Geophysical Research Abstracts, Vol. 9, 03056, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-03056

Partial melting and mantle dynamics at slow spreading ridges: New insights from the geochemistry of peridotites drilled at ODP Sites 1272 and 1274 (Mid-Atlantic Ridge)

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During ODP Leg 209, a magma-starved portion of the Mid-Atlantic Ridge (MAR) was drilled in the vicinity of the Fifteen-Twenty Fracture Zone (FZ) that offsets one of MAR's slowest segments ($\sim$ 2.5 cm/yr full spreading rate). We present here the results of a multi-elemental study (ICPMS and LA-ICPMS) of 27 peridotites drilled at Sites 1272 and 1274 (respectively to the south and the north of the FZ).

Hole 1272A and Hole 1274A peridotites comprise mainly harzburgites with minor dunites. Hole 1274A peridotites preserve abundant primary minerals (up to 40%–50%). Clinopyroxene (cpx) have interstitial or/and reactional textures, which suggest they are secondary. Spinels measured in Hole 1274A peridotites have high Cr# $\sim$ 45-50. The occurrence of refractory peridotites with high Cr# in spinels ($>$40) had been reported previously in the Fifteen-Twenty area, but only to the south of the FZ [*e.g.*, *Cannat et al.*, 1992].

The Fifteen Twenty FZ peridotites represent the most depleted peridotites yet sampled at a slow spreading ridge. They have low cpx primary modes, low Al_2O_3 contents ($\leq$ 1 an. wt. %) and high Mg# ($>$91.5), bulk rock trace elements compositions are mostly below 0.1 x primitive mantle (PM), and cpx trace element contents $<$1 x PM. These compositions suggest high degrees of partial melting ($>$17%). Yet, standard (closed-system) melting models fail to account for two notable geochemical characteristics of the peridotites: (1) their relatively linear REE patterns, with no trace of strong LREE depletion and (2) their strong depletion in HREE. An open system model (melting plus

percolation of melts produced by upwelling mantle at higher pressure) can explain their global depleted REE trend, their HREE depleted signature, plus the occurrence of secondary cpx. These results may imply a more actively convecting mantle than generally supposed below slow spreading centres.

Cannat et al, *Earth Planet. Sci. Lett.*, 109 (1-2), 87-106, 1992