Geophysical Research Abstracts,
Vol. 10, EGU2008-A-09857, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-09857
EGU General Assembly 2008

The role of assimilation and mixing in differentiation of post-collapse lavas on Tenerife, Canary Islands

S. Wiesmaier (1), V. R. Troll (1), G. L. Hart (2), R. Ellam (3), J. C. Carracedo (4) and J. A. Wolff (2)

(1) Dept. of Geology, Museum Building, Trinity College Dublin, (2) Now at University of Uppsala, Uppsala, Sweden, (3) School of Earth and Environmental Sciences, Washington State University, Pullman, WA, USA, (4) Scottish University Environmental Research Centre SUERC, East Kilbride, Scotland, UK, (5) Estacion Volcanologica de Canarias, Inst. Productos Naturales (CSIC), 38206 La Laguna, Tenerife (wiesmais@tcd.ie)

Lavas from the central Teide/Pico Viejo complex (TPV) show a small but significant difference in major and trace element concentrations and REE patterns when compared to lavas erupted from Tenerife's distal rift zones. This work aims to constrain the reason for this chemical discrepancy in two parts: the analysis of lava flows from the most recent succession ($<$200ka) on **a)** the $^{87}Sr/^{86}Sr$ of plagioclase crystals and **b)** the Pb isotope groundmass compositions. Our results suggest that a degree of internal recycling is pronounced in the central part of the island.

1. To constrain the types of differentiation processes at work, we employed a micro-analytical approach that served to resolve each feldspar crystal's prolonged crystallisation history. LA-MC-ICPMS yielded a stratigraphy of $^{87}Sr/^{86}Sr$ over core-to-rim profiles of single phenocrysts, i.e. a 'timeline' of the magma's isotopic evolution. Our wide-scale approach that encompassed 64 lava flows, 15 of which gave suitable plagioclase crystals, allowed us to detect variations in Sr ratio previously not detected within single feldspar crystals from Tenerife youngest lava flows. From the 111 plagioclases analysed, ten crystals yielded significant variation in $^{87}Sr/^{86}Sr$ as evidence for the activity of differentiation mechanisms such as assimilation and/of mixing of isotopically distinct components. In some crystals, these isotopic variations showed a simultaneous

change in the An content of the individual zones analysed, in others they did not. In contrast to central complex lavas, the variations in rift zone lavas and their feldspars are not significant, hence assimilation/mixing is far less pronounced there.

2. To further constrain the type of material assimilated/mixed, the analysis of groundmass Pb isotope ratios from 64 lava flows yielded two trends within the sample set where lavas from the central complex show variation in $^{207}Pb/^{204}Pb$ only and rift zone lavas in both $^{206}Pb/^{204}Pb$ and $^{207}Pb/^{204}Pb$. The data range from 19.5050 - 19.8142 $\pm$ 0.0009-0.0017 for $^{206}Pb/^{204}Pb$, 15.5288 - 15.6456 $\pm$ 0.0002-0.0015 for $^{207}Pb/^{204}Pb$ and from 39.4490 – 39.6371 $\pm$ 0.0025-0.0046 for $^{208}Pb/^{204}Pb$. Rift zone lavas appear to be influenced strongly by their respective underlying shield volcanoes whereas TPV lavas experienced assimilation of central pre- and syn-collapse lavas. Notably, trends do not point towards sediment assimilation, in contrast, internal recycling appears to be the key assimilation factor.

Results from the work on feldspar crystals suggest that assimilation and/or mixing are at work in differentiation of Tenerife's lavas and that these processes are much more pronounced in the centre of the island relative to the associated rift zones. Pb isotope ratios corroborate this contrast and additionally suggest internal recycling of (possibly hydrothermally altered) island's core as opposed to sediment assimilation.