



Shallow system rejuvenation and magma discharge trends at Piton de la Fournaise volcano (La Réunion Island)

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During April 2007, the largest historical eruption of Piton de la Fournaise (Île de La Réunion, France) drained the shallow plumbing system and resulted in collapse of the summit crater. Following the 2007 eruption, Piton de la Fournaise entered a seven-year long period of near-continuous deflation interrupted, in June 2014, by a new phase of significant inflation. By integrating multiple datasets (lava discharge rates, deformation, seismicity, gas flux, gas composition, and lava chemistry), we here show that the progressive migration of magma from a deeper (below sea level) storage zone gradually rejuvenated and pressurized the above-sea-level portion of the magmatic system to provoke four small ($<5 \times 10^6$ m³) eruptions from vents located close to the summit cone. Progressive increase in output rate between each eruption culminated, with the fifth, longest-lasting (August-October 2015) and largest-volume ($45 \pm 15 \times 10^6$ m³) eruption of the cycle. Activity observed in 2014 and 2015 points to a phase of shallow system rejuvenation and discharge, whereby continuous magma supply provoked eruptions from increasingly deeper and larger magma storage zones. Downward depressurization continued until unloading of the deepest, least differentiated magma triggered an “effusive paroxysm” that emptied the main shallow reservoir and terminated the cycle. Such an unloading process may characterize the evolution of shallow magmatic systems at other persistently active effusive centers.