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Analysis of two sub-reaches in an Alpine catchment: an evidence of sediment (dis)connectivity.

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Sediment connectivity is the degree of linkage that controls sediment fluxes throughout landscape, particularly between sediment sources and channel network. It is a key topic in the study of sediment dynamics in mountainous catchments. Sediment transport in mountain areas is strongly related to the gradient of slopes and to water stream. Along the channel network, streambed roughness, channel geometry and fluvial bed forms exert a dominant control on flow resistance, influencing local velocity and transport capacity. Using the morphometric characterization, the aim of this study is to evaluate the (dis)connectivity of two sub-reaches of an alpine river. These areas are located along the main channel of the Rio Cordon, an alpine boulder-bed, step-pool stream draining an area of 5 km2 in the Veneto Region (Italy). The mean slope of the river is 17%. Field surveys were carried out using a Terrestrial Laser Scanner (TLS), in two different reaches: one located in the upper part of the basin (S1), and the other located just 800 m downstream, below of a waterfall (S2). Thanks to the high point density (cell 0.03 m x 0.03 m), the TLS data permitted to analyze streambed roughness, slope, and to detect bed-forms. The sub-reach S1 is characterized by a mean slope of 14%, an active channel width ranging from 6.9 m to 9.6 m, a mean flowing channel width of about 2.2 m, with predominant riffle-pool morphology. On the other hand, a mean slope of 10.8%, an active channel width ranging from 2.6 m to 4.2 m, a mean flowing channel width of 1.9 m, and a step-pool morphology, characterizes S2. Along this study reach there are 4 steps, spaced on average 15 m, and along its lower part it presents a vegetated bar surrounded by exposed gravels. Roughness analysis show that class of medium-gravel (8-16 mm, according to the Wentworth's scale) prevails in both sub-reaches. However, comparing the sub-reaches S1 is characterized by a lower amount of sand, and more pebbles and stones detectable mainly along the banks. These differences derive probably from the selective removal of finer sediments caused by the higher stream power of the water fluxes along S1 (function of the slope). Hydro-geomorphological differences between S1 and S2 can be explained considering the morphology of the upper part and by the presence of the waterfall, separating the two reaches. Particularly the flat area just before the waterfall can influence the sediment transport, decoupling the upstream area to the downstream basin. To better understand sediment connectivity in alpine catchments, this study aims to increase the knowledge about the interactions between bed roughness, fluvial forms and sediment transport, through the hydro-geomorphological characterization. This research was funded by the University of Padova Research Projects 'Sediment transfer processes in an Alpine basin: sediment cascades from hillslopes to the channel network-BIRD167919'.