Submitted Abstract

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Abstract

In mountainous regions, natural hazards are omnipresent. Especially torrential processes such as debris flows frequently endanger populated areas and infrastructure facilities. In order to assess the impact of future changes related to the possible triggering of such mass flows, knowledge about the frequency is important. In this study, we analysed time series of more than 1,000 debris flow events based on a comprehensive event catalogue covering significant parts of the Eastern European Alps, supplemented by data available in the literature. Our study revealed three different approaches to characterise the frequency of debris flows: (i) irregular, (ii) regular, and (iii) clustered repose times. By applying a modified dynamic threshold concept in relation to debris flow triggering, we showed that in the case of irregular repose times, events can be assumed to occur randomly. However, our results indicated that for regular and clustered repose time series, interdependency between events is important and leads to dynamic changes in critical thresholds regarding climatic triggers and sediment availability. In case of regular and clustered repose types, modelling debris flow event frequencies will thus either result in an overestimation and underestimation of the occurrence probability of an event, respectively. Consequently, these biased estimates entail potentially substantial implications for mitigation and adaptation as well as risk management. In such a case, changes in climatic trigger conditions might not be independent of the prevailing geomorphological disposition i.e., sediment availability and land-use management activities.