Sediment trap flux collected from R/V Atlantic Explorer cruises AE1102, AE1118, AE1206, AE1219 in the Sargasso Sea, Bermuda Atlantic Time-Series Station from 2011-2012 (Trophic BATS project)

Website: https://www.bco-dmo.org/dataset/3935
Data Type: Cruise Results
Version: 1
Version Date: 2013-05-01

Project
» Plankton Community Composition and Trophic Interactions as Modifiers of Carbon Export in the Sargasso Sea (Trophic BATS)

Program
» Ocean Carbon and Biogeochemistry (OCB)

Contributors	Affiliation	Role
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Abstract
Sediment trap flux collected from R/V Atlantic Explorer cruises AE1102, AE1118, AE1206, AE1219 in the Sargasso Sea, Bermuda Atlantic Time-Series Station from 2011-2012.

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Coverage

Spatial Extent: **N**:33.46986667 **E**:-63.5012 **S**:29.5879 **W**:-65.77848
Temporal Extent: 2011-02-24 - 2012-07-26

Dataset Description

Sediment trap flux data collected on the Trophic BATS cruises in the Sargasso Sea. Data are from 4 cruises over the span 2011-2012.

Methods & Sampling

Samples for particles flux measurements were obtained using free-drifting cylindrical traps (MultiPITs) deployed at 150, 200, and 300 meters depth. Sinking fluxes of C, N, and P were calculated from the elemental mass of material captured in the sediment trap, its collection surface area and deployment length. Detailed methods for

all data collected as part of this study can be found in the publications arising from this study (references given below).

Sample QA/QC procedures followed those given in the associated manuscripts. Sample accuracy was assessed by using certified standards, for those measurements where standards are available. Certified standards were run with each analytical run and compared to long term control charts for respective analyses.

Detailed information on analyses:
Lomas, M.W., Burke, A., Lomas, D.A., Bell, D.W., Shen, C., Ammerman, J.W., Dyhrman, S.T. 2010. Sargasso Sea phosphorus biogeochemistry: An important role for dissolved organic phosphorus (DOP). Biogeosciences 7: 695-710. doi: 10.5194/bg-7-695-2010
Lomas, M.W., Bates, N.R., Johnson, R.J., Knap, A.H., Steinberg, D.K., Carlson, C.A. 2013. Two decades and counting: overview of 24-years of sustained open ocean biogeochemical measurements. Deep Sea Research II doi: 10.1016/j.dsr2.2013.01.008.

Data Processing Description

Data that were either not collected or were found to be in error for other reasons are denoted by 'nd'. Most of the data given in this dataset are not derived variables and are calculated using reasonably standard equations as given in the appropriate references. Where data are derived (e.g., bacterial carbon biomass) the appropriate reference is given in the parameter definition.

BCO-DMO Processing Notes:
- Modified parameter names to conform with BCO-DMO naming conventions.
- Replaced '-9.99' with 'nd'.

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Data Files

File
sediment_trap_flux.csv (Comma Separated Values (.csv), 7.95 KB) MD5:28ceeaf5e9d48b7a355d65cb3ba5cdd8 Primary data file for dataset ID 3935

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Parameters

Parameter	Description	Units
cruise_id	Official cruise identifier e.g. AE1102 = R/V Atlantic Explorer cruise number 1102.	text
deployment_no	Sequential trap deployment number within cruise.	integer
date	Date traps deployed in YYYYmmdd format.	unitless
month	2-digit month when traps were deployed.	mm (01 to 12)
day	2-digit day of month when traps were deployed.	dd (01 to 31)
year	Year when traps were deployed in YYYY format.	unitless
lat	Latitude of trap deployment, positive is North.	decimal degrees
lon	Longitude of trap deployment, West in negative.	decimal degrees
depth	Depth of individual sediment trap arrays.	meters
mass_flux	Total mass flux in milligrams per square-meter per day.	mg/m^2/d
POC_flux	Particulate organic carbon flux in milligrams per square-meter per day.	mg/m^2/d
PON_flux	Particulate organic nitrogen flux in milligrams per square-meter per day.	mg/m^2/d
particulate_P_flux	Particulate phosphorus flux in milligrams per square-meter per day.	mg/m^2/d

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Instruments

Dataset-specific Instrument Name	Sediment Trap - Particle Interceptor
Generic Instrument Name	Sediment Trap - Particle Interceptor
Generic Instrument Description	A Particle Interceptor Trap is a prototype sediment trap designed in the mid 1990s to segregate 'swimmers' from sinking particulate material sampled from the water column. The prototype trap used 'segregation plates' to deflect and segregate 'swimmers' while a series of funnels collected sinking particles in a chamber (see Dennis A. Hansell and Jan A. Newton. September 1994. Design and Evaluation of a "Swimmer"-Segregating Particle Interceptor Trap, Limnology and Oceanography, Vol. 39, No. 6, pp. 1487-1495).

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Deployments

AE1102

Website	https://www.bco-dmo.org/deployment/58672
Platform	R/V Atlantic Explorer
Start Date	2011-02-23
End Date	2011-03-07
Description	This cruise was the first in a series of four cruises planned to study the trophic interactions and particle export during the winter season in the Sargasso Sea. The researchers focused on several sampling locations including an anticyclonic eddy, slope waters of the eddy, and repeated visits to the Bermuda Atlantic Time Series (BATS) study site. The research focus for the cruise included phytoplankton production, microzooplankton grazing, mesozooplankton grazing and particle export. This process cruise was designed to quantify stocks and rate processes in the Sargasso Sea food web. Work entailed CTD casts, over the stern deployment of in situ primary production arrays and surface tethered sediment traps. Until 26 November 2012 this cruise was identified by BIOS and R2R as AE-X1101. On 26 November 2012, the cruise ID was corrected to AE1102. Original cruise data are available from the NSF R2R data catalog

AE1118

Website	https://www.bco-dmo.org/deployment/58934
Platform	R/V Atlantic Explorer
Start Date	2011-07-22
End Date	2011-08-04
Description	AE1118 was a process cruise aboard the R/V Atlantic Explorer to quantify stocks and rate processes in the Sargasso Sea food web. This was the second in a series of cruises for the Trophic BATS project. On each cruise, sampling was conducted at three stations: the center and edge of a mesoscale eddy and at one station outside of the eddy. Core CTD casts to ~2000 meters and pre-dawn 'Productivity' CTD casts were made at each station. Original cruise data are available from the NSF R2R data catalog.

AE1206

Website	https://www.bco-dmo.org/deployment/58935
Platform	R/V Atlantic Explorer
Start Date	2012-03-14
End Date	2012-03-23
Description	AE1206 was the third in a series of four cruises for the Trophic BATS project. On each cruise, sampling was conducted at three stations: the center and edge of a mesoscale eddy and at one station outside of the eddy. Core CTD casts to ~2000 meters and pre-dawn 'Productivity' CTD casts were made at each station. Cruise information and original data are available from the NSF R2R data catalog.

AE1219

Website	https://www.bco-dmo.org/deployment/58936
Platform	R/V Atlantic Explorer
Start Date	2012-07-19
End Date	2012-07-31
Description	AE1219 was the final cruise in a series of four for the Trophic BATS project. On each cruise, sampling was conducted at three stations: the center and edge of a mesoscale eddy and at one station outside of the eddy. Core CTD casts to ~2000 meters and pre-dawn 'Productivity' CTD casts were made at each station. Cruise information and original data are available from the NSF R2R data catalog.

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Project Information

Plankton Community Composition and Trophic Interactions as Modifiers of Carbon Export in the Sargasso Sea (Trophic BATS)

Coverage: Sargasso Sea, BATS site

Fluxes of particulate carbon from the surface ocean are greatly influenced by the size, taxonomic composition and trophic interactions of the resident planktonic community. Large and/or heavily-ballasted phytoplankton such as diatoms and coccolithophores are key contributors to carbon export due to their high sinking rates and direct routes of export through large zooplankton. The potential contributions of small, unballasted phytoplankton, through aggregation and/or trophic re-packaging, have been recognized more recently. This recognition comes as direct observations in the field show unexpected trends. In the Sargasso Sea, for example, shallow carbon export has increased in the last decade but the corresponding shift in phytoplankton community composition during this time has not been towards larger cells like diatoms. Instead, the abundance of the picoplanktonic cyanobacterium, Synechococccus, has increased significantly. The trophic pathways that link the increased abundance of Synechococcus to carbon export have not been characterized. These observations helped to frame the overarching research question, "How do plankton size, community composition and trophic interactions modify carbon export from the euphotic zone". Since small phytoplankton are responsible for the majority of primary production in oligotrophic subtropical gyres, the trophic interactions that include them must be characterized in order to achieve a mechanistic understanding of the function of the biological pump in the oligotrophic regions of the ocean.

This requires a complete characterization of the major organisms and their rates of production and consumption. Accordingly, the research objectives are: 1) to characterize (qualitatively and quantitatively) trophic interactions between major plankton groups in the euphotic zone and rates of, and contributors to, carbon export and 2) to develop a constrained food web model, based on these data, that will allow us to better understand current and predict near-future patterns in export production in the Sargasso Sea.

The investigators will use a combination of field-based process studies and food web modeling to quantify rates of carbon exchange between key components of the ecosystem at the Bermuda Atlantic Time-series Study (BATS) site. Measurements will include a novel DNA-based approach to characterizing and quantifying planktonic contributors to carbon export. The well-documented seasonal variability at BATS and the occurrence of mesoscale eddies will be used as a natural laboratory in which to study ecosystems of different structure. This study is unique in that it aims to characterize multiple food web interactions and carbon export simultaneously and over similar time and space scales. A key strength of the proposed research is also the tight connection and feedback between the data collection and modeling components.

Characterizing the complex interactions between the biological community and export production is critical for predicting changes in phytoplankton species dominance, trophic relationships and export production that might occur under scenarios of climate-related changes in ocean circulation and mixing. The results from this research may also contribute to understanding of the biological mechanisms that drive current regional to basin scale variability in carbon export in oligotrophic gyres.

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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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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1030149

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