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Improvement to the International Bathymetric Chart of the Arctic Ocean (IBCAO): Updating the Data Base and the Grid Model


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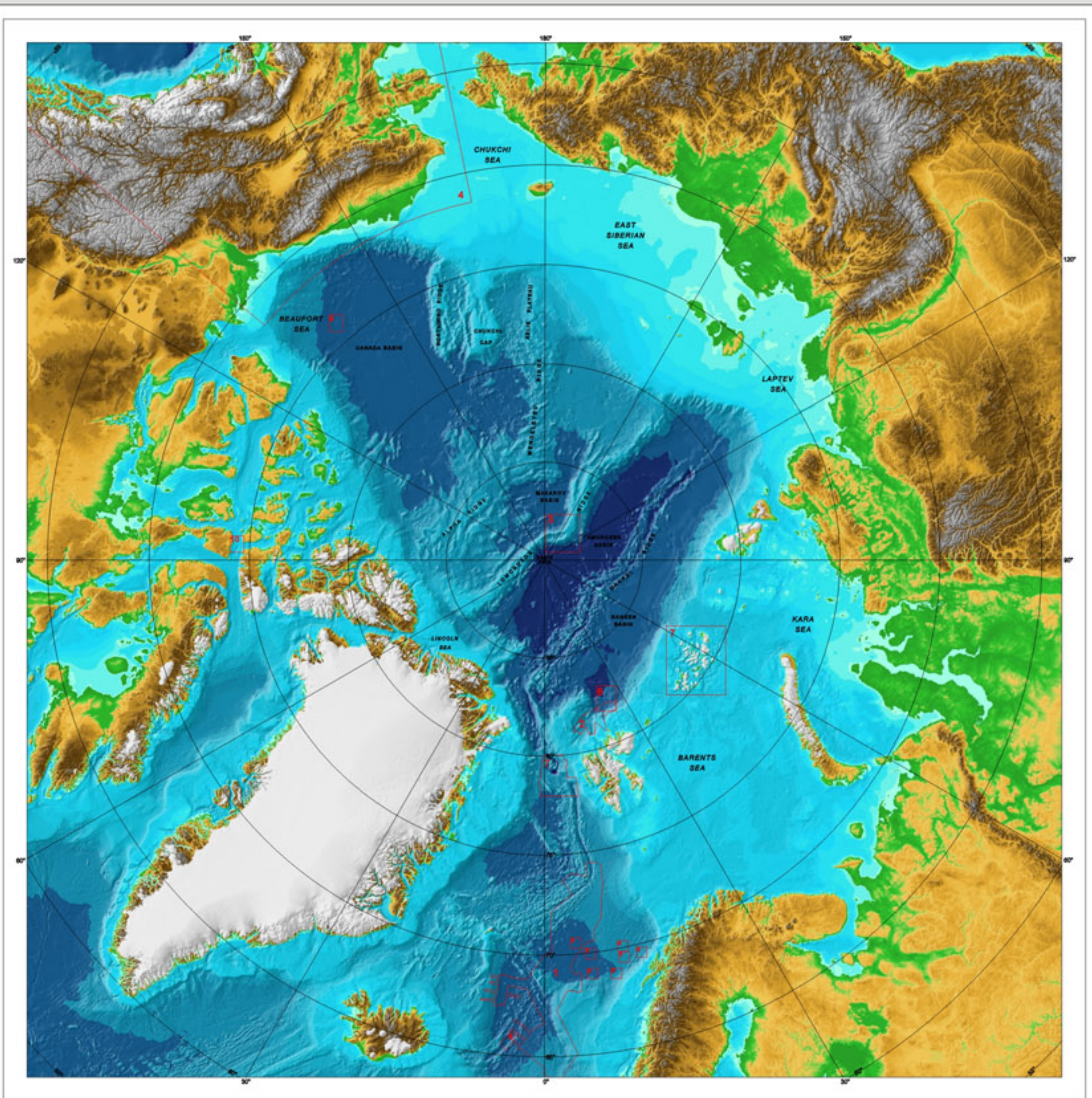
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SHADED RELIEF OF THE ARCTIC OCEAN AND ADJACENT CONTINENTS

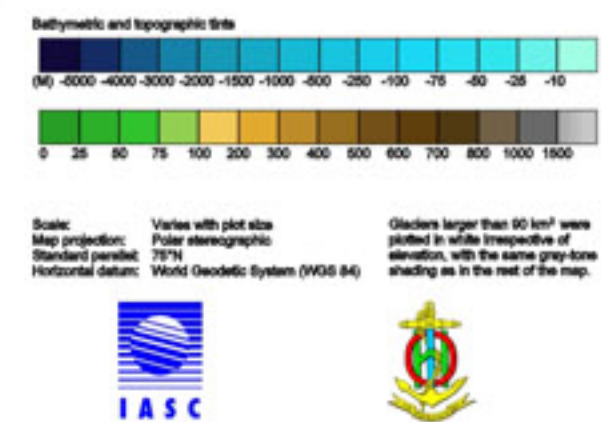
Map production:
This shaded relief map of regional oceanographic and continental morphology of the Arctic is based upon the IBCAO model (ver 1.0) which correlates bathymetry and topography in a digital Cartesian grid with 2.5 km cell size.

Acknowledgments:
Numerous individuals and institutions at national and international levels have contributed to the attainment of IBCAO objectives to date. George Newton of the US Arctic Research Commission and Robert Anderson of the US Arctic Submarine Laboratory were instrumental in the negotiations that led to the release of historic submarine data. The authors thank the following individuals who arranged support on behalf of their respective agencies: Chief Frigate of the International Arctic Science Committee, Dieter Trauer of the Interagency Arctic Research Support Activity, Commander John Joseph and Chris Butler of the US Office of Naval Research International Field Office, Anders Hvalvågner of the Swedish Polar Research Centre, Hans-Joachim Schenk of the Swedish Polar Research Centre, Jan Backman of Stockholm University. The Ymer-80 foundation contributed with funding for digitizing contour maps.

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Introduction

The project to develop the IBCAO grid model was initiated in 1997 with the objective of providing to the Arctic research community an improved portrayal of the seabed north of 64°N, in a form suitable for digital manipulation and visualization. The model was constructed from a compilation of all single-beam and multibeam echo soundings that were available for the polar region, complemented where appropriate by newly released contour information [Jakobsson et al., 2000]. The grid features a cell size of 2.5 x 2.5 km on a polar stereographic projection; it is constructed on the WGS 84 datum, with true scale at 75°N.

Designated the Beta Version, a preliminary implementation of IBCAO was introduced to the geophysical community in December 1999, and released four months later as a digital grid that could be downloaded from a project website hosted by the National Geophysical Data Center in Boulder, CO. Since that release, the Beta Version has seen widespread use in Earth Science applications, with the website continuing to garner between 500 and 1000 visitors per week; this reportedly makes it one of the most heavily-visited of all NGDC websites.

Updating the Data Base and the Grid Model

IBCAO has since been updated with the development of Version 1.0, which incorporates new information and formats, along with an expanded range of bathymetric products that will be released for public use through the same project website. Improvements include corrections to errors that were identified off Svalbard, in Canada Basin, and in Barrow Strait, as well as contributions of significant new data sets that were collected by the Norwegian Petroleum Directorate and the Alfred Wegener Institute off Norway and Svalbard, in Fram Strait, and over the Lomonosov Ridge (Figure 1). In addition, the portrayal of the Alaskan landmass was enhanced with a new topographic model extracted from NGDC's GLOBE data set.

More Available Formats and Poster size Charts for Download

New formats include downloadable Cartesian grids that can be imported directly into ArcInfo and Intergraph's module Terrain Analyst. A geographic grid has been produced as well, with a resolution of 1' x 1' for compatibility with the global grid of bathymetry that is now under construction by a working group operating under the auspices of the General Bathymetric Chart of the Oceans (GEBCO). New products include a suite of bathymetric contours derived from the grid at depths ranging from 20 metres to 5000 metres, and poster-sized Postscript maps showing isobaths printed over a shaded relief background (Figures 2-6). These latest developments reflect a commitment to maintain IBCAO as a 'live' product for the foreseeable future, with periodic upgrades to improve its quality and usefulness.

Figure 1. Specific updates incorporated into IBCAO version 1.0

1. Incorporated DTM (1 x 1 km) derived from multibeam data acquired by the Norwegian Petroleum Directorate.
- 2,7,8. Incorporated DTMs (1 x 1 km) compiled at the Alfred Wegener Institute (AWI) from Hydrosweep data acquired from R/V Polarstern.
3. Incorporated DTM (250 x 250 m) derived from Hydrosweep data acquired during the ARK-VIII/3 cruise with R/V Polarstern in 1991.
4. Updated topography from the Global Land One-km Base Elevation (GLOBE) data base.
5. Numerous erroneous features due to outliers discovered by the Norwegian Petroleum Directorate.
6. Data from Swedish cruise in 1991 with icebreaker Oden indicated large seamount like features in this area. Data from cruise ARK-XV/2 in 1999 with Polarstern showed that these features did not exist and, thus, they are removed.
7. The coastline of the Franz Josef Land archipelago has been improved. One 'false island', which appeared in the Beta version of the IBCAO grid due to overshooting of the gridding algorithm, has been removed.
9. A seamount-like feature in the Beta grid, derived from digitized contours from the HDNO/VNIO/RAS (1999) map, was found not to be supported after studies of Grantz and Hart (1984) previous published results from echo-sounding surveying.
10. A submarine track acquired between 1958-1962 resulted in an elongated deep channel in the IBCAO Beta grid. Matching crossings at either end of this feature suggest that this part of the submarine track is doubtful. Therefore, the section of the track was removed for the compilation of version 1.0 of IBCAO.



Figure 2-4. Polarstereographic maps constructed from the IBCAO grid model available for download in postscript format suitable for full size plotters. Each postscript file is ca 100 mb uncompressed.

Main Compilers of IBCAO version 1.0:

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Jakobsson, M., Cherkis, N., Woodward, J., Coakley, B., and Macnab, R., 2000. A new grid of Arctic bathymetry: A significant resource for scientists and mapmakers. EOS Transactions, American Geophysical Union, v. 81, no. 9, p. 89, 93, 96.

Figure 5-6. Maps constructed from the 1min geographic IBCAO grid model as well available for download in postscript format. Only 2 of 4 available maps are shown.

