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Magma fluxes and recurreance rate of eruptions at Nevado de Toluca volcano (Mexico)

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Forecasting the frequency and size of volcanic eruptions is a long-term goal for hazard mitigation. The frequency at which a given crustal magmatic system is driven towards a critical state and the magnitude of the resulting volcanic events are linked to the supply rate of fresh magma, crustal properties, and tectonic setting. Our ability to forecast the recurrence rate of eruptions is hampered by the lack of data on key variables such as the average magma flux locally and globally. The aim of this project is to identify the average magma supply rate and injection frequency for eruptions of different magnitude and eruptive style. We centred our study at Nevado de Toluca in Mexico, a subduction-related volcano with an eruptive history spanning about 1.5 million years of comparatively well documented effusive and explosive eruptions dominantly of dacitic composition. We carry out in-situ high precision zircon geochronology for a sequence of eruptions of different magnitude to obtain a distribution of crystal ages from which average crustal magma fluxes can be calculated. Eruptive fluxes will be constrained by extracting lava flow volumes from a digital elevation model. A combination of whole rock and mineral chemistry will provide quantitative insights on petrogenetic processes and on the frequency at which intensive parameters changed within the magma reservoir before the eruptions. Our results will be integrated in a global database including other volcanic systems and literature data to attempt to identify similarities and differences between magmatic reservoirs feeding volcanic eruptions of different magnitude. The final target of this project is to identify the physical factors controlling the recurrence rate of volcanic eruptions at regional and global scale.