δ15N (δ18O) scale contraction was calculated as the percent deviation of the difference between measured δ15N (δ18O) values of IAEA-NO3 and USGS-34 from the true difference (Biological Nitrogen Isotope Fractionation project)

Website: https://www.bco-dmo.org/dataset/865043
Data Type: experimental
Version: 1
Version Date: 2021-11-16

Project
» CAREER: The biological nitrogen isotope systematics of ammonium consumption and production (Biological Nitrogen Isotope Fractionation)

Contributors	Affiliation	Role
Granger, Julie	University of Connecticut (UConn)	Principal Investigator
Zhou, Mengyang	University of Connecticut (UConn)	Student, Contact
Chang, Bonnie X	University of Washington (UW)	Analyst
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Abstract
δ15N (δ18O) scale contraction was calculated as the percent deviation of the difference between measured δ15N (δ18O) values of IAEA-NO3 and USGS-34 from the true difference.

Table of Contents

Coverage

Temporal Extent: 2019-02-20 - 2019-03-21

Acquisition Description

Methodology:

Sampling and analytical procedures:

Using the lab experiment data in the dataset "Incidence of volume effect with the denitrifier method", δ15N (δ18O) scale contraction was calculated as the percent deviation of the difference between measured δ15N (δ18O) values of IAEA-NO3 and USGS-34 from the true difference.

Processing Description

Processing notes from submitting researcher:

- Data were processed using Microsoft Excel

BCO-DMO processing notes

- Date formats were changed from mm/dd/yy to yyyy-mm-dd
- Spaces and units removed from column headers

[table of contents | back to top]

Related Datasets

IsDerivedFrom

Zhou, M., Granger, J., Chang, B. X. (2022) **Volume-dependent offsets in NO3- N and O isotope ratios of reference materials (Biological Nitrogen Isotope Fractionation project).** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2021-11-16 doi:10.26008/1912/bco-dmo.865031.1 [view at BCO-DMO]

[table of contents | back to top]

Parameters

Parameter	Description	Units
Strain	The two denitrifying bacteria strains used in the laboratory experiment: P. aureofaciens and P. chlororaphis	unitless
Aliquot	Types of aliquot: freshwater or seawater	unitless
Date	Date of the experiments; yyyy-mm-dd	unitless
Trial	Trial name	unitless
Concentration	Concentrations of nitrate reference solutions	umolL-1
Sample_volume	Sample volume injected to aliquot 10 nmol of nitrate	mL
delta_18O_scale_contraction	The percent deviation of the difference between measured _18O values of IAEA-NO3 and USGS-34 from the true difference, using data from datasheet "Incidence of volume effect"	unitless
stdev_of_delta_18O_scale_contraction	Propagated standard deviation of _18O scale contraction for each trial	unitless
delta_15N_scale_contraction	The percent deviation of the difference between measured _15N values of IAEA-NO3 and USGS-34 from the true difference, using data from datasheet "Incidence of volume effect"	unitless
stdev_of_delta_15N_scale_contraction	Propagated standard deviation of _18O scale contraction for each trial	unitless

[table of contents | back to top]

Project Information

CAREER: The biological nitrogen isotope systematics of ammonium consumption and production (Biological Nitrogen Isotope Fractionation)

NSF Award Abstract:
The nitrogen (N) cycle in the marine environment is controlled by biological processes. Unfortunately, quantifying these processes and assessing their effect on the N cycle is difficult by direct measurements because of large spatial and temporal differences. Isotopic composition measurements of N provide a means to constrain these processes indirectly; however, there is still a great deal to be understood about isotope fractionation of recycled nitrogen through biological processes, which has made interpretation of novel nitrogen isotope data difficult. A researcher from the University of Connecticut plans to determine the influence of biological consumption and production on the isotope fractionation in ammonium. By helping to understand the processes surrounding fractionation of recycled ammonium at the organism level, this research will create a basis for which future researchers can better interpret isotope composition data to infer nitrogen cycle dynamics. A graduate student, a postdoctoral fellow, and two or more undergraduate students will be involved in the research. The researcher plans to integrate science with community-engaged learning by developing an undergraduate field and laboratory course that will require the students to present their research to stakeholders in the community. There will be a manual created for this course that will be disseminated in open-access forums for teachers hoping to develop similar courses.

Biological nitrogen isotope fractionation associated with nitrogen recycling remains poorly constrained despite the advent of a variety of new techniques to analyze nitrogen isotopes in recent years. The use of isotopic composition data can be incredibly useful to interpreting nitrogen cycle processes in the ocean that are difficult to measure directly, which makes it crucial to further understand the processes behind fractionation to catch up with the advancement of the datasets available to researchers. This research will characterize the isotope fractionation dynamics of ammonium during biological consumption and production. The researchers will investigate whether the characteristic low concentrations of ammonium in the surface ocean affect isotope fractionation when the ammonium is recycled and whether there is a trophic isotope effect associated with ammonium recycling by protozoan grazers. With this research, there will be a baseline from which researchers can interpret recycled nitrogen dynamics from ammonium isotope datasets. The methods of comparing nitrogen cycling studies will become significantly clearer with such a standard making interpretation uniform by removing significant uncertainties.

[table of contents | back to top]

Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1554474

[table of contents | back to top]