



Rockfall management strategy of a climbing wall of the former quarry of St-Triphon (Switzerland).

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As part of the promotion of the outdoor climbing sport, this project consists of monitoring the risk of rockfall on climbing walls of the old limestone quarry of St-Triphon (Switzerland). This specific study is the result of a comparison of 3D topographic survey of the North wall and the analysis of instability mechanisms.

A first LiDAR acquisition and structural analysis of the whole quarry were performed in March 2010. In March 2017, a second 3D topographic acquisition was performed by drone and Structure from motion (Sfm) and by LiDAR.

The comparison of the two 3D topographic datasets allowed an identification of the fallen and intentionally removed blocks from the North climbing wall. 15 blocks have been identified and their volumes have been estimated.

In the inventory, intentionally removed blocks are distinguished from those that fell spontaneously. In 2010, 9 major blocks were identified as potentially unstable. For all types of blocks, an estimation of their volume has been plotted on a magnitude-frequency graph and their distributions fitted by power laws.

For all considered “removed block”, we can expect that in average:

- A block of volume of at least of 0.05 m³ will fall each year.
- A block whose volume is greater or equal to 0.4 m³ will fall every 5 year.
- A block of 50 m³ each 10 years.

For other types of the block, interpreted as naturally fallen, we can expect a event of a volume greater or equal to 0.06 m³ each year. For potentially unstable blocks not yet fallen, we can expect a rockfall of 0.04 m³ each year, 0.3 m³ each 5 year and 30 m³ every 10 years.

Base on magnitude/frequency analysis, following recommendations can be made. Blocks with volume less than 0.05 m³, must be removed in the year. Blocks with volumes between 0.05 and 0.3 m³ have to be removed every 5 years. All these blocks are relatively small volumes, so they can be manually removed (work on rope and with a crowbar). Blocks with volumes greater than 0.3 m³ have a low probability of falling in a near future, but are considered as dangerous on a medium-term. These could be purged by blasting or nailed in order to significantly increase their stability.