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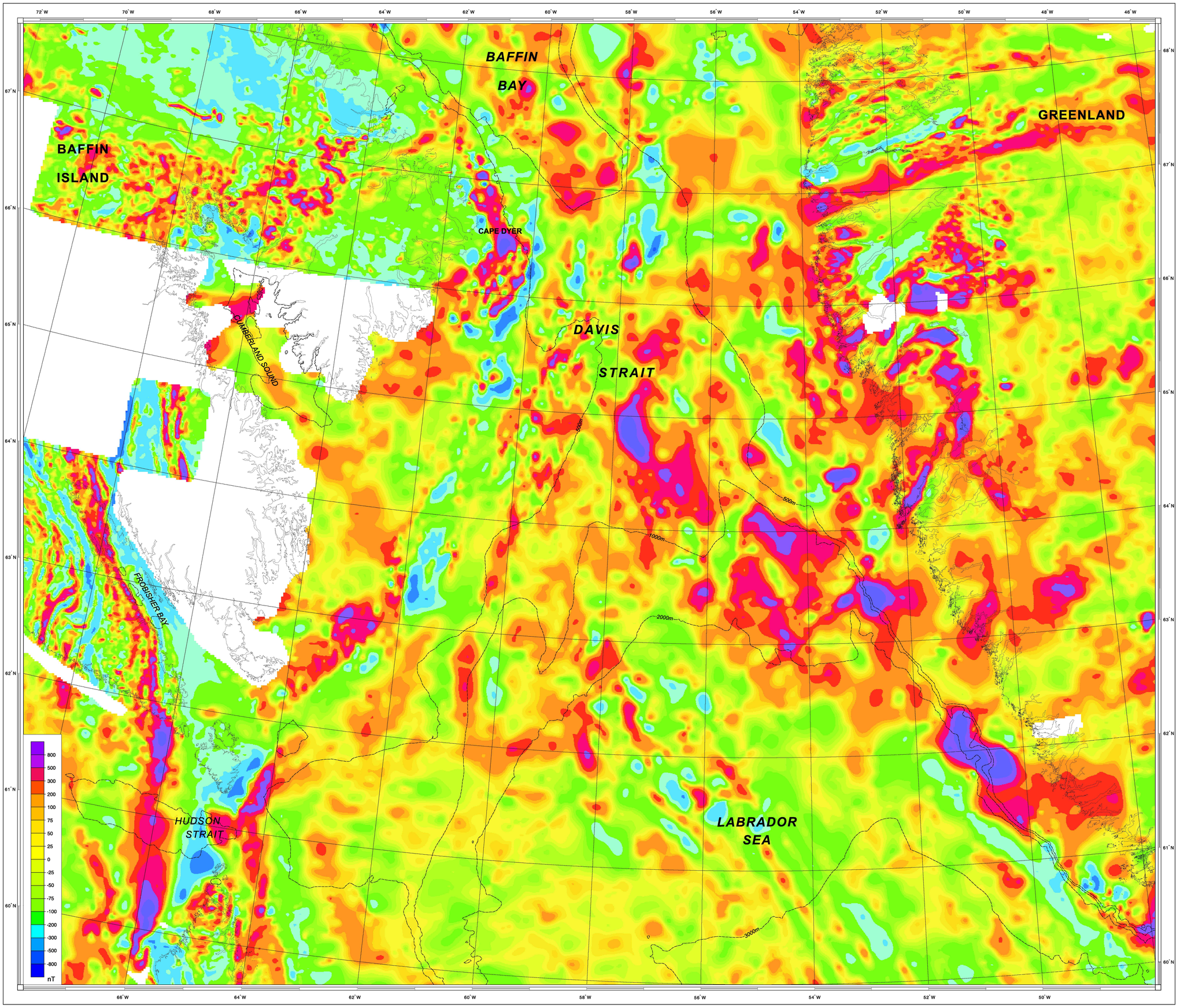
GEUS

Kort & Matrikelstyrelsen

# Magnetic Anomaly of the Davis Strait 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 developed by analysing magnetic field components collected at many observatories around the world by the International Association of Geomagnetism and Aeronomy and 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 ferrimagnetic 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 zonations (see map insert) are as outlined by Hoffman (1989). The high amplitude north-south trending positive anomaly extending across Ungava Bay onto southern Baffin Island 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 and Verhoef, 1989). Seaward, these anomalies become attenuated, a result of increased burial by sedimentary rocks. Magnetic anomalies north of 66° on Baffin Island have a mottled texture, with highs related to Proterozoic plutonic complexes and broad lows related to supracrustal rocks. On Greenland, south of 66° the Archean rocks of the Nain Province produce a patchwork of magnetic anomalies related to internal structures. North of 66° the magnetic anomalies are oriented east-west and correlate with highly deformed Early Proterozoic supracrustal rocks.

Offshore, extending from the mouth of Cumberland Sound northeast to Cape Dyer, lineated magnetic anomalies correlate with the distribution of volcanic material intruded during the strike-slip evolution of the area (Srivastava et al., 1981). These volcanic rocks are broadly distributed with outcrop at Cape Dyer on Baffin Island, the West Greenland Shelf, and significant exposure on the seafloor based on seismic data (Grant, 1975). On the West Greenland shelf several broad magnetic highs, such as the Hecla, Fylla, and (possibly) Gjoa rises reflect the magnetic character of buried Archean crustal blocks. Negative areas between these highs are associated with localized depocentres.

In the Labrador Sea, positive and negative magnetic anomalies are symmetrical about a central northwest trending axis. 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 (63 Ma). 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 Louden and Chian (1999). The extent of oceanic crust in Baffin Bay is currently not well known.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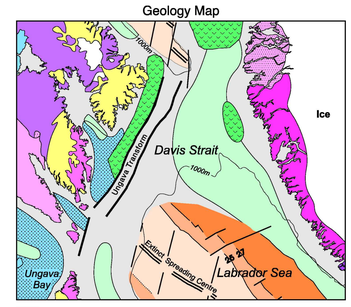
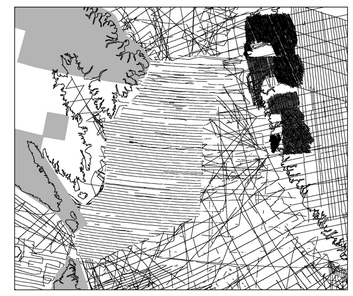
## Geology Map



## 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. Low-level aeromagnetic data collected by the Canadian Flight Research Lab (Hood and Bower, 1975) were used to improve the marine coverage. Gridded aero-magnetic data for the Canadian landmass were provided by the Geophysical Data Centre (Continental Geoscience Division, GSC Ottawa). Aeromagnetic data over western and southern Greenland were provided by the Greenland Geological Survey (Thorning, 1984; 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 microleveled using a decorrugation filter (Oakey 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, 1990) with a final resolution of 2 km.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Magnetic Anomaly Map of the Davis Strait Region

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Copies of this map can be obtained from the Geological Survey of Canada (Atlantic)
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Canada, B2Y 4A2
email: agc@agc.bio.ns.ca
web: http://agcwww.bio.ns.ca


CANADIAN - GREENLAND MARGINS
THEMATIC MAP SERIES

PHYSIOGRAPHY, GRAVITY and MAGNETICS


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Canada


OPEN FILE 3935B


MAGNETIC ANOMALY

# DAVIS STRAIT REGION

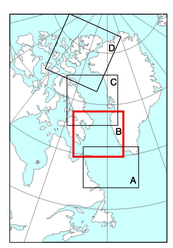
CANADIAN AND GREENLAND ARCTIC

Scale 1:1 500 000 - Échelle 1/1 500 000

kilometres 25 0 50 100 150 200 kilometres

Lambert Conformal Conic Projection
Standard Parallels 65° N and 75° N CM = 55° W






LOCATION MAP - LOCALISATION DE LA CARTE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OTTAWA
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, Innuitian Region