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Geochemical characteristics of the "Mid-Alkaline Basalts" from the "adventive cones" of Piton de la Fournaise volcano (La Réunion Island)

Marina Valer (1), Patrick Bachèlery (1), Pierre Schiano (1), and Brian G. J. Upton (2)

(1) Blaise Pascal University - Clermont-ferrand, Laboratoire Magmas et Volcans, France (m.valer@opgc.univ-bpclermont.fr), (2) School of GeoSciences, University of Edinburgh, Edinburgh EH9 3JW, UK

Piton de la Fournaise, the youngest volcano of La Réunion Island, is renowned for being frequently active. Its lavas (younger than ∼450 ka) have been subdivided into three compositional groups (see Lénat et al. 2012 for a review). Almost all recent and historical lavas belong to two of these groups: "cotectic basalts" and "olivine-rich basalts", marked by a constant $CaO/Al2O_3$ ratio of ∼0.8, and MgO content ranging from 5 to 30 wt % reflecting different degrees of olivine accumulation. Whereas that current activity is mainly located within the "Enclos Fouqué" caldera, ∼100 strombolian cones lie on the volcano's flanks, thought to date from ∼300 years to a few thousand years. Our study focuses on these "adventive cones", by studying bulk-rock major and trace element compositions, isotopic compositions, mineral phases and olivine-hosted melt inclusions. The bulk-rock compositions correspond to the third group of the Piton de la Fournaise lavas (see above), called the "mid-alkaline basalts". They mainly consist of magnesian basalts at 7.55 - 10.24 wt% MgO and $CaO/Al2O_3$ values down to 0.55. At constant MgO content, this group shows higher alkali content and a relative deficiency in Ca compared to the historic basalts. The "adventive cones" lavas usually contain magnesian olivine crystals (Fo > 86). Such crystals are not at the equilibrium with their host lava, raising thus the question of the recycling processes. The volatile contents of these olivine-hosted melt inclusions (work in progress) will allow to determine if such magnesian olivine crystals come from deep storage levels, as previously proposed by Bureau et al. (1998; 1999). The specific geochemistry the "adventive cones" lavas is attributed either to a high-pressure fractionation of a clinopyroxene-rich assemblage (Albarède et al. 1997), or to an assimilation process involving wehrlite-gabbro cumulates (e.g. Salaün et al. 2010). Although the trace element data show that the source of these magmas is chemically homogeneous to that of current magmas, the isotopic compositions of the lavas (work in progress) will be necessary to constraint potential source heterogeneities. In any case, the presence of the magnesian olivine crystals, as well as the dunitic, wherlitic and gabbroic cumulates in the "adventive cones" suggests that the ascent of these magmas clearly bypasses the current reservoirs, especially the shallow magma chamber.