Multi-variate analysis of elemental data from the Azores archipelago and Great Meteor seamounts

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Several dredge operations were sucessfully performed during the cruise EMEPC/Açores/G3/2007 along a track from the Azores to the Great Meteor seamounts covering also Plato and Hyeres seamounts. The recovered basaltic rocks are alkaline displaying mainly porphyritic textures with variable vesicularity and olivine, clinopyroxene ± plagioclase phenocrysts. Most samples contain thin veins or vesicles filled with calcite and/or zeolites and careful sample preparation was carried out to exclude low-temperature alteration signature on geochemical data. Following [1] incompatible element ratios (X/Th) were used to be compared with data from the Azores archipelago (GEOROC database) using Principal Component Analysis. Results show a coherent relationship between unaltered basalts from seamounts and those from the Azores Islands and supports previous models based on geophysical data linking these seamounts to the Azores hot spot activity during the last 85 Ma (e.g. [3]). However, the origin of the Azores hot spot is still strongly debated as a consequence of the high variablity in radiogenic isotopic ratios obtained for basalts from the Azores Islands. It is expected that isotopic analysis on samples from the Great Meteor seamounts will shed light on mantle source evolution and oceanic intraplate volcanism.

[1] Allègre *et al.* (1995) EPSL **129**, 1-12. [3] Gente *et al.* (2003) **G3 4**, 1-23. [6] Schilling (1975) EPSL **25**, 103-115.

Enriched geochemical reservoirs in D''? Constraints from the Earth's core thermal and magnetic evolution

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Earth's magnetic field history, as recorded by rocks, places constraints on the heat flow across the core-mantle boundary (CMB). The geochemistry of the lowermost mantle and the transport properties in this region can affect the thermal processes in the core, and implicitily the generation of magnetic field. If the heat flux across the CMB is high, vigorous convection takes place in the core and maintains the geodynamo process. If the heat flux is low, convection in the core is insufficient to maintain a magnetic field. We analyze the effects of the presence of hidden reservoirs of incompatible elements, enriched in radioactive elements, that may be present in the CMB region [1, 2] in the framework of numerical simulations and couple the numerical output to a set of conservation equations in the core. Our analysis focuses on the presence of additional internal heating in a 200-Km layer in the D'' region, and considers both convection and thermal conduction mechanisms of heat transport in this layer. We use a 2D axisymmetric numerical model for the mantle and we couple the CMB temperature output to energy and entropy evolution models in the core. Our results show that from a geomagnetic perspective, succesful scenarios can be constructed with low rates (up to 3-4TW) of additional internal heating in D'', with a trade-off between the efficiency of heat transport and the rate of additional heating. Lastly, we consider mixed scenarios in which a basal, stagnant layer, enriched in incompatible-elements may be later entrained in the whole mantle convection.

[1] Boyet & Carlson (2005). [2] Tolstikhin & Hofmann (2005).