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Slides showing aeromagnetic and gravity data for regional mineral exploration in Colorado, New Mexico, and Arizona

by

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Contents

Abstract[1]

Examples of aeromagnetic and gravity data over 1^{o} x 2^{o} areas are presented for regions near the Cripple Creek mining area, Colorado, and the Lordsburg-Tyrone-Silver City mining areas, southern New Mexico and Arizona. These data indicate broad crustal structures and compositional variations that are marked by magnetization and density contrasts. The focus is on anomalies that may signal large-dimension controlling structures for the emplacement of economic mineral deposits. An example is a continuous, quasi-linear, north-trending gradient in both gravity and magnetic data located west of Cripple Creek area along long. 105^{o} 30′ W. This trend correlates with two mineral deposits of the Southern Rocky Mountains Front Range. It also correlates in part with an area of volcanic rock and with a mapped fault complex (Elkhorn-Currant Creek-Else-Westcliffe). The trend is interpreted to indicate a continuous crustal fault system, although exposures of this system are discontinuous between areas of alluvium and volcanic-rock cover.

Similar geophysical trends exist in the Silver City to Tyrone area, where northeast-and northwest-trending anomalies appear to be marked by intrusion and mineralization. In this area, northwest-trending alluvial basins favor the use of geophysics to infer economically accessible but hidden bedrock whose association with exposed mineralization seems possible. An example of an inferred broad and relatively shallow, but hidden bedrock complex in association with more areally-limited mineralization is the Victorio Mountains area about 34 mi (55 km) south-southeast of Tyrone, New Mexico. The mineralization is within faulted sediments whose outcrop covers a small portion of the geophysical anomaly-complex.

[1]Geological Society of America, Abstracts with Programs, vol. 15, no. 7, abstract no. 05503 (General Economic Geology III).

Introduction

This report presents 35-mm slides that summarize some of the results of geophysical investigations in the Pueblo 1° x 2° quadrangle, Colorado and in the Silver City 1° x 2° quadrangle, Arizona and New Mexico. These investigations are part of the U.S. Geological Survey's Conterminous United States Mineral Assessment Program (CUSMAP).

An expanded description of the present colored slides will be released as a separate open-file report that will contain black and white reductions of the base-maps and overlays used in preparing the slides. A complete description of the residual aeromagnetic and gravity maps used for the present slides are planned for publication by the U.S. Geological Survey as part of the Silver City 1° x 2° quadrangle and the Pueblo 1° x 2° quadrangle CUSMAP folios.

Captions for the 35-mm slides

Slide 1.--Location map showing the areas of study: the Pueblo 1° x 2° quadrangle in south-central Colorado, and the Silver City 1° x 2° quadrangle in southwestern New Mexico and southeastern Arizona. The base map is from the tectonic map of North America (King, 1969) with the location of mineral deposits (shown as dots) added from the preliminary metallogenic map of North America (Guild, 1981a).

Slide 2.--Residual Bouguer gravity map of the Pueblo 1° x 2° quadrangle, Colorado. The area is from lat. 38° to 39° N and long. 104° to 106°W. The residual data results from the removal of a second-degree polynomial surface from a gridded data set of complete Bouguer anomaly values centered on the Pueblo 1° x 2° quadrangle and

extending 173 km beyond the quadrangle borders. The complete Bouguer anomaly map of the quadrangle was presented and described by Boler and others (1982). The map slide shows different colors within contour intervals of 10 mgal (original line contours are at a 5-mgal interval). The intensity of gravity increases from the blues for gravity-lows, greens for intermediate gravity values and orange to red for the higher gravity values. The area shown measures about 60-mi (96-km) north-south and 100-mi (161-km) east-west. Overlain on this map are generalized geologic features, geophysically inferred structures and major mineral deposits.

The generalized geologic features are from Tweto (1979). The contact between Precambrian through Paleozoic rock outcrop and younger rock and alluvium is shown by a thin line; major faults are shown by heavier lines; and intrusive bodies of late Mesozoic and younger age are shown by patterned areas. The dense-dot pattern indicates mid-Tertiary intrusions; the random-dash pattern indicates Laramide (late Cretaceous-early Tertiary) intrusions.

The geophysically inferred structures include fault controlled boundaries that are shown by the heavy-diagonal-dash lines and compositional boundaries that are marked by the dashed lines. The latter indicate contacts between distinct igneous or metamorphic rock masses. For reference, most structural trends are identified by capital letters, and the enclosed terranes are numbered.

Major deposits (Guild, 1981a, b; Boler and Klein, in preparation, a, b) are indicated by heavy dots and labeled with lower case letters: Trout Creek, a; Calumet, b; Turret, c; Whitehorn, d; Cotopaxi, e; Orient, f; Blake, g; Westcliff-Silver Cliff, h; Rosita Hills, i; Tallahassee Creek, j; Guffey, k; Lake George, l; Cripple Creek, m; Avery Ranch, n.

Slide 3.--Residual aeromagnetic map of the Pueblo 1^{o} x 2^{o} quadrangle. Included on this map are the generalized geology, mineral deposits and inferred structures described with slide 2. Different colors show contour intervals of 100 gammas (original line contours are 20 gammas). Magnetic intensity increases from the purple and blue-colored lows to the green-colored intermediate values, to the yellow and red colored highs. This map represents a merging of several different surveys (U.S. Geological Survey, 1970, 1978a, b, Zietz and Kirby, 1972 a, b). The original data, obtained at elevations of 9,500 ft to 14,400 ft (2,900 to 4,400 m), have been upward continued to a common elevation datum of 14,400 ft (4,400 m).

Slide 4.--Residual Bouguer gravity map of the Silver City 1^{o} x 2^{o} quadrangle, Arizona and New Mexico. This map was produced from the complete Bouguer gravity of Wynn (1981) by filtering out wavelengths longer than 78 mi (125 km). The area covers lat. 32^{o} -33^{o} N, long. 108^{o} - 110^{o} W, an area that measures about 60-mi (96-km) north-south, and 100-mi (161-km) east-west. Different colors represent contour intervals of 2.5 mgal. Gravity values increase from the blue-colored lows to the orange- to red-colored highs.

Generalized geological features are from a geologic base map composited by the U.S. Geological Survey for mineral assessment studies (Richter and Lawrence, in press). Faults, contacts of outcropping bedrock with alluvium, and Laramide (late Cretaceous-early Tertiary) and Middle Tertiary intrusions are shown with lines and patterns similar to those described with slide 2. The locations of the more important mineral deposits (total production exceeding $1,000,000) are shown by heavy dots (Richter and Lawrence, in press). Geophysically inferred intrusion and fault controlled boundaries on part of the Silver City 1^{o} x 2^{o} quadrangle, interpreted from gravity and magnetic data are also superimposed on the map. Interpretation is limited to the region southeast of a line from the Pino Altos Mountains to the Chiricahua-Dos Cabezas Mountains. Specific anomalous areas and boundaries are labelled for reference.

Slide 5.--Residual aeromagnetic map of the Silver City 1^{o} x 2^{o} quadrangle. The generalized geological features, mineral deposits, and inferred boundaries are as described with slide 4. Colored contours show 100-gamma intervals increasing from the blue to green lows, to intermediate values with yellow to orange and red highs (line-contours are at an interval of 25 gammas). The data is upward-continued to an average elevation of 9,840 ft (3,000 m) from original data flown at elevations ranging from 500 ft (150 m) above ground to 10,000 ft (3,050 m) barometric (U.S. Geological Survey 1974, 1979, 1980).

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