

Evaluation of sediment transport in steep channels combining sediment impact sensors, tracer stones and TLS

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Torrential floods combined with sediment transport presents major hazards to human life and infrastructure in alpine catchments. Despite the importance of sediment transport due to the large damage caused in case of flood events, we lack data on sediment movement and sediment transport rates in steep channels and torrents to improve the understanding of sediment transport processes in these areas.

This paper presents an improved application of sediment impact sensors (SIS) integrated in a unique measurement system in an Alpine catchment in Austria consisting of meteorological stations, runoff gauges and tracer stones. In addition sediment availability, mobilization and accumulation have been mapped and quantified by means of terrestrial laser scanning (TLS) and structure from motion using unmanned aerial vehicles (UAVs). Additionally a numerical model was used to simulate the bed load transport rates in the torrent.

This contribution focuses on field measurements of bed load transport rates in steep channels based on SIS data, tracer stone data, bed load measurements, precipitation and discharge data. The measurement data was compared to several sediment transport formulae for steep slopes and validated with the observed deposited amount of sediment in the sediment retention basin at the outlet of the catchment.