GEOLOGY OF SIERRA TINAJA PINTA AND CORNUDAS STATION AREAS, NORTHERN HUDSPETH COUNTY, TEXAS

by

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ABSTRACT

Igneous rocks in the Sierra Tinaja Pinta and Cornudas Station areas are part of a group of intrusions of Tertiary age t hat outline the northeastern margin of the Diablo Plateau; they are part of the larger alkalic petrographic province of Trans-Pecos Texas. Laccoliths, dikes, sills and a cone sheet were intruded into the Hueco and Victorio Peak Limestones of Permian age and into sandstone and limestone of Cretaceous age, which are paleontologically correlative with the Fredricksburg and Washita Groups of central Texas.

The igneous rocks are o f four types: (1) porphyritic analcime syenite and associated dike and contact rocks, (2) pyroxene trachyte, (3) porphyritic and analcime - nepheline syenite, and (4) olivine - analcime trachyte. When magma reached crustal levels presently exposed in the Sierra Tinaja Pinta-Cornudas Station vicinity, it was in an advanced stage of differentiation and crystallization. Hypersolvus feldspar, augite, and a minor amount of olivine and nepheline in a liquid were intruded near the base of the Hueco Limestone, and formed the Mayfield Valley intrusion. Filer pressing resulted in squeezing a liquid that contained a few microphenocrysts o f hypersolvus feldspar and nepheline into fractures overlying the Mayfield Valley intrusion. This liquid consolidated to form the porphyritic analcime - nepheline syenite o f the Miller Mountain, Cerro Diablo and East Mountain intrusions.

Experimental evidence suggests that nepheline syenites can be formed by two mechanisms: (1) differentiation from a magma of different composition, or (2) partial melting of pre-existing rocks to produce magma of nepheline syenite composition. The second mechanism is questionable because partial melting of most sedimentary rocks would produce granite rather than nepheline syenite; the hypothesis of partial melting of subsilicic igneous rocks to explain the origin of nepheline syenites merely postpones the problem of origin of subsilic rocks.

Fractional crystallization in the alkali olivine basalt series c a n produce phonolites. This mechanism i s favored as the origin of feldspathoidal igneous rocks that lie along the northeastern margin of the Diablo Plateau. Block faulting in the northern Trans-Pecos is thought to be related to the initiation of melting at depth.