ISOTOPIC EVIDENCE FOR VARIABLY ENRICHED MORB LITHOSPHERIC MANTLE IN XENOLITHS FROM NORTH QUEENSLAND, AUSTRALIA.

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Accretion of lower Phanerozoic lithosphere in eastern Australia is believed to have involved various intraplate and subduction-related processes. Ultramafic xenoliths from five Recent alkalic basalt eruptive centers in the Atherton, McBride and Chudleigh Provinces of north Queensland provide evidence for variable enrichment of very primitive MORB lithosphere. The samples studied are predominantly Cr-diopside spinel lherzolites and several pyroxenites and amphibole pyroxenites that occur as dikes in large composite samples (Irving, 1980). Nd and Sr isotopic compositions for our samples (not age corrected), along with those reported by O'Reilly et al. (1988), plot mostly within the field of modern MORB (Fig. 1), however, one sample from Sapphire Hill is markedly more enriched ($^{87}Sr/^{86}Sr$ 0.70991, ϵ_{Nd} -8). REE abundances for constituent clinopyroxenes range from light REE-depleted to quite light REE-enriched (Fig. 2), and correlate well with the range in isotopic composition. Two host basalts have isotopic compositions typical of continental OIB-like, asthenospheric melts.

The xenolith results are consistent with models of lithospheric mantle based on other xenolith suites (e.g., McDonough and McCulloch, 1987; Menzies, 1990), however, the range in the north Queensland examples is very large over a small area, and implies that the underlying mantle lithosphere is unusually heterogeneous on a small scale. We interpret the results as implying ancient subduction of oceanic lithosphere beneath the eastern margin of Australia, with subsequent metasomatism by fluids, now widely believed to be carbonatitic (Green and Wallace, 1988; Meen et al., 1989).

References

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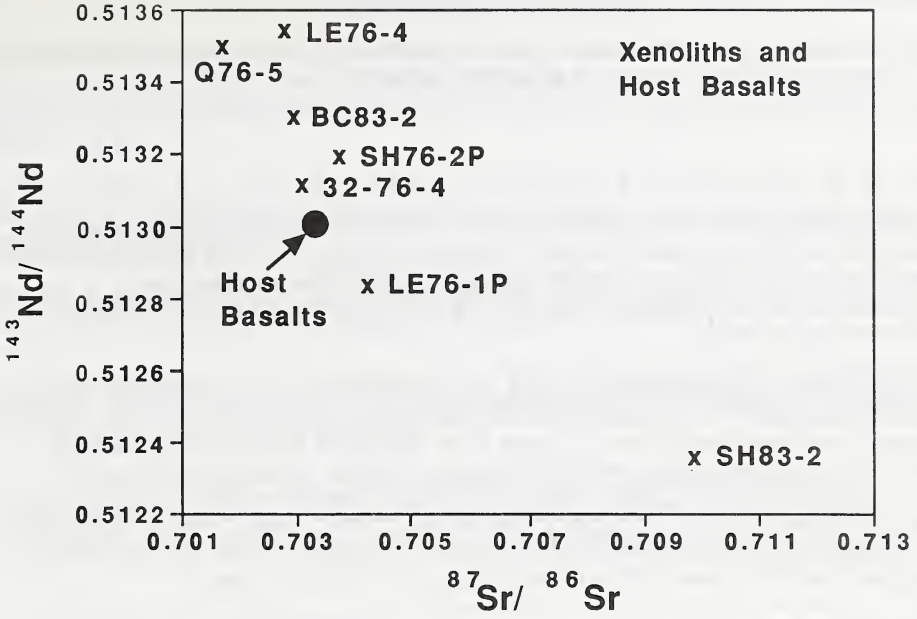
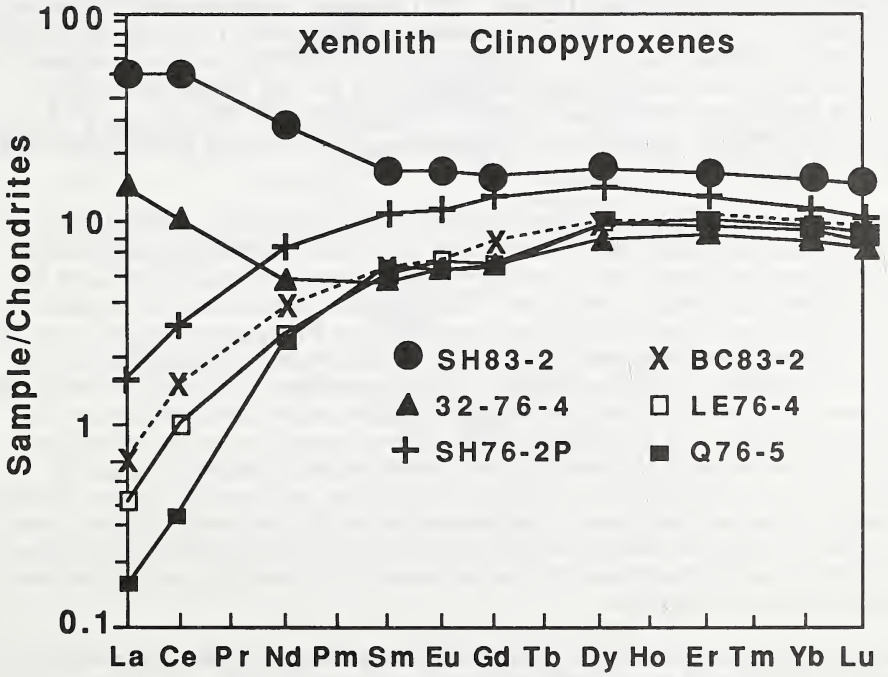

0.5136
0.5134
0.5132
0.5130
0.5128
0.5126
0.5124
0.5122
$^{143}Nd/^{144}Nd$
0.701
0.703
0.705
0.707
0.709
0.711
0.713
$^{87}Sr/^{86}Sr$
x LE76-4
x Q76-5
x BC83-2
x SH76-2P
x 32-76-4
Host Basalts
x LE76-1P
x SH83-2
Xenoliths and Host Basalts


100
10
1
0.1
Sample/Chondrites
La Ce Pr Nd Pm Sm Eu Gd Tb Dy Ho Er Tm Yb Lu
Xenolith Clinopyroxenes
SH83-2
32-76-4
SH76-2P
BC83-2
LE76-4
Q76-5