

Explanation

The principal gravity data set compiled for this map was generated by various projects of the U.S. Geological Survey. This set was then supplemented with data received from the Defense Mapping Agency Gravity Library. The observed gravity data, based on the International Gravity Standardization Net (IGSN71) datum (Heiskanen, 1974), were reduced to free air gravity anomalies by using the Geoidetic Reference System 1967 formula (CGS67) of Geodesy, 1971, p. 60 and Smith's (1942, p. 65) formula for the free air (166.7 m from the station) at a standard reduction density of 2.67 g/cm³ were added to the free-air anomaly at each station to determine complete Bouguer gravity anomalies.

Editing of data involved examination and subsequent deletion of stations which produced large anomalies not supported by values at neighboring stations. This procedure probably was successful in eliminating gross errors in areas with dense gravity coverage but incorrect values may still exist in areas of sparse coverage.

The bulk of the inconsistencies remaining within this data set probably stem from observed gravity values based on a datum other than IGSN71 and from errors in terrain corrections. Because the gravity data come from a variety of different sources, some datum problems were unavoidable. However, based on comparisons of redundant observations from different sources, datum inconsistencies are believed to be less than 1 mgal. Terrain corrections inconsistencies are believed to be less than 1 mgal. Terrain corrections inconsistencies of the U.S. Geological Survey data and generated by computer for the rest of the data set. The error introduced at this stage probably is less than 1 mgal for most stations but could be larger for stations in areas of extreme topographic relief. In view of these problems, the data are believed, in general, to be accurate to within 2 mgal.

The Bouguer gravity field over the western United States reflects both shallow crustal density variations and deep-seated density distributions, many of which are directly related to isostatic support of topography (Simpson and others, 1965). In an attempt to separate the gravity anomalies caused by the Bouguer gravity field from the isostatic support of topography, a regional gravity field was constructed from geologic mapping. The isostatic residual gravity field based on the Bouguer gravity data by removing a regional gravity field based on an isostatic model for isostatic compensation of topography, 2.67 g/cm³, and the continuous similar map from California (Jackson and Goff, 1963) and the continuous United States (Simpson and others, 1965) indicate that anomalies in isostatic residual gravity maps primarily reflect lateral density variations in the mid-to upper-crust.

Isostatic corrections were calculated assuming complete local compensation according to the Airy-Heiskanen system. Calculations were performed by computer (Jackson and others, 1981) out to a radius of 166.7 km from each station using formulas of Heiskanen and Vening Meinesz (1958, p. 136 and 162) modified to incorporate station elevations. Thicknesses of the model crust were calculated from topographic averages over 3 x 3 minute compartments (Simpson and others, 1973) assuming density of topography, 2.67 g/cm³, and mean crustal thickness, 25 km and density contrast, 0.48 g/cm³, on the basis of the model crust, 0.48 g/cm³. For the region beyond 166.7 km, combined terrain and isostatic corrections were taken from published topographic-isostatic reduction maps (Karki and others, 1961).

Contouring by computer with 1000 meter grid size.

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Data Sources

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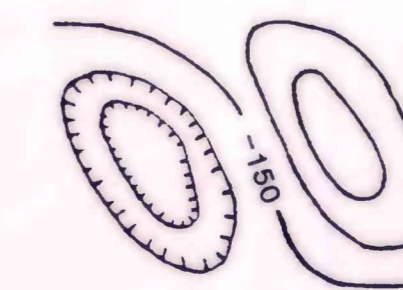
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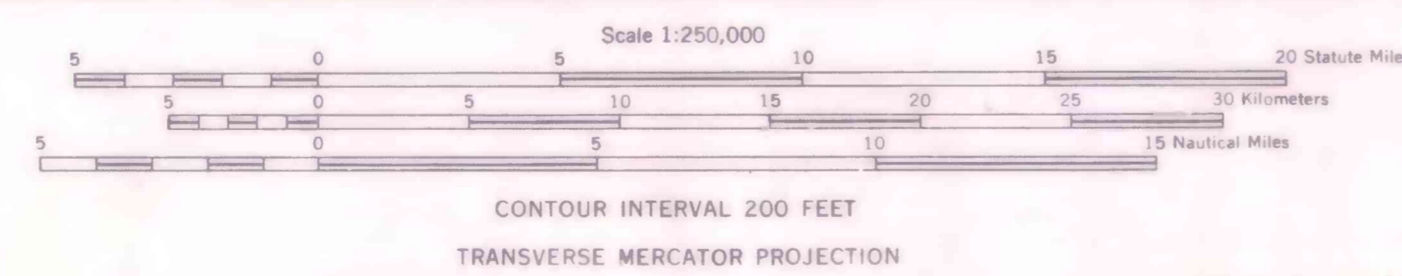
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Gravity Anomaly Contours
Contour interval is 2 mgal. Hachured contours indicate closed gravity lows.

BASE MAP FROM U.S. GEOLOGICAL SURVEY TOPOGRAPHIC SERIES 1:250,000
KINGMAN 1854



LOCATION DIAGRAM



**BOUGUER AND ISOSTATIC RESIDUAL GRAVITY MAPS OF
THE COLORADO RIVER REGION, INCLUDING THE KINGMAN,
NEEDLES, SALTON SEA, AND EL CENTRO QUADRANGLES**

KINGMAN ISOSTATIC RESIDUAL GRAVITY MAP

by

John Mariano, M. G. Helferty, and T. B. Gage

1986