

## **Tephra fallout hazard assessment at Vesuvius: the effect of uncertainties on the wind and the eruption source parameters**

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In this study we investigate the effect of using different meteorological datasets and eruption source parameters on tephra fallout hazard assessment for a sub-Plinian eruption of Vesuvius, which is considered as a reference case for hazard assessment analysis of Vesuvius. We analyze the effect of using different meteorological data, from: i) radio-sounding carried out at the meteorological station of Brindisi (Italy) between 1962 and 1976 and between 1996 and 2012 and at Pratica di Mare (Rome, Italy) between 1995 and 2013; ii) meteorological models of the National Oceanic and Atmospheric Administration (NOAA) and of the European Centre for Medium-Range Weather Forecasts (ECMWF). Furthermore, we consider the effects of perturbing reference eruptive source parameters. In particular, we vary the total mass, the total grain-size distribution, the column height, and the effective atmospheric diffusion coefficient to evaluate how these parameters affect the hazard probability maps. Moreover, the effect of the seasonal variation of the wind field and the effect of the rain on the deposit loading are considered. Results show that the parameter that mostly affects hazard maps is, as expected, the total erupted mass; furthermore, keeping constant the erupted mass, the most important control on hazard is due to the particle terminal settling velocity distribution which is a function of the total grain-size distribution, particle density and shape. Within the considered range variations, the hazard depends less on the use of different meteorological datasets, column height and effective diffusion coefficient.