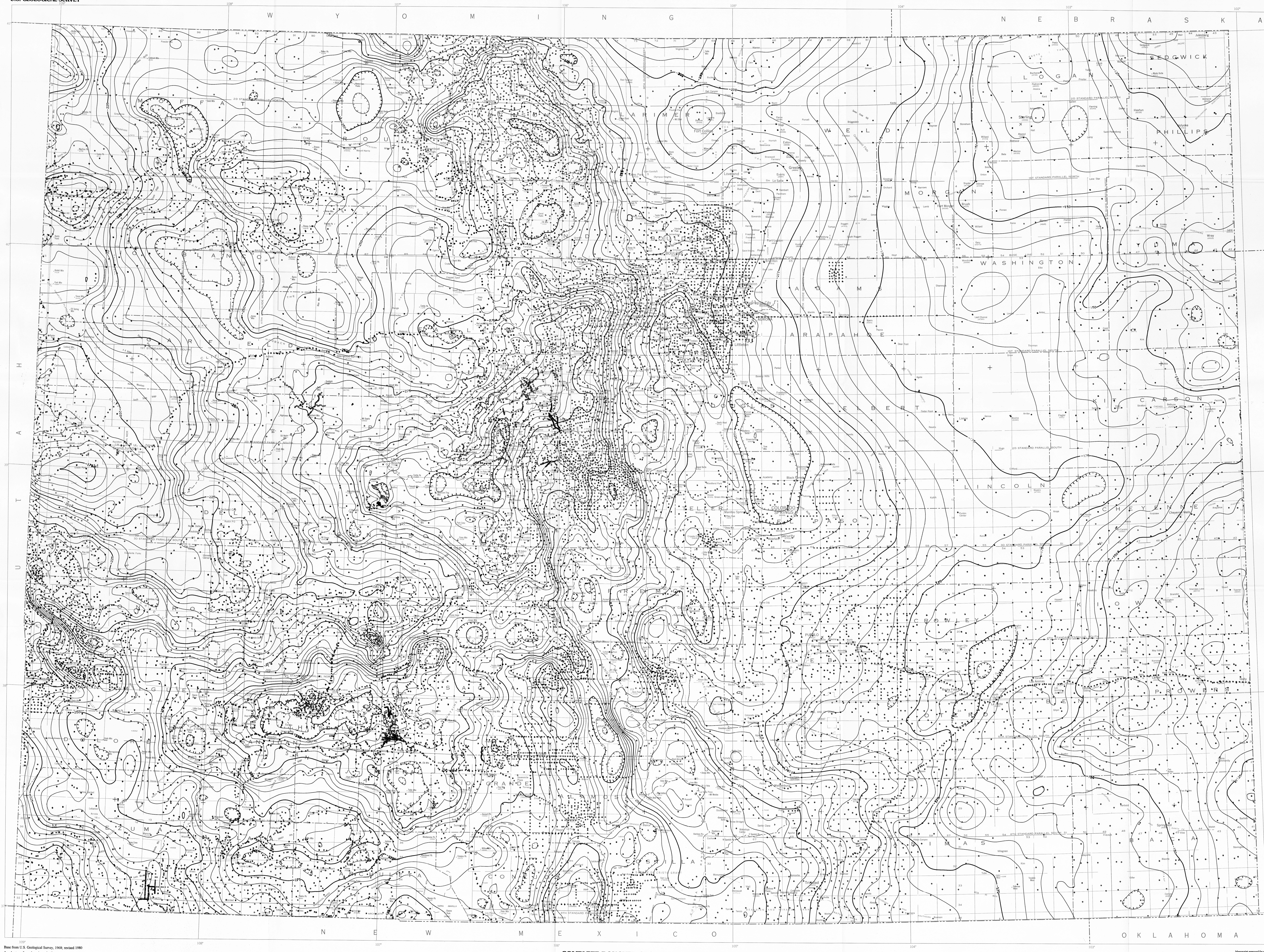
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

MISCELLANEOUS FIELD STUDIES
MAP MF-2236



Base from U.S. Geological Survey, 1968; revised 1980
Lambert conformal conic projection
based on standard parallels 33° and 45°

COMPLETE BOUGUER GRAVITY ANOMALY MAP OF THE STATE OF COLORADO

By
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INTRODUCTION

The Bouguer gravity anomaly map is part of a folio of maps of Colorado cosponsored by the National Mineral Resources Assessment Program (NAMRAP) and the National Geologic Mapping Program (COGEOMAP) and was produced to assist in studies of the mineral resource potential and tectonic setting of the State. Previous compilations of about 12,000 gravity stations by Behrendt and Bajwa (1974a,b) are updated by this map. The data were reduced at a 2.67 g/cm^3 and the grid contoured at 5 mGal intervals. This map will aid in the mineral resource assessment by indicating buried intrusive complexes, volcanic fields, major faults and shear zones, and sedimentary basins; helping to identify concealed geologic units; and identifying localities that might be hydrothermally altered or mineralized.

BOUGUER GRAVITY ANOMALY MAP

The complete Bouguer gravity anomaly map shows variations in the gravitational field caused by horizontal variations in the density of surface and subsurface rocks. The gravity data, consisting of 28,735 stations, were compiled from the Defense Mapping Agency gravity data base, from data obtained by A.E. McCafferty (written commun., 1992), Dolores Kulik (written commun., 1992), Webring and Abrams (1990a,b), Abrams and Grout (1990), and Abrams and Judy (1989). Principal facts of gravity stations and gridded data set are available on 9-track tape from Data Sources Officer, EROS Data Center, Sioux Falls, SD 57198. The gravity station localities are plotted on the map to indicate data spacing.

DATA REDUCTION

Observed gravity values were adjusted to conform to the International Standardization Net of 1971 (International Association of Geodesy, 1974). The theoretical gravity values were calculated using the 1967 formula of the Geodetic Reference System (International Association of Geodesy and Geophysics, 1971). Terrain corrections were computed using a program by R.H. Godson (U.S. Geological Survey, unpub. program, 1978); the gravity effects of terrain were corrected from each station to a radius of 166.7 km using the method of Plouff (1977). Godson's program also calculates Earth curvature corrections and complete (terrain-corrected) Bouguer gravity anomaly values. Cordell and others (1982) gives a complete description of gravity-reduction equations and approximations used. These computed terrain corrections use mean elevation digital data on a 15-second grid for corrections from 0.59 to 5 km, 1-minute terrain data for corrections from 5 to 21 km, and 3-minute terrain data for corrections from 21 to 166.7 km. Terrain located less than 0.59 km from a station is not corrected for by the above procedure. The elevation ranges from approximately 1,220 m (4,000 ft) above sea level near the Kansas and Nebraska border to above 4,268 m (14,000 ft) in the Rocky Mountains. A density of 2.67 g/cm^3 was used to calculate terrain corrections, giving one complete Bouguer gravity value per station. Because of the coarseness of the terrain grid, the terrain corrections are the most likely source of error in the data reduction process and may account for as much as 10-20 percent (R. Saltus, 1993, oral commun.) which translate to ±6 mGal as a maximum possible error at the highest elevations. In general, however, data are accurate to about 1 mGal.

MAP PREPARATION

The data are shown on a Lambert Conformal Conic projection, with a central meridian of 105° 30' W. and a base latitude of 38° N., then gridded to an interval of 2 km using a minimum curvature algorithm (Briggs, 1974; Webring, 1981). The grid spacing has an effect on the nature of the resulting map; calculations made using a smaller grid spacing emphasize shorter wavelength anomalies whereas those using a larger grid spacing tend to suppress shorter wavelength anomalies and emphasize broader wavelength anomalies.

The data density exerts a strong influence on the wavelength and hence the size of features that can be identified. The data set represents approximately one station per 2.5 sq km; however, the density coverage varies widely from dense distribution along roads to very sparse distribution in remote areas. Very sparse data cause considerable loss of important detail for smaller features. Some of the isolated anomalies (that is, one-station anomalies) may not represent true density variations but be caused by uncertainties in the observations.

The data were contoured (Godson and Webring, 1982) at an interval of 5 mGal. The Bouguer gravity values range from a low of -310 mGal to a high of -106 mGal. Bouguer anomalies have a strong inverse correlation with topography. In general, areas with high elevations have negative anomalies and areas with low elevation have relatively positive anomalies.

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EXPLANATION

-150 **Bouguer gravity contour**—Contour interval 5 mGal
Hachures indicate closed gravity lows

Gravity station

SCALE 1:500 000
10 0 10 20 MILES
10 0 10 20 KILOMETERS

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