Glass Buttes, a Pliocene silicic volcanic complex within the High Lava Plains province of Oregon, was erupted approximately 5.0 to 5.8 million years ago. Geologic mapping revealed that the eastern portion of the complex is underlain by rhyolitic glass domes, flows and rare pyroclastic flows. Basalt flows are interlayered with and onlap the silicic glass. Younger basalt flows, erupted from local vents, overlie silicic glass and onlapping basalts.

The eastern end of Glass Buttes is hydrothermally altered at the surface; a weak geothermal anomaly coincides with the altered areas. Alteration, localized by northwest trending normal faults, occurs primarily as opalite
replacement of rhyolite glass with associated cinnabar, alunite, clay-rich vein material, hematite, and hyalite. Alteration paragenesis at the surface was defined, and physicochemical conditions during hydrothermal activity were inferred from alteration minerals and assemblages and trace element content of alteration minerals.

Alteration identified in the subsurface is interpreted to be related to an older hydrothermal system. Carbonate, pyrite, quartz, and minor smectite and chlorite occur in vugs and fractures, and partially replace subsurface basalt. Abundant fine-grained disseminated pyrite occurs in permeable units. Pyrite separates from disseminations and veins within basalt and permeable glassy units contain up to 13 ppm Au. The pyrite samples are also anomalous with respect to arsenic and antimony.