

Sediment delta-13C methane and concentrations from pushcore samples collected at Guaymas Basin hydrothermal vents via Alvin dives on RV/Atlantis cruise AT42-05, Nov. 2018

Website: <https://www.bco-dmo.org/dataset/825169>

Data Type: Cruise Results

Version: 1

Version Date: 2020-09-21

Project

» [Collaborative Research: Hydrothermal Fungi in the Guaymas Basin Hydrocarbon Ecosystem](#) (HOTFUN)

Contributors	Affiliation	Role
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Abstract

Sediment delta-13C methane and concentrations from pushcore samples collected at Guaymas Basin hydrothermal vents via Alvin dives on RV/Atlantis cruise AT42-05, Nov. 2018.

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Coverage

Spatial Extent: N:27.01267 E:-111.405 S:27.00783 W:-111.40712

Temporal Extent: 2018-11-17 - 2018-11-30

Dataset Description

Sediment delta-13C methane and concentrations from pushcore samples collected at Guaymas Basin hydrothermal vents via Alvin dives on RV/Atlantis cruise AT42-05, Nov. 2018.

Acquisition Description

Alvin pushcores dedicated to hydrocarbon and methane 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 concentration and isotopic ¹³C 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 -20oC

Processing Description

BCO-DMO Processing:

- data submitted in Excel files "DATASET_HOTFUN_13C_methane.xlsx" and "DATASET_HOTFUN_methane concentrations.xlsx" were joined and extracted to csv
- added conventional header with dataset name, PI name, version date
- modified parameter names to conform with BCO-DMO naming conventions
- converted date from mm-ddd-yy to yyyy-mm-dd
- split lat and lon into separate columns and converted from degrees decimal minutes to decimal degrees
- removed extra hyphen from Sample_ID 617-14 for consistency and joining

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Parameters

Parameter	Description	Units
Site	sampling site	unitless
lat	latitude; north is positive	decimal degrees
lon	longitude; east is postivie	decimal degrees
Sampling_Date	sampling date (UTC); formatted as yyyy-mm-dd	unitless
Alvin_Dive	Alvin dive number	unitless
core	Alvin pushcore identifier	unitless
Sample_ID	sample identifier	unitless
methane_conc	methane concentration	mmol/ul/gr of wet sediment
methane_conc_stdev	methane concentration standard deviation	mmol/ul/gr of wet sediment
d13C_CH4	¹³ C to ¹² C ratio of methane	per mil (o/oo)
d13C_CH4_stdev	¹³ C to ¹² C ratio of methane standard deviation	per mil (o/oo)

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Instruments

Dataset-specific Instrument Name	Thermo Finnigan Delta plusXL Isotope Ratio Mass Spectrometer
Generic Instrument Name	Isotope-ratio Mass Spectrometer
Dataset-specific Description	Used to measure carbon isotopes.
Generic Instrument Description	The Isotope-ratio Mass Spectrometer is a particular type of mass spectrometer used to measure the relative abundance of isotopes in a given sample (e.g. VG Prism II Isotope Ratio Mass-Spectrometer).

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	Agilent 6890 gas chromatograph and an Hewlett Packard 5890 gas chromatograph with an FID detector
Generic Instrument Name	Gas Chromatograph
Dataset-specific Description	Used to measure carbon isotopes (Agilent) and to measure methane concentrations (HP 5890)
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)

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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-1829680

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