# Chlorophyll a concentrations measured along the cruise track of AE1812 which transected from the Sargasso Sea to Coastal Rhode Island during May 2018.

**Website**: https://www.bco-dmo.org/dataset/820948
**Data Type**: Cruise Results
**Version**: 2
**Version Date**: 2025-08-13

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

| Contributors | Affiliation | Role |
|---|---|---|
| Rynearson, Tatiana A. | University of Rhode Island (URI-GSO) | Lead Principal Investigator |
| Jenkins, Bethany D. | University of Rhode Island (URI-GSO) | Co-Principal Investigator |
| Haskins, Christina | Woods Hole Oceanographic Institution (WHOI BCO-DMO) | BCO-DMO Data Manager |

**Abstract**
Chlorophyll a concentrations measured along the cruise track of AE1812 which transected from the Sargasso Sea to Coastal Rhode Island during May 2018.

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## Coverage

**Spatial Extent**: **N**:41.193917 **E**:-63.2384 **S**:31.684933 **W**:-70.96835
**Temporal Extent**: 2018-05-02 - 2018-05-15

### Methods & Sampling

In situ Chlorophyll a was measured at each station along the AE1812 cruise track. A CTD was deployed to collect water from the euphotic zone. Samples were filtered in triplicate onto GF/F and 5µm and 20µm polycarbonate filters.

Chl a was extracted from filters in 100% denatured 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 3.6.2 (R-Core-Team 2019)

**BCO-DMO Processing Description**

Version 1 (chla_insitu.csv)
* Added a conventional header with dataset name, PI name, version date.
* Modified parameter names to conform with BCO-DMO naming conventions.
* Blank values in this dataset are displayed as "nd" for "no data." nd is the default missing data identifier in the BCO-DMO system.
* Converted datetime into ISO_DateTime_UTC format.
* Converted latitude and longitude from degrees decimal minutes to decimal degrees.
* Set types for each data column.

Version 2 (chla_insitu.csv)
* Metadata corrections and enhancements were made to parameter units. Parameter units have been fully typed to include long form names, grams per liter (g/L) units have been corrected to micrograms per liter (ug/L), and the size fraction units have been corrected from m to micrometer (um).

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## Data Files

| File |
|---|
| **chla_insitu.csv** (Comma Separated Values (.csv), 62.80 KB)<br>MD5:1ac35414c381167f85e5b01930aea960<br>Primary data file for dataset ID 820948 |

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## Parameters

| Parameter | Description | Units |
|---|---|---|
| ISO_DateTime_UTC | Date and time of sample collection | unitless |
| lat_converted | Latitude of sample collection | degrees |
| lon_converted | Longitude of sample collection | degrees |
| station | Station of CTD cast | unitless |
| cast | CTD cast number | unitless |
| niskin_bottle_ID | Bottle ID of niskin used to collect sample | unitless |
| depth | depth of sample collection | meters (m) |
| size_fraction | size fraction analyzed based on pore size of filter | micrometers (um) |
| tube_ID | ID of the tube | unitless |
| vol_filtered | Volume of seawater filtered for chl a analysis | milliliters (mL) |
| vol_extracted | Volume of ethanol used to extract chl a | milliliters (mL) |
| Fb | Fluorescence before acidification | Relative Fluorescence Units (RFU) |
| Fa | Fluorescence after acidification | Relative Fluorescence Units (RFU) |
| blank_subt_Fb | Blank corrected fluorescence before acidification | Relative Fluorescence Units (RFU) |
| blank_subt_Fa | Blank corrected fluorescence after acidification | Relative Fluorescence Units (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 (Turner Designs, San Jose, CA) |
| **Generic Instrument Name** | Turner Designs Fluorometer 10-AU |
| **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

**AE1812**

| | |
|---|---|
| **Website** | https://www.bco-dmo.org/deployment/739972 |
| **Platform** | R/V Atlantic Explorer |
| **Start Date** | 2018-05-01 |
| **End Date** | 2018-05-16 |

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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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