Core-top (0-1cm) sediment data collected by monocore from R/V Thomas G. Thompson TN303 (GP16; EPZT) GEOTRACES cruise from November to December 2013 (GEOTRACES EPZT project)

Website: https://www.bco-dmo.org/dataset/686982
Data Type: Cruise Results
Version: 06 April 2017
Version Date: 2017-04-06

Project
» U.S. GEOTRACES East Pacific Zonal Transect (GP16) (U.S. GEOTRACES EPZT)
» GEOTRACES: Suspended particle geochemistry along the US GEOTRACES Eastern Pacific Zonal Transect, from high productivity ocean margin to deep sea hydrothermal plume (GEOTRACES EPZT Suspended Particles)

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

Contributors	Affiliation	Role
German, Christopher R.	Woods Hole Oceanographic Institution (WHOI)	Principal Investigator
Rauch, Shannon	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

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Coverage

Spatial Extent: **N**:-10.5003 **E**:-77.8182 **S**:-15.0002 **W**:-152.0005
Temporal Extent: 2013-11-02 - 2013-12-18

Dataset Description

Core-top (0-1cm) sediment data from monocores collected on the GEOTRACES EPZT (GP16; TN303) cruise.

Methods & Sampling

On the TN303 cruise, attempts to collect mono-cores were made during the final deep cast of the ODF CTD rosette at each station except Station 18 at the EPR ridge-axis. Cores were stored upright and refrigerated before return to LDEO where each mono-core was split and analyzed non-destructively. One half core was then archived at LDEO and the other half made available for sampling. In Summer 2015, the sampling halves of each core were transported to WHOI for subsampling of core top material then returned to LDEO.

Approximately 5 g (wet-weight) of core top (0-1cm wet) material was extracted from each EPZT half-core with a stainless steel spatula, placed in a glass vial, dried at 60 degrees C overnight and then lightly homogenized with an agate pestle and mortar before being re-weighed.

Major elements were determined by fusing 10-20mg of dried sediment with Spectroflux and analyzed followed by ICP-ES analysis following the method of Ingamells (1970).

Total carbon and inorganic carbon concentrations was determined using a Perkin Elmer 2400 Elemental Analyzer and a UIC Coulometric Analyzer with Carbonate Module (Honjo et al., 1995). Organic carbon concentrations were calculated by difference between the total carbon and inorganic carbon concentrations.

Data Processing Description

Intercalibration: International Standard Used for Intercalibration: MAG 1. See the detailed analyses for accuracy and precision document (PDF).

BCO-DMO Processing:
- modified parameter names to conform with BCO-DMO and GEOTRACES naming conventions;
- copied columns from metadata sheet (lat/lon, dates, times, etc.) to data sheet.

Additional GEOTRACES Processing:
As was done for the GEOTRACES-NAT data, BCO-DMO added standard US GEOTRACES information, such as the US GEOTRACES event number, to each submitted dataset lacking this information. To accomplish this, BCO-DMO compiled a 'master' dataset composed of the following parameters:

cruise_id, EXPOCODE,SECT_ID, STNNBR, CASTNO, GEOTRC_EVENTNO, GEOTRC_SAMPNO, GEOTRC_INSTR, SAMPNO, GF_NO, BTLNBR, BTLNBR_FLAG_W, DATE_START_EVENT, TIME_START_EVENT, ISO_DATETIME_UTC_START_EVENT, EVENT_LAT, EVENT_LON, DEPTH_MIN, DEPTH_MAX, BTL_DATE, BTL_TIME, BTL_ISO_DATETIME_UTC, BTL_LAT, BTL_LON, ODF_CTDPRS, SMDEPTH, FMDEPTH, BTMDEPTH, CTDPRS, CTDDEPTH.

This added information will facilitate subsequent analysis and inter comparison of the datasets.

Bottle parameters in the master file were taken from the GT-C_Bottle and ODF_Bottle datasets. Non-bottle parameters, including those from GeoFish tows, Aerosol sampling, and McLane Pumps, were taken from the TN303 Event Log (version 30 Oct 2014). Where applicable, pump information was taken from the PUMP_Nuts_Sals dataset.

A standardized BCO-DMO method (called "join") was then used to merge the missing parameters to each US GEOTRACES dataset, most often by matching on sample_GEOTRC or on some unique combination of other parameters.

If the master parameters were included in the original data file and the values did not differ from the master file, the original data columns were retained and the names of the parameters were changed from the PI-submitted names to the standardized master names. If there were differences between the PI-supplied parameter values and those in the master file, both columns were retained. If the original data submission included all of the master parameters, no additional columns were added, but parameter names were modified to match the naming conventions of the master file.

See the dataset parameters documentation for a description of which parameters were supplied by the PI and which were added via the join method.

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Data Files

File
monocore_joined.csv (Comma Separated Values (.csv), 3.88 KB) MD5:a6eca1245deb9299db65a0048a7e5628 Primary data file for dataset ID 686982

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Related Publications

Honjo, S., Dymond, J., Collier, R., & Manganini, S. J. (1995). Export production of particles to the interior of the equatorial Pacific Ocean during the 1992 EqPac experiment. Deep Sea Research Part II: Topical Studies in Oceanography, 42(2-3), 831–870. doi:10.1016/0967-0645(95)00034-n https://doi.org/10.1016/0967-0645(95)00034-N
Methods

Ingamells, C. O. (1970). Lithium metaborate flux in silicate analysis. Analytica Chimica Acta, 52(2), 323–334. doi:10.1016/s0003-2670(01)80963-6 https://doi.org/10.1016/S0003-2670(01)80963-6
Methods

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Parameters

Parameter	Description	Units
cruise_id	Cruise identification	unitless
GEOTRC_INSTR	Sampling instrument	unitless
GEOTRC_SAMPNO	GEOTRACES Sample Number	unitless
GEOTRC_EVENTNO	GEOTRACES Event Number	unitless
core_number	Core identification number and depth range	unitless
STNNBR	Station number; joined from BCO-DMO EPZT master event file.	unitless
CASTNO	Cast number; joined from BCO-DMO EPZT master event file.	unitless
SAMPNO	Sequential sample number within the cast (usually corresponds to bottle number).	unitless
Al_DRY_MONOCORE	Aluminum concentration (dry)	weight %
Ba_DRY_MONOCORE	Barium concentration (dry)	weight %
Ca_DRY_MONOCORE	Calcium concentration (dry)	weight %
Fe_DRY_MONOCORE	Iron concentration (dry)	weight %
Mg_DRY_MONOCORE	Magnesium concentration (dry)	weight %
Mn_DRY_MONOCORE	Manganese concentration (dry)	weight %
Si_DRY_MONOCORE	Silicon concentration (dry)	weight %
Sr_DRY_MONOCORE	Strontium concentration (dry)	weight %
Ti_DRY_MONOCORE	Titanium concentration (dry)	weight %
C_TOT_DRY_MONOCORE	Total Carbon concentration (dry)	weight %
C_INORG_DRY_MONOCORE	Inorganic Carbon concentration (dry)	weight %
CaCo3_DRY_MONOCORE	Calcium Carbonate concentration (dry)	weight %
C_ORG_MONOCORE	Organic Carbon concentration (dry)	weight %
DATE_START	Date at start of sampling in yyyymmdd format	unitless
TIME_START	Time at start of sampling in HHMM format	unitless
ISO_DATETIME_START	Date and time at start of sampling formatted to ISO 8601 standard	unitless
DATE_END	Date at end of sampling in yyyymmdd format	unitless
TIME_END	Time at end of sampling in HHMM format	unitless
ISO_DATETIME_END	Date and time at end of sampling formatted to ISO 8601 standard	unitless
LATITUDE	Latitude	decimal degrees
LONGITUDE	Longitude	decimal degrees
depth	PI-provided depth	meters
COMMENT	Comment/notes about the sampling	unitless
BTMDEPTH	Bottom depth; joined from BCO-DMO EPZT master event file.	meters
CTDDEPTH	CTD bottle firing depth; joined from BCO-DMO EPZT master event file.	meters

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Instruments

Dataset-specific Instrument Name	monocorer
Generic Instrument Name	Gravity Corer
Generic Instrument Description	The gravity corer allows researchers to sample sediment layers at the bottom of lakes or oceans. The coring device is deployed from the ship and gravity carries it to the seafloor. (http://www.whoi.edu/instruments/viewInstrument.do?id=1079).

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Deployments

TN303

Website	https://www.bco-dmo.org/deployment/499719
Platform	R/V Thomas G. Thompson
Report	http://dmoserv3.whoi.edu/data_docs/GEOTRACES/EPZT/GT13_EPZT_ODFReport_All.pdf
Start Date	2013-10-25
End Date	2013-12-20
Description	A zonal transect in the eastern tropical South Pacific (ETSP) from Peru to Tahiti as the second cruise of the U.S.GEOTRACES Program. This Pacific section includes a large area characterized by high rates of primary production and particle export in the eastern boundary associated with the Peru Upwelling, a large oxygen minimum zone that is a major global sink for fixed nitrogen, and a large hydrothermal plume arising from the East Pacific Rise. This particular section was selected as a result of open planning workshops in 2007 and 2008, with a final recommendation made by the U.S.GEOTRACES Steering Committee in 2009. It is the first part of a two-stage plan that will include a meridional section of the Pacific from Tahiti to Alaska as a subsequent expedition. Figure 1. The 2013 GEOTRACES EPZT Cruise Track. [click on the image to view a larger version] Additional cruise information is available from the Rolling Deck to Repository (R2R): http://www.rvdata.us/catalog/TN303

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Project Information

U.S. GEOTRACES East Pacific Zonal Transect (GP16) (U.S. GEOTRACES EPZT)

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

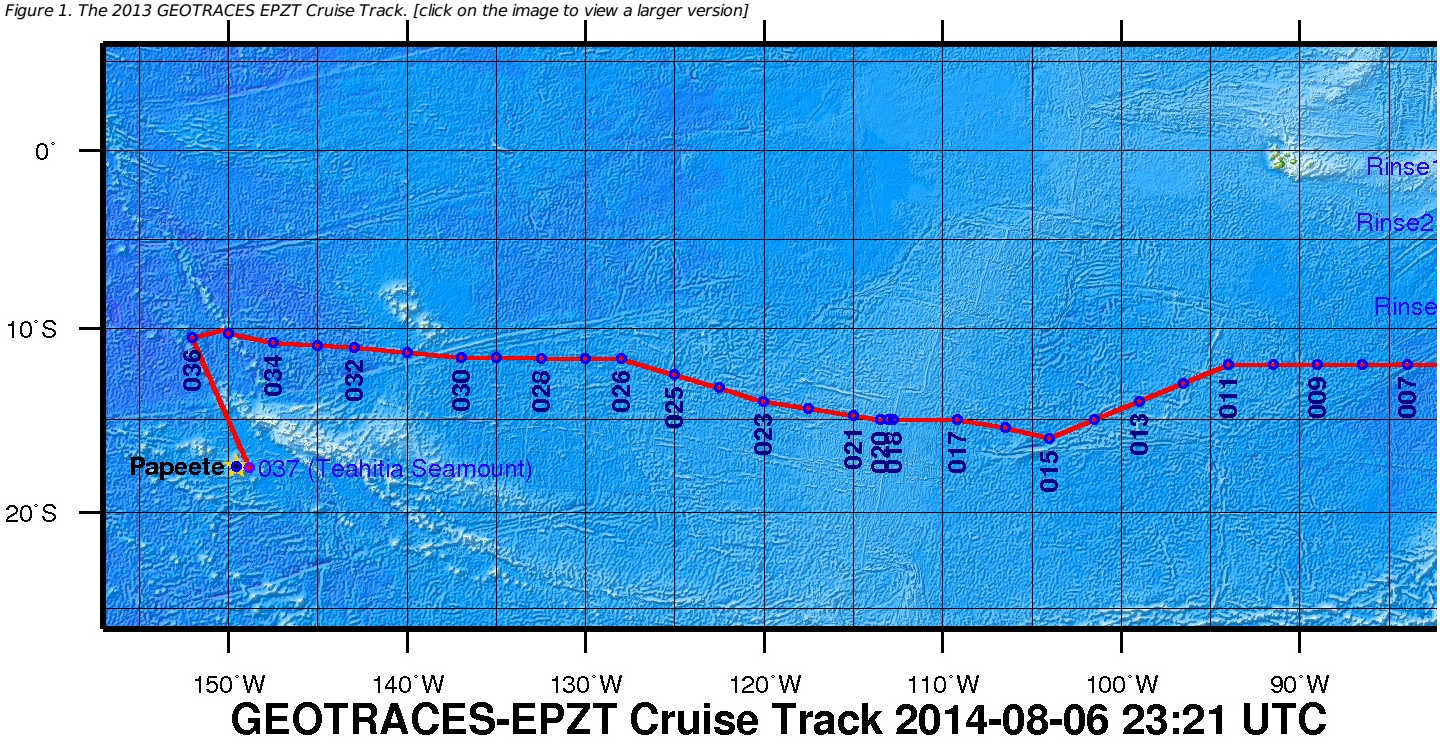
Coverage: Eastern Tropical Pacific - Transect from Peru to Tahiti (GP16)

From the NSF Award Abstract
The mission of the International GEOTRACES Program (https://www.geotraces.org/), of which the U.S. chemical oceanography research community is a founding member, is "to identify processes and quantify fluxes that control the distributions of key trace elements and isotopes in the ocean, and to establish the sensitivity of these distributions to changing environmental conditions" (GEOTRACES Science Plan, 2006). In the United States, ocean chemists are currently in the process of organizing a zonal transect in the eastern tropical South Pacific (ETSP) from Peru to Tahiti as the second cruise of the U.S.GEOTRACES Program. This Pacific section includes a large area characterized by high rates of primary production and particle export in the eastern boundary associated with the Peru Upwelling, a large oxygen minimum zone that is a major global sink for fixed nitrogen, and a large hydrothermal plume arising from the East Pacific Rise. This particular section was selected as a result of open planning workshops in 2007 and 2008, with a final recommendation made by the U.S.GEOTRACES Steering Committee in 2009. It is the first part of a two-stage plan that will include a meridional section of the Pacific from Tahiti to Alaska as a subsequent expedition.

This award provides funding for management of the U.S.GEOTRACES Pacific campaign to a team of scientists from the University of Southern California, Old Dominion University, and the Woods Hole Oceanographic Institution. The three co-leaders will provide mission leadership, essential support services, and management structure for acquiring the trace elements and isotopes samples listed as core parameters in the International GEOTRACES Science Plan, plus hydrographic and nutrient data needed by participating investigators. With this support from NSF, the management team will (1) plan and coordinate the 52-day Pacific research cruise described above; (2) obtain representative samples for a wide variety of trace metals of interest using conventional CTD/rosette and GEOTRACES Sampling Systems; (3) acquire conventional JGOFS/WOCE-quality hydrographic data (CTD, transmissometer, fluorometer, oxygen sensor, etc) along with discrete samples for salinity, dissolved oxygen (to 1 uM detection limits), plant pigments, redox tracers such as ammonium and nitrite, 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-type data to the GEOTRACES Data Center (and US data centers); and (6) coordinate cruise communications between all participating investigators, including preparation of a hydrographic report/publication.

Broader Impacts: The project is part of an international collaborative program that has forged strong partnerships in the intercalibration and implementation phases that are unprecedented in chemical oceanography. The science product of these collective missions will enhance our ability to understand how to interpret the chemical composition of the ocean, and interpret how climate change will affect ocean chemistry. Partnerships include contributions to the infrastructure of developing nations with overlapping interests in the study area, in this case Peru. There is a strong educational component to the program, with many Ph.D. students carrying out thesis research within the program.

Figure 1. The 2013 GEOTRACES EPZT Cruise Track. [click on the image to view a larger version]



GEOTRACES: Suspended particle geochemistry along the US GEOTRACES Eastern Pacific Zonal Transect, from high productivity ocean margin to deep sea hydrothermal plume (GEOTRACES EPZT Suspended Particles)

Coverage: Subtropical Southeastern Pacific Ocean

During the 2013 GEOTRACES Eastern Pacific cruise a diverse range of oceanic environments will be encountered from the high productivity/high particle flux waters off Peru to the Peru-Chile oxygen minimum zone, the hydrothermal plume of the East Pacific Rise, and finally to some of the most oligotrophic waters around Tahiti. Scientists from Rutgers University and Woods Hole Oceanographic Institution will sample suspended particulates from the same GO-Flo bottles that will be used to sample dissolved trace metals and their isotopes (TEIs) across this entire transect. The suspended matter samples will be analyzed for 42 elements, including the particle-reactive rare earth elements. In addition, core-top sediments will be collected at every water-column sampling station and analyzed for both bulk composition (i.e., relative % content of organic carbon, opal, biogenic carbonate and lithogenic components) and the same 42 elements to be analyzed in the suspended particulates. Results from this study will be used to assess the role of suspended particulates in the biogeochemical cycling of TEIs across the Eastern Pacific by addressing three key sets of questions: (1) How does uptake of TEIs into phytoplankton and non-living particles in the upper ocean drive the suspended particulate composition through the deeper water column, along the substantial gradient from the high productivity Peru margin to the oligotrophic ocean interior?; (2) How faithfully is the along-transect variability in the upper ocean transmitted to the sediment (paleo) record?; (3) What are the relative influences of vertical recycling versus lateral advection in generating the distributions of dissolved and particulate TEIs observed in the Peru-Chile OMZ?; (4) Is there a characteristic signature of OMZ activity that is preserved in core-top sediments?; (5) What dominates TEI uptake onto/into authigenic particles in hydrothermal plumes and to what extent are these processes augmented by continuing uptake in core-top sediments?; and (6) What is the net effect from submarine venting on global TEI budgets?

As regards broader impacts, the scientist from Rutgers University is collaborating with the Education Director of the Centers for Ocean Science Education Excellence Networked Ocean World (COSEE-NOW) to contribute to the MARE (Marine Activities, Resources, and Education) program by inviting teachers and high school students to workshops and presentations on climate and ocean sciences. With the help of COSEE-NOW, he also plans to create educational video clips during the Pacific cruise and the subsequent laboratory based analytical work to educate them on the use of geochemistry to understand how the ocean works. Both scientists also plan to develop a teaching module entitled "Particles, Metals, and Carbon" for an Introduction to Oceanography class taught by the Rutgers scientist. One postdoc from Rutgers University would be supported and trained as part of this project.

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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-1235248

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