

^{236}U concentrations and $^{236}\text{U}/^{239}\text{Pu}$ atom ratios in a Southern Hemisphere soil far from nuclear test or reactor sites

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The variation of the ^{236}U and ^{239}Pu concentrations as a function of depth has been studied in an undisturbed forest area in the Herbert River catchment (northeastern Queensland, Australia) well removed from nuclear weapon test sites. The chemical separation of U and Pu was carried out with a double column, which has the advantage of the extraction of both elements from a relatively large soil sample (~20 g) within a day.

The samples were measured by Accelerator Mass Spectrometry using the 14UD pelletron accelerator at the Australian National University. The highest atom concentrations of both ^{236}U and ^{239}Pu were found at a depth of 2-3 cm. The $^{236}\text{U}/^{239}\text{Pu}$ isotopic ratio in fallout at this site, as deduced from the ratio of the ^{236}U and ^{239}Pu inventories, is 0.085 ± 0.003 which is clearly lower than the Northern Hemisphere value of ~0.2. The ^{236}U inventory of $(8.4 \pm 0.3) \times 10^{11}$ at/m² was more than an order of magnitude lower than values reported for the Northern Hemisphere. The ^{239}Pu activity concentrations are in excellent agreement with a previous study and the $^{239,240}\text{Pu}$ inventory was (13.85 ± 0.29) Bq/m². The weighted mean $^{240}\text{Pu}/^{239}\text{Pu}$ isotopic ratio of 0.142 ± 0.005 is slightly lower than the value for global fallout, but our results are consistent with the average ratio of 0.173 ± 0.027 for the southern equatorial region (0-30°S).