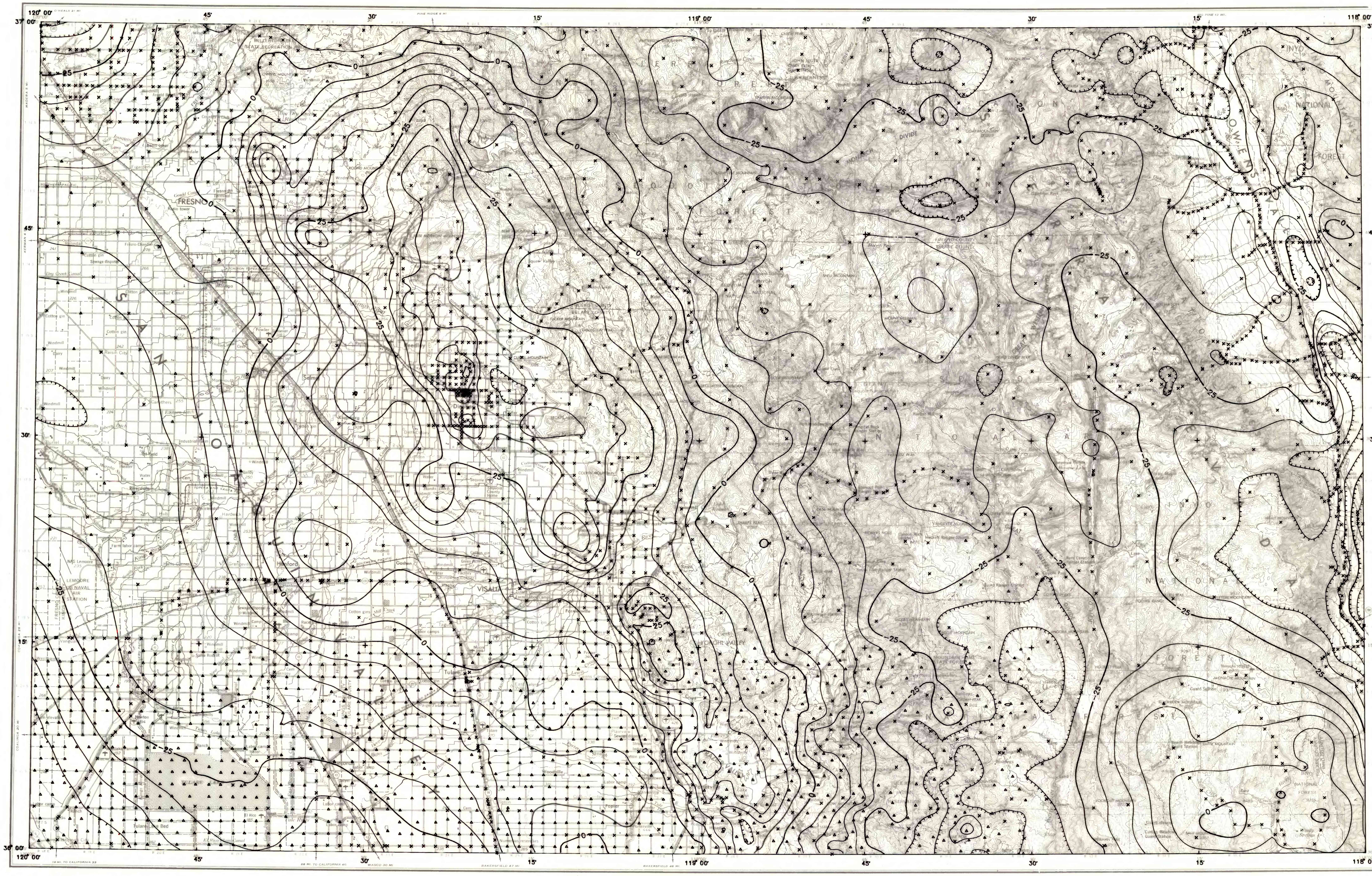
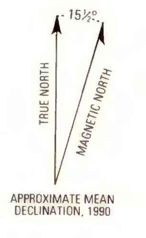
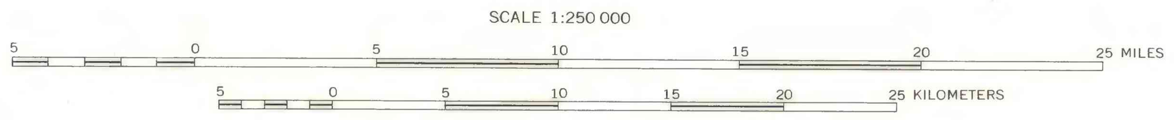
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

OPEN-FILE REPORT
91-106
SHEET 2 OF 2



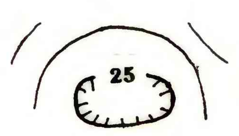
Base from U.S. Geological Survey
Fresno (1962, revised 1971) at 1:250,000
Universal Transverse Mercator projection





Contour interval of base 200 ft.

EXPLANATION



Gravity anomaly contours. Contour interval 5 mGal. Hachures indicate gravity low. Contours were computer generated based on a 800-meter grid derived from scattered gravity data. Although the data have been edited, caution should be exercised when interpreting anomalies controlled by only a single gravity station.

× Gravity station (see Robbins and others, 1975).

▲ Gravity station obtained from Defense Mapping Agency.

ISOSTATIC CORRECTION

The isostatic correction removes the long-wavelength effect of deep crustal and/or upper mantle masses that isostatically compensate regional topography. The isostatic correction assumes an Airy-Heiskanen model (Heiskanen and Vening Meinesz, 1958) of isostatic compensation; compensation is achieved by undulations of the crust-mantle interface, with a sea-level crustal thickness of 25 km, a crust-mantle density contrast of 0.40 g/cm³, and a crustal density of 2.67 g/cm³ for the topographic load. These model parameters were used because 1) they agree with seismically determined values of crustal thickness for central California and crust-mantle density contrast, 2) changing the model parameters does not significantly affect the resulting isostatic anomaly and 3) they are consistent with model parameters used for isostatic corrections computed for the rest of California (Jachens and Griscom, 1985; Oliver, 1973). The computer program ISOCOMP (Jachens and Roberts, 1981) directly calculates the attraction of an Airy-Heiskanen root by summing the attraction of individual mass prisms making up the root. The isostatic corrections calculated by ISOCOMP were used in order to be consistent with isostatic corrections computed for the rest of California (Roberts and others, 1981).

The isostatic residual gravity map differs markedly from the complete Bouguer gravity map (Sheet 1).The amplitude of the average isostatic residual gravity is significantly reduced from the average complete Bouguer anomaly value, from -96.5 ± 63.4 to -8.0 ± 21.4 mGal, suggesting that the isostatic correction removes most of the large negative gravitational effect of the Sierra Nevadan root. The isostatic residual gravity values should therefore reflect lateral variations of density within the crust. For example, a gravity low reflects low-density sedimentary rocks in the San Joaquin Valley. Gravity highs corresponding in general with outcrops of ultramafic rocks are better defined and more pronounced. The removal of the large negative gravitational gradient across the Sierra Nevada leaves a pattern of rounded, local highs and lows that probably are associated with plutons and roof pendants; however, better station coverage is necessary for detailed interpretations of the gravity field over the Sierra Nevada.

REFERENCES

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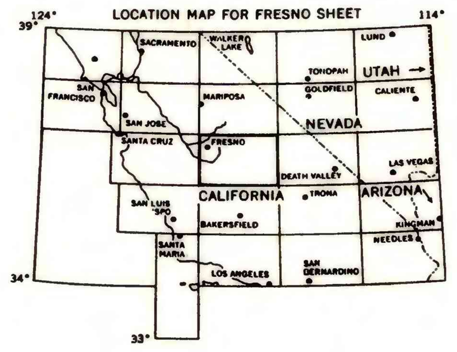
Robbins, S.L., Oliver, H.W., and Huber, D.F., 1975, Principal facts, base stations descriptions, accuracies, sources and plots for 2,124 gravity stations on the Fresno 1° x 2° quadrangle, California: National Technical Information Service, U.S. Department of Commerce, Springfield, Virginia, NTIS-PB-241 577/AS, 83 p.



COMPLETE BOUGUER GRAVITY ANOMALY AND ISOSTATIC GRAVITY MAPS OF THE FRESNO 1° x 2° QUADRANGLE, CALIFORNIA

ISOSTATIC GRAVITY MAP

By

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1991

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