

# ODF bottle data along with US GEOTRACES North Atlantic Transect from the R/V Knorr KN199-04 cruise in the subtropical N. Atlantic during 2010 (U.S. GEOTRACES NAT project)

**Website:** <https://www.bco-dmo.org/dataset/3519>

**Data Type:** Cruise Results

**Version:** 4

**Version Date:** 2013-02-13

## Project

» [U.S. GEOTRACES North Atlantic Transect \(GA03\)](#) (U.S. GEOTRACES NAT)

## Program

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

Contributors	Affiliation	Role
<a href="#">Jenkins, William J.</a>	Woods Hole Oceanographic Institution (WHOI)	Principal Investigator, Contact
<a href="#">Boyle, Edward A.</a>	Massachusetts Institute of Technology (MIT)	Co-Principal Investigator
<a href="#">Cutter, Gregory A.</a>	Old Dominion University (ODU)	Co-Principal Investigator
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## Abstract

ODF bottle data along with US GEOTRACES North Atlantic Transect from the R/V Knorr KN199-04 cruise in the subtropical N. Atlantic during 2010.

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## Table of Contents

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

## Coverage

**Spatial Extent:** N:38.3334 E:-9.66 S:17.3497 W:-24.5329

**Temporal Extent:** 2010-10-16 - 2010-11-03

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## Dataset Description

CTD bottle data from 30-ODF/SIOR (Ocean Data Facility 12 bottle, 30 liter Niskin rosette) GT10 Transect.

## Methods & Sampling

"Filtered samples for non-contamination prone elements were collected from the ODF Niskin rosette (12 x 30L Niskin bottles) using AcroPak 500 filter cartridges with a Supor 0.45/0.8µm membrane attached to Teflon-lined

Tygon tubing." (from KN199-04 cruise report). Refer to th KN199-04 Cruise Report for detailed descriptions of acquisition and processing methodologies.

## Data Processing Description

Refer to th KN199-04 Cruise Report for detailed descriptions of acquisition and processing methodologies.

Note: 'FLAG\_W' columns = WHP (WOCE Hydrographic Program) quality flags.

Processing Notes:

13 Feb 2013: BCO-DMO corrected the event numbers of several CTD casts. The correct event numbers were verified in the original cast sheets. Edits made:

Changed event number of station 2 cast 1 from 2022 to 2042;

Changed event number of station 4 cast 1 from 2024 to 2072;

Changed event number of station 5 cast 4 from 2075 to 2091;

Changed event number of station 7 cast 6 from 2107 to 2132;

Changed event number of station 9 cast 1 from 2009 to 2162;

Changed event number of station 9 cast 3 from 2059 to 2165.

The restriction on this dataset was removed according to instructions from the Chief Scientist, April 26, 2013.

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

## Data Files

File
<b>CTD_ODF_Bottle_GT10.csv</b> (Comma Separated Values (.csv), 298.79 KB) MD5:833243cd24f03e42ec7d02bcde781789
Primary data file for dataset ID 3519

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

## Parameters

Parameter	Description	Units
EXPCODE	Expedition code assigned by the CCHDO: NODCSHIPCodeYearMonthDay	text
SECT_ID	Synonym for cruise.	text
STNNBR	Station number.	integer
CASTNO	Cast number.	integer
GEOTRC_EVENTNO	GEOTRACES Event Number.	integer
DATE	Date (UTC). in the format YYYYMMDD	unitless
TIME	Time (UTC). in the format HHMM	unitless
LATITUDE	Latitude (South is negative).	decimal degrees
LONGITUDE	Longitude (West is negative).	decimal degrees
GEOTRC_SAMPNO	GEOTRACES sample number.	integer
SAMPNO	Sample number.	integer
BTLNBR	Bottle identification number.	text
BTLNBR_FLAT_W	Bottle quality flag.	integer
BTO_DATE	Bottle sampling date. in the format YYYYMMDD	unitless

BTL_TIME	Bottle collection time. in the format HHMM	unitless
BTL_LAT	Bottle latitude (South is negative).	decimal degrees
BTL_LON	Bottle longitude (West is negative).	decimal degrees
BTMDEPTH	Bottom depth.	meters, corrected
CTDPRS	CTD pressure.	decibars
CTDDEPTH	CTD depth.	meters
CTDTMP	CTD temperature.	ITS-90
CTDSAL	CTD salinity.	PSS-78
CTDSAL_FLAG_W	Quality flag for CTDSAL.	integer
SALNTY	Bottle salinity.	PSS-78
SALNTY_FLAG_W	Quality flag for SALINITY.	integer
CTDOXY	CTD Oxygen in micromoles per kilogram.	umol/kg
CTDOXY_FLAG_W	Quality flag for CTDOXY.	integer
OXYGEN	Bottle oxygen measured in micromoles per kilogram.	umol/kg
OXYGEN_FLAG_W	OXYGEN FLAG W	integer
SILCAT	Silicate.	umol/kg
SILCAT_FLAG_W	Quality flag for SILCAT.	integer
NITRAT	Nitrate.	umol/kg
NITRAT_FLAG_W	Quality flag for NITRAT.	integer
NITRIT	Nitrite.	umol/kg
NITRIT_FLAG_W	Quality flag for NITRIT.	integer
PHSPHT	Phosphate.	umol/kg
PHSPHT_FLAG_W	Quality flag for PHSPHT.	integer
REFTEMP	REFTEMP	ITS-90
REFTEMP_FLAG_W	REFTEMP FLAG W	integer
CFC_11	CFC 11 (trichlorofluoromethane) in picomoles per kilogram.	pmol/kg
CFC_11_FLAG_W	Quality flag for CFC_11.	integer
CFC_12	CFC 12 (Dichlorodifluoromethane) in picomoles per kilogram.	pmol/kg
CFC_12_FLAG_W	Quality flag for CFC_12.	integer
CFC113	CFC-113 (Trichlorotrifluoroethane) in picomoles per kilogram.	pmol/kg
CFC113_FLAG_W	Quality flag for CFC113.	integer
SF6	SF6 (Sulfur hexafluoride) in fmol per kilogram.	fmol/kg
SF6_FLAG_W	Quality flag for SF6.	integer
TCARBN_M	TCARBN M	UMOL/KG
TCARBN_M_FLAG_W	TCARBN M FLAG W	integer
ALKALI_M	ALKALI M	UMOL/KG
ALKALI_M_FLAG_W	ALKALI M FLAG W	integer
TCARBN_B	TCARBN B	UMOL/KG
TCARBN_B_FLAG_W	TCARBN B FLAG W	integer

ALKALI_B	ALKALI B	UMOL/KG
ALKALI_B_FLAG_W	ALKALI B FLAG W	integer
TRITUM	Tritium.	TU
TRITUM_FLAG_W	Quality flag for TRITUM.	integer
HELIUM	Helium.	nmol/kg
HELIUM_FLAG_W	Quality flag for HELIUM.	integer
DELHE3	Helium isotope ratio anomaly (percentage).	%
DELHE3_FLAG_W	Quality flag for DELHE3.	integer
DELC13	DELC13	/MILLE
DELC13_FLAG_W	Quality flag for DELC13.	integer
DELC14	DELC14	/MILLE
DELC14_FLAG_W	Quality flag for DELC14.	integer
D15N_NO3	D15N NO3	/MILLEvsAIR
D15N_NO3_FLAG_W	D15N NO3 FLAG W	integer
D18O_NO3	D18O NO3	/MILLEvsVSMOW
D18O_NO3_FLAG_W	D18O NO3 FLAG W	integer
O18_H2O	18O H2O	/MILLE
O18_H2O_FLAG_W	18O H2O FLAG W	integer
SI_SW DISS	SI SW DISS	/MILLE
SI_SW DISS_FLAG_W	SI SW DISS FLAG W	integer
SI_PM	SI PM	/MILLE
SI_PM_FLAG_W	SI PM FLAG W	integer
TCHLA	TCHLA	UG/L
TCHLA_FLAG_W	TCHLA FLAG W	integer
ACDOM	ACDOM	1/M
ACDOM_FLAG_W	ACDOM FLAG W	integer
AP	AP	1/M <sup>2</sup>
AP_FLAG_W	AP FLAG W	integer
DOC	Dissolved Organic Carbon in micromoles per liter.	UMOL/L
DOC_FLAG_W	Quality flag for DOC.	integer
POC	Particulate Organic Carbon in micrograms per liter.	ug/L
POC_FLAG_W	Quality flag for POC.	integer
SPM	SPM	UG/L
SPM_FLAG_W	SPM FLAG W	integer
HPLC_PIGMENTS	HPLC PIGMENTS	UG/L
HPLC_PIGMENTS_FLAG_W	HPLC PIGMENTS FLAG W	integer
CYSTEINE	CYSTEINE	PMOL/L
CYSTEINE_FLAG_W	CYSTEINE FLAG W	integer
GLUTATHIONE	GLUTATHIONE	PMOL/L
GLUTATHIONE_FLAG_W	GLUTATHIONE FLAG W	integer
GAMMA_GLU_CYST	GAMMA GLU CYST	PMOL/L

GAMMA_GLU_CYST_FLAG_W	GAMMA GLU CYST FLAG W	integer
HOMOCYSTEINE	HOMOCYSTEINE	PMOL/L
HOMOCYSTEINE_FLAG_W	HOMOCYSTEINE FLAG W	integer
PHYTOCHELATINS	PHYTOCHELATINS	PMOL/L
PHYTOCHELATINS_FLAG_W	PHYTOCHELATINS FLAG W	integer
METALLOTHEIONINE	METALLOTHEIONINE	PMOL/L
METALLOTHEIONINE_FLAG_W	METALLOTHEIONINE FLAG W	integer
DNA_CHISHOLM	DNA CHISHOLM	TBA
DNA_CHISHOLM_FLAG_W	DNA CHISHOLM FLAG W	integer
DNA_LAROCHE	DNA LAROCHE	TBA
DNA_LAROCHE_FLAG_W	DNA LAROCHE FLAG W	integer
BA	BA	NMOL/L
BA_FLAG_W	BA FLAG W	integer
ND_143_to_ND_144	ND-143/ND-144	RATIO
ND_143_to_ND_144_FLAG_W	ND-143/ND-144 FLAG W	integer
EPSILON_ND	EPSILON ND	(tbd)
EPSILON_ND_FLAG_W	EPSILON ND FLAG W	integer
PO_210	PO 210	DPM/100L
PO_210_FLAG_W	PO 210 FLAG W	integer
PB_210	Pb-210 (Lead-210).	DPM/100L
PB_210_FLAG_W	Quality flag for PB_210.	integer
RA_226	Radium-226 disintegrations per minute per 100 liters.	DPM/100L
RA_226_FLAG_W	Quality flag for RA_226.	integer
TH_230	Thorium-230.	fg/kg
TH_230_FLAG_W	Quality flag for TH_230.	integer
TH_232	Thorium-232.	pg/kg
TH_232_FLAG_W	Quality flag for TH_232.	integer
TH_232_COLLOIDS	TH 232 COLLOIDS	PG/KG
TH_232_COLLOIDS_FLAG_W	TH 232 COLLOIDS FLAG W	integer
TH_234	Thorium-234.	DPM/L
TH_234_FLAG_W	Quality flag for Th_234.	integer
PA_231	PA 231	FG/KG
PA_231_FLAG_W	PA 231 FLAG W	integer
U_238	Uranium-238.	TBA
U_238_FLAG_W	Quality flag for U_238.	integer
CS_137	Caesium-137 in becquerels per cubic meter.	BQ/M^3
CS_137_FLAG_W	Quality flag for CS_137.	integer
NP_237	Neptunium-237.	MBQ/M^3
NP_237_FLAG_W	Quality flag for NP_237.	integer
PU_239	Plutonium-239.	MBQ/M^3
PU_239_FLAG_W	Quality flag for PU_239.	integer

PU_240	Plutonium-240.	MBQ/M <sup>3</sup>
PU_240_FLAG_W	Quality flag for PU_240.	integer
PU_240_to_PU_239	PU-240/PU-239	RATIO
PU_240_to_PU_239_FLAG_W	PU-240/PU-239 FLAG W	integer
REE_LA_UH	REE (Rare Earth Element) Lanthanum reported by University of Hawaii.	PMOL/KG
REE_LA_UH_FLAG_W	Quality flag for REE_LA_UH.	integer
REE_CE_UH	REE (Rare Earth Element) Cerium reported by University of Hawaii.	PMOL/KG
REE_CE_UH_FLAG_W	Quality flag for REE_CE_UH.	integer
REE_PR_UH	REE (Rare Earth Element) Praseodymium reported by University of Hawaii.	PMOL/KG
REE_PR_UH_FLAG_W	Quality flag for REE_PR_UH.	integer
REE_ND_UH	REE (Rare Earth Element) Neodymium reported by University of Hawaii.	PMOL/KG
REE_ND_UH_FLAG_W	Quality flag for REE_ND_UH.	integer
REE_PM_UH	REE (Rare Earth Element) Promethium reported by University of Hawaii.	PMOL/KG
REE_PM_UH_FLAG_W	Quality flag for REE_PM_UH.	integer
REE_SM_UH	REE (Rare Earth Element) Samarium reported by University of Hawaii.	PMOL/KG
REE_SM_UH_FLAG_W	Quality flag for REE_SM_UH.	integer
REE_EU_UH	REE (Rare Earth Element) Europium reported by University of Hawaii.	PMOL/KG
REE_EU_UH_FLAG_W	Quality flag for REE_EU_UH.	integer
REE_GD_UH	REE (Rare Earth Element) Gadolinium reported by University of Hawaii.	PMOL/KG
REE_GD_UH_FLAG_W	Quality flag for REE_GD_UH.	integer
REE_TB_UH	REE (Rare Earth Element) Terbium reported by University of Hawaii.	PMOL/KG
REE_TB_UH_FLAG_W	Quality flag for REE_TB_UH.	integer
REE_DY_UH	REE (Rare Earth Element) Dysprosium reported by University of Hawaii.	PMOL/KG
REE_DY_UH_FLAG_W	Quality flag for REE_DY_UH.	integer
REE_HO_UH	REE (Rare Earth Element) Holmium reported by University of Hawaii.	PMOL/KG
REE_HO_UH_FLAG_W	Quality flag for REE_HO_UH.	integer
REE_ER_UH	REE (Rare Earth Element) Erbium reported by University of Hawaii.	PMOL/KG
REE_ER_UH_FLAG_W	Quality flag for REE_ER_UH.	integer
REE_TM_UH	REE (Rare Earth Element) Thulium reported by University of Hawaii.	PMOL/KG
REE_TM_UH_FLAG_W	Quality flag for REE_TM_UH.	integer
REE_YB_UH	REE (Rare Earth Elements) Ytterbium reported by University of Hawaii.	PMOL/KG
REE_YB_UH_FLAG_W	Quality flag for REE_YB_UH.	integer

REE_LU_UH	REE (Rare Earth Element) Lutetium reported by University of Hawaii.	PMOL/KG
REE_LU_UH_FLAG_W	Quality flag for REE_LU_UH.	integer

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

---

## Instruments

<b>Dataset-specific Instrument Name</b>	GO-FLO Bottle
<b>Generic Instrument Name</b>	GO-FLO Bottle
<b>Generic Instrument Description</b>	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.

<b>Dataset-specific Instrument Name</b>	Niskin bottle
<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](#) ]

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## Deployments

**KN199-04**

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/58066">https://www.bco-dmo.org/deployment/58066</a>
<b>Platform</b>	R/V Knorr
<b>Report</b>	<a href="http://bcodata.whoi.edu/US_GEOTRACES/AtlanticSection/Cruise_Report_for_Knorr_199_Final_v3.pdf">http://bcodata.whoi.edu/US_GEOTRACES/AtlanticSection/Cruise_Report_for_Knorr_199_Final_v3.pdf</a>
<b>Start Date</b>	2010-10-15
<b>End Date</b>	2010-11-04
<b>Description</b>	<p>This cruise constitutes the first survey section as part of the U.S. participation in an international program named GEOTRACES. Funding: NSF OCE award 0926423 Science Objectives: To obtain state of the art trace metal and isotope measurements on a suite of samples taken on a mid-latitude zonal transect of the North Atlantic. In particular, sampling targeted the oxygen minimum zone extending off the west African coast near Mauritania, the TAG hydrothermal field, and the western boundary current system along Line W. For additional information, please refer to the GEOTRACES program Web site (<a href="https://www.geotraces.org/">https://www.geotraces.org/</a>) for overall program objectives and a summary of properties measured. Science Activities include seawater sampling via GoFLO and Niskin carousels, in situ pumping (and filtration), CTDO2 and transmissometer sensors, underway pumped sampling of surface waters, and collection of aerosols and rain. Hydrography, CTD and nutrient measurements were supported by the Ocean Data Facility (J. Swift) at Scripps Institution of Oceanography and funded through NSF Facilities. They provided an additional CTD rosette system along with nephelometer and LADCP. A trace metal clean Go-Flo Rosette and winch were provided by the group at Old Dominion University (G. Cutter) along with a towed underway pumping system. Additional cruise information is available from the Rolling Deck to Repository (R2R): <a href="https://www.rvdata.us/search/cruise/KN199-04">https://www.rvdata.us/search/cruise/KN199-04</a> Other Relevant Links: List of cruise participants: [ PDF ] Cruise track: JPEG image (from Woods Hole Oceanographic Institution, vessel operator) ADCP data are available from the Currents ADCP group at the University of Hawaii: KN199-04 ADCP</p>

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

## Project Information

### U.S. GEOTRACES North Atlantic Transect (GA03) (U.S. GEOTRACES NAT)

**Website:** <https://www.geotraces.org/>

**Coverage:** Subtropical western and eastern North Atlantic Ocean (GA03)

*Much of this text appeared in an article published in OCB News, October 2008, by the OCB Project Office.*

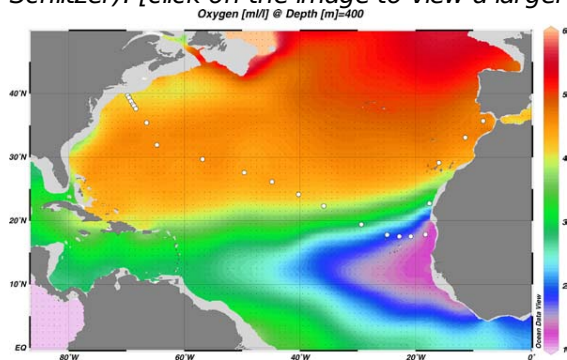
The first U.S. GEOTRACES Atlantic Section will be specifically centered around a sampling cruise to be carried out in the North Atlantic in 2010. Ed Boyle (MIT) and Bill Jenkins (WHOI) organized a three-day planning workshop that was held September 22-24, 2008 at the Woods Hole Oceanographic Institution. The main goal of the workshop, sponsored by the National Science Foundation and the U.S. GEOTRACES Scientific Steering Committee, was to design the implementation plan for the first U.S. GEOTRACES Atlantic Section. The primary cruise design motivation was to improve knowledge of the sources, sinks and internal cycling of Trace Elements and their Isotopes (TEIs) by studying their distributions along a section in the North Atlantic (Figure 1). The North Atlantic has the full suite of processes that affect TEIs, including strong meridional advection, boundary scavenging and source effects, aeolian deposition, and the salty Mediterranean Outflow. The North Atlantic is particularly important as it lies at the "origin" of the global Meridional Overturning Circulation.

It is well understood that many trace metals play important roles in biogeochemical processes and the carbon cycle, yet very little is known about their large-scale distributions and the regional scale processes that affect them. Recent advances in sampling and analytical techniques, along with advances in our understanding of their roles in enzymatic and catalytic processes in the open ocean provide a natural opportunity to make substantial advances in our understanding of these important elements. Moreover, we are motivated by the prospect of global change and the need to understand the present and future workings of the ocean's biogeochemistry. The GEOTRACES strategy is to measure a broad suite of TEIs to constrain the critical biogeochemical processes that influence their distributions. In addition to these "exotic" substances, more traditional properties, including



macronutrients (at micromolar and nanomolar levels), CTD, bio-optical parameters, and carbon system characteristics will be measured. The cruise starts at Line W, a repeat hydrographic section southeast of Cape Cod, extends to Bermuda and subsequently through the North Atlantic oligotrophic subtropical gyre, then transects into the African coast in the northern limb of the coastal upwelling region. From there, the cruise goes northward into the Mediterranean outflow. The station locations shown on the map are for the "fulldepth TEI" stations, and constitute approximately half of the stations to be ultimately occupied.

Figure 1. The proposed 2010 Atlantic GEOTRACES cruise track plotted on dissolved oxygen at 400 m depth. Data from the World Ocean Atlas (Levitus et al., 2005) were plotted using Ocean Data View (courtesy Reiner Schlitzer). [click on the image to view a larger version]

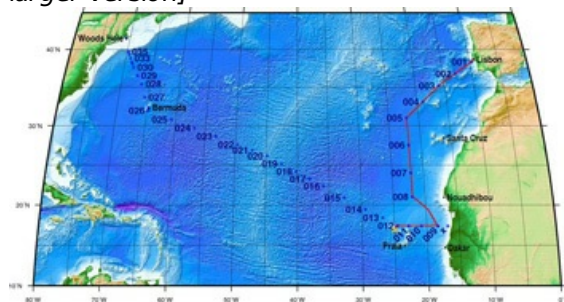


Hydrography, CTD and nutrient measurements will be supported by the Ocean Data Facility (J. Swift) at Scripps Institution of Oceanography and funded through NSF Facilities. They will be providing an additional CTD rosette system along with nephelometer and LADCP. A trace metal clean Go-Flo Rosette and winch will be provided by the group at Old Dominion University (G. Cutter) along with a towed underway pumping system.

The North Atlantic Transect cruise began in 2010 with KN199 leg 4 (station sampling) and leg 5 (underway sampling only) (Figure 2).

[KN199-04 Cruise Report \(PDF\)](#)

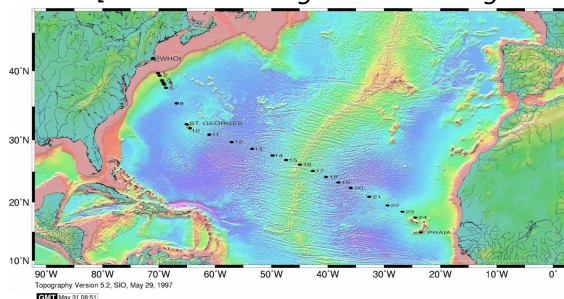
Figure 2. The red line shows the cruise track for the first leg of the US Geotraces North Atlantic Transect on the R/V Knorr in October 2010. The rest of the stations (beginning with 13) will be completed in October-December 2011 on the R/V Knorr (courtesy of Bill Jenkins, Chief Scientist, GNAT first leg). [click on the image to view a larger version]



The section completion effort resumed again in November 2011 with KN204-01A,B (Figure 3).

[KN204-01A,B Cruise Report \(PDF\)](#)

Figure 3. Station locations occupied on the US Geotraces North Atlantic Transect on the R/V Knorr in November 2011. [click on the image to view a larger version]



Data from the North Atlantic Transect cruises are available under the Datasets heading below, and consensus values for the SAFe and North Atlantic GEOTRACES Reference Seawater Samples are available from the GEOTRACES Program Office: [Standards and Reference Materials](#)

**ADCP data** are available from the Currents ADCP group at the University of Hawaii at the links below:

- [KN199-04](#) (leg 1 of 2010 cruise; Lisbon to Cape Verde)
- [KN199-05](#) (leg 2 of 2010 cruise; Cape Verde to Charleston, NC)
- [KN204-01A](#) (part 1 of 2011 cruise; Woods Hole, MA to Bermuda)
- [KN204-01B](#) (part 2 of 2011 cruise; Bermuda to Cape Verde)

[ [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
<a href="#">NSF Division of Ocean Sciences (NSF OCE)</a>	<a href="#">OCE-0926423</a>
<a href="#">NSF Division of Ocean Sciences (NSF OCE)</a>	<a href="#">OCE-0926092</a>

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