Long–term eruption forecasting at Ischia volcano

Laura Sandri[1], Lucia Zaccarelli[1], Sandro de Vita[2], Mauro Antonio Di Vito[2], Fabio Sansivero[2]

[1]Istituto Nazionale di Geofisica e Vulcanologia, Sezione di Bologna, Bologna, Italy, [2]Istituto Nazionale di Geofisica e Vulcanologia, Osservatorio Vesuviano, Napoli, Italy

E-mail: laura.sandri@bo.ingv.it

The island of Ischia, located in the Eastern side of the Gulf of Naples in Southern Italy, is a densely inhabited and highly touristic active volcano, characterized by effusive and explosive eruptions alternating with quiescent periods. The island undergoes a mechanism of caldera resurgence, and recent volcanic activity has been clearly influenced by the resurgence mechanism, although there is not a clear pattern in terms of eruption type or size.

In this study, we consider geological knowledge, represented by the volcano's past activity and observed deposits, to set up a Bayesian Event Tree for a long–term eruption forecasting. We try to (i) constrain the probability of next eruption in a given time interval, (ii) set up a spatial probability map for vent opening, and (iii) propose a classification of the possible eruptive types, quantifying their relative probabilities. In particular, for points (i) and (iii) we rely on the eruptive catalog available, and for point (iii) we also consider a more general frequency–size relationship.

For point (ii) we base our evaluation both on structural/morphological evidence, mostly related to the resurgence mechanism already proposed in the literature, and on the location of past eruptive vents. For all the above points, we pay a particular attention in keeping account of the uncertainty associated to our estimates, both of aleatory and epistemic types. Being a small island, a substantial source of epistemic uncertainty arises from the impossibility of constraining vent location and erupted volume from distal deposits (which are under the sea), while proximal ones are often buried by more recent lava flows, tephra layers or landslide deposits. In this respect, we take into account the different uncertainty on the inferred vent locations and erupted volumes of the different eruptions.

The resulting long–term eruption forecasting represents a quantitative probabilistic basis for a full Probabilistic Volcanic Hazard Assessment, that must necessarily account for the uncertainty in eruption occurrence, vent location and eruptive type and size.