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The “adventive cones” of Piton de la Fournaise volcano (La Réunion, Indian Ocean). Anomalous compositions.

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Piton de la Fournaise (PdF), the youngest volcano of La Réunion, is among the planet’s most productive volcanoes. Its current activity is located mainly within the “Enclos Fouqué” caldera, however there are also approximately one hundred strombolian cones, dating from Recent (few tens of years) to c. 300 ka on the volcano’s flanks: the “adventive cones” of this study. Most PdF lavas can be subdivided into “Steady-state Basalts” (SSB) and “olivine-rich basalts” (formerly known as oceanites). These are characterized by CaO/Al_2O_3 of ratios of ~0.8 and MgO contents of 5 - 30 wt.% reflecting varying degrees of olivine accumulation. In contrast, adventive cone lavas tend to have distinctive compositions, with CaO/Al_2O_3 ratios as low as 0.5 at MgO contents of 5 - 9 wt.%.

Following Boudoire et al. [1], we have geographically grouped adventive cone samples by distinguishing Central, Peripheral and Outer Peripheral cones located in the Enclos Fouque and along the North-West Rift Zone (NWRZ), while South Flank cones form an alignment sub-parallel to the NWRZ but located on the south flank of PdF. Petrographically, our samples are grouped into three categories: aphyric, cxp-bearing and ol-bearing.

Sr, Nd, Hf and Pb isotope data exhibit no obvious variations with geographical designations however there are trends with petrographic groups. Aphyric and cpx-bearing samples fall on relatively tight arrays with ol-bearing samples more broadly scattered to both more and less radiogenic Sr and Nd isotopic compositions and to less radiogenic Pb isotopic compositions. Numerous isotope – trace element ratio correlations also exist for aphyric (± cpx-bearing) samples (e.g., $^{87}Sr/^{86}Sr$ v. Zr/Nb; $^{176}Hf/^{177}Hf$ v. Ba/Th, $^{206}Pb/^{204}Pb$ v. Ba/Nb) while the ol-bearing samples are again more broadly scattered.

These relationships are consistent with aphyric and cpx-bearing lavas sampling variable proportions of two source components that are found over a wide geographic area beneath Piton de la Fournaise. The compositional scatter introduced by ol-bearing lavas is suggested to result from interaction of rising aphyric (±cpx) melts with an olivine-rich mush zone and their contamination by both olivines and associated interstitial melts.

[1] Boudoire et al. (2019), *Journal of Petrology* 60, 1717-1752.