Dissolved nitrite and ammonium concentration data from R/V Atlantis (AT15-61) cruise in Jan-Feb 2010 and R/V Melville (MV1104) cruise in Mar-Apr 2011 in the Eastern Tropical South Pacific

Website: https://www.bco-dmo.org/dataset/820165
Data Type: Cruise Results
Version: 1
Version Date: 2020-08-06

Project
» Expression of Microbial Nitrification in the Stable Isotopic Systematics of Oceanic Nitrite and Nitrate (Microbial Nitrification)

Contributors	Affiliation	Role
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Abstract
Dissolved nitrite ([NO2-]) and ammonium ([NH4+]) concentration data were collected on two cruises in the Eastern Tropical South Pacific. Data from R/V Atlantis (AT15-61) cruise collected in Jan-Feb 2010 and data from R/V Melville (MV1104) cruise collected in Mar-Apr 2011 as part of the Microbial Nitrification project.

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Coverage

Spatial Extent: **N**:-9.999 **E**:-79.985 **S**:-20 **W**:-100.001
Temporal Extent: 2010-01-31 - 2011-04-18

Methods & Sampling

Seawater samples were obtained during the R/V Atlantis (AT15-61) and R/V Melville (MV1104) cruises in Jan-Feb 2010 and Mar-Apr 2011. Water samples were collected at discrete depths using a standard 24-bottle Niskin rosette sampler equipped with an SBE9plus conductivity-temperature-depth (CTD) sensor package (SeaBird Electronics, Bellevue, WA).

Ammonium concentration ([NH4+]) was determined on-ship in unfiltered 50 mL seawater samples using *o*-phthaldialdehyde derivatization (Holmes *et al.*, 1999) and measurement on an Aquafluor 8000 handheld fluorometer (Turner Designs), with modifications as suggested in Taylor *et al.*, 2007. Nitrite ([NO2-]) was determined on-ship in unfiltered 50 mL sample volumes using standard colorimetric methods (Strickland and Parsons, 1968). NH4+ standards (30 – 300 nM) were freshly prepared for each analysis in duplicate using deep water (> 500 m) from the same station, which consistently had a lower blank than ultrapure water. Detection limits for [NH4+] and [NO2-] were 0.010 µM, and 0.10 µM for [NO2-]. Measured values are reported even if they are lower than the detection limit.

Data Processing Description

Full protocol on seawater [NH4+] processing can be found below under Supplemental Files: "Ammonium Concentration in Seawater Protocol Santoro Lab v2.3"

BCO-DMO processing:
- Adjusted parameter names to comply with database requirements.
- Combined year, month, day fields into one date field.
- Units in parentheses removed and added to Parameter Description metadata section.
- Added a conventional header with dataset name, PI name, version date.
- Missing data identifier of 'NaN' replaced with 'nd' ('nd' is BCO-DMO system default missing data identifier).

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Data Files

File
NO2_NH4_data.csv (Comma Separated Values (.csv), 21.24 KB) MD5:8588bacbaac009ab5ca2e6bdd3bf3cbf Primary data file for dataset ID 820165

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Supplemental Files

File
Ammonium Concentration in Seawater Protocol Santoro Lab v2.3 filename: Ammonium_Protocol_v2_3.pdf (Portable Document Format (.pdf), 146.25 KB) MD5:e8500c7276ab7116cfe3c1b56630ff51 Protocol (v2.3) to determine Ammonium [NH4+] Concentration in Seawater used by the Santoro Lab (UCSB)

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Related Publications

Holmes, R. M., Aminot, A., Kérouel, R., Hooker, B. A., & Peterson, B. J. (1999). A simple and precise method for measuring ammonium in marine and freshwater ecosystems. Canadian Journal of Fisheries and Aquatic Sciences, 56(10), 1801–1808. doi:10.1139/f99-128
Methods

Santoro, A. E., Buchwald, C., Knapp, A. N., Berelson, W. M., Capone, D. G., & Casciotti, K. L. (2020). Nitrification and nitrous oxide production in the offshore waters of the Eastern Tropical South Pacific. doi:10.1002/essoar.10503499.1
Results

Strickland, J.D.H and Parsons, T.R. (1968) A Practical Handbook of Seawater Analysis. Fisheries Research Board of Canada Bulletin 167, 71-75 [as seen in The Quarterly Review of Biology (1969) 44(3), 327–327. doi:10.1086/406210]
Methods

Taylor, B. W., Keep, C. F., Hall, R. O., Koch, B. J., Tronstad, L. M., Flecker, A. S., & Ulseth, A. J. (2007).

Improving the fluorometric ammonium method: matrix effects, background fluorescence, and standard additions. Journal of the North American Benthological Society, 26(2), 167–177. https://doi.org/10.1899/0887-3593(2007)26[167:ITFAMM]2.0.CO;2.
Methods

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Parameters

Parameter	Description	Units
Depth	Sample depth	meters
Year	Deployment year	unitless
Month	Deployment month (local)	unitless
Day	Deployment day (local)	unitless
Latitude	Latitude of sample collection, South is negative	decimal degrees
Longitude	Longitude of sample collection, West is negative	decimal degrees
Station	Station Number	unitless
Cast	Cast Number	unitless
NO2	Nitrite concentration	micromole per liter (umol/L)
NH4	Ammonium concentration	micromole per liter (umol/L)
ISO_Date_Local	Date of sampling in ISO format (yyyy-mm-dd). Timezone was GMT-5 in 2010, GMT-4 in 2011	yyyy-mm-dd

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Instruments

Dataset-specific Instrument Name	SBE9plus conductivity-temperature-depth (CTD) sensor package
Generic Instrument Name	CTD Sea-Bird 9
Dataset-specific Description	SeaBird 9plus conductivity-temperature-depth (CTD) sensor package (SeaBird Electronics, Bellevue, WA).
Generic Instrument Description	The Sea-Bird SBE 9 is a type of CTD instrument package. The SBE 9 is the Underwater Unit and is most often combined with the SBE 11 Deck Unit (for real-time readout using conductive wire) when deployed from a research vessel. The combination of the SBE 9 and SBE 11 is called a SBE 911. The SBE 9 uses Sea-Bird's standard modular temperature and conductivity sensors (SBE 3 and SBE 4). The SBE 9 CTD can be configured with auxiliary sensors to measure other parameters including dissolved oxygen, pH, turbidity, fluorometer, altimeter, etc.). Note that in most cases, it is more accurate to specify SBE 911 than SBE 9 since it is likely a SBE 11 deck unit was used. more information from Sea-Bird Electronics

Dataset-specific Instrument Name	standard 24-bottle Niskin rosette sampler
Generic Instrument Name	Niskin bottle
Generic Instrument Description	A Niskin bottle (a next generation water sampler based on the Nansen bottle) is a cylindrical, non-metallic water collection device with stoppers at both ends. The bottles can be attached individually on a hydrowire or deployed in 12, 24, or 36 bottle Rosette systems mounted on a frame and combined with a CTD. Niskin bottles are used to collect discrete water samples for a range of measurements including pigments, nutrients, plankton, etc.

Dataset-specific Instrument Name	Turner Designs Aquafluor 8000 handheld fluorometer/turbidometer
Generic Instrument Name	Turner Designs Aquafluor 8000
Dataset-specific Description	AquaFluor® is a lightweight, inexpensive, handheld fluorometer/turbidimeter ideal for field use. Can be configured with one or two channels to measure turbidity, chlorophyll, algae, dyes, ammonium, CDOM, and more. Detailed description at https://www.turnerdesigns.com/aquafluor-handheld-fluorometer
Generic Instrument Description	The Turner Designs Aquafluor 8000 is a lightweight, handheld fluorometer/turbidimeter ideal for field use. It can be configured with one or two channels to measure turbidity, chlorophyll, algae, dyes, ammonium, CDOM, and more. Detailed description at https://www.turnerdesigns.com/aquafluor-handheld-fluorometer

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Deployments

MV1104

Website	https://www.bco-dmo.org/deployment/555585
Platform	R/V Melville
Start Date	2011-03-23
End Date	2011-04-23
Description	See more information at R2R: https://www.rvdata.us/search/cruise/MV1104

AT15-61

Website	https://www.bco-dmo.org/deployment/58785
Platform	R/V Atlantis
Start Date	2010-01-29
End Date	2010-03-03
Description	See more information at R2R: https://www.rvdata.us/search/cruise/AT15-61

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Project Information

Expression of Microbial Nitrification in the Stable Isotopic Systematics of Oceanic Nitrite and Nitrate (Microbial Nitrification)

Coverage: Eastern Tropical South Pacific

Description from NSF award abstract:
Closing the marine budgets of nitrate and nitrous oxide are central goals for researchers interested in nutrient-driven changes in primary productivity and climate change. With the implementation of new methods for oxygen isotopic analysis of seawater nitrate, it will be possible to construct a budget for nitrate based on its oxygen isotopic distribution that is complementary to nitrogen isotope budgets. Before we can effectively use oxygen isotopes in nitrate to inform the current understanding of the marine nitrogen cycle, we must first understand how different processes that produce (nitrification) and consume (assimilation, denitrification) nitrate affect its oxygen isotopic signature.

In this study, researchers at the Woods Hole Oceanographic Institution will provide a quantitative assessment of the oxygen isotopic systematics of nitrification in the field and thus fill a key gap in our understanding of 18O variations in nitrate, nitrite, and nitrous oxide. The primary goal is to develop a quantitative prediction of the oxygen isotopic signatures of nitrite and nitrate produced during nitrification in the sea. The researchers hypothesize that oxygen isotopic fractionation during nitrification is the primary factor setting the 18O values of newly produced nitrate and nitrite. Secondly, they hypothesize that oxygen atom exchange is low where ammonia oxidation and nitrite oxidation are tightly coupled, but may increase in regions with nitrite accumulation, such as in the primary and secondary nitrite maxima. They will test these hypotheses with a series of targeted laboratory and field experiments, as well as with measurements of nitrite and nitrate isotopic distributions extending through the euphotic zone, primary nitrite maximum, and secondary nitrite maximum of the Eastern Tropical South Pacific. The results of these experiments are expected to provide fundamental information required for the interpretation of 18O isotopic signatures in nitrite, nitrate, and N2O in the context of underlying microbial processes. A better understanding of these features and the processes involved is important for quantifying new production, controls on the N budget, and N2O production in the ocean -- which should lead to a better understanding of the direct and indirect interactions among the nitrogen cycle, marine chemistry, and climate.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-0961098

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