DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY
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PREPARED IN COOPERATION WITH
THE MINNESOTA GEOLOGICAL SURVEY
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GEOPHYSICAL INVESTIGATIONS
MAP GP-148

AEROMAGNETIC MAP OF WESTERN POLK COUNTY, MINNESOTA

By

K. G. Books, G. M. Schwartz, J. L. Meuschke, and W. J. Dempsey

TOTAL INTENSITY CONTOURS RELATIVE TO ARBITRARY DATUM

SHEET 1 OF 2

EXPLANATION

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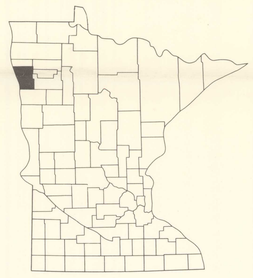
Magnetic contours with flight traverse; dashed contours indicate incomplete or doubtful data. Contour intervals 50 and 250 gammas

Magnetic contour enclosing area of lower magnetic intensity

X3750
Measured maximum or minimum intensity within closed high or closed low

Drill hole



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 49,000 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 pilot guidance. The actual flight path was recorded by a gyrostabilized 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 the nature of rocks underlying the glacial drift—although meager—are as complete as possible.

The area mapped lies within the Red River Valley. It is almost entirely below the principal beaches of former glacial Lake Agassiz and is largely covered by a thick blanket of lake sediments. The surface of the drift has been smoothed off or buried by glacial lake erosion or deposition and so is essentially level. Deposits of glacial drift are thick, probably not much less than 150 feet and as much as 250 feet at places.

Beds of Cretaceous clay and sand are widespread and may cover most of the map area. These beds are generally less than 50 to 100 feet thick, and they may be locally absent.

A few wells have penetrated the buried Precambrian rocks of the map area; well drillers usually stop drilling when they reach residual clays, which overlie the Precambrian in places. Granite without a Cretaceous cover was penetrated at 223 feet in a well at Crookston. Granite was also penetrated in a well in the northeast corner of the map area in sec. 12, T. 152 N., R. 46 W., and on the southern border in sec. 35, T. 147 N., R. 47 W.

Available data indicate that a pronounced depression open to the west exists in the Precambrian rock surface in the northern half of the map area.

With the exception of the northeast-trending anomalies in the central and southeast parts of the map, the pattern of the magnetic contours agrees with the granite found in scattered wells. The anomalies are believed to be related to anomalies farther northeast, but may also be related to the Precambrian metasedimentary rocks of the Knife Lake group.

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

APPROXIMATE MEAN DECLINATION, 1958

1 ½ 0 1 2 3 4 Miles

Approximate scale
Contour interval 50 and 250 gammas
1958

Aeromagnetic survey flown 500 feet above surface in 1952 by W. J. Dempsey and L. A. Anderson. Compilation directed by J. L. Meuschke and K. G. Books
Geology by G. M. Schwartz

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