



Analysis of actinides in an ombrotrophic peat core - evidence of post-depositional migration of fallout radionuclides

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Plutonium (^{239}Pu , ^{240}Pu , ^{241}Pu , ^{242}Pu) and uranium (^{236}U , ^{238}U) isotopes were analyzed in an ombrotrophic peat core from the Black Forest, Germany, representing the last 80 years of atmospheric deposition. The reliable determination of these isotopes at ultra-trace levels was possible using ultra-clean laboratory procedures and accelerator mass spectrometry.

The $^{240}\text{Pu}/^{239}\text{Pu}$ isotopic ratios are constant along the core with a mean value of 0.19 ± 0.02 ($N = 32$). This result is consistent with the acknowledged average $^{240}\text{Pu}/^{239}\text{Pu}$ isotopic ratio from global fallout in the Northern Hemisphere. The global fallout origin of Pu is confirmed by the corresponding $^{241}\text{Pu}/^{239}\text{Pu}$ (0.0012 ± 0.0005) and $^{242}\text{Pu}/^{239}\text{Pu}$ (0.004 ± 0.001) isotopic ratios. The identification of the Pu isotopic composition characteristic for global fallout in peat layers pre-dating the period of atmospheric atom bomb testing (AD 1956 - AD 1980) is a clear evidence of the migration of Pu downwards the peat profile.

The maximum of global fallout derived ^{236}U is detected in correspondence to the age/depth layer of maximum stratospheric fallout (AD 1963). This finding demonstrates that the ^{236}U bomb peak can be successfully used as an independent chronological marker complementing the ^{210}Pb dating of peat cores.

The profiles of the global fallout derived ^{236}U and ^{239}Pu are compared with those of ^{137}Cs and ^{241}Am . As typical of ombrotrophic peat, the temporal fallout pattern of ^{137}Cs is poorly retained. Similarly like for Pu, post-depositional migration of ^{241}Am in peat layers preceding the era of atmospheric nuclear tests is observed.