Transparent exopolymer particle (TEP) measurements from the MesoHux mesocosm experiment held in May 2017

Website: https://www.bco-dmo.org/dataset/748500
Data Type: experimental
Version: 1
Version Date: 2018-09-14

Project
» Quantifying competing loss rates of viral lysis and microzooplankton grazing on Emiliania huxleyi mortality (E huxleyi Mortality)

Contributors	Affiliation	Role
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Abstract
Transparent exopolymer particle (TEP) measurements from the MesoHux mesocosm experiment held in May 2017.

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Coverage

Temporal Extent: 2017-05-14 - 2017-05-30

Dataset Description

Water samples (75-250 mL) were gently (<150 mbar) filtered through 25 mm, 0.40 µm polycarbonate filters (Millipore, Isopore, HTTP02500). Post-filtration, filters were stained with 500 µL of a solution of 0.04% Alcian Blue (AB) and 0.06% acetic acid (pH 2.5) and were frozen at -20°C. For extraction, filters were immersed in sulfuric acid (80%) for 2 h and their absorbance was then measured spectrophotometrically (Agilent 8453 UV-visible spectrophotometer) at fixed wavelength of 787 nm. The AB-dye was calibrated using methods found in Bittar et al. (2018), where AB was used to stain known concentrations of xanthan gum (XG, Sigma-Aldrich). Two separate AB solutions (f factors 169 and 129) were used during the Bergen experiment.
TEP concentrations (µg xanthan gum (Xg) equivalents L-1; µg XG eq. L-1) were calculated according to Passow and Alldredge (1995).

Mesocosm treatments are as follows:
P-limited: N:P added in a 60:1 ratio during the first 3 days of the experiment, no shading
Redfield: N:P added in a 16:1 ratio during the first 3 days of the experiment, no shading
Shaded: N:P added in a 16:1 ratio during the first 3 days of the experiment, top shaded of the mesocosm

added on May 20, 2017
Ambient: no nutrients added, no shading

Data Processing Description

BCO-DMO Processing Notes:

- converted date from Mon, DD, YYYY to YYYY-MM-DD
- replace spaces with underscores in the field names

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Data Files

File
tep.csv (Comma Separated Values (.csv), 5.96 KB) MD5:21109be757d3dd04e3aa0c14d1780051 Primary data file for dataset ID 748500

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Related Publications

Bittar, T. B., Passow, U., Hamaraty, L., Bidle, K. D., & Harvey, E. L. (2018). An updated method for the calibration of transparent exopolymer particle measurements. Limnology and Oceanography: Methods, 16(10), 621–628. doi:10.1002/lom3.10268
Methods
,
Results

Passow, U., & Alldredge, A. L. (1995). A dye-binding assay for the spectrophotometric measurement of transparent exopolymer particles (TEP). Limnology and Oceanography, 40(7), 1326–1335. doi:10.4319/lo.1995.40.7.1326
Methods

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Parameters

Parameter	Description	Units
Date	date the sample was taken in YYYY-MM-DD format	unitless
Exp_Day	day of the experiment	unitless
Sample	sample identifier	unitless
Dilution	dilution percent	unitless
Treatment	type of treatment	unitless
Replication	replicate identifier	unitless
Volume_Filtered	volume filtered	mililiters (mL)
Absorbance	absorbance	nanometers (nm)
TEP	calibrated transparent exopolymer particle (TEP)	microgram TEP equivalent

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Instruments

Dataset-specific Instrument Name	Aglient 8453 UV-visible spectrophotometer
Generic Instrument Name	Spectrophotometer
Dataset-specific Description	For extraction, filters were immersed in sulfuric acid (80%) for 2 h and their absorbance was then measured spectrophotometrically (Agilent 8453 UV-visible spectrophotometer) at fixed wavelength of 787 nm.
Generic Instrument Description	An instrument used to measure the relative absorption of electromagnetic radiation of different wavelengths in the near infra-red, visible and ultraviolet wavebands by samples.

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Deployments

MesoHux_2017

Website	https://www.bco-dmo.org/deployment/752756
Platform	National Mesocosm Centre
Start Date	2017-05-01
End Date	2017-05-31
Description	Mesocosm experiments on bacteria and viruses.

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Project Information

Quantifying competing loss rates of viral lysis and microzooplankton grazing on Emiliania huxleyi mortality (E huxleyi Mortality)

Description from NSF award abstract:
Processes that either promote growth or cause mortality drive the abundance of all organisms. For microbes such as phytoplankton, that have a lifespan measured in hours to days, small changes in these processes can have significant impacts. Phytoplankton are the central currency in the flow of material and nutrients throughout the marine environment. Even small shifts in their growth and mortality rates will have large-scale implications for ecosystem structure and biogeochemical cycling. While factors that influence growth are often examined, less is known regarding the regulation of phytoplankton mortality. This project will focus on quantifying competing modes of mortality on the bloom-forming coccolithophore, *Emiliania huxleyi,* a globally important phytoplankton species that contributes significantly to ocean carbon and sulfur cycles. Mortality due to grazing by single-celled microzooplankton is the largest contributor to phytoplankton loss in the marine environment. However, *E. huxleyi* also has a well-characterized relationship with a virus that can result in mass mortality. Therefore, *E. huxleyi* serves as a good model organism for examining how mortality is partitioned between grazing by microzooplankton predators and lysis due to viral infection. Quantifying these mortality mechanisms will help to inform mathematical models for the accurate prediction of shifts in *E. huxleyi* population dynamics and ultimately, primary production and biogeochemical cycling. This work will involve collaboration with a high school science teacher in a school system with a large proportion of students from underrepresented groups, in the creation and implementation of short film clips that depict important ecological interactions. These film clips will then be incorporated into laboratory activities to communicate these concepts to students. Further, undergraduate students from underrepresented groups will be trained at both Woods Hole Oceanographic Institute and Rutgers University, to perform laboratory research on mortality processes on phytoplankton. This research will also provide training and career development for a postdoctoral scientist.

Mortality mechanisms in phytoplankton have generally been studied independent from one another, however in nature, these processes act concurrently. The relative proportion that microzooplankton grazing and viral lysis contribute to overall *E. huxleyi* loss and how they may interact to shape bloom dynamics is largely unknown. Understanding the relative importance of these processes, as well as their interaction, is critical due to their contrasting influence on the structure and function of marine food webs and biogeochemical cycles. While grazing tends to channel phytoplankton biomass to higher trophic levels, viral lysis stimulates microbial loop activity and vertical particle export flux. This research will determine the effect of one mortality process on the other, as well as their net effect on *E. huxleyi* population dynamics and export in both laboratory and field mesocosm experiments. This integrated approach will provide a unique mechanistic perspective of multi-trophic microbial interactions, thereby increasing the potential for accurate predictions of *E. huxleyi* population dynamics and biogeochemical cycling. The outcomes of this research have the potential to yield broadly applicable insights into how microbial interactions can drive ecological and biogeochemical dynamics in the marine environment.

This project is funded by an NSF Collaborative Research award.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1459190

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