



## **Evaluating intensity parameters for debris flow vulnerability**

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In mountain regions natural hazard processes such as debris flows or hyper-concentrated flows repeatedly lead to high damages. After an event, detailed documentation of the meteorological, hydrological and geomorphological indicators are standardized, and additional data on debris covering run out areas, indicators for processes velocity and transported volumes are gathered. Information on deposition height of debris is an important parameter to estimate the intensity of the process impacting the buildings and infrastructure and hence to establish vulnerability curves. However, the deposition height of mobilized material in settlements and on infrastructure is mostly not directly evaluated because recovery work starts immediately or even during the event leading to a removal of accumulated material.

Different approaches exist to reconstruct deposition heights after torrent events, such as point mapping, comparison of LIDAR-based DEM before and after the event as well as the reconstruction by using photo documentation and the estimation of deposition heights according to standardised elements at buildings and infrastructure. In our study, these different approaches to estimate deposition height and the spatial distribution of the accumulated material are applied and compared against each other by using the case study of the debris flow event in Brienz (Switzerland) which occurred during the severe flood events of August 2005 in the Alps. Within the analysis, different factors including overall costs and time consumption (manpower, equipment), accuracy and preciseness are compared and evaluated to establish optimal maps of the extent and deposition depth after torrent events and to integrate this information in the vulnerability analysis.