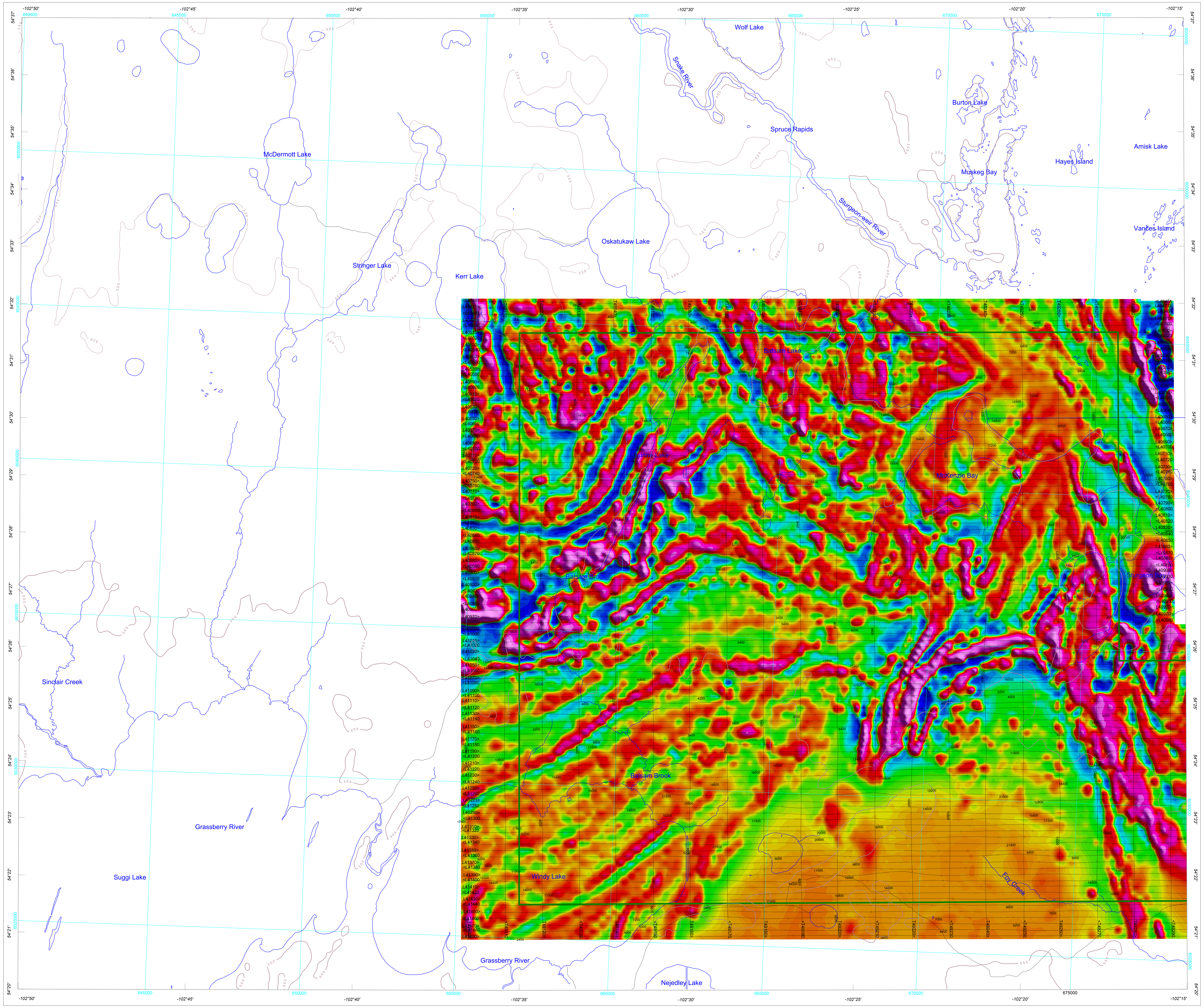
Natural Resources Canada / Ressources naturelles Canada

FIRST VERTICAL DERIVATIVE OF THE MAGNETIC FIELD



Technical Information

These data were acquired during a fixed-wing gravity gradiometer and magnetic survey carried out by CGG Canada Ltd. between April 27 and May 13, 2018. The survey was flown using a Cessna 208B aircraft (C-GGRD) equipped with a FALCON® AGG airborne gravity gradiometer, a Scintrex magnetic sensor, and a Riegl laser scanner. The nominal traverse line spacing was 200 m, with control line spacing of 1200 m. The nominal aircraft altitude was 95 m above ground. The traverse lines were oriented at N88°E and control lines were flown perpendicular to the traverse lines. The flight path was recovered with post-flight differential GPS. The survey was carried out according to a predetermined drape surface in order to minimize the differences in altitude at the intersections of the traverse and control lines.

Gravity

Two horizontal differential curvatures (G_{NE} and G_{UV}) of the gravity potential, expressed in a local north-east-and-down (NED) reference frame, were digitally recorded by the FALCON® AGG airborne system. The gravimetric data were corrected for the time-varying response from residual aircraft motion due to moving masses. The terrain effect was removed using a density of 2.67 g/cm^3 applied from a 50 m grid of the digital elevation model. The two terrain-corrected horizontal curvature components of the gravity gradient tensor were then levelled and transformed in the Fourier domain into the full gravity gradient tensor and the vertical gravity component. After all these corrections, results presented are the Fourier-derived vertical gravity gradient (g_{DD}) and the Fourier-derived vertical component of gravity (g_D), assuming a crustal density of 2.67 g/cm^3. The regional long-wavelength component was derived from a subset of the Canadian Gravity Anomaly Data Base to make the derived gravity conform to the regional gravity.

Magnetics

The magnetic field was sampled 10 times per second using a cesium vapour magnetometer (sensitivity = 0.001 nT) mounted on a stinger. 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 (403 m) for a constant mid-survey date (May 4, 2018) was then removed. Removal of the IGRF, representing the magnetic field of Earth's core, produces a residual component related essentially to magnetizations within the 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 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.

Digital versions of this map are 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.

Reference

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

Acknowledgments:

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Survey Area Parameters

Traverse line azimuth	N88°E
Traverse line spacing	200 m
Tie-line azimuth	N358°E
Tie-line spacing	1200 m
Aircraft altitude	95 m
Magnetic sensor nominal clearance	95 m
AGG system nominal clearance	95 m

Gravity Gradiometer Specifications

Gravity gradiometer	FALCON® AGG
Components measured	Curvature Components (G_{NE} & G_{UV})
Sample rate	8 Hz
Sensitivity	0.1E = 10^{-4} mGal/m

Sheet 1: Vertical Component of Gravity
Sheet 2: Vertical Gravity Gradient
Sheet 3: Residual Total Magnetic Field
Sheet 4: First Vertical Derivative of The Magnetic Field

ISOMAGNETIC LINES

2.5 nT
0.5 nT
0.1 nT
0.05 nT
Magnetic Depression

PLANIMETRIC SYMBOLS

Drainage
Topographic Contours (Contour Interval = 20 m)
Building
Trail
Flight Path
Project Limit

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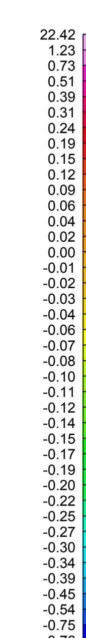
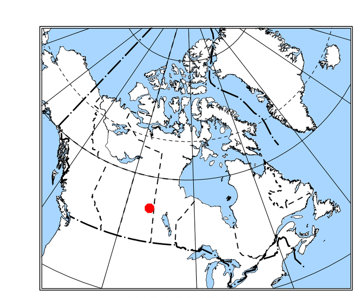
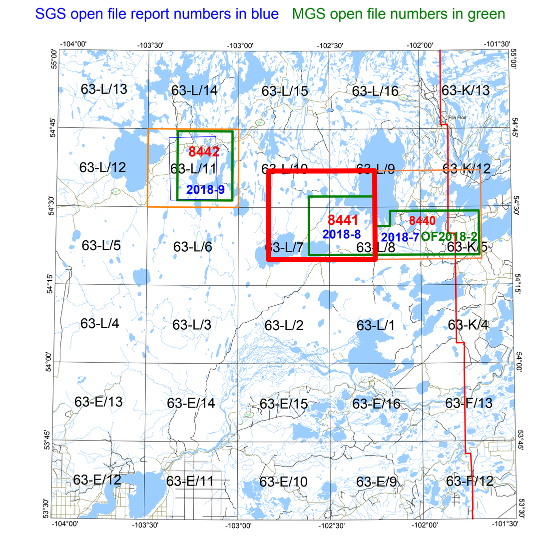




MAP LOCATION

NTS map sheet numbers in black
GSC open file numbers in red
SGS open file report numbers in blue
MGS open file numbers in green



NATIONAL TOPOGRAPHIC REFERENCE SYSTEM AND GEOPHYSICAL MAP INDEX

GEOLOGICAL SURVEY OF CANADA OPEN FILE 8441
SASKATCHEWAN GEOLOGICAL SURVEY OPEN FILE REPORT 2018-8

GRAVITY GRADIOMETER SURVEY OF THE CREIGHTON AREA

SASKATCHEWAN
Parts of NTS 63-L/7, 8, 9 and 10

FIRST VERTICAL DERIVATIVE OF THE MAGNETIC FIELD

Scale 1:50 000

1000 0 1000 2000 3000
(metres)
WGS 84 / UTM zone 13N

Map projection Universal Transverse Mercator, zone 13N. World Geodetic System 1984

Topographic data from Natural Resources Canada
Contour interval 20 metres

OPEN FILE / DOSSIER PUBLIC
8441
GEOLOGICAL SURVEY OF CANADA
COMMISSION GÉOLOGIQUE DU CANADA
2018
Sheet 4 of 4 / Feuillet 4 de 4

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OPEN FILE REPORT
RAPPORT DE DOSSIER PUBLIC
2018-8
SASKATCHEWAN GEOLOGICAL SURVEY
COMMISSION GÉOLOGIQUE DE LA SASKATCHEWAN
2018
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Recommended citation

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Scale 1:50 000. https://doi.org/10.4095/308422

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