FvFm and fluorescence lifetime data collected from the R/V Melville MV1405 along the California Coastline during 2014

Website: https://www.bco-dmo.org/dataset/652298
Data Type: Cruise Results
Version: 1
Version Date: 2016-07-21

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 A.	University of California-Santa Barbara (UCSB-LifeSci)	Co-Principal Investigator
Gorbunov, Maxim	Rutgers University	Scientist
Kuzminov, Fedor	Rutgers University	Scientist
Ake, Hannah	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

Abstract
FvFm and fluorescence lifetime data collected from the R/V Melville MV1405 along the California Coastline during 2014.

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Coverage

Spatial Extent: **N**:42.88 **E**:-117.62 **S**:32.81 **W**:-127.32
Temporal Extent: 2014-07-03 - 2014-07-25

Dataset Description

Quantum yield of photosynthesis (Fv/Fm) and lifetime fluorescence data from the MV1405 cruise (IrnBru).

[Lifetime fluorescence spectroscopy investigates the change in fluorescence over time of a sample when irradiated with UV, visible, or near-IR light. This decay in fluorescence can be measured over a wide time range: from picoseconds to milliseconds and beyond. - DMO] The average lifetime of these data are found in the TAV column.

Methods & Sampling

A custom-built Fast Repetition Rate Fluorometer and Lifetime Fluorometer measured surface water continuously using the ship's underway water system. Background fluorescence was measured daily using 0.2 um filtered seawater and manually subtracted from sample data.

Data Processing Description

For a complete description of data processing see Kuzminov and Gorbunov (2015)

BCO-DMO Processing Notes:
-filled in all blank cells with nd according to description in metadata
-changed column names to meet BCO-DMO naming standards
-removed header from file because repeated at toplevel
-separated the dateTime GMT column into two columns, date_gmt and time_gmt
-added a cruise_id and ISO_DateTime_UTC column

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Data Files

File
FvFm_lifetime.csv (Comma Separated Values (.csv), 1.72 MB) MD5:b875ad8786155b3d6651cba47b0d5900 Primary data file for dataset ID 652298

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Related Publications

Kuzminov, F. I., & Gorbunov, M. Y. (2015). Energy dissipation pathways in Photosystem 2 of the diatom, Phaeodactylum tricornutum, under high-light conditions. Photosynthesis Research, 127(2), 219–235. doi:10.1007/s11120-015-0180-3
General

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Parameters

Parameter	Description	Units
cruise_id	cruise identification	unitless
date_gmt	GMT date; mm/dd/yy	unitless
time_gmt	GMT time; HH:MM	unitless
lat	latitude	decimal degrees
lon	longitude	decimal degrees
corr_Fluor_min	minimal fluorescence yield corrected for background fluorescence by subtracting respective value measured in 0.2 micrometers filtered seawater from sample data	relative units
corr_Fluor_max	maximal fluorescence yield corrected for background fluorescence by subtracting respective value measured in 0.2 micrometers filtered seawater from sample data	relative units
corr_FvFm	maximum photosynthetic efficiency of photosystem II (quantum yield of photochemistry)	dimensionless
functional_absorbtion	sigma; functional absorption cross-section of photosystem II (PSII)	unitless
NPQ	non-photochemical quenching	dimensionless
TAV	average lifetime of fluorescence	picosecond
ISO_DateTime_UTC	DateTime (UTC) ISO formatted	unitless
amp1	amplitude 1 of the different components of the deconvolution of the fluorescence lifetime kinetics	dimensionless
amp2	amplitude 2 of the different components of the deconvolution of the fluorescence lifetime kinetics	dimensionless
amp3	amplitude 3 of the different components of the deconvolution of the fluorescence lifetime kinetics	dimensionless
time1	time 1 of the different components of the fluorescence lifetime kinetics	picosecond
time2	time 2 of the different components of the fluorescence lifetime kinetics	picosecond
time3	time 3 of the different components of the fluorescence lifetime kinetics	picosecond

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Instruments

Dataset-specific Instrument Name	Fast Repetition Rate Fluorometer
Generic Instrument Name	Fast Repetition Rate Fluorometer
Dataset-specific Description	A custom-built Fast Repetition Rate Fluorometer continuously measured surface water using the ships underway water system.
Generic Instrument Description	An FRRf is used for measuring the fluorescence of a sample of phytoplankton photosynthetic competency (Fv/Fm).

Dataset-specific Instrument Name	Lifetime Fluorometer
Generic Instrument Name	Lifetime Fluorometer
Dataset-specific Description	A custom-built Lifetime Fluorometer continuously measured surface water using the ships underway water system.
Generic Instrument Description	A Lifetime Fluorometer is used to measure picosecond fluorescence decay kinetics in phytoplankton.

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Deployments

MV1405

Website	https://www.bco-dmo.org/deployment/559966
Platform	R/V Melville
Start Date	2014-07-03
End Date	2014-07-26
Description	Deployment MV1405 on R/V Melville. Cruise took place during July 2014.

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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.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1333929
NSF Division of Ocean Sciences (NSF OCE)	OCE-1334387

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