Log of Jason Dives from cruise TN293 at the Loihi Seamount in March 2013

Website: https://www.bco-dmo.org/dataset/659743
Data Type: Cruise Results
Version: 26 Sept 2016
Version Date: 2016-09-26

Project
» Ecology of microbial mats at seamount associated Fe-rich hydrothermal vent systems (Ecology of Vent Mats)

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Dataset Description

This dataset provides metadata for all significant sample collections on the deployment, TN293. Date and time are in GMT. Location coordinates are based on the nav that the Jason team places before deployment (GPS coordinates are available through the virtual van website at http://4dgeo.whoi.edu/webdata/virtualvan/html/VV-tn293/index.html)

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Data Files

File
TN293_Dive_Log.csv(Comma Separated Values (.csv), 48.89 KB) MD5:e9e367ed36dbbfe973ac12a2fc7510bf Primary data file for dataset ID 659743

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Parameters

Parameter	Description	Units
ISO_DateTime_UTC	Date and time of collection, formatted to the ISO 8601 standard (YYYY-mm-ddTHH:MM:SS.xxZ where T indicates the start of the time string). BCO-DMO generated values in this columns using the date and time columns in the original data file.	unitless

dive	Dive identification number	unitless
location	Location of collection	unitless
x	x component of the location coordinates; location coordinates are based on the nav that the Jason team places before deployment. x, y, z, and heading are all based on the NAV net that Jason personnel deploy prior to the cruise. They convert these to GPS coordinates, but do a reanalysis of nav (re-nav) at the end of the dive. For GPS coordinates, see the virtual van website: http://4dgeo.whoi.edu/webdata/virtualvan/html/VV-tn293/index.html	unitless
y	y component of the location coordinates; location coordinates are based on the nav that the Jason team places before deployment. x, y, z, and heading are all based on the NAV net that Jason personnel deploy prior to the cruise. They convert these to GPS coordinates, but do a reanalysis of nav (re-nav) at the end of the dive. For GPS coordinates, see the virtual van website: http://4dgeo.whoi.edu/webdata/virtualvan/html/VV-tn293/index.html	unitless
z	z component of the location coordinates; location coordinates are based on the nav that the Jason team places before deployment. x, y, z, and heading are all based on the NAV net that Jason personnel deploy prior to the cruise. They convert these to GPS coordinates, but do a reanalysis of nav (re-nav) at the end of the dive. For GPS coordinates, see the virtual van website: http://4dgeo.whoi.edu/webdata/virtualvan/html/VV-tn293/index.html	unitless
heading	Heading. x, y, z, and heading are all based on the NAV net that Jason personnel deploy prior to the cruise. They convert these to GPS coordinates, but do a reanalysis of nav (re-nav) at the end of the dive. For GPS coordinates, see the virtual van website: http://4dgeo.whoi.edu/webdata/virtualvan/html/VV-tn293/index.html	degrees
depth	Depth	meters (m)
sample_name	Sample name	unitless

sample_type	Sample type: Temp probe = Jason high temperature probe. Echem = Cyclic voltammetry electrochemistry wand for in situ chemistry measurements. BMS = BM = Biomat syringe sampler for fine scale microbial mat sampling. Major = Major Ti-samplers for collection of discrete high temperature venting fluids. Gas = Gas sampler for collecting gasses from venting fluids. MTR = Miniature temperature recorder, placed in vent fluids and collected at a later time to download long-term temperature data. Slide Trap = Sampler with glass slides installed to allow for colonization by microbes and immediate visualization onboard. SIO Charges = Colonization chambers. Scoop = Contained sampler with ball valve on end to prevent turbulent flow. Nanostick = Stick sampler for long term deployment and chemical analysis. PVC = Grid for deployment at mat removal site. Slurp = Suction Sample = Suction sample hose for collecting large microbial mat samples. Micromanipulator = Manipulate EChem probe on a micron scale to collect profiles through mats. Baby Suck = Single syringe BMS sampler for collection of biomat. Photo document = Imaging of mat sites. Photo Mosaic = Downward-looking photography for stitching for large scale vent mapping. Rock = Collection of rocks for examination of microbial colonizers	unitless
sample_details	Sample details/notes	unitless

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Instruments

Dataset-specific Instrument Name	
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. https://ndsf.whoi.edu/jason/

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Deployments

TN293

Website	https://www.bco-dmo.org/deployment/659705
Platform	R/V Thomas G. Thompson
Start Date	2013-03-16
End Date	2013-04-01
Description	For Jason data/information from this cruise, please visit the Jason Virtual Control Van: http://4dgeo.whoi.edu/webdata/virtualvan/html/VV-tn293/index.html (This link includes all navigational data, images, and sample collection metadata and comments for the cruise. Data can be downloaded with export viewer.) Additional cruise information and original data are available from the NSF R2R data catalog.

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Project Information

Ecology of microbial mats at seamount associated Fe-rich hydrothermal vent systems (Ecology of Vent Mats)

Website: http://oceanexplorer.noaa.gov/explorations/14fire/welcome.html

Coverage: Loihi Seamount, Hawaii; and Mariana Arc and Backarc Hydrothermal Systems

Description from NSF award abstract:
A grand challenge in microbial ecology is to understand what drives the structure of microbial communities. A recently discovered novel class of Proteobacteria, the Zetaproteobacteria, are associated with microbial mats at iron rich hydrothermal vents at submarine volcanoes deep in the ocean. These bacteria only grow using iron as an energy source and fix carbon dioxide. Within iron rich microbial mats, Zetaproteobacteria are the dominant bacterial population; however they are rare in most other deep-sea or marine habitats, suggesting they may be restricted to specific niches characterized by gradients of oxygen and iron. Recent discoveries have expanded their range to fluids collected from deep ocean crust boreholes, iron deposits in coastal saltmarshes, and with steel associated bio-corrosion, demonstrating that marine Zetaproteobacteria are cosmopolitan. A unique property of these marine iron oxidizing bacteria is that they produce morphologically distinct iron oxide structures in the form of filamentous sheaths or stalk-like structures. These structures are easily recognized by light microscopy, and electron microscopy is beginning to reveal subtle differences among them that may be diagnostic of different populations of iron oxidizing bacteria. Another unusual aspect of iron oxidizing bacteria is that they produce large quantities of oxides with relatively little bacterial biomass. As a result, the oxides form a matrix that influences water and nutrient flow in the microbial mats where they grow, and in turn, may influence the growth of other groups of bacteria and archaea that live in the mats. In an ecological context, the PIs believe this makes them a keystone species that form the predominant structural matrix of the mat, and engineer an environment conducive for growth of specific bacterial populations within the mat ecosystem. The PIs propose to use high resolution mat sampling techniques to investigate the architecture of mat ecosystems and couple these with modern molecular methods (i.e., single-cell metagenomics) and geochemical measurements of the vent fluid to couple morphological and functional diversity to phylogenetic and physiological diversity. Because the Zetaproteobacteria are ancient, have unique metabolic and morphological attributes, and appear to be restricted to a well-defined habitat, they offer an interesting model for understanding fundamental ecological concepts that drive microbial diversity and evolution.

A better understanding of iron oxidizing bacteria that include Zetaproteobacteria is of fundamental interest to scientists interested in areas of earth science and oceanography because they illustrate how microbes can fundamentally influence geochemical cycling and mineral deposition. Furthermore, morphological structures similar to those produced by Zetaproteobacteria can still be identified hundreds of millions (and possibly billions) of years back in the geological record, making them of paleontological, and potentially of exobiological, interest. As knowledge of extant populations grow, it is possible they will also help to inform us of environmental change in past Earth history. A wealth of educational and outreach opportunities will be made possible by this work, including graduate and postdoctoral education, research experiences for undergraduates, and teacher training. In addition the participating scientists are involved in a number of programs to make the general public aware of the process of how scientific research is conducted, and how discoveries of a fundamental nature can ultimately benefit humankind.

Additional information/resources:
TN293 (Loihi 2013)
Loihi Summit Map (PDF)
Cruise blog: https://zetahunters.wordpress.com/
Jason Virtual Control Van: http://4dgeo.whoi.edu/webdata/virtualvan/html/VV-tn293/index.html

Related Publications:
Fullerton, H., K. W. Hager, S. M. McAllister, and C. L. Moyer. 2017. Hidden diversity revealed by genome-resolved metagenomics of iron-oxidizing microbial mats from Lō'ihi Seamount, Hawai'i. ISMEJ 11:1900–1914. doi:10.1038/ismej.2017.40
Emerson, D., J. J. Scott, A. Leavitt, E. Fleming, and C. L. Moyer. 2016. In situ estimates of iron-oxidation and accretion rates for iron-oxidizing bacterial mats at Loihi Seamount. bioRxiv 095414. doi:10.1101/095414
Scott, J. J., B. T. Glazer, and D. Emerson. 2017. Bringing microbial diversity into focus: high-resolution analysis of iron mats from the Lō'ihi Seamount. Environmental Microbiology 19:301–316. doi:10.1111/1462-2920.13607
Chan, C.S., S.M. McAllister, A.H. Leavitt, B.T. Glazer, S.T. Krepski, and D. Emerson. 2016. The architecture of iron microbial mats reflects the adaptation of chemolithotrophic iron oxidation in freshwater and marine environments. Frontiers in Microbiology 7:796. doi:10.3389/fmicb.2016.00796
Fullerton, H., K. W. Hager, and C. L. Moyer. 2015. Draft genome sequence of Mariprofundus ferrooxydans strain JV-1, isolated from Loihi Seamount, Hawaii. Genome announcements 3:e01118-15. doi:10.1128/genomeA.01118-15
Field, E.K., A. Sczyrba, A.E. Lyman, C.C. Harris, T. Woyke, R. Stepanauskas, and D. Emerson. 2015. Genomic insights into the uncultivated marine Zetaproteobacteria at Loihi Seamount. ISMEJ 9:857–870. doi:10.1038/ismej.2014.183
Jesser, KJ, Fullerton H, Hager KW, Moyer CL. 2015. Quantitative PCR analysis of functional genes in iron-rich microbial mats at an active hydrothermal vent system (Lō'ihi Seamount, Hawai'i). Appl Environ Microbiol 81:2976–2984. doi:10.1128/AEM.03608-14. (PDF)

RR1413 (Mariana 2014)
RR1413 Cruise Report (5.2 MB PDF)
Urushima to Rota Map (PDF)
Jason Virtual Control Van website: http://4dgeo.whoi.edu/webdata/virtualvan/html/VV-rr1413/index.html

Related Publications:
Hager, K. W., H. Fullerton, D. A. Butterfield, and C. L. Moyer. 2017. Community structure of lithotrophically-driven hydrothermal microbial mats from the Mariana Arc and Back-Arc. Frontiers in Microbiology 8:1578. doi:10.3389/fmicb.2017.01578

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Funding

Funding Source	Award
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