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Automatized near-real-time short-term Probabilistic Volcanic Hazard Assessment of tephra dispersion before eruptions: BET_VHst for Vesuvius and Campi Flegrei during recent exercises

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Probabilistic Volcanic Hazard Assessment (PVHA) represents the most complete scientific contribution for planning rational strategies aimed at mitigating the risk posed by volcanic activity at different time scales. The definition of the space-time window for PVHA is related to the kind of risk mitigation actions that are under consideration. Short temporal intervals (days to weeks) are important for short-term risk mitigation actions like the evacuation of a volcanic area. During volcanic unrest episodes or eruptions, it is of primary importance to produce short-term tephra fallout forecast, and frequently update it to account for the rapidly evolving situation. This information is obviously crucial for crisis management, since tephra may heavily affect building stability, public health, transportations and evacuation routes (airports, trains, road traffic) and lifelines (electric power supply).

In this study, we propose a methodology named BET_VHst (Selva et al. 2014) for short-term PVHA of volcanic tephra dispersal based on automatic interpretation of measures from the monitoring system and physical models of tephra dispersal from all possible vent positions and eruptive sizes based on frequently updated meteorological forecasts. The large uncertainty at all the steps required for the analysis, both aleatory and epistemic, is treated by means of Bayesian inference and statistical mixing of long- and short-term analyses. The BET_VHst model is here presented through its implementation during two exercises organized for volcanoes in the Neapolitan area: MESIMEX for Mt. Vesuvius, and VUELCO for Campi Flegrei.

References

Selva J., Costa A., Sandri L., Macedonio G., Marzocchi W. (2014) Probabilistic short-term volcanic hazard in phases of unrest: a case study for tephra fallout, J. Geophys. Res., 119, doi: 10.1002/2014JB011252