

The Terceira Rift, Azores: a melt inclusion study of submarine lavas

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The Azores plateau, a bathymetric high, is seated on an anomalous mantle domain located in the Azores Triple Junction where the American, EUR and AFR lithospheric plates meet. The cause for these anomalies is controversial but many authors consider the presence of an anomalously hot/wet enriched mantle probably supplied by a plume [3]. The origin, size and present location of the plume is under debate but an area near Terceira is the favoured plume centre [2]. The Terceira Rift (TR) defines the EUR/AFR plate boundary of the Azores triple junction. The TR is a 550 km long, generally ESE trending line of volcanic massifs along the axis (e.g. São Miguel, D. João de Castro, Terceira and Graciosa) alternating with deep basins (e.g. Hirondelle basin) interpreted as volcanically unfilled rift valley segments [3]. Vesicular, porphyritic basalts were sampled along the Terceira Rift during Portuguese scientific cruises (EMEPC 2007-2009). Initial studies focused on the adjacent areas Don João de Castro - DJC (submarine volcano) and Hirondelle - Hir (basin). Major and trace element data of phenocrysts (olivine, clinopyroxene, plagioclase), groundmass and exposed melt inclusions found in these vesicular lavas depict only slight differences between the two sites. DJC samples depict higher Fo and Mg# in olivine and clinopyroxene, respectively. Chondrite-normalized REE data indicate that groundmass material is LREE-enriched in both Hir and DJC lavas. Exposed melt inclusions (MI) show similar REE patterns compared to their hosts. Clinopyroxene in both sites display L-MREE enriched, HREE depleted sinusoidal patterns. MI were found in olivine, clinopyroxene and plagioclase phenocrysts. MI are glassy to completely opaque and devitrified, with one or more bubbles, and sulfide globules (SG). SG are spherical, depict two-phase lamellar intergrowths of Fe-Ni and Cu-Fe phases, and are ubiquitous in DJC and Hir lava samples. Some lavas display SG within clinopyroxene-hosted MI and dispersed in the groundmass. Preliminary data suggest that lavas found in these areas of the Terceira Rift were sulfur-saturated in different stages of their evolution; during early fractionation and prior to eruption. The geochemistry of melt inclusion will contribute to the understanding of mantle source, melting and mixing processes in the Terceira Rift, Azores.

[1] Asimow et al. (2004) *Geochem. Geophys. Geosyst.* **5**, Q01E16,

[2] Jean-Baptiste et al. (2009) *EPSL* **281**, 70-80.

[3] Vogt (2004) *EPSL* **218**, 77-90.