

Constraining the nature of the western Azores mantle source using Pb-Hf-Os isotope systematics

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Basalts from the Azores islands in the central North-Atlantic provide an opportunity to investigate the composition of the deeper mantle brought to the surface by the Azores plume. Here, we present Hf, Pb and Os isotopes in geochemically well-characterised primitive lavas from the Azores islands. New data are presented from the islands Flores and Corvo, which are situated west of the Mid-Atlantic ridge (MAR), in addition to several submarine lavas from the far west of the Azores plateau.

The location of Flores and Corvo furthest from the inferred Azores plume is geodynamically not well understood. Radiogenic isotopes allow constraining the source composition of the Flores and Corvo lavas and allow comparison with the islands east of the MAR. Their ¹⁷⁶Hf/¹⁷⁷Hf and ²⁰⁶Pb/²⁰⁴Pb isotope ratios range from 0.282957 to 0.283069 and from 19.5166 to 19.7799, respectively, whilst ¹⁸⁷Os/¹⁸⁸Os isotope ratios range to subchondritic ratios, from 0.13970 to 0.12485. We show that, at Corvo and Flores to the west of the MAR, an enriched mantle component is present that is similar to enriched mantle underneath the eastern islands. Yet, the highly enriched, EMII-type component found on São Miguel is absent in the western lavas.

However, simple mixing of a common Azores plume component with the local depleted mantle fails to fully explain the observed isotope-trace element relationships. Differences in Nb/Zr and Ta/Hf between islands east and west of the MAR indicate the presence of an additional mantle component that is largely absent in the east, or, that unusual conditions during partial melting prevail. The latter may promote pronounced fractionation of Zr and Hf from Nb and Ta, respectively. Interestingly, a similar enrichment of Nb-Ta over Zr-Hf has been observed in MORB from the MAR to the south of the Azores plateau [1], suggesting that this signature of the high field strength elements may be a feature of the regional north Atlantic mantle or that conditions during partial melting in ridge and plume-related settings can produce these unusual trace element signatures.

[1] Gale *et al* (2011), *Geochem Geophys Geosyst.* **12** (6).

A new insight of the role of the fluids below Victoria Land (Harrow Peaks, Antarctica)

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This contribution presents a mineralogical and petrological study of a new mantle xenoliths population NE of Harrow Peaks (HP, 74 02.785S 164 47.466E, q. 335m). Xenoliths are entrained in Cenozoic alkaline dykes and necks intruding consolidated tufaceous sediments. They are mainly amphibole-bearing spinel harzburgites and lherzolites similar to those found at Baker Rocks [1]. The xenoliths range from protogranular to porphyroclastic and granoblastic in texture with a medium to coarse grain size. Mg [MgO/(MgO+FeO) mol%] of primary olivine and orthopyroxene range from 86.6 to 89.5 and from 87.8 to 90.5 respectively. The high Ni contents of olivine (NiO 0.31-0.46 wt%) associated with low mg values of a few harzburgites and lherzolites would suggest Fe enrichment in this mantle domain. Metasomatic textures are widespread with amphibole and phlogopite as newly formed hydrous (metasomatic) minerals. The former occurred both disseminated and in veins whereas phlogopite is found only as tiny disseminated crystals.

X-ray powder diffraction quantitative analyses by Rietveld method were performed to determine modal composition, including amorphous phases. Moreover a detailed crystal-chemical study was developed on amphibole by means of single crystal X-ray diffraction and in-situ major and trace element (including volatiles) analyses. Among the peridotite phases amphibole is the main volatile acceptor and its study contributes to decipher the role of water circulation during metasomatic process and its effects in controlling the mantle redox conditions. Amphiboles are paragonite in composition, with partial vacancy in A site and M4 site disordered with presence of Ca, Na and Fe²⁺. Relatively low concentration of Ti (Ti ≤0.35 a.f.u.), as well as structural data of M1 site, testify that amphibole was crystallized in a low aH₂O environment [2]. Taking into account that amphiboles is equilibrated with the anhydrous parageneses (at least for Fe/Mg and Ti), aH₂O will be constrained by the degree of amphiboles dehydrogenation, as well as by the water content in coexisting nominally anhydrous phases (olivines and pyroxenes).

[1] Coltorti *et al* (2004), *Lithos* **75**, 115-139; [2] Bonadiman *et al* (2013) CMP submitted.