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Parameters calibration in rainfall induced landslides in the Langhe area (1994)

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In this work we have tackled as a 'cold case' the prolonged rainfall and flood event occurred in the Piedmont region (Northern Italy) in November 1994, when several hundreds of shallow landslides occurred. The aim is to investigate the key trigger factors of the landslides and to put some focus on the possibility to obtain calibrated parameters thanks to the use of a regional geotechnical database.

This research has been motivated by the effort to close the methodological and conceptual gap between the use of low-detail approaches, proposed to explore wide investigation domains and that of complex ones, applied to single hillslope scale, typically relying on finite elements solutions.

To achieve the above-mentioned goals, a simple model was preferred (i.e. that of Rosso, Rulli, Vannucchi, 2006), since it allowed a better check on the sensitivity of soil parameter values to the instability condition, under the assumption that these were the main sources of uncertainty.

With reference to the 1994 event, a database of 238 observed landslide has been used, for which well-documented geometries and geotechnical parameters are available.

To address the specific aim of cohesion and permeability validation, the safety factor expression from Limit Equilibrium Analysis has been targeted to assume the value 1 for all the considered slopes subjected to the actual (measured) rainfall.

The comparison between locally calibrated cohesion and permeability and the reference ones found in the database shows some differences; in particular, in several cases, safety factors quite lower than 1 have been derived, compared to those obtained using the published parameter values. The overall uncertainty resulting from this gap has been analysed for a limited (5%) number of carefully examined landslides and it will lay the foundations for subsequent, more geometrically accurate, investigations.