Hydrology in a Changing World: Environmental and Human Dimensions
Proceedings of FRIEND-Water 2014, Montpellier, France, October 2014 (IAHS Publ. 363, 297-302, 2014).

Using ^{137}Cs and $^{210}Pb_{ex}$ measurements to document erosion rates for different time windows in a small catchment in southern Italy

PAOLO PORTO[1,2] & DESMOND E. WALLING[2]

1 Dipartimento di Agraria, Università degli Studi Mediterranea, Località Feo di Vito, Reggio Calabria, Italy
paolo.porto@unirc.it
2 College of Life and Environmental Sciences, University of Exeter, Amory Building, Rennes Drive, Exeter EX4 4RJ, UK

Abstract In the last decades, climate change has begun to play a significant role in modifying the sediment dynamics of catchments and river basins in many areas of the world. These changes affect both the rates of soil redistribution within catchments and the magnitude of the downstream sediment load. Quantifying erosion rates over large areas commonly represents a considerable challenge as it requires long-term monitoring using experimental plots and related expensive field equipment. In recent years, the fallout radionuclides caesium-137 (^{137}Cs) and unsupported lead-210 ($^{210}Pb_{ex}$) have been successfully used to document rates of soil loss by sheet and rill erosion, both as an alternative to conventional measurements and for calibrating physically-based soil erosion models. This paper describes the use of ^{137}Cs and $^{210}Pb_{ex}$ measurements to assemble information on soil erosion and soil redistribution during recent decades, within a medium-scale (14.8 km^2) catchment located in southern Italy. Data available from sediment monitoring undertaken at the catchment outlet during the period 1961–1979 were used to estimate the longer-term catchment sediment yield. This estimate has been combined with the information provided by the ^{137}Cs and $^{210}Pb_{ex}$ measurements, to establish sediment budgets for the catchment. The results provided by the $^{210}Pb_{ex}$ measurements indicate higher erosion rates than those documented using the ^{137}Cs measurements. Because of its short half-life of 22.3 years, the radionuclide $^{210}Pb_{ex}$ has been shown to be more sensitive to erosion occurring during the past 15–20 years. These findings are consistent with the increased annual erosivity documented in southern Italy during the last 20 years, causing increased erosion rates in recent years.

Key words caesium-137; excess lead-210; erosion rates; sedimentation rates; sediment budget; Italy