GEOTRACES SCIENTIFIC STEERING COMMITTEE
ANNUAL REPORT TO SCOR 2012/2013
July 2013

SCOR Scientific Steering Committee (SSC) for GEOTRACES

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Members rotating off at the end of 2012
Gideon M. Henderson, UK
Sunil Kumar Singh, India

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.

1. SSC meeting

The seventh meeting of the GEOTRACES SSC was held from 29-31 October 2013 in Goa, India. The meeting was hosted by Sunil Kumar Singh from the Physical Research Laboratory (a Unit of Department of Space Government of India, Ahmbedabad, India).

The meeting was attended by 16 member of the 2011/2012 SSC. Other attendees included: Bob Anderson (Past SSC co-chair); Chris Measures (Co-chair of the Data Management Committee); Reiner Schlitzer (Co-chair of the Data Management Committee); Greg Cutter (Chair of the Standards and Intercalibration Committee); Ed Urban (SCOR); Ed Mawji (GEOTRACES Data Assembly Centre); Catherine Jeandel (GEOTRACES International Project Office).

The morning of the first day was spent in presentations of national reports detailing GEOTRACES activities of the last year in 16 countries and also of the COST Action ES0801 (cross-national activities). The afternoon started with presentation of activities of the International Project Office. Subsequent discussion addressed GEOTRACES Publications and Outreach. The day concluded with a review of the International Partnerships.

The morning of the second day of the SSC meeting focused on Data Management and Intercalibration. An important discussion item was the Intermediate Data Product to be released on Spring 2014. During the afternoon, a review of the GEOTRACES Sections was made. This included a presentation of the GEOTRACES International Arctic Programme, the GEOTRACES Mediterranean Cruise plans and the BioGEOTRACES initiative. The day ended with discussion about GEOTRACES funding and rotations of SSC and Data Management Committee (DMC).

The third and final day of the SSC meeting started with a review of the applications from ten studies to become GEOTRACES process studies. Subsequent discussion addressed past and future GEOTRACES Workshops and Special Sessions. The meeting concluded with a discussion of GEOTRACES Capacity Building.

The next SSC meeting is scheduled for 2-4 October in Bremerhaven (Germany) and will be hosted by Reiner Schlitzer at the Alfred Wegener Institute for Polar and Marine Research.

2. GEOTRACES Intercalibration

The GEOTRACES Standards and Intercalibration Committee (G. Cutter, Chair; P. Andersson, L. Codispoti, P. Croot, R. Francois, M. Lohan, H. Obata, and M. van der Loeff) met 1-3 May 2013 at the Swedish Museum of Natural History in Stockholm, Sweden to review Atlantic Ocean crossover station results and discuss several issues of relevance to the committee; the meeting was hosted by Per Andersson. It is important to remember that the S&I Committee's charge is to ensure that accurate and precise data are generated in the GEOTRACES Program through the use of appropriate sampling protocols, analytical standards and certified reference materials, and the active sharing of methods and results, with this last item being intercalibration. Of course there are few reference materials that actually represent real ocean waters, so as much as possible GEOTRACES cruises occupy stations along their transects that have been occupied by another GEOTRACES cruise, thus creating the "crossover" stations. At these crossovers data, particularly those in deeper waters, can be directly compared and if statistically significant differences are found, the investigators who generated the data can work together to resolve any underlying issues, for example differences in calibration or blanking. To date the S&I Committee has now examined more than 8000 data for trace elements and isotopes, mainly in the Atlantic Ocean, and water column hydrography (temperature, salinity, nutrients, and oxygen concentrations as a function of depth). Much of the data reviewed will be incorporated into the 2014 GEOTRACES Intermediate Data Product. Notices on the S&I Committee evaluations have been sent to all the data suppliers, and the Committee will meet again in late September 2013 for a re-evaluation of results that have been resubmitted after a thorough intercalibration by the cruises' participants.

Another significant activity in 2012-2013 was the publication of further results from the GEOTRACES Intercalibration Programme in a special issue of *Limnology and Oceanography: Methods* entitled, “Intercalibration in Chemical Oceanography: http://www.aslo.org/lomethods/si/intercal2012.html. The editors of this special volume are Greg Cutter (USA), Peter Croot (UK), and Per Andersson (Sweden).

3. Data Management for GEOTRACES

The GEOTRACES Data Assembly Centre (GDAC) is hosted by the British Oceanography Data Centre (BODC), Liverpool, UK. GDAC is responsible for all GEOTRACES data activities from start to finish, including interacting with the Principal Investigators (PI) and national data centres, and will eventually become the central point for all GEOTRACES data.

The office is staffed by a single person: Edward Mawji - Under the present data model GDAC will not contact the scientist directly (unless the PSO has grant priory permission) and all requests for data are channelled through the local/national data centres. This requires GDAC to have a good working relationship with each national office. Considerable effort is spent each year trying to establish a good working relationship with national data centres.

Working with the IPO

A good working mechanism has been established between GDAC and Elena Masferrer Dodas at the IPO office. Information is freely exchanged between the two sites. The IPO office has helped GDAC keep up to date with new developments and upcoming cruises, this has been especially important in 2012/13 with so many GEOTRACES process studies approved at the last SSC meeting.

Website progress

In 2011/2012 there was a desire from the GEOTRACES SSC and DMC to have a map interface as the front page of the GEOTRACES data management site hosted by BODC.
In response to this request an interactive world map has been developed to aid in cruise and data discovery in a visual manner. With the list of GEOTRACES section cruises and process studies growing such a capability greatly facilitates navigation.
The following functionalities were developed:-

- An interactive map with the ability to load on different layers. The layers available are past, future and process studies cruise lines
- Cruise lines that are mouse-sensitive. When users rest the mouse over such elements they: (1) obtain cruise names and (2) obtain a dropdown menu with links to cruise meta-information (dates, chief scientists, parameters/responsible PIs and data holdings).

A working version of this tool is available on the GDAC website however additional development is required to fix some obvious bugs. Once the final version is released a major website overhaul is planned by GDAC to make the maps and delivery mechanism more prominent on the website.

GEOTRACES intermediate data project

In 2014 GEOTRACES plans to release an intermediate data product. In preparation for this product GDAC has been working closely with the GEOTRACES Standards and Intercalibration committee (S&I). Over the past 12 months GDAC has spent a considerable effort collecting and preparing files for the S&I meeting in May 2013. This involved compiling data from crossover stations and producing XML method documentation.

In preparation for the final intermediate data product GDAC has started to load intercalibrated data from the IPY and GEOTRACES cruises into BODCs database (only data approved by the S&I committee will be loaded into the database). Detailed data and metadata checks are required and final XML method and quality control documents need to be created.

Data overview

The data management of the project is now a huge undertaking with 46 cruises associated with GEOTRACES and 815 data sets identified in BODCs database (expected to rise once missing metadata forms are submitted). Over 200 scientists have taken part in GEOTRACES cruises with 14 different nations having run a major GEOTRACES/IPY section cruise or process study.

2012/2013 has been a relatively successful year; considerable progress has been made collecting data. With the intermediate data product to be released in 2014, the GEOTRACES research community has made a massive effort to submit data to national data centres and GDAC. The US scientists have really led the way with DCO-DMO deserving a special mention.

However GDAC has noticed a problem with the quality of metadata being submitted. In 2012/2013 a significant amount of time and effort was wasted investigating missing metadata. Unfortunately data is being submitted with no event information (e.g. CTD cast number), no reference to the bottle the sample was collected from and no methodology. All this information is required to meet the data management principles of BODC and GEOTRACES.

Summary of GEOTRACES cruises

- 14 IPY cruises
- 2 compliant cruise
- 11 process studies
- 19 GEOTRACES cruises -13 sections

GEOTRACES section cruises:

GEOTRACES sections- 19 cruises

Pacific Ocean	GP13	2 cruise Australia and new Zealand
Pacific Ocean	GP03	1 cruise Japanese
Pacific Ocean	GP12	1 cruise France
Pacific Ocean	GP18	1 cruise Japanese
Pacific Ocean	GP02	1 cruise Japanese
Indian Ocean	GI04	1 cruise Japanese
Indian Ocean	GI03	1 cruise –India
Atlantic Ocean	GA02	3 cruise -Netherlands
Atlantic Ocean	GA10	2 cruise-UK
Atlantic Ocean	GA06	1 cruise -UK
Atlantic Ocean	GA11	1 cruise-Germany
Atlantic Ocean	GA03	2 cruise-USA
Mediterranean Sea	GA04N	1 cruise -Netherlands
Mediterranean Sea	GA04S	1 cruise -Spain

With the vast quantity of data from these cruises expected in 2013/14 it becomes apparent that data needs to be submitted by the time line specified. As ever, it is vitally important that scientists submit data following the GEOTRACES / BODC submission guidelines to ensure smooth processing and archiving.

In summary GDAC policies are proving effective with clear results; PI's are following guidelines and metadata is being submitted.

4. Status of GEOTRACES Section Cruises

The anticipated decade-long field program is now well underway and is enjoying a successful implementation (Figure 1).

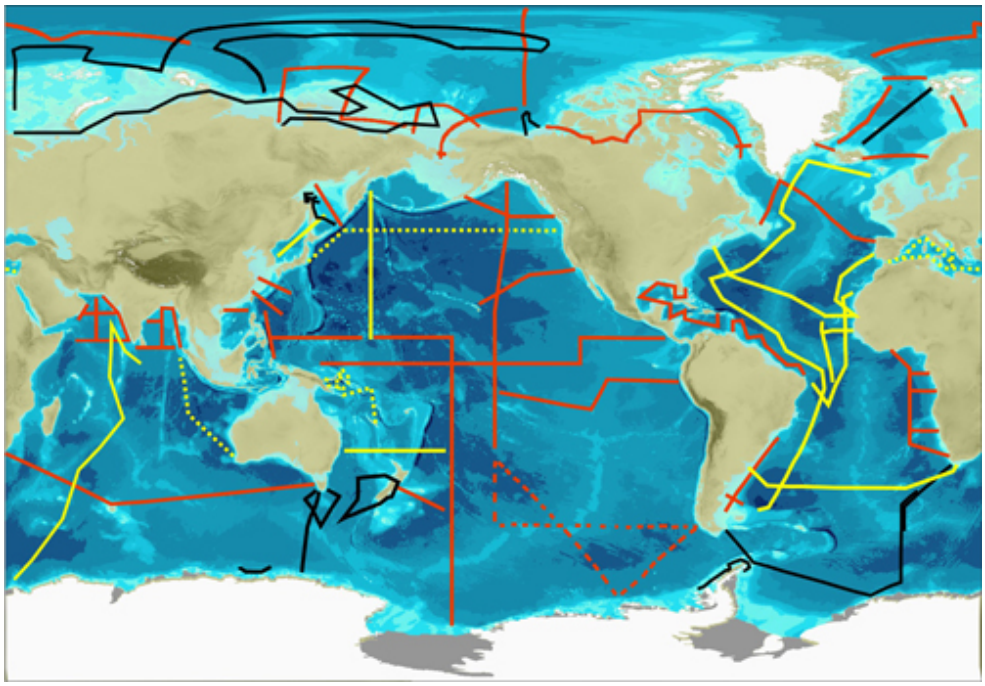

Figure 1. *Status of GEOTRACES global survey of trace elements and their isotopes. In black: Sections completed as GEOTRACES contribution to the International Polar Year. In yellow: Sections completed as part of the primary GEOTRACES global survey (dotted yellow, completed during the past year). In red: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

5. 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). Ms. Masferrer Dodas was on maternity leave from 19 October 2012 to 25 March 2013. During this period, the GEOTRACES IPO welcomed Ms. Paule Dossi.

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 web site and mailing lists; assisting the GDAC in securing information about upcoming cruises; and interacting with GEOTRACES national committees and groups, as well as other international projects.

This year, we would like to highlight the following tasks:

Outreach: Two new items deserve description:

GEOTRACES eNewsletter: The e-Newsletter has been set up in order to disseminate the main scientific results of the GEOTRACES Programme and inform about all GEOTRACES activities. It is a bimonthly on-line publication available on the web site and distributed through the GEOTRACES International mailing list. It includes highlights of main scientific results of GEOTRACES, summaries of GEOTRACES Activities, GEOTRACES News, information about any upcoming event (cruise, workshop, etc.) and the latest GEOTRACES-related papers published. The first issue was published in February 2013 with a total of 3 issues published. This publication replaces the previous *Science Highlights Newsletter*.

Outreach Library: To complement the educational material compilation, the IPO is assembling materials (images, figures, videos, etc.) in order to create a collection of compelling slides that shows GEOTRACES results and work. These materials will be available on the GEOTRACES web site for anyone to include in their presentations and help advertise the success of the programme.

GEOTRACES Facebook page: The IPO has set up and maintains a GEOTRACES Facebook page as requested by the SSC during last meeting. So far, 72 persons follow this page regularly. The GEOTRACES Facebook page is available on the following link:
https://www.facebook.com/pages/GEOTRACES/255668524559825?ref=stream

Communication tools: The GEOTRACES IPO has continued to improve and maintain the following communication tools:

GEOTRACES web site <http://www.geotraces.org>*:* The project web site, which provides up-to-date information about the GEOTRACES cruise programme and all GEOTRACES activities, has been overhauled this year. It has a new layout while maintaining the same structure. It also has new functionalities such as the possibility to link the articles directly to Facebook, a GEOTRACES eNewsletter archive web page, the possibility to create groups of users and make some pages (for instance, forum streams) only accessible to certain of these groups, etc. Maintaining and upgrading the programme Web site has consumed a considerable part of GEOTRACES IPO time this year.

The following addition to the Web site merits to be described:

*National and Regional Activities map: An interactive map has been set up on the GEOTRACES site. The map provides information about national representatives contact details and activities: http://www.geotraces.org/science/national-activities

GEOTRACES Poster: A poster to be presented at international meetings and conferences has been designed and presented to several international conferences. A customizable template is available on the private GEOTRACES site.

Brochure: A brochure is available on the GEOTRACES web site and hardcopies can be requested to the GEOTRACES IPO.

Databases: The IPO is responsible to maintain the following databases:

GEOTRACES Peer-reviewed Papers and PhD Dissertations & Master thesis Databases: Both databases have been set up by the IPO using the Mendeley free academic reference manager and they are available on the GEOTRACES web site. The IPO takes care of updating them. This year, as requested by the SSC, the PhD dissertation database has been extended to include Master Thesis. So far, 171 GEOTRACES peer-reviewed papers and 14 GEOTRACES-related PhD Dissertations or Master Thesis have been included.

GEOTRACES Researchers Database: The IPO worked with the GEOTRACES Standards and Intercalibration Committee (S&I Committee) and the GEOTRACES Intercalibration Coordinators to set up a database of GEOTRACES Researchers Analytical Expertise. 111 researchers registered their expertise in the database. The S&I Committee has now validated the information about each researcher.

Other main tasks for the GEOTRACES IPO this year have included:

Funding: The GEOTRACES IPO has concluded one new funding agreement with the Alfred Wegener Institute (AWI) for Polar and Marine Research (Germany). The contribution initially envisaged for one year (2012) has been extended for another year (2013).
French funding has been assured for one year more. Several meetings with sponsors were made.

Assisting GDAC: The GEOTRACES IPO is working closely to the GDAC and helps it to secure up to date information about new developments and upcoming cruises. This year it was particularly important to compile information about the 8 new Process Studies approved during last GEOTRACES SSC meeting.

Meeting organisation: The GEOTRACES IPO has helped to organize the GEOTRACES Latin American Workshop (12-15 November 2012, Rio de Janeiro, Brazil), the Russian GEOTRACES Workshop (27-29 November, Moscow, Russia) and the upcoming 2013 SSC and join Data Management and S&I Committees meetings (29 September – 4 October 2013, Bremerhaven, Germany).

6. GEOTRACES Science Highlights

GEOTRACES scientists discover new variability in iron supply to the oceans with climate implications

Researchers based at the National Oceanography Centre Southampton (UK) and at the University of South Carolina (USA) have found that the amount of dissolved iron released into the ocean from continental margins displays variability not currently captured by ocean-climate prediction models. This could alter predictions of future climate change because iron, a key micronutrient, plays an important role in the global carbon cycle. The amount of iron leaking from continental margin sediments was previously assumed to reflect rates of microbial activity within the sediments. Dr.

William Homoky and co-authors found that the rate of iron release from seafloor sediments close to continents is actually far more varied between regions because of local differences in weathering and erosion on land. The results of this study, which formed part of the GEOTRACES International Programme, are published in *Nature Communications:*
http://www.geotraces.org/images/stories/documents/Publications/13_Homoky/ncomms3143.pdf

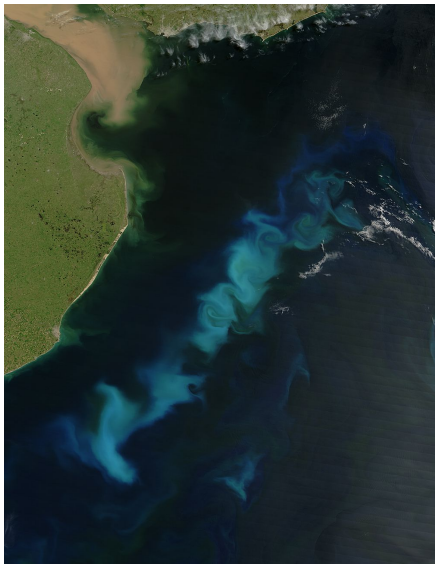

Figure 2. The image shows a satellite-captured view of a productive ocean margin in the western South Atlantic Ocean. Visible milky-blue swirls of ocean colour are blooms of tiny phytoplankton taking up carbon dioxide in the surface ocean. These blooms are caused by ocean currents, which stir nutrient laden waters from the continental margins into the sunlit surface ocean. Rivers, like the South American Río de la Plata or River Plate shown here, are an important source of nutrient-rich material to shelf systems. Credit: NASA http://visibleearth.nasa.gov/view.php?id=75351

Latest Recommendations for Successful Analysis of Dissolved Osmium in Seawater

Analysis of osmium in seawater presents complex challenges, linked to its very low (femtomolar) concentrations and multiplicity of possible oxidation states. Early insights were provided by Karl Turekian's group at Yale where it was realized that osmium tends to concentrate both in oxidizing Fe-Mn nodules and in reducing organic-rich marine sediments. Efforts to directly measure the seawater osmium isotope composition and concentration began in earnest following the developments in early 1990s of highly sensitive N-TIMS and ICP-MS. Initial techniques that attempted to pre-concentrate osmium using column chromatography (Minoru Koide and collaborators at Scripps Institution of Oceanography) and co-precipitation (Mukul Sharma and collaborators at Caltech) were only partially successful due a lack of equilibrium between seawater and tracer osmium. A breakthrough came in 1998, when Sylvain Levasseur in Claude Allegre's group in Paris simultaneously oxidized and pre-concentrated osmium in liquid bromine at 90°C. Oliver Woodhouse and coworkers at the Woods Hole Oceanographic Institution developed another procedure of directly distilling osmium from seawater and sparging it into an ICP-MS. These procedures appeared robust but yielded conflicting results. Subsequent work at Dartmouth (Sharma and collaborators) and Nancy (Maxence Paul and collaborators) has demonstrated that much higher temperatures and longer durations are required to fully equilibrate sample and tracer osmium. The complexities involved in storage of seawater osmium have also become apparent (see link to Eos report below). These findings resulted from U.S. National

Science Foundation funded GEOTRACES intercalibration efforts in the Pacific and Atlantic oceans. The new insights call into question much of the earlier data on the marine distribution of this important biogeochemical tracer and raise new issues: How actively is osmium cycled in the water column? What is the relative importance of the various sources? How important are anthropogenic inputs? The workshop on "Dissolved Osmium Isotope Analysis" held at the Palais de Congrès de Montreal on 24 June 2012 before the annual Goldschmidt Conference summarized the latest recommendations for successful seawater osmium analyses.

Reference:

Peucker-Ehrenbrink, B., M. Sharma, and L. Reisberg (2013), Recommendations for Analysis of Dissolved Osmium in Seawater, Eos Trans. AGU, 94(7), 73.
For further information: http://onlinelibrary.wiley.com/doi/10.1002/2013EO070006/abstract

A global compilation of dissolved iron measurements: focus on distributions and processes in the Southern Ocean

A data synthesis effort recently compiled over 13,000 observations of dissolved iron concentrations that more than doubled the previous data compilation. A systematic analysis of the distribution of data in the Southern Ocean was performed using four regions, six basins and five depth intervals as a framework. Substantial variability in the depth dependent trends were found between different basins and regions, which were indicative of the possible underlying influence of ocean physics, chemistry and biology. Alessandro Tagliabue's and co-authors (Tagliabue, et al. 2012) analysis was able to highlight where observations are lacking in a particular region or time of year, which they hope will assist future sampling efforts. *Overall, more observations have been collected in the past 5 years under the auspices of the International Polar Year and GEOTRACES efforts than were collected in the prior ~15 years.* Nevertheless, despite this progress the seasonal cycle of iron that can be extracted from the well-sampled region south of Tasmania remains enigmatic. From over 160 observations, they find little evidence of 'winter recharge' in iron concentrations and instead find the highest iron concentrations to be coincident with the highest phytoplankton biomass levels. This might reflect gaps in seasonal sampling between July and November or the influence of the so-called 'ferrous wheel' in driving the recycling of iron. This clearly highlights the need for more measurements of iron at 'seasonal transitions', even in well-sampled areas.

This dataset will prove useful for other regional synthesis studies or the evaluation of ocean biogeochemical models. It continues to be maintained by A. Tagliabue and is available from GEOTRACES Data Assembly Centre web site (http://www.bodc.ac.uk/geotraces/) or http://pcwww.liv.ac.uk/~atagliab/LIV_WEB/Home.html.

Reference:

Tagliabue, A., et al. (2012) A global compilation of dissolved iron measurements: focus on distributions and processes in the Southern Ocean, Biogeosciences, 9, 2333-2349, doi:10.5194/bg-9-2333-2012.

Substantial intra-basin variation of the dissolved metal/phosphorus ratio in the different water masses of the Indian Ocean

The first simultaneous, full-depth, and basin-scale section-distribution of dissolved (D) aluminum (Al), manganese (Mn), iron (Fe), cobalt (Co), nickel (Ni), copper (Cu), zinc (Zn), cadmium (Cd), and lead (Pb) is reported in the Indian Ocean. In addition to widespread co-limitation for phytoplankton production by dissolved iron (DFe) and occurrence of redox-related processes, the authors observe an important variability of the dissolved metal/phosphorus ratio among the water masses within the Indian ocean (up to a factor of 300 between Arabian Surface waters and Lower Circumpolar Deep Water). The Cu/P, Zn/P, and Cd/P ratios are within the same order of magnitude for both phytoplankton and deep water, whereas the Mn/P, Fe/P, and Co/P ratios of phytoplankton can increase 100-fold or more compared to those in deep water. Such results are questioning the validity of using an "extended Redfield ratio" to trace metals. The consistent mechanism yielding these variations remains to be understood.

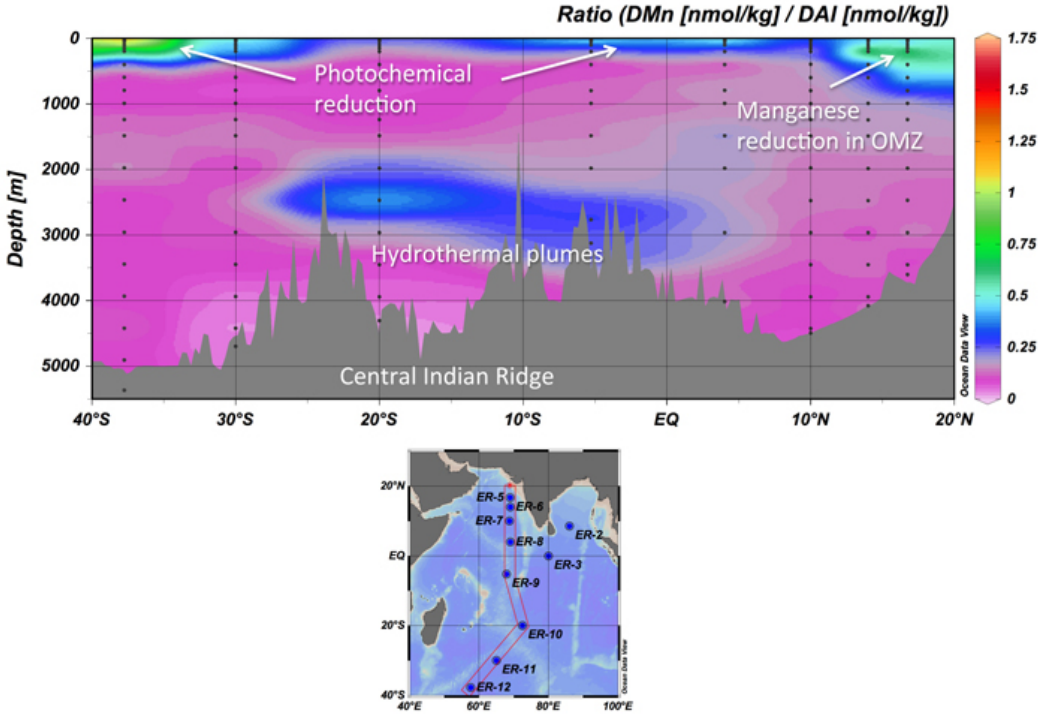

Figure 3. Meridional section distribution (~70°E) of the DMn/DAl ratio

Reference:

Thi Dieu Vu, H., Sohrin, Y. (2013) Diverse stoichiometry of dissolved trace metals in the Indian Ocean, Scientific Reports 3, DOI: 10.1038/srep01745
Available at : http://www.nature.com/srep/2013/130429/srep01745/full/srep01745.html

Arsenic detoxification by phytoplankton reveals that As species could be good proxies of P limitation

Some phytoplankton species have the capacity to modify surface water arsenic speciation, inhibiting its toxicity. Such detoxification is operative in oligotrophic waters when phosphate concentrations are below those for As. During the US GEOTRACES North Atlantic transect, fine determination of As speciation allowed establishing the potential use of these detoxification products as indicators of P limitation. The new As indicator has been used to assess P-limitation in the North Atlantic, improving on the contradictory assessments using the conventional proxies. The coupled relationship between As and P is a classic example of a biogeochemical cycle, and how such relationship can be used as a tool in oceanography.

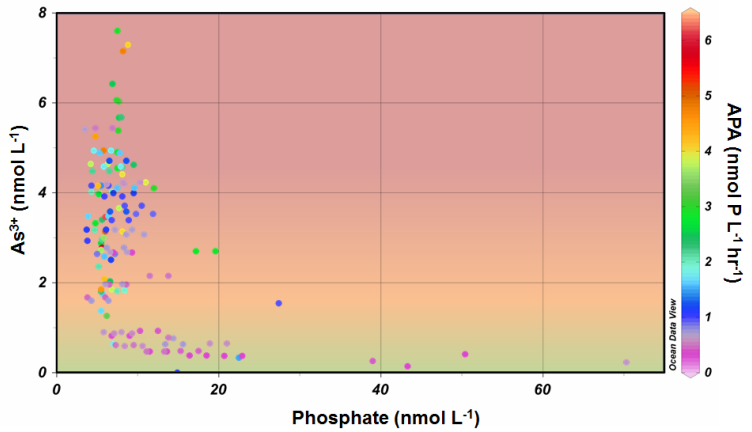

Figure 4. Relationship between inorganic phosphate, arsenite (As3+) and alkaline phosphate activity (APA), the latter being an enzyme to cleave organic-bound phosphate and typically increasing with decreasing inorganic phosphate. Arsenate (As5+) uptake by phytoplankton increases under low phosphate availability due to the chemical similarities between them. Detoxification includes reduction and excretion of As3+, consequently indicating moderate (orange background) and extreme (red background) limitation of phosphate. No phosphate limitation occurs if As3+ levels are below 1 nmol L-1 (green background).

Reference:

Wurl, O., L. Zimmer, and G.A. Cutter. 2013. Arsenic and phosphorus biogeochemistry in the ocean: Arsenic species as proxies for P-limitation. Limnol. Oceanogr. 58: 729-740.

Significant role of dissolved/particulate Nd from the Ganga–Brahmaputra river system and Bay of Bengale margin in contributing to the dissolved Nd budget of the global oceans

Data on dissolved Nd concentrations and isotopic compositions measured along a 87 E transect (GI01 section, "Indian GEOTRACES") have been used in an inverse model in order to identify the respective effects of water mass mixing and Nd release from particulate matter in balancing this tracer budget in the Bay of Bengal. Results clearly underline that release from particulate phases supplied by the Ganga–Brahmaputra river system is required to explain both the distribution and budget of the Nd parameters. Calculations also evidence that supply of Nd from continental margin sediments is occurring at places identified at places identified as "hotspots of Nd release".

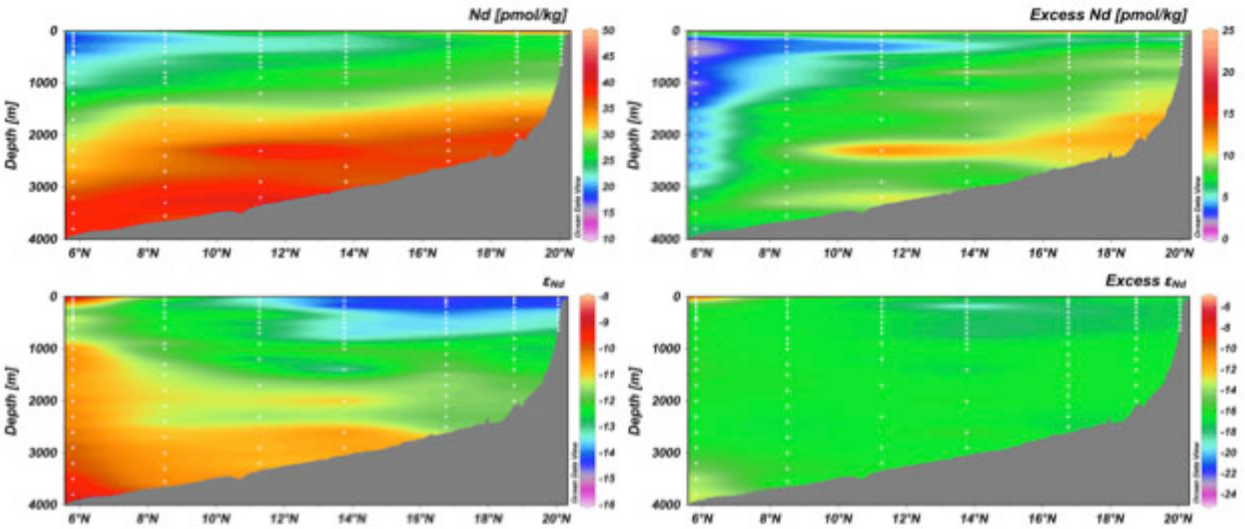

Figure 5. The distribution of concentration and isotope composition of dissolved Nd along the 87 degree E transect in the Bay of Bengal.

Reference:

Satinder Pal Singh, Sunil Kumar Singh, Vineet Goswami, Ravi Bhushan, Vinai Kumar Rai (2012), Spatial distribution of dissolved neodymium and εNd in the Bay of Bengal: Role of particulate matter and mixing of water masses: Geochimica et Cosmochimica Acta, ELSEVIER (94) p. 38-56, DOI : 10.1016/j.gca.2012.07.017.

Hydrothermalism: A Significant Dissolved Iron Source For The Deep Waters ?

A North-South basin-scale full-depth section profile of dissolved Fe was realized in the Indian Ocean, as part of the first GEOTRACES Japanese cruise (Nov 2009-Jan 2010). The data clearly show that hydrothermal Fe is distributed over 3000 km distance around a depth of ~ 3000 m, and that a large fraction of this Fe is truly dissolved. Several other sources supplying dissolved Fe to deep waters (e.g terrestrial Fe input) with a persistent condition in the oxygen minimum zone (OMZ)) were also evidenced.

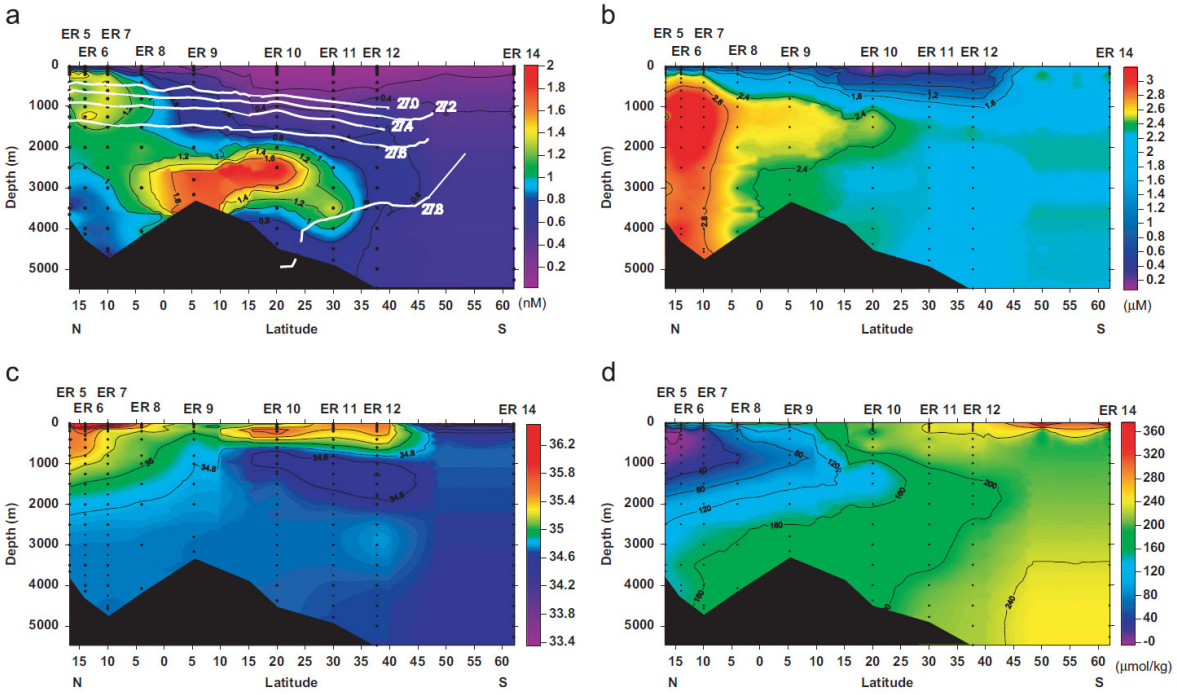

Figure 6. Vertical section profiles of (a) dissolved Fe concentration, (b) phosphate, (c) salinity, (d) dissolved oxigen. White number and line (a) indicate isopycnal surface.

Reference :

Jun Nishioka, Hajime Obata, Daisuke Tsumune (2013), Evidence of an extensive spread of hydrothermal dissolved iron in the Indian Ocean: *Earth and Planetary Science Letters*, ELSEVIER (361) p. 26-33, DOI: /10.1016/j.epsl.2012.11.040

Basin-scale inputs of cobalt, iron, and manganese from the Benguela-Angola front to the South Atlantic Ocean

The African coast appeared to be a major source of dissolved total dissolved cobalt, iron, manganese, and labile cobalt to the South Atlantic basin, with high cobalt concentrations in the oxygen minimum zone of the Angola Dome and extending 2500 km into the subtropical gyre. Linear relationships between cobalt, N_2O, and O_2, as well as low surface aluminum supported a coastal rather than atmospheric cobalt source. Point sources of the scale observed in this study likely serve as vital drivers of these tracer oceanic cycles.

Reference:

Abigail E. Noble, Carl H. Lamborg, Dan C. Ohnemus, Phoebe J. Lam, Tyler J. Goepfert, Chris I. Measures, Caitlin H. Frame, Karen L. Casciotti, Giacomo R. DiTullio, Joe Jennings, Mak A. Saito (2012), Basin-scale inputs of cobalt, iron, and manganese from the Benguela-Angola front to the South Atlantic Ocean : *Limnology and Oceanography* 57 (4) p. 989-1010, DOI: 10.4319/lo.2012.57.4.0989

New beautiful results on marine particle speciation, a challenge for the GEOTRACES community

Advanced Light Source x-ray spectromicroscopy (XANES) allows a fine description of the marine Fe pool chemical speciation and mineralogy. This work describes diverse arrays of iron particles (20- 700 nm), showing impressive variations in the oxidation state and composition of these iron particles between the coasts of South Africa and Antarctica. Moreover, different iron pools are occurring in different frontal zones. Because particle speciation is directly linked to the element solubilities, these differences may affect the production of bioavailable dissolved iron.

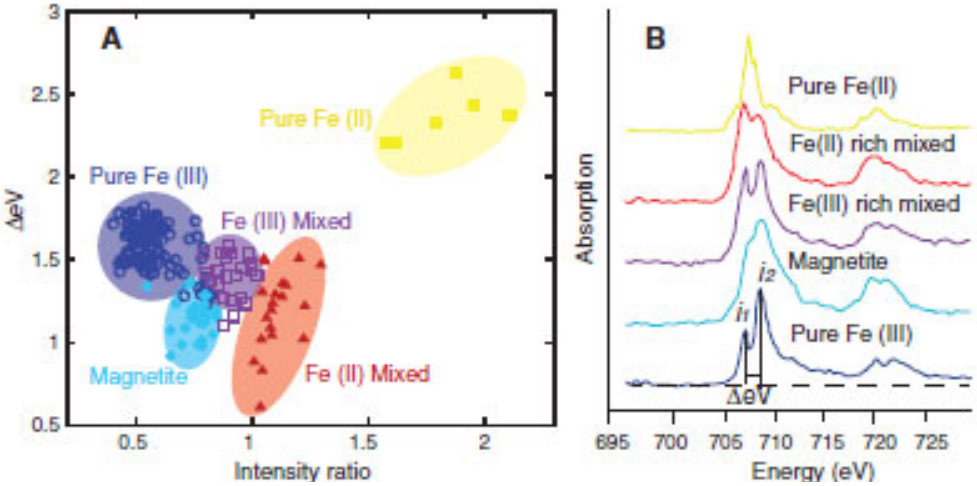

Figure 7. (A) Iron particle speciation plotted and defined accordingly to the particles' spectral features. Pure Fe(III), pure Fe(II), and magnetite phases occupy discrete fields, the mixed-valence species are distinguished by their variations in the spectral intensity rations. (B) Generalized Fe L-edge XANES spectra of the five species identifies in the South Atlantic and Southern oceans; colors correspond to the fields in (A). The ΔeV value is calculated as the energy difference between peaks i_1 and i_2; the intensity ratio value is given as absorption intensity i_1/i_2.

Reference:

B. P. von der Heyden, A. N. Roychoudhury, T. N. Mtshali1, T. Tyliszczak, S. C. B. Myneni. (2012). Chemically and Geographically Distinct Solid-Phase Iron Pools in the Southern Ocean: Science 338 (6111): 1199-1201, DOI: 10.1126/science.1227504

Results from the GEOTRACES cruise section GIPY11

An interesting comparison of data of dissolved barium (Ba) and data of dissolved aluminium (Al) and silicate (Si) collected onboard the GEOTRACES cruise GIPY11 (ARK-XXII/2 Polarstern expedition) is presented in the article of Roeske and colleagues (Roeske et al, 2012). This comparison is used to distinguish between signals produced by the regeneration of sinking particles and signals derived from entrainment of shelf waters, adding to the analysis of Al and Si data of the same cruise by Middag et al. (2009). The two papers investigate whether the relationships between Ba, Si and Al differ between water masses and between the various deep Arctic Basins, and whether these differences can help us to infer deep water circulation and shelf water inputs.

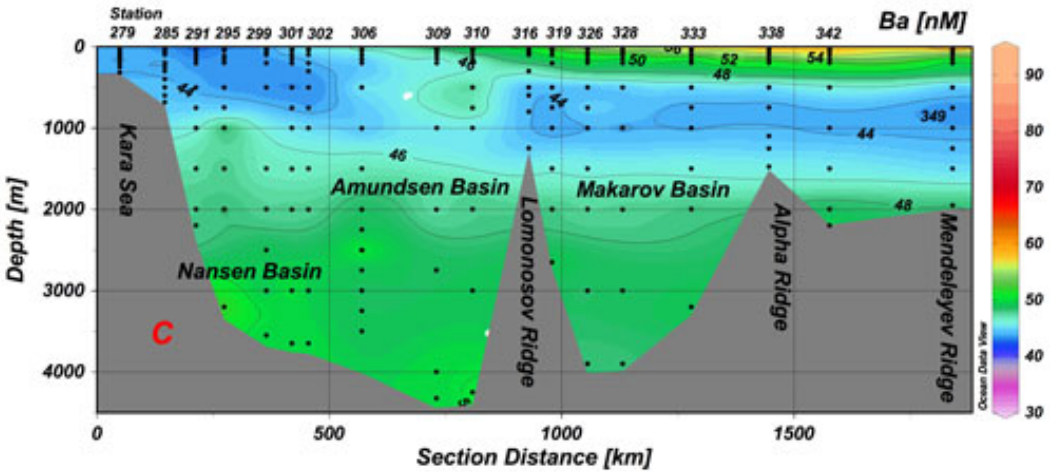

Figure 8. Distribution of Ba on section C, which reaches from the Kara Sea at 81.25°N to the Alpha Ridge at 84.5°N. Isolines are at 2 nM intervals. Source: Marine Chemistry.

References:

Middag, R., de Baar, H.J.W., Laan, P., Bakker, K., (2009). Dissolved aluminium and the silicon cycle in the Arctic Ocean. Marine Chemistry 115, 176-195

Roeske T., Rutgers vd Loeff M., Middag R, Bakker K. (2012), Deep water circulation and composition in the Arctic Ocean by dissolved barium, aluminium and silicate, Marine Chemistry 132-133, (56-67).

7. Workshops and events

Russian GEOTRACES Workshop

The first Russian GEOTRACES Workshop was held from 27th to 29th November 2012 in Moscow at the Shirshov Institute of Oceanology, Russian Academy of Sciences. About 90 persons including Russian scientists from seven institutes participated, together with scientists leading the GEOTRACES program in Europe and the USA. During the workshop about 30 oral presentations were made (including 8 talks of the young Russian scientists), along with 15 poster presentations. The workshop showed that research themes of Russian scientists in many respects correspond to the main GEOTRACES scientific goals. Particular Russian interests include estuarine chemistry (trace metals, radionuclides, and organic carbon compounds) of major rivers, biogeochemical processes, (including trace metals and gases such as methane) on the Russian shelf, sedimentary and chemical fluxes between the shelf and open Arctic Ocean as well as the fluxes from atmosphere to the Arctic Seas.

The Russian workshop established international contacts and identified priorities for research into the marine chemistry of the Arctic Ocean. Research cruises that would address the main GEOTRACES scientific goals have been identified during discussion at the workshop. Issues linked with a correct clean sampling and analysis of trace metals were discussed, as one of the main Russian problems is lack of special equipment to collect uncontaminated seawater samples for analysis of heavy metals. An obvious necessity of participation of Russian colleagues in intercalibration of the sampling procedures followed by the trace metal analysis, as well as training of the young Russian scientists in the leading GEOTRACES' laboratories was emphasized. All the participants supported a joint declaration (http://www.geotraces.org/images/stories/documents/workshops/Russian/Russian_GEOTRACES_Statement.pdf). Workshop participants suggested the rapid formation of Russian GEOTRACES Committee

to develop GEOTRACES activities and guide the scientific goals and implementation of the program in Russia.

GEOTRACES Latin American Workshop

To foster the involvement of Latin American (LA) scientists in the GEOTRACES program, the GEOTRACES SSC held a workshop in Rio de Janeiro (12-15 November 2012, Rio de Janeiro). About 40 scientists participated in the workshop including representatives from 7 Latin American countries, scientists leading the GEOTRACES program in Europe and the USA and 11 students. During the workshop about 33 presentations were made (The abstract collection is available on the following GEOTRACES web site:
http://www.geotraces.org/images/stories/documents/workshops/LA/2012_LA_Workshop_Abstracts_edited081112.pdf
The Workshop had as objectives to: (1) Define scientific questions of global interest that are geographically proximal to LA nations; (2) Define scientific questions of national or regional interest that are too large, or too complex, to be addressed by a single nation or by small projects, and therefore would benefit from international collaboration; (3) Identify opportunities and strategies for collaboration within the scope of the GEOTRACES Program; (4) Identify opportunities for technology transfer and training that would increase the capacity of scientists in LA nations to undertake GEOTRACES-related research. Participants at the meeting agreed on a final statement outlining important GEOTRACES science in the LA region, and synergies between GEOTRACES Activities and other science in LA:
http://www.geotraces.org/images/stories/documents/workshops/LA/GEOTRACES_LA_Statement.pdf

GEOTRACES-COST Workshop –Stable isotopes of biologically important trace metals

A successful workshop has been held at the Department of Earth Science and Engineering of Imperial College London (13-14 September 2012) to bring together, for the first time, the community of people working on stable isotopes of biologically important trace metals. The focus of the workshop was on the stable isotopes of Zn, Cd, and Fe but isotope systems of other micronutrient and contamination-prone elements (particularly Pb) were also considered. Almost 50 people from 12 countries attended the workshop to share novel data and discuss analytical issues related to sampling and the isotopic measurements in the context of the GEOTRACES program.
The Report of the Workshop is available on the GEOTRACES web site: http://www.geotraces.org/images/stories/documents/workshops/Stable_Isotopes/workshop_Stable_isotopes_report_final.pdf

The workshop was supported by COST Action ES0801 and SCOR. For further information: http://www.geotraces.org/meetings/meetings-by-year/eventdetail/121/-/geotraces-cost-workshop-stable-isotopes-of-biologically-important-trace-metals

GEOTRACES-COST Voltammetric Workshop

The workshop was held in the frame of research activities at marine station Martinska, Rudjer Bošković Institute, Šibenik, Croatia from October 7th to October 9th. The meeting, which was more than successful, gathered 40 participants from 14 countries among them 14 PhD students and post-Docs. Whole event was co-organized by GEOTRACES, COST action ES801 and Ruđer Bošković Institute. All the participants expressed their interest and will to organize a new meeting in a two year time as a necessity to discuss the role and use of electrochemistry in analysis and study of biogeochemical processes in aquatic systems. The Report of the Workshop is available on the GEOTRACES web site:
http://www.geotraces.org/images/stories/documents/workshops/Voltammetry/VoltammetryWorkshopReport_COSTActionES0801.pdf

For further information: http://www.geotraces.org/meetings/meetings-by-year/eventdetail/119/-/cost-geotraces-voltammetry-workshop

8. Special sessions at international conferences featuring GEOTRACES findings

A number of special sessions with relevance to GEOTRACES featured at major international meetings including:

American Geophysical Union Fall 2012, 3-7 December 2012, San Francisco, USA
For further information: http://fallmeeting.agu.org/2012/

> **OS013: Isotope Tracers in the 21st Century Ocean: New Results, Interesting Challenges, and Unique Opportunities*
> Conveners: Steven L Goldstein (Columbia University), Alison E Hartman (Lamont-Doherty Earth Observatory), Howie D Scher (University of South Carolina) and Torben Stichel (University of Hawaii at Manoa)
>
> **OS036: Sources, Sinks, and Speciation of Marine Micronutrient Trace Elements*
> Conveners: Jessica N Fitzsimmons (MIT) and Christopher T Hayes (Columbia University)

ASLO 2013, Aquatic Sciences Meeting, 17-22 February 2013, New Orleans, Louisiana, USA
For further information: http://www.aslo.org/meetings/neworleans2013/

> **SS57: Trace Elements and Isotopes in the Ocean and Atmosphere: the International GEOTRACES Program*
> Conveners: Peter Morton, Florida State University; Carl Lamborg, Woods Hole Oceanographic Institution
>
> **SS08: Biogeochemistry of Metal-binding Organic Ligands in the Ocean: Sources, Composition and Impacts on Trace Metal Cycling*
> Conveners: Maeve C. Lohan, University of Plymouth; Sylvia G. Sander, University of Otago; Kristen N. Buck, Bermuda Institute of Ocean Sciences

2013 Asia Oceania Geosciences Society Annual Meeting, 24-28 June 2013, Brisbane, Australia
For further information: http://asiaoceania.org/aogs2013/public.asp?page=home.htm

Controls on the Biogeochemistry of the Northwestern Pacific Ocean and its Adjacent Marginal Seas
Main Convener: Dr. Tung-Yuan Ho (Academia Sinica, China-Taipei)
Co-conveners: Dr. Sohrin Yoshiki (Kyoto University, Japan), Prof. I-I Lin (National Taiwan University, China-Taipei) and Dr. George T F Wong (Academia Sinica, China-Taipei)

Forthcoming:

The 2013 Gordon Research Conference on Chemical Oceanography, 4-9 August 2013, Biddeford, Maine, USA
For further information: http://www.grc.org/programs.aspx?year=2013&program=chemocean

Goldschmidt 2013, 25-30 August 2013, Florence, Italy
For further information: http://goldschmidt.info/2013/index

*16h. Chemical Weathering in Marginal Environments
Convenors: Bernhard Peucker-Ehrenbrink and Morgan Jones
Keynote: Catherine Jeandel (LEGOS, Toulouse)

*17a. The ins and outs of mud: chemical fluxes between sediments and seawater
Convenors: Silke Severmann and Rachel Mills Keynote: Ronnie N. Glud (University of Southern Denmark)

* 17b. Constraining rates of ocean processes
Convenors: Laura Robinson and Matt Charette Keynote: Bill Jenkins (WHOI)

*17d Isotope geochemistry of the modern oceans
Convenors: Seth John , Julie Granger, Katharine Pahnke and Gregory F. de Souza Keynote: Curtis Deutsch (University of Washington)

*17g Metal-biota interactions in seawater
Convenors: Jay Cullen, Maeve Lohan and Martha Gledhill Keynote: Mak Saito (Woods Hole)

9. 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 program 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 (2nd system planned)	Powder coated aluminum, autonomous 1018 intelligent rosette system	12 x 10-L Teflon-lined Niskin-1010X	6000 m; 6 mm Dynex rope
Canada	Complete	Powder coated aluminum with titanium CTD housing, Seabird Rosette	24 X 12-L GO-Flo	2300 m; conducting Vectran soon to be upgraded with 5000 m conducting Vectran 06/2013
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 aluminum with titanium pressure housing for CTD	12 X 12-L GO-Flo	8000 m; conducting Kevlar
Germany	CTD and bottles purchased, winch planned	Powder coated aluminum with titanium pressure housings and fittings	27 x 12-L OTE GO-Flo	8000 m; conducting Kevlar
India	Complete	Powder coated aluminum with titanium pressure housings and fittings	24 X 12-L Niskin-X	8000 m; conducting Kevlar
Italy	Complete	Go-Flo bottles on Kevlar line	5 x 20-L Go-Flos	Kevlar
Japan	Complete	Powder coated aluminum	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 aluminum	5-L Teflon-lined Niskin-X	2000 m; 8 mm Kevlar line

South Africa	Complete	Powder coated aluminum, titanium housing/fittings	24 X 12-liter GO-Flo	6500 m; Kevlar cable
UK	In testing phase	Titanium frame, Ti pressure housings	24 10-L OTE	8000m conducting Kevlar
USA - CLIVAR	Complete	Powder coated aluminum	12 X 12-L GO-Flo	1500 m; conducting Kevlar
USA - GEOTRACES	Complete	Powder coated aluminum 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 aluminum 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 aluminum 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 aluminum with titanium pressure housings and fittings	12 X12-L Niskin-X	3000 m; conducting Kevlar

Acknowledgements
We offer our special thanks to Ed Urban, who continues to provide tremendous support and valuable advice to the planning of the GEOTRACES programme.

Written and compiled by:
Ed Boyle (Co-Chair GEOTRACES SSC)
Reiner Schlitzer (Co-Chair GEOTRACES SSC)
Elena Masferrer (GEOTRACES IPO Executive Officer)

July 2013

National Reports

Australia

Meetings and workshops

- GEOTRACES presentations by Australian scientists at the ASLO Aquatic Sciences meeting (New Orleans, February 2013), the 45th International Liège Colloquium on Ocean Dynamics (Liège, May 2013), and the Strategic Science in Antarctica - a joint Australian & New Zealand Conference (Hobart, June 2013).
- Participation in GEOTRACES particle intercalibration workshop led by Phoebe Lam (Hawaii, March 2013)
- Participation to the SCOR Workgroup 139 in New Orleans in February 2013.

Cruises

- Completion of the GEOTRACES Process Study SIPEX-2 (GIpr02; Project PI: Klaus Meiners), a multidisciplinary biogeochemistry experiment examining the role of Antarctic sea ice as a natural ocean fertilizer during the spring in the sea ice zone near Casey station, east Antarctica in Sep/Oct 2012.

New funding

- Shiptime funding from the Marine National Facility of a major 2-month research expedition in austral summer 2014-15. The project will investigate submarine volcanism/hydrothermalism and biospheric impacts around the Heard/McDonald Islands in the Southern Ocean. GEOTRACES parameters will be sampled and the project will be proposed as a GEOTRACES Process Study at the next SSC meeting.
- The Antarctic Climate & Ecosystems Cooperative Research Centre (ACE CRC) has been refunded for 5 more years from 2014-2019. Scientists at the ACE CRC have carried out several Australian GEOTRACES in the past 5 years. The planned research activities and fieldwork in the new ACE CRC are currently under discussion.
- Funding for GEOTRACES activities in Australia continues to be tight, with most projects carried out using small research grants. The major laboratories in Australia at the University of Tasmania and the Australian National University have applied for large grant funding (3-4 years) from the Australian Research Council (results known in October 2013). No dedicated national funds available for GEOTRACES activities. Recent departure of Christel Hassler to Europe has decreased the number of active GEOTRACES researchers in the region.

New results

- Results of the French-led GEOTRACES Process Study KEOPS-2 (GIpr01; Project PI Stephane Blain), a natural iron fertilisation experiment around the Kerguelen Islands in the Southern Ocean, are currently being prepared for a submission to a Biogeosciences special issue (manuscripts to be submitted in the period October-December 2013).
- Continuing analyses from GEOTRACES GP13 cruise (voyage ss2011_v02), a zonal section in Southwest Pacific Ocean along approximately 30oS.
- Submission of data from Australian cruises GIPY2 (au0703), GIPY3 (au0701), GIPY6 (au0806) and GPpr02 (SS10_v01 PINTS) to GDAC for the GEOTRACES Intermediate Data Product.
- Publication of results from GPpr02 (SS10_v01 PINTS): Hassler C.S., Ridgway K., Bowie A.R., Butler E.C.V., Clementson L., Doblin M.A., Ellwood M., Ralph P., Davies D.M., van der Merwe

P., Watson R., 2013. Primary productivity induced by iron and nitrogen in the Tasman Sea – An overview of the PINTS expedition. Submitted to Marine and Freshwater Research, 1 June 2013.

New publications

- Butler, ECV and O'Sullivan, JE and Watson, RJ and Bowie, AR and Remenyi, TA and Lannuzel, D, 'Trace metals Cd, Co, Cu, Ni, and Zn in waters of the subantarctic and Polar Frontal Zones south of Tasmania during the 'SAZ-Sense' project', Marine Chemistry, 148 pp. 63-76. ISSN 0304-4203 (2013)
- Cropp, RA and Gabric, AJ and Levasseur, M and McTainish, GH and Bowie, AR and Hassler, CS and Law, CS and McGowan, H and Tindale, N and Viscarra Rossel, R, 'The likelihood of observing dust-stimulated phytoplankton growth in waters proximal to the Australian continent', Journal of Marine Systems, 117-118 pp. 43-52. ISSN 0924-7963 (2013)
- C.S. Hassler, V. Schoemann, M. Boye, A. Tagliabue, Rozmarynowycz M, McKay, RML. Iron Bioavailability in the Southern Ocean. In: Oceanography and Marine Biology: An Annual Review. (eds) Gibson RN, Atkinson RJA, Gordon JDM, Hughes RN. CRC Press, London, 2012, 50, 1–64.
- Hassler C.S., Legiret F.-E., Butler, E.C.V. Measurement of iron chemical speciation in seawater at 4 ^{0}C: the use of competitive ligand exchange - adsorptive cathodic stripping voltammetry. Marine Chemistry.149: 63-73. 2013.
- Morton, PL and Landing, WM and Hsu, S-C and Milne, A and Aguilar-Islas, AM and Baker, AR and Bowie, AR and Buck, CS and Gao, Y and Gichuki, S and Hastings, MG and Hatta, M and Johansen, AM and Losno, R and Mead, C and Patey, MD and Swarr, G and Vandermark, A and Zamora, LM, 'Methods for the sampling and analysis of marine aerosols: Results from the 2008 GEOTRACES aerosol intercalibration experiment', Limnology and Oceanography: Methods, 11 (FEB) pp. 62-78. ISSN 1541-5856 (2013)
- Smith, LV and McMinn, A and Martin, AR and Nicol, S and Bowie, AR and Lannuzel, D and Van Der Merwe, P, 'Preliminary investigation into the stimulation of phytoplankton photophysiology and growth by whale faeces', Journal of Experimental Marine Biology and Ecology, 446 pp. 1-9. ISSN 0022-0981 (2013)
- Bown, J and Boye, M and Laan, P and Bowie, AR and Park, Y-H and Jeandel, C and Nelson, DM, 'Imprint of a dissolved cobalt basaltic source on the Kerguelen Plateau', Biogeosciences, 9 (12) pp. 5279-5290. ISSN 1726-4170 (2012)
- Remenyi, T and Nesterenko, P and Bowie, A and Butler, E and Haddad, P, 'Reversed phase high performance liquid chromatographic determination of dissolved aluminium in open ocean seawater', Limnology and Oceanography: Methods, 10 pp. 832-839. ISSN 1541-5856 (2012)
- Sinoir, M and Butler, ECV and Bowie, AR and Mongin, M and Nesterenko, PN and Hassler, CS, 'Zinc marine biogeochemistry in seawater: A review', Marine and Freshwater Research, 63 (7) pp. 644-657. ISSN 1323-1650 (2012)

Other activities

The new Australian oceanographic research vessel *Investigator* will be delivered to Hobart (Australia) in late 2013, and the commissioning year will run through until mid-2014. The ship has improved facilities to undertake GEOTRACES science, including new clean container laboratories, a clean underway supply, aerosol samplers, in situ pumps and a new Seabird trace metal rosette system. Procurement of new equipment is currently underway and should be completed by end 2013.

Submitted by: Andrew Bowie

Belgium

Meetings

- ASLO 2013, New Orleans:
  Cavagna A.-J., B. Quéguiner, F. Planchon, S. Jacquet, I. Closet, F. Dehairs, Production regime and potential for carbon export in the naturally iron fertilised Kerguelen area (Southern Ocean).
  Dehairs F., T. Trull, C. Fernandez, D; Davies, A.-J. Cavagna, A.E. Piniella, Nitrate isotopic composition in the Kerguelen area (Southern Ocean) during KEOPS 2.
  Jacquet S., F. Dehairs, A.J. Cavagna, F. Planchon, Ivia Closset, D. Cardinal Seasonal variability of mesopelagic organic carbon remineralization in the naturally iron-fertilized Kerguelen area (Southern Ocean).
  de Brauwere A. et al., Putting the pieces together: A multi-tracer model to quantitatively identify the major processes related to the fertilized bloom on the Kerguelen Plateau (Southern Ocean).
- GRC on polar oceans, Ventura, USA, March 2013:
  Nitrogen isotopic distribution in Antarctic Sea Ice; poster by F. Fripiat.
- The 45th International Liège colloquium: Primary production in the ocean: From the synoptic to the global scale:
  Cavagna A.-J. and F. Dehairs, Primary production and potential for carbon export in naturally iron-fertilized waters in the Southern Ocean.
  Roukaerts A., Cavagna A.J., Dehairs F., Carbon and Nitrogen uptake rates in the East Antarctic sea-ice zone (SIPEX II preliminary results).
  Fonseca Batista D., F. Dehairs, L. Brunelli, C. Gil-Fernandez, M. Rembauville, D. Ribicic, T. Schwenke, Fixed-nitrogen and atmospheric N2 contribution to biological productivity along a North-South transect in the Eastern Atlantic Ocean.
- Goldschmidt Conference, Montreal, June 2012: Session on biogeochemical cycling of nutrients and metals in high latitude marine environments.
  Nitrate (δ15N) isotopic distribution in Antarctic Sea Ice; poster by F. Fripiat.
- AGU fall meeting 2012, San Francisco: Session on Source, Sinks, and Speciation of marine micronutrient trace elements.
  A. de Brauwere "Putting the pieces together: A multi-tracer model to quantitatively identify the major processes related to the fertilized bloom on the Kerguelen Plateau (Southern Ocean), poster.
- ASLO 2012, Lake Biwa (July 8-13):
  Cavagna A.J., F. Dehairs, B. Quéguiner, C. Fernandez, M. Elskens, D. Lefèvre, Regimes of production and potential for carbon export in naturally iron-fertilized waters in the Southern Ocean.
- Symposium on Iron in the Oceans, 4 October 2012, Texel:
  Schoemann, V., de Jong, J.T.M., Lannuzel, D., Hassler, C., Dellile, B., de Baar, H. Iron as a source of bioavailable iron to the Southern Ocean.
  De Jong, J.T.M., Schoemann, V., de Baar, H., Lannuzel, D., Tison, J.-L., Mattielli, N. Dissolved and particulate Fe and Zn isotopes in Antarctic waters. Symposium on Iron in the Oceans, 4 October 2012. Texel, The Netherlands.
  Rob Middag, R., Laan, P., Gerringa, L.J.A. van Aken, H.M., Schoemann, V., de Jong, J.T.M., van Haren, H., Hein J. W. de Baar, H.J.W. Sources and fluxes of Iron in the Atlantic Ocean; Symposium on Iron in the Oceans, 4 October 2012. Texel, The Netherlands. Oral presentation
- GEOTRACES Workshop – Stable isotopes of biologically important trace metals. 13-14 September 2012, London, UK:
  Schoemann, V., de Jong, J.T.M., Lannuzel, D., Dellile, B., Chou, L., Becquevort, S., Mattielli, N., de Baar, H., Tison, J.L. Iron isotopes in Antarctic sea ice. Poster presentation.

De Jong, J.T.M., Schoemann, V., de Baar, H., Tison, J.-L., Ackley, S., Mattielli, N. Dissolved and particulate Fe and Zn isotopes in the Bellingshausen Sea, Antarctica. Oral presentation.

- SOLAS Open Science Conference, 7- 10 May 2012, Cle Elum, WA, USA:
  Schoemann, V., Lannuzel, D., Delille, B., de Baar, H., Tison, J.-L. Sea ice as a source of bioavailable iron. Invited plenary talk.
  Schoemann, V., de Jong, J.T.M., Lannuzel, D., Dellile, B., Chou, L., Becquevort, S., Mattielli, N., de Baar, H., Tison, J.L. Iron stable isotopes : a tool to trace biological processes in Antarctic sea ice. Poster presentation.
- Goldschmidt Conference 2012, 24-29 June 2012, Montreal, Canada:
  De Baar, H., M. Rijkenberg, L. Gerringa, R. Middag, M. van Hulten, P. Laan, V. Schoemann, J. de Jong, A. Sterl, H. van Aken. Contrasting Biogeochemical Cycling of Iron and Aluminium along the GEOTRACES West Atlantic Section. Oral presentation.
- Ocean Sciences Meeting, 20-24 February 2012, Salt Lake City, Utah, USA:
  Hassler, C., L. Norman, R. Watson, M. Doblin, C. Nichols, G. McTainsh, L. Clementson, V. Schoemann. Impact of various iron sources to Tasman Sea phytoplankton: From bioavailability to community shift. Poster presentation.

Cruises

- Antarctic Winter Ecosystem & Climate Study ANT XXIX/6 (AWECS): 8 Jun-12 Aug 2013, Weddell Sea sector, RV Polarstern; trace metals (e.g. Fe, Cu, Zn, Mn, Cd) and isotopes (Fe, Zn) in sea ice, brines and seawater.
- Sea Ice Physics and Ecosystem eXperiment (SIPEX 2): Sep. - Nov. 2012; Australian-Antarctic Basin; R/V Aurora Australis; C, N uptake; nitrate isotopic composition
- European Universities and Research On board Polarstern in the Atlantic (EUROPA); Oct.-Nov. 2012; Bremerhaven – Cape Town; R/V Polarstern (ANT 29/1): C, N uptake; N2 fixation; nitrate isotopic composition
- YROSIAE (Scott Base, Antarctica), Sea Ice in the McMurdo Sound, Nov. 2011-Dec. 2012: δ15N (particulate nitrogen, total dissolvable nitrogen, ammonium, nitrate), δ18O (nitrate), δ30Si (biogenic silica, dissolved silicon), dissolved and particulate trace metals concentrations (e.g. Fe, Zn, Cu, Mn) and isotopic composition (δ56Fe and δ66Zn).
- IceArc ARK XXVII/3 on board the RV Polarstern in central Arctic. 2 Aug-8 Oct 2012: dissolved and particulate trace metals concentrations (e.g. Fe, Zn, Cu, Mn) isotopic composition (δ56Fe and δ66Zn).
- ICELIPIDS (Dumont D'Urville, Antarctica), Sea Ice in Terre Adélie, Apr. -Nov. 2011: δ15N (particulate nitrogen, total dissolvable nitrogen, ammonium, nitrate), δ18O (nitrate), δ30Si (biogenic silica, dissolved silicon).

New funding

- Belgian Science Policy, Science for Sustainable Development programme; "BIoGeochemical cycles in the SOUTHern ocean: Role within the Earth System" (BIGSOUTH); 2011 – 2014.
- Flanders Research Foundation, "The biological carbon pump and role of diazotrophs in open ocean carbon export"; 2011-2014.
- Fonds de la Recherche Scientifique (FNRS), "Year-Round Ocean-Sea-Ice-Atmosphere Exchanges"; 2011-2013.

New results

- Primary production, new production, POC export and mesopelagic remineralisation in the (naturally) iron-fertilised Kerguelen area (KEOPS 2)
- N, O isotopic composition of whole water column nitrate in the Kerguelen area (KEOPS 2)

- Sea-ice primary production, NO3, NH4, Si uptake; N, O isotopic composition of sea-ice nitrate (SIPEX 2)
- Primary production, new production, N2-fixation; C, N isotopic composition of suspended matter; N, O isotopic composition of nitrate in upper 700m (EUROPA)
- Whole water column dissolved Ba concentrations along CLIVAR/WOCE I9S line (R/V Aurora Australis, AU 1203; Jan. – Feb. 2012)
- Nitrogen isotopic composition (PN, TDN, NO3) in pack ice from the Weddell Sea (ISPOL, Dec. 2004), the Bellingshausen Sea (SIMBA, Oct. 2007), and Dumont D'Urville (ICELIPIDS, Apr. - Nov. 2011).
- Silicon isotopic composition (dissolved silicon) in landfast sea ice from a small Greenlandic bay (March. 2010).
- Trace metals concentrations (Fe, Ni, Cu, Zn, Pb, Al, Mn and Cd) in snow, seawater, brines and sea ice in Central Arctic (IceArc, Aug.-Oct 2012) and in McMurdo Sound (YROSIAE, Nov.-Dec 2011).

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Submitted by: F. Dehairs, M. Elskens, M. Leermakers, W. Baeyens, L. Chou, F. Fripiat, V. Schoemann, J.T.M. de Jong

Brazil

Meetings

The 1st Latin American GEOTRACES workshop took place in Rio de Janeiro from November 12 to 15. The aim was to foster regional research activities and enrollment of scientists from the region in the GEOTRACES program. A total of about 45 scientists (including some students) participated in the meeting that was considered very productive. All the material related to the workshop is uploaded in the GEOTRACES site for consultation.

Projects

A joint project PUC-Rio/MIT was approved for financial support and a first joint campaign occurred in April 2013. The main objective is to use dated sediments to understand the transport of land materials to the inner platform off Rio de Janeiro occurring during the last 500 years, since the beginning of colonization. Water samples were sampled for trace metal determination along a transect extending from the Guanabara Bay to the inner platform. This project may seed other activities in the future specifically directed to GEOTRACES interests.

Analyses of samples

Prof José Godoy from PUC-Rio in enrolled in the analytical work of samples collected during the 2013 Mediterranean Cruise. He will determine U, Ba e Mo, δD and δ ^{18}O in 1200 samples.

National Institute

The Brazilian government announced at the end of July the foundation of the National Institute of Oceanography and Waterways as well as the purchase of a new oceanographic ship. Four new modern and well equipped research centers shall be installed in different regions of the country with the intention to conduct oceanographic and waterways studies (South Atlantic Oceanographic Center to be located in the South of Brazil; Tropical Atlantic Oceanographic Center to be located in the Northeast Brazil; Harbors and Waterways Center to be located in Rio or São Paulo; and Marine Fisheries and Aquaculture Center). The establishment of these centers will take time but the ship may become available still within the life time of GEOTRACES.

Submitted by: Angela Wagener

Canada

Cruise activities

- The renewal of the Line P iron program (collaboration between UBC (Vancouver) UVic (Victoria) and DFO (Sydney). Three cruises a year (February, May and August)
- NSERC-CCAR funded 2 cruises in the Arctic in 2015. The Canadian Arctic GEOTRACES Program: Biogeochemical and tracer study of a rapidly changing Arctic Ocean. R. Francois plus 20 others ($5,000,000 for 5 years).

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Communications, posters and abstracts

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- FRANCOIS R., BROWN K., CULLEN J., GRANGER J., HOLMDEN C., KIENAST M., MALDONADO M., MILLER L., MUCCI A., ORIANS K., RIVKIN R.B., SAITO M., THOMAS H., TORTELL P. and VARELA D. (2012) Canadian IPY-GEOTRACES: Multi-tracer investigation of the effect of climate change on primary production, seawater chemistry and circulation of the Arctic Ocean. Contributed poster presentation, IPY-2012 Conference, April 22-27, Montreal, Canada.
- R. Francois, M. Soon, C. Not, C. Hillaire-Marcel. Recent incursion of deep water from the central Arctic into Canada Basin inferred from 230Th water column profiles measured during the IPY-GEOTRACES project. IPY-2012 Conference, April 22-27, Montreal, Canada.
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- Granger, J. and D. M. Sigman. Distinction of Atlantic vs. Pacific Nitrate in the Beaufort Sea from Coupled N and O Isotope Ratios; Presentation; International Polar Year Conference Montreal April 25th, 2012. [oral]
- Granger, J. and D. M. Sigman. Distinction of Atlantic vs. Pacific Nitrate in the Beaufort Sea from Coupled N and O Isotope Ratios Ocean Sciences Meeting 2012, Salt Lake City [oral]

Dissertations

- Taylor, R.L. 2011. Studies in Fe bioavailability: co-limitation of primary productivity by iron, light, and nitrate in the Beaufort Sea, and direct iron-siderophore uptake mechanisms in Fe deficient phytoplankton. Master of Science Thesis. Oceanography. University of British Columbia, Vancouver, Canada.https://circle.ubc.ca/handle/2429/39285.

Submitted by: Maite Maldonado

China-Beijing

Activities

- A part of China-GEOTRACES is accommodated in the Japanese KH-13-4 cruise by the *R/V Hakuho Maru* and in the NN376 cruise by the *R/V Nagasaki-Maru* in June and July 2013 to collaborate in the East China Sea. Measurements for dissolved Al, Mn and As were conducted to understand where and how terrestrial material transport into the Sea of Japan and western North Pacific.
- There are several cruises carried out in the Yellow Sea and East China Sea during 2013, including May, July, August and October cruises. Measurements for dissolved REEs, Al, Mn and As are planned to be measured to understand the composition of water masses in the study area.

Capacity building

- Clean lab is established in the OUC. Young researchers are trained by Prof. Jing Zhang from University of Toyama for the clean sampling protocols by attending Japanese cruises and also by attending testing cruise in July.
- A clean sampling system is to be purchased from the lab of C. Measure to accommodate the new vessel that is being built in XMU.

Publications

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Submitted by: Pinghe Cai

China-Taipei

Cruises

The first Taiwanese GEOTRACES test cruise will be carried out during July 14th-23rd 2013 in the Western Philippine Sea by using Taiwan most modern 2,700 ton research vessel, Ocean Research 5. The studied sites are shown in the Figure 9. The major objectives are to evaluate the sampling capability of OR/5 for trace metal clean sampling, to investigate the cycling and distribution of trace elements and their isotopes in the West Philippine Sea, and to determine the trace metal composition and fluxes in size-fractionated suspended particles and plankton, sinking particles and aerosols. Thirty scientists from 12 laboratories will join the cruise (PI: Tung-Yuan Ho), including the researchers from Xiamen University, HKUST, UC Santa Cruz, and the other 9 labs from Taiwanese research institutes. The 2nd Taiwanese GEOTRACES cruise will be carried out in March 2014 in the Western Philippine Sea.

Meetings

Tung-Yuan Ho, Yoshiki Sohrin, I-I Lin, and George Wong have proposed a GEOTRACES related session in 2013 AOGS meeting, with the following session title: (OS-19) Controls on the Biogeochemistry of the Northwestern Pacific Ocean and its Adjacent Marginal Seas. During the meeting, Tung-Yuan Ho and Yoshiki Sohrin have discussed the possibility to hold the other Asian GEOTRACES workshop in 2014 in Taipei, Taiwan.

Publications

There were about 10 marine trace metal biogeochemistry related research papers published by Taiwanese scientists in 2012-2013/6.

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- Ho, T.-Y., T.-H. Chu, and C.-L. Hu (2013) Interrelated influence of light and Ni on *Trichodesmium* growth. *Frontiers in Aquatic Microbiology*. doi: 10.3389/ fmicb.2013.00139.
- Hsu, S.-C. C.-A. Huh, C.-Y. Lin (2012) Dust transport from non-East Asian sources to the North Pacific. Geophysical Research Letters. 39: DOI: 10.1029/2012GL051962
- Hung, C.-C., Gong, G.-C., Santschi, P.H., (2012) 234Th in different size classes of sediment trap collected particles from the Northwestern Pacific Ocean. Geochim. Cosmochim. Acta, 91, 60-74.
- Jiann, K.-T. and Wen, L.-S. (2012) Distribution and lability of dissolved iron in surface waters of marginal seas in southeastern Asia. Estuarine Coastal and Shelf Science. 10: 142-149.
- Lee, C.-S., C.-L.Wei, L.-S.Wen, D. D. Sheu, and W.-H. Lee (2013) Distribution and removal of silver and lead in the nearshore waters of western Taiwan. Estuaries and Coasts.10.1007/s12237-013-9588-1
- Shen, C.-C., Wu C.-C., Cheng H., Edwards R. L., Hsieh Y.-T., Gallet S., Chang C.-C., Li T.-Y., Lam D. D., Kano A., Hori M., and Spötl C. (2012) High-precision and high-resolution carbonate 230Th dating by MC-ICP-MS with SEM protocols. Geochim. Cosmochim. Acta. 99: 71-86.
- Yang S.-C., D.-C. Lee, and T.-Y. Ho (2012) The isotopic composition of Cadmium in the water column of the South China Sea**.** *Geochimica et Cosmochimica Acta* 98: 66-77.
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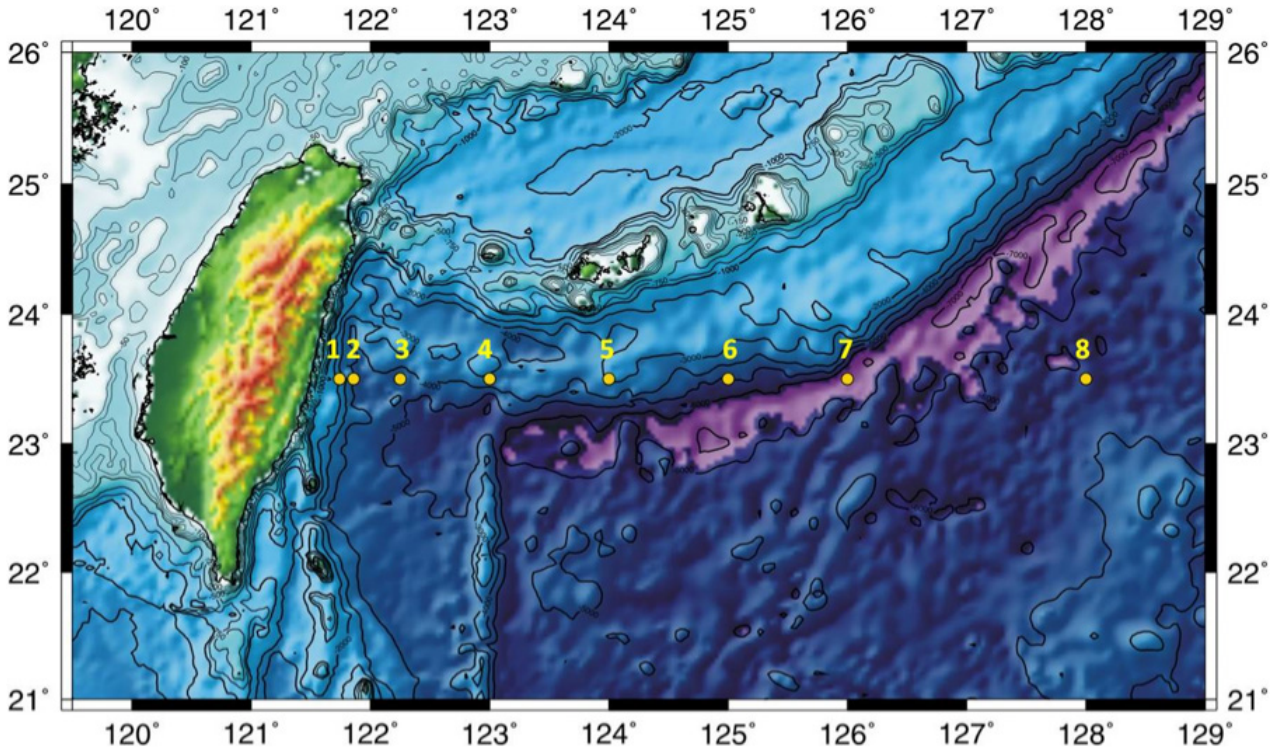

Figure 9. The 8 sampling stations of Taiwan 1st GEOTRACES test cruise. OR/5 equips with a 20-ft trace metal clean van, 12 L and 20 L Teflon coated Go-Flo bottles, and trace metal clean surface water pump but so far with normal hydrowire, CTD rosettes and winches. With the effort of related scientists, OR/5 management agency, TORI, is considering purchasing the related trace metal cleaning apparatus in 2014. The 2013 cruise will thus mainly focus on particle related studies, including total suspended particles, size-fractionated particles and plankton, sinking particles, total suspended aerosol, size-fractionated aerosols *et al*. The station 8 will become a GEOTRACES crossover station between Japan and Taiwan.

Submitted by: Tung-Yuan Ho

Croatia

The Croatian GEOTRACES activities are mainly related to: 1) improvement of electrochemical methods which, in combination with ICPMS, are used for trace metals speciation (including interaction with organic matter), determination and quantification (mostly Zn, Cd, Pb, Cu, Fe, Ni, Co); 2) development of an automated system for determination of trace metals in natural waters (Voltammetric AutoAnalyser - Volt-AA) and solid (gold wire) micro sensors for on-site and in-situ metal analysis in seawater, 3) assessment of metal bioavailability in aquatic environment using passive samplers for metals (DGT) and cytosolic metal levels in tissues of aquatic organisms. Research on development of electroanalytical methods for chalcogenide nanoparticles determination in natural waters is in progress.

The Croatian GEOTRACES activities of the past year were mainly characterized by preparations and organisation for marine voltammetry themed workshop: "Voltammetry and GEOTRACES", which was held in Šibenik, Croatia, at the Rudjer Boskovic Institute marine station Martinska, from October 6th to October 9th 2012.

In June 2013, we participated in organization of MERMEX International workshop. The workshop was related to French project MERMEX (*Marine Ecosystems Responses to climatic and anthropogenic forcings in the Mediterranean, http://mermex.pytheas.univ-amu.fr)* and was held at Rudjer Boskovic Institute, Zagreb.

One PhD student completed (24.09.-02.11.2012) Short Term Scientific Missions (STSM) in the frame of COST action ES0801 (The Ocean Chemistry of Bioactive Trace Metals and Paleoclimate Proxies) with the subject:

- Determination of trace metal concentrations by ICP-MS in seawater and biological matrices (Host: Prof. Dr. Andreas Prange, Helmholtz-Zentrum Geesthacht, Department for Marine Bioanalytical Chemistry, Geesthacht, Germany).

Meetings

Dr. Ivanka Pižeta participated at a second meeting of the SCOR working group 139 on 'Organic Ligands – A Key Control on Trace Metal Biogeochemistry in the Ocean' in New Orleans, SAD on the 16th February 2013 as a full member.

Field works

- Participation in the field work at Kinnerat Lake in Israel where we used electrochemical methods for sulfur and trace metals speciation in anoxic water layers. (October 2013).
- Participation in the 2013 EuroBASIN cruise to Atlantic PAP 2 station, Research Cruise No. JC87), where we work on organic matter speciation.

Participation at international conferences

- Helmholz, H., Strižak, Ž., Ruhnau, C., Erk, M., Prange, A., Utilization of Proteomic Techniques for the Identification of Potential Contaminant-related Biomarker - Environmental Proteomics, Proteomic Forum 2013, Berlin, Germany 17.-21.03.2013.
- M. Furdek, J Cavalheiro, M Monperrus , M Bueno, E Tessier, N Mikac. Investigation on organotin compounds reactivity using enriched isotopic traces in polluted coastal sediments from the Eastern Adriatic, Croatia. European Winter Conference on Plasma Spectrochemistry, Krakow, Poland, 10-15 February 2013.
- M. Furdek, M Ivanić, M Monperrus, M Bueno, E Tessier, N Mikac , Persistence of butyltin (BuT) compounds in the contaminated sediments from the Croatian Adriatic coast, 14th EuCheMS International Conference on Chemistry and the Environment; ICCE 2013, Barcelona, June 25 - 28, 2013.
- M. Marguš, E. Bura-Nakić, D. Jurašin, I. Milanović, I. Ciglenečki, Chronoamperometry as a tool for detecting nano- and microparticles: Example of Chalcogenide nanoparticles, 9th ECHEMS Meeting Electrochemistry in Particles, Droplets, and Bubbles; Lochow, Poland, June 23-26, 2013.
- Strmečki Kos, Slađana; Plavšić, Marta.Electrochemical analysis of polysaccharides on static mercury drop electrode, Fourth Regional Symposium on Electrochemistry South- East Europe, Ljubljana, Slovenia, May 24-27th 2013.

Publications

- M. Furdek, M. Vahčić, J. Ščančar, R. Milačić, G. Kniewald, N. Mikac, Organotin compounds in seawater and Mytilus galloprovincialis mussels along the Croatian Adriatic Coast, Marine Pollution Bulletin, 64 (2012) 189-199.
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Submitted by: Irena Ciglenečki-Jušić

France

International conferences

2013

- Abadie C., Lacan F., Radic, A. and Poitrasson F. Dissolved and particulate iron concentrations and isotopic compositions in the Southern Ocean. Goldschmidt Conference. Florence, Italy, August 2013.
- Bowie, A.R., Quéroué F., Sarthou G., Chever F., van der Merwe P., Bucciarelli E., Townsend A., Blain S., 2013, Dissolved and particulate trace metals in the vicinity of the Kerguelen Islands, Southern Ocean, during the KEOPS 2 experiment, Aquatic Sciences meeting, New Orleans, USA, 17-22 February.
- Cavagna, A.; Quéguiner, B.; Planchon, F.; Jacquet, S.; Closset, I.; Dehairs, F., Production regime and potential for carbon export in the naturally iron-fertilized Kerguelen area (Southern Ocean), Aquatic Sciences meeting, New Orleans, USA, 17-22 February.
- de Brauwere A., Jeandel C., Lacan F., van Beek P., Venchiarutti C., Fripiat F. Putting the pieces together: A multi-tracer model to quantitatively identify the major processes related to the fertilized bloom on the Kerguelen Plateau (TALK) ASLO, New Orleans, USA, February 2013.
- Dulaquais, G. R.; Boye, M.; Carton, X.: Contrasting features of the biogeochemical cycle of cobalt in the west atlantic ocean, Aquatic Sciences meeting, New Orleans, USA, 17-22 February.
- Heimbürger LE, Sonke JE, Cossa D, Galfond B, Laffont L, Point D, Lagane C, and Rutgers van der Loeff M, 2013. Arctic Ocean methylmercury profiles suggest a marine origin, influenced by the carbon cycle - Results from the 2011 GEOTRACES Arctic cruise, 11th International Conference on Mercury as a Global Pollutant, Edinburgh, Scotland 28 July-2 August 2013.
- Heimbürger LE, Sonke JE, Labatut M, Lacan F, Pradoux C, Lagane C, Point D, Jeandel C and Eldin G, 2013. Marine methylmercury production and marine boundary exchange - Results of the 2012 GEOTRACES PANDORA cruise 11th International Conference on Mercury as a Global Pollutant, Edinburgh, Scotland, 28 July-2 August 2013.
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GEOTRACES PANDORA cruise. 29th International Conference of the Society for Environmental Geochemistry and Health, Toulouse, France, 8-12 July 2013.

- Jacquet, S. H.; Dehairs, F.; Cavagna, A. J.; Planchon, F.; Closset, I.; Cardinal, D., Seasonal variability of mesopelagic organic carbon remineralization in the naturally iron-fertilized Kerguelen area (Southern Ocean), Aquatic Sciences meeting, New Orleans, USA, 17-22 February.
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- Labatut M., Radic A., Lacan F., Poitrasson F. and Murray J. Oceanic cycle of Fe in the western equatorial Pacific: A story of Fe in the western equatorial Pacific: Insights from its isotopic composition in the dissolved and particulate fractions of seawater and in potential sources. Submitted to ASLO. New Orleans, USA, February 2013.
- Planquette, H., M.P. Field. Improving absolute detection limits and minimizing sample size requirements for marine particulate trace metal determination by SF-ICP-MS, Thermo Scientific – Les Ulis, France. Innovations Technologiques en ICP-MS, 18 Juin 2013.
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- Quéroué, F., A.T. Townsend, D. Lannuzel, P. van der Merwe, G. Sarthou, E. Bucciarelli, A.R. Bowie, 2013, Trace metal (Fe, Mn, Co, Cu, Pb, Cd, Ni, Al) analysis in open ocean samples using Sector Field ICP-MS, Collaborative on Oceanographic Chemical Analysis Meeting, Hawaii, March 26-29, 2013.
- Sanial V., van Beek P., Lansard B., Souhaut M., Kestenare E. and Zhou M. Use of the radium quartet to study the natural iron fertilization off Kerguelen Islands. Aslo' 2013 Aquatic Sciences Meeting, News Orleans (Louisiana, USA), February 2013.
- van Beek P., Sanial V., Lansard B., Souhaut M., Kestenare E., F. D'Ovidio, Zhou M., S. Blain. Study of the Natural Iron Fertilization off Crozet and Kerguelen Islands (Southern Ocean) Using Radium Isotopes as Tracers, Goldschmidt conference, August 2013.
- Zhou M., d'Ovidio F., Park Y.H., Durand I., Kestenare E., Sanial V., van Beek P., Queguiner B. and Blain S. Estimates of horizontal surface circulation and upwelling using surface drifters in Kerguelen Plateau regions during the 2011 austral spring cruise. ASLO' 2013 Aquatic Sciences Meeting, New Orleans (Louisiana, USA), February 2013.

2012

- de Brauwere A., Jeandel C., Lacan F., van Beek P., Venchiarutti C., Fripiat F. Putting the Pieces Together: A Multi-Tracer Model to Quantitatively Identify the Major Processes Related to the Fertilized Bloom on the Kerguelen Plateau (Southern Ocean). POSTER. AGU. San Francisco, USA, December 2012.
- Eldin, G., A. Ganachaud, S. Cravatte and C. Jeandel The Pandora cruise, July 2012 : an integrated approach of the circulation in the Solomon Sea (POSTER) 10th ICSHMO, Noumea (New Caledonia), April 2012.
- Garcia-Solsona E., Labatut M., Lacan F., Pradoux C., Vance D., Jeandel C., Distribution of REE and Nd isotopes along the Bonus Goodhope section in the Southeast Atlantic Ocean. Ocean Sciences Meeting, Abstract ID: 9695. Salt Lake City, USA, February 2012.
- Grenier M., Cravatte S., Blanke B., Menkes C., Koch-Larrouy A., Durand F., Melet A., and Jeandel C. (ORAL) From the western boundary currents to the Pacific Equatorial Undercurrent: modeled pathways and water mass evolutions.10th ICSHMO, Noumea (New Caledonia), April 2012.

- Grenier M., C. Jeandel, F. Lacan, S. Cravatte, and F. Durand. From the subtropics to the equatorial Pacific: along the route, the neodymium relates. POSTER Ocean Sciences Meeting, Salt Lake City (Utah, USA), February 2012.
- Grenier M., S. Cravatte, and C. Jeandel. Origins and fates of the Solomon Sea thermocline waters: from the subduction areas to the Equatorial Undercurrent. Open Ocean Symposium on Western Pacific Ocean Circulation and Climate (TALK) Qingdao (China), October 2012.
- Grenier, Melanie, Catherine Jeandel, Francois Lacan, Derek Vance, Celia Venchiarutti, Alexandre Cros, S. Cravatte From the subtropics to the equatorial Pacific: along the route, the Neodymium relates., OSS on Western Pacific Ocean Circulation and Climate, October 15-17, 2012, Qingdao, China
- Grenier, M., C. Jeandel, F. Lacan et S. Cravatte REE & isotopes du Nd dans le Pacifique Sud, Workshop NEOSYMPA, Paris, 14 octobre 2012
- Jeandel, C., P. Behra, E. Oelkers, J. Sonke and M. Jones Particle/dissolve exchange processes at the land to ocean boundary: how to improve our understanding of the processes? INVITED ORAL Ocean Sciences Meeting, Abstract ID: 9695. Salt Lake City, USA, February 2012
- Jeandel Catherine (2012) AMANDES: a multidisciplinary GEOTRACES process study on the Amazon shelf Invited talk, GEOTRACES Latino-American workshop. Rio de Janeiro, Novembre 2012.
- Jeandel C., Grenier M., Garcia-Solsona E., Rousseau T., Jones M., and Pearce C. Rare earth Elements (REE) and Nd isotopes in the ocean. INVITED TALK Le STUDIUM® conference, Orléans, May 2012.
- Labatut M., Radic A., Lacan F., Poitrasson F. and Murray J. Oceanic cycle of Fe in the western equatorial Pacific: Insights from its isotopic composition in the dissolved and particulate fractions. Ocean Sciences Meeting, Abstract ID: 10247. Salt Lake City, USA, February 2012.
- Lacan F., Labatut M., Radic A., C. Abadie. Invited talk. Fe isotopic signatures in the seawater and suspended particles from the Equatorial Pacific and the Southern Ocean. AGU. San Francisco, USA, December 2012.
- Marchandise, S., E. Robin, S. Ayrault and M. Roy-Barman (2012) U-Th-REE-Hf-rich phases in marine sediments reflect weathering effect. Goldschmidt conference, Montréal
- Pearce, C.R., Jones, M.T., Oelkers, E.H., Jeandel, C. and Pradoux, C. Marine particulate weathering: A significant seawater source? Rip Meeting 2012, Int Conference, Open Univ. Milton, Keynes
- Pearce, C.R., Jones, M.T., Oelkers, E.H., Jeandel, C. and Pradoux, Marine particulate weathering: A significant seawater source? Geochemist group workshop, Oxford University, February 2012
- Planquette H., James R.H. & Parkinson I.J. (2012) Characterisation of the Cr isotopic signature of marine sediments deposited in the S1 Mediterranean sapropel, Mineralogical Magazine, 76(6) : 2239. Goldschmidt Conference, Montréal, Canada
- Planquette, H., James, R.H., Parkinson, I.J. (2012). Characterization of the Cr isotopic signature of marine sediments deposited in the S1 Mediterranean sapropel GEOTRACES Workshop Stable isotopes of biologically important trace metals, London, UK, September 2012.
- Rousseau,T. , Jeandel C., Sonke JE, Boanventura G R and Seyler P Nd isotopes in the western equatorial Atlantic water masses: Amazon river and margin contributions.(POSTER) Ocean Sciences Meeting, Abstract ID: 9695. Salt Lake City, USA, February 2012.
- Roy-Barman, M and S. Marchandise (2012) A short oceanic residence time for Hf: element/isotope comparison. Goldschmidt conference, Montréal.
- Sanial V., van Beek P., Lansard B., Souhaut M. and Zhou M. Land-Ocean Connectivity : Tracing and quantifying the iron input that fuels phytoplankton blooms off Kerguelen and Crozet Islands. Land-Ocean Connectivity Meeting : from hydrological to ecological understanding of Groundwater effects in the coastal zone. L'Aber Wrac'h, Brittany (France), September 2012.

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Workshops, Seminars, etc...

- Abadie C., Radic A., Labatut M., Pradoux C., Lacan F., Poitrasson F. Particulate Iron Concentrations and Isotopic Compositions in the Southern Ocean, Atlantic Sector. GEOTRACES Workshop, Stable isotopes of biologically important trace metals. Imperial College London, UK. Sept. 2012. Poster
- Grenier M., Jeandel C., Delattre H., Lacan F., Cravatte S. REE et isotopes du Nd dans le Pacifique Sud. NEOSYMPA Workshop. Paris 6 University, Oct. 2012.
- Lacan F. Equipe de Géochimie marine du LEGOS. Journées Scientifiques du LEGOS. Toulouse, March 2013.
- Lacan F., Radic A., Labatut M., C. Abadie, C. Pradoux. Les isotopes du fer pour l'étude des cycles biogéochimiques océaniques. Après-Midi Scientifique de la Société Francaise des Isotopes Stables, Toulouse, Nov. 2012.
- Lacan F., Labatut M., C. Abadie., Radic A. – Iron isotopes in the dissolved and particulate phases of seawater: sources and processes. GEOTRACES Workshop, Stable isotopes of biologically important trace metals. Imperial College London, UK. Sept. 2012.
- Lansard B, Sanial V., van Beek P., Souhaut M., d'Ovidio F. and Zhou M. What do we learn from radium isotopes about natural iron fertilization off Crozet and Kerguelen Islands ? 4th International Ra-Rn Workshop. Narragansett, June 2012.
- Souhaut, M., van Beek P. Presentation of the LAFARA underground laboratory of Ferrières, French Pyrénées, Collaboration of European Low-level Underground Laboratories (CELLAR) meeting, Lingolsheim, France, 16.-17 October 2012.
- Tachikawa K., Meeting Neo-SYMPA (Workshop NEOdymium isotopes in marine environments: SYnergy between Modern, Modelling and PAleo communities), Paris 6 University, Oct. 2012.
- van Beek P., Souhaut M., Sanial V., Lansard B. Study of the ocean using low-background gamma spectrometry, Collaboration of European Low-level Underground Laboratories (CELLAR) meeting, Lingolsheim, France, 16.-17 October 2012.

Working groups

- Working group on results from the KEOPS 2 cruise (GEOTRACES Process Study), 23-24 May 2013 at LEMAR-IUEM in Brest. 17 scientists from France, Belgium and Australia attended this meeting.
  http://www.geotraces.org/meetings/geotraces-events/eventdetail/152/-/working-group-on-fe-budget-during-the-keops-2-cruise

New Publications

- Annett A., Henley S., van Beek P., Souhaut M., Ganeshram R., Venables H., Meredith M., Geibert W., Use of radium isotopes to estimate mixing rates and trace sediment inputs to surface waters in northern Marguerite Bay (Antarctic Peninsula), Antarctic Science, Antarctic Science 25(3), 445–456, doi:10.1017/S0954102012000892.
- Bown, J., Boye, M., Nelson, D.M., 2012, New insights on the role of organic speciation in the biogeochemical cycle of dissolved cobalt in the southeastern Atlantic and the Southern Ocean. Biogeosciences, 9, 2719-2736, doi:10.5194/bg-9-2719-2012.
- Bown, J., Boye, M., Laan, P., Bowie, A., Park, H.-Y., Jeandel, C., Nelson, D.M. (2012) Imprint of a dissolved cobalt basaltic source on the Kerguelen Plateau. Biogeosciences, 9, 5279–5290, doi:10.5194/bg-9-5279-2012

- Boye, M., Wake, B.D., Lopez Garcia, P., Bown, J., Baker, A.R., Achterberg, E.P., 2012, Distributions of dissolved trace metals (Cd, Cu, Mn, Pb, Ag) in the southeastern Atlantic and the Southern Ocean. Biogeosciences, 9, 3231-3246, doi:10.5194/bg-9-3231-2012.
- Boyle E.A., John S., Abouchami W., Adkins J.F., Echegoyen-Sanz Y., Ellwood M., Flegal R., Fornace K., Gallon C., Galer S., Gault-Ringold M., Lacan F., Radic A., Rehkamper M., Rouxel O., Sohrin Y., Stirling C., Thompson C., Vance D., Xue Z., Zhao Y. 2012. GEOTRACES IC1 (BATS) contamination-prone trace element isotopes Cd, Fe, Pb, Zn, Cu, and Mo intercalibration. Limnology and Oceanography Methods, 10:653-665, DOI: 10.4319/lom.2012.10.653.
- Bressac M., C. Guieu. Organic complexation versus scavenging: What really happens to new atmospheric iron in the ocean surface? Submitted to Global Biogeochemical Cycles, in revision
- Cavagna, A.J., Dehairs, F., Bouillon, S., Woule-Ebongué, V., Planchon, F., Delille, B., Bouloubassi, I., 2013. Water column distribution and carbon isotopic signal of cholesterol, brassicasterol and particulate organic carbon in the Atlantic sector of the Southern Ocean. Biogeosciences 10, 2787-2801.
- Cheize, M., Sarthou, G., Croot, P.L., Bucciarelli, E., Baudoux, A.-C. and Baker, A.R., Iron organic speciation determination in rainwater using cathodic stripping voltammetry, 2012, Anal. Chim. Acta, 736, 45– 54, http://dx.doi.org/10.1016/j.aca.2012.05.011.
- Evrard O., van Beek P., Gateuille D., Pont V., Lefèvre I., Lansard B., P. Bonté, 2012. Evidence of the radioactive fallout in France due to the Fukushima nuclear accident, Journal of Environmental Radioactivity 114, Volume spécial Fukushima, 54-60.
- Grenier, M., C. Jeandel, F. Lacan, D. Vance, C. Venchiarutti, A. Cros, and S. Cravatte From the subtropics to the central equatorial Pacific Ocean: neodymium isotopic composition and rare earth element concentration variations. J. Geophys. Res. Oceans, 118, 592–618, doi: 10.1029/2012JC008239.
- Hassler, C.S., Schoemann, V., Boye, M., Tagliabue, A., Rozmarynowycz, M. and McKay, R.M.L., 2012. Iron bioavailability in the Southern Ocean. In: R.N. Gibson et al. (Editors), Oceanography and Marine Biology: An Annual Review. Taylor & Francis.
- Hsieh, Y.-T., Geibert, W., van-Beek, P., Stahl, H., Aleynik, D., and Henderson, G.M. (2013) Using the radium quartet (228Ra, 226Ra, 224Ra, and 223Ra) to estimate water mixing and radium inputs in Loch Etive, Scotland. Limnol. Oceanogr. 58: 1089-1102.
- Jeandel C., Delattre M., Grenier M., Pradoux C. and Lacan F. Rare Earth Concentrations and Nd isotopes reveal exchange processes along the East Pacific Rise, South East Pacific Ocean. G3, in press., doi:10.1029/2012GC004309
- Jones M.T., Pearce C .R., Oelkers E.H., Jeandel C., Eiriksdottir E. and Gislason S.R. Suspended river material as key parameter in the global strontium cycle Earth and Planet. Sci Letter, (2012), pp. 51-59 DOI information: 10.1016/j.epsl.2012.08.04
- Lacan F, Tachikawa K, Jeandel C. 2012. Neodymium isotopic composition of the oceans: a compilation of seawater data. Chemical Geology, 300-301, 177-184, 10.1016/j.chemgeo.2012.01.019.
- Maiti, K., Buesseler, K.O., Pike, S.M., Benitez-Nelson, C., Cai, P., Chen, W., Cochran, K., Dai, M., Dehairs, F., Gasser, B., Kelly, R.P., Masque, P., Miller, L.A., Miquel, J.C., Moran, S.B., Morris, P.J., Peine, F., Planchon, F., Renfro, A.A., Rutgers van der Loeff, M., Santschi, P.H., Turnewitsch, R., Waples, J.T., Xu, C., 2012. Intercalibration studies of short-lived thorium-234 in the water column and marine particles. Limnology and Oceanography Methods 10, 631-644
- Oelkers E.H, Morgan Jones, Christopher R. Pearce, Catherine Jeandel, Eydis Salome Eiriksdottir and Sigurdur R. Gislason. Riverine particulate material dissolution in seawater and its implications for the global cycles of the elements. Compte Rendu Academie des Sciences, 2012
- Pearce C. R., Morgan T. Jones, Eric H. Oelkers, Catherine Pradoux and Catherine Jeandel The effect of particulate dissolution on the neodymium (Nd) isotope and Rare Earth Element (REE)

composition of seawater. Earth and Planetary Science Letters (2013), http://dx.doi.org/10.1016/j.epsl.2013.03.023i

- Planchon, F., A.-J. Cavagna, D. Cardinal, L. André, and F. Dehairs, 2013, Late summer particulate organic carbon export and twilight zone remineralisation in the Atlantic sector of the Southern Ocean, Biogeosciences, 10, 803-820.
- Planquette H. and R.M. Sherrell, 2012. Sampling suspended particles from rosette-mounted bottles for determination of trace elements: methodology and comparison with in situ pumping. Limnology and Oceanography: Methods, 10: 367-388.
- Planquette H., Sherrell, R.M., Stammerjohn, S., Field, P.M., 2013. Sources of particulate iron in one of the most productive polynyas: the Amundsen Sea, Marine Chemistry, 153: 15-30
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- Stichel T., Frank M., Rickli J., Hathorne E.C., Haley B., Jeandel C. and Pradoux C. Sources and input mechanisms of Hf and Nd in surface waters of the Atlantic sector of the Southern Ocean. Geochim. Cosmochim. Acta, 94, 2012, 22-37 http://dx.doi.org/10.1016/j.gca.2012.07.005
- Stieglitz T., van Beek P., Souhaut M., Cook P., Groundwater discharge Karstic groundwater discharge and seawater recirculation through sediments in shallow coastal Mediterranean lagoons, determined from water, salt and radon budgets, Marine Chemistry, in press.
- van Beek P., Souhaut M., Lansard B., Bourquin M., Reyss J-L., Jean P., von Ballmoos P., 2013. LAFARA : A new underground laboratory in the French Pyrénées for low-background gamma spectrometry, Journal of Environmental Radioactivity 116, 152-158.
- van de Flierdt, T., Pahnke, K., Amakawa, H., Andersson, P., Basak, C., Coles, B., Colin, C., Crocket, K., Frank, M., Frank, N., Goldstein, S.L., Goswami, V., Haley, B.A., Hathorne, E.C., Hemming, S.R., Henderson, G.M., Jeandel, C., Jones, K., Kreissig, K., Lacan, F., Lambelet, M., Martin, E.E., Newkirk, D.R., Obata, H., Pena, L., Piotrowski, A.M., Pradoux, C., Scher, H.D., Schöberg, H., Singh, S.K., Stichel, T., Tazoe, H., Vance, D., Yang, J. 2012. GEOTRACES intercalibration of neodymium isotopes and rare earth elements in seawater and marine particulates - Part 1: international intercomparison, Limnology and Oceanography Methods. 10, 2012, 234–251. DOI 10.4319/lom.2012.10.234. Wuttig K., T. Wagener, M. Bressac, A. Dammshäuser, P. Streu, C. Guieu, and P. L. Croot, 2013, Impacts of dust deposition on dissolved trace metal concentrations (Mn, Al and Fe) during a mesocosm experiment Biogeosciences, 10, 2583-2600
- Yeghicheyan D., C. Bossy, M. Bouhnik-Le Coz, C. Douchet, G. Granier, A. Heimburger, Lacan F., Lanzanova A. Rousseau T., Seidel JL., Tharaud M., Candaudap F., Chmeleff J., Cloquet C., Delpoux S., Labatut M., Losno R., Pradoux C., Sivry Y. Sonke J. 2013. A compilation of silicon, rare earth element and twenty one other trace element concentrations in the natural river water standard SLRS-5 (NRC-CNRC), Geostandards and Geoanalytical Research. DOI: 10.1111/j.1751-908X.2013.00232.x.

Cruises

- Monopole cruise (may-15th June 22nd-2012, PI: F. Bassinot). During this paleo-oceanographic cruise in the Gulf of Bengal, seawater, ISP and top surface sediment samples were collected for Pa-Th, Ra, Nd and Os analysis (Matthieu Roy-Barman, LSCE).
- The GEOTRACES French Pandora Cruise GP12 was completed from 27 June 2012 to 7 August 2012 (http://www.geotraces.org/news-50/news/446-geotraces-french-cruise-in-the-solomon-sea-successfully-completed), with scientists from France (LEGOS, GET, LOCEAN and LEMAR) Hawai, Washington and Princeton universities (USA), British Columbia University (Ca), Bristol University (GB) and Max Plank Institute Mainz (G).

- GEOTRACES-A02 section extended in the west-northern Atlantic (LEG4), August 2012, RV Pelagia, Chief Scientist M. Rijkenberg (Gabriel Dulaquais, LEMAR).
- GEOTRACES-A04N in the Mediterranean and Black Seas, May-August 2013, RV Pelagia,Chief Scientist M. Rijkenberg (Gabriel Dulaquais and Marie Boyé, LEMAR; Lars-Eric Heimbürger, GET).

New funding

- French-Swedish funding for a project in the Arctic Ocean. PIs: Per Andersson and Matthieu Roy-Barman
- CHIPIE (Comportement des éléments d'intérêt biogéocHImiques et du carbone Particulaire aux Interfaces atmosphère-océan et continent-océan dans un contexte d'évolution des conditions Environnementales; PI C. Guieu) fundings UPMC and INSU: Main goal of CHIPIE is to quantify by the mean of well controlled experiments conducted in clean room, the evolution of the behavior of chemical elements with biogeochemical interest (N, P, Fe etc.) and carbon at the atmosphere-ocean interface in a context of evolving environmental conditions (ocean acidification, increase in temperature). We propose to develop an original experimental approach to simultaneously follow the behavior of chemical elements and the fate of particles combining atmospheric deposition and various environmental conditions such as pH, temperature, mixing, quality of organic material.
- ANR RPDOC BITMAP : Bioavailability of Iron and other Trace MetAls in marine Particles, 480 k€ (12/2012-12/2015), PI Hélène Planquette UMR 6539 LEMAR. Collaborators: LEMAR (E. Bucciarelli, S; LHelguen, F. Planchon, G. Sarthou); LEGOS (F. Lacan, C. Pradoux ; IPGP (E. Viollier), IMCS Rutgers (R. Sherrell)
- Pieter van Beek, Marc Souhaut (coll. Erika Sternberg; Roger François) : Analysis of the radium activities (226Ra, 228Ra) in water samples collected during ArcticNet 0903 – LEG 3a (Paulatuk – Paulatuk on board CCGS Amundsen) ; August 27 – September 12, 2009
- OPTIMISP project (F. Lacan) in 2012: optimization of in situ pumps (ISP).
- The 5 French McLane ISP should be modified by the end of 2013 in order to fit simultaneously 3 membranes (nuclepore for surface studies; SUPOR for trace metals and QMA or GFF for carbon) and 2 Mn impregnated cartridges for in situ preconcentration of dissolved elements such as radium. The prototype has been already modified by DT INSU (picture below).

Other activities

- Participation to cross-over station trace metal calibration (BGH/UK, BGH/NL, GA02/US, GA02/UK).
- Marine Hg and methylHg intercalibration exercise on the GEOTRACES Mediterranean / Black Sea cruise (PI Lars-Eric Heimbürger).
- Participation to the next intercalibration effort organised by P. Lam (WHOI): "Particles intercal. during GA04N section", H. Planquette.

Submitted by: Geraldine Sarthou

Germany

GEOTRACES activities in Germany mainly focused on the analysis of samples collected on cruises in previous years and the submission of two cruise proposals for the Arctic Ocean in 2015 (Central Arctic) and 2016 (Fram Strait) on *R/V Polarstern*.

Cruise proposals

We have submitted proposals for two *R/V Polarstern* expeditions 2015 and 2016, both with GEOTRACES components as part of the coordinated GEOTRACES program for the Arctic Ocean. The proposal for the 2015 expedition aims at sampling the central Arctic Ocean, while our part in the 2016 proposal has the objective to study the Fram Strait in order to quantify the tracer exchanges through this gateway to the Atlantic Ocean. Both proposals have received excellent reviews and have been selected to be scheduled as requested. A final decision is expected in July 2013.

Proposal for 2015: *Trans-Arctic Survey of the Arctic Ocean in Transition*, R/V Polarstern, 2015 (PIs: U. Schauer, M. R. v.d. Loeff, H.de Baar, M. Rijkenberg, P. Masqué, K. Pahnke, M. Frank).

Proposal for 2016: *FRAM Strait oceanography and GEOTRACES, East Greenland glacier melt*, R/V Polarstern, 2016 (PIs: U. Schauer, M. R. v.d. Loeff, H.de Baar, M. Rijkenberg, P. Masqué, K. Pahnke, M. Frank).

New results

Data for the intermediate data product obtained during M81/1 (GA11) (M. Frank, GEOMAR) and ANTXXVI-2 (Nd isotope data, C. Basak, K. Pahnke, U. of Oldenburg) have been submitted. The cruise report of M81/1 has been approved by the funding agency. A publication on the Nd/Hf isotope data obtained during the Baltic Sea process study has been submitted to GCA.
Cd isotope profiles from Pelagia cruise PE369 and stable Sr and Ca isotopes in seawater have been acquired.
The first five water column profiles from *R/V Sonne* cruise SO223T (GEOTRACES Process Study) have been analyzed for dissolved Nd isotopes.

Other activities

The trace metal clean rosette and CTD of GEOMAR has been purchased and delivered. The clean van for taking clean samples is close to being finished and a mobile winch is in the ordering process at GEOMAR. Eric Achterberg will join GEOMAR in August and will be a new player in the German GEOTRACES activities. Submission of a joint cruise proposal, most likely for the Indian Ocean, is planned for September.

Samples for the intercalibration of Nd isotopes, REE concentrations, and Si isotopes to be measured at GEOMAR have been collected on the GEOTRACES Mediterranean cruise.

Publications

Submitted manuscripts

- Abouchami, W., Galer, S.J.G., de Baar, H.J.W., Middag, R., Klunder, M., Mezger, K., Feldmann, H., Andreae, M.O. (2013, Cadmium isotopes in the Southern Ocean − a tracer of nutrient cycling, Geochimica Cosmochimica Acta (in revision).
- Chen, T.-Y., Stumpf, R., Frank, M., Beldowski J. and Staubwasser, M. (2013) Contrasting geochemical cycling of hafnium and neodymium in the central Baltic Sea. Geochimica Cosmochimica Acta (submitted).

Oral and poster presentations

- Abouchami, W., Galer, S.J.G., Feldmann, H., Andreae, M. O., de Baar, H.J.W., Middag, R., Klunder, M., Laan, P. (2012) Micronutrient Cadmium, distribution and stable isotope fractionation. AGU Fall Meeting, San Francisco, 2012 (invited talk).
- Abouchami, W., Galer, S.J.G., Feldmann, H., Andreae, M. O., de Baar, H.J.W., Middag, R., Klunder, M., Laan, P., Rijkenberg, M., Gerringa, L., de Jong, J., Timmermanns, K., Schuback, N. (2012). Stable Cd Isotopes in Seawater, UK Geotraces Meeting, London, September 2012 (Talk).
- Basak, C., Pahnke, K. (2012). Bottom Water Changes in the South Pacific Over the Last 30 ka Documented by Nd Isotopes. Goldschmidt Conference, Montréal, Canada, Mineralogical Magazine 76, 1458 (Talk).
- Basak, C., Pahnke, K. (2012). South Pacific Water Mass Structure From Nd Isotopes: Present And Past, AGU Fall Meeting, San Francisco (Talk).
- Chen, T., Frank, M. und Stumpf, R. (2012) *Nd & Hf concentrations and isotopic compositions in the Baltic Sea*. Goldschmidt Conference, Montréal, Canada (Talk).
- Pahnke, K., Basak, C., Gersonde, R. (2012) Neodymium isotopic composition of South Pacific bottom water. Goldschmidt Conference, Montréal, Canada, Mineralogical Magazine 76, 2199.
- Pöhle, S., Koschinsky, A., and Schmidt, K. (2012) Determination of Zr, Hf, Nb and Ta in seawater by the use of an online-preconcentrations system connected to inductively coupled mass-spectrometry (ICPMS). Geoanalysis, 8th International Conference on the Analysis of Geological and Environmental Materials, Buzios (Brazil), Sept. 16-20, 2012. (Talk)
- Pöhle, S., Koschinsky, A., Moos, S., and Sander, S., Chromium speciation in the oceanic water column. ASLO 2013 Ocean Sciences Meeting, New Orleans, 2013. (Talk)
- Zieringer, M., Frank, M. und Hathorne, E. (2012) *The distribution of neodynium isotopes and REE patterns in the water column of the tropical Atlantic Ocean*. Goldschmidt Conference, Montréal, Canada (Talk).

Submitted by: Katharina Pahnke

Greece

Meetings

- Participation in Davos Atmosphere and Cryosphere Assembly 2013, Switzerland.
- Scheduled participation in CIESM meeting next October in Marseille.
- Convener of a session at Goldschmidt conference (Aerosols deposition and their role on ecosystem and climate).

New funding

- University of Crete will start a new project to study whether interaction between anthropogenic and natural sources (namely dust) can affect solubility of important nutrients such as P and Fe.

Other activities

Within the framework of the Crete mesocosms facilities changes in dissolved and particulate abiotic components and the impact of dust on the autotrophic and heterotrophic surface microbial populations during a transitional spring season that is characterized by high inputs of dust events was studied by an international consortium composed by scientists from Israel, Turkey, UK, France and Greece (University of Crete, HCMR, University of Athens). Two different treatments were deployed : In the first treatment, Saharan dust event material collected in Crete was added to the mesocosms (3 replicates). In the second treatment aerosol also collected in Crete containing a natural mixture of desert dust and polluted European particles was added to the mesocosm. The results will be presented at CIESM and Goldschmidt international conferences.

Publications

- Parinos, C., Gogou, A., Bouloubassi, I., Stavrakakis, S., Plakidi, E., Hatzianestis, I. Sources and downward fluxes of polycyclic aromatic hydrocarbons in the open southwestern Black Sea, Organic Geochemistry, Volume 57, Pages 65-75, 2013.
- C. Theodosi, S. Stavrakakis, F. Koulaki, I. Stavrakaki, S. Moncheva, E. Papathanasiou, A. Sanchez-Vidal, M. Koçak, N. Mihalopoulos, The significance of atmospheric inputs of major and trace metals to the Black Sea, Journal of Marine Systems, Volume 109-110, 94-102, 2013.
- Christodoulaki, S., Petihakis, G., Kanakidou, M., Mihalopoulos, N., Tsiaras, K., Triantafyllou, G., Atmospheric deposition in th eastern Mediterranean. A driving force for ecosystem dynamics, Journal of Marine Systems, doi: 10.1016/j.jmarsys.2012.07.007.
- Hood, R.R., Drinkwater, K.F., Mihalopoulos, N., Introduction: Large-scale regional comparisons of marine biogeochemistry and ecosystem processes - Research approaches and results (Editorial), Journal of Marine Systems, Volume 109-110, 1-3, 2013.
- C. Theodosi, C. Parinos, A. Gogou, A. Kokotos, S. Stavrakakis, V. Lykousis, J. Hatzianestis, and N. Mihalopoulos, Downward fluxes of elemental carbon, metals and polycyclic aromatic hydrocarbons in settling particles from the deep Ionian Sea (NESTOR site), Eastern Mediterranean, Biogeosciences, 10, 4449–4464, 2013, doi:10.5194/bg-10-4449-2013.

Submitted by: Nikos Mihalopoulos

India

During last two years, GEOTRACES (India) were in process of acquiring clean sampling system. Finally the clean sampling system has been acquired as per the following details:
(i) Carousel Water Sampler with 24 Niskin X Teflon coated bottles(12 l) and CTD unit from Seabird
(ii) 14 mm Kevlar Cable from Cortland – 8000 m
(iii) Metal free CTD winch from Lebus International
(iv) Potable Clean Van from Silhouette, Canada

Cruises

Cruise of Section GI03 in Indian Ocean were undertaken during March 3 to May 10, 2013 onboard Sagar Kanya. This was first GEOTRACES – India cruise equiped with complete clean sampling system. All the key parameters are being measured in this section. Cruise track is shown in Figure 10. The initial planned track was modified after commencement of the cruise due to problems with dynamic positioning system of the vessel which was later rectified during the cruise.

Figure 10. Cruise track of section GI03 in the Indian Ocean.

Altogether 28 participants from 9 Indian institutions participated in this cruise. The entire cruise was devided in two legs, Leg 1: Goa, India to Jakarta, Indonesia and Leg 2: Jakarta, Indonesia to Chennai India. Water samples for measurements of key trace elements along with high volume samples for Hf, Nd, Ra, Th isotopes were collected on this cruise. Aerosol samples were collected all along this track. Water leachable ions from these aerosols were continuously monitored onboard.

Science

Internal cycling of dissolved barium in water column of the Bay of Bengal

Dissolved barium concentrations in water column of the Bay of Bengal along the 87°E transect (~6°N to ~21°N) have been measured to track the dispersion of its large influx from the Ganga–Brahmaputra river system and the outflow to the equatorial Indian Ocean. A typical barium concentration–depth profile shows relatively higher Ba concentration in surface waters (depth <5 m) followed by a

minimum in the depth interval ~50–150 m, which further increase with depth. The barium concentrations in surface waters (depth ≤ 5 m) of the Bay of Bengal vary from ~34.9 nmol/kg in the southern BoBt to ~112.8 nmol/kg close to mouth of the Hooghly. The dissolved Ba in the surface water of BoB is dominated by its supplyfrom the G–B river system. The Ba concentrations in deep waters (depth ≥500 m) is controlled dominantly by water mixing as suggested by a very strong and significant inverse correlation with salinity. Exceptions to this conservative behavior are the "hot-spots" of dissolved Ba in bottom waters, which are probably resulted by the dissolution of sediments at and/or below the sediment–water interface. Under the steady state the annual Ba influx from the Ganga–Brahmaputra river system seems to be balanced through its removal via sinking particulates as a result there is no lateral outflow of dissolved Ba from the G–B to the equatorial Indian Ocean through top ~100 m of the BoB. Most of this sinking particulate Ba (~95 %) is regenerated again in the lower box, preferentially in the intermediate waters ~100–500 m. Therefore, frequently ventilated intermediate waters of the Bay of Bengal, receiving a large input of dissolved Ba through particle remineralization can be the significant source of dissolved Ba to the Indian Ocean.

Molybdenum isotope composition in Narmada and Tapi estuaries

Behaviour of Mo isotope composition in dissolved phase has been studied in the Narmada and Tapi rivers and estuaries. Mo isotope composition in these water were measured ousing double spike by MC-ICP-MS. d^{98}Mo of dissolved Mo of these rivers display higher values compared to that of the basalt, the major lithology of these rivers indicating adsorption of lighter Mo on Fe, Mn oxy hydroxide during riverine transport. Mo isotope display non-conservative behaviour in both the Narmada and the Tapi estuary. In the Narmada estuary, lighter Mo being contributed either by particle desorption or from submarine groundwater discharge. In the Tapi estuary, lighter Mo is being supplied by anthropogenic activities such as from steel industry situated nearby. This study underscores the need to characterize the Mo isotope composition of global rivers and estuaries before using it as a proxy of paleo-redox condition.

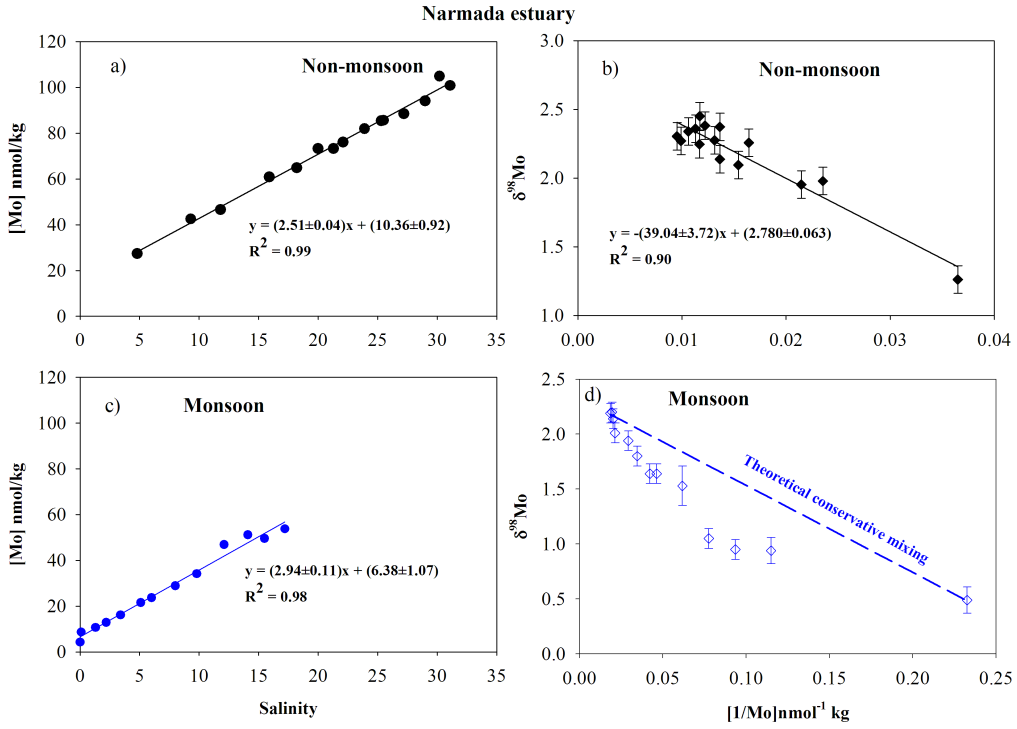

Figure 11. Mo isotope displays non-conservative behaviour in the Narmada Estuary indicating supply of lighter Mo either from particulates or from submarine groundwater discharge

Meeting Arranged

- GEOTRACES SSC meeting during October 29-31, 2013 at Goa, India.
- Data Management Committee meeting during October 27-28, 2013 at Goa, India.

Planned Cruise

- Arabian Sea: Cochin – Goa, January, 2014: along 68° E from 1° N to 21° N.

Publication

- Singh S.P., Singh S. K. and Bhushan R. (2013) Internal cycling of dissolved barium in water column of the Bay of Bengal, Marine Chemistry 154, 12–23.

Submitted by: Sunil Kumar Singh

Japan

Cruise

The GEOTRACES GP02 (R/V *Hakuho Maru* KH-12-4) cruise, nicknamed "Big Dipper (BD) Expedition, for the purpose of a zonal (~47°N) transect in the subarctic North Pacific Ocean was conducted from 23 Aug. to 3 Oct. 2012. Thirty three scientists including technical supporting staffs and graduate students joined the cruise (chief scientist: Toshitaka Gamo). Although the cruise had to omit several stations in the northeastern Pacific due to severe weather conditions, 22 stations as shown in the following figure were successfully occupied for clean seawater sampling from surface to bottom using a Seabird CTD-Carousel system with Teflon-coated Niskin-X (12L) bottles and a large volume (250 L) water sampling system. Bottom sediments were taken with a multiple corer. Measurements of chemical constituents and isotopes were and will be performed in clean rooms on board the ship and in shore-based laboratories. Inter-calibration was also conducted by comparing the GEOTRACES-recommended Kevlar wire hydrocast with the R/V *Hakuho Maru*'s titanium wire hydrocast. We visited a baseline station, K2 (BD-7) (47°N, 160°E) in the northwest Pacific Ocean, taking seawater samples not only for shipboard scientists but also for other international scientists who will be interested in measuring some of the GEOTRACES key parameters for comparison.

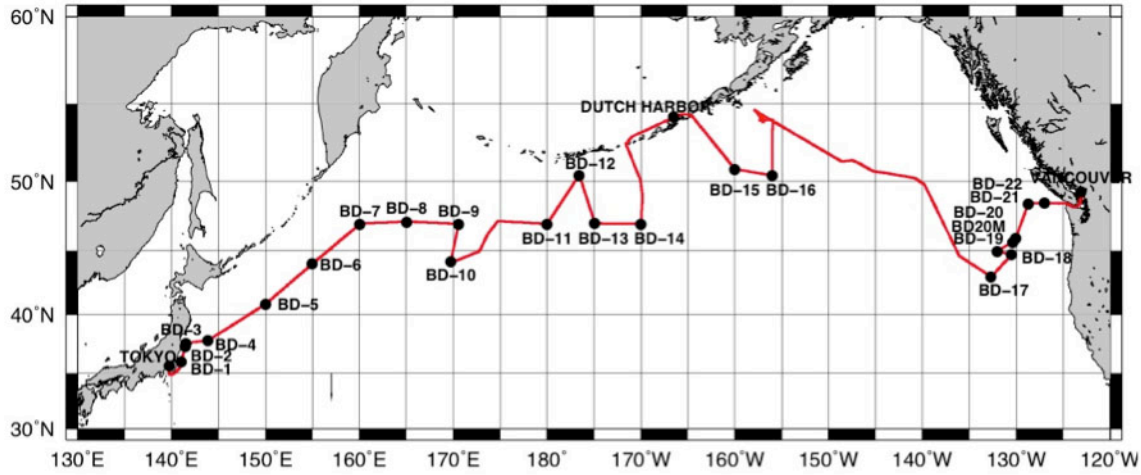

Figure 12. GEOTRACES GP02 (R/V *Hakuho Maru* KH-12-4) cruise track

Meetings

- GEOTRACES session in Annual Meeting of the Geochemical Society of Japan (in Japanese) was convened by Y. Sohrin and J. Zhang on 11 Sep 2012 at Kyushu Univ, Hakata. There were 11 oral presentations and fruitful discussions.
- National sub-committee on GEOTRACES (affiliated to the national SCOR committee) in the Science Council of Japan was held at Tokyo University of Marine Science and Technology on March 24, 2013, during the Spring Meeting of Oceanographic Society of Japan. International and national problems and information on GEOTRACES program were widely discussed and exchanged.

Recent publications

- Nishioka, J. Obata, H., Tsumune, D.: Evidence of an extensive spread of hydrothermal dissolved iron in the Indian Ocean. Earth Planet Sci. Lett., 361, 26-33 (2013).
- Vu, H.T.D. and Sohrin, Y.: Diverse stoichiometry of dissolved trace metals in the Indian Ocean. Sci. Reports, 3, DOI: 10.1038/srep01745 (2013).

New research vessel

R/V *Tansei Maru* (JAMSTEC) was retired at the end of January 2013. The successive new vessel *Shinsei Maru* (1630t, 15 scientists) is now being constructed by JAMSTEC, and will be completed in June 2013. R/V *Shinsei Maru* is equipped with a Kevlar armored cable and a clean container laboratory, which will be useful for trace element studies chiefly in coastal areas.

Submitted by: Toshitaka Gamo

Mexico

Meetings

- Two oral presentations and two posters were exposed by Mexican participants on the GEOTRACES Latin American Workshop (12-15 November 2012, Pontifical Catholic University of Rio de Janeiro, Brazil).
- Six oral presentations were given in international conferences such as AOGS-AGU (WPGM) Joint Assembly (13-17 August, 2012, Resorts World Convention Centre, Singapore), Primer congreso internacional de la red de medio ambiente. Instituto Politécnico Nacional (7 – 9 de noviembre del 2012. Querétaro, México), VII International Symposium on the Sea of Cortéz (Ensenada, Baja California, 8 a 12 de abril del 2013)
- Presentación oral en la XIII Reunión Anual IMECOCAL, Estudios Oceanográficos de la Corriente de California, Ensenada, BC, México, 29-30 de noviembre del 2012.
- Presentación oral en el IV Simposio Internacional del Carbono en México, Texcoco, Estado de México, 21-24 de mayo de 2013 RCD

Cruises

R/V " El Puma" (UNAM) was used in June 2013 in the western Gulf of California, in front of Santa Rosalía copper mining region to collect surface sediments and to study vertical profiles of dissolved oxygen in water column, because the deficit of the dissolved oxygen affects the accumulation of redox-sensitive elements such as uranium the marine sediments. The samples are necessary for geochemical studies of heavy metal pollution of the marine environment occurred as a consequence of ancient mining, as well as for the assessment of the combined impact of anthropogenic sources and water

column oxygen minimum zone influence on the geochemistry of redox-sensitive trace elements with special attention to uranium and lanthanides.

New funding

There is no direct funding for GEOTRACES activities in Mexico. However, GEOTRACES related projects obtain financial support from CONACyT (Mexican Council for Science and Technology) fundamental research fund. Limited financial support for the research and educational centers in the National Polytechnic Institute of Mexico system is also available.

New collaborative project "High resolution geochemical reconstructions of recent climate and oxygenation history in La Paz Bay, Gulf of California" was recently approved for next 18 months by UC MEXUS-CONACyT (grant number CN-13-563, amount requested 25,000 US $). PIs: Dr. T. Lyons, Department of Earth Sciences, University California, Riverside (USA) and Dr. E. Choumiline (Shumilin), Department of Oceanology, Centro Interdisciplinario de Ciencias Marinas-Instituto Politécnico Nacional, La Paz, Baja California Sur, Mexico

Ongoing projects

a) CONACyT funding:

- "Biogeochemistry of trace metals in the southern part of the Southern California Bight: a region influenced by the California Current, upwelling and anthropogenic inputs". Multidisciplinary project awarded to Universidad Autónoma de Baja California, Mexico with the funding of $2,500,000 pesos (P.I.- Dr. Francisco Delgadillo-Hinojosa; duration: 2010-2013).

- "Atmospheric fluxes of bioactive metals and their solubility in the Gulf of California: a scene towards climate change". Multidisciplinary project awarded to Universidad Autónoma de Baja California, Mexico, with the funding of $3,619,000 pesos (P.I.- Dr. José A. Segovia-Zavala; duration: 2012-2015).

b) Funding from "Secretaría de Investigación y Posgrado" of the National Polytechnic Institute of Mexico (Instituto Politécnico Nacional).

- Multidisciplinary scientific project "Geochemical and ecotoxicological evaluation of the contamination state by heavy metals of the coastal environment of Santa Rosalía mining region (Southern Baja California)", with the funding of $750,000 pesos from Instituto Politécnico Nacional (P.I.- Dr. Evgueni Shumilin; duration: 2011-2012) was successfully terminated in the January of 2013.
- Individual scientific project 20131764 "Arsenic and other potentially toxic elements in the sediments of the La Paz Lagoon, Baja California Sur: actual levels and historical record of the natural and anthropogenic contamination", with the funding of $65,000 pesos from Instituto Politécnico Nacional (P.I.- Dr. E. Shumilin; duration: February 2013-January 2014).
- Individual scientific project 20130611 "Ecology of the pelagic system of the Magdalena Bay, Baja California Sur, Mexico", with the funding of $48,000 pesos (P.I. –Dr. R. Cervantes Duarte; duration February 2013-January 2014).

New results

Scientific highlights

- Biogeochemical cycles of elements in the ocean lie at the center of our understanding of the functioning of ecosystems on different scales, whether global or regional. Some major, trace elements and lanthanides are known to be useful indicators of the origin of settling particulate matter and marine sediments, especially in contrasting environments with distinctive features such as active tectonics or environmental pollution.

The objective of this study is to characterize shale-normalized lanthanide patterns as well as trace element composition of settling particulate matter (SPM) and marine sediments of the Alfonso Basin, southwestern Gulf of California.

The SPM was collected with an automated sediment trap during 2002-2010 with a periodicity of 7-15 days near the bottom of Alfonso Basin. A recent sediment core was obtained with a box corer near the trap location. The major, trace element and lanthanide contents were determined using instrumental neutron activation analysis, aided with suitable standard reference materials. The core was dated using the Pb-210 method.

The trap material composition and sediment core analyses helped establishing fluvial supply, mostly during tropical cyclones (Sc and Fe), biogenic contribution (Ca, Ba and U), aeolian effect (Sc, Fe and As) and authigenic particle formation due to suboxic conditions of the water column or associated to organic matter (U and As). The shale-normalized patterns in SPM show an alternation between light and heavy lanthanides, as well as a typical negative Eu anomaly, which becomes positive during some events. The light/heavy (normalized La/Yb ratio) in the core, representing the time span between 1850 and 2008, showed the same alternation as the settling particles. Mostly the core has a negative Eu anomaly with rare positive Eu prominent peaks. The positive Eu anomaly in both cases is presumably related to hydrothermal activity of Gulf of California tectonics. Calcium values in the sediment core show an increase tendency after the year 1950 which seem to coincide with a superficial temperature reconstruction (NOAA ERSST v3b).

- Marine sediments from the coastal zone of Santa Rosalía are characterized by high contents of heavy metals due to ancient mining and smelting of copper ores. In order to find out the present-day levels of metals and specially due to the soon opening of the new mining and metallurgic company of “El Boleo”, 75 surficial sediment samples were collected in September 2011. The total contents of 50 elements in the sediments were measured by a combination of ICP-AES and ICP-MS instruments after concentrated strong acid digestion and heating at 250°C. “Mobile” metals in the sediments were determined after cold acid leaching. The Principal Component Analysis with Varimax rotation was applied to the obtained dataset, which allowed distinguishing three associations of elements with high positive scores (> 0.5). The association I (Ag, Ba, Be, Bi, Cd, Co, Cu, Fe, In, Li, Mg, Mn, Mo, Ni, lanthanides, Pb, Sr, Tl, U, V, Y and Zn) presumably corresponds to the input of mineralized terrigenous material of ore deposits, naturally formed at first or modified during a smelting of ore minerals afterwards. The association II (Cs, Hf, K, Rb, Re, S, Se, Th and Corg) probably reflects the contribution of fine natural clayey material, enriched in organic matter. The association III (Al and Sc) is probably due to the supply of the terrigeneous aluminosilicates. The enrichment factors (EFs) of Ag, Ba, Bi, Cd, Co, Cu, Mn, Ni, PB, Sb, U, V and Zn in sediments, calculated using Al as a normalizing crustal element, are higher than unity. With respect to the average EFs for the marine sediments with Cu content higher than the effect range medium guideline value (ERM) of 270 mg kg-1, these enriched elements showed the following sequence: Cu (115) > Zn (29) > Co (27) > Mn (23) > Cd (12.6) > U (11) > Bi (10.9) > Pb (6.7) > Sb (5.0) > Ag (4.1) > Ba (4.0) > Ni (3.2) > V(2.6). All these elements are supplied to the marine sedimentary environment from sources related to the ore-forming mineralization in this mining district, or as the constituents of smelter slugs.

  The spatial distributions of total and acid leachable Cd, Co, Cu, Mn, Pb and Zn contents in the surface sediments delimit the principal “hot spots”, associated with the dumped smelting wastes. About 50% of the surface sediment samples exceeded the ERM guideline value of 270 mg kg-1 proposed for Cu, the principal pollutant of this specific environment.

- The study of the biogeochemical cycles of the elements is important because they regulate the functioning of marine coastal ecosystems. To determine the factors that control the distribution of

potentially toxic elements (PTEs) in surface sediments of the La Paz Lagoon (south -western Gulf of California) and their possible sources, 91 sediment samples were collected by free diving. After a total digestion of oven-dried (60 oC, 24 h) sediments with a mixture of concentrated strong acids (HF+HCNO3+HClO4) the concentrations for over 50 elements were measured with inductively coupled plasma mass spectrometry. The enrichment factors and the Müller's geoacumulation index of the analyzed elements were calculated using obtained data to distinguish naturally or anthropogenically enriched PTEs.

A principal component analysis was also used to determine the possible associations between elements. The results obtained allow us to establish that there are natural inputs of elements such as Se, Ag, As, Cd and Sb into the sediments, which reflect mainly the lithology of the geological formations surrounding the lagoon. Greatest enrichments of As and Cd were found in the area adjacent to the Mogote peninsula which may reflect litoral transport of phosphatic materials rich in some trace elements, supplied to the sea by arroyos that cut through the Lomas de la Virgen geologic formation. The Pb probably has anthropogenic origin, because its higher concentrations up to 36.8 mg kg-1 were recorded near the La Paz city.

B.S., M.S. and Ph.D. theses related to local "GEOTRACES" problems.

- Cuauhlte-Mora D. Heavy metal levels in marine sediments and their bioaccumulation in the clam Megapitaria squalida in the coastal zone of the Santa Rosalía mining region, Gulf of California. M.S. Thesis, Postgraduate Program in Marine Sciences and Limnology, Universidad Nacional Autónoma de México, México, D.F. (in process).
- Félix-Bermúdez A., 2012. Biogeochemistry of Mn, Cu and Cd in the Colorado River delta. M.S. Thesis in Coastal Oceanography. Universidad Autónoma de Baja California. Ensenada, Mexico (concluded).
- Salamanca-Quevedo E. Spatial distribution and temporal variability of cadmium in Bahía de Todos Santos: the region influenced by the California current and upwellings. M.S. Thesis in Coastal Oceanography. Universidad Autónoma de Baja California. Ensenada, Mexico (in process).
- Pérez Tribouillier H. Biogeochemistry of trace elements in the La Paz Lagoon. M.S. Thesis. Centro Interdisciplinario de Ciencias Marinas-Instituto Politécnico Nacional, La Paz, Baja California Sur, Mexico (in process).
- Reyes-Bravo M. Temporal variability of the dissolved copper in the coastal zone of the Bahía de Todos Santos, Baja California. B.S. Thesis in Oceanology. Universidad Autónoma de Baja California. Ensenada, Mexico (in process).

Publications

Journal articles

- Cervantes-Duarte R., López-López S., Aguirre-Bahena F., González-Rodríguez E. and S. Futema-Jiménez, 2012. Relevancia de fuentes nitrogenadas nuevas y regeneradas en la columna de agua en Bahía Magdalena (SO) Península de Baja California), México. Revista de Biología Marina y Oceanografía, 47 (3): 587-592.
- Cervantes-Duarte R., Prego,R., López-López S., Aguirre-Bahena F. and N. Ospina-Alvarez, 2013. Annual patterns of nutrients and chlorophyll in a subtropical coastal lagoon under the upwelling influence (SW of Baja-California Peninsula). Estuarine, Coastal and Shelf Science, 120: 54-63.
- Hernández-Ayón J.M., Chapa-Balcorta C., Delgadillo-Hinojosa F., Camacho-Ibar V.F., Huerta-Díaz M.A., Santamaria-del-Ángel E., Galindo-Bect S. and J.A. Segovia-Zavala, 2013. Dynamics of dissolved inorganic carbon in the Midriff Islands region of the Gulf of California: Influence of water masses. Ciencias Marinas, 39(2): 65–83.

- Leal-Acosta M.L., Shumilin E., Mirlean N., Delgadillo-Hinojosa F. and I. Sánchez-Rodríguez, 2013.The impact of marine shallow-water hydrothermal venting on arsenic and mercury accumulation by seaweeds Sargassum sinicola in Concepcion Bay, Gulf of California. Environmental Science: Processes & Impacts, 15, 470-477. **doi:** 10.1039/C2EM30866E .
- Leal Acosta M.L., Shumilin E. and N. Mirlean, 2013. Sediment geochemistry of marine shallow-water hydrothermal vents in Mapachitos, bahía Concepción, Baja California peninsula, Mexico. Revista Mexicana de Ciencias Geológicas, 30 (1), 233-245
- Prol-Ledesma R.M., Torres-Vera M.A., Rodolfo-Metalpa R., Ángeles C., Lechuga Deveze C.H., Villanueva-Estrada R. E., Shumilin E. and C.Robinson, 2012. High heat flow and ocean acidification at a nascent rift in the northern Gulf of California. Nature Communications, 4: 1388; doi: 10.1038/ncomms2390.
- Segovia-Zavala J.A., Delgadillo-Hinojosa F., Huerta-Díaz M.A., Muñoz-Barbosa A., Galindo-Bect S., Hernández-Ayón J.M. and E.V. Torres-Delgado, 2013. Concentration of dissolved iron in the oxygen minimum zone off San Esteban sill, Gulf of California. Ciencias Marinas, 39(2): 231–237.
- Shumilin E.N., Jiménez -Illescas A.R. and S. López-López, 2013. Anthropogenic contamination of metals in sediments of the Santa Rosalía harbor, Baja California Peninsula. Bulletin of Environmental Contamination and Toxicology, 90 (3):333-337; doi: 10.1007/s00128-012-0923.
- Shumilin E., Rodríguez-Figueroa G., Sapozhnikov D., Yuri Sapozhnikov Yu. and K. Choumiline, 2012. Anthropogenic and authigenic uranium in the marine sediments of the Central Gulf of California adjacent to the Santa Rosalía mining region. Archives of Environmental Contamination and Toxicology, 63: 309-322; doi: 10.1007/s00244-012-9776-1.
- Shumilin E., Rodríguez Figueroa G., Sapozhnikov D. and N. Mirlean, 2013.Vertical profiles of cobalt and zinc in the marine sediments of the Santa Rosalía mining region, Gulf of California, Mexico. J. Iberian Geology, 39 (1), 89-96. Doi: 10.5209/rev_JIGE 2013v39.n1.41750.
- Torres-Delgado E.V., Delgadillo-Hinojosa F., Camacho-Ibar V.F., Huerta-Díaz M.A., Segovia-Zavala J.A., Hernández-Ayón J.M. and S. Galindo-Bect. Wintertime enrichment of inorganic nutrients in the Ballenas Channel, Gulf of California. Ciencias Marinas, 39(2): 47–64.

Other activities

- Dr. R. Cervantes Duarte from CICIMAR –IPN during 2012 passed his sabbatical year in the Laboratory of the Marine Biogeochemistry of the Instituto de Investigaciones Marinas (CSIC) in Vigo (Spain). He had participated in the project "The inputs of trace elements to the coastal zone during different oceanographic periods. The influence of phytolplankton on trace metal concentrations " (CTM2011-28792-C02-02).
- Dr. M. L. Leal Acosta (ex-Ph.D. student of CICIMAR-IPN) has a 8-month duration stay (October 2012-June 2013) in Bermuda Institute of Ocean Studies obtaining theoretical knowledge and practical experience of doing oceanographic research, which included also the marine element biogeochemical studies with the use of the sediment traps.
- M.S. K. Choumiline, ex-student of CICIMAR-IPN) is accepted as a Ph.D. student to the Biogeochemistry Laboratory of Dr. Timothy Lyons in the Department of Earth Sciences of the University California-Riverside (California, USA).

Submitted by: Evgueni Choumiline

The Netherlands

Western Atlantic Ocean: The Dutch GEOTRACES cruises between 2010-2012 aimed to map the distribution of important trace elements and isotopes (PI: Hein de Baar) and to investigate the deep-sea microbiology (PI: Gerhard Herndl) in the West Atlantic Ocean. Gerhard Herndl is also involved in bioGEOTRACES together with Penny Chisholm (MIT) and Julie LaRoche (now at Dalhousie University). In 2012-2013 we focused with our west Atlantic work on the compilation and analysis of the data collected in the western Atlantic Ocean in 2010 – 2012.

Mediterranean Sea and the Black Sea: In 2012/2013 funding was granted by the Dutch Organization for Scientific Research (NWO) for GEOTRACES cruises in the Mediterranean Sea and the Black Sea (PI: Hein de Baar). The Dutch GEOTRACES cruises in the Mediterranean Sea (GA04N) are organized in concert with a cruise of the Spanish Mediterranean GEOTRACES program (GA04S). In 2012/13 our work in the Mediterranean and Black Seas focused on: i) the preparation of 3 research cruises to the Mediterranean Sea and Black Sea, and ii) the execution of the first leg in the Mediterranean Sea (14 May-05 June 2013).

Meetings

- GEOTRACES SSC meeting: Micha Rijkenberg attended the GEOTRACES Scientific Steering Committee meeting on 29-31 October in Goa, India.
- Planning of Mediterranean GEOTRACES: Micha Rijkenberg visited Jordi Garcia-Orellana and Patrizia Ziveri at the Universitat Autonoma de Barcelona on 18 January 2013 to discuss the coordination between the Spanish and the Dutch Mediterranean GEOTRACES cruises.
- Ocean Sciences 2013 conference in New Orleans, USA: Micha Rijkenberg presented work at the Ocean Sciences 2013 conference in New Orleans.

Cruises

With Micha Rijkenberg as chief scientist 18 participants left Lisbon on board RV *Pelagia* on 14 May 2013 for the first Dutch leg of the MedBlack GEOTRACES cruises (GA04N), see Figure 13. We completed this first leg sampling 37 full depth stations starting in the eastern North Atlantic Ocean, through the Strait of Gibraltar, the western and eastern basins of the Mediterranean Sea and northward into the Aegean Sea, followed by the Dardanelles and the Sea of Marmara before arriving in Istanbul on 05 June 2013. The second leg of the MedBlack GEOTRACES cruises will leave Istanbul on 13 July 2013 for the Black Sea to return in Istanbul on 25 July 2013. The third leg will leave Istanbul on 25 July for the northern parts of the Mediterranean and arrives in Lisbon on 12 August 2013.

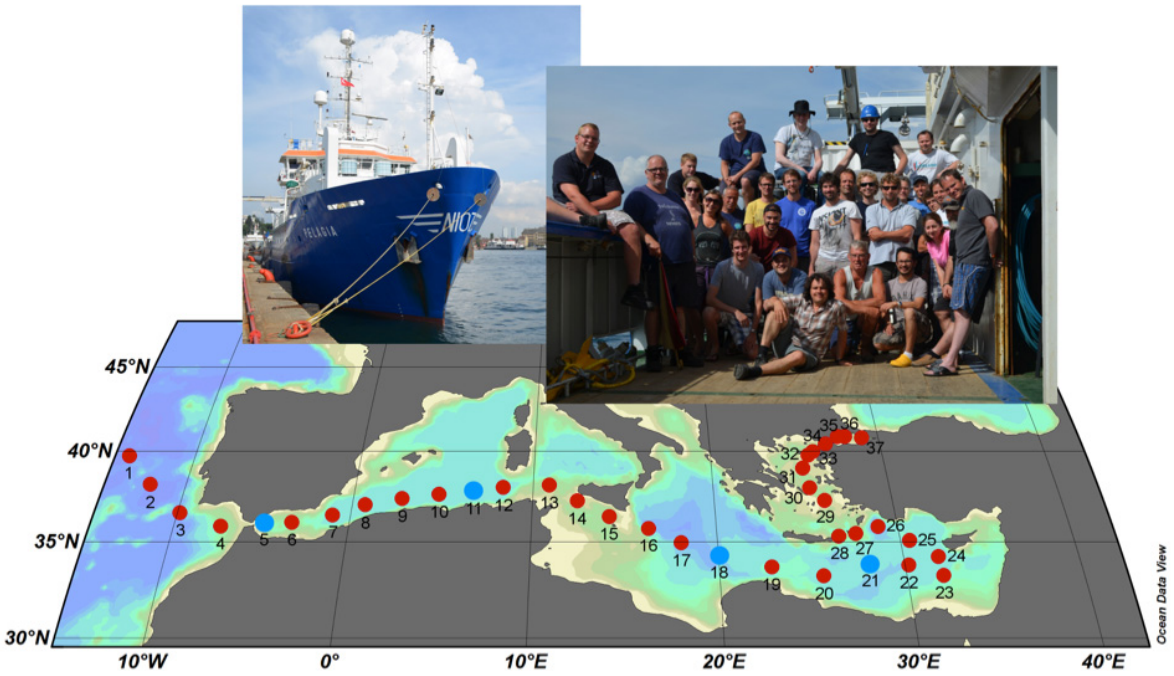

Figure 13. The RV *Pelagia*, its crew and participants, and the cruise track of leg 1 of the MedBlack GEOTRACES cruises (GA04N, 64PE370).

New funding

The proposal "GEOTRACES, the biogeochemical cycles of bio-essential trace metals and isotopes in the Mediterranean Sea and Black Sea" (300 kEuro and 50 ship days) by Hein de Baar & Micha Rijkenberg was funded by Dutch NWO Open Competition for GEOTRACES transects in the Mediterranean Sea and Black Sea.

New results

Investigators are making good progress in the sample analysis and subsequent interpretation of the data collected in the western Atlantic Ocean. Many results of the western Atlantic transect have been presented at international conferences and start to appear in journal publications. Most of the results of the International Polar Year/GEOTRACES cruises in the Arctic and Antarctic have been published now. The first new data of the MedBlack GEOTRACES cruises have been measured on board during 64PE370 (DFe, DAl and the micro and nanomolar nutrient concentrations).

Presentations

- De Baar, H.J.W., Klunder, M.A., Thuróczy, C.-E., Laan, P., Gerringa, L.J.A., Alderkamp, A.-C., Middag, R., Arrigo, K.R.. Dissolved Iron in the Arctic and Antarctic Oceans. Oral presentation at the 2012 Goldschmidt Conference 28-07-2012, Montreal, Canada.
- De Baar, H.J.W., Rijkenberg, M.J.A., Gerringa, L.J.A., Middag, R., Van Hulten, M.M.P., Laan, P., Schoemann, V., De Jong, J.T.M., Sterl, A., Van Aken, H.M.. Contrasting Biogeochemical Cycling of Iron and Aluminium along the GEOTRACES West Atlantic section. Oral presentation at the 2012 Goldschmidt Conference, 26-07-2012, Montreal, Canada.
- Lambelet, M., van de Flierdt, T., Crocket, K., Rehkämper, M., Kreissig, K., Coles, B., Rijkenberg, M.J.A., Gerringa, L.J.A., van Aken, H.M., de Baar, H.J.W. (2013) Neodymium isotopic composition and concentration in equatorial to North Atlantic seawater, Goldschmidt conference, Florence, Italy, oral

- Rijkenberg, Micha J.A., Gerringa, Loes, J.A., Laan, Patrick, Schoemann, Veronique, Middag, Rob, van Aken, Hendrik M., de Jong, Jeroen T.M., van Haren, Hans, and de Baar, Hein J.W. (2013) GEOTRACES: The accessibility of dissolved Fe for phytoplankton in the western Atlantic Ocean, ASLO Meeting, New Orleans, US, oral
- Rijkenberg, Micha J.A., Gerringa, Loes, J.A., Laan, Patrick, Schoemann, Veronique, Middag, Rob, van Aken, Hendrik M., de Jong, Jeroen T.M., van Haren, Hans, and de Baar, Hein J.W. (Nov 2012) GEOTRACES: What we learnt from the distribution of dissolved iron in the western Atlantic Ocean, ZKO funding agency Symposium, The Hague, oral

PhD theses

- Maarten Klunder successfully defended his thesis on Fe in Polar Oceans on 5 October 2012 at the University of Groningen (http://irs.ub.rug.nl/ppn/345817559).
- Steven van Heuven successfully defended his thesis on CO2 in the Southern Ocean on 8 February 2013 also at the University of Groningen (http://irs.ub.rug.nl/ppn/354004719).

Publications

Published:

- van Hulten, M.M.P., Sterl, A., Tagliabue, A., Dutay, J.-C., Gehlen, M., de Baar, H.J.W. and Middag, R., 2012. Aluminium in an ocean general circulation model compared with the West Atlantic Geotraces cruises. J. Mar. Syst., doi: 10.1016/j.jmarsys.2012.05.005
- Middag, R., De Baar, H.J.W., Klunder, M.B., Laan, P., 2013. Fluxes of dissolved aluminum and manganese to the Weddell Sea and indications for manganese co-limitation. Limnology and Oceanography 58 (1), 287-300.
- Roeske, T., Rutgers vd Loeff, M., Middag, R., Bakker, K., 2012. Deep water circulation and composition in the Arctic Ocean by dissolved barium, aluminium and silicate. Marine Chemistry, 132-133, 56-67.

Submitted:

- De Baar, H. J. W., K. Bakker, L. J. G. Gerringa, E. Keijzer, M. Laan, P. Laan, R. Middag, S. Ober, M. J. A. Rijkenberg, and M. G. Smit. Ultraclean PRISTINE samplers for the GEOTRACES program. intercomparison of hydrography and major nutrients at the Bermuda Atlantic Time Series Station. submitted to Limnol. Oceanogr. Methods.
- Gerringa,L.J.A., M.J.A. Rijkenberg, C-E. Thuróczy , L. R.M. Maas. A critical look at the calculation of the binding characteristics of Fe binding organic ligands, submitted to Research Front 'Applications of Voltammetry to Environmental Chemistry
- Klunder, M.B., Laan, P., de Baar, H.J.W., Neven, I., Middag, R. and van Ooijen, J. (submitted) Dissolved Fe across the Weddell Sea and Drake Passage: impact of Dfe on nutrient uptake in the Wedell Sea, Biogeosciences Discuss., 10, 7433-7489, doi: 10.5194/bgd-107433-2013
- Middag, R., K.W. Bruland and H.J.W de Baar (submitted) GEOTRACES Intercomparison of Dissolved Trace Elements at the Bermuda Atlantic Time Series Station. Limnol. Oceanogr. Methods, submitted.
- Middag, R., M. van Hulten, M. van Aken, M. Rijkenberg, L. Gerringa, P. Laan and H. de Baar. Aluminium in the Oceans: Unique Mirror Image of the Biological Cycle. Submitted.
- Rijkenberg, Micha J.A., Rob Middag, Patrick Laan, Loes J. A. Gerringa, Hendrik M. van Aken, Véronique Schoemann, Jeroen T. M. de Jong, Hans van Haren, Hein J. W. de Baar. Multiple sources of dissolved iron to the West Atlantic Ocean. Submitted.

Submitted by: Micha Rijkenberg

Norway

Overview

Scientific work on trace elements and their isotopes in the ocean was carried out mainly through global biogeochemical ocean modeling at The University of Bergen (Geophysical Institute and Bjerknes Centre for Climate Research/Centre for Climate Dynamics). In 2012, a revised version of the HAMOCC2s model for simulations of ^{230}Th and ^{231}Pa was provided. More specifically, the particle flux scheme was changed in order to allow for a more realistic concentration of particles in the water column (and to adjust the equilibrium constants accordingly). With the present model set up improved simulations of the particle attached and dissolved phases of ^{230}Th and ^{231}Pa in the water column as well as the sediment bioturbated layer could be carried out (pre-industrial, under elevated CO_2).

On the analytical side, apart from minor work on trace metals, continued work on $\delta^{13}C$ was carried out. A re-evaluation of natural $\delta^{13}C$ distributions (Suess corrected) in the global ocean is ongoing (by M. Eide, A. Olsen, U. Ninnemann et al.) as part of the NARE funded SOVAR project. A new project SNACS (coordinator A. Olsen) is funded through NORKLIMA which will include support for a new North Atlantic cruise and sampling for carbon isotope work tracing signals back to source regions and calibrating proxy recorders.

Presentations at meetings

- Heinze, C., 2012, BIOFEEDBACK – Biogeochemical feedbacks in the climate system, plenary presentations at SKD Days (annual meeting of core project BIOFEEDBACK of the Centre of Climate Dynamics), held at Hotel Augustin, 28 November 2012, Bjerknes Centre for Climate Research, Bergen Norway.

Submitted by: Christoph Heinze

Poland

Cruises

In May 2012 one sampling campaign was performed in order to analyse metals in seawater and groundwater discharged to the Bay of Puck both at Sea and in rivers and groundwater wells (Figure 14) were also analysed.

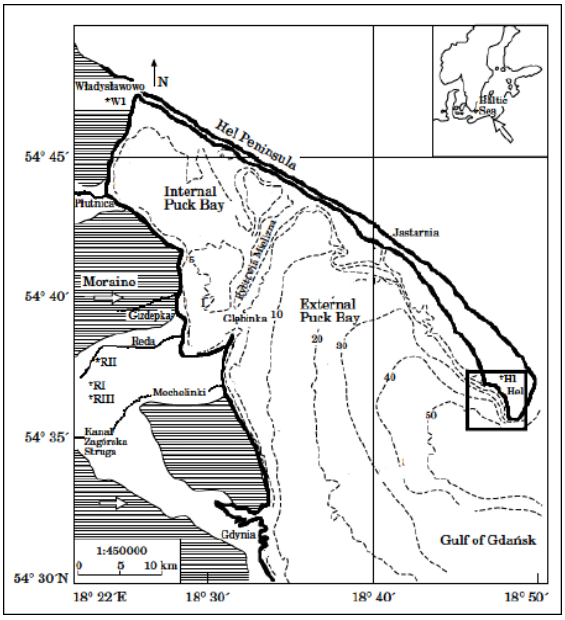

Figure 14. The map of the Bay of Puck with the location of the study area indicated by a square. Gizdepka, Zagórska Struga, Płutnica, Reda are names of the sampled rivers while: RI (Reda I), RII (RedaII), RIII (Reda III), H1 (Hel), W1 (Władysławowo) correspond to the positions of the groundwater wells.

Groundwater lances and seepage meters were used to collect water samples in the study area.

Measurements

Concentrations of dissolved metals (Cu, Co, Cd, Ni, Mn, Pb, Zn, Cr) were determined by ICP-MS method (Elan 9000, Perkin Elmer). Analysis of standard reference material (SLEW 3), and groundwater samples spiked with standard solution (2.5 and 5 µg L^{-1}-final volume) served as a quality check. Average recovery of metals were in the range 95-103% (depending on the metal), while the precision given as relative standard deviation (RSD, n=3) was smaller than 3.5 % . The obtained metals concentrations of the procedural blank samples never exceeded 5 % of concentrations measured in the actual samples. The analysis for Hg concentration in water were made by CV-AFS method (TEKRAN 2600, Canada), according to US EPA method 1631 (US EPA, 2002). Quality control included the analysis of blanks (n=5), and estimating accuracy and precision based on the analysis of water samples (n=3) (groundwater, seepage water and seawater) spiked with mercury nitrate to give the final concentrations in the range of 0.5-2.5 ng Hg l^{-1}. Adequate precision (6%; given as Relative Standard Deviation - RSD) and recovery (96%) was obtained throughout the study. During each sampling campaign procedural blank samples (n=5) were run. The obtained mercury concentrations of the procedural blank samples were lower than the detection limit (0.2 ng Hg L^{-1}) and never exceeded 10 % of concentrations measured in the actual samples.

In addition Mercury and organic mercury fraction were determined in suspended matter collected in years 2011-2012 in western Spitsbergen and Baltic. Results were published in PhD Dissertation of Michał Miotk and presented on scientific conferences.

Conferences

- Szymczycha B, Pempkowiak J, 2012. Nutrients, DIC, DOC and trace metal discharges to the coastal zone via Submarine Groundwater Discharge. The case of the Puck Bay, the Southern Baltic Sea. LAND OCEAN CONNECTIVITY Conference, Brest, France.
- Szymczycha B, 2012. Coastal monitoring strategy, 20th Annual Conference in Lillestrom, Norway.

- Miotk M., Bełdowski J. ,Pempkowiak J. Mercury and Methylmercury in Southern Baltic Sea Sediments, International Conference on Heavy Metals in the Environment, Rome, Italy

Publications

- Szymczycha B, Miotk M, Pempkowiak J, 2013. Submarine Groundwater Discharge as a Source of Mercury in the Bay of Puck, the Southern Baltic Sea. Water, Air and Soil Pollution 224, DOI 10.1007/s11270-013-1542-0.

PhD Thesis

- Submarine Groundwater Discharge (SGD) as a source of nutrients, carbon and heavy metals to the Bay of Puck, off Hel. Beata Szymczycha.
- Bioavailiability and methylation potential of mercury in the marine environment: case study of the Baltic Sea and Spitsbergen Fjords.

Submitted by: Jacek Bełdowski

Russia

Meetings and Workshops

- Russian GEOTRACES Workshop: From 27th to 29th November 2012 the first Russian workshop of the GEOTRACES International program was held in Moscow at the Shirshov Institute of Oceanology, Russian academy of sciences. About ninety persons including Russian scientists from seven institutes participated, together with scientists leading the GEOTRACES program in Europe and the USA. During the workshop about 30 oral presentations were made (including 8 talks of the young Russian scientists), along with 15 poster presentations. The workshop showed that research themes of Russian scientists in many respects correspond to the main GEOTRACES scientific goals. Particular Russian interests include estuarine chemistry (trace metals, radionuclides, and organic carbon compounds) of major rivers, biogeochemical processes, (including trace metals and gases such as methane) on the Russian shelf, sedimentary and chemical fluxes between the shelf and open Arctic Ocean as well as the fluxes from atmosphere to the Arctic Seas.

  The Russian workshop established international contacts and identified priorities for research into the marine chemistry of the Arctic Ocean. Research cruises that would address the main GEOTRACES scientific goals have been identified during discussion at the workshop. Issues linked with a correct clean sampling and analysis of trace metals were discussed as soon as one of the main Russian problem is lack of special equipment to collect uncontaminated seawater samples for analysis of heavy metals. An obvious necessity of participation of Russian colleagues in intercalibration of the sampling procedures followed by the trace metal analysis, as well as training of the young Russian scientists in the leading GEOTRACES' laboratories was emphasized. All the participants supported a joint declaration (http://www.geotraces.org/images/stories/documents/workshops/Russian/Russian_GEOTRACES_Statement.pdf). Workshop participants suggested the rapid formation of Russian GEOTRACES Committee to develop GEOTRACES activities and guide the scientific goals and implementation of the program in Russia.

  The workshop was followed by the round table "Prospects for the Arctic Ocean: International Expedition 2015" (held in the framework of the 2nd International Exhibition "Oceans 2012" in Moscow 30th November 2012). The round table aimed to support the Russian initiative for an

International Polar Decade, and considered proposals of representatives from the GEOTRACES Scientific Steering Committee to hold Arctic Ocean International Expeditions in 2015.

- The organizational meeting of Russian nation committee took place at the Shirshov Institute of Oceanology, Russian academy of sciences, on the 24-th of April. The Russian committee includes twenty-one high-level scientists representing leading Russian institutes with geochemical, oceanographic and related expertise. Sixteen scientists from the different institutes were present at the meeting where the following issues were under consideration:
  - Preparing of the GEOTRACES National program based on researches proposed in the Russian scientific institutes' program plans;
  - Address the leadership of the country to provide organizational and financial support to perform work on the Russian side;
  - Participation in the intercalibration of the total heavy metal content in the suspended particulate matter from the Mediterranian and Black Seas collected by professor Hein de Baar group (NIOZ);
  - Collection and treatment of oceanographic and geochemical data on the White Sea' for creation of data base.

  Academician Alexander Lisitzin (Shirshov Institute of Oceanology RAS, Moscow) and academician Valentin Sergienko (Far Eastern Branch RAS, Vladivostok) agreed to be Co-chairmen of the Russian nation Committee, as well as prof. Ludmila Demina, prof. Alexander Dubinin, Prof. Anatoly Astakhov, and Dr. Igor Ashik were approved as vice-chairmen.

Submitted by: Liudmila L. Demina

Slovenia

Meetings

Participation at the Workshop "The ocean chemistry of bioactive trace elements and paleoclimate proxies" May 29 to June 1, 2012, Geel, Belgium (L. Benedik – acting as an invited speaker, M. Vahčič as a participant).

Cruises

Participation of J. Kotnik, M. Vahčič and A. Bratkič on the FENICE 2012 cruise in W Mediterranean led by F. Sprovieri (CNR-IIA, Italy) from August 11 to August 29 2012. The cruise was organized within the EU project GMOS (Global Mercury Observation Systems). The activities were related to the cycling of Hg species in marine environment including deep water profiles of dissolved gaseous Hg (DGM), total (THg), monomethyl Hg (MeHg) and dimethyl Hg (DMeHg) in open ocean waters. All these analysis are still in progress.

New results

Results obtained during the James Cook cruise represent a part of PhD study of A. Bratkič entitled: "Mercury biotransformations in marine environments" defended in July 2013. All Hg speciation analyses were performed at the Department of Environmental Sciences at Jožef Stefan Institute under the supervision of M. Horvat.

The primary goal of the South Atlantic Ocean expedition was to perform Hg speciation analysis in ocean water at very high vertical and spatial frequency, which would indicate whether Hg transformation in the deep sea is a more active process than is currently reported. Secondary goals were to apply new strategies for sample storage and transport; and to obtain all the necessary supporting data on nutrients and physico-chemical parameters which could help with the interpretation of the data.

Oceanographic sampling for Hg speciation was demanding from the logistical point of view and particular attention was given to the issues of storage and transport of samples. During the time of storage and transport, samples never thawed, which contributed to the results being accurate and representative of the actual environmental conditions. The combination of freezers and dry ice proved to be sufficient for the safe transport of samples to the laboratory, where they could be stored in freezers with an uninterruptible power supply. Particularly useful was simple, but efficient double packing in zip-lock plastic bags. Besides preventing contamination of the bottles, they also prevented some physical damage to them.

The South Atlantic Ocean cruise from South Africa to Uruguay along the 40°S parallel resulted in a remarkably high spatial (both vertical and horizontal) frequency of Hg speciation measurements. Up to 24 depths per station were measured, which was indeed an above average number of sampling depths in this region, and in the ocean in general.

Total Hg (THg) profiles indicated a possible increase in deep waters as a result of the geothermal activity of the Mid-Atlantic Ridge. THg values were lower in the uppermost water layers, suggesting degassing of Hg^0 to the atmosphere. This is globally important because the large ocean surface represents a great potential flux of Hg^0 to the atmosphere. Even small changes in conditions that would affect dissolved gaseous mercury (DGM) formation in the ocean would also result in regionally significant Hg evasion or retention.

THg values in seawater were higher off the coast of South America, probably due to the influence of large cities and transport by the Rio de la Plata. The Argentine Basin also showed an increase.

Interestingly, water masses could be distinguished by DGM content, but not by THg. Upper Circumpolar Deep Water (UCDW) mass in the South Atlantic had higher DGM concentrations than North Atlantic Deep Water (NADW). Higher values in the Argentine Basin were unexpected, but might easily be explained by higher DGM solubility under high pressure, or might result from a Hg increase in newly formed Antarctic Bottom Water (AABW). Moreover, surface DGM distribution closely resembled that of Chl *a* (and hence photosynthetic organisms), but not of the bacterial community. This suggested that DGM might be formed principally by photosynthetic microbes and algae without the *mer* operon, and not by *mer* containing heterotrophic microbes. In addition, *merA* was not detected, but that was likely a consequence of unsuitable oligonucleotides which did not cover the marine *merA* diversity.

Methyl mercury (MeHg) concentrations were often below the limit of detection. Nevertheless, MeHg is formed in the South Atlantic Ocean water column as there were no increases of this species above the sediment or in the surface waters, where aerial deposition might be a source. The general decrease formed at the surface might be indicative of photodemethylation. In two instances MeHg coincided with the Chl *a* peak, which might be indicative that its formation is connected with primary production. Bacterial and archaeal 16S rRNA sequences were detected at all depths at one deep ocean station; therefore it is likely that heterotrophic activity contributes to the observed MeHg levels.

Dimethy methyl mercury (DMeHg) was measured only at one station. As expected, it was higher below 1000 m and very low above that depth, especially in the surface waters. It reached its highest concentration in UCDW, similarly to DGM, probably due to lower oxygen concentrations and hence lower oxidation potential.

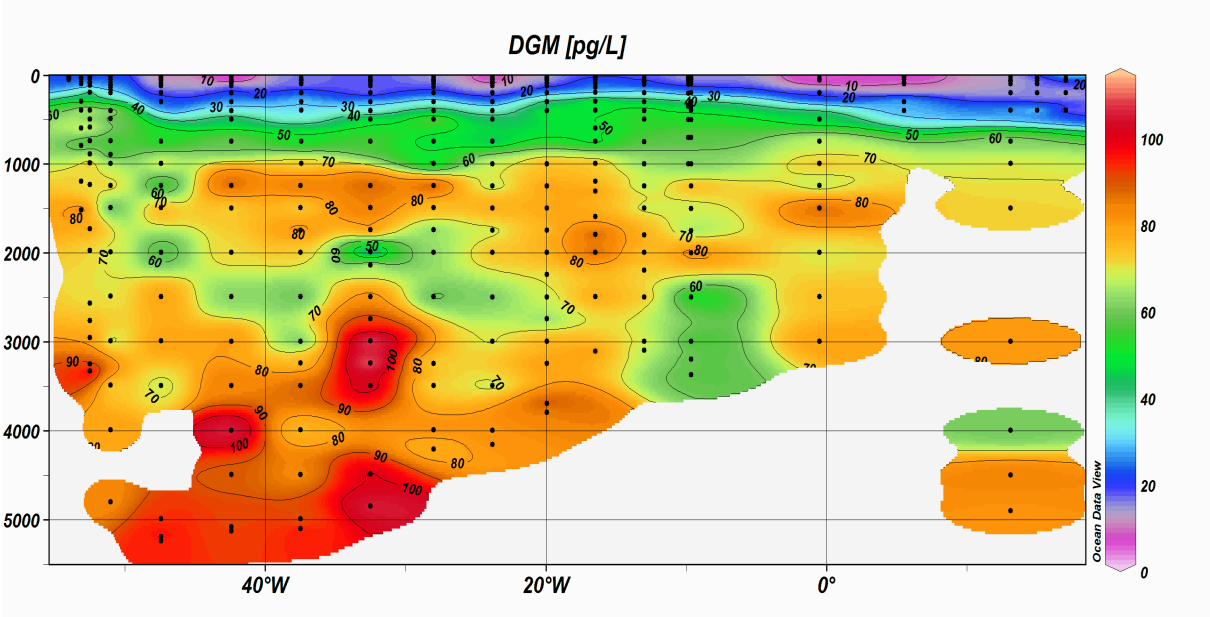

Figure 15. DGM concentrations for the whole water column from JC068 South Atlantic cruise (40°S parallel). Black dots represent sampling depths. Distinct layering of DGM can be observed. Deep waters in the Argentine Basin were characterized by the highest DGM values measured during the cruise.

In order to understand Hg biogeotransformations in the South Atlantic Ocean better, more sampling campaigns with such resolution are needed. The deep ocean is very important where Hg cycling is probably more intensive than is generally accepted.

Other activities

S. Tamše obtained GEOTRACES fellowship to perform his research on stable isotope composition of N and O in nitrates in marine samples. The research was conducted at the Laboratoire de Glaciologie et Géophysique de l'Environnement (CNRS/UJF), Grenoble, France during September 3 to October 26 2012.

Publications

Original scientific article

- KORON, Neža, BRATKIČ, Arne, RIBEIRO GUEVARA, Sergio, VAHČIČ, Mitja, HORVAT, Milena. Mercury methylation and reduction potentials in marine water. Appl. radiat. isotopes. [Print ed.], 2012, vol. 70, issue 1, str. 46-50, doi: 10.1016/j.apradiso.2011.07.015.
- ACQUAVITA, Alessandro, COVELLI, Stefano, EMILI, Andrea, BERTO, Daniela, FAGANELI, Jadran, GIANI, Michele, HORVAT, Milena, KORON, Neža, RAMPAZZO, Federico. Mercury in the sediments of the Marano and Grado Lagoon (northern Adriatic Sea): sources, distribution and speciation. Estuar., coast. shelf sci., 2012, vol. 113, str. 20-31, doi: 10.1016/j.ecss.2012.02.012.
- EMILI, Andrea, ACQUAVITA, Alessandro, KORON, Neža, COVELLI, Stefano, FAGANELI, Jadran, HORVAT, Milena, ŽIŽEK, Suzana, FAJON, Vesna. Benthic flux measurements of Hg species in a northern Adriatic lagoon environment (Marano and Grado Lagoon, Italy). Estuar., coast. shelf sci., 2012, vol. 113, str. 71-84, doi: 10.1016/j.ecss.2012.05.018.
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lagoon sediments (Marano & Grado Lagoons, Italy). Estuar., coast. shelf sci., 2012, vol. 113, issue 10, str. 85-95, doi: 10.1016/j.ecss.2011.12.021.

- BALDI, Franco, GALLO, Michele, MARCHETTO, Davide, FANI, Renato, MAIDA, Isabel, HORVAT, Milena, FAJON, Vesna, ŽIŽEK, Suzana, HINES, Mark E. Seasonal mercury transformation and surficial sediment detoxification by bacteria of Marano and Grado lagoons. Estuar., coast. shelf sci., 2012, vol. 113, issue 10, str. 105-115, doi: 10.1016/j.ecss.2012.02.008.
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- DE VITTOR, Cinzia, FAGANELI, Jadran, EMILI, Andrea, COVELLI, Stefano, PREDONZANI, Sergio, ACQUAVITA, Alessandro. Benthic fluxes of oxygen, carbon and nutrients in the Marano and Grado Lagoon (northern Adriatic Sea, Italy). Estuar., coast. shelf sci., 2012, vol. 113, str. 57-70, doi: 10.1016/j.ecss.2012.03.031.
- KORON, Neža, FAGANELI, Jadran. Benthic fluxes of mercury during redox changes in pristine coastal marine sediments from the Gulf of Trieste (northern Adriatic Sea). Journal of soils and sediments, 2012, vol. 12, 10, 1604-1614, graf. prikazi. http://dx.doi.org/10.1007/s11368-012-0602-1.
- BRATKIČ, Arne, OGRINC, Nives, KOTNIK, Jože, FAGANELI, Jadran, ŽAGAR, Dušan, YANO, Shinichiro, TADA, Akihide, HORVAT, Milena. Mercury speciation driven by seasonal changes in a contaminated estuarine environment. Environ. res. (N.Y.), [in press] 2013, 8 str., doi: 10.1016/j.envres.2013.01.004.
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- KOTNIK Jože, OGRINC Nives, HORVAT Milena, PIRRONE Nicola, SPROVIERI Francesca. Mercury in the Mediterranean Part I: spatial and temporal trends. Environ. Sci. Poll. Res., under review.
- ŽAGAR Dušan, SIRNIK Nataša, ČETINA Matjaž, HORVAT Milena, KOTNIK Jože, OGRINC Nives, HEDGECOCK Ian, CINNIRELLA Sergio, DE SIMONE Francesco, GENCARELLI Christian N., PIRRONE Nicola, Mercury in the Mediterranean Part 2: processes and mass balance. Environ. Sci. Poll. Res., under review.

Book chapter

- OGRINC, Nives, COVELLI, Stefano, OGORELEC, Bojan, FAGANELI, Jadran, BUDJA, Mihael. Reconstruction of the Holocene palaeoenvironment of the Gulf of Trieste by using geochemical methods. V: ANDRIČ, Maja (ur.). Dolgoročne spremembe okolja 1, (Opera Instituti Archaeologici Sloveniae, 25). Ljubljana: Inštitut za arheologijo ZRC SAZU, 2012, 81-88.

Scientific conference contribution

- HORVAT, Milena, PIRRONE, Nicola, SPROVIERI, Francesca, CINNIRELLA, Sergio, KOTNIK, Jože, OGRINC, Nives, ŽAGAR, Dušan, CINNIRELLA, Sergio. Mercury in the Mediterranean status and mass balance. V: 6th SETAC World Congress/SETAC Europe [and] 22nd Annual Meeting, 20-24 May 2012, Berlin, Germany. Abstract book. Brussels: SETAC, 2012, 126.
- HORVAT, Milena, VAHČIČ, Mitja. Comparability, traceability and uncertainty of the results for mercury analysis and speciation in the marine environment. V: 6th SETAC World Congress/SETAC

Europe [and] 22nd Annual Meeting, 20-24 May 2012, Berlin, Germany. Abstract book. Brussels: SETAC, 2012, 401.
- OGRINC, Nives, VAHČIČ, Mitja, BRATKIČ, Arne, KOTNIK, Jože, SPROVIERI, Francesca, PIRRONE, Nicola, HORVAT, Milena. Mercury speciation in deep-sea waters of the Mediterranean Sea. V: The 22nd V. M. Goldschmidt Conference, 24-29 June 2012, Montréal, Canada. Earth in evolution, 2012.
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Technical Report
- KOCMAN, David, HORVAT, Milena, WILSON, Simon, OUTRIDGE, Peter, TELMER, Kevin. Global releases of mercury to aquatic environments. V: BIEBER, Elke. /Technical background report for the global mercury assessment 2013/. Oslo: UNEP = United Nations Environment Programme, 2013, 69-81.
- OUTRIDGE, Peter, MASON, Robert P., KOCMAN, David, HORVAT, Milena, MUNTHE, John. Aquatic pathways, transport and fate. V: BIEBER, Elke. /Technical background report for the global mercury assessment 2013/. Oslo: UNEP = United Nations Environment Programme, 2013, 82-94.

Submitted by: Nives Ogrinc

South Africa

South African scientists are now on par with their international peers with the completion of the first 'Trace and Experimental Biogeochemistry Clean Lab' on the African continent at Stellenbosch University (SU). With this world-class facility now up and running, scientists are able to participate in long term international observational programs such as GEOTRACES, which aims to improve the understanding of biogeochemical cycles and large-scale distribution of trace elements and their isotopes in all the major ocean basins over the next.

Center for
Trace & Experimental
Biogeochemistry

Figure 16. New Class-10 trace clean laboratory at Stellenbosch University fitted with Pico-trace laminar flow benches

The R2.2 million laboratory was funded by the SU Rector's strategic fund and the Department of Science and Technology through the CSIR's Southern Ocean Carbon-Climate Observatory (SOCCO) program. This facility is part of an integrated research infrastructure development strategy, which also includes new analytical equipment and ultra-clean container labs for ocean sampling in the new research ship SA Agulhas II, managed by the Department of Environmental Affairs.

Activities of Interest and Personnel Training

Raimumd Rentel and Dr Thato Mtshali visited Maeve Lohan's lab at the University of Plymouth to trouble-shoot the FIA set-up for measurement of dissolved iron. Riana Rossouw, trained on ICP-MS to measure Fe and other bioactive elements at Bill Landing's lab (FSU). Dr Mtshali participated in the training of FRRF system set-up, data collection and analysis (Ocean Business exhibition) at Southampton National Oceanographic Center under supervision of Dr. Kevin Oxborough (Chelsea technology).

Conferences

- Satish Myneni, Alakendra Roychoudhury, Tolek Tyliszczak, Gustavo Martinez, Bjorn van der Heyden (2012) Speciation of colloidal Fe in terrestrial and marine environments using synchrotron X-ray spectroscopy and microscopy. 22nd Annual V M Goldschmidt Conference, Montreal, Canada June 24-29, 2012.

Publications

- B.P. von der Heyden, A.N. Roychoudhury, T.N. Mtshali, T. Tyliszczak and S.C.B. Myneni. Chemically and Geographically Distinct Solid-Phase Iron Pools in the Southern Ocean. Science. Vol. 338. No. 1199 – 1201.
- A. Tagliabue, T. Mtshali, O. Aumont, A. R. Bowie, M. B. Klunder, A. N. Roychoudhury, and S. Swart. A Global compilation of DFe measurements: Focus on distribution and processes in the Southern Ocean. Biogeosciences, 9, 2333–2349, 2012.
- Sebastiaan Swart, Nicolette Chang, Nicolas Fauchereau, Warren Joubert, Mike Lucas, Thato Mtshali, Alakendra Roychoudhury, Alessandro Tagliabue, Sandy Thomalla, Howard Waldron, Pedro M.S. Monteiro (2012) Southern Ocean Seasonal Cycle Experiment – 2012 (SOSCEx2012): Coupling of Climate and Carbon Cycling at the Seasonal Scale, South African Journal of Science. 189(3/4), pp 1-3.

Cruises

SOSCEX cruise was conducted along the Bonus Good Hole line to 55 ˚S between 15/02/2013 and 11/03/2013. Samples were collected along the 'transect' and during a Lagrangian 'process' studies. Onboard, two bioassay Fe and light incubation experiments were conducted for a period of 6 days as part of the SOSCEx program. The aim was to understand how southern ocean phytoplankton physiology adapts to Fe and light deprivation.

Samples were also collected to look at the spatial distribution of Fe pools (DFe, TDFe, SFe and PFe) along the transect and during the lagrangian study.

New Funding

- Roychoudhury, AN (2012 – 2014) Bioactive trace metals in the Southern Ocean: Capacity development and an integrated measurement-modeling approach to understand ocean primary productivity, SANAP, R 1,200,000.

- Roychoudhury, AN (2012) Building of a class 100 clean laboratory at Earth Sciences, Stellenbosch University Strategic funds and co-funding from DST, R 2,200,000.

Submitted by: Alakendra Roychoudhury

Spain

National committee (under SCOR-Spain)
- P. Masqué & J. Garcia-Orellana (Barcelona-UAB)
- A. Tovar-Sanchez (Mallorca-CSIC)
- A. Cobelo & R. Prego (Vigo-CSIC)

Meetings
- We co-organized the GEOTRACES section GA04-S on board *RV Ángeles Alvariño* between May 2nd and June 1st. We took circa 85 samples in 10 stations to analyze different isotopes such as 231Pa/230Th, 236,238U, Pu isotopes, 137Cs, 90Sr, 129I, 234Th, 237Np, 228,226Ra, Nd-isotopes and Deuterium. We also organized some experiments related to analyze 210Pb and 210Po in different ways to check the differences between some methods. We also deployed ISP (n=6) in order to collect particles to analyze particulate trace metals.
- Participation at the Arctic GEOTRACES Meeting, Bremerhaven, April 2012 and submission of two Polarstern proposals for expeditions in 2015 and 2016.
- Participation at the GEOTRACES Latin America Meeting, Rio de Janeiro, November 2012, we did some presentations and also started the collaboration with some south American labs.
- Participation in the Workshop on Voltammetry and GEOTRACES, Sibenik (Croacia), 6-9 October 2012.

Publications
GEOTRACES-related papers
- Rodellas V, Garcia-Orellana J, Tovar-Sánchez A, Basterretxea G, López-Garcia JM, Sánchez-Quiles D, Garcia-Solsona E, Masqué P. Submarine groundwater discharge as a source of nutrients and trace metals in a Mediterranean Bay (Palma Beach, Balearic Islands). Submitted to Limnology and Oceanography.
- Geibert W, Rodellas R, Annett A, van Beek P, Garcia-Orellana J, Hsieh Y-T, Masqué P. The measurement of 226Ra via the rate of 222Rn ingrowth with the radium delayed coincidence counter. Submitted to Limnology and Oceanography Methods.
- Santos-Echendia J, Caetano M, Brito P, Canario J, Vale C, 2012. The relevance of defining trace metal baselines in coastal waters at a regional scale: The case of the Portuguese coast (SW Europe). Marine Environmental Research 79: 86-99. doi: 10.1016/j.marenvres. 2012.05.010
- Prego, R., Santos-Echeandía, J., Bernárdez, P., Cobelo-García, A. & Varela, M. 2013. Trace metals in the NE Atlantic coastal zone of Finisterre (Iberian Peninsula): terrestrial and marine sources and rates of sedimentation. Journal of Marine Systems, in press, 10.1016/j.jmarsys.2012.05.008
- Rigaud S, Puigcorbé V, Camara-Mor P, Casacuberta N, Roca-Martí M, Garcia-Orellana J, Benitez-Nelson CR, Masque P and Church T. A methods assessment and recommendations for improving calculations and reducing uncertainties in the determination of 210Po and 210Pb activities in seawater. Submitted to Limnology and Oceanography Methods.

- Casacuberta N, Masqué P, Garcia-Orellana J, Garcia-Tenorio R and Buesseler KO (2013) 90Sr and 89Sr in seawater off Japan as a consequence of the Fukushima Dai-ichi nuclear accident. Biogeosciences 10, 3649-3659.

Coauthoring several papers of the Intercalibration special issue in Limnology and Oceanography Methods:

- Church, T., Rigaud, S., Baskaran, M., Kumar, A., Friedrich, J., Masqué, P., Puigcorbé, V., Kim, G., Radakovitch, O., Hong, G., Choi, H.-Y. and Stewart, G. (2012). Inter-calibration studies of 210Po and 210Pb in dissolved and particulate sea water samples. Limnology and Oceanography: Methods 10, 776-789.
- Kenna, T.C., Masqué P., Mas, J.L., Camara-Mor, P., Chamizo, C., Scholten, S., Eriksson, M., Sanchez-Cabeza, J.A., Gastaud, J., Levy, I., Herrmann, J., Lindahl, P. and Nielsen, S. (2012). Intercal: Intercalibration of selected anthropogenic radionuclides for the GEOTRACES Program. Limnology and Oceanography: Methods 10, 590-607.
- Maiti, K., Buesseler, K.O., Pike, S.M., Benitez-Nelson, C., Cai, P., Chen, W., Cochran, J.K., Dai, M., Dehairs, F., Gasser, B., P. Kelly, R., Masque, P., Miller, L., Miquel, J.C., Moran, S.B., Morris, P., Peine, F., Planchon, F., Renfro, A.A., Rutgers van der Loeff, M., Santschi, P., Turnewitsch, R., Waples, J. and Xu, C. (2012). Intercalibration studies of short lived Thorium-234 in the water column and marine particles. Limnology and Oceanography: Methods 10, 631-644.

Meetings

Several contributions to:

- 2012 Ocean Sciences Meeting, Salt Lake City, Utah (USA), 20-24 February 2012.
- 2012 Goldschmidt Meeting, Montreal, 25-29 June 2012.
- 2013 ASLO Aquatic Sciences Meeting,17-22 February 2013, New Orleans.
- 40th CIESM Congress – Marseille, France, 28 October - 1 November 2013.
- 12th International Estuarine Biogeochemistry Symposium (IEBS2013). http://www.iebs2013.org/ Plymouth University, 30th June - 4th July 2013.

Submitted by: Jordi Garcia-Orellana

Sweden

Meetings

- Per Andersson participated and presented GEOTRACES in the following meetings:
    - Arctic Council Meeting hosted at The Swedish Museum of Natural History during 28 to 30 March, 2012. Presented Arctic GEOTRACES and results from ISSS-08 (International Siberian Shelf Study 2008) as poster during the meeting.
    - Arctic GEOTRACES Planning workshop in Vancouver, Canada, 2 to 4 May, 2013. Presented and discussed Swedish Arctic planning.
    - Arctic GEOTRACES workshop in Moscow, 27 to 29 November, 2012. Presented and discussed Swedish GEOTRACES Arctic plans.

- David Turner participated in the workshop “Voltammetry and GEOTRACES”, Sibenik, Croatia, 6-9 October 2012

New funding (Per Andersson)

- "Particle transport derived from isotope tracers and its impact on ocean biogeochemistry: a GEOTRACES project in the Arctic Ocean". A joint French-Swedish project to study particle transport in the Arctic Ocean. This is a three year grant, including two PhD-students, with about 112 k€ for each institution. The funding starts during 2013.

GEOTRACES intercalibration work

- Per Andersson participated in the GEOTRACES intercalibration committee work. Hosted the GEOTRACES intercalibration meeting in Stockholm from 1 to 3 May, 2013.

Related projects

- Per Andersson: "Climate warming in Siberian Permafrost Regions; tracing the delivery of carbon and trace metals to the Arctic Ocean". Field work in the Lena River and tributaries during 2012-2013, total six weeks. The main objective is to study a large basin dominated by permafrost and the impact of changing temperatures on the delivery of TEI to the Arctic Ocean.
- David Turner: Two new projects that will provide a platform for chemical speciation modelling relevant to GEOTRACES:
    - OCEAN CERTAIN: **Ocean** Food web Patrol – **C**limate **E**ffects: **R**educing **Ta**rgeted Uncertainties with an **I**ntegrated **N**etwork. This is a large EU-FP7 project (10 M€; 2014 – 2017) led by NTNU (Trondheim, Norway) focusing on the effect of multi-stressors on marine biogeochemical cycles. I will contribute with chemical speciation modelling of key trace metals including interactions with natural organic ligands (ca. 300 k€).
    - Commercial shipping as a source of acidification in the Baltic Sea (Swedish funding, ca. 850 k€ in total, 2013 - 2016; ca. 200 k€ for development of chemical speciation modelling).

Forward look: Icebreaker Oden in the Arctic Ocean 2015

- Oden is "booked" for GEOTRACES in 2015, but the Swedish Polar Research Secretariat does not have funds for more than 15 days, enough for a return trip to Svalbard. GEOTRACES needs an additional 20 days at 50 k€ per day, 1 M€ in total. Approaches to the major Swedish funding agencies have thus far drawn a blank. Financial support from outside Sweden will be needed to ensure that GEOTRACES can make use of Oden in 2015.

Submitted by: David Turner

United Kingdom

Further details about UK GEOTRACES activity is available at: http://www.ukgeotraces.com/

Cruises and analysis

There have been no dedicated UK GEOTRACES cruises since January 2012. UK scientists have received samples from other GEOTRACES cruises, but the majority of UK effort in the last 12 months has continued to focus on analysis of samples from the two main UK cruises so far (GA06; Tropical Atlantic; and GA10 South Atlantic) and samples recovered from other cruises with significant UK involvement (e.g. Baltic GEOTRACES)

Meetings

- UK scientists have presented results GEOTRACES results at AGU, Ocean Sciences, and Goldschmidt conferences.
- UK scientists attending the Latin American and Russian GEOTRACES Workshops at the end of 2012.
- UK scientists continue to be involved in planning for future Arctic GEOTRACES efforts through international meetings and dialogue.
- A post-cruise meeting for GA10 was held in September 2012 and demonstrated the wide range of measurements conducted on this cruise, as well as initiating plans for publications.
- A COST and SCOR sponsored meeting focused on trace metal isotopes in seawater was held in September in London, organized by scientists from Imperial College (Mark Rehkamper and Tina van der Fleirdt). The final report of this meeting and lists of participants can be downloaded from: http://www.geotraces.org/meetings/meetings-by-year/eventdetail/121/-/geotraces-cost-workshop-stable-isotopes-of-biologically-important-trace-metals
- Maeve Lohan (University of Plymouth) attending intercalibration meetings in Hawaii (on particulates) and in Sweden (on cross-over stations).

National and international service

- The UK continues to host the GEOTRACES Data Assembly Centre at the British Oceanographic Data Centre in Liverpool.
- The UK is represented on the International GEOTRACES SSC and on the International Standards and Intercalibration Committee by Maeve Lohan.

Publications

A large number of publications from GA06 and GA10 are approaching publication or submission. Two early publications from these cruises are:

- Homoky, W.B., John, S.G., Conway, T.M., Mills, R.A., 2013. Distinct iron isotopic signatures and supply from marine sediment dissolution. Nature Communications 4. http://www.nature.com/ncomms/2013/130719/ncomms3143/full/ncomms3143.html
- T. J. Browning, H. A. Bouman, C. M. Moore, C. Schlosser, G. A. Tarran, E. M. S. Woodward, and G. M. Henderson, "Nutrient regimes control phytoplankton ecophysiology in the South Atlantic" Biogeosciences http://www.biogeosciences-discuss.net/10/11969/2013/bgd-10-11969-2013.pdf

The latter included clear identification of Fe limitation in the eastern South Atlantic through a series of incubation experiments.

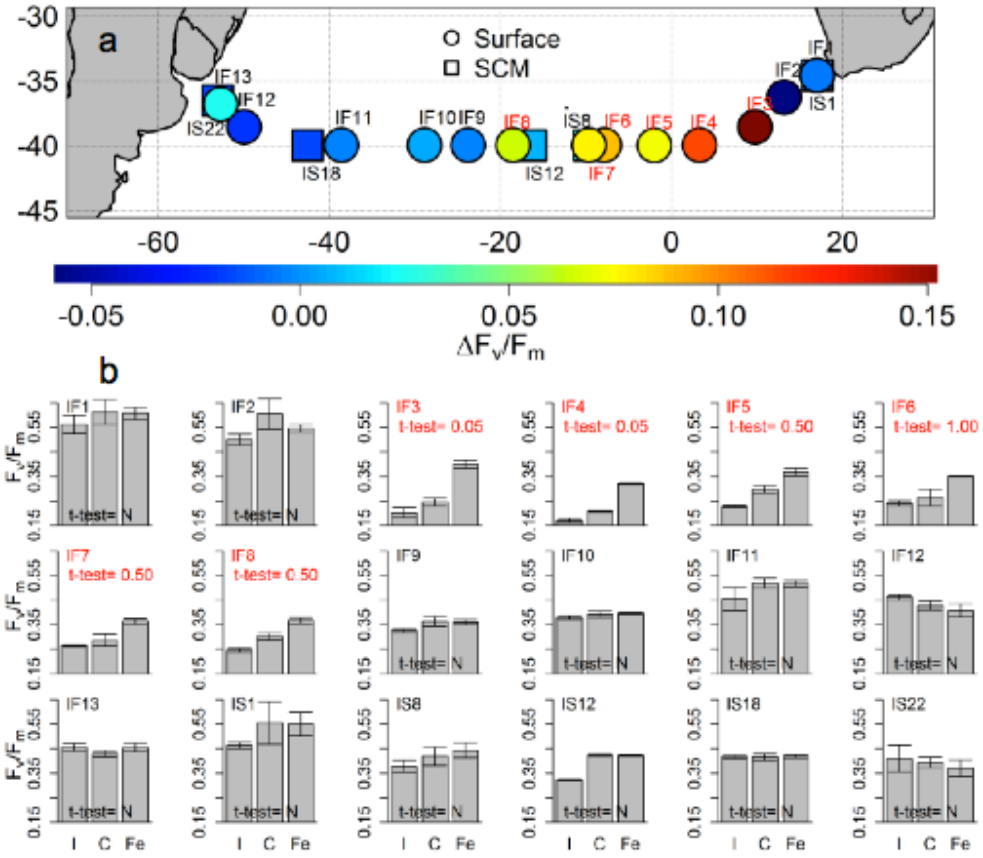

Figure 17. Red colours are regions were incubations showed a clear increase in phytoplankton growth in response to Fe addition.

Submitted by: Gideon Henderson

US

Principal activities of the U.S. GEOTRACES program include:

1) Data synthesis a North Atlantic zonal section,
2) Preparation for a Pacific section between Peru and Tahiti, and
3) Sustained planning for work in the Arctic Ocean

Activities

North Atlantic: A highlight of US GEOTRACES activity during the past year was a data workshop to examine results from the North Atlantic section GA03 (Figure 18).

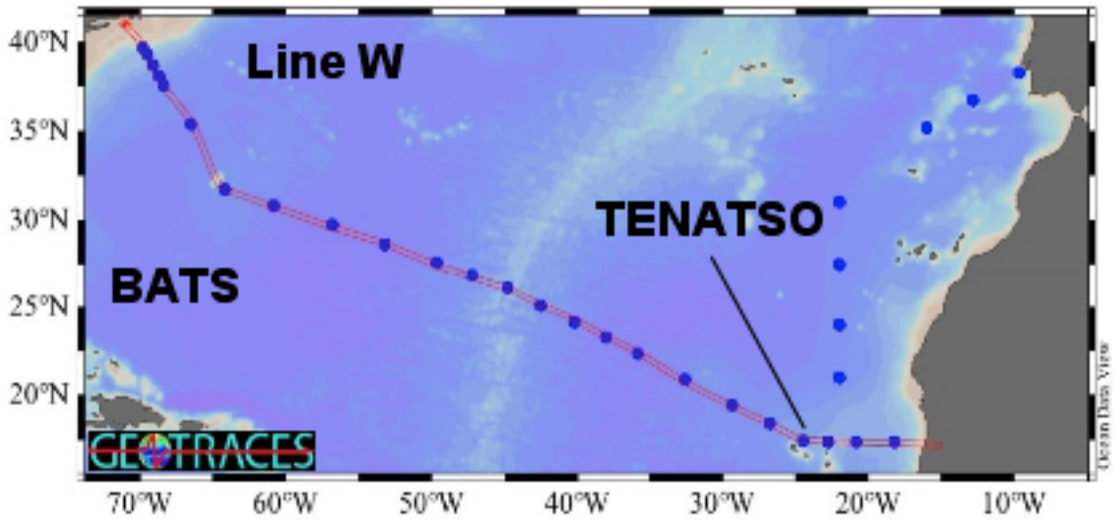

Figure 18. Locations of stations occupied during the U.S. North Atlantic zonal section GA03. Stations from Portugal to TENATSO were occupied during R/V Knorr cruise KN199-4 in October-November 2010. Stations from Woods Hole (upper left) to TENATSO were occupied during KN204-1 in November-December, 2011.

More than 60 scientists (including students and post docs) representing 30 TEI groups (trace elements, isotopes and supporting variables) assembled 11-15 March 2013 at Old Dominion University (Norfolk, Virginia) to examine the results from the US GEOTRACES North Atlantic section (GA03). Members of the US GEOTRACES Scientific Steering Committee met concurrently with the data workshop to assess the overall performance of the expedition and to make recommendations for future US GEOTRACES cruises.

The first two days of the workshop were devoted to presentation of results by each group, after which participants broke into working groups to compare results pertaining to specific processes (e.g., particle transport and mineral aerosols, boundary exchange, benthic nepheloid layer processes, sources and sinks associated with the hydrothermal plume, transformations across the chlorophyll maximum, oxygen minimum zone processes). Workshop participants repeatedly returned to questions about hydrography and ocean circulation in the context of interpreting TEI distributions, and developed a plan for optimal multiparameter analysis to characterize contributions of various end-member water masses and their respective supply of TEIs along the section.

An important aspect of the workshop was attention to the ongoing intercalibration process. In addition to crossover stations with other cruises, multiple US labs measured certain TEIs, especially at "superstations" (e.g., as many as 5 labs measured dissolved Fe at selected stations). Careful examination of the results indicated that whereas agreement was generally good, thanks to previous intercalibration work, some analytical issues remain unresolved. These findings emphasize the critical importance of sustaining intercalibration efforts on all GEOTRACES cruises.

The true potential of the GEOTRACES philosophy was realized as investigators compared results for different TEIs and supporting variables when interpreting the processes affecting TEI distributions along the section. For example, within the "margin section" between Mauritania and the Cape Verde Islands, iron isotopes, radium isotopes, circulation tracers, nutrients and oxygen were combined with distributions of a suite of trace elements to discriminate between dust and boundary exchange with

margin sediments as a source of iron and other TEIs. Workshop participants identified a number of synthesis topics like this to be developed for publication over the next year or so.

Preparations are underway for a special issue of Deep-Sea Research Part-II featuring results from GA03. Bill Jenkins, Ed Boyle, Greg Cutter and Bob Anderson will serve as guest editors.

Eastern Tropical Pacific: The second major section planned by US GEOTRACES is a zonal section in the eastern tropical Pacific roughly between Peru and Tahiti (GP16, Figure 19).

Approximately 60 representatives of the U.S. GEOTRACES community met on 22-24 April 2013 at the Woods Hole Oceanographic Institution to refine station and sampling protocols for the planned section between Peru and Tahiti scheduled for October - December 2013. The objectives of the workshop were to maximize coordination of sampling and analytical efforts, develop deck utilization plans, shipping and loading logistics, and explore data management protocols. The group resolved a critical situation in which the number of berths requires to cover all of the essential science operations at sea greatly exceed available bunks. Teams of specialists were established to assure that shipboard operations would be covered and that samples would be collected and archived for all funded projects. Station plans for the cruise were refined to provide a telescoping sampling resolution in regions of greatest anticipated gradients in the concentrations of trace elements and isotopes. The research vessel (Thompson) will be loaded in Seattle 5-7 October before steaming to Manta Ecuador where the scientific party will depart on 25 October for a two-month expedition scheduled to end just before Christmas in Tahiti.

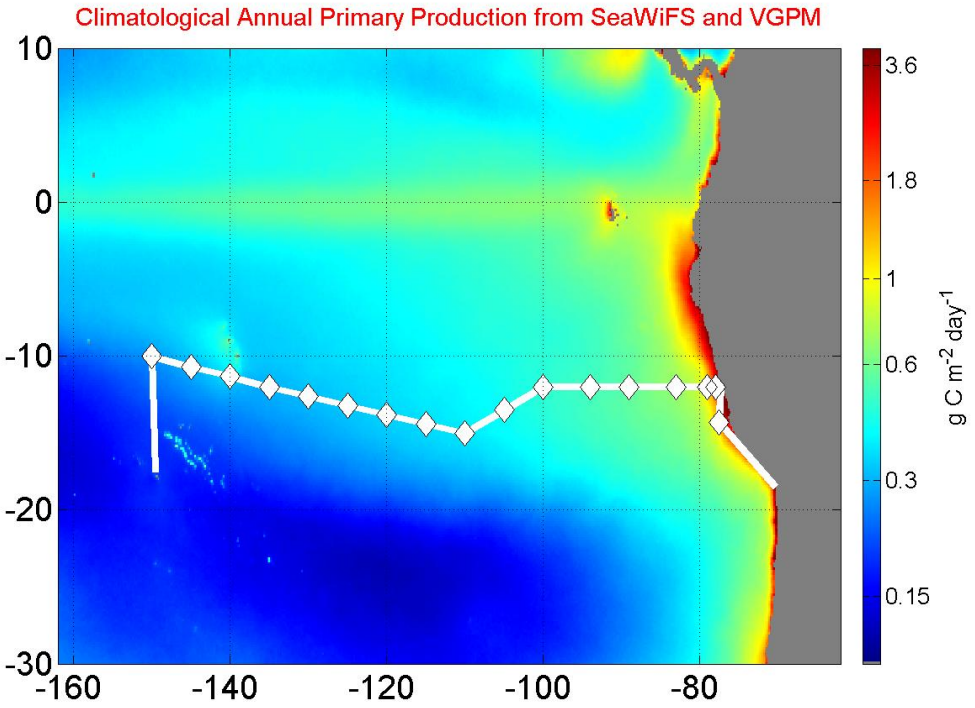

Figure 19. Tentative locations of full depth stations planned for the U.S. eastern tropical south Pacific zonal section (GP16). Shallow stations to 1000 m are not shown. The cruise is planned for late 2013. Map and productivity calculations courtesy of M-E Carr.

Arctic: US GEOTRACES submitted a proposal to the US National Science Foundation in October 2012 requesting support for management and logistics support of an Arctic cruise in 2015, contributing

to the international GEOTRACES initiative. That proposal was declined. The management team met with representatives from NSF to discuss a strategy to strengthen the proposal. We plan to submit a revised proposal for a NSF deadline on 15 August 2013.

New Funding

Funding for individual investigators to participate in the Peru-Tahiti section is now in place. Approximately 35 independent projects, involving more than 60 principal investigators as well as numerous students and post docs, have been funded. Completion of GP16 will generate a wealth of new data, both for TEIs and for complementary parameters that will facilitate the interpretation of TEI distributions.

Presentation of results

Preliminary results from the North Atlantic cruise (Figure 1) were presented at two international conferences:

- Fall 2012 AGU meeting (3 - 7 December 2012, San Francisco, California, USA).
- 93rd annual meeting of the American Meteorological Society (6 - 11 January 2013, Austin, Texas USA).

U.S. GEOTRACES Meetings

US GEOTRACES sponsored two large workshops during the past year. These are described above under "Activities". In addition, members of the US GEOTRACES community participated in two international planning workshops:

- Nine members of the US GEOTRACES community participated in the International GEOTRACES Latin America workshop (12 - 15 November 2012, Rio de Janeiro, Brazil).
- Seven members of the US GEOTRACES community participated in the GEOTRACES Russia planning workshop (27 - 29 November 2012, Moscow, Russia).

Publications (GEOTRACES and GEOTRACES-related*)

- * Fitzsimmons, J. N., R. Zhang, and E. A. Boyle (2013), Dissolved iron in the tropical North Atlantic Ocean, Marine Chemistry, 154, 87-99.

US GEOTRACES publications 2012 - 2013:

- Baskaran, M., Church, T., Hong, G., Kumar, A., Qiang, M., Choi, H., Rigaud, S. and Maiti, K., 2013. Effects of flow rates and composition of the filter, and decay/ingrowth correction factors involved with the determination of in situ particulate 210Po and 210Pb in seawater. Limnology and Oceanography: Methods, 11: 126-138.
- Bishop, J.K.B., Lam, P.J. and Wood, T.J., 2012. Getting good particles: Accurate sampling of particles by large volume in-situ filtration. Limnology and Oceanography: Methods, 10: 681-710.
- Boyle, E.A., John, S., Abouchami, W., Adkins, J.F., Echegoyen-Sanz, Y., Ellwood, M., Flegal, A.R., Fornace, K., Gallon, C. and Galer, S., 2012. GEOTRACES IC1 (BATS) contamination-prone trace element isotopes Cd, Fe, Pb, Zn, Cu, and Mo intercalibration. Limnology and Oceanography: Methods, 10: 653-665.
- Buck, C.S. and Paytan, A., 2012. Evaluation of commonly used filter substrates for the measurement of aerosol trace element solubility. Limnology and Oceanography: Methods, 10: 790-806.
- Church, T., Rigaud, S., Baskaran, M., Kumar, A., Friedrich, J., Masque, P., Puigcorbé, V., Kim, G., Radakovitch, O. and Hong, G., 2012. Intercalibration studies of 210Po and 210Pb in dissolved and particulate seawater samples. Limnology and Oceanography: Methods, 10: 776-789.

- Henderson, P.B., Morris, P.J., Moore, W.S. and Charette, M.A., 2012. Methodological advances for measuring low-level radium isotopes in seawater. Journal of Radioanalytical and Nuclear Chemistry, 296(1): 357-362.
- Kenna, T.C., Masqué, P., Mas, J.L., Camara-Mor, P., Chamizo, E., Scholten, J., Eriksson, M., Sanchez-Cabeza, J.-A., Gastaud, J. and Levy, I., 2012. Intercalibration of selected anthropogenic radionuclides for the GEOTRACES Program. Limnology and Oceanography: Methods, 10: 590-607.
- Maiti, K., Buesseler, K.O., Pike, S.M., Benitez-Nelson, C., Cai, P., Chen, W., Cochran, K., Dai, M., Dehairs, F. and Gasser, B., 2012. Intercalibration studies of short-lived thorium-234 in the water column and marine particles. Limnology and Oceanography: Methods, 10: 631-644.
- Morton, P.L., Landing, W.M., Hsu, S.-C., Milne, A., Aguilar-Islas, A.M., Baker, A.R., Bowie, A.R., Buck, C.S., Gao, Y. and Gichuki, S., 2013. Methods for the sampling and analysis of marine aerosols: results from the 2008 GEOTRACES aerosol intercalibration experiment. Limnology and Oceanography: Methods, 11: 62-78.
- Sharma, M., Chen, C. and Blazina, T., 2012. Osmium contamination of seawater samples stored in polyethylene bottles. Limnology and Oceanography: Methods, 10: 618-630.
- Twining, B.S. and Baines, S.B., 2013. The Trace Metal Composition of Marine Phytoplankton. Annual Review of Marine Science, 5(1): 191-215.
- Twining, B.S., Baines, S.B., Vogt, S. and Nelson, D.M., 2012. Role of diatoms in nickel biogeochemistry in the ocean. Global Biogeochemical Cycles, 26(4): GB4001 doi:10.1029/2011GB004233.
- Wozniak, A.S., Shelley, R.U., Sleighter, R.L., Abdulla, H.A.N., Morton, P.L., Landing, W.M. and Hatcher, P.G., 2013. Relationships among aerosol water soluble organic matter, iron and aluminum in European, North African, and Marine air masses from the 2010 US GEOTRACES cruise. Marine Chemistry, 154: 24-33.
- Wurl, O., Zimmer, L. and Cutter, G.A., 2013. Arsenic and phosphorus biogeochemistry in the ocean: Arsenic species as proxies for P-limitation. Limnology and Oceanography, 58(2): 729-740.
- Zimmer, L.A. and Cutter, G.A., 2012. High resolution determination of nanomolar concentrations of dissolved reactive phosphate in ocean surface waters using long path liquid waveguide capillary cells (LWCC) and spectrometric detection. Limnology and Oceanography: Methods, 10: 568-580.

Submitted by: Bob Anderson