Quantification of different chemical forms of cobalamin from San Pedro Ocean Time Series (SPOT) cruises on R/V Nerissa and R/V Yellowfin from March to December 2017

Website: https://www.bco-dmo.org/dataset/771777
Data Type: Cruise Results
Version: 1
Version Date: 2019-06-26

Project
» The role of organic and metal cofactors on the biogenic synthesis of halogenated volatile hydrocarbons (Volatile_Hydrocarbons)

Contributors	Affiliation	Role
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Abstract
This dataset contains data on quantifying different chemical forms of cobalamin from San Pedro Ocean Time Series (SPOT) cruises on R/V Nerissa and R/V Yellowfin from March to December 2017.

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Coverage

Spatial Extent: **Lat**:33.55 **Lon**:-118.4
Temporal Extent: 2017-03-15 - 2017-12-15

Methods & Sampling

Samples for quantification of the different cobalamin forms were collected at a six of depths within the euphotic zone (5-250m). Seawater was collected from each CTD depth using Niskin bottles and immediately filtered. Cobalamins were analyzed as in 1 Suffridge et al. (2017). Two liters of seawater were filtered through µm pore-size filters and then preconcentrated using a C18 resin (HF Bondesil (Agilent Technologies) and analyzed by liquid chromatography/triple mass spectrometry (LC/MS/MS/MS). The LC-MS system consists of a ThermoTSQ Quantum Access electro-spray ionization triple quadrupole mass spectrometer, coupled to a Thermo Accela High Speed Liquid Chromatography system. The LC system used a stable- bond C18 reversed-phase column (DiscoveryHSC18 10cm × 2.1mm,5 µm column, Supelco Analytical) with a100 µL sample loop.In order to increase the sensitivity and precision,theLC/MS was run in full-loop mode (100 µl/injection).

The LC-MS system used for the pigment quantification consists of a Thermo TSQ Quantum Access electro-

spray ionization triple quadruple mass spectrometer, coupled to a Thermo Accela High Speed Liquid Chromatography pump and auto-sampler.

Data Processing Description

The LC-MS data was processed using Xcalibur and LCQUAN quantitative softwares from Thermo Scientific.

BCO-DMO Processing:
- modified parameter names (removed units, renamed date and time columns);
- re-formatted date to yyyy-mm-dd (was m/dd/yyyy);
- split time column into start and end times;
- converted lat and lon from degrees and minutes to decimal degrees.

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Data Files

File	
SPOT_Cobalamins.csv	(Comma Separated Values (.csv), 3.44 KB) MD5:74af458717317e8be8855e83793eb267
Primary data file for dataset ID 771777	

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Related Publications

Suffridge, C., Cutter, L., & Sañudo-Wilhelmy, S. A. (2017). A New Analytical Method for Direct Measurement of Particulate and Dissolved B-vitamins and Their Congeners in Seawater. Frontiers in Marine Science, 4. doi:10.3389/fmars.2017.00011
Methods

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Parameters

Parameter	Description	Units
Cruise	Cruise name and date	unitless
Date	Date; format: yyyy-mm-dd	unitless
Time_Start	Start time; format: HH:MM	unitless
Time_End	End time; format: HH:MM	unitless
Longitude	Longitude	decimal degrees
Latitude	Latitude	decimal degrees
Depth	Sample depth	meters (m)
AB12	Average Adenosyl-B12 (Adenosylcobalamin) concentrations of triplicate analytical replicates using HPLC-MS.	picomoles per liter (pM)
HB12	Average Hydroxy-B12 (Hydroxycobalamin) concentrations of triplicate analytical replicates using HPLC-MS.	picomoles per liter (pM)
MB12	Average Methyl-B12 (Methylcobalamin) concentrations of triplicate analytical replicates using HPLC-MS.	picomoles per liter (pM)
CB12	Average Vitamin B12 (as Cyanocobalamin) concentrations of triplicate analytical replicates using HPLC-MS.	picomoles per liter (pM)
MET	Average Methionine concentrations of triplicate analytical replicates using HPLC-MS.	picomoles per liter (pM)

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Instruments

Dataset-specific Instrument Name	ThermoTSQ Quantum Access
Generic Instrument Name	Mass Spectrometer
Dataset-specific Description	The LC-MS system used for the pigment quantification consists of a Thermo TSQ Quantum Access electro-spray ionization triple quadruple mass spectrometer, coupled to a Thermo Accela High Speed Liquid Chromatography pump and auto-sampler.
Generic Instrument Description	General term for instruments used to measure the mass-to-charge ratio of ions; generally used to find the composition of a sample by generating a mass spectrum representing the masses of sample components.

Dataset-specific Instrument Name	Niskin bottles
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

SPOT_Nerissa_Cruises_2017

Website	https://www.bco-dmo.org/deployment/754351
Platform	R/V Nerissa
Start Date	2017-03-15
End Date	2017-12-15
Description	San Pedro Ocean Time Series (SPOT) station (33°33′N, 118°24′W) Deployment: SPOT Platform: RV Yellowfin and RV Nerissa Platform Type: vessel Start Date: 03/15/2017 End Date: 12/15/2017

SPOT_Yellowfin_Cruises

Website	https://www.bco-dmo.org/deployment/754348
Platform	R/V Yellowfin
Start Date	2005-01-19
End Date	2018-07-18
Description	San Pedro Ocean Time Series (SPOT) station (33°33′N, 118°24′W) R/V Yellowfin, monthly SPOT cruises in the San Pedro Channel Deployment: SPOT Platform: RV Yellowfin Platform Type: vessel

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Project Information

The role of organic and metal cofactors on the biogenic synthesis of halogenated volatile hydrocarbons (Volatile_Hydrocarbons)

NSF Award Abstract:
Volatile halogenated hydrocarbon gases, in this case halomethanes, are produced naturally by organisms in the ocean; which then serves as a source of these biogenic gases to the atmosphere. Their chemical reactions in the atmosphere are very similar to those of anthropogenic chlorofluorocarbons (CFCs). While CFCs are well-studied because they consume the ozone in the upper atmosphere that shields the earth from harmful ultraviolet radiation, halomethanes have been largely neglected, even though they currently account for 25% of the ozone depletion. As anthropogenic CFC levels steadily decline, however, halomethanes are predicted to account for 50% of ozone depletion by 2050. Based on limited study thus far, marine halomethane production has been ascribed mainly to phytoplankton and macro algae. This project will build on new and compelling data that suggests marine heterotrophic bacteria could also be major producers of halomethanes. The data produced here will provide the critical evaluation required to address discrepancies in global halomethane budgets which currently are out of balance due to an unknown source to the atmosphere, evaluating the hypothesis that marine heterotrophic bacteria can supply this missing source. Concerns over the stability of the earth's stratospheric ozone layer make this valuable and necessary research with added value of providing support for engaged undergraduate, graduate, and postdoctoral education at the University of Southern California.

Past research on the production of marine halomethanes has focused on phytoplankton and macro algae, while potential bacterial contributions to the processe have been neglected. This research proposes to study the role of marine heterotrophic bacteria on the production of halomethanes. It has been noted in past studies that there are discrepancies in the global atmospheric halomethane budget, and it is possible this is due to a large missing bacterial source. Additionally, this research will evaluate the potential importance of vitamin B12, methionine, and vanadium cofactors on the synthesis of halomethanes in bacteria. A large portion of marine bacteria cannot synthesize methylation co-enzymes, and therefore, would require available B12, methionine, and vanadium from external sources to complete the methylation step. This study will also measure concentrations of halomethanes, B12, methionine, and vanadium in upwelling regions as well as at a long-term time series site in order to put constraints on the variability of halomethanes concentrations for use in global linked air-sea models.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1559276

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