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

ANNEX – NATIONAL REPORTS

ANNUAL REPORT ON GEOTRACES ACTIVITIES IN AUSTRALIA
MAY 2014 – JUNE 2015

Meetings

- GEOTRACES presentations and co-authorships by Australian scientists at the following meetings: AGU Fall Meeting (San Francisco, USA, Dec 2014), ACCOMC-CGASM annual meeting (Aspendale, Victoria, Nov 2014), 3rd International Symposium on the Effects of Climate Change on the World's Oceans (Santos City, Brazil, Mar 2015), APICS (Melbourne, Australia), May 2015.
- Informal meeting on Aus-NZ GP13 data during *RV Investigator* trials voyage.

New funding

- Australian Research Council Discovery grant for project "Hot iron: Are submarine volcanoes important for Southern Ocean iron supply?". Operating funding to support the trace metal biogeochemistry on the 2-month research expedition (January-March 2016) on *RV Investigator* to study hydrothermalism and biospheric impacts around Heard/McDonald Islands in the Southern Ocean ("HEOBI" cruise).
- Australian Antarctic Science grant for project "Submarine Volcanism and Hydrothermalism around Heard and McDonald Islands". Funding to support logistics, geochemistry and geophysics on HEOBI voyage.
- Awarding of shiptime to support "K-axis" voyage in the Indian sector of the Southern Ocean south of Kerguelen plateau in January-March 2016 on *RSV Aurora Australis*. The project "Assessment of habitats, productivity and food webs on the Kerguelen Axis in the Indian Sector of the Southern Ocean" will examine principal drivers of ecosystem structure and processes and includes a trace element biogeochemistry component.
- Awarding of shiptime to support "SOTS-Eddies-CAPRICORN" voyage in the Southern Ocean in March-April 2016 on *RV Investigator*. The voyage combines three projects, including the "Integrated Marine Observing System Southern Ocean Time Series automated moorings for climate and carbon cycle studies southwest of Tasmania" and "Linking eddy physics and biogeochemistry in the Antarctic Circumpolar Current south of Tasmania", both of which will include a trace element biogeochemistry component.
- Awarding of in-kind logistical support for fieldwork on the Antarctic sea-ice in spring 2015, for the project "Impact of changes in sea ice extent on primary productivity in the Southern Ocean: links between the iron and carbon cycles in fast ice and the marginal ice zone".

New results

- Results from the French-led GEOTRACES Process Study KEOPS-2 (GIpr01), a natural iron fertilisation experiment around the Kerguelen Islands in the Southern Ocean published in a special issue of Biogeosciences (http://www.biogeosciences-discuss.net/special_issue133.html)
- Results from the GEOTRACES Process Study SIPEX-2 (GIpr02), a multidisciplinary biogeochemistry expedition examining the role of Antarctic sea ice as a natural ocean fertilizer during the spring in the sea ice zone near east Antarctica, are currently being published in a special issue of Deep-Sea Research II.
- Submission of results for the GEOTRACES intercalibration exercises for marine particulate trace elements (led by Phoebe Lam).

New projects *(two examples)*

- PROJECT 1: Tasman Sea biological response to dust storm events during the austral spring of 2009 (Gabric et al., 2015). We investigated various field, model and satellite data on atmospheric dust loading and chlorophyll levels in the Tasman Sea to explore the connection between the spring dust storm season of 2009, and the ecosystem response of the Tasman Sea. We used a high resolution dust transport model to simulate dust deposition to the ocean surface, which indicates significant, albeit episodic deposition which was enhanced by widespread precipitation, especially during the late September ('Red Dawn') and mid-October events. These events promoted large scale phytoplankton blooms in the Tasman, with chlorophyll-a values well above their springtime climatological averages. These results are noteworthy as this is the first report of a significant biological response to dust-derived nutrient addition in the Tasman Sea, with previous studies finding no response.

- PROJECT 2: Trace metal aerosol sampling to investigate inputs to Australian and Antarctic waters. A series of trace metal clean aerosol samplers have been established at various land based sites across Australia and also on the new Australian research vessel Investigator since 2013. This includes locations at: (1) Gunn Point Tropical Atmospheric Research Station (Northern Territory) to investigate the solubility of biomass burning derived aerosol iron to tropical waters as part of the 'Savannah Early-Late Dry Season Fire Experiment'. (2) Cape Grim Baseline Air Pollution Station (Tasmania) to investigate soluble iron inputs to the Southern Ocean using sector control to sample only 'baseline air'. (3) Gingin Gravity Discovery Centre (Western Australia) to investigate dust delivery into the southeast Indian Ocean from the dry arid regions of WA. (4) Onboard the *RV Investigator* in waters south of Tasmania, Australia to investigator dust delivery to the open Southern Ocean.

Cruises

- No GEOTRACES cruises took place in the reporting period.
- Four expeditions outlined above are planned for the next 12 months, including 3 to be proposed as GEOTRACES Process Studies. GEOTRACES researchers in Australia are heavily committed to these process studies in the Southern Ocean. This, combined with a current shortage of 'GEOTRACES researchers' nationally, limits our ability to lead GEOTRACES full sections at this time.

Other activities

- The commissioning of the new Australian oceanographic research vessel Investigator has been completed. The ship has improved facilities to undertake GEOTRACES science. A dedicated "Trace metals and micronutrients" trials voyage took place in April 2015, where new a clean container, a trace metal clean rosette (TMR), 6 in situ pumps (ISP), an aerosol sampling system, and a clean underway sampling system were tested.

New publications (involving Australian GEOTRACES researchers)

- Gabric AJ, Cropp R, McTainsh G, Butler H, Johnston B, O'Loingsigh T, Dien Van Tran, 2015. Tasman Sea biological response to dust storm events during the austral spring of 2009. Marine and Freshwater Research, in press.
- Chase Z., McManus J, Mix A.C., Muratli J., 2014. Southern-ocean and glaciogenic nutrients control diatom export production on the Chile margin. Quaternary Science Reviews 99, 135-145

- Norman L et al., 2015. The role of bacterial and algal exopolymeric substances in iron chemistry. Marine Chemistry 173, 148-161
- Sedwick PN, Sohst BM, Ussher SJ, Bowie AR, 2015. A zonal picture of the water column distribution of dissolved iron (II) during the US GEOTRACES North Atlantic transect cruise (GEOTRACES GA03). Deep Sea Research Part II: Topical Studies in Oceanography 116, 166-175
- Quéroué F et al., 2015. High variability in dissolved iron concentrations in the vicinity of the Kerguelen Islands (Southern Ocean). Biogeosciences 12 (12), 3869-3883
- Planchon F et al., 2015. Carbon export in the naturally iron-fertilized Kerguelen area of the Southern Ocean based on the 234Th approach. Biogeosciences 12 (12), 3831-3848
- Winton VHL et al., 2015. Fractional iron solubility of atmospheric iron inputs to the Southern Ocean. Marine Chemistry, in press
- Schallenberg C et al., 2015. Dissolved iron and iron (II) distributions beneath the pack ice in the East Antarctic (120° E) during the winter/spring transition. Deep Sea Research Part II: Topical Studies in Oceanography, in press
- van Der Merwe , 2015. Sourcing the iron in the naturally fertilised bloom around the Kerguelen Plateau: particulate trace metal dynamics. Biogeosciences 12 (3), 739-755
- Bowie AR et al., 2015. Iron budgets for three distinct biogeochemical sites around the Kerguelen archipelago (Southern Ocean) during the natural fertilisation experiment KEOPS-2. Biogeosciences Discussions 11 (12), 17861-17923
- Lannuzel D et al., 2015. Iron biogeochemistry in Antarctic pack ice during SIPEX-2. Deep Sea Research Part II: Topical Studies in Oceanography, in press
- Ratnarajah L, Bowie AR, Lannuzel D, Meiners KM, Nicol S, 2015. The Biogeochemical Role of Baleen Whales and Krill in Southern Ocean Nutrient Cycling. PloS one 9 (12), e114067
- Worsfold PJ, Lohan MC, Ussher SJ, Bowie AR, 2015. Determination of dissolved iron in seawater: A historical review. Marine Chemistry 166, 25-35
- BP von der Heyden BP et al., 2015. Ubiquitous presence of Fe (II) in aquatic colloids and its association with organic carbon. Environmental Science & Technology Letters 1 (10), 387-392
- Lannuzel D, van der Merwe PC, Townsend AT, Bowie AR, 2015. Size fractionation of iron, manganese and aluminium in Antarctic fast ice reveals a lithogenic origin and low iron solubility. Marine Chemistry 161, 47-56
- Boyd PW et al., 2015. Why are biotic iron pools uniform across high-and low-iron pelagic ecosystems? Global Biogeochemical Cycles, in press
- Ellwood M et al., 2015. Volatile Selenium Fluxes from Selenium-contaminated Sediments in an Australian Coastal Lake Environmental Chemistry, in press
- Ellwood MJ et al., 2015. Iron stable isotopes track pelagic iron cycling during a subtropical phytoplankton bloom. Proceedings of the National Academy of Sciences 112 (1), E15-E20
- Maher W, Ellwood M, Raber G, Foster S, 2015. Measurement of arsenic species in environmental, biological fluids and food samples by HPLC-ICPMS and HPLC-HG-AFS, Journal of Analytical Atomic Spectrometry, in press
- Thompson CM, Ellwood MJ, 2014. Dissolved copper isotope biogeochemistry in the Tasman Sea, SW Pacific Ocean. Marine Chemistry 165, 1-9
- Thompson CM, Ellwood MJ, Sander SG, 2014. Dissolved copper speciation in the Tasman Sea, SW Pacific Ocean. Marine Chemistry 164, 84-94

Submitted by Andrew Bowie (Andrew.Bowie@utas.edu.au).

ANNUAL REPORT ON GEOTRACES ACTIVITIES IN BELGIUM
MAY 2014 – JUNE 2015

Meetings

- Delille, B., F. Van der Linden, F. Fripiat, W. Champenois, B. Heinesch, J. Zhou, V. Schoemann, G. Carnat, S. Moreau, F. Vivier, M. Kotovitch, T. Haskell, and J.-L. Tison, Year Round survey of Ocean-Sea Ice-Air Exchanges – the YROSIAE survey. SOLAS open ocean conference, 07-11 September 2015, Kiel, Germany.
- Xuefeng LI, D. Fonseca-batista, H. Ingber, N. Roevros, F. Dehairs and L. Chou, The impact of iron biogeochemistry on the phytoplankton growth and the diazotrophic nitrogen fixation under a changing climate, SOLAS Open Science Conference, 07-11 September 2015, Kiel, Germany.
- Le Roy E., F. Fripiat, A. Roukaerts, D. Fonseca Batista, F. Dehairs, Isotopic composition of nitrate from the Sub-Arctic North Atlantic, Goldschmidt Conference, Prague, 16-21 August 2015.
- Lemaître N., H. Planquette, F. Dehairs, L. Monin, L. André, S. Jacquet and F. Planchon, Mesopelagic carbon remineralisation along the GEOVIDE transect in the North Atlantic (GEOTRACES GA01), Goldschmidt Conference, Prague, 16-21 August 2015.
- Xuefeng-Li, N. Roevros, F. Dehairs, D. Fonseca Batista and L. Chou, Iron biogeochemistry under a changing climate: impact on the phytoplankton growth and the diazotrophic nitrogen fixation, Goldschmidt Conference, Prague, 16-21 August 2015.
- Fonseca Batista, D., Fripiat, F. and Dehairs, F., Contribution of N2 fixation to biological productivity along a meridional transect in the Eastern Atlantic Ocean, Atlantic Meridional Transect (AMT) Open Science Conference, 23 – 25 June, 2015, Plymouth, UK.
- Lemaître N., Planquette H., F. Dehairs, L. Monin, L. André, S. Jacquet, and F. Planchon, Mesopelagic carbon reminerelization along the GEOVIDE transect in the North Atlantic (GEOTRACES GA01), GEOVIDE Post-cruise meeting, 26-27 May, 2015, IUEM, Brest, France.
- Roukaerts A., D. Fonseca-Batista, E. Le Roy, A. Plante, F. fripiat, F. Dehairs and M. Elskens, First results on nitrate isotopic signatures and production regimes, GEOVIDE Post-cruise meeting, 26-27 May, 2015, IUEM, Brest, France.
- Fripiat, F., M. Elskens, T.W. Trull, S. Blain, A.-J. Cavagna, C. Fernandez, D. Fonseca-Batista, F. Planchon, A. Roukaert, and F. Dehairs, Significant mixed layer nitrification in a natural iron-fertilized bloom of the Southern Ocean. Gordon Conference on Polar Ocean, 2015, Lucca, Italy.

Cruises

- Antarctica, Dumont d'Urville fast ice region: Primary production and N-uptake by sea ice and under ice algae (Nov. 2014 - Jan. 2015)
- Belgica 2015/14 (12-26 May 2015): Bay of Biscay and Iberian Margin; nitrogen uptake and cycling; significance of N2 fixation; nitrate isotopic composition; Role of iron.
- *R/V Atlantic Explorer* cruise: western north Atlantic (Bermuda to the U.S. east coast). Test of underway measurement system for marine nitrogen fixation; Chief scientist: Nicolas Cassar; Debany Fonseca Batista: participant in charge of N2 fixation rate measurements using via 15N2 spiking.

New funding

- Nolwenn Lemaître (PhD grant co-funded by Labex-mer, IUEM, Brest and Vrije Universiteit Brussel, Strategic Research Plan). Multi-proxy approach (234Th, Baxs, 13C, 15N) of biopump associated carbon, nitrogen, silicon, trace element export fluxes and remineralisation.

New results

Southern Ocean

- Nitrification appears to be an ubiquitous process in Antarctic Sea Ice, implying that a significant fraction of nitrate is regenerated in sea ice (up to ~100% of the ambient nitrate pool) and can explain the large nitrous oxide accumulation recently observed in spring landfast sea ice (B. Delille, unpublished results, ULG).
- Nitrification is significant over the Kerguelen Southeast plateau, being a naturally iron-fertilized area in the Southern Ocean. This observation challenges the general assumptions that nitrate in the Southern Ocean is mainly supplied through oceanic circulation, and that iron fertilization implies a more efficient biological pump to strip nutrients out of the surface water.
- Compilation of Antarctic sea ice nutrient data (in the framework of the SCOR working group "Biogeochemical exchange processes at the sea ice interface"). We collected ~13500 previously published data (from 1980 to 2015, i.e., nitrate, nitrite, ammonium, phosphate, and silicic acid) which should shed light on the nutrients dynamic in this extensive overlooked ecosystems (up to 8% of the Earth Surface).

Atlantic Ocean

- N2 fixation rates along a meridional section in the East Atlantic; regional upscaling
- Surprisingly elevated natural N2 uptake rates off the Iberian margin and strong boosting effect of Fe addition.
- A section showing the particulate non-lithogenic barium distribution across the North Atlantic (GEOVIDE).
- 234Th export and POC export (upcoming) in the North Atlantic (GEOVIDE)
- Isotopic composition of nitrate for selected North Atlantic sites (GEOVIDE)
- Primary production, nitrate, nitrite, ammonium uptake and N2 fixation rate for selected sites in the North Atlantic (GEOVIDE).

Relevant publications

- Fripiat F., M. Elskens, T. Trull, S. Blain, A.-J. Cavagna, C. Fernandez, D. Fonseca-Batista, F. Planchon, P. Raimbault, A. Roukaerts, and F. Dehairs. Enhanced nitrification in a natural iron-fertilized bloom of the Southern Ocean, Global Biogeochemical Cycles, in review.
- Roukaerts A., A.-J. Cavagna, F. Fripiat, D. Lannuzel, K. Meiners and F. Dehairs. Nitrogen uptake rates and primary production using stable isotope tracer experiments in East Antarctic Sea-Ice (SIPEX 2 expedition), Deep Sea Research II, accepted.
- Mawji E., R. Schlitzer, E. Masferrer Dodas, et al. (i.e. F. Dehairs and F. Fripiat), 2015. The GEOTRACES Intermediate Data Product 2014, In press in Marine Chemistry.
- van der Merwe P., A. Bowie, F. Quéroué, L. Armand, S. Blain, F. Chever, D. Davies, F. Dehairs, F. Planchon, G. Sarthou, A.T. Townsend, and T.W. Trull, 2015. Sourcing the iron in the naturally□fertilised bloom around the Kerguelen Plateau: particulate trace metal dynamics, Biogeosciences, 12, 739–755.

- Trull T.W., D. Davies, F. Dehairs, F. D'Ovidio, E. Laurenceau, M. Lasbleiz, F. Planchon, B. Queguiner and S. Blain, 2015. Chemometric perspectives on plankton community responses to natural iron fertilisation over and downstream of the Kerguelen Plateau in the Southern Ocean, Biogeosciences, 12, 1029-1056, doi:10.5194/bg-12-1029-2015.
- Dehairs F., F. Fripiat, A.-J. Cavagna, T.W. Trull, C. Fernandez, D. Davies, A. Roukaerts, D. Fonseca Batista, F. Planchon and M. Elskens, 2015. Nitrogen cycling in the Southern Ocean Kerguelen Plateau area: Evidence for significant surface nitrification from nitrate isotopic compositions, Biogeosciences, 12, 1459-148.
- Jacquet S. H. M., F. Dehairs, D. Lefèvre, A.-J. Cavagna, F. Planchon, U. Christaki, L. Monin, L. André, I. Closset, and D. Cardinal, 2015. Early season mesopelagic carbon remineralization and transfer efficiency in the naturally iron-fertilized Kerguelen area, Biogeosciences, 12, 1713-1731.
- Jeandel C., M. Rutgers van der Loeff, P.J. Lam, M. Roy-Barman, R. Sherrell, S. Kretschmer, C. German and F. Dehairs, 2015. What did we learn on the oceanic particle dynamics in the GEOSECS-JGOFS era? Progress in Oceanography, 133, 6-16.
- Planchon F., D. Ballas, A.-J. Cavagna, A.R. Bowie, D. Davies, T.W. Trull, E. Laurenceau, P. van der Merwe, and F. Dehairs, 2015. Carbon export in the naturally iron-fertilized Kerguelen area of the Southern Ocean based on the 234Th approach, Biogeosciences, 12, 3831-3848.
- Fripiat, F., D.M. Sigman, G. Massé, and J.-L. Tison, 2015. High turnover rates indicated by changes in the fixed N forms and their stable isotopes in Antarctic landfast sea ice. Journal of Geophysical Research: Oceans 120, doi:10.1002/2014JC010583.
- Miller, L.A., F. Fripiat, B.G.T. Else, J.S. Bowman, K.A. Brown, R.E. Collins, M. Ewert, A. Fransson, M. Gosselin, D. Lannuzel, K.M. Meiners, C. Michel, J. Nishioka, D. Nomura, S. Papadimitriou, L.M. Russel, L.L. Sorensen, D.N. Thomas, J.-L. Tison, M.A. van Leeuwe, M. Vancoppenolle, E.W. Wolff, and J. Zhou, 2015. Methods for biogeochemical studies of sea ice: The state of the art, caveats, and recommendations. Elementa: Science of the Anthropocene 3:000038, doi:10.12952/journal.elementa.000038.

Submitted by Frank Dehairs (fdehairs@vub.ac.be).

- Brazilian cruise (INCT Mar-COI) on January 2015 to test the new clean sampling system installed on the *R/V Atlântico Sul.* Transects were performed perpendicular to the South Coast of Brazil, collecting samples up to 1500 m for metal analysis.
- Planning activities of an expedition (INCT Mar-COI) to be lead by Brazil in collaboration with French scientists in the South Atlantic onboard of *R/V Atlântico Sul* in January 2016.
- Submission of a join proposal with French scientists in the scope of the Horizon 2020, project entitled MARBREU, coordinated by Marina Rabineau for the Centre National de la Recherche Scientifique (CNRS). A GEOTRACES section (GA09) along the South American shelf is planned and will be proposed as two collaborative Brazilian-French cruises on board *R/V Vital de Oliveira/Atlântico Sul* and Marion Dufresne/ Pourquoi Pas?.
- Organization of the GEOTRACES Brazil workshop. This meeting was held in Santos, São Paulo in March 2015 to foster the involvement of Brazilian Scientists in the GEOTRACES programme. The specific objectives of this meeting were: i. Promote a broad discussion on the infrastructure demands, training and tools to implement the study of trace elements in ocean waters by the Brazilian research community; ii. Promote and improve the quality of scientific production in chemical oceanography, especially focused on the study of TEIs in the oceans; iii. Initiate a GEOTRACES BRAZIL collaboration network; iv. Identify opportunities for technology transfer, training and international collaborations to increase the capacity of Brazilian scientists to undertake GEOTRACES-related research.
- Scientific planning missions USA-Brazil. Project entitled Facilitating Collaborative Research on the Southern Brazilian Continental Shelf. Program: Catalyzing New International Collaborating (CNIC - NSF)
- Meeting with the Brazilian Agency Coordination of Improvement of Higher Education Personnel (CAPES) to discuss mechanisms for providing scholarships for graduate students, post-doctoral fellowships, and support for scientific missions related to GEOTRACES.
- Meeting with the Secretary of the Brazilian Ministry of Science and Technology, Navy and the Coordinator for Ocean Science and Antarctica to discuss funding possibilities to support the clean sampling and clean container facilities for the new Brazilian *R/V Vital de Oliveira*.

GEOTRACES-related projects/grants

- PROJECT TITLE: Rare earth elements in the waters of Todos os Santos Bay and adjacent sea. IP: Vanessa Hatje. Funded by CNPq. 441828/2014-7.
- PROJECT TITLE: Method development for the analysis of rare earth elements in environmental matrices. IP: Vanessa Hatje. Funded by FAPESB. PAM0020/2014.
- PROJECT TITLE: A Geotraces trial study within the Brazil –Malvinas convergence. IPs: Leonardo Contreira, Helene Planquete. Funded by Europole Mer - International Cooperation with Brazil and WHOI – 2015.
- PROJECT TITLE: Submarine Groundwater Discharge (SGD) Influence and Atmospheric Contribution in Marine Biogeochemical Cycles. Comparative Study Between Cabo Frio Upwelling (Brazil) And Chubut River Estuary (Patagonia, Argentina). IPs: Emmanoel V Filho, Luis F H Niencheski, José Luis Esteves. Funded by CAPES/MINCYT (Brazil-Argentina).

GEOTRACES-related articles

- Niencheski,L.F., Moore, W.S. & Windom, H.L. History of Human Activity in Coastal Southern Brazil from Sediment. Marine Pollution Bulletin 78 (2014), pp. 209-212.
- Niencheski, L.F. & Windom, H. L. Chemistry of a Surficial Aquifer of a Large Coastal Lagoon Barrier and its Relation to Adjacent Surface Waters of Brazil. Journal of Coastal Research In-Press.
- Niencheski, L.F.; Windom, H.L. & Moore, W.S. Controls on water column chemistry of the southern Brazilian continental shelf. Continental Shelf Research, v. 88, p. 126-139, 2014.

Contributions to conferences

- Vanessa Hatje, Kenneth W. Bruland and A. Russell Flegal. Temporal and spatial gradients of anthropogenic Gd in San Francisco Bay. 3rd International Symposium: Effects of Climate Change on the World's Oceans. March 21-27, Santos.
- Leonardo Contreira-Pereira, Carlos F.F. de Andrade, Karina Attisano, Kayla Lima, Mariele Paiva, Gabriel Karagiannis, Cátia Von-Ahn, Daniel Costa and Luis Felipe Hax Niencheski. Study of the sources of iron to the southern Brazilian coast and adjacent ocean. 3rd International Symposium: Effects of Climate Change on the World's Oceans. March 21-27, Santos.
- Karina Kammer Attisano, Isaac Rodrigues Santos, Carlos F.F. de Andrade, Mariele Lopes de Paiva, Idel Cristina Bigliardi Milani and Luis Felipe Hax Niencheski. Submarine Groundwater Discharge revealed by radium isotopes (Ra-223 and Ra-224) near a paleochannel on the Southern Brazilian continental shelf. 3rd International Symposium: Effects of Climate Change on the World's Oceans. March 21-27, Santos.
- Mônica Wallner-Kersanach, Luis Felipe Hax Niencheski,Carlos FF de Andrade, Karina Attisano, Kayla Lima, Camila Sukekava, Leonardo Contreira, Daniel Costa, Joselene de Oliveira, Eunice Machado, Alice Costa, Rodrigo Kerr, Luiza Dy F Costa and Iarema FP de Carvalho. The submarine groundwater process, the biological pump and the CO2 fluxes on the Brazilian southeastern and southern shelf . 3rd International Symposium: Effects of Climate Change on the World's Oceans. March 21-27, Santos.
- Kayla Lima, Luiza Dy F Costa, Mônica Wallner-Kersanach, Carlos FF de Andrade, Karina Attisano, Camila Sukekava, Leonardo Contreira, Mariele Paiva, Iarema Ferreira Pinto de Carvalho and Luis Felipe Hax Niencheski. Nutrient concentrations along the coast of southern Brazil. 3rd International Symposium: Effects of Climate Change on the World's Oceans. March 21-27, Santos.

Submitted by Vanessa Hatje (vanessahatje@gmail.com).

Cruises

- GEOTRACES Arctic cruises: Labrador Sea, Baffi Bay and Canadian Arctic Archipelago; July 10-August 10, 2015 (Leg 2).
- GEOTRACES Arctic cruises: Beaufort Sea; September 4-October 1st, 2015 (Leg 3B).

Cruise Outreach:
http://pwias.ubc.ca/media-centre/wall-papers/fall-2014/predicting-changes-in-the-arctic-with-the-geotraces-project/

Cruise BLOG:
blogs.ubc.ca/geotraces2015

Radio interview:
CBC Radio; "As it happens", July 22, 2015: *Ice Scientists*
http://www.cbc.ca/radio/popup/audio/player.html?autoPlay=true&clipIds=2672371897,2672329229

Individual achievements

Diana Varela; Biology Dept., University of Victoria, Victoria, BC

- *Arctic Geotraces Productivity group meeting (UVic and UBC): Sept. 11, 2014*
  A conference call with the other members of the Canadian Arctic Geotraces group at UBC to discuss the scope of primary productivity measurements and potential collaborations and data sharing between groups for the upcoming Arctic Geotraces cruise

- *Geotraces - ArcticNET Joint Meeting (Laval University): Oct 27-28, 2014*
  Travelled to Quebec to participate in a two day meeting with other Geotraces and ArcticNet participants regarding the upcoming summer 2015 Arctic cruise on the CCGS Amundsen. The second day of the meeting included a ship visit with discussions of lab and deck space allocation.

- *Stable silicon isotope inter-calibration plans (UVic-Canada, UC Santa Barbara-USA, University of Brest-France): January - June, 2015*
  A series of discussions with collaborators in both the United States and France regarding intercalibration of the stable silicon isotope measurements on our respective Arctic Geotraces cruises. Samples with be collected at a crossover station for intercalibration with our US colleagues, while we will be collecting samples to share with our French colleagues as their crossover station (that they have already visited) was deemed unsuitable for intercalibration.

- *Stable silicon isotope analysis training (UBC): April 13-16, 2015*
  Travelled to Vancouver and worked with Nicolas Estrade to learn a new methodology for measuring the stable silicon isotope composition of seawater. This initial training was on

the preparation of the samples for analysis using a pre-concentration of silicic acid in seawater.

- *Geotraces - ArcticNet Productivity group meeting (UVic, UBC, ArcticNet): April 22, 2015*
  A conference call between members of the Geotraces and ArcticNet productivity groups to discuss deck space for incubators and potential collaborations and equipment sharing on the upcoming cruise.

Alfonso Mucci, Department of Earth and Planetary Sciences**,** McGill University, Montreal, QC

Refereed journal publications

- MILLER L.A., GIESBRECHT K.E., MUCCI A. and ZIMMERMAN S. (2014) Changes in the marine carbonate system of the western Arctic: Patterns in a rescued data set. Polar Research 33: 20577-20593. doi.org/10.3402/polar.v33.20577
- GIESBRECHT K.E., MILLER L.A., ZIMMERMAN S., CARMACK E., JOHNSON W.K., MACDONALD R.W., MCLAUGHLIN F., MUCCI A., WILLIAMS W.J. and WONG C.S. and YAMAMOTO-KAWAI M. (2014) Measurements of the dissolved inorganic carbon system and associated biogeochemical parameters in the Canadian Arctic, 1974-2009. Earth System Science Data 6: 91-104. doi: 10.5194/essdd-6-91-2014.

Presentations

- The Canadian Arctic GEOTRACES Program : Biogeochemical and tracer study of a rapidly changing Arctic Ocean. Meeting of the NSERC-CCAR Networks, May 3, 2015

Media interviews

- Opinion: Ocean acidification is an indisputable problem
  The Gazette, June 22, 2015
  http://montrealgazette.com/news/world/opinion-ocean-acidification-is-an-indisputable-problem

- Des lacs saskatchewanais ralentissent le réchauffement climatique
  Radio-Canada Saskatoon
  Interview by William Burr
  http://ici.radio-canada.ca/regions/saskatchewan/2015/02/25/007-lacs-saskatchewan-rechauffement-climatique-revue-nature.shtml?isAutoPlay=1

- Les Années Lumières, Radio-Canada – October 19, 2014
  Les oceans brûlés: Un impact des changements climatiques
  Interview with Chantal Srivastava
  http://www.radio-canada.ca/util/postier/suggerer-go.asp?nID=1214390

- Première chaîne de Radio-Canada – October 16, 2014
  Interviews about ocean acidification with:
  Stéphane Côté – Halifax
  Denis Duchesne – Charlottetown
  Marie Villeneuve – Vancouver

Jean Fontaine – Winnipeg
Michel Plourde – Sept-Îles
Jacques Montpetit – Rimouski
Doris Labrie – Regina
Sandra Gagnon – Edmonton/Calgary
Jean-Pierre Girard – Saguenay
Réjean Blais – Sherbrooke

- CBC International on the web – October 9, 2014
  Interview about ocean acidification with Marc Montgomery

- La Presse – October 9, 2014 (section Actualités)
  Interview with Charles Côté
  Acidification des océans: Les eaux canadiennes durement frappées
  http://plus.lapresse.ca/screens/1752d663-d612-4066-93e7-578499367521|_0.html

- La Presse – June 17, 2014
  Interview on ocean acidification with Mathieu Perreault

- Le Banc Public – CHOQ-FM, June 16, 2014
  Radio interview by Marion Bérubé - Le Saint-Laurent s'acidife.
  http://www.choq.ca/emissions/bancpublic

- Le Devoir, June 12, 2014
  Le Saint-Laurent étouffé par l'acidification (front page)

- TVA/Rimouski, June 4, 2014
  L'acidification du fleuve Saint-Laurent.

- Le monde aujourd'hui, Radio-Canada/Rimouski, June 3, 2014
  Le fleuve Saint-Laurent et les changements climatiques.

- Le Code Chastenay, Télé-Québec, February 18, 2014
  Le fleuve Saint-Laurent s'acidifie.

Celine Gueguen; Chemistry Dept., Trent University, Peterborough, ON

- V. Mangal, C. Guéguen (2014) Examining sulfur-containing proteins in both intracellular and extracellular fractions of the freshwater algae Scenedesmus using AsFlFFF. 17th International symposium on field- and flow-based separations. Salt Lake City, Utah, Oct 12-16, 12014. Oral presentation
- V. Mangal, C. Guéguen (2015) Examining concentrations and molecular weights of thiols in microorganism cultures and in Churchill River (Manitoba) using a fluorescent-labeling method coupled to asymmetrical flow field-flow fractionation. Anal Bioanal Chem (2015) 407:4305–4313

Andrew Ross; Fisheries and Oceans Canada, IOS, Sydney, BC

- I assisted in collecting samples for analysis of iron and other trace metals on the August/September Line-P cruise (2014-19) last year in support of our Line-P Iron Program (which is recognized as a Process Study by GEOTRACES).

- I've also been supervising Kyle Simpson on his development of a new Fe analysis system here at DFO-IOS.

- I am also going to submit an abstract for a SCOR WG 139/Frontiers in Marine Biogeochemistry special issue on organic ligands in a couple of days, if that counts (the abstract describes validation of the method my grad student has been developing and will be using to recover and analyze organic ligands in samples collected during the upcoming Arctic GEOTRACES cruise).

Kristin Orians; Earth, Ocean & Atmospheric Sciences, UBC, Vancouver

Publications:

- McAlister, J. and Orians, K. (2015) Dissolved Ga in the Beaufort Sea of the Western Arctic Ocean: A GEOTRACES cruise in the International Polar Year. Marine Chemistry (in press May 22) http://www.sciencedirect.com/science/article/pii/S0304420315001115

Conference presentations:
- McAlister, J., Charters, J., Orians, K. (2014) Sources of Pb to the North Pacific: temporal and spatial distributions. Chemistry of the Sea and Sky, 97th Canadian Chemistry Conference (CSC 2014), Vancouver British Columbia May 2014.
- Sim, N. and Orians, K. (2014) Dissolved Manganese in the Northeast Pacific: Line-P, 2011-2012. AGU/ASLO Ocean Sciences 2014 (Honolulu, Hawaii, USA)
- Cain, A. and Orians, K. (2014) Dissolved Aluminum in the Northeast Pacific. AGU/ASLO Ocean Sciences 2014 (Honolulu, Hawaii, USA)

Thesis:
- McAlister, J. Biogeochemistry of dissolved gallium and lead isotopes in the northeast Pacific and western Arctic Oceans. Ph.D. Thesis, Oceanography, UBC (April 2015)

Jay Cullen; Earth & Ocean Sciences, University of Victoria, Victoria, BC

Articles published in refereed journals
(* indicates UVic supervised graduate student/HQP, ** indicates a UVic supervised undergraduate student)

- *Janssen, D.J. and J.T. Cullen. (in press) Decoupling of zinc and silicic acid in the subarctic northeast Pacific interior. Marine Chemistry
- *Schallenberg, C., **A.B. Davidson, K.G. Simpson, L.A. Miller and J.T. Cullen. (in press) Iron(II) variability in the northeast subarctic Pacific Ocean. Marine Chemistry
- Quay, P., J.T. Cullen, P. Morton and W. Landing. (in press). Processes controlling the distributions of Cd and PO4 in the ocean. Global Biogeochemical Cycles

- *Janssen, D.J., T.M. Conway, S.G. John, J. Christian, D.I. Kramer, T.F. Pedersen and J.T. Cullen. (2014) Undocumented water column sink for cadmium in open ocean oxygen deficient zones. Proceedings of the National Academy of Sciences, 111(19): 6888-6893 doi: 10.1073/pnas.1402388111
- Mélançon, J., M. Levasseur, M. Lizotte, P. Delmelle, J.T. Cullen, R. C. Hamme, A. Peña, K. Simpson, M. Scarratt, Jean-Éric Tremblay *J. Zhou, K. Johnson, N. Sutherland, N. Nemcek, M. Arychuk and M. Robert. (2014) Early response of the northeast subarctic Pacific plankton assemblage to volcanic ash fertilization. Limnology and Oceanography, 59(1), 55–67 doi:10.4319/lo.2014.59.1.0055

Presentations at conferences or institutions

(* indicates invited presentation, **indicates UVic graduate student/HQP, ***indicates UVic undergraduate student)

- 2014 Cullen, J.T., **D.J. Janssen, J. Christian, T.M. Conway and S.G. John. An Undocumented Water Column Sink for Cadmium in Open Ocean Oxygen Minimum Zones. Goldschmidt 2014, Jun. 8-13, Sacramento, CA USA.
- 2014 Galer, S.J.G., W. Abouchami, R. Xie, **D.J. Janssen, M. Rijkenberg, L. Gerringa, J.T. Cullen and H. de Baar. Global Oceanic Cadmium Isotope Distribution. Goldschmidt 2014, Jun. 8-13, Sacramento, CA USA.
- 2014 John, S.G., T.M. Conway, **D.J. Janssen and J.T. Cullen. Cadmium Sulfide Formation in Low-Oxygen Waters of the North Atlantic. Goldschmidt 2014, Jun. 8-13, Sacramento, CA USA.
- 2014 **Janssen, D.J., J.T. Cullen, W. Abouchami, S.J.G. Galer and H. de Baar. Cadmium Isotopes along the Line-P Transect in the Northeast Subarctic Pacific. Goldschmidt 2014, Jun. 8-13, Sacramento, CA USA
- 2014 *Cullen, J.T. and **J. Zhou. Deep-sea Loss of Dissolved Iron in the Arctic Ocean: Potential Insight into the Oceanic Budget of an Essential Trace Nutrient. Canadian Chemistry Conference and Exhibition, Jun. 1-5, Vancouver, BC Canada.
- 2014 **D.J. Janssen and J.T. Cullen. Improvements to a Fluorescence-Based Flow-Injection Method For Shipboard Determination of Dissolved Zn. 2014 Ocean Sciences Meeting, Feb. 23-28, Honolulu, HI USA.
- 2014 **Schallenberg, C., ***A.B. Davidson and J.T. Cullen. Iron(II) Variability in the Northeast Subarctic Pacific Ocean. 2014 Ocean Sciences Meeting, Feb. 23-28, Honolulu, HI USA.
- 2014 Vance, D., S. Little, Y. Zhao, J.T. Cullen, G. de Souza and M.C. Lohan. The Oceanic Cycle of Zinc and its Isotopes: The Key Roles of Southern Ocean Export and Vertical Biogeochemical Cycling. 2014 Ocean Sciences Meeting, Feb. 23-28, Honolulu, HI USA.

Maite Maldonado; Earth, Ocean & Atmospheric Sciences, UBC, Vancouver, BC

- Participated in the Particulate Metals intercalibration, lead by Phoebe Lam

- Participated in SCOR Working Group 139 workshop and meeting in May; Sibenik, Croatia.

- Full Member of SCOR Working Group 145: Modelling Chemical Speciation in Seawater to Meet 21st Century Needs (MARCHEMSPEC)

Roger Francois; Earth, Ocean & Atmospheric Sciences, UBC, Vancouver, BC

Publications

- Brown, K. A, L. A. Miller, C. J. Mundy, T. Papakyriakou, R. Francois, M. Gosselin, G. Carnat, K. Swystun, P. D. Tortell. Inorganic carbon system dynamics in landfast sea ice during the early-melt period. J. Geophysical Res. – Ocean (in press)
- Scheiderich, K, M. Amini, C. Holmden, and R. Francois. Global variability of Chromium isotopes in seawater demonstrated by Pacific, Atlantic, and Arctic Ocean samples. Earth and Planetary Science Letters. (in press)
- Jonkers. L, R. Zahn, A.Thomas, G. Henderson, W. Abouchami, R. Francois, P. Masque, I. R. Hall, and T. Bickert. (2015) Deep circulation changes in the central South Atlantic during the past 145 kyrs inferred from a combined sedimentary 231Pa/230Th, neodymium isotopes and benthic δ13C record. Earth and Planetary Science Letters 419, 14-21.
- Holmden, C., Amini, M. and Francois, R. (2015) Uranium isotope fractionation in Saanich Inlet: A modern analog study of a paleoredox tracer. Geochim. Cosmochim. Acta 153, 202-215.
- Albani B. S., N. M. Mahowald, G. Winckler, R. F. Anderson, L. I. Bradtmiller, B. Delmonte, R. Francois, M. Goman, N. G. Heavens, P. P. Hesse, S. A. Hovan, K. E. Kohfeld, H. Lu, V. Maggi, J. A. Mason, P. A. Mayewski, D. McGee, X. Miao, B. L. Otto-Bliesner, A. T. Perry, A. Pourmand, H. M. Roberts, N. Rosenbloom, T. Stevens, and J. Sun. (2104) Twelve thousand years of dust: the Holocene global dust cycle constrained by natural archives. Climate of the Past 10, 4277-4363
- Brown, K. A., L.Miller, M. Davelaar, R. Francois, and P. D. Tortell (2014). Over-determination of the carbonate system in natural sea ice brine and assessment of carbonic acid dissociation constants under low temperature, high salinity conditions. Mar. Chem. 165, 36–45.
- Honjo, S., T. I. Eglinton, C. D. Taylor, K. M. Ulmer, S. M. Sievert, A. Bracher, C. German, V. Edgcomb, R. Francois, D. M. Iglesias-Rodriguez, B. van Mooy, and D. J. Repeta (2014). Understanding the Role of the Biological Pump in the Global Carbon Cycle: An Imperative for Ocean Science. Oceanography 27 (3), 10 – 16.
- Luo, Y., M. Miller, B. De Baere, M. Soon, and R. Francois (2014) POC fluxes measured by sediment traps and 234Th:238U disequilibrium in Saanich Inlet, British Columbia. Mar. Chem. 162, 19-29.
- Brown, K. A., F. McLaughlin, P. D. Tortell, D. E. Varela, M. Yamamoto-Kawai, B. Hunt, R. Francois (2014), Determination of particulate organic carbon sources to the surface mixed layer of the Canada Basin, Arctic Ocean, J. Geophys. Res. Oceans, 119, doi:10.1002/2013JC009197

Submitted by Maite Maldonado (mmaldonado@eos.ubc.ca).

ANNUAL REPORT ON GEOTRACES ACTIVITIES IN CHINA-BEIJING
MAY 2014 – JUNE 2015

Major progress in GEOTRACES-relevant activities in China during the year is highlighted by the start of the construction of two research vessels which are designed with chemically clean laboratories and sampling facilities, one for Xiamen University and the other for Ocean University of China.

The first Chinese cruise dedicated to GEOTRACES GP06-CN (PN) is planned for 19 Oct. - 2 Nov., 2015 with Jingling Ren / Meixun Zhao and Minhan Dai (Jing Zhang) as co-chief scientists using *R/V Dongfanghong 2* of Ocean University of China. Clean facilities in place for the cruise include X-Niskin bottles, Kevlar cable/electric winch, clean booth for sampling, and clean bench for filtration. Samples will be collected for the analysis of the following trace elements and isotopes: Al, Fe, Mn, REEs, Hg, 228Ra & 226Ra, 231Pa, 230Th, Δ14C (DIC), δ 15N (NO3), δ 13C (DIC), δ 30Si, δ 18O (H2O).

Despite current lack of facilities in China for GEOTRACES section cruises, several studies are relevant to GEOTRACES scientific activities. These include investigation of the influence of eastern Asian dust events on the geochemical behaviour of the particle active nuclides in Northwest Pacific using Th/Pa isotopes and study of the shelf-estuary interaction and CO2 source-sink and main regulating mechanisms in the river-dominated margin, the estimation of benthic flux of dissolved inorganic carbon into the Pearl River estuary and estimation of nutrient fluxes via submarine groundwater discharge using radium isotopes.

International collaboration is playing more active role in promoting GEOTRACES activities in China. For example, recent collaboration between China and Germany has led to the first results of non-traditional stable isotopes (Si) studies on samples from in the East China Sea.

Submitted by Liping Zhou (lpzhou@pku.edu.cn).

Overview

It has been a very difficult year for Taiwan oceanography community as we have lost our largest new R.V., the 3,000 ton *Ocean Researcher* V (OR/5), in October 2014. Due to the loss, our GEOTRACES cruises have been suspended. A 2000-ton new R.V. will be delivered at the end of 2016. Although it is designed for the operation of ROV, sediment coring, and mineral/energy survey, the R.V. will also be fully equipped with sampling capabilities for oceanography research. In addition, a 3000-ton R.V. (80 m in length) for oceanography research to replace OR/5 will be under construction in 2016 and is expected to be delivered in 2018. A complete trace metal clean sampling system will be installed on this vessel.

New results

We have determined the TEI composition of the dissolved and particulate samples collected in our 2nd GEOTRACES cruise, carried out in March 2014 and have obtained a lot of exciting new results from aerosols, seawater, size-fractionated SPM, and sinking particles samples. For example, the following figure exhibits the fate of the aerosol Fe in the oceanic region. Many manuscripts are under preparation.

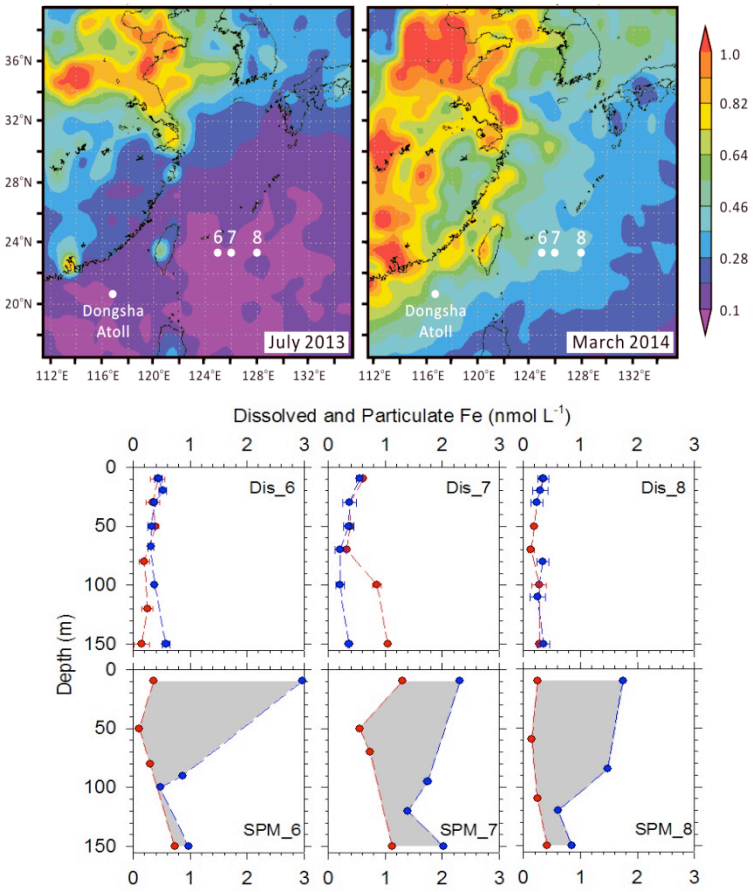

Figure 1. The comparison of MODIS aerosol optical depths and the distribution of dissolved and particulate Fe concentrations in the surface water of the offshore sampling station 6, 7, and 8 in the Western Philippine Sea in July 2013 (Red symbol) and March 2014 (Blue symbol) (Wang and Ho, in preparation).

New Publications (2014/6-2015/5)

- Huang, K.-F., D. W. Oppo and W. B. Curry (2014) Decreased influence of Antarctic Intermediate Water in the Tropical Atlantic during North Atlantic cold events, Earth Planet. Sci. Lett. doi:10.1016/j.epsl.2013.12.037
- **Jiann, Kuo-Tung** and Peng Ho (2014) Cadmium mixing behavior in estuaries: Redox controls on removal and mobilization. Terrestrial, Atmospheric and Oceanic Sciences, 25(5), 655-664. DOI: 10.3319/TAO.2014.04.01.01
- **Jiann, Kuo-Tung**, Liang-Saw Wen and Ching-Ling Wei (2014) Spatial and temporal distribution of trace metals (Cd, Cu, Ni, Pb, and Zn) in near-shore waters off the west coast of Taiwan. Terrestrial, Atmospheric and Oceanic Sciences, 25(1), 121-135.DOI: 10.3319/TAO.2013.09.13.01
- Rodriguez, I. B. and **T.-Y. Ho** (2015) Influence of Co and B12 on the growth and nitrogen fixation of *Trichodesmium*. *Frontiers in Microbiology* 6: 623. doi:10.3389/fmicb. 2015.00623.
- Wei, C.-L., P.-R. Chen, S.-Y. Lin, D. D. Sheu, L.-S. Wen, and W.-C. Chou (2015) Distributions of 210Pb and 210Po in surface waters surrounding Taiwan: A synoptic observation. Deep-Sea Res II, 117, 155-166. doi: 10.1016/j.dsr2.2014.04.010
- Wei, C.-L., M.-C. Yi, S.-Y. Lin, L.-S. Wen, and W.-H. Lee (2014) Seasonal distributions and fluxes of 210Po and 210Pb in the Northern South China Sea, Biogeosciences, 11, 6813-6826, doi:10.5194/bg-11-6813-2014.
- Yang, S.-C., D.-C. Lee, **T.-Y. Ho**, L.-S. Wen, and H.-H. Yang (2014) The isotopic composition of dissolved cadmium in the water column of the West Philippine Sea. *Frontiers in Marine Science* doi:10.3389/fmars.2014.00061.

Other activities

- Dr. Tung-Yuan Ho has received 5-yr funding (2015 to 2019) from Academia Sinica to study trace metal-nitrogen fixation interaction in marine diazotrophic cyanobacteria. Dr. Kuo-Fang (Denner) Huang, an assistant research fellow at Academia Sinica, has been supported to establish Taiwan 4th MC-ICPMS system (Neptune Plus). Dr. Haojia (Abby) Ren, an expert by using nitrogen isotope to study marine biogeochemistry, has joined the department of geosciences at National Taiwan University as an assistant professor in August 2014.

Submitted by Tung-Yuan Ho (tyho@gate.sinica.edu.tw).

ANNUAL REPORT ON GEOTRACES ACTIVITIES IN CROATIA
MAY 2014 – JUNE 2015

The Croatian GEOTRACES activities were related to: 1) improvement of electrochemical methods, which in combination with ICPMS, are used for trace metals speciation (including interaction with organic matter and sulfur species), 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, 4) development of electroanalytical methods (amperometry) for chalcogenide nanoparticles determination in natural waters, 5) characterization of marine aerosolos regarding presence of organic matter, sulfur species and trace metals.

Meetings
Organization of the open workshop and symposium within SCOR 139 working group 'Organic Ligands – A Key Control on Trace Metal Biogeochemistry in the Ocean' in Sibenik, Croatia, April 2015.
Active participation in the COST Actions ES1205, ES1302 and TD1105, and SCOR WG 139 and 145.

Selected Publications

- Pižeta, Ivanka; Sander, Sylvia; Hudson, Robert; Omanović, Dario; Baars, Oliver; Barbeau, Katherine; Buck, Kristen; Bundy, Randelle; Carrasco, Gonzalo; Croot, Peter; Garnier, Cédric; Gerringa, Loes; Gledhill, Martha; Hirose, Katsumi; Kondo, Yoshiko; Laglera, Luis; Nuester, Jochen; Rijkenberg, Micha; Takeda, Shigenobu; Twining, Benjamin; Wells, Mona. Interpretation of complexometric titration data: An intercomparison of methods for estimating models of trace metal complexation by natural organic ligands. // Marine chemistry. 173 (2015) 3-24.
- Omanović, Dario; Garnier, Cédric; Pižeta, Ivanka. ProMCC: an all-in-one tool for trace metal complexation studies. Marine chemistry. 173 (2015) 25-39.
- Bura-Nakić E, Marguš M, Jurašin D, Milanovic I, Ciglenecki I,(2015) Chronoamperometric study of elemental sulfur (S) nanoparticles (NPs) in NaCl water solution: new methodology for S NPs sizing and detection, Geochem.Transaction. 16:1, DOI: 10.1186/s12932-015-0016-2.
- E. Bura-Nakić, M. Marguš, I. Milanović, D. Jurašin, I. Ciglenečki. The development of electrochemical methods for determining nanoparticles in the environment. Part II: Chronoamperometric study of FeS in sodium chloride solutions, Environ. Chem. 11 (2014) 187
- M. Marguš, N. Batina, I.Ciglenečki, The development of electrochemical methods for determining nanoparticles in the environment. Part I: Voltammetry and in-situ ES-STM study of FeS in sodium chloride solutions. Environ. Chem. 11 (2014) 181.
- I. Milanović, D.Krznarić, E Bura-Nakić, I.Ciglenečki, Deposition and dissolution of metal sulfide layers at a Hg electrode surface in seawater electrolyte conditions. Environ. Chem. 11 (2014) 167.
- Strmečki, Slađana; Dautović, Jelena; Plavšić, Marta. Constant current chronopotentiometric stripping characterization of organic matter in seawater from the northern Adriatic, Croatia. // Environmental chemistry. 11 (2014) , 2; 158-166.

- Vukosav, Petra; Mlakar, Marina. Speciation of biochemically important iron complexes with amino acids: L-aspartic acid and L- aspartic acid - glycine mixture. // Electrochimica acta. 139(2014) , 1; 29-35 (članak, znanstveni).
- Vukosav, Petra; Mlakar, Marina; Cukrov, Neven; Kwokal, Željko; Pižeta, Ivanka; Pavlus, Natalija; Špoljarić, Ivanka; Vurnek, Maja; Brozinčević, Andrijana; Omanović, Dario. Heavy metal contents in water, sediment and fish in a karst aquatic ecosystem of the Plitvice Lakes National Park (Croatia). Environmental science and pollution research international. 21 (2014) , 5; 3826-3839 (članak, znanstveni).
- Dautović, Jelena; Fiket, Željka; Barešić, Jadranka; Ahel, Marijan; Mikac, Nevenka. Sources, distribution and behavior of major and trace elements in a complex karst lake system. Aquatic geochemistry. 20 (2014) , 1; 19-38 (članak, znanstveni).

New equipment

- Automated Low-Volume Aerosol Sampling Device, SEQ 47/50-CD-RN (150 000,00 Kn) bought in the frame of HRZZ project 1205 „The Sulphur and Carbon dynamics in the Sea- and Fresh-water EnviRonmEnt“
- Cell culture climate chamber bought in the frame of HRZZ project 8607 “Appearance and interaction of biologically important organic molecules and micronutrient metals in marine ecosystem under environmental stress”

New projects supported by the Croatian Ministry of Science, Education and Sport and Croatian Science Foundation (CSF)

- 2014-2018 CSF project: “Appearance and interaction of biologically important organic molecules and micronutrient metals in marine ecosystem under environmental stress”
- 2014-2018 CSF project: „The Sulphur and Carbon dynamics in the Sea- and Fresh-water EnviRonment“
- 2014-2018 CSF project: „Transport and Chemodynamics of Trace Elements in Freshwater and Coastal Sedimentary Systems„
- NEWFELLPRO project 2014-2017 “Using lakes to develop isotopic tools for understanding ocean redox through Earth history”

Submitted by Irena Ciglenecki Jusic (Irena.Ciglenecki-Jusic@irb.hr).

Science highlights

The KEOPS2 (Process study GIpr01), 2011, PI S. Blain (LOMIC, Banyuls, France)

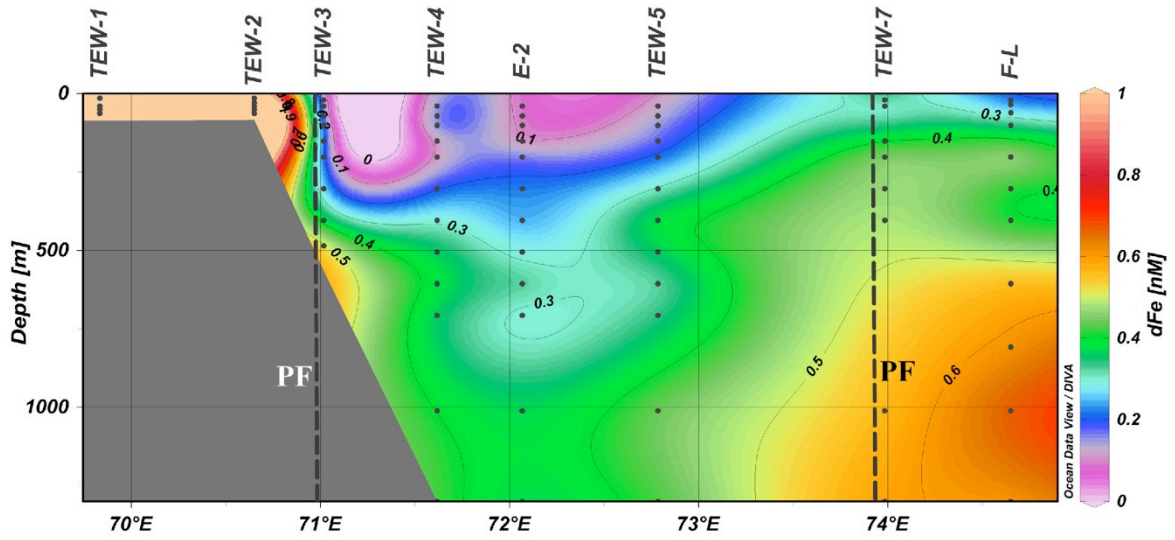

Figure 2: Concentrations of dFe (nmol L^{-1}) over an East-West transect carried out during the KEOPS2 cruise (Quéroué et al., 2015). The PF position is indicated with black dashed lines. One of the challenges proposed by KEOPS2 was to investigate the sources and fate of iron in the highly dynamic region east of Kerguelen Islands. Combining the dissolved iron concentrations measured in the water column and the new knowledge gathered on the circulation (including mesoscale features) by in situ and satellite observations, we demonstrated that the properties of the chlorophyll plume extending eastward of the plateau is well explained, qualitatively and quantitatively, by a source of iron located on the Kerguelen Plateau and a Lagrangien transport offshore.

A total of 44 articles were published related to the KEOPS2 process study, including a special issue in Biogeosciences (2014-2015) with 33 papers.

http://www.biogeosciences-discuss.net/special_issue133.html

The GEOTRACES-Mediterranean & Black Seas (GA04N), 2013, PI M. Rijkenberg (NIOZ, NL)

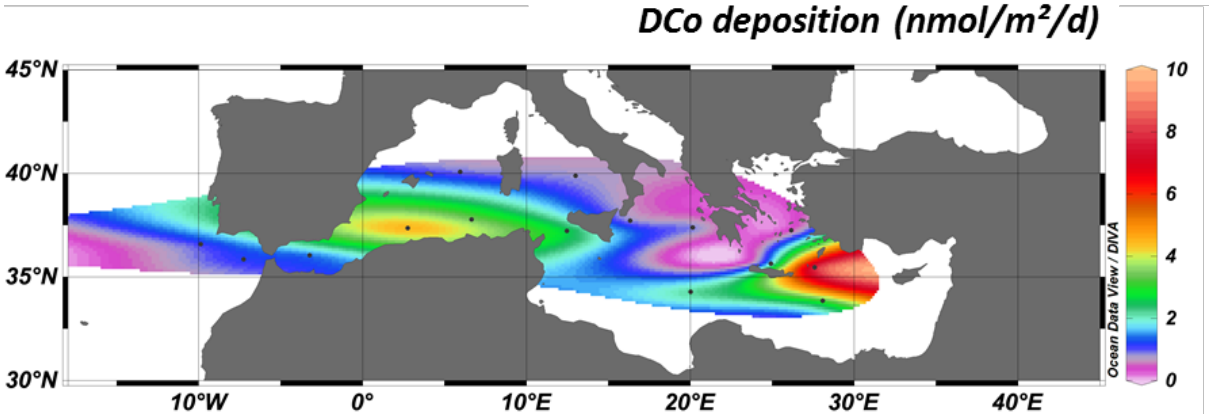

Figure 3: A new dust deposition model was developed using the particulate aluminium data as a tracer of dust deposition. Using this model together with dissolved and particulate cobalt concentrations showed the predominance for Co of high Saharan inputs in the Eastern and Central basins and of anthropogenic inputs in the North (Dulaquais, Boye, et al.).

The GEOVIDE cruise (GA01), 2014, PIs G. Sarthou (LEMAR, France) and P. Lherminier (LPO, France)

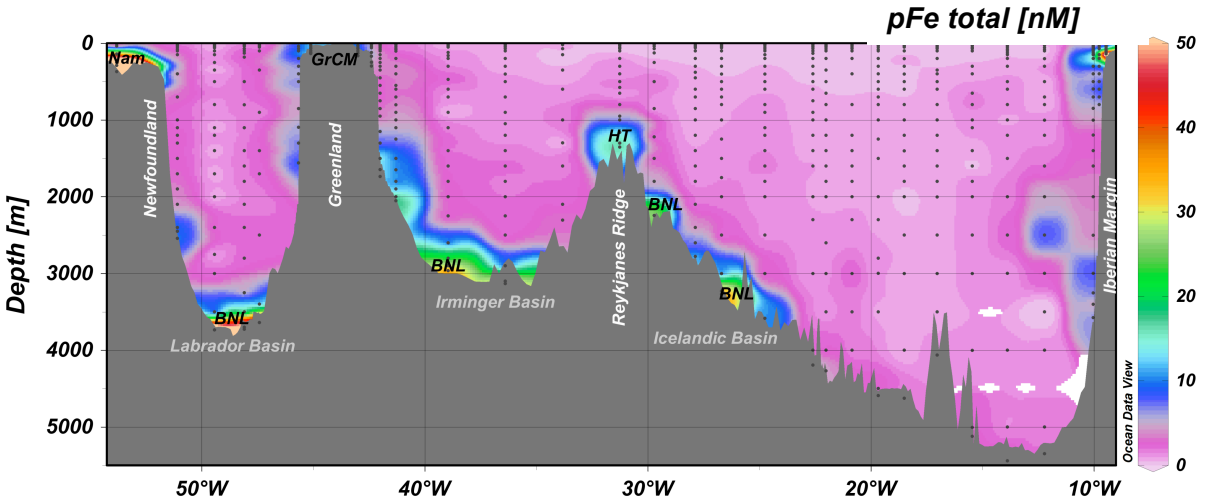

Figure 4: Distribution of total particulate Fe along the GEOVIDE section (Planquette, Gourain, Cheize, et al.). Concentrations ranged from 9 pM to 304 nM (median concentration 1.15 nM). Inputs from Benthic Nepheloid Layers (BNL) and Hydrothermal activity (HT) are clearly seen on the figure.

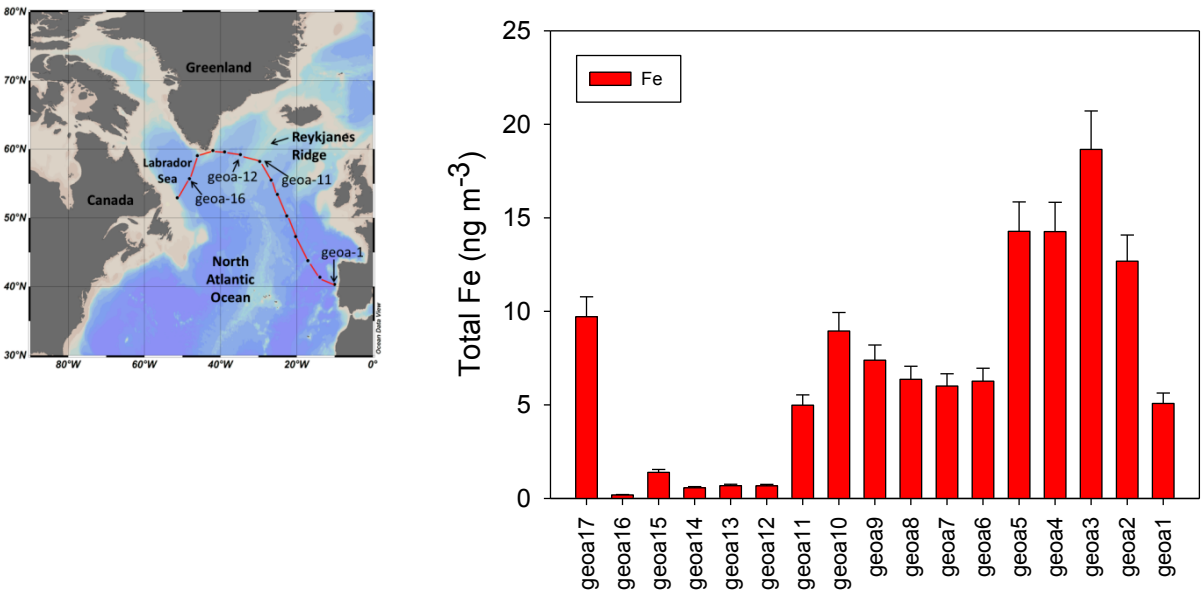

Figure 5: Distribution of total aerosol Fe along the GEOVIDE section (Shelley and Sarthou). Concentrations are low (0.19-18.7 ng m^{-3}) and are correlated to total aerosol Al, suggesting a common lithogenic source.

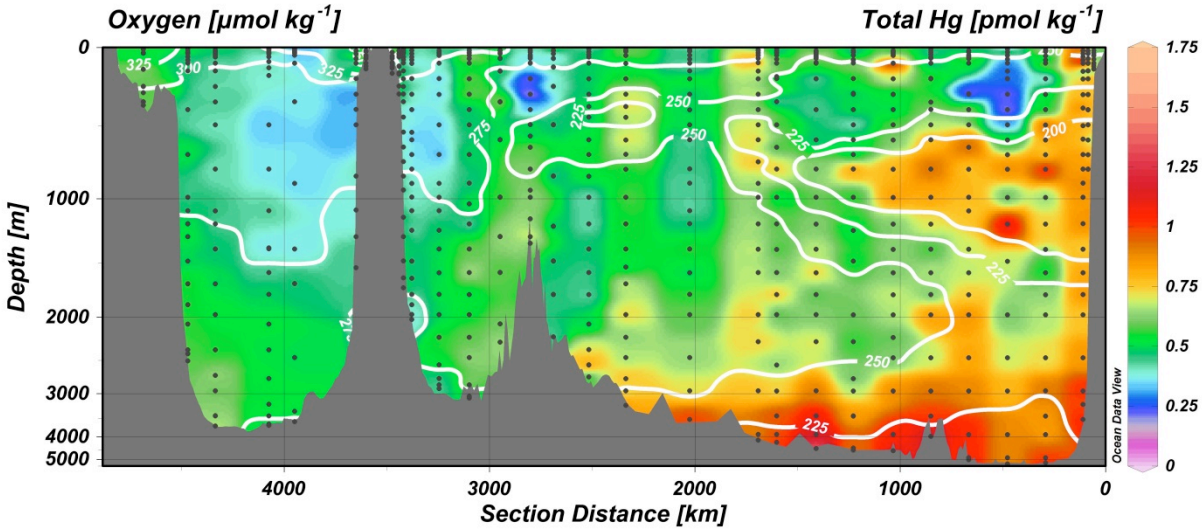

Figure 6: Distribution of total Hg along the GEOVIDE section (Cossa, Heimbürger et al.). Extremely low concentrations (<0.5 pM) were observed in the convection zone, highlighting the efficiency of the implementation of global anti-pollution policies around the North Atlantic Ocean.

Peer-review publications

2014

- Bowie A.R., van der Merwe, P., Quéroué, F., Trull, T., Fourquez, M., Planchon, F. Sarthou, G., Chever, F., Townsend, A.T., Obernosterer, I., Sallée, J.-B., Blain, S., 2014, Iron budgets for three distinct biogeochemical sites around the Kerguelen plateau (Southern Ocean) during the natural fertilization experiment KEOPS-2,. Biogeosciences Discussions KEOPS 2 special issue, 11, 17861-17923.
- Christaki U., Lefèvre D., Georges C., Colombet J., Catala P., Courties C., Sime-Ngando T., Blain S., Obernosterer I. 2014. Microbial food web dynamics during spring phytoplankton blooms in the naturally iron-fertilized Kerguelen area (South-ern Ocean). Biogeosciences, 11, 6739-6753, doi:10.5194/bg-11-6739-2014.
- Closset I., Lasbleiz M., Leblanc K., Quéguiner B., Cavagna A.-J., Elskens M., Navez J., Cardinal D. 2014. Seasonal evo-lution of net and regenerated silica production around a natural Fe-fertilized area in the Southern Ocean estimated with Si isotopic approaches. Biogeosciences, 11, 5827-5846, doi:10.5194/bg-11-5827-2014.
- Cossa D., Garnier C., Buscail R., Elbaz-Poulichet F., Mikac N., Patel-Sorrentino N., Tessier E., Rigaud S., Lenoble V., Gobeil C., 2014. A Michaelis–Menten type equation for describing methylmercury dependence on inorganic mercury in aquatic sediments, Biogeochemistry 119, 35-43
- Dang D. H., Tessier E., Lenoble V., Durrieu G., Omanovic D., Mullot J.-U., Pfeifer H.R., Mounier S., Garnier C., 2014. Key parameters controlling arsenic dynamics in coastal sediments: an analytical and modelling approach, Marine Chemistry 161, 34-46
- Dulaquais, G., Boye, M., Rijkenberg, M.J.A., and Xavier Carton (2014) Physical and remineralization processes govern the cobalt distribution in the deep western Atlantic Ocean. BIOGEOSCIENCES, 11, 1561-1580, doi:10.5194/bg-11-1561-2014.
- Dulaquais, G., Boye, M., Middag, R., Owens, S., Puigcorbe, V., Buesseler, K., Masqué, P., de Baar, H.J.W., Carton, X. (2014) Contrasting biogeochemical cycles of cobalt in the surface western Atlantic Ocean. GLOBAL BIOGEOCHEMICAL CYCLES, 28(12), 1387-1412, doi:10.1002/2014GB004903.
- Georges C., Monchy S., Genitsaris S., Christaki U. 2014. Protist community composition during early phytoplankton blooms in the naturally iron-fertilized Kerguelen area (Southern Ocean). Biogeosciences, 11, 5847-5863, doi:10.5194/bg-11-5847-2014.
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Other publications

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PhD

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- Llort Joan, 2015, LOCEAN, Université Pierre & Marie Curie. Influence des apports de Fer sur la variabilité de la production primaire et des flux de CO2 dans l'Océan Austral, PhD, 9 janvier 2015.
- Quéroué F., 2014, Trace metals distributions in the Southern Ocean: Kerguelen Plateau process study, PhD, co-tutelle University of Brest and University of Tasmania. Supervision G. Sarthou, A. Bowie, E. Bucciarelli, and D. Lannuzel.

International conferences

2014

- Boye, M., Delebecque, N., Sicre, M.-A., Diadhiou, H.D., Schmidt, S., Ndiaye, D., de la Broise, D., Brehmer, P. (2014) Development of new proxies to assess the 20th century variability of the North West African upwelling. 1st International Conference AWA, 9-11 December 2014, Dakar, Senegal.
- Boye, M., Giraud, M., Garçon, V., Donval, A., de la Broise, D. (2014) Assessing the impact on microphytoplankton of an artificial upwelling. 1st International Conference AWA, 9-11 December 2014, Dakar, Senegal.
- Heimbürger LE, D Cossa, JE Sonke, F Lacan, P Lherminier, G Sarthou, Mercury in the North Atlantic - results of the 2014 GEOTRACES GEOVIDE cruise, AGU Fall Meeting 2014, San Francisco, USA, (12/2014), Invited talk
- Heimbürger LE, JE Sonke, MJA Rijkenberg, L Gerringa, HJW de Baar, Mercury in the Black Sea - results of the 2013 GEOTRACES MEDBlack cruise, AGU Fall Meeting 2014, San Francisco, USA, (12/2014)
- Heimbürger LE, Current status and future needs in Hg research & management, 2014 International Mercury Symposium, Jeju, South Korea (02/2014)
- Landa M., S. Blain, U. Christaki, S. Monchy, I. Obernosterer. Link between bacterial diversity and productivity in a mosaic of phytoplankton blooms. IMBER Open Science Conference 'Future Oceans', Bergen, May 2014.
- Lemaitre, N. Bayon, G., Ondréas, H, Freslon, N., Bollinger, C., Rouget, M.L., De prunelé, A., Ruffine, L., Olu, K., Sarthou, G., Trace element behaviour and the export of organically-bound dissolved iron at cold seeps, 2014, Goldschmidt meeting, Sacramento, 8-13 June.
- Sanial V., Charette M., Moore W., Henderson P., Kipp L. and van Beek P. "Radium as a tracer of benthic trace element inputs from the Peruvian continental margin (2013 U.S. Pacific GEOATRCES cruise)". AGU Fall meeting, San Francisco (California, USA), December 2014
- Sanial V., van Beek P., Lansard B., Kestenare E., Souhaut M., d'Ovidio F., Zhou M. and Blain S. Use of Ra isotopes to track sediment derived-inputs from Crozet and Kerguelen Islands. 5th international Ra-Rn Workshop. Arraial do Cabo, Brazil, August 2014
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- Sutton, J.N., Boye, M., de la Broise, D., Probert, I. (2014) Influence of Cd, Co, Zn on specific growth rate, elemental quota, and inorganic carbon acquisition in Emiliania huxleyi. AGU 2014, 15-19 December 2014, San Francisco, USA.

2015

- Cheize, M.; Planquette, H. F.; Fitzsimmons, J.; Sherrell, R. M.; Sarthou, G.; Bucciarelli, E.; Lambert, C.; Le Goff, M.; Viollier, E., 2015 Contribution of suspended marine particles to the dissolved trace metals pool: an experimental study with sediments from contrasting environments, ASLO meeting, Granada, Spain, Feb. 2015
- Cindrić A.-M., Garnier C., Oursel B., Pižeta I., Omanović D. 2015. Natural and anthropogenic processes controlling trace metals dynamic in a highly stratified estuary: the Krka River estuary (Adriatic, Croatia), 13th International symposium on Estuarine Biogeochemistry (IEBS 2015), Bordeaux, 7-10 Juin 2015
- Cossa , LE Heimbürger, JE Sonke, Y Zhang, F Lacan, P Lherminier, G Sarthou, Mercury in the North Atlantic Ocean - results of the 2014 GEOTRACES GEOVIDE cruise, 12th International Conference on Mercury as a Global Pollutant, Jeju, South Korea (06/2015)
- Garnier C., Omanović D., Mounier S., Pižeta I., Seppecher P. 2015. PROSECE – a flexible fitting tool to investigate binding interactions, Workshop "Organic Ligands - A Key Control of Trace Metal Biogeochemistry in the Oceans", Sibenik, Croatie, 7-11 avril 2015
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- Godrant, A.; Bucciarelli , E.; Sarthou, G.; Le Grand , F.; Long, M.; Soudant, P.; Pichereau, V.; Otero-Ferrer, J. L.; Scharek, R., 2015, Iron limitation and Fe/Cu co-limitation driving photosynthesis and lipid strategies of the marine diatom T. pseudonana: a pluridisciplinary approach, ASLO meeting, Granada, Spain, Feb. 2015
- Gourain, A., Planquette, H., Cheize M., Menzel, J.-L., Boutorh J., Shelley R., Pereira Contreira L., Bucciarelli E., Sarthou G., Bassoullet, C., 2015, Size fractionated particulate iron along the GEOVIDE section (GEOTRACES section GA01), ASLO meeting, Granada, Spain, Feb. 2015.
- Heimbürger LE, C Lagane, L Laffont, D Cossa, JE Sonke, Mercury measurements in the oceans - results of the 2013 and 2014 GEOTRACES intercalibration exercises, 12th International Conference on Mercury as a Global Pollutant, Jeju, South Korea (06/2015). Invited talk
- Heimbürger LE, D Cossa, A Schartup, C Lagane, L Laffont, JE Sonke, Methylmercury production in the oceans: links to physics, chemistry and biology, 12th International Conference on Mercury as a Global Pollutant, Jeju, South Korea (06/2015). Invited talk
- Lherminier, P., Mercier, H., Sarthou, G., Perez, F., and García, M., Circulation and water masses across the GEOVIDE section, Geophysical Research Abstracts, Vol. 17, EGU2015-14216, 2015, EGU General Assembly 2015
- Menzel, J. L.; Schlosser, C.; Planquette, H.; Cheize, M.; Boutorh, J.; Shelley, R.; Contreira, L.; Gledhill, M.; Sarthou, G.; Achterberg, E. P.: High resolution dissolved aluminum (dAl) measurements along the GEOVIDE section (geotraces section GA01) and aerosol deposition rates to the north Atlantic, ASLO meeting, Granada, Spain, Feb. 2015
- Rosati G, LE Heimbürger, JE Sonke, MJA Rijkenberg, L Gerringa, HJW de Baar, Developing a methylmercury dynamic model for the Black Sea, 12th International Conference on Mercury as a Global Pollutant, Jeju, South Korea (06/2015)
- Sarthou, G., Quéroué, F., Chever, F., van der Merwe, P., Lannuzel, D., Townsend, A.T., Bucciarelli, E., Planquette, H.F., Cheize, M., Blain, S., d'Ovidio, F. and Bowie, A.R., High variability of dissolved iron concentrations in the vicinity of the Kerguelen Island (Southern Ocean), 3rd International Symposium on the Effects of Climate Change on the World's Oceans, Santos, Brazil, March 23-27

- Shelley, R. and Sarthou, G. 2015, Elemental composition of atmospheric deposition during the GEOVIDE campaign (Lisbon, Portugal-St John's, Canada; GEOTRACES GA01), Aquatic Sciences Meeting, Granada, Spain. 22-26 Feb.
- Soerensen AL, DJ Jacob, A Schartup, JA Fisher, I Lehnherr, Vl StLouis, LE Heimbürger, JE Sonke, An evaluation of internal production and external sources of methylmercury in the Arctic Ocean, 12th International Conference on Mercury as a Global Pollutant, Jeju, South Korea (06/2015)
- van Beek P., Stieglitz T., Souhaut M., Study of SGD along the French Mediterranean coastline using airborne TIR images and in situ analyses, European Geosciences Union General Assembly 2015 Vienne, Autriche, 12-17 avril 2015
- Zhang Y, LE Heimbürger, D Cossa, JE Sonke, F Lacan, P Lherminier, G Sarthou, Mercury in the North Atlantic Ocean - direct comparison of model and observations along the 2014 GEOTRACES GEOVIDE cruise transect, 12th International Conference on Mercury as a Global Pollutant, Jeju, South Korea (06/2015)

National conferences

2014

- Heimbürger LE, Mercury in the Oceans, Réunion des Sciences de la Terre, Pau, France (10/2014). Keynote talk
- Cossa D, LE Heimbürger, JE Sonke, F Lacan, P Lherminier, G Sarthou, Mercury distribution in the North Atlantic Ocean - results of the 2014 GEOTRACES GEOVIDE cruise, Réunion des Sciences de la Terre, Pau, France (10/2014)

2015

- Delebecque, N., Sicre, M.-A., Boye, M. (2015) Development of new proxies of pH and SST in coccoliths to assess the 20th century variability in semi-enclosed seas. Journées de la Paléocéanographie, Paleocean 2015, 4-6 Février 2015, IUEM/IPEV/IFREMER, Brest, France.

Cruises

2014

- GEOVIDE (15 May-30 June, PIs G. Sarthou and P. Lherminier): http://geovide.tumblr.com/, http://www.geovide.obs-vlfr.fr/
- L.-E. Heimbürger and D. Cossa coordinated the 2014 GEOTRACES intercalibration exercise for total mercury and methylmercury in sea water on the GEOVIDE cruise.

2015

- TransArc II coordination of the 2015 GEOTRACES intercalibration exercise for total mercury and methylmercury in sea water (LE Heimbürger)
- CIO-CALHIS, Peru upwelling, 22-28 April 2015, Peruvian *RV Olaya* (M. Boye, related to theme 3 of GEOTRACES).

New funding

- proCOCA project (Calibration of proxies (pH and SSTs) in coccoliths, PI M. Boye) supported by CNRS/INSU LEFE-CYBER - Related to theme 3 of GEOTRACES.
- GEOBRAMA : a GEOtraces trial study within the BRAzil-MALvinas convergence, H. Planquette and G. Sarthou. Coll. L.F. Niencheski and L. Contreira (FURG, Brazil).
- MERMEX C3A action: MISTRALS
- MEBTRACE project: Croatian National Research Foundation (HR NZZ)

Other activities

Special session, theme organizers/chairs or co-convenors:

- 3rd International Symposium on the Effects of Climate Change on the World's Oceans, Santos, Brazil, March 23-27 2014, S3. Changing Ocean Chemistry: From Trace Elements and Isotopes to Radiochemistry and Organic Chemicals of Environmental Concern (G. Sarthou and A. Peña)
- European Geophysical Union EGU, session "Hydrogeology of coastal zones: processes, consequences and potentials, G. Houben, E. Zechner, G.H.P. Oude Essink , T. Graf, P. de Louw , U. Mallast , P. Van-Beek , and C. Siebert", Avril 2015, Vienne, Asutria
- 12th International Conference on Mercury as a Global Pollutant, Integrating marine observational studies and model development, AL Soerensen & LE Heimbürger, , Jeju, South Korea (06/2015)
- Goldschmidt 2015, Prague; CZ, August 16-21 2015, Theme 2: Ocean Geochemistry. Present Conditions and Past Variation: Fluxes, reservoirs and processes. G.Sarthou and A. Bowie
- Goldschmidt 2015, Prague; CZ, August 16-21 2015, Theme 2, Session 02a Trace Metals in the Ocean: Distributions, Isotopic Variation and Speciation, K. Barbeau, A. Bowie, K. Buck, R. Middag, C. Pearce, P. Pogge von Strandmann, and G. Sarthou.
- Ocean Science meeting, 21-26 February 2016, New Orleans, USA, The role of particles in the cycling of trace elements and their isotopes in the ocean, H. Planquette, P. Lam, B. Twining. Session Proposal
- Ocean Science meeting, 21-26 February 2016, New Orleans, USA, Trace Elements and Isotopes at the Interfaces of the Atlantic Ocean, G. Sarthou, E. Boyle, G. Henderson, M. Rijkenberg. Session Proposal.
- Coupled meeting and workshop: "The biological and climatic impacts of ocean trace-element chemistry" and "Quantifying fluxes and processes of trace-metal cycling at ocean boundaries", 7-9 December 2015, London, G. Henderson, E. Boyle, M. Lohan, M. Rijkenberg and G. Sarthou
- Ocean Science meeting, 21-26 February 2016, New Orleans, USA, Integrating approaches to understanding the distribution and transfer of trace elements in the upper water column, R. Shelley, P. Morton, S. Kumar Singh. Session Proposal.

Workshop organization:

- 12th International Conference on Mercury as a Global Pollutant, water & sediment sampling, Jim Hurley, Seunghee Han, LE Heimbürger, Brooks Rand Labs, Jeju, South Korea (06/2015)
- 12th International Conference on Mercury as a Global Pollutant, GEOTRACES Intercalibration exercises for Hg species in seawater discussion forum, LE Heimbürger, Jeju, South Korea (06/2015). http://mercury2015.com/sub/sub02_05_pop16.asp
- GEOVIDE post-cruise meeting, 26-27 May 2015, Plouzané Brest, G. Sarthou and P. Lherminier. http://www.geovide.obs-vlfr.fr/meetings/

Public outreach

GEOVIDE Cruise:

- Novela, Toulouse, Oct. 2014 (interviews and movie) http://www.geotraces.org/outreach/other-outreach-materials/videos
- Sea Tech Week, Brest, Oct 2014 (photo exhibition)

Submitted by Geraldine Sarthou (Geraldine.Sarthou@univ-brest.fr).

Activities

- The Intermediate Data Product (IDP) Version 2 has been compiled and published by Reiner Schlitzer (http://www.bodc.ac.uk/geotraces/data/idp2014/). It contains both corrected and new data as well as additional data formats (excel and netCDF).
- The publication about the IDP14 in Marine Chemistry was lead by Reiner Schlitzer.
- GEOMAR received the winch (LEBUS) for the GO-FLO rosette, completing the acquisition of a trace metal clean sampling system. A short test cruise on R/V Alkor in the Baltic Sea is planned for the end of June 2015.
- Analysis of collected samples and publication of results continue.

Selected Research Highlights

South Atlantic Cd concentrations: New Cd concentration data along GEOTRACES GA02 in the southwest Atlantic suggest that the kink in the global dissolved Cd/PO_4 relationship is likely due to the injection of Subantarctic Mode Water (SAMW) into the thermocline. Significantly lower Cd concentrations in equatorial intermediate water compared to the southern stations is attributed to the influence of low-Cd waters originating in the oxygen-depleted zone of the Angola Basin that are brought in via the Benguela and Equatorial Currents. The study by Xie *et al*. is in press in Marine Chemistry.

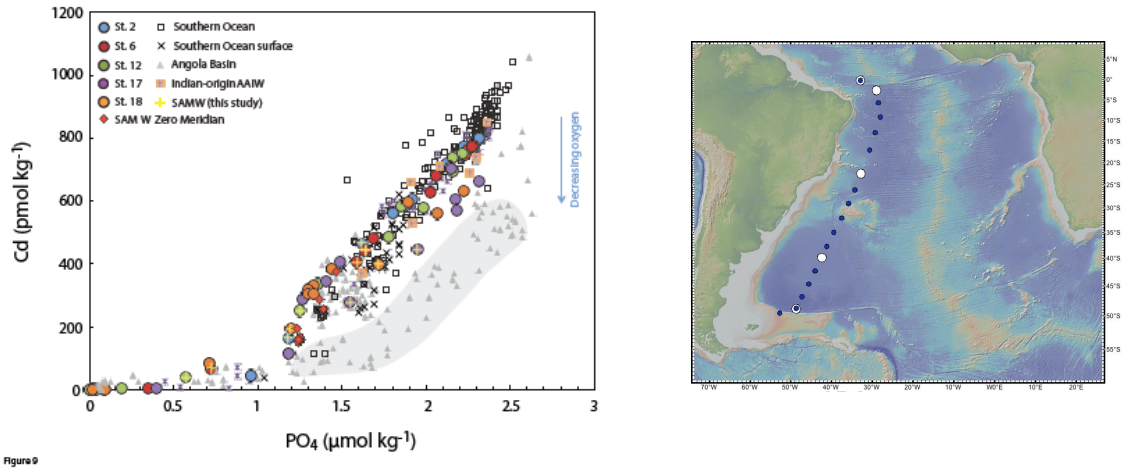

Figure 7: Evaluation of the Cd-PO_4 systematics at the scale of the South Atlantic Basin (colored circles - this study) and map of stations (GA02) (Xie et al., Marine Chemistry, in press).

South Pacific [Nd] and ε_{Nd}: The first seawater ε_{Nd} and [Nd] profiles across the South Pacific circum-Antarctic fronts have been published recently (Basak *et al.,* EPSL, 2015). The GEOTRACES-compliant data, collected on *R/V Polarstern* cruise PS75, show a clear ε_{Nd} signature of Ross Sea Bottom Water (ε_{Nd} ~ -7) and meridional [Nd] changes that follow the density structure of the South Pacific. The latter suggests a lateral component for the processes controlling [Nd] in the Southern Ocean.

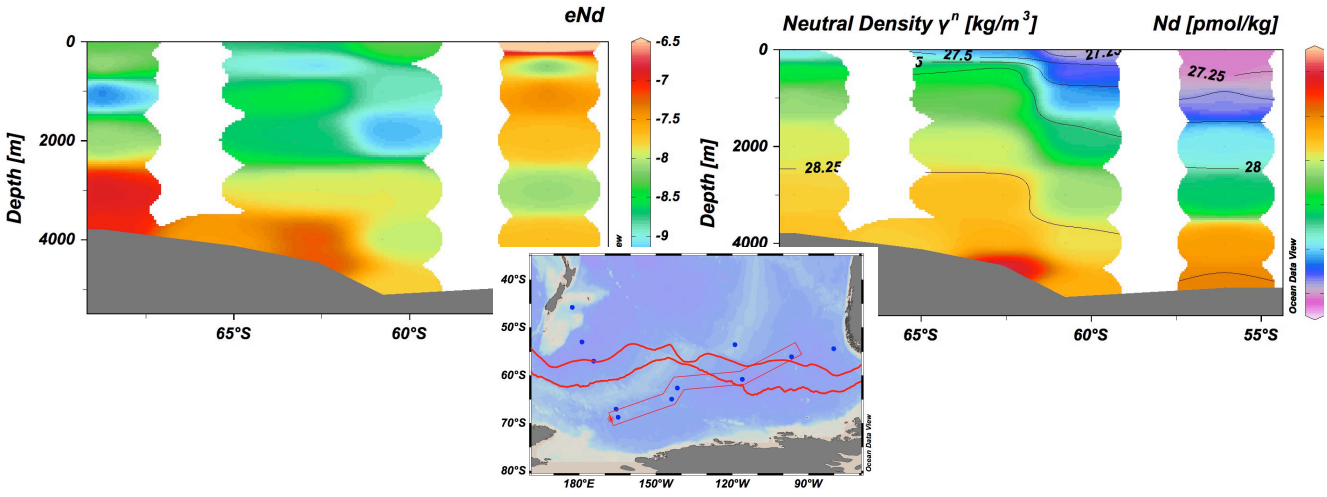

Figure 8: Distribution of ε_{Nd} and [Nd] across the South Pacific frontal system (map) from the Ross Sea into the southeast Pacific. ***Left:*** *Distribution of dissolved ε_{Nd};* ***right:*** *Distribution of [Nd] with neutral density contours. Data from Basak et al. (2015).*

Cruises

- GEOTRACES Southeast Atlantic cruise (GA08) on R/V Meteor has been approved and will take place Nov. 22 – Dec 26, 2015 (PIs: E. Achterberg, M. Frank, A. Koschinsky). The cruise will focus on the distribution of TEIs in the South East Atlantic under the influence of the Benguela upwelling, the Namibian desert, and the Congo and Orange river discharge.
- GEOTRACES Indian Ocean cruise (GI05) on R/V Sonne has been approved and will likely be scheduled for early 2017 (PIs: E. Achterberg, M. Frank).
- GEOTRACES Arctic cruise (TransArcII, Aug.-Oct. 2015) on R/V Polarstern: Several planning meetings were held at the Alfred Wegener Institute in Bremerhaven in 2014. GEOTRACES PIs: Michiel Rutgers van der Loeff (GEOTRACES chief-scientist), Lars-Eric Heimbürger (Univ. Bremen), Michael Staubwasser (Univ. Köln), Stephen Galer (MPI Mainz), Katharina Pahnke (MPI, Univ. Oldenburg).
- GEOTRACES Process Study: The cruise to the oligotrophic South Pacific gyre on R/V Sonne is scheduled for Dec. 2015-Jan. 2016. GEOTRACES PIs: K. Pahnke (Nd isotopes, REE), P. Croot (trace metals), R. Anderson (Th, Pa isotopes), C. Ehlert (Si isotopes).

Proposals

- Proposal submitted to the DFG (PI: A. Koschinsky):'Input, particle reactivity, and (bio)geochemical cycling of the transition metals from subgroups IV, V and VI (Ti-Zr-Hf, V-Nb-Ta, Cr-Mo-W)' (renewal proposal for an extension of the original DFG-project related to cruise M81/1 (GA11)). The project will focus on the distribution of V and Mo, and Cr redox species in the South and North Atlantic, and the application of a recently published method for the determination of Ti, Hf, and Ta in seawater (samples from ANT-XXVIII/5, 2012, and M81/1, 2010).

Workshops & Meetings

Organized by German GEOTRACES people:

- Workshop: *GEOTRACES Intercalibration exercises for Hg species in seawater discussion forum:* http://mercury2015.com/sub/sub02_05_pop16.asp, L.-E. Heimbürger 12th International Conference on Mercury as a Global Pollutant, Jeju, South Korea
- Workshop: *Water & sediment sampling,* Jim Hurley, Seunghee Han, L.-E. Heimbürger, 12th International Conference on Mercury as a Global Pollutant, Jeju, South Korea

National and international service

- Germany is represented on the International GEOTRACES Standards and Intercalibration Committee by Walter Geibert (AWI) and Lars-Eric Heimbürger (Univ. Bremen), and on the SSC by Reiner Schlitzer (co-chair, AWI) and Katharina Pahnke (MPI/ICBM).
- Lars-Eric Heimbürger and Daniel Cossa coordinated the 2014 GEOTRACES intercalibration exercise for total mercury and methylmercury in seawater on the GEOVIDE cruise.

Other

- Lars-Eric Heimbürger moved to the University of Bremen
- Walter Geibert moved to the Alfred-Wegener Institute, Bremerhaven

Publications

- Abouchami, W., Galer, S.J.G., de Baar, H.J.W., Middag, R., Vance, D., Zhao, Y., Klunder, M., Mezger, K., Feldmann, H., Andreae, M.O., 2014. Biogeochemical cycling of cadmium isotopes in the Southern Ocean along the Zero Meridian. Geochimica et Cosmochimica Acta 127, 348-367. doi:10.1016/j.gca.2013.10.022.
- Basak, C., Pahnke, K., Frank, M., Lamy, F., Gersonde, R., 2015. Neodymium isotopic characterization of Ross Sea Bottom Water and its advection through the southern South Pacific. Earth and Planetary Science Letters 419, 211-221. doi:10.1016/j.epsl.2015.03.011.
- Hathorne, E., Stichel, T., Brück, B., and Frank, M. (accepted): Rare earth element distribution in the Atlantic sector of the Southern Ocean: the balance between particle scavenging and vertical supply. Marine Chemistry.
- Heimbürger, L.-E., Sonke, J.E., Cossa, D., Point, D., Lagane, C., Laffont, L., Galfond, B.T., Nicolaus, M., Rabe, B., van der Loeff, M.R., 2015. Shallow methylmercury production in the marginal sea ice zone of the central Arctic Ocean. Scientific Reports 5. doi:10.1038/srep10318
- Heimbürger, L.-E., Migon, C., Losno, R., Miquel, J.-C., Thibodeau, B., Stabholz, M., Dufour, A., Leblond, N., 2014. Vertical export flux of metals in the Mediterranean Sea. Deep Sea Research Part I: Oceanographic Research Papers 87, 14-23. doi:10.1016/j.dsr.2014.02.001.
- Lamborg, C.H., Hammerschmidt, C.R., Bowman, K.L., Swarr, G.J., Munson, K.M., Ohnemus, D.C., Lam, P.J., Heimbürger, L.-E., Rijkenberg, M.J.A., Saito, M.A., 2014. A global ocean inventory of anthropogenic mercury based on water column measurements. Nature 512, 65-68. doi: 10.1038/nature13563
- Mawji, E., Schlitzer, R. et al., in press. The GEOTRACES Intermediate Data Product 2014. Marine Chemistry. doi:10.1016/j.marchem.2015.04.005.

- Stichel, T., Hartman, A.E., Duggan, B., Goldstein, S.L., Scher, H., Pahnke, K., 2015. Separating biogeochemical cycling of neodymium from water mass mixing in the Eastern North Atlantic. Earth and Planetary Science Letters 412, 245-260. doi:10.1016/j.epsl.2014.12.008.
- Xie, R.C., Galer, S.J.G., Abouchami, W., Rijkenberg, M.J.A., De Jong, J., de Baar, H.J.W., Andreae, M.O., in press. The cadmium-phosphate relationship in the western South Atlantic – the importance of mode and intermediate waters on the global systematics. Marine Chemistry. doi:10.1016/j.marchem.2015.06.011.

Abstracts

- Heimbürger, L.-E., Lagane, C., Laffont, L., Cossa, D., Sonke, J.E., 2015. Mercury measurements in the oceans - results of the 2013 and 2014 GEOTRACES intercalibration exercises, 12th International Conference on Mercury as a Global Pollutant, Jeju, South Korea, June 2015 (invited talk).
- Heimbürger, L.-E., Cossa, D., Schartup, A., Lagane, C., Laffont, L., Sonke, J.E., 2015. Methylmercury production in the oceans: links to physics, chemistry and biology, 12th International Conference on Mercury as a Global Pollutant, Jeju, South Korea, June 2015 (invited talk).
- Cossa, D., Heimbürger, L.-E., Sonke, J.E., Zhang, Y., Lacan, F., Lherminier, P., Sarthou, G., 2015. Mercury in the North Atlantic Ocean - results of the 2014 GEOTRACES GEOVIDE cruise, 12th International Conference on Mercury as a Global Pollutant, Jeju, South Korea, June 2015.
- Rosati, G., Heimbürger, L.-E., Sonke, J.E., Rijkenberg, M., Gerringa, L., de Baar, H., 2015. Developing a methylmercury dynamic model for the Black Sea, 12th International Conference on Mercury as a Global Pollutant, Jeju, South Korea, June 2015.
- Soerensen, A., Jacob, D., Schartup, A., Fisher, J., Lehnherr, I., StLouis, V., Heimbürger, L.-E., Sonke, J.E., 2015. An evaluation of internal production and external sources of methylmercury in the Arctic Ocean, 12th International Conference on Mercury as a Global Pollutant, Jeju, South Korea, June 2015.
- Zhang, Y., Heimbürger, L.-E., Cossa, D., Sonke, J.E., Lacan, F., Lherminier, P., Sarthou, G., 2015. Mercury in the North Atlantic Ocean - direct comparison of model and observations along the 2014 GEOTRACES GEOVIDE cruise transect, 12th International Conference on Mercury as a Global Pollutant, Jeju, South Korea, June 2015.
- Heimbürger, L.-E., Cossa, D., Sonke, J.E., Lacan, F., Lherminier, P., Sarthou, G., 2014. Mercury in the North Atlantic - results of the 2014 GEOTRACES GEOVIDE cruise, AGU Fall Meeting, San Francisco, USA.
- Heimbürger, L.-E., Sonke, J.E., Rijkenberg, M., Gerringa, L., de Baar, H., 2014. Mercury in the Black Sea - results of the 2013 GEOTRACES MEDBlack cruise, AGU Fall Meeting 2014, San Francisco, USA.
- Heimbürger, L.-E., 2014. Mercury in the Oceans, Reunion des Sciences de la Terre, Pau, France (keynote talk)
- Cossa, D., Heimbürger, L.-E., Sonke, J.E., Lacan, F., Lherminier, P., Sarthou, G., 2014. Mercury distribution in the North Atlantic Ocean - results of the 2014 GEOTRACES GEOVIDE cruise, Reunion des Sciences de la Terre, Pau, France.
- Heimbürger, L.-E., 2014. Current status and future needs in Hg research and management, 2014 International Mercury Symposium, Jeju, South Korea.

Submitted by Katharina Pahnke (k.pahnke@icbm.de).

GEOTRACES Activity is continuing in India with sampling in The Indian Ocean and measurement of trace elements and isotopes. Flow injection system to measure dissolved Fe was developed and several deep water profiles were measured in Indian Ocean. Funding for GEOTRACES programme in India is continuing through the Ministry of Earth Sciences, Government of India. We are in process of purchasing two in situ pumps for sampling particulates.

Science Highlights

Distributions of dissolved iron (DFe) in the Indian Ocean

Dissolved iron (DFe) concentrations from different meridional sections in Indian Ocean collected during GEOTRACES-INDIA cruises SK-304, 311 and 312 between 18 °N to 28 °S (Fig. 1). The clean sampling and measurement techniques were validated using measurement of DFe at Japanese cross over stations in the Indian Ocean and by analyzing GEOTRACES and SAFe reference samples. The DFe in Surface waters of the Indian Ocean ranges from 0.1 nM to 1.8 nM. The higher surface concentrations are observed in Arabian Sea which shows the high amount of dust deposition from nearby desert sources. The concentrations of DFe in sub-surface waters got elevated and reach a maximum of 1.5 nM.

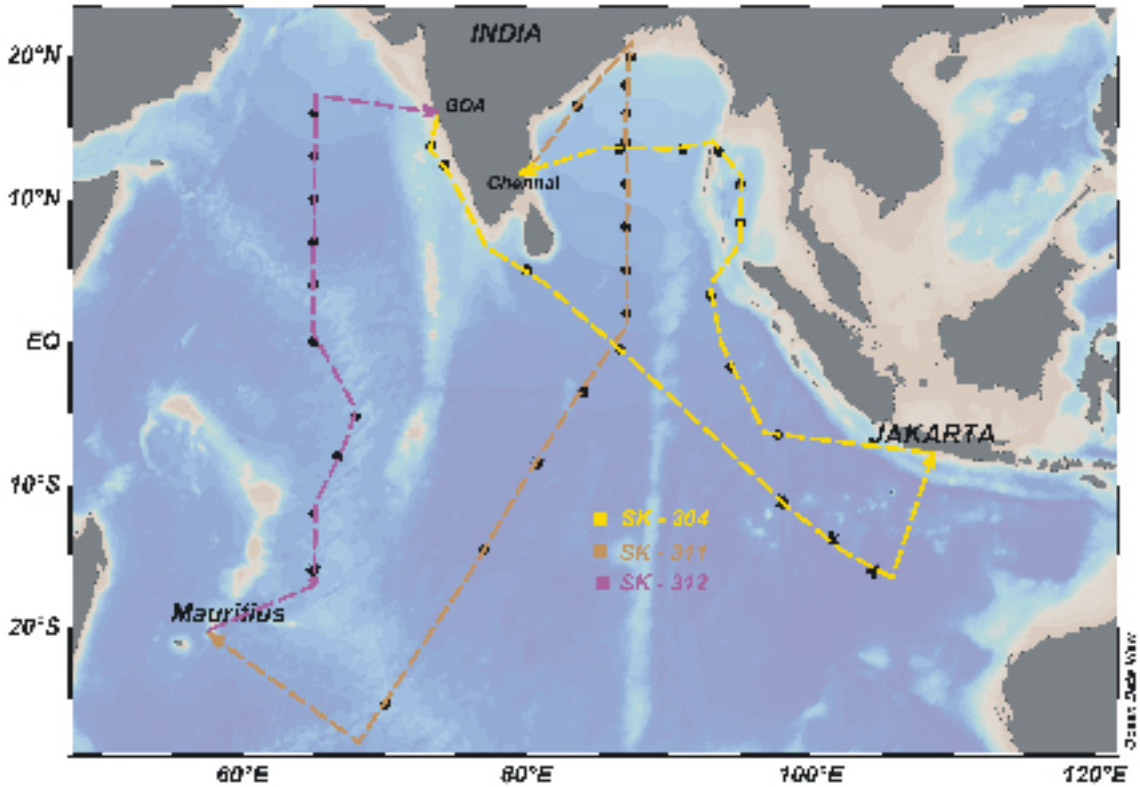

Figure 9: Various sections sampled for SOTRACES studies in the Indian Ocean

Remineralization of sinking organic matter may be the cause for the elevated concentrations of DFe in the sub-surface waters and remains constant throughout the water column. The Bay of Bengal is also characterized by higher DFe concentration owing to higher riverine

particulate flux and OMZ. Water sampled around some of the hydrothermal sections along the central Indian ridge display high DFe concentrations, reaching a maximum of 27 nM. In addition to diverging boundaries in the oceans, the converging boundaries are also acting as an important source of dissolved Fe to the oceans.

εNd in the Arabian Sea: Water Mass mixing vs particle – water interaction

Arabian Sea is characterized by intermediate water column oxygen minimum zone resulting from high productivity sustained by upwelling during SW monsoon. It receives significant amount of particulates from the rivers such as the Indus, the Narmada etc and atmospheric dust from adjoining arid landmasses. An extensive study of Nd isotope composition has been carried out in the Arabian Sea to characterize the various water masses present and quantify the Nd sourced from the fluvial and Aeolian particles by their interaction with the seawater. Several water profiles were collected onboard Sagar Sampada during April 2012 in the Arabian Sea along 68 °E meridional section between equator and 21 °N. Nd isotope composition was determined using MC-ICPMS after pre-concentrating and purifying it from ~20 liters of seawater. ε_{Nd} in the Arabian Sea vary significantly from -14.37 to -5.57 with less radiogenic values in the northern Arabian Sea and more radiogenic Nd in the surface waters between 4 °N and 16 °N. The ε_{Nd} results demonstrate the significant presence of Antarctic Bottom Water AABW) and North Atlantic Deep Water (NADW) in the bottom and deep Arabian Sea respectively. Persian Gulf water (PGW) and Red Sea Water (RSW) are present at water depth 400 to 1000 m between 4 °N to 16 °N. Important features of this study are the non-radiogenic Nd in the northern Arabian Sea and the radiogenic Nd in the surface water of the Central Arabian Sea, between 4 °N to 16 °N. Northern Arabian Sea is dominated by less radiogenic Nd resulting from its release from the lithogenic particles with $\varepsilon_{Nd} \sim -14$ brought by the river Indus. Radiogenic Nd of the surface water of the Central Arabian Sea is contributed by dissolution of Aeolian dust having $\varepsilon_{Nd} \sim -6$. Particle – water interaction seems to have a dominant control on the Nd budget of the Arabian Sea with Nd contribution from fluvial particles increases towards northern Arabian Sea whereas Aeolian contribution decreases towards northern and eastern Arabian Sea.

Upper Ocean cabon export using 210Po/210Pb disequilibrium

Naturally-occurring particle-reactive radionuclides (^{234}Th, ^{210}Po) provide possible means for quantifying export flux of particulate organic carbon (POC) from the surface ocean at various time scales, because of their specific half-lives. The naturally occurring radionuclide ^{210}Po is typically deficient relative to its parent ^{210}Pb in the surface ocean due to preferential removal by biota, while it is in near equilibrium or excess below the surface mixed layer due to rapid regeneration from sinking organic matter.

Seawater profiles for ^{210}Po and ^{210}Pb from surface to 800 m water depth were collected at several locations from the Arabian Sea, Bay of Bengal and the Indian Ocean during March – May, 2014 under GEOTRACES programme. The Arabian sea, being more productive zone, shows more deficit of ^{210}Po relative to ^{210}Pb indicating intense biological removal of ^{210}Po. Generally surface waters of the Indian Ocean have excess ^{210}Pb, which increases sharply north of the equator due to atmospheric input of ^{210}Pb from continental aerosol. Removal flux of ^{210}Po relative to ^{210}Pb from 0-300 m depth from two transects along 87 °E and 65 °E between 18 °N to 14 °S ranged widely from 0.03 to 84.4 dpm m^{-2} d^{-1}. The C/^{210}Po ratio in particulates ranged between 239 and 717 μM dpm^{-1}. The derived export flux of POC using

^{210}Po varied from 0.01 to 33.2 mmol m^{-2} d^{-1} due to the variable source of biogenic particles and spatial changes in the surface biogeochemical and physical conditions.

Submarine groundwater discharge and nutrient addition to the coastal zone of the Godavari estuary

Submarine groundwater discharge (SGD) represents a significant pathway of materials between land and sea, especially as it supplies nutrients, carbon and trace metals to coastal waters. To estimate SGD fluxes to the Godavari estuary, India, we used multiple tracers: salinity, Si, ^{223}Ra, ^{224}Ra, ^{228}Ra and ^{226}Ra. Tracer abundances were elevated in groundwater from the unconfined coastal aquifer and in surface water from the near shore zone; these enrichments decreased to low levels offshore, indicative of groundwater discharge. A model based on the decay of ^{224}Ra relative to ^{228}Ra was used to determine apparent water ages of various bays within the estuary. These ages ranged from 2.6 to 4.8 d during November 2011. Knowing the water age, the distribution of radium in the estuary, and the radium isotopic composition of groundwater enabled us to calculate SGD fluxes to the estuary. These fluxes (in units of 106 m^3 d^{-1}) were on the order of 5 in the Gautami Godavari estuary, 20–43 in the Vasishta Godavari estuary, and about 300 in Kakinada bay, where enhanced ion exchange processes and redox-controlled cycling in the mangrove ecosystem may contribute to higher fluxes. These estimates of water fluxes allowed us to determine the magnitude and seasonal variability in the nutrient fluxes to the estuary associated with SGD. These nutrient fluxes (in units of mmol m^{-2} d^{-1}) ranged from 1–19 (N), 0.6–2.6 (P), and 5–40 (Si) in Gautami Godavari; 19–40 (N), 2.6–5.5 (P), and 200 (Si) in Vasishta Godavari; and 120–140 (N), 10 (P), and 220 (Si) in Kakinada bay. The high SGD fluxes to Kakinada bay contribute significant nutrients to this bay; considerably lower SGD fluxes to Vasishta Godavari still contribute significant nutrients to this estuary. Thus SGD represents a major source of new nutrients to these coastal ecosystems. For the entire Godavari estuarine system, SGD fluxes contribute (48–88) × 10^9 mol DIC y^{-1} and (51–94) × 10^9 mol TA y^{-1}. These fluxes represent ~54 and ~62% of the riverine DIC and TA fluxes to the Godavari estuarine system. This study provides baseline data against which future changes in nutrient and carbon fluxes due to urbanization and economic growth over this region can be compared.

Publications

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- Singh S.P., Singh S.K., Bhushan R. and Rai V.K. Dissolved silicon and its isotopes in water column of the Bay of Bengal: Internal cycling versus lateral transport, Geochim. Cosmochim. Acta, 151, 2015, 172–191.
- Rengarajan R., Sarma V.V.S.S. Submarine groundwater discharge and nutrient addition to the coastal zone of the Godavari estuary, Mar. Chem. doi: 10.1016/j.marchem.2015.03.008, 2015.

Submitted by Sunil Kumar Singh (sunil@prl.res.in).

ANNUAL REPORT ON GEOTRACES ACTIVITIES IN IRELAND (ÉIRE)
MAY 2014 – JUNE 2015

Meetings

- Meeting of the GEOTRACES Standards and Intercalibration committee was held in Galway from the 26-28 January, 2015 (organized by Peter Croot, NUIG).

New funding

- There is no direct funding of GEOTRACES activities in Ireland. However iCRAG , the Irish Centre for Research in Applied Geosciences (http://icrag-centre.org) is a new SFI (Science Foundation Ireland) research centre that began on the 1st of January 2015. iCRAG is co-funded (total funding 25 M€) by SFI, industry and the European Regional Development Fund (ERDF). Prof Peter Croot (NUIG) is a co-PI in iCRAG and is the co-Spoke leader for Marine Geosciences. Participation in the GEOTRACES process study UltraPac, as part of theSonne expedition (SO245) to the South Pacific, forms part of this work.

National and international service

- Ireland is represented on the International GEOTRACES Standards and Intercalibration committee by Peter Croot.

New results

- Surface seawater within Galway Bay was sampled for the Radium quartet (223Ra, 224Ra, 226Ra and 228Ra) as part of investigations into submarine groundwater in this region during the Celtic Voyager expedition CV14010 (May 2014). This data is currently being written up for publication.

New publications (involving GEOTRACES researchers in Ireland)

- Baars, O., Abouchami, W., Galer, S.J.G., Boye, M., Croot, P.L., 2014. Dissolved cadmium in the Southern Ocean: Distribution, speciation, and relation to phosphate. Limnol. Oceanogr. 59, 385-399.
- Baars, O., Croot, P.L., 2015. Dissolved cobalt speciation and reactivity in the eastern tropical North Atlantic. Marine Chemistry 173, 310-319.
- Chever, F., Rouxel, O.J., Croot, P.L., Ponzevera, E., Wuttig, K., Auro, M., 2015. Total dissolvable and dissolved iron isotopes in the water column of the Peru upwelling regime. Geochimica et Cosmochimica Acta 162, 66-82.
- Heller, M.I., Croot, P.L., 2015. Copper speciation and distribution in the Atlantic sector of the Southern Ocean. Marine Chemistry 173, 253-268.
- Loescher, C.R., Groskopf, T., Desai, F.D., Gill, D., Schunck, H., Croot, P.L., Schlosser, C., Neulinger, S.C., Pinnow, N., Lavik, G., Kuypers, M.M.M., LaRoche, J., Schmitz, R.A., 2014. Facets of diazotrophy in the oxygen minimum zone waters off Peru. ISME J 8, 2180-2192.
- Pižeta, I., Sander, S.G., Hudson, R.J.M., Omanović, D., Baars, O., Barbeau, K.A., Buck, K.N., Bundy, R.M., Carrasco, G., Croot, P.L., Garnier, C., Gerringa, L.J.A., Gledhill, M., Hirose, K., Kondo, Y., Laglera, L.M., Nuester, J., Rijkenberg, M.J.A., Takeda, S., Twining, B.S., Wells, M., 2015. Interpretation of complexometric titration data: An intercomparison of methods for estimating models of trace metal complexation by natural organic ligands. Marine Chemistry 173, 3-24.

- Schubert, M., Knoeller, K., Rocha, C., Einsiedl, F., 2015. Evaluation and source attribution of freshwater contributions to Kinvarra Bay, Ireland, using 222Rn, EC and stable isotopes as natural indicators. Environmental Monitoring and Assessment 187, 1-15.
- Simonella, L.E., Palomeque, M.E., Croot, P.L., Stein, A., Kupczewski, M., Rosales, A., Montes, M.L., Colombo, F., Garcia, M.G., Villarosa, G., Gaiero, D., 2015. Soluble iron inputs to the Southern Ocean through recent andesitic to rhyolitic volcanic ash eruptions from the Patagonian Andes. Global Biogeochem. Cycles (accepted).

Other activities

- Inaugural meeting of the COST Action TD1407 "Network on technology-critical elements - from environmental processes to human health threats", (Brussels, Belgium, 15-16 April 2015). This network grew out of the earlier GEOTRACES related COST Action ES0801.
- Prof. Peter Croot is currently a member of the European Marine Board – Deep Sea Working Group – A report to the EU will be released in late 2015.
- Funding within iCRAG (see above) also supports new facilities (a quadruple mass spectrometry and a laser ablation system) for the National Centre for Isotope Geochemistry located at UCD (Prof. Stephen Daly) and TCD (Prof. Balz Kamber). The National Centre for Isotope Geochemistry at UCD was set up in January 2009 and is located within the UCD School of Geological Sciences. The Centre facilitates inter-disciplinary research in radiogenic and heavy stable isotope geochemistry by academics from UCD, TCD, NUIG and UCC, as well as international collaborators. Present equipment includes a Thermo Scientific Triton (TIMS) and a Thermo Scientific Neptune (MC-ICPMS) coupled with a New Wave Excimer laser ablation system.

Submitted by Peter Croot (peter.croot@nuigalway.ie)

Paolo Montagna (ISMAR-CNR, Bologna)

Cruises

Seven seawater samples were collected in March 2015 in the canyon of Perth on board R/V Falkor during the FK150301 cruise led by Prof Malcolm McCulloch (UWA, Australia). The cruise was primarily devoted to surveying the canyon using a Remotely Operated Vehicle (ROV) and sampling biogenic carbonates and seawater for proxy calibration. The samples were collected along a depth profile, from the surface down to 2000 m. Ten litres filtered (AcroPak 500 cartridge) seawater samples were drawn into pre-cleaned carboys from 12L Niskin bottles attached to the ship's rosette, acidified to pH = 2, sealed with parafilm and stored with double bag before sending to the laboratory.

The seawater samples will be analysed at the University of Western Australia. Neodymium isotopes will be measured on a MC-ICPMS Neptune^{Plus} after Nd pre-concentration with ferric hydroxide and extraction using Eichrom TRU-spec and LN-spec resins.

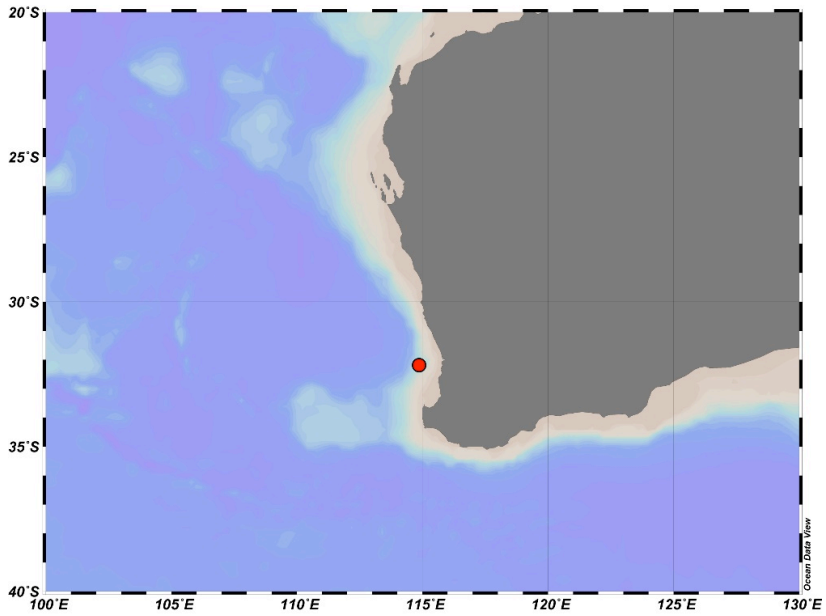


Figure 10: Map of the western coast of Australia. Red circle represents the location of the seawater samples collected during the FK150301 cruise (March 2015).

Abstracts

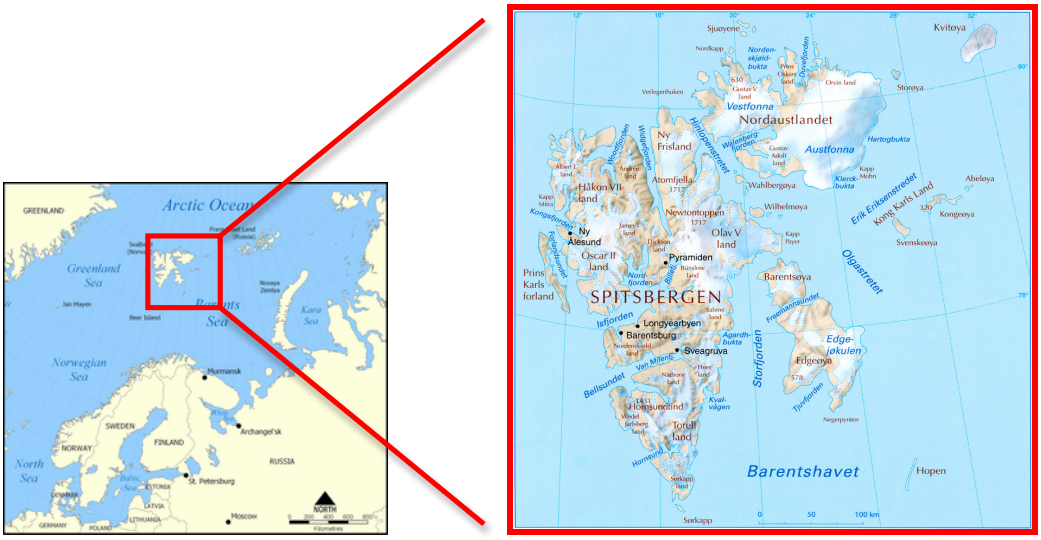
Tachikawa K., Arsouze T., Bayon G., Bory A., Colin C., Dutay J-C., Frank N., Gourlan A. T., Hillaire-Marcel C., Jeandel C., Lacan F., Meynadier L., Montagna P., Pucéat E., Roy-Barman M., Waelbroeck C. Comparison between seawater and archive Nd isotope compositions using multi-scatter plots: a new global data compilation. Goldschmidt 2015, 16-21 August, Prague, Czech Republic.

Clara Turetta (IDPA-CNR, Venezia)
Elena Barbaro (DAIS-Ca' Foscari University, Venezia)

Sampling campaign

Fifty seawater samples were collected from March to June 2015 in the Kongsfjorden, Svalbard Island (N). The release of large volumes of cold and fresh water from melting of ice caps will be studied both from paleoclimatic point of view and from processes of interaction air-sea-ice. The samples were collected along the coast (from west to east approximately, till the glacier) and along a depth profile in the centre of the fjord down to 100 m. An aliquot of each sample was filtered and stored, with unfiltered samples, at -20°C before sending to Italy. Also aerosol and snow sampling were performed during artic campaign.

The samples will be analysed at laboratory of IDPA-CNR and Ca' Foscari University to determine rare earth elements, trace element and organic compounds content to understand the interaction between freshwater –seawater-aerosol.



Map of Svalbard Island

Abstracts

C. Turetta, E. Barbaro, R. Zangrando, A. Gambaro and C. Barbante, "Water-soluble trace elements in Arctic aerosol: possible indicators of extreme events?". EAC 2015, Milan (Italy) September 6-11, 2015

E. Barbaro, A. Spolaor, T. Kirchgeorg, R. Zangrando, C. Turetta, C. Barbante, A. Gambaro. "Exchange of Water Soluble Organic Compounds (WSOC) between aerosol and snow layers: a preliminary study to investigate new climate change markers". SSF workshop on: "Taking the next step in Svalbard snow research", 1-4 September 2015, Polish Polar Consortium and University of Silesia, Poland.

Submitted by Clara Turetta (clara.turetta@idpa.cnr.it).

ANNUAL REPORT ON GEOTRACES ACTIVITIES IN ISRAEL
MAY 2014 – JUNE 2015

This report summarizes activities by scientists in Israel that are related to the GEOTRACES objectives.
Briefly, this report presents the related work of Yeala Shaked, Adi Torfstein, Yishai Weinstein and Boaz Luz. I also provided a paragraph about the work of the Israeli National Monitoring Program, which includes a long and extensive time series of open ocean measurments in the Gulf of Eilat/Aqaba.

Prof. Yeala Shaked, Institute of Earth Sciences, Hebrew University of Jerusalem, and Interuniversity Institute for Marine Sciences of Eilat:

Seawater analyses: surface seawater from Eilat (north Gulf of Aqaba) was filtered and sent for analysis of trace metals to Martha Geldhill and Eric Acktenberg in Geomar Kiel. These samples are part of a larger experiment where we check dissolution rates of dust in the presence and absence of Trichodesmium and its associated bacteria.
In each experiment we will determine the background metals in the water and then check for metal accumulation / removal following dust only, organism only, dust & organism etc.

Dr. Adi Torfstein, Institute of Earth Sciences, Hebrew University of Jerusalem, and Interuniversity Institute for Marine Sciences of Eilat:

I operate a sediment trap mooring that has been deployed continuously since January 2014.

This mooring combines two types of traps and time resolutions:

- KC-Denmark cylinder trap stations deployed at five depth points (water depth is 600 meters) that are sampled at a monthly resolution.
- McLane PARFLUX-II time series trap that collects the sinking particulates at a depth of 400 meters (water depth is 600 meters) on a ~daily resolution (between 24-48 hours) across the year.
- The mooring also hosts continuously a S4 current meter (InterOcean Systems, Inc.) that records current direction and velocity at a 10 minute resolution

The collected samples are weighted, analyzed for their organic C and N content, $\delta^{13}C$ and $\delta^{15}N$ of the organic fraction, major and trace element concentrations of the bulk fraction, 230Th, 232Th, 234U, 238U. Planktonic assemblages are also picked and their chemical composition will be analyzed in the near future.

Different aspects of the above project are funded by the Israel Science Foundation as well as collaborative work with Dr. Stephanie Kienast at Dalhousie University funded by the Schulich Science Foundation.

A first set of seawater samples was analyzed for the dissolved composition of 232Th and 230Th during September 2014.

The Pb isotopic composition of Gulf of Eilat/Aqaba waters was measured at high temporal and spatial resolution during the summer of 2015, in collaboration with Adina Paytan (UCSC).
Trace element concentrations in depth profiles will be measured in the Gulf of Eilat routinely as of the summer of 2015.

Other sampling equipment and facilities:

1. A clean lab (class 1000) was recently constructed by Torfstein at the IUI. It is trace metal free and includes two class 100 workstations, a Teflon coated acid purification system (Analab), two Teflon coated hotplates (Analab) and a mq water system.
2. Eight Teflon coated GO-Flo bottles (12 Liters each), for trace element seawater sampling.
3. One McLane WTS-Large Volume pump, 142 mm diameter, LV04.

Additional activities at the InterUniversity Institute (IUI) for Marine Sciences of Eilat (location of Adi Torfstein and Yeala Shaked):

A dust collection system has been sampling on a weekly basis continuously since 2006. Sampling takes place on the IUI pier and collects weekly 6-40 mg of suspended aerosols. All samples between 2006-2010 have been measured for major and trace element concentrations on the water-dissolved, acid-leachable and silicate fractions.

The National Monitoring Program (NMP) for the Gulf of Eilat/Aqaba operates out of the IUI (http://www.iui-eilat.ac.il/Research/NMPAbout.aspx). Activities include monthly cruises across the north Gulf of Eilat/Aqaba, during which physical, chemical and biological measurements are performed in depth profiles (at a water depth of 700 meters) together with spatial-surface coverage. The main-relevant parameters monitored are:
Temperature, salinity, dissolved oxygen, pH, alkalinity, POC, NO2, NO3, Si(OH)4, PO4, Chl-a.
The samples are collected with the IUI Research Vessel, which has a powder coated aluminium Rosette (SeaBird) with 12 niskin bottles (12 liters each), and a CTD (SeaBird electronics). These measurements have been performed continuously since the year 2000. Analyses are performed at the IUI labs.

Prof. Yishai Weinstein, Bar-Ilan University:
Measurements in the Mediterranean: Ra isotopes, mainly 228, although also short-lived and 226.
Equipment: Just purchased Quantulus 1220 and beta counter (gas proportional) for 234Th etc.
ultra low gamma counter
RaDeCC for short-lived radium isotopes (6 channels)
Rn emanation line + Lucas Cells

Prof. Boaz Luz, Institute of Earth Sciences, Hebrew University of Jerusalem: (background text in brackets):

My involvement in GEOTRACES is in the study of 17O-excess of dissolved O2 in the deep ocean
(Unlike O2 concentration, the excess is a conservative property at depth and indicates conditions at the surface formation regions of deep water masses. In general, low excess means that dissolved O2 is affected only by air-sea gas exchange. In contrast, higher values indicate presence of upper water photosynthesis. We have substantial evidence that NADW in the deep Sargasso Sea does not contain photosynthetic O2. This shows that the source regions in the high latitude N. Atlantic are dominated by air-sea O2 exchange in winter with no effect of photosynthesis).

Samples of deep water from the S. Atlantic were taken for us on GEOTRACES Cruise D357. (Surprisingly, 17O-excess of dissolved O2 in both AABW and NADW were significantly higher than in the N. Atlantic and clearly indicate presence of photosynthetic O2 in the source region where these deep waters formed. This discovery was the basis for writing grant proposals to further investigate how photosynthetic O2 is introduced to the deep ocean.)

I now have a 3 yr funded project from the Israel Science Foundation to work on the deep sea. A major part of the project is documentation of the excess in the open ocean. By generous help from GEOTRACES, we obtained samples from the deep Mediterranean and currently work is underway in two GEOTRACES cruises in the Arctic Ocean. So far we have been able to clearly demonstrate that high 17O-excess is generated when the ocean surfaces is covered by sea ice. Light penetrates through the ice and drives production of new O2, which remains in the surface ocean because the ice cover prevents air-sea gas exchange. Further work will show how much and by what mechanism this photosynthetic O2 finds it way into various parts of the deep ocean.

Submitted by Adi Torfstein (adi.torf@mail.huji.ac.il).

ANNUAL REPORT ON GEOTRACES ACTIVITIES IN JAPAN
MAY 2014 – JUNE 2015

General overview

- We have completed the GEOTRACES GP19 cruise track during the R/V Hakuho Maru KH-14-6 cruise (from Dec. 2, 2014 to Feb. 26, 2015).
- The national GEOTRACES organization under the Science Council of Japan (SCJ) was continued as the GEOTRACES sub-committee under the SCOR committee in October 2014, when the SCJ started a new 3-year term.
- Fourteen papers have been published as below, and some of them were also presented during the annual meeting of AOGS (Asia Oceania Geosciences Society) held at Sapporo (Japan) in July-August 2014. There were more presentations in Japanese at the Annual Meetings of Geochemical Society of Japan, the Oceanographic Society of Japan, Japan Geoscience Union etc.

New publications

- Echegoyen, Y., Boyle, E.A., Lee, J.M., Gamo, T., Obata, H., Norisuye, K. (2014): Recent distribution of lead in the Indian Ocean reflects the impact of regional emissions. Proceedings of the National Academy of Sciences of the United States of America (PNAS), 111, 15328-15331.
- Gamo, T., Okamura, K., Hatanaka, H., Hasumoto, H., Komatsu, D., Chinen, M., Mori, M., Tanaka, J., Hirota, A., Tsunogai, U., Tamaki, K. (2015): Hydrothermal plumes in the Gulf of Aden, as characterized by light transmission, Mn, Fe, CH4 and d13C-CH4 anomalies. Deep-Sea Res. II, in press.
- Kanna, N., T. Toyota, J. Nishioka (2014): Iron and macro-nutrient concentrations in sea ice and their impact on the nutritional status of surface waters in the southern Okhotsk Sea, Progress in Oceanography, 126, 44-57.
- Kim, T-J., Obata, H., Kondo, Y., Ogawa, H., Gamo, T. (2015): Distribution and speciation of dissolved zinc in the western North Pacific and its adjacent seas. Marine Chemistry, in press.
- Kim, T-J., Obata, H., Gamo, T., Nishioka, J. (2015): Sampling and onboard analytical methods for determining subnanomolar concentrations of zinc in seawater. Limnol. Oceanogr. Methods, 13, 30-39.
- Kumamoto, Y., M. Aoyama, Y. Hamajima, M. Murata and T. Kawano (2015): Impact of Fukushima-derived radiocesium in the western North Pacific Ocean about ten months after the Fukushima Dai-ichi nuclear power plant accident, Journal of Environmental Radioactivity, 140, 114-122.
- Minami, T., Konagaya, W., Zheng, L., Takano, S., Sasaki, M., Murata, R., Nakaguchi, Y. & Sohrin, Y. (2015): An off-line automated preconcentration system with ethylenediaminetriacetate chelating resin for the determination of trace metals in seawater by high-resolution inductively coupled plasma mass spectrometry. Analytica Chimica Acta, 854, 183-190, doi: http://dx.doi.org/10.1016/j.aca.2014.11.016.
- Murata, A., K. Hayashi, Y. Kumamoto and K. Sasaki (2015): Detecting progression of ocean acidification from the saturation state of CaCO3 in the subtropical South Pacific, Global Biogeochemical Cycles, in press.
- Nägler, T. F., Anbar, A. D., Archer, C., Goldberg, T., Gordon, G. W., Greber, N. D., Siebert, C., Sohrin, Y. & Vance, D. (2014): Proposal for an International Molybdenum Isotope Measurement Standard and Data Representation. Geostandards and Geoanalytical Research, 38, 149-151, doi: 10.1111/j.1751-908X.2013.00275.x.

- Nishioka, J., T. Nakatsuka, K. Ono, Y. N. Volkov, A. Scherbinin, T. Shiraiwa (2014): Quantitative evaluation of iron transport processes in the Sea of Okhotsk, Progress in Oceanography, 126, 180-193.
- Nishioka, J., H. Mitsudera, I. Yasuda, H. Liu, T. Nakatsuka, Y. N. Volkov (2014): Biogeochemical and physical processes in the Sea of Okhotsk and the linkage to the Pacific Ocean, Progress in Oceanography, 126, 1-7.
- Suzuki, A., Obata, H., Okubo, A., Gamo, T. (2014): Precise determination of dissolved platinum in seawater of the Japan Sea, the Sea of Okhotsk, and the western North Pacific. Marine Chemistry, 166, 114-121.
- Takano, S., Tanimizu, M., Hirata, T. & Sohrin, Y. (2014): Isotopic constraints on biogeochemical cycling of copper in the ocean. Nature Communications, 5, doi: 10.1038/ncomms6663.
- Tanita, I., Takeda, S., Sato, M. and Furuya, K. (2015): Surface and middle layer enrichment of dissolved copper in the western subarctic North Pacific. La mer, 53 : 1-18.

International Meetings

- Norisuye, K., Takano S., Sohrin, Y., Ho, T.-Y., Morton, P., Choi, M.S. Bismuth of anthropogenic origin supplied to the modern western North Pacific. Asia Oceania Geosciences Society (2014). OS01-D2-PM2-PB-008, 29 July.
- Obata, H., Nishioka, J., Kim, T., Norisuye, K., Takeda, S., Wakuta, Y., Gamo, T. Clean seawater sampling for trace metals during Japanese GEOTRACES cruises. Asia Oceania Geosciences Society (2014). OS01-D2-PM2-PB-006, 29 July.
- Takano, S., M. Tanimizu, T. Hirata, and Y. Sohrin. Biogeochemical Cycling of Copper Isotopes in the Ocean. (14-11) in AOGS2014. 2014, 7. 29. Sapporo.
- Zheng, L., Y. Sohrin, T. Minami, and W. Konagaya. The Determination of Bioactive Trace Metals in Seawater Using an Automated Preconcentration Device and the Distribution of These Metals in the North Pacific Ocean. (14-12P) in AOGS2014. 2014, 8. 1. Sapporo.

Cruises

- GEOTRACES section cruise (GP19) by *R/V Hakuho-Maru* (KH-14-6 cruise, 2 Dec. 2014-26 Feb. 2015)

Submitted by Toshitaka Gamo (gamo@aori.u-tokyo.ac.jp).

Transect GA02: 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 (Dalhousie University). In 2014-2015 we focused with our west Atlantic work on the ongoing compilation and analysis of the data collected in the western Atlantic Ocean in 2010 – 2012. An estimated 16 articles have appeared.

Transect GA04N: 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) was organized in concert with a cruise of the Spanish Mediterranean GEOTRACES program (GA04S). In 2014/15 our work in the Mediterranean and Black Seas focused on; i) measurements of samples, ii) calibration of CTD data, compilation and analysis of the data. The first research article has been published.

Transect GN04: Arctic Ocean: In August-October 2015, a Dutch team (NIOZ and RUG) will participate in the German organized GEOTRACES cruise (TransARC-II, PS94) on the *RV Polarstern* to the Arctic Ocean. We will be responsible for the trace metal sampling, trace metal measurement, measurements of DIC, alkalinity and oxygen, macronutrient measurements, and the CTD data.

Process study: Response of the Iron Biogeochemical Cycle on Continental Shelves to Seawater Deoxygenation. In 2014, funding was granted by the Dutch Organization for Scientific Research (NWO) for GEOTRACES cruises in the Black Sea (September 2015) and Baltic Sea (planned for June 2016) (PI: Caroline Slomp). The research during both cruises will focus on quantifying the release of Fe and Mn and other metals from shelf sediments, elucidating the relevant mechanisms and assessing the transport pathways of the metals in the water column over the shelf and its transfer to the deep basin. Techniques include: lander deployments for in-situ determinations of sediment-water exchange fluxes, porewater analyses and the collection and analyses of dissolved and particulate constituents in the water column (with in-situ pumping and on deck filtration).

Meetings

- GEOTRACES SSC meeting: Micha Rijkenberg attended the GEOTRACES Scientific Steering Committee meeting on 8-10 October 2014 in Stellenbosch, South Africa.
- Post-cruise meeting of the GEOTRACES cruises in the Mediterranean Sea and Black Sea on 30-31 March 2015 at Royal NIOZ, The Netherlands, see Figure 11.

Figure 11: Attendees of the MedBlack post-cruise meeting at Royal NIOZ, Texel

Cruises

- Transect GN04: in the Arctic Ocean will be sailed from half August to half October 2015 on board of the Polarstern.
- Black Sea, Istanbul-Varna will be sailed in September 2015 on board Pelagia.
- Baltic Sea, will be sailed in June 2016 on board Pelagia.

New funding

N/A

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.
- The first new data of the MedBlack GEOTRACES cruises have been measured on board during 64PE370, 64PE373 and 64PE374 (DFe, DAl, DIC & alkalinity and the micro and nanomolar nutrient concentrations). Other trace elements like Y, Cd, La, Pb, Sc, Ti, V, Mn, Fe, Ni, Zn and Ga were measured by ICP-MS. This year, the calibrated CTD data, DOC, CDOM, and phytoplankton species composition data has been added to the cruise database. Furthermore, aerosol trace metals and major ions, Co, Nd, Hg, organic Fe-binding ligands, Zn and Ni isotopes, phytoplankton pigment data have been (almost) completed. Results have been presented at conferences and the first research article has been published.

Presentations

- Bridgestock, L., Van de flierdt, T., Rehkämper, M., Baker, A., Achterberg, E., Rijkenberg, M., Lohan, M., de Baar, H., 2015. Detection of Pb from natural sources in the Tropical Atlantic, Goldschmidt. Prague.
- Dijkstra, N., Kraal, P., Rijkenberg, M.J.A., Slomp, C.P., 2015. Coupled dynamics of iron, manganese and phosphorus in the water column of the Black Sea and implications for phosphorus burial Nutrient Cycling on the Modern and Ancient Earth conference. Leeds, School of Earth & Environment, University of Leeds.
- Galer, S.J.G., Abouchami, W., Xie, R.C., Janssen, D.J., Rijkenberg, M., Gerringa, L., Cullen, J.T., W., de Baar, H.J., 2014. Global Oceanic Cadmium Isotope Distribution. Goldschmidt, Sacramento, US, 8-13 June. oral, Goldschmidt Conference, Prague.

- Heimburger, L.-E., Sonke, J.E., Rijkenberg, M.J.A., Gerringa, L.J.A., de Baar, H.J.W., 2014. Mercury in the Black Sea - results of the 2013 GEOTRACES MEDBlack cruise. AGU, San Francisco, California, USA.
- Little, S.H., Vance, D., Cameron, V., Rijkenberg, M.J.A., Andersen, M.B., Lyons, T., McManus, J., 2014. Zn and Ni isotope systematics in the Black Sea, an analogue for past ocean anoxia. AGU, San Francisco, California, USA.
- Margolin, A.R., Hansell, D.A., Rijkenberg, M.J.A., Gerringa, L.J.A., 2015. Distribution of dissolved organic carbon deficits in the Black Sea. Aquatic Sciences Meeting, Granada, Spain.
- Middag, R., Rolison, J.M., Stirling, C.H., van Hulten, M.M.P., Rijkenberg, M.J.A., de Baar, H.J.W., 2015. Dissolved aluminium in the West-Atlantic Ocean and Mediterranean Sea, Goldschmidt Conference. Prague.
- Rijkenberg, M.J.A., 2015. Bio-essential and pollutant trace metals in a changing Atlantic Ocean, Third International Symposium on the effects of Climate Change on the world's oceans. Santos, Brazil., plenary talk
- Rolison, J.M., Middag, R., Stirling, C.H., Rijkenberg, M.J.A., de Baar, H.J.W., 2014. Dissolved trace metal distributions in the Black Sea and Bannock Basin: results from the recent MedBlack GEOTRACES expedition. Goldschmidt, Sacramento, California, USA.
- Rolison, J.M., Middag, R., Stirling, C.H., Rijkenberg, M.J.A., de Baar, H.J.W., 2014. Dissolved Trace Metal Distributions in the Mediterranean Sea: Results from the MedBlackGEOTRACES Expedition. Goldschmidt, Sacramento, California, USA.
- Rolison, J.M., Stirling, C.H., George, E., Middag, R., Gault-Ringold, M., Rijkenberg, M.J.A., de Baar, H.J.W., 2015. Biogeochemical cycling of the uranium, iron and cadmium isotope systems during oceanic anoxia: A case study of the Black Sea, Goldschmidt Conference. Prague.
- Rosati, G., Heimbürger, L.E., Sonke, J.E., Rijkenberg, M.J.A., Gerringa, L.J.A., de Baar, H.J.W., 2015. Developing a methylmercury dynamic model for the Black Sea, 12th International Conference on Mercury as a Global Pollutant. Jeju.
- Stichel, T., Kretschmer, S., Lambelet, M., van der Flierdt, T., Rutgers van der Loeff, M., Rijkenberg, M.J.A., Gerringa, L.J.A., de Baar, H.J.W., 2014. The interplay between particulate and dissolved neodymium in the Western North Atlantic: First insights and interpretations. AGU, San Fransisco, US.
- Stirling, C.H., Rolison, J.M., Middag, R., Rijkenberg, M.J.A., de Baar, H.J.W., 2014. Biogeochemical cycling of uranium in redox-controlled environments: A 238U/235U case study of the Black Sea. Goldschmidt, Sacramento, California, USA.
- Wu, Y., Goldstein, S.L., Pena, L.D., Hartman, A.E., Rijkenberg, M.J.A., de Baar, H.J.W., 2014. How Well Do Neodymium Isotopes Trace AMOC Mixing? A Test in the Southwest Atlantic. AGU, San Fransisco, US.
- Xie, R.C., Galer, S.J.G., Abouchami, W., A., R.M.J., de Jong, J., de Baar, H.J.W., 2014. Biogeochemical and circulation control on cadmium isotope distribution in the western South Atlantic, Aquatic Sciences, Portland, Oregon, US.
- Zaaboub, N., Bejaoui, B., Khalfallah, W., Rijkenberg, M.J.A., 2014. Phosphorus cycling in sediment gulf of Gabes (Eastern Mediterranean Sea, Tunisia) and Modeling of phosphorus dispersion. Challenger Society Conference, Plymouth, UK.

PhD theses

- Marco van Hulten successfully defended his thesis on the modeling of the distribution of Aluminium and Manganese in the West Atlantic Ocean on 28 November 2014 at the University of Groningen

Publications

Published:

- Abouchami, W., Galer, S.J.G., de Baar, H.J.W., Middag, R., Vance, D., Zhao, Y., Klunder, M., Mezger, K., Feldmann, H., Andreae, M.O. (2014) Biogeochemical cycling of cadmium isotopes in the Southern Ocean along the Zero Meridian. Geochim. Cosmochim. Acta 127, 348-367.
- Dulaquais, G., Boye, M., Middag, R., Owens, S., Puigcorbe, V., Buesseler, K., Masqué, P., de Baar, H., Carton, X. (2014) Contrasting biogeochemical cycles of cobalt in the surface Western Atlantic Ocean. Global Biogeochem. Cy., 2014GB004903.
- Edward Mawji, Reiner Schlitzer, Elena Masferrer Dodas, …, Karel Bakker, …, Johann Bown, …, Hein J.W. de Baar, …, Loes J.A. Gerringa, …, Maarten Klunder, …, Patrick Laan, …, Rob Middag, …, Micha J.A. Rijkenberg, …, Lesley Salt, …, Hendrik M. van Aken, Steven van Heuven, Jan van Ooijen, Evaline van Weerlee, … . (2015) The GEOTRACES Intermediate Data Product 2014. Mar. Chem., in press
- Gerringa, L. J. A., Laan, P., van Dijken, G. L., van Haren, H., de Baar, H. J. W., Arrigo, K. R., Alderkamp, A.-C. (2015) Sources of iron in the Ross Sea polynya in early summer, Marine Chemistry, in press
- Gerringa, L.J.A., Rijkenberg, M.J.A., Schoemann, V., Laan, P., de Baar, H.J.W. (2015) Organic speciation of dissolved iron in the West Atlantic Ocean. Mar. Chem., in press
- van Hulten, M.M.P., Sterl, A., Middag, R., de Baar, H.J.W., Gehlen, M., Dutay, J.C., Tagliabue, A. (2014) On the effects of circulation, sediment resuspension and biological incorporation by diatoms in an ocean model of aluminium. Biogeosciences 11, 3757-3779.
- Lamborg, C.H., Hammerschmidt, C.R., Bowman, K.L., Swarr, G.J., Munson, K.M., Ohnemus, D.C., Lam, P.J., Heimburger, L.-E., Rijkenberg, M.J.A., Saito, M.A. (2014) A global ocean inventory of anthropogenic mercury based on water column measurements. Nature 512, 65-68.
- Middag, R., van Hulten, M.M.P., van Aken, H.M., Rijkenberg, M.J.A., Gerringa, L.J.A., Laan, P., de Baar, H.J.W. (2015) Dissolved aluminium in the ocean conveyor of the West Atlantic Ocean: Effects of the biological cycle, scavenging, sediment resuspension and hydrography. Mar. Chem., in press
- Middag, R., Séférian, R., Conway, T. M., John, S. G., Bruland, K.W., de Baar, H.J.W (2015) Intercomparison of Dissolved Trace Elements at the Bermuda Atlantic Time Series Station, Marine Chemistry, in press
- Rijkenberg, M.J.A., Middag, R., Laan, P., Gerringa, L.J.A., van Aken, H.M., Schoemann, V., de Jong, J.T.M., de Baar, H.J.W. (2014) The Distribution of Dissolved Iron in the West Atlantic Ocean. PLoS ONE 9, e101323.
- Rolison, J.M., Middag, R., Stirling, C.H., Rijkenberg, M.J.A., de Baar, H.J.W. (2015) Zonal distribution of dissolved aluminium in the Mediterranean Sea. Mar. Chem., in press
- Salt, L.A., van Heuven, S.M.A.C., Claus, M.E., Jones, E.M., de Baar, H.J.W. (2015) Rapid acidification of mode and intermediate waters in the southwestern Atlantic Ocean. Biogeosciences 12, 1387-1401.
- Xie, R.C., Galer, S.J.G., Abouchami, W., Rijkenberg, M.J.A., de Jong, J., de Baar, H.J.W., Andreae, M.O. (2015) The cadmium-phosphate relationship in the western South Atlantic – the importance of mode and intermediate waters on the global systematics. Mar. Chem., in press
- Zhao, Y., Vance, D., Abouchami, W., de Baar, H.J.W. (2014) Biogeochemical cycling of zinc and its isotopes in the Southern Ocean. Geochim. Cosmochim. Acta 125, 653-672.

Submitted:

- Lambelet, M., van de Flierdt, T., Crocket, K., Rehkämper, M., Kreissig, K., Coles, B., Rijkenberg, M.J.A., Gerringa, L.J.A., de Baar, H.J.W., Steinfeldt, R. (2015) Neodymium isotopic composition and concentration in western North Atlantic seawater: results from the GEOTRACES GA02 section. Geoch. Cosmochim. Acta., submitted
- van de Poll, W.H., Boute, P.G., Rozema, P.D., Buma, A.G.J., Kulk, G., Rijkenberg, M.J.A. (2015) Sea surface temperature control of taxon specific phytoplankton production along an oligotrophic gradient in the Mediterranean Sea. Mar. Chem., submitted
- Rijkenberg, M.J.A., de Baar, H.J.W., Bakker, K., Gerringa, L.J.A., Keijzer, E., Laan, M., Laan, P., Middag, R., Ober, S., van Ooijen, J., Ossebaar, S., van Weerlee, E.M., Smit, M.G. (2015) "PRISTINE", a new high volume sampler for ultraclean sampling of trace metals and isotopes. Mar. Chem., submitted

Submitted by Micha Rijkenberg (micha.rijkenberg@nioz.nl).

Two NZ scientists (Honours student Ella Patterson and Dr Rob Middag) participated in the GEOTRACES process study Phantastic II in the Southern Ocean, west of the Antarctic Peninsula. A total of 44 stations were sampled along 5 transects from the Antarctic Circumpolar Current toward the continent aboard the Nathaniel B Palmer during cruise NBP 14-09 from 26-10 till 26-11 in 2015. Shipboard measurements of dissolved Fe were performed at all stations as well as 5 bioassay experiments that tested for Fe and light limitation. Additionally, samples were collected for multi element analysis (Y, Cd, La, Pb, Sc, Ti, Mn, Fe, Ni, Zn and Ga) at all stations for dissolved metals (0.2 µm filtered) and at 33 stations for total (unfiltered) metals. Samples for iron binding ligands, cobalamin, iron isotopes and uranium isotopes were collected at 7 stations.

Several papers based on GEOTRACES data have been published:

- Middag, R., Seferian, R., Conway, T. M., John, S. G., Bruland, K. W. & de Baar, H. J. W. Intercomparison of Dissolved Trace Elements at the Bermuda Atlantic Time Series Station. In press with Marine Chemistry. (2015)
- Rolison, J.M., Middag, R., Stirling, C.H., Rijkenberg, M.J.A., de Baar, H.J.W., 2015. Zonal distribution of dissolved aluminium in the Mediterranean Sea. In press with Marine Chemistry. http:// dx.doi.org/10.1016/j.marchem.2015.05.001.
- Middag, R., van Hulten, M.M.P., van Aken, H.M., Rijkenberg, M.J.A., Gerringa, L., Laan, P. and de Baar, H.J.W., in press. Dissolved aluminium in the Ocean Conveyor of the West Atlantic Ocean: effects of the biological cycle, scavenging, sediment resuspension and hydrography. In press with Marine Chemistry, http://dx.doi.org/10.1016/j.marchem.2015.02.015.

Results from GEOTRACES studies have been presented:

- Stirling, C.H., Rolison, J.M., Middag, R., Rijkenberg, M.J., de Baar, H.J.W. Biogeochemical Cycling of Uranium in Redox-Controlled Environments: A238U/235U Case Study of the Black Sea. Invited oral presentation at the 2014 Goldschmidt meeting – Sacramento, 10-06-2014, California USA
- Rolison, J.M., Middag, R., Rijkenberg, M.J., Stirling, C.H., de Baar, H.J.W. Dissolved trace metal distributions in the Black Sea: results from the MedBlack GEOTRACES expedition. Oral presentation at the 2014 Goldschmidt meeting – Sacramento, 12-06-2014, California USA .
- George, E., Stirling, C.H., Gault-Ringold, M. Biogeochemical cycling of cadmium in the South West Pacific. Oral presentation the 2014 Goldschmidt meeting – Sacramento, 10-06-2014, California USA.

The NIWA/University of Otago Research Centre for Oceanography has acquired a new mobile clean lab. This modified shipping container with HEPA filtered air supply is used for shipboard clean sub-sampling and sample acidification. The mobile lab has successfully been tested on a research cruise off New Zealand in May 2015.

Assoc Prof Sylvia Sander (University of Otago, NIWA/University of Otago Research Centre for Oceanography) co-organized a workshop and symposium in Sibenik, Croatia from 7-11 April 2015 as the last meeting of the SCOR WG 138 themed: Organic Ligands – A Key Control on Trace Metal Biogeochemistry in the Ocean, which she co-chaired together with

Prof Maeve Lohan and Assistant Prof Kristen Buck. Following that meeting the new SCOR WG 145 MARCHEMSPEC - Modelling Chemical Speciation in Seawater to Meet 21st Century Needs which is also vice chaired by Sylvia Sander, beside David Turner (chair) and Simon Clegg (vice chair), held its first meeting. Sylvia Sander has also been appointed Associate Editor for Marine Chemistry and agreed to guest edit a special issue of Frontiers in Marine Science Research Topic Organic Ligands.

Submitted by Rob Middag (rob.middag@otago.ac.nz).

ANNUAL REPORT ON GEOTRACES ACTIVITIES IN NORWAY
MAY 2014 – JUNE 2015

Projects

- Ocean-Certain; An EU-funded project (http://oceancertain.eu/what-is-ocean-certain/) led by Murat Ardelan from the Norwegian University of Science and Technology (NTNU). Ocean-Certain is a multinational/multidisciplinary study with partners from eight European countries in additional to Chile and Australia. Activities for the past year include:
  i) Sampling and measurement of Fe and other nutrient trace metal during multi stressors mesocosm experiments in both Patagonia (october-november 2014) and Ny Aalesund-Arctic (June-July 2015)
  ii) Collection of ice samples from Green Land for trace metal analysis
  iii) Measurement of Fe(II) to Fe(III) oxidation rates and diurnal Fe dynamics in different conditions in Patagonia and Ny Aalesund.
  iv) Developing a speciation model for Fe and Zn together with David Turner
- Activities on other related projects include: ongoing measurements of Fe speciation in Antarctica Peninsula water samples from A Norwegian Research Council funded project

New Proposals

- Kuria Ndungu (Norwegian Institute for Water Research-NIVA), Murat Ardelan (NTNU) and Mats Granskog (Norwegian Polar Institute; submitted a proposal to the Norwegian Research Council entitled: Biogeochemistry of bioactive trace metals in Arctic waters: Fram Strait case study

Meetings

- Murat Ardelan attended the 2014 Ocean Sciences meeting in Hawaii.

Other Activities

- Phillip Wallhead at the Biogeochemistry group at The Norwegian Institute for Water Research (NIVA) are using the the SINMOD biogeochemical model to investigate climate change and acidification of the sea floor in the Arctic Ocean and Nordic Seas. SINMOD is a physical-biological hydrodynamic model including nitrogen, silicate and carbon chemistry coupled to a simple planktonic food web.

Submitted by Kuria Ndungu (Kuria.ndungu@niva.no)

Metals (Co, Cd, Ni, Mn, Pb, Zn, Cr) in the groundwater impacted areas in the Baltic Sea

New results

The groundwater discharge is a source of Cd, Co, Cr Mn and Zn for the southern Baltic Sea. Locally, as in the Bay of Puck, groundwater discharge can be a significant source of metals in comparison with rivers. The trace elements concentrations in the groundwater are one (Pb, Cd, Co, Zn, Ag,) to two (Mn) orders of magnitude higher than in seawater. Ni and Cu concentrations similarly to Hg concentrations (Szymczycha et al., 2013) were smaller in groundwater. Dissolved Co and Zn both exhibited conservative distribution relative to salinity and showed depletion in seawater and enrichment in groundwater. Dissolved Cu, Ni and Cr show non-conservative mixing between the two end-members. Dissolved Ni and Cu both showed depletion in groundwater and enrichment in seawater while the trend for Cr is reverse. Dissolved Pb, Cd and Mn concentrations did not show clear trends to salinity. Dissolved Pb, Cd, Mn, and Cr change its phase to solid while the ORP increase and as a result increasing their concentrations in the sediment.

New publications

- Szymczycha B, Submarine Groundwater Discharge to the Bay of Puck, Southern Baltic Sea and Its Possible Changes with Regard to the Predicted Climate Changes, 2015, 61-75, in Impact of Climate Changes on Marne Environments, Edited by Zieliński T, Węsławski M, Kuliński K, Springer, London, 2015.

Cruises

June, 2014 Sampling Campaign

Other activities (e.g., acquisition of new sampling systems)

- Acquisition of groundwater lance in order to collect pore water samples

Sources of mercury in the Southern Baltic Sea

New publications

- Saniewska, D., Bełdowska, M., Bełdowski J., Jędruch A., Saniewski, M., Falkowska L. (2014a). Mercury loads into the sea associated with extreme flood. Environmental pollution, 191, 93-100.
- Saniewska, D., Bełdowska, M., Bełdowski, J., Saniewski, M., Szubska M., Romanowski A., Falkowska L. 2014. The impact of land use and season on the riverine transport of mercury into the marine coastal zone. Environ Monit. Assess 186:7593–7604.

Submitted by Jacek Beldowski (hyron@iopan.gda.pl).

New results

- The isotope composition of hydrogen and oxygen in the water of the central part of the Black Sea and at the continental slope was studied in detail. The vertical distribution of the δD and δ18O values allows one to distinguish four water masses. The surface layer is homogenous in the center of the sea despite the formation of cyclonic and anticyclonic eddies. The main variations in the δD and δ18O values take place within the pycnocline beneath the CIL core to the depth of 500 m. The salinity increases by 3‰ with the growth of the delta values by 0.8 and 5‰ for the δ18O and δD, respectively. Deeper than the layer of 500 m down to the bottom, including the BCL, the δD and δ18O values practically do not vary. The isotope composition of the oxygen and hydrogen in water is linearly dependent on the variations in salinity. This fact allows one to describe the formation of the Black Sea waters using a simple model of mixing of the waters of the lower Bosporus current and a hypothetical freshwater component of isotope composition formed by the riverine runoff, atmospheric precipitation, and evaporation (Dubinin, Dubinina, 2014).
- Genesis and concentration of suspended particulate matter (SPM) in the Kara Sea during the greatest Arctic sea-ice sheet decreasing (2007) were studied. The isotope composition of POC is correlative with the SPM concentration. The anomalous desalination of the sea surface layer in 2007 results in significant lightening of the organic carbon isotopic composition in the western part of the Kara Sea. Our data on 2007 confirmed an early observations that the share of marine (phytoplankton) organic matter in the composition of POC increased from the coast toward the outer shelf, the δ13CPOC values became heavier in the same direction (Kravchishina et al., 2015).
- Study of trace metal speciation in the early diagenetic processes has allowed to estimate geochemical mechanisms of trace metal accumulation in the bottom sediments in the semi-enclosed White Sea. From our data the lythogenic form contains a great deal of Al, Fe, Cr, Co, Ni and U (>80% bulk content). Percentage of As, Pb, Mo and Cu in lythogenic form varies from 50 to 80% in average, whereas for Mn and Cd this amounts less than 50% bulk content. Manganese and Cd proved to exist in exchangeable complex and carbonate particles (30-40% bulk content). Iron and manganese in form of Fe-Mn-amorphous hydroxides contain only partially (in average 15-20% bulk content). Approximately the same amount (10–25%) of the Pb, Cd, As and Mo bulk content was adsorbed on the Fe-Mn-amorphous hydroxides. Among the metals cupper was found to be associated with organic compounds in higher amounts (25%) comparing to the other metals. The predominance of the geochemically inert occurrence form of most trace metals, with the exception of Mn and Cd, reflects a major role of terrigenous processes in the trace metal accumulation in the bottom sediments in this subarctic sea (Demina et al., 2015).
- Bromine content in shelf sediments may serve as a geochemical indicator of paleo-typhoons of the Amur Bay, Sea of Japan. A negative correlation on the timescale was found between of bromine content peaks in bottom sediments with extreme floods caused by typhoons or deep cyclones (Astakhov et al., 2015).

New publications

- Akulichev V.A., Obzhirov A.I., Shakirov R.B., Maltseva E.V., Gresov A.I., Telegin Yu.A. 2014. Conditions of gas hydrate formation in the Sea of Okhotsk. Doklady Earth Sciences. Vol. 454, No. 1, pp. 94-96.

- Akulichev V. A., Astakhov A. S., Karnaukh V. N., et al. 2015. Geoacoustic Evidence of Methane Migration from Submarine Coaliferous Formations to Holocene Sediments (Amur Gulf, Sea of Japan) Doklady Earth Sciences, Vol. 460, Part 2, pp. 163–167.
- Asadulin En. E., Miroshnikov A. Yu., Usacheva , A. A., Velichkin V.A. Geochemical Recognition of Terrigeneous Material from the Ob and Yenisei Rivers in Bottom Sediments of the Eastern Part of the Kara Sea, ISSN 1028_334X, Doklady Earth Sciences, 2015, Vol. 461, Part 1, pp. 270–272 http://www.springer.com/-/6/d5683965a0d246568ed4dbb0b6c983eb
- Astakhov A.S., Kalugin I. A., Aksentov K. I., and A. V. Darin. 2015. Geochemical Indicators of Paleo-Typhoons in Shelf Sediments. Geochemistry International, Vol. 53, No. 4, pp. 383–388.
- Demina L.L., Budko D.F., Novigatsky A.N., Filippov A.S. Occurrence Forms of Trace Metals in Bottom Sediments of the White Sea // 26-th IUGG-2015 General Assembly, Prague, 22June-2 July 2015.Abstracts. IAPSO: PO-2 Symposium. Physics and biogeochemistry of semi-enclosed and shelf seas.
- Demina L.L. Quantification of role of the organisms in the geochemical migration of trace metal in the ocean// Geochemistry International. 2015. Vol. 53. No 3. P. 224–240.
- Gorbarenko S., Chebykin E., Goldberg E., Stepanova O., Lu H. Chronicle of regional volcanic eruptions recorded in Okhotsk Sea sediments over the last 350 ka // Quaternary Geochronology. 2014. T. 20. C. 29-38.
- Gorbarenko S.A., Nam S-I., Rybiakova Y.V., Shi X., Liu Y., Bosin A.A. High resolution climate and environmental changes of the northern Japan (East) Sea for the last 40 kyr inferred from sedimentary geochemical and pollen data // Palaeogeography, Palaeoclimatology, Palaeoecology. 2014. T. 414. C. 260-272.
- Kalinchuk V.V., Astakhov A.S. 2014. Atmochemical mercury dispersion aureoles over active geologic structures of the northern Sea of Japan. Russian Geology and Geophysics. 55. 1361–1368.
- Kolesnik O.N., Kolesnik A.N., Pokrovskii B.G. 2014. A Find of an Authigenic Methane-Derived Carbonate in the Chukchi Sea. Doklady Earth Sciences. V. 458. Part 1. P. 1168–1170.
- Kravchishina M., Lein A., Burenkov V., Artem'ev V., Novogatsky A. Distribution and sources of suspended particulate matter in the Kara Sea // Complex Interfaces Under Change: Sea - River - Groundwater – Lake. IAHS Publ. 365. Proceedings of IAHS-IAPSO-IASPEI Assembly. Land-ocean interaction: Hydrodynamics and biogeochemistry. Gothenburg, Sweden, July 2014. IAHS Press, 2014. P. 42–48.
- Kravchishina M., Klyuvitkin A., Filippov A., Novigatsky A., Politova N., Shevchenko V., Lisitzin A. Suspended particulate matter in the White Sea: the results of long-term interdisciplinary research // Complex interfaces under change: Sea – River – Groundwater – Lake. IAHS Publ. 365. Proceedings of IAHS-IAPSO-IASPEI Assembly "Land-ocean interaction: Hydrodynamics and biogeochemistry", Gothenburg, Sweden, July 2014. IAHS Press, 2014. P. 35–41.
- Kravchishina M.D., Lein A.Yu., Sukhanova I.N., Artem'ev V.A., Novigatsky A.N. Genesis and spatial distribution of suspended particulate matter concentrations in the Kara Sea during maximum reduction of the Arctic ice sheet // Oceanology. 2015. V. 55. No. 3. In press.
- Lein A.Yu., Savvichev A.S., Kravchishina M.D., Kozina N.V., Peresypkin V.I., Zakharova E.E., Veslopolova E.F., Mitskevich I.N., Shul'ga N.A., Lobus N.V., Politova N.V., Ivanov M. V. Microbiological and biogeochemical properties of the Caspian Sea sediments and water column // Microbiology. 2014. V. 83. No. 5. PP. 648–660.

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- Polyakov D.M., Zarubina N.V. 2014. Accumulation of alkaline and alkaline-earth elements in subcolloidal fraction of bottom sediments at the river-sea geochemical barrier. Water Resources. V. 41, No 6. P. 666-670.
- Sattarova V.V., Artemova A.V. 2014. Geochemical and micropaleontological character of Deep-Sea sediments from the Northwestern Pacific near the Kuril-Kamchatka Trench// Deep Sea Research Part II: Topical Studies in Oceanography. V 111. P. 10-18.
- Semenkov I.N., Miroshnikov A. Yu., Asadulin E.E., Usacheva A. A., Velichkin V.I., Laverov N.P. The Ob River Basin as a Source of Kara Sea Contamination with Global Fallout of Cs–137, ISSN 1028_334X, Doklady Earth Sciences, 2015, Vol. 463, Part 1, P. 704–706.
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- Wenshen Xiao, Rujian Wang, Leonid Polyak, Anatolii Astakhov, Xinrong Cheng. 2014. Stable oxygen and carbon isotopes in planktonic foraminifera Neogloboquadrina pachyderma in the Arctic Ocean: An overview of published and new surface-sediment data // Marine Geology. V. 352. 397–408 DOI: 10.1016/j.margeo.2014.03.02

Meetings

- Over late 2014 up to date (July 2015) Russian scientists participated in 3 conference, where they have presented around 30 presentations. Among the conferences there was only one relevant to GEOTRACES: 26-th IUGG General Assembly, Prague, 22 June- 02 July 2015. About 15 presentations were made there, among them one titled "GEOTRACES highlights in the Indian Ocean and plans for the future, by E. Masferrer Dodas[1], E. Boyle[2], C. Jeandel[1],R. Schlitzer[3], was presented by L.Demina[4] ([1]GEOTRACES International Project Office, Toulouse, France; [2]Massachusetts Institute of Technology, Cambridge, USA; [3]Alfred Wegener Institute, Bremerhaven, Germany; [4]Shirshov Institute of Oceanology, Moscow, Russia).

Cruises

- In November 2014 Shirshov Institute of Oceanology held a cruise in the Caspian Sea (hydrochemistry, currents, sedimentation). In February-April 2015 there were 2 expeditions for collection of snow and ice at the White Sea (winter fluxes of aerosols), besides at the Biological Marine Station of Moscow State University in the coastal zone of the White Sea a continuous collection of aerosols (analysis of black carbon) is carried out by the High volume sampler (UK). In June –July on board the *RV "Academik Ioffe*" a transect along 60oN in the Northern Atlantic was made to estimate evolution of water masses by hydrochemical and hydrophysical parameters. Just in a few days a cruise of the *RV "Academik Mstislav Keldysh*" will start in the Northern Atlantic and the Barents Sea to perform a geological and geochemical investigation.
- In plans for 2016 there is an international multidisciplinary expedition in the Arctic Ocean which helds Pacific Oceanology Institute (*RV "Academik Lavrent'yev")* where participants from other nations are welcome.

New funding

- We have got a financial support of the 15 initiative projects, related to the GEOTRACES objectives, from the Russian Foundation on Basic Research (rfbr.ru), aimed to investigate Russian Seas.
- In addition we have got 2 initiative projects from the recently organized Russian Scientific Foundation (rscf.ru).
- Among the aims of some projects, multidisplinary expeditions in the Arctic seas (including the Barents, Kara and East Siberian and Chukchi Seas) are laid out on 2016.

Other activities

- New equipment was bought (Laminar box, Teflon subboiling system for acids' cleaning, new Multicorer sampler for bottom sediment sampling with possibility of high resolution of layers and so on).

Submitted by Ludmila Demina (l_demina@mail.ru).

New results

Nitrogen concentrations and isotopic composition were used to investigate whether they have any notable influence on the Gulf of Trieste. The combined use of salinity, nutrient concentrations, and nitrate, particulate nitrogen and carbon isotopic compositions revealed that the seawater surface was influenced by mixing with different sources including seawater, rivers and sewage effluent. The site influenced by sewage effluent is relatively spatially isolated, which suggests that NO_3^- is not widely distributed by this point source. In addition, our results are consistent with the occurrence of nitrification in the water column in autumn and winter. The nitrification activity was higher in autumn, while in winter it occurred in parallel to phytoplankton uptake.

The coastal northern Adriatic Sea receives pulsed inputs of riverine nutrients, causing phytoplankton blooms and seasonally sustained dissolved organic carbon (DOC) accumulation—hypothesized to cause episodes of massive mucilage. The underlying mechanisms regulating P and C cycles and their coupling are unclear. Results provide novel insights on post-bloom C and P dynamics and mechanisms. 1) Post-bloom DOC accumulation to 186 μM remained elevated despite high bacterial carbon demand. Presumably, a large part of DOC accumulated due to the bacterial ectohydrolytic processing of primary productivity that adventitiously generated slow-to-degrade DOC; 2) bacteria heavily colonized post-bloom diatom aggregates, rendering them microscale hotspots of P regeneration due to locally intense bacterial ectohydrolase activities; 3) Pi turnover was rapid thus suggesting high P flux through the DOP pool (dissolved organic phosphorus) turnover; 4) Alpha- and Gamma-proteobacteria dominated the bacterial communities despite great differences of C and P pools and fluxes in both mesocosms. However, minor taxa showed dramatic changes in community compositions. Major OTUs were presumably generalists adapted to diverse productivity regimes.We suggest that variation in bacterial ectohydrolase activities on aggregates, regulating the rates of POM → DOM transition as well as dissolved polymer hydrolysis, could become a bottleneck in P regeneration. This could be another regulatory step, in addition to APase, in the microbial regulation of P cycle and the coupling between C and P cycles.

Our comprehensive 2 year time - series study showed that despite the shallowness of this area there was a significant difference between the surface and the bottom bacterial community structure. The bottom bacterial community was more diverse than the surface one and influenced by sediment re-suspension. The surface seawater temperature had a profound effect on bacterial productivity, while the bacterial community structure was more affected by freshwater - borne nutrients and phytoplankton blooms. Our results propose the importance of the water mass movements as drivers of freshwater - borne nutrients and of allochthonous microbial taxa.

Polonium-210 (Po-210, t1/2 = 138.4 days) is a naturally occurring radionuclide originating from Uranium-238 decay chain as the daughter of Lead-210 (Pb-210, t1/2 = 22 years). The alpha decay of Po-210 accounts for most of the radioactive dose to marine organisms. In some cases it can represent a serious risk to human health, particularly due to its biomagnification along marine (benthic and pelagic) food webs. We studied the total activity of Po-210 determined by alpha-spectrometry in various samples (matrices) collected in the Gulf of

Trieste (northern Adriatic Sea) affected by fresh water inflows especially from the Isonzo River in the northern part. Observed Po-210 levels were: 1) 1.41-3.35 mBq/L in dissolved phase (<0.45 μm) in seawater column (0-20 m) and up to 26.7 mBq/L in the river Isonzo, 2) 0.81-4.59 mBq/L (400-2300 Bq/kg, dw) in the suspended particulate matter (SPM. 0.45-200 μm) in the seawater column and up to 10.1 mBq/L in the river Isonzo, 3) 40 (Isonzo River) - 158 Bq/kg in surface sediments (5 sediment cores collected in a N-S transect in the gulf and sectioned in 1 cm slices to the depth of 20 cm), 4) 239 (autumn) – 415 to 1800 (spring) Bq/kg (dw) in meso(zoo)plankton (>200 μm) and 5) 300-400 Bq/kg (ww) in mussels (*Mytilus galloprovincialis*) consumed by humans. In seawater, 1/4 to 1/2 of total Po-210 was found in particulate form, while in the Isonzo River the dissolved form dominates (up to 3/4). Plankton fractionation revealed the highest levels in >200 μm fraction - mesoplankton (415-1272 Bq/kg) followed by 55-200 μm (388-997 Bq/kg) and 20-55 μm (318-810 Bq/kg) fractions - microplankton. In sediments, slightly higher levels were encountered in the Isonzo prodelta and in the central (deepest) part of gulf. KD (L/kg) calculated between seawater and SPM, and seawater and sediment amounted to about 5.106 and 6.104, respectively. Obtained data show higher Po-210 levels in all matrices analyzed in the Gulf of Trieste compared to other Adriatic (central Adriatic) and Mediterranean (Ligurian Sea) areas. The Po-210/Pb-210 ratios in water and sediments were mostly below or close to 1 while this ratio greatly increased in trophic levels (up to about 50) reflecting a preferential bioaccumulation of Po-210 over Pb-210. Po-210 accumulation between seawater and SPM and seawater and mesozooplankton amounts to 3.7.104 and 1.1.104. Comparison of the relative importance of pelagic and benthic bioaccumulation pathways suggests greater accumulation in pelagic feeding species except in filter feeder bivalves.

In the framework of the GMOS project further measurements of Hg in air, precipitation, and seawater continued. Research on the analytical approach related to Hg species in seawater was performed. Evasion to the atmosphere of elemental mercury from surface ocean water constitutes an important source of Hg in the environment. Its availability in aqueous samples is affected by a number of factors such as light, temperature, the presence of other ions (Cl^- or Br^-), metals (Fe(III)), organic matter, biological activity, tectonic activity and wind speed. In addition, the presence of oxidized forms of Hg increases the chances of methylation processes where MeHg is formed. For these reasons the importance of DGM and RHg measurements is highly important in understanding and building on existing knowledge of Hg chemistry and in improving the analytical methods used. The overall conclusion stresses the need of on-spot measurements but when this is not possible, analysis of the sample about 24 hours after sampling, without the addition of any preservative agent or filtration, can ensure reliable results. Acidifying the sample or adding a preservative agent such as $AgCl_3$ and HNO_3, may lead to unpredictable results, depending on sample matrix.

Publications

Original scientific article

- KOTNIK, Jože, SPROVIERI, Francesca, OGRINC, Nives, HORVAT, Milena, PIRRONE, Nicola. Mercury in the Mediterranean. Part 1, Spatial and temporal trends. V: 16th International Conference on Heavy Metals in the Environment, 23-27 September, 2012, Rome, Italy. Heidelberg: Springer, vol. 21, no. 6. 2014, vol. 21, no. 6, 4063-4080, doi: 10.1007/s11356-013-2378-2.
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Invited lecture

- FAGANELI, Jadran, COVELLI, Stefano, OGRINC, Nives, ČERMELJ, Branko. "Zgodovina" recentnega (holocenskega) sedimenta Tržaškega zaliva z uporabo geokemijskih indikatorjev. V: 4. slovenski geološki kongres, Ankaran, 8.-10. oktober 2014. ROŽIČ, Boštjan (ur.), VERBOVŠEK, Timotej (ur.), VRABEC, Mirijam (ur.). Povzetki in ekskurzije = Abstracts and field trips. Ljubljana: Naravoslovnotehniška fakulteta, 2014, 16.

Scientific conference contribution

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- MOZETIČ, Patricija, FRANCÉ, Janja, KOGOVŠEK, Tjaša, LIPEJ, Lovrenc, MAVRIČ, Borut, ORLANDO-BONACA, Martina, TALABER, Iva, MALEJ, Alenka. An integrative approach towards the assessment of marine ecosystem health (Northern Adriatic). V: Aquatic sciences: global and regional perspectives - North meets South. [S. l.]: Association for the Sciences of Limnology and Oceanography, 2013-2015, sess. no. 013, abstract no. 25851. http://www.sgmeet.com/aslo/granada2015/viewabstract.asp?AbstractID=25851.
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- MOZETIČ, Patricija, TALABER, Iva, FLANDER PUTRLE, Vesna, FRANCÉ, Janja, KOGOVŠEK, Tjaša, ROTTER, Ana, MALEJ, Alenka. Can the status of food webs be assessed by the characteristics of plankton communities?. V: 2nd International ocean research conference, Barcelona 2014, Spain, 16-21 November. One planet, one ocean : program and abstracts. Barcelona: UNESCO IOC, 2014, str. 227.

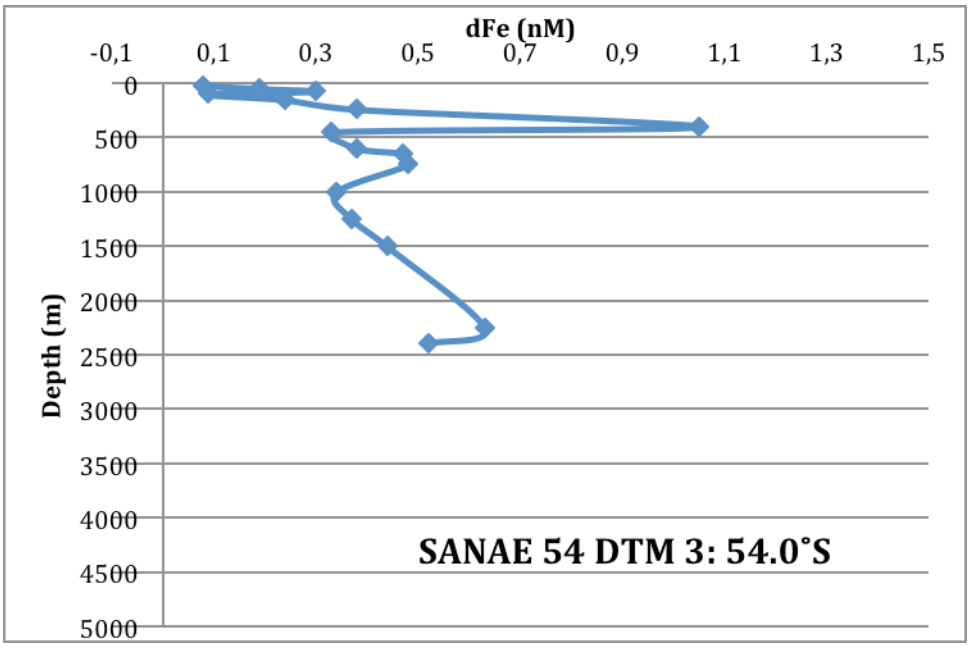
PhD thesis

- TAMŠE, Samo. The CO2 system and carbon cycling in coastal waters (the Gulf of Trieste, N Adriatic : doctoral dissertation = CO2 in kroženje ogljika v obalnem morju (Tržaški zaliv, S Jadran): doktorska disertacija. Ljubljana: [S. Tamše], 2014. XII, 160 str., ilustr.
- SOCZKA-MANDAC, Rok. Vpliv rečnega vnosa na termohaline razmere in porazdelitev suspendirane snovi v malem zalivu (Koprski zaliv) : doktorsko delo = Impact of river discharge on the thermo-haline properties and suspended matter distribution in the small bay (Bay of Koper): doctoral dissertation. Portorož: [R. Soczka Mandac], 2014. XXI, 150 str., ilustr.
- TALABER, Iva. Fotosintetske značilnosti in produktivnost fitoplanktona v Tržaškem zalivu: doktorska disertacija = Photosynthetic properties and productivity of phytoplankton in the Gulf of Trieste: doctoral dissertation. Ljubljana: [I. Talaber], 2014. XI, 106 f., ilustr.

Submitted by Nives Ogrinc (nives.ogrinc@ijs.si).

New results

Validation of clean sampling protocol using of Go-Flo bottles and Trace CTD rosette. The reproduced profile matches well with data from Klunder et al., (2011). Samples were analyzed in the laboratory of Maeve Lohan, Plymouth, UK.



New publications

- Bjorn P. Von der Heyden and Alakendra N. Roychoudhury (2015) A review of colloidal iron partitioning and distribution in the open ocean, Marine Chemistry, doi:10.1016/j.marchem.2015.05.010.
- P. J. Lam, B. S.Twining, C Jendel, A.N. Roychoudhury, J. Resing, W. Geibert, P. Santschi, R. F. Anderson (2015) Methods for analyzing the composition and speciation of marine particles, Progress in Oceanography, 133; pp 32-42.
- Bjorn P. Von der Heyden, Emily J. Hauser, Bhoopesh Mishra, Gustavo A. Martinez, Andrew R. Bowie, Tolek Tyliszczak, Thato N. Mtshali, Alakendra N. Roychoudhury, Satish C.B. Myneni (2014) Ubiquitous presence of Fe(II) in aquatic colloids and its association with organic carbon. Environmental Science & Technology, Letters, 1; pp 387 – 392.

Cruises

- SANAE 54 (Southern Ocean physics and biogeochemistry) cruise was undertaken along the BONUS-GOODHOPE line in the Southern Ocean to support the following projects (Dec 2014 – Feb2015):
  1. Seasonal Cycle of Carbon in Southern Ocean – SNA2011112600001
  2. Fe and light limitation in Southern Ocean phytoplankton – SNA2011120600005
  3. Bioactive trace elements in Southern Ocean – SNA2011110100001
  4. Stratification dynamics in the Southern Ocean mixed layer: a high resolution approach – YREF 0000005441

5. Southern Ocean Phytoplankton Adaption to mimicked future changes in light and iron availability - Molecular bases and modelling – SANCOOP 234229
6. Bio-optics - SNA2011120800004

New funding

- Roychoudhury AN (2015) ICP-MS mass spectrometer for ultra-trace metal analysis. National Equipment Program, NRF, R 2,699,000
- Roychoudhury AN (2015-2017) Speciation and interaction of iron nanoparticles in Southern Ocean, SANAP, R 1,353,500
- Roychoudhury AN (2014 – 2016) Iron nanoparticles in environment, NRF Competitive Rated Researcher Grant, R 1,427,220
- Fietz, S and Roychoudhury, AN (2014- 2016) Southern Ocean Phytoplankton adaption to mimicked future changes in light and iron availability – molecular bases and modeling, South Africa – Norway bilateral grant, R2,421,712 + NOK1,453,027

Other activities *(e.g., acquisition of new sampling systems)*

A pico-Fast® system has been acquired for pre-concentration of sea-water samples for trace elemental analysis using ICP-MS. The system is currently undergoing installation and validation for measurement of bioactive trace elements.

Report submitted by AN Roychoudhury (roy@sun.ac.za).

ANNUAL REPORT ON GEOTRACES ACTIVITIES IN SPAIN
MAY 2014 – JUNE 2015

National committee (under SCOR-Spain)

P. Masqué, E. Garcia-Solsona, V. Rodellas, J. Garcia-Orellana (Barcelona-UAB)
A. Tovar-Sanchez (Cádiz-CSIC)
A. Cobelo, R. Prego, J. Santos (Vigo-CSIC)
J. Magdalena Santana-Casiano, Melchor González-Dávila (Canarias-ULPGC)
L. Lagrera (UIB)

- Results from the GEOTRACES section GA04-S (Mediterranean Sea) on board the R/V Ángeles Alvariño between May 2nd and June 1st 2013 are now available and being to be published.

- Participation at a meeting held at ETH-Zurich in December 2014 to discuss U-236 data in the frame of GEOTRACES section GA04-S (Mediterranean Sea).

- Participation in the Ocean Research Meeting on November 2014 presenting the Intermediate Data Product

- Participation in the French GEOVIDE cruise on May 2014 to undertake an integrated oceanographic transect in the North Atlantic Ocean and Labrador Sea (GEOTRACES GA01 section), collecting samples for artificial (i.e. 236U, Pu isotopes, 137Cs, 90Sr, 129I) and natural (i.e. 7Be, 210Po and 210Pb) radionuclides. Samples are in process.

- Participation in the planning activities of two expeditions lead by Germany in the Arctic Ocean onboard Polarstern in 2015 and 2016.

- Participation at the Mediterranean GEOTRACES workshop that was hold in Barcelona in July 10th 2014 and in Texel in March 30th-31th 2015, that lead to share data from different labs and determine the contributions from each lab involved in the cruise.

GEOTRACES-related projects/grants

- PROJECT TITLE: Metal Transport in the Environment (MetTrans).
  IP: Don Porcelli (U. Oxford).
  Funded by EU FP7-People-2011-ITN, 290336.

- PROJECT TITLE: NUevos REtos en la investigación de cañones submarinos: Indicadores del Estado ambiental y Variabilidad espacio- temporal – El papel de los temporales (NUREIEV).
  IP: Miquel Canals (U. of Barcelona).
  Funded by Ministerio de Economía y Competitividad, CTM2013-44598-R.

- PROJECT TITLE: MEzcla y DISpersión en el TRAnsporte de Energia y Solutos (MeDistraes).
  IP: Jesus Carrera y Maaten W Saaltink.

Funded by Ministerio de Economía y Competitividad. CGL2013-48869-C2-2-R, 2014-2016.

- PROJECT TITLE: Effect of the ocean acidification and warming in the biogeochemical cycle of Fe in the Norh Atlantic.
  IP: J. Magdalena Santana-Casiano, M. González-Dávila (ULPGC).
  Funded by Ministerio de Economía y Competitividad. CTM2014-53342-P.

GEOTRACES-related articles

- Rodellas V, Garcia-Orellana J, Tovar-Sánchez A, Basterretxea G, López-Garcia JM, Sánchez-Quiles D, Garcia-Solsona E, Masqué P. 2014. Submarine groundwater discharge as a source of nutrients and trace metals in a Mediterranean Bay (Palma Beach, Balearic Islands). Marine Chemistry 160, 56 – 66.
- Cobelo-García A, Santos-Echeandía J, Lopez-Sannchez DE, Almecija C, Omanovic D. 2014. Improving the Voltammetric Quantification of Ill-Defined Peaks Using Second Derivative Signal Transformation: Example of the Determination of Platinum in Water and Sediments. Analytical Chemistry 86, 2308 – 2313.
- Prego R, Caetano M, Ospina-Alvarez N, Raimundo J, Vale C. 2014. Basin-scale contributions of Cr, Ni and Co from Ortegal Complex to the surrounding coastal environment (SW Europe). Science of the Total Environment 468-469, 495-504.
- Ospina-Alvarez, N., Caetano, M., Vale, C., Santos-Echeandía, J., Prego, R. 2014. Prevalence of tide-induced transport over other metal sources in a temperate estuarine zone (NW Iberian Peninsula). Journal of Geochemical Exploration, 140: 46-55.
- Garcia-Solsona E, Jeandel J, Labatut M, Lacan L, Vance D, Chavagnac V, Pradoux C. 2014. Rare earth elements and Nd isotopes tracing water mass mixing and particle-seawater interactions in the SE Atlantic. Geochimica et Cosmochimica Acta, Volume 125, 351-372.
- J. M. Santana-Casiano, M. González-Dávila, A. G. González, M. Rico, A. López, A. Martel. Characterization of phenolic exudates from Phaeodactylum tricornutum and their effects on the chemistry of Fe(II)–Fe(III). Mar. Chem. 158, 10-16, 2014
- Garcia-Orellana J, Cochran JK, Bokunievicz H, Daniel JWR, Rodellas V, Heilburn C. Evaluation of 224Ra as a SGD tracer in Long Island Sound (NY). Accepted in Geochimica et Cosmochimica Acta 141, 314-330, 2014
- Rodellas V, Garcia-Orellana J, Masqué P, Feldman M, Weinstein Y Submarine Groundwater Discharge: a major source of nutrients to the Mediterranean Sea. Proceedings of the National Academy of Sciences of the United States of America 112 (13), 3926-3930
- Bokuniewicz, H., Cochran, J.K., Garcia-Orellana, J., Rodellas, V., Daniel, J.W.R., Heilbrun, C. Intertidal percolation through beach sands as a source of 224,223Ra to Long Island Sound, New York and Connecticut, U.S.A. Journal of Marine Research. In press.
- Rodellas, V., Garcia-Orellana, J., Masqué, P., Font-Muñoz, J.S., 2015. The influence of sediment sources on radium-derived estimates of Submarine Groundwater Discharge. Marine Chemistry 171, 107-117.
- Tovar-Sanchez, A., Basterretxea, G., Rodellas, V., Sánchez-Quiles, D., Garcia-Orellana, J., Masqué, P., Jordi, A., López, J.M., Garcia Solsona, E., 2014. Contribution of groundwater discharge to the coastal dissolved nutrients and trace metal concentrations in Majorca Island: karstic vs detrital systems. Environmental Science and Technology 48, 11819–11827.

- The GEOTRACES Group. The GEOTRACES Intermediate Data Product 2014. Marine Chemistry, in press.
- Dulaquais, G., Boye, M., Middag, R., Owens, S., Puigcorbe, V., Buesseler, K.O., Masqué, P., de Baar, H. and Carton, X. (2014). Contrasting biogeochemical cycles of cobalt in the surface Western Atlantic Ocean. Global Biogeochemical Cycles, 138 (12), 1387-1412.
- Casacuberta, N., Christl, M., Lachner, J., Rutgers van der Loeff, M., Masque, P. and Synal, H.-A. (2014). A first transect of 236U in the North Atlantic. Geochimica et Cosmochimica Acta, 133, 34-46.
- Pižeta I., S.G. Sander, R.J.M. Hudson, D. Omanoviæ, O. Baars, K.A. Barbeau, K.N. Buck, R.M. Bundy, G. Carrasco, P.L. Croot, C. Garnier, L.J.A. Gerringa, M. Gledhill, K. Hirose, Y. Kondoo, L.M. Laglera, J. Nuester, M.J.A. Rijkenberg, S. Takeda, B.S. Twining, M. Wells. 2015. Interpretation of complexometric titration data: An intercomparison of methods for estimating models of trace metal complexation by natural organic ligands, Mar. Chem., 173(0), 3-24.
- Laglera, L. M., and M. Filella (2015), The relevance of ligand exchange kinetics in the measurement of iron speciation by CLEAdCSV in seawater, Mar. Chem., 173(0), 100-113.
- Santana-Casiano J. M., M. González-Dávila, A. G. González, M. Rico, A. López and A. Martel (2014) Characterization of phenolic exudates from Phaeodactylum tricornutum and their effects on the chemistry of Fe(II)-Fe(III). Marine Chemistry, 158, 10-16.
- González A.G., J.M. Santana-Casiano, M., González-Dávila, N., Pérez-Almeida, M., Suárez De Tangil. (2014) Effect of Dunaliella tertiolecta organic exudates on the Fe(II) oxidation kinetics in seawater. Environmental Science & Technology, 48(14), 7933-7941.

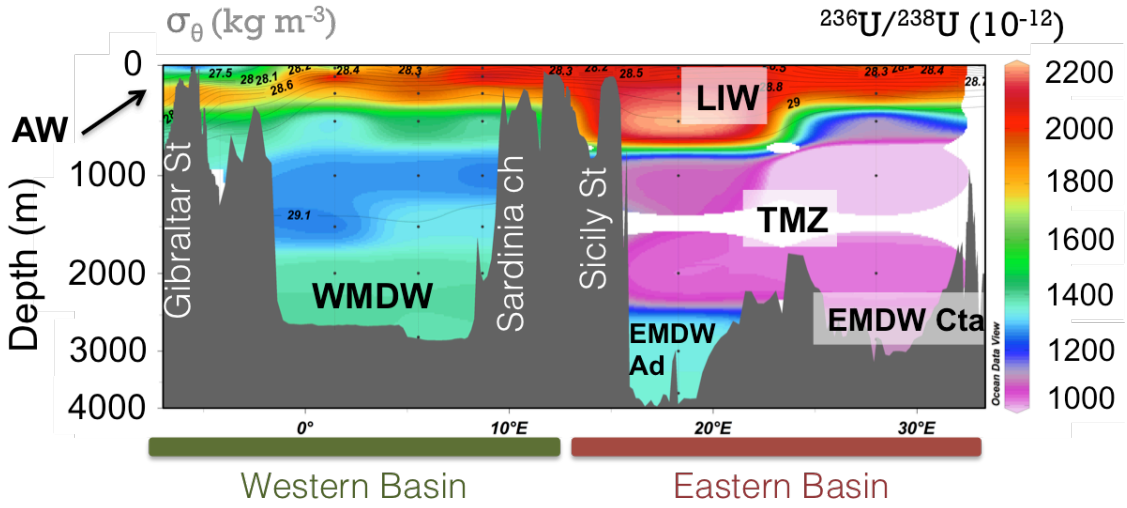


Figure 12: Distribution of 236U/238U in the Mediterranean Sea. 236U/238U ratios are in correspondence to the different water masses in the region. In preparation.

Contributions to conferences:

- Garcia-Orellana J., Mawji E., Schlitzer R., Masferrer E. et al. GEOTRACES Intermediate Data Product 2014. 2nd International Ocean Research Conference. Barcelona, November 2014.
- Kenna, T. and Masqué, P. (2014). Anthropogenic radionuclides in the Atlantic Ocean. ICRER 2014 - Third International Conference on Radioecology and Environmental Radioactivity. Barcelona (Spain). 7-12 September 2014.

- Buesseler, K.O., Black, E., Pike, S., T. Kenna and Masqué, P. (2014). Plutonium isotopes in the ocean off Japan after Fukushima. ICRER 2014 - Third International Conference on Radioecology and Environmental Radioactivity. Barcelona (Spain). 7-12 September 2014.
- Casacuberta, N., Christl, M., Lachner, J., Rutgers van der Loeff, M., Masqué, P., Vockenhuber, C., Walther, C. and Synal, H.-A. (2014). 236U, 129I and Pu-isotopes as oceanographic tracers in the Arctic and Atlantic Oceans. AMS-13, Aix-en-Provence (France), 24-29 August 2014.
- Castrillejo, M., Casacuberta, N., Masqué, P., Breier, C., Pike, S. and Buesseler, K.O. (2014). Reassessment of 90Sr in the Pacific Pcean and the coast off Japan derived from the Fukushima Dai-ichi nuclear accident. ICRER 2014 - Third International Conference on Radioecology and Environmental Radioactivity. Barcelona (Spain). 7-12 September 2014.
- Neira del Rio, P. Antonio Cobel-García; Juan Santos-Echeandía; Victoria Besada. Evidence of Increased Anthropogenic Emissions of Platinum in Coastal Systems from Time-Series Analysis of Mussels Samples (1991-2011). IMMR | International Meeting on Marine Research 2014. Peniche, Portugal. 10-11/07/2014.
- Laglera L.; Juan Santos-Echeandia; Christine Klaas; Dieter Wolf-Gladrow. Iron partition in surface waters of a large-scale summer bloom south of the Antarctic Polar Front. IV Congreso de Ciencias del Mar. Las Palmas de Gran Canaria, Canary Islands, Spain. 11-13/06/2014.
- Santos-Echeandia J.; Patricia Bernárdez; Miguel Caetano; Ricardo Prego. Natural enrichment of coastal waters: the influence of the geological basement on trace metal. IV Congreso de Ciencias del Mar. Las Palmas de Gran Canaria, Canary Islands, Spain. 11-13/06/2014.
- Almécija C.; Antonio Cobelo-García; Juan Santos-Echeandía; Miguel Caetano. Platinum in Salt Marsh sediments: behaviour and biological uptake. IV Congreso de Ciencias del Mar. Las Palmas de Gran Canaria, Canary Islands, Spain. 11-13/06/2014.
- Almécija-Pereda C.; Mukul Sharma; Antonio Cobelo-García; Juan Santos-Echeandia; Miguel Caetano. Salt Marsh Sediment as Source of Osmium to the Oceans. Goldschmidt 2014. California, United States of America. 08-13/06/2014.
- Trimborn S.; Clara J.M. Hoppe; Louiza Norman; Juan Santos-Echeandia; Luis M. Laglera; Christel Hassler. The availability and the source of iron modulate ocean acidification effects in antarctic phytoplankton. DUST 2014: International Conference on Atmospheric Dust. Castellaneta Marina, Italy. 01-06/06/2014.
- Cerdà-Domènech M., Jordi Garcia-Orellana, Albert Folch, Valentí Rodellas. Characterization of the Ra isotope end-members in the Submarine Groundwater Discharge (SGD). ASLO Meeting. Granada, 22-27 February 2015.
- Trezzi G., Garcia-Orellana J., Rodellas V., Masqué P., Garcia-Solsona E., Andersson P. Continental inputs of Sr to the Mediterranean Sea: SGD and Ebro riverine flux along the Iberian Peninsula Eastern Coast. ASLO Meeting. Granada, 22-27 February 2015.
- Castrillejo, M., N. Casacuberta, M. Christl, C. Vockenhuber, H-A. Synal, P. Masqué and J. Garcia-Orellana. First comprehensive mapping of 236U and 129I in the Mediterranean Sea. Granada, 22-27 February 2015.
- Rodellas V., J. Garcia-Orellana, G. Trezzi, P. Masqué, E. Berdalet, H. Bokuniewicz, J.K. Cochran. Seasonal cycles in Radium fluxes to a Mediterranean Bay: SGD vs porewater advection. Granada, 22-27 February 2015.
- Laglera L.M. New applications of cathodic polarography for the study of metal-natural organic ligands interactions in seawater. XI Simposio Latinoamericano de Química Analítica Ambiental y Sanitaria. Riobamba (Ecuador), 2015.

- Filella M. and Laglera L.M. Chemical speciation and kinetics of ligand substitution reactions: are we using the right approach? The BNASS (Biennial National Atomic Spectroscopy Symposium) / TraceSpec Tandem Conference. Aberdeen (UK), 2014.
- Monticelli D., L. M. Laglera, S. Caprara. Ultratrace element analysis and speciation with twenty-fold sample size reduction. The BNASS (Biennial National Atomic Spectroscopy Symposium) / TraceSpec Tandem Conference. Aberdeen (UK), 2014.
- Casacuberta, N.; Rutgers van der Loeff, M.; Masqué, P.; Herrmann, J.; Lachner, J.; Henderson, G.; Walther, C.; Vockenhuber, C.; Synal, H. A.; Christl, M.; 236U as a new oceanographic tracer: first data in the North Sea, the Arctic Ocean and the Western North Atlantic Ocean. ASLO Meeting. Granada, 22-27 February 2015.
- Timothy Kenna, María Villa Alfageme, Núria Casacuberta Arola and Pere Masque. The Influence of Hydrothermal Plumes on the Distribution of Anthropogenic Radionuclides Between the Particulate and Dissolved Phases: Results from U.S. Geotraces Equatorial Pacific Zonal Transect GP16. AGU Fall Meeting. San Francisco, 15-19 December 2014.
- Fraile-Nuez E., J. M. Santana-Casiano, M. González-Dávila. The submarine volcano eruption at the island of El Hierro: physical-chemical perturbation and biological response. EGU, Vienna, Austria, 27 April- 2 May, 2014.
- Santana-Casiano J.M., M. González-Dávila, E. Fraile-Nuez The natural ocean acidification and fertilization event caused by the submarine eruption of El Hierro. EGU, Vienna, Austria, 27 April- 2 May, 2014.
- López A., Milagros Rico, J. Magdalena Santana-Casiano, Melchor González-Dávila, and Aridane G. González. Phenolic profile in Dunaliella tertiolecta growing under copper stress. EGU, Vienna, Austria, 27 April- 2 May, 2014

PhD defenses

- Valentí Rodellas Vila. Evaluating submarine groundwater discharge to the Mediterranean Sea by using Ra isotopes. Advidors: Jordi Garcia-Orellana and Pere Masqué. Universitat Autònoma de Barcelona. 28/11/2014.

- Clara Almécija-Pereda. Geochemical behaviour and sources of platinium group elements in anthropogenically-impacted sediments. Advisors: Antonio Cobelo Garcia and Juan Santos Echeandía. Universidade de Vigo 29/5/2015.

Equipment acquisition project

- Luis M Laglera (UIB). Project: Adquisición de material de muestreo para el estudio de la concentración de metales traza en aguas del litoral balear (compra 4 botellas GoFlo con linea kevlar y polea teflón). Budget: 15020€. (submitted)

Submitted by Jordi Garcia-Orellana (Jordi.Garcia@uab.cat).

ANNUAL REPORT ON GEOTRACES ACTIVITIES IN SWEDEN
MAY 2014 – JUNE 2015

Meetings

- Per Andersson participated in the Intercalibration committee meeting 26 to 28 January 2015 at the National University of Ireland at Galway Ireland. This was Per's last meeting as a member of this committee and he is rotating off.

GEOTRACES fieldwork (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 by U-series nuclides. Sandra Gdaniec (PhD student) is participating on *R/V Polarstern* 2015 cruise ARK XXIX/3 (PS94) 16 August – 15 October 2015 to the Arctic Ocean. The field work is partly funded by the Swedish Research Council and The Swedish Polar Research Secretariat: http://polar.se/en/expedition/transarc-ii/

Relevant SCOR Working Groups

- Šibenik, Croatia, April 2015: David Turner attended the WG139 symposium, and chaired the first meeting of WG145.

Submitted by David Turner (davidt@chem.gu.se).

Bio-geochemistry of surface sediment in Mediterranean Sea toward modeling nutrient fluxes at sediment-water interface

Noureddine ZAABOUB
National Institute of Marine Science and Technology, Tunisia

Summary
Surface cores sediments (14 core samples) are sampled during Med Black Cruise in the first Leg, they interest the first centimeters processes. Carbon, Nitrogen and Sulfur geochemistry in sediment shows a clear accumulation of TOC in eastern Mediterranean Sea comparing to western area. The average value of the C/N ratio in western area was between 1 and 8, which is characteristic of marine and coastal regions. The average value of the C/N ratio in the eastern area reaches 22, which characterize continental origin. Phosphorous fractionation was investigated and presents High levels of total phosphorus (264 μgg^{-1}) similar to previous measured value in Mediterranean Sea. This phosphorous accumulation is related to mineralization factors and the hydrodynamic process.
The phosphorus in the Mediterranean Sea is mainly abundant in carbonate fraction (Ca–P) and iron bound fraction (Fe–P). The amount of Ca–P and Fe–P in sediment also depends on the physical and chemical parameters of sediment, which shows strong interdependence in the cycling of these elements in the marine environment and currents. An amount of bioavailable phosphorous fraction can be dispersed in the water column under specific biogeochemical conditions. Modeling of P production confirm fluxes variability depending on hydrodynamic conditions, biological and geochemical change (Figure 13).

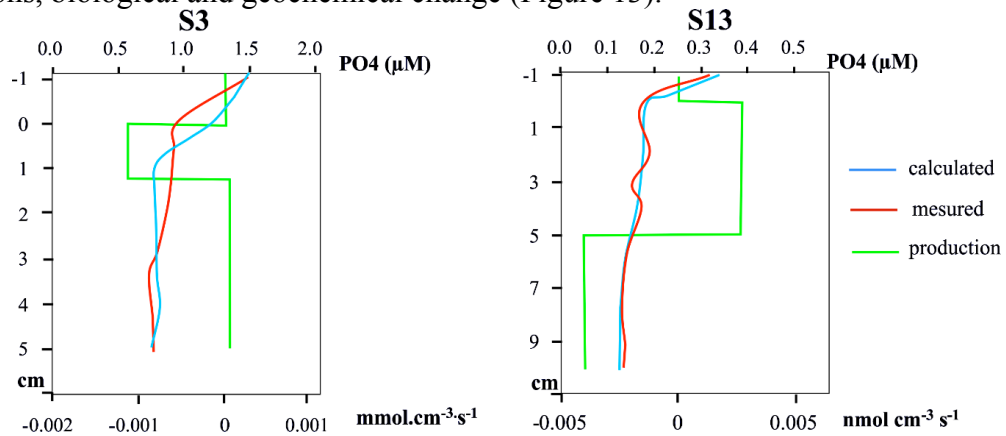


Figure 13: PO_4^- measured concentration in pore water, modeling of concentration and production zone in Atlantic core profile (S3) and Mediterranean core profile (S13). Positive production rates (no consumption) are to be considered, in which case the value 0 is specified. Negative production rates (consumption) are considered (Concentrations are given per volume of pore water, while production rates and irrigation rates are given per volume of sediment). Profile MODEL (Berg et al.1998).

Submitted by Noureddine Zaaboub (nouri_zaaboub@yahoo.fr).

ANNUAL REPORT ON GEOTRACES ACTIVITIES IN UNITED KINGDOM
MAY 2014 – JUNE 2015

New results

- 2 process cruises GApr04 Leg 1 and Leg 2- Shows clear offshore Fe transport that can be traced using Ra isotopes, Seasonal drawdown of Fe at the start of the bloom on-shelf, benthic resuspension of Fe.
- Particulate Nd isotopes from GA02- Torben Stichel, Myriam Lambelet & Tina van de Flierdt (Lambelet et al. submitted).
- Modelling- Alessandro Tagliabue demonstrated that you need Fe-binding ligands to stabilise dissolved Fe from Hydrothermal vents-work with US GEOTRACES GP13- Resing et al. accepted in Nature.

New publications

- Aumont, O., C. Ethé, A. Tagliabue, L. Bopp, and M. Gehlen, PISCES-v2: an ocean biogeochemical model for carbon and ecosystem studies, Geoscientific Model Development Discussions, 8(2), 1375-1509, doi:10.5194/gmdd-8-1375-2015.
- Boyd, P. W., & A. Tagliabue, Using the L* concept to explore controls on the relationship between paired ligand and dissolved iron concentrations in the ocean, Marine Chemistry, doi:10.1016/j.marchem.2014.12.003.
- Bridgestock, P.M., L., Rehkamper, M., van de Flierdt, T., Weiss, D. (2015), High-precision measurements of seawater Pb isotope compositions by double spike thermal ionization mass spectrometry. Analytica Chimica Acta, 863, 59-69.
- Dutay, J-C., A.Tagliabue, I Kriest and M. Van Hulten, (2015) Modelling the role of marine particles on large scale 231Pa, 234Th, Iron and Aluminium distributions, Progress in Oceanography, doi:10.1016/j.pocean.2015.01.010.
- Ellwood, M.J., Hutchins, D.A., M. Lohan, A. Milne, P. Nasemann, S.D. Nodder, S.G. Sander, R. Strzepak, S.W. Wilhelm, P.W. Boyd (2015). Iron stable isotopes track pelagic iron cycling during a subtropical bloom, Proc. Nat. Acad. Sci., 112: 15-20.
- Henderson, G.M. & O. Marchall (2015) Recommendations for future measurement and modelling of particles in GEOTRACES and other ocean biogeochemistry programmes. Progress in Oceanography, 133: 73-78.
- Lohan, M.C. K.N. Buck, S.G. Sander (2015) Organic ligands – A key Control on trace metal biogeochemistry in the oceans. Marine Chemistry 173: 1-2
- Marsay, C.M., R.J. Sanders, S.A. Henson, K. Pabortsava, E.P. Achterberg, R.S. Lampitt (2015). Attenuation of sinking particulate organic carbon flux through the mesopelagic ocean. Proc. of the Nat. Acad. Sci. 112: 1089-1094
- Mahaffey, C., S. Reynolds, C. Davis, Lohan, M.C. (2014). Alkaline phosphatase activity in the subtropical ocean: insights from nutrient, dust and trace metal addition experiments. Frontiers in Marine Science, 1:73. doi: 10.3389/fmars.2014.00073.
- Resing, J.A., P. N. Sedwick, C. R. German, W. J. Jenkins, J. W. Moffat, B. M. Sohst and Tagliabue, A. (2015) Basin-scale transport of hydrothermal dissolved metals across the South Pacific Ocean, Nature, accepted. May 2015.
- Tagliabue, A. (2014) More to hydrothermal iron input than meets the eye, Proc. of the Nat. Acad. Sci., doi:10.1073/pnas.1419829111
- Tagliabue, A. R. G. Williams, N. Rogan, E. P. Achterberg, and P. W. Boyd (2014) A ventilation-based framework to explain the regeneration - scavenging balance of iron in the Ocean, Geophysical Research Letters, doi:10.1002/2014gl061066

- The GEOTRACES group The GEOTRACES Intermediate Data Product 2014, Marine Chemistry, doi:10.1016/j.marchem.2015.04.005., 2015.
- Van Hulten, M. M. P., Sterl, A., Middag, R., de Baar, H. J. W., Gehlen, M., Dutay, J.-C., and Tagliabue, A. (2014) An improved ocean model of aluminium: the effects of circulation, sediment resuspension and biological incorporation, Biogeosciences, 11(14), 3757-3779, doi: 10.5194/bg-11-3757-2014,
- Völker, C., and A. Tagliabue, (2014) Modelling organic iron-binding ligands in a three-dimensional biogeochemical ocean model, Marine Chemistry, doi:10.1016/j.marchem.2014.11.008.

Meetings:

- Maeve Lohan attended a standards and intercalibration meeting in Jan 2015.
- Final SCOR working group meeting was held in Croatia in April 2015.
- Presentations at DUST 2014:
  - Khonder, R., D. Weiss, T. van de Flierdt, M. Rehkamper, A. baker, R. Chance, S. Strekopytov, E. Willams, P. Aguero, P. Smichowski, M. Babinski, R. Losono. Assessing the geochemistry of aerosols in the South Atlantic Ocean along the 40oS transect using Pb and Nd isotopes and REE and select trace elements

- Presentations at Goldschmidt 2014
  - Honey, D.J., C. Schlosser, J. Snow, C.M. Moore, E.P. Achterberg, M.Gledhill. Heme b distributions in the tropical Atlantic Ocean are influenced by iron demand for nitrogen fixation.
  - Scott, P.M., X. Zheng, Y. Plancherel, D. J. Hembury, M. Pointing, E.M.S. Woodward, G.M. Henderson. Quantifying the non-conservative behaviour of the rare earth elements in the South Atlantic.

- Presentations at Challenger Society for Marine Sciences 2014
  - Tuerena, R., R. Ganeshram, W. Geibert, A. Fallick, EMS Woodward. An isotopic approach to assessing Nitrogen fixation within the Atlantic (UK GEOTRACES)
  - Homoky, W. S. John, T. Conway, Y-T. Heish, D. Hembury, EMS Woodward, G.M. Henderson, R. Mills. Distinct iron isotope signature of sediment dissolution are widespread in the pore waters across the South Atlantic Ocean
  - Milne, A., C. Schlosser, J. Klar, E. P. Achterberg, R. Chance, A. Baker, M.C. Lohan. Identifying the sources of iron to the sub-tropical North Atlantic

- Presentations at The seasonal Dynamics of Iron supply, biological consumption and cycling in the Southern Ocean
  - Tagliabue, A. The seasonal cycle of Iron Supply

- Presentations at AGU 2014
  - Bratkic, A., M. Bahcic, J. Kotnik, M. Horvat, Hg species distribution in the South Atlantic along 40oS parallel

- Presentations at 3rd International Symposium on "Effects of climate change on the World's Oceans" 2015
  - Lohan, M.C., N. Wyatt, D. Vance, S. Little, Y. Zhao, R. Middag, H. de Baar. The role of the Southern Ocean export in the biogeochemical cycling of zinc and cobalt in the Atlantic Ocean

Cruises
- GPpr04: Process Study: The supply of iron from shelf sediments to the ocean.
- GPpr04 leg 1- DY018: 09/11/2014-03/12/2014.
- GPpr04 leg 2- DY029: 1/4/2015-30/04/2015.

New funding
- Royal Society funding for a coupled meeting 'The biological and climatic impacts of ocean trace-element chemistry' and workshop to discuss ocean trace-element and new findings from the GEOTRACES programme.
- Process study 'The impact of mid-ocean ridges on the ocean's iron cycle' was not funded but ranked very highly and will be resubmitted to NERC on 21st of July 2015.

Outreach
- Royal Society meeting which is open to general public in December 2015.

Other activities (e.g., acquisition of new sampling systems)
- New conducting Kevlar winch was deployed on the RSS Discovery during Shelf sea Program and worked well.
- Consultation finished for new Polar Ship (due in 2017) and will include a trace metal clean sampling laboratory, conducting Kevlar winch and trace metal clean CTD.

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

Submitted by Maeve Lohan (M.Lohan@soton.ac.uk).

ANNUAL REPORT ON GEOTRACES ACTIVITIES IN THE UNITED STATES
MAY 2014 – JUNE 2015

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

1) Submitting manuscripts from a North Atlantic zonal section (GA03),
2) Ongoing analysis of samples from a Pacific section between Peru and Tahiti (GP16), and
3) Mobilizing for work in the Arctic Ocean.

Activities

North Atlantic US GEOTRACES investigators remain active in the synthesis and interpretation of results from section GA03 in the North Atlantic. Twenty-five manuscripts appeared in a special issue of Deep-Sea Research Part-II featuring results from GA03. Bill Jenkins, Ed Boyle, Greg Cutter, Rana Fine and Bob Anderson served as guest editors. Papers from this volume are listed separately from other publications produced during the past year by U.S. GEOTRACES investigators at the end of this report.

A substantial amount of work remains to complete the interpretation and publication of results from GA03, especially for the more labor-intensive and time-consuming measurements. US GEOTRACES decided not to pursue a second DSR-II volume. Instead, investigators are encouraged to publish in a journal of their choice.

Eastern Tropical Pacific The second major section carried out by US GEOTRACES, in the eastern tropical Pacific roughly between Peru and Tahiti (GP16, see figure below), was completed in October - December 2013. Chief scientists were James Moffett (University of Southern California) and Christopher German (Woods Hole Oceanographic Institution).

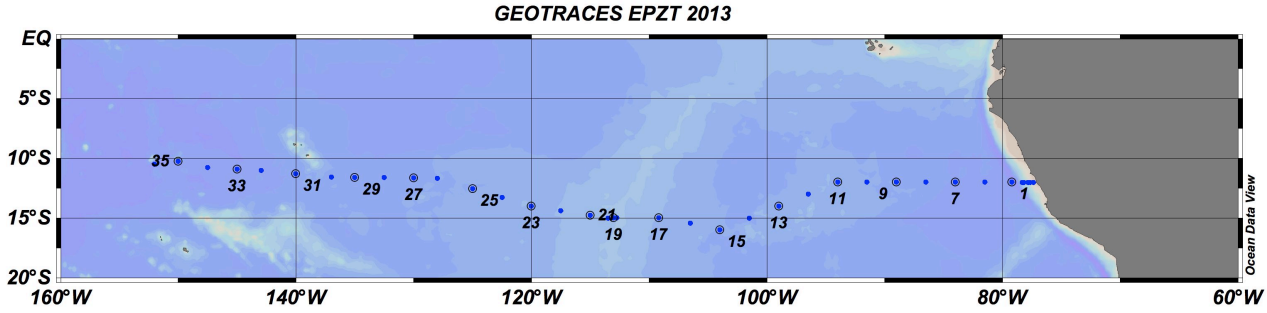


Figure 14: Locations of stations occupied on cruise TGT303 of the Thomas G Thompson in support of the US GEOTRACES completion of section GP16.

Cruise objectives included a comprehensive study of the biogeochemical cycle of trace elements and isotopes within: 1) the highly productive Peru upwelling system, 2) the intense oxygen minimum zone off Peru, and 3) the hydrothermal plume that extends eastward from the East Pacific Rise for up to 3000 km. Preliminary shipboard results from the cruise are presented in the figure below. Many of these results were presented in a special session at the Fall 2014 AGU meeting (San Francisco, California, December 2014) entitled "OS22BTrace Metals and Isotopes in the Eastern Tropical South Pacific: Results of the 2013 U.S. Geotraces Zonal Transect and Complimentary Studies."

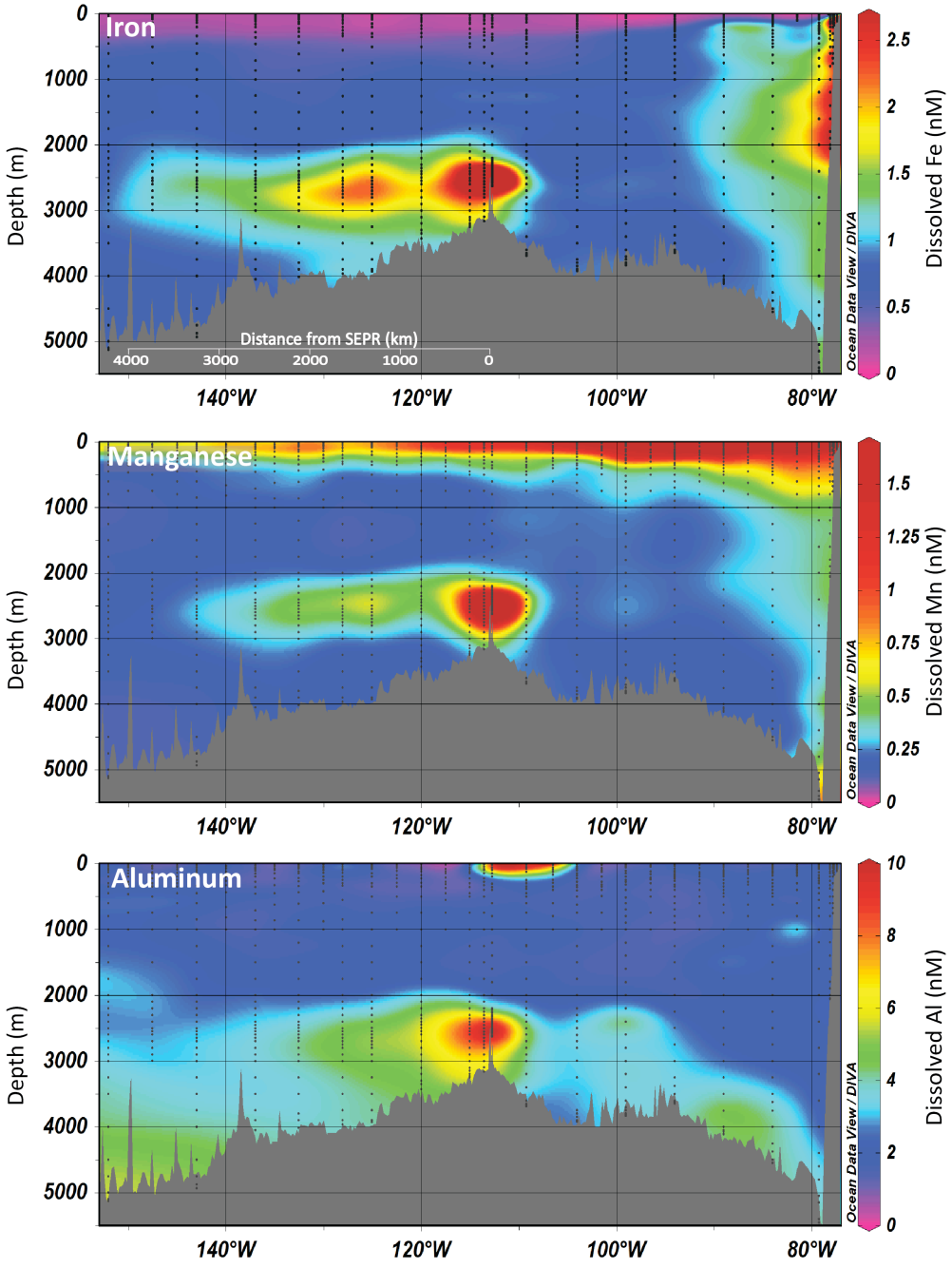


Figure 15: Shipboard data for dissolved Fe, Mn and Al collected along section (GP16) illustrate the chemical imprint of the hydrothermal plume extending more than 3000 km (see scale) to the west of the East Pacific Rise. Additional noteworthy features include surface enrichment of Mn, enrichment of Fe and Mn near the eastern boundary, potentially related to redox cycling, and an apparent benthic source of Al. Figure credit: Joe Resing (University of Washington) and Pete Sedwick (Old Dominion University).

Selected Research Highlights

Atlantic In a novel approach exploiting stable isotopes of iron, Conway and John (*Nature*, 511 (2014) 212-215, see full reference below) partitioned the measured dissolved iron distribution along section GA03 according to its supply from four principal sources: dust, hydrothermal plume, reductive sediment dissolution, and non-reductive sediment dissolution.

Pacific

1) Results illustrated in the figure above, for Fe, Mn and Al, together with ^{3}He concentrations measured along the same section, indicate surprisingly conservative behavior of dissolved Fe released into the ocean by hydrothermal plumes on the East Pacific Rise. Modeling of the dissolved iron distribution suggests that these hydrothermal plumes may supply a significant fraction of the dissolved iron delivered by upwelling to phytoplankton in the Southern Ocean. These findings are in press in Nature (Resing, J.A., P.N. Sedwick, C.R. German, W.J. Jenkins, J.W. Moffett, B.M. Sohst, and A. Tagliabue. in press. Basin-scale transport of hydrothermal dissolved metals across the South Pacific Ocean. *Nature*.)

2) Additional findings will be discussed at a cruise data workshop to be held in November 2015 (Catalina Island, California).

Planning for an Arctic Expedition

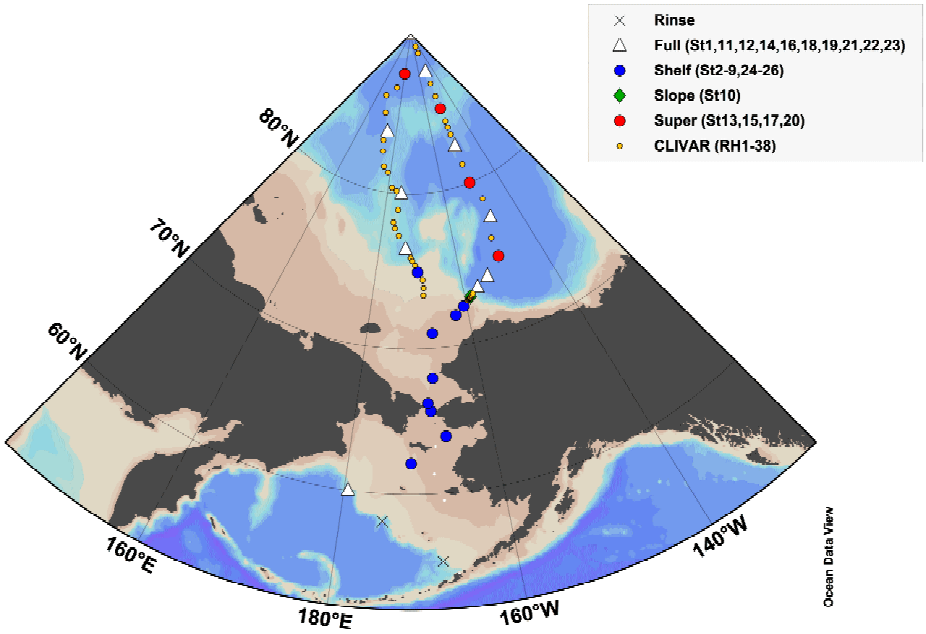


Figure 16: Planned route of the US GEOTRACES expedition in the Arctic Ocean.

US investigators will participate in an international GEOTRACES study of the Arctic Ocean during the summer of 2015, sailing aboard the USCGC Healy (7 August - 15 October, 2015; Chief Scientist: David Kadko, Co-Chief Scientist: Bill Landing, Logistics Coordinator: Greg Cutter). Science gear for the expedition was successfully loaded aboard the Healy in Seattle, Washington, during the week of 12 June 2015. GEOTRACES scientists will be accompanied on the expedition by scientists from the CLIVAR Repeat Hydrography program. It is anticipated that the additional insights into Arctic Ocean circulation provided by the Repeat

Hydrographic program will be very beneficial in interpreting the distributions of trace elements and their isotopes to be measured along the cruise track.

New Funding

Funding for the US GEOTRACES Arctic expedition is being provided through a partnership between the Chemical Oceanography program and the Arctic Natural Sciences program at the US National Science Foundation. Altogether, 27 separate projects were funded, involving 49 Principal Investigators, as well as many students, post docs and technicians, representing 29 academic institutions in the U.S.

A proposal to continue funding for the U.S. GEOTRACES project office at the Lamont-Doherty Earth Observatory was submitted to the US NSF in February 2015. We have received verbal notice that the proposal will be recommended for funding, beginning in November 2015 and for a period of three years. The proposal will be funded jointly by the Chemical Oceanography program and the Arctic Natural Sciences program at NSF.

Presentation of results

A large number of presentations based on results from the GP16 section were made at the Fall 2014 meeting of the American Geophysical Union (San Francisco, California, December 2014). Additional presentations are planned for the Goldschmidt Conference (Prague, Czech Republic, August 2015).

U.S. GEOTRACES Meetings

The US GEOTRACES SSC met at the US NSF on 10 and 11 June 2015.

Outreach

Pacific Section (GP16)

The principal outreach activity completed during the past year by U.S. GEOTRACES was a webinar series that was developed by several investigators involved in the US GEOTRACES Eastern Pacific Zonal Transect (GP16) under the leadership of Ben Twining, Director of Research and Education, Bigelow Laboratory for Ocean Sciences. The webinar was organized under the supervision of, and with tremendous technical support from, the COSEE (Center for Ocean Science and Education Excellence)-Ocean Systems Central Office, School of Marine Sciences, University of Maine. Funded by the National Science Foundation's Chemical Oceanography Program, the four-part GEOTRACES webinar series focused on several trace elements and what they can tell us about biogeochemical processes, the carbon cycle, and climate. Nine scientists, each studying a unique facet of the ocean's chemistry, shared their work and the importance of researching these rare and vital "clues" from the ocean:

1) An Introduction to GEOTRACES - Thursday, April 30, 2015
   Ben Twining - Bigelow Laboratory
   Phoebe Lam - Univeristy of California Santa Cruz
2) Nutrients in the Open Ocean - Tuesday, May 5, 2015
   Kathy Barbeau - Scripps Institution of Oceanography
   Kristen Buck - College of Marine Science, University of South Florida
   Claire Parker - University of California, Santa Cruz.
3) Oxygen Minimum Zones - Thursday, May 7, 2015
   Carl Lamborg - University of California, Santa Cruz

Dan Ohnemus - Bigelow Laboratory for Ocean Sciences.

4) Hydrothermal Vents and Megaplumes - Tuesday, May 12, 2015

Jessica Fitzsimmons - Texas A&M University

Brandy Toner - University of Minnesota.

Participants joined the webinar from 29 states in the U.S. plus Puerto Rico and 13 other nations. Among the participants joining the webinar, 35% identified themselves as formal educators, 22% were faculty or postdoctoral researchers, 20% were college or graduate students and 10% identified as "other."

Each of the webinar presentations was recorded and posted online within a few days of each event. The webinar archive pages on the COSEE-OS web site: http://cosee.umaine.edu/programs/webinars/geotraces/

Two supplemental pages were created in addition to the archived webinar content. The first outlines how the series aligns with the Next Generation Science Standards, which can help formal K-12 educators find the content most relevant to their teaching needs. The second contains two slide shows that were created, upon user requests, to walk through the process of obtaining data from the eGEOTRACES web site.

GEOTRACES and the Next Generation Science Standards:
http://cosee.umaine.edu/programs/webinars/geotraces/ngss/

GEOTRACES Data Access
http://cosee.umaine.edu/coseeos/webinars/geotraces/data.htm

Collectively, the archive pages have received more than 1700 visits since the webinar broadcasts and the webinar archive videos have been played more than 250 times (as of 1 June 2015).

Arctic Section (GN01)

US GEOTRACES plans to involve multiple components of outreach in its Arctic expedition.

An early step has been outreach to local populations who depend on the Arctic Ocean for their livelihood. Ana Aguilar-Islas (University of Alaska) gave a presentation on the GEOTRACES Arctic project at the 2015 Kawerak Regional Conference in Nome, Alaska (1-4 June 2015). Kawerak Inc. organizes services for residents of the Bering Strait Region, 75% of whom are Eskimo, Aleut or American Indian, descent. Kawerak's organizational goal is to assist Alaska Native people and their governing bodies to take control of their future. With programs ranging from education to transportation, and natural resource management to economic development, Kawerak seeks to improve the Region's social, economic, educational, cultural and political conditions.

William Schmoker of the Centennial Middle School in Boulder, Colorado, will participate in the US Arctic cruise as a "Teacher at Sea" sponsored by Polar-Trec: http://www.polartrec.com/. The goal of PolarTREC is to invigorate polar science education and understanding by bringing K-12 educators and polar researchers together. Bill Schmoker is an experienced PolarTREC teacher. He has decades of educational experience in and out of the classroom, teaching preschoolers through retirees in formal and informal settings. A

widely published bird/wildlife photographer, author, and public speaker, Bill finds adventure and seeks new knowledge wherever he finds himself, whether gardening in his back yard or 800 miles north of Barrow, Alaska in the Arctic Ocean pack ice.

US GEOTRACES will also participate in the "Float Your Boat outreach project" – A Seattle-based program: Youths will have the opportunity to prepare precut toy boat hulls for deployment as an ocean drifter, to learn about polar currents and Polar Research. At the time this report was written (30 June 2015), the US GEOTRACES plans to release over 1300 boats near the North Pole was featured on the Float Your Boat home page: http://www.floatboat.org/.

Outreach efforts for the US GEOTRACES Arctic expedition are coordinated by Bill Landing of Florida State University.

Data Management at BCO-DMO

website:	http://www.bco-dmo.org
email:	info@bco-dmo.org
U.S. GEOTRACES:	http://www.bco-dmo.org/program/2022

Overview

The Biological and Chemical Oceanography Data Management Office (BCO-DMO), based at Woods Hole Oceanographic Institution, manages GEOTRACES data from U.S. funded investigators. Serving as the U.S. GEOTRACES Data Assembly Center (DAC), BCO-DMO currently serves data from the GEOTRACES Intercalibration cruises, the North Atlantic Transect cruises, the East Pacific Zonal Transect cruise, and from projects producing GEOTRACES-compliant data.

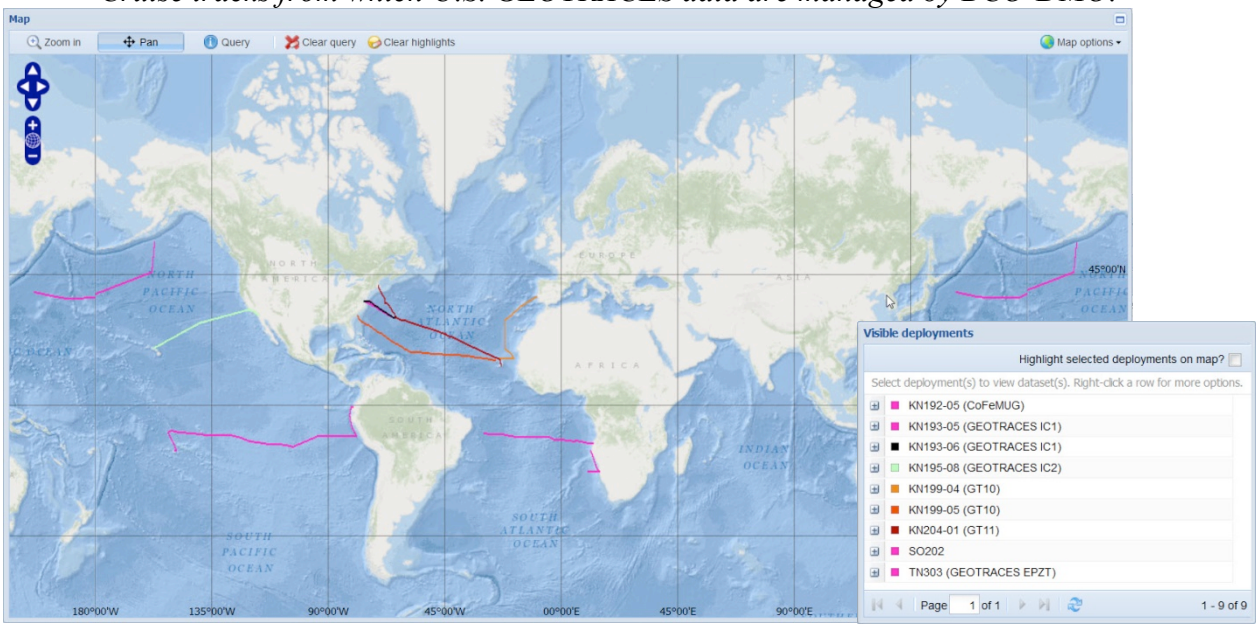
The BCO-DMO data managers work closely with contributing investigators to ensure the quality and completeness of data and metadata before transferring the data to the GEOTRACES International DAC at the British Oceanographic Data Center (BODC).

Summary of U.S. GEOTRACES Data Available from BCO-DMO as of June 2015.

Cruise ID	Chief Sci	Dates	# of Datasets
CoFeMUG (GEOTRACES-compliant data)			
KN192-05 (GAc01_CoFeMUG)	Mak Saito	2007-11-16 to 2007-12-13	9
Intercalibration Cruises			
KN193-05 (InterCal 1 Leg 1)	Greg Cutter	2008-06-08 to 2008-06-27	3
KN193-06 (InterCal 1 Leg 2)	Greg Cutter	2008-06-29 to 2008-07-12	6
KN195-08	Greg Cutter	2009-05-06 to 2009-05-29	3
SO202-INOPEX			
SO202-INOPEX (GPc01_INOPEX)	Rainer Gersonde	2009-07-08 to 2009-08-28	1
North Atlantic Transect (NAT)			
KN204 (Section Cruise GA03)	Ed Boyle	2011-11-06 to 2011-12-11	61
KN199-04 (Section Cruise GA03)	William Jenkins	2010-10-15 to 2010-11-04	66

KN199-05	Oliver Wurl	2010-11-08 to 2010-11-26	5
East Pacific Zonal Transect (EPZT)			
TN303 (Section cruise GP16)	Jim Moffett / Chris German	2013-10-25 to 2013-12-22	22
Arctic			
CGC Healy HLY1502 (Section cruise GN01)	David Kadko	2015-08-07 to 2015-10-10	N/A

Cruise tracks from which U.S. GEOTRACES data are managed by BCO-DMO.



Current and Future Activities

As of June 2015, datasets from the NAT cruises are all publicly available (with a few exceptions) and were contributed to BODC for inclusion in the Intermediate Data Product. NAT data were contributed from over 30 PIs across the U.S.

The basic hydrography datasets (CTD downcasts, CTD bottles, event log, cast logs, etc.) from the EPZT have been contributed to BCO-DMO and are available online. Some of these datasets are under password-protection to prevent public access while still allowing GEOTRACES investigators to access the data until they can be considered final. Investigators may contact the Chief Scientists or the BCO-DMO office (info@bco-dmo.org) to obtain the required log-in information.

BCO-DMO data managers are prepared to work with investigators on making additional EPZT data available online and to provide support to investigators participating in the upcoming Arctic Cruise (HLY1502) led by Chief Scientist Dr. David Kadko. We encourage PIs to contact us with questions or concerns about their data. When contributing datasets, we strongly suggest including complete sample metadata with each record (sample ID number, event number, station number, cast number, bottle number, depth, latitude, longitude, and

date-time). PIs may opt to restrict their data for a specified time period, though we encourage open sharing of data as early as possible to foster collaboration and data re-use.

Data Management Resources

The "Resources" page of the BCO-DMO website (http://www.bco-dmo.org/resources) provides valuable information about contributing data to BCO-DMO, as well as general data management guidance and resources. That page includes data management best practices guides, data management planning guidance, a template for the required NSF two-page Data Management Plan, frequently asked questions, and instructions for submitting data to BCO-DMO.

Publications (GEOTRACES, GEOTRACES Compliant and GEOTRACES-related)

During the past year US GEOTRACES investigators published a total of 46 peer-reviewed papers, 25 of which appeared in a special issue of Deep-Sea Research - Part II devoted to the GA03 section.

US GEOTRACES Papers in the GA03 volume of DSR-II

- Bowman, K.L., Hammerschmidt, C.R., Lamborg, C.H. and Swarr, G., 2015. Mercury in the North Atlantic Ocean: The U.S. GEOTRACES zonal and meridional sections. Deep Sea Research Part II: Topical Studies in Oceanography, 116(0): 251-261.
- Boyle, E.A., Anderson, R.F., Cutter, G.A., Fine, R., Jenkins, W.J. and Saito, M., 2015. Introduction to the U.S. GEOTRACES North Atlantic Transect (GA-03): USGT10 and USGT11 cruises. Deep Sea Research Part II: Topical Studies in Oceanography, 116(0): 1-5.
- Brzezinski, M.A. and Jones, J.L., 2015. Coupling of the distribution of silicon isotopes to the meridional overturning circulation of the North Atlantic Ocean. Deep Sea Research Part II: Topical Studies in Oceanography, 116(0): 79-88.
- Buck, K.N., Sohst, B. and Sedwick, P.N., 2015. The organic complexation of dissolved iron along the U.S. GEOTRACES (GA03) North Atlantic Section. Deep Sea Research Part II: Topical Studies in Oceanography, 116(0): 152-165.
- Fitzsimmons, J.N., Carrasco, G.G., Wu, J., Roshan, S., Hatta, M., Measures, C.I., Conway, T.M., John, S.G. and Boyle, E.A., 2015. Partitioning of dissolved iron and iron isotopes into soluble and colloidal phases along the GA03 GEOTRACES North Atlantic Transect. Deep Sea Research Part II: Topical Studies in Oceanography, 116(0): 130-151.
- Hatta, M., Measures, C.I., Wu, J., Roshan, S., Fitzsimmons, J.N., Sedwick, P. and Morton, P., 2015. An overview of dissolved Fe and Mn distributions during the 2010,Äì2011 U.S. GEOTRACES north Atlantic cruises: GEOTRACES GA03. Deep Sea Research Part II: Topical Studies in Oceanography, 116(0): 117-129.
- Hayes, C.T., Anderson, R.F., Fleisher, M.Q., Huang, K.-F., Robinson, L.F., Lu, Y., Cheng, H., Edwards, R.L. and Moran, S.B., 2015. 230Th and 231Pa on GEOTRACES GA03, the U.S. GEOTRACES North Atlantic transect, and implications for modern and paleoceanographic chemical fluxes. Deep Sea Research Part II: Topical Studies in Oceanography, 116(0): 29-41.

- Jacquot, J.E. and Moffett, J.W., 2015. Copper distribution and speciation across the International GEOTRACES Section GA03. Deep Sea Research Part II: Topical Studies in Oceanography, 116(0): 187-207.
- Jenkins, W.J., Lott Iii, D.E., Longworth, B.E., Curtice, J.M. and Cahill, K.L., 2015a. The distributions of helium isotopes and tritium along the U.S. GEOTRACES North Atlantic sections (GEOTRACES GAO3). Deep Sea Research Part II: Topical Studies in Oceanography, 116(0): 21-28.
- Jenkins, W.J., Smethie Jr, W.M., Boyle, E.A. and Cutter, G.A., 2015b. Water mass analysis for the U.S. GEOTRACES (GA03) North Atlantic sections. Deep Sea Research Part II: Topical Studies in Oceanography, 116(0): 6-20.
- Lam, P.J., Ohnemus, D.C. and Auro, M.E., 2015. Size-fractionated major particle composition and concentrations from the US GEOTRACES North Atlantic Zonal Transect. Deep Sea Research Part II: Topical Studies in Oceanography, 116(0): 303-320.
- Measures, C., Hatta, M., Fitzsimmons, J. and Morton, P., 2015. Dissolved Al in the zonal N Atlantic section of the US GEOTRACES 2010/2011 cruises and the importance of hydrothermal inputs. Deep Sea Research Part II: Topical Studies in Oceanography, 116(0): 176-186.
- Noble, A.E., Echegoyen-Sanz, Y., Boyle, E.A., Ohnemus, D.C., Lam, P.J., Kayser, R., Reuer, M., Wu, J. and Smethie, W., 2015. Dynamic variability of dissolved Pb and Pb isotope composition from the U.S. North Atlantic GEOTRACES transect. Deep Sea Research Part II: Topical Studies in Oceanography, 116(0): 208-225.
- Ohnemus, D.C. and Lam, P.J., 2015. Cycling of lithogenic marine particles in the US GEOTRACES North Atlantic transect. Deep Sea Research Part II: Topical Studies in Oceanography, 116(0): 283-302.
- Owens, S.A., Pike, S. and Buesseler, K.O., 2015. Thorium-234 as a tracer of particle dynamics and upper ocean export in the Atlantic Ocean. Deep Sea Research Part II: Topical Studies in Oceanography, 116(0): 42-59.
- Quay, P. and Wu, J., 2015. Impact of end-member mixing on depth distributions of Œ¥13C, cadmium and nutrients in the N. Atlantic Ocean. Deep Sea Research Part II: Topical Studies in Oceanography, 116(0): 107-116.
- Ratten, J.-M., LaRoche, J., Desai, D.K., Shelley, R.U., Landing, W.M., Boyle, E., Cutter, G.A. and Langlois, R.J., 2015. Sources of iron and phosphate affect the distribution of diazotrophs in the North Atlantic. Deep Sea Research Part II: Topical Studies in Oceanography, 116(0): 332-341.
- Revels, B.N., Ohnemus, D.C., Lam, P.J., Conway, T.M. and John, S.G., 2015. The isotopic signature and distribution of particulate iron in the North Atlantic Ocean. Deep Sea Research Part II: Topical Studies in Oceanography, 116(0): 321-331.
- Rigaud, S., Stewart, G., Baskaran, M., Marsan, D. and Church, T., 2015. 210Po and 210Pb distribution, dissolved-particulate exchange rates, and particulate export along the North Atlantic US GEOTRACES GA03 section. Deep Sea Research Part II: Topical Studies in Oceanography, 116(0): 60-78.
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