Variations in mantle and subduction contributions to mafic magmas in the southern Oregon Cascade arc

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In the Cascade arc, erupted mafic magmas reflect complex and variable mantle melting and subduction contributions. For example, intraplate basalts (IPB) and low-K tholeiites (LKT), both erupted in the arc, are throught to result from decompression melting whereas calc-alkaline basalts (CAB) originate from fluid-flux melting [1]. Further, the mantle beneath the Cascade arc has been interpreted as ranging from highly depleted (e.g., Mt Shasta [2]) to enriched (e.g., Central Oregon [3]); however, it has also been suggested that the subarc mantle is isotopically homogeneous [4].

This research investigates subduction and mantle contributions to mafic magmas (CAB, LKT, and IPB) erupted in the southern Oregon (OR) Cascade arc using whole-rock and melt inclusion major and trace element geochemistry, melt volatile contents, and whole-rock Sr-Nd-Pb-Hf isotopic compositions. Our results show that IPB magmas, and most LKTs, have lower Pb/Ce and Sr/Nd and other fluid tracers and higher $^{143}Nd/^{144}Nd$ and lower $^{87}Sr/^{86}Sr$ than CABs, consistent with a decompression-melt origin for the IPB and LKT magmas. Additionally, our data suggest subduction contributions decrease from southern to central OR. We also find distinctive mantle source regions beneath central and southern OR; southern OR basalts include CAB and LKT magmas that have depletions in Nb and other HFSE consistent with a depleted mantle source. The IPB magmas from this study are found only in central OR and tap an enriched mantle unmodified by subduction contributions. Given the trace element and isotope geochemistry of the IPB samples, and their location in central OR, we suggest two possible origins for the enriched central OR mantle: 1) the Siletz terrane, an accreted ocean island plateau that may underlie the arc in central OR, or, 2) entrainment of enriched mantle flowing from eastern Oregon (e.g., Long [5]) into the arc.

[1] Leeman *et al.* (2005), *JVGR* 140, 67-105. [2] Grove *et al.* (2002) *CMP* 142, 375-396. [3] Ruscitto *et al.* (2010) *EPSL* 298, 153-161. [4] Mullen *et al.* (2017) *Chem Geol* 448, 43-70. [5] Long (2016) *J Geodyn* 102, 151-170.