

Instrumental monitoring of lahars for warning purposes: new experiences and applications along the Colima Volcano, México

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In mountainous regions, a number of instrumented catchments exist where debris flow monitoring is performed using stage sensors, video cameras, ground vibration detectors (GVDs). In-situ monitoring techniques allow the collection of field data that provide an important comparison with geomorphic and topographical surveys of erosion, sediment supply and channel evolution. In addition, instrumental monitoring has demonstrated to be of crucial importance for hazard assessment, land-use planning and design of Early Warning Systems (EWSs). For this latter purpose, the possibility to detect debris flows from a distance is an important advantage of GVDs. Most monitoring devices need to be installed in the channel bed or very close to it, with consequent great danger to be destructed. As a consequence, most monitoring systems of active basins integrate a linear array of GVDs distributed along the channel, in safe locations. A debris flow warning algorithm based on seismic monitoring data was recently developed and implemented in the Gatria testing field for EWSs. This algorithm uses the Signal-to-Noise Ratio (SNR) as warning parameter instead of a classical intensity/duration threshold. The event detection algorithm has a non-simultaneous triggering condition requiring that at least two GVDs trigger in order, upstream to downstream. In this study, we present a new development of this method to early detect and characterize lahar processes occurring along the Colima Volcano. Two monitoring stations are installed along the SW flank of the volcano, in the Montegrande and La Lumbre basins. In both sites there are a GVD array and a videocamera. Along the Montegrande ravine is also installed an infrasound sensor while the La Lumbre monitoring station integrates a flow stage sensor. The new detection algorithm, currently under testing, is still based on the SNR but detected by two different sensors: a GVD paired with a stage sensor or an infrasound device.



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