



Comparison of two methods for landslide susceptibility mapping in the Champagne region (France) where viticultural activity is threatened by slope failure

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The vineyards of the Champagne region are planted on steep south-oriented cuesta fronts receiving a maximum of sun radiation. However, due to the location of the vineyards on steep hillslopes, the viticultural activity is threatened by slope failures.

In this study we attempt to better understand the spatial variability of landslides by comparing two techniques for landslide susceptibility assessment in a 1120 km² study area in the Champagne Ardenne. The first landslide susceptibility map was derived from an heuristic model adopted from the Bureau de Recherches Géologiques et Minières, geomorphologists of Reims University and the Comité Interprofessionnel du Vin de Champagne. In this qualitative model expert knowledge of the Champagne region was used to assign weights to all slope classes and lithologies located in the area. The second landslide susceptibility map was developed in this study by the application of a statistical model, logistic regression, to a calibration dataset of 'old' (Holocene) landslides. This map was successfully evaluated using ROC curves and values.

Both models indicate that present and future landslides are mainly controlled by slope gradient and lithology. However, the comparison of the two landslide susceptibility maps through (1) evaluation with the location of mapped 'old' (Holocene) landslides and through (2) temporal validation with spatial data of 'recent' (between forty and ten years old) and 'very recent' (less than ten years old) landslides showed that the statistical model produced in this study allowed better prediction of sites already affected by landslides. In total the statistically-derived susceptibility map succeeded in correctly classifying 83.2% of the 'old' and 84.0% of the 'recent' and 'very recent' landslides. The heuristic model on the other hand classified only 50.6% of the 'old' and 58.5% of the 'recent' and 'very recent' landslides correctly as unstable.

Taking into account the resolution (i.e. 50 m x 50 m) at which the classified landslide susceptibility map obtained from logistic regression was produced, this study succeeded in producing a tool for regional landslide susceptibility analysis. The map allows delineating zones where the implementation of precaution measures is needed to secure slope stability, and where more detailed geotechnical studies should precede important human interventions decreasing slope stability.