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Developing an Event Tree for probabilistic hazard and risk assessment at Vesuvius

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Probabilistic characterizations of possible future eruptive behaviour of Vesuvius volcano are elaborated and organized within a risk-based framework. A wide variety of topics relating to this basic problem have been pursued: updates of historical data, collection of new fieldwork results, development of novel numerical modelling codes, and risk assessment techniques. To achieve coherence, many diverse strands of evidence had to be unified within a formalised structure, and linked together by expert knowledge. For this purpose, a Vesuvius 'Event Tree' (ET) has been created to summarise in a numerical-graphical form, at different levels of detail, all the relative likelihoods relating to the genesis and style of eruption, development and nature of volcanic hazards, and the probabilities of occurrence of different volcanic risks in the next eruption crisis. In order to achieve a complete parameterization for this all-inclusive approach, exhaustive hazard and risk models were needed, quantified with uncertainty distributions for all factors involved, rather than simple 'best-estimate' or nominal values. Thus, a structured expert elicitation procedure was implemented to complement more traditional data analysis and interpretative approaches. That process promoted clarity of thought and analytical debate, and has acted as a valuable catalyst for identifying the critical scientific issues associated with volcanic hazard and risk assessment at this volcano. The structure of the Vesuvius Event Tree is outlined, and some of the key data and analysis findings, which provide initial indicative probability distributions for calculations based on the tree, are summarized. The organization of the Event Tree will allow easy updating, as and when new information becomes available.