A GRAVIMETER SURVEY OF A PORTION OF MONROE COUNTY, ILLINOIS

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This report describes briefly the results of a geological and geophysical study of the buried rocks occurring in a portion of Monroe County, Illinois. The surveyed area is located approximately 40 miles southeast of the city of Saint Louis, Missouri and is thought to exist on the complex border of the Ozark Region.

The study was undertaken at the suggestion of Professor Ross R. Heinrich, Director, Department of Geophysics and Geophysical Engineering, Saint Louis University, because of the interest aroused concerning the seismicity and subsurface geology of the area.

The objectives of this work were as follows:

1. To investigate by gravimetric means the configuration of the basement under the area bounded by the geographic coordinates 38°8'00" - 38°23'06" North latitude and 89°58'00" - 90°25'00" West longitude.

2. Contingent upon the existence of a gravity anomaly, to compare this anomaly with the known magnetic

anomaly.

3. To describe, at least qualitatively the ultimate cause(s) for any anomalous distribution of gravity throughout the area.

4. To give quantitative estimates, if possible, of the source(s) of any anomaly.

5. To correlate any existing structure with major structural features known to exist within the region of southwestern Illinois.

A total of 232 stations, located at easily identifiable places, were laid out to complete the gravity network. An enlarged photographic reproduction of the pertinent U. S. Geological Survey topographic maps facilitated the location of the stations. Stations were spaced at intervals deemed advisable to delineate the gravity anomaly.

An Atlas gravimeter, Model F-22, with a sensitivity of 0.1150 milligals per scale division, was employed for the determination of the gravity measurements in this report. Where elevations were not known by independent means, an American Paulin aneroid micro-altimeter, using repeat readings, gave elevations of sufficient accuracy. All field observations were

made in a series of closed loops to permit an accurate appraisal of the drift of each instrument.

The study of the stratigraphy of the buried rocks includes a graphic columnar section, a written description of the stratigraphic column, and maps showing the distribution of the formations underlying Monroe County. The structure of the rocks in the area is described and shown graphically by structure contour maps.

A map, drawn of the "reduced gravity values, indicated an anomaly in the area south of the city of Waterloo and west of the village of Redbud. The second derivative method was used to "correct" for the regional gravity effect and a map of the second derivative of the gravity values with respect to the vertical emphasized the near-surface anomalies.

Critical information regarding the physical characteristics of the formations involved was not available, so quantitative estimates of the anomalies were not possible. However, the size and shape of the anomaly indicated that its source must lie at considerable depth. Further, the gravity data

as indicated on the Bouguer Gravity Map revealed that the Herculaneum fault crosses the Mississippi River into Monroe County. Other features on this map were accentuated on the Second Derivative Maps and these local anomalies found compatibility with their magnetic counterpart. The gravity anomalies were caused by a horizontal density contrast under the area, such as a density contrast existing along vertical relief in the contact surface between the basement and the sediments. Such differences in elevation in the basement may, or may not, find expression in the overlying strata, but this study seems to substantiate the postutate that a subsurface zone of weakness exists in Monroe County.