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A statistical approach for hazard mapping for the NE flank Etnean area

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This work deals with the use of the SCIARA model for the creation of lava hazard maps. The specific objective is the realization of thematic maps, showing the susceptibility to lava invasion in the NE Etnean area, in the vicinity of Linguaglossa. Hazard maps were obtained thorough a statistical approach, by simulating hundreds of lava flows originated from probable emission points, these latter characterised by different eruptive histories (i.e. effusion rate, duration) and rheological parameters. SCIARA is a family of empirical cellular automata models for simulating lava flows of aa type. Through simulations, the evolution of a hypothetical lava flow can be evaluated. The evolution of simulated cases permits an appraisal of the area, which might be invaded by the flow. The model has recently been successfully applied to numerous real cases of lava flows occurred at Mt. Etna (Sicily). Simulations satisfactorily predicted the limits of the real lava flows, permitting the application for predictive purposes during the eruptive crises of 2001 and 2002. The identification of the areas characterised by highest probabilities of opening of eruptive vents was first carried out, on the base of historical, prehistoric and geological records. Such zones were assumed as sources for lava flows to be simulated. Subsequently, the main volcanological characteristics were set through selection of eruption typology (summit, flank) and location; the most representative physical parameters to be used for simulation were derived from the above mentioned records. Once source areas and volcanological parameters were defined, a large number of simulations of lava flows were carried out, in order to realize maps depicting the relative frequency of lava affecting the considered areas. To each simulation, a weight value (depending on the probability of occurrence of the simulated event) was assigned, based on location and altitude of the source, event duration, lava

volume and event history. The relative weights of the areas involved in the simulations were summed by superposition, thus obtaining a lava invasion hazard map at a resolution of about 65 square meters (i.e. the area of the cell). Results demonstrated the usefulness of the approach in assessing lava flow hazard. The methodology could also be applied to other sectors of Mt. Etna, as well as to other threatened areas worldwide, characterised by similar types of lava flows.