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SLOPE STABILITY ANALYSES AND GEOLOGICAL RISK REDUCTION: TWO CASE STUDIES, FROM ENGINEERING-GEOLOGICAL CHARACTERIZATION TO ROCKFALL RUNOUT MODELING WITH INTERVENTION PROPOSAL

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Rock slope instability is a major risk to human life, often leading to economic losses, property damage and maintenance costs, as well as injuries or death.

Because the rock mass behavior is significantly governed by the presence of joints or other discontinuities, several types of slope failure such as plane failure, toppling failure, wedge failure, buckling failure and circular failure are often observed.

These failures may be gradual with very slow movement of the sliding block or instantaneous without much warning. To understand this process, it is important to study the rock slope (geological data collections, geotechnical collections, data kinematic stability analysis, runout analyses…)

This work is divided in two cases of studies, which are both complementary to study a rock slope stability:

1. The first case of study is an underground quarry of marble located in Levigliani (Luca, Italy), which we did a classification of the rockmass based on the empirical method of Bieniawski (RMR) and also a kinematic analysis of the conditions of stability with the software Rocscience Dips, after a 3D stability analysis was used by the software Rocscience Unwedge which was developed specifically for the use in underground rock mining;

2. For the second case of study is an ex open pit quarry of limestone located in Vecchiano (Pisa, Italy), in which we calculated the trajectories of falling blocks with an advanced numerical method (Rockyfor3D): rigid body approach, capable of analyzing the propagation phase of the volumes detached from the slope; methodology that allowed to simulate the rockfall phenomena through the production of block rebound mechanisms during the descent towards the slope and also we gave an intervention proposal to mitigate the risk; the localization and sizing of the blocks was done by a Digital Terrain Model (DTM).

Keywords: Underground quarrying, Rock slope stability, 3D modeling, Terrestrial Laser Scanning, Vecchiano, Levigliani.