Nitrogen fixation rates from samples collected in the Chukchi Sea, Arctic Ocean near Barrow, Alaska in August of 2011 (ArcticNITRO project)

Website: https://www.bco-dmo.org/dataset/701789
Data Type: Cruise Results
Version:
Version Date: 2017-06-02

Project
» Does competition for nitrogen between autotrophs and heterotrophs control carbon fluxes in the western coastal Arctic? (ArcticNITRO)

Contributors	Affiliation	Role
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Coverage

Spatial Extent: **N**:71.34444 **E**:-156.65833 **S**:71.11889 **W**:-157.0625
Temporal Extent: 2011-08-15 - 2011-08-20

Dataset Description

This dataset contains nitrogen fixation rates, as well as ammonium, nitrate, and phosphate concentrations collected in the coastal Chukchi Sea west of Barrow, Alaska between 15 Aug 2011 and 20 Aug 2011. Salinity, temperature, and collection depth are also provided.

Methods & Sampling

Nitrogen fixation rates were calculated according to Montoya et al. (1996) and are reported as the average +- the standard error for each site (n=3). Sampling methodology and other analytical procedures are described in detail in Baer et al (2017).

Data Processing Description

BCO-DMO Data Manager Processing Notes:
* added a conventional header with dataset name, PI name, version date
* modified parameter names to conform with BCO-DMO naming conventions
* data with value "surface" in collection depth column changed to 0
* Added ISO_DateTime_UTC from UTC_Time and date_local fields
* latitude and longitude converted to decimal degrees from degrees minutes seconds.

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Data Files

File
N_fix.csv (Comma Separated Values (.csv), 2.17 KB) MD5:5c302c5f44b559a434362416e3c696bd Primary data file for dataset ID 701789

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Related Publications

Baer, S. E., Sipler, R. E., Roberts, Q. N., Yager, P. L., Frischer, M. E., & Bronk, D. A. (2017). Seasonal nitrogen uptake and regeneration in the western coastal Arctic. Limnology and Oceanography, 62(6), 2463–2479. doi:10.1002/lno.10580
Methods

Montoya, J. P., M. Voss, P. Kahler, and D. G. Capone. 1996. A Simple, High-Precision, High-Sensitivity Tracer Assay for N (inf2) Fixation. Applied and Environmental Microbiology 62: 986-993. https://aem.asm.org/content/62/3/986
Methods

Sipler, R. E., Baer, S. E., Connelly, T. L., Frischer, M. E., Roberts, Q. N., Yager, P. L., & Bronk, D. A. (2017). Chemical and photophysiological impact of terrestrially-derived dissolved organic matter on nitrate uptake in the coastal western Arctic. Limnology and Oceanography, 62(5), 1881–1894. doi:10.1002/lno.10541
General

Sipler, R. E., Kellogg, C. T. E., Connelly, T. L., Roberts, Q. N., Yager, P. L., & Bronk, D. A. (2017). Microbial Community Response to Terrestrially Derived Dissolved Organic Matter in the Coastal Arctic. Frontiers in Microbiology, 8. doi:10.3389/fmicb.2017.01018
General

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Parameters

Parameter	Description	Units
Sample_ID	Station number (name)	unitless
Date_local	Date of sample collection (time zone AKDT, UTC-8)	unitless
Time_local	Time of sample collection (time zone AKDT, UTC-8)	unitless
ISO_DateTime_UTC	Date and time of sample collection (UTC) in ISO 8601:2004(E) format YYYY-MM-DDThh:mmZ	unitless

Latitude	Latitude of sample collection	decimal degrees
Longitude	Longitude of sample collection; West is negative	decimal degrees
Depth	Water Column Depth (Bottom depth)	meters (m)
Collection_Depth	Depth of sample collection	meters (m)
Size_fraction	Size Fraction	micrometer (um)
Temperature	Temperature	degrees Celsius
Salinity	Salinity	Practical Salinity Units (PSU)
N_Fixation_Rate_Absolute	Absolute Nitrogen fixation rate	micromoles per liter per hour (umol/L/h)
Nitrogen_Fixation_Rate_SE	Nitrogen fixation rate standard error	micromoles per liter per hour (umol/L/h)
Ammonium	Ammonium concentration [NH4]	micromolar (umol/L)
Ammonium_SD	Ammonium concentration [NH4] standard deviation	micromolar (umol/L)
Nitrate	Nitrate concentration [NO3]	micromolar (umol/L)
Nitrate_SD	Nitrate concentration [NO3] standard deviation	micromolar (umol/L)
Phosphate	Phosphate concentration [PO4]	micromolar (umol/L)
Phosphate_SD	Phosphate concentration [PO4] standard deviation	micromolar (umol/L)

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Instruments

Dataset-specific Instrument Name	Lachat QuickChem 8500 autoanalyzer
Generic Instrument Name	Flow Injection Analyzer
Dataset-specific Description	Nitrate and phosphate were measured using a Lachat QuikChem 8500 autoanalyzer.
Generic Instrument Description	An instrument that performs flow injection analysis. Flow injection analysis (FIA) is an approach to chemical analysis that is accomplished by injecting a plug of sample into a flowing carrier stream. FIA is an automated method in which a sample is injected into a continuous flow of a carrier solution that mixes with other continuously flowing solutions before reaching a detector. Precision is dramatically increased when FIA is used instead of manual injections and as a result very specific FIA systems have been developed for a wide array of analytical techniques.

Dataset-specific Instrument Name	Europa GEO 20/20
Generic Instrument Name	Mass Spectrometer
Dataset-specific Description	Isotopic measurements for 15N fixation rates were analyzed on a Europa GEO 20/20 mass spectrometer with an ANCA-SL autosampler.
Generic Instrument Description	General term for instruments used to measure the mass-to-charge ratio of ions; generally used to find the composition of a sample by generating a mass spectrum representing the masses of sample components.

Dataset-specific Instrument Name	Shimadzu UV-1601 spectrophotometer
Generic Instrument Name	UV Spectrophotometer-Shimadzu
Dataset-specific Description	Ammonium concentrations were measured on a Shimadzu UV-1601 spectrophotometer.
Generic Instrument Description	The Shimadzu UV Spectrophotometer is manufactured by Shimadzu Scientific Instruments (ssi.shimadzu.com). Shimadzu manufacturers several models of spectrophotometer; refer to dataset for make/model information.

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Deployments

ArcticNitro_Barrow

Website	https://www.bco-dmo.org/deployment/535682
Platform	ArcticNitro
Start Date	2010-08-30
End Date	2012-01-19
Description	Extracted from the NSF proposal Study sites: Because of its unique combination of year-round access to the coastal Arctic Ocean and strong scientific support system (Barrow Arctic Science Consortium we propose to make our primary winter and summer measurements from Barrow, Alaska. At 71°N, Barrow receives 24- hour sunlight between May 10 and August 2, and is in 24-h darkness between November 18 and January 24. Less than 1 km from shore, shelf depths exceed 10m, and significantly deeper waters (>100 m) are not far away. Twice each year (January and July) for two years, working from Barrow, we will use either small boat or skidoo to travel offshore to sample seawater. We anticipate having access to surface waters of 10-20 m depth within a mile of the town of Barrow. We plan to sample biological and biogeochemical inventories along three offshore transects, with 3-5 depths that sample through the surface mixed layer and into the subsurface layer, accessing both the eastward coastal and the offshore westward currents (Weingartner 2006). More extensive rate measurements and incubation studies will be made at selected sites and depths The rationale for the transects is to sample the microbial community response to the cross-shelf and depth gradients DIN availability. Nearshore stations will be N-limited throughout the water column in the summer. Offshore stations may have significant NO3 below summer stratification. As part of SNACS (Study of the Northern Alaska Coastal) C. Ashjian and colleagues have recently completed summer research near Barrow, using small (43') boats to investigate environmental controls on zooplankton populations. They will have nutrient profiles offshore, which will help guide our study. During the summer, we will coordinate with native Inupiat subsistence whalers (Barrow Whaling Captain Association. In the winter, safe travel over the ice by foot or snow machine, as far out as the nearshore lead, will offer access to the ocean using an ice auger. We will not be able to sample far offshore during winter, but gradients will be weaker due to mixing.

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Project Information

Does competition for nitrogen between autotrophs and heterotrophs control carbon fluxes in the western coastal Arctic? (ArcticNITRO)

Website: http://arcticnitro.org

Coverage: Nearshore Arctic Ocean; Barrow, Alaska; 71.25-71.50N, 156-157W

The Arctic is changing. Warm air is melting the sea ice at an accelerating pace, impacting the marine ecosystem. Further changes on land mean higher river discharge, rising seas, thawing of permafrost, and coastal erosion.

For the Arctic continental shelf, these physical changes impact the creatures that live there in major ways, ultimately altering the pathways and magnitude of energy transfer to fish, sea birds and marine mammals, and impacting the people dependant on those resources. Our challenge today is to understand what is happening in specific Arctic ecosystems to assess future change.

Understanding the microorganisms in Arctic coastal ecosystems is important because microbes dominate the biological biomass, production, and remineralization in marine systems. They are the "composters." Microbes are also the major producers and consumers of carbon dioxide and other greenhouse gases.

This study is focused on the climate-sensitive relationship between these microbes -- particularly the competition for nitrogen between phytoplankton/algae and bacteria -- and the productivity of the food web that depends on these organisms.

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Funding

Funding Source	Award
NSF Arctic Sciences (NSF ARC)	PLR-0909839

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