

Criteria for Establishing GEOTRACES Process Studies

The following information is provided to guide scientists who wish to develop a research programme to be designated as a GEOTRACES process study. General characteristics of GEOTRACES processes are described in Section 8.1.3 of the Science Plan (available on the web at www.geotraces.org), the text of which is reproduced below.

The GEOTRACES Scientific Steering Committee (SSC) has established eight criteria that must be met by a process study in order to gain endorsement by the SSC:

1. The study must contribute to the scientific goals of GEOTRACES.
2. It must provide measurements of at least one of the key parameters of GEOTRACES (listed in Table 2 of the Science Plan).
3. Ideally, the study would include multiple trace elements and isotopes (TEIs; programmes are encouraged to take account of the principle that additional information is gained from measurement of multiple TEIs; the SSC will assist investigators planning process studies in locating scientists who can help expand the number of TEIs to be measured by participating in the programme).
4. It will collect sufficient ancillary data to allow interpretation of the TEI data.
5. It will follow GEOTRACES Intercalibration and Standardization protocols to allow comparison with data collected elsewhere. These protocols will be updated periodically on the GEOTRACES web site.
6. It will follow GEOTRACES Data Management protocols, including submission of data on appropriate time scales. These protocols will be updated periodically on the GEOTRACES web site.
7. It will commit in advance to acknowledging GEOTRACES in products of the project.
8. The programme will seek and obtain prior approval by the GEOTRACES SSC.

- To seek endorsement, projects should approach their national or regional SSC member (either before writing the proposal or with the proposal; names and contact information for SSC members are provided on the GEOTRACES web site) with a 1-page summary of the proposal that addresses the criteria above. This SSC member will provide initial advice and forward the proposal and the summary document to all SSC members with a recommendation. Any SSC member can partake in the discussion of whether the project meets the criteria.

- Data from cruises that have not gained GEOTRACES endorsement, but which use GEOTRACES Standardization and & Intercalibration procedures, will be termed “GEOTRACES-compliant data” and investigators will be encouraged to submit to the GEOTRACES data management system. These projects will not be considered “GEOTRACES” process studies, however.

8.1.3 Process studies

Although ocean sections will offer insight into many processes of interest to GEOTRACES, in some cases dedicated process studies will be required to fulfil the GEOTRACES mission. Many processes influence the marine biogeochemical cycles of TEIs, far more than can be examined by a single programme. Therefore, while it remains the prerogative of national GEOTRACES programmes and funding agencies to select specific process studies to be carried out (Section 9), some guiding principles will help set priorities in reaching these decisions.

Process studies likely to be of greatest value to GEOTRACES are those that:

- evaluate sources and sinks for TEIs for which large uncertainties currently exist;
- establish the processes that control the recording of geochemical proxies in sedimentary archives;
- establish the sensitivity of critical processes to changing environmental parameters; and
- complement but do not duplicate research conducted by other programmes.

Based on the implementation strategies outlined in Sections 3, 4 and 5 above, four particular process studies are currently identified as meeting these criteria and therefore as being high priority. This is not an exhaustive list of process studies that would help GEOTRACES meet its goals, but it represents those process studies that can already be identified as of particularly high priority:

- ocean–sediment exchange at oxygen minimum zones (see implementation strategy under Sections 3.3, 4.2 and 4.3);
- release of TEIs from particulate material when high-particulate load rivers discharge to the ocean (see Section 3.2);
- the flux of TEIs to the ocean from SGDs (see Section 3.2);
- recording of geochemical proxies in sediments from regions underlying strong ocean gradients (see Sections 5.2 and 5.3).

In each of these cases, additional work will be required to complement that derived from the ocean section approach. This work will involve tasks such as the collection of sediment or of data on repeat sections that are not planned as part of the ocean section campaign.

Other processes, although important to the goals of GEOTRACES, may be investigated by other programmes. Examples include the processes controlling the fractional dissolution of aerosol material (Section 3.1), which may be investigated by SOLAS, or the chemistry of near-vent hydrothermal fluids (Section 3.4), which may be investigated by InterRidge. The GEOTRACES Scientific Steering Committee will ensure close dialogue with such programmes to ensure that, while there is no duplication, suitable process studies are performed to meet the GEOTRACES goals. Synergies between

programmes will also be sought, for instance, by adding new TEI measurements to existing programmes, or by welcoming scientists from other programmes on GEOTRACES cruises.

In general, process studies will run concurrently with ocean section work. However, it is anticipated that the analysis of section results may identify unexpected areas in need of process studies. For example, anomalies in systematic relationships between TEI concentrations and standard hydrographic parameters may indicate the location of previously unknown TEI sources or sinks for which further investigation by process studies is deemed necessary. Therefore, the long-range plan for GEOTRACES should allow for such process studies to occur near the end of the programme.