Total dissolved cobalt and labile cobalt concentrations from the US GEOTRACES EPZT cruise TN303 on R/V Thomas G. Thompson from October to December 2013

Website: https://www.bco-dmo.org/dataset/642974
Data Type: Cruise Results
Version: 2
Version Date: 2016-07-01

Project
» U.S. GEOTRACES East Pacific Zonal Transect (GP16) (U.S. GEOTRACES EPZT)
» US GEOTRACES Pacific Section: Measurement of the organic complexation of dissolved iron, copper and cobalt, and total dissolved cobalt (EPZT Fe Cu Co)

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

Contributors	Affiliation	Role
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Abstract
Total dissolved cobalt and labile cobalt concentrations from the US GEOTRACES EPZT cruise TN303 on R/V Thomas G. Thompson in the Eastern Tropical Pacific (Transect from Peru to Tahiti) from October to December 2013.

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Coverage

Spatial Extent: **N**:-10.21911 **E**:-77.3761 **S**:-16.0006 **W**:-152.11975
Temporal Extent: 2013-10-29 - 2013-12-16

Dataset Description

Total dissolved cobalt and labile cobalt concentrations measured by cathodic stripping voltammetry. Samples were collected on the 2013 U.S. GEOTRACES East Pacific Zonal Transect (EPZT) cruise (TN303).

Methods & Sampling

Samples were collected using the ODU GEOTRACES Carousel (GT-C), filtered through 0.2 um Acropak filters in the GEOTRACES clean van and immediately refrigerated. Acid-washed 60 mL LDPE bottles were filled entirely, leaving no headspace. Samples were either stored at 4 degrees C, double-bagged, prior until analysis at sea, or preserved in a heat-sealed bag containing gas absorbing satchels immediately after sample collection and kept at 4 degrees C until analysis in lab. Both labile and total dissolved cobalt were analyzed from this sample bottle, identified by its GEOTRACES number.

The carousel was used to collect samples from surface to near bottom waters. An additional sample was collected from a surface towfish at each station. Pre-conditioned, teflon-coated 12L Go-Flo sampling bottles (General Oceanics, Miami, FL) were deployed on a polyurethane powder-coated aluminum rosette with titanium pilings and pressure housings (Sea-Bird Electronics, Inc., Bellevue, WA) attached to a Kevlar, non-metallic conducting cable. For more information regarding carousel deployment, please refer to the GEOTRACES Cookbook (www.geotraces.org/science/intercalibration/222-sampling-and-sample-handling-protocols-for-geotraces-cruises), located on the GEOTRACES Program website (www.geotraces.org/). Following carousel retrieval, Go-Flo bottles were moved to the GEOTRACES Program class-100 trace metal clean van, and pressurized with HEPA filtered air for sampling in accordance with published methods (Cutter and Bruland 2012). Surface towfish samples were collected by suspending the towfish off the starboard side with a boom, and sampled water at approximately 2 m depth using a Teflon diaphragm pump following the GEOTRACES Program Cookbook sampling recommendations, and in accordance with previous collection protocols (Bruland et al. 2004).

Sample storage and reagent bottles were soaked for >1 week in the acidic detergent Citranox, rinsed thoroughly with 18.2 M-Ohm Milli-Q water (Millipore), filled with 10% HCl to soak for 10 days, and rinsed thoroughly with Milli-Q water adjusted to pH 2 with TM-grade HCl. Reagent purification protocols were identical to those previously published (Saito and Moffett 2001).

Concentrations of total dissolved cobalt and labile cobalt during the TN303 cruise were determined ship-board using a previously described cathodic stripping voltammetry (CSV) method (Saito and Moffett 2001, Saito et al. 2004). Measurements were made using the Eco-Chemie µAutolabIII systems connected to Metrohm 663 VA Stands equipped with hanging mercury drop electrodes and Teflon sampling cups. Sample preparation was modified slightly to accommodate use of a Metrohm 837 Sample processor, operated with NOVA 1.8 software (Metrohm Autolab B.V.).

For total dissolved cobalt analyses, samples were UV-irradiated for 1 h prior to analysis in a Metrohm 705 UV digester to degrade the organic ligands that bind cobalt, enabling full chelation by the added electroactive ligand, dimethylglyoxime (DMG). 11 ml of sample was pipetted into 15ml polypropylene tubes. Recrystallized DMG (0.1M in methanol) was added to a final concentration of 400 uM and purified N-(2-hydroxyethyl)piperazine-N-(3-propanesulfonic acid) (EPPS) buffer (0.5 M in Milli-Q water) was added to a final concentration of 3.8 mM. Tubes were inverted several times before being placed in the autosampler queue, where 8.5 ml of the mixture was dosed into the teflon analysis cup using a 800 Dosino automated burrette (Metrohm). 1.5 ml of purified sodium nitrite (1.5M in Milli-Q water) was added directly to the Teflon cup using a dedicated 800 Dosino burrette. Once loaded, samples were purged with high purity (>99.99%) N2 for 3 min and cobalt concentrations were determined by standard addition, with triplicate measurement of the sample followed by four 25 pM cobalt additions. 5 nM Co stock was diluted from a certified 1ppm reference (SPEX) and added to the analysis cup via a third Dosino burrette.

For labile cobalt analyses, 11 ml of sample were pipetted into acid washed teflon vials, preconditioned with a small aliquot of sample water. DMG was added to a concentration of 400 uM and allowed to equilibrate for 8-16hr in the dark prior to analysis (Saito et al. 2004). EPPS was added just prior to measurement using the same standard addition protocol described above. Previously, we determined that natural cobalt ligands in seawater have a conditional stability constant of >10^16.8 (Saito et al. 2005). This suggests that the cobalt is very strongly bound to ligands. Thus, we define labile cobalt as the fraction of total dissolved cobalt that is either bound to weak organic and inorganic ligands in seawater or present as free Co(II), and is then exchangeable with the complexing agent (DMG) used for analysis (Saito et al. 2004, Saito et al. 2005). The difference between the total dissolved cobalt and the labile cobalt can then be used as an estimation of the strong cobalt ligand concentration. The same electrode was used for both total and labile analyses. Before transitioning from labile analyses to total analyses, the autosampler tubing and Teflon cup were rinsed with Milli-Q water and pH2 HCl in Milli-Q water.

The analytical blank was determined by analyzing seawater that had been UV-irradiated for 1 h, equilibrated overnight with prepared Chelex 100 resin beads (Bio-Rad), and UV-irradiated a second time to degrade any leached synthetic ligands. Mean blank for at sea analysis was 3.7 +/- 1.2 pM (n=28), indicating a detection limit of 3.6 pM. For in lab analyses, mean blank was 4.7 +/- 1.4 pM, and the detection limit was 4.2 pM.

GEOTRACES standard seawater and internal standard lab seawater were analyzed periodically. A large batch of UV oligotrophic seawater was generated prior to the cruise and used as a primary standard during at sea analysis. This standard seawater was run ~3x per week, as were blanks, and values were consistent for the duration of the cruise. Our laboratory has participated in the GEOTRACES intercalibration effort using this electrochemical Co method. Acidified standards were neutralized with concentrated ammonium hydroxide (Seastar), mixing the entire sample between drops, prior to UV digestion. We report our laboratory values for the GEOTRACES and SAFe standard analyses using this electrochemical method, including those conducted during analysis of the EPZT samples to be: SAFe D1 = 48.5 +/- 2.4 (n=3, at sea), SAFe D2 = 45.0 +/- 2.7 (n=7), GEOTRACES GSP = 2.5 +/- 2.0 (n=10), GEOTRACES GSC = 77.7 +/- 2.4 (n=4). These results are in good agreement with those from the GEOTRACES intercalibration effort for Co and demonstrate that the methodologies employed to produce this dataset detect concentrations within the standard deviation of current consensus values for UV irradiated samples, which can be found on the International GEOTRACES Program website (www.geotraces.org/).

Data Processing Description

Peak height (in nA) was measured relative to a linear baseline for the Co reduction peak ca. -1.15V. All seven scans (3 baseline and 4 standard additions) were used to determine a sample specific sensitivity (nA/pM Co added, mean r2 = 0.998). Cobalt concentrations were calculated from the baseline peak height, divided by the sensitivity and corrected from volume changes from sodium nitrite addition, followed by subtraction of the mean blank for at sea, or in lab analyses.

At sea analyses were characterized with mild to moderate electrical inference that mandated additional processing before peak height could be reliably measured. We adopted a simplified least squared fitting routine included in the NOVA software package that conducted a 15-point weighted moving average according to a 2nd order polynomial. This method did not distort cobalt concentrations when noise was low. A small fraction of scans (~2.6%) were not adequately fit using this routine and were instead smoothed using a 9-point linear moving average (22.1 mV window), also included in NOVA. For all samples peak height was measured manually to minimize distortion due to added noise. Subsequent investigation in the laboratory, on land, was able to remove this signal by increasing the current sampling step (but without changing the scan speed) from 2.46 mV to 4.88 mV, which eliminated the need for smoothing prior to sample analysis. We observed good agreement between samples analyzed at sea and in lab, indicating that the smoothing procedures applied at sea did not bias the data and that gas adsorbing satchels preserved original concentrations reasonably well.

On occasion, analyses were repeated due to obvious electrode malfunction or to confirm oceanographic consistency of measured values. If the repeated measurement was similar to the initial, the initial value is reported. If the repeated analysis was more oceanographically consistent with adjacent values in the water column, that analysis was used instead.

Flags for both total and labile cobalt follow WOCE conventions, where:

2 = Good value.
3 = Questionable value, due to need for increased smoothing of scan or loss of mercury drop during scanning.
4 = Bad value, identified by poor r2 of standard addition and/or large disagreement between triplicate baseline scans.
5 = No reported result because analysis was not performed or because of instrument malfunction.

BCO-DMO Processing:
- moved GeoFish data into separate columns per GEOTRACES naming conventions;
- replaced blanks with "nd" (no data);
- 17 July 2017: made dataset publicly available (was previously restricted to GEOTRACES PIs only).

Additional GEOTRACES Processing by BCO-DMO:
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
cobalt_joined.csv(Comma Separated Values (.csv), 163.60 KB) MD5:f7bb441c70592028357b7c84a568ecda Primary data file for dataset ID 642974

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Related Publications

Bruland, K. W., Rue, E. L., Smith, G. J., & DiTullio, G. R. (2005). Iron, macronutrients and diatom blooms in the Peru upwelling regime: brown and blue waters of Peru. Marine Chemistry, 93(2-4), 81–103. doi:10.1016/j.marchem.2004.06.011
Methods

Cutter, G. A., & Bruland, K. W. (2012). Rapid and noncontaminating sampling system for trace elements in global ocean surveys. Limnology and Oceanography: Methods, 10(6), 425–436. doi:10.4319/lom.2012.10.425
Methods

Noble, A. E., Saito, M. A., Maiti, K., & Benitez-Nelson, C. R. (2008). Cobalt, manganese, and iron near the Hawaiian Islands: A potential concentrating mechanism for cobalt within a cyclonic eddy and implications for the hybrid-type trace metals. Deep Sea Research Part II: Topical Studies in Oceanography, 55(10-13), 1473–1490. doi:10.1016/j.dsr2.2008.02.010
General

Saito, M. A., & Moffett, J. W. (2001). Complexation of cobalt by natural organic ligands in the Sargasso Sea as determined by a new high-sensitivity electrochemical cobalt speciation method suitable for open ocean work. Marine Chemistry, 75(1-2), 49–68. doi:10.1016/s0304-4203(01)00025-1
Methods

Saito, M. A., Moffett, J. W., & DiTullio, G. R. (2004). Cobalt and nickel in the Peru upwelling region: A major flux of labile cobalt utilized as a micronutrient. Global Biogeochemical Cycles, 18(4), n/a–n/a. doi:10.1029/2003gb002216
Methods

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Parameters

Parameter	Description	Units
cruise_id	Cruise identifier. TN = R/V Thomas G. Thompson.	unitless
STNNBR	Station number.	unitless
GEOTRC_SAMPNO	GEOTRACES sample number.	unitless
DEPTH_PI	Depth, as reported by the PI.	meters
Co_D_CONC_BOTTLE	Total concentration of cobalt (Co) in a 0.22 um filtered sample, determined following a 1hr UV oxidation procedure that removes organic ligands; samples collected by GT-C rosette.	picomoles (pM)
Co_D_BOTTLE_FLAG_W	WOCE quality flag for Co_D_CONC_BOTTLE.	unitless
Co_DL_CONC_BOTTLE	The concentration of dissolved labile (DL) cobalt (Co) that is measured without UV oxidation; samples collected by GT-C rosette.	picomoles (pM)
Co_DL_BOTTLE_FLAG_W	WOCE quality flag for Co_DL_CONC_BOTTLE.	unitless
Co_D_CONC_FISH	Total concentration of cobalt (Co) in a 0.22 um filtered sample, determined following a 1hr UV oxidation procedure that removes organic ligands; samples collected by GeoFish.	picomoles (pM)
Co_D_FISH_FLAG_W	WOCE quality flag for Co_D_CONC_FISH.	unitless
Co_DL_CONC_FISH	The concentration of dissolved labile (DL) cobalt (Co) that is measured without UV oxidation; samples collected by GeoFish.	picomoles (pM)
Co_DL_FISH_FLAG_W	WOCE quality flag for Co_DL_CONC_FISH.	unitless
CASTNO	Cast number; added from BCO-DMO GEOTRACES master file.	unitless
GEOTRC_EVENTNO	GEOTRACES event number; added from BCO-DMO GEOTRACES master file.	unitless
GEOTRC_INSTR	Sampling instrument; added from BCO-DMO GEOTRACES master file.	unitless
SAMPNO	Sequential sample number within the cast (usually corresponds to bottle number); added from BCO-DMO GEOTRACES master file.	unitless
GFISH_NO	GeoFish tow number; added from BCO-DMO GEOTRACES master file.	unitless
BTLNBR	Bottle number; typically 1-24; added from BCO-DMO GEOTRACES master file.	unitless
BTLNBR_FLAG_W	Bottle number quality flag; follows WOCE conventions. 2 = good; 3 = questionable; 4 = bad; 9 = missing data; added from BCO-DMO GEOTRACES master file.	unitless
ISO_DATETIME_UTC_START_EVENT	Date and time (UTC) at the start of the sampling event. Formatted to ISO 8601 standard.	YYYY-mm-ddTHH:MM:SS.xxZ
EVENT_LAT	Latitude at the start of the event; north is positive; added from BCO-DMO GEOTRACES master file.	decimal degrees
EVENT_LON	Longitude at the start of the event; east is positive; added from BCO-DMO GEOTRACES master file.	decimal degrees
BTL_ISO_DATETIME_UTC	Date and time, formatted to the ISO 8601 standard, at the time of bottle firing; added from BCO-DMO GEOTRACES master file.	YYYY-MM-DDTHH:MM:SS[.xx]Z
BTL_LAT	Latitude of bottle firing; north is positive; added from BCO-DMO GEOTRACES master file.	decimal degrees
BTL_LON	Lonitude of bottle firing; east is positive; added from BCO-DMO GEOTRACES master file.	decimal degrees
ODF_CTDPRS	The ODF software acquisition measurement of pressure; added from BCO-DMO GEOTRACES master file.	decibars
SMDEPTH	Saunders-Mantyla depth (integrated; uses dynamic height); added from BCO-DMO GEOTRACES master file.	meters
FMDEPTH	Fofonoff-Millard depth (non-integrated; also used by SBE); added from BCO-DMO GEOTRACES master file.	meters

BTMDEPTH	Bottom depth; added from BCO-DMO GEOTRACES master file.	meters
CTDPRS	CTD pressure; added from BCO-DMO GEOTRACES master file.	decibars
CTDDEPTH	CTD bottle firing depth; added from BCO-DMO GEOTRACES master file.	meters

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Instruments

Dataset-specific Instrument Name	surface towfish
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	Go-Flo Bottles
Generic Instrument Name	GO-FLO Bottle
Generic Instrument Description	GO-FLO bottle cast used to collect water samples for pigment, nutrient, plankton, etc. The GO-FLO sampling bottle is specially designed to avoid sample contamination at the surface, internal spring contamination, loss of sample on deck (internal seals), and exchange of water from different depths.

Dataset-specific Instrument Name	Metrohm 663 VA
Generic Instrument Name	Metrohm 663 VA Stand mercury electrode
Dataset-specific Description	Measurements were made using the Eco-Chemie µAutolabIII systems connected to Metrohm 663 VA Stands equipped with hanging mercury drop electrodes and Teflon sampling cups.
Generic Instrument Description	The Metrohm 663 VA stand forms the wet chemical part of a polarographic and voltammetric analytical system. It features a mercury electrode, an Ag/AgCl reference electrode and a glassy carbon counter electrode. The size of the mercury drop and the stirrer speed are set manually on the VA Stand. The VA Stand can be operated in Dropping Mercury Electrode (DME), Hanging Mercury Drop Electrode (HMDE) and Static Mercury Drop Electrode (SMDE) modes. The VA Stand can be controlled by a potentiostat in conjunction with the Metrohm IME663 interface.

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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/

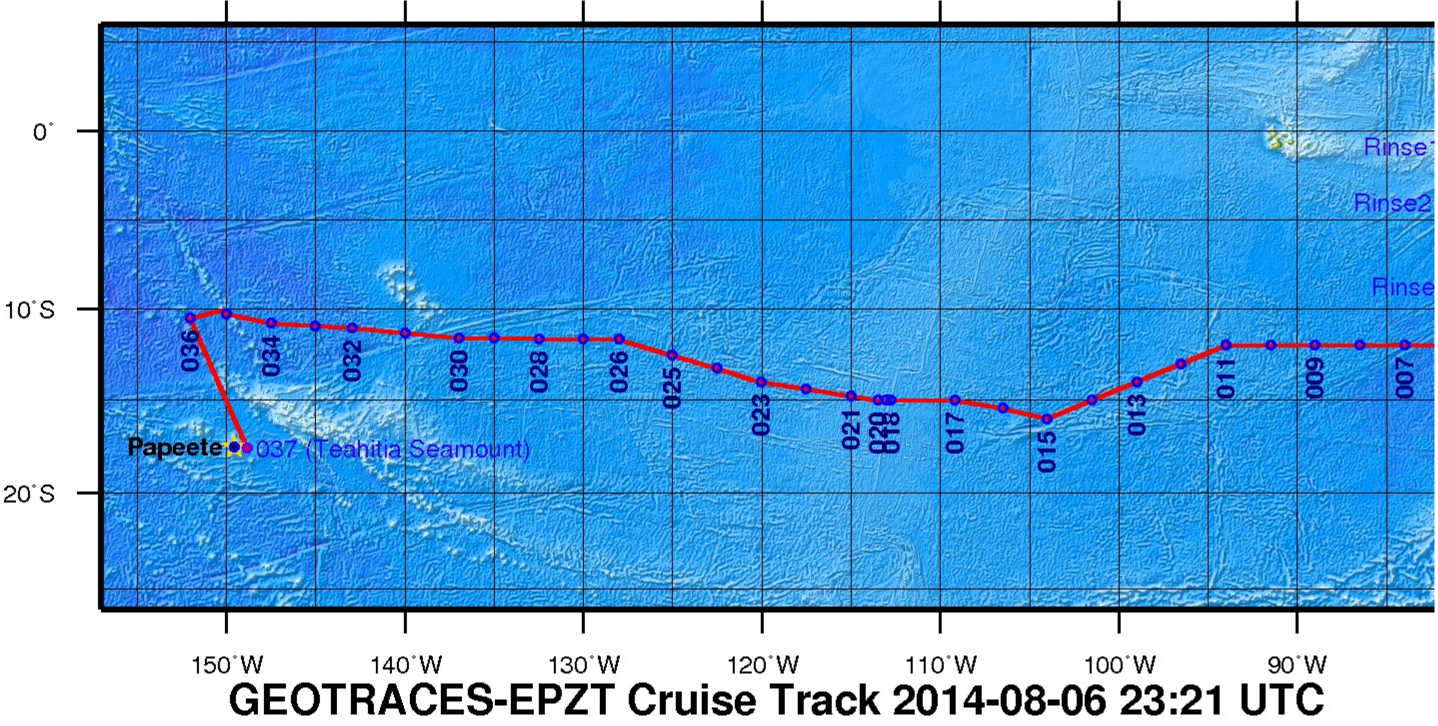
Coverage: Eastern Tropical Pacific - Transect from Peru to Tahiti (GP16)

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]



US GEOTRACES Pacific Section: Measurement of the organic complexation of dissolved iron, copper and cobalt, and total dissolved cobalt (EPZT Fe Cu Co)

Coverage: East Pacific

Description from NSF award abstract:
Dissolved iron (Fe), copper (Cu), and cobalt (Co) are essential elements for phytoplankton growth which in turn influences the marine carbon cycle; however, despite this important role, the cycling, distribution, and bioavailability of these bioactive elements remains poorly understood. For example, strong organic ligands influence bioavailability and solubility, but it is unclear how interactions change throughout the water column under variable conditions. Recognizing a need for this data, researchers from the Bermuda Institute of Ocean Sciences, Woods Hole Oceanographic Institution, and Scripps Institute of Oceanography will measure the organic complexation of dissolved Fe, Cu, and Co as well as total dissolved Co concentrations during the 2013 GEOTRACES cruise which will transect the coastal upwelling zone off Peru, an intense oxygen minimum zone, the East Pacific Rise hydrothermal plume, and the oligotrophic waters near Tahiti. This study will result in a significant dataset on the speciation of these bioactive elements throughout the water column which will help assess the relationships between dissolved Fe, Cu, and Co distributions and ligand concentration gradients and will likely reveal large chemical gradients over this dynamic oceanographic region. As regards dissolved Co concentrations, these measurements should provide new insights on the marine biogeochemistry of the element, especially in relation to oxygen minimum zones and hydrothermal plumes.

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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-1233261

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