Nitrate and Oxygen isotope measurements from CLIVAR line P16S in 2005 from R/V Roger Revelle ZHNG02RR in the A meridional transect from 16 to 71 degrees South along 150 degrees West from January to February 2005 (CAREER project)

Website: https://www.bco-dmo.org/dataset/651722
Data Type: Cruise Results
Version: Final
Version Date: 2016-07-13

Project
» CAREER: Nitrate Isotopes and Biogeochemistry; A Plan for coupling (CAREER)

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Dataset Description

Nitrogen and Oxygen isotopes in Nitrate (NO3) measurements from samples retrieved from CLIVAR P16S in 2005.

These data are discussed in **Rafter et al., 2013**. Coupled nitrate nitrogen and oxygen isotopes and organic matter remineralization in the Southern and Pacific Oceans, *J. Geophys. Res. Oceans*, **118**, 4781-4794, doi: 10.1002/jgrc.20316.

Methods & Sampling

Seawater samples between 65 S and 20 S were collected by the science crew of the CLIVAR program (CLIVAR P16S during January/February 2005). Seawater samples between 8 S and 7N were collected by the science crew of NOAA ship R/V Ka'imimoana. Nutrients were measured on board (nitrate, nitrite, phosphate, and silicate), and 50 mL samples were frozen. Samples from the Chilean Margin were acquired in February 2010 and frozen, and nutrient measurements were made at Rutgers University shortly afterward.

Data Processing Description

All samples were analyzed at Princeton University for nitrate N and O isotopes using the "denitrifier" method [Sigman et al., 2001; Casciotti et al., 2002]. In this method, nitrate and nitrite are converted to N2O gas using

denitrifying bacteria and the N and O isotopes of this N2O are measured on an isotope ratio mass spectrometer. These measurements are referenced to atmospheric N2 or Vienna Standard Mean Ocean Water, respectively, with analytical precision of +/-0.2% for nitrate d15N and +/-0.3% for nitrate d18O for in-house seawater-based reference material. The reported measurements are of nitrate + nitrite. Nitrite is generally less than 1% or less of the nitrate + nitrite at all stations and for simplicity the analyses are referred to below as "nitrate."

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Data Files

File
SPacNO3.csv (Comma Separated Values (.csv), 43.28 KB) MD5:e66384a905d2aea6a86946b85ff7ae61 Primary data file for dataset ID 651722

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Parameters

Parameter	Description	Units
date_sample	sampling data; yyyymmdd	unitless
lat	latitude	decimal degrees; South is negative
lon	longitude	decimal degrees; West is negative
mixed_layer_depth	depth range where active mixing has homogenized the water	meters
press	sampling depth	decibars
NO3_umol_kg	nitrate concentration	micromols per kilogram
NO3d15N	ratio of stable isotopes 15N:14N used to differentiate Nitrate from different sources	per mil
NO3d180	ratio of stable isotopes O18:O16 used to differentiate Nitrate from different sources	per mil
temp	water temperature	degrees Celsius
sal	salinity; pss-78	dimensionless
pot_density	potential density; also known as sigma-theta	kilograms per meter cubed-1000
potemp	potential temperature	degrees Celsius
O2_umol_kg	dissolved oxygen	micromoles per kilogram
NO2	Nitrite	micromoles per kilogram
PO4	Phosphate	micromoles per kilogram
SiO3	Silicate	micromoles per kilogram
D15_18	D(15-18) is the difference between the nitrogen and oxygen isotopic composition of nitrate	per mil

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Instruments

Dataset-specific Instrument Name	Isotope Ratio Mass Spectrometer
Generic Instrument Name	Isotope-ratio Mass Spectrometer
Dataset-specific Description	These measurements are referenced to atmospheric N2 or Vienna Standard Mean Ocean Water, respectively, with analytical precision of 60.2% for nitrate 15N and 60.3% for nitrate 18O for in-house seawater-based reference material.
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

ZHNG02RR

Website	https://www.bco-dmo.org/deployment/58662
Platform	R/V Roger Revelle
Report	http://bcodata.whoi.edu/CLIVAR_AEROSOL/CLIVAR_P16S_2005ado.pdf
Start Date	2005-01-09
End Date	2005-02-19
Description	SIOGDC_Cruise_CruiseID: ZHNG02RR SIOGDC_Cruise_Name: ZHENG HE Expedition (ZHNG) A hydrographic/carbon/tracer survey in the South Pacific Ocean was carried out from R/V Roger Revelle from 9 January through 19 February 2005. The cruise departed from Papeete, Tahiti on 9 January, 2005. A meridional transect from 16 to 71 degrees South along 150 degrees West was completed. 111 full-depth CTD/rosette/LADCP casts (at one-half degree spacing), 4 shallow CDOM rosette casts, and 58 trace metals CTD/rosette casts were completed from 10 January to 11 February. Salinity, dissolved oxygen, and nutrients were analyzed for up to 36 water samples from each cast of the principal CTD/rosette program. Other parameters sampled included CFCs, helium, total inorganic carbon, alkalinity, radiocarbon, tritium, several parameters related to dissolved organic matter, and nitrogen-15. Additional deployments included 12 ARGOS floats and 21 Bio-Optics casts. The cruise ended in Wellington, New Zealand on 19 February 2005. EXPOCODE 33RR200501 was confirmed with the CLIVAR CCHDO (June 2011) and the other data sets from this cruise are available from the U.S. CLIVAR DAC at CCHDO from: https://cchdo.ucsd.edu/cruise/33RR200501 Cruise Track Image Cruise information and original data are available from the NSF R2R data catalog. **Methods & Sampling** This deployment was correct for MOST of the dataset. There were three samples from three other cruises, aboard NOAA's R/V Ka'imimoana.

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Project Information

CAREER: Nitrate Isotopes and Biogeochemistry; A Plan for coupling (CAREER)

Coverage: Subantarctic waters, Antarctic Zone, and Ross Sea

Nitrate is a ubiquitous form of biologically available nitrogen in the environment. Based on previous method development in the principal investigator's laboratory, CAREER graduate students and undergraduates investigate the nitrogen (N) and oxygen (O) isotopes of nitrate as 'tracers' of the N cycle, focusing on the marine environment. Research centers on two projects: (1) lab culture, in vitro assay, and field incubation studies of the coupled N and O isotope dynamics of nitrate assimilation and denitrification, two of the critical reactions in the N cycle; and (2) incorporation of the N and O isotopes of nitrate into numerical models of ocean circulation and biogeochemistry. These projects, in the context of the oceanic data sets generated in the principal investigator's laboratory, allow for the quantification of biogeochemical processes the signals of which are otherwise complicated by their simultaneous occurrence and by ocean circulation.

Oceanic data used in this project includes Nitrogen and delta 15N of dissolved nitrate relative to atmospheric N2 (dN15_NO3) collected during five cruises in the Southern Ocean -- in September, 1997, March, 1998, and August, 1998, February, 2001, and November 2006. During the last two cruises, samples of Oxygen isotopic composition (18O/16O) of nitrate (d180_NO3) were also collected.

Related files and references:
DiFiore, P. J., D. M. Sigman, T. W. Trull, M. J. Lourey, K. Karsh, G.Cane, and R. Ho (2006), Nitrogen isotope constraints on subantarctic biogeochemistry, J. Geophys. Res., 111, C08016, doi:10.1029/2005JC003216.

DiFiore, P. J., D. M. Sigman, and R. B. Dunbar (2009), Upper ocean nitrogen fluxes in the Polar Antarctic Zone: Constraints from the nitrogen and oxygen isotopes of nitrate, Geochem. Geophys. Geosyst.,10, Q11016, doi:10.1029/2009GC002468.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-0447570

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