Multidisciplinary monitoring techniques to investigate a landslide system in north-central Peru

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Abstract

In north-central Peru, gravitational movements generally lead the slope evolution, driven by recent Andean Mountains uplift coupled with Pleistocene glacial dynamics. Slope instability often influence the vulnerability of facilities, especially in narrow valley characterized by present linear fluvial erosion. The aim of this study is the investigation of a landslide system, in order to mitigate the risk involving high economic importance road. A geomorphological survey has been performed to recognize the landslide features, the distribution and state of activity. Simultaneously, available monitoring data (inclinometers, electric and seismic tomography, geodetic and satellite data) have been collected and treated to comprehend their morphometry. The possible sliding surface was hypothesised using slope stability analysis software. A deep rotational sliding surface (maximum 65 meters) was identified according with all the information gathered through. The movement is not homogeneous along the slope, having an average speed between 0,05 and 0,35 meters in 10 years, but daily peaks of about 4 mm. Whether in the lowered part or in the accumulation body, debris flow and shallow landslide occur eroding the material still mobilized by the deeper movement. Furthermore, a village is going to be involved by the crown area retreatment. To guarantee a better comprehension of this kind of complex phenomenon, we suggest an improvement in density and spatial distribution of the monitoring network. To plan risk mitigation measures and a rapid alert system, we recommend to install pluviometers and seismometers in three different contexts properly located considering elevation, slope and aspect.

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