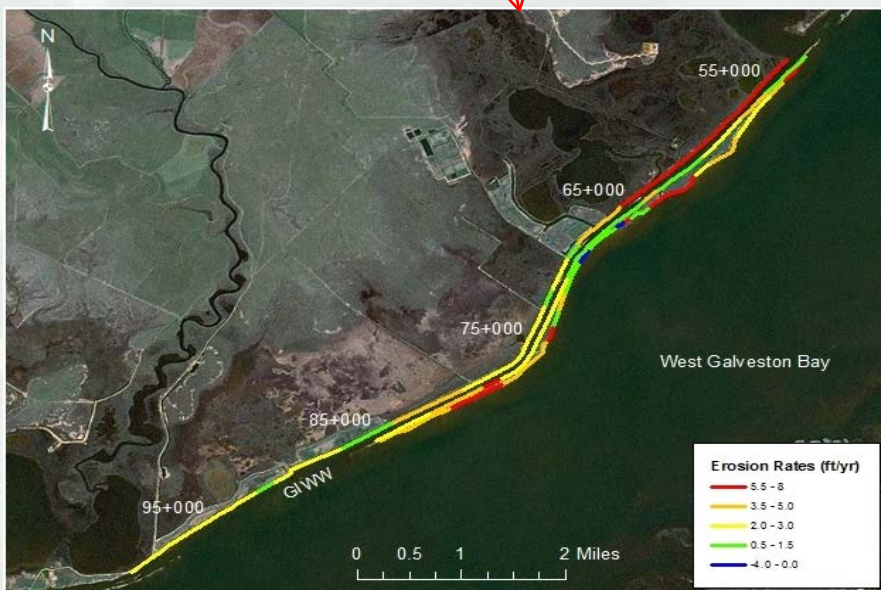


Galveston Bay on average 7-9' deep; WGB ~ 5-7' deep
GIWW, 125' wide, 12' deep; HSC, 530' wide, 45' deep





Placement Area (PA) 63 and 64

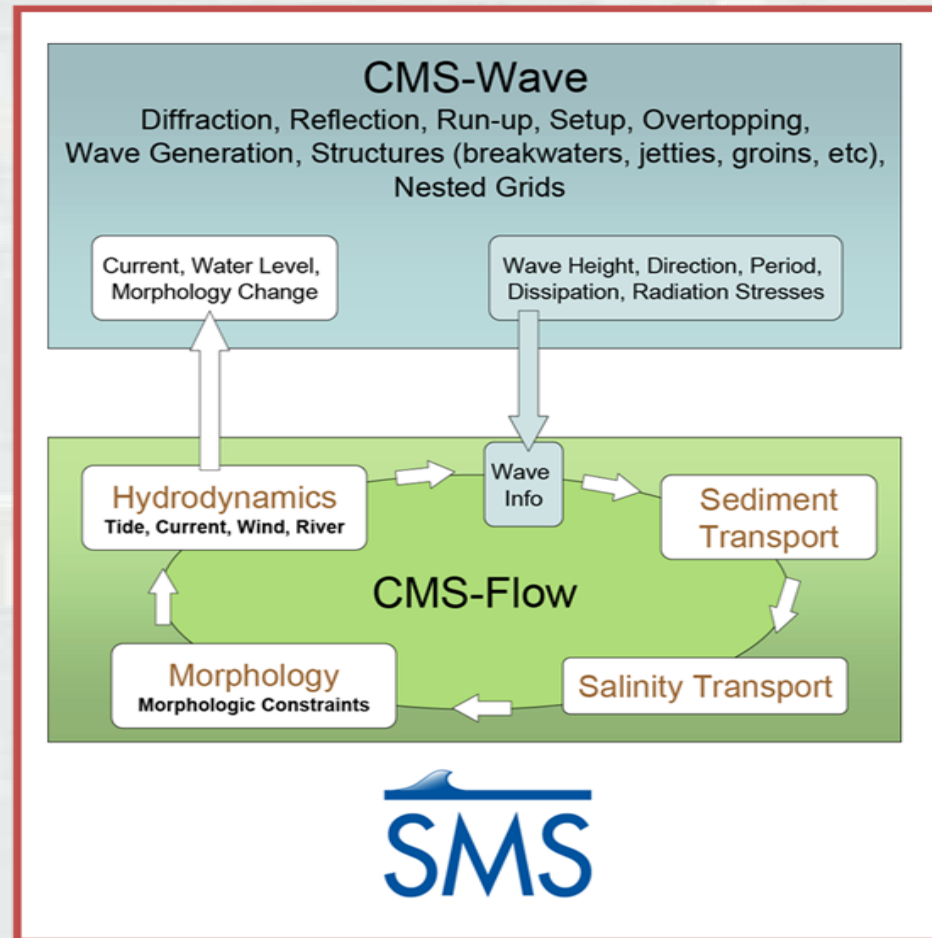




Numerical Models

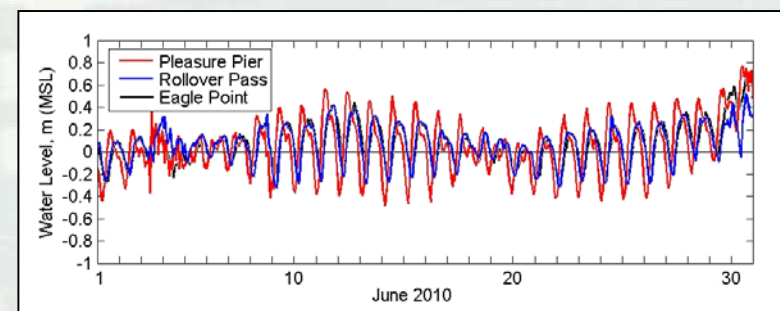
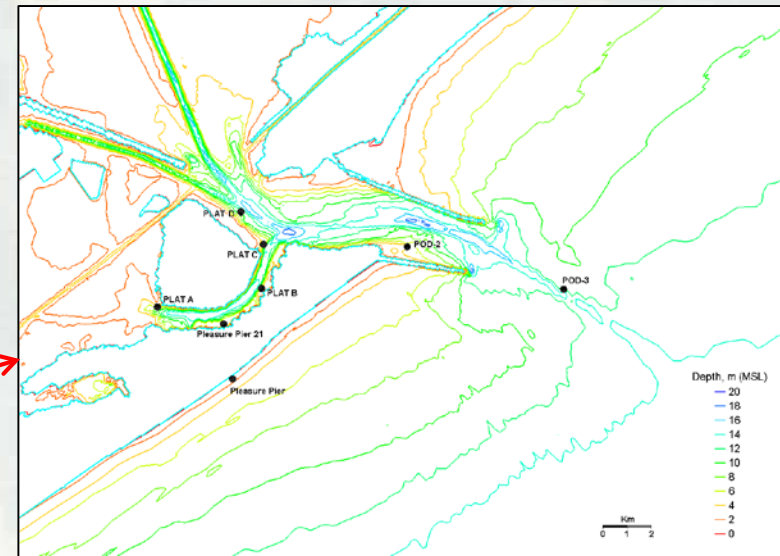
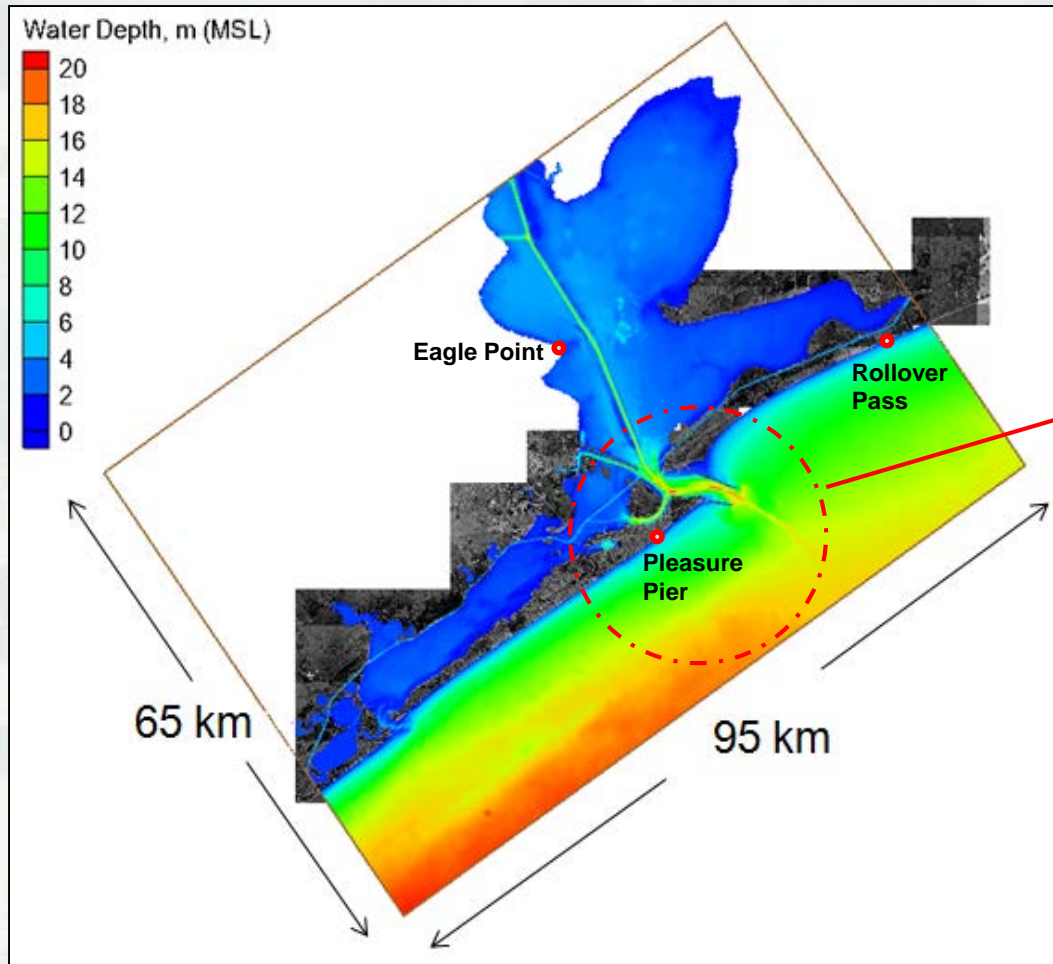


Coastal Modeling System (CMS)





CMS Grid and Water Level Input

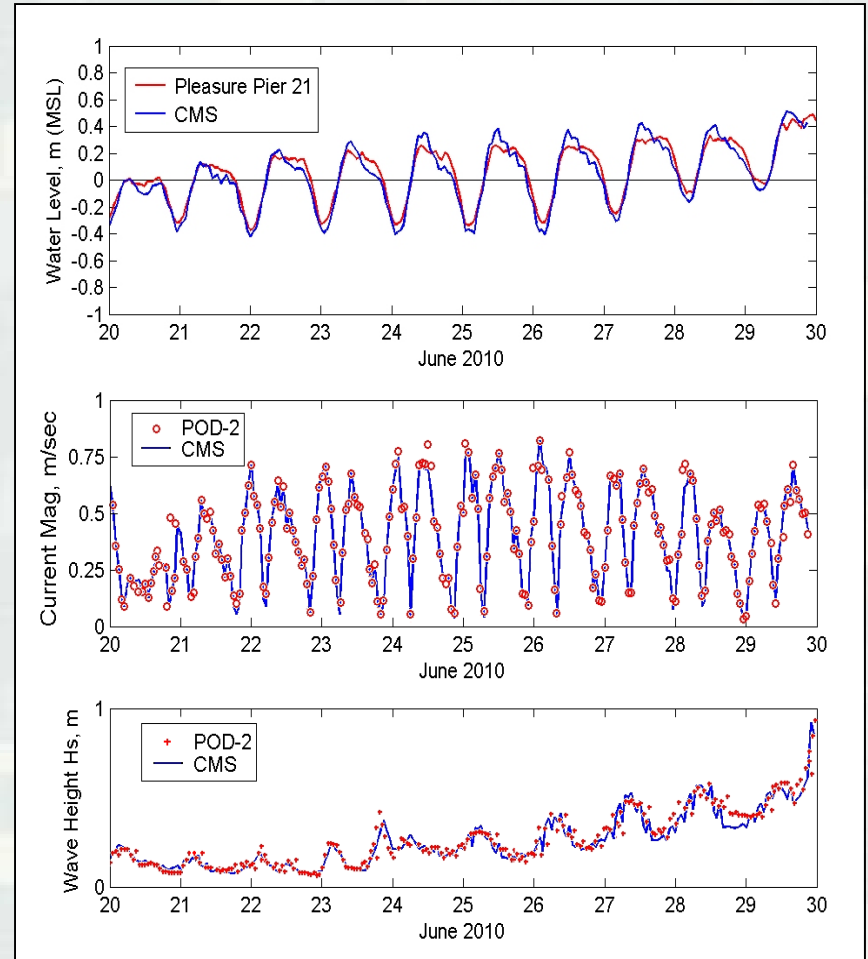
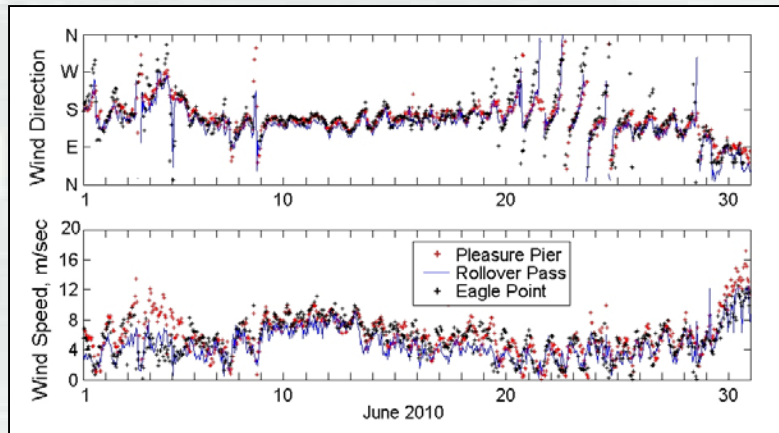
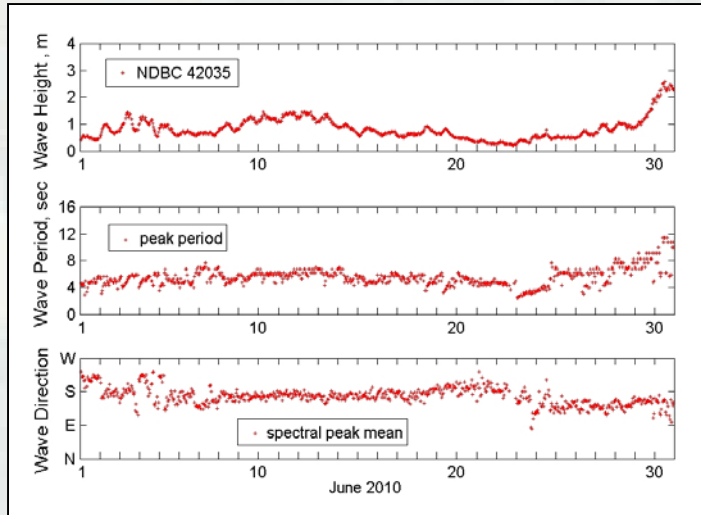


Model Calibration: June 2010





Wind Wave Input & Model Calibration

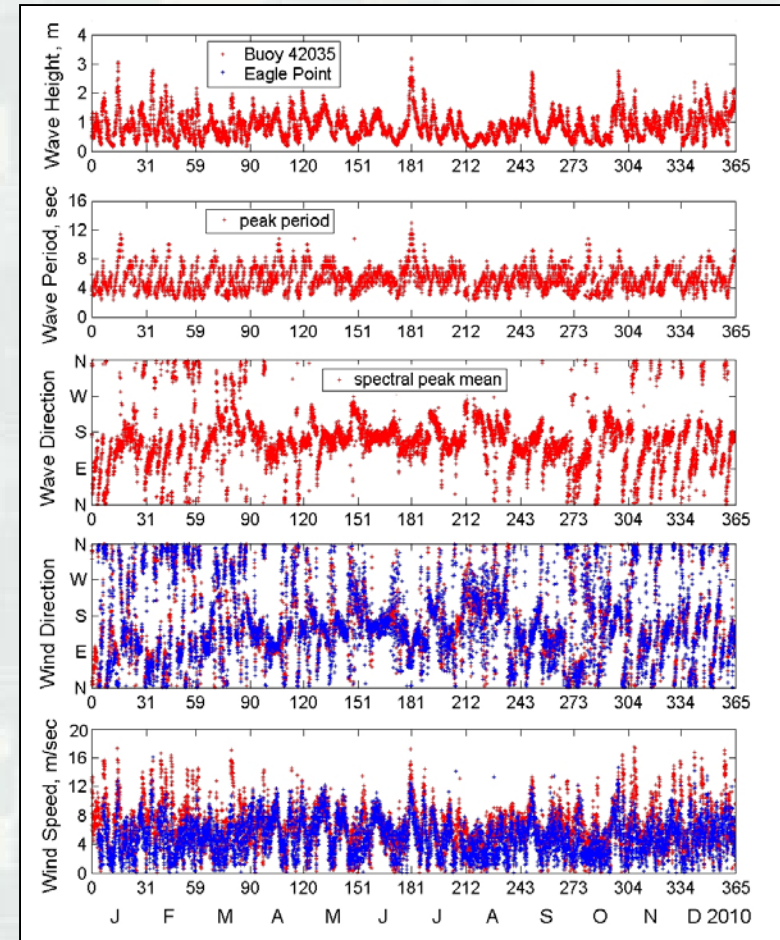
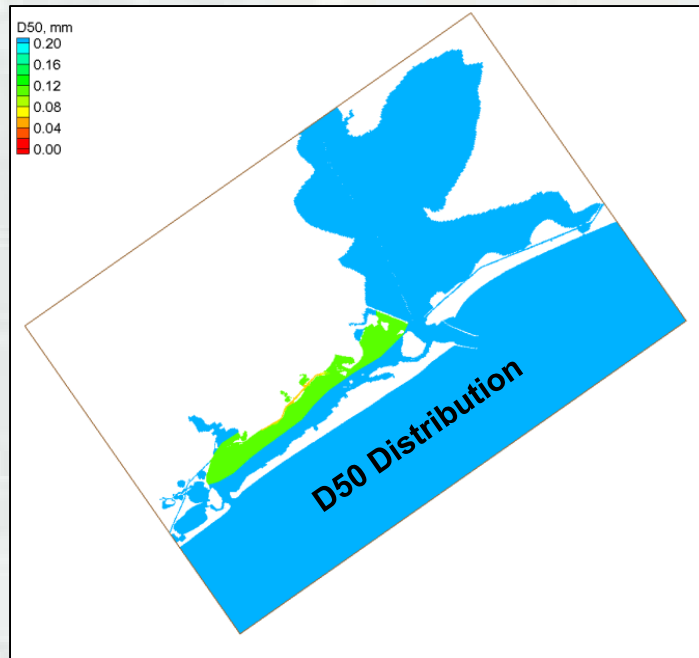
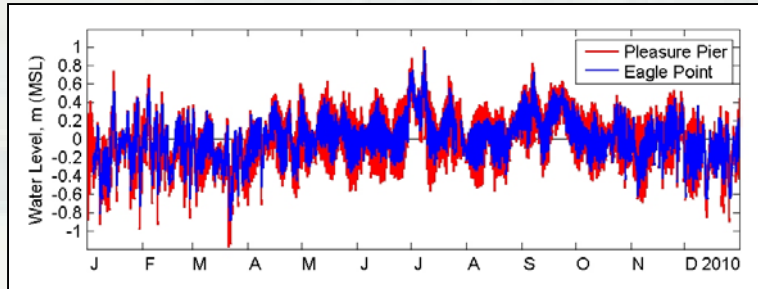


Model Calibration: June 2010





Mixed Sediment Transport Modeling

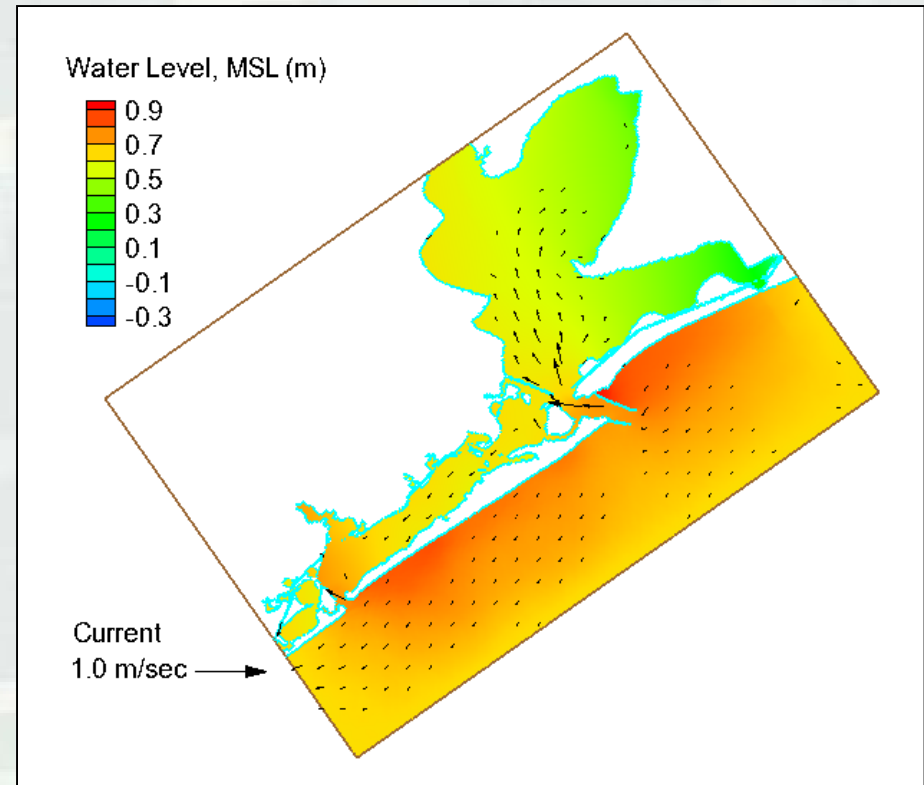
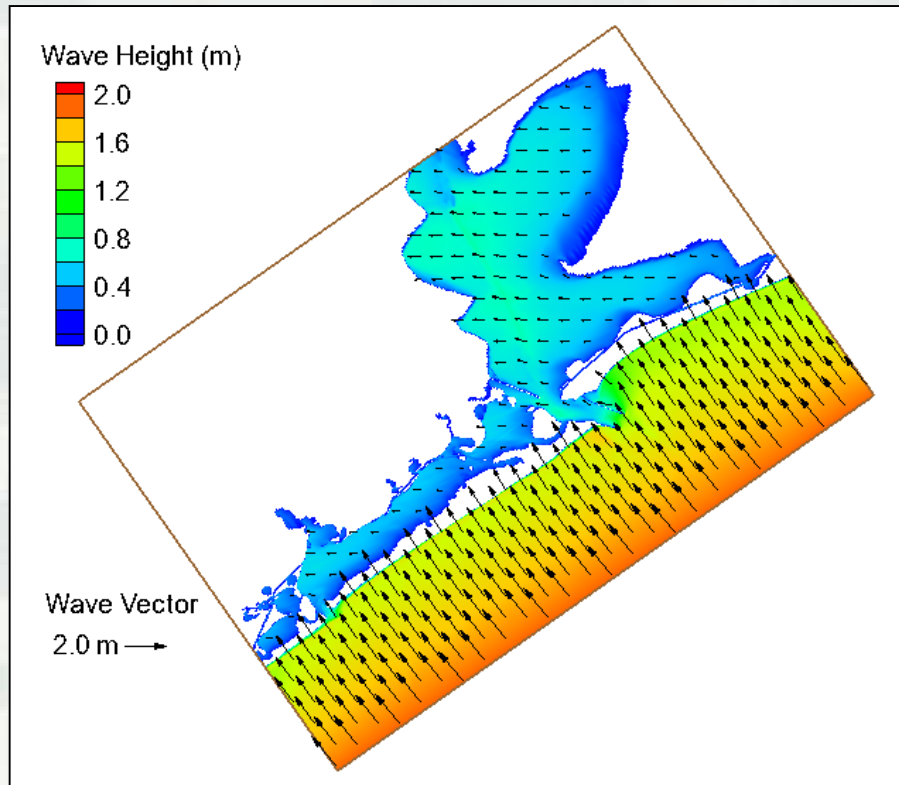


Sediment Transport Modeling: 1-yr Simulation: 2010

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Example Model Wave and Flow Fields



Calculated wave and flow fields at 2100 GMT, 29 June 2010



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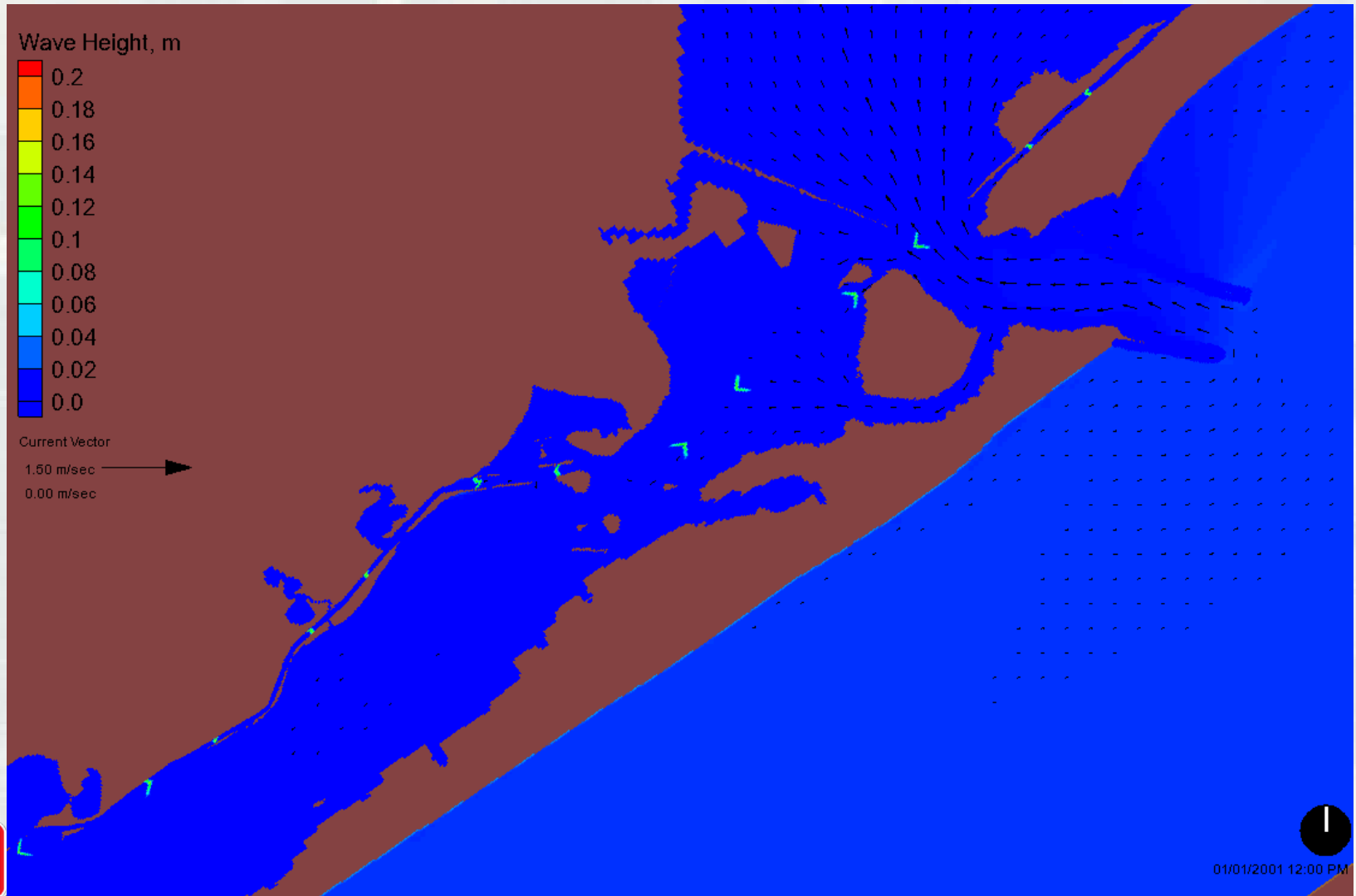


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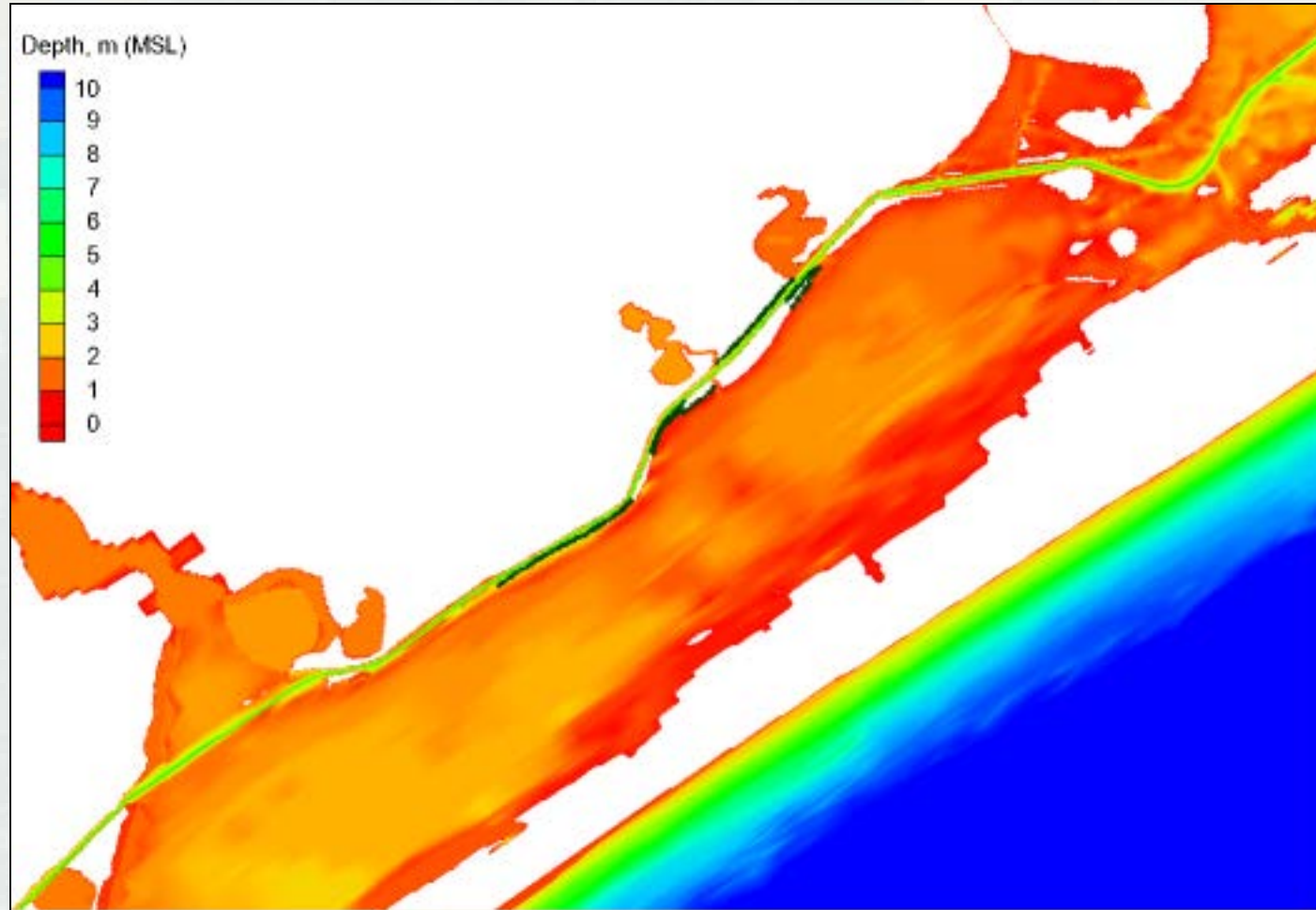
Barge Traffic Simulation

Barge Speed = 5 mph (1 Barge/Hr Each Way)





Proposed Priority 1 Alternative

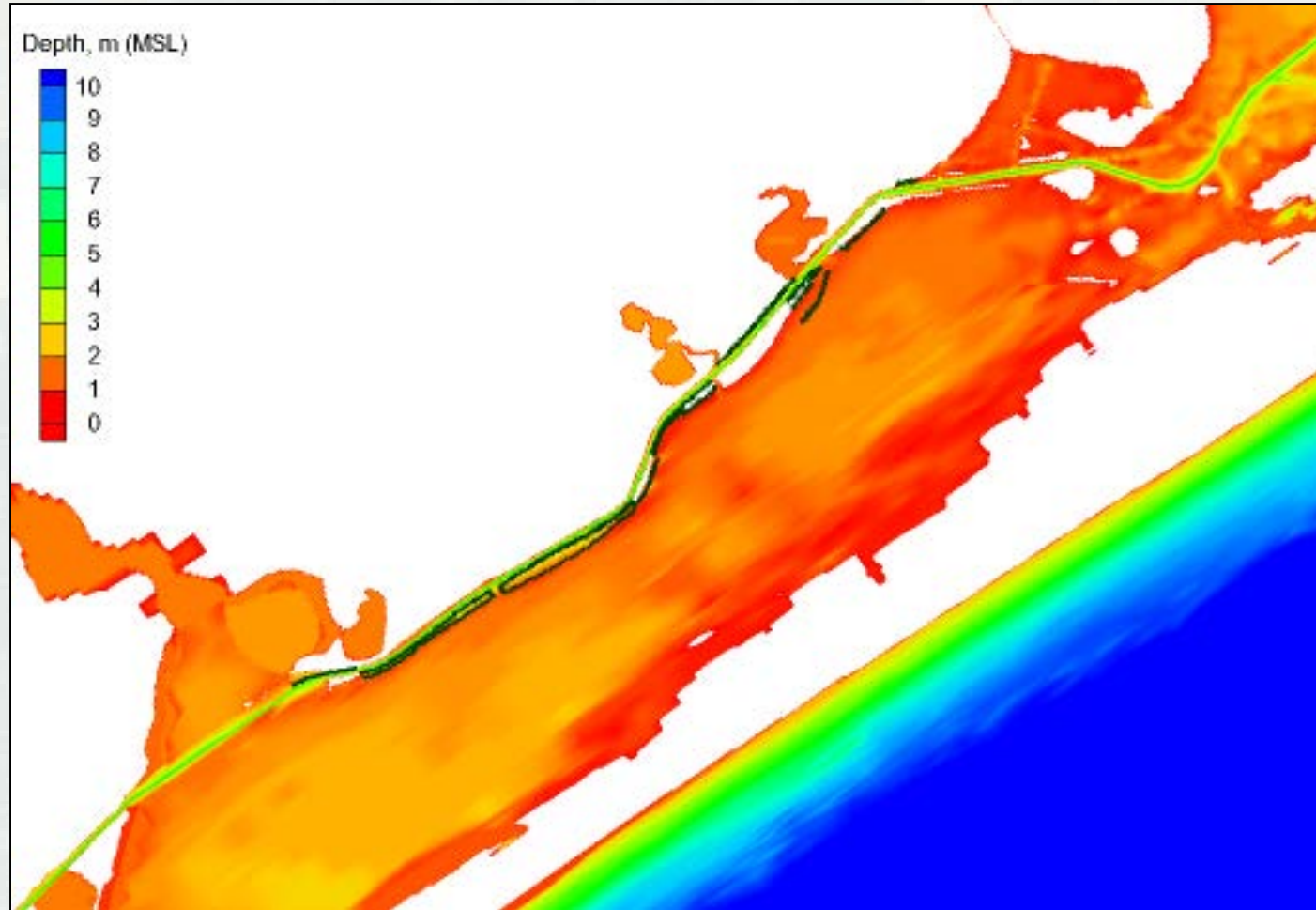


Extend existing revetments to protect shoreline





Proposed All Priorities Alternative



Restore PAs with shoreline protection revetments

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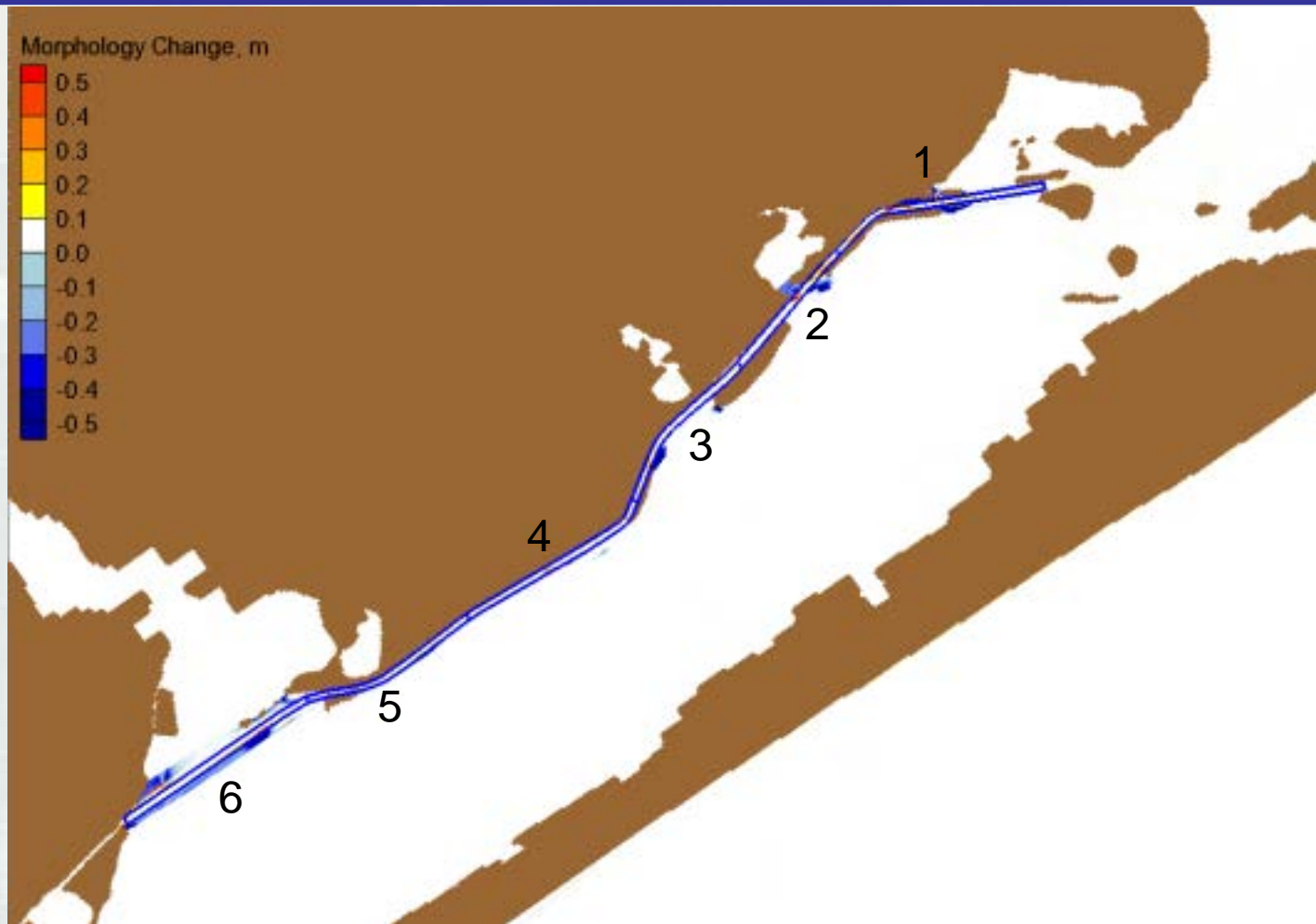
Model Morphology Change (m)

Existing Configuration – Jan-March 2010





Model Volume Change 6 Channel Sections





Model Volume Change (CY*)

Jan-Dec 2010



Channel Sections	Existing Channel	Priority 1 Structures	All Priorities
1	156,140	155,440	148,920
2	89,530	74,030	35,680
3	125,630	48,840	41,150
4	550	2,750	3,130
5	3,360	2,770	8,880
6	21,530	21,640	25,990
Total (Sec1-6)	396,750**	305,470 (23% reduction)	263,750 (34% reduction)

* Calculation based on model hydrated (wet) volume

** Agreed with recent annual average dredge volume
~ 400,000 CY

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Summary & Conclusions



- US Army Engineer RSM, CIRP and Galveston District are teamed up to investigate remedial solutions to reduce the excessive channel shoaling in the GIWW along the west side of WGB, Texas.
- A Coastal Modeling System (CMS) is used to simulate mixed sediment transport in Galveston Bay multi-bay-and-inlet system. The CMS performance is validated by current and wave field data collected in June 2010.
- The model results indicate fine sediments from PAs and shoreline erosion are the main source for channel shoaling in GIWW.
- Based on the model simulation, the shoreline protection and barrier island restoration Alternatives 'Priority 1' and 'All priorities' can reduce GIWW channel shoaling by 23 and 34%, respectively.





Thank you!



Questions?

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