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'Understanding volcanoes and society: the key for risk mitigation'



Probabilistic lahar hazard assessment as tool for risk analysis

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An important task to perform when evaluating hazards and risk is to actually connect both processes. The better the connection, the better the successful use of both for authorities and society, the final users of the results. Risk deals with the expected loss after realization of certain hazard, over a certain period in the future. It can be evaluated from the expected economic loss, number of threaten lives or extent of physical damage. This study tackles the probabilistic determination of laharic hazard in the case an event occurs (conditional probability). In order to model the hazard, TITAN2F was used to simulate biphasic flows on a digital elevation model. At the same time, the model determines several characteristics of the simulated flow such as: inundation level, flow velocity and dynamic pressure. Probabilistic hazard needs a suitable sampling technique for generation of a number of initial-condition scenarios, statistically representative and comprising all possible cases within the geological nature of the volcano. In this study, probabilistic analysis was performed using OCTAVE routines, for confluent flow sources, Bayesian inference was applied and in the case of single flow source, frequential analysis was made. The approach was applied for laharic hazard/risk evaluation for Santiago Xalitxintla village on the NE flank of Popocatepetl volcano (Mexico), Chiles and Panan villages on the skirts of Chiles-Cerro Negro volcano (Colombia) and secondary lahars at Quebrada Mijitayo at the city of Pasto (Colombia). This methodology gives results on the probability of affected inundated area and probability distribution of different dynamic pressure levels threatening human life and infrastructure, important benefits of the tool.