

## **Classification of Parameters by Priority**

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

Key trace element and isotope parameters (TEIs) 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 GP17 section, which can be further separated according to each of the two expeditions contributing to the section, either to provide an overall oceanographic context for the section or to interpret the distribution, supply or removal of other trace elements and isotopes.

Parameters of interest incorporate most remaining parameters, including most TEIs 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 first below are the parameters designated as “key.” These parameters are expected to be a focus of research on both GP17-OCE and GP17-ANT.

Essential parameters are listed next. There is some overlap between cruises among the parameters thought to be essential, while some parameters are thought to be of particular importance exclusively to one cruise or the other. To help illustrate the context in which these parameters are ranked, the essential parameters for each cruise are associated with one or more of four principal research themes that motivate each cruise. The common theme shared by the two cruises, in which exchange of TEIs between the continental margin and the ACC is investigated, is listed separately. Each of the listed essential parameters is recognized by the SSC to be necessary to achieve the research goals of the section, however the list is not meant to be exhaustive or exclusive. In this regard, the SSC encourages proposal writers to clearly articulate to reviewers and NSF how their proposed applications will advance the science of the GP17 cruises in a way that is essential to the cruise objectives.

The list of parameters “of interest” is extensive, and the SSC does not presume to know every application that may be proposed for each of these parameters. Therefore, rather than placing parameters of interest within the framework of the major themes of each segment of GP17, as for the essential parameters, a separate list is provided indicating all of the parameters for which interest was expressed by PIs who participated in the cruise planning workshop, either within their written statements of interest or during their oral advocacy presentations. Parameters are organized according to the environment associated with the stated interest (water column, atmosphere, ice, sediments), and key TEIs are indicated in red font. However, no other classification is made (e.g., by process) to encourage PIs to propose novel applications that may not be apparent to the SSC. In addition, 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 of GP17.

## 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:  $^{230}\text{Th}$ ,  $^{231}\text{Pa}$ .

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

Particles and aerosols: GEOTRACES considers that particles in the water column 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.

## Parameters Considered Essential for GP17 (In addition to key TEIs)

### GP17-ANT Section

#### 1. Sediment-water exchange, including benthic sources and sinks

- Radium isotopes
- Iron redox speciation
- Iron isotopes

#### 2. Ice shelf processes: including meltwater pump, ice source and subglacial sources

- Noble gases (incl. He isotopes)
- Stable isotopes of water ( $\delta^{18}\text{O}$  and/or  $\delta\text{D}$ )

#### 3. Environmental control of internal cycling of TEIs - biological uptake, remineralization and abiotic scavenging in the marginal ice zone and in polynyas

- Cobalt and nickel concentrations in dissolved and particulate phases
- Organic speciation of iron (ligands)
- Redox and size speciation of dissolved iron
- Particulate trace metals (bulk concentrations and cellular micronutrient:P ratios)
- Particulate trace metal lability
- $^{234}\text{Th}$  (export fluxes)

#### 4. Sea ice and snow as sources and as agents of transport of TEIs

- $^7\text{Be}$
- Key- or essential-TEI binding ligands
- Particulate trace metal concentrations and lability
- Iron isotopes

### GP17-OCE Section

#### 1. What is the relative magnitude of external fluxes of TEIs including dust, upwelling and sediment inputs (Chilean shelf), and how do they impact primary production in the gyre?

- $^7\text{Be}$
- Radium Isotopes
- Soluble TEIs in aerosols
- Iron isotopes

#### 2. How much Fe and other micronutrients from hydrothermal and benthic origin are carried by Pacific Deep Water to the Southern Ocean? How much are sourced within the Southern Ocean?

- Physico-chemical speciation of Fe
- Iron isotopes for fingerprinting sources
- Helium Isotopes and other noble gases

#### 3. How does the chemical environment (e.g. micronutrient:macronutrient ratios) across the ACC fronts interact with the biological community to drive the elemental stoichiometry of the exported flux?

- Key- or essential-TEI binding ligands
- Particulate trace metals (bulk and cellular micronutrient:P ratios)
- Particulate TEI lability
- $^{234}\text{Th}$  (export fluxes)

#### 4. Following from 3, what is the end-member composition of deep, intermediate and mode waters formed in the Southern Ocean and how are these water masses altered by scavenging and regeneration as they flow northward?

- Water mass tracers (CFCs)
- Si isotopes

*US GEOTRACES: Priorities for parameters to be measured on (GP17)*

### [Linking the Sections](#)

#### **Characterizing shelf-ACC exchange**

- Noble gases ( $^3\text{He}$  to trace CDW, full noble gas suite for ice melt)
- Stable isotopes of water ( $\delta^{18}\text{O}$  and/or  $\delta\text{D}$ )
- Iron isotopes
- Radium isotopes