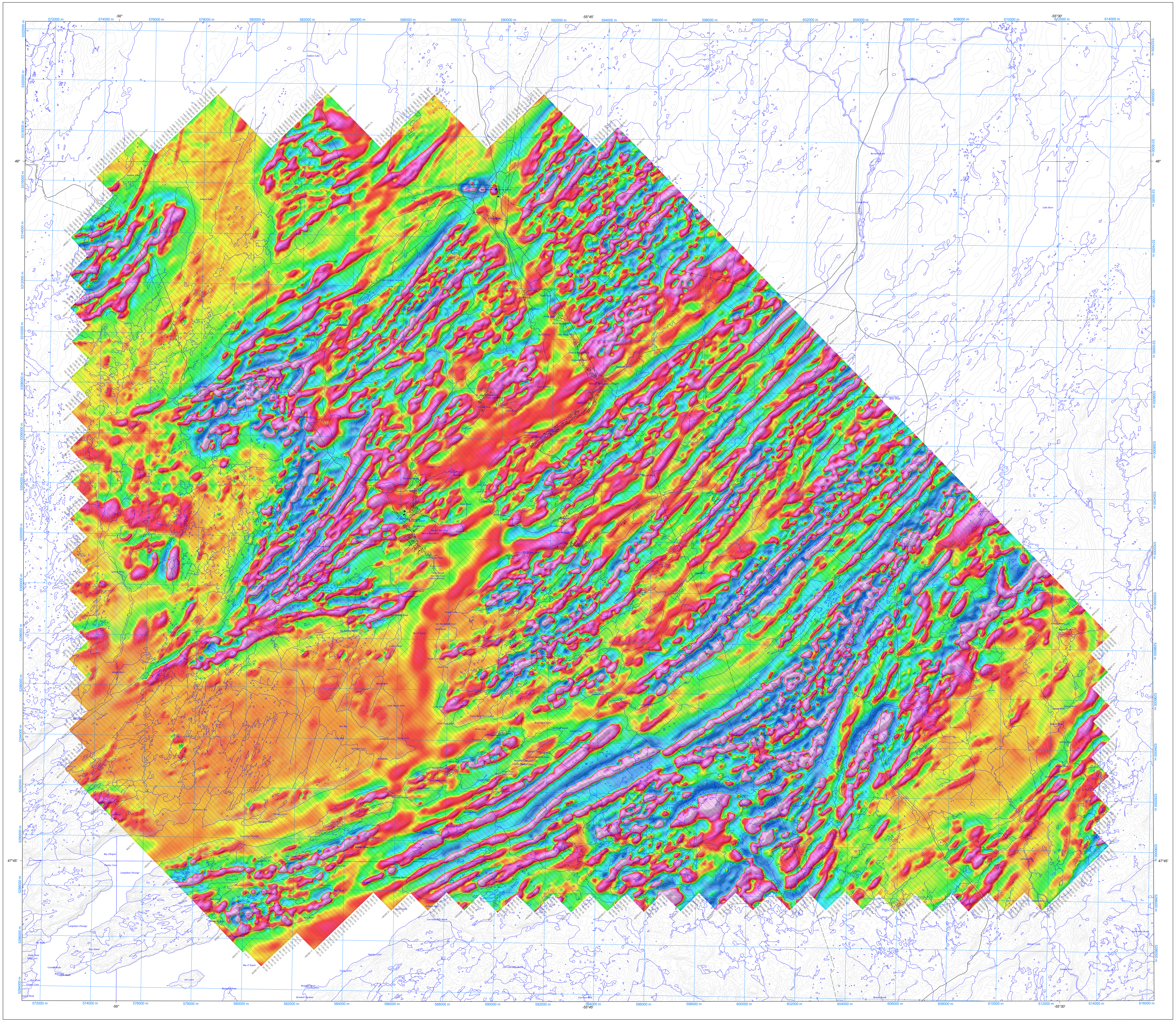

Topographic contour interval: 30 metres

Digital topographic data provided by Geomatics Canada, Natural Resources Canada

MAP 2016-05
ST. ALBAN'S
NTS MAP AREA 1M/13 AND PARTS OF 1M/12, 1M/14, 11P/16, AND 2D/04

Scale 1: 50 000

1 0 1 2 3 4 kilometres

NAD 83 / UTM zone 21N

Newfoundland Labrador
NATURAL RESOURCES

AIRBORNE GEOPHYSICAL SURVEY OF THE ST. ALBAN'S REGION, NEWFOUNDLAND

NTS MAP AREA 1M/13 AND PARTS OF 1M/12, 1M/14, 11P/16, AND 2D/04

FIRST VERTICAL DERIVATIVE OF THE MAGNETIC FIELD

MAP 2016-05
OPEN FILE NFLD/3272
Map 2 of 10

G.J. Kilfoil

ABOUT THE SURVEY

Introduction

This quantitative gamma-ray spectrometric and aeromagnetic airborne geophysical survey of St. Alban's region, Newfoundland, was completed by Goldak Airborne Surveys. The survey was flown from October 16th to November 26th, 2015 using a single Cessna 208 Caravan (C-GLDX). The nominal traverse and control line spacings were, respectively, 150 m and 1000 m, and the aircraft flew at a nominal terrain clearance of 125 m at airspeed between 200 and 270 km/h. Traverse lines were oriented 135° with orthogonal control lines. The flight path was recovered following post-flight differential corrections to raw data recorded by a Global Positioning System.

Gamma-ray Spectrometric Data

The airborne gamma-ray measurements were made with a Radiation Solutions RS-500 gamma-ray spectrometers using fifteen 102x102x406 mm NaI (Tl) crystals. The main detector array consisted of twelve crystals (total volume 50.4 litres). Three crystals (total volume 12.6 litres), shielded by the main array, were used to detect variations in background radiation caused by atmospheric radon. The system constantly monitored the natural thorium peak for each crystal, and using a Gaussian least squares algorithm, adjusted the gain for each crystal.

Potassium is measured directly from the 1460 keV gamma-ray photons emitted by K^{40}, whereas uranium and thorium are measured indirectly from gamma-ray photons emitted by daughter products (Bi^{214} for uranium and Tl^{208} for thorium). Although these daughters are far down their respective decay chains, they are assumed to be in equilibrium with their parents; thus gamma-ray spectrometric measurements of uranium and thorium are referred to as equivalent uranium and equivalent thorium, i.e. eU and eTh. The energy windows used to measure potassium, uranium and thorium are, respectively; 1370-1570 keV, 1660-1860 keV, and 2410-2810 keV.

Gamma-ray spectra were recorded at one-second intervals. Data processing followed standard procedures as described in IAEA, 1991 and IAEA, 2003. During processing, the spectra were energy calibrated, and counts were accumulated into the windows described above. Counts from the radon detectors were recorded in a 1660 - 1860 keV window and radiation at energies greater than 3000 keV was recorded in the cosmic window. The window counts were corrected for dead time, background activity from cosmic radiation, radioactivity of the aircraft and atmospheric radon decay products. The window data were then corrected for spectral scattering in the ground, air and detectors. Corrections for deviations from the planned terrain clearance and for variation of temperature and pressure were made prior to conversion to ground concentrations of potassium, uranium and thorium, using factors determined from flights over the Danielson, Saskatchewan calibration range.

Corrected data were interpolated to a 37 m grid interval. The results of an airborne gamma-ray spectrometer survey represent the average surface concentrations that are influenced by varying amounts of outcrop, overburden, vegetation cover, soil moisture and surface water. As a result the measured concentrations are usually lower than the actual bedrock concentrations. The total air absorbed dose rate in nanograys per hour was produced from measured counts between 400 and 2810 keV.

Magnetic Data

The magnetic field was sampled 10 times per second using three split-beam cesium vapour magnetometers (sensitivity = 0.005 nT) mounted inside the tail boom and two wingtip pods of the aircraft. This array of sensors form a horizontal gradiometer with a lateral dimension of 18.25 m and a longitudinal dimension of 11.23 m. Differences in magnetic values at the intersections of control and traverse lines were computer-analysed to obtain a mutually levelled set of flight-line magnetic data. The International Geomagnetic Reference Field (IGRF) defined at the average GPS altitude of 300 m for the date 2015-11-05 was then removed. Removal of the IGRF, representing the magnetic field of the Earth's core, produces a residual component related essentially to magnetizations within the Earth's crust. The levelled values were then interpolated to a 37 m grid using local horizontal gradients to guide between-line splines.

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 of magnetic units at high magnetic latitudes (Hood, 1965).

Additional Information

Data compilation and map production were performed by Goldak Airborne Surveys, Saskatoon, Saskatchewan. Contract and project management was provided by the Newfoundland and Labrador Department of Natural Resources.

Copies of this map may be obtained from the Geoscience Publications and Information Section, Geological Survey, Department of Natural Resources, Government of Newfoundland and Labrador, PO Box 8700, St. John's, NL, Canada, A1B 4J6.

This map is subject to revision and modification. Comments to the author concerning errors or omissions are invited.

Department Website: http://www.nr.gov.nl.ca/nr
Geological Survey Website: http://www.nr.gov.nl.ca/nr/mines/Geoscience/
E-mail: pub@gov.nl.ca

References

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

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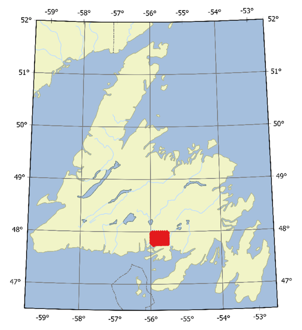
nT/m

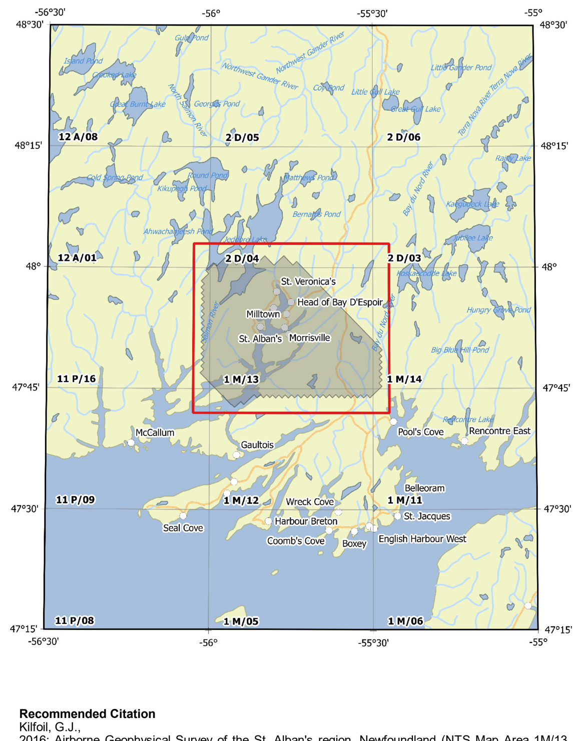
PLANIMETRIC SYMBOLS

Topographic contour
Drainage
Road
Flight line (1155 > 12345)
Building
Transmission line

LOCATION MAP



NATIONAL TOPOGRAPHIC SYSTEM REFERENCE AND GEOPHYSICAL MAP INDEX



Recommended Citation

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Note

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