Proteome data for the Prasinophyte alga Micromonas from the OSU Behrenfeld laboratory, Corvalis, OR; 2007-2011 (Iron stress in phytoplankton project)

Website: https://www.bco-dmo.org/dataset/3580
Version: (tbd)

Project
» Resolving the physiological basis for fluorescence diagnostics of iron stress in natural phytoplankton populations (Iron stress in phytoplankton)

Contributors	Affiliation	Role
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Dataset Description

Dataset of proteome data for the Prasinophyte alga *Micromonas* grown under iron-liming and iron-repelete conditions

Methods & Sampling

(tbd)

Data Processing Description

(tbd)

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Parameters

Parameters for this dataset have not yet been identified

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Deployments

lab_OSU_Behrenfeld_proteome

Website	https://www.bco-dmo.org/deployment/58742
Platform	OSU Behrenfeld
Start Date	2007-09-15
End Date	2011-08-31
Description	*/ Department of Botany and Plant Pathology 2082 Cordley Hall Oregon State University Corvallis, OR 97331-2902 **Methods & Sampling** (tbd) **Processing Description** (tbd)

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Project Information

Resolving the physiological basis for fluorescence diagnostics of iron stress in natural phytoplankton populations (Iron stress in phytoplankton)

Website: http://www.science.oregonstate.edu/ocean.productivity/

Phytoplankton constitute the base of nearly all ocean ecosystems and have a profound influence on the global cycling of carbon and other nutrients. The growth rate and distribution of phytoplankton reflect the distribution of growth limiting factors such as nutrients and light. Understanding the environmental factors regulating phytoplankton biomass and activity has been a foremost goal in biological oceanography. This problem has been approached from many directions (including bottle enrichment studies, molecular probes, and in situ nutrient enrichments), with each technique having unique advantages and disadvantages. Recent research in the tropical Pacific Ocean has uncovered a new set of fluorescence-based diagnostics that allow detection of particular micronutrient and macronutrient growth conditions. As the fluorescence features are truly striking and can be evaluated without the need for incubations or enrichments, they provide a path to investigate nutrient constraints in natural phytoplankton populations at a scale inaccessible to the more traditional approaches. The diagnostic fluorescence properties were resolved using over 11 years of field measurements and involve diel changes in normalized variable fluorescence, the functional absorption cross section of photosystem II, and the electron turnover time of the plastoquinone pool. An underlying mechanistic basis for the diagnostics has been proposed based on decades of directed laboratory research on iron stress effects in phytoplankton, but an outstanding issue remains: the inferred mechanisms been never demonstrated in the field and the diagnostic diel fluorescence patterns have never been reproduced in the laboratory. The lack of confirmation of the physiological mechanisms involved (and thus their specificity to specific nutrient conditions) undermines the utility of the diagnostics to describe nutrient growth conditions. This project aims at bridging the gap between physiological processes and expressions in natural phytoplankton populations. The proposed approach includes field and laboratory components, both aimed at linking the diel fluorescence characteristics to proposed (or revised) mechanisms. Ship time for the field component is being provided at no cost to the project by the NOAA TAO Program. The intellectual merit of this project resides in (1) an improved understanding of iron-stress effects in natural marine phytoplankton populations and their impacts on measured photosynthetic efficiencies, (2) resolving specific cellular stress responses in the laboratory in association with variable fluorescence attributes, and (3) if successful, the establishment of a new approach for assessing nutrient stress in the open ocean on a truly basin-scale.

Broader Impacts: Broader impacts include (1) a potential significant adjustment in the contribution of HNLC regions to global ocean production if the proposed mechanisms for the fluorescence diagnostic are correct, (2) an approach to globally monitor the distribution and variability of iron-stressed phytoplankton populations using remotely-sensed natural fluorescence, (3) an important contribution toward better physiological interpretation of variable fluorescence data collected in the field.

PUBLICATIONS PRODUCED AS A RESULT OF THIS RESEARCH

M.J. Behrenfeld, T.K. Westberry, E.S. Boss, R.T. O?Malley, D.A. Siegel, J.D. Wiggert, B.A. Franz, C.R. McClain, G.C. Feldman, S.C. Doney, J.K. Moore, G. Dall?Olmo, A.J. Milligan, I. Lima, N. Mahowald. "Satellite-detected Fluorescence reveals Global Physiology of Ocean Phytoplankton," *Biogeosciences*, v.6, 2009, p. 779.

Schrader, P.S., A.J. Milligan and M.J. Behrenfeld. (2011) Surplus photosynthetic antennae complexes underlie diagnostics of iron limitation. PLoS One. 6:e18753.
10.1371/journal.pone.0018753

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