FY 2011 Implementation of the U.S. Integrated Ocean Observing System (IOOS)
Southern California Coastal Ocean Observing System (SCCOOS)
National Oceanographic Partnership Program Report:
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1) PROJECT SUMMARY

The Southern California Coastal Ocean Observing System (SCCOOS) is one of eleven regions that contribute to the national U.S. Integrated Ocean Observing System (IOOS[®]). The regional observing systems work to collect, integrate, and deliver coastal and ocean observations in order to improve safety, enhance the economy, and protect the environment. The primary goal of SCCOOS is to provide the scientific data and information needed to inform decision-making and better understand the changing conditions of the coastal ocean in Southern California.

SCCOOS has aligned its priorities and objectives with the focus areas designated by U.S. Integrated Ocean Observing System (IOOS[®]), as identified by users and stakeholders throughout the nation.

- **Ecosystems and Climate:** to monitor ocean climate trends and environmental changes in the Southern California Bight by collecting physical, chemical, and biological variables.

- **Water Quality:** to provide monitoring, tracking, and prediction tools for harmful algal blooms, outfall and storm water plumes, and surf zone contaminants.

- **Marine Operations:** to advance integrated, customized products that are critical for safe and efficient navigation, search and rescue, and oil spill response.

- **Coastal Hazards:** to provide accurate, validated inundation models and information with the long-term goal of improving coastal safety.

- **Science Education and Communication:** to provide a way for the public to learn, educate, and promote scientific research using data obtained from SCCOOS.

2) PROGRESS AND ACCOMPLISHMENTS

SCCOOS continues to have the ability to achieve its milestones by providing access to high-quality integrated data and support regional user needs while complying with the standards and protocols for sharing and archiving data that are developed nationally. SCCOOS actively participates in IOOS Data Management efforts such as the Thematic Real-Time Environmental Distributed Data Services (THREDDS). By leveraging the Coastal Data Information Program (CDIP) and the HF Radar National Network programs, SCCOOS will target THREDDS distribution for both wave and surface current data. SCCOOS participants also contribute to ongoing efforts to develop quality control standards for waves and HF radar-derived surface currents. Wave and current data have associated XML and FDGC compliant metadata.

The following goals/milestones have been met.

Ecosystems and Climate:
- Underwater glider surveys collect offshore measurements of temperature, salinity, chlorophyll, and current velocity.
- Add sensors for dissolved oxygen to gliders to monitor hypoxia and ocean acidification.
- As part of CalCOFI-LTER program, measure variables in nearshore region including temperature, salinity, zooplankton, phytoplankton, fish eggs and invertebrate larvae.
- Conduct shipboard observations three times yearly to count seabirds and marine mammals in conjunction with CalCOFI-LTER surveys.
- Meteorological stations provide wind speed and direction, air temperature, sea surface temperature, barometric pressure, humidity, and rainfall levels.

Water Quality:
- Monitor HABs at six pier stations by collecting weekly measurements of temperature, salinity, chlorophyll, nutrients, and toxic species; distribute data.
- Expand HABs website to include Central and Northern California.
- Continue automated sampling at four shore stations to measure temperature, salinity, chlorophyll, turbidity, and water level.
- Implement the 3-km California statewide ROMS ocean forecasting system for real-time operations and conduct a systematic validation of the model.
- Analyze pollution dispersal in finescale, nearshore, and shelf ROMS for the San Pedro and Santa Monica Bays.
- Provide HF radar-based trajectory tracking tool for Tijuana River Plume.

Marine Operations:
- The live feed of HF radar data are now available on the national HFR network for oil and hazardous spill response in the Environmental Response Management Application® (ERMA) map viewer for the southwest region. Near real-time and archived surface current measurements have been used in the National Preparedness for Response Exercise Program (NPREP) drill scenarios led by the U.S. Coast Guard in San Diego, Los Angeles, and Ventura.
- Provide Weather Research & Forecasting Model (WRF) wind and precipitation forecasts online from the UCLA Department of Atmospheric and Oceanic Sciences, Climate Sensitivity Research Lounge.
- Customized and expanded interactive map displays of wave and surface currents with multi-layered views of observations, nowcasts, and forecasts were developed for Naval Air Systems Command (NAVAIR), Point Mugu.
- The customized, interactive map display of ocean conditions and forecasts for the Port of Los Angeles and Long Beach Harbor is used to improve navigation, safety, and efficiency for commercial vessels, harbor pilots, and port operations.
- Surface current measurements and surface wind analyses are integrated into the General NOAA Operational Modeling Environment (GNOME) for oil spill trajectory analysis.

Coastal Hazards:
- Validate and refine inundation models based on surveys of beach sand and water levels.
- Expand online development and integration of inundation information.

Science Education and Communication
- Memorandum of Understanding (MOU) with NANOOS, CeNCOOS, & SCCOOS.
- SCCOOS surface currents are featured on an interactive touch-screen kiosk at the Birch Aquarium as part of "Boundless Energy," an exhibit on sources of renewable ocean energy.
- SCCOOS data are included in the Channel Islands National Marine Sanctuaries Interactive Touch Screen Kiosk Program.

U.S. IOOS regional awards were finalized by the National Oceanic and Atmospheric Administration (NOAA) in late August 2011, so work on this award is still ongoing.

Ecosystems and Climate
- Operate and maintain the network of short, medium, and long range HF radar systems and deliver data streams to the National HFR Network.
- Long-term time series of physical, biological, and chemical ocean data are critical in monitoring climate trends and determining ecosystem health.
- Physical and ecological ocean patterns and processes constitute valuable information for Coastal and Marine Spatial Planning and marine protected areas monitoring. Under the auspices of SCCOOS, the California Current Ecosystem Long Term Ecological Research (CCE_LTER) program, and in conjunction with the California Cooperative Ocean Fisheries Investigation (CalCOFI), the distribution and abundance of seabirds during 3 seasonal surveys were studied.
- Publish survey reports and maps of species' distribution and abundance on SCCOOS web site.

- Operate, support, and maintain network of three glider lines to collect measurements of temperature, salinity, chlorophyll, current velocity, and acoustic backscatter; deliver data to SCCOOS website and push to modeling centers.
- Conduct automated sampling at four shore stations of temperature, salinity, chlorophyll, turbidity, and water level.
- Seabirds were identified and counted over 64 days that were spent at sea during the winter, spring, and summer surveys. The survey reports and maps of species' distribution and abundance on SCCOOS web site.
- The integration of dissolved oxygen sensors on the gliders is proceeding for the purpose of monitoring hypoxia in coastal waters. The dissolved oxygen data also allow an estimate of parameters relevant to ocean acidification through proxy relationships. Using relationships developed by scientists at Scripps Institution of Oceanography, NOAA Pacific Marine Environmental Laboratory, Universidad Autonoma de Baja California, and University of Washington, the glider data have been used to estimate pH and aragonite saturation. Aragonite is important to organisms that form shells, as saturation levels below one may lead to dissolution of the shells.
- SCCOOS is working closely with staff from the California Ocean Science Trust's Marine Protected Area Monitoring Enterprise on the development and successful execution of a monitoring program for Southern California's newly established network of marine protected areas.

Water Quality
- Accurate forecasts, measurements, and reports of water quality, for coastal pollutants and harmful algal blooms, inform beach closures and warnings which can affect tourism revenue and the local economy.
- Tracking impacted or polluted sources such as rivers and sewage outfalls can influence public health and ecosystem health (Areas of Special Biological Significance and marine protected areas).
- Analyze pollution dispersal in finescale, nearshore, and shelf ROMS for the San Pedro and Santa Monica bays.
- The SCCOOS HAB program contributes to the statewide HAB Monitoring and Alert Program (HABMAP) initiated by NOAA, the California Ocean Science Trust, and the Southern California Coastal Water Research Project (SCCWRP). The HAB program generates a baseline time-series of ocean properties to monitor ocean conditions in the very near shore zone of the Southern California Bight. These measurements are used to develop forecast models for short term warnings. They also increase our knowledge of the sign, frequency, and magnitude of variation of temperature, salinity, density, nutrients, and pollutants.
- Weekly reports are derived from a year long time series of sampling for HAB species and related water quality measurements and are provided to the California HAB Monitoring and Alert Program Group.
- In conjunction with autonomous glider and boat sampling *Pseudo-nitzscha* blooms that produce domoic acid are being monitored. The Caron lab is responsible for the analysis of domoic acid from the 5 SCCOOS HAB monitoring sites.
- Fine-scale simulations with ROMS are being analyzed at UCLA to examine two phenomena. First, pollution effluent dispersal from the Orange County and Hyperion discharge outfalls we examined. This includes alternative near shore outfalls planned in the coming years. The second examined area was a storm river plume dispersal near

Santa Barbara. In both situations the material stays mainly on the continental shelf and slope, and the near shore outfall materials stay very near the coast.
- The County of San Diego's Department of Environmental Health uses the SCCOOS Tijuana River Plume Tracker to inform water quality warnings and beach closures.

Marine Operations
- Ocean conditions, surface currents measurements, and surface wind analyses can be used to aid in spill response as well as generate trajectories to inform search and rescue (SAR) operations.
- Customized, interactive map displays of ocean conditions with multilayer views of observations, nowcasts, and forecasts can improve navigation and safety for military regions and testing ranges.
- Ocean observing data can be used to inform and validate ocean models used by the military and federal agencies.
- Customized, interactive map displays of ocean conditions can improve navigation, safety, and efficiency for commercial vessels, harbor pilots, and port operations.
- Implementation of surface currents measured by the SCCOOS HF radar network are now accessible by U.S. Coast Guard for search and rescue (SAR) applications using their Environmental Data Server.
- Glider data are provided to the Naval Oceanographic Office (NAVO) for assimilation into operational models.
- Annually provide training to first responders of maritime incidences in the use of SCCOOS products.

Coastal Hazards
- Expand development and integration of inundation web site.
- Develop Shoreline inundation forecast, validation, and dissemination of warnings.
- Use surveys of sand levels on beaches and monitor storm inundations at selected locations to validate and refine coastal data and forecast models of erosion, flooding, and inundation levels can be used to protect and improve beaches, real estate, and highways.

Science Education and Communication
- SCCOOS ocean data can inform classroom curriculum and informal education programs.
- SCCOOS data visualizations can provide a larger, environmental context for aquariums, science centers, and coastal tourist locations.
- Provide ocean observing system training for State and Regional Water Resources Control Board staff, in partnership with CeNCOOS.
- MOU between NANOOS, CeNCOOS, SCCOOS and the West Coast Governance Alliance.
- In partnership with SCCOOS PIs and staff members, the Centers for Ocean Sciences Education Excellence (COSEE)-West and University of Southern California Sea Grant educators conduct an education program for HABs, Ocean Observing Systems Institute for teachers, and multiple online workshops.
- Conducted by the Ocean Institute, the 5th grade "Weather and Water" school program is based on SCCOOS meteorological data and meets Earth Science Standards on the water cycle and weather.
- SCCOOS has recently signed, but hasn't finalized a Memorandum of Understanding with CeNCOOS and NANOOS to expand and strengthen coordination at the West Coast scale, which will enhance efforts to contribute ocean observing information to regional

management efforts including coastal and marine spatial planning and the West Coast Governors' Agreement on Ocean Health.

3) SCOPE OF WORK

SCCOOS operates as a system of partnerships and projects that are facilitated by technical and programmatic staff. Organized by the four focus areas, the SCCOOS scientific and technical approach is based on a system of core ocean observing technologies and the delivery of useful data products and tools. System components include sub-surface ocean observations from underwater gliders, nearshore and coastal measurements, wave measurements and models, pier-based monitoring, satellite imagery, high frequency (HF) radar surface current mapping, and data assimilative ocean modeling. The projects described in this report represent the multi-disciplinary and collaborative efforts of the research teams that contribute data and information to SCCOOS.

4) PERSONNEL AND ORGANIZATION STRUCTURE
* No changes in partner organization

* Danielle Williams replaced Amanda Dillon as SCCOOS Program Coordinator

5) BUDGET ANALYSIS

In FY2011, SCCOOS will continue its core observations and expand data products when possible within budget constraints. SCCOOS is also committed to contributing to larger ocean observing efforts regionally, nationally, and internationally.

Expenditures are progressing as expected, with no major discrepancies between actuals and budgeted on both the main award and the subawards.

6) ANNUAL SUPPLEMENTALS

Training and Education Activities
* Annually provide training to first responders of maritime incidences in the use of SCCOOS products.
* Publish survey reports and maps of species' distribution and abundance on SCCOOS website.
* Provide ocean observing system training for State and Regional Water Resources Control Board staff, in partnership with CeNCOOS.

Marketing, Outreach, and Engagement Activities
* SCCOOS data visualizations can provide a larger, environmental context for aquariums, science centers, and coastal tourist locations.
* SCCOOS ocean data can inform classroom curriculum and informal education programs.
* SCCOOS surface currents are featured on an interactive touch-screen kiosk at the Birch Aquarium as part of "Boundless Energy," an exhibit on sources of renewable ocean energy.
* In partnership with SCCOOS PI's and staff members, the Centers for Ocean Sciences Education Excellence (COSEE)-West, and University of Southern California Sea Grant educators an education program is conducted for HABs, Ocean Observing Systems Institute for teachers, and multiple online workshops.

- Conducted by the Ocean Institute, the 5th grade "Weather and Water" school program is based on SCCOOS meteorological data and meets Earth Science Standards on the water cycle and weather.
- SCCOOS data are included in the Channel Islands National Marine Sanctuaries Interactive Touch Screen Kiosk Program.

Regional Ocean Governance Organization Activities
- Memorandum of Understanding (MOU) with NANOOS, CeNCOOS, and SCCOOS.
- SCCOOS initiated but has not finalized a MOU with CeNCOOS and NANOOS to expand and strength coordination at the West Coast scale, which will enhance efforts to contribute ocean observing information to regional management efforts including coastal and marine spatial planning and the West Coast Governors' Agreement on Ocean Health.

Efforts to Leverage IOOS Funding
- SCCOOS continues discussion with state and federal organizations

Update to RA membership, Board of Directors, and Committee Members
- Some of our Joint Strategic Advisory Committee (JSAC) members have rotated. [Click here](#) to view a complete membership listed online.