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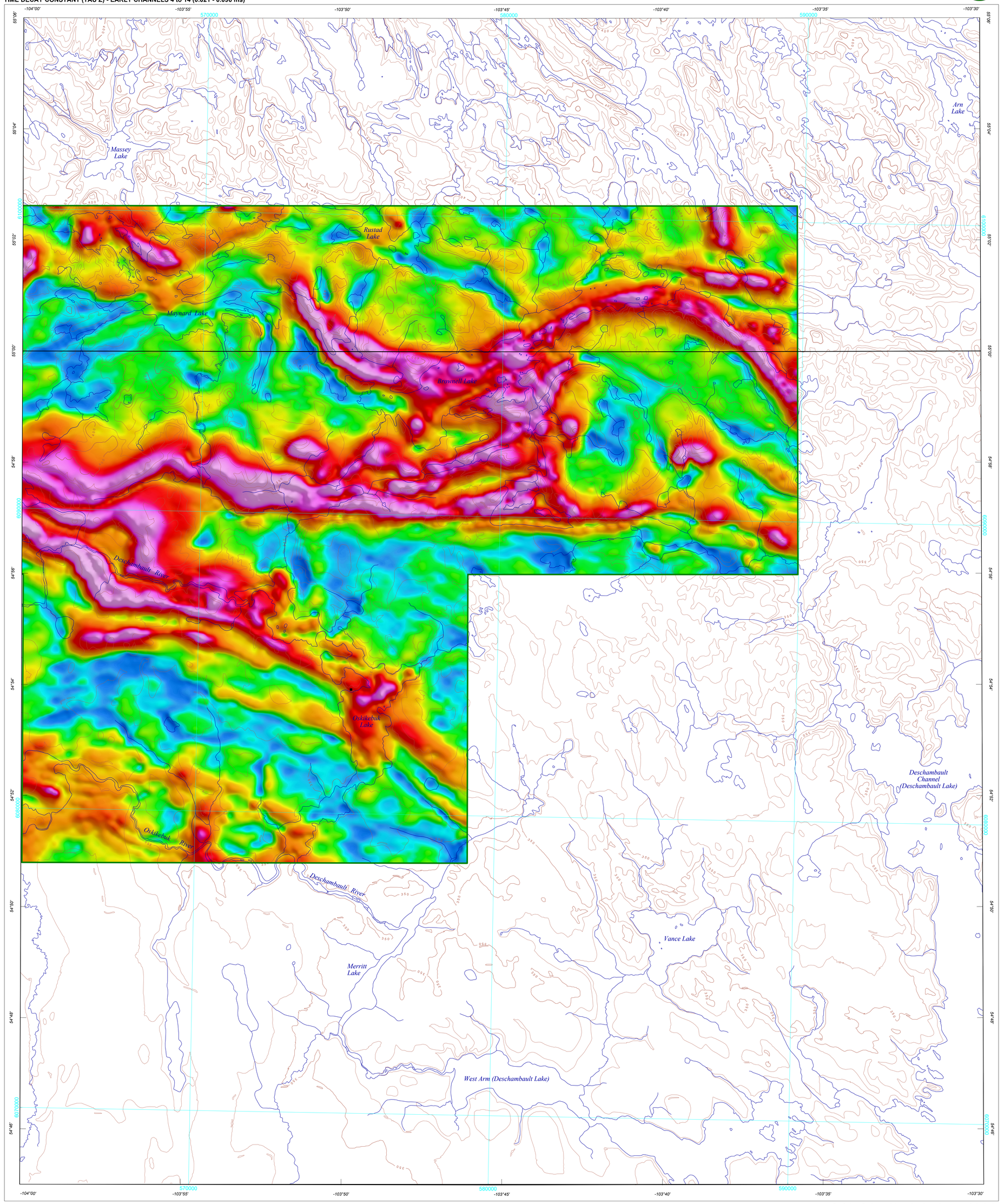
TIME DECAY CONSTANT (TAU Z) - EARLY CHANNELS 4 to 14 (0.021 - 0.096 ms)



Technical Information

This map was compiled from data acquired during an airborne electromagnetic/magnetic survey carried out by Geotech Canada Inc. utilizing Geotech's VTEM Max Time-Domain Electromagnetic (TDEM) system. The systems were mounted on two Eurocopter AS350 B3 helicopters (registration C-GTEQ and C-FBZN) and the survey was carried out between December 19, 2019 and March 10, 2020. The helicopter flight altitude was maintained at an average ground clearance of 98 m, with an average speed of 80 km/h. Aircraft navigation used a 14-channel NovaTel dual frequency GPS system. Post-flight differential corrections were applied to finalize the flight path position. A vertically mounted video camera was used to record images of the ground. The radar height was recorded ten times per second using a TRA3000 altimeter. The magnetic data were recorded 10 times per second using a Geometrics G-822A cesium magnetometer installed in a bird 10 m below the helicopter.

Survey Area Parameters:

Traverse line azimuth	N0°E
Traverse line spacing	200 m
Tie line azimuth	N90°E
Tie line spacing	1200 m
Aircraft average clearance	98 m
EM transmitter nominal clearance	50 m
Magnetic sensor nominal clearance	88 m
EM receiver nominal clearance	50 m

Electromagnetic System Specifications:

Base frequency	30 Hz
Waveform	Polygonal
Transmitter pulse width	7 ms
Transmitter area	840 m²
Transmitter off-time	8.7 ms
Transmitter loop diameter	34.6 m
Transmitter peak current	192 A
Dipole moment (peak)	721 920 Am² (4 turns)
Windowed data sampling rate	10 Hz
Receiver	3-component induction coil: (Z, X, Y)
Measured response	Voltage (dB/dt)
Digital recording	Z: 4-46 channels X,Y: 20-46 channels
1st off-time Z channel	Channel 4 at ~0.021 ms after pulse turn off
Tx-Rx configuration	In-loop concentric

Electromagnetics

The TDEM system operated at a base frequency of 30 Hz transmits a 7.0 ms half square signal from a four-turn, 840 m² horizontal loop mounted approximately 48 m below and 8 m behind the helicopter. This configuration generates a peak dipole moment of 721 920 Am². The response of conductors in the subsurface was recorded at 192 kHz over the entire waveform using a three axis (X, Y and Z) electromagnetic receiver coincident with the transmitter loop (In-Loop Transmitter-Receiver). The EM system recorded data in a continuous stream for each of the three components. The EM receiver directly measures the change in the magnetic field with respect to time (dB/dt) from which the secondary magnetic field (B) is numerically integrated. High-altitude background sections flown at the start and end of each flight allowed a first-order removal of system drift.

Apparent Conductivity

The apparent conductivity values (mS/m) were derived from the electromagnetic decays using selected early channels 4 to 14 (0.021 - 0.096 ms), middle channels 15 to 30 (0.110 - 0.880 ms) and late channels 31 to 46 (1.010 - 8.083 ms) of the off-time signal to a single exponential. In semi-log space, the slope of this function will reflect the exponential decay rate of the transient field and, therefore, the strength of the conductivity. A slow rate of decay, reflecting a high conductivity, will be represented by a high decay constant value.

Electromagnetic Decay Constant

Decay constant (Tau) values were obtained by fitting the data from selected early Z channels 4 to 14 (0.021 - 0.096 ms), middle channels 15 to 30 (0.110 - 0.880 ms) and late channels 31 to 46 (1.010 - 8.083 ms) of the off-time signal to a single exponential. In semi-log space, the slope of this function will reflect the exponential decay rate of the transient field and, therefore, the strength of the conductivity. A slow rate of decay, reflecting a high conductivity, will be represented by a high decay constant value.

Magnetics

The magnetic field was sampled 10 times per second using a cesium vapour magnetometer (sensitivity = 0.001 nT) mounted on the EM transmitter loop. Differences in magnetic values at the intersections of control and traverse lines were analysed to obtain a mutually levelled set of flight-line magnetic data. The levelled values were then interpolated to a 50 m grid. The International Geomagnetic Reference Field (IGRF) defined at a mean GPS altitude (472 m) for a constant mid-survey date (January 15, 2020) was then removed. Removal of the IGRF, representing the magnetic field of Earth's core, produces a residual component related essentially to magnetizations within Earth's crust.

The first vertical derivative of the magnetic field is the rate of change of the magnetic field in the vertical direction. Computation of the first vertical derivative removes long-wavelength features of the magnetic field and significantly improves the resolution of closely spaced and superposed anomalies. A property of first vertical derivative maps is the coincidence of the zero-value contour with vertical geologic contacts at high magnetic latitudes (Hood, 1965). The first vertical derivative of the magnetic field was calculated using the fast Fourier transform on the gridded total magnetic field with a grid cell size of 50 m.

Availability

This map is available for free download through GEOSCAN (http://geoscan.nrcan.gc.ca/). Corresponding digital profile and gridded data as well as similar data for adjacent airborne geophysical surveys can be downloaded, at no charge, from Natural Resources Canada's Geoscience Data Repository for Geophysical Data at http://gdr.agg.nrcan.gc.ca/index_e.html. The same products are also available, for a fee, from the Geophysical Data Centre, Geological Survey of Canada, 601 Booth Street, Ottawa, Ontario K1A 0E8. Telephone: 613-995-5326, email: infogdc@nrcan.gc.ca.

Acknowledgments

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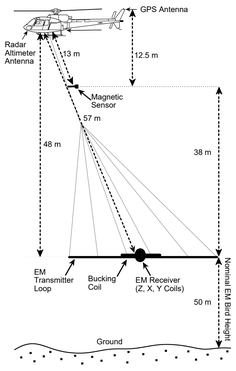
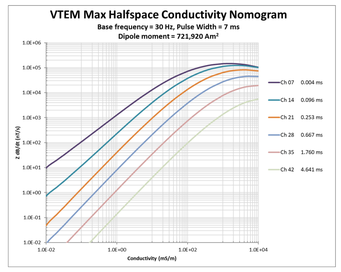
Reference

Hood, P.J., 1965. Gradient measurements in aeromagnetic surveying; Geophysics, v. 30, p. 891-902.





PLANIMETRIC SYMBOLS

Project Limit .....
Drainage .....
Topographic Contour ....
Building .....
Road .....

MAP SHEET SUMMARY
Sheet 1: Time Decay Constant (Tau-Z) - Early Channels 4 to 14 (0.021 - 0.096 ms)
Sheet 2: Time Decay Constant (Tau-Z) - Mid Channels 15 to 30 (0.110 - 0.880 ms)
Sheet 3: Time Decay Constant (Tau-Z) - Late Channels 31 to 46 (1.010 - 8.083 ms)
Sheet 4: Apparent Conductivity - Early Channels 4 to 14 (0.021 - 0.096 ms)
Sheet 5: Apparent Conductivity - Mid Channels 15 to 30 (0.110 - 0.880 ms)
Sheet 6: Apparent Conductivity - Late Channels 31 to 46 (1.010 - 8.083 ms)
Sheet 7: Residual Total Magnetic Field
Sheet 8: First Vertical Derivative of the Magnetic Field
Sheet 9: Interpretation

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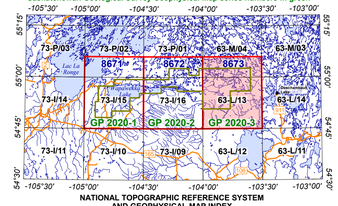

GEOLOGICAL SURVEY OF CANADA OPEN FILE 8673
SASKATCHEWAN GEOLOGICAL SURVEY GEOPHYSICAL MAP GP 2020-3

ELECTROMAGNETIC SURVEY OF THE SOUTHERN GLENNIE AREA

SASKATCHEWAN
Parts of NTS 63-L/13 and NTS 63-M/04

TIME DECAY CONSTANT (TAU Z) - EARLY CHANNELS 4 to 14 (0.021 - 0.096 ms)

Scale 1:50 000

1 0 1 2 3
(kilometres)
WGS 84 / UTM zone 13N

Universal Transverse Mercator Projection
World Geodetic System 1984

Base map at the scale of 1:50 000 from Natural Resources Canada, with modifications
Elevations in metres above sea level

OPEN FILE / DOSSIER PUBLIC
8673
GEOLOGICAL SURVEY OF CANADA
COMMISSION GEOLOGIQUE DU CANADA
2020
Sheet 1 of 9 / Feuillet 1 de 9

Publications in this series have not been edited; they are released as submitted by the author.

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GEOPHYSICAL MAP
CARTE GÉOPHYSIQUE
GP 2020-3
SASKATCHEWAN GEOLOGICAL SURVEY
COMMISSION GEOLOGIQUE DE LA SASKATCHEWAN
2020
Sheet 1 of 9 / Feuillet 1 de 9

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The Southern Glennie area electromagnetic and magnetic survey was funded by the Saskatchewan Ministry of Energy and Resources in support of the province's Mineral Development Strategy. It also complements a National Geological Surveys Committee (NGSC) pilot project in the Southern Glennie area that demonstrates how public geoscience supports Canada's junior mining sector. Natural Resources Canada provided survey oversight and data processing and produced the maps as part of the Targeted Geoscience Initiative (TGI) program of the Lands and Minerals Sector, Natural Resources Canada.

Canada Saskatchewan