

# Acetate and methanol turnover rates from sediment push cores collected during HOV Alvin dives during the R/V Atlantis cruise AT37-06 in Guaymas Basin, Gulf of California in December 2016

**Website:** <https://www.bco-dmo.org/dataset/814406>

**Data Type:** Cruise Results

**Version:** 1

**Version Date:** 2020-06-04

## Project

» [Collaborative Research: Microbial Carbon cycling and its interactions with Sulfur and Nitrogen transformations in Guaymas Basin hydrothermal sediments](#) (Guaymas Basin Interactions)

Contributors	Affiliation	Role
<a href="#">Joye, Samantha B.</a>	University of Georgia (UGA)	Principal Investigator
<a href="#">Teske, Andreas P.</a>	University of North Carolina at Chapel Hill (UNC-Chapel Hill)	Co-Principal Investigator
<a href="#">York, Amber D.</a>	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

## Abstract

Acetate and methanol turnover rates from sediment push cores obtained using the human-occupied deep-diving vehicle (HOV) Alvin dives 4867-4872 during the R/V Atlantis cruise AT37-06 in Guaymas Basin, Gulf of California (27 00.00 N, -111 20.00 W) in December 2016. These data were published in (Zhuang et al., 2018).

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## Coverage

**Spatial Extent:** N:27.46667 E:-111.38417 S:27.00733 W:-111.47317

**Temporal Extent:** 2016-12-18 - 2016-12-24

## Acquisition Description

Methodology:

Sediment samples were collected from hydrothermal areas of Guaymas Basin in the Gulf of California during cruise AT3706 of R/V Atlantis in December 2016. Push cores were obtained using the human-occupied deep diving vehicle Alvin during dives 4867 to 4872. Porewater was extracted from the sediment

by centrifugation and then filtered through a 0.2 µm syringe filter. For rate measurements, approximately 3 mL of live sediment was transferred into a modified Hungate tube as described previously (Bowles et al., 2011). At each depth, triplicate live samples and one killed control were collected for the quantification of acetate and methanol turnover rates. The details of the rate measurements can be found in Zhuang et al. (2018).

Instruments:

Methanol and ethanol in the porewater were quantified with a purge and trap system connected to a GC-FID (SRI) (Zhuang et al., 2018).

Issues of note: Due to the limited volume of porewaters, methanol and ethanol were not determined for most of the samples collected from Dives 4867 to Dive 4870.

Missing data identifiers:

\* B.D.: Below detection limit.

\* nd □ Not determined. nd is the default missing data identifier in the BCO-DMO data system.

## Processing Description

BCO-DMO Data Manager Processing Notes:

\* Data submitted in Excel file "Data submission OCE.xlsx" sheet "Rate" extracted to csv

\* added a conventional header with dataset name, PI name, version date

\* modified parameter names to conform with BCO-DMO naming conventions (spaces, +, and - changed to underscores). Units in parentheses removed and added to Parameter Description metadata section.

\* The default missing identifier in the original file N.D. for "not determined" is displayed as "nd" in the data. nd is the default missing data identifier in the BCO-DMO system.

\* removed metadata notes at the bottom of the file and moved to parameter descriptions. E.g. "B.D.: Below detection limit."

\* Date formats converted to ISO 8601 yyyy-mm-dd

\* Lat/Ion converted to decimal degrees from degrees decimal minutes

\* values rounded to integer instead of the scientific notation for `_time_to_` columns which have units of days. (Acetate\_turnover\_time\_to\_methane, Actate\_turnover\_to\_CO2, Methanol\_turnover\_time\_to\_methane, Methanol\_turnover\_to\_CO2)

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## Related Datasets

### IsRelatedTo

Joye, S. B., Teske, A. P. (2020) **Results from inhibition experiments conducted using sediment samples from push cores obtained using HOV Alvin dive 4869 during the R/V Atlantis cruise AT37-06 in Guaymas Basin, Gulf of California in December 2016.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2020-06-04 <http://lod.bco-dmo.org/id/dataset/814415> [[view at BCO-DMO](#)]

*Relationship Description: Related Datasets which used the same sediment core samples.*

Joye, S. B., Teske, A. P. (2020) **Sediment geochemistry from push cores collected during HOV Alvin dives during the R/V Atlantis cruise AT37-06 in Guaymas Basin, Gulf of California in December 2016.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2020-07-21 <http://lod.bco-dmo.org/id/dataset/814391> [[view at BCO-DMO](#)]

*Relationship Description: Related Datasets which used the same sediment core samples.*

Joye, S. B., Teske, A. P. (2020) **Sediment geochemistry summary from push cores collected during**

**HOV Alvin dives during the R/V Atlantis cruise AT37-06 in the Guaymas Basin from December 2016.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2020-07-21 <http://lod.bco-dmo.org/id/dataset/819127> [[view at BCO-DMO](#)]

*Relationship Description: Related Datasets which used the same sediment core samples.*

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## Parameters

Parameter	Description	Units
Dive_No	Dive number	unitless
Site	Site name	unitless
Sampling_date	Sample date (UTC) in ISO 8601 format yyyy-mm-dd	unitless
Latitude	Latitude	decimal degrees
Longitude	Longitude	decimal degrees
Depth	Sediment sampling depth	centimeters (cm)
Incubation_T	Incubation temperature	degrees Celsius
Acetate_methanogenesis_rate	Methanogenesis rate from acetate measured with radiotracers	picomoles per cubic centimeter per day (pmol cm <sup>-3</sup> d <sup>-1</sup> )
Acetate_turnover_time_to_methane	The turnover time acetate to methane measured with radiotracers	days
Acetate_Oxidation_rate	Acetate oxidation rate measured with radiotracers	picomoles per cubic centimeter per day (pmol cm <sup>-3</sup> d <sup>-1</sup> )
Acetate_turnover_to_CO2	The turnover time of acetate to CO2 measured with radiotracers	days
Methanol_methanogenesis_rate	Methanogenesis rate from methanol measured with radiotracers	picomoles per cubic centimeter per day (pmol cm <sup>-3</sup> d <sup>-1</sup> )
Methanol_turnover_time_to_methane	The turnover time methanol to methane measured with radiotracers	days
Methanol_Oxidation_rate	Methanol oxidation rate measured with radiotracers	picomoles per cubic centimeter per day (pmol cm <sup>-3</sup> d <sup>-1</sup> )
Methanol_turnover_to_CO2	The turnover time of methanol to CO2 measured with radiotracers	days

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## Deployments

**AT37-06**

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/720354">https://www.bco-dmo.org/deployment/720354</a>
<b>Platform</b>	R/V Atlantis
<b>Report</b>	<a href="https://datadocs.bco-dmo.org/d3/data_docs/GuaymasBasin_Interactions/AT37-06_CruiseReport.pdf">https://datadocs.bco-dmo.org/d3/data_docs/GuaymasBasin_Interactions/AT37-06_CruiseReport.pdf</a>
<b>Start Date</b>	2016-12-09
<b>End Date</b>	2016-12-27

### AT37-06\_Alvin\_Dives

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/782870">https://www.bco-dmo.org/deployment/782870</a>
<b>Platform</b>	Alvin
<b>Report</b>	<a href="https://datadocs.bco-dmo.org/d3/data_docs/GuaymasBasin_Interactions/AT37-06_CruiseReport.pdf">https://datadocs.bco-dmo.org/d3/data_docs/GuaymasBasin_Interactions/AT37-06_CruiseReport.pdf</a>
<b>Start Date</b>	2016-12-09
<b>End Date</b>	2016-12-27
<b>Description</b>	Alvin dives conducted at Guaymas Basin on R/V Atlantis cruise AT37-06.

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## Project Information

### **Collaborative Research: Microbial Carbon cycling and its interactions with Sulfur and Nitrogen transformations in Guaymas Basin hydrothermal sediments (Guaymas Basin Interactions)**

**Coverage:** Guaymas Basin, Gulf of California, 27.00 N, 111.00W

#### *Description from NSF award abstract:*

Hydrothermally active sediments in the Guaymas Basin are dominated by novel microbial communities that catalyze important biogeochemical processes in these seafloor ecosystems. This project will investigate genomic potential, physiological capabilities and biogeochemical roles of key uncultured organisms from Guaymas sediments, especially the high-temperature anaerobic methane oxidizers that occur specifically in hydrothermally active sediments (ANME-1Guaymas). The study will focus on their role in carbon transformations, but also explore their potential involvement in sulfur and nitrogen transformations. First-order research topics include quantifying anaerobic methane oxidation under high temperature, in situ concentrations of phosphorus and methane, and with alternate electron acceptors; sulfate and sulfur-dependent microbial pathways and isotopic signatures under these conditions; and nitrogen transformations in methane-oxidizing microbial communities, hydrothermal mats and sediments.

This integrated biogeochemical and microbiological research will explore the pathways of and environmental controls on the consumption and production of methane, other alkanes, inorganic carbon, organic acids and organic matter that fuel the Guaymas sedimentary microbial ecosystem. The hydrothermal sediments of Guaymas Basin provide a spatially compact, high-activity location for investigating novel modes of methane cycling and carbon assimilation into microbial biomass. In the case of anaerobic methane oxidation, the high temperature and pressure tolerance of Guaymas Basin methane-oxidizing microbial communities, and their potential to uncouple from the dominant electron acceptor sulfate, vastly increase the predicted subsurface habitat space and biogeochemical role for anaerobic

microbial methanotrophy in global deep subsurface diagenesis. Further, microbial methane production and oxidation interlocks with sulfur and nitrogen transformations, which will be explored at the organism and process level in hydrothermal sediment microbial communities and mats of Guaymas Basin. In general, first-order research tasks (rate measurements, radiotracer incorporation studies, genomes, in situ microgradients) define the key microbial capabilities, pathways and processes that mediate chemical exchange between the subsurface hydrothermal/seeps and deep ocean waters.

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## Funding

Funding Source	Award
<a href="#">NSF Division of Ocean Sciences (NSF OCE)</a>	<a href="#">OCE-1357360</a>

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