Particulate trace element concentrations from the NOAA R/V Ronald H. Brown CLIVAR A16N cruise in 2013.

Website: https://www.bco-dmo.org/dataset/699160
Data Type: Cruise Results
Version: 1
Version Date: 2017-04-26

Project
» Collaborative Research: Trace Metal Deposition And Cycling In The North Atlantic On The 2013 CLIVAR/Repeat Hydrography A16N Expedition (A16N Trace Metals)

Contributors	Affiliation	Role
Resing, Joseph A.	National Oceanic and Atmospheric Administration (NOAA-PMEL)	Principal Investigator
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Abstract
Particulate trace element concentrations from the NOAA R/V Ronald H. Brown CLIVAR A16N cruise in 2013.

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Coverage

Spatial Extent: **N**:63.71 **E**:-18.8726 **S**:3.1505 **W**:-31.0015
Temporal Extent: 2013-08-04 - 2013-09-29

Dataset Description

Particulate trace element concentrations along CLIVAR A16N in 2013.

Note that related data from 2003 are available here: https://www.bco-dmo.org/dataset/3702

Methods & Sampling

Seawater samples were collected from the surface ocean to depths of 750–1000 m, then sub-sampled for suspended particulate matter under trace-element-clean conditions (see Measures et al., 2008 for details). Briefly, suspended particulate matter samples were collected by pressurizing GO-FLO bottles with <10 psi filtered, compressed air. Samples were filtered through acid-cleaned 0.4 um polycarbonate filters (Nuclepore) in polypropylene holders. Acid-cleaned backing filters of mixed cellulose esters were used to ensure even loading on sample filters. Samples were rinsed while on the filter holders with 15–20 mL deionized (DI) water adjusted to pH 8 with ammonium hydroxide from the edges to the center, with a low vacuum applied to avoid loss or re-distribution of particles. Filtration was started approximately 30 to 60 minutes after water samples were collected and was generally completed within 60 minutes.

Particulate trace element concentrations were determined by energy-dispersive X-ray fluorescence (ED-XRF) using a thin film technique described by Feely et al. (1991). An optical subsample of each filter was analyzed on a Thermo Fisher Quant'X equipped with a Rhodium Target X-Ray tube and an electronically cooled, lithium-drifted solid state detector. X-rays for primary sample excitation were filtered for optimum control of peak-to-background ratios. Standards for calibration consisted of commercial thin film standards (MicroMatter), geochemical reference sample material MAG-1 (Gladney and Roelandts, 1988) finely ground and loaded onto polycarbonate filters (Feely et al., 1991), and a series of standards prepared using a modification of the method reported by Holynska and Bisiniek (1976) using sodium diethyldithiocarbamate (NaDDTC) to quantitatively precipitate trace metals from a solution of known concentration. These standards were prepared using a 1% NaDDTC solution that was added to trace metal solutions at pH 4 with a ligand-to-metal ratio of 4:1. The resulting precipitate was filtered over an acid-cleaned, 0.4 um polycarbonate Nuclepore filter. Procedural blanks were made by addition of a NaDDTC solution to a sample of acidified DI water followed by filtration. MicroMatter and MAG-1 standards were used to create individual standard curves for all elements; standard curves for Fe and Mn also included NaDDTC standards.

Four different excitation conditions, all conducted under a vacuum atmosphere, were used for sample analysis and are detailed along with minimum determination limits (MDL) in Table 1. MDLs are defined as 3 times the square root of the background intensity measured from a standard of known concentration:

$MDL = (3 * \sqrt{Ib})/(Ip/conc)$

where Ib is the background intensity, Ip is the peak intensity, and conc is the concentration of the standard. MicroMatter standards were used to calculate MDLs.

Data Processing Description

ED-XRF output is in ng cm-2 and is reported here as seawater concentrations (nM) using the following formula for each trace element of interest.

Seawater concentration (nmol L-1) = filter concentration (ng cm-2) * filter sample area (cm2) / filtered seawater volume (L) / atomic weight (g/mol)

The filter sample collection area is 12.41 cm2. The volume of seawater filtered per sample ranged from 1 to 11 L, average 9 L.

For values below the analytical detection limit, values are indicated as “BDL”

Quality flags are indicated as:

1 = sample drawn from bottom but measurement not received
2 = acceptable
3 = questionable
9 = no sample drawn

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Data Files

File
particulate.csv(Comma Separated Values (.csv), 120.28 KB) MD5:03f500a4d496c0ba3db82fea594e4487 Primary data file for dataset ID 699160

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Parameters

Parameter	Description	Units
SECT_ID	Section ID number	unitless
STNNBR	Station number	unitless
CASTNO	Cast number	unitless
SAMPNO	Sample number	unitless
BTLNBR	Bottle number	unitless
DATE	Date sample was taken; YYYYMMDD	unitless
TIME	Time sample was taken; HH:MM	unitless
LAT	Latitude; E is positive	decimal degrees
LON	Longitude; N is positive	decimal degrees
CTDPRS	Pressure	dbar
Mg	Particulate trace element concentration	nmol/L
Mg_FLAG	Flag for particulate trace element concentration	unitless
Al	Particulate trace element concentration	nmol/L
Al_FLAG	Flag for particulate trace element concentration	unitless
Si	Particulate trace element concentration	nmol/L
Si_FLAG	Flag for particulate trace element concentration	unitless
P	Particulate trace element concentration	nmol/L
P_FLAG	Flag for particulate trace element concentration	unitless

S	Particulate trace element concentration	nmol/L
S_FLAG	Flag for particulate trace element concentration	unitless
Cl	Particulate trace element concentration	nmol/L
Cl_FLAG	Flag for particulate trace element concentration	unitless
Ca	Particulate trace element concentration	nmol/L
Ca_FLAG	Flag for particulate trace element concentration	unitless
Ti	Particulate trace element concentration	nmol/L
Ti_FLAG	Flag for particulate trace element concentration	unitless
Mn	Particulate trace element concentration	nmol/L
Mn_FLAG	Flag for particulate trace element concentration	unitless
Fe	Particulate trace element concentration	nmol/L
Fe_FLAG	Flag for particulate trace element concentration	unitless
Ni	Particulate trace element concentration	nmol/L
Ni_FLAG	Flag for particulate trace element concentration	unitless
Cu	Particulate trace element concentration	nmol/L
Cu_FLAG	Flag for particulate trace element concentration	unitless
Zn	Particulate trace element concentration	nmol/L
Zn_LAG	Flag for particulate trace element concentration	unitless
Br	Particulate trace element concentration	nmol/L

Br_FLAG	Flag for particulate trace element concentration	unitless
Sr	Particulate trace element concentration	nmol/L
Sr_FLAG	Flag for particulate trace element concentration	unitless
ISO_DateTime_UTC	Date/Time (UTC) ISO formatted	unitless

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Instruments

Dataset-specific Instrument Name	CTD
Generic Instrument Name	CTD - profiler
Dataset-specific Description	Used to collect environmental data
Generic Instrument Description	The Conductivity, Temperature, Depth (CTD) unit is an integrated instrument package designed to measure the conductivity, temperature, and pressure (depth) of the water column. The instrument is lowered via cable through the water column. It permits scientists to observe the physical properties in real-time via a conducting cable, which is typically connected to a CTD to a deck unit and computer on a ship. The CTD is often configured with additional optional sensors including fluorometers, transmissometers and/or radiometers. It is often combined with a Rosette of water sampling bottles (e.g. Niskin, GO-FLO) for collecting discrete water samples during the cast. This term applies to profiling CTDs. For fixed CTDs, see https://www.bco-dmo.org/instrument/869934.

Dataset-specific Instrument Name	GO-FLO Bottle
Generic Instrument Name	GO-FLO Bottle
Dataset-specific Description	GO-FLO bottles with
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	Thermo Fisher Quant’X
Generic Instrument Name	X-ray fluorescence analyzer
Dataset-specific Description	Thermo Fisher Quant’X equipped with a Rhodium Target X-Ray tube and an electronically cooled, lithium-drifted solid state detector
Generic Instrument Description	Instruments that identify and quantify the elemental constituents of a sample from the spectrum of electromagnetic radiation emitted by the atoms in the sample when excited by X-ray radiation.

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Deployments

RB-13-04

Website	https://www.bco-dmo.org/deployment/699279
Platform	NOAA Ship Ronald H. Brown
Start Date	2013-08-03
End Date	2013-10-02
Description	CLIVAR A16N 2013

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Project Information

Collaborative Research: Trace Metal Deposition And Cycling In The North Atlantic On The 2013 CLIVAR/Repeat Hydrography A16N Expedition (A16N Trace Metals)

Coverage: Eastern North Atlantic

Description from NSF award abstract:
Dr. Joseph Resing of the Joint Institute for the Study of the Atmosphere and the Ocean, Pacific Marine Environmental Laboratory, University of Washington and Dr. William Landing of Florida State University have proposed an ambitious field study to conduct trace metal sampling on the CLIVAR/CO2 Repeat Hydrography section A16N in the Atlantic Ocean in 2013. This field program will provide a valuable opportunity to elucidate aerosol-water column coupling, and possible decadal variability, for selected trace metals (Fe, Al, and others) and biogenic calcium carbonate. In addition to examining important questions regarding the nature of the response of trace element distributions in the water column to external dust input, these investigators will gain further insight into the issue of temporal and spatial changes in trace metal distributions through comparison with other field programs, most notably the international GEOTRACES program. With regard to the broader significance of this study, results from this large expedition will generate multiple national and international collaborations, contribute positively to the education and training of a graduate student and a postdoctoral fellow, and be of broad interest to the ocean sciences community.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1260376
NSF Division of Ocean Sciences (NSF OCE)	OCE-1260287

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