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Calibration of Q-LavHA a Quantum GIS plugin for lava flow simulation

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Q-LavHA (Quantum-Lava Hazard Assessment) is a Quantum GIS plugin which simulates lava flows from one or multiple aligned eruptive vents on a Digital Elevation Model (DEM). It combines existing probabilistic (VORIS) and 1D thermo-rheological deterministic (FLOWGO) models in order to improve the simulation of lava flow spatial spread and terminal length. The spatial spread is constrained by the probabilistic steepest slope (VORIS model – Felpeto et al., 2001) but the corrective factor which is included allows the lava flow simulation to overcome small topographical obstacles or pits. The terminal length of the lava flow simulation can be determined based on a fixed length value, a Gaussian probability density function, or it can be calculated based on the thermo-rheological properties of the open-channel lava flow (FLOWGO model – Harris and Rowland, 2001).

Q-LavHA is designed for scientists and stakeholders confronted with imminent or long term lava flow hazard from basaltic volcanoes. Q-LavHA can improve their understanding of the spatial distribution of lava flow hazard, influence their land use decisions and support evacuation planning during a volcanic crisis. Because of the diversity of its uses, Q-LavHA has been developed in Python in order to allow users to adapt the code to their needs. Its availability as a Quantum GIS plugin facilitates its distribution and its use by the community.

To determine the ideal parameters for lava flow simulation, we calibrated Q-LavHA based on recent lava flows of the volcanoes Karthala (Comoros islands) and Nyamuragira (Democratic Republic of the Congo), both with an overall mafic and low-viscosity lava

composition. The influence of the different input parameters on the quality of the simulations is discussed. Additionally, we use a probabilistic density function for eruptive vents in order to estimate, on a volcano-wide scale, the probability of an area to be flooded by lava.

REFERENCES:

Felpeto et al. (2001), Assessment and modelling of lava flow hazard on Lanzarote (Canary Islands), Nat. Hazards, 23, 247-257.

Harris and Rowland (2001), FLOWGO: a kinematic thermo-rheological model for lava flowing in a channel, Bull. Volcanol., 63, 20-44.

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