

15NO₃ uptake measured during experimental cycles in 24-hour in situ incubations on R/V Melville cruise MV1008 in the Costa Rica Dome in 2010 (CRD FLUZIE project)

Website: <https://www.bco-dmo.org/dataset/516108>

Data Type: Cruise Results

Version: 1

Version Date: 2014-05-29

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

15NO₃ uptake rates measured during experimental cycles 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:10.41583 E:-86.82898 S:8.50004 W:-92.98494

Temporal Extent: 2010-06-24 - 2010-07-23

Dataset Description

15NO₃ uptake rates measured during experimental cycles on the MV1008 cruise in the Costa Rica Dome (CRD) region of the Eastern Tropical Pacific Ocean.

Methods & Sampling

$^{15}\text{NO}_3$ - uptake rates were determined daily during experimental cycles from samples incubated on the *in situ* array at 8 depths spanning the euphotic zone. Each day samples were collected from Niskin rosette into polycarbonate bottles (a single 1.2-L bottle per depth). Samples were spiked with K^{15}NO_3 (final concentration $0.100 \mu\text{mol L}^{-1}$). All samples were incubated *in situ* for 24 hours beginning and ending at $\sim 04:00$ am local time. Upon recovery, $^{15}\text{NO}_3$ uptake samples were immediately filtered through pre-combusted GF/F filters at low pressure and frozen in liquid nitrogen. On land, they were thawed, acidified, dried out, and analyzed by mass spec at the SIO Analytical Facility.

Data Processing Description

Nitrate uptake was calculated following Dugdale and Wilkerson (1986). $^{15}\text{N}_{\text{init}}$, $^{15}\text{N}_{\text{final}}$, $^{15}\text{N}_{\text{nat}}$, and $^{15}\text{N}_{\text{spk}}$ were the 15:14N mass ratios for ambient PON in the water column (averaged for the cycle), final PON at the end of the incubation, water column NO_3 , and the K^{15}NO_3 spike, respectively. $[\text{NO}_3]_{\text{nat}}$ was the water column nitrate values at the beginning of the incubation (determined from 0.1- μm filtered, frozen samples analyzed at the UCSB Analytical Facility) and $[\text{NO}_3]_{\text{spk}}$ was the final concentration of added K^{15}NO_3 ($0.1 \mu\text{mol L}^{-1}$). Since $[\text{NO}_3]_{\text{nat}}$ was not determined until the end of the cruise, the investigators used a fixed $[\text{NO}_3]_{\text{spk}}$. The previous equation can significantly overestimate ambient nitrate uptake rates when $[\text{NO}_3]_{\text{spk}}$ is greater than 10% of $[\text{NO}_3]_{\text{nat}}$, so when this was determined to be the case, the investigators assumed that $[\text{NO}_3]_{\text{nat}}$ was significantly than the half-saturation constant for NO_3 and hence applied a correction such that $p_{\text{corrected}} = p \times [\text{NO}_3]_{\text{nat}} / ([\text{NO}_3]_{\text{nat}} + [\text{NO}_3]_{\text{spk}})$.

BCO-DMO added lat and lon values from the MV1008 event log.

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Data Files

File
nitrate_uptake.csv (Comma Separated Values (.csv), 9.21 KB) MD5:6a82ea5b547b3ded69ef3e78b31965eb
Primary data file for dataset ID 516108

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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 of CTD cast from which the water for the incubation was drawn (local time zone of UTC -6). format: mmddyyyy	unitless
event_lat	Latitude (in degrees North); added by BCO-DMO from the MV1008 event log.	decimal degrees
event_lon	Longitude (in degrees East); added by BCO-DMO from the MV1008 event log.	decimal degrees
depth	Nominal depth (in meters) that the sample was taken from and incubated at.	meters
sample	Refers to a specific $^{15}\text{NO}_3$ uptake incubation measurement.	unitless
nitrate	Ambient nitrate concentration of the initial water that was used for the incubation.	micromolar (μM)
NO3_uptake	NO ₃ - uptake rate. See processing description for equations used.	micromoles N per liter per day ($\mu\text{mol N L}^{-1} \text{d}^{-1}$)

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Instruments

Dataset-specific Instrument Name	Mass Spec
Generic Instrument Name	Mass Spectrometer
Dataset-specific Description	Samples were analyzed by mass spec at the SIO Analytical Facility.
Generic Instrument Description	General term for instruments used to measure the mass-to-charge ratio of ions; generally used to find the composition of a sample by generating a mass spectrum representing the masses of sample components.

Dataset-specific Instrument Name	Niskin bottle
Generic Instrument Name	Niskin bottle
Dataset-specific Description	Each day samples were collected from Niskin rosette into polycarbonate 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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