

Description of Axial Seamount hydrothermal sampling sites from 5 cruises to the Axial Seamount, Juan de Fuca Ridge from 2012 to 2015 (NeMO2015 project)

Website: <https://www.bco-dmo.org/dataset/664201>

Data Type: Cruise Results

Version:

Version Date: 2016-11-23

Project

» [Event response to an eruption at Axial Seamount](#) (NeMO2015)

Program

» [Ocean Observatories Initiative](#) (OOI)

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Table of Contents

- [Dataset Description](#)
 - [Methods & Sampling](#)
 - [Data Processing Description](#)
- [Data Files](#)
- [Parameters](#)
- [Instruments](#)
- [Deployments](#)
- [Project Information](#)
- [Program Information](#)
- [Funding](#)

Dataset Description

This dataset includes descriptions of the fluid sample temperatures and the sample sites.

Relevant Reference: Topcuoglu, BD, Stewart LC, Morrison HG, Butterfield DA, Huber JA and Holden JF (2016) Hydrogen Limitation and Syntrophic Growth among Natural Assemblages of Thermophilic Methanogens at Deep-sea Hydrothermal Vents. *Front. Microbiol.* 7:1240. doi: [10.3389/fmicb.2016.01240](https://doi.org/10.3389/fmicb.2016.01240)

Related Datasets:

[Thermophile abundance - MPN](#)

[Thermophile growth](#)

Methods & Sampling

In August 2012, September and October 2013, August 2014, and August 2015, 7-40°C diffuse hydrothermal fluids were collected from 10 vent sites at 1515-1716 m depths from Axial Seamount on the Juan de Fuca Ridge. The fluid samples were drawn into 650 ml Tedlar plastic bags with polyethylene valves within rigid housings using the NOAA Hydrothermal Fluid and Particle Sampler. The sampler pumped vent fluid through a

titanium nozzle and recorded the temperature of the fluid within the intake nozzle once every second during pumping. Samples were collected using the research submarines ROV Jason II and ROV ROPOS. All operations at sea occurred on the research vessels Marcus G. Langseth, Thomas G. Thompson, Falkor, and Ronald H. Brown.

Data Processing Description

BCO-DMO Processing notes:

- added conventional header with dataset name, PI name, version date, reference information
- modified parameter names to conform with BCO-DMO naming conventions
- split information into multiple columns
- added latitudes and longitudes for mapping purposes

[[table of contents](#) | [back to top](#)]

Data Files

File
thermophile_sites.csv (Comma Separated Values (.csv), 1.75 KB) MD5:131b4b385cb90f3a6894b7405769c3af
Primary data file for dataset ID 664201

[[table of contents](#) | [back to top](#)]

Parameters

Parameter	Description	Units
site	sampling location	unitless
lat	approximate latitude; north is positive	decimal degrees
lon	approximate longitude; east is positive	decimal degrees
depth	sampling depth	meters
temp_2012	temperature at site during 2012 sampling	degrees Celsius
temp_2013	temperature at site during 2013 sampling	degrees Celsius
temp_2014	temperature at site during 2014 sampling	degrees Celsius
temp_2015	temperature at site during 2015 sampling	degrees Celsius
site_descrip	description of sampling site	unitless

[[table of contents](#) | [back to top](#)]

Instruments

Dataset-specific Instrument Name	NOAA Hydrothermal Fluid and Particle Sampler
Generic Instrument Name	Discrete water sampler
Dataset-specific Description	Pumps vent fluid through a titanium nozzle and records the temperature of the fluid within the intake nozzle once every second during pumping. http://www.pmel.noaa.gov/edd/hydrothermal-fluid-and-particle-sampler
Generic Instrument Description	A device that collects an in-situ discrete water sample from any depth and returns it to the surface without contamination by the waters through which it passes, such as a water bottle.

Dataset-specific Instrument Name	ROV ROPOS
Generic Instrument Name	Remotely Operated Vehicle
Dataset-specific Description	Used to collect hydrothermal vent samples. For further information, see http://ropos.com/
Generic Instrument Description	Remotely operated underwater vehicles (ROVs) are unoccupied, highly maneuverable underwater robots operated by a person aboard a surface vessel. They are linked to the ship by a group of cables that carry electrical signals back and forth between the operator and the vehicle. Most are equipped with at least a video camera and lights. Additional equipment is commonly added to expand the vehicle's capabilities. These may include a still camera, a manipulator or cutting arm, water samplers, and instruments that measure water clarity, light penetration, and temperature.

Dataset-specific Instrument Name	ROV Jason
Generic Instrument Name	ROV Jason
Dataset-specific Description	Used to collect hydrothermal fluid samples.
Generic Instrument Description	The Remotely Operated Vehicle (ROV) Jason is operated by the Deep Submergence Laboratory (DSL) at Woods Hole Oceanographic Institution (WHOI). WHOI engineers and scientists designed and built the ROV Jason to give scientists access to the seafloor that didn't require them leaving the deck of the ship. Jason is a two-body ROV system. A 10-kilometer (6-mile) fiber-optic cable delivers electrical power and commands from the ship through Medea and down to Jason, which then returns data and live video imagery. Medea serves as a shock absorber, buffering Jason from the movements of the ship, while providing lighting and a bird's eye view of the ROV during seafloor operations. During each dive (deployment of the ROV), Jason pilots and scientists work from a control room on the ship to monitor Jason's instruments and video while maneuvering the vehicle and optionally performing a variety of sampling activities. Jason is equipped with sonar imagers, water samplers, video and still cameras, and lighting gear. Jason's manipulator arms collect samples of rock, sediment, or marine life and place them in the vehicle's basket or on "elevator" platforms that float heavier loads to the surface. More information is available from the operator site at URL.

Deployments

TN327

Website	https://www.bco-dmo.org/deployment/664100
Platform	R/V Thomas G. Thompson
Start Date	2015-08-14
End Date	2015-08-29
Description	NOAA New Millennium Observatory (NeMO) 2015/Rapid Response to an Eruption

RB1403

Website	https://www.bco-dmo.org/deployment/665908
Platform	NOAA Ship Ronald H. Brown
Start Date	2014-08-07
End Date	2014-08-19

MGL1216

Website	https://www.bco-dmo.org/deployment/665937
Platform	R/V Marcus G. Langseth
Start Date	2012-08-16
End Date	2012-08-26

TN300

Website	https://www.bco-dmo.org/deployment/665996
Platform	R/V Thomas G. Thompson
Start Date	2013-09-03
End Date	2013-09-19

FK010

Website	https://www.bco-dmo.org/deployment/666111
Platform	R/V Falkor
Report	https://datadocs.bco-dmo.org/d3/data_docs/Subseafloor_Life/FK010_CruiseReport_Huber_Final.pdf
Start Date	2013-09-22
End Date	2013-10-05

Project Information

Event response to an eruption at Axial Seamount (NeMO2015)

Website: <http://axial2015.blogspot.com>

Coverage: Axial Seamount, Juan de Fuca Ridge, northeastern Pacific Ocean (46.06°N 130.00°W)

On 24 April 2015, the NSF-funded Ocean Observatories Initiative's (OOI) Cabled Array detected the onset of a probable eruption at Axial Seamount, heralded by a swarm of >8000 small earthquakes and a rapid subsidence of the seafloor by >2.4 meters at the center of the caldera. Evidence that lava was erupted in or near the summit caldera includes a dramatic temperature rise recorded by instruments on the OOI Cabled Array-- up to 0.6-0.7°C above ambient sustained for weeks after the event. This eruption is likely to have significantly perturbed the hydrothermal and biological systems in and around the summit caldera, and provides the rare opportunity to address time-critical scientific questions that can only be investigated with the near-term seafloor investigations. A currently scheduled NSF and NOAA funded cruise to Axial Seamount on R/V Thompson with ROV Jason and AUV Sentry in August 2015 provides an excellent opportunity for such a response. This study adds 3 days onto this cruise to facilitate time-critical event response science.

Detailed seafloor mapping with shipboard multi-beam sonar and near-bottom Sentry surveys will cover areas of the caldera and adjacent rift zones that are expected eruption site(s). Fresh rock, if located, will be sampled and dated using the ²¹⁰Po-²¹⁰Pb technique. Hydrothermal plumes will be discerned with CTD casts and sensor tows. A mooring will be deployed with Miniature Autonomous Plume Recorders to measure temperature, light attenuation, and redox potential. The at-sea team plans to make samples and data available to the broader science community for targeted research on seafloor processes.

[[table of contents](#) | [back to top](#)]

Program Information

Ocean Observatories Initiative (OOI)

Website: <http://oceanobservatories.org/>

The Ocean Observatories Initiative (OOI) is a science-driven ocean observing network that delivers real-time data to address critical science questions regarding the world's oceans. Funded by the National Science Foundation to encourage scientific investigation, OOI data are freely available online to anyone with an Internet connection. OOI was designed as a long-term project to collect ocean data for up to 30 years. This longevity makes it possible to measure and directly observe both short-lived episodic events and longer-term changes occurring in the ocean. Such data make it possible to better understand ocean processes and how the ocean is changing.

The OOI has five active research arrays that comprise the three major observatory elements linked together by instrument, infrastructure, and information management systems. Global Ocean Arrays consist of moored arrays and autonomous vehicles that provide time-series observations and mesoscale spatial sampling at sparsely sampled, high-latitude regions critical to our understanding of climate, the carbon cycle, and ocean circulation. The Regional Cabled Array consists of fiber-optic cables off the Oregon coast that provide unprecedented power, bandwidth, and communication to seafloor instrumentation and profiler moorings, enabling monitoring of volcanic and hydrothermal activity, methane seeps, earthquakes, and myriad ocean processes in coastal and blue water environments. Coastal Arrays consist of cross-shelf moored arrays and autonomous vehicles that observe the dynamic coastal environment, enabling examination of upwelling, shelf break fronts, and cross-shelf exchanges.

These marine arrays are outfitted with more than 900 instruments — of 45 different types — measuring more than 200 different parameters. These instruments gather physical, chemical, geological, and biological data — from the air-sea interface to the seafloor. The data collected are transmitted through a cyberinfrastructure, an information management system that allows users to access real- to near real-time data from suites of sensors. The OOI provides annotations and automated quality control for data streams and is working to meet

the IOOS Quality Assurance of Real Time Ocean Data (QARTOD) standards.

[[table of contents](#) | [back to top](#)]

Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1547004

[[table of contents](#) | [back to top](#)]