Enzyme linked fluorescence (ELF) assays of Trichodesmium colonies collected from RV/Atlantis cruise AT39-05, Feb-Mar 2018

Website: https://www.bco-dmo.org/dataset/766128
Data Type: Cruise Results
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) assays of Trichodesmium colonies collected from RV/Atlantis cruise AT39-05, Feb-Mar 2018.

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Coverage

Spatial Extent: **N**:17 **E**:-22 **S**:-5.6 **W**:-65.4
Temporal Extent: 2018-02-13 - 2018-03-13

Dataset Description

These data report enzyme-linked fluorescence (ELF) assays of Trichodesmium colonies collected 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
- re-formatted date from m/d/yyyy to yyyy-mm-dd
- re-formatted date to 24 hour time

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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

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Parameters

Parameter	Description	Units
station	station identifier	unitless
lat	latitude; north is positive	decimal degrees
lon	longitude; east is positive	decimal degrees
date_local	local sampling date formatted as yyyy-mm-dd	unitless
time_local	local sampling time formatted as HH:MM	unitless
slide_label	slide label	unitless
colony_description	Whether Trichodesmium colony morphology is Puff/Tuft/Raft	unitless
Tricho_filament_thickness	Filament Thickness (e.g. normal; thick; some normal some thick)	unitless
Tricho_filament_fluor	Trichodesmium 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	Plus or 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

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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".

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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
NSF Division of Ocean Sciences (NSF OCE)	OCE-1657766

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