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K-AR AGES OF PLUTONIC AND VOLCANIC ROCKS FROM THE VOLCANIC HIGHLANDS OF GUATEMALA NORTHWEST OF GUATEMALA CITY

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These three analyses were performed at the University of Texas at Austin as part of a dissertation study in the San Juan Sacatepéquez quadrangle, Guatemala (Ritchie, 1975), supervised by Dr. W. R. Muehlberger. This work was supported by the Instituto Geográfico Nacional de Guatemala, the University of Texas at Austin Institute for Latin American Studies, and the University of Texas at Austin Geology Foundation.

Potassium was analyzed by flame photometry using lithium internal standard and sodium buffering. Radiogenic argon was measured using isotope dilution mass spectrometry. Uncertainty in the ages is reported at two standard deviations. The constants used in the age calculations are: $\lambda_{\beta} = 4.963 \times 10^{-10} \text{ yr}^{-1}$, $\lambda_{\epsilon+\epsilon'} = 0.581 \times 10^{-10} \text{ yr}^{-1}$, $^{40}\text{K}/\text{K} = 1.167 \times 10^{-4} \text{ atom/atom}$.

DISCUSSION

The San Juan Sacatepéquez quadrangle is located in the volcanic highlands of south-central Guatemala between lat $14^{\circ}40'$ and $14^{\circ}50'$ N. and long $90^{\circ}30'$ and $90^{\circ}45'$ W. The town of San Juan Sacatepéquez is approximately 17 km northwest of the center of Guatemala City and 18 km south of the Motagua fault zone.

The oldest rocks in the area are Paleozoic greenschist-facies metavolcanic and metasedimentary rocks belonging to the El Tambor Formation. These rocks are overlain with great angular unconformity by Mesozoic sedimentary rocks consisting of a thin remnant of Upper Jurassic or Lower Cretaceous redbeds overlain by several hundred meters of recrystallized micritic limestone of the Aptian-Albian Atima Formation.

Granitic plutonic rocks containing xenoliths of a more mafic pluton intrude the metamorphic rocks. Fluids from the granitic intrusion deposited fine, disseminated sphalerite and argentiferous galena in northwest-trending fractures in the limestones of the Atima Formation. Biotite from the granitic intrusive rocks (sample 1) has a K-Ar age of 94.8 ± 2.7 m.y. Hornblende from the mafic xenoliths (sample 2) has a K-Ar age of 104.0 ± 6.1 m.y. Radiogenic argon may not have been completely expelled from hornblende of the xenolith at the time of incorporation into the pluton. In general, these ages agree with the observed field relationships and stratigraphy and place these intrusions in the chain of "Laramide" plutons which extends across northern Guatemala (Williams, McBirney, and Dengo, 1964).

Beginning in Miocene time, up to 400 m of silicic ignimbrites and interlayered thin basalts of the Padre Miguel Group blanketed the area from sources to the south.

Plagioclase from an ignimbrite near the base of the Padre Miguel Group (sample 3) has a K-Ar age of 17.1 ± 0.7 m.y. This age is compatible with K-Ar ages of 10 to 30 m.y. for Padre Miguel ignimbrites from Honduras (McDowell, 1974).

These ignimbrites are overlain by 200 to 400 m of Quaternary-Tertiary andesites. Associated with the andesites are fanglomerates, composed predominantly of andesite clasts, which developed locally across fault scarps associated with the Guatemala City graben.

Cenozoic rhyodacitic pumice blankets the area, thickening into and filling topographic lows. ^{14}C and K-Ar ages for these deposits indicate that the bulk of the pumice was deposited between 40,000 y. and 1.84 m.y. ago (Koch and McLean, 1975).

SAMPLE DESCRIPTIONS

- 4-15-1A+1B** K-Ar
Biotite from granite. (Rio de Quezada bridge, 684323, 1 km NW of San Antonio las Flores, Departamento de San Juan Sacatepéquez, Guatemala). Granite consists of 44% quartz, 7% plagioclase, 32% alkali feldspar, 9% muscovite, 6% biotite, and 1% accessory minerals. All grains are fresh and unaltered, but the quartz and plagioclase show some evidence of strain (undulose extinction and bent twin lamellae, respectively). *Analytical data:* K = 6.45, 6.40%, $^{40}\text{Ar}/\Sigma\text{Ar} = 94, 94\%$, $^{40}\text{Ar} = 2.39, 24.1 \times 10^{-5} \text{ scc/gm}$.
(biotite) 94.8 ± 2.7 m.y.
- 4-15-1D** K-Ar
Hornblende from diorite. (Rio de Quezada bridge, 684323, 1 km NW of San Antonio las Flores, Departamento de San Juan Sacatepéquez, Guatemala). Sample consists of 80% plagioclase; 15% hornblende; and 5% accessory and secondary minerals, including veinlets of prehnite. Sample is from core of 1.5 m diameter xenolith in granite. Xenolith has 2 cm reaction rim. The plagioclase is partially saussuritized, but the hornblende is unaltered. *Analytical data:* K = 0.1043, 0.1064%, $^{40}\text{Ar}/\Sigma\text{Ar} = 33, 20\%$, $^{40}\text{Ar} = 0.427, 0.439 \times 10^{-6} \text{ scc/gm}$.
(hornblende) 104.0 ± 6.1 m.y.
- 11-6-5A** K-Ar
Plagioclase from ignimbrite. (Road cut on National Route 5, at 540628, between San Pedro Sacatepéquez and San Juan Sacatepéquez, Departamento de San Juan Sacatepéquez, Guatemala). Ignimbrite is moderately welded, phenodacitic crystal-vitric tuff. Crystal content

is 54%, of which 38% are quartz, 43% are plagioclase, 10% are biotite partially altered to chlorite, and 9% are sanidine. The remainder of the sample consists of 30% partially devitrified glass, 12% collapsed pumice, and 6% rock fragments. *Analytical data*: $K = 0.850$, 0.843% , $^{40}\text{Ar}/\Sigma\text{Ar} = 47, 43\%$, $^{40}\text{Ar} = 0.555, 0.559 \times 10^{-6}$ scc/gm.

(plagioclase) 17.1 ± 0.7 m.y.

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