Summary of Alvin dives at 9N hydrothermal vent field on the East Pacific Rise (EPR) with links to pdf's of dive plans, reports, and sample sheets, RV/Atlantis cruise AT37-12, April-May 2017

Website: https://www.bco-dmo.org/dataset/738099
Data Type: Cruise Results
Version: 1
Version Date: 2018-06-04

Project
» Collaborative Research: Environmental Drivers of Chemoautotrophic Carbon Production at Deep-Sea Hydrothermal Vents - Comparative Roles of Oxygen and Nitrate (vent O2 NO3 roles)

Contributors	Affiliation	Role
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Abstract
This dataset includes a summary of the 13 human-occupied vehicle (HOV) Alvin dives that took place during RV/Atlantis cruise AT37-12 at deep-sea hydrothermal vents near 9º North in the East Pacific Rise (EPR), April-May 2017. Links to PDFs containing dive plans, reports (event logs), and sample sheets are included.

Table of Contents

- Coverage
- Dataset Description
- Data Files
- Supplemental Files
- Parameters
- Deployments
- Project Information
- Funding

Coverage

Spatial Extent: **N**:9.8495 **E**:-104.2883 **S**:9.8378 **W**:-104.2935
Temporal Extent: 2017-04-26 - 2017-05-08

Dataset Description

This dataset includes a summary of the 13 human-occupied vehicle (HOV) Alvin dives that took place during RV/Atlantis cruise AT37-12 at deep-sea hydrothermal vents near 9º North in the East Pacific Rise (EPR), April-May 2017. Links to PDFs containing dive plans, reports (event logs), and sample sheets are included.

[table of contents | back to top]

Data Files

File
Alvin dive report #4893 filename: 4893.pdf (Portable Document Format (.pdf), 2.29 MB) MD5:4d0fa70e1dbffa17e668449dbfd8337c Dive report: AT37-12, Alvin Dive 4893

File
Alvin dive report #4894 filename: 4894.pdf (Portable Document Format (.pdf), 2.74 MB) MD5:a47d73d7001e8d31709ef0c1e3ef5791 Dive report: AT37-12, Alvin Dive 4894
Alvin dive report #4895 filename: 4895.pdf (Portable Document Format (.pdf), 5.42 MB) MD5:e9d085acb958979faa47afeca6415267 Dive report: AT37-12, Alvin Dive 4895
Alvin dive report #4896 filename: 4896.pdf (Portable Document Format (.pdf), 3.71 MB) MD5:02ca938152e0ba44bfa3abda83cd2756 Dive report: AT37-12, Alvin Dive 4896
Alvin dive report #4897 filename: 4897.pdf (Portable Document Format (.pdf), 965.63 KB) MD5:8ce95547d21f67a37570f43cf74f81c2 Dive report: AT37-12, Alvin Dive 4897
Alvin dive report #4898 filename: 4898.pdf (Portable Document Format (.pdf), 4.26 MB) MD5:b038f1093fd9308d9f72c17d1ba5cfea Dive report: AT37-12, Alvin Dive 4898
Alvin dive report #4899 filename: 4899.pdf (Portable Document Format (.pdf), 4.26 MB) MD5:7fa0e4b5b39f26206dc330845ed1b386 Dive report: AT37-12, Alvin Dive 4899
Alvin dive report #4900 filename: 4900.pdf (Portable Document Format (.pdf), 4.28 MB) MD5:736b31412c4d9d8aa4e5ad7a3efa2fca Dive report: AT37-12, Alvin Dive 4900
Alvin dive report #4901 filename: 4901.pdf (Portable Document Format (.pdf), 4.99 MB) MD5:de14e04256c3fe7f8b3480fe1a5c470a Dive report: AT37-12, Alvin Dive 4901
Alvin dive report #4902 filename: 4902.pdf (Portable Document Format (.pdf), 2.16 MB) MD5:696b646ce359dae397bdb8bead854896 Dive report: AT37-12, Alvin Dive 4902
Alvin dive report #4903 filename: 4903.pdf (Portable Document Format (.pdf), 4.28 MB) MD5:332e45439bfc83d3c05bea37aade744c Dive report: AT37-12, Alvin Dive 4903
Alvin dive report #4904 filename: 4904.pdf (Portable Document Format (.pdf), 5.12 MB) MD5:36ef3e6878abf0138bddfaf989b6107c Dive report: AT37-12, Alvin Dive 4904
Alvin dive report #4905 filename: 4905.pdf (Portable Document Format (.pdf), 4.59 MB) MD5:327a110356bdb3de9aaecd1003f64672 Dive report: AT37-12, Alvin Dive 4905

[table of contents | back to top]

Supplemental Files

File
Alvin dive report #4893 filename: 4893.pdf (Portable Document Format (.pdf), 2.29 MB) MD5:4d0fa70e1dbffa17e668449dbfd8337c Alvin dive report #4893

[table of contents | back to top]

Parameters

Parameter	Description	Units
Dive	Alvin dive identifier	unitless
Date	dive date	unitless
Time_at_seafloor	time at seafloor in hours:minutes	unitless
Vent_SID	number of deployments of the Vent-Submersible Incubation Device at the designated site (CS=Crab Spa; TB=Teddy Bear)	unitless
LVP	number of deployments of the Large Volume Pump samples at the designated site (CS=Crab Spa; TB=Teddy Bear)	unitless
pdf_link	link to pdf file containing dive plans; reports(event logs); and sample sheets	unitless

[table of contents | back to top]

Deployments

AT37-12

Website	https://www.bco-dmo.org/deployment/734074
Platform	R/V Atlantis
Report	http://datadocs.bco-dmo.org/docs/Vent_O2_NO3_Roles/data_docs/AT37-12_Cruise_Report.pdf
Start Date	2017-04-24
End Date	2017-05-15

[table of contents | back to top]

Project Information

Collaborative Research: Environmental Drivers of Chemoautotrophic Carbon Production at Deep-Sea Hydrothermal Vents - Comparative Roles of Oxygen and Nitrate (vent O2 NO3 roles)

Coverage: Deep-Sea hydrothermal vent field at 9 deg N on the East Pacific Rise

NSF award abstract:

Deep-sea hydrothermal vents, first discovered in 1977, are exemplary ecosystems where microbial chemosynthesis rather than photosynthesis is the primary source of organic carbon. Chemosynthetic microorganisms use the energy generated by oxidizing reduced inorganic chemicals contained in the vent fluids, like hydrogen sulfide or hydrogen gas, to convert carbon dioxide (CO2) into cell material. By doing so, they effectively transfer the energy from a geothermal source to higher trophic levels, in the process supporting the unique and fascinating ecosystems that are characterized by high productivity - oases in the otherwise barren deep ocean landscape. While the general view of the functioning of these ecosystems is established, there are still major gaps in our understanding of the microbiology and biogeochemistry of these systems. Particularly lacking are studies measuring rates of microbial activity in situ, which is ultimately needed to understand production of these ecosystems and to assess their impact on global biogeochemical cycles. This project makes use of the Vent-Submersible Incubation Device (Vent-SID), a robotic micro-laboratory that was recently developed and tested in the field. This instrument makes it possible for the first time to determine rates of carbon fixation at both in situ pressures and temperatures, revolutionizing the way we conduct microbial biogeochemical investigations at deep-sea hydrothermal vents. This is an interdisciplinary and collaborative effort between two US and foreign institutions, creating unique opportunities for networking and to foster international collaborations. This will also benefit two graduate students working in the project, who will get exposed to a wide range of instrumentation and scientific fields, facilitating their interdisciplinary education. In collaboration with Dr. Nitzan Resnick, academic dean of The Sage School, an elementary school outreach program will be developed and a long-term partnership with the school established. Further, a cruise blog site to disseminate the research to schools and the broader public will be set up. The results will be the topic of media coverage as well as be integrated into coursework and webpages existing either in the PI's labs or at the institution.

This project is using a recently developed robotic micro-laboratory, the Vent-SID, to measure rates of chemoautotrophic production and to determine the relative importance of oxygen and nitrate in driving chemosynthesis at deep-sea hydrothermal vents at in situ pressures and temperatures and to tackle the following currently unresolved science objectives: 1) obtain in situ rates of chemoautotrophic carbon fixation, 2) obtain in situ nitrate reduction rate measurements, and 3) directly correlate the measurement of these processes with the expression of key genes involved in carbon and energy metabolism. Although recent data suggests that nitrate reduction either to N2 (denitrification) or to NH4+ (dissimilatory reduction of nitrate to ammonium) might be responsible for a significant fraction of chemoautotrophic production, NO3-reduction rates have never been measured in situ at hydrothermal vents. The researchers hypothesize that chemoautrophic growth is strongly coupled to nitrate respiration in vent microbial communities. During a cruise that will take place approximately 12 months into the project (~Feb 2017), the researchers will carry out a total of 4 deployments of the Vent-SID as well as ancillary sampling collection at the 9°46N to 9°53N segment of the East Pacific Rise. They will focus efforts on two diffuse-flow vent sites, "Crab Spa" and "Teddy Bear". "Crab Spa" is a diffuse flow vent site (T: 25°C) that has been used as a model system to gain insights into chemoautotrophic processes and has been frequently sampled over the last several years. This vent site has been very well characterized, both geochemically and microbiologically, providing excellent background data for the proposed process oriented studies. "Teddy Bear" is a diffuse-flow site that was discovered in Jan 2014, and it has a lower temperature (T: 12°C), making it a good comparative site. The researchers will perform a number of short duration time-course incubations to assess the role of different environmental parameters that have been identified as likely key variables (e.g., O2, temperature, NO3-), and to link these process rate measurements to the expression of functional genes using metatranscriptomic analyses. This study will be the first attempt to measure critical metabolic processes of hydrothermal vent microbial assemblages under critical in situ conditions and to assess the quantitative importance of electron donor and acceptor pathways in situ. In the future, it is envisioned that the Vent-SID will become a routine application by the oceanographic community for measuring time series rates of relevant metabolic processes at hydrothermal vents under in situ pressures and vent fluid temperatures.

[table of contents | back to top]

Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1559198
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[table of contents | back to top]