

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

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Award Number: NA11NOS0120033
<http://www.secoora.org>

Reporting Period: 1 October 2013 – 30 November 2014
Date submitted: 25 November 2014

Important Note on SECOORA's 2014 Annual Progress Report

During this reporting period, SECOORA submitted the revised scope of work and funding request for Year 4 (June 1, 2014 – May 31, 2015). After the contractual review and account establishment for the Year 4 award, funding for SECOORA sub-awards were disbursed to partner institutions. The administration of the NOAA IOOS award and sub-awards are being continued by SECOORA. This report details the progress and accomplishments over the reporting period. We have allocated funding for the following tasks in Year 4 to further address the integration of our existing ongoing projects and address stakeholder and user needs: (1) ocean variable experiment; (2) rip current model validation and forecasting, and (3) enhance and strengthen data management infrastructure.

LONG-TERM GOAL

The long-term goal of this project is to integrate and augment existing observational, modeling, data management, and education assets in the Southeast Coastal Ocean Observing Regional Association (SECOORA) domain to create an end-to-end Regional Coastal Ocean Observing System (RCOOS) in support of user-defined needs for improved coastal and ocean decision making.

OBJECTIVES

SECOORA will:

1. Ensure that stakeholder needs are met through assessment and governance mechanisms that effectively prioritize the distribution of RCOOS-related funding and other resources that are required to meet critical regional needs.
2. Coordinate and execute an operations plan for a fully instrumented RCOOS in the SE with defined service levels, commensurate with funding, that provides coordinated monitoring, assessment and prediction.
3. Maintain an observing subsystem that includes moored and coastal stations, high frequency radars (HF Radar), gliders and storm event monitoring subcomponents.

4. Support a multi-scale, multi-resolution modeling framework that includes shelf and estuarine circulation, estuarine and surge/inundation prediction, addresses user-defined modeling needs, and uses the observing subsystem for verification, assimilation, and operation.
5. Build upon the SECOORA Data Management and Communication (DMAC) infrastructure to optimize existing operations, facilitate technology evolution / transfer, and address structural / project management complexities.
6. Support an education and outreach (E and O) program partnered with other RAs and marine education efforts that engages diverse education and stakeholder audiences to understand the benefits of ocean observing to society.

APPROACH AND WORK PLAN

SECOORA is a [membership](#)-based organization that attracts and invites stakeholders with interests in coastal and ocean data and information. These members not only help prioritize SECOORA activities, but participate in developing stakeholder-based products. SECOORA will be responsible for fiscal and overall project management. SECOORA is an independent nonprofit 501(c)(3) organization that has implemented a strategy to sustain observations in the SECOORA domain, and supports the development and implementation of predictive models and decision-making tools as identified by a broad user community. As described in the funded [IOOS descope proposals](#), SECOORA is focusing on the following goals during this period of the five-year Regional Coastal and Ocean Observing System (RCOOS) project:

1. Sustain SECOORA as a Regional Information Coordination Entity (RICE).
2. Sustain and expand a coastal and ocean observing subsystem for the Southeast (SE).
3. Support a multi-scale modeling subsystem.
4. Support the Data Management and Communication (DMAC) subsystem.
5. Support an education and outreach subsystem.

Specific approaches and goals include the following:

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

Project management includes fiduciary oversight of all sub-awards, preparation and submission of financial and progress reports, and ensuring coordination, integration and collaboration both among principal investigators (PIs) within each RCOOS subcomponent and among PIs across the various RCOOS subcomponents. Sixteen PIs and 19 sub-awards (Year 3 and Year 4) contribute to this project necessitating a significant investment of effort for project and fiscal management, technical communications, and task coordination for effective operations and success of implementing a RCOOS for the SE. Responsibilities will be shared among SECOORA's Executive Director (D. Hernandez), the RCOOS Manager (V. Subramanian), Business Manager (M. Lee), Bookkeeper (C. Kight) and a Communication Specialist (A. Wakely). The Bookkeeper and Communication Specialist are part-time employees with SECOORA.

SECOORA will continue to seek new members through our website and direct recruitment by staff and Board members, and outreach via social media outlets. SECOORA will continue to host two board meetings (May and December) and an annual member and stakeholder meeting (May) in a calendar year. SECOORA will partner with stakeholders, specifically through the engagement of SECOORA Board, staff, principal investigators, member institutions, IOOS Association, U.S. IOOS Program Office, and the Governors' South Atlantic Alliance.

SECOORA will utilize the Build Out Plan to implement a RCOOS that leverages, integrates and augments existing observational, modeling, data management, education and scientific assets within the region. SECOORA staff will coordinate these efforts with ongoing SECOORA RCOOS projects, other proposal efforts, neighboring Regional Associations (RAs), the IOOS RICE Certification process, the IOOS Catalog, and the RA Gaps Analysis.

Additional coordination responsibilities include working closely with the neighboring Regional Associations and state and federal government agencies to ensure that messages, products, and projects are coordinated and resources are leveraged. Staff will attend IOOS Association, U.S. IOOS Program Office, coastal ocean observing system related conferences, and other RA meetings as funding allows.

2. Sustain and expand a coastal and ocean observing subsystem for the Southeast (SE)

The observing subsystem provides the basis for the RCOOS by providing observations specific to use of data in numerical models and the development of data products. SECOORA is supporting the maintenance of existing sub-regional observing systems deployed as part of pre-SECOORA programs, which include the operation and maintenance of offshore moored stations, coastal stations, a Gray's reef ocean acidification buoy and HF Radar sites. Assets in the SECOORA footprint have been purchased through a mix of state, federal, research, and IOOS funding. Primary partners include the University of South Florida (B. Weisberg, M. Luther and C. Merz), University of Georgia (Scott Noakes), University of Delaware (Wei Jun Cai), University of North Carolina System (L. Leonard and H. Seim), UGA Skidaway Institute of Oceanography (D. Savidge), University of Miami (N. Shay) and the University of South Carolina (G. Voulgaris). In Year 4, SECOORA will fund an ocean variable experiment project. We will consider outfitting the gliders with CTD, VEMCO acoustic receivers and optical sensors to collect valuable data that can be combined with HF Radar, in-situ stations, circulation models and satellite data. The proposed experiment is aimed at the integration of SECOORA's observational, modeling and data management subsystem projects, and will support SECOORA's scientific and operational goals.

Each observing asset collects and provides near-real-time data for multiple users, enabling the development of 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).

3. Support a multi-scale modeling subsystem

In support of user-identified modeling needs, all the modeling components funded during Year 1, Year 2 and Year 3 are continued in Year 4. In Year 4, SECOORA will allocate funds to provide observational support for rip current forecast model validation in the SE region. Final reports of the real-time forecasting of inundation and storm surge projects at University of Florida and North Carolina State University will be compiled in Year 4.

The modeling component includes the following (primary partners):

- Regional and sub-regional circulation modeling (North Carolina State University, R. He)
- Forecasting of storm surge, inundation, and coastal circulation (University of Florida, P. Sheng; North Carolina State University, L. Xie)
- Species-specific habitat models that enhance South Atlantic Fisheries Marine Council stock assessments (ROFFS, M. Roffer; University of Miami, B. Muhling; SAFMC, R. Pugliese)
- Improved models in support of issuing beach swimming advisories (University of South Carolina, D. Porter).

4. Support the Data Management and Communication (DMAC) subsystem

Key strengths of SECOORA's DMAC enterprise are effective working relationships and collaborations. Key collaborators include data providers, RCOOS PIs, other RA DMAC coordinators, IOOS DMAC and stakeholders. These relationships are fostered by the SECOORA staff and regional technical personnel responsible for operating and upgrading the data management system. Building on previous work, SECOORA will continue to recruit new data, integrate and optimize access to regionally-aggregated data and information via a web interface that supports SECOORA's thematic priorities. University of South Carolina (D. Porter) will be the primary partner maintaining and supporting the SECOORA DMAC subsystem. In Year 4, SECOORA will award mini-grants to plan for enhancements to SECOORA data management programs and infrastructure, and to increase and improve access to SECOORA aggregated near-real-time and historical observational and hindcast physical-biogeochemical model data.

5. Support an 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, 3 and 4 include outreach activities that complement and contribute to the E&O subsystem.

WORK COMPLETED AND ASSOCIATED RESULTS

For the current reporting period, the progress to date and associated results for each goal are as follows:

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

SECOORA provides a network and structure for engagement of regional stakeholders. We have 46 members and a 17 person Board. SECOORA holds Executive Committee calls monthly and Board member conference calls approximately four to five times a year. We also held the SECOORA annual Members, Board and PIs meetings (May 13 - 15, 2014) in Savannah, GA. Presentations and 2014 annual meeting materials can be accessed via the [SECOORA May 2014 meeting website](#). We held a Board meeting (December 4-5, 2013) in Charleston, SC, and are planning to hold the next Board meeting also in Charleston, SC on December 9, 2014. We continue to host our monthly PI conference calls in order to ensure coordination among the SECOORA data management activities, the PIs within each RCOOS subcomponents, and the PIs across all SECOORA RCOOS subcomponents.

SECOORA continues to provide the fiscal and overall project management for this project. SECOORA submitted the [Year 4 descope proposal](#) to the NOAA IOOS Program Office on August 13, 2014, and established sub-awards. The FY14 SECOORA A-133 audit was conducted by the firm Elliott Davis, LLC and was finalized on September 22, 2014. There were no negative findings. The management of sub-awards to primary partner institutions is being continued. SECOORA has bi-monthly administration meetings to ensure efficient and effective fiscal operations. The Finance and Audit Committee meets once a quarter. Megan Lee, SECOORA Business Manager attended via webinar the NOAA Grants Management Financial Assistance Workshop Silver Spring, MD held June 24-25, 2014.

SECOORA continued to actively participate in the Governors' South Atlantic Alliance (GSAA), IOOS Association and U.S. IOOS Program Office activities (progress reports, meetings, conference calls and responding to information requests and data calls). Many of these activities focus on advancing the collective capabilities of SECOORA, the IOOS enterprise, and our partners.

2. Sustain and expand a coastal and ocean observing subsystem for the Southeast (SE)

SECOORA continued to fund and sustain existing sub-regional observing networks. Specific progress and results to date include the following.

University of South Florida (USF) Coastal Ocean Monitoring and Prediction System (COMPS) three surface and two subsurface moorings, along with one near shore tower installation are maintained for real-time and delayed mode observations (surface meteorology and water column currents and T/S on surface moorings, water column V and bottom T/S on subsurface moorings, and surface meteorology, water column currents and waves on the near shore tower). New data logger/telemetry systems were deployed on three surface moorings, which led to improved data returns from the moorings. Support is continued for USF COMPS coastal stations that collect physical and meteorological data in real-time. USF has added the Clam Bayou station, located on Boca Ciega Bay in St. Petersburg, FL, to the COMPS coastal stations network. A new radar-based water level sensor on a NOAA designed mounting frame with bubbler back-up was added to this site on October 29, 2014. In addition to water level and meteorological data, the Clam Bayou site measures salinity, dissolved oxygen, pH, water temperature, turbidity, chlorophyll, blue green algae, fluorescent dissolved organic matter. Water quality and water level sensors were supplied by YSI/Xylem. Consolidation of the COMPS Egmont Key and Anna Maria sites into a single nearby site is in the planning stages. It is expected that USF will maintain 6 coastal stations (Shell Point, Aripeka, Fred Howard Park, Big Carlos Pass, Clam Bayou and the consolidated Egmont/Anna Maria site). The real-time data collected by the moorings and coastal stations are delivered to SECOORA and NDBC, and are made available via Global Telecommunication System (GTS).

University of North Carolina Wilmington (UNCW) continued to operate and maintain 7 nearshore real-time moorings and 1 coastal pier station. These stations collect and provide hourly reports of the following variables: wind velocity, barometric pressure, sea surface temperature, atmospheric temperature, solar radiation, sea level, in-water velocity, salinity, and waves. During this reporting period, UNCW's Coastal Ocean Research and Monitoring Program (CORMP) successfully redesigned the communications/telemetry systems. Currently, 5 of the nearshore

moorings (≤ 5 nm from shore) use Verizon cell modems, replacing the Iridium satellite communications service. One more mooring will be converted to cell modem within the next reporting period, and another mooring will continue to use Iridium since it is 27 miles from shore and cell phone coverage does not extend that far offshore. All data collected are provided to SECOORA and NDBC and are made available via GTS.

University of Georgia continues to operate and maintain the NOAA's Ocean Acidification Program NDBC Gray's Reef National Marine Sanctuary (GRNMS) buoy (41008). The Gray's Reef National Marine Sanctuary (GRNMS) pCO₂ system has been transmitting water and air pCO₂ measurements and pH without incident during the reporting period. The batteries on the Sea-Bird failed in September so the water quality parameters are currently not being transmitted. On October 24, all the pCO₂ system mounted on the buoy deck were replaced. This also included mounting a new GPS integrated iridium antenna on the buoy mast. The SAMI-pH and Sea-Bird mounted under the buoy could not be replaced at this time due to sea conditions. Seas were moving the buoy considerably and did not allow for safe diving under the buoy. UGA and GRNMS are currently watching the sea conditions for an opportune window to head back offshore to replace the two sensors. The waters offshore Georgia are currently undergoing their annual shift from being a CO₂ source to becoming a CO₂ sink. During this reporting period, surface water pCO₂ has shifted from the mid 500 μ atm to the mid 300 μ atm. Atmospheric pCO₂ at GRNMS is currently around 400 μ atm. Also at GRNMS, pH is slowly increasing during this period from approximately 8 to 8.1. These seasonal changes are primarily temperature driven and expected annually, however overall the pCO₂ at GRNMS has been increasing at a rate of 2.7% per year for seawater and 0.78% per year for atmospheric pCO₂. Continued monitoring at the site will help to determine if this rate is an ongoing event. During this reporting period, the estuarine and coastal water offshore Georgia were surveyed extensively (April, May, July, July, September) by partner institution University of Delaware for the following purposes: a) provide a ground-truthing for the mooring pCO₂ and pH at the Gray's Reef, b) build a robust total alkalinity (TAlk) and salinity relationship; thus high frequency mooring salinity data can be translated into TAlk and, using TAlk and high frequency pCO₂, we can calculate high frequency dissolved inorganic carbon (DIC), pH, and carbonate saturation state and c) understand coastal carbon cycling and relevant biogeochemistry such that they can be incorporated into building a predictive model for pCO₂, pH and saturation state at the mooring site and in the region. During these cruises, scientists measured pCO₂, pH, and took water samples for dissolved inorganic carbon (DIC) and total alkalinity (TAlk) analysis. During each survey, in addition to underway (pumping seawater through an instrument when the ship is sailing) survey of pCO₂ and O₂, they also took about 100 water samples to measure DIC and TAlk back at lab. Two manuscripts are nearly ready for submission. The first one examines the drivers, i.e variables (DIC, TAlk, Temperature and Salinity etc.), that control the pCO₂ at the mooring site. The second paper will examine the secular trend over the 7 years since observations started at the mooring for pCO₂ in 2006.

The University of Miami operates WERA HF Radar installations on Key Biscayne (Crandon), Virginia Key and Dania Beach. Dania Beach and Virginia Key transmit at 12 MHz; Crandon Park site is now transmitting again at 16 MHz. Crandon Park site was not operational from the summer of 2013 to the summer of 2014 due to a cable being severed by city park and recreation maintenance crew. These radars are estimating significant wave heights for the National Weather Service marine forecast models and provide mean radials at hourly intervals to SECOORA and the U.S. National HF Radar network archive. Discussions are underway with Ocean Reef Club, Key Largo to establish the fourth WERA site at Key Largo, FL. Operational uptime and average spatial range statistics for the period from October 2013 through November 2014 of Virginia Key and Dania Beach HF Radar sites are: 90.5%, 111km and 67.8%, 111km.

University of Miami was awarded funds to carry out an applied research project during this reporting period to evaluate the feasibility of delivering accurate wave estimates from high frequency radar for broad use by stakeholders. The objective of this project is to deploy an Acoustic Wave and Current Profiler (AWAC) in the HF Radar footprint in the FL Straits to obtain wave measurements, which can be compared to the WERA HF Radar derived significant wave height measurements. The work will also include a careful assessment of the errors in wave extraction algorithms. In April 2014, University of Miami (UM) Rosenstiel School of Marine and Atmospheric Science deployed a subsurface mooring in the Straits of Florida. The mooring was equipped with a NortekUSA AWAC instrument. AWAC profiler was located at 25.93N and 79.88W in the UM maintained High Frequency radar footprint (between Dania Beach and Virginia Keys stations) and collected waves and currents data for three months. The AWAC (Nortek) mooring was recovered in August 2014. Data recovery is 100% based on preliminary analysis. These raw data have been provided to NWS (current and wave data), and is now carefully being analyzed relative to HF Radar measurements for currents and waves.

The University of North Carolina Chapel Hill operates two CODAR HF Radar installations on the Outer Banks of North Carolina. A new station at Core Banks, NC has been added (March 2014). Funding for this additional site comes from the state of NC through the UNC Coastal Studies Ocean Energy Program. Operations and maintenance are being partially supported by SECOORA. Other progress and accomplishments during this reporting period are: (i) continued collaboration with Johns Hopkins University to develop ship-tracking capabilities using the DUCK 5 MHz CODAR site located at the Army Corps Field Research Facility in Duck, NC. Improvements to the site from this collaboration include: additional transmit antenna and high power transmitter added (fall 2013), new model receive antenna replaced the 10 year old existing antenna, a new antenna calibration was completed 11/07/14; and (ii) continue to develop Gulf Stream landward edge tracking capabilities with the NC radars, and compare them with existing data products. The investigators have also begun seeking optimal reprocessing parameters for the NC radars to improve radar surface current quality at the radial short, or 30 minute averaged radial, level. Hourly data from the systems are delivered to SECOORA and the U.S. National HF Radar network archive. Operational uptime and average spatial range statistics for the period from October 2013 through November 2014 of Cape Hatteras and Duck HF Radar sites are: 99.8%, 187km, 99.1%, 226km.

Skidaway Institute of Oceanography (SkIO) continued to operate two WERA HF Radars on St. Catherine's Island and Jekyll Island, GA for this reporting period. The data are being continuously provided to SECOORA and the U.S. National HFR Network archive in near-real time. Estimates of wave and wind parameters are also made as experimental products. Operational uptime and average spatial range statistics for the period from October 2013 through November 2014 of St. Catherine's Island and Jekyll Island HF Radar sites are: 97.1%, 189km, 98.7%, 201km.

The University of South Carolina currently maintains, operates and delivers data from two priority radar sites (Fort Caswell, NC and Georgetown, SC) covering Long Bay, SC. The operation of the two systems was continued without major interruptions during the reporting period, despite a number of issues developed with the Georgetown site due to coastal erosion (storm activity) that made the antennas of the GTN vulnerable to damage. The sites provide half-hourly surface current maps via the PI's and the SECOORA websites and estimates of significant waves heights on an experimental basis. Operational uptime and average spatial range statistics for the period from October 2013 through November 2014 for Fort Caswell, NC and Georgetown, SC HF Radar sites are: 99.2%, 184km, 98.4%, 223km. The data from each station are provided in near real-time to SECOORA and the US National HF Radar network.

The College of Marine Science (CMS), University of South Florida (USF) currently operates, maintains and delivers data from three CODAR priority radar sites (Naples, Venice and Reddington Shores). Acquisition of CODAR equipment spares for installing the fourth site is in progress. USF maintains the two co-located WERA stations and assessment of CODAR and WERA HF Radars in mapping currents were performed. The data from the stations are provided in near real-time to SECOORA and the U.S. National HF Radar network maintained by the Scripps Institution. The performance metrics (temporal and average spatial range) of the CODAR systems indicate operation for 99.4% and 177km, 91.2% and 169km and 94.4% and 184km, for the period October 2013 to November 2014 for the Reddington Shore, Venice and Naples, respectively. The performance metrics of the WERA systems indicate operation for 98.8% and 135km and 98.1% and 126km for the period October 2013 to November 2014 for the Fort DeSoto and Venice, respectively.

3. Support a multi-scale modeling subsystem

The North Carolina State University South Atlantic Bight Gulf of Mexico (SABGOM) model continues to run on a 24/7-basis, providing three-dimensional (3D) regional ocean predictions. The model provides daily 72 hour nowcast/forecast, and model output (sea level, temperature, salinity and 3D currents) are made available via the SECOORA website and the NCSU PI's website. SABGOM model has been coupled with a biogeochemical prediction model, and testing data assimilation (DA) schemes within the SABGOM modeling system using 3D-variable and 4D-variable data assimilation schemes. The DA system, once fully implemented, will be able to assimilate observations including satellite sea surface temperature, sea surface height, HF Radar surface currents, and glider observed hydrography to improve SECOORA regional ocean circulation predictions. Using SABGOM model predictions, the PI and his team supported USF and NOAA in a 30-day glider survey of the Gulf Stream, which was conducted in March 2014. The resulting high-resolution hydrographic data are being used to test

SABGOM data assimilation system. The NCSU SABGOM modeling team worked with the SECOORA data management team to standardize model output and data products via the establishment of THREDDS server and SECOORA's interactive map display.

The North Carolina State University Coastal Marine and Atmospheric Environment Prediction System (CMAEPS) maintained the near-real-time CMAEPS forecast system and provides atmospheric, sea surface wave, and storm surge forecasts for the SECOORA region, and high-resolution storm surge forecasts for the Northern Florida Coast domain. Specific progress and accomplishments during this period include: (1) Maintaining the near-real-time CMAEPS forecast system on the NCSU IBM Blade Center Linux Cluster (henry2) and providing real-time atmospheric, sea surface wave, and storm surge forecasts for the SECOORA region, and high-resolution storm surge forecasts for the Florida Coast domain; 2) Providing the atmospheric WRF model forecasts and sea surface wave forecasts through the web and data server; and 3) Starting to summarize their previous research and application works for the past three-year period and to draft the final progress report.

The University of Florida has completed a 3D forecasting system coupled with a SWAN wave model for the entire Florida coast and provides a two to three day forecast depending on the forecast wind fields. Specific progress and accomplishments during this period include: (1) Maintaining the near-real-time 3D forecasting system; (2) Serving 3D model data via SECOORA THREDDS server as well as PI's website and (3) Starting to summarize their previous research and application works for the past three-year period and to draft the final progress report.

The University of South Carolina and University of Maryland continued to maintain and support the decision support web and mobile app tools for issuance of beach swimming advisories by the South Carolina Department of Health and Environmental Control (SCDHEC). The beach swimming forecast, advisory and data are available via the [SECOORA website \(Beach Swimming Advisory Portlet\)](#). During this reporting period, the PI and his team are working to evaluate / demonstrate geographical transferability of their modeling approach. They are focusing on swimming beaches in FL identified as areas of concern by State of Florida beach managers / public health officials. Initial stakeholder interactions and discussions yielded recommendations for the study area to be within the Sarasota County, FL beach area. Data gathering efforts and model setup (historical and real-time bacterial, water quality and meteorological) are in progress.

Roffer's Ocean Fishing Forecasting Service, Inc. (ROFFS Inc.), the University of Miami Cooperative Institute for Marine and Atmospheric Studies (CIMAS) and the South Atlantic Fisheries Management Council (SAFMC) are developing habitat modeling for enhancing fish stock assessments. Engagement by regional stakeholders in the stock assessment process has increased substantially during this reporting period. A scientific paper ("Habitat models for Gray Triggerfish collected in fishery independent trap surveys off the Southeastern United States,") was prepared and presented to the members of the SouthEast Data, Assessment and Review (SEDAR) at the Charleston, SC (Aug. 04-08, 2014) SEDAR #41 Workshop (http://www.sefsc.noaa.gov/sedar/Sedar_Workshops.jsp?WorkshopNum=41). It is important to note that this scientific paper resulted in substantive discussions during the Assessment Index Working Group at this meeting. Walt Ingram (NOAA, NMFS, Pascagoula Laboratory), Barbara Muhling (Co-PI) and Joey Ballenger are presently engaged in discussions related to refining, evaluating, and hopefully implementing the use of the habitat model into the grey triggerfish stock assessment. It was felt at the SEDAR meeting that habitat modeling had great value to stock assessment in general as it provided a good mechanism to introduce environmental variability into the stock assessment indices. The idea of using habitat modeling was further advanced by Roger Pugliese (SAFMC) within the South Atlantic Fishery Management Council during their June (Ponte Vedra Beach, FL) and September (Charleston, SC) meetings. The ongoing work by the project team with NOAA NMFS Southeast Fisheries Science Center (Miami, FL) with highly migratory species also continues to serve the advancement of the use of habitat modeling for stock assessment. Roffer is also working on habitat modeling with Aaron Adams (Bonefish Tarpon Trust) and Jon Shenker (Florida Institute of Technology) on items related to bonefish, tarpon, and permits within and outside of the SECOORA footprint. Discussions relative to the sharing and utilization of the physical data collected by the MARMAP fisheries independent monitoring program to the SECOORA community have been initiated. The project team is also engaged in working with other SECOORA Principal Investigators as well as with other researchers at the Florida Wildlife Research Institute to identify and develop products that could be served on SECOORA's website to assist the South Atlantic Fishery Management Council and others involved with fish stock assessment in the SECOORA region.

Filipe Pires Alvarenga Fernandes, Oceanographer, Brazil, was awarded the SECOORA Model Skill Assessment project contract. Richard Signell, Scientist, United States Geological Survey (USGS), U.S. IOOS Modeling Test Bed Steering Committee member will be a collaborator and act in a consultant role on this project. The contract was established in May 2014, and the work is in progress to develop an on-line tool for SECOORA numerical model skill assessment. A SECOORA model skill assessment project website (<http://ocefpaf.github.io/secoora/>) has been set up to post the results and progress of the ongoing work. The workflow and model skill assessment version controlled software code base are hosted at <https://github.com/ocefpaf/secoora.git>. Identification and access to SECOORA observations (in-situ, HF Radar and Glider) and numerical models (SABGOM, USF FVCOM, etc.) via SECOORA and IOOS developed catalog endpoints (Sensor Observation Service and THREDDS) have been completed. Work has also been completed on the development of software for the comparison and estimation of error metrics of water level observations with model data, and an interactive map of the results of the comparison and bias estimates can be accessed via <http://ocefpaf.github.io/secoora/comparisons/timeseries/elevation/>. Work is in progress to compare salinity, temperature and currents (in-situ and HF Radar) observations with model data.

4. Support the Data Management and Communication (DMAC) subsystem

University of South Carolina (D. Porter) is the primary partner who will maintain and support the SECOORA DMAC subsystem and the University of North Carolina at Chapel Hill (H. Seim) is funded to support IOOS Vocabulary efforts. The details of ongoing data management activities during this reporting period are described in this section.

The University of South Carolina (USC) hosts and maintains the hardware and software related to SECOORA's [Data and Maps](#) section of the website. Significant effort has focused on redefining the look and feel of the Data Portal to mimic the technological approach of the [GSAA Data Portal](#). The GSAA Data Portal project is now in maintenance mode, and updates to data endpoints and server software are being performed.

SECOORA RCOOS Manager (V. Subramanian) and USC Data Management team continued to participate in IOOS Data Management monthly conference calls and provide input and contributions towards IOOS and RAs common data management topics and discussions such as Sensor Observation Service (SOS), IOOS Catalog and QARTOD etc. We have implemented the netCDF version (ncSOS) and have registered our SOS, THREDDS and ERDDAP services on IOOS catalog registry. SECOORA RCOOS Manager worked with USF technical personnel to demonstrate the implementation of quality control tests outlined in the IOOS Manual for Real-Time Quality Control of In-Situ Current Measurements for buoys on the West Florida Shelf at the May 2014 IOOS DMAC Webinar. We have started to archive our near real-time in-situ observations at National Oceanographic Data Center (NODC).

We continue to recruit new data from data providers and also provide services on data management related solutions to data collectors and providers within the region. We also maintain a [Wiki site](#) in which documentation and notes on technologies we use are made available. We also started contributing to the IOOS established documentation and code sharing [github](#) site. We worked with data providers and PIs on: THREDDS data server installation and making model and observations available via the same; added Florida Atlantic University LOBO and Florida Institute of Technology (FIT) Sebastian Inlet station data; and glider deployment track posting on SECOORA web site in coordination with IOOS glider Data Assembly Center (DAC) and SECOORA glider operators. Added Northeast Fisheries Science Center (NEFSC) drifter program latest drifter tracks to SECOORA map interface. USC has been working closely with NC State University/Ruoying He as they are developing larger footprint US East Coast model products including salinity, water temperature, and circulation. We are developing Catalog Service for the Web (CSW) compliant catalog to host a more dynamic and up-to-date listing of SECOORA assets. Towards accomplishing the objectives of SECOORA product development project, created daily/monthly summary average/minimum/maximum/variance files from NCSU SABGOM model data, provided data query and netCDF format support with USF and UNCW observations and NCSU (SABGOM) model data, and performed the upgrade of THREDDS server to better support performance and improved uptime.

IOOS Parameter Vocabulary work was continued during this reporting period. UNC personnel built and deployed a demonstration utility to visualize mappings of IOOS Parameter Name Vocabulary. The visual demonstration shows general relationships between various terms returned by querying Marine Metadata Interoperability (MMI) Ontology Registry and Repository (ORR). The graphic user interface (GUI) allows a user to dynamically select terms and see detailed display of mapped terms from general to more specific utilizing relationships and terms

registered and mapped in the MMI ORR (<http://www.unc.edu/usr-bin/haines/orrviz.py>). A review of the current IOOS parameter vocabulary to Climate and Forecast (CF) standard name map was performed. There have been several updates to the CF standard name table, which required new mappings. Ten new mappings as a consequence of 358 new terms were added. The new IOOS parameter to CF standard name map can be found [here](#). Documented vocabulary search use-cases for IOOS catalog are located at the IOOS [github](#) website.

Second Creek Consulting, LLC was awarded the SECOORA product development support service contract in January 2014. With the help of the SECOORA product committee members, the data providers and managers at UNC Wilmington and USF, the Ocean Observing and Modeling Group at NCSU, and the USC SECOORA DMAC team, Second Creek Consulting, LLC developed and released the [SECOORA Climatology product](#). This product allows users to visualize, interact and download historical surface temperature and salinity data from select SECOORA buoys and historical nowcast/forecast South Atlantic Bight Gulf of Mexico (SABGOM) model data from 2011 - 2014. Work is in progress to add visualization of seasonal climatologies of NCSU model generated salinity and temperature.

5. Support an Education and Outreach subsystem

The primary focus of SECOORA's Education and Outreach (E and O) subsystem is to engage stakeholders in observing technologies, data, products, and services. Note that Goals 1, 3 and 4 include outreach activities that complement and contribute to the E and O subsystem. We have listed work carried out during this reporting period below. We hired Abbey Wakely, a part-time Communication Specialist to work with SECOORA staff and member organizations on SECOORA outreach activities. No Education and Outreach PIs were funded in Year 2, Year 3 or Year 4.

SECOORA continued to engage in marketing and outreach activities via e-newsletter, e-mails, social media and website. SECOORA sent e-newsletters, referring and increasing traffic sessions to our website during this reporting period. We sent emails outlining staff activities to the Board. Stories highlighting Members work, SECOORA newsletters and more were published on our website. We continue to engage in outreach and education events as well as provide materials to RCOOS PI and Board members, who attend science meetings, provide information to governmental representatives, etc. SECOORA staff and members engaged in many in-person outreach events, including meeting with congressional staff. During this reporting period, we developed the SECOORA Annual Report, new outreach rack cards and one-pagers for each state, which can be accessed via our website.

SECOORA In-person Outreach: SECOORA staff constantly engaged in either delivering a talk at institutions or visiting institutions and attending meetings to promote the need for the implementation of regional coastal ocean observing systems to address coastal zone issues. The following are some outreach activities that occurred during this reporting period: NOAA Ecological Forecasting webinar and meeting; Weather Ready Nation events; Weather Forecast Office visits: Tampa, Miami and Charleston; Wilmington Sector USCG; North Carolina Sea Grant; North Carolina Member institutes as well as potential new member organizations; Ocean Acidification office in Charleston; GSAA meetings; Our Global Estuary meeting; Congressional offices; North Carolina Coastal Management and Sentinel Site Programs; South Carolina Maritime Association; GCOOS-RA Annual Meeting; Integrated Tracking of Aquatic Animals in the Gulf of Mexico (iTAG) workshop; SURA Coastal and Environmental Research Committee (CERC) Spring 2014; Fleet Weather Center, Norfolk, VA; Florida Gulf Coast University; West Central Florida American Meteorological Society Meetings; International Radio Oceanography Working Group meeting; 2014 St. Petersburg Science Festival; Undergraduate Environmental Science Lab Tours USF Clam Bayou Water Quality Monitoring Station; Guy Harvey Fisheries Symposium, St. Petersburg, FL (November 13-15, 2014); Researching Plastic Marine Debris Canterbury School of Florida, St. Petersburg Oceanography Class; and 2014 World GIS Day, University of South Florida, St. Petersburg, FL (November 18, 2014).

During this reporting period we conducted our SECOORA Board meeting in Charleston, SC (December 4-5, 2013). We also conducted our SECOORA Annual Meetings in Savannah, Georgia (May 13-15, 2014). We held our RCOOS PIs meeting on Day 1, Annual Member and Stakeholders meeting on Day 2 and Board meeting on Day 3. All meeting materials are available via [SECOORA website](#).

IMPACT AND APPLICATIONS and TRANSITIONS

The coastal and ocean observations and associated models and decision-support tools supported by SECOORA are all being collected/developed to address specific user-described needs relevant to all four of the NOPP evaluation factors. Monitoring data are used by federal, state, academic, private and local agencies for a wide range of applications including weather forecasting, beach swimming advisories, water quality predictions, and search and rescue. Developed numerical models are made available for use by federal and state agencies to support coastal evacuation orders, issuance of beach swimming advisories, storm surge inundation and rip tide advisories, and fisheries management. SECOORA has partnered with private industry to support the development of commercial products related to commercial and recreational fishing. SECOORA staff was actively engaged in outreach efforts as described in the earlier section of this report. SECOORA worked with US IOOS, University of South Florida and Florida Gulf Coastal University to submit a NOAA Educational Partnership Program internship proposal for the summer of 2014. The student, Pedro Matos-Llavona, worked directly with COMPS Operations Manager Jason Law while at USF. As part of the program the student was taught all aspects of coastal ocean observing operations, including instrument set-up, maintenance and deployment as well as cruise and dive planning and execution. The student acted as Assistant Chief Scientist on a mooring cruise under the direction of Mr. Law.

RELATED PROJECTS

North Carolina State University (NCSU) and Skidaway Institute of Oceanography (SKIO), University of Georgia from SECOORA participated in the Glider Palooza for the Fall 2014 season (September - November 2014). Thirteen to sixteen Slocum Gliders are being deployed covering from South Nova Scotia, Canada to Georgia and Gulf of Mexico waters by academic and research institutions. SKIO, UGA Glider Modena was equipped with a pumped CTD, Aanderaa oxygen optode, an Ecopuck triplet (CDOM, chl-a, turbidity), and a Vemco VMT receiver operating at 69 kHz. The data collected by the glider systems along with data from ocean satellites, HF Radar and in-situ moorings supported an ensemble of ocean models. SECOORA supported NCSU SABGOM model predictions were made available to USF and NOAA in a 30-day glider survey of the Gulf Stream, which was conducted in March 2014, Glider Palooza 2014 and UNC Coastal Studies Ocean Energy Program. SECOORA partially supports operations and maintenance for the UNC Core Banks HF Radar system, which was funded by the state of NC through the UNC Coastal Studies Ocean Energy Program. SECOORA also continued partnership with GSAA, and maintains the Regional Information Management System Portal for the GSAA.

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OUTREACH ACTIVITIES AND MATERIALS

Numerous outreach materials have been developed for specific audiences and are available at www.secoora.org.

University of South Carolina, Columbia, SC, George Voulgaris

South Carolina Beach Community Kick-off Meeting (Aug 12-13, 2014), a coastal communities / municipalities effort to organize and influence activities for the preservation of beaches.

Working Session meeting (July 2014) organized by the Southeastern Coastal Wind Coalition in Charlotte, NC.

University of North Carolina – Wilmington, NC, CW Lynn Leonard

US IOOS Advisory Committee Meetings (<http://www.ioos.noaa.gov/advisorycommittee/welcome.html>).

UNCW CORMP hosted Patrick McCarty, Doctoral candidate at the UNCW Watson School of Education and Principal at Murray Middle School (New Hanover County, NC), as an ocean observing intern during summer 2014. Mr. McCarty participated on buoy maintenance trips, assisted CORMP mooring technicians with sensor testing and evaluation, and learned about the Basic Observation Buoy (BOB) for classroom applications. Mr. McCarty plans on using his experience with CORMP to implement BOB in science classrooms at Murray Middle School.

UNCW participated in the NC Coastal Atlas Steering Committee call on September 11, 2014 as the SECOORA representative.

UNCW, in partnership with SECOORA, hosted a Congressional Day event at UNCW's Center for Marine Science on August 5, 2014. Invitations for the event were sent to the offices North Carolina Congressmen, SECOORA members, and SECOORA stakeholders. This event provided SECOORA with the opportunity for community education on ocean observing activities within the state.

University of South Florida, St. Petersburg, Mark Luther

Clam Bayou Water Quality monitoring teacher training activities - Undergraduate Environmental Science Lab Tours Water Quality Monitoring Station (October 2014).

University of South Florida, St. Petersburg, Robert Weisberg

Partnered with SECOORA/IOOS/Florida Gulf Coastal University (FGCU) to host NOAA EPP intern for the summer of 2014.

Partnered with SECOORA/GCOOS-RA/IOOS on 2014 St. Petersburg Science Festival.

USF/Sea Education Association/SECOORA Canterbury School of Florida, St. Petersburg, Marine Debris Research Project.

University of North Carolina, Chapel Hill, Harvey Seim

UNC HF Radar Data sharing with Cape Hatteras and Cape Lookout National Park Service groups.

ROFFS Inc. Mitch Roffer

Steering Committee of the Climate and Fisheries Workshop.

SEDAR Stock Assessment Meeting, Charleston, SC, August 4 – 8, 2014.

University of South Carolina, Columbia, SC, Dwayne Porter

Florida Department of Health, Mote Marine Laboratory, Sarasota and Pinellas County, Florida Wildlife Research Institute (FWRI) - Beach Water Quality Modeling Geographic transferability to a beach location in Florida.

University of Georgia, Athens, GA, Scott Noakes

NOAA Ocean Acidification Education and Outreach Lecture (October 22, 2014) - Ocean Acidification: The Other CO2 Problem.

UM, Nick Shay

National HF Radar Technical Steering Team Annual Meetings.

NCSU, Ruoying He

Engaging National Weather Service on nearshore circulation and wave predictions (Newport/Morehead City, NC Weather Forecast Office)

Supporting NOAA fishery science and service on fish/turtle migration and sampling study (NOAA fishery- Beaufort Lab, Southeast Fishery Science Center and FWRI/FWC)

Assisting in a NC state funded Ocean Energy project by providing SABGOM simulated Gulf Stream results (Coastal Studies Institute, UNC-CH).

GeoOptics Conrad C. Lautenbacher, Jr., PhD., SECOORA Board Chair

Chair of the US IOOS Advisory Committee, US IOOS Advisory Committee Meetings

(<http://www.ioos.noaa.gov/advisorycommittee/welcome.html>).

Surface Current Monitoring for the US Gulf of Mexico and Southeastern coasts using High Frequency Radar (HF Radar): What we have and What we need

[A joint GCOOS-RA and SECOORA call for funding article](#)

SECOORA Congressional Outreach Documents - [FL](#), [GA](#), [SC](#) and [NC](#) One Pagers.

[SECOORA 2013 Annual Report](#)