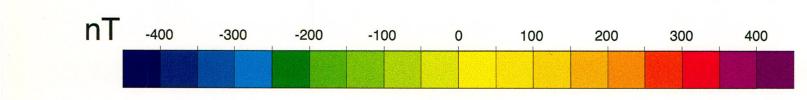


OPEN FILE 1815 MAGNETIC ANOMALY MAP

GULF OF ST. LAWRENCE AND SURROUNDS

Scale 1:1 500 000/Échelle 1/1 500 000 kilometres 50 0 Transverse Mercator Projection Projection de Mercator transverse Central Meridian 60° West Meridien central 60° O

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Atlantic Canada Magnetic Map Series

This series of shadow-enhanced magnetic anomaly maps of Atlantic Canada is based on a new 500 m grid assembled from marine track-data, modern digital airborne surveys, digitized profiles from contoured airborne surveys, and gridded data sets. New techniques for micro-levelling individual surveys were employed to image small-amplitude structures and provide offshore continuity of onshore geology. Regional levelling was achieved by adjusting the longer wavelength component (200 to 400 km) with high-elevation survey data. Wavelengths longer than 400 km are invariably due to sub-crustal sources and were removed from this data compilation.

The original data sources include coherent marine and aeromagnetic survey blocks and randomly-oriented marine tracklines. Individual survey blocks were micro-levelled using a Fourier-domain directional filter to remove cross-track Nyquist frequencies (Oakey et al., 1994). This technique involved gridding the raw data using a weighted minimum-curvature algorithm (Smith and Wessel, 1990) to a resolution finer than the track-spacing, applying the directional filter, and producing along-line corrections for the survey lines. For this application, high-amplitude anomalies (outside 2-sigma) were clipped to minimize contamination of correction values for adjacent areas.

In order to assemble the regional grid, the individual micro-levelled survey blocks were gridded at two resolutions (500m and 2km). The 500m grid blocks were high-pass filtered (2km) and a mosaic was assembled by smoothing the seams with a 2.5km weighted-mean filter. The 2km grid blocks were band-pass filtered (20 to 200 km) and a mosaic was assembled by smoothing the seams with a 10km weighted-mean filter. For most of the deep-water marine data, the tracklines of survey blocks were widely spaced (e.g. Scotian Slope) or data existed only as random tracks. In these areas, selected short sections of random lines were carefully merged with levelled survey blocks and merged with the band-passed 2km grid. Where data were very sparse (e.g. north-east of Sable Island) the tracklines are shown without interpolation. The high-elevation data (Haines and Hannaford, 1980) were gridded at a 20 km resolution, downward continued 4.2 km to correct anomaly amplitudes, and hand-Hannaford, 1980) were gridded at a 20 km resolution, downward continued 4.2 km to correct anomaly amplitudes, and bandpass filtered (200 to 400km). This regional component and the band-passed 2 km grid were re-sampled at 500m resolution and added to the high-pass 500m grid to produce the final composite grid.

References:

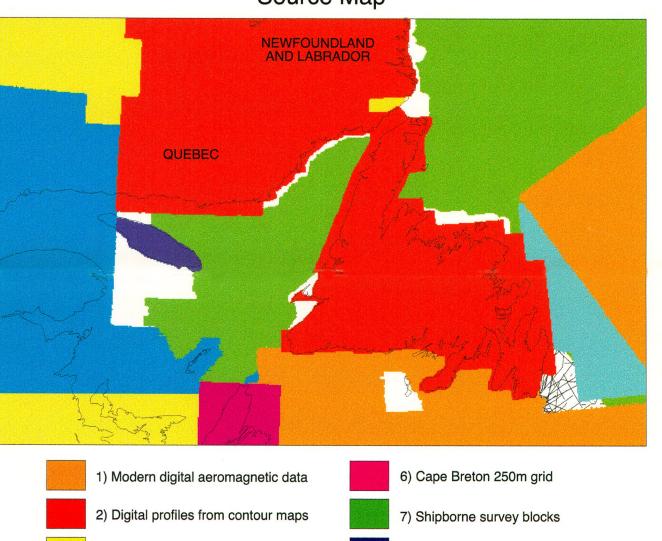
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Source Map



Data Sources:

1, 2, 4, 8: Geological Survey of Canada, Geophysical Data Centre, Ottawa, ON.

4) Canada 1km grid

5) Hibernia .02°x.02° grid

3: Unpublished data compilation by Paterson, Grant and Watson Limited, for B.D.L. Loncarevic, GSC, 1993.

5: Unpublished data compilation by K.G. Shih, GSC (Atlantic) (pers. comm. 1994).

6: Dehler, S.A., and J. Verhoef (comp.) Magnetic Anomaly Map, Cape Breton Island, Nova Scotia, with Geology Overlay. Scale 1:250 000. Geological Survey of Canada, Open File 3378, 1996. 7, 9: Geological Survey of Canada (Atlantic), Dartmouth, NS.

Magnetic Anomaly Map: Gulf of St. Lawrence and Surrounds

9) Regional shipborne tracklines

This map features the Gulf of St. Lawrence and surrounding landmasses of Atlantic Canada. The area includes the Proterozoic Grenville Orogen, the Paleozoic Appalachian Orogen and thick sequences of Paleozoic strata within the Maritimes Basin.

The Grenville Orogen, exposed in southern Quebec and Labrador, is characterised by a complex patchwork of high-amplitude, short-wavelength magnetic anomalies, reflecting both structural complexities and compositional variations. Prominent positive anomalies are related to large gabbroic complexes whereas negative anomalies generally correlate with anorthosite and related rocks. The Grenville Orogen extends seaward beneath the Gulf of St. Lawrence, and the frequency content of the magnetic anomalies gradually decreases due to an increase in source depth beneath successively thicker early Paleozoic sedimentary rocks. Between Newfoundland and Québec, the magnetic data reveal a complex fault-bounded basin geometry with a NE trending fabric interpreted as Taconian (Hayward et al., 2001). The tectonic boundary (Acadian Structural Front) separating rocks of the Grenville Orogen and the Appalachian Orogen is exposed along the west coast of Newfoundland and the north coast of the Gaspé Peninsula, and is inferred beneath the Gulf of St. Lawrence. The Grenville may extend southward for some distance beneath Appalachian rocks, but the magnetic signature of the Appalachians dominates south of the Acadian for some distance beneath Appalachian rocks, but the magnetic signature of the Appalachians dominates south of the Acadian

Magnetic anomalies of the Appalachian Orogen on the island of Newfoundland are generally discrete medium-amplitude features with a low-amplitude long-wavelength background. The boundaries between tectonic zones (Humber, Dunnage, Gander, Avado and generally identified by marked contrasts in magnetic signatures. Anomalies associated with the Humber, Dunnage, and Gander zones are generally related to ultramafic intrusions, while magnetic highs within the Avalon zone are commonly associated with volcanic extrusive rocks. On the west coast of Newfoundland, large amplitude anomalies are related to ultramafic allochthonous ophiolites. Offshore eastern Newfoundland, Appalachian terranes are buried by sedimentary rocks of Paleozoic to Cenozoic age, resulting in long-wavelength magnetic anomalies.

The Appalachian tectonic zones extend from Newfoundland across the Sydney Basin to Nova Scotia, where the frequency content of the magnetic anomalies is decreased due to burial beneath thick Late Paleozoic sedimentary rocks. Direct correlation of terranes across the Sydney Basin is still debated, but rocks associated with the Avalon and other terranes have been recognized on Cape Breton Island (eg. Williams et al., 1999, Barr and Raeside, 1989). Sedimentary rocks of the Maritimes Basin extend from the Gulf of St. Lawrence to cover much of eastern New Brunswick, subduing much of the signature from underlying Appalachian terranes and limiting the effectiveness of mapping basement structures. A few high-amplitude anomalies can be recognized that correlate with volcanic extrusives of the Avalon and Gander zones.

This magnetic compilation allows imaging of fine-scale magnetic features such as volcanic intrusions. North of Newfoundland, several linear N-NE trending anomalies are associated with dike intrusions that cut strata as young as Cretaceous-Tertiary (Haworth et al., 1976) and may be offshore extensions of lamprophyre dikes mapped onshore Newfoundland (Strong and Harris, 1974). The Avalon Dike, exposed on southeast Newfoundland (Hodych and Hayatsu, 1980), has a well-defined magnetic anomaly and can be mapped as a continuous feature for at least 300km. The NE trending Caraquet dyke (Burke et al., 1973) can be identified in eastern New Brunswick and traced for over 100km.

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