



Types and mechanism of shallow slope failures affecting the soil-regolith cover: a case study from Molise Region (S. Italy)

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Shallow slope failure in areas used for agricultural activities represent one of the main causes for soil loss. In fact, the occurrence of shallow landslides normally do not induce land use changes or the abandonment of the affected areas, but their effects on soil quality, both primarily and due to successive interventions aimed to level the involved land surface, are consistent.

In the Molise region such slope failures are very frequent, occurring typically during the wet season (winter-spring) beginning from the first more consistent rainfalls in late autumn-winter. Their observation and analysis, taking in consideration relative slope features and management, are fundamental for understanding the mechanism which are at their origin, and for developing prevention measures. The rare possibility to systematically observe and study such slope failures - which are normally of limited visibility, as they rapidly evolve or are reclaimed, and “casually” distributed - was given in the Molise region when a very large number of landslides occurred consequently to a persistent rainfall on January 2003 giving rise to a significant geomorphic event and huge damages for the community. The landslide affected area covered a large portion of the medium-upper sector of the Adriatic flank of the Molise Apennines which represented more than 50% of the regional territory. About 2500 landslides were surveyed and besides the deeper phenomena which were normally related to the re-activation of dormant or suspended landslides (corresponding to about 20% of the total), most of them were shallow and first-time activations. Most of these shallow landslides occurred on hill slopes sculptured prevalingly on clays and marls, characterised by gradients between 8 and 25° and covered by a coat of soil and/or regolith,

varying in thickness between about 0.5 and 5.0 m in relation to local slope angles and distances from the slope bottom. The circumstance that the major part of these shallow landslides occurred on the gentler lower slope portions and that they involved only the soil-regolith cover, indicate clearly their link both to the thickness and the hydrological and hydro-geological features of this cover, and their independence from the shear strength of the bedrock. In fact, as main triggering factors the action of surface water (causing fluvial undercutting of the slope at its base and consequent sliding of the more unstable fluvial scarp portions, and producing erosion features as gullies on the slope evolving in slides and slide-flows due to their widening and up-slope migration), soil saturation, and the combined action of seepage and underpressure could be identified. With reference to the latter, in particular, the observed effects on the slopes allowed to identify in detail the main mechanism and to reconstruct a typical sequence of events which characterise the progressive evolution of so-produced landslide features.