SUPPLEMENTARY MATERIAL:

1. ANALYTICAL TECHNIQUES:

We determined major elements diopside and spinel by electron microprobe, trace elements by laser ablation ICP-MS, and Sr-Nd isotopic composition by thermal ionization mass spectrometer on diopside (cpx) separates from the abyssal peridotites. For MCR basalts we measured trace element concentrations (by ICP-MS) and Sr-Nd isotopic composition (thermal ionization mass spectrometer) on hand picked glasses.

Peridotites were crushed and sieved to obtain a 200-500 μm fraction. This fraction was treated with hydrogen peroxide (H_2O_2) to remove the manganese and iron oxide coating from the mineral grains. After rinsing with deionized water and drying, the fraction was passed through the Frantz Ma-gnetic Separator to obtain a Cpx-rich fraction. This fraction was handpicked under a binocular microscope to obtain a pure Cpx fraction. Only clear Cpx, free of inclusion and alteration was selected. Since Nd concentration in Cpx is as low as 50 ppb, 100-150 mg of Cpx was picked for the determination of the isotopic composition.

Electron microprobe major element mineral analyses on Cpx and spinel (Table 1) were performed according to Keshav et al. [2001a] [2001b] and Bizimis et al. [2007]. Backscattered images were used to ensure inclusion free grains. On average 6-10 spots from different grains were measured for a single sample. Reproducibility for standard analyses was better than 2% for all elements.

Trace element concentrations in Cpx were analyzed in-situ by laser ablation ICP-MS on the same crystals as used for major element analysis (213 mm Nd-YAG laser, New Wave coupled with a ThermoFinnegan ELEMENT). Operating parameters of the laser was set at 10Hz, 60-80 micron spot size and 60% energy level (see also [*Bizimis et al.*, 2007]) Intensities for the individual isotopes, after background correction, were normalized to the ^{43}Ca intensity. Four to six spots from a several Cpx grains of a single sample were measured. Concentrations are obtained against the NIST 612 glass standard, using the preferred concentration reported by Pearce et al. [1997]. The average long-term reproducibility of the NIST 612 standard is 5% or better. Reported concentrations are the average of the single spot analyses.

Trace element analyses of Cayman basalts were determined on 5 mg of handpicked glass samples dissolved in an HF: HNO_3 (3:1) mixture. The concentration of the trace elements were determined using ThermoFinnegan ELEMENT ICP-MS in a 2% nitric (HNO_3) solution at 100

ppm total dissolved solid. Signal drift was measured using indium as an internal standard. In addition a sequence of three samples, one standard (BIR-1 or BCR-1) and one blank was bracketed by measurement of standard BHVO-1. Blank corrected intensities of the elements are corrected for external drift based on the BHVO-1 data; external drift is assumed to be linear as is confirmed by the In-data. Drift correction is less than 5% for most elements. The concentrations of the trace elements are calculated against the concentration of the BHVO-1 as reported in Eggins et al. [1997]. Rock standards (BIR-1, n=5; and BCR-1, n=8) were measured repeatedly to check the precision and accuracy. For most of the elements reproducibility is within 5% and the calculated concentrations agree very well with reported value. Concentrations obtained for the standards are listed in table S2.

Samples for isotope analyses were leached prior to dissolution. The hand-picked Cpx fraction was leached at room temperature for 15 hours with 6N hydrochloric acid (HCl). The hand-picked basalt glass was cold-leached with 2.5N HCl for 15-20 min. The leached fraction is rinsed several times with deionized water (18MΩ). Dissolution and separation techniques followed procedures described in Stracke et al. [2003]. Approximately 40-60 ng of Sr and 5-20 ng of Nd are obtained for isotope analyses. $^{87}Sr/^{86}Sr$ and $^{143}Nd/^{144}Nd$ ratios of the Cpx fractions are measured using thermal ionization mass spectrometer (TIMS). The $^{87}Sr/^{86}Sr$ ratios are normalized to an $^{86}Sr/^{88}Sr$ ratio of 0.1194, and $^{143}Nd/^{144}Nd$ ratios are normalized to an $^{146}Nd/^{144}Nd$ ratio of 0.7219. Measured $^{87}Sr/^{86}Sr$ of E & A standard for Sr is 0.708007 ± 19 (2 stdev, n =14); measured $^{143}Nd/^{144}Nd$ of La Jolla standard for Nd is 0.511848 ± 13 (2 stdev, n= 39). Total blanks for Sr and Nd are less than 10 pg.

Some $^{143}Nd/^{144}Nd$ of the basalts were also measured using the NEPTUNE multi collector inductively coupled plasma mass spectrometer (MC-ICP-MS) as part of the inter calibration between the old TIMS technique and the new plasma technique. Results are in Table S2 as $^{143}Nd/^{144}Nd$ (P). The second set of values represent duplicates after chemical separation.

References

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