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The effect of the sea on hazard assessment for tephra fallout at Campi Flegrei: a preliminary approach through the use of pyPHaz, an open tool to analyze and visualize probabilistic hazards

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Campi Flegrei (CF) is a large volcanic field located west of the Gulf of Naples, characterized by a wide and almost circular caldera which is partially submerged beneath the Gulf of Pozzuoli. It is known that the magma-water interaction is a key element to determine the character of submarine eruptions and their impact on the surrounding areas, but this phenomenon is still not well understood and it is rarely considered in hazard assessment.

The aim of the present work is to present a preliminary study of the effect of the sea on the tephra fall hazard from CF on the municipality of Naples, by introducing a variability in the probability of tephra production according to the eruptive scale (defined on the basis of the erupted volume) and the depth of the opening submerged vents. Four different Probabilistic Volcanic Hazard Assessment (PVHA) models have been defined through the application of the model BET_VH at CF, by accounting for different modeling procedures and assumptions for the submerged part of the caldera. In particular, we take into account: 1) the effect of the sea as null, i.e. as if the water were not present; 2) the effect of the sea as a cap that totally blocks the explosivity of eruptions and consequently the tephra production; 3) an ensemble model between the two models described at the previous points 1) and 2); 4) a variable probability of tephra production depending on the depth of the submerged vent. The PVHA models are then input to pyPHaz, a tool developed and designed at INGV to visualize, analyze and merge into ensemble models PVHA's results and, potentially, any other kind of probabilistic hazard assessment, both natural and anthropic, in order to evaluate the importance of considering a variability among subaerial and submerged vents on tephra fallout hazard from CF in Naples.

The analysis is preliminary and does not pretend to be exhaustive, but on one hand it represents a starting point for future works; on the other hand, it is a good case study to show the potentiality of the pyPHaz tool that, thanks to a dedicated Graphical User Interface (GUI), allows to interactively manage and visualize results of probabilistic hazards (hazard curves together with probability and hazard maps for different levels of uncertainties), and to compare or merge different hazard models producing ensemble models.

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