Shallow-drifting sediment trap fluxes (C, N, pigments) from R/V Melville cruise MV1008 in the Costa Rica Dome in 2010 (CRD FLUZiE project)

Website: https://www.bco-dmo.org/dataset/515984
Data Type: Cruise Results
Version: 1
Version Date: 2014-05-27

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
Carbon, Nitrogen, and pigment fluxes from sediment trap arrays deployed in the Costa Rica Dome region of the Eastern Tropical Pacific Ocean during June and July 2010.

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Coverage

Spatial Extent: **N**:10.41636 **E**:-87.00394 **S**:8.54574 **W**:-92.91637
Temporal Extent: 2010-06-24 - 2010-07-23

Dataset Description

Carbon, Nitrogen, and pigment fluxes from sediment trap arrays deployed in the Costa Rica Dome region of the Eastern Tropical Pacific Ocean during June and July 2010.

Methods & Sampling

The sediment trap array was deployed at the beginning and recovered at the end of each experimental

cycle.The array consisted of two VERTEX-style particle interceptor tube (PIT) crosspieces (Knauer et al. 1979, Stukel et al. 2013), deployed at what investigators initially thought to be the base of the euphotic zone (100 m on cycle 1, 90 m on other cycles) and 150 m. Each crosspiece held 8-12 cylindrical trap tubes, with an inner diameter of 70 mm and an 8:1 aspect ratio. Each tube also contained a baffle constructed of 14 smaller tubes that had been tapered at the top to ensure that all particles settling within the inner diameter of the outer tube would sink into the trap. Tubes were deployed with 2 L of a slurry comprised of 0.1-um filtered seawater, amended with an additional 50 g L-1 NaCl, and formalin (1% final concentration).

Upon recovery, the height of the interface between trap slurry and overlying water was immediately determined and the overlying water was gently removed with a peristaltic pump. Samples were then gravity filtered through a 200-um mesh Nitex filter and the contents of the filter were sorted under a dissecting microscope to remove mesozooplankton that were believed to have swam into the trap. The remainder of the >200-um particles were then re-combined with the <200-um. Individual tubes were split using a Fulsom split to allow replicate measurements of multiple different components of the sinking including organic C (Corg), N, and pigments (reported in Stukel et al. 2013). Samples for pigments were filtered through GF/F filters and extracted in 90% acetone for greater than 24 hours. Chlorophyll a and phaeopigments were then determined on a Turner Designs model 10 fluorometer (Strickland and Parsons, 1972). Samples for C and N were filtered through a GF/F filter and frozen at -80C. On land, filters were cut in half and acidified with HCl for 24 hours. They were then analyzed for C and N on the CHN analyzer at the SIO Analytical Facility.

Related publications and references:
Knauer, G.A., Martin, J.H., and Bruland, K.W. (1979) Fluxes of particulate carbon, nitrogen, and phosphorus in the upper water column of the northeast Pacific. Deep Sea Research, 26A, 97-108. doi: 10.1016/0198-0149(79)90089-X
Stukel, M. R., Decima, M. ,Selph, K. E., Taniguchi, D. A. A., Landry, M. R. (2013) The role of *Synechococcus* in vertical flux in the Costa Rica upwelling dome. Progress in Oceanography 112-113: 49-59. doi: 10.1016/j.pocean.2013.04.003

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Data Files

File
sediment_traps.csv (Comma Separated Values (.csv), 1.33 KB) MD5:21f18ae7eb063e8df2156581722d5358 Primary data file for dataset ID 515984

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Parameters

Parameter	Description	Units
event_deploy	Number referring to the particular deployment activity (event) on the FluZiE cruise.	integer
event_recover	Number referring to the particular recovery activity (event) on the FluZiE cruise.	integer
date_deployed	Date of deployment of the drifting sediment trap array (local time zone of UTC -6). format: ddmmyyyy	unitless

date_recovered	Date of recovery of the drifting sediment trap array (local time zone of UTC -6). format: ddmmyyyy	unitless
cycle	Refers to the 4-day Lagrangian experiment during which the sample was taken.	integer
lat_deploy	Latitude (in degrees North) that sediment trap array was deployed.	decimal degrees
lon_deploy	Longitude (in degrees East) that sediment trap array was deployed.	decimal degrees
lat_recover	Latitude (in degrees North) that sediment trap array was recovered.	decimal degrees
lon_recover	Longitude (in degrees East) that sediment trap array was recovered.	decimal degrees
depth	Depth of sediment trap.	meters
C_org_flux	Particulate organic carbon flux into trap.	milligrams Carbon per square meter per day (mg C m-2 d-1)
C_org_flux_stdev	Standard deviation of particulate organic carbon flux into trap.	milligrams Carbon per square meter per day (mg C m-2 d-1)
N_org_flux	Particulate nitrogen flux into trap.	milligrams Nitrogen per square meter per day (mg N m-2 d-1)
N_org_flux_stdev	Standard deviation of particulate nitrogen flux into trap.	milligrams Nitrogen per square meter per day (mg N m-2 d-1)
chla_flux	Chlorophyll a flux into trap.	micrograms Chl-a per square meter per day (ug Chl a m-2 d-1)
chla_flux_stdev	Standard deviation of chlorophyll a flux into trap.	micrograms Chl-a per square meter per day (ug Chl a m-2 d-1)
phaeo_flux	Phaeopigment flux into trap.	micrograms Chl-a equivalents per square meter per day (ug Chl a equivalents m-2 d-1)
phaeo_flux_stdev	Standard deviation of phaeopigment flux into trap.	micrograms Chl-a equivalents per square meter per day (ug Chl a equivalents m-2 d-1)

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Instruments

Dataset-specific Instrument Name	Sed Trap - Float
Generic Instrument Name	Sediment Trap - Floating
Dataset-specific Description	The sediment trap array consisted of two VERTEX-style particle interceptor tube (PIT) crosspieces (Knauer et al. 1979, Stukel et al. 2013), deployed at what was initially thought to be the base of the euphotic zone (100m on cycle 1, 90 m on other cycles) and 150 m. Each crosspiece held 8-12 cylindrical trap tubes, with an inner diameter of 70 mm and an 8:1 aspect ratio. Each tube also contained a baffle constructed of 14 smaller tubes that had been tapered at the top to ensure that all particles settling within the inner diameter of the outer tube would sink into the trap. Refer to Knauer et al. 1979 (doi: 10.1016/0198-0149(79)90089-X) for more information about VERTEX-style sediment traps.
Generic Instrument Description	Floating sediment traps are specially designed sampling devices deployed to float in the water column (as opposed to being secured to a mooring at a fixed depth) for periods of time to collect particles from the water column that are falling toward the sea floor. In general a sediment trap has a container at the bottom to collect the sample and a broad funnel-shaped opening at the top with baffles to keep out very large objects and help prevent the funnel from clogging. The 'Sediment Trap -Floating' designation is used for a floating type of sediment trap about which no other design details are known.

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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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