

## Parameter Naming Conventions

All of the GEOTRACES parameter names that are used in the Intermediate Data Products are sorted into Domains; these are used to separate different types of datasets and to cluster different sets of parameters:

1. **Aerosols** - all measurements associated with aerosols, with different collection and analytical methods.
2. **BioGEOTRACES** - Biological measurements (including pigments, DNA parameters, cell quotas and proteins)
3. **Dissolved TEIs** - dissolved trace metals, ligands, radionuclides, rare earth elements and their isotopes,
4. **Hydrography and Biogeochemistry** - Including temperature, salinity, oxygen, major nutrients and their isotopes and noble gases
5. **Particulate TEIs** - particulate trace metals, ligands, radionuclides and major phases, and their isotopes
6. **Precipitation** - all measurements associated with rain and with freshly falling snow, with different collection and analytical methods.
7. **Polar** - unique samples from polar expeditions, also cross listed with “Dissolved TEIs,” “Precipitation,” “Particulate TEIs,” “Hydrography and Nutrients,” “Ligands” and, with “BioGEOTRACES” to facilitate locating this information.
8. **Ligands** - dissolved and particulate ligands also cross listed with “Dissolved TEIs”, “Particulate TEIs” and with “Polar” to facilitate locating this information.

GEOTRACES Intermediate Data Products employ the following parameter naming scheme. Standard hydrographic parameters, such as temperature, salinity and oxygen use names as defined in the WOCE/CLIVAR naming convention (CTDTMP, CTDSAL and CTDOXY for temperature, salinity and oxygen from CTD sensors; <https://exchange-format.readthedocs.io/en/latest/parameters.html>). Other hydrographic and biogeochemistry parameters use names defined intuitively. Examples are CTDPRS for the CTD pressure at the bottle sample depth, SALINITY, PHOSPHATE, NITRATE, and SILICATE for salinity, phosphate, nitrate and silicate measured on bottle samples. Note that NO<sub>3</sub> and NO<sub>2</sub> are used in the Precipitation Domain parameter names. Biogeochemistry parameters use names defined by SCOR naming conventions (e.g., HPLC pigments; Roy et al., 2011) or names that intuitively define the parameters (e.g., nifH\_UCYN-A\_DNA\_P\_CONC\_BOTTLE; concentration of nifH genes from uncultured unicellular cyanobacteria (UCYN-A) particles (P) in a bottle sample).

All other trace elements and isotope names are composed of up to six separate tokens as shown below. Tokens 2 and 3 are optional, while all other tokens are mandatory for trace elements and isotopes, nutrients and biogeochemistry parameters. A few physical parameters that do not align with the convention of 4 to 6 tokens are exempt from the requirement to include Phase, Data Type and Sampling system (see examples below). This is indicated by \_NONE” in the examples list.

| 1                    | 2                  | 3              | 4      | 5         | 6                |
|----------------------|--------------------|----------------|--------|-----------|------------------|
| Element/<br>Compound | [_Oxidation State] | [_Atomic Mass] | _Phase | _DataType | _Sampling System |

### Explanations

| # | Explanation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Example                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | <p>Element or compound (mandatory); information about TEI speciation (e.g., methylation of TEIs, such as Me_MM, Me_DM and free inorganic elements (Me')) is incorporated into the first token.</p> <p>Dissolved metal binding ligands are given names reflective of the analytical methods. Some new Cu ligand names are shown for example. The new ligand names for Co, Cu, and Fe along with their detailed descriptions are implemented in the DOoR.</p>                                             | <p>Fe, Th, DIC, NITRATE</p> <p>Cu_Cu'_CSV2SA<br/>Cu_Cu'_CSV2.5SA<br/>Cu_Cu'_CSV5SA<br/>Cu_Cu'_CSV10SA<br/>Cu_Cu'_CSV25SA<br/>Cu_Cu'_IMAC<br/>Cu_Cu'_SPEENV<br/>L1Cu_CSV2SA<br/>L1Cu_CSV2.5SA<br/>L1Cu_CSV5SA<br/>L1Cu_CSV10SA<br/>L1Cu_CSV25SA<br/>L1Cu_IMAC<br/>L1Cu_SPEENV<br/>L2Cu_CSV2SA<br/>L2Cu_CSV2.5SA<br/>L2Cu_CSV5SA<br/>L2Cu_CSV10SA<br/>L2Cu_CSV25SA<br/>L2Cu_IMAC<br/>L2Cu_SPEENV</p>                                                                                                                                                                                                                                                      |
| 2 | Oxidation state as roman number (optional)                                                                                                                                                                                                                                                                                                                                                                                                                                                              | _II, _IV, _III_V_ where III and V are combined                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 3 | Atomic mass (optional); two entries for isotope ratios                                                                                                                                                                                                                                                                                                                                                                                                                                                  | _228, _208_204                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 4 | <p>Phase on which element or compound was measured (mandatory); may include two components (e.g., _R_TD_ refers to the Total Dissolvable concentration of a constituent in Rain). The default is "seawater" when the medium (e.g., R (rain), A (aerosol), SNOW, ICE is not given. Note that "CELL" is considered a phase where cell quotas are presented. In the cases of Co and Cu, Token_DL (dissolved labile) is used where sample oxidation was not conducted prior to extraction and analysis.</p> | <p>_D (dissolved)<br/>_DL (dissolved labile)<br/>_C (colloidal)<br/>_S (soluble)<br/>_T (total: dissolved plus particulate)<br/>_TD (total dissolvable)<br/>_TP (total particulate)<br/>_TPL (total particulate, labile fraction)<br/>_TPR (total particulate, refractory fraction)<br/>_LPT (large particulate, total, unleached)<br/>_SPT (small particulate after prefiltration to collect medium sized particles, total, unleached)<br/>_SPL (small particulate after prefiltration to collect medium sized particles, labile fraction)<br/>_SPR (small particulate after prefiltration to collect medium sized particles, refractory fraction)</p> |

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|---|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|   |                             | _MPT (medium particulate using prefiltration, total, unleached)<br>_MPL (medium particulate using prefiltration, labile fraction)<br>_MPR (medium particulate using prefiltration, refractory fraction)<br>_CELL (specific individual cell)<br>_ICE (ice)<br>_ICE_D (dissolved on melted ice)<br>_ICE_TD (total dissolvable on melted ice)<br>_ICE_T (total dissolved plus particulate on melted ice)<br>_ICE_TP (total particulate on melted ice)<br>_ICE_TPL (total particulate, labile fraction, on melted ice)<br>_SNOW (snow)<br>_SNOW_D (dissolved on melted snow)<br>_SNOW_TD (total dissolvable on melted snow)<br>_SNOW_T (total dissolved plus particulate on melted snow)<br>_SNOW_TP (total particulate on melted snow)<br>_SNOW_TPL (total particulate, labile fraction, on melted snow)<br>_A (aerosol)<br>_A_SMLH2O (soluble mild leach with ultrapure water)<br>_A_SMLSW (soluble mild leach with seawater)<br>_A_SSLNH4AC (soluble strong leach with ammonium acetate)<br>_A_SSLHAC (soluble strong leach with acetic acid)<br>_A_SSLHNO3 (soluble strong leach with nitric acid)<br>_R (rain) |
| 5 | DataType (mandatory)        | _CONC (concentration)<br>_DELTA (isotope ratio in DELTA notation)<br>_EPSILON (isotope ratio in epsilon notation)<br>_LogK (log of binding constant of ligand)<br>_RATIO (atomic abundance ratio of isotopes or molecular ratio of gases)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 6 | Sampling system (mandatory) | _BOTTLE (Niskin or similar water sampling bottle)<br>_FISH (trace-metal clean towed surface sampler)<br>_PUMP (either in-situ pump or on-deck pump)<br>_UWAY (ship's underway surface seawater)<br>_HIVOL (high-volume aerosol sampler)<br>_LOWVOL (low-volume aerosol sampler)<br>_FINE_IMPACTOR (size-fractionated aerosols, small fraction, $\leq 1\mu\text{m}$ or as close as possible)<br>_COARSE_IMPACTOR (size-fractionated aerosols, coarse fraction, $\geq 1\mu\text{m}$ or as close as possible)<br>_AUTO (automated rain or snow sampler)<br>_MAN (rain or snow sampler with manual on-off controls)<br>_CORER (ICE cores)<br>_GRAB (ICE or SNOW grab samples)                                                                                                                                                                                                                                                                                                                                                                                                                                       |

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|  |  | _SUBICE_PUMP (seawater collected from an ice floe using a pump)<br>_BOAT_PUMP (seawater collected from a small boat using a pump)<br>_MELTPOND_PUMP (collected from a meltpond using a pump) |
|--|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### Examples

| Parameter Name                | Parameter description                                                                           |
|-------------------------------|-------------------------------------------------------------------------------------------------|
| Fe_D_CONC_BOTTLE              | Concentration of dissolved Fe                                                                   |
| Fe_II_D_CONC_BOTTLE           | Concentration of dissolved Fe(II)                                                               |
| Fe_II_TP_CONC_BOTTLE          | Concentration of total particulate Fe(II) determined by filtration from a water sampling bottle |
| Fe_TPL_CONC_BOTTLE            | Concentration of labile particulate iron determined by filtration from a water sampling bottle  |
| Nd_143_144_D_RATIO_BOTTLE     | Atom ratio of given isotopes for dissolved Nd                                                   |
| Nd_143_144_D_EPSILON_BOTTLE   | Atom ratio of dissolved Nd isotopes expressed in conventional EPSILON notation                  |
| Cd_114_110_D_DELTA_BOTTLE     | Atom ratio of dissolved Cd isotopes expressed in conventional DELTA notation                    |
| Cu_D_CONC_BOTTLE              | Concentration of dissolved Cu obtained following UV or H2O2 oxidation                           |
| Cu_DL_CONC_BOTTLE             | Concentration of dissolved labile Cu (without sample pre-oxidation)                             |
| Cu_65_63_D_DELTA_BOTTLE       | Dissolved Cu isotope ratio in DELTA notation obtained following UV or H2O2 oxidation            |
| Cu_65_63_DL_DELTA_BOTTLE      | Dissolved labile Cu isotope ratio in DELTA notation obtained without oxidation                  |
| Cu_Cu'_CSV2.5SA_D_CONC_BOTTLE | Concentration of dissolved inorganic Cu using CSV with 2.5SA added                              |
| L1Cu_CSV2.5SA_D_CONC_BOTTLE   | Concentration of dissolved L1Cu-binding ligand using CSV with 2.5SA added                       |
| L1Cu_CSV2.5SA_D_LogK_BOTTLE   | Log of the stability constant of L1Cu using CSV with 2.5SA added                                |
| Pb_206_204_D_RATIO_BOTTLE     | Atom ratio of given isotopes for dissolved Pb                                                   |
| DIC_13_12_D_DELTA_BOTTLE      | Atom ratio of given isotopes for dissolved C as DIC in DELTA notation                           |
| DIC_14_12_D_DELTA_BOTTLE      | Atom ratio of radiocarbon as dissolved C in DIC in DELTA notation                               |
| NITRATE_15_14_D_DELTA_BOTTLE  | Atom ratio of given isotopes for dissolved N as nitrate in DELTA notation                       |
| L1Fe_CSV5SA_D_CONC_BOTTLE     | Concentration of dissolved L1 Fe-binding ligand using CSV with 5SA added.                       |
| L1Fe_CSV5SA_D_LogK_BOTTLE     | Log of the stability constant of L1Fe using CSV with 5SA added.                                 |
| HOMOCYS_D_CONC_BOTTLE         | Concentration of dissolved homocysteine                                                         |
| Chl a_HPLC_TP_CONC_BOTTLE     | Concentration of particulate Chlorophyll a measured using HPLC method                           |

|                                    |                                                                                                                                                                                                           |
|------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| nifH_UCYN-A_DNA_TP_CONC_BOTTLE     | Abundance nifH Uncultured unicellular cyanobacteria (UCYN-A)                                                                                                                                              |
| Al_A_T_CONC_HIVOL                  | Total aerosol Al concentration, high-volume sampler                                                                                                                                                       |
| Al_A_SMLH2O_CONC_HIVOL             | Soluble aerosol Al concentration, mild leach with ultrapure water, high-volume sampler                                                                                                                    |
| Al_A_SMLSW_CONC_HIVOL              | Soluble aerosol Al concentration, mild leach with seawater, high-volume sampler                                                                                                                           |
| Al_A_SMLH2O_CONC_COARSE_IMPACTOR   | Soluble aerosol Al concentration, mild leach with ultrapure water, coarse fraction, impactor sampler                                                                                                      |
| Al_A_SMLH2O_CONC_FINE_IMPACTOR     | Soluble aerosol Al concentration, mild leach with ultrapure water, fine fraction, impactor sampler                                                                                                        |
| Al_A_SSLNH4AC_CONC_HIVOL           | Soluble aerosol Al concentration, strong leach with ammonium acetate, high-volume sampler                                                                                                                 |
| Al_A_SSLNH4AC_CONC_COARSE_IMPACTOR | Soluble aerosol Al concentration, strong leach with ammonium acetate, coarse fraction, impactor sampler                                                                                                   |
| Al_A_SSLNH4AC_CONC_FINE_IMPACTOR   | Soluble aerosol Al concentration, strong leach with ammonium acetate, fine fraction, impactor sampler                                                                                                     |
| PH_SWS_BOTTLE                      | Example of a parameter that is exempt from the requirement to include Phase, Data Type and Sampling System: pH measured on the seawater scale that is measured on a water sample collected with a bottle. |
| TMP_ICE_CORER                      | Example of a parameter that is exempt from the requirement to include Phase, Data Type and Sampling System: Temperature measured by inserting a probe into a hole drilled into ice.                       |