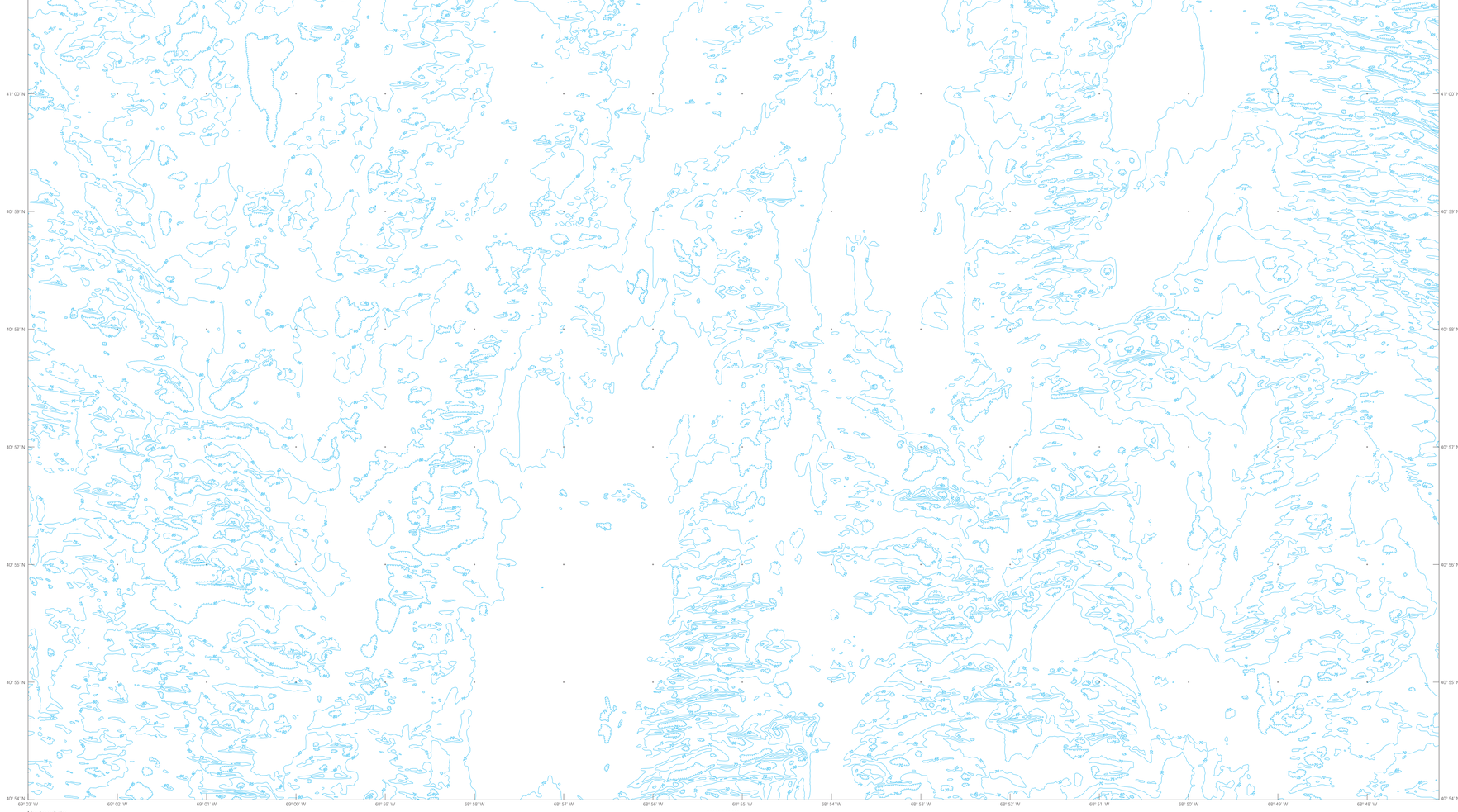
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

Prepared in cooperation with the
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

GEOLOGIC INVESTIGATIONS SERIES
MAP I-2698-A



Mercator projection

Geodetic Reference System 1980, North American Datum 1983
Longitude of central meridian 68° 55' W.; latitude of true scale 40° 50' N.
False easting 0 m; false northing 0 m

This map is not intended for navigational purposes

SCALE 1:25 000
ONE CENTIMETER REPRESENTS 250 METERS ON THE SEA FLOOR

1 0.5 0 1 2 3 4 KILOMETERS
1 0.5 0 1 2 NAUTICAL MILES

CONTOUR INTERVAL 5 METERS
DATUM MEAN LOWER LOW WATER

DISCUSSION

Introduction

The Georges Bank Mapping Project is a cooperative effort of the U.S. Geological Survey and the National Oceanic and Atmospheric Administration (NOAA), with support from the University of New Brunswick and the Canadian Hydrographic Service. A multibeam echo sounder survey of the Great South Channel region was conducted in November 1998. This map, one in a series of two mapped quadrangles (see location map), presents the results of this survey, in which sea floor topography is depicted at a scale of 1:25,000. For a map showing sun-illuminated sea floor topographic imagery, see the comparison map by Valentine and others (2002) on this CD-ROM.

Survey methods

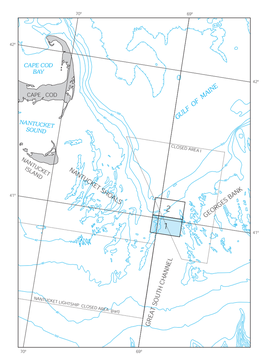
The survey was conducted using a multibeam echo sounder installed aboard the Canadian Hydrographic Service vessel *Frederick G. Creed*, a SWATH Small Waterplane Area Twin Hull ship that surveys at speeds up to 15 knots. During the survey, the ship's position was determined with an accuracy of 10 m or better using a global positioning system (GPS) receiver in conjunction with differential GPS corrections transmitted by U.S. Coast Guard radio beacons. The multibeam echo sounder data were collected by means of a Simrad Subsea EM 1000 Multibeam Echo Sounder (95 kHz) that is permanently installed in the hull of the *Creed*. In water depths between 5 and 200 m, the EM 1000 generates 60 aimed beams, spaced at intervals of 2.5 degrees, that insonify a swath of sea floor measuring in width approximately 7.5 times the water depth. Horizontal spatial resolution is on the order of 10 percent of the water depth at 15 knots; vertical resolution is approximately 1 percent of the water depth or better. Software developed by the Ocean Mapping Group, University of New Brunswick, was used to process and edit the echo sounder bathymetric and differential GPS navigation data; tidal corrections based on NOAA's Nantucket tide gauge were used to reference depth data to mean lower low water.

Topographic contour mapping

Bathymetric data were contoured using the *Arc/Info* geographic information system software (Environmental Systems Research Institute, Inc., version 7.0.3). Processed data were formatted into a point file using the *Arc/Info* "point generate" routine. The point file was transformed to a Mercator projection, with the longitude of the central meridian at 68° 55' W. and the latitude of true scale at 40°50' N. The "point grid" routine was used to create a grid from the point file and to assign depth values to individual grid cells. The cell size of the output grid was 9 m. Topographic contours at 5-meter intervals were generated using the "lattice contour" routine. Most of the contour lines are shown here unedited. However, in areas of very smooth sea floor, some contours displayed distortions caused by problems encountered during data acquisition at nadir (directly below the vessel's keel) and by refraction effects at the outermost edge of the swath. These distortions were smoothed by employing a user-defined low-frequency "focal median" filter routine on the grid created by "point grid". A square focal median filter using a 3-cell by 3-cell size was used. The resulting contours were compared with features displayed in shaded-relief seabed imagery of the same data, and were edited manually with *Arc/Edit* to remove small artifacts that remained after filtering. Large east-west-trending bedforms (typically 5 to 10 m high, but ranging up to 20 m) characterize parts of the sea floor in this region. The multibeam echo sounder had difficulty imaging these features because they are oriented at right angles to the ship's tracks and display steep sides and narrow crests. As a result, some of these bedforms are depicted by slightly irregular contours. Each of the quadrangles was contoured independently, and contours that extend into Quadrangle 2 were edited manually to match at the boundary.

REFERENCE CITED

Valentine, P.C., Middleton, T.J., and Malczyk, J.T., 2002, Sun-illuminated sea floor topography of Quadrangle 1, map B of Valentine, P.C., ed., Maps showing sea floor topography, sun-illuminated sea floor topography, and backscatter intensity of Quadrangles 1 and 2 in the Great South Channel region, western Georges Bank: U.S. Geological Survey Geologic Investigations Series Map I-2698, scale 1:25,000, on a CD-ROM.



Location map outlining the two quadrangles in this series. Quadrangle 1 shown in blue. Closed Area I and Nantucket Lightship Closed Area were established in December 1994 by the New England Fishery Management Council. Bathymetric contours are in meters.

SEA FLOOR TOPOGRAPHY OF QUADRANGLE 1

By

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Map A of

Maps Showing Sea Floor Topography, Sun-Illuminated Sea Floor Topography, and Backscatter Intensity of Quadrangles 1 and 2 in the Great South Channel Region, Western Georges Bank

Page C. Valentine, editor

2002

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CD-ROM of I-2698 is for sale by U.S. Geological Survey, Information Services, Box 25286, Federal Center, Denver, CO 80225; telephone: 1-888-ASK-USGS

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