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Identification of objective representative scenarios for hazard assessment

Laura Sandri, Jacopo Selva, and Antonio Costa
Istituto Nazionale di Geofisica e Vulcanologia, Sezione di Bologna, Bologna, Italy (laura.sandri@bo.ingv.it)

Assessment of volcanic hazards is typically based on one or a few representative eruptive scenarios, meant as specific combinations of a representative eruptive size, intensity, and vent position, selected with subjective criteria neglecting the full intrinsic natural variability characterizing volcanic processes. In common practice, the size and intensity of such scenarios are taken as representative of wider ranges, here termed "size classes". The approach implicitly or explicitly assumes that the inter-size class variability (among different eruptive size classes) is predominant with respect to the intra-size class variability (i.e. the variability inside each range represented by an eruptive size and intensity), the latter assumed as negligible. So far, no quantitative study has been carried out to verify such an assumption.

Here, we first adopt a novel statistical strategy, that accounts for the full natural variability, to quantify the Probabilistic Volcanic Hazard Assessment for tephra fallout in the Campania area. Secondly, we compare the results of the new method with those based on few representative scenarios only. On one hand, such comparison allows for determining when the simplified approach is valid, and quantifying the bias introduced in hazard assessment when the full variability is not accounted for. On the other hand, this novel approach opens the way to an objective a posteriori identification of a limited number of representative scenarios, which are necessary when there is no possibility to explore the full variability, as for example for rapid hazard assessment during emergencies, or for short-term hazard assessment.