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A SUMMARY OF RADIOMETRIC AGE DETERMINATIONS OF IGNEOUS ROCKS FROM SOUTHEASTERN ARIZONA

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A total of 230 radiometric age determinations on igneous rocks from 175 localities in southeastern Arizona between lat. 31°30′N–33°00′N and long. 110°W–112°W includes 183 by potassium-argon methods, 14 by rubidium-strontium, 2 by uranium-lead, and 31 by lead-alpha techniques (list 1 and 2, fig. 1). The rock sample number is given for reference for each determination. Analytical data and discussion are in the original references cited in the lists of dates. No attempt is made here to evaluate the age in a geologic context. Brief remarks in the "Note" column indicate metamorphic (M), anomalous (A), rerun (R), and Rb-Sr Isochron (I) dates. (IN) in the "Rock Type" column indicates an intrusive rock; (EX) indicates an extrusive rock. Only when certain determinations are at odds with geologic interpretation or with other age determinations is an explanation given in the footnotes.

Sample descriptions follow on pages 2-19.

See map (fig. 1) on page 20 for sample localities.

SAMPLE DESCRIPTIONS

List 1. Dates from lat. 32°–33°N, long. 110°W–112°W

LOCALITY NO.	LOCATION	ROCK TYPE	MINERAL DATED	DATE M. Y.	NOTE	METHOD	REFERENCE/SAMPLE NO.	
1	32°59′30″N 111°51′00″W	Granite (IN)	Muscovite	853±26 861±26		K-Ar K-Ar	Balla, 1972	KA–71–70
2	32°59′00″N 111°49′00″W	Monzonite (IN)	Biotite	70.9±2 71.7±2		K-Ar K-Ar	Balla, 1972	KA–71–69
3	32°32′06″N 111°53′02″W	Quartz monzonite (IN)	Biotite	65.9±6.6		K-Ar	Damon and Mauger, 1966	PED–20–64
4	32°26′36″N 111°29′30″W	Quartz latite (EX)	Biotite	25.0±2.0 25.3±1.0		K-Ar K-Ar	Mauger and others, 1965 Damon and Bikerman, 1964	RM–4–63
5	32°25′67″N 111°32′22″W	Quartz monzonite (IN)	Biotite	65.5±2.0 67.1±2.0		K-Ar K-Ar	Mauger and others, 1965 Damon and Mauger, 1966	PED–3–63
6	32°24′82″N 111°33′10″W	Alaskite (IN)	Biotite	64.6±2.5		K-Ar	Mauger and others, 1965	PED–22–59
7	32°23′87″N 111°31′77″W	Quartz monzonite (IN)	Biotite	67.1±2.7		K-Ar	Mauger and others, 1965 Damon and Mauger, 1966	PED–21–59
8	32°23′00″N 111°29′00″W	Dacite (EX)	Biotite	55.3±2.8	A[1]	K-Ar	Mauger and others, 1965	RM–3–63
9	32°24′00″N 111°30′00″W	Dacite (EX)	Biotite	57.5±3.0	A[1]	K-Ar	Mauger and others, 1965	PED–23–59

[1] According to Mauger and others (1965), the geologic relation of the Silver Bell Mountains show that the volcanic rocks (nos. 8, 9, 9a) are older than the monzonite (nos. 3, 5, 7), and they suggest that argon loss is responsible for the anomalous younger dates.

9a	Location unknown	Rhyolite (EX)	Sanidine	59.7±2.0	A[1]	K-Ar	Mauger and others, 1965	PED–6–63
10	32°23′07″N 111°24′42″W	Andesite (EX)	Biotite	27.9±1.4		K-Ar	Mauger and others, 1965 Damon and Bikerman, 1964	PED–1–63
11	32°12′34″N 111°22′14″W	Basalt dike (IN)	Whole rock	9.7±1.7		K-Ar	Bikerman, 1967	MB–17–64
12	32°13′06″N 111°20′37″W	Granodiorite (IN)	Biotite	68.6±2.2 67		K-Ar Rb-Sr	Bikerman, 1967 Damon, 1965	MB–10–64
13	32°09′57″N 111°23′34″W	Rhyodacite (EX)	Biotite	68.7±2.9 70.0±1.5		K-Ar K-Ar	Bikerman, 1967	MB–14–64
14	32°10′44″N 111°21′24″W	Rhyodacite (EX)	Sanidine	14.0±0.5 12.6±0.6	 R	K-Ar K-Ar	Damon and Bikerman, 1964 Bikerman, 1967	MB–3–64
15	32°10′07″N 111°19′18″W	Andesite (EX)	Whole rock	108.1±2.0		K-Ar	Bikerman, 1967	MB–16–64
16	32°09′16″N 111°26′36″W	Granodiorite (IN)	Plagioclase	34.1±2.3		K-Ar	Bikerman, 1967	MB–9–64
17	32°08′19″N 111°23′26″W	Quartz latite (EX)	Biotite K-feldspar Plagioclase	72.6±1.5 68.8±1.7 66.3±3.0	 R	K-Ar K-Ar K-Ar	Bikerman, 1967	MB–15–64
18	32°09′21″N 111°21′21″W	Rhyolite-trachyte (EX)	Sanidine	12.6±0.4		K-Ar	Bikerman, 1967	MB–2–64
19	32°07′29″N 111°19′50″W	Basaltic andesite (EX)	Whole rock	23.5±1.4		K-Ar	Bikerman, 1967	MB–12–64
20	32°07′27″N 111°19′46″W	Basaltic andesite (EX)	Whole rock	14.4±2.4	A[2]	K-Ar	Bikerman, 1967	MB–13–64

[2] Argon loss is apparently responsible for discordant dates obtained by Bikerman (1967) from andesite (no. 23), which is considered to be the same as the andesite dated at 108 m. y. (no. 15), and for similar basaltic andesites (nos. 19 and 20).

List 1. Dates from lat. 32°–33°N, long. 110°W–112°W (Cont.)

LOCALITY NO.	LOCATION	ROCK TYPE	MINERAL DATED	DATE M. Y.	NOTE	METHOD	REFERENCE/SAMPLE NO.	
21	32°05′50″N 111°19′17″W	Basalt (EX)	Whole rock	10.4±1.3		K-Ar	Bikerman, 1967	MB–7–64
22	32°06′47″N 111°25′07″W	Rhyolite-quartz latite (EX)	Biotite	68.9±1.5		K-Ar	Bikerman, 1967	MB–1–65
23	32°06′04″N 111°26′52″W	Andesite (EX)	Whole rock	65.2±2.0	A[2]	K-Ar	Bikerman, 1967	MB–2–65
24	32°05′28″N 111°26′06″W	Rhyodacite (EX)	Biotite	74.2±1.5		K-Ar	Bikerman, 1967	MB–5–64
25	32°04′50″N 111°28′54″W	Rhyodacite (EX)	Biotite	74.1±2.2		K-Ar	Bikerman, 1967	PED–12–61
26	32°04′41″N 111°27′52″W	Rhyodacite (EX)	Biotite	71.3±2.2 69.7±1.6	 R	K-Ar K-Ar	Bikerman, 1967	MB–1–64
27	32°04′03″N 111°24′23″W	Basaltic andesite (EX)	Whole rock	23.3±0.7		K-Ar	Bikerman, 1967	MB–6–64
28	32°20′44″N 111°08′55″W	Dacite neck (EX)	Biotite	24.5±0.9		K-Ar	Bikerman and Damon, 1966	PED–1–64
29	32°19′43″N 111°08′21″W	Tuff (EX)	Biotite	25.2±1.4		K-Ar	Bikerman and Damon, 1966	PED–10–63
30	32°19′34″N 111°08′22″W	Andesite (EX)	Biotite	38.5±1.3		K-Ar	Bikerman and Damon, 1966	PED–9–63

31	32°19′28″N 111°07′37″W	Andesite (EX)	Biotite	27.9±1.9	K-Ar	Bikerman and Damon, 1966	PED–1–64
32	32°19′43″N 111°08′06″W	Vitrophyre (EX)	Biotite	26.0±1.2	K-Ar	Bikerman and Damon, 1966	5 A–2
33	32°17′38″N 111°09′46″W	Granophyre (IN)	Biotite	75.1±2.2	K-Ar	Bikerman and Damon, 1966	PED–12–63
34	32°17′40″N 110°09′45″W	Quartz monzonite (IN)	Biotite	72.9±2.2	K-Ar	Bikerman and Damon, 1966	PED–11–63
35	32°16′22″N 111°12′34″W	Granite (IN)	Biotite	71.4±3.3	K-Ar	Bikerman and Damon, 1966	PED–3–64
36	32°13′35″N 111°05′08″W	Rhyolite (EX)	Feldspar	65.6±2.8	K-Ar	Bikerman and Damon, 1966	MB–3–62
37	32°12′56″N 111°05′57″W	Rhyolite (EX)	Feldspar	70.3±2.3	K-Ar	Bikerman and Damon, 1966	MB–1–62
38	32°12′56″N 110°58′06″W	Basaltic andesite (EX)	Whole rock	27.0±1.2	K-Ar	Bikerman and Damon, 1966	PED–17–63
39	32°12′47″N 111°00′20″W	Basaltic andesite (EX)	Whole rock	19.8±3.0	K-Ar	Bikerman and Damon, 1966	PED–8–63
40	32°12′32″N 110°59′19″W	Tuff (EX)	Feldspar	26.6±0.9	K-Ar	Bikerman and Damon, 1966	PED–1–62 B
41	32°12′32″N 110°59′22″W	Tuff (EX)	Sanidine	25.8±0.9	K-Ar	Bikerman and Damon, 1966	PED–7b–63 PED–17–62
42	32°12′28″N 110°59′56″W	Porphyry (EX)	Plagioclase	28.0±2.6	K-Ar	Bikerman and Damon, 1966	PED–16–63
43	32°12′30″N 110°59′19″W	Basaltic andesite (EX)	Whole rock	25.2±5.8	K-Ar	Bikerman and Damon, 1966	PED–15–63

List 1. Dates from lat. 32°–33°N, long. 110°W–112°W (Cont.)

LOCALITY NO.	LOCATION	ROCK TYPE	MINERAL DATED	DATE M. Y.	NOTE	METHOD	REFERENCE/SAMPLE NO.	
44	32°12′26″N 111°00′38″W	Andesite (EX)	Biotite	56.8±1.7		K-Ar	Bikerman and Damon, 1966	PED–15–62
45	32°09′23″N 111°02′54″W	Rhyolite (EX)	Biotite	60.5±1.8		K-Ar	Bikerman and Damon, 1966	PED–19–62
46	32°28′00″N 111°05′00″W	Quartz monzonite gneiss (IN)	Biotite	27.3±0.9	M	K-Ar	Mauger and others, 1968	PED–20–62
47	32°58′45″N 110°56′45″W	Rhyolite tuff (EX)	Sanidine	24.1±0.7		K-Ar	Krieger, 1973b	
48	32°56′03″N 110°57′12″W	Dacite porphyry (IN)	Hornblende	71.3±2.1		K-Ar	Krieger, 1973b	
49	32°57′44″N 110°51′22″W	Quartz monzonite (IN)	Biotite	68		K-Ar	Damon and others, 1964	PED–27–61
50	32°57′30″N 110°51′30″W	Granodiorite (IN)	Biotite	66.0±2.0		K-Ar	Krieger, 1973a	
51	32°57′30″N 110°51′30″W	Rhyodacite porphyry (IN)	Biotite	65.7±2.0		K-Ar	Krieger, 1973a	
52	32°50′00″N 110°45′30″W	Rhyolite dike (IN)	Biotite	22.3±0.7		K-Ar	Krieger, 1973c	
53	32°45′30″N 110°52′00″W	Granite (IN)	Whole rock Muscovite	1550±80 1310±40		Rb-Sr K-Ar	Krieger, 1973c	

54	32°41′00″N 110°41′30″W	Granodiorite porphyry (IN)	Biotite	65, 69		K-Ar	Creasey, 1965	
55	32°35′00″N 110°45′00″W	Quartz monzonite (IN)	Plagioclase Biotite	1420 1370		K-Ar K-Ar	Livingston and others, 1967	DEL–13–62
56	32°33′00″N 110°43′00″W	Quartz monzonite (IN)	Biotite Biotite	1420 1450		K-Ar Rb-Sr	Livingston and others, 1967 Gilletti and Damon, 1961	PED–2–58 PED–2–58
57	32°26′00″N 110°45′00″W	Quartz diorite (IN)	Biotite	29.6±0.6		K-Ar	Damon, 1969	PED–1–68
58	32°22′30″N 110°43′00″W	Granitic gneiss (IN)	Muscovite	32±3	M	K-Ar	Cantanzaro and Kulp, 1964	PED–4a–58 ?
59	32°22′01″N 110°43′00″W	Granitic gneiss (IN)	Muscovite Biotite Biotite Muscovite	29.5±0.9 24.8±1.0 23.9±1.4 37.6±1.0	M M M M	K-Ar K-Ar Rb-Sr Rb-Sr	Damon and others, 1963 Livingston and others, 1967	PED–4a–58
60	32°20′06″N 110°55′04″W	Banded gneiss	Muscovite	31.2±0.9	M	K-Ar	Mauger and others, 1968	PED–56–66
61	32°19′04″N 110°48′06″W	Banded gneiss	Muscovite	25.9±1.1	M	K-Ar	Damon and others, 1963	PED–4–58
62	32°20′03″N 110°41′04″W	Banded gneiss (light band) (dark band)	 Muscovite Biotite Orthoclase Biotite	 25.4±1.0 25.1±1.0 26.8±0.8 27.5±0.9	 M M M M	 K-Ar K-Ar K-Ar K-Ar	Livingston and others, 1967 Mauger and others, 1968	PED–18–62L PED–18–62d
63	32°20′15″N 110°29′50″W	Porphyry (EX)	Plagioclase	26.3±2.4		K-Ar	Damon, 1970	PED–3–69
64	32°13′08″N 110°31′00″W	Schist lens in gneiss	Muscovite	27.0±1.0	M	K-Ar	Livingston and others, 1967	PED–29–60
65	32°12′04″N 110°33′02″W	Pegmatite in gneiss (IN)	Muscovite	32.7±1.1	M	K-Ar	Damon and others, 1963	PED–30–60

List 1. Dates from lat. 32°–33°N, long. 110°W–112°W (Cont.)

LOCALITY NO.	LOCATION	ROCK TYPE	MINERAL DATED	DATE M. Y.	NOTE	METHOD	REFERENCE/SAMPLE NO.	
66	32°13′30″N 110°25′30″W	Mica schist	Biotite Muscovite	33.8±1.2 29.0±0.9	M M	K-Ar K-Ar	Marvin and others, 1973	70D–143
67	32°12′00″N 110°27′00″W	Granodiorite pegmatite (IN)	Biotite Muscovite	27.3±1.1 36.8±1.6	A[3]	K-Ar K-Ar	Marvin and others, 1973	69D93 69D95
68	32°12′00″N 110°27′00″W	Mica schist	Biotite	28.4±1.1	M	K-Ar	Marvin and others, 1973	69D92
69	32°05′00″N 110°37′00″W	Quartz monzonite (IN)	Biotite Hornblende	1450±50 1560±100		K-Ar K-Ar	Marvin and others, 1973	69D61
70	32°01′24″N 110°38′06″W	Tuff (EX)	Biotite	29.4±0.9 29.0±0.9		K-Ar K-Ar	Damon, 1966	PED–7–65
71	32°06′00″N 110°26′00″W	Quartz monzonite (IN)	Biotite	1540±60		K-Ar	Marvin and others, 1973	69D46
72	32°58′27″N 110°38′10″W	Rhyolite (EX)	Biotite	61.0±2		K-Ar	Krieger, 1968c	
73	32°54′52″N 110°32′48″W	Rhyolite tuff (EX)	Biotite Sanidine	24.56±1 22.4±1		K-Ar K-Ar	Krieger, 1968a	
74	32°51′34″N 110°32′06″W	Quartz latite (EX)	Biotite Sanidine	25.6 25.4		K-Ar K-Ar	Krieger, 1968b	
75	32°51′07″N 110°31′36″W	Rhyolite tuff (EX)	Biotite Sanidine	25.9±1 23.4±1		K-Ar K-Ar	Krieger, 1968b	

[3]Marvin and others (1973) state that the biotite age appears to be hybrid.

76	32°51′30″N 111°29′54″W	Tuff (EX)	Biotite	24.4±1	K-Ar	Krieger, 1968b	
77	32°38′30″N 110°30′00″W	Granodiorite (IN)	Biotite	68	K-Ar	Creasey and Kistler, 1962	
78	32°39′10″N 110°32′52″W	Vitric tuff (EX)	Glass	4.6±0.4	K-Ar	Damon, 1969	LDA–1–66
79	32°52′00″N 110°15′00″W	Granite (IN)	Zircon	60±10	Pb-a	Simons, 1964	
80	32°09′00″N 110°13′00″W	Granodiorite (EX)	Zircon	1655±20	U-Pb	Silver and Deutsch, 1963	
81	32°08′00″N 110°12′00″W	Intrusive rhyolite (IN)	Zircon	1715±15	U-Pb	Silver, 1967	
82	32°07′05″N 110°09′00″W	Quartz monzonite (IN)	Biotite Biotite Muscovite Biotite Muscovite Muscovite	49.6 50.5 52.4 48.4 47.4 54.2	K-Ar K-Ar K-Ar K-Ar K-Ar K-Ar	Livingston and others, 1967 Livingston and others, 1967	PED–6–64 PED–11–60
83	32°06′00″N 110°05′00″W	Quartz monzonite (IN)	Biotite Hornblende	50±3 52±3	K-Ar K-Ar	Marvin and others, 1973	A15
84	32°07′N 110°28′W	Quartz monzonite (IN)	Biotite Muscovite	23.5±0.9 24.8±0.9	K-Ar K-Ar	Marvin and others, 1973	
85	32°07′N 110°25′W	Granodiorite (IN)	Biotite	26.3±0.9	K-Ar	Marvin and others, 1973	

SAMPLE DESCRIPTIONS

List 2. Dates from lat. 31°30′N–32°00′N, long. 110°W–112°W

LOCALITY NO.	LOCATION	ROCK TYPE	MINERAL DATED	DATE M. Y.	NOTE	METHOD	REFERENCE/SAMPLE NO.	
1	31°58′12″N 111°35′30″W	Granite (IN)	Biotite	27.4±0.9		K-Ar	Damon and Bikerman, 1964	PED–2–62
2	31°56′N 111°16′W	Quartz monzonite (IN)	Zircon	210±30		Pb-a	Marvin and others, 1973	T168
3	31°52.41′N 111°14.34′W	Monzonite (IN)	Whole rock Whole rock, plagioclase, orthoclase	130±6 154±25	R I	Rb-Sr Rb-Sr	Damon, 1966 Damon, 1965	RM–10–63 RM–10–63
4	31°48′00″N 111°15′00″W	Basaltic andesite (EX)	Whole rock	23.4±0.9		K-Ar	Damon, 1969	JKP–2–68
5	31°54′N 111°11′30″W	Granite (IN)	Zircon	150±20		Pb-a	Marvin and others, 1973	T169
6	31°54.12′N 111°10.59′W	Aplite (IN)	Whole rock	69±6		Rb-Sr	Damon, 1965	RM–1–65
7	31°52.29′N 111°10.20′W	Granite (IN)	Whole rock Whole rock	140±14 123±18	R	Rb-Sr Rb-Sr	Damon, 1966 Damon, 1965	RM–2–65
8	31°52′N 111°10′W	Quartz monzonite (IN)	Zircon	190±20		Pb-a	Marvin and others, 1973	T400
9	31°59.1′N 111°07.8′W	Albite-muscovite-quartz-pegmatite (IN)	Muscovite	50.7±1.1		K-Ar	Damon and Mauger, 1966	RM–9–63
10	31°55′49″N 111°06′49″W	Tuff (EX)	Biotite	27.9±2.6		K-Ar	Damon and Bikerman, 1964	RM–1–64

11	31°53.95′N 111°06.95′W	Granodiorite (IN)	Biotite	58.7±0.8	K-Ar	Damon and Mauger, 1966	PED–8–62
12	31°54′00″N 111°06′30″W	Granodiorite (IN)	Biotite	60	K-Ar	Marvin and others, 1973 Creasey and Kistler, 1962	4
13	31°53′N 111°09′W	Biotite veinlets in diorite (IN)	Biotite Feldspar	60±3 56±3	K-Ar K-Ar	Marvin and others, 1973	T317
14	31°52′30″N 111°07′45″W	Quartz monzonite (IN)	Biotite	56	K-Ar	Marvin and others, 1973 Creasey and Kistler, 1962	5
15	31°52.0′N 111°07.7′W	Phlogopite-sericite rock	Phlogopite	62.6±2.0	K-Ar	Damon and Mauger, 1966	RM–1–62
16	31°52.0′N 111°07.7′W	Muscovite-quartz veinlet	Muscovite	60.6±1.8	K-Ar	Damon and Mauger, 1966	RM–3–62
17	31°58′N 111°06′W	Granodiorite porphyry (IN)	Biotite	46±2	K-Ar	Marvin and others, 1973	T358
18	31°59′35″N 111°04′00″W	Gangue	Feldspar	47±2	K-Ar	Marvin and others, 1973	T321
19	31°59′42″N 111°04′00″W	Kersantite dike (IN)	Biotite	26.4±1.0	K-Ar	Marvin and others, 1973	T430
20	31°57′30″N 111°04′30″W	Rhyolite tuff (EX)	Biotite	57	K-Ar	Marvin and others, 1973 Creasey and Kistler, 1962	6
21	31°56′45″N 111°04′15″W	Andesite (EX)	Biotite	24	K-Ar	Marvin and others, 1973 Creasey and Kistler, 1962	7
22	31°54′N 111°05′W	Gneissic quartz monzonite (IN)	Zircon	850±100	Pb-a	Marvin and others, 1973	T401
23	31°55′N 111°02′ W	Quartz monzonite (IN)	Biotite	53.5±1.9	K-Ar	Damon and Mauger, 1966	RM–3–64

List 2. Dates from lat. 31°30′N–32°00′N, long. 110°W–112°W (Cont.)

LOCALITY NO.	LOCATION	ROCK TYPE	MINERAL DATED	DATE M. Y.	NOTE	METHOD	REFERENCE/SAMPLE NO.	
24	31°34′06″N 111°05′30″W	Welded tuff (EX)	Biotite with hornblende	26.5±1.7		K-Ar	Damon, 1963	PED–9–62
25	31°27′N 111°03′30″W	Olivine basalt (EX)	Whole rock	12.6±0.8		K-Ar	Marvin and others, 1973	70D133
26	31°42′35″N 110°56′00″W	Quartz porphyry (IN)	Biotite Zircon	68.2±3.0 170±20	A[4]	K-Ar Pb-a	Marvin and others, 1973 Drewes, 1971b	65D754
27	31°43′35″N 110°53′50″W	Quartz monzonite (IN)	Biotite Zircon	69.0±2.9 190±30	A[4]	K-Ar Pb-a	Marvin and others, 1973 Drewes, 1971b Marvin and others, 1973	65D876 66D876
28	31°42.9′N 110°52.2′W	Granodiorite (IN)	Biotite	67.9±2.1		K-Ar	Damon and Mauger, 1966	RM–6–63
29	31°42′N 110°51′W	Latitic lava (EX)	Zircon	220±30		Pb-a	Marvin and others, 1973 Drewes, 1971b Drewes, 1968	65D918
30	31°36′30″N 110°56′20″W	Granite (IN)	Biotite Zircon	145±6 160±20		K-Ar Pb-a	Marvin and others, 1973 Drewes, 1971b Drewes, 1968	64D605
31	31°35′45″N 110°55′35″W	Rhyodacite welded tuff (EX)	Biotite	72.5±3.3		K-Ar	Marvin and others, 1973 Drewes, 1971b Drewes, 1968	64D580
32	31°35′35″N 110°55′35″W	Rhyodacite vitrophyre (IN)	Hornblende	27.8±2.2		K-Ar	Marvin and others, 1973 Drewes, 1971b	64D581

[4]The discrepancy between K-Ar dates and Pb-a dates determined from two samples from the same intrusive body (Elephant Head Quartz Monzonite) has been interpreted by Drewes (1968, p. C13-14) as suggesting that the quartz monzonite is a completely recrystallized Jurassic granite (Squaw Gulch Granite) exposed in the same area and dated by K-Ar and Pb-a techniques (nos. 29, 41).

33	31°32′15″N 110°59′00″W	Granodiorite (IN)	Biotite	27.6±1.3	K-Ar	Marvin and others, 1973 Drewes, 1971b	65D687
34	31°37′40″N 110°49′35″W	Monzonite (IN)	Zircon	180±20	Pb-a	Marvin and others, 1973 Drewes, 1971b Drewes, 1968	63D280
35	31°37′25″N 110°47′30″W	Porphyritic dacite dike (IN)	Hornblende Zircon	67±3 60±10	K-Ar Pb-a	Marvin and others, 1973 Drewes, 1971b	63D379
36	31°34′40″N 110°47′50″W	Rhyolitic welded tuff (EX)	Zircon	180±20	Pb-a	Marvin and others, 1973 Drewes, 1971b	65D905
37	31°35′05″N 110°46′55″W	Dacite (EX)	Hornblende	60.4±4.2	K-Ar	Marvin and others, 1973 Drewes, 1971b	64D660
38	31°35′10″N 110°46′40″W	Micro-granodiorite (IN)	Zircon Biotite	50±10 60±3	Pb-a K-Ar	Marvin and others, 1973 Drewes, 1971b	63D281
39	31°34′55″N 110°51′10″W	Diorite (IN)	Zircon Biotite	60±10 67±3	Pb-a K-Ar	Marvin and others, 1973 Drewes, 1971b Drewes, 1968	63D316
40	31°33′55″N 110°50′40″W	Diorite (IN)	Zircon	60±10	Pb-a	Marvin and others, 1973 Drewes, 1971b	63R292
41	31°34′15″N 110°49′05″W	Granite (IN)	Zircon	160±20	Pb-a	Marvin and others, 1973 Drewes, 1971b	63D282
42	31°32′50″N 110°49′40″W	Granite (IN)	Zircon	60±20	Pb-a	Marvin and others, 1973 Drewes, 1971b Drewes, 1968	63D507
43	31°34′05″N 110°53′10″W	Rhyodacite vitrophyre (EX)	Plagioclase	26.2±1.9	K-Ar	Marvin and others, 1973 Drewes, 1971b	66D710
44	31°31′15″N 110°50′55″W	Latite vitrophyre (EX)	Biotite Hornblende Zircon	26±2 27±3 40±10	K-Ar K-Ar Pb-a	Marvin and others, 1973 Drewes, 1971b	63D315
45	31°29′15″N 110°48′15″W	Rhyolite tuff (EX)	Biotite	26±2	K-Ar	Marvin and others, 1973	63P333

List 2. Dates from lat. 31°30′N–32°00′N, long. 110°W–112°W (Cont.)

LOCALITY NO.	LOCATION	ROCK TYPE	MINERAL DATED	DATE M. Y.	NOTE	METHOD	REFERENCE/SAMPLE NO.	
46	31°28′48″N 110°48′00″W	Tuff (EX)	Biotite	25.3±5.1		K-Ar	Damon and Bikerman, 1964	PED–10–62
47	31°28′N 110°46′30″W	Alkali syenite (IN)	Zircon	150±20		Pb-a	Marvin and others, 1973	63N322
48	31°27′26″N 110°47′30″W	Quartz monzonite (IN)	Zircon	160±20		Pb-a	Marvin and others, 1973	64N364
49	31°24′30″N 110°55′30″W	Quartz monzonite (IN)	Biotite Hornblende	160±7 164±19		K-Ar K-Ar	Marvin and others, 1973	66N454
50	31°25′35″N 110°42′10″W	Granodiorite (IN)	Zircon	1280±150		Pb-a	Marvin and others, 1973	63P241B
51	31°23′15″N 110°43′W	Granodiorite (IN)	Biotite Hornblende	58±3 58±5		K-Ar K-Ar	Marvin and others, 1973	62P242
52	31°23.2′N 110°43.1′W	Quartz monzonite (IN)	Biotite	63.9±2.0		K-Ar	Damon and Mauger, 1966	RM–7–63
53	31°20′30″N 110°44′45″W	Quartz monzonite (IN)	Biotite	58±3		K-Ar	Marvin and others, 1973	63P286
54	31°55′50″N 110°43′36″W	Quartz monzonite (IN)	Biotite	73.8±2.6		K-Ar	Marvin and others, 1973	
55	31°52′31″N 110°47′20″W	Quartz latite (EX)	Biotite	53.9±2.0		K-Ar	Marvin and others, 1973 Drewes, 1971a	70D1612
56	31°51′45″N 110°47′00″W	Quartz latite (EX)	Biotite	56.3±2.1		K-Ar	Marvin and others, 1973 Drewes, 1971a	67D245 (1245)

57	31°50′15″N 110°48′25″W	Granodiorite (IN)	Biotite Biotite	53.5±2.0 52.2±2.0		K-Ar K-Ar	Marvin and other, 1973 Drewes, 1971a	66D51 (1051)
58	31°51′15″N 110°45′30″W	Quartz latite (EX)	Biotite	55.8±2.1		K-Ar	Marvin and others, 1973 Drewes, 1971a	66D185 (1185)
59	31°51′07″N 110°44′58″W	Rhyolitic welded tuff (EX)	Zircon	210±30		Pb-a	Marvin and others, 1973	F–34–68
60	31°47′55″N 110°48′30″W	Porphyroblastic granodiorite (IN)	Biotite Zircon	55.5±2.4 1360±200	M	K-Ar Pb-a	Marvin and others, 1973 Drewes, 1971a	66D46 (1046)
61	31°47′55″N 110°46′50″W	Porphyroblastic granodiorite (IN)	Whole rock Zircon	800±80 1450±160	M	Rb-Sr Pb-a	Marvin and others, 1973 Drewes, 1971a	65D914
62	31°46′00″N 110°46′45″W	Quartz latite (EX)	Biotite	55.7±2.2		K-Ar	Marvin and others, 1973 Drewes, 1971a	68D1472
63	31°45′30″N 110°48′05″W	Rhyolite vitrophyre dike (IN)	Sanidine	25.9±1.3		K-Ar	Marvin and others, 1973 Drewes, 1971a	65D899
64	31°45′30″N 110°46′W	Quartz monzonite (IN)	Zircon	180±30		Pb-a	Marvin and others, 1973	66D893
65	31°43′45″N 110°46′10″W	Dacite flow (EX)	Plagioclase	240±10		K-Ar	Damon, 1970	PED–27–66
66	31°43′15″N 110°46′05″W	Dacite flow (EX)	Zircon	190±20		Pb-a	Marvin and others, 1973 Drewes, 1971b	63D339
67	31°43′13″N 110°46′03″W	Rhyolite dike (IN)	Zircon	40±10		Pb-a	Marvin and others, 1973	63D340
68	31°59′48″N 110°38′36″W	Rhyolite ash flow (EX)	Sanidine Biotite	36.7±1.7 32.8±2.6		K-Ar K-Ar	Damon and Bikerman, 1964	PED–13–62
69	31°55′20″N 110°42′30″W	Quartz diorite (IN)	Biotite	73.6±2.8		K-Ar	Marvin and others, 1973	F–33–68

List 2. Dates from lat. 31°30′N–32°00′N, long. 110°W–112°W (Cont.)

LOCALITY NO.	LOCATION	ROCK TYPE	MINERAL DATED	DATE M. Y.	NOTE	METHOD	REFERENCE/SAMPLE NO.	
70	31°55′50″N 110°36′40″W	Rhyolite (?) tuff (EX)	Zircon	170±35		Pb-a	Marvin and others, 1973	Empire 1
71	31°54′30″N 110°39′20″W	Quartz monzonite (IN)	Zircon	80±15		Pb-a	Marvin and others, 1973	Empire 3
72	31°54′N 110°38′W	Quartz monzonite (IN)	Biotite	70.3±2.5		K-Ar	Marvin and others, 1973	F–32–68
73	31°53′15″N 110°37′40″W	Quartz monzonite (IN)	Zircon	110±20		Pb-a	Marvin and others, 1973	T–2–64
74	31°52′48″N 110°39′51″W	Dacite (EX)	Biotite	28.0±1.1		K-Ar	Marvin and others, 1973 Finnell (1970, p. A36)	F-94–68
75	31°27′40″N 110°40′W	Rhyolite tuff (EX)	Biotite Hornblende	23±2 27±3		K-Ar K-Ar	Marvin and others, 1973	62D250
76	31°28′45″N 110°36′W	Latitic welded tuff (EX)	Biotite	72.1±3.0		K-Ar	Marvin and others, 1973	61C–S–40
77	31°29′30″N 110°32′W	Rhyolitic tuff (EX)	Biotite	173±8		K-Ar	Marvin and others, 1973	62P4
78	31°24′45″N 110°30′45″W	Latitic tuff (EX)	Biotite	72±4		K-Ar	Marvin and others, 1973	62P35
79	31°24′N 110°23′W	Welded tuff (EX)	Biotite	165±6		K-Ar	Marvin and others, 1973	HH450
80	31°23′20″N 110°23′W	Welded tuff (EX)	Biotite Whole rock	144±6 144±11		K-Ar Rb-Sr	Marvin and others, 1973	HH443

81	31°27′45″N 110°23′10″W	Andesite (EX)	Zircon	220±35	Pb-a	Marvin and others, 1973	HH446
82	31°21′15″N 110°15′15″W	Quartz monzonite (IN)	Biotite	164±6	K-Ar	Marvin and others, 1973	HH447
83	31°46′18″N 110°25′21″W	Granodiorite (IN)	Biotite Hornblende	74±4 74±4	K-Ar K-Ar	Marvin and others, 1973	A25
84	31°37′N 110°25′W	Rhyolite tuff (EX)	Biotite	38.9±1.5	K-Ar	Marvin and others, 1973	
85	31°41′15″N 110°14′45″W	Rhyodacite (IN)	Biotite	71.9±2.7	K-Ar	Marvin and others, 1973	68D582
86	31°43′48″N 110°06′00″W	Granodiorite (IN)	Biotite	72	K-Ar	Marvin and others, 1973 Creasey and Kistler, 1962	3
87	31°39′09″N 110°02′42″W	Rhyolite (IN)	Biotite	63	K-Ar	Marvin and others, 1973 Creasey and Kistler, 1962	2
88	31°56′N 110°00′W	Quartz monzonite (IN)	Biotite	26±2	K-Ar	Marvin and others, 1973	
89	31°30′10″N 110°00′09″W	Granite (IN)	Biotite Biotite Biotite	163 186 188	K-Ar Rb-Sr Rb-Sr	Marvin and others, 1973 Creasey and Kistler, 1962	1

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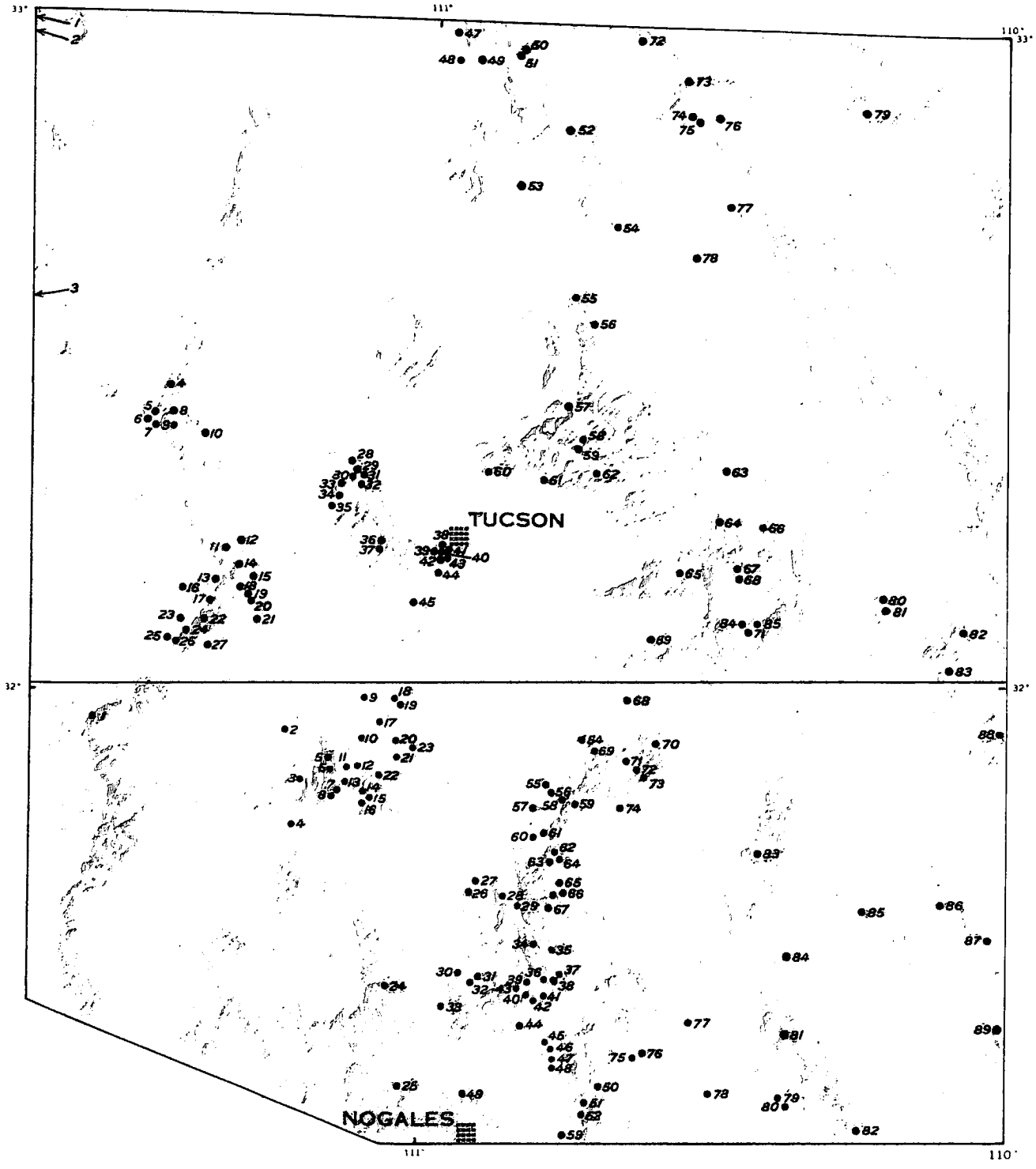

Figure 1 – Shaded relief map showing the location of dated rock samples. (The numbers on the map are the same as the "locality numbers" in the Sample Descriptions section; samples from north of latitude 32°N are in List 1, those south of latitude 32°N are in List 2.) *(Johnson and Todd article.)*