FY2009: Regional Integrated Ocean Observing System Development

NOAA continued a merit-based funding process in 2009 to enhance regional coastal ocean observing systems (RCOOS) and achieve three long-term outcomes: establishing coordinated regional observing and data management infrastructures, developing applications and products for regional stakeholders, and crafting regional and national data management and communications protocols. In addition, regional associations received planning grant awards designed to assist them in stakeholder engagement, education and outreach, and long-range planning activities.

SOUTHEAST ATLANTIC REGION

The Southeast Atlantic Region includes the coastal states from North Carolina to Florida. In 2009, RCOOS implementation funds were provided to four recipients totaling $2,444,150. The 2008 Regional Association Planning Grant award to this region is $391,991.

Project Title:

Implementation of Regional Integrated Ocean Observing Systems: Support of RCOOS Development in SECOORA

Recipient/ Lead Principal Investigator:

Southeast Coastal Ocean Observing Regional Association, Debra Hernandez *(debra@secoora.org)*

Co-Principal Investigator:

University of North Carolina at Chapel Hill, Dr. Harvey E. Seim (*hseim@email.unc.edu*)

Cost:

Funded: FY 2008 (Year 1) - $400,000
FY 2009 (Year 2) - $500,000

Proposed (subject to available funds): Year 3 - $3,476,595

Performance:

This project originally proposed to consolidate Coastal Ocean Observing System (COOS) assets and products in the Carolinas with those in Georgia and Florida to establish a user-driven observing system that spans the entire SECOORA footprint. The foundation of the SECOORA RCOOS will build initially upon six primary elements included in this proposal: 1) maintenance and development of existing observing assets and consolidation of existing sub-regional observing systems; 2) construction of an integrated and embedded modeling system; 3) development of ecosystem models targeted at predicting the characteristics of regionally important fish stocks; 4) establishment of a data management system designed to disseminate rapid, high quality products; 5) establishment of a systems engineering based structure to the observing system architecture that enables the seamless interoperability, and; 6) integration of an end-user community into the fabric of SECOORA to ensure responsiveness to regional needs. Due to funding limitations for Years 1 and 2, and likely for Year 3, elements 1, 4 and 6 have been the only ones implemented to date.

Schedule:

1. Year 1

(over)

- Improve guidance and processes for data providers
- Complete the redesign of the SECOORA website that will allow for the incorporation of existing data streams and format them as prescribed by target user groups, and complete the development of basic tailored interfaces that support specific communities of interest

2. Years 1-3
   - Maintain operations and data flow from four HF Radar sites
   - Work with membership of SECOORA and its Stakeholders Advisory Council to prioritize elements of RCOOS growth

3. Year 2
   - Establish accuracies of observed and simulated data (skill assessment) for all available physical components through appropriate comparisons and intercomparisons

4. Years 2-3
   - To the extent feasible with the limited funding, sustain and enhance observing assets in the SECOORA domain, including buoys, offshore towers and coastal stations
   - Maintain High Frequency (HF) Radar measurement systems and provide data in near-real time
   - Coordinate with the U.S. Coast Guard (USCG) and MACOORA to enable surface current field input to the USCG Search and Rescue Operations application
   - Enhance and refine tailored interfaces to include aggregated near-real-time delayed mode, and model output data that supports the thematic priorities of waves, and search and rescue
   - Develop, test, and deploy a range of applications
   - Integrate national DMAC advances with SECOORA data management activities and ensure interoperability with other COOS efforts throughout the southeast region

5. Year 3
   - Enable access to archival information
   - Coordinate with ecosystem and fisheries stakeholder groups to inform any modeling efforts
   - Regularly meet with other Regional Associations to share lessons learned and outreach initiatives
   - Work with COSEE-SE and COSEE GoM to develop standards-based curriculum based on fisheries/ecosystem management, waves, coastal hazards, and search and rescue activities
   - Sustain observing assets, to the maximum extent possible with funding provided, in the SECOORA domain, including buoys, offshore towers and coastal stations established through prior sub-regional and regional efforts
   - Estimate the accuracy of HF radar surface current estimates by establishing reliable error bars for stakeholder specific applications, and provide the data in near-real time to identified user groups such as USCG, local fisherman, modelers, and emergency planners
   - Establish accuracies of observed and simulated data (skill assessment) for all available physical components through appropriate comparisons and inter-comparisons
   - Sustain and enhance Nowcast/Forecast modeling systems currently used in the region
   - Implement locally-relevant ecosystem models to quantify the role of abiotic and biotic effects on the growth, survival and recruitment of target species in the SECOORA region
   - Develop nowcasting capabilities of oceanographic and ecosystem properties to provide relevant information for use in the South-East Data, Assessment, and Review (SEDAR) recruitment forecast process
   - Assess current operational processes
   - Define desired future state of the RCOOS, identify gaps and cost/schedule drivers

- Develop methodologies for the RA design and implementation that maximizes use of existing assets and interoperability, and ensures cost-effectiveness and long-term sustainability

Project Title:

Integration of Coastal Observations and Assets in the Carolinas in Support of Regional Coastal Ocean Observation System Development in the Southeast Atlantic

Recipient/ Lead Principal Investigator:

University of North Carolina Wilmington/ Dr. Lynn Leonard (*lynnl@uncw.edu*)

Cost:

Funded: FY 2007 (Year 1) - $1,200,000
FY 2008 (Year 2) - $1,200,000
FY 2009 (Year 3) - $1,200,000

Performance:

The over-arching goal of this project is to integrate existing assets and observations in the North Carolina and South Carolina coastal region to create an end-to-end, proto-type regional coastal ocean observing system (RCOOS). This RCOOS will provide an instrumented test-bed, integrated through sophisticated data management protocols, that supports development of coastal process models, surf zone hazards (including rip-current) forecasts, and water quality products and services. Project objectives are to: 1) maintain and enhance observing assets; 2) support data analysis and modeling for U.S. Army Corps of Engineers (USACE) Coastal Process Model skill assessments; 3) support data analysis and modeling for National Weather Service nearshore forecasting; 4) ensure delivery of high-quality, DMAC-compliant data and products in a timely fashion, and; 6) engage regional partners, stakeholders and end-users in implementation and operation of a sustainable RCOOS and ensure coordination with SECOORA and IOOS. Since most of the data collection infrastructure is in place, this project is immediately executable and creates a test bed to evaluate observing system design criteria, such as the ability of a system to directly support specific user-driven application needs, as put forth by SECOORA.

Schedule:

1. Years 1-3
   - Maintain inner-shelf and nearshore monitoring stations in North and South Carolina coastal waters
   - Provide operational data streams for existing USACE stations
   - Develop prototype Surf Conditions Nowcasting System (SCNS)

2. Year 2
   - Develop prototype validations module linkage to RCOOS archive
   - Develop prototype interface with the USACE Model Evaluation and Diagnostics System (MEDS)
   - Migrate website components to appropriate (e.g.SECOORA) platform

3. Years 2-3
   - Upgrade NERR stations in North and South Carolina to real time
   - Build a comprehensive database including archived data from previous NOAA-funded programs in the Carolinas, USACE, and various water quality programs
   - Optimize and ensure access to near-real-time, delayed mode, and model output data via web
   - Develop rigorous procedures for assessment of real-time data and relay information to users

- Integrate standards and processes with other SECOORA data management activities
- Assess system function
- Conduct public outreach and stakeholder engagement for both the Carolinas RCOOS and SECOORA

4. Year 3
   - Assess, assimilate and disseminate water quality information in North and South Carolina
   - Upgrade systems that have surpassed expected lifecycle
   - Demonstrate RCOOS-wide wave/current validation
   - Deliver semi-operational RCOOS-wide validation module
   - Evaluate Simulated WAve NearShore (SWAN) model as an approach to forecast wave conditions in Long Bay
   - Document procedures for real-time data assessment and relay information to users
   - Verify model improvement
   - Develop standards-based visualization tools for SECOORA

Project Title:

A Regional Storm Surge and Inundation Model Test Bed for the Southeast Coastal Ocean Observing System Regional Association

Recipient/ Lead Principal Investigator:

University of Florida/ Dr. Peter Sheng (*pete@coastal.ufl.edu*)

Cost:

Funded: FY 2007 (Year 1) - $500,000
FY 2008 (Year 2) - $372,200
FY 2009 (Year 3) - $372,200

Performance:

Using a community-based approach and working with the National Weather Service (NWS), Federal Emergency Management Agency (FEMA), and state and county departments of Emergency Management, this project will conduct a comprehensive validation and comparative study of four leading storm surge and inundation models developed by the academic community. The goals of this project are to enhance the storm surge and inundation modeling capabilities; establish common standards for storm surge and inundation modeling; bridge the gap between leading academic storm surge modelers and the operational agencies, and; potentially improve maps of inundation, e.g. the SLOSH surge atlas and Flood Insurance Rate Maps (FIRMs), for enhanced emergency planning and management.

Schedule:

1. Year 1
   - Establish a panel of experts and users to produce a set of objective protocols and criteria for model-data and model-model comparisons
   - Produce an updated inventory of storm surge, wave, and inundation modeling activities
   - Identify the major products (e.g., SLOSH surge atlas, FIRMs, and inundation maps) produced by NWS and FEMA and used by Emergency Managers and determine possible enhancements
   - Develop a common data framework and design realistic test problems with archived field and analytic data for model-data comparison and inter-comparison of storm surge and inundation models while leveraging current advances in DMAC and Marine Metadata Interoperability

- Develop a set of common model quality and performance standards for all surge, wave, and inundation models to be used in the region
- Select past hurricanes for model validation and inter-comparison, gather and store data in a Storm Archive, as part of a virtual computing "Grid" that will leverage and build upon a Virtual Grid

2. Year 2
   - Conduct simulations of selected hurricanes
   - Compare model results to data and with each other in terms of a number of model variables and skill assessment methods and to determine if these models meet existing federal standards
   - Determine the sensitivity of models' skills to model attributes, coefficients, and input data
   - Using the four storm surge models and the Sea, Lake and Overland Surges from Hurricanes (SLOSH) model, produce and compare a surge atlas for a coastal region, following the method used to produce SLOSH surge atlas
   - Determine the sensitivity of a surge atlas to various model attributes and input data and improve the storm surge and inundation models if necessary
   - Working with NWS and Emergency Managers, recommend ways to potentially enhance the SLOSH surge atlas or produce ensemble surge atlas

3. Years 2-3
   - Maintain and enhance Virtual Grid

4. Year 3
   - Provide the results from the four storm surge models to FEMA and produce FIRMs for inter-comparison and comparison with the FEMA FIRM
   - Identify the sensitivity of FIRMs to various model features and input data
   - Working with FEMA, identify ways to enhance their FIRMs
   - Continue monthly PI and bi-weekly technical team coordination

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Project Title:

A Prototype Operational Modeling System for Waves, Coastal Currents, Inundation, and Hydrologic Flooding for Eastern North Carolina

Recipient/ Lead Principal Investigator:

University of North Carolina at Chapel Hill/ Dr. Rick Luettich (*rick_luettich@unc.edu*)

Cost:

Funded: FY 2007 (Year 1) - $499,991
FY 2008 (Year 2) - $371,950
FY 2009 (Year 3) - $371,950

Performance:

This project is developing a modular, integrated modeling system for 24/7/365 forecasts of waves, storm surge, inundation, coastal circulation, and hydrologic runoff for Eastern North Carolina, a region highly susceptible to catastrophic impacts of severe coastal weather and a companion capability to improve rip current forecasts. Model skill is continuously and automatically evaluated against available in-situ observations using AutoMEDS. The goal is to demonstrate relevance to regional stakeholders of an operational watershed-to-coastal ocean modeling system that provides: information on offshore and nearshore wave conditions; information to assess rip current threats; regional wave and current conditions in high traffic areas, such as tidal

inlets; nearshore currents for search and rescue operations, and; inundation data associated with coastal storm surge and hydrologic runoff. Information is currently provided to three regional National Weather Service Weather Forecast Offices and North Carolina emergency managers for application during moderate conditions and severe storms and for use in marine forecasts, search and rescue operations, decision-making by emergency managers, and the U.S. Army Corps of Engineers for evaluating near shore sediment transport budgets.

Schedule Major Components:

1. Year 1
    - Develop and refine model domains and associated databases
    - Implemented quasi-operational, 24/7/365 high-resolution uncoupled wave (SWAN) and current/surge (ADCIRC) models for North Carolina. Developed data streams to distribute output to WFOs via OPeNDAP server
    - Ingest regional IOOS observational data streams and implement AutoMEDS skill assessment scheme
    - Evaluate strategies for establishing boundary conditions at the dynamic interface between the hydrologic and coastal models; determine the type and spatial/temporal frequency of shared information

2. Years 1-3
    - Work with lifeguards in Kill Devil Hills, NC, to provide daily rip current surveys. Couple these with wave observations and bathymetry observations to develop better understanding of conditions leading to rip current formation
    - Conduct annual meetings with primary users (NWS WFOs) to document and discuss feedback on product value and provide tech transfer

3. Year 2
    - Evaluate model skill, including development of methodology for directional wave spectra
    - Implement coupled wave and current/surge models
    - Configure uncoupled wave model to run locally in 3 collaborating WFOs for ingest into AWIPs system
    - Evaluate coupled wave/surge modeling system vs. historical hurricanes
    - Develop methodology to blend 24/7/365 model runs with event-based tropical cyclone ensemble forcing
    - Implement initial coupling of hydrologic and coastal models in quasi-operational job stream

3. Year 3
    - Evaluate coupled modeling system against historical data (e.g., Hurricane Floyd)
    - Enhance coupled system based on knowledge gained from initial implementation
    - Continue evaluation of system wide real time model skill
    - Pursue distribution of data to alternate partners
    - Develop educational modules based on hazards models for implementation in undergraduate environmental sciences class

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