

A Gravity Survey of the Island of Maui, Hawaii¹

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A BOUGUER ANOMALY CONTOUR MAP, based on gravity measurements made on the island of Maui during February 1962, is presented as Figure 1. The table of principal facts is reported elsewhere (Hawaii Inst. Geoph., 1965, Table 2). Gravity measurements were made, using a LaCoste Romberg gravimeter, along most of the main roads and along a few foot trails at the summit of West Maui and inside Haleakala Caldera on East Maui. The relative inaccessibility of parts of the volcanoes, especially at the higher elevations, made the gravity station coverage sparse in those areas. Thus the depicted gravity contour pattern is strongly influenced by

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the measurements made at the lower elevations.

Most of the stations were located at bench marks or spot elevations published on standard 1:24,000 scale U. S. Geological Survey topographic quadrangle maps. A few stations (U153, U155, U157, U159, U160, U161, U204, U207, U208, U209) were established at identifiable points and plotted on topographic maps. The elevations of these stations were determined by altimetry. All of the gravity measurements were made relative to a base station with an observed gravity value of 978,889.27 mgal which was established at the Kahului airport in 1961 by R. R. MacDonald (personal communication). The gravimeter was read at the base station at the beginning and end of each day,

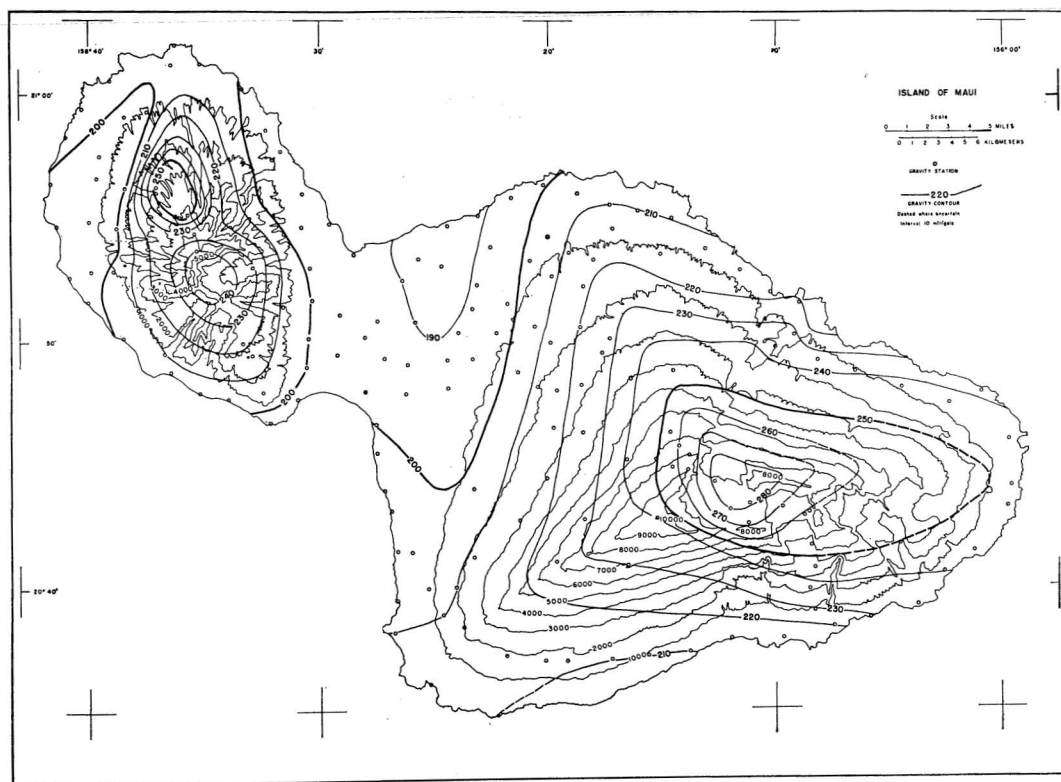


FIG. 1. Complete Bouguer anomaly map of the island of Maui, Hawaii.

and the readings varied by less than 0.15 mgal during the six days of the field work. Corrections for instrumental drift and tidal effect, therefore, were neglected in the calculations, as their combined effects amount to only a few tenths of a mgal. The data were corrected for elevation above sea level and effects of above-sea-level terrain within about 100 miles of each station. An assumed average rock density of 2.3 g/cc was used in the Bouguer and topographic corrections. Topographic corrections were made at about 15% of the stations; corrections at other stations were estimated on the basis of the calculated corrections.

Observed gravity values are believed to be accurate to at least 0.5 mgal. The elevations of bench marks and spot elevations are known within ± 5 ft of their true elevations, and the altimeter-determined elevations are believed to be accurate within ± 25 ft. In terms of a com-

bined free-air Bouguer correction, these elevation uncertainties would correspond to errors of 0.3 mgal and 1.6 mgal, respectively. Topographic corrections are probably correct to within 10%. Hence, the largest topographic corrections, such as the 40- to 50-mgal values obtained at the summits of West Maui and Haleakala volcano, can introduce errors up to 5 mgal. However, most of the stations had topographic corrections of less than 20 mgal, so probably the complete Bouguer anomaly value, at most stations, is accurate to at least 3 mgal.

REFERENCE

- HAWAII INSTITUTE OF GEOPHYSICS. 1965. Data from gravity surveys over the Hawaiian Archipelago and other Pacific islands. Hawaii Inst. Geoph. Rept. 65-4, March 1965. 10 tables.