Geophysical Research Abstracts
Vol. 14, EGU2012-4163, 2012
EGU General Assembly 2012

Assessing pyroclastic density current dynamics and hazard of Plinian events at Campi Flegrei (Italy) by using 3D numerical simulations

T. Esposti Ongaro (1), A. Neri (1), and M. Todesco (2)

(1) Istituto Nazionale di Geofisica e Vulcanologia, Sezione di Pisa, Pisa, Italy (augusto.neri@pi.ingv.it), (2) Istituto Nazionale di Geofisica e Vulcanologia, Sezione di Bologna, Bologna, Italy

Campi Flegrei is a densely populated widespread caldera located near the city of Naples. Current evaluation of volcanic hazard include the probable generation of pyroclastic density currents (PDC) produced by explosive events of variable size and uncertain vent location. In this study we investigate the dynamics and hazard of PDC produced by the partial collapse of the volcanic column by using the 3D transient multiphase flow model PDAC (Esposti Ongaro et al., Parallel Computing, 2007). The model allows to describe the temporal and spatial evolution of the stratified PDC by accounting for the multiparticle nature of the flow and the complex topography of the caldera. Employed eruptive intensity and pyroclast properties are representative of magmatic phases of the Agnano Monte Spina (AMS, 4100 BP) Plinian eruption, the largest explosive event of the last cycle of activity of the caldera. Eruptive centers are supposed to be located in the north-eastern part of the caldera, the area with the largest number of past vents. Several simulations were performed considering different collapsing regimes, flow conditions at the source and vent locations. Results illustrate the complex dynamics of flow propagation in the caldera settings and quantify the associated hazards. Fountain instabilities, recycling of collapsed material into the jet caused by the caldera walls, triggering of thermals and co-ignimbrite clouds by topographic reliefs, flow decoupling between dense and dilute streams, and generation of backflows are some of the processes simulated. The areas invaded by the PDC result affected by the inner topography of the caldera and therefore largely influenced by the assumed location of the vent. PDC result mostly confined by the outer caldera rims although they appear able to overcome Posillipo Hill and affect the eastern portions of the city of Naples. Comparisons with reconstructions of the AMS event are also discussed.