



## **Lava flow simulation code LavaSIM for an advanced hazard mitigation system**

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The lava flow simulation code LavaSIM has been developed to give accurate predictions for volcanic disasters and support hazard mitigation strategy. LavaSIM is applicable to various types of lava flows and flow behaviors such as flood basalt, subaqueous lava flow, and lava levee formation by introducing the three-dimensional analysis and modeling of boundary transportation between the melt and the crust. The heat transfer between the lava and the ground, air, and water, and the melt and crust inside the lava flow are calculated by using appropriate correlations. The basic field equations are the Navier-Stokes equations for three-dimensional natural convection analysis with inertia, viscosity, pressure, buoyancy and gravity terms. LavaSIM enables a multiplex heat and mass transfer analysis with flow spearhead and melt front transportation through the evaluating two types of mesh attributions, natural convection mesh and free surface mesh, and re-arrangement of the pressure matrix. The natural convection mesh is completely filled with lava melt or crust. The free surface mesh is the one in which the volume of lava is less than the mesh volume and it is constructed of the ground top or the top of the natural convection mesh (melt or crust) or the mesh under the crust. The calculation boundary is formed between meshes of different attribution. The reliability of LavaSIM was verified by applying to the observed lava flows in 1986 Izu-Oshima eruption. Then, we simulated some cases of lava flow around the Mt. Fuji, which has the strange high LP events at about 15 km beneath the summit since 2000. The simulation was adopted to hazard maps of local government and are useful to enhance the awareness of volcanic disaster mitigation.