Dissolved Po-210 and Pb-210 from GEOTRACES-EPZT cruise TN303, 2013

Website: https://www.bco-dmo.org/dataset/641044
Data Type: Cruise Results
Version: 2
Version Date: 2016-06-13

Project
» U.S. GEOTRACES East Pacific Zonal Transect (GP16) (U.S. GEOTRACES EPZT)
» GEOTRACES - 210Po and 210Pb distribution at Eastern Pacific Interface Regimes (GEOTRACES EPZT Po Pb)

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

Contributors	Affiliation	Role
Baskaran, Mark	Wayne State University (WSU)	Principal Investigator
Copley, Nancy	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

Abstract
Dissolved Po-210 and Pb-210 in six vertical profiles from super stations of EPZT of US GEOTRACES cruise on RV Thompson cruise 303. Dissolved Po-210 and Pb-210, dissolved: ≤ 0.45 mm; units: disintegration per minute (dpm) / 100 L of water.

Table of Contents

- Coverage
- Dataset Description
  - Methods & Sampling
  - Data Processing Description
- Data Files
- Supplemental Files
- Related Publications
- Parameters
- Instruments
- Deployments
- Project Information
- Program Information
- Funding

Coverage

Spatial Extent: **N**:-10.5002 **E**:-77.8181 **S**:-14.9839 **W**:-152.0385
Temporal Extent: 2013-10-29 - 2013-12-17

Dataset Description

Dissolved Po-210 and Pb-210 in six vertical profiles from super stations of EPZT of US GEOTRACES cruise on RV Thompson cruise 303. Dissolved Po-210 and Pb-210, dissolved: ≤ 0.45 mm; units: disintegration per minute (dpm) / 100 L of water.

The FISH and BOTTLE data have been split into separate columns as per GEOTRACES Parameter Naming Conventions.The data is the same as version 2016-06-03. The FISH data are to the far right.

Methods & Sampling

The methodology is published in Church et al., (2012) and Baskaran et al. (2013) as well as given in the *Sampling and Sample-handling Protocols for GEOTRACES Cruises* (Cookbook).

Chemical Procedures for the analysis of dissolved Po-210 and Pb-210 may be downloaded below under 'Supplemental Files'.

We have conducted a large number of blanks to obtain high-quality data. We have also an archived water sample from the Atlantic and assessed the activities of Po-210 and Pb-210 in a known sample. We have developed an Excel Spreadsheet that includes all the corrections (both decay and in-growth) needed to get accurate data.

Data Processing Description

Details of all calculations are in Baskaran et al. (2013).

BCO-DMO Processing:
- added conventional header with dataset name, PI name, version date
- renamed parameters to BCO-DMO standard
- added columns by joining the submitted data with an Events Master file - bottle and fish samples separated; parameter names revised

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.

[table of contents | back to top]

Data Files

File
PoPb_diss_join_fish_btl.csv (Comma Separated Values (.csv), 22.47 KB) MD5:5da6802096f9f813307b03cd07071dc3 Primary data file for dataset ID 641044

[table of contents | back to top]

Supplemental Files

File
Baskaran GEOTRACES EPZT procedures for dissolved Po filename: Chemical_Procedures_for_the_analysis_of_dissolved_Po_7March2016.pdf (Portable Document Format (.pdf), 394.10 KB) MD5:aaaf25febf80f2f51204be8ad1ce8478 Procedures for dissolved Po used by M. Baskaran for GEOTRACES EPZT data.

[table of contents | back to top]

Related Publications

Baskaran, M., Church, T., Hong, G., Kumar, A., Qiang, M., Choi, H., ... Maiti, K. (2013). Effects of flow rates and composition of the filter, and decay/ingrowth correction factors involved with the determination of in situ particulate210Po and210Pb in seawater. Limnology and Oceanography: Methods, 11(3), 126–138. doi:10.4319/lom.2013.11.126
Methods

[table of contents | back to top]

Parameters

Parameter	Description	Units
cruise_id	Cruise identification	unitless
STNNBR	Station Number	unitless
CASTNO	Cast Number. Values were added from the intermediate US GEOTRACES master file (see Processing Description).	unitless
GEOTRC_EVENTNO	GEOTRACES Event Number. Values were added from the intermediate US GEOTRACES master file (see Processing Description).	unitless
SAMPNO	Sample number. Values were added from the intermediate US GEOTRACES master file (see Processing Description).	unitless
BTLNBR	Bottle number. Values were added from the intermediate US GEOTRACES master file (see Processing Description).	unitless
BTLNBR_FLAG_W	Bottle quality flag: 2 = good; 3 = questionable; 4 = bad; 9 = missing data. Values were added from the intermediate US GEOTRACES master file (see Processing Description).	unitless
ISO_DATETIME_UTC_START_EVENT	ISO 8601:2004 standard date and time at start of event. Values were added from the intermediate US GEOTRACES master file (see Processing Description). in the format YYYY-MM-DDTHH:MM:SS[.xx]Z	unitless
BTL_ISO_DATETIME_UTC	ISO 8601:2004 standard date and time of bottle firing. Values were added from the intermediate US GEOTRACES master file (see Processing Description).	yyyy-MM-dd'T'HH:mm:ss.SS'Z'
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
GEOTRC_SAMPNO	GEOTRACES sample number	unitless
depth_PI	Depth as reported by PI	meters
CTDDEPTH	CTD bottle firing depth. Values were added from the intermediate US GEOTRACES master file (see Processing Description).	meters
vol_sample	Volume of sample	kg
Po_210_D_CONC_BOTTLE	Dissolved Po-210; dissolved: = 0.45 um; units: disintegration per minute (dpm) / 100 L of water from CTD bottle sample	210Po dpm 100L-1

Po_210_D_CONC_BOTTLE_sd	Error as standard deviation	210Po dpm 100L-1
Po_210_D_CONC_BOTTLE_flag	WOCE quality flag: 2 = good; 3 = questionable; 4 = bad; 9 = missing dat	unitless
Pb_210_D_CONC_BOTTLE	Dissolved Pb-210; dissolved: = 0.45 um; units: disintegration per minute (dpm) / 100 L of water from CTD bottle sample	210Pb dpm 100L-1
Pb_210_D_CONC_BOTTLE_sd	Error as standard deviation	210Pb dpm 100L-1
Pb_210_D_CONC_BOTTLE_flag	WOCE quality flag: 2 = good; 3 = questionable; 4 = bad; 9 = missing dat	unitless
Po_210_Pb_210_D_RATIO_BOTTLE	Ratio of Po-210 to Pb-210	unitless
Po_210_Pb_210_D_RATIO_BOTTLE_sd	Error as standard deviation	unitless
Po_210_D_CONC_FISH	Dissolved Po-210; dissolved: = 0.45 um; units: disintegration per minute (dpm) / 100 L of water from GEO-FISH sample	210Po dpm 100L-1
Po_210_D_CONC_FISH_sd	Error as standard deviation	210Po dpm 100L-1
Po_210_D_CONC_FISH_flag	WOCE quality flag: 2 = good; 3 = questionable; 4 = bad; 9 = missing dat	unitless
Pb_210_D_CONC_FISH	Dissolved Pb-210; dissolved: = 0.45 um; units: disintegration per minute (dpm) / 100 L of water from GEO-FISH sample	210Pb dpm 100L-1
Pb_210_D_CONC_FISH_sd	Error as standard deviation	210Pb dpm 100L-1
Pb_210_D_CONC_FISH_flag	WOCE quality flag: 2 = good; 3 = questionable; 4 = bad; 9 = missing dat	unitless
Po_210_Pb_210_D_RATIO_FISH	Ratio of Po-210 to Pb-210 from GEO-FISH sample	unitless
Po_210_Pb_210_D_RATIO_FISH_sd	Error as standard deviation	unitless

[table of contents | back to top]

Instruments

Dataset-specific Instrument Name	
Generic Instrument Name	CTD Sea-Bird SBE 911plus
Generic Instrument Description	The Sea-Bird SBE 911 plus is a type of CTD instrument package for continuous measurement of conductivity, temperature and pressure. The SBE 911 plus includes the SBE 9plus Underwater Unit and the SBE 11plus Deck Unit (for real-time readout using conductive wire) for deployment from a vessel. The combination of the SBE 9 plus and SBE 11 plus is called a SBE 911 plus. The SBE 9 plus uses Sea-Bird's standard modular temperature and conductivity sensors (SBE 3 plus and SBE 4). The SBE 9 plus CTD can be configured with up to eight auxiliary sensors to measure other parameters including dissolved oxygen, pH, turbidity, fluorescence, light (PAR), light transmission, etc.). more information from Sea-Bird Electronics

Dataset-specific Instrument Name	
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	
Generic Instrument Name	Niskin bottle
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.

[table of contents | back to top]

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

[table of contents | back to top]

Project Information

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

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

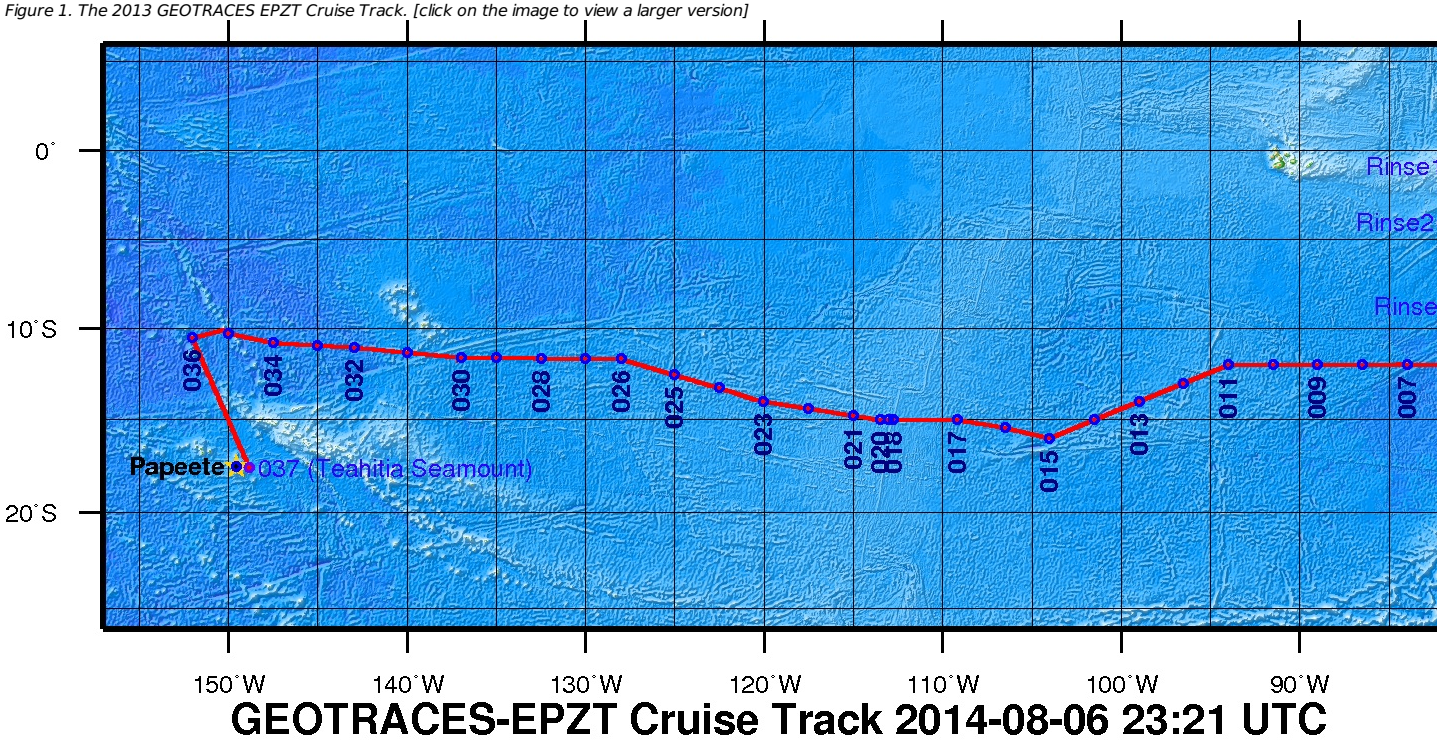
Coverage: Eastern Tropical Pacific - Transect from Peru to Tahiti (GP16)

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 - 210Po and 210Pb distribution at Eastern Pacific Interface Regimes (GEOTRACES EPZT Po Pb)

Coverage: Eastern South Pacific

Extracted from the NSF award abstract

In 2013, a multi-institutional team of U.S. marine chemists and geochemists will launch a major expedition to the Pacific Ocean to map and study the distribution of trace elements and isotopes as part of the International GEOTRACES Program. Because of their proven value as natural tracers of both sedimentation dynamics and hydrodynamics in the sea, radioactive daughter isotopes in the natural U-Th radionuclide series will be of immense value to all GEOTRACES researchers. In particular the naturally-occurring Pb210/Po210 radioisotope pair would be useful for quantifying rates of particulate scavenging of other trace elements and isotopes of interest in the U.S.GEOTRACES Pacific campaign. This is because these two isotopes are themselves particle-reactive and radioactive, thus providing a natural clock for tracking the vertical transport of other particle-reactive substances.

In this project, researchers at Wayne State University and CUNY Queens College will sample and analyze several hundred dissolved and particulate (large and small) samples for 210Po and 210Pb along the U.S.GEOTRACES Eastern South Pacific section. About two thirds of the samples will be focused at six so-called "super stations" (sites chosen for intensive study), half above the main thermocline and the other half down across the benthic nepheloid layer (the zone of suspended material extending several meters above the seafloor). The depths will be chosen according to regional atmospheric input, ecosystems, and coordinated with sampling by other researchers onboard. The other third will be taken within the hydrothermal plume in the vicinity of the East Pacific Rise. The data will be synthesized according to interface scavenging models by particle types (e.g. fine/colloidal, lithogenic and biogenic). As such, the proposed work will be closely coordinated with that of other U.S.GEOTRACES PIs funded to study other particle-reactive or dissolved trace elements and radionuclide isotopes during the campaign.

BROADER IMPACTS: The broader impacts are closely linked to those of the GEOTRACES Program as a whole: to enhance (1) research infrastructure by providing a broad array of 210Po and 210Pb data useful for biogeochemical scavenging models, (2) education by mentoring graduate and undergraduate students, teaching by example from proposed research, (3) participation of under-represented students interested in careers in the geosciences, (4) research training of graduates in marine radiochemistry, and 5) public dissemination of results through publications, presentations, and on a dedicated public website at Wayne State University.

[table of contents | back to top]

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.

[table of contents | back to top]

Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1237059

[table of contents | back to top]