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Source Heterogeneity and Mixing of Hawaiian 'Loa' and 'Kea' Trends using $^{187}Os/^{188}Os$ and Platinum Group Elements Abundances

MR. BRIAN OLLER AND PROF. JAMES M.D. DAY
Scripps Institution of Oceanography
Presenting Author: boller@ucsd.edu

Studies of shield-stage lavas have established that there exist two compositionally distinct geochemical trends in Hawaiian volcanoes referred to as the 'Loa' and 'Kea' trends [1, 2]. The two trends occur in parallel geographical alignment, from northwest to southeast. These trends correspond to distinct $^{87}Sr/^{86}Sr$, $^{143}Nd/^{144}Nd$ and Pb isotope ratios, with the southern Loa trend showing more radiogenic Pb and Sr and low Nd isotopic compositions versus the Kea trend [1, 2, 3]. These parallel trends have been interpreted to reflect distinct mantle sources. Radiogenic $^{206}Pb^{*}/^{208}Pb^{*}$, $^{87}Sr/^{88}Sr$, alongside low $^{143}Nd/^{144}Nd$ suggests the Loa trend samples a recycled component within the mantle, while the Kea trend is consistent with a DMM-like source [4]. We report new $^{187}Os/^{188}Os$, Re and platinum group element (PGE: Pd, Pt, Ru, Ir, Os) abundances, and bulk rock major and trace element abundance data for ultramafic peridotite cumulate xenoliths from Mauna Kea (Kea trend), Mauna Loa, and Hualalai (Loa trend). Peridotite cumulates are advantageous for examining PGE variations because they pre-concentrate these and other compatible elements. Loa trend xenoliths have more radiogenic Os (Avg = 0.1341 ±0.0023; 2SD n = 8) than Kea trend xenoliths (Avg = 0.1294 ±0.0006; 2SD n = 10), consistent with higher time integrated Re/Os for the Loa trend mantle and consistent with a recycled oceanic crustal component. Absolute abundances of the PGE for Loa trend xenoliths are 0.5 – 2× primitive mantle (PM) estimates versus Kea trend xenoliths, which are depleted (~0.2×) relative to PM. Ratios of Pt/Ir for both trends correlate negatively with MgO, albeit with markedly different slopes. These data support the recycling and DMM source hypothesis for the Loa and Kea trends respectively, although limited mixing of Kea magmas with Loa magmas cannot be excluded.

[1] Abouchami et al. (2005) *Nature*, *434*(7035), 851; [2] Weiss et al. (2011) *Nature Geoscience*, *4*(12), 831; [3] Jackson et al. (2012) *Geochem. Geophys. Geosyst*. 13, Q09009; [4] Ireland et al. (2009) *Chemical Geology*, (260) 112-128.