15N uptake rates from R/V Hugh R. Sharp cruise HRS100808BW in 2010 (Marine Nitrogen Cycling by Stable Isotope Probing project)

Website: https://www.bco-dmo.org/dataset/473429
Version: 09 January 2014
Version Date: 2014-01-09

Project
» Determining rates of group-specific phytoplankton and bacterial uptake of inorganic and organic nitrogen by means of stable isotope techniques (Marine Nitrogen Cycling by Stable Isotope Probing)

Program
» Ocean Carbon and Biogeochemistry (OCB)

Contributors	Affiliation	Role
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Dataset Description

15N Uptake Rates

Data Processing Description

BCO-DMO Processing Notes
Original file: "BCB2010-FinalDataReport.xlsx", Sheet "Uptake" contributed by Marta Sanderson
- Date coverted to YYYYMMHH
- Time converted to HHMM
- Lon signed negative for West longitude
- Parameter names edited to conform to BCO-DMO parameter naming conventions - "nd" (no data) inserted into blank cells

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Data Files

File
Nuts_15N_Uptake.csv (Comma Separated Values (.csv), 7.16 KB) MD5:8b791ea6244b6cc4f8880123d070d759 Primary data file for dataset ID 473429

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Parameters

Parameter	Description	Units
Experiment	Experiment	text
Substrate_Addition	Substrate Addition	umol N/L
Time_Point	Time Point	hours
Station	Station	text
Lat	Latitude (South is negative).	decimal degrees
Lon	Longitude (West is negative)	decimal degrees
Fraction	Fraction	um
Date	Date	YYYYMMDD
Cast_Time	Cast Time	HHMM
Depth	Depth	m
NH4_Specific_Uptake	NH4 Specific Uptake	1/h
NH4_Specific_Uptake_SD	NH4 Specific Uptake SD	1/h
NH4_Absolute_Uptake	NH4 Absolute Uptake	umol N/L h
NH4_Absolute_Uptake_SD	NH4 Absolute Uptake SD	umol N/L h
NH4_Regeneration	NH4 Regeneration	umol N/L h
NH4_Regeneration_SD	NH4 Regeneration SD	umol N/L h
NO3_Specific_Uptake	NO3 Specific Uptake	1/h
NO3_Specific_Uptake_SD	NO3 Specific Uptake SD	1/h
NO3_Absolute_Uptake	NO3 Absolute Uptake	umol N/L h
NO3_Absolute_Uptake_SD	NO3 Absolute Uptake SD	umol N/L h
Urea_Specific_Uptake	Urea Specific Uptake	1/h
Urea_Specific_Uptake_SD	Urea Specific Uptake SD	1/h
Urea_Absolute_Uptake	Urea Absolute Uptake	umol N/L h
Urea_Absolute_Uptake_SD	Urea Absolute Uptake SD	umol N/L h
Amino_Acid_Specific_Uptake	Amino Acid Specific Uptake	1/h
Amino_Acid_Specific_Uptake_SD	Amino Acid Specific Uptake SD	1/h
Amino_Acid_Absolute_Uptake	Amino Acid Absolute Uptake	umol N/L h
Amino_Acid_Absolute_Uptake_SD	Amino Acid Absolute Uptake SD	umol N/L h

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Instruments

Dataset-specific Instrument Name	CTD SBE 911plus
Generic Instrument Name	CTD Sea-Bird SBE 911plus
Dataset-specific Description	CTD System: SeaBird Electronics 911 plus CTD, Rosette is a 12-bottle General Oceanic Model 1015, outfitted with an array of 10 liter bottles.
Generic Instrument Description	The Sea-Bird SBE 911 plus is a type of CTD instrument package for continuous measurement of conductivity, temperature and pressure. The SBE 911 plus includes the SBE 9plus Underwater Unit and the SBE 11plus Deck Unit (for real-time readout using conductive wire) for deployment from a vessel. The combination of the SBE 9 plus and SBE 11 plus is called a SBE 911 plus. The SBE 9 plus uses Sea-Bird's standard modular temperature and conductivity sensors (SBE 3 plus and SBE 4). The SBE 9 plus CTD can be configured with up to eight 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	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.

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Deployments

HRS100808BW

Website	https://www.bco-dmo.org/deployment/58715
Platform	R/V Hugh R. Sharp
Start Date	2010-08-10
End Date	2010-08-16
Description	August 2010 Marine Nitrogen Cycling by Stable Isotope Probing cruise in Chespeake Bay, funded by: NSF OCE-0241310 Original cruise data are available from the NSF R2R data catalog

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Project Information

Determining rates of group-specific phytoplankton and bacterial uptake of inorganic and organic nitrogen by means of stable isotope techniques (Marine Nitrogen Cycling by Stable Isotope Probing)

Coverage: Chesapeake Bay

From the NSF award abstract: The marine nitrogen (N) cycle involves a complex network of biological transformations among different inorganic and organic N reservoirs. Considerable progress has been made in defining N cycling processes in marine environments in recent years, but significant questions remain unanswered in part due to methodological limitations. Traditional tools for studying N cycling, for example, cannot accurately assess phytoplankton or bacteria specific N use in marine ecosystems. Therefore there is a need to develop new techniques and methodologies. The PIs of this project have recently made two important advances in this context: (1) a flowcytometric methodology (FCM) to separate phytoplankton from bacteria was applied to separately measure N uptake by these two groups. Prior methodologies relied on measurements of different size fractions, which always contain some degree of both phytoplankton and bacterial uptake. FCM allows for the distinct separation of bacterial versus phytoplankton N incorporation. (2) N-based DNA stable isotope probing (SIP) methodology has been adapted to interrogate N uptake in specific phytoplankton populations. DNA SIP can provide evidence for the uptake of an N source into a specific population of phytoplankton or bacteria. This methodology is in contrast to traditional measurements, which cannot make inferences about individual populations or species.

This project aims to apply these two methodological advances in order to obtain the next generation of N uptake measurements. Phytoplankton and bacteria specific uptake rates will be measured via the FCM technique, and the individual groups or species of phytoplankton or bacteria will be interrogated for N uptake via DNA SIP. These tools will be applied across the well-characterized nutrient gradient found in Chesapeake Bay during one summer cruise and one winter cruise. Phytoplankton, bacterial, and archaeal populations will be characterized along the sampling transect via multiplexed pyrosequencing technology. N uptake will be measured for inorganic (NH4+, NO3-, and NO2-) and organic N sources (15N and 14C urea dual-labeled and amino acids) as substrates. The investigators hypothesize that phytoplankton will derive a larger percentage of their N nutrition from organic forms along the transect (i.e. North to South), as competition with bacteria for ammonium increases. DNA SIP will be applied to specific dominant phytoplankton and bacterial populations in order to investigate their N nutrition. By applying this unique combination of methodologies, the project will provide unprecedented community, group and species level resolution of N uptake in Chesapeake Bay and will furnish us with an improved understanding of N cycling in the Bay and marine systems as a whole.

Related Publication: Wawrik, B; Callaghan, AV; Bronk, DA. "Use of Inorganic and Organic Nitrogen by Synechococcus spp. and Diatoms on the West Florida Shelf as Measured Using Stable Isotope Probing," *APPLIED AND ENVIRONMENTAL MICROBIOLOGY*, v.75, 2009, p. 6662-6670. View record at Web of Science

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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-0960806

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