# Assessment of landslide hazard in the Collazzone area, Umbria, central Italy

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We present the results of an experiment aimed at testing the possibility to apply a recently proposed model to determine landslide hazard. The model predicts where landslides will occur, how frequently they will occur, and how large they will be in a given area, based chiefly on geomorphological information that can be collected through field surveys and the interpretation of aerial photographs. For the Collazzone area, in the central Italian Apennines, we prepared a multi-temporal inventory map through the interpretation of multiple sets of aerial photographs taken between 1941 and 1997 and field surveys conducted in the period between 1998 and 2004. We then partitioned the 79 square kilometres study area into 894 slope units, and obtained the probability of spatial occurrence of landslides by discriminant analysis of thematic variables, including morphology, lithology, structure and land use. For each slope unit, we computed the expected landslide recurrence by dividing the total number of landslide events inventoried in the terrain unit by the time span of the investigated period. Assuming landslide recurrence was constant, and adopting a Poisson probability model, we determined the exceedance probability of having one or more landslides in each slope unit, for different periods. We validate the forecasts of the temporal and the spatial probability of landslide occurrence using independent information, i.e., new landslides mapped in the field. We obtained the probability of landslide size, a proxy for landslide magnitude, by analysing the frequency-area statistics of landslides, obtained from the multi-temporal inventory map. Assuming independence of the three obtained probability estimates, we determined landslide hazard for each slope unit as the joint probability of landslide size, of landslide temporal occurrence, and of landslide spatial occurrence. We conclude discussing the results obtained, outlining advantages and limitations of the proposed probability model for the determination of

landslide hazard.