

Letter of Intent to Participate in GEOTRACES Pacific Section

Principal Investigator

Douglas E. Hammond
Dept. of Earth Sciences
University of Southern California
Los Angeles, CA 90089-0740

Contact info:

dhammond@usc.edu
213-740-5837

Project Focus:

228Ra and 226Ra distribution in Pacific Surface Waters and Deep Waters as a Constraint on Mixing and Mass Transport of Solutes

Rationale:

Radium has been identified as a core tracer for the Geotraces program. Its value lies in the potential insight it might have as a tracer for mixing and transport. Two isotopes will be most valuable, 226Ra (1600 y half-life) and 228Ra (6 y half-life). The primary sources of these isotopes will be benthic inputs, with a modest input from hydrothermal sources. The shorter-lived 228Ra will be most easily measured near boundaries; using large samples (100-1000 liters), it is also possible to measure gradients a considerable distance from its sources with a precision of 5-20% (depending on concentration and sample size). 226Ra is easily measured in modest (about 20 liters) sized samples and can be measured with precision of a few percent. Concentration fields can be integrated with estimates of regional source strength to estimate mass transport rates.

Measurement Techniques:

Our lab has considerable experience with 226Ra measurement, based on ingrowth and analysis of its 222Rn daughter. Water samples are collected and stored in glass bottles. After several weeks, Rn is extracted and analyzed by alpha scintillation counting with a precision that is limited by activity, available counting time, and extraction reproducibility. We also have expertise in 228Ra analysis, based on sorption of Ra from large volumes of water onto acrylic fibers impregnated with Mn. The 228Ra activity on the fiber is determined from ingrowth of its 224Ra granddaughter, analyzed by the delayed coincidence counting technique developed by Moore and Arnold (1996). This technique has low background, but also requires long storage sample times and repeated analysis of each sample to evaluate the contribution of Thorium-228 extracted on the fiber with the Ra. Ra extraction efficiency is determined based on 226Ra sorption and the direct measurement of its concentration. We have participated in the 2008 GEOTRACES intercalibration exercise for Ra, with our results being comparable to those of other groups.

Proposed Sampling:

It is difficult to offer a firm plan with many fiscal unknowns that will affect the ability to carry out field work and subsequent laboratory analyses. We anticipate that it may make sense to collaborate on these analyses with other investigators, and look forward to further discussions at the September workshop.