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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Salish Sea Ecosystem Conference / Salish Sea Marine Ecosystem Data Collation and Management panel.
2018 Apr. 4, Seattle
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
Regional Associations engage DIVERSE LOCAL STAKEHOLDERS to assure CONSISTENT NATIONAL CAPABILITY.

- Observations
- Forecasts/Modeling
- Data Management
- User Products
- Outreach

Leverage and Link
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

Overlays (Satellite, Models, & other geospatial data)

Shelf moorings & gliders

Shorelines & Bathymetry
**NANOOS**
Northwest Association of Networked Ocean Observing Systems

**NVS**

- **Data Explorer**
- **Tsunami Evacuation Zones**
- **Boaters**
- **Tuna Fishers**
- **Shellfish Growers**
- **Beach and Shoreline Changes**
- **Maritime Operations**
- **Climatology**
- **High Frequency Radar**
- **Cruises**
- **Gliders**
- **Help**

**Additions & Updates**

- **HMSC Newport**
  Station is offline since 6/22 due to sensor malfunction. It will likely be a few months before station is back online.
  Updated on 6 Jul 2017

- **OSU CB-06**
  New NANOOS shelf mooring deployed 6/10, 6 nm off Coos Bay / Cape Arago as relocation of now-decommissioned NH-10 mooring. Measures (in near-real-time) weather, temp., & salt (1.5 m), and currents. PMEL air & water CO2, and 1-m temp. & salt also deployed.
  Added on 5 Jul 2017

- **OSU NH-10**
  The NH-10 mooring has been relocated to a new location offshore of Coos Bay, designated as CB-06. See the OOI C02SHSM mooring for continued data near the NH-10 station location.
  Updated on 5 Jul 2017

- **CMOP Saturn02**
  Mooring was redeployed in early June. NVS harvesting is now restored, with an updated weather and water sensor configuration for this multi-depth asset.
  Updated on 23 Jun 2017

- **Taylor-PCSGA Dabob**
  Sensors are back online starting on June 14, after a gap due to instrument problems and maintenance.
  Updated on 21 Jun 2017

- **NDBC Washington**
  Buoy deployed and data released on 5/31/2017, but continuous data transmission started on Jun. 5. Buoy location was updated (previous deployment position was 42.612 N, 120.537 W).
  Updated on 7 Jun 2017
WA Department of Health
Seasonal Shellfish Monitoring Network
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Buoy deployed and data released on 5/31/2017; but continuous data transmission started on Jun 5. Buoy location was updated (previous deployment position was 42.612 N, 130.537 W).
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

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**Pseudo-nitzschia pungens (Abundance)**

Quantitative cell abundances of *Pseudo-nitzschia pungens*. This species can sometimes produce domoic acid which can cause amnesic shellfish poisoning in humans.
Forecast Origin Dates


Overview  Chlorophyll  Sea Surface Temperature  Sardines  Oxygen  Ω  CA Current Indicators

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 Ω is forecasted to be undersaturated throughout the upwelling season, with the exception of supersaturated conditions on shallow Washington shelves. Surface Ω 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.
https://ioos.us  See also https://ioos.noaa.gov/data/
Geospatial web services in action

![Image of ERMA interface showing sea surface temperature and details on specific location with water temperature data.]
Geospatial web services in action *(sort of)*
IOOS Catalog

Based on standard-compliant, distributed service endpoints

95 datasets found for "NANOOS"

SG108-20130923T1728
Seaglider La Push NANOOS line, Washington. Glider covering a 200km SW-NE transect off La Push (Olympic Peninsula), Washington, as part of the Northwest Association of Networked...

[ERDDAP-TableDAP, ERDDAP]

SG187-20100716T1208
Seaglider La Push NANOOS line, Washington. Glider covering a 200km SW-NE transect off La Push (Olympic Peninsula), Washington, as part of the Northwest Association of Networked...

[OPeNDAP, SOS, HTML]

SG187-20120912T1125
Seaglider La Push NANOOS line, Washington. Glider covering a 200km SW-NE transect off La Push...

https://data.ioos.us
Underwater Glider Network Map

2017: 679 Glider Days

Slider Range: 01/01/2011 - 12/31/2017

Map Time: 03/14/2017 17:00 - 07:00

Seaglider UW157 Deployed on 2016-10-21

Oct 21, 2016 11:14 (GMT -07:00) to Mar 14, 2017 06:41 (GMT -07:00)

Attribution: Integrated Ocean Observing System

- Sea Water Density: graph only
- Sea Water Electrical Conductivity: graph only
- Sea Water Salinity: graph only
- Sea Water Temperature: graph only

Leaflet | Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, NPS, AAFC, NRCAN

https://gliders.ioos.us/map/
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](https://ioos.gov), [NANOOS](https://www.nanoos.org) and [OBIS-USA](https://www.obis-usa.org)

**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 process 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](https://ioos.github.io/BioData-Training-Workshop/) 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

OBIS Mapper
Baleen whale observations

http://iobis.org
Code Gallery

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

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

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 poincarn

Using r-ohistools and r-obis to explore the OBIS database

Fetching data from a CSW catalog with Python tools
Thank you!
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http://www.nanoos.org
http://nvs.nanoos.org