Water-column particulate biogenic silica and net rate of biogenic silica production measured on R/V Melville cruise MV1008 in the Costa Rica Dome in 2010 (CRD FLUZiE project)

Website: https://www.bco-dmo.org/dataset/556995
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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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Dataset Description

Water-column particulate biogenic silica and the net rate of biogenic silica production (i.e. gross production minus remineralization) measured on the MV1008 cruise in the Costa Rica Dome (CRD) region of the Eastern Tropical Pacific Ocean.

Methods & Sampling

Samples for standing stock and biological rate determinations were collected during early morning hydrocasts (~02:00 local time) using Niskin bottles on a CTD rosette. Experimental bottles were filled directly from the rosette bottles, placed into mesh bags, secured to an in situ array and the array deployed for 24 hours. Incubated samples were processed immediately after array recovery. Seawater samples (1.0 L) for biogenic silica analysis, were filtered through 0.6-um polycarbonate membranes, placed in cryovials, and dried in an oven for ~24 h. On shore, quantification of biogenic silica concentration was done using a NaOH digestion procedure in Teflon tubes, which provides low and stable blanks. The rate of net biogenic silica production was determined by the difference between biogenic silia concentration in initial whole seawater samples (no nutrient amendments or dilution, processed immediately) relative to those incubated for 24 h on the drift array. In small-volume bottles (i.e., <4 L) with a high surface-area to volume ratio, the biogenic silica adsorption to the bottle walls can be quantitatively significant, and without correction can lead to systematic errors in the calculated net rates. To minimize these effects for biogenic silica filtrations (i.e. initial or final), the bottles were rinsed three times with ~50 mL of 0.1-um filtered seawater per rinse, and the rinse volume was added to the volumes filtered.

Data Processing Description

BCO-DMO Processing:
- Modified parameter names to conform with BCO-DMO naming conventions.
- Modified format of date field.
- Replaced '-9999' with 'nd' to indicate 'no data'.

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Data Files

File
biogenic_silica_profiles.csv (Comma Separated Values (.csv), 9.49 KB) MD5:1a0a38a40d93adfd0974a6dd1b547d6c Primary data file for dataset ID 556995

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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
cycle	Refers to the 4-day Lagrangian experiment during which the sample was taken.	integer
date	Date (local time zone of UTC -6).	mmddYYYY
event_lat	Latitude (in degrees North) of the event.	decimal degrees
event_lon	Longitude (in degrees East) of the event.	decimal degrees
depth	Depth (in meters) that the sample was taken from.	meters
silicate	Silicate concentration.	uM (micromolar)
biogenic_silica	Water-column particulate biogenic silica.	nanomoles Si per Liter (nmol Si L-1)
net_biogenic_silica_production	The net rate of biogenic silica production (i.e. gross production minus remineralization) in the water column. (nd = no data)	nanomoles Si per Liter per day (nmol Si L-1 d-1)

Instruments

Dataset-specific Instrument Name	Niskin bottle
Generic Instrument Name	Niskin bottle
Dataset-specific Description	Samples for standing stock and biological rate determinations were collected during early morning hydrocasts (~02:00 local time) using Niskin bottles on a CTD rosette.
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.

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.

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.

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 sensitivies 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.

Funding

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NSF Division of Ocean Sciences (NSF OCE)	OCE-0826626