Picoplankton Abundance Data from R/V Roger Revelle KNOX22RR in the Patagonian Shelf (SW South Atlantic) from December 2008 (COPAS08 project)

Website: https://www.bco-dmo.org/dataset/3347
Version: 14 May 2010
Version Date: 2010-05-14

Project
» Coccolithophores of the Patagonian Shelf 2008 (COPAS08)

Program
» Ocean Carbon and Biogeochemistry (OCB)

Contributors	Affiliation	Role
Moore, Lisa R.	University of Southern Maine (USM)	Principal Investigator
Gegg, Stephen R.	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

Table of Contents

Dataset Description

Picoplankton abundance data from the COPAS'08 cruise

Population abundances of Prochlorococcus, Synechococcus, picoeukaryotic phytoplankton and non-chlorophyll containing prokaryotes, "heterotrophic bacteria", analyzed from collected flow cytometry samples.

Methods & Sampling

The primary goal of the Moore lab on the COPAS cruise was to study the horizontal and vertical abundance distributions of the picophytoplankton populations along and across the Patagonia Shelf region with a particular emphasis on the picocyanobacteria. We collected water samples from roughly 25 stations at five depths: three within the surface mixed layer, at the chlorophyll max, and immediately below the chlorophyll max. At each of these five depths 1 mL of water was preserved with 0.125% glutaraldehyde and frozen in liquid nitrogen for subsequent flow cytometric analysis of the picophytoplankton populations back at USM. From the carboy CO2 incubation experiments we preserved water at T0, T24 and T72 from all CO2 pressures for flow cytometric analysis of the picophytoplankton populations response to increased CO

Data Processing Description

BCO-DMO Processing Notes

Generated from original text file "copas08_picoplankton_14may2010.xlsx" contributed by Lisa Moore

BCO-DMO Edits
- Parameter names modified to conform to BCO-DMO convention
- date/time added from CTD header data/stations
- lat/lons standardized to lat/lons in CTD data for consistency
- blank cells changed to "nd"

[table of contents | back to top]

Data Files

File
picoplankton.csv (Comma Separated Values (.csv), 12.84 KB) MD5:ea70c7c3b040547907071c5f2c4d17ba Primary data file for dataset ID 3347

[table of contents | back to top]

Parameters

Parameter	Description	Units
station	COPAS'08 Station Id	text
date	date (GMT)	YYYYMMDD
time	time (GMT)	HHMMSS
lon	Station longitude (West is negative)	decimal degrees
lat	Station latitude (South is negative)	decimal degrees
Depth	Sample depth	meters
Syn	Synechococcus	cells/ml
Pro	Prochlorococcus	cells/ml
Pico_Euk	picoeukaryotic phytoplankton	cells/ml
Total_Cyano	Total Cyanophores	cells/ml
Total_picophytoplankton	Total picophytoplankton	cells/ml
HB	non-chlorophyll containing prokaryotes (heterotrophic bacteria)	cells/ml

[table of contents | back to top]

Instruments

Dataset-specific Instrument Name	CTD Sea-Bird 911
Generic Instrument Name	CTD Sea-Bird 911
Dataset-specific Description	Data were acquired using SeaBird SeaSave v7 for SBE 911 software
Generic Instrument Description	The Sea-Bird SBE 911 is a type of CTD instrument package. The SBE 911 includes the SBE 9 Underwater Unit and the SBE 11 Deck Unit (for real-time readout using conductive wire) for deployment from a vessel. The combination of the SBE 9 and SBE 11 is called a SBE 911. The SBE 9 uses Sea-Bird's standard modular temperature and conductivity sensors (SBE 3 and SBE 4). The SBE 9 CTD can be configured with auxiliary sensors to measure other parameters including dissolved oxygen, pH, turbidity, fluorescence, light (PAR), light transmission, etc.). More information from Sea-Bird Electronics.

Dataset-specific Instrument Name	Flow Cytometer
Generic Instrument Name	Flow Cytometer
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
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.

[table of contents | back to top]

Deployments

KNOX22RR

Website	https://www.bco-dmo.org/deployment/57987
Platform	R/V Roger Revelle
Report	http://bcodata.whoi.edu/COPAS08/COPAS08_Cruise_Report_V4.pdf
Start Date	2008-12-04
End Date	2009-01-02
Description	Cruise KNOX22RR was an expedition to study the Patagonian Shelf coccolithophorid bloom. A total of 168 CTD profiles at 152 stations were completed during the cruise, including 25 dawn primary productivity casts. Depths of the profiles varied from less than 10 m for carboy experiments to a maximum of 5204 m. Most casts, however, extended to 1000 m offshore and were limited by topography along the shelf break and inshore. Profile casts down to 1000 m were interspersed with water casts to increase the along-track resolution of the hydrographic data and to resolve the deeper structure beyond the euphotic zone. On such casts, water was not sampled. On casts where water was taken, sampling from Niskin bottles took place in the following order: oxygen, DIC/Alk, DMS, DOC, nutrients, primary productivity, PIC/POC/Chl, cyanobacteria distribution, HPLC, virus abundance, salts. Sampling was carried out at the following fixed light depths: 50%, 30%, 20%, 10%, 5%, 3%, 1%, 0.1%. The depths were calculated based on one of two methods: (a) during the day, percentages of surface irradiance taken from the downcast profile immediately preceding bottle firing or, (b) at night, based on the measured beam transmittance and previously determined relationships between beam transmittance and diffuse attenuation of photosynthetically available radiation (PAR). Cruise information and original data are available from the NSF R2R data catalog.

[table of contents | back to top]

Project Information

Coccolithophores of the Patagonian Shelf 2008 (COPAS08)

Website: http://www.bigelow.org/research/srs/william_m_balch/barney_balch_laboratory/

Coverage: Patagonian Shelf (SW South Atlantic) 35-55°S, 55-65°W.

A main focus of the COPAS project is to study coccolithophores at the fringes of the Southern Ocean on the Patagonian Shelf (PS) east of Argentina. Some of the most extensive coccolithophore blooms in the world occur on the PS but the remoteness of the region has impeded their study. In this part of the southern ocean, the most basic knowledge is lacking about a) the relationships between coccolithophores and other species of phytoplankton, b) the impact of coccolithophores on the carbon cycle and c) how environmental changes affect bloom taxonomy and function.

This will be the first multi-disciplinary ship-based investigation of these mesoscale blooms, building on an understanding of coccolithophore ecology derived almost exclusively from northern hemisphere bloom studies. This study will document the ecological factors regulating the spatial-temporal distribution of the coccolithophore blooms (the largest recurring coccolithophorid bloom in the sounthern hemisphere) using a combination of underway, satellite and discrete sampling. Satellite measurements will provide quantitative estimates of particulate inorganic carbon (PIC) and particulate organic carbon (POC) in coccolithophore blooms while underway hydrographic and optical sampling will allow real-time evaluation of coccolithophores in both bloom and surrounding non-bloom waters. Vertical casts across the shelf front will provide depth resolved coccolithophore abundance as well as estimates of phytoplankton species richness.

Another goal is to examine the effects of ocean acidification on algal optical properties, coccolithophore concentrations and PIC concentrations (to be determined from deck experiments). Dilution experiments will provide key estimates on phytoplankton growth rates, coccolithophore growth rates and calcification rates, plus the intrinsic loss rates (i.e. phytoplankton grazing, coccolithophore grazing and dissolution associated with zooplankton grazing). PIC has not been examined in dilution experiments heretofore. The project will yield fundamental insights into a) our understanding of coccolithophore ecology (not just Emiliania huxleyi) and b)

the utility of the "functional group" concept to describe coccolithophore variability over the PS. Such knowledge is critical to model complex biogeochemical processes that regulate phytoplankton production and the biological pump. It is also worthy of note that the PS coccolithophore populations are at the western edge of a southern hemisphere belt of enhanced coccolithophores thought to extend from the southern tip of South America to waters south of Australia, (~180 degrees of longitude).

The burning of fossil fuels is predicted to increase atmospheric CO2 to 750 p.p.m.v. or more under various future scenarios. As a large fraction of the anthropogenic CO2 diffuses into seawater, the ocean is becoming more acidic; it is predicted that the pH of the surface ocean will drop by up to 0.7 units by year 2300, a 5-fold increase in the proton concentration. A major goal is to examine the effects of ocean acidification on coccolithophores, in a region of low calcite saturation. This study will provide the first detailed analysis of the coccolithophores in this enormous area of high suspended calcite water. The results will be highly relevant to our basic understanding of the marine carbon cycle.

Financial support for the participating UK scientists was also provided by the Luminescence and Marine Plankton project funded by the Defence Science and Technology Laboratory under the Joint Grant Scheme programme via Proposal Ref. 1166 to Dr. John Allen.

COPOAS'08 Cruise Report

[table of contents | back to top]

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.

[table of contents | back to top]

Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-0728582
Defence Science and Technology Laboratory (DSTL)	JGS 1166
National Aeronautics & Space Administration (NASA)	NNX08AJ88A

[table of contents | back to top]