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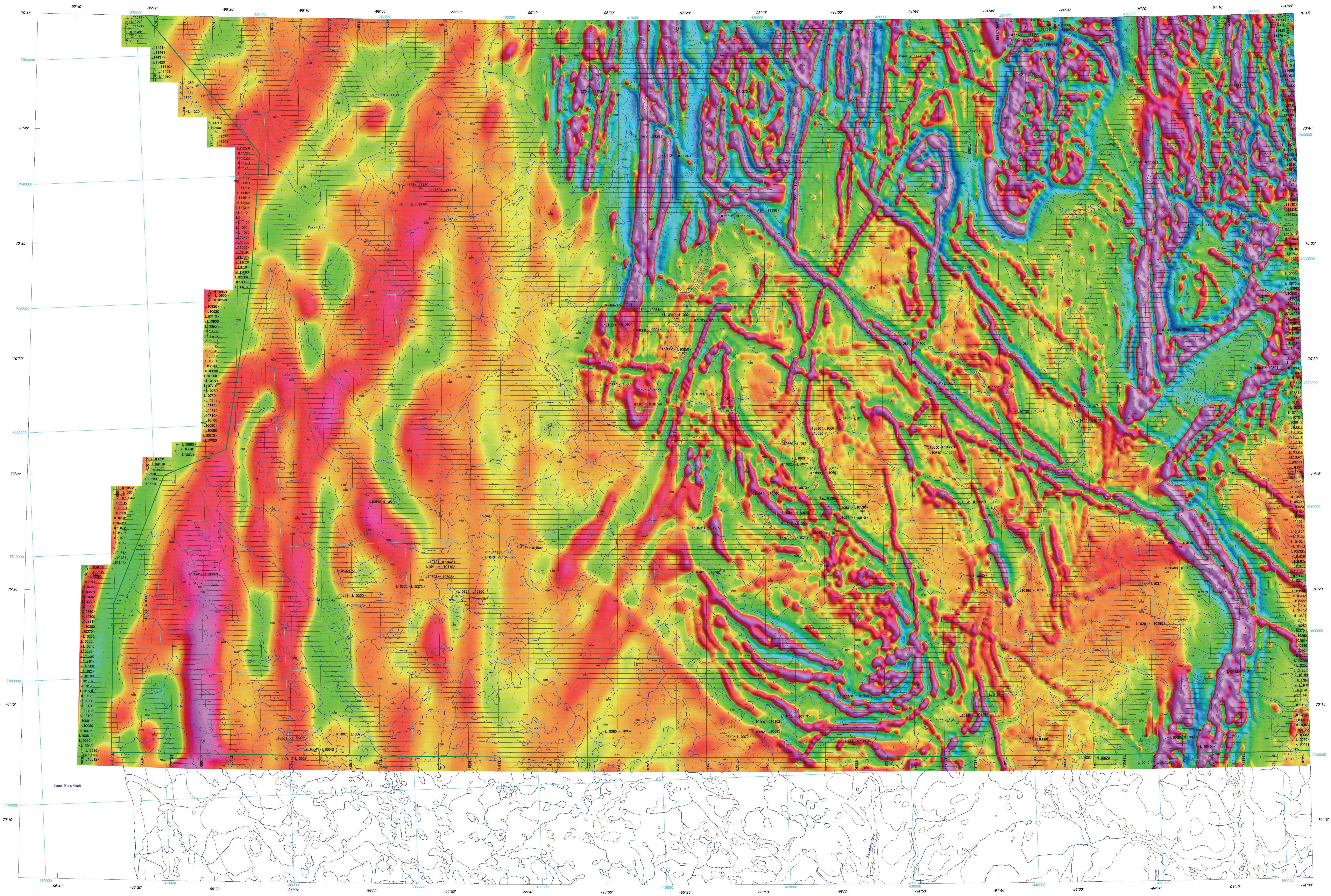
FIRST VERTICAL DERIVATIVE OF THE MAGNETIC FIELD



First Vertical Derivative of the Magnetic Field

This map of the first vertical derivative of the magnetic field was derived from data acquired during an aeromagnetic survey carried out by Sander Geophysics Limited from March 15, 2016 to July 3, 2016. The data were recorded using split-beam cesium vapour magnetometers (sensitivity = 0.005 nT) mounted in each of the tail booms of two Cessna 208B Grand Caravan aircraft (C-GSGL and G-GSGV). The nominal traverse and control line spacings were, respectively, 400 m and 2400 m, and the aircraft flew at a nominal terrain clearance of 150 m. Traverse lines were oriented N90°E with orthogonal control lines. The flight path was recovered following post-flight differential corrections to the raw Global Positioning System (GPS) data and inspection of ground images recorded by a vertically-mounted video camera. The survey was flown on a pre-determined flight surface to minimize differences in magnetic values at the intersections of control and traverse lines. These differences were computer-analysed to obtain a mutually levelled set of flight-line magnetic data. The levelled values were then interpolated to a 100 m grid. The International Geomagnetic Reference Field (IGRF) defined at the average GPS altitude of 385 m for the year 2016.38 was then removed. Removal of the IGRF, representing the magnetic field of the Earth's core, produces a residual component related almost entirely 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).

Keating Correlation Coefficients

Possible kimberlite targets have been identified from the first vertical derivative of the magnetic field 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 0.80 were retained.

The results are depicted as circular symbols to reflect the correlation value. The most favorable targets are those that exhibit a cluster of highly correlative solutions. Correlation coefficients with a negative value correspond to reversely magnetized sources. It is important to be aware that other magnetic sources may correlate with the vertical cylinder models, whereas some kimberlite pipes of irregular geometry or insufficient diameter may not.

Cylinder radius	100 m
Cylinder length	infinite
Depth of cylinder	(below tail sensor) 180 m
Magnetic inclination	86°N
Magnetic declination	14°W
Window cell size	9 x 9 (900 m x 900 m)

This publication 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 are available from Natural Resources Canada's Geoscience Data Repository for Aeromagnetic 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@agg.nrcan.gc.ca.

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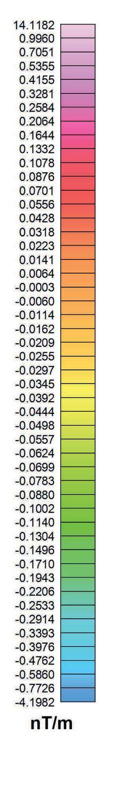
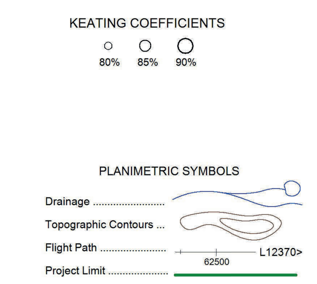
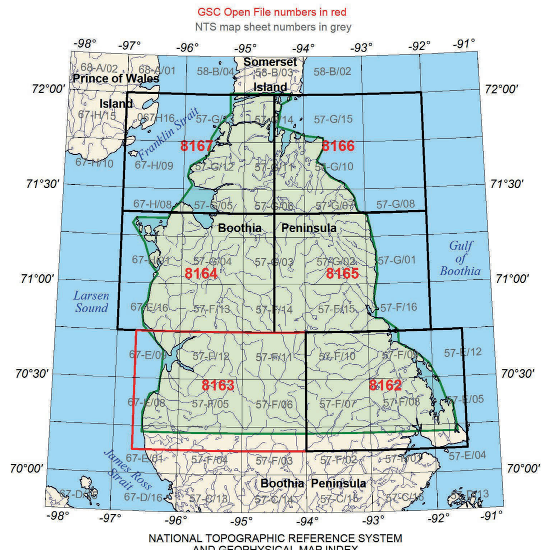
References

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

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







AEROMAGNETIC SURVEY OF THE NORTHERN BOOTHIA PENINSULA II

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GEOLOGICAL SURVEY OF CANADA OPEN FILE 8163

FIRST VERTICAL DERIVATIVE OF THE MAGNETIC FIELD

AEROMAGNETIC SURVEY OF THE NORTHERN BOOTHIA PENINSULA II

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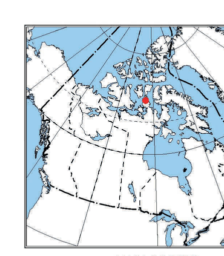
NTS 57-F/5, 6, 11, 12 and parts of 57-F/3, 4, 67-E/1, 8, 9
Scale 1:100 000

(kilometres)
UTM zone 15N

Universal Transverse Mercator Projection
North American Datum,1983

Topographic Data from Natural Resources Canada
Contour Interval 100 metres


MAP LOCATION

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