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Changing Ecosystems, Economies, and Climate: Strategic Priorities for the Southeast Coastal Ocean Observing Regional Association

SECOORA
Southeast Coastal Ocean Observing
Regional Association

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SECOORA's Organization: A Snapshot

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1. Strategic Priorities

1.1 Purpose

This document presents the Southeast Coastal Ocean Observing Regional Association (SECOORA) priorities for contributing to our understanding, management, and sustainment of our valued ocean and coastal resources.

SECOORA is one of 11 Regional Associations established nationwide through the NOAA Integrated Ocean Observing System (IOOS). IOOS coordinates the multi-agency, cooperative effort to routinely collect real-time data and manage historical information based on a continuously operating network of buoys, ships, satellites, underwater vehicles, and other platforms. These data are needed for many purposes which include rapid detection and prediction of changes in our nation's ocean and coastal waters.

SECOORA participating members contribute to IOOS implementation in multiple ways. This region has long been a leader in ocean data management and communication (DMAC) activities, high frequency WERA coastal current radar research, locally run buoy-based research systems, estuarine nutrient enrichment and harmful algal bloom (HAB) research, high resolution coupled ocean-atmosphere modeling and wave research, and inundation models. Many SECOORA member projects are being conducted on a small, or pilot scale, that need to be expanded region-wide. For instance, expanding the buoy networks at the U.S. Weather Research Program recommended spacing of 100 km intervals in the South Atlantic Bight from Cape Hatteras to Miami would require 20 more buoys, which cost approximately $200,000 dollars each, $2.3 million more than SECOORA's entire FY10 IOOS funding. Similarly, tracking pathogens on our extensive beachfront is ongoing as a separate local project, but needs regional expansion to improve protection of public safety. Tracking the excessive nutrients from eutrophic rivers into our estuaries, and the harmful algal blooms they enable in our coastal ocean, should be closely tracked region-wide before another public health hazard occurs. SECOORA needs to continue to do these things at the larger scale. This Strategic Priorities Plan is how we intend to start, if appropriately funded.

SECOORA developed this plan based on the needs of the region, the capabilities of the membership, and the ability to make significant progress in specific areas. It describes in general terms what the regional requirements for an ocean observing system are. This work enables marine spatial planning in our estuaries and coastal ocean as well as supplies the data required to implement ecosystem based management.

The SECOORA Priorities Plan is directed to:
1. SECOORA members, to articulate priorities and provide guideposts

The Coastal Ocean Monitoring and Prediction System (COMPS) for West Florida provides data needed for a variety of management issues, including more accurate predictions of coastal flooding by storm surge, safety and efficiency of marine navigation, search and rescue efforts, and fisheries management, as well as supporting basic research. COMPS sites are operated in close collaboration with Florida local and state emergency management officials. Wherever possible, there are direct line-of-sight radio links from the observing site to the local emergency operations center. COMPS personnel provide training for the emergency managers on how to access and use the data from each site. Photo: Cliff Merz, USF/St. Petersburg

for future activities;

2. regional stakeholders and potential members, to demonstrate capabilities and describe connections to identified stakeholder needs;

3. decision-makers, including elected officials, to explain why funding is needed and what will be accomplished.

1.2 Introduction

The ocean and coastal waters of the southeastern United States help drive local weather and regional climate conditions, support ecologically and economically significant ecosystems (which include important fisheries), and provide tourism, boating, and other recreational opportunities. The oceans and coasts annually provide over $675 billion dollars worth of economic impact in the southeast U.S.[i] SECOORA integrates existing widely scattered ocean and coastal information and data over North Carolina, South Carolina, Georgia, and Florida. Currently over 200 ocean observing platforms operate in the southeast and report data through the SECOORA data portal at www.secoora.org and other outlets. Many SECOORA members have been observing and reporting information for over a decade. This improves marine weather forecasts, harmful algae bloom forecasts, beach swimming advisories, understanding of rip currents, search and rescue operations, and inundation maps.

However, ocean observing in the southeast is at a critical juncture. Funds to support ocean observing have been declining in recent years. Buoys and other platforms that provide critical data are suffering from lack of maintenance, and some are being completely removed from service. This loss of critical infrastructure as well as skilled labor to maintain and operate the systems erodes the region's ability to efficiently capitalize on past investments. With additional funding, SECOORA can sustain and build upon existing regional assets to make a significantly greater contribution.

The foundation of SECOORA is service. SECOORA's vision is to:

Protect people by providing comprehensive information and tools on:
▸ Weather, wind, current, and wave conditions for improved safety of marine operations;
▸ Inundation from storms and sea level rise to inform coastal communities and inhabitants of the risks to lives and property; and
▸ Pathogen and rip-currents to support beach users and communities.

Conserve our marine environment by providing ocean current, wind, and ecosystem condition information:
▸ to support Coastal and Marine Spatial Planning for improved ecosystem-based management;
▸ to predict location and movement of contaminants for better preparation and response; and

The oceans and coasts in the southeast region annually provide over $675 billion dollars worth of impact to the regional economy.

National Ocean Economic Project, 2009

The USCG ELM deploys a UNCW/US Marine Corps weather and oceanographic buoy 5 miles offshore of the Camp Lejeune Marine Corps Base. The buoy will provide valuable data for boaters and mariners and play a significant role in Base training and operations.
Photo: UNCW/Jamie Moncrief

▶ to determine the best locations, from sea surface to seafloor, for renewable ocean energy, marine protected areas, and other offshore operations and activities.

Enhance our coastal economy by providing information and models:

▶ to facilitate more effective decision-making regarding commercial and recreational fisheries;

▶ for predicting acute and chronic beach and shoreline change affected by climate change and high energy events, such as storms and hurricanes; and

▶ to support tourism, offshore energy, and shipping industries.

SECOORA, a not-for-profit membership organization, coalesces the significant efforts of academia, industry, government agencies, and NGOs, many of which are data and information providers and users. SECOORA's commitment to providing the most reliable marine data and information will ensure protection of people and property, a healthy marine economy, and sustainable natural coastal and ocean resources.

1.3 National and Regional Priorities

National

Ocean observing has been recognized by the US Commission on Ocean Policy, the Ocean Research and Resources Advisory Panel, the Joint Ocean Commission Initiative, and many other ocean policy entities and initiatives as foundational to meeting the nation's need for more effective coastal and ocean management. The Interim Report of the Interagency Task Force on Ocean Policy (September 2009) has called for strengthening the nation's capacity for observing the nation's ocean, coastal, and Great Lakes systems.

President Obama signed the Integrated Coastal and Ocean Observing System Act into law on March 30, 2009[ii]. Congress and the Administration recognize the importance of observing to accomplishing critical national objectives of national security, maritime safety, economic prosperity, and environmental sustainability. The Act provides a renewed impetus and a requirement to fully realize the vision of an integrated observing system. This system must be driven by the needs of stakeholders and be able to provide sustained real-time data and information. Benefits accrue to such diverse issues as climate change, coastal inundation, ocean acidification, renewable offshore energy, ecosystem-based management, marine transportation, and marine search and rescue.

Regional

As part of this strategic planning process, SECOORA reviewed stakeholder needs assessments of the southeast region. Themes that regularly appear in these assessments include climate change and its impacts on habitats and sea level, marine weather and operations, and ecosystem

Gag is the most common grouper in the SECOORA region. Managing fisheries is a priority issue SECOORA members are using coastal and ocean observing data to address.
Photo: NOAA Photo Library/OAR/National Undersea Research Program (NURP)/UNCW

management including fisheries and water quality. Another important expression of regional priorities is the one articulated by the newly formed Governors' South Atlantic Alliance. The Alliance has identified their four initial priorities as healthy ecosystems, working waterfronts, clean coastal and ocean waters, and disaster-resilient communities. These priorities are incorporated into SECOORA's Themes.

1.4 Themes

SECOORA's previous and ongoing regional observing efforts in the southeast focused on delivering information and products to inform harmful algae bloom predictions, inundation modeling, marine weather forecasts, and analysis of circulation and temperature anomalies. This Priorities Plan expands these efforts in four themes, which include specific areas of emphasis for this planning period:

Ecosystems, Living Marine Resources and Water Quality
▸ Fish
▸ Water quality, including beach advisories and harmful algae blooms

Coastal Hazards
▸ Inundation
▸ Rip Currents

Marine Operations
▸ Safety, including support of Search And Rescue (SAR) operations
▸ Improving Marine Weather Forecasting
▸ Offshore Energy

Climate Change
▸ Long-term data collection and analysis
▸ Ocean Acidification

1.5 Strategic Partnerships

Implementation of SECOORA's vision can only be accomplished through strategic partnerships at three levels.

Thematic
For each of the major themes and subcomponents, a primary end-user is (or will be) partnering with SECOORA to ensure resources are focused on delivering information and products that will be immediately useful and meet priority needs of stakeholders. These partners represent local, state, regional, public, or private interests.
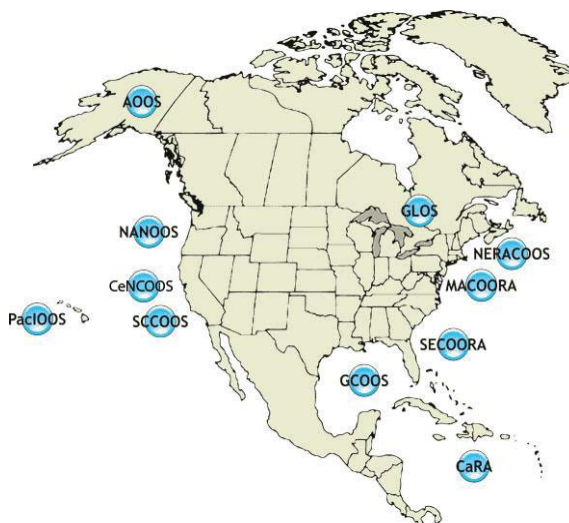
Regional
SECOORA will fully engage with the Governor's South Atlantic Alliance as a supporting partner to provide both information and expertise through

tailored products and services that meet the needs of the Alliance and its member states. This support is often expressed in local level operations that can be expanded to achieve regional results. The products may include maps, GIS layers, and interoperable formats that foster ecosystem-based management and inform coastal and marine spatial planning.

National

SECOORA will continue efforts to insure a strong and sustained IOOS. In partnership with NOAA, the IOOS program office, and other federal programs and offices, SECOORA will address critical national priorities. Engagement will be fostered with additional national programs including the U.S. Coast Guard, U.S. Army Corp of Engineers, U.S Environmental Protection Agency, U.S. Geological Survey, Minerals Management Service, Department of Homeland Security, and FEMA.

SECOORA is a member of the National Federation of Regional Associations (NFRA), working along with ten other Regional Associations (RAs) to assure the needs and positions of on-the-ground users in the regions are adequately reflected in national policy and priority setting. We are actively engaged with our neighboring RAs in the Gulf of Mexico, Caribbean, and on the East Coast. These collaborations across regions help ensure efficient pooling of expertise and resources, limit redundancy, and improve effective transfer of knowledge.
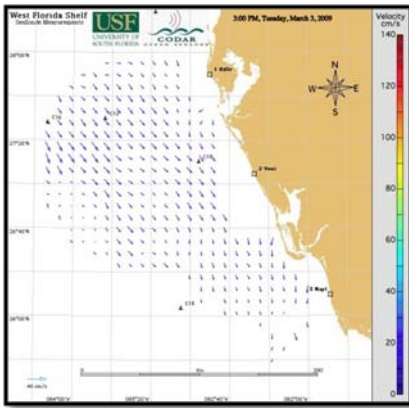
Ongoing work of NFRA articulates the regional response to the need for accurate and timely information for coastal areas in the United States. The 11 RAs are working to demonstrate how five years of sustained funding would be used to meet the nation's critical need for observing information to:

▶ adapt to climate change,

▶ conserve ecosystems,

▶ respond to coastal hazards, and

▶ ensure safe and efficient marine operations.

2. Coastal Ocean Observing Regional Associations

High frequency radar data such as those seen in the map above are used for search and rescue operations, tracking and predicting oil spills and harmful algal blooms, assessing shoreline erosion, predicting rip currents, providing maritime forecasts of currents and waves to recreational and commercial marine communities.
Map source: B. Weisburg

Regional Associations (RAs) coordinate coastal and ocean observing activities and facilitate dialogue with the public; local, state, and federal agencies; and public and private sector interests so that the benefits from the sustained operation of a regional coastal and ocean observing system (RCOOS) can be realized. The RA enables an end-to-end system from cutting edge research and technology, yielding continuous ocean observations, feeding into predictive modeling and societal applications. Data are archived, undergo quality assurance and quality control, and provide the best source of unbiased information to our stakeholders.

Expertise is needed to sustain a RCOOS. Coastal ocean observing systems have been operating in the southeast for over a decade, and SECOORA members and institutions have extensive experience with these observing platforms, which include buoys, high frequency radar sites, and gliders. These systems have improved marine weather forecasts, inundation models, circulation studies, and current maps. Experience and expertise within SECOORA membership provides core capacity necessary to operate and sustain a RCOOS.

Coastal ocean observing systems consist of:

▶ Collective observations from multipurpose platforms (e.g., buoys, moorings, ships, gliders, satellites);

▶ Data management and marine geospatial planning system that transmits geo-located data, ensures data quality and interoperability, and integrates data within its geospatial context from multiple sources;

▶ Modeling capacity that interpolates limited observations into regional and ecosystem-level information and provides forecasting capability; and

▶ Outreach and education to seek continual input and feedback.

SECOORA supports the need of the southeastern United States to have real-time, or near real-time, marine information on coastal and ocean conditions that protects our people, environment and economy. SECOORA's ocean and coastal observation and information network improves the capability to sustain the quality and productive use of our marine environment.

3. Ecosystems, Living Marine Resources and Water Quality

Marine ecosystems are dynamic and complex. These three-dimensional and fluid dependent systems function through complex chemical, geological, and biological interactions that change over time and space. Water temperature, salinity, dissolved oxygen content, sea level, upwelling, hurricanes, and drought conditions all affect water quality and ecosystem health[iii].

The estuaries and coastal ocean of the South Atlantic Bight region have a shallow slope with large tidal differences and the unique property of a near-24-hour inertial current cycle that approximates the daily cycle, as well as arguably the most energetic current system in the world ocean in the Florida Current and Gulf Stream. Our estuaries and coastal ocean provide larval habitat of many important fisheries including shrimp, shellfish, crabs and fin fish. These habitats are impacted by changes in water level at spatial and temporal scales from storm to climate scale, with relatively little known to date to quantify these impacts. Our coastal ecosystems are plagued by eutrophic rivers that export excessive nutrients into the estuarine and coastal ocean environment. These eutrophic conditions can lead to harmful algal bloom events, which cause significant fish kills with large impacts to local economies. For example, the St. Johns River estuary in Florida is over 100 miles in length and up to 2 miles wide, yet has recently been troubled by increasingly frequent algal blooms caused by excessive nutrients that turn the estuary bright green and load tributaries with excessive cyanobacteria and potential pathogens.

For this planning period, SECOORA will focus on delivering products for two specific sub-components of ecosystem management. However, the sustained operation of the RCOOS is critical to enabling research and management of a broad range of issues generally described ecosystem assessment and management.

3.1 Fish

Fish, fishing, and fisheries are major components of the economy, heritage, and ecological systems that support and sustain the unique culture of the southeastern states. In 2007, commercial fisheries landings from the four southeast states were valued at $280 million[iv]. For 2006, the American Sportfishing Association estimates the economic impact of recreational saltwater fishing at over $7.3 billion to these economies[v].   In Florida alone in 2006, over two million saltwater anglers contributed $3 billion in retail sales[vi].   The South Atlantic Fisheries Management Council (SAFMC) is considering restrictions on fishing that would heavily impact the recreational fishery in the our region, with expected reductions in revenues ranging from $9.2 to $19.5 million depending on which of the alternative actions under consideration are chosen[vii].   SECOORA is working to develop

methods to link fisheries management and oceanographic data to improve fisheries management decisions.

In August, 2009, SECOORA in partnership with the Florida Fish and Wildlife Research Institute held a workshop to assess the data and information needs of fisheries managers and researchers throughout the southeast region. SECOORA is uniquely qualified to provide information that informs decisions about fisheries limitations and closures. Stock recruitment and rebuilding processes are governed in part by ocean circulation, climate, and weather. The current stock assessment processes are not closely linked with the oceanographic processes so influential on stock health and viability.

Strategic Partners: The South Atlantic Fisheries Management Council, which includes a diverse range of commercial and recreational fishing interests, and the natural resources/fisheries agencies of the four southeastern states.

Key Products, Services, and Expected Results
SECOORA will deliver:

▸ Geo-referenced regional level data, analyses and climatologies to support nowcasts and forecasts of events of social and ecosystem significance (e.g., harmful algae blooms, anoxia, etc.). These will improve response by managers and users (fishing and shellfisheries industry, mariners, tourism officials), and potentially reduce overall economic impacts by directing swimmers and fishers to areas not impacted by events.

▸ Visualization and analyses tools for historical circulation and climate data, including maps of mean fields and seasonal variation of surface and subsurface temperature (which is a key parameter of interest to fisheries managers), salinity, circulation, and other physical variables from the estuaries and across the shelf to inform stock assessments and understanding of stock refurbishment processes. These historical and near real-time products will improve prediction of year-class health, and support decision-making by managers regarding fisheries restrictions.

▸ Evaluation of past HABs, anoxia/hypoxia or similar events. These analyses will improve understanding of stock recruitment processes, and aid in development of models to inform fisheries management decisions.

▸ Linked biological and physical stock assessment models to support recovery of the snapper/grouper complex.

Scup and Black Sea Bass hovering around a reef ledge in Gray's Reef National Marine Sanctuary, Georgia. The commercial fishery for Black Sea Bass has been closed to vessels fishing in South Atlantic Federal Waters effective December 2009. These are the types of decisions that fishery managers make on a regular basis that coastal and ocean observing data can support.
*Photo: NOAA Photo Library*

3.2 Water Quality

Millions of people visit the beaches of NC, SC, GA, and FL every year. These states monitor beach water quality to ensure public health is protected. Advisories are issued based on water samples that take 24 hours to process. Thus today's advisory is based on yesterday's water quality. SECOORA will work with state agencies to improve beach advisories through the incorporation of observing data. SECOORA members have worked on a pilot project that utilizes standard statistical methods and historical rainfall, wind, water quality, and other data to produce a model for specific South Carolina beaches. Upon validation, the model will be available for use in real-time by water quality managers to make advisory decisions.

Strategic Partners: State and local water quality managers and tourism officials in NC, SC, GA, and FL.

Key Products, Services and Expected Results

SECOORA will help provide support to water quality managers to improve beach advisories in all four states, including delivering:

▸ Standardized and interoperable data management interface to simplify and organize the real-time and historical data necessary to develop statistical models to predict when beach or shellfish advisories should be issued.

▸ Support to, and collaboration with, the appropriate agency in each state to help develop preemptive models for beach advisories for priority beach communities that can serve as pilot projects. These models will increase the reliability of issuance of beach advisories in these communities, thus reducing the risk to both human health and local economies.

▸ A training workshop for water quality managers to enable expansion of the results of the pilot projects to beach communities throughout the southeast, and potentially to other regions as well. This training will increase the capacity of the region to protect public health, while preventing harm to local economies.
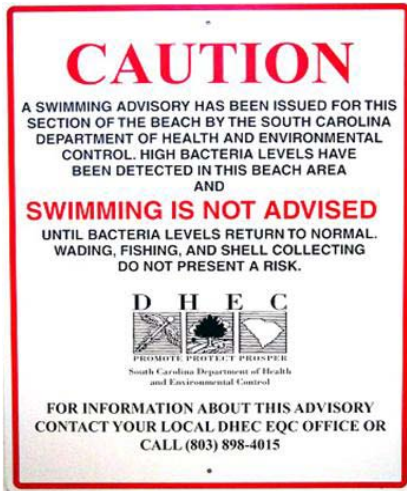
The University of South Carolina has recently collaborated with SCDHEC, NOAA, Raytheon, Inc. and the University of Maryland to implement decision support models to improve beach advisory accuracy. Using a variety of modeling techniques and ocean observing variables (wind, weather, current, salinity, etc.) , the research team created one of the first marine/Enterococcus predictive models. These models are now being used in support of issuing beach swimming advisories, resulting in improved public health protection.

4. Safe and Efficient Marine Operations

Commercial and recreational boating safety, efficient shipping, and informed and cost-effective offshore energy production (including renewable and non-renewable) are aspects of marine operations that impact ecosystem health and economic vitality in the U.S.

4.1 Saving Lives: Improving Marine Forecasts

Over a recent five-year period the U.S. Coast Guard investigated well over 100 vessel-related incidents per year in the Southeast marine environment, which speaks to the importance of marine weather information. SECOORA members and partners have been maintaining critically important weather and wave stations for over a decade. These observations have been demonstrated to measurably improve NWS marine weather forecasts. Unfortunately, lack of funding has resulted in the removal of many data collection platforms from our coastal waters exacerbating critical gaps in coverage of marine weather throughout our region, most notably off the northeast coast of Florida, all of the Georgia coast, and the southern South Carolina coast.

Strategic Partners: NOAA National Weather Service (NWS), US Coast Guard, state saltwater fishing associations

Key Products, Services and Expected Results

During the next five years, SECOORA will deliver:
- A more geographically rich set of integrated and real-time web-available wind, wave, circulation and current data to promote safe and efficient maritime transportation and recreational boating. This information will measurably improve NWS marine weather forecasts, increase efficiency of maritime shipping, and improve boater safety.
- Enhanced access to maritime weather information through improved web-based applications, interfaces, and user-selected options for information delivery.
- Local to regional scale circulation models to support U.S. Coast Guard SAR operations and spill response. These models, coupled with real-time observations, are necessary to produce nowcasts and forecasts critical to effective search and rescue and hazardous spill response operations. Accurate circulation models will improve operational safety and efficiency of emergency responders.

Photo: National Data Buoy Center, Station 41004, 41 NM Southeast of Charleston, SC

In addition to the traditional offshore energy activities in the Gulf of Mexico, the Southeastern U.S. states currently have other active offshore initiatives. These include natural gas pipelines, potentially will include new drilling for hydrocarbons, and also involve "alternative" efforts to harness wind and currents in offshore areas with the potential to make contributions to our nation's energy options. SECOORA has the expertise to effectively investigate and provide monitoring data to support these initiatives. At a recent southeast Marine Spatial Planning workshop hosted by The Nature Conservancy and SECOORA, offshore energy was identified as a regional issue that would benefit from a marine spatial planning process.

Through active partnerships with state Departments of Energy, state and local permitting authorities, industry, and other stakeholders, SECOORA can provide a network of expertise to support investigation, installation, and monitoring of offshore energy projects.

Strategic Partners: State Departments of Energy, environmental permitting agencies, private and public utilities, and private industry

Key Products, Services and Expected Results
Within the five year planning period, SECOORA will:
▸ Provide integrated, readily accessible, spatially explicit data and information to support evaluation and monitoring of potential alternative energy options, and inform coastal and marine spatial planning processes geared to minimize use conflicts and provide efficiency and objective expertise to state and regional energy initiatives.
▸ Convene a regional workshop to facilitate interactions between potential offshore energy providers, state energy officials, potential data providers and ocean observing experts to identify opportunities to efficiently support state efforts to encourage alternative energy development.
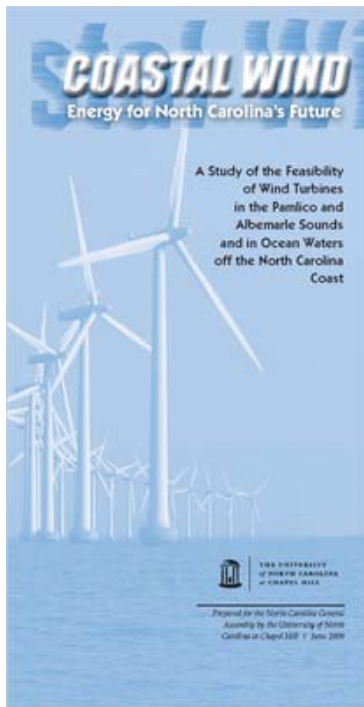
The University of North Carolina at Chapel Hill recently completed a 9-month study for the N.C. General Assembly to assess the feasibility of installing wind turbines in the sounds and off the coast of North Carolina. This study confirms that, because of a promising wind resource, large areas offshore of the North Carolina coastline are potentially well-suited for wind energy development and worthy of further investigation. A pilot project that builds on the study has just been announced. UNC and Duke Energy have signed a contract to place up to three demonstration wind turbines in the Pamlico Sound.

The map to the right displays wind speed at 30m height: measured v. extrapolated v. modeled. This data, captured by ocean observing buoys, was critical for the UNC Coastal Wind Energy Feasibility Study. Image and Map: UNC Chapel Hill
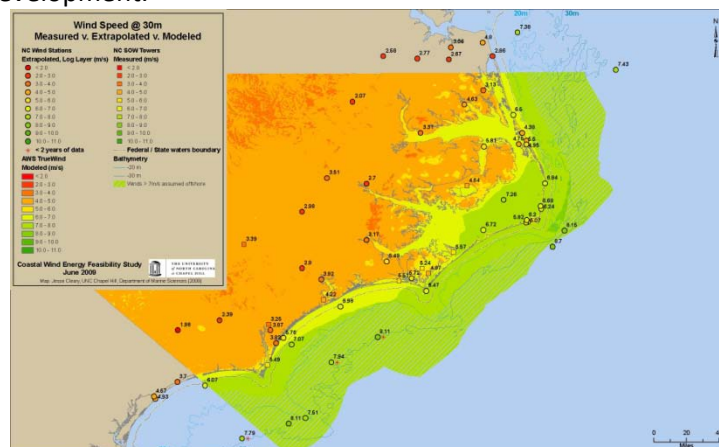
5. Coastal Hazards

A photo showing a rip current at Kill Devil Hills Beach on the Outer Banks of North Carolina. The foam and more turbid water heading offshore identifies the location of the rip. Photo: Greg Dusek, UNC Chapel Hill

Rip currents remain the number one cause for rescues and drownings at the beach, yet our ability to accurately forecast strong rip currents is limited. A University of North Carolina Chapel Hill Beach Hazard Study focuses on better understanding the of the underlying processes that influence dangerous rip current formation. A major component of the study is the collection of nearshore bathymetry data using GPS and directional wave data using Acoustic Doppler Current Profilers (ADCP) and the SWAN (Simulating Waves Nearshore) wave model to determine what factors most influence beach hazards, such as rip currents. Lifeguard surf zone observations and historical rescue data are also being analyzed to better understand beach hazards. Ultimately, the revised beach hazard forecast model will be used by NWS Weather Forecast Offices to provide spatially-explicit predictions of beach hazards in North Carolina.

Coastal hazards come in many varieties in the southeast, with the most significant being hurricanes. SECOORA will focus on two specific threats to the safety of coastal residents and visitors, inundation associated with storms and rip currents.

5.1 Flooding and Inundation: Improving Models and Forecasts

Resilient coastal communities know their risks from inundation and have implemented measures to mitigate those risks. Improving the resilience of coastal communities is identified as a priority for the Governors South Atlantic Alliance as well as many other federal and state agencies. SECOORA's role in addressing resiliency rests with its modeling expertise, data management capability, and experience in operating observing platforms to provide community-level data necessary to improve the accuracy of inundation models.

Strategic Partners: Utility companies, local and state emergency and stormwater managers, NOAA, and FEMA

Key Products, Services and Expected Results
SECOORA will:
- Collect and make interoperable and readily available key data necessary to improve inundation models. The availability of data such as real-time water-levels during inundation events, wind fields during hurricane landfall, and fine-scale bathymetric and topographic data will improve the accuracy of inundation models, saving people and lessening the economic impacts of emergency response.
- Build on existing regional modeling expertise and effort to expand and improve a model test bed that will allow both comparisons of different models to determine which are most accurate and ready access to observing data to compare model predictions with real data.

5.2 Rip Currents: An Unseen Threat

NOAA estimates that over 100 people die each year in the U.S. because of rip currents. Six National Weather Service Weather Forecast Offices (WFO) in the SECOORA region now issue surf zone forecasts that include rip current outlooks.

Strategic Partners: National Weather Service WFOs

Key Products, Services and Expected Results
- Collect and make interoperable and readily available in real time key data necessary to improve rip current models. These data, which will

include near-shore directional water levels, wind, waves, and currents as well as near-shore bathymetry and bottom type, will be used by WFOs to issue rip current outlooks.

▶ Improve the models used to predict the occurrence of rip currents, which will save lives and help support local tourism-based economies

6. Climate Change

KEY CLIMATE ISSUES FOR THE SOUTHEAST REGION

Projected increases in air and water temperatures will cause heat-related stresses for people, plants, and animals.

Decreased water availability is very likely to affect the region's economy as well as its natural systems.

Sea-level rise and the likely increase in hurricane intensity and associated storm surge will be among the most serious consequences of climate change.

Ecological thresholds are likely to be crossed throughout the region, causing major disruptions to ecosystems and to the benefits they provide to people.

Quality of life will be affected by increasing heat stress, water scarcity, severe weather events, and reduced availability of insurance for at-risk properties.

From *Global Climate Change Impacts in the United States*, U.S. Global Change Research Program, www.globalchange.gov/usimpacts, Cambridge University Press, ISBN978-0-521-14407-0

Communities in the southeast are struggling to identify strategies to adapt to the impacts changing climate may have. Marine ecosystems may experience severe impacts. The U.S. Global Change Research Program needs historical datasets and continuous long-term observing to inform development of regional scale climate indices that inform communities of the regional impacts associated with global predictions.

Strategic Partners: NOAA

Key Products, Services and Expected Results
SECOORA will provide:
▶ Support for Governors' South Atlantic Alliance climate change initiatives with marine observations and scientific studies by scientists from the university, agency, NGO and private sectors.
▶ Platforms for NOAA carbon dioxide sensors that are part of the national ocean acidification monitoring program. These sensors will provide data necessary to more accurately assess changes in ocean pH, which has significant impacts on coastal and marine ecosystems.
▶ Readily available and continuous ocean observing data for use in regional climate indices and models that inform understanding of local level impacts associated with climate change.

7. Invest in Observing

7.1 Maximizing our Investment

Now is the time to make our region's ocean observing system fully operational. We know our region's requirements for ocean observing data and information, and have described the initial priorities and objectives for our Regional Coastal Ocean Observing System (RCOOS) in this plan. With knowledge of our region's requirements, our existing assets, and the costs associated with various system subcomponents, a conceptual system design can be articulated.

SECOORA's conceptual system design has four principles:
1. assure the requirements of regional stakeholders are met,
2. effectively utilize existing assets,
3. maximize efficiency,
4. ensure scientific rigor for understanding of regional ocean processes.

Approximately 200 coastal ocean observing platforms are supported in the SECOORA region, including coastal HFR sites, offshore buoys, gliders, drifters, coastal water quality stations, and weather stations, which comprise the vast majority.
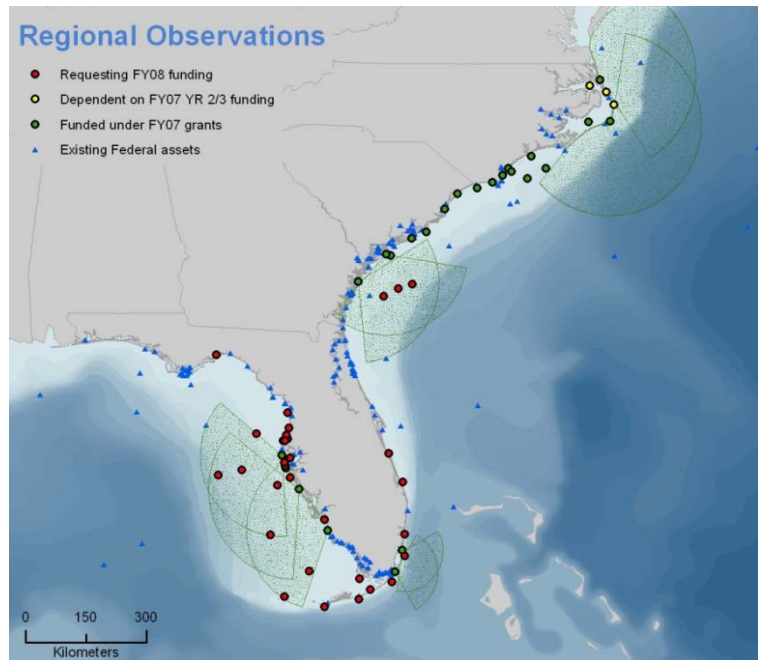
7.2 RCOOS Subcomponents and Existing Assets

To deliver the promised products, investments are needed for observations, data integration, modeling, product development, education and outreach, and system management. Together, these subcomponents comprise an integrated system that can take the raw observations and existing data and deliver useful and meaningful products.

- ‣ Observing capacity supports fixed stations (such as buoys) and transects with gliders and/or ships.
- ‣ Product Services
  - o Data integration supports the development of regional data integration centers for seamless access to existing and new regional data.
  - o Regional-scale models that can be nested within basin and global models can be used for higher resolution forecasts.
  - o Product development support for IT and science experts to translate raw data into useful and meaningful information products.
- ‣ System management support of the operational experts to coordinate and oversee the system to ensure routine and reliable delivery of information.
- ‣ Outreach and education programs so that users and stakeholders can help determine priorities for the system and provide input on observing system design, and educator partners can ensure incorporation of data and information into educational tools and curriculum resources.

Currently, approximately 200 coastal ocean observing platforms are supported in the SECOORA region. These include coastal HFR sites, offshore buoys, gliders, drifters, coastal water quality stations, and weather stations. The vast majority of these platforms are marine weather stations as opposed to ocean observing platforms, leaving significant areas of the region without buoys to provide basic information on ocean conditions. SECOORA also includes data management, regional modeling, and remote sensing components. Capabilities, including multiple gliders and moored buoys, exist in the region but are not currently deployed due to resource constraints.

7.3 Budget

SECOORA is working cooperatively with NFRA and the other RAs on a funding strategy that will enable implementation of RCOOSs and an IOOS that meet our Nation's requirements for ocean observing. As a preliminary short-term goal that recognizes the current economic crisis and the limitations it imposes on budgets, NFRA is requesting a very modest federal funding level of $33 million for fiscal year 2011 (FY11), that would ramp up over five years to $95 M in FY15. Funds would be distributed to the regions on a competitive basis.

The next phase of SECOORA's planning process will assess the costs associated with meeting those requirements. As a practical matter, in addition to describing the costs of a requirements-driven RCOOS and RA, SECOORA will describe what will be cut if funding is limited to the amounts

in the current NFRA strategy, which might equate to approximately $3M in FY11 ramping to $8.6 M in FY15 (total $27.5 M over five years) for the region.

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[i] National Ocean Economics Program. J. Kildow, C. Colgan, J. Scorse, *State of the U.S. Ocean and Coastal Economies,* June 2009.

[ii] ICOOS Act: Omnibus Land Management Act of 2009, Public Law 111-11 Section 12301-12309

[iii] Draft Report: Providing Coastal Information in a Changing Climate, NFRA, November 14, 2009

[iv] National Ocean Economics Program. J. Kildow, C. Colgan, J. Scorse, *State of the U.S. Ocean and Coastal Economies,* June 2009

[v] Southwick Associates. *Sportfishing in America: An Economic Engine and Conservation Powerhouse.* Produced for the American Sportfishing Association with funding from the Multistate Conservation Grant Program, 2007. Revised January 2008.

[vi] *Florida's Ocean and Coastal Economies Report*, J. Kildow, June 2008

[vii] Testimony of Mr. Duane Harris before the Subcommittee on Insular Affairs, Oceans and Wildlife of the House Committee on Resources, October 27, 2009