



Predicting typology of landslide occurrences by statistical GIS analysis

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This study aims at the landslide susceptibility mapping by multivariate statistical methods with the additional capability to distinguish among typology of landslide occurrences. The methodology is being tested in a hilly area of the Daunia Region (Apulia, southern Italy) where small settlements are historically threatened by landslide phenomena. In the used multivariate statistical analysis all the variables were managed in a GIS in addition to the landslide inventory where geometric and descriptive properties have to be implemented in a suitable data structure in order to refer the independent set of variables to the typology of landslide occurrences. The independent set of variable selected as possible triggering factors of slope instability phenomena are: elevation, slope, aspect, planform and profile curvature, drained area, lithology, land use, distance from road and river network. The implementation of the landslide inventory was more demanding with respect to a usual multivariate analysis, such as the multiple regression analysis, where the simple presence/absence status of occurrences is being required. According to the classification proposed by Cruden and Varnes, three main landslide typologies were included in the inventory after recognizing by geomorphological survey: a) intermediate to deep-seated compound landslides with failure surface depth $> 30\text{m}$; b) mudslides of shallow to intermediate depth sliding surface; c) deep-seated to intermediate depth rotational landslides with depth of sliding surface $< 30\text{m}$. The inventory implementation constitutes a significant effort supported by the project "Landslide risk assessment for the planning of small urban settlements within chain areas: the case of Daunia" through several expertise. The outcomes of the analysis provide the proneness to landslide, as predicted level of probability, by considering in addition the failure mechanism introduced in the landslide inventory. A map of landslide susceptibility along the Apulian Apennines was finally produced by the GIS capability and the overall performance of the analysis assessed by a cross validation procedure.