Cruise event logs from R/V Oceanus cruises OC399-03, OC408-01, OC408-02 from the Northwestern Sargasso Sea roughly 35-28N and 58-68W, water depths always exceeded 4200m; 2004-2005 (NP project)

Website: https://www.bco-dmo.org/dataset/3213
Version: 07Dec2009
Version Date: 2009-12-07

Project
» New Production During Winter Convective Mixing Events (NP)

Contributors	Affiliation	Role
Lomas, Michael W.	Bermuda Institute of Ocean Sciences (BIOS)	Principal Investigator, Contact
Bates, Nicholas R.	Bermuda Institute of Ocean Sciences (BIOS)	Co-Principal Investigator
Knap, Anthony	Bermuda Institute of Ocean Sciences (BIOS)	Co-Principal Investigator
Lipschultz, Fredric	National Aeronautics and Space Administration (NASA) HQ (NASA HQ)	Co-Principal Investigator
Nelson, David M.	Institut Universitaire Européen de la Mer (IUEM)	Co-Principal Investigator
Gegg, Stephen R.	Woods Hole Oceanographic Institution (WHOI)	BCO-DMO Data Manager

Table of Contents

- Dataset Description
  - Methods & Sampling
  - Data Processing Description
- Data Files
- Parameters
- Deployments
- Project Information
- Funding

Dataset Description

New Production (NP) Cruise Event Logs

Methods & Sampling

Prepared by science party aboard the vessel

Data Processing Description

BCO-DMO Edits
- Parameter names modified to conform to BCO-DMO convention
- date reformatted to YYYYMMDD
- lat/lon padded to 4 decimal places
- commas in activities and comments field replaced with semi colons

- added CruiseId column and combined all three event logs into one
- OC408-2, Station 67 latitude corrected from 13 to 31 degs

[table of contents | back to top]

Data Files

File
Event_Logs.csv (Comma Separated Values (.csv), 37.25 KB) MD5:b6f15620e1672a89215d8b3049ab9a96 Primary data file for dataset ID 3213

[table of contents | back to top]

Parameters

Parameter	Description	Units
CruiseId	Cruise Id	text
station	CTD drop number	integer
date	date operation occurred (GMT)	YYYYMMDD
time	time operation occurred (GMT)	HHMM
lon	Longitude position (West is negative)	decimal degrees
lat	Latitude position (South is negative)	decimal degrees
operation	operation type: CTD; XBT; drogue; spar; pump	text
activities_and_comments	operation description: CTD In/Out; spar deployment/recovery	text
person	scientist in charge of operation	text

[table of contents | back to top]

Deployments

OC399-03

Website	https://www.bco-dmo.org/deployment/57994
Platform	R/V Oceanus
Report	http://data.bco-dmo.org/NewProduction/NP_Cruise_report_Oceanus399-03.pdf
Start Date	2004-02-15
End Date	2004-03-15
Description	New Production During Winter Convective Mixing Events: A Missing Component of Current Estimates Cruise Summary In 2004 the New Production research group conducted a 30-day research cruise in the Sargasso Sea from February 15th to March 15th. The primary objective of this cruise was to study the biological response to the passage of winter storms. From Julian Day 66.5 to 74, we 'caught' a significant storm event and were indeed able to follow the biological response. Original cruise data are available from the NSF R2R data catalog

OC408-01

Website	https://www.bco-dmo.org/deployment/57995
Platform	R/V Oceanus
Report	http://data.bco-dmo.org/NewProduction/NP_Cruise_report_Oceanus408-1and2.pdf
Start Date	2005-02-15
End Date	2005-03-04
Description	New Production During Winter Convective Mixing Events: A Missing Component of Current Estimates Original cruise data are available from the NSF R2R data catalog

OC408-02

Website	https://www.bco-dmo.org/deployment/57996
Platform	R/V Oceanus
Report	http://data.bco-dmo.org/NewProduction/NP_Cruise_report_Oceanus408-1and2.pdf
Start Date	2005-02-15
End Date	2005-03-16
Description	New Production During Winter Convective Mixing Events: A Missing Component of Current Estimates Note the break in the cruise was due to the loss of the CTD. Returned to Bermuda to pick up a spare CTD that had been flown in from WHOI. Original cruise data are available from the NSF R2R data catalog

[table of contents | back to top]

Project Information

New Production During Winter Convective Mixing Events (NP)

Website: http://www.bios.edu/Labs/pel/Research%20Pages/Research_NP.html

Coverage: Northwestern Sargasso Sea roughly 35-28N and 58-68W. Water depths always exceeded 4200m

New Production During Winter Convective Mixing Events: A Missing Component of Current Estimates

Daily biogeochemical data collected during winter convection in the Sargasso Sea.

Photosynthetic uptake of CO2 by oceanic phytoplankton and the export of the resulting organic carbon to the deep sea comprise a 'biological pump' (Volk and Hoffert, 1985), capable of extracting globally significant amounts of CO2 from the atmosphere. As a consequence, it is important from the perspective of the global carbon cycle to understand both the present efficiency and the main controlling mechanisms of this important carbon pathway. In the open ocean the biological pump is driven by new production of organic matter (production supported by externally supplied nutrients) and export of that organic matter to depth. Many methods have been employed to estimate new production, with varying degrees of agreement.

In the Sargasso Sea, for example, geochemical estimates of new production largely exclude the winter mixing period (because their fundamental assumption are valid only during stratified periods). Biological methods suggest that the pre-stratification period can be as important, in terms of new production, as the remainder of the year. Those biological estimates are poorly constrained and based on sparse data. Because of the enormous spatial extent of subtropical gyres similar to the Sargasso Sea, uncertainty in the rate of new production and organic matter export in those systems leads to large uncertainty in biologically-driven carbon fluxes at the global-scale.

Short-term stochastic events are increasingly recognized as being disproportionately important for biogeochemical cycling and carbon storage in the ocean. Recent data suggest that in the Sargasso Sea, the passage of weather fronts leads to increased new production during the winter mixing period. We hypothesize that these events lead to enhanced NO3-input, followed by a rapid biological response and accumulation of biomass, and an equally rapid export of that biomass. This rapid export may be systematically missed by the 3-4 day particle trap deployments of the Bermuda Atlantic Time-series Study (BATS) because they are hypothesized to happen during or immediately after the passage of frontal systems, when the vessel used for the BATS sampling program does not leave port. Such events have, however, been captured as increases in the fluorometer traces at the Bermuda Testbed Mooring (BTM) and increases in organic carbon flux in the continuous Ocean Flux Program (OFP) sediment traps, both of which are deployed in the Sargasso Sea near Bermuda

We propose a process-oriented study of new production and its control during the period before formation of the seasonal thermocline in the BATS/BTM/OFP region near Bermuda. This study will be conducted during two 30-day cruises (one in 2004 and one in 2005) during the winter mixing period when the passage of these fronts is most common and when few data are available to constrain new production estimates. It will be crucial for this study to sample from a fully weather-capable research vessel, which can stay out and continue operations through most winter storms. We will use direct measurements of NO3-entrainment, NO3-uptake, phytoplankton community structure change, and dissolved and particulate organic matter export to elucidate the linkages between new production and export production as well as determine the main biological responses to short-term physical forcing. Particular emphasis will be placed on biogeochemically critical phytoplankton groups such as diatoms and coccolithophorids, which can exploit transiently favorable conditions of the kind we hypothesize to occur in late winter/early spring and which play a disproportionately large role in organic-matter export in many systems.

An understanding of ocean function is no longer important just to practicing ocean scientists. This project will provide information critical for biogeochemical modelers seeking to constrain future predictions of changes in the oceanic biological pump, and will also provide information of interest to students, teachers and the general public.

If in fact a significant, and previously unmeasured, amount of new production occurs in subtropical gyres during the winter mixing period, then biological processes in the central oceans play a greater role in the global carbon cycle - including regulation of atmospheric CO2 - than we recognize at present. Regardless of whether or not our study shows that this is the case, we will explain the results and their implications to graduate and undergraduate courses through the teaching programs at BBSR and OSU, to high-school and elementary-school teachers through a targeted teacher-training program at BBSR and to the broader public in seminars and other public presentations.

Related files

OC399-3 Cruise Report
OC408-1,2 Cruise Report

References:

Detailed information on phytoplankton analysis.
Lomas, M.W., Roberts, N., Lipschultz, F., Krause, J.W., Nelson, D.M., and Bates, N.R. 2009. Biogeochemical responses to late-winter storms in the Sargasso Sea. IV. Rapid succession of major phytoplankton groups.

Deep Sea Research I, 56: 892-909.
doi:10.1016/j.dsr.2009.03.004

Detailed information on all silica cycle measurements.
Krause, J.W., Nelson, D.M., and Lomas, M.W. 2009. Biogeochemical responses to late-winter storms in the Sargasso Sea. 2009. II. Increased rates of biogenic silica production and export.
Deep Sea Research I, 56: 861-875.
doi:10.1016/j.dsr.2009.01.002

Maiti, K., Benitez-Nelson, C.R., Lomas, M.W., and Krause, J. W. 2009. Biogeochemical responses to late-winter storms in the Sargasso Sea. IV. Comparison of Export Production by 234Th and Sediment Traps.
Deep Sea Research I, 56: 875-892.
doi:10.1016/j.dsr.2009.01.008

Detailed information on general biogeochemical measurements.
Lomas, M.W., Lipschultz, F., Nelson, D.M., and Bates, N.R. 2009. Biogeochemical responses to late-winter storms in the Sargasso Sea. I. Pulses of new and primary production.
Deep Sea Research I, 56: 843-861.
doi:10.1016/j.dsr.2008.09.002

[table of contents | back to top]

Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-0241662

[table of contents | back to top]