Porewater hydrocarbon concentrations in Alvin pushcore samples from Guaymas Basin hydrothermal vents, RV/Atlantis cruise AT42-05, Nov. 2018

Website: https://www.bco-dmo.org/dataset/773288
Data Type: Cruise Results
Version: 1
Version Date: 2019-07-15

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

Contributors	Affiliation	Role
Edgcomb, Virginia P.	Woods Hole Oceanographic Institution (WHOI)	Principal Investigator
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Abstract
Porewater hydrocarbon concentrations in Alvin pushcore samples from Guaymas Basin hydrothermal vents, RV/Atlantis cruise AT42-05, Nov. 2018.

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Coverage

Spatial Extent: **N**:27.0116 **E**:-111.4044 **S**:27.0078 **W**:-111.4071
Temporal Extent: 2018-11-17 - 2018-11-25

Dataset Description

This dataset includes porewater hydrocarbon concentrations from samples collected using Alvin pushcores at Guaymas Basin hydrothermal vents, RV/Atlantis cruise AT42-05, Nov. 2018.

Acquisition Description

Alvin pushcores dedicated to hydrocarbon analyses were sectioned to recover the 0-6cm, 6-12, and 12-

18cm fractions, or the 0-10, 10-20, and 20-30cm fractions. 7 ml of sediment from each horizon was sampled for methane analysis. The samples were collected at 10 ml serum vials and treated with 2.8 ml of NaOH 1M. The serum vials were sealed with black stoppers and stored inverted at -20 degrees C. The remaining sediment from each horizon (~40ml of sample) was aliquoted into two 50 ml Falcon tubes and was centrifuged at 3000 rpm for 15 minutes to separate porewater from the sediment. After centrifugation, the porewater was filtered through sterile syringe cellulose 0.45micron filters. 20 ml of the porewater was collected into 20 ml serum vials for saturated hydrocarbons, polycyclic aromatic hydrocarbons (PAH) and alkane analysis and stored at 4 degrees C. The sediment cake from each horizon was kept and stored at 4 degrees C for hydrocarbons, polycyclic aromatic hydrocarbons (PAH) and alkane analysis.

All hydrocarbon analyses were performed at Alpha Analytical Labs, Mansfield MA.

Processing Description

BCO-DMO Processing Notes:
- added conventional header with dataset name, PI name, version date
- modified parameter names to conform with BCO-DMO naming conventions and match porewater nutrients dataset
- added columns for EPA_method and sample_type
- moved header columns to separate dataset "hydrocarbon_sample_log"
- removed blank rows

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Related Publications

Standard Methods for the Examination of Water and Wastewater. ALPHA-AWWA-WEF. Standard Methods Online. https://www.standardmethods.org/
Methods

Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I-IV, 2007. https://www.epa.gov/hw-sw846/sw-846-compendium
Methods

U.S. EPA. (2003) METHOD 8270D SEMIVOLATILE ORGANIC COMPOUNDS BY GAS CHROMATOGRAPHY/MASS SPECTROMETRY (GC/MS). https://www.epa.gov/sites/production/files/2015-07/documents/epa-8270d.pdf
Methods

U.S. EPA. (2003) Method 8015D (SW-846): Nonhalogenated Organics Using GC/FID, Revision 4. Washington, DC. https://www.epa.gov/sites/production/files/2015-12/documents/8015d_r4.pdf
Methods

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Parameters

Parameter	Description	Units
EPA_method	Methods used for the analysis; from EPS publication	unitless
sample_type	type of sample: pore water or sediment	unitless
units	units for the concentrations of each	unitless

hydrocarbon	name of organic compound	unitless
core7_0_6cm	concentration of hydrocarbon in sample 'Core 7 0-6cm'	nanograms/liter (ng/l) or milligrams/liter (mg/l)
core7_6_12cm	concentration of hydrocarbon in sample 'Core 7 6-12cm'	nanograms/liter (ng/l) or milligrams/liter (mg/l)
core7_12_18cm	concentration of hydrocarbon in sample 'Core 7 12-18cm'	nanograms/liter (ng/l) or milligrams/liter (mg/l)
core35_10_10cm	concentration of hydrocarbon in sample 'Core 35 10-10cm'	nanograms/liter (ng/l) or milligrams/liter (mg/l)
core35_10_20cm	concentration of hydrocarbon in sample 'Core 35 10-20cm'	nanograms/liter (ng/l) or milligrams/liter (mg/l)
core35_20_30cm	concentration of hydrocarbon in sample 'Core 35 20-30cm'	nanograms/liter (ng/l) or milligrams/liter (mg/l)
core41_0_10cm	concentration of hydrocarbon in sample 'Core 41 0-10cm'	nanograms/liter (ng/l) or milligrams/liter (mg/l)
core41_10_20cm	concentration of hydrocarbon in sample 'Core 41 10-20cm'	nanograms/liter (ng/l) or milligrams/liter (mg/l)
core41_20_30cm	concentration of hydrocarbon in sample 'Core 41 20-30cm'	nanograms/liter (ng/l) or milligrams/liter (mg/l)
core24_0_10cm	concentration of hydrocarbon in sample 'Core 24 0-10cm'	nanograms/liter (ng/l) or milligrams/liter (mg/l)
core24_0_20cm	concentration of hydrocarbon in sample 'Core 24 0-20cm'	nanograms/liter (ng/l) or milligrams/liter (mg/l)
core5_10_7cm	concentration of hydrocarbon in sample 'Core 5 10-7cm'	nanograms/liter (ng/l) or milligrams/liter (mg/l)
core5_17_14cm	concentration of hydrocarbon in sample 'Core 5 17-14cm'	nanograms/liter (ng/l) or milligrams/liter (mg/l)
core5_14_21cm	concentration of hydrocarbon in sample 'Core 5 14-21cm'	nanograms/liter (ng/l) or milligrams/liter (mg/l)
core15_0_7cm	concentration of hydrocarbon in sample 'Core 15 0-7cm'	nanograms/liter (ng/l) or milligrams/liter (mg/l)
core15_7_14cm	concentration of hydrocarbon in sample 'Core 15 7-14cm'	nanograms/liter (ng/l) or milligrams/liter (mg/l)
core15_14_21cm	concentration of hydrocarbon in sample 'Core 15 14-21cm'	nanograms/liter (ng/l) or milligrams/liter (mg/l)
core20_0_10cm	concentration of hydrocarbon in sample 'Core 20 0-10cm'	nanograms/liter (ng/l) or milligrams/liter (mg/l)
core20_10_20cm	concentration of hydrocarbon in sample 'Core 20 10-20cm'	nanograms/liter (ng/l) or milligrams/liter (mg/l)
core20_20_30cm	concentration of hydrocarbon in sample 'Core 20 20-30cm'	nanograms/liter (ng/l) or milligrams/liter (mg/l)
core8_0_7cm_A	concentration of hydrocarbon in sample 'Core 8 0-7cm' from dive 4999	nanograms/liter (ng/l) or milligrams/liter (mg/l)
core8_7_14cm_A	concentration of hydrocarbon in sample 'Core 8 7-14cm' from dive 4999	nanograms/liter (ng/l) or milligrams/liter (mg/l)

core8_14_21cm_A	concentration of hydrocarbon in sample 'Core 8 14-21cm' from dive 4999	nanograms/liter (ng/l) or milligrams/liter (mg/l)
core8_0_7cm_B	concentration of hydrocarbon in sample 'Core 8 0-7cm' from dive 5000	nanograms/liter (ng/l) or milligrams/liter (mg/l)
core8_7_14cm_B	concentration of hydrocarbon in sample 'Core 8 7-14cm'	nanograms/liter (ng/l) or milligrams/liter (mg/l)
core8_14_21cm_B	concentration of hydrocarbon in sample 'Core 8 14-21cm'	nanograms/liter (ng/l) or milligrams/liter (mg/l)

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Instruments

Dataset-specific Instrument Name	
Generic Instrument Name	Gas Chromatograph
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	
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
Dataset-specific Description	Used to collect sediment samples
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

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

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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.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1829903

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