

Environmental Pollution & Marine Biogeochemistry – Isotopic Tracing and Modelling of Lead & Cadmium in the Indian Ocean

Supervisors: Tina van de Flierdt, Mark Rehkämper

Background: One of the key targets in current environmental research is to gain 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 its biogeochemical cycling (e.g., exchange of gases with the atmosphere and uptake of carbon via photosynthesizing organisms). Documenting and understanding modern biogeochemical cycles in the ocean is, therefore, critical for understanding potential threats placed on the marine environment by anthropogenic climate change and pollution, and for unraveling the ocean's role in past and future climate change.

The international GEOTRACES programme (www.geotraces.org) offers an exciting opportunity. The programme's 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. The vision is to map the global ocean for its geochemical composition and to understand the cycling of trace metals that act as nutrients, pollutants, or tracers of source inputs and oceanographic processes.

The Project: This project will target isotopic analysis of unique seawater samples collected on GEOTRACES section cruise G107 along a transect in the southern Indian Ocean by collaborator Eric Achterberg (GEOMAR, Germany). The new results will allow us to map an understudied area in the global ocean and investigate Pb and Cd pollution, ocean circulation, and biogeochemical cycling. Sample processing and analyses 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 (<https://www.imperial.ac.uk/earth-science/research/research-groups/magic/>).



Our group has one of only a handful of laboratories world-wide where these challenging analyses are routinely conducted. Results will subsequently be used to model the Pb and Cd cycles, to better understand how atmospheric inputs, ocean circulation and biogeochemistry govern the marine distributions of these elements.

You will be part of the GEOTRACES program (www.geotraces.org), an international study of the marine cycles of trace elements and isotopes with the mission 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.

The project is suitable for a student with a background in oceanography, chemistry, geology or an equivalent qualification and can be focused in a variety of directions.

Further information on the research can be obtained from Tina van de Flierdt (tina.vandeflierdt@imperial.ac.uk) or Mark Rehkämper (markrehk@imperial.ac.uk). Don't hesitate to get in touch if you are interested.