The Masaya Triple Layer: A petrological approach to constraining the dynamics of an episodic, highly explosive basaltic Plinian eruption

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Basaltic volcanism is the most common style of volcanic activity on Earth. Low-viscosity basaltic magma enables efficient gas-melt seperation during magma ascent, producing dominantly effusive activity. However, the occurrence of several highly explosive basaltic Plinian eruptions challenges this model. Masaya caldera, Nicaragua, has produced 2 of the 4 examples of basaltic Plinian volcanism, presenting a unique opportunity to test diverse hypotheses of the triggering mechanism of this highly hazardous volcanic activity [1].

We present new insight into the evolution of the Masaya Triple Layer event (2.1 ka), aiming to constrain the pre and syn-eruptive conditions of an episodic basaltic Plinian eruption [2]. By combining EPMA analysis, MELTS and Raman spectroscopy, we can infer that magma was last stored at high tempeature and shallow pressure, with a maximum H_2O concentration of 2 wt.%. Skeletal, dendritic and hopper plagioclase and pyroxene morphologies dominate crystalline domains, evidence of rapid syn-eruptive crystallisation under disequilbrium conditions, supported by quantitative analysis of crystal size distributions. Extensive syn-eruptive crystallisation significantly increased magmatic viscosity during ascent, inducing a change in magma rheology Constraining the dynamics of the Masaya Triple Layer eruption is crucial for vulnerable populations living in proximity to a potentially highly explosive caldera, and furthers our understanding of the most poorly understood and hazardous expression of basaltic volcanism.

[1] Costantini. L. *et al.* (2009) *B. Volcanol*. **71**, 337-355. [2] Pérez. W. *et al.* (2009) *J. Volcanol. Geotherm. Res.* **179**, 191-205.