Photosynthetic data collected from the R/V Oceanus OC1504A in the Oregon/California Coastal Upwelling Zone, between 34-44N and 120-124W in 2015.

Website: https://www.bco-dmo.org/dataset/652739

Data Type: Cruise Results

Version: 1

Version Date: 2016-07-28

Project

» Linking physiological and molecular aspects of diatom silicification in field populations (Diatom Silicification)

Contributors	Affiliation	Role
Thamatrakoln, Kimberlee	Rutgers University (Rutgers IMCS)	Principal Investigator, Contact
Brzezinski, Mark	University of California-Santa Barbara (UCSB-LifeSci)	Co-Principal Investigator
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Abstract

Photosynthetic data collected from the R/V Oceanus OC1504A in the Oregon/California Coastal Upwelling Zone, between 34-44N and 120-124W in 2015.

Table of Contents

Coverage

Temporal Extent: 2015-04-20 - 2015-05-01

Dataset Description

Photosynthetic data on water collected by CTD and measured using fast repetition rate fluorometry.

Acquisition Description

Photosynthetic parameters were measured using fast repetition rate fluorometry on whole seawater collected by CTD. See reference below for details on data analysis.

Processing Description

Photosynthetic parameters were corrected for background fluorescence by measuring 0.2 µm filtered seawater from 1-2 depths. Fo and Fm of background samples were subtracted from sample Fo and Fm and corrected values were used to calculate Fv/Fm, where Fv=Fm-Fo (Kolber et al. 1998)

DMO Notes:

-File was resubmitted by PI after some consultation with several columns and rows removed

-Column names were changed to meet BCO-DMO standards

- Some spaces were removed from cell contents

- cruise_id and ISO_DateTime_UTC column were added

[table of contents | back to top]

Related Publications

Kolber, Z. S., Prášil, O., & Falkowski, P. G. (1998). Measurements of variable chlorophyll fluorescence using fast repetition rate techniques: defining methodology and experimental protocols. Biochimica et Biophysica Acta (BBA) - Bioenergetics, 1367(1-3), 88–106. doi:10.1016/S0005-2728(98)00135-2

[table of contents | back to top]

Parameters

Parameter	Description	Units
cruise_id	cruise identification where samples where collected	unitless
CTD	CTD cast	unitless
depth	depth at which samples were collected	meters
date_local	local date of sample collection; mm/dd/yy	unitless
time_local	local time of sample collection; HH:MM:SSpp	unitless
Fluor_min	minimal fluorescence yield corrected for background fluorescence. Fo	relative units
Fluor_max	maximal fluorescence yield corrected for background fluorescence. Fm	relative units
FvFm	maximum quantum yield corrected for background fluorescence; Fv divided by Fm	dimensionless
functional_absorption	Functional absorption cross-section of photosystem II (measured using 450 nm excitation; units A2); sigma	unitless
connectivity_p	connectivity factor defines the efficiency of exciton energy transfer between individual photosynthetic units; originally p	unitless
ISO_DateTime_UTC	DateTime (UTC) ISO formatted	unitless

[table of contents | back to top]

Instruments

Dataset-specific Instrument Name	Fast Repetition Rate Fluorometer
Generic Instrument Name	Fast Repetition Rate Fluorometer
Dataset-specific Description	Photosynthetic parameters were measured.
Generic Instrument Description	An FRRf is used for measuring the fluorescence of a sample of phytoplankton photosynthetic competency (Fv/Fm).

[table of contents | back to top]

Deployments

OC1504A

Website	https://www.bco-dmo.org/deployment/560135
Platform	R/V Oceanus
Report	https://musicc2015.wordpress.com
Start Date	2015-04-19
End Date	2015-05-02
Description	Data for the project "Linking physiological and molecular aspects of diatom silicification in field populations" (PIs Kimberlee Thamatrakoln and Mark Brzezinski) were collected on this cruise.

[table of contents | back to top]

Project Information

Linking physiological and molecular aspects of diatom silicification in field populations (Diatom Silicification)

Coverage: Oregon/California Coastal Upwelling Zone, between 34-44N and 120-124W

Description from NSF award abstract: Diatoms, unicellular, eukaryotic photoautotrophs, are among the most ecologically successful and functionally diverse organisms in the ocean. In addition to contributing one-fifth of total global primary productivity, diatoms are also the largest group of silicifying organisms in the ocean. Thus, diatoms form a critical link between the carbon and silicon (Si) cycles. The goal of this project is to understand the molecular regulation of silicification processes in natural diatom populations to better understand the processes controlling diatom productivity in the sea. Through culture studies and two research cruises, this research will couple classical measurements of silicon uptake and silica production with molecular and biochemical analyses of Silicification-Related Gene (SiRG) and protein expression. The proposed cruise track off the West Coast of the US will target gradients in Si and iron (Fe) concentrations with the following goals: 1) Characterize the expression pattern of SiRGs, 2) Correlate SiRG expression patterns to Si concentrations, silicon uptake kinetics, and silica production rates, 3) Develop a method to normalize uptake kinetics and silica production to SiRG expression levels as a more accurate measure of diatom activity and growth, 4) Characterize the diel periodicity of silica production and SiRG expression. It is estimated that diatoms process 240 Teramoles of biogenic silica each year and that each molecule of silicon is cycled through a diatom 39 times before being exported to the deep ocean. Decades of oceanographic and field research have provided detailed insight into the dynamics of silicon uptake and silica production in natural populations, but a molecular understanding of the factors that influence silicification processes is required for further understanding the regulation of silicon and carbon fluxes in the ocean. Characterizing the genetic potential for silicification will provide new information on the factors that regulate the distribution of diatoms and influence in situ rates of silicon uptake and silica production. This research is expected to provide significant information about the molecular regulation of silicification in natural populations and the physiological basis of Si limitation in the sea.

[table of contents | back to top]

Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1333929
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[table of contents | back to top]