

Quantification of the sediment budget of a river basin, based on reconstruction of the post-fallout redistribution of Chernobyl particle-bound ^{137}Cs

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Abstract Quantitative assessment of the sediment budget of a fluvial system is a key approach to understanding its geomorphic behaviour and an essential tool for investigating the redistribution of particle-bound contaminants along the sediment cascade. Here, we present a study involving the application of several independent approaches for quantifying the post-fallout (1986–2009) redistribution of Chernobyl particle-bound ^{137}Cs and the basin-scale sediment budget for the River Plava basin situated in the northern part of the Srednerusskaya Upland (Central European Russia). The techniques employed include ^{137}Cs -based sediment tracing, two soil erosion models and the analysis of soil profile morphology. The results show that most of the sediment originating from human-accelerated soil erosion on cultivated slopes is redeposited on the uncultivated lower parts of the slopes or in the bottoms of infilled gullies, hollows and 1–3rd order valleys. The River Plava valley itself represents a system dominated by efficient transport, with very limited floodplain sediment storage. The ^{137}Cs -contaminated sediment export from the River Plava basin outlet exerts a significant impact on the River Upa. Its floodplain sediment contamination by ^{137}Cs downstream of the River Plava mouth increases by almost an order of magnitude.

Key words fluvial system; sediment budget; sediment sources and sinks; ^{137}Cs ; human-accelerated soil erosion; Central European Russia