

ANNUAL REPORT ON GEOTRACES ACTIVITIES IN NETHERLANDS
JUNE 2013 – JUNE 2014

Activities

Western Atlantic Ocean: The Dutch GEOTRACES cruises between 2010-2012 aimed to map the distribution of important trace elements and isotopes (PI: Hein de Baar) and to investigate the deep-sea microbiology (PI: Gerhard Herndl) in the West Atlantic Ocean. Gerhard Herndl is also involved in bioGEOTRACES together with Penny Chisholm (MIT) and Julie LaRoche (now at Dalhousie University). In 2013-2014 we focused with our west Atlantic work on the compilation and analysis of the data collected in the western Atlantic Ocean in 2010 – 2012. The first publications appeared and various data sets were accepted for implementation in the GEOTRACES Intermediate Data Product.

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 2013/14 our work in the Mediterranean and Black Seas focused on; i) the execution of three research cruises in the Mediterranean Sea and Black Sea, ii) measurements of samples, iii) calibration of CTD data.

Meetings

- GEOTRACES SSC meeting: Hein de Baar and Micha Rijkenberg attended the GEOTRACES Scientific Steering Committee meeting on 2-4 October in Bremerhaven, Germany.
- GRIFF/GROCE workshop GEOTRACES Fram Strait 2016: Micha Rijkenberg attended the workshop on 24-25 March in Bremen, Germany.
- Goldschmidt conference 2013, Florence, Italy: Hein de Baar presented work at the Goldschmidt conference 2013 in Italy.
- Ocean Sciences Meeting 2014, Hawaii, USA: Hein de Baar presented work at the Ocean Science Meeting 2014 on Hawaii.

Cruises

Three research cruises (64PE370, 64PE373, 64PE374) have been completed sampling a total of 68 full depth stations to map the distribution of trace elements and isotopes in the Mediterranean Sea and Black Sea (Figure 1). The first leg started in Lisbon 14 May 2013 to sample the southern parts of the Mediterranean Sea and arrived in Istanbul on 5 June 2013. The second leg of the MedBlack GEOTRACES cruises left Istanbul on 13 July 2013 for the Black Sea to return in Istanbul on 25 July 2013. The third leg left Istanbul on 25 July for the northern parts of the Mediterranean and arrived in Lisbon on 11 August 2013.

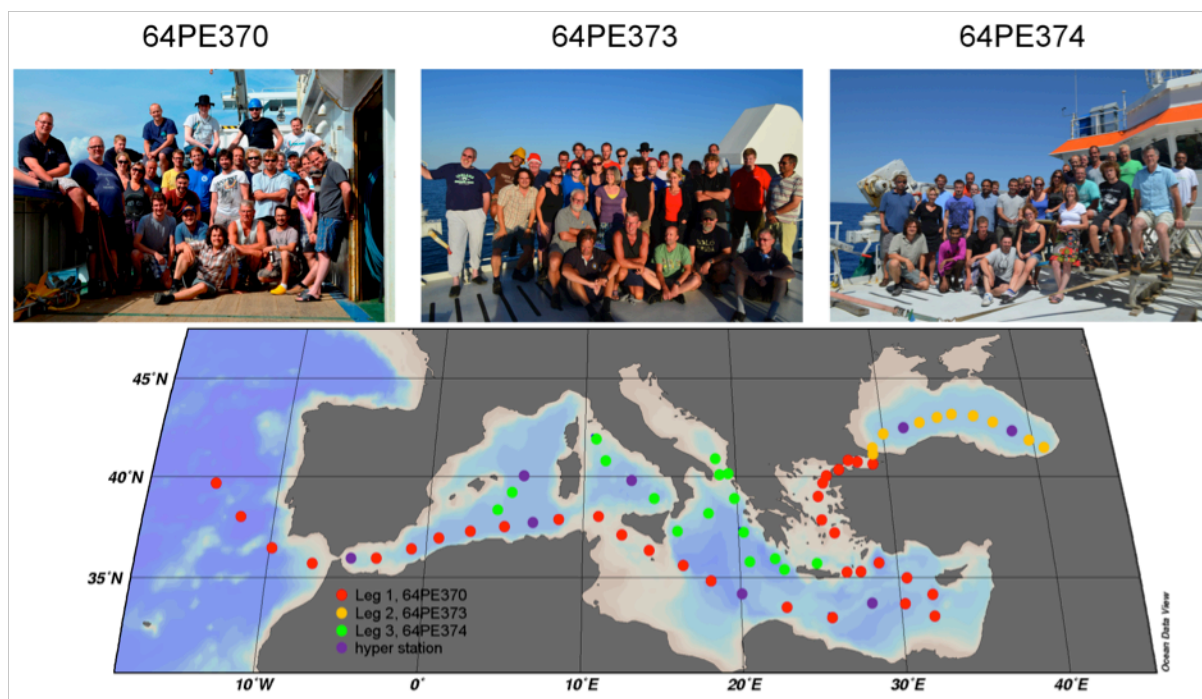


Figure 1. The crew and participants on RV Pelagia and the cruise track of the MedBlack GEOTRACES cruises (GA04N) in 2013.

New results

- Investigators are making good progress in the sample analysis and subsequent interpretation of the data collected in the western Atlantic Ocean. Many results of the western Atlantic transect have been presented at international conferences and start to appear in journal publications. Most of the results of the International Polar Year/GEOTRACES cruises in the Arctic and Antarctic have been published now.
- The first new data of the MedBlack GEOTRACES cruises have been measured on board during 64PE370, 64PE373 and 64PE374 (DFe, DA1, 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 have in the mean time been measured by ICP-MS. Some results have been presented at the Ocean Sciences Meeting 2014 on Hawaii.

Presentations

- de Baar H, van Heuven S, Middag R, Neven I, Klunder M, van Ooijen J, Xue Z, Abouchami W, Rehkamper M & Galer S (2013) Interactions of Dissolved CO₂ with Cadmium Isotopes in the Southern Ocean, Goldschmidt conference 2013, Florence, Italy.
- de Baar, H. J.; Conway, T. M.; Middag, R.; Noble, A. E.; Wyatt, N. J.: GEOTRACES 3-D distribution of accurate concentrations of dissolved trace metals Manganese, Iron, Nickel, Zinc, Cadmium and Lead in the Atlantic Ocean, Ocean Sciences Meeting 2014, Honolulu, Hawaii.
- Boye, M.; Dulaquais, G.; Carton, X.; Rijkenberg, M.; De Baar, H.: First assessment of the dissolved cobalt partitioning between the soluble and colloidal fractions in the upper Westnorthern Atlantic, Ocean Sciences Meeting 2014, Honolulu, Hawaii.
- Dulaquais, G. R.; Boye, M.; Middag, R.; Planquette, H.; Puigcorbe, V.: Comparative atmospheric contributions to dissolved Cobalt in the mixed layer: case of the Western North.
- Aatlantic and Mediterranean sea (sections GA02 & GA04n), Ocean Sciences Meeting 2014, Honolulu, Hawaii.

- van Hulst M, de Baar H, Middag R, Sterl A, Dutay J-C, Gehlen M & Tagliabue A (2013) Aluminium in an Ocean General Circulation Model and Observations, Goldschmidt conference 2013, Florence, Italy.
- Lambelet M, van de Flierdt T, Crocket K, Rehkämper M, Kreissig K, Coles B, Rijkenberg M, Gerringa L, van Aken H & de Baar H. Neodymium Isotopic Composition and Concentration in Equatorial to North Atlantic Seawater, Goldschmidt conference 2013, Florence, Italy.
- Lambelet, M.; van de Flierdt, T.; Crocket, K.; Rehkämper, M.; de Baar, H.: The Neodymium isotopic composition of North Atlantic Deep Water revisited, Ocean Sciences Meeting 2014, Honolulu, Hawaii.
- Little, S. H.; Vance, D.; Lyons, T. W.; McManus, J.; Rijkenberg, M. J.: The significance of anoxic settings to the oceanic cycling of Cu and Zn isotopes, Ocean Sciences Meeting 2014, Honolulu, Hawaii.
- Lohan, M. C.; Wyatt, N.; Milne, A.; Middag, R.; Conway, T. M.: Zinc distributions in the Atlantic Ocean: the use of a new tracer Zn*, Ocean Sciences Meeting 2014, Honolulu, Hawaii.
- Middag, R.; Bruland, K. W.; de Baar, H. J.; van Heuven, S. M.: The relationships of Cadmium, Nickel and Zinc with major nutrients in the West Atlantic ocean, Ocean Sciences Meeting 2014, Honolulu, Hawaii.
- Rijkenberg, M.; Middag, R.; Conway, T.; Bruland, K.; de Baar, H.: Excellent consistency of dissolved Manganese, Iron, Cobalt, Nickel, Copper, Zinc, Cadmium and Lead at the Bermuda crossover station of two GEOTRACES sections, Ocean Sciences Meeting 2014, Honolulu, Hawaii.
- Rolison, J. M.; Middag, R.; Stirling, C. H.; Rijkenberg, M. J.; de Baar, H. J.: MedBlack GEOTRACES expedition: distribution of dissolved Aluminium, Ocean Sciences Meeting 2014, Honolulu, Hawaii.
- Xie, R. C.; Galer, S.; Abouchami, W.; Rijkenberg, M.; De Jong, J.: Cadmium isotope distribution along the western boundary of the South Atlantic, Ocean Sciences Meeting 2014, Honolulu, Hawaii.

PhD theses

- Lesley Salt successfully defended her thesis on CO₂ in coastal and ocean environments of the Atlantic Ocean on 21 March 2014 at the University of Groningen (<http://irs.ub.rug.nl/ppn/373486987>).

Publications

Published:

- Bruland, K. W., R. Middag, and M. C. Lohan (2014), Controls of Trace Metals in Seawater, in Treatise on Geochemistry, edited by H. D. Holland and K. K. Turekian, pp. 19-51, Elsevier, Oxford.
- Casacuberta, N., M. Christl, J. Lachner, M. R. van der Loeff, P. Masqué, and H. A. Synal (2014), A first transect of ²³⁶U in the North Atlantic Ocean, *Geochimica et Cosmochimica Acta*, 133(0), 34-46, doi: <http://dx.doi.org/10.1016/j.gca.2014.02.012>.
- Deng, F., A. L. Thomas, M. J. A. Rijkenberg, and G. M. Henderson (2014), Controls on seawater ²³¹Pa, ²³⁰Th and ²³²Th concentrations along the flow paths of deep waters in the Southwest Atlantic, *Earth Planet. Sci. Lett.*, 390, 93-102.
- Dulaquais, G., M. Boye, M. J. A. Rijkenberg, and X. Carton (2014), Physical and remineralization processes govern the cobalt distribution in the deep western Atlantic Ocean, *Biogeosciences*, 11(6), 1561-1580, doi: 10.5194/bg-11-1561-2014.

- Gerringa, L. J. A., M. J. A. Rijkenberg, C.-E. Thuroczy, and L. R. M. Maas (2014), A critical look at the calculation of the binding characteristics and concentration of iron complexing ligands in seawater with suggested improvements, *Environ. Chem.*, doi: 10.1071/EN13072.
- Klunder, M. B., P. Laan, H. J. W. De Baar, I. Neven, R. Middag, and J. Van Ooijen (2014), Dissolved Fe across the Weddell Sea and Drake Passage: impact of DFe on nutrients uptake in the Weddell Sea, *Biogeosciences*, 10(4), 7433-7489, doi: 10.5194/bg-11-651-2014.
- Rijkenberg, Micha J.A., Rob Middag, Patrick Laan, Loes J. A. Gerringa, Hendrik M. van Aken, Véronique Schoemann, Jeroen T. M. de Jong, Hein J. W. de Baar. The distribution of dissolved iron to the West Atlantic Ocean. *PlosONE*, in press.

Submitted:

- Middag, R., T. Conway, S. John, K. W. Bruland, and H. J. W. de Baar, Intercomparison of dissolved trace elements at the Bermuda Atlantic Time Series Station, submitted.
- Middag, R., M. van Hulst, M. van Aken, M. Rijkenberg, L. Gerringa, P. Laan and H. de Baar. Aluminium in the Oceans: Unique Mirror Image of the Biological Cycle, submitted.
- Rijkenberg, M. J. A., De Baar, H. J. W., K. Bakker, L. J. G. Gerringa, E. Keijzer, M. Laan, P. Laan, R. Middag, S. Ober, and M. G. Smit. "PRISTINE": a new high volume sampler for ultraclean sampling of trace metals and isotopes, submitted.

Submitted on behalf of all participants by Micha Rijkenberg (Micha.Rijkenberg@nioz.nl).