Understanding modern biogeochemical cycles in the context of the international GEOTRACES program – Cadmium, zinc, lead and neodymium isotope analyses

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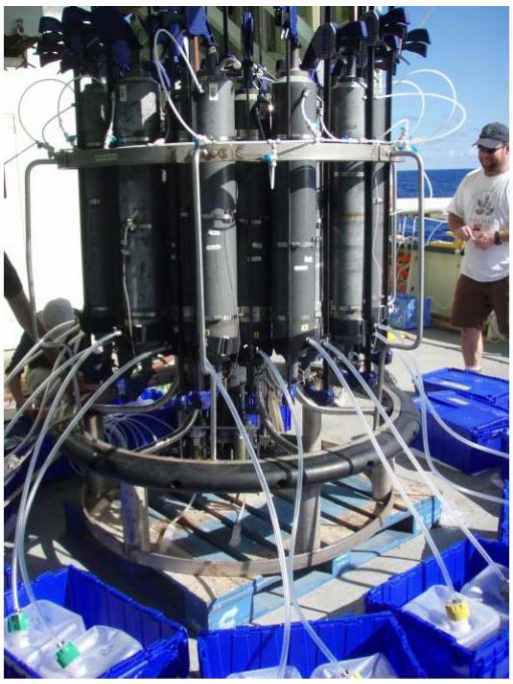
One of the key targets in current environmental research is an advanced understanding of Earth's climate, in particular the complex feedback mechanisms between climate, oceanic and atmospheric circulation patterns, and the carbon cycle. It is clear that the ocean can affect climate through its high heat capacity, the ability to distribute heat (ocean currents, sea ice), and biogeochemical cycling (exchange of gases with the atmosphere). **Documenting and understanding modern biogeochemical cycles in the ocean is therefore critical for unravelling the ocean's role in past climate change and understanding potential threats to the marine environment by anthropogenic global warming and other human activities**

The project will target **seawater, marine particulate, and aerosol samples** from various GEOTRACES cruises in the Atlantic, Southern and Pacific Ocean. **GEOTRACES** (www.geotraces.org) is an international study of the global marine biogeochemical cycles of trace elements and their isotopes. Its mission is to identify processes and quantify fluxes that control the distributions of key trace elements and isotopes in the ocean, and to establish the sensitivity of these distributions to changing environmental conditions.



Set up to filter seawater directly from the ship's rosette on the first GEOTRACES intercalibration cruise in June/July 2008.

By joining this project, you will be **part of a large international project** and work on samples that will be characterized for other trace elements & isotopes in laboratories around the world. The project is deliberately described in broad terms. Dependent on your interest, specific targets can address topics such as tracing water masses (Nd isotopes), anthropogenic inputs to the ocean (Pb isotopes) and biological fractionation of trace metals (Cd and Zn isotopes).

The sample processing and analyses that form part of this project will be carried out in the **clean room and mass spectrometry facilities of the MAGIC Laboratories** at the Department of Earth Science & Engineering, Imperial College London (http://www.imperial.ac.uk/earth-science/research/research-groups/magic/). The project may also include participation in a research cruise to collect samples.

The project is suitable for a student with a background in marine sciences, earth sciences/geology, chemistry or an equivalent qualification. Further information on the research can be obtained from Mark Rehkämper (markrehk@imperial.ac.uk). Don't hesitate to get in touch if you are interested.

Selected literature:

Olivelli, A., Murphy, K., Bridgestock, L., Wilson, D.J., Rijkenberg, M., Middag, R., Weiss, D.J., van de Flierdt, T., Rehkämper, M., 2023. Decline of anthropogenic lead in South Atlantic Ocean surface waters from 1990 to 2011: New constraints from concentration and isotope data. Mar. Pollut. Bull. 189, 114798. doi.org/https://doi.org/10.1016/j.marpolbul.2023.114798.

Xie, R.C., Rehkämper, M., Grasse, P., van de Flierdt, T., Frank, M., Xue, Z., 2019. Isotopic evidence for complex biogeochemical cycling of Cd in the eastern tropical South Pacific. Earth Planet. Sci. Lett. 512, 134-146. doi.org/https://doi.org/10.1016/j.epsl.2019.02.001.