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System Shift? Geomorphological system response following two extreme torrential events (Schöttlbachtal, Austria)

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Flash-floods, hyper-concentrated flows and debris flows in small headwater systems are among the most dangerous geohazards in alpine regions. In 2016, the major share of natural hazard related damages in Austria was linked to heavy discharge events in torrential catchments. Future climate projections predict an intensification of extreme precipitation events in both frequency and magnitude exposing the Alps to stronger and heavier discharge hazards and risks – and highlighting the need of further research on the geomorphological response of alpine headwater systems to the impact of climate change.
The Schöttlbach catchment (71 km^2) is dominated by mica-schist and gneiss with smaller amphibolite, limestone and dolomite enclosures. Main sediment sources are located in the lower part of the catchment (>1600 m), where the Schöttlbach torrent cuts into thick and highly erodible quaternary deposits. Two exceptional rainfall and discharge events in July 2011 and August 2017 mobilized large amounts of these sediments and caused considerable damage to the underlying city of Oberwölz and surroundings.
We hypothesize that these events induced a shift of the system towards a higher sensitivity and susceptibility with stronger geomorphologic responses to rainfall events as a consequence of multiple channel slope failures providing increased amounts of sediment to the stream (slope-channel coupling). To test this hypothesis we model topographic change using a high resolution DEM database (ALS 2010, UAV-based DEMs 2014/2015/2017, TLS-based DEMs 2013-2018, UAV/ALS-based DEM 2018) as well as information from two geomorphological mapping campaigns (2014, 2018). Pre- and post-event data is analysed with respect to the availability and the state of activity of sediment sources and to the degree of coupling and changes in sediment supply from hillslopes to the river channel. First results indicate that these two flood events enhanced the system activity resulting in additional sediment sources and higher lateral sediment supply.