



Comparative evaluation of two sediment tracers in a rainfall simulation experiment

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The use of sediment tracers tries to contribute to solving problems of traditional soil erosion measurements such as allocation of erosional and depositional areas. A number of different tracing approaches have already been established however, as none of available techniques are able to fully satisfy all the requirements for being an ideal tracer the search for alternative methods continues.

Clays tagged with quaternary ammonium compounds are widely used in industry and are easy to incorporate into soils for sediment tracing experiments. To explore the potential of these clays a laboratory experiment was carried out in order to characterize their behaviour as compared to the well-established sediment tracer magnetic iron oxide.

The experiment consisted of a simulated rainfall event of 60 mm/h in a box laboratory flume divided in two ridge-furrow subplots (200 x 57 cm). In order to evaluate transport and redistribution of soil from the ridges to the furrow and to measure the dynamic behaviour of the tracers during the rainfall a dense grid of soil samples was taken before and after the experiment (140 samples in total). Runoff and sediment were collected and all samples were analysed for both tracers.

Results indicate the general suitability of organophilic clays to monitor soil redistribution by water erosion. The average relative contributions from shoulders and furrow to total sediment export determined by both tracers were similar and indicated a higher contribution from ridges. A key advantage of using organophilic clays is that the detection limit of organophilic clays is extremely low and the background concentration is zero. Despite the inherent differences between both tracers such as way of bounding, sediment enrichment or analytical technique, this experimental comparison of an established and more novel tracer method underscores the potential suitability of the latter for soil erosion studies.