TOC concentrations from sediment cores collected on the Guaymas Basin Ridge flanks and the Sonora Margin from R/V El Puma during October 2014

Website: https://www.bco-dmo.org/dataset/784172
Data Type: Cruise Results
Version: 1
Version Date: 2019-12-12

Project
» RAPID proposal: Site characterization cruise to document the active and extensive subsurface biosphere in the Guaymas Basin (RAPID Guaymas Basin)
» Characterizing subseafloor life and environments in the Guaymas Basin (C-DEBI Guaymas Subseafloor Life)

Programs
» Center for Dark Energy Biosphere Investigations (C-DEBI)
» Center for Dark Energy Biosphere Investigations (C-DEBI)

Contributors	Affiliation	Role
Teske, Andreas	University of North Carolina at Chapel Hill (UNC-Chapel Hill)	Principal Investigator
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Abstract
TOC concentrations from sediment cores P6, P10, P11, P12, and P13, collected on the Guaymas Basin Ridge flanks and the Sonora Margin. Sediment cores were collected from R/V El Puma, the Pacific Coast research vessel of the Autonomous University of Mexico, leaving Guaymas on October 14, 2014, and heading to Mazatlan on October 27, 2014.

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Coverage

Spatial Extent: **N**:27.86855 **E**:-111.22955 **S**:27.20745 **W**:-111.70287
Temporal Extent: 2014-10-19 - 2014-10-22

Dataset Description

TOC concentrations from sediment cores P6, P10, P11, P12, and P13, collected on the Guaymas Basin Ridge flanks and the Sonora Margin. Sediment cores were collected from R/V El Puma, the Pacific Coast research vessel of the Autonomous University of Mexico, leaving Guaymas on October 14, 2014, and heading to Mazatlan on October 27, 2014.

Methods & Sampling

All coring operations were performed using a the piston-coring system onboard the R/V El Puma. See http://www.buques.unam.mx for additional information.

Briefly, samples were acidified by buffered solution of glacial acetic acid (pH=5) and repeatedly rinsed with deionized water and centrifuged to remove acid. Carbonate-free samples were then analyzed for TOC. Sediment samples were run on a Carlo Erba 1108 elemental analyzer with a Costech zero-blank autosampler (Costech Analytical Technologies, Inc., USA) interfaced to a Thermo Finnigan Delta Plus XP IRMS (Thermo Finnigan, USA), at the University of California, Santa Cruz.

Data Processing Description

BCO-DMO Processing:
- modified parameter names (removed units in parens);
- added dates provided by submitter.

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Data Files

File
TOC_2014.csv (Comma Separated Values (.csv), 3.71 KB) MD5:c65626b46918800e993c4952c8ab648d Primary data file for dataset ID 784172

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Parameters

Parameter	Description	Units
core	Core identifier	unitless
lat	Latitude at sampling location; positive = north	decimal degrees
long	Longitude at sampling location; negative = west	decimal degrees
depth_water	Water depth at sampling location	meters (m)
core_sample	Identifier for the core sample	unitless
depth_cmbsf	Depth in centimeters below seafloor	centimeters (cm)
TOC	Total Organic Carbon (% weight)	percent weight
date	Sample date. Format: yyyy-mm-dd	unitless

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Instruments

Dataset-specific Instrument Name	Carlo Erba 1108 elemental analyzer
Generic Instrument Name	Elemental Analyzer
Dataset-specific Description	Sediment samples were run on a Carlo Erba 1108 elemental analyzer with a Costech zero-blank autosampler (Costech Analytical Technologies, Inc., USA) interfaced to a Thermo Finnigan Delta Plus XP IRMS (Thermo Finnigan, USA).
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	Thermo Finnigan Delta Plus XP IRMS
Generic Instrument Name	Isotope-ratio Mass Spectrometer
Dataset-specific Description	Sediment samples were run on a Carlo Erba 1108 elemental analyzer with a Costech zero-blank autosampler (Costech Analytical Technologies, Inc., USA) interfaced to a Thermo Finnigan Delta Plus XP IRMS (Thermo Finnigan, USA).
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).

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Deployments

Guaymas_2014

Website	https://www.bco-dmo.org/deployment/661688
Platform	R/V El Puma
Start Date	2014-10-14
End Date	2014-10-27

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Project Information

RAPID proposal: Site characterization cruise to document the active and extensive subsurface biosphere in the Guaymas Basin (RAPID Guaymas Basin)

Coverage: Guaymas Basin

Description from NSF project abstract:
The Guaymas Basin in the central Gulf of California is an active tectonic spreading center overlain with thick, organic-rich sediments. In contrast to typical deep-water, mid-ocean ridge spreading centers that have very focused magmatism and little or no sediment, magmatism in the Guaymas Basis is more broadly distributed.

This broadly-distributed magmatism significantly expands the fraction of organic-rich sediments that may be subject to alteration by the magmatic heat and thus it greatly expands the range of environments that support hydrocarbon generation and microbial populations in the sediments. Recognition that magmatism is not confined to the spreading axis, but instead is distributed throughout Guaymas Basin, suggests that models for the natural sequestration of carbon, the formation of oceanic crust, and life in the subsurface in marginal rift basins should be reconsidered as this has implications for the long-term removal of atmospheric carbon dioxide (and hence potential climatic implications). The Principal Investigator of this RAPID proposal is a lead proponent on an International Ocean Discovery Program (IODP) proposal to study this system in depth through scientific ocean drilling. To properly plan this expensive IODP expedition, additional site characterization gained from sediment sampling and seismic data is required. This proposal requests funds for the Principal Investigator to participate on an already planned site survey cruise aboard the Mexican Research Vessel (RV) El Puma. The results from this cruise will provide valuable data, at an exceptionally low investment, to guide decisions about potential future scientific drilling in the Guaymas Basin.

This RAPID proposal requests funds for the Principal Investigator to participate on a Mexican site survey cruise in October 2014 on RV El Puma to collect five-meter gravity cores of an extensive sediment transect across the Guaymas Basin and to integrate sequencing-based microbial community analyses of subsurface bacteria and archaea with biogechemical characterizations of these subsurface sediments. Gravity coring and microbial community analysis will target cold non-hydrothermal sediments as well as off-axis hydrothermally-influenced sediments. The gravity coring campaign and the geochemistry/microbiology studies are coordinated with heatflow measurements and extensive 2D seismic analysis and high-resolution 3D seismic mapping by other planned Mexican and German cruises. This multi-pronged strategy will deliver the additional data and complete the site characterizations that are required to properly plan a potential IODP drilling expedition by the JOIDES Resolution.

Characterizing subseafloor life and environments in the Guaymas Basin (C-DEBI Guaymas Subseafloor Life)

Coverage: Guaymas Basin

Project description from C-DEBI:
The Guaymas Basin in the Gulf of California is a young marginal rift basin characterized by active seafloor spreading and rapid deposition of organic-rich sediments, characterized by extensive temperature and geochemical gradients. Deeply emplaced volcanic sills originating at the spreading center indurate and altered their surrounding sediment matrix, and shape hydrothermal circulation patterns (Einsele et al. 1980). Hydrothermal alteration and mobilization re-injects buried carbon into the biosphere (esp. as hydrocarbons and methane), a process with climate history relevance (Peter et al. 1991, Lizarralde et al. 2011). Subsurface microbial populations can intercept and process these hydrothermally generated and mobilized carbon sources (Teske et al. 2014). In support of a new IODP drilling proposal (No. 833), two Guaymas Basin site survey cruises in 2014 (RV El Puma) and 2015 (RV Sonne) are refining the 2D and 3D seismic structure of the Guaymas Basin subsurface, and collect gravity cores for up-to-date microbial and geochemical analyses. We propose combined microbiological, geochemical and sedimentological analyses to investigate subseafloor life and its environments using sediment cores that we collected on the site survey cruise with RV El Puma in October 2014.

This project was funded by a C-DEBI Research Grant.

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Program Information

Center for Dark Energy Biosphere Investigations (C-DEBI)

Website: http://www.darkenergybiosphere.org

Coverage: Global

The mission of the Center for Dark Energy Biosphere Investigations (C-DEBI) is to explore life beneath the seafloor and make transformative discoveries that advance science, benefit society, and inspire people of all ages and origins.

C-DEBI provides a framework for a large, multi-disciplinary group of scientists to pursue fundamental questions about life deep in the sub-surface environment of Earth. The fundamental science questions of C-DEBI involve exploration and discovery, uncovering the processes that constrain the sub-surface biosphere below the oceans, and implications to the Earth system. What type of life exists in this deep biosphere, how much, and how is it distributed and dispersed? What are the physical-chemical conditions that promote or limit life? What are the important oxidation-reduction processes and are they unique or important to humankind? How does this biosphere influence global energy and material cycles, particularly the carbon cycle? Finally, can we discern how such life evolved in geological settings beneath the ocean floor, and how this might relate to ideas about the origin of life on our planet?

C-DEBI's scientific goals are pursued with a combination of approaches:
(1) coordinate, integrate, support, and extend the research associated with four major programs—Juan de Fuca Ridge flank (JdF), South Pacific Gyre (SPG), North Pond (NP), and Dorado Outcrop (DO)—and other field sites;
(2) make substantial investments of resources to support field, laboratory, analytical, and modeling studies of the deep subseafloor ecosystems;
(3) facilitate and encourage synthesis and thematic understanding of submarine microbiological processes, through funding of scientific and technical activities, coordination and hosting of meetings and workshops, and support of (mostly junior) researchers and graduate students; and
(4) entrain, educate, inspire, and mentor an interdisciplinary community of researchers and educators, with an emphasis on undergraduate and graduate students and early-career scientists.

Note: Katrina Edwards was a former PI of C-DEBI; James Cowen is a former co-PI.

Data Management:
C-DEBI is committed to ensuring all the data generated are publically available and deposited in a data repository for long-term storage as stated in their Data Management Plan (PDF) and in compliance with the NSF Ocean Sciences Sample and Data Policy. The data types and products resulting from C-DEBI-supported research include a wide variety of geophysical, geological, geochemical, and biological information, in addition to education and outreach materials, technical documents, and samples. All data and information generated by C-DEBI-supported research projects are required to be made publically available either following publication of research results or within two (2) years of data generation.

To ensure preservation and dissemination of the diverse data-types generated, C-DEBI researchers are working with BCO-DMO Data Managers make data publicly available online. The partnership with BCO-DMO helps ensure that the C-DEBI data are discoverable and available for reuse. Some C-DEBI data is better served by specialized repositories (NCBI's GenBank for sequence data, for example) and, in those cases, BCO-DMO provides dataset documentation (metadata) that includes links to those external repositories.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-0939564
NSF Division of Ocean Sciences (NSF OCE)	OCE-1449604

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