

Classification of Parameters by Priority

Parameters (variables) to be studied along the section are divided into three categories: “key”, “essential” and “of interest”.

Key parameters are designated in Table 2 of the GEOTRACES Science Plan as those that must be measured on every GEOTRACES section. Selection of key parameters was guided by the following considerations: 1) their anticipated contribution to the fulfillment of the GEOTRACES mission and 2) the readiness of the international community of ocean chemists to undertake a global survey of the parameter.

Essential parameters are those considered to be necessary specifically for the Alaska-Tahiti section, either to provide an overall oceanographic context for the cruise or to interpret the distribution, supply or removal of other trace elements and isotopes.

Parameters of interest incorporate most remaining parameters, including most trace elements and isotopes not included in the key parameter list. The rationale for designating most parameters in this manner is to allocate as much of the available funding as possible to the most scientifically compelling proposals.

Listed below are the parameters included in each category, with annotations where explanations may be helpful. The “of interest” list is not meant to be exclusive or comprehensive. Investigators may wish to propose study of parameters not included in this list. The primary criterion to be used in proposal evaluation, beyond the two standard NSF criteria, is the ability of the proposed work to support the GEOTRACES mission and the specific research goals defined for this section, as described in the accompanying GP15_Guidelines document and in the management proposal, which will also be posted on this site after a funding recommendation has been made. Compelling proposals on any topic relevant to the marine biogeochemical cycling of trace elements and their isotopes along the Alaska-Tahiti section are welcome.

Key Parameters (adapted from Table 2 of the GEOTRACES Science Plan)

Dissolved and particulate trace element concentrations: Fe, Al, Zn, Mn, Cd, Cu

Dissolved stable isotopes: $\delta^{15}\text{N}$ of nitrate and $\delta^{13}\text{C}$ of dissolved inorganic carbon

Dissolved and particulate radioisotope concentrations: ^{230}Th , ^{231}Pa .

Radiogenic isotope ratios: Dissolved and particulate Nd isotope ratios; Dissolved Pb isotope ratios as well as measurements of dissolved Pb concentrations.

Particles and aerosols: Particles in the water column and aerosols. GEOTRACES considers that particles and aerosols must be collected on each section, but that the specific parameters to be measured in these phases may vary from one section to another depending on the scientific questions and processes of interest that are specific to each section.

NOTE:

Other parameters are organized below according to the above designations and by process/phenomenon to help facilitate searches for additional information. This organizational scheme is not meant to prescribe or to proscribe the measurement of any parameter.

Parameter Listing

Atmospheric deposition

Essential Parameters

- Dissolved and particulate concentrations of ^{232}Th in seawater,
- Concentrations of total and soluble ^{232}Th in aerosols,
- Concentrations of total and soluble rare earth elements in aerosols,
- Concentrations of dissolved ^7Be in seawater
- Concentrations of ^7Be in aerosols
- Key TEIs in aerosols (except ^{13}C)
- Ga
- Colloidal TEs in aerosol leaches and in surface water
- Fe isotopes, in aerosols and dissolved phase surface seawater

Parameters of interest

- Activity of ^{210}Pb
- Cu isotopes
- Hg in aerosols, surface water and atmosphere
- V, Ni
- Major anions and nitrate concentration in aerosols and wet deposition
- Se
- Sb

Margin/Sediment sources/sinks

Essential Parameters

- Ra isotopes
- REEs, complete suite to detect patterns and anomalies
- Fe isotopes
- Co

Parameters of interest

- Si and Si isotopes
- Al:Ti ratio distinguishes volcanic source
- Methane
- sulfides
- Fe(II)
- Fe and Cu ligands
- Colloids

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- Barium
- Particles – Fe speciation, Mn enrichment
- N₂/Ar concentration ratio
- Methyl-Hg
- Ac227 (abyssal only)

Hydrothermal inputs/removal

Essential Parameters

- Volcanic ³He/⁴He, He and Ne concentrations
- Shipboard Fe and Mn
- Fe colloids, ligands
- Particulate Key Trace Metals
- 4 Th isotopes

Parameters of interest

- Ra and Ac
- Fe isotopes
- LMW thiols
- Sc
- REEs
- Pb

Oxygen Minimum Zones

Essential Parameters

- Dissolved and particulate Fe isotope ratios
- Shipboard Fe and Mn
- Fe-ligands
- Co - dissolved and particulate
- Hg - monomethyl, dimethyl, total, elemental
- Dissolved and particulate rare earth elements
- Dissolved and particulate sulfide

Parameters of interest

- N₂O concentrations and isotopes
- Particulate Fe(II)/Fe(III) fractionation (synchrotron)
- Particulate CuS by synchrotron
- Cu-binding ligands
- Labile Co concentration
- Dissolved Cu, Cd, Zn isotopes
- Ag: dissolved and particulate concentration (total and acid leachable particulate fraction)
- N₂/Ar concentration ratio

Biological uptake, Export and regeneration

Essential Parameters

- Shipboard Fe & Zn concentrations
- Dissolved and particulate concentrations of ^{234}Th
- Particulate concentrations of POC, opal and CaCO_3 determined with samples collected by *in situ* filtration
- Ba: dissolved and particulate concentration
- Pigments
- Fe, Cu, Co bulk ligands
- Colloids

Parameters of interest

- Dissolved and particulate concentrations of ^{228}Th ,
- Dissolved and particulate concentrations of ^{226}Ra , ^{210}Pb and ^{210}Po ,
- Isotope ratios of particulate authigenic trace elements
- Sulfide concentration, ideally at nanomolar detection
- Triple oxygen isotopes
- Taxon specific particulate trace metals
- LISST/ UVP5
- POC/PIC/scattering optics/transmissometry
- Genomics/Transcriptomics
- Proteomics
- O_2/Ar
- DOC
- Particulate N-15
- N_2O
- DIC, alkalinity, pH
- Molecular ligands
- Be-7
- Noble gas and He-3 flux gauge
- Underway CFC and noble gas
- Si and Si isotopes
- Fv/Fm, underway
- Flow cytometry, preserved and on-shore
- Ba isotopes

Abiotic scavenging

Essential Parameters

- Particle composition and particle mass
- Fe and Cu bulk ligands
- Colloids
- Elements with a range of particle reactivity: e.g., Al, Ga, Sc (decreasing reactivity) and REE (heavy vs light)

Parameters of interest

- Sulfide dissolved and particulate, concentration, ideally at nanomolar detection
- Ti: dissolved and particulate concentration (total and acid leachable particulate fraction)
- ^{226}Ra , ^{210}Pb , ^{210}Po
- UVP/LISST
- Molecular techniques for ligands at depth
- Weak leaches of particles
- Elements with a range of potential types of scavenging behavior (reversible e.g. ^{230}Th ; regenerative e.g. Zn; irreversible e.g. Al?)
- Anthropogenic radionuclides

Anthropogenic Impact

Essential Parameters

- Hg
- Pb

Parameters of interest

- Plastic-hosted TEs

Circulation

Essential Parameters

- ^3He (tracer of dispersion and dilution of hydrothermal plume)
- CFC-SF₆ (ventilation ages)

Parameters of interest

- ^3H - ^3He ,
- Shipboard ADCP
- Lowered ADCP
- ^{14}C of DIC
- Dissolved ^7Be
- Quartet of short-lived radium isotopes
- Dissolved ^{227}Ac
- $\delta^{18}\text{O}$ of H₂O
- Remote sensing (wind, color, SST, altimetry)
- Si and Si isotopes