# Fluorescence data from a depth profile collected at 200 m depth intervals at the Bermuda Atlantic Time Series Station (BATS) in August 2019 and at the Hawaii Ocean Time Series Station Aloha in July 2021

**Website**: https://www.bco-dmo.org/dataset/905149
**Data Type**: Other Field Results
**Version**: 1
**Version Date**: 2023-09-18

**Project**
» The fate of lysis products of picocyanobacteria contributes to marine humic-like chromophoric dissolved organic matter (Picocyanobacteria CDOM)



| Contributors | Affiliation | Role |
|---|---|---|
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**Abstract**
This dataset contains the Parallel Factor Analysis data derived from excitation emission matrix data from solid-phase extracted.

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## Coverage

**Spatial Extent**: **N**:31.833333 **E**:-64.166667 **S**:22.75 **W**:-158

### Methods & Sampling

This dataset contains the excitation emission matrix data from solid-phase extracted (Agilent Bond Elut PPL).

Water samples were collected using the ship's CTD profiler and 12 L Nisking bottles. 10 L water samples from each depth were then transferred into 5 gallon polycarbonate water bottles and extractrated.

The solid-phase extracted methanolic sample was dried (0.5 mL of methanolic extract) under nitrogen and re-dissolved in 5 mL of pure water prior to fluorescence analyses. All fluorescence data were normalized to the water raman scattering (RU).

### Data Processing Description

The raw fluorescence data was scatter corrected and the processed using the Matlab-based DrEEM toolbox and Parellel Factor Analyses (PARAFAC) developed by Kate Murphy.

### BCO-DMO Processing Description

* Added lat/lon

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## Data Files

| File | |
|---|---|
| **905149_v1_fluoresence.csv** | (Comma Separated Values (.csv), 2.30 KB) MD5:90aaebccd27ab595c915939973dc4d36 |
| Primary data file for dataset 905149 | |

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## Supplemental Files

| File | |
|---|---|
| **Fmax_PARAFAC components.xlsx** | (Microsoft Excel, 23.06 KB) MD5:8fc17dbd2384284e456cff3020133bea |
| Fmax components derived from PARAFAC Modeling. | |

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## Related Publications

drEEM toolbox (decomposition routines for Excitation Emission Matrices). Copyright drEEM toolbox (C) 2013,2014,2015,2019 Kathleen R. Murphy & Urban Wuensch http://dreem.openfluor.org/
*Software*

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## Parameters

| Parameter | Description | Units |
|---|---|---|
| location | Sampling station (HOT or BATS) | unitless |
| latitude | Sampling latitude, south is negative | decimal degrees |
| longitude | Sampling longitude, west is negative | decimal degrees |
| depth | Sampling Depth | meters (m) |
| Fmax1 | humic-like Fmax1(453nm) (water raman units (RU)) | Raman units (RU) |
| Fmax2 | humic-like  Fmax2 (400nm) (water raman units (RU)) | Raman units (RU) |
| Fmax3 | protein-like fluorescence Fmax 3 (325nm) (water raman units (RU)) | Raman units (RU) |
| Fmax4 | humic-like Fmax4 (493nm) (water raman units (RU)) | Raman units (RU) |

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## Instruments

| | |
|---|---|
| **Dataset-specific Instrument Name** | Horiba Aqualog Excitation Emission Matrix Fluorescence Instrument |
| **Generic Instrument Name** | Spectrometer |
| **Dataset-specific Description** | Horiba Aqualog Excitation Emission Matrix Fluorescence Instrument. Post-processing was undertaking using the DrEEM matlab toolbox developed by Kate Murphy. |
| **Generic Instrument Description** | A spectrometer is an optical instrument used to measure properties of light over a specific portion of the electromagnetic spectrum. |

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## Deployments

**KM2110**

| | |
|---|---|
| **Website** | https://www.bco-dmo.org/deployment/905115 |
| **Platform** | R/V Kilo Moana |
| **Start Date** | 2021-07-06 |
| **End Date** | 2021-07-11 |

**AE1920**

| | |
|---|---|
| **Website** | https://www.bco-dmo.org/deployment/905112 |
| **Platform** | R/V Atlantic Explorer |
| **Start Date** | 2019-08-08 |
| **End Date** | 2019-08-13 |

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## Project Information

**The fate of lysis products of picocyanobacteria contributes to marine humic-like chromophoric**

**dissolved organic matter (Picocyanobacteria CDOM)**

**Coverage**: Bermuda Atlantic Time Series Station (BATS) and station Aloha, Hawaii

*NSF Award Abstract:*
This study focuses on the sources and composition of colored dissolved organic matter (CDOM) in the ocean. CDOM is a part of water that absorbs sunlight. This material is important because it filters out harmful ultraviolet radiation. Scientists use it to track the movement of carbon and other important biological and chemical processes in the ocean. Organisms such as algae living in the open ocean have been shown to be sources of CDOM, but the chemical composition of these algal natural products remains to be discovered. Recent results from studying common algae show that viruses may break down algal cells and release material that looks like CDOM. This study will use new tools to find out if viruses and algae are creating this material and study its chemical makeup. This project will support two graduate students and provide summer internships for undergraduates through the NSF Research Experiences for Undergraduates (REU) program. The investigators will participate in a range of education and outreach activities.

The sources and structural nature of marine CDOM within the oceans remain unclear and continue to be a subject of debate. Marine in situ sources of CDOM have been suggested and some have been confirmed, but thus far none could explain the ubiquitous appearance of the so called "humic-like" CDOM component. Unique features of this component include its unusual exponential behavior in ultraviolet-visible (UV-Vis) absorbance with the absorbance extending well above 400 nm, and the large Stoke's shift in fluorescence spectroscopy. Picocyanobacteria are ubiquitous in the World's Oceans and make up 50 % of the autotrophic marine primary production. Preliminary results showed that the picocyanobacteria Synechococcus and Prochlorococcus release CDOM that matched the "humic-like" appearance of globally observed marine CDOM after virus-induced lysis. The main focus of this study is the characterization of the optical properties and molecular composition of viral-lysed DOM (VDOM) from different strains of Synechococcus and Prochlorococcus and additionally Trichodesmium which was shown in a previous study to also release CDOM. Associations between the chemical characterization information and metagenomics and transcriptomics data will be investigated for picocyanobacteria in the Pacific and Atlantic Oceans. This study includes long-term incubation experiments to determine the persistence of picocyanobacteria-derived CDOM as well as changes in microbial communities and processes (gene expression) that are related to the degradation of VDOM during the incubation period.

This award reflects NSF's statutory mission and has been deemed worthy of support through evaluation using the Foundation's intellectual merit and broader impacts review criteria.

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## Funding


| Funding Source | Award |
|---|---|
| NSF Division of Ocean Sciences (NSF OCE) | OCE-1829888 |


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