

SUBDUCTION VS. EXTENSION AS A SOURCE FOR LAVAS IN THE SOUTHERN CASCADES

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Thirteen volcanic units were mapped in a sixteen square mile area in the transitional region between the High Cascades and Basin and Range in southern Oregon. These units show characteristics of both subduction-related and extension-related volcanism. The units range in composition from andesite to basalt, and most are genetically linked to three volcanic centers: Hayden Mountain, Chase Mountain, and the Chicken Hills. The major flows from these three centers interfinger with each other and with other minor units in the area. A suite of plagioclase-rich andesite flows, the source of which is unknown, underlie the Chicken Hills flows and interfinger with Hayden Mountain flows. Potassium-Argon dating reveals ages of 3.7 +/- 0.2 Ma for Hayden Mountain, 2.5 +/- 0.1 Ma for Chase Mountain and 1.1 +/- 0.2 for the Chicken Hills.

Hayden Mountain flows, which are all basaltic andesite, contain 63% to 75% plagioclase, 2.7% to 13.6% olivine, 4.8% to 14.6% clinopyroxene, and trace amounts of orthopyroxene. Chemistry is characterized by SiO₂ ranging from 52.2% to 55.1%. Na₂O/K₂O ratios range from 2.99 to 3.85, and Fe₂O₃T/MgO ratios range from 1.33 to 1.75. The flows have P and Ti concentrations 0.4% to 0.44%, and 1.17% to 1.26%, respectively. Mineral compositions in flows from Chase Mountain range from 73.5% to 82.4% plagioclase (An₄₆₋₅₂), 1.5% to 5.1% olivine, 8.8% to 11.3% clinopyroxene, and <1% to 3.4% orthopyroxene. SiO₂ content ranges from 53.66% to 56.7%; Na₂O/K₂O ratios range from 2.42 to 3.24 and Fe₂O₃T/MgO ratios range from 1.77 to 2.09. P concentrations for Chase Mountain vary from 0.32% to 0.38%, with one anomalously high value of 0.52%. Ti ranges from 1.17% to 1.25%. Units erupted from the Chicken Hills are basalt, and comprised of 57% to 64% plagioclase, which is An₅₂₋₅₃ in groundmass and An₅₃₋₆₁ in phenocrysts, 19% clinopyroxene, and trace amounts of orthopyroxene. SiO₂ content is 49.1%, Na₂O/K₂O ratio is 1.3, and Fe₂O₃T/MgO ratio ranges from 9.3 to 10.4. P and Ti values are 0.25% and 1.4%, respectively.

All the units are subalkaline on a Na₂O + K₂O vs. SiO₂ plot. On a FeO/MgO vs. SiO₂ plot, Chase Mountain and Hayden Mountain flows plot as calc-alkaline, and Chicken Hills units straddle the discrimination line between tholeiitic and calc-alkaline. Spiderplots and REE plots from INAA data allow the identification of tectonic settings and evaluation of the degree of mixed sources in this transitional province. P, Ti, and Nb are particularly useful elements for separating Basin and Range from High Cascades volcanism.

volcanism, Cascades, subduction, extension