

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

Website: <https://www.bco-dmo.org/dataset/661750>

Data Type: Cruise Results

Version: 14 October 2016

Version Date: 2016-10-14

Project

- » [RAPID proposal: Site characterization cruise to document the active and extensive subsurface biosphere in the Guaymas Basin](#) (RAPID Guaymas Basin)
- » [Characterizing seafloor life and environments in the Guaymas Basin](#) (C-DEBI Guaymas Seafloor Life)

Programs

- » [Center for Dark Energy Biosphere Investigations](#) (C-DEBI)
- » [Center for Dark Energy Biosphere Investigations](#) (C-DEBI)

Contributors	Affiliation	Role
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Dataset Description

Porewater methane concentrations from sediment cores P3, 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.

Related datasets:

[Guaymas Basin 2014 DIC](#)

[Guaymas Basin 2014 Sulfate](#)

[Guaymas Basin 2014 Sulfide](#)

Methods & Sampling

2 ml sediment samples were taken with cut-off syringes from freshly retrieved sediment cores, placed into 5 ml of 1 mM NaOH in 30 ml serum vials, and capped with thick rubber stoppers. Methane concentrations were measured in the laboratory of J.P. Chanton (Florida State University) according to a modified headspace technique (Magen et al. 2014). Methane isotopic composition was measured by gas chromatography coupled with mass spectrometry (Chanton and Liptay 2014).

References:

Magen, C., L.L. Lapham, J.W. Pohlman, K. Marshall, S.Bosman, M. Casso, and J.P. Chanton. 2014. A simple headspace equilibration method for measuring dissolved methane. *Limnol. Oceanogr. Methods* 12 637-650. doi:[10.4319/lom.2014.12.637](https://doi.org/10.4319/lom.2014.12.637)

Chanton, J., and K. Liptay. 2000. Seasonal variation in methane oxidation in a landfill cover soils as determined by an in-situ stable topic technique. *Global Biogeochemical Cycles* 14:51-60. doi:[10.1029/1999GB900087](https://doi.org/10.1029/1999GB900087)

Data Processing Description

BCO-DMO Processing:

- created a column for core number;
- added lat, lon, and depth for each core from the metadata form;
- replaced "n.a." with "nd" (no data);
- modified parameter names to conform with BCO-DMO naming conventions.

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Data Files

File
Guaymas_Methane2014.csv (Comma Separated Values (.csv), 2.60 KB) MD5:5a0a3e0035fdf328b51163e08710f873 Primary data file for dataset ID 661750

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Parameters

Parameter	Description	Units
core	Core identifier	unitless
lat	Latitude of sampling location; postive = north	decimal degrees
lon	Longitude of sampling location; negative = west	decimal degrees
depth	Water depth at sampling location	meters
core_sample	Identifier for the core sample	unitless
actual_depth	Sample depth, within the core	centimeters (cm)
methane_mM	Methane concentration	millimolar (mM)
methane_d13C	Methane d13C signature	permille

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Instruments

Dataset-specific Instrument Name	gas chromatography
Generic Instrument Name	Gas Chromatograph
Dataset-specific Description	Methane isotopic composition was measured by gas chromatography coupled with mass spectrometry (Chanton and Liptay 2014).
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)

Dataset-specific Instrument Name	mass spectrometry
Generic Instrument Name	Mass Spectrometer
Dataset-specific Description	Methane isotopic composition was measured by gas chromatography coupled with mass spectrometry (Chanton and Liptay 2014).
Generic Instrument Description	General term for instruments used to measure the mass-to-charge ratio of ions; generally used to find the composition of a sample by generating a mass spectrum representing the masses of sample components.

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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 Basin 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 biogeochemical 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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