

Characterization of a rock avalanche deposit aimed at the geologic risk assessment in the town of Celano (Fucino Basin, Central Italy)

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This paper deals with multidisciplinary surveys carried out in the little town of Celano, in order to assess the safety of civil and industrial settlements with regard to natural risks, namely landslides and earthquakes. The studied area is located at the northern border of the Fucino intermountain basin, a geologically complex and highly seismic area of Central Italy characterized by slopes instability, fault scarps and other co-seismic structures that reveal the occurrence of a recent earthquake activity. The town lies on the wide body of an ancient landslide that is currently covered by a layer of flood alluvium and detritus. The landform is a typical rock avalanche deposit, constituted by a well delimited, continuous heap of fragments and blocks up to various cubic meter size, with an estimated volume of nearly $40 \times 10^6 \text{ m}^3$.

The comparison and integration of data from geoelectrical surveys (ERT and VES), laboratory analyses, cross-hole (C-H) and down-hole (D-H) geophysics allowed to obtain a detailed framework of the landslide arrangement and important informations related to the geomechanical characterization of its lithologies. ERT and VES prospectings highlighted in the shallower part of the landslide body some resistivity lateral variations, with values generally increasing with depth. The coupling of VES investigations with ERT measurements was aimed at characterizing the sections at major depths, where the ERT resolution decreases and moves away from the real stratigraphy. The ground models obtained fit with the stratigraphy identified by drillings. D-H and C-H geophysics enhanced sharp variations of the elastic properties of lithologies throughout all the investigated sections, both between the landslide body and the embedding materials, and into the calcareous debris itself. Undisturbed core samples were also collected for laboratory analyses to compute the index properties of the cohesive materials and to carry out geotechnical and permeability tests.

The amount of collected data led to a detailed framework of the landslide deposit and the surrounding units, namely regarding the physical, mechanical and dynamic properties of the materials. The informations obtained were used to assess the geologic hazard of the area and to appraise the degree of vulnerability of the industrial sites situated in the Celano municipality, by analyzing the current stability of the landslide body and the behaviour of its lithologic components under seismic loads.