Study at the nanoscale of the alteration of submarine basaltic glass from the Ontong Java Plateau

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Frequent observations of tubular to vermicular microchannels in altered basalt glass have led to increasing appreciation of a possible significant role of microbes in the low-temperature alteration of seafloor basalt. We have examined such microchannel alteration features at the nanoscale in basalt glass shards from the Ontong Java Plateau using a combination of focused ion beam milling, transmission electron microscopy and scanning transmission x-ray microscopy. Three types of material were found in ultrathin cross-sections cut through the microchannels by FIB milling: fresh basalt glass, amorphous Si-rich rims surrounding the microchannels, and clays within the microchannels. X-ray absorption spectroscopy at the C K-edge and Fe L2,3-edges showed the presence of organic carbon in association with carbonates within the microchannels and partial oxidation of iron in palagonite compared with basalt glass. Although these observations alone cannot discriminate between a biotic or abiotic origin for the microchannels, they provide new information on their mineralogical and chemical composition and thus better constrain the physical and chemical conditions prevailing during the alteration process. Finally, we will compare these results on modern samples with preliminary observations we made using the same analytical approach on altered archean (3.5 Ga old) basalts from Barberton (South Africa).

References

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Age constraints on the Late Cretaceous alkaline magmatism on the West Iberian Margin

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The post-Paleozoic magmatic activity of the West Iberian Margin (WIM) has been subdivided in three major magmatic cycles occurring at 190-160 Ma, 130-135 Ma, and 100-70 Ma (Ferreira and Macedo, 1979). Magmatic occurences produced during the last cycle have been grouped along with other intrusions in the Pyrenees in the Late Cretaceous Alkaline Igneous Province of Iberia (Rock, 1982) and in the Circum-Mediterranean Anorogenic igneous province (Lustrino & Wilson , 2007). The onshore magmatic activity postdates by at least 40 Ma the end of the rifting that preceded the openning of the North Atlantic (Rassmussen *et al*., 1998).

In order to better constrain the sequence of events that characterized the Late Cretaceous magmatic cycle, we present several LA-ICP-MS U-Pb, Ar-Ar, K-Ar and Rb-Sr datings on several intrusions distributed along the WIM.

The new age determinations, combined with the previously published data, allow us to define two distinct pulses of magmatic activity. The first one (94-80Ma) occurred sycronously with the rotation of Iberia and consequent oppenning of the bay of Biscay (123-80 Ma; , Sibuet *et al*., 2004) and clusters around the Lisbon area (above N38º20'). The second pulse (75-72 Ma) has a wider geographical distribution between Algarve in the southermost Portugal (N37º20') and the Lisbon area.

Trace element geochemistry and isotopic data indicate that different mantle sources supplied the two Late Cretaceous pulses, with the more recent one being characterized by more important enrichment in incompatible elements, but less radiogenic Sr and more radiogenic Nd isotopic signatures.

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