Particulate & dissolved Po-210 & Pb-210 in seawater, snow, melt ponds, ice core, ice-rafted sediments, and aerosols from the US GEOTRACES Arctic cruise (HLY1502) on USCGC Healy from August to October 2015

Website: https://www.bco-dmo.org/dataset/794064
Data Type: Cruise Results
Version: 1
Version Date: 2020-02-25

Project

» U.S. Arctic GEOTRACES Study (U.S. GEOTRACES Arctic)

» GEOTRACES Arctic section: Application of 210Po and 210Pb distribution at contrasting interface regimes of Western Arctic (GEOTRACES Arctic 210Po and 210Pb)

Program

» U.S. GEOTRACES (U.S. GEOTRACES)

Contributors	Affiliation	Role
Baskaran, Mark	Wayne State University (WSU)	Principal Investigator
Krupp, Katherine	Wayne State University (WSU)	Scientist
Rauch, Shannon	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

Abstract

Particulate & dissolved Po-210 & Pb-210 in seawater, snow, melt ponds, ice core, ice-rafted sediments, and aerosols from the US GEOTRACES Arctic cruise (HLY1502) on USCGC Healy from August to October 2015.

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Coverage

Spatial Extent: **N**:91.625 **E**:176.761 **S**:56.074 **W**:175.896
Temporal Extent: 2015-08-10 - 2015-10-09

Dataset Description

Status as of 2020-02-25: These data have been contributed to BCO-DMO. Data are restricted from public access until August 2021. Please contact PI for prior access.

Acquisition Description

Sampling and analytical procedures:
The chemical procedure for the analysis of Po-210 and Pb-210 in aerosols, water samples, snow, ice core, melt ponds and ice-rafted sediments are given in Sampling and Sample-handling Protocols for GEORACES Cruises (known as "Cookbook"): http://geotraces.org/science/intercalibration/222-sampling-and-sample-handling-protocols-for-geotraces-cruises; Baskaran et al., 2013).

Samples for Po-210/Pb-210 analysis were collected from 4 super stations, 3 shelf stations, 1 full station, 1 pacific end member station, 6 ice stations, 2 dirty ice events, and from 14 aerosol deployments. The number of water samples ranged from 16-24 depths for super stations and 3-6 depths for shelf/end member stations. These samples were collected from the ODF rosette and filtered using 0.2um Acropack filters. Two additional filtered water samples were taken from 8L niskins attached atop the multicorer instrument at two separate shelf stations. Four unfiltered water samples were collected for intercalibration between the Wayne State University and Louisiana State Laboratory (collected from 1 full station and 1 super station (original GT 15)). The particulate samples collected by McLane pumps for associated dissolved water samples will be sent to the participating labs for analysis upon completion of the cruise. Samples collected at ice stations included snow, melt pond water, under ice water, and ice cores. All samples were collected unfiltered and subsequently filtered in the onboard lab for analysis of both particulate and dissolved phases. The 2 dirty ice events were conducted between stations using a man basket and each event included a community sample which was divided among other groups. Aerosol deployments were conducted every three or four days, depending on the total run time of the pumps. Dissolved water samples from the shelf stations and 2 of the 4 super stations (original GT13, 15) were acidified and stored for shipment to Dr. Maiti's laboratory where they will be processed. All of the remaining samples were processed onboard by Wayne State personal (Katie Krupp). Dissolved seawater/melted ice station samples were processed by co-precipitation using an iron carrier followed by electroplating to silver planchets. Particle samples and aerosols were leached with acids and plated in the same manner. A known amount of Po-209 spike was added to each sample for determination of Po-210 recovery. These planchets and sample solutions were brought back to Wayne State University for alpha counting and further processing in order to measure Pb-210 and thus determine the Po-210/Pb-210 ratio for each sample collected. In summary, approximately 310 samples were collected for polonium- 210 and lead-210 analysis on the 2015 Arctic GEOTRACES cruise.

Meltpond sampling:
Melt ponds were sampled at Stations 33, 38, 42, 43 and 46. A battery-powered peristaltic pump and silicone tubing were used to fill a carboy for shipboard filtration (Acropak-200, <0.2 um). At each station, the melt ponds were frozen over, so a hole was drilled using the TM-clean corer. Salinity was measured at each melt pond following sampling.

Aerosol sampling:
Aerosol samples were collected over periods of three to five days using five high-volume aerosol
samplers. Three samplers were used to collect aerosols on acid-cleaned Whatman-41 (cellulose) filters for analysis of inorganic trace elements and isotopes (TEIs).

Sea Ice operations:
Snow, ice cores and water under the ice was collected from the six sea ice stations (Table 1). Ice stations were constricted north of 88.4o N on the northward leg, and north of 82.5o N on the southward leg of the cruise. This narrow latitudinal range resulted from a combination of ice conditions, weather conditions, and available time.

Ice Station Longitude Latitude (samples include snow, ice core, melt ponds and ice-rafted sediment)
Station 31: 183.33W 88.42N
Station 33: 3.529E 89.96N
Station 39: 149.61W 87.78N
Station 42: 150.54W 85.74N
Station 43: 150.00W 85.16N
Station 46: 149.83W 82.49N

Bulk Snow:
Bulk snow for Po-210 and Pb-210 was collected with an acid clean high density polyethylene shovel into a low density polyethylene drum liner. Discrete snow samples were also collected in community provided containers. The bulk snow was melted on board, filtered through a Supor 0.2 um filter membrane and subsampled.

Sea Ice Cores:
Discrete ice cores were collected at all stations. Cores were collected with the Kovaks corer. A total of two Twelve to fifteen cores were taken at each station for a total of 85 sea ice community cores.

Problem report:
We had analyzed a total of 43 water samples, 43 small particle size and 43 large particle size. Out of these, two batches (3 dissolved and 4 particulate (both large and small)) were lost during analysis onboard.

Processing Description

Data processing:
Polonium-210 and Pb-210 data from the alpha spectrometer were analyzed using Excel spreadsheets to calculate their specific activities. Plots have been made using Kaleidagraph software.

Data quality flags:
SeaDataNet data quality flags have been assigned to these data. More information is available from GEOTRACES at http://www.geotraces.org/library-88/geotraces-policies/1577-geotraces-quality-flag-policy and from SeaDataNet at https://www.seadatanet.org/Standards/Data-Quality-Control. In summary:
0 = no quality control
1 = good value
2 = probably good value
3 = probably bad value
4 = bad value
5 = changed value
6 = value below detection (BDL)
7 = value in excess
8 = interpolated value
9 = missing value

BCO-DMO Processing:
- formatted dates as yyyy-mm-dd;

- added a column for data/sample type;
- replaced 'N/A' and 'NM' with 'nd' (no data, not measured);
- modified column names.

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Related Publications

Baskaran, M., Church, T., Hong, G., Kumar, A., Qiang, M., Choi, H., … Maiti, K. (2013). Effects of flow rates and composition of the filter, and decay/ingrowth correction factors involved with the determination of in situ particulate210Po and210Pb in seawater. Limnology and Oceanography: Methods, 11(3), 126–138. doi:10.4319/lom.2013.11.126 [details]

Church, T., Rigaud, S., Baskaran, M., Kumar, A., Friedrich, J., Masque, P., … Stewart, G. (2012). Intercalibration studies of210Po and210Pb in dissolved and particulate seawater samples. Limnology and Oceanography: Methods, 10(10), 776–789. doi:10.4319/lom.2012.10.776 [details]

Cutter, G., Casciotti, K., Croot, P., Geibert, W., Heimbürger, L.-E., Lohan, M., Planquette, H., & Van De Flierdt, T. (2017). Sampling and Sample-handling Protocols for GEOTRACES Cruises. Version 3, August 2017. GEOTRACES International Project Office. https://doi.org/10.25607/OBP-2 [details]

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Parameters

Parameter	Description	Units
data_type	Sample type	unitless
Station_ID	Station ID number	unitless
Start_Date_UTC	Start date (UTC); format: yyyy-mm-dd	unitless
Start_Time_UTC	Start time (UTC); format: HH:MM	unitless
End_Date_UTC	End date (UTC); format: yyyy-mm-dd	unitless
End_Time_UTC	End time (UTC); format: HH:MM	unitless

ISO_DateTime_UTC_Start	Start date and time (UTC) formatted to ISO 8601 standard: yyyy-mm-ddTHH:MMZ	unitless
ISO_DateTime_UTC_End	End date and time (UTC) formatted to ISO 8601 standard: yyyy-mm-ddTHH:MMZ	unitless
Start_Latitude	Latitude at start of sample collection; positive values = North	decimal degrees
Start_Longitude	Longitude at start of sample collection; positive values = East	decimal degrees
End_Latitude	Latitude at end of sample collection; positive values = North	decimal degrees
End_Longitude	Longitude at end of sample collection; positive values = East	decimal degrees
Event_ID	GEOTRACES event number	unitless
Sample_ID	GEOTRACES sample number	unitless
Sample_Depth	Sample depth	meters (m)
Pb_210_A_T_CONC_HIVOL_7io704	Concentration of Pb-210	dpm/100m^-3
SD1_Pb_210_A_T_CONC_HIVOL_7io704	Propagated error from counting statistics, Po-209 spike, blanks	dpm/100m^-3
Flag_Pb_210_A_T_CONC_HIVOL_7io704	SeaDataNet quality flag code used	unitless
Po_210_A_T_CONC_HIVOL_th4b6v	Concentration of Po-210	dpm/100 m^3

SD1_Po_210_A_T_CONC_HIVOL_th4b6v	Propagated error from counting statistics, Po-209 spike, blanks	dpm/100 m^3
Flag_Po_210_A_T_CONC_HIVOL_th4b6v	SeaDataNet quality flag code used	unitless
Pb_210_D_CONC_MELTPOND_PUMP_l1tcik	Dissolved Pb-210 concentration	dpm/100L^-1
SD1_Pb_210_D_CONC_MELTPOND_PUMP_l1tcik	Propagated error from counting statistics, Po-209 spike, blanks	dpm/100L^-1
Flag_Pb_210_D_CONC_MELTPOND_PUMP_l1tcik	SeaDataNet quality flag code used	unitless
Po_210_D_CONC_MELTPOND_PUMP_jltiiz	Dissolved P0-210 concentration	dpm/100L^-1
SD1_Po_210_D_CONC_MELTPOND_PUMP_jltiiz	Propagated error from counting statistics, Po-209 spike, blanks	dpm/100L^-1
Flag_Po_210_D_CONC_MELTPOND_PUMP_jltiiz	SeaDataNet quality flag code used	unitless
Po_210_D_CONC_BOTTLE_f0nzql	Dissolved Po-210 concentration	dpm/100L^-1
SD1_Po_210_D_CONC_BOTTLE_f0nzql	Propagated error from counting statistics, Po-209 spike, blanks	dpm/100L^-1
Flag_Po_210_D_CONC_BOTTLE_f0nzql	SeaDataNet quality flag code used	unitless
Pb_210_D_CONC_BOTTLE_ib2fhj	Dissolved Pb-210 concentration	dpm/100L^-1
SD1_Pb_210_D_CONC_BOTTLE_ib2fhj	Propagated error from counting statistics, Po-209 spike, blanks	dpm/100L^-1
Flag_Pb_210_D_CONC_BOTTLE_ib2fhj	SeaDataNet quality flag code used	unitless

Pb_210_LPT_CONC_PUMP_apdd2j	Large particulate (>51 um) Pb-210 concentration; nd: No data	dpm/100L^-1
SD1_Pb_210_LPT_CONC_PUMP_apdd2j	Propagated error from counting statistics, Po-209 spike, blanks	dpm/100L^-1
Flag_Pb_210_LPT_CONC_PUMP_apdd2j	SeaDataNet quality flag code used	unitless
Pb_210_SPT_CONC_PUMP_v4orif	Small particulate (1-51 um) Pb-210 concentration; nd: No data	dpm/100L^-1
SD1_Pb_210_SPT_CONC_PUMP_v4orif	Propagated error from counting statistics, Po-209 spike, blanks	dpm/100L^-1
Flag_Pb_210_SPT_CONC_PUMP_v4orif	SeaDataNet quality flag code used	unitless
Po_210_SPT_CONC_PUMP_m0d14g	Small particulate (1-51 um) Po-210 concentration; nd: No data	dpm/100L^-1
SD1_Po_210_SPT_CONC_PUMP_m0d14g	Propagated error from counting statistics, Po-209 spike, blanks; BLD: Below detection limit (< 0.01 dpm)	dpm/100L^-1
Flag_Po_210_SPT_CONC_PUMP_m0d14g	SeaDataNet quality flag code used	unitless
Po_210_LPT_CONC_PUMP_mag4or	Large particulate (>51 um) Po-210 concentration; nd: No data; BDL:Below detection limit (< 0.01 dpm)	dpm/100L^-1

SD1_Po_210_LPT_CONC_PUMP_mag4or	Propagated error from counting statistics, Po-209 spike, blanks	dpm/100L^-1
Flag_Po_210_LPT_CONC_PUMP_mag4or	SeaDataNet quality flag code used	unitless
Po_210_ICE_D_CONC_CORER_x87y8c	Concentration of dissolved Po-210	dpm/100L^-1
SD1_Po_210_ICE_D_CONC_CORER_x87y8c	Propagated error from counting statistics, Po-209 spike, blanks	dpm/100L^-1
Flag_Po_210_ICE_D_CONC_CORER_x87y8c	SeaDataNet quality flag code used	unitless
Pb_210_ICE_D_CONC_CORER_x6zzed	Concentration of dissolved Pb-210	dpm/100L^-1
SD1_Pb_210_ICE_D_CONC_CORER_x6zzed	Propagated error from counting statistics, Po-209 spike, blanks	dpm/100L^-1
Flag_Pb_210_ICE_D_CONC_CORER_x6zzed	SeaDataNet quality flag code used	unitless
Po_210_SNOW_D_CONC_GRAB_s66twp	Concentration of dissolved Po-210 in snow	dpm/100L^-1
SD1_Po_210_SNOW_D_CONC_GRAB_s66twp	Propagated error from counting statistics, Po-209 spike, blanks	dpm/100L^-1
Flag_Po_210_SNOW_D_CONC_GRAB_s66twp	SeaDataNet quality flag code used	unitless
Pb_210_SNOW_D_CONC_GRAB_pyg6ay	Concentration of dissolved Pb-210 in snow	dpm/100L^-1
SD1_Pb_210_SNOW_D_CONC_GRAB_pyg6ay	Propagated error from counting statistics, Po-209 spike, blanks	dpm/100L^-1
Flag_Pb_210_SNOW_D_CONC_GRAB_pyg6ay	SeaDataNet quality flag code used	unitless

Pb_210_ICE_D_CONC_GRAB_daladt	Concentration of dissolved Pb-210 in grab ice sample	dpm/100L^-1
SD1_Pb_210_ICE_D_CONC_GRAB_daladt	Propagated error from counting statistics, Po-209 spike, blanks	dpm/100L^-1
Flag_Pb_210_ICE_D_CONC_GRAB_daladt	SeaDataNet quality flag code used	unitless
Po_210_ICE_D_CONC_GRAB_apyjov	Concentration of dissolved Po-210 in grab ice sample	dpm/100L^-1
SD1_Po_210_ICE_D_CONC_GRAB_apyjov	Propagated error from counting statistics, Po-209 spike, blanks	dpm/100L^-1
Flag_Po_210_ICE_D_CONC_GRAB_apyjov	SeaDataNet quality flag code used	unitless

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Instruments

Dataset-specific Instrument Name	
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	TM-clean corer and Kovaks corer
Generic Instrument Name	Ice Corer
Generic Instrument Description	An ice corer is used to drill into deep ice and remove long cylinders of ice from which information about the past and present can be inferred. Polar ice cores contain a record of the past atmosphere - temperature, precipitation, gas content, chemical composition, and other properties. This can reveal a broad spectrum of information on past environmental, and particularly climatic, changes. They can also be used to study bacteria and chlorophyll production in the waters from which the ice core was extracted.

Dataset-specific Instrument Name	ODF Rosette
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

Dataset-specific Instrument Name	McLane pumps
Generic Instrument Name	McLane Pump
Generic Instrument Description	McLane pumps sample large volumes of seawater at depth. They are attached to a wire and lowered to different depths in the ocean. As the water is pumped through the filter, particles suspended in the ocean are collected on the filters. The pumps are then retrieved and the contents of the filters are analyzed in a lab.

Dataset-specific Instrument Name	alpha spectrometer
Generic Instrument Name	Spectrometer
Generic Instrument Description	A spectrometer is an optical instrument used to measure properties of light over a specific portion of the electromagnetic spectrum.

Dataset-specific Instrument Name	high-volume aerosol samplers
Generic Instrument Name	Aerosol Sampler
Generic Instrument Description	A device that collects a sample of aerosol (dry particles or liquid droplets) from the atmosphere.

Dataset-specific Instrument Name	battery-powered peristaltic pump
Generic Instrument Name	Pump
Generic Instrument Description	A pump is a device that moves fluids (liquids or gases), or sometimes slurries, by mechanical action. Pumps can be classified into three major groups according to the method they use to move the fluid: direct lift, displacement, and gravity pumps

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Deployments

HLY1502

Website	https://www.bco-dmo.org/deployment/638807
Platform	USCGC Healy
Report	http://dmoserv3.whoi.edu/data_docs/GEOTRACES/Arctic/ARC01-report.pdf
Start Date	2015-08-09
End Date	2015-10-12
Description	US GEOTRACES Arctic cruise: The cruise began in Dutch Harbor, Alaska on 08 October 2015. After a station in the Bering Sea, Healy cruised to the North Pole on a westerly track before returning to the Canadian margin on an easterly track, returning to Dutch Harbor on 10 October 2015.

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Project Information

U.S. Arctic GEOTRACES Study (U.S. GEOTRACES Arctic)

Coverage: Arctic Ocean; Sailing from Dutch Harbor to Dutch Harbor

Description from NSF award abstract: In pursuit of its goal "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", in 2015 the International GEOTRACES Program will embark on several years of research in the Arctic Ocean. In a region where climate warming and general environmental change are occurring at amazing speed, research such as this is important for understanding the current state of Arctic Ocean geochemistry and for developing predictive capability as the regional ecosystem continues to warm and influence global oceanic and climatic conditions. The three investigators funded on this award, will manage a large team of U.S.scientists who will compete through the regular NSF proposal process to contribute their own unique expertise in marine trace metal, isotopic, and carbon cycle geochemistry to the U.S. effort. The three managers will be responsible for arranging and overseeing at-sea technical services such as hydrographic measurements, nutrient analyses, and around-the-clock management of on-deck sampling activites upon which all participants depend, and for organizing all pre- and post-cruise technical support and scientific meetings. The management team will also lead educational outreach activities for the general public in Nome and Barrow, Alaska, to explain the significance of the study to these communities and to learn from residents' insights on observed changes in the marine system. The project itself will provide for the support and training of a number of pre-doctoral students and post-doctoral researchers. Inasmuch as the Arctic Ocean is an epicenter of global climate change, findings of this study are expected to advance present capability to forecast changes in regional and globlal ecosystem and climate system functioning. As the United States' contribution to the International GEOTRACES Arctic Ocean initiative, this project will be part of an ongoing multi-national effort to further scientific knowledge about trace elements and isotopes in the world ocean. This U.S. expedition will focus on the western Arctic Ocean in the boreal summer of 2015. The scientific team will consist of the management team funded through this award plus a team of scientists from U.S. academic institutions who will have successfully competed for and received NSF funds for specific science projects in time to participate in the final stages of cruise planning. The cruise track segments will include the Bering Strait, Chukchi shelf, and the deep Canada Basin. Several stations will be designated as so-called super stations for intense study of atmospheric aerosols, sea ice, and sediment chemistry as well as water-column processes. In total, the set of coordinated international expeditions will involve the deployment of ice-capable research ships from 6 nations (US, Canada, Germany, Sweden, UK, and Russia) across different parts of the Arctic Ocean, and application of state-of-the-art methods to unravel the complex dynamics of trace metals and isotopes that are important as oceanographic and biogeochemical tracers in the sea.

GEOTRACES Arctic section: Application of 210Po and 210Pb distribution at contrasting

interface regimes of Western Arctic (GEOTRACES Arctic 210Po and 210Pb)

Coverage: 170E-140W; 54N-90N

NSF Award Abstract: In this project, a team of investigators participating in the 2015 U.S. Arctic GEOTRACES expedition will study the distribution of the naturally-occurring radioactive isotopes lead-210 and polonium-210 in the western and central Arctic Ocean. These measurements are expected to be very useful in helping to meet the goals of the U.S. Arctic GEOTRACES expedition: namely, to identify processes and quantify fluxes that control the distributions of key trace elements and isotopes (TEIs) in the ocean, and to establish the sensitivity of these distributions to changing environmental conditions. Some trace elements are essential to life, others are known biological toxins, and still others are important because they can be used as tracers of a variety of physical, chemical, and biological processes in the sea. A primary source of lead-210 to the oceans is from the atmosphere, where it is produced from the decay of radon-222. In the oceans, it decays to polonium-210. The half-lives of polonium-210 (138 days) and lead-210 (22.3 years) provide "natural clocks" with which to investigate processes such as the sorption of elements on to sinking particles, and the transport of elements between the ocean margins and deep basins. The lead investigator proposes to concentrate sampling and investigate processes at three "interfaces:" the air-sea-ice interface at the surface, the interface between biologically produced particles and water, and the interface between non-biological particles and water. The investigator proposes the following three hypotheses: 1) At the air-sea interface, the polonium-210/lead-210 ratios can be used to "age date" the sea ice (and sediments contained within the ice). 2) At the biotic-water interface, different biogenic particle types encountered in the upper waters will affect the fractionation and remineralization depths of polonium-210 and lead-210. 3) At the particle-water interface, layers of resuspended sediments in the water column will be zones of enhanced polonium and lead scavenging from the surrounding waters. These processes are important for understanding the distributions of other key particle-reactive trace elements such as iron, lead, and manganese. To test these hypotheses, the investigator will sample and analyze about four hundred dissolved and particulate (large and small) samples, 10 multi-year ice cores, ice-rafted sediments, and water from melt ponds for polonium-210 and lead-210 along the GEOTRACES Western Arctic section. About half of the samples will be focused at the four designated "super stations", with half of these in the highly dynamic upper water column and the other half near the sea floor where resuspension of bottom sediments can affect element cycling. The depths will be chosen according to regional atmospheric input, ecosystems, and coordinated sampling with groups measuring other trace elements and isotopes. The remainder of the samples will be ice cores, water from melt ponds, ice-rafted sediments in sea ice, and atmospheric aerosol samples. The proposed work will be closely coordinated with other GEOTRACES. The broader impacts are closely linked to the GEOTRACES program as a whole to enhance (1) research infrastructure by providing a broad array of polonium-210 and lead-210 data useful for biogeochemical scavenging models, (2) education by mentoring graduate and undergraduates, teaching by example from proposed research, (3) participation of under-represented students careers in the geosciences, (4) research training of graduates in marine radiochemistry, and 5) broad dissemination of results through publications, presentations, and on dedicated public Wayne State University websites (www.clas.wayne.edu) and at GEOTRACES (www.geotraces.org).

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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 Polar Programs (NSF PLR)	PLR-1434578

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