CTD profiles collected in support of molecular samples from B/O Hermano Gines cruises for the CARIACO Basin Time Series Station from May to November 2014 (CariacoMetaOmics project)

Website: https://www.bco-dmo.org/dataset/652313
Data Type: Cruise Results
Version: Final
Version Date: 2016-07-22

Project
» Genetic and Metabolic Signatures of Marine Microorganisms in Oxygen Depleted and Varying Geochemical Seascapes (CariacoMetaOmics)

Contributors	Affiliation	Role
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Dataset Description

These are CTD profiles as part of the Cariaco Metagenomics project, collecting standard CTD data and including fluorometry, several kinds of Oxygen measurements, stability and buoyancy at the CARIACO Basin time series station.

Methods & Sampling

Standard Seabird 25 deployment and collection procedures. These data include both down and upcasts in 1 meter bins.

Data Processing Description

CTD files were processed according to the standard methods used by the CARIACO Time Series program, available in the manual at http://reef01.marine.usf.edu/sites/default/files/project/cariaco/publications/CARIACO_Methods_Manual.pdf.

DMO Notes:
Created a top-level file of all CTDs from all cruises.
renamed the column headers to comply with normal usages and BCO-DMO standards.
changed -9.99E-29 to 'nd'. Changed blanks to 'nd'.

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Data Files

File
CTD.csv (Comma Separated Values (.csv), 1.70 MB) MD5:7f3a1906df29b6ab4eb60a16f11984ca Primary data file for dataset ID 652313

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Parameters

Parameter	Description	Units
cruise_id	cruise designation	unitless
CTD_num	sequential CTD number	unitless
cast	cast number	unitless
month_utc	month of year; Universal Coordinated Time	unitless
day_utc	day of month; Universal Coordinated Time	unitless
year	year	unitless
time_start	time the cast started in hours and decimal minutes	unitless
lat_start	latitude at start of cast; North is positive	decimal degrees
lon_start	longitude at start of cast; West is negative	decimal degrees
depth_w	water depth	meters
ISO_DateTime_UTC	standardized time parameter	YYYY-MM-DDTHH:MM:SS[.xx]Z
press	pressure by CTD strain gauge	decibars
depth	depth of instrument	meters
temp	temperature of water; ITS90	degrees centigrade
cond	conductivity	Siemans per meter
O2_volt	dissolved Oxygen	voltage
fluor	fluorescence from Wetlab ECO-AFL/FL	milligrams per cubic meters
beamc	beam attenuation; Chelsea SeaTech Wetlab Cstar	1/meters
O2sat_ml_L	Oxygen saturation	milliliters per liter
O2sat_mg_L	Oxygen saturation	milligrams per liter
O2_ml_L	dissolved oxygen	milliliters per liter
O2_mg_L	dissolved oxygen	milligram per liter
O2_umol_Kg	dissolved oxygen	micromoles per kilogram
sigma_0	sigma theta; potential density of seawater	kilograms per cubic meter
sigma_t	density of seawater	kilograms per cubic meters
potemp	potential temperature; ITS90	degrees centigrade
sal	salinity calculated from the primary CTD temp and conductivity sensors	Practical Salinity Units(PSU)
E stability and N buoyancy terms	Calculated by Sea Bird CTD; calculates buoyancy (Brunt-Väisälä) frequency (N) and stability (E) using the Fofonoff adiabatic leveling method (Bray N. A. and N. P. Fofonoff(1981) Available potential energy for MODE eddies. Journal of Physical Oceanography 11 30-46.).	radians per second or cycles per hour

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Instruments

Dataset-specific Instrument Name	Seabird 25
Generic Instrument Name	CTD Sea-Bird 25
Dataset-specific Description	With fluorometer, beam transmissometer, and several O2 sensors.
Generic Instrument Description	The Sea-Bird SBE 25 SEALOGGER CTD is battery powered and is typically used to record data in memory, eliminating the need for a large vessel, electrical sea cable, and on-board computer. All SBE 25s can also operate in real-time, transmitting data via an opto-isolated RS-232 serial port. Temperature and conductivity are measured by the SBE 3F Temperature sensor and SBE 4 Conductivity sensor (same as those used on the premium SBE 9plus CTD). The SBE 25 also includes the SBE 5P (plastic) or 5T (titanium) Submersible Pump and TC Duct. The pump-controlled, TC-ducted flow configuration significantly reduces salinity spiking caused by ship heave, and in calm waters allows slower descent rates for improved resolution of water column features. Pressure is measured by the modular SBE 29 Temperature Compensated Strain-Gauge Pressure sensor (available in eight depth ranges to suit the operating depth requirement). The SBE 25's modular design makes it easy to configure in the field for a wide range of auxiliary sensors, including optional dissolved oxygen (SBE 43), pH (SBE 18 or SBE 27), fluorescence, transmissivity, PAR, and optical backscatter sensors. More information from Sea-Bird Electronics: http:www.seabird.com.

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Deployments

CAR212_2

Website	https://www.bco-dmo.org/deployment/652493
Platform	B/O Hermano Gines
Start Date	2014-05-07
End Date	2014-05-09
Description	These deployments are part of the MetaOmics studies in the Cariaco Basin

CAR216_2

Website	https://www.bco-dmo.org/deployment/652494
Platform	B/O Hermano Gines
Start Date	2014-11-05
End Date	2014-11-07
Description	These deployments are part of the MetaOmics studies in the Cariaco Basin.

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Project Information

Genetic and Metabolic Signatures of Marine Microorganisms in Oxygen Depleted and Varying Geochemical Seascapes (CariacoMetaOmics)

Coverage: Southern Caribbean Sea - 10" 30' N, 64" 40' W (CARIACO Ocean Time Series Station)

Oxygen depleted water columns (ODWCs) appear to be expanding in response to global climate change. This alters trophic structure, compresses habitat and modifies geochemical cycles of major elements. Oxygen depletion can vary in intensity and duration from seasonal hypoxia to permanent anoxia. The focus of this study is a classic example of the anoxic end-member, the Cariaco Basin. The overall goal is to examine how microbial functional potential (metagenomic), activity (metatranscriptomic), taxonomic diversity (based on SSU rRNA) and the ecological/geochemical consequences (in terms of measured rates of key processes) relate along vertical oxygen/geochemical gradients and between seasons in the Cariaco Basin. This will reveal relationships between expression of particular sets of genes, environmental differences in nutrients, energy substrates and oxidant availabilities.

The objectives are to: (1) Integrate hydrographic, geochemical and microbial ecological data with metagenomic and metatranscriptomic profiles to understand regulatory and metabolic networks defining microbial community responses to environmental forcing during high and low productivity periods. This will help to understand the importance of processes, such as anaerobic oxidation of methane, utilization of redox-sensitive metals, the cryptic sulfur cycle in this ODWC, and the impacts of oxygen depletion on nitrogen transformations. (2) Determine the importance of associations between microbial eukaryotes (mEuks) and prokaryotes in this ODWC. (3) Identify "indicator" genes of known or unknown function that may be relevant to major elemental and trace gas cycling as targets for further biochemical characterization and molecular probe development, and quantify a key subset of these genes and transcripts across redox gradients using qPCR. (4) Provide a basis for developing monitoring tools using expressed genes indicative of important elemental transformations and fluxes for diagnosing the health status of natural and human engineered ecosystems. (5) Compare results with recent and ongoing studies of other ODWCs to discern shared and unique attributes of these systems.

Intellectual Merit: Previous studies of ODWCs have underscored the need for more data on microbial community structure and functionality in ODWCs, particularly biochemical rate measurements and other data on community responses to changing conditions. Better predictive models of responses of marine microbial communities and biogeochemical processes to global climate change are essential for informing future policy and management decisions. Data from an anoxic end-member ODWC like Cariaco Basin are critically needed to compare with data from other recent and ongoing studies of seasonally-depleted coastal systems and permanently-depleted deep basin and western boundary oxygen minimum zones (OMZs) to construct more skillful models. This study will advance the understanding of impacts of expanding ODWCs around the world, moving beyond assessments based only on taxonomic diversity, to yield new insights into the ecology and physiology of major microbial groups in these environments and interactions among Bacteria, Archaea and microbial eukaryotes.

Broader Impacts: The PIs and their collaborators will train one Research Associate, one postdoctoral investigator, a graduate student, and numerous undergraduates from SBU. All personnel will be trained in various aspects of microbial ecology and oceanography, with an emphasis on both traditional (e.g., microscopy) and "cutting edge" (e.g. metagenomics/transcriptomics) techniques. The PIs will also involve the Zephyr Education Foundation's marine science literacy and education program, located in Woods Hole, MA. The PIs will work with this organization to educate inner city K-12 students using local boat field trips organized by Zephyr, and lectures, and classroom laboratory exercises designed by the PIs. Additionally, this project will have broad implications for understanding how ODWCs affect marine ecosystems, and may influence future management strategies and models describing the cycling of C and N between the ocean and atmosphere.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1335436
NSF Division of Ocean Sciences (NSF OCE)	OCE-1336082

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