

A relationship between timing of mafic recharge and VEI at Popocatepetl volcano, Mexico?

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Popocatepetl volcano (Mexico) is an active stratovolcano whose eruptive activity ranges from effusive to Plinian. The VEI 6 Yellow Pumice (~2150 yrs BP) and VEI 4 Pink Pumice (~1100 yrs BP) eruptions, as well as the intermediate Nealticán lava produced andesites with a narrow compositional range (61 – 63 wt. % SiO₂) [1]. All three units preserve compositional and textural evidence for mafic recharge prior to eruptions, however Fe–Mg diffusion modelling in orthopyroxene suggests that timing, frequency and volume of mafic injections vary systematically. Nealticán lavas records only one injection <1 year and two further ones <100 years before the effusive eruption, whereas the Plinian events show a significantly higher frequency of magma injections in the decades preceding the eruptions. In the case of the Yellow Pumice, a series of mafic injections 2–20 years prior to the event are recorded, and timescales <1 year are rare. In contrast, the Pink Pumice shows a peak of multiple injections <1 year before the eruption.

These results suggest a link between the timing and frequency of magma recharge and the explosivity of ensuing eruptions. Specifically, a longer gap between mafic injections and eruptions appears to be related to a greater VEI. This has significant implications for the interpretation of present-day dome-building activity at Popocatepetl, which has been characterised as an essentially intrusive event ongoing for 25 years.

[1] Mangler et al. (2019), *Volcanica* 2(1), 45-72