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Combined approach for hillslope hydrogeological assessment in rainfall-induced shallow landslides prone area.

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In the last years extreme rainfall events and seasonal cumulated rainfall distribution variations occurred, increasing also the arise of slope instabilities, mostly in the more susceptible areas.

Heavy rainfall events are one of the main triggering factors in shallow landslides occurrence: therefore, a better understanding of the trigger processes is necessary, also for early warning systems development and improvement. The soil water content of the first 3-5 meters of soil becomes thus an important shallow landslide predisposing factor to monitor. At this purpose, the mainly employed technique for soil moisture monitoring is the in-situ measurement, through different types of soil probes directly installed in the first soil layers. However, despite being a very precise technique, this monitoring technique provides only for a punctual dataset.

An integrated method to extend the hydrological characterization from site-specific to a slope scale is presented, combining geotechnical analyses, field data monitoring and geophysical investigations, in particular the electrical resistivity tomography (ERT).

Geophysical models of the first subsoil were carried out through different geoelectrical investigations (2D-3D-4D) and were calibrated and interpreted based on soil monitoring data, stratigraphic logs and trenches carried out in the study areas.

Estimation of the test sites average bulk permeability was performed through time-lapse 3D-S surveys, carried out by simulating very intense precipitations through manual irrigation, that allowed to determine the resistivity variation from undisturbed to disturbed conditions.

Finally, resistivity variations were correlated to soil horizons geotechnical parameters to perform hydrogeological conceptual models of the first soil horizons.

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