



## **Geophysical surveying for mapping areas susceptible to landsliding: case study from Italy**

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Hillslope areas susceptible to landsliding often show remarkable lateral variations of lithological, hydrogeological conditions and of physical properties so that the interpolation and extrapolation efforts based on surface observations and information from isolated boreholes are extremely difficult and can lead to unreliable interpretations. This problem can be overcome by resorting to a variety of existing geophysical techniques. In order to highlight the potential of geophysical prospecting to identify subsurface conditions, which may often be the critical factor governing the instability and the extent of landsliding, we present a case history of a joint application of seismic refraction, electrical resistivity tomography and Ground Penetrating Radar (GPR) techniques for the assessment of a recent, large (about 25 ha) slope failure in the Apennine mountains (Italy). We illustrate how the geophysical surveying was arranged following the preliminary geological investigation and how the initial surveying results were used to define the subsequent phases of geophysical and geotechnical investigations. We also draw attention to the advantages (e.g. coverage allowing for the necessary unification of data) and limitations (e.g. challenges regarding data interpretation) of the methods. We recognise that, at present, in situ geophysical investigations do not represent a cost-effective way of obtaining temporal changes in ground conditions, which are the pre-requisite information for defining landslide hazard. Nevertheless, as shown in this case study, geophysical surveying can assist in mapping apparently minor geological details such as structural and groundwater anomalies that may often control strength behaviour and mass movement characteristics. This knowledge helps to define the spatial susceptibility to landsliding (rather than hazard), i.e. where future

instabilities are more likely to occur. We conclude that to produce more useful results geophysical evaluations of slope instability should rely more frequently on the application of complementary surveying methods. Furthermore, through the arrangement of a suitable combination of investigative methods, based on the specific ground and environmental/logistic conditions, geophysics can help to assure a proper balance with respect to the direct and generally more expensive geotechnical methods and thus lead to a rationalization of the overall costs of landslide assessments.