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Suitability of $^{239+240}$Pu and ^{137}Cs as tracers for soil erosion assessment in Swiss mountain grasslands

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We compare the suitability of the anthropogenic FRNs, ^{137}Cs and $^{239+240}$Pu as soil erosion tracers in two alpine valleys of Switzerland (Ursern Valley, Canton Uri, Central Swiss Alps and Val Piora, Ticino, Southern Alps). We sampled reference and potentially erosive sites in transects along both valleys. ^{137}Cs measurements of soil samples were done with a Li-drifted Germanium detector and $^{239+240}$Pu with ICP-MS. Our data indicates a heterogeneous deposition of the ^{137}Cs, since most of the fallout origins from the Chernobyl April/May 1986 accident, when large parts of the European Alps were still snow-covered. In contrast, $^{239+240}$Pu fallout originated mainly from 1950's-1960's atmospheric nuclear weapons tests, resulting in a more homogenous distribution and thus seems to be a more suitable tracer in mountainous grasslands.

Soil erosion assessment using $^{239+240}$Pu as a tracer pointed to a huge dynamic and high heterogeneity of erosive processes (between sedimentation of 0.9 to 6.4 t ha^{1}yr^1 and erosion of 2.3 to 14.1 t ha^{1}yr^1 in the Ursern Valley and sedimentation of 0.7 to 77 t ha^{1}yr^1 and erosion of 1 to 5.3 t ha^{1}yr^{1}at Val Piora). Our study represents a novel, successful application of $^{239+240}$Pu as a tracer of soil erosion in a mountain environment.