



Morpho-structural influences on landslide pattern and distribution: Grass GIS tool application.

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Relationships between landslide distribution and pattern, morphology and geologic setting is a key information for landslide susceptibility assessment. We performed a geomorphological analysis to assess the influence of the morpho-structural setting on landslides spatial characteristics (i.e. flowing direction, aspect ratio, type of landslide) in a 25 km² wide hilly area in Umbria (Central Italy), where alternating sands, marls and clays crop out developing a monocline-type morphology which is strictly related to the structural setting. For the whole Umbria region relationships between morpho-structural and hydrological conditions and landslide spatial distribution had already been investigated and extensively described. Moreover a detailed geomorphologic landslide inventory map was available for the study area, showing that most of slope failures are flows, slides, slide-earthflows and soil slides. The study followed these steps: (i) assigning to each landslide a flowing direction and an aspect ratio; (ii) mapping of the bedding information (bedding traces) through aerial photo-interpretation; (iii) exploiting a Grass GIS tool developed to extract bedding attitude values, with the relative uncertainty, starting from a polyline vector layer where bedding traces were stored, and a DEM with a proper resolution (10m in this study); (iv) interpolating of bedding data, which allowed to obtain spatially distributed information on the attitude of the bedding towards slopes, particularly five attitude classes were defined: strata dipping (a) into the slope, (b) less than the slope, (c) as the slope, (d) more than the slope and (e) across the slope. For each of these morpho-structural settings we analyzed the landslides spatial distribution and pattern. Results show that landslide flow direction is not straightforwardly driven by slope and aspect, but also by bedding dip direction. We argued that in this case bedding discontinuities act as preferential ways for flowing, particularly where the free face of the strata crop out (case c and d). Further work is needed in more complex morpho-structural settings, to enhance the tool capability to extract and interpolate bedding attitude data in geologically complex areas.