Supplementary Table 2: Drill fluid contamination testiFMC in drilling. GC mass spectrometry measurements of concentrations of the tracers PFMD and Png fluid and sample materials

Website: https://www.bco-dmo.org/dataset/810923
Data Type: Other Field Results
Version: 1
Version Date: 2020-05-12

Project
» Collaborative Research: Delineating The Microbial Diversity and Cross-domain Interactions in The Uncharted Subseafloor Lower Crust Using Meta-omics and Culturing Approaches (Subseafloor Lower Crust Microbiology)

Program
» International Ocean Discovery Program (IODP)

Contributors	Affiliation	Role
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Abstract
Supplementary Table 2: Drill fluid contamination testing. GC mass spectrometry measurements of concentrations of the tracers PFMD and PFMC in drilling fluid and sample materials.

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Coverage

Temporal Extent: 2015-11-30 - 2016-01-30

Dataset Description

Supplementary Table 2: Drill fluid contamination testing. GC mass spectrometry measurements of concentrations of the tracers PFMD and PFMC in drilling fluid and sample materials.

Methods & Sampling

Contamination controls. Rotary coring contaminates the exteriors of core samples due to the circulation of drilling fluids (a mixture of Sepiolite and surface seawater) around the drilling bits. Extreme care was taken to remove/minimize this contamination and to not introduce new contamination during sample handling and analysis. During IODP Expedition 360, a new less volatile tracer, perfluoromethyldecalin (PFMD), was

successfully tested and calibrated and thus used to quantify intrusion of drilling fluids into the interior of samples.

Data Processing Description

BCO-DMO processing notes:

- Adjusted column names to comply with database requirements

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Data Files

File
drill_fluid.csv (Comma Separated Values (.csv), 2.13 KB) MD5:abcad8d32b4c59c08c72da2238969d91 Primary data file for dataset ID 810923

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Parameters

Parameter	Description	Units
Tracer	PFMB or PMCH tracer	unitless
Sample	Sample ID	unitless
Replicate	Replicate number	unitless
Drilling_Fluid	Tracer concentration in drilling fluid	part per billion (ppb); Abbreviations: bd=below detection limit; ad=above detection limit/-a: after 4 washes; -b: after 3 washes ; -c: no core liner used
Core_Exterior_Before_Cleaning	Tracer concentration on core exterior before cleaning	part per billion (ppb); Abbreviations: bd=below detection limit; ad=above detection limit/-a: after 4 washes; -b: after 3 washes ; -c: no core liner used
Core_Exterior_After_Cleaning	Tracer concentration on core exterior after cleaning	part per billion (ppb); Abbreviations: bd=below detection limit; ad=above detection limit/-a: after 4 washes; -b: after 3 washes ; -c: no core liner used
Core_Interior	Tracer concentration on core	part per billion (ppb); Abbreviations: bd=below detection limit; ad=above detection limit/-a: after 4 washes; -b: after 3 washes ; -c: no core liner used

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Instruments

Dataset-specific Instrument Name	Gas Chromatograph (GC) Hewlett Packard 5890
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)

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Deployments

IODP-360

Website	https://www.bco-dmo.org/deployment/810905
Platform	R/V JOIDES Resolution
Report	http://publications.iodp.org/scientific_prospectus/360/index.html
Start Date	2015-11-30
End Date	2016-01-30

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Project Information

Collaborative Research: Delineating The Microbial Diversity and Cross-domain Interactions in The Uncharted Subseafloor Lower Crust Using Meta-omics and Culturing Approaches (Subseafloor Lower Crust Microbiology)

Coverage: SW Indian Ridge, Indian Ocean

NSF abstract:

The lower ocean crust has remained largely unexplored and represents one of the last frontiers for biological exploration on Earth. Preliminary data indicate an active subsurface biosphere in samples of the lower oceanic crust collected from Atlantis Bank in the SW Indian Ocean as deep as 790 m below the seafloor. Even if life exists in only a fraction of the habitable volume where temperatures permit and fluid flow can deliver carbon and energy sources, an active lower oceanic crust biosphere would have implications for deep carbon budgets and yield insights into microbiota that may have existed on early Earth. This is all of great interest to other research disciplines, educators, and students alike. A K-12 education program will capitalize on groundwork laid by outreach collaborator, A. Martinez, a 7th grade teacher in Eagle Pass, TX, who sailed as outreach expert on Drilling Expedition 360. Martinez works at a Title 1 school with ~98% Hispanic and ~2% Native American students and a high number of English Language Learners and migrants. Annual school visits occur during which the project investigators present hands on-activities introducing students to microbiology, and talks on marine microbiology, the project, and how to pursue science related careers. In addition, monthly Skype meetings with students and PIs update them on project progress. Students travel to the University of Texas Marine Science Institute annually, where they get a campus tour and a 3-hour cruise on the R/V Katy, during which they learn about and help with different oceanographic sampling approaches. The project partially supports two graduate students, a Woods Hole undergraduate summer student, the participation of multiple Texas A+M undergraduate students, and 3 principal investigators at two institutions, including one early career researcher who has not previously received NSF support of his own.

Given the dearth of knowledge of the lower oceanic crust, this project is poised to transform our understanding of life in this vast environment. The project assesses metabolic functions within all three domains of life in this crustal biosphere, with a focus on nutrient cycling and evaluation of connections to other deep marine microbial habitats. The lower ocean crust represents a potentially vast biosphere whose microbial constituents and the biogeochemical cycles they mediate are likely linked to deep ocean processes through faulting and subsurface fluid flow. Atlantis Bank represents a tectonic window that exposes lower oceanic crust directly at the seafloor. This enables seafloor drilling and research on an environment that can transform our understanding of connections between the deep subseafloor biosphere and the rest of the ocean. Preliminary analysis of recovered rocks from Expedition 360 suggests the interaction of seawater with the lower oceanic crust creates varied geochemical conditions capable of supporting diverse microbial life by providing nutrients and chemical energy. This project is the first interdisciplinary investigation of the microbiology of all 3 domains of life in basement samples that combines diversity and "meta-omics" analyses, analysis of nutrient addition experiments, high-throughput culturing and physiological analyses of isolates, including evaluation of their ability to utilize specific carbon sources, Raman spectroscopy, and lipid biomarker analyses. Comparative genomics are used to compare genes and pathways relevant to carbon cycling in these samples to data from published studies of other deep-sea environments. The collected samples present a rare and time-sensitive opportunity to gain detailed insights into microbial life, available carbon and energy sources for this life, and of dispersal of microbiota and connections in biogeochemical processes between the lower oceanic crust and the overlying aphotic water column.

About the study area:

The International Ocean Discovery Program (IODP) Expedition 360 explored the lower crust at Atlantis Bank, a 12 Ma oceanic core complex on the ultraslow-spreading SW Indian Ridge. This oceanic core complex represents a tectonic window that exposes lower oceanic crust and mantle directly at the seafloor, and the expedition provided an unprecedented opportunity to access this habitat in the Indian Ocean.

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Program Information

International Ocean Discovery Program (IODP)

Website: http://www.iodp.org/index.php

Coverage: Global

The International Ocean Discovery Program (IODP) is an international marine research collaboration that explores Earth's history and dynamics using ocean-going research platforms to recover data recorded in seafloor sediments and rocks and to monitor subseafloor environments. IODP depends on facilities funded by three platform providers with financial contributions from five additional partner agencies. Together, these entities represent 26 nations whose scientists are selected to staff IODP research expeditions conducted throughout the world's oceans.

IODP expeditions are developed from hypothesis-driven science proposals aligned with the program's science plan *Illuminating Earth's Past, Present, and Future*. The science plan identifies 14 challenge questions in the four areas of climate change, deep life, planetary dynamics, and geohazards.

IODP's three platform providers include:

- The U.S. National Science Foundation (NSF)
- Japan's Ministry of Education, Culture, Sports, Science and Technology (MEXT)
- The European Consortium for Ocean Research Drilling (ECORD)

More information on IODP, including the Science Plan and Policies/Procedures, can be found on their website at http://www.iodp.org/program-documents.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1658031

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