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K-AR DATES ON A BASALT FLOW AND A VENT PLUG IN NORTHEAST HARDING COUNTY, NORTHEASTERN NEW MEXICO*

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The samples listed below were collected specifically for radiometric age determinations to establish the age of a sequence of basalt flows and their relationship to the Raton, Clayton, and Capulin basalts described and mapped in Union and Colfax Counties by Baldwin and Muehlberger (1959) and earlier by Lee (1922), Collins (1949), and Wood, Northrop, and Griggs (1953), none of whom had the benefit of K-Ar dates.

The flows overlie fluviatile deposits of Pliocene age (considered to be part of the Ogallala Formation) and rocks of Cretaceous age, and are mostly covered by colluvium, soil, and stabilized dune-sand. They are best exposed in scattered outcrops in shallow drainage ways on the plain and in the rim rock bordering Carrizo Creek. The dozen or so vents rise as conspicuous prominences above the otherwise rather featureless surface of the High Plains outlier upon which they and the flows rest. The surface of the High Plains outlier stands about 800 feet above the valley floor of Ute Creek at Bueyeros.

In earlier reports the various sequences of flows were assigned ages ranging from early Pleistocene to late Holocene. The early Pleistocene ages were predicated on the assumption that the underlying beds of the Ogallala Formation represented latest Pliocene age. Baldwin and Muehlberger (1959, p. 79) recognized that the older basalts might have been erupted during the Pliocene and so changed the Pliocene-Pleistocene boundary to include the first and second period flows of Lee (Raton basalt of Collins, 1949, and Wood and others, 1953). These earlier workers had, on the basis of certain inferences, arbitrarily placed the boundary at the beginning of volcanic activity. Baldwin and Muehlberger's change in the boundary was based on the inferred correlation of algal limestones overlying the basalts with algal limestones of Pliocene age in Kansas.

The high topographic position of the flow sampled, considered with the fact that it locally overlies beds of Pliocene (Ogallala) age, suggested that it was of early Pleistocene age and therefore probably equivalent to the Raton and Clayton basalts. The 3.4±1.0 m.y. age means that the basalt could be of late Pliocene age and therefore is equivalent to either the first or second period flows of Lee and Mertie (or Raton and Clayton basalts of the later reports). If it is of late Pliocene age, and equivalent to the second period of flows, it would mean that the first period flows could extend well back into Pliocene time, perhaps even farther back than imagined by Baldwin and Muehlberger. Obviously, more K-Ar dates are needed from the various sequences of flows to get a good fix on their ages.

The 1.2±1.0 m.y. age of the sample from the central spine in the vent (fig. 2) came as something of a surprise as it was thought this vent was the source of the flow. The age as determined would make it a correlative of the third-period basalt flows of Lee (1922), or the "Clayton" basalt of Collins (1949) and Wood and others (1953), and the Folsom area flows of Baldwin and Muehlberger (1959). It supports Baldwin and Muehlberger's observation (1959, p. 78) "that volcanic activity was essentially continuous in the region but that the locus of volcanism shifted, so that in any particular area the volcanism appears to have been periodic".

A relevant observation resulting from the determination of a late Pliocene or early Pleistocene age for the flows in the area southeast of Yates is that the broad deep valley of Ute Creek, from the vicinity of Bueyeros to the Canadian River, had to have been cut to nearly its present width and depth during early and middle-Pleistocene time. Gravel-capped hills and fossil-bearing lake deposits of probable late-Pleistocene age are found in the valley of Ute Creek south from Bueyeros. Some of the gravel-capped hills lie almost at the foot of the Canadian Escarpment, and about 700 feet below the Pliocene-age High Plains surface.

Thanks are due Frank E. Kottlowski of the New Mexico State Bureau of Mines and Mineral Resources for receiving and transmitting the samples and to Rodger E. Denison of the Mobil Research and Development Corporation for the age determinations.

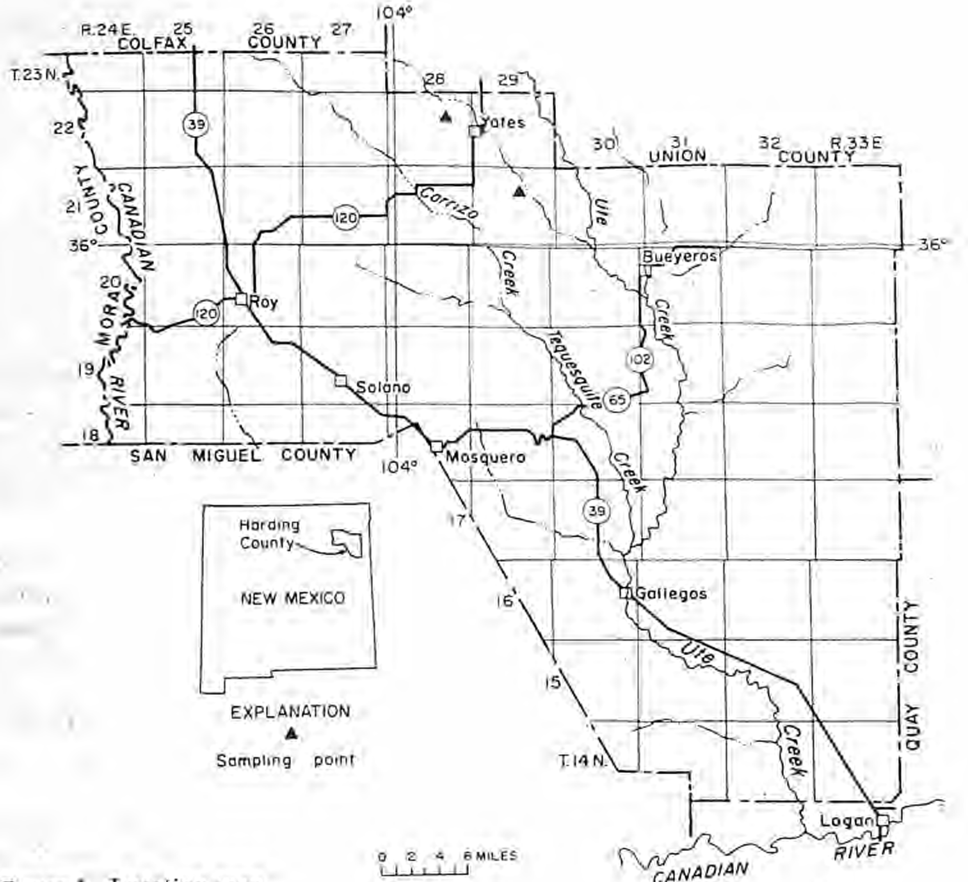

Figure 1. Location map

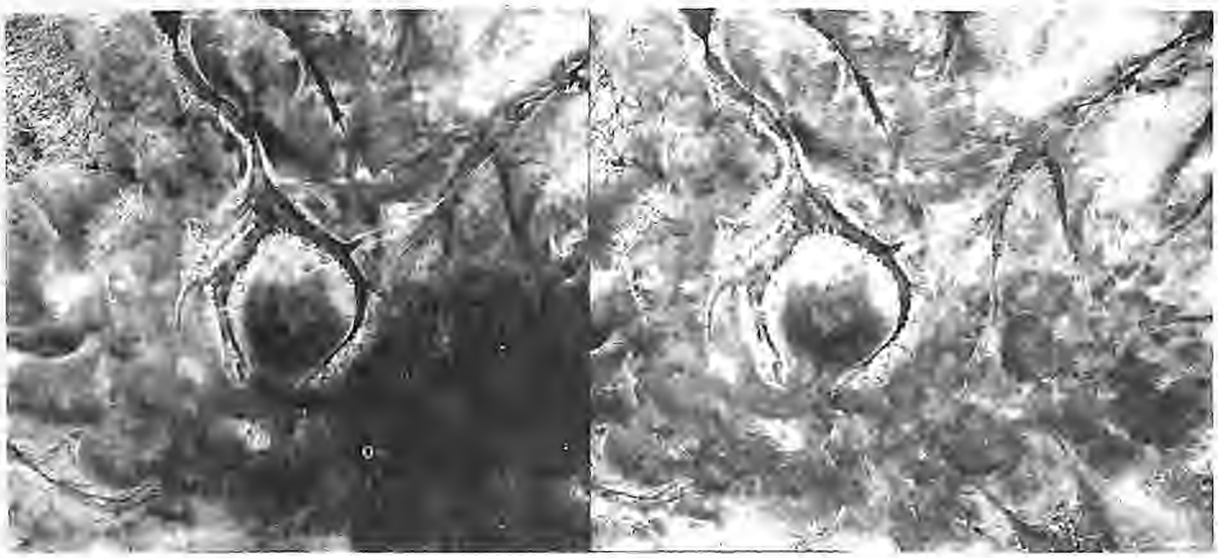

Figure 2. Stereo pair of air photos showing the volcanic cone and central spine at the top of which sample FRL #2087 was collected.

SAMPLE DESCRIPTIONS

1. M-FRL2087 K-Ar <u>(whole rock) 1.3±1.0 m.y.</u>[1]
<u>1.6±0.6 m.y.</u>[2]
<u>0.7±1.4 m.y.</u>[3]

Volcanic rock (NW¼SE¼NW¼NW¼ Sec. 14, T22N, R28E; 2 mi NW of Yates, Harding Co., NM) from the central plug of a vent. The rock is generally fresh and made up of exceptionally fine-grained pyroxene, plagioclase, and iron ores, and larger phenocrysts of pyroxene (?) containing abundant iron ore blebs and sparse phenocrysts of plagioclase. <u>Analytical data</u>: K = 0.618%; (sample 1) $\overset{*}{Ar}{}^{40} = 5.039 \times 10^{-2}$ mole/gm, $\overset{*}{Ar}{}^{40}/\Sigma Ar^{40} = 97.5\%$; (sample 2) $\overset{*}{Ar}{}^{40} = 7.041 \times 10^{-2}$ mole/gm, $\overset{*}{Ar}{}^{40}/\Sigma Ar^{40} = 94.8\%$; (sample 3) $\overset{*}{Ar}{}^{40} = 2.590 \times 10^{-2}$ mole/gm, $\overset{*}{Ar}{}^{40}/\Sigma Ar^{40} = 99.0\%$. <u>Collected by</u>: F. D. Trauger, U. S. Geological Survey; <u>dated by</u>: R. E. Denison, Mobil Research and Development Corp.

2. M-FRL2088 K-Ar <u>(whole rock) 3.5±1.3 m.y.</u>[1]
<u>3.3±0.8 m.y.</u>[2]

Olivine basalt flow (NE¼NE¼NE¼ Sec. 15, T21N, R29E; in a roadcut 6 mi SE of Yates, Harding Co., NM). The rock is fresh and consists of olivine grains rimmed by iddingsite, green pyroxene, plagioclase, and iron ore. <u>Analytical data:</u> K = 0.752%; (sample 1) $\overset{*}{Ar}{}^{40} = 12.95 \times 10^{-2}$ mole/gm; $\overset{*}{Ar}{}^{40}/\Sigma Ar^{40} = 94.5\%$; (sample 2) $\overset{*}{Ar}{}^{40} = 12.73 \times 10^{-2}$ mole/gm, $\overset{*}{Ar}{}^{40}/\Sigma Ar^{40} = 91.3\%$. <u>Collected by</u>: F. D. Trauger, U. S. Geological Survey; <u>dated by</u>: R. E. Denison, Mobil Research and Development Corp.

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