Niskin bottle sample data 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/685756
Version:
Version Date: 2018-03-09

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
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Coverage

Spatial Extent: **N**:34.9707 **E**:-117.523 **S**:21.684 **W**:-158.633
Temporal Extent: 2014-08-08 - 2014-09-16

Dataset Description

This dataset contains measurements from Niskin bottle samples 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.

Measurements from Fast Repetition Rate Fluorometry (FRRF): initial fluorescence, maximum photochemical efficiency of photostream II, and functional absorption of cross-section.

CTD measurements: temperature, salinity, pressure, PAR, in-situ chlorophyll a, dissolved oxygen, fluorescence.

Derived values: Extracted chlorophyll a, 15N2 enrichment, 14C primary production.

Methods & Sampling

Samples were 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 during upcasts at discrete depths. Once on board seawater was collected from each bottle for analysis. CTD data included are also from the upcasts.

Data Processing Description

Data quality flags are the same as defined in the World Ocean Circulation Experiment (WOCE) and are as follows:

Citations for methods and calculations:

FRRF measurements: Kolber et al. (1998) Biochimica et Biophysica Acta 1367:88-106
14C Primary Production: Lohrenz et al. (1992) Journal of Plankton Research 14:201-221
N2 Fixation: Wilson et al. (2012) Applied Environmental Microbiology 78:6491-6498
Chl a: Welschmeyer (1994) Limnology and Oceanography 39:1985-1992

Quality flag definitions for water bottles:

1 = Bottle information unavailable.

2 = No problems noted.

3 = Leaking.

4 = Did not trip correctly.

5 = Not reported.

6 = Significant discrepancy in measured values between Gerard and Niskin bottles.

7 = Unknown problem.

8 = Pair did not trip correctly. Note that the Niskin bottle can trip at an unplanned depth while the Gerard trips correctly and vice versa.

9 = Samples not drawn from this bottle.

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
* Added ISO formatted timestamp from TIME and DATE
* original missing data value '-999' displayed as "nd" for no data in the bco-dmo system

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Data Files

File
bottle.csv(Comma Separated Values (.csv), 1.33 MB) MD5:5e36f3a3b538ad2588848fa1592ec92a Primary data file for dataset ID 685756

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Parameters

Parameter	Description	Units
EXPOCODE	expedition code assigned by the CCHDO: NODCShipCodeYearMonthDay	unitless
SECT_ID	cruise section identification number	unitless
STNNBR	station number	unitless
CASTNO	cast number	unitless
BTLNBR	Bottle Number	unitless
BTLNBR_FLAG_W	Bottle Quality Flag	unitless
DATE	Station Date (GMT); format is YYYYMMDD	years days months
TIME	Station Time (GMT); format is HHMM	hours and minutes
LATITUDE	Station Latitude (South is negative)	decimal degrees
LONGITUDE	Station Longitude (West is negative)	decimal degrees
DEPTH	CTD depth	meters
CTDPRS	CTD pressure	decibars
CTDTMP_UP	Temperature from CTD upcast (Sea-Bird Model 03, ITS-90)	degrees Celsius
CTDTMP_UP_FLAG_W	Temperature from CTD upcast (CTDTMP_UP) quality flag	unitless
CTDTMP1_UP	Temperature from CTD upcast (ITS-90)	degrees Celsius
CTDTMP1_UP_FLAG_W	Temperature from CTD upcast (CTDTMP1_UP) quality flag	unitless
CTDSAL_UP	Salinity (primary, PSS-78) from CTD upcast	Practical Salinity Units (PSU)
CTDSAL_UP_FLAG_W	Salinity (primary, PSS-78) from CTD upcast) quality flag	unitless
CTDSAL2_UP	Salinity (secondary, PSS-78) from CTD upcast	Practical Salinity Units (PSU)
CTDSAL2_UP_FLAG_W	Salinity (secondary, PSS-78) from CTD upcast) quality flag	unitless
CTDOXY_UP	Dissolved oxygen from CTD upcast (SBE 43)	milliliters per liter (ml/l)
CTDOXY_UP_FLAG_W	Dissolved oxygen from CTD upcast (SBE 43) quality flag	unitless
CTDFLUOR_UP	Fluorescence from CTD upcast	milligrams per meter cubed (mg/m^3)
CTDFLUOR_UP_FLAG_W	Fluorescence from CTD upcast quality flag	unitless
CTDTRANS_UP	Beam transmission from CTD upcast	percent (%)

CTDTRANS_UP_FLAG_W	Beam transmission from CTD upcast quality flag	unitless
CTDPAR_UP	Photosynthetically Active Radiation (PAR) from CTD upcast	microEinsteins per meter squared per second (uE/m^2/s)
CTDPAR_UP_FLAG_W	Photosynthetically Active Radiation (PAR) from CTD upcast quality flag	unitless
CTDSPAR_UP	Surface Photosynthetically Active Radiation from CTD upcast	microEinsteins per meter squared per second (uE/m^2/s)
CTDSPAR_UP_FLAG_W	Surface Photosynthetically Active Radiation from CTD upcast quality flag	unitless
Chlorophyll_a	Chlorophyll a	micrograms per liter (ug/L)
Chlorophyll_a_FLAG_W	Chlorophyll a quality flag	unitless
Chlorophyll_a_STDEV	Standard deviation of Chlorophyll a	micrograms per liter (ug/L)
Chlorophyll_a_STDEV_FLAG_W	Standard deviation of Chlorophyll a quality flag	unitless
POC	Particulate organic carbon concentration	micromoles per liter (umol/L)
POC_FLAG_W	Particulate organic carbon concentration quality flag	unitless
PON	Particulate organic nitrogen concentration	micromoles per liter (umol/L)
PON_FLAG_W	Particulate organic nitrogen concentration quality flag	unitless
NITRAT	Nitrate (NO3) concentration	micromoles per liter (umol/L)
NITRAT_FLAG_W	Nitrate (NO3) concentration quality flag	unitless
NITRAT_STDEV	Nitrate (NO3) concentration	micromoles per liter (umol/L)
NITRAT_STDEV_FLAG_W	Nitrate (NO3) concentration quality flag	unitless
PHSPHT	Phosphate (PO4) concentration	micromoles per liter (umol/L)
PHSPHT_FLAG_W	Phosphate (PO4) concentration quality flag	unitless
PHSPHT_STDEV	Phosphate (PO4) concentration standard deviation	micromoles per liter (umol/L)
PHSPHT_STDEV_FLAG_W	Phosphate (PO4) concentration standard deviation quality flag	unitless
N2_FIXATION	Dinitrogen Fixation (15N2 enrichment)	nanomoles per liter per hour (nmol/L/h)
N2_FIXATION_FLAG_W	Dinitrogen Fixation (15N2 enrichment) quality flag	unitless
N2_FIXATION_STDEV	Dinitrogen Fixation (15N2 enrichment) standard deviation	nanomoles per liter per hour (nmol/L/h)
N2_FIXATION_STDEV_FLAG_W	Dinitrogen Fixation (15N2 enrichment) standard deviation quality flag	unitless
FRRF_Fo_Color1	Initial Flourescence (445-450nm)	relative
FRRF_Fo_Color1_FLAG_W	Initial Flourescence (445-450nm) quality flag	unitless

FRRF_Fo_Color1_STDEV	Initial Flourescence (445-450nm) Standard Deviation	relative
FRRF_Fo_Color1_STDEV_FLAG_W	Initial Flourescence (445-450nm) Standard Deviation quality flag	unitless
FRRF_FvFm_Color1	Maximum Photochemical Efficiency (Fv/Fm) of Photosystem II (445-450nm)	dimensionless
FRRF_FvFm_Color1_FLAG_W	Maximum Photochemical Efficiency of Photosystem II (445-450nm) quality flag	unitless
FRRF_FvFm_Color1_STDEV	Maximum Photochemical Efficiency of Photosystem II (445-450nm) Standard Deviation	dimensionless
FRRF_FvFm_Color1_STDEV_FLAG_W	Maximum Photochemical Efficiency of Photosystem II (445-450nm) Standard Deviation quality flag	unitless
FRRF_Sig_Color1	Functional Absorbtion Cross section (445-450nm)	10^-20 M^2/QUANTA
FRRF_Sig_Color1_FLAG_W	Functional Absorbtion Cross section (445-450nm) quality flag	unitless
FRRF_Sig_Color1_STDEV	Functional Absorbtion Cross section (445-450nm) Standard Deviation	10^-20 M^2/QUANTA
FRRF_Sig_Color1_STDEV_FLAG_W	Functional Absorbtion Cross section (445-450nm) Standard Deviation quality flag	unitless
FRRF_Fo_Color2	Initial Flourescence (470nm)	unitless
FRRF_Fo_Color2_FLAG_W	Initial Flourescence (470nm) quality flag	unitless
FRRF_Fo_Color2_STDEV	Initial Flourescence (470nm) Standard Deviation	relative
FRRF_Fo_Color2_STDEV_FLAG_W	Initial Flourescence (470nm) Standard Deviation quality flag	unitless
FRRF_FvFm_Color2	Maximum Photochemical Efficiency (Fv/Fm) of Photosystem II (470nm)	dimensionless
FRRF_FvFm_Color2_FLAG_W	Maximum Photochemical Efficiency of Photosystem II (470nm) quality flag	unitless
FRRF_FvFm_Color2_STDEV	Maximum Photochemical Efficiency of Photosystem II (470nm) Standard Deviation	dimensionless
FRRF_FvFm_Color2_STDEV_FLAG_W	Maximum Photochemical Efficiency of Photosystem II (470nm) Standard Deviation quality flag	unitless
FRRF_Sig_Color2	Functional Absorbtion Cross section (470nm)	10^-20 M^2/QUANTA
FRRF_Sig_Color2_FLAG_W	Functional Absorbtion Cross section (470nm) quality flag	unitless
FRRF_Sig_Color2_STDEV	Functional Absorbtion Cross section (470nm) Standard Deviation	10^-20 M^2/QUANTA
FRRF_Sig_Color2_STDEV_FLAG_W	Functional Absorbtion Cross section (470nm) Standard Deviation quality flag	unitless
FRRF_Fo_Color3	Initial Flourescence (505nm)	relative
FRRF_Fo_Color3_FLAG_W	Initial Flourescence (505nm) quality flag	unitless
FRRF_Fo_Color3_STDEV	Initial Flourescence (505nm) Standard Deviation	relative
FRRF_Fo_Color3_STDEV_FLAG_W	Initial Flourescence (505nm) Standard Deviation quality flag	unitless

FRRF_FvFm_Color3	Maximum Photochemical Efficiency (Fv/Fm) of Photosystem II (505nm)	dimensionless
FRRF_FvFm_Color3_FLAG_W	Maximum Photochemical Efficiency of Photosystem II (505nm) quality flag	unitless
FRRF_FvFm_Color3_STDEV	Maximum Photochemical Efficiency of Photosystem II (505nm) Standard Deviation	dimensionless
FRRF_FvFm_Color3_STDEV_FLAG_W	Maximum Photochemical Efficiency of Photosystem II (505nm) Standard Deviation quality flag	unitless
FRRF_Sig_Color3	Functional Absorbtion Cross section (505nm)	10^-20 M^2/QUANTA
FRRF_Sig_Color3_FLAG_W	Functional Absorbtion Cross section (505nm) quality flag	unitless
FRRF_Sig_Color3_STDEV	Functional Absorbtion Cross section (505nm) Standard Deviation	10^-20 M^2/QUANTA
FRRF_Sig_Color3_STDEV_FLAG_W	Functional Absorbtion Cross section (505nm) Standard Deviation quality flag	unitless
FRRF_Fo_Color4	Initial Flourescence (530nm)	relative
FRRF_Fo_Color4_FLAG_W	Initial Flourescence (530nm) quality flag	unitless
FRRF_Fo_Color4_STDEV	Initial Flourescence (530nm) Standard Deviation	relative
FRRF_Fo_Color4_STDEV_FLAG_W	Initial Flourescence (530nm) Standard Deviation quality flag	unitless
FRRF_FvFm_Color4	Maximum Photochemical Efficiency (Fv/Fm) of Photosystem II (530nm)	dimensionless
FRRF_FvFm_Color4_FLAG_W	Maximum Photochemical Efficiency of Photosystem II (530nm) quality flag	unitless
FRRF_FvFm_Color4_STDEV	Maximum Photochemical Efficiency of Photosystem II (530nm) Standard Deviation	dimensionless
FRRF_FvFm_Color4_STDEV_FLAG_W	Maximum Photochemical Efficiency of Photosystem II (530nm) Standard Deviation quality flag	unitless
FRRF_Sig_Color4	Functional Absorbtion Cross section (530nm)	10^-20 M^2/QUANTA
FRRF_Sig_Color4_FLAG_W	Functional Absorbtion Cross section (530nm) quality flag	unitless
FRRF_Sig_Color4_STDEV	Functional Absorbtion Cross section (530nm) Standard Deviation	10^-20 M^2/QUANTA
FRRF_Sig_Color4_STDEV_FLAG_W	Functional Absorbtion Cross section (530nm) Standard Deviation quality flag	unitless
PRIPROD	Primary Productivity	micrograms of carbon per liter per day (ug/L/d)
PRIPROD_FLAG_W	Primary Productivity quality flag	unitless
PRIPROD_STDEV	Primary Productivity Standard Deviation	unitless
PRIPROD_STDEV_FLAG	Primary Productivity Standard Deviation quality flag	unitless
SAMPNO	Sample Number	unitless

ISO_DateTime_UTC	ISO_DateTime_UTC,ISO timestamp based on the ISO 8601:2004(E) standard in format YYYY-mm-ddTHH:MM (UTC),unitless,nd,ISO_DateTime_UTC	unitless

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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.

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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

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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.

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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.

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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

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