Supporting diverse Pacific NW marine data access needs via the NANOOS Visualization system (NVS) and data services

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Supporting diverse Pacific NW marine data access needs via the NANOOS Visualization System (NVS) and data services

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What is IOOS?

• The Integrated Ocean Observing System (IOOS) in the U.S. is a **national-regional partnership** working to provide **new tools and forecasts** to improve safety, enhance the economy, and protect health.

• **Integrated ocean information** is available in near-real-time, as well as retrospectively.

• **Easier and better access** to this information is improving our ability to understand and predict coastal events and conditions (e.g., waves, acidification, etc.).

• Such knowledge is **widely used and needed**...!
Coastal U.S. IOOS:
17 Federal Agencies; 11 Regional Associations
CONSISTENT NATIONAL CAPABILITY

Regional Associations

assure

Observations
Forecasts/Modeling
Data Management
User Products
Outreach

Leverage and Link

engage

DIVERSE LOCAL STAKEHOLDERS
NANOOS Visualization System: Rationale and Goals

• Disparate suite of web sites available to the public (serving a wide range of data).

• Regional needs: seamless delivery of coastal, estuarine and ocean data to stakeholders within the NANOOS domain (+external partners, other IOOS RA’s, and national/international programs).

• NANOOS currently provides access to 47 different types of variables, and in total ~200 ‘assets’ & 10 model/forecast overlays.

Effective delivery of these data and product feeds can lead to:

• greater situational awareness (local and regional scales);

• improved access to and understanding of environmental variables/conditions; and,

• enable development and access to short- and long-term time-series.

• Overall goal: to aid our understanding of climate variability, safety, operations, and lead to improved resource management and regional productivity.
A Challenge - Many stakeholders and many potential data providers/sources

| State agencies (e.g. ODFW, WADOE, DSL, etc.) | Fishers (recreational and commercial) |
| Federal agencies (NOAA, NWS, FEMA, US Coast Guard, etc.) | Shellfish growers |
| Cities and Counties | Recreational boaters |
| Ocean engineering (instruments, wave energy, telecommunication) | Tribes |
| NGO’s | Geotechnical consultants |
| Ports | Universities/researchers |
| Bar pilots | Schools (K-12) |
| | Public-at-large |
| | Scientists |
| | and many others... |
A Challenge - Many Data Types & How to Display Complex Data Effectively

NANOOS RCOOS

Existing assets to be sustained in partnership:
- Existing coastal and estuarine buoys
- Existing fixed mooring estuarine buoys
- Existing glider tracks
- Existing long-range (180 km range) HF radar site
- Existing standard-range (50 km range) HF radar site
- Port X-band wave radar
- Beach and shoreline assessment. Includes multiple sites where nearshore bathymetry is being collected
- Puget Sound ferry box
- Existing glider tracks (OOI)
- OOI moorings

Federal assets:
- NDBC buoys
- CDIP buoys
- NOS Tide gauges
- CMAN station

Overlays (Satellite, Models, & other geospatial data)

Shelf moorings & gliders
Shorelines & Bathymetry
WA Department of Health
Seasonal Shellfish Monitoring Network
Cruises

2017 September
2017 July
2017 May
2017 April
2016 October
2016 September
2016 July
2016 April
2016 March
2015 November
2015 September
2015 July
2015 May
2015 April

Variables

Temperature - CTD
Salinity - CTD
Density - CTD
Sigma-theta - CTD
Oxygen Concentration MG - CTD
Oxygen Concentration MOL - CTD
Oxygen Concentration Mag - Bottle
Oxygen Concentration MOL - Bottle
Oxygen Saturation - CTD
Beam Transmission - CTD
Beam Attenuation - CTD
PAR - CTD
Chlorophyll Fluorescence - CTD
Chlorophyll Concentration - Bottle
Phaeopigment Concentration - Bottle
Nitrite - Bottle
Nitrate - Bottle
Nitrate + Nitrite - Bottle
Ammonium - Bottle
Silicate - Bottle
Phosphate - Bottle
Dissolved Inorganic Carbon - Bottle
Total Alkalinity - Bottle
Dissolved Oxygen - Bottle

Cross Sections

Main Basin
Hood Canal
Whidbey Island
Sound to Sea

Scale

Global
Local
NANOOS
Northwest Association of Networked Ocean Observing Systems

Missions 2010-2016
Type: Seaglider  Provider: UW IOP  Contact: Craig Lee

Temperature
Salinity  Density

Lat: 49.3538  Lon: -123.5962

La Push Seaglider  25-Jan-2016 to 01-Feb-2016

Depth [m]

Distance [km]

Map data ©2017 Google  100 km
Terms of Use
The latest water measurements at the NEMO Observatory site where the Environmental Sample Processor is located 13 miles off La Push, Washington. Data are updated in near-real time. These products are provided to help understand where toxic algae may be moving and the conditions that may influence toxic blooms.

**Species Abundance**

- *Pseudo-nitzschia australis*
- *Pseudo-nitzschia multiseries*
- *Pseudo-nitzschia fraudulenta*
- *Pseudo-nitzschia pungens*

**Species Present / Not Detected**

- *Alexandrium Species*
- *Heterosigma akashiwo*

**Toxins**

- Domoic Acid Concentration
The J-SCOPE forecast system for Washington and Oregon coastal waters presents preliminary results for the 2018 upwelling season. The CFS forecast indicates continued La Niña conditions until late spring, with more neutral conditions heading into the summer. In comparison to the climatological data, during the summer upwelling season (May - August), coastal regions are forecasted to have slightly higher sea surface temperatures (SST) with slightly lower temperatures subsurface. Bottom oxygen is forecasted to be lower over much of the region during the upwelling season. Chlorophyll concentrations vary spatially but mostly approach climatology. Bottom $\Omega$ is forecasted to be undersaturated throughout the upwelling season, with the exception of supersaturated conditions on shallow Washington shelves. Surface $\Omega$ is forecasted to be supersaturated throughout the upwelling season for all coastal areas.

The forecast system predicts the timing of the spring transition from downwelling to upwelling, the cumulative upwelling index, sea-surface temperature (SST), primary production, chlorophyll stock, dissolved oxygen, and sardine habitat. The forecast for 2018 is composed of three model runs that make up an ensemble. Each model run is initialized at a different time (January 5, January 15, January 25), and has complementary forcing files from the large scale model CFS. The details of the wind forcing for each model run can be found on the California Current Indicators tab. For each of the predicted quantities listed above, we report the ensemble average anomaly as well as the relative uncertainty within the ensemble, which is defined as the standard deviation of the ensemble divided by the mean of the ensemble and is reported as a percentage of the mean. All of these quantities are reported as monthly averaged anomalies from our new January-initialized reforecast climatology, which spans 2009 - 2017. An anomaly is an indication of how different conditions are to what they have been in the past. For more information about anomalies, please see the NANOOS Climatology App. These predicted quantities are key indicators for the California Current Integrated Ecosystem Assessment report.
See also https://ioos.noaa.gov/data/
Geospatial web services in action

[Image of a web page showing a map with a temperature layer, and a pop-up displaying the location and temperature details.]

ID location (lat,lon): 47.384344, -123.01138 - Mozilla
Water Temperature Daily Average, Upper 3 meters (NANOOS)
NANOOS Situational Awareness Maps
Water Temperature Daily Average, Upper 3 meters
ORCA-UW monitoring site (Salish Sea): Profiling Buoy at Twanoh - Hood Canal
- Value: 18.0 °C (n=12)
- Interval mid-point: Aug 8, 2016 12:00:00 PM
Geospatial web services in action *(sort of)*

**SoundIQ**

A PROJECT OF THE NORTHWEST STRAITS COMMISSION

Layers

- Management Areas
- Octopus Protection Area
- Harvest Sites
- Landforms
- Human
- PointsOfInterest
- Shoreline Developments (SNOC)
- Human Structures and Activities
- Sea Level Rise (SJC)
- nanos_nvs
  - Buoy
  - Fixed Shore Platform
  - River Gauge
  - Land Station
  - Moored Shellfish Raft
  - Mooring Array
  - Seabed Cabled Platform
  - NANOOs Assets
- Coastal Atlas
IOOS Catalog

Based on standard-compliant, distributed service endpoints

https://data.ioos.us
IOOS Biological Data Training Workshop

Summary: IOOS Biological Data Workshop Home page

Thursday, February 8 – Friday, February 9, 2018
University of Washington, Seattle, Washington
Organized by IOOS, NANOOS and OBIS-USA

Workshop Overview

This workshop builds on the successful partnership between the U.S. Integrated Ocean Observing System (IOOS) and the Ocean Biogeographic Information System (OBIS-USA) in coordination with IOC’s OceanTeacher Global Academy, and OBIS international to develop a community of practice around the management and analysis of marine biological data. It will provide hands-on training in a computer lab setting and is intended to educate participants on the benefits, goals, technology and processes to standardize biological data (and associated physical or chemical data) and make it accessible via OBIS and IOOS, including the MBON Portal. The workshop will also expose participants to OBIS, IOOS and MBON applications for using those data.

See the Workshop Details and Instructions page for additional information about the workshop, including the location, hotels, and workshop preparations.

Scope

- IOOS and OBIS standards and tools for biological data
- Web services for data access
- Darwin Core, WoRMS (taxonomy) and metadata standards
- Hands-on data exercises

Outcomes

- Expand the IOOS and OBIS network of collaborators
- Improve marine biogeographic data quality

https://ioos.github.io/BioData-Training-Workshop/
OBIS Mapper
Baleen whale observations

http://iobis.org
OTHER RESOURCES

1. Installing the IOOS conda environment
2. Opening netCDF files - hints from AODN
3. Unidata Jupyter notebook gallery
4. Extracting and enriching OBIS data with R
5. USGS-R examples

Code Gallery

http://ioos.github.io/notebooks_demos/code_gallery/

- Coastal Ocean Wave Height Assessment
- Investigating ocean models skill for sea surface height with IOOS catalog and Python
- erddapy: a python client/URL builder for ERDDAP
- Creating a CF-1.6 timeSeries using pcocean
- Using r-obistools and r-obis to explore the OBIS database
- Fetching data from a CSW catalog with Python tools
Thank you!

emiliom@uw.edu

http://www.nanoos.org
http://nvs.nanoos.org