FY2007: Regional Integrated Ocean Observing System Development

NOAA initiated a competitive funding process in 2007 to continue building capacity for regional ocean observing systems towards three long-term outcomes; establishing coordinated regional observing and data management infrastructure, developing applications and products for regional stakeholders, and establishing regional and national data management and communications protocols. These projects are contributing to these outcomes.

SOUTHERN CALIFORNIA REGION

The Southern California Region runs south from Point Conception to the Mexico border. Four awards were made to recipients at the University of California at San Diego, Scripps Institution of Oceanography totaling $1,580,000.

Project Title:

Southern California Coastal Ocean Observing System (SCCOOS): Shelf to Shoreline Observatory Development

Recipient/ Lead Principal Investigator:

University of California at San Diego, Scripps Institution of Oceanography/
Dr. Eric Terrill (*eterrill@ucsd.edu*)

Cost:

Funded: $500,000

Performance:

The project will support the development of optimal nowcasts and forecasts of ocean surface currents and trajectory computations based upon synthesized surface currents. This focus is in response to the need identified by the SCCOOS stakeholder community and leverages California's existing investment in HF radar and associated observations directed toward coastal ocean circulation monitoring. Product development will focus on water quality related problems in Southern California. To support this effort, in-situ assets including gliders, drifters, and autonomous underwater vehicles will be deployed to track a discharge plume from the Hyperion Outfall that is tentatively scheduled to have a diversion in 2008. These observations will contribute to those provided by the HF radar and a single mooring located in Santa Monica Bay, and feed into a data assimilating model. During the planned three-week diversion, over 7 billion gallons of sewage will be dispersed in a surface plume in Santa Monica Bay, introducing potential human health and ecosystem risks that will necessitate careful environmental management. SCCOOS will support this effort as a milestone activity to demonstrate capability.

Schedule:

1. Operate a core of observing elements.
    - Continue operation of a single automatic shore station located on the Santa Monica Pier.
    - Provide low level maintenance (beam pattern and telemetry) of two long range HF radar systems.

(over)

- Maintain the mooring in Santa Monica Bay to provide measurements during the Hyperion Discharge, and to provide baseline data for this Marine Protected Area.

2. Maintain data management and modeling efforts.
   - Continue data management and product development/delivery efforts for SCCOOS observations.
   - Continue ocean model operations that will assimilate HF radar surface current data, and be driven by atmospheric and tidal forcing.

3. Provide ocean circulation information to support support a response activity – Hyperion sewage outfall diversion or similar.
   - Provide nowcasts and forecasts for ocean currents during a planned 3-week diversion of the Hyperion sewage outfall.
   - Conduct a small focused deployment of drifters, autonomous underwater vehicles, and a single glider to assist in tracking.
   - Optimize surface currents and trajectory product development.

4. Provide surf zone current forecasts.
   - Support surf zone current forecasts and model developments used for products related to estimating the fate and transport of stormwater and for products in use by the Southern California marine safety community.

Project Title:

Long Beach/Los Angeles Harbor IOOS Demonstration Project

Recipient/ Lead Principal Investigator:

University of California at San Diego, Scripps Institution of Oceanography/
Julianna Thomas (*jot@splash.ucsd.edu*)

Cost:

Funded: Years 1 – 3 $99,999

Performance:

This project will integrate regional assets by leveraging existing observations, models, and data management to develop products that contribute to the safety and efficiency of maritime transportation. The proposed customized website for Long Beach/Los Angeles Harbor entrance is designed to provide critical marine conditions necessary for the safe passage inbound and outbound from Long Beach/Los Angeles Harbor.

Present infrastructure and methodology is used to collect, analyze, and disseminate wave and surface currents data in near real-time. The following parameters will be integrated in the web display: wave measurements, model wave nowcasts and forecasts, sea surface temperature (in-situ and remote), HF radar-derived surface currents, tides, and modeled winds. The final website design will include information windows activated on the display map for areas of interest as selected by the stakeholders. The intent is that maritime traffic users will access near real-time data for immediate transit decisions or forecast information for planning purposes.

Schedule:

1. Obtain stakeholder input throughout project development.
   - Years 1 – 3: Meet with Long Beach/Los Angeles Harbor stakeholders at project start, mid-point, and end of year to obtain input and feedback.
   - Year 2: Hold tutorial in Long Beach/Los Angeles area to train stakeholders in the most efficient and productive use of the website, and assure the optimum use of site as a decision-support tool.
   - Year 2: Begin meeting with stakeholders for a second harbor.
   - Year 3: Meet with both harbor stakeholders to evaluate the applicability and usefulness of the product.

2. Develop website product.
   - Year 1: Aggregate existing relevant assets.
   - Years 1 – 3: Refine website development.

3. Establish data management processes.
   - Year 1: Develop Federal Geographic Data Committee (FGDC) compliant XML metadata and use a common data model.
   - Years 1 – 3: Transmit data to NOAA National Data Buoy Center.

Project Title:

Using Ocean Data Assimilation to Incorporate Environmental Variability into Sardine and Squid Assessments

Recipient/ Lead Principal Investigator:

University of California at San Diego, Scripps Institute of Oceanography/
Dr. Arthur J. Miller (*ajmiller@ucsd.edu*)

Cost:

Funded: $377,559
Proposed (subject to available funds): Year 2 – $381,246; Year 3 – $367,705

Performance:

This project will study the influence of physical oceanography on the populations of sardine and squid by selecting key El Niño and La Niña time periods (which represent environmental extremes) for intensive analysis, comparison, and contrast to typical conditions. The project will include extensive analysis of the various IOOS data using sophisticated ocean data assimilation tools. The overall goals are to develop a coupled ecological and hydrologic model for assessing and predicting the physical oceanographic influences on sardine and squid stocks using both IOOS and federal and state fisheries data.

The primary steps in accomplishing this project are: 1) study the physical oceanographic state during the key years using sophisticated ocean data assimilation tools of the Regional Ocean Modeling System (ROMS); 2) relate the biological observations to the time-evolving physical state using statistical models; and 3) evaluate the predictive capability of the physical-biological system using independent years of data. The end goal is to deliver the system to stock assessment managers through the Southwest Fisheries Science Center. The resulting forecast will be presented to the

sardine and squid stock managers and scientists for consideration in the catch quotas for these species.

Schedule:

1. Assimilate physical oceanographic and biological datasets to provide coastal conditions that inform fisheries stock assessment.
   - Year 1: Assemble physical oceanographic datasets for key years to assimilate into ocean model and test model with first key time period.
   - Year 1: Assemble biological datasets.
   - Years 1 – 3: Collect and analyze zooplankton samples, analyze squid egg beds habitats, and conduct plankton and diet investigations.
   - Years 1 – 2: Conduct sardine feeding morphology and diet studies.
   - Year 2: Test model for second key time period.
   - Years 2 – 3: Analyze ocean model fits for physical processes affecting biology.

2. Improve ability to incorporate environmental data into harvest guidelines for sardine and squid.
   - Year 2: Examine model ability to accurately predict temporal and spatial variation in sardine recruitment.
   - Years 1 – Year 3: Discuss results with Pacific Marine Fisheries Management Council.

3. Year 3: Evaluate which environmental variables will add value to squid stock assessments.

Project Title:

Coordination of Ocean Observatories Initiative Cyberinfrastructure with the NOAA IOOS DMAC - Transparency of Data Access Across the Observatories

Recipient/ Lead Principal Investigator:

University of California at San Diego, Scripps Institution of Oceanography/
Dr. John Orcutt (*jorcutt@ucsd.edu*)

Cost:

Funded: $599, 975
Proposed (subject to available funds): Year 2 - $599,998

Performance:

The National Science Foundation (NSF) implemented the Ocean Observatories Initiative to focus on science, technology, education, and public awareness activities needed to develop and deploy a network of science-driven ocean observing systems. The OOI infrastructure, will provide users with the means to characterize and interact with the ocean for decades. The OOI comprises three types of interconnected observatories spanning global, regional and coastal scales. The global component addresses planetary-scale problems via a network of moored buoys and platforms linked to shore via satellite. A regional cabled observatory will 'wire' a single region in the Northeast Pacific Ocean with a high speed optical and power grid. The coastal component of the OOI will expand existing coastal observing assets, providing extended opportunities to characterize the effects of high frequency forcing on the coastal environment. The OOI CyberInfrastructure (CI) constitutes the integrating element that links and binds the three types of marine observatories and particularly the associated sensors into a coherent system-of-systems. Indeed, it is most appropriate to view the OOI as a whole, which will allow scientists and citizens to view particular phenomena irrespective of the observing

elements (e.g. coastal, global, regional, ships, satellites, IOOS…) to which the observations belong.

This project will exercise and establish the core aspects of data management and interoperability between IOOS and OOI. This will be realized through a set of specific deliverables that expand the integrated set of real-time data streams produced by SCCOOS and delivered to the NOAA data systems at NODC, NDBC and others. Building on the work the Coastal Observing Research and Development Center (CORDC) has developed at SCCOOS, with NOAA support, for a national integrated HF Radar data system for current monitoring off the coastal U.S., the goal is to have data available by the end of the first year using OOI CI web display and middleware technologies.

Schedule:

Year 1:

- Schedule and complete stakeholder meetings on modeling (12/1/07)
- Develop system architecture for WWW tools for OOI/IOOS toolkits (11/1/07)
- Develop candidate software architecture linking OOI and IOOS CI systems to review scalability issues (2/1/08)
- Determine as many as 5 observables in consultation with NODC and NDBC (2/1/08)
- Develop system architecture for QA/QC review of RCOOS data and for integrating autonomous vehicles into OOI and IOOS in near real-time (2/1/08)
- Develop architecture for extending regional ocean or wind models to scales larger than the southern CA Bight (2/1/08)
- Agree upon NOAA/NDBC data to be made available to OOI (3/1/08)
- Document science requirements for modeling (4/1/08)
- Complete V1.0 OOI/IOOS middleware to support evaluation of scalability (6/30/08)
- Implement architecture for 1-3 measured variables from RCOOS data and 1-3 observables from NOAA data for delivery to the OOI (6/30/08)
- Implement transfer of 1-3 data types from NOAA/NDBC to OOI
- Develop and test tools for web-based display of 2-3 heterogeneous data sets (6/30/08)
- Demonstrate delivery of near-real-time data from a single autonomous vehicle type (6/30/08)
- Extend regional ocean wind model to CA scale and demonstrate to US scale (6/30/08)
- Complete planning to extend ocean or wind model to continental US off-shore scale (8/1/08)
- Review effectiveness of implementation of RCOOS data (8/1/08)

Year 2:

- Extend architecture to 5-10 measured variables for delivery to NOAA from OOI
- Extend program to 5-10 data types for NDBC data and 5-10 variables from NOAA data sources (6/30/09)
- Demonstrate command and control capabilities for OOI and IOOS for autonomous vehicles (AUVs – gliders) (6/30/09)
- Provide complete web-based toolkit allowing users to readily develop and display data sets of interest from IOOS and OOI (6/30/09)

NOAA Contacts:

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