Microbial cell counts in seawater samples collected on R/V Nerissa and R/V Yellowfin cruises at the San Pedro Ocean Time-series (SPOT) in 2017

Website: https://www.bco-dmo.org/dataset/827826
Data Type: Cruise Results
Version: 1
Version Date: 2020-10-28

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 microbial cell counts in seawater samples collected on R/V Nerissa and R/V Yellowfin cruises at the San Pedro Ocean Time-series (SPOT) in 2017. Samples for microbial cell counts were collected at six depths within the euphotic zone using Niskin bottles. Autotrophic picoplankton (Prochlorococcus, Synechococcus, and picoeukaryotes) and heterotrophic prokaryotes were enumerated by flow cytometry.

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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 microbial cell counts were collected at six depths within the euphotic zone (5-250 m). Seawater was collected from each CTD depth using Niskin bottles, immediately fixed with formalin 2% (0.72% formaldehyde final concentration), and immediately frozen at -80C. Autotrophic picoplankton (Prochlorococcus, Synechococcus, and picoeukaryotes) and heterotrophic prokaryotes were enumerated by flow cytometry (Becton Dickinson FACSCalibur) (Gasol and del Giorgio, 2000).

Data Processing Description

The flow cytometry data were analyzed and processed using BD FACStation software from Becton Dickinson.

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Data Files

File
SPOT_cell_counts.csv (Comma Separated Values (.csv), 5.29 KB) MD5:56b1ec297171720b8aa05f3b4d750bb7
Primary data file for dataset ID 827826

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Related Publications

Gasol, J. M., & Del Giorgio, P. A. (2000). Using flow cytometry for counting natural planktonic bacteria and understanding the structure of planktonic bacterial communities. Scientia Marina, 64(2), 197–224. doi:10.3989/scimar.2000.64n2197
Methods

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Parameters

Parameter	Description	Units
Cruise	Cruise name, month, and year	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	degrees East
Latitude	Latitude	degrees North
Depth	Depth	meters (m)
HNA_bacteria	Number of high nucleic acid content bacterial cells per milliliter of seawater measured with Flow Cytometry	cells per milliter (cell ml-1)
LNA_bacteria	Number of low nucleic acid content bacterial cells per milliliter of seawater measured with Flow Cytometry	cells per milliter (cell ml-1)

Total_Bacteria	Number of total bacteria (high + low nucleic acid content) per milliliter of seawater measured with Flow Cytometry	cells per milliter (cell ml-1)
Pro	Number of Prochlorococcus cells per milliliter of seawater measured with Flow Cytometry	cells per milliter (cell ml-1)
Syn	Number of Synechococcus cells (regular fluorescence) per milliliter of seawater measured with Flow Cytometry	cells per milliter (cell ml-1)
Syn_HighF	Number of Synechococcus cells (high fluorescence) per milliliter of seawater measured with Flow Cytometry	picomoles per liter (pico mol L-1)
Syn_total	Number of Synechococcus cells (regular fluorescence + high fluorescence) per milliliter of seawater measured with Flow Cytometry	picomoles per liter (pico mol L-1)
Pico_small	Number of small picoeukaryotic cells per milliliter of seawater measured with Flow Cytometry	picomoles per liter (pico mol L-1)
Pico_large	Number of large picoeukaryotic cells per milliliter of seawater measured with Flow Cytometry	picomoles per liter (pico mol L-1)
Pico_total	Number of total picoeukaryotic cells (small + large) per milliliter of seawater measured with Flow Cytometry	picomoles per liter (pico mol L-1)
Nano	Number of total nanophytoplanktonic cells per milliliter of seawater measured with Flow Cytometry	picomoles per liter (pico mol L-1)

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Instruments

Dataset-specific Instrument Name	Becton Dickinson FACSCalibur
Generic Instrument Name	Flow Cytometer
Dataset-specific Description	Autotrophic picoplankton (Prochlorococcus, Synechococcus, and picoeukaryotes) and heterotrophic prokaryotes were enumerated by flow cytometry (Becton Dickinson FACSCalibur).
Generic Instrument Description	Flow cytometers (FC or FCM) are automated instruments that quantitate properties of single cells, one cell at a time. They can measure cell size, cell granularity, the amounts of cell components such as total DNA, newly synthesized DNA, gene expression as the amount messenger RNA for a particular gene, amounts of specific surface receptors, amounts of intracellular proteins, or transient signalling events in living cells. Description from: http://www.bio.umass.edu/micro/immunology/facs542/facswhat.htm

Dataset-specific Instrument Name	Niskin bottles
Generic Instrument Name	Niskin bottle
Dataset-specific Description	Seawater was collected from each CTD depth using Niskin bottles.
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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