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Emergency preparedness: community-based short-term eruption forecasting at Campi Flegrei

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A key element in emergency preparedness is to define advance tools to assist decision makers and emergency management groups during crises. Such tools must be prepared in advance, accounting for all of expertise and scientific knowledge accumulated through time. During a pre-eruptive phase, the key for sound short-term eruption forecasting is the analysis of the monitoring signals. This involves the capability (i) to recognize anomalous signals and to relate single or combined anomalies to physical processes, assigning them probability values, and (ii) to quickly provide an answer to the observed phenomena even when unexpected.

Here we present a > 4 years long process devoted to define the pre-eruptive Event Tree (ET) for Campi Flegrei. A community of about 40 experts in volcanology and volcano monitoring participating to two Italian Projects on Campi Flegrei funded by the Italian Civil Protection, has been constituted and trained during periodic meetings on the statistical methods and the model BET_EF (Marzocchi et al., 2008) that forms the statistical package tool for ET definition. Model calibration has been carried out through public elicitation sessions, preceded and followed by devoted meetings and web forum discussion on the monitoring parameters, their accuracy and relevance, and their potential meanings. The calibrated ET allows anomalies in the monitored parameters to be recognized and interpreted, assigning probability values to each set of data. This process de-personalizes the difficult task of interpreting multi-parametric sets of data during on-going emergencies, and provides a view of the observed variations that accounts for the averaged, weighted opinion of the scientific community.

An additional positive outcome of the described ET calibration process is that of providing a picture of the degree of confidence by the expert community on the capability of the many different monitored quantities of recognizing significant variations in the state of the volcano. This picture is particularly useful since it can be used to guide future implementations in the monitoring network, as well as research investments aimed at substantially improving the capability to forecast the short-term volcanic hazard.