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Comparison of landslide susceptibility estimations derived from SRTM-1 and TanDEM-X

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Slope movement processes in the Gerecse Hills (Hungary) are posing threat to property both in agricultural and populated areas, especially along the steeper stream valleys descending towards the Danube and on the loess-covered riverside bluffs. The landslide inventory database of the Hungarian National Landslides Cadastre stores around 50 sites of various slope movement processes (falls, creeps, landslides) in the area, although its records are slightly outdated in many cases. To update its records and to help locating potential landslides, a susceptibility map was created applying Chung's (2005) "likelihood ratio function model" on the SRTM-1 (along with thematic geological data and the landslide inventory sites) without removing the vegetation offset (Gerzsenyi & Albert 2017). With the availability of TanDEM-X data that offers higher resolution (approx. 12m) than the SRTM-1 the goal of our study is to assess the applicability of the TanDEM-X data over the SRTM for similar tasks.
For the analysis we used geomorphometric parameters (elevation, slope, aspect) as quantitative variables and thematic data as qualitative variables acquired from the Geological Map of Hungary (1 : 100 000) and the National Landslides Cadastre. The distribution of the four variables (elevation, slope, aspect, categorized geologic features) were computed on both the landslide and non-landslide areas. Comparing the distribution functions of the variables from the two areas yielded relative probability estimates for the four variables and by combining the estimates of the separate variables we got an estimated landslide hazard value for each cell. The relative hazard values showed how similar is a certain area to the areas already affected by slope movements according to the four variables.
Comparing the results with the previous susceptibility map that used SRTM-1 as a digital surface model, the methodological difficulties were highlighted. Although the TanDEM-X offers a higher resolution elevation model – and thus, it could provide more detailed maps as results – the removal of non-ground artefacts (vegetation, buildings) prior to morphometric analysis is a necessary and complicated process. For this, we used remotely sensed data to verify the coverage types and various raster filtering methods.

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