K-Ar ages of dike rocks. Big Bend National Park, Texas

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K-Ar AGES OF DIKE ROCKS, BIG BEND NATIONAL PARK, TEXAS

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The Los Alamos National Laboratory is currently producing a series of crustal stress and paleostress maps for the Arizona–New Mexico–Trans-Pecos region, Texas. The first map in the series (LA-9158-MAP), which shows the present stress field, was recently published and is available from the authors.

In order to produce the paleostress maps, K-Ar ages are being determined for dikes within this region. Chemical analyses of mafic dikes are being obtained to permit correlation and possible evaluation of tectonic settings at the time of dike emplacement. Because these data have many other uses besides stress field interpretations, we will attempt to release the ages and compositions of dikes from discrete areas as rapidly as possible. At the same time, we solicit contributions of unpublished ages, compositions, and dike orientations from other sources.

We report here the ages and chemical compositions of four basaltic dikes from Big Bend National Park, Texas. The new IUGS constants were used in calculating these ages. For consistency we have used the rock names of Maxwell and others (1967) where available.

DISCUSSION

Samples have been dated from three dike sets within Big Bend National Park, Texas. These samples represent NS-, NW-, and NE-striking dikes; fresh unaltered samples, suitable for dating, were not obtained on the east-striking dikes.

Our results indicate that dike emplacement persisted for about 13 m.y. within the Big Bend region and through several apparent shifts in orientation of the stress field. Additional younger shifts are recorded NW of Big Bend. In the Rim Rock area, Dasch and others (1969) report average ages of 22.3 m.y. (22.8 m.y., new constants) for NW-striking dikes and 19.2 m.y. (19.7 m.y., new constants) for N-striking dikes. They suggest a shift in orientation of the least principal horizontal axis from NE to E between

TABLE 1. Chemical and normative compositions of Big Bend basalts.

	VCK-82-TX-028 (%)	VCK-82-TX-029 (%)	VCK-82-TX-030 (%)	VCK-82-TX-031 (%)
SiO_2	49.55	48.66	46.99	51.95
TiO_2	2.09	2.99	3.35	1.86
Al_2O_3	17.94	17.26	17.10	18.30
Fe_2O_3	2.43	2.12	3.07	2.43
FeO	6.29	8.04	9.06	6.02
MgO	2.46	3.04	4.54	1.81
CaO	5.46	7.86	6.28	5.35
Na_2O	5.37	4.72	4.40	4.58
K_2O	3.25	2.53	1.86	3.60
H_2O^+	3.42	1.66	1.98	2.06
H_2O^-	0.25	0.08	0.26	0.44
P_2O_5	0.75	1.06	0.70	0.93
MnO	0.143	0.175	0.186	0.147
SrO	0.114	0.094	0.068	0.057
SO_3	<0.1	<0.1	<0.1	<0.1
Total	99.52	100.29	99.84	99.53

Normative Minerals (Niggli)	VCK-82-TX-028 (%)	VCK-82-TX-029 (%)	VCK-82-TX-030 (%)	VCK-82-TX-031 (%)
Q	0.00	0.00	0.00	0.00
Or	19.90	15.23	11.33	21.96
Lc	0.00	0.00	0.00	0.00
Ab	34.98	31.28	35.80	42.45
Ne	7.00	7.15	2.97	0.00
An	15.81	18.79	22.09	19.35
Di	5.75	11.11	4.26	1.42
Ol	7.29	7.67	13.92	7.15
Hy	0.00	0.00	0.00	0.36
Mt	2.63	2.26	3.31	2.62
Il	3.02	4.24	4.81	2.67
Ap	1.63	2.26	1.51	2.01
Ac	0.00	0.00	0.00	0.00
Hm	0.00	0.00	0.00	0.00
C	0.00	0.00	0.00	0.00
Wo	0.00	0.00	0.00	0.00
Total	100.00	100.00	100.00	100.00

these dates. At Bofecillos, about halfway between the Big Bend and Rim Rock regions, McDowell (written commun., 1982) obtained an age of 22.5 m.y. for a NW-striking dike.

The data suggest that stress field changes have been complex in the Trans-Pecos region. Despite these changes, the general character of the dike rocks has remained the same. All of the Big Bend samples are alkalic with high concentrations of K_2O, TiO_2, and P_2O_5.

SAMPLE DESCRIPTIONS

1. *VCK-82-TX-028* K-Ar
Locality 139 (Maxwell and others, 1967)
Porphyritic analcite basalt dike (29°20.2'N, 103°21.1'W; Big Bend National Park, TX). *Analytical data:* K = 3.151%; Ar^{40*} = 0.009634 ppm; Ar^{40*}/Total Ar = 0.790; Ar^{40*}/K^{40} = 0.002506. *Comment:* dike strikes N43.5°W.
(whole rock)43.5 ± 1.8 m.y.

2. *VCK-82-TX-029* K-Ar
Locality 160 (Maxwell and others, 1967)
Analcite trachybasalt porphyry dike (29°19.2'N, 103°26.1'W; Big Bend National Park, TX). *Analytical data:* K = 2.002%; Ar^{40*} = 0.006648 ppm; Ar^{40*}/Total Ar^{40} = 0.830; Ar^{40*}/K^{40} = 0.002723. *Comment:* dike strikes N2°W.
(whole rock)47.2 ± 2.0 m.y.

3. *VCK-82-TX-030* K-Ar
Locality 164 (Maxwell and others, 1967)
Analcite microsyenogabbro dike (29°3.4'N, 103°26'W; Big Bend National Park, TX). *Analytical data:* K = 1.598%; Ar^{40*} = 0.004130 ppm; Ar^{40*}/Total Ar^{40} = 0.702; Ar^{40}/K^{40} = 0.002118. *Comment:* dike strikes N62°E.
(whole rock)36.8 ± 1.7 m.y.

4. *VCK-82-TX-031* K-Ar
Basalt porphyry dike (29°3.1'N,103°24'W; Big Bend National Park, TX). *Analytical data:* K = 3.152%; Ar^{40*} = 0.007389 ppm; Ar^{40*}/Total Ar^{40} = 0.808; Ar^{40}/K^{40} = 0.001922. *Comment:* dike strikes N52°E.
(whole rock)33.4 ± 1.4 m.y.

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