Pigment concentrations determined by HPLC from samples collected on Leg 1 (Seattle, WA to Hilo, HI) of the US GEOTRACES Pacific Meridional Transect (PMT) cruise (GP15, RR1814) on R/V Roger Revelle from September to October 2018

Website: https://www.bco-dmo.org/dataset/914655
Data Type: Cruise Results
Version: 1
Version Date: 2023-11-09

Project
» US GEOTRACES Pacific Meridional Transect (GP15) (U.S. GEOTRACES PMT)

Program
» U.S. GEOTRACES (U.S. GEOTRACES)

Contributors	Affiliation	Role
Cutter, Gregory A.	Old Dominion University (ODU)	Principal Investigator
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Abstract
This dataset contains high-performance liquid chromatography (HPLC) pigment data (19But, 19Hex, Allo, β Car, α Car, Chl a, Chl b, Chlc 1,2, Chl c 3, Cphlid, Diadino, Diato, Fuco, Lut, Neo, Peri, Prasino, Viola, Zea) from the U.S. GEOTRACES GP15 Pacific Meridional Transect from Alaska (56°M) to Tahiti (20°S) along 152°W between September 24, 2018 and November 24, 2018. Samples for pigment analysis were collected at 6 depths at every major station (N=23 stations) and filtered onto GF/F filters, which were frozen at -80°C until analysis at the HPLC Facility at Oregon State University managed by Ricardo Letelier (https://ceoas.oregonstate.edu/ocean-ecology-and-biogeochemistry-facilities). Samples were extracted and analyzed on a Waters 996 absorbance photodiode array detector in combination with a Waters 2475 fluorescence detector in September 2019. These data were collected by the GP15 management team to provide biological context for the geochemical measurements made by GEOTRACES PIs. This dataset contains the data from Leg 1 of the cruise (RR1814), from Seattle, Washington, USA to Hilo, Hawaii, USA. Leg 2 data are provided in a separate dataset (see 'Related Datasets' section of metadata).

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Coverage

Spatial Extent: **N**:56.0585 **E**:-151.9996 **S**:22.0003 **W**:-156.9628
Temporal Extent: 2018-09-24 - 2018-10-19

Methods & Sampling

Pigments were sampled from the shallowest 6 depths (<=150 meters) on every "PigRaTh" cast (including the surface

bottle) at all major stations (N=23 stations). Pigments were collected into 2-liter (L) amber bottles, triple-rinsed with sample prior to filling. They were immediately filtered under vacuum through 47-millimeter (mm) GF/F filters. They were folded and placed inside cryovials, labeled with appropriate GEOTRACES numbers, and frozen at -80° Celsius (C). Vials were shipped in LN2 dry shippers to Stanford, and then on dry ice to the HPLC Facility at Oregon State University (OSU) managed by Ricardo Letelier (https://ceoas.oregonstate.edu/ocean-ecology-and-biogeochemistry-facilities).

OSU HPLC facility methods: Our method for pigment analysis is based on the protocol described by Mantoura and Lewellyn (1983) and modified according to Bidigare et al. (1989). Briefly, samples are extracted for up to 48 hours in 100% acetone at -20°C, then analyzed on a Waters 2690 separations module equipped with a C18 column and full spectrum photodiode array detector. Pigment standards for calibration and response factor calculations are obtained from DHI Group in Denmark.

BCO-DMO Curation Notes

- Imported the first sheet ("HPLC_RR1814") of the original file "HPLC_Pigments_GP15_OSU_bco-dmo_barcodes.xlsx" into the BCO-DMO system.
- Renamed fields/columns to comply with BCO-DMO naming conventions.
- Converted Start_Date_UTC column to YYYY-mm-dd format.
- Removed rows of data dated after 2018-10-19 (those are part of Leg 2, RR1815).
- Saved the final file as "914655_v1_rr1814_hplc_pigments.csv".

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Data Files

File	
914655_v1_rr1814_hplc_pigments.csv	(Comma Separated Values (.csv), 10.31 KB) MD5:cb727443112924eed7a125ef2c058acf
Primary data file for dataset ID 914655, version 1	

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Related Publications

Bidigare, R. R., Schofield, O., & Prézelin, B. B. (1989). Influence of zeaxanthin on quantum yield of photosynthesis of Synechococcus clone WH7803 (DC2). Marine Ecology Progress Series, 56(1/2), 177–188. http://www.jstor.org/stable/24835757 https://www.jstor.org/stable/24835757
Methods

Jeffrey, S. W., Mantoura, R. F. C., Wright, S. W., International Council of Scientific Unions., & Unesco. (1997). Phytoplankton pigments in oceanography: Guidelines to modern methods. Paris: UNESCO Pub.
Methods

Mantoura, R. F. C., & Llewellyn, C. A. (1983). The rapid determination of algal chlorophyll and carotenoid pigments and their breakdown products in natural waters by reverse-phase high-performance liquid chromatography. Analytica Chimica Acta, 151, 297–314. https://doi.org/10.1016/S0003-2670(00)80092-6
Methods

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Related Datasets

IsContinuedBy

Cutter, G. A., Casciotti, K. L., Lam, P. J. (2023) **Pigment concentrations determined by HPLC from samples collected on Leg 2 (Hilo, HI to Papeete, French Polynesia) of the US GEOTRACES Pacific Meridional Transect (PMT) cruise (GP15, RR1815) on R/V Roger Revelle from Oct-Nov 2018.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2023-11-13 doi:10.26008/1912/bco-dmo.914845.1 [view at BCO-DMO]
Relationship Description: GP15 was made up of two cruise legs, RR1814 (Leg 1) and RR1815 (Leg 2)

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Parameters

Parameter	Description	Units
Start_Date_UTC	Date (UTC) when sample was collected	unitless
Event_ID	Event number	unitless
Sample_ID	GEOTRACES sample number	unitless
Niskin	Niskin bottle number	unitless
Sample_Depth	Sample depth	meters (m)
Station_ID	Station number	unitless
Cast_number	Cast number	unitless
Start_Latitude	Latitude where sample was collected; positive values = North	decimal degrees
Start_Longitude	Longitude where samples were collected; negative values = West	decimal degrees
But_fuco_HPLC_TP_CONC_BOTTLE_dnax4l	Concentration of 19'-But-Fucoxanthin	nanograms per liter (ng/L)
Hex_fuco_HPLC_TP_CONC_BOTTLE_aeqqpa	Concentration of 19'-Hex-Fucoxanthin	nanograms per liter (ng/L)
Allo_HPLC_TP_CONC_BOTTLE_n3dfmg	Concentration of Alloxanthin	nanograms per liter (ng/L)
Beta_Car_HPLC_TP_CONC_BOTTLE_weksrk	Concentration of Beta Carotene	nanograms per liter (ng/L)
Alpha_Car_HPLC_TP_CONC_BOTTLE_kc31kx	Concentration of Alpha Carotene	nanograms per liter (ng/L)
Chl_a_HPLC_TP_CONC_BOTTLE_t7ylyl	Concentration of Chlorophyll a	nanograms per liter (ng/L)
Chl_b_HPLC_TP_CONC_BOTTLE_0ocmnn	Concentration of Chlorophyll b	nanograms per liter (ng/L)
Chl_c1_chl_c2_HPLC_TP_CONC_BOTTLE_q8hvyu	Concentration of Chlorophyll c 1&2	nanograms per liter (ng/L)
Chl_c3_HPLC_TP_CONC_BOTTLE_xghapc	Concentration of Chlorophyll c 3	nanograms per liter (ng/L)

Chlide_a_HPLC_TP_CONC_BOTTLE_b3wnjk	Concentration of Chlorophyllide	nanograms per liter (ng/L)
Diadino_HPLC_TP_CONC_BOTTLE_edfcfg	Concentration of Diadinoxanthin	nanograms per liter (ng/L)
Diato_HPLC_TP_CONC_BOTTLE_zldkgz	Concentration of Diatoxanthin	nanograms per liter (ng/L)
Fuco_HPLC_TP_CONC_BOTTLE_e664mt	Concentration of Fucoxanthin	nanograms per liter (ng/L)
Lut_HPLC_TP_CONC_BOTTLE_nhojjn	Concentration of Lutein	nanograms per liter (ng/L)
Neo_HPLC_TP_CONC_BOTTLE_le5llo	Concentration of Neoxanthin	nanograms per liter (ng/L)
Perid_HPLC_TP_CONC_BOTTLE_jhwjny	Concentration of Peridinin	nanograms per liter (ng/L)
Pras_HPLC_TP_CONC_BOTTLE_jhhbgh	Concentration of Prasinoxanthin	nanograms per liter (ng/L)
Viola_HPLC_TP_CONC_BOTTLE_hdckeg	Concentration of Violaxanthin	nanograms per liter (ng/L)
Zea_HPLC_TP_CONC_BOTTLE_rlwxro	Concentration of Zeaxanthin	nanograms per liter (ng/L)

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Instruments

Dataset-specific Instrument Name	HPLC
Generic Instrument Name	High-Performance Liquid Chromatograph
Dataset-specific Description	Samples are analyzed on a Waters 2690 separations module equipped with a C18 column and full spectrum photodiode array detector. Samples are extracted and analyzed on a Waters 996 absorbance photodiode array detector in combination with a Waters 2475 fluorescence detector in September 2019 at OSU.
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

RR1814

Website	https://www.bco-dmo.org/deployment/776913
Platform	R/V Roger Revelle
Report	https://datadocs.bco-dmo.org/docs/geotraces/GEOTRACES_PMT/casciotti/data_docs/GP15_Cruise_Report_with_ODF_Report.pdf
Start Date	2018-09-18
End Date	2018-10-21
Description	Additional cruise information is available from the Rolling Deck to Repository (R2R): https://www.rvdata.us/search/cruise/RR1814

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Project Information

US GEOTRACES Pacific Meridional Transect (GP15) (U.S. GEOTRACES PMT)

Website: http://www.geotraces.org/

Coverage: Pacific Meridional Transect along 152W (GP15)

A 60-day research cruise took place in 2018 along a transect from Alaska to Tahiti at 152° W. A description of the project titled "*Collaborative Research: Management and implementation of the US GEOTRACES Pacific Meridional Transect*", funded by NSF, is below. Further project information is available on the US GEOTRACES website and on the cruise blog. A detailed cruise report is also available as a PDF.

Description from NSF award abstract:
GEOTRACES is a global effort in the field of Chemical Oceanography in which the United States plays a major role. The goal of the GEOTRACES program is to understand the distributions of many elements and their isotopes in the ocean. Until quite recently, these elements could not be measured at a global scale. Understanding the distributions of these elements and isotopes will increase the understanding of processes that shape their distributions and also the processes that depend on these elements. For example, many "trace elements" (elements that are present in very low amounts) are also important for life, and their presence or absence can play a vital role in the population of marine ecosystems. This project will launch the next major U.S. GEOTRACES expedition in the Pacific Ocean between Alaska and Tahiti. The award made here would support all of the major infrastructure for this expedition, including the research vessel, the sampling equipment, and some of the core oceanographic measurements. This project will also support the personnel needed to lead the expedition and collect the samples.

This project would support the essential sampling operations and infrastructure for the U.S. GEOTRACES Pacific Meridional Transect along 152° W to support a large variety of individual science projects on trace element and isotope (TEI) biogeochemistry that will follow. Thus, the major objectives of this management proposal are: (1) plan and coordinate a 60 day research cruise in 2018; (2) obtain representative samples for a wide variety of TEIs using a conventional CTD/rosette, GEOTRACES Trace Element Sampling Systems, and in situ pumps; (3) acquire conventional CTD hydrographic data along with discrete samples for salinity, dissolved oxygen, algal pigments, and dissolved nutrients at micro- and nanomolar levels; (4) ensure that proper QA/QC protocols are followed and reported, as well as fulfilling all GEOTRACES intercalibration protocols; (5) prepare and deliver all hydrographic data to the GEOTRACES Data Assembly Centre (via the US BCO-DMO data center); and (6) coordinate all cruise communications between investigators, including preparation of a hydrographic report/publication. This project would also provide baseline measurements of TEIs in the Clarion-Clipperton fracture zone (~7.5°N-17°N, ~155°W-115°W) where large-scale deep sea mining is planned. Environmental impact assessments are underway in partnership with the mining industry, but the effect of mining activities on TEIs in the water column is one that could be uniquely assessed by the GEOTRACES community. In support of efforts to communicate the science to a wide audience the investigators will recruit an early career freelance science journalist with interests in marine science and oceanography to participate on the cruise and do public outreach, photography and/or videography, and social media from the ship, as well as to submit articles about the research to national media. The project would also support several graduate students.

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Program Information

U.S. GEOTRACES (U.S. GEOTRACES)

Website: http://www.geotraces.org/

Coverage: Global

GEOTRACES is a SCOR sponsored program; and funding for program infrastructure development is provided by the U.S. National Science Foundation.

GEOTRACES gained momentum following a special symposium, S02: Biogeochemical cycling of trace elements and isotopes in the ocean and applications to constrain contemporary marine processes (GEOSECS II), at a 2003 Goldschmidt meeting convened in Japan. The GEOSECS II acronym referred to the Geochemical Ocean Section Studies To determine full water column distributions of selected trace elements and isotopes, including their concentration, chemical speciation, and physical form, along a sufficient number of sections in each ocean basin to establish the principal relationships between these distributions and with more traditional hydrographic parameters;

* To evaluate the sources, sinks, and internal cycling of these species and thereby characterize more completely the physical, chemical and biological processes regulating their distributions, and the sensitivity of these processes to global change; and

* To understand the processes that control the concentrations of geochemical species used for proxies of the past environment, both in the water column and in the substrates that reflect the water column.

GEOTRACES will be global in scope, consisting of ocean sections complemented by regional process studies. Sections and process studies will combine fieldwork, laboratory experiments and modelling. Beyond realizing the scientific objectives identified above, a natural outcome of this work will be to build a community of marine scientists who understand the processes regulating trace element cycles sufficiently well to exploit this knowledge reliably in future interdisciplinary studies.

Expand "Projects" below for information about and data resulting from individual US GEOTRACES research projects.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1657781
NSF Division of Ocean Sciences (NSF OCE)	OCE-1658318
NSF Division of Ocean Sciences (NSF OCE)	OCE-1657944

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