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HASSET: a probability event tree tool to evaluate future volcanic scenarios using Bayesian inference. Presented as a plugin for QGIS.

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Event tree structures constitute one of the most useful and necessary tools of modern volcanology to assess the volcanic hazard of future volcanic scenarios. They are particularly relevant to evaluate long- and short-term probabilities of occurrence of possible volcanic scenarios and their potential impacts on urbanized areas. Here we introduce HASSET, a Hazard Assessment Event Tree probability tool, built on an event tree structure that uses Bayesian inference to estimate the probability of occurrence of a future volcanic scenario, and to evaluate the most relevant sources of uncertainty from the corresponding volcanic system. HASSET includes hazard assessment of non-eruptive and non-magmatic volcanic scenarios, that is, episodes of unrest that do not evolve into volcanic eruption but have an associated volcanic hazard (eg. sector collapse and phreatic explosion), as well as those with external triggers as primary sources of unrest (as opposed to magmatic unrest alone). Additionally, HASSET introduces the Delta method to assess how precise the probability estimates are, by reporting a one standard deviation variability interval around the expected value for each scenario. HASSET is presented as a free software package in the form of a plugin for the open source geographic information system Quantum Gis (QGIS), providing a graphically supported computation of the event tree structure in an interactive and user-friendly way. We also include an example of HASSET applied to Teide-Pico Viejo volcanic complex (Spain).