CTD data from the equatorial and north Pacific from R/V Knorr cruise KN195-03 in 2009 (Subseafloor Microbial Life project)

Website: https://www.bco-dmo.org/dataset/567276
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Project
» Oceanographic control and global distributions of subseafloor microbial life and activity (Subseafloor Microbial Life)

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

Contributors	Affiliation	Role
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Table of Contents

- Dataset Description
  - Methods & Sampling
  - Data Processing Description
- Data Files
- Parameters
- Instruments
- Deployments
- Project Information
- Program Information
- Funding

Dataset Description

CTD hydrocasts were performed during the KN195-03 cruise in the equatorial and north Pacific with a Sea-Bird SBE 9.

Related references:
Walsh, E.A., Kirkpatrick, J.K., Rutherford, S.D., Smith, D.C., Sogin, M.L, D'Hondt, S. 2015. Bacterial diversity and community composition from seasurface to subseafloor. In Press - ISME J.

Methods & Sampling

CTD Hydrocasts were performed with a Sea-Bird SBE 9 mounted near the base of a Niskin 24 Bottle Rosette. The CTD instrumentation included Conductivity (S/N 2186 & 2670), Temperature (ITS-90, S/N 4039 & 4195), Pressure (Digiquartz, S/N 785), Oxygen (SBE 43, S/N 0273), Fluorescence (Wetlab ECO-AFL/FL, S/N FLNTURTD-304), and Beam Transmission (Chelsea/Seatech/Wetlab CStar, S/N CST-1116DR). The data were processed with Seasave v. 7.18.

The downcast was conducted at 60 m per minute to a maximum depth of ~5 m above the seafloor (based on altimeter data). Features were selected from the downcast data for sampling on the upcast. These features included oxygen minimum layer(s), chlorophyll maximum layer(s) and the thermocline. In addition, standard

depths of bottom, 50 m above bottom, 5000 m, 4000 m, 3000 m, 2000 m, 1500m, 1000m, 300m, 200m, 100 m, 50 m, 10 m, and surface were sampled.

Water samples were collected with a 24 bottle rosette with 10-L Niskin bottles. The water was filtered with flat membrane filters (Supor-200, 47-mm diameter, 0.2 µm P/N 60301) were placed into Swinex filter holders and attached to the petcock valve of the Niskin bottles with 1/4" tubing. The valves were opened and the water was pushed through the filters with the compressed air. The filtration rate is ~200 ml per minute. Filtered water samples were collected for molybdenum and nitrogen isotopes. When the water stopped dripping through the filter, the filters were removed, folded in half and placed into a whirl-pak bag and stored at -70 degrees C in the lower lab freezer.

Data Processing Description

The CTD data were processed with Seasave v. 7.18.

BCO-DMO Processing:
- Modified parameter names to conform with BCO-DMO naming conventions;
- Obtained lat_start, lon_start, date_start, and time_start from the CTD file headers;
- Converted lat and lon to decimal degrees;
- Added ISO_DateTime_Start column.

[table of contents | back to top]

Data Files

File
KN195-03_CTD.csv (Comma Separated Values (.csv), 27.50 MB) MD5:9f2e10a617f783c0529f63ddc83a6d23 Primary data file for dataset ID 567276

[table of contents | back to top]

Parameters

Parameter	Description	Units
cruise_id	Cruise identification number.	dimensionless
station	Station identification number.	dimensionless
cast	Cast number.	dimensionless
lat_start	Latitude at start of cast.	decimal degrees
lon_start	Longitude at start of cast.	decimal degrees
date_start	Date (YYYYmmdd) at start of cast.	YYYYmmdd

time_start	Time (HH:MM:SS) at start of cast.	HH:MM:SS
ISO_DateTime_Start	Date and time at start of cast, formatted to ISO8601 standard.	YYYY-mm-ddTHH:MM:SS.xx
press	Pressure. Originally named 'PrDM'.	decibars (db)
temp	Temperature, ITS-90 (primary). Originally named 'T090C'.	degrees Celsius
temp2	Temperature, ITS-90 (secondary). Originally named 'T190C'.	degrees Celsius
cond	Conductivity (primary). Originally named 'C0S/m'.	Siemens per meter (S/m)
cond2	Conductivity (secondary). Originally named 'C1S/m'.	Siemens per meter (S/m)
O2_volt	Oxygen voltage from SBE43. Originally named 'Sbeox0V'.	volts
bean_trans	Beam transmission from Chelsea/Seatech/Wetlab Cstar. Originally named 'Xmiss'.	percent (%)
fluor	Fluorescence from Wetlab ECO-AFL/FL. Originally named 'FlECO-AFL'.	milligrams per cubic meter (mg/m^3)
turbidity	FLNTU turbidity. Originally named 'Upoly0'.	?
density	Density (primary). Originally named 'Density00'.	kilograms per cubic meter (kg/m^3)
density2	Density (secondary). Originally named 'Density11'.	kilograms per cubic meter (kg/m^3)
sigma_t	Sigma-t density (primary). Originally named 'Sigma-t00'.	kilograms per cubic meter (kg/m^3)
sigma_t_2	Sigma-t density (secondary). Originally named 'Sigma-t11'.	kilograms per cubic meter (kg/m^3)
potemp	Potential temperature, ITS-90 (primary). Originally named 'Potemp090C'.	degrees Celsius
potemp2	Potentential temperature, ITS-90 (secondary). Originally named 'Potemp190C'.	degrees Celsius
sal	Salinity (primary). Originally named 'Sal00'.	practical salinity units (PSU)

sal2	Salinity (secondary). Originally named 'Sal11'.	practical salinity units (PSU)
O2_pcnt_sat	Oxygen percent saturation from SBE43. Originally named 'Sbeox0PS'.	percent (%)
O2	Oxygen from SBE43. Originally named 'Sbeox0Mm/Kg'.	micromoles per kilogram (umol/kg)
sal_diff	Salinity difference (sal2 - sal). Originally named 'SecS-priS'.	practical salinity units (PSU)
cond_diff	Conductivity difference (cond2 - cond). Originally named 'T2-T190C'.	Siemens per meter (S/m)
soud_vel	Sound velocity. Originally named 'SvWM'.	Wilson meters per second (m/s)

[table of contents | back to top]

Instruments

Dataset-specific Instrument Name	Sea-Bird SBE 9
Generic Instrument Name	CTD Sea-Bird 9
Dataset-specific Description	CTD Hydrocasts were performed with a Sea-Bird SBE 9 mounted near the base of a Niskin 24 Bottle Rosette.
Generic Instrument Description	The Sea-Bird SBE 9 is a type of CTD instrument package. The SBE 9 is the Underwater Unit and is most often combined with the SBE 11 Deck Unit (for real-time readout using conductive wire) when deployed from a research vessel. The combination of the SBE 9 and SBE 11 is called a SBE 911. The SBE 9 uses Sea-Bird's standard modular temperature and conductivity sensors (SBE 3 and SBE 4). The SBE 9 CTD can be configured with auxiliary sensors to measure other parameters including dissolved oxygen, pH, turbidity, fluorometer, altimeter, etc.). Note that in most cases, it is more accurate to specify SBE 911 than SBE 9 since it is likely a SBE 11 deck unit was used. more information from Sea-Bird Electronics

[table of contents | back to top]

Deployments

KN195-03

Website	https://www.bco-dmo.org/deployment/58736
Platform	R/V Knorr
Start Date	2009-01-12
End Date	2009-02-23
Description	The cruise went from Puntarenas, Costa Rica to Honolulu, Hawaii and was the first cruise during which scientists used the long coring system (developed at Woods Hole Oceanographic Institution) to recover sediments from the seafloor. Cruise information and original data are available from the NSF R2R data catalog.

[table of contents | back to top]

Project Information

Oceanographic control and global distributions of subseafloor microbial life and activity (Subseafloor Microbial Life)

Coverage: Pacific Ocean

Recent studies of subseafloor life, that is microbes living deep below the ocean&aposs seafloor, have produced astonishing results that challenge fundamental ideas about the limits and distributions of life. These include: (1) that the microbial biomass of subseafloor sediments is spatially much more variable and possibly much smaller than previously believed; (2) that rates of subseafloor sedimentary microbial activity are far below the rate required for cell maintenance, implying that either most subseafloor cells are inactive or that the energy required for their cellular maintenance is lower than anticipated; and (3) the global distributions of subseafloor sedimentary microbes and their activities are significantly affected by the oceanographic properties of the overlying water column. This proposal will conduct fieldwork to test these ideas at a range of sites in the equatorial Pacific. To do this the principal investigators will conduct a transect study where the following samples and measurements will be taken: (1) coring the sediment to ~18 meter or more below seafloor (mbsf) at 12 sites in the Pacific Ocean; (2) conducting extensive microbiological and biogeochemical analyses of these cores; (3) surveying the oceanographic and geologic characteristics of each site; and (4) using the results to test and refine models for the global distribution of subseafloor microbial abundances and their metabolic activities. Using these data the investigators will then address four important questions: (1) What are the principal controls on the magnitude and geographic distribution of subseafloor sedimentary cell abundance and steady-state rates of microbial activities? (2) Can we accurately estimate the magnitude and global distribution of subseafloor sedimentary cell abundance? (3) Can we accurately estimate the global distribution of organic carbon-fueled microbial activity in subseafloor sediment? and (4) Do different subseafloor sediments with very different cell abundances and rates of metabolic activity characterized by different groups of organisms? This study will significantly advance our understanding of life in the subseafloor ocean and will provide samples for diverse independent studies, including the International Census of Marine Microbes. This project will also have a strong research and training impact at both the graduate and undergraduate levels as the inherently multidisciplinary nature of subsurface life provides an ideal entry into collaborative modern science.

[table of contents | back to top]

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.

[table of contents | back to top]

Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-0752336

[table of contents | back to top]