Barium VUB - Dissolved Ba; particulate Ba, Sr, Ca, Al from MULVFS from VERTIGO cruises KM0414, ZHNG09RR from the Hawaiian Islands HOT Site, NW SubArctic Pacific Ocean K2 Site, 2004-2005 (VERTIGO project)

Website: https://www.bco-dmo.org/dataset/2953
Version: 10 November 2008
Version Date: 2008-11-10

Project
» VERtical Transport In the Global Ocean (VERTIGO)

Program
» Ocean Carbon and Biogeochemistry (OCB)

Contributors	Affiliation	Role
Dehairs, Frank	Vrije Universiteit Brussel (VUB)	Principal Investigator
Jacquet, Stéphanie	Vrije Universiteit Brussel (VUB)	Co-Principal Investigator
Chandler, Cynthia L.	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

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Dataset Description

Barium VUB - Dissolved Ba; particulate Ba, Sr, Ca, Al from MULVFS

Methods & Sampling

Methodology: Methodology

Change history: YYMMDD
080710: contributed by Frank Dehairs
081110: Cruise_ID added manually
date, event, ev_code, lon, lat from cruise logs merged with original data
one single multi-ship dataset generated for both KM0414 and RR_K2 data
081110: added to OCB database; Steve Gegg (sgegg@whoi.edu), OCB DMO

DMO Note 1: Comments in cells from original spreadsheets preserved below
KM0414/ALOHA:

date_local	cast	MULVFS	Comment
20040625	2_'night'	Dec	Frank: suspect data
20040704	2_'night'	Dec	Frank: ICP-OES result

RR_K2/K2:
(none)

DMO Note 2: Used common "cast" id from these data to determine sample position, date and event code for MULVFS data
KM0414 event log
RR_K2 event log

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Data Files

File
bariumVUB_mulvfs.csv (Comma Separated Values (.csv), 6.77 KB) MD5:23226eab7189cb5d0cbf5fc25c3d5449 Primary data file for dataset ID 2953

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Parameters

Parameter	Description	Units
Cruise_ID	VERTIGO cruise name	text
date	date sampling began (GMT)	YYYYMMDD
event	unique sampling event	dimensionless
ev_code	event code from cruise log	alphanumeric
lon	longitude, negative denotes West	decimal degs
lat	latitude, negative denotes South	decimal degs
date_local	date sampling began (local)	YYYYMMDD
cast	MULVFS cast id	text
MULVFS	MULVFS id	text
depth	depth	meters
Ba_part	Particulate Ba	Picomoles per liter (pmol/l)
Sr_part	Particulate Sr	Picomoles per liter (pmol/l)
Ca_part	Particulate Ca	Nanomoles per liter (nmol/l)
Al_part	Particulate Al	Nanomoles per liter (nmol/l)

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Deployments

KM0414

Website	https://www.bco-dmo.org/deployment/57847
Platform	R/V Kilo Moana
Start Date	2004-06-20
End Date	2004-07-10
Description	VERTIGO project expedition to the U.S. Hawaii Ocean Time-series (HOT) site, near the deep-water Station ALOHA (A Long-Term Oligotrophic Habitat Assessment; 22° 45'N, 158° 00'W) located 100 km north of Oahu, Hawaii. Funded by: NSF OCE-0301139 Related information: VERTIGO cruise information from the VERTIGO Project site: https://cafethorium.whoi.edu/projects/vertigo/vertigo-hi/ HOT Web site: https://hahana.soest.hawaii.edu/index.html Original cruise data are available from the NSF R2R data catalog: http://www.rvdata.us/catalog/KM0414 **Methods & Sampling** Methodology: Methodology Change history: YYMMDD 080710: contributed by Frank Dehairs 081110: Cruise_ID added manually date, event, ev_code, lon, lat from cruise logs merged with original data one single multi-ship dataset generated for both KM0414 and RR_K2 data 081110: added to OCB database; Steve Gegg (sgegg@whoi.edu), OCB DMO DMO Note 1: Comments in cells from original spreadsheets preserved below KM0414/ALOHA: date_local cast MULVFS Comment 20040625 2_'night' Dec Frank: suspect data 20040704 2_'night' Dec Frank: ICP-OES result RR_K2/K2: (none) DMO Note 2: Used common "cast" id from these data to determine sample position, date and event code for MULVFS data KM0414 event log

ZHNG09RR

Website	https://www.bco-dmo.org/deployment/57848
Platform	R/V Roger Revelle
Start Date	2005-07-21
End Date	2005-08-27
Description	VERTIGO 2005 expedition to the K2site in the NW Pacific near 45° N and 160° E Funded by: NSF OCE-0301139 Cruise information from the VERTIGO project site: https://cafethorium.whoi.edu/projects/vertigo/vertigo-k2/ Original cruise data for the Revelle are available from the NSF R2R data catalog: http://www.rvdata.us/catalog/ZHNG09RR **Methods & Sampling** Methodology: Methodology Change history: YYMMDD 080710: contributed by Frank Dehairs 081110: Cruise_ID added manually date, event, ev_code, lon, lat from cruise logs merged with original data one single multi-ship dataset generated for both KM0414 and RR_K2 data 081110: added to OCB database; Steve Gegg (sgegg@whoi.edu), OCB DMO DMO Note 1: Comments in cells from original spreadsheets preserved below KM0414/ALOHA: date_local cast MULVFS Comment 20040625 2_'night' Dec Frank: suspect data 20040704 2_'night' Dec Frank: ICP-OES result RR_K2/K2: (none) DMO Note 2: Used common "cast" id from these data to determine sample position, date and event code for MULVFS data RR_K2 event log

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Project Information

VERtical Transport In the Global Ocean (VERTIGO)

Website: https://cafethorium.whoi.edu/projects/vertigo/

Coverage: HOT site and subarctic NW Pacific

NSF Award Abstract:
In this study, researchers at the Woods Hole Oceanographic Institution, Virginia Institute of Marine Science, University of California - Santa Cruz, University of California - Santa Barbara, University of Tasmania, and NIWA-Australia will work collaboratively to answer a difficult question in marine biogeochemistry: What controls the efficiency of particle transport between the surface and deep ocean? More specifically, what is the fate of sinking particles leaving the upper ocean and what factors influence remineralization length scales for different sinking particle classes? Knowing the efficiency of particle transport is important for an accurate assessment of the ocean carbon sink. Globally, the magnitude and efficiency of the biological pump will in part modulate levels of atmospheric carbon dioxide.

The research team intends to test two basic hypotheses about remineralization control, namely: (1) particle source characteristics are the dominant control on the efficiency of particle transport; and/or that (2) mid-water processing, either by zooplankton or bacteria, controls transport efficiency. To do so, they will conduct process studies at sea focused on particle flux and composition changes in the upper 500-1000m of the ocean. The basic approach is to examine changes in particle composition and flux with depth within a given source region using a combination of approaches, many of which are new to the field. These include neutrally buoyant sediment traps, particle pumps, settling columns and respiration chambers, along with the development of new biological and geochemical tools for an integrated biogeochemical assessment of the biological pump. Two sites will be studied extensively on three-week process study cruises: the Hawaii Ocean Time-series site (HOT) and a new moored time-series site in the subarctic NW Pacific (Japanese site K2; 47oN 160oE). There are strong contrasts between these sites in rates of production, export, particle composition and expected remineralization length scales.

Evidence for variability in the flux vs. depth relationship of sinking particles is not in dispute, but the controls on particle transport efficiency through the twilight zone remain poorly understood. A lack of reliable flux and particle characterization data within the twilight zone has hampered our ability to make progress in this area, and no single approach is likely to resolve these issues. The proposed study will apply quantitative modeling to determine the net effects of the individual particle processes on the effective transport of carbon and other elements and to place the shipboard observations in the context of spatial and temporal variations in these processes

Besides the obvious contributions to the study of the oceanic and planetary carbon cycles, there are broader outcomes and impacts forthcoming from this project. Graduate and undergraduate students will be included in all aspects of the research, and the involvement of non-US PIs will encourage exchange of students and post-docs between labs in different countries. In addition, the component groups will continue to maintain science web sites designed for both public and scientific exchange where the broader and specific goals and outcomes of this work can be communicated.

Original PI-provided project description:
The main goal of VERTIGO is the investigation of the mechanisms that control the efficiency of particle transport through the mesopelagic portion of the water column.

Question: What controls the efficiency of particle transport between the surface and deep ocean? More specifically, what is the fate of sinking particles leaving the upper ocean and what factors influence remineralization length scales for different sinking particle classes? VERTIGO researchers have set out to test two basic hypotheses regarding remineralization control, namely:
1. particle source characteristics are the dominant control on the efficiency of particle transport; and/or that
2. mid-water processing, either by zooplankton or bacteria, controls transport efficiency.

To test their hypotheses, they will conduct process studies in the field focused on particle flux and composition changes in the upper 500-1000m of the ocean. The basic approach is to examine changes in particle composition and flux with depth within a given source region using a combination of approaches, many of which are new to the field. These include neutrally buoyant sediment traps, particle pumps, settling columns and respiration chambers, along with the development of new biological and geochemical tools for an integrated biogeochemical assessment of the biological pump. Three week process study cruises have been planned at two sites - the Hawaii Ocean Time-series site (HOT) and a new moored time-series site in the subarctic NW Pacific (Japanese site K2; 47oN 160oE) - where there are strong contrasts in rates of production, export, particle composition and expected remineralization length scales.

Evidence for variability in the flux vs. depth relationship of sinking particles is not in dispute but the controls on particle transport efficiency through the twilight zone remain poorly understood. A lack of reliable flux and particle characterization data within the twilight zone has hampered our ability to make progress in this area, and no single approach is likely to resolve these issues. The proposed study will apply quantitative modeling to determine the net effects of the individual particle processes on the effective transport of carbon and other

elements, and to place the shipboard observations in the context of spatial and temporal variations in these processes. For rapid progress in this area, we have organized this effort as a group proposal taking advantage of expertise in the US and international community.

The efficiency of particle transport is important for an accurate assessment of the ocean C sink. Globally, the magnitude and efficiency of the biological pump will in part modulate levels of atmospheric CO2. We maintain that to understand present day ocean C sequestration and to evaluate potential strategies for enhancing sequestration, we need to assess possible changes in the efficiency of particle transport due to climate variability or via purposeful manipulations of C uptake, such as via iron fertilization.

*VERTIGO Acknowledgments: (*from K.O. Buesseler, et al / Deep-Sea Research II 55 (2008) 1522-1539) We thank the officers, crew and shore-based support teams for the R/V Kilo Moana (2004) and R/V Roger Revelle (2005). Funding for VERTIGO was provided primarily by research grants from the US National Science Foundation Programs in Chemical and Biological Oceanography (KOB, CHL, MWS, DKS, DAS). Additional US and non-US grants included: US Department of Energy, Office of Science, Biological and Environmental Research Program (JKBB); the Gordon and Betty Moore Foundation (DMK); the Australian Cooperative Research Centre program and Australian Antarctic Division (TWT); Chinese NSFC and MOST programs (NZJ); Research Foundation Flanders and Vrije Universiteit Brussel (FD, ME); JAMSTEC (MCH); New Zealand Public Good Science Foundation (PWB); and internal WHOI sources and a contribution from the John Aure and Cathryn Ann Hansen Buesseler Foundation (KOB). A number of individuals at sea and on shore, helped make the VERTIGO project a success, including: J. Andrews, C. Bertrand, R. Bidigare III, S. Bray, K. Casciotti, M. Charette, R. Condon, J. Cope, E. Fields, M. Gall, M. Gonneea, P. Henderson, T. Kobari, D. Kunz, S. Saitoh, S. Manganini, C. Moy, S. Okamoto, S. Pike, L. Robertson, D. Ruddick and Y. Zhang. Suggestions by three anonymous reviewers and help by the editor, R. Lampitt, are also greatly appreciated.

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Program Information

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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