Bacterial production data from R/V Knorr cruise KN207-01 along the southern tip of Nova Scotia to Bermuda in 2012 (SargassoSeaLipids project)

Website: https://www.bco-dmo.org/dataset/555826
Version: 14 April 2015
Version Date: 2015-04-14

Project
» Biogeochemical Impact and Fate of Non-phosphorus Membrane Lipids in the Sargasso Sea (SargassoSeaLipids)

Program
» Ocean Carbon and Biogeochemistry (OCB)

Contributors	Affiliation	Role
Van Mooy, Benjamin A.S.	Woods Hole Oceanographic Institution (WHOI)	Principal Investigator
Collins, James	Woods Hole Oceanographic Institution (WHOI)	Contact
Rauch, Shannon	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

Table of Contents

Dataset Description

Water column bacterial production (BP) rates measured using the 3H-leucine incorporation microcentrifuge method.

Methods & Sampling

Refer to Collins et al., *Global Biogeochem. Cycles* (2015), in review. Excerpted from methods section:

Water column bacterial production (BP) rates were measured using the 3H-leucine incorporation microcentrifuge method of Simon and Azam (1989), as modified by Kirchman (2001). Incubations were conducted following each CTD cast using water samples from six depths; the first and sixth samples were always from the immediate surface layer (3-5 m) and 150 m. Triplicate 1 mL samples from each chosen depth or net trap were incubated with 3H-leucine (PerkinElmer, Inc., Waltham, MA; 146.5 Ci mmol-1, diluted to achieve 20 nM final concentration) for 4-12 hours at the temperature of the mixed layer. At the conclusion of the cruise, samples were processed and analyzed in a laboratory ashore according to Kirchman (2001) using Ultima Gold Low-Level Tritium cocktail (PerkinElmer, Inc.). Decay per minute counts in killed control samples were subtracted from the mean of each set of triplicates and divided by the incubation time to obtain a blank-corrected leucine incorporation rate in units of pmol leucine L-1 h-1.

References:

Collins, J. R., B. R. Edwards, K. Thamatrakoln, J. E. Ossolinksi, G. R. DiTullio, K. D. Bidle, S. C. Doney, and B. A. S. Van Mooy (2015), The multiple fates of sinking particles in the North Atlantic Ocean, *Global Biogeochem. Cycles,* in review.

Simon, M., and F. Azam (1989), Protein-content and protein-synthesis rates of planktonic marine bacteria, *Mar. Ecol. Prog. Ser.*, *51*(3), 201-213, doi:10.3354/Meps051201.

Kirchman, D. (2001), Measuring bacterial biomass production and growth rates from leucine incorporation in natural aquatic environments, in *Methods in Microbiology*, edited by J. H. Paul, pp. 227-237, Academic Press, doi:10.1016/S0580-9517(01)30047-8.

Data Processing Description

The "signal_to_noise" column gives the ratio for each measurement, i.e., the ratio of the incorporation rate in the live samples to the killed control at that depth.

BCO-DMO processing notes:
- Replaced 'NaN' with 'nd' to indicate 'no data'.
- Modified parameter names to conform with BCO-DMO naming conventions.
- Modified format of date/time to fit ISO8601 format.

[table of contents | back to top]

Data Files

File
KN207-01_bac_prod.csv (Comma Separated Values (.csv), 29.20 KB) MD5:a848591fa8fa6dc0203be29d07ba0a4f Primary data file for dataset ID 555826

[table of contents | back to top]

Parameters

Parameter	Description	Units
station_ctd	CTD station number.	dimensionless
incub_duration	Incubation duration.	minutes
ISO_DateTime_UTC	Date and time (from CTD timestamp) formatted to ISO 8601 standard. T represents the start of the time string and Z indicates UTC.	YYYY-mm-ddTHH:MM:SS.xxZ
lat_CTD	Latitude of CTD station.	decimal degrees
lon_CTD	Longitude of CTD station.	decimal degrees
depth	Sample depth.	meters (m)

DPM_live_samples_mean	Mean DPM (disintegrations per minute), live samples.	dpm (disintegrations per minute)
DPM_live_samples_stdev	Standard deviation DPM (disintegrations per minute), live samples.	dpm (disintegrations per minute)
DPM_of_killed_control	DPM (disintegrations per minute) of killed control.	dpm (disintegrations per minute)
trit_leu_uptake_live_mean_dpm	Mean tritium-labeled leucine (3H-Leu) uptake, live samples.	dpm per liter per hour (dpm/L/hr)
trit_leu_uptake_live_stdev_dpm	Standard deviation of tritium-labeled leucine (3H-Leu) uptake, live samples.	dpm per liter per hour (dpm/L/hr)
trit_leu_uptake_killed_dpm	Tritium-labeled leucine (3H-Leu) uptake, killed control.	dpm per liter per hour (dpm/L/hr)
trit_leu_uptake_dpm	Tritium-labeled leucine (3H-Leu) uptake.	dpm per liter per hour (dpm/L/hr)
trit_leu_uptake_stdev_dpm	Standard deviation of tritium-labeled leucine (3H-Leu) uptake.	dpm per liter per hour (dpm/L/hr)
trit_leu_uptake_live_mean_pmol	Mean tritium-labeled leucine (3H-Leu) uptake, live samples.	picomoles per liter per hour (pmol/L/hr)
trit_leu_uptake_live_stdev_pmol	Standard deviation tritium-labeled leucine (3H-Leu) uptake, live samples.	picomoles per liter per hour (pmol/L/hr)
trit_leu_uptake_killed_pmol	Tritium-labeled leucine (3H-Leu) uptake, killed control.	picomoles per liter per hour (pmol/L/hr)
trit_leu_uptake_pmol	The final, blank-corrected, replicate-averaged rates of leucine incorporation for each CTD station and depth.	picomoles 3H-leucine per liter per hour (pmol 3H-leu/L/hr)
trit_leu_uptake_stdev_pmol	Standard deviation of the final, blank-corrected, replicate-averaged rates of leucine incorporation for each CTD station and depth.	picomoles 3H-leucine per liter per hour (pmol 3H-leu/L/hr)
signal_to_noise	The "signal to noise" ratio for each measurement, i.e., the ratio of the incorporation rate in the live samples to the killed control at that depth.	dimensionless (ratio)

[table of contents | back to top]

Deployments

KN207-01

Website	https://www.bco-dmo.org/deployment/58787
Platform	R/V Knorr
Start Date	2012-04-21
End Date	2012-05-04
Description	Projected Science Plan: The plan is to conduct two, 5-day quasi-lagrangian time-series stations at 65W, one north of the Gulf Stream and one south of the Gulf Stream. The daily cruise track will be centered around following free-floating sediment net traps arrays. The traps will be retrieved and re-deployed on 24 hour intervals (generally beginning at day break). CTD casts, primarily in the upper 250 meters, will be done in the afternoons, with McLane pumps deployed overnight. This cruise is funded by NSF OCE-1031143. More information about this cruise is available from the vessel operator (WHOI cruise synopsis). Cruise information and original data are available from the NSF R2R data catalog.

[table of contents | back to top]

Project Information

Biogeochemical Impact and Fate of Non-phosphorus Membrane Lipids in the Sargasso Sea (SargassoSeaLipids)

Coverage: Sargasso Sea

Intact polar diacyglycerols (IP-DAGs) are the fatty-acid bearing lipid molecules that compose bacterial and eukaryotic cell membranes. As such, they are one of the most abundant classes of lipid molecules in plankton, and play a major role in the marine carbon cycle. However, until very recently, the molecular diversity of IP-DAGs was poorly understood; the structural identity and characteristics of IP-DAGs were inferred almost exclusively from their constituent fatty acids. These non-phosphorus containing IP-DAGs were largely unknown to chemical oceanography. In contrast, phospholipids, which have been the focus of considerable research, compose a disproportionally small fraction of total IP-DAGs. But we still lack even a cursory understanding of biochemical functions and geochemical fates of non-phosphorus IP-DAGs. Given that these molecules are among the most abundant lipid molecules on the planet, this represents a profound and unexpected gap in our understanding the marine carbon and phosphorus cycles.

In this project, researchers at the Woods Hole Oceanographic Institution will launch a pioneering study of these poorly understood compounds. Their approach will be guided by four questions: (1) How do non-phosphorus lipids contribute to variations in the C:N:P of particulate organic matter in the Sargasso Sea? (2) What are the relative degradation rates of phospholipids and non-phosphorus lipids in surface waters? (3) Which groups of microbes utilize the carbon and phosphorus from different IP-DAGs? (4) What are the relative contributions of different IP-DAGs to particulate organic matter export to the deep-sea?

These questions will be answered by using sophisticated HPLC/MS analyses and novel isotope tracing approaches in conjunction with long-standing methods for measuring the C:N:P of plankton and determining the degradation rates of organic molecules. The research team will establish whether these newly-recognized sulfolipids and betaine lipids molecules are a quantitatively important biochemical option for phytoplankton to affect flexible C:N:P stoichiometry in the face of nutrient stress. They will also elucidate the degradation rate, microbial fate, and export potential of the carbon and phosphorus from IP-DAGs. This will shed new light on the broader roles of these molecules in the cycling of these elements by the planktonic community.

This project contains components that are specifically designed to meet the NSF criteria for "advancing discovery and understanding while promoting teaching, training and learning." The project will support the training of a graduate student and postdoctoral fellow. In addition, the research team will work with the non-profit Zephyr Foundation in Woods Hole to design educational 'units' based on the team's research that will be tailored to student in grades 6 - 12. The Foundation will present these units as part of their hands-on marine science field trip series that is delivered to over 200 students and their teachers per year.

[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-1031143

[table of contents | back to top]