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Lahars simulation and field calibration in Popocatépetl Volcano (Mexico)

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The term "lahar" refers to the process generated in volcanoes by high sediment concentration flows that range from hyperconcentrated to Debris flows. This complex dynamic system represents a threat to people living near volcanoes. In order to delimitate hazardous area, mathematical models should be applied and tested. These models depend strongly on data collected in the field and, an additionally, good DEM is required to produce satisfactory results.

Recent Popocatépetl lahars are well documented and as a result, they can be used to assess the accuracy of numerical models. In this work, SPH (Smoothed Particle Hydrodynamics) depth integrated model created by Pastor in 2005 is applied to reproduce Popocatépetl lahars. The mathematical model is derived from the velocity-pressure version of the Biot-Zienkiewicz model and the assumed rheology corresponds to the Bingham model. On the other hand, a systematic collection of field data it's carried out by GFAM group in Popocatépetl volcano and it's included updating channel topography; as well as the factors: i) run out area boundary; ii) estimation of the velocity of the flow and iii) depth distribution of lahar's deposit. All this field data it's used for back analyses and calibration of the rheological parameters. Besides the calibration of rheological parameters, it is also investigated the effect of the topographic mesh resolution. Moreover, flow depth obtained by SPH model is systematically compared with field evidences along the lahar's path.

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