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Using caesium-137 measurements to establish a sediment budget for the catchment of a small reservoir in southern Italy

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Abstract Predicting the expected life of a reservoir and assessing the potential for increasing this life is a great challenge for the hydraulic engineer, as it involves predicting the sediment input to the reservoir. The rate of sedimentation in a reservoir will primarily reflect the amount of sediment eroded from the upstream catchment and the efficiency of sediment delivery to the reservoir. When fine particles dominate the soil texture of a catchment and the land use is conducive to erosion, a large proportion of the soil loss can commonly be ascribed to sheet erosion from the slopes. The fallout radionuclide caesium-137 (^{137}Cs) has been increasingly used to document rates of soil loss by sheet erosion in recent years, both as an alternative to conventional measurements and for calibrating physically-based soil erosion models. This paper reports an example of the application of the ^{137}Cs technique in a medium-scale (14.8 km^2) catchment upstream of a small reservoir in southern Italy, aimed at assembling information on soil erosion and redistribution on the catchment slopes, and flood plain sedimentation rates, in order to establish a catchment sediment budget. Data available from sediment (turbidity) monitoring undertaken at the catchment outlet prior to the construction of the reservoir have been used to estimate the catchment sediment yield. This estimate has been combined with the information provided by the ^{137}Cs measurements, to establish a sediment budget for the catchment. The sediment budget provides a valuable tool for understanding sediment inputs to a reservoir and their sensitivity to climate change, and for planning and implementing sediment control measures within the catchment, in order to reduce reservoir sedimentation rates.

Key words reservoirs; caesium-137; erosion rates; sedimentation rates sediment budget; Italy