ABSTRACT

The Stratigraphy, Petrography, and Chemistry
of the Saddle Mountain Area,
Thirtynine Mile Volcanic Field,
Central Colorado

Kimberly Sultze
Carleton College

The Saddle Mountain area lies within the Oligocene Thirtynine Mile Volcanic Field in southcentral Colorado. Models for the petrogenesis of the area were created through the use of suite chemistry, petrography, and field relations. The Saddle Mountain sequence contains the following volcanic units from oldest to youngest: pyroxene-hornblende trachyandesites, laharic breccias and interbedded basaltic trachyandesite flows, hornblende-biotite rhyolites, hornblende-biotite trachyte dikes, biotite-hornblende trachyte flows, olivine-clinopyroxene basaltic trachyandesite dikes, and olivine-clinopyroxene trachybasalt flows. These units, when combined with samples from the Dicks Creek volcanics (Keating, 1988) comprise a bimodal alkali-calcic, shoshonitic suite characterized by high alkalis, particularly K_2O, high total REE contents, large LREE/HREE ratios, and a lack of fractionation in the tightly-clustered REE values.

Chemical trends indicate that the rocks are genetically related. The clustering of chondrite normalized REE values and the smooth linear to curvilinear trends on the diagrams of several major elements plotted versus silica support this claim. Of the two evolutionary models considered, fractional crystallization and partial melting, fractional crystallization is the favored model as it is supported by the near-logarithmic depletion of compatible trace elements at low silica contents. The chondrite normalized REE plots, however, do not agree with this model because fractionation trends for the REE contents of mafic versus felsic volcanic rocks are absent.

Two further scenarios were proposed to explain the bimodality and the origin of this suite; both involved the initial eruption of intermediate to felsic volcanics followed by mafic dikes and flows that resulted from the replenishment of chamber or chambers with basaltic liquid. Although no clear-cut solution to the problem of the petrogenesis of these complexly-evolved Saddle Mountain and Dicks Creek volcanic rocks has been proposed, this study does provide a groundwork on which further research can build or rebuild to formulate a model that adequately explains all geochemical, petrographic, and stratigraphic characteristics of the suites from the Thirtynine Mile Volcanic Field.

Le Bas, M.J., Le Maitre,R.W., Streckeisen,A., and Zanettin,B., 1986, A Chemical Classification of Volcanic Rocks Based on the Total Alkali-Silica Diagram, in Journal of Petrology, vol. 27, part 3, pp. 745-750.

Figure 1.

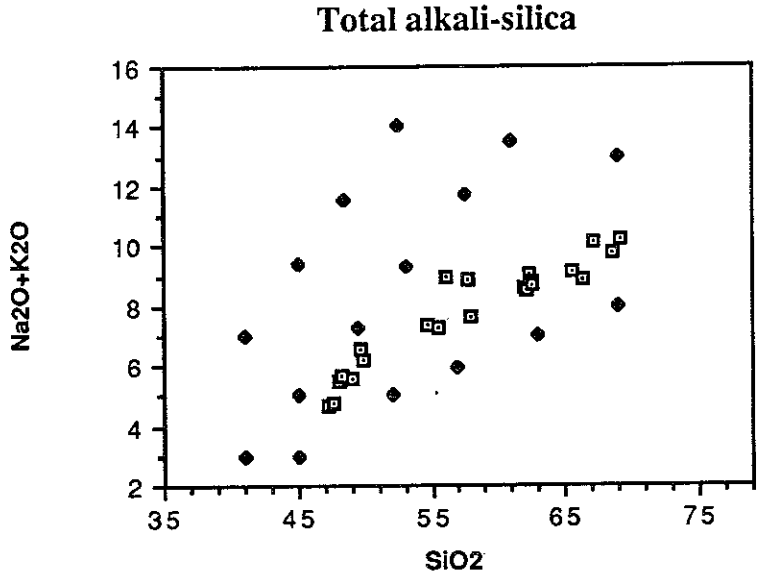
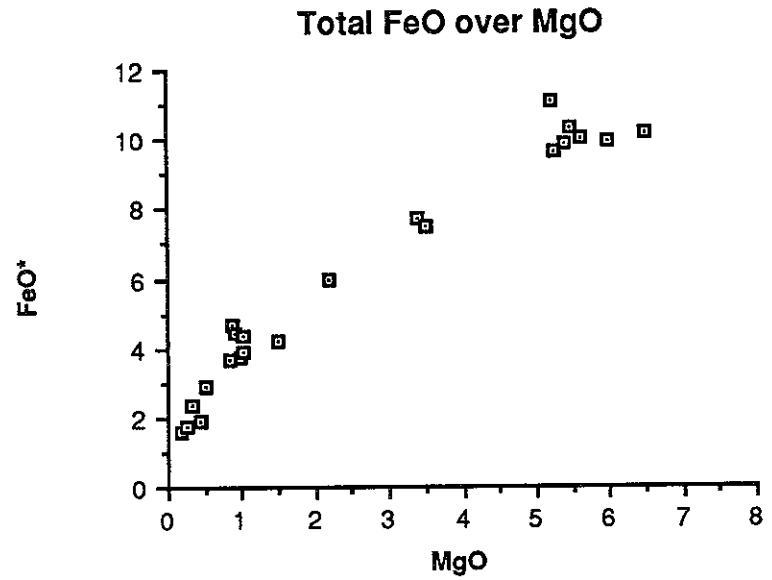


Figure 2.



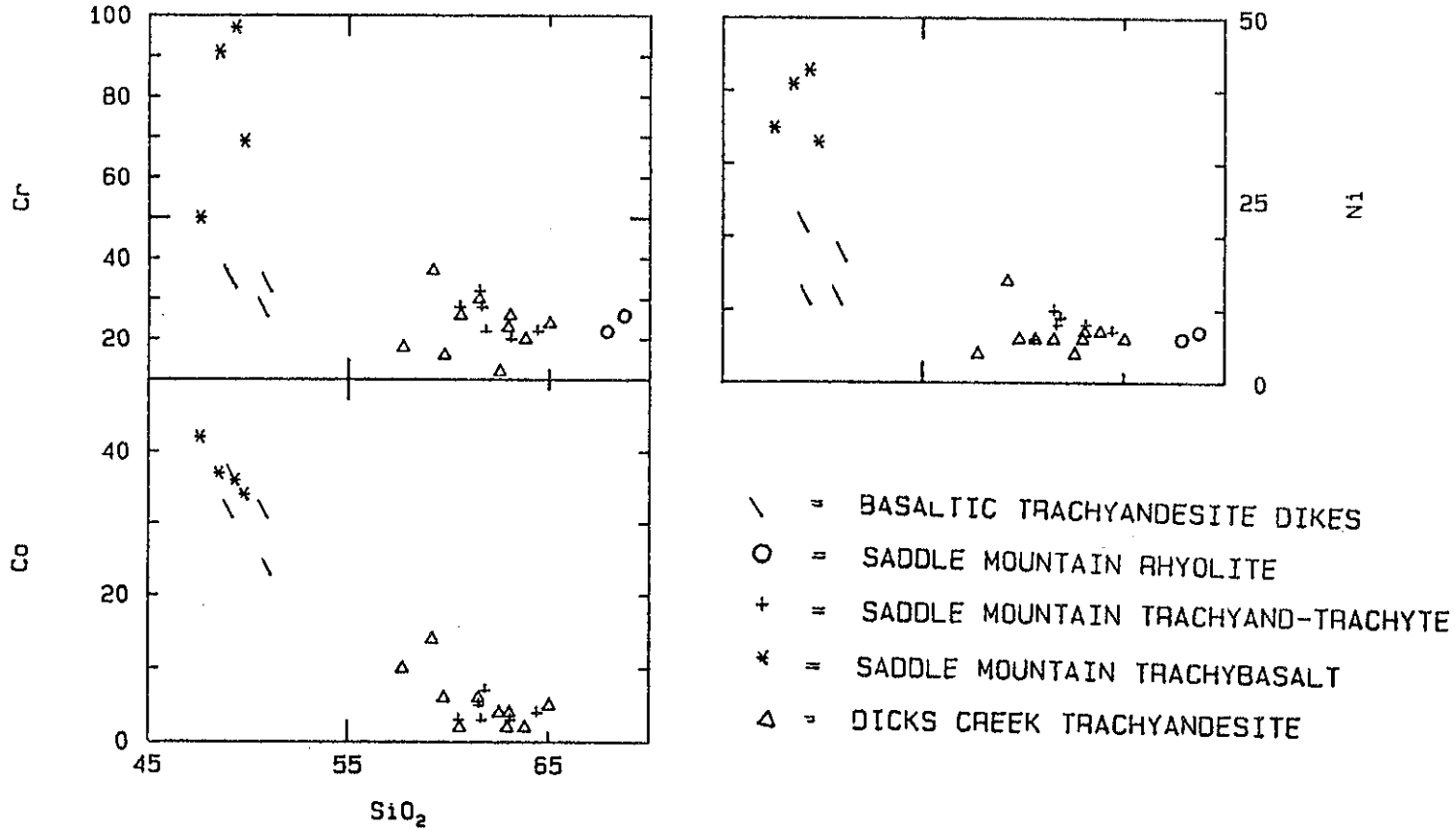


Fig. 25 Ni, Co, and Cr versus silica for the Saddle Mountain and Dicks Creek rocks. Y-axis values are in ppm and X-axis in weight percent.

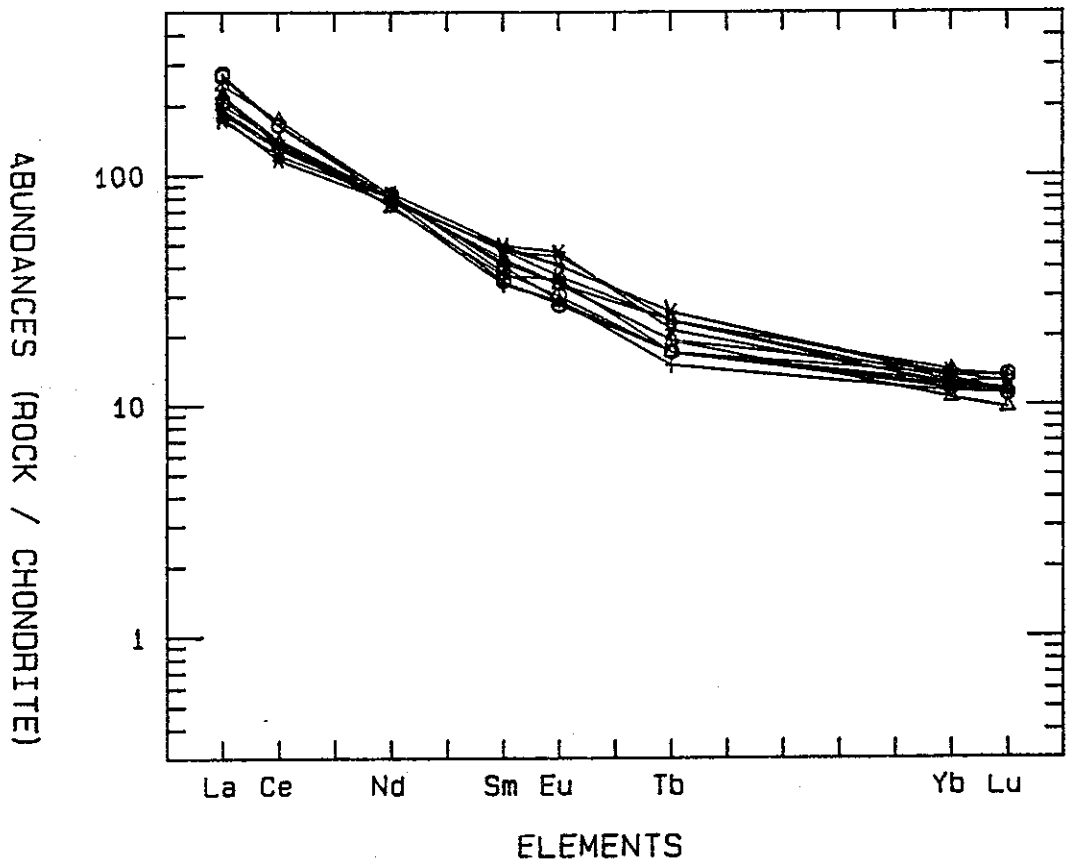


Fig. 28 REE/chondrite plots for the Saddle Mountain and Dicks Creek samples. Notice the tight clustering of all samples, the high total REE conc., and the large LREE/HREE ratios.