



U.S. Integrated Ocean Observing System (IOOS) Implementation
Southern California Coastal Ocean Observing System (SCCOOS)
FY16-21 National Oceanographic Partnership Program Report:
1 December 2018 to 31 May 2019

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Grant Number: NA16NOS0120022
www.sccoos.org

I. PERFORMANCE PROGRESS REPORTS

1) PROJECT SUMMARY

The Southern California Coastal Ocean Observing System (SCCOOS) is one of eleven regions that contributes 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 principal goal of SCCOOS is to provide observations and products to a diverse stakeholder community of managers and planners, operational decision makers, scientists, and the general public. As the regional observing system for Southern California, SCCOOS, has developed the capabilities to support short-term decision-making and long-term assessment by implementing and leveraging biological, chemical, and physical observations and models, many of which are available in near real-time. SCCOOS priorities and objectives are aligned with the seven societal goals as outlined in the IOOS Summit Report. The focus themes, as designated by IOOS, highlight these priorities and are designed to improve safety, enhance the economy, and protect our environment.

- **Coastal Hazards:** to provide accurate, validated inundation models and information with the long-term goal of improving coastal safety.
- **Ecosystems and Climate:** to monitor ocean climate trends and environmental changes in the Southern California Bight by collecting physical, chemical, and biological data.
- **Marine Operations:** to advance integrated, customized products that are critical for safe and efficient navigation, search and rescue, and oil spill response.
- **Science Education and Communication:** to provide visualizations and resources for the public to learn, educate, and promote scientific research using data obtained from SCCOOS.
- **Water Quality:** to provide monitoring, tracking, and prediction tools for harmful algal blooms, outfall and storm water plumes, and surf zone contaminants.

2) PROGRESS AND ACCOMPLISHMENTS

SCCOOS continues to achieve its milestones by providing access to high-quality integrated data and supporting 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 use of the UCAR community program Thematic Real-Time Environmental Distributed Data Services (THREDDS) and the NOAA NMFS Environmental Research Division's Data Access Program (ERDDAP). By leveraging the Coastal Data Information Program (CDIP) and the HF Radar National Network programs (HFRnet), SCCOOS targets THREDDS and ERDDAP distribution for most of our datasets, including automated shore stations and ocean acidification measurements. SCCOOS also continues to implement QARTOD data quality control standards for all parameters for which QARTOD exists, including the recent chlorophyll fluorometry QARTOD manual. All data have associated ISO 19115 compliant metadata.

As a result of SCCOOS listservs and social media streams (e.g., [Facebook](#), [Twitter](#)), more ocean observing news items are now widely distributed throughout the Regional Associations, the IOOS program office, as well as the SCCOOS user community.

Climate Variability and Change

1. Operate and maintain a network of gliders to collect measurements of temperature, salinity, chlorophyll, current velocity, dissolved oxygen, and acoustic backscatter; deliver data to the SCCOOS website and push to modeling centers.
 - a. Completion date: TBD - ongoing milestone
 - b. Status: On-Track
 - c. Successes: The principal investigator has added an oxygen sensor (SBE63) to the glider fleet. New procedures for *in situ* and lab calibration have been implemented. Real-time data are delivered to the

ERDDAP, then to the national glider DAC, and then onto GTS. Delayed mode, quality controlled data including temperature, salinity, depth-averaged velocity, time, latitude, longitude, where/depth and profile ID are available for download at spraydata.ucsd.edu.

There are three Spray underwater gliders off the coast of California at all times sending back data on temperature, salinity and ocean currents. These missions are funded through IOOS and the NOAA Climate Program Office/Ocean Observing and Monitoring Division. The data are assimilated into regional circulation forecasts. These models are used by a variety of end-users and are crucial to predicting circulation patterns relevant to fisheries and oil spill response. An alongshore glider line has been occupied continuously since January 2019. The Fill the Gaps funding will allow this line to be sustained for a year. In addition, following the winter PI meeting, a new glider page (<http://sccoos.org/gliders/>) was developed with background information and links to access the data.

2. Continue to develop, integrate, and enhance long-term time series products for distribution.
 - a. Completion date: TBD - ongoing milestone
 - b. Status: On-Track
 - c. Successes: Lead Co-PI C. Anderson spearheaded the California HAB Bulletin that is hosted on the SCCOOS website (sccoos.org/california-hab-bulletin/). The CA HAB Bulletin synthesizes model output, near real-time observations, and public health alerts to provide a more complete picture of the regional variability in harmful algal blooms (HABs) to help managers and the public interpret the HAB seascape on a monthly basis. The bulletin is a nice example of a federal-state-academic-private collaboration in that many groups are actively engaged in contributing data or model output: SCCOOS and CeNCOOS California Harmful Algal Bloom Monitoring and Alert Program (HABMAP) monitoring data, monthly means of California Harmful Algae Risk Mapping (C-HARM) predictions, California Department of Public Health (CDPH) Marine Biotoxin Quarantines and Health Advisories, and The Marine Mammal Center (TMMC), the Marine Mammal Care Center – Los Angeles, California Wildlife Center, the Pacific Marine Mammal Center (PMMC), and SeaWorld marine mammal and seabird strandings due to suspected domoic acid. The team is working (and building the relationships) to soon incorporate BeachCOMBERS sea bird strandings and NOAA Marine Mammal Stranding Network cetacean strandings to the CA HAB Bulletin.

Coastal Hazards

1. Shoreline inundation forecast, validation, and dissemination of warnings to select city managers.
 - a. Completion date: TBD - ongoing milestone
 - b. Status: On-Track
 - c. Successes: Emails are sent to the City of Encinitas when the Cardiff flood index shows potential flooding events three days in advance.
2. Expand development and integration of inundation website.
 - a. Completion date: TBD - ongoing milestone
 - b. Status: On-Track
 - c. Successes: Surveys of sand levels on beaches and storm inundation monitoring at select locations are posted on the SCCOOS website. The data are used to validate and refine coastal data and forecast models of erosion and flooding, and inundation levels can be used to protect and improve beaches, real estate, and highways. These endeavors have led to the development of a statewide ‘flooding index’ in accordance with the CDIP research on wave run-up. The new flood forecasts are based on the tide and wave height, as well as wave period. The resulting water level predictions are generally lower than those from the old model, but they should be significantly more representative of the actual water levels observed at the coast. The Cardiff CDIP water level page has been updated to include mild and moderate flood thresholds (<http://sccoos.org/data/flooding-storm-surge-models/#a>).

As part of its Resilient Futures project, the SIO Center for Climate Change Impacts and Adaption (CCCIA) has teamed with the Imperial Beach community with support from the David C. Copley Foundation and SCCOOS to upgrade the city's flood alert capabilities and to develop tools to better prepare stakeholders for sea-level rise. The dedicated observing network and modeling system will provide the information needed for accurate, early flood warnings for vulnerable locations throughout the city, as well as the baseline information needed to develop and evaluate future sea-level rise adaptation strategies. A prototype Imperial Beach website has been developed (<http://resilientib.ucsd.edu/home.html>) for presentation of historical, current, and forecast conditions.

Comprehensive field observations at Imperial Beach from an energetic storm, including wave buoy and current meter measurements of the incident wave conditions and Lidar and pressure sensor measurements of runup were obtained this past 18-21 January 2019 and will be used to validate and improve wave and water level forecasts, nowcasts, and hindcasts.

A prototype Cardiff coastal hazard website analogous to the Imperial Beach website has been developed and will be posted on the CCCIA website in the coming months. Work to standardize and improve the online portal for public access to the coastal hazard model products will continue.

3. Develop model for Huntington and Imperial Beach inundation sites
 - a. Completion date: TBD – ongoing milestone
 - b. Status: On-Track
 - c. Successes: In order to provide the public and beach managers with an assessment of how various processes combine to cause coastal flooding, total water level for extreme historic events at Imperial Beach have been deconstructed to quantify relative contributions from tides, nontidal residual sea level, and wave runup. Examples of these extreme water level products are available at the Imperial Beach CCCIA Resilient Futures website (<http://resilientib.ucsd.edu/pastevents.html>). The website continues to be populated with products and updated based on city managers feedback on website content.

At Cardiff the relative contributions to the total water level from the tide, nontidal residual sea level, and wave runup for extreme historic events have also been determined and will be available from the coastal hazard website. This information is being used to develop extreme water level statistics and return periods specific to this location.

A template based on the Imperial Beach and Cardiff coastal hazard websites has been developed and will be used to expand to other coastal sites in the region.

Ecosystems, Fisheries, and Water Quality

1. Monitor Harmful Algal Blooms (HABs) at five pier stations by collecting weekly measurements of temperature, salinity, chlorophyll, nutrients and potentially harmful phytoplankton species. Provide data online and distribute via the California HABMAP listserv.
 - a. Completion date: TBD - ongoing milestone
 - b. Status: On-TrackSuccesses: SCCOOS HABs webpage includes Central and Northern California (CeNCOOS) stations. Weekly reports of HAB species and related water quality measurements are provided to the California HAB Monitoring and Alert Program (HABMAP) and the California Department of Public Health (CDPH). *Pseudo-nitzschia* blooms that produce domoic acid are being monitored as part of ongoing observations. The Caron lab at the University of Southern California (USC) is responsible for the analysis of domoic acid from the five SCCOOS HAB

monitoring sites, and the Brzezinski lab at the University of California, Santa Barbara is responsible for organizing the macronutrient analysis (NO₃, NO₂, PO₄, Si(OH)₄) with the UCSB Marine Science Institute Analytical Laboratory. The SCCOOS HAB program contributes to the statewide HABMAP program initiated by NOAA, the California Ocean Science Trust, and the Southern California Coastal Water Research Project (SCCWRP). The HABMAP program generates a baseline time series of HABs, nutrients, and water quality to monitor ocean conditions in the very near shore zone of the Southern California Bight. These measurements are used to validate the California-Harmful Algae Risk Mapping (C-HARM) forecast model system for short-term warnings. They also increase our knowledge of the sign, frequency, and magnitude of variation of temperature, salinity, density, nutrients and pollutants. Data manager, Vicky Rowley, and HABMAP PIs standardized the reporting format to make the datasets Darwin Core-compliant for ingestion to ERDDAP (<http://erddap.sccoos.org/erddap/tabledap/HABs-pre20190601.html>) and the OBIS database. She has succeeded in serving the HABMAP data on ERDDAP and is now working with expertise in the SBC-MBON program and at CeNCOOS to convert files to Darwin Core formats. We expect to reach completion on this task by the end of July 2019. Vicky has also been working closely with personnel at UCSC to rebuild the HABMAP site to complement and be maximally compatible with the new SCCOOS website. Next steps include updating the aging HAB page on the SCCOOS website with an up-to-date WordPress version that capitalizes on those improvements made to the HABMAP website (run by UCSC) as an independent site that links back to the SCCOOS portal. Megan Hepner is building a ShinyApp module that will be iFramed on the new SCCOOS HAB page.

2. Continue to collect California Cooperative Oceanic Fisheries Investigations (CalCOFI) observations and measurements.
 - a. Completion date: TBD - ongoing milestone
 - b. Status: On-Track
 - c. Successes: SCCOOS links to data that are measured in the nearshore region of Southern California as part of CalCOFI - CCE-LTER program. These parameters include temperature, salinity, zooplankton, phytoplankton, fish eggs and invertebrate larvae. CalCOFI data, resources, and reports are posted online (<http://sccoos.org/calcofi/>). In addition, following the winter PI meeting we developed a new SCCOOS CalCOFI page (<http://sccoos.org/calcofi/>) with background information and links to access the data.
3. Conduct shipboard observations with CalCOFI and NMFS Rockfish Recruitment and Ecosystem Assessment Survey (RREAS); count seabirds; post data reports and data online.
 - a. Completion date: TBD - ongoing milestone
 - b. Status: On-Track
 - c. Successes: Physical and ecological ocean patterns and processes constitute valuable information for Coastal and Marine Spatial Planning and Marine Protected Area monitoring. Under the auspices of SCCOOS, the California Current Ecosystem Long Term Ecological Research (CCE-LTER) program, and in conjunction with the CalCOFI and NMFS Rockfish Recruitment and Ecosystem Assessment Survey (RREAS), the distribution and abundance of seabirds and marine mammals during one season (spring CalCOFI) were studied. The survey data report, including time series plots of species density, are published on the SCCOOS website (sccoos.org/seabirds/). The RREAS is currently underway. The main finding from spring 2019 was a continuing general decrease in seabird species with warm-water affinities following the end of the 2015-2017 ENSO event.

Challenges: The winter CalCOFI survey was delayed and then severely truncated by the government shutdown. Owing to the delay, field personnel were unavailable for the survey when it was rescheduled many weeks later.

4. Publish survey reports and maps of seabird species' distribution and abundance on SCCOOS web site.
 - a. Completion date: TBD - ongoing milestone
 - b. Status: On-Track
 - c. Successes: Survey reports and maps of species distribution and abundance are published on SCCOOS website (sccoos.org/seabirds/).
5. Display the 3-km ROMS ocean forecasting system for real-time operations statewide.
 - a. Completion date: TBD - ongoing milestone
 - b. Status: On-Track
 - c. Successes: 3-km California ROMS model with data assimilation and real-time forecasting capabilities has been running continuously. This state-wide ROMS model is assimilating both the HF radar surface current data and the vertical profiles of temperature and salinity from four Spray gliders as well as other available observational data sets including satellite sea surface temperature and vertical profiles of temperature and salinity from moorings, ships and floats. In addition to the display at the SCCOOS web site, we are also displaying some static ROMS images (e.g., nowcasts, forecasts and validations) on a group website (<http://west.rssoffice.com/>).
6. Validate the 3-km CA ROMS output against non-assimilated observations.
 - a. Completion date: TBD - ongoing milestone
 - b. Status: On-Track
 - c. Successes: On a daily basis, we are making on the order of 20 ensemble model forecasts in order to quantify errors. Six hourly nowcasts and 72-hour forecast files are available via OPeNDAP/THREDDS. Three validation products have been developed and are being tested on the PI's website (http://west.rssoffice.com/ca_roms_valid_other?variable=IRsst). On a daily basis, there are on the order of 100,000 satellite SST pixels that are assimilated into ROMS. The RMS difference between the ROMS nowcast and the original satellite SST data is slightly less than 1°C comparable to the 0.5°C - 1°C errors specified for the satellite retrieved SST data. In addition to the assimilated data sets, the ROMS nowcast has been validating against a number of non-assimilated data sets. The results are summarized in [Chao et al., 2017](#). Aging servers continue to be a problem in sustaining this quasi-operational model.
7. Develop a coupled ROMS/biogeochemical model to aid the evaluation of the effects of nutrient inputs on bloom formation and nutrient cycles.
 - a. Completion date: TBD - ongoing milestone
 - b. Status: On-Track
 - c. Successes: Fine-scale simulations with a research-level, high-resolution ROMS are being analyzed in hindcast mode at UC Los Angeles to examine two circulation phenomena in particular. First, pollution effluent dispersal throughout the Southern California Bight is being assessed for augmentation of net primary productivity in the surrounding shelf regions. Second, shelf submesoscale currents and surf-zone turbulence under various surface gravity wave and coastline shape influences are being assessed to determine their roles in along- and across-shore transports of material concentrations, biological and otherwise. This is being done using the surface wave-current interaction theory and grid-nesting capabilities of ROMS to examine cross-shore exchange of materials in the shelf and surf zone. Sites near Pt. Conception, the northern Channel Islands, Santa Monica Bay, and the Newport region are the primary locales of interest. In parallel, we are developing a coupled ROMS/biogeochemistry/ecosystem model that we hope to use in the future to aid the evaluation of the effects of nutrient inputs on bloom formation and nutrient cycles, as well as variability and trends in hypoxia and acidification. The progress is both published and periodically published online. Funding for much of this work is provided by various extramural grants from the Ocean Acidification Program

and the California Ocean Protection Council to SCCWRP and UCLA. SCCOOS funds contribute to general model development and system maintenance.

8. Continue automated sampling at four shore stations to measure temperature, salinity, chlorophyll and water level.
 - a. Completion date: TBD - ongoing milestone
 - b. Status: On-Track
 - c. Successes: Thanks to funding from the City of LA/Hyperion Water Reclamation Plant, The Bay Foundation, and The Los Angeles Waterkeeper, the decommissioned Santa Monica Pier shore station came back online on the 16th of October (sccoos.org/data/autoss/). This site is now being serviced by The Bay Foundation and the Los Angeles Waterkeeper. Also, funding by Orange County Sanitation District has allowed for continued collections of oxygen and pH data at the Newport Beach Pier location.

The automated shore stations program operates and maintains four stations (Scripps Pier, Newport Pier, Santa Monica Pier, and Stearns Wharf) and provides real-time, continuous data at 4-minute intervals with limited interruptions. Automated shore station data are one of the most requested data sets provided through SCCOOS. These data are used by both the public and local state and research agencies to assess local conditions related to water quality, nearshore processes, population dynamics of coastal species and HABs.

9. Burke-o-lator (BoL) and ACDC field deployment at Carlsbad Aquarium and Catalina Sea Ranch
 - a. Completion date: TBD – ongoing milestone
 - b. Status: On-Track
 - c. Successes: Throughout 2019, the team deployed the Gen 1 and 2 ACDC units in the CSRF test tank at Scripps Institution of Oceanography. The Gen1 was transferred to Catalina Sea Ranch where it was deployed on the NOMAD buoy; after several months, the data began to show signs of degradation and the ACDC was sent to Sunburst Sensors for evaluation. The Gen2 ACDC was again tested at SIO and found to be operational. Due to space changes at the aquafarm, the BoL was replaced with a SeapHOx instrument that has been successfully integrated into NOAA ERDDAP. The BoL is currently in the T. Martz laboratory being serviced and evaluated. The SeapHOx data and BoL data are available on ERDDAP (<http://erddap.sccoos.org/erddap/>) and IPACOA.

Marine Operations

1. Annually provide training to first responders of maritime incidents in the use of SCCOOS products.
 - a. Completion date: TBD - ongoing milestone
 - b. Status: On-Track
 - c. Successes: SCCOOS participates in training and science education to a broad range of stakeholders either by request or as opportunity arises.
2. Operate and maintain a network of short, medium, and long-range HF radar systems and deliver data streams to the National HFR Network.
 - a. Completion date: TBD - ongoing milestone
 - b. Status: On-Track
 - c. Successes: The live feed of HF radar data is 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.

The SCCOOS radar site at Nicholas Canyon was damaged and went offline in November 2018 as the Woolsey fire burned to the coastline near Malibu, California. The power pole and transformer at the site

were destroyed. Repairs at the site were conducted in December 2019 after the power pole and transformer at Nicholas Canyon were re-installed by Southern California Edison. The electronics enclosure was repaired, and the site went back on line in December 2019.

Progress was made toward returning the HFR site at Pt. Mugu to operations. Navy contractors working on the building assisted SCCOOS personnel with the temporary removal of the antennas and electronics in preparation for building renovation. SCCOOS personnel have also been working with Navy contacts to temporarily deploy a solar-powered HFR and trailer at the site.

Development continued in SCCOOS of a small vessel (based on a boogie board) for measuring antenna patterns in areas where flying drones are prohibited, such as the Dockweiler State Beach HFR site near the LAX Airport. Improvements in the vessel make it easier to use. A manual describing construction of the device was completed.

Cal Poly's nine HF radar sites were calibrated on their yearly schedule. Diablo Canyon's solar batteries were all recharged and maintained to maximize their lifespan, include a replacement of the solar charge controller. Ragged Point's GPS and AWG board were replaced. Point Arguello LR GPS board was replaced. New cables were laid at Point Conception and the antenna was repaired. Point Arguello LR and SR power went out in February and we are still waiting to hear back from Vandenberg Air Force Base to make the needed repairs. All other Cal Poly sites were maintained in a manner that maximizes their uptime and lifespan. We also ordered a combined TX/RX antenna to install at Point Conception. Ongoing student research is investigating poleward currents around Point Conception, as part of a range-expansion study for a marine gastropod.

The electrical power supply at Catalina Island was offline due to a damaged cable. The USC replaced the entire .5 km power line, at their expense, and power to the site has been restored. Currently there is an issue with the sites transmit power which is being diagnosed. At Dockweiler Headquarters the HF radar system is offline as both the transmit and receive chassis are at the manufacturer for upgrades. All six USC sites, excluding Dan Blocker, have been upgraded to the latest CODAR software release.

In addition, following the winter PI meeting, a new High-Frequency Radar page (<http://sccoos.org/high-frequency-radar/>) was developed with background information and links to access the data.

Challenges: Efforts continued to identify possibilities for funding from the state of California. As previously noted, many of the oldest HFR systems in the IOOS network are located in California. SCCOOS and CeNCOOS jointly operate about 60 radars at any given time and these comprise about 40% of the overall IOOS HFR network. California RAs conducted a study of the California portion of the HF radar network to determine needs for maintaining the existing network within operational requirements of NOAA, USCG, the Bureau of Ocean Management, State Agencies, County Sanitation Districts and Public Works, private companies and non-governmental organizations. Results of this study have motivated the efforts by SCCOOS and CeNCOOS to acquire state funding for recapitalizing aging hardware infrastructure of the network. Over 10% of the California network have reached the normal service life of equipment of 20 years, and 65% of the network's sites have been in service over 10 years. The network requires hardening of its existing infrastructure as evidenced by the damage to the NIC1 site from the Woolsey wildfire. Regional climate assessments suggest that wildfire threats will increase into the future. SCCOOS and CeNCOOS operators estimate that \$7.5 million is needed to fully recapitalize and bring the network back to its original specifications.

3. Maintain and expand integrated, customized products with multi-layer views of observations, nowcasts, and forecasts. Collaborate with the Port of Long Beach to maximize the benefit of SCCOOS observations.

- a. Completion date: TBD - ongoing milestone
 - b. Status: On-Track
 - c. Successes: 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.
4. Deliver surface current data and surface wind analyses to aid spill response, SAR real-time recovery, and post analysis trajectories.
- a. Completion date: TBD - ongoing milestone
 - b. Status: On-Track
 - c. Successes: Surface current measurements and surface wind analyses are integrated into the General NOAA Operational Modeling Environment (GNOME) for oil spill trajectory analysis. 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), at Point Mugu. Progress continued on incorporating HFR sites within the IOOS network into a new QA/QC system. All HFR sites with over-water baselines or coastline sites suitable for producing “synthetic radials” were identified. These developments will be used to improve QA/QC procedures throughout the IOOS network. 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.
5. Provide HF Radar Quality Control Development.
- a. Completion date: TBD - ongoing milestone
 - b. Status: On-Track
 - c. Successes: Over the past six months work has continued to implement the QA/QC procedures over the entire IOOS network of about 145 radars. An important ongoing step is to identify all HFR-site pairs for comparing radial currents along over-water baselines. Another important step is to identify all groups of three HFR sites for computing synthetic radials. This work is almost complete for the over-water baselines and is continuing for the synthetic radials for which there are many HFR-site combinations. A user interface has been developed so that comparison results can be obtained from the over-water baselines and synthetic radials. The QA/QC software code is being tested over the entire network. Problems have been found for some over-water baseline site combinations and synthetic radial site combinations. Work is underway to correct these. Overall the scaling up of the QA/QC procedures to the IOOS HFR network is proceeding satisfactorily.

3) SCOPE OF WORK

SCCOOS operates as a system of partnerships and projects that are facilitated by technical and programmatic staff. Organized by the five 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 (served via the PODACC), 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

In May 2019, Ross Timmerman joined the SCCOOS team working part-time as a Research Data Analyst. Ross spent a number of years working for PacIOOS and Ocean Networks Canada, where he was responsible for a range of duties including field operations to metadata management. He holds B.S. and M.S. degrees in Environmental Science. Ross has already helped SCCOOS revise and create new web pages on the main site, and he participates in our weekly Executive Chair conference calls. Extramural funding from the Ocean

Protection Council to work with CeNCOOS on MPA data and model synthesis will fund a postdoctoral fellow at SCCOOS in the following year. SCCOOS and CA Sea Grant will likely cost-share the fellow for a maximum of two years support.

5) BUDGET ANALYSIS

FY 2018, SCCOOS received an increased allocation of directed funding (\$175,422) and an increase in base funds (\$4,542) from FY17. Directed Fill the Gaps Observations went towards gliders (\$150,000) and HF radar operations and maintenance (\$150,000). To streamline access to ocean observations we received an additional \$75,000 in directed funds that we put toward improving HAB monitoring and developing the CA HAB Bulletin. The Matt Howard Memorial one-time fund was directed to advance biological observations by creating new data management schemes for applying “Darwin Core” standards to SCCOOS (and CeNCOOS) HABMAP data and serving them on the ERDDAP for eventual ingestion by the global Ocean Biogeographic Information System (OBIS) database.

FY18 funding has provided a valuable investment in important assets and will strengthen regional partnerships and national program planning. SCCOOS will continue providing 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.

II. PERFORMANCE PROGRESS REPORT ADDENDUM

NA

III ENVIRONMENTAL COMPLIANCE

1) First Responder Training

IOOS/NOAA determined this project has a categorical exclusion, and their statement is as follows:
The aforementioned project will not result in any changes to the human environment. As defined in Section 6.03c3(d), Administrative r Routine Program Functions, of NAO 216-6, this project involves conference room and/or classroom training activities that hold no potential for significant environmental impacts. As such, they should be categorically excluded from the need to prepare an Environmental Assessment or an Environmental Impact Statement.

2) Gliders

IOOS/NOAA determined this project has No Significant Impact, and their statement is as follows:
It has been determined that this proposed activity is described in the Final U.S. IOOS Programmatic Environmental Assessment, dated June 2016. The action is covered by the analysis within the U.S. JOOS Program PEA and the signed U.S. IOOS Finding of No Significant Impact. The project and its potential impact may be limited through terms or conditions placed on receipt of NOAA funds. The action requires no further environmental review.

3) Shore Stations

IOOS/NOAA determined this project has No Significant Impact, and their statement is as follows:
It has been determined that this proposed activity is described in the Final U.S. IOOS Programmatic Environmental Assessment, dated June 2016. The action is covered by the analysis within the U.S. JOOS Program PEA and the signed U.S. IOOS Finding of No Significant Impact. The project and its potential impact may be limited through terms or conditions placed on receipt of NOAA funds. The action requires no further environmental review.

4) Vessel Sampling – CalCOFI

IOOS/NOAA determined this project has No Significant Impact, and their statement is as follows:
It has been determined that this proposed activity is described in the Final U.S. IOOS Programmatic Environmental Assessment, dated June 2016. The action is covered by the analysis within the U.S. JOOS Program PEA and the signed U.S. IOOS Finding of No Significant Impact. The project and its potential impact may be limited through terms or conditions placed on receipt of NOAA funds. The action requires no further environmental review.

5) Mooring

IOOS/NOAA determined this project has No Significant Impact, and their statement is as follows:
It has been determined that this proposed activity is described in the Final U.S. IOOS Programmatic Environmental Assessment, dated June 2016. The action is covered by the analysis within the U.S. JOOS Program PEA and the signed U.S. IOOS Finding of No Significant Impact. The project and its potential impact may be limited through terms or conditions placed on receipt of NOAA funds. The action requires no further environmental review.

The project and its potential impact may be limited through the following terms or conditions placed on receipt of NOAA funds:

- A permit is in place to allow the mooring to reside in its location: 1) Aid to navigation application; 2) Aid to navigation addendum; and 3) FCC Experiment License valid until 2017. The applicant must provide copies of these permits to the IOOS Office for the EC File of Record prior to undertaking the Del Mar Mooring Activities under the subject award.
- SCCOOS has implemented the Essential Fish Habitat Conservation Recommendations provided by NMFS on July 7, 2014 to avoid, minimize, or offset effects of this activity.

**United States of America
FEDERAL COMMUNICATIONS COMMISSION
EXPERIMENTAL
RADIO STATION CONSTRUCTION PERMIT
AND LICENSE**

EXPERIMENTAL
(Nature of Service)

XR FX
(Class of Station)

WI2XAA
(Call Sign)

0539-EX-PL-2015
(File Number)

NAME Scripps Institution Of Oceanography

Subject to the provisions of the Communications Act of 1934, subsequent acts, and treaties, and all regulations heretofore or hereafter made by this Commission, and further subject to the conditions and requirements set forth in this license, the licensee hereof is hereby authorized to use and operate the radio transmitting facilities hereinafter described for radio communications in accordance with the program of experimentation described by the licensee in its application for license.

Operation: In accordance with Sec. 5.3(d) of the Commission's Rules

Station Locations

- (1) Santa Barbara Channel, within 32 km, PC - NL 34-18-31; WL 120-48-15
- (2) Pacific Ocean,, within 32 km, PC - NL 33-31-41; WL 122-30-15
- (3) Pacific Ocean, within 32 km, PC - NL 32-55-48; WL 117-18-57

Frequency Information

Santa Barbara Channel, within 32 km, PC - NL 34-18-31; WL 120-48-15

Frequency	Station Class	Emission Designator	Authorized Power	Frequency Tolerance (+/-)
161.975-162.025 MHz	FX	25K0F1D	12.5 W (ERP)	0.00015 %

Pacific Ocean,, within 32 km, PC - NL 33-31-41; WL 122-30-15

Frequency	Station Class	Emission Designator	Authorized Power	Frequency Tolerance (+/-)
161.975-162.025 MHz	FX	25K0F1D	12.5 W (ERP)	0.00015 %

This authorization effective **November 09, 2017** and will expire **3:00 A.M. EST** November 01, 2019

FEDERAL COMMUNICATIONS COMMISSION



Frequency Information

Pacific Ocean, within 32 km, PC - NL 32-55-48; WL 117-18-57

Frequency	Station Class	Emission Designator	Authorized Power	Frequency Tolerance (+/-)
161.975-162.025 MHz	FX	25K0F1D	12.5 W (ERP)	0.00015 %

Special Conditions:

- (1) The occupied bandwidth of the emission shall not extend beyond the band limits set forth above.