

# Biogeochemical and microbial field surveys from the BATS site, Bermuda from R/V Atlantic Explorer cruises from 2009-2013 (Ocean Microbial Observatory project)

**Website:** <https://www.bco-dmo.org/dataset/543314>

**Data Type:** Cruise Results

**Version:** 1

**Version Date:** 2020-05-04

## Project

» [Transitions in the Surface Layer and the Role of Vertically Stratified Microbial Communities in the Carbon Cycle - An Oceanic Microbial Observatory](#) (Ocean Microbial Observatory)

Contributors	Affiliation	Role
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## Abstract

Biogeochemical and microbial field surveys from the BATS site, Bermuda from R/V Atlantic Explorer cruises from 2009-2013. This dataset includes water samples collected from 2009-2013 at the Bermuda Hydrostation that were analyzed for DOC, POC, bacterial abundance, leucine, and thymidine incorporation.

## Table of Contents

- [Coverage](#)
- [Dataset Description](#)
  - [Methods & Sampling](#)
  - [Data Processing Description](#)
- [Data Files](#)
- [Related Publications](#)
- [Parameters](#)
- [Instruments](#)
- [Deployments](#)
- [Project Information](#)
- [Funding](#)

## Coverage

**Spatial Extent:** N:32.1829 E:-64.16473 S:31.66381 W:-64.51155

**Temporal Extent:** 2009-06-18 - 2009-06-24

## Dataset Description

Water samples collected from 2009-2013 at the Bermuda Hydrostation were analyzed for DOC, POC, bacterial abundance, leucine and thymidine incorporation.

## Methods & Sampling

Methods References:

- Dissolved organic carbon method reference: Carlson, et al. (2010).
- Particulate organic carbon methodological references, calibrations, precision and accuracy detailed at the UCSB MSI Analytical Lab Website: <http://www.msi.ucsb.edu/services/analytical-lab>
- Bacterioplankton Abundance methodological reference: Porter, K.G. and Y.S. Feig (1980)

- Bacterial Production method reference: Smith, D.C. and F. Azam (1992).

## Data Processing Description

### BCO-DMO Processing:

- added conventional header with dataset name, PI name, version date, reference information
- renamed parameters to BCO-DMO standard
- added UNOLS cruise id's

[ [table of contents](#) | [back to top](#) ]

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## Data Files

File
<b>biogeochem.csv</b> (Comma Separated Values (.csv), 29.80 KB) MD5:e731aa0825651886adfa2912b47b2c71 Primary data file for dataset ID 543314

[ [table of contents](#) | [back to top](#) ]

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## Related Publications

Carlson, C. A., Hansell, D. A., Nelson, N. B., Siegel, D. A., Smethie, W. M., Khatiwala, S., Meyers, M. M., Halewood, E. (2010). Dissolved organic carbon export and subsequent remineralization in the mesopelagic and bathypelagic realms of the North Atlantic basin. *Deep Sea Research Part II: Topical Studies in Oceanography*, 57(16), 1433-1445. doi:[10.1016/j.dsr2.2010.02.013](https://doi.org/10.1016/j.dsr2.2010.02.013)  
*Methods*

Particulate organic carbon methodological references, calibrations, precision and accuracy detailed at the UCSB MSI Analytical Lab Website: <http://www.msi.ucsb.edu/services/analytical-lab>  
*Methods*

Porter, K. G., & Feig, Y. S. (1980). The use of DAPI for identifying and counting aquatic microflora. *Limnology and Oceanography*, 25(5), 943-948. doi:[10.4319/lo.1980.25.5.0943](https://doi.org/10.4319/lo.1980.25.5.0943)  
*Methods*

Smith, D.C. and F. Azam (1992). A simple, economical method for measuring bacterial protein synthesis rates in seawater using 3H-leucine. *Marine Microbial Food Webs* 6:107-114  
<http://www.gso.uri.edu/dcsmith/page3/page19/assets/smithazam92.PDF>  
*Methods*

[ [table of contents](#) | [back to top](#) ]

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## Parameters

Parameter	Description	Units
cruise_id	UNOLS cruise identification	unitless
cruise_id2	alternate cruise id	unitless
station	station label. HS = Hydrostation "S"	unitless
cast_type	cast type; B for bottle	unitless
ISO_DateTime_UTC	date and time at start of cast [UTC], formatted as yyyyymmddThh:mm	yyyyMMdd'T'HH:mm
lon	Longitude at start of cast; east is positive	decimal degrees
lat	Latitude at start of cast; north is positive	decimal degrees
cast	unique Identified Code for each cast	unitless
sample	rosette bottle number	unitless
depth_n	Bottle target depth	meters
depth	CTD Depth in meters	meters
DOC	Dissolved organic carbon concentration by HTCO. Glass fiber filtrate type GF/F (Whatman). Methodological reference is Carlson et al. 2010 DSRII	micromoles per liter
DOC_stdev	standard deviation for DOC	umol/L
POC	Particulate organic carbon measured by combustion analysis (CEC 440HA). Collected on Glass fiber filter type GF/F (Whatman).	umol/L
bact_abund	Bacterioplankton abundance by microscopy. Methodological reference: Porter, K.G. and Y.S. Feig (1980)	10 <sup>8</sup> cells/liter
bact_abund_stdev	standard deviation for bacterioplankton abundance	10 <sup>8</sup> cells/liter
leuc_incorp	Heterotrophic bacterial production by 3H Leu uptake. Methodological reference: Smith DC, Azam F (1992)	picomoles per liter per hour
leu_sd	standard deviation for leucine incorporation	picomoles per liter per hour
thy_incorp	heterotrophic bacterial production by 3H Thymidine uptake	picomoles per liter per hour
thy_sd	standard deviation of heterotrophic bacterial production by 3H Thymidine uptake	picomoles per liter per hour

[ [table of contents](#) | [back to top](#) ]

## Instruments

<b>Dataset-specific Instrument Name</b>	CHN Elemental Analyzer
<b>Generic Instrument Name</b>	CHN Elemental Analyzer
<b>Dataset-specific Description</b>	CE440 Elemental Analyzer from Control Equipment Corp. (now Exeter Analytical) - for POC measurements
<b>Generic Instrument Description</b>	A CHN Elemental Analyzer is used for the determination of carbon, hydrogen, and nitrogen content in organic and other types of materials, including solids, liquids, volatile, and viscous samples.

<b>Dataset-specific Instrument Name</b>	
<b>Generic Instrument Name</b>	Fluorescence Microscope
<b>Dataset-specific Description</b>	for measuring bacterioplankton abundance
<b>Generic Instrument Description</b>	Instruments that generate enlarged images of samples using the phenomena of fluorescence and phosphorescence instead of, or in addition to, reflection and absorption of visible light. Includes conventional and inverted instruments.

<b>Dataset-specific Instrument Name</b>	Shimadzu TOC-V
<b>Generic Instrument Name</b>	Shimadzu TOC-V Analyzer
<b>Dataset-specific Description</b>	Shimadzu TOC-V, used to measure DOC
<b>Generic Instrument Description</b>	A Shimadzu TOC-V Analyzer measures DOC by high temperature combustion method.

[ [table of contents](#) | [back to top](#) ]

## Deployments

### AE0912

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/543338">https://www.bco-dmo.org/deployment/543338</a>
<b>Platform</b>	R/V Atlantic Explorer
<b>Start Date</b>	2009-06-18
<b>End Date</b>	2009-06-19
<b>Description</b>	Cruise for project "Microbial Observatory: Community Structure in the Carbon Cycle"

### AE0914

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/543340">https://www.bco-dmo.org/deployment/543340</a>
<b>Platform</b>	R/V Atlantic Explorer
<b>Start Date</b>	2009-06-30
<b>End Date</b>	2009-07-01
<b>Description</b>	Cruise for project "Microbial Observatory: Community Structure in the Carbon Cycle"

### AE0923

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/543342">https://www.bco-dmo.org/deployment/543342</a>
<b>Platform</b>	R/V Atlantic Explorer
<b>Start Date</b>	2009-10-02
<b>End Date</b>	2009-10-03
<b>Description</b>	Cruise for project "Microbial Observatory: Community Structure in the Carbon Cycle"

**AE1004**

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/514381">https://www.bco-dmo.org/deployment/514381</a>
<b>Platform</b>	R/V Atlantic Explorer
<b>Start Date</b>	2010-03-02
<b>End Date</b>	2010-03-02
<b>Description</b>	Cruise information and original data are available from the NSF R2R data catalog.

**AE1103**

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/543356">https://www.bco-dmo.org/deployment/543356</a>
<b>Platform</b>	R/V Atlantic Explorer
<b>Start Date</b>	2011-03-09
<b>End Date</b>	2011-03-10
<b>Description</b>	Cruise for project "Microbial Observatory: Community Structure in the Carbon Cycle" Underway data available at: SAMOS

**AE1114**

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/543358">https://www.bco-dmo.org/deployment/543358</a>
<b>Platform</b>	R/V Atlantic Explorer
<b>Start Date</b>	2011-06-27
<b>End Date</b>	2011-06-28
<b>Description</b>	Cruise for project "Microbial Observatory: Community Structure in the Carbon Cycle" Underway data available at: SAMOS

**AE1126**

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/543350">https://www.bco-dmo.org/deployment/543350</a>
<b>Platform</b>	R/V Atlantic Explorer
<b>Start Date</b>	2011-11-09
<b>End Date</b>	2011-11-10
<b>Description</b>	Cruise for project "Microbial Observatory: Community Structure in the Carbon Cycle" Underway data available at: SAMOS

**AE1215**

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/543348">https://www.bco-dmo.org/deployment/543348</a>
<b>Platform</b>	R/V Atlantic Explorer
<b>Start Date</b>	2012-06-23
<b>End Date</b>	2012-06-25
<b>Description</b>	Cruise for project "Microbial Observatory: Community Structure in the Carbon Cycle" Underway data available at: SAMOS

**AE1224**

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/543346">https://www.bco-dmo.org/deployment/543346</a>
<b>Platform</b>	R/V Atlantic Explorer
<b>Start Date</b>	2012-09-19
<b>End Date</b>	2012-09-20
<b>Description</b>	Cruise for project "Microbial Observatory: Community Structure in the Carbon Cycle" Underway data available from SAMOS.

**AE1015**

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/554187">https://www.bco-dmo.org/deployment/554187</a>
<b>Platform</b>	R/V Atlantic Explorer
<b>Start Date</b>	2010-06-18
<b>End Date</b>	2010-06-18
<b>Description</b>	Cruise for Microbial Observatory: Community Structure in the Carbon Cycle project

**AE1017**

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/554174">https://www.bco-dmo.org/deployment/554174</a>
<b>Platform</b>	R/V Atlantic Explorer
<b>Start Date</b>	2010-06-28
<b>End Date</b>	2010-06-29
<b>Description</b>	Cruise for Microbial Observatory: Community Structure in the Carbon Cycle project

**AE1030**

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/554197">https://www.bco-dmo.org/deployment/554197</a>
<b>Platform</b>	R/V Atlantic Explorer
<b>Start Date</b>	2010-10-01
<b>End Date</b>	2010-10-02
<b>Description</b>	Cruise for Microbial Observatory: Community Structure in the Carbon Cycle project

**AE1314**

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/543580">https://www.bco-dmo.org/deployment/543580</a>
<b>Platform</b>	R/V Atlantic Explorer
<b>Start Date</b>	2013-06-24
<b>End Date</b>	2013-06-25
<b>Description</b>	Cruise for Panulirus Hydrographic Stations project.

[ [table of contents](#) | [back to top](#) ]

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**Project Information**

**Transitions in the Surface Layer and the Role of Vertically Stratified Microbial Communities in the**

## Carbon Cycle - An Oceanic Microbial Observatory (Ocean Microbial Observatory)

**Website:** <http://www.bios.edu/research/projects/oceanic-microbial-observatory/>

**Coverage:** Bermuda Atlantic Time-Series study site

*(Adapted from the NSF award abstract)*

The premise of this project is that stratified bacterioplankton clades engage in specialized biogeochemical activities that can be identified by integrated oceanographic and microbiological approaches. Specifically, the objective of this project is to assess if the mesopelagic microbial community rely on diagenetically altered organic matter and subcellular fragments that are produced by microbial processes in the euphotic zone and delivered into the upper mesopelagic by sinking or mixing. In past efforts this microbial observatory had greater success cultivating members of the euphotic zone microbial community, and revealed an unanticipated growth requirement for reduced sulfur compounds in alphaproteobacteria of the SAR11 clade. Genomic information showed that intense competition for substrates imposes trade-offs on bacterioplankton - there are regions of N dimensional nutrient space where specialists win. We postulate that specific growth requirements may explain some the regular spatial and temporal patterns that have been observed in upper mesopelagic bacterioplankton communities, and the difficulties of culturing some of these organisms.

The specific objectives of this project are: 1) to produce  $^{13}\text{C}$  and  $^{15}\text{N}$  labeled subcellular (e.g., soluble, cell wall, and membrane) and DOM fractions from photosynthetic plankton cultures and use stable isotope probing to identify specific clades in the surface and upper mesopelagic microbial community that assimilate fractions of varying composition and lability. 2) to use fluorescence in situ hybridization approaches to monitor temporal and spatial variability of specific microbial populations identified from the SIP and HTC experiments. To increase resolution we will use CARD-FISH protocols. 3) to measure the proteomes of bacterioplankton communities to identify highly translated genes in the surface layer and upper mesopelagic, and community responses to seasonal nutrient limitation. 4) and, to cultivate these organisms via high throughput culturing (HTC) by pursuing the hypothesis that they require specific nutrient factors and/or diagenetically altered organic substrates. Complete genome sequences from key organisms will be sought and used as queries to study patterns of natural variation in genes and populations that have been associated with biogeochemically important functions.

[ [table of contents](#) | [back to top](#) ]

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### Funding

Funding Source	Award
<a href="#">NSF Division of Ocean Sciences (NSF OCE)</a>	<a href="#">OCE-0802004</a>

[ [table of contents](#) | [back to top](#) ]