N2O concentrations from San Pedro Ocean Time-series (SPOT) measured between 2014 to 2016

Website: https://www.bco-dmo.org/dataset/774571
Data Type: Other Field Results
Version: 2
Version Date: 2020-11-04

Project
» Collaborative Research: New Approaches to New Production (N-SPOT)

Contributors	Affiliation	Role
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Abstract
N2O concentrations from San Pedro Ocean Time-series (SPOT) measured between 2014 to 2016. Water samples were collected using a Niskin bottle rosette equipped with a CTD. N_2O concentrations were measured using a headspace equilibration method and analyzed on a SRI Greenhouse Gas Monitoring Gas Chromatograph.

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Coverage

Spatial Extent: **Lat**:33.55 **Lon**:-118.4
Temporal Extent: 2014-09-10 - 2016-08-10

Methods & Sampling

From 2014 to 2015, water samples were collected using a 12 x 12 L Niskin bottle rosette equipped with a conductivity, temperature, and density (CTD) instrument package (SBE 9plus, Sea-Bird Electronics, Bellevue, Washington, USA), including dissolved oxygen (SBE 43) and photosynthetically available radiation (PAR, LI-COR, Biospherical Instruments Inc., San Diego, California, USA) sensors. Due to CTD failure, samples collected in 2015 and 2016 were collected primarily using manually triggered Go-Flo bottles and depths were chosen primarily using a profiling natural fluorometer (PNF) system as well as secchi disk.

N_2O concentrations were measured using a headspace equilibration method and analyzed on a SRI Greenhouse Gas Monitoring Gas Chromatograph (GC) equipped with an electron capture detector (ECD), dual HayeSep D packed columns, and a 1-mL sample loop (SRI Instruments, Torrance, California, USA; Elkins 1980; Laperriere et al. 2019). N_2O concentrations were calculated according to Walter et al. (2006).

Data Processing Description

BCO-DMO Processing:
- changed date format to yyyy-mm-dd;
- replaced NA with nd ("no data");
- 2020-11-06: replaced data with version 2, which corrects errors and adds standard deviation.

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Data Files

File
N2O.csv (Comma Separated Values (.csv), 4.85 KB) MD5:cbe77f6338ec8d8ad31ca8de926bdaca Primary data file for dataset ID 774571

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Related Publications

Elkins, J. W. (1980). Determination of dissolved nitrous oxide in aquatic systems by gas chromatography using electron-capture detection and multiple phase equilibration. Analytical Chemistry, 52(2), 263–267. doi:10.1021/ac50052a011
Methods

Laperriere, S. M., Nidzieko, N. J., Fox, R. J., Fisher, A. W., & Santoro, A. E. (2018). Observations of Variable Ammonia Oxidation and Nitrous Oxide Flux in a Eutrophic Estuary. Estuaries and Coasts, 42(1), 33–44. https://doi.org/10.1007/s12237-018-0441-4
Methods

Walter, S., Bange, H. W., Breitenbach, U., & Wallace, D. W. R. (2006). Nitrous oxide in the North Atlantic Ocean. Biogeosciences, 3(4), 607–619. doi:10.5194/bg-3-607-2006
Methods

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Parameters

Parameter	Description	Units
date	Date. Format: yyyy-mm-dd	unitless
depth	Depth	meters (m)
n2o	Nitrous oxide concentration	nanomoles per liter (nmol L-1)
std	Standard deviation of n2o	nanomoles per liter (nmol L-1)

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Instruments

Dataset-specific Instrument Name	SBE 9plus
Generic Instrument Name	CTD Sea-Bird 9
Dataset-specific Description	From 2014 to 2015, water samples were collected using a 12 x 12 L Niskin bottle rosette equipped with a conductivity, temperature, and density (CTD) instrument package (SBE 9plus, Sea-Bird Electronics, Bellevue, Washington, USA), including dissolved oxygen (SBE 43) and photosynthetically available radiation (PAR, LI-COR, Biospherical Instruments Inc., San Diego, California, USA) sensors. Due to CTD failure, samples collected in 2015 and 2016 were collected primarily using manually triggered Go-Flo bottles and depths were chosen primarily using a profiling natural fluorometer (PNF) system as well as secchi disk.
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	profiling natural fluorometer
Generic Instrument Name	Fluorometer
Generic Instrument Description	A fluorometer or fluorimeter is a device used to measure parameters of fluorescence: its intensity and wavelength distribution of emission spectrum after excitation by a certain spectrum of light. The instrument is designed to measure the amount of stimulated electromagnetic radiation produced by pulses of electromagnetic radiation emitted into a water sample or in situ.

Dataset-specific Instrument Name	SRI Greenhouse Gas Monitoring Gas Chromatograph
Generic Instrument Name	Gas Chromatograph
Generic Instrument Description	Instrument separating gases, volatile substances, or substances dissolved in a volatile solvent by transporting an inert gas through a column packed with a sorbent to a detector for assay. (from SeaDataNet, BODC)

Dataset-specific Instrument Name	Go-Flo bottles
Generic Instrument Name	GO-FLO Bottle
Generic Instrument Description	GO-FLO bottle cast used to collect water samples for pigment, nutrient, plankton, etc. The GO-FLO sampling bottle is specially designed to avoid sample contamination at the surface, internal spring contamination, loss of sample on deck (internal seals), and exchange of water from different depths.

Dataset-specific Instrument Name	Niskin bottle
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	secchi disk
Generic Instrument Name	Secchi Disc
Generic Instrument Description	Typically, a 16 inch diameter white/black quadrant disc used to measure water optical clarity

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Deployments

N-SPOT_Yellowfin_Cruises

Website	https://www.bco-dmo.org/deployment/773571
Platform	R/V Yellowfin
Start Date	2014-09-10
End Date	2016-08-31
Description	R/V Yellowfin cruises completed as part of the project "Collaborative Research: New Approaches to New Production" (N-SPOT) from September 2014 through August 2016. Cruises were conducted in the coastal waters of Southern California at the San Pedro Ocean Time-series (SPOT), located 17 km offshore between Los Angeles Harbor and Catalina Island.

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Project Information

Collaborative Research: New Approaches to New Production (N-SPOT)

Website: https://dornsife.usc.edu/labs/capone

Coverage: Coastal Waters of Southern California, San Pedro Ocean Time-series (SPOT), located 17 km offshore between Los Angeles Harbor and Catalina Island

NSF Award Abstract:
Coastal marine ecosystems are seasonally dynamic and highly productive. Phytoplankton populations shift from nutrient replete conditions in the spring to nutrient poor conditions in other seasons. The San Pedro Ocean Time-series (SPOT), located 17 km offshore between Los Angeles Harbor and Catalina Island, is a representative and accessible model coastal system with regular sampling and a substantial archive of relevant observations. The SPOT program has cataloged the dynamics, diversity, and productivity of microbial populations since 2000. With rising carbon dioxide (CO_2) concentrations and resulting decreases in surface pH, it is critically important to understand the nutrient controls on primary production in coastal waters and the capacity of coastal ecosystems to sequester CO_2. This project will examine rates of primary production, nitrogen uptake associated with primary production, and the oxidation of ammonium to nitrate (nitrification), at SPOT over two seasonal cycles. It will also contribute to the development of human resources in the marine sciences through the training of undergraduate and graduate students at the University of Southern California and the University of Maryland. The researchers participate in education outreach activities (e.g. through the Centers for Ocean Sciences Education Excellence programs), and will incorporate findings from this study in those presentations.

This project will investigate primary production and nitrogen (N) dynamics at SPOT and specifically implement an analysis of new production. The new production conceptual model has been a powerful organizing principle in biological oceanography and provides a means to constrain the amount of primary production that may be exported or "sequestered" from the system. Despite qualifications to the definitions of new and regenerated forms of N as originally articulated, the concept has, for the most part, been narrowly applied, specifying nitrate as the primary form of new N, and ammonium as the predominant recycled form. Evidence continues to accumulate that these definitions may warrant expansion. N fixation can be at times a substantial source of new N; similarly, forms of dissolved organic N (e.g., urea) may contribute significantly to recycled production, but the specific organisms taking part in these transformations are still uncertain. Nitrification in the upper water column may also compromise the strict definitions of new and recycled N. Scientists can now probe more deeply into new and regenerated production, and directly identify major agents of these processes using new molecular techniques. This project will quantify new and regenerated production in a coastal ecosystem, illuminating the predominant compounds involved. Rates of primary production, nitrate, ammonium and urea assimilation, N_2 fixation, and nitrification will be determined in the upper water column in concert with monthly SPOT cruises. In tandem, two stable isotope probing (SIP) approaches (conventional SIP for nitrate, ammonium and urea uptake coupled to high throughput sequencing and microarray based Chip-SIP for N_2 fixation) will be used to directly identify the major agents involved in these processes, along with the uptake of 13C-urea into nitrifier biomass. The following two hypotheses will be tested:

1. N_2 fixation is a substantial source of new N in coastal waters of Southern California supporting export production.

2. Forms of dissolved organic N, and specifically urea, can be substrates for nitrification and contribute substantially to regenerated production.

See the related project "Direct Identification and Characterization of Marine Heterotrophic Nitrogen Fixers by Stable Isotope Probing", funded by OCE-1341178, that involved novel stable isotope probing (SIP) methods.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1437310

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