

The role of a pre-eruptive fluid phase for the volatile budget and atmospheric influence of large explosive eruptions in Central America

Wednesday, 12 February 2020 09:18 (18 minutes)

Plinian eruptions inject gases, aerosols, and fine ashes into the stratosphere, potentially influencing climate. The amounts of volatiles emitted from such eruptions are typically estimated using the difference between contents in silicate melt inclusions formed at depth and those in the groundmass of glassy tephra (the so-called petrologic method). We have compared chlorine emission data obtained by the petrologic method from Plinian eruptions along the Central American Volcanic Arc (CAVA) from Kutterolf et al. (2013, 2015) with data obtained from magmatic fluid inclusions in the same samples.

The average composition of the pre-eruptive fluid phase from silicic CAVA eruptions amounts to 90 wt% water, 5 wt% CO₂ and 5 wt% NaCl equivalents, and show little systematic along-arc variations. The pressures obtained from the earliest fluid inclusions range between 150 and 400 MPa for the various eruptions. The occurrence of magmatic fluid inclusions provides evidence for pre-eruptive criticality of all volcanic systems at such pressures, and correspond to water contents in the magmas between about 4 and 8 wt% at depth. Taking into account the fluid phase salinity of each eruption, and assuming complete degassing during eruption, the chlorine budgets obtained from fluid inclusion data typically match very well those obtained by the petrologic method. For some eruptions, however, emissions of a pre-eruptive fluid phase may have significantly contributed to the volatile budget. Similar data from other large eruptions may be used to significantly revise the emission budgets.

Kutterolf S, Hansteen TH, Appel K, Freundt A, Krüger K, Pérez W, Wehrmann H (2013), *Geology*, doi:10.1130/G34044.1

Kutterolf S, Hansteen TH, Freundt A, Wehrmann H, Appel K, Krüger K, Pérez W (2015), *Earth Planet Sci Lett* 429: 234-246, doi:10.1016/j.epsl.2015.07.064

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Session Classification: Subsurface & Surface Processes

Track Classification: Subsurface & Surface Processes