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# How were crystallization pressures and temperatures affected by temporal and morphological changes in the last 2 Ma beneath Martinique Island?

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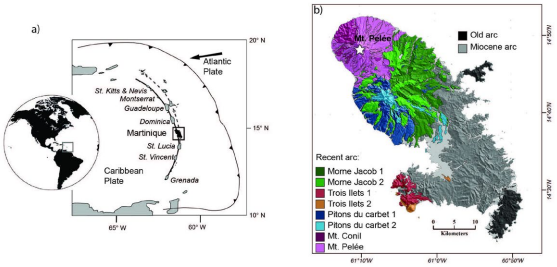


We calculated crystallization pressures and temperatures within reservoirs that fed recent (<2 Ma) eruptions along the western coast of Martinique Island. It is the first study that provides such insights for volcanoes other than Mt. Pelée on Martinique. Morne Jacob, Pitons du Carbet, Trois Îlets, and Mt. Conil – Mt. Pelée barely overlapped in space and time for the last 5 Ma. The northern volcanoes all experienced surface morphological changes associated with flank collapses followed by an increase in eruptive rate and more mafic magmas being emitted just after the collapse.

In this work, samples range from basalt to dacite, and from 2.11 Ma to 1929 AD. All samples contain plagioclase with distinct zoning patterns, as well as inclusion-rich zones, that reveal one or more crystal resorption events due to rapid temperature changes following injection of mafic magma and crystal mush remobilization. We identify plagioclase physical textures that are (1) normal, (2) oscillatory, (3) sieved, (4) resorbed core, and (5) resorbed rim. Anorthite content ranges from $An_{41}$ to $An_{96}$, and crystals compositional profiles are used in conjunction with the aforementioned textures to reveal dynamic processes that take place in deep to shallow plumbing systems. Plagioclase-liquid equilibrium temperatures range from 969 to 1072°C with water content of 3.1 to 6.5 $H_2O$ wt.%, similar to conditions measured for other Lesser Antilles volcanoes. Pyroxene-liquid temperatures and pressures are also in agreement with other estimates, and overall range from 964 - 1175°C and 0.1 – 8.2 kbar (0.04 - 32.3 km) for the whole island. More specifically, all four volcanoes have distinct crystallization depths in the lower and upper crust, with a crystallization gap in the upper middle crustal layer. Trois Îlets is the only complex that shows continuous crystallization through the entire crust. Additionally, we see drastic changes in terms of crystal population and chemical compositions in pre- and post-collapse lavas. Indeed, post-collapse eruptions mobilize crystals from deeper and more mafic regions than pre-collapse events. Our study provides context for a better understanding of plumbing system architecture, magma mixing, and crystal remobilization, in relation to surface changes such as flank collapse events.