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CONCEPT PAPER ON
FLORIDA PORTS AND COASTAL OCEAN OBSERVING SYSTEM (FL-PCOOS)

INITIATED AT SEAPORTS AND RELATED MARINE AND ESTUARINE ENVIRONMENTS

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VISION

WITHIN FIVE YEARS, THE FLORIDA COASTAL OCEAN (INCLUDING THE FLORIDA SEAPORTS, AND THEIR APPROACHES AND OFFINGS) WILL BE PROVIDED WITH SIGNIFICANTLY IMPROVED REAL-TIME ENVIRONMENTAL INFORMATION TO FACILITATE SAFER AND MORE EFFICIENT MARINE TRANSPORTATION AND OFFSHORE OPERATIONS; PROVIDE BETTER WARNINGS OF COASTAL HAZARDS; AND SUPPORT MORE ADEQUATE ECOSYSTEM-BASED FISHERIES MANAGEMENT. THIS INITIAL CAPABILITY FOR A FLORIDA COASTAL OCEAN OBSERVING SYSTEM WILL RADIATE

OUTWARD FROM THE FLORIDA PORTS, PROVIDING CONNECTIVITY BETWEEN THE CONTINENTAL SHELF AND MAJOR ESTUARIES AND PORTS, AND BETWEEN THE CONTINENTAL SHELF AND THE OPEN OCEAN. A MAJOR STEP IS ENVISIONED TOWARD SOCIETAL APPLICATION OF SUPERIOR ENVIRONMENTAL INFORMATION FROM NEW TECHNOLOGY AND SCIENTIFIC UNDERSTANDING. FL-PCOOS WILL BE THE FIRST STATE-WIDE ACTIVITY ENGAGING ALL OF FLORIDA'S COASTAL OCEAN-ORIENTED ACADEMIC AND RESEARCH INSTITUTIONS IN AN APPLIED SCIENCE AND ENGINEERING EFFORT TO SUPPORT STATE ECONOMIC, INDUSTRY, AND MARINE ENVIRONMENTAL INFORMATION NEEDS IN THE COASTAL OCEAN.

BACKGROUND

As a peninsula, Florida is nearly surrounded by water; thus, the economic and societal health of the State of Florida is critically linked to its coastal ocean (i.e., the Exclusive Economic Zone (EEZ)). Coastal ocean properties related to safe and efficient navigation, public safety and health, sustained fisheries (through ecologically based management), and clean and abundant beaches are determined by interactions between the continental shelf and the estuaries and between the continental shelf and the open ocean, in essence from the head of tides to the (ca. 200nm) limit of the EEZ. Coastal ocean currents determine how nutrients of both estuarine and deep-ocean origin are distributed across (and along) the continental shelf, and in the vertical dimension, and, hence, how ecosystems are organized. Coastal ocean currents also contribute to life cycles for many of Florida's commercial and recreational fisheries. For instance, Gag Grouper adults are known to spawn offshore near the shelf break, whereas the juveniles grow to adults near the beach. The currents determine the larval pathways from the spawning sites to the beach and hence how this fishery is organized around the state. The currents are also a key input to red-tide functionality, providing another societal-relevant ecological example on their importance. As regards safe and efficient navigation, knowledge of currents within waterways is essential, and even subtle variations in water depth (through sea level variations) can affect dockage and cargo transfer. Sea level variations are attributable to shelf-wide responses to winds and other external forcing factors, so, for either subtle or extreme (hurricane storm surge) events, the entire coastal ocean response to external forcing must be known. Here, input is provided to a comprehensive Florida Coastal Ocean Observing System plan by focusing on observing systems within and radiating out from Florida's seaports.

The fourteen seaports of Florida are increasingly significant contributors to this state's economy. Florida has recognized and made sizable commitments to ongoing initiatives and related funding programs to assure the safe and productive use of our seaport resources. (See Florida Seaport Transportation and Economic Development Program for a description of the existing Florida Department of Transportation funded seaport program, Florida Statutes, Chapter 311).

The efficient and safe operation of Florida's seaports and other ocean inlets used by a wide array of boating, fishing, and tourism marine resource users depends, in part, on environmental conditions (e.g., winds, visibility, currents, waves, and tides, and, during extreme weather conditions, storm surges, exceptional surface waves, and rip currents) that affect the safe navigation and harboring of merchant ships, cruise liners, fishing vessels, recreational boats, and other vessels. There are also concerns for the environmental impacts that may be attributable to shipping and emergency management support efforts that can impair living and non-living marine resources, also impact tourism and, therefore, affect Florida's most important sources of revenues.

As Florida's largest estuary and largest port by gross tonnage, Tampa Bay is under substantial environmental stress and has experienced oil spills, maritime accidents, and other deleterious events where environmental factors have played a notable role. In response, over the past fifteen years, a real-time environmental information support system, called PORTS (Physical Oceanography Real-Time System), has been implemented and operated in Tampa Bay through a collaboration including the University of South Florida's College of Marine Science (USF CMS), Tampa Port Authority, Tampa Bay Pilots organizations, and the National Ocean Service (NOS) of the National Oceanic and Atmospheric Administration (NOAA).

The Tampa Bay PORTS system includes a moored Acoustic Doppler Current Profiler (ADCP) and water level (tide gauge) observing system. These are complemented by meteorological stations (i.e., air and water temperature, humidity, atmospheric pressure, precipitation, wind speed and direction, etc.) and a numerical estuarine circulation model. While in recent years, the St. Johns River/ Port of Jacksonville complex has received some enhancement of its environmental information systems from NOS and the National Weather Service (NWS) of NOAA, the other major ports of Florida are not generally supported with such a substantial set of real-time environmental information as is available in Tampa Bay. Importantly, not even Tampa Bay is supported with the comprehensive set of observations that are feasible within the present state-of –the art to meet contemporary standards and user needs/expectations.

Over the same time period, plans have advanced (at the national and large regional levels) for the coastal ocean portion of the US Integrated Ocean Observing System (IOOS), often referred to as the Coastal Ocean Observing System (COOS). COOS is conceived as a partnership between academia, private sector, and state and federal agencies. It assumes a regionally implemented, yet comprehensive, coastal ocean observing system (i.e., moored arrays with real-time data transmission from a variety of ocean sensors, satellite and airborne remote sensing, high frequency coastal radar, floats, drifters, and gliders. etc.), numerical modeling with data assimilation, Web-based information management, and outreach components.

The coastal ocean observing plans have assumed the COOS efforts would extend outward from the U.S. coast for at least 200 nautical miles (the area defined as within the American Exclusive Economic Zone or EEZ) and inland to the head of tides (i.e., the inland limit of estuaries and river systems affected by the marine tidal flows). In the case of Florida, this involves the areas most heavily impacted by hurricane force winds, rains, storm surges, and waves. Based on the severity of hurricane impacts over the last several years, Florida clearly has paramount economic, ecological, and public safety interests that should cause COOS efforts to move from the talking and planning

stage to the experimental stage and then to full operational implementation as soon as scientifically, technically, organizationally, and fiscally possible.

Within the IOOS efforts, two regional efforts have been initiated that have involved significant Florida attention. The Southeast Coastal Ocean Observing Regional Association (SECOORA) and Gulf of Mexico Coastal Ocean Observing System Regional Association (GCOOS) have both involved the efforts and participation of virtually all of the oceanographic research and educational institutions from Florida. In addition, the Governors of the states adjoining the Gulf of Mexico have, through the Gulf of Mexico Alliance (GoMA) charter, expressed their interest in jointly reviewing and undertaking coastal ocean observing system developments within the Gulf of Mexico *per se* that are in the mutual interests of Texas, Louisiana, Mississippi, Alabama, and Florida, and in coordination with their Mexican counterparts.

Further, with the passage of Chapter 2005-166, Laws of Florida (Oceans and Coastal Resources Act), additional coordination will be required as the Florida Oceans and Coastal Resources Council (FOCRC) undertakes efforts: to establish a library to serve as a repository of information for use by those involved in ocean and coastal research; to develop a Florida Oceans and Coastal Scientific Research Plan; and, to prepare a comprehensive oceans and coastal resource assessment to serve as a baseline of information for assisting the development of its research plan.

To bridge the various Florida interests to be pursued in SECOORA, GCOOS, GoMA and FOCRC and to promote COOS-related activities throughout Florida, the Florida COOS Caucus (FL COOS Caucus) meetings have been inaugurated to bring together Florida's oceanographic, coral reef, and ecosystem experts, expected data and resource users, environmental and conservation organizations, governmental regulators and program managers and other stakeholders who wish to discuss and advocate what is in Florida's best COOS- related interests. FL COOS is part of IOOS – a priority in both the U.S. Ocean Action Plan and the U.S. Commission on Ocean Policy Report.

The initial FL COOS Caucus meeting was held in Orlando on June 7, 2005, and the second was held in Orlando on August 2, 2005. A third FL COOS Caucus meeting is being planned in late 2005 in St. Petersburg. At the past FL COOS Caucus meeting, it was recommended that a proposal be developed that would address the most appropriate method to design and implement a coastal ocean observing system in Florida using the best available talent and resources from Florida in partnership with adjoining states, the regional associations, and the federal and international organizations working consistently within the broad parameters of the IOOS efforts. Given that the critical action item in the First IOOS Development Plan is to "sustain and integrate existing systems", it is essential that the observing system assets presently operating in the State of Florida are sustained and integrated.

This white paper is a draft description of such a Florida-developed COOS initiative. It is hoped that, with its circulation through academic, governmental, non-governmental (NGO) organizations and the private sector community to individuals and entities that have expressed an interest in COOS efforts, that this paper will evolve into a document by which the State of Florida will be able to accept as a statement of intent and summary plan of action.

The stage has been set for a collective, ports-related, coastal ocean observing system approach that would be undertaken by Florida's ocean and related institutions, as a common effort, to deliver oceanic and other environmental information to further the advance of Florida's seaports and, at the same time, help protect the coastal resources, and ecosystems. These integrated efforts can best be described as the Florida Ports and Coastal Ocean Observing System (FL-PCOOS).

CONCEPTUAL PROPOSAL

To maximize its societal utility, FL-PCOOS efforts will be designed to function autonomously in real-time and become fully operational on a sub-regional (i.e.., local) basis such that each sub-regional effort will seamlessly link to other sub-regional efforts (i.e., PORTS, SEACOOS (Southeast Atlantic Coastal Ocean Observing System), COMPS (Coastal Ocean Monitoring and Prediction System) and EFSIS (East Florida Shelf Information System) as part of SEACOOS, and NOAAs South Florida Program) to help form and integrate a state-wide (as defined by FOCRC), regional system (e.g., SECOORA, GCOOS, and Caribbean Integrated Ocean Observing System Regional Association [CaRA]), national (e.g., IOOS) coastal ocean observing system and to link such a system of systems internationally (e.g., IOCARIBE-GOOS). Some areas of local interest and application would include: coastal hazards; maritime safety and offshore operations; sustainable marine fisheries, mammals and turtles; and oceanic, coral reef and estuary conservation (OCREC) efforts.

Based on prioritizations to be determined with all user groups, including but not limited to port and harbor pilots, port associations or entities, and other marine, coastal, environmental, and conservation interest groups, all the seaports, coastal inlets, the associated marine and estuarine environments in the State will be equipped with a multi-purpose, real-time Web-based environmental information system tailored to the geometry and hydrodynamics of each individual port and inlet, the marine and estuarine environments associated with the port and inlet activities and, importantly, the shipping lane or other approaches to the ports and inlets.

The information will cover surface meteorology and oceanography and flow structures over the water column. The information will be derived from an appropriate mix of: velocity profilers (ADCPs); tide gauges; meteorological buoys and coastal stations; thermosalinograph and bio-chemical sensors; coastal HF radar; satellite thermal, color and radar imagery; the use of shipboard transects (across relevant water bodies including the Gulf of Mexico and the Straits of Florida),; autonomous underwater vehicles, profiling floats, gliders or similar observational elements; mesoscale meteorological models; high-resolution coastal ocean models; and, auxiliary data from federal or other agencies (regional wind and sea level, remote sensing, acoustic data, freshwater discharge, groundwater flows, precipitation, storm surge, wind waves and swell, and other observational data).

Some of these observing system elements will be provided or supported by NOAA or other federal agencies; some will need to be supported by Florida to sustain and expand upon present efforts that are being undertaken by PORTS, SEACOOS and similar sub-regional projects.

The initial priorities are recommended to be:

- Sustain and integrate existing COOS systems within the State of Florida, including the Tampa Bay PORTS, COMPS and EFSIS Programs, and the NOAA South Florida Program.
- Establish FL PCOOS initiatives within and radiating out from all of the Florida ports. Consideration of initial emphases, based on matters of ecology and marine operations, may go to ports associated with: Pensacola, Panama City, Charlotte Harbor, Miami, Fort Lauderdale, St. Lucie, and Jacksonville, where these are listed from the northwestern-most to the northeastern-most ports.
- Establish additional elements for a comprehensive FL COOS within the context of SECOORA, GCOOS, and the deliberations of the FOCRC.

If FL-PCOOS projects are undertaken on a unified, coordinated, and sub-regional basis by a consortium of academic institutions, governmental entities, NGOs, and private sector entities, then each sub-regional effort will be built upon and linked with contiguous sub-regions to provide a continuum of observations, data, and analysis. This linkage design feature will encourage federal, state, and local efforts to implement each sub-regional segment of FL-PCOOS as quickly as they can provide funding knowing that each implemented component will add to a more comprehensive system as the components are installed, linked and integrated to other components of the larger systems.

All the qualified and interested Florida oceanographic and meteorological institutions, governmental entities, NGOs, and the private sector community will be invited to participate in one capacity or another. Their participation will entail: designing and implementing the observing system elements; maintaining and operating one or more of the observing system elements; operating and upgrading numerical hydrodynamic models; making Web-based information products; performing general education and public outreach; designing and developing the next generation observing systems; and so forth. A vigorous research and development program will be maintained to facilitate system utilization, assessment, and upgrades.

The FLPCOOS data will be non-proprietary. Interfaces will be implemented to link FL-PCOOS to PORTS, COMPS, EFSIS, SECOORA, GCOOS, SEACOOS, and similar COOS activities. NGO and private sector partnerships will be encouraged to facilitate experience in vendor operations relevant to fully matured COOS operations involving mutually useful and beneficial public-private partnerships. Project assignments will be developed through discussions with the institutional leadership of the various Florida-based oceanographic and meteorological education and research institutions and will be discussed at future FL COOS Caucus meetings. (FL COOS Caucus recommendations and requests will be forwarded to Florida Ocean Alliance (FOA), FOCRC, SECOORA, GCOOS, GoMA, or other COOS related entities as is appropriate.)

A Concept-of-Operations (CONOPS) will be developed to ensure a robust, 24 by 7 operation aimed at providing reliable, real-time observational data and higher level information of defined quality to support seaport and related activities. The CONOPS will also deal with interfaces to federal and state agencies, academia, research institutions, and the private sector. And it will define management (e.g., command-and-control) policies.

BUDGET

The capital equipment costs are roughly estimated to be $3 million per port. Annual operation and maintenance costs are roughly estimated to be $1 million per port. Annual system assessment and research and development costs are roughly estimated to be $1 million per port. With 14 seaports, the cumulative capital costs would then be approximately $42 million, while the annual recurring costs would approximate $28 million. For the initial step of the three ports named above, the cumulative capital cost would be approximately $9 million with annual recurring costs of $6 million.

These are very preliminary cost estimates, and budget refinements would need to be developed. While federal cost share has not been estimated, it will be an important part of Florida's leadership role in these matters to develop an appropriate matching funds program with the federal government to fairly share the financial burdens of this federally recognized program initiative. For example, FL-PCOOS will become recognized as a systematic, Florida-wide enhancement to the observing system provided by the federal government as the so-called "National Backbone".

New segments not fully funded, but authorized, will be encouraged to become operational with sufficient resources and a phasing plan for full implementation and funding during the next three to five years consistent with the comprehensive and fully coordinated Florida COOS efforts.

ACTION ITEMS

Several steps need to be taken to expand upon the Prospectus.

- 12 AUG – begin to initiate communications with NSU, FIT, HBOI, USF, UNF, FSU, UF, MML, and others for a quick reaction of interest. **Completed**
- 22 AUG – FOA Board Meeting --- seek preliminary approval for the program concept. **Completed**
- OCT – develop and refine Prospectus. **Completed**
- NOV – communicate with FOA, FOCRC, Florida State Pilots Association, Florida Ports Council, Florida Department of Transportation, Florida Fish and Wildlife Conservation Commission, Florida Department of Community Affairs (including state and county Emergency Managers), Enterprise Florida, Inc., Florida Department of Environmental Protection, Florida Water Management Districts, NOAA (NOS,NWS,OAR,NMFS, NESDIS), USGS

- NOV circulate draft prospectus for review to FOA and FOCRC
- 17 & 18 NOV – present advanced draft Prospectus to FOCRC, with information copies to SECOORA, GCOOS, GoMA, etc., as appropriate.
- 6 DEC 2005 – ***FL COOS Caucus3*** at St. Petersburg, Florida to discuss this and other agenda items.
- Winter 2006 – To establish a program plan for FL-PCOOS, form a consortium for program management and seek funding for a planning grant, including engineering design for three new FL-PCOOS locations and the upgrading of Tampa Bay and Jacksonville PORTS systems.

MAJOR ELEMENTS OF THE NEEDED PROGRAM PLAN

The FL COOS Caucus community needs to develop requirements and capabilities statement with relevant local, state, and federal agencies and private entities.

Establish one-year contracts for the engineering design and the initial implementation/demonstration efforts of an observing system for at least the three new initial FL- PCOOS locations that are adapted to the nature and needs of individual seaports or clusters of seaports, conducted in collaboration with the FL COOS Caucus community.

Establish a four-year contract for full installation and evaluation of observing systems for the initial FL- PCOOS locations.

Establish a time frame and plan of action for full implementation of Florida COOS activities throughout the entire State, from the head of tides to the outer edge of the EEZ, including international cooperative agreements with The Commonwealth of The Bahamas to jointly undertake COOS activities in Bahamian waters that impact the Florida Coast.

Establish five-year contract for subsequent and continuing operation, maintenance, extension, and upgrading of the observing systems at the initial FL-PCOOS locations and as soon as possible with the remaining FL-PCOOS locations.

From the outset, implement a linked, sustained R&D program focused on observing system utilization, assessment, and upgrades.