

## Probabilistic invasion maps of long-term pyroclastic density current hazard at Campi Flegrei caldera (Italy)

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Campi Flegrei is an example of active and densely urbanized caldera with a very high risk associated with the occurrence of pyroclastic density currents (PDCs) produced by explosive events of variable scale and vent location. The mapping of PDC hazard in such a caldera setting is particularly challenging not only due to the complex dynamics of the flow but also due to the large uncertainty on future vent location and the complex topography affecting the flow propagation. Nevertheless, probabilistic mapping of PDC invasion, able to account for the intrinsic uncertainties affecting the system, is needed for hazard assessment. In this study we present a variety of probabilistic PDC hazard maps of the Campi Flegrei area based on different invasion models and accounting for the uncertainty in vent opening and event size. Invasion models were based on simple empirical correlations derived by field reconstruction of past events, simplified one-dimensional models based on a linear decay of the flow energy (e.g. energy line), and correlations derived from 2D and transient numerical simulations of the flow dynamics. Field data referred mostly to the third epoch of activity of the volcano (i.e. last 5 kyr) although the analysis was extended to the last 15 kyr. In addition to the uncertainty affecting the vent location the probability invasion maps illustrate some of the uncertainties and features affecting the invasion models adopted. Results show that, consistently with field evidences, the central-eastern part of the caldera (i.e. Agnano-Astroni) is the area most exposed to flow invasion whereas values up to about 5-10