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NEW ISOTOPIC DATES FOR THE TAYLOR CREEK RHYOLITE AND ASSOCIATED ROCKS IN THE BLACK RANGE OF NEW MEXICO

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Six new Rb-Sr isochron dates and two new K-Ar dates are reported for rhyolite lavas and intrusive rocks in the northern Black Range and Sierra Cuchillo (fig. 1). Five domes of the mid-Tertiary Taylor Creek Rhyolite in the northern Black Range and an aplitic granite in the northern Sierra Cuchillo were dated by Rb-Sr isochron techniques. K-Ar dates on sanidine from the Taylor Creek Rhyolite range from about 24 m.y. to about 28 m.y. (Elston and others, 1973; Ratte and others, 1984; Maxwell and others, 1986; (see fig. 1 and Sample Descriptions section, this paper). The Rb-Sr dates reported here range from 28.4 ± 0.5 to 30.2 ± 0.1 m.y. (see figs. 1, 2, and table 1). Stratigraphic considerations suggest that the age of the Taylor Creek Rhyolite is near the Rb-Sr dates (Ratte and others, 1984; McIntosh and others, 1986). Many of the domes have vitric blocks in carapace breccia. Vapor phase crystallization was locally intense and locally redistributed Rb and Sr while the lava was cooling. Geochemical samples were selected to characterize the entire spectrum of crystallization types in each dome. Samples for isotopic analyses were chosen from a larger population of geochemical samples. Those samples were chosen because they exhibit the largest spread in Rb/Sr ratios within the individual domes. Five samples of the granite of Iron Mountain were collected specifically for dating.

Two samples for K-Ar dating were collected. A sample of the Taylor Creek Rhyolite (#136) and a sample of intensely alunitized ignimbrite (#109) from an advanced argillic alteration assemblage surrounding a rhyolite porphyry intrusive. The alteration is believed to be related to the intrusive and is thus the same age as the intrusive. The sample of the Taylor Creek Rhyolite was lithoidal. Sanidine was separated using a combination of magnetics and heavy liquids and then treated with HF and HNO_3 to remove any alteration.

Rb-Sr isotopic analyses of the whole rock rhyolite samples were performed at the Mineralogisk-Geologisk Museum, Oslo, Norway, on a Vacuum Generators model 354 mass spectrometer. Rb and Sr analyses were performed by x-ray fluorescence spectrometry at the facilities of the New Mexico Bureau of Mines and Mineral Resources and by isotope dilution at the Mineralogisk-Geologisk Museum. Errors of $^{87}Rb/^{86}Sr$ values determined by isotope dilution are ±0.5%, values determined by XRF are ±2%. Twenty-three replicate analyses of NBS 987 performed before and during the analyses reported here yield $^{87}Sr/^{86}Sr = 0.71020 \pm 13$ (2 sigma). All $^{87}Sr/^{86}Sr$ values were normalized to $^{86}Sr/^{88}Sr = 0.1194$. The decay constant was 1.42×10^{-11} yr^{-1} (Steiger and Jager, 1977). Isochrons were calculated by the least squares regression technique of York (1966).

The K-Ar dates were determined by Kreuger Enterprises' Geochron Laboratories Division in February 1984. The following constants were used: $\lambda_\beta = 4.962 \times 10^{-10}$ yr^{-1}; $\lambda_\epsilon = 0.581 \times 10^{-10}$ yr^{-1}; $K^{40}/K = 1.1927 \times 10^{-4}$g/g.

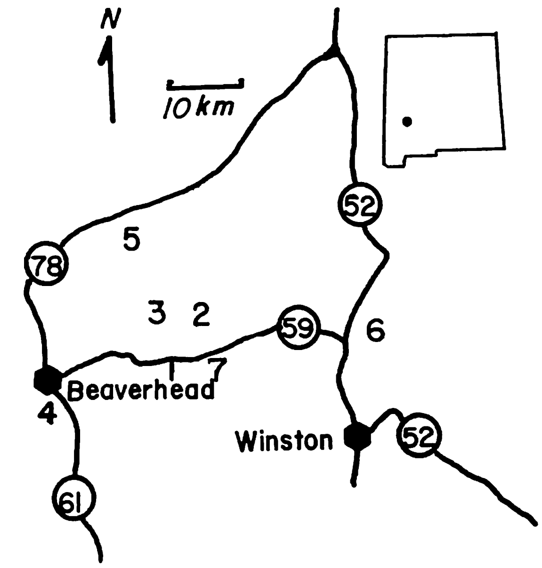

FIGURE 1. Location map for dated samples in the northern Black Range and Sierra Cuchillo. Locations 1 through 6 were dated by Rb-Sr, locations 2 and 7 by conventional K-Ar. Index of locations: 1—Boiler Peak-Paramount Canyon, 2—Nugget Gulch, 3—Squaw Creek, 4—Kemp Mesa, 5—Indian Peaks, 6—Iron Mountain, 7—Kline Mountain.

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SAMPLE DESCRIPTIONS

109 K-Ar

Field #10-5-1; (fig. 1, #7)

Tuff of Kline Mountain (S23,T10S,R10W; 33°25′43″N, 107°50′47″; NM) intensely alunitized and kaolinized ignimbrite. Primary textures are totally obscured, but weathered surfaces suggest that this rock was an ignimbrite prior to alteration. It now consists of >60% alunite. *Analytical data:* $^{40}Ar^* = 0.07682$ ppm; $^{40}Ar^*/\Sigma^{40}Ar = 0.547$; K = 3.872%; $^{40}K = 4.723$ ppm.

(alunite) 28.41 ± 1.2 m.y.

136 K-Ar

Field #11-15-1; (fig. 1, #2)

Taylor Creek Rhyolite (S29,T9S,R10W; 33°29′33″N, 107°53′31″; NM) crystal-rich, flow banded, white to lavender rhyolite lava. The sample is little affected by vapor phase crystallization; contains about 8% quartz, 9% sanidine and traces each of biotite and zircon. The quartz are up to 4 mm and the sanidine up to 2 mm in size. *Analytical data:* $^{40}Ar^* = 0.01175$ ppm; $^{40}Ar^*/\Sigma^{40}Ar = 0.7455$; K = 6.236%; $^{40}K = 7.608$ ppm.

(sanidine) 26.99 ± 1.1 m.y.

(for sample nos., see table 1)
Taylor Creek Rhyolite domes (northern part Black Range; NM) a monotonous group of lava domes and flows. There are two mineralogically distinct groups of lavas: the first group consists of about 15% phenocrysts of quartz and sanidine in subequal proportions in a granophyric groundmass; plagioclase, amphibole, and biotite are present in trace quantities (this group includes the domes at Boiler Peak-Paramount Canyon, and Indian Peaks (see table 1 and fig. 2). The second group contains as much as 40% phenocrysts of quartz and sanidine in subequal proportions in a granophyric groundmass; plagioclase and biotite each comprise as much as 1% of the groundmass (this group comprises the Squaw Creek and Kemp Mesa domes (see table

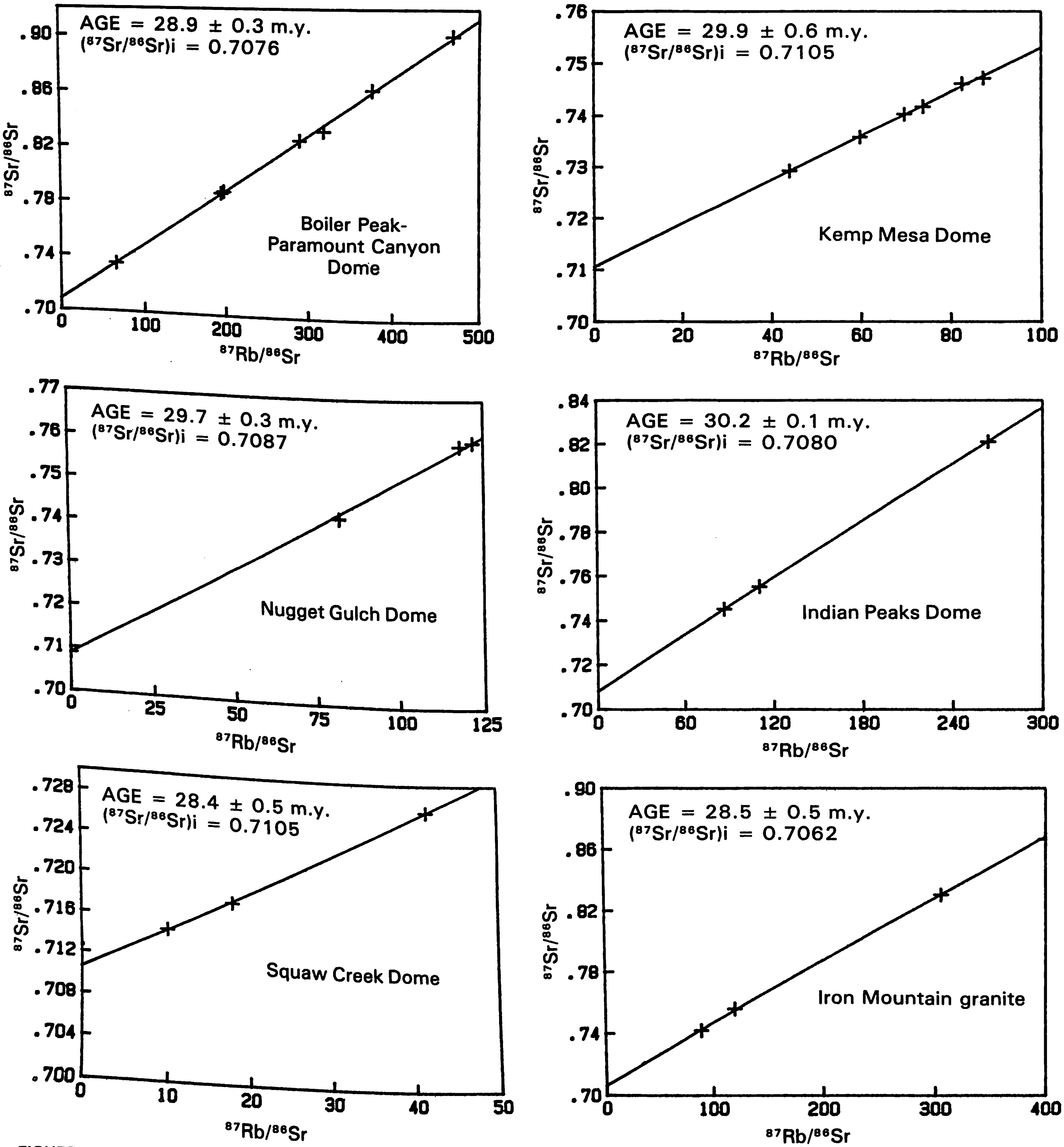

FIGURE 2. **Isochron diagrams.**

TABLE 1. Sr isotopic analyses.

Sample	Rb	Sr	$^{87}Rb/^{86}Sr$	$^{87}Sr/^{86}Sr$	error[1]
Boiler Peak-Paramount Canyon Dome					
131	416*	3.830	318.1	0.83411	21
149	347.7	2.716	376.0	0.86338	1
150	393.8	2.474	469.3	0.90139	6
190	366.7	16.10	66.07	0.73452	29
221	357.9	5.275	197.9	0.78940	1
226	376.3	5.635	194.7	0.78811	2
227	360.0	3.641	289.4	0.82724	9
Nugget Gulch Dome					
140	222.3	7.143	118.1	0.75959	11
141	288.5	6.885	121.9	0.76040	18
142	350.6	10.180	82.13	0.74259	15
196	8.03	199.60	0.116	0.70880	10
Squaw Creek Dome					
30	470*	75*	18.15	0.71770	20
31	676*	47*	41.70	0.72737	26
33	617*	174*	10.27	0.71470	18
Kemp Mesa Dome					
2	274.0	9.638	82.56	0.74601	15
3	326.0	15.82	59.79	0.73566	11
4	285.9	11.237	73.86	0.74165	14
167	292.2	19.24	44.03	0.72918	13
168	306.5	10.20	87.28	0.74710	10
268	264.3	11.01	69.68	0.74015	5
Indian Peaks Dome					
207	368.39	4.087	263.7	0.82106	18
208	300.2	10.086	86.43	0.74505	23
211	300.7	7.973	110.3	0.75529	10
Iron Mountain granite					
198	395.6	9.576	120.1	0.75567	1
199	359.6	11.696	89.25	0.74182	1
200	601.1	4.416	400.0	0.86676	2
201	469.5	4.49	306.1	0.83009	12

*Analysis by XRF, all others by isotope dilution.
[1]2 sigma.

1 and fig. 2). Sphene is present only in the second group; zircon and opaque minerals are accessory minerals in both groups.

198, 199, 200, 201

Granite of Iron Mountain (N end Sierra Cuchillo; NM) an aplitic granite consisting of K-feldspar (50%), quartz (25%), plagioclase (25%), and accessory zircon, biotite (primary and secondary, and opaque minerals. Quartz is locally resorbed, but more commonly is interstitial to the feldspars; the feldspars are intergrown and typically exhibit complex exsolution textures.

Quartz-fluorite veinlets locally cut the granite, and some fluorite crystals appear to be primary rather than the product of later hydrothermal alteration. Numerous fluorite-magnetite skarns enriched with beryllium and tungsten surround the granite (Jahns, 1944). Chapin and others (1978) obtained a conventional K-Ar date of 30.0 ± 1.1 m.y. on secondary biotite in one of the samples used in this study (#201). The isochron date of 28.5 ± 0.5 (fig. 2) is somewhat younger than the K-Ar date, but because the errors overlap, the differences are probably not significant.

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