

## **Letter of Intent to Participate in the GEOTRACES South Pacific Section**

**Project Focus:**  $^{227}\text{Ac}$  distribution in South Pacific Waters as a Constraint on Mixing and Mass Transport of Solutes

**Principal Investigator**

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**Research Goals:**

$^{227}\text{Ac}$  (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. Its analysis and distribution is complementary to analysis of  $^{228}\text{Ra}$  (6 year half-life), although the greater lifetime of  $^{227}\text{Ac}$  may provide estimates of mixing over greater distances than  $^{228}\text{Ra}$ . The primary sources of these isotopes is be benthic inputs, with some geothermal inputs as well. Excess  $^{227}\text{Ac}$  should be detectable more than 2 km from the bottom in this region, providing insight into transport of other solutes which may show gradients over these length scales. The availability of precise measurements of the water column distribution of the  $^{231}\text{Pa}$  parent of  $^{227}\text{Ac}$ , along with measurements of nutrients and metals that are made by other participants in the program, offers opportunities for obtaining  $^{227}\text{Ac}$  results with only modest additional effort and funding.

In addition to water column measurements, we would like to also measure  $^{227}\text{Ac}$ ,  $^{231}\text{Pa}$ , and  $^{210}\text{Pb}$  profiles in near-surface sediments. These profiles will constrain the  $^{227}\text{Ac}$  source function, helping to elucidate the relative role of vertical and horizontal transport in this region.

**Sample and Berthing Requirements:**

Both  $^{227}\text{Ac}$  can be measured along with  $^{228}\text{Ra}$  by sorbing these isotopes from large volumes of water (500-1500 liters) onto acrylic fibers impregnated with  $\text{MnO}_2$ . Isotope sampling can be done in situ, in coordination with deep pumping to obtain particulates. Plans for large volume pumping for deep stations assume that two casts with 8 pumps each will be needed. We anticipate that the  $^{227}\text{Ac}$  collections can be carried out with a minimum of additional effort, as it should require only addition of a second 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.