Porewater NO3+NO2 and Ammonia from samples collected by pushcore from Guaymas Basin hydrothermal sediments on R/V Atlantis cruise AT37-06 in the Guaymas Basin in December 2016

Website: https://www.bco-dmo.org/dataset/720895
Data Type: Cruise Results
Version: 1
Version Date: 2017-12-07

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
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Abstract
Porewater NO3+NO2 and Ammonia from samples collected by pushcore from Guaymas Basin hydrothermal sediments on R/V Atlantis cruise AT37-06 in the Guaymas Basin in December 2016.

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Coverage

Spatial Extent: **Lat**:27 **Lon**:-111
Temporal Extent: 2016-12-09 - 2016-12-27

Dataset Description

Porewater NO3+NO2 and Ammonia from samples collected by pushcore from Guaymas Basin hydrothermal sediments on cruise AT37-06 in December 2016.

Acquisition Description

Sampling and Analytical Methodology: Freshly collected sediment cores were sliced on the ship into 3 cm layers; porewater was obtained by gently centrifuging freshly collected sediment in 50 ml conical Falcon

tubes for ca. 5 to 10 minutes until the sediment had settled; one Falcon tube produced ca. 8 to 10 ml of porewater. For porewater sulfate measurements, 1 ml subsamples of the overlying porewater were drawn into syringes and injected through 0.45 µm filters into screw cap Eppendorf vials, each acidified with 50 µl of 6N HCl, and then gently bubbled with nitrogen for 4 min to remove sulfide; the samples were then stored at 4ºC before shipping and analysis

Geochemical Analyses: Porewaters from Guaymas Basin sediments were analyzed for Nitrate+Nitrite and ammonia concentrations colorimetrically using a Flow Solutions IV segmented flow Auto Analyzer from O.I Analytical, College Station, TX. The samples were preserved in H2SO4 and were neutralized with NaOH before analysis. Nitrate+Nitrite was determined using the cadmium reduction method and ammonia was determined using the phenate method. Both nutrients were diluted to get their concentrations within the linear range of the auto analyzer. Quality control standards from certified stock standard purchased from Environmental Research Associates, were analyzed every 15-20 samples.

Analysis Notes:
Samples with a NH4 or N+N concentration of greater than 20um were repated at a higher dilution.
Samples were run for NH4 first at a dilution of 40 X (0.1 ml sample to 3.9 ml DDI water).
All NH4 samples were repeated by making a 10x dilution from the 40x dilutions resulting in a 400x dilution.
NH4 and N+N were analyzed separately.
A NaOH solution was made to adjust the pH of the sample to between 5 and 9 upon sample dilution.
The N+N samples were run at a 2x dilution (0.75 ml sample to 0.75 ml NaOH solution).
Repeated 4869-21 (0-3) at 140x dilution; value confirmed.
Repated all remaining N+N samples greater than 20um at 20x dilution.
EPA Method: NO2+NO3 = EPA 353.4; NH4 = EPA 350.1.

Data Processing: The porewater data of Guaymas Basin sand Sonora Margin piston cores were tabulated in Excel sheets.

Quality Control: Note that Sample_IDs "QCS" are internal quality control standards (10 uM)
and Sample_IDs "ICV" are external quality control standards.

Processing Description

BCO-DMO Processing:
- modified parameter names (replaced spaces with underscores);
- replaced commas in Sample_ID column with semi-colons.

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Related Publications

Schutte, C. A., Teske, A., MacGregor, B. J., Salman-Carvalho, V., Lavik, G., Hach, P., & de Beer, D. (2018). Filamentous Giant Beggiatoaceae from the Guaymas Basin Are Capable of both Denitrification and Dissimilatory Nitrate Reduction to Ammonium. Applied and Environmental Microbiology, 84(15). doi:10.1128/aem.02860-17 https://doi.org/10.1128/AEM.02860-17
Methods

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Parameters

Parameter	Description	Units
Sample_ID	Sample identification number	unitless
NO2_NO3	NO2+NO3	micromolar (uM)
NH4	NH4	micromolar (uM)

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Instruments

Dataset-specific Instrument Name	Flow Solutions IV segmented flow Auto Analyzer
Generic Instrument Name	Nutrient Autoanalyzer
Dataset-specific Description	Porewaters from Guayman Basin sediments were analyzed for Nitrate+Nitrite and ammonia concentrations colorimetrically using a Flow Solutions IV segmented flow Auto Analyzer from O.I Analytical, College Station, TX.
Generic Instrument Description	Nutrient Autoanalyzer is a generic term used when specific type, make and model were not specified. In general, a Nutrient Autoanalyzer is an automated flow-thru system for doing nutrient analysis (nitrate, ammonium, orthophosphate, and silicate) on seawater samples.

Dataset-specific Instrument Name	
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.

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Deployments

AT37-06

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

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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 syulfur 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
NSF Division of Ocean Sciences (NSF OCE)	OCE-1357238

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