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Hazard mapping in the NE flank Etnean area: a statistical approach

G.M. CRISCI[1] and R. RONGO[1] and V. LUPIANO[2] and S. DI GREGORIO[3] and W. SPATARO[3] and D. D'AMBROSIO[3]

[1]*Department of Earth Sciences and High Performance Computing Center, University of Calabria, Arcavacata di Rende - 87036, CS, Italy (crisci@fis.unical.it, rongo@unical.it)*
[2]*CNR-IRPI - Sezione di Cosenza, via Cavour, 6 - 87030 Rende, CS, Italy (lupiano@irpi.cnr.it)*
[3]*Department of Mathematics and High Performance Computing Center, University of Calabria, Arcavacata di Rende - 87036, CS, Italy (dig@unical.it, spataro@unical.it, d.dambrosio@unical.it)*

SCIARA [1] 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 assessment 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 specific objective of this work is the realization of lava hazard maps, with the aid of the SCIARA model, showing the susceptibility to lava invasion in the NE Etnean area near Linguaglossa. The maps were obtained by means of a statistical approach, simulating hundreds of lava flows, characterised by different eruptive histories (i.e. effusion rate, duration) and rheological parameters, each originated from plausible emission points. On the basis of historical, prehistoric and geological records, the identification of the areas characterised by highest probabilities of opening of eruptive vents was first carried out. Consequently, 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 that 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. Eventually, a weight value (depending on the probability of occurrence of the simulated event) was assigned to each simulation, 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 overlapping, thus obtaining a lava invasion hazard map at a resolution of about 65 square meters (i.e. the area of the cell). The obtained results can permit the application of the methodology to other sectors of Mt. Etna, as well as to other threatened areas worldwide, characterised by similar types of lava flows.

References

[1] G.M. Crisci and S. Di Gregorio and R. Rongo and W. Spataro. *Journal of Vulcanogy and Geothermal Research*, **132**, 253-267 (2004).