Annual Work Plan
SOUTHERN CALIFORNIA COASTAL OCEAN OBSERVING SYSTEM (SCCOOS)
Grant # 04-078

Period of Performance: 1 January, 2005 – 31 December 2005

PROJECT DESCRIPTION

This grant by the California State Coastal Conservancy (SCC), spanning a period of three years, covers the implementation for the Coastal Ocean Currents Monitoring Program (COCMP) in Southern California. It has been designed to provide ocean current monitoring infrastructure for the region on a variety of space and time scales in a manner that is best suited for the broad range of regional and statewide needs. Data and information products will be made available in near real-time where possible, and integrated with monitoring data obtained by regional data provider user groups when those data are made available. This 2005 Annual Work Plan includes an internal program management structure that will allow efficient design, installation, and operation of the California Proposition 40/50 funded infrastructure. The functional tasks of internal and external program management should be considered separate from the evolving governance structure of the broader SCCOOS Regional Association. However, it is recognized that COCMP will be one of the building blocks of capacity for the region that will be augmented with federal funding, serve user needs, and motivate the evolution to a comprehensive observational system for both the region and State. SCCOOS is coordinating with colleagues in Northern California to ensure a unified statewide system, including the formation of a Federation of California Regional Observing Systems (http://www.sccoos.ucsd.edu/docs/SCCOOSMOU04.pdf).

The system elements proposed to meet COCMP objectives include Surface Current Mapping (SCM) to map ocean surface currents within the Southern California Bight; high resolution (GPS-tracked) drifters; propeller and buoyancy driven autonomous platforms, integration of data from moorings maintained by local agencies; surf zone current measurements and modeling; a Regional Ocean Modeling System with data assimilation for nowcasting and forecasting of the physical properties of the ocean; and IT infrastructure with wireless networking where needed based on the requirements of the recent Ocean.US DMAC (Data Management and Communications) recommendations. To complement the establishment of Southern-California wide observing system infrastructure, a focused, integrative effort of many of the COCMP components will be executed in year 2 of the program in the San Pedro/Huntington Beach region as an end-to-end effort of connecting nearshore observations to end-user water quality needs. Alliances with additional data provider user groups will be established to entrain the widest range of interested parties. In addition, JPL, through internal NASA funds, will provide an acquisition, storage, and distribution capacity for remote sensing data products including ocean color and sea surface temperature and will also participate in providing guidance for the ocean modeling activities.   The following is the 2005 Annual Work Program as requested in the grant guidance language provided by the California Coastal Conservancy.

TASKS AND DELIVERABLES

The Coastal Ocean Circulation Monitoring Program – Southern California Coastal Ocean Observing System (SCCOOS) will develop and initiate the following proposed activities. Estimated time periods are provided in bold and parenthesis to represent the minimum requisite time period to complete each task and do not represent man months of effort expended. These periods do not necessarily commence upon initiation of this grant or approval of the Annual Work Plan, but are program dependent and are often inter-related to the progress of other related tasks. Therefore, durations are initiated, managed and may be modified at the discretion of the program scientists.

A. ESTABLISH SCM ARRAY FOR MAPPING OCEAN CURRENTS

- Initiate development of the progressive installation and operation of a coastal current mapping array consisting of both long and short range measurements. New installations will extend from San Diego to Point Estero. **(April)**
- Install communication hardware where necessary as sites become available in order to operate and configure remote sites. **(September)**
- Development of software to deliver hourly radial and combined ocean surface current measurements for near real-time monitoring. **(ongoing activity to be conducted over the year)**
- Plan to install approximately seven new sites each year increasing coverage of the Southern California Bight region to achieve full build out of SCCOOS COCMP over three years Locations will be determined in conjunction with Task A.1, and prioritized based on site accessibility and permitting response. Projected sites can be viewed from http://sdcoos.ucsd.edu/SoCal. Initial targeted sites include LA Basin region in support of the integrated, special sites project targeted for summer in year 2 of COCMP.

> **Deliverable: Approximation of SCM antenna locations along coast ensuring most complete coverage map of Southern California, documentation submitted for proposed site requests permits, installation costs of year 1 SCM installations, and where possible, integrated real-time data products of surface currents. (ongoing activity distributed over 12 months)**

Task A.1 - SCM Site Assessment

- Evaluate physical locations for SCM antennas deployment taking into account local noise, distance to the ocean, potential structural interference, and site permission process. **(June)**
- Assess installation logistics particular to each site location. Determine means of equipment transport including car, boat, and helicopter travel. **(June)**
- Note foreseeable impediment to successful installation and operation of SCM locations. While accessible power and communications significantly ease site construction, existing buildings, towers, and ground characteristics can significantly affect the performance of SCM antennas. **(ongoing activity to be conducted over the year)**

> **Deliverable: Status reports as required on site assessment detailing location and existing infrastructure beneficial or detrimental to setup, installation milestones anticipated particularly for remote sites with no existing power and/or communications. (ongoing activity distributed over 12 months)**

Task A.2 - Site Permissions

- Identify and contact local land owners regarding necessary site permits for installation and site visits.
- Perform and document any required permission surveys.
- Potential Site Installations include: (*from south to north*)
    - Mission Bay
    - La Jolla
    - Del Mar
    - Oceanside
    - Santa Catalina East
    - Dana Point
    - Newport Beach
    - Seal Beach
    - Point Fermin, San Pedro
    - Redondo Beach
    - Point Dome (long range and short range system)
    - San Pedro Point, Santa Cruz Island
    - Point Mugu
    - Port Hueneme
    - Point Conception
    - Point Arguello
    - Point San Luis
    - Port San Luis
    - Point Estero

    Deliverable: Status reports as required on site permissions outlining granting agencies and documentation submitted for site approval. Included in this report will be details presented on antenna characteristics and accessory equipment. (ongoing activity distributed over 12 months)

Task A.3 - Frequency Allocation

- Submit requests to FCC for experimental frequency allocations. **(June)**

    Deliverable: Status reports as required on frequency allocations currently in use, requested and received through FCC. (ongoing activity distributed over 12 months)

Task A.4 - Site Preparation and Equipment Order

- Document and identify antenna locations for maximum performance. **(September)**
- Negotiate and secure agreement with equipment vendors for best pricing/delivery schedules. **(June)**
- Determine additional hardware required for site operation. **(as needed: ongoing activity)**

    Deliverable: Status reports as required on site preparation and installation plan. Depending on geography, accessibility, and available utilities, each site requires unique antenna configuration and hardware. (ongoing activity distributed over 12

months)

Task A.5 - Standard Operating Practices

- Provide hourly radials in real-time to user accessible website.
- Download and archive lower level spectral data for detailed analysis and reprocessing capabilities.
- Develop and improve standards for antenna operation and maintenance. **(ongoing activity)**

    Deliverable: Status report on standard operating practices for data retrieval and system maintenance to include any troubleshooting or notable observations. (ongoing activity distributed over 12 months)

B. ESTABLISH NEARSHORE AND SURFZONE OBSERVATIONS

Task B.1 - Wave & Current Observations

- Fabricate the nearshore current measuring system including surfzone drifters, current/pressure sensors, and frames for mounting instruments in the surfzone. **(December)**
- Fabricate cables to bring data to shore. **(December)**
- Prepare drifters for deployment to include purchase of components, fabrication and calibration of parts, and other technical tasks as necessary to ready drifters for deployment. **(December)**

    Deliverable: Status reports as required on the fabrication of nearshore current measuring system to include system characteristics. (ongoing activity distributed over 12 months)

Task B.2 - Transition Zone Observations - AUV Deployment

- Ready the REMUS AUV for deployment including mission planning and sensor calibration. **(December)**
- Deploy the REMUS AUVs concurrently with other COCMP platforms (drifters and moorings) with the goal of providing near-real-time physical description of the transition zone for model parameterization, validation and implementation in the Southern California Bight. **(ongoing activity over 12 months)**
- Perform REMUS AUV surveys on a consecutive basis throughout each month of observations. The survey pattern consisting of a number of across-shore transects will be designed to cover the focus area and to be completed in three hours to resolve adequately tidal motions. AUVs will be equipped with CTDs and upward- and downward-looking ADCPs.

  Deliverable: Status reports as required on AUV-based data collection. (ongoing activity distributed over 12 months)

Task B.2 - Transition Zone Observations - Drifter Deployment

- Instrumentation procurement and preparation for deployment to include the purchase of 18 drifters. **(September)**
- Develop MATLAB based computer programs to:
  1) parse the drifter data,
  2) display drifter trajectories in near real-time on a map, and
  3) make the mapped trajectories accessible via the web. **(October)**
- Formalize the nearshore-surfzone observations schedule with other SCCOOS PIs. **(December)**
- Begin nearshore and surfzone modeling efforts. **(June)**

  Deliverable: Status report of instrumentation preparation and deployment efforts. (ongoing activity distributed over 12 months)
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Task B.2 - Transition Zone Observations - Mooring Deployment

- Begin fabrication and system integration of two moorings to be deployed in waters of 20 m depth. Moorings will consist of surface flotation, downward-looking ADCP mounted in a cage beneath the buoy, & thermistor chain. **(ongoing activity over year 1 in preparation for year 2 deployment)**
- Begin preparation of moorings for deployment including the installation of software, telemetry testing, and calibration of sensors. **(ongoing activity over year 1 in preparation for year 2 deployment)**
- Begin dialog within SCCOOS to determine optimal deployment locations of these two moorings. **(June)**

  Deliverable: Status report of instrumentation to include a description of mooring and sensor components as well as proposed deployment locations. (ongoing activity distributed over 12 months)

Task B.3- Modeling wave evolution & currents to nowcast surfzone currents (Santa Monica and San Pedro Bays)

- Begin developing data integration processes for the surfzone current model based upon wave height models. **(September)**
- Begin developing an interactive web site with point-and-click "nowcasts" of vertically-averaged alongshore currents in the nearshore and maps. **(December)**

> **Deliverable: Status report of model development and implementation and display tools. (ongoing activity distributed over 12 months)**

Task B.4 – Northern and Central Nearshore Data

- Purchase and establish a working UNIX server for integration of statewide CDIP data. **(December)**
- Begin developing and validating a statewide nearshore wave prediction database. **(December)**

> **Deliverable: Status report of UNIX database development. (ongoing activity distributed over 12 months)**

C. ESTABLISH SUBSURFACE OBSERVATIONS

Task C.1 - Underway CTD

- Purchase components, fabricate, calibrate and make other necessary technical preparations for readying an underway CTD for deployment.
- Establish relationships with vessels of opportunities for the routine deployment of the underway CTD.
- Develop methodologies for transport of data to SCCOOS data system.

> **Deliverable: Status report on underway CTD preparations. (ongoing activity distributed over 12 months)**

Task C.2 - Bight-Scale Monitoring

- Build 3 new gliders with CTD, ADCP and fluorometer.
- Prepare gliders for deployment including mission planning and sensor calibration
Develop and test data transfer, collection, processing, and dissemination.
> **Deliverable: Status report on development of instrumentation and techniques for data collection, processing and dissemination. (ongoing activity distributed over 12 months)**

D. ESTABLISH REGIONAL OCEAN MODELING

Task D.1 - Model Research and Development

- Establish initial oceanic model configuration for Southern California.
- Work with JPL to implement and test data assimilation techniques**.**

   Deliverable: Status report of model configuration, data assimilation, data transfer and data presentation. (ongoing activity distributed over 12 months)

Task D.2 – Wind Product for use by ROMS

- Purchase a computer system for establishing a meteorological domain using MM5 wind model. **(April)**
- Operate wind model at a high resolution within the Southern California Domain. **(October)**
- Make wind fields from the MM5 model readily available. **(December)**

   Deliverable: Status report of the establishment and operation of the MM5 high resolution wind model. (ongoing activity distributed over 12 months)

Task D.3 - Covariance and Objective Mapping using COCMP observations

- Work up data covariances of key observations of currents and their forcing. Factor into frequency bands, depth regions, forcing sources (tides, winds, alongshore, offshore).
- Start producing maps using simple covariance functions parameterized as functions of depth, distance offshore and alongshore. Investigate covariance between outer surfzone and inner radar bins.
- Begin Regional Ocean Modeling System (ROMS) runs on fine grids using observed winds and tides, compare to observed structures and covariances.
- Build simple models of wind-forced surface currents based on observations and models.
- Cross-validate maps by withholding observations**.**

   Deliverable: Status report of mapping development and integration of model and observations to include progress of objective mapping, data assimilation, data and model presentation, and general quality assurance. Validation techniques and comparisons of assimilated data versus observed data will be provided. (ongoing activity distributed over 12 months)

Task D.3 - Synthesis of SCCOOS Data and Prediction of Fields

- Develop algorithms for processing satellite data and test algorithms using training sets of data, determine the optimum statistical model for use in data assimilation and modeling. Test algorithms and statistical model.
- Integrate the surface current data assimilation scheme into ROMS.
- Implement the ROMS configuration over the Southern California Bight with assimilation of both *in situ* and satellite data sets.

Deliverable: Status report of in situ data and satellite data assimilation techniques. Assimilation results will be analyzed and processed for visualization. Model output will be provided to the SCCOOS data system. (ongoing activity distributed over 12 months).

E. DATA DISTRIBUTION AND MANAGEMENT

Task E.1 - Information Technology Development

- Expand the SCCOOS data system as data are made available.
- Prepare to integrate data from various sensor types and locations into a growing centralized data system.
- Develop a statewide data grid system to enable participants to access model output from ocean and wind modeling efforts, as well as products as they become available.
- Manage the flow of data from the distributed SCM sites, including data storage, data archives, and data access.
- Begin development of user interfaces to the SCCOOS data system.

> **Deliverable: Status report of data collection and grid system for dissemination. This report will include the development and adaptations made to the system, difficulties experienced, and achievements. Present summary of data system interfaces. (ongoing activity distributed over 12 months)**

Task E.2 - Product Development

- Compare available data products and optimal data products that would be desirable for coastal management and end user applications. **(June)**
- Initiate mechanisms for data qa/qc. **(October)**
- Identify classes of SCCOOS data provider/user groups in Southern California. **(ongoing)**
- Identify classes of products based upon level of sophistication and user needs assessment. **(ongoing)**
- Identify potential methods of data and product communication to end users. Create methodologies to connect outreach, data management, and product development efforts. **(ongoing)**
- Begin generation and development of products based upon available observations. **(ongoing)**
- Coordinate product development with the State Coastal Conservancy. **(ongoing)**

> **Deliverable: Status Report on users needs and defined products. Status report and examples of generated products. (ongoing effort distributed over 12 months)**