

# CFC-12, CFC-11, CFC-113, and SF6 concentration from US GEOTRACES EPZT cruise (R/V Thomas G. Thompson TN303) in the Eastern Tropical Pacific from October to December 2013

Website: <https://www.bco-dmo.org/dataset/679306>

Data Type: Cruise Results

Version: 4

Version Date: 2017-07-24

## Project

» [U.S. GEOTRACES East Pacific Zonal Transect \(GP16\)](#) (U.S. GEOTRACES EPZT)

## Program

» [U.S. GEOTRACES](#) (U.S. GEOTRACES)

Contributors	Affiliation	Role
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## Abstract

CFC-12, CFC-11, CFC-113, and SF6 concentration from US GEOTRACES EPZT cruise (R/V Thomas G. Thompson TN303) in the Eastern Tropical Pacific from October to December 2013.

## Table of Contents

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

## Coverage

**Spatial Extent:** N:-10.25018 E:-77.37617 S:-16.00067 W:-152.0005

**Temporal Extent:** 2013-10-29 - 2013-12-18

## Dataset Description

CFC-12, CFC-11, CFC-113, and SF6 concentration from US GEOTRACES EPZT cruise. This dataset supercedes the values reported in the bottle file.

## Methods & Sampling

**Niskin samples:** Samples were collected in 300 ml BOD bottles from the 30 liter Niskins and then analyzed via purge and trap capillary column gas chromatography with electron capture detection.

**Underway samples:** The ships underway system was directly plumbed to the CFC/SF6 system, so that that water sample fixed volume sample loop could be filled directly from the flowing water. Analysis was then carried out as it was from the bottle collected from the Niskins.

## Data Processing Description

CFC and SF6 concentrations were calculated from standard calibration curves and corrected for analytical blanks, and detector response drift with time. There is no flag for values below the detection limit.

BCO-DMO Processing:

- parameter names were modified to conform with GEOTRACES and BCO-DMO naming conventions;
- 07 July 2017: added GEOTRC\_SAMPNO to all samples by joining by STNNBR, CASTNO, and SAMPNO except for the underway samples where there some ambiguous sampling events where the GEOTRC\_SAMPNO cannot be determined based on the provided information from the PI.
- 12 July 2017: removed sample erroneously included in dataset (was labeled as 9497).
- 24 July 2107: created separate columns for bottle and underway samples to be in compliance with GEOTRACES naming conventions.

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

## Data Files

File
<b>CFC_joined.csv</b> (Comma Separated Values (.csv), 157.15 KB) MD5:02281751857fe5193f96c6f8bc292602
Primary data file for dataset ID 679306

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

## Parameters

Parameter	Description	Units
STNNBR	Station number	unitless
bottle_num	Sample/bottle number. Combination of CASTNO and Niskin bottle number (e.g. 201 = cast 2, bottle 1).	unitless
CFC12_BOTTLE	CFC-12 concentration for samples collected by Niskin bottle	picomoles per kilogram (pmol/kg)
CFC12_BOTTLE_FLAG_W	WOCE quality flag for CFC-12 samples collected by Niskin bottle	unitless
CFC11_BOTTLE	CFC-11 concentration for samples collected by Niskin bottle	picomoles per kilogram (pmol/kg)
CFC11_BOTTLE_FLAG_W	WOCE quality flag for CFC-11 samples collected by Niskin bottle	unitless
CFC113_BOTTLE	CFC-113 concentration for samples collected by Niskin bottle	picomoles per kilogram (pmol/kg)
CFC113_BOTTLE_FLAG_W	WOCE quality flag for CFC-113 samples collected by Niskin bottle	unitless
SF6_BOTTLE	SF6 concentration for samples collected by Niskin bottle	femtomoles per kilogram (fmo/kg)
SF6_BOTTLE_FLAG_W	WOCE quality flag for SF6 samples collected by Niskin bottle	unitless
cruise_id	Cruise identification	unitless
CASTNO	Cast number; field created from the original bottle_num column.	unitless
GEOTRC_EVENTNO	GEOTRACES event number; joined from BCO-DMO EPZT master file.	unitless
GEOTRC_INSTR	Sampling instrument; joined from BCO-DMO EPZT master file.	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; joined from BCO-DMO EPZT master file.	unitless
EVENT_LAT	Latitude at the start of the event; north is positive. Joined from BCO-DMO EPZT master file.	decimal degrees
EVENT_LON	Longitude at the start of the event; east is positive. Joined from BCO-DMO EPZT master file.	decimal degrees
SAMPNO	Sequential sample number within the cast (usually corresponds to bottle number). Created from original bottle_num column.	unitless
GEOTRC_SAMPNO	Unique GEOTRACES sample number; joined from BCO-DMO EPZT master file using combination of STNNBR, CASTNO, and SAMPNO.	unitless
BTLNBR	Bottle number; typically 1-24. Joined from BCO-DMO EPZT master file.	unitless
BTLNBR_FLAG_W	Bottle number quality flag; follows WOCE conventions. 2 = no problems noted; 3 = leaking; 4 = did not trip correctly; 9 = samples not drawn from this bottle. Joined from BCO-DMO EPZT master file.	unitless
BTL_ISO_DATETIME_UTC	Date and time, formatted to the ISO 8601 standard, at the time of bottle firing. Format: YYYY-MM-DDTHH:MM:SS[.xx]Z. Joined from BCO-DMO EPZT master file.	unitless
CTDPRS	CTD pressure; joined from BCO-DMO EPZT master file.	decibars
CTDDEPTH	CTD bottle firing depth; joined from BCO-DMO EPZT master file.	meters
CFC12_UWAY	CFC-12 concentration for samples collected by the underway system	picomoles per kilogram (pmol/kg)
CFC12_UWAY_FLAG_W	WOCE quality flag for CFC-12 samples collected by the underway system	unitless
CFC11_UWAY	CFC-11 concentration for samples collected by the underway system	picomoles per kilogram (pmol/kg)
CFC11_UWAY_FLAG_W	WOCE quality flag for CFC-11 samples collected by the underway system	unitless
CFC113_UWAY	CFC-113 concentration for samples collected by the underway system	picomoles per kilogram (pmol/kg)
CFC113_UWAY_FLAG_W	WOCE quality flag for CFC-113 samples collected by the underway system	unitless
SF6_UWAY	SF6 concentration for samples collected by the underway system	femtomoles per kilogram (fmo/kg)
SF6_UWAY_FLAG_W	WOCE quality flag for SF6 samples collected by the underway system	unitless

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

## Instruments

<b>Dataset-specific Instrument Name</b>	
<b>Generic Instrument Name</b>	Gas Chromatograph
<b>Generic Instrument Description</b>	Instrument separating gases, volatile substances, or substances dissolved in a volatile solvent by transporting an inert gas through a column packed with a sorbent to a detector for assay. (from SeaDataNet, BODC)

<b>Dataset-specific Instrument Name</b>	
<b>Generic Instrument Name</b>	Niskin bottle
<b>Generic Instrument Description</b>	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

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/499719">https://www.bco-dmo.org/deployment/499719</a>
<b>Platform</b>	R/V Thomas G. Thompson
<b>Report</b>	<a href="http://dmoserv3.whoi.edu/data_docs/GEOTRACES/EPZT/GT13_EPZT_ODFReport_All.pdf">http://dmoserv3.whoi.edu/data_docs/GEOTRACES/EPZT/GT13_EPZT_ODFReport_All.pdf</a>
<b>Start Date</b>	2013-10-25
<b>End Date</b>	2013-12-20
<b>Description</b>	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): <a href="http://www.rvdata.us/catalog/TN303">http://www.rvdata.us/catalog/TN303</a>

[ [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)

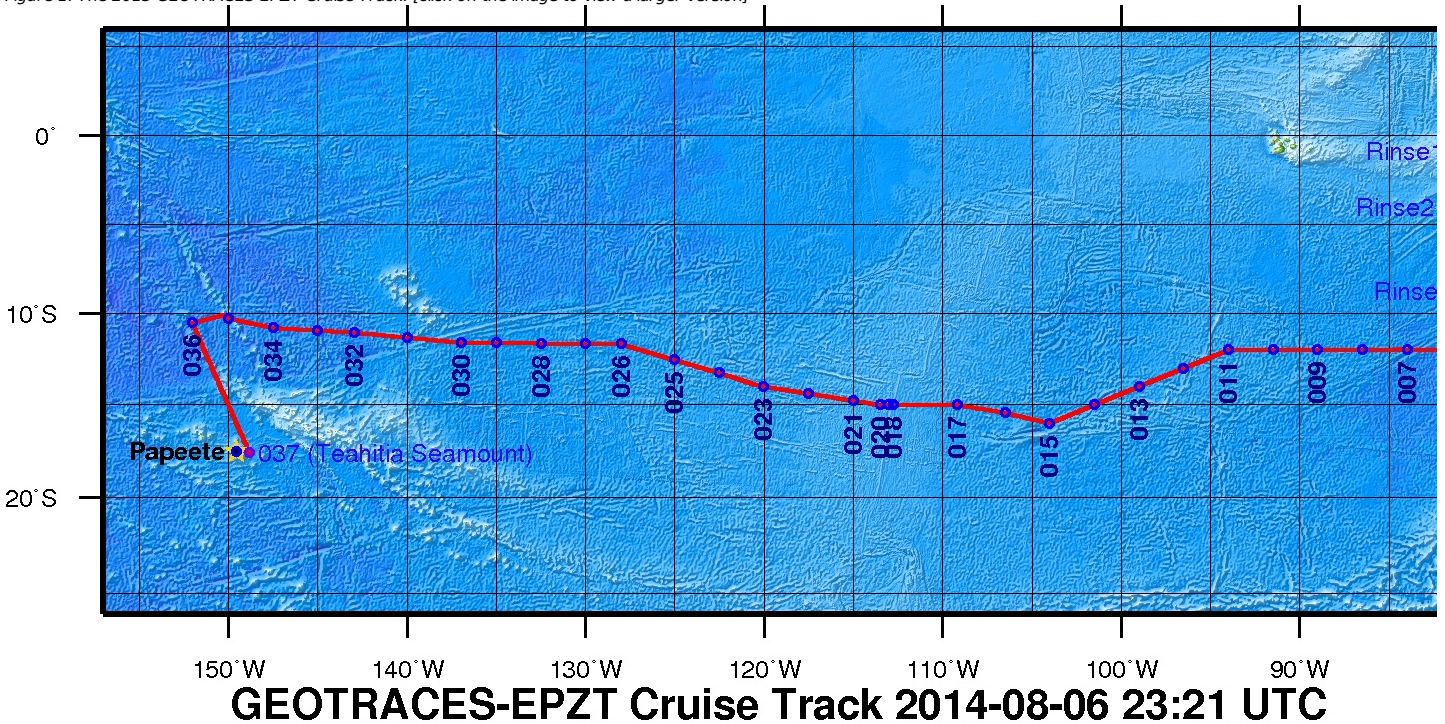
#### From the NSF Award Abstract

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 JGOF5/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]



[ [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](#) ]