

ACTIVE LEARNING ABOUT THE OCEAN

Jan Hodder

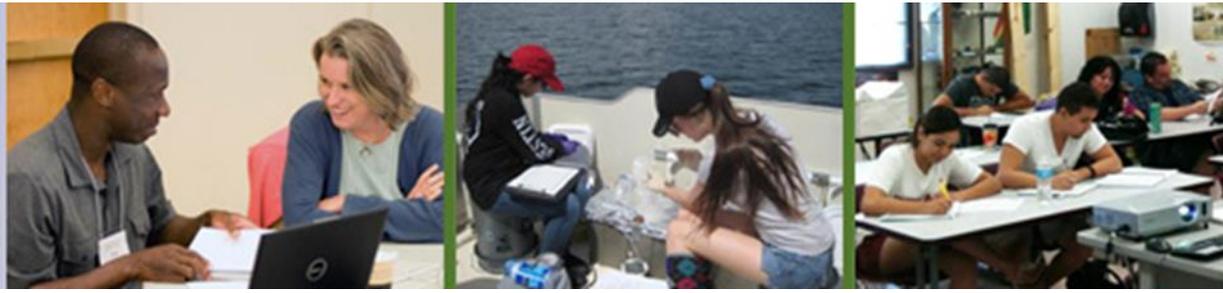
University of Oregon

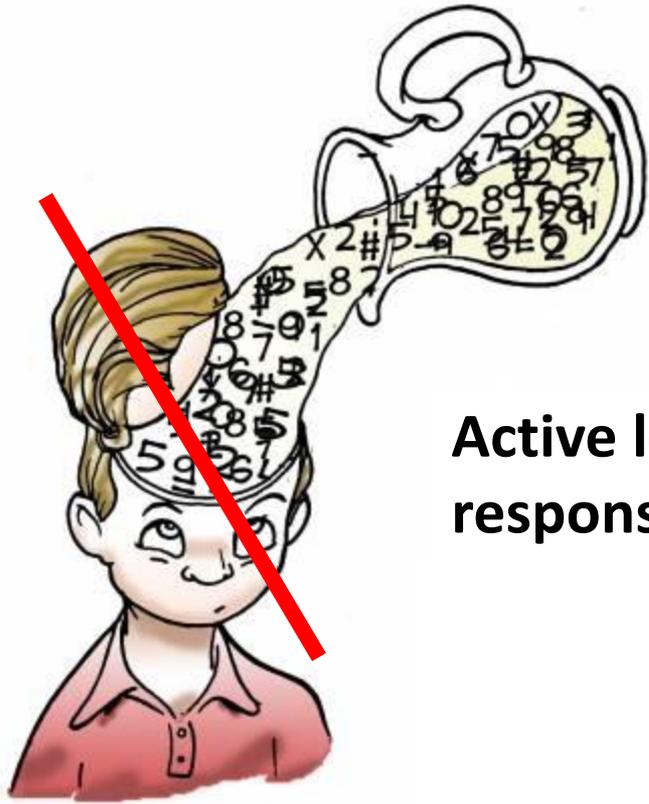
Oregon Institute of Marine Biology

jhodder@uoregon.edu

SAGE 2YC

*Supporting and Advancing
Geoscience Education in
Two-year Colleges*





Active learning = encourages student responsibility for their own learning



You are the guide on the side – not the sage of the stage

Students learn fundamental concepts about the ocean that will:

- a. build a foundation for future studies**
- b. provide them with useful information outside of their college experience**

Oceanography

Topical Resources

Cutting Edge > Courses > Oceanography

Cutting Edge

Develop Program-Wide Abilities

...click to see 2 more...

Courses

Atmospheric Science

...click to see 12 more...

Structural Geology

Oceanography

Course Descriptions

Teaching Activities

Datasets and Tools

Visualizations

Additional Resources

2013 Workshop

2005 Workshop

Contribute Materials

Discussion Board

Topics

About this Project

Workshops

Strong Geoscience Departments

Teaching Oceanography

Oceans cover about 70% of the globe and have a major influence on all of Earth's systems. Oceanography offers a fascinating context to connect science with human dimensions through the study of current events and issues such as hazards, pollution, energy resources, and more. Dive into the resources below for exciting ways to incorporate oceanography and its multi-disciplinary facets into your classroom and laboratory.

Jump down to: [Course Design & Pedagogy](#) | [Resource Collections](#) | [Special Topics](#) | [Workshops & Events](#) | [Get Involved](#)



Designing an Effective Oceanography Course

1. Set goals

Explore [example student learning outcomes](#) from your colleagues. Learn more about [setting effective course goals](#) in the Course Design [Tutorial](#). You can also explore course goals from others' oceanography courses using the syllabi available in the [course collection](#).

2. Consider assessment options

Aligning your assessment strategies with the goals of your course is an essential part of the design process. You can learn more about assessment in the section about [Assessing Student Learning](#) in the Course Design Tutorial and through our module on [Observing and Assessing Student Learning](#).

3. Select pedagogies and teaching activities

The [resource collections](#) below are organized to provide a rich set of materials to draw from in constructing the specific set of learning experiences you want for your students. You may also want to explore specific pedagogies to incorporate into your classroom such as those listed below. Learn more about teaching methods from the *On the Cutting Edge* [teaching methods module](#).

- [Teaching Geoscience in the Field](#) provides students important data-gathering, observation,



Science Education Resource Center (SERC) Resources

More Ways to Navigate
[Projects and Collaborations](#)
 Find projects on which SERC is a leader or collaborator
[Search all of SERC](#)

- Site Guides Home
- How To Find**
- Activities
- Projects and Collaborations
- Visuals: Images, Diagrams, Video
- Course Descriptions
- Email Lists and Discussions
- Workshops
- People
- Teaching**
- Strengthening your Teaching
- Research on Teaching and Learning
- Designing Courses
- Assessment
- Teaching Large Classes
- Quantitative Skills, Thinking, and Reasoning
- Teaching in the Field
- Teaching with Current Research and Data
- Introductory Level Courses
- Upper Division Geoscience Courses

Oceanography Activities

[Help](#)

Results 1 – 10 of 244 matches

[Air-sea Interactions: Activities in Oceanography](#)

Steve LaDochy, California State University-Los Angeles

This online set of activities help students learn properties of ocean waves, wind-wave relationships and properties of tsunamis.

Resource Type: Activities: Audio/Visual:Animations/Video, Assessments, Activities:Lab Activity, Audio/Visual:Images/Illustrations, Activities:Classroom Activity

Subject: Geoscience:Oceanography:Physical , Marine Hazards, Environmental Science:Natural Hazards:Coastal Hazards:Tsunami, Geoscience:Atmospheric Science:Climatology

[Geological Oceanography One-Page Papers](#)

Laura Wetzel, Eckerd College

Each student in the Geological Oceanography class writes a series of one-page papers for topics throughout the semester, presents one topic as a 3 to 5 minute oral presentation, and revises all papers as a ...

Resource Type: Activities: Activities:Writing Assignment

[Writing A Book Synopsis for Oceanography](#)

Mary Anne Holmes, University of Nebraska-Lincoln

Students read popular science books and write a synopsis of the book, linking the topic(s) covered in the book with those covered in class. This activity is designed for a large geoscience lecture course to aid ...

Resource Type: Activities: Activities, Writing Assignment

Subject: Geoscience:Oceanography

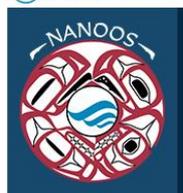
Refine the Results ▾

Resource Type: Activities

- [109 matches](#) General/Other
- Problem Set [14 matches](#)
- Classroom Activity [127 matches](#)
- Lab Activity [78 matches](#)
- Project [28 matches](#)
- Field Activity [6 matches](#)
- Writing Assignment [23 matches](#)
- Discussion [1 match](#)
- Video Assignment [1 match](#)

Subject

- Biology [22 matches](#)
- Chemistry [9 matches](#)
- Education [6 matches](#)
- Engineering [1 match](#)
- English [1 match](#)
- Environmental Science [85 matches](#)
- Geography [7 matches](#)
- Geoscience [204 matches](#)
- Mathematics [4 matches](#)
- Physics [5 matches](#)



NANOOS

Welcome to NANOOS, the Northwest Association of Networked Ocean Observing Systems. NANOOS is part of IOOS and provides information and products related to weather and ocean data.

NANOOS Visualization System
 NVS provides easy access to observations, forecasts, data, and visualizations.

[Demo](#)

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- Education
- Resources
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NVS Version 5

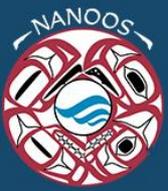
The NANOOS Visualization System (NVS) version 5 is now live with several exciting new features. One of the key additions to this update include a new "Current Conditions" feature within many NVS apps. This new feature provides a regional view of data from all assets reporting real-time water and air temperatures, barometric pressures, waves, and wind measurements. NVS 5 also includes new profile and heatmap plots for select profiler platforms, including ORCA buoys. Additionally, the NVS Salish Cruises app now provides downloadable cruise data from 1998 to 2016 in the Salish Sea.

- [Visit NVS](#)
- [View Current Conditions in NVS](#)
- [View Profiler Data in NVS](#)
- [Access Salish Cruise Data](#)

Navigation arrows: << || >>

- [NVS Version 5](#)
- [2015 Puget Sound Marine Waters](#)
- [New HAB Forecast System to be Developed](#)
- [New GOA-ON Interactive Data Portal](#)
- [New Real-Time HABs Website](#)
- [2nd Pacific Anomalies Workshop Report](#)
- [Tracking the "Blob" on NVS — Is it Back?](#)

Using real data – the NANOOS visualization system



NANOOS Education Blog

M G+ +1 Recommend this on Google

Labels: Bellingham Bay, buoy, field work, NWIC

Friday, December 11, 2015

New NVS Video Demo



<https://youtu.be/MEVz0jOsqml>

NANOOS Education, Engagement and Outreach has developed a new video demo to walk users through what NVS has to offer... check it out!

Posted by Rachel Wold at 11:28 AM No comments:

M G+ +1 Recommend this on Google

Labels: how-to, NVS

Wednesday, November 4, 2015

ORCA Tracks the "Blob"

If you have any comments or questions, please contact [Amy Sprenger](#)

How to use the NANOOS visualization system

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Many options for exploration



Data Explorer



Tsunami Evacuation Zones



Boaters



Tuna Fishers



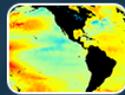
Shellfish Growers



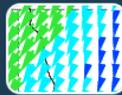
Beach and Shoreline Changes



Maritime Operations



Climatology



High Frequency Radar



Cruises



Gliders



Help

ADDITIONS & UPDATES

[View Last 3 Months](#)



APL-UW Chá?ba

Offline since late June. The week of Oct. 24, mooring will be recovered and new winter mooring will be deployed.

Updated on 21 Oct 2016



CDIP Umpqua

Offline. From CDIP Activity log, 2016-10-01: Buoy offsite.

Updated on 21 Oct 2016



CDIP Cape Mendocino

Buoy was redeployed and is back online since Oct 12. Position has been updated.

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NDBC Tillamook

Offline. Summary from NDBC: Station 46089 ceased transmitting Met data 10/01/2016. GPS Positioning continues to report and confirms that the buoy is on station.

Updated on 20 Oct 2016



OOI CE01ISSM

New mooring deployment on 2016-09-30, replacing previous mooring recovered on 2016-10-02. All oceanographic variables currently ingested by NVS are active and transmitting in near-real-time.

Updated on 18 Oct 2016



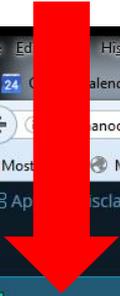
OOI CE02SHSM

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Assets



Browser tabs: NVS: Data Explorer

Address bar: nanoos.org/Explorer

Search: NANOOS

Navigation: Home, Getting Started, COSEE calendar, COSEE Pacific Partners, Bookmarks Menu, canvas.uoregon.edu, Gmail - Inbox (3) - jho..., Google Scholar, The Seas Project - Ho..., Supporting and Advan..., SERC CMS, Home - Dropbox

App: Disclaimer, Settings, Log In

NVS DATA EXPLORER

Map | Asset List | Help

Lat: 39.2833 Lon: -137.4170

- Regions
- Filters
- Current Conditions
- Fixed Platforms
- Mobile Platforms
- Remote Sensing
- Models
- Retired Platforms
- Legend

Lat: 46.7154 Lon: -126.4197

- Regions
- Filters
- Current Conditions
- Fixed Platforms
- Mobile Platforms
- Remote Sensing
- Models
- Retired Platforms
- Legend

Google



Settings

Units
Determines the format in which units are displayed.

Common °F, ft, ft/s, Hg, etc.

Scientific °C, m, m/s, mbar, etc.

Lat / Lon Format
Determines the format in which latitude and longitude are displayed.

DDD.dddd° 44.5226

DDD° MM' SS.ss" 44° 31' 21.36"

DDD° MM.mmm' 44° 31.356'

Plot Y-Axis
Determines if plots use a common y-axis for all plots of the same measurement, or if each plot uses a y-axis based on its values.

Global

Local

Overlay Value Locations
Determines the location of numeric labels on map overlays. Only applicable to overlays that have value layers.

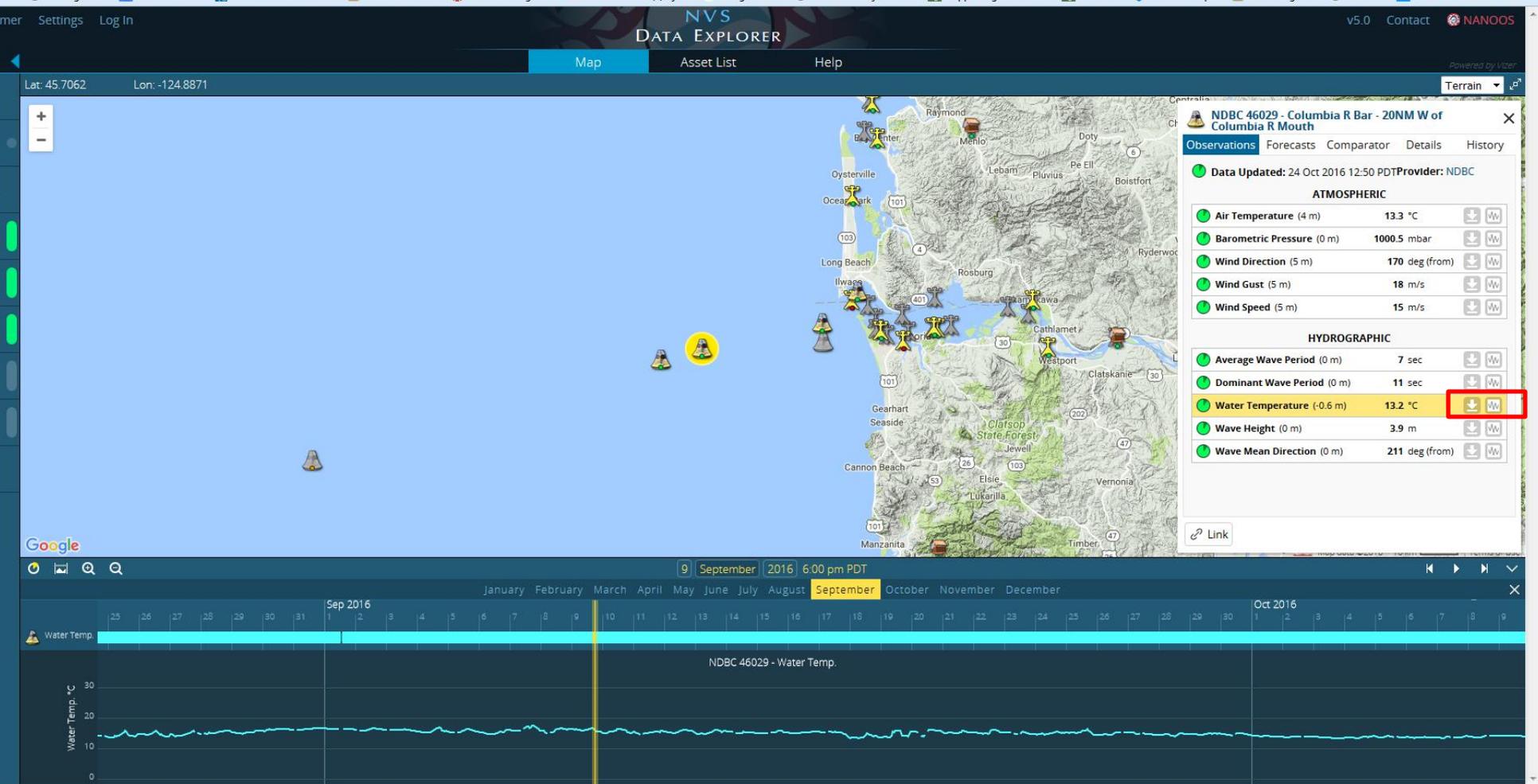
Geographical Features

Grid Points

Time Zone Region
Local time zone region

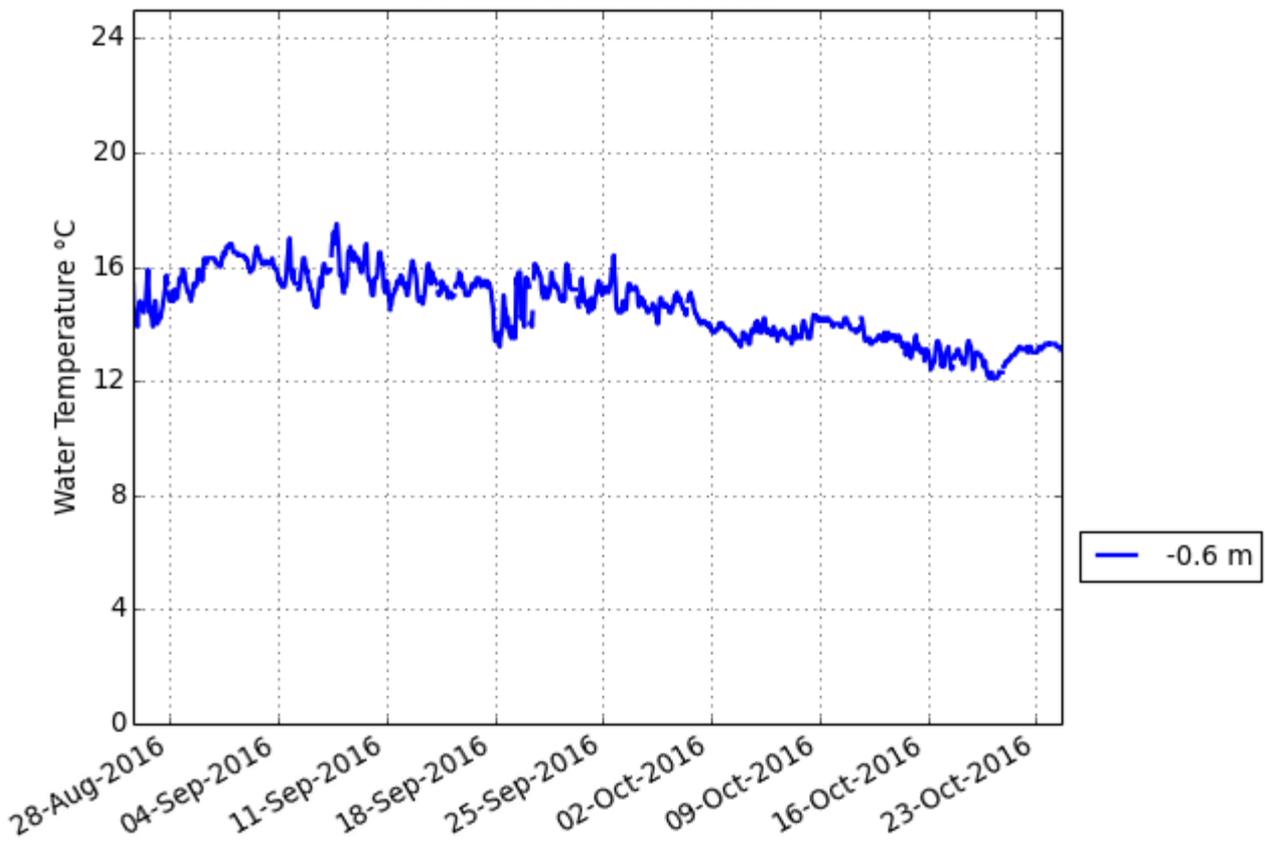
US/Pacific

Change the units to metric



Plot the data and download to Excel

NDBC Columbia R Bar - Water Temperature - 60 Days
24 October 2016 2:44 PDT





Data Explorer

Tsunami
Evacuation Zones

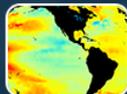
Boaters



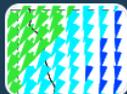
Tuna Fishers



Shellfish Growers

Beach and
Shoreline ChangesMaritime
Operations

Climatology

High Frequency
Radar

Cruises



Gliders



Help

ADDITIONS & UPDATES

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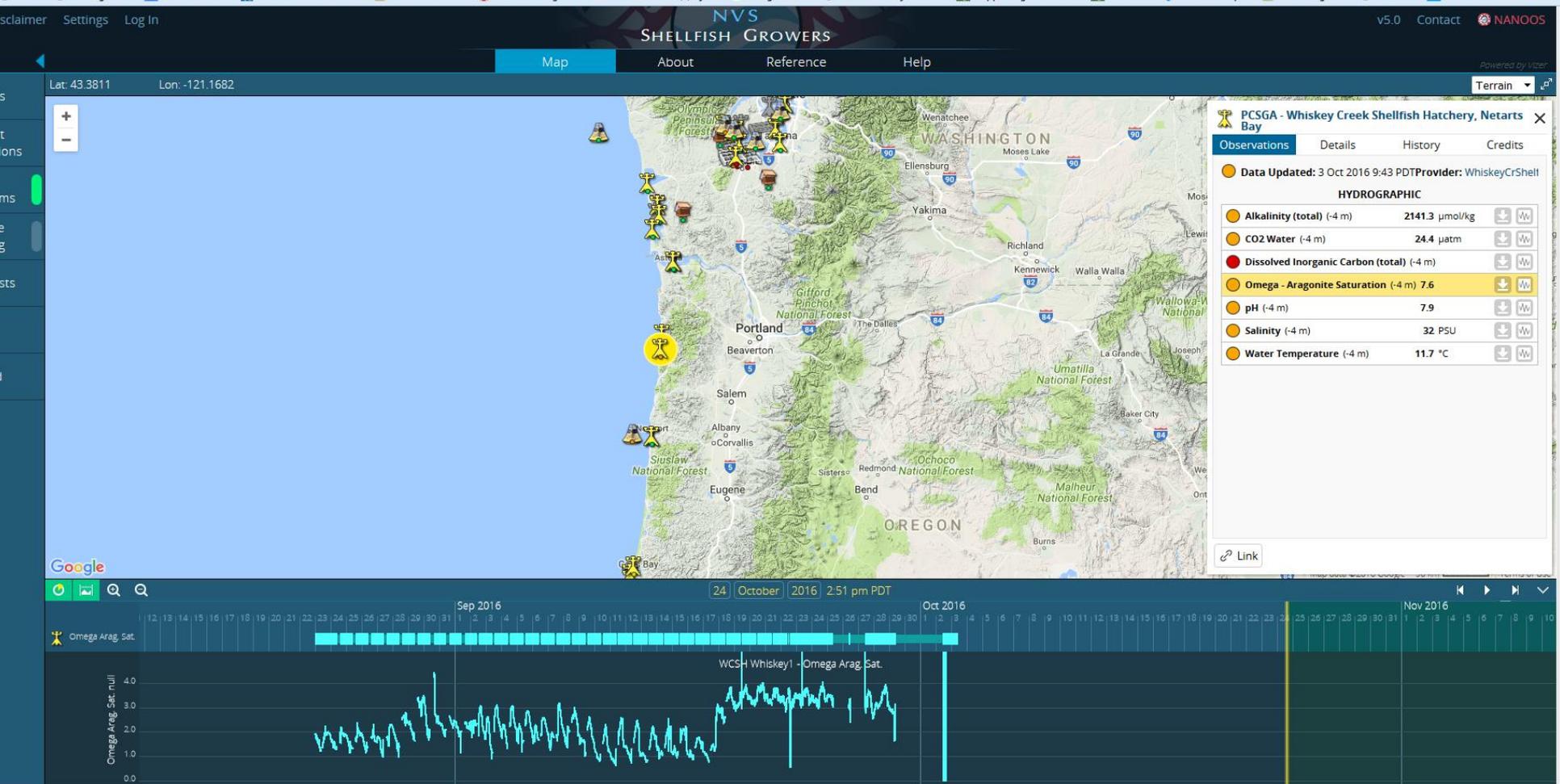
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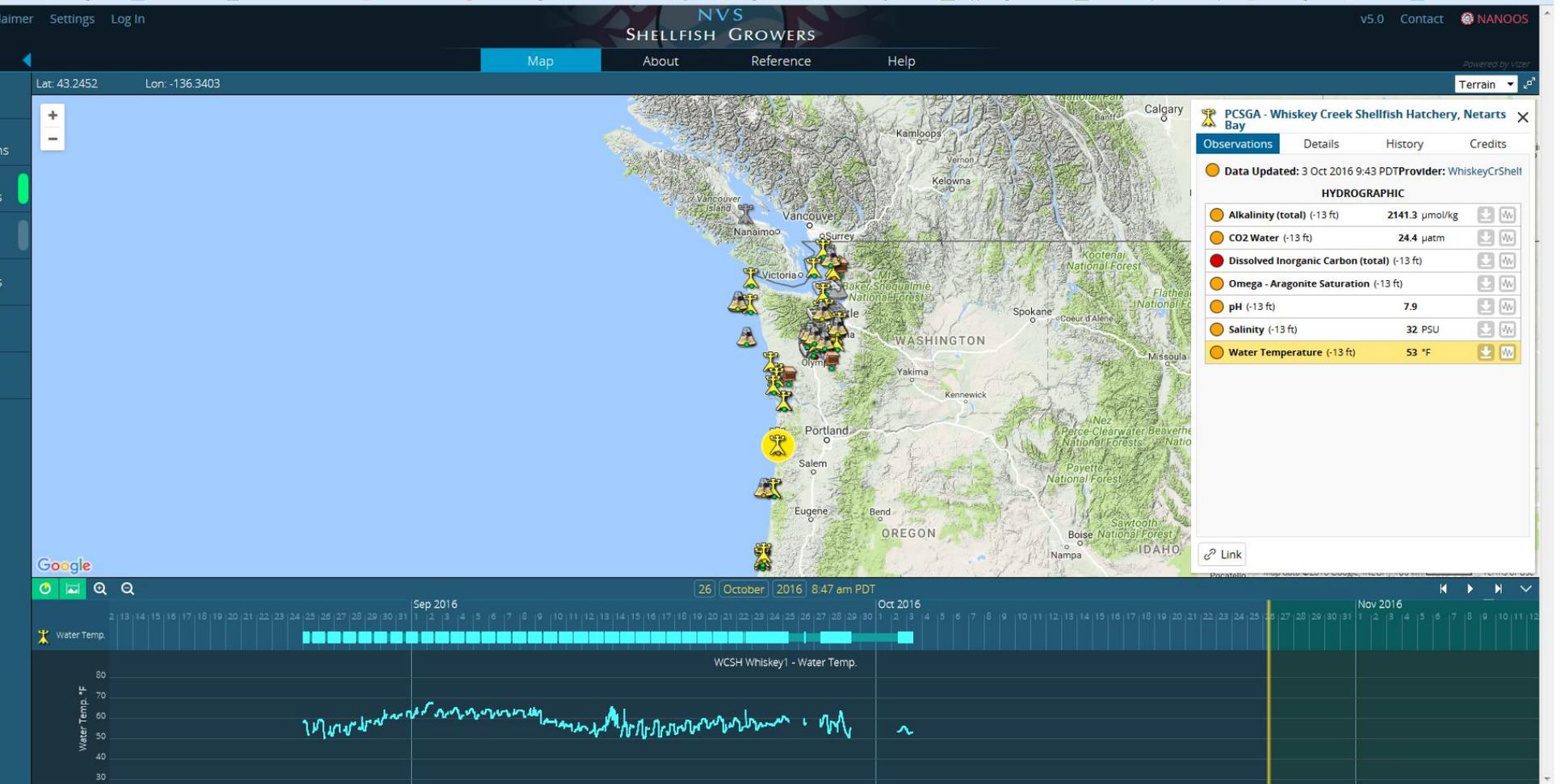
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Updated on 18 Oct 2016 >>>



Whiskey Creek Shellfish Hatchery Data – useful for ocean acidification investigations



Correlation with water temperature – upwelling and down welling concepts



Data Explorer

Tsunami
Evacuation Zones

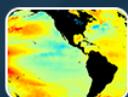
Boaters



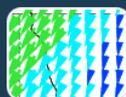
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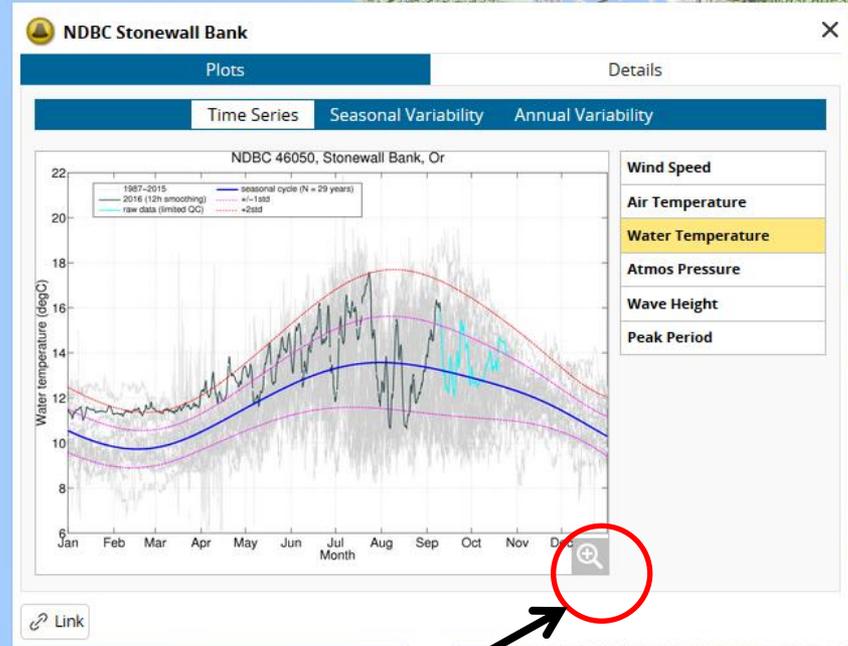
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Updated on 18 Oct 2016 >>>

Climatology – Time Series data

Lat: 42.9001

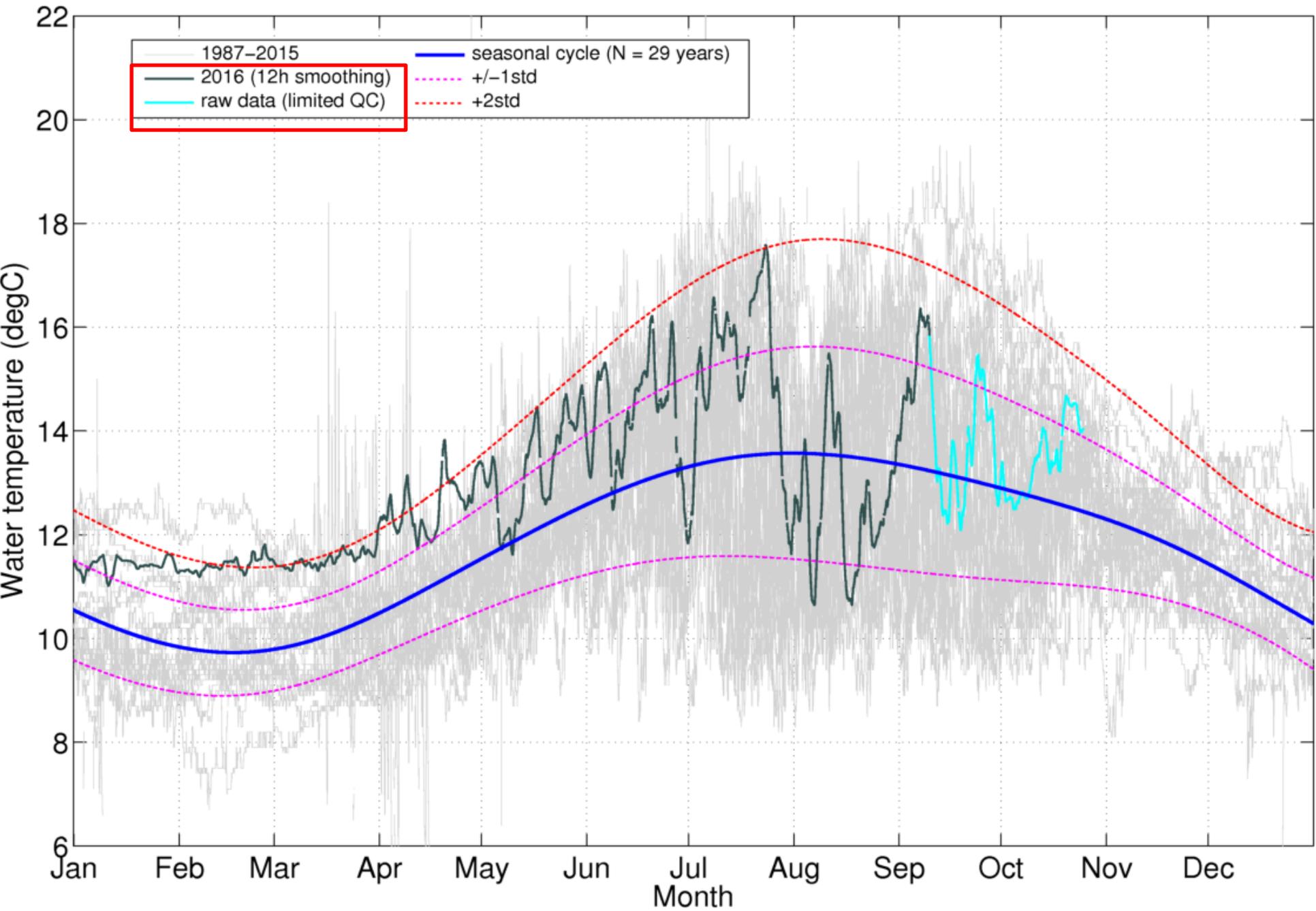
Lon: -127.9358



Increases size of plot

2016 water temperature for Stonewall Bank off Newport

NDBC 46050, Stonewall Bank, Or



Lat: 42.9001 Lon: -127.9358



NDBC Stonewall Bank

Plots Details

Time Series Seasonal Variability Annual Variability

NDBC 46050, Stonewall Bank, Or

Water temperature (degC)

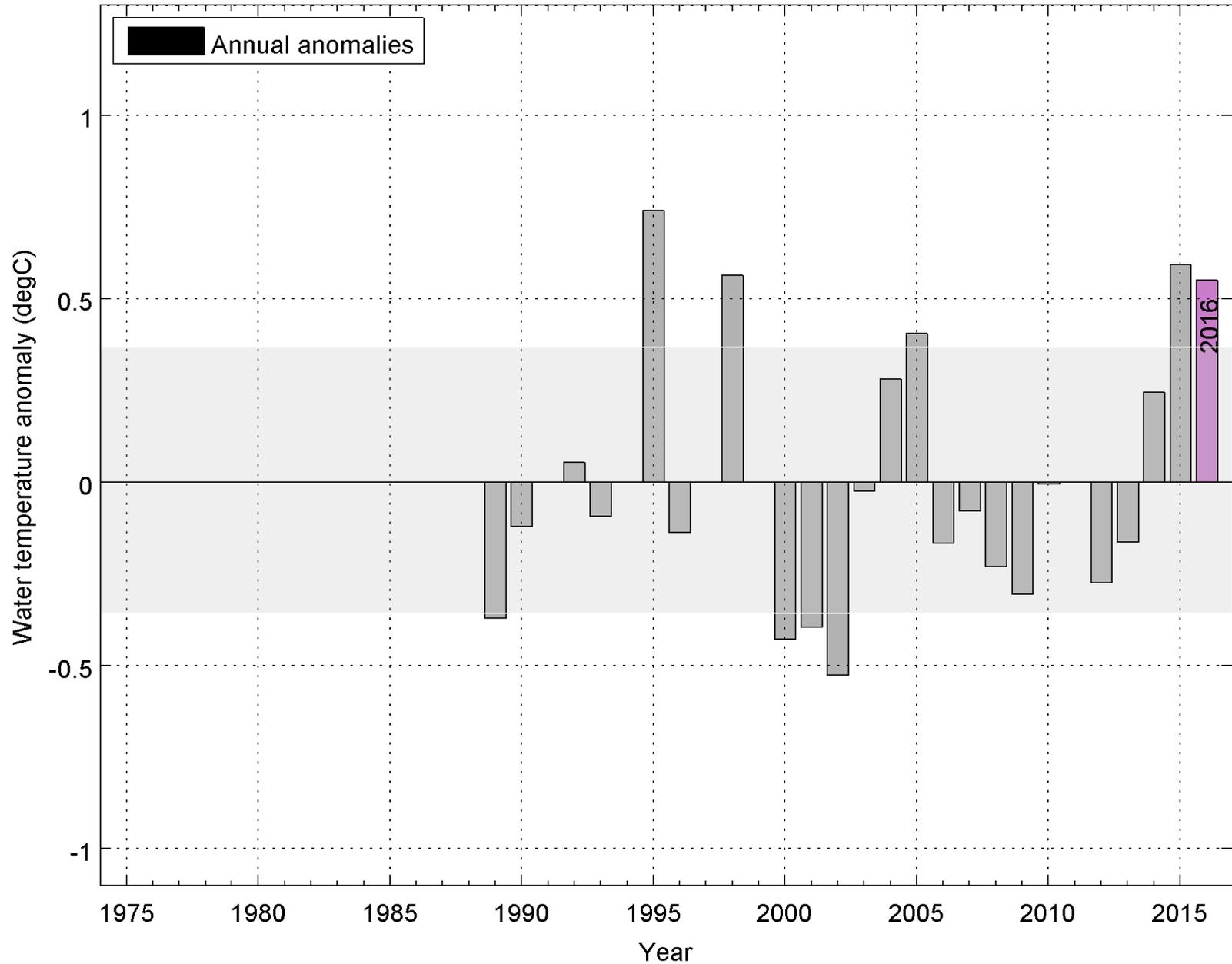
1987-2015 2016 12h smoothing raw data (limited QC) seasonal cycle (N = 29 years) +/- 1988

- Wind Speed
- Air Temperature
- Water Temperature**
- Atmos Pressure
- Wave Height
- Peak Period

[Link](#)

LONGER TERM DATA

NDBC 46050, Stonewall Bank, Or



READING A TIDE TABLE

Plot the high and low tides for:

APRIL 9 and 10

AND

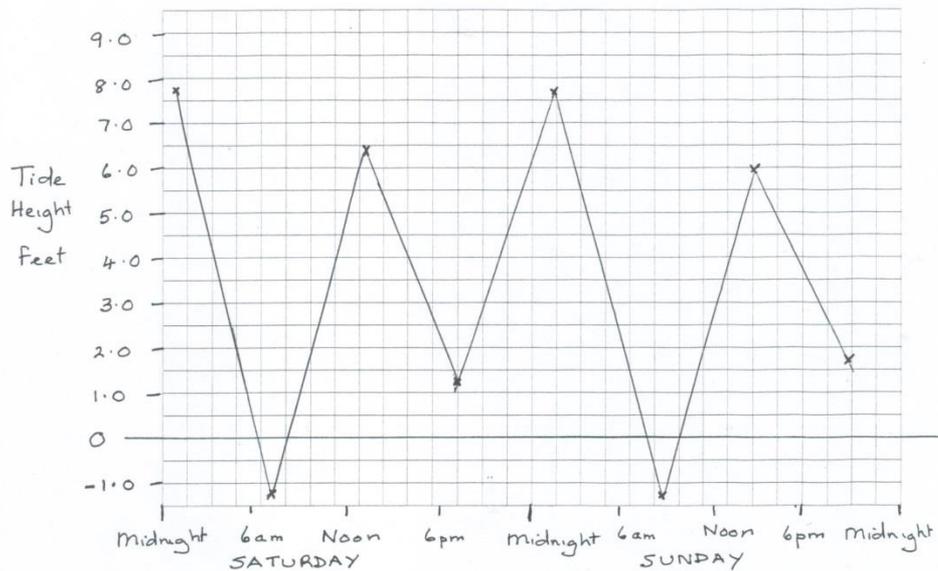
APRIL 16 and 17

NORTHERN CALIFORNIA AND SOUTHERN OREGON
2016 Tides HUMBOLDT District

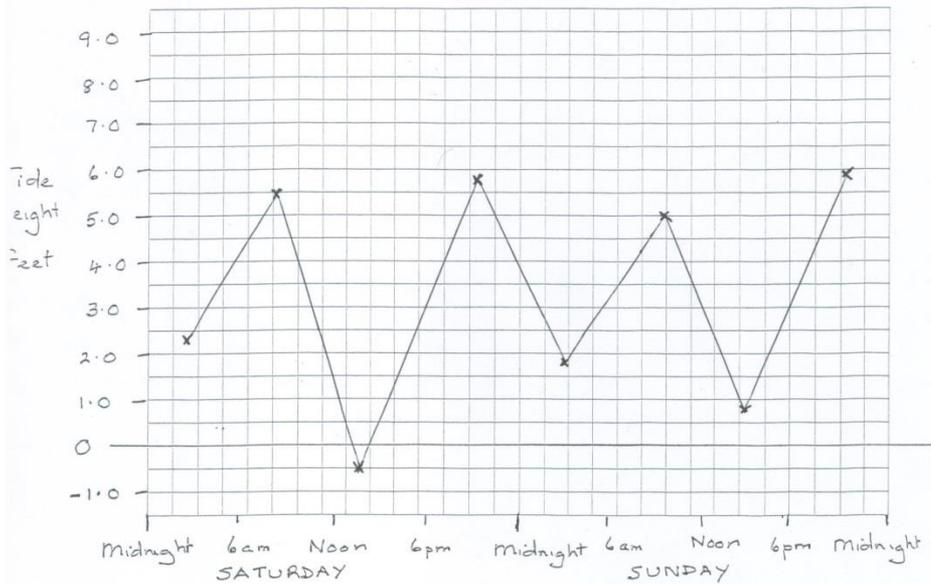
DATE	DAY	HIGH APRIL				LOW APRIL			
		TIME	FT.	TIME	FT.	TIME	FT.	TIME	FT.
1	Fri	6:34	5.8	8:34	4.9	0:28	3.2	1:41	0.6
2	Sat	7:45	5.9	9:26	5.3	1:47	3.0	2:40	0.4
3	SUN	8:53	6.1	10:10	5.7	2:54	2.5	3:33	0.1
4	Mon	9:54	6.4	10:51	6.3	3:52	1.8	4:21	-0.1
5	Tues	10:52	6.6	11:30	6.8	4:44	1.0	5:06	-0.3
6	Wed	11:46	6.8	.....	.....	5:34	0.3	5:50	0.0
7	Thur	0:10	7.2	12:40	6.8	6:22	-0.4	6:33	0.3
8	Fri	0:50	7.5	1:33	6.6	7:11	-0.9	7:17	0.7
9	Sat	1:31	7.7	2:28	6.4	8:01	-1.1	8:02	1.2
10	SUN	2:15	7.6	3:25	6.0	8:53	-1.1	8:51	1.7
11	Mon	3:02	7.4	4:26	5.6	9:47	-0.9	9:44	2.2
12	Tues	3:54	7.0	5:32	5.4	10:45	-0.6	10:46	2.6
13	Wed	4:52	6.5	6:43	5.2	11:48	-0.2	11:59	2.8
14	Thur	5:59	6.0	7:53	5.3	.....	.....	12:53	0.1
15	Fri	7:11	5.7	8:54	5.5	0:18	2.7	1:57	0.4
16	Sat	8:22	5.5	9:42	5.7	2:31	2.4	2:55	0.5
17	SUN	9:26	5.5	10:22	5.9	3:31	1.9	3:44	0.7
18	Mon	10:21	5.5	10:55	6.1	4:21	1.4	4:27	0.8
19	Tues	11:09	5.6	11:26	6.3	5:03	1.0	5:05	1.0
20	Wed	11:53	5.6	11:56	6.4	5:41	0.6	5:39	1.2
21	Thur	.....	.....	12:33	5.6	6:17	0.2	6:13	1.5
22	Fri	0:23	6.5	1:13	5.5	6:52	0.0	6:45	1.7
23	Sat	0:52	6.5	1:53	5.4	7:27	-0.2	7:17	2.0
24	SUN	1:21	6.5	2:35	5.3	8:02	-0.2	7:50	2.3
25	Mon	1:52	6.4	3:19	5.1	8:40	-0.2	8:25	2.6
26	Tues	2:24	6.3	4:07	5.0	9:21	-0.2	9:05	2.8
27	Wed	3:01	6.1	5:00	4.9	10:06	0.0	9:53	3.0
28	Thur	3:47	5.9	5:58	4.9	10:57	0.1	10:56	3.1
29	Fri	4:46	5.6	6:57	5.0	11:54	0.2	.....	.....
30	Sat	5:58	5.5	7:52	5.3	0:13	3.0	12:54	0.3

A.M. TIDES LITE TYPE DAYLIGHT TIME P.M. TIDES BOLD TYPE

April 9 and 10, 2016



April 16 and 17, 2016



Turn to your neighbor and discuss:

1. Which dates have a spring tide and which dates a neap?
2. What patterns do you see in the heights of the tide each day? Do you have any ideas for why those patterns exist?
3. What patterns do you see in the timing of the high and low tides from one day to the next. Why might these patterns exist?
4. On April 9 when would you plan to go clamming?
5. On April 10 when would you plan to go crabbing in a boat on the bay?

In the Trenches – January 2016

Volume 6, Number 1

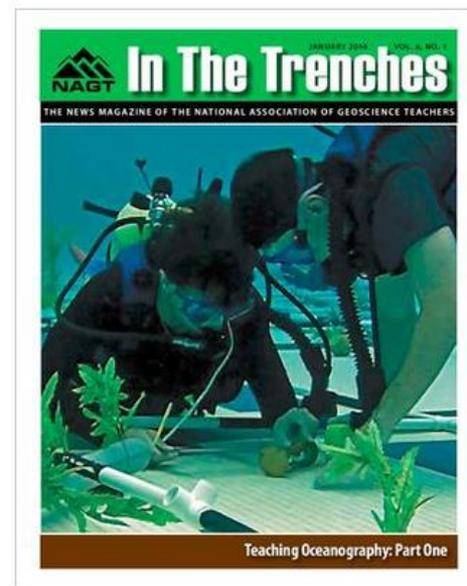
In This Issue

- [Getting Your Feet Wet: Simulation Science and the Marine Sciences Curriculum](#) – Richard (Rick) Schmidt, Upper Dublin High School
- [Active Learning: Engaging Students in Marine Sediment Classification](#) – Margaret E. Crowder, Western Kentucky University
- [Planning Underway for Earth Educators Rendezvous 2016 in Madison](#)
- [Marine Sediments' Dirty Little Secret: Using Sediments to Study Human-altered Ecosystems](#) – Debra Woodall, Daytona State College
- [NAGT Awards and Scholarships Recognize Outstanding K-12 Earth Science Teachers, Fund Field Study for Undergraduates](#)
- [FAVORITE DEMONSTRATIONS: A Very Simple Experiment for Understanding Global Ocean Circulation](#) – Mirjam Sophia Glessmer, Center for Teaching and Learning, Hamburg University of Technology

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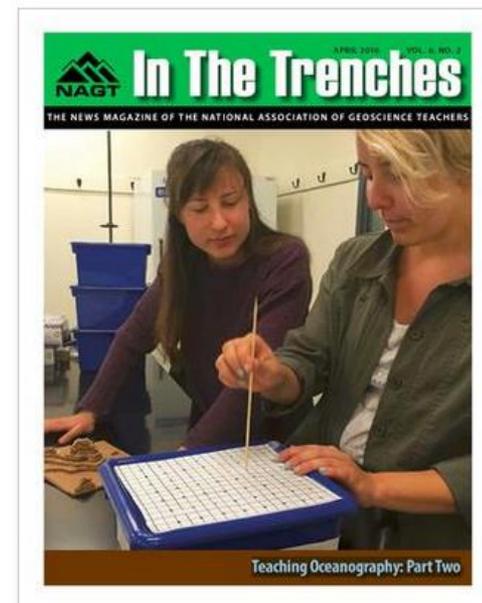


In the Trenches – April 2016

Volume 6, Number 2

In This Issue

- [Diving Deep: Engaging Students with Authentic Ocean Data](#) – Meghan E. Marrero, Mercy College, and Karen Woodruff, US Satellite Laboratory
- [A Tactile Lab: Contours, Ocean Bathymetry, and Scaling](#) – Jessica Kleiss, Lewis & Clark College
- [Improving Student Ocean Science Literacy Through Collaboration with a Librarian](#) – Laura A. Guertin and Nina Clements, Penn State Brandywine
- [More Resources for Teaching Ocean Science](#)
- [The Algae-in-a-Bottle Experiment](#) – W. Sean Chamberlin, Fullerton College
- [Nominations Due for NAGT's Annual Awards to Outstanding Earth Science Teachers in Grades K-12](#)
- [The Coolest Mixing Process in the Ocean](#) – Mirjam Sophia Glessmer, Center for Teaching and Learning, Hamburg University of Technology
- [Earth Educators Rendezvous 2016, July 18-22, University of Wisconsin, Madison — Register Today!](#)
- [A Departmental Approach to Addressing the Problem of Sexual Harassment and Assault in Field Experiences](#) – Walter A. Robinson, North Carolina State University



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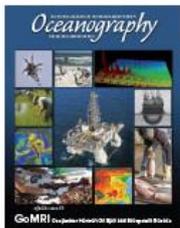
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ABOUT US

Oceanography contains peer-reviewed articles that chronicle all aspects of ocean science and its applications.

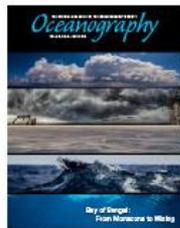
Photo credit: NSF and NOAA

RECENT ISSUES



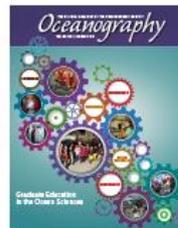
September 2016

Social Issue: GOMRI



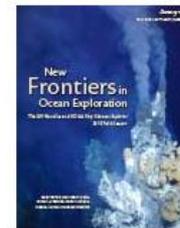
June 2016

Social Issue: Bay of



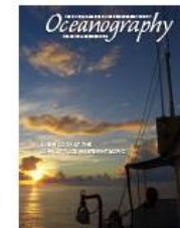
March 2016

Social Issue: Graduate



March 2016

CLIPPERMENT - New

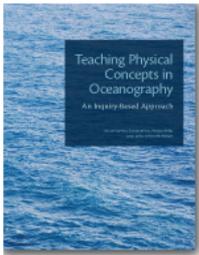


December 2015

Social Issue: A New

Hands-On Oceanography

A recurring column in *Oceanography* magazine, Hands-On Oceanography provides peer-reviewed activities appropriate for undergraduate and/or graduate classes in oceanography. Hands-on is broadly interpreted as those activities that actively engage students (i.e., activities where students have to make decisions, record results, and interpret results). Hands-on activities include, but are not limited to, computer-based models and laboratory demonstrations. Below is a list with links to all of the published activities.



In addition to the recurring column, the supplemental issue of *Oceanography*, *Teaching Physical Concepts in Oceanography*, offers a collection of hands-on/minds-on activities for teaching physical concepts that are fundamental in oceanography.

SUBMIT AN ACTIVITY

We encourage submissions of hands-on activities to Ellen Kappel, Oceanography Editor (ekappel@geo-prose.com). Submitted activities will be peer-reviewed. Accepted hands-on activities will be published in *Oceanography* and posted online as downloadable pdf files. Text plus graphics must fit on four to six magazine pages (roughly 2,000-3,500 words and 2-4 figures). Suggested subheadings include:

- Purpose of Activity
- Audience
- Background
- Research Question
- Materials
- Activity
- Possible Modifications to Activity

Please make sure to include an estimate of the the amount of time needed to complete the lab.

PUBLISHED ACTIVITIES

[Building Intuition for In-Water Optics and Ocean Color Remote Sensing: Spectrophotometer Activity with littleBits™](#)

Schollaert Uz, S. 2016. *Oceanography* 29(1):98–103, <http://dx.doi.org/10.5670/oceanog.2016.01>.

[Mimicking the Rayleigh Isotope Effect in the Ocean](#)

E.M. Griffith, J.D. Ortiz, and A.J. Jefferson. 2015. *Oceanography* 28(4):96–101, <http://dx.doi.org/10.5670/oceanog.2015.89>.

[Turbidity Currents: Comparing Theory and Observation in the Lab](#)

A collection of active learning oceanography including
Teaching Physical Concepts in Oceanography

Colored water experiments



Concepts:

- Density
- Salinity
- Ocean currents
- Estuarine circulation
- Convection currents



Marine Advanced Technology Education



About MATE

MATE's mission is to use marine technology to create interest in and improve science, technology, engineering, and math (STEM) education and to provide the marine technical workforce with well-educated professionals. A hallmark of all MATE's programs, products, and services is that they are aligned with ocean workforce research and trends. [Read More](#)

Marine News

MATE ROV competition students participate in the **White House Science Fair**. Visit the

MATE News

THE 2017 COMPETITION BRIEFING AND PREVIEW MISSION ARE POSTED!

[Click here for the 2016 international competition results](#)

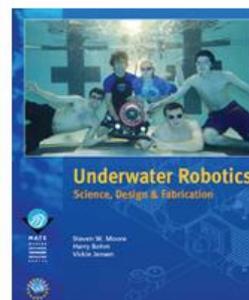
MATE Competition has been highlighted in documentary film as well as a Hollywood film & book.

[Watch ROV Competition Videos](#)

FOLLOW OUR INTERNS WHO ARE OUT AT SEA NOW!



ON SALE NOW!



"The Ultimate Text on Underwater Robotics"

ROV LIFE OFFSHORE VIDEO

Marine Advanced Technology Education

[Store Home](#)[Underwater Robotics
Textbook](#)[SeaMATE ROV Kits](#)[AngelFish Kit](#)[PufferFish ROV Kit](#)

PUFFERFISH 2.0 ROV KIT

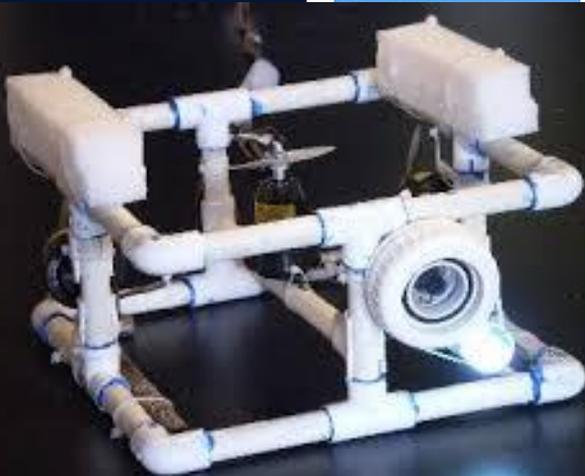
With Many Exciting New Upgrades!

Purchase Items:

[SEAMATE STORE](#)

The **SeaMATE PufferFish** makes ROV building fun, educational, and straight-forward. The PufferFish ROV Kit consists of a control system, wires to receive and deliver power, and thrusters (motors, propeller adapters, and propellers). The frame is not included but frame materials can easily be purchased from a hardware store.

- ◆ [VIEW THE PUFFERFISH INSTRUCTIONS HERE](#)
- ◆ [View Photo of the PufferFish ROV Kit Unassembled](#)
- ◆ [PufferFish Frequently Asked Questions](#)
- ◆ [The PufferFish Curriculum Page](#)





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SEARCH



NATIONAL MARINE
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Sea Grant



Geology

Page 1 of 3

[Marine Geological Discoveries](#)

This site by a Norwegian researcher features descriptions of marine geological formations: pockmarks, mud volcanoes, deep-water coral reefs, and gas hydrates. Using ROV technology, he has taken photos of these deep seafloor features, and compares them to geological structures seen on land, and even on the moon.

Grade Level: Middle school, High school

[New Millennium Observatory \(NeMO\) Curriculum](#)

Classroom activities based on how scientists study active volcanoes on the deep ocean floor. Activities include: locating an earthquake epicenter, recording geological and biological information during an ocean floor traverse, creating cross-section profiles of the ocean floor, and graphing seafloor data. Resources include videos and teacher guides.

Grade Level: High school, Graduate or professional

[Woods Hole Oceanographic Institution's Coastal Ocean Topics](#)

COI strives to translate the results of basic coastal research for citizens and policymakers, while providing a solid information base for better resource management. This site provides information on a multitude of coastal issues including natural hazards, such as tsunamis and hurricanes, moving shorelines, coastal pollution, fisheries and coastal resources, waves, tides, currents, groundwater. Most topics feature more specific sub-topics which include Woods Hole Oceanographic Institution literature concerning the issue.

Grade Level: High school, Undergraduate lower division, Undergraduate upper division, Graduate or professional, General public

[Marine Geology & Geophysics Images](#)

Excellent images of ocean topography, continental margins, crustal age, Great Lakes bathymetry, plus images of available posters and slide sets. Downloadable animations also available. Links to other NOAA resources.

Grade Level: High school, Graduate or professional

[Ocean Planet: Sea Secrets](#)

Unit from Smithsonian multidisciplinary ocean curriculum. Lesson plan focuses on ocean bottom features including continental shelf, deep ocean plain, and mid-ocean ridges. Students study the discovery and mapping of seafloor features, learn to read seafloor maps, then create a map of Atlantic seafloor features. Unit includes: background essay; teacher instructions; maps and forms for student activity; discussion questions; all online in PDF format. Resources include online version of Smithsonian Ocean Planet exhibition.

Grade Level: Intermediate elementary, Middle school

[NJMSC Beach Profiling](#)

Wavelets on bow wave

Posted on [October 25, 2016](#) by [mglessmer](#)

The other day (well, the other day when I was still at sea and wrote that blog post. Been quite a while since...), when sailing in calm waters, I noticed the wavelets of a bow wave.

And I cannot **not** see them these days! No matter how much the other waves try to disguise any trace the boat might be trying to leave to prove its existence, the bow wave wavelets put up a fight to be noticed.



Below you see the direction the ship is sailing in (yellow), the wash from the



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