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Detecting surface changes of slope to channel coupling in an alpine catchment using terrestrial laser scanning

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Understanding the evolution and functions of a river system and interpreting the morphology and the dynamics of the channel is a key factor in fluvial geomorphology. For this purpose it is essential to analyse the processes of sediment input and output within and between river reaches and to detect the various forms of storage types on hillslopes and in the channel network. From these processes catchment scale sediment fluxes are derived and result in sediment budgets showing the amount and motion of sediment through the system. Sediment connectivity is a highly important characteristic of catchments when sediment transfer processes are studied. In this context, connectivity controls the sediment fluxes throughout the landscape which means the transfer of sediment from sediment sources to sinks and particularly the potential of a particle to move through the system.
This study focuses on slope to channel coupling in the Johnsbach Valley, a typical, non-glaciated alpine catchment in the eastern Austrian Alps. The valley covers an area of 65 km^2 with altitudes ranging from 584 m a.s.l. at the outlet to 2369 m a.s.l. (Hochtor). The valley is drained by the Johnsbach River which originates in a crystalline bedrock dominated part of the catchment. After approximately 10 km of the distance downstream the lithology changes to calcareous bedrock. In this part of the Johnsbach Valley most of the sediment contributing areas are situated.
To detect slope to channel coupling surface changes were measured and mass balances were quantified by terrestrial laser scanning using a RIEGL LMS-Z620. Four field sites were chosen were side channels are directly connected to the main fluvial system. Additionally two field sites show sediment movement in between the side channels. Field campaigns were carried out in September and October of 2013 as well as in April, July, August and October of 2014.
First results show that sediment contribution from the side channels and erosion of sediment by the main river are not consistent throughout the investigated areas.