CTD profiles from R/V Oceanus cruise OC1703A along the Northern California continental shelf in March of 2017 (Deep Sediment N Fix project)

Website: https://www.bco-dmo.org/dataset/717418
Data Type: Cruise Results
Version:
Version Date: 2017-10-25

Project
» Nitrogen Fixation in Deep-Sea Sediments (Deep Sediment N Fix)

Contributors	Affiliation	Role
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Coverage

Spatial Extent: **N**:37.13467 **E**:-122.544 **S**:35.689 **W**:-124.922

Dataset Description

CTD data collected from stations along the Northern California continental shelf at depths ranging from 100 to 4500 meters during R/V Oceanus cruise OC1703A from the 12th to 23rd of March 2017.

Methods & Sampling

CTD profiles

Data Processing Description

In addition to the data available by clicking the "Get Data" button, the Seasave formatted files originally submitted to BCO-DMO are available for download.
 * OC1703A_CTD.zip (11.2 MB)
* Software used to generate files: Seasave V 7.23.2

BCO-DMO Data Manager Processing Notes:
* added a conventional header with dataset name, PI name, version date
* included information in original filenames for ctd number
* NMEA latitude, longitude and UTC time extracted from Seasave V 7.23.2 files.

* NMEA UTC timestamp converted to ISO DateTime format
* Descriptive data parameter names supplied by data contributor were used in the dataset, original seasave variable names are included in the data parameter descriptions.
* seasave header lines were commented out in this dataset. but the original seasave files with all header information are available for download (see zip file link above).

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Data Files

File
CTD.csv (Comma Separated Values (.csv), 153.68 MB) MD5:33d020688075c6717d3df9d93c1bf0f3 Primary data file for dataset ID 717418

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Parameters

Parameter	Description	Units
cruise	Cruise identifier	unitless
site	Site identifier (format is OC-Nominal depth)	meters
CTD_deployment	CTD cast number	unitless
lat	Latitude of CTD profile	decimal degrees
lon	Longitude of CTD profile	decimal degrees
ISO_DateTime_UTC	ISO timestamp based on the ISO 8601:2004(E) standard in format YYYY-mm-ddTHH:MM:SSZ (UTC)	unitless
PSU	Salinity [Seasave name sal00]	Practical Salinity Units (PSU)
PAR	Photosynthetically Active Radiation (PAR) Irradiance from Biospherical/Licor [Seasave name par]	microEinsteins per meter squared per second (uEinsteins/m2/s)
Temperature	Primary temperature (ITS-90) [Seasave name t090C]	degrees Celsius (deg C)
Temperature_2	Secondary temperature [Seasave name t190C]	degrees Celsius (deg C)
sigma_t	Density; sigma-t [Seasave name sigma-t00]	kilograms per meter cubed (kg/m3)
Beam_Attenuation	Beam attenuation from WET Labs C-Star [Seasave name CStarAt0]	per meter (1/m)
Fluorescence	Fluorescence from WET Labs ECO-AFL/FL [Seasave name flECO-AFL]	milligrams per meter cubed (mg/m3)
O2_ml_L	Dissolved oxygen [Seasave name sbeox0ML/L]	milliliters per liter (ml/l)
Depth_m	Depth [Seasave name depSM]	meters (m)
Depth_nominal	Nominal depth of cast	meters

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Instruments

Dataset-specific Instrument Name	Sea-Bird SBE 9
Generic Instrument Name	CTD Sea-Bird 9
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

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Deployments

OC1703A

Website	https://www.bco-dmo.org/deployment/717423
Platform	R/V Oceanus
Start Date	2017-03-14
End Date	2017-03-23
Description	See additional cruise information from the Rolling Deck to Repository (R2R): https://www.rvdata.us/search/cruise/OC1703A

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Project Information

Nitrogen Fixation in Deep-Sea Sediments (Deep Sediment N Fix)

Coverage: California Shelf (36,-123)

NSF Award Abstract:
Life requires nitrogen for growth. Atmospheric nitrogen (N2) is the most abundant form of nitrogen on the surface of the planet, but most organisms cannot assimilate N2 directly. Habitats can therefore be nitrogen limited, meaning the demand for "bioavailable" nitrogen exceeds the supply, and its availability controls the overall growth and productivity of the community. A small subset of microorganisms, termed diazotrophs, convert N2 to bioavailable forms of nitrogen, including ammonium and nitrogenous organic matter, in a process known as N2 fixation. Diazotrophs are the largest natural source of bioavailable nitrogen on the planet, and the rate at which they fix N2 can control the rates at which other important microbial processes occur, such as the production and consumption of greenhouse gases. Understanding diazotrophs in the environment - their identity, distribution, activity levels, and biogeochemical controls - is therefore essential to understanding overall microbial community activity and biogeochemical cycling. The goal of this project is to characterize N2 fixation in deep-sea sediments, a generally understudied but expansive habitat, covering nearly two thirds of our planet. The project will have broader impacts via educational outreach, support and training of early career scientists, and scientific impact: since rates of marine methane, carbon dioxide, and nitrous oxide cycling are affected by nitrogen availability, the results will inform our understanding of greenhouse gas cycling in the marine environment, and therefore climate stability, a topic central to global security.

N2 fixation is a critical and intensely studied metabolism in the marine photic zone. Much less is known about N2 fixation in deep-sea sediments, but it could be an important factor in both benthic productivity and ocean-scale elemental cycling. Several observations have suggested or directly detected N2 fixation at localized areas of enhanced productivity on the seafloor (e.g., methane seeps and hydrothermal vents), raising the possibility that deep-sea N2 fixation is widespread. However, few measurements of N2 fixation have been made outside of these anomalous areas, and thus little is known about N2 fixation in the vast majority of the deep ocean floor. Preliminary data suggest N2 fixation does occur in typical deep marine sediment, and is mediated by a diverse set of yet unidentified microorganisms. This project will combine techniques from molecular biology and geochemistry to systematically investigate N2 fixation in representative deep-sea sediments collected along a depth profile (500 to 4500 m water depth) offshore California. The project will determine the (1) rates and distribution of N2 fixation (2) abundance, diversity, and distribution of genes and transcripts associated with N2 fixation (nif) (3) phylogenetic identity of the biological mediators (diazotrophs) and (4) physiochemical controls on diazotrophic community structure and activity. For context, the activity of the non-diazotrophic bacterial community will also be characterized. The results may lead to upward revisions of the estimates of new nitrogen production in the seafloor, and therefore change our understanding of the current balance of the marine nitrogen cycle. Together, this hypothesis-driven characterization of N2 fixation in deep-sea sediments will shed light on an expansive, climatically important, and traditionally understudied habitat, and facilitate more accurate extrapolation of the rates and distribution of N2 fixation on the whole seafloor as well as the metabolic response of the seafloor community to environmental change.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1634297

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