

1.3-P14. The variability of Ar-37 concentrations in soil air due to changing environmental conditions

Ar-37 as an indicator for underground nuclear explosions in the frame of an on-site-inspection depends on knowledge of the natural background and its variability. The Ar-37 production rate in the soil or rock matrix is proven to be spatially variable e.g as function of depth (Riedmann 2011, Johnson 2015). However, Ar-37 concentrations over time for the same location also scatter in the order of ~50% around the mean value. These significant variations are mainly related to gas transport processes in the soil or in the rock formation. Only the combination of barometric pressure variations, wind stress and water content changes in the pore volume, which affect the effective gas diffusion coefficient, can explain the observed magnitude of concentration variations. During times of lower monthly precipitation, where the soil matrix of the 'capping layers' were less saturated, the effective porosity was at its highest (~0.1- 0.4) and resulted in the lowest Ar-37. The timescale of the activity recovery after a venting event is closely linked with the half-live of the isotope with a faster recovery of Rn-222 compared to Ar-37. The mechanisms governing gas transport are consistent for both gases even though their production pathways are different.

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