Chlorophyll a concentrations from addition incubation experiments performed on AR16 from May 2017 in the Sargasso Sea

Website: https://www.bco-dmo.org/dataset/775742
Data Type: experimental
Version: 0
Version Date: 2019-08-21

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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Coverage

Temporal Extent: 2017-05-10 - 2017-05-20

Dataset Description

Chlorophyll a concentrations from addition incubation experiments performed on AR16.

Methods & Sampling

In situ Chlorophyll a was measured at the conclusion of each incubation experiment conducted in triplicate on AR16. Samples were taken from biological replicates and filtered onto GF/F and 5µm polycarbonate filters.

Chl a was extracted from filters in 100% ethanol for 12 hours, measured on a 10-AU Fluorometer, and chlorophyll a and phaeophytin concentrations were calculated based on a predetermined calibration curve. Concentrations on each filter were used to determine total chl a within each size fraction.

Data Processing Description

Data was processed in R 3.4.1 (R-Core-Team 2017).

BCO-DMO Processing Notes:
- added conventional header with dataset name, PI name, version date
- modified parameter names to conform with BCO-DMO naming conventions
- removed greater than symbol (>) from size_fraction field.
- reformatted date from mm/dd/yy HH:MM to yyyy-mm-ddTHH:MM:SS to conform with the ISO 8601 convention

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Parameters

Parameter	Description	Units
datetime	Date and time of incubation conclusion in UTC following ISO 8601 format	unitless
experiment	Experiment number in series	unitless
treatment	Experimental treatment	unitless
bottle_number	Incubation bottle that was sampled	unitless
replicate	Biological replicate of triplicate incubations	unitless
size_fraction	greater than size fraction analyzed based on pore size of filter	micrometers (um)
vol_filtered	Volume of seawater filtered for chl a analysis	milliliters (ml)
vol_extracted	Volume of ethanol used to extract chla a	milliliters (ml)
Fb	Fluorescence before acidification	RFU
Fa	Fluroescence after acidification	RFU
Notes	Notes regarding sample	unitless
blank_subt_Fb	Blank corrected fluorescence before acidification	RFU
blank_subt_Fa	Blank corrected fluorescence after acidification	RFU
chla	Chlorophyll a concentration	micrograms per liter (ug/L)
phaeo	Phaeophytin concentration	micrograms per liter (ug/L)

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Instruments

Dataset-specific Instrument Name	10AU Fluorometer
Generic Instrument Name	Turner Designs Fluorometer 10-AU
Dataset-specific Description	Chl a was extracted from filters in 100% ethanol for 12 hours, measured on a 10-AU Fluorometer, and chlorophyll a and phaeophytin concentrations were calculated based on a predetermined calibration curve.
Generic Instrument Description	The Turner Designs 10-AU Field Fluorometer is used to measure Chlorophyll fluorescence. The 10AU Fluorometer can be set up for continuous-flow monitoring or discrete sample analyses. A variety of compounds can be measured using application-specific optical filters available from the manufacturer. (read more from Turner Designs, turnerdesigns.com, Sunnyvale, CA, USA)

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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

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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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