Water column nutrient data from RV/Neil Armstrong cruise AR16, May 2017

Website: https://www.bco-dmo.org/dataset/762849

Data Type: Cruise Results

Version: 1

Version Date: 2019-03-21

Project

» Collaborative Research: Defining the biogeochemical drivers of diatom physiological ecology in the North Atlantic (North Atlantic Diatoms)

Contributors	Affiliation	Role
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Abstract

This dataset includes water column nutrient data from RV/Neil Armstrong cruise AR16, May 2017: silicate, nitrate, nitrite, and ammonium concentrations.

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Coverage

Temporal Extent: 2017-05-04 - 2017-05-20

Dataset Description

This dataset includes water column nutrient data from RV/Neil Armstrong cruise AR16, May 2017: silicate, nitrate, nitrite, and ammonium concentrations.

Acquisition Description

Sampling was conducted aboard the R/V Neil Armstrong during a cruise in May 2017. Seawater was collected from Niskin bottles deployed on a rosette with a CTD. Samples were pre-filtered through a 0.2 micrometer filter into a 50 mL Falcon tube and frozen at -20 degrees C. Samples were shipped frozen to the University of Washington Marine Chemistry Laboratory. Samples were analyzed on a Technicon AAII Autoanalyzer.

Analytical methods (from https://www.ocean.washington.edu/story/Marine+Chemistry+Laboratory):

Analysis	Method Reference	EPA/SM#	MELAC Code
PO4	UNESCO(1994)	EPA 365.5_1.4_1997	WM920270
Si(OH)4	UNESCO(1994)	EPA 366	WM920240
NO3	UNESCO(1994)	EPA 353.4_2_1997	10068209
NO2	UNESCO(1994)	EPA 353.4_2_1997	10068209
NH4	UNESCO(1994)	EPA 349	WM920220

Processing Description

BCO-DMO Processing:
- added conventional header with dataset name, PI name, version date
- modified parameter names to conform with BCO-DMO naming conventions
- re-formatted date from m/d/yyyy to yyyy-mm-dd

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Parameters

Parameter	Description	Units
Date	Sampling date formatted as yyyy-mm-dd.	unitless
Depth	Depth at which the samples were collected.	meters
Station	Numeric identifier for the station where the data was collected.	unitless
CTD_Cast	Numeric identifier for the CTD cast where the data was collected.	unitless
PO4	Phosphate concentration.Samples were NOT pre-concentrated with MAGIC; bdl = 0.014 umol per liter	umol per liter
Silicate	Silica concentration; bdl = 0.23 umol per liter	umol per liter
NO3	Nitrate concentration; bdl = 0.288 umol per liter	umol per liter
NO2	Nitrite concentration; bdl = 0.011 umol per liter	umol per liter
NH4	Ammonium concentration; bdl = 0.047 umol per liter	umol per liter

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Instruments

Dataset-specific Instrument Name	
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.

Dataset-specific Instrument Name	
Generic Instrument Name	CTD profiler
Generic Instrument Description	The Conductivity, Temperature, Depth (CTD) unit is an integrated instrument package designed to measure the conductivity, temperature, and pressure (depth) of the water column. The instrument is lowered via cable through the water column and permits scientists observe the physical properties in real time via a conducting cable connecting the CTD to a deck unit and computer on the ship. The CTD is often configured with additional optional sensors including fluorometers, transmissometers and/or radiometers. It is often combined with a Rosette of water sampling bottles (e.g. Niskin, GO-FLO) for collecting discrete water samples during the cast. This instrument designation is used when specific make and model are not known.

Dataset-specific Instrument Name	Technicon AAII Autoanalyzer
Generic Instrument Name	Nutrient Autoanalyzer
Generic Instrument Description	Nutrient Autoanalyzer is a generic term used when specific type, make and model were not specified. In general, a Nutrient Autoanalyzer is an automated flow-thru system for doing nutrient analysis (nitrate, ammonium, orthophosphate, and silicate) on seawater samples.

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Deployments

AR16

Website	https://www.bco-dmo.org/deployment/747056
Platform	R/V Neil Armstrong
Start Date	2017-05-03
End Date	2017-05-22
Description	Redox Cycling of Phosphorus in the Western North Atlantic

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Project Information

Collaborative Research: Defining the biogeochemical drivers of diatom physiological ecology in the North Atlantic (North Atlantic Diatoms)

Coverage: North Atlantic

NSF abstract: About half of photosynthesis on earth is generated by marine phytoplankton, single celled organisms that drift with tides and currents. Within the phytoplankton, the diatoms conduct nearly half of this photosynthesis, exerting profound control over global carbon cycling. Despite their importance, there are surprisingly fundamental gaps in understanding how diatoms function in their natural environment, in part because methods to assess in situ physiology are lacking. This project focuses on the application of a powerful new approach, called Quantitative Metabolic Fingerprinting (QMF), to address this knowledge gap and examine species-specific physiology in the field. The project will provide transformative insights into how ocean geochemistry controls the distribution of diatoms, the metabolic responses of individual diatom species, and how metabolic potential is partitioned between diatom species, thus providing new insights into the structure and function of marine systems. The overarching goal is to examine how diatom species respond to changes in biogeochemistry across marine provinces, from the coast to the open ocean, by following shifts in diatom physiology using QMF. This research is critical to understand future changes in oceanic phytoplankton in response to climate and environmental change. Furthermore, activities on this project will include supporting a graduate student and postdoctoral fellow and delivering the Artistic Oceanographer Program (AOP) to diverse middle school age children and teachers in the NYC metropolitan area and to middle-school girls in the Girl Scouts of RI, reaching an anticipated 60 children and 30 teachers annually. The programs will foster multidisciplinary hands-on learning and will directly impact STEM education at a critical point in the pipeline by targeting diverse middle-school aged groups in both NY and RI. In laboratory studies with cultured isolates, there are profound differences among diatom species' responses to nutrient limitation. Thus, it is likely that different species contribute differently to nutrient uptake, carbon flux and burial. However, marine ecosystem models often rely on physiological attributes drawn from just one species and apply those attributes globally (e.g. coastal species used to model open ocean dynamics) or choose a single average value to represent all species across the world's oceans. In part, this is due to a relatively poor understanding of diatom physiological ecology and a limited tool set for assessing in situ diatom physiological ecology. This research project will address this specific challenge by explicitly tracking metabolic pathways, measuring their regulation and determining their taxonomic distribution in a suite of environmentally significant diatoms using a state of the art, species-specific approach. A research expedition is set in the North Atlantic, a system that plays a major role in carbon cycling. Starting with a New England coastal shelf site, samples will be collected from the coast where diatoms thrive, to the open ocean and a site of a long term ocean time series station (the Bermuda Atlantic Time Series) where diatom growth is muted by nutrient limitation. This research takes advantage of new ocean observatories initiative (OOI) and time series information. Through the research expedition and downstream

laboratory experiments, the molecular pathways of nutrient metabolism and related gene expression in a suite of environmentally significant diatoms will be identified. Data will be combined to predict major limiting factors and potentially important substrates for diatoms across marine provinces. Importantly, this integrated approach takes advantage of new advances in molecular and bioinformatics tools to examine in situ physiological ecology at the species-specific level, a key knowledge gap in the field.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1558490
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