

Chemical composition of hydrothermal fluids collected on RV/Roger Revelle RR1507 in the Eastern Lau Spreading Center and Valu Fa Ridge, April-May 2015 (Functional microbial dynamics of vent deposits project)

Website: <https://www.bco-dmo.org/dataset/674750>

Data Type: Cruise Results

Version: 1

Version Date: 2017-01-13

Project

» [Geochemical effects on the functional microbial community dynamics of hydrothermal deposits along the Eastern Lau Spreading Center](#) (Functional microbial dynamics of vent deposits)

Contributors	Affiliation	Role
Seewald, Jeffrey S.	Woods Hole Oceanographic Institution (WHOI)	Principal Investigator
Copley, Nancy	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

Abstract

This dataset is the chemical composition of hydrothermal fluids collected during RV/Roger Revelle cruise RR1507 at the 9°N deep-sea hydrothermal vent field on the East Pacific Rise, Pacific Ocean, April - May 2015.

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Coverage

Spatial Extent: N:-20.45669 E:-176.133725 S:-22.2157 W:-176.608612

Temporal Extent: 2015-04-26 - 2015-05-10

Methods & Sampling

- All fluids were collected using isobaric gas-tight fluid samplers (Seewald et al., 2002).
- Temperature was measured during sample collection using a type-J thermocouple attached to the inlet snorkel. Reported values are maximums observed during sample collection.

Analytical methods:

pH: Ag/AgCl combination reference electrode

Na⁺, K⁺, Ca²⁺, Mg²⁺, Cl⁻, Br⁻, SO₄²⁻ : ion chromatography with suppressed conductivity detection

CH₄: gas chromatography with flame ionization detection

H₂: gas chromatography with thermal conductivity detection

Data Processing Description

BCO-DMO Processing:

- Added conventional header with dataset name, PI name, version date
- Modified parameter names to conform with BCO-DMO naming conventions
- Replaced blanks (missing data) and 'nd' to indicate 'no data'
- Added cruise_id column
- Replaced spaces with underscores (vent_site)
- Changed format of lat and lon to degrees north and east

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Data Files

File
vent_fluid_chemistry_RR1507.csv (Comma Separated Values (.csv), 5.48 KB) MD5:c7eccaaabe212614fe5e6851ebd15ff1
Primary data file for dataset ID 674750

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Related Publications

Seewald, J. S., Doherty, K. W., Hammar, T. R., & Liberatore, S. P. (2002). A new gas-tight isobaric sampler for hydrothermal fluids. *Deep Sea Research Part I: Oceanographic Research Papers*, 49(1), 189-196. doi:10.1016/s0967-0637(01)00046-2 [https://doi.org/10.1016/S0967-0637\(01\)00046-2](https://doi.org/10.1016/S0967-0637(01)00046-2)
Methods

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Related Datasets

IsSupplementedBy

Reysenbach, A., Seewald, J. S. (2021) **Sampling overview from R/V Roger Revelle cruise RR1507 in the Eastern Lau Spreading Center in 2015 (Functional microbial dynamics of vent deposits project)**. Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2015-09-21 doi:10.26008/1912/bco-dmo.566965.1 [[view at BCO-DMO](#)]

IsRelatedTo

Seewald, J. S., Sievert, S. M. (2017) **Vent fluid chemistry from R/V Atlantis AT26-10 and AT26-23 in the East Pacific Rise, Pacific Ocean from 2013-2014 (Microbial Communities at Deep-Sea Vents project)**. Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2017-01-13 <http://lod.bco-dmo.org/id/dataset/674781> [[view at BCO-DMO](#)]

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Parameters

Parameter	Description	Units
cruise_id	cruise identifier	unitless
vent_site	vent site name	unitless
sample_working_ID	working id for sample	unitless
sample_Jason_Virtual_Van_ID	Jason Virtual Van sample identifier	unitless
vent_id	vent identifier	unitless
temp	temperature	degrees Celsius
pH_25C	pH at 25 degrees C	unitless
Mg_mmol_kg	Magnesium concentration	millimoles/kilogram (mmol/kg)
Na_mmol_kg	Sodium	millimoles/kilogram (mmol/kg)
K_mmol_kg	Potassium	millimoles/kilogram (mmol/kg)
Li_umol_kg	Lithium	micromoles/kilogram (umol/kg)
Ca_mmol_kg	Calcium	millimoles/kilogram (mmol/kg)
H2S_mmol_L	Hydrogen sulfide	micromoles/kilogram (umol/kg)
CH4_umol_L	Methane	micromoles/kilogram (umol/kg)
lat	latitude; north is positive	degrees
lon	longitude; east is positive	degrees
HDG	? Heading; north is 0 or 360	?radial degrees
depth	sample depth	meters

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Instruments

Dataset-specific Instrument Name	
Generic Instrument Name	Isobaric Gas-Tight Sampler
Dataset-specific Description	Used for sample collection.
Generic Instrument Description	Isobaric Gas Tight (IGT) samplers, designed and built by scientists and engineers at WHOI, are titanium instruments designed to be used with deep submergence vehicles to sample corrosive hydrothermal vent fluids at high temperature and high pressure. The IGT prevents the sampled fluid from degassing as pressure decreases during the vehicle's ascent to the surface.

Dataset-specific Instrument Name	ROV Jason
Generic Instrument Name	ROV Jason
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.

Dataset-specific Instrument Name	type-J thermocouple attached to the inlet snorkel
Generic Instrument Name	Water Temperature Sensor
Dataset-specific Description	Used to measure in-situ temperature.
Generic Instrument Description	General term for an instrument that measures the temperature of the water with which it is in contact (thermometer).

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Deployments

RR1507

Website	https://www.bco-dmo.org/deployment/566757
Platform	R/V Roger Revelle
Report	http://dmoserv3.whoi.edu/data_docs/RR1507/RV1507report.pdf
Start Date	2015-04-21
End Date	2015-05-14
Description	The cruise goals were to collect samples to explore the following objectives: 1) Link geochemical and microbial dynamics along the ELSC 2) Use of metagenomic and transcriptomic data to explore biogeochemical cycles that are regulating the functional roles of the microbial communities in vent fields along the ELSC. 3) Use the metagenomic information to enrich for targeted novel Thermoprotei and acidophiles. Cruise RR1507 departed from Auckland, 21 April 2015, and arrived on site April, 24. Unfortunately, due to mainly weather related issues, almost 9 of the 15 planned sampling days with the Remotely Operated Vehicle (ROV), Jason, were lost. During the cruise, about 54 different vent deposits and about 27 (duplicate) hydrothermal fluid samples were collected for microbiological and geochemical investigations. ROV Jason Virtual Van for this cruise: http://4dgeo.whoi.edu/webdata/virtualvan/html/VV-rr1507/index.html

Project Information

Geochemical effects on the functional microbial community dynamics of hydrothermal deposits along the Eastern Lau Spreading Center (Functional microbial dynamics of vent deposits)

Coverage: Eastern Lau Spreading Center

Extreme environmental gradients exist at deep-sea hydrothermal vents where high temperature, low pH and reduced fluids mix with cold oxygenated seawater. This results in a plethora of microbes taking advantage of abundantly available microniches. From small subunit (16S) rRNA gene surveys and directed enrichment culturing of vent deposits from many sites, patterns in diversity are emerging that suggest that geochemical processes, particularly those that affect fluid pH, play a fundamental role in regulating microbial diversity and community composition.

This is a three year study at vent fields along the Eastern Lau Spreading Center (ELSC) to investigate the relationship between vent geochemistry and microbial community dynamics. The ELSC was chosen because it provides large and systematic changes in fluid and rock geochemistry, spreading rate, magmatic/tectonic processes, and proximity to the volcanic arc over its relatively short length of 397 km. The individual vent fields therefore provide excellent natural laboratories for exploring, in depth, the factors that influence the diversity and relationships of microbial communities associated with actively forming deep-sea hydrothermal deposits. The study will be carried out at 3 geochemically different hydrothermal fields along the ELSC. The scientists will document microbial community composition and diversity associated with hydrothermal deposits from each area for comparison with data obtained in 2009 and 2005. The close proximity of these geochemically distinct vent areas within the ELSC provides an ideal opportunity to investigate the effect of vent fluid and deposit geochemistry on the structure and function of microbial communities, as well as the specific roles of individual populations, associated with active hydrothermal deposits. The investigators hypothesize that, given the extreme environmental characteristics (e.g., low fluid pH and high iron at Mariner), they will see distinct differences in the metagenomes and particularly in the metatranscriptomes among the Kilo Moana, ABE and Mariner vent fields.

The specific objectives are to:

- 1) Link geochemical and microbial dynamics along the ELSC (from 2005-2013);
- 2) Use of metagenomic and transcriptomic data to explore biogeochemical cycles that are regulating the functional roles of the microbial communities in vent fields along the ELSC; and
- 3) Use the metagenomic information to enrich for targeted novel Thermoprotei and acidophiles. Active hydrothermal metal sulfide deposits and fluid samples will be collected from the vent fields along the ELSC.

Bar-coded pyrosequencing of archaeal and bacterial 16S rRNA amplicons will be obtained for over eighty samples. The geochemical environment of the chimneys will be modeled to determine in situ geochemical conditions. These values will be used in statistical analyses to explore the factors affecting the observed differences in the communities. Using the 16S rRNA gene 454 pyrotags coupled with the geochemical characterization, specific samples will be selected for metagenomic and metatranscriptomic analyses (1-3 of each per site). The molecular information will be used to target specific samples that: (i) harbor novel unclassified diversity; (ii) have vent endemic lineages; and (iii) have acidophilic relatives from terrestrial systems, for enrichment culturing (using the geochemistry to help constrain culturing conditions).

Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1233037

