



## **Displacement of RFID tracers in a steep mountain stream (Rio Cordon, Italy)**

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The bedload transport plays a fundamental role in the mountain streams affecting several aspects as morphology and ecological status of the fluvial system, influencing fields as engineering, natural hazard and river management. The monitoring, assessment and quantification of this type of transport is not simple due to impulsive nature that distinguishes it. Moreover, in mountain streams the particle motion is strongly affected by the bed structures as well as by the highly heterogeneous bed material, acting especially through the hiding/exposure, consolidation and embedding effects. Thanks to the assumption that bedload transport may be understood as the result of random individual particle displacements, the sediment tracing method was widely employed in the last years. Such method allow to obtain precious data concerning sediment dynamic in mountain streams, improving the results obtainable by samplers, traps and permanent monitoring stations. In this work, the results obtained by two years of RFID tracers monitoring are presented. This typology of tracers was employed in a steep mountain stream in order to investigate the displacement due to different conditions of hydraulic forcing. The Rio Cordon (northeast Italy) is a typical alpine channel characterized by step-pool and riffle-pool morphology and by a mean slope equal to 13%. The catchment extended 5 km<sup>2</sup> exhibits a nivo-pluvial runoff regime. Overall, 250 tracers were seeded in the channel bed, monitoring the travel distance along a study reach 318 m long. For this purpose a mobile antenna in combination with a laser rangefinder were used. The measurement campaign was carried out from 2013 to 2014, performing a survey every 2 months as well as after every flood event occurred. Following such approach 7 tracers monitoring were performed, reaching a mean tracers recovery rate of roughly 65%. During the study period the peak of flood discharges is ranged between 0.85 to 2.10 m<sup>3</sup> s<sup>-1</sup>, therefore allowing to investigate the transport distance due to hydraulic conditions that varied between about a third of bankfull discharge (2.30 m<sup>3</sup> s<sup>-1</sup>) to values very close to it. The results showed negligible displacements (< 1 m) due to the peak discharges lower than 1 m<sup>3</sup> s<sup>-1</sup> while travel distances abruptly increases as consequence of higher flow magnitude. The mean transport distance reaches values near to 7 m as a result of peak discharges between 1 and 2 m<sup>3</sup> s<sup>-1</sup> while for the larger floods (> 2 m<sup>3</sup> s<sup>-1</sup>) the mean displacement increase of one order of magnitude, ranging between 63 and 79 m. In this sense, also a different dynamic of transport was observed, with the medium range of peak discharges (1-2 m<sup>3</sup> s<sup>-1</sup>) characterized by size selective transport while an equal mobility condition is shown by the larger floods. This research was funded by the Italian Project of Relevant Interest N.20104ALME4; ITSE: National network for monitoring, modeling and sustainable management of erosion processes in agricultural land and hilly-mountainous area.