Bottle sample data from CTD casts from R/V Hugh R. Sharp HRS1610 in the Mid-Atlantic coastal waters from August 2016 (CyanateInTheSea project)

Website: https://www.bco-dmo.org/dataset/920383
Data Type: Cruise Results
Version: 1
Version Date: 2024-02-16

Project
» Cyanate in the Sea: Sources, Sinks, and Quantitative Significance (CyanateInTheSea)

Contributors	Affiliation	Role
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Abstract
Bottle sample data from CTD casts aboard the R/V Huge R. Sharp cruise to Mid-Atlantic coastal waters in August 2016. The parameters include bottle temperature, salinity, pressure, depth, nitrate, nitrite, ammonium, phosphate, and cyanate concentrations. The cruise was comprised of eight cross-shelf transects (41 stations in total) that spanned a region between 33 and 38 oN latitude at approximately 0.5o intervals. Stations were occupied in coastal, continental shelf, and oceanic waters in the Mid- Atlantic Bight, South Atlantic Bight, and Gulf Stream. Water depths ranged from 10−3450 m with most stations located on the continental shelf and in the Gulf Stream. Stations were also occupied in waters influenced by the shelf-break jet (200−1000 m) and in the Slope Sea (>1000 m). At each station, water for the determination of nutrients were collected at various depths using Niskin bottles.

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Coverage

Location: Mid-Atlantic coastal waters, 33-38º N, 73-79º W
Spatial Extent: **N**:37.668 **E**:-73.3663 **S**:33.334 **W**:-78.5773
Temporal Extent: 2016-08-07 - 2016-08-17

Methods & Sampling

Nutrient samples at each depth were collected directly from Niskin bottles through a 0.2 µm capsule filter (Pall Supor®) using a peristaltic pump at pressures ≤5 mm Hg. Filtrate was collected directly into two 50 mL sterile polypropylene centrifuge tubes (Falcon®) to measure nitrate (NO3–), nitrite (NO2–), orthophosphate ions (simplified as PO4, sum of HPO42– and PO43–), and urea concentrations. Filtrate was also pumped into three 2 mL sterile polypropylene tubes for cyanate determinations, two 15 mL OPA-treated polypropylene tubes (Falcon®) for ammonium (NH4+) analyses, and two 40 mL combusted amber glass vials for analysis of total dissolved free primary amine. To minimize contamination from filtration and between samples, filters and tubing were rinsed thoroughly with site water before sample collection. NO3–+ NO2–, NO2–, PO4, and urea samples (duplicates) were stored at 4 °C until analysis within 48 hours of their collection using a nutrient autoanalyzer (Astoria-Pacific, Inc., USA) according to the manufacturer's specifications. The method detection limits for NO3–+ NO2–, NO2–, PO4, and urea were 0.14 µmol L–1, 0.07 µmol L–1, 0.03 µmol L–1, and 0.08 µmol L–1, respectively. NH4+ samples (duplicates) were kept at 4 °C until analysis within 24 hours of collection. The concentrations of NH4+ were measured onboard using the OPA-fluorescence method of Holmes et al. (1999) with a spectrofluorometer. The method detection limit was 10.0 nmol L–1. Cyanate samples (triplicates) were stored in liquid nitrogen aboard the ship and at -80 °C once samples were returned to the land-based laboratory. Cyanate concentrations were measured by high-performance liquid chromatography (HPLC) using a precolumn fluorescence derivatization method (Widner et al., 2013; Widner and Mulholland, 2017). The method detection limit was 0.4 nmol L–1.

BCO-DMO Processing Description

- Removed row from data containing unit information
- Changed second "Density" column header name to "Density_sigma_t"
- Rounded latitude and longitude values to 6 degrees of precision
- "No data" values in the primary data file are represented by blank values in cells (NAs were removed from the original data presentation)
- Merged separate date and time columns into one datetime column called ISO_DateTime_UTC

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Data Files

File
920383_v1_HRS1610_Bottle_Data.csv (Comma Separated Values (.csv), 53.55 KB) MD5:773e4e00c0b52b94e4735802c841f0a0
Primary data file for dataset ID 920383, version 1

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Related Publications

Selden, C. R., Chappell, P. D., Clayton, S., Macías-Tapia, A., Bernhardt, P. W., & Mulholland, M. R. (2021). A coastal N2 fixation hotspot at the Cape Hatteras front: Elucidating spatial heterogeneity in diazotroph activity via supervised machine learning. Limnology and Oceanography, 66(5), 1832–1849. Portico. https://doi.org/10.1002/lno.11727
Results

Zhu, Y., Mulholland, M.R., Bernhardt, P., Neeley A.R., Tapia, A.M., and Echevarría, M.A. (2024). Summertime phytoplankton composition and nitrogen uptakes across contrasted North Atlantic Ocean regimes off Cape Hatteras. Frontiers in Microbiology
Results

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Related Datasets

IsRelatedTo

Mulholland, M. (2024) **Particulate Carbon and Nitrogen data from CTD casts from R/V Hugh R. Sharp HRS1610 in the Mid-Atlantic coastal waters from August 2016 (CyanateInTheSea project).** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2024-02-19 doi:10.26008/1912/bco-dmo.920423.1 [view at BCO-DMO]

Mulholland, M. (2024) **Station CTD profiles from R/V Hugh R. Sharp HRS1610 in the Mid-Atlantic coastal waters from August 2016 (CyanateInTheSea project).** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2024-02-19 doi:10.26008/1912/bco-dmo.920405.1 [view at BCO-DMO]

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Parameters

Parameter	Description	Units
Station	Station number (1-41)	unitless
Cast	CTD cast number	unitless
ISO_DateTime_UTC	Datetime of CTD cast in UTC	unitless
Latitude	Latitude of cast location in decimal degrees; a positive value indicates a Northern coordinate	decimal degrees
Longitude	Longitude of cast location in decimal degrees; a negative value indicates a Western coordinate	decimal degrees
Pressure	Pressure value from CTD	decibar (db)
Depth	Depth value converted from pressure value	meters (m)
Temperature	Temperature value from CTD	Celcius (C)
Salinity	Salinity value from CTD	practical salinity unit (PSU)
Fluorescence	Fluorescence value from WET Labs ECO-AFL/FL	milligram per cubic meter (mg/m^3)
Density	Density value calculated from Gibbs-SeaWater (GSW) quation	kilograms per cubic meter (kg/m^3)
Density_sigma_t	Density sigma-t value calculated from Gibbs-SeaWater (GSW) equation	kilograms per cubic meter (kg/m^3)
Nitrate	Nitrate value determined by NO3+NO2 minus NO2	micromole per liter (µmol/L^1)
Phosphate	Orthophosphate ions	micromole per liter (µmol/L^1)
Nitrite	Nitrite value measured separately from NO3+NO2	micromole per liter (µmol/L^1)
Ammonium	Ammonium value averaged from duplicates	nanomole per liter (nmol/L^1)
Cyanate	Cyanate averaged from duplicates	nanomole per liter (nmol/L^1)

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Instruments

Dataset-specific Instrument Name	High-performance liquid chromatography (Shimadzu)
Generic Instrument Name	High-Performance Liquid Chromatograph
Dataset-specific Description	A high-performance liquid chromatography was used for cyanate analysis
Generic Instrument Description	A High-performance liquid chromatograph (HPLC) is a type of liquid chromatography used to separate compounds that are dissolved in solution. HPLC instruments consist of a reservoir of the mobile phase, a pump, an injector, a separation column, and a detector. Compounds are separated by high pressure pumping of the sample mixture onto a column packed with microspheres coated with the stationary phase. The different components in the mixture pass through the column at different rates due to differences in their partitioning behavior between the mobile liquid phase and the stationary phase.

Dataset-specific Instrument Name	10 L Niskin bottles
Generic Instrument Name	Niskin bottle
Dataset-specific Description	Dissolved seawater samples were collected using a sampling rosette equipped with a 12 X 10 L Niskin bottles.
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	Astoria-Pacific, Inc., USA
Generic Instrument Name	Nutrient Autoanalyzer
Dataset-specific Description	A nutrient autoanalyzer was used for nutrient measurement
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.

Dataset-specific Instrument Name	Peristaltic pump
Generic Instrument Name	Pump
Dataset-specific Description	A peristaltic pump and 0.2 µm capsule filter were used for seawater sample collection
Generic Instrument Description	A pump is a device that moves fluids (liquids or gases), or sometimes slurries, by mechanical action. Pumps can be classified into three major groups according to the method they use to move the fluid: direct lift, displacement, and gravity pumps

Dataset-specific Instrument Name	Spectrofluorometer
Generic Instrument Name	Spectrometer
Dataset-specific Description	A spectrofluorometer was used for ammonium determination
Generic Instrument Description	A spectrometer is an optical instrument used to measure properties of light over a specific portion of the electromagnetic spectrum.

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Deployments

HRS1610

Website	https://www.bco-dmo.org/deployment/715332
Platform	R/V Hugh R. Sharp
Start Date	2016-08-05
End Date	2016-08-18
Description	Additional cruise information is available from the Rolling Deck to Repository (R2R): http://www.rvdata.us/catalog/HRS1610

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Project Information

Cyanate in the Sea: Sources, Sinks, and Quantitative Significance (CyanateInTheSea)

Coverage: Western North Atlantic Coastal waters (mid- and south Atlantic Bight)

NSF Award Abstract:

Nitrogen is a critical nutrient in the world's oceans because, among other things, it is a major component of living organisms and can be a driver in primary productivity. Nitrogen is present in the ocean in a number of organic and inorganic forms, which vary in their ease in being assimilated by marine organisms. Cyanate is a simple form of organic nitrogen present in the ocean, although its abundance and importance to the ocean nitrogen cycle is poorly understood. Using newly developed and tested methods for measuring ambient cyanate concentrations and its uptake in seawater, researchers will analyze the distribution, sources, and

geochemistry of cyanate in shelf waters of the Atlantic Ocean. Results from this project will elucidate the importance of cyanate in the marine nitrogen cycle and transform understanding of cyanate production and assimilation in the sea. This project will provide a unique opportunity for both graduate student research and undergraduate training, and will likely expose underrepresented groups to marine sciences.

Although physiological and genomic evidence suggest that marine microbes can utilize a broad array of inorganic and organic nitrogen compounds, cyanate's role in the marine nitrogen cycle has not yet been examined. As one of the simplest organic nitrogen compounds, cyanate has likely been present in the environment over Earth's long history. Evidence suggests that cyanate metabolism appeared early on in bacterial genomes and thus, the study of cyanate assimilation in the contemporary ocean may illuminate microbial processes with deep evolutionary roots. However, a decade since discovering the genomic capacity for cyanate utilization in marine cyanobacteria, little is still known about cyanate distributions in the environment, how it is produced, and how widespread cyanate utilization is among marine microbes. To further understanding of cyanate's role in the marine nitrogen cycle, a combination of geochemical approaches will be used to assess: 1) the distribution of cyanate in the marine environment, 2) potential sources of cyanate and the timescales at which cyanate is produced, 3) the rate of cyanate removal via microbial uptake and spontaneous decomposition, and 4) the geochemical coupling between cyanate production and consumption. Results generated from this study will be important for augmenting knowledge of the marine nitrogen cycle, refining biogeochemical models, and further understanding of the functioning of marine microbial communities.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1459698

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