

Sr-Nd-Hf-Pb Isotopic Composition of Primitive Lavas from the Lassen Region of the Cascade Arc: Insights into Variation between the Northern and Southern Cascades

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The Cascade Volcanic Arc extends approximately 1300 km along western North America from northern California to southwestern British Columbia. The milestone study of Bacon et al (1997) indicates isotopic variation from north to south in the High Cascades. Recent isotopic studies north of the border, in the Garibaldi Volcanic Belt, show an isotopic distinction from the southern Cascades (Mullen & Weis 2014, this meeting). We sought to understand whether these differences related to distinct mantle sources or slab inputs, or to improvements in analytical techniques, especially in Pb isotopes where multi-collector inductively coupled mass spectrometry (MC-ICP-MS) allows for a precision ten times better than by TIMS. Ten primitive basalts and andesites from the Lassen region in northern California were re-analysed for trace element abundances and for high precision Sr, Nd, Hf, and Pb isotopic ratios. Comparison with data from basalts from the Garibaldi Volcanic Belt, approximately 1000 km to the north, has shown that the Lassen region has distinctly higher $^{86}\text{Sr}/^{87}\text{Sr}$, $^{208}\text{Pb}/^{204}\text{Pb}$, $^{207}\text{Pb}/^{204}\text{Pb}$ and $^{206}\text{Pb}/^{204}\text{Pb}$, and lower maximum $^{143}\text{Nd}/^{144}\text{Nd}$ and $^{176}\text{Hf}/^{177}\text{Hf}$ values. The new data documents the presence of three mantle components (depleted mantle, “intermediate” mantle and intraplate mantle) and multiple subduction components (fluids released from subducting, minimally altered oceanic crust and sediments) contributing to the compositional diversity of the lavas in the Lassen region.