



Magnetic Anomaly of the Labrador Sea Region

Magnetic anomalies, the differences between measured values and a theoretical model of the Earth's magnetic field, are produced by lateral inhomogeneities of magnetic material in the crustal rocks. The model of the Earth's internal magnetic field (or core field) has been derived by analysing magnetic field components collected at many observatories around the world by the International Association of Geomagnetism and Aeronomy and is referred to as the International Geomagnetic Reference Field (IGRF) (IAGA, Division V, Working Group 8, 1991). Onshore, magnetic anomalies are generally higher amplitude and shorter wavelength than over the oceanic basins due to shallower depths of the source rocks and higher magnetization values. Rocks containing ferromagnetic minerals, particularly magnetite, are the predominant cause of these large amplitude anomalies with variations in metamorphic grade strongly influencing the distribution of these minerals. The generalized geological zonation (see map insert) are as outlined by Hoffman (1989). Over southern Labrador magnetic anomalies are aligned east-west corresponding with the Grenville orogen. Adjacent to the Grenville orogen, a region of positive magnetic anomalies corresponds with Early Proterozoic rocks of the Makovik Province. A high amplitude north-south trending positive anomaly on northern Labrador corresponds with Archean Rocks of the Rae Province. The linear negative anomaly east of this feature is associated with a major shear zone of supracrustal rocks suturing the Nain Province and the Rae Province (Woodside, 1989). These Precambrian rocks are postulated to continue offshore for at least 40 km without significant sedimentary cover (Douglas et al., 1988) based on the continuation of high-frequency magnetic anomalies. Further seaward, these anomalies become attenuated, a result of increased burial by sedimentary rocks (Woodside and Verhoef, 1989). The high amplitude east-west positive magnetic anomalies over southern Greenland are a continuation of the Early Proterozoic plutonic rocks of the Makovik Province. In the Labrador Sea, positive and negative magnetic anomalies are symmetrical about a central northwest trending axis (Srivastava, 1978). This pattern of magnetic stripes is characteristic of oceanic crust, and represents magnetization zones of alternating polarity caused by past reversals in the polarity of the Earth's magnetic field. These stripes have been used to define the geometry and ages of the plate boundaries, and produce paleo-positions of the tectonic plates (Roest and Srivastava, 1989). The oceanic crust in central Labrador Sea has been dated as anomaly 13 time to anomaly 25 time (35 to 63 Ma) with a nearly north-south spreading direction. Prior to anomaly 25 time, the direction of spreading was nearly east-west, with oceanic crust clearly defined back to anomaly 27 time (50Ma). Crust older than anomaly 27 has been interpreted as oceanic (as old as anomaly 33) by Srivastava and Roest (1999), as continental by Chalmers and Laursen (1995) and as a mix of continental and serpentinized peridotite by Chalmers (1997) and Loudon and Chian (1999).

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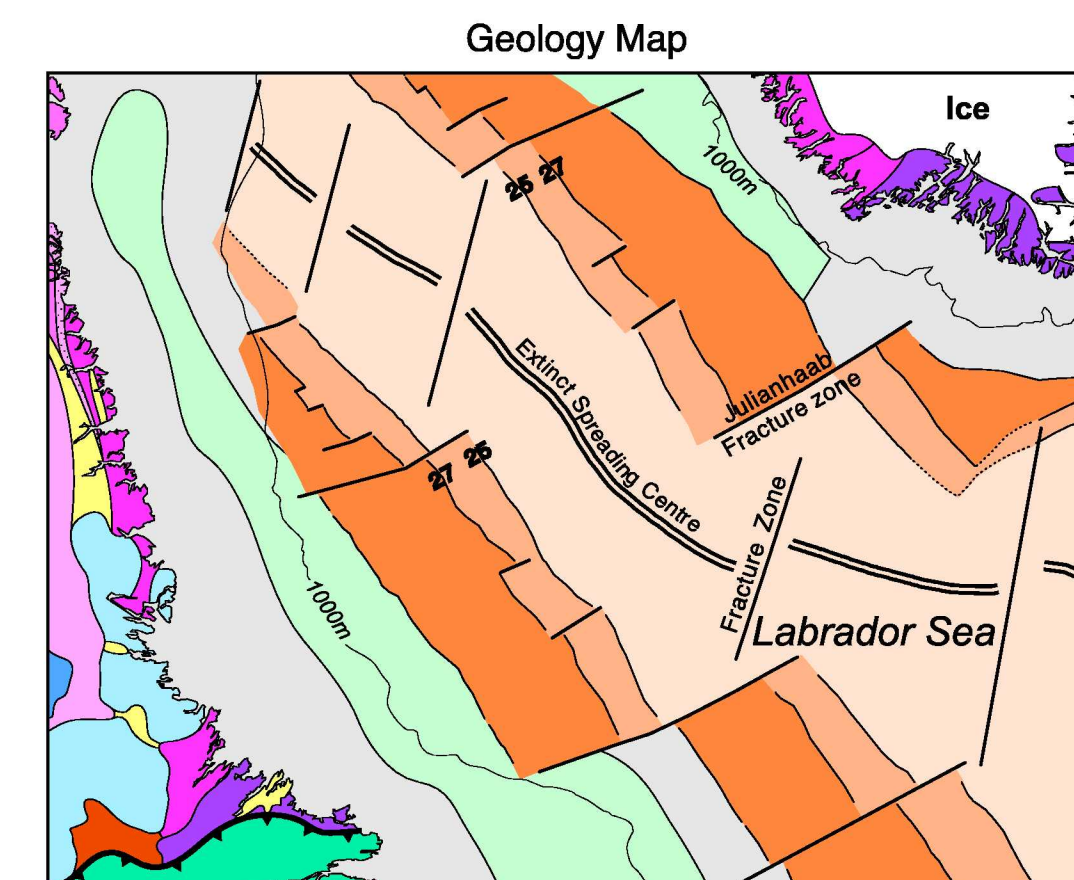
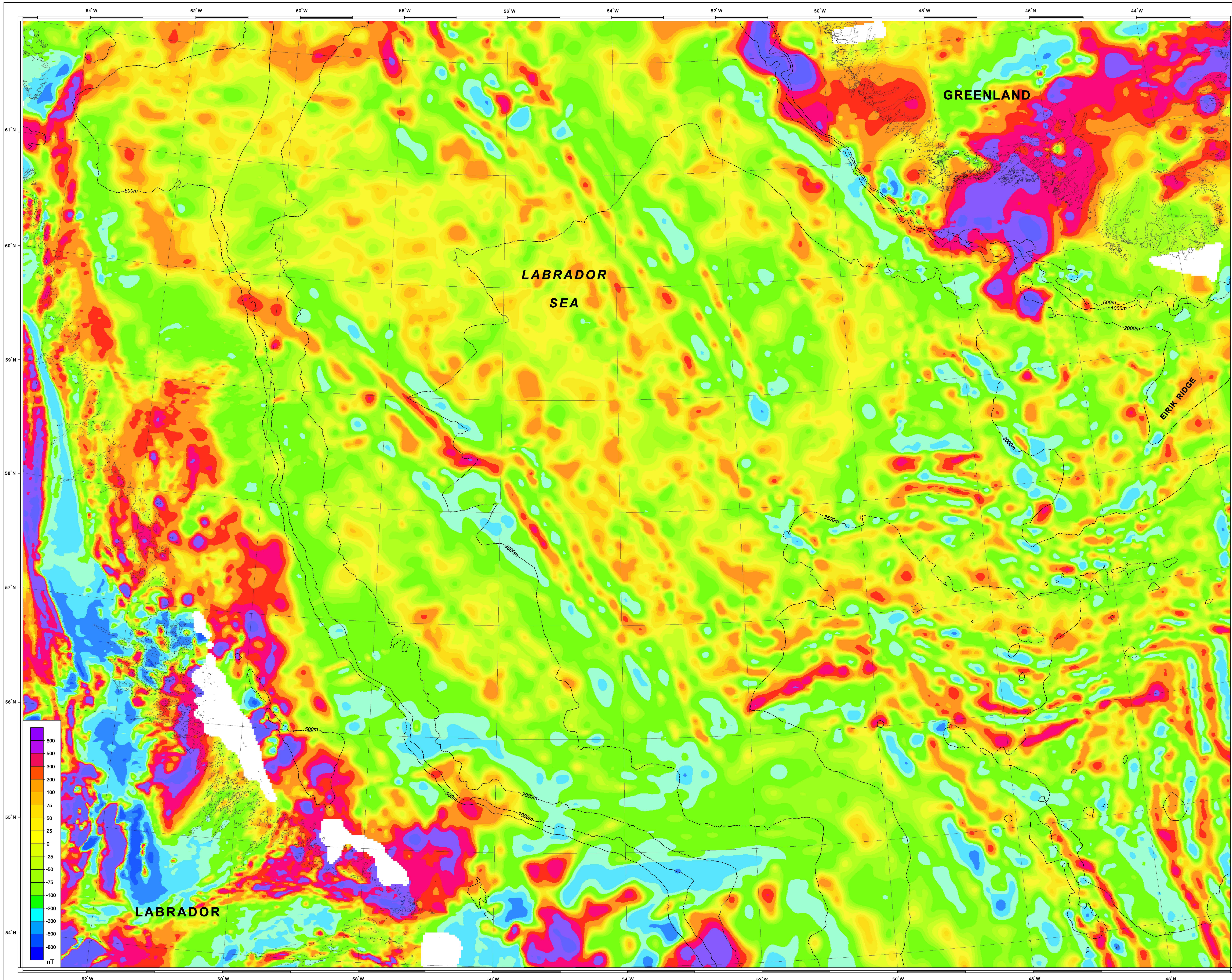
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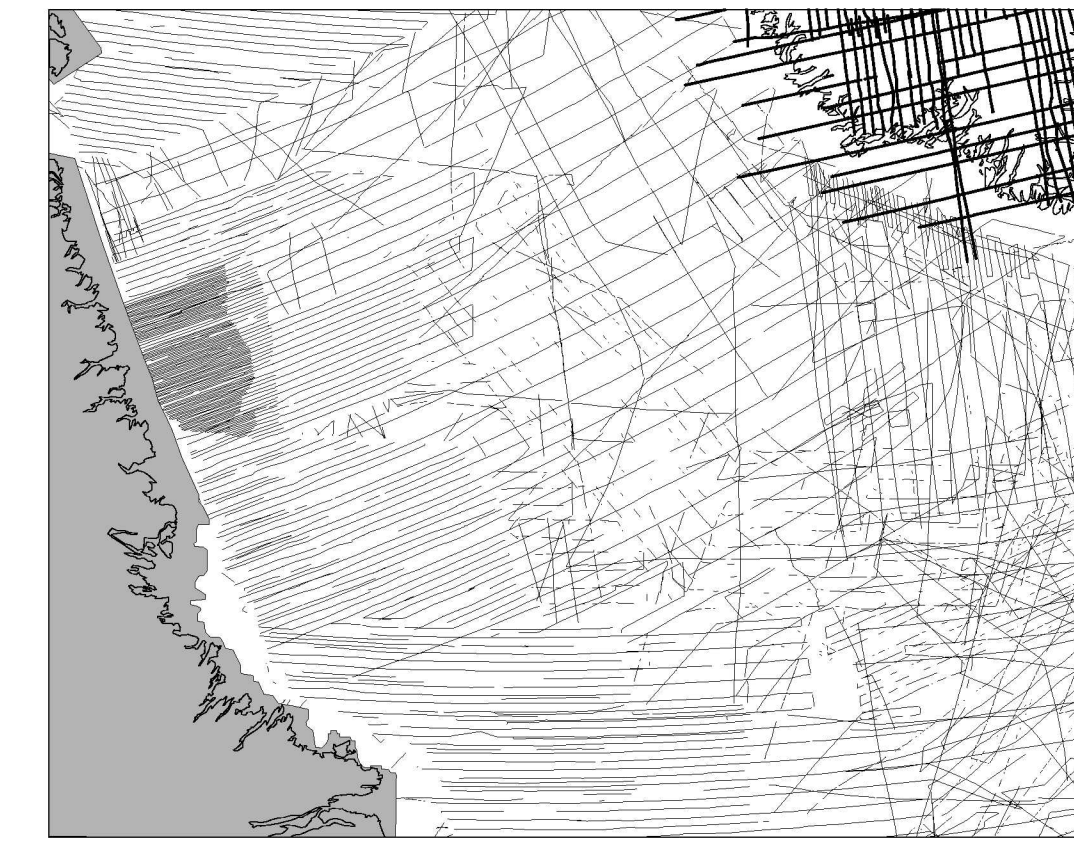
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13-25 magnetic chron	Mesozoic Basins	Continental crust
25-27 magnetic chron	Transition crust	Archean provinces
Greenland orogen	Early Proterozoic orogens	Rae
supracrustal rocks	plutonic rocks (1.9-1.8 Ga)	Burwell
anorogenic intrusions	supracrustal rocks	Nain
	reworked Archean	



Data Sources

The data sets used to produce this map include both shipborne and airborne magnetic measurements. Data distribution and coverage are shown on the insert map. Most of the data sets were compiled as part of an international project to assemble data for the North Atlantic and Arctic (Verhoef et al., 1996) coordinated by the Geological Survey of Canada (GSC). The majority of marine survey data were collected by the Atlantic Geoscience Centre (now GSC Atlantic) and merged with surveys from a large number of international agencies. Gridded aeromagnetic data for the Canadian landmass were provided by the Geophysical Data Centre (Continental Geoscience Division, GSC Ottawa). Aeromagnetic data over southern Greenland were provided by the Greenland Geological Survey (Thorning, et al., 1988). Anomaly values were calculated using the IGRF-91 model, manually edited to eliminate spikes, and adjustments made to remove atmospheric effects. Coherent survey blocks were isolated and microlevelled using a decorrelation filter (Oakley et al., 1994). Data with high crossover errors were eliminated. Further adjustments were made to remove wavelengths longer than 400 km. For a complete description of data processing techniques refer to GSC Open File 3125a (Verhoef et al., 1996). For marine data, the average spacing of the observations is between 2 km and 20 km. Aeromagnetic surveys were usually conducted over targeted areas, and consequently track spacing is often less than 1 km. Adjusted data were gridded and interpolated using a minimum curvature method (Smith and Wessel, 1998) with a final resolution of 2 km.

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Copies of this map can be obtained from the Geological Survey of Canada (Atlantic) Centre, 610 Booth Street, Nova Scotia, Canada, B3H 2Y2. Tel: 902-426-7000. Fax: 902-426-7001. Email: gsc@geoscan.nova.ns.ca. Web: <http://www.geoscan.nova.ns.ca>

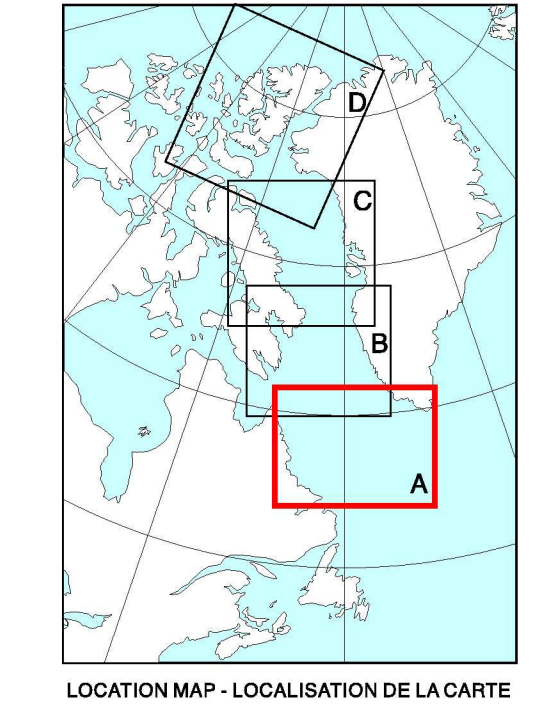
CANADIAN - GREENLAND MARGINS THEMATIC MAP SERIES

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OPEN FILE 3935A
MAGNETIC ANOMALY
LABRADOR SEA REGION
CANADIAN AND GREENLAND ARCTIC
Scale 1:1 500 000 - Échelle 1/1 500 000

Lambert Conformal Conic Projection
Standard Parallels 65°N and 75°N. Central Meridian 55°W
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COMMISSION GÉOLOGIQUE DU CANADA
03/2001

This map is one of a set of four (GSC Open File 3935A-D) covering the magnetics of the Canadian and Greenland Arctic:
Open File 3935A: Magnetic Anomaly Map, Labrador Sea Region
Open File 3935B: Magnetic Anomaly Map, Davis Strait Region
Open File 3935C: Magnetic Anomaly Map, Baffin Bay Region
Open File 3935D: Magnetic Anomaly Map, Inuit Region

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