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## Probability hazard map for future vent opening at Etna volcano (Sicily, Italy).

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Mount Etna is a composite stratovolcano located along the Ionian coast of eastern Sicily. The frequent flank eruptions occurrence (at an interval of years, mostly concentrated along the NE, S and W rift zones) lead to a high volcanic hazard that, linked with intense urbanization, poses a high volcanic risk.

A long-term volcanic hazard assessment, mainly based on the past behaviour of the Etna volcano, is the basic tool for the evaluation of this risk. Then, a reliable forecast where the next eruption will occur is needed. A computer-assisted analysis and probabilistic evaluations will provide the relative map, thus allowing identification of the areas prone to the highest hazard. Based on these grounds, the use of a code such BET\_EF (Bayesian Event Tree\_Eruption Forecasting) showed that a suitable analysis can be explored (Selva et al., 2012).

Following an analysis we are performing, a total of 6886 point-vents referring to the last 4.0 ka of Etna flank activity, and spread over an area of 744 km<sup>2</sup> (divided into N=2976 squared cell, with side of 500 m), allowed us to estimate a pdf by applying a Gaussian kernel. The probability values represent a complete set of outcomes mutually exclusive and the relative sum is normalized to one over the investigated area; then, the basic assumptions of a Dirichlet distribution (the prior distribution set in the BET\_EF code (Marzocchi et al., 2004, 2008)) still hold. One fundamental parameter is the the equivalent number of data, that depicts our confidence on the best guess probability.

The BET\_EF code also works with a likelihood function. This is modelled by a Multinomial distribution, with parameters representing the number of vents in each cell and the total number of past data (i.e. the 6886 point-vents).

Given the grid of N cells, the final posterior distribution will be evaluated by multiplying the a priori Dirichlet probability distribution with the past data in each cell through the likelihood.

The probability hazard map shows a tendency to concentrate along the NE and S rifts, as well as Valle del Bove, increasing the difference in probability between these areas and the rest of the volcano edifice. It is worthy notice that a higher significance is still evident along the W rift, even if not comparable with the ones of the above mentioned areas.

### References

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