

Publication

Use of a Cs-137 re-sampling technique to investigate temporal changes in soil erosion and sediment mobilisation for a small forested catchment in southern Italy

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Author(s) Porto, Paolo; Walling, Des E.; Alewell, Christine; Callegari, Giovanni; Mabit, Lionel; Mallimo, Nicola; Meusburger, Katrin; Zehring, Markus

Author(s) at UniBasel [Alewell, Christine](#) ; [Di Bella, Katrin](#) ;

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Soil erosion and both its on-site and off-site impacts are increasingly seen as a serious environmental problem across the world. The need for an improved evidence base on soil loss and soil redistribution rates has directed attention to the use of fallout radionuclides, and particularly Cs-137, for documenting soil redistribution rates. This approach possesses important advantages over more traditional means of documenting soil erosion and soil redistribution. However, one key limitation of the approach is the time-averaged or lumped nature of the estimated erosion rates. In nearly all cases, these will relate to the period extending from the main period of bomb fallout to the time of sampling. Increasing concern for the impact of global change, particularly that related to changing land use and climate change, has frequently directed attention to the need to document changes in soil redistribution rates within this period. Re-sampling techniques, which should be distinguished from repeat-sampling techniques, have the potential to meet this requirement. As an example, the use of a re-sampling technique to derive estimates of the mean annual net soil loss from a small (1.38 ha) forested catchment in southern Italy is reported. The catchment was originally sampled in 1998 and samples were collected from points very close to the original sampling points again in 2013. This made it possible to compare the estimate of mean annual erosion for the period 1954-1998 with that for the period 1999-2013. The availability of measurements of sediment yield from the catchment for parts of the overall period made it possible to compare the results provided by the Cs-137 re-sampling study with the estimates of sediment yield for the same periods. In order to compare the estimates of soil loss and sediment yield for the two different periods, it was necessary to establish the uncertainty associated with the individual estimates. In the absence of a generally accepted procedure for such calculations, key factors influencing the uncertainty of the estimates were identified and a procedure developed. The results of the study demonstrated that there had been no significant change in mean annual soil loss in recent years and this was consistent with the information provided by the estimates of sediment yield from the catchment for the same periods. The study demonstrates the potential for using a re-sampling technique to document recent changes in soil redistribution rates. (C) 2014 Published by Elsevier Ltd.

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