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NEW K-Ar ANALYSES OF BASALTS FROM SOUTHERN CALIFORNIA AND CENTRAL NEW MEXICO

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One of us (Leavy) is currently testing the feasibility of using the *in-situ* buildup of cosmogenic isotopes (^{36}Cl and ^{10}Be) as a method for determining the surface-exposure age of young volcanic rocks (Leavy and others, 1985; Phillips and others, 1986). The main interest to date has been the measurement of $^{36}\text{Cl}/\text{Cl}$ and $^{10}\text{Be}/^{9}\text{Be}$ in volcanic rocks of known age, and the comparison of the measured ratios to a calculated buildup curve. Samples were selected on the basis of three general criteria: 1) that they have known, or reasonably assumed, exposure histories; 2) that they are of known age, having been dated using appropriate existing methods; and 3) that the ages for the units fit the observed geology of the sample sites.

Three basalt units were of interest because their published ages fill several gaps in the range of dated rocks used for calibrating the cosmogenic isotope geochronometers. These include two flows from the Cima volcanic field in southern California (Turrin and others, 1985), and the Suwanee flow of Nichols (1933) along the valley of the Rio San Jose in central New Mexico (Bachman and Mehnert, 1978). The latter flow is also known as the Cerro Verde flow, since it originates from Cerro Verde volcano to the southwest (Kelley and Kudo, 1978; Baldrige and others, in prep.).

While these flows satisfy criteria 1 and 3 above, the large analytical uncertainties of the previously published dates (table 1) do not fully satisfy criterion 2. Hence we have sampled and re-analysed these basalts in an effort to improve the precision of the age determinations. In each case, K-Ar was measured on groundmass plagioclase concentrates, using procedures described in Damon and others (1983). Constants used in the age calculations are: decay = $5.544\text{e}^{-10}/\text{yr}$; beta = $4.963\text{e}^{-10}/\text{yr}$; "e" = $0.581\text{e}^{-10}/\text{yr}$; and $^{40}\text{K}/\text{K} = 1.167\text{e}^{-4}$ mol/mol. Analytical data and calculated ages are given in Sample Descriptions, below. The reported precision for all analyses is 2σ .

A comparison of results is shown in table 1. In two cases (C84-40 and C84-41) the precision of the analyses has been improved, but only marginally so, and the error in the analysis of the Cerro Verde basalt is greater than that determined by Bachman and Mehnert (1978). The large analytical errors associated with all determinations are probably due to the low K content and the large amount of atmospheric Ar in the flows. Two of the new ages (C84-41 and SG-1C) compare extremely well with those published previously. The third (C84-40) compares less well, but agrees within the limits of analytical error. The agreement of our analyses of these young basalts with previously published data strongly suggests that the ages are correct in spite of the large analytical errors associated with all determinations.

TABLE 1

Sample	Age, m.y., this study	Age, m.y., published
C84-40	0.480 ± 0.114	0.670 ± 0.130
C84-41	0.227 ± 0.084	0.270 ± 0.100
SG-1C	0.278 ± 0.302	0.320 ± 0.200

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SAMPLE DESCRIPTIONS

- C84-40** K-Ar Basalt ($35^{\circ}15.5'N, 115^{\circ}43.0'W$; elev. 1220 m; immediately above and to the N of the C84-41 flow; from the dense central zone of the flow, 2 m below the top surface, in a small south-facing cave exposed on the southern margin by a recent rockfall; SW corner Old Dad Mountain 15' USGS quad; San Bernardino Co., CA). Gray, fine-grained, sparsely vesicular, with sparse green olivine phenocrysts. *Analytical data:* (mean of 3 extractions) K = 1.756%; $^{40}\text{Ar}^*$ = 1.461 pm/g; Atm. Ar = 88.5%. *Comment:* sample UAKA86-62; site is within 100 m of Turrin and others (1985) MC-40 location.
(plagioclase) 0.480 ± 0.114 m.y.
- C84-41** K-Ar Basalt ($35^{\circ}15.5'N, 115^{\circ}43.0'W$; elev. 1195 m; 2 m from top surface in crevice recently exposed by rockfall along eroded southern margin of flow; approx. 200 m N of quarry road; SW corner Old Dad Mountain 15' USGS quad; San Bernardino Co., CA). Gray, fine-grained, sparsely vesicular, with sparse green olivine phenocrysts and prominent vugs of fresh calcite. *Analytical data:* (mean of 3 extractions) K = 1.952%; $^{40}\text{Ar}^*$ = 0.768 pm/g; Atm. Ar = 92.0%. *Comment:* sample UAKA86-63; site is within 100 m of Turrin and others (1985) MC-41 location.
(plagioclase) 0.227 ± 0.084 m.y.
- SG-1C** K-Ar Cerro Verde flow, basalt ($35^{\circ}50.3'N, 107^{\circ}03.1'W$; elev. 1610 m; southernmost end of "Black Mesa," where NM Route 6 cuts up through the flow in a 3-5 m deep roadcut; 2 m below surface, approx. 50 m from S end of roadcut; South Garcia SE 7.5' USGS quad; Valencia Co., NM). Medium-grained, gray, vesicular, glassy, with sparse green olivine phenocrysts. *Analytical data:* (mean of 3 extractions) K = 0.760%; $^{40}\text{Ar}^*$ = 0.360 pm/g; Atm. Ar = 97.5%. *Comment:* sample UAKA86-64; site is approx. 5 mi SE of Bachman and Mehnert (1978) location.
(plagioclase) 0.278 ± 0.302 m.y.

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