Establishing detection limits and optimal sample-matrix composition for an enhanced actinide determination using the ETH MILEA system

Habacuc Pérez-Tribouillier [1], Philip Gautschi[1], Christof Vockenhuber[1] and Marcus Christl[1]

[1]*Laboratory of Ion Beam Physics, ETH Zürich, Switzerland*

In this study, the detection limits for Pu, U, and Am isotopes are presented, demonstrating the ETH MILEA system's capability to identify these isotopes at ultra-trace levels. Additionally, the impact of varied matrix compositions, specifically iron and niobium content, on the detection efficiency of these actinides was investigated. Larger matrices were observed to be advantageous for extended measurement times, particularly benefiting lower-concentration samples. These findings were then applied to determine isotopic concentrations in small-volume environmental samples collected from areas near the Fukushima Nuclear Power Plant and the North Sea.

This research forms an integral part of the ongoing MetroPOEM project, which aims to harmonize different mass spectrometry methods for the determination of radioactive pollutants in the environment. Our results also contribute to improving actinide measurements in the fields of tracer oceanography and nuclear forensics.