



Susceptibility assessments of landslide triggered by Wencuan earthquake at Longnan by rare events logistic regression analyses

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Earthquake triggered landslides are very common throughout the world. In particular the last events, e.g. in Pakistan and in China 2008 have demonstrated, that this trigger should not be underestimated. In order to determine the most fragile landslide areas in the future for a similar earthquake, it is important to calculate for these areas landslide susceptibility maps.

In this paper, firstly, the earthquake triggered landslide distribution inventory at Longnan, a case study in China, is build up by field investigation and interpretation of remote-sensing image data (SPOT 5 and ALOS). Then we presented the approach for the analysis and modeling of landslide data using rare events logistic regression. Data include digital orthophotomaps (DOM), digital elevation models (DEM), topographical parameters (e.g. altitude, slope, aspect, profile curvature, plan curvature, sediment transport capacity index, stream power index, topographic wetness index), geological information and further different GIS layers including settlement, road net and rivers. Landslides were identified by monoscopic manual interpretation, and validated during the field investigation. The quality of susceptibility mapping was validated by splitting the study area into a training and a validation set. The prediction capability analysis showed that the landslide susceptibility map could be used for land planning in this region as well as emergency planning by local authorities. The study are of Longnan is located in southern Gansu province bordering Shanxi in the east and Sichuan in the south. The major geographic features in Longnan are the Qinba Mountains in the east, the Loess Plateau in the north, and the Tibetan Plateau in the west. It is part of the Central Han basin in the east and the Sichuan basin in the south. The geological environment is in particular determined by regional fault zones. Neotectonic movements are active, and seismic activities are frequent. The length from east to west is 237 km, and the width from south to north is 203.5 km. Elevations range from 550 to 4187 meters above sea level. The Longnan region covers a total area of 27,000 km². The 2008 Wenchuan earthquake ($M_s=8.0$; epicenter located at 31.0° N, 103.4° E) caused more than 15,000 landslides, in particular rockfalls and debris flows. About 20,000 deaths have to be reported.

Because of the complex nature of such earthquake triggers, current technology cannot accurately predict the time of landslide. Therefore, most local and regional authorities and the land use planners rely on landslide inventory map and susceptibility map to conduct emergency rescue and land use assessment. In order to deal with the landslide risk management (e.g. selecting safe sites for the ongoing reconstruction after the earthquake), the local authorities of Longnan request high quality and updated landslide susceptibility maps.