

Aerosols analyzed for Pb-210 collected on R/V Thomas G. Thompson cruise TN303 in the Eastern Tropical Pacific from October to December 2013 (U.S. GEOTRACES EPZT project)

Website: <https://www.bco-dmo.org/dataset/675403>

Data Type: Cruise Results

Version: 19 January 2017

Version Date: 2017-01-09

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
Rauch, Shannon	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

Table of Contents

- [Dataset Description](#)
 - [Methods & Sampling](#)
 - [Data Processing Description](#)
- [Data Files](#)
- [Related Publications](#)
- [Parameters](#)
- [Instruments](#)
- [Deployments](#)
- [Project Information](#)
- [Program Information](#)
- [Funding](#)

Dataset Description

Aerosols collected during the GEOTRACES EPZT cruise (TN303), analyzed for Pb-210

Methods & Sampling

During the GEOTRACES GP16 (EPZT) cruise, aerosol samples (for bulk aerosols using a Tisch Environmental TSP TE-5170V-BL, 47mm Whatman 41 filters and size-fractionated aerosols using a Tisch TE-235 5-stage slotted impactor with Whatman 41 slotted substrates) by the Florida State University group (FSU) aboard the RV Thompson. Aerosol samples were frozen onboard and sent to FSU. The filter were cut into strips and sent to Wayne State University for radiochemical processing. The filter strips were placed in a digestion vessel and 5 ml each of concentrated HCl, concentrated HNO₃ and HF were added. To the mixture, precisely weighed 209Po equivalent to 1 dpm was added. The mixture was digested at 100 degrees C for about 24-hours in a furnace. After the digestion was complete, the solution was transferred into a 100 ml pre-cleaned Teflon beaker and evaporated. To the residue, 5.0 ml conc. HCl was added and dried. This process was repeated one more time and finally 5.0 ml 6M HCl was added to the residue. To this solution, 45.0 ml of deionized water was added and the solution was quantitatively transferred into a 100 ml low density polyethylene bottle and stored for ~ 1 yr. After the time elapsed, Po plating was conducted as described in Baskaran et al. (2013). The planchet was assayed in an alpha spectrometer. Appropriate decay corrections, including the decay of 210Pb from the time of sample collection to plating, were applied and the final activity of 210Pb was calculated (Baskaran et al., 2013).

Data Processing Description

After deployment blank subtraction, negative amounts were used to represent detection limits. Equations used can be found in Baskaran et al. (2013).

BCO-DMO Processing:

- modified parameter names to conform with BCO-DMO and GEOTRACES naming conventions;
- replaced blanks (missing data) with nd.

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, EXPCODE, 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, CTDDPTH.

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
Pb210_Aerosol_joined.csv (Comma Separated Values (.csv), 5.26 KB) MD5:a4fba3306852c80c31672adf3a48a4f6
Primary data file for dataset ID 675403

[[table of contents](#) | [back to top](#)]

Related Publications

Baskaran, M. Chemical Procedures for the analysis of dissolved Po-210 and Pb-210. http://dmoserv3.bco-dmo.org/data_docs/GEOTRACES/EPZT/baskaran/Chemical_Procedures_for_the_analysis_of_dissolved_Po_7March2016.pdf

General

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](https://doi.org/10.4319/lom.2013.11.126)

Methods

Buck, C. S., Landing, W. M., Resing, J. A., & Lebon, G. T. (2006). Aerosol iron and aluminum solubility in the northwest Pacific Ocean: Results from the 2002 IOC cruise. *Geochemistry, Geophysics, Geosystems*, 7(4), n/a-n/a. doi:10.1029/2005gc000977 <https://doi.org/10.1029/2005GC000977>

General

Buck, C. S., Landing, W. M., Resing, J. A., & Measures, C. I. (2010). The solubility and deposition of aerosol Fe and other trace elements in the North Atlantic Ocean: Observations from the A16N CLIVAR/CO2 repeat hydrography section. *Marine Chemistry*, 120(1-4), 57-70. doi:[10.1016/j.marchem.2008.08.003](https://doi.org/10.1016/j.marchem.2008.08.003)

General

Morton, P. L., Landing, W. M., Hsu, S.-C., Milne, A., Aguilar-Islas, A. M., Baker, A. R., ... Zamora, L. M. (2013). Methods for the sampling and analysis of marine aerosols: results from the 2008 GEOTRACES aerosol intercalibration experiment. *Limnology and Oceanography: Methods*, 11(2), 62-78. doi:[10.4319/lom.2013.11.62](https://doi.org/10.4319/lom.2013.11.62)

General

[[table of contents](#) | [back to top](#)]

Parameters

Parameter	Description	Units
cruise_id	Cruise identification	unitless
SECT_ID	Cruise section identifier; EPZT = GEOTRACES East Pacific Zonal Transect.	unitless
GEOTRC_INSTR	Sampling instrument; added from BCO-DMO EPZT master data file.	unitless
GEOTRC_EVENTNO	GEOTRACES event number	unitless
GEOTRC_SAMPNO	Unique GEOTRACES sample number	unitless
deployment	Deployment identifier	unitless
STNNBR	Station number; added from BCO-DMO EPZT master data file.	unitless
sampler_type	Aerosol sampler type	unitless
stage	The Tisch Ambient Eight-Stage Cascade Impactor (Impactor) is a high sample-rate, multiple orifice and multiple stage Inertial Impactor. A Cascade Impactor is a multi-stage impaction device used to separate airborne particles into aerodynamic size classes. Ambient air enters the circular inlet of the Pre-Impactor Size Selective Inlet (High Capacity Pre-Separator) and cascades through the succeeding orifice stages with successively higher orifice velocities from Stage #0 to Stage #7.	unitless
impactor_strip	Impactor strip identifier. The Tisch Ambient Eight-Stage Cascade Impactor (Impactor) is a high sample-rate, multiple orifice and multiple stage Inertial Impactor. A Cascade Impactor is a multi-stage impaction device used to separate airborne particles into aerodynamic size classes. Ambient air enters the circular inlet of the Pre-Impactor Size Selective Inlet (High Capacity Pre-Separator) and cascades through the succeeding orifice stages with successively higher orifice velocities from Stage #0 to Stage #7.	unitless
julian_day	Sampling start Julian day	unitless
day_start	Sampling start day	unitless
month_start	Sampling start month	unitless
year_start	Sampling start year	unitless
lat_start	Sampling start Latitude; North = positive values.	decimal degrees
lon_start	Sampling start Longitude; East = positive values.	decimal degrees
day_end	Sampling end day	unitless
month_end	Sampling end month	unitless
year_end	Sampling end year	unitless
lat_end	Sampling end Latitude; North = positive values.	decimal degrees
lon_end	Sampling end Longitude; East = positive values.	decimal degrees
run_time_hrs	Run time of the sampler	hours
air_volume	Total volume of air sampled	cubic meters
Pb_210_AEROSOL_CONC	Pb-210 concentration	decays per minute/1000 cubic meters
Pb_210_AEROSOL_CONC_SD	Standard deviation of Pb-210 concentration	decays per minute/1000 cubic meters
Pb_210_AEROSOL_CONC_FLAG	Quality flag for Pb-210 concentration	unitless
ISO_DATETIME_UTC_START_EVENT	Date and time, formatted to the ISO 8601 standard, at the start of the sampling event, according to the event log. Format: YYYY-MM-DDTHH:MM:SS[.xx]Z	unitless

[[table of contents](#) | [back to top](#)]

Instruments

Dataset-specific Instrument Name	Tisch Environmental TSP TE-5170V-BL
Generic Instrument Name	Aerosol Sampler
Dataset-specific Description	Aerosol samples (for bulk aerosols using a Tisch Environmental TSP TE-5170V-BL, 47mm Whatman 41 filters and size-fractionated aerosols using a Tisch TE-235 5-stage slotted impactor with Whatman 41 slotted substrates) by the Florida State University group (FSU). Refer to: https://tisch-env.com/wp-content/uploads/2015/07/TE-5170V-BL-Manual.pdf
Generic Instrument Description	A device that collects a sample of aerosol (dry particles or liquid droplets) from the atmosphere.

Dataset-specific Instrument Name	Alpha Spectrometer
Generic Instrument Name	Spectrometer
Dataset-specific Description	The planchet was assayed in an alpha spectrometer.
Generic Instrument Description	A spectrometer is an optical instrument used to measure properties of light over a specific portion of the electromagnetic spectrum.

[[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)

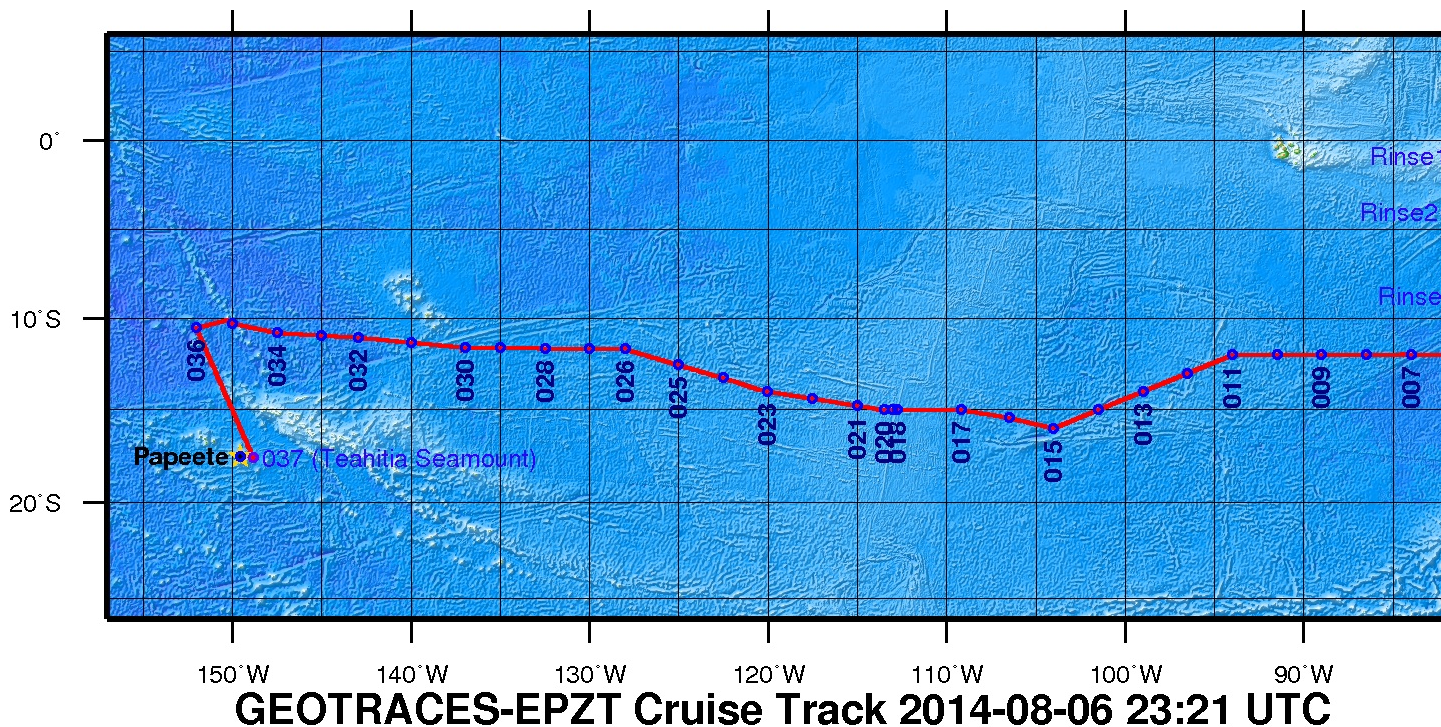
From the NSF Award Abstract

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 Inter-calibration 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](#)]