
Title: Stratigraphic and Geochemical Evolution of the Glass Buttes Complex, Oregon.

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The Glass Buttes complex lies at the northern margin of the Basin and Range province in central Oregon and is cut by the northwest-trending Brothers fault zone. An older acrystalline volcanic sequence of high-silica rhyolites (\( \geq 75\% \text{SiO}_2 \)) forms a broad platform composed of domes and flows with minor pyroclastic deposits. The high-silica rhyolite sequence is divided on the basis of texture into 1) zoned flows and domes, 2) obsidian flows, 3) felsite flows, and 4) biotite-phyric flows and domes.
Stratigraphic relations indicate that high-silica rhyolite units in the western part of the complex overlie those to the east. K/Ar age determinations for the sequence range from 5.03 to 7.7 million years. Geochemical trends within the sequence are characteristic of highly evolved magmas. The majority of the elements analyzed within the Glass Buttes high-silica rhyolite sequence fall into two groups that display similar behavior: 1) Sc, Rb, Cs, Sm, Tb, Yb, Lu, Ta, Th, U, and 2) Mg, Ca, Ti, Fe, Co, Ba, La, Ce, Nd, Eu, and P. Elements within each group generally show positive correlations with each other, but negative correlations with elements of the other group. The variations between the two groups reflects the chemical stratification present within the high-silica rhyolite magma chamber prior to the eruption of the sequence. The presence of biotite phenocrysts within the sequence may indicate that the high-silica rhyolites were erupted from a relatively shallow magma chamber.

The vent locations of a younger volcanic sequence of rhyolites and rhyodacites are strongly controlled by structure. Vents are aligned along the trend of the Brothers fault zone. The petrology and geochemistry of the sequence indicate that it is not genetically related to the high-silica rhyolite sequence of volcanism. The rocks are phyric and contain various proportions of plagioclase (andesine-labradorite), hornblende, quartz, biotite, and ortho- and clinopyroxene phenocrysts. Phenocrysts range up to 40% of the rock volume. There are large variations in the concentrations of Fe, Mg, Ca, Ti, Sc, Co, Cr, and Eu among the
Basaltic volcanism occurred throughout the silicic eruptive sequence. Several of the basalt flows erupted within the Glass Buttes complex show petrographic and geochemical evidence of contamination by rocks of the high-silica rhyolite sequence. The intrusion of basaltic magma into the crust is believed to have provided the heat source for the partial melting of crustal materials, leading to the generation of the silicic magmas.