Mantle source compositions of magmas from the North Atlantic Igneous Province

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It is widely accepted that the recycled oceanic crust plays an important role in the composition of mantle-derived magmas. In the case of North Atlantic Province, the amount of ancient oceanic crust is not well constrained. We used a new method of analysing the minor elements in olivine phenocrysts [1, 2] to determine the proportions of peridotite and eclogite in the source, and report new estimates for the lithology of mantle sources of Tertiary basalts in Northern Ireland and Scotland, which represent the oldest parts of the North Atlantic Province.

Preliminary results indicate significant and variable Ni excess and Mn deficiency in the compositions of magnesian olivine phenocrysts. This suggests a considerable but variable amount of non-peridotitic component (olivine-free pyroxenite) in the mantle sources of British Tertiary Province. Overall the estimated proportions of pyroxenite-derived melt are similar to that previously found for North Atlantic Province [1], and are markedly lower than in Hawaii.

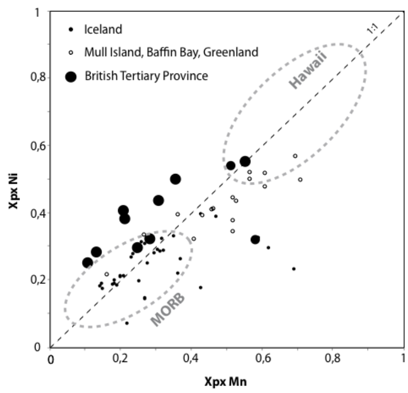

Figure 1: Proportion of pyroxenite derived melt from Ni excess and Mn deficiency in olivine composition (averaged per sample) [2]

[1] A. V. Sobolev *et al.* (2007) *Science* **316**, 412–417. [2] A.V. Sobolev *et al.* (2008) *Science* **321**, 536.

Reconnaissance trace element and Os-Mo-Nd isotope geochemistry of Late Archean black shales in the Carajás iron ore district, Brazil

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The 250-300-m-thick Carajás Formation in the Carajás Mineral Province, northeastern Brazil, consists of banded iron formation (including giant iron ore deposits) and a lower shale-siltstone member, overlying several kms of 2.76-Ga-old meta-basalt. The shale-siltstone member hosts black shale units. The black shales (drillcore from the Serra Sul exploration project) have up to 29 ppm Mo, and trace element patterns reflect variable degree of clastic and hydrogenous input for a suite of redox-sensitive elements. We studied a 20-cm-drillcore interval in detail. The systematic $\delta^{98}/^{95}$Mo isotope pattern defines a clastic end-member with about 0.2 permil for continental input and 0.9 permil for seawater input. Five samples with the most euxinic signature give a Re-Os isochron of 2703 ± 64 Ma (2s) with an initial $^{187}/^{188}$Os of -0.26 ±0.55 (MSWD 0.57). Initial Os isotope ratios for the entire black shale population indicate mixing of continental material with a high $^{187}/^{188}$Os ratio up to 1.4 with a ~chondritic Os source (e.g. hydrothermal ridge input via seawater). Some black shale samples from deeper drillcore have astonishingly heavy Mo isotope compositions up to 1.8 permil $\delta^{98}/^{95}$Mo which suggests oxidative isotope fractionation similar to what has been described from the 2.5 Ga McRae Shale in Australia, but the Carajás samples are 200 Ma older. We interpret this finding as a very early 'whiff of oxygen'.