Radium Isotopes as Tracers of TEI Boundary Inputs

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We plan to submit a proposal on August 15th for Tahiti-Antarctic-Chile (GP17) GEOTRACES (both legs) with a focus on Ra isotopes (^{224}Ra: $t_{1/2}$=3.66 d; ^{223}Ra: $t_{1/2}$=11.4 d; ^{228}Ra: $t_{1/2}$=5.75 y; ^{226}Ra: $t_{1/2}$=1600 y), which are essential tools to quantify TEI boundary sources on time and space scales that are required to interpret lateral and vertical distributions of the TEIs in this basin. Specifically we plan to focus on (1) Chilean and Antarctic margin exchange rates on short and intermediate time scales (days-decades: ^{224}Ra, ^{223}Ra, ^{228}Ra) (2) shelf and deep ocean sources of TEIs including sediments, submarine groundwater discharge, and subglacial melt with a focus on Fe in the HNLC Southern Ocean (^{228}Ra, ^{226}Ra); and (3) hydrothermal inputs of Fe (all 4 Ra isotopes). Additionally, the ^{226}Ra and ^{228}Ra distributions and inventories in the water column will be used in global models aimed to resolve the inputs and losses of long-lived Ra isotopes in the world ocean. For ^{226}Ra this will be the first global model since GEOSECS.

The sampling effort requires 20 L samples from the CTD (^{226}Ra), larger volumes from surface pumping (4 Ra isotopes), and large volume *in situ* pump samples for vertical profiles of dissolved Ra isotopes. For the large volume radionuclide samples, we will attach a single Mn cartridge to the LVP flow path after filtration. In addition to the water collected using standard CTD/Rosette casts, two casts with 8 in situ pumps each will be needed, one shallow (6hrs) and one deep (9-10 hrs, and only at stations where the bottom exceeds roughly 1000-2000 m); therefore, most full ocean depth stations will have a 16-depth profile for large volume Ra isotopes. The short-lived isotopes will be measured onboard; a minimum of two berths will be required for this effort (includes support of the pump deployment team).