



USGS Contributions to Gulf of Mexico Coastal Science: Selected Projects of the St. Petersburg Coastal and Marine Science Center

Jack Kindinger, Oceanographer

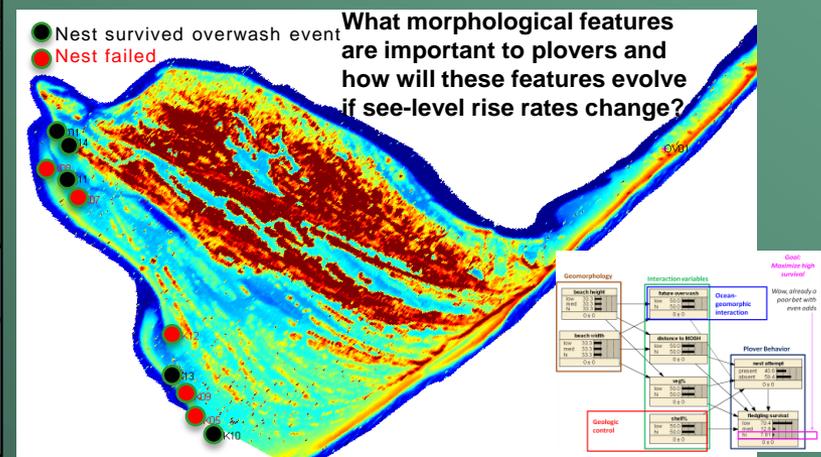
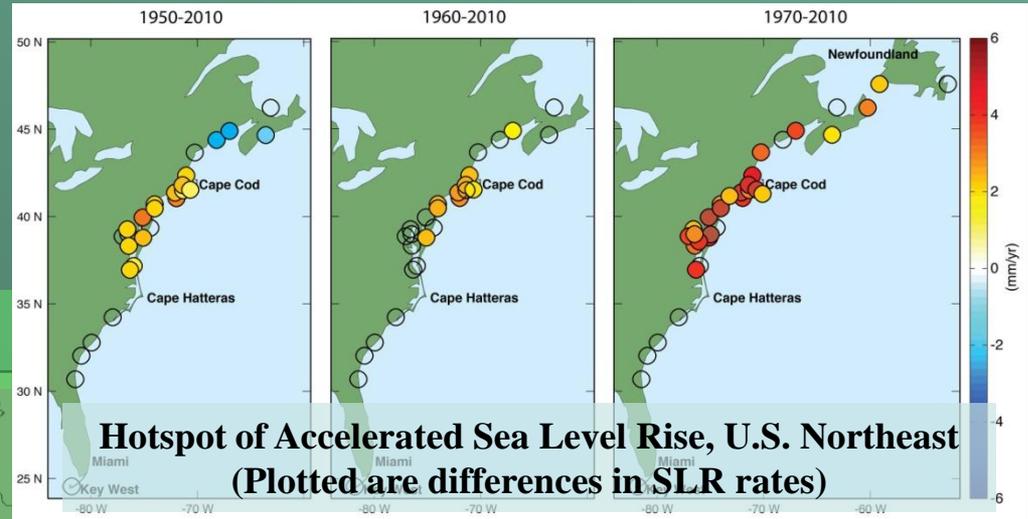
**WebEx Texas Water Science Center, Austin, Texas
September 8, 2011**

U.S. Department of the Interior
U.S. Geological Survey

Predicting Coastal Change

Coastal Hazards Sea Level Rise and Storms

Probability of overwash during category 1-5 hurricane landfall
Hilary Stockdon



Predicting Coastal Change

Coastal Hazards Sea Level Rise and Storms

Hurricane Irene - Coastal Change Hazards: Hurricanes and Storms

<http://coastal.er.usgs.gov/hurricanes/irene/>

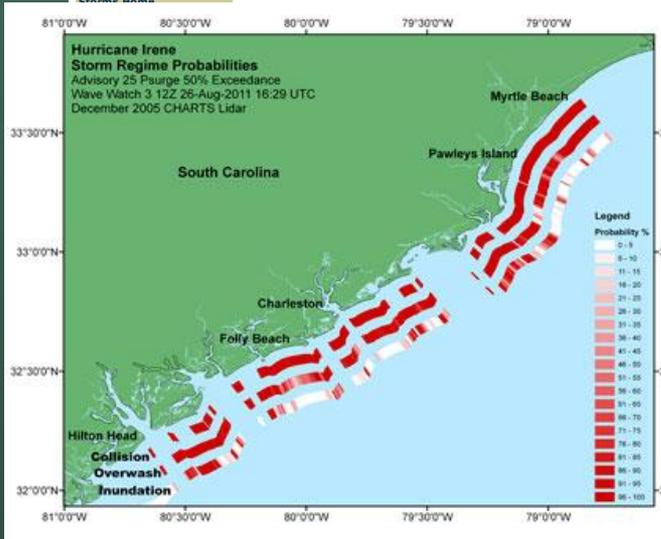
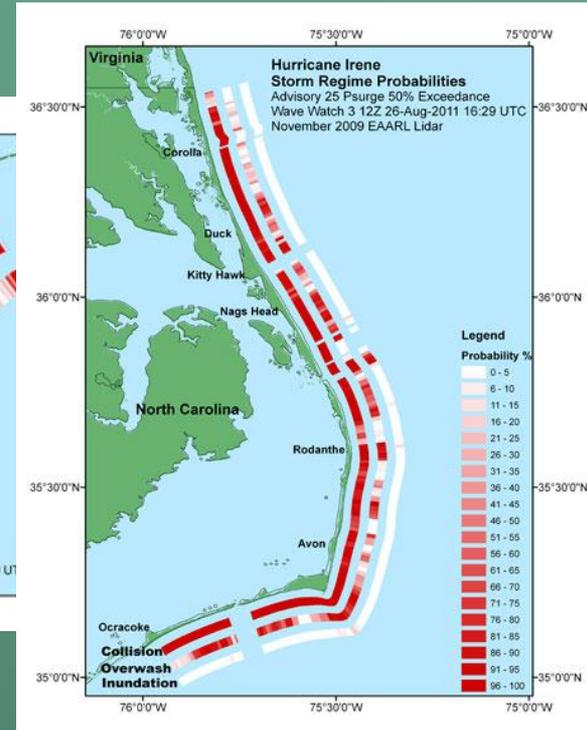
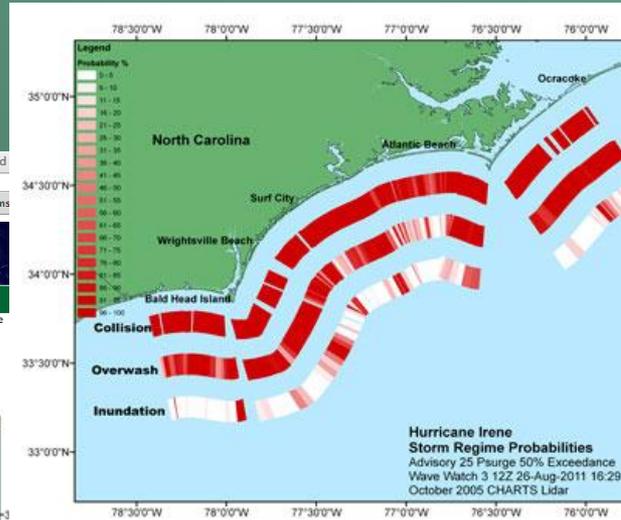
Bonjour SPC&M home Personal My Yahoo! Internal USGS AOL Mail Govtrip Webforms

USGS
science for a changing world

St. Petersburg Coastal and Marine Science Center
St. Petersburg Coastal and Marine Science Center > Coastal Change Hazards: Hurricanes and Extreme Storms > Hurricane Irene

Coastal Change Hazards: Hurricanes and Extreme Storms

Hurricane & Extreme Storms
Hurricane Irene



topography and the
to show the nature,
erwash deposition, and
els of coastal impacts

pleted 08/25/11)
zed storm scenarios
-specific conditions

(web post)

**Assessment of Potential Coastal-
Change Impacts Hurricane Irene
Friday Aug. 26th**



Gulf of Mexico Science Projects

Predicting Coastal Change

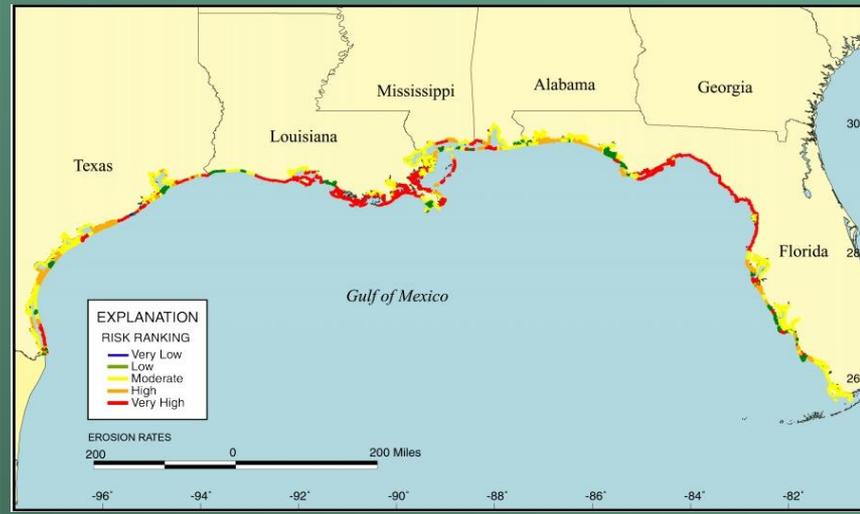
Coastal Hazards Sea Level Rise and Storms



Pea Island Ranger Station, Coastal-
Change Impacts Hurricane Irene
Wednesday, August 30, 2011

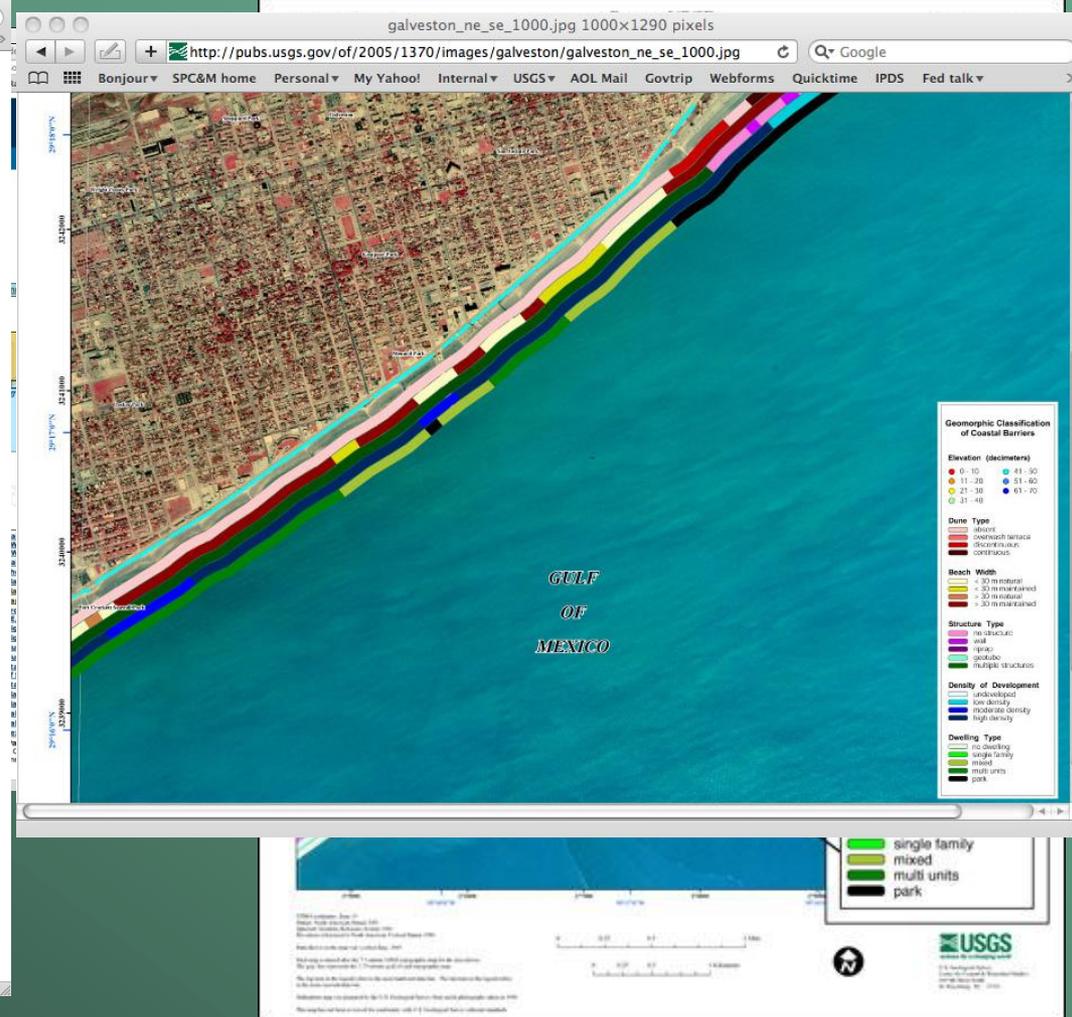
Predicting Coastal Hazards: Coastal Vulnerability

Ranking of coastal vulnerability index					
	Very low	Low	Moderate	High	Very high
VARIABLE	1	2	3	4	5
Geomorphology	Rocky, cliffed coasts Fiords Fiords	Medium cliffs Indented coasts	Low cliffs Glacial drift Alluvial plains	Cobble beaches Estuary Lagoon	Barrier beaches Sand Beaches Salt marsh Mud flats Deltas Mangrove Coral reefs
Coastal Slope (%)	>0.115	0.115 – 0.055	0.055 – 0.035	0.035 – 0.022	< 0.022
Relative sea-level change (mm/yr)	< 1.8	1.8 – 2.5	2.5 – 3.0	3.0 – 3.4	> 3.4
Shoreline erosion/accretion (m/yr)	>2.0	1.0 – 2.0 Accretion	-1.0 – +1.0 Stable	-1.1 – -2.0	< - 2.0 Erosion
Mean tide range (m)	> 6.0	4.1 – 6.0	2.0 – 4.0	1.0 – 1.9	< 1.0
Mean wave height (m)	<0.55	0.55 – 0.85	0.85 – 1.05	1.05 – 1.25	>1.25



Gulf of Mexico Science Projects

Predicting Coastal Change: Having a Good Baseline



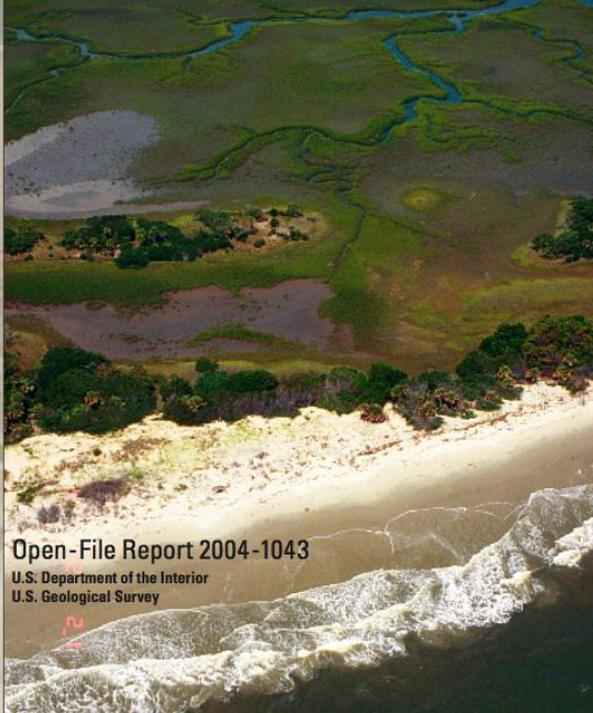
Gulf of Mexico Science Projects

Gulf of Mexico Historic Shoreline Changes



National Assessment Of Shoreline Change: Part 1 Historical Shoreline Changes And Associated Coastal Land Loss Along The U.S. Gulf Of Mexico

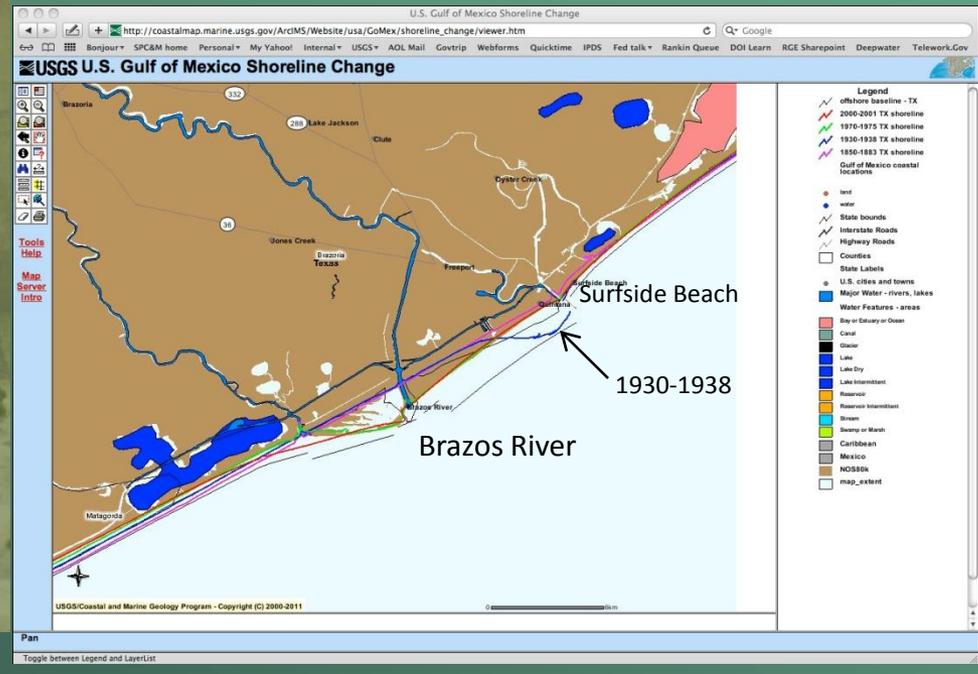
Robert A. Morton, Tara L. Miller, and Laura J. Moore



Open-File Report 2004-1043
U.S. Department of the Interior
U.S. Geological Survey

National Assessment of Shoreline Change Web Mapping Application provides a national map view of short- and long-term shoreline change evaluations, and historical and modern shorelines. This map includes data layers compiled in support of the U.S. Geological Survey's (USGS) National Assessment of Shoreline Change Program.

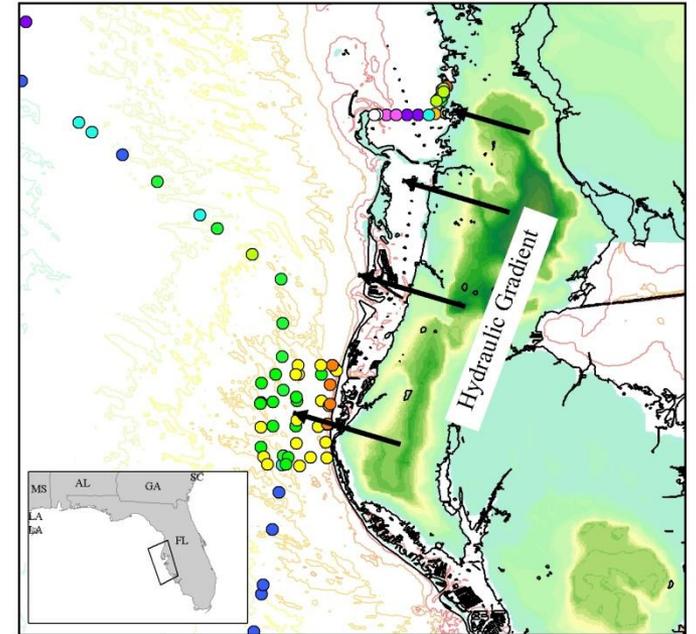
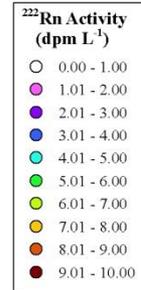
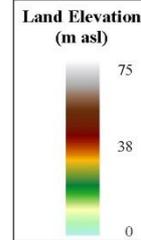
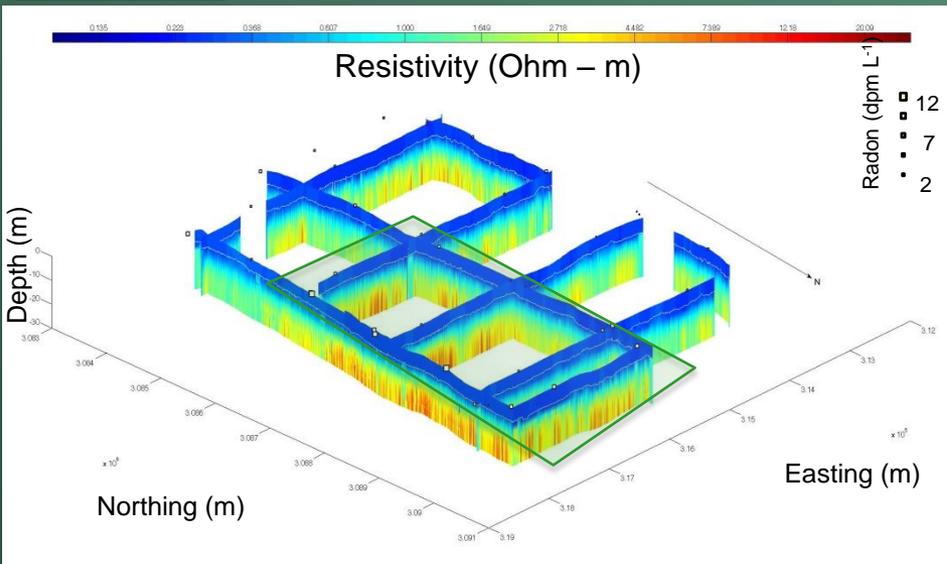
http://coastalmap.marine.usgs.gov/ArcIMS/Website/usa/GoMex/shoreline_change/viewer.htm



Gulf of Mexico Science Projects

Submarine Groundwater Discharge

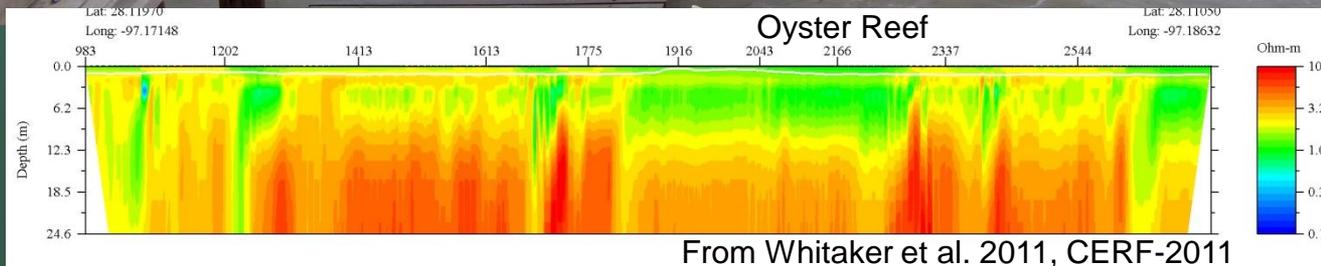
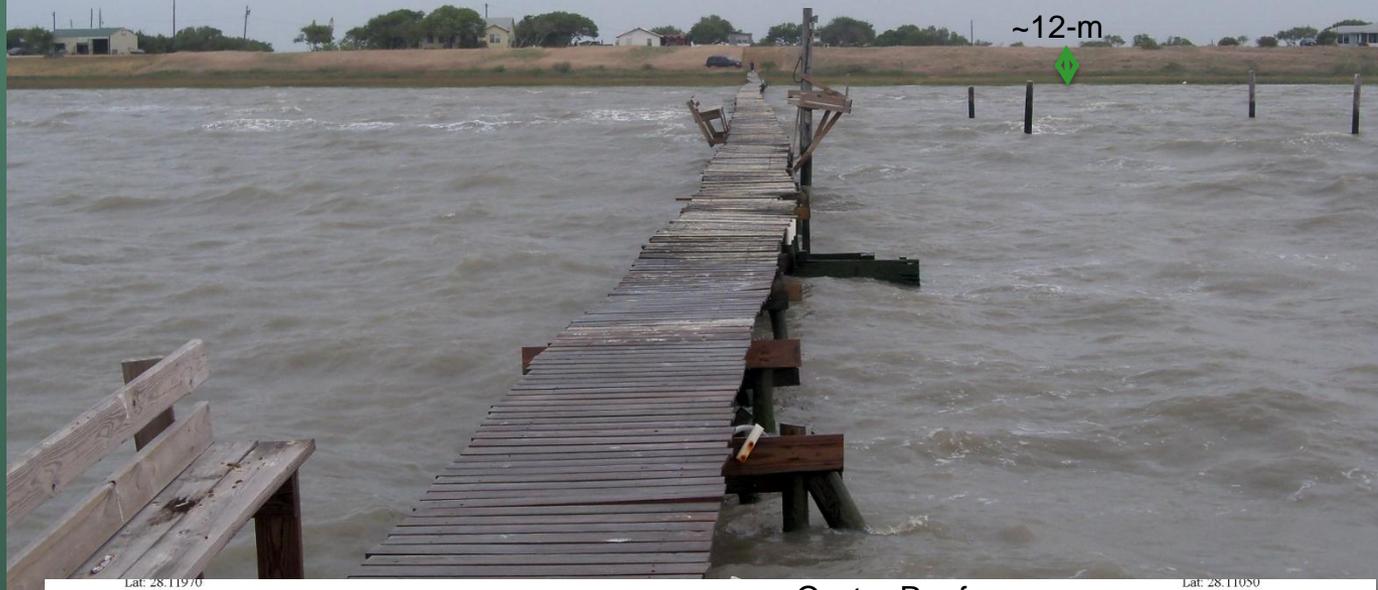
Using ^{222}Rn activities and streaming resistivity measurements to calculate diffuse seepage.



Here the higher radon activities (warmer colors) are potentially associated with higher rates of diffuse seepage.

Submarine Groundwater Discharge

Similar geomorphic controls in Texas: Copano Bay, TX



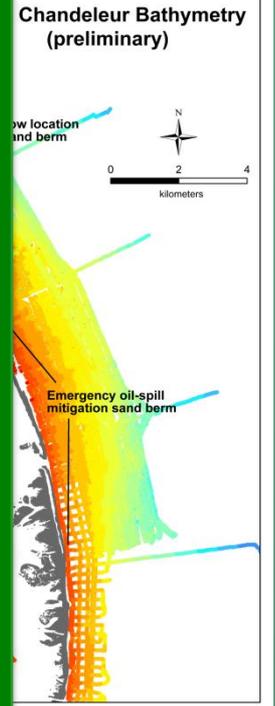
Coastal Response to Mitigation

The Ch... a natural port

Berm br
disinteg

OBSERVATIONS after passage of T.S. LEE

04 sep is still high water level, but...



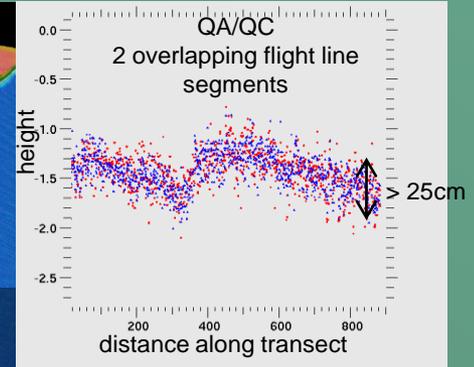
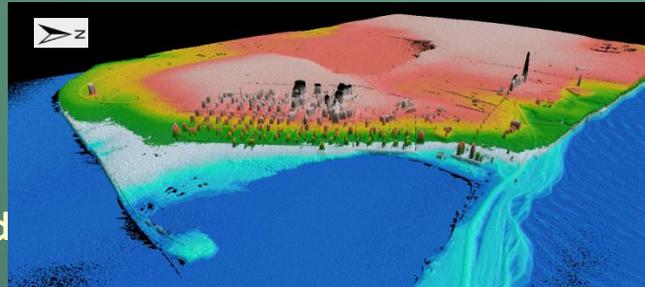
ne-based Lidar
tem

Airborne LIDAR, Data Processing, and Analysis

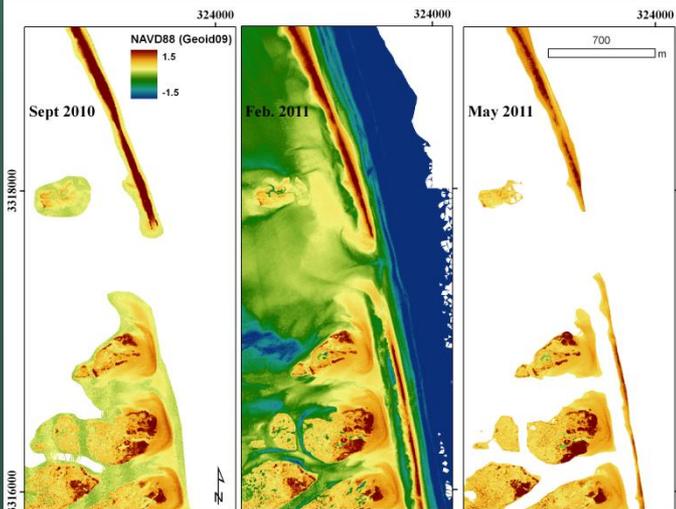
Using Lidar to establish a modern, elevation based shoreline

North Slope Coastal Alaska Airborne Lidar Acquisition and Processing

Repeat Lidar surveys of the Berm and Chandeleur Islands, LA



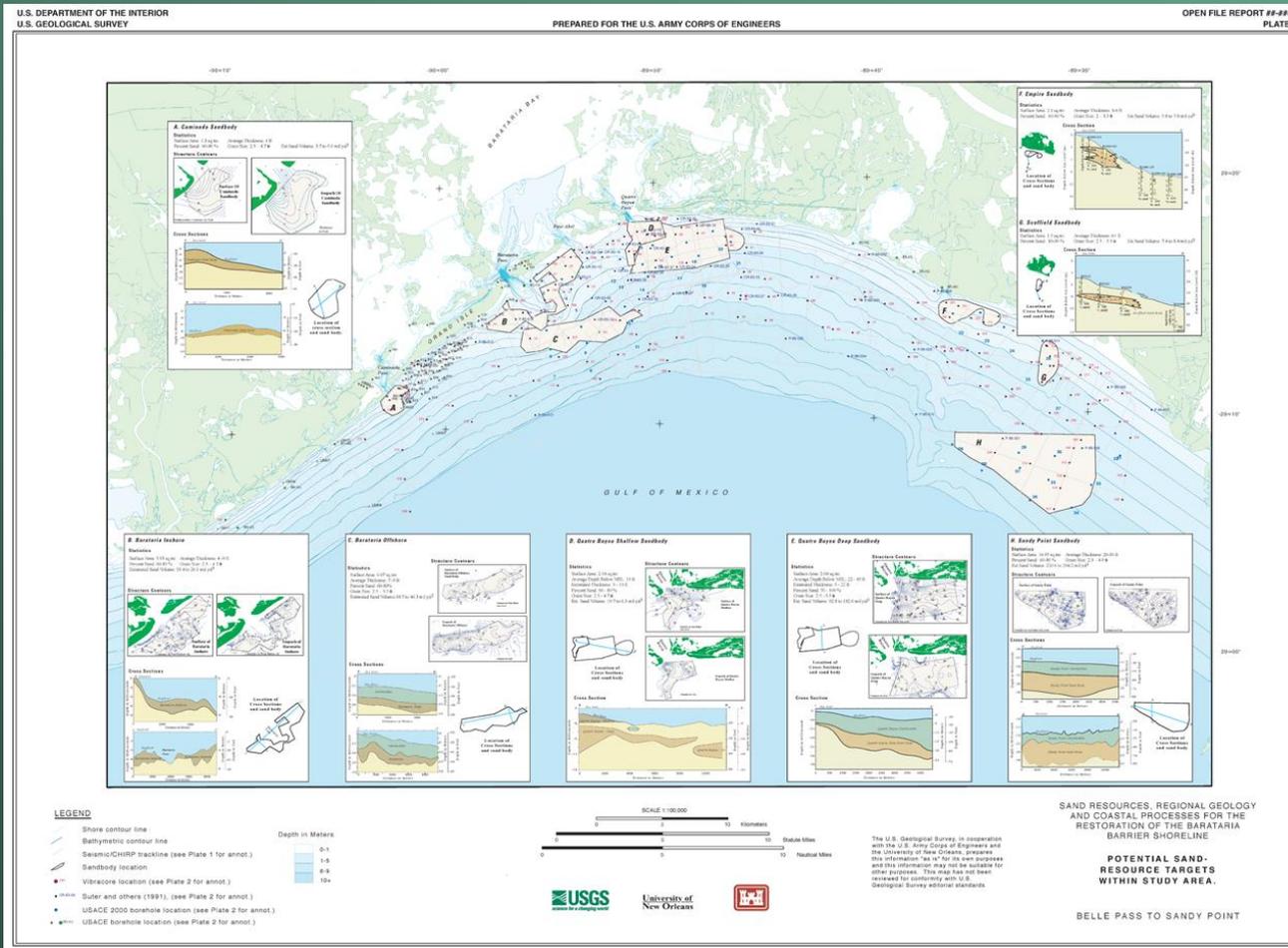
In collaboration with WCMG, National Assessment project, and USGS NGPO
Establish a modern, elevation-based shoreline
~1 Billion Lidar data samples acquired in 2009 and 2010



Gulf of Mexico Science Projects

Barataria Feasibility Study: USACE – New Orleans District

Geologic investigation and identification of sand resources



Sand resources, regional geology, and coastal processes for the restoration of the Barataria Barrier shoreline.

Kindinger, Jack; Flocks, James; Kulp, Mark; Penland, Shea; Britsch, L. D.; Brewer, G.; Brooks, G.; Dadisman, S.; Dreher, C.; Ferina, N.

USGS Open File Report 2001-384
<http://pubs.usgs.gov/of/2001/0384/report.pdf>

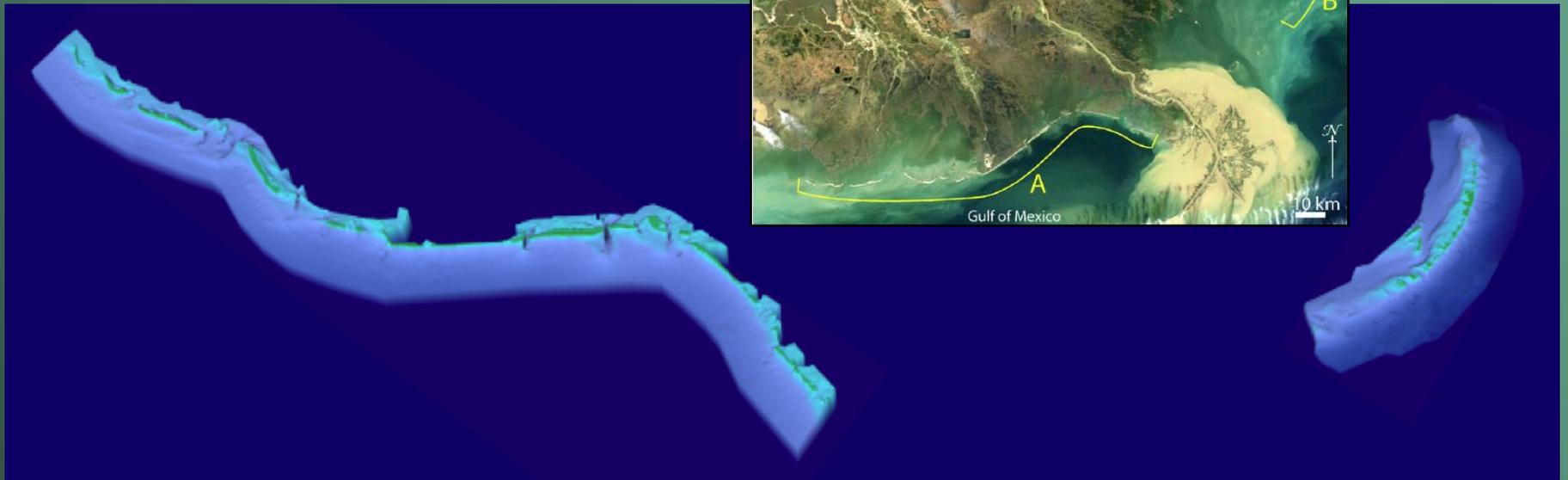
Evolution and preservation potential of fluvial and transgressive deposits on the Louisiana inner shelf: understanding depositional processes to support coastal management

James Flocks, Michael D. Miner, David C. Twichell, Dawn L. Lavoie and Jack Kindinger

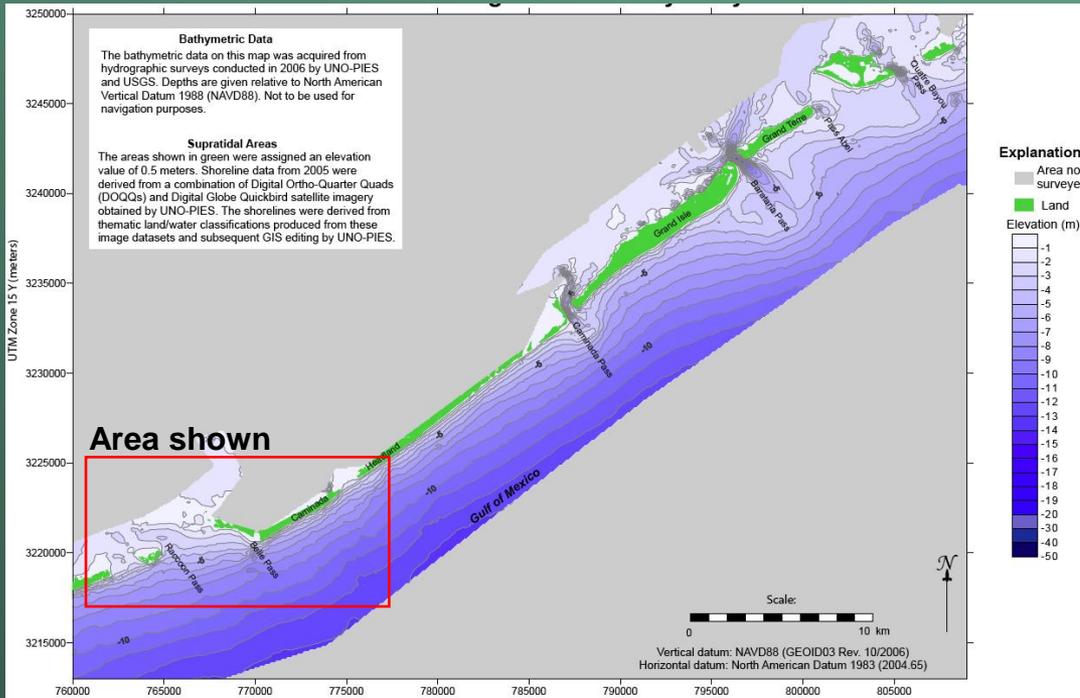
Geo-Mar Letters (2009) 29:359–378
<http://www.springerlink.com/content/85571r85265231n2/>

Louisiana Barrier Island Comprehensive Monitoring Program (BICM)

Bathymetric and Historical Seafloor Change (1869 – 2007) and Geologic Framework

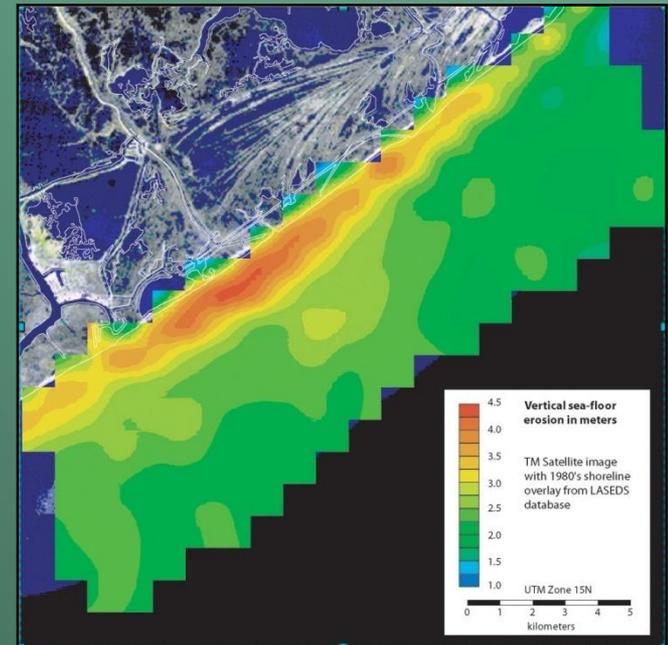


Louisiana Barrier Island Comprehensive Monitoring Program (BICM)

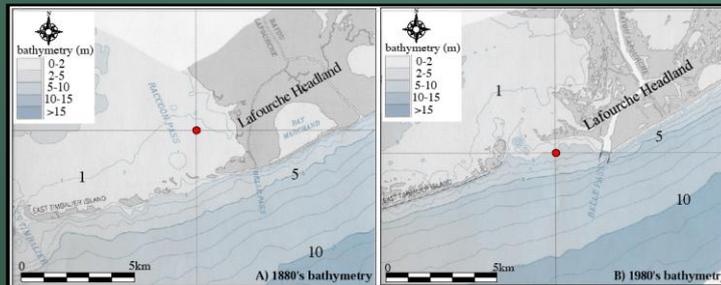


2006 Bathymetry, Barataria Region, Louisiana

Shoreline loss (1880 - 2006)



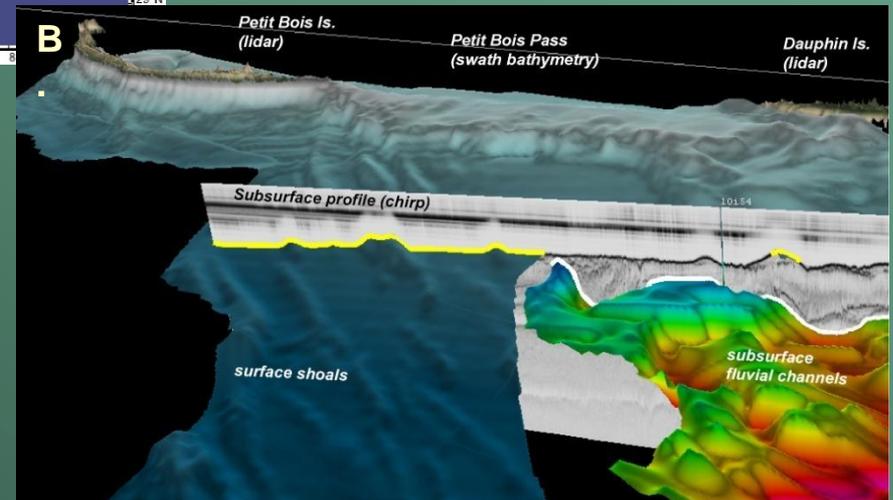
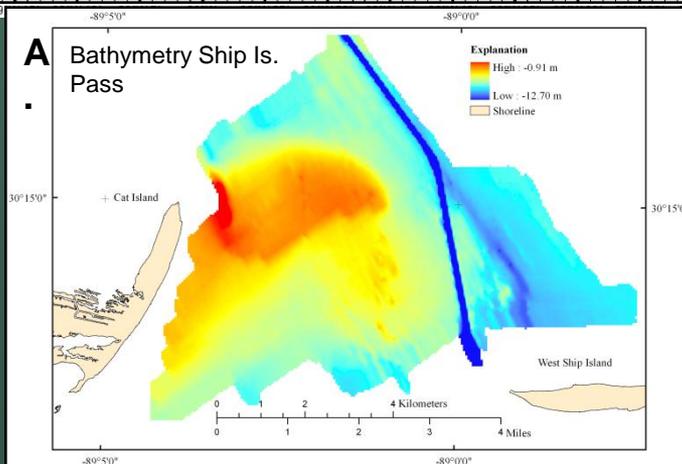
Shoreline loss (1880 - 1980)



Geologic Framework/Seafloor mapping



Deployment of a chirp subbottom profiler

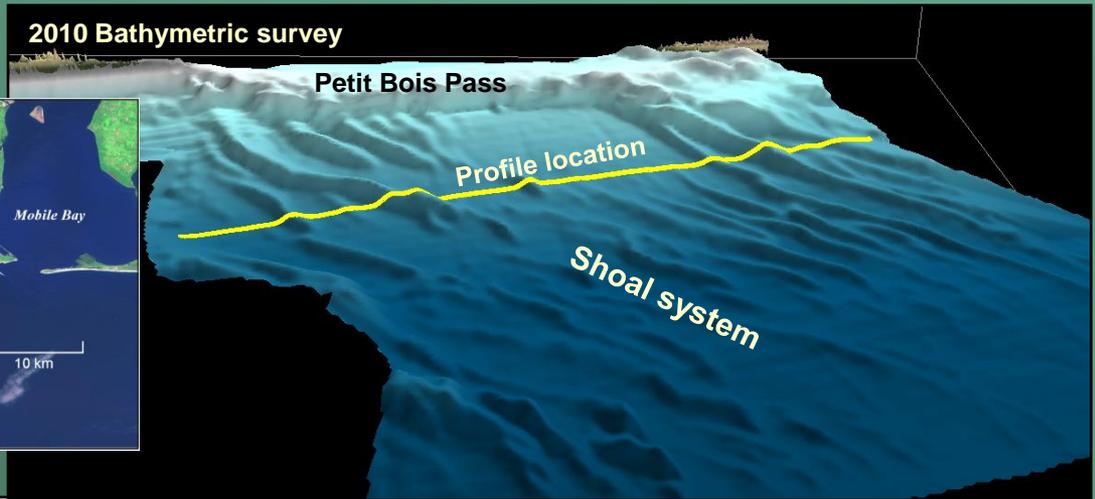


Geologic investigations, Mississippi Barrier Islands

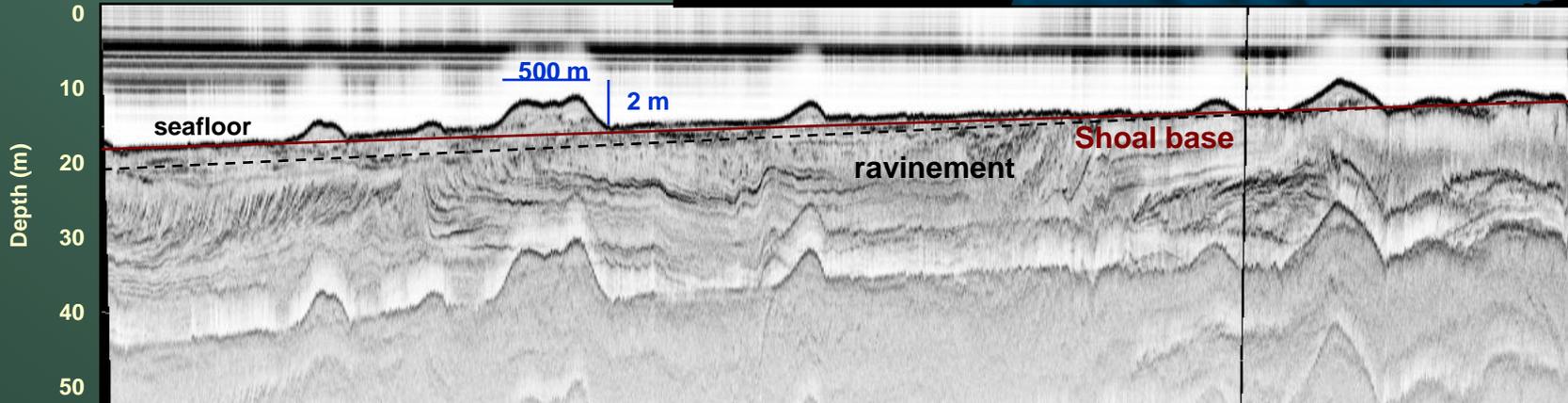
USGS Northern Gulf of Mexico Hazards and Susceptibility (NGOM)

USACE-Mobile/USGS Mississippi Coastal Improvement (MsCIP)

Sea floor/subbottom surveys



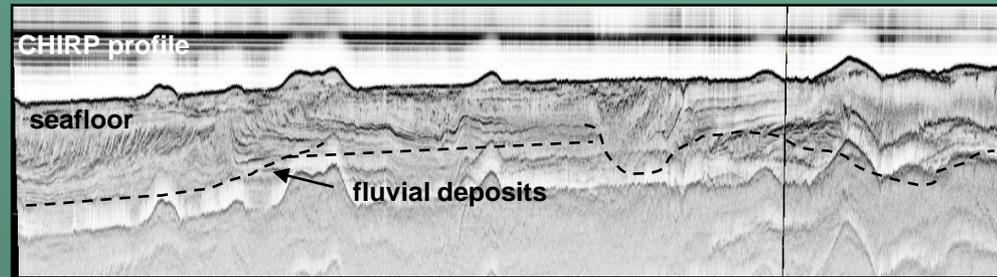
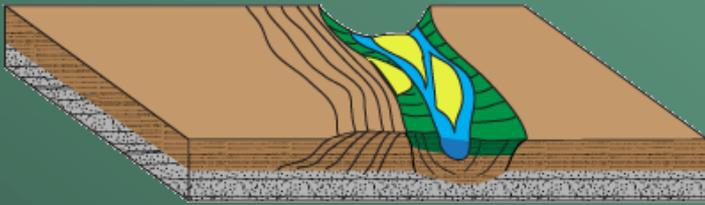
Subbottom profile



Geologic investigations, Mississippi Barrier Islands

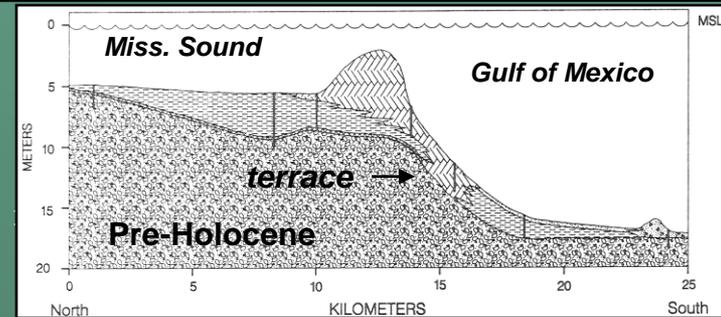
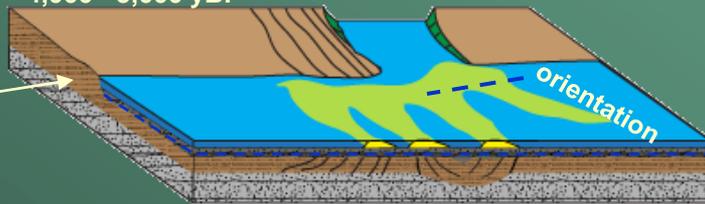
Conceptual model for the development of the offshore shoals and Petit Bois Pass

Pre-Holocene

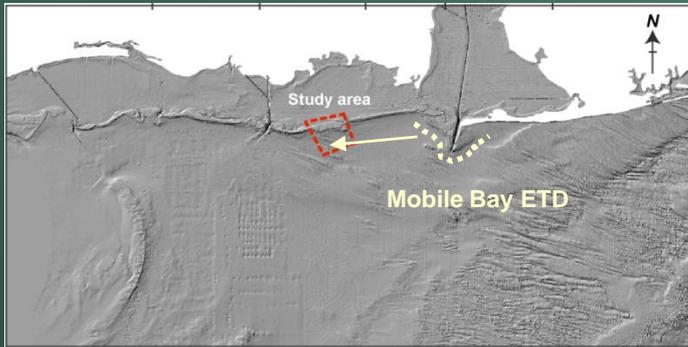
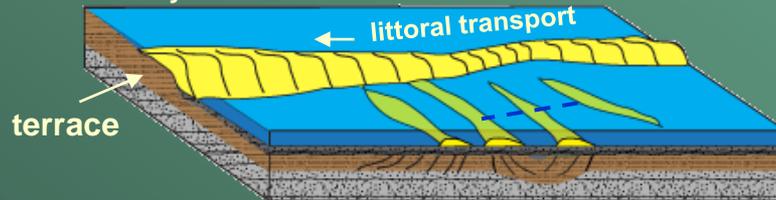


4,000 - 5,000 yBP

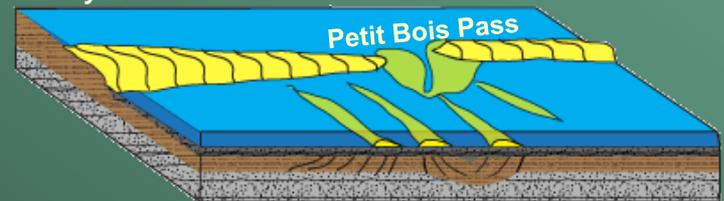
still-stand terrace (?)



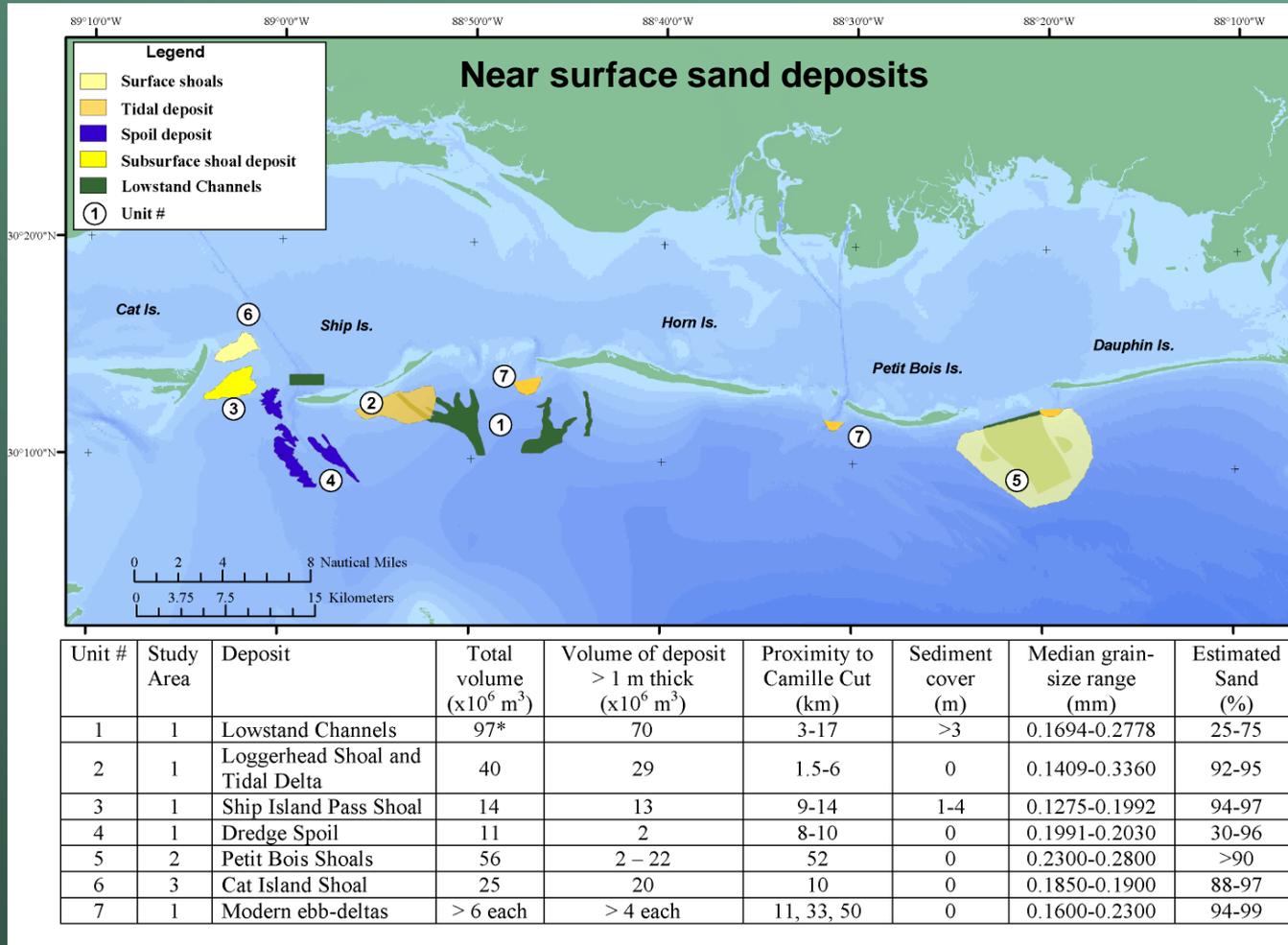
200+ yBP



200 yBP



Geologic investigations, Mississippi Barrier Islands



Questions?

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 - jkindinger@usgs.gov