Dinitrogen fixation (N2fix) rates and nifH community structure from in situ 15N2 Gas Array from R/V Kilo Moana KM1016, KM1110 in the North Pacific Subtropical Gyre near Station ALOHA from 2010-2011 (DIAZOTROPHS-CO2 project)

Website: https://www.bco-dmo.org/dataset/4017
Version: 22 August 2013
Version Date: 2013-08-22

Project
» Oceanic diazotroph community structure and activities in a high carbon dioxide world (DIAZOTROPHS-CO2)

Program
» Ocean Carbon and Biogeochemistry (OCB)

Contributors	Affiliation	Role
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Dataset Description

Assessments of fixation rates of Rates of $^{15}N_2$ and cyanobacterial nifH gene dynamics from In situ $^{15}N_2$ Gas Array near station ALOHA deployed during KM1016 and KM1110.

Methods & Sampling

Rates of $^{15}N_2$ fixation were assessed using the ^{15}N isotopic tracer technique. Whole seawater samples from six discrete depths (5, 25, 45, 75, 100, and 125 m) were withdrawn into acid-washed duplicate 4.3 L polycarbonate bottles and sealed with caps fitted with a silicone septa. Three mL of $^{15}N_2$ gas (98 %; Isotech Laboratories ©) was injected into each polycarbonate bottle through the silicone septum using a gas-tight syringe fitted with a stainless steel needle. The bottles were attached to a free drifting array, deployed before dawn and incubated at in situ light and temperature for ~24 hours. After recovery of the array, the entire volume of each bottle was filtered onto pre-combusted glass microfiber (GF/F) filters (25 mm diameter) for whole seawater N_2-fixation estimates. All GF/F filters were placed on combusted foil pieces in Petri dishes and stored frozen at -20 °C for transport.

Data Processing Description

See: Dinitrogen fixation and nifH analysis methods.

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Data Files

File
N2fix_array.csv (Comma Separated Values (.csv), 4.05 KB) MD5:b30082649dc182d9908e99e3d1c10839 Primary data file for dataset ID 4017

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Parameters

Parameter	Description	Units
cruise_id	Cruise Id	text
sta	Station Id	integer
date	date sampling began	YYYYMMDD
time	time sampling began	hhmm
lon	longitude; negative denotes West	decimal degrees
lat	latitude; negative denotes South	decimal degrees
depth	depth of measurement	meters
year	Year of sample	YYYY
month	month of sample	MM
day	day of sample	DD
N2fix_mean	Mean dinitrogen fixation rate (mean from num_obs.) bd = below detection	nanomol N/liter/day
N2fix_diff	Difference in dinitrogen fixation rate using N2fix_num_obs samples.	nanomol N/liter/day
PP_mean	Primary production mean derived from num_obs samples. bd = below detection	micrograms/liter/day
PP_std_dev	Standard deviation between Primary Production samples using PP_num_obs samples.	micrograms/liter/day
N2fix_num_obs	number of samples used in calculation of dinitrogen fixation rate mean (N2fix_mean) and difference (N2fix_std_dev.)	integer
PP_num_obs	number of samples used in calculation of Primary Production mean (PP_mean) and standard deviation (PP_std_dev.)	integer
leuc_3H_light_incorp_mean	3H-leucine (Light) incorporations rates in picomoles Leucine(Light) per liter per hour	picomole/liter/hour
leuc_3H_dark_incorp_mean	Mean 3H-Leucine (Dark) incorporation rates in picomoles Leucine (Dark) per liter hour using Leucine_3H_Dark_num_obs samples.	picomole/liter/hour
leuc_3H_light_incorp_diff	Standard deviation between leuc_3H_num_obs samples of 3H-Leucine (light) incorporation rate.	picomole/liter/hour
leuc_3H_dark_incorp_diff	Standard deviation between leuc_3H_num_obs samples of 3H-Leucine (dark) incorporation rate.	picomole/liter/hour
leuc_3H_light_num_obs	Number of observations used in calculation of leuc_3H_light_incorp mean and standard deviation.	integer
leuc_3H_dark_num_obs	Number of observations used in calculation of leuc_3H_dark_incorp mean and standard deviation.	integer

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Instruments

Dataset-specific Instrument Name	Mass Spectrometer
Generic Instrument Name	Mass Spectrometer
Generic Instrument Description	General term for instruments used to measure the mass-to-charge ratio of ions; generally used to find the composition of a sample by generating a mass spectrum representing the masses of sample components.

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Deployments

KM1016

Website	https://www.bco-dmo.org/deployment/59055
Platform	R/V Kilo Moana
Report	http://dmoserv3.bco-dmo.org/jg/serv/BCO-DMO/DIAZOTROPHS_CO2/726342.html1%7Bdir=dmoserv3.whoi.edu/jg/dir/BCO-DMO/DIAZOTROPHS_CO2/,info=dmoserv3.bco-dmo.org/jg/info/BCO-DMO/DIAZOTROPHS_CO2/CO2_experimental%7D?cruise_id_eq_km1016
Start Date	2010-08-20
End Date	2010-08-30
Description	Cruise information and original data are available from the NSF R2R data catalog.

KM1110

Website	https://www.bco-dmo.org/deployment/59056
Platform	R/V Kilo Moana
Report	http://dmoserv3.bco-dmo.org/jg/serv/BCO-DMO/DIAZOTROPHS_CO2/726342.html1%7Bdir=dmoserv3.whoi.edu/jg/dir/BCO-DMO/DIAZOTROPHS_CO2/,info=dmoserv3.bco-dmo.org/jg/info/BCO-DMO/DIAZOTROPHS_CO2/CO2_experimental%7D?cruise_id_eq_km1110
Start Date	2011-03-12
End Date	2011-03-23

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Project Information

Oceanic diazotroph community structure and activities in a high carbon dioxide world (DIAZOTROPHS-CO2)

The North Pacific Subtropical Gyre (NPSG) is the largest ocean ecosystem on Earth, playing a prominent role in global carbon cycling and forming an important reservoir of marine biodiversity. Nitrogen (N2) fixing bacteria (termed diazotrophs) provide a major source of new nitrogen to the oligotrophic waters of the NPSG, thereby

exerting direct control on the carbon cycle. Oceanic uptake of CO2 causes long-term changes in the partial pressure of CO2 (pCO2) in the seawater of this ecosystem. Therefore, understanding how carbon system perturbations may influence ocean biogeochemistry is an important and timely undertaking.

In this project, the investigators will examine how natural assemblages of N2 fixing microorganisms respond to perturbations in seawater carbon chemistry. Laboratory and field-based experiments will be placed in the context of monthly time series measurements on the activities and abundances of N2 fixing microorganism abundances. Together, the project will provide insight into the dependence of N2 fixing microorganism physiology on variations in CO2. The broad objectives of the research are: (1) Quantify the responses and consequences of changes in seawater pCO2 on the growth and community structure of naturally-occurring assemblages of ocean diazotrophs; (2) Identify why and how changes in seawater pCO2 influence the growth and carbon acquisition strategies of two model marine diazotrophs (Trichodesmium and Crocosphaera); and (3) Quantify temporal variability in diazotroph community structure and activities at Station ALOHA.

This is a Collaborative Research award.

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Program Information

Ocean Carbon and Biogeochemistry (OCB)

Website: http://us-ocb.org/

Coverage: Global

The Ocean Carbon and Biogeochemistry (OCB) program focuses on the ocean's role as a component of the global Earth system, bringing together research in geochemistry, ocean physics, and ecology that inform on and advance our understanding of ocean biogeochemistry. The overall program goals are to promote, plan, and coordinate collaborative, multidisciplinary research opportunities within the U.S. research community and with international partners. Important OCB-related activities currently include: the Ocean Carbon and Climate Change (OCCC) and the North American Carbon Program (NACP); U.S. contributions to IMBER, SOLAS, CARBOOCEAN; and numerous U.S. single-investigator and medium-size research projects funded by U.S. federal agencies including NASA, NOAA, and NSF.

The scientific mission of OCB is to study the evolving role of the ocean in the global carbon cycle, in the face of environmental variability and change through studies of marine biogeochemical cycles and associated ecosystems.

The overarching OCB science themes include improved understanding and prediction of: 1) oceanic uptake and release of atmospheric CO2 and other greenhouse gases and 2) environmental sensitivities of biogeochemical cycles, marine ecosystems, and interactions between the two.

The OCB Research Priorities (updated January 2012) include: ocean acidification; terrestrial/coastal carbon fluxes and exchanges; climate sensitivities of and change in ecosystem structure and associated impacts on biogeochemical cycles; mesopelagic ecological and biogeochemical interactions; benthic-pelagic feedbacks on biogeochemical cycles; ocean carbon uptake and storage; and expanding low-oxygen conditions in the coastal and open oceans.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-0850827

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