



Extensional forces in intraplate magmatism: constraints from Faial Island, Azores

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The Azores archipelago formed by the influence of both an intraplate melting anomaly and a system of ultra-slow spreading rift axes. The majority of recent submarine and subaerial eruptions in the Azores occur along volcanic rift zones and thus, rates and pathways of magma transport, as well as magmatic processes, are likely being controlled by lithospheric extension [1]. We present new geochemical, petrological and geophysical data providing insights into the interaction between a melting anomaly in the asthenosphere and extensional forces in the lithosphere. New bathymetric data displays that much of the volcanic activity related to the island of Faial occurs submarine. The submarine volcanic rift zones on the western flank of Faial island were the focus of RV METEOR cruises M113 and M128. Major element compositions, incompatible trace element ratios (e.g. Nb/Zr, Sm/Nd) and Sr-Nd-Pb isotope ratios of lavas from the recently active Capelinhos rift differ from those of the inactive Condor de Terra rift some 14 km further south. Lavas from the Capelinhos rift zone are chemically and structurally similar to the youngest subaerial lavas from Faial. The older subaerial lavas on Faial were erupted from the central volcanoes which are chemically and structurally distinct to the submarine rift zones. On the basis of absolute ages [2, 3], seismic imagery, and direct observations of submarine lava formations at Capelinhos we develop a relative chronology of the magmatic evolution of the rift zones. We can show that the conditions of melting varied with time and fed distinct volcanic rift zones and larger volcanic edifices. Our model implies that dikes efficiently transport melts along the volcanic rift zones at Faial over length scales of >12 km while plumbing systems orthogonal to the rift axes are distinct over a similar length scale. As progressive changes in the plume upwelling occur, the composition of lavas and their spatial distribution progressively change. As a result, extensional structural processes become more important in the distribution of lavas in the last 10 ka exclusively erupting along fissures, alignments of elongated cones and dikes all showing a preferred WNW-ESE orientation. These observations may also be applicable to other intraplate settings that have a significant tectonic component.

[1] Galipp et al. (2006) *JVGR* 155(3-4), 285-306. [2] Beier et al. (2015) *GSA Special Papers* 511, 27-55. [3] Hildenbrand et al. (2012) *JVGR* 241, 39-48.