Global observations Prochlorococcus, Synechococcus, and picoeukaryotic phytoplankton with ancillary environmental data from 1987 to 2008

Website: https://www.bco-dmo.org/dataset/793451
Data Type: Other Field Results
Version: 2
Version Date: 2021-08-30

Project
» Convergence: RAISE: Linking the adaptive dynamics of plankton with emergent global ocean biogeochemistry (Ocean_Stoichiometry)

Contributors	Affiliation	Role
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Abstract
Prochlorococcus, Synechococcus, and picoeukaryotic phytoplankton global observations with ancillary environmental data (nitrate, phosphate and temperature)from 1987 to 2008.

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Coverage

Spatial Extent: **N**:81.162 **E**:180 **S**:-78.05 **W**:-179.05
Temporal Extent: 1987 - 2008

Dataset Description

Prochlorococcus, Synechococcus and picoeukaryotic phytoplankton global observations with ancillary environmental data (nitrate, phosphate and temperature) from 1987 to 2008.

The data in version 2 is in the correct order, but has the exact same data as version 1.

Acquisition Description

We compiled in situ observations with ancillary environment data of *Prochlorococcus, Synechococcus* and picoeukaryotic phytoplankton abundances in the global ocean.

For a list of cruises and time series included please refer to supplementary table 1 of Visintini et al., (2021).

Processing Description

BCO-DMO processing notes:

- Renamed fields to comply to database requirements

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Related Publications

Flombaum, P., Gallegos, J. L., Gordillo, R. A., Rincon, J., Zabala, L. L., Jiao, N., … Martiny, A. C. (2013). Present and future global distributions of the marine Cyanobacteria Prochlorococcus and Synechococcus. Proceedings of the National Academy of Sciences, 110(24), 9824–9829. doi:10.1073/pnas.1307701110
Results

Flombaum, P., Wang, W.-L., Primeau, F. W., & Martiny, A. C. (2020). Global picophytoplankton niche partitioning predicts overall positive response to ocean warming. Nature Geoscience, 13(2), 116–120. doi:10.1038/s41561-019-0524-2
Related Research

Visintini, N., Martiny, A. C., & Flombaum, P. (2021). Prochlorococcus , Synechococcus , and picoeukaryotic phytoplankton abundances in the global ocean. Limnology and Oceanography Letters, 6(4), 207–215. doi:10.1002/lol2.10188
Results

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Parameters

Parameter	Description	Units
Year	year (format:YYYY)	unitless
Day	Julian day	unitless
Latitude	Latitude, south is negative	decimal degrees
Longitude	Longitude, west is negative	decimal degrees
Nitrite_Nitrate	Sun of nitrite and nitrate concentration	Micromoles per Liter (umol/l)
Phosphate	Phosphate concentration	Micromoles per Liter (umol/l)
Temperature	Water temperature	Degrees Celcius (°C)
Depth	Water column depth	Meters (m)
Prochlorococcus	Cell abundance	Cells per milliliter (cells/ml)
Synechococcus	Cell abundance	Cells per milliliter (cells/ml)
Pico_eukaryotes	Picoeukaryotic phytoplankton cell abundance	Cells per milliliter (cells/ml)

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Project Information

Convergence: RAISE: Linking the adaptive dynamics of plankton with emergent global ocean biogeochemistry (Ocean_Stoichiometry)

NSF Award Abstract:
Due to their sheer abundance and high activity, microorganisms have the potential to greatly influence how ecosystems are affected by changes in their environment. However, descriptions of microbial physiology and diversity are local and highly complex and thus rarely considered in Earth System Models. Thus, the researchers focus on a convergence research framework that can qualitatively and quantitatively integrate eco-evolutionary changes in microorganisms with global biogeochemistry. Here, the investigators will develop an approach that integrates the knowledge and tools of biologists, mathematicians, engineers, and geoscientists to understand the link between the ocean nutrient and carbon cycles. The integration of data and knowledge from diverse fields will provide a robust, biologically rich, and computationally efficient prediction for the variation in plankton resource requirements and the biogeochemical implications, addressing a fundamental challenge in ocean science. In addition, the project can serve as a road map for many other research groups facing a similar lack of convergence between biology and geoscience.

Traditionally, the cellular elemental ratios of Carbon, Nitrogen, and Phosphorus (C:N:P) of marine communities have been considered static at Redfield proportions but recent studies have demonstrated strong latitudinal variation. Such regional variation may have large - but poorly constrained - implications for marine biodiversity, biogeochemical functioning, and atmospheric carbon dioxide levels. As such, variations in ocean community C:N:P may represent an important biological feedback. Here, the investigators propose a convergence research framework integrating cellular and ecological processes controlling microbial resource allocations with an Earth System model. The approach combines culture experiments and omics measurements to provide a molecular understanding of cellular resource allocations. Using a mathematical framework of increasing complexity describing communicating, moving demes, the team will quantify the extent to which local mixing, environmental heterogeneity and evolution lead to systematic deviations in plankton resource allocations and C:N:P. Optimization tools from engineering science will be used to facilitate the quantitative integration of models and observations across a range of scales and complexity levels. Finally, global ocean modeling will enable understanding of how plankton resource use impacts Earth System processes. By integrating data and knowledge across fields, scales and complexity, the investigators will develop a robust link between variation in plankton C:N:P and global biogeochemical cycles.

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Funding

Funding Source	Award
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Agencia Nacional de Promoción Científica y Tecnológica	PICT-2017-3020
Universidad de Buenos Aires	UBACyT 20020170100620BA

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