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Comparative analysis of three data treatment techniques for landslide susceptibility assessment in the Eastern Pyrenees, Spain.

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In this communication, the comparison of three data treatment methodologies for assessing landslide susceptibility is presented. The artificial neural networks (ANN) analysis, discriminant analysis (DA) and logistic regression (LR) have been performed in a test area of the Eastern Pyrenees (Spain), at a local scale (1:5.000). The main objective of our research is the comparison of the results obtained with the different techniques and to discuss the advantages and drawbacks of each of them. A database containing an inventory of 280 shallow landslides triggered during the intense rainy event of November of 1982 has been used. Additional information on significant conditioning factors such as vegetation cover and presence of superficial formation has been included as well as other input variables captured automatically from the Digital Elevation Model (DEM). ANN was performed with MATLAB while DA and LR with the statistical package SPSS. The input data and the results have been implemented on a GIS platform (ArcGIS). The test area has a size of about 40km2 and the susceptibility has been determined at each cell (15x15m). The input variables were selected from previous susceptibility assessment studies carried out in the area. The training and validation analyses have worked with two input cell classes (stable and unstable) and final maps with five susceptibility levels have been prepared. DA and LR classify dichotomous variables. The ANN analysis has been carried out with both classification and regression structures.
The Receiver Operating Characteristic (ROC) curves obtained are similar in all the models. However, frequency histograms on stable and unstable populations show significant differences in the distance between the mean values of the populations and in the distribution of the overlapping area. The susceptibility maps prepared with ANN and LR minimize the potentially unstable area. The cumulative percentage curves (Duman et al. 2006) show that using standard cut-off values for each model, the percentage of failed cells properly classified is very similar in all of them while the associated unstable area is higher for the DA. On the other hand, the indexes of relative landslide density indicate that using equal susceptibility value intervals, the low susceptibility cells are better identified with DA.