Steps towards the determination of $^{237}Np/^{239}Pu$ atom ratios on air filters from Vienna, Austria

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In the early 1960s air filters were collected at the meteorological observatory Hohe Warte in Vienna, Austria, in order to determine the amount of aerosol bound γ-emitting fission products like $^{141}Ce+^{144}Ce$, ^{103}Ru and $^{95}Zr+^{95}Nb$ present in ambient air (Schönfeld et al. 1960). Some years later ^{137}Cs and $^{239+240}Pu$ concentrations of selected filters were measured (Irlweck et al. 1981). In the last years we found it worthwhile to investigate the left-over filters with regard to Pu atom ratios, and the more "exotic" ^{236}U and ^{233}U isotopes by using accelerator mass spectrometry (AMS) (Wallner et al. 2022).

Now we concentrate on the determination of the $^{237}Np/^{239}Pu$ atom ratios of the collected aerosols (mainly from 1964-66), which represent pure nuclear weapons fallout nearly undisturbed by mixing or dilution processes. As there is still no Np tracer for AMS available, the challenge is to develop a chemical procedure where ^{237}Np is separated simultaneously with the Pu isotopes (including also ^{242}Pu or ^{236}Pu as a yield tracer). After carefully adjusting the oxidation states of Np and Pu (Maxwell et al. 2011), we used UTEVA to separate them from matrix elements and other radionuclides. When using ^{242}Pu as a tracer not only for Pu isotopes, but also for ^{237}Np (i.e. as a so-called non-isotopic tracer), it is essential that the ratio of the respective Np and Pu yields is well known. This ratio, however, is likely to change between different sample batches if they are processed after longer intermittence. Therefore, a certified reference material (e.g. IAEA-385 Sediment from Irish Sea) should always be co-processed together with the samples of interest as an internal standard for yield shift corrections.

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