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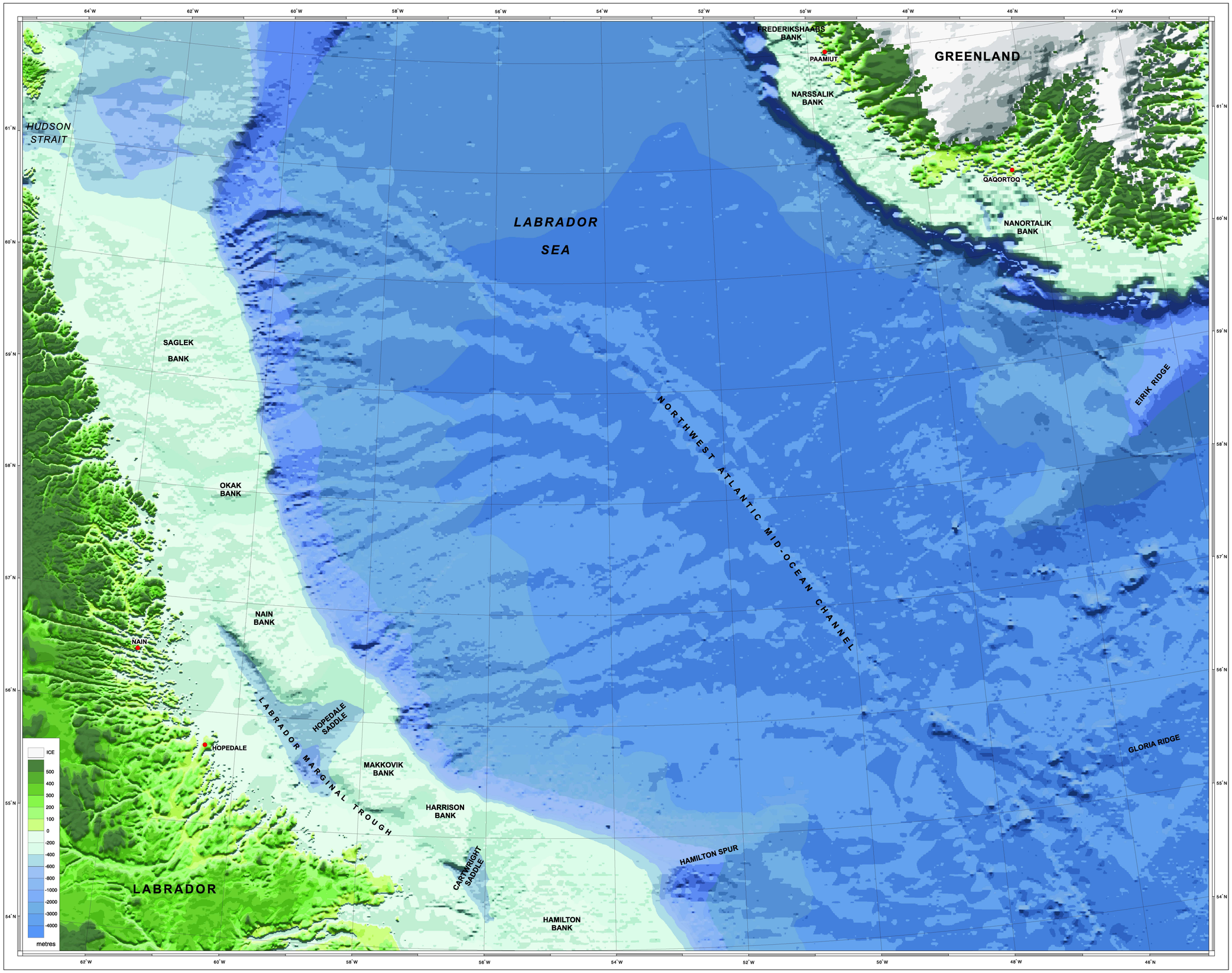
GEOLOGICAL SURVEY OF CANADA | COMMISSION GÉOLOGIQUE DU CANADA

GEUS

Kort & Matrikelstyrelsen



Physiography of the Labrador Sea Region

The map shows a shadow-illuminated image of combined topographic and bathymetric Digital Terrain Models (DTM) featuring Labrador, the Labrador Sea and South Greenland. This false coloured image is illuminated from the north with colour changes representing contours of elevation or bathymetric depth. The distribution of ice, shown in white, has been defined with a gridded mask for Greenland (Ekholm, 1996) and polygons for Canada (Digital Chart of the World, 1992). The Labrador Highlands and shelf regions are based on Sanford et al. (1976) and for the continental shelf of Greenland, the geographic names of Ghisler (1990) are used.

The physiography of the Labrador Sea area generally reflects differences in bedrock geology and structures, which influence different styles of erosion (Sempels, 1982). On Labrador, the highlands are stable cratonic blocks with moderate topographic relief. Sutures between these blocks are often characterized by well defined linear erosional patterns, such as near Nain. On the southern tip of Greenland, the topography is dominated by glacial erosional effects, with many deeply scoured fjords. Although active ice tongues extending from the vast Inland Ice Sheet are not common in South Greenland, these fjords have been significantly influenced by ice erosion.

The Labrador Basin forms part of the waterway that connects the Atlantic and Arctic oceans (Piper et al., 1990). The Labrador Shelf is much wider (~3 x) than the conjugate shelf of western South Greenland. Even at these southerly latitudes, offshore the effects of glaciation are noticeable: the Cartwright Saddle, Hopedale Saddle and Hudson Strait have all been influenced by glacial processes. On Greenland, the shelf at Qaqortoq is also cut by a glacial channel. The slope area of the Labrador margin is dominated by a complex dendritic drainage system which extends to the centre of the Labrador Sea and feeds into the North Atlantic Mid Ocean Channel (NAMOC) (Hesse et al., 1999). Along the Greenland slope region, a similar but less developed drainage system is documented, however the low density of bathymetric data in this area does not allow proper imaging. The position of the NAMOC is roughly coincident with the extinct Labrador Sea spreading centre.

Balkwill, H.R., McMillan, N.J., MacLean, B., Williams, G.L., and Srivastava, S.P.
1990: Geology of the Labrador shelf, Baffin Bay and Davis Strait Chapter 7, *in* Geology of the Continental Margin of Eastern Canada; M.J. Keen and G.L. Williams (ed). Geological Survey of Canada, no. 2, p. 293-348 (also Geological Society of America, The Geology of North America, v. I-1)

Digital Chart of the World
1992: Ice Boundaries, edition 1, July, 1992. United States Defence Mapping Agency.

Ekholm, S.
1996: A full coverage, high resolution, topographic model of Greenland computed from a variety of digital elevation data, Journal of Geophysical Research, B10, p. 21,961-21,972.

Ghisler, M.
1990: Geographic subdivisions of Greenland, Rapp. of Grønlands Geologiske Undersøgelse, v. 148, p. 8-10.

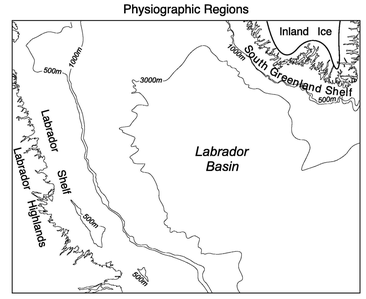
Hesse, R., Klaucke, I., Khodabakhsh, S., and Piper, D.
1999: Continental slope sedimentation adjacent to an ice margin. III. The upper Labrador Slope, Marine Geology, v. 155, p. 249-276.

Piper, D.J.W., Mudie, P.J., Fader, G.B.J., Josenhans, H.W., MacLean, B., and Vilks, G.
1990: Quaternary Geology Chapter 10; *in* Geology of the Continental Margin of Eastern Canada; M.J. Keen and G.L. Williams (ed). Geological Survey of Canada, no. 2, p. 475-607 (also Geological Society of America, The Geology of North America, v. I-1)

Sanford, B.V., Grant, A.C., Ross, D.I., and van der Linden, W.J.M.
1976: Physiography of eastern Canada and adjacent regions, 1: 2 000 000, Geological Survey of Canada Map 1398A (SE).

Sempels, J-M.
1982: Coastlines of the eastern Arctic, Arctic, v. 35, p. 170-179.

Physiographic Regions



30 arc second grid, GTOPO30 (USGS)

.01 x .025 degree grid (KMS)

Bathymetric points, tracks and contours (GSC, GEUS, RDANH)

Data Sources

Topographic data for Greenland were provided by Kort and Matrikelstyrelsen (KMS) of Denmark: a 0.01° x 0.025° grid (~1 km) (updated from Ekholm, 1996). Data for the Canadian land area were provided by the United States Geological Survey (GTOPO30, 1999), as a 30 arc second grid (~1 km). The areas were regridded to a 1 km resolution.

Bathymetric data points were assembled from a combination of the Geological Survey of Canada's National Gravity Database and Marine Surveys databases. Digital bathymetric contours for the shelf and slope off West Greenland were provided by the Geological Survey of Denmark and Greenland (GEUS) (Henderson, 1975). Point data on the shelf near Qaqortoq were provided by the Royal Danish Administration of Navigation and Hydrography (RDANH). GEBCO digital bathymetric contours (Jones et al., 1994) were used in southeastern Labrador Sea where ship track data were sparse. Bathymetric depths were standardized using a conversion of 1463 m/s. The adjusted point observations were gridded at a 2 km resolution, using a spline interpolation method (Smith and Wessel, 1990), and finally regridded to 1 km for merging with the topographic DTM. In most coastal regions data are sparse and the topography of the seafloor is poorly constrained. In these areas, extrapolated bathymetric values were used to fill the gap.

Ekholm, S.
1996: A full coverage, high resolution, topographic model of Greenland computed from a variety of digital elevation data, Journal of Geophysical Research, B10, p. 21,961-21,972.

GTOPO30
1999: Global 30 Arc Second Elevation Data. United States Geological Survey, National Mapping Division, EROS Data Center.

Henderson, G.
1975: New Bathymetric Maps covering offshore West Greenland 55° - 69°30'N. Proceedings, Offshore Technology Conference, Houston, v. 1, p. 761-773.

Jones, M.T., Tabor, A.R., and Weatherall, P.
1994: GEBCO Digital Atlas: CDROM and Supporting Volume. British Oceanographic Data Centre, Birkenhead, UK.

Smith, W.H.F. and Wessel, P.
1990: Gridding with continuous curvature splines in tension, Geophysics, v. 55, p. 293-305.

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Copies of this map can be obtained from
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web: http://agcwww.bio.ns.ca

CANADIAN - GREENLAND MARGINS
THEMATIC MAP SERIES

PHYSIOGRAPHY, GRAVITY and MAGNETICS

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OPEN FILE 3933A

PHYSIOGRAPHY

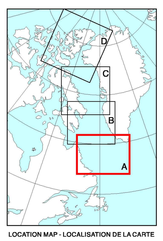
LABRADOR SEA REGION

CANADIAN AND GREENLAND ARCTIC

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

kilometres 25 0 50 100 150 200 kilomètres

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
01/2001

This map is one of a set of four (GSC Open file 3933A-D) covering the physiography of the Canadian and Greenland Arctic:

Open File 3933A: Physiography, Labrador Sea Region
Open File 3933B: Physiography, Davis Strait Region
Open File 3933C: Physiography, Baffin Bay Region
Open File 3933D: Physiography, Innuitian Region

Physiography of the Labrador Sea Region

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