Preliminary Multi-Isotopic Data and Potential Regional Connections for Late Cenozoic Basalts of the Western Snake River Plain, Idaho

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Previous research regarding the origin and evolution of Snake River Plain (SRP) basalts west of the 116° meridian has utilized field mapping, petrographic and geochemical data, and some Sr-isotopic analyses. These studies showed that in the past 2 m.y. at least three suites of chemically and isotopically distinct basalts were produced. The oldest (1.0 Ma to 1.6 Ma) are iron-rich tholeiitic basalts (N-tholeiities); the intermediate suite (0.90 Ma) is tholeiitic with an usually high phosphorus content (P-tholeiites); and the youngest basalts (<0.50 Ma) are mildly alkaline (A-lavas). The current study presents Sr, Nd, and Pb isotopic data for basalts collected from each of these suites.

Temporal trends in isotopic systematics of western SRP basalts, from N-tholeiites ($^{87}Sr/^{86}Sr$ >0.707, epsilon Nd <-4, $^{206}Pb/^{204}Pb$ <18.5) to younger P-tholeiites and A-lavas ($^{87}Sr/^{86}Sr$ <0.706, epsilon Nd from -2 to 0, $^{206}Pb/^{204}Pb$ >18.5), are comparable to Late Cenozoic basalts of nearby provinces. These trends are nearly identical to those exhibited by the Boise River Group (BRG) northeast of the study area. In eastern Oregon, the Jordan Valley Volcanic Field (JVVF) also displays similar trends; however the JVVF data are slightly offset to less radiogenic Sr and more radiogenic Nd. This may be controlled by differences in the character of the underlying lithospheric mantle across the western boundary of the North American craton. Further comparisons show the N-tholeiites are isotopically similar to the Saddle Mountain basalts of the Columbia River Group (CRG), which are attributed a subcontinental lithospheric mantle source. In contrast, the P-tholeiites and A-lavas trend toward the isotopically depleted Imnaha basalts of the CRG. These, and the younger alkaline rocks of the BRG and JVVF, are interpreted to be derived from a deeper asthenospheric source. We interpret our data as recording

a similar lithospheric to asthenospheric source transition for basalt magma genesis in the western SRP. The similarities in evolution of basaltic volcanism across this area imply that similar processes generate and modify magmas on a regional scale.