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**Oceanographic maps of the
North Atlantic**

R.T.Pollard & C.M.Pollard

1991

**INSTITUTE OF OCEANOGRAPHIC SCIENCES
DEACON LABORATORY**

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Wormley
Godalming
Surrey GU8 5UB
Tel 0428 684141
Telex 858833 OCEANS G
Telefax 0428 683066

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ABSTRACT <p style="margin-top: 20px;">Maps from a number of recent publications have been redrawn and are presented in a standard format. The computerised storage will allow the maps to be redrawn in several different projections.</p>	
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ISSUING ORGANISATION <div style="display: flex; justify-content: space-between; margin-top: 10px;"> <div style="width: 60%;"> <p>Institute of Oceanographic Sciences Deacon Laboratory Wormley, Godalming Surrey GU8 5UB. UK.</p> <p>Director: Colin Summerhayes DSc</p> </div> <div style="width: 35%; text-align: right;"> <p>Telephone Wormley (0428) 684141 Telex 858833 OCEANS G. Facsimile (0428) 683066</p> </div> </div>	
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Oceanographic Maps of the North Atlantic

Abstract

Maps from a number of recent publications have been redrawn and are presented in a standard format. The computerised storage will allow the maps to be redrawn in several different projections.

Introduction

A series of maps compiled by Woods (1987) has proved a valuable source of data for anyone working on the North Atlantic or planning cruises to the area. We decided that it would be useful to update the Woods Miscellany by recontouring a number of property maps that have been published since that publication appeared, or that were not included in it. This short report is the first result.

The major strength of the original work is that numerous maps were all drawn to the same scale for ease of overlaying. However, the maps were hand-drawn by a cartographer, so the projection (Stereographic, centred on 0°N, 30°W) cannot be changed. In this version, the maps have been transferred into an Apple Mac cartographic package called Azimuth. They are thus all held in computerised form, and can be easily revised or redrawn on different projections.

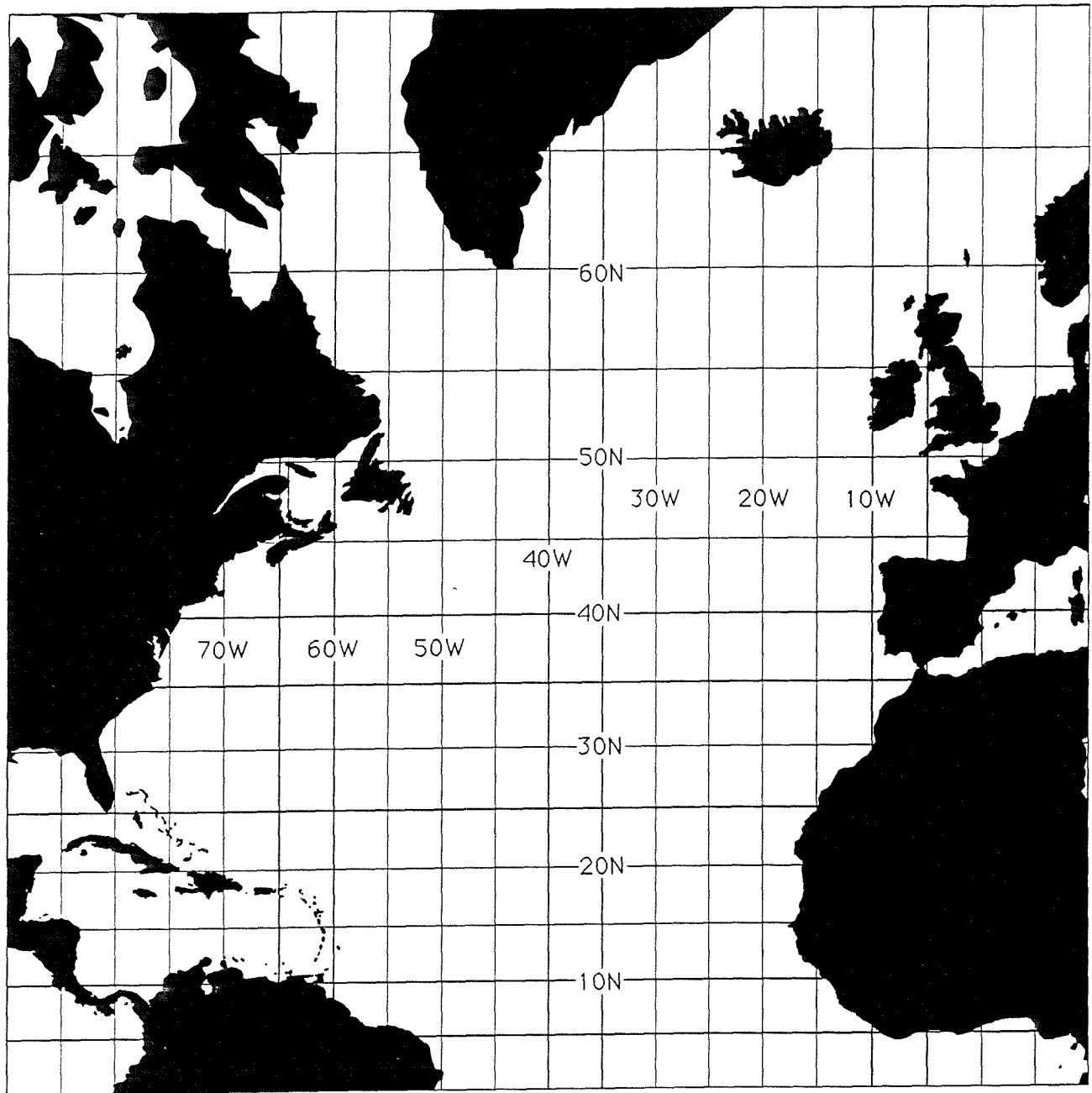
This first issue is the result of a three-week trial project using beta-test software. The projection used is Mercator. Suggestions are welcome for a better standard, if there is one, and for maps that it would be particularly useful to convert to this format. We hope that the data-base will grow gradually. If it does, this unpublished report will be reissued from time to time.

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- Figure 1. Base Chart (Mercator)
- Figure 2. Potential density of the surface mixed layer in late winter (McCartney and Talley, 1982)
- Figure 3. Potential temperature of the surface mixed layer in late winter (McCartney and Talley, 1982)
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- Figure 5. Potential vorticity of Labrador Sea Water (Talley and McCartney, 1982)
- Figure 6. Potential vorticity between the isopycnals 27.3 and 27.6 (McDowell et al., 1982)
- Figure 7. TOPOGULF survey lines (Sy, 1988)
- Figure 8. Potential temperature at 300 m during TOPOGULF (Arhan, 1990)
- Figure 9. Dynamic height 100 m/1500 m during TOPOGULF (Arhan, 1990)
- Figure 10. Schematic of North Atlantic and Azores Currents (Sy, 1988)

References

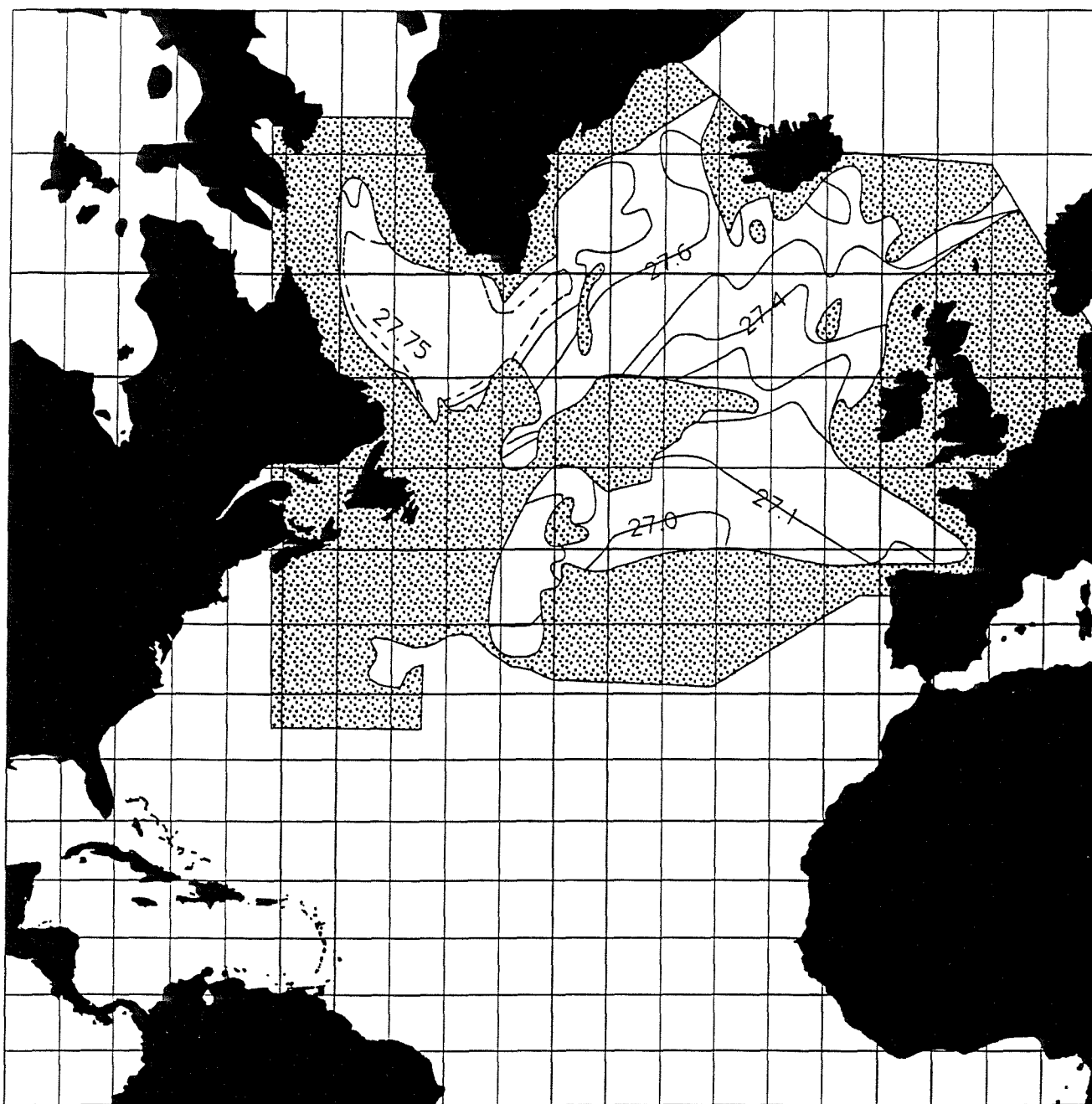
- Arhan, M., 1990: The North Atlantic Current and Subarctic Intermediate Water.
Journal of Marine Research, **48**, 109-144.
- McCartney, M. S. and L. D. Talley, 1982: The Subpolar Mode Water of the North Atlantic Ocean.
Journal of Physical Oceanography, **12**(11), 1169-1188.
- McDowell, S., P. Rhines and T. Keffer, 1982: North Atlantic Potential Vorticity and Its Relation to the General Circulation.
Journal of Physical Oceanography, **12**(12), 1417-1436.
- Sy, A., 1988: Investigation of large-scale circulation patterns in the central North Atlantic: the North Atlantic Current, the Azores Current, and the Mediterranean Water plume in the area of the Mid-Atlantic Ridge.
Deep-Sea Research, **35**(3), 383-413.
- Talley, L. D. and M. S. McCartney, 1982: Distribution and Circulation of Labrador Sea Water.
Journal of Physical Oceanography, **12**(11), 1189-1205.
- Woods, J. D., 1987: The Warmwatersphere of the Northeast Atlantic, A Miscellany.
Report 128, 2nd edition, Institut für Meereskunde, 47 pp.



Base Map

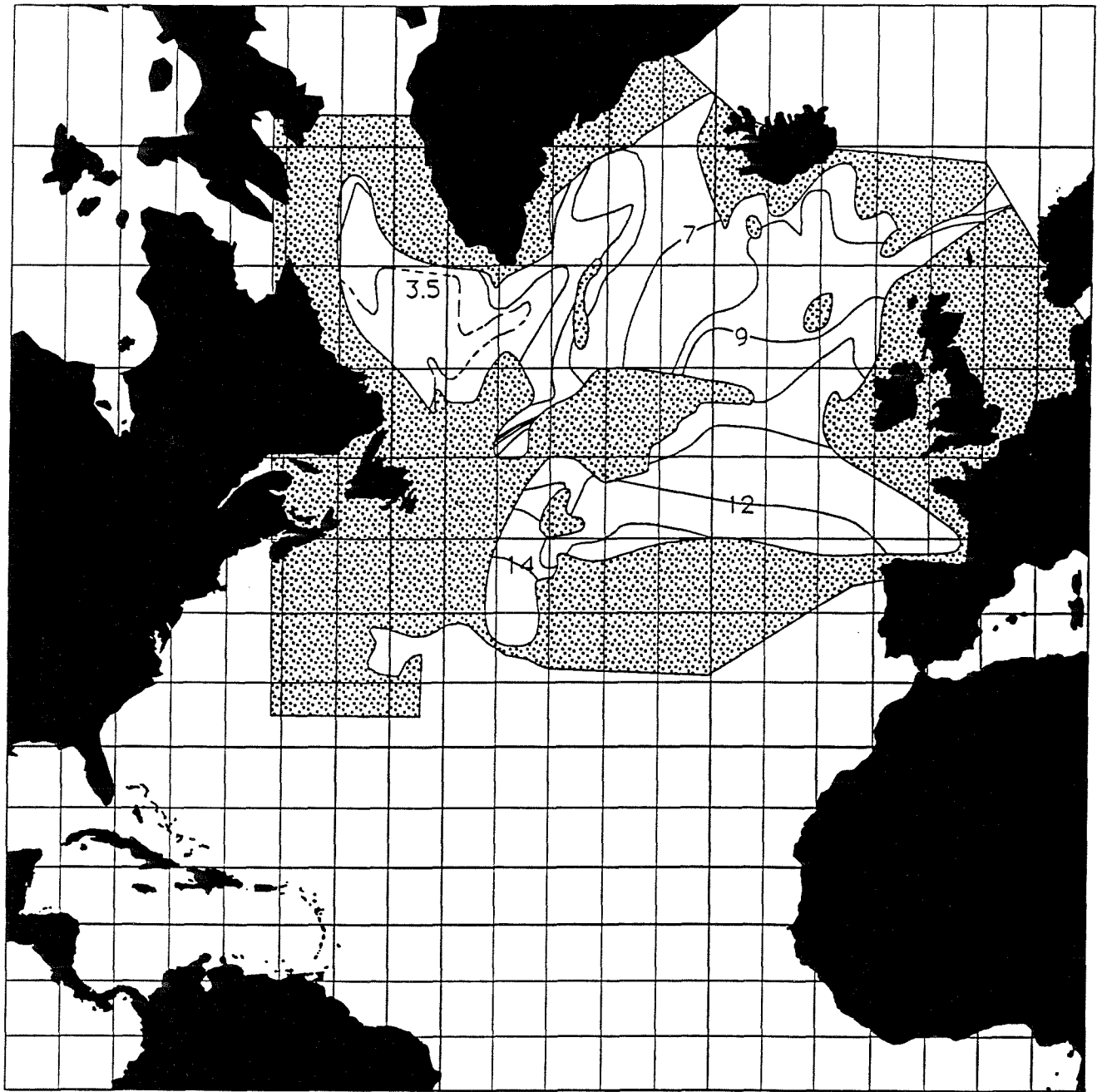
Figure 1. Basis for all the maps following, before data was added.

Mercator Projection; Area 0 North to 70 North, 10 East to 90 West



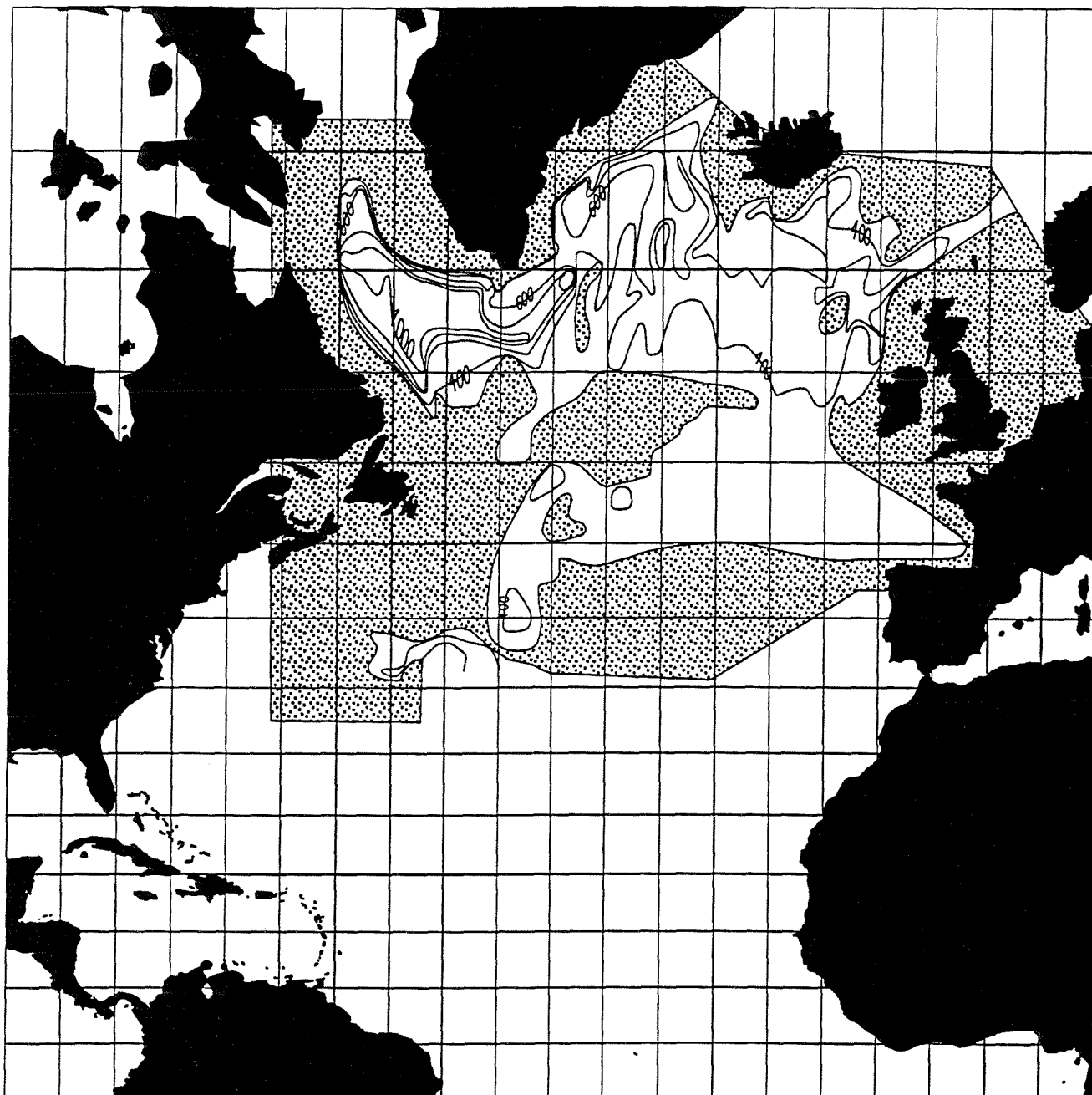
Potential density of the surface mixed layer in late winter
(McCartney and Talley, 1982)

Figure 2. Potential density σ_θ (mg cm^{-3}) of the surface mixed layer in "late winter" - January through April. Properties are contoured only where the layer thicknesses are greater than 200 m for a density layer of $\Delta\sigma_\theta = 0.02$ mg cm^{-3} . The shaded area occurs where the layer thickness is less than 200 m. The Norwegian-Greenland Sea is excluded from the contouring, except where shown in the Norwegian Current.



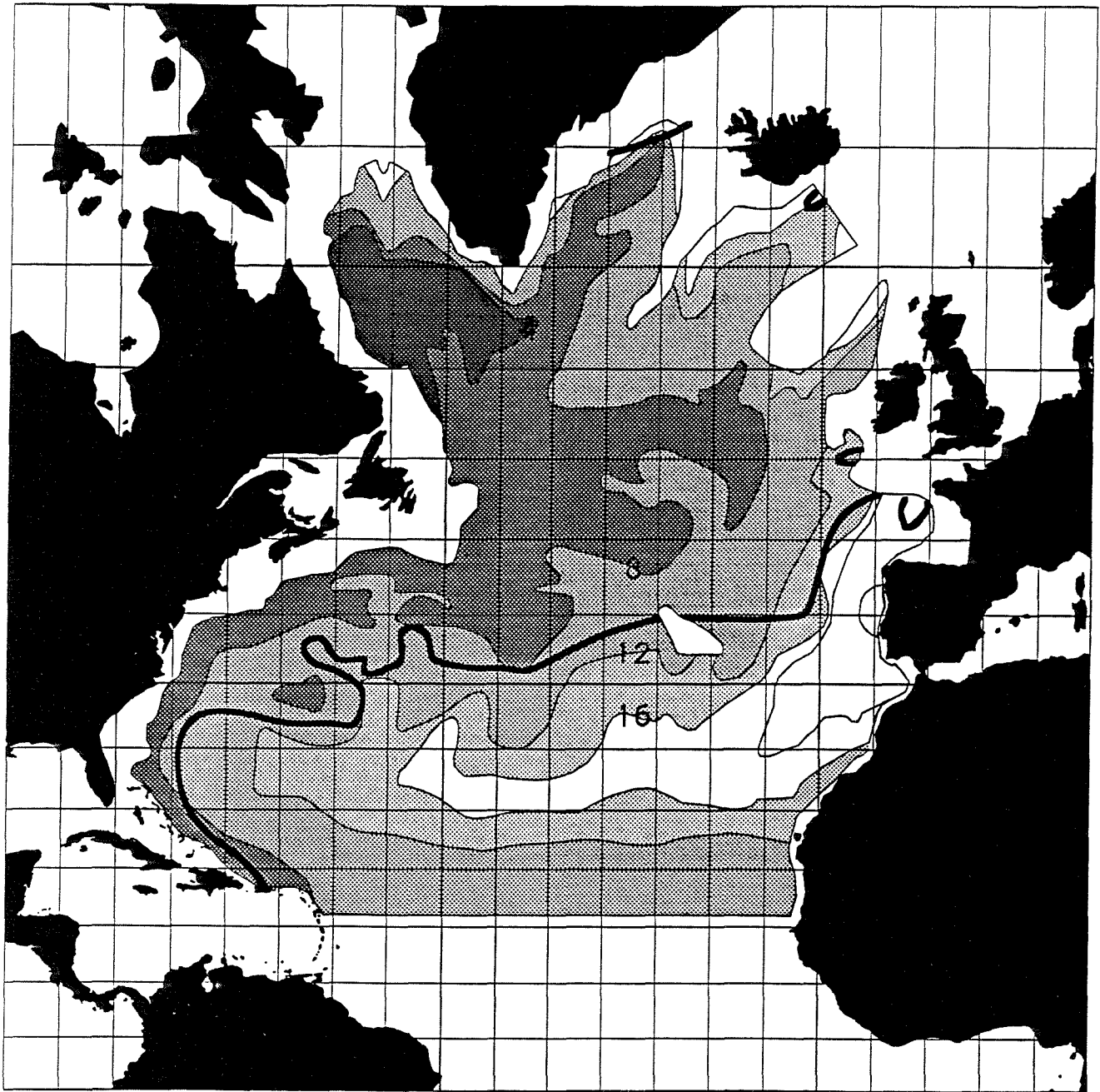
Potential temperature of the surface mixed layer in late winter
(McCartney and Talley, 1982)

Figure 3. Potential temperature θ ($^{\circ}\text{C}$) of the surface mixed layer in "late winter" - January through April. Properties are contoured only where the layer thicknesses are greater than 200 m for a density layer of $\Delta\sigma_{\theta} = 0.02 \text{ mg cm}^{-3}$. The shaded area occurs where the layer thickness is less than 200 m. The Norwegian-Greenland Sea is excluded from the contouring, except where shown in the Norwegian Current.



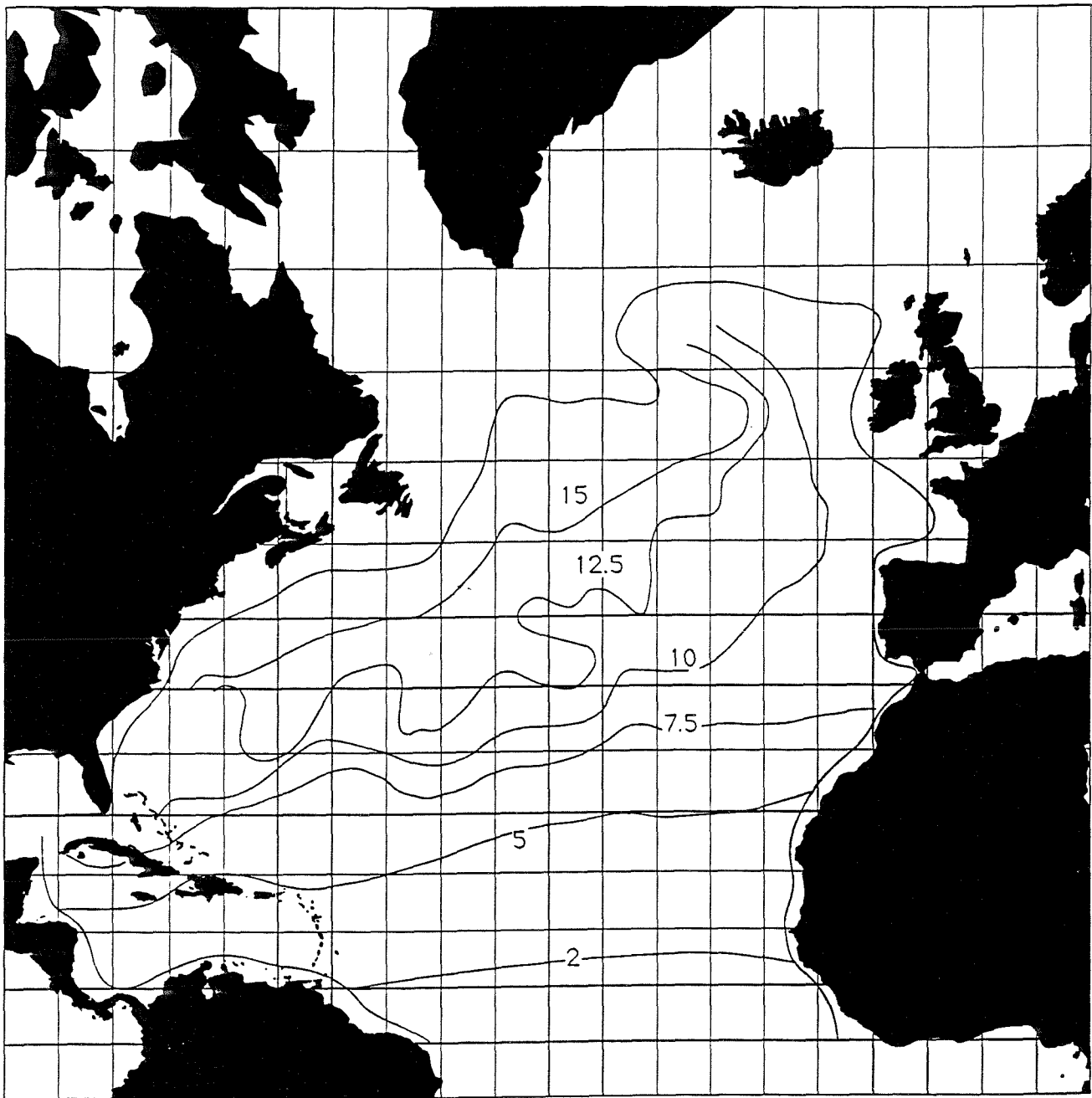
Mixed layer depth in late winter (McCartney and Talley, 1982)

Figure 4. Thickness of a density layer of $\Delta\sigma_\theta = 0.02 \text{ mg cm}^{-3}$ at or close to the sea surface based on "late winter" - January through April. Properties are contoured only where the layer thicknesses are greater than 200 m for a density layer of $\Delta\sigma_\theta = 0.02 \text{ mg cm}^{-3}$. The shaded area occurs where the layer thickness is less than 200 m. The Norwegian-Greenland Sea is excluded from the contouring, except where shown in the Norwegian Current.



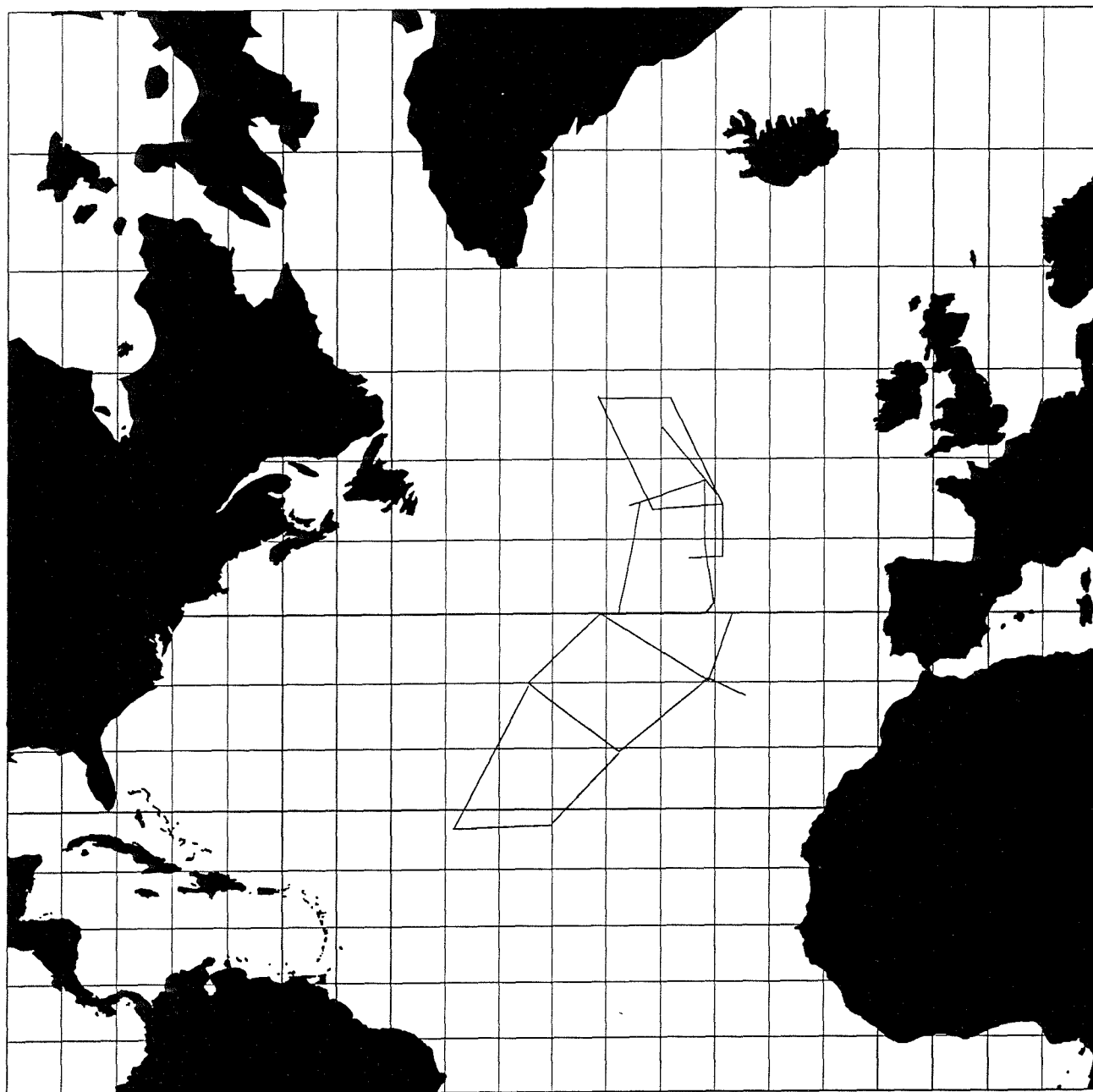
Potential vorticity of Labrador Sea Water (Talley and McCartney, 1982)

Figure 5 Potential vorticity ($10^{-12} \text{ m}^{-1} \text{ s}^{-1}$) at the LSW potential vorticity minimum. The heavy curves are the limits of the identifiable LSW potential vorticity minimum. Beyond these curves, contouring is continued on the $\sigma_{1500} = 34.72 \text{ mg cm}^{-3}$ surface.



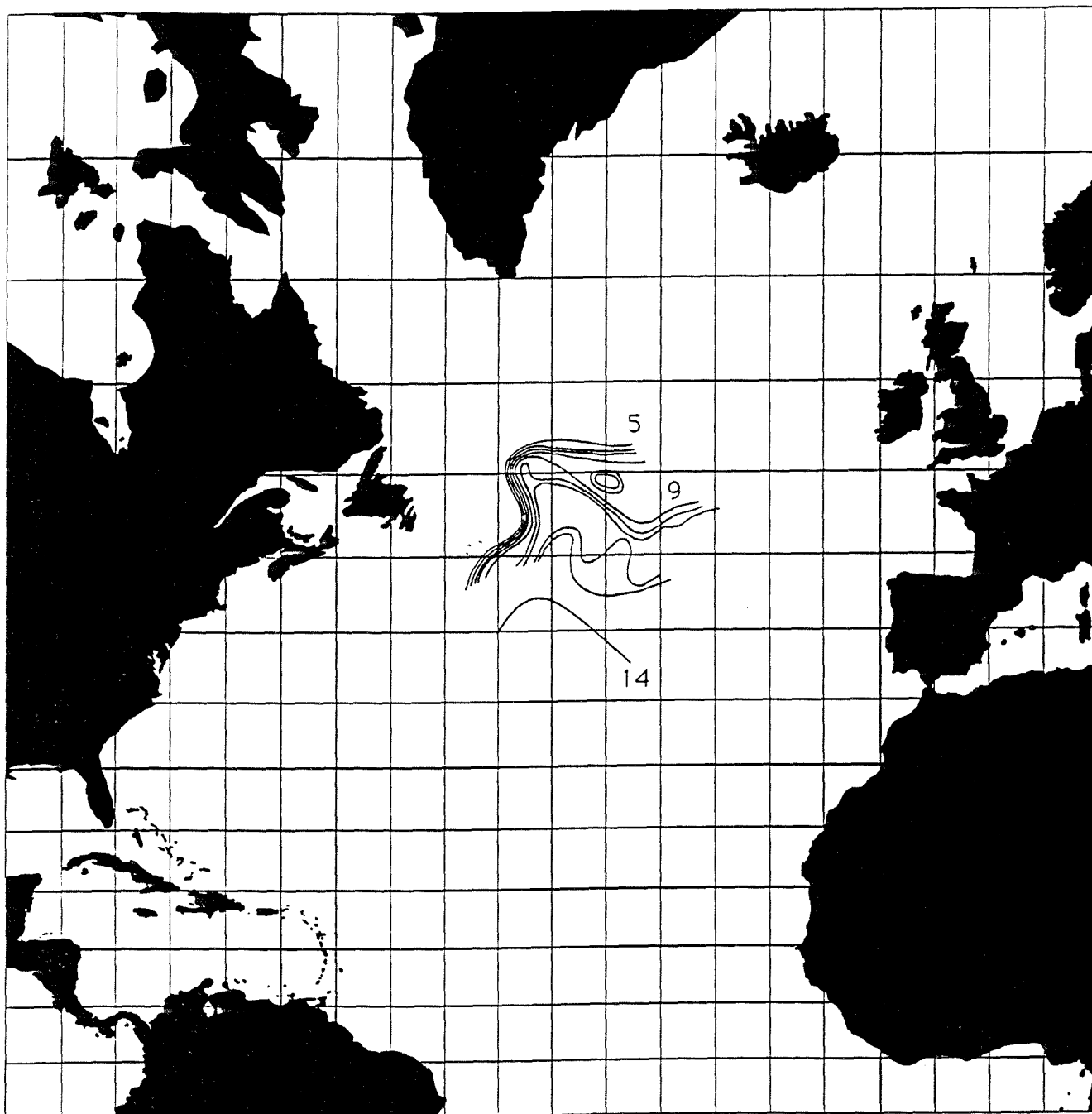
Potential vorticity between the isopycnals 27.3 and 27.6 (McDowell et al, 1982)

Figure 6 Potential vorticity ($10^{-11} \text{ m}^{-1} \text{ s}^{-1}$) between the $\sigma_\theta = 27.3$ and 27.6 surfaces. The q contours stretch from northeast to southwest, allowing easy communication of fluid between high latitude and the deep subtropical Atlantic.



TOPOGULF survey lines (based on Sy, 1988)

Figure 7 CTD sections worked by RV Suroit, Poseidon and Meteor in 1983 and 1984.



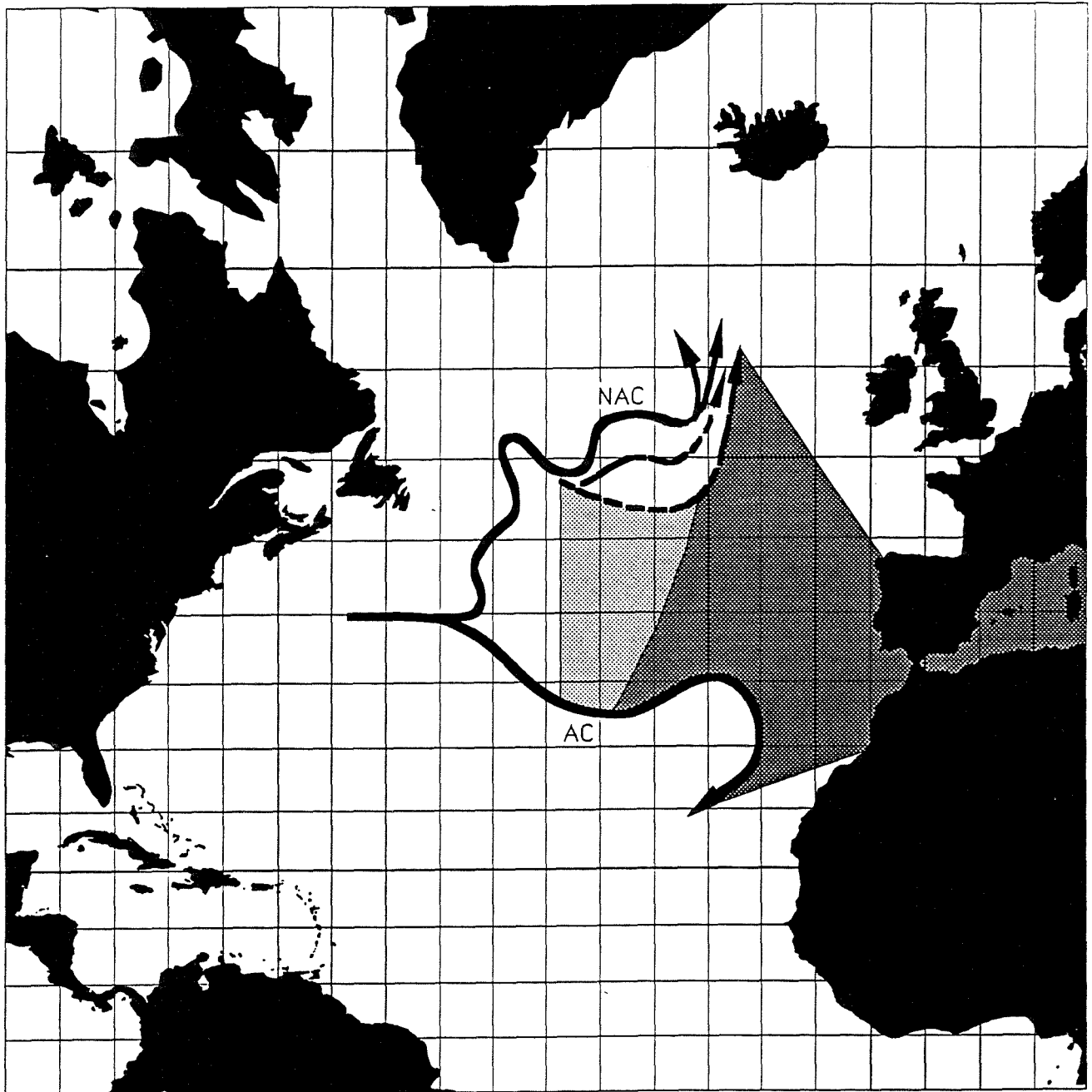
Potential temperature at 300 m during TOPOGULF (Arhan, 1990)

Figure 8 Potential temperature at 300 m in the Newfoundland Basin from a historical composite set of data gathered from R/V Discovery in August 1958, R/V Atlantis II from January to April 1964, and R/V Baffin in July 1964.



Dynamic height 100 m/1500 m during TOPOGULF (Arhan, 1990)

Figure 9 Dynamic height 100 m/1500 m in the Newfoundland Basin from a historical composite set of data gathered from R/V Discovery in August 1958, R/V Atlantis II from January to April 1964, and R/V Baffin in July 1964.



Schematic of North Atlantic and Azores Currents (Sy, 1988)

Figure 10 Diagrammatic map of the Gulf Stream extension current: the North Atlantic Current (NAC) and Azores Current (AC) based on TOPOGULF and selected literature. The broken lines of the NAC indicate the transient nature of its current branches.

Procedure for map conversion to AppleMac

by C. Pollard

Initial processing of data

(1) Photocopy (enlarge as much as is sensible) map which is to be transfered.

(2) Rule lines onto the photocopy at: 1, 2, or 5 degree intervals, whichever is most suitable (both latitude & longitude lines).

(3) Define each line to be transfered.

(4) Work out the coordinates every time a line crosses a lat. or long. line. Also find coordinates of turning points within grid squares. Note down all coordinates under separate headings for each line.

Transference to computer

(1) Load AZIMUTH 

(2) Goto pull-down menu **File**, go to **Open**.

(3) You are presented with the folder Azimuth & the selection:

- HiRes World
- LoRes World
- North America
- Symbol Template
- (Maps)
- (Scaled Maps)

Open "HiRes World" (double click)

(4) You are given a map of the world with even spacing between lat. & long. lines. Firstly set the grid to spacing of 1, 2 or 5 degrees..using pull down menu **Page, set grid...**

(5) Under reference grid, change number to 1, 2, or 5 then click **OK**.

(6) If you are working from a Mercator Projection one can easily limit the map area shown on screen. By doing this one also reduces the time the computer takes to plot out the map onto the screen. Goto pull-down menu **Map** and select **Set Projection**.

(7) Set the projection to Mercator Conf. , and the screen will look like this;

SET PROJECTION

E.A.=Equal Area, E.D.=Equidistant, Conf.=Conformal

☐ Pictorial Perspective

☒ Mercator Conf.

☐ McBryde-Thomas (E.A.)

☐ Miller Cylin

☐ Albers Conic (E.A.)

☐ Lambert Conic (E.A.)

☐ Equidistant Conic (E.D.)

☐ Azimuthal Equi. D (E.D.)

☐ Azimuthal Equi. A (E.A.)

CENTRAL MERIDIAN

Scale

Grid Limits

Latitude (-for South)

from to

Longitude expanse

Grid interval

OK

Cancel

Help

From the top..


Set to central longitude line.

Set to furthest southern latitude line (minus if below the equator).

Set to furthest northern latitude line (minus if below the equator).

Set to width (in degrees) of map area.


Set grid intervals to the same as in (5), leave the scale selection till later.

(8) Having pressed the OK button, you should now be back on the Base Layer (shown bottom left of screen). Goto the side menu  and double click to get Create Box menu; Input height as latitudinal expanse, and width as longitudinal expanse.

Position X }

Y } ...(coordinates of top left-hand corner of map area)

Then click .

(9) Click on the side menu  (zoom in) & drag a window around the box you have created (8)


(10) While holding down the shift key, click on all land which is within the box, (this selects it) or if they are small then, still holding the shift key down, drag a window around them.

(11) Go to the pull down menu Δ then go to **Lock**.

(12) Then select all, $\% A$ Then go to **Edit** and thence to **Clear**. This leaves only the land relevant to the map which you are transferring, thus reducing the time it takes the computer to process all the polygons.

(13) Goto the pull down menu **File** go to **Save as...** then type in..

Title (Filename) Base. This means that if you have more than one figure to copy, but with an identical base map, you do not need to repeat all the above steps for the next map, you just open *Title* Base

(14) You are now ready to start plotting the lines onto the map; Double click side menu 

(15) CREATE POLYGON

Enter the coordinates of the lines within the X & Y boxes. (use mouse to get into each box, because if you try to use return it will end the section and draw as far as you have got. Reserve return for the end of the whole line.) After you have entered one

pair of X & Y coordinates press the **Add** button. After you have entered the last set of coordinates for the line, click off the close polygon square, then press return or **OK**..

(16) Goto the pull down menu **Edit** thence to :

Smoothing h **NONE**

Bezier Spline

Cubic Spline

Click on the Bezier Spline

(17) Repeat steps (14), (15), & (16) for each line then press **⌘ A**


(18) Checking Accuracy..

Goto pull down menu **Layer** then to :

Set Layer h **Untitled**

Base Layer


and click on Untitled.

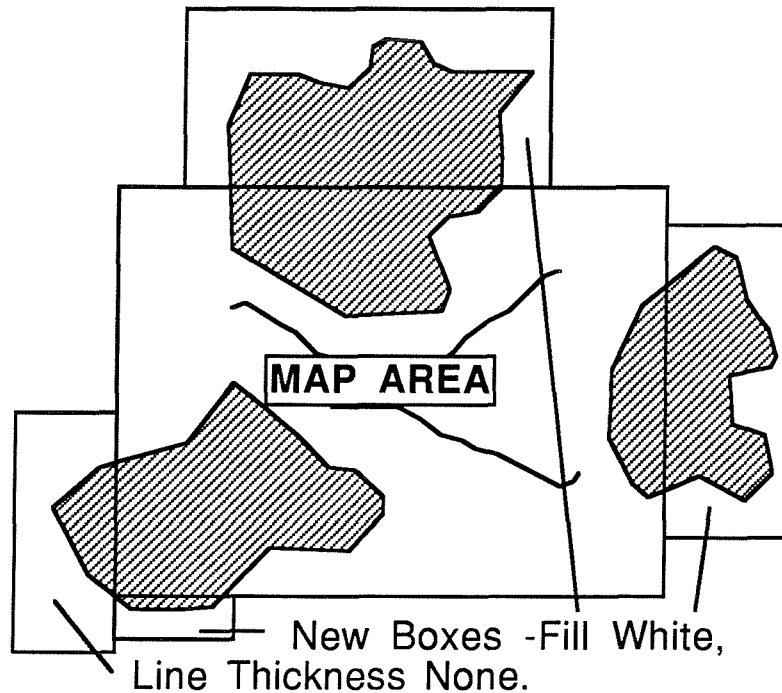
(19) Zoom out  until the gray rectangle is visible (the page marker).

(20) Goto **Map** then to **Plot Grid**. If the grid will fit reasonably within the grayed area go to (22) else press **⌘ H**.

(21) Goto **Map** then to **Set Projection...** & reduce or increase the scale facility as necessary. Click on **OK**..then go back to (20)

(22) Press **⌘ H**, go to **Map,Plot Map**.

(23) Press **H6** to group the polygons, then using  (side menu, single click) draw boxes (fill white) up to the box made in (8) to cover up any land hanging out at the edges ie.



(24) Each new box should have **Fill** - White, // set thickness

(25) Then press **H6** to tidy up.

(26) Goto **Map, Plot Grid**, if nothing appears to happen then go to set line thickness .. thin. Then press **H6**.

(27) Then select all and drag everything until the map area is situated within the gray rectangle.

(28) Go to **File, Print Set up ...** and set this from 72 (very coarse to) to 1500 (very fine but takes a long time to print.)

(29) Press **HP** to print.

(30) Go to **File, Save as...** then enter only the filename.

