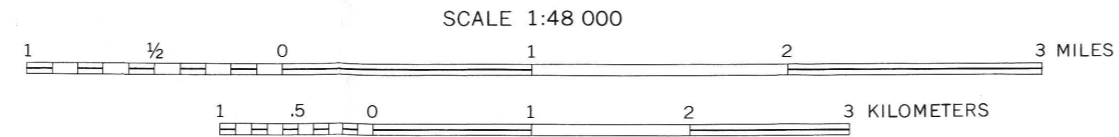
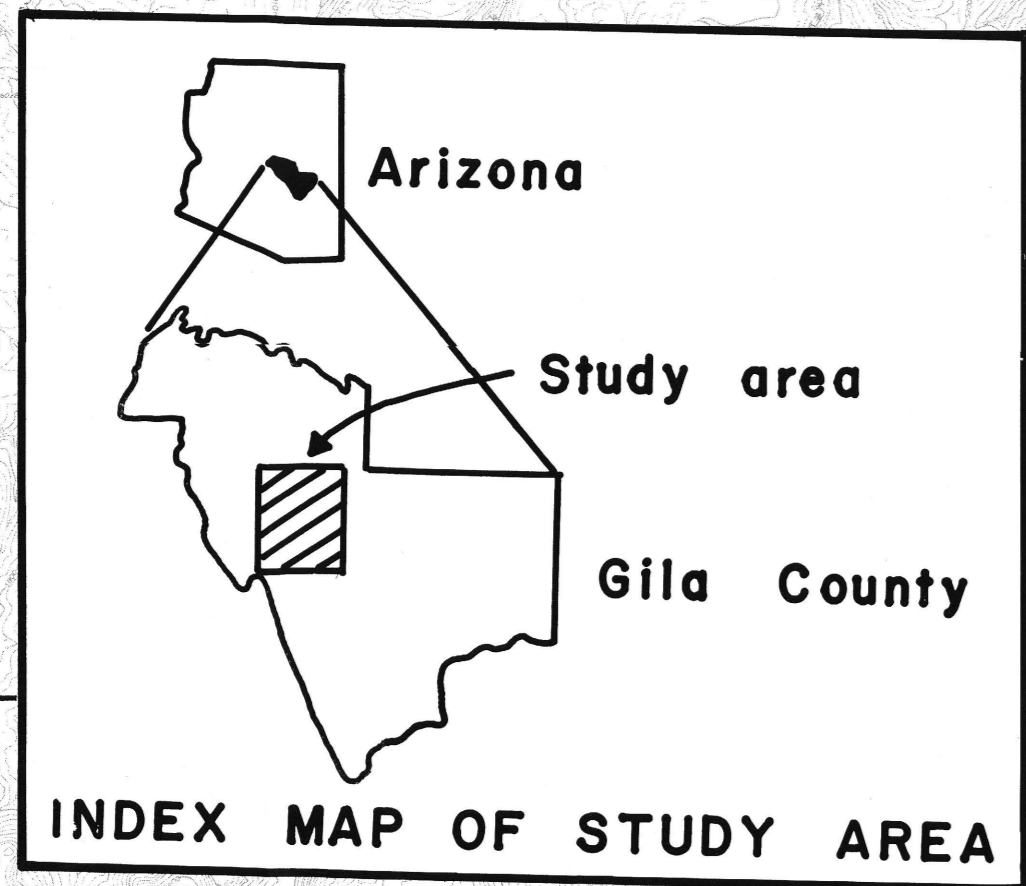


Base from U.S. Geological Survey
Mc Fadden Peak and Rockinstraw Mtn,
1949, 1:62,500; Arner Mountain,
Copper Mountain, Greenback Creek,
Picture Mtn, Theodore Roosevelt Dam,
and Windy Hill, 1964, 1:24,000



Geology from Bergquist and others (1981)

By
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1981

MISCELLANEOUS FIELD STUDIES
MAP MF-1162-G

Table 1. Density measurements for rock samples from the Sierra Ancha Wilderness, Salome Study Area, and vicinity, Gila County, Arizona

Formation	Bulk Density g/cm ³
Apache Group	
Pioneer	2.74
Do.	2.63
Dripping Spring	2.64
Do.	2.60
Mescal	2.67
Do.	2.67
Average	2.63
Precambrian Diabase	
Diabase	3.02
Do.	2.99
Do.	3.00
Do.	2.78
Do.	2.95
Do.	2.99
Average	2.96
Ruin Granite	
Ruin	2.65

Gravity Interpretations

Qualitative analyses of structural relationships and subsurface geology were made by examination of gravity gradients and configurations of gravity anomalies. The gravity data are of reconnaissance quality and are extremely sparse in the central Sierra Ancha Wilderness due to the inaccessibility of the area. Many of the gravity anomalies are defined by only one data point and are subject to a range of error in location, elevation, terrain correction, and meter reading; they should, therefore, be considered tentative.

[illegible]

The distribution of diabase in the area appears to have minimal influence on the gravity values. A positive gravity anomaly of approximately 0.3 to 0.5 mgal could be expected for each one hundred feet thickness of diabase. No appreciable thickness of diabase is present in the northeastern area, and the lower density granite (table 1) is nearer the surface than the Proterozoic Y Apache Group rocks lap out against it to the north. Both these factors contribute to the gravity low to the northeast and down-dropped fault blocks east of the Cherry Creek monocline may also contribute to the anomaly.

Estimates from geologic mapping indicate the Proterozoic diabase in the Salome Creek Area probably exceeds 1500 ft in thickness, whereas the diabase in the central Sierra Ancha averages 1000 ft thick. The difference in thickness is not sufficient to explain the 10- to 15-mgal difference in the gravity values of the two areas. The diabase alone would account for less than 2 mgal of the anomaly.

Superimposed on the central Sierra Ancha gravil plateau are localized short-wave-length anomalies which probably reflect heterogeneity in the underlying basement rocks.

The Sierra Ancha block has acted as a structural unit since Precambrian time when it was downdropped between the Cherry Creek and Sierra Ancha monoclines (Berquist and others, 1980). The upper part of the sedimentary section of the block was inflated by 1200-ft-thick diabase sill emplaced contemporaneous with development of the monoclines. The present position of the entire block is now structural, higher than the block to the east of the Cherry Creek monocline (Berquist and others, 1980), as a result of uplift of the central Sierra Ancha since the formation

The Sierra Ancha block is roughly surrounded by anomalous values of tin, tungsten, molybdenum, boron and fluorine (Marton, Tripp, and Theobald, 1980). U. alkalic affinities of the geochemical anomalies suggest that a silicic, alkalic pluton lies beneath the central Sierra Ancha (Ortuo and others, 1980). The gravity data permit the interpretation of such a pluton at shallow depth. Gravity data collected in 1979-1980 in the Payson, Arizona area to the north and in the Mazatzal Wilderness approximately 70 miles northwest of the Sierra Ancha study area also show

extensive gravity lows over alkalic, granitic rock (Kulik, D. M., unpub. data). The gravity data in these areas appear to reflect the distribution of low-density granite in the Precambrian basement. Preliminary measurements on samples from the Payson, Mazatzal, and Salome areas (Kulik, D. M., unpub. data) show bulk densities which average 2.56 g/cm³ in the Payson area, 2.57 g/cm³ in the Mazatzal area, and 2.59 g/cm³ in the Salome area. Porosity measurements on these samples show a greater degree of porosity at greater variability in samples from the Payson and Mazatzal areas. Porosity ranges from 0.5 to 1.6 percent

The granite which underlies the central Sierra Ancha probably is similar to the granite beneath the Payson and Mazatzal areas, which appears to have lower density and higher porosity than the granite beneath the Salome area.

Conclusion

The gravity data in the Sierra Ancha Wilderness-Salome Study Area and vicinity reflect the structural relationships, and suggest the westward extension of the McPadden fault. The gravity data permit the interpretation from geochemical data that silicic, alkalic pluton, for which there is no surface geologic evidence, underlies the Sierra Ancha block.

References

Barton, H. N., Tripp, R. B., and Theobald, P. K.
1980. Geochemical maps showing the distribution
elements in the heavy-mineral concentrate of stream
sediments in the Sierra Ancha Wilderness and Salo
Study Area, Gila County, Arizona: U.S. Geologic
Survey Miscellaneous Field Studies Map MF-1162

Introduction

Gravity data provide information on structural relationships and the subsurface distribution of rock types. The Bouguer-Gravity Anomaly Map of Arizona (West and Sumner, 1973) provided background information.

Method of Study

The gravity survey was made during the spring of 1978, and was supplemented by additional data collected in the spring of 1979 and winter of 1980. A total of 193 stations were established using LaCoste and Romberg and Worden gravimeters¹ and were tied to the International Gravity Standardization Net 1971 (Defense Mapping Agency Aerospace Center, 1974) at base stations AC1C 3210-1 at Globe, Arizona, and AC1C 3203-1 at Payson, Arizona. Secondary base stations were established at the following locations: the Resort at Roosevelt, Arizona, Kohl's Ranch in Payson, Arizona, and Mountain Shadows Leisure Villa, also in Payson. The bases are described and the principal facts published in U.S. Geological Survey Open-File Report 80-1070 (Wilson & Banker, 1980).

Because of rugged terrain, stations within the Sierra Ancha Wilderness and a portion of the Salome Study Area were reached by helicopter; those stations adjacent, less rugged areas were reached on foot and by 4-wheel drive vehicle. Station elevations were obtained from benchmarks, spot elevations and estimations from topographic maps at 1:24,000 and 1:62,500 scales; elevations are accurate to 1-2 m in areas of low relief, but may be in error by 5-10 m in the rugged terrain. Resultant error in the Bouguer anomaly is less than 2 mgal.

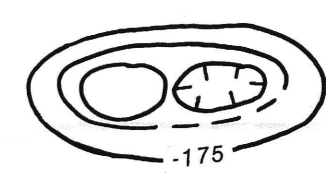
Data Preparation

The gravity data were reduced using a digital computer program by R. H. Godson and D. A. Danersau (unpub.). Gravity meter readings were converted to observed gravity using the 1971 base values of the International Gravity Standardization Net. Corrections were made for tidal effect and linear

Instrument drift. The Geodetic Reference System 1967 formula (International Association of Geodesy, 1967) was used to compute theoretical gravity. The data were reduced to Bouguer anomaly values using an assumed average rock density of 2.67 g/cm³. Terrain corrections were made by digital computer to 167 km radius from each station; these corrections were based on terrain elevations digitized at 15 second intervals. The corrections ranged from 0.86 mgal at station 5033 near Young to 25.13 mgal at station 9059 on Zimmerman Point.

Density measurements were made on 13 rock samples from the study area to aid in the interpretation of the gravity data. The samples were weighed, saturated with water under normal barometric pressure, then weighed while suspended in water. Density values are summarized in table 1.

¹Use of brand names in this report is for descriptive purposes only and does not constitute endorsement by the U.S. Geological Survey.



GRAVITY CONTOURS--Dashed where inferred. Contour in 2.5 milligals. Hachures indicate closed area of gravity values

GRAVITY STATION