South Bay Coastal Ocean Observing System
California Clean Beaches Initiative

Quarterly Report
March 2004

to
City of Imperial Beach

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Executive Summary

This quarterly reports reflects efforts conducted under a contract between Scripps Institution of Oceanography and the City of Imperial Beach under California's Clean Beaches Initiative for the period between December 31, 2003 – March 31, 2004. Resources provided under this contract are to be used to establish a Coastal Observing System in the San Diego South Bay region to provide real-time time measurements of key oceanographic parameters that are relevant to understanding the complex coastal transport mechanisms present in this region and their relevance to local water quality issues.

Efforts conducted during this time period are as follows:

- Continued maintenance and implementation of real-time data products resulting from the integration of 4 CODAR systems. These four systems include three SDCOOS systems deployed at Point Loma, Border Park, and Coronado Island, as well as one system deployed at Rosarito Beach and owned by colleagues at CICESE/UABC. Several networking components were replaced to enhance system performance and increase stability.

- Recovery of the nearshore water quality sampling station, which allow real-time measurements of ocean water temperature, water salinity, and turbidity in the surfzone near the I.B. Pier. The system had to be recovered in late January due to damage from high surf and a system malfunction of one of the components. The system is being repaired, and will be redeployed in coming months.

- Improved data display and access to real-time South Bay buoy data of ocean stratification. The buoy data, which is telemetered to a receiving station on the Imperial Beach pier is now uploaded to a central data repository for web posting and archival. The temperature profile can be viewed as a time series, color contour plot, or profile. The buoy is located over the wye of the South Bay Ocean Outfall.

- Development of an interactive water quality data entry form to support and facilitate integration of County and City of San Diego Department of Environmental Health monitoring data. Web pages have been developed that allow sample results to be entered directly into the SDCOOS display and archival system. This has been the principal means for communicating results within the County of San Diego sponsored bacteria monitoring program that is specific for SDCOOS.

- Recovery of Imperial Beach waves monitoring bottom mounted package. The power and signal cable that connects the Imperial Beach currents and waves monitoring system experienced vandalism and had to be recovered. While the system is out of the water, we anticipate placing a number of improvements into the system to provide added capabilities and reliability.

- Development of an online interactive utility for viewing local bathymetry within the South Bay. This interactive map shows coastal watershed areas, deep ocean canyons, and satellite topographic imagery.

- Development of quicklook data access pages in support of local monitoring. These pages include information pertinent to the Bight 2003, Southern California Regional Marine Monitoring program and the International Boundary Water Commission (IBWC) river gauge monitoring.

Project Timeline – Schedule update

TASK ITEM	Schedule completion date based on a July 1, 2002 start
1.1. *Coastal Ocean Dynamics Application Radar*	
1.1.1 – 1.1.3 site planning, array design, order system	September 15, 2002 (2.5 months)
1.1.4 – 1.1.6 system installation	January 31, 2003 (6.5 months)
1.1.5 – 1.1.8 system calibrations and optimization	September 15, 2003 (14.5 months)
1.1.9 data integration	continuous effort through June 30, 2004 (24 months)
1.2. *Nearshore Currents and Water Type Sampling*	
1.2.1 – 1.2.2 system fabrication, site planning	December 15, 2002 (5.5 months)
1.2.3 – 1.2.4 system installation	January 15, 2003 (6.5 months)
1.2.5 – 1.2.6 data integration	continuous effort through June 30, 2004 (24 months)
1.3. *Surf-zone Currents and Water Quality Sampling System*	
1.3.1 fabricate system	December 15, 2002 (5.5 months)
1.3.2 install system	January 15, 2003 (6.5 months)
1.3.3 install data cable / logging computers	January 15, 2003 (6.5 months)
1.3.4 data integration	continuous effort through June 30, 2004 (24 months)
1.4. *Water Column Stratification Measurement System*	
1.4.1 – 1.4.2 system fabrication and installation	January 1, 2003 (6 months)
1.4.3 data integration	continuous effort through June 30, 2004 (24 months)
1.5. *Central Data Acquisition and Real-Time Data Distribution System*	
1.5.1 – 1.5.3 database development, data merger, online access tool development	continuous effort through June 30, 2004 (24 months)
1.6. *Data Integration and Interpretation*	continuous effort through June 30, 2004 (24 months)
1.7. *Reporting*	
1.7.1-1.7.3 progress reports of activities, milestones, data summaries, and interpretation efforts	continuous effort through June 30, 2004 (24 months)

Activities undertaken for the above timeline during the time period of this report:

Tasks 1.1   Coastal Ocean Dynamics Application Radar

CODAR sites continue to be operational providing real-time surface currents for the South Bay region. Throughout this quarter, we focused efforts on development of an improved archiving method for the Coastal Radar data. This method includes an Object Ring Buffer, which consistently queries several databases for file updates and changes, triggering an automatic data transfer and population of an offsite data repository at the San Diego SuperComputing Center.

Task 1.2   **Nearshore Currents and Water Type Sampling System**

In order to provide real-time data products, we have our instruments cabled the length of the Imperial Beach pier to a computer system in the tower. This cabling became a source of intrigue to local teens when their fishing lines caught, and tested the strength of the cable ultimately causing irreparable damage. We recovered nearshore current meter sampling system in early March for overhaul.

Task 1.3   **Surf-zone Currents and Water Quality Sampling System**

The surf-zone can be an extremely challenging environment for maintaining oceanographic equipment. In late January, we had to recover our water sampling system due to storm damage. The instruments were securely mounted to a pier piling directly below the lifeguard tower, but unfortunately the communications cables were damaged and began transmitting faulty data readings. The instruments were sent back to the factory for repair and recalibration, as we devised a new deployment mechanism. With the bottom mounted waves system and water sampling systems recovered, we were able to engineer an integrated system. We anticipate redeploying the system in the following quarter.

Task 1.4   **Water Column Stratification Measurement System**

In an effort to provide improved user-friendly data products, we expanded our water column stratification display. Users are now able to view the data in several formats including time series, contour, and vertical profile images. This system remained operational throughout the quarter.

Task 1.5   **Central Data Acquisition and Real-Time Data Distribution System**

A development and maintenance effort for the SDCOOS real-time data distribution system continues through this quarter. We were able to provide online support to the Bight '03 Southern California Regional Marine Monitoring program by tailoring our Real-Time Data Distribution System to fit their needs. Participants were able to review the synoptic situation each day prior to collection events. We provided the essential products need on one easy access page specifically designed for their needs. The page still remains at http://www.sdcoos.ucsd.edu/bight03/

Task 1.6   **Data Integration and Interpretation**

As the installation of the San Diego Coastal Observing System progresses, we are able to utilize our data products for further integration, interpretation, and analysis. We have assimilated Tijuana river gauge data and information provided by the International Boundary Water Commission (IBWC) for quick reference during storm water overflows: http://www.sdcoos.ucsd.edu/data/CurrentRiver.cfm We have also have obtained and provide to the public ocean color satellite imager from the Ocean Color Monitor (OCM) data over the South Bay coastline through March 2004. This data has been geo-referenced to the coastline.
In an effort to facilitate ease of water quality data reporting, we structured a web entry system based on the reporting scheme of the San Diego County Department of Environmental Health.
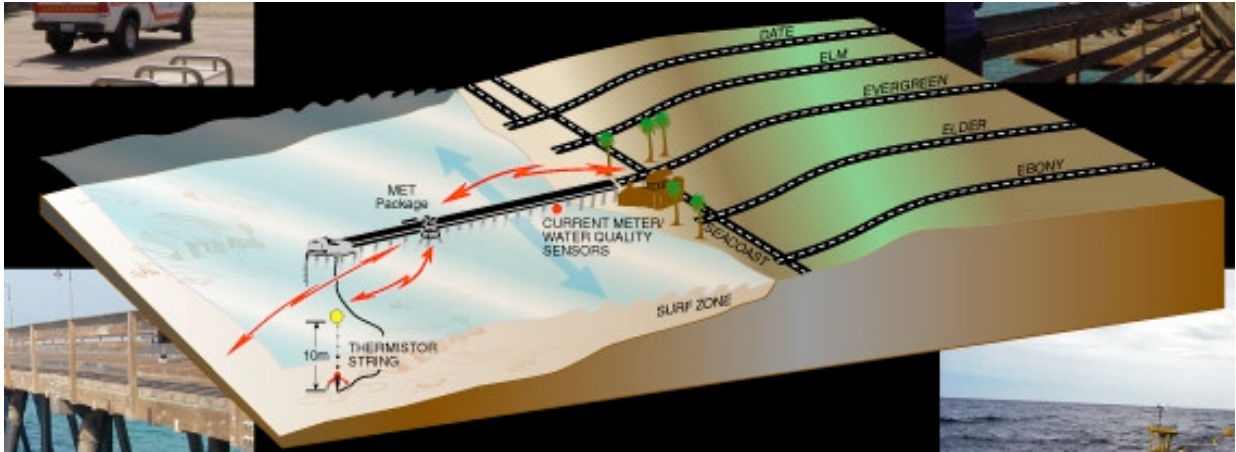
Figure 1. Overview of the monitoring equipment deployed on the Imperial Beach pier. The system cabled to the pier represents a vertical profiling current meter, which allows measurement of ocean waves and currents. The measurement site is approximately 200' offshore of the pier. Wave and currents at this location are displayed on the SDCOOS web site http://www.sdcoos.ucsd.edu/data/current_data_IB.cfm .
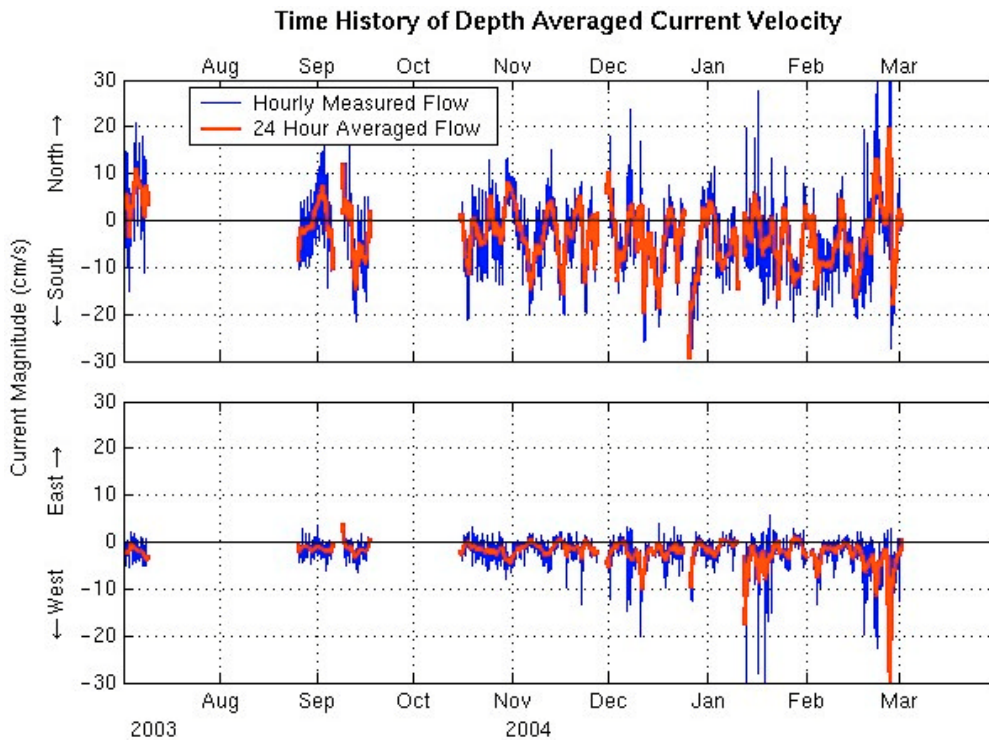
Figure 2. Continued summary of the depth averaged currents at the I.B. pier location measured to date by the Acoustic Doppler Current Profiler. The time history and real time flow reporting allows users to incorporate flow direction with storm events. Web links have been enabled for viewing surface, full water column, and averaged currents. Ongoing analysis is performed to ensure HF correlation between multiple data sources. HF radar surface currents can be compared with in water point measurements. The blue lines represent hourly data, and the red line is a sliding 24 hour average. Gaps in the time series at the beginning of the records are a result of bringing the system offline for QA/QC efforts. A comparison of the plots shows that the dominant current directions in this region are alongshore.

Basic Data

Site ID | Latitude | Longitude | Direction | Location Changes
AA-#### | 32 ° 0.0 ' | 117 ° 0.0 ' | M | ☐

Site Descriptor | **Distance**
[ ] | 0

Sample Date | Sample Time | ⦿ GMT | Water Salinity
yyyy-mm-dd | hh:mm (24 hour format) | ○ Pacific |

Water Temperature | Sample Number | Lab ID | Bottle Number
[ ] °C | [ ] | [ ] | [ ]

Test Results

Test Name	Method	Qualifier	Result	Units	
TOTAL COLI	Mendo ▾	=		MPN	/100ml
FECAL COLI	MFC ▾	=		MPN	/100ml
ENTEROCOCCI	Enterolert ▾	=		MPN	/100ml

Collector's Data

Name | ID Number | Email
Paul Reuter | | preuter@ucsd.edu

Figure 3. This web page is representative of the user interface for the County of San Diego water quality data entry. Fields and formats were included based on pertinent logged information. The data feeds directly into an SDCOOS database and can be displayed easily on the web page for public viewing. The system is fully functional, but still in beta testing.

Figure 4 and 5. Both the nearshore and surfzone water quality sampling systems were recovered this quarter due to harsh environmental conditions and unfortunate tampering. A new nearshore system has been developed with improved cabling. The surfzone currents require additional servicing and will be reported upon in subsequent reports.
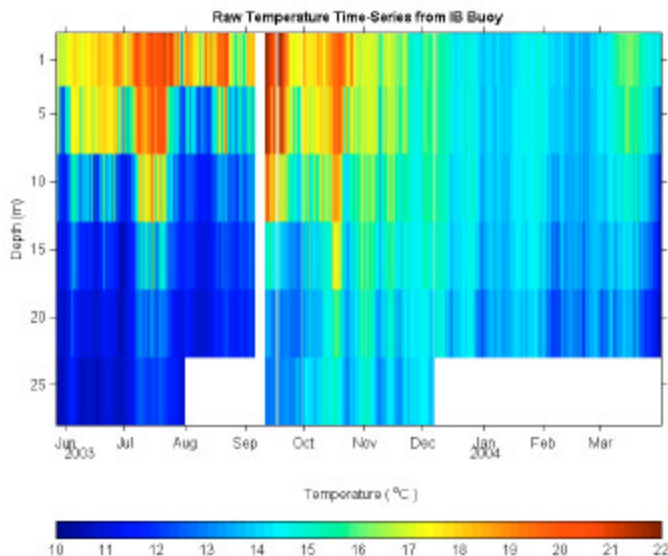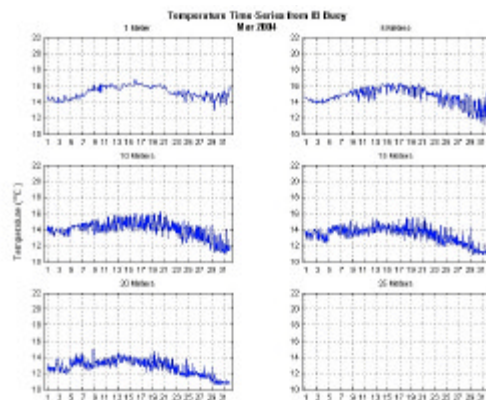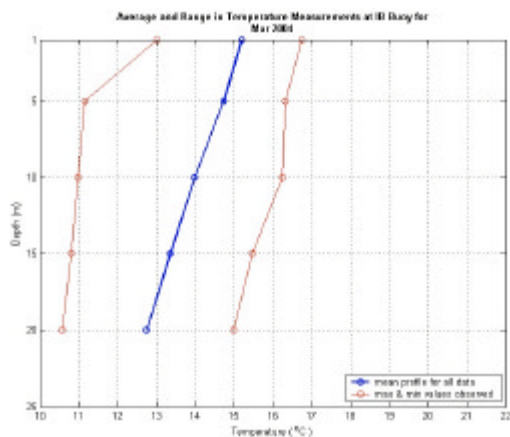
Figure 6. Expanded data representation of the SDCOOS buoy located at the South Bay outfall. Users are able to choose between profile, time series and color contour data plots.

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SAN DIEGO COASTAL OCEAN OBSERVING SYSTEM

Home | About SDCOOS | Sites | Data | Technology | Partners | UCSD

SDCOOS Support Page for San Diego Bight '03

Offshore Marine Forecast

Map of Sampling Grid

24 hr Averaged Currents

OCM Data

IB Meteorological Data

Imperial Beach Currents & Wave Data

Tijuana River Data

National Weather Service - Radar

Visible/IR GOES Satellite Data

SDCOOS Website

San Diego Rain trigger = 0.5" for the first seasonal event

February 24, 2004 Rain Event - Page contains material relevant to the sampling which occured on Feb. 24, 2004.

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For Offshore Marine Forecasts, Please See Links:
San Diego Coastal Weather Observations
San Diego Short Term Coastal Forecast
Extreme Southern California Zone Forecast
Offshore Marine Forecast
Southwest California Area Forecast

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Map of Sampling Grid:

Point Loma   San Diego
Coronado   Chollas Creek

Local intranet

Figure 7. Support page for the Bight 2003 Southern California Regional Marine Monitoring program. The program, coordinated by the Southern California Coastal Water Research Project (SCCWRP), is an effort to address, standardize, and focus regional coastal monitoring techniques and observations. SDCOOS provided realtime data streams for the Bight 03 participants both in San Diego as well as for the entire Bight with the online satellite data.
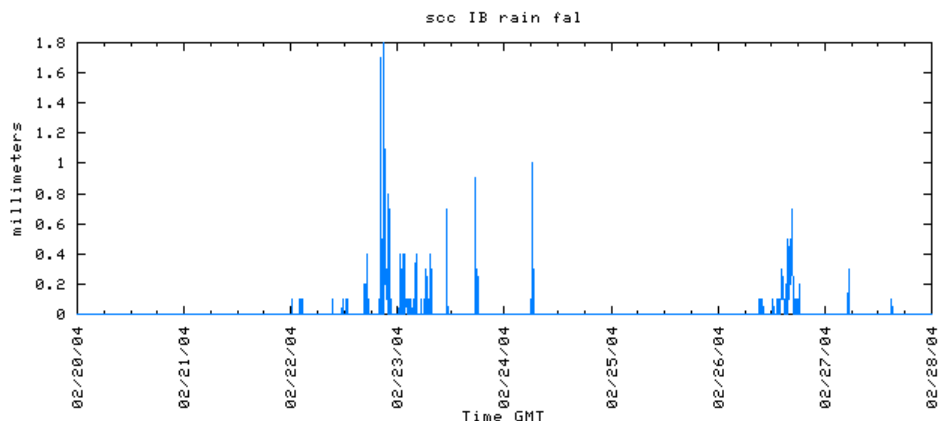

Figure 8. Rain event that occurred during Bight '03 monitoring program. Archived data remains posted as a reference to relevant sampling which occurred on Feb 24, 2004
http://www.sdcoos.ucsd.edu/bight03/Sampling022404.cfm

IBWC Tijuana River Gauge Data at the International Border
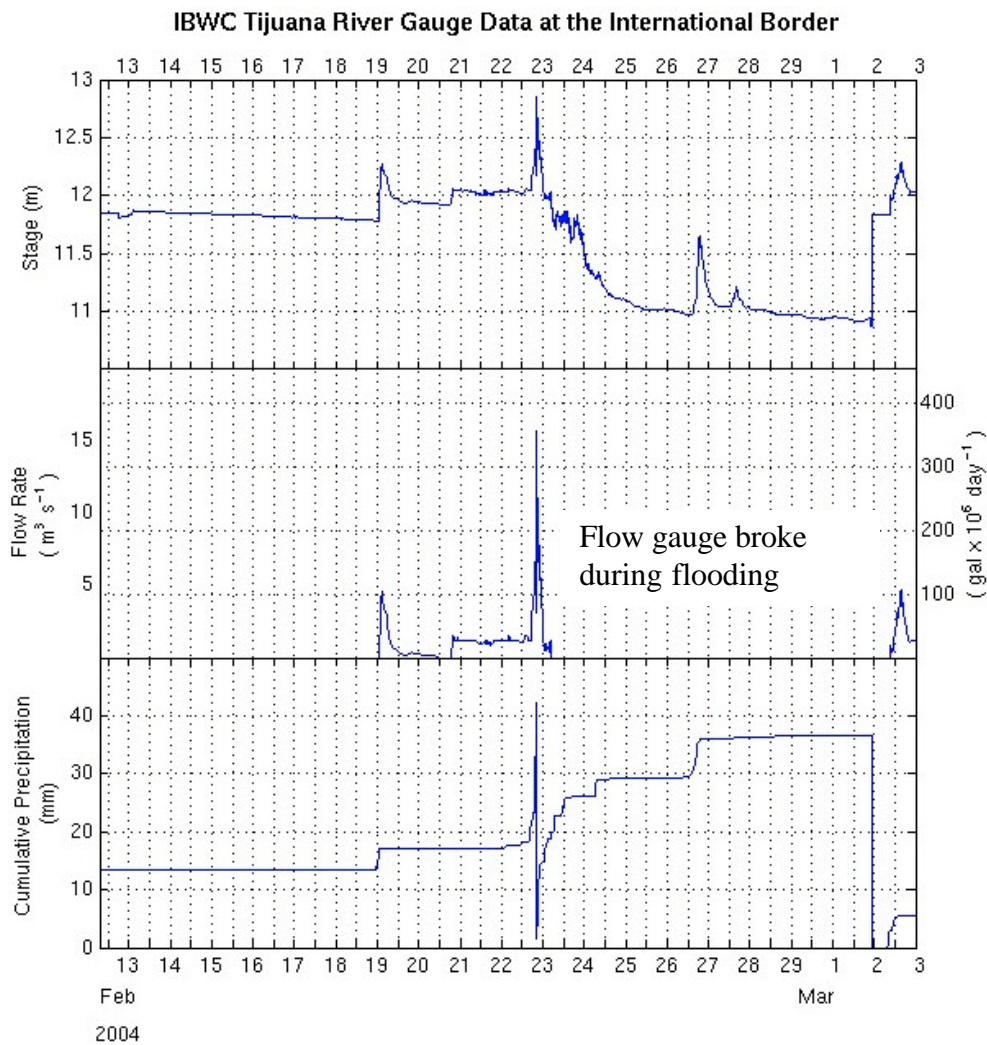

Flow gauge broke during flooding

Figure 9. Real time display of IBWC Tijuana river gauge. These plots were developed in conjunction with the Bight '03 effort. A time history of CODAR generated surface ocean currents at the Tijuana river estuary entrance can be found online at: http://www.sdcoos.ucsd.edu/data/CurrentRiver.cfm The currents are displayed along side river gauge measurements. Both realtime and archived data from this IBWC maintained gauge are available via SDCOOS.

Figure 10. The time history of CODAR derived currents at the mouth of the Tijuana River are displayed in realtime on SDCOOS. Shown to the right are the relationships between the location of these ocean current measurements, and the IBWC river gauge.
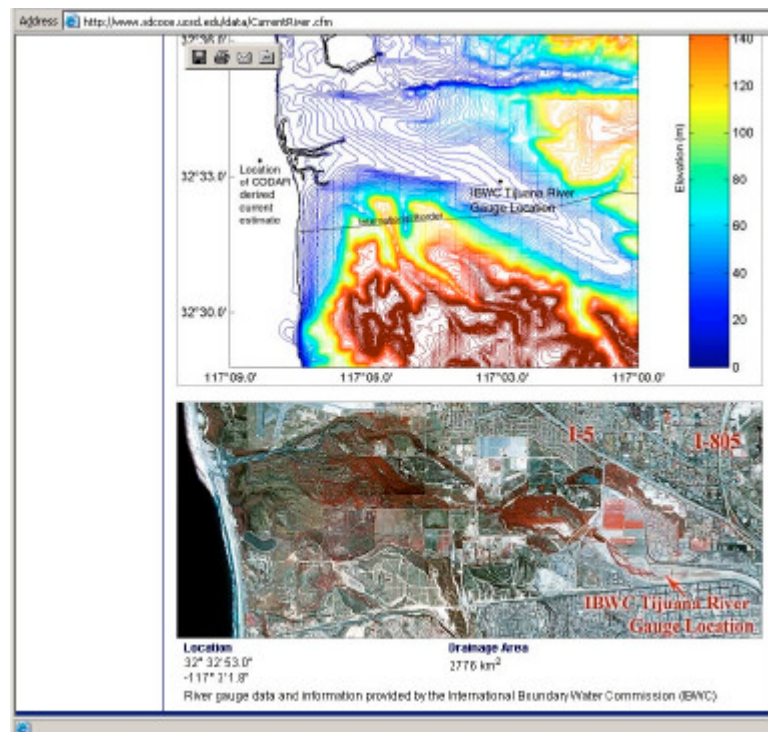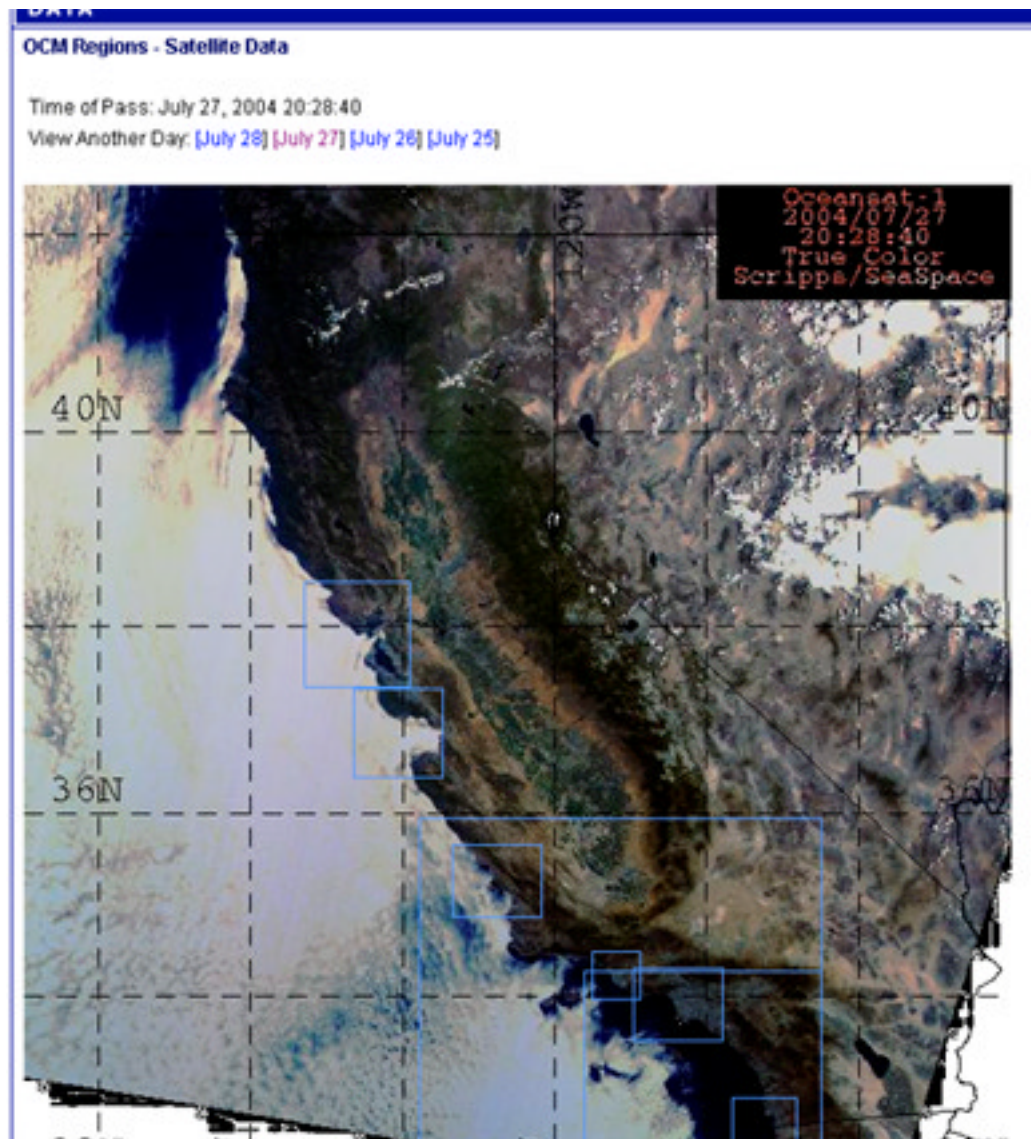
Figure 11. An example of the interface to ocean color data provided by OCEANSAT-1. Satellite data can be viewed in varying degrees of resolution depending on the area of interest. Predefined regions include San Diego, Los Angeles, LA to SD, Ventura, Morro Bay, Southern California, Monterey, San Francisco Bay, and all of California. An example web shot of the regions is shown here. The non-San Diego Bight03 regions relied heavily on this data stream in regions where no HF radar coverage was available.
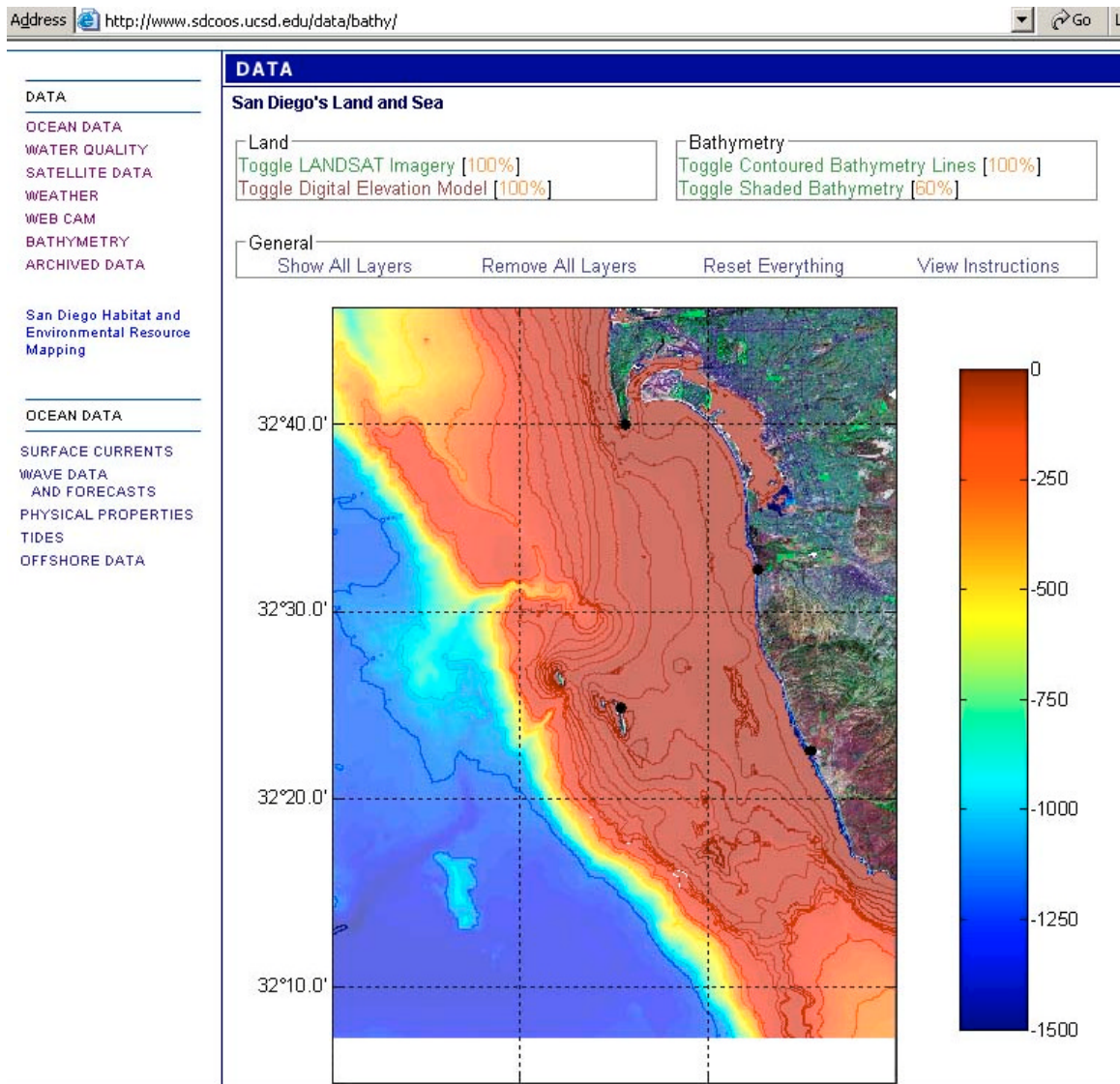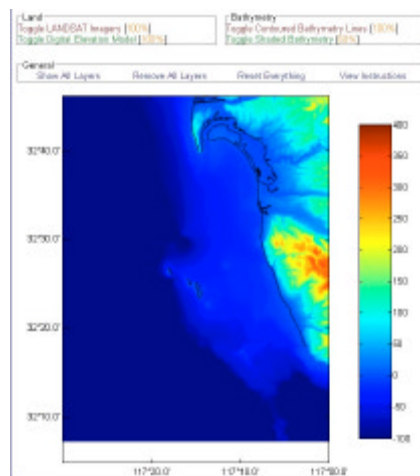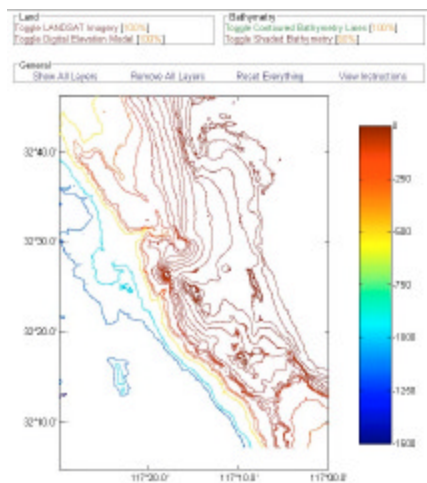
Figure 12. Local bathymetry data display. This is an interactive page allowing users to view local topographic and bathymetric features. Toggling of layers will produce an enhancement of elevation.

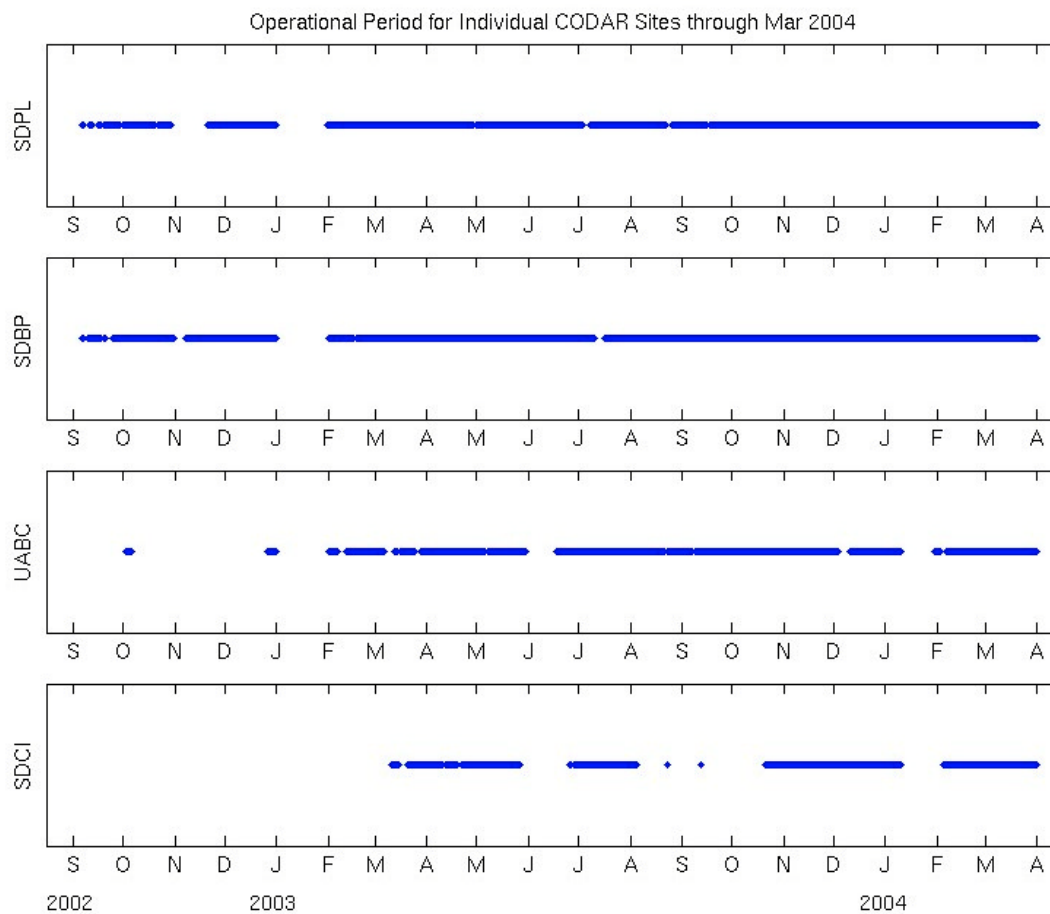Operational Period for Individual CODAR Sites through Mar 2004

Figure 13. Operational statistics of the SDCOOS CODAR array. The graphs indicate when each individual site was operational on a daily basis. Shown are the statistics for the Coronado Islands (SDCI), the Pemex refinery site owned by CICESE/UABC (UABC), the Point Loma site (SDPL), and the site at Border Field State Park (SDBP). Outages shown in the graphs are indicative of the system down for software upgrades, system improvements, or component failures that required on-site servicing by SDCOOS personnel. The outage that occurred for sites SDCI and UABC correspond to a network upgrade. The hardware that links both systems to SIO is located on Coronado Island and required several major field trips for final completion.