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Evaluating landslide susceptibility in hillslopes of the Daunia Apennines (Apulia, Italy)

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Landslide susceptibility, defined as the probability of occurrence of slope movements in a given territory, is evaluated in this contribution by means of a computerized methodology in GIS environment, based upon geomorphological surveys, geotechnical characterization of involved materials, and hydrological analysis of time series of hourly rainfall.

The Daunia Apennines are located at the north-western border of Apulia region (southern Italy), representing the outer front of the southern Italian Apenninic Range, and the transition to the Apulian foreland. They are characterized by hilly landscapes, rarely above 1,000 m a.s.l., and present outcropping rocks consisting of pre-Pliocene terrigenous sediments, and recent colluvial and alluvial deposits. The area is intensely affected by several types of slope movements, the most common being complex landslides (roto-translational slides evolving to debris- and/or earth-flows). Locally, rock failures in the more competent lithotypes, and mud flows in the prevailing clay deposits are also present. In most of the cases, slope movements are related to partial or total re-activation of dormant phenomena, triggered by prolonged, intense rainstorms.

The sector between San Marco la Catola, Volturara Appula, Celenza Valfortore, Alberona and San Bartolomeo in Galdo, in the catchment of La Catola Torrent, a right tributary of the Fortore River, has been selected as sample area. With slope gradients around 20°, the area is highly affected by shallow instabilities, involving mostly clay terranes. The index parameters were determined on both fresh and remoulded samples of involved lithotypes, as well as the consolidated-drained (CD) and consolidated-undrained (CU) shear strength. Permeability was evaluated through determination of the hydraulic conductivity by means of aedometric tests and falling head permeability tests. The digital elevation model (DEM), from which using a class rating method the main environmental factors (slope gradient, rock type, slope aspect, land use, etc.) that play a role in predisposing the slopes to instability were indexed. The final susceptibility map was eventually produced by overlying the separate layers representing each considered factor.