GEOTRACES SCIENTIFIC STEERING COMMITTEE
ANNUAL REPORT TO SCOR 2014/2015
June 2015

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1. SCOR Scientific Steering Committee (SSC) for GEOTRACES

Co-Chairs
Ed Boyle, USA
Reiner Schlitzer, Germany

Members
Andrew Bowie, Australia
Ludmila L. Demina, Russia
Jordi Garcia-Orellana, Spain
Vanessa Hatje, Brazil
Tung-Yuan Ho, China-Taipei
Phoebe Lam, USA
Maria T (Maite) Maldonado, Canada
Maeve Lohan, UK
Olivier Marchal, USA
Hajime Obata, Japan
Katharina Pahnke, Germany
Micha Rijkenberg, Netherlands
Alakendra Roychoudhury, South Africa
Géraldine Sarthou, France
David Turner, Sweden
Angela Wagener, Brazil
Liping Zhou, China-Beijing

The SSC membership (listed above) contains representatives of 14 different countries with diverse expertise including: Marine biogeochemistry of carbon and nutrients; Trace elements and isotopes as proxies for past climate conditions; Land-sea fluxes of trace elements/sediment-water interactions; Trace element effects on organisms; Hydrothermal fluxes of trace elements; Tracers of ocean circulation; Tracers of contaminant transport; Controls on distribution and speciation of trace elements; and Ocean modelling.

2. Progress on implementation of the project

After the very successful release of the first Intermediate Data Product on February 2014, GEOTRACES sustains a very favourable implementation. Its cruise field programme has now 55 GEOTRACES cruises with 747 section stations completed and about 550 papers published.

2.1 Status of GEOTRACES field programme

The field programme continues to progress very successfully. Overall 66 cruises associated with GEOTRACES (this includes 11 International Polar Year- IPY cruises) have been completed. With one section cruise already completed in the Pacific (Japan) since the last reporting period, the main field effort this year is currently focused on the completion of the GEOTRACES research Arctic Programme with 4 section cruises (from Canada, US and Germany) to be held from July to October 2015.

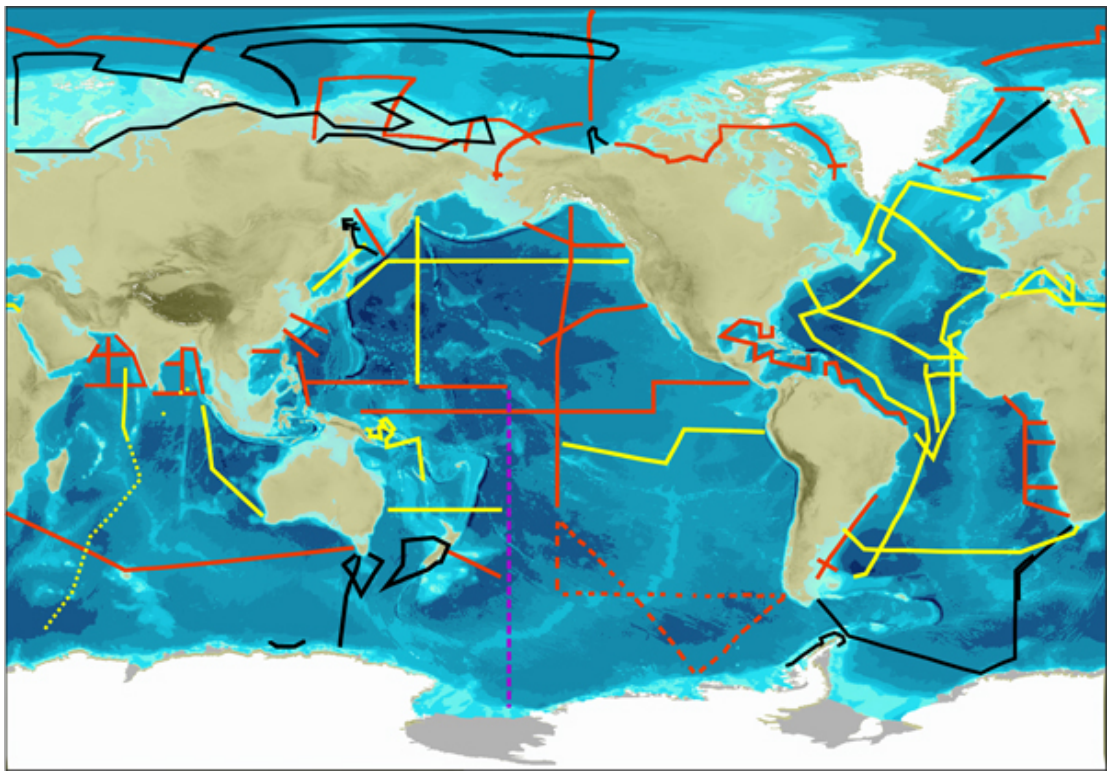


Figure 1: *Status of GEOTRACES global survey of trace elements and their isotopes. In black: Sections completed as the GEOTRACES contribution to the International Polar Year. In yellow: Sections completed as part of the primary GEOTRACES global survey (dotted purple, completed during the past year). In red: Planned Sections. An updated version of this map can be found on the GEOTRACES home page <http://www.geotraces.org>.*

2.2 GEOTRACES Intermediate Data Product 2014

A corrected and updated version of the GEOTRACES Intermediate Data Product 2014 (IDP2014) was made available on May 2015. The new version (version 2) of the digital data is available in two new formats (Excel and netCDF). As a result, the IDP2014 is available now in four formats (ASCII, Excel, netCDF, and ODV, http://www.bodc.ac.uk/geotraces/data/idp2014/). A special thanks to Reiner Schlitzer for producing this new version of the IDP2014.

In addition, a DOI has been assigned to the IDP2014 which should be cited as follows:

Mawji, E., et al., The GEOTRACES Intermediate Data Product 2014, Mar. Chem. (2015), http://dx.doi.org/10.1016/j.marchem.2015.04.005.

GEOTRACES Intermediate Data Product 2014 survey

In order to help improve the Intermediate Data Products, GEOTRACES designed a survey to collect feedback from users of the IDP2014. The survey collected 262 responses from which only 16% of the respondents were data contributors. Results from the survey can be grouped on: (1) completion of the product and suggestions for improvement; (2) use of data; (3) and dissemination. Results from each of these categories are described below:

- Completion of the product and suggestions for improvement

Results from the survey proved that the product was very successfully received by the community in that 97% of respondents did not notice errors or inaccuracies, 89% did not find any missing data or information and only 11% suggested other organization or packaging. When asking about other formats for the data to be released, 16% suggested other formats mostly netCDF, Excel and Matlab. NetCDF and Excel have already been included in version 2 of the IDP2014.

- Use of data

When inquiring about the use of data, "comparison with other data" is the use listed most frequently followed by teaching (and outreach). Other uses reported are data synthesis and modelling.

- Dissemination

76% of the respondents were aware of the IDP2014 prior to the survey (the survey served as an effective means of dissemination for the other respondents). When asking about how users learned about the IDP2014, GEOTRACES media (website and mailing list) was listed first (total of 44% of the respondents), followed by the GEOTRACES 2014 Ocean Sciences Town Hall and SCOR Booth (24% of the respondents). Word of mouth was listed in third position.

The fact that 24% of the respondents identified the 2014 Ocean Sciences Town Hall and SCOR Booth proves the worth of the time and expenditure of the SCOR Booth at Ocean Sciences. GEOTRACES is very grateful to SCOR for this opportunity.

2.3 GEOTRACES Publications

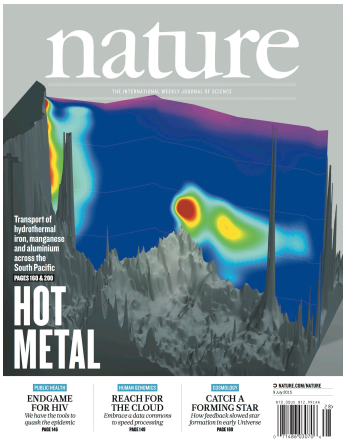
From the beginning of the project, 548 GEOTRACES publications have been included on the GEOTRACES publications database (http://www.geotraces.org/library-88/scientific-publications/peer-reviewed-papers). The following three new Special Issues have been published this year and four more are in preparation:

Progress in Oceanography (Volume 133, Pages 1-78, April 2015)
GEOTRACES Synthesis and Modeling: The role of particles in the marine biogeochemical cycles of trace elements and their isotopes
Edited by Catherine Jeandel, Olivier Marchal, Phoebe J. Lam and Robert F. Anderson
http://www.sciencedirect.com/science/journal/00796611/133

Deep Sea Research Part II: Topical Studies in Oceanography (Volume 116, Pages 1-342, June 2015)
GEOTRACES GA-03 - The U.S. GEOTRACES North Atlantic Transect
Edited by Edward A. Boyle, Robert F. Anderson, Gregory A. Cutter, Rana Fine, William J Jenkins and Mak Saito
http://www.sciencedirect.com/science/journal/09670645

Marine Chemistry (Volume 173, Pages 1-342, July 2015)
SCOR WG 139: Organic Ligands – A Key Control on Trace Metal Biogeochemistry in the Ocean
Edited by Sylvia Sander, Kristen Buck and Maeve Lohan
http://www.sciencedirect.com/science/journal/03044203/173

GEOTRACES findings featured on the cover of Nature



The work of Joseph Resing et al. (2015, see reference below) has been featured on the cover of *Nature* (Volume 523 Number 7559, Thursday 9 July 2015). The cover shows an eGEOTRACES 3D scene view of dissolved iron across the South Pacific Ocean.

Reference:
Resing, J., Sedwick, P. N., German, C. R., Jenkins, W. J., Moffett, J. W., Sohst, B. M., & Tagliabue, A. (2015). Basin-scale transport of hydrothermal dissolved metals across the South Pacific Ocean. Nature, 523(7559), 200–203. doi:10.1038/nature14577.

2.4 GEOTRACES Science highlights

Below is a selection of recent GEOTRACES science discoveries. Owing to the large amounts of publications related to GEOTRACES, our criteria this year was to extract those published in the journal *Nature*:

Dissolved Iron Sources in the North Atlantic Ocean Quantified

The relative importance of four different dissolved iron (Fe) sources in the North Atlantic Ocean have been precisely determined for the first time thanks to GEOTRACES.

Using a novel method based on the stable isotopic composition of dissolved Fe, Conway and John (2014, see reference below) have "fingerprinted" different sources of Fe along a section in the North Atlantic Ocean (GEOTRACES GA03 section). This has allowed the scientists to determine precisely the relative contribution of these sources to the North Atlantic Ocean. They found that the dominant sources were Saharan dust, which contributes 71-87 per cent of dissolved iron, followed by North American margin sediments (10-19 per cent). Smaller contributions were observed from the African margins (1-4 per cent) and hydrothermal venting at the Mid-Atlantic Ridge (2-6 per cent).

Since Fe is an essential marine micronutrient for phytoplankton, the scarcity of dissolved Fe in surface waters limits biological productivity over much of the oceans. Thus, changes in Fe inputs from different dissolved Fe sources have important implications for patterns of marine productivity and the global carbon cycle. This study therefore represents a significant contribution to our understanding of how dissolved Fe may influence past and future global change.

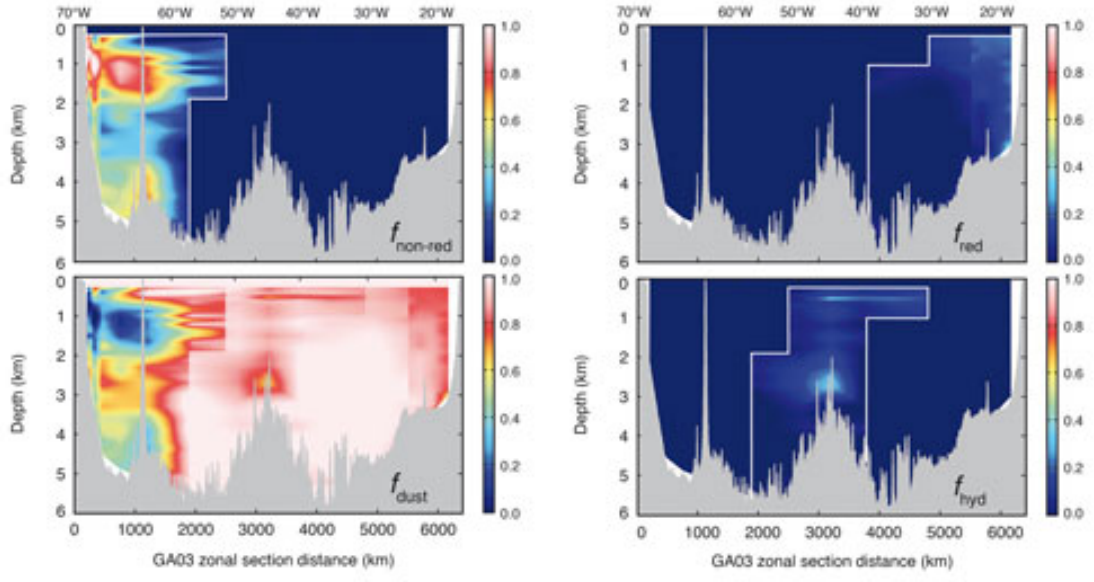


Figure 2: *The figure shows the fraction of the seawater-dissolved Fe across the GA03 North Atlantic section that originates from each of four distinct sources : 1. Fe from oxygenated sediments on the North American margin (fnon-red); 2. Fe released by dissolution of atmospheric dust (fdust); 3. Fe from reducing sedimentry porewaters on the West African Margin (fred); and 4. Fe from hydrothermal venting on the Mid-Atlantic Ridge (fhyd).*

Reference:

Conway, T. M., & John, S. G. (2014). Quantification of dissolved iron sources to the North Atlantic Ocean. Nature, 511(7508), 212–215. doi:10.1038/nature13482.

Field Data Constrain Ocean Mercury Budget

Thanks to recent measurements during several oceanographic expeditions, among them GEOTRACES cruises, estimates of the total amount and spatial distribution of anthropogenic mercury in the global ocean were substantially improved.

Global budgets of total mercury suggest that there has been a tripling of the surface water mercury content and a ~150% increase in the amount of mercury in thermocline waters above preindustrial levels.

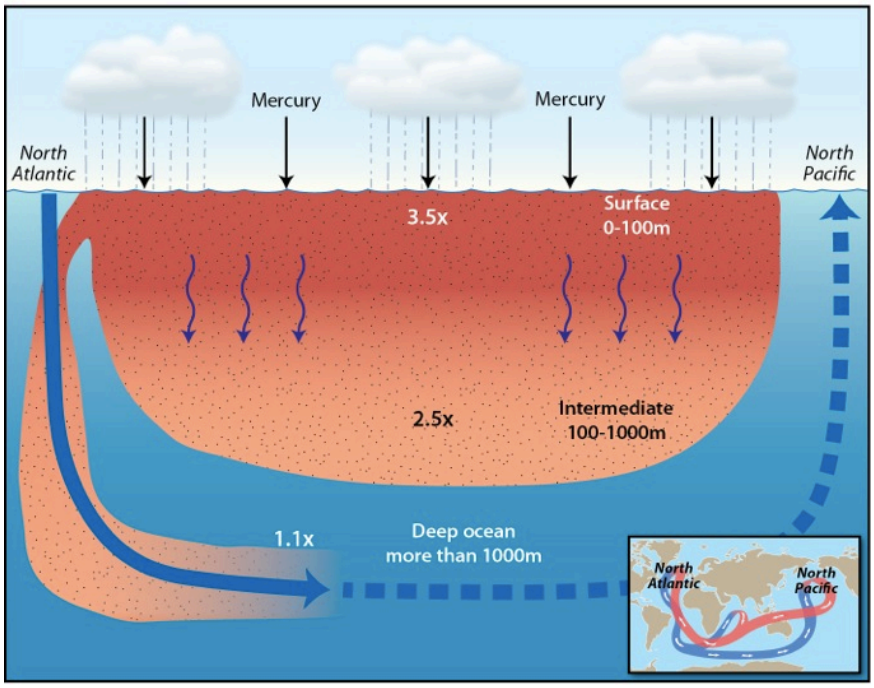


Figure 3: *GEOTRACES researchers led by Carl Lamborg found that anthropogenic mercury (primarily atmospheric emissions produced by coal burning and cement production, as well as gold mining) have caused ocean waters down to 100 meters depth to be enriched in the toxic element up to 3.5 times the background level resulting from the natural breakdown, or weathering, of rocks on land. Once in the ocean, mercury adheres to organic particles and sinks or is consumed by progressively larger marine animals. One result is that intermediate levels of the ocean (between 100 and 1,000 meters depth) are also enriched in mercury up to 2.5 times the natural background rate. Even the deepest parts of the ocean have not escaped unscathed. Researchers found signs of pollution-derived mercury in the North Atlantic at depths below 1,000 meters, but those levels decreased as sampling efforts moved away from the North Atlantic basin. This is likely because pollution mercury has not yet moved with deep ocean currents throughout the global ocean, a process that can take as long as 1,000 years (extracted from WHOI's press release). Artwork: Jack Cook, WHOI.*

Reference:

Lamborg, C. H., Hammerschmidt, C. R., Bowman, K. L., Swarr, G. J., Munson, K. M., Ohnemus, D. C., Lam P.J., Heimbürger L-E., Rijkenberg M., Saito, M. A. (2014). A global ocean inventory of anthropogenic mercury based on water column measurements. Nature, 512(7512), 65–68. doi:10.1038/nature13563

Seasonal Iron Supply in the Southern Ocean is Dominated by Winter Mixing

An international team of researchers analysed the available dissolved iron data taken from all previous studies of the Southern Ocean, together with satellite images taken of the area, to quantify the amount of iron supplied to the surface waters of the Southern Ocean. They found that in contrast to the processes that supply so-called macronutrients in the tropics, seasonal iron supply is dominated by winter mixing with little iron input afterwards. This is because the vertical profile of iron is distinct from other nutrients, with subsurface reserves located much deeper in the water column and therefore only accessible by the deeper mixing that occurs in winter. This means that after this input pulse, intense iron recycling by the 'ferrous wheel' is necessary to sustain biological activity. This unique aspect of iron cycling is yet to be explained but places important constraints on how climate models represent the iron distribution and how changes in ocean physics impact iron limitation.

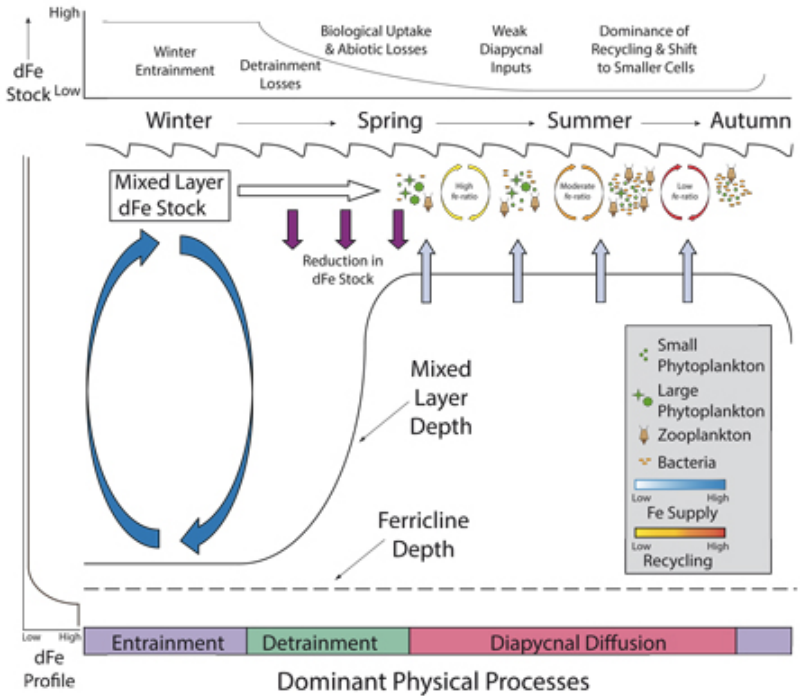


Figure 4: *This diagram represents the seasonal variability in Southern Ocean iron (Fe) cycling.*

Reference:

Tagliabue, A., Sallée, J.-B., Bowie, A. R., Lévy, M., Swart, S., & Boyd, P. W. (2014). Surface-water iron supplies in the Southern Ocean sustained by deep winter mixing. Nature Geoscience, 7(4), 314–320. doi:10.1038/ngeo2101

What Controls the Copper Isotopic Composition in Oceanic Waters?

Takano and co-workers (2014, see reference below) strongly suggest that the isotopic composition of dissolved copper ($\delta^{65}Cu$) in surface seawater is mainly controlled by supply from rivers, the atmosphere and deep seawater. This is the conclusion of a study involving six vertical profiles of copper (Cu) concentration and isotopes measured in the Indian (1) and North Pacific (5) Oceans. The finding contradicts previous interpretations suggesting a strong role of the biological activity in $\delta^{65}Cu$ fractionation.

At depth, $\delta^{65}Cu$ values are becoming heavier with the age of deep seawater, likely due to preferential scavenging of the light isotope (^{63}Cu). The authors built a box-model to quantify the oceanic budgets of both Cu concentrations and $\delta^{65}Cu$. Imbalance in this model suggests that Cu fluxes from continental shelf sediment might affect Cu distribution in the open ocean.

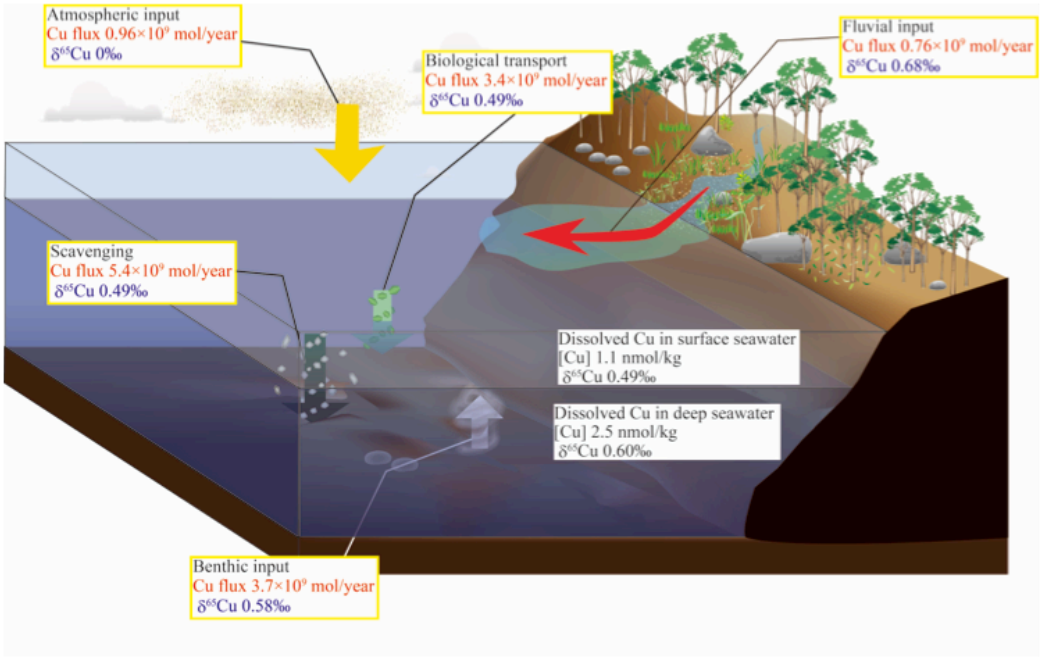


Figure 5: *A box-model of Cu in the ocean based on both Cu concentration and isotopic composition.*

Reference:

Takano, S., Tanimizu, M., Hirata, T., & Sohrin, Y. (2014). Isotopic constraints on biogeochemical cycling of copper in the ocean. Nature Communications, 5, 5663. doi:10.1038/ncomms6663

Shallow Methylmercury Production in The Marginal Sea Ice Zone of the Central Arctic Ocean

Understanding persistent high levels of mercury in arctic biota has been an elusive goal for nearly two decades. Little is known about where exactly inorganic Hg inputs into the Arctic generate the toxic methylmercury (MeHg) form that bioaccumulates in biota. Lars-Eric Heimbürger and colleagues (2015, see reference below) present the first full-depth high resolution profiles (> 5200 m-depth) of total mercury (tHg) and MeHg in the central Arctic Ocean (79-90°N). MeHg maxima occur in the pycnocline waters, although noticeably shallower than in the other oceans (150 m in the Arctic versus roughly 1000 m in the Atlantic). These shallow maxima are probably due to the accumulation of settling biogenic particles slowed down by the strong density barrier of the arctic pycnocline, which in turn will favor their microbial degradation and MeHg production. The shallow MeHg maxima likely result in enhanced biological uptake at the base of the marine food web, yielding elevated MeHg levels in Arctic wildlife. For this study the authors developed a new double isotope-dilution MeHg detection method with exceptional precision and low detection limit. These new findings will guide future Arctic Hg research, notably the international Arctic GEOTRACES multi-ship survey planned for summer 2015 by American, Canadian and German teams.

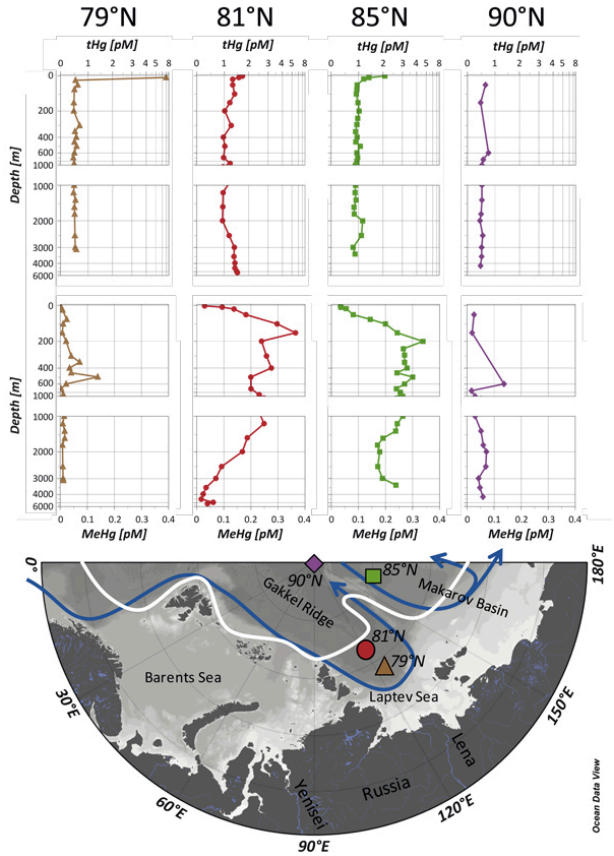


Figure 6: *Total mercury (tHg) and methylmercury (MeHg) profiles in picomoles per litre (pM) at the coastally influenced open water Laptev Sea station (PS78/280:79°N; brown triangles), the open-water Amundsen Basin station at the sea ice edge (PS78/273:81°N; red dots), the > 75% sea ice covered Makarov Basin station (PS78/245:85°N; green squares), and the permanently sea ice-covered North Pole station (PS78/218:90°N, purple diamonds). The white line indicates the sea ice extent during the time of sampling. The blue line shows the general oceanic circulation of intermediate and Atlantic waters, after Rudels, 2012.*

References:

Heimbürger, L.-E., Sonke, J. E., Cossa, D., Point, D., Lagane, C., Laffont, L., Galfond, B.T., Nicolaus, M., Rabe, B., van der Loeff, M. R. (2015). Shallow methylmercury production in the marginal sea ice zone of the central Arctic Ocean. Sci. Rep., 5. DOI: 10.1038/srep10318.

Rudels, B. Arctic Ocean circulation and variability - advection and external forcing encounter constraints and local processes. Ocean. Sci. 8 261–286 (2012).

Unexpected Magnitude of the Hydrothermal Iron Inputs in the Deep Pacific

Data from the US GEOTRACES Eastern Pacific Zonal Transect (EPZT, GP16) demonstrate that lateral transport of hydrothermal iron, manganese and aluminium extends up to 4000 km west of the southern East Pacific Rise, therefore crossing a significant part of the deep Pacific Ocean. The dissolved iron behaves more conservatively than expected, and the resulting flux is more than four times what was assumed before. Results from a coupled ocean circulation/biogeochemical model demonstrate that this hydrothermal iron input may sustain a large fraction of the Southern Ocean export production.

Nature decided to largely promote this work by reporting a GEOTRACES 3D view of the bottom Pacific showing the hydrothermal vent as a cover (see above).

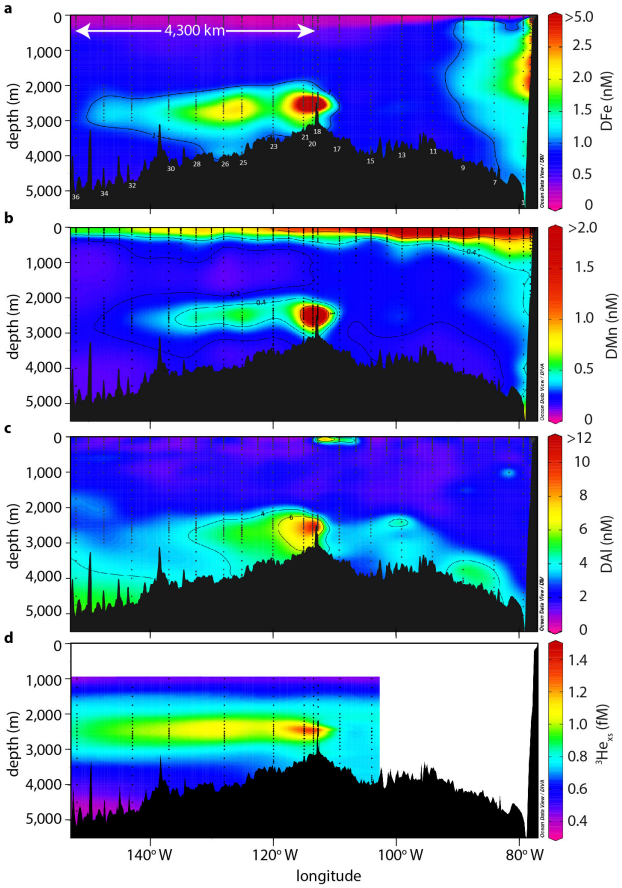


Figure 7: *The top three panels show concentrations of dissolved iron, manganese and aluminum measured during the voyage. The bottom panel shows concentration of a form of helium that marks the water as coming from a hydrothermal vent, and its decreasing concentration away from the ridge reflects mixing rather than a chemical reaction. Credit: J. Resing / Univ. of Washington.*

Reference:

Resing, J. A., Sedwick, P. N., German, C. R., Jenkins, W. J., Moffett, J. W., Sohst, B. M., & Tagliabue, A. (2015). Basin-scale transport of hydrothermal dissolved metals across the South Pacific Ocean. Nature, 523(7559), 200–203. doi:10.1038/nature14577.

Coupling Rare Earth Elements Concentrations, Neodymium And Radium Isotopes: A Powerful Tool to Decode Environmental Processes

For the first time, neodymium (Nd) isotopic compositions have been measured together with dissolved and colloidal Rare Earth Elements (REE) concentrations in the Amazon estuary salinity gradient, as part of the GEOTRACES process study AMANDES (Chief scientist: Catherine Jeandel). The sharp drop of REE concentrations in the low-salinity area (already observed in several estuaries) is clearly driven by the coagulation of colloidal material. While dissolved REE concentrations are increasing again at mid-salinities, Nd isotopic ratios allow tracing that these REE are released by the lithogenic material, weathered and transported by the river to the Atlantic Ocean. The original coupling with the radium (Ra) isotopes demonstrates that these dissolution processes are occurring within three weeks in the Amazon plume.

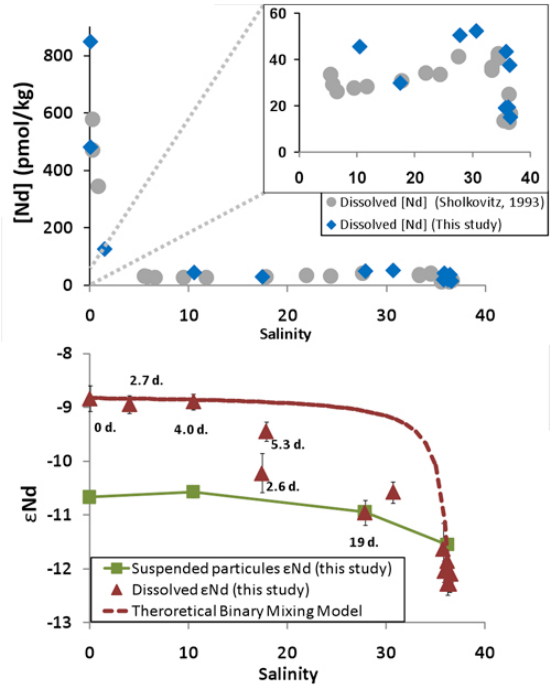


Figure 8: *Nd concentrations and isotopic composition in the Amazon River estuary.*

Upper panel: *Amazon estuary [Nd] from Sholkovitz' 1993 study (grey circles) and this study (Blue diamonds) are reported against the salinity gradient. We observe the non conservative mixing between the Amazon river and the Atlantic waters. The sharp drop in [Nd] in the low salinity region is attributed to the coagulation of colloids, the main REE carriers within river. This drop in concentrations is followed by an increase with salinity before reaching typical low Nd levels of marine waters.*

Lower panel: *Amazon estuary dissolved (Red triangles), particulate (Green squares) εNd and apparent radium ages (in days) values are reported against the salinity gradient. A simple two-endmember (Amazon and Atlantic dissolved Nd) mixing model (red dashed line) is not sufficient to explain εNd variation within the salinity gradient. The dissolved Nd phase rapidly (19 days) homogenizes with a third source, the suspended sediments.*

Reference:

Rousseau, T. C. C., Sonke, J. E., Chmeleff, J., Beek, P. van, Souhaut, M., Boaventura, G., Seyler, P., Jeandel, C. (2015). Rapid neodymium release to marine waters from lithogenic sediments in the Amazon estuary. Nature Communications, 6, 7592. doi:10.1038/ncomms8592.

3. Activities

3.1 GEOTRACES intercalibration activities

After the preceding and very busy year reviewing all intercalibration results for the first IDP release, the S&I Committee had a far less stressful, but productive, year. In addition, three new members joined the committee: Karen Casciotti at Stanford University, California (USA) covering N and C isotopes, Walter Geibert at Alfred Wegner Institute (Germany) handling radionuclides, and Tina van de Flierdt at Imperial College, London (UK) covering radiogenic isotopes such as neodymium. Both Karen and Tina were elemental coordinators in the initial 2008-2009 phase of the GEOTRACES Intercalibration programme and cruises, while Walter stood in for Michael van der Loeff for one meeting during the same phase of the programme. Thus, they are experienced with the processes of intercalibration and evaluating results from cruises.

The major accomplishment of the Committee in this period was completion and posting of the newest (Version 2.0) "Sampling and sample handling protocols for GEOTRACES cruises" cookbook on the GEOTRACES website, http://www.geotraces.org/images/stories/documents/intercalibration/Cookbook.pdf. This version has many updates for the various TEIs throughout the document and also includes a new section on artificial radionuclides that did not make it into the original version. Additionally, the hydrography requirements and methods were updated to be fully compliant with the GO-SHIP programme protocols. More significantly, the specifications for meeting intercalibration criteria were tightened up, changing the recommendations to requirements. The Committee decided that the cookbook would be updated every two years, so the next one will be in 2017 unless something critical needs to be updated/modified. To complement the cookbook, two Intercalibration Procedure documents, one for cruises with crossover stations and one for those without them, were created to help investigators undertake intercalibration before the S&I Committee sees the results (http://www.geotraces.org/science/intercalibration/89-intercalibration-documents). Both documents are only 2 pages long and should facilitate intercalibration between the relevant investigators largely independent of the Committee.

The Committee met in Galway, Ireland in January 2015 at the National University of Ireland and hosted by Peter Croot. In attendance were Per Andersson attending his last S&I meeting, Peter Croot, Greg Cutter, Walter Geibert, and Maeve Lohan; Karen Casciotti participated via conference software/internet connection. Topics discussed included: calibration and reference materials for GEOTRACES TEIs; the latest compilation of TEI acceptability criteria to achieve intercalibration (e.g., nutrients within 2%); updates on recent intercalibration efforts including mercury, ligands (SCOR Working Group), cobalt, silicon isotopes, and particles; status of data from post 2014 IDP cruises; data review procedures for the next IDP; and timelines for reviews and our next meeting. With respect to the latter, the Committee would like to meet in June 2016 and Karen Casciotti offered to host it at Stanford University. Finally, to better track the status of cruises, relevant investigators, and intercalibration status for each TEI, the Committee began a spreadsheet with all the relevant information. This document will be shared with the Data Management Committee to better coordinate and inform our collaborations for ensuring a timely and accurate IDP.

For the next year, 2015-2016, the major activities of the S&I Committee will be contacting cruise investigators to ensure that they are conducting their intercalibrations via the established procedures and submitting their results to the Committee, and reviewing these results for the next IDP. With

respect to the latter, we will work much more closely with the Data Management Committee to ensure the timely and accurate incorporation of cruise data into the IDP. We also will continue to identify suitable dissolved and particulate reference materials for the diverse suite of TEIs examined in GEOTRACES and monitor on-going intercalibration activities (e.g., chemical speciation). Finally, Lars-Eric Heimbürger at University of Bremen (Germany) will join the Committee as its newest member with an expertise in mercury and other contamination-prone trace elements.

3.2 Data management for GEOTRACES

The GEOTRACES Data Assembly Centre (GDAC) is hosted by the British Oceanographic Data Centre (BODC), with the head office located in Liverpool, but the GEOTRACES Data Manager based in Southampton, UK. Regular communication is maintained between the two sites so that support and assistance can be offered to the GEOTRACES Data Manager when required.
GDAC is responsible for the entirety of the GEOTRACES data activities from inception to completion. This takes into account the following components:

- interaction between PI's and national data centres in order to encourage regular and timely data/ metadata submissions
- maintaining and modifying GDAC webpages to include updated ocean basin maps (http://www.bodc.ac.uk/geotraces/cruises/section_maps/) and upcoming cruises on the programme page (http://www.bodc.ac.uk/geotraces/cruises/programme/)
- liaising with the Data Management Committee and Standards and Inter-calibration Committee to ensure issues/ questions relating to GEOTRACES and its progression as a project can be discussed, and deadlines can be met accordingly.
- input of metadata/ data into the BODC database and compilation of documentation to include analysis methodologies
- Collation of data/ metadata for the 2017IDP

GDAC, until recently, has been staff by a single person. This was Edward Mawji up until February 2015, at which point Abigail Bull took his place as the GEOTRACES Data Manager. BODC has allowed for extra resources to be brought on to the GEOTRACES Project in order to aid and provide support to Abigail, primarily with the data processing. When the GEOTRACES Project expects to experience busy periods (i.e. in the lead up to the 2017 IDP) this extra resource will be invaluable.
Abigail took over as GEOTRACES Data Manager in February 2015. This data management report will therefore concentrate on highlighting tasks which have been the focal point since this time.

Working with the IPO
A sound working mechanism has been established between the IPO Office and GDAC, even with the changeover of staff members at BODC. The IPO has been particularly useful in providing guidance to the new GEOTRACES Manager so the GEOTRACES project can continue to run efficiently. When there is a change in staff there is often a period of time dedicated to learning and development – the IPO Office has provided unending support in this matter and has made the new GEOTRACES Project Manager feel welcome. The IPO Office has also helped GDAC stay up to date with new cruises, as well as serving reminders of when certain people should be contacted in order to extract various information at relevant times.

Meetings attended

Various visits have been made since stepping into the GEOTRACES Data Manager role. These are:

- Visit to the IPO Office in Toulouse where Abigail met with Elena Masferrer Dodas and Catherine Jeandel. The GEOTRACES Project as a whole was discussed, as well as ways in which the IPO Office could support Abigail in her new role. Meeting significant GEOTRACES Project participants in person has solidified working relationships. This meeting also presented an opportunity to ask questions and clarify any outstanding issues. Also present was Catherine Schmechtig (Data Manager at French data centre - LEFE Cyber), and so the formats and submission of French data were discussed, along with retrieval of outstanding cruise reports for French cruises. This proved beneficial as there is now a strong working relationship and communication method between the French data centre and GDAC.

- Visit to meet Reiner Schlitzer in Bremen, Germany. The aim was to meet Reiner before the DMC/ SSC meeting in July 2015, and to discuss various data related items. These included: version 2 of the 2014 IDP, the possibility of an interactive map on the GDAC website, IDP parameter codes, and preparation techniques for the 2017 IDP. The meeting was extremely useful in regards to identifying priorities for the project, as well as ascertaining items which should be addressed/ discussed at the DMC meeting in order to clarify unanswered questions.

- Regular meetings with Alessandro Taglibue (DMC co-chair) in Liverpool – these one to one meetings have provided guidance and support to Abigail as the new GEOTRACES Data Manager. Data discussions as well as GDAC DMC items have been addressed in these informal meetings.

- Meeting with Cyndy Chandler (BCO-DMO) in Liverpool – discussion centred around BCO-DMO (US data centre) and what they can do in order to assist GDAC in its responsibilities. Further discussions regarding this will take place between 8th and 10th July when Abigail and Graham Allen (Head of BODC) will visit BCO-DMO at Woods Hole, MA, USA.

Data overview

The data management of the GEOTRACES Project is a large undertaking with a total of 66 cruises (including all cruise legs) associated with the project (this takes into account all section cruises, process studies and compliant data). More than 800 Scientists have taken part in the GEOTRACES cruises, with 15 different nations having run a major GEOTRACES IPY/ section/ process study cruise.

2014/2015 has been a successful period, where contact has been made with those PI's of outstanding data and submissions of data/ metadata are becoming more forthcoming. It has been recognised that a way of encouraging PI's to submit their data to GDAC more readily is to use the 2017 IDP as an incentive.

Summary of completed GEOTRACES cruises to date:

Section cruises	**IPY cruises**	**Process studies**	**Compliant data**
27 cruises (including all legs) with 19 sections	11	21 (including all legs) with 17 sections	5

In addition, 2 intercalibration cruises have been completed.

Since taking over as GEOTRACES Data Manager one process study cruise has taken place - NBP1409 (GPpr08 Leg2 - PHANTASTIC II cruise)). The PHANTASTIC I cruise NBP1310 02 (GPpr08 Leg1) took place in December 2013 – January 2014. This cruise has recently been approved as a GEOTRACES Process Study and so it is new to the GDAC programme page (http://www.bodc.ac.uk/geotraces/cruises/programme/). The SSB (Shelf Seas Biogeochemistry)/ GEOTRACES cruise is on its way to completion, with leg 3 (DY033 – GApr04 leg3) still to take place between 11th July and 3rd August 2015. DY018 (GApr04 Leg1) and DY029 (GApr04 Leg2) are already complete. One section cruise, KH14-6 (GP19), undertaken by Japan in the Western South Pacific and Antarctic Sea, took place at the beginning of this year.

Summary of forthcoming GEOTRACES cruises to take place in 2015/2016:

This year the International GEOTRACES Arctic research programme focuses on field effort from the US, Canada and Germany. Three Arctic cruises have been planned and funded and will take place between July to October 2015. German cruise M121 (GA08) is scheduled in the SE Atlantic with planned cruise dates of 21st November — 27th December 2015.

In summary
The collection and processing of data to be included in the 2017 IDP will be a priority over the coming year.

In summary, GDAC continues to receive outstanding data/ metadata. In order to encourage more timely submission the incentive of having data in the 2017 IDP as well as the recognition, which is attached to this, will be more formally advertised.

3.3 GEOTRACES International Project Office

The GEOTRACES International Project Office (IPO) is based at the Laboratoire d'Etudes en Géophysique et Océanographie Spatiales (LEGOS) in Toulouse, France. The IPO is staffed by a single person, the IPO Executive Officer, Elena Masferrer Dodas. She works under the scientific supervision of Catherine Jeandel (CNRS, LEGOS, France).

The IPO is responsible for assisting the Scientific Steering Committee (SSC) in implementing the GEOTRACES Science Plan and implementation plans of the programme; organising and staffing meetings of the SSC, working groups and task teams; liaising with the sponsors and other relevant organisations; seeking and managing programme finances; representing the project at international meetings; maintaining the project website and Facebook and Twitter pages; maintaining the project mailing lists; preparing GEOTRACES science highlights and the bimonthly GEOTRACES eNewsletter; maintaining the GEOTRACES publications database and the GEOTRACES Scientists Analytical Expertise Database; assisting the GDAC in securing information about upcoming cruises; and interacting with GEOTRACES national committees and groups, as well as other international projects.

Outreach effort
Outreach has been the top priority for the GEOTRACES IPO this year:

Firstly, several actions have been undertaken to publicize the Intermediate Data Product 2014 (e.g. presentations in international conferences or other international programmes conferences, sending announcements to other international programmes mailing lists).

Secondly, the IPO is collecting the GEOTRACES outreach materials and activities developed during the five years of the programme and promoting them to be used not only through the GEOTRACES Community but also to other communities. For this, the IPO has developed an Outreach website:

- GEOTRACES Outreach website
  An important effort has been done by the IPO to create website devoted to Outreach. This public website displays all the GEOTRACES outreach materials and activities:
  http://www.geotraces.org/outreach
  Example of materials available on the website are: cruise blogs, webinars, cartoons, videos, podcasts, textbooks, brochures, posters, publicity documents, etc.

Thirdly, the IPO has helped GEOTRACES national programmes in developing and promoting their outreach initiatives, as for example:

- GEOTRACES Webinar series: Ben Twining (US GEOTRACES) has developed a webinar series devoted to GEOTRACES in collaboration with COSEE. The webinar hosted by the COSEE-OS office at University of Maine is available here:
  http://www.geotraces.org/outreach/other-outreach-materials/webinars

- Toulouse Knowledge Festival (La Novela) and sharing science with prisoners (Association the stars shine for all): During the French GEOVIDE cruise, Catherine Jeandel (IPO science director, France) set up a project with the Seysses Prison (Toulouse, France). During 6 months (April-October 2014), they communicated with prisoners (via their teachers). They did this before the cruise, during the cruise (thanks to a cruise blog) and after the cruise. The project ended with a session at the Toulouse Knowledge Festival (called La Novela) in October 2014 where a video was projected followed by a debate. For further information:
  http://www.geotraces.org/outreach/other-outreach-materials/videos/1079-geovide-sharing-oceanography-with-prisioners

In addition, we would like to highlight the following tasks:

- Major GEOTRACES website overhaul: One important task this year has been to overhaul the GEOTRACES website. While keeping the same structure to facilitate access to information, the website has now a new dynamic design that provides more visibility to GEOTRACES products, including outreach activities. At the same time, the link within the GDAC website and the IPO website has strengthened. Special thanks to Olivier Boebion (Obs. Oceano. Villefranche sur Mer) and Paule Dossi (DOoWEB) for their technical assistance and advice in upgrading the website.

- Twitter account: Since February 2015, GEOTRACES has a Twitter account that counts 111 followers at the time this report is written. This is in complement to the Facebook page that accumulates 235 likers (and with 1453 people reached on a post).

- International Conferences: With the aim of publicising GEOTRACES towards other communities, two abstracts have been submitted and accepted to international conferences presenting the GEOTRACES Programme:

    - « GEOTRACES highlights in the Indian Ocean and plans for the future », oral presentation, presented by L .Demina[4] (26th IUGG General Assembly, IAPSO Symposium, special session on *the 50th Anniversary of the Indian Ocean Expedition,* Prague, 22 June- 02 July 2015)
    - « Highlights from the GEOTRACES International Programme », poster, to be presented by G. Henderson on Monday 17 August at 17h (Goldschmidt 2015, Prague, August 16-21, 2015)

- Working with GDAC: A very nice working relation has been established between the IPO and the new GEOTRACES Data Manager, Abigail Bull. On March 2015, the IPO organized a meeting in Toulouse for Abigail Bull to meet not only the IPO staff but also the French Data Manager Catherine Schmechtig.

- Intermediate Data Product 2014 Survey:
  The GEOTRACES IPO has assisted DMC co-chairs and SCOR Executive Director in disseminating the IDP2014 Survey and analysing and presenting the results.

- Some statistics:
  80 highlights published (24 since last reporting period)
  15 eNewsletter published (bimonthly newsletter)
  120 researchers included in the GEOTRACES Researchers Analytical Expertise Database
  548 peer-reviewed papers included in the GEOTRACES Publication Database

3.4 GEOTRACES Workshops

First GEOTRACES Brazil Workshop, 21-22 March 2015, Santos, Brazil.
As a result of the Latin America workshop held in 2012 (12-15 November 2012, Rio de Janeiro, a network of researchers has been established and a core community is being structured in Brazil. The *Final Statement* resulting from the this workshop is available on the GEOTRACES site:
http://geotraces.org/images/stories/documents/workshops/2015_Brazil/2015_Workshop_GEOTRACES_BRASIL_final_statement_08_05.pdf

Forthcoming:

Coupled meeting and workshop to discuss and synthesise findings from the GEOTRACES programme:

*The biological and climatic impacts of ocean trace-element chemistry, 7th – 8th December 2015, The Royal Society, London, UK.
For further information: https://royalsociety.org/events/2015/12/ocean-chemistry/

A Royal Society Scientific Discussion Meeting to present new results and discoveries about the role of ocean trace-element cycling in earth systems. Speakers from eight countries will discuss the oceanic cycles of trace elements, their role in ocean biology, their use to assess past and present ocean processes, and the influence of human activity on ocean trace-element chemistry. The meeting is open to all, with registration at the above website. There is no charge to attend.

*Quantifying fluxes and processes of trace-metal cycling at ocean boundaries, 9th – 10th December 2015, Chicheley Hall, Buckinghamshire, UK.
For further information: https://royalsociety.org/events/2015/12/ocean-chemistry/

This is a workshop format meeting to synthesise knowledge about the fluxes of trace elements at the four ocean boundaries: from continents across the shelf; from marine sediments; from mid-ocean-ridges; and from the atmosphere. Keynote talks will describe recent advances in data and understanding for each interface. Discussion groups and posters will enable a full exploration of the state of knowledge for each interface, identify areas of uncertainty, and consider possible future research. The programme is presently being finalised. This workshop has a limited number of places and is by invitation or application only.

3.5 Special sessions at international conferences featuring GEOTRACES findings

Several special sessions with relevance to GEOTRACES were featured or planned in major international conferences including:

2014 Asia Oceania Geosciences Society 11th Annual Meeting (AOGS 2014), 28 July to 1 August 2014, Sapporo, Hokkaido, Japan.
For further information: http://www.asiaoceania.org/aogs2014/public.asp?page=home.htm

*OS01: Trace elements and their isotopes in the ocean: GEOTRACES activities in Asia and Oceania

Convenors : Dr. Yoshiki Sohrin (Kyoto University, Japan), Dr. Tung-Yuan Ho (Academia Sinica, Taiwan), Dr. Pinghe Cai (Xiamen University, China), Prof. Man Sik Choi (Chungnam National University, Korea, South).

24th Earth Sciences meeting, 27-31 October 2014, Pau, France.
For further information: http://rst2014-pau.sciencesconf.org

*Session 8.5: Advances in mercury biogeochemistry. Organizers: Jeroen Sonke (GET, Toulouse) and David Amouroux (LCABIE, IPREM, Pau).

*Session 8.7 : Biogeochemical cycling of contaminants in the Arctic. Organizers: Lars-Eric Heimburger (GET, Toulouse, France) and Aurélien Dommergue (LGGE, Grenoble, France).

American Geophysical Union Fall 2014 Meeting,15-19 December 2014, San Francisco, California, USA.
For further information : http://fallmeeting.agu.org/2014/

GEOTRACES sessions:

*Trace Element and Isotope Cycling in the Coastal Environment – 40 Years of Innovations.
Conveners: Greg Cutter and Pete Sedwick

*Trace metals and isotopes in the Eastern Tropical South Pacific: Results of the 2013 US GEOTRACES Zonal Transect and complimentary studies. Conveners: Jim Moffett, Chris German and Martin Frank

GEOTRACES-related sessions:

*Productivity Proxies: New Developments and Records. Conveners: Fatima Abrantes, Bob Anderson and Heather Stoll

*Biogeochemical cycling of silicon in coastal transition zones. Conveners: Claudia Ehlert, Patricia Grasse, Daniel J Conley and Mark A Brzezinski

*The Biogeochemical Cycling of Mercury in the Coastal and Open Ocean.
Conveners: Robert P Mason and Arthur Russell Flegal

*Past Ocean Dynamics
Conveners: Joerg Albert Lippold, Luke Skinner and Sam Jaccard

ASLO 2015, Aquatic Sciences Meeting, 22-27 February 2015, Granada, Spain.
For further information: http://www.aslo.org/meetings/index.html

*142 - Chemical Oceanography/GEOTRACES
Convenor: Andrea Kochinsky, Jacobs University Bremen.

*037 - The Molecular Ecology of Metal-Microbe Interactions in the Ocean Environment.
Convenors: Robert Strzepek, The Australian National University; Maite Maldonado, The University of British Columbia; and Yeala Shaked, The Hebrew University in Jerusalem.

*014 - Atmospheric Deposition Effects in Aquatic Ecosystems
Convenors: Francesc Peters, Institut de Ciències del Mar (CSIC), Barak Herut, National Institute of Oceanography, Adina Paytan, Institute of Marine Sciences, Cecile Guieu, Laboratoire d'oceanographie de Villefranche, Ana M Aguilar-Islas, University of Alaska Fairbanks, Clifton Buck, Skidaway Institute of Oceanography and Simon Usher, University of Plymouth.

3rd International Symposium on the Effects of Climate Change on the World's Oceans, 23-27 March 2015, Santos, Brazil.
For further information: http://www.pices.int/meetings/international_symposia/2015/2015-Climate-Change/scope.aspx

*S3. Changing Ocean Chemistry: From Trace Elements and Isotopes to Radiochemistry and Organic Chemicals of Environmental Concern
Co-chairs: Angelica Peña (Institute of Ocean Sciences, Department of Fisheries and Oceans, Canada) and Geraldine Sarthou (LEMAR, IUEM, Brest, France)

12th International Conference on Mercury as a Global Pollutant, 14 - 19 June 2015, Jeju, Korea.
For further information: http://mercury2015.com/main/

*17. Integrating marine observational studies and model development
Conveners: Anne Laerke Soerensen & Lars-Eric Heimbürger

*Conference Workshop : GEOTRACES Intercalibration exercises for Hg species in seawater discussion forum
Conveners: Lars-Eric Heimbürger

Forthcoming:

Goldschmidt 2015, 16-21 August 2015, Prague, Czech Republic.
For further information: http://goldschmidt.info/2015/index

** Theme 2: Ocean Geochemistry. Present Conditions and Past Variation: fluxes, reservoirs and processes
Co-ordinators: Geraldine Sarthou (Brest University, France) and Andrew Bowie (University of Tasmania).
Team members: Katherine Barbeau (Scripps, USA), Kristen Buck (Univ South Florida, USA), Zanna Chase (Institute for Marine and Antarctic Studies, Austra), Rob Middag (Univ Otago, New Zealand), James Moffett (Univ. Southern Carolina, USA)

*02a: Trace Metals in the Ocean: Distributions, Isotopic Variation and Speciation. Session Convenors: Katherine Barbeau (UC San Diego, Scripps Institution of Oceanography, USA),

Andrew Bowie (University of Tasmania), Kristen Buck (University of South Florida, College of Marine Science, USA), Rob Middag (Univ Otago, New Zealand), Christopher Pearce (National Oceanography Centre), Phil Pogge von Strandmann (Earth Sciences, University College London, UK), Géraldine Sarthou (LEMAR CNRS, Brest, France).

*02b: Radionuclides in the Ocean
Session Convenors: Bob Anderson (Lamont-Doherty Earth Observatory, USA), Ken Buesseler (Woods Hole Oceanographic Institution, USA), Pere Masque (Universitat Autònoma de Barcelona)

*02c: Past Changes in Ocean Biogeochemistry and Circulation and their Interaction with Climate
Session Convenors: Zanna Chase (Institute for Marine and Antarctic Studies, Australia), Martin Frank (GEOMAR Helmholtz centre for ocean research Kiel, Germany), Norbert Frank (University of Heidelberg, Germany), Katharina Pahnke (ICBM and MPI for Marine Microbiology, Germany), Laetitia Pichevin (University of Edinburgh, UK), Laura Robinson (University of Bristol, UK), Tina van de Flierdt (Imperial College London, UK), Kazuyo Tachikawa (Cerege, CNRS, France)

*02d: What are the unifying principles common to all three Oxygen Minimum Zones (OMZs)?
Session Convenors: Jim Moffett (Univ. Southern Carolina, USA), Aurélien Paulmier (LEGOS, France)

*02e: Air-Sea Exchange, the Biological Pump, and Ocean Acidification
Session Convenors: Steve Emerson (University of Washington, USA), Doug Wallace (Dalhousie University, Canada)

*02f: Biogeochemistry of Arctic and Antarctic sea ice systems
Session Convenors: Jun Nishioka (Univ. Hokkaido, Japan), Delphine Lannuzel (University of Tasmania, Australia)

*02g: Advances in marine N, P and Si biogeochemistry
Session Convenors: Damien Cardinal (University Pierre and Marie Curie, LOCEAN, Paris), Albert Colman (University of Chicago, USA), Masha Prokopenko (University of Southern California, USA), Christian März (Newcastle University, UK)

*02s: Goldschmidt 25th Anniversary
The 25th anniversary talk is an overview of the progress and breakthroughs made in this theme over the last 25 years. Invited speaker: Catherine Jeandel

22nd International Society for Environmental Biogeochemistry (ISEB) Symposium Dynamics of Biogeochemical Systems: Processes and Modeling, 28 September - 2 October 2015, Piran, Slovenia.
For further information : http://www.iseb22.ijs.si

*Marine and coastal environments – Special session: GMOS and GEOTRACES

American Geophysical Union Fall 2015 Meeting, 14-18 December 2015, San Francisco, California, USA.
For further information: http://osm.agu.org/2016/

*GC067: Trace Metal Cycling in the Environment – 40 Years of Advancements
Session ID#: 8771
Convenors: Priya Ganguli, Frank Black, Sergio Sanudo-Wilhelmy and Ed Boyle

*A035: Dust in High Latitudes: From its Origins to its Impacts
Session ID#: 8015
Primary Convener: Santiago Gasso, GESTAR/NASA, Silver Spring, MD, United States
Conveners: John Crusius, USGS Western Regional Offices Seattle, Seattle, WA, United States, Gisela Winckler, Lamont -Doherty Earth Observatory, Palisades, NY, United States and Paul A Ginoux, NOAA Princeton, Princeton, NJ, United States

*OS010: Exploring the Dust-Ocean Connection in a Changing Climate
Session ID#: 8749
Primary Convener: Maurice Levasseur, Laval University, Quebec-Ocean, Quebec City, QC, Canada
Conveners: William L Miller, University of Georgia, Athens, GA, United States and Mitsuo Uematsu, University of Tokyo, Bunkyo-ku, Japan

2016 Ocean Sciences Meeting, 21-26 February 2016, New Orleans, Louisiana, USA.
For further information : http://osm.agu.org/2016/

*CT001: Atmospheric deposition and ocean biogeochemistry
Session ID#: 9243
Primary Chair: Ana M Aguilar-Islas, University of Alaska Fairbanks, Fairbanks, AK, United States
Chairs: Clifton S Buck, Skidaway Institute of Oceanography, Savannah, GA, United States and Meredith Galanter Hastings, Brown Univ-Geological Sciences, Providence, RI, United States

*CT002: Integrating approaches to understanding the distribution and transfer of trace elements in the upper water column
Session ID#: 8750
Primary Chair: Rachel Shelley, LEMAR/UBO, Brest, France
Chairs: Peter L Morton, Florida State University, Department of Earth, Ocean, and Atmospheric Science, Tallahassee, FL, United States and Sunil Kumar Singh, Physical Research Laboratory, Ahmedabad, India

*CT003: Kinetics: the force driving trace metal distributions in marine waters
Session ID#: 9486
Primary Chair: Christian Schlosser, GEOMAR Helmholtz Centre for Ocean Research Kiel, Chemical Oceanography, Kiel, Germany
Chairs: Eric P. Achterberg, GEOMAR Helmholtz Centre for Ocean Research Kiel, Chemical Oceanography, Kiel, Germany, Christoph D Voelker, Alfred Wegener Institute Helmholtz-Center for Polar and Marine Research Bremerhaven, Bremerhaven, Germany and Alessandro Tagliabue, University of Liverpool, Earth, Ocean and Ecological Sciences, Liverpool, United Kingdom

*CT008: The role of particles in the cycling of trace elements and their isotopes in the ocean
Session ID#: 7493
Primary Chair: Hélène Planquette, LEMAR, CNRS, Plouzané, France
Chairs: Phoebe J Lam, University of California Santa Cruz, Department of Ocean Sciences, Santa Cruz, CA, United States and Benjamin S. Twining, Bigelow Lab for Ocean Sciences, East Boothbay, ME, United States

*CT009: Trace Elements and Isotopes at the Interfaces of the Atlantic Ocean
Session ID#: 9208
Primary Chair: Geraldine Sarthou, LEMAR UMR 6539 CNRS UBO IRD IFREMER, IUEM, Plouzané, France
Chairs: Edward A Boyle, Massachusetts Institute of Technology, Earth Atmospheric and Planetary Sciences, Cambridge, MA, United States, Gideon Mark Henderson, University of Oxford, Earth Sciences, Oxford, United Kingdom and Micha J.A. Rijkenberg, Royal Netherlands Institute for Sea Research, Den Burg, Netherlands

*CT010: Trace Metal Bioavailability and Metal-Microorganism Interactions
Session ID#: 8373
Primary Chair: Julia M Gauglitz, Woods Hole Oceanographic Institution, Marine Chemistry and Geochemistry, Woods Hole, MA, United States
Chairs: Randelle Bundy, Woods Hole Oceanographic Institution, Marine Chemistry and Geochemistry, Woods Hole, MA, United States and Jill N Sutton, IUEM/UBO, Technopôle Brest-Iroise, Place Nicolas Copernic, Plouzané, France

*CT011: Trace metal speciation in seawater: measurements, modelling and impact on marine biogeochemistry
Session ID#: 9231
Primary Chair: David R Turner, University of Gothenburg, Gothenburg, Sweden
Chairs: Stan MG van den Berg, University of Liverpool, Liverpool, L69, United Kingdom, Sylvia Gertrud Sander, University of Otago, Dunedin, New Zealand and Kristen N Buck, University of South Florida Tampa, Tampa, FL, United States

GEOTRACES Tutorial:

*T014: What Controls the Distribution of Dissolved Iron in the Ocean?
Session ID#: 9303
Primary Chair: Alessandro Tagliabue, University of Liverpool, Liverpool, L69, United Kingdom

3.6 Capacity building

At-Sea Training GEOTRACES gratefully acknowledges support from SCOR to enable one scientist per year from a developing nation to participate in a GEOTRACES cruise. These opportunities are vital to the development of technical expertise in sampling and sample handling for contamination-prone elements aboard "dirty" ships.

Sampling Systems It is a goal of GEOTRACES that every nation carrying out oceanographic research should have access to a trace metal-clean sampling system. GEOTRACES offers guidance based on past experience in the design and construction of sampling systems as well as advice in operating these systems as shared facilities. A complementary goal is to establish a programme whereby scientists who have accrued experience in operating these systems can share that knowledge with scientists from nations that either are in the process of acquiring clean sampling systems.

An updated status of trace metal-clean sampling systems to support GEOTRACES research is provided in the table below. Scientists interested in developing one of these systems for their own use are encouraged to contact the GEOTRACES IPO or any member of the SSC, who will arrange for contact with an appropriate person to provide technical information about the design, construction and cost of a system.

Nation	Status	System/ Carousel	Bottles	Depth
Australia	Complete	Powder coated aluminium, autonomous 1018 intelligent rosette system	12 x 10-L Teflon-lined Niskin-1010X	6000 m; 6 mm Dynex rope
Australia	2nd system (complete)	Polyurethane powder-coated aluminium autonomous Seabird rosette with CTD and other sensors, auto-fire module, and all titanium housings and fittings	12 x 12-L Teflon-lined OTE external-spring Niskin-style bottles	1750 m 9mm Dyneema rope or 200 m 6 mm Dyneema rope with coupling to 6000 m CTD wire
Brazil	Complete	GEOTRACES WATER SAMPLER - 24-bottle sampler for use with modem equipped 911plus CTD	24 X 12-L GO-Flo	3000 m; Kevlar cable
Canada	Complete	Powder coated aluminium with titanium CTD housing, Seabird Rosette	24 X 12-L GO-Flo	5000 m conducting Vectran
China - Beijing	Complete	Towed fish	NA	Surface

China - Taipei	Complete	Teflon coated rosette	Multi- size GO-Flo	3000 m; Kevlar line
France	Complete	Powder coated aluminium with titanium pressure housing for CTD	24 X 12-L GO-Flo	8000 m; conducting Kevlar
Germany	CTD and bottles purchased, winch planned	Powder coated aluminium with titanium pressure housings and fittings	27 x 12-L OTE GO-Flo	8000 m; conducting Kevlar
India	Complete	Powder coated aluminium with titanium pressure housings and fittings	24 X 12-L Niskin-X	8000 m; conducting Kevlar
Israel	Complete	Powder coated aluminium, SeaBird Rosette	12 X 12-L Niskin; 8 X 12-L GO-Flo (Teflon coated)	2000 m, steel conducting cable
Italy	Complete	Go-Flo bottles on Kevlar line	5 x 20-L Go-Flos	Kevlar
Japan	Complete	Powder coated aluminium	12-L Niskin-X	10000 m; titanium armored cable
Netherlands	Complete	Titanium frame	24 X 12-liter GO-Flo	10000 m; conducting Kevlar
Netherlands	Complete	Titanium frame	24 X 27-liter ultraclean PVDF	10000 m; conducting Kevlar
New Zealand	Complete	Powder coated aluminium	5-L Teflon-lined Niskin-X	4000 m; 8 mm Kevlar line
Poland	Complete	Powder coated aluminum, SeaBird Rosette	8x 10L GoFlo	3000m, steel conducting cable
Poland	Complete	Single bottle	10l G-FLO X Teflon coated	300m Kevlar
Poland	Complete	Teflon pump on-line	Surface water pump	1.5m fixed
Poland	In development	Pump CTD	Teflon hose 10mm	Up to 200m
South Africa	Complete	Powder coated aluminium, titanium housing/fittings	24 X 12-liter GO-Flo	6500 m; Kevlar cable
UK	Complete	2 x Titanium frame, Ti pressure housings	24 10-L OTE 24 10-L OTE	2 x 8000m conducting Kevlar
USA - CLIVAR	Complete	Powder coated aluminium	12 X 12-L GO-Flo	1500 m; conducting Kevlar

USA - GEOTRACES	Complete	Powder coated aluminium with titanium pressure housings and fittings	24 X 12-L GO-Flo	8000 m; conducting Kevlar
USA- University of Alaska Fairbanks	Complete	Seabird Rosette. Powder coated aluminium with Ti parts and pressure housing. Fires at pre-programmable depths	12 X 5-L Teflon-lined Niskin-X	No Kevlar line available yet.
USA- Old Dominion University	Complete	Seabird Rosette. SBE-19plusV2 CTD unit. Powder coated aluminium with Ti parts and pressure housing. Fires at pre-programmable depths	12 X 5-L Teflon-lined Niskin-X	2000 m 0.5-inch Kevlar wire
USA – Polar Programs	Complete	Powder coated aluminium with titanium pressure housings and fittings	12 X12-L Niskin-X	3000 m; conducting Kevlar

4. Plans for coming years

Field Programme
The completion of the GEOTRACES research Arctic programme (4 cruises in 2015 and 1 more planned for 2016) will be one important target of the field programme for the coming reporting year. In addition, other cruises are already planned in the Atlantic Ocean (Germany, Netherlands), Pacific Ocean (Japan and Germany) and Southern Ocean (Australia).

Next Intermediate Data Product
GEOTRACES plans to release **the second Intermediate Data Product at Goldschmidt 2017** (13-18 August 2017, Paris, France). Thus, preparing the next Intermediate Data Product will be the top priority for the GEOTRACES community. A procedure and clear timeline for data submission and review will be established and communicated in order to ensure the timely release of the next IDP.

GEOTRACES synthesis of results strategy
GEOTRACES plans to launch a three-pronged synthesis initiative. The first component focuses on sources and sinks of TEIs at ocean boundaries, starting with the workshop "The biological and climatic impacts of ocean trace-element chemistry" (7-8 December 2015, Royal Society in London, UK, see « GEOTRACES Workshops » above).

The second component focuses on internal cycling of TEIs within the ocean. This will be organised by U.S. GEOTRACES, in collaboration with the Ocean Carbon and Biogeochemistry Programme (OCB) in mid-2016.

The third component will be centered on geochemical tracers used as paleoceanographic proxies with a workshop planned for 2017. GEOTRACES is exploring a partnership with the Past Global Changes project (PAGES) in hosting this workshop.

The first two workshops will use the wealth of data in the 2014 Intermediate Data Product (IDP2014) and demonstrate to the broader oceanographic community the usefulness of the IDP2014. The 2017 workshop will have access to the first and second IDPs, as well as to the results of the 2015 and 2016 workshops.

Together, these workshops cover the main scientific goals of GEOTRACES and are designed to respond to the expectation that GEOTRACES results benefit other oceanographic disciplines.

Acknowledgements

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Written and compiled by:
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