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Assessment of the spatial agreement of landslide susceptibility maps

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Indirect assessment of landslide susceptibility provides planners and decision-makers with a practical and cost-effective way to zone areas susceptible to landsliding. This goal can be achieved by applying statistic models to estimate the spatial probability of slope instability within the investigated area.

It is also of crucial importance to assess the accuracy of the model outcome. To this purpose, cross-validation techniques, based on independent samples, are usually adopted. However further attention has to be paid to the evaluation of the spatial variability of the predicted results. In this work, the assessment of the statistical relations between the landslides and the controlling geo-environmental factors was used to produce a series of landslide susceptibility maps. A quantitative data-driven model (Weights of Evidence modeling technique) was applied at a regional scale for a study area site in Central Italian Alps (Valtellina di Tirano).

The landslides present within this area were identified from aerial photographs, field surveys and exiting inventories; consequently, two different landslide inventory maps at scale 1:10000, were produced for the study, each one characterized by a different level of accuracy. The goodness of fit and prediction capabilities of susceptibility maps was evaluated through the use of success-rate and prediction-rate curves.

Using different landslide inventories, a series of different combinations of predisposing factors were utilized to produce different susceptibility maps, each one classified in 5 and 10 classes. Subsequently, Kappa Statistic, and Principal Component analysis were performed to measure the classification agreement among the maps produced by models using different combinations of support covariates.

This analysis have shown that despite the substantially identical prediction rate of different models, the spatial agreement of these maps is non consistent, as their spatial pattern is considerably different. This result in problems connected with the use of success and prediction rates curves as an exhaustive measure of accuracy for spatial data.