Geophysical Research Abstracts
Vol. 15, EGU2013-5923, 2013
EGU General Assembly 2013

Spatial scan statistics in vulnerability assessment

Sven Fuchs (1) and Christine Ornetsmüller (2)

(1) University of Natural Resources and Life Sciences, Institute of Mountain Risk Engineering, Vienna, Austria (sven.fuchs@boku.ac.at), (2) University of Vienna, Institute of Geography and Regional Research

In the European Alps the concept of risk has increasingly been applied in order to reduce the susceptibility of society to mountain hazards. Risk is defined as a function of the magnitude and frequency of a hazard process times consequences; the latter being quantified by the value of elements at risk exposed and their vulnerability. Vulnerability means the degree of loss to a given element at risk resulting from the impact of a natural hazard. Recent empirical studies suggested a dependency of the degree of loss on the hazard impact, and respective vulnerability (or damage-loss) functions were developed. However, until now only little information is available on the spatial characteristics of vulnerability on a local scale; considerable ranges in the loss ratio for medium process intensities only provide a hint that there might me mutual reasons for lower or higher loss rates. In this paper we therefore focus on the spatial dimension of vulnerability by searching for spatial clusters in the damage ratio of elements at risk exposed. By using the software SaTScan, we applied an ordinal data model and a normal data model in order to detect spatial distribution patterns of five individual torrent events in Austria. For both models, we detected some significant clusters of high damage ratios, and consequently high vulnerability. Moreover, secondary clusters of high and low values were found. Based on our results, the assumption that lower process intensities result in lower damage ratios, and therefore in lower vulnerability, and vice versa, has to be partly rejected. The spatial distribution of vulnerability is not only dependent on the process intensities but also on the overall land use pattern and the individual constructive characteristics of the buildings exposed. Generally we suggest the use of a normal data model for test sites exceeding a minimum of 30 elements at risk exposed. As such, the study enhanced our understanding of spatial vulnerability patterns on a local scale.