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Impact of topographical data uncertainties on the MAGFLOW model for lava flow simulations

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MAGFLOW is a physical-mathematical model for the simulation of lava flows based on the Cellular Automaton approach, where the evolution of the flow is controlled by a stationary solution for the open-channel flow of a Bingham fluid, with a rheology controlled by temperature dependent viscosity and yield strength. A sensitivity analysis of the model to its rheological parameters was recently conducted (Bilotta et al, 2008), highlighting the importance of water content in the lava flow emplacement, as well as the adherence of the model to the physical phenomenon. We extend here the analysis to another important input parameter, which is the topography over which the lava flows. The topography is provided to MAGFLOW as a Digital Elevation Model (DEM), a matrix of heights distributed over a regularly spaced grid encompassing the area of interest. We quantify the impact the DEM resolution and quality (coarseness, distortion, georeferencing issues) can have on simulations modeled with MAGFLOW, and discuss approaches to mitigate the effect of uncertainty associated to topographical data in the production of scenarios.