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A methodological approach to collect representative source sediment fingerprinting samples using an ad hoc rainfall simulator

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The sediment source fingerprinting technique is based upon the assumption that the sediment properties remain stable allowing the comparison between the source material and the fluvial sediment. Nevertheless, the processes occurred during the mobilization, mixing and delivery throughout the sediment paths from hillslopes to the stream channel are often overlooked, representing a black-box approach. Therefore, further research is needed to assess uncertainties related to the alterations in the particle size distribution, organic matter content, and other physical and biochemical transformations that may modify the fingerprint properties within the black-box. Here is presented a methodological approach to collect representative samples to carry out an experiment about the conservative behaviour of different physicochemical sediment properties. The sampling strategy is designed discriminating three different land uses (i.e. agricultural, forest and scrubland). To collect only the potential erodible material, artificial rainfall will be generated at 1 m * 3 m plots isolated from the adjacent areas using aluminium plates nailed to the ground. In the lower part according to the topography, an aluminium triangle built in the form of a funnel discovered at the top will be placed. Its dimensions are 1 m in the part that closes the plot, and 50 cm the sides arranged at an obtuse angle ending in a channel, allowing the sampling of sediment concentrations. A circular overture of 5 cm in diameter at the end of the channel will allow the collection of runoff and sediment generated. The rainfall will be generated using a wild-land fire truck with high capacity of regulation of intensity and dispersion of water flow. Six accumulative rain gauges will be placed around the perimeter of the plots and a tipping bucket rain gauge in one of the corners to control the distribution of the rain and its intensity. The hydro-sedimentary response of each plot will be monitored, as well as the previous moisture conditions, vegetation cover, bulk density and gravel content. In addition a 3D model of the plots will be made before and after the rainfall simulation using Structure-from-Motion photogrammetry due to the relevance of the microtopography in the geomorphological processes at plot scale.

Fourteen samples will be generated for each land use from the collected material. Every sample will be composed of 5 sub-samples. The samples will be sieved to <63 μ, introduced in polyamide bags (25 μm mesh size) and placed on the bed of the main channel of the Es Fangar catchment (3.3 km^2), a Mediterranean mountainous catchment under an intermittent fluvial regime. A sample of each type will be extracted from the channel in each of the 14 expected time intervals (in days: 7, 15, 30, 60, 90, 120, 150, 180, 210, 240, 270, 300, 330, and 360). In addition, 20 samples artificially mixed in different proportions will be located in the experimental point. After the specified period of time has elapsed, the geochemical properties, particle size distribution, organic matter, colour spectrometry, and ^{137}Cs, ^{210}Pb$_{ex}$ activity will be measured.