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Methodologies for measuring the temporal evolution of the lava flow geometry and monitoring the related hazard

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The lava flow propagation can pose a high risk both for the territory and the infrastructures located on the flanks of an active volcano. The presented study is aimed at analyzing different methodology for measuring the evolution of a flow field by combining ground and aerial observations, as well as satellite data. Data acquired by ground sensors must be opportunely processed to extract orthorectified images. In addition during volcanic crisis, the frequent acquisition of oblique digital images from helicopter allows for quasi-real-time monitoring to support mitigation actions by civil protection. These images can be processed through a straightforward photogrammetric approach to generate digital orthophotos from single-view oblique images. Moreover, airborne remote sensing systems, such as those based on digital photogrammetry and laser scanner sensors, can be also adopted to monitor the lava emplacement processes in active volcanic areas. The capability of extracting accurate topographic data from ground and aerial acquisitions, allow to use these methods to constrain the regular and more frequent measurements derived from satellite observations. The presented work analyses the discrepancy among the different datasets in terms of accuracy and resolution and will attempt to provide an approach for combining the different datasets.
The measured evolution of a flow field can be used to evaluate the related hazard by applying a numerical model for evaluating the areas potentially at risk of lava invasion. Numerical simulations can also be aimed at evaluating the reduction of the hazard by simulating the application of different containment systems for mitigating the effect of lava flow propagation.