

Landslide characterization by geophysical and seismological measurements: application to Eagle's Lake landslide, Carpathian Mountains.

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Assessing the geometry and volume of mass movements is essential in the evaluation of slope stability and the understanding of slope failure trigger mechanisms. At this purpose, we conducted abundant geophysical and seismological measurements in order to better characterize the subsurface of the deep-seated landslide of Eagle's Lake (RO: Lacul Vulturilor) in Carpathian Mountains (Buzau-Vrancea region) in Romania. This region, seismically active, hosts numerous mass movements with a large variety of morphologies and. These mass movements find generally their origin in climatic, seismic or both sources sizes.

Eagle's lake site has been object of debate for decades in the literature as its genesis is not fully understood. Therefore, we performed, over two geophysical campaigns, abundant HVSR measurements, installed seismic arrays to retrieve the dispersion of the surface waves, performed seismic active measurements to build seismic refraction tomographies and apply multichannel analysis of the surface waves, geoelectrical measurements were also performed, and UAV flights were conducted to establish a 3D model of the investigated site. These measurements were accompanied by a thorough geomorphological analysis of the area, which highlighted several surface features indicating structural weaknesses.

Combining both active and passive seismic measurements, we were able to better interpret the results provided by the surface wave analyses. Jointly inverting the above information, we retrieve the shear-wave velocity profiles in three positions over the landslide. We identified lateral variations in seismic velocities, as higher P-wave velocity (V_p) values in proximity of the edge of the landslide and low V_p values at the crest, indicating a rock fatigue due to dynamic processes. HVSR measurements present several resonance peaks, including peaks associated with impedance contrasts, possibly deriving from landslide shearing horizons and lithological contacts. The rich dataset helped reconstructing the geometry of the Eagle's Lake landslide and identifying zones of weaknesses at depth.

This work aims, in prospect, at reconstructing the conditions and the energy needed for triggering the mass movement and provide clarification on the mechanism at its origin.