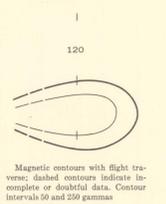


EXPLANATION



Index map of Minnesota showing area covered by this map

This aeromagnetic contour map and accompanying profiles are a part of a series showing the results of aeromagnetic surveys over approximately 40,000 square miles in Minnesota. The survey was conducted by the U. S. Geological Survey in cooperation with the Minnesota Geological Survey. The purpose of the investigation was to delineate the major magnetic trends associated with known iron ore deposits and to indicate areas that may be favorable for additional exploration.

Total-intensity aeromagnetic data were obtained by flying north-south lines spaced a mile apart at altitudes close to 500 feet above the ground. Magnetic detecting equipment consisted of the continuous recording AN-ASQ-3A airborne magnetometer modified for geophysical use with the detecting element towed about 75 feet below the aircraft. A continuous record of the altitude above ground was obtained by a recording radio altimeter. Flight lines plotted on aerial photos were used for glide guidance. The actual flight path was recorded by a gyro-stabilized continuous-strip camera establishing ground location control. A system of simultaneous identification points marked the camera, altimeter, and magnetometer records. East-west base lines were flown to correct for diurnal variation and drift and to adjust the flight lines to a common arbitrary datum.

The magnetic anomalies shown on this map result from differences in the magnetic properties of the buried Precambrian rocks and not of the overlying rocks described in this text. The available data on both the depth of drift and nature of rocks underlying the glacial drift—although meager—are as complete as possible.

The area mapped was covered by the highest stage of former glacial Lake Agassiz. Much of the northern and eastern parts are very flat and were partly covered by thin sand deposits before drainage. A low, water-laid moraine covers a small area in the north-west corner of the map about with ridges of beach gravel on its west side. In general the relief is slight and much of the area in Beltrami County is swampy. The drift cover is thick, ranging from 150 to over 300 feet.

There are no known Cretaceous rocks. The Precambrian surface slopes to the southwest as part of a westerly trend of the region.

Not much is known about the character of the Precambrian rocks. Possible granite has been reported from a well at Grygla town at less than 400 feet. At a few other places residual clays, presumably derived from Precambrian rocks, have been penetrated in wells.

The prominent magnetic anomalies that trend southwest across the map furnish evidence that the rocks beneath part of the area are different from those beneath the map areas to the north and west. It is fairly evident that these anomalies are related to strong anomalies shown in an adjacent area (Meuschke et al., 1957). The meager evidence available suggests that these anomalies may be caused by bands of iron formation in the rocks of the Knife Lake group.

LITERATURE CITED

Meuschke, J. L., Books, K. G., Henderson, J. R., and others, 1957. Aeromagnetic map of northern Beltrami and southern Lake of the Woods Counties, Minn., U. S. Geol. Survey Geophys. Inv. Map GP-128.

Note

Aeromagnetic data are obtained and compiled along a continuous line, whereas ground magnetic surveys are made at separate points. Errors within the normal limits of any magnetic measurement may cause slight discrepancies between flight lines in an aeromagnetic map, which would be more obvious than similar discrepancies between points in a ground magnetic map. For this reason as much care should be exercised in evaluating magnetic features that appear as elongations along a single aeromagnetic traverse as in interpreting an anomaly indicated by a single ground station.

Base map from Minnesota Department of Highway maps  
Planimetry does not meet national standard map accuracy

AEROMAGNETIC MAP OF EASTERN MARSHALL AND NORTHWESTERN BELTRAMI COUNTIES, MINNESOTA

By  
K. G. Books, G. M. Schwartz, J. L. Meuschke, and W. J. Dempsey  
TOTAL INTENSITY CONTOURS RELATIVE TO ARBITRARY DATUM

