Age of thrust faulting. Little Hatchet Mountains, southwestern New Mexico

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AGE OF THRUST FAULTING, LITTLE HATCHET MOUNTAINS, SOUTHWESTERN NEW MEXICO

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Within the discontinuous mountain ranges of the Basin and Range Province of southwestern New Mexico are numerous exposures of thrust faults thought to have formed during the Laramide orogeny. These faults differ in structural style from those bordering the Rocky Mountain uplifts of northern New Mexico in that Precambrian basement is generally not involved in thrusting and there is no known evidence that the thrusts in southwestern New Mexico steepen with depth.

Corbitt and Woodward (1973) summarize the occurrences of the thrusts in this part of the state and theorize that collectively these faults form a Laramide thrust belt of major significance (Fig. 1). Drewes (1978) discusses extension of this Late Cretaceous and early Tertiary thrust belt into Arizona and postulates that it is part of the Cordilleran orogenic belt which extends from Alaska to Guatemala. However, the nature of individual thrusts and their tectonic significance are still in question in Arizona and southwestern New Mexico.

The Little Hatchet Mountains are severely deformed by multiple thrust sheets which have been mapped by Zeller (1970). The thrusts cut and thus are younger than the Hidalgo Volcanics. Fossil wood from sedimentary rocks interbedded within the Hidalgo Volcanics is probably Tertiary in age, although there is a slight chance it is Late Cretaceous (Zeller, 1970). The thrusts are intruded by diorite sills.

AGE OF THRUSTING

Bracketing the age of thrusting in the Little Hatchet Mountains and, by analogy, perhaps elsewhere in southwestern New Mexico requires dating of the Hidalgo Volcanics, which are cut by the thrusts, and dating of the diorite sills which intrude the thrusts. Basaltic andesite and andesite said to be part of the Hidalgo Volcanics have yielded fission-track ages of 54.9 ± 2.7 m.y., 57.9 ± 2.7 m.y., and 67.3 ± 7.1 m.y. in the Pyramid Mountains (Marvin and others, 1978). According to C. H. Thorman (1979, oral commun.), part of the spread of fission-track ages on the Hidalgo Volcanics in the Pyramid Mountains may reflect intrusive activity of the Lordsburg stock, which may have reset some ages. Ages of 44.7 ± 2.7 m.y., 27.5 ± 4.8 m.y., and 32.7 ± 1.5 m.y. have been obtained on rocks that may be part of the Hidalgo Volcanics in the northern Peloncillo Mountains (Marvin and others, 1978).

A fission-track age of 69.6 ± 3.2 m.y. was obtained by Marvin and others (1978) on andesite of the Hidalgo Volcanics in the Coyote Hills, just north of the Little Hatchet Mountains. The only reported date on the Hidalgo Volcanics in the Little Hatchet Mountains is a K-Ar whole rock date of 61.7 ± 2.2 m.y. and 63.0 ± 2.0 m.y. on porphyritic basalt in the Hidalgo Volcanics at the southern end of Howell's Ridge (Mobil Oil Corp., J. M. Cys, 1970, written commun., cited in Chapin and others, 1975). However, because the porphyritic basalt of Howell's Ridge is somewhat altered, this date is probably a minimum age. We obtained a K-Ar date of 58.2 ± 2.0 m.y. on hornblende from diorite mapped by Zeller (1970) as intruding a thrust on Howell's Ridge (Fig. 1). This evidence suggests that the thrusting is Paleocene, or perhaps latest Cretaceous, in age.

METHODS USED

K – Atomic absorption
Ar – Isotope dilution with high purity Ar^{38} spike
$\lambda_\beta = 4.962 \times 10^{-10}\ yr^{-1}$
$\lambda_\epsilon = 0.581 \times 10^{-10}\ yr^{-1}$
$K^{40}/K_{total} = 1.167 \times 10^{-4}$

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SAMPLE DESCRIPTION

1. *HTA-T* K-Ar
Diorite sill. (NW/4 S13,T28S,R16W on Howell's Ridge, Little Hatchet Mountains, 31°52'39"N, 108°25'56"W, Grant Co., N.M.) %K = 0.483; Radiogenic Ar^{40} = 0.1110×10^{-5} cc STP/g (49.52×10^{-12} moles/g); Radiogenic Ar^{40}/Total Ar^{40} = 0.474. *Collected by*: R. B. Loring and A. K. Loring. *Analyzed by*: R. L. Armstrong and J. E. Harakal, University of British Columbia. Diorite sill mapped by Zeller (1970) as intruding a thrust fault.
(hornblende) 58.2 ± 2.0 m.y.

REFERENCES

Chapin, C. E., Siemers, W. T., and Osburn, G. R. (1975) Summary of radiometric ages of New Mexico rocks: N.M. Bur. Mines Min. Res. open-file rept. 60.

Corbitt, L., and Woodward, L. A. (1973) Tectonic framework of Cordilleran foldbelt in southwestern New Mexico: Amer. Assoc. Petrol. Geologists Bull., v. 57, no. 11, p. 2207–2216.

Drewes, H. (1978) The Cordilleran orogenic belt between Nevada and Chihuahua: Geol. Soc. America Bull., v. 89, p. 641–657.

Marvin, R. F., Naeser, C. W., and Mehnert, H. H. (1978) Tabulation of radiometric ages—including unpublished K-Ar and fission-track ages—for rocks in southeastern Arizona and southwestern New Mexico, *in* Land of Cochise, southeastern Arizona: N. M. Geol. Society 29th field conf., guidebook, p. 243–252.

Zeller, R. A., Jr. (1970) Geology of the Little Hatchet Mountains, Hidalgo and Grant Counties, New Mexico: N. M. Bur. Mines Min. Res. Bull. 96.

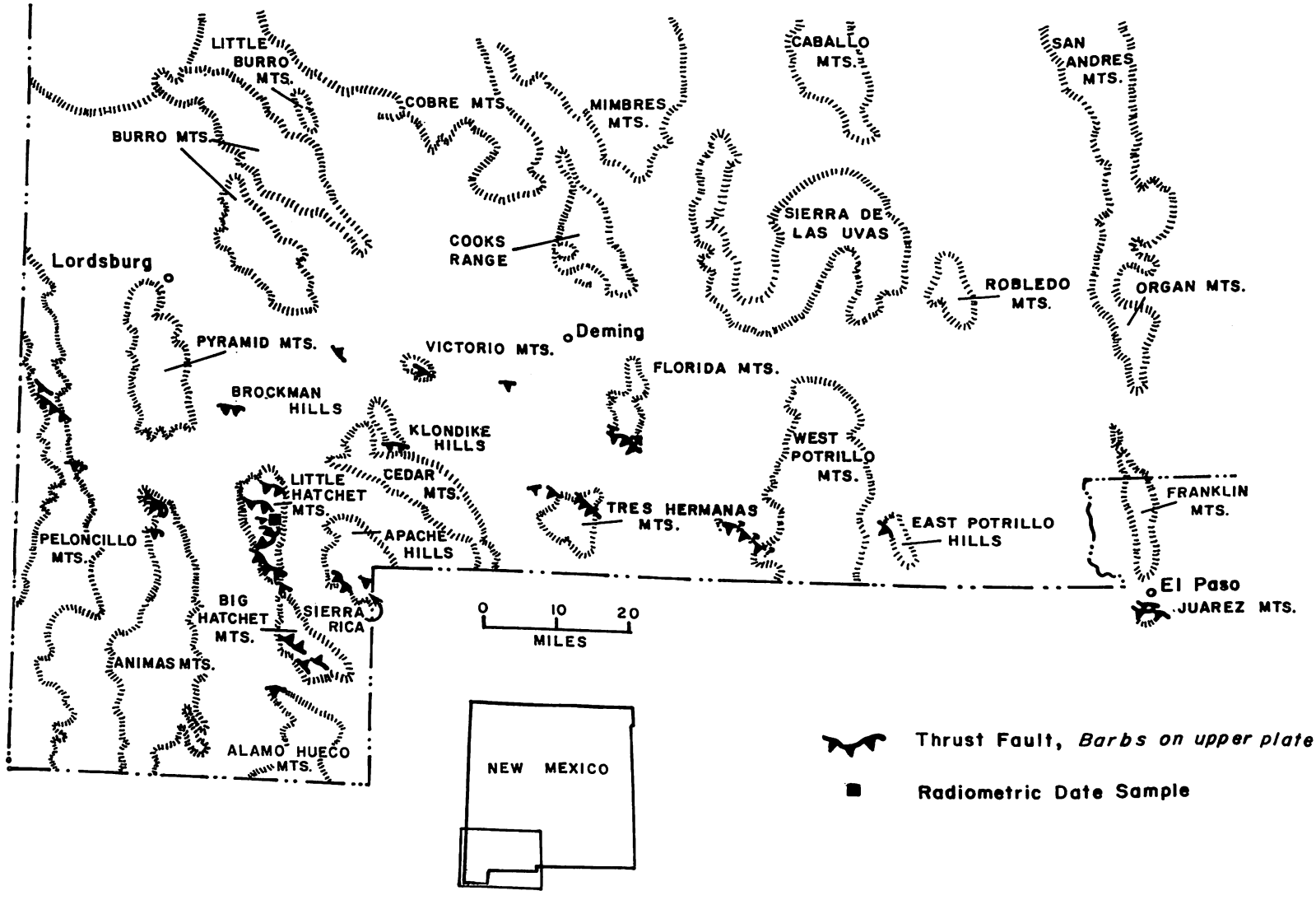

Fig. 1 Tectonic map of southwestern New Mexico showing thrusts (Corbitt and Woodward, 1973) and location of radiometric date in the Little Hatchet Mountains.