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Exploring the lowest levels of environmental $^{90}\text{Sr}/\text{Sr}$ compared to $^{236}\text{U}/\text{U}$ in carbonates and seawater using a new, highly sensitive Accelerator Mass Spectrometry technique

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Strontium-90 (^{90}Sr) is an anthropogenic radionuclide, which, due to its radiological relevance, has been most intensively monitored in the past. In terms of initial activity, over 630 PBq of this radionuclide have been distributed globally from stratospheric fallout of bomb-testing, and there are more localized contributions from tests, accidents, and releases from reprocessing plants. In the past, massive sample sizes (up to 100 l of seawater or 100 g of coral aragonite) were required, even right after the peak period of global fall-out from bomb testing. On the other hand, the high amount of strontium dissolved in seawater complicates the use of mass spectrometric methods, as an isotopic abundance sensitivity of at least $1 \cdot 10^{-15}$ is required to detect the estimated main signal. With recent advances in isobar separation techniques in accelerator mass spectrometry (AMS) at the University of Vienna, this requirement has come within reach, offering new research possibilities. The new technique uses an ion-cooler and laser-photo-detachment to suppress the stable isobar ^{90}Zr almost completely. With initial test samples we could confirm an isotopic abundance sensitivity of $8 \cdot 10^{-16}$ $^{90}\text{Sr}/\text{Sr}$, sufficient for application to ocean water samples. In this presentation, we will show comparison of ^{90}Sr to ^{236}U , another ocean tracer that has been studied intensively recently. We will present results from contemporary coral skeleton material, the methods, requirements, and impact of sample preparation. Further, we present the first results from ocean water samples and the sample preparation and blank levels for these types of samples.

Finally, we explain our sample preparation scheme to extract ^{236}U , simultaneously with ^{90}Sr , for multi-isotope applications of both.

Student Submission

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