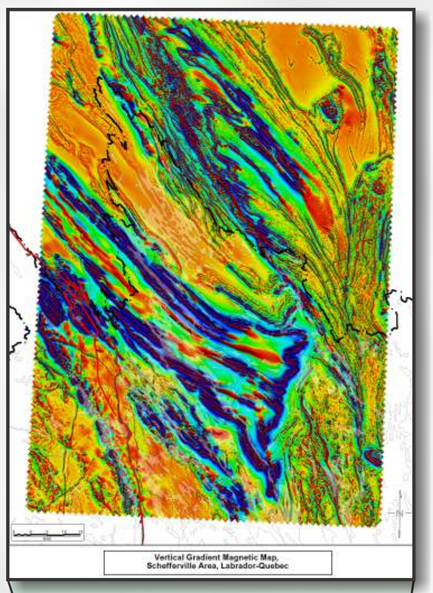
GEOPHYSICAL RESOURCES

GEOLOGICAL SURVEY
NEWFOUNDLAND AND LABRADOR
Celebrating 150 years

Newfoundland Labrador
Natural Resources

Composite magnetic map for NTS 14E/SE, northern Labrador, shaded from the north. These composite maps are constructed by first piecing together the magnetic results from detailed airborne surveys to form a patchwork assembly. The results are then merged into, and referenced to the lower resolution, regional magnetic data available for the area. The result portrays the best available magnetic data for all parts of the map. Note that subtle offsets are visible, as a result of small post-leveling discrepancies remaining along the data boundaries between adjacent airborne survey blocks.

First vertical derivative of magnetic field results from an airborne magnetic and radiometric survey flown during the summer of 2009 in the Schefferville area, Labrador-Québec. Survey was by fixed-wing aircraft, and was flown at 80 m nominal terrain clearance along NE-SW oriented flight traverses spaced at 200 m and perpendicular control lines at 1200 m intervals. The results from this second phase of airborne survey, flown as part of an ongoing 5-year GEM cooperative agreement (GSC/GSNL/MRNFQ), have been released as series of PDF maps during the last few months.



Strange Lake

Introduction

Geophysical data are now routinely collected as part of most mineral exploration programs, varying in scope from property-wide reconnaissance airborne surveys to very detailed surface or 3-D borehole surveys focused on specific mineral deposits. Since 1995, the results of these surveys have been submitted in digital as required by assessment reporting. These digital geophysical results are being archived to form an ever-expanding and valuable resource for future exploration phases and for geoscience studies in general.

Airborne Surveys

By far, the largest proportion of digital geophysical data held by the Geological Survey originates from airborne surveys. Various types of airborne survey are flown to target specific mineral commodities: time-domain or frequency-domain electromagnetic (EM), radiometric, high-resolution magnetic gradient, or gravimetric surveys (or combinations of these). Magnetic data are recorded during most airborne surveys, as the magnetic instrumentation is compact and lightweight, and the magnetic results can provide valuable bedrock geological information to assist the interpretation of the targeting geophysical method.

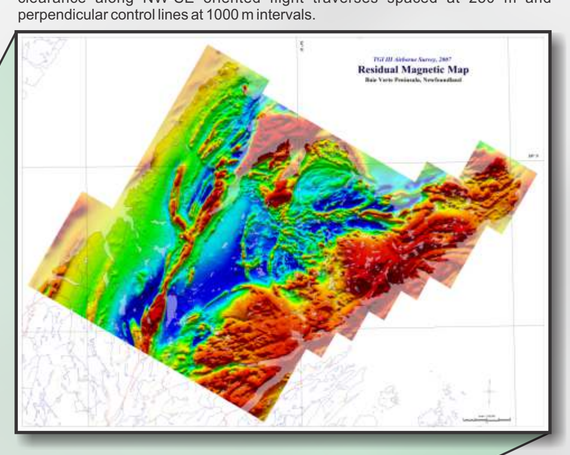
Digital Data Access

The base map shown here consists of the regional magnetic field for the Province as a shaded relief image, overlain with the outlines (in red) of airborne surveys for which digital data are currently available. The recorded data and various products from these surveys can be accessed online through the Geoscience Resource Atlas: **http://gis.geosurv.gov.nl.ca** When the new version of the Atlas was released earlier this year, results were included from several of the larger airborne surveys flown in the province in recent years. These results will provide a much more detailed representation of the local magnetic field (as well as EM results) for many parts of the Province than can be presented here.

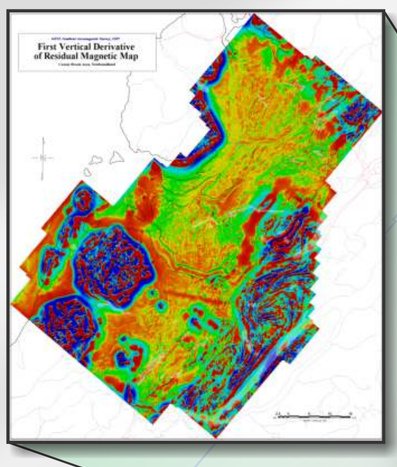
Examples

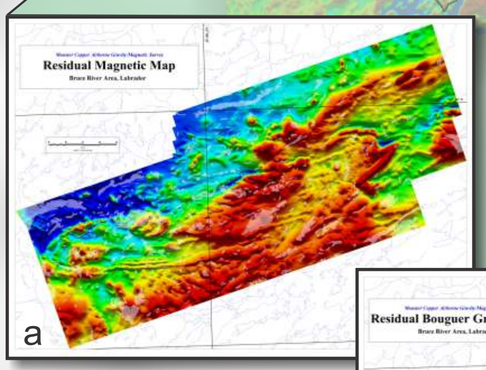
The figures, detailing individual survey results, have been selected to show a few examples of the types of geophysical data that are currently available, and to illustrate that compilation of the results from different surveys can add a significant “value-added” aspect to the geophysical products. Refer to the figure captions for explanations of their contents.

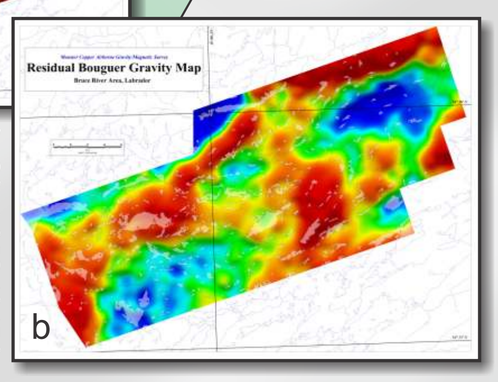
Residual magnetic field results for the Targeted Geoscience Initiative (2007 – GSC/GSNL) survey of the Baie Verte Peninsula, Newfoundland. Survey was by fixed-wing aircraft equipped with wingtip magnetometers, flown at 100 m terrain clearance along NW-SE oriented flight traverses spaced at 250 m and perpendicular control lines at 1000 m intervals.



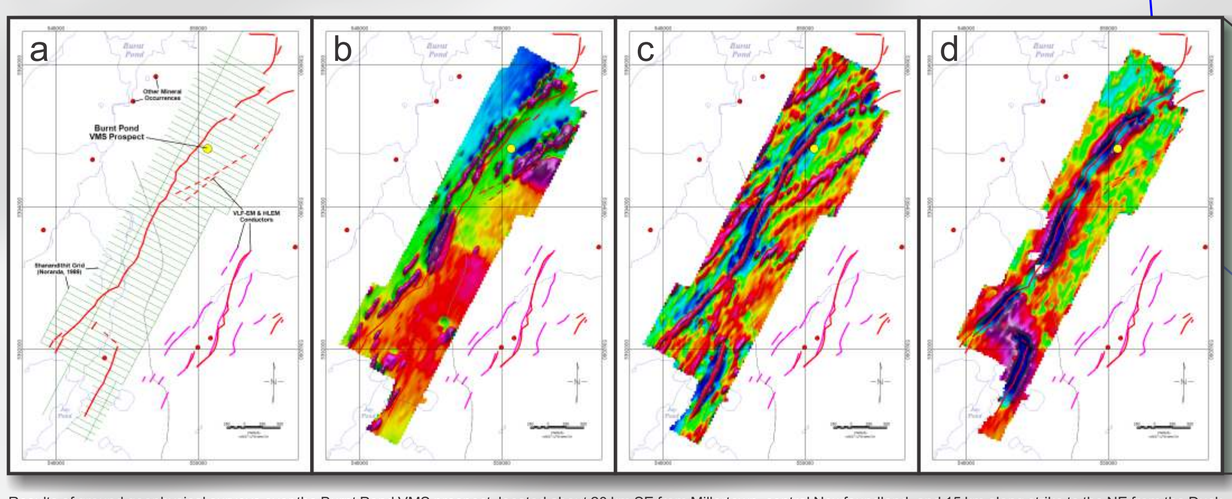
First vertical derivative of the magnetic field results from a gradient aeromagnetic survey of the Corner Brook area, Newfoundland, flown in 2008/2009. The fixed-wing survey aircraft was equipped with two wing-tip magnetometers and a third magnetometer mounted in a tail boom. The survey was flown on a pre-determined drape surface (90 m nominal terrain clearance) along NW-SE oriented flight traverses spaced at 200 m and perpendicular control lines at 2000 m intervals. Note how this gradient image enhances subtle magnetic differences, yielding patterns and features which can be related to the underlying bedrock geology.



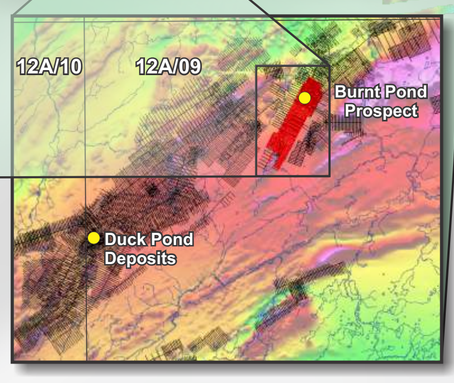




Results of an airborne gravity and magnetic survey flown in 2003 within the Bruce River area of central Labrador by Monster Copper Resources Inc.: a) residual magnetic field after removal of the Geomagnetic Reference Field, and b) residual Bouguer gravity field after removal of a 2nd order regional trend from the data. A drape surface having minimum 150 m terrain clearance was flown during the survey, with traverse lines spaced at 100 m and oriented ENE-WSW (along the long dimension of the survey block), while perpendicular control lines were spaced at 500 m. Airborne gravity requires a relatively large and dense network of flights in order to yield effective results.



Results of ground geophysical surveys over the Burnt Pond VMS prospect, located about 20 km SE from Millertown, central Newfoundland, and 15 km along strike to the NE from the Duck Pond deposits and mine. The Burnt Pond prospect has been identified by historical drilling to have a lenticular form extending for about 400 m in the NNE-SSW direction, centered on the location indicated here. a) In 1989, the Shandandithit grid (100 m line spacing) was established over the prospect by Noranda Exploration Co. Ltd. The alteration and mineralization occur in close association with graphitic sedimentary horizons, readily identified by strong VLF-EM and Max-Min (HLEM) conductive trends, and shown here in red colours. Note the main NNE-oriented conductive trend, coincident with the main geologic strike, which extends for greater than 4 km along the west side of the grid, as well as the shorter but similar conductive trend, displaced to the SE, in the southern part of the grid. b) Total field magnetic data. Note that the main magnetic anomalies lie to the west of the conductive trends - these have been interpreted to be due to mafic sills and dykes within the predominately sedimentary rocks mapped here. c) Fraser filtered VLF-EM in-phase results. This defines the main conductive trends, as well as weaker trends which splay off the main trend in a NE direction (dashed lines). d) Low frequency (444 Hz) quadrature from HLEM (Max-Min) survey - these results indicate that the main graphitic conductors extend at depth. Note the HLEM response changes along strike, probably due to thinning and varying depth of burial. Breaks and changes in character of these conductive trends may indicate minor fault displacements – these could have influenced VMS mineralization. The data presented on these maps were compiled from several historical mineral assessment reports.



The map to the left shows some of the extensive network of ground grids, which extends from the Duck Pond Pb-Zn-Cu deposits in the SW to the Burnt Pond VMS prospect in the NE (and beyond). The colour image in the background shows results from the most detailed airborne surveys flown over this area. Historical geophysical data collected over the Shanandithit grid, highlighted in red, are featured in this example, but similar geophysical survey results exist for many adjacent grids.