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Retrospective determination of $^{236}\text{U}/^{238}\text{U}$ and $^{240}\text{Pu}/^{239}\text{Pu}$ atom ratios in aerosols and lung ashes from Vienna, Austria

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Already in the frame of the first scientific project sponsored by the IAEA with the title “Factors controlling the distribution of fission products in the biosphere” in the early 1960ies of the last century, air filters and lung autopsy samples from people, who had been living in Vienna, Austria, were collected and investigated with regard to short-lived fission products from the nuclear weapons tests.

The organs were ashed and then measured with a well-type NaI(Tl) crystal to quantify $^{141}\text{Ce}+^{144}\text{Ce}$, ^{103}Ru , and $^{95}\text{Zr}+^{95}\text{Nb}$ contamination of humans. Later on (after decay of these rather short-lived radionuclides) also ^{137}Cs was determined. From a part of the ash samples Pu was separated and the sum activity of ^{239}Pu and ^{240}Pu was measured by alpha-spectrometry. Corresponding investigations were also performed with air filters.

In the last years we investigated some of the remaining air filters and lung ash samples with Accelerator Mass Spectrometry (AMS) with regard to ^{236}U (half-life 2.3·10⁷ years) which is mainly produced via the reactions $^{235}\text{U}(n,\gamma)^{236}\text{U}$ and $^{238}\text{U}(n,3n)^{236}\text{U}$. Additionally, the Pu isotopes ^{239}Pu and ^{240}Pu were measured to obtain an improved data set with reduced uncertainties compared to the earlier study.

The samples were dissolved in half-concentrated nitric acid, a defined amount of ^{233}U was added as a spike and uranium was then separated by anion exchange (UTEVA) and co-precipitated with $\text{Fe}(\text{OH})_3$. Pu was separated with DOWEX 1x2, here a ^{242}Pu spike was used. After calcination the samples were analysed by AMS at the VERA laboratory (university of Vienna).

The results of our lung measurements will be compared to the corresponding filter results. Possible explanations of the discrepancies will be discussed.

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