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Quantitative vulnerability analysis of different types of walls due to an impact of lahars

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Risk assessment by lahars includes a study of the vulnerability of the elements exposed to this volcanic hazard. Therefore it is necessary to establish the damage to the structures impacted by this type of flow. The damage depends on the resistance of each structure. Although there are qualitative and semi-quantitative approaches for the damage produced by lahars on different structural types, a quantitative analysis has not yet been made. In this paper the vulnerability analysis of concrete and brick typical walls is done in order to make generalizations for complete structures in future works. Considering that the dynamic characteristics of an impacting lahar such as its speed, particle concentration and high are uncertain we deal with a problem in which the number of combinations of that impacting characteristics is infinite, so a technique of statistical sampling was used to try to represent all possible cases. Structural analysis with different flow conditions was performed numerically in the Fastflo (TM) software using the finite element theory. From each of the modeling results it was possible to obtain displacement values at all points of the walls after the impact of lahar. In the analysis conditions are assumed isotropic walls. It is also assumed that the flow reaches the whole wall at the same time with constant height and density. It is considered that the depth lahar has a uniform particle distribution. Finally, the flow conditions and wall materials under which the walls were definitive or partial structural damage were determined.