Geochemical and Petrologic attributes of the PX1 Miocene pyroxenitic layered intrusion, root-zone of an ocean-island volcano, Fuerteventura (Canary Islands).

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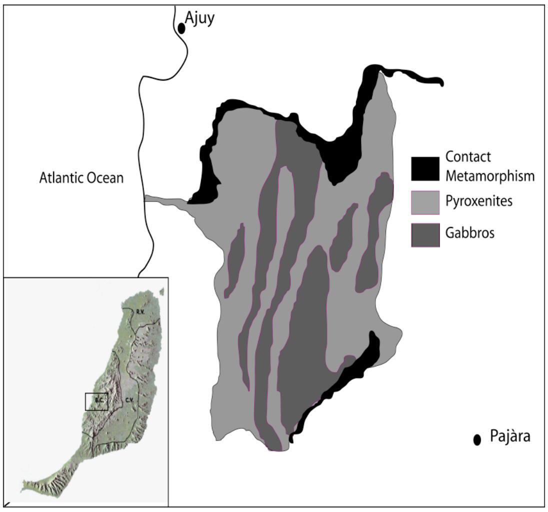
Fuerteventura is the easternmost island of the Canary archipelago, lying about 100 Km west of the Moroccan coast. This island allows direct observation of the hypabyssal root zone of an ocean island volcano, which is best illustrated in its uplifted Basal Complex Unit. This complex is composed of oceanic sediments of Mesozoic and Cenozoic age and records a remarkable magmatic activity, characterized by the intrusion of numerous magma batches as small plutons, dykes, dyke swarms and ring-dyke complexes of alkali-gabbros, pyroxenites, syenites and carbonatites. This alkaline-carbonatitic magmatism took place in short spanned episodes clustered around 26-20Ma (Muñoz et al., 2005) in a WNW-ESE transtensive dextral tectonic regime. The tectonic control of the magmatic intrusions is well illustrated by an extremely dense (up to 100% of the outcrop) dyke swarm, emplaced in-between and after the different magmatic pulses.

This study focuses on a specific gabbro-pyroxenite intrusion, called PX1 or Pajàra, which displays a remarkable magmatic layering. The layering is vertical, without gravitational component, NNE trending, parallel to the general tectonic trend and dyke swarm, which suggests a tight dependence on the regional NW-SE transtensional dextral stress field. This tectonically-controlled vertical magmatic layering can be seen at all scales. On the intrusion scale (Fig.1), 100m-wide alternating horizons of gabbros and pyroxenites are clearly noticeable and were generated by successive magma pluses injected into a progressively widening dyke system. At sample scale, the compositional layering is underlined by syn- to late-magmatic compaction and shearing, which generated schistosity in the pyroxenites and banding in the gabbros.

Variations in rock types are identical from one gabbro-pyroxenite horizon to the next and can, on a smaller scale, also be seen in smaller sequences (on a metric and centimetric scale). On a large scale, rock facies variation is symmetrical around a main gabbroic horizon that is non cumulative in its central part. As seen in Fig. 2, the two end-member facies are non-cumulative gabbro and olivine-rich clinopyroxenite. These are separated by different rock types derived from these two extreme compositional modes, from pure clinopyroxenite to plagioclase-rich clinopyroxenite. A preliminary mineralogical study of clinopyroxenes shows different core/rim crystal zonings from one micro-horizon to the next, revealing chemical variations linked to fractionation and to the existence or non-existence (due to compaction-linked expulsion) of trapped liquids and/or localised magma replenishment as expected in a multiple-pulsed system.

Preliminary results for whole-rock major- and trace-element analysis do not allow us to estimate the effects of residual trapped liquid on cumulate-mineral crystallising in this pluton. However incoming data should allow us to estimate these effects following Cawthorn's (1996) method. Pb, Sr and Nd isotopic determinations on non-cumulative gabbros and separated clinopyroxenes are under way; they will allow characterization of the initial magmatic source and possibly its evolution during the build up of the PX1 pluton. Hoernle et al. (1991) and Demény et al. (2004) have shown the influence of an enriched mantle component and possibly of a depleted mantle component on the HIMU hotspot source responsible for Canary Island volcanics.



· Fig. 1. Geological map of the Px1 gabbro-pyroxenite pluton. Modified from A. Hobson (unpublished).

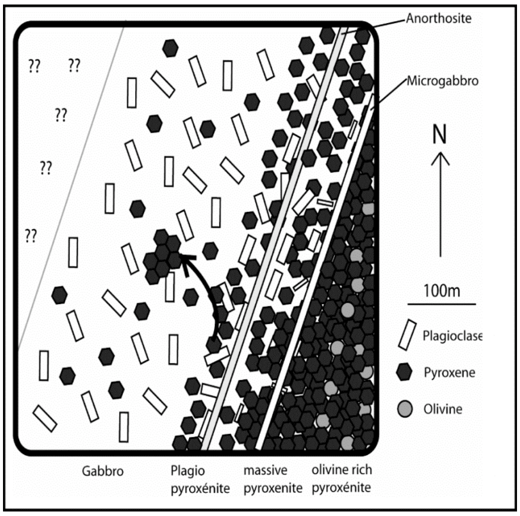


Fig. 2. Schematic drawing of the rock type variations found within PX1 micro-horizons.

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