DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY
THOMAS B. NOLAN, DIRECTOR

PREPARED IN COOPERATION WITH
THE MINNESOTA GEOLOGICAL SURVEY
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GEOPHYSICAL INVESTIGATIONS
MAP GP 130

AEROMAGNETIC AND GEOLOGIC MAP OF NORTH-CENTRAL BELTRAMI AND NORTHEASTERN CLEARWATER COUNTIES, MINNESOTA

This aeromagnetic map and accompanying profiles are a part of a series showing the results of aeromagnetic surveys over approximately 45,000 square miles in Minnesota. The survey was conducted by the U. S. Geological Survey in cooperation with the Minnesota Geological Survey.

Total-intensity aeromagnetic data were obtained by flying north-south lines spaced one mile apart at elevations ranging between 500 and 1,150 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 plane. A continuous record of the elevation above ground was obtained by use of a recording radio altimeter. Flight lines plotted on aerial photos were used by the pilots for flight guidance. The aerial flight path was recorded by gyrostabilized continuous-strip camera. A system of simultaneous identification points marked all records, and strip film established the ground-location control. East-west base lines were flown to facilitate correction for diurnal variation and drift, and to adjust the flight lines to a common arbitrary datum.

Most of this map area lies within the bed of former glacial Lake Agassiz. The exceptions are a small zone south of Lower Red Lake and an area of approximately 50 square miles in the southeast corner where morainic deposits form higher land. Red Lake covers half of the area and much of the remainder is swampland with deposits of peat a few feet thick.

Outcrops are lacking over most of the surface, and as settlements are few, wells to bedrock are scarce. As a result knowledge of the bedrock is poor. The only known outcrops are greenstone in the NE¼SE¼ sec. 36, T.152 N., R.31 W., and in the SW¼ sec. 31, T.152 N., R.30 W. Mica schist also appears near the southeast corner of sec. 6, T.153 N., R.30 W. Highly foliated greenstone is well exposed there and is clearly cut by diabase, which is completely lacking in foliation. The greenstone is probably of Keewatin age and the diabase Keweenawan.

The bedrock encountered in a few of the wells is reported as blue rock, which is probably a phase of the greenstone. A well near the northeast shore of Red Lake is reported to have entered granite. Most of the area has not been systematically examined and other outcrops may exist.

The cause of the many magnetic highs in the southern half of the area is not known, but the highs indicate formations or beds having a greater magnetic susceptibility.

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.

EXPLANATION

FORMATIONS

- pC — Precambrian, formation not determined
- Granite, with numerous inclusions of older rocks — Hornetta series (?) — PRECAMBRIAN
- pCk — Knife Lake group, with granite, pegmatite, and diabase intrusions — Keewatin series — PRECAMBRIAN
- pCe — Ely greenstone — PRECAMBRIAN

OUTCROPS
(Lithologic symbols)

- Diabase and greenstone
- Greenstone
- Schist

Indefinite contact

62 — Magnetic contours with flight traverse; dashed contours indicate incomplete or doubtful data; hachured contour encloses area of lower magnetic intensity; "+" and number denote location and value of measured maximum or minimum intensity within closed contour.

Drill hole

Index map of Minnesota

Base from Minnesota Department of Highway maps

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TOTAL-INTENSITY AEROMAGNETIC CONTOURS RELATIVE TO ARBITRARY DATUM

By
J. L. Meuschke, K. G. Books, John R. Henderson, Jr., and G. M. Schwartz

Scale 1:63 360

1 ½ 0 1 2 3 4 Miles

Contour interval 50, 250, 500, and 1000 gammas
Aeromagnetic survey flown 1000 feet above the surface

1957

INTERIOR—GEOLOGICAL SURVEY, WASHINGTON, D. C.
M-P-3761
Aeromagnetic survey 1949 and 1951

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