



## **Lava flow hazard at Mount Etna (Italy)**

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Invasion of inhabited areas and destruction of human property by lava flows represents the greatest volcanic hazard at Mount Etna (Italy) in the short term, based on the character of the historically documented eruptions of the volcano. Virtually all eruptions of Etna produce lava flows, which are more likely to cause damage when emitted from flank vents. Since 1600, more than sixty eruptions have occurred on the flanks of Etna. About half of these caused damage to, or destruction of, human property, dwellings and infrastructures, and at least two destroyed entire population centers. The present study consists of an analysis of the post-A.D. 1600 eruptions of Mount Etna and of their main volcanological parameters as well as the identification of vulnerable areas around the volcano. The most common hazard produced by these eruptions is the invasion and burial by lava flows. Lava-producing summit eruptions are frequent but their destruction potential is very low due to the nearly complete absence of man-made structures in the area likely to be covered by lava flows. Potentially hazardous eruptions occur on the flanks at intervals of a few months to a few decades, although the intervals between such eruptions have been fairly consistent at an average of 1.5 years since 1971. The areas subjected to the greatest hazard lie within about 6.3-8.9 km from the zones with the highest vent densities, where >90% of the flank eruptions between A.D. 1600 and 2004 have taken place. We present a quantitative analysis and evaluation of a new database containing numerical volcanological parameters of each post-1600 eruption, which allows us to quantify the hazard from future eruptions and to create a preliminary hazard zonation map divided into six zones. A total area of nearly 1400 km<sup>2</sup> is considered vulnerable, which is home to >900,000 people. The greatest hazard is from voluminous and/or low-altitude flank eruptions, which during the historical period have occurred at irregular intervals of 120-400 years, the most recent in 1669. The risk from lava invasion is highest around the summit area, due to the frequent activity and the high density of vents. The level of hazard decreases away

from the summit, but at the same time, the vulnerability increases significantly. Many of the marginal areas of hazard zone 6 may not be affected by lava flows for many thousands of years to come. However, any eruption occurring on the lower flanks bears the potential of becoming the worst volcanic disaster at Etna in 2000 years. In the future, eruptions at higher elevations will occur much more frequently, at intervals of a few months to several decades, and many will cause damage in relatively limited areas. A recent increase in the intensity and frequency of eruptions indicate that the Etna volcanic system is presently more dynamic than during the past 330 years, and low-altitude flank eruptions have to be considered a realistic possibility for the near future.