



Magma chamber history related to the shield building stage of Piton des Neiges volcano, La Réunion Island

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Piton des Neiges volcano (La Réunion hotspot) experienced a long-lasting shield building stage before entering its degenerative stage 0.4 my ago. The deep edifice incision due to the intense tropical erosion allowed the description for several decades of a layered gabbroic complex interpreted as a piece of magma chamber, which has been tectonically displaced (Chevallier & Vatin-Perignon, 1982; Upton & Wadsworth, 1972).

Here, we combine field investigations, petrographic, mineralogical, geochemical and anisotropy of magnetic susceptibility (AMS) studies to constrain the spatial distribution of the plutonic complex, to identify the physical and chemical processes and to integrate this complex in the evolution of Piton des Neiges (PdN). Field investigations allowed us to discover three additional massifs of gabbro and peridotite along the Mât River. The four massifs are overlaid by a pile of basic sills and a breccia interpreted as a debris avalanche deposit. Albeit spatially disconnected, the massifs show a relatively constant dip of the magnetic foliation toward the current summit of the volcano (i.e. toward the SSE). The two massifs cropping in the upper Mât River are exclusively composed of massive dunite and wherlite units with a cumulate texture and no visible dynamic structures. The two massifs located in the lower Mât River are made of olivine-gabbro, ferrogabbro and gabbro showing numerous flow structures and synmagmatic faults that indicates instabilities which trend NNW-SSE. Minerals (olivine, clinopyroxene and oxide) present primitive compositions in the two upper massifs and slightly differentiated ones in the lower massif.

Given the consistency of our dataset, we propose that the four massifs correspond to outcrops of a unique chemically stratified magma chamber, whose center would have been located about 4 km North of the current summit of PdN. The existence of an initial PdN, North of the current edifice, is supported by morphological reconstruction, gravimetric data (Gailler & Lénat, 2012) and submarine sedimentation (Lebas, 2012). It would have been built prior to 2 Ma and subsequently experienced a large north-directed destabilization. The PdN volcano later reconstructed south of the initial magmatic centre.

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