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Spatial models for landslide susceptibility using logistic regression method with different landslide inventories. Application in Moldavian Plateau, north-east Romania

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Quantitative methods for landslide susceptibility at medium scale are considered to have a high level of objectivity. This is because of the acquisition and preparation mode of the geospatial data, but also due to the possibilities of model error and robustness estimation. Beside this, cross-validation procedure, have a good predictive power on the models realized on multi-temporal data sets.
In this study we have chosen a representative area of approx. 120 km2 situated in central part of Moldavian Plateau (north-east Romania). This is an area in which landslides have an important frequency, at the moment almost 30% being covered by these processes. Their extension and distribution is governed by the geologic monoclinal structure, clay predominance of the bessarabian strata, landform dissection and climatic conditions. Landslide susceptibility assessment was realized using logistic regression, on a multiple landslide inventory. This inventory was created using ortorectified aerial images from 1978 and 2010, for each periods being considered both old and active landslides.
The covariates for modelling were based on a Digital Elevation Model at 10x10 m obtained using 2.5 m contours lines extracted from 1:5,000 topographic maps. As causal factors and predictors of landslide initiation the main geomorphometric variables (elevation, slope angle, slope aspect, plan, profile and mean curvature, modified catchment area, topographic wetness index), statistical indices of them (standard deviation of elevation, slope gradient and slope aspect), distance to drainage network and roads, soil types and land use, were considered. The land use data, also included the land use changes between 1978-2010.
The predictive performance of the models was assessed by Receiver Operating Characteristic (ROC) curve. The results show a good correspondence between the actual distribution of landslides and the susceptibility estimation for the two periods. In both cases AUROC (Area Under the ROC curve) values go toward 0.9. Bigger values appear for the estimation of the 1978 data, situation which can be explained by the fact that in that period the rain quantities were higher than in the present times, and the active landslide perimeters were mapped with high accuracy.