Porewater sulfate and sulfide concentrations in Alvin pushcore samples collected from Guaymas Basin hydrothermal vents during R/V Atlantis cruise AT42-05 in November 2018 and analyzed at UNC Chapel Hill

Website: https://www.bco-dmo.org/dataset/816852
Data Type: Cruise Results
Version: 1
Version Date: 2020-06-26

Project
» Collaborative Research: Hydrothermal Fungi in the Guaymas Basin Hydrocarbon Ecosystem (HOTFUN)

Contributors	Affiliation	Role
Teske, Andreas	University of North Carolina at Chapel Hill (UNC-Chapel Hill)	Principal Investigator
Edgcomb, Virginia P.	Woods Hole Oceanographic Institution (WHOI)	Co-Principal Investigator
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Abstract
Porewater sulfate and sulfide concentrations in Alvin pushcore samples collected from Guaymas Basin hydrothermal vents during R/V Atlantis cruise AT42-05 in November 2018. This dataset was obtained at the University of North Carolina Chapel Hill.

Table of Contents

Coverage

Spatial Extent: **N**:27.0118 **E**:-111.4039 **S**:27.0011 **W**:-111.4073
Temporal Extent: 2018-11-17 - 2018-11-26

Dataset Description

Porewater sulfate and sulfide concentrations in Alvin pushcore samples collected from Guaymas Basin hydrothermal vents during R/V Atlantis cruise AT42-05 in November 2018. This dataset was obtained at the University of North Carolina Chapel Hill.

Porewater sulfate and sulfide samples from this cruise were also analyzed at the Max Planck Institute for Marine Microbiology. See related dataset: https://www.bco-dmo.org/dataset/816549 (MPI)

Methods & Sampling

This porewater dataset was obtained by Chris Chambers at the University of North Carolina Chapel Hill. The sampling site names in the data are based on Teske et al. 2016.

For analysis at UNC (Chris Chambers), porewater was obtained from freshly collected sediment push cores on R/V Atlantis. The sediment cores were sampled in 3 cm intervals; ca. 40 ml sediment samples were centrifuged in 50 ml conical Falcon tubes for 5 to 10 minutes at approx. 1000 g, until the sediment had settled and produced ca. 8 to 10 ml of porewater. The sediment interval depths are given in the dataset (Sediment_depth). For porewater sulfide analysis, 1 ml porewater subsamples were drawn into syringes, filtered immediately through 0.45 µm filters, and placed in Eppendorf sample vials each containing 0.1 ml of 0.1 M zinc acetate solution to preserve the sulfide as zinc sulfide until analyzed. Sulfide was quantified spectrophotometrically at UNC-Chapel Hill using the methylene blue method (Cline 1969). For sulfate analysis, 1 ml porewater samples were acidified with 50 microliters of 1 N HCl, and bubbled with N2 for 1 minute to remove hydrogen sulfide. After returning the samples to the home laboratory, sulfate concentrations were determined using the ion chromatograph of the UNC Environmental Program.

Problem report: Transport problems have caused sample losses among the porewater samples, which are evident in occasional gaps in porewater profiles.

Data Processing Description

BCO-DMO Processing:
- added columns for Site, Sample_type, Lat, Lon, Date, Dive, Core, and Water_depth fields from header rows;
- renamed fields;
- removed commas in Site and Sample_type columns.

[table of contents | back to top]

Data Files

File
UNC_porewater.csv (Comma Separated Values (.csv), 6.93 KB) MD5:c7f8f8823b1c691ac13ec516d6bf8b86 Primary data file for dataset ID 816852

[table of contents | back to top]

Parameters

Parameter	Description	Units
Site	Site name	unitless
Sample_type	Description of sample	unitless
Lat	Site latitude; positive values = North	decimal degrees North
Lon	Site longitude; positive values = East	decimal degrees East
Water_depth	Depth of the water	meters
Date	Date of sampling; format: YYYY-MM-DD	unitless
Dive	Dive ID number	unitless
Core	Core ID number	unitless
Sediment_depth	Sample depth within the core	centimeters
Sulfate	Sulfate	millimolar (mM)
Sulfide	Sulfide	millimolar (mM)

[table of contents | back to top]

Instruments

Dataset-specific Instrument Name	Alivn pushcore
Generic Instrument Name	Alvin tube core
Generic Instrument Description	A plastic tube, about 40 cm (16 inches) long, is pushed into the sediment by Alvin's manipulator arm to collect a sediment core.

Dataset-specific Instrument Name	
Generic Instrument Name	Ion Chromatograph
Dataset-specific Description	Sulfate concentrations were determined using the ion chromatograph of the UNC Environmental Program.
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	Spectrophotometer
Dataset-specific Description	Sulfide was quantified spectrophotometrically at UNC-Chapel Hill.
Generic Instrument Description	An instrument used to measure the relative absorption of electromagnetic radiation of different wavelengths in the near infra-red, visible and ultraviolet wavebands by samples.

[table of contents | back to top]

Deployments

AT42-05

Website	https://www.bco-dmo.org/deployment/773347
Platform	R/V Atlantis
Start Date	2018-11-15
End Date	2018-11-29
Description	Alvin dives to hydrothermal vent area.

AT42-05_Alvin_Dives

Website	https://www.bco-dmo.org/deployment/773374
Platform	Alvin
Start Date	2018-11-17
End Date	2018-11-25
Description	Alvin dives 4991-5001at Guaymas Basin

[table of contents | back to top]

Project Information

Collaborative Research: Hydrothermal Fungi in the Guaymas Basin Hydrocarbon Ecosystem (HOTFUN)

Coverage: Guaymas Basin, Gulf of CA, Mexico

NSF Award Abstract:
Fungi that can derive energy from chemicals, yet consume other organisms or organic material to obtain carbon have been reported from diverse marine subsurface samples, including from hundreds of meters below the seafloor. Evidence exists that Fungi are active in subsurface marine sediments globally, yet there is a dearth of knowledge on their role in the marine subsurface, and specifically on their role(s) in hydrocarbon degradation within deep-sea sediments. This team is isolating a broad collection of environmentally relevant filamentous Fungi and yeasts from hydrothermally-influenced and hydrocarbon-rich seep sediments of Guaymas Basin using high-throughput culture-based approaches. They aim to reveal the diversity of Fungi and Bacteria in these hydrothermal sediments, how temperature and hydrocarbon composition shape their distribution, and how Fungi cooperate to enhance the degradation of hydrocarbons by Bacteria. By hosting six undergraduates through the WHOI Summer Student Fellows program and the Woods Hole Partnership Education Program, the project contributes to increasing diversity in marine science by offering opportunities for promising undergraduates from disadvantaged populations. High school students are involved in summer projects and in intensive summer workshops. One postdoc, a graduate student, and two Research Associates are supported, and international collaborations are strengthened. The postdoc and graduate student are gaining valuable cruise-based experience. An e-lecture on Fungi and their role(s) in biodegradation of hydrocarbons will be made publicly available by the end of the project. Fungal isolates with accompanying information will be secured in a reference culture collection for long-term storage and are available to any interested researcher throughout the project.

The PIs are isolating a broad collection of environmentally relevant filamentous Fungi and yeasts from hydrothermally-influenced and hydrocarbon-rich seep sediments of Guaymas Basin using high-throughput culture-based approaches, with the aim to reveal their ability to degrade individual hydrocarbons under in situ pressures and temperatures. Culture independent methods marker gene analyses are used to characterize in situ fungal and bacterial diversity and to examine how temperature and hydrocarbon composition shape fungal community composition and distribution. Traditional and comprehensive two-dimensional gas chromatographic analyses are used to examine the complexities and subtle changes in inventories of hydrocarbons within sediment cores, and provide evidence for in situ microbial alteration of individual hydrocarbons. Incubation experiments are used to test the ability of fungal isolates to utilize different hydrocarbons as a sole or auxiliary carbon source under in situ pressures and temperatures and their ability to stimulate biodegradation of hydrocarbons by hydrocarbon-degrading bacteria. Expressed genes within these incubation studies tell us how Fungi and Bacteria couple metabolisms to increase overall specificity and extent of biodegradation of hydrocarbons.

This award reflects NSF's statutory mission and has been deemed worthy of support through evaluation using the Foundation's intellectual merit and broader impacts review criteria.

[table of contents | back to top]

Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1829680

[table of contents | back to top]