Geophysical Research Abstracts
Vol. 16, EGU2014-2732-1, 2014
EGU General Assembly 2014

Volcanic ash aggregation: experimental, field and theoretical investigations

Eduardo Rossi (1), Gholamhossein Bagheri (1), Sébastien Biasse (1), Costanza Bonadonna (1), Jean-Luc Falcone (2), Bastien Chopard (2), Piero Pontelandolfo (3), and Patrick Haas (3)

(1) Earth Sciences Department, University of Geneva, Geneva, Switzerland, (2) Computer Sciences, University of Geneva, Geneva, Switzerland, (3) CMEFE University of Applied Sciences Western Switzerland in Geneva, Geneva, Switzerland

Particle aggregation is considered as a key process that may affect dispersal and sedimentation of volcanic ash, with significant implications for the associated hazards. Most theoretical studies of particle aggregation have been based on the Smoluchowski Coagulation Equation (SCE), which describes the expected time evolution of the total grain-size distribution under the hypothesis that particles can collide and stick together following specific mathematical relations (kernels). Unfortunately these kernels are not very well understood and quantified. In particular, the probability of sticking is almost completely unknown and it can be described theoretically just in a very approximate way. We have carried out a set of experiments to investigate how the sticking efficiency varies as a function of particle size and velocity. Ash particles larger than 100 micron were suspended in a 4-meters high vertical wind tunnel and recorded in time with a high-speed camera. Filming the interactions of small particles and using a dedicated Particle Tracking Velocimetry software, sticking efficiencies were characterized based on the number of particles that formed aggregates in relation to the number of collisions. Experiments were repeated in order to have a good statistical significance and to cover different environmental conditions (temperature and humidity). We have also carried out field experiments during various eruptions at Sakurajima volcano (Japan) for the characterization of aggregates in situ in combination with high speed recordings and SEM studies. Experimental and field results were then merged with the theoretical framework (SCE) to study the time evolution of different initial grain-size distributions for different external conditions.