



Real time eruption forecasting during a volcanic crisis: BET_EF and the MESIMEX experiment

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We have developed a fully Bayesian method called BET_EF (Bayesian Event Tree for Eruption Forecasting), useful for computing and visualizing volcanic hazard and eruption forecasting. Physical and volcanological models, past data from Vesuvius and "analog" volcanoes eruptive history, and monitoring measures commonly taken at Vesuvius have been used to set up the parameters of the probabilistic model. BET_EF computes the different probabilities of interest in a possible volcanic crisis, like the probability of unrest, of magmatic unrest, of eruption, of the size of the impending eruption, and the spatial probability of vent opening given there is an eruption. BET_EF provides also the uncertainty associated to the probability estimates. We have applied the method in real time during the MESIMEX (Major Emergency Simulation Exercise) exercise, held in Naples during 18-23 Oct. 2006, in order to upgrade the probabilities of interest according to the evolving scenario assumed during the experiment. On purpose, no personal communication between the monitoring personnel or other people in Naples and our group running BET_EF in Bologna has occurred during the experiment. Thus, BET_EF results are based, regarding the input of monitoring data, only on the official communications published on MESIMEX web site in real time. No substantial correction has been made after the end of the experiment. This was the first time a quantitative volcanic hazard estimate in real time has been provided in Italy, based on all the available information including real time monitoring. Such quantitative estimates of volcanic hazard in real time might significantly help Civil Protection Authorities in managing a real volcanic crisis. For example, where stochastic simulations of mass evacuation and cost/benefit analysis are available, a probabilistic hazard assessment can quantitatively support Authorities in evacuation decision-making.