

Local and global scale systematics in the MORB source chemistry

V. SALTERS^{1*}, S. MALLICK¹, M. BIZIMIS¹ AND C. LANGMUIR²

¹NHMFL and Department of Geological Sciences, Florida State University

(*correspondence: salters@magnet.fsu.edu)

²Department of Earth and Atmospheric Sciences, Harvard University, Cambridge, Massachusetts

For three decades Hf and Nd isotopic compositions in ocean island basalts have been very well correlated, but MORB have not show a good correlation between the two isotope systems. High-precision isotope analyses now reveal correlations. On a Hf-Nd isotope correlation diagram MORB from ridges far removed from hot-spots form parallel "local" arrays with similar slope as MORB from hotspot-influenced ridges, indicating that the nature of the heterogeneity that causes the local Hf-Nd isotope variation can be related to contamination by "enriched" OIB-type mantle. The parallel "local" arrays (differing Hf-isotopic composition) suggest a second, larger-scale length heterogeneity most likely related varying amounts of recycled oceanic lithosphere, which has a radiogenic Hf-isotopic composition.

We also report on a detailed analysis of the EPR between 8-18N. At the EPR we observe a systematic variation in the isotopic composition of the basalts related to ridge discontinuities. At migrating ridges such as the EPR leading (LE) and trailing edges (TE) of ridge segments have been identified. LEs have thicker crust suggesting a larger accumulation of melt [1]. The low degree melts generated off-axis on the TE of the ridge segment find a shorter route to the ridge by crossing the transform fault plane. The LE therefore has additional low-degree melts which are missing at the TE. We observe a larger variation in Hf and Nd isotopic composition at the leading edges and a more homogeneous and radiogenic isotopic composition at the TE. These variations can be explained if the source of the EPR basalts has two lithologies with different solidi, whereby the lithology with the lower solidus also has a less radiogenic Nd and Hf isotopic composition. This material will melt earlier and will be concentrated in the low degree melts. Crossing the transform fault plane of these low degree melts could explain the observed isotopic variations. This supports the Carbotte *et al.* [1] model for the explanation of the crustal thickness variations.

[1] S.M. Carbotte *et al.* (2004) *Nature* **429**, 743-746.

The Marathon Cu-PGE deposit, Ontario: Insights from sulphide chemistry and textures

I.M. SAMSON*, B.J. FRYER AND J.E. GAGNON

Dept. of Earth & Environmental Sciences, University of Windsor, Ontario, Canada

(*correspondence: ims@uwindsor.ca)

The Marathon Cu-Pd deposit is hosted by a marginal gabbro of the 1.1 Ga Coldwell intrusive complex. Mineralization comprises disseminated sulphides and PGM close to the contact with Archean country rocks. Most mineralized gabbros have been hydrothermally altered, represented by replacement of pyroxene \pm plagioclase by some combination of amphibole, biotite, chlorite, epidote, carbonate, and muscovite. Sulphides are represented by a wide variety of textural types. Massive to semi-massive, magmatic sulphides occur at or close to the contact. These are po-rich, with minor ccp, pn and py. Away from the contact, magmatic sulphides (ccp, po \pm pn) are represented by inclusions in unaltered cpx and by interstitial aggregates with equilibrium boundaries. The majority of ccp in mineralized rocks, however, appears to be texturally late, replacing po and intergrown with alteration hydrous silicates.

Preliminary LA-ICP-MS analysis, using a femtosecond laser, of the trace element contents of these various textural types of sulphide have been determined in order to evaluate the interpretations of the textural relationships. Massive and interstitial magmatic po have similar, and generally low, trace element contents. Disseminated, interstitial po from altered rocks generally has higher trace element contents, particularly Co, Ni, Pd, Ag, Te, Pt, and Bi.

As with po, ccp in massive sulphide has generally low trace element contents compared to other ccp types, most notably in Se, Pd, Cd, and Pb. Magmatic inclusions in cpx generally have distinctly higher trace element contents than other types, including ccp in massive sulphide. Ccp in alteration silicates generally has lower trace element contents compared to interstitial and cpx-hosted inclusions, but is distinct in having higher concentrations of As, Mn, and Pd and low concentrations of Ag. Interstitial, replacement ccp hosted by altered silicates is also characterized by high As and Se, but also by high Te, Au and Bi.

The trace element content of these sulphides is likely to have been controlled by a variety of factors, however, these preliminary data support the conclusion from textural relationships that much of the ccp in mineralized rocks resulted from fluid-mineral interaction.