DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

PREPARED IN COOPERATION WITH
THE MINNESOTA GEOLOGICAL SURVEY

GEOPHYSICAL INVESTIGATIONS
MAP GP-473

Base from Army Map Service 1:250,000 series: Fargo, 1953; Brainerd, 1953; Millbank, 1953 and St. Cloud, 1953

AEROMAGNETIC AND GEOLOGIC MAP OF WEST-CENTRAL MINNESOTA

By

G. D. Bath, G. M. Schwartz, and F. P. Gilbert

SCALE 1:250 000

5 0 5 10 15 20 25 MILES

5 0 5 10 15 20 25 KILOMETERS

CONTOUR INTERVALS 100, 500, AND 2000 GAMMAS

1965

EXPLANATION

Only units present on this map are colored

Applies to GP's 471, 472, 473, and 474

CRETACEOUS

Ks — Sand, shale, and conglomerate

PALEOZOIC

Pzs — Sandstone, shale, and limestone
May include some Mesozoic rocks

PRECAMBRIAN

Keweenawan Series

ss — Sandstone and shale
Includes Fond du Lac and Hinckley Sandstones of Winchell (1886, 1899)

bi | bd | bdi — Mafic intrusive rocks
bi, *undifferentiated basic intrusive rocks*
bd, *Duluth Gabbro*
bdi, *diabase intrusive rocks*

bl — Mafic lava flows
Includes some rhyolite and interflow sedimentary rocks

ps | pw | ph | pf | pm — Igneous rocks of the Penokean orogeny
ps, *Stearns Magma Series of Woyski (1949)*
pw, *Warman Quartz Monzonite of Woyski (1949)*
ph, *Hillman Gneissoid Tonalite of Woyski (1949)*
pf, *Freedhem Tonalite of Woyski (1949)*
pm, *McGrath Gneiss of Woyski (1949)*

Animikie Group

vd / sg — Slate-graywacke sequence
Includes Virginia and Rove Slates; and Thomson Slate of Winchell (1899)
vd, *Deerwood Iron-Formation Member of Virginia Slate*

ib | im — Iron-formations
ib, *Biwabik Iron-Formation of Mesabi and Gunflint districts*
im, *main iron-formation of the North Cuyuna district*

pg — Pokegama Quartzite

ai | ag | av — Igneous rocks of the Algoman orogeny
ai, *undifferentiated intrusive rocks*
ag, *Giants Range Granite*
av, *Vermilion Granite*

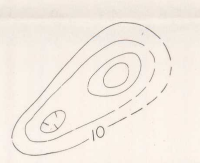
ia / kl — Knife Lake Group
Includes sedimentary rocks and some flows, tuffs, and agglomerates
ia, *Agawa Iron-Formation Member (of former usage)*

sa — Saganaga Granite

is / eg — Ely Greenstone
Includes some tuff and interbedded sedimentary rocks, and intrusive rocks
is, *Soudan Iron-Formation*

pC — Undifferentiated Precambrian rocks
Stratigraphic position uncertain

— — — — — — Contact



Magnetic contours showing total intensity magnetic field of the earth in hundreds of gammas relative to arbitrary datum

Hachured to indicate closed areas of lower magnetic intensity; dashed where data are incomplete

×

Location of measured maximum or minimum intensity within closed high or closed low

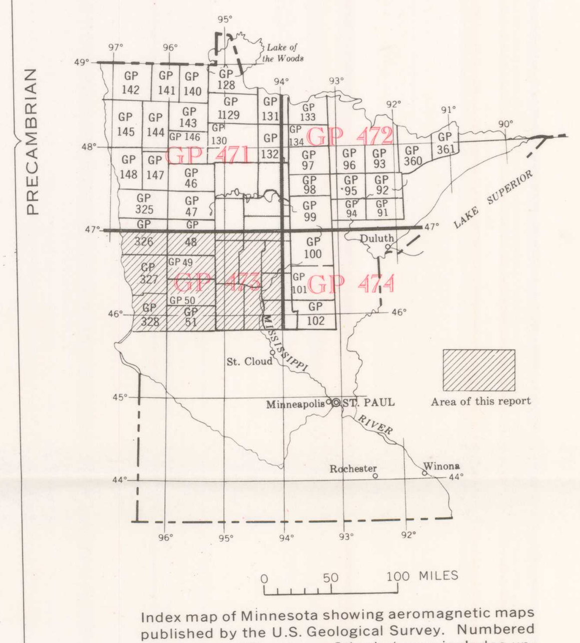
SOURCES OF GEOLOGIC DATA

Regional geology from:

1. Grout, F. F., and others, 1932, Geologic map of the State of Minnesota: Minnesota Geol. Survey, scale 1:500,000 [2 sheets].
2. Leith, C. K., Lund, R. J., and Leith, Andrew, 1935, Precambrian rocks of the Lake Superior regions; a review of newly discovered geologic features with a revised geologic map: U.S. Geol. Survey Prof. Paper 184, 34 p.

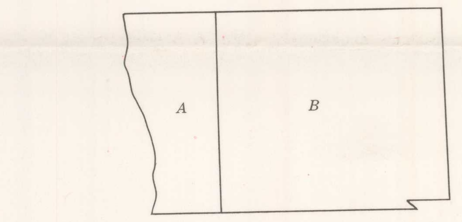
Details of some iron-formations and igneous features from:

1. Woyski, M. S., 1949, Intrusives of central Minnesota: Geol. Soc. America Bull., v. 60, no. 6, p. 999-1016.
2. Grout, F. F., and Wolff, J. F., Sr., 1955, The geology of the Cuyuna district, Minnesota—a progress report: Minnesota Geol. Survey Bull. 36, 144 p.
3. Reid, Ian L., 1956, The Vermilion Range [Minn.] *in* Geol. Soc. America, Guidebook for field trips, Field Trip no. 1, p. 109-119, pl. 2.
4. Grout, F. F., Sharp, R. P., and Schwartz, G. M., 1959, The geology of Cook County, Minnesota: Minnesota Geol. Survey Bull. 39, 163 p.
5. Schmidt, R. G., 1959, Bedrock geology of the northern and eastern parts of the North Range, Cuyuna district, Minnesota: U.S. Geol. Survey Mineral Inv. Field Studies Map MF-182, scale 1:7,200.
6. Meuschke, J. L., Books, K. G., Henderson, J. R., and Schwartz, G. M., 1957a, Aeromagnetic and geologic map of northern Lake of the Woods and northeastern Roseau Counties, Minnesota: U.S. Geol. Survey Geophys., Inv. Map GP-128.
7. Meuschke, J. L., Books, K. G., Henderson, J. R., and Schwartz, G. M., 1957b, Aeromagnetic and geologic map of northern Beltrami and southern Lake of the Woods Counties, Minnesota: U.S. Geol. Survey Geophys. Inv. Map GP-129.
8. Meuschke, J. L., Books, K. G., Henderson, J. R., Schwartz, G. M., 1957c, Aeromagnetic and geologic map of north-central Beltrami and northeastern Clearwater Counties, Minnesota: U.S. Geol. Survey Geophys. Inv. Map GP-130.
9. Goldich, S. S., Nier, A. O., Baadsgaard, H., Hoffman, J. H., and Krueger, H. W., 1961, The Precambrian geology and geochronology of Minnesota: Minn. Geol. Survey Bull. 41, 193 p.
10. Schwartz, G. M., 1949, The geology of the Duluth metropolitan area [Minnesota]: Minnesota Geol. Survey Bull. 33, 136 p.



Index map of Minnesota showing aeromagnetic maps published by the U.S. Geological Survey. Numbered maps are in GP series. Stippled area includes unnumbered geophysical investigations published in 1949

7°
TRUE NORTH
MAGNETIC NORTH
APPROXIMATE MEAN DECLINATION, 1965



Index map showing flight elevations above ground, direction of flight, and spacing of traverses

A 500 feet, N-S, 1 mile
(Magnetic datum for this area has been lowered by 2100 gammas to agree with rest of map)
B 1000 feet, N-S, 1 mile

GEOPHYSICAL INVESTIGATIONS
MAP GP-473

For sale by U.S. Geological Survey, price 75 cents