Depth profiles of seawater dissolved 232Th, 230Th, and 231Pa during the GEOTRACES Equatorial Pacific Zonal Transect on cruise TN303 during 2013

Website: https://www.bco-dmo.org/dataset/643639
Data Type: Cruise Results
Version:
Version Date: 2017-01-31

Project
» U.S. GEOTRACES East Pacific Zonal Transect (GP16) (U.S. GEOTRACES EPZT)
» U.S. GEOTRACES Pacific Section: Analysis of 230Th, 232Th and 231Pa (EPZT_Th_Pa)

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

Contributors	Affiliation	Role
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Dataset Description

The FISH and BOTTLE data have been split into separate columns as per GEOTRACES Parameter Naming Conventions. The FISH data are to the far right.

* To access the data with the FISH and BOTTLE data merged, see:
http://data.bco-dmo.org/jg/serv/BCO/GEOTRACES/EPZT/Th_Pa_diss_joined.html0%7Bdir=data.bco-dmo.org/jg/dir/BCO/GEOTRACES/EPZT/,info=data.bco-dmo.org/jg/info/BCO/GEOTRACES/EPZT/Th_Pa_diss%7D

Methods & Sampling

See methodology and notes (pdf)

Related References:

Andersen, M.B., Stirling, C.H., Zimmermann, B., Halliday, A.N. (2010) Precise determination of the open ocean 234U/238U composition. Geochem. Geophys. Geosyst. 11, Q12003.

Anderson, R.F., Fleisher, M.Q., Robinson, L.F., Edwards, R.L., Hoff, J., Moran, S.B., Rutgers van der Loeff, M.M., Thomas, A.L., Roy-Barman, M., François, R. (2012) GEOTRACES intercalibration of 230Th, 232Th, 231Pa, and prospects for 10Be. Limnol. Oceanogr. Methods 10, 179-213.

Auro ME, LF Robinson, A Burke, LI Bradtmiller, MQ Fleisher, RF Anderson (2012) Improvements to 232-thorium, 230-thorium, and 231-protactinium analysis in seawater arising from GEOTRACES intercalibration Limnology and Oceanography, Methods 10, 464-474

Chen, J.H., Lawrence Edwards, R., Wasserburg, G.J. (1986) 238U, 234U and 232Th in seawater. Earth Planet. Sci. Lett. 80, 241-251.

Cheng, H., Edwards, R.L., Hoff, J., Gallup, C.D., Richards, D.A., and Asmerom, Y. (2000) The half-lives of uranium-234 and thorium-230. Chemical Geology 169, 17-33.

Cheng, H., Edwards, R.L., Shen, C.-C., Polyak, V.J., Asmerom, Y., Woodhead, J., Hellstrom, J., Wang, Y.J., Kong, X.G., Spötl, C., Wang, X.F., and E.Calvin Alexander Jr. (2013) Improvements in 230Th dating, 230Th and 234U half-life values, and U–Th isotopic measurements by multi-collector inductively coupled plasma mass spectrometry. Earth and Planetary Science Letters 371-372, 82-91.

Owens, S.A., Buesseler, K.O., Sims, K.W.W. (2011) Re-evaluating the 238U-salinity relationship in seawater: Implications for the 238U–234Th disequilibrium method. Marine Chemistry 127, 31-39. Rev. Geophys. 33 (2), 241–265.

Roy-Barman, M., Coppola, L. and Souhaut, M. (2002) Thorium isotopes in the western Mediterranean Sea: an insight into the marine particle dynamics. Earth Planet. Sci. Lett. 196, 161-174.

Shen, C.-C., Cheng, H., Edwards, R.L., Thomas, R.B. and Moran, S.B. (2003) Attogram-sized 231Pa Analysis in Dissolved and Particulate fractions of Seawater by Thermal Ionization Mass Spectroscopy. Analytical Chemistry v. 75, issue 5, 1075-1079.

Shen, C.-C., Edwards, R.L., Cheng, H., Dorale, J.A., Thomas, R.B., Moran, S.B., Weinstein, S., and Edmonds, H.N. (2002) Uranium and thorium isotopic and concentration measurements by magnetic sector inductively coupled plasma mass spectrometry. Chemical Geology 185. no. 3-4, 165-178.

Shen, C.C., Wu, C.C., Cheng, H., Edwards, R.L., Hsieh, Y.T., Gallet, S., Chang, C.C., Li, T.Y., Lam, D.D., Kano, A, Hori, M. and Spotl, C. (2012) High-precision and high-resolution carbonate Th-230 dating by MC-ICP-MS with SEM protocols. Geochimica Cosmochim. Acta 99, 71-86. DOI: 10.1016/j.gca.2012.09.018

Taylor, S.R., McLennan, S.M., (1995) The geochemical evolution of the continental crust.

Weyer, S., Anbar, A.D., Gerdes, A., Gordon, G.W., Algeo, T.J., Boyle, E.A. (2008). Natural fractionation of 238U/235U. Geochim. Cosmochim. Acta 72, 345-359.

Data Processing Description

BCO-DMO Processing:

- added conventional header with dataset name, PI name, version date
- renamed parameters to BCO-DMO and BODC standards
- split the FISH and BOTTLE data into separate columns as per GEOTRACES Parameter Naming Conventions
- commented out duplicate lines and changed version from 2016-06-13 to 2016-11-21
- version 2016-11-22: expanded Th_232_D_CONC_BOTTLE and Th_232_D_CONC_BOTTLE_ERR precision from 3 to 5 places
- version 2017-01-31: expanded Th_232_D_CONC_FISH and Th_232_D_CONC_FISH_ERR precision from 3 to 5 places and changed values of Th_232_D_CONC_BOTTLE and Th_232_D_CONC_BOTTLE_ERR to nd for samples collected by FISH.

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	
Th_Pa_diss_joined_fish_botl.csv	(Comma Separated Values (.csv), 128.81 KB) MD5:9d2c4ea1aa3c2c887bca8eac472163c3
Primary data file for dataset ID 643639	

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Parameters

Parameter	Description	Units
cruise_id	Official cruise identifier	text
STNNBR	GEOTRACES station number. PI-supplied values were identical to those in the intermediate US GEOTRACES master file.	unitless
lab	lab group that analyzed the samples: LDEO=Lamont Doherty Earth Observatory; WHOI=Woods Hole Oceanographic Inst.; UMN=Univ. of Minnesota	text
CTDDEPTH	Observation/sample depth in meters; Niskin sample depth calculated from CTD pressure.	meters
depth_pi	Observation/sample depth in meters as reported by the PI	meters
GEOTRC_SAMPNO	Unique identifying number for US GEOTRACES samples. PI-supplied values were identical to those in the intermediate US GEOTRACES master file	integer
CASTNO	Cast identifier numbered consecutively within a station. PI-supplied values were identical to those in the intermediate US GEOTRACES master file.	integer
BTL_LAT	Latitude of bottle firing; north is positive. Values were added from the intermediate US GEOTRACES master file (see Processing Description).	decimal degrees
BTL_LON	Longitude of bottle firing; east is positive. Values were added from the intermediate US GEOTRACES master file (see Processing Description).	decimal degrees
lat_pi	latitude provided by PI; north is positive	decimal degrees
lon_pi	longitude provided by PI; east is positive	decimal degrees
GEOTRC_EVENTNO	Unique identifying number for US GEOTRACES sampling event. PI-supplied values were identical to those in the intermediate US GEOTRACES master file.	integer
SAMPNO	Sample number; Values were added from the intermediate US GEOTRACES master file (see Processing Description).	unitless
BTLNBR	Alphanumeric characters identifying bottle type (e.g. NIS representing Niskin and GF representing GOFLO) and position on a CTD rosette. PI-supplied values were identical to those in the intermediate US GEOTRACES master file.	text-integer
BTLNBR_FLAG_W	Quality flag: 2) ok; 3) questionable; 4) bad analysis; 5) sample lost	unitless
ISO_DATETIME_UTC_START_EVENT	Event start date/time (UTC) formatted to ISO8601 standard. T indicates start of time string; Z indicates UTC. Calculated from original date and time fields. Values were added from the intermediate US GEOTRACES master file (see Processing Description).	YYYY-mm-ddTHH:MM:SS.ssZ
BTL_ISO_DATETIME_UTC	Bottle date/time (UTC) formatted to ISO8601 standard. T indicates start of time string; Z indicates UTC. Calculated from original date and time fields. Values were added from the intermediate US GEOTRACES master file (see Processing Description).	YYYY-mm-ddTHH:MM:SS.ssZ
date_collected	Date sample collected; UTC. PI-supplied values	yyyymmdd
time	Time sample collected; UTC. PI-supplied values	hhmm
date_dissolved_U_separation	Date when dissolved U separated from Th and Pa (used for correcting measured dissolved Th-230 and Pa-231 for ingrowth by decay of dissolved uranium during the time between sample collection and U separation. PI-supplied values.	yyyymmdd
Th_232_D_CONC_BOTTLE	Dissolved Th-232 concentration from CTD bottle sample	pmol/kg
Th_232_D_CONC_BOTTLE_ERR	1 sigma error in Dissolved Th-232	pmol/kg
Th_232_D_CONC_BOTTLE_FLAG	Flag for Dissolved Th-232: 1 = good; 2 = questionable; 3 = bad or no data	unitless
Th_230_D_CONC_BOTTLE	Dissolved Th-230 concentration from CTD bottle sample	uBq/kg
Th_230_D_CONC_BOTTLE_ERR	1 sigma error in Dissolved Th-230	uBq/kg
Th_230_D_CONC_BOTTLE_FLAG	Flag for Dissolved Th-230: 1 = good; 2 = questionable; 3 = bad or no data	unitless
Pa_231_D_CONC_BOTTLE	Dissolved Pa-231 concentration from CTD bottle sample	uBq/kg
Pa_231_D_CONC_BOTTLE_ERR	1 sigma error in Dissolved Pa-231	uBq/kg
Pa_231_D_CONC_BOTTLE_FLAG	Flag for Dissolved Pa-231: 1 = good; 2 = questionable; 3 = bad or no data	unitless
Th_230_D_XS_CONC_BOTTLE	Dissolved Th-230 concentration corrected for the dissolution of lithogenic minerals from CTD bottle sample; thereby isolating the dissolved Th-230 produced by decay of dissolved uranium	uBq/kg
Th_230_D_XS_CONC_BOTTLE_ERR	Dissolved Th-230 concentration error	uBq/kg
Th_230_D_XS_CONC_BOTTLE_FLAG	Flag for Dissolved Th-230: 1 = good; 2 = questionable; 3 = bad or no data	unitless
Pa_231_D_XS_CONC_BOTTLE	Dissolved Pa-231 concentration corrected for the dissolution of lithogenic minerals (see notes for full explanation) from CTD bottle sample	uBq/kg
Pa_231_D_XS_CONC_BOTTLE_ERR	Dissolved Pa-231 concentration error	uBq/kg
Pa_231_D_XS_CONC_BOTTLE_FLAG	Flag for Dissolved Pa-231: 1 = good; 2 = questionable; 3 = bad or no data	unitless
Th_232_D_CONC_FISH	Dissolved Th-232 concentration from Geo-Fish sample	pmol/kg
Th_232_D_CONC_FISH_ERR	1 sigma error in Dissolved Th-232	pmol/kg
Th_232_D_CONC_FISH_FLAG	Flag for Dissolved Th-232: 1 = good; 2 = questionable; 3 = bad or no data	unitless
Th_230_D_CONC_FISH	Dissolved Th-230 concentration from Geo-Fish sample	uBq/kg
Th_230_D_CONC_FISH_ERR	1 sigma error in Dissolved Th-230	uBq/kg
Th_230_D_CONC_FISH_FLAG	Flag for Dissolved Th-230: 1 = good; 2 = questionable; 3 = bad or no data	unitless
Pa_231_D_CONC_FISH	Dissolved Pa-231 concentration from Geo-Fish sample	uBq/kg
Pa_231_D_CONC_FISH_ERR	1 sigma error in Dissolved Pa-231	uBq/kg
Pa_231_D_CONC_FISH_FLAG	Flag for Dissolved Pa-231: 1 = good; 2 = questionable; 3 = bad or no data	unitless
Th_230_D_XS_CONC_FISH	Dissolved Th-230 concentration corrected for the dissolution of lithogenic minerals from Geo-Fish sample; thereby isolating the dissolved Th-230 produced by decay of dissolved uranium	uBq/kg
Th_230_D_XS_CONC_FISH_ERR	Dissolved Th-230 concentration error	uBq/kg
Th_230_D_XS_CONC_FISH_FLAG	Flag for Dissolved Th-230: 1 = good; 2 = questionable; 3 = bad or no data	unitless
Pa_231_D_XS_CONC_FISH	Dissolved Pa-231 concentration corrected for the dissolution of lithogenic minerals (see notes for full explanation) from Geo-Fish sample	uBq/kg
Pa_231_D_XS_CONC_FISH_ERR	Dissolved Pa-231 concentration error	uBq/kg
Pa_231_D_XS_CONC_FISH_FLAG	Flag for Dissolved Pa-231: 1 = good; 2 = questionable; 3 = bad or no data	unitless

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Instruments

Dataset-specific Instrument Name	
Generic Instrument Name	CTD Sea-Bird
Dataset-specific Description	Sea-Bird Electronics CTD carousel fitted with 12 30-liter PVC Niskin bottles, maintained and operated by the Ocean Data Facility of Scripps Institution of Oceangraphy. The carousel was lowered from the ship with steel wire. Niskin bottles were equipped with nylon-coated closure springs and Viton O-rings.
Generic Instrument Description	Conductivity, Temperature, Depth (CTD) sensor package from SeaBird Electronics, no specific unit identified. This instrument designation is used when specific make and model are not known. See also other SeaBird instruments listed under CTD. More information from Sea-Bird Electronics.

Dataset-specific Instrument Name	
Generic Instrument Name	GeoFish Towed near-Surface Sampler
Generic Instrument Description	The GeoFish towed sampler is a custom designed near surface (

Dataset-specific Instrument Name	
Generic Instrument Name	Inductively Coupled Plasma Mass Spectrometer
Dataset-specific Description	Thermo-Finnegan ELEMENT XR Single Collector Magnetic Sector ICP-MS, equipped with a high performance Interface pump (Jet Pump), and specially-designed sample (X) and skimmer (Jet) cones to ensure the highest possible sensitivity.
Generic Instrument Description	An ICP Mass Spec is an instrument that passes nebulized samples into an inductively-coupled gas plasma (8-10000 K) where they are atomized and ionized. Ions of specific mass-to-charge ratios are quantified in a quadrupole mass spectrometer.

Dataset-specific Instrument Name	
Generic Instrument Name	Niskin bottle
Dataset-specific Description	Twelve 30-liter PVC Niskin bottles, maintained and operated by the Ocean Data Facility of Scripps Institution of Oceangraphy.
Generic Instrument Description	A Niskin bottle (a next generation water sampler based on the Nansen bottle) is a cylindrical, non-metallic water collection device with stoppers at both ends. The bottles can be attached individually on a hydrowire or deployed in 12, 24, or 36 bottle Rosette systems mounted on a frame and combined with a CTD. Niskin bottles are used to collect discrete water samples for a range of measurements including pigments, nutrients, plankton, etc.

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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)

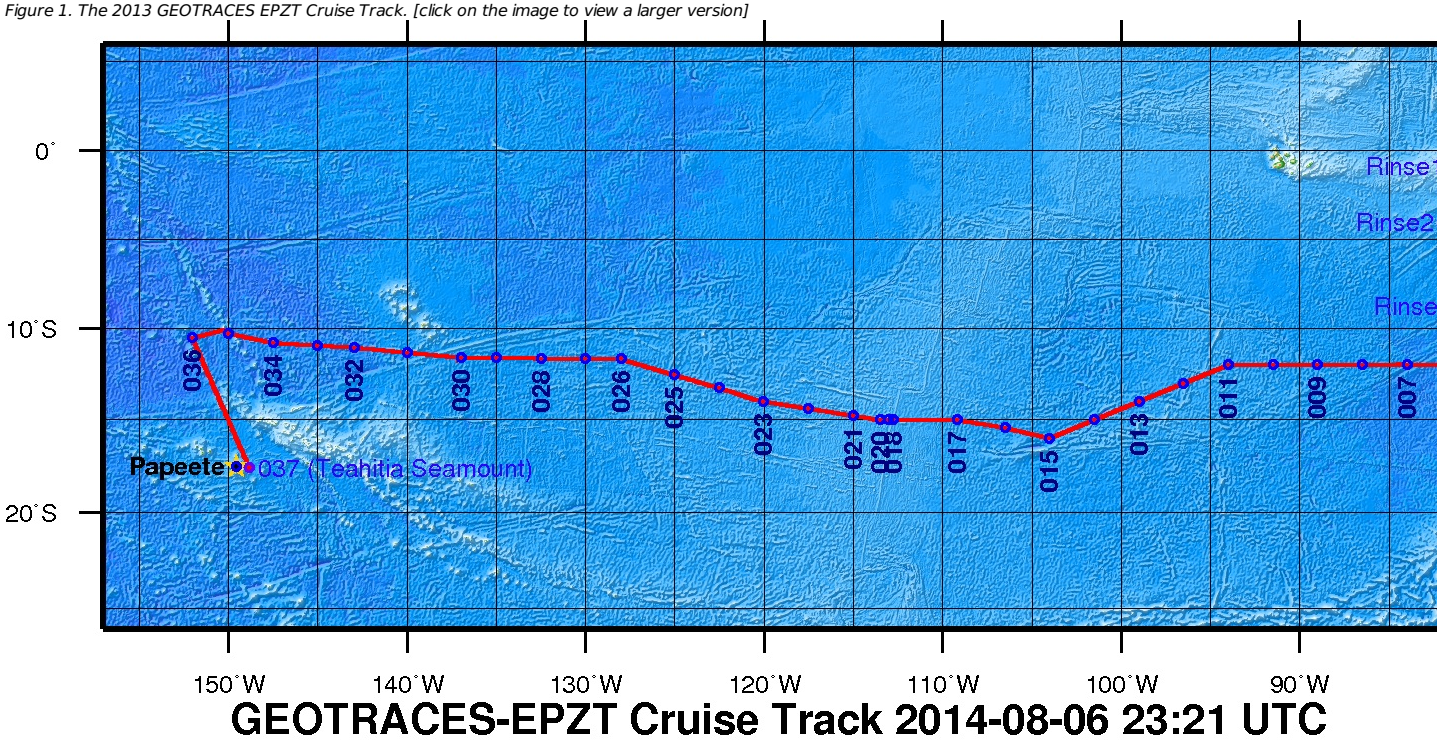
From the NSF Award Abstract
The mission of the International GEOTRACES Program (https://www.geotraces.org/), of which the U.S. chemical oceanography research community is a founding member, is "to identify processes and quantify fluxes that control the distributions of key trace elements and isotopes 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]



U.S. GEOTRACES Pacific Section: Analysis of 230Th, 232Th and 231Pa (EPZT_Th_Pa)

Coverage: Eastern Tropical South Pacific

The International GEOTRACES program is a multi-national effort to survey (by a series of cross-ocean sections) and understand the global-ocean distribution of trace elements and isotopes in seawater. The GEOTRACES Science Plan has designated the natural radioisotopes 231Pa and 230Th to be key parameters inasmuch as their measurement on all sections is deemed to be critical to the success of entire international ocean science program

In this project, a research team from the Lamont- Doherty Earth Observatory of Columbia University and the University of Minnesota - Twin Cities will undertake measurement of the dissolved and particulate concentrations of 230Th and 231Pa on the US GEOTRACES Peru-Tahiti section, one of the American contributions to the global GEOTRACES effort. Additionally, they will measure dissolved and particulate 232Th concentrations and analyze a limited number of aerosol samples, aerosol leachates, and surface sediments for these radionuclides. These data will be used to: 1) Quantify the rates of boundary scavenging of 231Pa and 230Th associated with the biologically productive Peru upwelling system, 2) Quantify the rates of bottom scavenging of 231Pa and 230Th thought to be associated with resuspended sediments in nepheloid layers, 3) Quantify the uptake of dissolved Th and Pa by metalliferous particles associated with the hydrothermal plume emanating from the East Pacific Rise as well as by authigenic particles formed within the oxygen minimum zone, 4) Quantify the supply of lithogenic 232Th from margin sediments by the combined study of 232Th and 230Th, and 5) Quantify the supply of lithogenic 232Th from aerosols by the combined study of 232Th and 230Th.

Through collaboration with other US GEOTRACES investigators, the team expects that this work will provide unprecedented constraints on the processes that supply trace elements to the ocean as well as the processes that remove them.

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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-1233688

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