

## Coastal Observation Technology System Project Summary – 2006

**Project Name/Title:** The Carolinas Coastal Ocean Observing and Prediction System (Caro-COOPS)

**Date Project Initiated:** June 1, 2002 (grant start date); July 3, 2002 (the financial assistance award received by USC from NOAA Grants Management Division)

**Recipient Institution:** University of South Carolina Research Foundation  
Belle W. Baruch Institute for Marine and Coastal Sciences  
University of South Carolina  
with  
North Carolina State University

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### Brief Project Summary:

The central goal of Caro-COOPS is prediction of coastal ocean processes. The ultimate objectives are to: 1) collect data related to coastal zone physical and ecological phenomena and conditions and make this information readily available for a variety of stakeholders and users; 2) integrate information on biological, chemical, and physical processes in the Carolinas' coastal ocean in order to provide a thorough understanding of how physical forcing and biological responses are coupled on a range of spatial and temporal scales; 3) assess the predictability of specific coastal processes and events and use this information to develop accurate forecasting models; 4) create tools for applying and evaluating these predictions to provide user communities with early-warning systems and for informed decision-making and planning; and 5) routinely provide information and products that are of interest and have value for the Carolinas coastal user communities. Caro-COOPS is a wholly integrated system for coastal observations and their application to user-driven needs, including 1) an extensive array of instrumented moorings in the South Atlantic Bight off the Carolinas; 2) a comprehensive data management system, essential for aggregation, organization, standardization,

visualization, and dissemination of high quality, real-time data and information; and 3) an advanced suite of integrated models that will markedly improve the predictive capacities of real-time physical data from coastal zone instrumentation. An initial demonstration of the real-time interdisciplinary forecast concept for Caro-COOPS is real-time prediction and analyses of storm surge, flooding, and inundation well before and during passage of coastal storms. This will improve warnings and provide local officials with the information needed for mitigation, preparedness, and prevention measures. Caro-COOPS has also been laying the groundwork for development of information tools that support commercial and recreational fisheries and their management, marine surface transportation, and recreation and tourism. Implementation of Caro-COOPS involves collaborative interactions with other observing systems programs, particularly the Coastal Ocean Research Program (CORMP) at University of North Carolina at Wilmington, as well as the multi-institutional SouthEast Coastal Ocean Observing System (SEACOOS), and the emerging Southeast Coastal Ocean Observations Regional Association (SECOORA) promoted by OceanUS.

#### **Accomplishments to Date:**

- Establishment of a real-time observational network consisting of three cross-isobath lines of stations, including a line beginning at Sunset Beach, NC and extending into Upper Long Bay, NC; a second line extending from Capers Island above Charleston Harbor, SC, and a third line set north of Hilton Head Island, SC at Fripp Inlet. The lines include NOAA/NOS/CO-OPS NWLON-compatible shore-based water level / meteorological stations (WLS) and offshore moorings located on the inner shelf (10m isobath) and mid-shelf (30m).
- Successful implementation of the use of the Iridium Low Earth Orbiting communication satellite system for data transmission from offshore sites.
- Establishment of a sophisticated and robust information management system that organizes, disseminates, documents, displays, archives, and displays information in a manner that is consistent with OceanUS Data Management and Communications (DMAC) standards and is readily accessible to a broad user community.
- Development of a web interface and information portal for access to observational data, model predictions, and information products, including the development of map- and GIS-based tools that visualize observational data, model predictions, and additional data layers, e.g. aerial maps, topographic and bathymetric data, and land use information, for user applications.
- Development of a new technique to model inundation and drying processes of coastal flooding and a state-of-the-art three-dimensional, time dependent storm surge and inundation and retreat model, and application of the new technique/model to Charleston Harbor.
- Application of the enhanced three dimensional storm surge and flooding model to a user-targeted demonstration tool that will improve flooding prediction and community response.
- Development of ongoing, constructive relationships with product-targeted user communities, specifically those in emergency response and fisheries management communities, to ensure development of applications that have sociological and economic value.

- Support of the national backbone through incorporation of Caro-COOPS data into federal information services, i.e. CO-OPS NWLON, NDBC, NWS (NCEP and WFOs), and NOS.
- Establishment of a versatile and experienced team that develops and maintains the critical components of the Caro-COOPS infrastructure: observations, modeling, data management, and information product development.
- Establishment of productive collaborative interactions and operations with other IOOS programs, with an increasing emphasis on optimizing functionality and reliability; such interaction is illustrated by the increasing collaboration between Caro-COOPS and CORMP.

**Current Year Objectives:**

1. Enhance the observational component through establishment of increased redundancy and back-up systems and through increased coordination and collaborative operations with the University of North Carolina at Wilmington's Coastal Ocean Research and Monitoring Program.
2. Ensure that the data management component is optimized for access, aggregation, visualization, dissemination, and archival of data in a way that is consistent with DMAC recommendations and supportive of SECOORA and IOOS efforts; particular focus will be placed on QA/QC processes, incorporation of new types of data, and development of effective information delivery tools.
3. Optimize and validate storm surge and flooding model output for prediction and product development, with additional emphasis on data assimilation, coupled ocean current and wave modeling, and cross-shelf transport modeling.
4. Develop user-targeted web-based applications and products that support emergency response and management communities, with increased emphasis on transition of products to the user communities this project year.
5. Develop user-targeted web based products that are bi-hourly, routinely updated and that support such communities as the marine surface transportation industry, commercial and recreational fisheries, and coastal recreation and tourism.

**Partners:**

University of South Carolina's Belle W. Baruch Institute (USC), the North Carolina State University (NCSU), the University of North Carolina at Wilmington (UNCW).