N2 gas concentration in excess of saturation determined by N2:Ar ratiometry from samples collected in the Bering Sea, Chukchi Sea, and Western Arctic on cruise HLY1702 from August to September 2017

Website: https://www.bco-dmo.org/dataset/812052
Data Type: Cruise Results
Version: 1
Version Date: 2020-05-20

Project
» Collaborative Research: GEOTRACES Arctic Ocean section-Constraining Nitrogen Cycling in the western Arctic Ocean. (US GEOTRACES Arctic Nitrogen Flux)

Contributors	Affiliation	Role
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Abstract
N2 gas concentration in excess of saturation determined by N2:Ar ratiometry from samples collected in the Bering Sea, Chukchi Sea, and Western Arctic on cruise HLY1702 from August to September 2017.

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Coverage

Spatial Extent: **N**:73.56 **E**:-157.152317 **S**:62.39 **W**:-174.574833
Temporal Extent: 2017-08-29 - 2017-09-12

Dataset Description

N2 gas concentration in excess of saturation determined by N2:Ar ratiometry.

Methods & Sampling

Sampling at sea was done using a standard SeaBird CTD/Rosette system. Hydrographic data processing used SeaBird software and standard procedures.

N2 excess was determined from N2/Ar ratios measured using procedures described by Charoenpong et al. (2014) with an IsoPrime Isotope Ratio Mass Spectrometer (IRMS) using IonVantage software.

Final data reduction and organization was done using Microsoft Excel.

Data Processing Description

BCO-DMO Processing:
- renamed fields;
- changed date format to yyyy-mm-dd from mm/dd/yy;
- changed #N/A to nd ("no data").

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Data Files

File
N2_excess.csv (Comma Separated Values (.csv), 16.44 KB) MD5:7f74c0fdadd81b9629d8a5f7cd72f25a Primary data file for dataset ID 812052

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Related Publications

Charoenpong, C. N., Bristow, L. A., & Altabet, M. A. (2014). A continuous flow isotope ratio mass spectrometry method for high precision determination of dissolved gas ratios and isotopic composition. Limnology and Oceanography: Methods, 12(5), 323–337. doi:10.4319/lom.2014.12.323
Methods

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Parameters

Parameter	Description	Units
Station	Station number	unitless
Niskin	Niskin bottle number	unitless
Lat	Latitude	degrees North
Lon	Longitude	degrees East
Date	Date; format: yyyy-mm-dd	unitless
Depth	Depth	meters (m)
Temp	Temperature	degrees Celsius
Salinity	Salinity	unitless
Sigma_Theta	Sigma theta density	kg/m3 -1000
excess_N2	Excess N2	umol/kg
excess_N2_stdev	Standard deviation of replicate measurements	umol/kg

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Instruments

Dataset-specific Instrument Name	SeaBird CTD/Rosette
Generic Instrument Name	CTD Sea-Bird
Generic Instrument Description	A Conductivity, Temperature, Depth (CTD) sensor package from SeaBird Electronics. This instrument designation is used when specific make and model are not known or when a more specific term is not available in the BCO-DMO vocabulary. Refer to the dataset-specific metadata for more information about the specific CTD used. More information from: http://www.seabird.com/

Dataset-specific Instrument Name	IsoPrime Isotope Ratio Mass Spectrometer (IRMS)
Generic Instrument Name	Isotope-ratio Mass Spectrometer
Generic Instrument Description	The Isotope-ratio Mass Spectrometer is a particular type of mass spectrometer used to measure the relative abundance of isotopes in a given sample (e.g. VG Prism II Isotope Ratio Mass-Spectrometer).

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Deployments

HLY1702

Website	https://www.bco-dmo.org/deployment/812055
Platform	USCGC Healy
Start Date	2017-08-26
End Date	2017-09-14
Description	See cruise information from Rolling Deck to Repository (R2R): https://www.rvdata.us/search/cruise/HLY1702

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Project Information

Collaborative Research: GEOTRACES Arctic Ocean section-Constraining Nitrogen Cycling in the western Arctic Ocean. (US GEOTRACES Arctic Nitrogen Flux)

Coverage: Chukchi shelf and western Arctic Ocean basins

In this project, a group of investigators from the University of Connecticut, the University of Massachusetts-Dartmouth, and Brown University will participate in the 2015 U.S. GEOTRACES Arctic expedition to determine the biogeochemistry of nitrogen in the region. In common with other multinational initiatives in the International GEOTRACES Program, the goals of the U.S. Arctic expedition are to identify processes and quantify fluxes that control the distributions of key trace elements and isotopes in the ocean, and to establish the sensitivity of these distributions to changing environmental conditions. Some trace elements are essential to life, others are known biological toxins, and still others are important because they can be used as tracers of a variety of physical, chemical, and biological processes in the sea. Nitrogen is one of the two major nutrients required universally by plankton in the ocean, and this study in the Arctic Ocean will increase our understanding of the ocean?s ecology, productivity, and carbon cycle. This study will also provide training for graduate and undergraduate students, and results will be shared through public outreach events.

The state of knowledge of Arctic nitrogen (N) biogeochemistry remains cursory as compared to that in other ocean basins despite the fact that understanding Arctic Ocean nitrogen cycling is central to understanding its global biogeochemistry. For one, benthic nitrogen loss on Arctic continental shelves may represent a globally significant sink of oceanic fixed nitrogen. Second, benthic nitrogen loss on the Arctic continental shelf and slope reduces the ratio of nitrate to phosphate substantially below the mean requirements of phytoplankton nitrogen, consequently limiting primary production at the ice-free surface of the western Arctic Ocean. In light of the rapid changes in Arctic climatology, the characterization of its biogeochemistry and establishment of a baseline from which to monitor future changes is critical. Researchers will use the stable N isotope (15N/14N) ratio in nitrate, nitrite, ammonium, and nitrogen gas determined for a suite of dissolved, particulate,

atmospheric, snow, and sea-ice samples to better constrain the spatial and temporal variability of biological nitrogen transformations in the Arctic. Results from this study will provide a first order understanding of the contribution of water masses to the regional nitrogen budget, identify regional nitrogen sources and sinks, and diagnose important biological nitrogen transformations that occur on the Chukchi shelf, and in the central basins.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1434417

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