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Heavy Mo isotope signatures and high B/Ce reveal a serpentinite source in the Aleutian arc lavas

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We report here Mo isotope and B concentration data on along-arc Aleutian lavas, serpentinites from the SW Indian Ridge and Mo isotope compositions on Pacific sediments (DSDP 183 and ODP 886C), as proxies for subducting serpentinites and sediments, respectively. Unlike radiogenic isotopes (Pb, Sr, Nd, Hf), Mo isotopes ($\delta^{98/95}$Mo) do not vary continuously along the arc and are not correlated with the eastward increase of the sediment flux along the trench. Both $\delta^{98/95}$Mo and B enrichments (as B/Ce) are low in the west (B/Ce= 0.15-1.07; $\delta^{98/95}$Mo= -0.38 to –0.12‰ like MORB), and abruptly increase in the eastern volcanoes Korovin, Seguam and Yunaska (B/Ce= 1.20-2.60; $\delta^{98/95}$Mo= +0.03 to +0.30‰) near the intersection of the Amlia Fracture Zone (AFZ) with the trench, before decreasing farther east at Okmok (B/Ce= 0.75 average; $\delta^{98/95}$Mo= -0.12‰ average). Pacific sediments have predominantly low $\delta^{98/95}$Mo (+0.17 to -1.95‰), while serpentinites have extremely heavy $\delta^{98/95}$Mo (up to +1.10‰) and high B/Ce (~22000). The low $\delta^{98/95}$Mo in the sediments and lack of correlation of $\delta^{98/95}$Mo in the Aleutian lavas with sediment flux proxies indicate that sediments do not exert first-order controls on Mo isotope compositions. Instead, the sudden increase of $\delta^{98/95}$Mo and B/Ce in lavas near the AFZ support the presence of a serpentinite-like component in their source characterized by heavy $\delta^{98/95}$Mo values and high B contents not evident elsewhere along the arc. We argue that, additional to inhibiting the westward sediment deposition, the subduction of the AFZ plays a localized role in enhancing serpentinization of the incoming lithosphere to the trench, and subsequent incorporation of a serpentinite-derived component (perhaps fluids from dehydration) into the arc source. Our data show that the combination of $\delta^{98/95}$Mo and B concentrations are a powerful proxy for tracing fluids in subduction zones.