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A methodological approach for comparing predictive maps derived from statistic-probabilistic methods

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The assessment of susceptibility related to natural or man-made damaging events shows significant improvements in recent years by using indirect statistically-based methods implemented within GIS. Although spatial data analysis techniques are now widely adopted as effective tools for an independent validation of predicted results in post-processing operations (prediction rate curves and areas under curves - AUC), poor attention is often paid to the evaluation of the spatial variability of the predicted results.

The relationships between past events and predisposing factors may give us information on the likely spatial distribution of future occurrences. However, it seems that the quality of predicted results does not automatically increase with the number of predisposing factors used in the modeling procedures, and the significance of such conditioning factors is frequently not thoroughly evaluated. This study is aimed at assessing different spatial patterns of predicted values of susceptibility maps with almost similar prediction rate curves and AUCs.

Our approach is applied to two different study areas and each one characterized by a specific harmful event. The former is an alpine environment (Italian Alps) where debris flows represent a frequent damaging process. The latter is a sector of the Po

Plain (Province of Milan, Italy) characterized by nitrate pollution in groundwater.

Weights of Evidence modeling technique (a data driven Bayesian method) was applied using ArcSDM (Arc Spatial Data Modeler). The output maps were reclassified in a same way to compare the predicted results. A relative classification, based on the proportion of the area classified as susceptible, was made. The thresholds between different susceptibility classes were put at 15%, 30% and 50% of the area classified decreasingly from the highest to the lowest susceptibility values. According to this, we reclassified maps with highest AUC values and compared all the possible combinations of the predicted maps. The results have shown great differences within the output patterns of the predicted maps and also within the highest predicted class. In some cases the total mismatch reached more than 20% of the whole study area. Comparing only the mismatch of the highest susceptibility class (15% of the area classified as most susceptible) the total difference between the spatial distributions of the highest class is higher than 35%.