



Tectonic significance of the Pony Hills, Luna County, New Mexico

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TECTONIC SIGNIFICANCE OF THE PONY HILLS, LUNA COUNTY, NEW MEXICO

by

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INTRODUCTION

The Pony Hills are in the Mexican Highlands section of the Basin and Range province in north-central Luna County, New Mexico about 12 mi northeast of Deming between Cookes Range and Fluorite Ridge (Fig. 1).

Some of the major structures and stratigraphic features of the area were observed by Darton (1916, 1917) during mapping for the Deming Folio. Jicha (1954) and Elston (1957) mapped the northern part of Cookes Range. Griswold (1961) mapped and described the geology of Fluorite Ridge. The state geologic map (Dane and Bachman, 1961) follows Darton's interpretation of the geology in the Pony Hills area.

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PREVIOUS WORK

Darton (1916, 1917) mapped the Pony Hills (Fig. 1) as several blocks of Precambrian granite in fault contact with the Cretaceous Sarten Sandstone and surrounded by Quaternary bolson deposits. Darton also mapped several outcrops of Precambrian granite exposed through Tertiary agglomerates one mile southwest of the Pony Hills along the northeast flank of Fluorite Ridge. Griswold (1961, p. 100) noted that these outcrops appear to be zones within the Gila (?) conglomerate containing an abundance of Precambrian lithologies and suggested a similar origin for Precambrian lithologies in the Pony Hills. Griswold also described three small patches of conglomerate composed entirely of subrounded Precambrian rock fragments contained in a highly ferruginous matrix and intruded by granodiorite porphyry on Fluorite Ridge.

PRESENT WORK

Detailed mapping in the Pony Hills area indicates that all the areas previously mapped as Precambrian outcrop are actually Tertiary (Eocene ?) andesitic fanglomerates and mudflows containing large clasts of Precambrian and Paleozoic rocks. The soft andesitic matrix has been selectively removed leaving a residual lag gravel that appears to be outcrop when in fault contact with the Sarten Sandstone. The sedimentary contact between the Sarten Sandstone and the overlying andesitic conglomerate is best seen in the southern part of sec. 25, T. 21 S., R. 9 W. (Fig. 2).

STRATIGRAPHY

The stratigraphy of the Pony Hills area is summarized in Figure 3. The Abo Formation consists of interbedded limestone, limestone conglomerate, chert-breccia conglomerate, and red shale and siltstone. The best exposure is along the axis of Goat Ridge about three miles west of the Pony Hills where 100 to 200 ft of the Abo Formation are exposed beneath the Sarten Sandstone. Basal Abo strata are not exposed along Goat Ridge. However, the Abo overlies a thin Pennsylvanian section

to the north in Cookes Range where Kottlowski (1958, p. 84) reported angular fragments of Precambrian igneous and metamorphic lithologies in the Abo, indicating nearby uplift and erosion of the Precambrian during Wolfcampian time. Uplift of this magnitude is not indicated by the Abo Formation in the Pony Hills area; here it appears to be a landward facies of the massive Hueco Limestone exposed to the south in the Florida Mountains.

The Sarten Sandstone unconformably overlies the Abo Formation and consists of a basal chert-breccia conglomerate overlain by buff to gray, thin- to medium-bedded sandstone; it is about 300 ft thick along Sarten Ridge one mile east of the Pony Hills.

The Sarten Sandstone is unconformably overlain by the Rubio Peak Formation (?) which consists of andesite, andesitic fanglomerate, mudflows and in some areas a basal red bed conglomerate unit, which appears to be equivalent to the Lobo Formation in the Florida Mountains and to the Love Ranch Formation in the San Andres Mountains. The best exposure of the lower unit is 2 mi north of the Pony Hills in sec. 11, T. 21 S., R. 9 W., where it consists of red shale, sandstone and conglomerate (Fig. 4) containing clasts of Precambrian rocks up to 3 ft in diameter. There the strata are highly lenticular, appear to be fluvial in origin, and are overlain by reworked andesitic material. The three outcrops described by Griswold (1961) on Fluorite Ridge, which consist of Precambrian clasts in a highly ferruginous matrix and intruded by granodiorite, appear to be equivalent to the above described red beds and conglomerate.

In the Pony Hills, the Sarten Sandstone is overlain by andesitic fanglomerate (Fig. 5) and mudflows (Fig. 6) containing Precambrian and Paleozoic clasts up to 10 ft in diameter (Fig. 7). The soft matrix has been selectively removed, leaving a residual pile of boulders which locally appear to be rooted outcrops when in fault contact with the Sarten Sandstone.

The andesitic material ranges from relatively clean reworked purplish tuff to fanglomerate and mudflows containing various mixtures and sizes of Precambrian and Paleozoic lithologies. The largest Precambrian blocks appear to be concentrated near the Pony Hills (Fig. 7). Immediately northwest of the Pony Hills, Paleozoic boulders predominate over Precambrian. North of Fluorite Ridge the clasts are mostly Precambrian. Between Fluorite Ridge and Goat Ridge about 100 ft of andesitic material containing no clasts is exposed below the boulder beds. Boulder beds are absent in the andesite exposed about one mile northeast of the Pony Hills. One mile southeast of the Pony Hills, Precambrian and Paleozoic clasts are highly mixed.

The best exposure of the andesitic unit is in an arroyo 2 mi east of the Pony Hills near Starvation Draw dam #4. Here the andesite contains Precambrian clasts (Figs. 5, 6). The roundness of most of the clasts and the huge size of some blocks

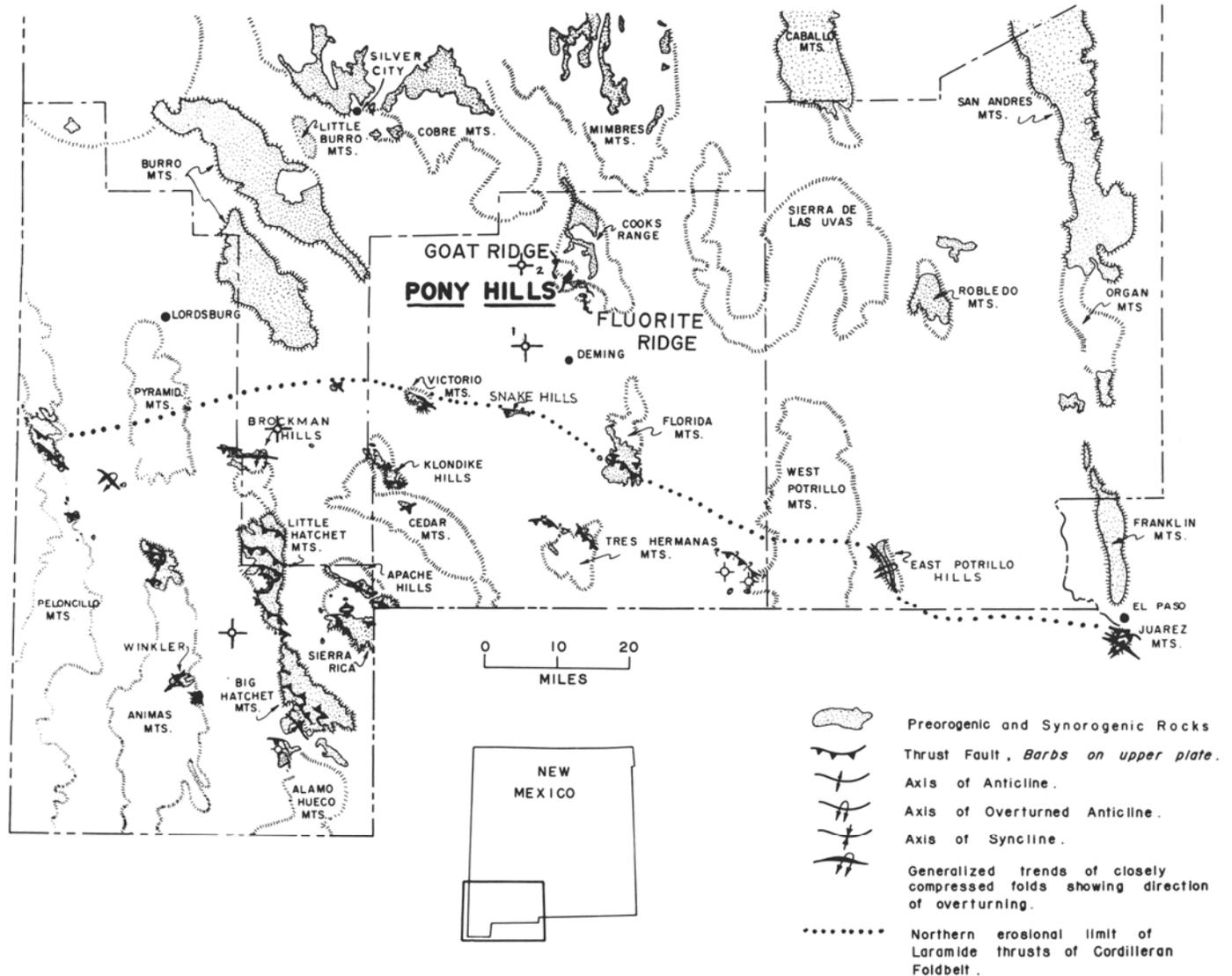


Figure 1. Index and tectonic map of southwestern New Mexico, showing structures of the Cordilleran foldbelt (modified from Corbitt and Woodward, 1973).

suggest fanglomerate mudflow deposition from a nearby source area.

The bulk of Cookes Peak and Fluorite Ridge are composed of granodiorite porphyry which was intruded after deposition of the Eocene (?) andesitic strata. The intrusive nature of the granodiorite into the red beds and andesite is revealed 3 mi northwest of the Pony Hills in NW 1/4 sec. 16, T. 21 S., R. 9 W. and on Fluorite Ridge.

Both the andesitic strata and the granodiorite are cut by basalt and basaltic andesite dikes of uncertain age.

The Eocene (?) andesitic unit is overlain by late Tertiary conglomerate, which may be correlative with the Santa Fe-Gila conglomerate exposed elsewhere in Luna County.

The Quaternary consists of a sand-silt alluvium in the flood plains and principal arroyos that drain the area and a coarse gravel that forms alluvial fans surrounding Fluorite Ridge and Cookes Range. Considerable difficulty is encountered in distinguishing between the alluvial fans and the lag-gravel covered slopes of the Santa Fe-Gila conglomerate.

TECTONIC SIGNIFICANCE

The Pony Hills are located immediately north of the Laramide Cordilleran foldbelt (Fig. 1) of southwestern New Mexico. The large clasts of Precambrian rock in the Tertiary Eocene (?) Lobo-Love Ranch Formation and overlying andesitic rocks indicate the magnitude of local relief produced by Laramide deformation. The source of the Precambrian clasts in the Pony Hills is unknown; however, an area of high relief within 2 or 3 mi is suggested.

The Pony Hills area may have been a southeast extension of the Mesozoic Burro uplift (Elston, 1958); however, 3 mi south of the Pony Hills, 2,700 ft of Permian through Cambrian strata overlying Precambrian igneous rock are preserved at the south end of Fluorite Ridge. Griswold (1961) noted that the Precambrian boulders in the conglomerate intruded by the granodiorite of Fluorite Ridge were in no way similar to the Precambrian outcrops a few hundred feet to the south. Permian through Cambrian strata also overlie Precambrian rocks in

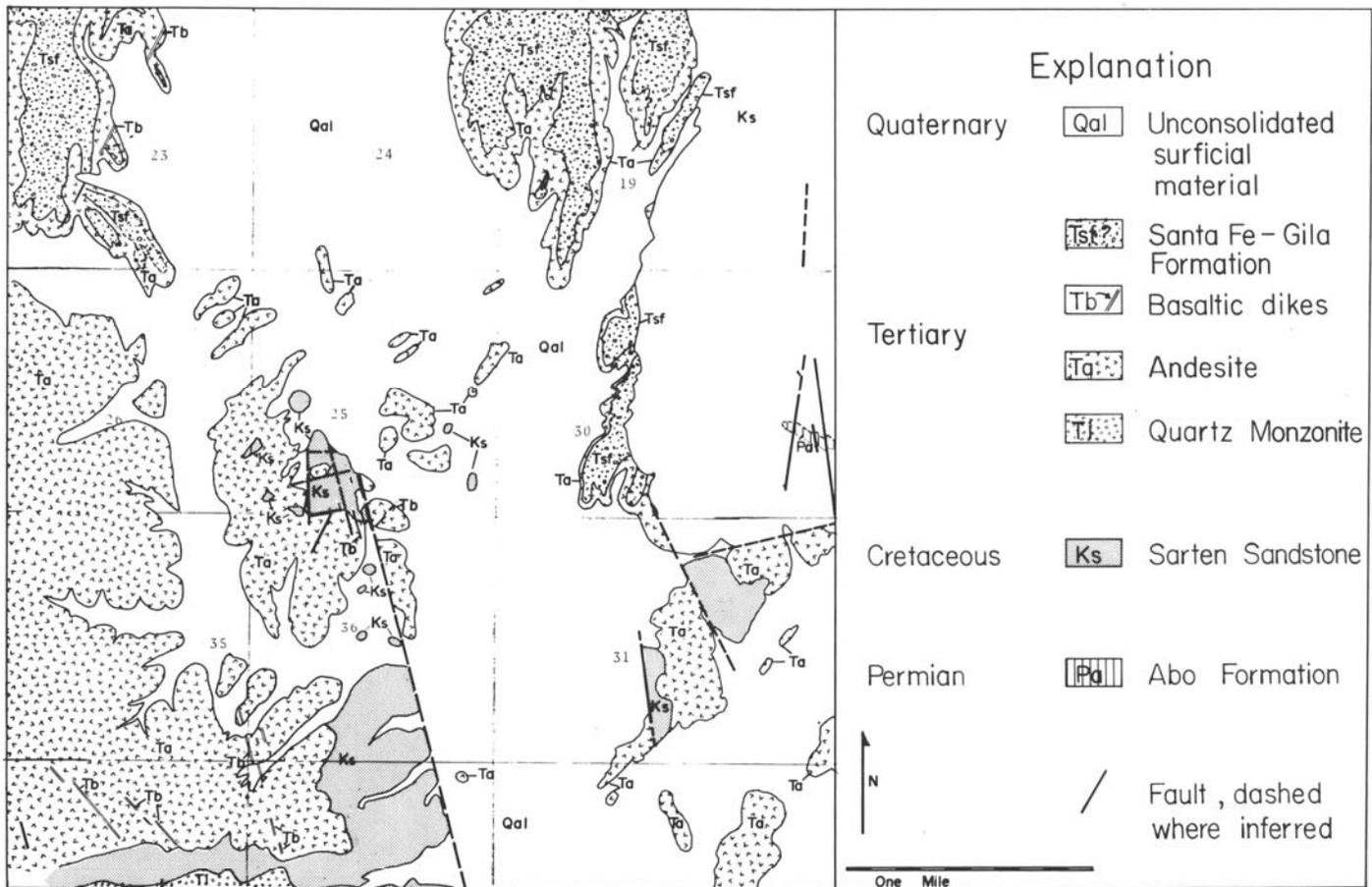


Figure 2. Geologic map of the Pony Hills, Luna County, New Mexico.

AGE	ROCK UNITS	LITHOLOGY	
QUATERNARY	SILT, SAND AND GRAVELS		
	PLIOCENE(?)	SANTA FE-GILA FORMATION	CONGLOMERATE AND SANDSTONE
TERTIARY	BASALT AND BASALTIC ANDESITE DIKES		
	COOKS RANGE-FLUORITE RIDGE GRANODIORITE	GRAY GRANODIORITE PORPHYRY	
	RUBIO PEAK FORMATION	ANDESITE, ANDESITIC FANGLOMERATES AND MUDFLOWS CONTAINING LARGE CLASTS OF PRECAMBRIAN AND PALEOZOIC ROCK	
EOCENE (?)	LOBO-LOVE RANCH FORMATION	RED SHALE, SANDSTONE AND FLUVIAL CONGLOMERATES WITH LARGE BOULDERS OF PRECAMBRIAN ROCK	
	LOWER	SARTEN SANDSTONE	BUFF TO GRAY, THIN-TO MEDIUM-BEDDED SANDSTONE
PERMIAN	WOLFCAMP	ABO FORMATION	INTERBEDDED LIMESTONE, LIMESTONE-CHERT CONGLOMERATE, RED SHALES AND SANDSTONE

Figure 3. Summary of rock units in the Pony Hills.



Figure 4. Lobo-Love Ranch Formation, consisting of red channel sandstone and basal conglomerate derived from Precambrian igneous and metamorphic rocks.

Cookes Range and underlie the Cretaceous Sarten Sandstone. These Precambrian outcrops are located about 8 mi north of Pony Hills.

The nearest mapped possible source area is 20 mi to the south in the Florida Mountains, where the Tertiary Eocene (?) Lobo Formation overlies Precambrian and Paleozoic rocks and



Figure 5. Precambrian clasts in andesitic matrix.



Figure 7. Precambrian granite block in andesitic matrix.



Figure 6. Precambrian boulders in andesitic matrix.

contains pebbles of both. The Lobo Formation is overlain by 1,600 ft of Rubio Peak (?) andesitic agglomerate containing no Precambrian or Paleozoic clasts. The Florida Mountains appear to have been a southeast extension of the Mesozoic Burro uplift and were involved in Laramide thrusting. A southeast extension of the Burro uplift is also suggested in a test well drilled by Cockrell Corporation 15 mi southwest of the Pony Hills in sec. 7, T. 23 S., R. 10 W. (Fig. 1). Here the Precambrian is overlain by 140 ft of Bliss Formation, 540 ft of El Paso Group and 6,500 ft of valley fill and volcanic rocks (R. W. Foster, written comm., 1974). About 10 mi west of the Pony Hills, 6,070 ft of Tertiary sedimentary and volcanic rocks are reported at total depth in the Angelus #3 Angelus

located in sec. 20, T. 21 S., R. 10 W. (Kottlowski and others, 1969). These two wells give an indication of the present relief of the Precambrian surface and the hazards of projecting from uplifts into the valley fill.

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