

GEOTRACES in IPY

The recently inaugurated international Programme GEOTRACES is being set up to greatly expand our understanding of the distribution and circulation of trace elements and their isotopes (TEIs) in the ocean. IPY offers a unique opportunity to include the polar oceans in this global study. Many proposals/research ideas have been submitted aiming at synoptic studies of the Arctic and Antarctic Oceans during IPY. As described below, GEOTRACES has much to offer to enhance these coordinated, interdisciplinary synoptic studies.

The GEOTRACES programme

Our knowledge of ocean circulation and global biogeochemical cycles has a strong basis in the GEOSECS programme, conducted in the 1970s. GEOSECS included stations in the Greenland, Norwegian and Bering Seas, but due to logistic constraints, not in the Arctic Ocean proper. The ensuing development of analytical techniques now allows studies of trace elements and their isotopes at concentration levels and at space and time resolution that were inconceivable during the GEOSECS era. These developments include clean sampling, sensitivity, miniaturisation, automation, in-situ techniques or entirely new detection principles. This means that detailed mapping can be obtained of far more tracers including their isotopic composition with the potential to provide unique insights into a wide range of oceanic processes. This opportunity was the stimulus of the recently inaugurated GEOTRACES programme.

The primary objectives for the GEOTRACES programme are:

- Determine distributions of selected TEIs
- Evaluate the oceanic sources, sinks, and internal cycling of these TEIs and thereby characterize more completely their global biogeochemical cycles
- Provide a baseline distribution as reference for past and future

The case for GEOTRACES within IPY

What GEOTRACES has to offer IPY:

In the framework of GEOTRACES the international geochemical community brings together the best available techniques for a range of important TEIs. Key aspects such as intercalibration and data management are being organized within the programme.

GEOTRACES therefore offers the ideal platform for a major internationally coordinated study of tracer distributions in polar waters that will help us to better understand the role of the polar oceans in the biogeochemical cycles.

GEOTRACES will largely contribute to document the contemporary environmental status of the Polar Seas by establishing the state of the art of the distribution of natural and anthropogenic TEIs, contributing therefore to quantify their spatial and temporal variability and characterizing present day processes. In addition, GEOTRACES sections will help to understand the processes and conditions that control the present-day distribution of some tracers of paleoceanography (proxies), contributing therefore to studies on long term climate changes.

Why GEOTRACES aspires to be part of IPY:

IPY offers the opportunity to obtain a synoptic TEI distribution embracing all major Polar basins. The strong projects that have been proposed for the synoptic studies (Arctic and Antarctic) within IPY will offer the hydrographical and biological context that is needed for a good interpretation of the tracer fields. Proposals have been submitted to

- make GEOTRACES part of the synoptic studies planned for the polar oceans
- Arctic: join forces with SNAPSHOT, SPACE, CARE to achieve a detailed picture and improved understanding on the distribution of trace elements and their isotopes along
 - shelf-deep basin sections
 - sections across major pathways of Arctic ocean circulation
- Southern Ocean: join forces with CLIVAR and SCACE to perform multiple transects. Present options are:
 - approx 10 meridional transects with emphasis on micronutrient cycling (CLIVAR-SCACE-GEOTRACES)
 - Zero meridian (proposed for early 2007 on Polarstern)

International Cooperation and Interdisciplinary Collaboration

- The framework of GEOTRACES guarantees a very wide international cooperation and coordination
- Originally, the idea for a GEOTRACES component in Arctic studies (idea 226) was submitted by Michiel Rutgers van der Loeff (D), Per Andersson (Sweden), Bob Anderson (US), Kelly Falkner (US), Martin Frank (CH), Hein de Baar (NL) and Catherine Jeandel (F)
- Many more have expressed interest to participate: Roger Francois, UBC/Canada; Chris Measures, Hawaii, USA; Brad Moran, Rhode Island, USA; Jan Scholten (D); Graham Shimmiel (UK).
- The GEOTRACES concept is included in the overview of Arctic synoptic IPY studies made by Bob Dickson for the Arctic Ocean Science Board (AOSB-CLIC)
- GEOTRACES is part of the proposals for synoptic studies that have been grouped under the umbrella of the overarching proposal BIPOMAC
- More recently, a proposal for GEOTRACES collaboration with physical (CLIVAR) and biological (SCACE) oceanographers to complete synoptic sections of the Southern Ocean has been submitted by Bob Anderson (US), Michiel Rutgers van der Loeff (D), Martin Frank (CH), Hein de Baar (NL) and Catherine Jeandel (F).