Test of integrity of dissolved 15N2 gas samples stored in Exetainer vials

Website: https://www.bco-dmo.org/dataset/778047
Data Type: experimental
Version: 1
Version Date: 2019-10-02

Project
» EAGER: Collaborative Research: Detection limit in marine nitrogen fixation measurements - Constraints of rates from the mesopelagic ocean (EAGER NitFix)

Contributors	Affiliation	Role
Granger, Julie	University of Connecticut (UConn)	Principal Investigator
Bourbonnais, Annie	University of Massachusetts Dartmouth (UMass Dartmouth)	Co-Principal Investigator
Wilson, Samuel	University of Hawai'i (UH)	Co-Principal Investigator
Biddle, Mathew	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

Abstract
We monitored the 15N2 gas atom% values of prepared solutions stored in Exetainer vials (filled with no headspace) in order to verify that these values remained stable over a period of weeks to months of storage. The integrity of samples was preserved for at least 6 months.

Table of Contents

Dataset Description

Test of integrity of dissolved 15N2 gas samples stored in Exetainer vials

Methods & Sampling

We tested the integrity of 15N2 gas samples dissolved in seawater samples during storage in Exetainer™ vials, which were kept submerged at 8˚C or otherwise left at room temperature unsubmerged. Multiple Exetainer™ subsamples were gravity-filled with discrete 15N2 preparations (in 1 L bottles) and triplicate subsamples were measured by MIMS at consecutive time intervals.

Data Processing Description

BCO-DMO Processing Notes:
- table was extracted from original spreadsheet.
- added conventional header with dataset name, PI name, version date
- modified parameter names to conform with BCO-DMO naming conventions

[table of contents | back to top]

Data Files

File
integrity_tests.csv (Comma Separated Values (.csv), 5.34 KB) MD5:93db74db8991b10f62cfc199b2d217f6 Primary data file for dataset ID 778047

[table of contents | back to top]

Related Publications

White, A. E., Granger, J., Selden, C., Gradoville, M. R., Potts, L., Bourbonnais, A., Fulweiler, R. W., Knapp, A. N., Mohr, W., Moisander, P. H., Tobias, C. R., Caffin, M., Wilson, S. T., Benavides, M., Bonnet, S., Mulholland, M. R., & Chang, B. X. (2020). A critical review of the 15N2 tracer method to measure diazotrophic production in pelagic ecosystems. Limnology and Oceanography: Methods, 18(4), 129–147. Wiley. https://doi.org/10.1002/lom3.10353
Results

[table of contents | back to top]

Parameters

Parameter	Description	Units
Trial	trial information	unitless
Sample_ID	sample identification	unitless
Date_of_analysis	date sample was analyzed	unitless
Days_of_storage	length of storage	days
Avg_15N_at_pcnt	Average 15N at% (n = 3)	unitless
stdev_at_pcnt	stdev at%	unitless
Notes	additional comments	unitless

[table of contents | back to top]

Instruments

Dataset-specific Instrument Name	Isotope Ratio Mass Spectrometer
Generic Instrument Name	Isotope-ratio Mass Spectrometer
Dataset-specific Description	continuous flow Delta V Isotope Ratio Mass Spectrometer (Smith et al. 2015), and continuous flow-GV Isoprime IRMS (Charoenpong et al., 2014)
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).

Dataset-specific Instrument Name	Membrane Inlet Mass Spectrometer
Generic Instrument Name	Membrane Inlet Mass Spectrometer
Dataset-specific Description	Membrane Inlet Mass Spectrometer (Bay Instruments)
Generic Instrument Description	Membrane-introduction mass spectrometry (MIMS) is a method of introducing analytes into the mass spectrometer's vacuum chamber via a semipermeable membrane.

[table of contents | back to top]

Project Information

EAGER: Collaborative Research: Detection limit in marine nitrogen fixation measurements - Constraints of rates from the mesopelagic ocean (EAGER NitFix)

Coverage: North Atlantic Ocean, Pacific Ocean

NSF Award Abstract:
The availability of nitrogen is required to support the growth and production of organisms living in the surface of our global ocean. This element can be scarce. To alleviate this scarcity, a special class of bacteria and archaea, called nitrogen fixers, can derive the nitrogen needed for growth from nitrogen gas. This project would carefully examine one specific method for measuring nitrogen fixation that has been used recently to suggest the occurrence of small amounts of nitrogen fixation in subsurface ocean waters. If these reports are verified, then a revision of our understanding of the marine nitrogen cycle may be needed. The Ocean Carbon and Biogeochemistry program will be used as a platform to develop community consensus for best practices in nitrogen fixation measurements and detection of diversity, activity, and abundances of the organisms responsible. In addition, a session will be organized in a future national/international conference to communicate with the broader scientific community while developing these best practices.

The goal of this study is to conduct a thorough examination of potential experimental and analytical errors inherent to the 15N2-tracer nitrogen fixation method, in tandem with comprehensive molecular measurements, in mesopelagic ocean waters. Samples will be collected and experimental work conducted on a cruise transect in the North Atlantic Ocean, followed by analytical work in the laboratory. The specific aims of this study are to (1) determine the minimum quantifiable rates of 15N2 fixation based on incubations of mesopelagic waters via characterization of sources of experimental and analytical error, and (2) seek evidence of presence and expression of nitrogen fixation genes via comprehensive molecular approaches on corresponding samples. The range of detectable rates and diazotroph activity from the measurements made in this study will be informative for the understanding of the importance of nitrogen fixation in the oceanic nitrogen budget.

[table of contents | back to top]

Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1732246

[table of contents | back to top]