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Single versus multiple scenarios to assess volcanic hazard of calderas: the example of Campi Flegrei

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The intrinsic uncertainty in vent location and size of next eruption strongly affects short- to long-term Volcanic Hazard assessment of calderas. Often, emergency plans are established accounting for the effects of one selected "reference scenario". By means of a new Bayesian tool, here we show that the selection of a single reference setting, defined assuming a single vent location and a single size for the eruption, introduces a significant bias on the Volcanic Hazard assessment, since most of the intrinsic sources of uncertainty are completely neglected. For the sake of example, we explore this issue by analyzing sort- to long-term volcanic hazard for tephra fall at Campi Flegrei, Italy. The results obtained clearly show that volcanic hazard based on the weighted average of all possible eruptive settings (i.e., size and vent locations) is significantly different from the analysis based on a single reference setting, as used in volcanic hazard common practice. Remarkably, the volcanic hazard maps for tephra fall at Campi Flegrei obtained here, accounting for the natural variability usually neglected, largely reduces the bias intrinsically introduced by the choice of a specific reference setting, i.e., the selection of a single reference scenario.