

The Netherlands

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

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

Meetings

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

Cruises

With Micha Rijkenberg as chief scientist 18 participants left Lisbon on board RV *Pelagia* on 14 May 2013 for the first Dutch leg of the MedBlack GEOTRACES cruises (GA04N), see Figure 1. We completed this first leg sampling 37 full depth stations starting in the eastern North Atlantic Ocean, through the Strait of Gibraltar, the western and eastern basins of the Mediterranean Sea and northward into the Aegean Sea, followed by the Dardanelles and the Sea of Marmara before arriving in Istanbul on 05 June 2013. The second leg of the MedBlack GEOTRACES cruises will leave Istanbul on 13 July 2013 for the Black Sea to return in Istanbul on 25 July 2013. The third leg will leave Istanbul on 25 July for the northern parts of the Mediterranean and arrives in Lisbon on 12 August 2013.

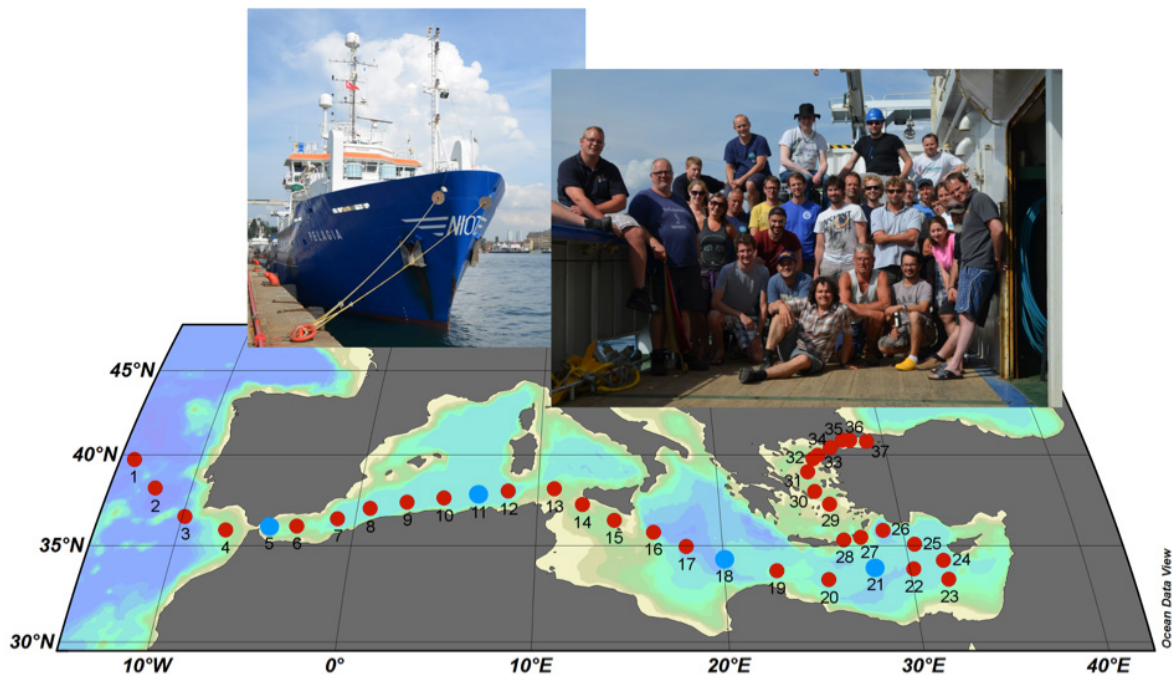


Figure 1. The RV *Pelagia*, its crew and participants, and the cruise track of leg 1 of the MedBlack GEOTRACES cruises (GA04N, 64PE370).

New funding

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

New results

Investigators are making good progress in the sample analysis and subsequent interpretation of the data collected in the western Atlantic Ocean. Many results of the western Atlantic transect have been presented at international conferences and start to appear in journal publications. Most of the results of the International Polar Year/GEOTRACES cruises in the Arctic and Antarctic have been published now. The first new data of the MedBlack GEOTRACES cruises have been measured on board during 64PE370 (DFe, DA1 and the micro and nanomolar nutrient concentrations).

Presentations

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

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

PhD theses

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

Publications

Published:

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

Submitted:

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

Submitted by: Micha Rijkenberg