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Determining the volume of Pifo Pumice Layers, a major Plinian fall from Chacana Caldera – Ecuador

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The Pifo Plinian tephra layers is a large ash deposit and one of the most important stratigraphic markers in Northern Ecuador. Pifo layers erupted from the Chacana Caldera (Hall and Mothes, 2008) located at 40 km east of Quito (capital city). Its deposit was expulsed from an N-S aligned fracture system on the Cordillera Real´s crest and covered the central portion of Ecuador´s Sierra. Most outcrops are in the Northern Interandean Valley, between Ruminahui county to the south and Otavalo to the north and extend westward over the western Cordillera and beyond. Pifo deposits are marginally exposed on the coastal plain, near Manta. The tephra layers are associated with the Mullumica obsidian flows which have a fission-track age of ~0.17–Ma (Bigazzi et al., 1992). Recent attempts to date the Pifo´s groundmass with Ar/Ar and K/Ar methods have been unsuccessful.

The Pifo stratigraphic marker is a product of the Ecuadorian Rhyolitic Province (Mothes and Hall, 2008). It covers a broad area and thus can be used to provide relative dates for other associated volcanic units. The pumice-rich deposit is rhyolitic with 76 wt.% SiO_2 and 4.6 wt.% K_2O, and has a low crystal content of mainly biotite and plagioclase. The main body is cream/white to grey colored and it is easy to identify because the two layers are always tandem and thickness is often ≥ 3 m.

We are estimating the volume of this huge fallout deposit using the program TephraProb (Biass et al., 2016) that is designed to produce scenario–based probabilistic hazard assessments for ground tephra accumulation. This software is suitable for studying the Pifo falls because it uses the distribution of eruption source parameters based on a wide range of probabilistic eruption scenarios. Another important aspect of this work is that we have a database of more than two hundred field control points for thickness and particle size of the deposit.

Necessary input parameters were chosen from the scientific literature from analog volcanos like Valles Caldera, Cotopaxi, etc; determining similarities like eruptive dynamism, geochemical composition, clast density, and concentration.

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