

Enzyme-linked fluorescence (ELF) analysis results from Trichodesmium colony incubations from RV/Atlantis cruise AT39-05, Feb-Mar 2018

Website: <https://www.bco-dmo.org/dataset/766157>

Data Type: experimental

Version: 0

Version Date: 2019-05-02

Project

» [Collaborative Research: Iron and phosphorus balanced limitation of nitrogen fixation in the oligotrophic ocean \(TriCoLim\)](#)

| Contributors | Affiliation | Role |
|------------------------------------|---|---------------------------|
| Webb, Eric A. | University of Southern California (USC) | Principal Investigator |
| Hutchins, David A. | University of Southern California (USC) | Co-Principal Investigator |
| Copley, Nancy | Woods Hole Oceanographic Institution (WHOI BCO-DMO) | BCO-DMO Data Manager |

Abstract

Enzyme-linked fluorescence (ELF) analysis results from Trichodesmium colony incubations from RV/Atlantis cruise AT39-05, Feb-Mar 2018

Table of Contents

- [Coverage](#)
 - [Dataset Description](#)
 - [Methods & Sampling](#)
 - [Data Processing Description](#)
 - [Related Publications](#)
 - [Parameters](#)
 - [Instruments](#)
 - [Deployments](#)
 - [Project Information](#)
 - [Funding](#)
-

Coverage

Spatial Extent: N:17 E:-22 S:-5.6 W:-65.4

Dataset Description

These data report enzyme-linked fluorescence (ELF) analysis results from Trichodesmium colony incubations from RV/Atlantis cruise AT39-05, Feb-Mar 2018.

Methods & Sampling

Methods are described in Dyhrman et al (2002).

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

[[table of contents](#) | [back to top](#)]

Related Publications

DYHRMAN, S. T., WEBB, E. A., ANDERSON, D. M., MOFFETT, J. W., & WATERBURY, J. B. (2002). Cell-specific detection of phosphorus stress in *Trichodesmium* from the western North Atlantic. *Limnology and oceanography*, 47(6), 1832-1836.
Methods

[[table of contents](#) | [back to top](#)]

Parameters

| Parameter | Description | Units |
|---------------------------------|---|-----------------|
| station | station identifier | unitless |
| lat | latitude; north is positive | decimal degrees |
| lon | longitude; east is positive | decimal degrees |
| slide_label | slide label | unitless |
| colony_description | Whether <i>Trichodesmium</i> colony morphology is Puff/Tuft/Raft | unitless |
| Tricho_filament_thickness | Filament Thickness (e.g. normal; thick; some normal some thick) | unitless |
| Tricho_filament_fluor | <i>Trichodesmium</i> filament fluorescence pigmentation on DAPI LP filter (orange; reddish; greenish) | unitless |
| Tricho_filament_ELF_glow | Filament ELF Glow (e.g. none/few/some/majority lightly/moderately speckled) | unitless |
| ELF_reaction_results_plus_minus | ? | unitless |
| backgrnd_speckling | background speckling (e.g. none; little; some; a lot) | unitless |
| backgrnd_speckling_filamaments | speckling around filaments (e.g. none; little; some; a lot) | unitless |
| backgrnd_speckling_colonies | speckling around colonies (e.g. none; little; some; a lot - n/a if no colony) | unitless |

[[table of contents](#) | [back to top](#)]

Instruments

| | |
|---|---|
| Dataset-specific Instrument Name | ZeissAxioplan2 microscope |
| Generic Instrument Name | Microscope - Optical |
| Generic Instrument Description | Instruments that generate enlarged images of samples using the phenomena of reflection and absorption of visible light. Includes conventional and inverted instruments. Also called a "light microscope". |

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. |

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.

[[table of contents](#) | [back to top](#)]

Funding

| Funding Source | Award |
|--|-----------------------------|
| NSF Division of Ocean Sciences (NSF OCE) | OCE-1657757 |
| NSF Division of Ocean Sciences (NSF OCE) | OCE-1657766 |

[[table of contents](#) | [back to top](#)]