Geophysical Research Abstracts
Vol. 18, EGU2016-8081, 2016
EGU General Assembly 2016

Uncertainties in volcanic plume modeling: a parametric study using FPLUME model

Giovanni Macedonio (1), Antonio Costa (2), and Arnau Folch (3)

(1) Istituto Nazionale di Geofisica e Vulcanologia, Osservatorio Vesuviano, Napoli, Italy (giovanni.macedonio@ingv.it), (2) Istituto Nazionale di Geofisica e Vulcanologia, Sezione di Bologna, Italy, (3) Barcelona Supercomputing Center, Barcelona, Spain

Tephra transport and dispersal models are commonly used for volcanic hazard assessment and tephra dispersal (ash cloud) forecasts. The proper quantification of the parameters defining the source term in the dispersal models, and in particular the estimation of the mass eruption rate, plume height, and particle vertical mass distribution, is of paramount importance for obtaining reliable results in terms of particle mass concentration in the atmosphere and loading on the ground. The study builds upon numerical simulations of using FPLUME, an integral steady-state model based on the Buoyant Plume Theory, generalized in order to account for volcanic processes (particle fallout and re-entrainment, water phase changes, effects of wind, etc). As reference cases for strong and weak plumes, we consider the cases defined during the IAVCEI Commission on tephra hazard modeling inter-comparison exercise. The goal was to explore the leading order role of each parameter in order to assess which should be better constrained to better quantify the eruption source parameters for use by the dispersal models. Moreover, a sensitivity analysis investigates the role of wind entrainment and intensity, atmospheric humidity, water phase changes, and particle fallout and re-entrainment. Results show that the leading-order parameters are the mass eruption rate and the air entrainment coefficient, specially for weak plumes.