Geophysical Research Abstracts
Vol. 12, EGU2010-1057, 2010
EGU General Assembly 2010

A quantitative vulnerability function for fluvial sediment transport

Reinhold Totschnig, Walter Sedlacek, and Sven Fuchs

Institute of Mountain Risk Engineering, University of Natural Resources and Applied Life Sciences, Vienna, Austria (reinhold.totschnig@boku.ac.at)

In quantitative risk assessment, risk is expressed as a function of hazard, elements at risk exposed, and the vulnerability. From a natural sciences perspective, vulnerability is defined as the expected degree of loss for an element at risk as a consequence of a certain event. The resulting value is dependent on the impacting process intensity and the susceptibility of the elements at risk, and ranges from 0 (no damage) to 1 (complete destruction). With respect to torrent processes, i.e. fluvial sediment transport, the concept of vulnerability – though widely acknowledged – did not result in any sound quantitative relationship between process intensities and vulnerability values so far, even if considerable loss occurred during recent years. To close this gap and establish this relationship, data from three well-documented torrent events in the Austrian Alps was used to derive a quantitative vulnerability function applicable to residential buildings located on torrent fans. The method applied followed a spatial approach, and was based on process intensities, the spatial characteristics of elements at risk, and average reconstruction values on a local scale. The results suggest a modified Weibull function to fit best to the observed damage pattern if vulnerability is quantified in absolute values, and a modified Frechet function if vulnerability is quantified relatively in relation to the individual building height. The vulnerability relationship obtained is applicable to a mixed type of construction used in European mountain regions, composed from brick masonry and concrete, a typical design in post-1950s building craft in alpine countries.