

Uranium-236, a new environmental tracer

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Room 118 Nieuwland Science Hall

Refreshments @ 3:30 in 202 NSH

The use of nuclear energy and the testing of nuclear weapons have led to significant releases of anthropogenic isotopes, in particular a number of actinide isotopes generally not abundant in nature. Most prominent amongst these are Plutonium-239, Plutonium-240, and Uranium-236. The study of these actinides in nature has been an active field of study ever. Measurements of actinides are applied nuclear safeguards, investigating the sources of contamination, and as a tracer for a number of erosion and hydrology studies.

Accelerator Mass Spectrometry (AMS) is ideally suited for these studies and offers much higher abundance sensitivities than competing techniques, like ICP-MS, TIMS, or decay counting. In particular, thanks to recent advances in AMS, ^{236}U can now be measured at the levels expected from the global stratospheric fall-out of the atmospheric nuclear weapon tests in the 1950s and 1960s. Bomb fall-out Uranium-236 is a potential oceanic tracer with great merits: Uranium-236 behaves conservatively in the ocean with a strong correlation to salinity, while the long half-life of 23.5 million years makes it an essentially stable isotope on the time-scales of ocean transport phenomena. Recent studies includes the first coral core record of Uranium-236 and several ocean water depth profiles. In the future, even the pre-anthropogenic $^{236}\text{U}/^{238}\text{U}$ -isotope ratios – expected to be below 10^{-12} – will be within reach, opening the potential of new applications for this tracer.