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Ontario

Ontario Geological Survey

MAP 82 657

AIRBORNE MAGNETIC AND GAMMA-RAY SPECTROMETRIC SURVEYS

Shaded colour image of the second vertical derivative of the residual magnetic field and Keating coefficients

MAHON LAKE AND FLATROCK LAKE AREAS

Scale 1:50 000

1 km 0 1 2 km

NTS References: 52 C/7, 8, 9, 10

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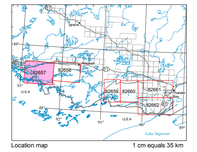


Location map 1 cm equals 35 km

SURVEY PARAMETERS

AIRCRAFT
Type: Cessna Caravan 208
Registration: C-FZLK

MAGNETOMETER
Type: Scintrex CS-3 single cell cesium vapour
Sensitivity: 0.005 nT
Noise level: 0.05 nT
Sample interval: 10 readings per second
Sensor locations: wingtip (transverse separation is 15.75 m)
tail stinger (longitudinal separation is 12.42 m)
Compensation: RMS AADCII
Data Acquisition: FASDAS

GAMMA-RAY SPECTROMETER SYSTEM
Type: Exploranium GR-820
Downward-looking crystal volume: 33.6 L
Upward-looking crystal volume: 8.4 L
Number of channels: 256
Sample interval: 1 reading per second
Sensor location: near centre of aircraft
Potassium window: 1370 to 1570 keV
Uranium window: 1660 to 1860 keV
Thorium window: 2410 to 2810 keV
Total count window: 410 to 2810 keV

NAVIGATION SYSTEM
GPS receiver: NovAtel OEMV-3G
GPS sample interval: 1 reading per second
Radar altimeter: King KRA-10A
Radar sample interval: 1 reading per second
Barometric altimeter: Vaisala PMB100
Barometric sample interval: 1 reading per second
Video flight path camera: Sanyo VCC-3972
Navigation-Acquisition: FASDAS

BASE STATION
Type: Scintrex CS-3 single cell cesium vapour
Magnetometer sample interval: 1 reading per second
GPS sample interval: 1 reading per second

SURVEY SPECIFICATIONS
Survey dates: 16 to August 27, 2014
Nominal aircraft terrain clearance: 100 m
Traverse line spacing: 200 m
Control line spacing: 2000 m
Traverse line direction: North-south
Control line direction: East-west

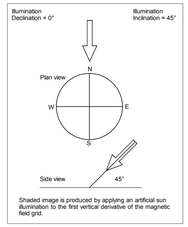
CO-ORDINATE SYSTEM
Projection: Universal Transverse Mercator
Datum: NAD83
Central meridian: 93°W (UTM zone 15N) Mahon Lake
Central meridian: 87°W (UTM zone 16N) Flatrock Lake
Central scale factor: 0.9996
False easting: 500 000 m
False northing: 0 m

LEGEND

KEATING COEFFICIENTS

Positive correlation		Negative correlation
○	90%	○
○	85%	○
○	80%	○
○	75%	○

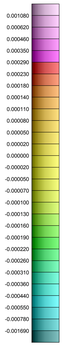
SHADED IMAGE SUN ANGLE



Shaded image is produced by applying an artificial sun illumination to the first vertical derivative of the magnetic field grid.

SECOND VERTICAL DERIVATIVE OF THE MAGNETIC FIELD GRID

nanoteslas per metre^2 (nT/m^2)



DESCRIPTIVE NOTES

Introduction

The data comprising this map are derived from the results of an airborne magnetic and gamma-ray spectrometric survey carried out by CGG Canada Services Ltd. The survey was flown using a Cessna Caravan 208 aircraft. The aircraft was equipped with 3 Scintrex magnetic sensors, an Exploranium gamma-ray spectrometer, a GPS navigation system and a digital data acquisition system.

Second Vertical Derivative of the Magnetic Field

The second vertical derivative of the magnetic field is the rate of change of the magnetic field in the vertical direction. Computation of the second vertical derivative removes long wavelength features of the magnetic field and significantly improves the resolution of closely spaced and superposed anomalies. The values for the second vertical derivative of the magnetic field were computed directly from the gridded gradient enhanced residual magnetic intensity data using a fast Fourier transform, combining the transfer functions of the first vertical derivative and a 3 point Hanning filter. The Hanning filter was aimed at attenuating unwanted high frequencies enhanced by the derivative operator.

The shaded relief parameters are:
Shading inclination: 45°
Shading declination: 0°

Keating Correlation Coefficients

Possible kimberlite targets have been identified from the residual magnetic intensity data, based on the identification of roughly circular anomalies. This procedure was automated by using a known pattern-recognition technique (Keating 1995), which consists of computing, over a moving window, a first-order regression between a vertical cylinder model anomaly and the gridded magnetic data. Only the results where the absolute value of the correlation coefficient is above a threshold of 75% were retained. The results are depicted as circular symbols, scaled to reflect the correlation value. The most favourable targets are those that exhibit a cluster of high amplitude solutions. Correlation coefficients with a negative value correspond to reversely magnetized sources. It is important to be aware that other magnetic sources may correlate well with the vertical cylinder model, whereas some kimberlite pipes of irregular geometry may not.

The cylinder model parameters are as follows:
Cylinder diameter: 200 m
Cylinder length: infinite
Overburden thickness: 5.5 m (average) Mahon Lake and
6.0 m (average) Flatrock Lake
Magnetic inclination: 74.0° W Mahon Lake and
74.1° N Flatrock Lake
Magnetic declination: 1.1° W Mahon Lake and
3.0° W Flatrock Lake
Window size: 17 x 17 cells (680 m x 680 m)

SOURCES OF INFORMATION

Base map information derived from the Land Information Ontario Data Warehouse, Land Information Ontario, Ministry of Natural Resources and Forestry, scale 1:50 000.

Magnetic declination for the centre of the map area was approximately 0°54.1'W in 2015.

Keating, P.B. 1995. A simple technique to identify magnetic anomalies due to kimberlite pipes; Exploration and Mining Geology, v.4, no.2, p.121-125.

CREDITS

Data acquisition, data compilation and map production by CGG Canada Services Ltd., Ottawa, Ontario.

Project management and quality assurance by Paterson, Grant and Watson Ltd., Toronto, Ontario.

Contract management, base maps and map surrounds by the Ministry of Northern Development and Mines, Sudbury, Ontario.

Every possible effort has been made to ensure the accuracy of the information presented on this map; however, the Ministry of Northern Development and Mines does not assume liability for any errors that may occur. Users may wish to verify critical information.

Corresponding digital data for this survey are available from the following Ontario Geological Survey publication:

Ontario Geological Survey 2015. Ontario airborne geophysical surveys, magnetic and gamma-ray spectrometric data, grid and profile data (ASCII and Geosoft® formats) and vector data, Mahon Lake and Flatrock Lake areas; Ontario Geological Survey, Geophysical Data Set 1077.

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