Isotopic Evolution of the Backarc Oceanic Mantle

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Abyssal peridotites and obducted ophiolites each provide unique insights into the depleted upper mantle. Studies from both abyssal peridotites [1, 2] and ophiolites [3] demonstrate that the mantle can retain small, distinct melt-depleted domains, which result in a geochemically and isotopically heterogeneous mantle. Much of our geochemical and isotopic understanding of the upper mantle comes from suprasubduction zone ophiolites or abyssal peridotites exposed during midocean ridge extension. These distinct tectonic settings potentially leave different geochemical tracers in both the mantle and crustal rocks formed in these settings. Backarc basin extension may also leave distinct geochemical "fingerprints" on the upper mantle. New Os isotopic and HSE data from abyssal peridotite exposed in the Parece Vela backarc basin (Philippine Sea) demonstrate that the backarc mantle also records heterogenous zones of variable melt depletion and melt-rock interaction. The $^{187}Os/^{188}Os$ ratios range from unradiogenic to highly radiogenic (0.1174-0.1704). However, unlike peridotite preserved in ophiolite sequences, the abyssal peridotites with radiogenic Os isotopic signatures are lherzolites and harzburgites rather than dunites [3, 4]. There is no correlation between indicators of melt-rock interaction and $^{187}Os/^{188}Os$ ratios, which means the radiogenic signature cannot come from interaction with ascending melts. The high Os abundance (2-4.5 ppb) precludes significant overprinting by seawater. We suggest that the isotopic signature of the Parece Vela Basin upper mantle may reflect subduction zone modifications imparted before the opening of the backarc basin.

[1] Brandon *et al* 2000. *EPSL* **177**, 319-335. [2] Liu *et al* 2008. *Science* **452**, 311-316. [3] O'Driscoll *et al* 2012. *EPSL* **333-334**, 226-237. [4] Hanghoj *et al* 2010. *J Pet* **51**, 201-227.