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Simulations of lava flows at Mt Etna for hazard assessment

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The activity of Mt Etna is characterized by a great variety of eruptive processes that are potentially hazardous. Among them, lava invasion from effusive vents, also located close to urban areas, has produced from considerable to vast damage to the people living and working on the volcano flanks and over the coast of eastern Sicily, both in historical time and in the last decades. Potential hazard assessment for these volcanic phenomena needs to be known in terms of probabilistic maps for the medium-long period. The development of physical-mathematical models able to describe the evolution of volcanic processes is fundamental in order to understand the dynamic of volcano and to estimate its dangerousness and hazard mitigation. The physical-mathematical models constitute a complementary methodology and are closely connected to the observation techniques of the volcanic system and those of laboratory and field. The TecnoLab (INGV-Catania Section) has developed a model for lava flow simulations based on Cellular Automatons, called MAGFLOW. The proposed model represents the central part of an extensive methodology for the hazard assessment at Mount Etna, currently under investigation. Hazard assessment can be performed by simulating a number of lava flows from a set of initial data (a record of past eruptions) and with different parameters of the volcanic system in a meaningful range of variation. In particular, a preliminary zonation is necessary for identifying possible emission regions with the highest probability of opening. After that, a set of reference values for the parameters of the simulation model based on the knowledge of past eruptions is estimated. So, MAGFLOW is used to determine for each emission region the area that can be invaded by lava flows originated from sample points located in that region. Last step is to assign the probability of lava invasions to interested region, calculated on the

basis of the simulated lava flows. It is important to realize that the uncertainties of the input data will also produce uncertainties in forecasting of lava flow paths.