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Spatial Prediction of landslide hazards - a case study in Gasen/Haslau - Eastern Styria, Austria

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During the night between 21st and 22nd August 2005 exceptional rainfall (up to 210mm/36h) triggered more than 500 landslides of different size in the area of the two communities “Gasen” and “Haslau” (Eastern Styria, Austria). These landslides caused high economic losses as well as two fatalities. The two communities count about 1131 residents. To determine the landslide hazard for this area the Spatial Prediction Model (SPM) of CHUNG & FABBRI (2002, 2003, 2007) is applied.

The SPM is based on the favourability function model assuming that future landslide occurrence can be predicted by calculating statistical relationships between the spatial position of each landslide and the on site attributes of e.g. topography, land-cover or geology. The proposed two step procedure of CHUNG & FABBRI is followed: first a prediction map is generated, which includes several relative hazard levels. In the second step the prediction rate of the prediction map is calculated by a cross validation technique. For validation the occurrence data set is partitioned in two groups, once spatially and once randomly. With one subset of the occurrence data set a prediction map is generated, and the second subset serves for validation of the prediction map.

The spatial data set used for the analyses includes continuous data on slope, elevation and aspect and thematic data on geology, soil, land-cover and distance from path network. Several data set combinations are tested, in order to find the best fit in success- and prediction rate. To study the significance of different spatial resolutions of the input data sets on the results, the model is run with a pixel size of 10m x 10m and 50m

x 50m. The applicability of “Austrian standard maps” for this approach is analysed.

In general the results show satisfying success and prediction rates, which imply that the resolution of the available data sets meets the requirements. The following layers could predict landslide occurrences best: soil, slope and distance from path network. In detail the soil layer shows very susceptible soil types in the empirical frequency distribution graphs which are “Felsbraunerde on slopes” and “oils in trench beds”. The high success-rate of the soil data layer indicates, that prediction maps incorporating the soil layer (refers to scale: 1:25.000) give better results, than using the geology data layer (refers to scale : 1:50.000). The adding of data on the distance from path network and of slope information to the model improved the results considerably.