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VolcFlow, an approach to simulate lava flows. Case of El Reventador volcano (Ecuador)

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The numerical code VolcFlow is a finite difference Eulerian code which is based on the depth-averaged approach and was developed for the simulation of isothermal geophysical flows. Used to simulate pyroclastic density currents, debris avalanches and tsunamis; VolcFlow code is now being tested to reproduce lava flows. The first approach was applied a plastic-viscous isothermal model with Binghman rheology to simulate some well-known deposits of lava flows from Tungurahua and El Reventador volcanoes in Ecuador. Even if the cooling effect was not considered in the simulations, we found similarities between the results and the real deposits in terms of length, morphology and thickness. With the aim to improve the code we incorporate a heat budget model as a second approach. Its corresponds to the same that has been applied in the code FLOWGO (2015), which includes heat lost by radiation, convection, conduction and heat gained due to crystallization. The ongoing research is to test this new version of VolcFlow (including the cooling effect) in andesitic lava flows of El Reventador volcano. The continuous monitoring of this volcano by the IG-EPN allowed to identify ~40 lava flows in the period 2002-2016. The most part of those flows have been well mapped, bringing information about their surface, volume, morphology. Although El Reventador is one of the most actives volcanoes in Ecuador, not much is known about its rheology and dynamics. To check the new version of the code, we compare the morphology, the lava flow distance and its velocity in both the field and simulations. The further research will corresponds to include a body crust in the lava flows surface, in which its thickness will increase due to the cooling effect and distance.