SIMPLE BOUGUER GRAVITY MAP OF GEORGIA

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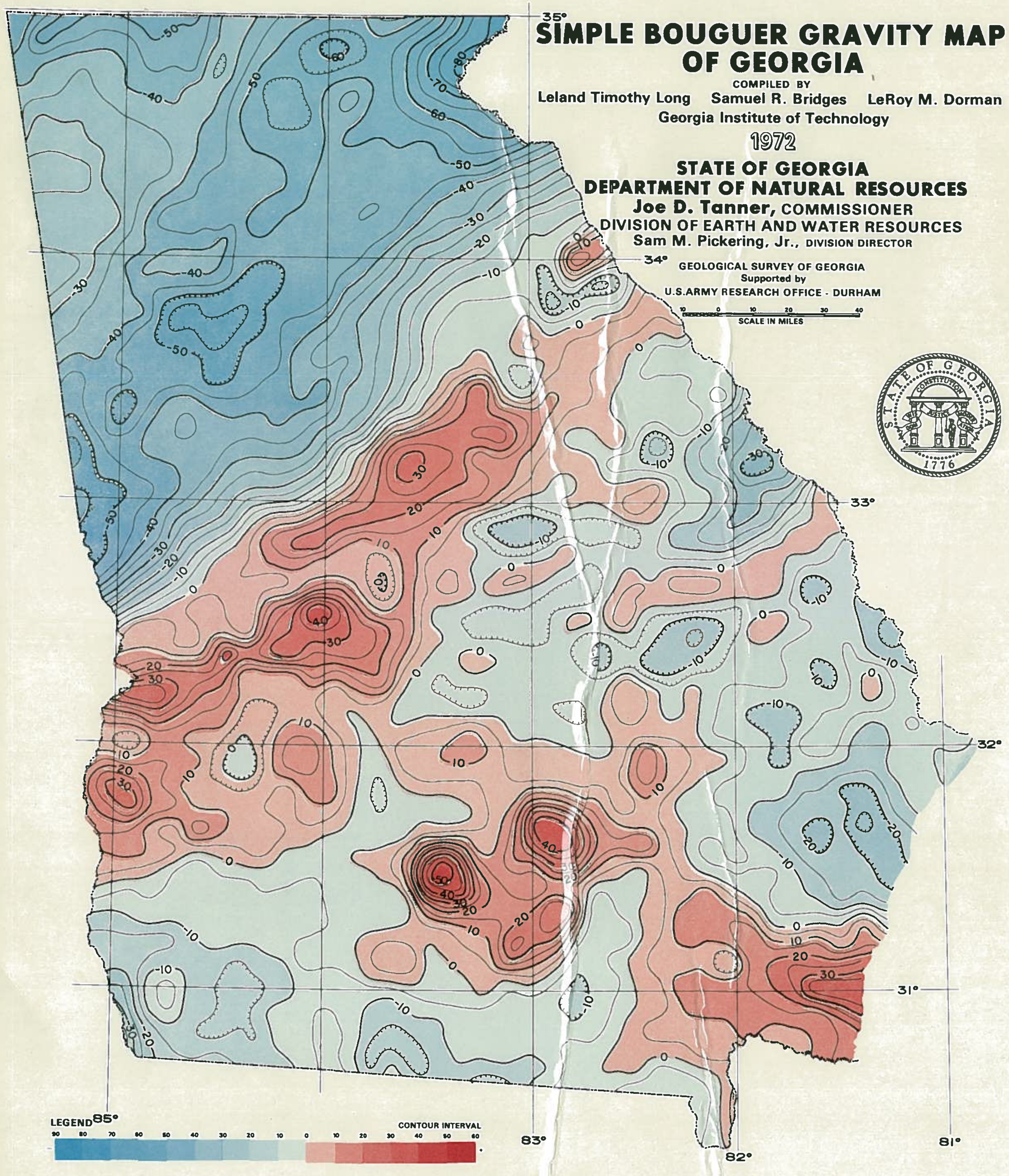

EXPLANATION

Interpretation of Bouguer Anomalies

Bouguer gravity anomalies are measures of the influence of local geology and crustal structure on the earth's gravitational field. The character of these anomalies is determined by the distribution of the variations of the density in the earth's crust which in turn is due to changes in rock type or structure. Positive and negative Bouguer anomalies indicate an excess or deficiency, respectively, of mass near the point of observation. Shallow density variations usually will cause anomalies of short length whereas density variations deep in the earth's crust will cause anomalies which will vary gradually over a distance comparable to their depth. The gravity map shown here is a representation of the Bouguer gravity anomalies (see section on computation for theoretical details) in the form of a contour map. The contour lines connect points of equal strength in the anomalous portion of the earth's gravity field in the same manner that topographic contours connect points of equal elevation. The scale of this map is best suited for illustrating the regional trends of the gravity surface, but it provides valuable information for more detailed future studies. Such studies will help solve geologic and mineral exploration problems by locating rock bodies and structures which are not exposed at the surface and to give information on the 3-dimensional geometry of known rock bodies.

GRAVIMETRIC REFERENCE BASE NET STATE OF GEORGIA

On a broad scale, the Bouguer gravity anomaly map shows regional patterns which correlate with the major geologic subdivisions in Georgia. The folded, unmetamorphosed Paleozoic rocks of the Valley and Ridge Province of northwest Georgia are characterized by -20 to -40 milligal anomalies with only moderate variation. Southeast of this zone the Brevard Fault Zone, which extends northeastward across Georgia through the northwestern portion of Atlanta, follows a region of broad gravity lows. These lows extend north of the Brevard Fault Zone into the northeast Georgia mountains where on the South Carolina border they attain the lowest value (-80 milligals) found in the State. The boundary of the zone of broad lows to the northwest generally corresponds to the Murphy Marble Belt. Continuing southward from the Brevard Fault Zone, the gravity increases smoothly until this trend culminates in a sharp northeast-trending "ridge" just north of the Fall Line. The negative anomalies north of the Fall Line can be accounted for almost entirely by the existence of low density roots for the crust which are required to support mountainous and elevated areas like north Georgia in isostatic equilibrium.

South of the Fall Line, the Bouguer anomalies average about zero but show a wide range of from -30 milligals to +50 milligals. The positive anomalies occur in the form of irregularly spaced knobs on ridges. The negative anomalies are the smoother intervening depressions which tend to be aligned along the northeasterly trend. One particularly prominent set of knobs and ridges occurs just south of the southwestern portion of the Fall Line. Another set of three prominent knobs, divided from the first by a series of irregular depressions, occurs further to the southeast. The Bouguer anomaly on one of those exceeds +50 milligals, the highest positive anomaly in the state. The positive Bouguer anomalies of the knobs and ridges are most likely due to the occurrence of dense basic rock types (like diabase or gabbro). The knobs show strong magnetic anomalies typical of basic rocks and furthermore basic rocks have been encountered in some deep wells. These rocks were either intruded into the crustal rocks now below a sedimentary blanket, intruded as sills (between the sedimentary strata), or extruded as flows on the former surface. Most of the prominent knobs show steeper anomalies on the northwest flank than to the southeast indicating a possible dip of the structures to the southeast. The gravity lows are related to increased thicknesses of sedimentary rock of pre-Cretaceous age. The younger rocks exposed at the surface do not significantly affect the gravity anomalies since they have uniform or only gradually varying thicknesses.

Computation of Bouguer Anomalies

The attraction of gravity at the earth's surface shows both regular and irregular variation. The regular variations are a consequence of the earth's shape and rotation. The irregular variations of primary interest to the geologist (see previous section) are a result of the distribution of mass in the earth's crust. In the Bouguer reduction of gravity data, the regular variations of the earth's gravity field are removed to allow the comparison of gravity anomalies with the densities of geologic structures.