Nutrients, pigments, silicate and experimental data collected aboard the OCEANUS during cruise OC1504A in the North Pacific Ocean from 2015-04-19 to 2015-05-06

Website: https://www.bco-dmo.org/dataset/650831
Data Type: Cruise Results
Version: Final
Version Date: 2016-07-12

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

Contributors	Affiliation	Role
Brzezinski, Mark A.	University of California-Santa Barbara (UCSB-MSI)	Principal Investigator
Thamatrakoln, Kimberlee	Rutgers University (Rutgers IMCS)	Co-Principal Investigator
Ake, Hannah	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager
Allison, Dicky	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

Abstract
These data include nutrient, pigment, silica and experimental data collected aboard the OCEANUS during cruise OC1504A in the North Pacific Ocean along the California Coast from 2015-04-19 to 2015-05-06. The water samples were collected by CTDs. Silica production rates were characterized by delivering incremental increases in silicic acid (Si) along with a radioactive isotope of silicon (32Si). This is an extremely sensitive assay and can determine the maximum production rates of the community being studied and the degree that its growth is being limited by lack of Si. These data were collected by Mark Brzezinski from the University of California at Santa Barbara as part of Linking Physiological and Molecular Aspects of Diatom Silicification.

Table of Contents

Coverage

Spatial Extent: **N**:42.654 **E**:-120.82 **S**:34.551 **W**:-124.482
Temporal Extent: 2015-04-20 - 2015-05-01

Dataset Description

Nutrients, pigments, bottle data, and experimental and survey biogeochemical data from cruise OC1504A. "Silica production rates were characterized by delivering incremental increases in silicic acid (Si) along with a radioactive isotope of silicon (32Si). This extremely sensitive assay can determine the maximum production rates of the community being studied and the degree that its growth is being limited by lack of Si." (from cruise blog)

CRUISE BLOG

These data are restricted until 2017 (2 years after the cruise), or contact Mark Brzezinski, PI.

Methods & Sampling

See the following protocol documents:

32Si Sample Processing (.doc)
Biogenic Si Analysis (.doc)
Dissolved Si Analysis (.doc)

Data Processing Description

BCO-DMO Processing Notes:
- system added negative to the longitude because West;
- modified parameter names to conform with BCO-DMO naming conventions;
- replaced ~ with 'nd' to indicate 'no data';

[table of contents | back to top]

Data Files

File
MUSiCC.csv (Comma Separated Values (.csv), 11.21 KB) MD5:c12f8390c9d76f52cabe2778bef5daa4 Primary data file for dataset ID 650831

[table of contents | back to top]

Parameters

Parameter	Description	Units
cruise_id	cruise during which sample was collected	unitless
brief_desc	the way the project refers to the cruise	unitless
event	event number from Bruland event log	unitless
station	sampling station number	unitless
date_utc	date at longitude 0; the universal time coordinate (UTC);format:dd-mon-yy	unitless
time_utc	time at longitude 0; the universal time coordinate (UTC);format:HH:MM	unitless

lat	latitude in decimal degrees	decimal degrees
lon	longitude in decimal degrees; West is negative	decimal degrees
depth_w	bottom depth in meters	meters
cast	cast type (CTD)	unitless
ISO_DateTime_UTC	date and time formatted to ISO 8601 standard; added by DMO;format:YYYY-mm-ddTHH:MM:SS.xx	yyyy-MM-dd'T'HH:mm:ss
depth	sampling depth in meters	meters
sample_no	identifier for all types of samples at the given depth	unitless
bottle_rosette	rosette bottle number	unitless
PAR_percent	percent light level; original name: percent lo	percent
bottle_pooled	sample identifier denoting whether sample was pooled from several Niskins	unitless
depth_target	target depth for sample collection	meters
PO4	dissoved phosphate concentration in micromoles; analyzed in UCSB MSI Analytical lab;http://www.msi.ucsb.edu/services/analytical-lab/seawater-nutrients-fia	micromoles per liter
NO3_NO2	dissolved nitrate+nitrite concentration in micromoles; analyzed in UCSB MSI Analytical lab; http://www.msi.ucsb.edu/services/analytical-lab/seawater-nutrients-fia	micromoles per liter
chl_total	total chlorophyll (a+b+c) in micrograms per litre determined fluorometrically	micrograms per liter
chla	chlorophyll a in micrograms per litre determined fluorometrically	micrograms per liter
phaeo	phaeophytin in micrograms per litre determined fluorometrically	micrograms per liter

dSi	silicic acid concentration in micromoles (also known as dissolved silicon concentration or dSi)	micromoles per Si per liter
bSi	particulate biogenic silica in micromoles Si per litre	micromoles per Si per liter
Si_prod_4h	four hour incubation silica production rate; original name=4h-32Si rho	micromoles per Si per liter per day
Si_prod_bionorm_4h	four hour incubation biomass normalized silica production rate; original name=4h-32Si Vb	per day
Si_prod_Na2SiO3_4h	four hour incubation silica production rate after the addition of sodium silicate to a final concentration of ~20uM Na2SiO3; original name=4h-32Si E rho	micromoles per Si per liter per day
Si_prod_bionorm_Na2SiO3_4h	four hour incubation biomass normalized silica production rate after the addition of sodium silicate to a final concentration of ~20uM Na2SiO3; original name=4h-32Si E Vb	per day
Si_prod_12h	twelve hour incubation silica production rate; original name=12h-32Si rho	micromoles per Si per liter per day
Si_prod_bionorm_12h	twelve hour incubation biomass normalized silica production rate; original name=12h-32Si Vb	per day
Si_prod_Na2SiO3_12h	twelve hour incubation silica production rate after the addition of sodium silicate to a final concentration of ~20uM Na2SiO3; original name=12h-32Si E rho	micromoles per Si per liter per day
Si_prod_bionorm_Na2SiO3_12h	twelve hour incubation biomass normalized silica production rate after the addition of sodium silicate to a final concentration of ~20uM Na2SiO3; original name=12h-32Si E Vb	per day

[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-1334387

[table of contents | back to top]