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Title: Rock blocks impacts on masonry walls: modelling for vulnerability evaluation

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Abstract

Rockfalls are frequent and widespread phenomena in mountain environments. The hazard can endanger people, structures, infrastructure, environmental features and economic activities. To mitigate the risk, several solutions have been developed, from active measures that prevent the occurrence of the phenomenon, to passive structures that intercept and stop the falling boulders. The kinetic energies range between few kJ to tens of thousands of kJ, depending on the size of the falling boulder and the morphology of the slope along which the phenomenon propagates [1].
The effects of rockfall on constructions can lead to local damages, which can propagate to complete collapses [2]. To quantify the vulnerability of buildings it is necessary to evaluate the local response, i.e. the occurrence of a damage and its size, and the global effects, i.e. how the damage affects the whole building. The present work focuses on the local response of masonry walls to rockfall impacts. The impacting block is modelled as a lumped mass and the wall is considered with its equivalent mass and configuration. For the interaction between the bodies, a one-sided nonlinear element is inserted. The mechanical properties of the element are derived from an experimental campaign on small scale specimen of similar material couples. The results plotted in a kinetic energy-radius of the equivalent sphere chart indicate that there are wall configurations that presuppose large damages when impacted. A simple reliability analysis to produce fragility curves is then proposed [3].

References

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