Letter of Intent to Participate in the Peru-Tahiti GEOTRACES Section

Project Focus: 227Ac distribution in Pacific Deep Waters as a Constraint on Mixing and Mass Transport of Solutes

Principal Investigator

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Research Goals:

227Ac (22 year half-life) has been identified as a parameter of interest for the Geotraces program. Its value lies in the potential insight it should have as a tracer of mixing and transport, particularly if coupled with analysis of 228Ra (6 year half-life). The primary sources of these isotopes will be benthic inputs, with a modest input from hydrothermal sources. Both isotopes can be measured near boundaries using large samples. Concentration fields can be combined with estimates of regional benthic inputs to estimate mass transport rates. The advantage of having multiple radiogenic tracers with different half-lives allows construction of models that can assess both horizontal and vertical components of transport.

Sample Requirements:

Both 227Ac and 228Ra can be measured based on their sorption of Ra from of large volumes of water (100-1000 liters) onto acrylic fibers impregnated with Mn. This sampling would be done in situ, in coordination with deep pumping to obtain particulates. Plans for large volume pumping are based on assuming that two casts with 8 in situ pumps each will be needed. One will be shallow (6hrs) and one deep (9-10 hrs, only at stations where the bottom exceeds roughly 1000-2000 m). Consequently, most full ocean depth stations will have a 16-depth profile for large volume particulates and radioisotopes.

Berth Requirements:

Assuming the deep pumping and on-board radium program is funded, we anticipate that the 227Ac collections can be carried out with a minimum of additional effort, as it should require only addition of a collection cartridge to the pumping system. Analyses can be done after samples are returned to shore. Thus, we do not anticipate needed additional berthing beyond that required to support the pumping and radium analyses.

Anticipated Collaborations and Synergies:

We are coordinating this proposal with a separate proposal that will be submitted by Buessler, Moore and Charette, focused on deep pumping and analyses of U-series isotopes, including radium. We anticipate that the results will be of value to other investigators who will be doing analyses of sub-thermocline waters and need to constrain transport rates to establish solute dynamics.