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

## 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 |
|---|---|---|
| Van Mooy, Benjamin A.S. | Woods Hole Oceanographic Institution (WHOI) | Principal Investigator |
| Dyhrman, Sonya T. | Lamont-Doherty Earth Observatory (LDEO) | Co-Principal Investigator |
| Biddle, Mathew | Woods Hole Oceanographic Institution (WHOI BCO-DMO) | BCO-DMO Data Manager |

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

## Table of Contents

## 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.

[ table of contents | back to top ]

# Data Files

| File |
| --- |
| **water_column.csv** (Comma Separated Values (.csv), 6.01 KB)<br>MD5:c70c34f4143c3634914253a0a6b41d69<br><br>Primary data file for dataset ID 709476 |

[ table of contents | back to top ]

# 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*

[ table of contents | back to top ]

# 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 |

## 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). |

## 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. |

## 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.

## Funding

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