**Detecting Environmental Pa-231 Using Accelerator Mass Spectrometry**

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Uranium mining and milling activities contribute to the release of natural uranium and its decay products into the environment. This may lead to radiological risks. While U-238 and its decay products are routinely monitored, the behaviour of the U-235 decay products is either not considered, or only estimated based on the U-238 decay chain in radiological assessments [1].

Pa-231 (t1/2= 3.28·104 a) is one of the few long-lived isotopes in the U-235 decay chain. It has a half-life of 3∙105 years and lacks analogues in the U-238 decay series. Hence, it is necessary to study Pa-231 to learn about the transport and possible accumulation of U-235 decay products in the environment that might differ from the U-238 decay series [2].

While many actinides (e.g., U-236, Pu-239, Am-241) are routinely measured in environmental samples using accelerator mass spectrometry (AMS), Pa-231 is not among them, even though it has been shown that its AMS detection limit is in the lower femtogram range [3]. Challenges in the measurement of Pa-231 include complicated sample preparation procedures and lack of a long-lived isotope that one could use for normalization.

We developed chemical sample preparation procedures for environmental water and sediment samples, proven successful by our first beam time using MILEA at ETH Zürich. We achieved a suppression of neighboring masses by over 11 orders of magnitude on the mass 231, and saw no significant background contribution of Th-232. We also investigated challenges caused by using the short-lived Pa-233 (t1/2= 26.98 days) for normalization.

In this contribution I will present our findings of the transport of U-235 and Pa-231 downstream of a former uranium mine in the German state Saxony and its implications for potential accumulation of Pa-231 in different environmental sinks.

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[1] Beaugelin-Seiller, K., et al., J. Environ. Radioact., 2016, 151, 114-125.

[2] Medley, P., et al., Nucl. Instrum. Methods Phys. Res. B, 2019, 438, 66-69.

[3] Christl, M., et al., Nucl. Instrum. Methods Phys. Res. B, 2007, 262, 379-284.