Dataset: 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

Project(s): Linking physiological and molecular aspects of diatom silicification in field populations (DiatomSilicification)

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. For a complete list of measurements, refer to the supplemental document 'Field_names.pdf', and a full dataset description is included in the supplemental file 'Dataset_description.pdf'. The most current version of this dataset is available at: http://www.bco-dmo.org/dataset/650831

Description: Molecular Underpinnings of SIlicification in the California Current - OC1504A

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.

Acquisition Description: See the following protocol documents:

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

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';

Project Information

Linking physiological and molecular aspects of diatom silicification in field populations

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.

Deployment Information

Deployment description for R/V Oceanus OC1504A

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.
