

Artificial Radionuclides

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I plan to submit a proposal to the February 15th NSF OCE panel to measure the dissolved and particulate concentrations of artificial radionuclides at selected sites along the Atlantic zonal section. Nuclides of interest include ^{239}Pu , ^{240}Pu , ^{237}Np , and ^{137}Cs . This work offers the opportunity learn about the fate and transport of these man-made contaminants by re-measuring and comparing plutonium and ^{137}Cs distributions in the Atlantic 38 years after the GEOSECS Atlantic Expedition as well as providing East West transects of ^{237}Np and the $^{240}\text{Pu}/^{239}\text{Pu}$ atom ratio in the Atlantic for the first time.

The abovementioned anthropogenic nuclides are of interest for a several reasons. They are transient tracers capable of constraining the time scales of certain processes. They exhibit a range of particle reactivity ($\text{Cs} < \text{Np} < \text{Pu}$), allowing one to address issues related to boundary scavenging and particle dynamics. In some cases, the isotopic composition (e.g., $^{240}\text{Pu}/^{239}\text{Pu}$) is diagnostic of contaminant source.

For dissolved Pu and Np, I would require filtered 10-20 liter samples from the ship's rosette for depth profiles. For cesium, I would need to arrange to deploy copper-ferrocyanide cartridges in-line in a similar fashion as the Mn-cartridges used by researchers measuring radium isotopes. This method of collection will allow the measurement of ^{137}Cs in large volume samples (~600 liters) without significant increase in wire time. This will also substantially reduce gamma counting time and allow the pursuit of a thermal-ionization (TIMS) method for Pu and Np, further reducing sample water requirements. If the system is available, I would be interested in obtaining aliquots of particulate samples from the MULVS system (90mm punches from the main filters) to examine radionuclide distribution distributions between particulate and dissolved phases in the upper 1000 meters of the water column. If possible, I would like to obtain particulate samples from depths greater than 1000 meters at only a few sites. At this point, I would require 1 berth and a small amount of lab space for performing iron co-precipitations and separations at sea. Any sea-going personnel associated with this project would be willing to assist other groups where necessary.