Solid phase chemistry from push cores taken during R/V Atlantis cruise AT26-24 at the Dorado Outcrop near Cocos Ridge in December of 2014 (Dorado Outcrop project)

Website: https://www.bco-dmo.org/dataset/671225
Data Type: Cruise Results
Version:
Version Date: 2016-12-27

Project
» Discovery, sampling, and quantification of flows from cool yet massive ridge-flank hydrothermal springs on Dorado Outcrop, eastern Pacific Ocean (Dorado Outcrop)

Program
» Center for Dark Energy Biosphere Investigations (C-DEBI)

Contributors	Affiliation	Role
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Table of Contents

Dataset Description

This dataset contains concentrations of calcium carbonate (CaCO3), total inorganic carbon (TIC), organic carbon (OC), nitrogen (N), d13C, and refractory concentrations of various metals (Fe, Cr, Cu, Mn, Zn). Push cores were collected during the R/V Atlantis cruise AT26-24 by the submersible Alvin in December of 2014.

Methods & Sampling

Push core sampling took place at Dorado Outcrop off the west coast of Costa Rica in the Pacific Ocean during the R/V Atlantis cruise AT26-24. For more information about operations of this cruise see the cruise page which contains a link to the cruise report (AT26-24).

Total inorganic carbon (TIC) was measured using coulometry and CaCO3 is calculated from this value. Organic carbon (OC) and nitrogen (N) were measured on a Perkin Elmer Series II 2400 CHNS/O analyzer. The Fe, Cr,

Cu, Mn, and Zn represent results from dithionite extractions (see Roy et al., 2012, Continental Shelf Research, 54, 67-79). Metals were analyzed by Inductively Coupled Plasma Optical Emission Spectrophotometer (ICPOES) at the University of Akron. d13C was measured on a Carlo Erba NA-1500 elemental analyzer connected to a DeltaPlus XL mass spectrometer at Oregon State University.

Data Processing Description

The data have not been processed further.

BCO-DMO Processing Notes:

* added a conventional header with dataset name, PI name, version date
* modified parameter names to conform with BCO-DMO naming conventions
* BD indicates Below Detection
* blank values replaced with no data value 'nd'
* added dive_date,dive_id,dive_lat,dive_lon from information in the cruise report (Table 4)

[table of contents | back to top]

Data Files

File
PushSolidPhase.csv (Comma Separated Values (.csv), 12.22 KB) MD5:22c615f224afbe44e75f26a6a65f8b73 Primary data file for dataset ID 671225

[table of contents | back to top]

Parameters

Parameter	Description	Units
core_id	Gravity core identifier	unitless
dive_id	Alvin submersible dive identifier	unitless
dive_date	Alvin submersible dive date in format yyyy-mm-dd	unitless
dive_lat	Approximate latitude of Alvin Dive.	decimal degrees
dive_lon	Approximate longitude of Alvin dive.	decimal degrees
top_depth	Top of sample interval in core	centimeters
bottom_depth	Bottom of sample interval in core	centimeters

depth	Middle of sample interval in core	centimeters
CaCO3	Average concentration of calcium carbonate by weight	percent
CaCO3_stdev	Standard deviation of the concentration of calcium carbonate by weight	percent
TIC	Average concentration of total inorganic carbon by weight	percent
TIC_stdev	Standard deviation of the concentration of total inorganic carbon by weight	percent
OC	Average concentration of organic carbon (OC) by weight	percent
OC_stdev	Standard deviation of the concentration of organic carbon (OC) by weight	percent
N	Average concentration of nitrogen by weight	percent
N_stdev	Standard deviation of the concentration of nitrogen by weight	percent
Fe_R	Average refractory concentration of iron	percent
Fe_R_stdev	Standard deviation of the refractory concentration of iron	percent
Cr_R	Average refractory concentration of chromium	miligrams per gram (mg/g)
Cr_R_stdev	Standard deviation of the refractory concentration of chromium	miligrams per gram (mg/g)
Cu_R	Average refractory concentration of copper	miligrams per gram (mg/g)
Cu_R_stdev	Standard deviation of the refractory concentration of copper	miligrams per gram (mg/g)
Mn_R	Average refractory concentration of manganese	percent
Mn_R_stdev	Standard deviation of the refractory concentration of manganese	percent
Zn_R	Average refractory concentration of zinc	miligrams per gram (mg/g)
Zn_R_stdev	Standard deviation of the refractory concentration of zinc	miligrams per gram (mg/g)

d13C	Ratio of stable isotopes 13C:12C; reference standard Vienna Pee Dee Belemnite (VPDB)	permil (0/00)
d13C_stdev	Standard deviation of the ratio of stable isotopes 13C:12C; reference standard Vienna Pee Dee Belemnite (VPDB)	permil (0/00)

[table of contents | back to top]

Instruments

Dataset-specific Instrument Name	Perkin Elmer Series II 2400 CHNS/O analyzer
Generic Instrument Name	Elemental Analyzer
Generic Instrument Description	Instruments that quantify carbon, nitrogen and sometimes other elements by combusting the sample at very high temperature and assaying the resulting gaseous oxides. Usually used for samples including organic material.

Dataset-specific Instrument Name	Carlo Erba NA-1500 elemental analyzer
Generic Instrument Name	Elemental Analyzer
Dataset-specific Description	Carlo Erba NA-1500 elemental analyzer connected to a DeltaPlus XL mass spectrometer.
Generic Instrument Description	Instruments that quantify carbon, nitrogen and sometimes other elements by combusting the sample at very high temperature and assaying the resulting gaseous oxides. Usually used for samples including organic material.

Dataset-specific Instrument Name	Inductively Coupled Plasma Optical Emission Spectrophotometer (ICPOES)
Generic Instrument Name	Inductively Coupled Plasma Optical Emission Spectrometer
Generic Instrument Description	Also referred to as an Inductively coupled plasma atomic emission spectroscope (ICP-AES). These instruments pass nebulised samples into an inductively-coupled gas plasma (8-10000 K) where they are atomised and excited. The de-excitation optical emissions at characteristic wavelengths are spectroscopically analysed. It is often used in the detection of trace metals.

Dataset-specific Instrument Name	DeltaPlus XL mass spectrometer
Generic Instrument Name	Mass Spectrometer
Generic Instrument Description	General term for instruments used to measure the mass-to-charge ratio of ions; generally used to find the composition of a sample by generating a mass spectrum representing the masses of sample components.

Dataset-specific Instrument Name	
Generic Instrument Name	Push Corer
Generic Instrument Description	Capable of being performed in numerous environments, push coring is just as it sounds. Push coring is simply pushing the core barrel (often an aluminum or polycarbonate tube) into the sediment by hand. A push core is useful in that it causes very little disturbance to the more delicate upper layers of a sub-aqueous sediment. Description obtained from: http://web.whoi.edu/coastal-group/about/how-we-work/field-methods/coring/

[table of contents | back to top]

Deployments

AT26-24

Website	https://www.bco-dmo.org/deployment/627856
Platform	R/V Atlantis
Report	http://dmoserv3.whoi.edu/data_docs/C-DEBI/cruise_reports/AT26-24_Dorado_Outcrop_2014_Cruise_Report_reduced.pdf
Start Date	2014-11-30
End Date	2014-12-12
Description	Research was conducted on this cruise as part of the C-DEBI project titled "Discovery, sampling, and quantification of flows from cool yet massive ridge-flank hydrothermal springs on Dorado Outcrop, eastern Pacific Ocean" (see: http://www.bco-dmo.org/project/627844).

AT26-24_Alvin_Dives

Website	https://www.bco-dmo.org/deployment/671838
Platform	HOV Alvin
Start Date	2014-12-01
End Date	2014-12-11
Description	dives numbers: 4775 4776 4777 4778 4779 4780 4781 4782 4783 4784 see data page: http://dmoserv3.bco-dmo.org/jg/serv/BCO-DMO/Dorado_Outcrop/AlvinLogAT26_... for location information

[table of contents | back to top]

Project Information

Discovery, sampling, and quantification of flows from cool yet massive ridge-flank hydrothermal springs on Dorado Outcrop, eastern Pacific Ocean (Dorado Outcrop)

Website: http://www.darkenergybiosphere.org/research/dorado.html

Coverage: Dorado Outcrop near Cocos Ridge (9N, 87W)

Description from NSF award abstract:
Pristine fluids from a typical ridge-flank hydrothermal system have never been sampled, mainly because it has not been possible to locate a site of focused discharge where representative samples could be collected. The PIs have located a small basement feature, Dorado outcrop, on 23 m.y.-old seafloor on the eastern flank of the East Pacific Rise that they plan to sample to determine the fluid composition, and to assess the rate of discharge from the outcrop, so that they can quantify the chemical impact of this hydrothermal system. They plan an 18-day expedition that combines the surveying capabilities of the AUV Sentry (bathymetric, sub-bottom sonar, photo mosaics, water column anomalies) and an ocean-class vessel capable of collecting high-quality multi-beam data and CTD samples, and supporting the survey and sampling capabilities of the ROV Jason II for collection of spring and plume fluids, heat flow data, sediment push cores, and still and video photography. These data and samples will be combined hopefully to generate the first well-constrained estimates of hydrothermal flows from Dorado outcrop. This expedition will result in the collection of samples and data from a "fire hose" of ridge-flank, hydrothermal system, challenging the commonly held view that discharge from ridge flank hydrothermal systems occurs primarily from diffuse seeps.

[table of contents | back to top]

Program Information

Center for Dark Energy Biosphere Investigations (C-DEBI)

Website: http://www.darkenergybiosphere.org

Coverage: Global

The mission of the Center for Dark Energy Biosphere Investigations (C-DEBI) is to explore life beneath the seafloor and make transformative discoveries that advance science, benefit society, and inspire people of all ages and origins.

C-DEBI provides a framework for a large, multi-disciplinary group of scientists to pursue fundamental questions about life deep in the sub-surface environment of Earth. The fundamental science questions of C-DEBI involve exploration and discovery, uncovering the processes that constrain the sub-surface biosphere below the oceans, and implications to the Earth system. What type of life exists in this deep biosphere, how much, and how is it distributed and dispersed? What are the physical-chemical conditions that promote or limit life? What are the important oxidation-reduction processes and are they unique or important to humankind? How does this biosphere influence global energy and material cycles, particularly the carbon cycle? Finally, can we discern how such life evolved in geological settings beneath the ocean floor, and how this might relate to ideas about the origin of life on our planet?

C-DEBI's scientific goals are pursued with a combination of approaches:
(1) coordinate, integrate, support, and extend the research associated with four major programs—Juan de Fuca Ridge flank (JdF), South Pacific Gyre (SPG), North Pond (NP), and Dorado Outcrop (DO)—and other field sites;
(2) make substantial investments of resources to support field, laboratory, analytical, and modeling studies of the deep subseafloor ecosystems;
(3) facilitate and encourage synthesis and thematic understanding of submarine microbiological processes, through funding of scientific and technical activities, coordination and hosting of meetings and workshops, and

support of (mostly junior) researchers and graduate students; and
(4) entrain, educate, inspire, and mentor an interdisciplinary community of researchers and educators, with an emphasis on undergraduate and graduate students and early-career scientists.

Note: Katrina Edwards was a former PI of C-DEBI; James Cowen is a former co-PI.

Data Management:
C-DEBI is committed to ensuring all the data generated are publically available and deposited in a data repository for long-term storage as stated in their Data Management Plan (PDF) and in compliance with the NSF Ocean Sciences Sample and Data Policy. The data types and products resulting from C-DEBI-supported research include a wide variety of geophysical, geological, geochemical, and biological information, in addition to education and outreach materials, technical documents, and samples. All data and information generated by C-DEBI-supported research projects are required to be made publically available either following publication of research results or within two (2) years of data generation.

To ensure preservation and dissemination of the diverse data-types generated, C-DEBI researchers are working with BCO-DMO Data Managers make data publicly available online. The partnership with BCO-DMO helps ensure that the C-DEBI data are discoverable and available for reuse. Some C-DEBI data is better served by specialized repositories (NCBI's GenBank for sequence data, for example) and, in those cases, BCO-DMO provides dataset documentation (metadata) that includes links to those external repositories.

[table of contents | back to top]

Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1130146
NSF Division of Ocean Sciences (NSF OCE)	OCE-1131210

[table of contents | back to top]