South Carolina Coastal Erosion Studies

SUMMARY:

Shoreline change is a major concern along much of the nation's coastline, where population growth has rapidly increased in recent decades. Two of the most important problems are determining the physical response of the coastline to sea-level rise and predicting the impact of major storm events on coastal infrastructure. The USGS is working in cooperation with the State of South Carolina, NOAA Sea Grant, several universities, and the US Army Corps of Engineers to better understand the factors that control beach erosion, marine habitat distribution, and vulnerability of coastal communities to storms and sea-level rise along the northern South Carolina coast

State of South Carolina map and two images showing field deployment of seismic reflection profiler (left) and oceanographic instruments.

offshore south carolina

INVESTIGATORS:

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DESCRIPTION:

The ultimate vision for this program is to acquire a sophisticated understanding of the entire coastal system of South Carolina, focusing on the factors controlling sediment transport in order to predict coastal change. The main objectives are to: 1. determine the influence of geologic framework on the evolution of the shoreface, inner shelf, and subaerial components of the coastal system, 2. quantify the sediment transport links between the shoreface and the inner continental shelf, and 3. identify sediment sources and transport pathways and eventually to construct a regional sediment budget.

START DATE OF PROJECT:

October 1, 1999

END DATE OF PROJECT:

September 30, 2006

LOCATION:

South Carolina

TOPIC:

Coastal erosion assessments and loss reduction, Seafloor geology, resources and the environment

APPROACH:

Onshore geology is mapped using boreholes, ground-penetrating radar (GPR), and vibracores. Seafloor geology is mapped using data from interferometric and multibeam sonars (swath bathymetry), sidescan sonar (acoustic backscatter), chirp seismic-reflection profiling (stratigraphy and structure), direct sampling and bottom photography/video. Process-oriented studies deploy instrument packages on the seafloor to measure oceanographic processes (waves,

currents, etc) and define large-scale, long-term trends in circulation and transport.

IMPACT/RESULTS:

The geologic mapping component of the project indicates a complex geologic framework in which differential erosion of older, underlying units have heavily influenced the evolution of the region, exerting control over the locations of river systems and tidal inlets, modern depositional patterns, and areas of chronic erosion. Results from the mapping were immediately useful in identifying new aggregate resources for planned beach nourishment projects, and providing new baseline maps for ongoing biological habitat studies within the region. Based upon observations from geologic mapping and shoreline erosion/accretion rates, numerical models of shoreline behavior have been tested and supplemented by quantitative measurements of the physical processes that drive inner-shelf circulation and sediment transport. These are requisite components needed to develop quantitative sediment budgets for the Long Bay coastal system and, ultimately, to improve predictive capabilities that will support management decisions.

PUBLICATIONS:

- Baldwin, W.E., Morton, R.A., Denny, J.F., Dadisman, S.V., Schwab, W.C., Gayes, P.T., and Driscoll, N.W., 2004, Stratigraphic framework maps of South Carolina's Long Bay from Little River Inlet to Winyah Bay: U.S. Geological Survey Open-File Report 04-1013, 30 p.
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- Denny, J.F., Baldwin, W.E., Schwab, W.C., Warner, J.C., and DeVoe, M.R., 2005, South Carolina coastal erosion study: U.S. Geological Survey Fact Sheet 2005-3041, 4 p.
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- Ojeda, G.Y., Gayes,P.T., Van Dolah, R.F., and Schwab, W.C., 2004, Spatially quantitative seafloor habitat mapping: example from the northern South Carolina inner continental shelf: Estuarine Coastal and Shelf Science, v. 59, p. 399-416.
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- Scott, D.B., Collins, E.C., Gayes, P.T., and Wright, 2003, Records of pre-historic hurricanes on the South Carolina coast based on micropaleontological and sedimentological evidence with comparison to other Atlantic coast records: Geological Society of America Bulletin, v. 115, p. 1027-1039.

RELATED:

- Denny, J.F., and Schwab, W.C., 2004, USGS South Carolina Coastal Erosion Project, USGS, Administrative Reports