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Modelling of in-situ crystallisation processes in 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 and 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 intruded by numerous magmatic plutons, 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 in a NNE-SSW transtensive dextral tectonic regime, as shown by an extremely dense contemporaneous dyke swarm.

The PX1 gabbro-pyroxenite intrusion displays a remarkable vertical magmatic layering. This vertical layering shows no gravitational component and is NNE trending, parallel to the general tectonic trend and dyke swarm, which suggests a tight dependence on the regional stress field. This tectonically-controlled vertical magmatic layering can be seen at all scales. On the intrusion scale 100m-wide alternating horizons of gabbros and pyroxenites are noticeable and were generated by successive magma injections 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 metric and centimetric sequences. On a large scale, rock facies variation is symmetrical around a main gabbroic horizon. Compositional variations span from olivine-rich clinopyroxenite to pure clinopyrox-

enite and plagioclase bearing clinopyroxenite and non-cumulative gabbro. EPMA and LA-ICPMS studies of clinopyroxenes show different core/rim crystal zonings from one micro-horizon to the next, revealing chemical variations linked to fractionational cristallisation and to the existence or non-existence of trapped liquids and/or localised magma replenishment as expected in a multiple-pulse system.

Whole-rock incompatible trace-element contents show large variations and poorly correlate with major element compositions. These features are characteristic of in-situ crystallisation with variable amounts of interstitial trapped liquid (L). Quantitative modelling based on Langmuir's equation and using REE concentrations in mineral phases shows that the latter underwent re-equilibration with interstitial melts. The calculated amounts of L are 30 to 35% for gabbros and correlate well with the proportion of interstitial amphibole in studied samples. The calculated amounts of fractionation (F) relative to a primary magma are less than 10%, which confirms the efficiency of convection in this periodically replenished magma chamber.

Discordant dikelets of highly differentiated anorthosites are interpreted as intercumulus liquids expelled by compaction of the crystallizing mush in relation to the repeated injection of magma batches in the dyke system.