Felsic Rocks of the Central Thirtynine Mile Volcanic Field

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This study focuses on two groups of felsic rocks that occur near the center of the Thirtynine Mile Volcanic Field. One center is located in Chumway Park and the other is farther north at "Rhyolite Hill" (Fig. 1). The Chumway Park Group (CPG) is comprised of vents and associated rhyolite flows, and may represent one of the oldest volcanic units in the Thirtynine Mile Volcanic Field. A series of rhyolitic, pyroclastic breccias is chemically and spatially related to the CPG. The Rhyolite Hill Group (RHG) is comprised of a shallow intrusive and associated felsic flows. The rocks have been classified chemically using the total alkali-silica diagram (TAS), recommended by the IUGS (LeBas and others, 1986). In contrast with the rhyolites of the CPG, the felsic rocks at Rhyolite Hill are trachytes and low-silica rhyolites (Fig. 2), and the two groups are chemically quite distinct.

The CPG has a nearly circular outcrop pattern, one-half mile in diameter, and consists of vent breccias, a dark, flow-banded glassy rhyolite, perlites, a pink, thinly-laminated rhyolite flow, and a pyroclastic block tephra. A vent located in the southern part of the group (Fig.1) has been delineated by large clasts of flow-banded rhyolite and pumice fragments up to nine centimeters in diameter. Other possible smaller vents were mapped along the northern and eastern edge of the body by the presence of tuff breccias containing clasts of flow-banded rhyolite, as well as large clasts (up to 24 centimeters across) of Precambrian gneisses which differ from the Precambrian granodiorite found locally at the surface. These smaller vents show intense silicification giving them a cherty appearance, which may have resulted from circulation of fluids within the vent. The dark, flow-banded rhyolite and the perlite are always found near the vent locations. The pink, thinly-laminated rhyolite forms the center of the body. The pink rhyolite is younger than the other flows because of the presence of small stringers of this rhyolite cutting the perlite below. Part of this unit is fine-grained and vesicular, probably representing the top of a flow. The western edge of the body is dominated by a pyroclastic block tephra containing clasts of flow-banded rhyolite, up to seven centimeters across, representing a sub-aerial fall deposit. Together, the features in Chumway Park indicate surface emplacement, suggesting that we are looking today at the exhumed topographic surface which existed when the CPG was emplaced.

The rocks of the CPG lie in contact with rocks of Precambrian age (Silver Plume?) and with the Lower Member of the Thirtynine Mile Andesite (Ttml) of Epis and Chapin, 1974. In Chumway Park, the Ttml is subdivided into three units: a lower laharic breccia, overlain by a biotite trachydacite flow, present as erosional remanents on topographic highs, and a hornblende trachyte. Because of the low relief and poor outcrop in Chumway Park, elevations and extended dips were used to obtain some of the working stratigraphy. The CPG cuts and overlies the lower laharic breccia of the Ttml. A perlite pipe in the Hammond Peak area, probably related to the CPG, also cuts this lower laharic

breccia (per. comm., Dave Mochel, 1988). The features indicating subaerial emplacement, and the topographic relations, show the CPG to be older than the overlying hornblende trachyte and either to be contemporaneous with or older than the biotite trachydacite. Thus, the CPG was emplaced within the (Ttml), which makes it one of the oldest eruptive units in the Thirtynine Mile Volcanic Field.

A series of green, pyroclastic breccias and lapilli tuffs outcrops north of Guffey, along Colorado Highway 9 (Fig. 1), in the southern Dicks Peak area, and in the Hammond Peak and Baldy Mountain areas. The pyroclastic breccias and lapilli tuffs are related chemically to the CPG and occupy the same stratigraphic position. In addition, clasts of flow-banded rhyolite similar to the rocks seen in the CPG are ubiquitous throughout the breccias and tuffs. Finally, the decrease in clast size away from Chumway Park and its central location relative to the outcrops of the tuff breccias suggest that Chumway Park may be their eruptive center.

The RHG is subdivided into two main volcanic units: a rhyolite intrusion and related flows, and a set of trachyte flows. The trachyte flows, overlying a diorite intrusion on the southeast, a pyroxene trachyandesite on the west and south, and a hornblende andesite on the north and east (mapped as Ttml by Epis,1979), comprise the lower portion of Rhyolite Hill. The upper portion of Rhyolite Hill consists of a shallow intrusion of low-silica rhyolite which is capped by a glassy, rhyolite flow.

From field relations, the trachyte flows lie stratigraphically within the Ttml. The shallow rhyolite and the associated rhyolite flow, overlie and cut the trachyte flows. The intrusion may represent a shallow-level magma chamber, which solidified within its own extrusive edifice. The intrusion has areas of brecciation with secondary quartz mineralization and a zone with thin, finely-spaced sulphide veins, containing pyrite and chalcopyrite. Reconstructing the Thirtynine Mile Andesite along dip from Thirtynine Mile Mountain to the north, places the rhyolite below the majority of this unit. Thus, the emplacement of the RHG is contemporaneous with the Ttml.

Major- and trace-element whole rock analyses demonstrate that the CPG and the RHG are distinctly different. Additionally, these data link the pyroclastic breccias and lapilli tuffs to the CPG. A TAS diagram, a chondrite-normalized REE plot, and a series of Harker diagrams were used to evaluate the data.

All of the rocks of the CPG are high-silica rhyolites (Fig. 1). They have about 4.00 wt.% Na_2O, about 5.00 wt.% K_2O, and low FeO (about 1.00 wt.%) (Fig. 3). They are relatively depleted in LIL elements, for instance Zn, Zr, Y, and Ba (Fig. 4). The CPG has a modest LREE enrichment (La/Lu ratio of about 4.5) (Fig. 5).

In comparison to the rocks of the CPG, the rocks of the RHG have an overall lower silica content, but higher total alkalis, and are classified as trachytes and low-silica rhyolites (Fig. 1). In addition, the rocks of the RHG are relatively enriched in LIL elements (Fig. 4). They also have about 10 times the abundance of REE as the rocks of the CPG, and show a greater LREE enrichment (La/Lu ratio of about 17) (Fig. 5).

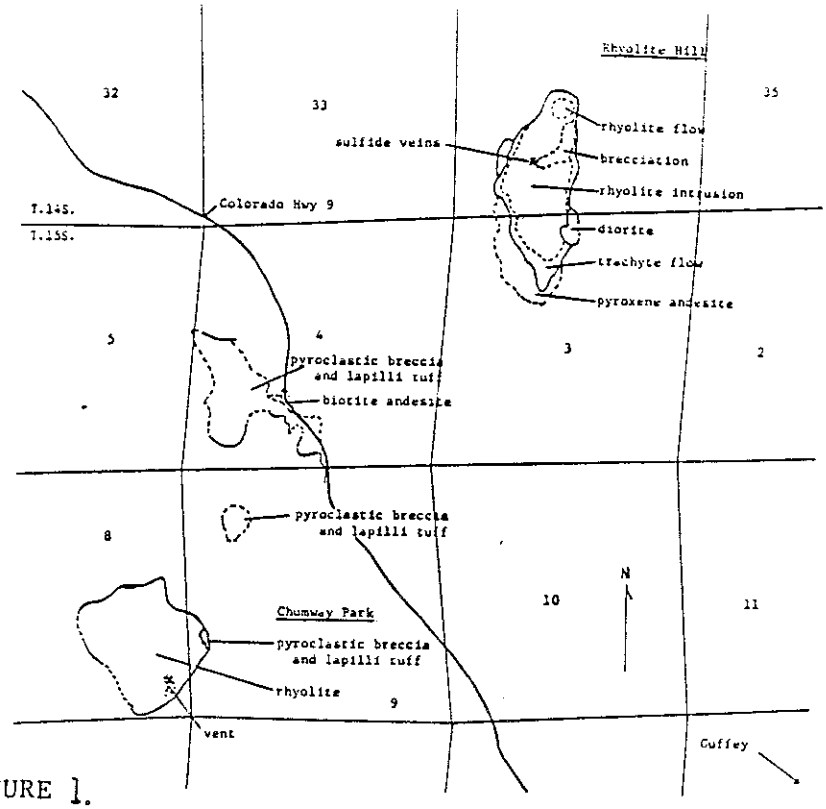


FIGURE 1.

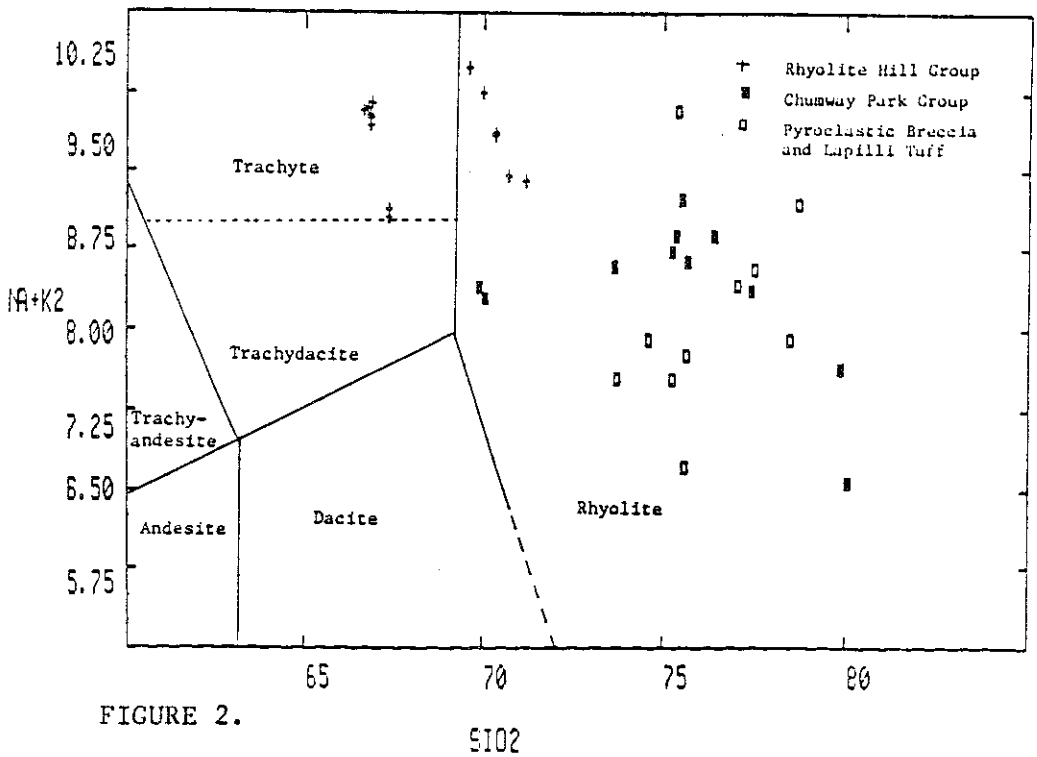
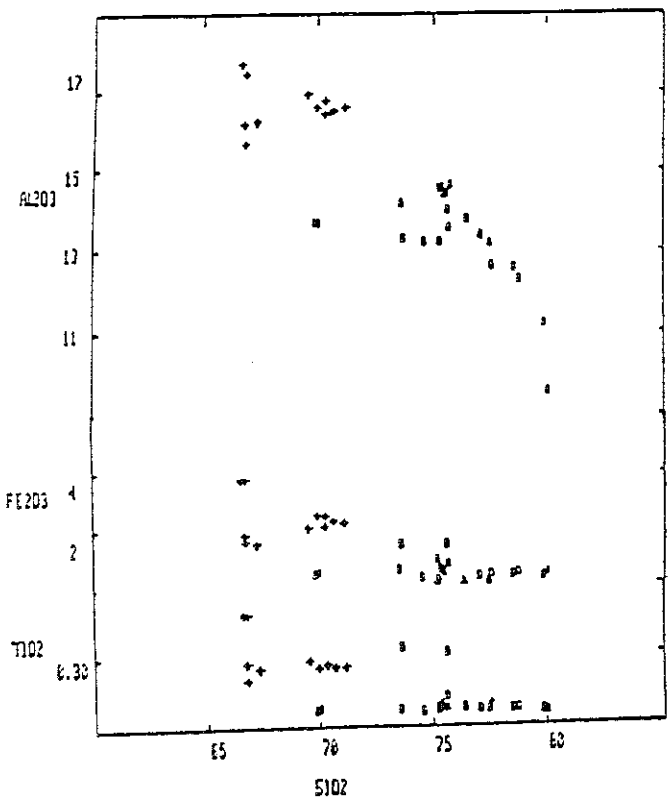


FIGURE 2.



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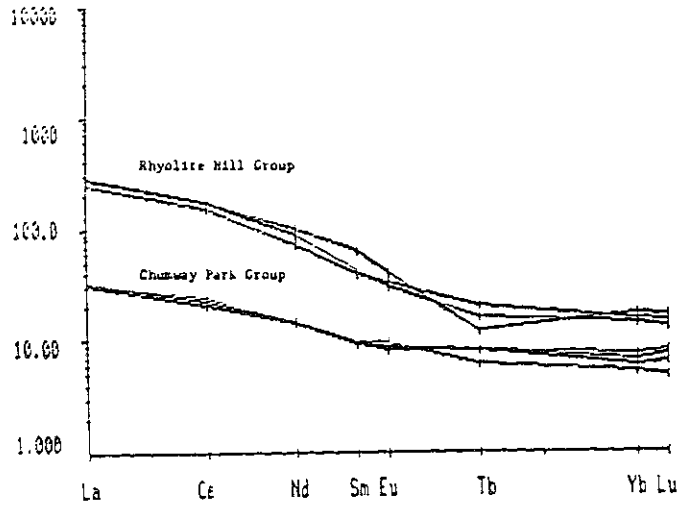

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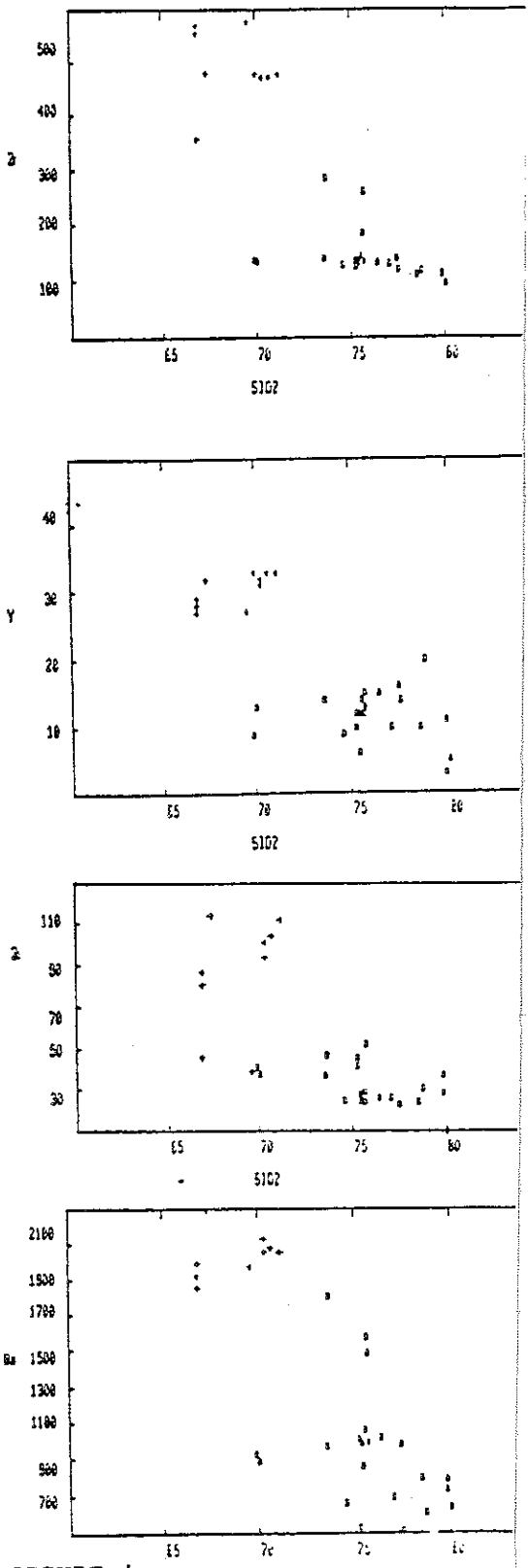

FIGURE 4.