



Estimation of spatial distribution of soil mechanical properties along a sliding slope through GIS tool: the case of the Vasto landslide (Abruzzo, central Italy)

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The present study deals with the spatial interpolation of concentrated measurements of geo-mechanical properties located nearby landslide areas in urban centers. Often, the hydro-mechanical conditions of geomaterials involved into landslides within urban centers are not known. Moreover, only a few geological, hydrogeological and mechanical measurements are available within the body of the mass movement at the time of the failure from monitoring activities. After the landslide occurrence, the short time to take decisions during the state of emergency and the possible disastrous evolution of the landsliding phenomenon suggests to take advantage of the pre-existing territorial information. Geographical Information System (GIS), then, can represent a useful tool to provide a representative description of spatially variable soil conditions that triggered the failure and to collect information that can be used to design engineering structures for civil protection purposes. In this study, an application of the working strategy implemented in GIS environment for managing spatial geo-mechanical information has been proposed. The authors focused on highlighting the advantages and the limitations of the spatial interpolation techniques applied at the scale of a single slope. The studied area is the coastal slope of the town of Vasto (Abruzzo, central Italy) that recently has been affected by a landslide reactivation. The Vasto landslide extends for 2 km² from the crown zone (at about 150m a.s.l.) towards the coastal line. The deep-seated gravitational deformations and large landslides with submarine foots observed on the Vasto coast are typical of those mass movements occurring along the Adriatic coast, in the Plio-Pleistocene sequences represented by clays, sands and conglomerates with continental deposits covers. Hence, this site can be considered representative for the landslide phenomena affecting the Adriatic central coast from Pesaro to Petacciato (placed in Molise Region). A paleo-morphologic reconstruction of the studied slope enables to correlate the numerous instabilities experienced to the fluctuations in the level of the Adriatic Sea from the Middle Pleistocene to the present coastline. From the local archives of the newspapers and from some historical books of local authors detailed descriptions of past large landslides can be drawn from 1816 to 2005. To define the geo-mechanical behavior of the slope a geological and geotechnical survey have been carried out, consisting in 11 Dynamic penetrometric tests (DPSH), 3 SPT, 10 geognostic boreholes. Furthermore, routine laboratory tests have been performed on undisturbed soil samples. Actually, the survey has been focused on three areas, due to the difficulty to reach some parts of the landslide body. To cope the objective of predicting the mechanical behavior of the entire unstable zone, the authors tried to integrate the available information layers (historical, geographical, geo-lithological, hydrological, geo-mechanical) into a multi-layered map to support the civil protection decisions during the emergency time after the landslide movement.