Southeast Coastal Ocean Observing Regional Association (SECOORA): A Framework for Monitoring, Prediction and Assessment to Support Decision-Makers Needs for Coastal and Ocean Data and Tools

Revised Scope of Work - Year 3

TOPIC AREA 1: Continued Development of Regional Coastal Ocean Observing Systems
AWARD TYPE: Cooperative Agreement
PROJECT DURATION: June 1, 2011 – May 31, 2016

This revised grant proposal is submitted in response to the Funding Opportunity Title:
Continued Development of Regional Coastal Ocean Observing Systems
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Introduction

SECOORA has been allocated $2,497,703 for Year 3 of its five-year Regional Coastal and Ocean Observing System (RCOOS) project. This is a slight increase from our FY12 award level but only represents 59% of the funding that was requested. This revised scope of work describes the activities that will be undertaken with this level of funding. As per the FY13 award letter, SECOORA will commit: (1) $600,000 towards supporting priority High Frequency Radars (2) $104,661 to University of Georgia for support to NOAA's Ocean Acidification Program; (3) $24,752 to University of North Carolina-Chapel Hill for IOOS DMAC support on IOOS vocabulary development and management, particularly with respect ontology support to the IOOS Geoportal; (4) $10,000 to University of South Carolina for support to the Eye on the Earth project, and (5) $2,800 to support travel and participation by Dr. Lynn Leonard, UNCW at the U.S. IOOS Federal Advisory Committee meetings. Major goals and objectives for Year 2 are described in Table 1.

Table 1. Major Goals and Objectives

Goals	Objectives
Goal 1: Sustain SECOORA as a Regional Information Coordination Entity	1.1: Ensure Stakeholders Inform RA Priorities and RCOOS Development and Implementation. 1.2: Coordinate and Implement a Conceptual Operations Plan for a Southeast (SE) RCOOS.
Goal 2: Sustain an Observing Subsystem for the SE	2.1: Sustain Moored and Coastal Stations. 2.2: Maintain High Frequency Radar (HFR) Operations. 2.3: Support Glider Operations. (NOT FUNDED IN YEAR 1, 2 or 3) 2.4: Support Hurricane Wind & Water Level Measurements. (NOT FUNDED IN YEAR 1, 2 or 3) 2.5: Support to NOAA's Ocean Acidification Program. 2.6: Support to HFR Waves Data Project. (contractor to be identified)
Goal 3: Support a Multi-Scale Multi-Resolution Modeling Subsystem	3.1: Support Regional and South Atlantic Bight (SAB) Subregional Circulation Modeling. 3.2: Implement Forecasting of Storm Surge, Inundation, and Coastal Circulation. 3.3: Develop a Nearshore Circulation Model for Rip Current Forecasting. (NOT FUNDED IN YEAR 1,2 or 3) 3.4: Provide Species-specific Habitat Models that Integrate Remotely Sensed and In Situ Data to Enhance South Atlantic Fisheries Management Council (SAFMC) Stock Assessments. 3.5: Improve Beach/Shellfish Water Quality Advisories. 3.6: Support Model Skill Assessment. (contractor to be identified)
Goal 4: Enhance the Data Management and Communication (DMAC) Subsystem	4.1: Service Data Providers and Capture Data. 4.2: Provide data, data products and information to users and stakeholders rapidly and effectively. 4.3: Coordinate/Collaborate data management efforts with U.S Integrated Ocean Observing System (IOOS®) on IOOS vocabulary development and management, and Eye on the Earth projects. 4.4: Consolidate and develop a DMAC infrastructure plan to improve efficiency and operational status. 4.5 Develop new products and upgrade SECOORA's data and maps portal. (Contractor to be identified.)

Goals	Objectives
Goal 5: Support a Targeted and Leveraged Education and Outreach Subsystem	5.1: Provide Tools and Opportunities for Observing Related Science Education. (Not funded in Year 3) 5.2: Increase Understanding of and Support for Observing Through Targeted Stakeholder Outreach. (Not funded in Year 3)

Goal 1: Sustain SECOORA as a Regional Information Coordination Entity (RICE)

SECOORA is an independently operating 501(c) (3). We will provide fiscal management for this award. Megan Lee is SECOORA's Business Manager and serves as fiscal manager, with assistance from an accountant, bookkeeper, and oversight of the Executive Director. We will be responsible for overall project management, which includes fiduciary oversight of all sub-awards, preparation and submission of financial and progress reports, and ensuring coordination and collaboration both among PIs within each RCOOS subcomponent and among PIs across the other RCOOS subcomponents. Thirteen PIs and 16 separate sub-awards contribute to this project necessitating significant effort for project and fiscal management, technical communications, integration and task coordination. Responsibilities will be shared among the RCOOS manager (V. Subramanian), SECOORA's Executive Director (D. Hernandez), and the Business Manager (M. Lee). A communication specialist will assist with website, e-newsletter and related outreach activities.

SECOORA is a membership-based organization that seeks stakeholders with interests in coastal and ocean data and information to help prioritize our activities and participate in developing stakeholder-based products. With Year 3 funding, SECOORA will continue to seek new members through our website, outreach via newsletters and direct recruitment by staff. We will also host a board meeting December 4-5, 2013 and an annual member and stakeholder meeting May 13-15, 2014. SECOORA will partner with stakeholders, such as the Governors' South Atlantic Alliance (GSAA), federal agency representatives, fishery managers, and others. SECOORA will continue advancement of a Conceptual Operations Plan for a fully instrumented RCOOS with defined service levels, commensurate with funding, that provides coordinated monitoring, assessment and prediction. We will also be working with SECOORA's Board, PIs and members to prioritize activities in recognition of ongoing budget limitations. Hernandez and Subramanian will coordinate these efforts with IOOS and IOOS Association activities. Additional coordination responsibilities include working closely with the neighboring GCOOS-RA in the FL region, CariCOOS in the Caribbean region and MARACOOS in the Mid-Atlantic region. We will continue to interact with IOOS Association, US IOOS program office and other IOOS regional associations to ensure that messages, products, and projects are coordinated and resources are leveraged. SECOORA will sponsor coastal ocean observing related meetings and SECOORA staff and Board will attend IOOS Association, US IOOS Program Office, and other RA meetings as funding allows.

Table 2. RICE Activities

Institution	Funding	Activity
SECOORA	$450,125	Ensure continued and efficient governance, management and operations of the RA. Coordinate RCOOS tasks and integration projects Provide forums, i.e. workshops, meetings, that enable stakeholder assessment and engagement. Coordinate with the Governors' South Atlantic Alliance (GSAA). Ensure SECOORA activities align with US IOOS Program Office guidance and/or requirements. Refine and maintain RCOOS Conceptual Operations Plan.
TOTAL	**$450,125**	

Goal 2: Sustain an Observing Subsystem for the SE

The observing subsystem provides the basis for the RCOOS by supporting and integrating existing assets and observations specific to the development of products identified in this proposal. In most cases, we propose to maintain existing systems deployed as part of pre-SECOORA programs. For all observing assets, the level of funding greatly impacts spare parts and technician support for maintenance of assets and management of data. It also limits principal investigator (PI) time and ability to interface with stakeholders. SECOORA will continue to support the operation and maintenance of offshore moored stations and coastal stations with the caveat that assets in the SECOORA footprint have been purchased through a mix of state, research, and IOOS funding. Operations are not sustainable at current funding levels. USF will maintain as many moorings as possible, but can only commit to operating two of the moored stations with the available funding. Similarly, UNCW is operating without any margin and any significant equipment failures will likely result in removing assets from the water. The SEAKEY network was removed from operational status in FY12, resulting in the discontinuation of data collection from long-term monitoring stations, some with 20-year records. SECOORA is continuing to allocate $600,000 to the IOOS identified priority HF Radar sites in the SECOORA foot print. Each observing asset will provide near-real-time data for multiple users, and provide information required to support proposed and existing stakeholder products (e.g., those required for oil spill response, National Weather Service Marine Weather Portal, Beach/Shellfish Water Quality Advisories, and search and rescue (SAR) operation surface current requests). Table 3 below provides specific information on the PI's, funding, and assets for the Observing Subsystem. Note that funding is not available for **Objective 2.3: Support Glider Operations** in Year 3 and **Objective 2.4: Support Hurricane Wind and Water Level Measurements** in year 3. **Objective 2.5: Support to NOAA's Ocean Acidification Program,** is a new task funded by NOAA's Ocean Acidification Program. **Objective 2.6: Support to HFR Waves Data Project, is a new** task that integrates several observing subsystem activities in Year 3.

Table 3. Observing Subsystem Activities

Institution	Funding	Activity
Objective 2.1: Sustain Moored and Coastal Stations		
University of South Florida (Weisberg)	$162,451	Funding COMPS surface moorings: C10 measures wind velocity, relative humidity, barometric pressure, sea surface temperature (SST), air temperature (AT), incoming short and long-wave radiation, in-water velocity and temperature/salinity (T/S). C12 and C13 measure wind velocity, relative humidity, barometric pressure, SST, AT, in-water velocity and T/S. C11 and C15 measure in-water velocity and T. C21 measures wind velocity, relative humidity, pressure, SST, AT.
University of South Florida (Luther, Merz)	$49,557	Funding COMPS in-shore tidal meteorological stations: Five stations located along Florida's Gulf of Mexico coast from Shell Point to Big Carlos Pass. These stations typically are outfitted with water level, wind velocity, relative humidity, AT, barometric pressure, and precipitation sensors.
University of North Carolina - Wilmington (Leonard)	$350,588	Oceanographic data from seven real-time moorings operated through partnerships between UNCW and USC will be maintained along NC and SC. Six systems measure wind velocity, barometric pressure, SST, AT, solar radiation, sea level, in-water velocity, and T/S. Two of the moorings also measure surface-waves. In addition, one coastal pier station that measures wind velocity, barometric pressure, SST, AT, solar radiation, sea level, S, water-column currents, and surface waves also will be supported.
TOTAL MOORED AND COASTAL	**$562,596**	

Institution	Funding	Activity
Objective 2.2: Maintain High Frequency Radar Operations		
University of South FL (Weisberg)	$143,570	Support three CODAR sites and transition to adding fourth CODAR site. Location: West Florida Shelf
Skidaway Institute of Oceanography (SkIO), Univ. of Georgia (Savidge)	$104,286	Support two WERA radar arrays. Location: St. Catherine's and Jekyll Island, GA
University of Miami (Shay)	$143,571	Support four WERA radar arrays. Location: Crandon, Virginia Key, Broad Key and Dania Beach
University of NC - Chapel Hill (Seim)	$104,287	Support two CODAR radar arrays. Location: Outer Banks of NC
University of South Carolina (Voulgaris)	$104,286	Support two WERA radar arrays. Location: Georgetown, SC and Fort Caswell, NC
TOTAL HFR	**$600,000**	
Objective 2.5: Maintain the sensors on NOAA Gray's Reef National Marine Sanctuary (GRNMS) buoy (NDBC 41008)		
University of Georgia (Noakes)	$104,661	Maintain the sensors on NDBC Gray's Reef National Marine Sanctuary (GRNMS) buoy (41008) as a part of international efforts to quantify the effects of ocean acidification on the world's ocean. These sensors include pCo2, pH, dissolved oxygen (DO), salinity and water temperature.
Objective 2.6: HF Radar Waves Data Project		
Contractor to be identified	$60,000	SECOORA will fund an applied research project to evaluate the feasibility of delivering accurate wave estimates from high frequency radar for broad use by stakeholders.

Goal 3: Support a Multi-Scale Multi-Resolution Modeling Subsystem

Most modeling components are supported with the funding currently available, although start times and durations vary. SECOORA will solicit proposals to conduct a model skill assessment project in Year 3.

The modeling components include the following:

Objective 3.1: Support Regional and South Atlantic Bight (SAB) Subregional Circulation Modeling.
Objective 3.2: Implement Forecasting of Storm Surge, Inundation, and Coastal Circulation.
Objective 3.3: Develop a Nearshore Circulation Model for Rip Current Forecasting. (Not funded in Year 3)
Objective 3.4: Provide Species-specific Habitat Models that Integrate Remotely Sensed and In Situ Data to Enhance SAFMC Stock Assessments.
Objective 3.5: Improve Beach/Shellfish Water Quality Advisories.
Objective 3.6: Model Skill Assessment (Contractor to be identified in Year 3)

All projects except Objective 3.3, rip current modeling, were initiated in Year 1 and all will be re-assessed in Year 3 for continued funding.

Table 4. Modeling and Related Product Development

Institution	Funding	Activity
North Carolina State University (He)	$ 124,797	3.1: Support regional and SAB subregional circulation modeling.
University of Florida (Sheng) and North Carolina State University (Xie)	$112,618 and $54,218	3.2: Provide real-time forecasting of inundation and storm surge.
ROFFS (Roffer), University of Miami CIMAS (Muhling), and SAFMC (Pugliese)	$70,609	3.4: Develop data products derived from satellite and in situ observations for fisheries stock assessment.
University of South Carolina (Porter)	$37,209	3.5: Expand the beach water quality swimming advisories with other environmental variables.
TOTAL MODELING	**$399,451**	
Objective 3.6: SECOORA Model Skill Assessment		
Contractor to be identified	$32,731	Develop an automated algorithm/tool that performs routine systematic comparison of model data to the assembled real-time observations, provides comprehensive error covariance skill assessment metrics for both observations and models, and displays via graphs output of these analyses.

Goal 4: Enhance the DMAC Subsystem

Building on previous work, SECOORA will optimize access to regionally-aggregated information via a web interface that supports SECOORA's thematic priorities. This will be accomplished through continued investment of funding to enhance the work accomplished under previous SECOORA RCOOS grants, and to incorporate the progress made by the complementary Carolinas RCOOS data management effort.

Table 5. Data Management and Communication

Institution	Funding	Objectives: 4.1, 4.2, 4.3 and 4.4: Activity
University of South Carolina (Porter)	$192,387	• Maintain SECOORA DMAC Infrastructure. • Assess and Advance IOOS recommended SOS implementation. • Maintain and upgrade interactive maps and data portal. • Service and provide support to data providers. • Recruit and integrate new data to SECOORA data portal. • Support Eye On Earth Activities. • Support data providers and RCOOS Manager on implementation of QA/QC flags based on published QARTOD manuals. • Collaborate with SECOORA product development contractor.
University of North Carolina – Chapel Hill (Seim)	$24,752	Support IOOS Vocabulary activities • Improve and test SPARQL queries. • Investigate the quality of information of ESRI Geoportal side response of catalog search of metadata records
TOTAL DMAC	**$217,139**	

Institution	Funding	Activity
Objective 4.5: Product Development Support Services		
Contractor to be identified	$56,000	The Product Development Support Services contractor will be responsible for data product upgrades, developing new data products and provide data management support services. The contractor will work closely with SECOORA staff, data management team, RCOOS Principal Investigators and stakeholders on identifying new product needs under these SECOORA thematic areas: Ecosystems, Water Quality and Living Marine Resources; Marine Operations; Coastal Hazards; and Climate Change.
Objective 4.6: SECOORA Website upgrade		
Contractor to be identified	$15,000	SECOORA will conduct a workshop to scope upgrades for SECOORA's website.

Goal 5: Support a Targeted and Leveraged Education and Outreach Subsystem

Due to funding limitations, the primary focus of the Education and Outreach (E&O) subsystem is to provide outreach to stakeholders regarding observing technologies, data, products, and services. Outreach activities are provided by all SECOORA staff, as well as the RCOOS PIs. Resources for formal educators are maintained on the SECOORA website, and we continue to promote the Basic Observation Buoy as a STEM education tool. Note that Goals 1 and 3 include outreach activities that complement and contribute to the E&O subsystem.

Table 6. Education and Outreach Activities

Institution	Funding	Activity
SECOORA (Hernandez, Subramanian, Lee)	Funding allocated in Goals 1 & 4	Develop success stories and related outreach information.
TOTAL EDUCATION AND OUTREACH	**Funding allocated in Goals 1 & 4**	

Milestone Chart

Table 7. Milestones for Year 3 by Quarter

	2012-2013 Quarter			
Goals and Milestones	**1**	**2**	**3**	**4**
Goal 1: Sustain SECOORA as a regional information coordination entity				
A. Provide timely grant reports to NOAA		x		x
B. Hold Board Meeting and Member Meeting		x		x
C. Publish e-newsletters and other outreach material	x	x	x	x
D. Coordinate with GCOOS on FL observing activities and other RAs to effectively respond to NOAA and other National level requirements, including RA Certification	x	x	x	x
E. SECOORA website updates focused on data portal expansion, and PI project news	x	x	x	x
F. Refine and maintain RCOOS Conceptual Operations (Build out) Plan	x	x	x	x
G. Support local, regional, national collaboration	x	x	x	x

	2012-2013 Quarter			
Goals and Milestones	**1**	**2**	**3**	**4**
H. Evaluate mechanisms to track operational statistics, product usage, and outcome measures and metrics	x	x	x	x
Goal 2: Sustain an Observing Subsystem for the SE				
A. Operate and maintain moored and coastal stations (COMPS and Carolina RCOOS)	x	x	x	x
B. Report moored and coastal stations data to seco-ora.org and NDBC	x	x	x	x
C. Operate and maintain Priority Radars				
i. Hourly surface current maps from the various regions via individual and SECOORA websites	x	x	x	x
ii. Estimates of experimental significant wave heights from the HF radar data	x	x	x	x
iii. Develop/report performance metrics of CODARs and WERAs throughout the SE including accuracy estimates of the surface currents	x	x	x	x
iv. Provide the radial currents to the National Serv-ers (SIO) for the National HF radar network	x	x	x	x
D. Maintain the sensors on Gray's Reef National Ma-rine Sanctuary (GRNMS) buoy (41008)	x	x	x	x
E. HF Radar Waves Data Project (Contractor to be identified)	x	x	x	x
Goal 3: Support a multi-scale multi-resolution Modeling Subsystem				
A. Support and enhance SABGOM model	x	x	x	x
i. Maintain and enhance NCSU Ocean circulation Nowcast/ Forecast modeling system and serve model output through the THREDDS server	x	x	x	x
ii. Model skill assessment for all physical variables through appropriate comparisons with available observations; including near real-time compari-sons with available coastal sea levels, buoy meas-ured temperature/ salinity, HF Radar currents, satellite observations;	x	x	x	x
B. Provide real-time forecasting of inundation and storm surge				
i. University of Florida: Transition present 2D FL model domains simulations to 3D baroclinic model simulation domains	x	x	x	x
ii. North Carolina State University: Begin forecasts in SC-NC domains	x	x	x	x
iii. Validate FL domain forecast and make forecast data available to partners via THREDDS server – UF/NCSU	x	x	x	x
iv. Solicit partner feedback	x	x	x	x
C. Develop data products derived from satellite & in situ observations for fisheries stock assessment				
i. Determine if the habitat modeling techniques will be able to improve the presently used techniques to adjust the SCDNR's indices of abundance de-rived from the fishery independent trap data	x	x	x	x
ii. Develop a robust habitat model for red porgy since year 2014 was an important baseline year for the stock assessment of this species	x	x	x	X

	2012-2013 Quarter			
Goals and Milestones	**1**	**2**	**3**	**4**
iii. Extract and compile habitat and environmental data for all species of interest	x	x	x	x
iv. Define relationships between species distributions and environment	x	x	x	x
v. Develop and refine satellite data products	x	x	x	x
vi. Attend stakeholder and SECOORA meetings		x		x
vii. Final report and Manuscript preparation			x	x
D. Provide decision support tool for beach/shellfish WQ advisories				
i. Enhance the beach water quality swimming advisories application that allows users to see current water and air temperature, cloud cover and sun exposure, UV index, wind speed and direction, and surf conditions including rip tide warnings along with advisories	x	x	x	x
Goal 4: Implement a DMAC Subsystem				
A. Service Data Providers and RCOOS Subsystem PIs	x	x	x	x
B. Assess Sensor Observation Service response formats	x	x	x	x
C. Maintain DMAC infrastructure (hardware and software)	x	x	x	x
D. Work with IOOS Program Office on Eye on Earth related activities	x	x	x	x
E. Collaborate with product development support contractor	x	x	x	x
F. Support IOOS controlled vocabulary work	x	x		
G. Upgrade SECOORA website services	x	x	x	
Goal 5: Support a targeted and leveraged Education and Outreach Subsystem				
A. Maintain web portal for BOB and other outreach activities	x	x	x	x
B. Develop outreach materials	x	x	x	x
C. Conduct community outreach highlighting the importance of observatories and SECOORA's products	x	x	x	x
D. Develop success stories with PIs to highlight on website, newsletters, one-pagers, etc.	x	x	x	x

Appendix A: SECOORA Priority Radar Sites

All Radar Sites identified in the table below support IOOS Key Activities: Search, Rescue, Oil Spill Response, Major Ports and Shipping Lanes; USF, with the support received will find a location and install the 4 CODAR site.

Responsible Agency/Vendor	Station Name/State	Latitude (N)	Longitude (W)	Nominal Frequency (MHz)
University of North Carolina/ CODAR	Duck, NC	36.18	-75.75	5.0
University of North Carolina/ CODAR	Cape Hatteras, NC	35.26	-75.52	5.0
University of South Carolina/ WERA	Georgetown, SC1	33.25	-79.15	8.3
University of South Carolina/ WERA	Caswell Beach, NC2	33.88	-78.11	8.3
Skidaway Institute of Oceanography/WERA	St. Catherine, GA	31.69	-81.13	8.3
Skidaway Institute of Oceanography/WERA	Jekyll Island, GA	31.06	-81.41	8.3
University of Miami/WERA	Dania Beach, FL	26.08	-80.12	12.6
University of Miami/WERA	Virginia Key, FL	25.74	-80.15	12.6
University of Miami/WERA	Crandon Park, FL	25.71	-80.15	16.0
University of Miami/WERA	Broad Key, FL3	25.35	-80.25	16.0
University of South Florida/CODAR	Redington Shores, FL	27.83	-82.83	5.0
University of South Florida/CODAR	Venice, FL	27.08	-82.45	5.0
University of South Florida/CODAR	Naples, FL	26.16	-81.81	5.0
University of SF/CODAR	To be determined	N/A	N/A	12.6