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Distribution and susceptibility assessments of landslides triggered by Wenchuan earthquake using 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 been underestimated. In order to determine the most prone landslide area in the future for a similar earthquake, it is important to calculate for these areas landslide susceptibility maps. The purpose of this study is to present a spatial approach for the analysis of landslide distribution characteristics and for the investigation of the landslide effects using rare event logistic regression.

The study area within the scope of the damage area of the WenChuan Earthquake covers about 120,000 km2. The 8909 post WenChuan earthquake landslides and collapses have been compiled in an inventory by a combination of field investigation and SPOT 5 and ALOS remote-sensing image data applying monoscopic manual interpretation, image classification and texture analysis.

The landslide causative factor database was constructed and contains a digital elevation model (DEM based on 30×30m and 90×90m) and derived topographical parameters (e.g. altitude, slope, aspect, profile curvature, plan curvature), geology (the map scale of lithological properties and fault characteristics is 1:500,000), land use (at map scale 1:100,000) and further different environmental layers including road network and rivers. The triggering factors of the WenChuan earthquake have been collected from the USGS database and include the Peak Ground Acceleration, Peak Ground Velocity, and the Modified Mercalli Intensity.

The quality of the resulting susceptibility map was validated by splitting the study area into a training and validation set. The two separate susceptibility maps were compared by the spatial locations of the re-classification susceptibility mapping score within a pixel. To achieve the most appropriate results some sensitivity analyses were also carried out. The prediction capability analysis showed that the landslide susceptibility map could be used for land use planning in this region as well as emergency planning by the responsible local authorities.