Water column data from R/V Atlantic Explorer cruise AE1409 in the Western Tropical North Atlantic from May 2014 (P Processing by Tricho project)

Website: https://www.bco-dmo.org/dataset/709476
Data Type: Cruise Results
Version: 1
Version Date: 2017-07-20

Project
» Dissolved Phosphorus Processing by Trichodesmium Consortia: Quantitative Partitioning, Role of Microbial Coordination, and Impact on Nitrogen Fixation (P Processing by Tricho)

Contributors	Affiliation	Role
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Abstract
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Coverage

Spatial Extent: **N**:27.8657 **E**:-52.1795 **S**:7.4618 **W**:-64.9907
Temporal Extent: 2014-05-10 - 2014-05-27

Dataset Description

Water column data from cruise AE1409.

Methods & Sampling

MAGIC Soluble reactive phosphorus (SRP) concentrations. SRP (i.e. phosphate) was determined in seawaters samples and incubations was quantified using MAGnesium Induced Coprecipitation (MAGIC) as described by Karl and Tien (1992).

Total dissolved phosphorus (TDP) concentrations – TDP was determined on 0.2 um filtrates of surface water

(~5 m depth) samples collected via CTD into acid-clean polycarbonate bottles. Samples were processed at the SOEST Laboratory for Analytical Biogeochemistry at the University of Hawaii, according to facility protocols.

Alkaline phosphatase rates - Alkaline phosphatase activity samples were obtained by placing 2-5 cleaned *Trichodesmium* colonies on 5 um PC filters, gently vacuum filtering away excess liquid, then storing in 47 mm plastic petri dishes at -20 C until analysis. Samples were processed as previously described by Dyhrman and Ruttenberg (2006) using 6,8-difluoro-4-methylumbeliferyl phosphate (DiMufP) on a Synergy H1 Hybrid plate reader using the Gen5 software package (BioTek, Winooski, VT)

Data Processing Description

BCO-DMO Processing:
Added conventional header with dataset name, PI name, version date.
Modified parameter names to conform with BCO-DMO naming conventions.
Re-formatted date from m/dd/yyyy to yyyymmdd.
Replaced spaces and / with underscores.
Added coordinate information to the data from the station list provided by the PI.

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Data Files

File
water_column.csv (Comma Separated Values (.csv), 6.01 KB) MD5:c70c34f4143c3634914253a0a6b41d69 Primary data file for dataset ID 709476

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Related Publications

Dyhrman, S. T., & Ruttenberg, K. C. (2006). Presence and regulation of alkaline phosphatase activity in eukaryotic phytoplankton from the coastal ocean: Implications for dissolved organic phosphorus remineralization. Limnology and Oceanography, 51(3), 1381–1390. doi:10.4319/lo.2006.51.3.1381
Methods

Frischkorn, K. R., Rouco, M., Van Mooy, B. A. S., & Dyhrman, S. T. (2017). Epibionts dominate metabolic functional potential of Trichodesmium colonies from the oligotrophic ocean. The ISME Journal, 11(9), 2090–2101. doi:10.1038/ismej.2017.74
General

Karl, D. M., & Tien, G. (1992). MAGIC: A sensitive and precise method for measuring dissolved phosphorus in aquatic environments. Limnology and Oceanography, 37(1), 105–116. doi:10.4319/lo.1992.37.1.0105
Methods

Van Mooy, B. A. S., Krupke, A., Dyhrman, S. T., Fredricks, H. F., Frischkorn, K. R., Ossolinski, J. E., … Sylva, S. P. (2015). Major role of planktonic phosphate reduction in the marine phosphorus redox cycle. Science, 348(6236), 783–785. doi:10.1126/science.aaa8181
Methods

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Parameters

Parameter	Description	Units
Date	Sampling date formatted as YYYYMMDD.	YYYYMMDD
Station	Numeric identifier for the station where the data was collected.	unitless
Depth	Depth at which the sample was collected.	meters
Sample	Numeric identifier of the sample.	unitless
SRP	Soluble reactive phosphorous (SRP).	micromole per liter (umol/L)
MAGIC_SRP	soluble reactive phosphorus measured by magnesium-induced co-precipitation	micromole per liter (umol/L)
TDP	Total dissolved phosphorus.	micromole per liter (umol/L)
DOP_calc	Dissolved organic phosphorus.	micromole per liter (umol/L)
Lat	Latitude of sampling. Positive indicate North.	Decimal Degrees
Long	Longitude of sampling. Negative indicate West.	Decimal Degrees

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Instruments

Dataset-specific Instrument Name	Niskin bottles
Generic Instrument Name	Niskin bottle
Dataset-specific Description	Water samples for whole community analyses were collected from Niskin bottles deployed on a rosette with a CTD.
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.

Dataset-specific Instrument Name	AA3 Nutrient Autoanalyzer
Generic Instrument Name	Nutrient Autoanalyzer
Dataset-specific Description	Samples were processed at the SOEST Laboratory for Analytical Biogeochemistry at the University of Hawaii and analyzed for phosphate via the AA3 autoanalyzer. More information about the Phosphorous measurements can be found at the SOEST Laboratory Webiste.
Generic Instrument Description	Nutrient Autoanalyzer is a generic term used when specific type, make and model were not specified. In general, a Nutrient Autoanalyzer is an automated flow-thru system for doing nutrient analysis (nitrate, ammonium, orthophosphate, and silicate) on seawater samples.

Dataset-specific Instrument Name	Synergy H1 Hybrid plate reader
Generic Instrument Name	plate reader
Dataset-specific Description	Samples were processed as previously described by Dyhrman and Ruttenberg (2006) using 6,8-difluoro-4-methylumbeliferyl phosphate (DiMufP) on a Synergy H1 Hybrid plate reader using the Gen5 software package (BioTek, Winooski, VT). Reference: Dyhrman, S.T., Ruttenberg, K.C., 2006. Presence and regulation of alkaline phosphatase activity in eukaryotic phytoplankton from the coastal ocean: Implications for dissolved organic phosphorus remineralization,. Limnol. Oceanogr. 51, 1381-1390.
Generic Instrument Description	Plate readers (also known as microplate readers) are laboratory instruments designed to detect biological, chemical or physical events of samples in microtiter plates. They are widely used in research, drug discovery, bioassay validation, quality control and manufacturing processes in the pharmaceutical and biotechnological industry and academic organizations. Sample reactions can be assayed in 6-1536 well format microtiter plates. The most common microplate format used in academic research laboratories or clinical diagnostic laboratories is 96-well (8 by 12 matrix) with a typical reaction volume between 100 and 200 uL per well. Higher density microplates (384- or 1536-well microplates) are typically used for screening applications, when throughput (number of samples per day processed) and assay cost per sample become critical parameters, with a typical assay volume between 5 and 50 µL per well. Common detection modes for microplate assays are absorbance, fluorescence intensity, luminescence, time-resolved fluorescence, and fluorescence polarization. From: http://en.wikipedia.org/wiki/Plate_reader, 2014-09-0-23.

Dataset-specific Instrument Name	temperature logger (Onset)
Generic Instrument Name	Water Temperature Sensor
Dataset-specific Description	Temperature in the incubators was occasionally monitored with a waterproof temperature logger (Onset).
Generic Instrument Description	General term for an instrument that measures the temperature of the water with which it is in contact (thermometer).

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Deployments

AE1409

Website	https://www.bco-dmo.org/deployment/565190
Platform	R/V Atlantic Explorer
Start Date	2014-05-08
End Date	2014-05-26
Description	May 2014 cruise conducted as part of the "Dissolved Phosphorus Processing by Trichodesmium Consortia: Quantitative Partitioning, Role of Microbial Coordination, and Impact on Nitrogen Fixation" project.

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Project Information

Dissolved Phosphorus Processing by Trichodesmium Consortia: Quantitative Partitioning, Role of Microbial Coordination, and Impact on Nitrogen Fixation (P Processing by Tricho)

Coverage: Western Tropical North Atlantic

Description from NSF award abstract:
Colonies of the cyanbacterium *Trichodesmium* are responsible for a large fraction of N2 fixation in nutrient-poor, open-ocean ecosystems, ultimately fueling primary production in both *Trichodesmium* and in the broader planktonic community. However, in some parts of the ocean, the scarcity of dissolved phosphorus limits rates of *Trichodesmium* N2 fixation. *Trichodesmium* colonies employ an arsenal of strategies to mitigate the effects of phosphorus limitation, and the consortia of epibiotic bacteria in the colonies may play a significant role in phosphorus acquisition.

In this study, researchers from Woods Hole Oceanographic Institution and Columbia University will use metagenomic and metatranscriptomic sequencing to investigate how phosphorus metabolism is coordinated in *Trichodesmium* consortia, and to discern the role of quorum sensing in phosphorus acquisition and partitioning. Results from this study are expected to expand understanding of *Trichodesmium* from a monospecific colony whose primary function is fixing CO2 and N2 toward a unique planktonic consortium with a diverse, complex, and highly coordinated overall metabolism that exerts profound control over the cycling of inorganic and organic nutrients in the oligotrophic upper ocean.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1332898
NSF Division of Ocean Sciences (NSF OCE)	OCE-1332912

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