ODF bottle data 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)

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Data Type: Cruise Results
Version: 1
Version Date: 2014-10-30

Project
» U.S. GEOTRACES East Pacific Zonal Transect (U.S. GEOTRACES EPZT)

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

Contributors	Affiliation	Role
Moffett, James W.	University of Southern California (USC-HIMS)	Lead Principal Investigator, Contact
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Abstract
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Coverage

Spatial Extent: **N**:-10.224 **E**:-77.3761 **S**:-17.5734 **W**:-152.079
Temporal Extent: 2013-10-29 - 2013-12-20

Dataset Description

CTD bottle data from 30-ODF (Ocean Data Facility 12 bottle, 30 liter Niskin rosette) EPZT Transect. TEI columns are incomplete. Refer to separate TEI datasets from GEOTRACES EPZT for those values.

ODF CTD BOTTLE 20141030ODF

Note: 'FLAG_W' columns = WHP (WOCE Hydrographic Program) quality flags.

Acquisition Description

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. Deep ODF/30L-Niskin casts included a device suspended 20 meters below the rosette, designed either to take a core sample or pick up particulates from the sea floor.

ODF/30L-Niskin Rosette/CTD casts were performed with a package consisting of a 12-bottle rosette frame (SIO/STS), a 12- or 24-place carousel (SBE32) and 12 ea. 30L General Oceanics Niskin-style bottles with an absolute volume of 30L each.

A 12-place carousel was used on station 1, but had repeated trip-confirmation failures during stations 2 and 3. It was replaced with an older 24-place carousel mid-station 3, which resolved the trip-confirmation issues. Prior to station 4, the carousel head was replaced by one with titanium instead of stainless steel latches in order to resolve mechanical tripping issues. This "hybrid" carousel was used successfully for the remainder of the cruise.

Underwater electronic components consisted of a Sea-Bird Electronics CTD (SBE9plus) with dual pumps (SBE5), dual temperature (SBE3plus), reference temperature (SBE35RT), dual conductivity (SBE4C), dissolved oxygen (SBE43), transmissometer (WET Labs C-Star), fluorometer (Seapoint SCF), Oxidation Reduction Potention (ORP) sensor (NOAA), turbidity meter (Seapoint STM11) and altimeter (Simrad 807). A second dissolved oxygen + oxygen temperature sensor (JFE Advantech RINKO-III) was incorporated into the data stream for future sensor evaluation; it was not processed for this cruise. Additionally, an SBE19plus CTD was mounted on the rosette during deep ODF casts for full and super stations beginning with station 25, since it could no longer be deployed on deep McLane pump casts after their wire was damaged.

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.

Pre-cruise laboratory calibrations were applied, then CTD data were processed into a 0.5-second time series, bottle trips were extracted, and a 1-decibar down-cast pressure series of the data was created. The pressure-series data were used by the web service for interactive plots, sections and CTD data distribution. Time-series data, and eventually basic up-cast pressure-series data, were also available for distribution through the website.

SIO/ODF CTD data were examined at the completion of each deployment for clean, corrected sensor response and any calibration shifts. As bottle salinity and oxygen results became available, they were used to refine shipboard conductivity and oxygen sensor calibrations.

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.**

The ODF CTD data files are fully processed for PTCO. Lab calibrations were applied, except for CTDO2; then shipboard corrections were determined and applied to all 4 parameters using ODF software. The PI for ODF CTD and bottle data is:
Dr. James H. Swift (UCSD/SIO) (jswift@ucsd.edu.)
Questions should (also) be directed to: Susan M. Becker, ODF Supervisor (sbecker@ucsd.edu) and Mary C. Johnson, data processor (mcj@ucsd.edu)

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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Parameters

Parameter	Description	Units
EXPOCODE	expedition code assigned by the CCHDO: NODCShipCodeYearMonthDay	text
SECT_ID	cruise section identification number	text
STNNBR	station number	dimensionless
CASTNO	cast number	dimensionless
GEOTRC_EVENTNO	GEOTRACES Event Number	dimensionless
DATE	Station Date (GMT)	YYYYMMDD
TIME	Station Time (GMT)	HHMM
LATITUDE	Station Latitude (South is negative)	decimal degrees
LONGITUDE	Station Longitude (West is negative)	decimal degrees
GEOTRC_SAMPNO	GEOTRACES Sample Number	dimensionless
SAMPNO	sequential sample number within a cast	dimensionless
BTLNBR	Bottle Number	text
BTLNBR_FLAG_W	Bottle Quality Flag	dimensionless
BTL_DATE	Bottle Date (GMT)	YYYYMMDD
BTL_TIME	Bottle Time (GMT)	HHMM
BTL_LAT	Bottle Latitude (South is negative)	decimal degrees
BTL_LON	Bottle Longitude (West is negative)	decimal degrees

ODF_CTDPRS	ODF_CTDPRS is referred to as the ODF software acquisition measurement of pressure.	DBARS
SMDEPTH	SMDEPTH IS SAUNDERS-MANTYLA DEPTH (INTEGRATED; USES DYNAMIC HEIGHT)	METERS
FMDEPTH	FMDEPTH IS FOFONOFF-MILLARD DEPTH (NON-INTEGRATED; ALSO USED BY SBE)	METERS
BTMDEPTH	Bottom Depth	CORR_M
CTDPRS	CTD pressure	DBARS
CTDDEPTH	CTD depth. This is the primary/preferred depth measurement.	METERS
CTDTMP	CTD temperature; ITS-90	degrees celsius
CTDSAL	CTDSAL is the calculated corrected value of salinity derived from the conductivity sensors on the CTD unit at the time of the bottle trip. CTDSAL is compared with SALNTY which is the PSS-78 value measured from the actual samples drawn from the niskin bottles themselves. Reporting both is meant, among other things, as a of show the goodness of fit, source of quality coding and offer alternative for measurements/calculations if one of those values is missing or lacking a good quality code.	PSS-78
CTDSAL_FLAG_W	CTD salinity quality flag	dimensionless
SALNTY	salinity	PSS-78
SALNTY_FLAG_W	salinity quality flag	dimensionless
SALTREF	SELFTREF is salinity reference in TEOS-10 (http://www.teos-10.org/) and defined as absolute salinity units (G/KG) published in 2010. That compared with the classic salinity measurement in practical salinity units (PSS-78).	G/KG

SALTREF_FLAG_W	SALTREF quality flag	dimensionless
CTDOXY	CTD oxygen	UMOL/KG
CTDOXY_FLAG_W	CTD oxygen quality flag	dimensionless
OXYGEN	oxygen	UMOL/KG
OXYGEN_FLAG_W	oxygen quality flag	dimensionless
SILCAT	SILCAT	UMOL/KG
SILCAT_FLAG_W	SILCAT quality flag	dimensionless
NITRAT	NITRAT	UMOL/KG
NITRAT_FLAG_W	NITRAT quality flag	dimensionless
NITRIT	NITRIT	UMOL/KG
NITRIT_FLAG_W	NITRIT quality flag	dimensionless
PHSPHT	PHSPHT	UMOL/KG
PHSPHT_FLAG_W	PHSPHT quality flag	dimensionless
REFTEMP	REFTEMP	ITS-90
REFTEMP_FLAG_W	REFTEMP quality flag	dimensionless
CFC_11	CFC-11	PMOL/KG
CFC_11_FLAG_W	CFC-11 quality flag	dimensionless
CFC_12	CFC-12	PMOL/KG
CFC_12_FLAG_W	CFC-12 quality flag	dimensionless
CFC113	CFC113	PMOL/KG
CFC113_FLAG_W	CFC113 quality flag	dimensionless
SF6	SF6	FMOL/KG
SF6_FLAG_W	SF6 quality flag	dimensionless
TCARBN	TCARBN	UMOL/KG
TCARBN_FLAG_W	TCARBN quality flag	dimensionless
ALKALI	ALKALI	UMOL/KG
ALKALI_FLAG_W	ALKALI quality flag	dimensionless
TRITUM	TRITUM	TU
TRITUM_FLAG_W	TRITUM quality flag	dimensionless
HELIUM	HELIUM	NMOL/KG
HELIUM_FLAG_W	HELIUM quality flag	dimensionless
DELHE3	DELHE3	PERCNT

DELHE3_FLAG_W	DELHE3 quality flag	dimensionless
NEON	NEON	NMOL/KG
NEON_FLAG_W	NEON_FLAG_W	dimensionless
ARGON	ARGON	UMOL/KG
ARGON_FLAG_W	ARGON_FLAG_W	dimensionless
KRYPTON	KRYPTON	NMOL/KG
KRYPTON_FLAG_W	KRYPTON_FLAG_W	dimensionless
XENON	XENON	NMOL/KG
XENON_FLAG_W	XENON_FLAG_W	dimensionless
DELC14	DELC14	/MILLE
DELC14_FLAG_W	DELC14_FLAG_W	dimensionless
DELC13	DELC13	/MILLE
DELC13_FLAG_W	DELC13_FLAG_W	dimensionless
DOC	DOC	UMOL/KG
DOC_FLAG_W	DOC_FLAG_W	dimensionless
D15N_NO3_DISS	D15N-NO3_DISS	/MILLEvsAIR
D15N_NO3_DISS_FLAG_W	D15N-NO3_DISS_FLAG_W	dimensionless
D18O_NO3_DISS	D18O-NO3_DISS	/MILLEvsVSMOW
D18O_NO3_DISS_FLAG_W	D18O-NO3_DISS_FLAG_W	dimensionless
D15N_NO2_DISS	D15N-NO2_DISS	/MILLEvsAIR
D15N_NO2_DISS_FLAG_W	D15N-NO2_DISS_FLAG_W	dimensionless
D18O_NO2_DISS	D18O-NO2_DISS	/MILLEvsVSMOW
D18O_NO2_DISS_FLAG_W	D18O-NO2_DISS_FLAG_W	dimensionless
NO2_CASC	NO2_CASC	UMOL/KG
NO2_CASC_FLAG_W	NO2_CASC_FLAG_W	dimensionless
N2_AR_DISS	N2_AR_DISS	N/A
N2_AR_DISS_FLAG_W	N2_AR_DISS_FLAG_W	dimensionless
D15N_N2_DISS	D15N-N2_DISS	0/00vsAIR
D15N_N2_DISS_FLAG_W	D15N-N2_DISS_FLAG_W	dimensionless
D15N_bulk_N2O_DISS	D15N(bulk)-N2O_DISS	/MILLEvsAIR
D15N_bulk_N2O_DISS_FLAG_W	D15N(bulk)-N2O_DISS_FLAG_W	dimensionless

D15N_a_N2O_DISS	D15N(a)-N2O_DISS	/MILLEvsAIR
D15N_a_N2O_DISS_FLAG_W	D15N(a)-N2O_DISS_FLAG_W	dimensionless
D15N_b_N2O_DISS	D15N(b)-N2O_DISS	/MILLEvsAIR
D15N_b_N2O_DISS_FLAG_W	D15N(b)-N2O_DISS_FLAG_W	dimensionless
D18O_N2O_DISS	D18O-N2O_DISS	/MILLEvsVSMOW
D18O_N2O_DISS_FLAG_W	D18O-N2O_DISS_FLAG_W	dimensionless
N2O_DISS	N2O_DISS	NMOL/KG
N2O_DISS_FLAG_W	N2O_DISS_FLAG_W	dimensionless
SI_SW_DISS	SI_SW_DISS	/MILLEvsNBS28
SI_SW_DISS_FLAG_W	SI_SW_DISS_FLAG_W	dimensionless
SILCAT_BRZ	SILCAT_BRZ	UMOL/KG
SILCAT_BRZ_FLAG_W	SILCAT_BRZ_FLAG_W	dimensionless
THIOL_CYSTEINE	THIOL_CYSTEINE	PMOL/L
THIOL_CYSTEINE_FLAG_W	THIOL_CYSTEINE_FLAG_W	dimensionless
THIOL_GLUTATHIONE	THIOL_GLUTATHIONE	PMOL/L
THIOL_GLUTATHIONE_FLAG_W	THIOL_GLUTATHIONE_FLAG_W	dimensionless
THIOL_GAMMA_GLU_CYST	THIOL_GAMMA-GLU-CYST	PMOL/L
THIOL_GAMMA_GLU_CYST_FLAG_W	THIOL_GAMMA-GLU-CYST_FLAG_W	dimensionless
THIOL_ARG_CYS	THIOL_ARG-CYS	PMOL/L
THIOL_ARG_CYS_FLAG_W	THIOL_ARG-CYS_FLAG_W	dimensionless
THIOL_HOMOCYSTEINE	THIOL_HOMOCYSTEINE	PMOL/L
THIOL_HOMOCYSTEINE_FLAG_W	THIOL_HOMOCYSTEINE_FLAG_W	dimensionless
TH_232_DISS	TH-232_DISS	PG/KG
TH_232_DISS_FLAG_W	TH-232_DISS_FLAG_W	dimensionless
TH_232_COLL	TH-232_COLL	FG/ML
TH_232_COLL_FLAG_W	TH-232_COLL_FLAG_W	dimensionless
TH_230_DISS	TH-230_DISS	FG/KG
TH_230_DISS_FLAG_W	TH-230_DISS_FLAG_W	dimensionless
PA_231_DISS	PA-231_DISS	FG/KG
PA_231_DISS_FLAG_W	PA-231_DISS_FLAG_W	dimensionless

PA_231_COLL	PA-231_COLL	FG/ML
PA_231_COLL_FLAG_W	PA-231_COLL_FLAG_W	dimensionless
ND_143_to_ND_144_DISS	ND-143/ND-144_DISS	RATIO
ND_143_to_ND_144_DISS_FLAG_W	ND-143/ND-144_DISS_FLAG_W	dimensionless
EPSILON_ND_DISS	EPSILON_ND_DISS	n/a
EPSILON_ND_DISS_FLAG_W	EPSILON_ND_DISS_FLAG_W	dimensionless
REE_LA_DISS	REE_LA_DISS	PMOL/KG
REE_LA_DISS_FLAG_W	REE_LA_DISS_FLAG_W	dimensionless
REE_CE_DISS	REE_CE_DISS	PMOL/KG
REE_CE_DISS_FLAG_W	REE_CE_DISS_FLAG_W	dimensionless
REE_PR_DISS	REE_PR_DISS	PMOL/KG
REE_PR_DISS_FLAG_W	REE_PR_DISS_FLAG_W	dimensionless
REE_ND_DISS	REE_ND_DISS	PMOL/KG
REE_ND_DISS_FLAG_W	REE_ND_DISS_FLAG_W	dimensionless
REE_SM_DISS	REE_SM_DISS	PMOL/KG
REE_SM_DISS_FLAG_W	REE_SM_DISS_FLAG_W	dimensionless
REE_EU_DISS	REE_EU_DISS	PMOL/KG
REE_EU_DISS_FLAG_W	REE_EU_DISS_FLAG_W	dimensionless
REE_GD_DISS	REE_GD_DISS	PMOL/KG
REE_GD_DISS_FLAG_W	REE_GD_DISS_FLAG_W	dimensionless
REE_TB_DISS	REE_TB_DISS	PMOL/KG
REE_TB_DISS_FLAG_W	REE_TB_DISS_FLAG_W	dimensionless
REE_DY_DISS	REE_DY_DISS	PMOL/KG
REE_DY_DISS_FLAG_W	REE_DY_DISS_FLAG_W	dimensionless
REE_HO_DISS	REE_HO_DISS	PMOL/KG
REE_HO_DISS_FLAG_W	REE_HO_DISS_FLAG_W	dimensionless
REE_ER_DISS	REE_ER_DISS	PMOL/KG
REE_ER_DISS_FLAG_W	REE_ER_DISS_FLAG_W	dimensionless
REE_TM_DISS	REE_TM_DISS	PMOL/KG
REE_TM_DISS_FLAG_W	REE_TM_DISS_FLAG_W	dimensionless
REE_YB_DISS	REE_YB_DISS	PMOL/KG
REE_YB_DISS_FLAG_W	REE_YB_DISS_FLAG_W	dimensionless

REE_LU_DISS	REE_LU_DISS	PMOL/KG
REE_LU_DISS_FLAG_W	REE_LU_DISS_FLAG_W	dimensionless
PO_210_DISS	PO-210_DISS	DPM/100L
PO_210_DISS_FLAG_W	PO-210_DISS_FLAG_W	dimensionless
PB_210_DISS	PB-210_DISS	DPM/100L
PB_210_DISS_FLAG_W	PB-210_DISS_FLAG_W	dimensionless
PU_239_PU_240_DISS	PU-239_PU-240_DISS	MBQ/KG
PU_239_PU_240_DISS_FLAG_W	PU-239_PU-240_DISS_FLAG_W	dimensionless
PU_239_DISS	PU-239_DISS	ATOMS/KG
PU_239_DISS_FLAG_W	PU-239_DISS_FLAG_W	dimensionless
PU_240_DISS	PU-240_DISS	ATOMS/KG
PU_240_DISS_FLAG_W	PU-240_DISS_FLAG_W	dimensionless
PU_240_to_PU_239_DISS	PU-240/PU-239_DISS	RATIO
PU_240_to_PU_239_DISS_FLAG_W	PU-240/PU-239_DISS_FLAG_W	dimensionless
NP_237_DISS	NP-237_DISS	ATOMS/KG
NP_237_DISS_FLAG_W	NP-237_DISS_FLAG_W	dimensionless
CS_137_DISS	CS-137_DISS	BQ/KG
CS_137_DISS_FLAG_W	CS-137_DISS_FLAG_W	dimensionless
CS_134_DISS	CS-134_DISS	BQ/KG
CS_134_DISS_FLAG_W	CS-134_DISS_FLAG_W	dimensionless
SR_90_DISS	SR-90_DISS	BQ/KG
SR_90_DISS_FLAG_W	SR-90_DISS_FLAG_W	dimensionless
I_129_DISS	I-129_DISS	ATOMS/KG
I_129_DISS_FLAG_W	I-129_DISS_FLAG_W	dimensionless
U_236_DISS	U-236_DISS	ATOMS/KG
U_236_DISS_FLAG_W	U-236_DISS_FLAG_W	dimensionless
U_238_DISS	U-238_DISS	UG/KG
U_238_DISS_FLAG_W	U-238_DISS_FLAG_W	dimensionless
U_236_to_U_238_DISS	U-236/U-238_DISS	RATIO
U_236_to_U_238_DISS_FLAG_W	U-236/U-238_DISS_FLAG_W	dimensionless
TH_234	TH-234	DPM/L

TH_234_FLAG_W	TH-234_FLAG_W	dimensionless
RA_226	RA-226	DPM/100L
RA_226_FLAG_W	RA-226_FLAG_W	dimensionless
PIGM_CHLIDEA	PIGM_CHLIDEA	NG/L
PIGM_CHLIDEA_FLAG_W	PIGM_CHLIDEA_FLAG_W	dimensionless
PIGM_CHLC	PIGM_CHLC	NG/L
PIGM_CHLC_FLAG_W	PIGM_CHLC_FLAG_W	dimensionless
PIGM_PER	PIGM_PER	NG/L
PIGM_PER_FLAG_W	PIGM_PER_FLAG_W	dimensionless
PIGM_BUT	PIGM_BUT	NG/L
PIGM_BUT_FLAG_W	PIGM_BUT_FLAG_W	dimensionless
PIGM_FUCO	PIGM_FUCO	NG/L
PIGM_FUCO_FLAG_W	PIGM_FUCO_FLAG_W	dimensionless
PIGM_HEX	PIGM_HEX	NG/L
PIGM_HEX_FLAG_W	PIGM_HEX_FLAG_W	dimensionless
PIGM_VIOL	PIGM_VIOL	NG/L
PIGM_VIOL_FLAG_W	PIGM_VIOL_FLAG_W	dimensionless
PIGM_DDX	PIGM_DDX	NG/L
PIGM_DDX_FLAG_W	PIGM_DDX_FLAG_W	dimensionless
PIGM_ALLOX	PIGM_ALLOX	NG/L
PIGM_ALLOX_FLAG_W	PIGM_ALLOX_FLAG_W	dimensionless
PIGM_DTX	PIGM_DTX	NG/L
PIGM_DTX_FLAG_W	PIGM_DTX_FLAG_W	dimensionless
PIGM_LUT	PIGM_LUT	NG/L
PIGM_LUT_FLAG_W	PIGM_LUT_FLAG_W	dimensionless
PIGM_ZEA	PIGM_ZEA	NG/L
PIGM_ZEA_FLAG_W	PIGM_ZEA_FLAG_W	dimensionless
PIGM_CHLB	PIGM_CHLB	NG/L
PIGM_CHLB_FLAG_W	PIGM_CHLB_FLAG_W	dimensionless
PIGM_ACAR	PIGM_ACAR	NG/L
PIGM_ACAR_FLAG_W	PIGM_ACAR_FLAG_W	dimensionless

PIGM_BCAR	PIGM_BCAR	NG/L
PIGM_BCAR_FLAG_W	PIGM_BCAR_FLAG_W	dimensionless
PIGM_DVCHLA	PIGM_DVCHLA	NG/L
PIGM_DVCHLA_FLAG_W	PIGM_DVCHLA_FLAG_W	dimensionless
PIGM_MVCHLA	PIGM_MVCHLA	NG/L
PIGM_MVCHLA_FLAG_W	PIGM_MVCHLA_FLAG_W	dimensionless
PIGM_TCHLA	PIGM_TCHLA	NG/L
PIGM_TCHLA_FLAG_W	PIGM_TCHLA_FLAG_W	dimensionless
FE_II_DISS_FILT	FE_II_DISS_FILT	NMOL/L
FE_II_DISS_FILT_FLAG_W	FE_II_DISS_FILT_FLAG_W	dimensionless
AL_TOT_DISS_NOAA	AL_TOT_DISS_NOAA	NMOL/L
AL_TOT_DISS_NOAA_FLAG_W	AL_TOT_DISS_NOAA_FLAG_W	dimensionless
FE_TOT_DISS_NOAA	FE_TOT_DISS_NOAA	NMOL/L
FE_TOT_DISS_NOAA_FLAG_W	FE_TOT_DISS_NOAA_FLAG_W	dimensionless
MN_TOT_DISS_NOAA	MN_TOT_DISS_NOAA	NMOL/L
MN_TOT_DISS_NOAA_FLAG_W	MN_TOT_DISS_NOAA_FLAG_W	dimensionless
TH_232_SED	TH-232_SED	DPM/G
TH_232_SED_FLAG_W	TH-232_SED_FLAG_W	dimensionless
TH_230_SED	TH-230_SED	DPM/G
TH_230_SED_FLAG_W	TH-230_SED_FLAG_W	dimensionless
PA_231_SED	PA-231_SED	DPM/G
PA_231_SED_FLAG_W	PA-231_SED_FLAG_W	dimensionless
U_234_SED	U-234_SED	DPM/G
U_234_SED_FLAG_W	U-234_SED_FLAG_W	dimensionless
U_238_SED	U-238_SED	DPM/G
U_238_SED_FLAG_W	U-238_SED_FLAG_W	dimensionless
ND_143_to_ND_144_SED	ND-143/ND-144_SED	RATIO
ND_143_to_ND_144_SED_FLAG_W	ND-143/ND-144_SED_FLAG_W	dimensionless
EPSILON_ND_SED	EPSILON_ND_SED	n/a
EPSILON_ND_SED_FLAG_W	EPSILON_ND_SED_FLAG_W	dimensionless
TONER_SED	TONER_SED	TBA

TONER_SED_FLAG_W	TONER_SED_FLAG_W	dimensionless
BE_PART_TOTAL	BE_PART_TOTAL	PMOL/L
BE_PART_TOTAL_FLAG_W	BE_PART_TOTAL_FLAG_W	dimensionless
MG_PART_TOTAL	MG_PART_TOTAL	PMOL/L
MG_PART_TOTAL_FLAG_W	MG_PART_TOTAL_FLAG_W	dimensionless
AL_PART_TOTAL	AL_PART_TOTAL	PMOL/L
AL_PART_TOTAL_FLAG_W	AL_PART_TOTAL_FLAG_W	dimensionless
P_PART_TOTAL	P_PART_TOTAL	PMOL/L
P_PART_TOTAL_FLAG_W	P_PART_TOTAL_FLAG_W	dimensionless
CA_PART_TOTAL	CA_PART_TOTAL	PMOL/L
CA_PART_TOTAL_FLAG_W	CA_PART_TOTAL_FLAG_W	dimensionless
TI_PART_TOTAL	TI_PART_TOTAL	PMOL/L
TI_PART_TOTAL_FLAG_W	TI_PART_TOTAL_FLAG_W	dimensionless
V_PART_TOTAL	V_PART_TOTAL	PMOL/L
V_PART_TOTAL_FLAG_W	V_PART_TOTAL_FLAG_W	dimensionless
CR_PART_TOTAL	CR_PART_TOTAL	PMOL/L
CR_PART_TOTAL_FLAG_W	CR_PART_TOTAL_FLAG_W	dimensionless
MN_PART_TOTAL	MN_PART_TOTAL	PMOL/L
MN_PART_TOTAL_FLAG_W	MN_PART_TOTAL_FLAG_W	dimensionless
FE_PART_TOTAL	FE_PART_TOTAL	PMOL/L
FE_PART_TOTAL_FLAG_W	FE_PART_TOTAL_FLAG_W	dimensionless
CO_PART_TOTAL	CO_PART_TOTAL	PMOL/L
CO_PART_TOTAL_FLAG_W	CO_PART_TOTAL_FLAG_W	dimensionless
NI_PART_TOTAL	NI_PART_TOTAL	PMOL/L
NI_PART_TOTAL_FLAG_W	NI_PART_TOTAL_FLAG_W	dimensionless
CU_PART_TOTAL	CU_PART_TOTAL	PMOL/L
CU_PART_TOTAL_FLAG_W	CU_PART_TOTAL_FLAG_W	dimensionless
ZN_PART_TOTAL	ZN_PART_TOTAL	PMOL/L
ZN_PART_TOTAL_FLAG_W	ZN_PART_TOTAL_FLAG_W	dimensionless
AS_PART_TOTAL	AS_PART_TOTAL	PMOL/L
AS_PART_TOTAL_FLAG_W	AS_PART_TOTAL_FLAG_W	dimensionless

RB_PART_TOTAL	RB_PART_TOTAL	PMOL/L
RB_PART_TOTAL_FLAG_W	RB_PART_TOTAL_FLAG_W	dimensionless
SR_PART_TOTAL	SR_PART_TOTAL	PMOL/L
SR_PART_TOTAL_FLAG_W	SR_PART_TOTAL_FLAG_W	dimensionless
Y_PART_TOTAL	Y_PART_TOTAL	PMOL/L
Y_PART_TOTAL_FLAG_W	Y_PART_TOTAL_FLAG_W	dimensionless
ZR_PART_TOTAL	ZR_PART_TOTAL	PMOL/L
ZR_PART_TOTAL_FLAG_W	ZR_PART_TOTAL_FLAG_W	dimensionless
MO_PART_TOTAL	MO_PART_TOTAL	PMOL/L
MO_PART_TOTAL_FLAG_W	MO_PART_TOTAL_FLAG_W	dimensionless
AG_PART_TOTAL	AG_PART_TOTAL	PMOL/L
AG_PART_TOTAL_FLAG_W	AG_PART_TOTAL_FLAG_W	dimensionless
CD_PART_TOTAL	CD_PART_TOTAL	PMOL/L
CD_PART_TOTAL_FLAG_W	CD_PART_TOTAL_FLAG_W	dimensionless
SN_PART_TOTAL	SN_PART_TOTAL	PMOL/L
SN_PART_TOTAL_FLAG_W	SN_PART_TOTAL_FLAG_W	dimensionless
SB_PART_TOTAL	SB_PART_TOTAL	PMOL/L
SB_PART_TOTAL_FLAG_W	SB_PART_TOTAL_FLAG_W	dimensionless
BA_PART_TOTAL	BA_PART_TOTAL	PMOL/L
BA_PART_TOTAL_FLAG_W	BA_PART_TOTAL_FLAG_W	dimensionless
REE_LA_PART_TOTAL	REE_LA_PART_TOTAL	PMOL/L
REE_LA_PART_TOTAL_FLAG_W	REE_LA_PART_TOTAL_FLAG_W	dimensionless
REE_CE_PART_TOTAL	REE_CE_PART_TOTAL	PMOL/L
REE_CE_PART_TOTAL_FLAG_W	REE_CE_PART_TOTAL_FLAG_W	dimensionless
REE_PR_PART_TOTAL	REE_PR_PART_TOTAL	PMOL/L
REE_PR_PART_TOTAL_FLAG_W	REE_PR_PART_TOTAL_FLAG_W	dimensionless
REE_ND_PART_TOTAL	REE_ND_PART_TOTAL	PMOL/L
REE_ND_PART_TOTAL_FLAG_W	REE_ND_PART_TOTAL_FLAG_W	dimensionless
REE_SM_PART_TOTAL	REE_SM_PART_TOTAL	PMOL/L
REE_SM_PART_TOTAL_FLAG_W	REE_SM_PART_TOTAL_FLAG_W	dimensionless
REE_EU_PART_TOTAL	REE_EU_PART_TOTAL	PMOL/L

REE_EU_PART_TOTAL_FLAG_W	REE_EU_PART_TOTAL_FLAG_W	dimensionless
REE_GD_PART_TOTAL	REE_GD_PART_TOTAL	PMOL/L
REE_GD_PART_TOTAL_FLAG_W	REE_GD_PART_TOTAL_FLAG_W	dimensionless
REE_TB_PART_TOTAL	REE_TB_PART_TOTAL	PMOL/L
REE_TB_PART_TOTAL_FLAG_W	REE_TB_PART_TOTAL_FLAG_W	dimensionless
REE_DY_PART_TOTAL	REE_DY_PART_TOTAL	PMOL/L
REE_DY_PART_TOTAL_FLAG_W	REE_DY_PART_TOTAL_FLAG_W	dimensionless
REE_HO_PART_TOTAL	REE_HO_PART_TOTAL	PMOL/L
REE_HO_PART_TOTAL_FLAG_W	REE_HO_PART_TOTAL_FLAG_W	dimensionless
REE_ER_PART_TOTAL	REE_ER_PART_TOTAL	PMOL/L
REE_ER_PART_TOTAL_FLAG_W	REE_ER_PART_TOTAL_FLAG_W	dimensionless
REE_TM_PART_TOTAL	REE_TM_PART_TOTAL	PMOL/L
REE_TM_PART_TOTAL_FLAG_W	REE_TM_PART_TOTAL_FLAG_W	dimensionless
REE_YB_PART_TOTAL	REE_YB_PART_TOTAL	PMOL/L
REE_YB_PART_TOTAL_FLAG_W	REE_YB_PART_TOTAL_FLAG_W	dimensionless
REE_LU_PART_TOTAL	REE_LU_PART_TOTAL	PMOL/L
REE_LU_PART_TOTAL_FLAG_W	REE_LU_PART_TOTAL_FLAG_W	dimensionless
PB_PART_TOTAL	PB_PART_TOTAL	PMOL/L
PB_PART_TOTAL_FLAG_W	PB_PART_TOTAL_FLAG_W	dimensionless
TH_232_PART_TOTAL	TH-232_PART_TOTAL	PMOL/L
TH_232_PART_TOTAL_FLAG_W	TH-232_PART_TOTAL_FLAG_W	dimensionless
U_PART_TOTAL	U_PART_TOTAL	PMOL/L
U_PART_TOTAL_FLAG_W	U_PART_TOTAL_FLAG_W	dimensionless
BE_PART_LABILE	BE_PART_LABILE	PMOL/L
BE_PART_LABILE_FLAG_W	BE_PART_LABILE_FLAG_W	dimensionless
MG_PART_LABILE	MG_PART_LABILE	PMOL/L
MG_PART_LABILE_FLAG_W	MG_PART_LABILE_FLAG_W	dimensionless
AL_PART_LABILE	AL_PART_LABILE	PMOL/L
AL_PART_LABILE_FLAG_W	AL_PART_LABILE_FLAG_W	dimensionless
P_PART_LABILE	P_PART_LABILE	PMOL/L
P_PART_LABILE_FLAG_W	P_PART_LABILE_FLAG_W	dimensionless

CA_PART_LABILE	CA_PART_LABILE	PMOL/L
CA_PART_LABILE_FLAG_W	CA_PART_LABILE_FLAG_W	dimensionless
TI_PART_LABILE	TI_PART_LABILE	PMOL/L
TI_PART_LABILE_FLAG_W	TI_PART_LABILE_FLAG_W	dimensionless
V_PART_LABILE	V_PART_LABILE	PMOL/L
V_PART_LABILE_FLAG_W	V_PART_LABILE_FLAG_W	dimensionless
CR_PART_LABILE	CR_PART_LABILE	PMOL/L
CR_PART_LABILE_FLAG_W	CR_PART_LABILE_FLAG_W	dimensionless
MN_PART_LABILE	MN_PART_LABILE	PMOL/L
MN_PART_LABILE_FLAG_W	MN_PART_LABILE_FLAG_W	dimensionless
FE_PART_LABILE	FE_PART_LABILE	PMOL/L
FE_PART_LABILE_FLAG_W	FE_PART_LABILE_FLAG_W	dimensionless
CO_PART_LABILE	CO_PART_LABILE	PMOL/L
CO_PART_LABILE_FLAG_W	CO_PART_LABILE_FLAG_W	dimensionless
NI_PART_LABILE	NI_PART_LABILE	PMOL/L
NI_PART_LABILE_FLAG_W	NI_PART_LABILE_FLAG_W	dimensionless
CU_PART_LABILE	CU_PART_LABILE	PMOL/L
CU_PART_LABILE_FLAG_W	CU_PART_LABILE_FLAG_W	dimensionless
ZN_PART_LABILE	ZN_PART_LABILE	PMOL/L
ZN_PART_LABILE_FLAG_W	ZN_PART_LABILE_FLAG_W	dimensionless
AS_PART_LABILE	AS_PART_LABILE	PMOL/L
AS_PART_LABILE_FLAG_W	AS_PART_LABILE_FLAG_W	dimensionless
RB_PART_LABILE	RB_PART_LABILE	PMOL/L
RB_PART_LABILE_FLAG_W	RB_PART_LABILE_FLAG_W	dimensionless
SR_PART_LABILE	SR_PART_LABILE	PMOL/L
SR_PART_LABILE_FLAG_W	SR_PART_LABILE_FLAG_W	dimensionless
Y_PART_LABILE	Y_PART_LABILE	PMOL/L
Y_PART_LABILE_FLAG_W	Y_PART_LABILE_FLAG_W	dimensionless
ZR_PART_LABILE	ZR_PART_LABILE	PMOL/L
ZR_PART_LABILE_FLAG_W	ZR_PART_LABILE_FLAG_W	dimensionless
MO_PART_LABILE	MO_PART_LABILE	PMOL/L

MO_PART_LABILE_FLAG_W	MO_PART_LABILE_FLAG_W	dimensionless
AG_PART_LABILE	AG_PART_LABILE	PMOL/L
AG_PART_LABILE_FLAG_W	AG_PART_LABILE_FLAG_W	dimensionless
CD_PART_LABILE	CD_PART_LABILE	PMOL/L
CD_PART_LABILE_FLAG_W	CD_PART_LABILE_FLAG_W	dimensionless
SN_PART_LABILE	SN_PART_LABILE	PMOL/L
SN_PART_LABILE_FLAG_W	SN_PART_LABILE_FLAG_W	dimensionless
SB_PART_LABILE	SB_PART_LABILE	PMOL/L
SB_PART_LABILE_FLAG_W	SB_PART_LABILE_FLAG_W	dimensionless
BA_PART_LABILE	BA_PART_LABILE	PMOL/L
BA_PART_LABILE_FLAG_W	BA_PART_LABILE_FLAG_W	dimensionless
REE_LA_PART_LABILE	REE_LA_PART_LABILE	PMOL/L
REE_LA_PART_LABILE_FLAG_W	REE_LA_PART_LABILE_FLAG_W	dimensionless
REE_CE_PART_LABILE	REE_CE_PART_LABILE	PMOL/L
REE_CE_PART_LABILE_FLAG_W	REE_CE_PART_LABILE_FLAG_W	dimensionless
REE_PR_PART_LABILE	REE_PR_PART_LABILE	PMOL/L
REE_PR_PART_LABILE_FLAG_W	REE_PR_PART_LABILE_FLAG_W	dimensionless
REE_ND_PART_LABILE	REE_ND_PART_LABILE	PMOL/L
REE_ND_PART_LABILE_FLAG_W	REE_ND_PART_LABILE_FLAG_W	dimensionless
REE_SM_PART_LABILE	REE_SM_PART_LABILE	PMOL/L
REE_SM_PART_LABILE_FLAG_W	REE_SM_PART_LABILE_FLAG_W	dimensionless
REE_EU_PART_LABILE	REE_EU_PART_LABILE	PMOL/L
REE_EU_PART_LABILE_FLAG_W	REE_EU_PART_LABILE_FLAG_W	dimensionless
REE_GD_PART_LABILE	REE_GD_PART_LABILE	PMOL/L
REE_GD_PART_LABILE_FLAG_W	REE_GD_PART_LABILE_FLAG_W	dimensionless
REE_TB_PART_LABILE	REE_TB_PART_LABILE	PMOL/L
REE_TB_PART_LABILE_FLAG_W	REE_TB_PART_LABILE_FLAG_W	dimensionless
REE_DY_PART_LABILE	REE_DY_PART_LABILE	PMOL/L
REE_DY_PART_LABILE_FLAG_W	REE_DY_PART_LABILE_FLAG_W	dimensionless
REE_HO_PART_LABILE	REE_HO_PART_LABILE	PMOL/L
REE_HO_PART_LABILE_FLAG_W	REE_HO_PART_LABILE_FLAG_W	dimensionless

REE_ER_PART_LABILE	REE_ER_PART_LABILE	PMOL/L
REE_ER_PART_LABILE_FLAG_W	REE_ER_PART_LABILE_FLAG_W	dimensionless
REE_TM_PART_LABILE	REE_TM_PART_LABILE	PMOL/L
REE_TM_PART_LABILE_FLAG_W	REE_TM_PART_LABILE_FLAG_W	dimensionless
REE_YB_PART_LABILE	REE_YB_PART_LABILE	PMOL/L
REE_YB_PART_LABILE_FLAG_W	REE_YB_PART_LABILE_FLAG_W	dimensionless
REE_LU_PART_LABILE	REE_LU_PART_LABILE	PMOL/L
REE_LU_PART_LABILE_FLAG_W	REE_LU_PART_LABILE_FLAG_W	dimensionless
PB_PART_LABILE	PB_PART_LABILE	PMOL/L
PB_PART_LABILE_FLAG_W	PB_PART_LABILE_FLAG_W	dimensionless
TH_232_PART_LABILE	TH-232_PART_LABILE	PMOL/L
TH_232_PART_LABILE_FLAG_W	TH-232_PART_LABILE_FLAG_W	dimensionless
U_PART_LABILE	U_PART_LABILE	PMOL/L
U_PART_LABILE_FLAG_W	U_PART_LABILE_FLAG_W	dimensionless
ISO_DATETIME	Date/Time (ISO formatted)	YYYY-MM-DDTHH:MM:SS[.xx]Z
BTL_ISO_DATETIME	Date/Time of bottle firing (ISO formatted)	unitless

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Instruments

Dataset-specific Instrument Name	GO-FLO
Generic Instrument Name	GO-FLO Bottle
Dataset-specific Description	CTD bottle data from 30-ODF/SIOR (Ocean Data Facility 12 bottle, 30 liter Niskin rosette)
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	Niskin bottle
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.

Dataset-specific Instrument Name	
Generic Instrument Name	CTD Sea-Bird SBE 911plus
Generic Instrument Description	The Sea-Bird SBE 911plus is a type of CTD instrument package for continuous measurement of conductivity, temperature and pressure. The SBE 911plus 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 9plus and SBE 11plus is called a SBE 911plus. The SBE 9plus uses Sea-Bird's standard modular temperature and conductivity sensors (SBE 3plus and SBE 4). The SBE 9plus 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] Original data are available from the NSF R2R data catalog

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Project Information

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

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

Coverage: Eastern Tropical Pacific - Transect from Peru to Tahiti

From the NSF Award Abstract The mission of the International GEOTRACES Program (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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