Bottle data from CTD casts conducted on R/V Sally Ride cruise SR1805 in the Eastern Tropical North Pacific Ocean from March to April 2018

Website: https://www.bco-dmo.org/dataset/854091
Data Type: Cruise Results
Version: 1
Version Date: 2021-06-18

Project
» Collaborative Research: Mechanisms and Controls of Nitrous Oxide Production in the Eastern Tropical North Pacific Ocean (N2O in ETNP)

Contributors	Affiliation	Role
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Abstract
This dataset includes bottle data from CTD casts conducted on R/V Sally Ride cruise SR1805 in the Eastern Tropical North Pacific Ocean from March to April 2018.

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Coverage

Spatial Extent: **N**:19.6232 **E**:-102.35 **S**:9.99998 **W**:-114.792
Temporal Extent: 2018-03-16 - 2018-04-15

Methods & Sampling

CTD casts were conducted on R/V Sally Ride cruise, SR1805. Two different rostte/CTD systems for were used for the casts. Casts CTD2, -24-26, -62-69 and -103-108 were done with a 24-place rosette with 10L Niskins. All the other casts were done with a 12-place rosette and 30-L Niskins. Both rosettes deployed a Sea-Bird SBE 9 CTD.

Known Problems/Issues:
For casts CTD29, -62, -62.b, -65, -68, -107, the date and time data were wrong. The CTD automatically reset to January 01 2000 and we did not catch this every time. These incorrect dates and times have been replaced with 'nd' (no data) in this dataset. The elapsed times are correct, and the true date, an approximate time of each cast, can be found in the overall event file for this cruise (see Supplemental Files).

Data Processing Description

CTD data were processed with Seasave V7.26.7.107.

BCO-DMO Processing:
- renamed fields to comply with BCO-DMO naming conventions;
- replaced incorrect dates and times with "nd" (no data);
- changed date format to YYYY-MM-DD;
- created ISO8601 date/time field (UTC).

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Data Files

File
SR1805_bottle.csv (Comma Separated Values (.csv), 289.66 KB) MD5:17068ba0bfa90cc538e3a856138b747c Primary data file for dataset ID 854091

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Supplemental Files

File
SR1805_EventLog filename: ETNP_2018_EventLog.xls (Octet Stream, 60.00 KB) MD5:85b1168151387e2d17397dde6b6e9b0a Cruise event log from R/V Sally Ride cruise SR1805 (ETNP 2018).

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Parameters

Parameter	Description	Units
Station	Station designation	unitless
Cast	Cast number	unitless
Bottle	Niskin bottle number	unitless
Date	Date; format: YYYY-MM-DD	unitless
Time	Time UTC; format: hh:mm:ss	unitless
ISO_DateTime_UTC	Date and time (UTC) in ISO8601 format: YYYY-MM-DDThh:mm:ssZ	unitless

TimeS	Time marker for cast events (time elapsed)	seconds
TimeS_sdev	standard deviation of TimeS	seconds
Latitude	Latitude, N is positive	decimal degrees North
Latitude_sdev	standard deviation of Latitude	decimal degrees North
Longitude	Longitude, E is positive	decimal degrees East
Longitude_sdev	standard deviation of Longitude	decimal degrees East
PrDM	pressure	meters (m)
PrDM_sdev	standard deviation of PrDM	meters (m)
DepSM	depth	meters (m)
DepSM_sdev	standard deviation of DepSM	meters (m)
Sigma_E00	sigma theta	kilograms per cubic meter (kg/m3)
Sigma_E00_sdev	standard deviation of Sigma_E00	kilograms per cubic meter (kg/m3)
Sal00	salinity	PSU
Sal00_sdev	standard deviation of Sal00	PSU
T090C	temperature	degrees Celsius
T090C_sdev	standard deviation of T090C	degrees Celsius
CStarAt0	beam attenuation	reciprocal meters (1/m)
CStarAt0_sdev	standard deviation of CStarAt0	reciprocal meters (1/m)
FlSP	fluorescence	milligrams per cubic meter (mg/m3)

FlSP_sdev	standard deviation of FISP	milligrams per cubic meter (mg/m3)
Par	phytosynthetically active radiation	micromoles photons per square meter per second (umol photons/m2/sec)
Par_sdev	standard deviation of Par	micromoles photons per square meter per second (umol photons/m2/sec)
Sbeox0MmL	dissolved oxygen	micromoles per liter (umol/L)
Sbeox0MmL_sdev	standard deviation of Sbeox0MmL	micromoles per liter (umol/L)

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Instruments

Dataset-specific Instrument Name	Sea-Bird SBE 9 CTD
Generic Instrument Name	CTD Sea-Bird 9
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	10L Niskins and 30L Niskins
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.

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Deployments

SR1805

Website	https://www.bco-dmo.org/deployment/833015
Platform	R/V Sally Ride
Start Date	2018-03-13
End Date	2018-04-16
Description	See additional cruise information from the Rolling Deck to Repository (R2R): https://www.rvdata.us/search/cruise/SR1805 Cruise DOI: 10.7284/908014

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Project Information

Collaborative Research: Mechanisms and Controls of Nitrous Oxide Production in the Eastern Tropical North Pacific Ocean (N2O in ETNP)

Coverage: Eastern Tropical North Pacific Ocean (oxygen minimum zone)

NSF Award Abstract:
Nitrous oxide (N2O) is present at very low concentrations in the atmosphere but is an important greenhouse gas and ozone destroying substance. As with other climate-active gases like methane and carbon dioxide, human activities are responsible for most of its production, either directly through fossil fuel burning or agricultural activities. However, about a third of natural N2O emissions come from the ocean, but even these emissions can be indirectly affected by human activities. About half of the ocean source is derived from three specific geographic regions in the Pacific Ocean and Arabian Sea. These three oceanic regions are places where oxygen concentrations are so low in the intermediate depths that metabolic processes requiring the absence of oxygen are able to occur. These regions are called Oxygen Minimum Zones (OMZs) and they have microbiological processes that occur nowhere else in global ocean waters. In the work proposed here, we will investigate how the microbiological pathways of N2O production and consumption are regulated by environmental conditions such as oxygen and nutrient concentration. This work will involve a research expedition to one of the OMZs, the Eastern Tropical Pacific Ocean off the coast of Mexico. On the cruise, we will perform experiments and collect samples for analysis in our home laboratories at Princeton and Stanford Universities. Advising of graduate students and teaching at the graduate and undergraduate levels at both institutions will be linked to this research. This work is particularly timely because global warming has already indirectly affected the size and geographic extent of the OMZs. Greater expanse of low oxygen water could cause N2O production to increase, leading to increased fluxes of N2O to the atmosphere. In the atmosphere, the role of N2O in ozone destruction and as a greenhouse gas could be critical elements of global change.

Nitrous oxide (N2O) is an important greenhouse gas and ozone destroying substance. About a third of natural N2O emissions come from the ocean, and about half of the ocean source is derived from waters with oxygen deficient intermediate waters (oxygen minimum zones, OMZs). Nitrification is recognized as the main source of N2O in the ocean, but denitrification also likely contributes to the net source in and around OMZs. Because nitrification and denitrification are performed by microbes with very different metabolisms and environmental controls, their contributions to N2O production are expected to differ in response to changes in oxygenation and nutrient inputs. Thus it is important to understand the regulation of N2O production by both processes. The main goal of this project is to quantify the environmental regulation of N2O production and consumption pathways in and around OMZs in order to obtain predictive understanding of N2O distributions and fluxes in the ocean. To do this, production and consumption of N2O will be measured using stable isotope tracer incubations at stations located within and outside one of the major OMZs in the Eastern Tropical North Pacific ocean. The dependence of the rate processes on substrate, product, and oxygen concentrations will be determined, and the composition of the microbial assemblages will be assessed to determine whether different microbial components are involved under different environmental conditions. Natural abundance stable isotope and isotopomer measurements of N2O will be interpreted in concert with measured rates to deduce the sources and pathways (nitrification, nitrifier-denitrification, denitrification, and ?hybrid? formation) involved in N2O production and consumption. This work will also involve a novel application of isotopomer measurements of N2O from incubations to identify the placement of 15N from NH4+ and NO2- within labeled N2O pools.

OMZ regions are the sites of unique nitrogen cycling processes that are critical in determining the fixed

nitrogen inventory of the ocean. If OMZs expand as predicted due to anthropogenic changes in the coming decades, changes in these chemical distributions may affect the atmospheric flux of nitrous oxide as well as modify overall ocean productivity via changes in the fixed nitrogen inventory. Understanding the regulation and environmental control of the processes responsible for N2O production and consumption is the foundation of understanding their response to global change.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1657663

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