

EGU24-2811, updated on 26 Jan 2025

<https://doi.org/10.5194/egusphere-egu24-2811>

EGU General Assembly 2024

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Forecasting the evolution of volcanic unrest

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The management of volcanic unrest near densely inhabited areas requires collaboration between scientists, who are required to provide near real-time information, and decision makers. The ambiguity of pre-eruptive patterns and the inaccessibility and the complexity of the system lead to large uncertainties, suggesting the preference for probabilistic approaches over deterministic ones. The divergence of scientists' opinions regarding pre-eruptive phenomena can lead to extreme confusion, which inevitably translates into the difficulty of reaching an agreement for the optimal management of an emergency. Expert elicitation is a procedure for extracting a collective opinion in a relatively short time despite the incomplete knowledge of the problem and is therefore an effective tool for managing forecasts during volcanic crises in near real-time. In this work we present the results of the latest elicitation sessions at the Campi Flegrei caldera, represented by a list of weighted parameters with their respective thresholds that define the anomalous values and their interpretation, to calibrate BET_EF eruption forecasting model. Our aim is to re-calibrate it using the most recent scientific evidence linked to the increase of the activity of Campi Flegrei which has been observed in the last few years, evaluating the probability that the mechanism underlying the current unrest is a rise of magma, and the probability that this could lead to an eruption. Finally, we demonstrate a practical application showing the variation of the probability of magmatic unrest and eruption as a function of the variation of the values of the monitoring parameters obtained through the elicitation.