DEPARTMENT OF THE INTERIOR
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OPEN-FILE REPORT
90-55

DATA SOURCES, REDUCTIONS, AND ACCURACIES

Gravity data in the San Jose 1:100,000 scale quadrangle and vicinity were obtained from Snyder and others (1982) and supplemented by 88 additional measurements made during 1989 in the mountains northeast of the Santa Clara Valley. The observed gravity data, based on the International Gravity Standardization Net Datum (Morelli, 1974), were reduced to free-air gravity anomalies by using standard formulas (e.g. Telford and others, 1976). Bouguer, curvature, and terrain corrections (out to a distance of 166.7 km from each station) at a standard reduction density of 2.67 g/cm^3 were added to the free-air gravity anomaly at each station to determine complete Bouguer anomalies (Plouff, 1977; Godson and Plouff, 1988).

Accuracies for the gravity data from Snyder and others (1982) may be found in Robbins and others (1974) which gives an accuracy code for each gravity measurement. In general, Bouguer gravity values for stations in the valleys are probably accurate to within 0.3 mGal whereas stations in the adjacent mountains have larger uncertainties because of possible errors in elevations and the terrain corrections. However, even stations in the most rugged parts of the Diablo Range seldom have estimated uncertainties in excess of 2 mGal. For the new data, uncertainties due to possible errors in elevation and observed gravity are estimated to be less than 0.8 mGal. Most new stations have terrain corrections of less than 10 mGal, with uncertainties estimated to be less than 1 mGal. Therefore, in general the total uncertainties for the data shown on the map are estimated to be less than 2 mGal (or one contour interval).

The Bouguer gravity field over the San Jose 1:100,000 quadrangle reflects not only density variations related to upper-crustal lithology and geologic structure but also deep crustal and upper mantle density distributions that support the topography in a manner consistent with the concept of isostasy (Oliver, 1980). Often, long-wavelength anomalies associated with isostasy distort or mask more subtle anomalies related to near-surface geology (Jachens and Griscom, 1985). Therefore, in order to isolate that part of the gravity field due to near-surface sources (those sources most readily related to the mapped geology), this isostatic residual gravity map was constructed from the Bouguer gravity data by removing a regional gravity field computed from a model of the crust-mantle interface assuming Airy-type isostatic compensation. The parameters for the Airy compensation model were: crustal thickness at sea-level, 25 km; density of the topography, 2.67 g/cm^3; and density contrast across the base of the model crust, 0.4 g/cm^3. Digital topography averaged over 3-by 3-minute compartments was used as input to the isostatic compensation calculation.

PREVIOUS DISCUSSION

Previous authors have discussed the relation between gravity and geology in parts of the San Jose 1:100,000 quadrangle, primarily in qualitative terms but supported in some instances with gravity models. Robbins and others (1976) present the most comprehensive discussion; all the major anomalies on the present map are treated by them at least in a qualitative manner. Their discussion also includes numerous references to pertinent geological and other geophysical data. Robbins (1971) examined gravity and magnetic data in the vicinity of the Calaveras, Hayward, and Silver Creek faults (along the eastern edge of the Santa Clara Valley) and tested, by gravity modeling, various hypotheses for the origin of the pronounced gravity low that lies between the Calaveras and Silver Creek faults. He also suggested a possible sedimentary source for the large gravity low centered a few kilometers west of Campbell. Clark and Rietman (1973) used the gravity field in the vicinity of the extreme southwest corner of the San Jose quadrangle to argue for the continuity of the Zayante and Vergeles faults and to estimate the thickness of Tertiary sedimentary deposits in the basin lying between the San Andreas and Zayante-Vergeles faults. More general discussions of the gravity field over the Coast Ranges and the Great Valley can be found in Oliver (1980).

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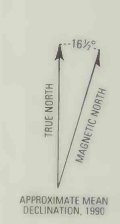
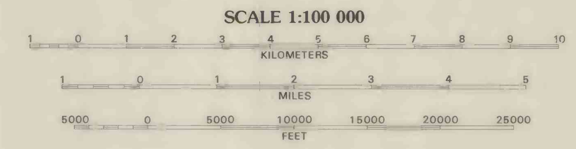
BASE MAP FROM U.S. GEOLOGICAL SURVEY
TOPOGRAPHIC SERIES 1:100,000
SAN JOSE 1978



APPROXIMATE MEAN DECLINATION, 1990

SCALE 1:100 000



CALIFORNIA

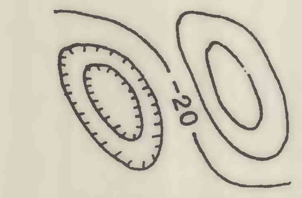
QUADRANGLE LOCATION

PRELIMINARY ISOSTATIC RESIDUAL GRAVITY MAP OF THE SAN JOSE 1:100,000 SCALE QUADRANGLE, CALIFORNIA

By

Bruce A. Chuchel and Robert C. Jachens

1990



Gravity Anomaly Contours

Contour interval is 2 mGal. Hachured contours indicate closed gravity lows.