

Ancient depleted components recorded in Re-Os isotope composition of petit-spot mantle xenoliths in northwestern pacific.

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Re-Os systematics of abyssal peridotites have shown that the present-day mantle preserves $^{187}\text{Os}/^{188}\text{Os}$ heterogeneity generated as a result of ancient melting events. Here we report the Os isotopic ratios of mantle xenoliths from petit-spot volcanoes, which are small volcanic sites on the oceanic lithosphere off the subduction zone. In the absence of seismic anomalies indicative of mantle plume affection, peridotite xenoliths from petit-spot lavas provide direct information from within the old oceanic lithosphere just prior to subduction complementing abyssal peridotites, that represent shallow residues of young oceanic lithosphere.

Peridotite samples, including deeply derived garnet lherzolites, were collected from the petit-spot volcanoes Site-A (seafloor age ~130 Ma) and Site-B (seafloor age ~135 Ma) in the northwestern Pacific, using the deep-submersible vehicle Shinkai 6500 during expeditions of YK05-06, YK20-14S, YK21-07S, and YK24-10S by R/V Yokosuka. We conducted whole rock Re-Os isotopes and highly siderophile element concentration analyses on some representative harzburgite-lherzolite samples from both sites. Our data demonstrate that the $^{187}\text{Os}/^{188}\text{Os}$ ratios obtained are generally in agreement with the range reported for global abyssal peridotites (~0.122 to 0.132). One sample has a distinctively lower $^{187}\text{Os}/^{188}\text{Os}$ ratio of about ~0.118, suggesting that part of the lithosphere beneath the petit-spot volcano in the northwestern Pacific underwent melt depletion in Proterozoic.

Previous studies have shown that basaltic lavas from petit-spot volcanoes are enriched in incompatible trace elements with EM-1 like signatures [e.g., 1]. Since the mantle source that produced the EM-1 like melt is thought to be recycled crustal material generated in ancient times, it is possible that the unradiogenic Os components in the xenoliths also represent part of the recycled components that resided in the Pacific domain of the convective mantle.

[1] Machida et al., 2009, *Geochim. Cosmochim. Acta* 73, 3028–3037