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AEROMAGNETIC MAP OF THE WHEELER-LATIR-COSTILLA SECTION OF THE SANGRE DE CRISTO MOUNTAINS IN NEW MEXICO

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An aeromagnetic survey covering about 11,000 km2 in northern New Mexico has recently been completed through a cooperative project between the New Mexico State Bureau of Mines and Mineral Resources and the U.S. Geological Survey. At this writing only the data from about the eastern one-third of this project have been reduced and contoured (Fig. 1). The entire project area, which will extend westward to 106° 30' west longitude, is being mapped at a scale of 1:62,500.

The purpose of this note is to call attention to the existence of the aeromagnetic data and also to certain regional features evident on small scale aeromagnetic contour maps. Detailed interpretation must be based on the larger-scale maps because of the complexity of the geology and the effect of topography. Rugged terrain exists in much of the area surveyed, producing spurious magnetic anomalies due not to variation in lithology, but to variation in distance between the magnetic source rocks and the magnetometer. Terrain-effect anomalies are evident at Latir Peak, Wheeler Peak, Baldy Peak and elsewhere (Fig. 1, p. 282). Many of the anomalies that are obviously related to mountain tops extend beyond the mountain tops, indicating that the anomalies are probably also related to lithologic variations, with the terrain effect superimposed. This is reasonable inasmuch as the terrain itself may be related to lithology.

The magnetic anomalies are caused by sources either in the Precambrian basement or in Cenozoic igneous rocks. The thick sequence of Phanerozoic sedimentary rocks are effectively nonmagnetic. The anomalies are related primarily to the concentration of the accessory mineral magnetite, which may or may not be diagnostic of lithology. Anomalies are broad where sources are deep, as in the Raton basin, and sharp where sources are shallow. This variation explains the subdivision of the area of Figure 1 into: Tertiary igneous rocks, exposed or shallow Precambrian basement and deep basement. Geological data (Fig. 1) discussed below, unless cited specifically, are based primarily on the work of Clark and Read (1972), Dane and Bachman (1965) and McKinlay (1956, 1957).

Over areas of exposed Precambrian basement rocks, the magnetic gradients are generally parallel to bedding and to fold axes in the older metamorphic units where these units are observed and mapped within the pervasive younger regional "granite." Aeromagnetic and geological data show that basement grain trends northeast in the Costilla and Red River basement massifs, in the southern parts of the Wheeler Peak massif and in the area northwest of Latir Peak. South of a line between Cerro and the Cimarron Mountains, magnetic gradients over basement rocks generally trend northwest whereas north of that line gradients generally trend northeast. This subtle demarcation, if it exists, would indicate that the eastward-protruding Cimarron Mountains salient of the Rocky Mountain front occurs along a northwest-trending basement discontinuity. To judge from regional considerations, a more likely basement trend would be northeasterly along the Jemez lineament (Laughlin, Brookins and Causey, 1972; Lambert, 1966), although this trend is not observed in the magnetic map considered by itself.

Large magnetic anomalies occur over Tertiary intrusive and related rocks at Baldy Peak, and thence along a line to the southeast. Similar anomalies at the east border of the map may indicate the presence of these rocks under sedimentary and Quaternary basalt-flow cover. No obvious magnetic signature is observed over a sequence of andesite-latite porphyry and rhyolitic ignimbrite of probable Oligocene age in the Latir Peak field. Circular features suggestive of volcano-tectonic ring structures are not observed in the aeromagnetic data southwest of Red River (cf. Clark and Read, 1972) or elsewhere. Nevertheless, the presence of calderas in this area seems a likely possibility.

The large open pit molybdenum mine operated by the Molybdenum Corporation of America at Sulfur Gulch between Questa and Red River (Fig. 1) is situated in a granite stock of early Miocene age (about 23 m.y.B.P. dated independently by Damon and Ishihara as cited in Clark and Read, 1972). Similar-looking granite also occurs southeast of Questa (Flag Mountain), northeast of Arroyo Seco and at Red River (Fig. 1). On a line between Questa and Red River these granites occur within a magnetic low which might be attributed to alteration and destruction of magnetite in a zone of extensive fracturing within the Red River graben along this trend. The magnetic low seems to continue from Questa northwestward to the edge of the map, although in this area it may be related to younger volcanic rocks.

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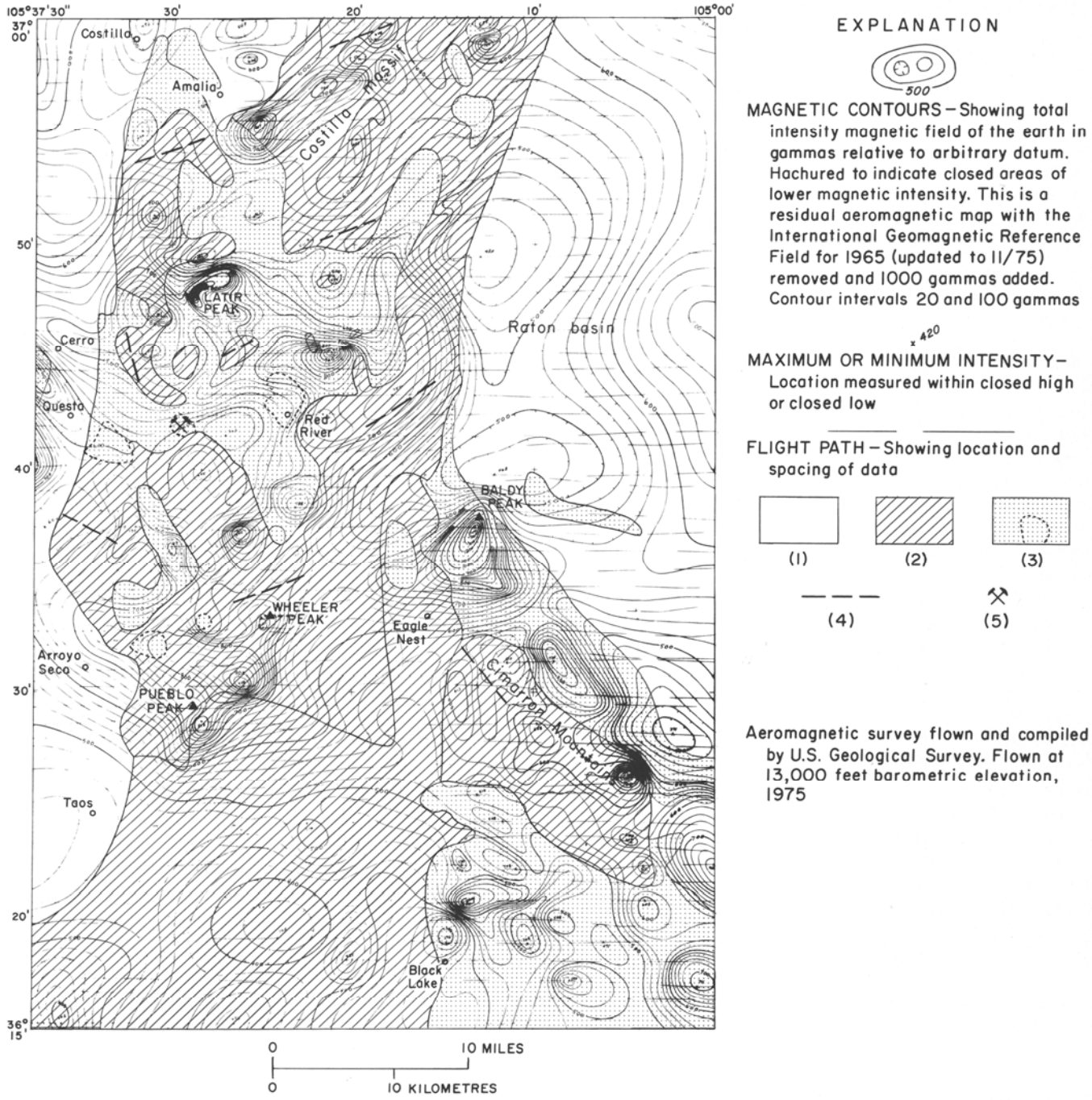

Figure 1. Aeromagnetic map of the Wheeler-Latir-Costilla section of the Sangre de Cristo Mountains in northern New Mexico. (1) Precambrian basement deeply buried under thick sedimentary cover; (2) basement exposed or (in area south of Pueblo Peak) under thinner sedimentary cover; (3) Cenozoic igneous rocks—dotted lines enclose granitic rocks similar to the Miocene Sulfur Gulch stock associated with molybdenum mineralization; (4) strike of Precambrian metamorphic units; (5) molybdenum mine at Sulfur Gulch.