

GEOTRACES – Marine Biogeochemical Cycles of Trace Elements and Isotopes

The GEOTRACES program will determine the global ocean distributions of selected trace elements and their isotopes, and generate a sufficient understanding of their biogeochemical cycles (sources, sinks, transport, transformations, chemical speciation, biological availability, fates, etc.) to apply that knowledge reliably to interdisciplinary problems.

GEOTRACES will be built around two themes:

- Theme 1—Modern biogeochemical cycles of trace elements and isotopes (TEIs):
 - Interface fluxes: atmosphere, freshwater, ocean margins, mid-ocean ridges
 - Internal cycling: biological uptake, chemical scavenging, transport by and regeneration from particulate matter, physical transport

• Theme 2—Development of Paleoceanographic Proxies:

- Factors controlling the proxies in the water column today
- Factors influencing the recording of proxies in geological substrates

The development of a full understanding of the distribution and biogeochemical behavior of trace elements and their isotopes (TEIs) in seawater has the potential to provide unique insights into a wide range of oceanic processes. It will provide, for instance, understanding of the role that limiting micronutrients play in regulating ecosystem structure and oceanic production, and it will elucidate the mechanisms controlling the fate of contaminants added to the ocean by human activities. Certain TEIs, particularly natural radionuclides, can also be exploited to constrain rates of key processes regulating the marine carbon cycle. Other TEIs provide valuable insight into the mean velocity field and mixing processes in the ocean on timescales that are not readily amenable to direct measurements by more conventional methods. Furthermore, TEI distributions in marine sediments and other geological archives yield vital clues about an array of environmental conditions in the past (e.g., ocean productivity, circulation patterns and rates, ecosystems structure, continental weathering, hydrothermal activity, ocean anoxia).

GEOTRACES will be conducted in close collaboration with other ocean research initiatives, such as CLIVAR (WCRP), IMBER, SOLAS, LOICZ, GLOBEC, IMAGES/PAGES (IGBP/SCOR), RIDGE, MARGINS, as well as various modeling programs to ensure synergy among the different initiatives and to avoid duplications of effort. To facilitate the planning, the Scientific Committee on Oceanic Research (SCOR) is providing support for a GEOTRACES planning group, co-chaired by Gideon Henderson (Oxford University) and Bob Anderson (Lamont-Doherty Earth Observatory), whose primary purpose is to develop a Science Plan. Following review and adoption of the Science Plan, the Planning Group will be replaced by a Steering Committee.