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Statement of Interest **Measurement of CFCs and SF_6 on GEOTRACES Peru-Tahiti Cruise**

Distributions of the chlorofluorocarbons (CFC-11 and CFC-12) and sulfur hexafluoride (SF_6) in both seawater and the atmosphere will be measured on-board ship at all stations and appropriate depths. Concentrations of CFCs and SF_6 in seawater and air are measured by electron-capture gas chromatography using an analytical system that measures CFCs and SF_6 from the same water sample. Preliminary CFC and SF_6 concentrations will be calculated and merged with other hydrographic parameters daily at sea. The final data will be available within 6 months of cruise.

The CFCs are gases that have been used as refrigerants and aerosol spray propellants. SF_6 is a gas used as an electrical insulator in high voltage equipment. It has a very high chemical stability and extremely long atmospheric lifetime, and is there is no evidence of chemical or biological degradation in the oceans. Similar to the CFCs, SF_6 is almost entirely of anthropogenic origin, and its present concentration in the atmosphere is ~6 ppt, as compared with ~250 and 545 ppt for CFC-11 and CFC-12, respectively. CFC-11 and CFC-12 have been entering the ocean for the past half-century and will continue to enter the ocean and spread into the interior for decades. SF_6 has been entering the ocean for the past 2-3 decades. While the CFC concentrations have leveled off, SF_6 has been rising in the atmosphere, and continues to increase at about 5-7% per year. Since they are potent greenhouse gases, their atmospheric time histories are well known and monitored. The measurement of SF_6 in conjunction with CFCs greatly increases the temporal information in the suite of anthropogenic transient tracers. The most robust tracer combination for oceanic time scales of up to several decades is obtained using the SF_6/CFC ratio.

The GEOTRACES Pacific zonal section will run along 10°-15°S from Peru to Tahiti at 150°W. The section crosses the highly productive Peru margin and upwelling, South Pacific oxygen minimum zone (OMZ), and oligotrophic low nitrate region - an important denitrification zone. The proposed SF_6/CFC tracer measurements will contribute to Theme 2 of the GEOTRACES Science Plan, the Internal Cycling Objective, and to Peru-Tahiti Objectives 1-3. A combination of physical and biogeochemical processes determines oceanic distributions of TEIs. Measurements of tracers and TEIs on the same samples will provide added constraints on time scales and physical transports. The CFC/SF_6 tracer data will contribute to the following specific objectives.

● For the low oxygen waters in the OMZ, calculate ages to distinguish *old* shadow zone and not recently renewed waters - from recently renewed waters that may have low oxygen due to biochemical processes.

● Estimate rates of biogeochemically important processes- e.g., apparent oxygen utilization, denitrification - to contrast rates in upwelling, OMZ and low nitrate regions.

● Identify sources and sinks and estimate effective time scales of the circulation, mixing and ventilation for thermocline and intermediate water masses within which TEIs reside - to contribute to a characterization of the physical processes affecting trace speciation and internal cycling.