CTD profile downcasts from R/V New Horizon NEMO cruise NH1417 in the Eastern Pacific between San Diego and Hawaii from August to September 2014 (Phyto response to N substrates project)

Website: https://www.bco-dmo.org/dataset/685709
Data Type: Cruise Results
Version:
Version Date: 2017-03-23

Project
» Oligotrophic phytoplankton community response to changes in N substrates and the resulting impact on genetic, taxonomic and functional diversity (PhytoNsubResponse)

Program
» Dimensions of Biodiversity (Dimensions of Biodiversity)

Contributors	Affiliation	Role
Mills, Matthew M.	Stanford University	Principal Investigator
Arrigo, Kevin R.	Stanford University	Co-Principal Investigator
Church, Matthew J.	University of Montana	Co-Principal Investigator
Kolber, Zbigniew	Soliense Inc.	Co-Principal Investigator
Zehr, Jonathan P.	University of California-Santa Cruz (UCSC)	Co-Principal Investigator
van Dijken, Gert	Stanford University	Contact
York, Amber D.	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

Table of Contents

Coverage

Spatial Extent: **N**:34.9707 **E**:-117.523 **S**:21.684 **W**:-158.633

Dataset Description

This dataset contains CTD data including temperature, salinity, depth, pressure, fluorescence, sigma-theta density, PAR, beam attenuation, and beam transmission from R/V New Horizon cruise NH1417 from August 18th to September 16th of 2014 in the Eastern Pacific between San Diego and Hawaii.

The R/V New Horizon cruise NH1417 was a Nutrient Effects on Marine microOrganisms (NEMO) cruise.

Methods & Sampling

Data was collected using standard oceanographic techniques. A CTD Rosette with 24 10L Niskin bottles was lowered to the maximum sampling depth and then brought back to the surface. Water was collected on up casts at discrete depths. Once on board seawater was collected from each bottle for analysis.

Data Processing Description

CTD data is only down cast, up cast data was removed. Data was 1m binned. Data processed using Seabird Seasoft software.

Calculation methods:
* Salinity (sal1,sal2) calculated with 1978 PRACTICAL SALINITY SCALE EQUATIONS, from IEEE Journal of Oceanic Engineering, Vol. OE-5, No. 1, January 1980, page 14.
* Derived density (sigma_theta,sigma_theta2) calculated with N.P. Fofonoff and R.C Millard Jr.; Unesco technical papers in marine science #44, 1983

BCO-DMO Data Manager Processing Notes:
* added a conventional header with dataset name, PI name, version date
* modified parameter names to conform with BCO-DMO naming conventions
* blank values replaced with no data value 'nd'
* added Z to timestamp to make it ISO format
* rounded values to three decimal places except lat/lon left as 4 places
* replaced values of -10000000000 in sensor data with "nd" indicating no data

[table of contents | back to top]

Data Files

File
ctd.csv (Comma Separated Values (.csv), 7.03 MB) MD5:82230e84a724a7f1611d77d598bdf43c Primary data file for dataset ID 685709

[table of contents | back to top]

Parameters

Parameter	Description	Units
cruise_id	Cruise identifier	unitless
station	Station identifier	unitless
cast	cast identifier	unitless
ISO_DateTime_UTC	ISO timestamp based on the ISO 8601:2004(E) standard in format YYYY-mm-ddTHH:MM:SS[.xx]Z (UTC)	unitless
lat	Latitude	decimal degrees

lon	Longitude; west is negative	decimal degrees
depth	Derived Depth	meters
press	Pressure	digiquartz (db)
temp	Temperature 1	degrees Celsius
temp2	Temperature 2	degrees Celsius
sal	Salinity 1 from instrument PSS-78	practical salinity units (PSU)
sal2	Salinity 2 from instrument PSS-78	practical salinity units (PSU)
O2	Dissolved oxygen from SBE 43	milliliters per liter (ml/L)
fluor	In-situ chlorophyll a flourescence from Wet Labs Eco-AFL/FL	milligrams per meter squared (mg/m3)
PAR	Photosynthetically Active Radiation from Biospherical QSP-200L	microEinsteins per square meter per second (uEIN/m2/s)
density	Derived Density- sigma theta 1	kilograms per meter squared
density2	Derived Density- sigma theta 2	kilograms per meter squared
beam_att	Beam Attenuation from Chelsea/Seatech instrument	per meter (1/m)
beam_trans	Beam Transmission from Chelsea/Seatech instrument	percent

[table of contents | back to top]

Instruments

Dataset-specific Instrument Name	CTD Rosette
Generic Instrument Name	CTD - profiler
Generic Instrument Description	The Conductivity, Temperature, Depth (CTD) unit is an integrated instrument package designed to measure the conductivity, temperature, and pressure (depth) of the water column. The instrument is lowered via cable through the water column. It permits scientists to observe the physical properties in real-time via a conducting cable, which is typically connected to a CTD to a deck unit and computer on a ship. The CTD is often configured with additional optional sensors including fluorometers, transmissometers and/or radiometers. It is often combined with a Rosette of water sampling bottles (e.g. Niskin, GO-FLO) for collecting discrete water samples during the cast. This term applies to profiling CTDs. For fixed CTDs, see https://www.bco-dmo.org/instrument/869934.

Dataset-specific Instrument Name	
Generic Instrument Name	Niskin bottle
Generic Instrument Description	A Niskin bottle (a next generation water sampler based on the Nansen bottle) is a cylindrical, non-metallic water collection device with stoppers at both ends. The bottles can be attached individually on a hydrowire or deployed in 12, 24, or 36 bottle Rosette systems mounted on a frame and combined with a CTD. Niskin bottles are used to collect discrete water samples for a range of measurements including pigments, nutrients, plankton, etc.

[table of contents | back to top]

Deployments

NH1417

Website	https://www.bco-dmo.org/deployment/544429
Platform	R/V New Horizon
Start Date	2014-08-18
End Date	2014-09-16
Description	NEMO cruise. Bounding box -- 35 degrees N to 21.5 degrees N, 117 degrees W to 157 degrees W NSF R2R data catalog

[table of contents | back to top]

Project Information

Oligotrophic phytoplankton community response to changes in N substrates and the resulting impact on genetic, taxonomic and functional diversity (PhytoNsubResponse)

Coverage: North Pacific Subtropical Gyre at Station ALOHA, and a transect from San Diego, CA to Hawaii

(Extracted from NSF award abstract)

Marine phytoplankton are a diverse group of Prokaryotic and Eukaryotic unicellular organisms that account for approximately 50% of global carbon fixation. Nitrogen (N) is an essential element for microbial growth, but concentrations of bioavailable nitrogen in vast regions of subtropical ocean gyres are extremely low (submicromolar to nanomolar concentrations), and generally limit phytoplankton growth. Phytoplankton taxa differ in their genetic capabilities to take up and assimilate nutrients, and thus competition for different chemical forms of N (NH4+, NO3- and urea) and supply of these N-containing compounds are important controls on phytoplankton growth, productivity, and ultimately ecosystem function. The form and supply of N to phytoplankton have already been altered by anthropogenic activities, and with increasing environmental perturbations the effects will accelerate. To date however, there is limited information on how the N forms and fluxes impact the marine phytoplankton community composition and primary production. Similarly, determining the mechanisms of the response are crucial to assessing how ocean ecosystem function will respond to global climate change.

This project seeks to determine how taxonomic, genetic and functional dimensions of phytoplankton diversity are linked with community-level responses to the availability of different N substrates (NH4+, NO3-, and urea) in one of Earth's largest aquatic habitats, the North Pacific Subtropical Gyre. The project will characterize phytoplankton community composition change and gene expression, photosynthetic performance, carbon fixation, and single-cell level N and C uptake in different taxa within the phytoplankton assemblage in response to different N compounds. The research project is unique in investigating community-to-single-cell level function and species (strain)-specific gene expression patterns using state-of-the-art methods including fast repetition rate fluorometry, nanoscale secondary ion mass spectrometry and a comprehensive marine microbial community microarray. The results will provide predictive understanding of how changes in the availability of key nitrogen pools (N) may impact phytoplankton dynamics and function in the ocean.

References:

Karl, D. M., Bjorkman, K. M., Dore, J. E., Fujieki, L., Hebel, D. V., Houlihan, T., Letelier, R. M., Tupas, L. M. 2001. Ecological nitrogen-to-phosphorus stoichiometry at station ALOHA. Deep-Sea Research II. 48:1529 - 1566.

Karl, D. M., Letelier, R., Tupas, L., Dore, J., Christian, J. & Hebel, D. 1997. The role of nitrogen fixation in biogeochemical cycling in the subtropical North Pacific Ocean. Nature. 388:533-538.

McCarthy, J., Taylor, W. R., Taft, J. 1997. Nitrogenous nutrition of the plankton in the Chesapeake Bay. Limnology and Oceanography. 35:822 - 829.

Letelier, R., Karl, D. M. 1996. Role of Trichodesmium spp. in the productivity of the subtropical North Pacific Ocean. Marine Ecology Progress Series. 133:263 - 273.

Lipschultz, F. 1995. Nitrogen-specific uptake rates of marine phytoplankton isolated from natura populations of particles by flow cytometry. Marine Ecology Progress Series. 123:245-258.

[table of contents | back to top]

Program Information

Dimensions of Biodiversity (Dimensions of Biodiversity)

Website: http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=503446

Coverage: global

(adapted from the NSF Synopsis of Program)
Dimensions of Biodiversity is a program solicitation from the NSF Directorate for Biological Sciences. FY 2010 was year one of the program. [MORE from NSF]

The NSF Dimensions of Biodiversity program seeks to characterize biodiversity on Earth by using integrative, innovative approaches to fill rapidly the most substantial gaps in our understanding. The program will take a broad view of biodiversity, and in its initial phase will focus on the integration of genetic, taxonomic, and

functional dimensions of biodiversity. Project investigators are encouraged to integrate these three dimensions to understand the interactions and feedbacks among them. While this focus complements several core NSF programs, it differs by requiring that multiple dimensions of biodiversity be addressed simultaneously, to understand the roles of biodiversity in critical ecological and evolutionary processes.

[table of contents | back to top]

Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1241221
NSF Division of Ocean Sciences (NSF OCE)	OCE-1241263
NSF Division of Ocean Sciences (NSF OCE)	OCE-1241093

[table of contents | back to top]