Stable Isotope Data for Invertebrates Collected from Southern California Seeps in May and August 2021

Website: https://www.bco-dmo.org/dataset/877823
Data Type: Cruise Results
Version: 1
Version Date: 2022-08-11

Project
» Collaborative Research: Redefining the footprint of deep ocean methane seepage for benthic ecosystems (Methanosphere)

Contributors	Affiliation	Role
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Abstract
This dataset provides C and N stable isotope data for invertebrates collected by ROV from the Western Flyer 0521 (May 2021) at the Del Mar and Santa Monica Seeps and the Falkor 210726 in August 2021 at Lasuen Seep. There are also POC/PON data for one surface and one near bottom water sample collected by CTD. δ13C and δ15N measurements were made on 0.2-4 mg dry-weight samples combusted using an elemental analyzer interfaced to a continuous flow isotope ratio mass spectrometer at the Stable Isotope Facility at the University of California, Davis (SIF-UCD).

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Coverage

Spatial Extent: **N**:35.9 **E**:-117.766667 **S**:33.388589 **W**:-118.007
Temporal Extent: 2021-05-19 - 2021-08-02

Methods & Sampling

Carbon and nitrogen stable isotope data for invertebrates were collected by ROV from the R/V Western Flyer 0521 (May 2021) at the Del Mar Seep (35.9°N, -117.766667°E) and Santa Monica Seep (33.799438°N, -118.64672°E) and from the R/V Falkor 210726 in August 2021 at Lasuen Seep (33.388589°N, -118.007°E). There are also POC/PON data for one surface and one near bottom water sample collected by CTD.

Sampling was performed by ROV manipulator, collecting rocks, pushcores, and slurps. Tissue samples for isotope analysis were preserved frozen.

Data Processing Description

Data Processing:
δ13C and δ15N measurements were made on 0.2-4 mg dry-weight samples combusted using an elemental analyzer interfaced to a continuous flow isotope ratio mass spectrometer at the Stable Isotope Facility at the University of California, Davis (SIF-UCD).

BCO-DMO Processing:
- Converted dates to format YYYY-MM-DD
- Adjusted field/parameter names to comply with BCO-DMO naming conventions
- Missing data identifier "NA" replaced with "nd" (BCO-DMO's default missing data identifier)
- Added a conventional header with dataset name, PI names, version date

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Data Files

File
stable_isotope_data_set_1_southern_california_seeps-1.csv (Comma Separated Values (.csv), 6.40 KB) MD5:c2f68217f212e7ce440ed8b4333df301 Primary data file for dataset ID 877823

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Parameters

Parameter	Description	Units
Cruise	Number of the cruise	unitless
Date	Date of the collection in format YYYY-MM-DD	unitless
Dive_No	Number of the ROV dive	unitless
Station	Name of the station	unitless
Depth	Depth of collection	meters (m)
Sample_Type	Sample type (e.g. rock or pushcore)	unitless
Sample_No	Number of the sample	unitless
Ship_ID	Log number of each sample in the ship numbering system	unitless
Habitat	Seepage activity of sample location	unitless
Taxon_ID	Taxonomic identification of the sample	unitless
d13C	d13C value of the sample	Per mil (‰)
d15N	d15N value of the sample	Per mil (‰)

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Instruments

Dataset-specific Instrument Name	
Generic Instrument Name	Elemental Analyzer
Dataset-specific Description	Elemental analyzer interfaced to a continuous flow isotope ratio mass.
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	
Generic Instrument Name	ROV Doc Ricketts
Generic Instrument Description	The remotely operated vehicle (ROV) Doc Ricketts is operated by the Monterey Bay Aquarium Research Institute (MBARI). ROV Doc Ricketts is capable of diving to 4000 meters (about 2.5 miles). The R/V Western Flyer is the support vessel for Doc Ricketts and was designed with a center well whose floor can be opened to allow Doc Ricketts to be launched from within the ship into the water below. For a complete description, see: https://www.mbari.org/at-sea/vehicles/remotely-operated-vehicles/rov-doc...

Dataset-specific Instrument Name	
Generic Instrument Name	ROV SuBastian
Generic Instrument Description	ROV SuBastian is operated from the research vessel Falkor and the R/V Falkor(too). The ROV is outfitted with a suite of sensors and scientific equipment to support scientific data and sample collection, as well as interactive research, experimentation, and technology development. More information available at https://schmidtocean.org/technology/robotic-platforms/4500-m-remotely-op...

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Deployments

FK210726

Website	https://www.bco-dmo.org/deployment/877835
Platform	R/V Falkor
Start Date	2021-07-26
End Date	2021-08-06

WF05-21

Website	https://www.bco-dmo.org/deployment/877837
Platform	R/V Western Flyer
Start Date	2021-05-19
End Date	2021-05-22

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Project Information

Collaborative Research: Redefining the footprint of deep ocean methane seepage for benthic ecosystems (Methanosphere)

Coverage: Gulf of Alaska and Southern California Bight

NSF Award Abstract:
This research examines the role of deep-sea organisms in determining the fate and footprint of methane, a potent greenhouse gas, on Pacific continental margins. The investigators are evaluating the deep ocean methanosphere defined by the microbial communities that consume methane and the animals that directly feed on or form symbioses with methane-consuming microbes. They are also investigating animal communities that gain energy indirectly from methane, as well as those that take advantage of carbonate rocks, the physical manifestation of methane consumption in seafloor sediments. The study of methane seeps in the deep waters of both Alaska (4400-5500 meters) and Southern California (450-1040 meters) is enabling comparisons of the methanosphere under different food-limitation and oxygen regimes. By applying diverse chemical, isotopic, microscopy, and genetic-based analyses to seep microbes and fauna, this study is advancing understanding of the contribution of methane to deep-sea biodiversity and ecosystem function, information that can inform management and conservation actions in US waters. In addition to training for graduate and undergraduate students at their home institutions, the investigators are collaborating with the Alaska Native Science and Engineering Program (ANSEP). They are recruiting Alaskan undergraduates to participate in the research, contributing to ANSEP's online resources that promote interaction between scientists and middle and high school students, and participating in ANSEP's annual residential Career Exploration in Marine Science programs to engage middle school students in learning about deep-sea ecosystems and the variety of career pathways available in marine related fields.

Microbial production and consumption of methane is dynamic and widespread along continental margins, and some animals within deep-sea methane seeps rely on the oxidation and sequestration of methane for nutrition. At the same time, understanding of methane-dependent processes and symbioses in the deep-sea environment is still rudimentary. The goals of this study are to 1) examine the diversity of animals involved in methane-based symbioses and heterotrophic consumption of methane-oxidizing microbes and how these symbioses extend the periphery of seeps, contributing to non-seep, continental slope food webs; and 2) determine whether carbonates on the seep periphery sustain active methanotrophic microbial assemblages, providing a localized food source or chemical fuel for thiotrophic symbioses, via anaerobic oxidation of methane, or free-living, sulfide-oxidizing bacteria consumed by animals. The investigators are addressing these goals by surveying, sampling, and characterizing microbes, water, sediments, carbonates and animals at a deep seep site on the Aleutian Margin and a shallow site off Southern California. Shipboard experiments and laboratory analyses are using molecular, isotopic, geochemical, and radiotracer tools to understand transfer of methane-sourced carbon from aerobic methanotrophs under multiple oxygen levels, pressures, and photosynthetic food inputs. This approach offers a wide lens by which to examine the methane seep footprint, allow reinterpretation of past observations, and identify new scientific areas for future study. Improved characterization of the deep continental margin methanosphere informs climate science, biodiversity conservation, and resource management.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-2048481
NSF Division of Ocean Sciences (NSF OCE)	OCE-2048666
NSF Division of Ocean Sciences (NSF OCE)	OCE-2048720

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