Central and Northern California Ocean Observing System

Presented by
Tom Wadsworth
CeNCOOS Database Coordinator

With assistance from
Rondi Robison and
Heather Kerkering

www.cencoos.org
Presentation Outline

- CeNCOOS and Education
- What is Integrated Ocean Observing System?
- What is CeNCOOS?
- What information does CeNCOOS collect?
- How can you access these data?
- How are these data applied?
- IOOS, regional associations and educators
It was the best of times, it was the worst of times, it was the age of wisdom, it was the age of foolishness …
- Charles Dickens
CeNCOOS Education Goals

• **Increase ocean literacy!**
  – Show students the importance of ocean systems
  – Give them the tools to unravel the many mysteries

• **Demonstrate to educators and students the opportunities for careers in ocean science and policy**

• **Provide web-based access to data in a user-friendly format**

• **Create products to help educators meet their teaching goals and standards**
Integrated Ocean Observing System (IOOS)

Seven Societal Goals

- Improve predictions of climate change and weather
- Improve the safety and efficiency of marine operations
- Mitigate effects of natural hazards more effectively
- Improve national and homeland security
- Reduce public health risks
- Protect and restore healthy coastal ecosystems
- Enable sustained use of coastal and ocean resources
Central and Northern California Ocean Observing System
CeNCOOS Ocean Observing Priorities

- **Marine Populations**
  - Fisheries, Mammals, MPAs
  - State of the CA Current Ecosystem

- **Water Quality and Public Health**
  - Seafood, Public Beaches
  - Nutrient, Bacteria and HAB tracking
  - Desalination Plants

- **Marine Operations**
  - Oil Spills, Search and Rescue
  - Marine Traffic
Bridging the Gap

- Identification of Needs
- Identification of Providers and Data
- Product design and evaluation
- Future needs and opportunities
- Product development and application
- Communication and outreach
Active Collaborators
- CIMT
- CICORE
- COCMP
- PaCOOS
- CalCOFI
- MBARI
- PISCO
- BOON
- CoastWatch
- ERD
- MBNMS
- TOPP
- UC and CSU
- NSF
- MARS
- ONR

Variables Include
- Water Temperature
- Ocean Color
- Animal Populations
- Current profiles
- Seafloor Bathymetry
- Sea Level
- Salinity
- Water Quality
- Sediment Movement
- Wave Conditions
- Tides
- Many More!

Study Methods
- Buoys
- In-situ stations
- Vessel surveys
- HF Radar
- Tagged animals
- Bathymetric Surveys
- Hyperspectral Imagery
- Biological Surveys
- Satellites
Data Access

- CeNCOOS Homepage (www.cenkoos.org)
- OceanObs Database/Map (www.oceanobs.org)
- Live Access Server
- Demonstration Project

- IOOS Registry Map (www.oceanobs.org/wc/map)

- Other Regional Associations (visit your RA’s site)
What is CeNCOOS?

CeNCOOS is a regional organization that coordinates ocean observing activities in Northern and Central California. We apply regional solutions and expertise to create customized informational products that address the Integrated Ocean Observing System's seven societal goals (listed below) and that focus on 1) marine populations and interannual variability; 2) public health and water quality; and 3) marine operations.

Seven Societal Goals

- Improve the safety and efficiency of marine operations
- More effectively mitigate the effects of natural hazards
- Improve predictions of climate change and its effects on coastal populations
- Improve national security
- Reduce public health risks
- More effectively protect and restore healthy coastal marine ecosystems
- Enable the sustained use of marine resources

News Update

Happenings in the CeNCOOS Region

- Heal-the-Bay 17th Annual California Beach Report Card

- New CDP oceanographic buoy deployed over the Monterey Canyon
  http://www.ndbc.noaa.gov/station_page.php?station=45236

- MBARI Open House – June 30th
  http://www.mbari.org/ni/ni_events/ni_events_mbari.asp

- National Marine Sanctuary: Monterey Bay Seeks Applicants for Advisory Council

Regional Data

Access data from the CeNCOOS region using the CeNCOOS Live Access Server.

Coastal Conditions

View near real-time and archived data from the CeNCOOS region.
Satellite Data

NOAA Satellite Information Center
www.osdpm.noaa.gov

CoastWatch
costwatch.pfel.noaa.gov/data.html

Ocean Data Center UCSC
oceandatacenter.ucsc.edu/NRT
Weather

National Weather Service

Print format
North Coast  Central Coast  Marine Sanctuaries

Graphical Interface
Northern California  Southern California

Local Meteorological Stations

CICORE - Entire California Coast
Bodega Bay Marine Lab

Latest Infrared Satellite Image
Web Cams

Humboldt County
- Live WebCam at Trinidad Harbor
- HSU real time video of seabirds at Castle Rock

Mendocino Coast
- Anderson WebCam
- Mendocino Community Network Weather Cam
- Crystal Bluffs WebCam
- USGS Station Noyo River, CA

North of San Francisco
- Point Reyes National Seashore
- Rodensi Marine Laboratory WebCam
- Muir Beach

Monterey Bay Area
- Aptos AWS WeatherNet Cam - Aptos, CA
- Monterey Bay Aquarium Web Cam
- Monterey Bay Aquarium
- Monterey Cam
- Monterey Cam
- Del Monte Beach - Monterey Cam - Del Monte Beach and the Pacific Coast from Monterey
- Fremont Peak Web Cam

Moro Bay/Big Sur
- Shell Beach, CA
- Avila Bay Watch Cam
- Cayucos Beach Cam
- Morro Bay Harbor Cam - Live webcam from U.S. Coast Guard Office in Morro Bay, California
- Baywood Inn Cam
- Four Views Near Morro Bay - Morro Bay, Big Sur, and Hearst Castle
- Big Sur - Nepomthe
What is CeNCOOS?

CeNCOOS is a regional organization that coordinates ocean observing activities in Northern and Central California. We apply regional solutions and expertise to create customized informational products that address the Integrated Ocean Observing System’s seven societal goals (listed below) and that focus on 1) marine populations and interannual variability; 2) public health and water quality; and 3) marine operations.

Seven Societal Goals

- Improve the safety and efficiency of marine operations
- More effectively mitigate the effects of natural hazards
- Improve predictions of climate change and its effects on coastal populations
- Improve national security
- Reduce public health risks
- More effectively protect and restore healthy coastal marine ecosystems
- Enable the sustained use of marine resources

News Update

Happenings in the CeNCOOS Region

- Heal-the-Bay 17th Annual California Beach Report Card

- New CDP oceanographic buoy deployed over the Monterey Canyon
  http://www.ndbc.noaa.gov/station_page.php?station=45236

- MBARI Open House – June 30th
  http://www.mbari.org/vi/vi_events/vi_events_mbari.asp

- National Marine Sanctuary: Monterey Bay Seeks Applicants for Advisory Council

REGIONAL OCEAN OBSERVING PRODUCTS & DATA

oceanObs

Inventory of CeNCOOS products, partner information, and sensor locations: queriable by data type, format, and observing program.

Regional Data

Access data from the CeNCOOS region using the CeNCOOS Live Access Server.

Coastal Conditions

View near real-time and archived data from the CeNCOOS region.

Click here for a list of "Active CeNCOOS Partners"
Central California Ocean Observing System (CeNCOOS)
Center for Integrated Marine Technologies

Monterey Bay Winds

CIMT Realtime Wind Product

Wind for 09/15/2006 10:00 Pacific Daylight Saving Time

View More Images

- 09/13/2006 10:00:00
- 09/13/2006 11:00:00
- 09/13/2006 12:00:00
- 09/13/2006 13:00:00
- 09/13/2006 14:00:00
- 09/13/2006 15:00:00
- 09/13/2006 16:00:00
- 09/13/2006 17:00:00
- 09/13/2006 18:00:00
- 09/13/2006 19:00:00
- 09/13/2006 20:00:00
- 09/13/2006 21:00:00
- 09/14/2006 00:00
- 09/14/2006 01:00
- 09/14/2006 02:00
- 09/14/2006 03:00
- 09/14/2006 04:00
- 09/14/2006 05:00
- 09/14/2006 06:00
- 09/14/2006 07:00
- 09/14/2006 08:00
- 09/14/2006 09:00
- 09/14/2006 10:00
- 09/14/2006 11:00
- 09/14/2006 12:00
- 09/14/2006 13:00
- 09/14/2006 14:00
- 09/14/2006 15:00
- 09/14/2006 16:00
- 09/14/2006 17:00
- 09/14/2006 18:00
- 09/14/2006 19:00
- 09/14/2006 20:00
- 09/14/2006 21:00
- 09/14/2006 22:00
- 09/14/2006 23:00
- 09/15/2006 00:00
- 09/15/2006 01:00
- 09/15/2006 02:00
- 09/15/2006 03:00
- 09/15/2006 04:00
- 09/15/2006 05:00
- 09/15/2006 06:00
- 09/15/2006 07:00
- 09/15/2006 08:00
- 09/15/2006 09:00
- 09/15/2006 10:00
- 09/15/2006 11:00
- 09/15/2006 12:00
- 09/15/2006 13:00
- 09/15/2006 14:00
- 09/15/2006 15:00
- 09/15/2006 16:00
- 09/15/2006 17:00
- 09/15/2006 18:00
- 09/15/2006 19:00
- 09/15/2006 20:00
- 09/15/2006 21:00
- 09/15/2006 22:00
- 09/15/2006 23:00
- 09/16/2006 00:00

Developed through collaboration with:
• Jet Propulsion Lab
• Naval Research Lab
• Naval Postgraduate School

Time Series Plots for the COAMPS wind and the observations

Station M0: 09/14/2006 09:00 PDT

Figure Caption: The observed (red circle) and model-simulated (blue line) wind speed (top panel) and direction (bottom panel) during the past and future 48 hours. The digital data are displayed in the table below.
Access Data from the CeNCOOS Region

CeNCOOS Data Server

The CeNCOOS Live Access Server provides access to data collected in the CeNCOOS geographical region.

oceanObs

An inventory of CeNCOOS products, partner information, and sensor locations: queriable by data type, format, and observing program.
High-Resolution Bathymetry

The Seafloor Mapping Lab Data Library at California State University, Monterey Bay includes:

- remotely sensed images (high-resolution multibeam bathymetry and side scan sonar geotiffs),
- derived data (bathymetric contours, grid analyses),
- habitat classification data,
- associated data sets (survey footprints, coastline, NOAA charts), and
- FGDC metadata for 30+ locations along the California coast.

The Seafloor Mapping Lab is a member of CICORE
<table>
<thead>
<tr>
<th>Northern California</th>
<th>Central California</th>
<th>Monterey Bay Region</th>
<th>Southern California</th>
</tr>
</thead>
<tbody>
<tr>
<td>BODEGA BASIN</td>
<td>FARALLON ISLANDS</td>
<td>MONTEREY PENINSULA</td>
<td>CHANNEL ISLANDS</td>
</tr>
<tr>
<td>HUMBOLDT BAY</td>
<td>CORDELL BANK</td>
<td>MONTEREY BAY CANYON HEAD</td>
<td>SANTA BARBARA CHANNEL</td>
</tr>
<tr>
<td>MACKERRICHER STATE RESERVE</td>
<td>SAN FRANCISCO BAY</td>
<td>SOQUEL CANYON</td>
<td>SANTA CATALINA ISLAND</td>
</tr>
<tr>
<td>POINT CABRILLO</td>
<td>SAN PABLO BAY</td>
<td>MEGS LANDING HARBOR</td>
<td>SANTA BARBARA ISLAND</td>
</tr>
<tr>
<td>POINT ARENA</td>
<td>OUTER SANTA CRUZ BASIN</td>
<td>ELKHORN SLOUGH</td>
<td>SAN CLEMENTE ISLAND</td>
</tr>
<tr>
<td>EEL RIVER BASIN</td>
<td>MORRO BAY</td>
<td>ELKHORN SLOUGH 2003</td>
<td>SANTA MONICA- EAST (BLOCKS 13-14)</td>
</tr>
<tr>
<td>CALIFORNIA MARGIN GEOLOGY SERIES</td>
<td>PT CONCEPTION TO PT ARGUELLO</td>
<td>POINT LOBOS</td>
<td>SANTA MONICA- WEST (BLOCKS 15-16)</td>
</tr>
<tr>
<td></td>
<td>SOUTH OF PT CONCEPTION</td>
<td>BIG SUR COAST</td>
<td>LA JOLLA</td>
</tr>
<tr>
<td></td>
<td>PT ARGUELLO TO SANTA MARIA</td>
<td></td>
<td>CORTES BANK / TANNER BANK</td>
</tr>
</tbody>
</table>
What is CeNCOOS?

CeNCOOS is a regional organization that coordinates ocean observing activities in Northern and Central California. We apply regional solutions and expertise to create customized informational products that address the Integrated Ocean Observing System’s seven societal goals listed below and that focus on 1) marine populations and interannual variability; 2) public health and water quality; and 3) marine operations.

Seven Societal Goals

- Improve the safety and efficiency of marine operations
- More effectively mitigate the effects of natural hazards
- Improve predictions of climate change and its effects on coastal populations
- Improve national security
- Reduce public health risks
- More effectively protect and restore healthy coastal marine ecosystems
- Enable the sustained use of marine resources

Regional Ocean Observing Products & Data

OceanObs

Inventory of CeNCOOS products, partner information, and sensor locations: queriable by data type, format, and observing program.

Regional Data

Access data from the CeNCOOS region using the CeNCOOS Live Access Server.

Coastal Conditions

View near real-time and archived data from the CeNCOOS region.

News Update

Happenings in the CeNCOOS Region

- Heal-the-Bay 17th Annual California Beach Report Card

- New CDP oceanographic buoy deployed over the Monterey Canyon
  http://www.ndbc.noaa.gov/station_page.php?station=45236

- MBARI Open House – June 30th
  http://www.mbayerg.org/vi/vi_events/vi_events_mbari.asp

- National Marine Sanctuary: Monterey Bay Seeks Applicants for Advisory Council
OceanObs: the CeNCOOS Online Database
Cataloging and Promoting Coastal Research

• OceanObs was created in May 2005 in collaboration with the Sanctuary Integrated Monitoring Network (SIMON)

• The first web based catalog of coastal research for northern and central California (freshwater, bays, estuaries, wetlands and open ocean)

• Contact info for regional partners

• A data discovery tool for a variety of users
How will OceanObs benefit educators?

- A centralized directory of research activities
  - Learn about what is going on in the ocean for our area

- Much more comprehensive than the CeNCOOS site

- Contact organizations to see how to involve students

- Resource for students to query for many variables
  - Direct links to research organizations & data
Current OceanObs Statistics

- 45 CeNCOOS Partners with catalogued metadata
- 360 Data Products
- 180 Observing Devices
- 100+ Study Variables
- Nearly 1000 Observing Sites
Who Uses OceanObs?

- IOOS Regional Coordinators
- CeNCOOS personnel
- CeNCOOS Partners (Data Managers)
- Regional Stakeholders - including federal and state government agencies, industries, researchers, educators, students and recreation enthusiasts
Welcome to OceanObs: An Information Management and Data Discovery Tool for the Integrated Ocean Observing System

Latest News (May 11, 2007)

- New query feature added to interactive map. Now users seeking information on observing locations, devices, and data products can search the oceanObs database by subregion of the CeNCOOS regional association area. Try out this new feature here.
- oceanObs User Guide Now Available. A new user guide is available to help CeNCOOS partners enter information into oceanObs. The guide is available here and on each data entry screen.

Access the oceanObs Inventory of Observing Activities

What information can you find?
Using a public query form you can find access to specific data products from CeNCOOS partners tracked in the oceanObs inventory. Click the button at right to begin.

Interactive map of CeNCOOS Data Collection Sites
Now data collection sites inventoried in oceanObs are available to visualize and query on a Google map. For each point on the map users can find access to data products, information on sensors, and variables collected there. Map was developed by the Sanctuary Integrated Monitoring Network (SIMON) program.

To access the interactive map click here.
Real Time Data - Large Animal Tracking

Satellite Data
- Sea Surface Temperature
  - Chlorophyll
  - Winds

Mooring Data
- Site M0
- Site M1
- Site M2

HF Radar
- Surface Currents

Data/Model Products
- Monterey Bay Winds

Large Animal Tracking
- California Sea Lions
- Elephant Seals
- Whales

Data Description
Movement of Elephant Seals

Source
Tagging of Pacific Pelagics

Contact
Central and Northern California Ocean Observing System

Welcome to OceanObs: An Information Management and Data Discovery Tool for the Integrated Ocean Observing System

Latest News (May 11, 2007)

- **New query feature added to interactive map.** Now users seeking information on observing locations, devices, and data products can search the oceanObs database by subregion of the CeNCOOS regional association area. Try out this new feature [here](#).
- **oceanObs User Guide Now Available.** A new user guide is available to help CeNCOOS partners enter information into oceanObs. The guide is available [here](#) and on each data entry screen.

Access the oceanObs Inventory of Observing Activities

What information can you find?
Using a public query form you can find access to specific data products from CeNCOOS partners tracked in the oceanObs inventory. Click the button at right to begin.

Interactive map of CeNCOOS Data Collection Sites
Now data collection sites inventoried in oceanObs are available to visualize and query on a Google map. For each point on the map users can find access to data products, information on sensors, and variables collected there. Map was developed by the Sanctuary Integrated Monitoring Network (SIMon) program.

To access the interactive map [click here](#).
CeNCOOS Observing Project Inventory

Full inventory

Below is the entire inventory of CeNCOOS ocean observing activities that are currently tracked in the oceanObs database. These activities are grouped by individual regional partners. This list will continue to grow as more partners are entered into the oceanObs database.

Program: **Alliance for Coastal Technologies (ACT)**
Contact: Jason Smith (jsmith@mlml.calstate.edu)

Element: Searchable database of technologies

[ Data product inventory ]

Element: Technology Database

[ Data product inventory ]

Program: **Bay Delta and Tributaries Project (BDAT)**
Contact: Karl Jacobs (kjacobs@water.ca.gov)

Element: Bay-Delta Environmental Data

[ Data product inventory ]

Program: **Bodega Ocean Observing Node (BOON)**
Contact: Vic Chow (vichow@ucdavis.edu)

Element: Offshore Mooring and ADCP Data

[ Data product inventory ]

Element: Sea Surface Currents and Waves

[ Data product inventory ]
CeNCOOS Observing Project Inventory
Query inventory
Enter any combination of search criteria in the form below and click Query. Leaving all fields blank will return a comprehensive list of all partners in this region.

Data type (you may select from both lists)
- (IOOS standard variables)
- Regional variables

[ View the full inventory ]
CeNCOOS Observing Project Inventory
Query inventory
Enter any combination of search criteria in the form below and click Query. Leaving all fields blank will return a comprehensive list of all partners in this region.

Data type (you may select from both lists)
- (100S standard variables)
- (Regional variables)

Data format
- 

Observing program
- 

Query Inventory

- Your query results will display here -
<table>
<thead>
<tr>
<th>Data type</th>
<th>AND Marine Mammal Observations</th>
<th>Data format</th>
<th>Observing program</th>
</tr>
</thead>
</table>

**Program:** California Sea Otter Survey CSOS  
**Contact:** Brian Hatfield (brian_hatfield@usgs.gov)

**Element:** Bi-annual Sea Otter Survey

**Program:** Center for Integrated Marine Technologies CINT  
**Contact:** Rondi Robison (rrobison@ucsc.edu)

**Element:** Apex Predator Tagging

**Program:** Center for Integrated Marine Technologies CINT  
**Contact:** Rondi Robison (rrobison@ucsc.edu)

**Element:** Ship Survey
Spring Surveys, 1983-2006

Spring Counts of Southern Sea Otters
1983 - 2006

<table>
<thead>
<tr>
<th>YEAR</th>
<th>INDEP</th>
<th>% CHANGE</th>
<th>PUPS</th>
<th>% CHANGE</th>
<th>PUP/INDEP RATIO</th>
<th>TOTAL</th>
<th>% CHANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1983</td>
<td>1156</td>
<td>-</td>
<td>121</td>
<td>-</td>
<td>10.5 : 100</td>
<td>1277</td>
<td>-</td>
</tr>
<tr>
<td>1984</td>
<td>1180</td>
<td>2.1</td>
<td>123</td>
<td>1.6</td>
<td>10.4 : 100</td>
<td>1303</td>
<td>2.0</td>
</tr>
<tr>
<td>1985</td>
<td>1119</td>
<td>-5.2</td>
<td>242</td>
<td>96.8</td>
<td>21.6 : 100</td>
<td>1361</td>
<td>4.5</td>
</tr>
<tr>
<td>1986</td>
<td>1358</td>
<td>21.4</td>
<td>228</td>
<td>-5.8</td>
<td>16.8 : 100</td>
<td>1586</td>
<td>14.2</td>
</tr>
<tr>
<td>1987</td>
<td>1435</td>
<td>5.7</td>
<td>226</td>
<td>-0.9</td>
<td>15.7 : 100</td>
<td>1661</td>
<td>4.7</td>
</tr>
</tbody>
</table>
Beyond OceanObs

- Continue adding research partners, make the system more user-friendly for all user groups.
- OceanObs is a regional database serving the national observing system (IOOS) registry.
Beyond OceanObs

- Continue adding research partners, make the system more user-friendly for all user groups-

- OceanObs is a regional database serving the national observing system (IOOS) registry

- Data integration efforts have already begun
Products & Data

Access Data from the CeNCOOS Region

CeNCOOS Data Server

The CeNCOOS Live Access Server provides access to data collected in the CeNCOOS geographical region.

oceanObs

An inventory of CeNCOOS products, partner information, and sensor locations: queriable by data type, format, and observing program.
Select a program and dataset link

http://oceanwatch.pfeg.noaa.gov/CeNCOOS/

**CALCOFI**
- Echosounder
- CTD
- Zooplankton
- Nutrients
- Chlorophyll
- Metals
- TSG

**HF Radar Surface Currents**
- Monterey Bay
- San Francisco Bay
- Golden Gate

**Elephant Seals**

**Buoys/Moorings**
- CICORE (green diamonds)
- MBARI Moorings (green circles)
- NDBC Buoys (NOAA - blue, others red)

**Satellite Data**
- Ocean Surface Temperature
  - AVHRR HRPT SST 1.26km
  - GOES SST 0.6km
  - GOES SST 0.05 deg
- Ocean Surface Chlorophyll-a
- OSU MODIS Aqua 1.26km
- Chlorophyll Fluorescence
- OSU MODIS Terra 1.26km
- Diffuse Attenuation Coefficient k_d 980
- OSU MODIS Terra 1.26km
- Ocean Surface Winds
- QuikSCAT Winds 25km
1) Select a satellite data set: MODIS Aqua Chlorophyll-a Concentration
2) Select a vector data set: Currents, HF Radio-derived, Monterey Bay, 33 hr, EXPERIMENTAL
3) Select a centered time (GMT): 2007-06-08 12:30:00 < - + > Or, 2007-06-08 08 > 12:30:00
4) Optional: view an animation: of the previous 24 hours of data View it! (It may take a minute to generate it)
5) Optional: view a drift model: of the previous 24 hours. Click on the map to specify the starting location. (It may take a minute to generate it)
6) Download the satellite data: abc | ESRI .asc | Google Earth .cmd | hsf .rst | nc | ncHeader | tif | xyz | FGDC File Type Info | GET Queries | Data Set Info
7) Download vector data: .xyz | nc | ncHeader | small .xyz | medium .xyz | large .xyz | File Type Info | GET Queries | Data Set Info

WARNING: The time periods for the data sets are somewhat different.

Select:
- Satellite Imagery (SST or Chlorophyll)
- Geographical Region
- Time Series (Historical or Predictive)
Beyond OceanObs

- Continue adding research partners, make the system more user-friendly for all user groups.
- OceanObs is a regional database serving the national observing system (IOOS) registry.
- Data integration efforts have already begun.
- Plans for more integrated data products will be developed with help from CeNCOOS partners.
APPLICATIONS
Coastal Ocean Currents Monitoring Program
SAFE SEAS 2006

Oil Spill Simulation Exercise

• 11 HF radar sites from two COCMP nodes

• Generated hourly surface current maps for pollution tracking model
Modeling – Track deposition with CODAR (CeNCOOS)
Red circles denote stations with measurable toxin, size is proportional to concentration, white circles were undetectable for particulate domoic acid.

Station T301 had 26,000 ng/L particulate domoic acid.
Anomaly is calculated as YEAR DAY minus the composite for Day 105-112, 2007 (log transformed).

May 2 exhibited very high Pseudo-nitzschia abundance at Santa Cruz Wharf, and had elevated levels of domoic acid. May 9 was at the beginning of a red tide (Ceratium) event. May 9 had greatly reduced levels of Pseudo-nitzschia and domoic acid at Santa Cruz Wharf. Note the high biomass associated with the Gulf of the Farallones, Davenport, and Monterey Bay.

Anomaly is calculated as YEAR DAY minus the composite for Day 105-112, 2007. May 2 exhibited very high Pseudo-nitzschia abundance at Santa Cruz Wharf, and had elevated levels of domoic acid. May 7 was at the beginning of a red tide (Ceratium) event. May 9 had greatly reduced levels of Pseudo-nitzschia and domoic acid at Santa Cruz Wharf. Note the rapid warming between May 2 and 7, likely stimulating the red tide event.
National Federation of Regional Associations (NFRA)

- CeNCOOS – Central and Northern California
- NANOOS – Northwest Association of Networked
- SCCOOS – Southern California
- AOOS – Alaska
- SEACOOS – South East U.S.
- GoMOOS – Gulf of Maine
- PacIOOS – Pacific Islands Integrated
- MACOORA – Mid-Atlantic Coastal
- GLOS – Great Lakes Observing System
- SECOORA – South East Coastal
- Caribbean
CeNCOOS and Education

Goals:
• Increase ocean literacy!
• Demonstrate to educators and students the opportunities for careers in oceans
• Provide web-based access to data in a user friendly format
• Create products to help educators meet their teaching goals and standards

Partners/Collaborators:
• COSEE
• CICORE and CIMT
• NERR (SF and Elkhorn Slough)
• MBARI EARTH
• Monterey Bay Aquarium
• UCSC Seymour Center
• MBNMS
Education in the National Estuarine Research Reserve System

New! Searchable Education Calendar of Events!

National Estuarine Research Reserves are federally designated "to enhance public awareness and understanding of estuarine areas, and provide suitable opportunities for public education and interpretation." The reserve system is one of only 3 programs within NOAA in which education is federally mandated, and the reserve system provides a range of educational programming to key audiences in reserve watersheds.

National Estuarine Research Reserves offer education and training for professionals who make decisions about coastal resources on a regular basis such as planners, conservation council members, resource managers and community leaders. The Coastal Training Program ensures that community members have the science-based information they need to make decisions about coastal resources.

In addition to targeting coastal decision makers, most reserves provide K-12 education, ranging from hands-on field experiences for students to professional teacher development opportunities. In addition, the reserves invite students and teachers to learn about estuaries by actively participating in the EstuaryLive program, an interactive field trip over the internet. These are great opportunities to learn, teach about estuaries, and engage students in activities that will excite them and get them to explore the estuarine environment. Reserve educators also provide regularly scheduled public programs and special events, and they are always eager to partner with schools, community-based organizations and volunteers. To search the NEW calendar of educational activities taking place at reserves, click this link.

To learn about a reserve visit the site-based pages, and to learn more about a specific reserve's educational program, visit the reserves that currently have an education website.

For more information about education in the estuarine reserves, contact Atziri.Ibanez@noaa.gov.
• Train the Trainer
• Real-time Data in the classroom
Welcome!

Welcome to the classroom under the Atlantic Ocean. The folks at Rutgers Marine and Coastal Sciences have built a special website for you and your teachers so that you can join the scientists in the COOLroom as they explore the waters off New Jersey. Learn how to predict if it will be a good beach day or if the fish are running. See for yourself what the ocean looks like from 500 miles above the earth and 15 meters below the surface. We're glad you came. COOL classes are now in session.

Coastal Ocean Observation Laboratory

Newsletter

Help us improve this site!

Take a survey

LEO: the movie

© Rutgers University 2003
Welcome Seafarers!
How do you use the ocean?

Fishermen
Find out where the fish may be hiding

Boaters and Sailors
Discover where ocean currents are going

Swimmers, Surfers and Divers
Check out ocean temperatures and wave heights before you drive

Simply click on what you're interested in to begin your underwater voyage.

Looking for more than just New Jersey?

What's a COOLroom?
In the COOLroom, scientists from Rutgers University pull together data from satellites, coastal radars and underwater weather stations. The COOLroom.org is the place where this information is processed and posted on the web for you to use to make the most of New Jersey's coastal resources.
The ocean is a major player in the Earth system. It is in constant motion. Winds drive currents on the ocean surface and these currents in turn mix down into the ocean depths. Data from buoys, drifters, and satellites such as ocean color, sea height, temperature, and winds, provide us with observations about the speed and direction of currents and about heat stored in the ocean, which help to predict global climate variations.
Opportunities for Educators

- Education & outreach partnering
- Provide evaluation or feedback
- Help us develop useful products
- Attend quarterly CeNCOOS Council meetings
- Visit the website for useful data and information
- Keep us informed!
- Promote IOOS legislation!
We are tied to the ocean. And when we go back to the sea, whether it is to sail or to watch – we are going back from whence we came.       - John F. Kennedy