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Analysis of factors inducing different type of landslide in apparently similar environmental contexts

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Landslides frequently hit the hilly region of the Vicenza province (North-Eastern Italian Alps) exposing human activities to damage. The region includes Lessini Mountains and Marostica hills. These two areas are separated by a portion of the upper Vicenza plain. They have the same lithological framework, with the predominance of Tertiary volcanic rocks (Basalts and Tuffs) and most of landslides are earth slides and earth flows which affect the altered volcanic bedrock. At first glance, only considering these two type of movements, it seems that the predisposing conditions, as well as triggering factors (i.e. rainfall) are the same.
The aim of this work is to find the factors that determine earth slides rather than earth flows. In other words, we checked if there are any anomalies due to particular lithological and morphological constraints attributable to a type of movement. The research was performed both at large and small scale.
At large scale, we decide to perform spatial analysis of four numerical and seven categorical factors. Numerical factors are elevation, provided by the Veneto Region, slope gradient, slope aspect and surface curvature, derived from elevation. Categorical data are: soils map and land-use map, both provided by the Veneto Region; lithological map provided by the Vicenza province; IFFI (Inventory of Landslide Phenomena in Italy) project data. We also consider factors such as roads, rivers network and civil buildings. Spatial analysis was performed using a simple probabilistic method that compares spatial distribution of landslides with numerical and categorical factors.
At small-scale, we performed mineralogical and geotechnical analyses of samples collected from an earth slide and an earth flow. In order to define the mineralogical phases we use x-ray powder diffraction (XRD) of whole sample and of thin portion. Geotechnical indexes were obtained by Atterber Limits and sieve analyses. We also determined the rheological and swelling properties of the materials. In particular we investigated the variation of those properties as a function of water content.
At large-scale, we identified which are the main factors (morphological, lithological and anthropic factors) that determine the different types of landslides. At small-scale, we found significant differences in geotechnical and mineralogical properties of materials involved in the two type of landslide.