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GEOTRACES 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.

Mailing list

We invite you to join our mailing list and to be informed about all GEOTRACES activities by visiting the GEOTRACES Web site.

>> www.geotraces.org

An International Study of the Marine Biogeochemical Cycles of Trace Elements and their Isotopes

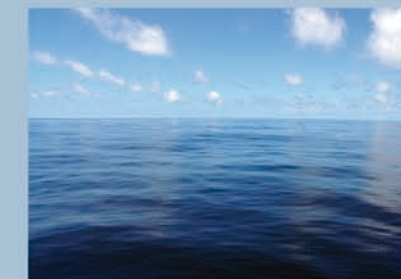
GEOTRACES



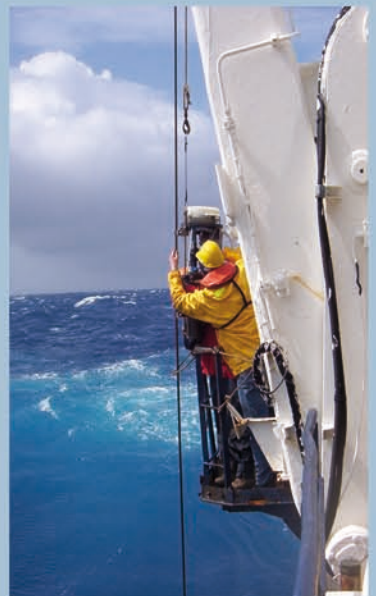
Introduction

Many trace elements are critical for marine life and therefore influence the functioning of ocean ecosystems and the global carbon cycle. Some trace elements are also of concern as contaminants, while others, together with a diverse array of isotopes, are used to assess modern-ocean processes and the role of the ocean in past climate change.

Despite the recognised importance of trace elements and isotopes in the ocean, our ability to exploit knowledge of their attributes is limited by uncertainty about their sources, sinks, internal cycling and chemical speciation.



GEOTRACES will fill this critical gap with knowledge of the marine biogeochemical cycles of trace elements and their isotopes at an unprecedented scale.



Challenges and Benefits

Trace elements serve as regulators of biological processes in the ocean, influencing marine ecosystem dynamics and the carbon cycle. But knowledge of the marine biogeochemical cycles of these essential micronutrients is surprisingly incomplete. **GEOTRACES is quantifying the supply, removal, chemical form and distribution of micronutrients. Understanding the sensitivity of these cycles to changing environmental conditions will improve projections of the ocean's response to global change.**

The cycles of many trace elements and isotopes have been impacted significantly by human activity, which has increased the discharge of harmful elements into the ocean. **GEOTRACES' emphasis on understanding the processes regulating the marine biogeochemical cycles of trace elements will improve prediction of the transport and fate of contaminants in the ocean and thereby help to protect the ocean environment.**

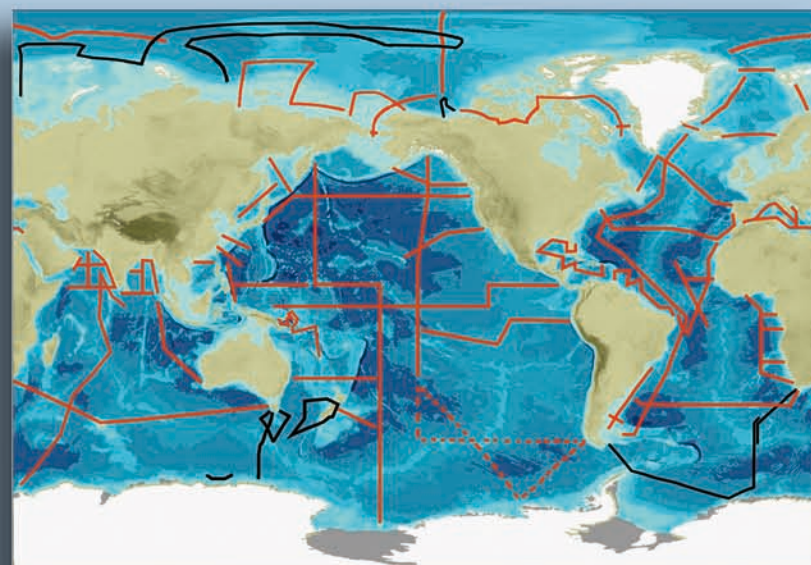
Much of what is known about ocean conditions in the past and, therefore, about the ocean's role in climate variability is derived from trace element and isotope patterns recorded in marine archives (sediments, corals, etc.). **Greater knowledge of the processes governing these tracers in the modern ocean will improve interpretation of ocean conditions in the past, from which more reliable prediction of future changes can be made.**

GEOTRACES Goals

Benefits will be realised by pursuing two overarching goals:

To determine global ocean distributions of selected trace elements and isotopes, and to evaluate the sources, sinks, and internal cycling of these species in order to characterise more completely the physical, chemical and biological processes regulating their distributions.

To understand the response of trace element and isotope cycles to global change, to help predict the future and to improve chemical proxies for past changes in the ocean environment.



GEOTRACES sections. Sections in black were completed as a GEOTRACES contribution to the International Polar Year (IPY). An updated version is available at www.geotraces.org

GEOTRACES Themes

GEOTRACES goals will be achieved through activities organized under three complementary themes:

Theme 1: Fluxes and processes at ocean interfaces

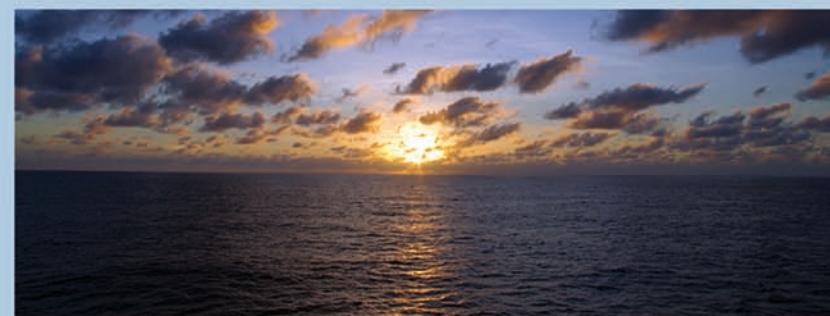
- Atmospheric deposition
- Continental run-off
- Sediment-water boundary
- Ocean crust

Theme 2: Internal cycling

- Uptake/removal from surface waters
- Uptake/regeneration in the sub-surface ocean
- Seafloor regeneration
- Physical circulation

Theme 3: Development of proxies for past change

- Controls on water column distributions of proxies
- Uptake of proxies by sediment substrates
- Geochemical responses to sediment fluxes



GEOTRACES Activities

The central component of GEOTRACES is a series of cruises spanning the global ocean (see map). These cruises will collect water and particles for analysis of many trace elements and isotopes. This strategy reflects the fact that more will be learned through complementary investigation of multiple elements than by studying one element in isolation.

The power of this approach is illustrated below for a meridional section in the Southern Ocean. High concentrations of iron above the ridge unaccompanied by similar enrichments of aluminium diagnose a hydrothermal source for the iron rather than mobilisation of sediments.

Process studies and modelling, together with comprehensive methods intercalibration and data management, complement the ocean section work that forms the core of the GEOTRACES programme.

Dissolved Fe and Al (nmol/l) along a GEOTRACES IPY section in the Atlantic sector of the Southern Ocean.

