

Radium Isotopes as Tracers of TEI Boundary Inputs

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We plan to submit a proposal Feb 15th for Pacific GEOTRACES with a focus on Ra isotopes, 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) bottom boundary layer exchange rates on short and intermediate time scales (days-months; ^{224}Ra : $t_{1/2}=3.66$ d; ^{223}Ra : $t_{1/2}=11.4$ d); (2) shelf sources of TEIs including sediments and submarine groundwater discharge (^{228}Ra : $t_{1/2}=5.75$ y, ^{226}Ra : $t_{1/2}=1600$ y); and (3) hydrothermal inputs of Fe (all 4 Ra isotopes). Additionally, the ^{226}Ra and ^{228}Ra 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.

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 would 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 one berth will be required for this effort.