Sargassum photochem FTI-CR MS

Website: https://www.bco-dmo.org/dataset/938847
Version: 1
Version Date: 2024-09-25

Project
» Collaborative Research: Phlorotannins - An Important Source of Marine Chromophoric Dissolved Organic Matter? (Sargassum DOM)

Contributors	Affiliation	Role
Gonsior, Michael	University of Maryland Center for Environmental Science (UMCES)	Principal Investigator
Blough, Neil V.	University of Maryland - College Park (UMD)	Co-Principal Investigator
Del Vecchio, Rossana	University of Maryland - College Park (UMD)	Co-Principal Investigator
Powers, Leanne	University of Maryland Center for Environmental Science (UMCES)	Scientist
York, Amber D.	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

Abstract
FTICRMS data of irradiated Sargassum SPE-DOM.

Table of Contents

Dataset Description

SPE-DOM = Solid-Phase Extracted Dissolved Organic Matter
FT-ICR MS = Fourier transform ion cyclotron resonance mass spectrometry

Methods & Sampling

For full details on irradiation experiments, please see Related Dataset page https://www.bco-dmo.org/dataset/938807.

The irradiation experiment described here was a separate experiment to couple with FT-ICR-MS analysis. Because a pH electrode was found to contaminate samples for mass spectrometry, no pH control was used in this experiment (sample pH ~ 4.5). Additionally, the sample volume was doubled compared to other experiments to minimize volume changes when subsampling. The absorbed photon dose was also decreased due to the larger volume, so that a 46 h time point was equivalent to ~20 h exposure in the previous irradiation experiments described in the Photodeg/pH dependence document mentioned above. At time points of 2, 4, 6, 22, and 46 h, 0.2 mL was sampled from the reactor and was added to 0.8 mL of methanol until analysis by ultrahigh resolution mass spectrometry (for full details please related FT-ICR-MS dataset https://www.bco-

dmo.org/dataset/938847) using negative ion mode electrospray ionization (ESI). Only CHO formula assignments are described here because they were most abundant using negative ESI mode in the *Sargassum* SPE-DOM analyzed previously (Powers et al., 2019).

[table of contents | back to top]

Related Publications

Powers, L. C., Hertkorn, N., McDonald, N., Schmitt-Kopplin, P., Del Vecchio, R., Blough, N. V., & Gonsior, M. (2019). Sargassum sp. Act as a Large Regional Source of Marine Dissolved Organic Carbon and Polyphenols. Global Biogeochemical Cycles, 33(11), 1423–1439. Portico. https://doi.org/10.1029/2019gb006225 https://doi.org/10.1029/2019GB006225
Results

[table of contents | back to top]

Related Datasets

IsRelatedTo

Gonsior, M., Blough, N. V., Del Vecchio, R., Powers, L. (2024) **FT-ICR MS data from exudation experiments in outdoor tanks with Sargassum samples collected off the coast of Bermuda and in the Sargasso Sea in 2016.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2024-09-25 http://lod.bco-dmo.org/id/dataset/938799 [view at BCO-DMO]
Relationship Description: Data from the separate exudation experiments. "Sargassum exudation experiments: FTICRMS (938799)" dataset was cited on the "Sargassum photochem FTICRMS (938847)" dataset for details of ultrahigh resolution mass spectrometry using negative ion mode electrospray ionization (ESI).

Gonsior, M., Blough, N. V., Del Vecchio, R., Powers, L. (2024) **Sargassum DOM optical properties tested for photodegradation rates and pH dependence from experiments conducted in outdoor tanks with Sargassum samples collected off the coast of Bermuda and in the Sargasso Sea in 2016.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2024-09-25 http://lod.bco-dmo.org/id/dataset/938807 [view at BCO-DMO]
Relationship Description: Data from separate irradiation experiments.

[table of contents | back to top]

Parameters

Parameters for this dataset have not yet been identified

[table of contents | back to top]

Instruments

Dataset-specific Instrument Name	Bruker Solarix 12 Tesla Fourier transform (FT) ion cyclotron resonance (ICR) mass spectrometer located at the Helmholtz Zentrum, Munich, Germany.
Generic Instrument Name	Fourier Transform Ion Cyclotron Resonance Mass Spectrometer
Generic Instrument Description	In Fourier Transform Ion Cyclotron Resonance Mass Spectrometry, the mass-to-charge ratio (m/z) of an ion is experimentally determined by measuring the frequency at which the ion processes in a magnetic field. These frequencies, which are typically in the 100 KHz to MHz regime, can be measured with modern electronics making it possible to determine the mass of an ion to within +/- 0.000005 amu or 5 ppm.

[table of contents | back to top]

Deployments

HRS1608

Website	https://www.bco-dmo.org/deployment/938772
Platform	R/V Hugh R. Sharp
Start Date	2016-07-18
End Date	2016-07-22

[table of contents | back to top]

Project Information

Collaborative Research: Phlorotannins - An Important Source of Marine Chromophoric Dissolved Organic Matter? (Sargassum DOM)

Coverage: Mid-Atlantic Bight (July 2016), Sargasso Sea (July and September 2016), Coastal Bermuda (September/October 2016) and Coastal Puerto Rico (Laguna Grande, Fajardo; Las Croabas, Fajardo; Salinas; May/June 2018)

NSF Award Abstract:

Chromophoric dissolved organic matter (CDOM), the sunlight absorbing components in filtered water, is important in the study of marine and freshwater ecosystems as it can be used to trace the mixing of surface waters, as a proxy for carbon cycles, and other biogeochemical processes. Although its importance in ocean studies has been firmly established over the last several decades, sources and structural composition of CDOM within the oceans remains unclear and continues to be a subject of debate. Sargassum, a brown alga, is widely distributed in temperate and subtropical marine waters and may be important source of CDOM to the Sargasso Sea and Gulf of Mexico where Sargassum is abundant. This project will investigate the contribution of macro brown algae-derived compounds to the marine CDOM pool. Results from this study will have implications for the marine carbon cycle and satellite remote sensing of ocean color to assess mixing of surface water masses and biogeochemical processes. The project will provide educational opportunities for a postdoctoral scholar, summertime undergraduate internships (through a local NSF-sponsored Research Experiences for Undergraduates (REU) program), and workshop and research opportunities for local high schools students.

Sources of marine CDOM remain debatable and a comprehensive understanding of its origins, distribution and fate have been difficult. Marine CDOM, and in particular the "humic-like" component, have been suggested to originate from terrestrial sources, primarily lignins. However, recent evidence indicates that the exudation of phlorotannins produced by macro brown algae may contribute significantly to the marine CDOM pool.

Phlorotannins, a class of polyphenols that are only found in, and continuously exuded by macro brown algae such as Sargassum, strongly absorb ultraviolet light and may have been underestimated in their contribution to the marine CDOM pool within certain geographic locales. Upon partial oxidation, light absorption by these specific compounds extends into longer wavelengths in the visible creating an absorption spectrum similar to that of lignin. These phlorotannins and their transformation products absorb light that might explain in part the "humic-like" signatures observed in open ocean environments. This study aims to characterize the optical properties and molecular composition of Sargassum-derived CDOM including its aerobic oxidation and photochemical behavior, as well as quantify Sargassum-derived CDOM to better estimate its possible contribution to the CDOM pool in the Sargasso Sea and Gulf of Mexico.

[table of contents | back to top]

Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1536888
NSF Division of Ocean Sciences (NSF OCE)	OCE-1536927

[table of contents | back to top]