

Submitted Abstract

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Abstract

In recent years, losses due to torrential flooding (fluvial sediment transport, debris floods, and debris flow) have been increasing in the Eastern European Alps. While a considerable number of studies on flooding along large foreland rivers are available, comprehensive investigations linking exposure and mitigation to the frequency of torrential flooding in mountain headwater catchments are still outstanding. Repeatedly, however, effects of climate change and settlement growth have been postulated as root causes for the development of loss. In the context of hazard mitigation, however, it remains unclear to which degree loss dynamics can be attributed to these causes. We addressed this question based on a record of approximately 12,000 events covering the period between 1962 and 2017, a database containing roughly 120,000 mitigation structures, an inventory of the building stock and 15 climate indices related to hazard triggering conditions. While the indices of triggering precipitation and the number of exposed buildings increased steadily, frequency, magnitude and seasonality of damage-inducing torrential flooding did not show clear trends. This contradiction was attributed to a compensatory effect of the increasing number of technical mitigation structures. Maintaining these structures is of paramount importance to counteract future effects of climate change on the magnitude and frequency of events and the increasing demand for land development in hazard-prone areas.