Geophysical Research Abstracts
Vol. 19, EGU2017-13628, 2017
EGU General Assembly 2017

An application of excess lead-210 analysis for the study of fine sediment connectivity in a Mediterranean mountain basin with badlands, the Vallcebre research catchments

Mariano Moreno de las Heras (1), Francesc Gallart (1), Jérôme Latron (1), Núria Martínez-Carreras (2), Laura Ferrer (3), and Joan Estrany (4)

(1) Surface Hydrology and Erosion group, Institute of Environmental Assessment and Water Research (IDAEA), Spanish Research Council (CSIC), Jordi Girona 18, 08034 Barcelona, Spain, (2) Luxembourg Institute of Science and Technology (LIST), 41, Rue du Brill, 4422 Belvaux, Luxembourg, (3) Environmental Radioactivity Laboratory (LaboRA), University of the Balearic Islands, Ctra. Valldemossa km 7.5, 07122 Palma de Mallorca, Spain, (4) Department of Geography, University of the Balearic Islands, Ctra. Valldemossa km 7.5, 07122 Palma de Mallorca, Spain

Analysis of sediment dynamics in Mediterranean environments is fundamental to basin management, particularly for mountain catchments with badlands, which affect water bodies and freshwater ecosystems. Connectivity has emerged in Environmental and Earth Sciences as an evolution of the sediment delivery concept, providing a useful framework for understanding how sediments are transferred between geomorphic zones of the catchment. This study explores the feasibility of excess lead-210 (210Pbex) to analyse sediment connectivity in a 4-km2 Mediterranean mountain basin with badlands (the Vallcebre research catchments, Eastern Pyrenees) by applying simple 210Pbex mass-balance models for hypothesis generation and experimental testing in the field. Badland surfaces in the basin are weathered by freezing during the winter and are further eroded in summer by the effect of high-intensity storms. The eroded sediments may remain deposited within the catchment streams from months to years. Application of 210Pbex balance models in our basin proposes: (i) a saw-tooth seasonal pattern of badland surface 210Pbex activities (increasing from October to May, and depleted in summer) and (ii) a downstream increase in sediment activity due to fallout lead-210 accumulation in streambed sediment deposits. Both deposited and suspended sediments collected at the Vallcebre catchments showed, in general, low sediment 210Pbex concentrations, illustrating their fresh-rock origin at the badland sites, but also hampering the understanding of sediment 210Pbex patterns due to high measurement uncertainty (particularly for sediments with d50>20μm) and to strong dependence on sediment sampling methodology. Suspended sediment 210Pbex activity reproduced the simulated seasonal activity patterns for the badland surfaces. Contrary to the in-stream transit increases of sediment 210Pbex activity that were predicted by our model simulations, fallout lead-210 concentrations in the suspended sediments decreased towards the basin outlet, suggesting that fine sediment flushing by flooding prevented 210Pbex accumulation in the coarser streambed sediment deposits. These results indicate a high fine-sediment connectivity between the badlands, streams and basin outlet of the Vallcebre catchments, as well as the sequestration and fast transmission of fallout lead-210 by the finest and most dynamic fraction of sediments.