GTC CTD down casts along the US GEOTRACES East Pacific Zonal Transect from the R/V Thomas G. Thompson TN303 cruise in the tropical Pacific from Peru to Tahiti during 2013 (U.S. GEOTRACES EPZT project)

Website: https://www.bco-dmo.org/dataset/522646
Data Type: Cruise Results
Version: 1
Version Date: 2014-10-30

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
GTC CTD down casts along the US GEOTRACES East Pacific Zonal Transect from the R/V Thomas G. Thompson TN303 cruise in the tropical Pacific from Peru to Tahiti during 2013.

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Coverage

Spatial Extent: **N**:-10.2502 **E**:-77.3761 **S**:-16.0006 **W**:-152.0004
Temporal Extent: 2013-10-28 - 2013-12-17

Dataset Description

CTD - GT-C DownCasts 20141030ODU

SMDEPTH IS SAUNDERS-MANTYLA DEPTH (INTEGRATED; USES DYNAMIC HEIGHT)
FMDEPTH IS FOFONOFF-MILLARD DEPTH (NON-INTEGRATED; ALSO USED BY SBE)

Methods & Sampling

From the TN303 cruise report:
Two types of rosette/SBE9plus CTD casts (ODF/30L-Niskin and GT-C/12L-GoFlo) were made at 36 station locations during U.S. GEOTRACES EPZT.

Shipboard CTD data processing was performed automatically at the end of each deployment using SIO/STS CTD processing software v.5.1.6-1. Raw GT-C CTD data and bottle trip files, acquired by SBE Seasave V 7.17a on a Windows XP workstation, were also imported into the Linux processing system, providing a backup of the raw data.

At the end of the cruise, all GT-C CTD data were updated in the database using the post-cast Seasave-processed ".btl" file 5-second averaged CTD data, in order to include processed CTD Oxygen values. The 5-second average used resulted in slightly better agreement between CTD and GoFlo salinity values than the shorter 3-second average used for the Niskin rosette.

Data Processing Description

Processing notes from README provided by ODF:
The CTD depths in the shipboard version (20 Dec 2013) of the data - bottle data in particular - were originally calculated incorrectly due to two software errors. A small error in the gravity calculation affected both bottle and CTD data. In addition, the bottle file CTDDEPTH calculation was inadvertently using a combination of latitude and longitude, vs just latitude, as input to the gravity component of the depth equation, causing up to a 20m error in some of the casts.

Two different depth calculations were subsequently added into these data files: the original, integrated Saunders-Mantyla integrated depth calculations (SMDEPTH), with the gravity error corrected; and the non-integrated Fofonoff-Millard depth calculations (FMDEPTH), same as those used by SBE. The Fofonoff-Millard depths are used for the primary CTDDEPTH column in both bottle data files.

ODF reports that the CTDDEPTH column agreed best with depths identified from CTD bottle trips recorded during GEOTRACES CTD acquisition. The depth values in CTDDEPTH column are from the Saunders & Fofonoff 1976 calculation of depth from pressure. This is the same default calculation of depth used by SeaBird (SBE) software. GEOTRACES CTD data acquisition uses SBE software. **It follows that it would be preferable and consistent for GEOTRACES and ODF to use the values in the CTDDEPTH column.**

Processing notes from README_1410.txt:
Separate columns of S-M and F-M depths ("SMDEPTH" and "FMDEPTH") are included in bottle and CTD files. In addition, "ODF_CTDPRS" is an added column in the bottle files. This may differ from the main CTDPRS in the bottle file only for EPZT GT-C casts, where Seasave-processed CTD trip data were used.

Note: 'FLAG_W' columns = WHP (WOCE Hydrographic Program) quality flags. ODF used the WHP quality coding schema, but also included two non-standard quality codes in the GT-C bottle file:
- QUALITY CODE 'A' WAS USED FOR DATA VALUES SUBMITTED AS 'ABOVE DETECTION LIMITS'
- QUALITY CODE 'B' WAS USED FOR DATA VALUES SUBMITTED AS 'BELOW DETECTION LIMITS'
This was at the request of two different PIs.

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Data Files

File
GT-C_DownCasts_v30Oct2014.csv (Comma Separated Values (.csv), 27.93 MB) MD5:1b9badc112bf3ea91e25c5d9ab2a6c39 Primary data file for dataset ID 522646

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Parameters

Parameter	Description	Units
DATASET_ID	CTD Dataset Identifier	text
EXPOCODE	expedition code assigned by the CCHDO: NODCShipCodeYearMonthDay	text
SECT_ID	cruise section identification number	text
GEOTRC_EVENTNO	GEOTRACES Event Number	dimensionless
STNNBR	Station Number	dimensionless
CASTNO	Cast Number	dimensionless
DATE	Station Date (GMT) in the format YYYYMMDD	unitless
TIME	Station Time (GMT)	HHMM
LATITUDE	Station Latitude (South is negative)	decimal degrees
LONGITUDE	Station Longitude (West is negative)	decimal degrees
BTMDEPTH	Multibeam bottom depth of the cast	meters
INSTRUMENT_ID	Instrument Id (from CTD profile data headers)	dimensionless
CTDPRS	CTD Pressure	DBARS
CTDPRS_FLAG_W	CTD pressure quality flag (see WOCE Hydrographic Program Quality Flags)	dimensionless
CTDTMP	CTD Temperature; ITS-90	degrees celsius
CTDTMP_FLAG_W	CTD temperature quality flag (see WOCE Hydrographic Program Quality Flags)	dimensionless
CTDSAL	CTD Salinity	PSS-78
CTDSAL_FLAG_W	CTD salinity quality flag (see WOCE Hydrographic Program Quality Flags)	dimensionless
CTDOXY	CTD Oxygen	UMOL/KG
CTDOXY_FLAG_W	CTD oxygen quality flag(see WOCE Hydrographic Program Quality Flags)	dimensionless
TRANSM	Light Transmission (0-5VDC)	volts
TRANSM_FLAG_W	Light Transmission quality flag (see WOCE Hydrographic Program Quality Flags)	dimensionless
FLUORM	Fluorescence (0-5VDC)	volts
FLUORM_FLAG_W	Fluorescence quality flag (see WOCE Hydrographic Program Quality Flags)	dimensionless
TURBDTY	Turbidity (0-5VDC)	volts
TURBDTY_FLAG_W	Turbidity quality flag (see WOCE Hydrographic Program Quality Flags)	dimensionless

SMDEPTH	SMDEPTH IS SAUNDERS-MANTYLA DEPTH (INTEGRATED; USES DYNAMIC HEIGHT)	METERS
SMDEPTH_FLAG_W	SMDepth quality flag (see WOCE Hydrographic Program Quality Flags)	dimensionless
F_M_DEPTH	FMDEPTH IS FOFONOFF-MILLARD DEPTH (NON-INTEGRATED; ALSO USED BY SBE)	METERS
FMDEPTH_FLAG_W	FMDepth quality flag (see WOCE Hydrographic Program Quality Flags)	dimensionless
CTDNOBS	CTD Number of Observations	dimensionless
CTDETIME	CTD Elapsed Time	SECONDS
ISO_DATE_TIME	Date/Time (ISO formatted)	YYYY-MM-DDTHH:MM:SS[.xx]Z

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Instruments

Dataset-specific Instrument Name	
Generic Instrument Name	Sea-Bird SBE 911plus CTD
Generic Instrument Description	[tethered, real-time] 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

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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/

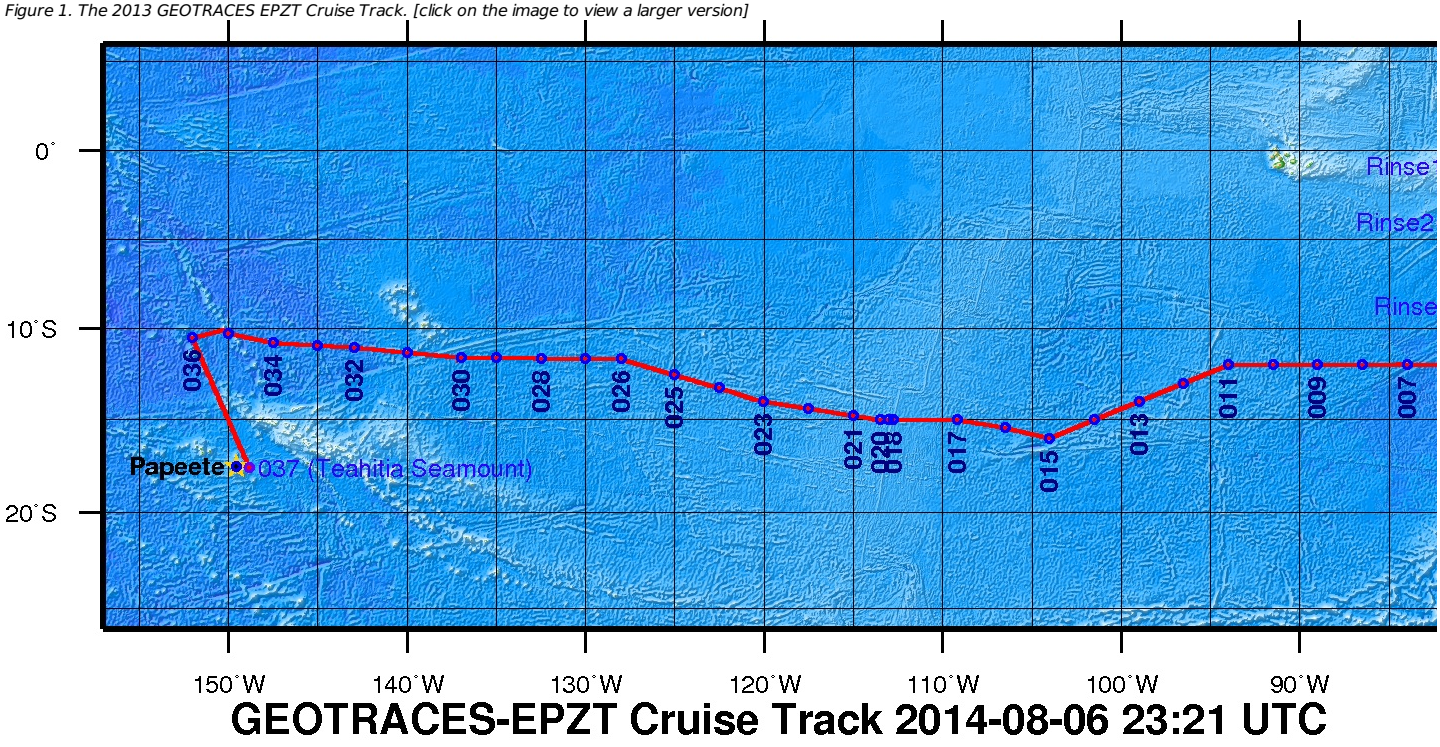
Coverage: Eastern Tropical Pacific - Transect from Peru to Tahiti (GP16)

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]



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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-1235248
NSF Division of Ocean Sciences (NSF OCE)	OCE-1130870

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