POC and PON from bulk seawater samples from RV/Atlantic cruise AT39-05, Feb-Mar 2018

Website: https://www.bco-dmo.org/dataset/766374
Data Type: Cruise Results, experimental
Version: 1
Version Date: 2019-05-02

Project
» Collaborative Research: Iron and phosphorus balanced limitation of nitrogen fixation in the oligotrophic ocean (TriCoLim)

Contributors	Affiliation	Role
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Abstract
POC and PON from bulk seawater samples from RV/Atlantic cruise AT39-05, Feb-Mar 2018.

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Coverage

Spatial Extent: **N**:13.6776 **E**:-21.998 **S**:-7.9989 **W**:-55.8123
Temporal Extent: 2018-02-11 - 2018-03-14

Dataset Description

These data reports POC and PON from bulk seawater samples from RV/Atlantic cruise AT39-05, Feb-Mar 2018.

Methods & Sampling

Shipboard incubation experiments were carried out at 15 stations in the tropical Atlantic with trace metal clean-collected bulk seawater to examine iron (Fe) and phosphorus (P) co-limitation of dinitrogen (N2) fixation (see TriCoLim Station coordinates metadata). Treatments were: Co-limited control (no additions, “Colimit”), + 2nM Fe (“Fe”), + 50 nM P (“P”) and Replete (+Fe+P, “Rep”). All incubations were carried out at ambient (“Lo”) temperature and ambient temperature +3C (“Hi”) for 2-4 days on deck before measuring 15N2 and 13CO2 fixation rates and particulate organic carbon (POC) and nitrogen (PON). See related datasets.

Nitrogen and carbon fixation rates - bulk seawater	Nitrogen and carbon fixation rates from bulk water samples from RV/Atlantic cruise AT39-05, Feb-Mar 2018
Nitrogen and carbon fixation rates - Trichodesmium	Nitrogen and carbon fixation rates from Trichodesmium colonies from RV/Atlantic cruise AT39-05, Feb-Mar 2018
POC and PON - Trichodesmium	POC and PON from Trichodesmium colonies from RV/Atlantic cruise AT39-05, Feb-Mar 2018

Data Processing Description

BCO-DMO Processing Notes:
- added conventional header with dataset name, PI name, version date
- modified parameter names to conform with BCO-DMO naming conventions
- reduced lat and lon precision from 14 to 3 places to better reflect sampling precision

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Data Files

File
POC_PON_bulkH2O.csv (Comma Separated Values (.csv), 20.63 KB) MD5:b95dbe48f4f778e7dedae4c41b0d27e1 Primary data file for dataset ID 766374

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Parameters

Parameter	Description	Units
Station	station identifier	unitless
Experiment_ID	experiment_id identifier	unitless
Latitude	latitude; north is positive	decimal degrees
Longitude	longitude; east is positive	decimal degrees
Sample_D	sample identifier	unitless
Treatment	treatment: Lo temp = ambient temperature Hi temp = ambient temperature plus 3 degrees C. Colimit = Co-limited control (no additions Fe = 2nM Fe P = 50 nM P Rep = Replete (+Fe+P)	unitless
POC	Particulate Organic Carbon concentration	micromol/liter (umol/L)
PON	Particulate Organic Nitrogen concentration	micromol/liter (umol/L)
POC_PON	ratio of POC to PON	unitless

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Instruments

Dataset-specific Instrument Name	
Generic Instrument Name	Trace Metal Bottle
Dataset-specific Description	Used to collect clean seawater.
Generic Instrument Description	Trace metal (TM) clean rosette bottle used for collecting trace metal clean seawater samples.

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Deployments

AT39-05

Website	https://www.bco-dmo.org/deployment/765978
Platform	R/V Atlantis
Start Date	2018-02-11
End Date	2018-03-14
Description	For study of iron and phosphorus balanced limitation of nitrogen fixation in the oligotrophic ocean.

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Project Information

Collaborative Research: Iron and phosphorus balanced limitation of nitrogen fixation in the oligotrophic ocean (TriCoLim)

Coverage: Tropical Atlantic

NSF abstract:

Marine cyanobacteria are able to use or "fix" atmospheric nitrogen gas, and so supply much of the essential nutrient nitrogen that supports open ocean food chains. Oceanographers have usually thought that the growth of these nitrogen-fixing cyanobacteria is limited at any particular time and place by the supply of either iron, or of phosphorus. Preliminary experiments have shown, though, that these nitrogen fixers instead grow best when both iron and phosphorus are scarce at the same time. In this project, the researchers will use cellular indicators that are specific for iron and phosphorus limitation to determine how important this type of "balanced limitation" of nitrogen-fixing cyanobacteria is in controlling the productivity of ocean food chains in the tropical Atlantic Ocean. Two graduate students will be trained at the University of Southern California (USC) and Woods Hole Oceanographic Institution, as well as a postdoctoral researcher at USC. Educational outreach efforts will take place at a Los Angeles inner city high school with a student body that is over 98% Hispanic and African-American, and with underrepresented undergraduates in the USC Global Environmental Microbiology course. In addition, two Research Experiences for Undergraduates students will be supervised for summer research projects to help them learn about science career options.

The researchers will investigate the biological and biogeochemical consequences of this unique balanced iron/phosphorus-limited phenotype, using both laboratory and fieldwork approaches. During the first year of this project, the nitrogen-fixing cyanobacteria will be cultured under iron and/or phosphorus limitation, followed by application of proteomics and transcriptomics to identify genes that are potential diagnostic biomarkers for iron/phosphorus balanced limitation. Preliminary work has already identified one promising candidate biomarker in one cyanobacterium, an EzrA protein domain that appears to be associated with the cell size decreases seen specifically under balanced limitation, and the researchers have identified numerous other potential candidates for similar biomarkers. During the second year, these new co-limitation biomarkers and others previously validated for iron limitation (IsiB) and phosphorus limitation (SphX) will be used to investigate balanced limitation

during a research cruise transecting from relatively high-iron, low-phosphorus North Atlantic waters, to the relatively high-phosphorus, low-iron South Atlantic. This fieldwork component will survey nitrogen fixing cyanobacteria populations across this natural iron/phosphorus gradient for genetic, proteomic, and physiological indicators of balanced limitation, as well as testing their responses to iron and phosphorus manipulations in shipboard incubation experiments. The third year will be devoted to sample analysis, and publications exploring the responses of oceanic nitrogen fixers to simultaneous limitation by both iron and phosphorus.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1657757

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