



## **Vulnerability to torrent events - Empirical evidence from Austria**

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In natural hazards research, risk is defined as a function of (1) the probability of occurrence of a hazardous process, and (2) the assessment of the related extent of damage, defined by the damage potential and the vulnerability according to the intensity of the hazard process.

Until now, only little work has been done to determine vulnerability values for objects exposed to torrent processes. A broader validation of these estimates is outstanding. Moreover, the vulnerability values proposed in the literature show a high range, in particular with respect to medium and high process intensities.

In this study, data from Austrian catchments were used to empirically analyse and assess the vulnerability of buildings to torrent events (debris flows and hyperconcentrated flows) using data from previous events. The results from the test sites clearly indicate a dependence of object vulnerability on process intensities. The results extend conclusions drawn by other studies towards a better understanding of damage patterns of objects affected by torrent processes through quantifying the geomorphologic impact.

Since the analysis was based on process intensities and is thus independent from recurrence intervals, not only the risk resulting from design events can be quantified but also every other event with a different magnitude and frequency. Hence, the suggested method might be applicable in operational risk analysis procedure.