Preliminary 3-D finite element analyses of the triggering mechanism of an occasional reactivation of a large landslide in stiff clays

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In December 2013 a large landslide occurred along a clay slope located at the south-western outskirts of the Montescaglioso village (Basilicata, Southern Italy) as a consequence of intense and prolonged rainfalls that presumably caused a significant increment of the pore water pressures in the slope. The slope is formed of stiff clays belonging to the formation of the Subappennine Blue Clays, which are over-consolidated and characterized by medium plasticity. According to aerial photos dating back to 1950s, the slope was already affected by previous landslide processes, so that the examined landslide process can be classified as an occasional reactivation according to the well-known classification of Cruden & Varnes (1996). Also, during the last decades several man-made actions in the area resulted in strong changes in the original water surface network that could have played some role in the slope reactivation. Based on displacement data, obtained from a monitoring system installed few days after the phenomenon, and still in function, at present the landslide does not show relevant signs of activity.

Preliminary 2-D and 3-D finite element analyses have been carried out to investigate the factors that controlled the mechanism of reactivation of the landslide. The numerical model has been setup based on the available topographical, geological and geomorphological information, the geotechnical properties of the involved soils and the information concerning the piezometric regime in the slope. The results indicate that the mobilized shear strength of the clays ranges between the typical post-peak and residual values for this type of material and confirmed that the strong increment of the pore water pressures in the slope induced by the exceptional rainfalls occurred in the previous days can be identified as the main triggering factor of the reactivation.