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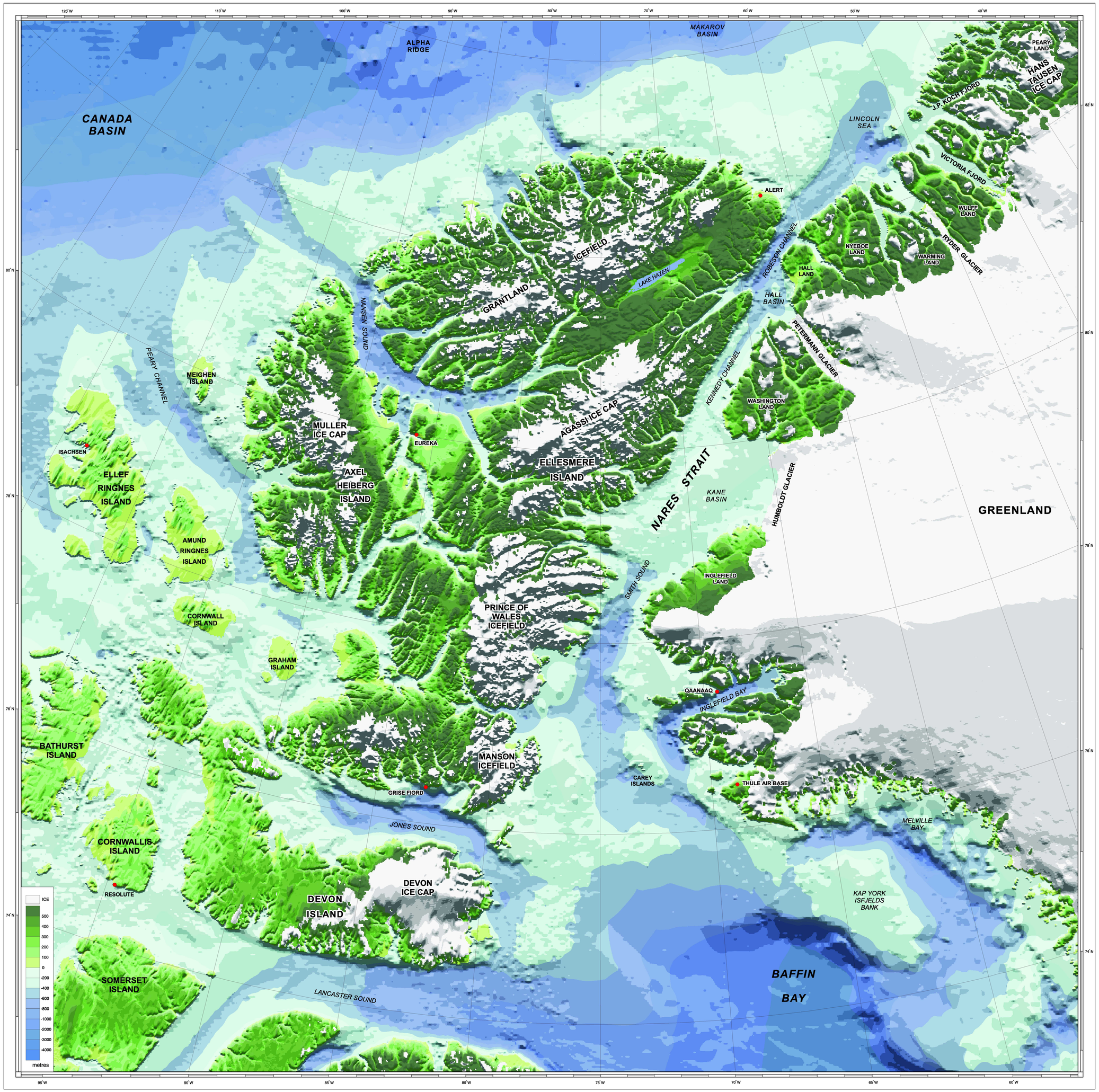
GEOLOGICAL SURVEY OF CANADA | COMMISSION GÉOLOGIQUE DU CANADA

GEUS

Kort & Matrikelstyrelsen

Physiography of the Innuitian Region



The map shows a shadow-illuminated image of a combined topographic and bathymetric Digital Terrain Model (DTM) for a large portion of the Canadian and Greenland High Arctic. Featured are North and North-West Greenland, Ellesmere and Axel Heiberg islands, the Northernmost Arctic Archipelago, and the surrounding bathymetry of the Arctic Ocean, interisland channels and northern Baffin Bay. 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 physiography of the Innuitian area generally reflects differences in bedrock geology and structures, which influence different styles of erosion (Sempels, 1982). The region is broadly divided into the tectonically active Innuitian Orogen, which forms the northern continental rim, and the Central Stable Region, including the Canadian Greenland Shield and Arctic Platform. These regions are outlined by Dawes and Christie (1991).

The map shows a vast, glacially dominated mountainous region with elevations on northern Ellesmere Island exceeding 2500 metres, making these one of Canada's highest mountain ranges. Prominent glaciers include: Grantland Icefield, Agassi Ice Cap, Prince of Wales Icefield, Muller Ice Cap, and Devon Ice Cap. These ice covered areas are a mix of both broad featureless topography where ice is thick, and highly textured topography, where thinner ice reflects the fabric of the underlying bedrock. On Greenland several glacial tongues extend from the vast Inland Ice and reach the ocean: Humbolt Glacier, Petermann Glacier, and Ryder Glacier. On Ellesmere Island, Lake Hazen is the largest high latitude lake in the world. The waterway that separates Greenland and Ellesmere Island, which includes Smith Sound, Kane Basin, Kennedy Channel, Hall Basin and Robeson Channel, is also called Nares Strait.

Several seaward extensions of deep glacial drainage features (over 600 m) are noted (Peary Channel, Nansen Sound, Lincoln Sea, Smith Sound, Inglefield Bay, Jones Sound, and Lancaster Sound). Some of these drainage features have associated marginal deltas, such as Nansen Sound, and were a significant control over the Pleistocene and Quaternary evolution of the region. The amount of influence geological structures had on the geometry of these drainage features is largely unknown. Two deep water regions (below 2000 m) are the Arctic Ocean and Baffin Bay. In the Arctic Ocean, the Alpha Ridge separates the Canada Basin from the Makarov Basin. Low data density in these areas significantly decreases the ability to resolve sea-floor morphology.

Dawes, P.R., and Christie, R.L.
1991: Geomorphic regions; in Geology of The Innuitian Orogen and Arctic Platform of Canada and Greenland; H.P. Trettin (ed), Geological Survey of Canada, Geology of Canada, no. 3, p. 29-56 (also Geological Society of America, The Geology of North America, v. E).

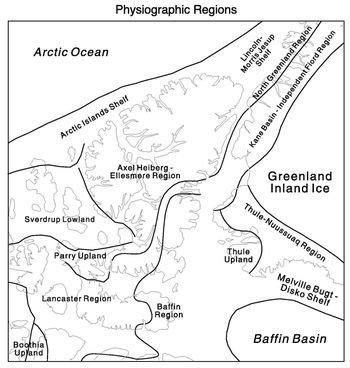
Digital Chart of the World
1992: Ice Boundaries, edition 1, July, 1992. United States Defence Mapping Agency.

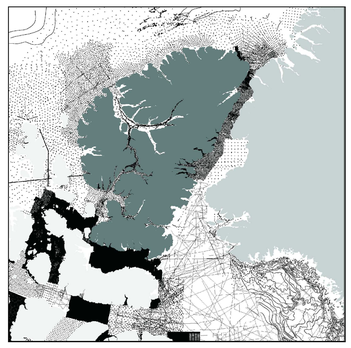
Ekholm, S.
1996: A full coverage, high resolution, topographic model of Greenland computed from a variety of digital elevation data. Journal of Geophysical Research, B10, p. 21,961-21,972.

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

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

Physiographic Regions





- 30 arc second grid (USGS)
- .01 x .025 degree grid (KMS)
- 1:250 000 scale contours (Geomatics Canada)
- Bathymetric points (high density CHS survey)
- Bathymetric points, tracks and contours (GSC, GEUS, GEBCO)

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 most of the Canadian land area were provided by the United States Geological Survey (GTOPO30, 1999), as a 30 arc second grid (~1 km). The topographic grid for Ellesmere Island and Axel Heiberg Island was produced from 1: 250 000 scale digital contours obtained from Geomatics Canada. The areas were gridded to a 1 km resolution.

Bathymetric data points were assembled from databases of the Geological Survey of Canada (GSC) and the Canadian Hydrographic Service (CHS). GSC's contribution was a combination of Canada's National Gravity Database and the Marine Surveys databases. CHS data came from existing digital data archives assembled as part of the Canadian Law of the Sea interests. GEBCO digital bathymetric contours (Jones, et al., 1994) were used in the Arctic Ocean and Melville Bay, where digital point data were sparse. Bathymetric depths were standardized using a depth 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 observations. 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.

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.

Stark, A., Deslfoches, K., Vardy, D., Macnab, R., Oakey, G., Verhoef, J., Monahan, D., and Haworth, R.
1996: An Improved Bathymetric Portrayal of the Northwest Atlantic, for use in Delimiting the Juridical Continental Shelf According to Article 76 of the Law of the Sea. Geological Survey of Canada, Open File Report 3371.

Acknowledgements

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Copies of this map can be obtained from
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CANADIAN - GREENLAND MARGINS
THEMATIC MAP SERIES

PHYSIOGRAPHY, GRAVITY and MAGNETICS

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Canada

OPEN FILE 3933D

PHYSIOGRAPHY

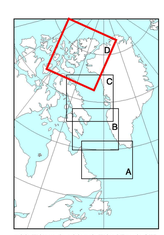
INNUITIAN REGION

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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3933D
GEOLOGICAL SURVEY OF CANADA
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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 Innuitian Region

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