Porewater geochemistry (sulfate, methane, and DIC) from sediments of the White Oak River (WOR), NC, Station H in 2013 (SEDpep project)

Website: https://www.bco-dmo.org/dataset/640333
Data Type: Other Field Results
Version: 11 March 2016
Version Date: 2016-03-11

Project
» Novel peptidases in subsurface sediments: Activities and substrate specificities (SEDpep)

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

Contributors	Affiliation	Role
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Dataset Description

Porewater geochemistry (sulfate, methane, and DIC) from sediments of the White Oak River, NC, Station H, in three cores collected on 28 May 2013.

Methods & Sampling

Three sediment pushcores were collected manually from the White Oak River, Station H. Cores were transported to the Institute of Marine Sciences in Morehead City, NC, and sectioned at 3 cm intervals. Porewater was preserved for methane, sulfate, DIC, and cell count measurements as described in Lloyd et al (2011) Environmental Microbiology 13(9) 2548-2564.

Briefly, for cell counts: sediments were fixed with 3% formaldehyde for 4-5 hours at 2 degrees C, washed twice with PBS and stored at -20 degrees C in 1:1 PBS:ethanol for approximately two weeks before counting. For sulfate, 15-ml tubes filled with sediment were centrifuged. The resulting porewater was filtered at 0.2 um, acidified with 10% HCl, and sulfate was measured by ion chromatograph. For methane measurements, 3 ml of sediment was sampled immediately after sectioning using a cutoff syringe into the side of the core, and quickly added to 60 ml serum vials which had been preloaded with 1 ml 0.1 M KOH. These were immediately stoppered and crimp-sealed with butyl rubber stoppers and then shaken vigorously to equilibrate methane into the headspace. Headspace methane was then measured by gas chromatography. Porewater for DIC was preserved in sealed glass vials and measured by ion chromatography.

Data Processing Description

All porewater geochemical measurements were calibrated to known standards. Cell counts were calculated using standard formulas to account for the volume of sediment filtered, the area of the filter, and the area of the gridded field.

BCO-DMO processing:
- modified parameter names to conform with BCO-DMO naming conventions;
- replaced blanks (missing data) and "not measured" with "nd" (no data);
- added site name, lat, lon, and date from metadata form;
- converted original lat and lon provided to decimal degrees.

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Data Files

File
Porewater_Geochem_WOR.csv (Comma Separated Values (.csv), 8.31 KB) MD5:cbf78fb71969dcf25a767b3d3e0b0b36 Primary data file for dataset ID 640333

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Parameters

Parameter	Description	Units
site	Name of sampling site.	dimensionless
lat	Latitude of sampling site.	decimal degrees
lon	Longitude of sampling site.	decimal degrees
year	4-digit year of sampling.	YYYY
month	2-digit month of sampling.	mm (01 to 12)
day	2-digit day of month.	dd (01 to 31)
core	Core identifier.	dimensionless
depth_cmbsf	Core depth.	centimeters below seafloor (cmbsf)
porosity	Porosity.	?
CH4	Methane (CH4)	mM
SO4	Sulfate (SO4--)	mM
DIC	Dissolved inorganic carbon (DIC)	mM
cells	Cell count	cells per cubic cm (per cm-3)
cells_sd	Standard deviation of cells.	cells per cubic cm (per cm-3)

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Instruments

Dataset-specific Instrument Name	gas chromatograph
Generic Instrument Name	Gas Chromatograph
Dataset-specific Description	Headspace methane was measured by gas chromatography.
Generic Instrument Description	Instrument separating gases, volatile substances, or substances dissolved in a volatile solvent by transporting an inert gas through a column packed with a sorbent to a detector for assay. (from SeaDataNet, BODC)

Dataset-specific Instrument Name	ion chromatograph
Generic Instrument Name	Ion Chromatograph
Dataset-specific Description	Sulfate was measured by ion chromatograph. Porewater for DIC was preserved in sealed glass vials and measured by ion chromatography.
Generic Instrument Description	Ion chromatography is a form of liquid chromatography that measures concentrations of ionic species by separating them based on their interaction with a resin. Ionic species separate differently depending on species type and size. Ion chromatographs are able to measure concentrations of major anions, such as fluoride, chloride, nitrate, nitrite, and sulfate, as well as major cations such as lithium, sodium, ammonium, potassium, calcium, and magnesium in the parts-per-billion (ppb) range. (from http://serc.carleton.edu/microbelife/research_methods/biogeochemical/ic....)

Dataset-specific Instrument Name	
Generic Instrument Name	Push Corer
Dataset-specific Description	Three sediment pushcores were collected manually from the White Oak River, Station H. Cores were transported to the Institute of Marine Sciences in Morehead City, NC, and sectioned at 3 cm intervals.
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/

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Deployments

WOR_2013

Website	https://www.bco-dmo.org/deployment/640354
Platform	White Oak River Station H
Start Date	2013-05-28
End Date	2013-05-28

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Project Information

Novel peptidases in subsurface sediments: Activities and substrate specificities (SEDpep)

Coverage: White Oak River Station H, (34 44.490'N, 77 07.44W); Tennessee River at Knoxville TN (Volunteer Landing Dock), and Bogue Sound at the Institute of Marine Sciences dock, Morehead City, NC.

Description from C-DEBI:
The goal of this project was to explore the mechanisms of subsurface organoheterotrophy by identifying the range of extracellular peptidases present in sediments of the White Oak River, NC, consistent with C-DEBI Research Theme 1, Activity in the Deep Subseafloor Biosphere: function & rates of global biogeochemical processes. This grant funded two sampling expeditions to the White Oak River as well as extensive laboratory work with a purified peptidase that was supplied by collaborators Andrzej Joachimiak and Karolina Michalska of Argonne National Laboratory and preparatory work on peptidases of the Tennessee River. So far this dataset has led to the submission of two manuscripts, with one more manuscript in preparation. The White Oak River work showed that a wide range of peptidases are present in depths up to 80 cm in the White Oak River, which is deeper than the zone of methanogenesis. Although absolute peptidase activities declined with depth, activities normalized to cell abundance were roughly constant, and activities normalized to organic carbon oxidation rates increased nearly two orders of magnitude relative to the surface, indicating that extracellular peptidases were important to the subsurface ecosystem. Biochemical analysis of a purified peptidase that was expressed by the Argonne group showed it to be a novel aminopeptidase with specificity for N-terminal cysteine, a function not previously observed in peptidses. In summary, *in situ* and *in vitro* studies of subsurface peptidases revealed that they are ecologically important and may contain novel properties.

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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.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-0939564

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