A prototype tracing-technique to assess the mobility of dispersed earthworm casts on a vegetated hillslope using caesium-134 and cobalt-60

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Soil transport on fully vegetated land surfaces is typically detachment limited. Rates of soil and nutrient transport, and ultimately long-term landscape evolution, are controlled by processes that supply soil material for entrainment and transport. Despite their on-going nature, many such processes operate at low rates and have not been subject to detailed investigation. We present preliminary findings from a prototype tracing approach to quantify one such process; namely to determine the relative mobility of sediment from earthworm casts on a fully vegetated hillslope surface. A 0.6 $*$ 0.5 m bounded area of pasture was prepared and fifteen intact earthworm casts representing 203 g of soil were labelled with an estimated 216 Bq of caesium-134 (źştCs) activity and evenly distributed across the upslope half of the plot, 0.3–0.6 m from the downslope outlet. A further 15 intact casts representing 190.7 g of soil were labelled with 224 Bq of cobalt-60 (vpCo) activity and distributed between 0.3 and 0.0 m from the same outlet. All labelled casts were exposed to natural weather events over 76 days, during which time 186.3 mm of rainfall generated 16 runoff samples. A mass balance was used to partition labelled sediment from the unlabelled material. A total of 27.17 g of vpCo-labelled casts, equivalent to 14.2% of the original mass deployed, was recovered from a distance of $\leq$0.3 m from their original locations. In contrast, 8.77 g of źştCs-labelled casts, equivalent to 4.3% of the original mass deployed, was recovered from a distance $\geq$0.3 m from their original locations. Some runoff-derived samples recorded an over-enrichment of radionuclide material, which suggests that intact casts may sorb more material than the original assumption predicts. Ways in which sorption can be more accurately quantified to improve the accuracy of the tracing approach are outlined.
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