



Characteristics and impacts of recent ash falls produced by Tungurahua and El Reventador volcanoes, Ecuador

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Recent eruptions in the Ecuadorian Andes have generated notable volcanic plumes and ash fallout events that have severely impacted agricultural and urban activities in the Interandean valley. To investigate the relation between ash fall characteristics and their associated impacts, we studied dissimilar ash fall deposits that accumulated during two recent Ecuadorian eruptions. In August 2001, a relatively intense Strombolian episode at Tungurahua deposited an ash layer that affected livestock and agricultural resources to the west of the edifice. Through study of 90 ash thickness measurements and utilizing different calculation models from the literature, we estimated the bulk ash volume to be $\sim 6 \times 10^6 \text{ m}^3$. Grain-size and component data reveal various fractionation processes in the plume, including rain flushing (i.e. enrichment of fine particles in the deposit) and grain sorting linked to vesicularity (i.e. increased concentration of low-density grains with distance from source). Damage to houses, livestock and agricultural resources was mainly due to accumulation of wet ash and to acid rains during the three-week-long eruption episode. The large phreatomagmatic plume erupted on November 3, 2002 from El Reventador volcano deposited a low-density ash layer in the Interandean valley. Thickness measurements in the range 3 to 35 mm were obtained at ~ 65 sites and a calibration curve was set up from selected data to convert rain-compacted to non-compacted ash fall thickness values. In the studied thickness range, the decay rate shows no clear inflexion, suggesting that particles in general had similar settling behaviors. Bulk volume estimates for the ash fall layer prior to erosion is estimated at $3 \times 10^8 \text{ m}^3$. In the Quito area, the layer was mainly composed of medium to fine ash particles with about 20 % free crystals (work in progress). Remobilization of the ash during windy afternoons caused ocular irritations, as well as respiratory troubles and other health problems.