

Sediment tracing in a sub-humid Mediterranean badland: RFID technology as a direct tracer

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In this study, Radio Frequency IDentification (RFID) technology was used as a direct tracer for water and sediment dynamics in a sub-humid Mediterranean badland located within the Villacarli catchment (42 km^2) at the Southern fringe of the Central Spanish Pyrenees. About 500 RFID tags with a size of $12 \times 2 \text{ mm}$ were deployed on various hillslope positions and in the streambed to investigate sediment transfer characteristics on different morphological units (i.e. channel, rills, slopes) and the influence of vegetation cover on erosion and transport processes. Mobile tag detection with a portable antenna was employed to allow high precision spatial mapping after individual rainfalls events and during longterm surveys. Two stationary antennas placed in channel cross-sections were used for time-continuous monitoring of tag passage. Complementary field and laboratory experiments in an artificial flow channel with RFID tags and colored sediment particles were performed to compare the transport behaviour and tracer properties of sediment particles and RFID tags.

From the field observations, we derived transport distances and rates for a three year period and assessed the potentials and limitations of RFID technology for water and sediment tracking along hillslopes to and within first order channels. Tag recovery rates were high for surveys with the mobile antenna (85 %) and acceptable at the stationary antennas (30 %). The results indicate the important role of terrain position and vegetation patches for erosion patterns, sediment transfer and the associated time scales along the catchment.