



FingerPro and D-MixSIAR: New fingerprinting development approaches for tracking sediment provenance

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Fingerprinting techniques provide a means of assembling valuable information on the principal fine-grain sediment provenance at catchment scale. However, the outcome of these studies often depends on the type of model and the selection of the tracers used to determine the relative contribution from different sources. Despite the rapidly increasing number of studies reporting the use of fingerprinting as a tool to detect the sediment provenance, there is a need to refine or clarify existing approaches and the key components of the current methodological procedures. To tackle this problem the aim of this study is to compare the results from two recently used unmixing models, MixSIAR (Bayesian model) and FingerPro (Determinist model). Furthermore, the new D-MixSIAR and a hierarchical approach of the FingerPro model are tested.

Both models are tested in the Barués area as a representative catchment of the Mediterranean mountainous agroecosystems. The study catchment was selected because of its independent behavior and its lithological homogeneity composed by sandstones, claystones and conglomerates of the Uncastillo Formation to better identify the factors of variation involved.

Radionuclides and stable elements contents in sediment mixtures and possible sources such as agricultural, rangeland, afforestation forest, bare soil and channel bank samples collected across the catchment were used to assess the relative contribution from different land uses/land covers. After running both types of models, the results obtained allowed to identify the differences and similarities from FingerPro and D-MixSIAR when they are applied to the same dataset. Our results aim to shed light to: i) There is a need for using a tracer selection procedure? ii) Do all tracers give useful information to the model or some of them are leading the models to different results? iii) How sensitive are the models to the traditional fingerprinting procedures such as tracer selection, source grouping, and source removal?