

## **The ticking eruptive clock at Popocatepetl Volcano (Mexico): the 23-14ky eruptive sequence.**

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The timescales over which an explosive stratovolcano switches from low-to-moderate explosive activity to cataclysmic Plinian eruption are fundamental in understanding the eruptive behaviour and thus contributing to volcanic hazard assessment. Popocatepetl volcano in Mexico ranks high both in term of explosivity and threatend population (> 20 million, including Mexico City). It has had at least five major Plinian eruptions in the last 23 ky. These highly explosive events punctuate periods of quiescence and interplinian activity with effusive and Vulcanian eruptions – a pattern shown by many arc volcanoes.

El Fraile lavas erupted between 23 and 14 ky BP, prior to the Pumice with Andesite (PwA) Plinian eruption, the most powerful eruption at Popocatepetl. Macroscopic evidence of magma mingling are abundant both at El Fraile, with red and black lavas, and in the PwA, which shows mingled deposits and banded pumices. However, each eruptive sequence is very homogenous in term of whole rock major and trace elements and Sr and Nd isotope signature. El Fraile lavas are andesites and dacites with a narrow range of Sr and Nd isotope compositions. The PwA sequence is more mafic (basalt-andesite) with more variable Sr isotope ratios and lower  $\epsilon_{\text{Nd}}$ . All samples have similar paragenesis (phenocrysts of plagioclase, ortho- and clinopyroxene  $\pm$  amphibole). A complex population of pyroxenes textures is found in both eruptive events, namely: (i) single banded pyroxene with evolved cores and rims and mafic bands (El Fraile Mg-v 64-86, PwA Mg-v 73-86), and (ii) mafic and patchy cores surrounded by evolved rims. These pyroxene textures testify pulsatory intrusion of new mafic magma carrying mafic crystals and/or antecrysts. We applied the NIDIS chronometry (Bugatti et al., Gold. Abst. 2015 n 417) to suitable ortho- and clinopyroxene to constrain the timescale of refilling events at El Fraile and PwA. An order of magnitude difference in timescales between interplinian and Plinian events is evident. El Fraile interplinian activity points to a rapid/short magma resident time (days/months) similar to the present-day activity, whereas the building up of the PwA Plinian eruption occurred over longer magma storage timescales (tens of years).