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Comparing forward logistic regression and conditional analysis in a regional landslide susceptibility assessment: Sicilian municipalities mapping

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The statistical approaches of the forward logistic regression and the conditional analysis were compared to assess the landslide susceptibility for the whole territory of Sicilian Region (about 25,000 km2). The used susceptibility approaches are based to find a statistical correlation between the spatial distribution of landslides have affected the Sicilian region in the past and a set of controlling factors: outcropping lithology, rainfall, landform classification, soil use, and steepness. The landslide inventory, obtained under the PAI project that counts more than 33,000 events, have been used as dependent variable. In particular, on the basis of the landslide position along the slope the 11 different typologies of the PAI archive, were grouped into 4 macro-typologies and then, for two of these (scarp landslide and hillslope landslide) the susceptibility models were created. The testing has confirmed that it is possible to realize a regional study of landslide susceptibility based only on existing data (maps of the factors and landslides archive) with a considerable saving of time and money. The scale of the study affects the quality of the results also depending on the type of slope failure. In fact, for the scarp landslides, where the selected factors (steepness, landform classification and lithology) are more discriminating, the models show excellent performances: areas under ROC (AUCs) is on average > 0.9, while for the hillslope landslides the results are highly satisfactory (average AUCs about 0.8). The stochastic approach allows to classify the territory Sicilian dependently to its propensity to landsliding in order to identify, at this level of study, those municipalities resulting more susceptible and potentially subject of more specifics studies as required by the protocols provided at European level.