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

Website: https://www.bco-dmo.org/dataset/938807
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
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Abstract
Sargassum DOM optical properties tested for photodegradation rates and pH dependence. Sargassum was collected during two sampling events in July and in late September/early October 2016. Sargassum samples were collected aboard the R/V Henry Stommel off the coast of Bermuda and R/V Hugh.R. Sharp in the Sargasso Sea. Outdoor exudation experiments were performed under natural (sunlight) conditions (n = 4) (data were published in Powers et al., 2019). After incubation experiments, Sargassum dissolved organic matter (DOM) was isolated by a solid phase extraction (SPE) technique. Sargassum SPE-DOM was primarily used for the irradiation and pH titration experiments. Optical properties were monitored during these experiments.

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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

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Related Datasets

IsRelatedTo

Gonsior, M., Blough, N. V., Del Vecchio, R., Powers, L. (2024) **DOC and TDN concentrations & phenolic content 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/938791 [view at BCO-DMO]
Relationship Description: These datasets all utilized samples from the same outdoor exudation experiments.

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: These datasets all utilized samples from the same outdoor exudation experiments.

Gonsior, M., Blough, N. V., Del Vecchio, R., Powers, L. (2024) **Fluorescence spectra 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/938831 [view at BCO-DMO]
Relationship Description: These datasets all utilized samples from the same outdoor exudation experiments.

Gonsior, M., Blough, N. V., Del Vecchio, R., Powers, L. (2024) **Sargassum photochem FTI-CR MS.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2024-09-25 http://lod.bco-dmo.org/id/dataset/938847 [view at BCO-DMO]
Relationship Description: Data from separate irradiation experiments.

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Parameters

Parameters for this dataset have not yet been identified

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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

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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.

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Funding

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

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