Phytoplankton diagnostic pigments from HPLC from samples collected on R/V Endeavor cruise EN614 in the tropical North Atlantic during May 2018

Website: https://www.bco-dmo.org/dataset/769601
Data Type: Cruise Results
Version: 1
Version Date: 2019-06-05

Project
» Collaborative Research: Impact of the Amazon River Plume on Nitrogen Availability and Planktonic Food Web Dynamics in the Western Tropical North Atlantic (Amazon River Plume Nitrogen)

Contributors	Affiliation	Role
Subramaniam, Ajit	Lamont-Doherty Earth Observatory (LDEO)	Principal Investigator
Rauch, Shannon	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

Abstract
Phytoplankton diagnostic pigments from HPLC from samples collected on R/V Endeavor cruise EN614 in the tropical North Atlantic during May 2018. Note: these data are also available through NASA's SeaBASS repository at
https://seabass.gsfc.nasa.gov/archive/COLUMBIA_U/subramaniam/LAMONT_ATL/may18atl/archive

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Coverage

Spatial Extent: **N**:16.292 **E**:-50.8897 **S**:4.8901 **W**:-57.2529
Temporal Extent: 2018-05-07 - 2018-05-29

Dataset Description

Phytoplankton diagnostic pigments from HPLC from samples collected on R/V Endeavor cruise EN614 in the tropical North Atlantic during May 2018. Note: these data are also available through NASA's SeaBASS repository
at https://seabass.gsfc.nasa.gov/archive/COLUMBIA_U/subramaniam/LAMONT_ATL/may18atl/archive

Methods & Sampling

The samples were collected using a CTD rosette and an appropriate volume of water was filtered through a 25mm GF/F filter soon after collection. The filters were then stored in liquid nitrogen until analyzed. The analysis and duplicate filter precision details as well as calibration details are provided in may18atl_HPLC_readme.pdf.

The samples were run at NASA GSFC by Crystal Thomas.

The diagnostic pigments were measured using High-performance liquid chromatography as detailed in Van Heukelem and Thomas (2001) and Hooker et al (2005).

The HPLC used for pigment analysis is an Agilent RR1200 with a programmable autoinjector (900 ul syringe head), refrigerated autosampler, degasser, and photo-diode array detector with deuterium and tungsten lamps. The HPLC is controlled by Agilent Chemstation software. The 4.6 x 150 mm HPLC Eclipse XDB column (Agilent Technologies, Palo Alto, CA) is filled with a C8 stationary phase (3.5 um stationary phase); the mobile phase consists of a linear gradient from 5-95% solvent B over the 27 minutes, for which solvent A is 70 parts methanol, 30 parts 28 mM tetrabutylammononium acetate (pH 6.5) and solvent B is methanol. The column temperature is 60 C and the photo diode array detector is set to plot chromatograms at 450, 665, and 222 nm to acquire visible absorbance spectra between 350 and 750 nm.

Data Processing Description

Data notes:
missing = -9999
below detection limit = -8888
above detection limit = -7777

BCO-DMO Processing:
- replaced hyphens with underscores in parameter names;
- lat and lon labels were backwards in original file; switched them around (determined by looking at boudning box of EN614 cruise)
- created ISO_DateTime_UTC field from original date/time columns

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Data Files

File
HPLC_pigments.csv (Comma Separated Values (.csv), 17.62 KB) MD5:466e041668ca4c495341a8667dd131b8 Primary data file for dataset ID 769601

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Supplemental Files

File
EN614 HPLC Pigements README filename: may18atl_hplc_readme.pdf (Portable Document Format (.pdf), 796.88 KB) MD5:052b090da7473cd644227c4c28a6973a README file describing EN614 HPLC pigments. Includes column descriptions and details on replicate filters, replicate injections, limits of quantification, zeros/missing data, and analysis methods.

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Related Publications

Hooker, S.; L. Van Heukelem; C. S. Thomas; H. Claustre, J. Ras; R. Barlow; H. Sessions; L. Schlüter; J. Perl and C. Trees; V. Stuart; E. Head; L. Clementso; J. Fishwick; C. Llewellyn and J. Aiken. 2005. The Second SeaWiFS HPLC Analysis Round-Robin Experiment (SeaHARRE-2). NASA Technical Memorandum NASA/TM-2005-212785. https://oceancolor.gsfc.nasa.gov/fsg/hplc/SH2_TM2005_212785.pdf
Methods

Van Heukelem, L., & Thomas, C. S. (2001). Computer-assisted high-performance liquid chromatography method development with applications to the isolation and analysis of phytoplankton pigments. Journal of Chromatography A, 910(1), 31–49. doi:10.1016/s0378-4347(00)00603-4
Methods

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Parameters

Parameter	Description	Units
Sample	Sample ID	unitless
volfilt	Volume of water filtered	liters (L)
Station	Station ID	unitless
depth	Depth of sample	meters (m)
Year	Year	meters (m)
month	Month	unitless
Day	Day	unitless
sdy	Julian day number	unitless
time	Time UTC; format: HH:MM:SS	unitless
ISO_DateTime_UTC	Date and time (UTC) formatted to ISO8601 standard. Format: yyyy-mm-ddTHH:MM:SSZ (Z indicates UTC)	unitless
lon	Longitude (negative = west)	decimal degrees
lat	Latitude (negative = south)	decimal degrees
Tot_Chl_a	total chlorophyll a; DV_Chl_a + MV_Chl_a + Chlide_a + Chl_a allomers + Chl_a epimers	milligrams per cubic meter (mg/m^3)
Tot_Chl_b	total chlorophyll b; DV_Chl_b + MV_Chl_b + Chl_b epimers	milligrams per cubic meter (mg/m^3)
Tot_Chl_c	total chlorophyll c; Chl_c3 + Chl_c1c2	milligrams per cubic meter (mg/m^3)
Alpha_beta_Car	carotenes; alpha (beta, epsilon) + beta (beta, beta) carotene. Unresolved and therefore undifferentiated.	milligrams per cubic meter (mg/m^3)
But_fuco	19'-butanoyloxyfucoxanthin	milligrams per cubic meter (mg/m^3)
Hex_fuco	19'-hexanoyloxyfucoxanthin	milligrams per cubic meter (mg/m^3)
Allo	alloxanthin	milligrams per cubic meter (mg/m^3)
Diadino	diadinoxanthin	milligrams per cubic meter (mg/m^3)
Diato	diatoxanthin	milligrams per cubic meter (mg/m^3)
Fuco	fucoxanthin	milligrams per cubic meter (mg/m^3)
Perid	Peridinin	milligrams per cubic meter (mg/m^3)
Zea	Zeaxanthin	milligrams per cubic meter (mg/m^3)

MV_Chl_a	monovinyl chlorophyll a	milligrams per cubic meter (mg/m^3)
DV_Chl_a	divinyl chlorophyll a	milligrams per cubic meter (mg/m^3)
Chlide_a	chlorophyllide a	milligrams per cubic meter (mg/m^3)
MV_Chl_b	monovinyl chlorophyll b	milligrams per cubic meter (mg/m^3)
DV_Chl_b	divinyl chlorophyll b	milligrams per cubic meter (mg/m^3)
Chl_c1c2	Chlorophyll c2 + chlorophyll c1 + MGDVP Mg-2,4-divnyl pheoporphyrin a5 monomethyl ester	milligrams per cubic meter (mg/m^3)
Chl_c3	Chlorophyll c3	milligrams per cubic meter (mg/m^3)
Lut	Lutein	milligrams per cubic meter (mg/m^3)
Neo	Neoxanthin	milligrams per cubic meter (mg/m^3)
Viola	Violaxanthin	milligrams per cubic meter (mg/m^3)
Phytin_a	total pheophorbide a; multiple peaks	milligrams per cubic meter (mg/m^3)
Phide_a	total pheophytin a; pheophytin a + pheophytin a'	milligrams per cubic meter (mg/m^3)
Pras	Prasinoxanthin	milligrams per cubic meter (mg/m^3)
Gyro	Gyroxanthin diester	milligrams per cubic meter (mg/m^3)
TChl	total chlorophylls; Tot_Chl_a +Tot_Chl_b +Tot_Chl_c	milligrams per cubic meter (mg/m^3)
PPC	photoprotective carotenoids; allo + diadino + diato + zea + alpha-beta-car	milligrams per cubic meter (mg/m^3)
PSC	photosynthetic carotenoids; but-fuco + fuco + hex-fuco + perid	milligrams per cubic meter (mg/m^3)
PSP	photosynthetic pigments; PSC + TChl	milligrams per cubic meter (mg/m^3)
TCar	total carotenoids; PPC + PSC	milligrams per cubic meter (mg/m^3)
TAcc	total accessory pigments; PPC + PSC + Tot_Chl_b + Tot_Chl_c	milligrams per cubic meter (mg/m^3)
TPg	total pigments; TAcc + Tot_Chl_a	milligrams per cubic meter (mg/m^3)
DP	total diagnostic pigments; PSC + allo + zea + Tot_Chl_b	milligrams per cubic meter (mg/m^3)
Tacc_Tchla	ratio of total accessory pigments to total chlorophyll a; [Tacc]/[Tchla]	unitless (ratio)
PSC_TCar	ratio of photosynthetic carotenoids to total carotenoids; [PSC]/[TCar]	unitless (ratio)
PPC_TCar	ratio of photoprotective carotenoids to total carotenoids; [PPC]/[Tcar]	unitless (ratio)

TChl_TCar	ratio of total chlorophyll to total carotenoids; [TChl]/[TCaro]	unitless (ratio)
PPC_Tpg	ratio of photoprotective carotenoids to total pigments; [PPC]/[Tpg]	unitless (ratio)
PSP_TPg	ratio of photosynthetic pigments to total pigments; [PSP]/[TPg]	unitless (ratio)
TChla_TPg	ratio of total chlorophyll a to total pigments; [TChla]/[TPg]	unitless (ratio)

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Instruments

Dataset-specific Instrument Name	Agilent RR1200
Generic Instrument Name	High-Performance Liquid Chromatograph
Dataset-specific Description	The HPLC used for pigment analysis is an Agilent RR1200 with a programmable autoinjector (900 ul syringe head), refrigerated autosampler, degasser, and photo-diode array detector with deuterium and tungsten lamps.
Generic Instrument Description	A High-performance liquid chromatograph (HPLC) is a type of liquid chromatography used to separate compounds that are dissolved in solution. HPLC instruments consist of a reservoir of the mobile phase, a pump, an injector, a separation column, and a detector. Compounds are separated by high pressure pumping of the sample mixture onto a column packed with microspheres coated with the stationary phase. The different components in the mixture pass through the column at different rates due to differences in their partitioning behavior between the mobile liquid phase and the stationary phase.

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Deployments

EN614

Website	https://www.bco-dmo.org/deployment/751104
Platform	R/V Endeavor
Start Date	2018-05-06
End Date	2018-06-01
Description	See additional cruise information from the Rolling Deck to Repository (R2R): https://www.rvdata.us/search/cruise/EN614

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Project Information

Collaborative Research: Impact of the Amazon River Plume on Nitrogen Availability and Planktonic Food Web Dynamics in the Western Tropical North Atlantic (Amazon River Plume Nitrogen)

Coverage: Amazon River plume

NSF Award Abstract:
This is a focused program of field research in waters of the Western Tropical North Atlantic influenced by the Amazon River Plume during the high river flow season. The Amazon Plume region supports diverse plankton communities in a dynamic system driven by nutrients supplied by transport from the river proper as well as nutrients entrained from offshore waters by physical mixing and upwelling. This creates strong interactions among physical, chemical, and biological processes across a range of spatial and temporal scales. The field program will link direct measurements of environmental properties with focused experimental studies of nutrient supply and nutrient limitation of phytoplankton, as well as the transfer of phytoplankton nitrogen to the zooplankton food web. The Amazon Plume exhibits a close juxtaposition of distinct communities during the high-flow season, making it an ideal site for evaluating how nutrient availability, nutrient supply, and habitat longevity interact to drive offshore ecosystem dynamics and function. This project will include German collaborators and will seamlessly integrate education and research efforts. The investigators and their institutions have a strong commitment to undergraduate and graduate education and to increasing the diversity of the ocean science community through active recruiting and training efforts. The team has a strong track record of involving both undergraduate and graduate students in their field and lab research. The two research cruises planned will provide opportunities for students and technicians to interact with an interdisciplinary and international research team.

The ultimate objectives of this project are to understand the processes and interactions that promote distinct communities of nitrogen-fixing organisms (diazotrophs) and other phytoplankton around the Amazon Plume and to explore the impacts of these diazotroph-rich communities on zooplankton biomass and production. The research team includes scientists with expertise in nutrient and stable isotope biogeochemistry, remote sensing as well as specialists in characterizing water mass origin and history using naturally occurring radium isotopes. This combination of approaches will provide a unique opportunity to address fundamental questions related to plankton community structure, primary production, and links to secondary production in pelagic ecosystems. The project will address the following key questions focused on fundamental issues in plankton ecology resulting from previous research in this region:

A. What mechanisms promote the preferential delivery of bioavailable phosphorus and the resulting strong nitrogen limitation associated with the northern reaches of the Amazon Plume during the high flow season?

B. What factors lead to the clear niche separation between diazotrophs within and around the Amazon Plume and how are the distinct diazotroph communities influenced by hydrographic and biogeochemical controls associated with the Amazon River Plume and offshore upwelling processes?

C. How does the nitrogen fixed by the different types of diazotrophs contribute to secondary production, and how efficiently does diazotroph nitrogen move through the food web?

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1737128

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