

2023_42_ESE_Plancherel: Exploiting the GEOTRACES toolbox to characterize ocean biogeochemical processes: trace elements, isotopes and new quasi-conservative tracers.

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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 (through ocean currents, sea ice), and biogeochemical cycling (exchange of gases with the atmosphere, biological uptake and remineralisation). 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.

The project will target seawater, marine particulate, and aerosol samples and data 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. By joining this project, you will be part of a large international project and work on the interpretation or measurement of samples that originate from laboratories around the world.

Quantitative understanding of the oceanic cycling of trace elements and isotopes lags that of the major nutrients, carbon and oxygen. Yet, trace elements play fundamental roles in the marine ecosystems, provide significant information about processes on a variety of time and space scales in the interior and at ocean boundaries, and have cycles that are increasingly perturbed by human activity.

The overall objective of this project is to exploit the growing dataset provided by the international GEOTRACES programme to develop new understanding of trace elements and isotopic tracers in biogeochemistry to reveal and quantify the influence of key and evolving sources (e.g. dust, rivers, sediments) and biogeochemical gradients (e.g. oxygen, pH, salinity, temperature) on the cycling of elements and elemental stoichiometry in the ocean.

You will also be able to use 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/>) to perform a variety of measurements as required. The project may also include participation in fieldwork and a research cruise to collect samples.

The project is suitable for a student with a background in oceanography, biogeochemistry, chemistry, physics, or an equivalent qualification and with suitable experience in computer programming and data analysis. Further information on the research can be obtained from Yves Plancherel, y.plancherel@imperial.ac.uk.

For more information on how to apply to us please visit: <https://www.imperial.ac.uk/grantham/education>