# AGA 7: Nuclear Archeology

Time: Friday 11:15–12:30 Location: H8

AGA 7.1 Fri 11:15 H8

**Forensic measurements for nuclear archaeology - A new approach** — •Lukas Rademacher and Malte Göttsche — Nuclear Verification and Disarmament, RWTH Aachen

The availability of effective and widely accepted verification tools is an essential prerequisite for any lasting and successful effort towards nuclear disarmament. One such verification toolbox is nuclear archaeology - it aims to reconstruct the production and removal history of weapons-usable fissile materials. A central method of nuclear archaeology is the deduction of a shut-down reactor's lifetime plutonium production using samples taken from within its core. Specific isotopic ratios are measured to assess neutron fluence and thus estimate plutonium production.

We will present a new approach aiming to strengthen the potential of the method by analyzing a larger set of measured isotopic ratios. This allows for the reconstruction of operational histories of the considered reactor in more detail , therefore providing more information to cross-check declarations. However, this requires a considerably more complex analysis. A feasibility study for this new approach using state-of-the-art mathematical and computational methods has been conducted and will be presented, showing that it is indeed possible to reconstruct additional information.

AGA 7.2 Fri 11:45 H8

**Uncertainty Quantification of Plutonium Production Estimates Using the Isotope Ratio Method** — •Benjamin Jung and Malte Göttsche — RWTH Aachen University, Aachen, Germany

An understanding of fissile material production histories is essential to enable nuclear disarmament. The Isotope Ratio Method is a technique to estimate the lifetime plutonium production of shut-down reactors. Robust uncertainty assessments are crucial to determine whether these plutonium estimates are consistent with a state's declaration. With Monte Carlo methods and sensitivity analysis techniques, we examine which impact different magnitudes of various uncertainty sources have, using a CANDU 6 and the graphite-moderated Yongbyon reactors as models. The results show that, in particular, uncertain burnup values and, to a lesser degree, nuclear data uncertainties impact the overall uncertainty. To appropriately consider this, we propose a new sequence of applying the Isotope Ratio Method, which calculates tolerance intervals (as opposed to mean values with a standard deviation). The scenarios considered here result in intervals of approximately +/- 10% around the plutonium estimate, suggesting possibly larger uncertainties of the Isotope Ratio Method than previously assumed.

**15 min. break**