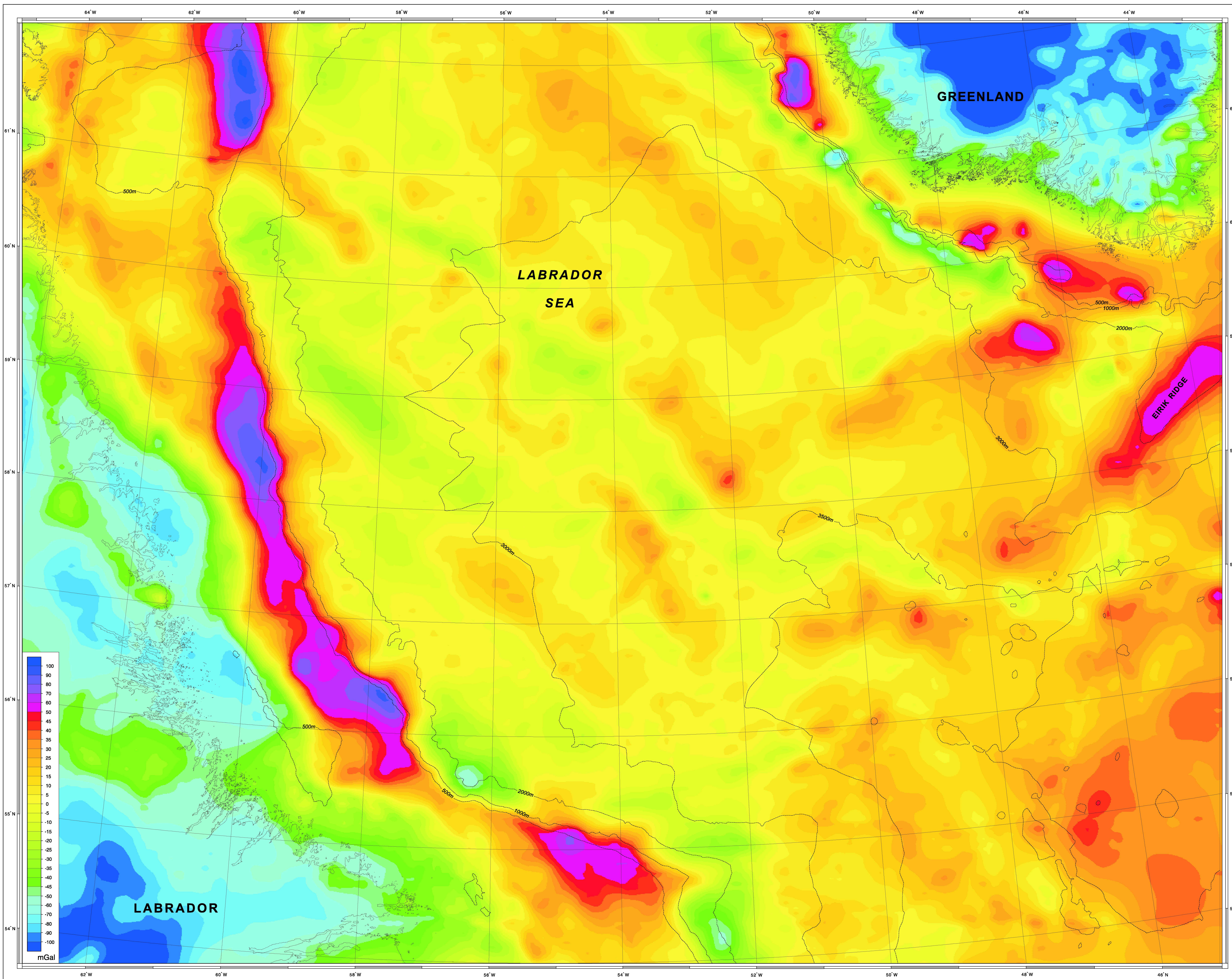




Gravity Anomaly of the Labrador Sea Region



Gravity anomalies, the differences between measured data and a theoretical model (a rotating homogeneous ellipsoid), are produced by lateral variations of mass in the Earth. These anomalies are attributed to: 1) Variability in rock densities due to lithological changes; 2) rapid changes in topography (or bathymetry); and 3) isostatic compensation of mass loading (or mass deficit) on a regional or local scale. Variations at shallow depths are better resolved than deep sources. Gravity measurements at sea are at the same vertical elevation (sea level) and anomaly values referred to as free air gravity. Onshore, anomaly values are further adjusted to account for the extra mass between sea level and the elevation at which data are measured. This is referred to as Bouguer gravity.

Onshore, negative Bouguer gravity values correspond to a thick continental crust and therefore a greater depth to higher density mantle rocks. On Labrador, at the southern edge of the map sheet, the large gravity low (<100 mGal) correlates with the middle Proterozoic Grenville Orogen. In central and northern Labrador, gravity zones (>+40 mGal) reflect the major Archean Provinces and Early Proterozoic orogeny outlined by Hoffman (1986). On Greenland, gravity values are particularly low (<150 mGal) due to crustal depression under the thick ice sheet.

A prominent feature associated with the shelf region is a large positive free air anomaly that follows the shelf break (<500 m). This anomaly is predominantly caused by the combined effect of a thick continental crust adjacent to thin oceanic crust and the large bathymetric gradient associated with the slope region (Keen et al., 1990). Along the Labrador margin, the shelf edge anomaly is broad with amplitudes exceeding 60 mGal, interpreted as a thick sedimentary section deposited on thinned continental crust, and the intrusion of dense volcanic material (Woodside, 1989). On the Southwest Greenland margin the shelf-edge anomaly is narrow, with an associated seaward low. This is consistent with an abrupt continent-ocean transition with thin sedimentary cover (Woodside and Verhoef, 1989).

Gravity variations in the Labrador Sea are smaller in amplitude than on the continents or margins. The most significant feature is the linear northwest trending negative low (<40 mGal) in the centre of the Labrador Sea attributed to an extinct spreading centre. Parallel to this gravity low are several positive and negative features (<+40 mGal) that have been related to variable relief of the oceanic crust now buried by sedimentary rocks (Srivastava, 1978). The region landward of anomaly 27 to the slope has been interpreted as oceanic crust by Srivastava and Rowat (1999) and as continental by Chalmers et al. (1993). The largest marine gravity anomalies (>60 mGal) are off the southern tip of Greenland and are associated with the Julianhaab Transform and the Eric Ridge.

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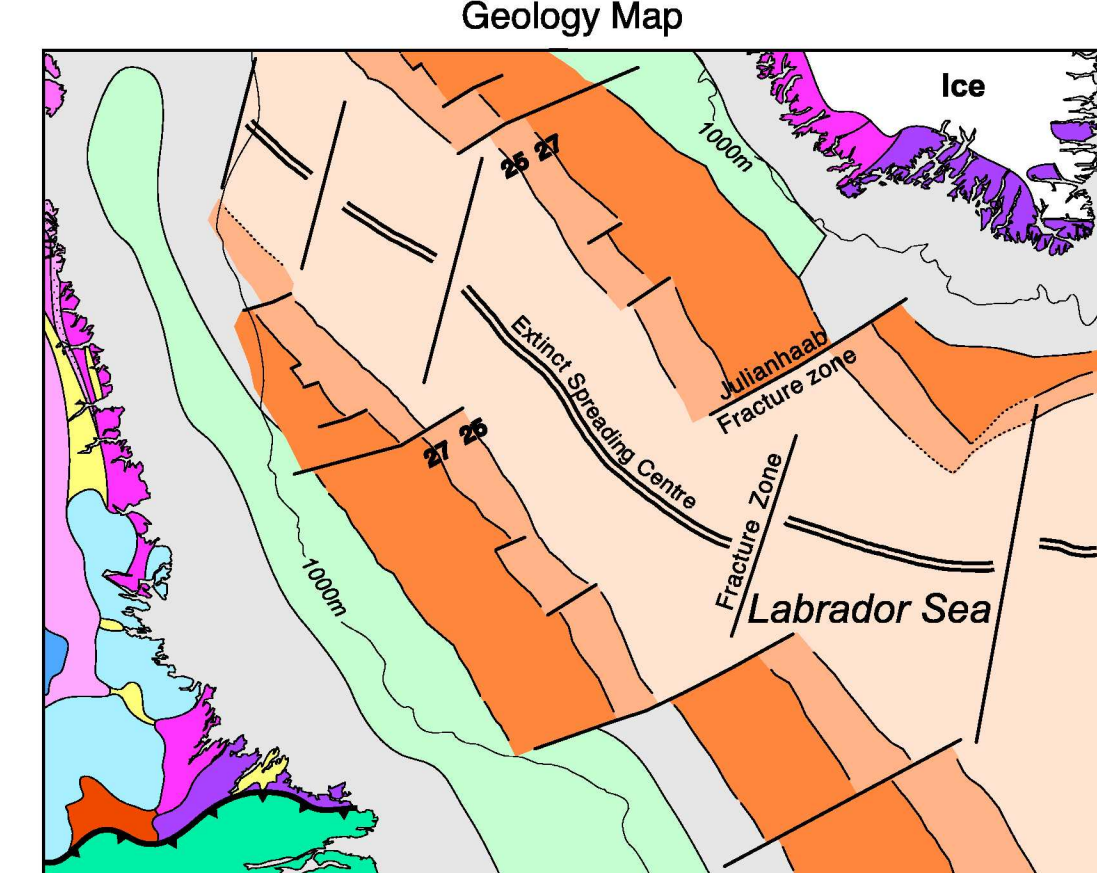
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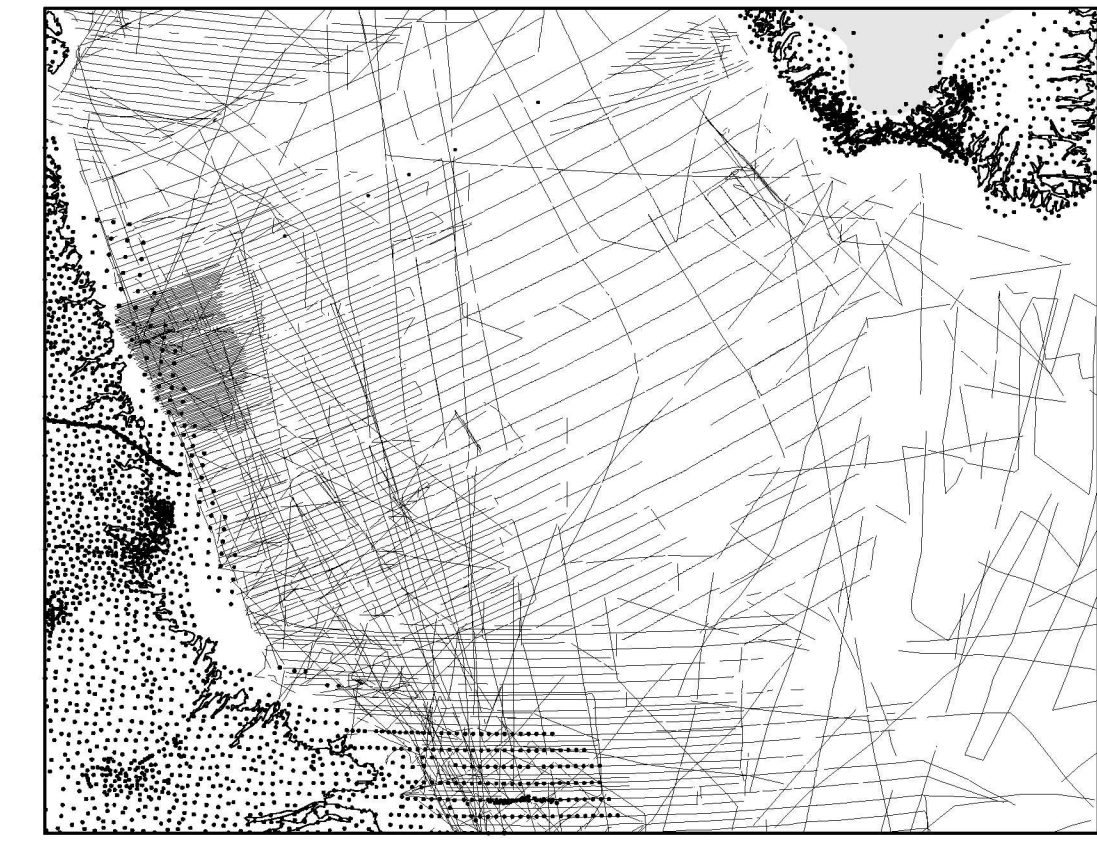
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13-25 magnetic chron
25-27 magnetic chron
Mesozoic Basins
Continental Transition crust
Grenville orogen
Early Proterozoic orogens
Archean provinces
supracrustal rocks
plutonic rocks (1.9-1.8 Ga)
Rase
anorogenic intrusions
supracrustal rocks
Burwell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



gridded aerogravity
station gravity
marine survey data

Data Sources

The data sets used to produce this map include land station and marine surface measurements. Data distribution and coverage are shown on the insert map. The average spacing of the regional observations is from 5-10 km for the land and between 2-20 km for the ship tracks. Station data for Canada and its margins were provided by the Geophysical Data Centre, Continental Geoscience Division, GSC, Ottawa. Marine survey data were collected by the Atlantic Geoscience Centre (now GSC Atlantic) and merged into the National Gravity Data Base (Earth Physics Branch, 1986). Station data and gridded Bouguer data for Greenland and its margins were provided by the National Survey and Cadastre Denmark. All data were gridded and interpolated using a minimum curvature method (Smith and Wessel, 1990) with a final resolution of 5 km.

The rock density used for the Bouguer correction was 2670 kg/m³. Where gravity was measured on a lake or glacier, densities of 1000 kg/m³ and 900 kg/m³ were used for water and ice respectively. The Bouguer gravity often has an additional terrain correction applied to minimize the effect of rugged topography. This correction was only applied in some coastal regions where measurements were made adjacent to fjords. All Bouguer corrections were made by the contributing organizations.

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2000: Canadian National Gravity Database, Geological Survey of Canada, 615 Booth Street, Ottawa.

Earth Physics Branch
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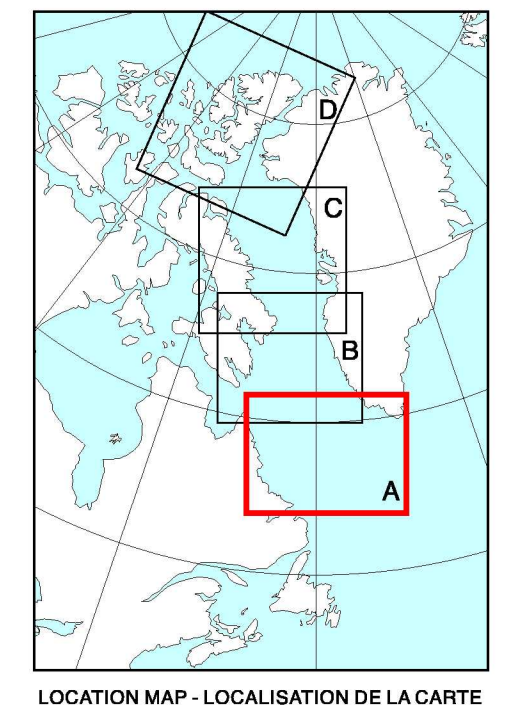
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Copies of this map can be obtained from the Geological Survey of Canada (Atlantic) PO Box 1206, Dartmouth, Nova Scotia, Canada, B2Y 4A2 email: agp@agp.sbc.ns.ca web: http://www.bdc.gc.ca

CANADIAN - GREENLAND MARGINS THEMATIC MAP SERIES
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OPEN FILE 3934A
GRAVITY ANOMALY MAP
BOUGUER ON LAND, FREE AIR AT SEA
LABRADOR SEA REGION
CANADIAN AND GREENLAND ARCTIC
Scale 1:1 500 000 - Echelle 1/1 500 000
kilometres 25 0 50 100 150 200 kilometres
Lambert Conformal Conic Projection
Standard Parallels 60°N and 70°N; CM = 95°W
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3934A
GEOLOGICAL SURVEY OF CANADA
COMMISSION GÉOLOGIQUE DU CANADA
OTTAWA
02/2001

This map is one of a set of four (GSC Open file 3934A-C) covering the gravity anomaly of the Canadian and Greenland Arctic.
Open File 3934A: Gravity Anomaly Map, Labrador Sea Region
Open File 3934B: Gravity Anomaly Map, Davis Strait Region
Open File 3934C: Gravity Anomaly Map, Baffin Bay Region
Open File 3934D: Gravity Anomaly Map, Inuvialut Region

Gravity Anomaly Map of the Labrador Sea Region
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Geological Survey of Canada, Open File 3934A, scale 1:1 500 000.

