Heterotrophic (non-pigmented) bacteria abundances determined by flow cytometry (post-cruise/on-shore analysis) from samples collected on R/V Melville cruise MV1008 in the Costa Rica Dome in 2010 (CRD FLUZiE project)

Website: https://www.bco-dmo.org/dataset/516204
Data Type: Cruise Results
Version: 1
Version Date: 2014-05-30

Project
» Costa Rica Dome FLUx and Zinc Experiments (CRD FLUZiE)

Programs
» Integrated Marine Biogeochemistry and Ecosystem Research -US (IMBER-US)
» Ocean Carbon and Biogeochemistry (OCB)

Contributors	Affiliation	Role
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Abstract
Non-pigmented bacteria abundances from preserved (0.5% paraformaldehyde) frozen samples run on a Beckman-Coulter Altra flow cytometer after staining with Hoechst 33342 DNA stain and excitation with 200 mW UV and 1W 488 nm laser light. Bacteria discriminated based on DNA content (450±40 nm), as well as forward and 90° side light scatter parameters. Samples were collected on the MV1008 cruise in the Costa Rica Dome (CRD) region of the Eastern Tropical Pacific Ocean.

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Coverage

Spatial Extent: **N**:10.2998 **E**:-86.735 **S**:6.6219 **W**:-92.9871
Temporal Extent: 2010-06-24 - 2010-07-24

Dataset Description

Non-pigmented bacteria abundances from preserved (0.5% paraformaldehyde) frozen samples run on a Beckman-Coulter Altra flow cytometer after staining with Hoechst 33342 DNA stain and excitation with 200 mW UV and 1W 488 nm laser light. Bacteria discriminated based on DNA content (450±40 nm), as well as forward and 90° side light scatter parameters. Samples were collected on the MV1008 cruise in the Costa Rica Dome (CRD) region of the Eastern Tropical Pacific Ocean.

Methods & Sampling

Samples were collected from the CTD-Rosette PVC Niskin bottles, then preserved with paraformaldehyde (0.5% final concentration). Preserved samples were then flash frozen in liquid nitrogen, and subsequently stored at -80°C until analysis on-shore in batches. Upon thawing, samples were stained with Hoechst 33342 DNA stain (1 ug/mL final concentration), incubated at room temperature in the dark for 1 h, then analyzed using a Beckman-Coulter Altra flow cytometer, equipped with one 488 nm 1W laser and one UV 200 mM laser for excitation. Samples (100 ul) were delivered quantitatively to the instrument using a Harvard Apparatus syringe pump, at a rate of 50 ul per minute. Signals from the DNA detector (450±40 nm) and the forward and side scatter detectors were used to delineate non-pigmented bacteria, in conjunction with the Chlorophyll detector (680±20 nm) and Phycoerythrin detector (575±20 nm) to eliminate chlorophyll and/or phycoerythrin-bearing cells that overlapped (e.g., Prochlorococcus and Synechoccoccus). Calibration beads (0.5 uμm and 1.0 um yellow-green and 0.5 um UV) were used to normalize cellular fluorescence values and assure optimal instrument settings. Raw data files (listmode) were processed in FlowJo software (Treestar Inc.).

Data Processing Description

Raw data, representing 100 ul of sample, was corrected for dilution with preservative, dye, and run volume, to arrive at cellular concentrations (cells/mL).

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Data Files

File
bacteria_fcm_lab.csv (Comma Separated Values (.csv), 15.08 KB) MD5:682a743acb1c81cb6df43557f3b5394f Primary data file for dataset ID 516204

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Parameters

Parameter	Description	Units
event	Number referring to the particular activity (event) on the FluZiE cruise.	integer
cast	CTD Cast number from the FluZiE cruise.	integer
niskin	Niskin bottle that the sample was taken from.	integer
date_local	Date of CTD cast (local time zone of UTC -6). format: mmddyyyy	unitless
lon	Longitude in degrees East.	decimal degrees
lat	Latitude in degrees North.	decimal degrees
depth	Sample depth.	meters
cycle	Type and number of cruise sampling event. Either "Stn_n" or "Cycle_n". A transect of stations was sampled from 29 June to 03 July. Five quasi-Lagrangian experiments called "cycles" were conducted during the remainder of the cruise.	text
bact_het_cyt	Heterotrophic bacteria (non-pigmented bacteria) abundance.	cells per milliliter (cells/mL)

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Instruments

Dataset-specific Instrument Name	Beckman-Coulter Altra flow cytometer
Generic Instrument Name	Flow Cytometer
Dataset-specific Description	Samples were run on a Beckman-Coulter Altra flow cytometer, equipped with one 488 nm 1W laser and one UV 200 mM laser for excitation.
Generic Instrument Description	Flow cytometers (FC or FCM) are automated instruments that quantitate properties of single cells, one cell at a time. They can measure cell size, cell granularity, the amounts of cell components such as total DNA, newly synthesized DNA, gene expression as the amount messenger RNA for a particular gene, amounts of specific surface receptors, amounts of intracellular proteins, or transient signalling events in living cells. (from: http://www.bio.umass.edu/micro/immunology/facs542/facswhat.htm)

Dataset-specific Instrument Name	Niskin bottle
Generic Instrument Name	Niskin bottle
Dataset-specific Description	Samples were collected from the CTD-Rosette PVC Niskin bottles.
Generic Instrument Description	A Niskin bottle (a next generation water sampler based on the Nansen bottle) is a cylindrical, non-metallic water collection device with stoppers at both ends. The bottles can be attached individually on a hydrowire or deployed in 12, 24, or 36 bottle Rosette systems mounted on a frame and combined with a CTD. Niskin bottles are used to collect discrete water samples for a range of measurements including pigments, nutrients, plankton, etc.

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Deployments

MV1008

Website	https://www.bco-dmo.org/deployment/58834
Platform	R/V Melville
Report	http://dmoserv3.whoi.edu/data_docs/CRD_FLUZiE/CRUISE_REPORT_Melville1008.pdf
Start Date	2010-06-22
End Date	2010-07-25
Description	Research on the cruise was aimed at acquiring a better understanding of plankton dynamics, carbon and nutrient fluxes, and potential trace element limitation in the Costa Rica Dome region of the eastern tropical Pacific. The specific science objectives were: 1) to assess grazing and trace metal/nutrient controls on primary production and phytoplankton standing stocks; 2) to quantify carbon and elemental fluxes and export rates from the euphotic zone; and 3) to measure microbial population, processes, stable isotope abundances associated with the OMZ and nitrite maxima. Operations included: 4-day sediment trap deployments, daily process experiments conducted on satellite-tracked drifters, CTD and trace-metal rosette sampling, shipboard grow-out experiments, net sampling for zooplankton biomass and grazing assessments, and MOCNESS stratified tows to 1000 m. BCO-DMO Note: March 2013 (CLC): The original CTD profile data (85 casts) have been submitted by R2R to NODC. Jim Moffett (USC) was a participant on this cruise and is interested in getting a copy of the full set of CTD cast data (deep and shallow casts). He plans to contact SIO ODF group or Mike Landry (Chief Scientist). Original cruise data are available from the NSF R2R data catalog.

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Project Information

Costa Rica Dome FLUx and Zinc Experiments (CRD FLUZiE)

Coverage: Costa Rica Dome, Eastern Tropical Pacific Ocean

Research was aimed at improved understanding of plankton dynamics, carbon and nutrient fluxes, and potential trace element limitation in the Costa Rica Dome region of the eastern tropical Pacific. The specific science objectives of the 2010 R/V Melville cruise (MV1008) were:

1) to assess grazing and trace metal/nutrient controls on primary production and phytoplankton standing stocks;
2) to quantify carbon and elemental fluxes and export rates from the euphotic zone; and
3) to measure microbial population, processes, stable isotope abundances associated with the OMZ and nitrite maxima.

Additional information about MV1008 can be found in the cruise report (PDF).

NOTE: The original proposal and award abstract are not relevant. The project was originally funded by NSF as experimental tests of phytoplankton controls in the Arabian Sea. Piracy concerns in the region led to the cancellation of the research cruise in 2009, and a Change of Scope request was approved to focus the project on related issues in the Costa Rica Dome (CRD).

Though this project is not formally affiliated with any large program, it aligns with IMBER's emphasis on community ecology and biogeochemistry, and the OCB focus on carbon-based measurements of production, grazing and export processes.

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Program Information

Integrated Marine Biogeochemistry and Ecosystem Research -US (IMBER-US)

Website: http://www.imber.info/

Coverage: global

The BCO-DMO database includes data from IMBER endorsed projects lead by US funded investigators. There is no dedicated US IMBER project or data management office. Those functions are provided by US-OCB and BCO-DMO respectively.

The information in this program description pertains to the Internationally coordinated IMBER research program. The projects contributing data to the BCO-DMO database are those funded by US NSF only. The full IMBER data catalog is hosted at the Global Change Master Directory (GCMD).

IMBER Data Portal: The IMBER project has chosen to create a metadata portal hosted by the NASA's Global Change Master Directory (GCMD). The GCMD IMBER data catalog provides an overview of all IMBER endorsed and related projects and links to datasets, and can be found at URL http://gcmd.nasa.gov/portals/imber/.

IMBER research will seek to identify the mechanisms by which marine life influences marine biogeochemical cycles, and how these, in turn, influence marine ecosystems. Central to the IMBER goal is the development of a predictive understanding of how marine biogeochemical cycles and ecosystems respond to complex forcings, such as large-scale climatic variations, changing physical dynamics, carbon cycle chemistry and nutrient fluxes, and the impacts of marine harvesting. Changes in marine biogeochemical cycles and ecosystems due to global change will also have consequences for the broader Earth System. An even greater challenge will be drawing together the natural and social science communities to study some of the key impacts and feedbacks between the marine and human systems.

To address the IMBER goal, four scientific themes, each including several issues, have been identified for the IMBER project: Theme 1 - Interactions between Biogeochemical Cycles and Marine Food Webs; Theme 2 - Sensitivity to Global Change: How will key marine biogeochemical cycles, ecosystems and their interactions, respond to global change?; Theme 3 - Feedback to the Earth System: What are the roles of the ocean biogeochemistry and ecosystems in regulating climate?; and Theme 4 - Responses of Society: What are the relationships between marine biogeochemical cycles, ecosystems, and the human system?

Ocean Carbon and Biogeochemistry (OCB)

Website: http://us-ocb.org/

Coverage: Global

The Ocean Carbon and Biogeochemistry (OCB) program focuses on the ocean's role as a component of the global Earth system, bringing together research in geochemistry, ocean physics, and ecology that inform on and advance our understanding of ocean biogeochemistry. The overall program goals are to promote, plan, and coordinate collaborative, multidisciplinary research opportunities within the U.S. research community and with international partners. Important OCB-related activities currently include: the Ocean Carbon and Climate Change (OCCC) and the North American Carbon Program (NACP); U.S. contributions to IMBER, SOLAS, CARBOOCEAN; and numerous U.S. single-investigator and medium-size research projects funded by U.S. federal agencies including NASA, NOAA, and NSF.

The scientific mission of OCB is to study the evolving role of the ocean in the global carbon cycle, in the face of environmental variability and change through studies of marine biogeochemical cycles and associated ecosystems.

The overarching OCB science themes include improved understanding and prediction of: 1) oceanic uptake and release of atmospheric CO2 and other greenhouse gases and 2) environmental sensitivities of biogeochemical cycles, marine ecosystems, and interactions between the two.

The OCB Research Priorities (updated January 2012) include: ocean acidification; terrestrial/coastal carbon fluxes and exchanges; climate sensitivities of and change in ecosystem structure and associated impacts on biogeochemical cycles; mesopelagic ecological and biogeochemical interactions; benthic-pelagic feedbacks on biogeochemical cycles; ocean carbon uptake and storage; and expanding low-oxygen conditions in the coastal and open oceans.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-0826626

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