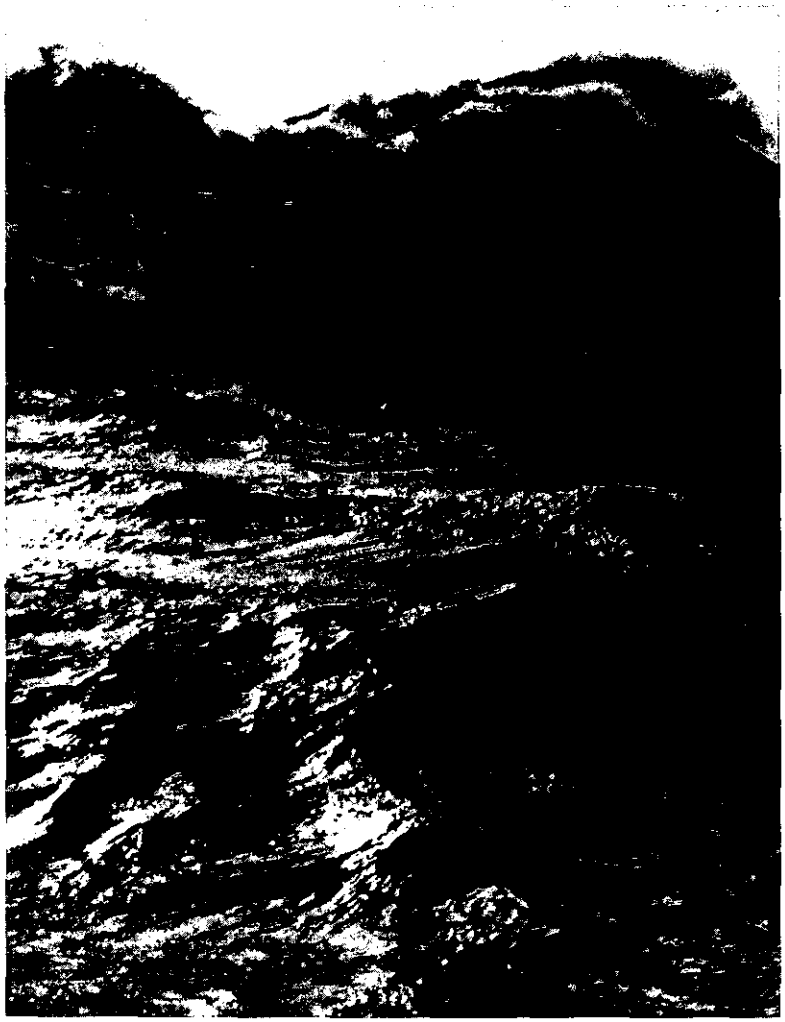
OCEANOGRAPHIC Monthly Summary

Volume I Number 1 January 1981



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National Weather Service/National Earth Satellite Service

Hemispheric Analyses

On alternate days for the Northern and Southern Hemispheres, two-day composite hemispheric sea surface temperature (SST) analyses are prepared using SST observations from ship weather reports, data buoys, expendable bathythermographs, and satellites. These data are analyzed on polar stereographic grids having a mesh length of 190.5 km at 60° latitude (true) and 102.1 km at the equator. Agreement between the hemispheric analyses in the equatorial regions is largely assured by the fact that corners of the polar stereographic grids extend well into the opposing hemisphere permitting the analyses to overlap near the equator.

The objective analysis technique known as "conditional relaxation" corrects the previous analysis with those new observations which have passed a variety of validity tests. Areas where no observations are available are modified by the "relaxation" procedure which maintains the divergence of the SST gradient in these areas.

Each two-day SST analysis is interpolated to a 2° latitude/longitude grid using bilinear interpolation. The monthly products are then derived from the interpolated analyses on the 2° x 2° grid. The Alexander-Mobley climatology is used to form the anomalies.....Sigurd Larson

Regional Analyses

Five-day composite regional sea surface temperature (SST) analyses are prepared twice each week using SST observations from ship weather reports, data buoys, expendable bathythermographs, and satellites. These data are analyzed on polar stereographic grids, having mesh lengths of 23.8 km at 60°N (true).

The objective analysis technique, similar to the "Cressman" technique, corrects the previous analysis with those new observations which have passed a variety of validity tests. These corrections are a weighted mean of differences between the observation and the previous analysis. Grid points in data-sparse areas are modified by distant observations through corrections weighted inversely proportional to the distance between the observation and the grid point.

Each twice-weekly SST analysis is interpolated to a 1° latitude/longitude grid using bilinear interpolation. The monthly products are then derived from the interpolated analyses on the 1° x 1° grid. The Robinson-Bauer climatology (described on page 3) is used to form the anomalies. . . . . Bill Gemmill

*Alexander, R.C. and R.L. Mobley, 1976. Monthly Average Sea-Surface Temperature and Ice-Pack Limits on a 1° Global Grid; *Monthly Weather Review, 104 (2), 143-8.*

Oceanographic Monthly Summary

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Oceanographic Monthly Summary replaces two long-lived oceanographic analysis publications, *gulfstream* and *Fishing Information*.

The *gulfstream* magazine was first published in January 1964 as *The Gulf Stream Monthly Summary* by the U.S. Naval Oceanographic Office (NavOceano). NavOceano's Antisubmarine Warfare Environmental Prediction System (ASWEPS) program collected a lot of Gulf Stream data that program managers felt could be useful to both academic researchers and the Navy Fleet if released in a timely manner. The 4-page monthly magazine was begun to meet these needs, and included maps of Gulf Stream location, monthly mean surface temperature patterns and anomalies, and subsurface temperature data. The climatology used for calculating anomalies was put together from NavOceano oceanographic data files. In 1967, the magazine was expanded to include a 2-page article on Gulf Stream research findings. NOAA took over the magazine, changing its name to *gulfstream*, in January 1975, continuing to present basically the same information. The two Gulf Stream magazines thus constitute an uninterrupted 16-year history of Gulf Stream meandering and associated eddy movements.

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Our new climatology (regional analyses products only) will be from Robinson and Bauer.* This is a computer-assisted, subjective analysis of all vertical-profile temperature data: the entire mechanical and expendable bathythermograph (MBT and XBT) files; portions of the hydrocast, salinity/conductivity temperature depth (STD/CTD), radio message files; analysis of the Asheville Marine Deck; published data and analysis; and subjective interpretation of wind and current charts. Data comprise 381,199 North Pacific Observations to 1969, 727,452 Atlantic/Indian Ocean observations to 1974, and 250,000 Southern Hemisphere observations to 1979. The majority of data are MBT's, so the climatology best represents conditions since 1942.

Climatology preparation included correction of raw data, subjective selection of dominant patterns, separate hand-analysis of coastal areas, and extrapolations in no-data areas based on wind, topography, and currents. We chose this SST climatology because it includes (and is consistent with) subsurface levels, and because the data have been quality-controlled and subjectively corrected. *Oceanographic Monthly Summary* will publish a supplement in mid-1981 containing Robinson-Bauer monthly mean SST climatologies for each of our six map areas.

*Robinson, M.K., 1976. Atlas of North Pacific Ocean Monthly Mean Temperatures and Mean Salinities of the Surface Layer; *NavOceano Ref. Pub. 2.*

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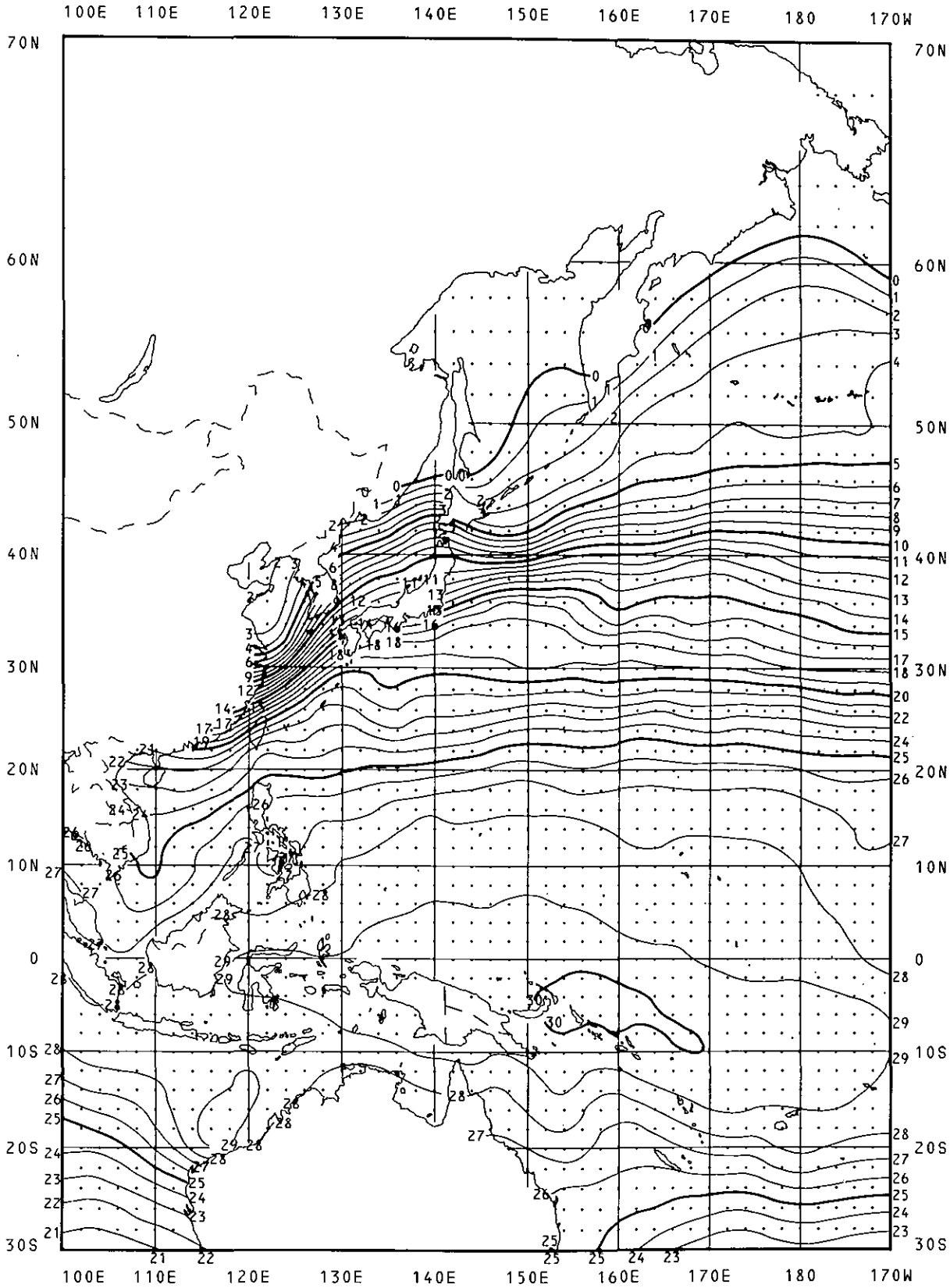

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SST--MONTHLY MEAN (°C)
January 1981

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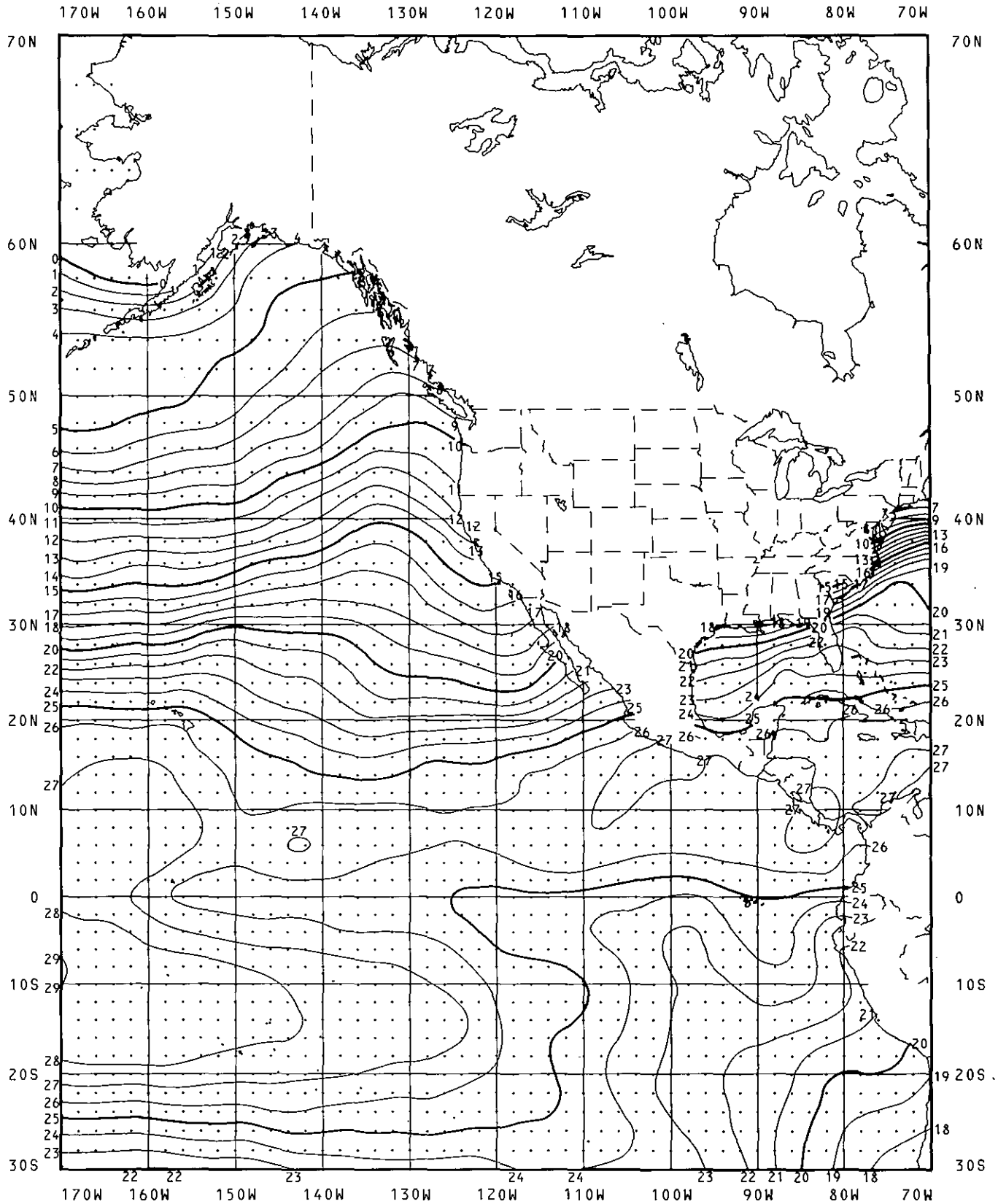

Eastern Pacific Ocean
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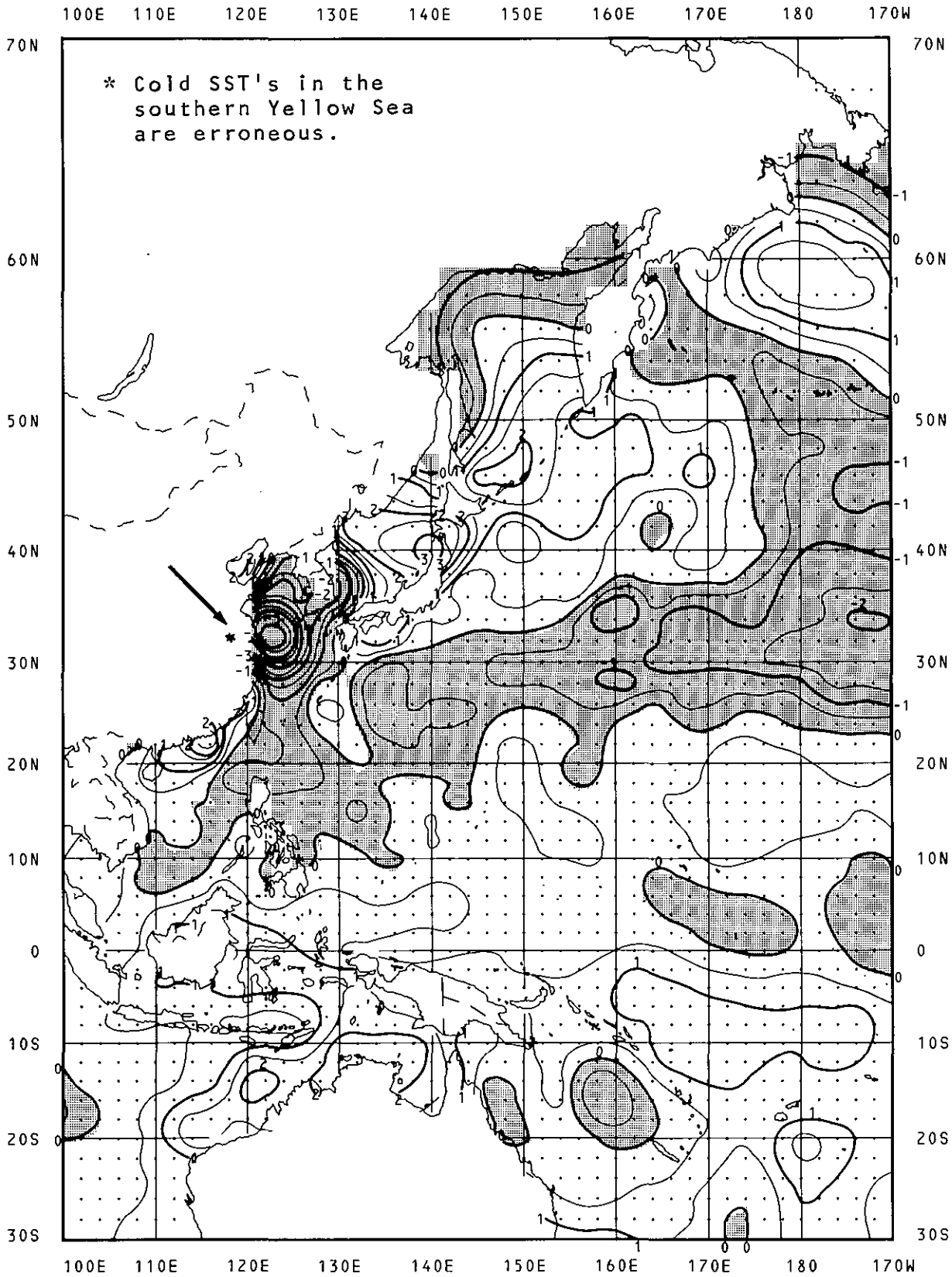

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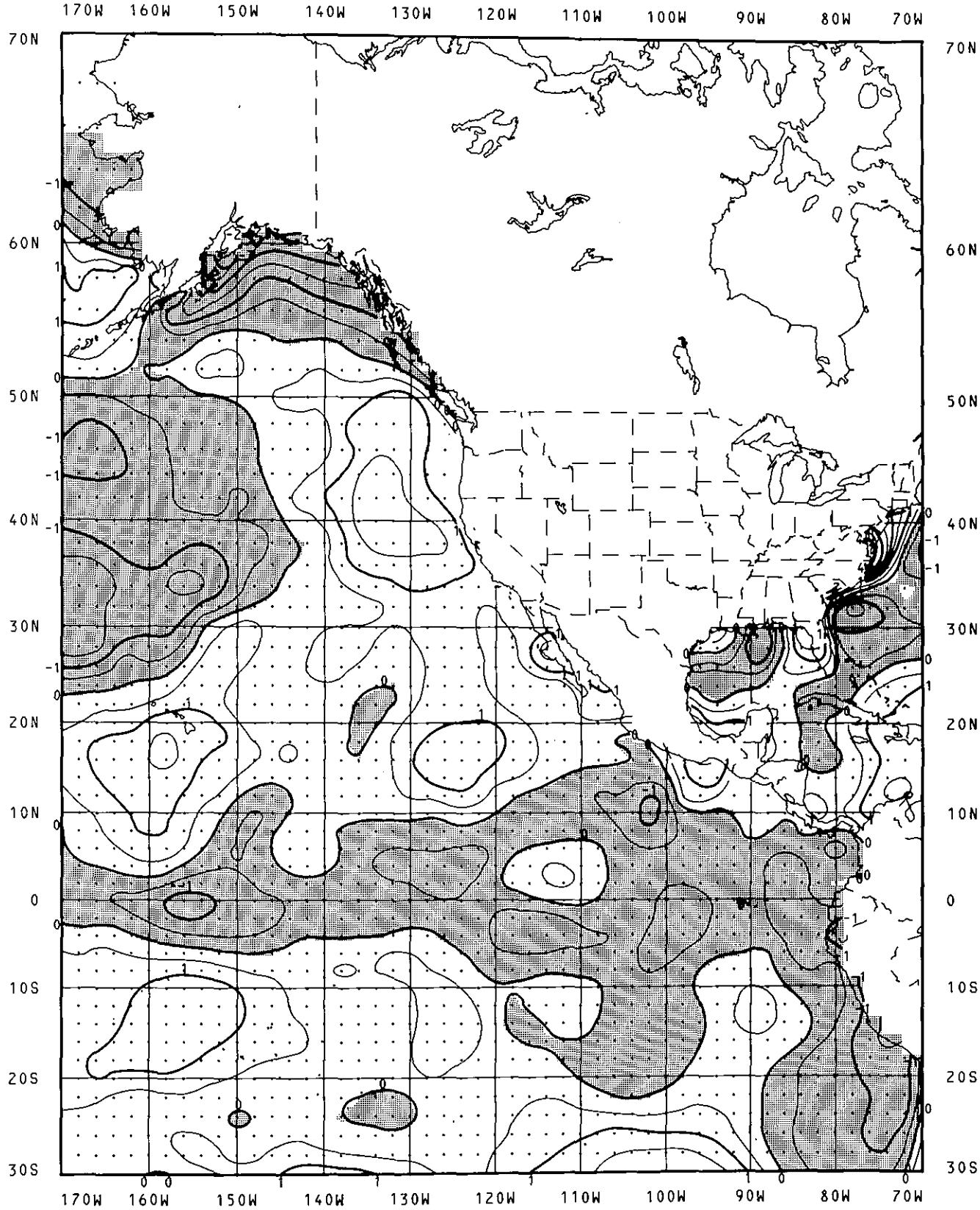

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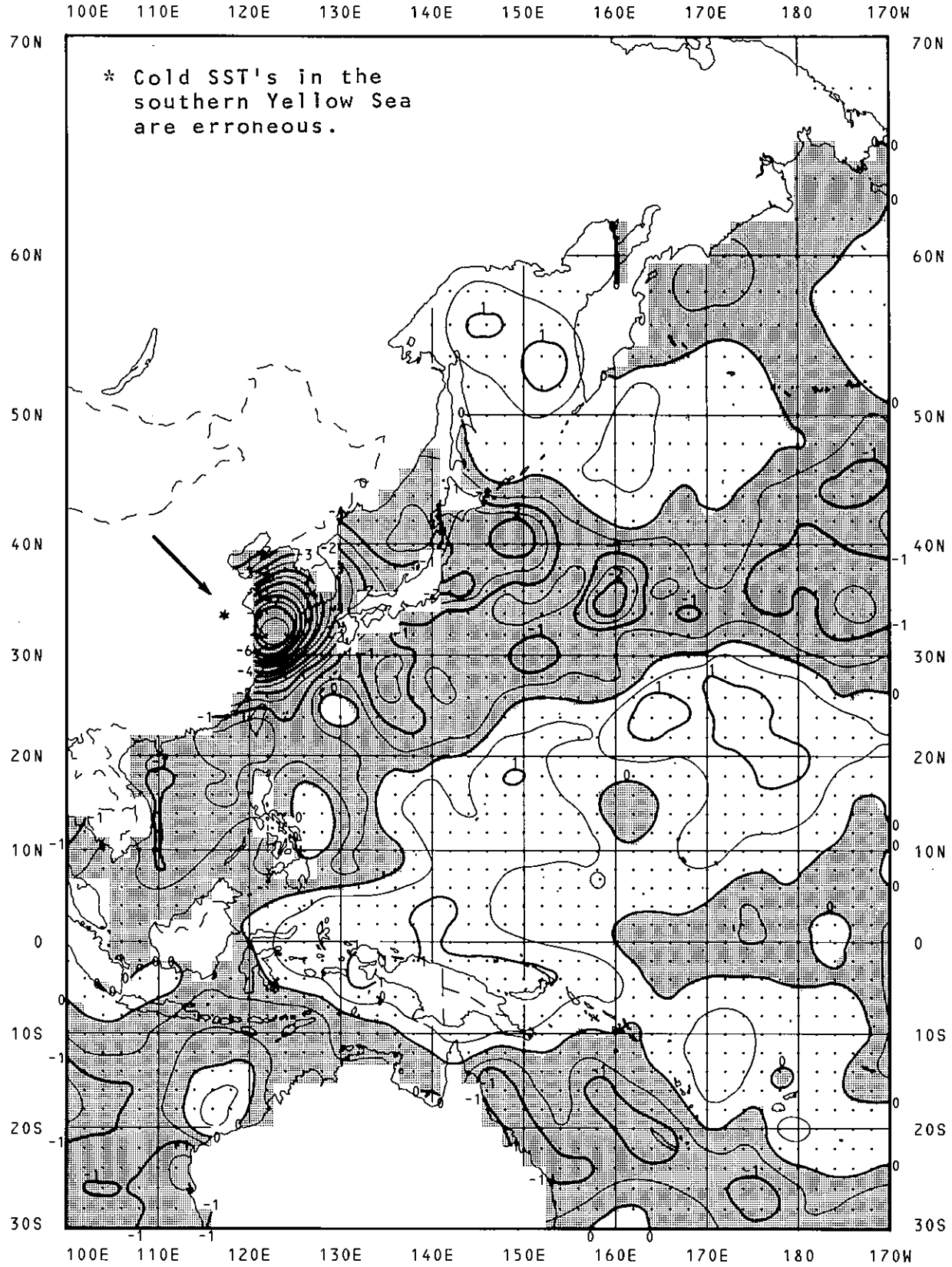

Western Pacific Ocean
SST--YEARLY CHANGE (°C)
January 1981

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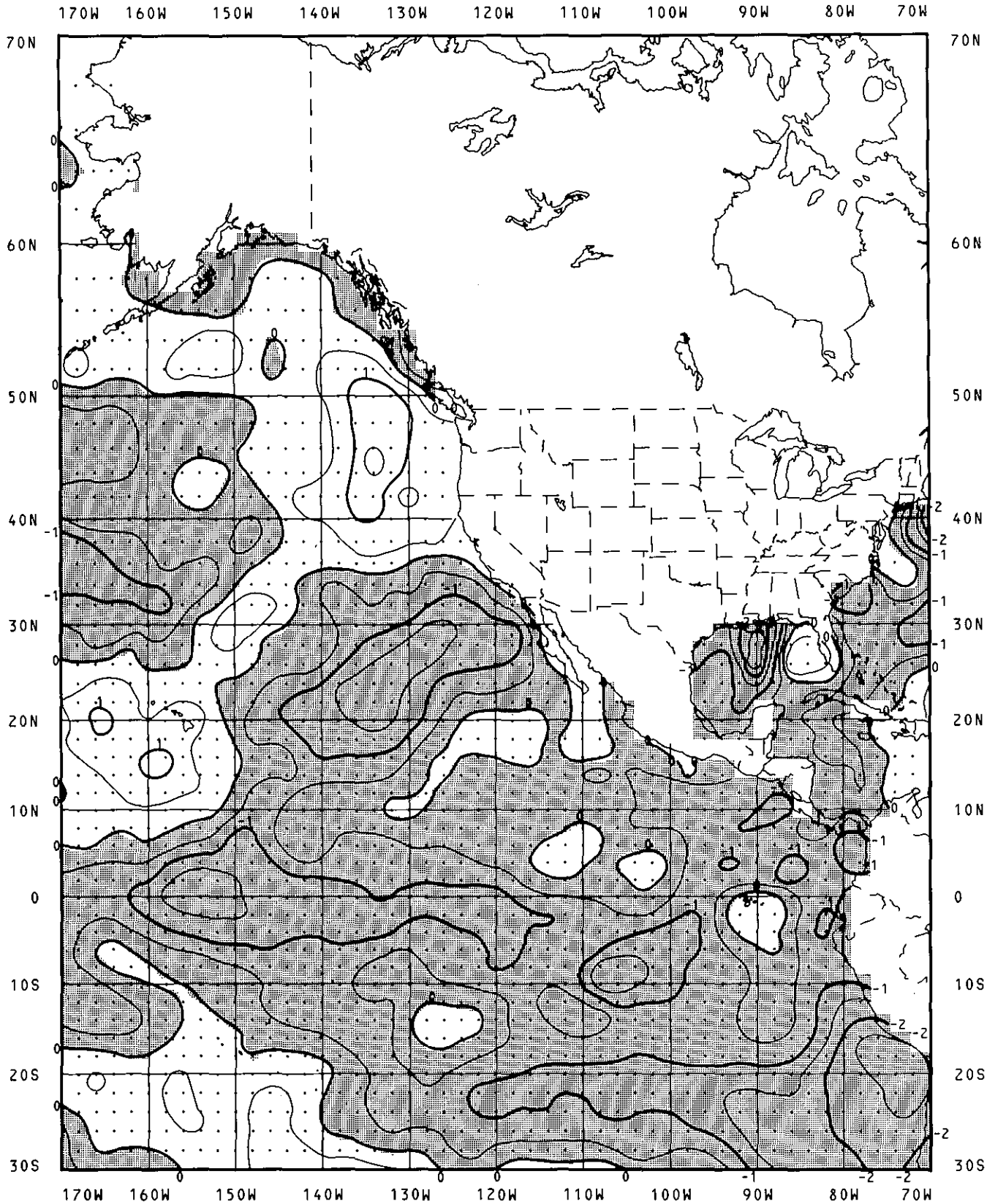

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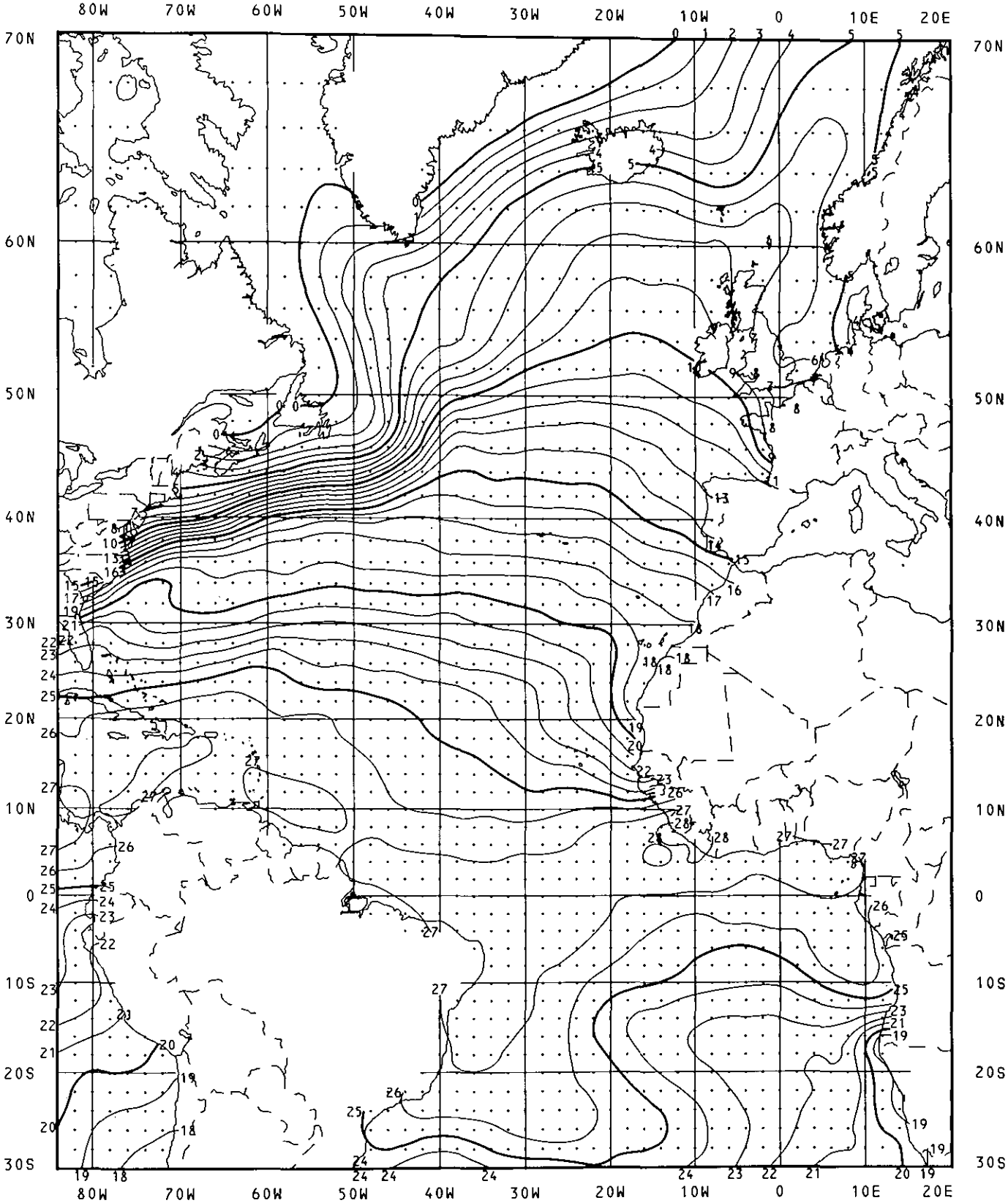

Atlantic Ocean
SST--MONTHLY MEAN (°C)
January 1981

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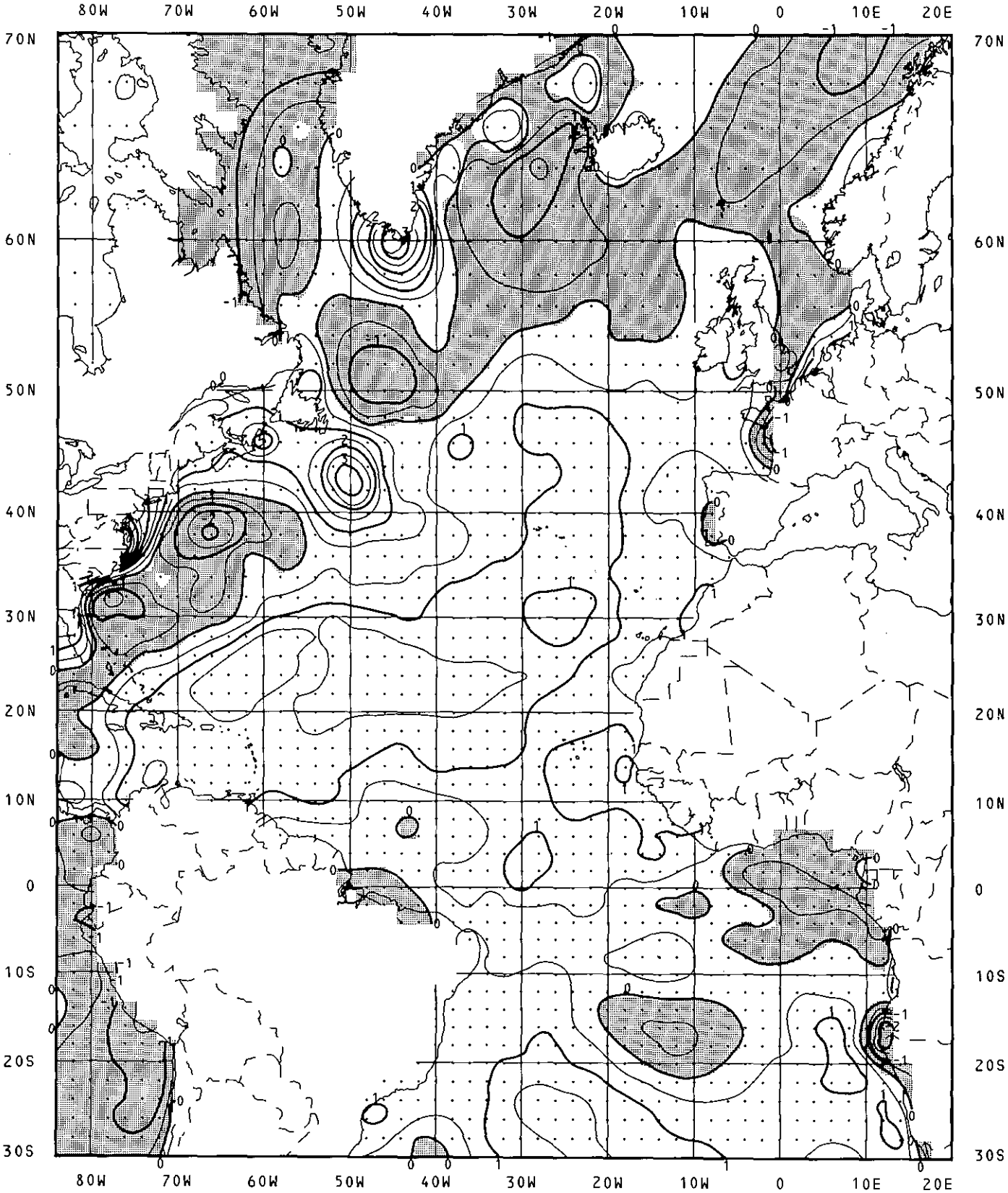

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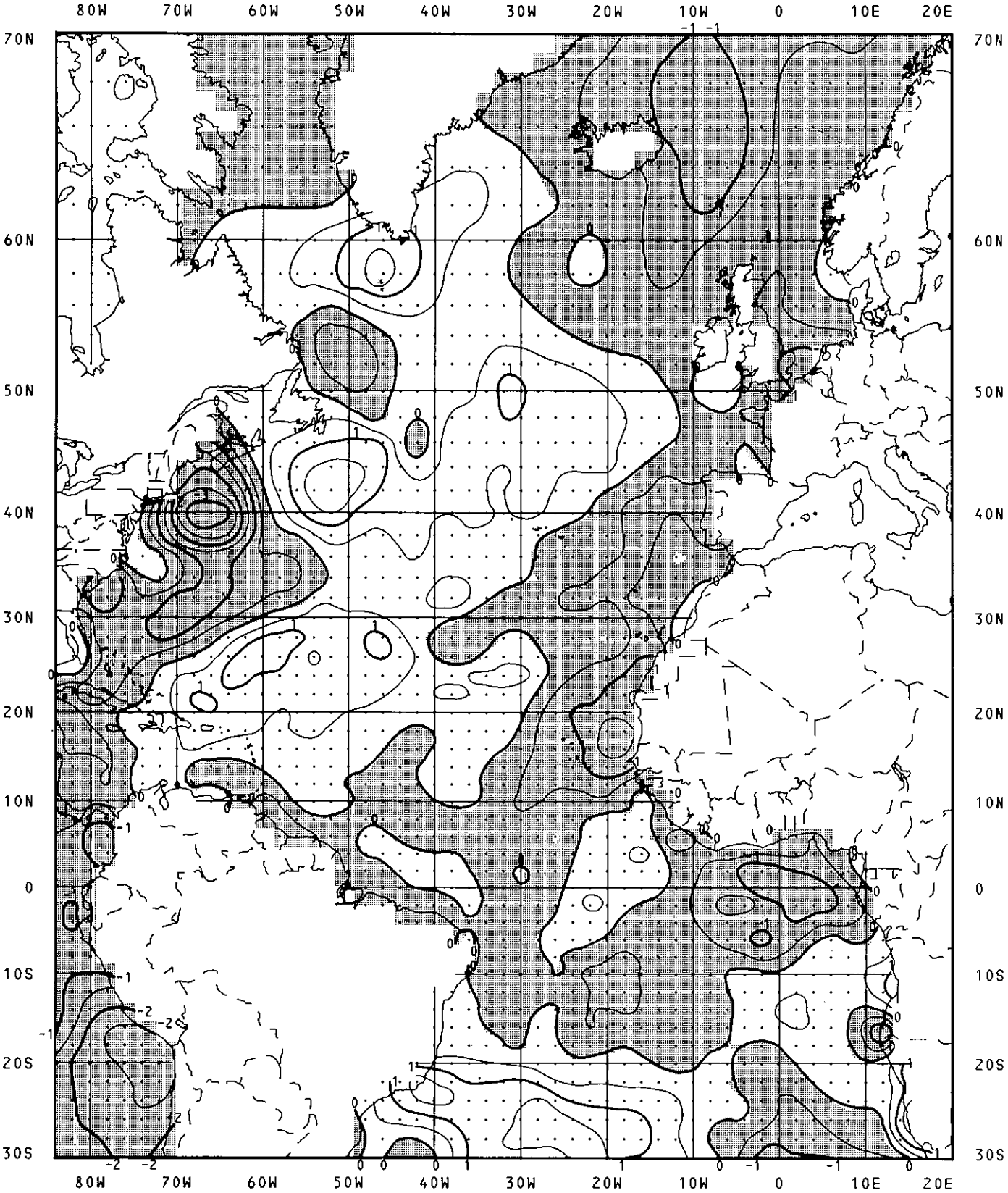

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REGIONAL ANALYSES

Bering Sea Ice

West Coast

Ocean features

Sea surface temperature

SST anomaly

East Coast

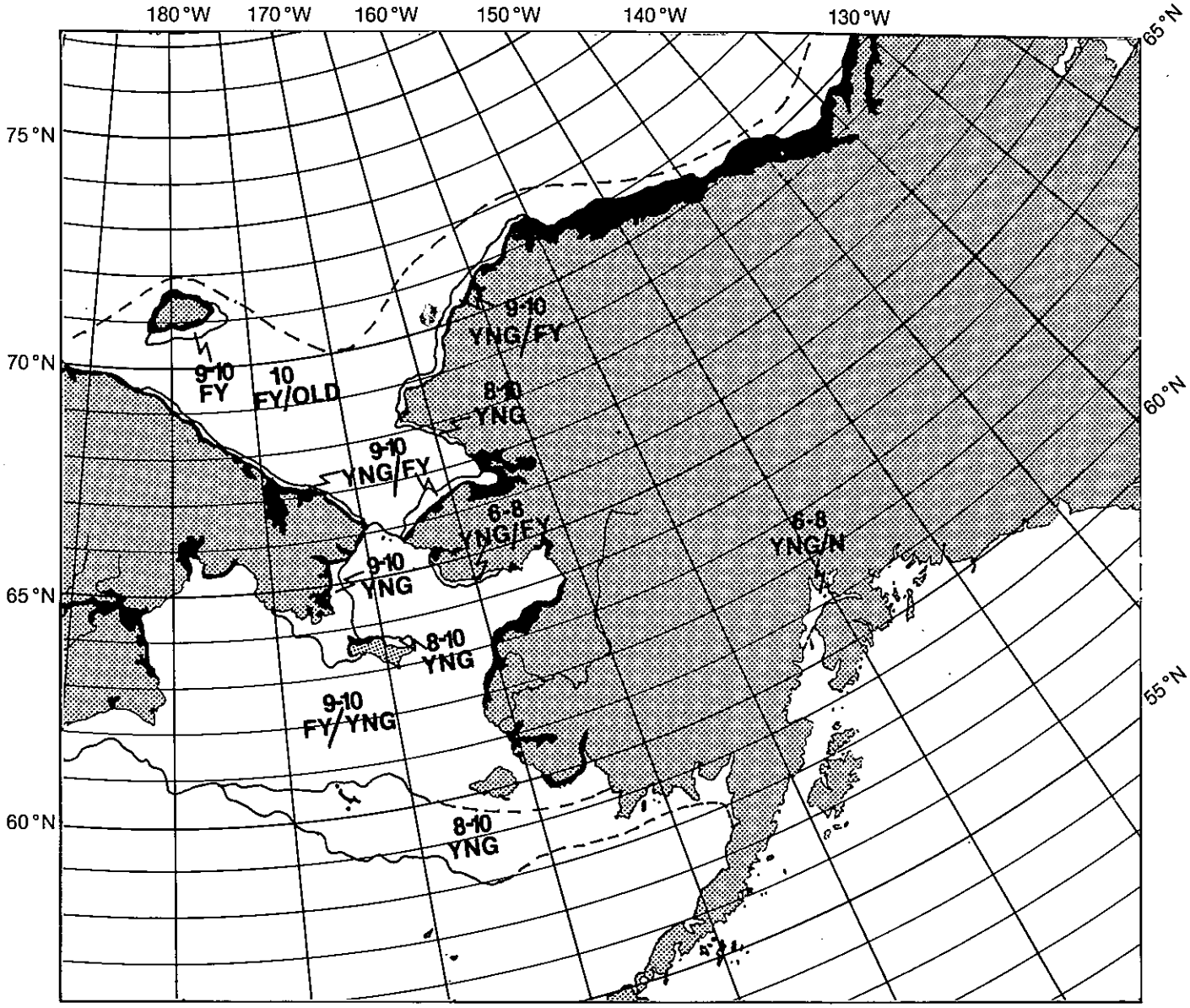
Ocean features

Sea surface temperature

SST anomaly

BERING SEA / NORTH SLOPE ICE ANALYSIS

NAVY– NOAA JOINT ICE CENTER



KEY

ICE CONCENTRATION

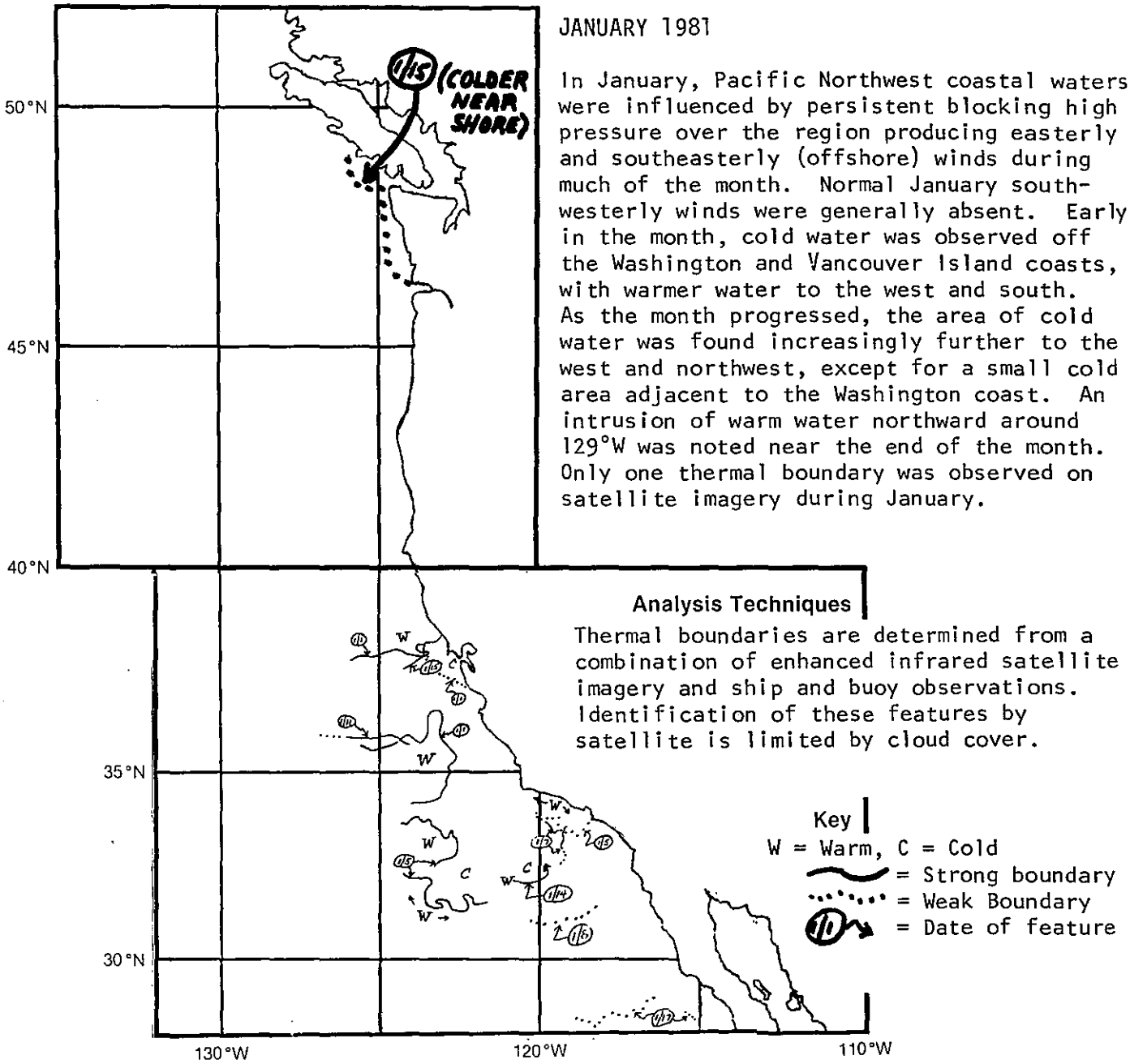
4-6	Area 4-6 tenths ice-covered.
OW	Open water. Sea ice present in concentrations less than one tenth.
ICE-FREE	No sea ice. Ice of land origin (iceberg e.g.) may be present.

ICE THICKNESS (AGE)

OLD	Includes both multi-year and second-year ice. Generally 2-3.5m thick.
FY	Any or all first year ice types (30 cm - 2 m thick).
YNG	Young ice (10-30 cm thick).
N	New and nilas.
■	Fast ice. Sea ice which forms and remains fast along the coast.
120	Theoretical thickness of this season's growth (cm), based on freezing degree days (presented for first day of each month on first succeeding chart).
———	Ice boundary visually or satellite observed.
- - - -	Ice boundary estimated.

JANUARY 1981 by Raymond H. Godin

A 985mb low located near 50°N 170°W was the most prominent feature of the mean surface pressure circulation affecting sea ice distribution. Easterly geostrophic flow dominated the region. Winds were generally northeasterly north of the Bering Strait and west of 170°W in the Bering Sea. Surface temperatures were higher than normal along most of the Alaskan coast. Theoretical ice thicknesses computed from seasonal accumulations of freezing degree days indicate a normal thickness for Barrow and thinner than normal for all other surveyed stations. During January, the ice edge receded 20 to 110 km east of 162°W, changed little between 162°W and 166°W, and expanded 20 to 110 km west of 166°W. The most significant deviations from mean climatological ice extents are east of 163°W with 35 to 90 km less and west of 173°W with 30 to 110 km greater ice extent. During most of January, coastal leads were observed north of Norton Sound on the leeside of coastal boundaries.



JANUARY 1981

In January, Pacific Northwest coastal waters were influenced by persistent blocking high pressure over the region producing easterly and southeasterly (offshore) winds during much of the month. Normal January southwesterly winds were generally absent. Early in the month, cold water was observed off the Washington and Vancouver Island coasts, with warmer water to the west and south. As the month progressed, the area of cold water was found increasingly further to the west and northwest, except for a small cold area adjacent to the Washington coast. An intrusion of warm water northward around 129°W was noted near the end of the month. Only one thermal boundary was observed on satellite imagery during January.

Analysis Techniques

Thermal boundaries are determined from a combination of enhanced infrared satellite imagery and ship and buoy observations. Identification of these features by satellite is limited by cloud cover.

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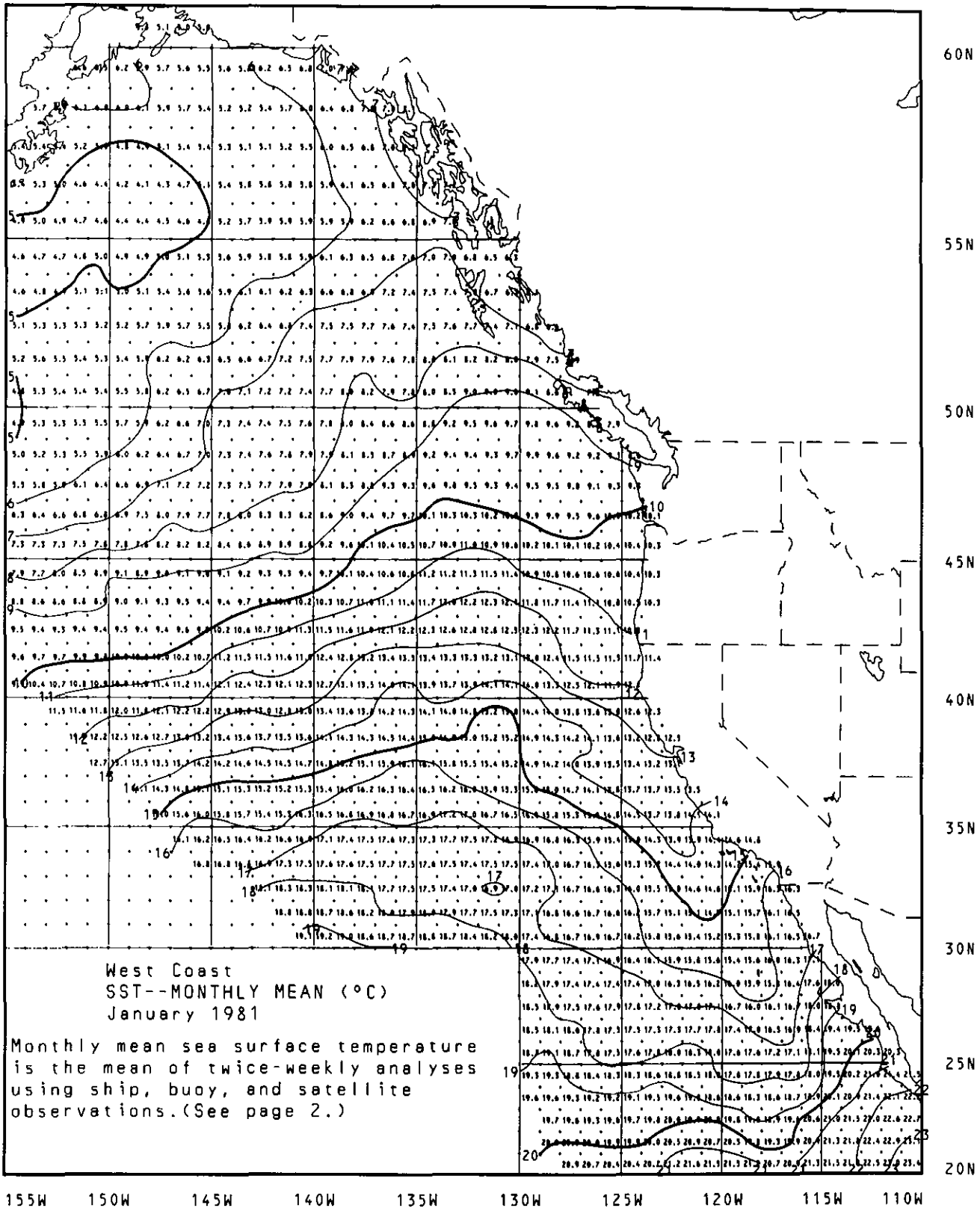
Satellite Field Service Station
National Earth Satellite Service
NOAA
660 Price Avenue
Redwood City, CA 94063
415/364-2422

The SST monthly anomaly analysis (p.17) indicates less cooling than normal over most of the south panel area; this is attributed to the lack of winter storm activity during January. The NOAA Data Buoys at both Pt. Sal (35°N 121°W) and Half Moon Bay (37°N 123°W) showed small monthly SST ranges of 1.5°C. Satellite imagery during the first two weeks indicated a thermal boundary north of Pt. Reyes (38°N 123°W) extending at least 260 km offshore. During the same period nonseasonal coastal upwelling was seen along central California from 37°N to 38°30N. No intense frontal activity was seen along the Baja north of 28°N.



West Coast
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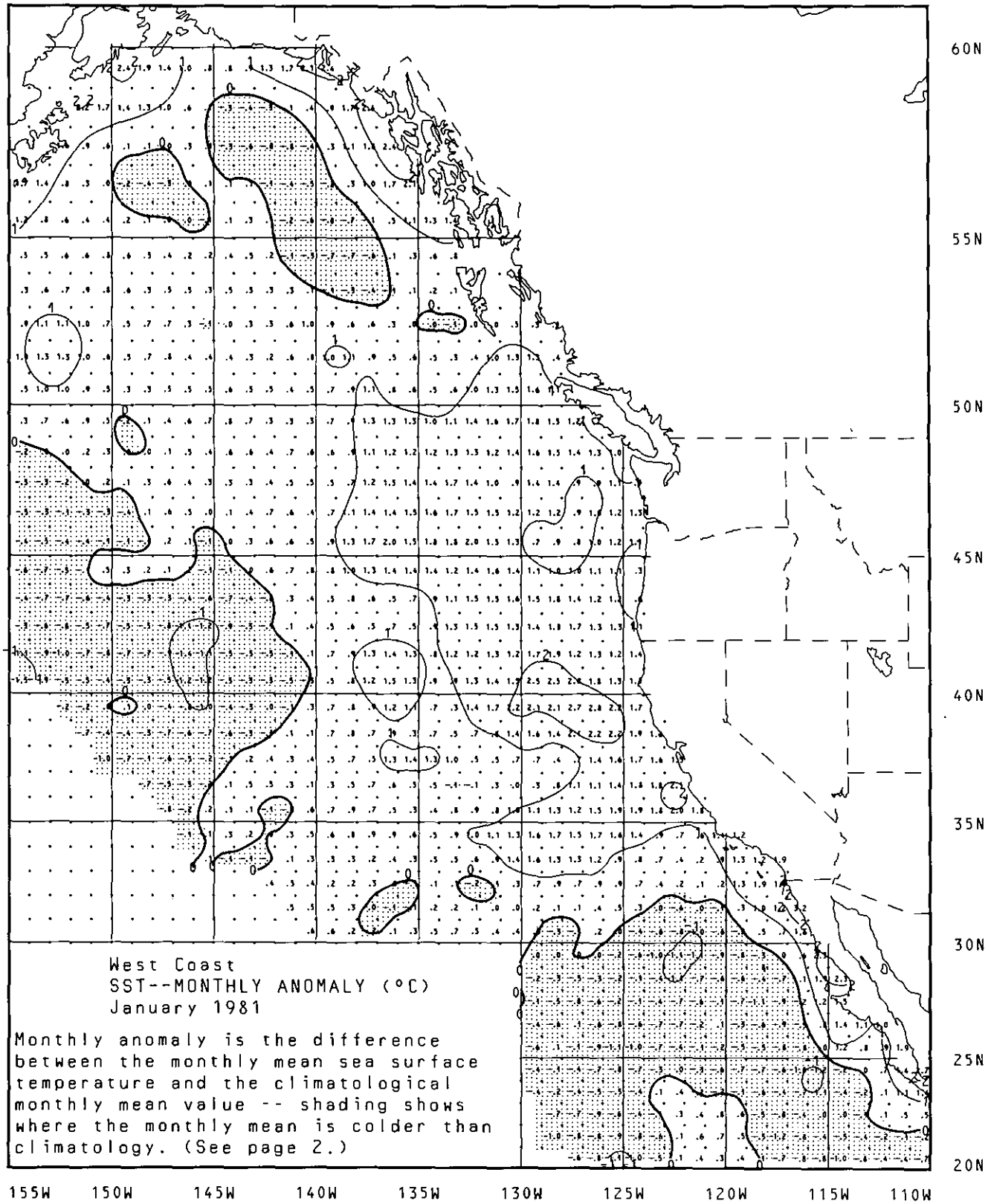
60N
55N
50N
45N
40N
35N
30N
25N
20N
155W
150W
145W
140W
135W
130W
125W
120W
115W
110W
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End of the month positions of the Gulf Stream System and its associated eddies are shown for the NW Atlantic and the Gulf of Mexico. The Gulf Stream and Loop Current boundaries are located by prominent sea surface temperature gradients or by the 15°C isotherm at 200m. Arrows indicate direction of eddy circulation. Warm-core or anticyclonic eddies rotate clockwise; cold-core or cyclonic eddies rotate counterclockwise. Anticyclonic eddies are labeled a-z in the Gulf of Mexico and 1-99 in the NW Atlantic. The long arrows indicate the date of data used.

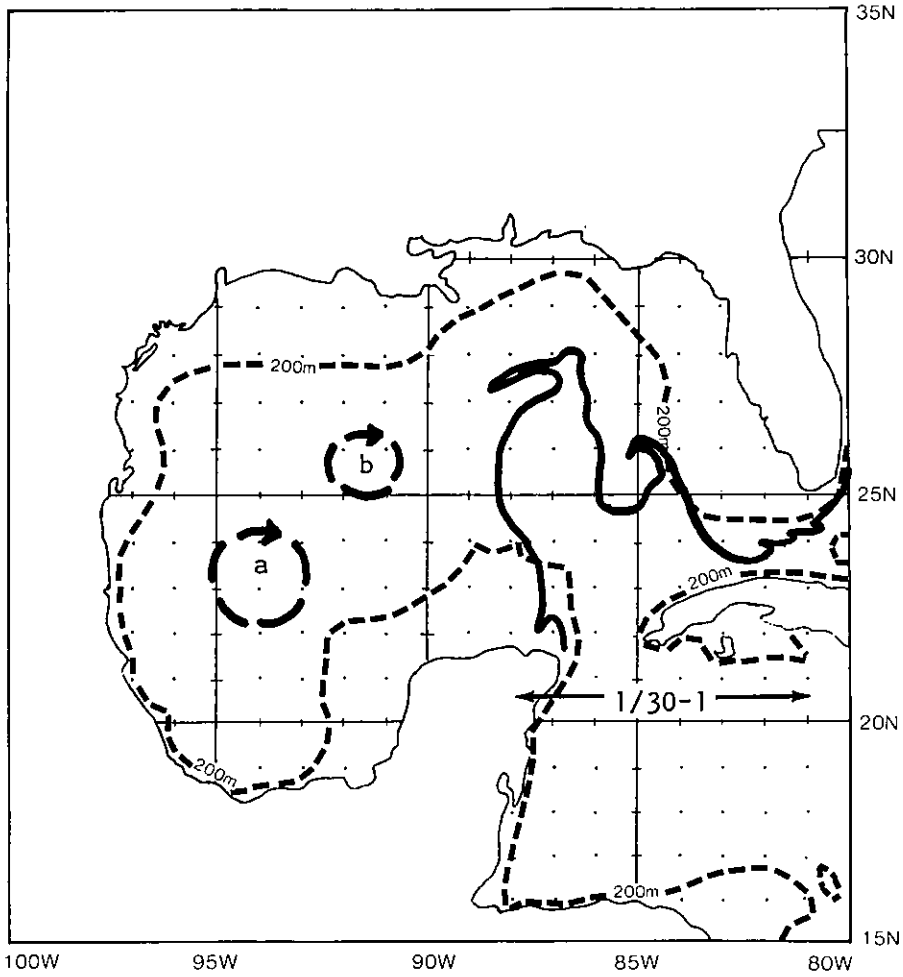
EAST COAST OCEAN FEATURES

Feature positions are drawn from:

NOAA-6 satellite infrared imagery

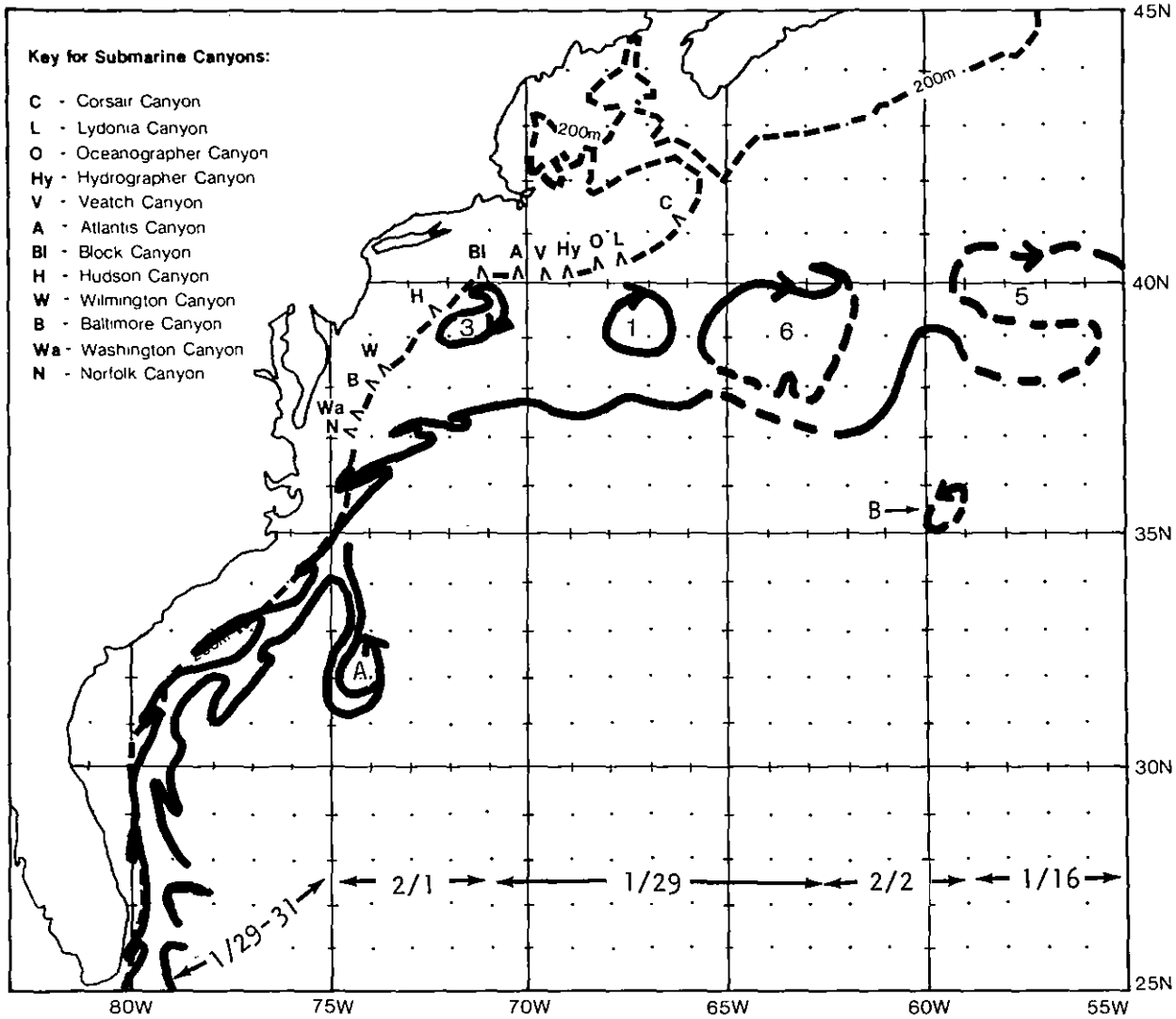
Bathythermograph data,
National Meteorological Center
of National Weather Service

Oceanographic Analysis,
National Weather Service/National
Earth Satellite Service



JANUARY 1981
by Steve Auer and
Jenifer Wartha Clark

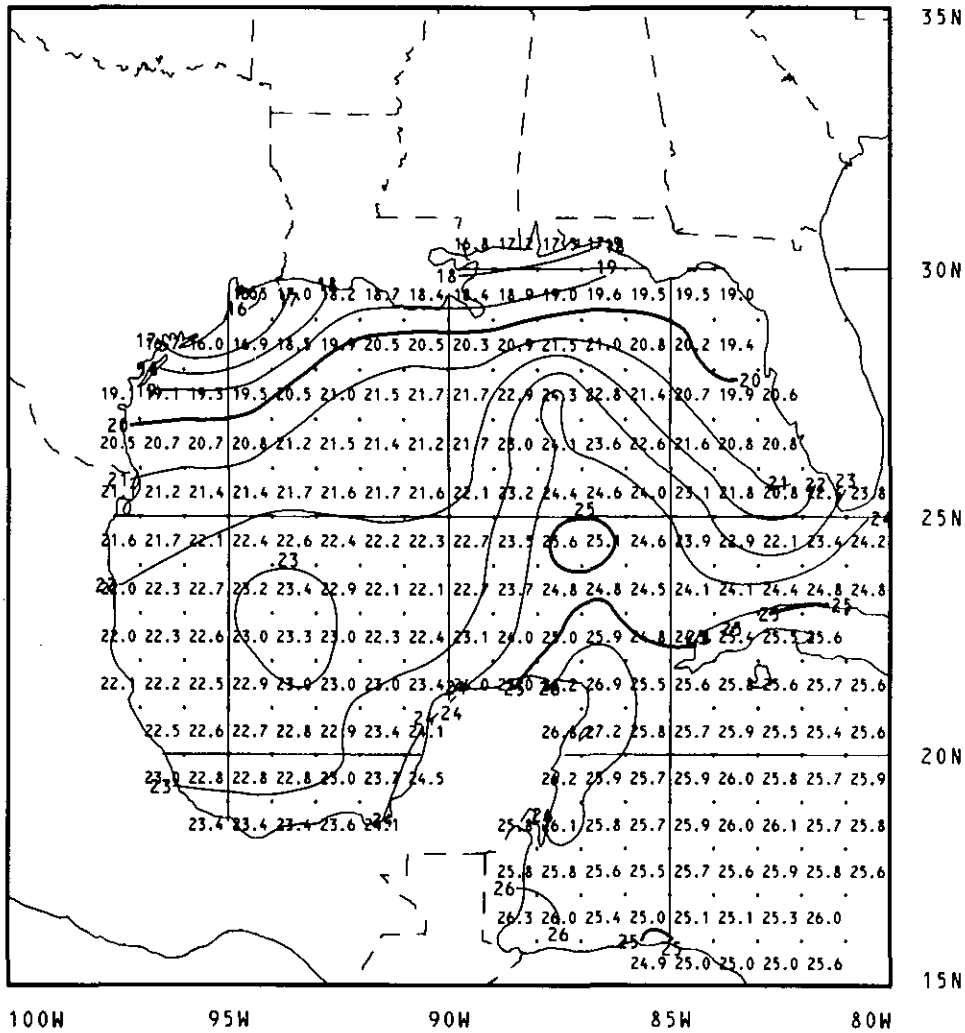
The amplitude (northernmost intrusion into the Gulf) of the Loop Current fluctuated slightly during January without an overall increase or decrease. The Loop has pinched in near 25°N 85°30W. The horizontal thermal gradient between the anticyclonic eddies and the surrounding surface waters is small making eddy tracking difficult. During January eddy a moved approximately 205 km WSW and eddy b moved about 210 km SW.



The anticyclonic eddies in the NW Atlantic have been renamed as numbers instead of the greek alphabet. Eddy xi-2 is retitled eddy 1, eddy omicron-2 is eddy 2, eddy pi-2 is eddy 3, and eddy rho-2 is eddy 4. The cyclonic eddies will be labeled A-Z.

Persistent cloudiness in the area east of Cape Hatteras prevents a clearer definition of the features present, particularly the Stream's south wall, the cyclonic eddies, and all features east of 65°W. During January anticyclonic eddy 3 moved 145 km W and eddy 1 moved 80 km SW. Eddy 5 formed about January 6 near 39°N 55°W. Eddy 6 formed in early January and was first sighted on January 13 near 40°N 62°30W. Eddy 2 was not sighted during January and may have been absorbed, most likely by eddy 6. Eddy 4 was sighted on January 16 near 39°30N 59°W and was later absorbed by either eddy 5 or the Gulf Stream. The origin of cyclonic eddy A is unknown. Eddy B seen on January 16 was last observed during May and June 1980. During May very cold Labrador water was discernible inside a Gulf Stream meander which pinched off forming a small cold eddy near 38°N 50°W. Although the eddy sightings are 7 months apart the small size and cold water core appear so similar that they are probably the same eddy.

EAST COAST SST-
MONTHLY MEAN



Gulf of Mexico
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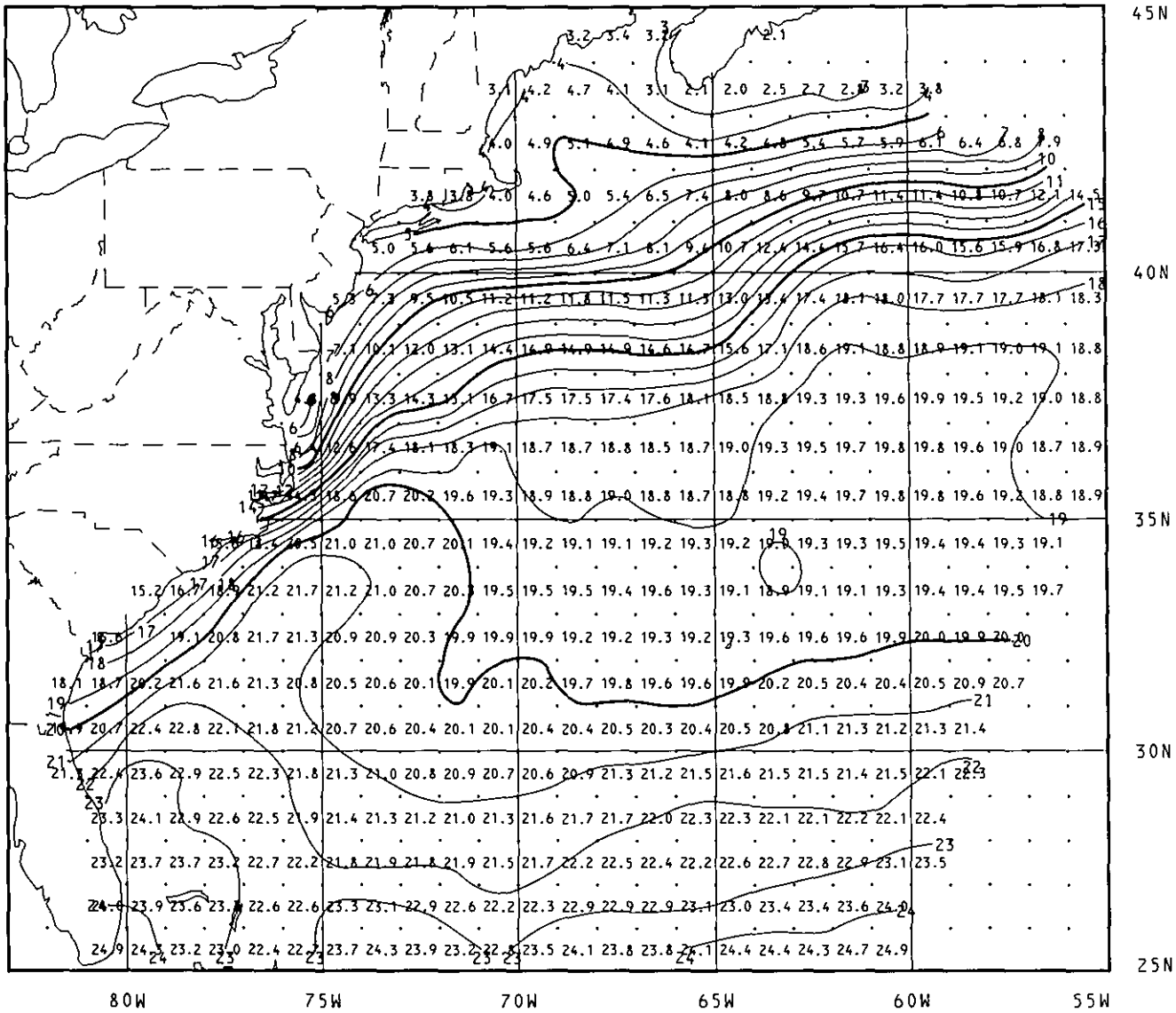

NW Atlantic Ocean
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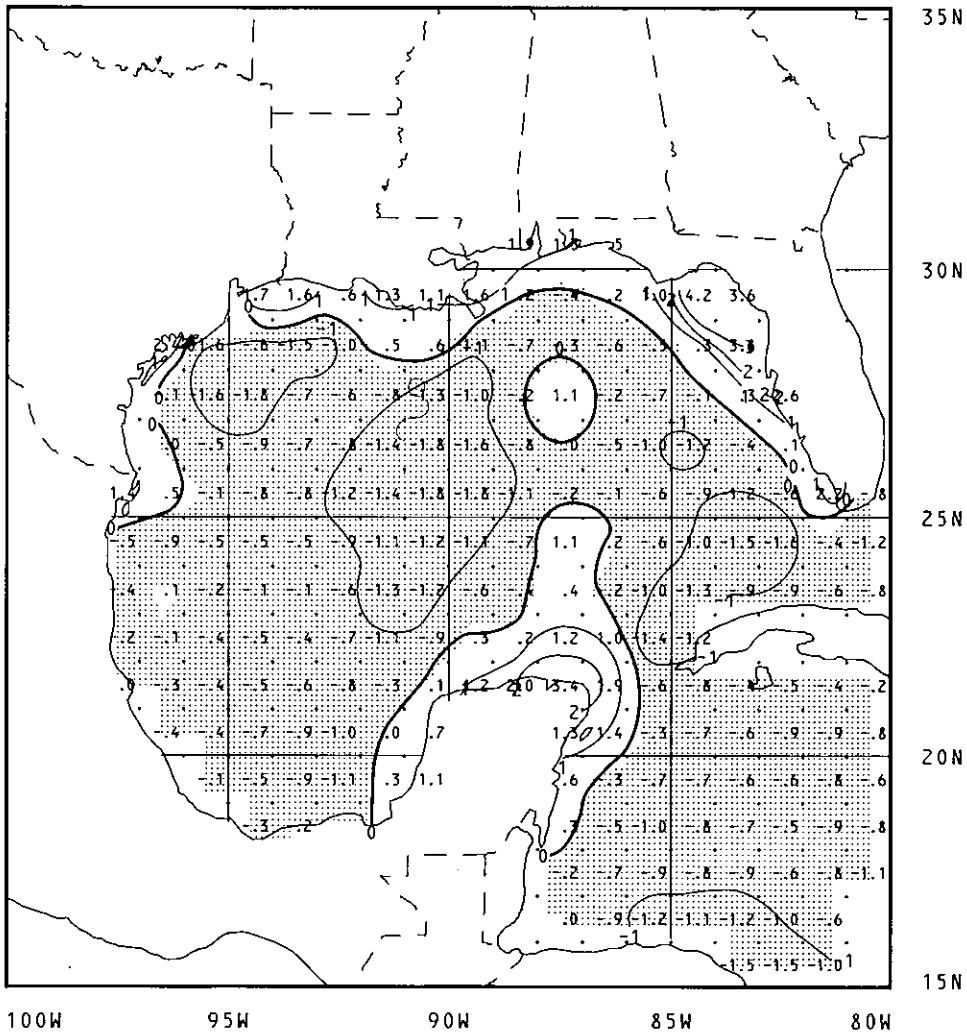
EAST COAST SST-ANOMALY



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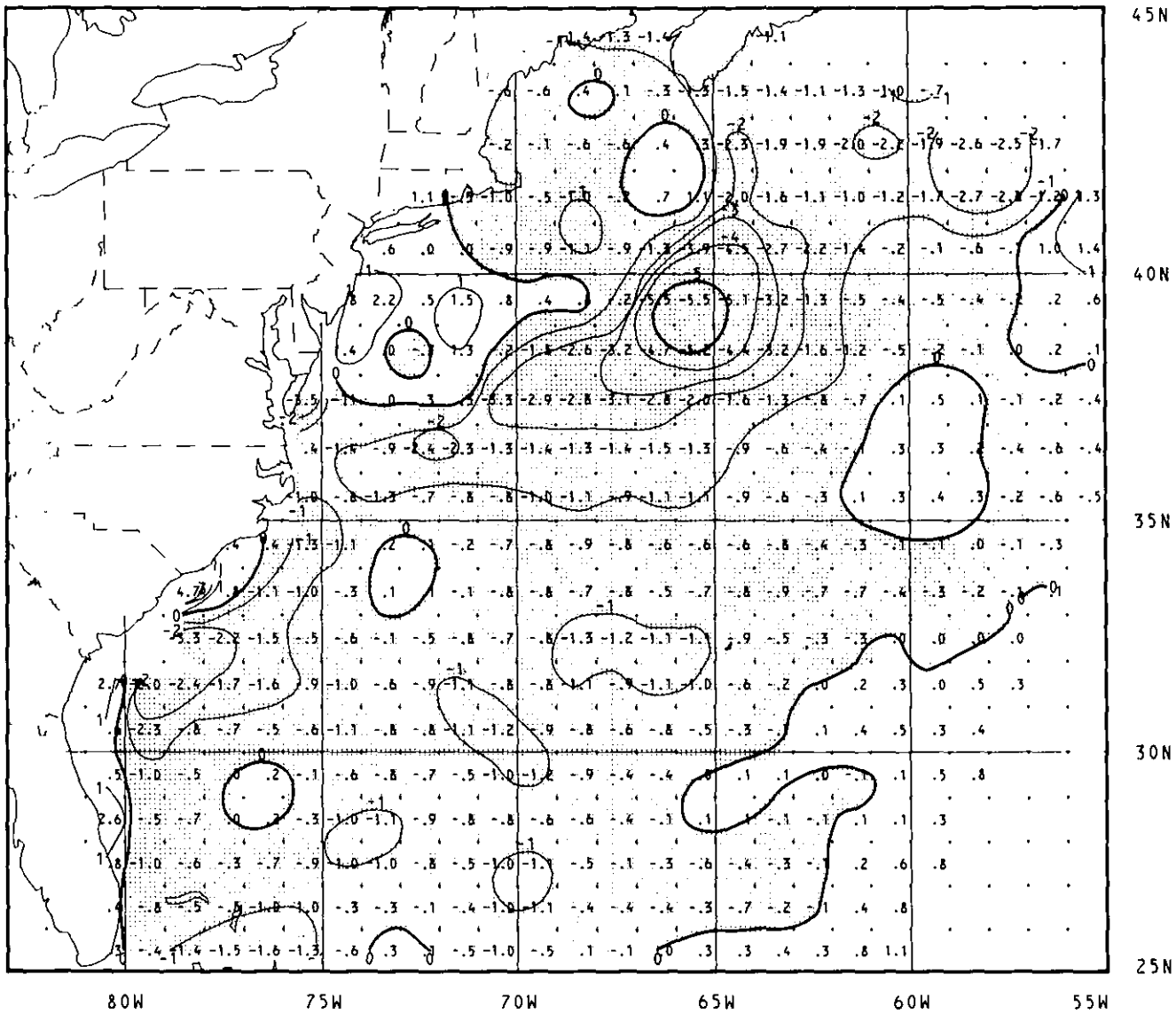

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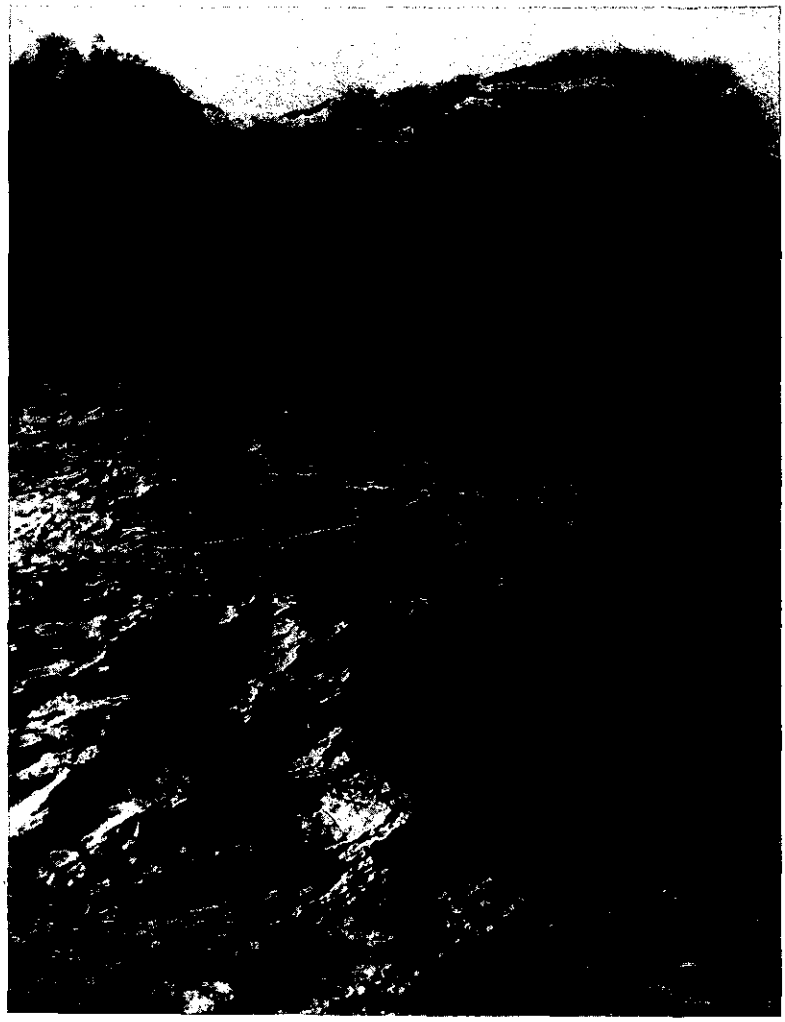

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CTD), radio message files; analysis of the Asheville Marine Deck; published data and analysis; and subjective interpretation of wind and current charts. Data comprise 381,199 North Pacific Observations to 1969, 727,452 Atlantic/Indian Ocean observations to 1974, and 250,000 Southern Hemisphere observations to 1979. The majority of data are MBT's, so the climatology best represents conditions since 1942.

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Each two-day SST analysis is interpolated to a 2° latitude/longitude grid using bilinear interpolation. The monthly products are then derived from the interpolated analyses on the 2° x 2° grid. The Alexander-Mobley climatology* is used to form the anomalies.....Sigurd Larson

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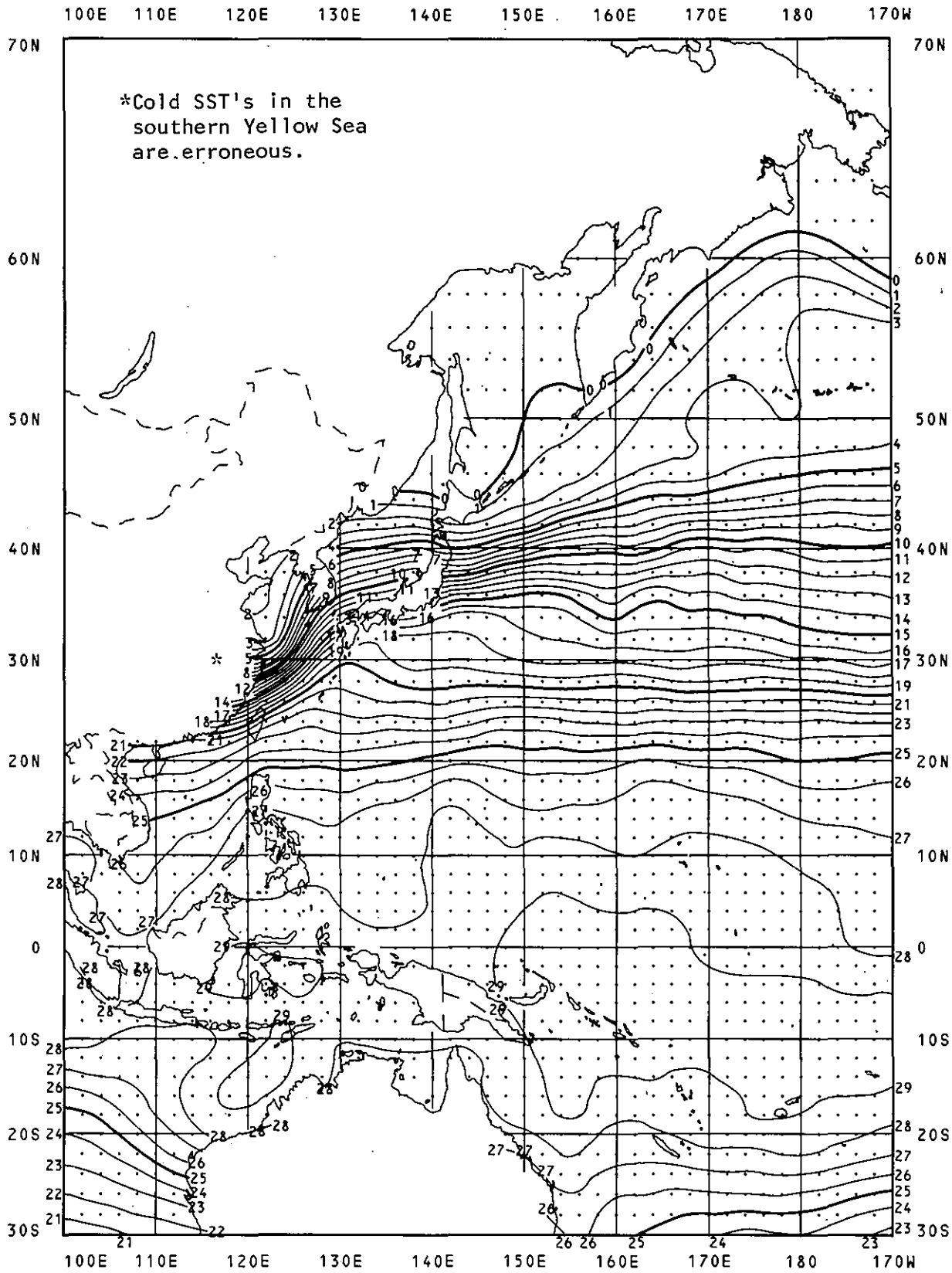
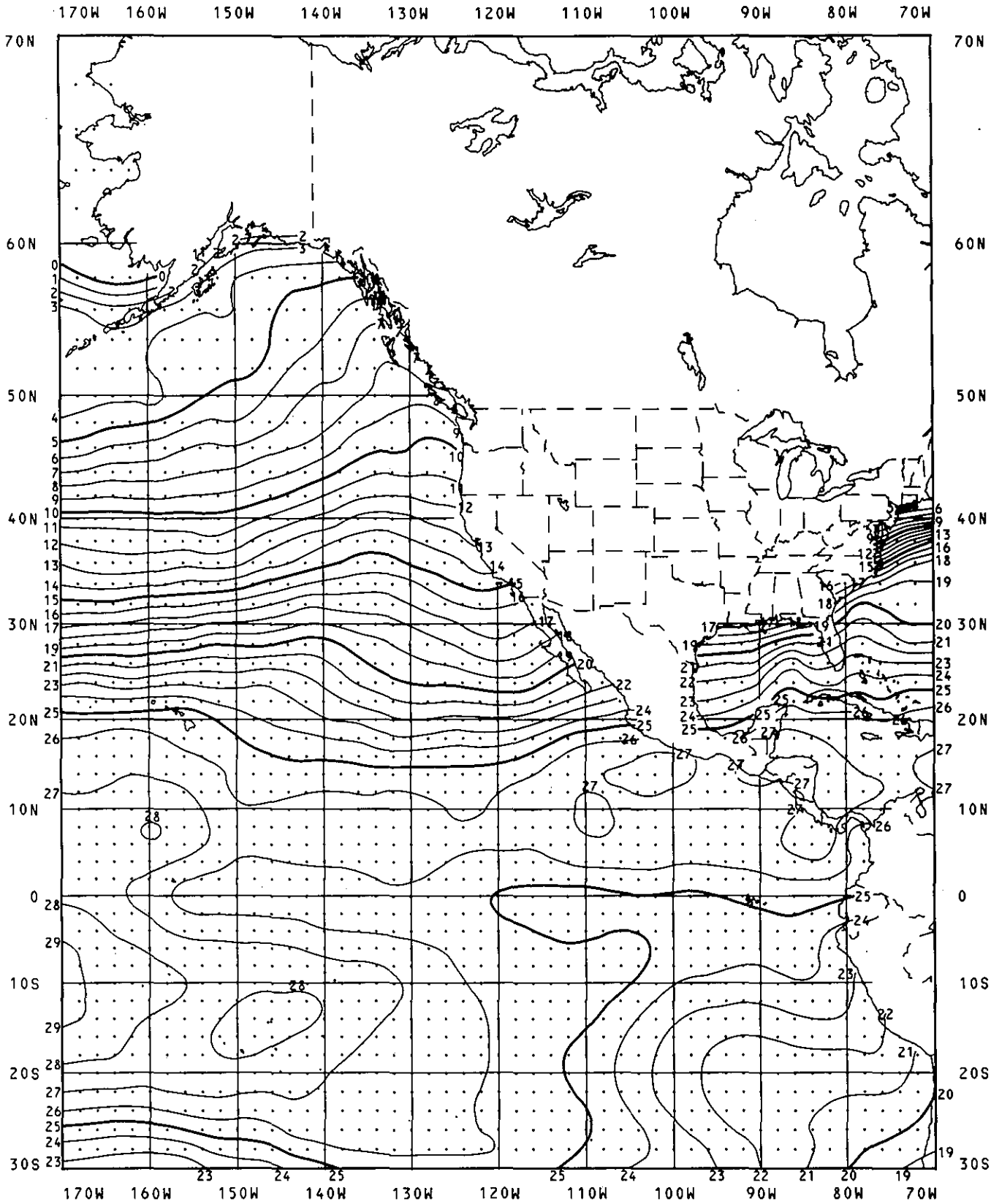
*Alexander, R.C. and R.L. Mobley, 1976. Monthly Average Sea-Surface Temperature and Ice-Pack Limits on a 1° Global Grid; *Monthly Weather Review, 104* (2), *143-8.*



Western Pacific Ocean
SST--MONTHLY MEAN (°C)
February 1981

Monthly mean sea surface temperature is the mean of two-day analyses using ship, buoy, and satellite observations. (See page 2.)



Eastern Pacific Ocean
SST--MONTHLY MEAN (°C)
February 1981

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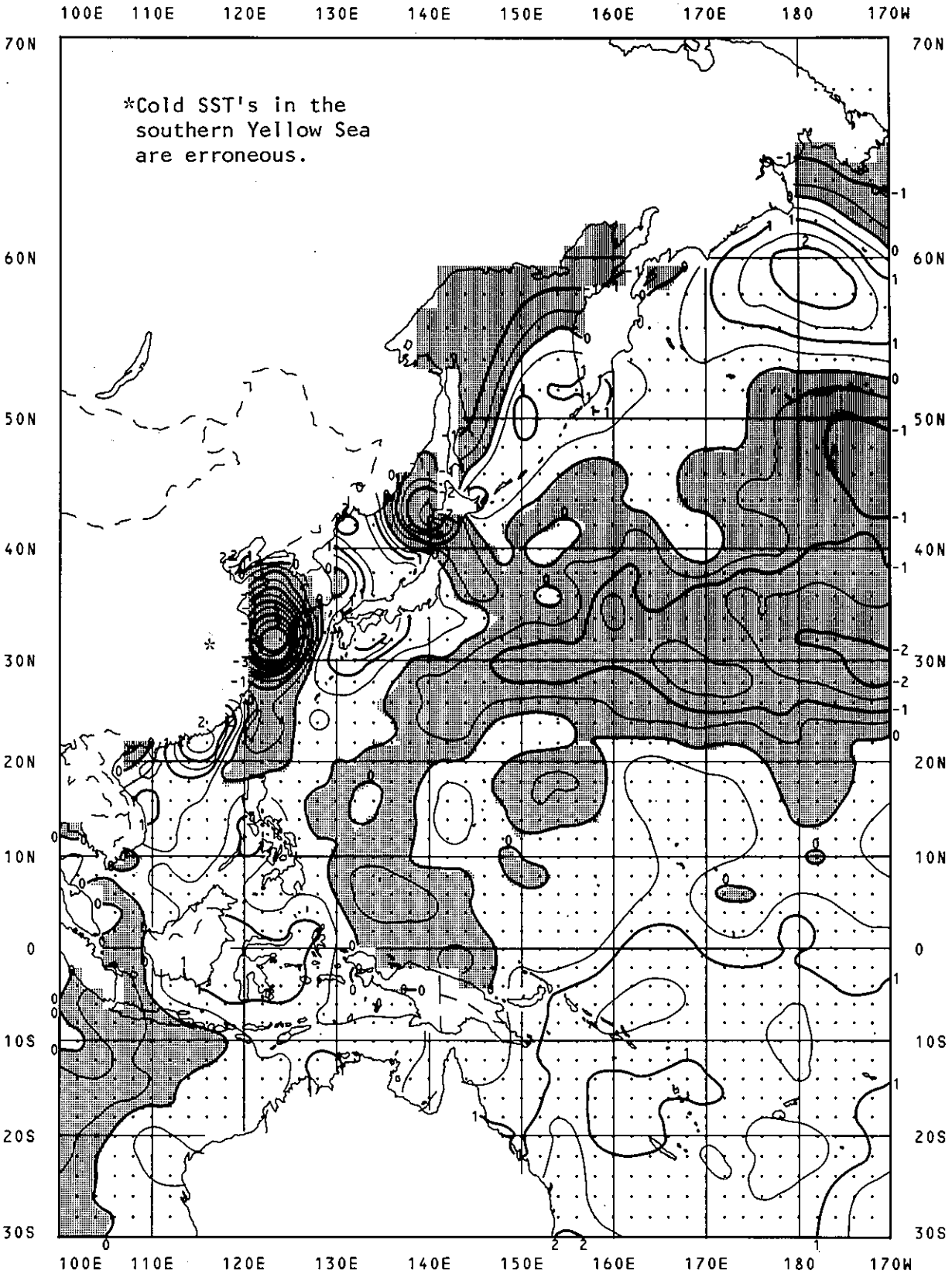
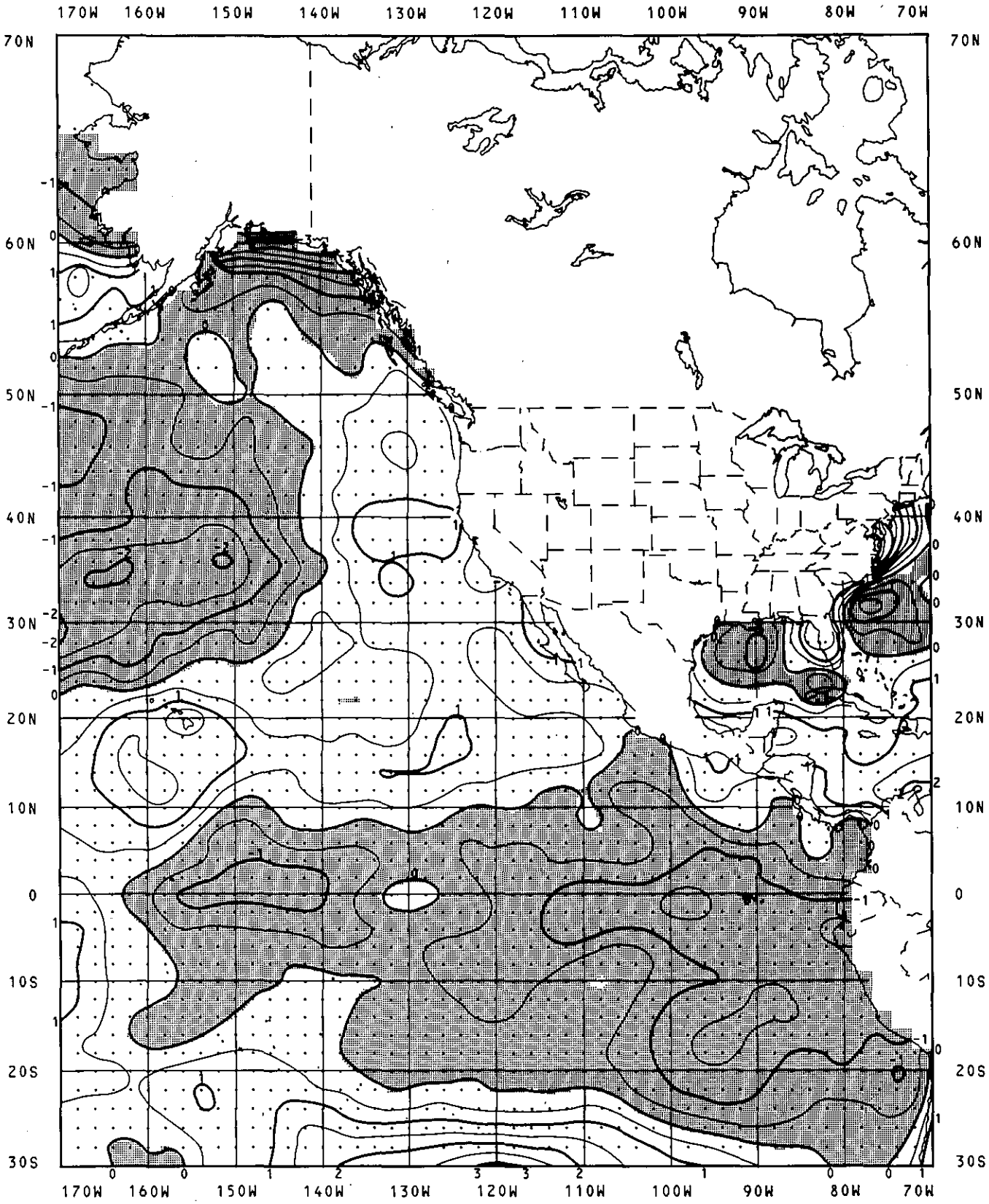


Western Pacific Ocean
SST--MONTHLY ANOMALY (°C)
February 1981

Monthly anomaly is the difference between the monthly mean sea surface temperature and the climatological monthly mean value -- shading shows where the monthly mean is colder than climatology. (See page 2.)



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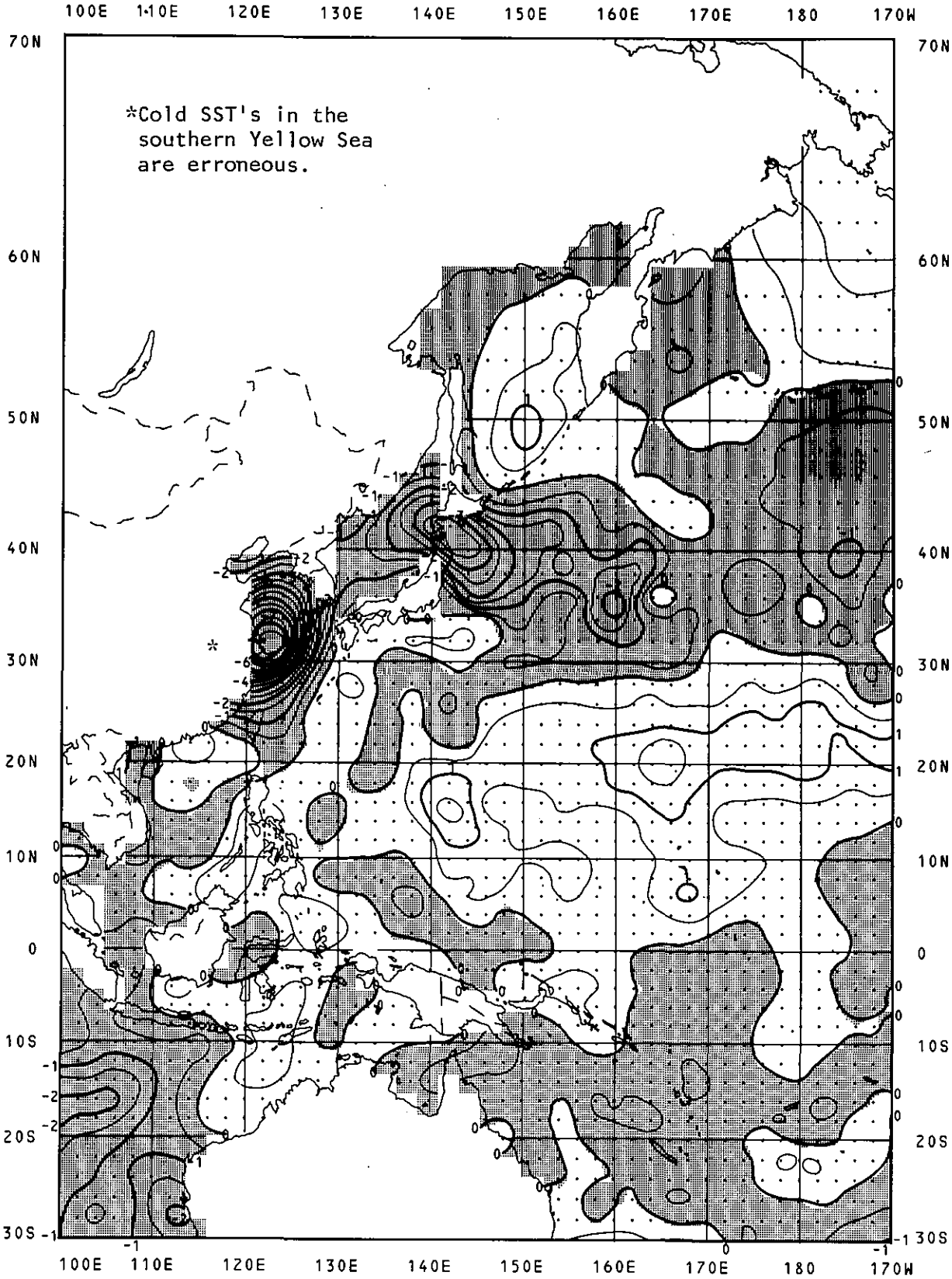
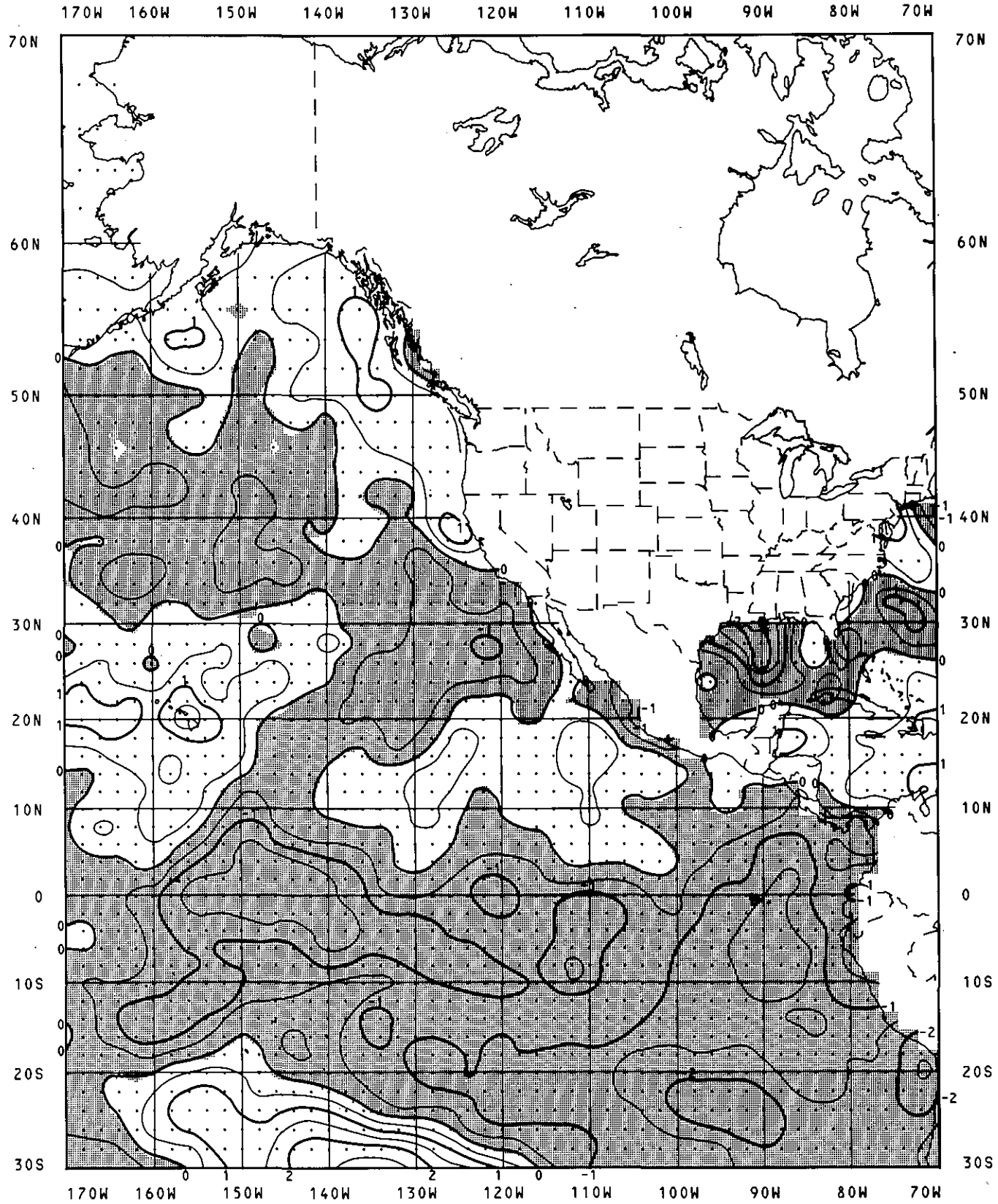


Western Pacific Ocean
SST--YEARLY CHANGE (°C)
February 1981

Yearly change is the difference between the monthly mean SST for this month and for the corresponding month last year -- shading shows where this year's monthly mean is colder than the corresponding monthly mean last year.



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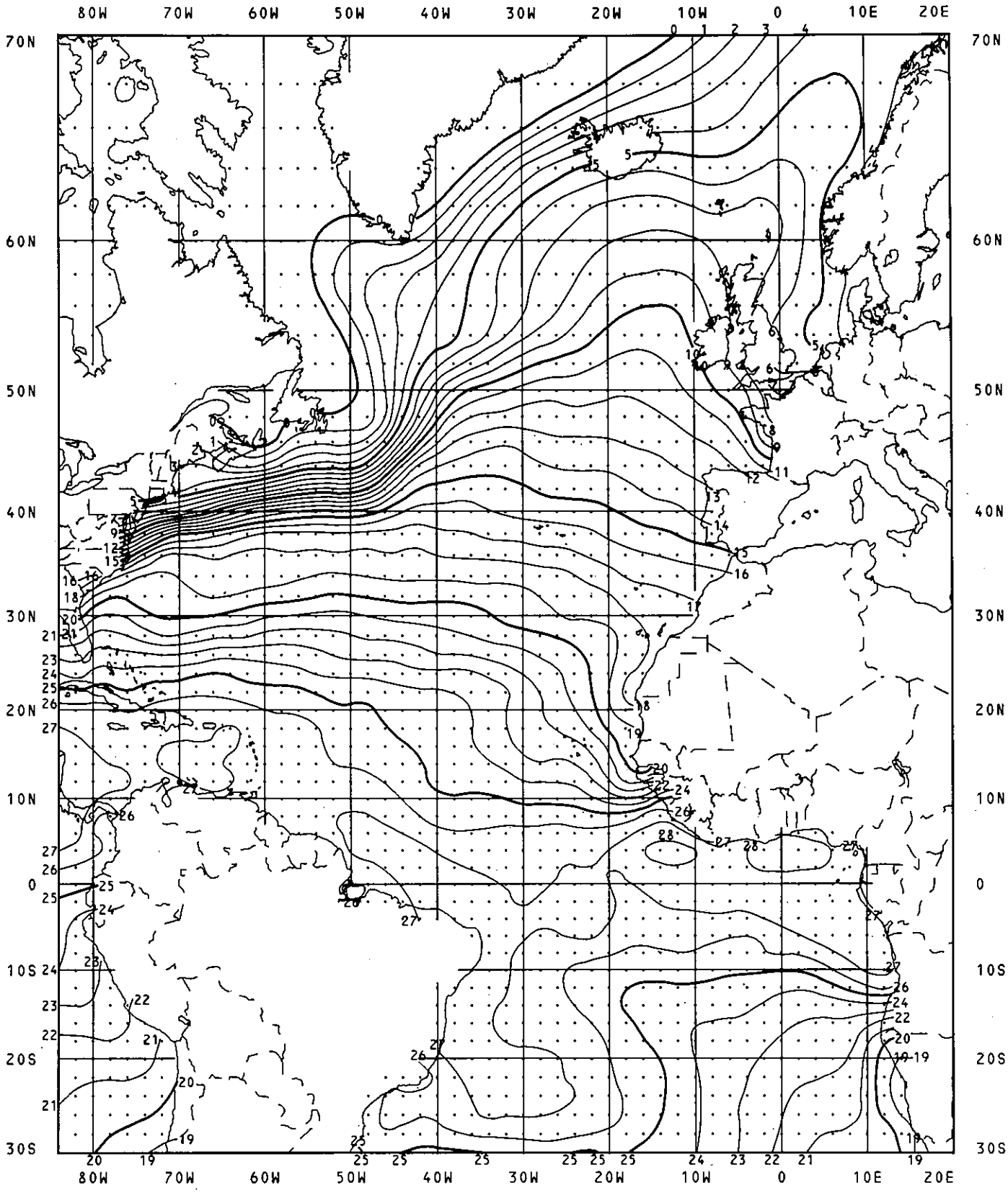

Atlantic Ocean
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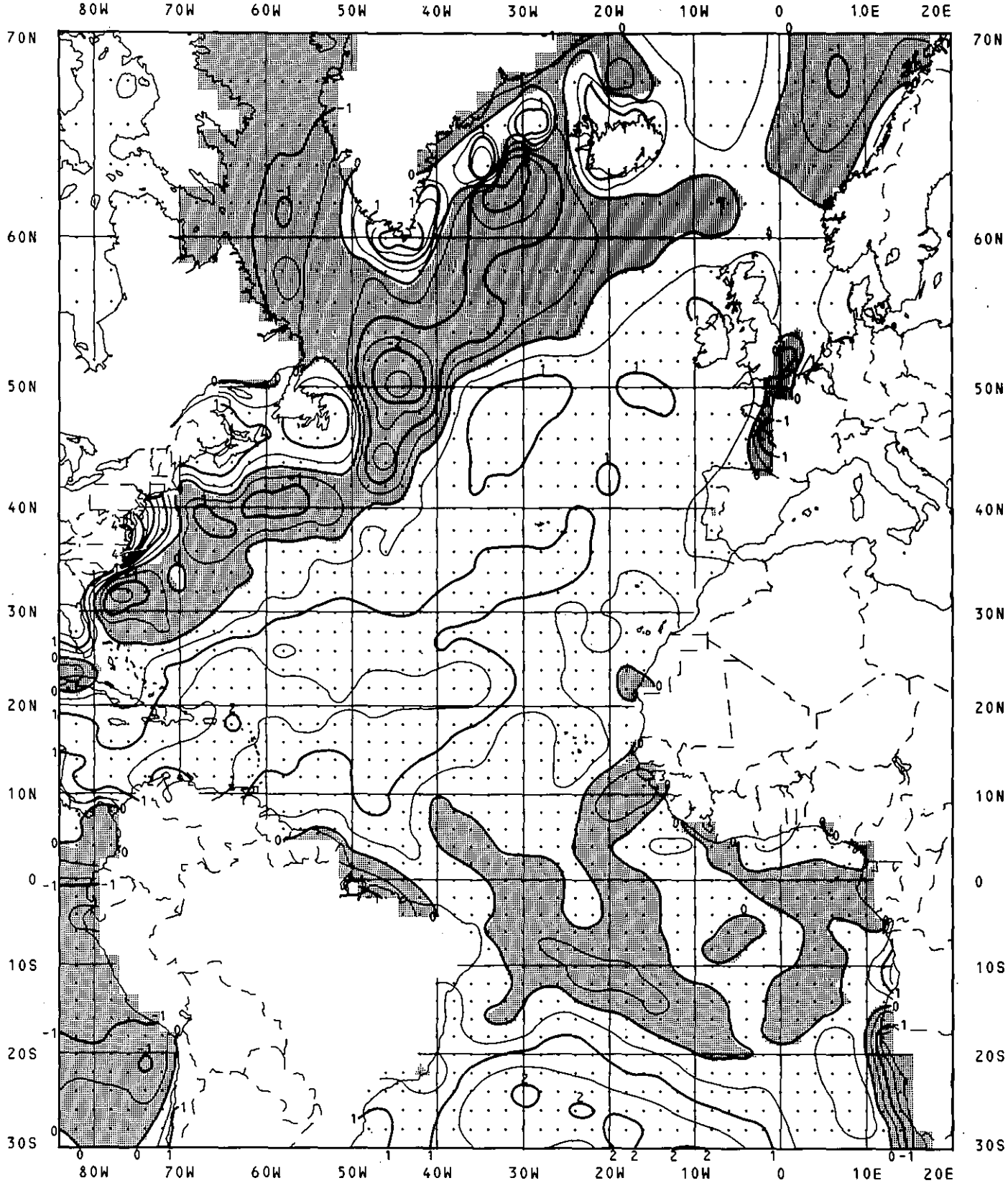

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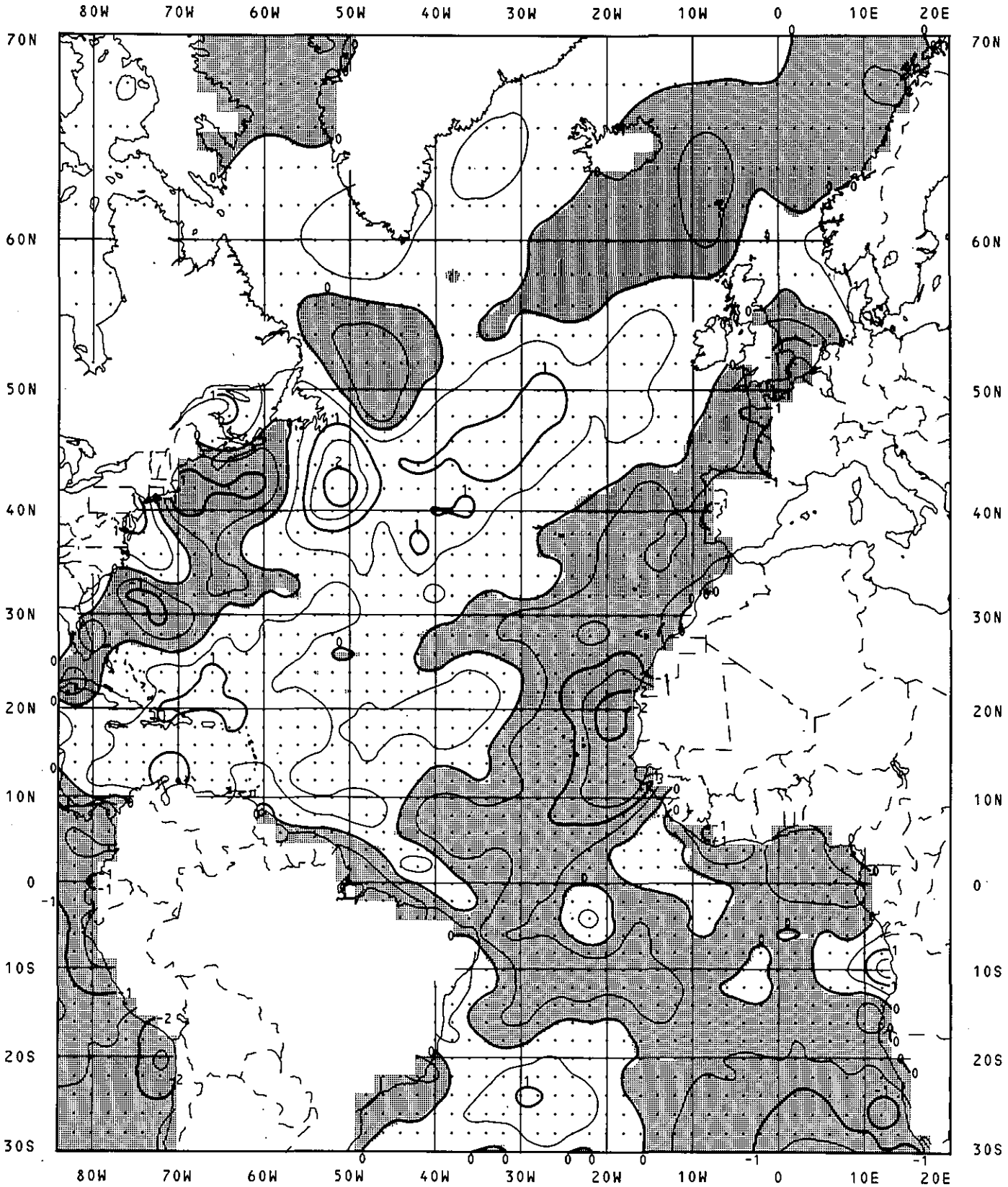

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REGIONAL ANALYSES

Bering Sea /North Slope Ice

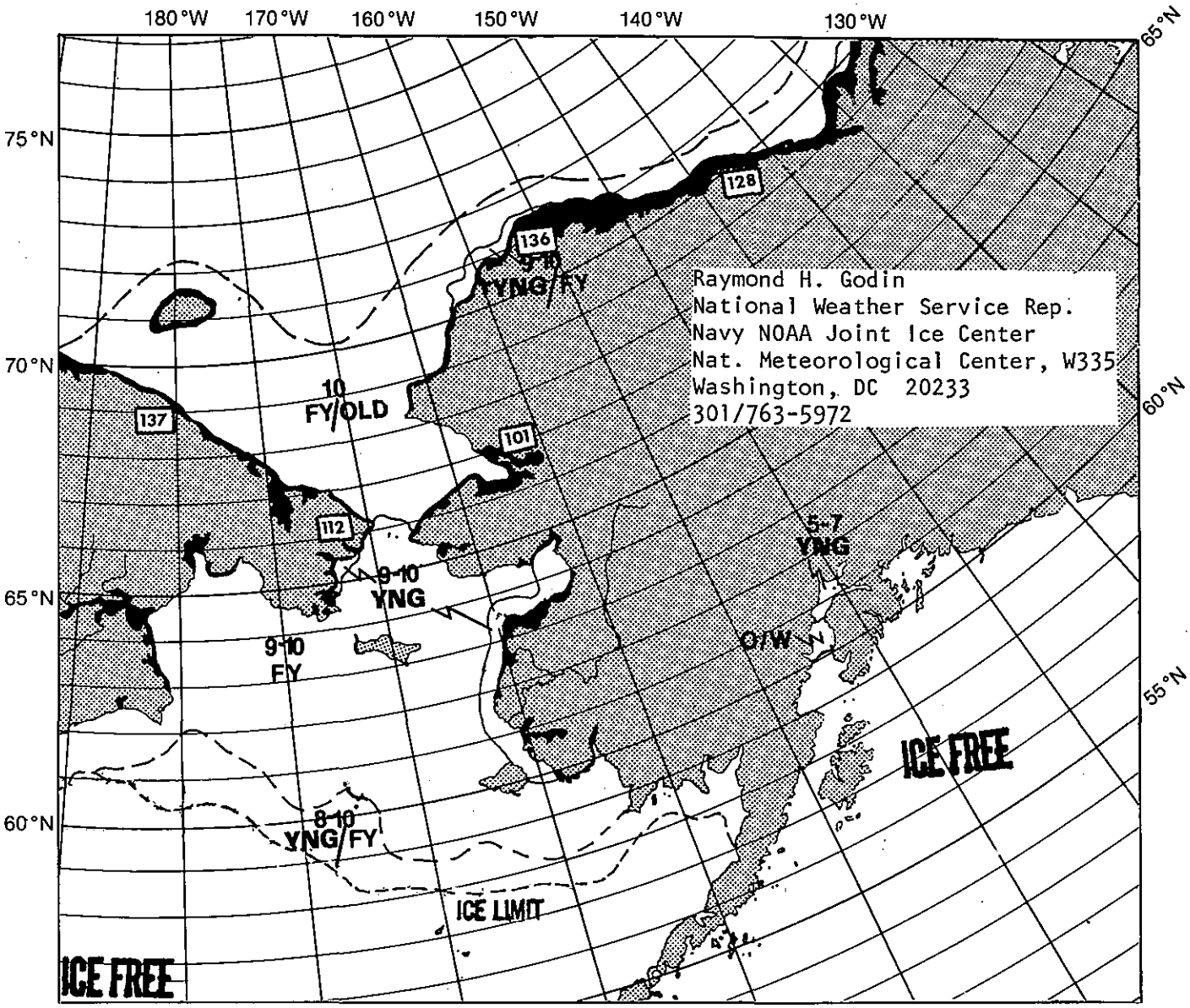
West Coast

Ocean features
Sea surface temperature
SST anomaly

East Coast

Ocean features
Sea surface temperature
SST anomaly

BERING SEA / NORTH SLOPE ICE ANALYSIS



KEY

ICE CONCENTRATION

4-6	Area 4-6 tenths ice-covered.
OW	Open water. Sea ice present in concentrations less than one tenth.
ICE-FREE	No sea ice. Ice of land origin (iceberg e.g.) may be present.

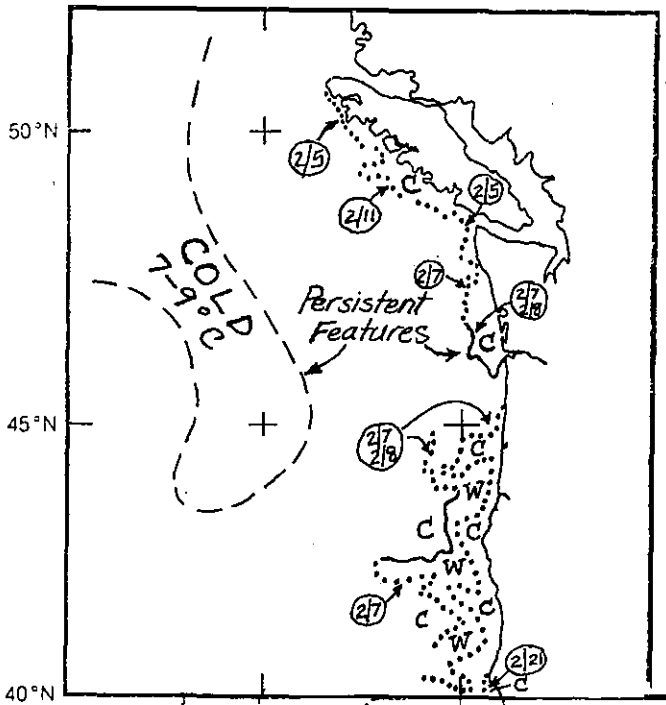
ICE THICKNESS (AGE)

OLD	Includes both multi-year and second-year ice. Generally 2-3.5m thick.
FY	Any or all first year ice types (30 cm - 2 m thick).
YNG	Young ice (10-30 cm thick).
N	New and nilas.
■	Fast ice. Sea ice which forms and remains fast along the coast.
120	Theoretical thickness of this season's growth (cm), based on freezing degree days (presented for first day of each month on first succeeding chart).
———	Ice boundary visually or satellite observed.
- - - -	Ice boundary estimated.

FEBRUARY 1981

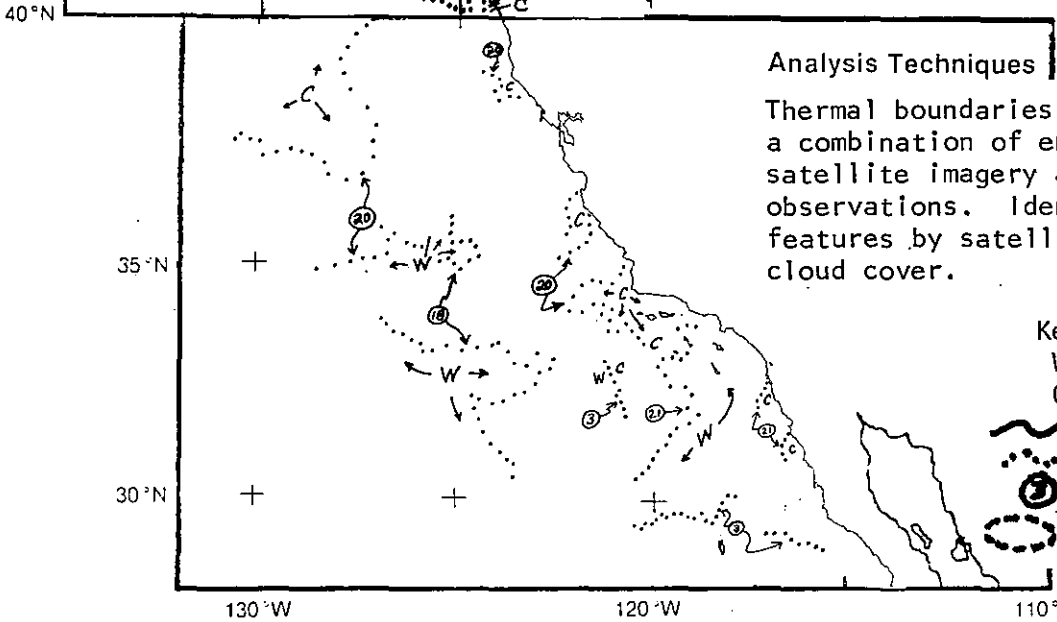
The surface pressure circulation during February consists of periods of significant positive and negative pressure anomalies which when averaged over the month yield a near normal mean surface pressure circulation. The mean geostrophic flow affecting ice advection is northeasterly north of the Bering Strait, easterly in the Bering Sea, and southeasterly in the Gulf of Alaska. Average temperatures for the month are generally above normal for reporting stations bordering the Beaufort and Chukchi Seas, normal in the Bering Sea, and above normal in the Gulf of Alaska. Seasonal accumulations of theoretical ice thicknesses reflect a normal thickness at Barrow and thinner than normal for all other surveyed stations. During February, the ice edge expanded 18-90 km. The most significant deviation from mean historical ice edge extent is east of 163°W with 55 km less ice extent. A coastal lead 30-40 km in width, which consisted of young ice resulting from an easterly wind flow, was observed between 60°N and 65°N along the Alaskan coast.

WEST COAST OCEAN FEATURES



FEBRUARY 1981

Two persistent, stationary features exist in the Pacific Northwest during February, a tongue of cold water extending from the northwest and a body of cold water adjacent to the Washington coast. This coastal feature is due to cold river runoff moving northward in the Davidson Current. Early February satellite imagery shows an unusual amount of thermal boundary complexity. In mid-February, several vigorous lows moving through the region brought strong southwesterly winds erasing much of the thermal boundary activity along the Oregon coast and advecting warmer offshore water towards the coast. The data buoy near the mouth of the Columbia River showed a 1-2°C SST increase from February 10-19. SST's over the entire area, however, showed little net change from beginning to the end of the month.



Analysis Techniques

Thermal boundaries are determined from a combination of enhanced infrared satellite imagery and ship and buoy observations. Identification of these features by satellite is limited by cloud cover.

Key
W = Warm
C = Cold
= Strong boundary
= Weaker boundary
= Date of feature
= Outline of water mass feature

Persistent above normal SST's continued in the Pacific Southwest during February as few intrusions of polar air from the northwest occurred. SST's within 500 km of the coast between 30°N to 40°N showed little change from January. West of 130°W the SST's generally decreased about 1°C, particularly north of 35°N. SST's from the data buoys off Pt. Sal (35°N 121°W) and Half Moon Bay (37°N 123°W) remained steady at 13-14°C. Occasional 24-hour oscillations of 0.5°C were observed at both locations. Satellite imagery revealed several instances of eddy-like intrusions of warm water within 300 km of the coast between 32°N and 36°N. Local upwelling was occasionally seen near prominent capes along the coast.

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South Panel
Larry Breaker
Satellite Field Service Station
National Earth Satellite Service
NOAA
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Redwood City, CA 94063
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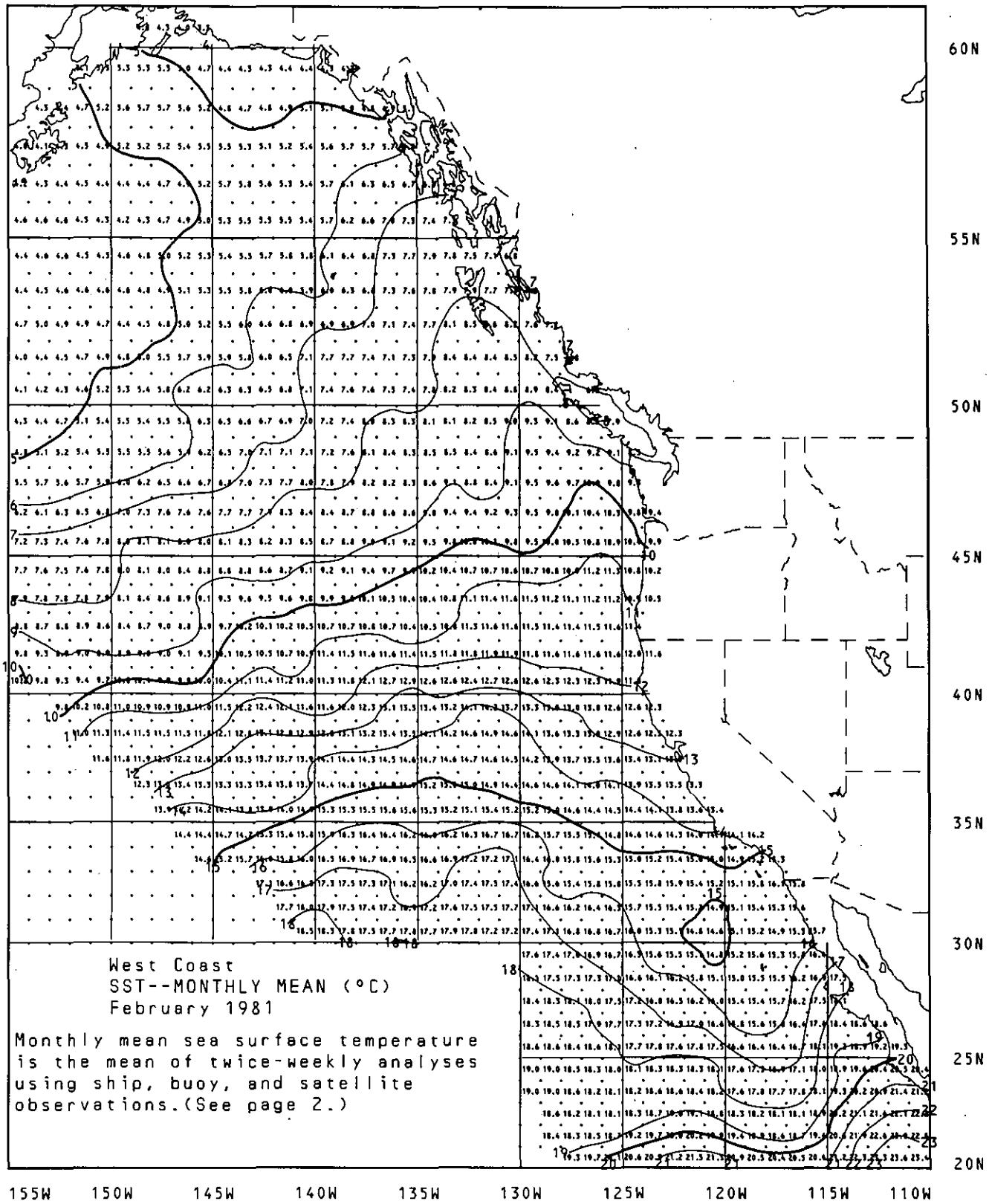

West Coast
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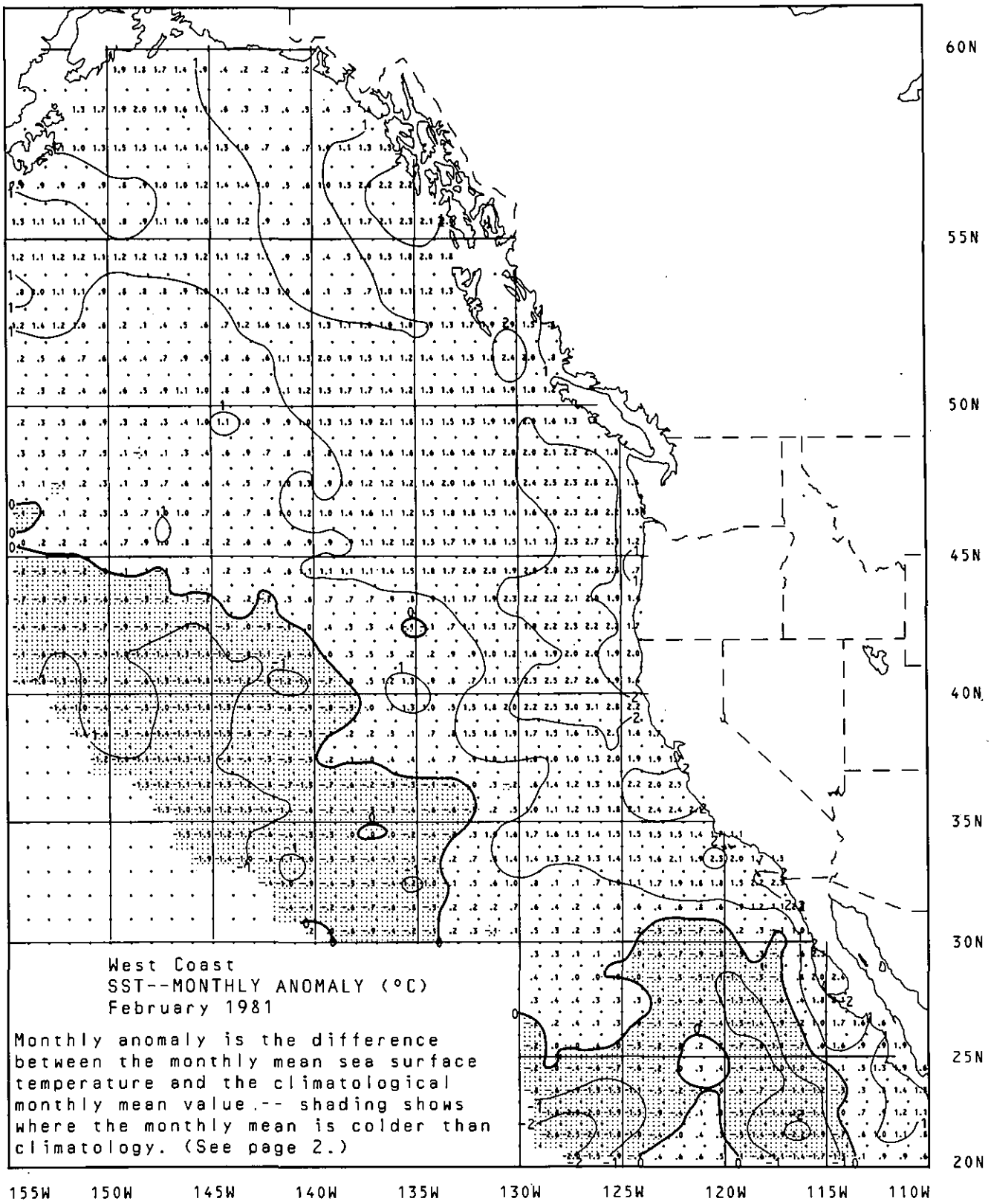
60N
55N
50N
45N
40N
35N
30N
25N
20N
155W
150W
145W
140W
135W
130W
125W
120W
115W
110W
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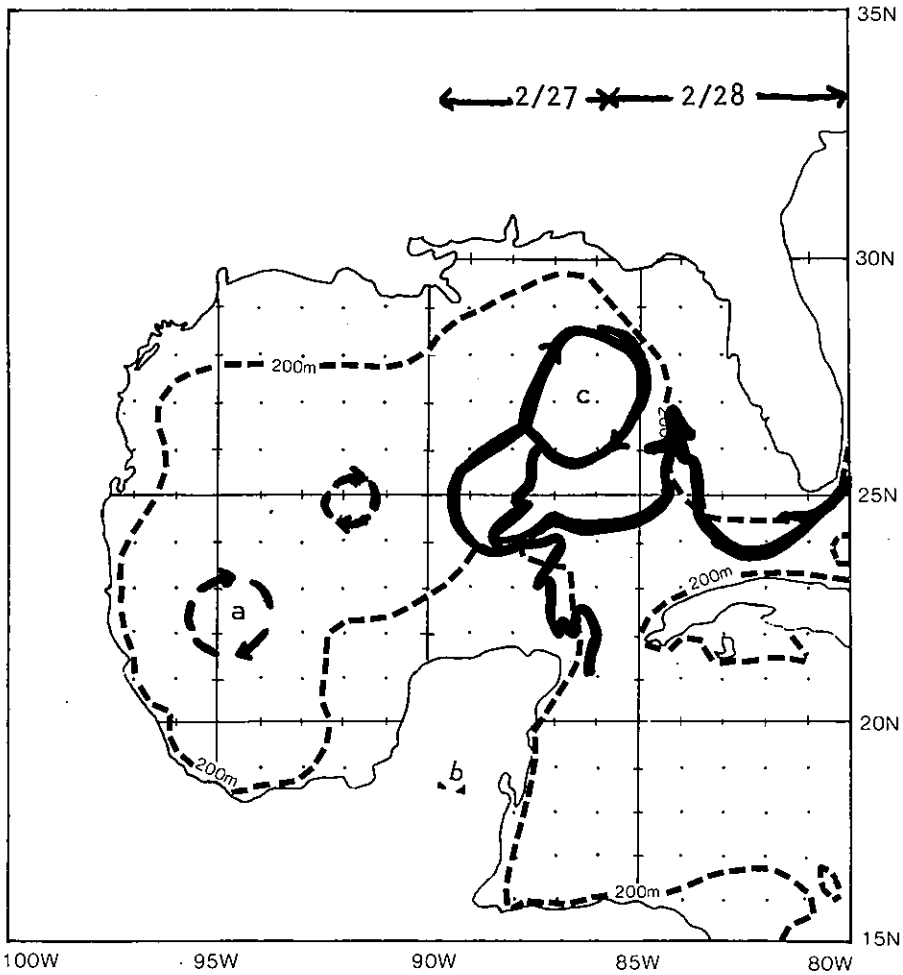
EAST COAST OCEAN FEATURES

End of the month positions of the Gulf Stream System and its associated eddies are shown for the NW Atlantic and the Gulf of Mexico. The Gulf Stream and Loop Current boundaries are located by prominent sea surface temperature gradients or by the 15°C isotherm at 200m. Anticyclonic eddies are labeled a-z in the Gulf of Mexico and 1-99 in the NW Atlantic. Cyclonic eddies are labeled A-Z. Arrows on eddies indicate direction of circulation. Warm-core or anticyclonic eddies rotate clockwise; cold-core or cyclonic eddies rotate counterclockwise. The long arrows indicate the date of data used.

Feature positions are drawn from:
- NOAA-6 satellite infrared imagery
- Bathythermograph data, National Meteorological Center of National Weather Service
- Oceanographic Analysis (daily), National Weather Service/National Earth Satellite Service



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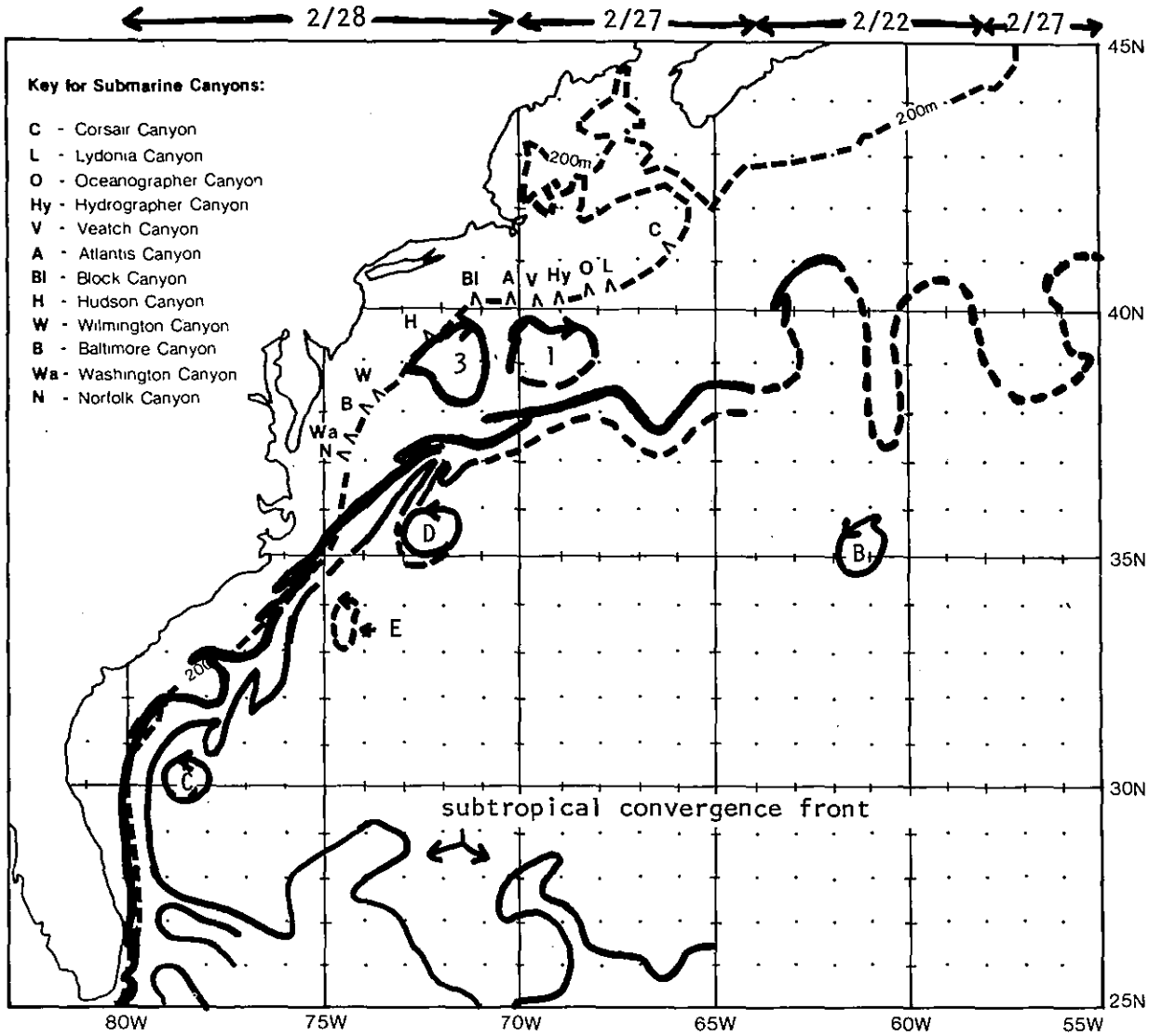
FEBRUARY 1981

The upper portion of the Gulf of Mexico's Loop Current pinched off around February 18 forming large, new anticyclonic eddy c. The average diameter of eddy c is 260 km. The extent of the Gulf Loop's amplitude decreased from 28°N to 25°N due to the new eddy formation. A large patch of warm Loop water remains westward between the Loop and the new eddy. The small protrusion in the Loop near 25°N 84°W has persisted since January. During February, this feature moved about 65 km eastward. Eddy



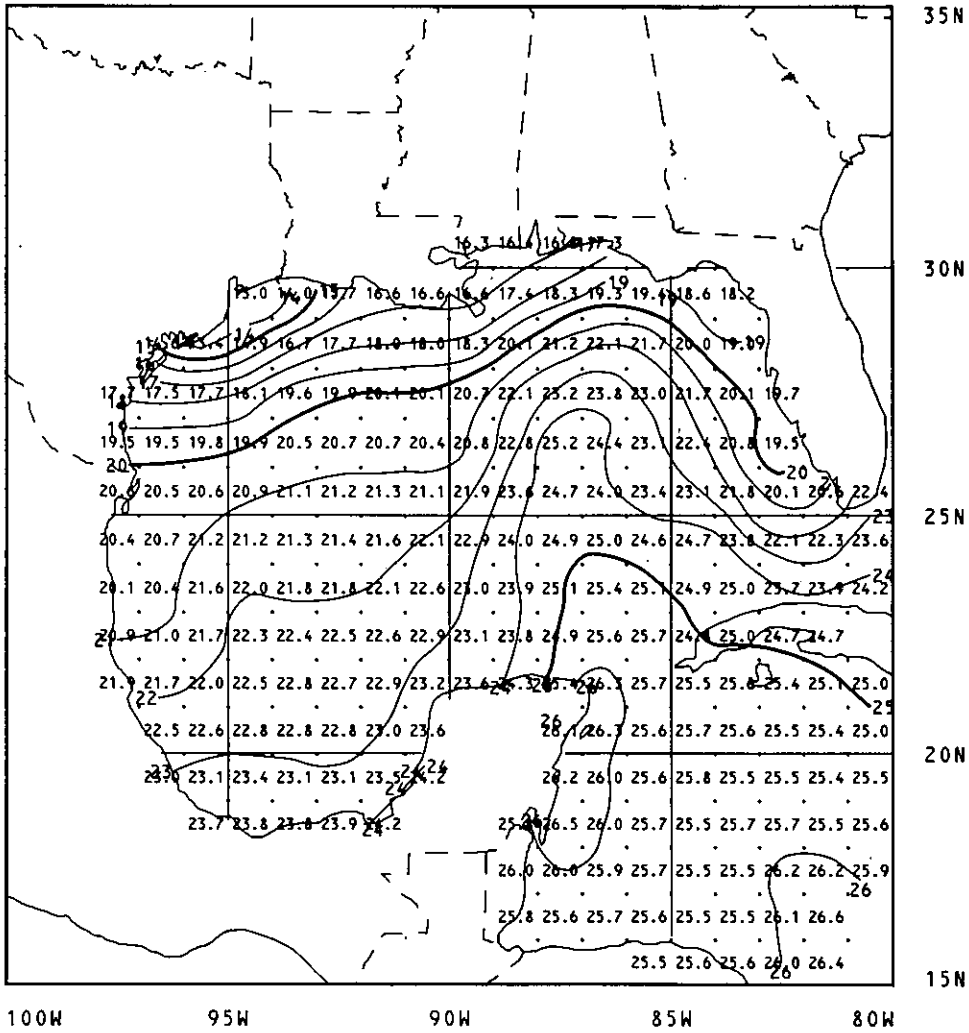
a is drawn from a possible sighting on February 21. Thus, eddy a translated about 130 km SW since the end of January. Eddy b was not observed on satellite imagery during February, but its location is estimated from late February sea surface temperature reports. Thus, eddy b moved approximately 100 km SE since January.

The most prominent feature of the Gulf Stream are the three meanders east of 65°W. Persistent cloudiness obscured much of this region during February. Apparently, the Gulf Stream absorbed both eddy 5 and eddy 6 between February 7-16, creating the first two high amplitude meanders. During February, eddy 1 translated 160 km W and eddy 3 translated 35 km SW.

Four cyclonic cold-core eddies were observed, three were initial sightings. Eddy A was not seen all month. Eddy B was last observed on February 12, having moved 160 km W since January. Eddy C was first seen on February 10 near 30°N 78°W and has since moved 50 km W. Eddy D was first sighted on February 17 near 35°30N 71°W and has since moved 110 km W. Eddy E was only observed on February 25.

The subtropical convergence front shown is from satellite imagery of February 28 and March 1.

EAST COAST SST-
MONTHLY MEAN



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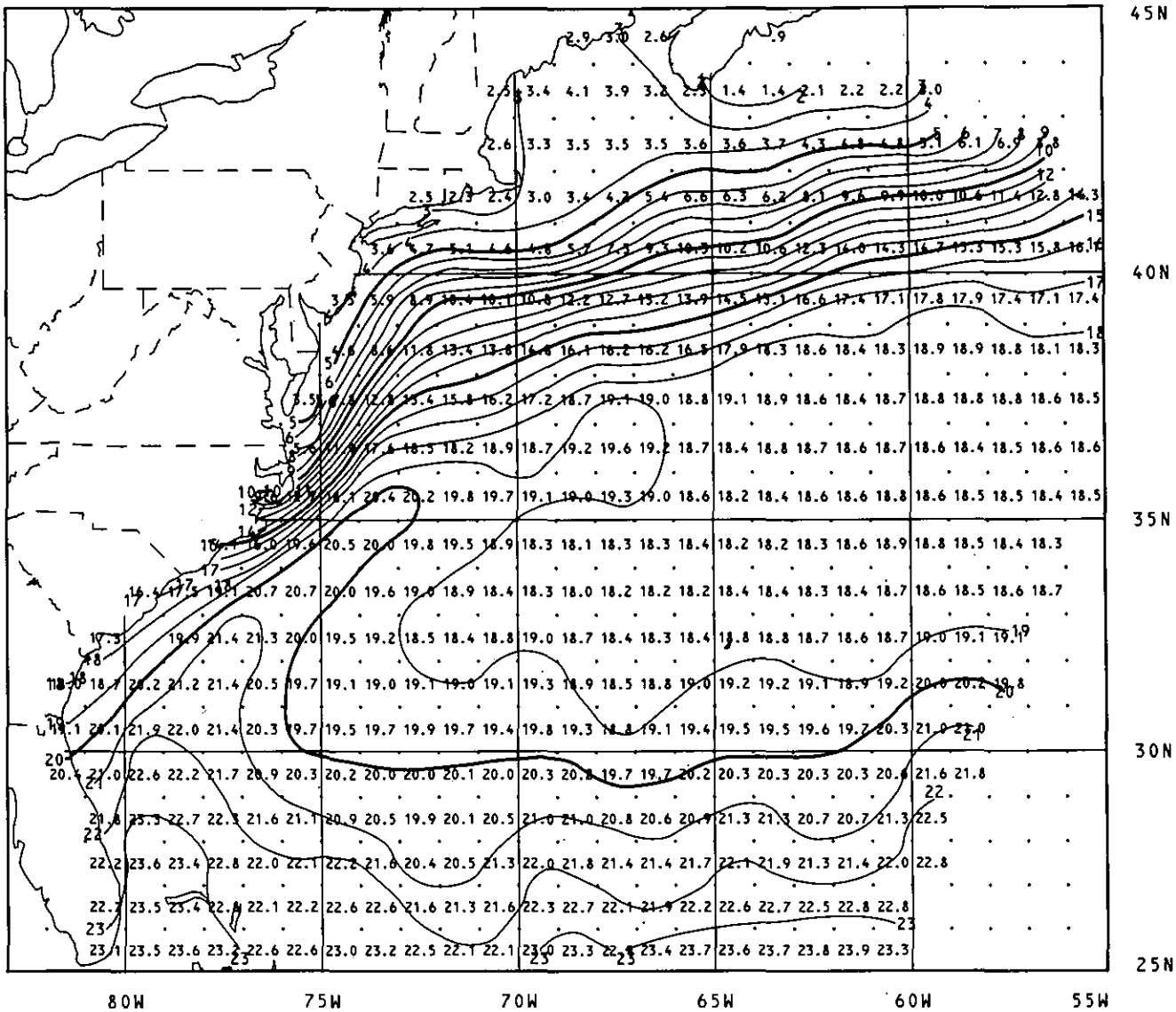

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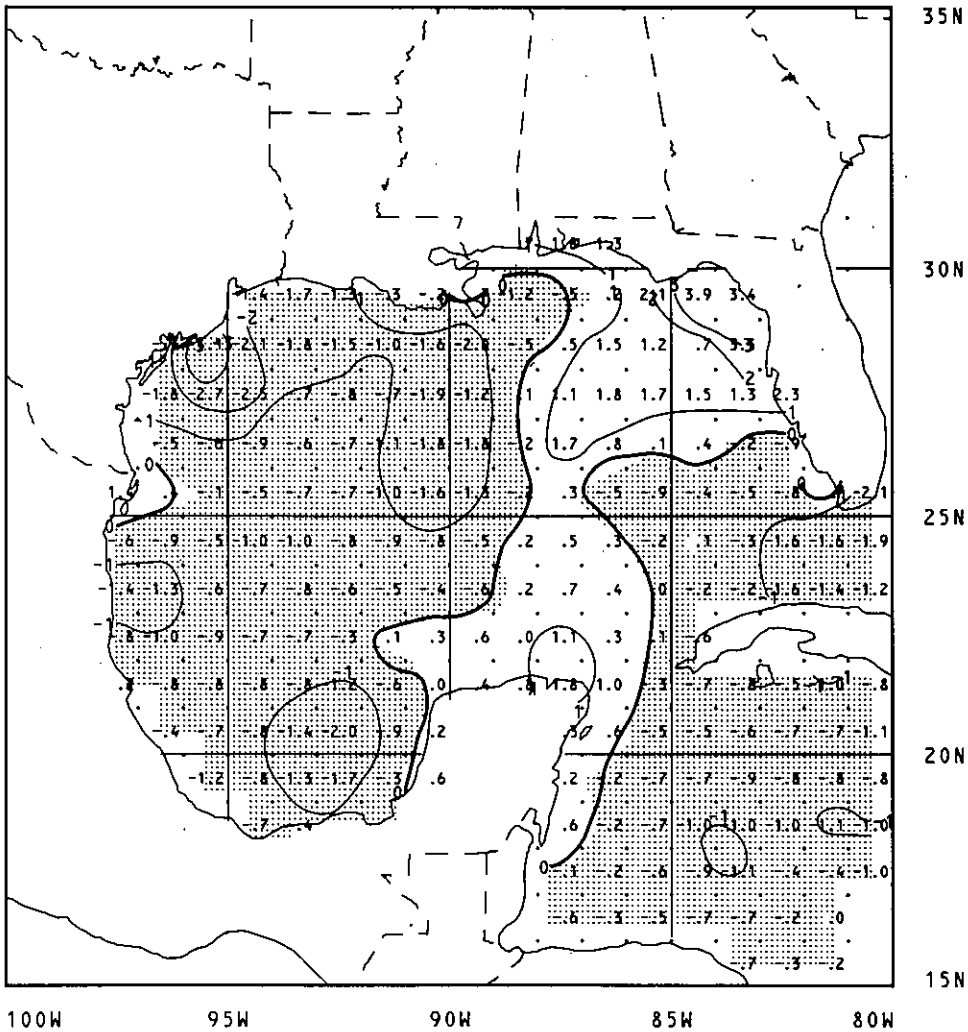
EAST COAST SST-ANOMALY



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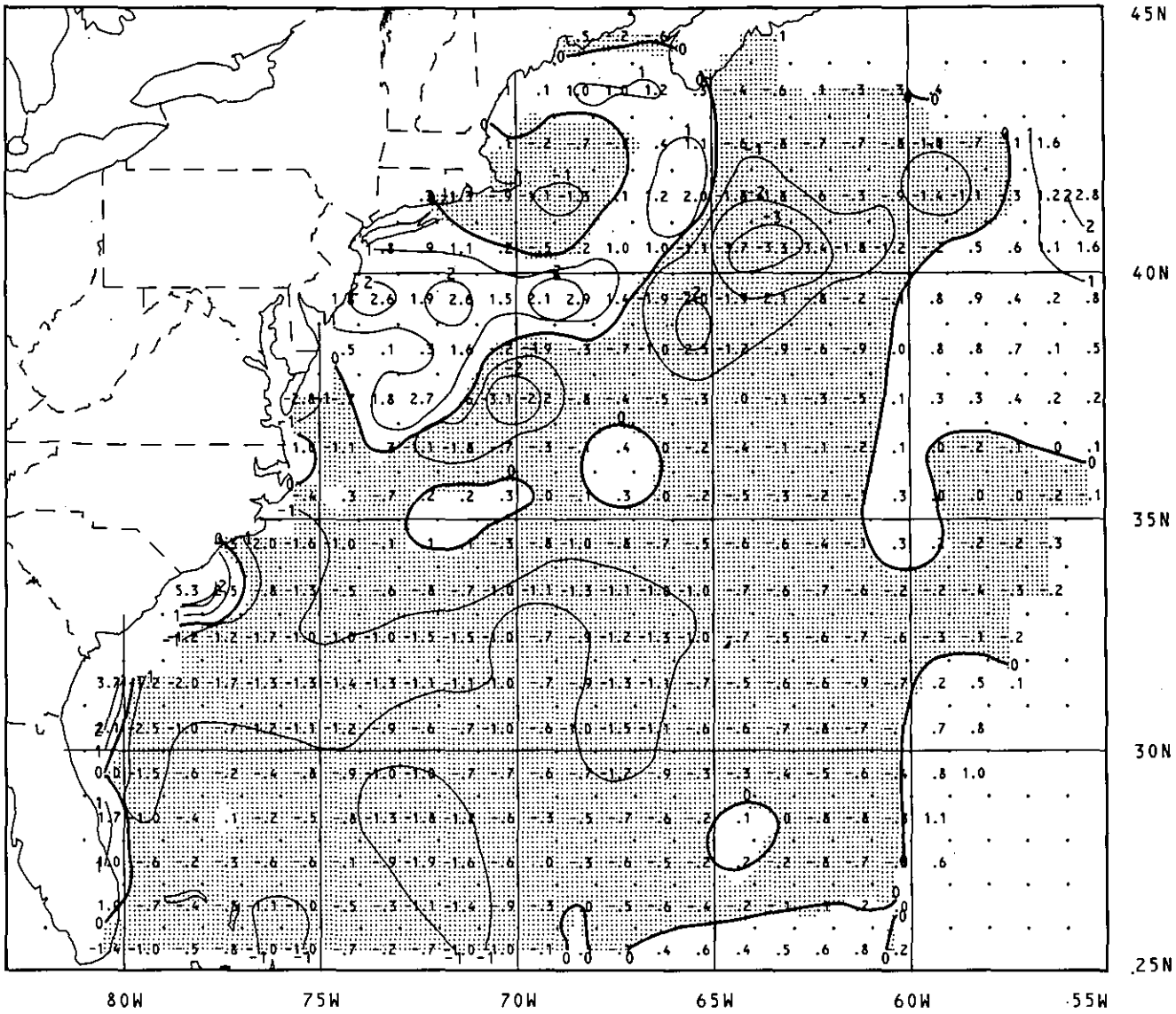

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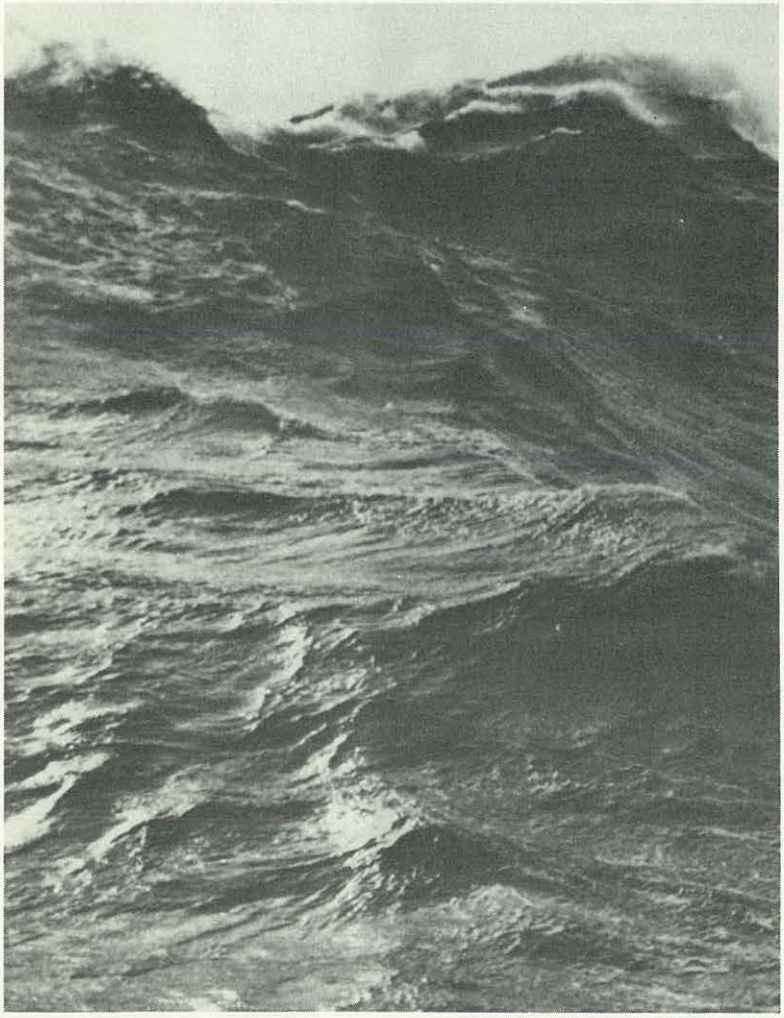
OCEANOGRAPHIC Monthly Summary

Volume I Number 3 March 1981



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22 East Coast SST - anomaly
24 Subscription information

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National Weather Service/National Earth Satellite Service

Oceanographic Monthly Summary replaces two long-lived oceanographic analysis publications, *gulfstream* and *Fishing Information*.

The *gulfstream* magazine was first published in January 1964 as *The Gulf Stream Monthly Summary* by the U.S. Naval Oceanographic Office (NavOceano). NavOceano's Antisubmarine Warfare Environmental Prediction System (ASWEPS) program collected Gulf Stream data that program managers felt could be useful to both academic researchers and the Navy Fleet if released in a timely manner. The 4-page monthly magazine was begun to meet these needs, and included maps of Gulf Stream location, monthly mean surface temperature patterns and anomalies, and subsurface temperature data. The climatology used for calculating anomalies was put together from NavOceano oceanographic data files. In 1967, the magazine was expanded to include a 2-page article on Gulf Stream research findings. NOAA took over the magazine, changing its name to *gulfstream*, in January 1975, continuing to present basically the same information. The two Gulf Stream magazines thus constitute an uninterrupted 16-year history of Gulf Stream meandering and associated eddy movements.

The *Fishing Information* history goes back even further. The old Bureau of Commercial Fisheries' San Diego laboratory began in 1960 to issue a monthly series of North Pacific sea surface temperature and anomaly maps in a publication called *California Fishery Market News Monthly Summary; Part II-Fishing Information*. Because certain fish species follow particular isotherms, fishers use the oceanographic information in planning their fishing trips. This publication represents a continuous 20-year climatology of North Pacific oceanographic conditions.

Oceanographic Monthly Summary will continue both of these data series, as well as beginning standardized oceanographic data series in all other U.S. offshore areas; hand analyses of some features will be continued. The computer-analyzed and computer-drawn maps will include more data (e.g., satellite SST), improved analysis techniques (see p. 3), improved climatology (described below), and will allow more timely publication of the information. Duane Kidwell of NOAA's Office of Management and Computer Services prepared software for all of the computer-drawn maps.

Our new climatology will be from Robinson and Bauer.* This is a computer-assisted, subjective analysis of all vertical-profile temperature data: the entire mechanical and expendable bathythermograph (MBT and XBT) files; portions of the hydrocast, salinity/conductivity temperature depth (STD/CTD), ratio message files; analysis of

*Robinson, M.K., 1976. Atlas of North Pacific Ocean Monthly Mean Temperatures and and Mean Salinities of the Surface Layer; *NavOceano Ref. Pub. 2*.
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Hemispheric: Sigurd E. Larson

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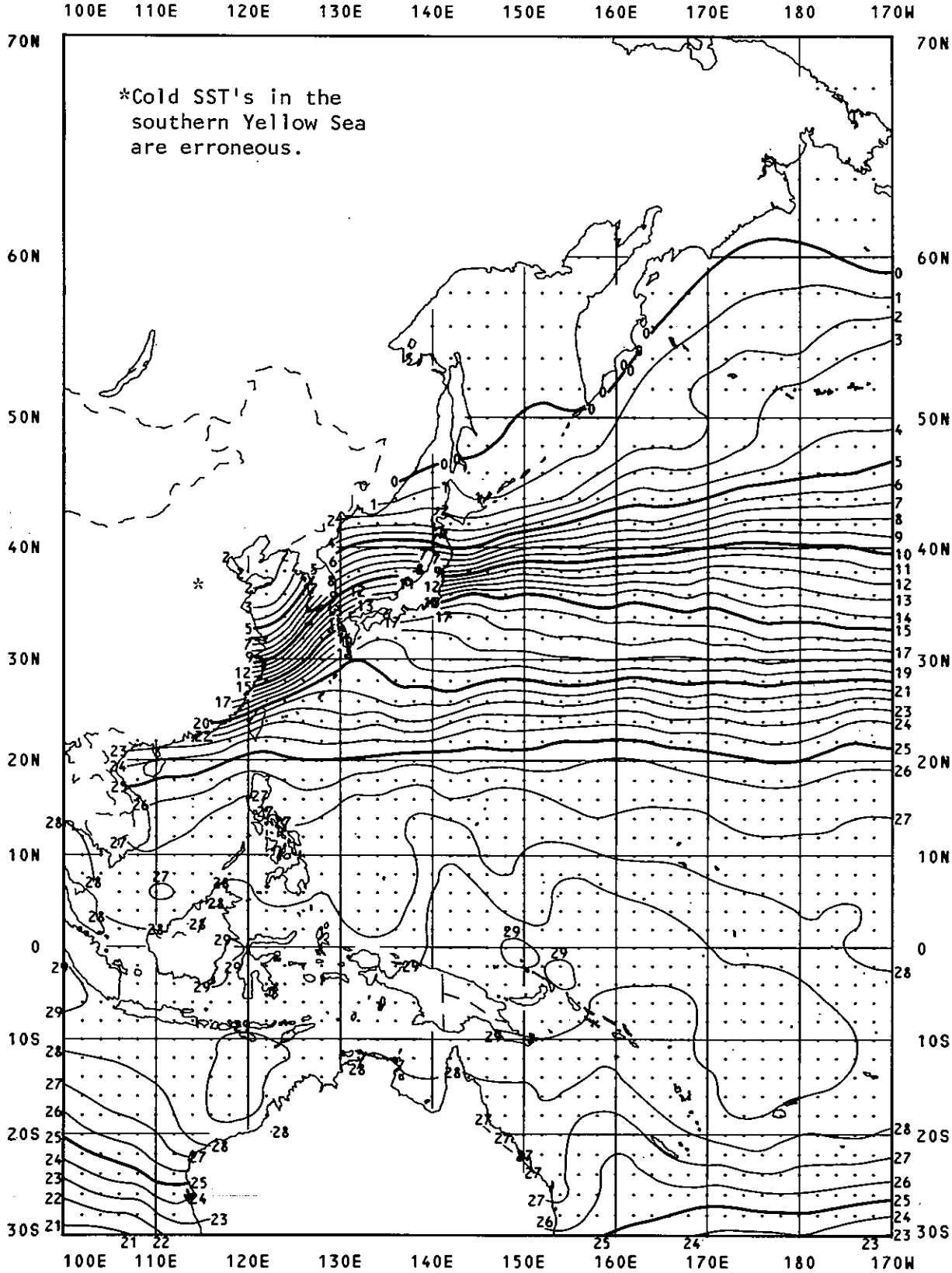
Beginning with this issue, the hemispheric analyses (p. 4-12) will be using the Robinson-Bauer climatology (see p. 2). The Alexander-Mobley climatology will no longer be used.



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March 1981

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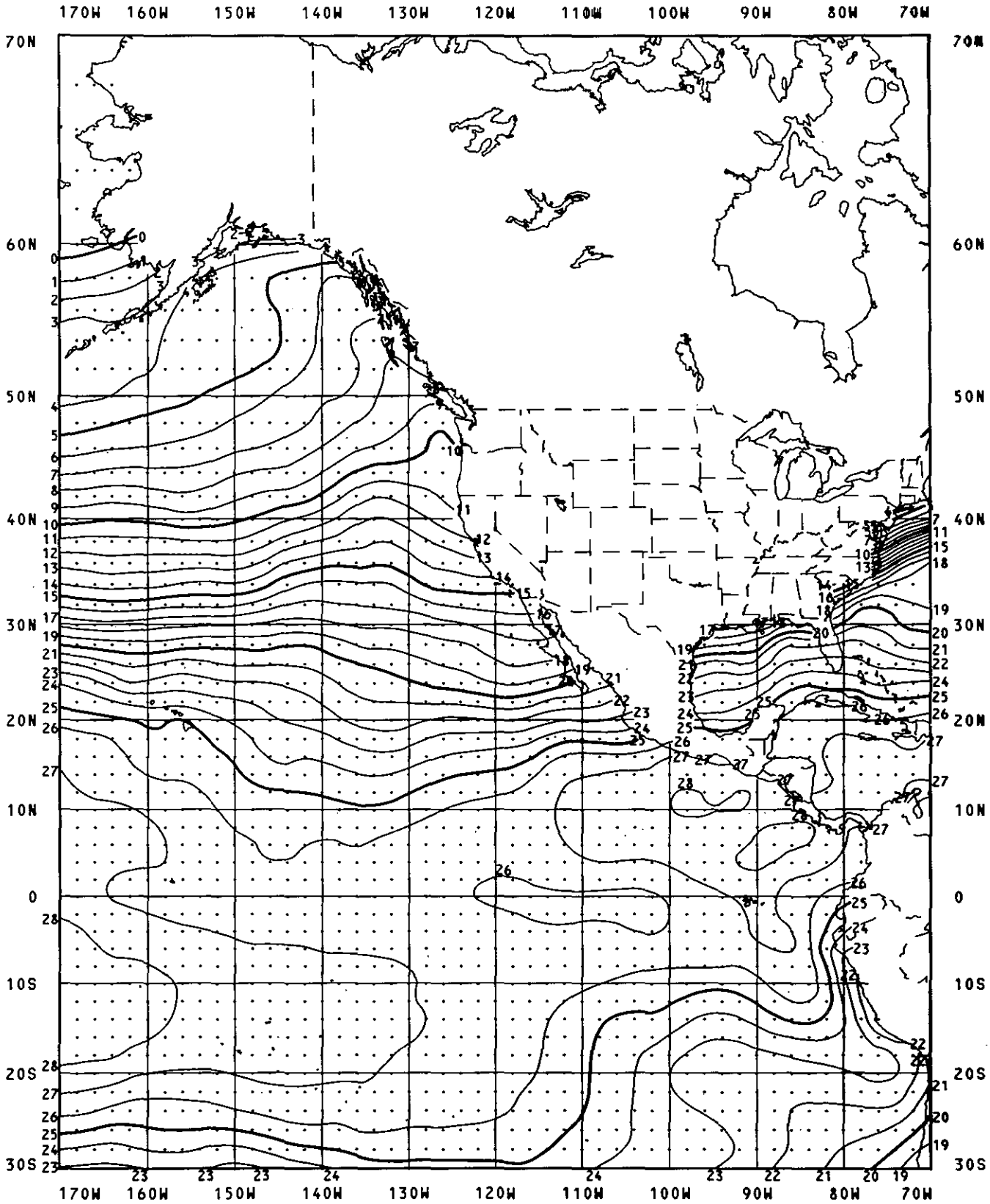

Eastern Pacific Ocean
SST--MONTHLY MEAN (°C)
March 1981

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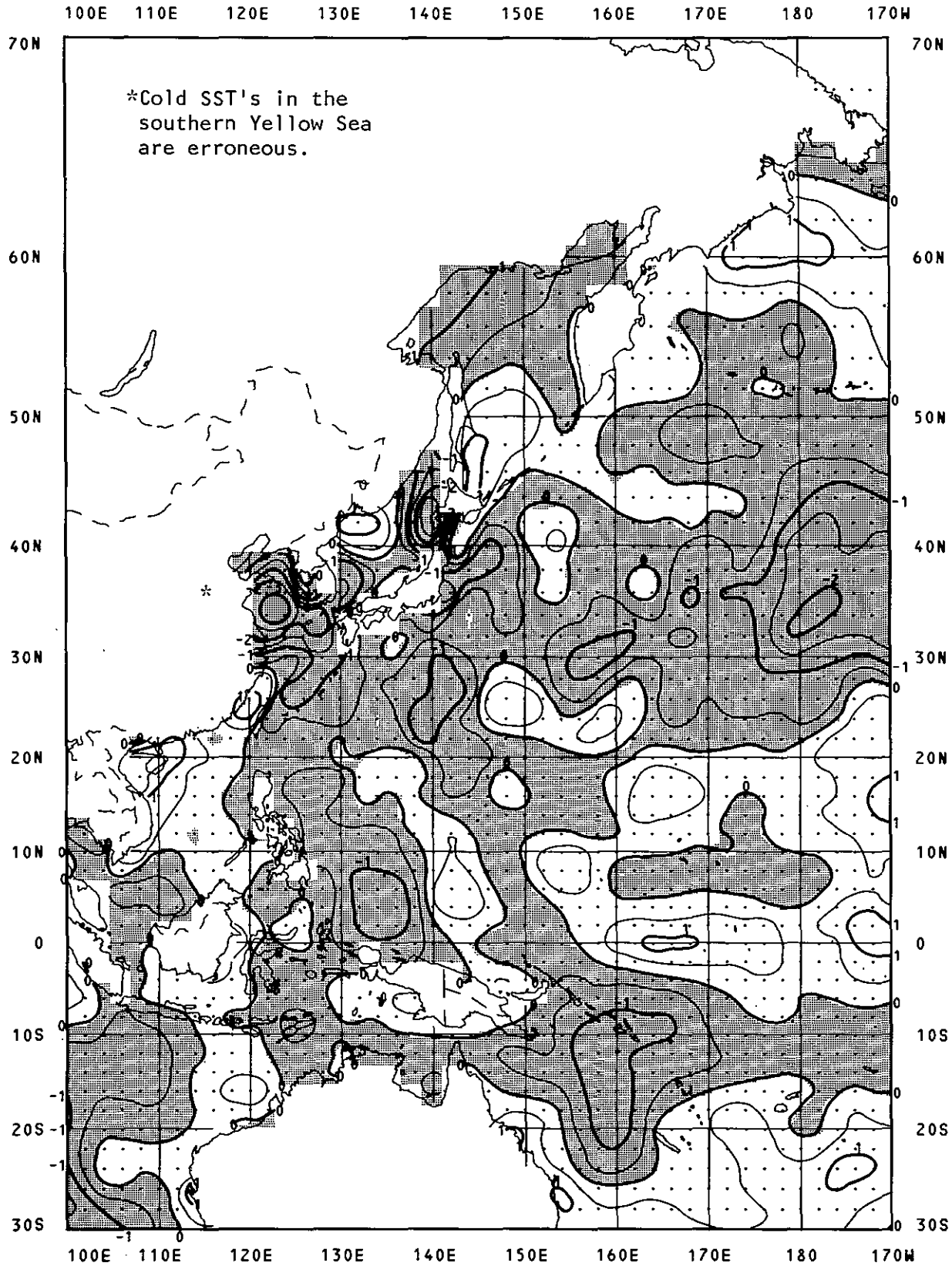

Western Pacific Ocean
SST--MONTHLY ANOMALY (°C)
March 1981

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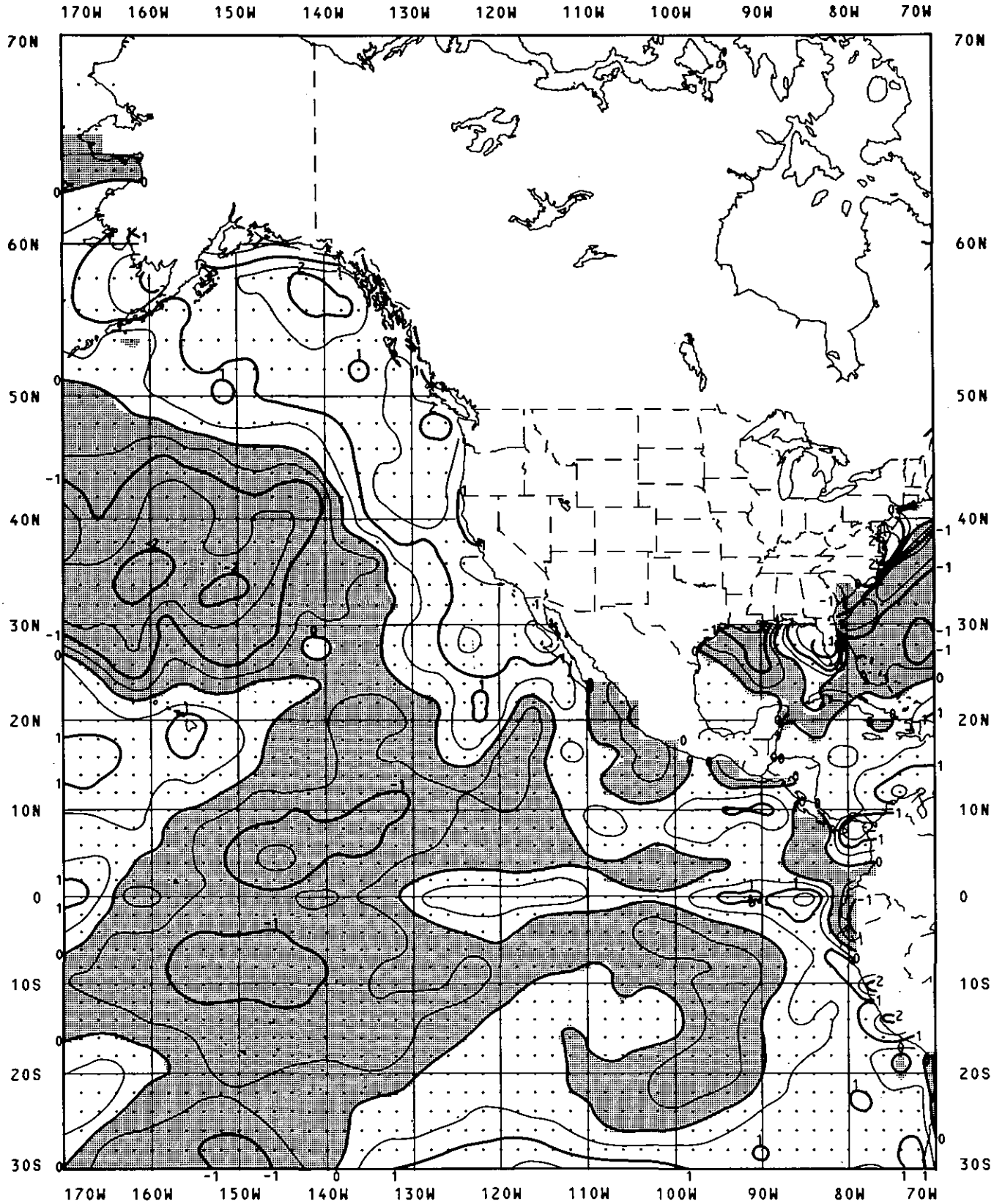

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SST--MONTHLY ANOMALY (°C)
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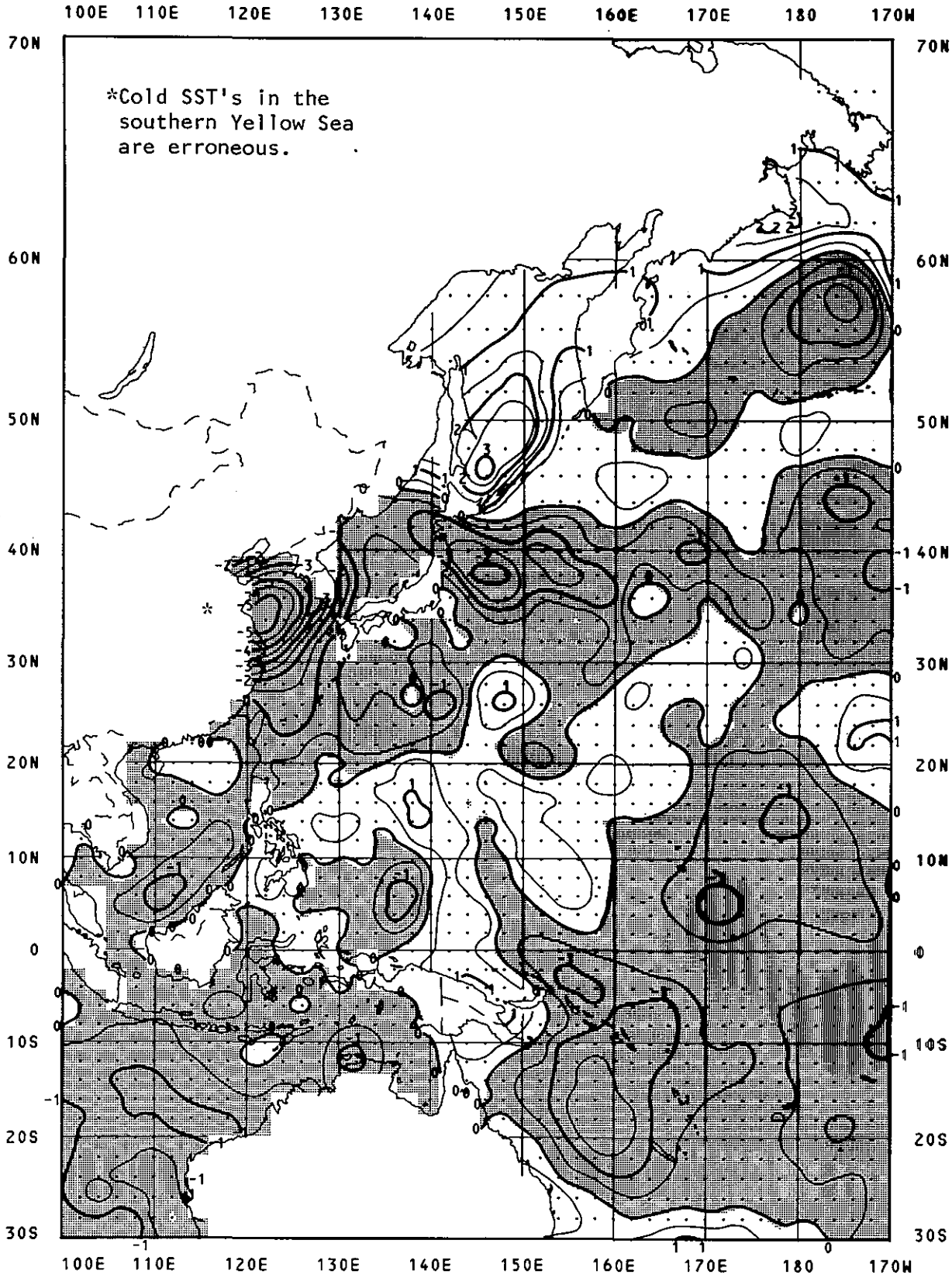

Western Pacific Ocean
SST--YEARLY CHANGE (°C)
March 1981

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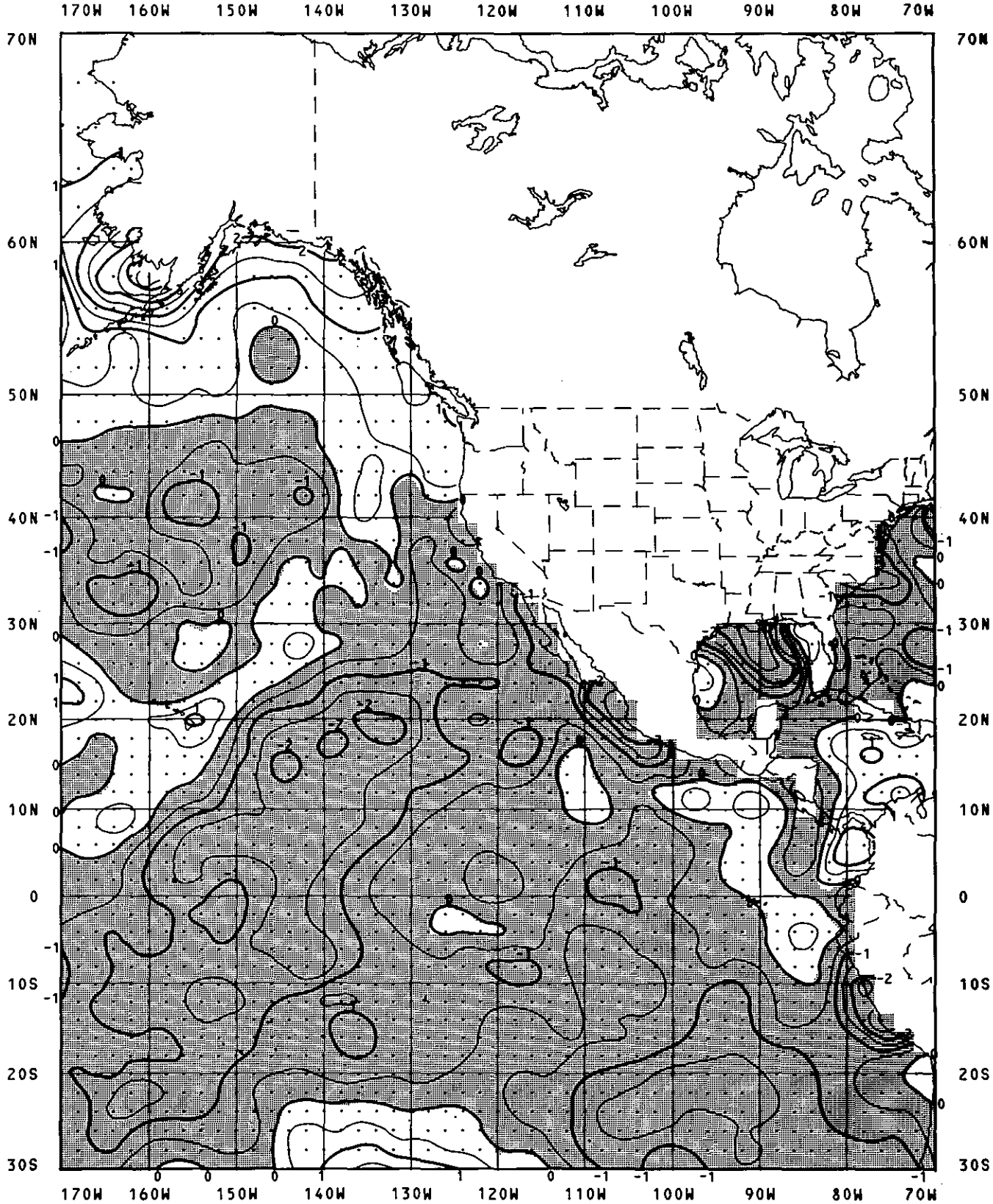

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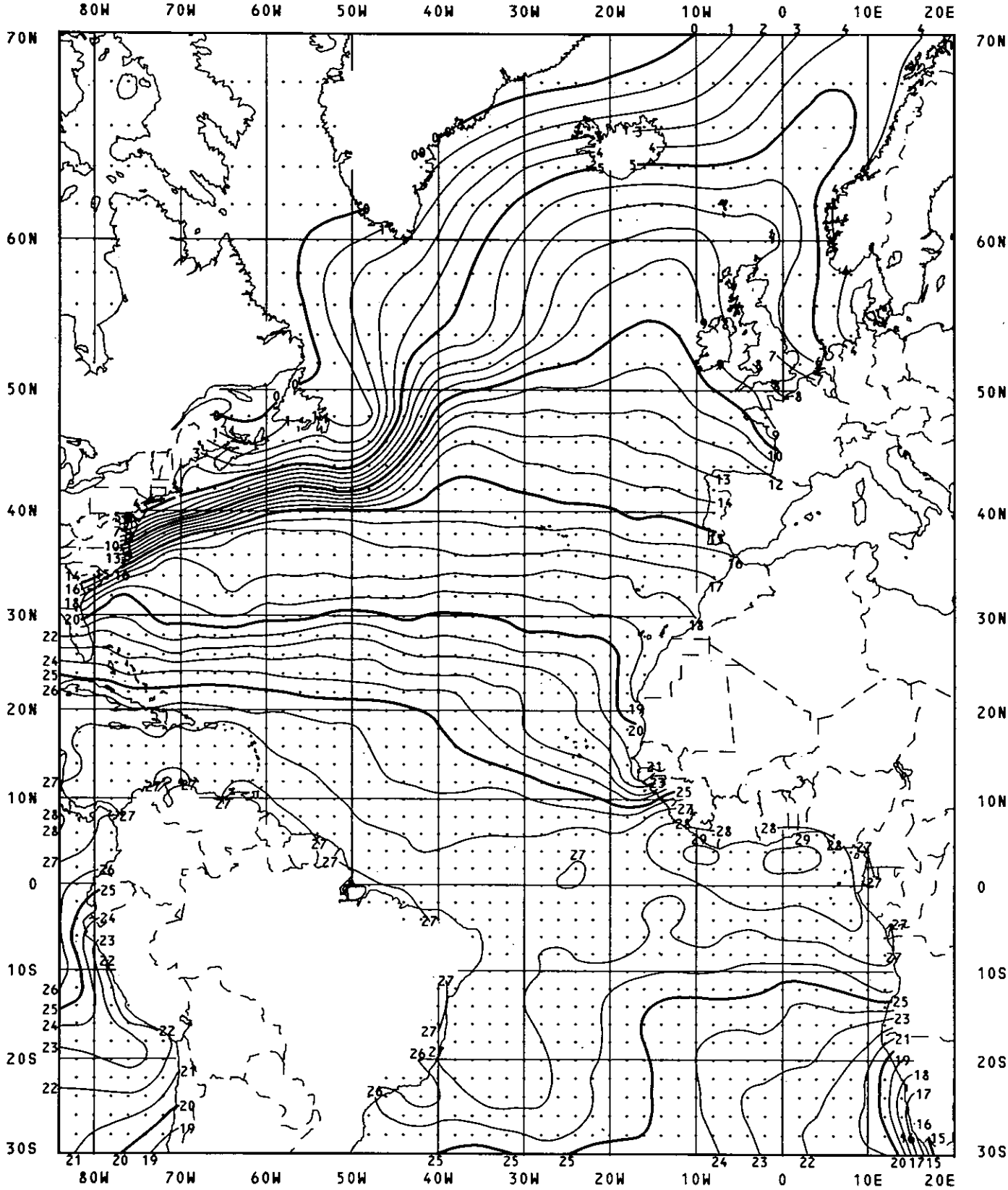

Atlantic Ocean
SST--MONTHLY MEAN (°C)
March 1981

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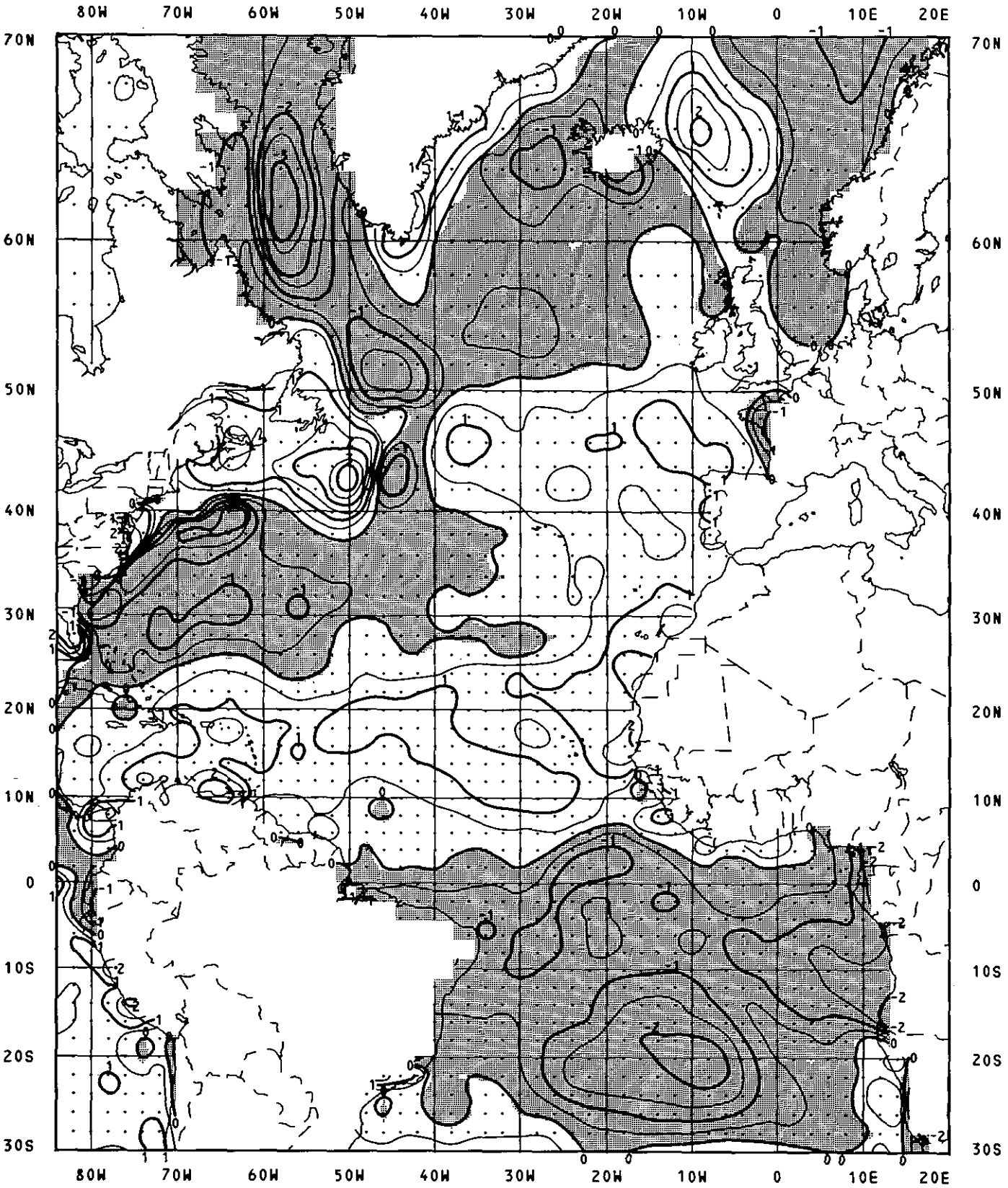

Atlantic Ocean
SST--MONTHLY ANOMALY (°C)
March 1981

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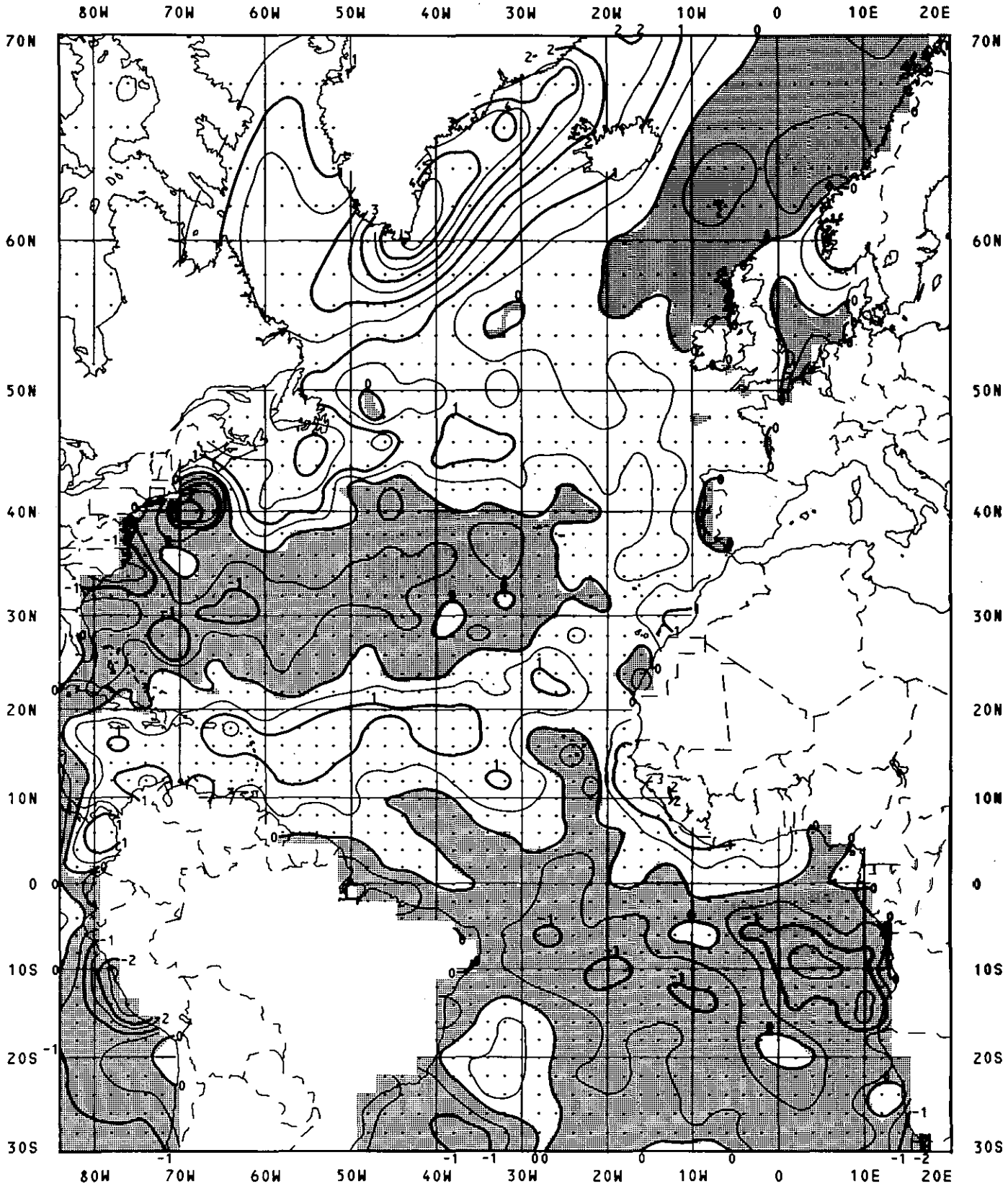

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SST--YEARLY CHANGE (°C)
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REGIONAL ANALYSES

Bering Sea /North Slope Ice

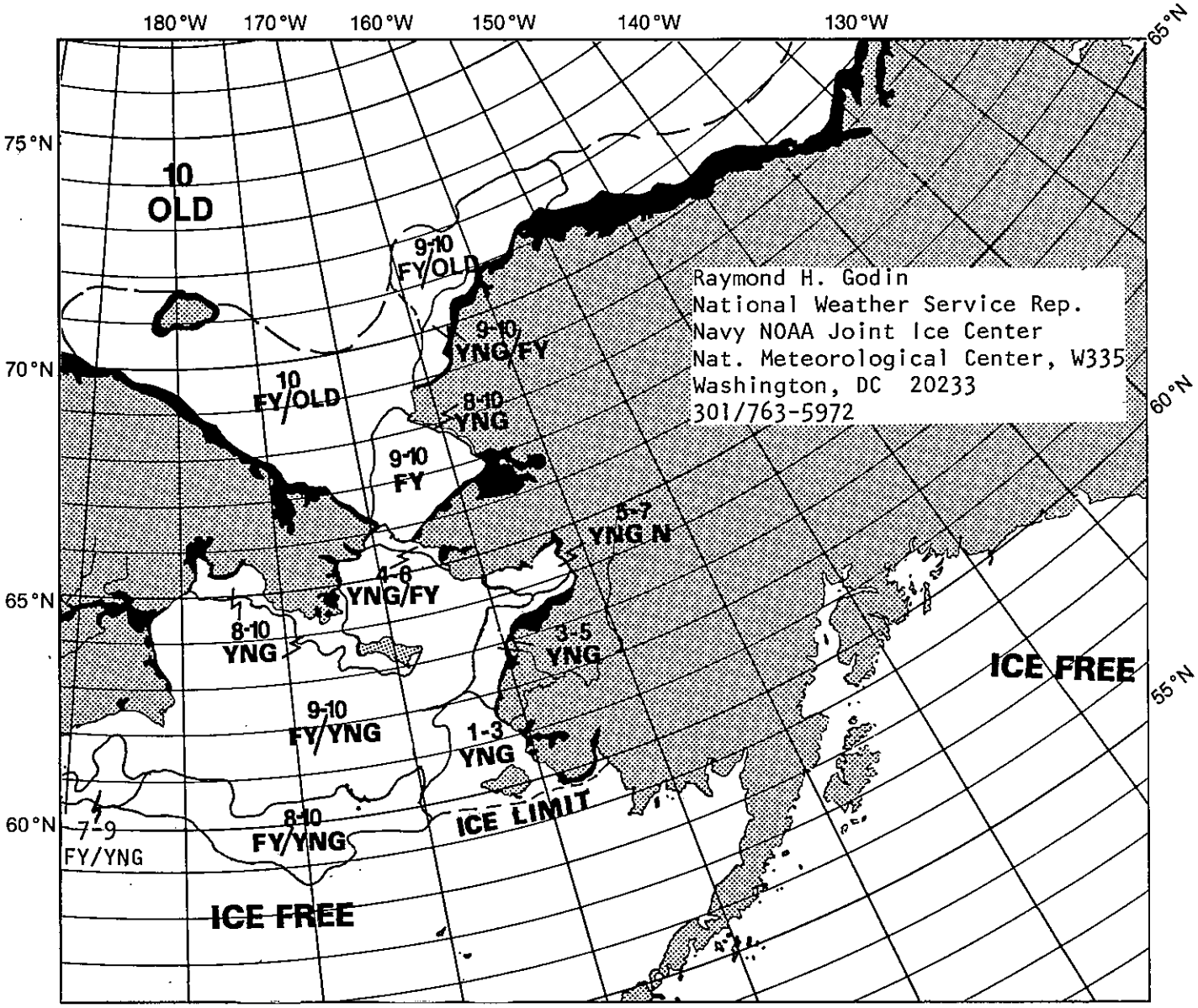
West Coast

Ocean features
Sea surface temperature
SST anomaly

East Coast

Ocean features
Sea surface temperature
SST anomaly

BERING SEA / NORTH SLOPE ICE ANALYSIS



MARCH 1981

KEY

ICE CONCENTRATION

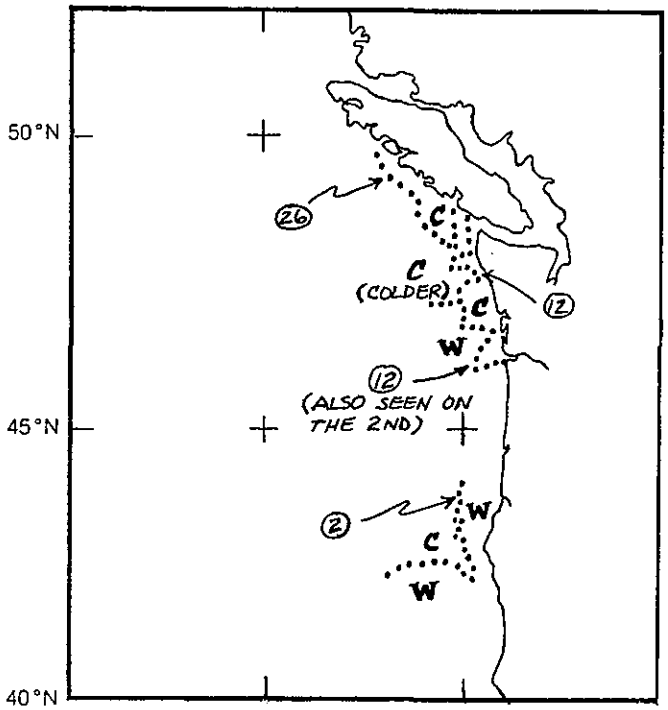
4-6	Area 4-6 tenths ice-covered.
OW	Open water. Sea ice present in concentrations less than one tenth.
ICE-FREE	No sea ice. Ice of land origin (iceberg e.g.) may be present.

ICE THICKNESS (AGE)

OLD	Includes both multi-year and second-year ice. Generally 2-3.5m thick.
FY	Any or all first year ice types (30 cm - 2 m thick).
YNG	Young ice (10-30 cm thick).
N	New and nilas.
■	Fast ice. Sea ice which forms and remains fast along the coast.
120	Theoretical thickness of this season's growth (cm), based on freezing degree days (presented for first day of each month on first succeeding chart).
———	Ice boundary visually or satellite observed.
- - - -	Ice boundary estimated.

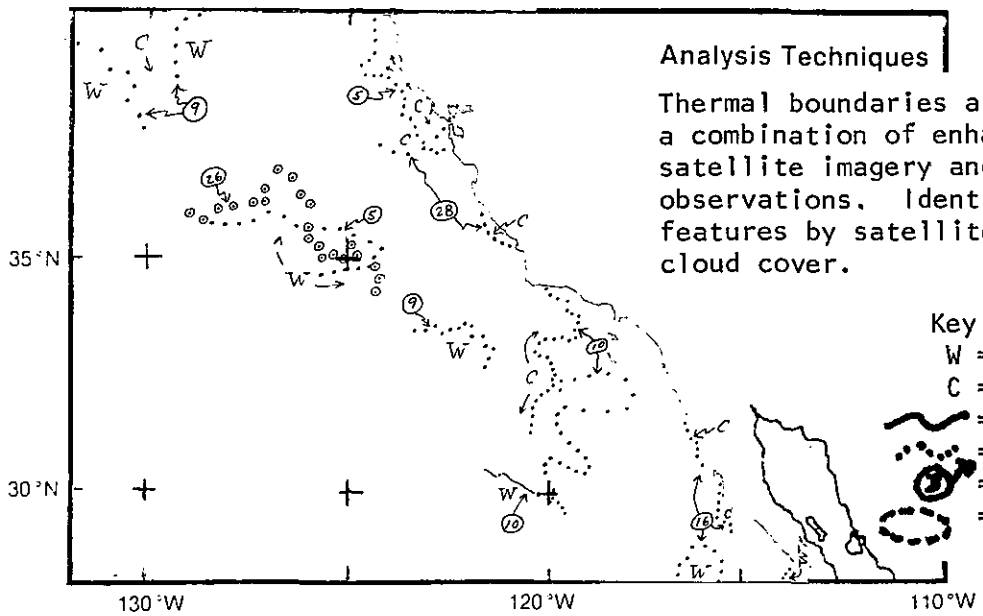
A 988mb low located near 53°N 170°W is the most prominent feature of the mean monthly surface pressure circulation affecting sea ice distribution. The mean geostrophic flow ranged from southeasterly in the Gulf of Alaska and southeastern Bering Sea to northeasterly from the Bering Strait northward. A very warm air mass pushed monthly mean air surface temperatures to much above normal values in the eastern Bering Sea. Temperatures in some areas ranged from 4-8°C above normal. In the most northern region of Alaska, Barrow (71°N 157°W) observed an above normal mean air temperature of over 2°C. In response to unseasonably warm air temperatures and southerly winds the ice edge receded 160-210 km east of 173°W during March. Massive ablation of the pack ice is observed west of the fast ice zone in the eastern Bering Sea. West of 173°W the ice edge generally expanded from 0-70 km. The current ice edge extent east of 173°W is 70-180 km north of the mean historical position for the end of March.

WEST COAST OCEAN FEATURES



MARCH 1981

March SST patterns in Pacific Northwest waters exhibited few persistent or pronounced features. The primary exception was the continuation of a feature seen last month, cold water adjacent to the Washington coast, which is a result of cold river runoff moving northward in the Davidson Current. This feature persisted through the first half of March. Beginning on March 21, five days of moderate to strong southeasterly to southwesterly winds resulted in the month's strongest episode of onshore water transport, causing warming nearshore and the disappearance of the cold coastal feature. Little change was observed over the remainder of the area. During March the NOAA buoys at 46°N 131°W and 42°30N 130°W recorded small transient changes without clear trends.



Analysis Techniques

Thermal boundaries are determined from a combination of enhanced infrared satellite imagery and ship and buoy observations. Identification of these features by satellite is limited by cloud cover.

Key
W = Warm
C = Cold
= Strong boundary
= Weaker boundary
= Date of feature
= Outline of water mass feature

In the south panel, several late winter storms occurred, causing rapid SST fluctuations in the region surrounding 30°N 130°W. SST's recorded by the data buoys at Half Moon Bay (37°N 123°W) and Pt. Sal (35°N 121°W) ranged between 12-13.5°C and 12.2-14.7°C. Areas of cooler water were observed along the central California and Baja coasts. The thermal boundary observed on March 10 running south of Pt. Conception (34°N 120°W) separates the cold California Current water from the warmer water towards the coast. Again in March, warm water intrusions were repeatedly seen near 35°N 125°W.

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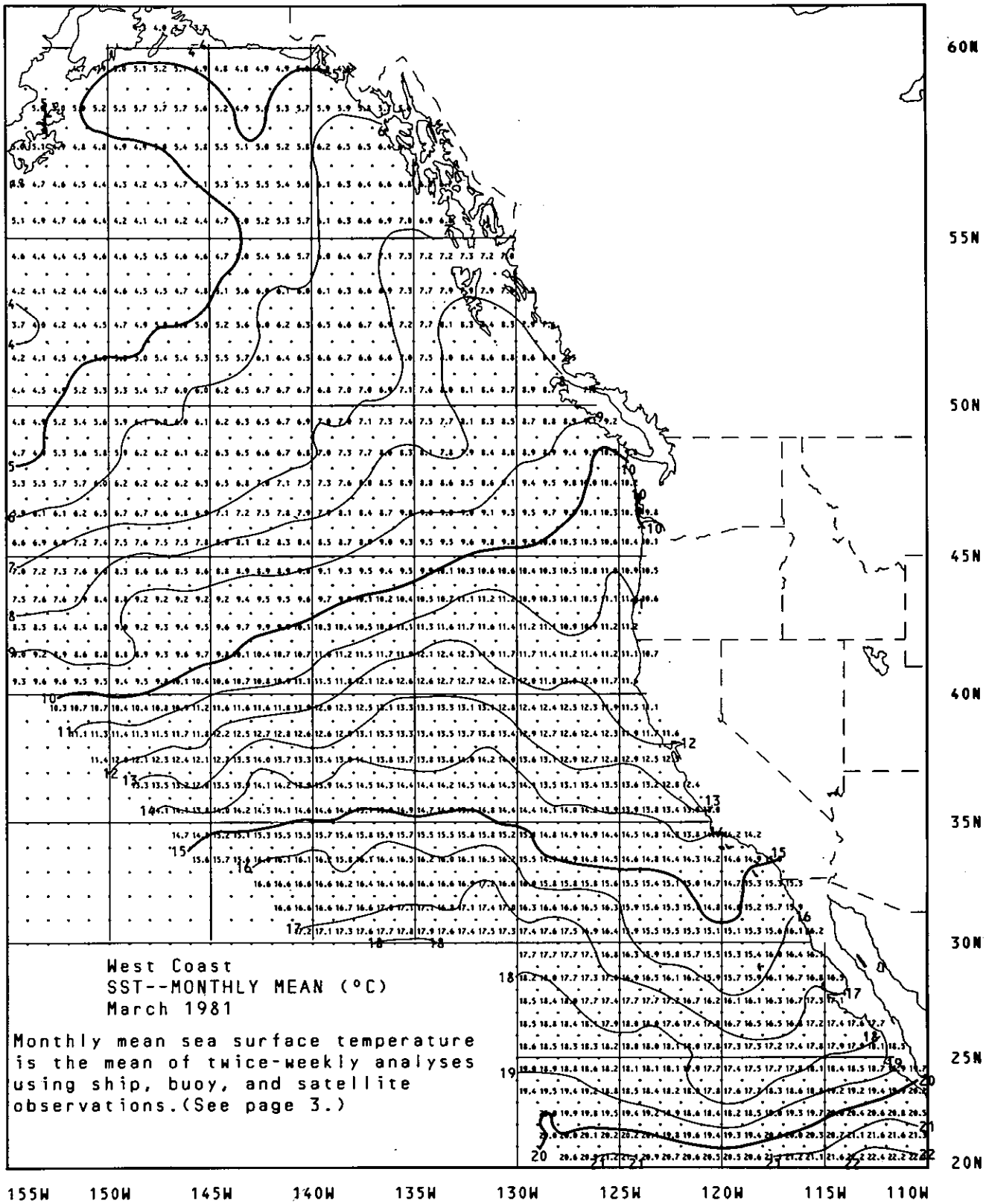

West Coast
SST--MONTHLY MEAN (°C)
March 1981

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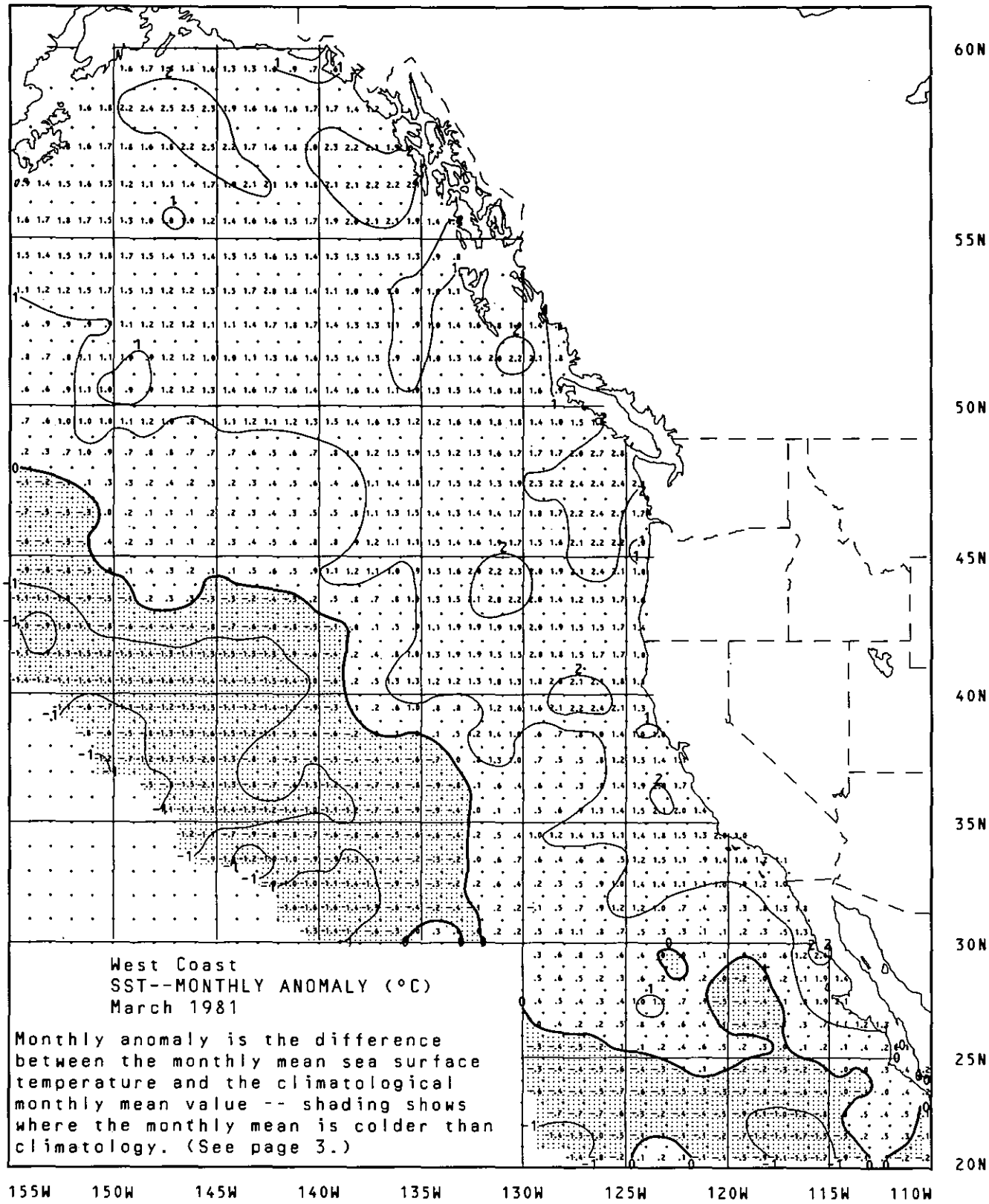

West Coast
SST--MONTHLY ANOMALY (°C)
March 1981

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EAST COAST OCEAN FEATURES

The end of this month's positions of the Gulf Stream System and its associated eddies are shown for the NW Atlantic and the Gulf of Mexico. The Gulf Stream and Loop Current boundaries are located by prominent sea surface temperature gradients or by the 15°C isotherm at 200m. Anticyclonic eddies are labeled a-z in the Gulf of Mexico and 1-99 in the NW Atlantic. Cyclonic eddies are labeled A-Z. Arrows on eddies indicate direction of circulation. Warm-core or anticyclonic eddies rotate clockwise; cold-core or cyclonic eddies rotate counterclockwise. The long arrows indicate the date of data used.

Feature positions are drawn from:
- NOAA-6 satellite infrared imagery
- Bathythermograph data,
  - National Meteorological Center of National Weather Service
- Oceanographic Analysis (daily),
  - National Weather Service/National Earth Satellite Service

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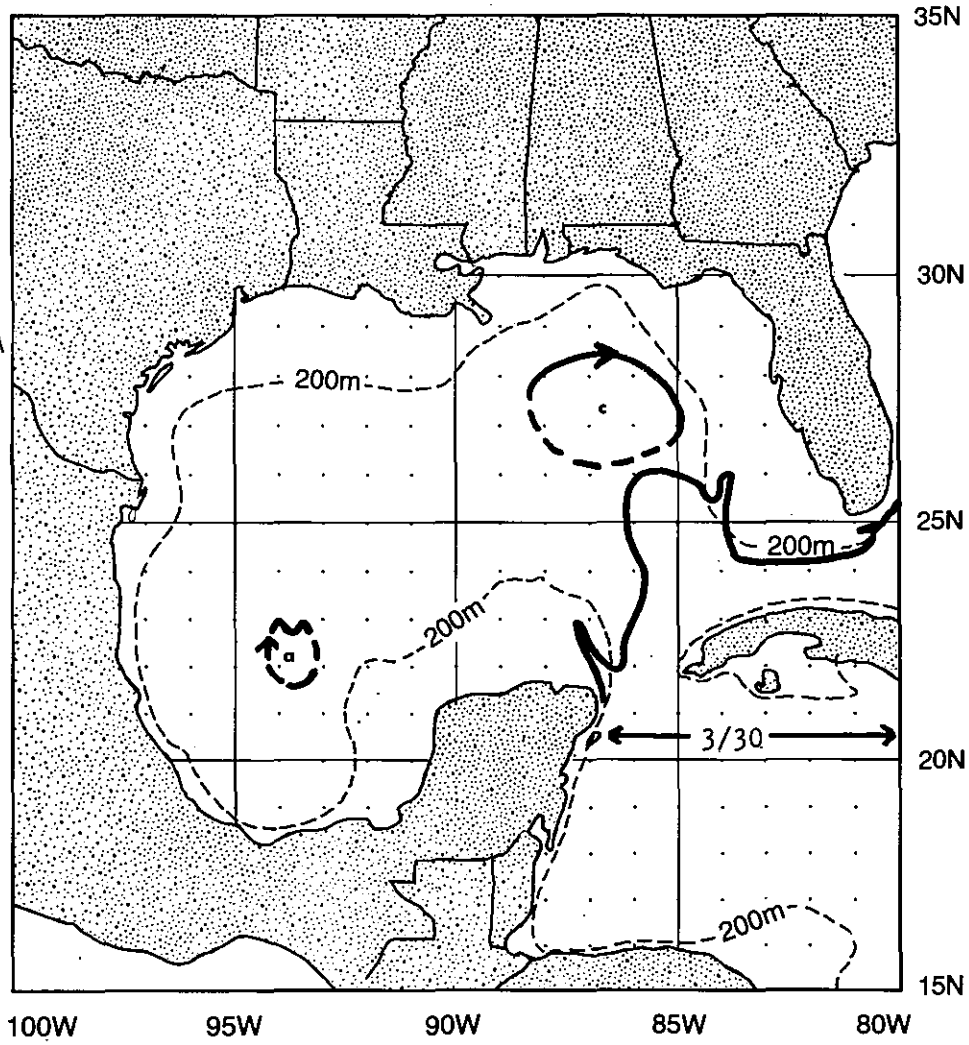
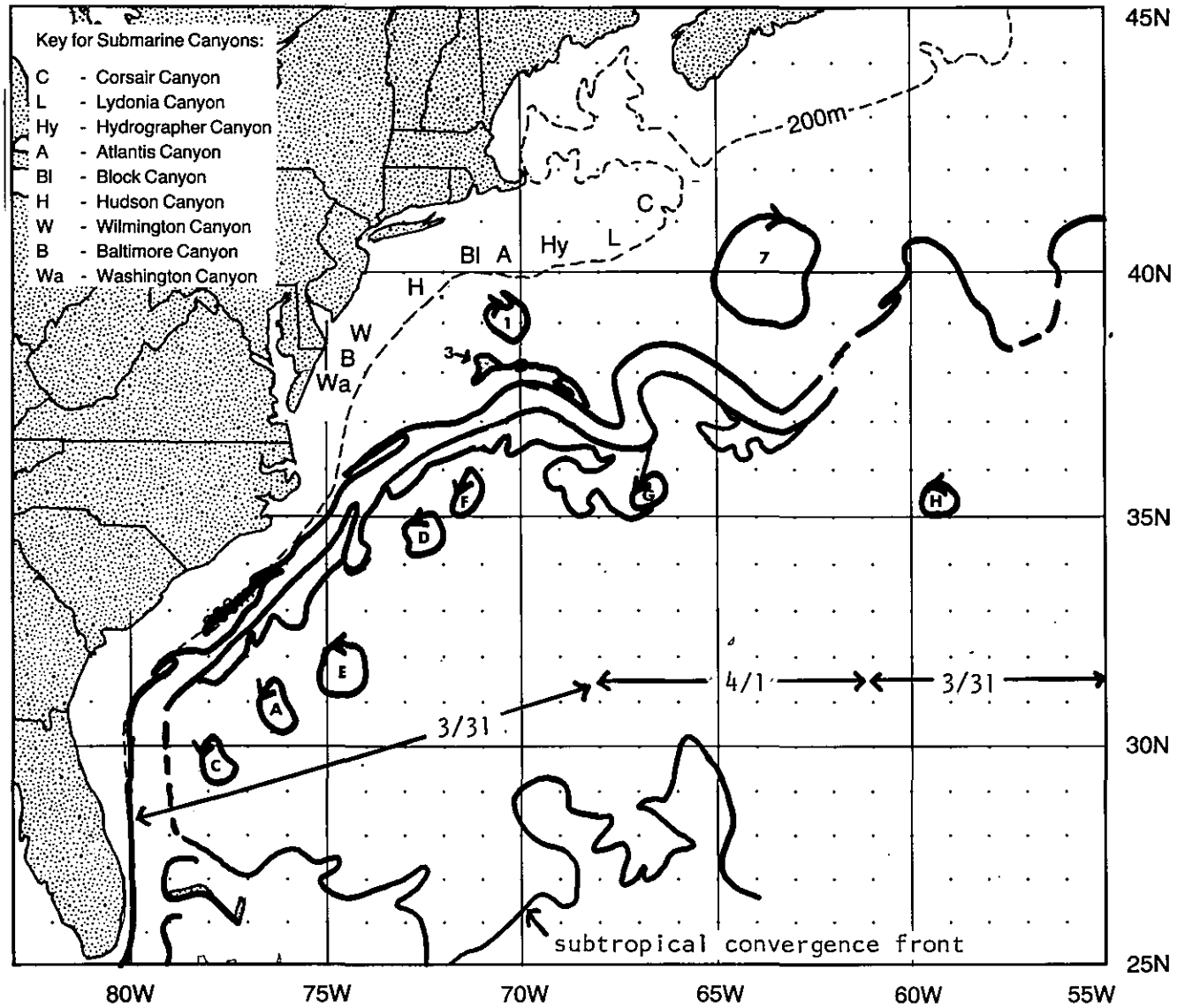


MARCH 1981

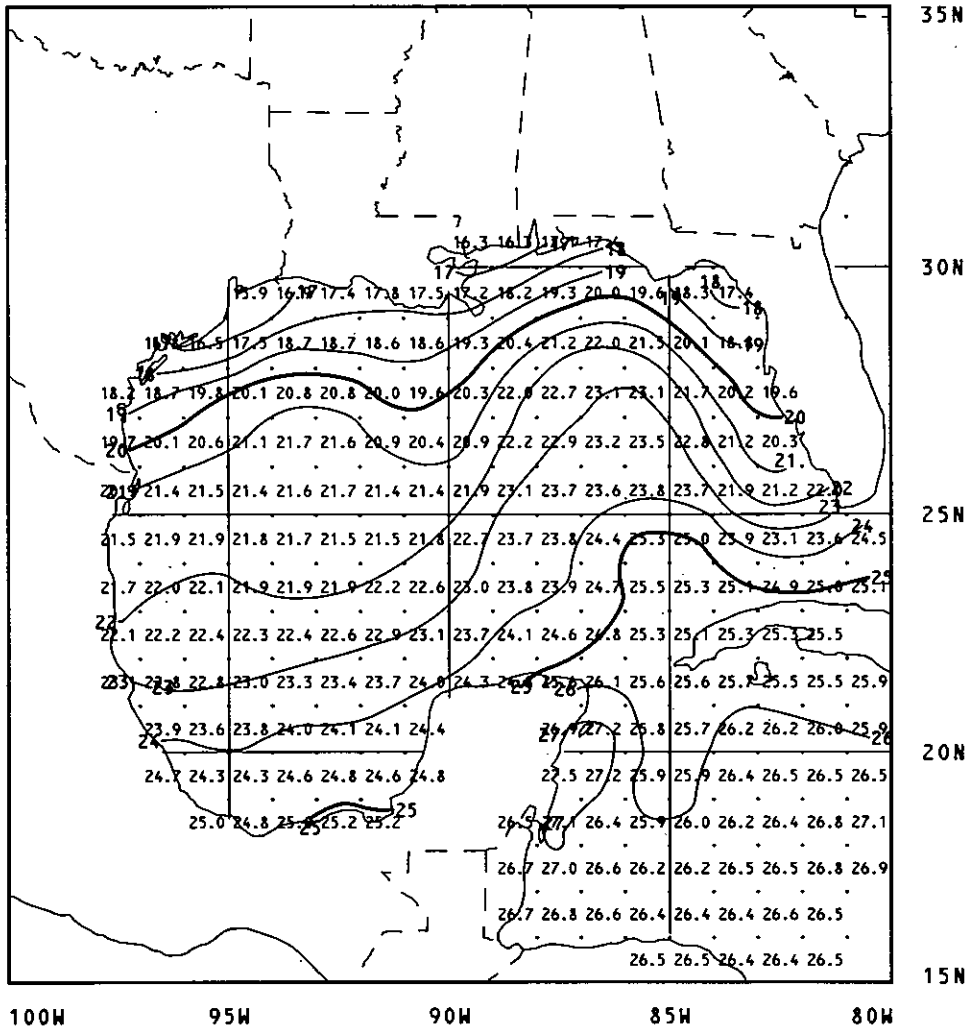
During March the Gulf of Mexico's Loop Current increased its amplitude northward from 24°30N to 26°N. Anticyclonic eddy c, which formed in February, moved 50 km WNW during the month. Eddy a is drawn from a possible sighting on March 20, apparently, having translated 74 km E. Eddy b was not observed.



Prominent features of the Gulf Stream chart above include the moderate amplitude meander near 38°N 67°W and the two large amplitude meanders near 40°N 60°W and 41°N 55°W. During March the Stream formed one anticyclonic eddy and partially absorbed one. Around March 5 a large amplitude Gulf Stream meander pinched off near 38°30N 62°W forming new anticyclonic eddy 7 which has translated about 130 km W since. Anticyclonic eddy 3 moved slightly southeast during early March. Meanwhile, a small amplitude wave of the Stream moving downstream interacted with and partially absorbed eddy 3 around March 20 near 38°N 71°30W. On the chart above, the small wave is seen near 37°30N 70°W and the remnants of eddy 3 are seen trailing from the Stream out to 38°N 71°W. Anticyclonic eddy 1 moved 90 km NW and its mean surface diameter decreased from 150 to 80 km.

During March seven cyclonic eddies were observed in the Sargasso region. Eddies F, G, and H are newly observed cyclonic eddies. Eddy A reappeared on March 26 after having translated about 240 km SW since it was last observed on February 1 near 32°N 74°W. Eddy B was not observed. Eddy C translated 80 km SE. Eddy D moved 62 km SSW. Eddy E apparently moved 200 km S. Much warm, mixed Gulf Stream and Sargasso water is seen in the chart near the Stream's south wall. The subtropical convergence front is drawn from April 1 satellite imagery.

EAST COAST SST-
MONTHLY MEAN



Gulf of Mexico
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March 1981

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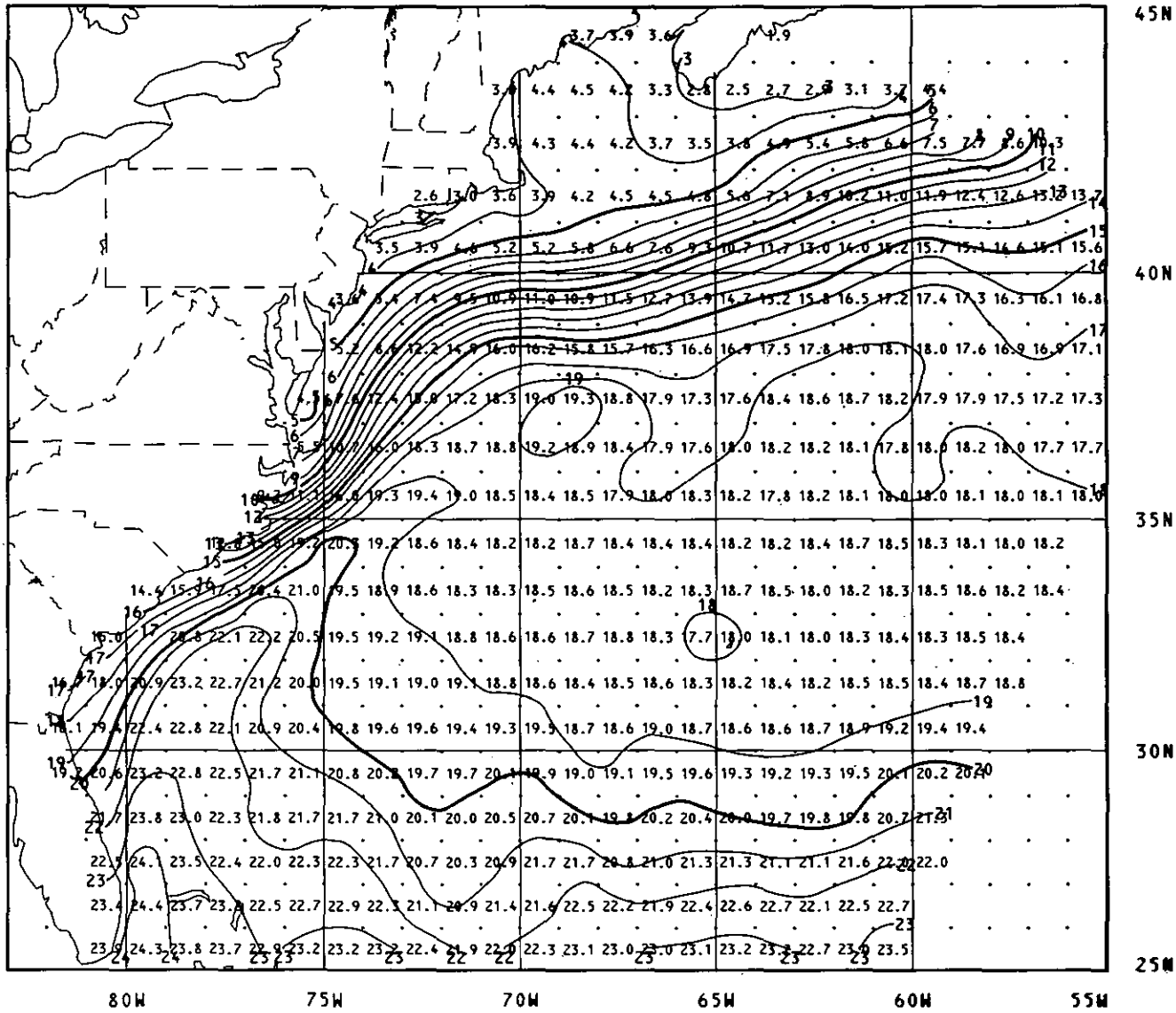

NW Atlantic Ocean
SST--MONTHLY MEAN (°C)
March 1981

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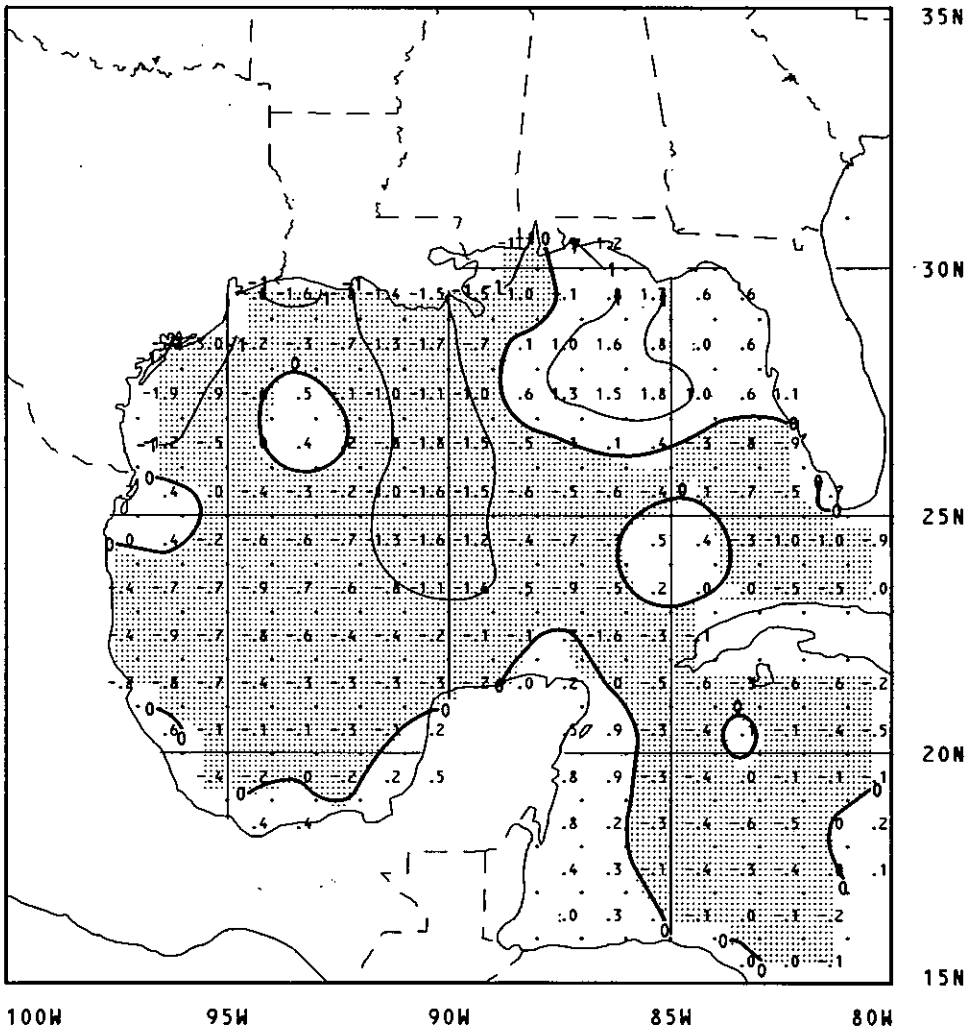
EAST COAST SST-ANOMALY



Gulf of Mexico
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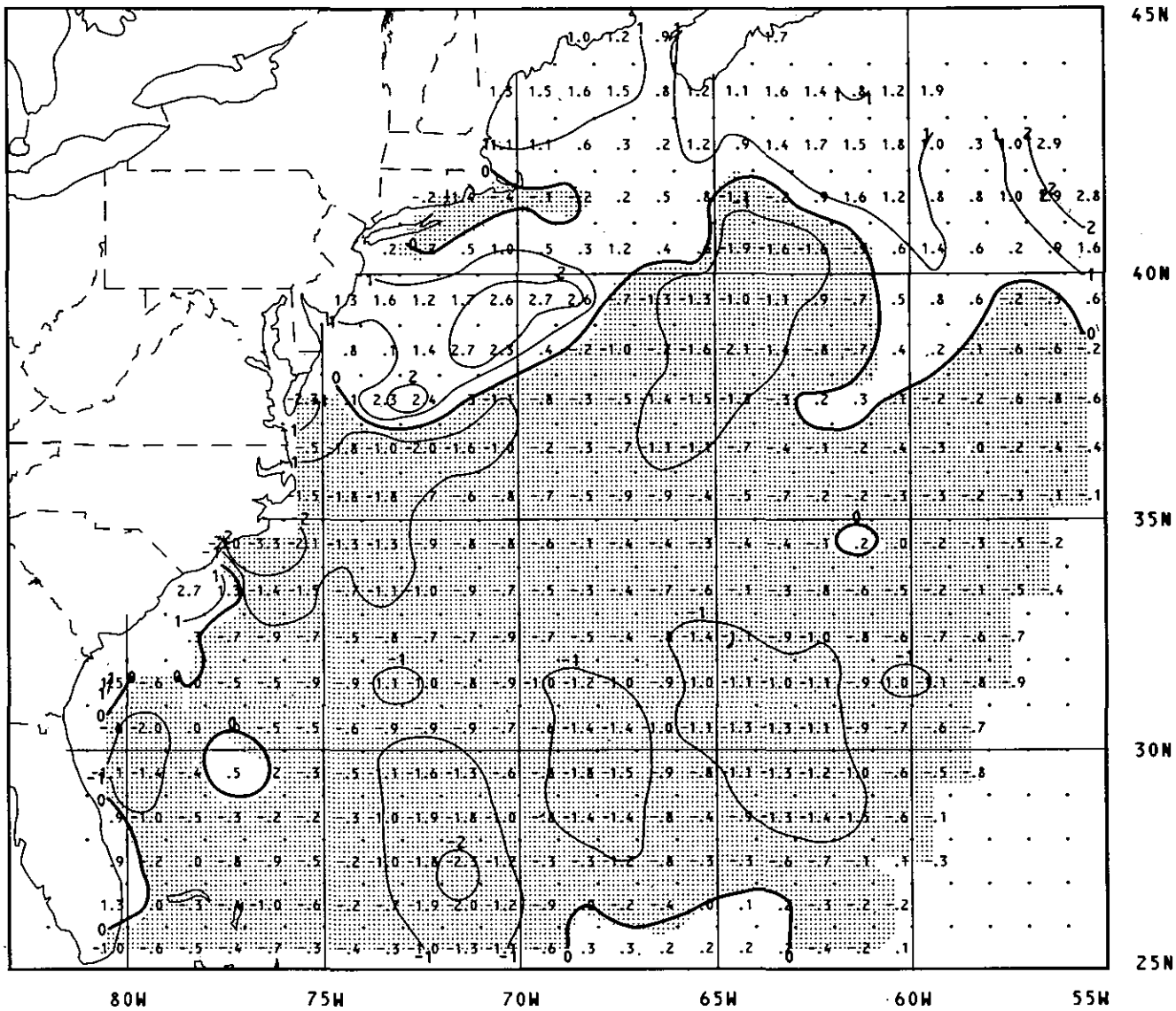

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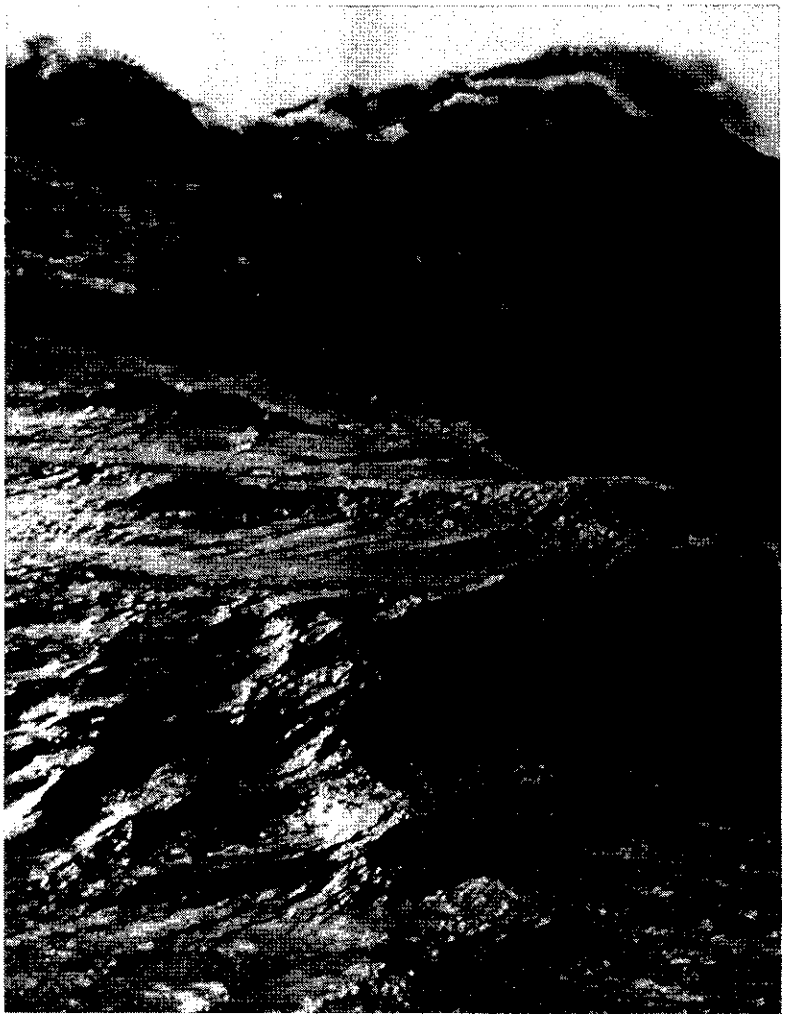
OCEANOGRAPHIC Monthly Summary

Volume I Number 4 April 1981



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National Weather Service/National Earth Satellite Service

Oceanographic Monthly Summary is a continuation of two NOAA oceanographic publications, *gulfstream* and *Fishing Information*.

The *gulfstream* magazine included charts of the Gulf Stream location and Northwest Atlantic monthly mean SST's and anomalies. It was originally published as *The Gulf Stream Monthly Summary* by the U.S. Naval Oceanographic Office from 1964 to 1975. NOAA's National Weather Service took over the magazine, changing the name to *gulfstream*, from 1975 to 1980. The two Gulf Stream magazines thus constitute an uninterrupted 16-year history of Gulf Stream meandering and associated eddy movements.

Fishing Information included monthly charts of North Pacific mean SST's and anomalies. It was first published as the *California Fishery Market News Monthly Summary;* laboratory in 1960. The name was later shortened to *Fishing Information*, and was published until 1980 by NOAA's National Marine Fisheries Service. This publication represents a continuous 20-year climatology of North Pacific oceanographic conditions.

Oceanographic Monthly Summary continues these data series, as well as beginning standardized oceanographic data series in all other U.S. offshore areas. All of the SST analyses use the Robinson-Bauer climatology.* This is a computer-assisted subjective analysis of all vertical-profile temperature data: the entire mechanical and expendable bathythermograph (MBT and XBT) files; portions of the hydrocast, salinity/conductivity temperature depth (STD/CTD), radio message files; analysis of the Asheville Marine Deck; published data and analysis; and subjective interpretation of wind and current charts. Data comprise 381,199 North Pacific observations to 1969; 727,452 Atlantic/Indian Ocean observations to 1974; and 250,000 Southern Hemisphere observations to 1979. The majority of data are MBT's, so the climatology best represents conditions since 1942.

o

*Robinson, M.K., 1976. Atlas of North Pacific Ocean Monthly Mean Temperatures and and Mean Salinities of the Surface Layer; *NavOceano Ref. Pub. 2.*

Robinson, M.K., R.A. Bauer and E.H. Schroeder, 1979. Atlas of North Atlantic-Indian Ocean Monthly Mean Temperatures and Mean Salinities of the Surface Layer; *NavOceano Ref. Pub. 18.*

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Hemispheric Analyses

On alternate days for the Northern and Southern Hemispheres, two-day composite hemispheric sea surface temperature (SST) analyses are prepared using SST observations from ship weather reports, data buoys, expendable bathythermographs, and satellites. These data are analyzed on polar stereographic grids having a mesh length of 190.5 km at 60° latitude and 102.1 km at the equator. Agreement between the hemispheric analyses in the equatorial regions is largely assured by the fact that corners of the polar stereographic grids extend well into the opposing hemisphere permitting the analyses to overlap near the equator.

The objective analysis technique known as "conditional relaxation" corrects the previous analysis with those new observations which have passed a variety of validity tests. Areas without observations are modified by the "relaxation" procedure which maintains the divergence of the SST gradient in these areas.

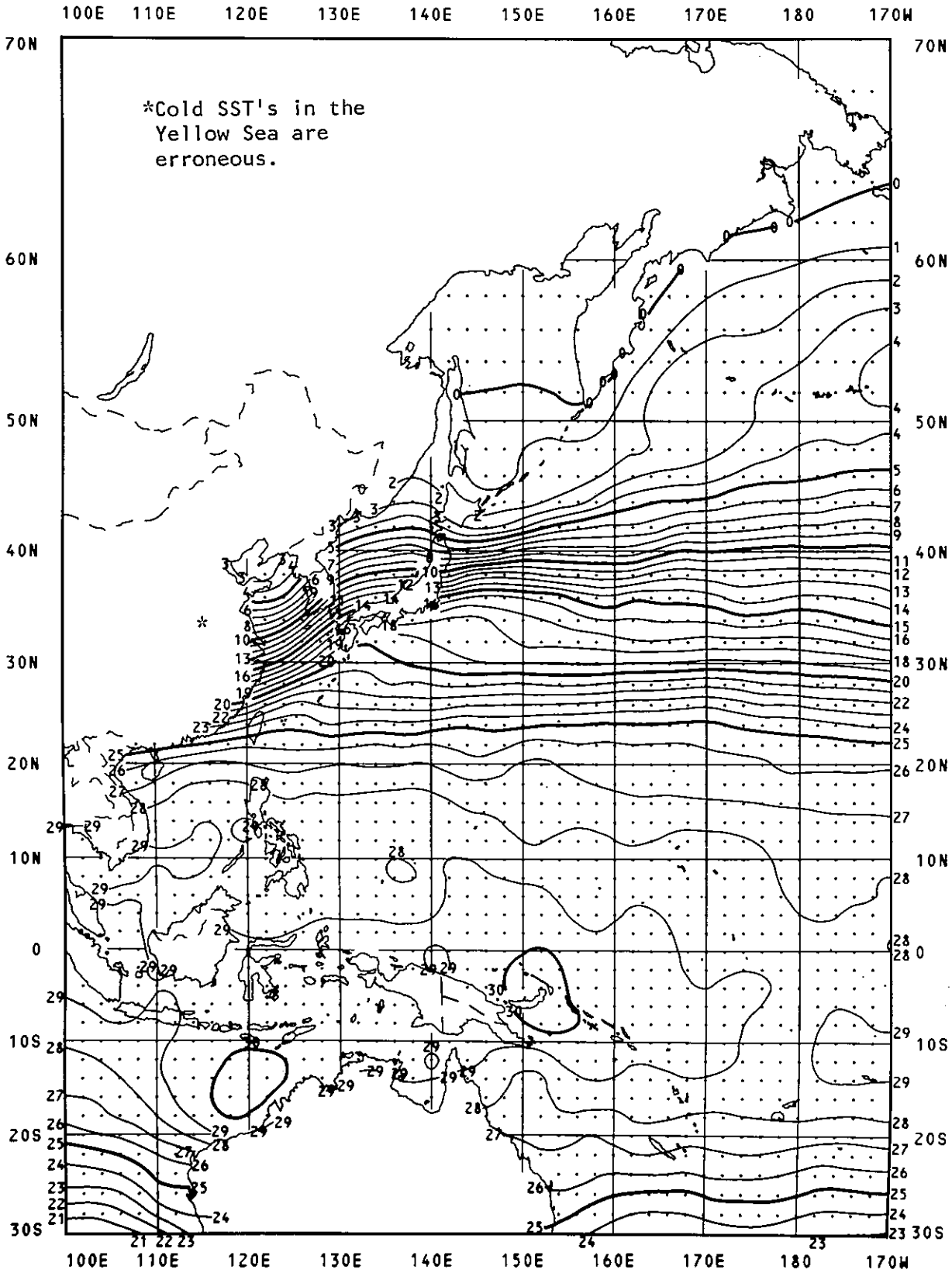
Each two-day SST analysis is interpolated to a 2° latitude/longitude grid using bilinear interpolation. The monthly products are then derived from the interpolated analyses on the 2° x 2° grid. The Robinson-Bauer climatology (see p. 2) is used to form the anomalies.....Sigurd Larson

Regional Analyses

Five-day composite regional sea surface temperature (SST) analyses are prepared twice each week using SST observations from ship weather reports, data buoys, expendable bathythermographs, and satellites. These data are analyzed on polar stereographic grids, having mesh lengths of 23.8 km at 60°N.

The objective analysis technique, similar to the "Cressman" technique, corrects the previous analysis with those new observations which have passed a variety of validity tests. These corrections are a weighted mean of differences between the observation and the previous analysis. Grid points in data-sparse areas are modified by distant observations through corrections weighted inversely proportional to the distance between the observation and the grid point.

Each twice-weekly SST analysis is interpolated to a 1° latitude/longitude grid using bilinear interpolation. The monthly products are then derived from the interpolated analyses on the 1° x 1° grid. The Robinson-Bauer climatology (see p. 2) is used to form the anomalies.....Bill Gemmill



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April 1981

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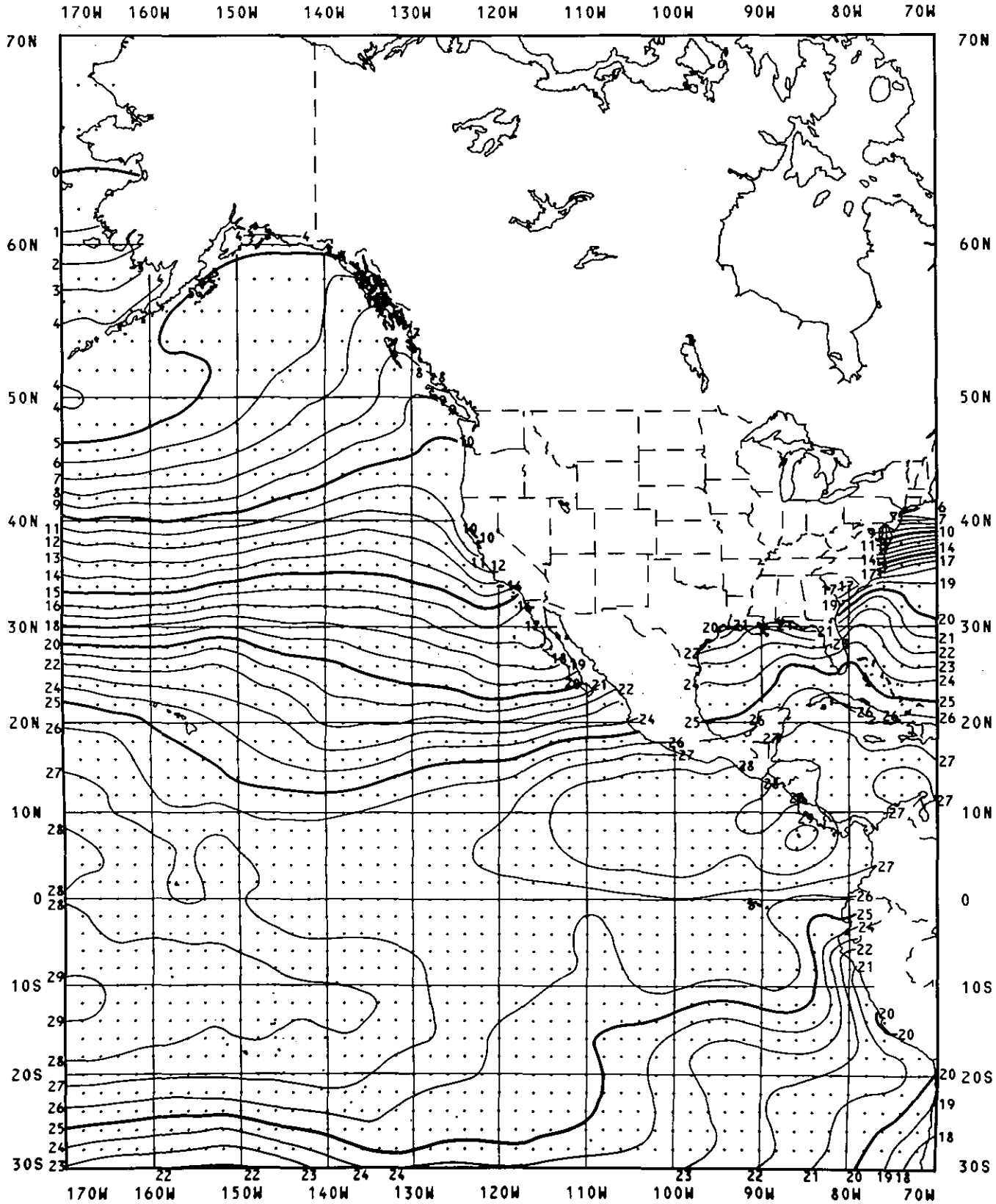

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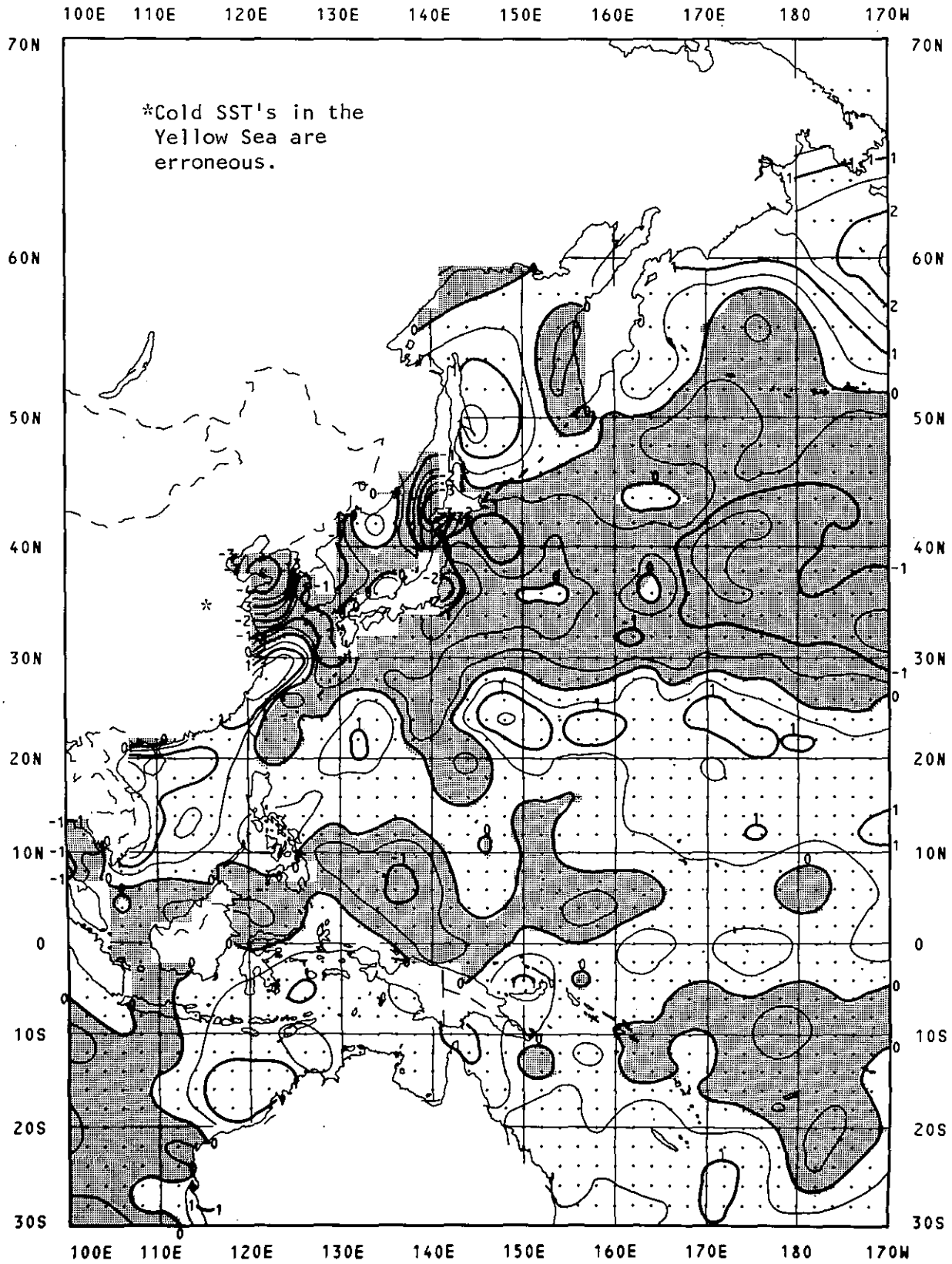

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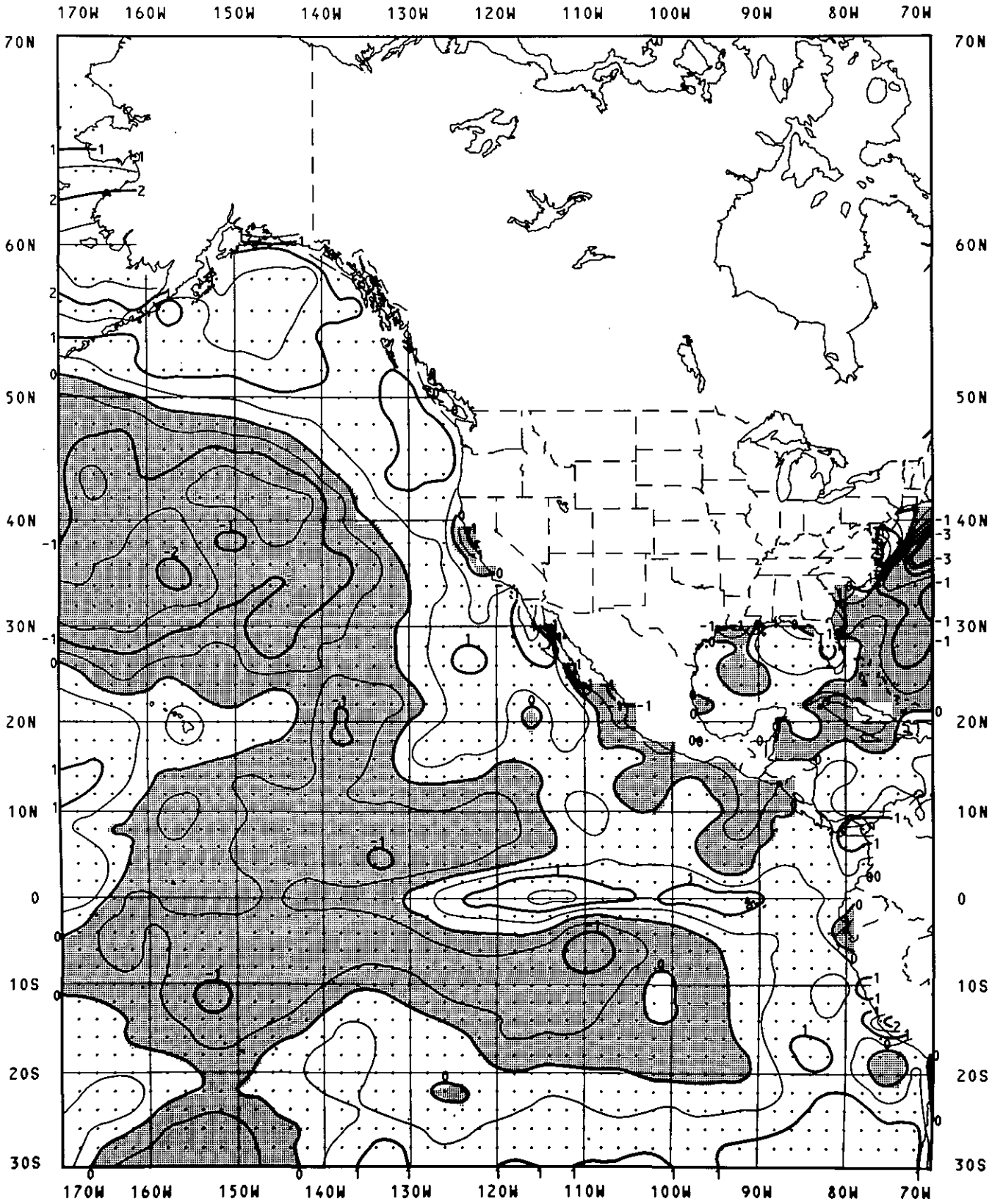

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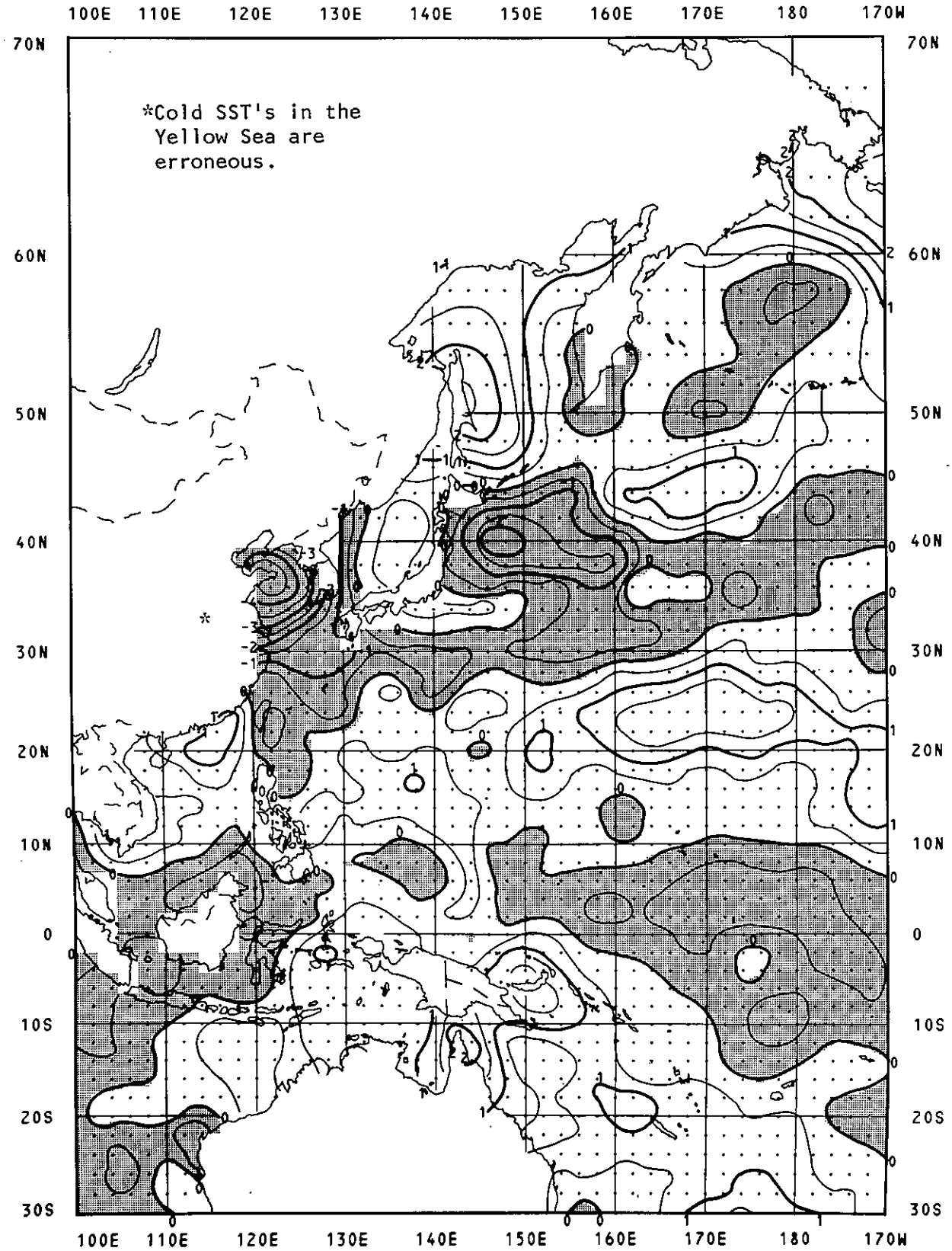

Western Pacific Ocean
SST--YEARLY CHANGE (°C)
April 1981

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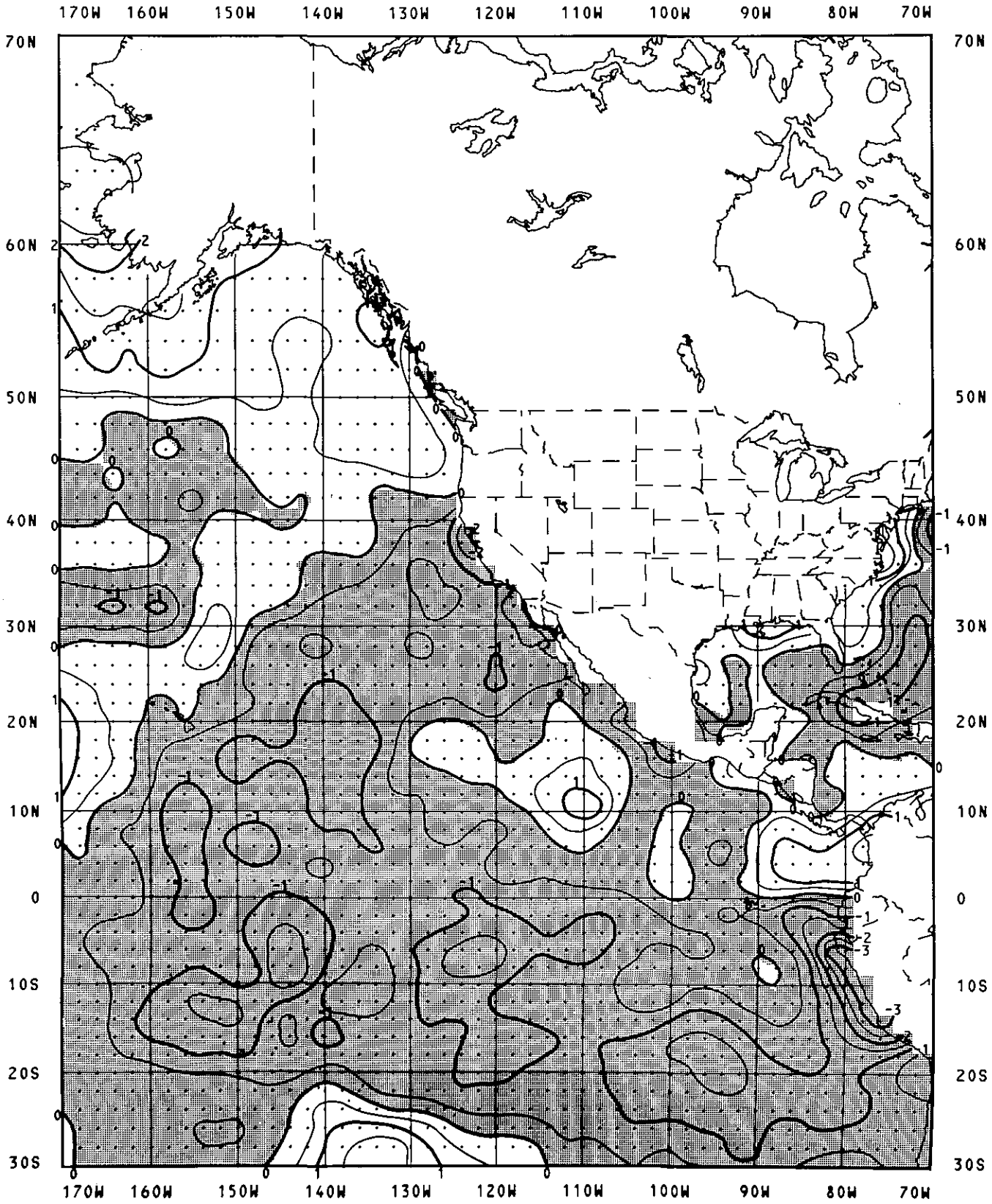

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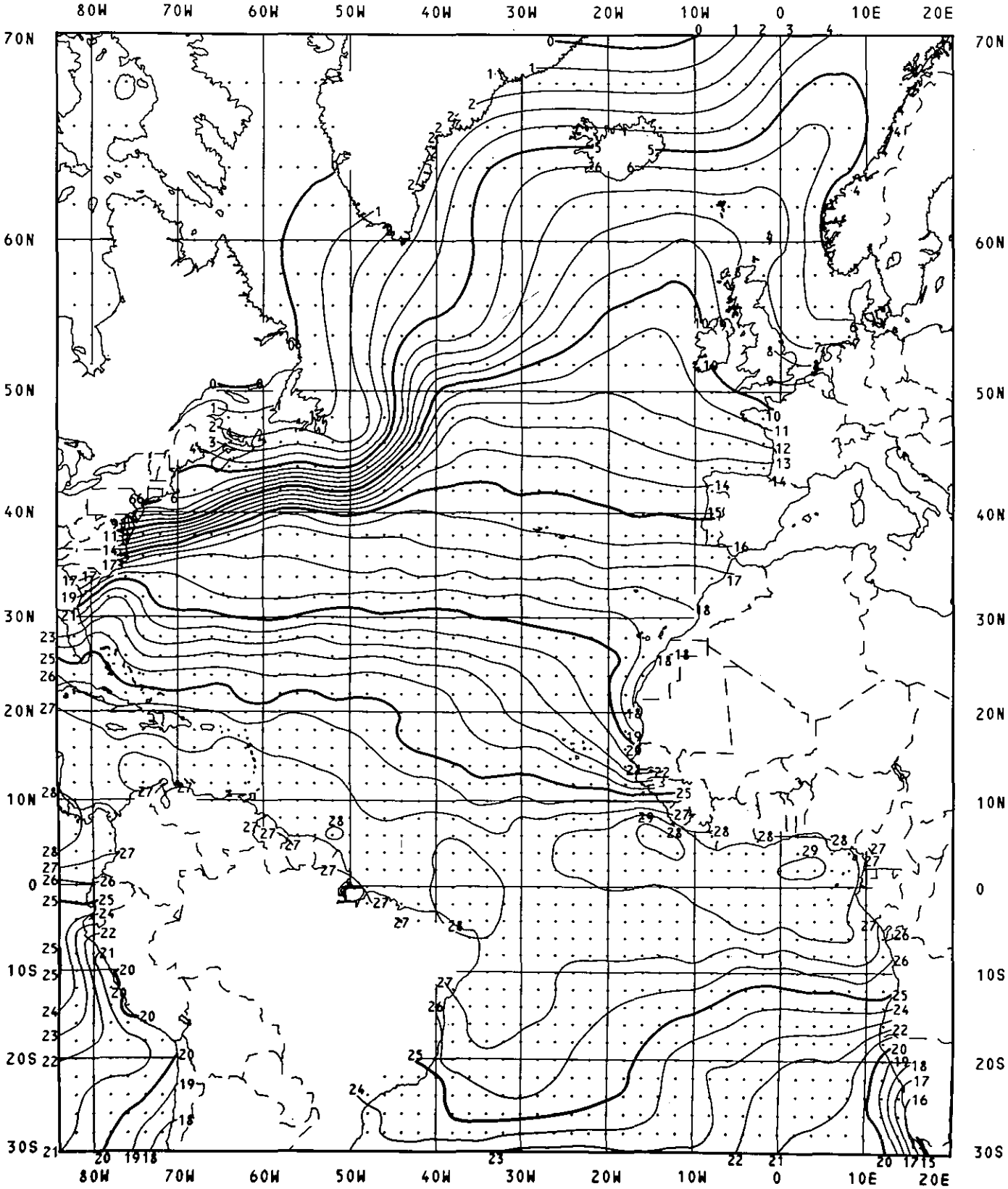

Atlantic Ocean
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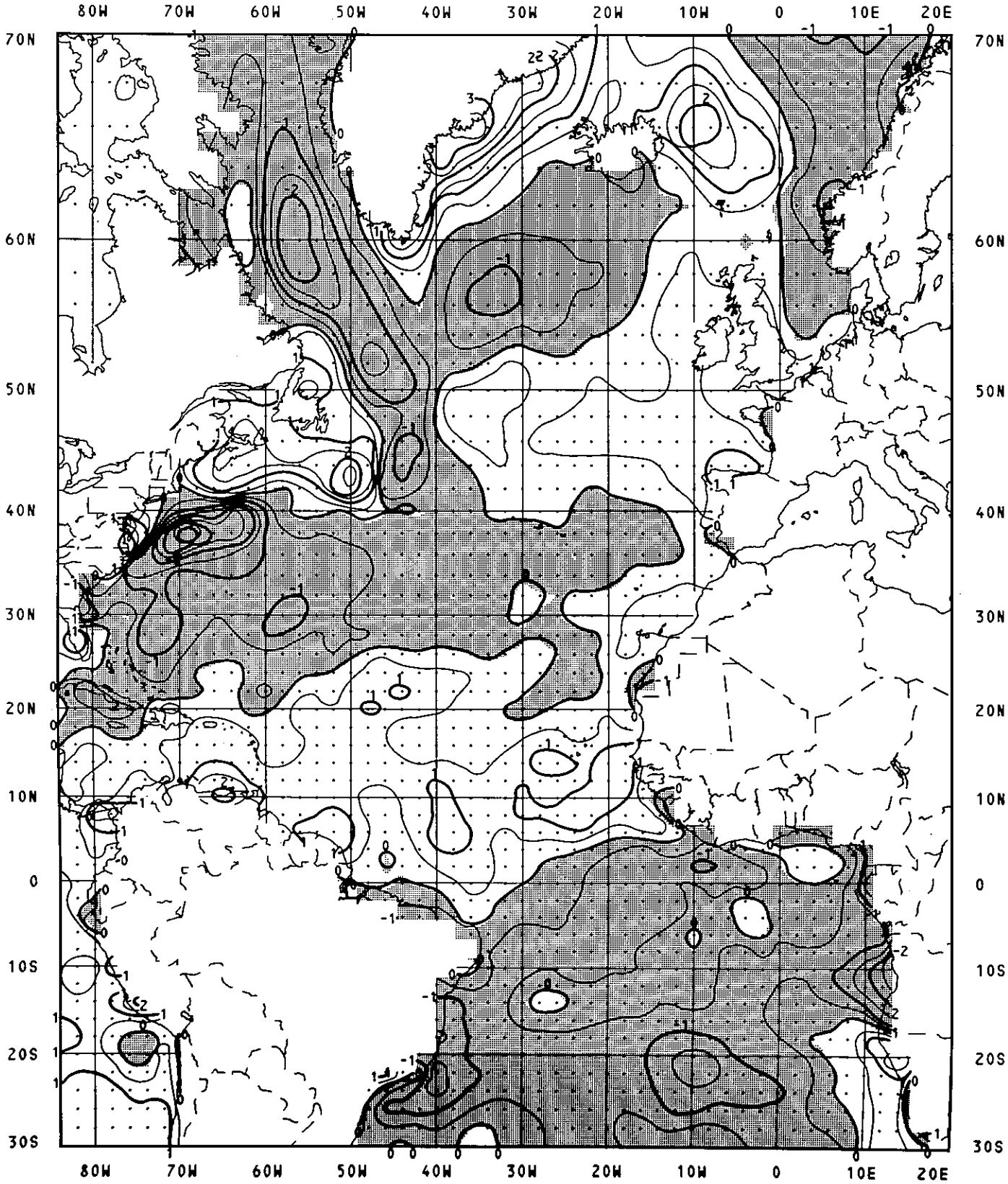

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April 1981

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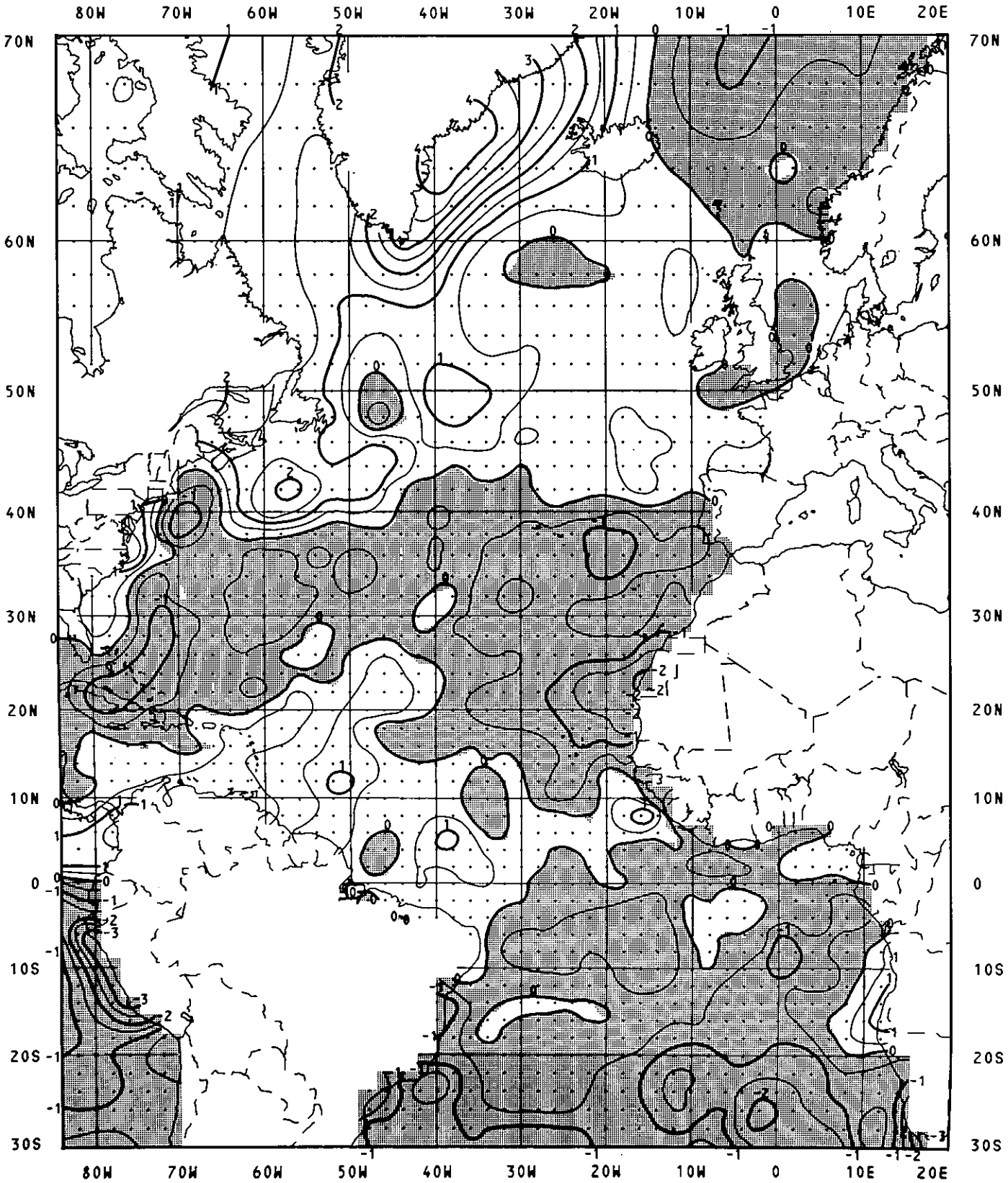


Atlantic Ocean
SST--YEARLY CHANGE (°C)
April 1981

Yearly change is the difference between the monthly mean SST for this month and for the corresponding month last year -- shading shows where this year's monthly mean is colder than the corresponding monthly mean last year.

REGIONAL ANALYSES

Bering Sea /North Slope Ice

West Coast

Ocean features

Sea surface temperature

SST anomaly

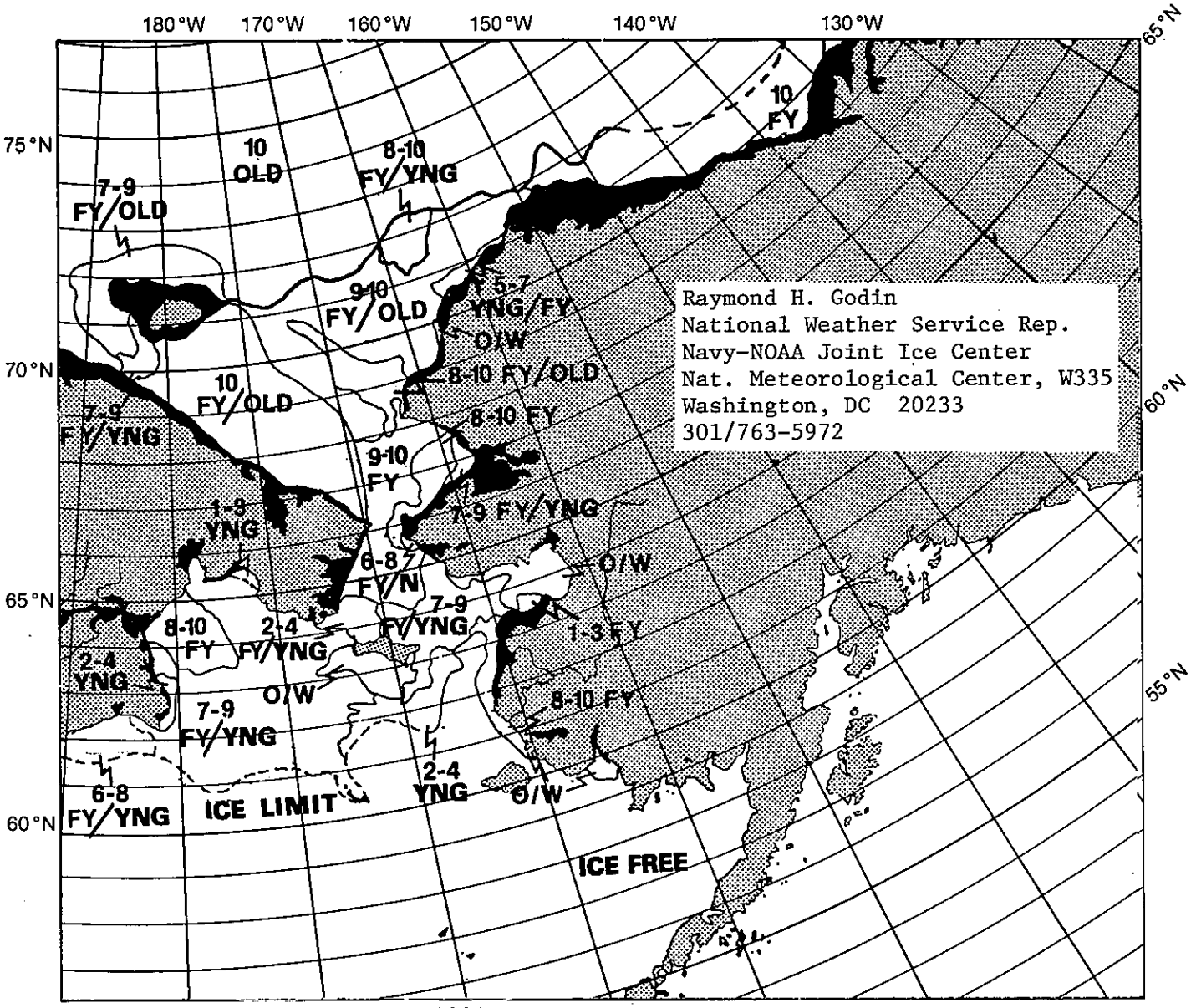
East Coast

Ocean features

Sea surface temperature

SST anomaly

BERING SEA / NORTH SLOPE ICE ANALYSIS



APRIL 1981

KEY

ICE CONCENTRATION

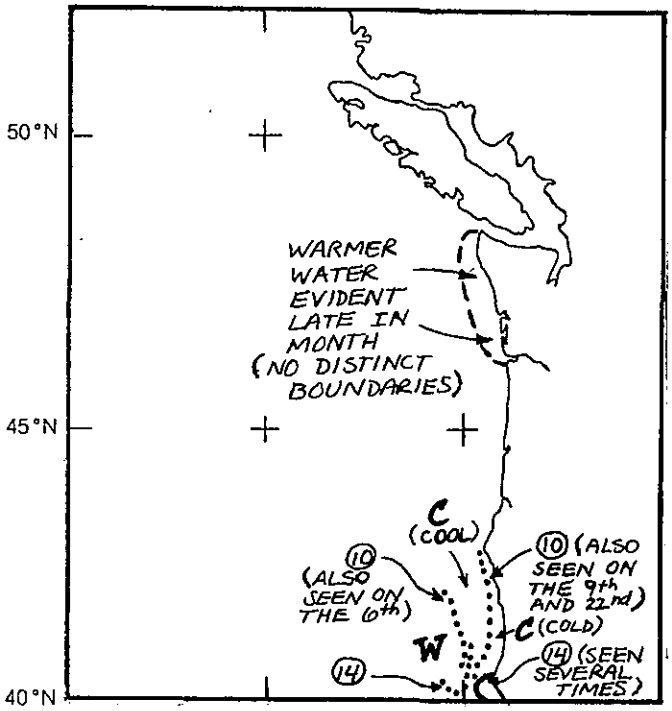
4-6	Area 4-6 tenths ice-covered.
OW	Open water. Sea ice present in concentrations less than one tenth.
ICE-FREE	No sea ice. Ice of land origin (iceberg e.g.) may be present.

ICE THICKNESS (AGE)

OLD	Includes both multi-year and second-year ice. Generally 2-3.5m thick.
FY	Any or all first year ice types (30 cm - 2 m thick).
YNG	Young ice (10-30 cm thick).
N	New and nilas.
■	Fast ice. Sea ice which forms and remains fast along the coast.
120	Theoretical thickness of this season's growth (cm), based on freezing degree days (presented for first day of each month on first succeeding chart).
———	Ice boundary visually or satellite observed.
- - - -	Ice boundary estimated.

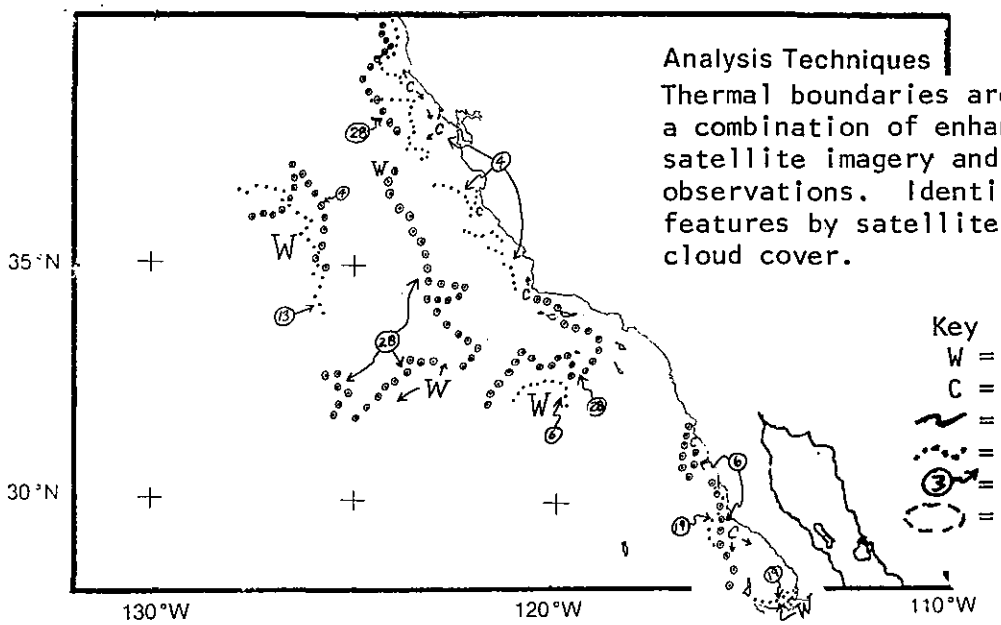
A 1001mb low located near 53°N 166°E and a 1024mb high located near 69°N 160°W are the most prominent features of the mean monthly surface pressure circulation affecting sea ice distribution in Alaskan waters. Southeasterly mean geostrophic winds affected much of the region. Monthly mean air temperatures ranged from near normal at Barrow (71°N 157°W) to above normal at Nome (64°N 165°W) and King Salmon (59°N 157°W). Much of the young and new ice observed last month in the Alaskan coastal regions south of 65°N have ablated or drifted from the area. As a result of seasonably warmer and above freezing temperatures, generation of new ice in this area has effectively ceased. The current ice edge extent east of 172°W is 100-200 km north of the mean historical position for the end of April.

WEST COAST OCEAN FEATURES



APRIL 1981

The onset of springtime transition was observed in Pacific Northwest waters. A gradual warming trend occurred at all environmental buoys and most coastal stations. SST increases during April ranged from 0.5°C to 1.0°C. The only thermal boundary activity observed was in the vicinity of Cape Mendocino and northward to Cape Blanco. This was due to early-season coastal upwelling, which persisted throughout the month, particularly in the immediate vicinity of Cape Mendocino. Late in the month, warmer water was observed near shore along the Washington coast. This was due to: (1) onshore transport of warmer offshore water; and (2) river runoff. Unlike the case in the preceding three months, the runoff is now warmer than the ambient ocean temperatures due to warming of the land.



Analysis Techniques

Thermal boundaries are determined from a combination of enhanced infrared satellite imagery and ship and buoy observations. Identification of these features by satellite is limited by cloud cover.

Key
W = warm
C = cold
= strong boundary
= weaker boundary
= date of feature
= outline of water mass feature

By April 7 persistent NW winds had caused intense upwelling along the California coast north of 35°N, preceding the expected seasonal upwelling by at least one month. Consequently, SST's were at least 1-2°C below normal near the coast (north of 35°N). Beyond 200 km from the coast, SST's generally showed little change between March and April over the south panel. SST ranges recorded by the data buoys during April were 9-12°C at Pt. Arena (39°N 124°W), 8.3-10.5°C at Bodega Bay (38°N 123°W), 10-12°C at Half Moon Bay (37°N 123°W), and 10.5-14°C at Pt. Sal (35°N 121°W). SST's at all buoy locations reached minimum values between April 7-12, coinciding with the intense upwelling. Satellite imagery generally showed strong SST gradients within 100-200 km of the coast between 35 and 40°N. These gradients are attributed mainly to increased upwelling along the coast and not to increased warming farther off the coast.

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South Panel
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Satellite Field Service Station
National Earth Satellite Service
NOAA
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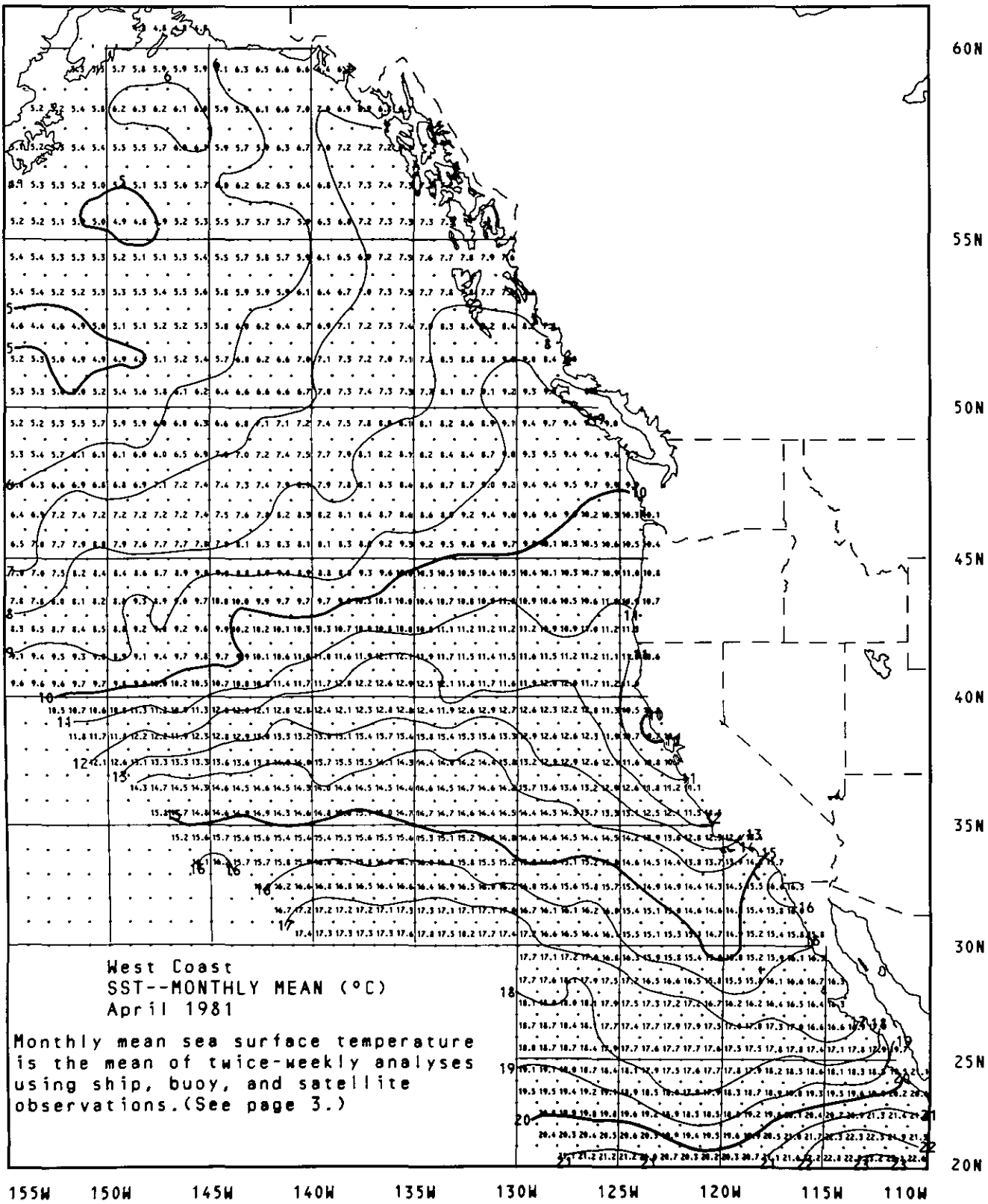
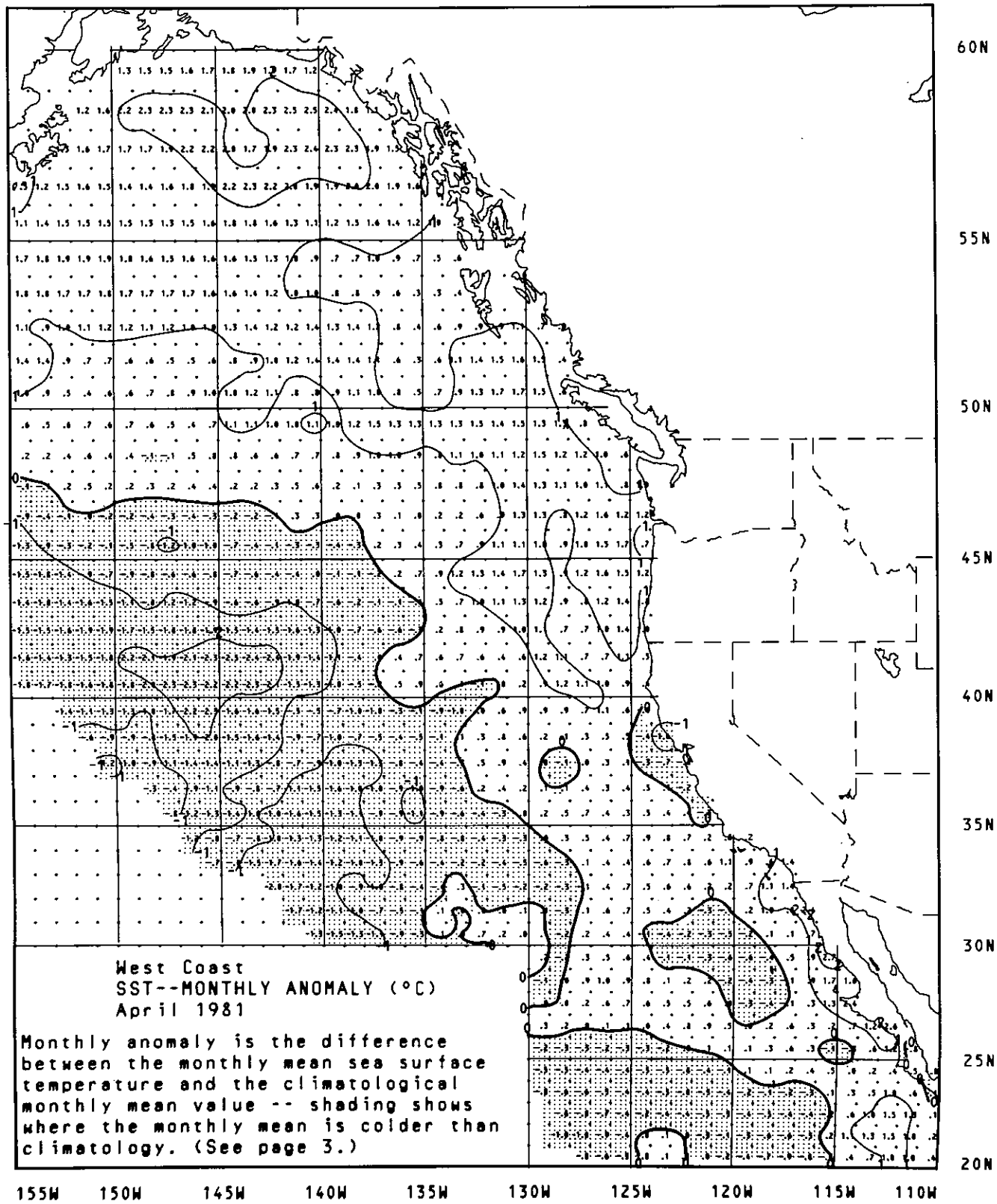
415/364-2422


West Coast
SST--MONTHLY MEAN (°C)
April 1981
Monthly mean sea surface temperature is the mean of twice-weekly analyses using ship, buoy, and satellite observations.(See page 3.)
60N
55N
50N
45N
40N
35N
30N
25N
20N
155W
150W
145W
140W
135W
130W
125W
120W
115W
110W


60N
55N
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25N
20N
155W
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140W
135W
130W
125W
120W
115W
110W
West Coast
SST--MONTHLY ANOMALY (°C)
April 1981
Monthly anomaly is the difference between the monthly mean sea surface temperature and the climatological monthly mean value -- shading shows where the monthly mean is colder than climatology. (See page 3.)

EAST COAST OCEAN FEATURES

The end of this month's positions of the Gulf Stream System and its associated eddies are shown for the NW Atlantic and the Gulf of Mexico. The Gulf Stream and Loop Current boundaries are located by prominent sea surface temperature gradients or by the 15°C isotherm at 200m. Anticyclonic eddies are labeled a-z in the Gulf of Mexico and 1-99 in the NW Atlantic. Cyclonic eddies are labeled A-Z. Arrows on eddies indicate direction of circulation. Warm-core or anticyclonic eddies rotate clockwise; cold-core or cyclonic eddies rotate counterclockwise. The long arrows indicate the date of data used.

Feature positions are drawn from:
- NOAA-6 satellite infrared imagery
- Bathythermograph data,
  - National Meteorological Center of National Weather Service
- Oceanographic Analysis (daily),
  - National Weather Service/National Earth Satellite Service

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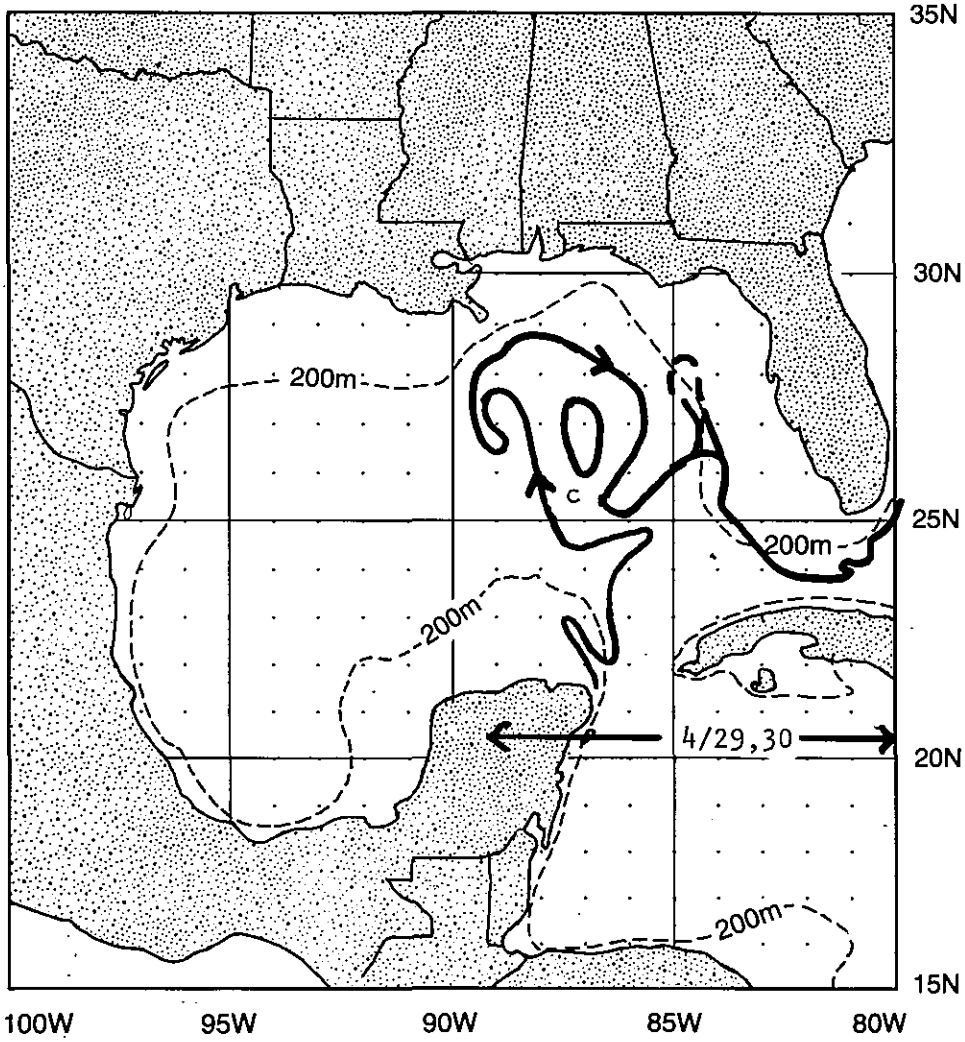
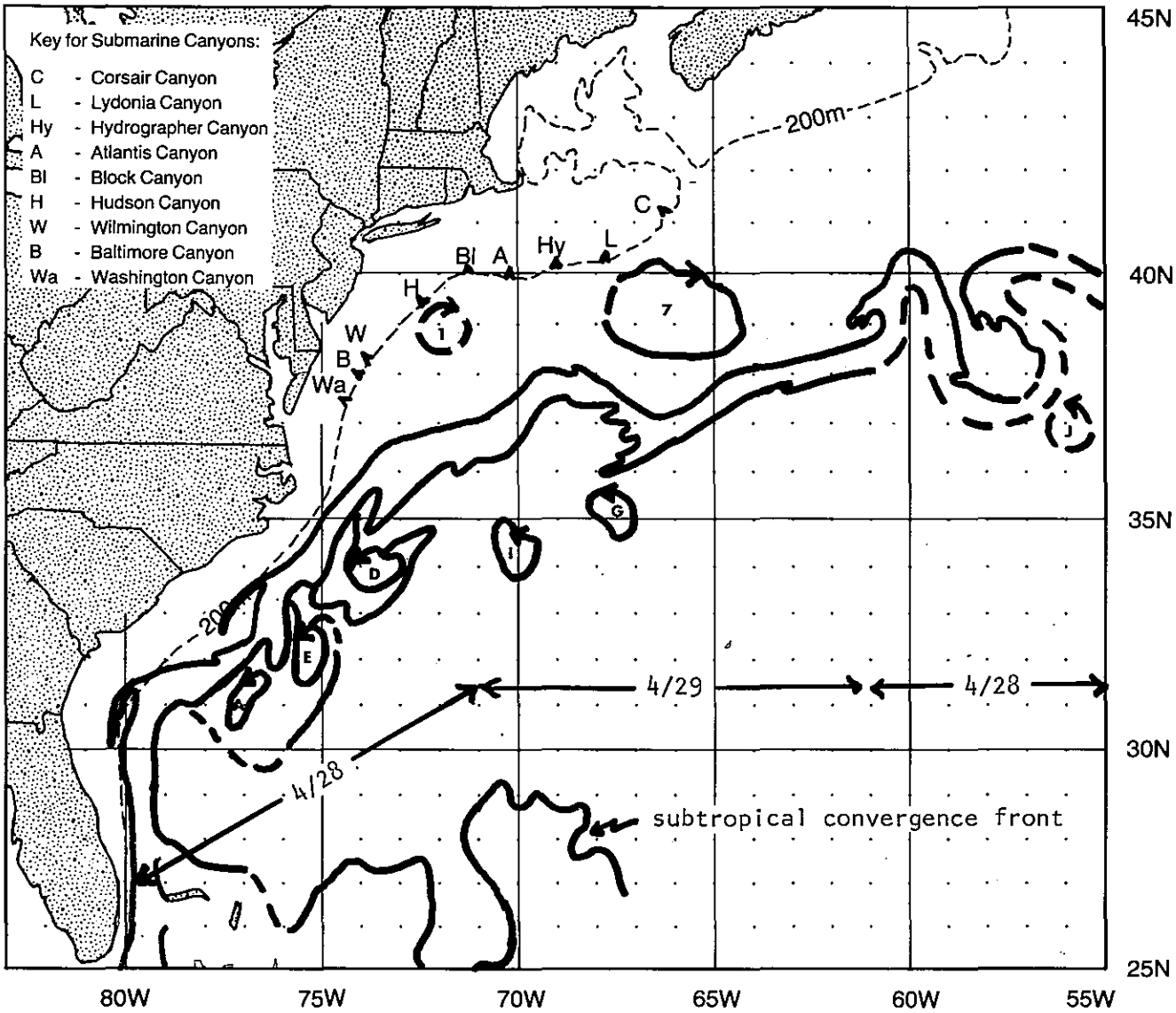


APRIL 1981

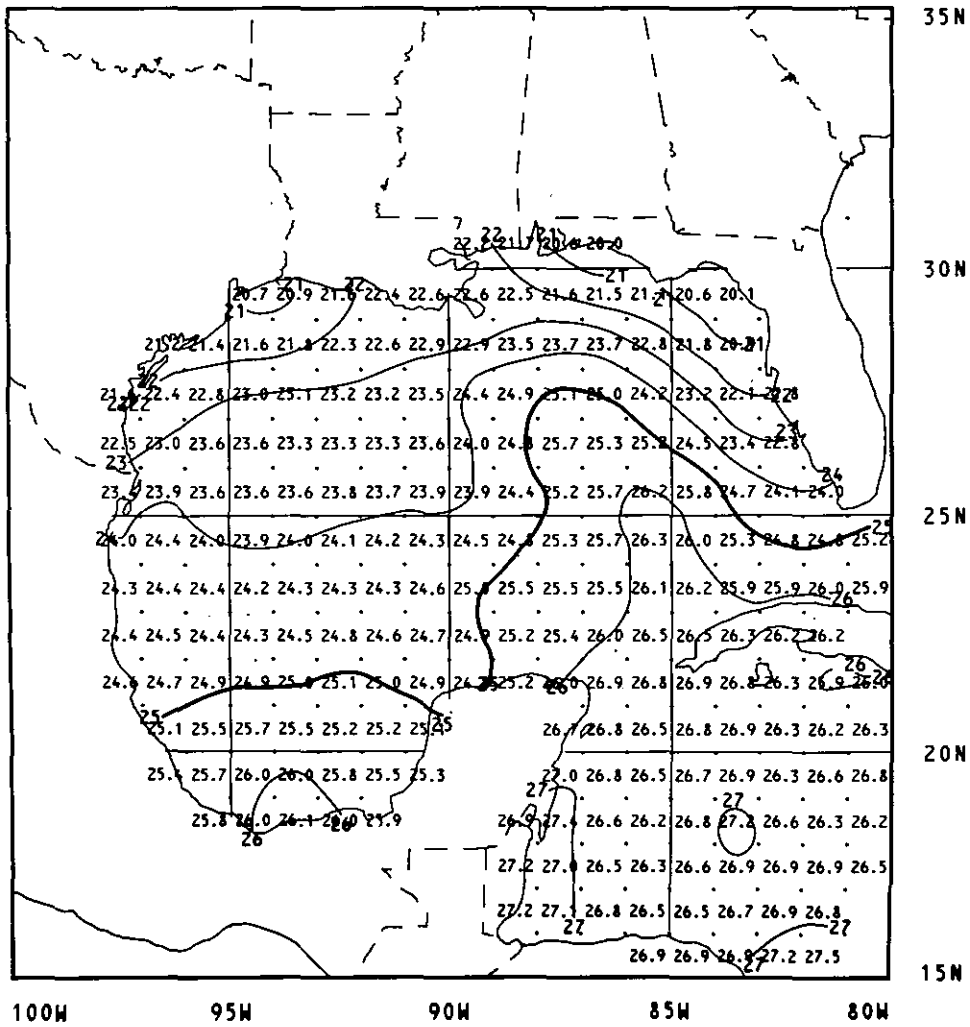
In the Gulf of Mexico, the Loop Current's amplitude slightly increased during April. Anticyclonic eddy c translated 55 km SW. A lens of cooler surface water has been observed in the center of eddy c since mid-April. Eddy a was not observed. Two long filaments of warm water are protruding from the loop near 22°N 87°W and 27°N 84°W.



Prominent Gulf Stream features seen in the chart above are the small amplitude wave at 69°W and the two meanders at 60°W and 57°W. Anticyclonic eddy 3 was apparently absorbed by the Stream around April 15 near 38°N 72°W. Eddy 7 interacted with a Gulf Stream meander around April 10 near 39°N 65°W increasing its mean surface diameter from 210 km to 240 km. Eddy 7 translated 220 km SW during April. Eddy 1 translated 140 km WSW.

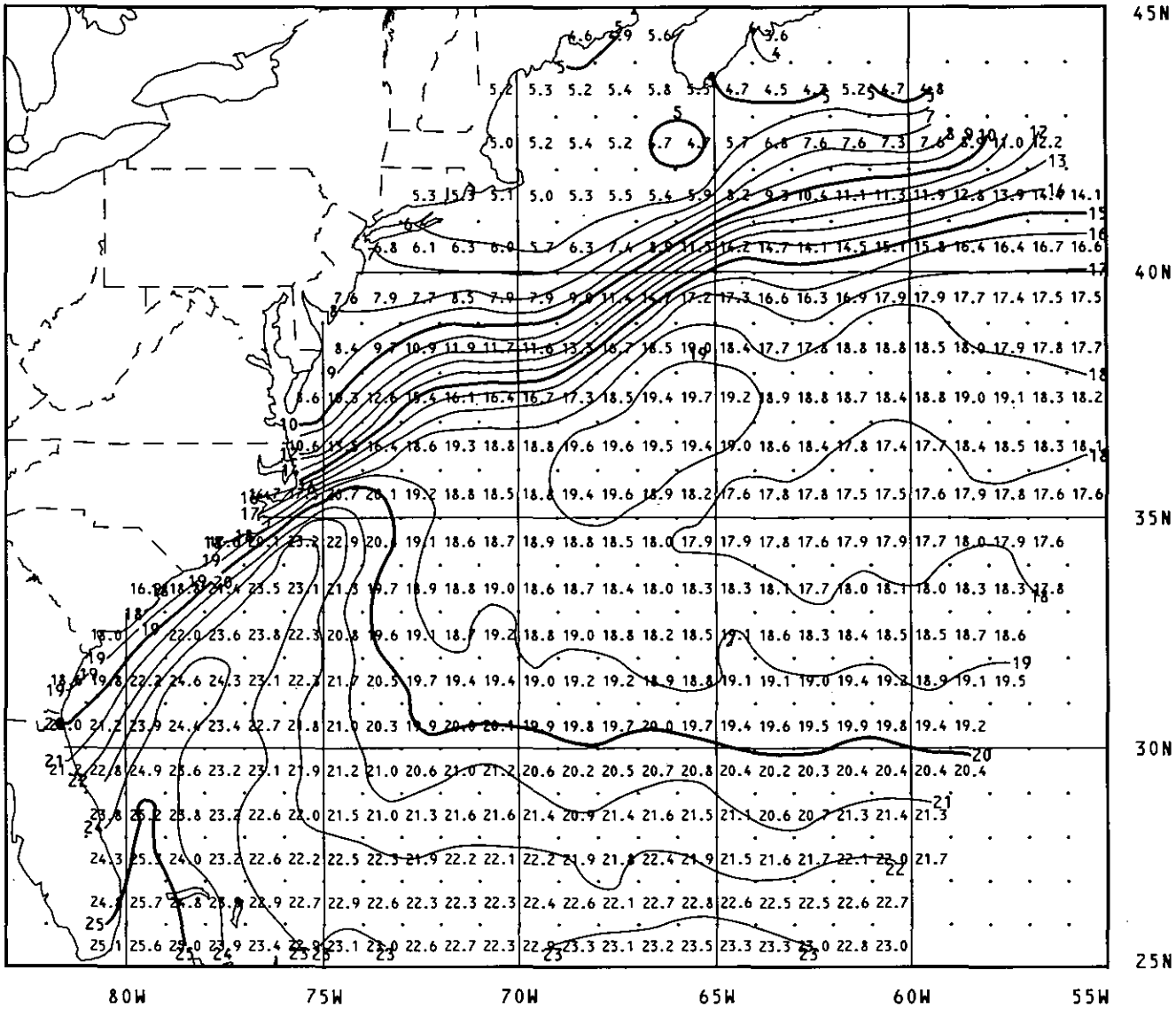
Cyclonic eddies I and J were first observed this month. Eddy A moved 75 km WNW. Eddy D moved 130 km SW. Eddy E moved 95 km NW. Eddy F was last seen on April 19 near 35°N 73°W. Possibly, it has been absorbed into the Stream. Eddy G moved 90 km SW. Eddies B, C, and H were not observed. The positions of cyclonic eddies G, I shown above are from April 19. Much warm, mixed Gulf Stream and Sargasso water is seen near eddies A, D, and E. The subtropical convergence front is drawn from satellite imagery of April 19 and 23.

EAST COAST SST-
MONTHLY MEAN



Gulf of Mexico
SST--MONTHLY MEAN (°C)
April 1981

Monthly mean sea surface temperature is the mean of twice-weekly analyses using ship, buoy, and satellite observations.(See page 3.)



NW Atlantic Ocean
SST--MONTHLY MEAN (°C)
April 1981

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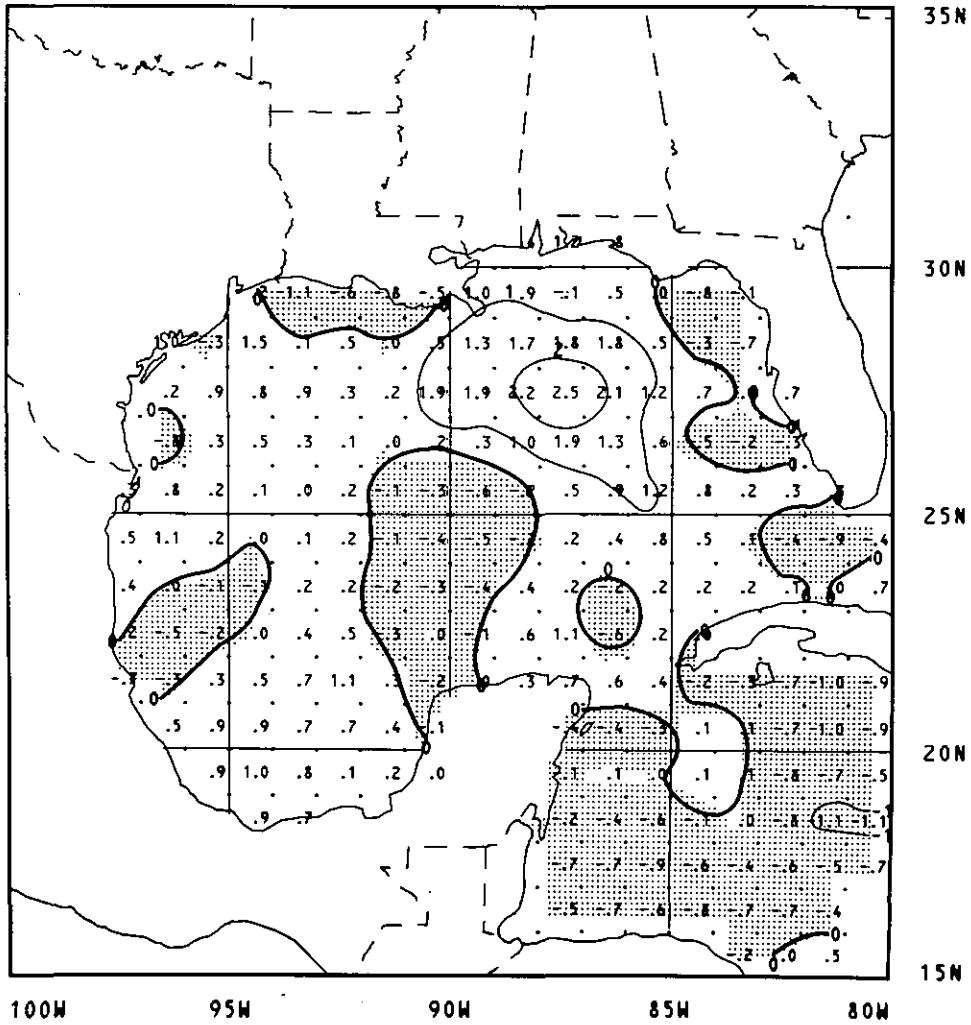
EAST COAST SST-ANOMALY



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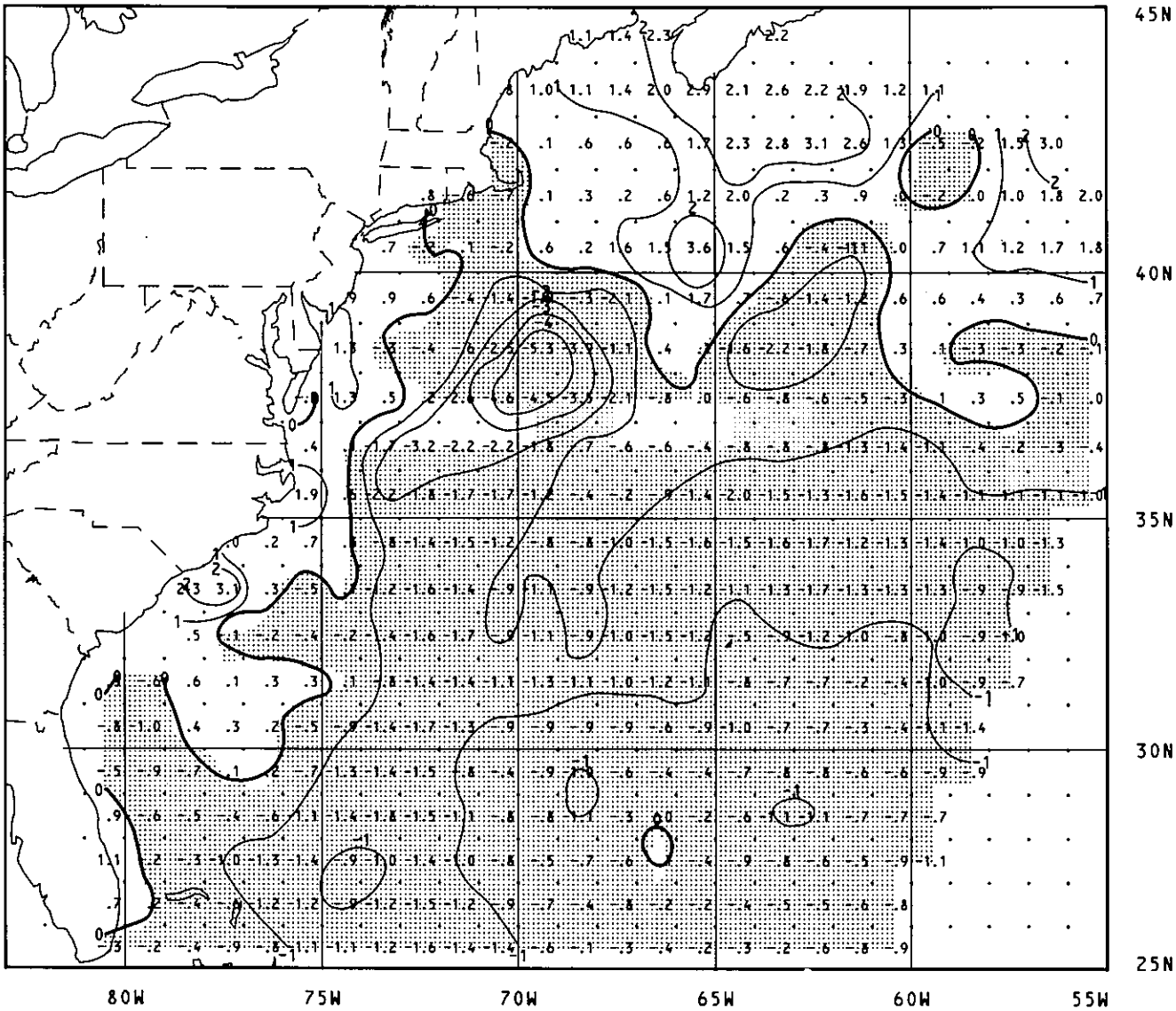

NW Atlantic Ocean
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April 1981

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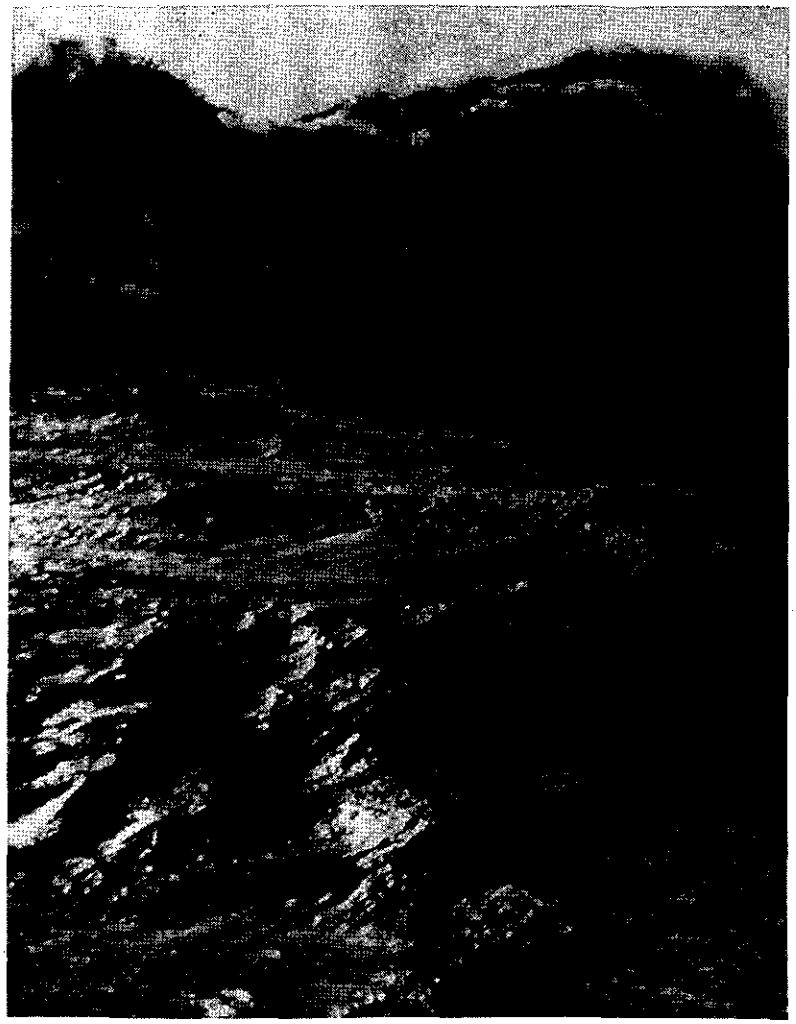
OCEANOGRAPHIC Monthly Summary

Volume I Number 5 May 1981



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U.S. DEPARTMENT OF COMMERCE • National Oceanic and Atmospheric Administration
National Weather Service/National Earth Satellite Service

Oceanographic Monthly Summary is a continuation of two NOAA oceanographic publications, *gulfstream* and *Fishing Information*.

The *gulfstream* magazine included charts of the Gulf Stream location and Northwest Atlantic monthly mean SST's and anomalies. It was originally published as *The Gulf Stream Monthly Summary* by the U.S. Naval Oceanographic Office from 1964 to 1975. NOAA's National Weather Service took over the magazine, changing the name to *gulfstream*, from 1975 to 1980. The two Gulf Stream magazines thus constitute an uninterrupted 16-year history of Gulf Stream meandering and associated eddy movements.

Fishing Information included monthly charts of North Pacific mean SST's and anomalies. It was first published as the *California Fishery Market News Monthly Summary; Part II-Fishing Information* by the old Bureau of Commercial Fisheries' San Diego laboratory in 1960. The name was later shortened to *Fishing Information*, and was published until 1980 by NOAA's National Marine Fisheries Service. This publication represents a continuous 20-year climatology of North Pacific oceanographic conditions.

Oceanographic Monthly Summary continues these data series, as well as beginning standardized oceanographic data series in all other U.S. offshore areas. All of the SST analyses use the Robinson-Bauer climatology.* This is a computer-assisted subjective analysis of all vertical-profile temperature data: the entire mechanical and expendable bathythermograph (MBT and XBT) files; portions of the hydrocast, salinity/conductivity temperature depth (STD/CTD), radio message files; analysis of the Asheville Marine Deck; published data and analysis; and subjective interpretation of wind and current charts. Data comprise 381,199 North Pacific observations to 1969; 727,452 Atlantic/Indian Ocean observations to 1974; and 250,000 Southern Hemisphere observations to 1979. The majority of data are MBT's, so the climatology best represents conditions since 1942.

*Robinson, M.K., 1976. Atlas of North Pacific Ocean Monthly Mean Temperatures and Mean Salinities of the Surface Layer; *NavOceano Ref. Pub. 2.*
Robinson, M.K., R.A. Bauer and E.H. Schroeder, 1979. Atlas of North Atlantic-Indian Ocean Monthly Mean Temperatures and Mean Salinities of the Surface Layer; *NavOceano Ref. Pub. 18.*

Oceanographic Monthly Summary
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Hemispheric: Sigurd E. Larson

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Hemispheric Analyses

On alternate days for the Northern and Southern Hemispheres, two-day composite hemispheric sea surface temperature (SST) analyses are prepared using SST observations from ship weather reports, data buoys, expendable bathythermographs, and satellites. These data are analyzed on polar stereographic grids having a mesh length of 190.5 km at 60° latitude and 102.1 km at the equator. Agreement between the hemispheric analyses in the equatorial regions is largely assured by the fact that corners of the polar stereographic grids extend well into the opposing hemisphere permitting the analyses to overlap near the equator.

The objective analysis technique known as "conditional relaxation" corrects the previous analysis with those new observations which have passed a variety of validity tests. Areas without observations are modified by the "relaxation" procedure which maintains the divergence of the SST gradient in these areas.

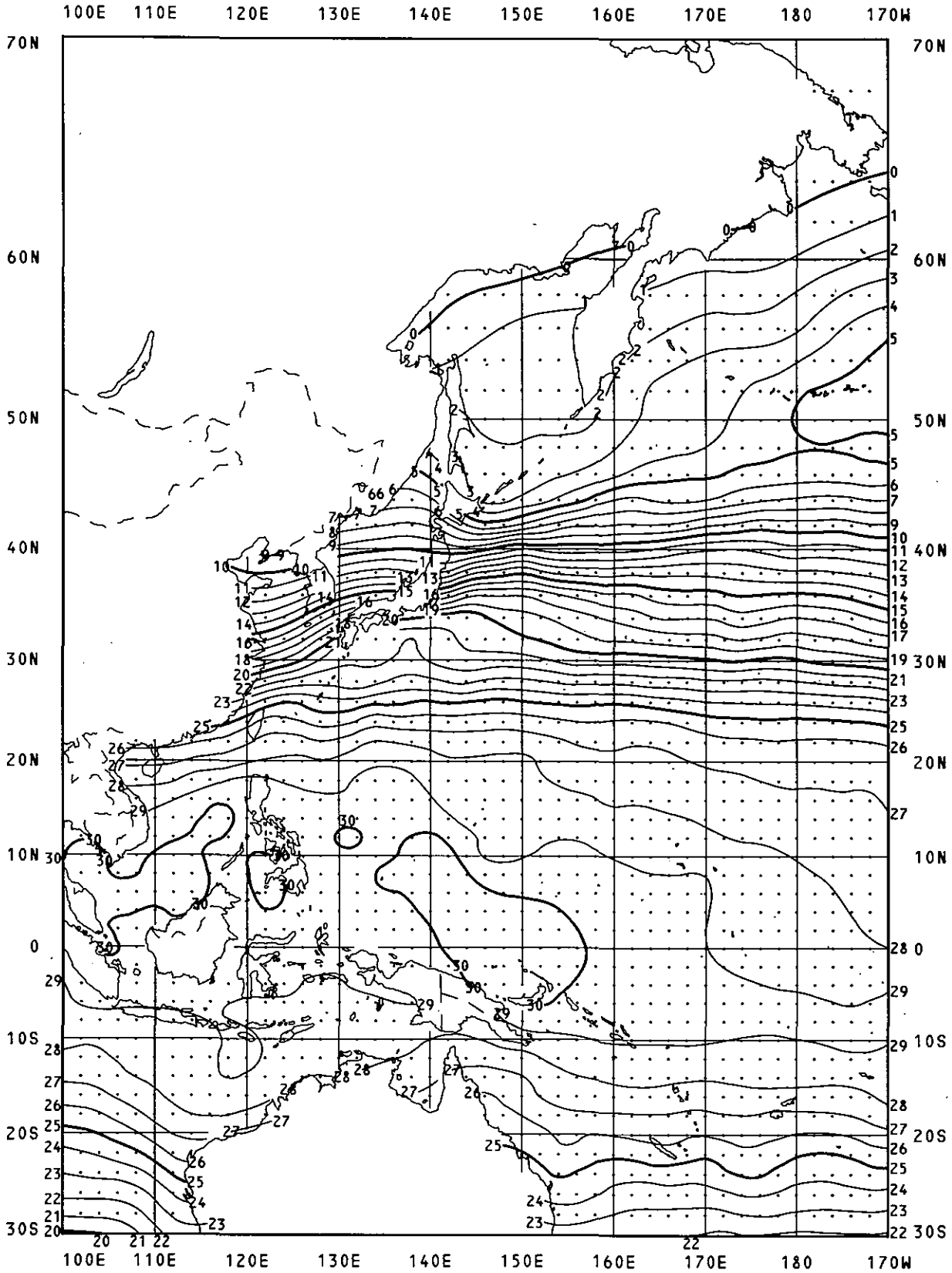
Each two-day SST analysis is interpolated to a 2° latitude/longitude grid using bilinear interpolation. The monthly products are then derived from the interpolated analyses on the 2° x 2° grid. The Robinson-Bauer climatology (see p. 2) is used to form the anomalies.....Sigurd Larson

Regional Analyses

Five-day composite regional sea surface temperature (SST) analyses are prepared twice each week using SST observations from ship weather reports, data buoys, expendable bathythermographs, and satellites. These data are analyzed on polar stereographic grids, having mesh lengths of 23.8 km at 60°N.

The objective analysis technique, similar to the "Cressman" technique, corrects the previous analysis with those new observations which have passed a variety of validity tests. These corrections are a weighted mean of differences between the observation and the previous analysis. Grid points in data-sparse areas are modified by distant observations through corrections weighted inversely proportional to the distance between the observation and the grid point.

Each twice-weekly SST analysis is interpolated to a 1° latitude/longitude grid using bilinear interpolation. The monthly products are then derived from the interpolated analyses on the 1° x 1° grid. The Robinson-Bauer climatology (see p. 2) is used to form the anomalies.....Bill Gemmill



Western Pacific Ocean
SST--MONTHLY MEAN (°C)
May 1981

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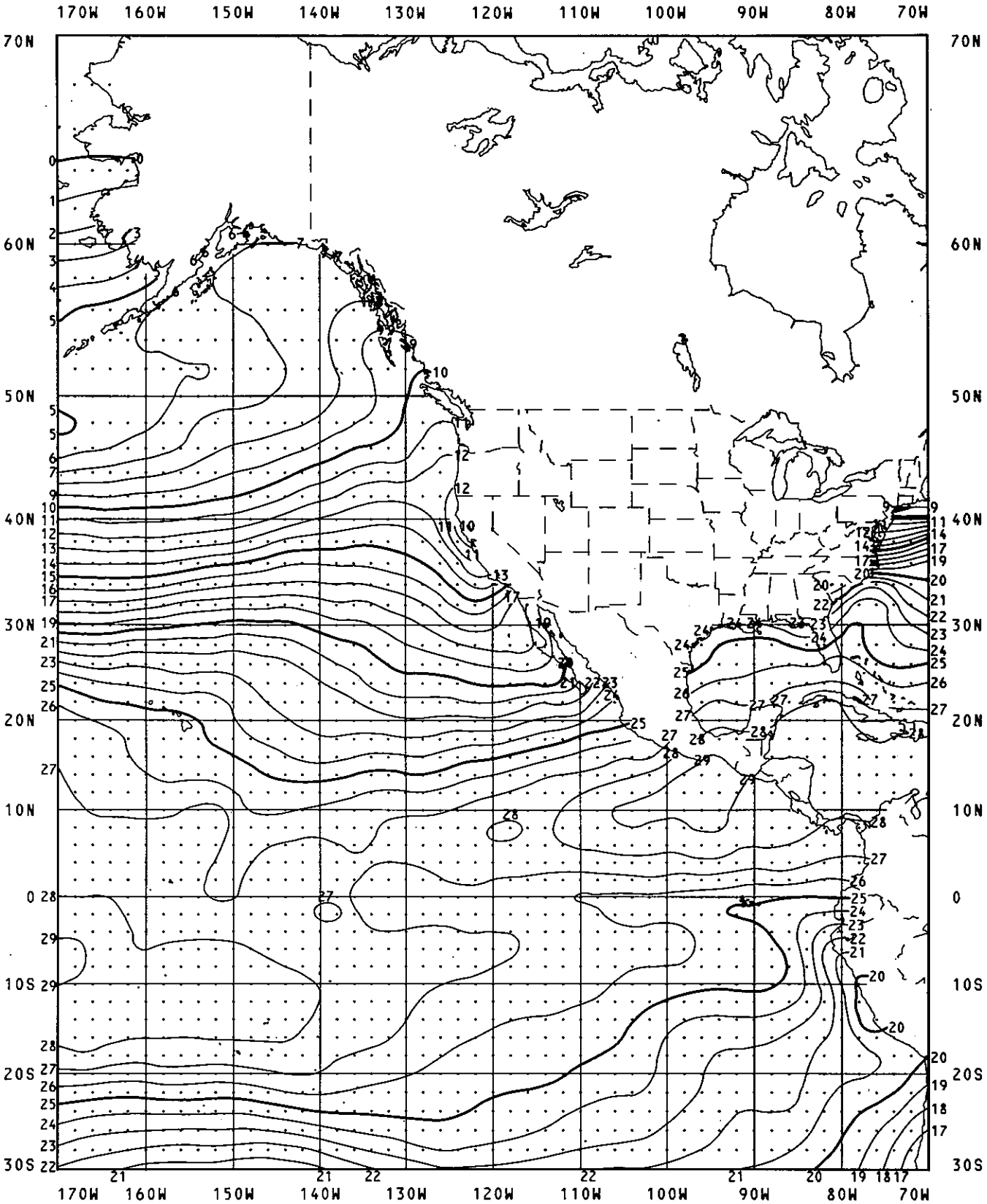

Eastern Pacific Ocean
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May 1981

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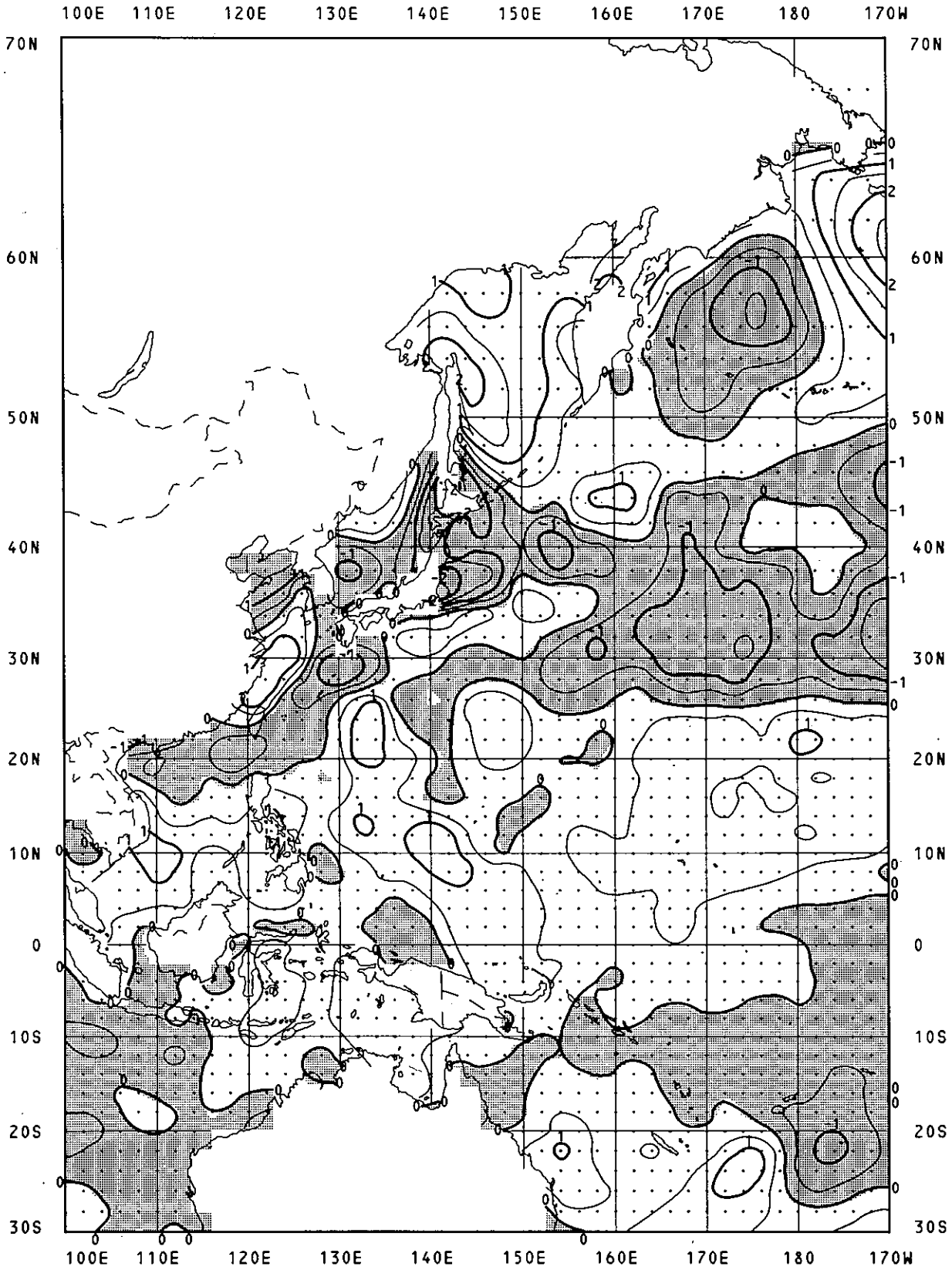

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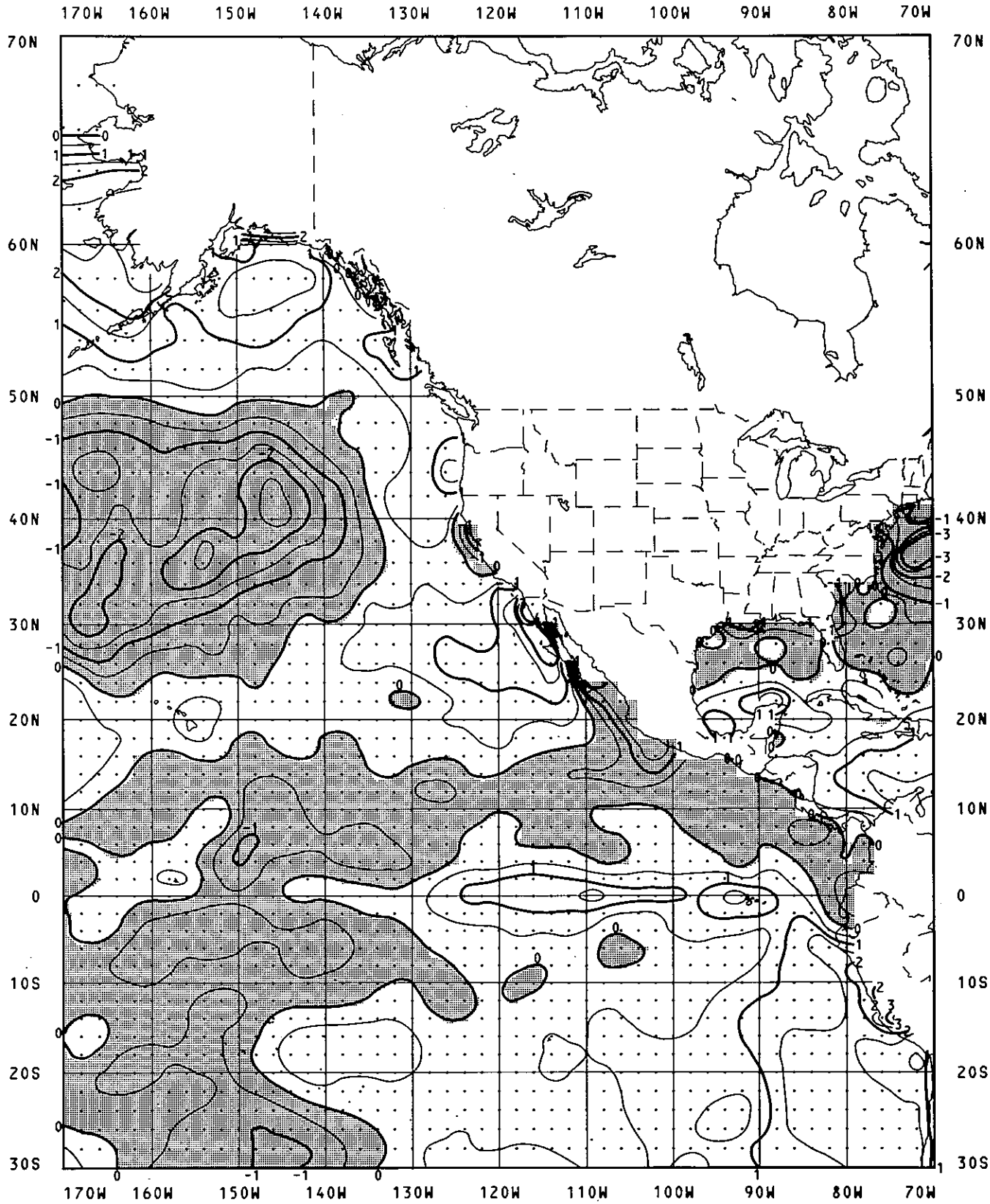

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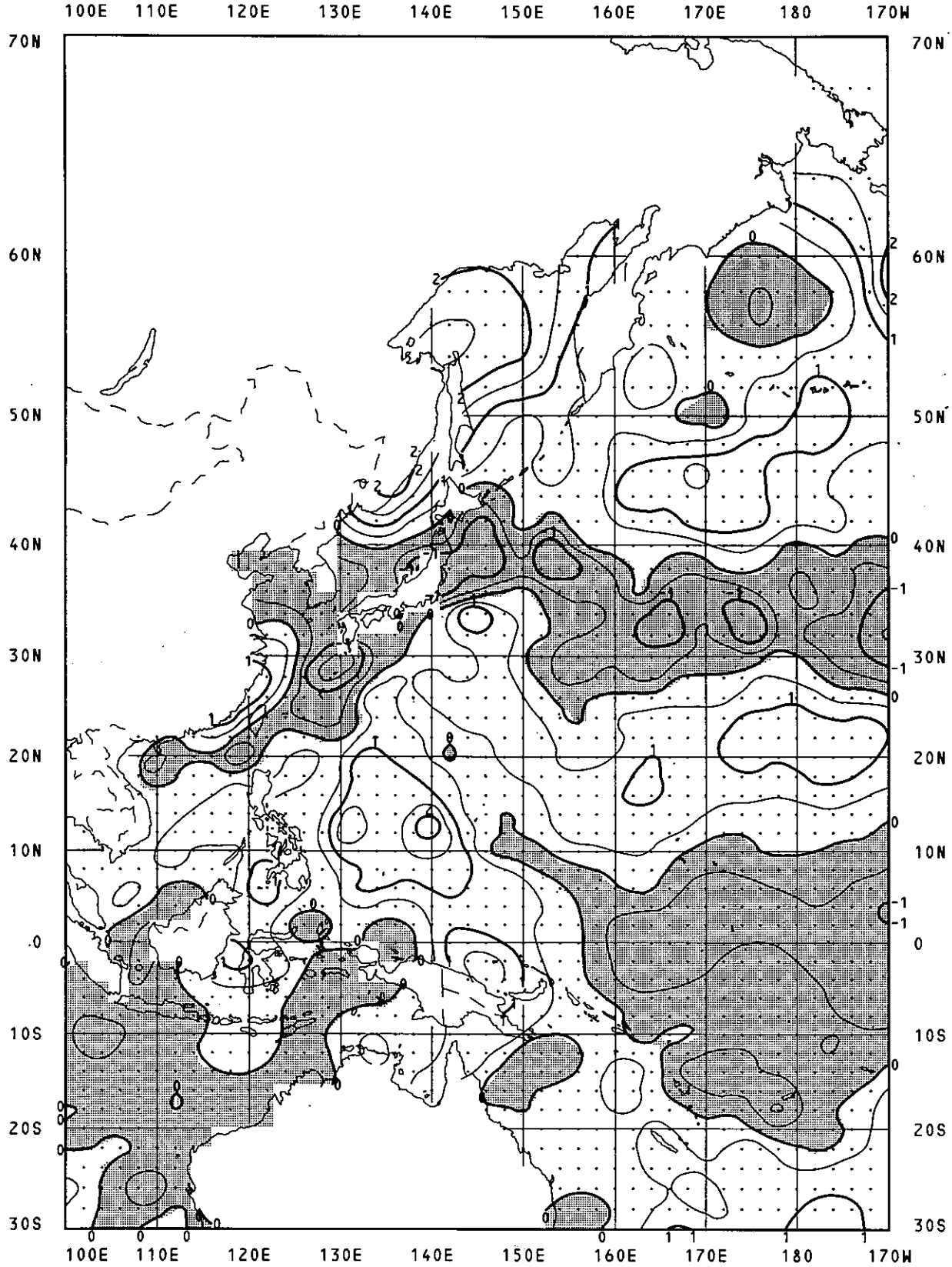

Western Pacific Ocean
SST--YEARLY CHANGE (°C)
May 1981

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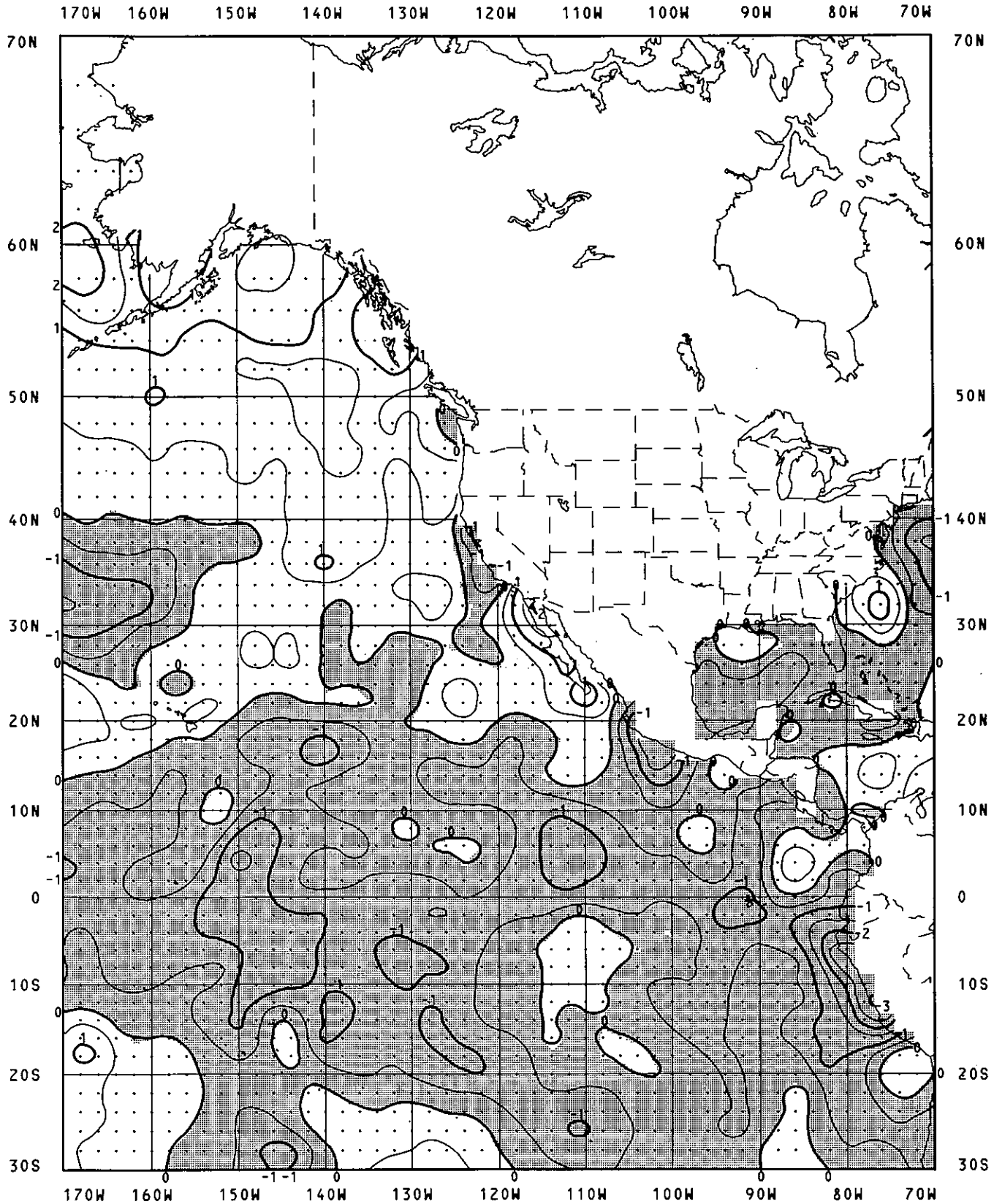

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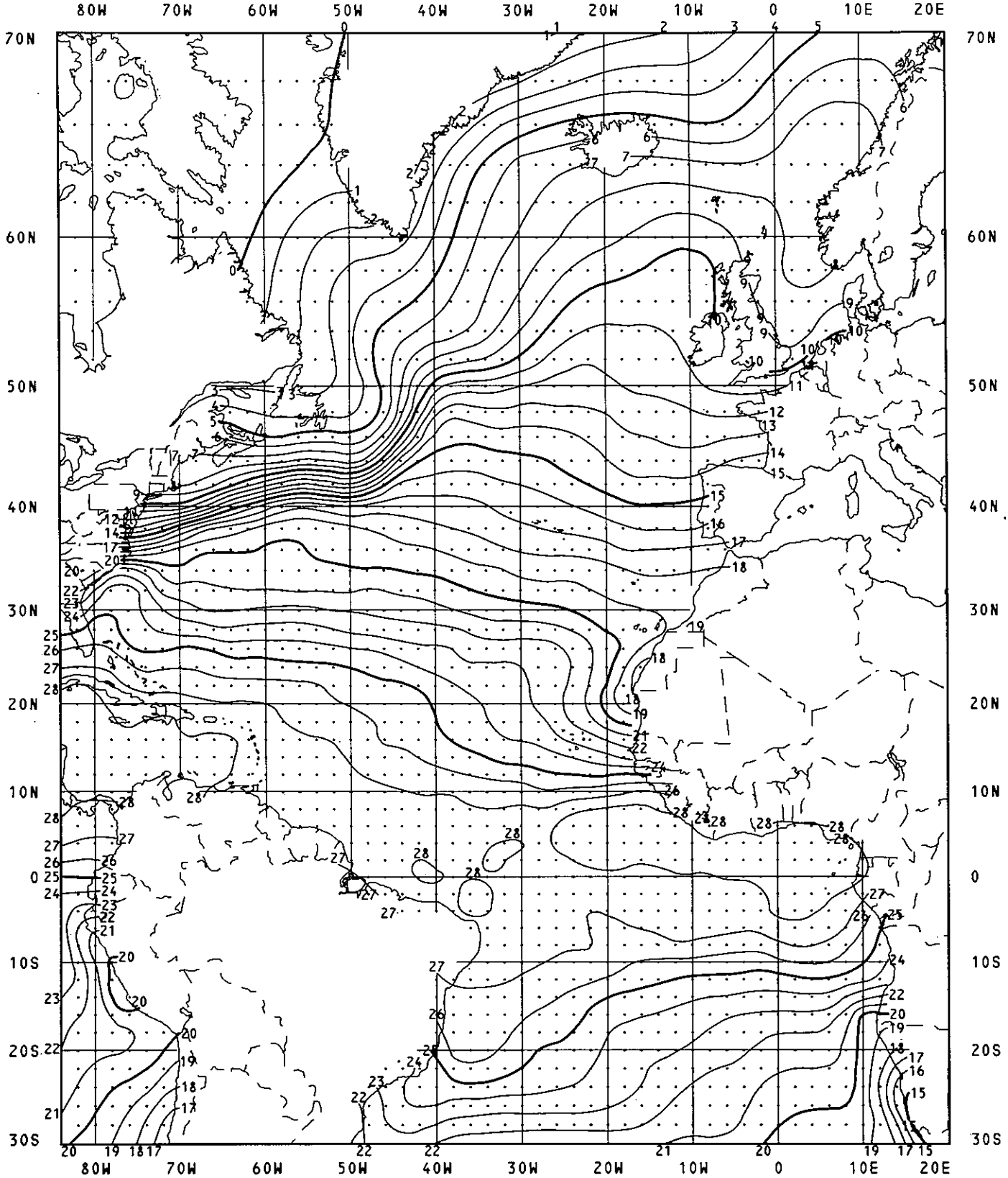

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May 1981

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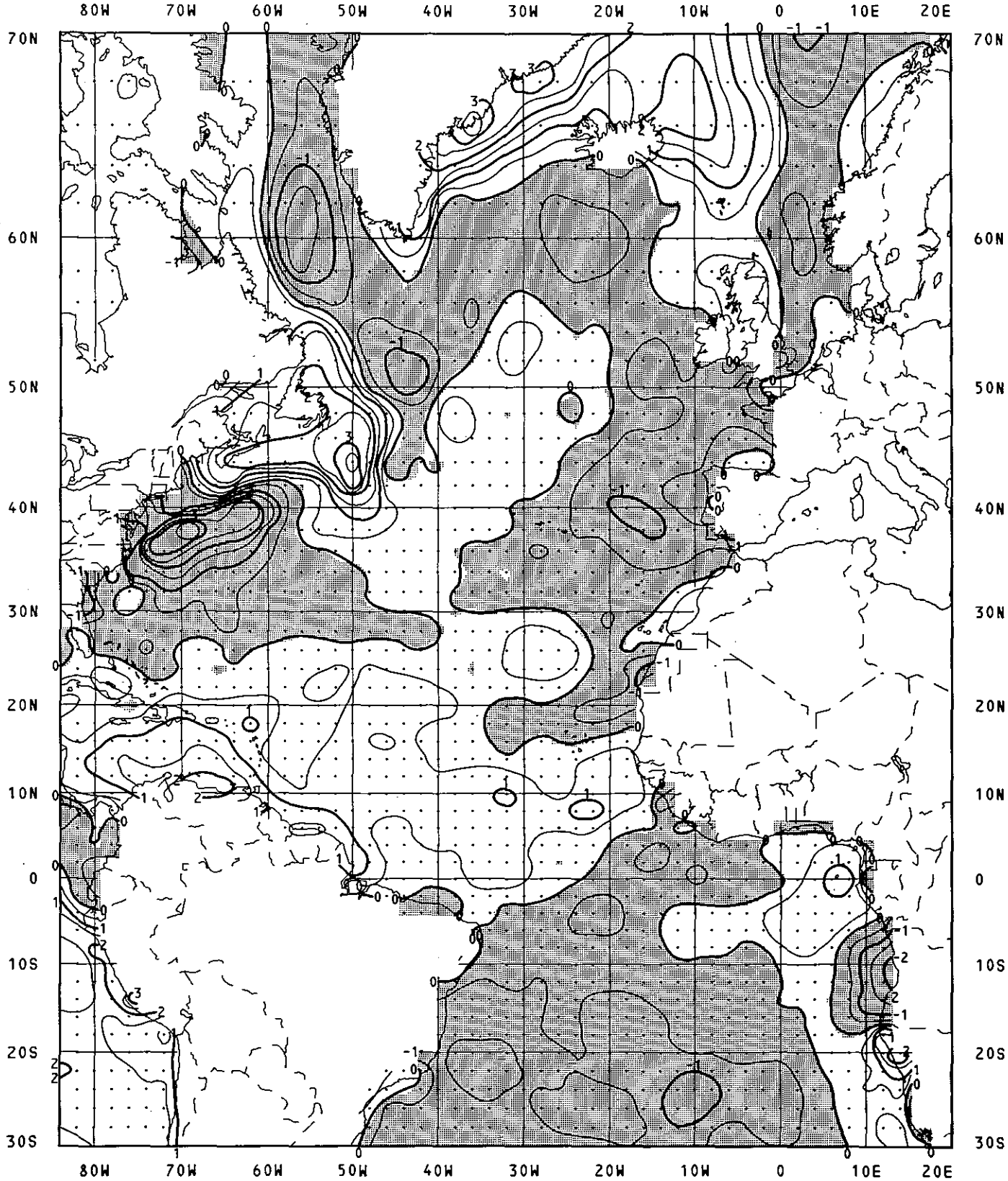

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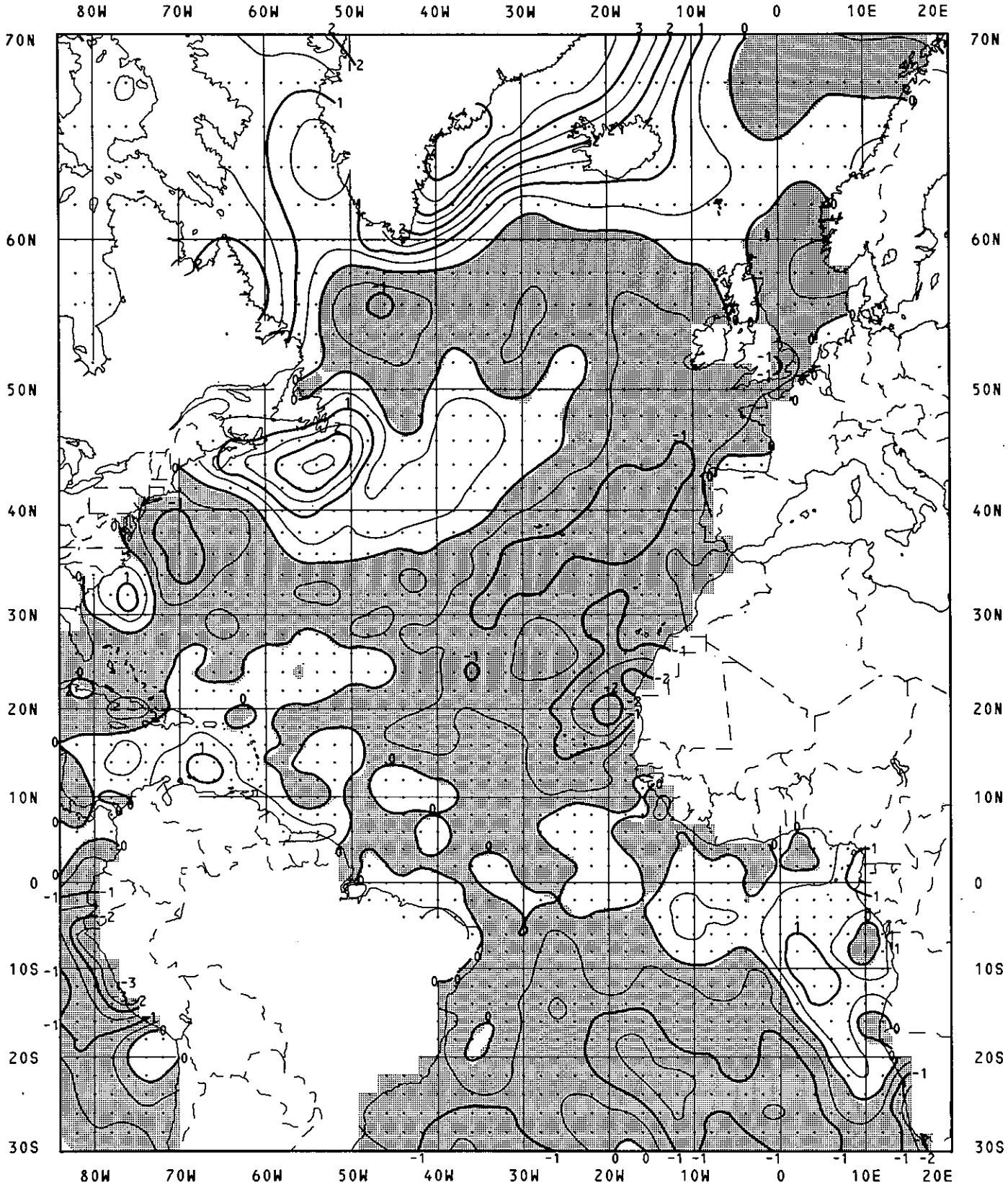

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REGIONAL ANALYSES

Bering Sea /North Slope Ice

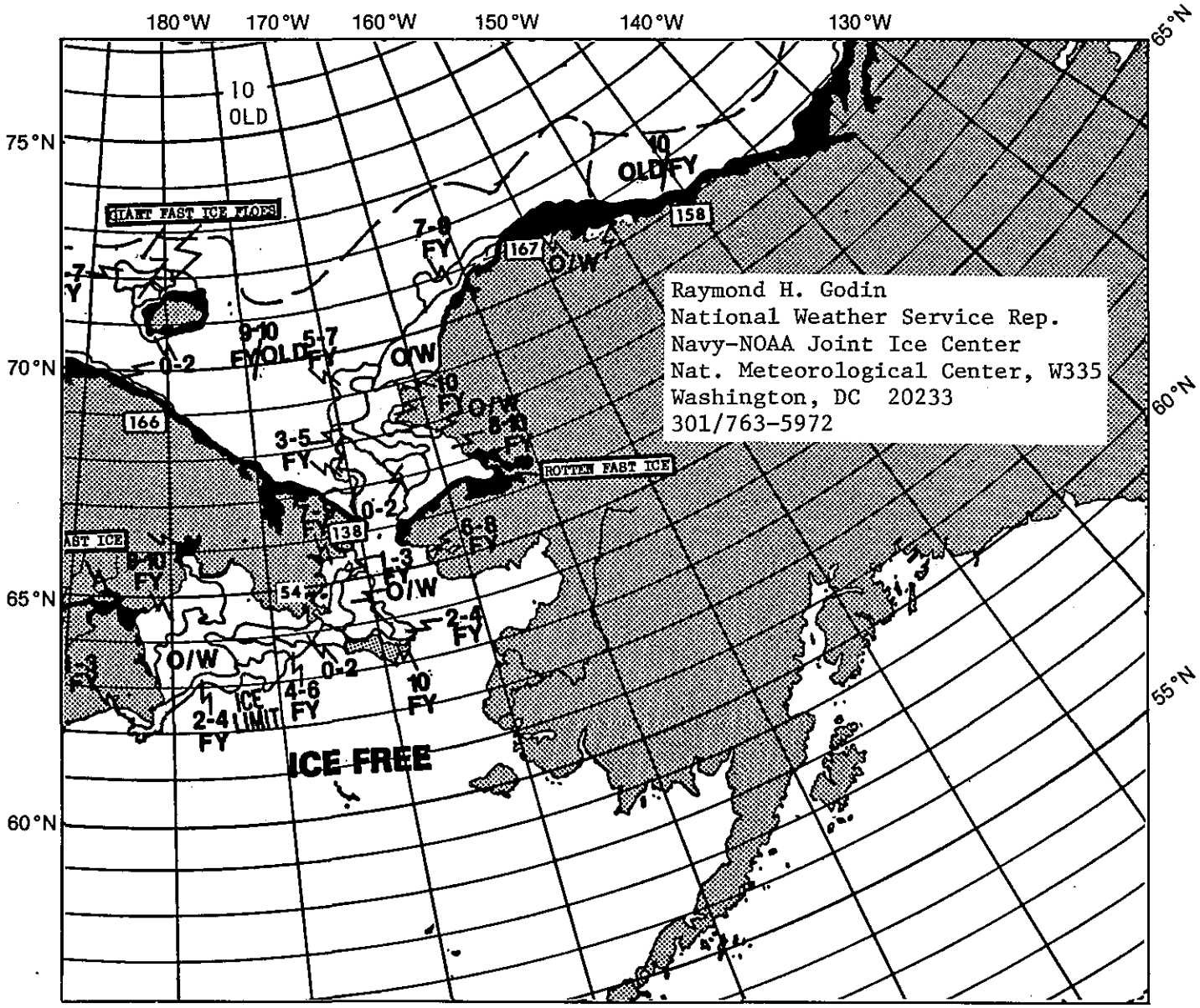
West Coast

Ocean features
Sea surface temperature
SST anomaly

East Coast

Ocean features
Sea surface temperature
SST anomaly

BERING SEA / NORTH SLOPE ICE ANALYSIS



MAY 1981

KEY

ICE CONCENTRATION

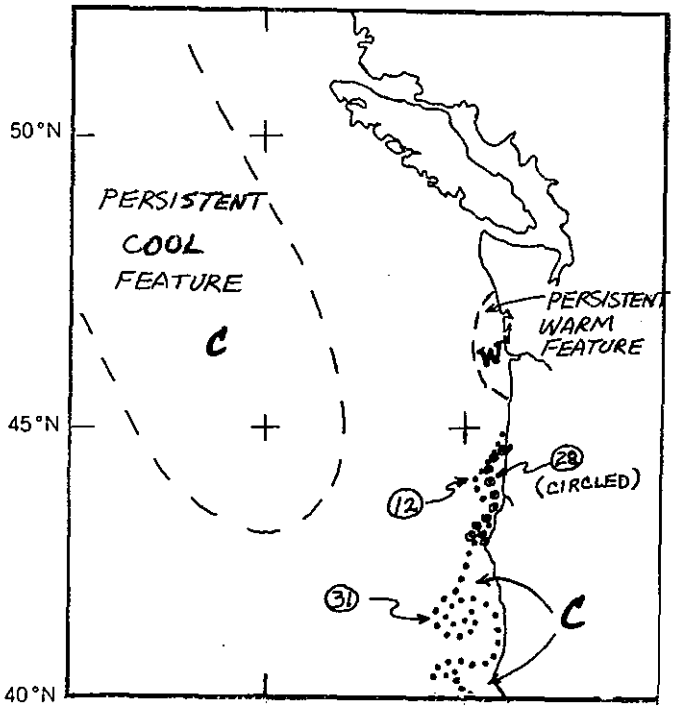
4-6	Area 4-6 tenths ice-covered.
OW	Open water. Sea ice present in concentrations less than one tenth.
ICE-FREE	No sea ice. Ice of land origin (iceberg e.g.) may be present.

ICE THICKNESS (AGE)

OLD	Includes both multi-year and second-year ice. Generally 2-3.5m thick.
FY	Any or all first year ice types (30 cm - 2 m thick).
YNG	Young ice (10-30 cm thick).
N	New and nilas.
■	Fast ice. Sea ice which forms and remains fast along the coast.
120	Theoretical thickness of this season's growth (cm), based on freezing degree days (presented for first day of each month on first succeeding chart).
———	Ice boundary visually or satellite observed.
- - - -	Ice boundary estimated.

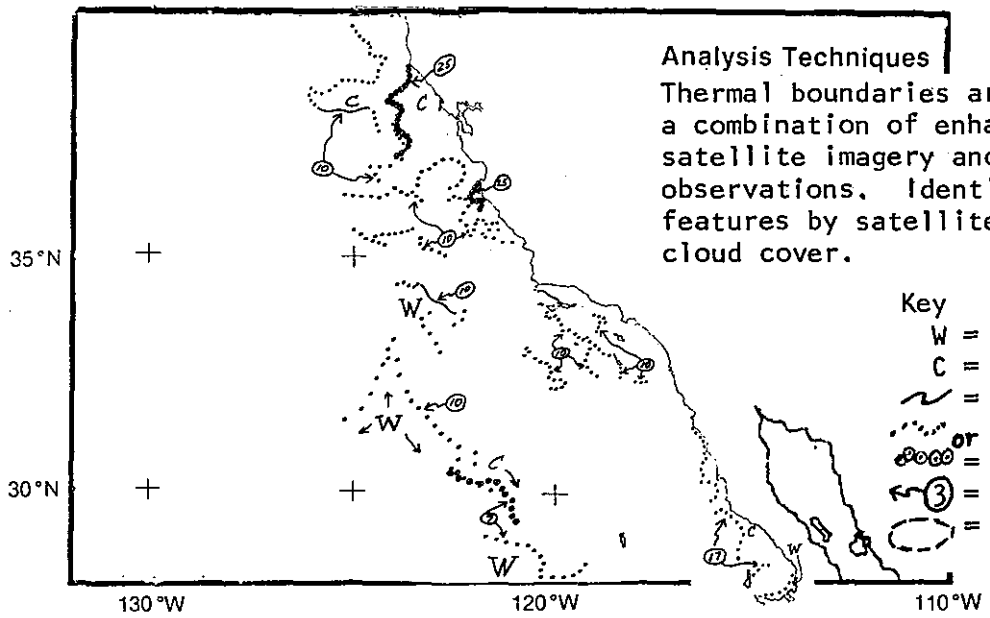
The most prominent synoptic scale features of the mean monthly surface pressure circulation affecting Alaskan sea ice distribution are a 1005mb low located near 50°N 166°E and a 1020mb high located near 74°N 145°W. Easterly mean geostrophic winds affected all of the ice covered region. Barrow (71°N 157°W) and Nome (64°N 165°W) recorded above normal monthly mean air temperatures. On the north slope, ice thicknesses reached their maximum seasonal accumulation during the month. By the end of May the first indications of breakup in the fast ice zone are observed. The open water east of Barrow is a result of river runoff flooding of the fast ice causing rapid disintegration of the sea ice. Between Barrow and Cape Lisburne (69°N 166°W) an open water lead has formed outside of the fast ice zone in what had been a source area of new ice formation during the winter. The warm north setting current flowing through the Bering Strait is opening the Chukchi Sea to ice free waters. The fast ice observed in Kotzebue Sound is rotten and breaking up.

WEST COAST OCEAN FEATURES



MAY 1981

May satellite imagery shows a series of thermal boundaries along the mid-Oregon coast and southward. These were caused by coastal upwelling episodes, the strongest of which occurred during May 9-13 and May 26-31. The greatest occurrence of thermal boundary activity was seen near Cape Mendocino (40°N 124°W). Other persistent features seen during May include a cool water mass extending into the panel area from the northwest and a warm water mass along the southern Washington and northern Oregon coasts, similar to the one seen in late April. Seasonal warming continues over most of the area with SST increases averaging 1.5-2°C. The only exceptions are southern Oregon coastal stations, which recorded decreases of as much as 1.5°C, due to upwelling effects.



Analysis Techniques

Thermal boundaries are determined from a combination of enhanced infrared satellite imagery and ship and buoy observations. Identification of these features by satellite is limited by cloud cover.

Key
W = warm
C = cold
= strong boundary
or
= weaker boundary
3 = date of feature
= outline of water mass feature

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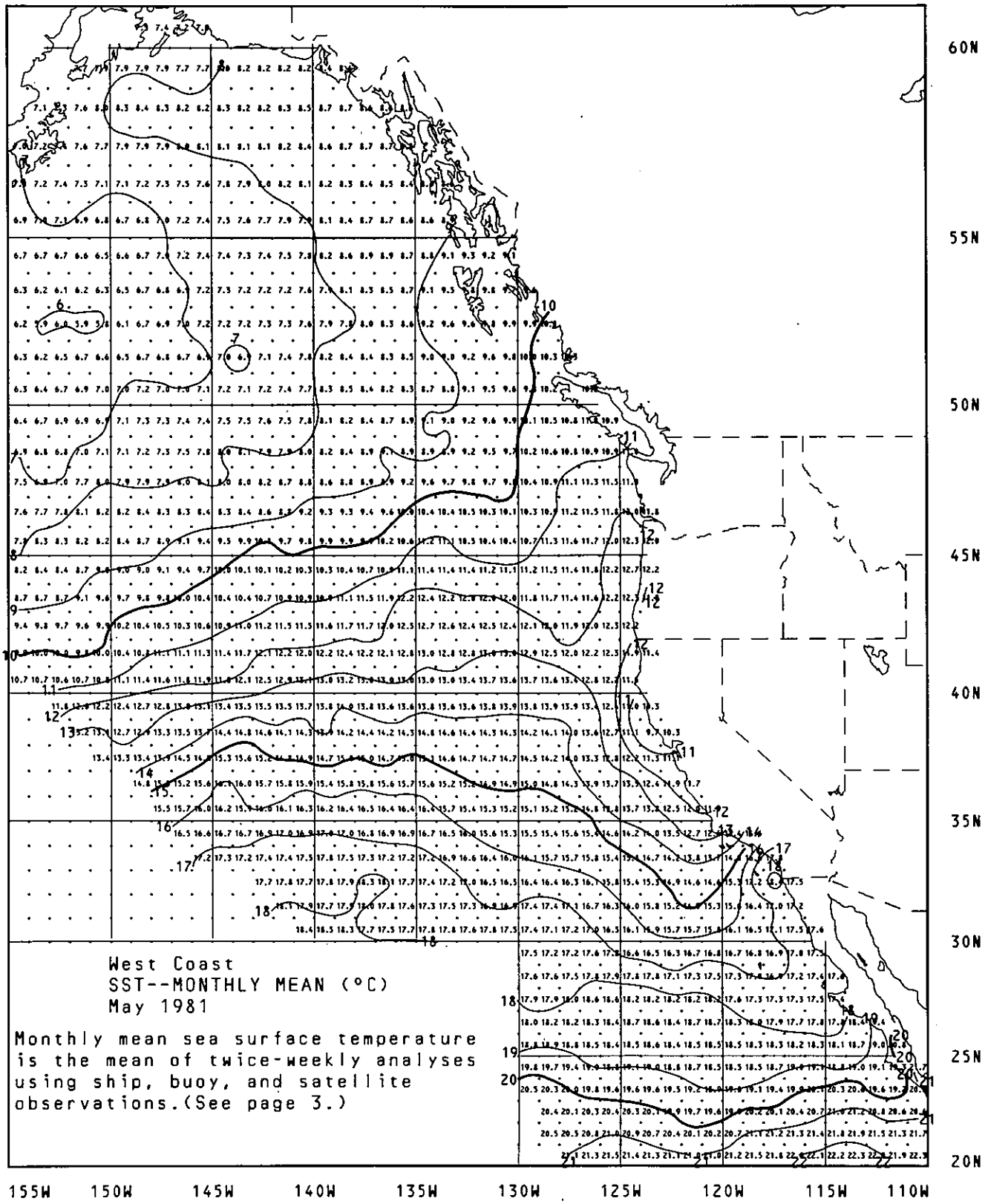
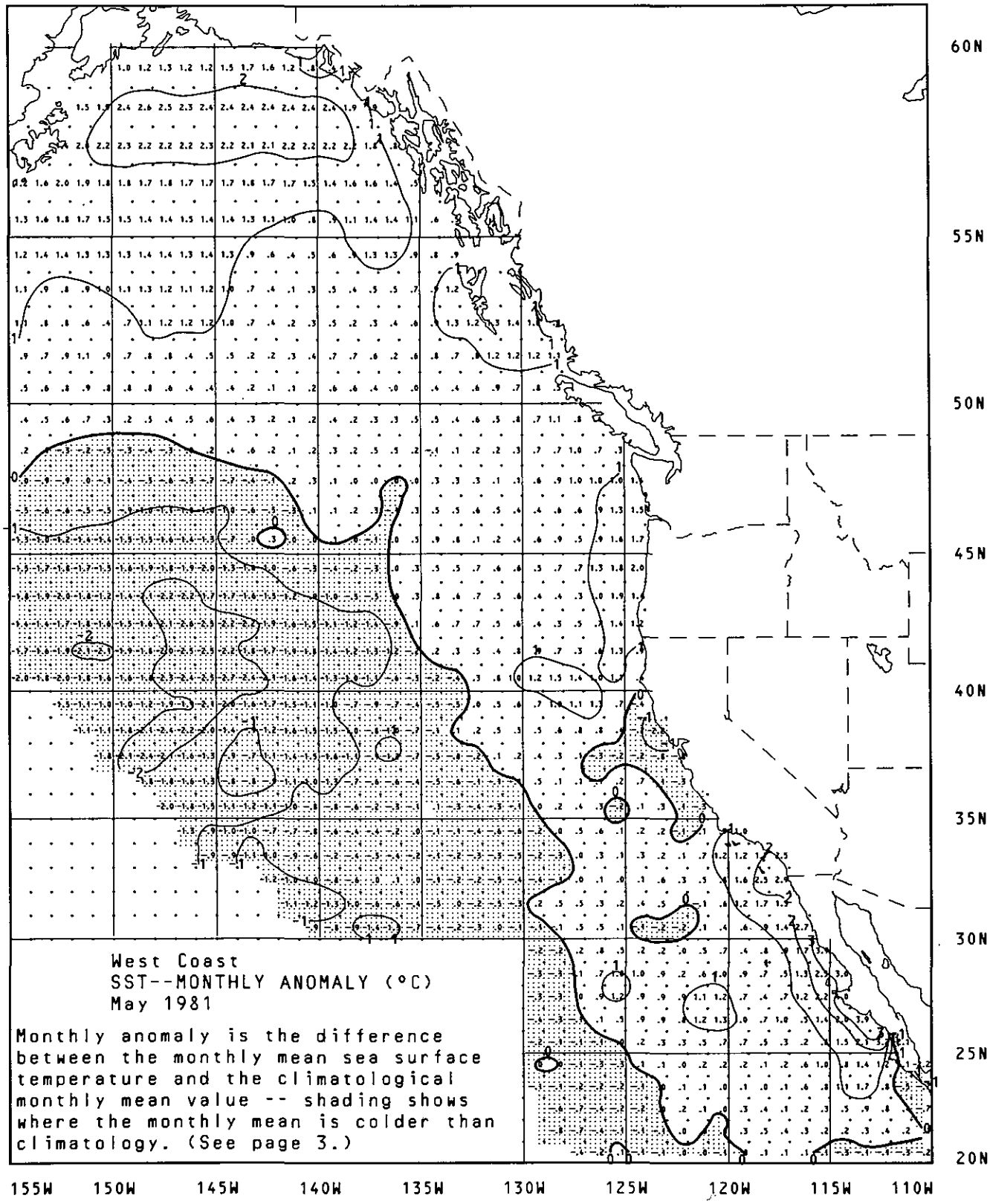
During May, SST increases were approximately seasonal 200 km beyond the coast, averaging about 1°C. Within 150 km of the coast from Pt. Conception (34°N 120°W) north, SST's remained cool (8-14°C) due to continued coastal upwelling. Within 100-150 km of the coast south of 34°N, SST's were 1-2°C above normal, with temperatures occasionally exceeding 18°C. May SST ranges at the NOAA data buoys were 11-13.5°C at Pt. Sal (35°N 121°W), 9.7-12.8°C at Half Moon Bay (37°N 123°W), 8.1-11.8°C off Bodega Bay (38°N 123°W), and 8.8-12.6°C at Pt. Arena (39°N 124°W). SST's at all four buoys were lowest between May 4-10 and gradually increased from May 16-31. Satellite data again showed intrusions of warm water centered about 250 km WSW and 400 km SE of Pt. Conception.



West Coast
SST--MONTHLY MEAN (°C)
May 1981

Monthly mean sea surface temperature is the mean of twice-weekly analyses using ship, buoy, and satellite observations.(See page 3.)



West Coast
SST--MONTHLY ANOMALY (°C)
May 1981

Monthly anomaly is the difference between the monthly mean sea surface temperature and the climatological monthly mean value -- shading shows where the monthly mean is colder than climatology. (See page 3.)

EAST COAST OCEAN FEATURES

The end of this month's positions of the Gulf Stream System and its associated eddies are shown for the NW Atlantic and the Gulf of Mexico. The Gulf Stream and Loop Current boundaries are located by prominent sea surface temperature gradients or by the 15°C isotherm at 200m. Anticyclonic eddies are labeled a-z in the Gulf of Mexico and 1-99 in the NW Atlantic. Cyclonic eddies are labeled A-Z. Arrows on eddies indicate direction of circulation. Warm-core or anticyclonic eddies rotate clockwise; cold-core or cyclonic eddies rotate counterclockwise. The long arrows indicate the date of data used.

Feature positions are drawn from:
- NOAA-6 satellite infrared imagery
- Bathythermograph data,
  - National Meteorological Center of National Weather Service
- Oceanographic Analysis (daily),
  - National Weather Service/National Earth Satellite Service

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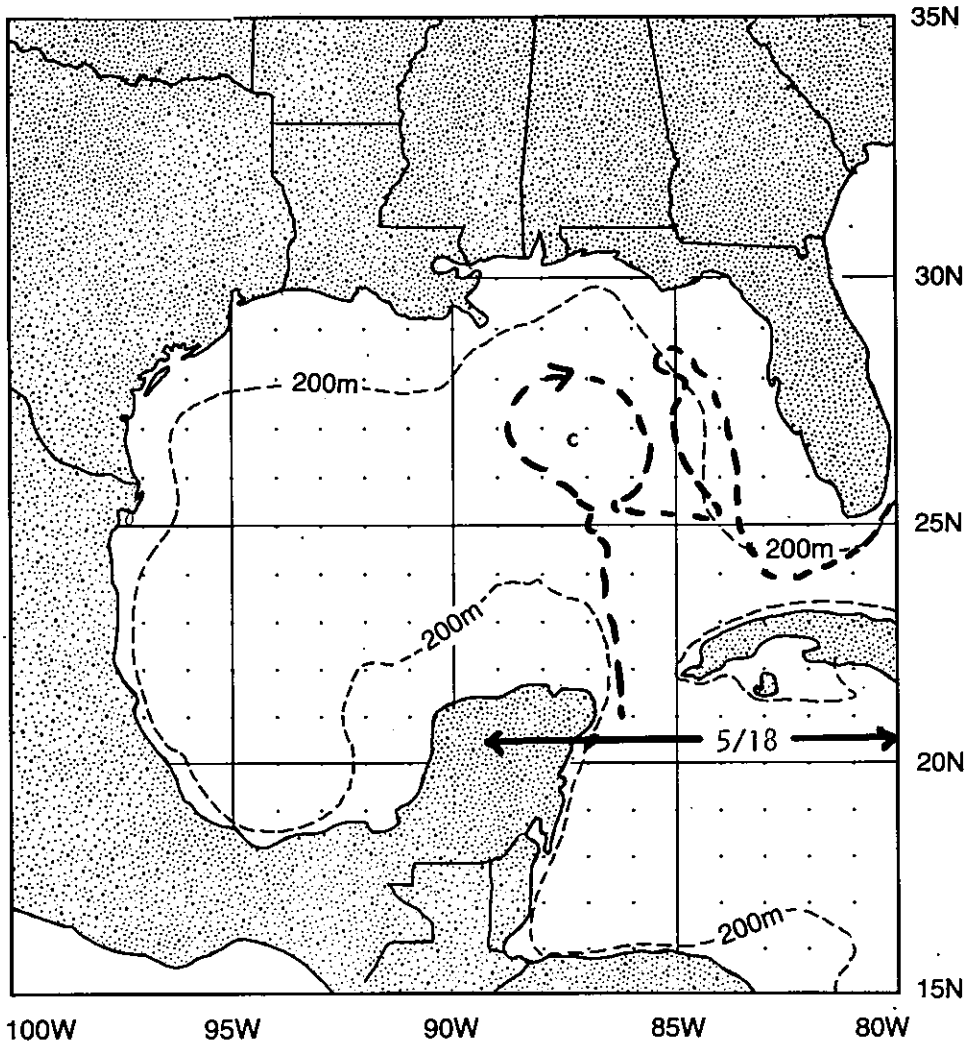
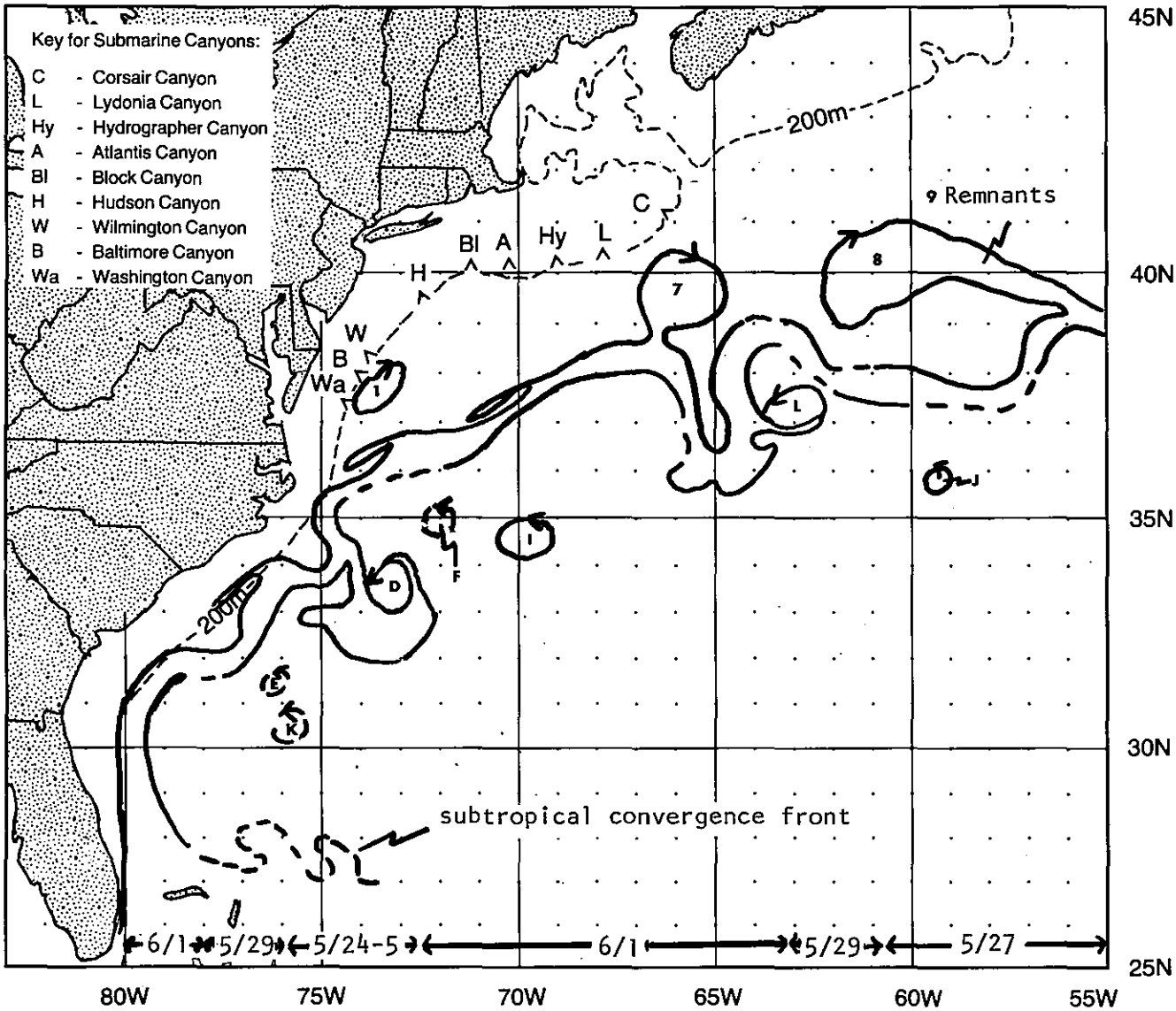


MAY 1981

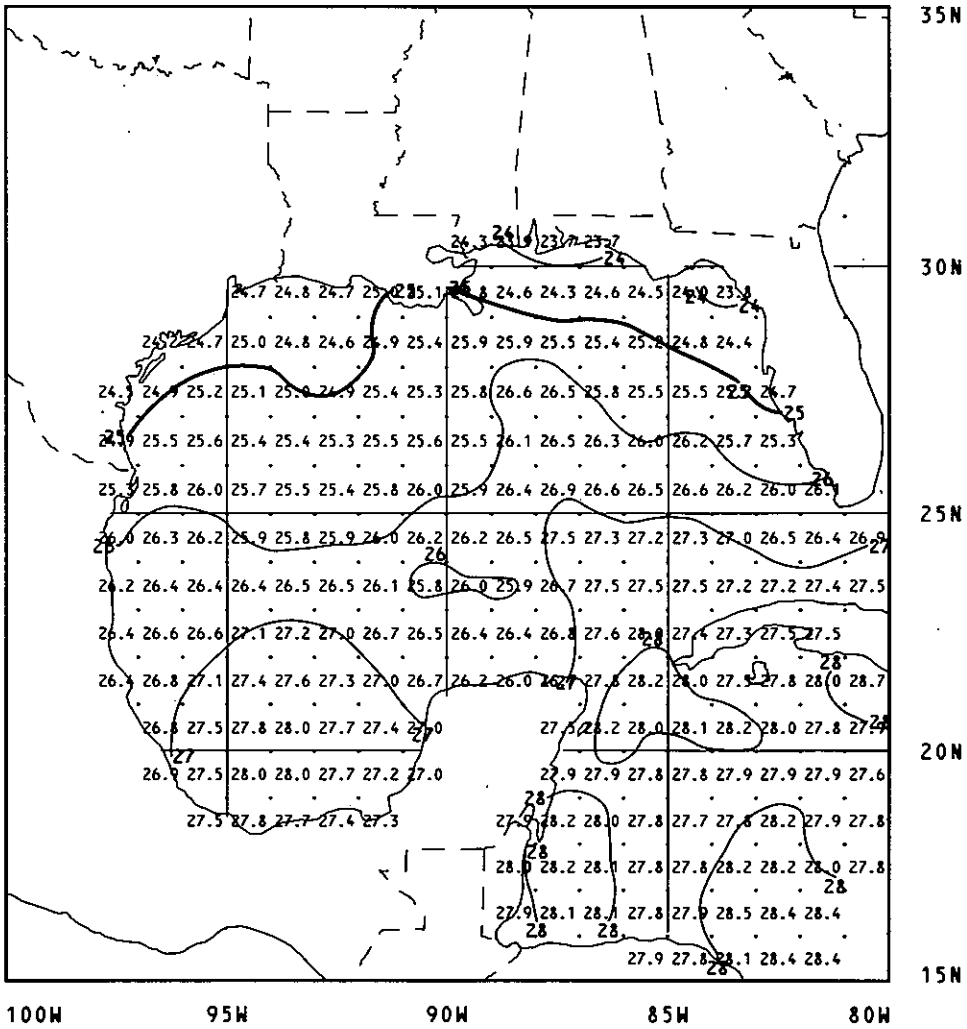
Seasonal warming of the surface waters in the Gulf of Mexico has created a near isothermal condition, making identification of the Loop Current by satellite imagery difficult since mid-May. Anticyclonic eddy c apparently moved about 20 km SW and decreased slightly in mean surface diameter. The Loop's amplitude apparently decreased from 26°N to 25°N. A long filament of warm water protrudes from the Loop at 84°W. This filament has persisted since mid-April.



Prominent features of the Gulf Stream include the wave near 34°N 75°W, which has pushed the Stream east of 75°W, and the large amplitude meander at 65°W. Two Gulf Stream meanders formed two new anticyclonic eddies during May. Eddy 8 formed about May 5 near 39°N 59°30W. Eddy 9 formed about May 10 near 39°N 56°W. Due to cloudiness, we were not able to observe most of the movements of eddy 9 during its short lifespan. Apparently, eddy 9 collided with eddy 8 around May 14. By May 27, eddy 8 and a Stream meander had absorbed eddy 9, forming a long neck between eddy 8 and the Stream, as seen in the chart above. A moderate Gulf Stream wave has been interacting with eddy 7 since May 10 decreasing its mean surface diameter from 240 km to 185 km. During May, eddy 7 translated 45 km N. Eddy 1 translated 190 km SW.

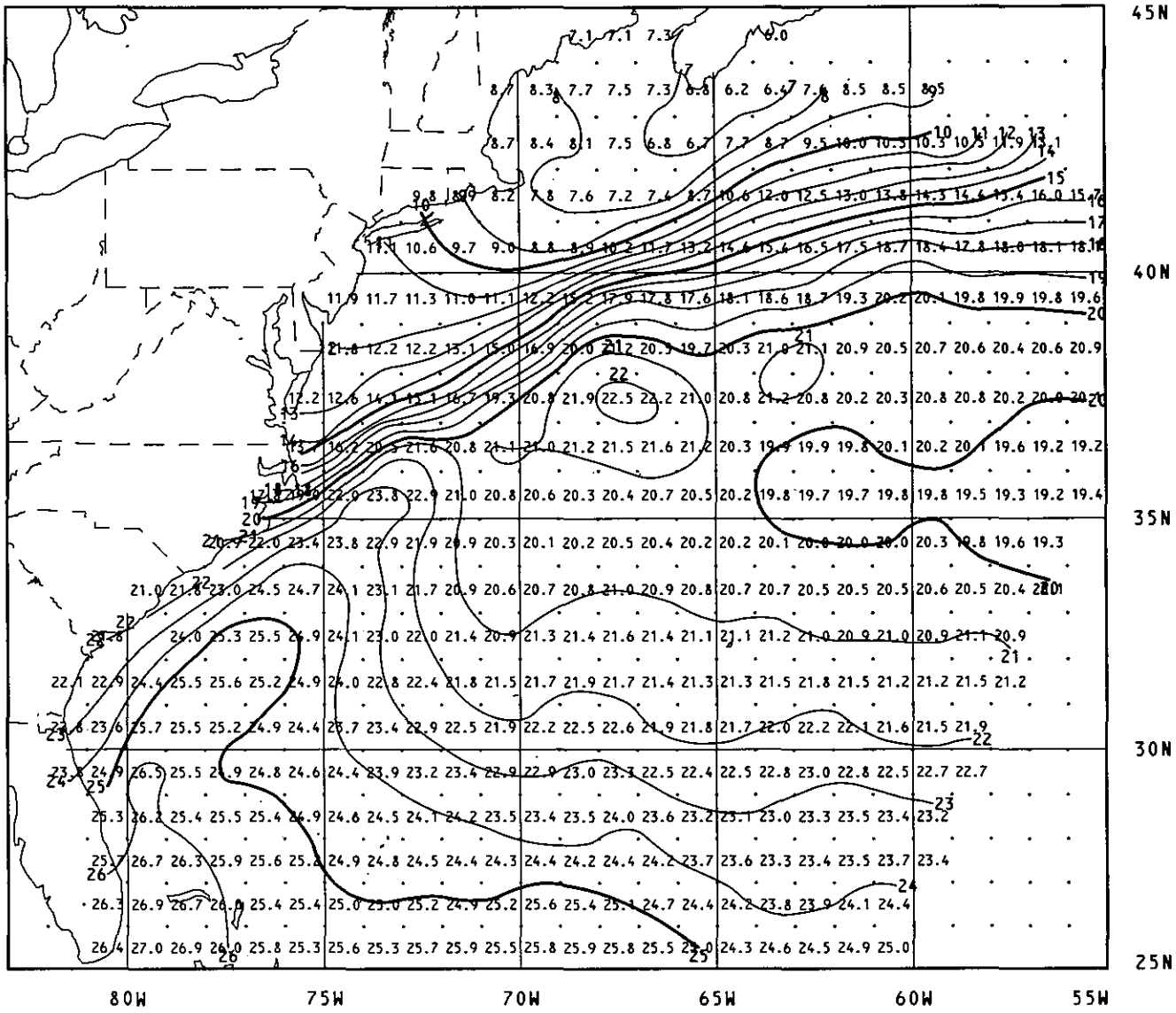
Cyclonic eddy D translated 70 km SE. Eddy E, last seen on May 23, translated 105 km SW. Eddy F has apparently translated 90 km SW from March 31 to May 18. The eddy at 34°30N 70°W is probably eddy 1, if so, it has translated 45 km NE since April 19. The eddy near 36°N 59°W is possibly eddy J, if so, it has translated 360 km SW in 39 days. Eddies K and L are newly observed cyclonic eddies. The positions of eddy K and the subtropical convergence front are drawn from May 23 satellite imagery.

EAST COAST SST-
MONTHLY MEAN



Gulf of Mexico
SST--MONTHLY MEAN (°C)
May 1981

Monthly mean sea surface temperature is the mean of twice-weekly analyses using ship, buoy, and satellite observations.(See page 3.)



NW Atlantic Ocean
SST--MONTHLY MEAN (°C)
May 1981

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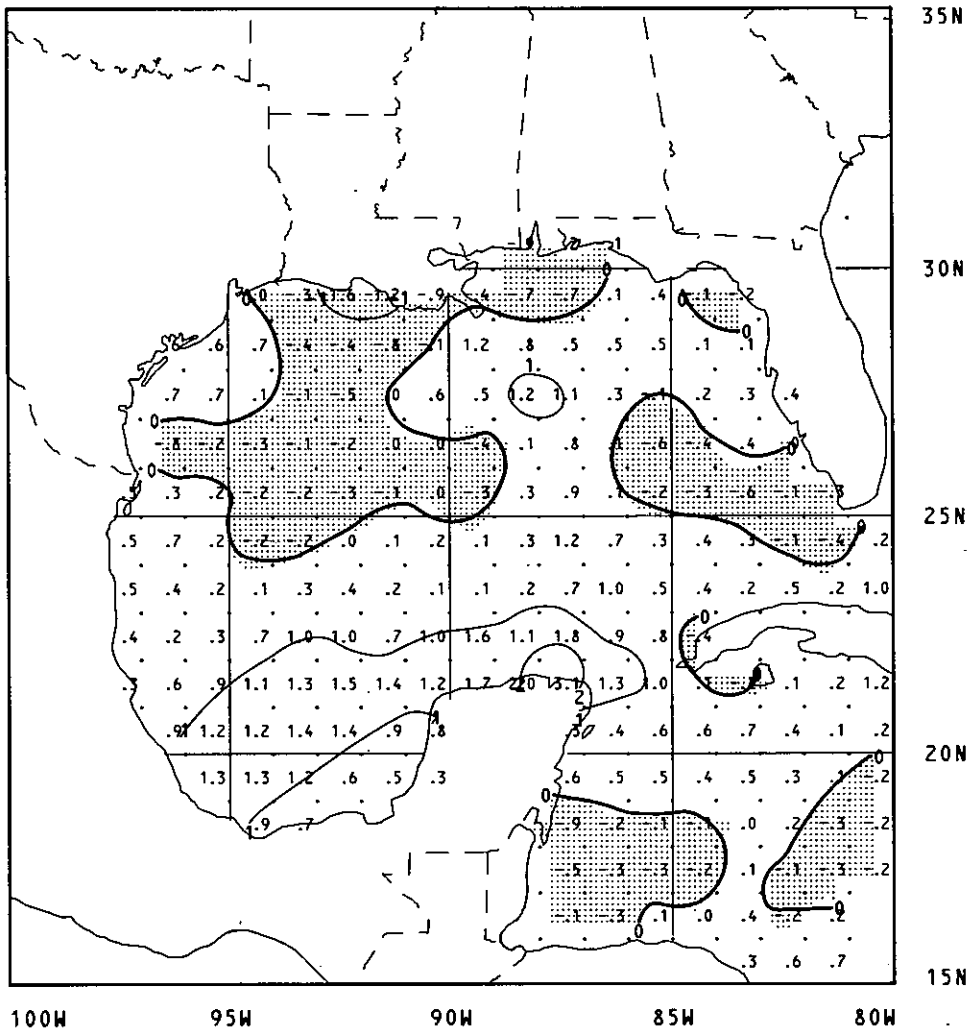
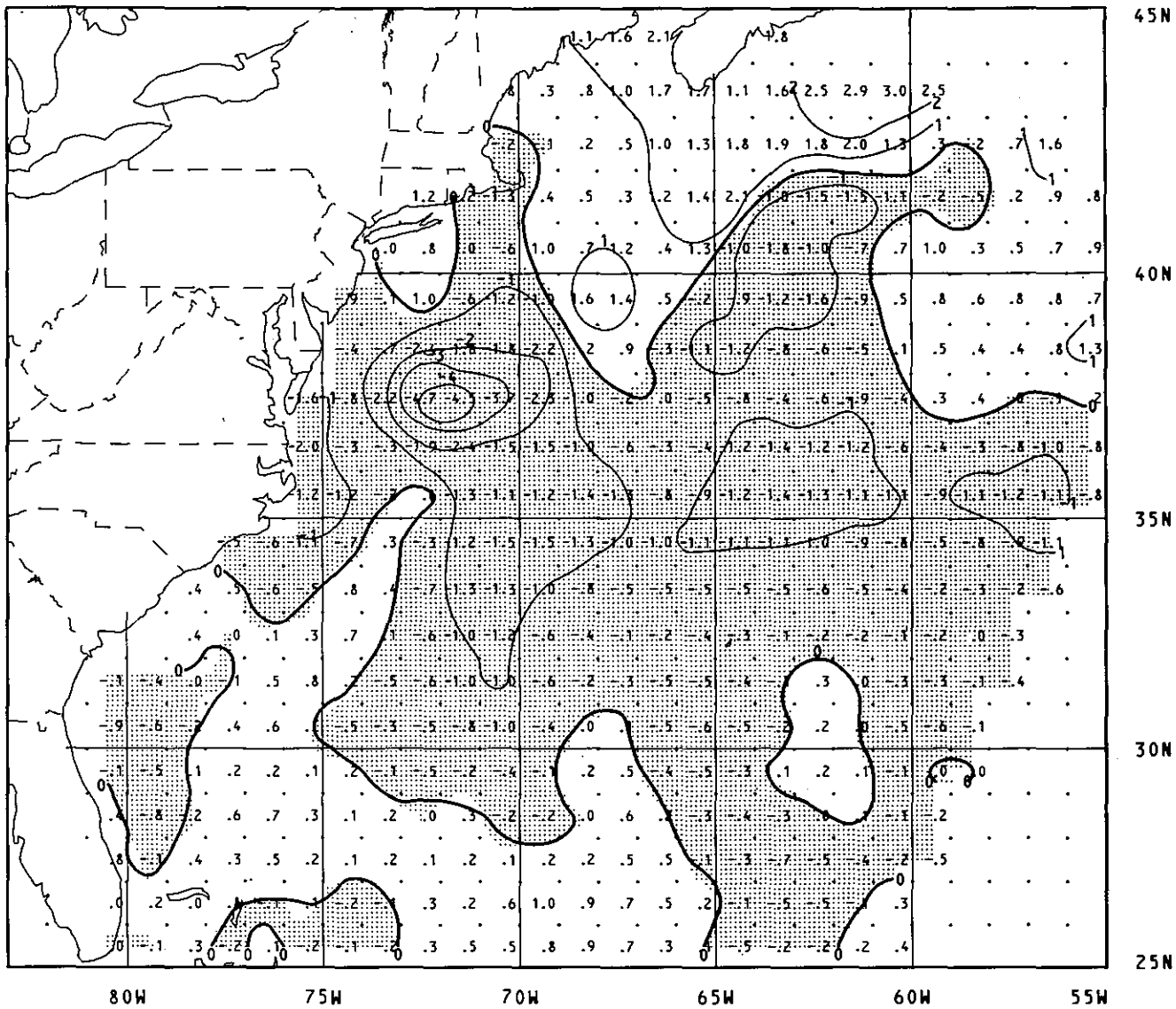
EAST COAST SST-ANOMALY



Gulf of Mexico
SST--MONTHLY ANOMALY (°C)
May 1981

Monthly anomaly is the difference between the monthly mean sea surface temperature and the climatological monthly mean value -- shading shows where the monthly mean is colder than climatology. (See page 3.)



NW Atlantic Ocean
SST--MONTHLY ANOMALY (°C)
May 1981

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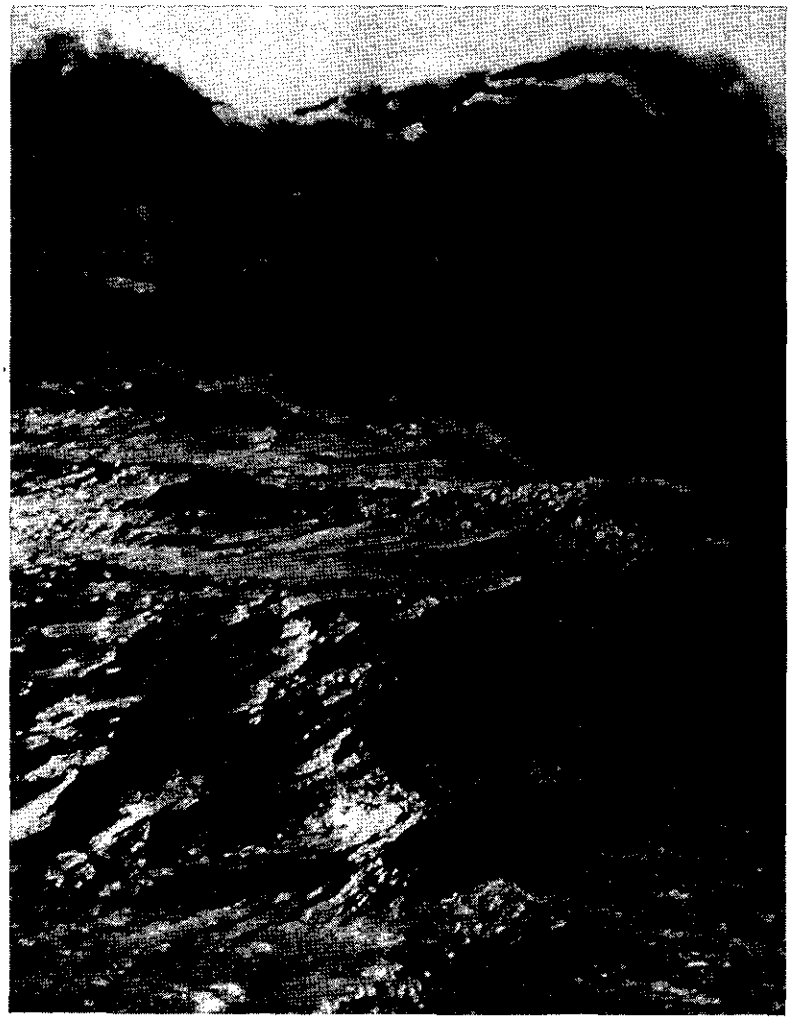
The Secretary of Commerce has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through September 1, 1983.

OCEANOGRAPHIC Monthly Summary

Volume I Number 6 JUNE 1981



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U.S. DEPARTMENT OF COMMERCE • National Oceanic and Atmospheric Administration
National Weather Service/National Earth Satellite Service

Oceanographic Monthly Summary is a continuation of two NOAA oceanographic publications, *gulfstream* and *Fishing Information*.

The *gulfstream* magazine included charts of the Gulf Stream location and Northwest Atlantic monthly mean SST's and anomalies. It was originally published as *The Gulf Stream Monthly Summary* by the U.S. Naval Oceanographic Office from 1964 to 1975. NOAA's National Weather Service took over the magazine, changing the name to *gulfstream*, from 1975 to 1980. The two Gulf Stream magazines thus constitute an uninterrupted 16-year history of Gulf Stream meandering and associated eddy movements.

Fishing Information included monthly charts of North Pacific mean SST's and anomalies. It was first published as the *California Fishery Market News Monthly Summary Part II-Fishing Information* by the old Bureau of Commercial Fisheries' San Diego laboratory in 1960. The name was later shortened to *Fishing Information*, and was published until 1980 by NOAA's National Marine Fisheries Service. This publication represents a continuous 20-year climatology of North Pacific oceanographic conditions.

Oceanographic Monthly Summary continues these data series, as well as beginning standardized oceanographic data series in all other U.S. offshore areas. All of the SST analyses use the Robinson-Bauer climatology.* This is a computer-assisted subjective analysis of all vertical-profile temperature data: the entire mechanical and expendable bathythermograph (MBT and XBT) files; portions of the hydrocast, salinity/conductivity temperature depth (STD/CTD), radio message files; analysis of the Asheville Marine Deck; published data and analysis; and subjective interpretation of wind and current charts. Data comprise 381,199 North Pacific observations to 1969; 727,452 Atlantic/Indian Ocean observations to 1974; and 250,000 Southern Hemisphere observations to 1979. The majority of data are MBT's, so the climatology best represents conditions since 1942.

*Robinson, M.K., 1976. Atlas of North Pacific Ocean Monthly Mean Temperatures and Mean Salinities of the Surface Layer; *NavOceano Ref. Pub. 2.*
Robinson, M.K., R.A. Bauer and E.H. Schroeder, 1979. Atlas of North Atlantic-Indian Ocean Monthly Mean Temperatures and Mean Salinities of the Surface Layer; *NavOceano Ref. Pub. 18.*

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Hemispheric Analyses

On alternate days for the Northern and Southern Hemispheres, two-day composite hemispheric sea surface temperature (SST) analyses are prepared using SST observations from ship weather reports, data buoys, expendable bathythermographs, and satellites. These data are analyzed on polar stereographic grids having a mesh length of 190.5 km at 60° latitude and 102.1 km at the equator. Agreement between the hemispheric analyses in the equatorial regions is largely assured by the fact that corners of the polar stereographic grids extend well into the opposing hemisphere permitting the analyses to overlap near the equator.

The objective analysis technique known as "conditional relaxation" corrects the previous analysis with those new observations which have passed a variety of validity tests. Areas without observations are modified by the "relaxation" procedure which maintains the divergence of the SST gradient in these areas.

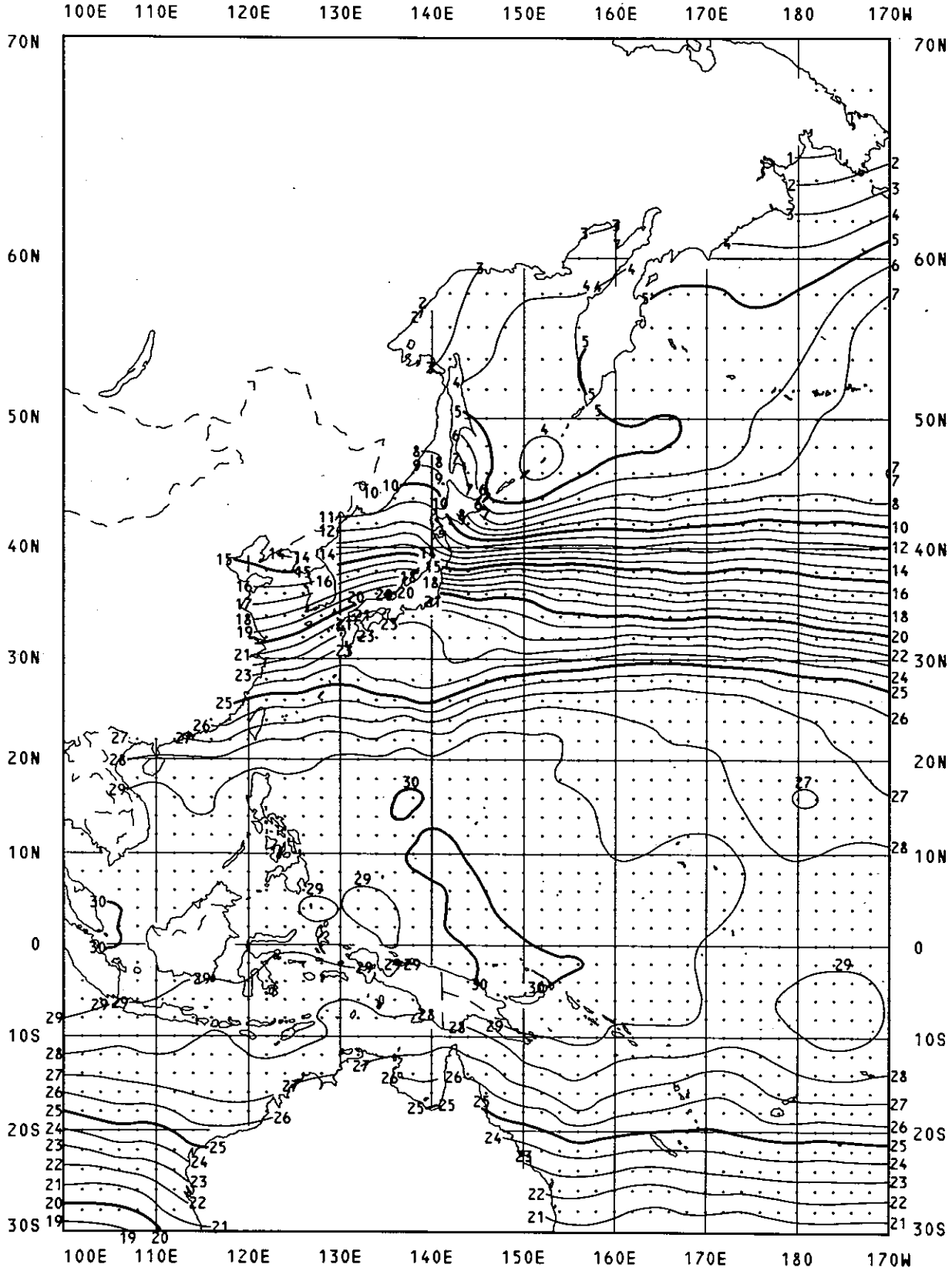
Each two-day SST analysis is interpolated to a 2° latitude/longitude grid using bilinear interpolation. The monthly products are then derived from the interpolated analyses on the 2° x 2° grid. The Robinson-Bauer climatology (see p. 2) is used to form the anomalies.....Sigurd Larson

Regional Analyses

Five-day composite regional sea surface temperature (SST) analyses are prepared twice each week using SST observations from ship weather reports, data buoys, expendable bathythermographs, and satellites. These data are analyzed on polar stereographic grids, having mesh lengths of 23.8 km at 60°N.

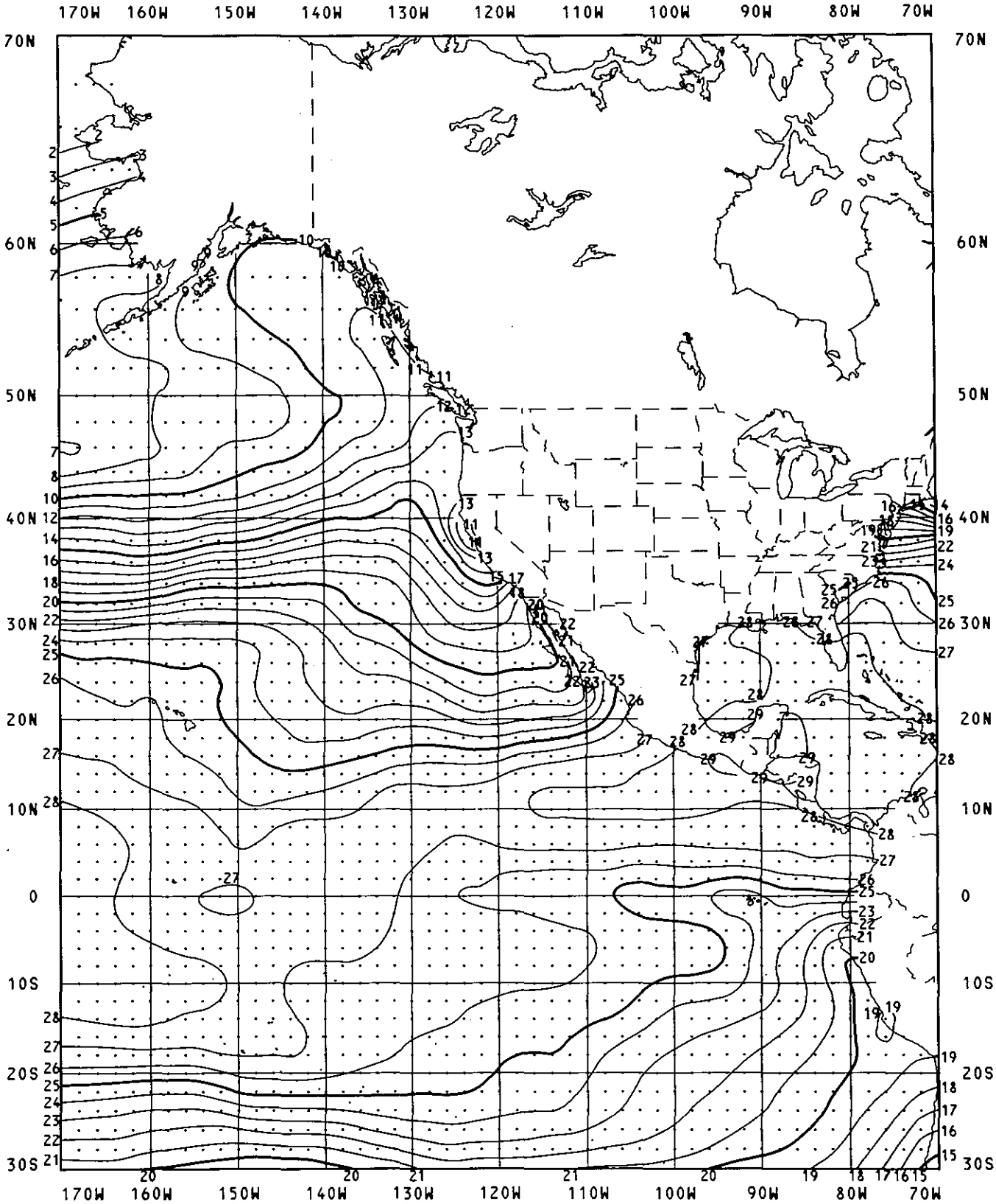
The objective analysis technique, similar to the "Cressman" technique, corrects the previous analysis with those new observations which have passed a variety of validity tests. These corrections are a weighted mean of differences between the observation and the previous analysis. Grid points in data-sparse areas are modified by distant observations through corrections weighted inversely proportional to the distance between the observation and the grid point.

Each twice-weekly SST analysis is interpolated to a 1° latitude/longitude grid using bilinear interpolation. The monthly products are then derived from the interpolated analyses on the 1° x 1° grid. The Robinson-Bauer climatology (see p. 2) is used to form the anomalies.....Bill Gemmill



Western Pacific Ocean
SST--MONTHLY MEAN (°C)
June 1981

Monthly mean sea surface temperature is the mean of two-day analyses using ship, buoy, and satellite observations. (See page 3.)



Eastern Pacific Ocean
SST--MONTHLY MEAN (°C)
June 1981

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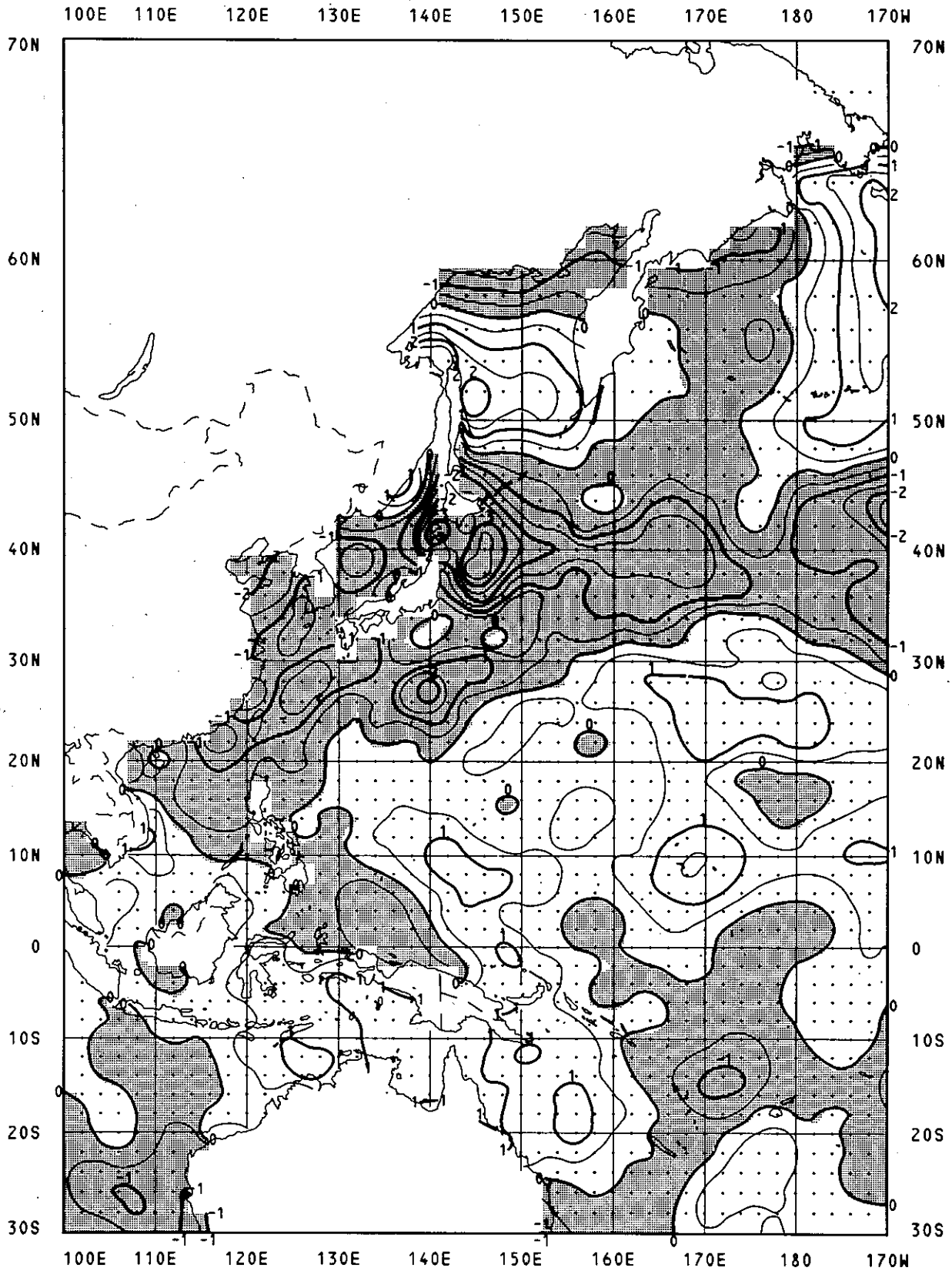

Western Pacific Ocean
SST--MONTHLY ANOMALY (°C)
June 1981

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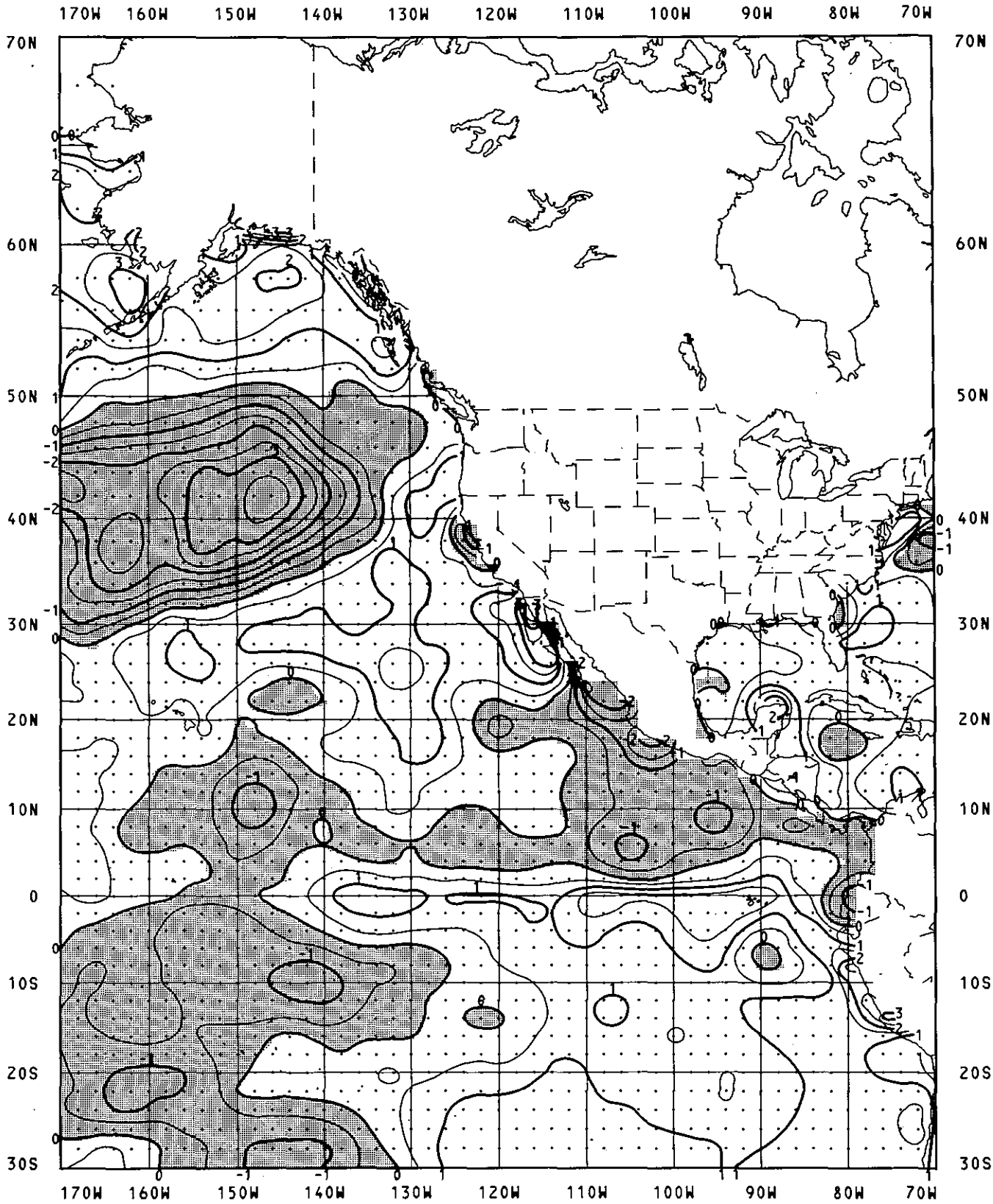

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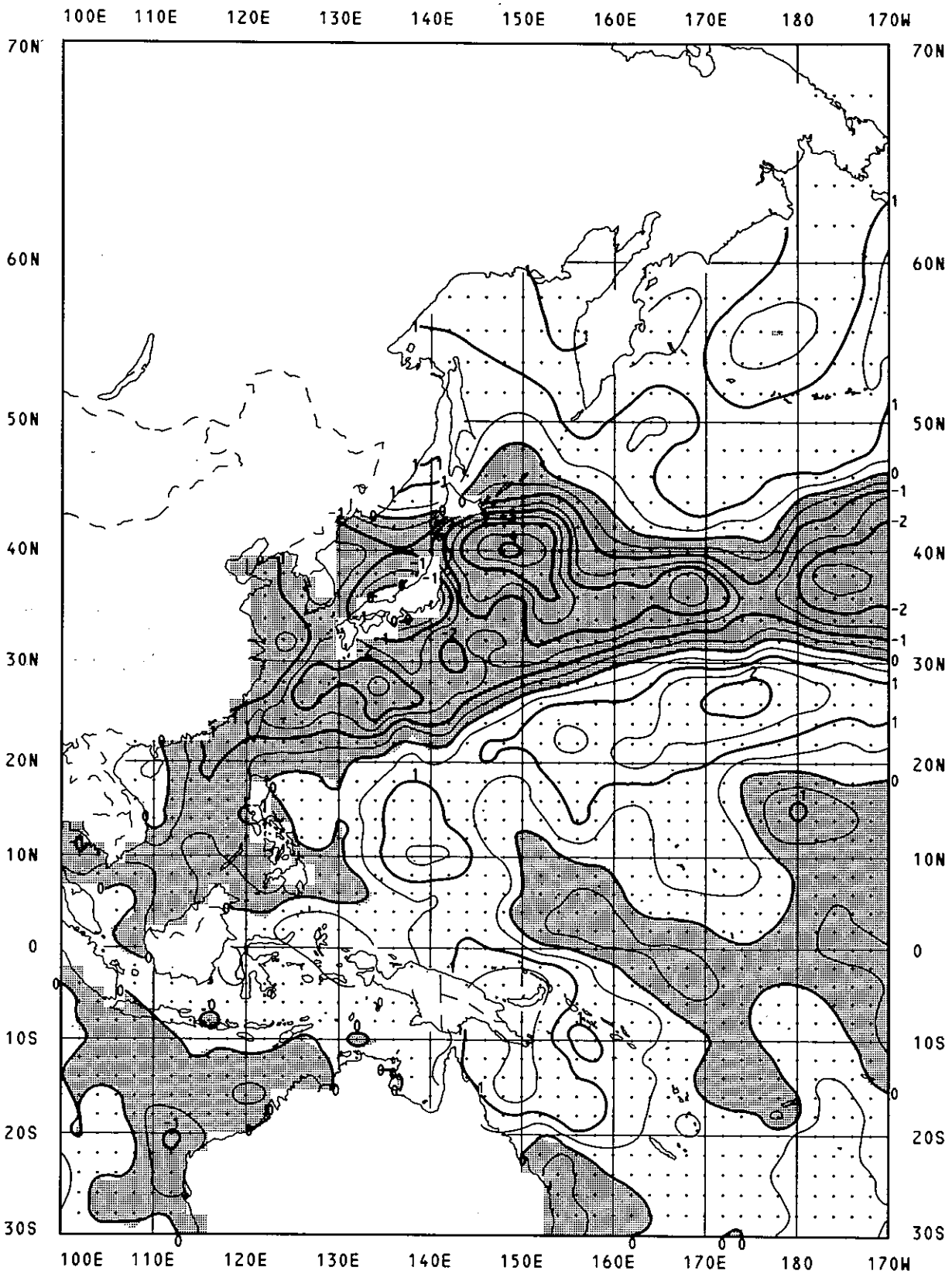
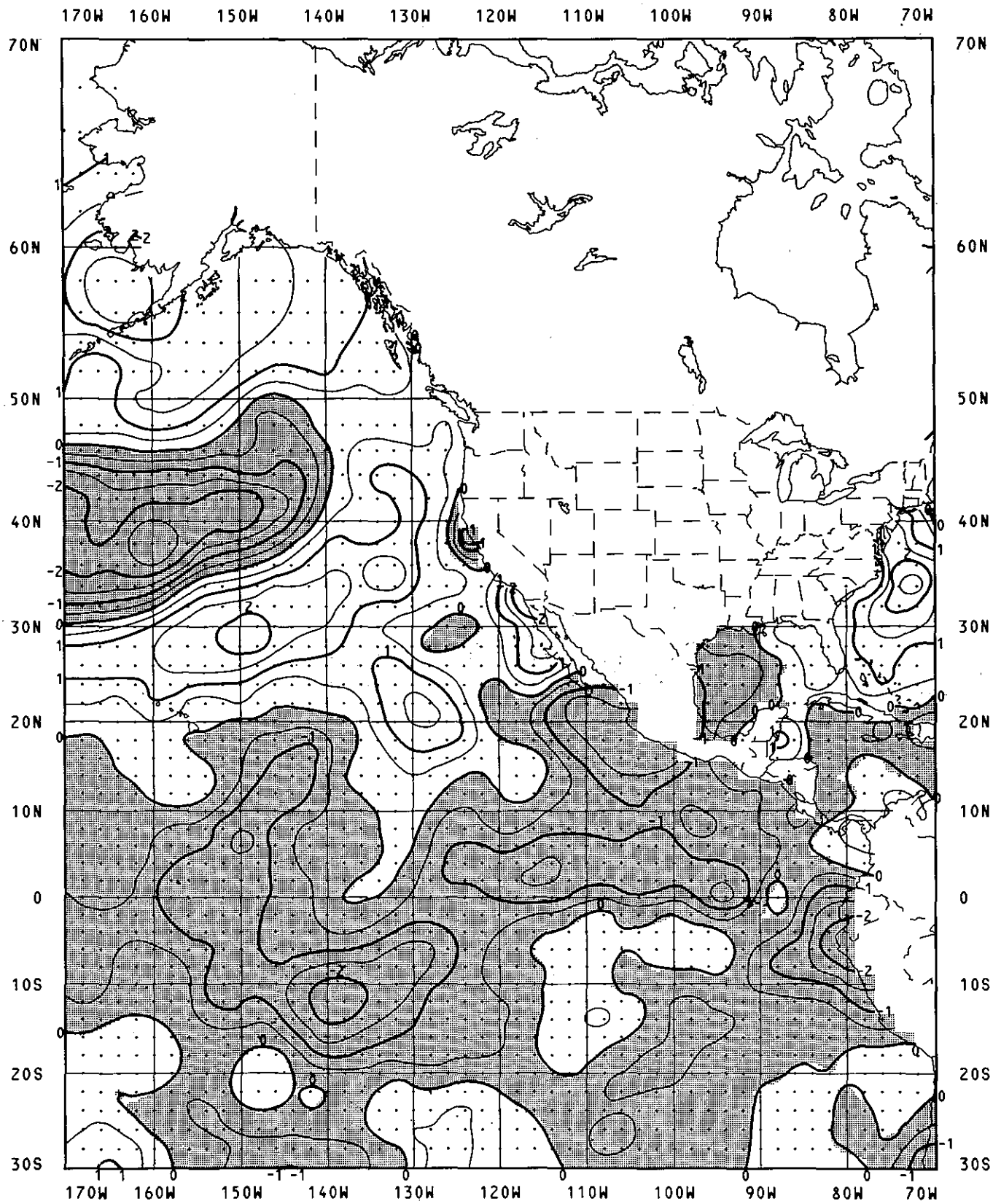


Western Pacific Ocean
SST--YEARLY CHANGE (°C)
June 1981

Yearly change is the difference between the monthly mean SST for this month and for the corresponding month last year -- shading shows where this year's monthly mean is colder than the corresponding monthly mean last year.



Eastern Pacific Ocean
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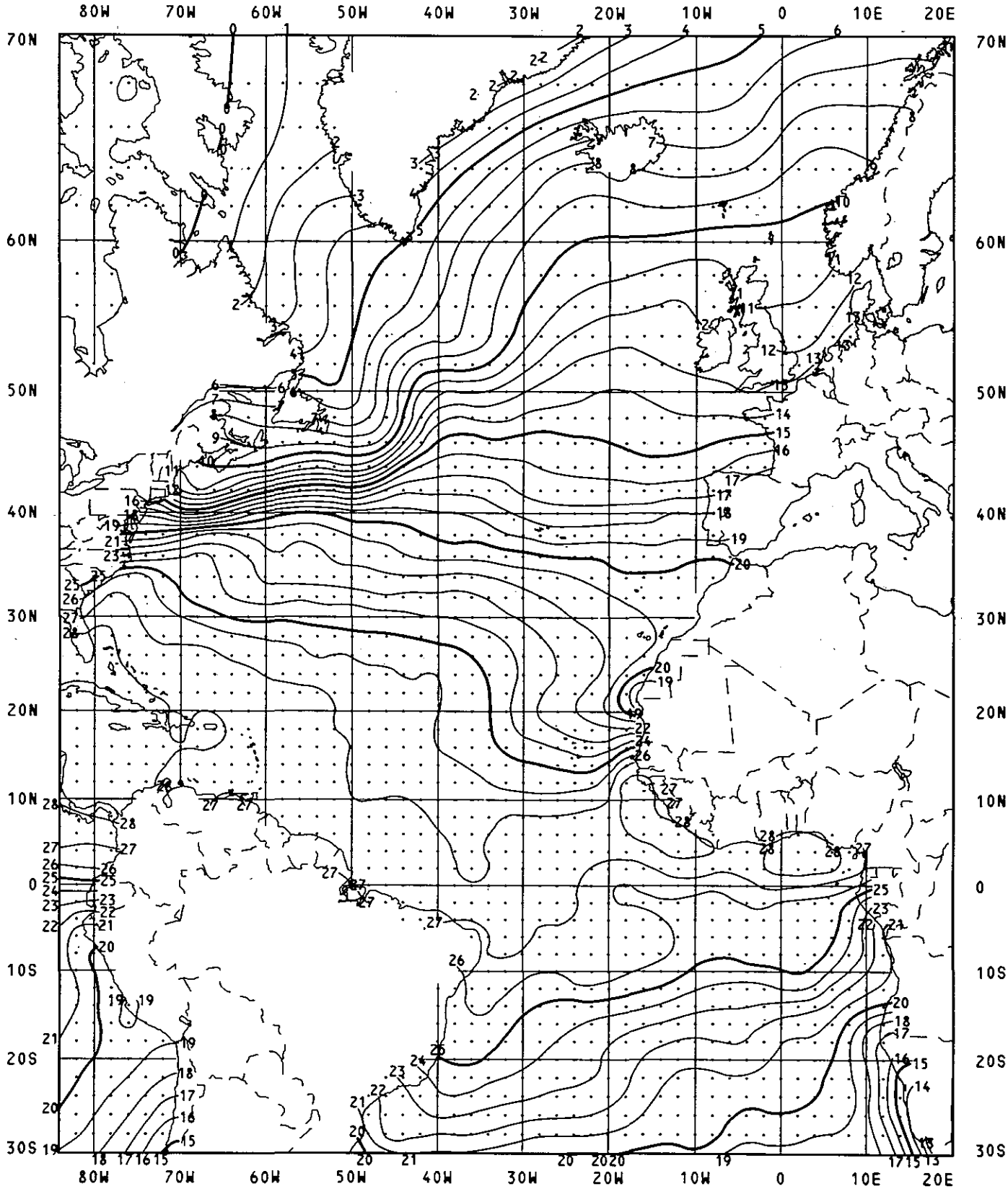
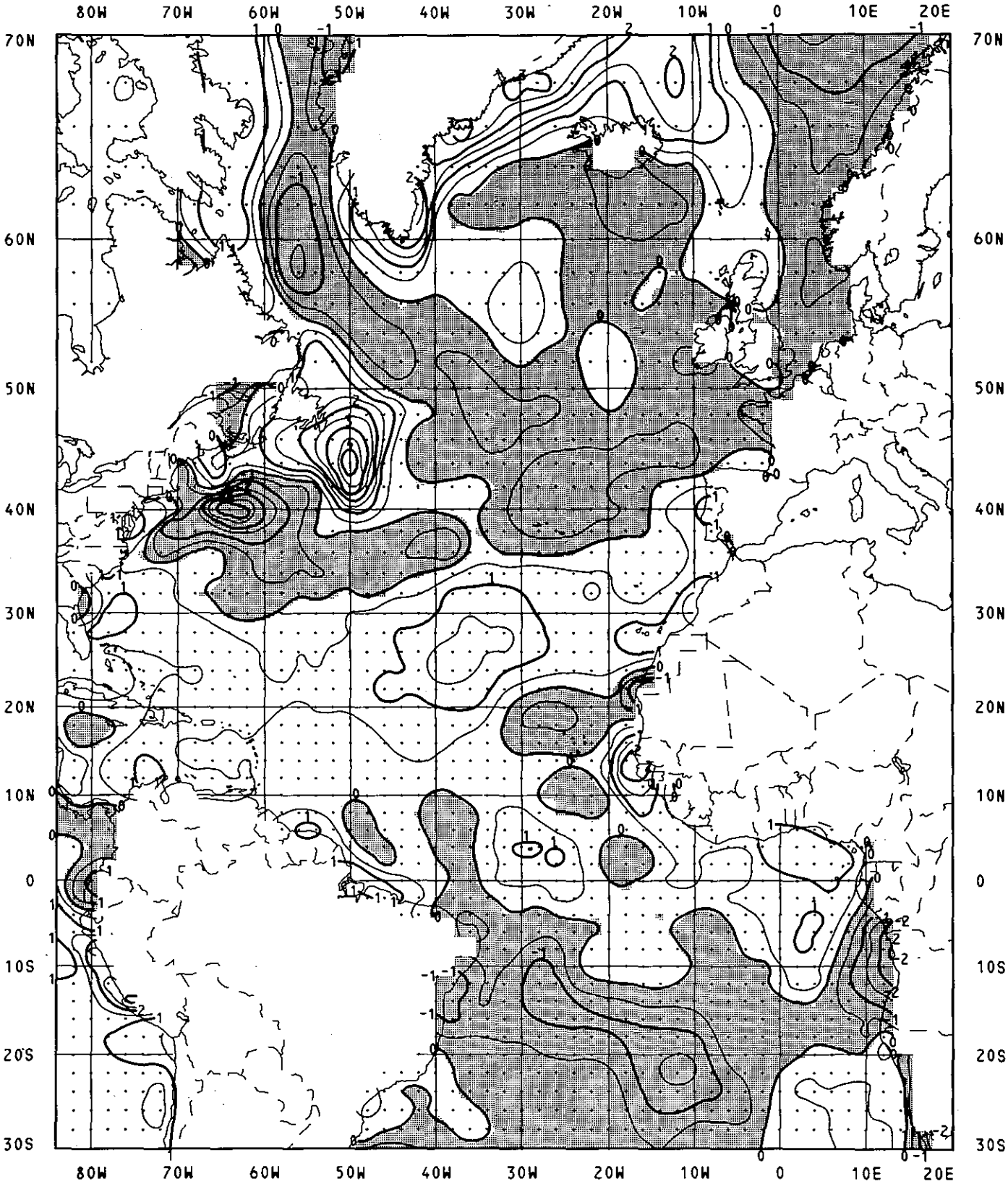


Atlantic Ocean
SST--MONTHLY MEAN (°C)
June 1981

Monthly mean sea surface temperature is the mean of two-day analyses using ship, buoy, and satellite observations. (See page 3.)



Atlantic Ocean
SST--MONTHLY ANOMALY (°C)
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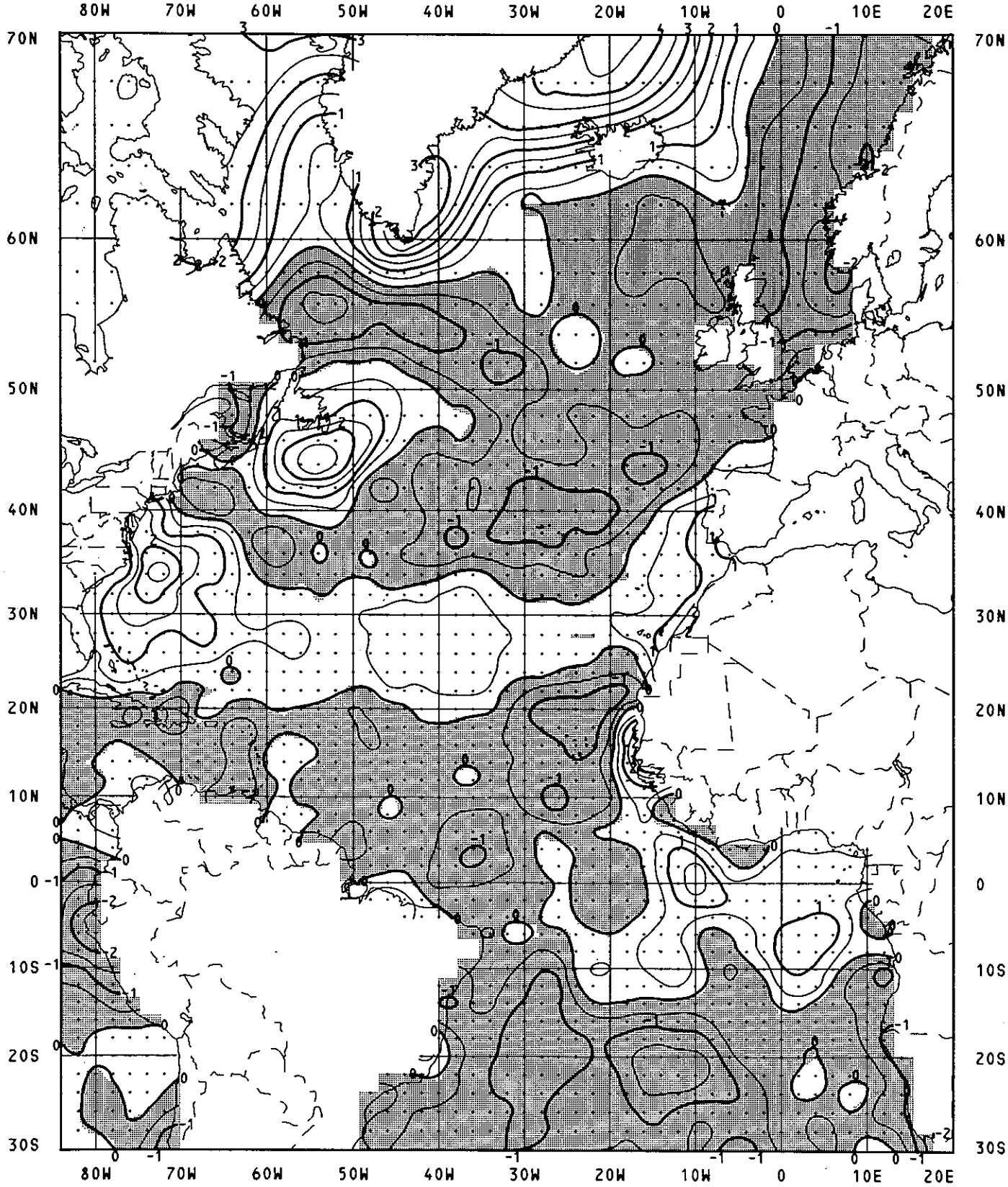

Atlantic Ocean
SST--YEARLY CHANGE (°C)
June 1981

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REGIONAL ANALYSES

Bering Sea /North Slope Ice

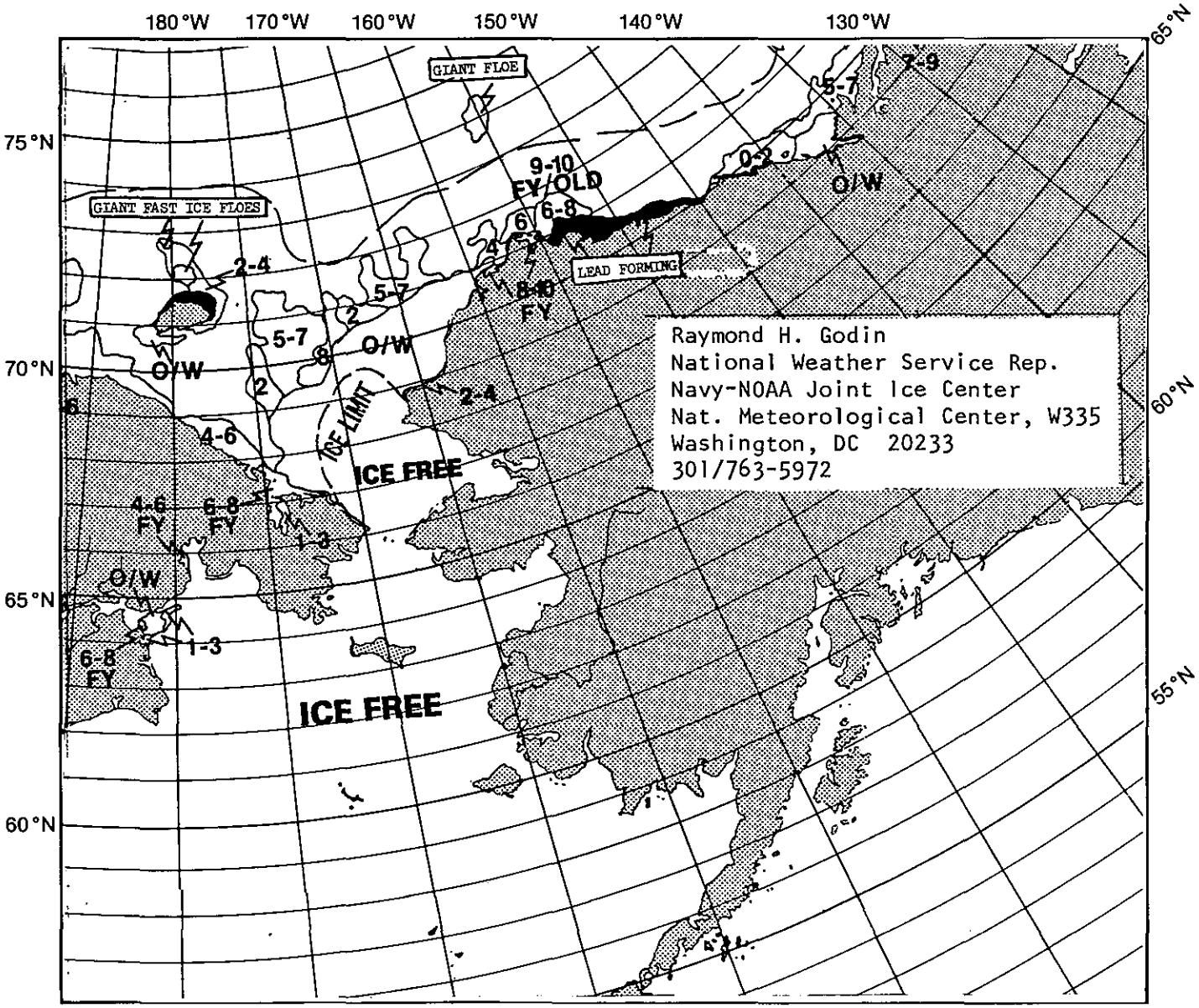
West Coast

- Ocean features
- Sea surface temperature
- SST anomaly

East Coast

- Ocean features
- Sea surface temperature
- SST anomaly

BERING SEA / NORTH SLOPE ICE ANALYSIS



JUNE 1981

KEY

ICE CONCENTRATION

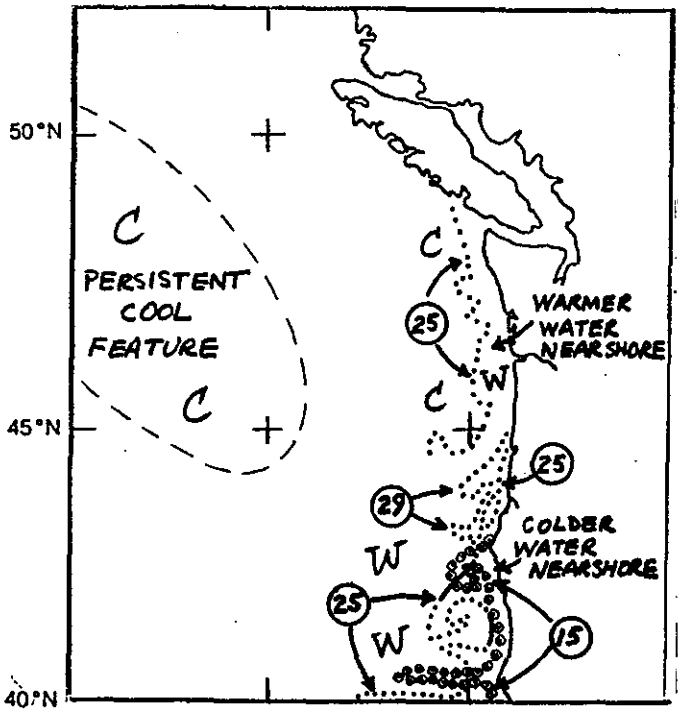
4-6	Area 4-6 tenths ice-covered.
OW	Open water. Sea ice present in concentrations less than one tenth.
ICE-FREE	No sea ice. Ice of land origin (iceberg e.g.) may be present.

ICE THICKNESS (AGE)

OLD	Includes both multi-year and second-year ice. Generally 2-3.5m thick.
FY	Any or all first year ice types (30 cm - 2 m thick).
YNG	Young ice (10-30 cm thick).
N	New and nilas.
■	Fast ice. Sea ice which forms and remains fast along the coast.
120	Theoretical thickness of this season's growth (cm), based on freezing degree days (presented for first day of each month on first succeeding chart).
———	Ice boundary visually or satellite observed.
- - - -	Ice boundary estimated.

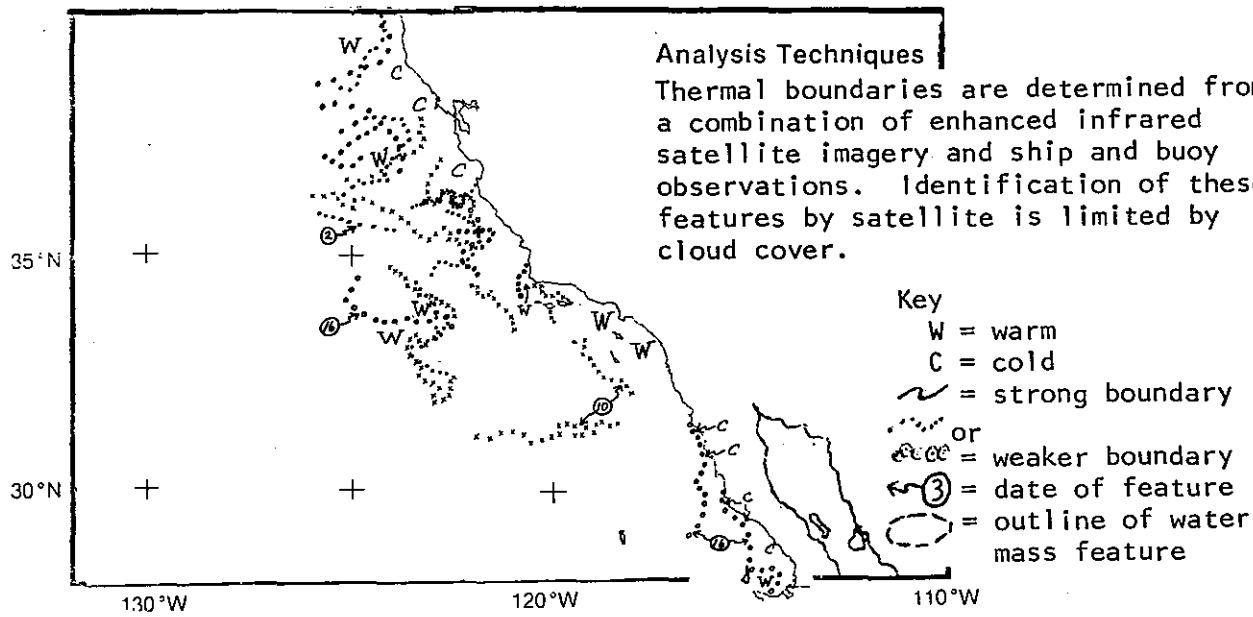
A 1020mb high located near 79°N 140°W is the most prominent synoptic scale feature of the mean monthly surface pressure circulation affecting Alaskan sea ice distribution. Easterly mean geostrophic winds affected the ice covered region north of the Bering Strait. Barrow (71°N 157°W) and Nome (64°N 165°W) recorded normal and above normal monthly mean air temperatures, respectively. A significant change in the meteorological pattern, which is not reflected in the mean monthly pattern, occurred during the last week of June. The resultant northerly geostrophic winds and below normal temperatures are hindering further ice breakup throughout the Alaskan north coast. The open water areas east of Barrow observed last month have closed, with only a narrow lead. West of Barrow, ice free and open water conditions extend to 71°N followed by open pack (4-6 tenths ice coverage) to Barrow. Ice breakup continues ahead of normal, however, to a lesser degree than observed last month.

WEST COAST OCEAN FEATURES



JUNE 1981

June satellite imagery shows continued upwelling-induced thermal boundary activity near the coast south of 45°N, with complex cold eddy patterns occurring near Cape Blanco (43°N 124°W) and Cape Mendocino (40°N 124°W). North of 45°N, persistent onshore winds inhibited coastal upwelling for most of the month and maintained unusually warm water nearshore. However, the strongest coastal upwelling event of the month, from the 25th through the 29th, lowered SST's during this five-day period by about 3°C at coastal stations as far north as the mid-Washington coast, and by as much as 6°C along the mid-Oregon coast. Seasonal warming continues in offshore areas, with SST increases of 1-1.5°C. Coastal SST's show transient fluctuations of several degrees C, but little net change from the beginning to the end of the month.



Analysis Techniques

Thermal boundaries are determined from a combination of enhanced infrared satellite imagery and ship and buoy observations. Identification of these features by satellite is limited by cloud cover.

Weak boundaries are shown as dots for June 2, X's for June 10, and small circles for June 16. Seasonal SST increases of about 1°C were observed 200 km beyond the coast. SST's were extremely high (3°C above average) within 150 km of the coast between 32-34°N. Vigorous upwelling along the coast north of 36°N caused SST's to remain from 8.5-13°C. The subtropical high intensified and moved to the northeast by mid-June causing locally intense coastal winds along the north coast where upwelling remained intense but relaxed south of 36°N. SST's at Pt. Sal buoy (35°N 121°W) ranged from 11.0-13.4°C until June 19, increased rapidly to 17°C by June 22, and then leveled off to about 15°C. SST's ranged from 10.4-14.5°C at the Half Moon Bay buoy (37°N 123°W) and from 8.5-11.3°C at Bodega Bay (38°N 123°W). At Pt. Arena (39°N 124°W) SST's were 8.5-12°C with a brief excursion to 13.5°C on June 9. Coastal warm water intrusions occurred at 34°N 123°W, 37°18N 124°W, and 39°30N 124°36W.

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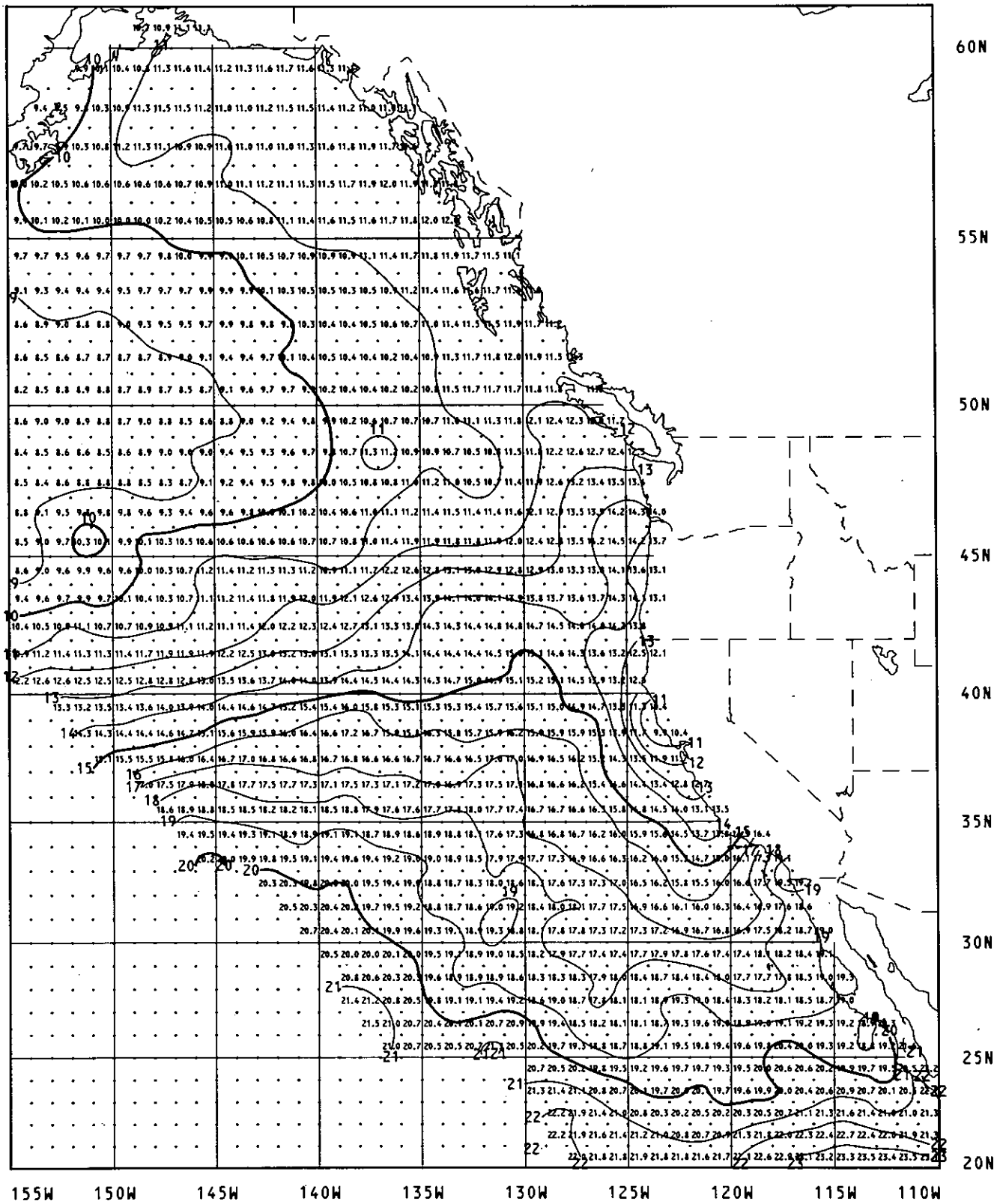
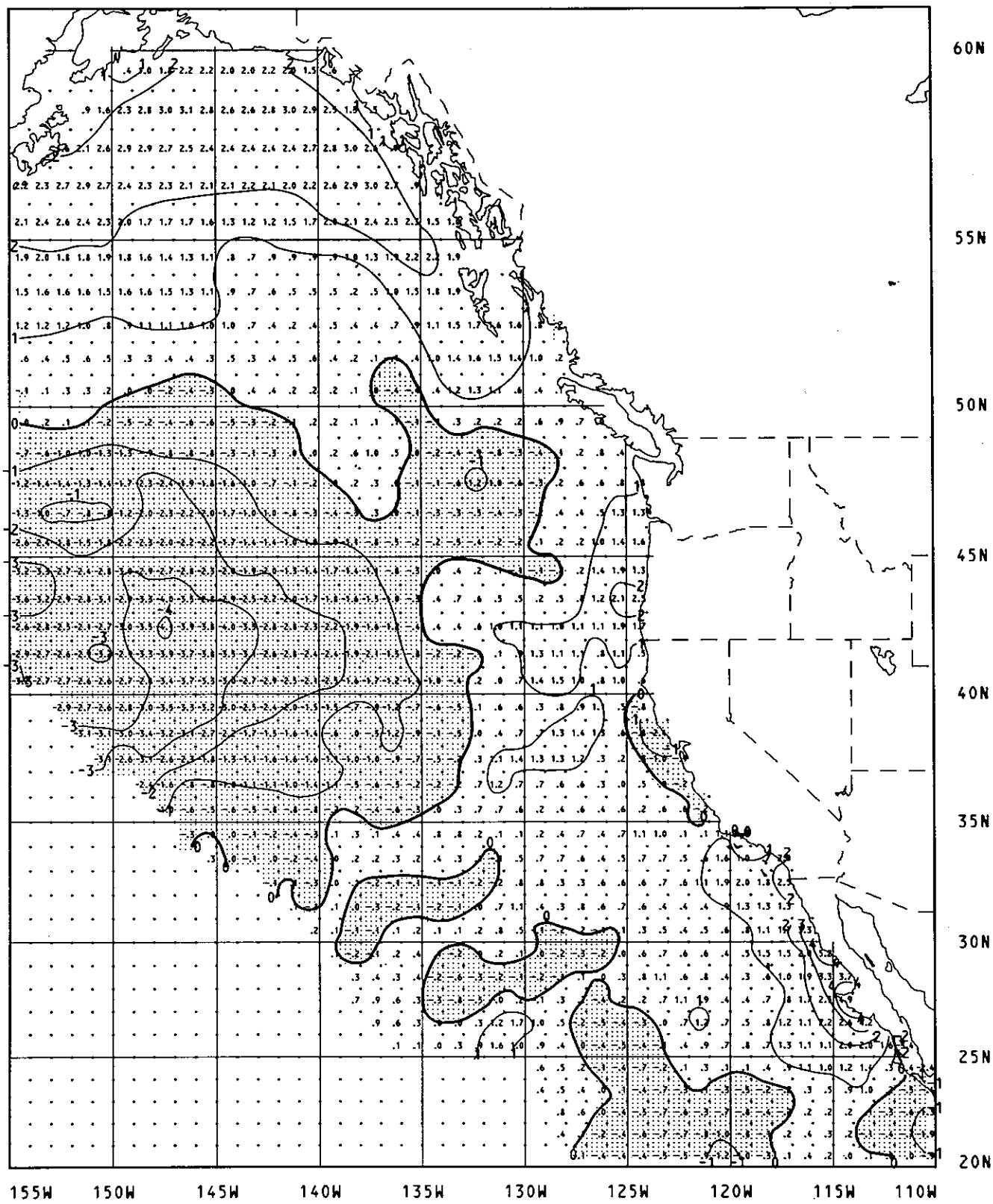


West Coast
SST--MONTHLY MEAN (°C)
June 1981

Monthly mean sea surface temperature is the mean of twice-weekly analyses using ship, buoy, and satellite observations.(See page 3.)



West Coast
SST--MONTHLY ANOMALY (°C)
June 1981

Monthly anomaly is the difference between the monthly mean sea surface temperature and the climatological monthly mean value -- shading shows where the monthly mean is colder than climatology. (See page 3.)

EAST COAST OCEAN FEATURES

The end of this month's positions of the Gulf Stream System and its associated eddies are shown for the NW Atlantic and the Gulf of Mexico. The Gulf Stream and Loop Current boundaries are located by prominent sea surface temperature gradients or by the 15°C isotherm at 200m. Anticyclonic eddies are labeled a-z in the Gulf of Mexico and 1-99 in the NW Atlantic. Cyclonic eddies are labeled A-Z. Arrows on eddies indicate direction of circulation. Warm-core or anticyclonic eddies rotate clockwise; cold-core or cyclonic eddies rotate counter-clockwise. The long arrows indicate the date of data used.

Feature positions are drawn from:
- NOAA-6 satellite infrared imagery
- Bathythermograph data,
  - National Meteorological Center of National Weather Service
- Oceanographic Analysis (daily),
  - National Weather Service/National Earth Satellite Service

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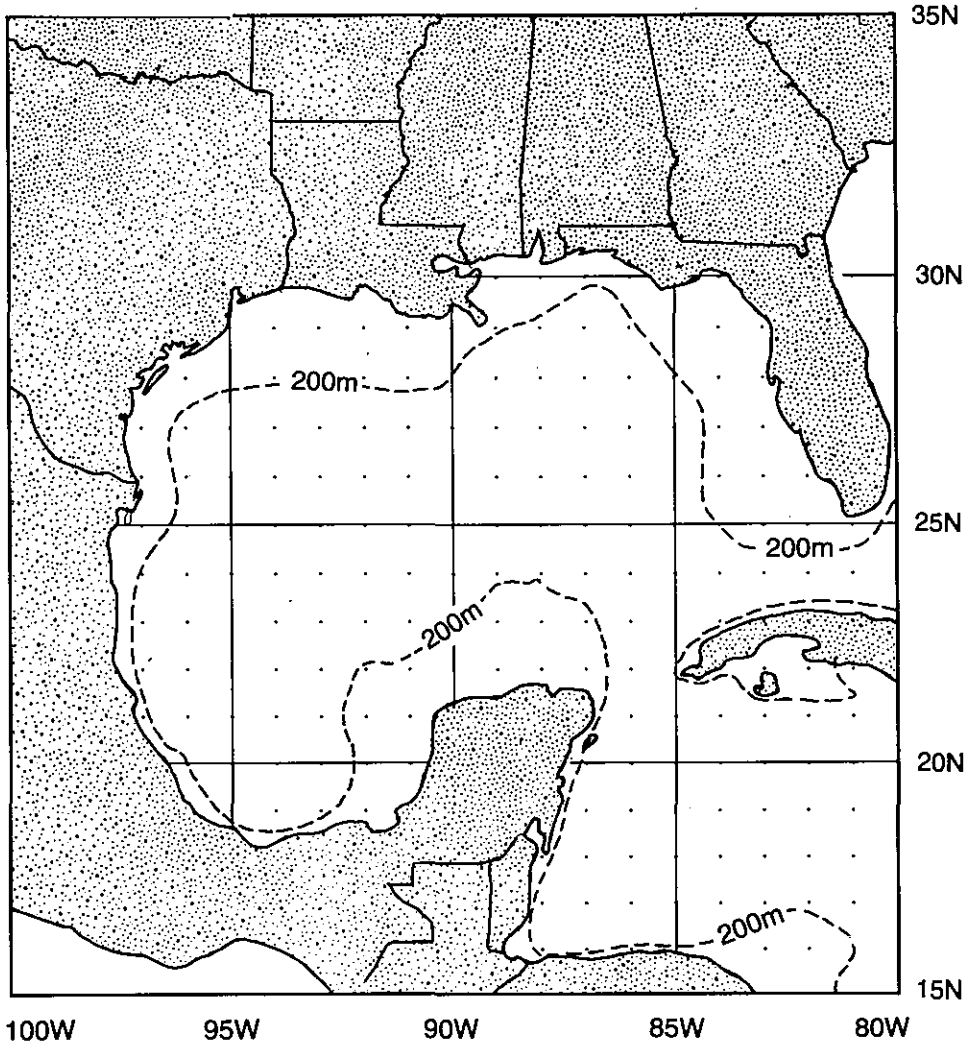
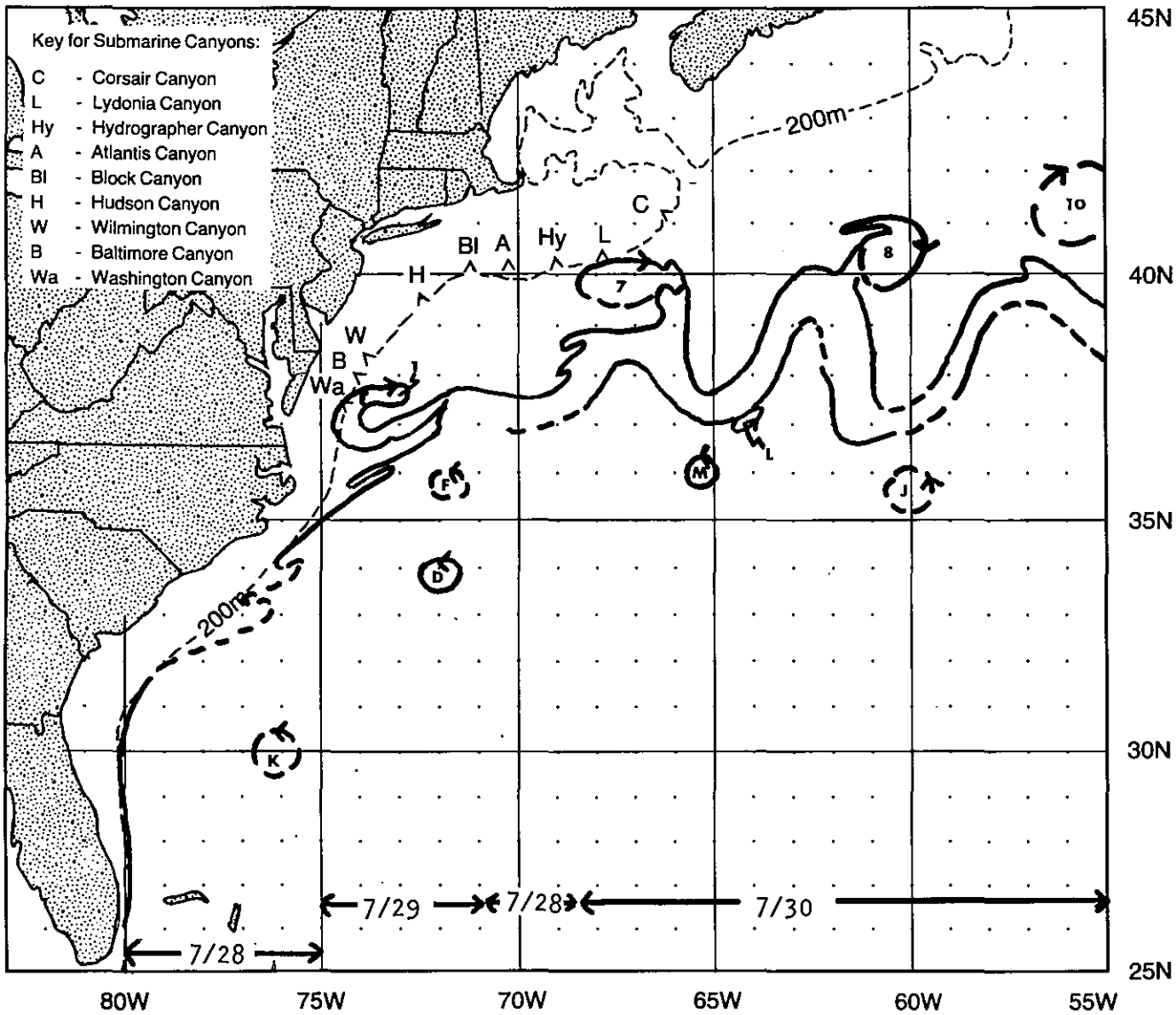


JUNE 1981

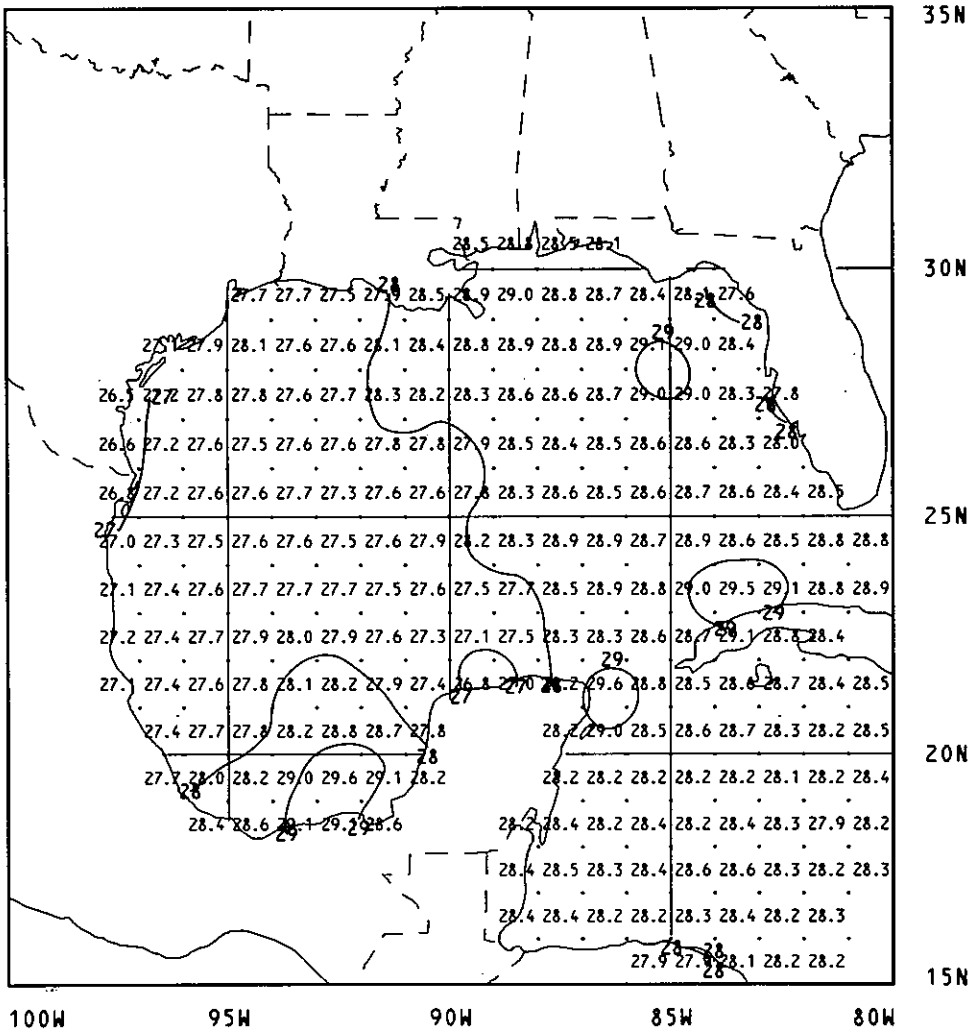
During June, Loop Current features in the Gulf of Mexico are not discernible by satellite imagery due to the seasonal warming of the surface waters. Therefore, no satellite data analysis was attempted.



Prominent features in the end-of-June Gulf Stream analysis are the long hooked filament attaching eddy 1 to the Stream and the three meanders at 67°W, 62°30W, and 57°W. A Gulf Stream meander formed new anticyclonic eddy 10 around June 8 near 41°N 55°30W. Another meander has been interacting with eddy 8 since June 27. Eddy 8 translated 55 km NE during June. Eddy 7, which interacted with the Stream during May, separated from the Stream on June 5. On June 27, a Gulf Stream meander collided with eddy 7 and has partially absorbed it. Eddy 7 translated 110 km WNW. Eddy 1 has been interacting with the Stream since June 6 and has a net translation of 20 km E.

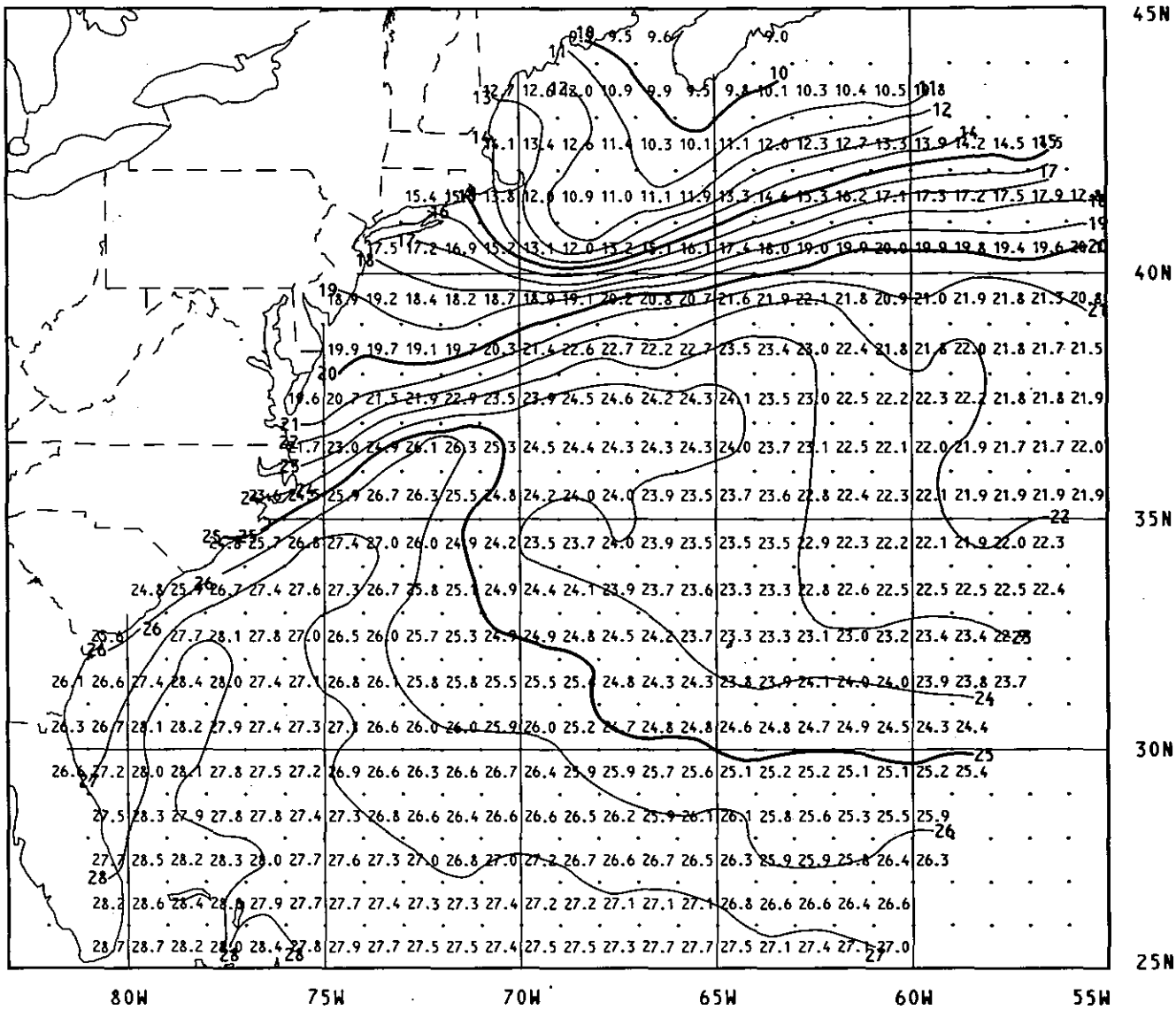
New cyclonic eddy M formed around June 6 and was centered near 36°30N 64°30W. Eddy M translated 95 km SW. Eddy J translated 65 km WSW. Eddy L apparently translated 115 km W. Eddy F translated 90 km N from June 1-16. Eddy D apparently translated 120 km NE . Eddy K translated 30 km SW from May 23 to June 16. The positions of eddies J, F, and K are drawn from satellite imagery of June 20, 16, and 16, respectively.

EAST COAST SST-
MONTHLY MEAN



Gulf of Mexico
SST--MONTHLY MEAN (°C)
June 1981

Monthly mean sea surface temperature is the mean of twice-weekly analyses using ship, buoy, and satellite observations.(See page 3.)



NW Atlantic Ocean
SST--MONTHLY MEAN (°C)
June 1981

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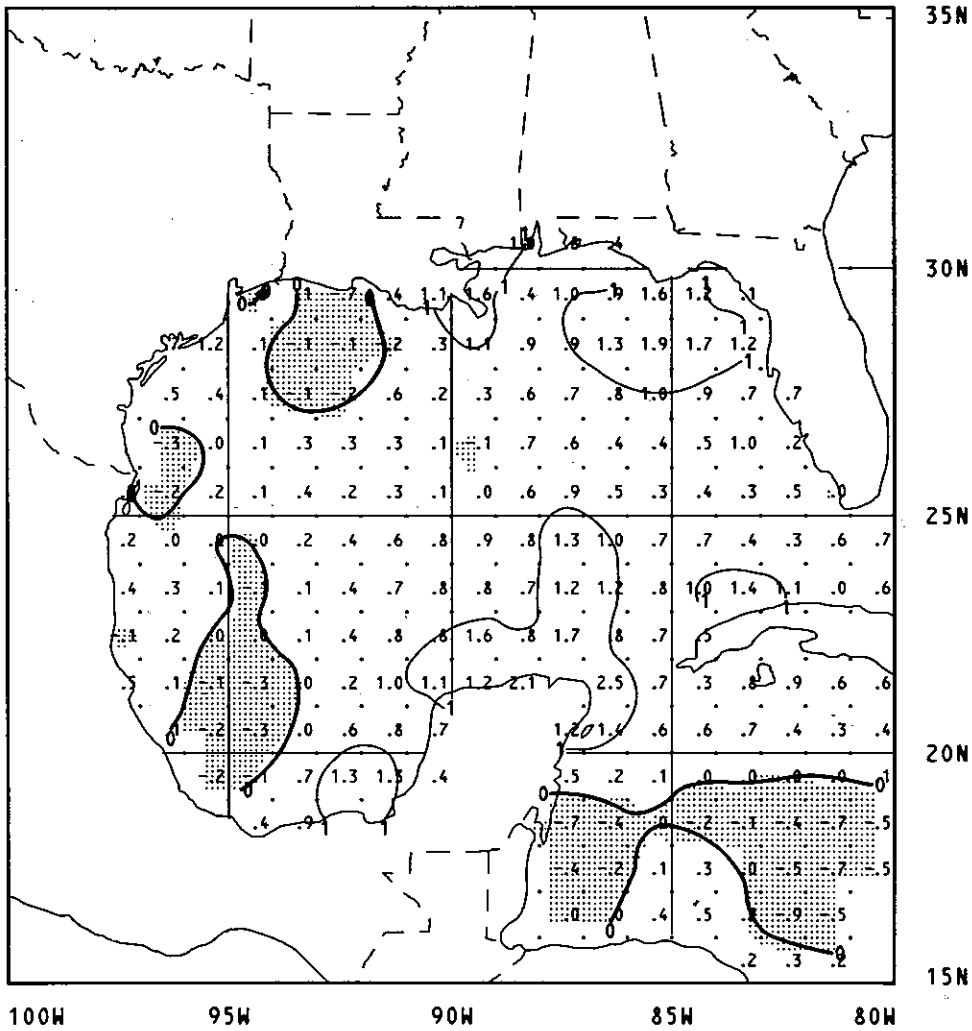
EAST COAST SST-ANOMALY



Gulf of Mexico
SST--MONTHLY ANOMALY (°C)
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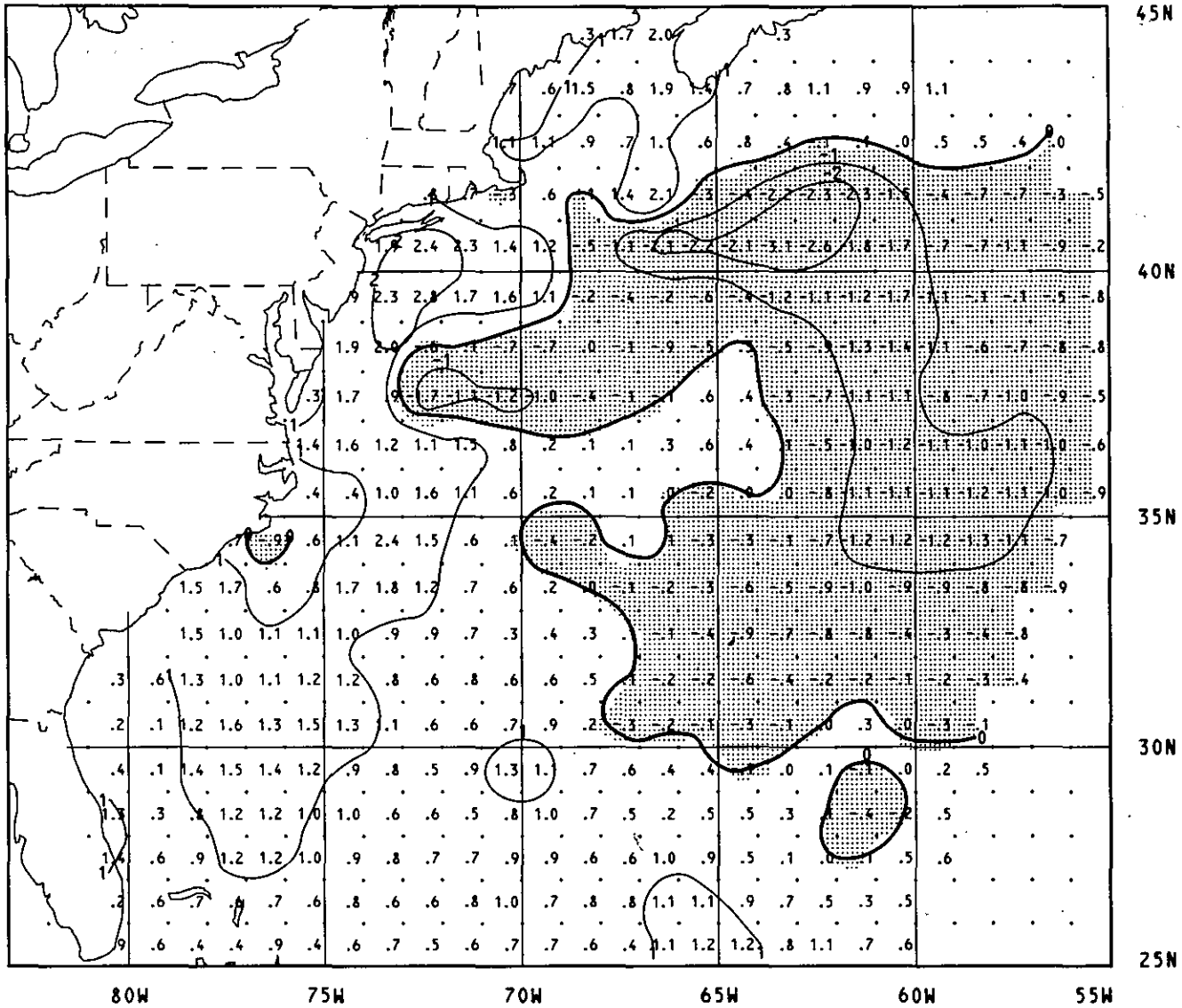

NW Atlantic Ocean
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June 1981

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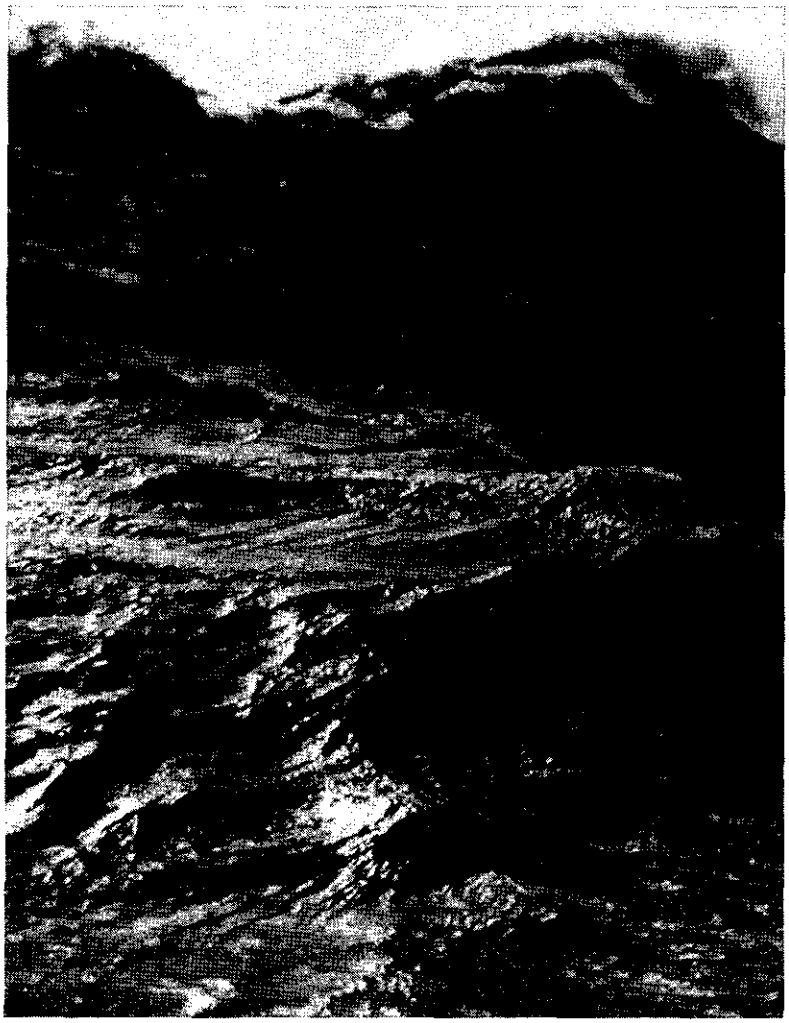
OCEANOGRAPHIC Monthly Summary

Volume I Number 7 July 1981



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U.S. DEPARTMENT OF COMMERCE • National Oceanic and Atmospheric Administration
National Weather Service/National Earth Satellite Service

Oceanographic Monthly Summary is a continuation of two NOAA oceanographic publications, *gulfstream* and *Fishing Information*.

The *gulfstream* magazine included charts of the Gulf Stream location and Northwest Atlantic monthly mean SST's and anomalies. It was originally published as *The Gulf Stream Monthly Summary* by the U.S. Naval Oceanographic Office from 1964 to 1975. NOAA's National Weather Service took over the magazine, changing the name to *gulfstream*, from 1975 to 1980. The two Gulf Stream magazines thus constitute an uninterrupted 16-year history of Gulf Stream meandering and associated eddy movements.

Fishing Information included monthly charts of North Pacific mean SST's and anomalies. It was first published as the *California Fishery Market News Monthly Summary Part II-Fishing Information* by the old Bureau of Commercial Fisheries' San Diego laboratory in 1960. The name was later shortened to *Fishing Information*, and was published until 1980 by NOAA's National Marine Fisheries Service. This publication represents a continuous 20-year climatology of North Pacific oceanographic conditions.

Oceanographic Monthly Summary continues these data series, as well as beginning standardized oceanographic data series in all other U.S. offshore areas. All of the SST analyses use the Robinson-Bauer climatology.* This is a computer-assisted subjective analysis of all vertical-profile temperature data: the entire mechanical and expendable bathythermograph (MBT and XBT) files; portions of the hydrocast, salinity/conductivity temperature depth (STD/CTD), radio message files; analysis of the Asheville Marine Deck; published data and analysis; and subjective interpretation of wind and current charts. Data comprise 381,199 North Pacific observations to 1969; 727,452 Atlantic/Indian Ocean observations to 1974; and 250,000 Southern Hemisphere observations to 1979. The majority of data are MBT's, so the climatology best represents conditions since 1942.

*Robinson, M.K., 1976. Atlas of North Pacific Ocean Monthly Mean Temperatures and Mean Salinities of the Surface Layer; *NavOceano Ref. Pub. 2.*
Robinson, M.K., R.A. Bauer and E.H. Schroeder, 1979. Atlas of North Atlantic-Indian Ocean Monthly Mean Temperatures and Mean Salinities of the Surface Layer; *NavOceano Ref. Pub. 18.*

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Hemispheric: Sigurd E. Larson

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Hemispheric Analyses

On alternate days for the Northern and Southern Hemispheres, two-day composite hemispheric sea surface temperature (SST) analyses are prepared using SST observations from ship weather reports, data buoys, expendable bathythermographs, and satellites. These data are analyzed on polar stereographic grids having a mesh length of 190.5 km at 60° latitude and 102.1 km at the equator. Agreement between the hemispheric analyses in the equatorial regions is largely assured by the fact that corners of the polar stereographic grids extend well into the opposing hemisphere permitting the analyses to overlap near the equator.

The objective analysis technique known as "conditional relaxation" corrects the previous analysis with those new observations which have passed a variety of validity tests. Areas without observations are modified by the "relaxation" procedure which maintains the divergence of the SST gradient in these areas.

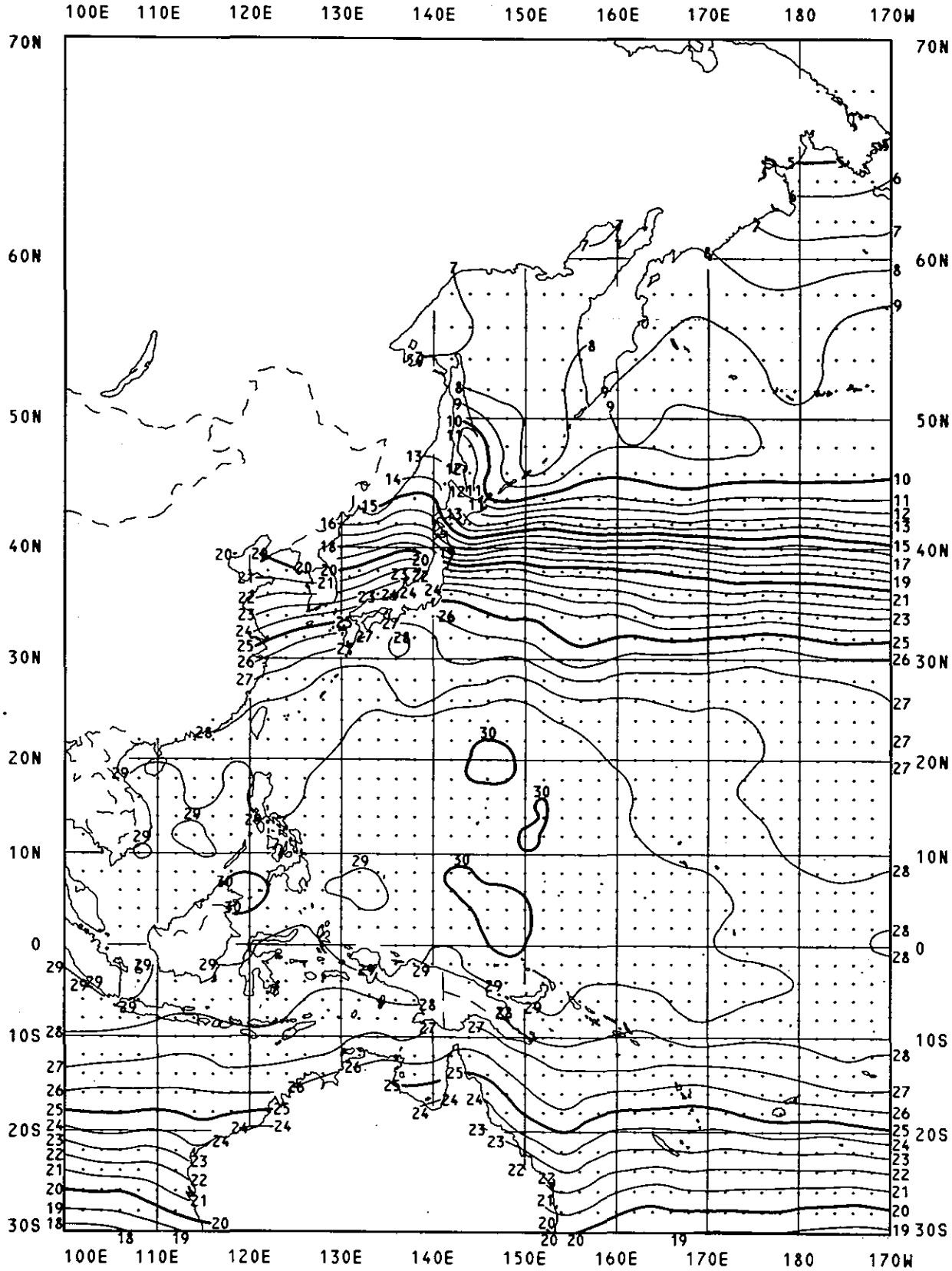
Each two-day SST analysis is interpolated to a 2° latitude/longitude grid using bilinear interpolation. The monthly products are then derived from the interpolated analyses on the 2° x 2° grid. The Robinson-Bauer climatology (see p. 2) is used to form the anomalies.....Sigurd Larson

Regional Analyses

Five-day composite regional sea surface temperature (SST) analyses are prepared twice each week using SST observations from ship weather reports, data buoys, expendable bathythermographs, and satellites. These data are analyzed on polar stereographic grids, having mesh lengths of 23.8 km at 60°N.

The objective analysis technique, similar to the "Cressman" technique, corrects the previous analysis with those new observations which have passed a variety of validity tests. These corrections are a weighted mean of differences between the observation and the previous analysis. Grid points in data-sparse areas are modified by distant observations through corrections weighted inversely proportional to the distance between the observation and the grid point.

Each twice-weekly SST analysis is interpolated to a 1° latitude/longitude grid using bilinear interpolation. The monthly products are then derived from the interpolated analyses on the 1° x 1° grid. The Robinson-Bauer climatology (see p. 2) is used to form the anomalies.....Bill Gemmill



Western Pacific Ocean
SST--MONTHLY MEAN (°C)
July 1981

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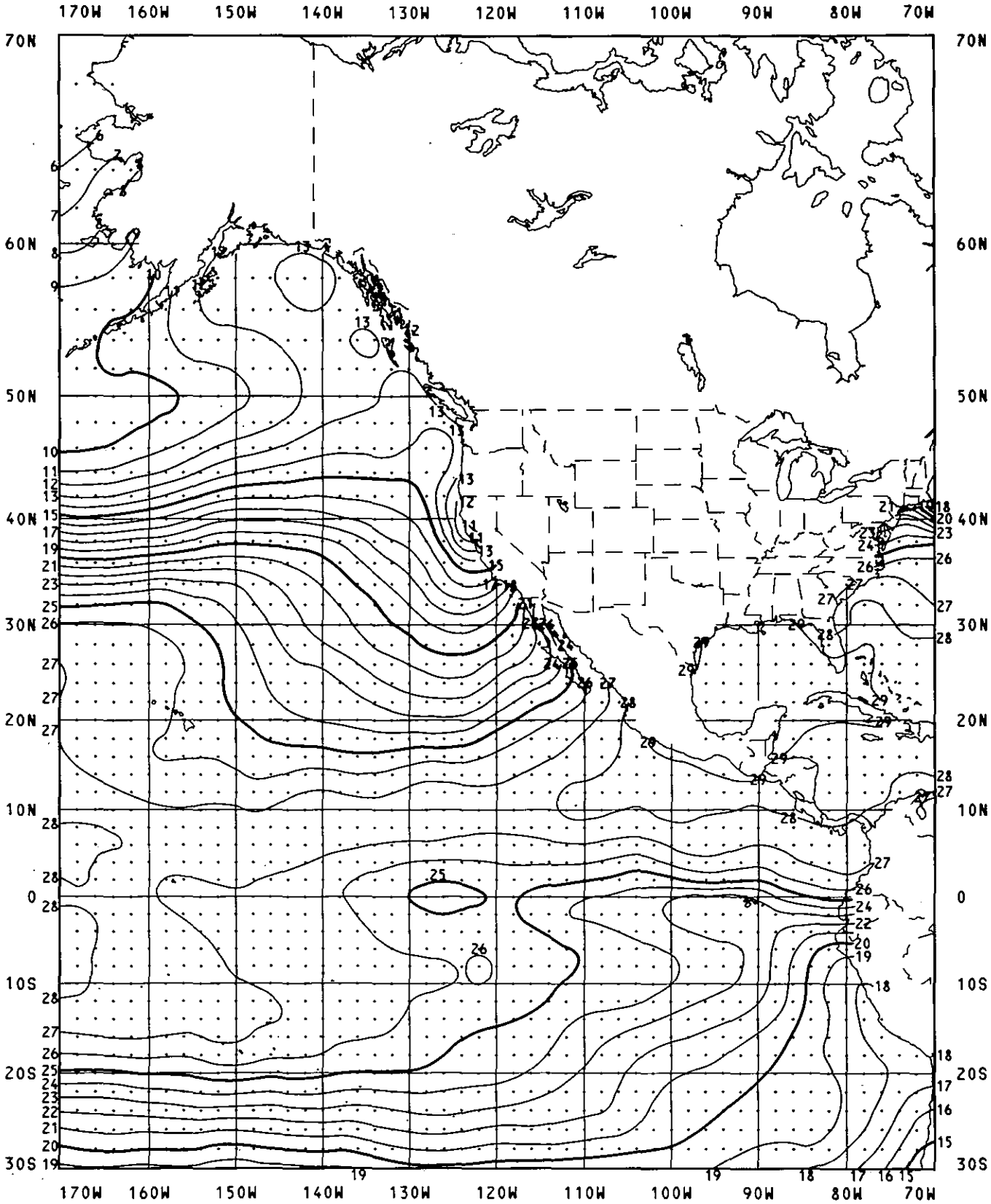

Eastern Pacific Ocean
SST--MONTHLY MEAN (°C)
July 1981

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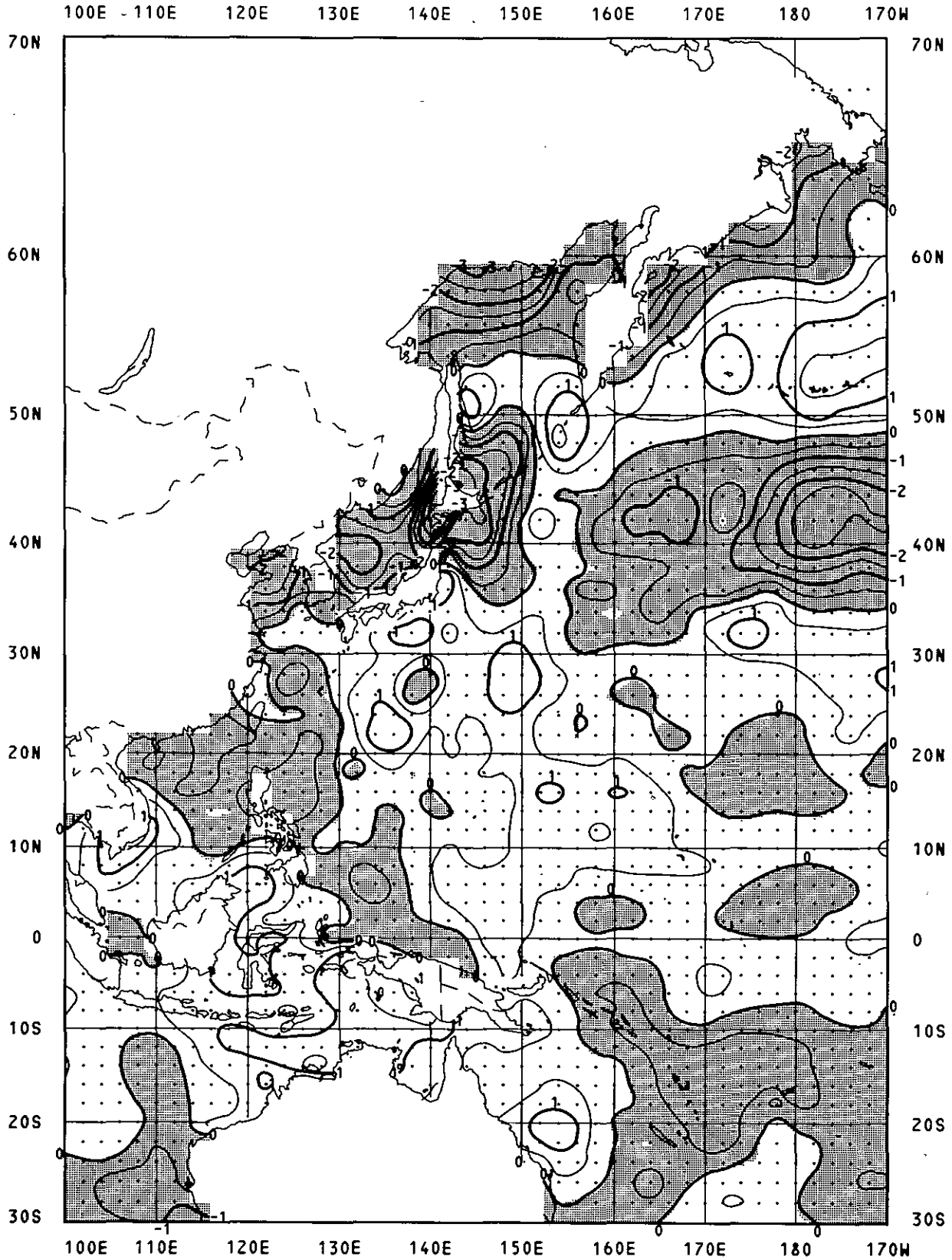

Western Pacific Ocean
SST--MONTHLY ANOMALY (°C)
July 1981

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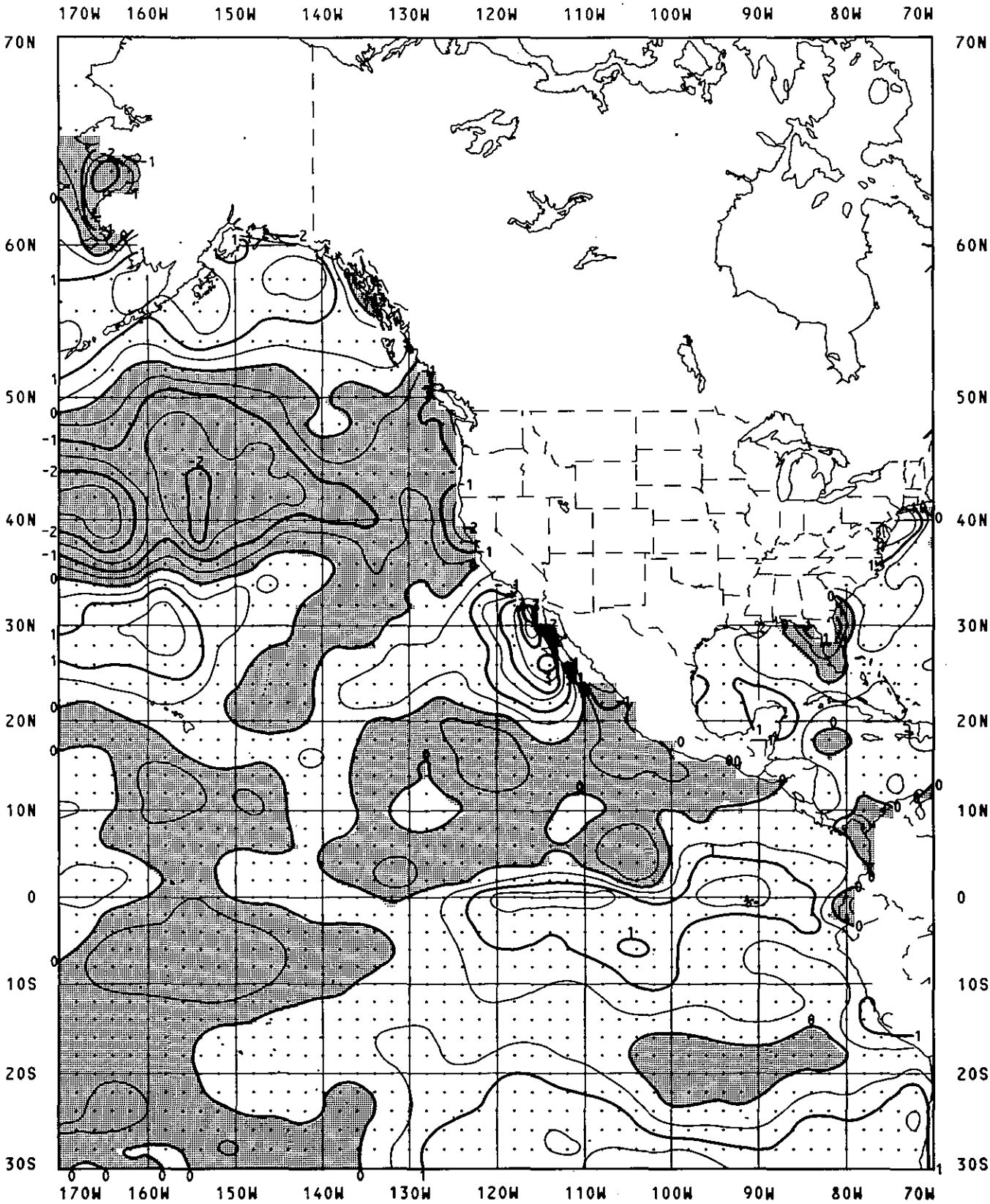

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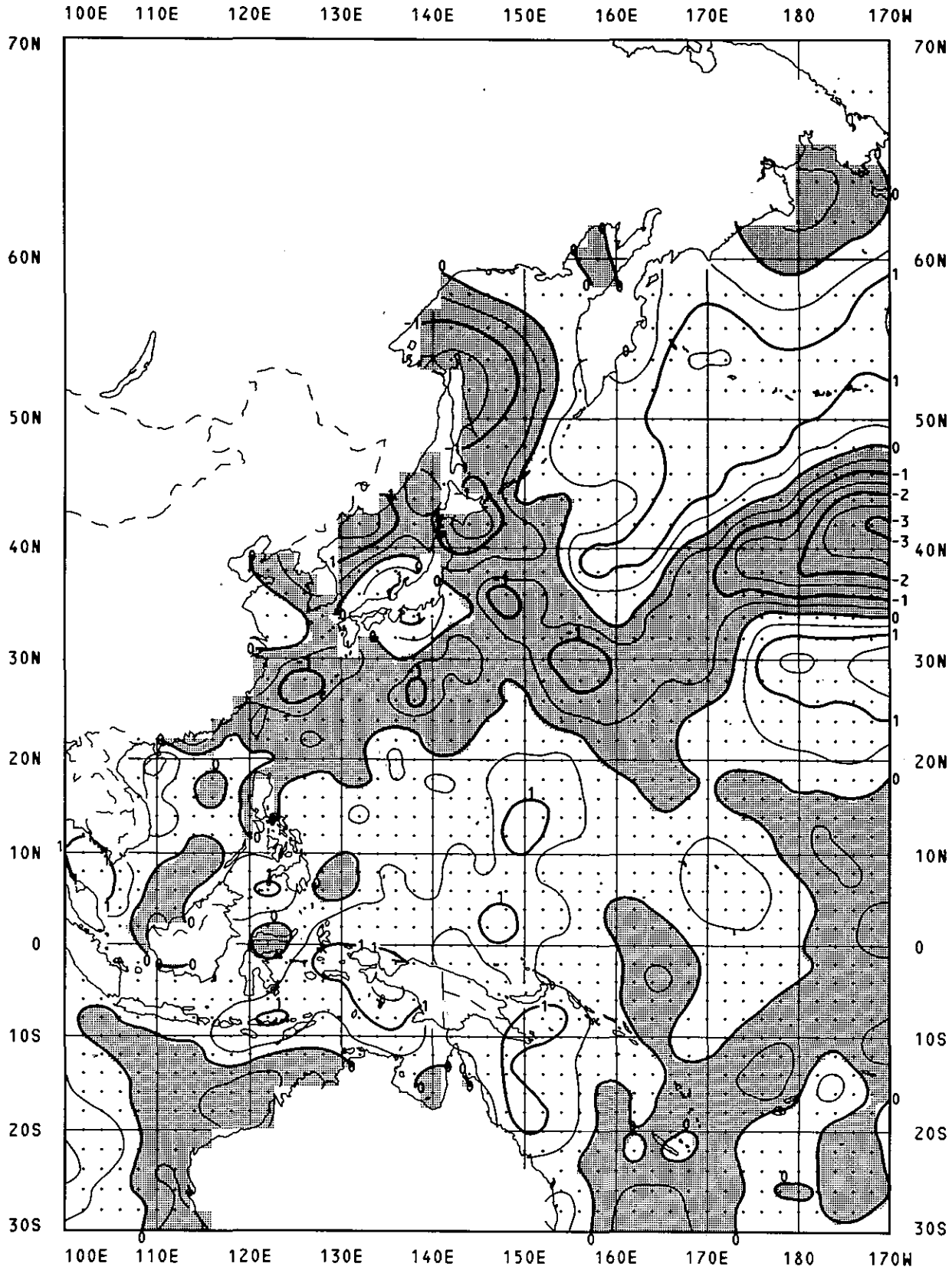
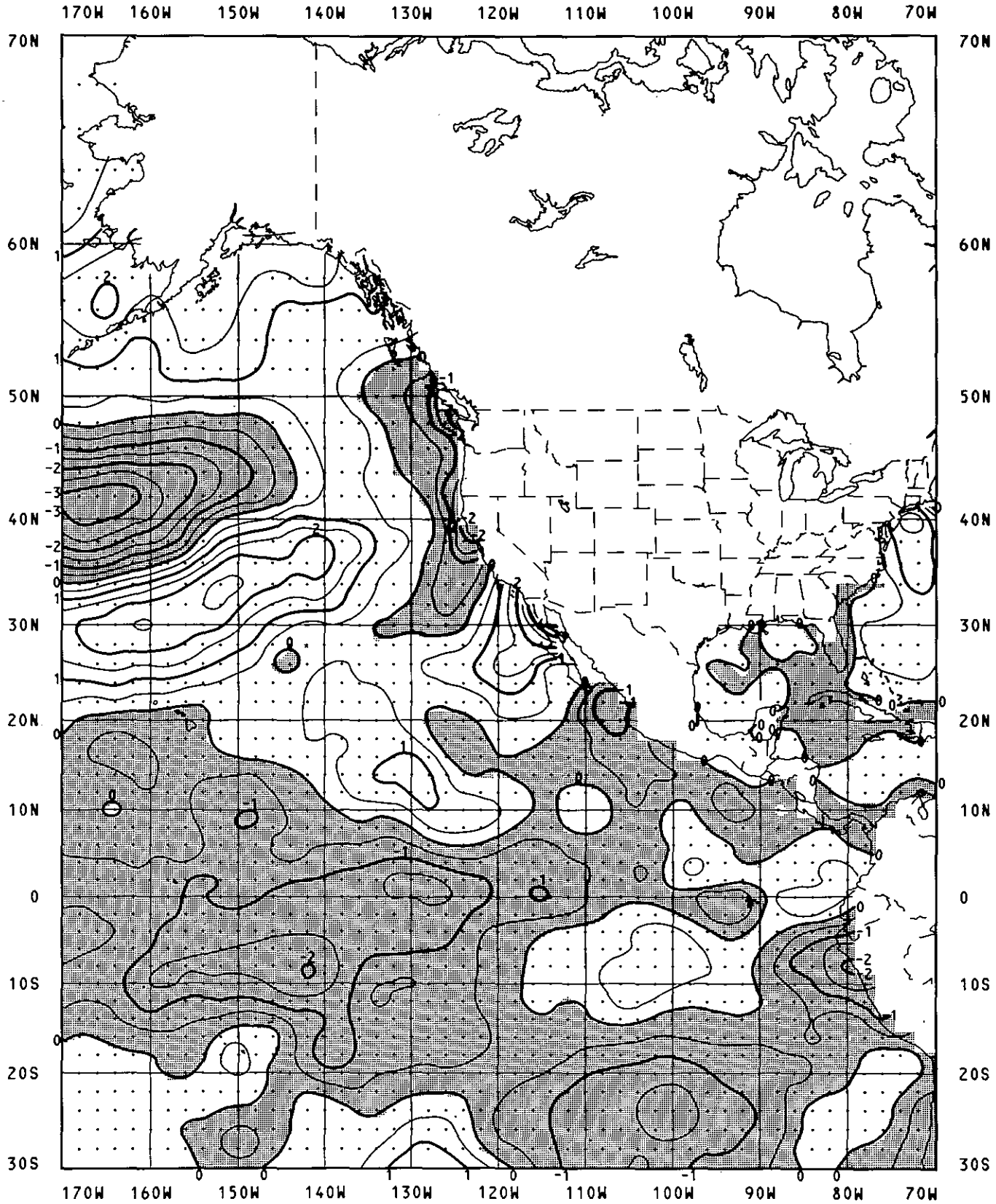


Western Pacific Ocean
SST--YEARLY CHANGE (°C)
July 1981

Yearly change is the difference between the monthly mean SST for this month and for the corresponding month last year -- shading shows where this year's monthly mean is colder than the corresponding monthly mean last year.



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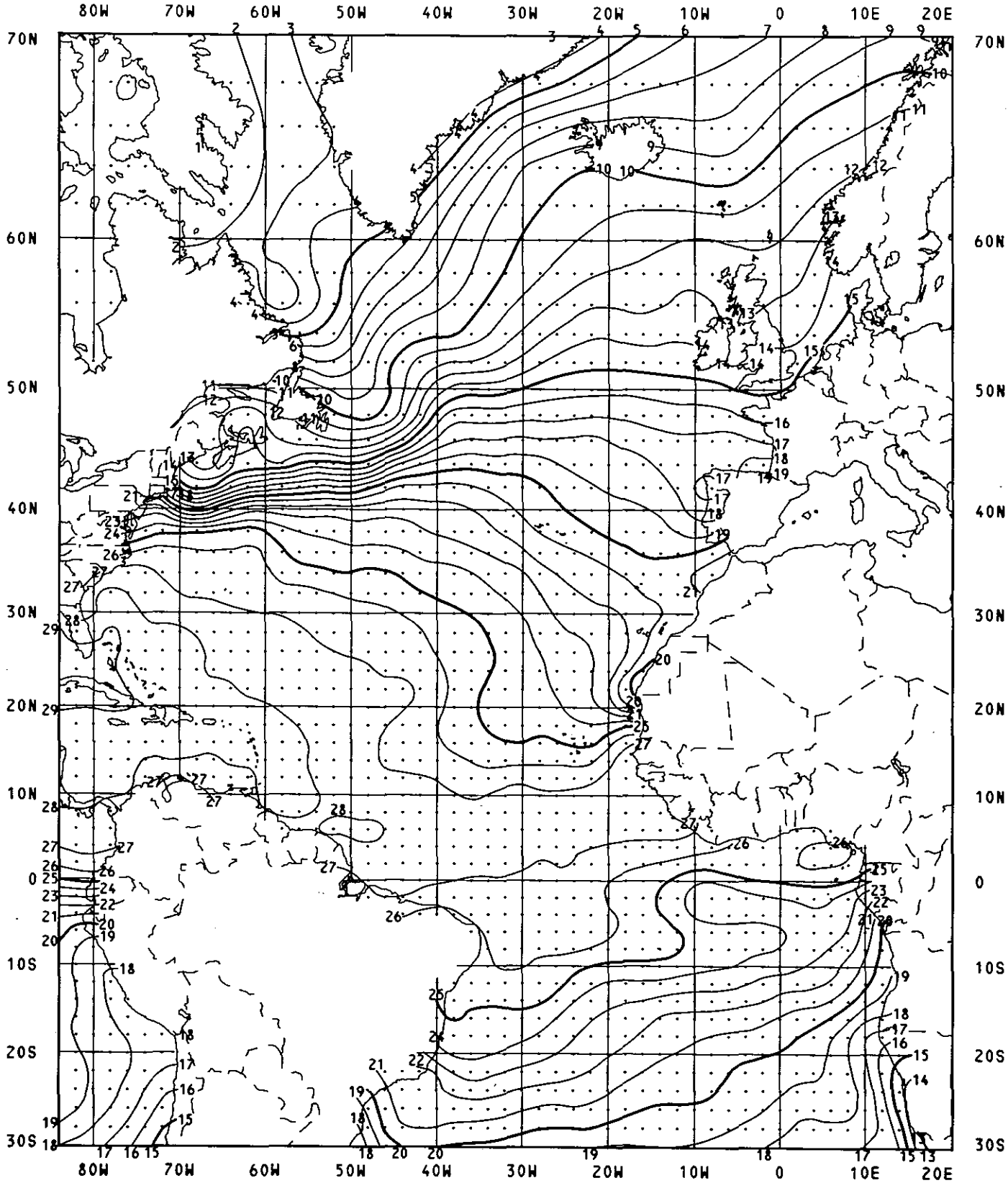

Atlantic Ocean
SST--MONTHLY MEAN (°C)
July 1981

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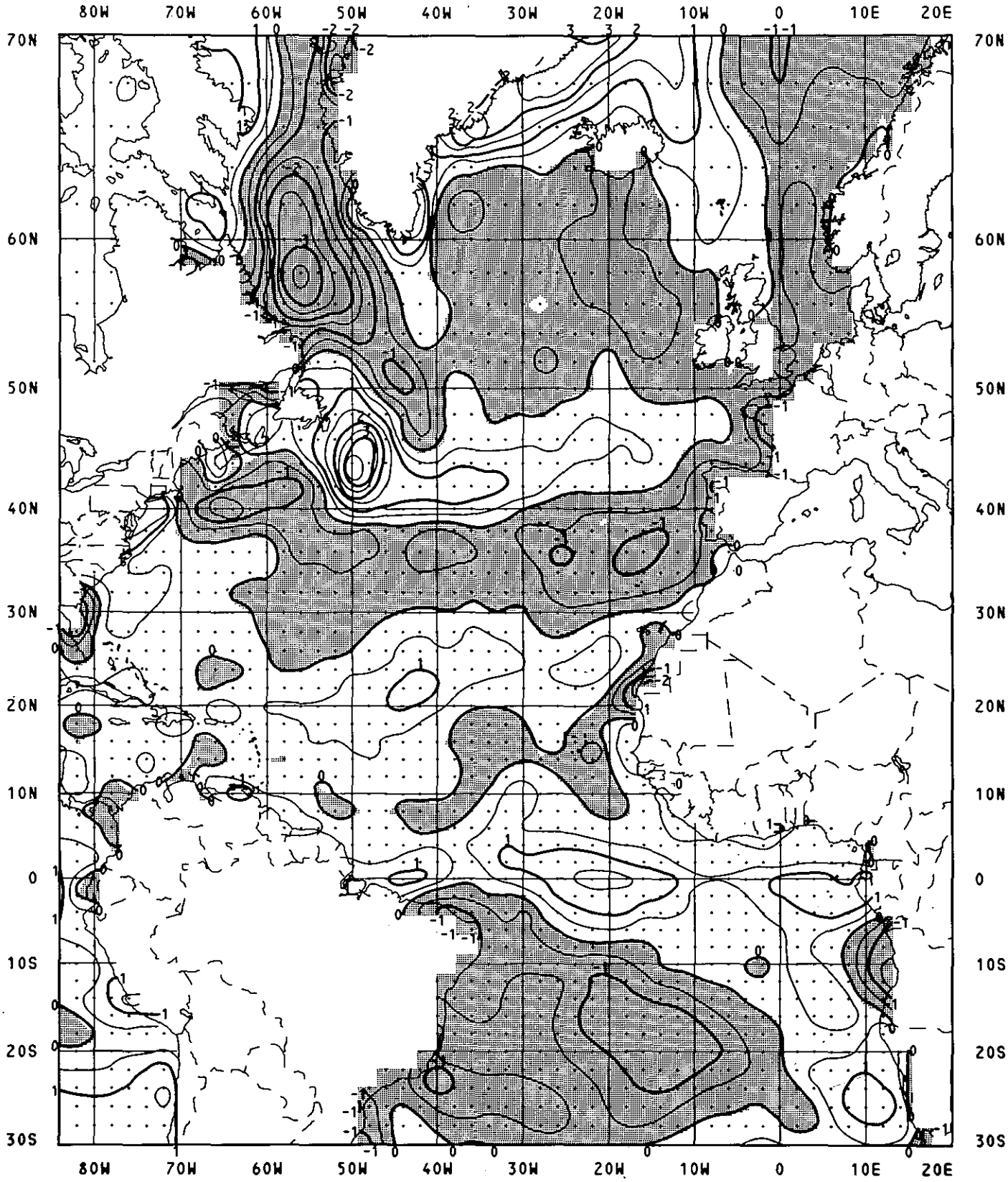

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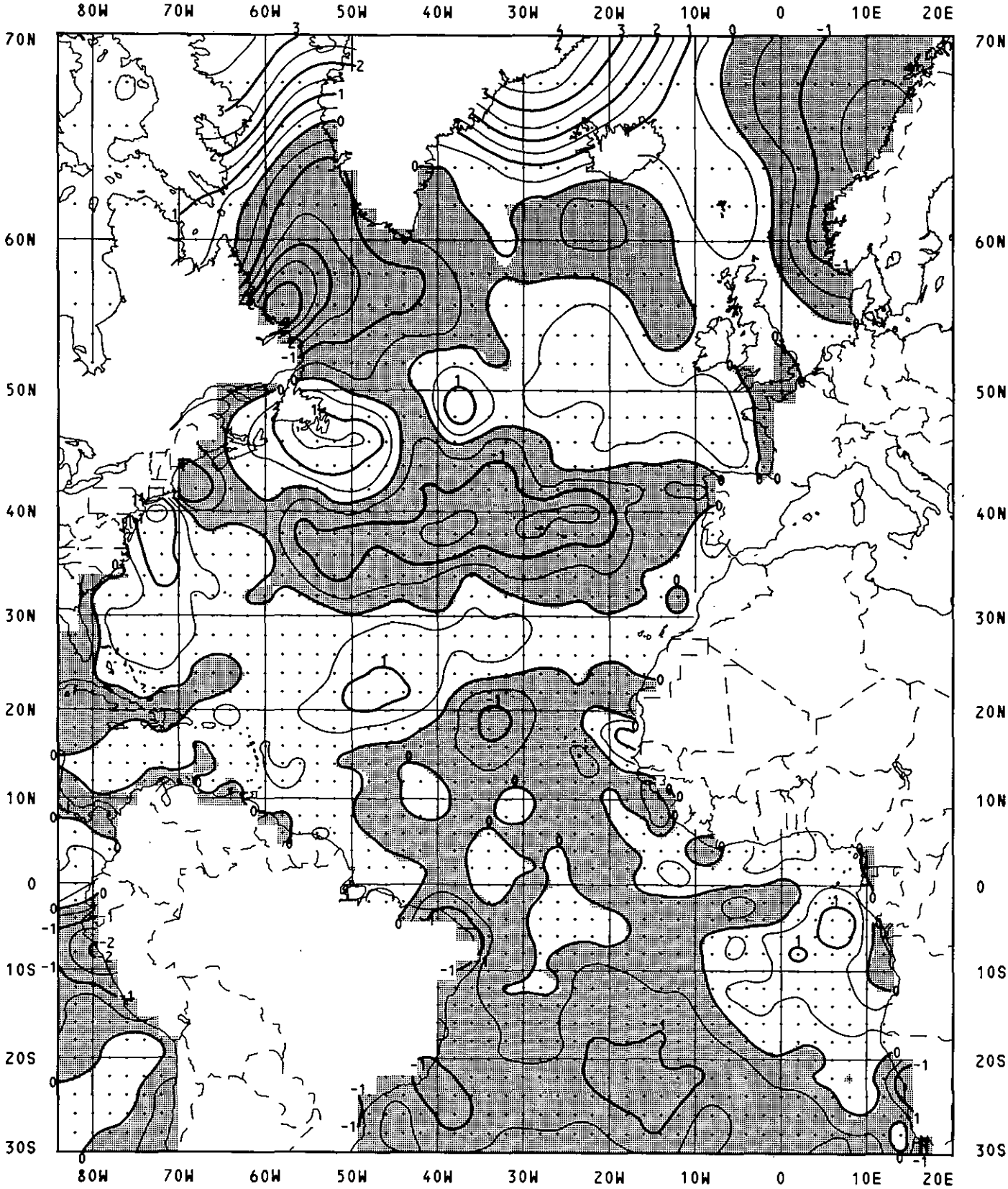

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REGIONAL ANALYSES

Bering Sea /North Slope Ice

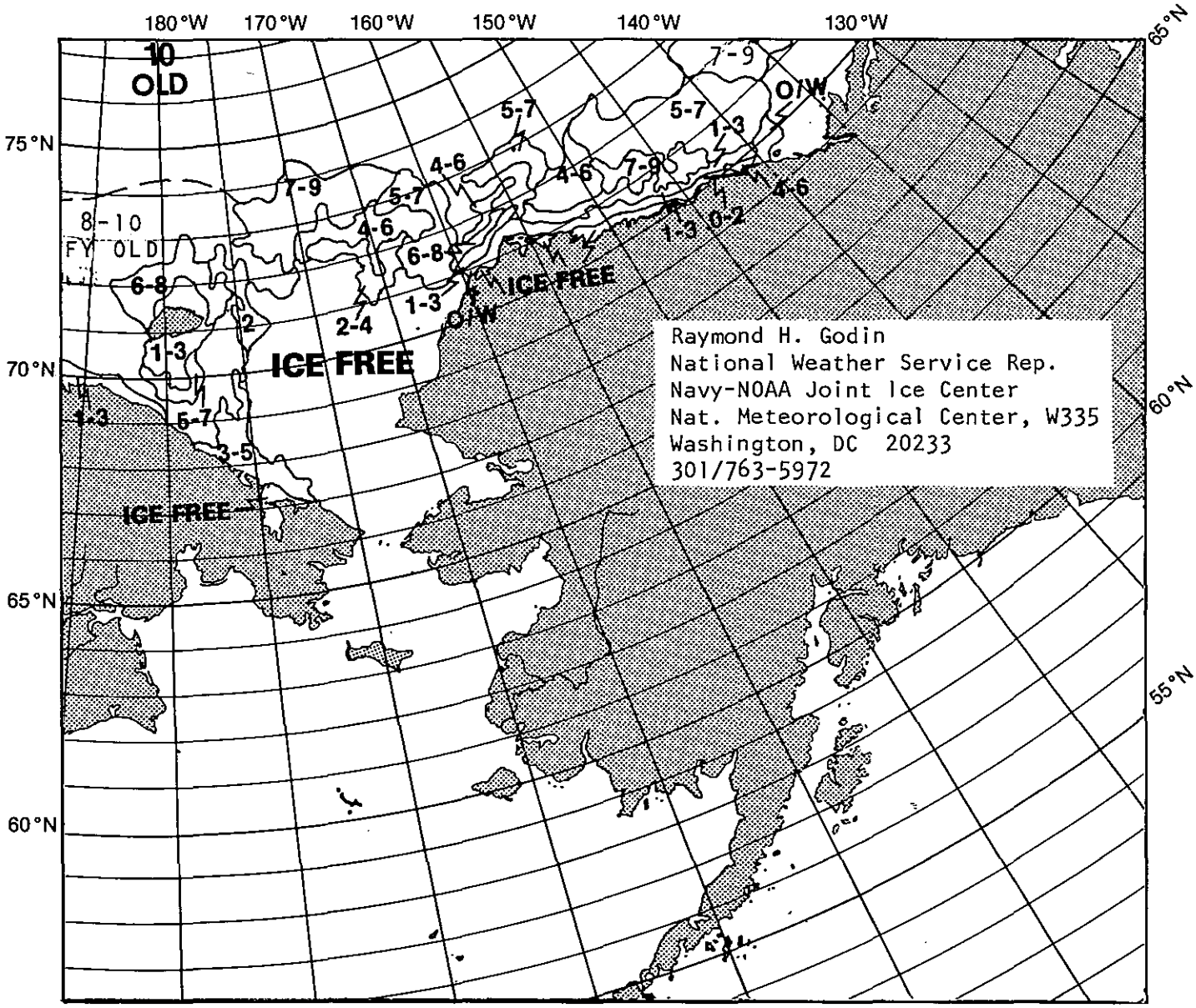
West Coast

Ocean features
Sea surface temperature
SST anomaly

East Coast

Ocean features
Sea surface temperature
SST anomaly

BERING SEA / NORTH SLOPE ICE ANALYSIS



KEY

ICE CONCENTRATION

4-6	Area 4-6 tenths ice-covered.
OW	Open water. Sea ice present in concentrations less than one tenth.
ICE-FREE	No sea ice. Ice of land origin (iceberg e.g.) may be present.

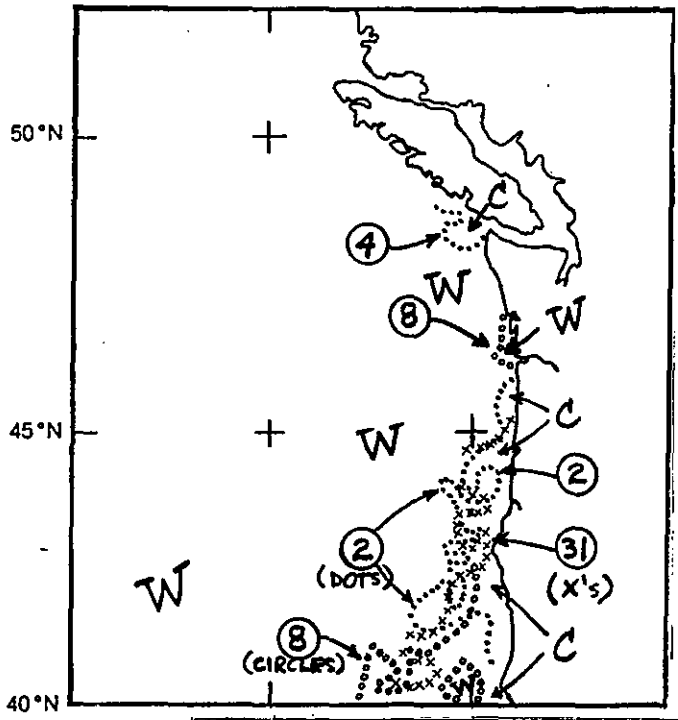
ICE THICKNESS (AGE)

OLD	Includes both multi-year and second-year ice. Generally 2-3.5m thick.
FY	Any or all first year ice types (30 cm - 2 m thick).
YNG	Young ice (10-30 cm thick).
N	New and nilas.
■	Fast ice. Sea ice which forms and remains fast along the coast.
120	Theoretical thickness of this season's growth (cm), based on freezing degree days (presented for first day of each month on first succeeding chart).
———	Ice boundary visually or satellite observed.
- - - -	Ice boundary estimated.

JULY 1981

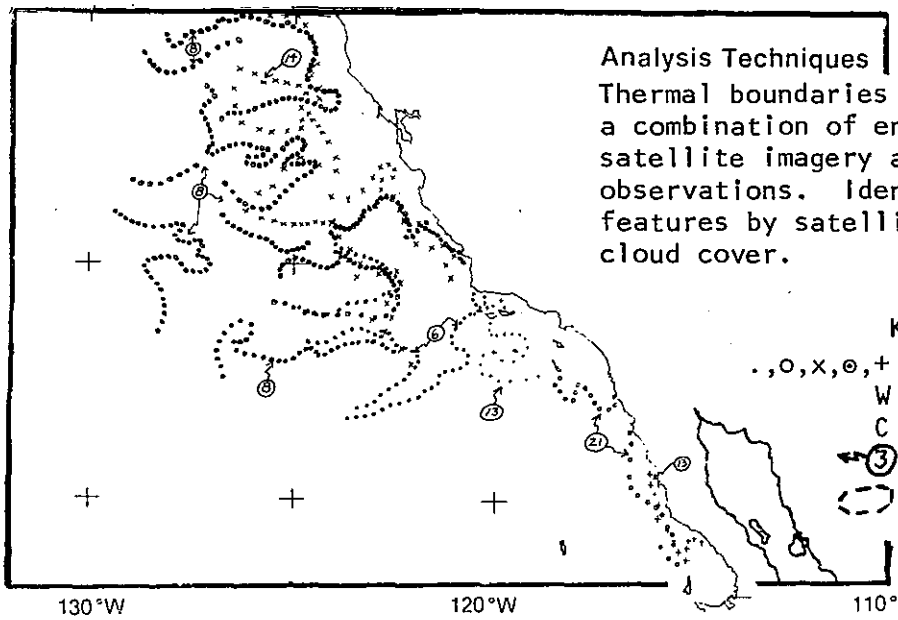
Westerly geostrophic flow is the most significant feature of the mean monthly surface pressure circulation affecting Alaskan sea ice distribution. A free-drifting ice buoy reported an east-northeasterly monthly drift of the ice pack in the area near Barrow (71°N 157°W). The buoy drifted from 71°12N 164°12W to 72°24N 155°18W from July 2-30, a net movement of 330 km. Monthly mean air temperatures along the north coast are near normal. At Barrow the much above normal temperatures observed in the last third of the month offset earlier below normal temperatures. During the first week of July, the fast ice east of Barrow separated from the coast. Weaknesses within the pack continued to expand as seasonal melt and drift removed ice from coastal regions. Around July 23, a navigable shipping lead opened between Barrow and Prudhoe Bay (70°N 148°W).

WEST COAST OCEAN FEATURES



JULY 1981

A strong latitudinal variation is seen in July nearshore SST features. July satellite imagery shows a complex thermal boundary structure induced by coastal upwelling and wind mixing along the Oregon and Northern California coasts. Persistent weak onshore winds accounted for warmer SST's off Washington. Coastal SST's as low as 8-9°C were observed along central Oregon, while generally consistent SST's of 14.5-16°C persisted along most of Washington. The strongest wind forcing of coastal upwelling occurred south of 45°N during the first few days and the last two weeks of July. Most coastal locations showed a weak warming episode during the week beginning July 8. Further offshore, the deep ocean buoy at 46°N 131°W showed a steady SST increase of about 2°C during the month, while the buoy at 42°30N 130°W recorded little change.



Analysis Techniques

Thermal boundaries are determined from a combination of enhanced infrared satellite imagery and ship and buoy observations. Identification of these features by satellite is limited by cloud cover.

Key

.,o,x,⊙,+ = thermal boundaries
W = warm
C = cold
③ = date of feature
(dashed) = outline of water mass feature

NORTH PANEL

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Seattle Ocean Services Unit
National Weather Service/NOAA
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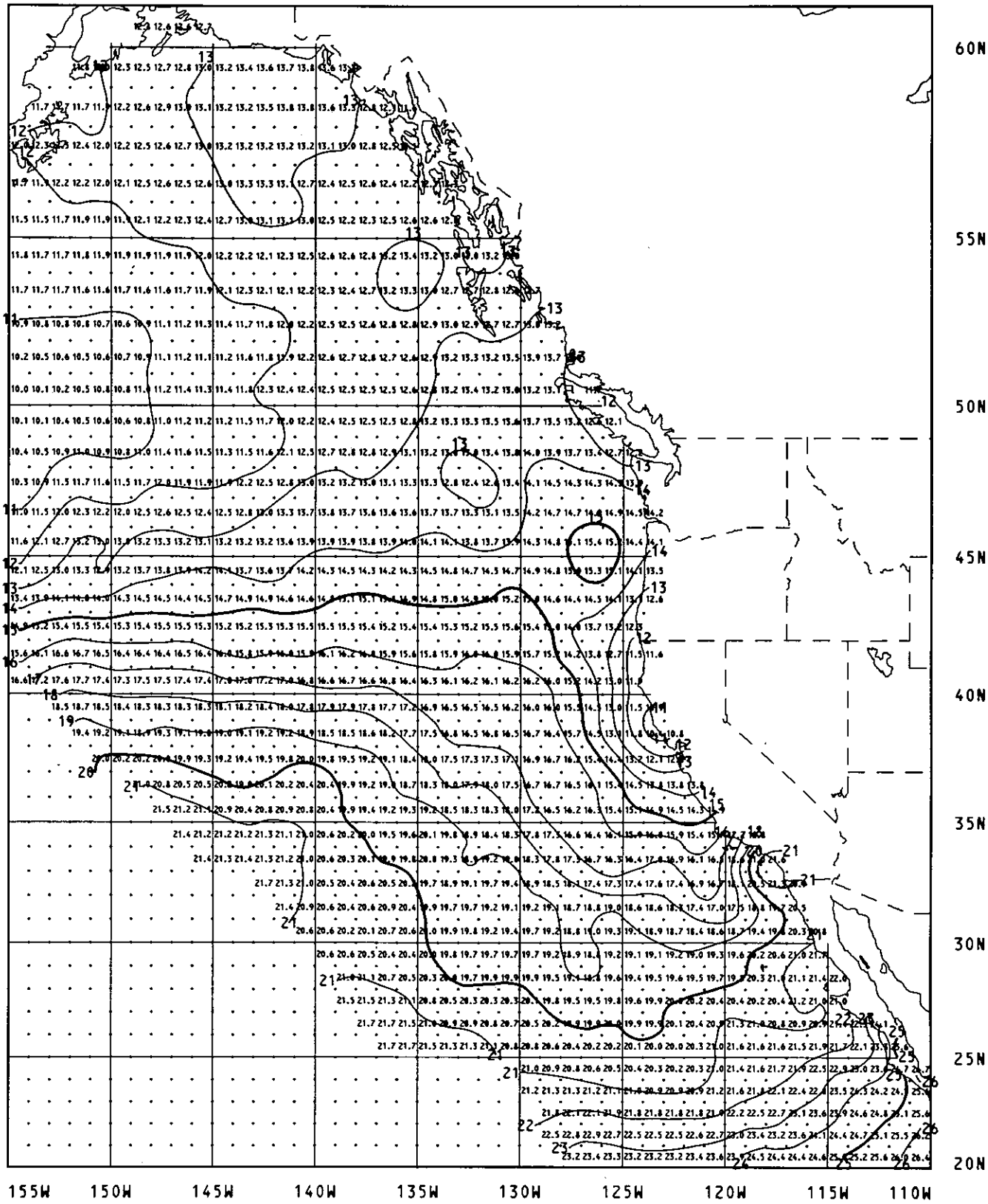
Bin C15700
Seattle, WA 98115
206/527-6105

SOUTH PANEL

Larry Breaker
Seattle Field Service Station
National Earth Satellite Service
NOAA
660 Price Avenue
Redwood City, CA 94063
415/364-2422

During July, SST's were 1-2°C below normal in the NW corner of the panel (40°N 135°W), near normal over the center (away from the coast), and 0.5-1.0°C above normal in the SE (30°N 120°W). Within 150-200 km of the coast SST's remained cool (10-13°C) north of 37°N, but increased southward toward Pt. Conception (34°N 120°W). SST's remained about 2°C above normal over the southern California coast south of 34°N. SST ranges recorded through July 26 were 13-17.8°C at Pt. Sal buoy (35°N 121°W), 11.3-13.8°C at Half Moon Bay buoy (37°N 123°W), and 9.1-12.2°C at Bodega Bay buoy (38°N 123°W). Due to the development of persistent coastal fog and stratus by mid-July, satellite coverage of the area has been somewhat restricted. However, available imagery shows that upwelling boundaries have generally moved further seaward, and in some cases north of 34°N as much as 100 km.



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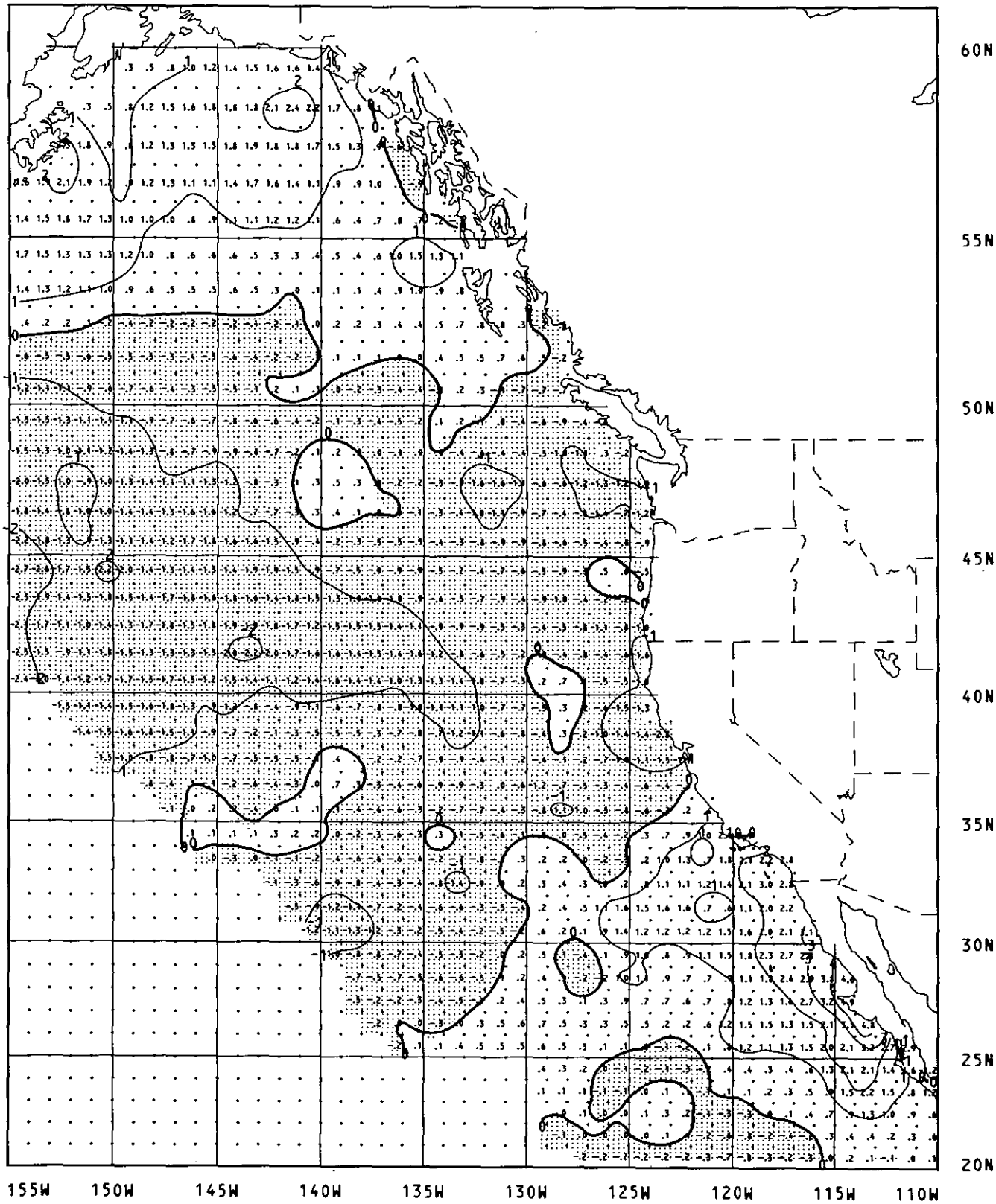

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Feature positions are drawn from:
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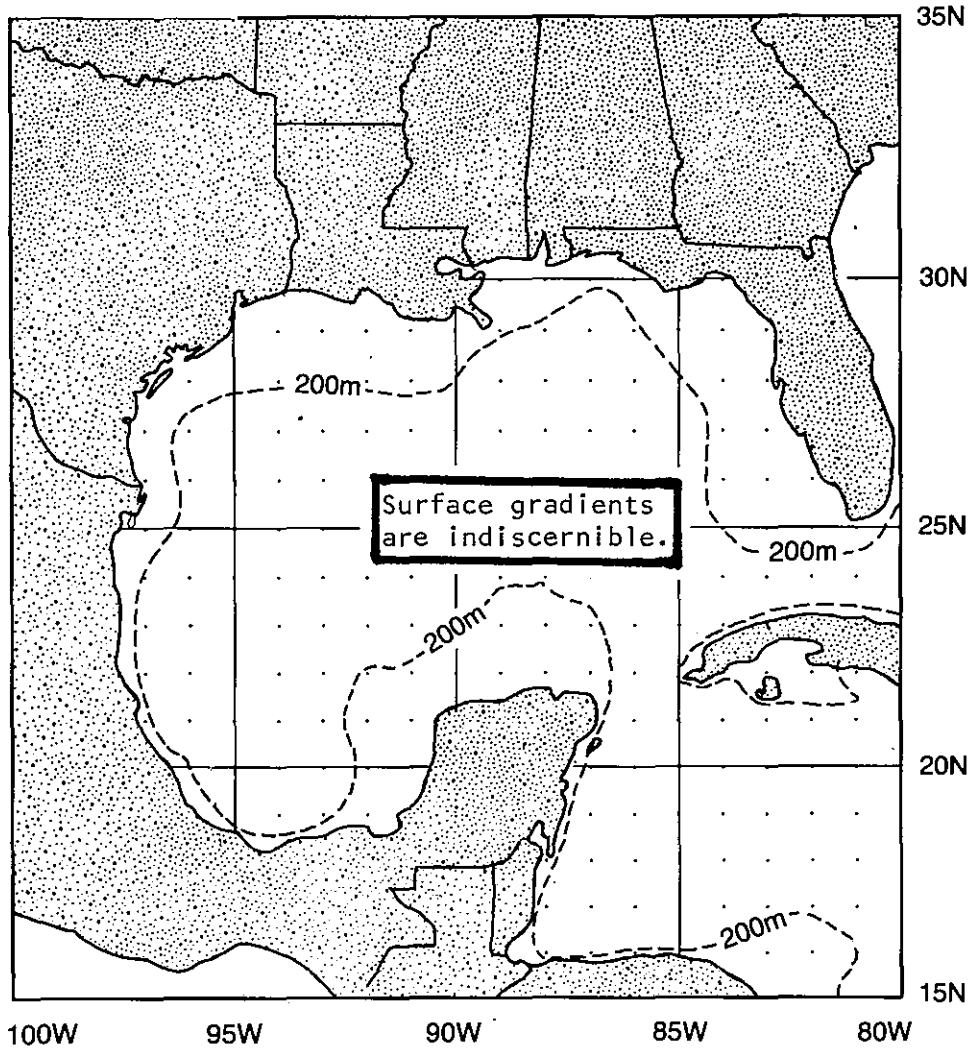
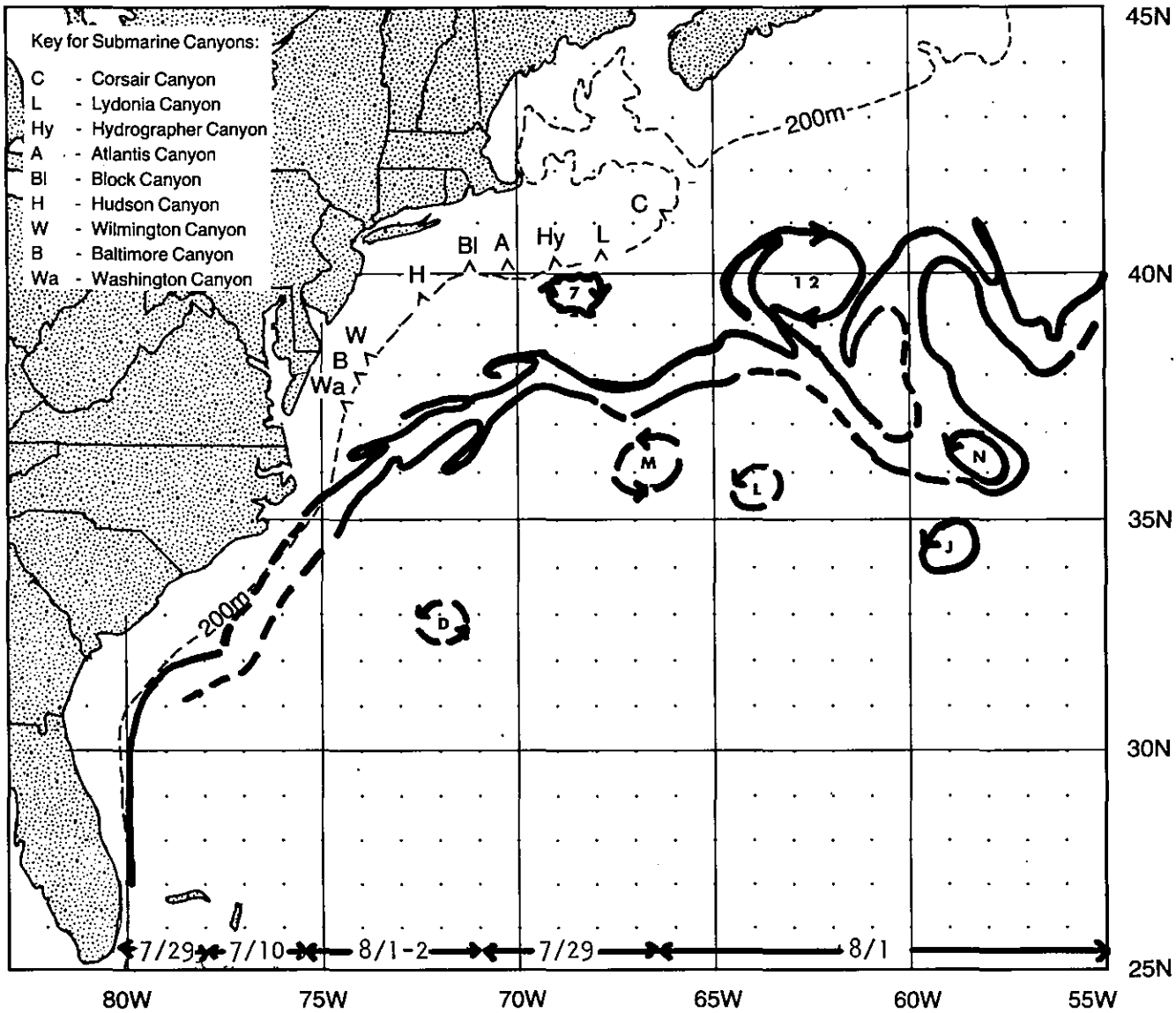


JULY 1981

During July, Loop Current features in the Gulf of Mexico are not discernible by satellite imagery due to seasonal warming of the surface waters. Thus, the above chart does not contain end-of-July positions.

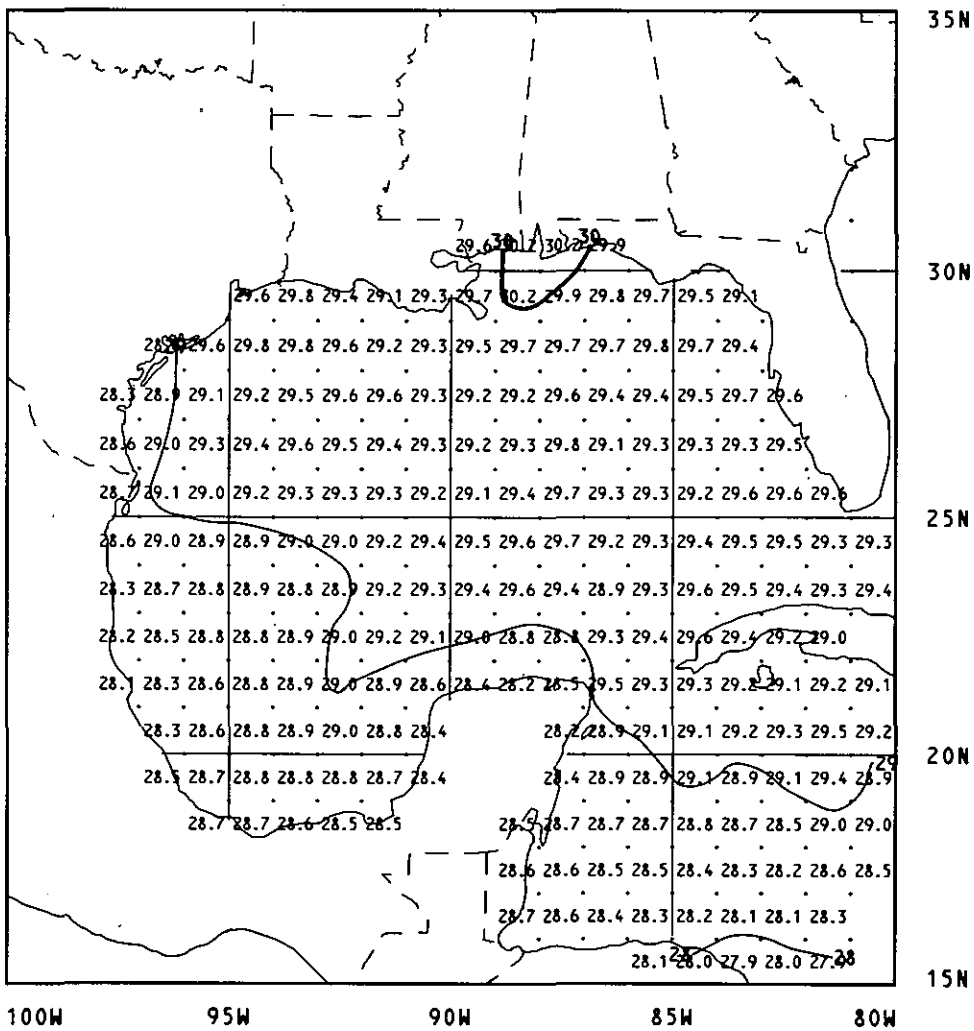


Prominent Gulf Stream features in the analysis are the high amplitude trough and crest of the North Wall near 37°N 60°W and 41°N 60°W, respectively. The dashed Gulf Stream boundaries along the Carolinas are not a true end-of-July position, as they are drawn from July 10 satellite imagery.

During July, two anticyclonic eddies were formed and four were absorbed. Anticyclonic eddy 1 translated 140 km S until July 19, when it was absorbed into the Stream near 36°30N 73°30W. Warm eddy 7 translated 120 km WSW during July. Eddy 8 translated 55 km S until July 18, when a rapidly increasing amplitude Gulf Stream meander absorbed it near 40°N 61°W. On July 19, this further enlarged meander pinched off from the Stream near 38°N 61°W forming new eddy 12. Eddy 10 translated 150 km SE until July 30, when a meander absorbed it near 40°N 55°W. New anticyclonic Eddy 11 is not shown on the above analysis. The origin of Eddy 11 is unknown. It was first observed on July 13 centered near 40°30N 58°30W. Around July 28, a meander absorbed eddy 11 near 40°30N 59°W.

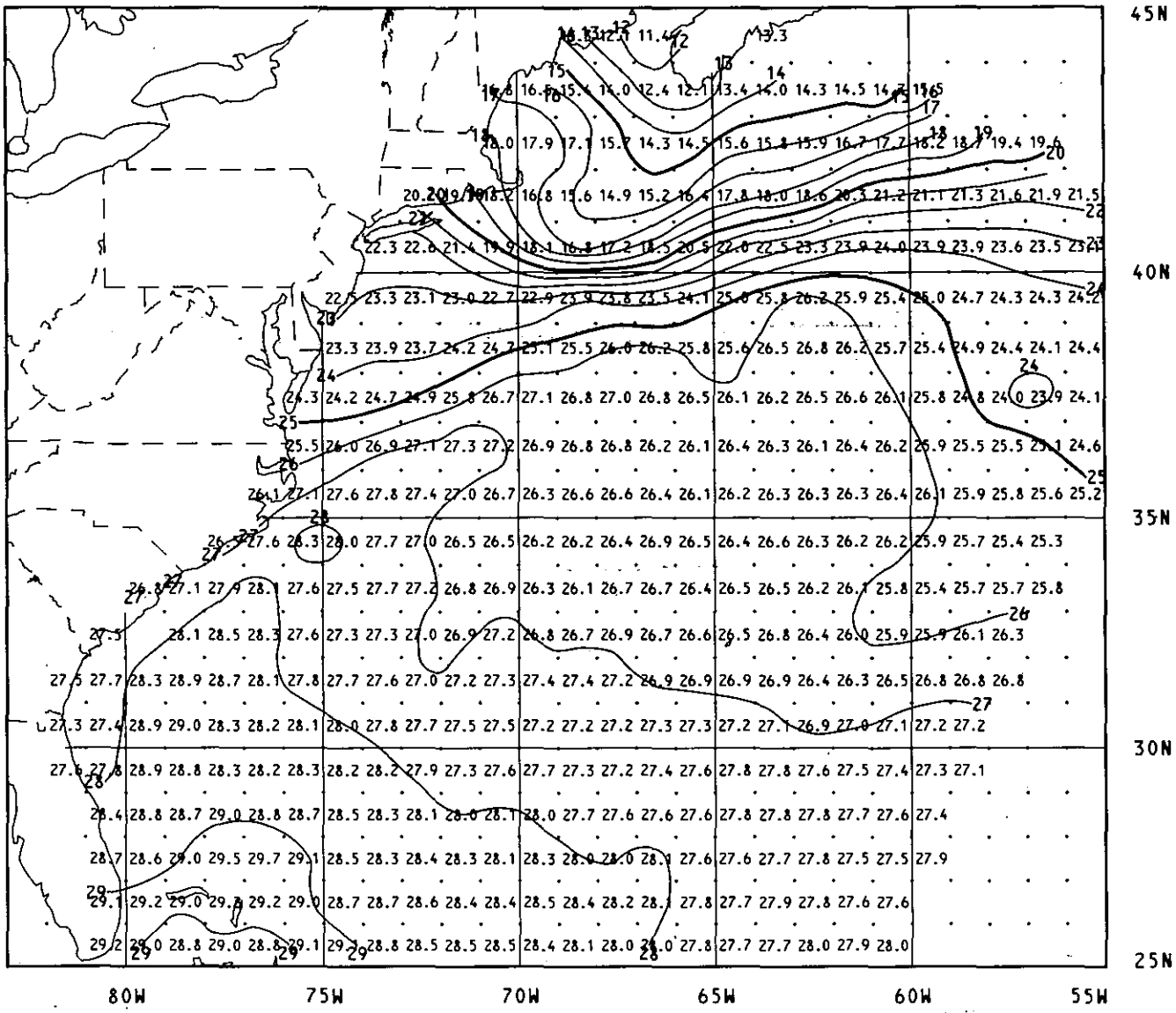
The positions of cyclonic eddies D and L are drawn from satellite imagery of July 11 and 17, respectively. Eddy D translated 120 km S and eddy L apparently moved 150 km S. Eddy J has apparently translated 165 km SE since June 20. Eddy M translated 110 km WNW. On July 20, a Gulf Stream meander pinched off forming new cyclonic eddy N centered near 36°30N 58°30W.

EAST COAST SST-
MONTHLY MEAN



Gulf of Mexico
SST--MONTHLY MEAN (°C)
July 1981

Monthly mean sea surface temperature is the mean of twice-weekly analyses using ship, buoy, and satellite observations.(See page 3.)



NW Atlantic Ocean
SST--MONTHLY MEAN (°C)
July 1981

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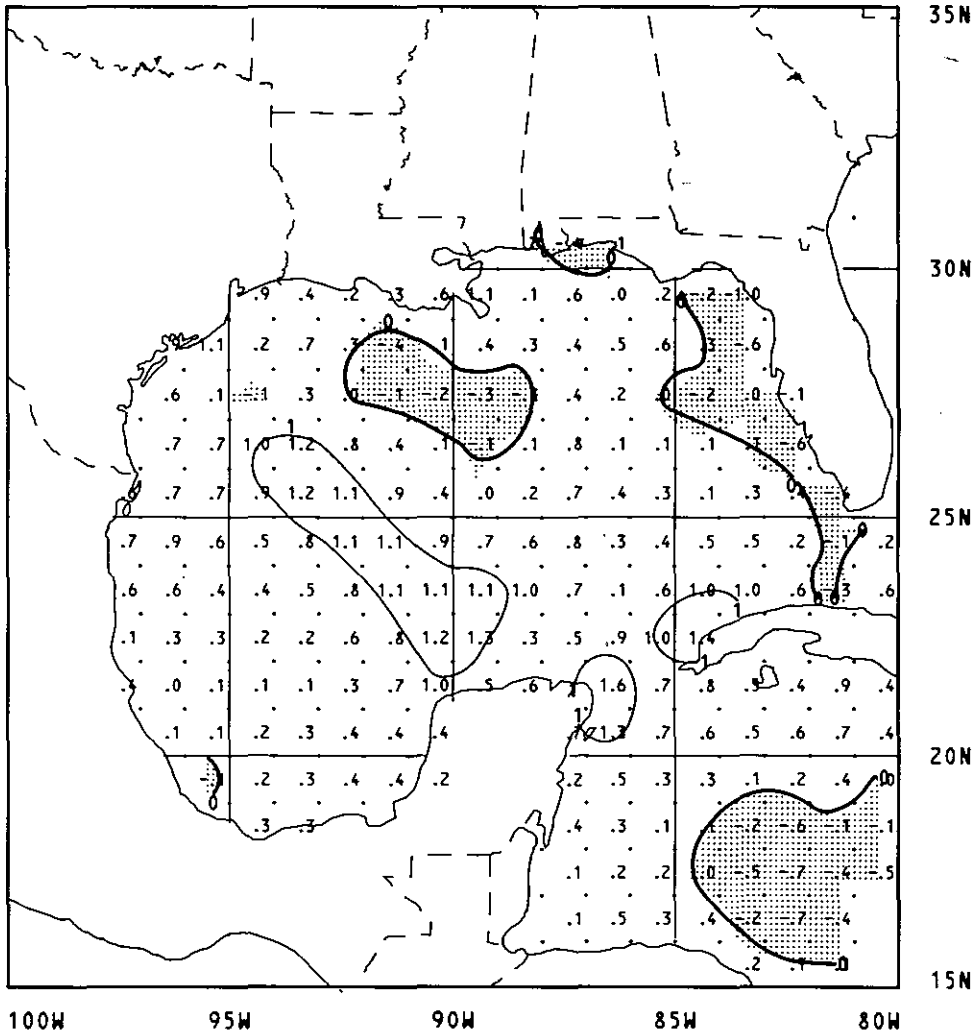
EAST COAST SST-ANOMALY



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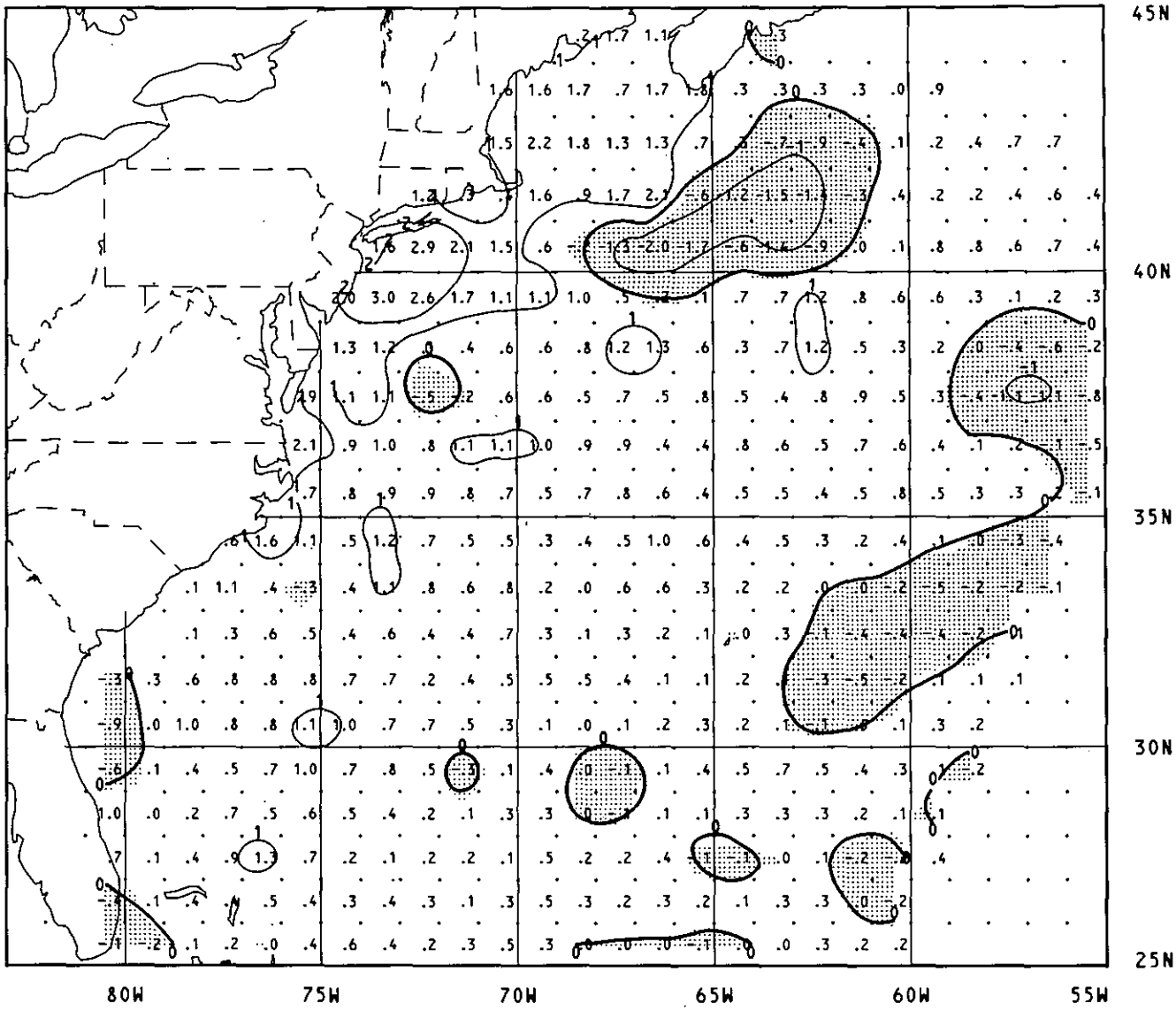

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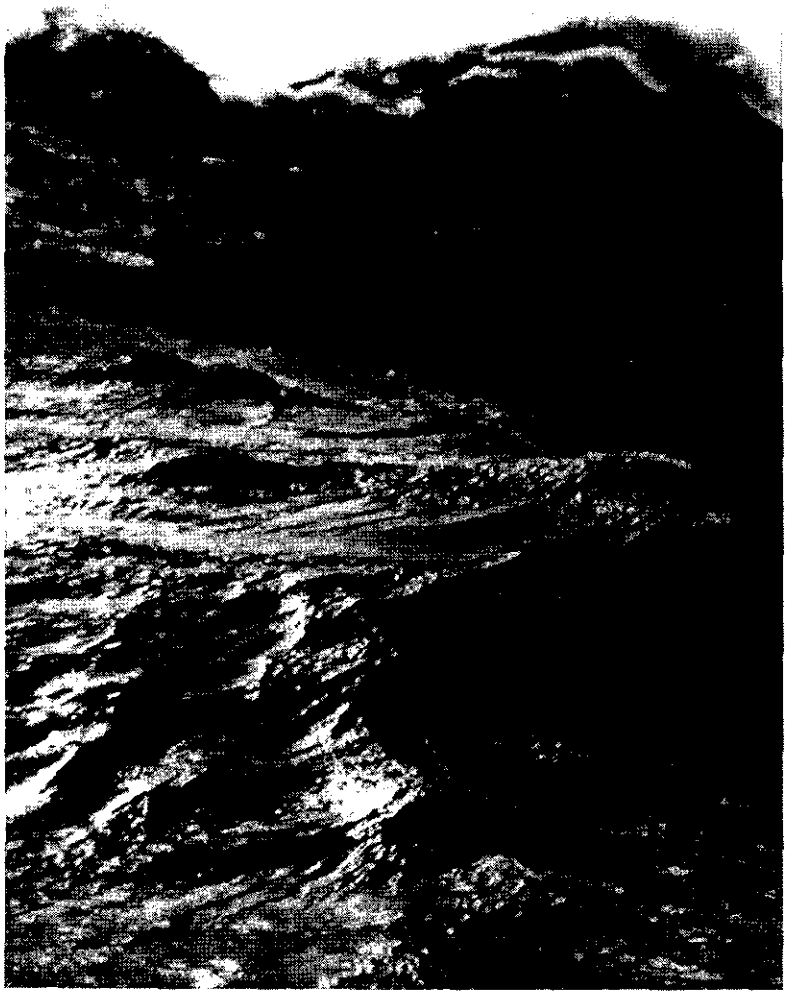
OCEANOGRAPHIC Monthly Summary

Volume I Number 8 August 1981



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National Weather Service/National Earth Satellite Service

Oceanographic Monthly Summary is a continuation of two NOAA oceanographic publications, *gulfstream* and *Fishing Information.*

The *gulfstream* magazine included charts of the Gulf Stream location and Northwest Atlantic monthly mean SST's and anomalies. It was originally published as *The Gulf Stream Monthly Summary* by the U.S. Naval Oceanographic Office from 1964 to 1975. NOAA's National Weather Service took over the magazine, changing the name to *gulfstream*, from 1975 to 1980. The two Gulf Stream magazines thus constitute an uninterrupted 16-year history of Gulf Stream meandering and associated eddy movements.

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Oceanographic Monthly Summary continues these data series, as well as beginning standardized oceanographic data series in all other U.S. offshore areas. All of the SST analyses use the Robinson-Bauer climatology.* This is a computer-assisted subjective analysis of all vertical-profile temperature data: the entire mechanical and expendable bathythermograph (MBT and XBT) files; portions of the hydrocast, salinity/conductivity temperature depth (STD/CTD), radio message files; analysis of the Asheville Marine Deck; published data and analysis; and subjective interpretation of wind and current charts. Data comprise 381,199 North Pacific observations to 1969; 727,452 Atlantic/Indian Ocean observations to 1974; and 250,000 Southern Hemisphere observations to 1979. The majority of data are MBT's, so the climatology best represents conditions since 1942.

*Robinson, M.K., 1976. Atlas of North Pacific Ocean Monthly Mean Temperatures and Mean Salinities of the Surface Layer; *NavOceano Ref. Pub. 2.*
Robinson, M.K., R.A. Bauer and E.H. Schroeder, 1979. Atlas of North Atlantic-Indian Ocean Monthly Mean Temperatures and Mean Salinities of the Surface Layer; *NavOceano Ref. Pub. 18.*

Oceanographic Monthly Summary
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Hemispheric: Sigurd E. Larson

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(telephone: 301/763-8115)

Hemispheric Analyses

On alternate days for the Northern and Southern Hemispheres, two-day composite hemispheric sea surface temperature (SST) analyses are prepared using SST observations from ship weather reports, data buoys, expendable bathythermographs, and satellites. These data are analyzed on polar stereographic grids having a mesh length of 190.5 km at 60° latitude and 102.1 km at the equator. Agreement between the hemispheric analyses in the equatorial regions is largely assured by the fact that corners of the polar stereographic grids extend well into the opposing hemisphere permitting the analyses to overlap near the equator.

The objective analysis technique known as "conditional relaxation" corrects the previous analysis with those new observations which have passed a variety of validity tests. Areas without observations are modified by the "relaxation" procedure which maintains the divergence of the SST gradient in these areas.

Each two-day SST analysis is interpolated to a 2° latitude/longitude grid using bilinear interpolation. The monthly products are then derived from the interpolated analyses on the 2° x 2° grid. The Robinson-Bauer climatology (see p. 2) is used to form the anomalies.....Sigurd Larson

Regional Analyses

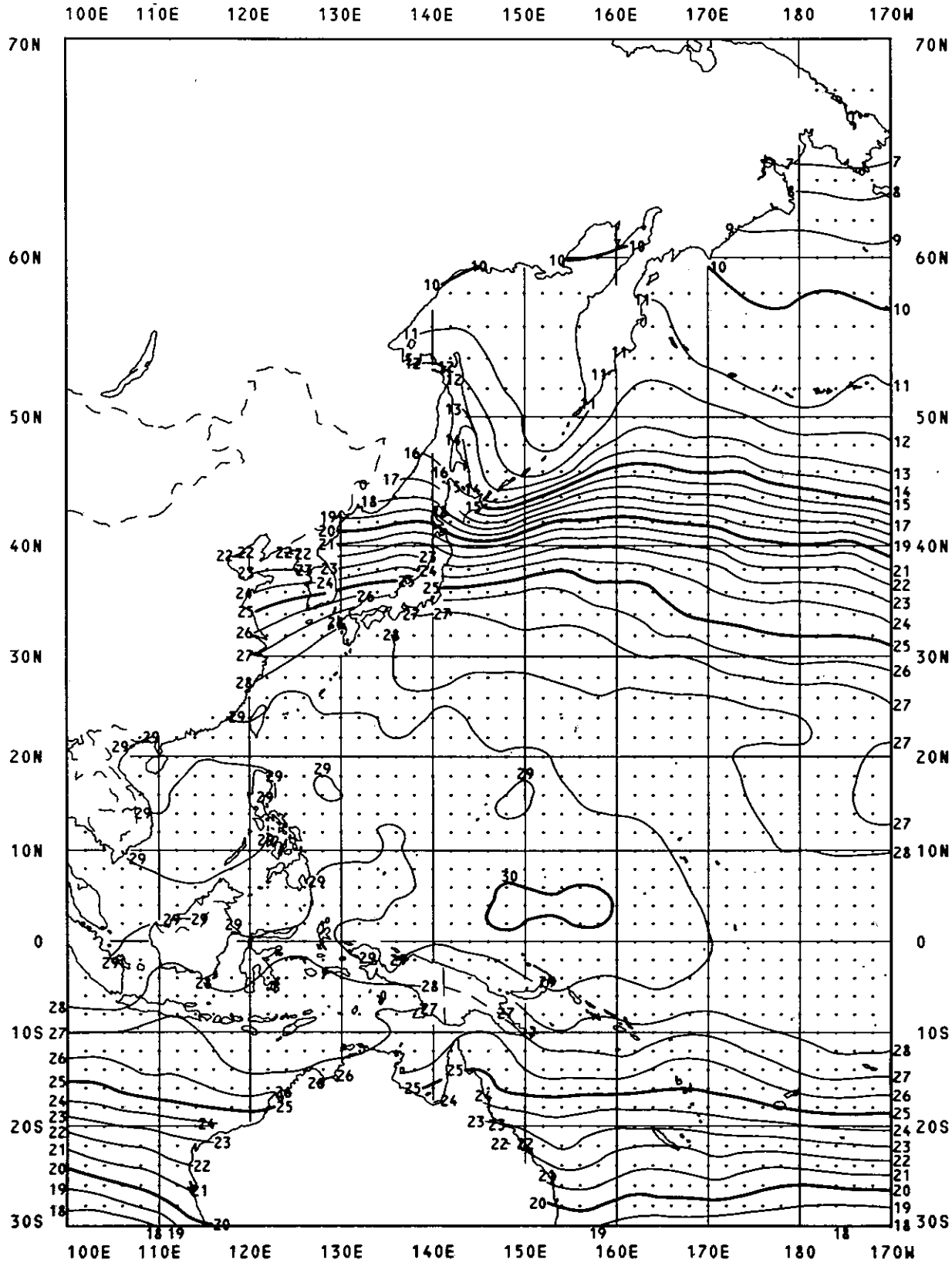
Five-day composite regional sea surface temperature (SST) analyses are prepared twice each week using SST observations from ship weather reports, data buoys, expendable bathythermographs, and satellites. These data are analyzed on polar stereographic grids, having mesh lengths of 23.8 km at 60°N.

The objective analysis technique, similar to the "Cressman" technique, corrects the previous analysis with those new observations which have passed a variety of validity tests. These corrections are a weighted mean of differences between the observation and the previous analysis. Grid points in data-sparse areas are modified by distant observations through corrections weighted inversely proportional to the distance between the observation and the grid point.

Each twice-weekly SST analysis is interpolated to a 1° latitude/longitude grid using bilinear interpolation. The monthly products are then derived from the interpolated analyses on the 1° x 1° grid. The Robinson-Bauer climatology (see p. 2) is used to form the anomalies.....Bill Gemmill

Sigurd Larson Leaving Staff

The *Oceanographic Monthly Summary* staff bids adieu to Sigurd E. Larson who will be leaving the National Weather Service in September. The staff wishes to thank Sig for his contributions to the publication, especially for programming the hemispheric SST analyses. His responsibility for preparing the analyses will be assumed by Steve Auer and John Kundrat of the National Meteorological Center.



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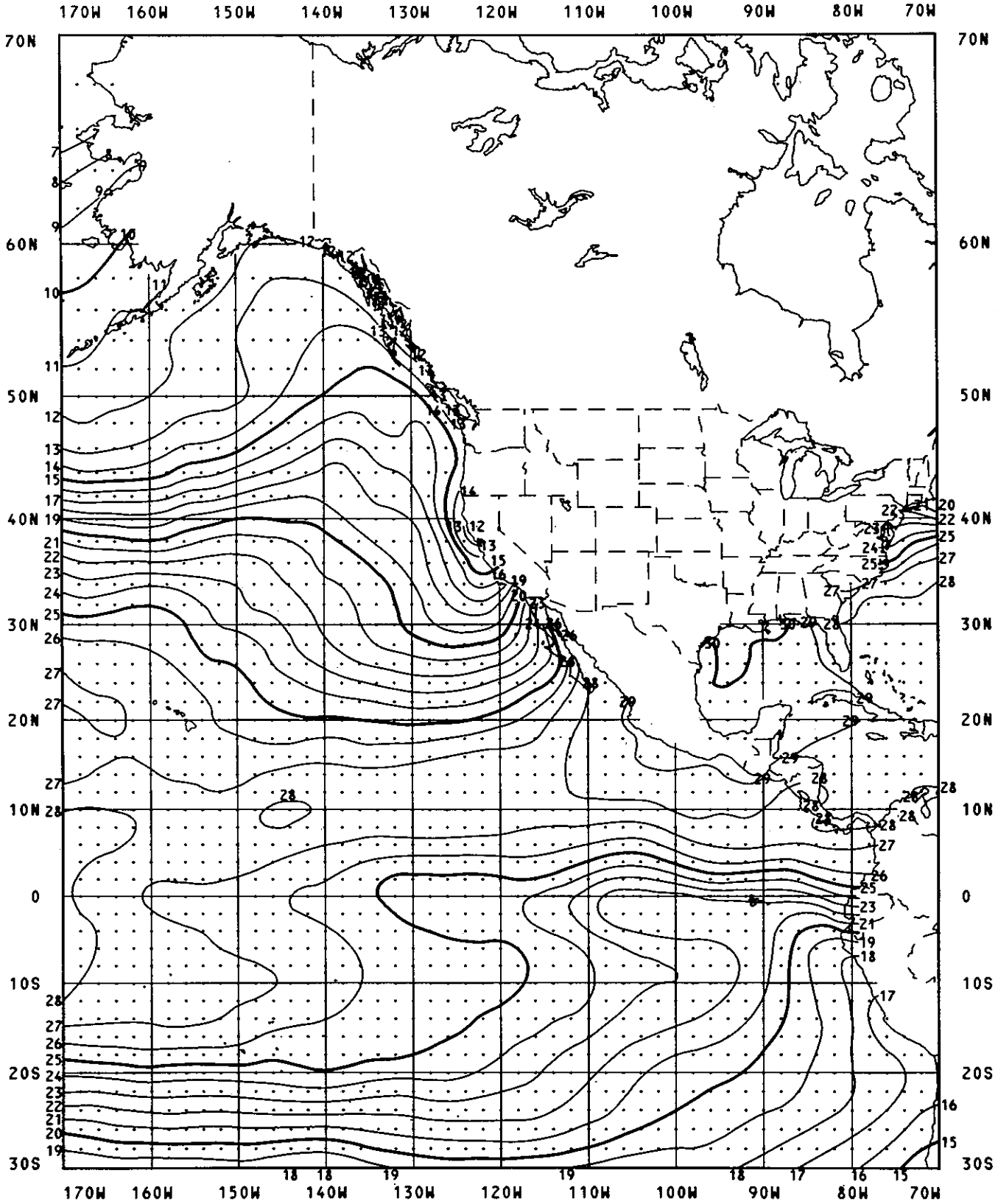

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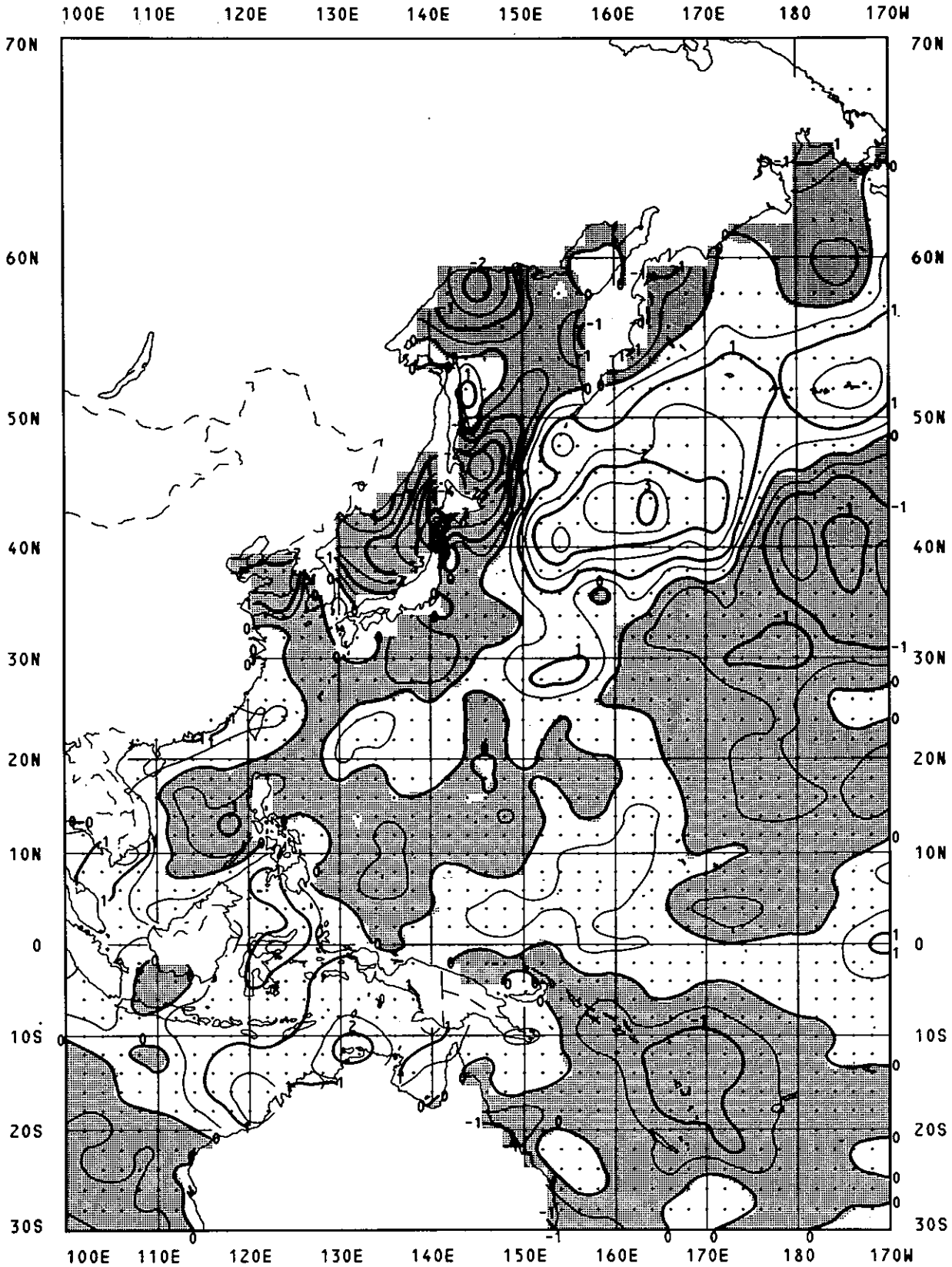

Western Pacific Ocean
SST--MONTHLY ANOMALY (°C)
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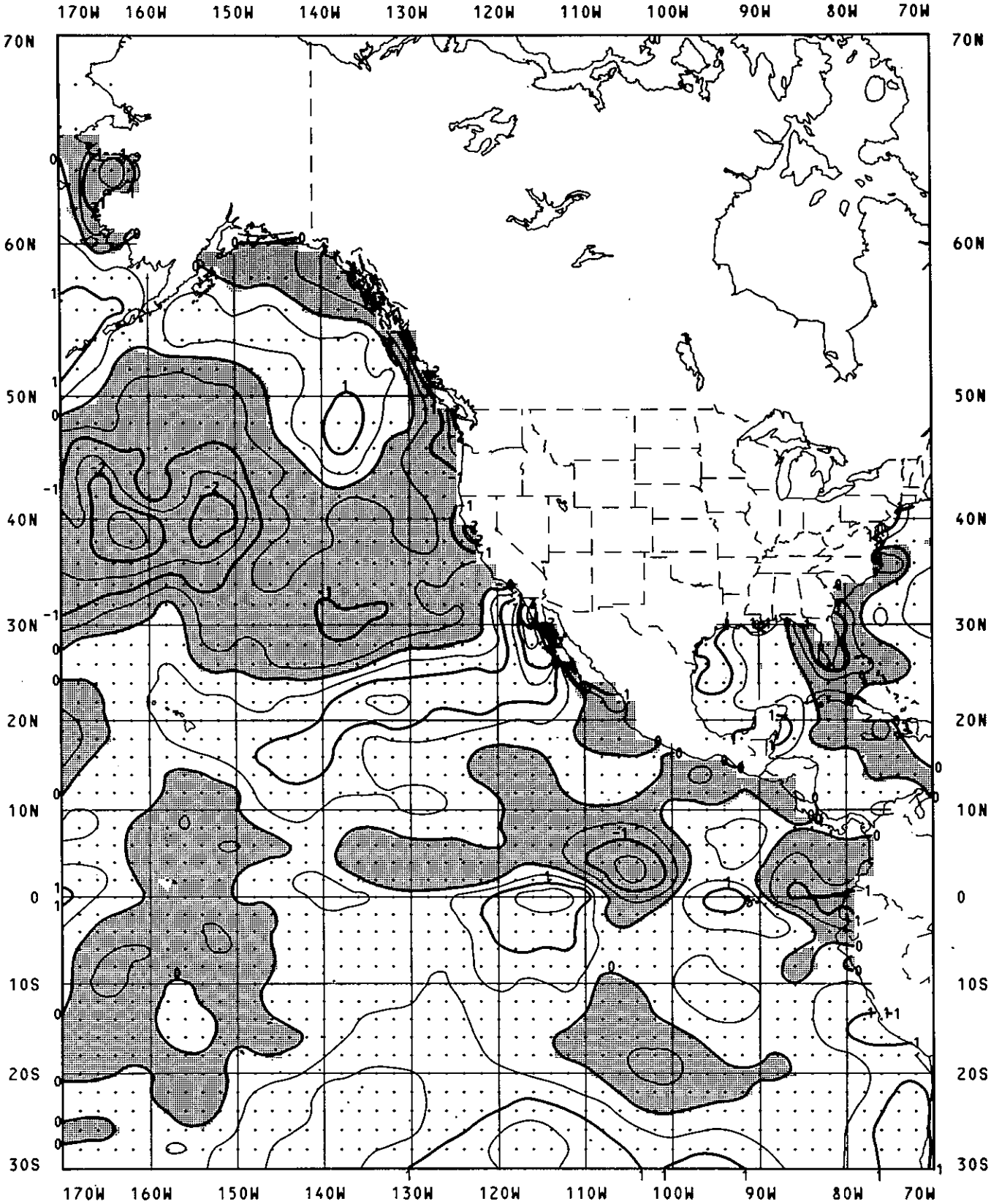

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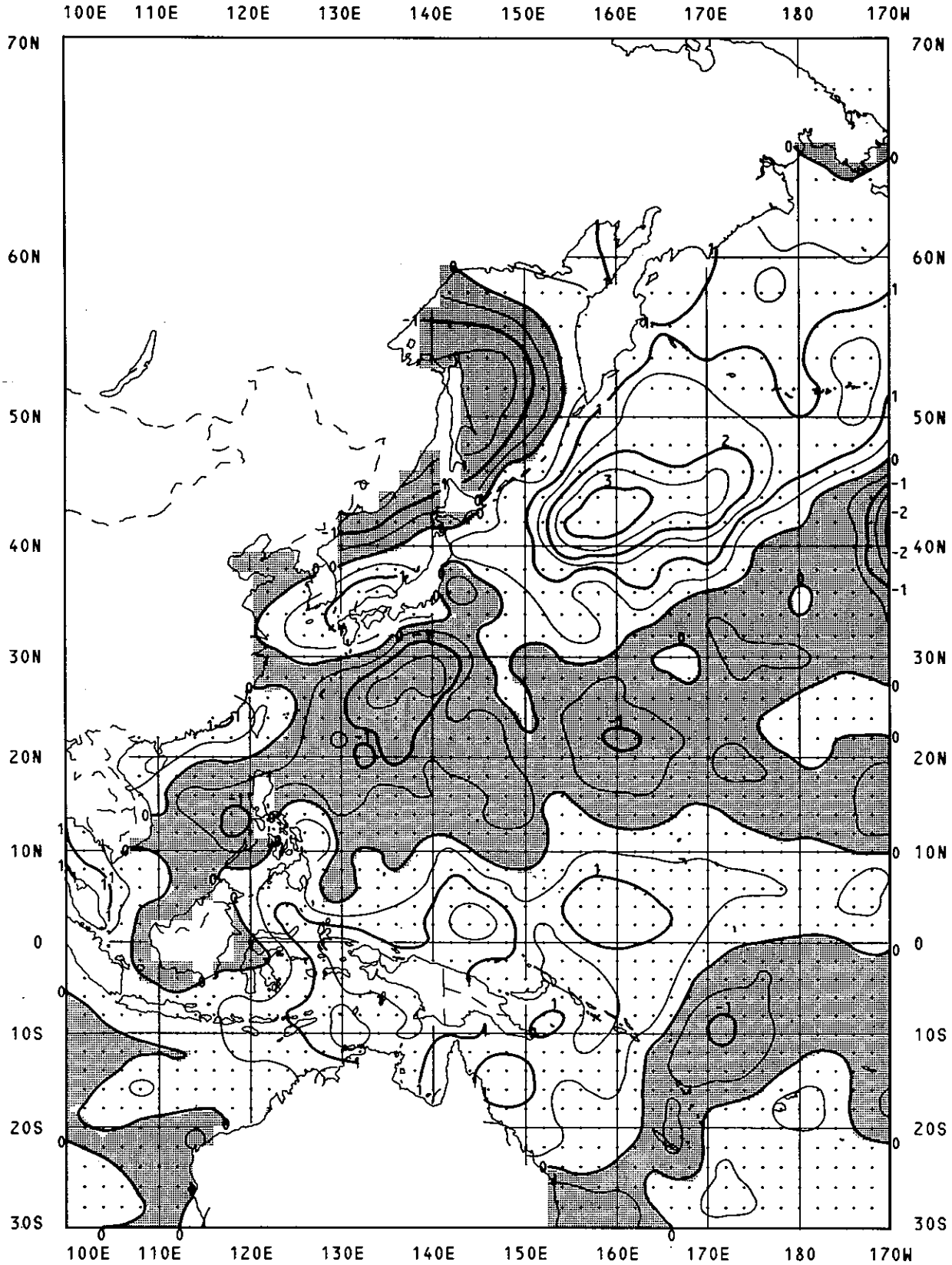
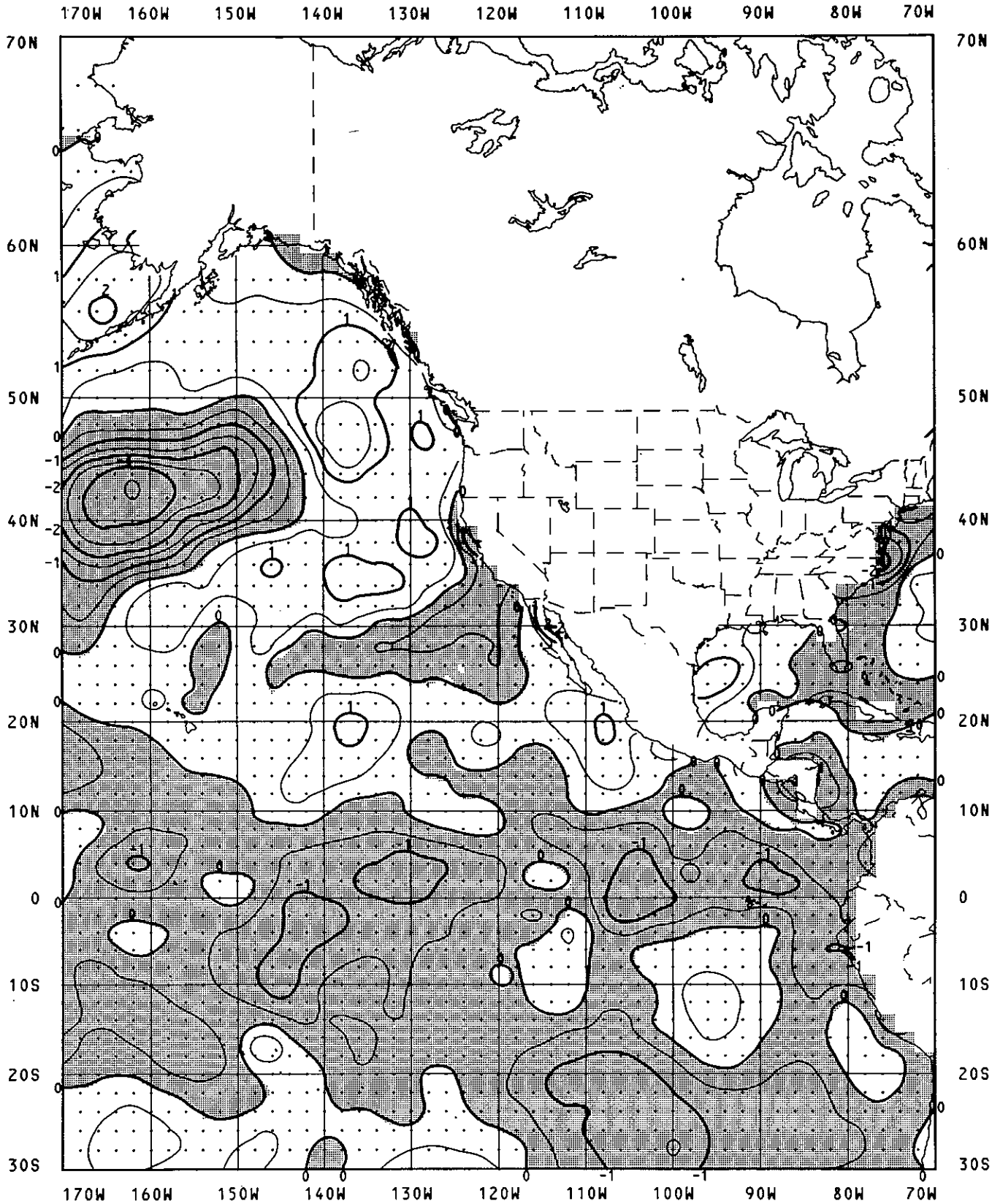


Western Pacific Ocean
SST--YEARLY CHANGE (°C)
August 1981

Yearly change is the difference between the monthly mean SST for this month and for the corresponding month last year -- shading shows where this year's monthly mean is colder than the corresponding monthly mean last year.



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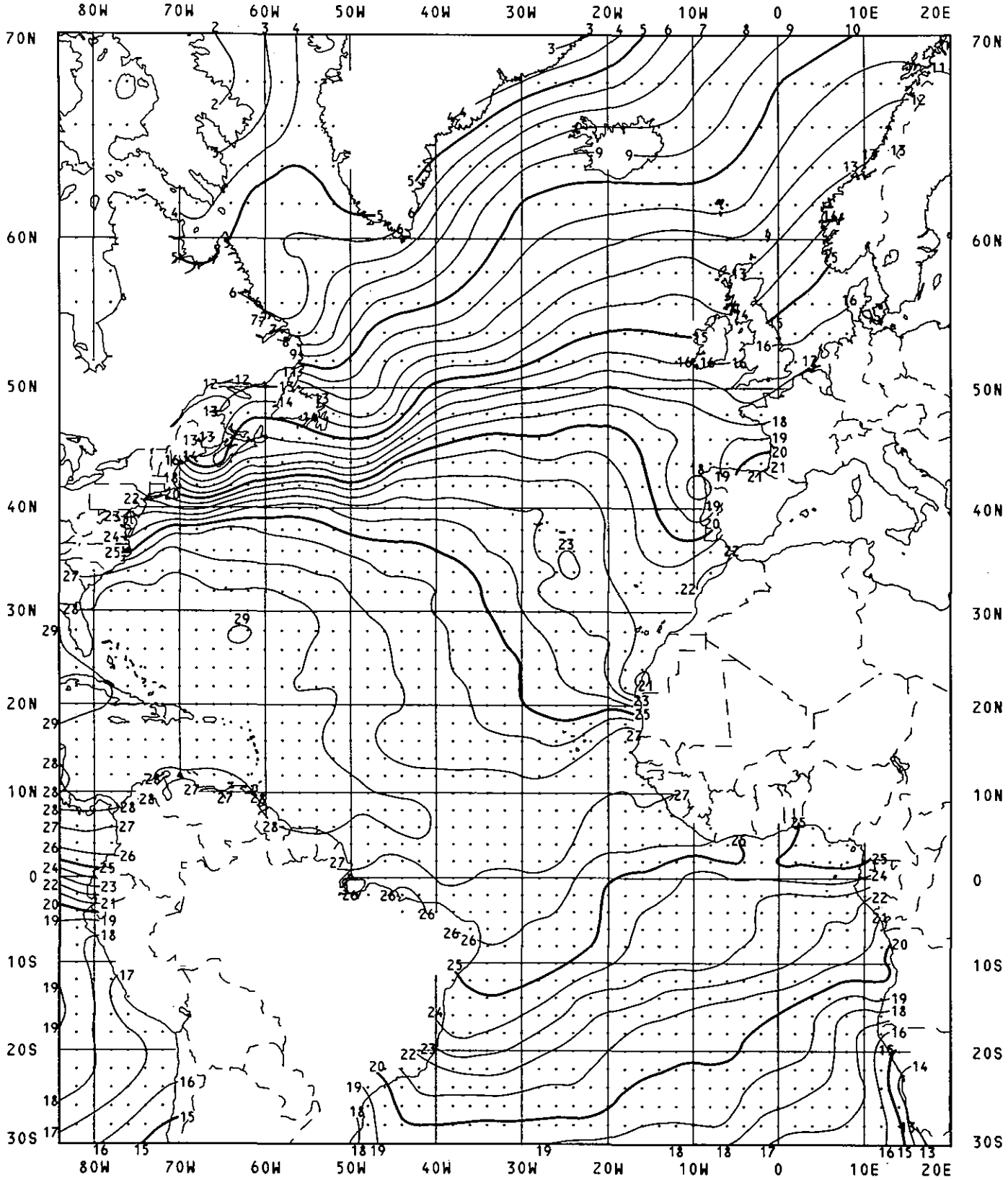

Atlantic Ocean
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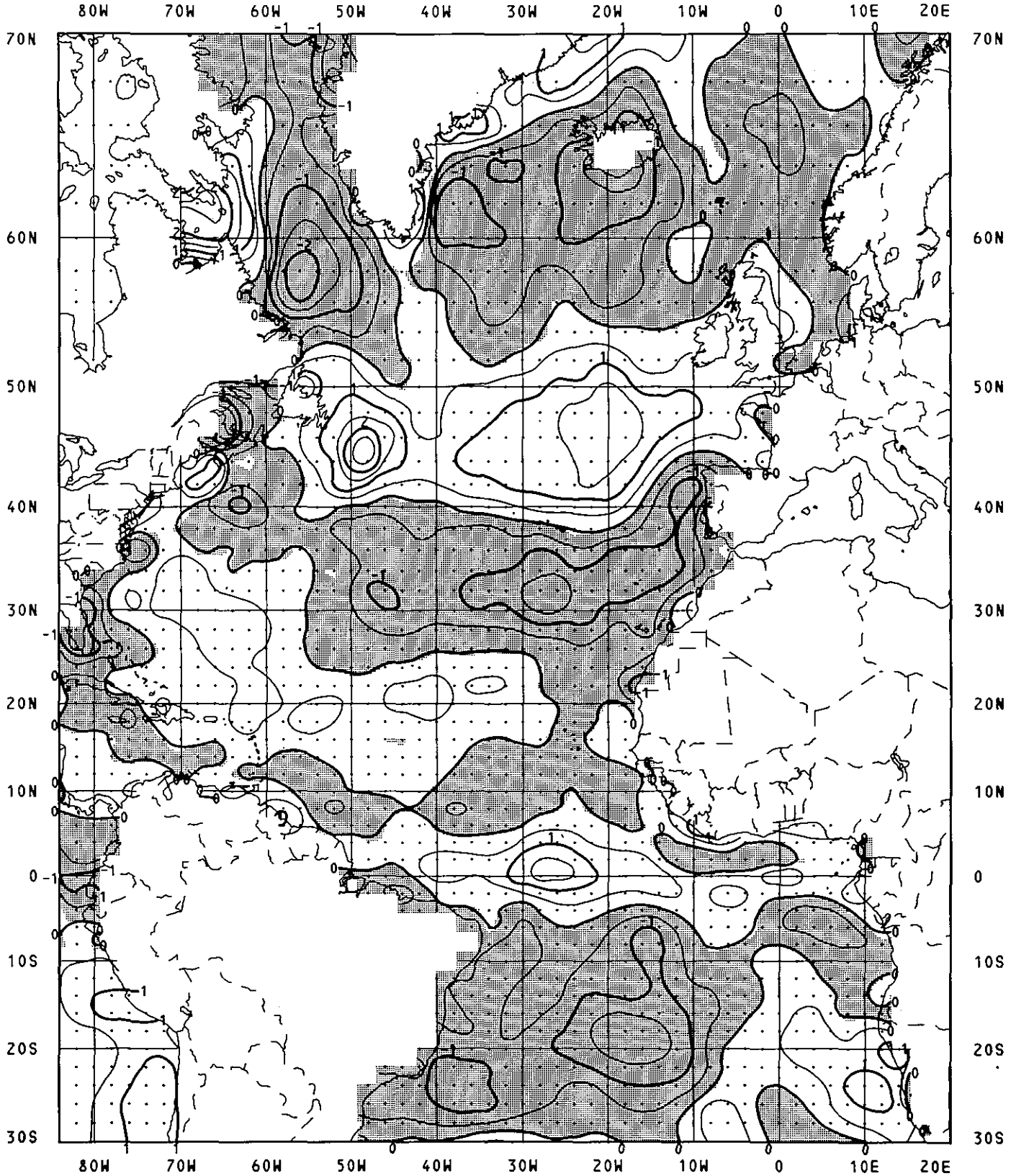

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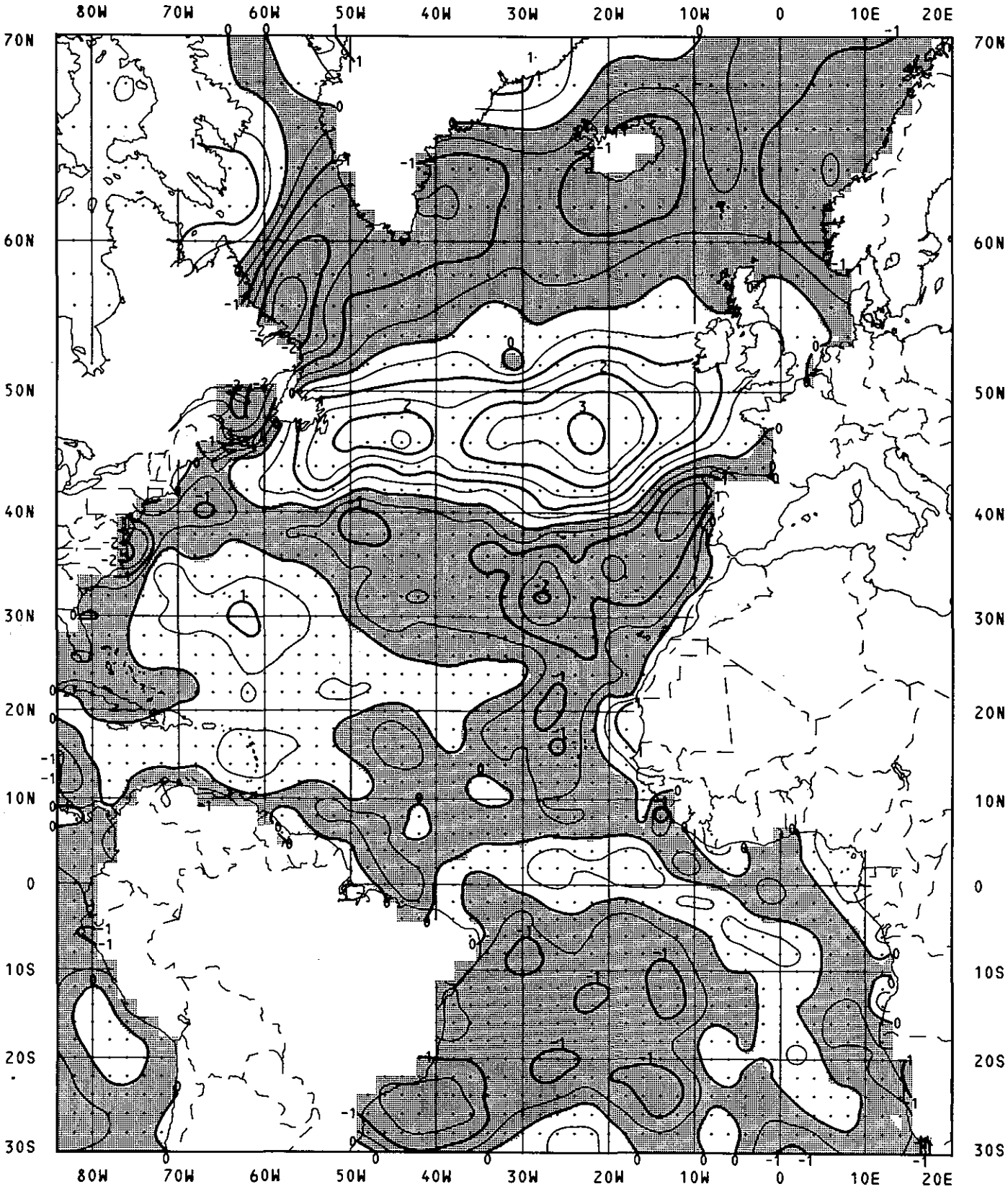

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REGIONAL ANALYSES

Bering Sea /North Slope Ice

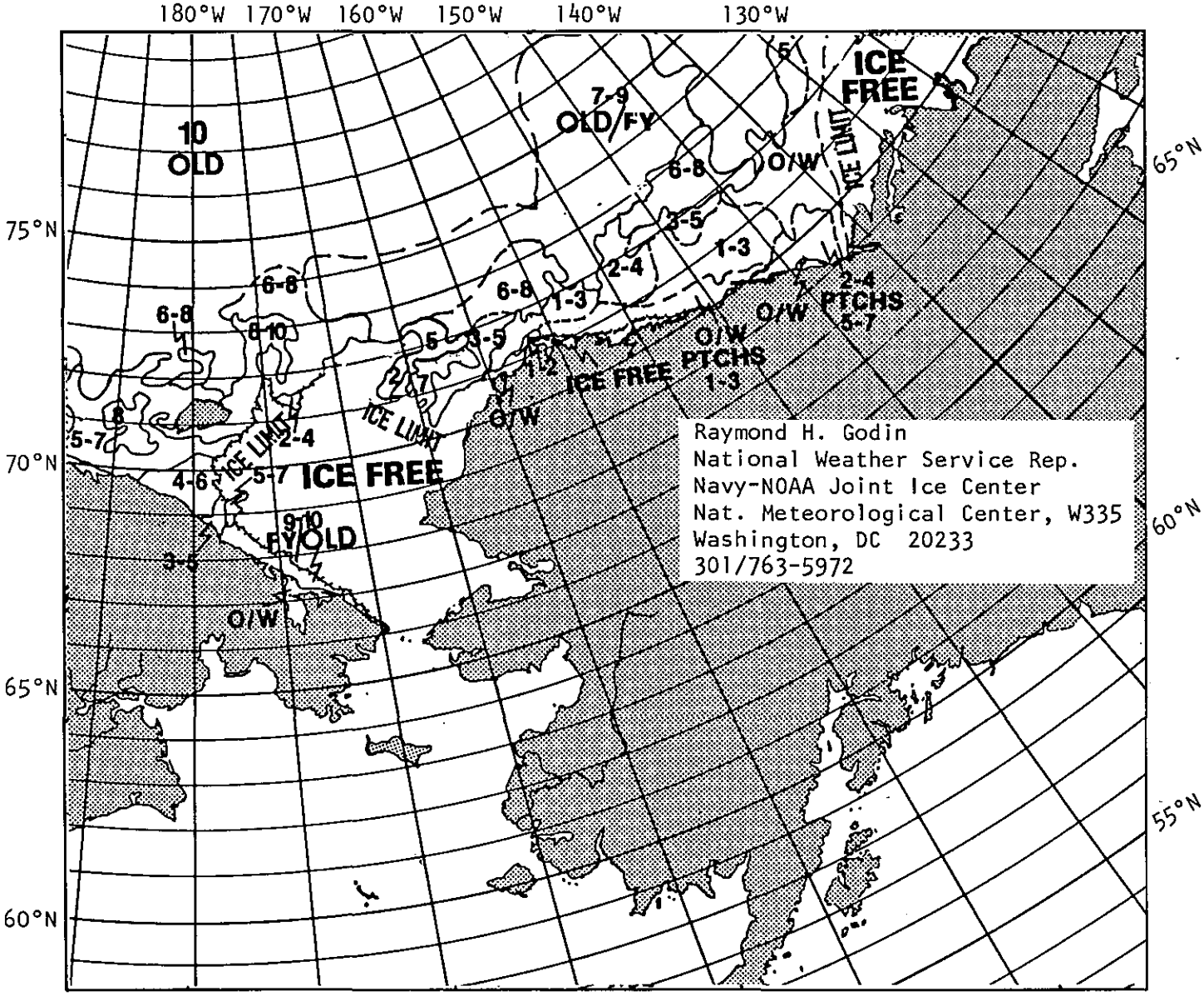
West Coast

Ocean features
Sea surface temperature
SST anomaly

East Coast

Ocean features
Sea surface temperature
SST anomaly

BERING SEA / NORTH SLOPE ICE ANALYSIS



KEY

ICE CONCENTRATION

4-6	Area 4-6 tenths ice-covered.
OW	Open water. Sea ice present in concentrations less than one tenth.
ICE-FREE	No sea ice. Ice of land origin (iceberg e.g.) may be present.

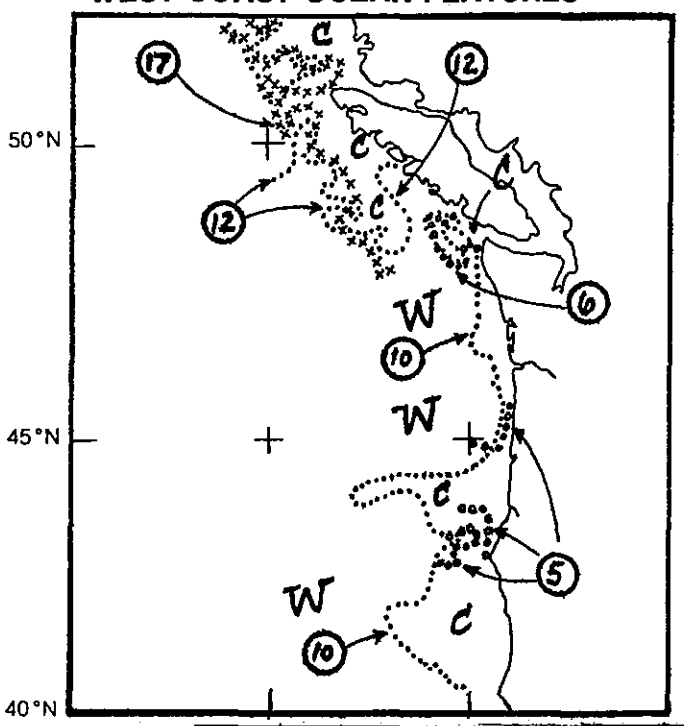
ICE THICKNESS (AGE)

OLD	Includes both multi-year and second-year ice. Generally 2-3.5m thick.
FY	Any or all first year ice types (30 cm - 2 m thick).
YNG	Young ice (10-30 cm thick).
N	New and nilas.
■	Fast ice. Sea ice which forms and remains fast along the coast.
120	Theoretical thickness of this season's growth (cm), based on freezing degree days (presented for first day of each month on first succeeding chart).
———	Ice boundary visually or satellite observed.
- - - -	Ice boundary estimated.

AUGUST 1981

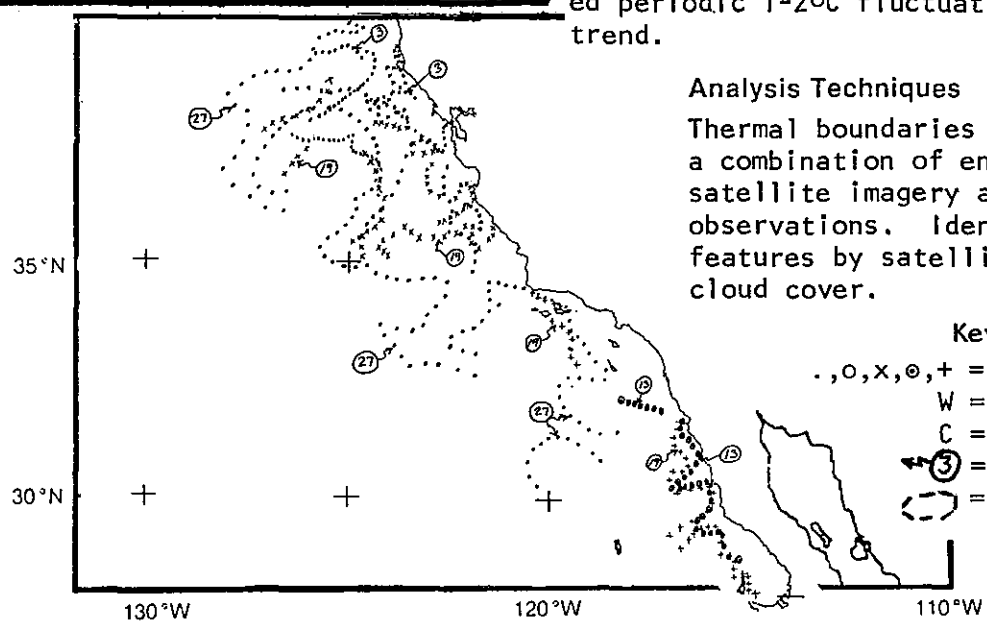
Mean westerly geostrophic surface winds, summer current conditions and seasonal melt continue to affect Alaskan sea ice distribution. A free drifting buoy located north of Barrow (71°N 157°W) drifted from 72°18N 155°12W to 72°12N 159°18W from August 2-31, a net westerly drift of 140 km. This observed drift is counter to the mean wind flow and is suggestive of a westerly setting offshore current. Barrow recorded a monthly mean air temperature of 1°C. Although below normal, this temperature is indicative of above freezing temperatures that continue the seasonal melt of the ice pack. Ice concentrations within the pack continue to decrease, and the shipping lanes between the Bering Strait and Prudhoe Bay have remained open throughout August. In the vicinity of Barrow, strong northwesterly winds advected ice with concentrations of 5 tenths or more onto the coast from August 17-21. No significant changes in ice edge locations are observed from last month.

WEST COAST OCEAN FEATURES



AUGUST 1981

During August, the coolest SST's consistently occurred along the coasts of Vancouver Island, southern Oregon, and northern California. For the first time this season, satellite imagery showed thermal structure in Queen Charlotte Sound, northwest of Vancouver Island, an area of complex mixing of oceanic water and estuarine and fjord runoff. Coastal upwelling was below normal along the entire coast this month, with the only significant episode occurring from August 7-12 along Oregon and northern California. Significant warming of more than 2°C occurred during the month at all coastal observation points, except Coos Bay (43°N 124°W) which recorded little change. Most of the coastal warming occurred during the last ten days of the month due to relaxation of normal northwesterly winds. Offshore, the ocean buoy at 42°30N 130°W recorded SST increases of 2°C during the month, while the buoy at 46°N 131°W showed periodic 1-2°C fluctuations, but no clear trend.



Analysis Techniques

Thermal boundaries are determined from a combination of enhanced infrared satellite imagery and ship and buoy observations. Identification of these features by satellite is limited by cloud cover.

Key

.,o,x,⊙,+ = thermal boundaries
W = warm
C = cold
(3) = date of feature
(dashed) = outline of water mass feature

NORTH PANEL

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Seattle Ocean Services Unit
National Weather Service/NOAA
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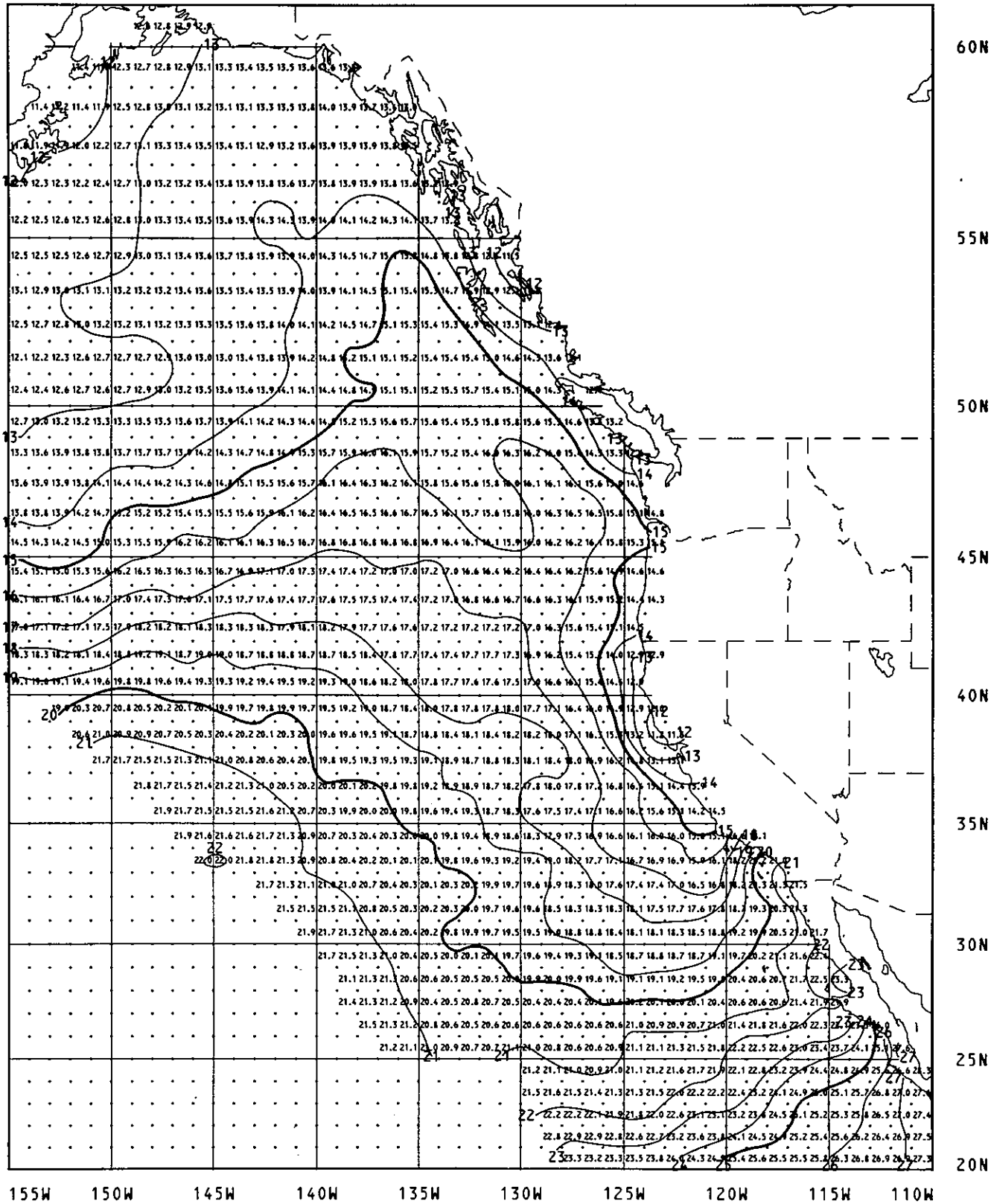
Bin C15700
Seattle, WA 98115
206/527-6105

SOUTH PANEL

Larry Breaker
Satellite Field Service Station
National Earth Satellite Service
NOAA
660 Price Avenue
Redwood City, CA 94063
415/364-2422

In the south panel, most SST's are less than 1°C below normal for August and increased about 0.5-1.0°C since July. In the NW corner SST's increased 1-2°C. South of 34°N and east of 119°W SST's remain 2-3°C above normal, except within 50 km of the coast south of 32°N. Upwelling continues along the coast north of 34°N, although, not as intense due to slightly weaker coastal winds. Data buoy SST ranges from August 1-10 are 9.6-11°C at Pt. Arena (39°N 124°W), 11-12.3°C at Bodega Bay (38°N 123°W), 12.3-13.9°C at Half Moon Bay (37°N 123°W), and 13.1-16.7°C at Pt. Sal (35°N 121°W). The SST ranges from August 10-26 are about 12-16°C at Bodega Bay, Half Moon Bay, and Pt. Sal. Satellite imagery indicates upwelling fronts as far as 400 km offshore, and persistent upwelling within 50 km of the Baja coast south of 32°N.



West Coast
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August 1981

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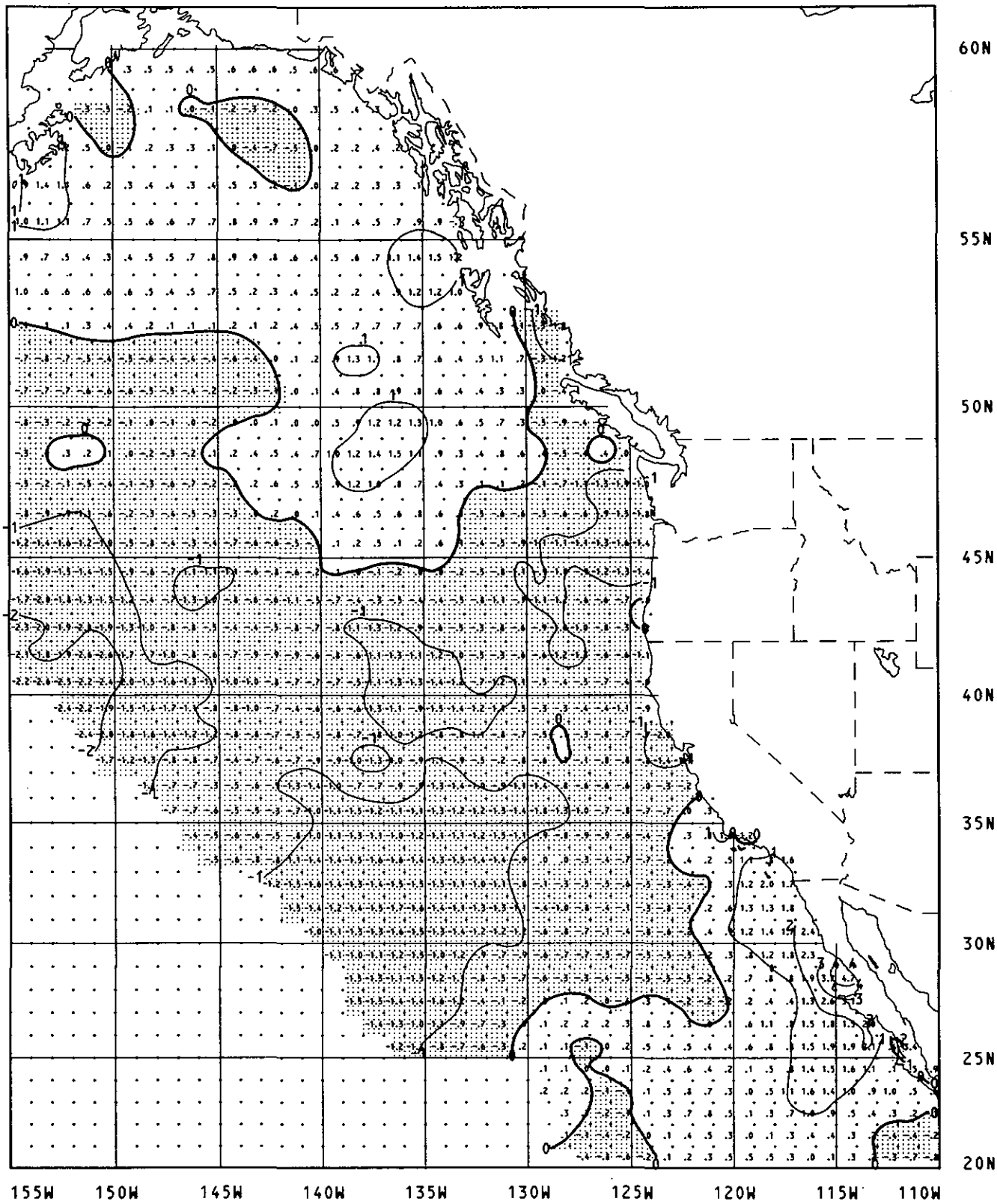

West Coast
SST--MONTHLY ANOMALY (°C)
August 1981

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EAST COAST OCEAN FEATURES

The end of this month's positions of the Gulf Stream System and its associated eddies are shown for the NW Atlantic and the Gulf of Mexico. The Gulf Stream and Loop Current boundaries are located by prominent sea surface temperature gradients or by the 15°C isotherm at 200m. Anticyclonic eddies are labeled a-z in the Gulf of Mexico and 1-99 in the NW Atlantic. Cyclonic eddies are labeled A-Z. Arrows on eddies indicate direction of circulation. Warm-core or anticyclonic eddies rotate clockwise; cold-core or cyclonic eddies rotate counterclockwise. The long arrows indicate the date of data used.

Feature positions are drawn from:
NOAA-6 satellite infrared imagery
Bathythermograph data,
National Meteorological Center of National Weather Service
Oceanographic Analysis (daily),
National Weather Service/National Earth Satellite Service

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Nat. Met. Center, W322
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Jenifer Wartha Clark
Synoptic Anal. Br., S/DS23
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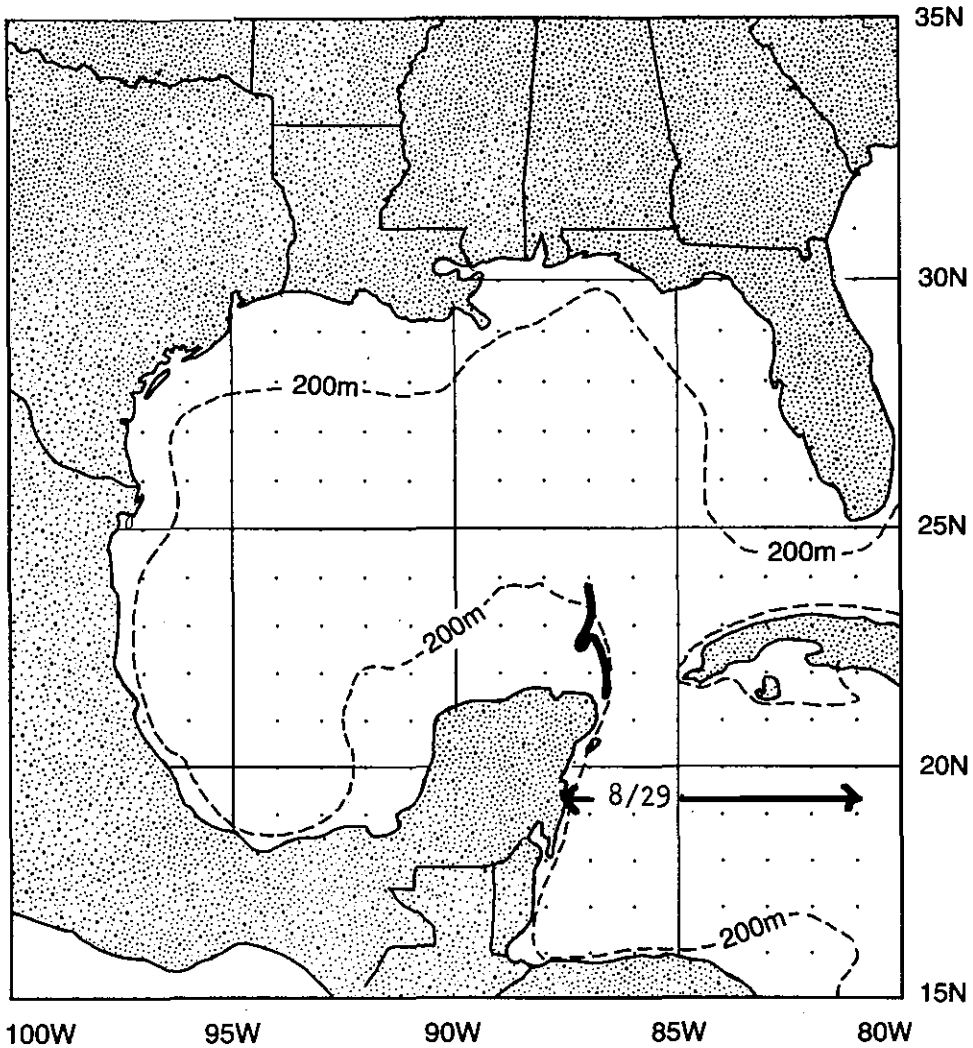
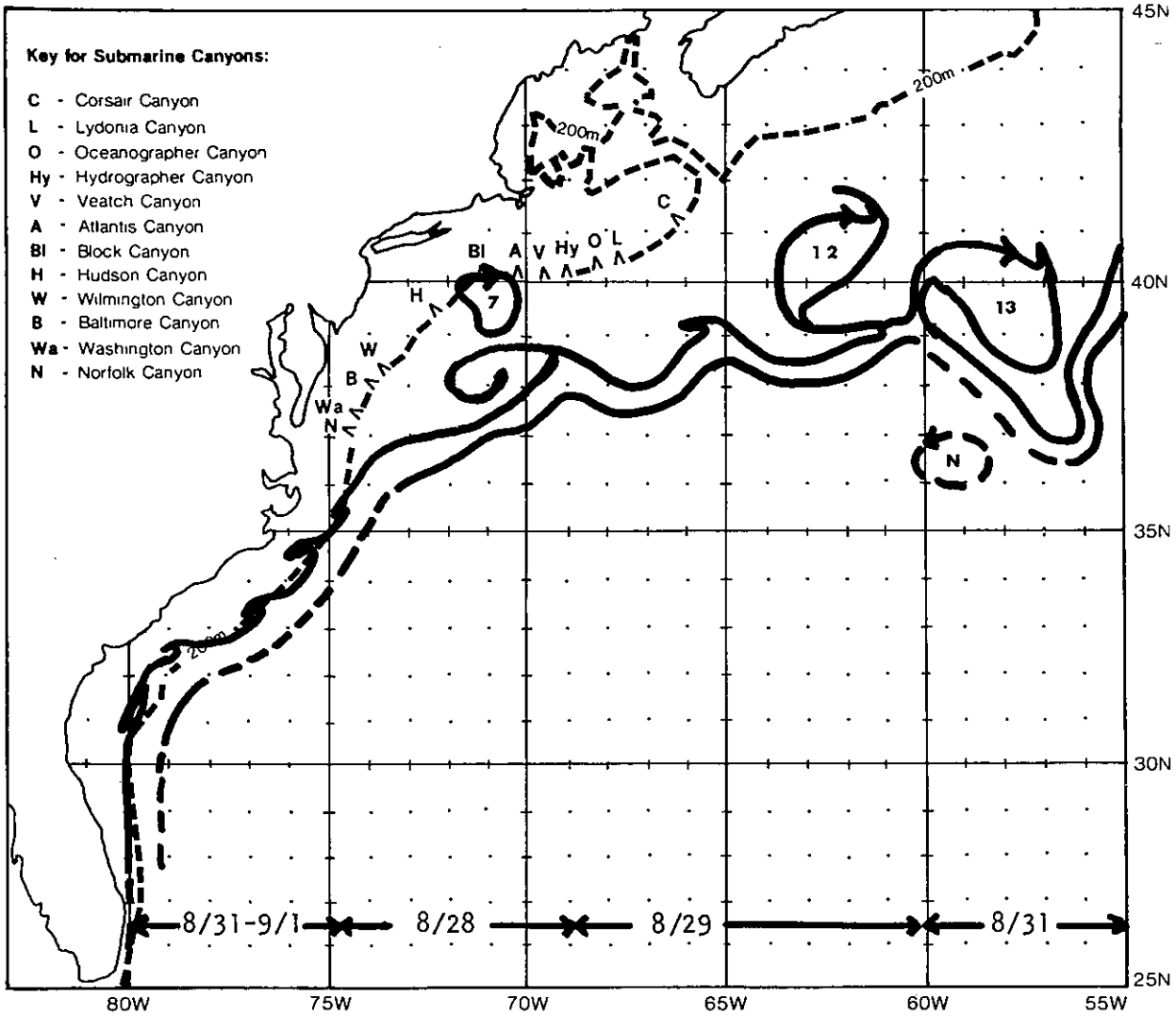


AUGUST 1981

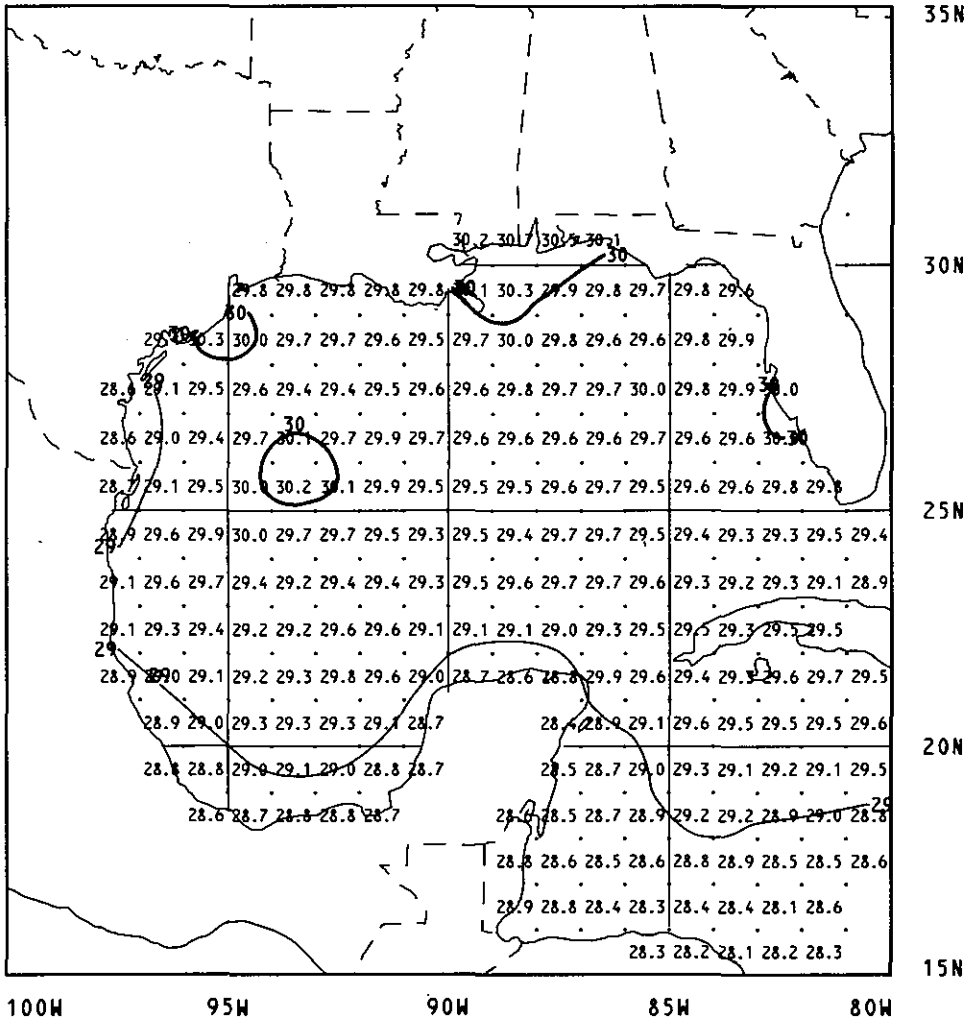
The small western section of the Loop Current seen in the end-of-August analysis is the only observation of the Loop Current during August. The absence of observations for the rest of the Loop is due to seasonal warming of the surface waters. This weakens the thermal gradients between the Loop and Gulf waters, a normal condition found during this time of year.



Prominent Gulf Stream features in the above analysis are the trough of the North Wall near 37°N 56°30W and new anticyclonic eddy 13. The absence of more cyclonic eddy observations is due to the seasonal warming.

Anticyclonic eddy 13 apparently formed in late August from a Gulf Stream meander. Anticyclonic eddy 12 translated 50 km N during August. Anticyclonic eddy 7 translated 210 km W. Cyclonic eddy N was last observed on August 13 after having translated 80 km WNW since July 27.

EAST COAST SST-
MONTHLY MEAN



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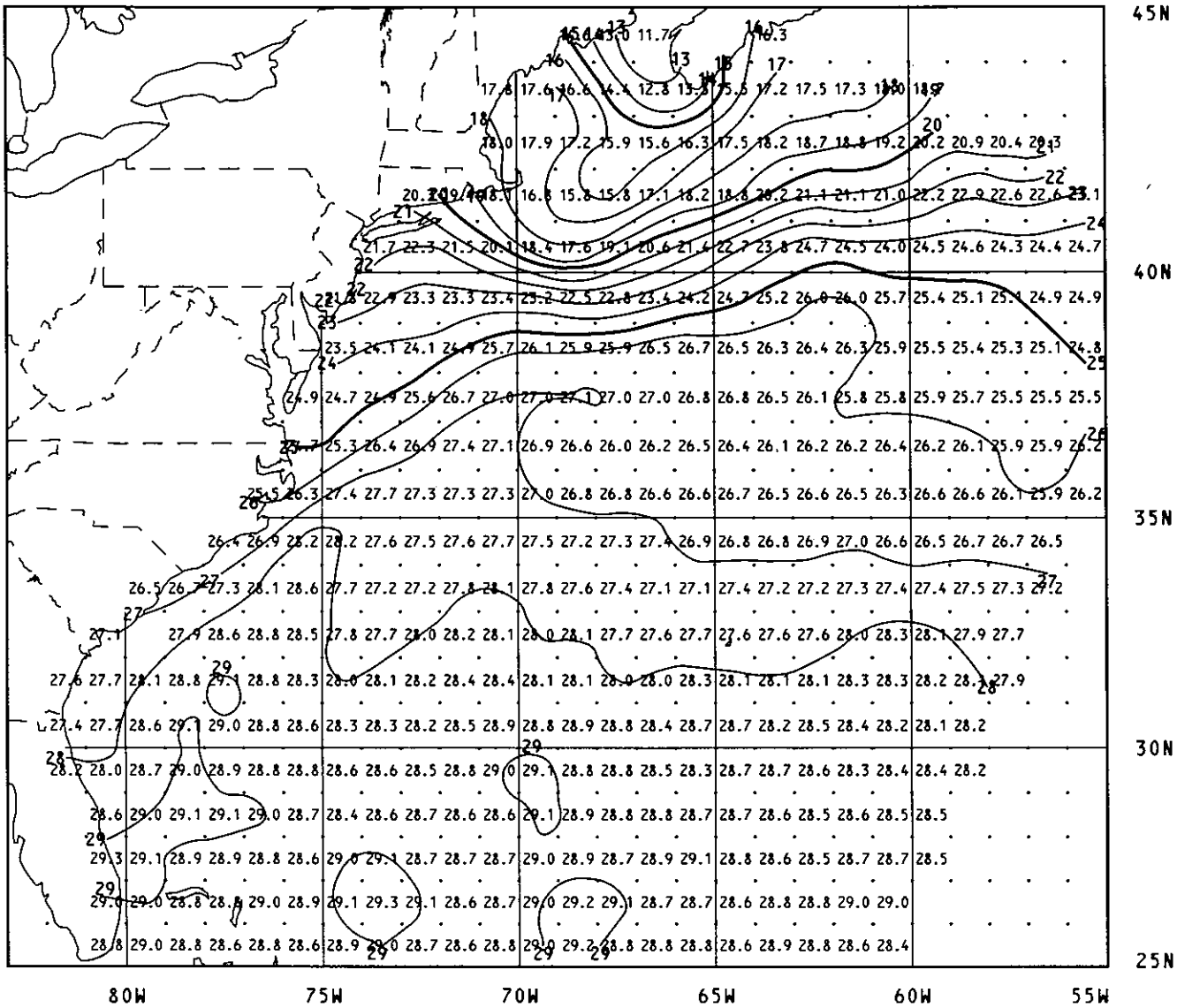

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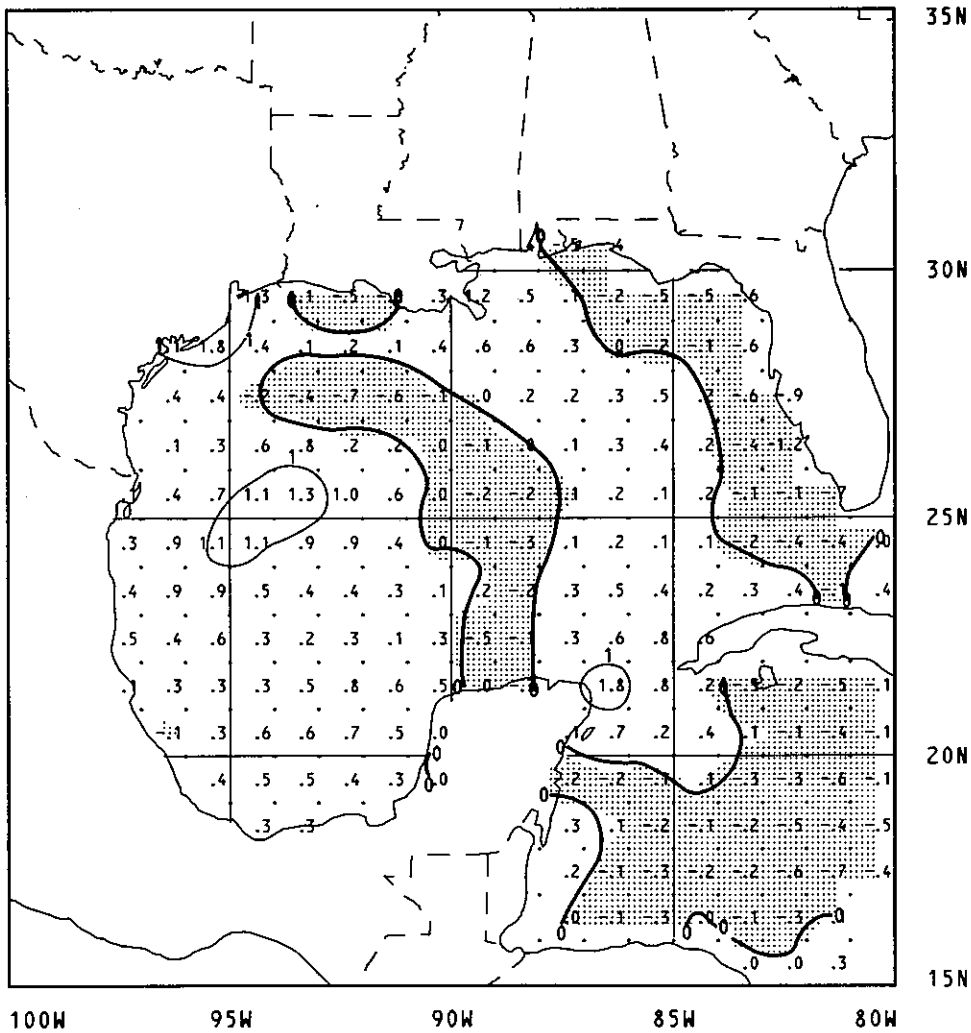

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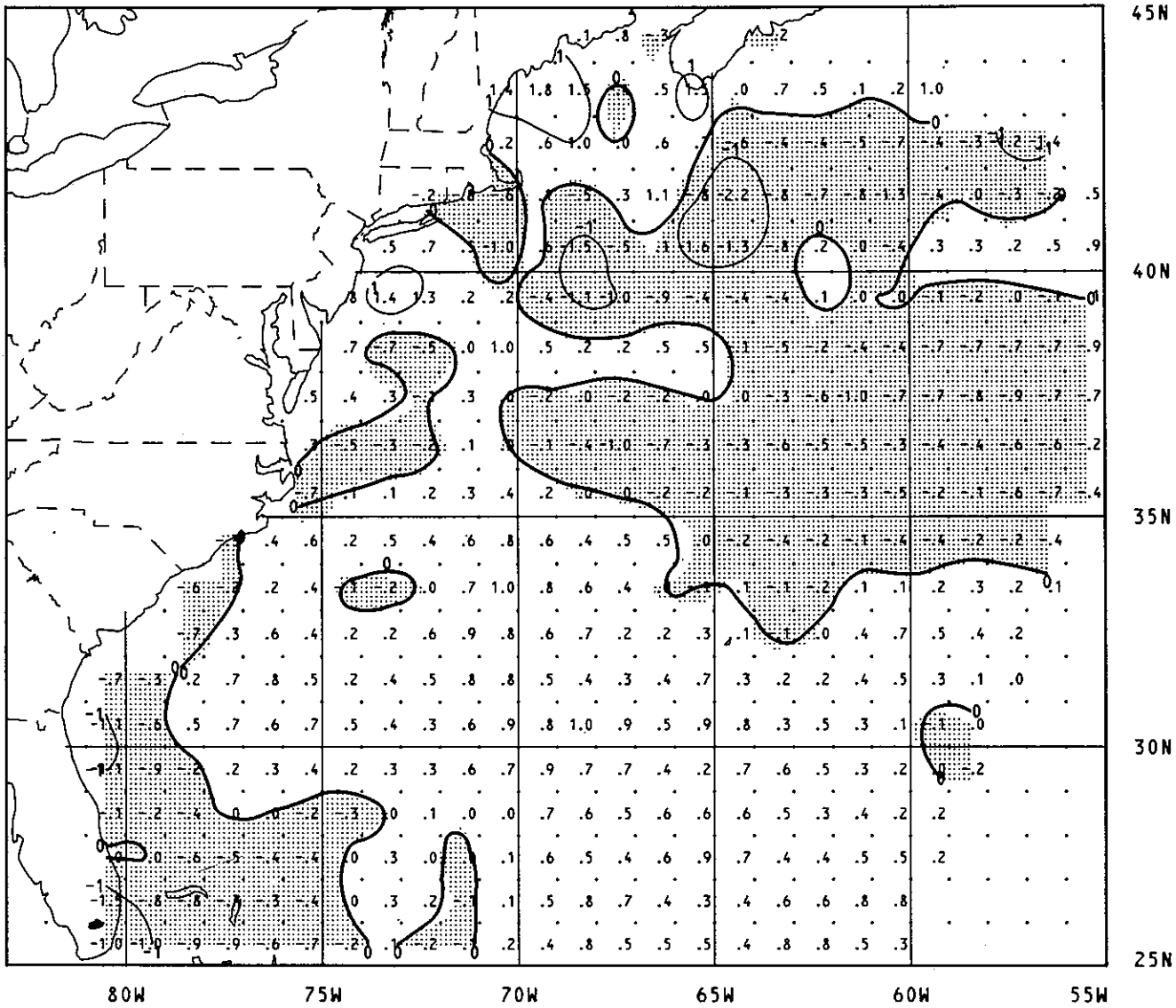

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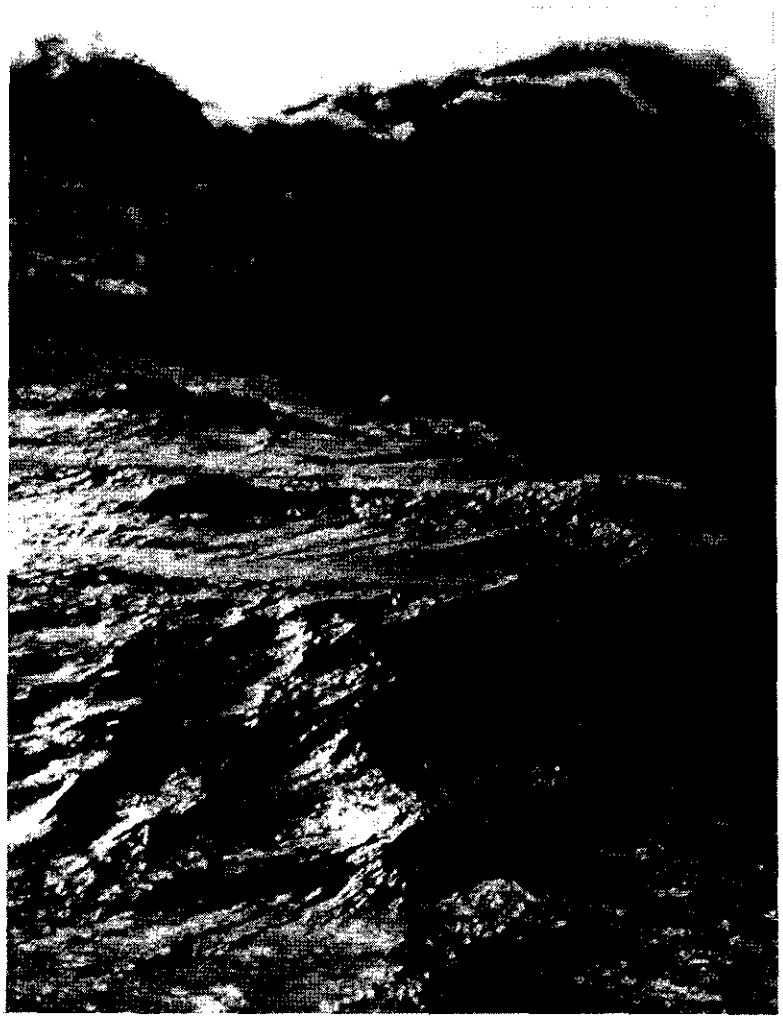

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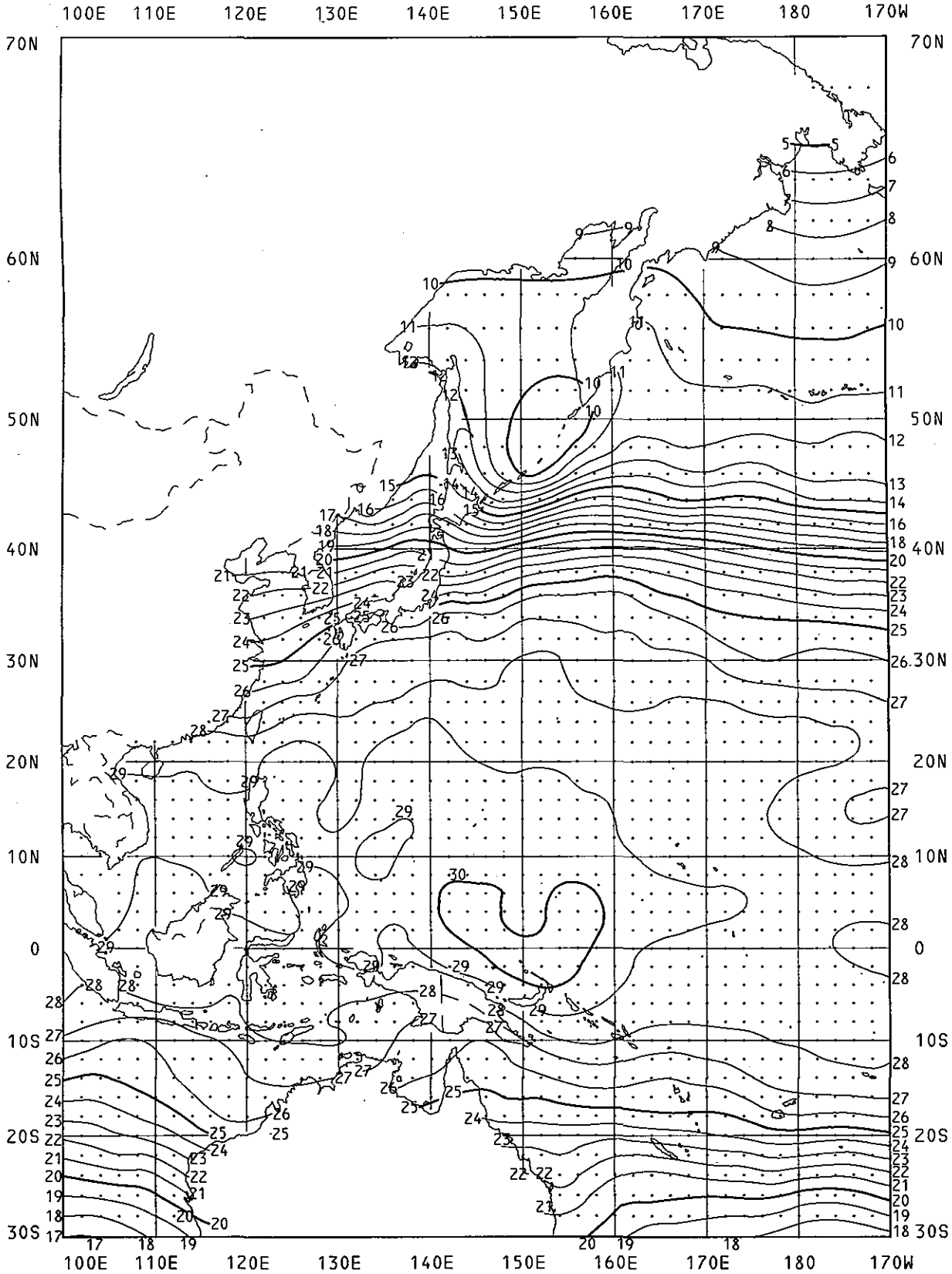

Western Pacific Ocean
SST--MONTHLY MEAN (°C)
September 1981

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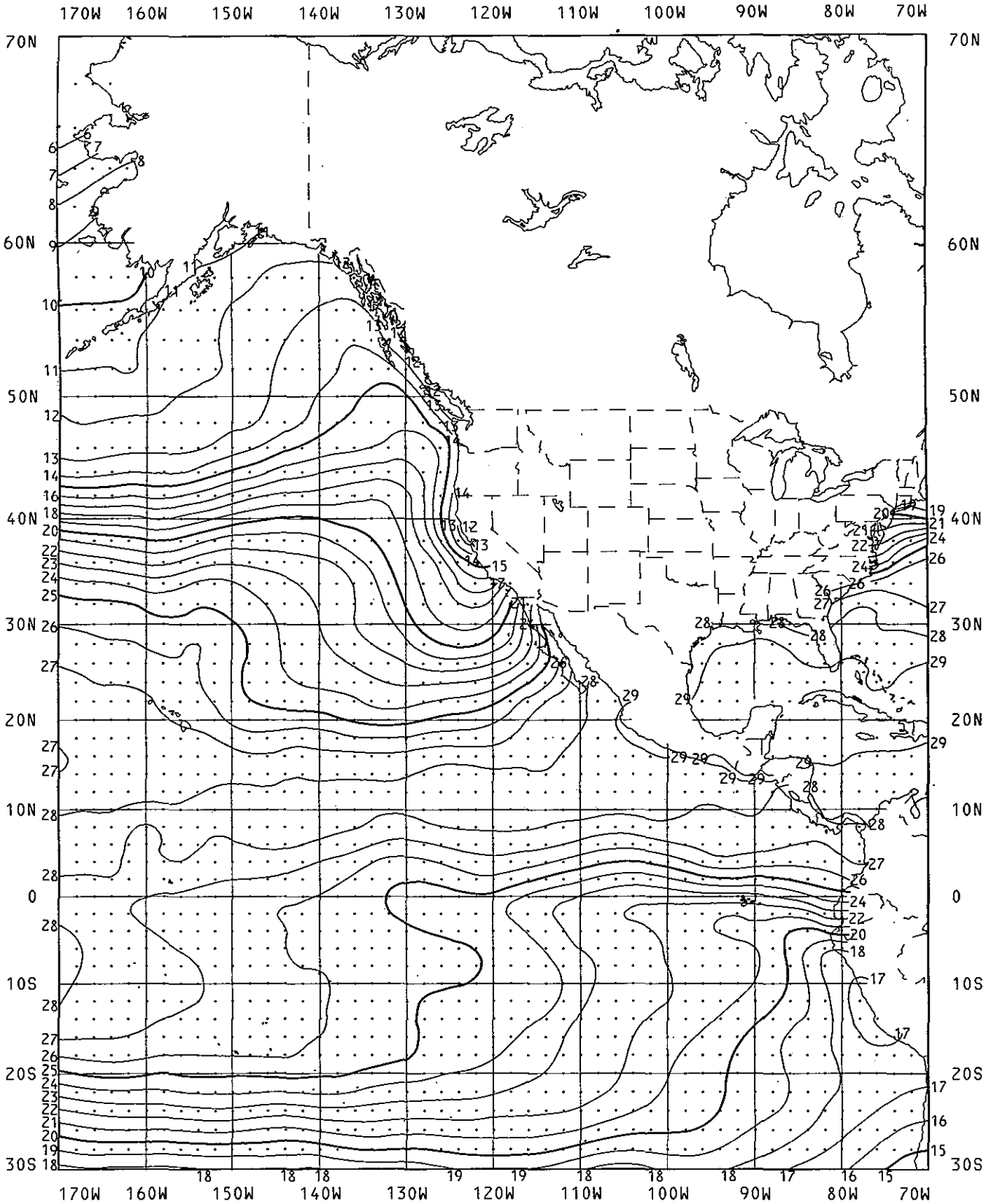

Eastern Pacific Ocean
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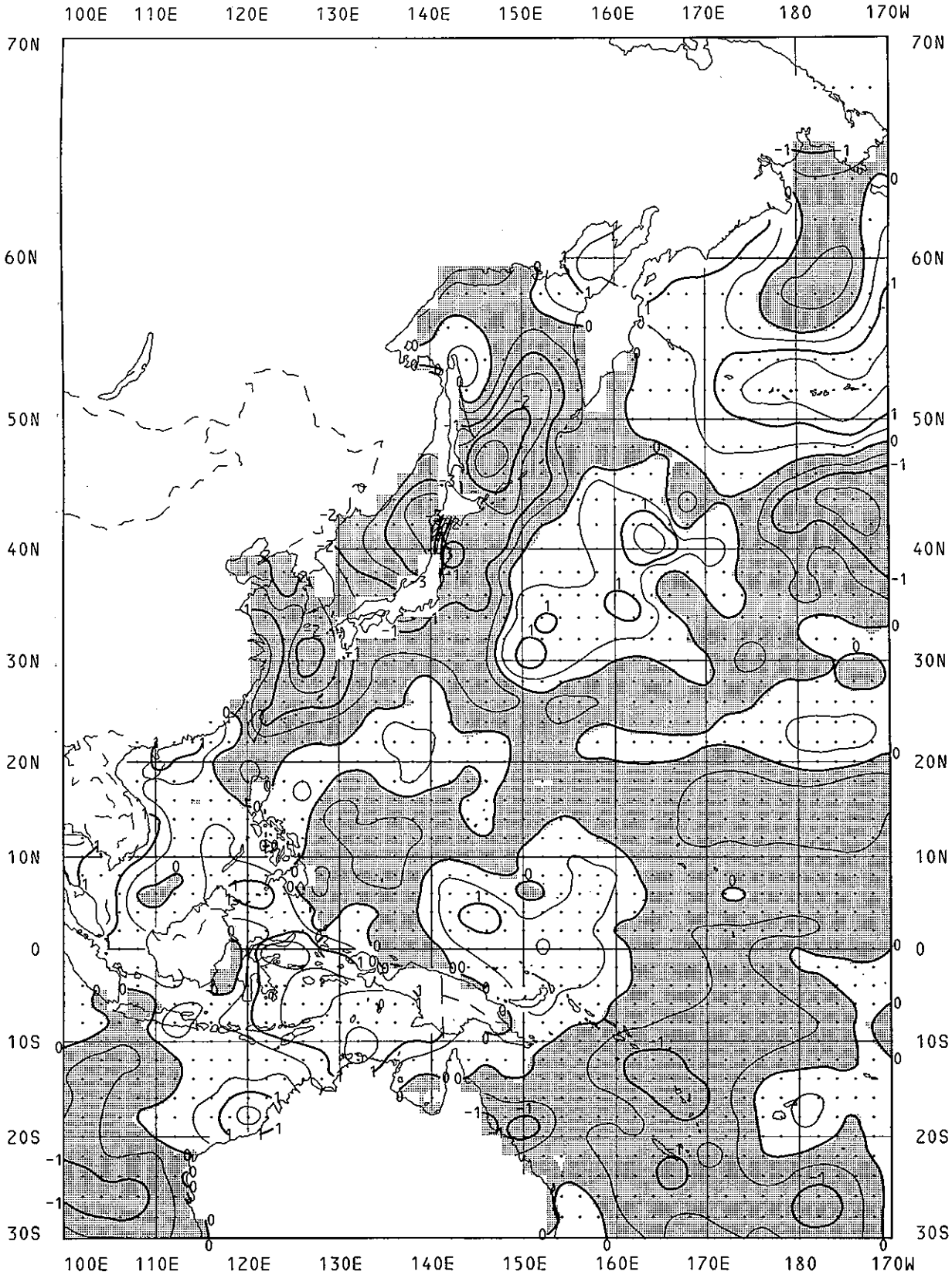

Western Pacific Ocean
SST--MONTHLY ANOMALY (°C)
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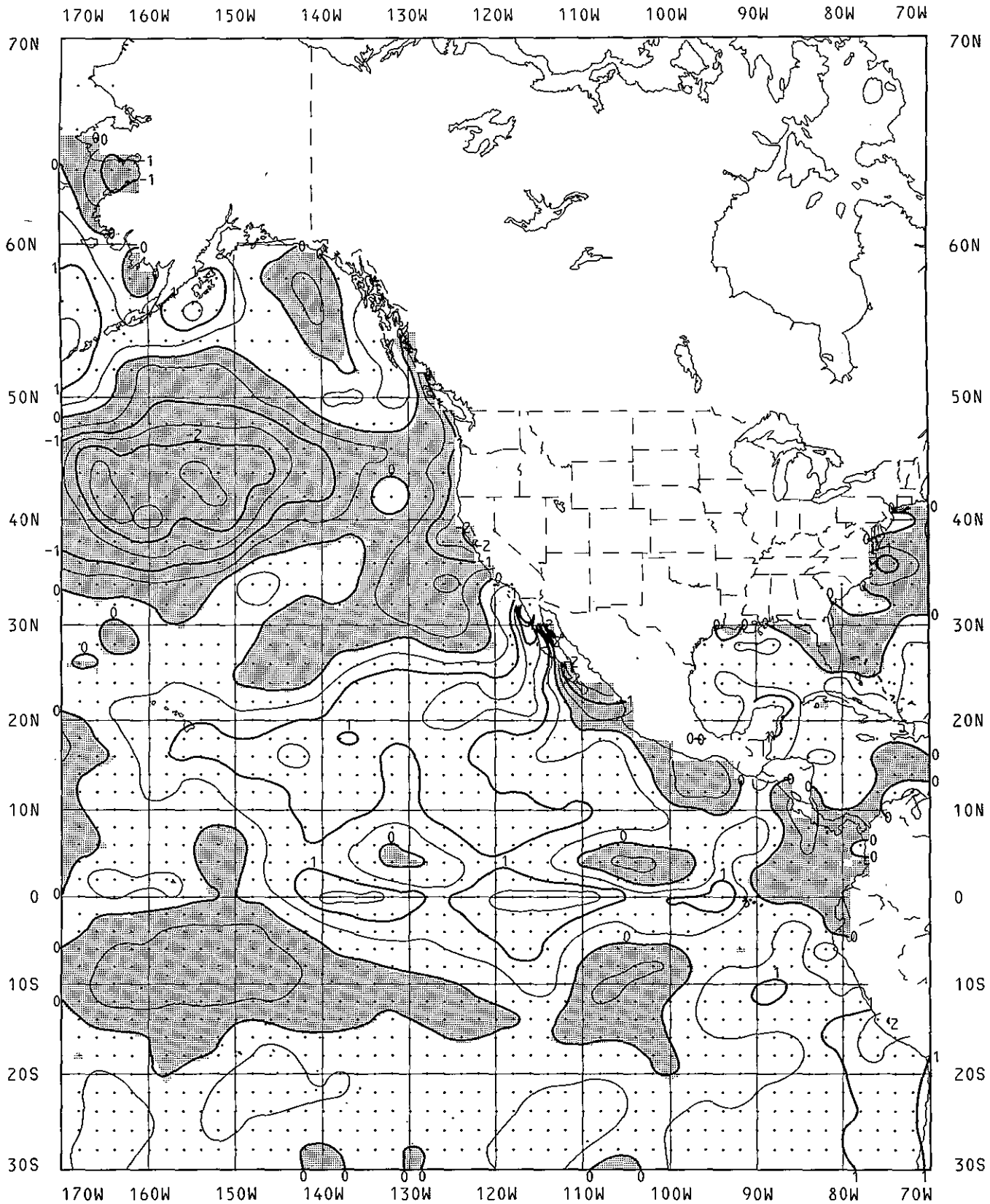

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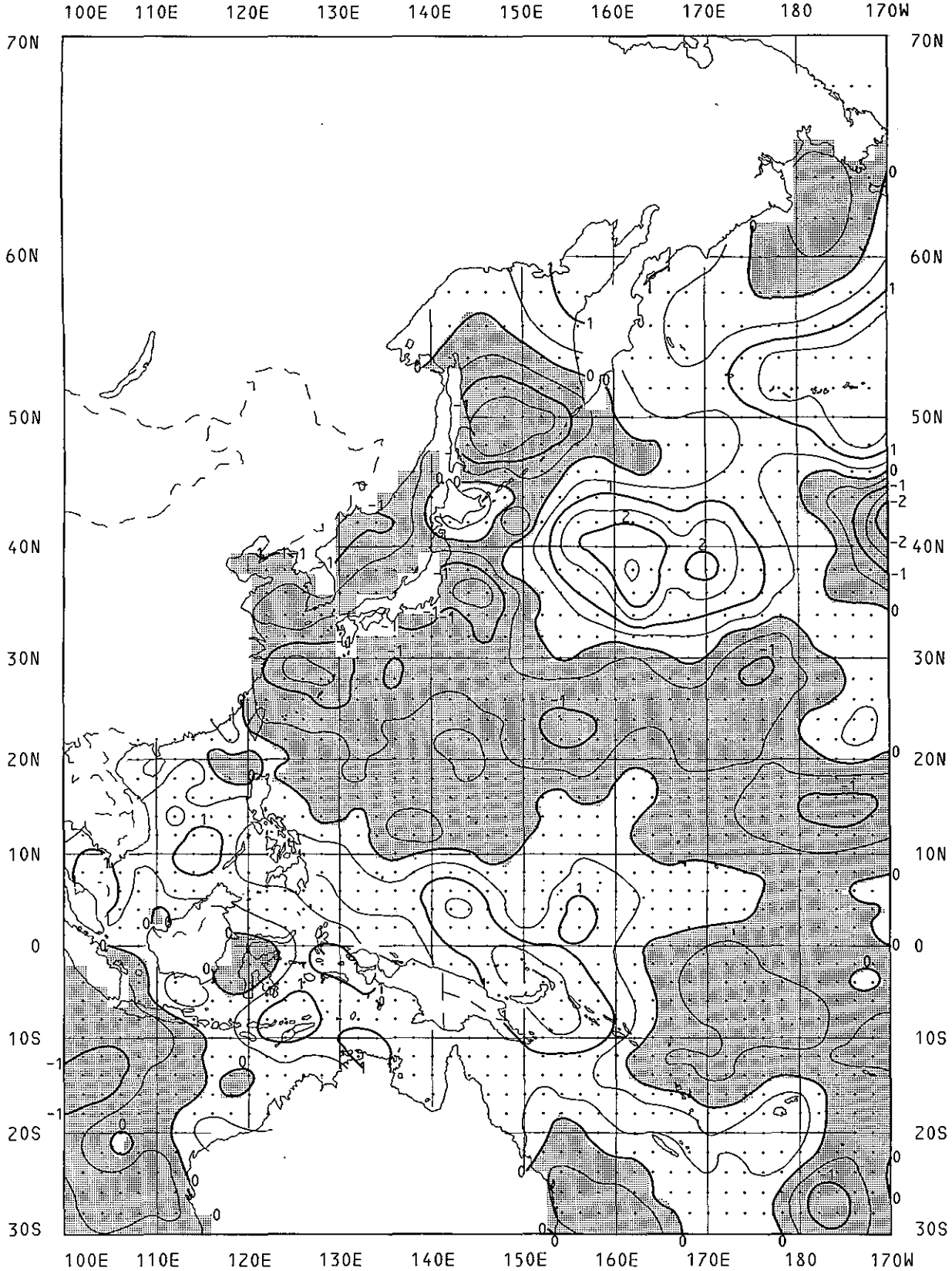

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SST--YEARLY CHANGE (°C)
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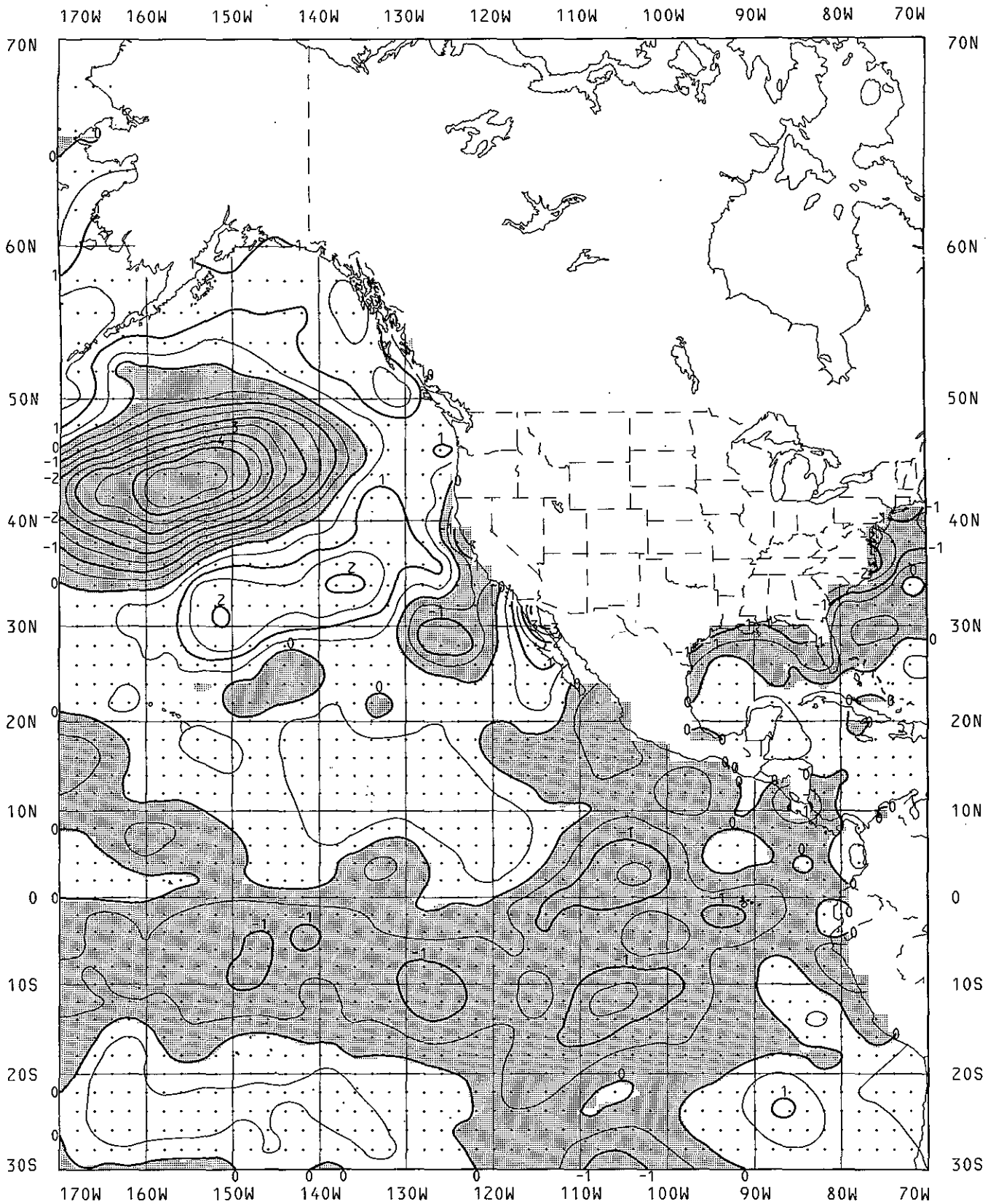

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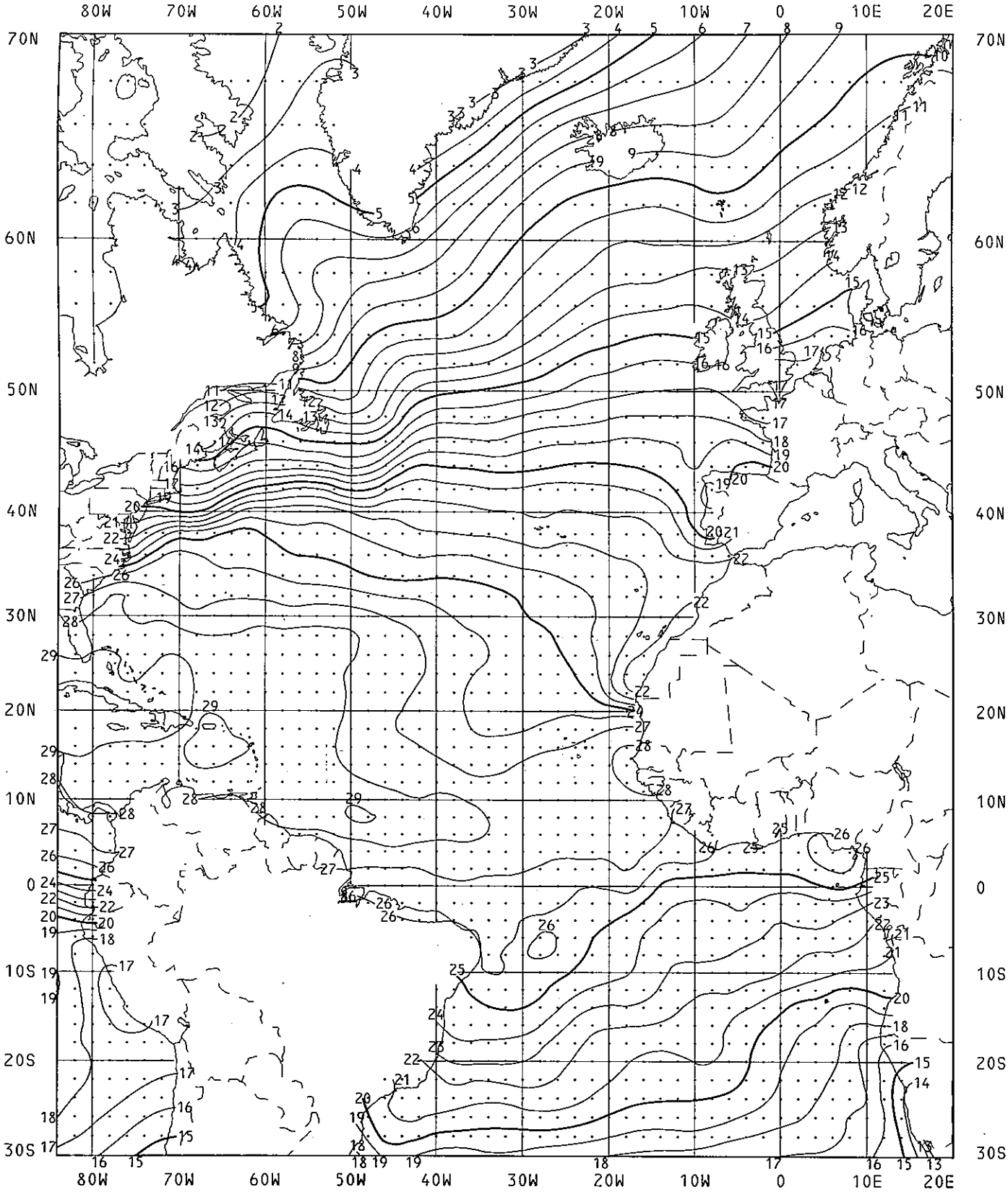

Atlantic Ocean
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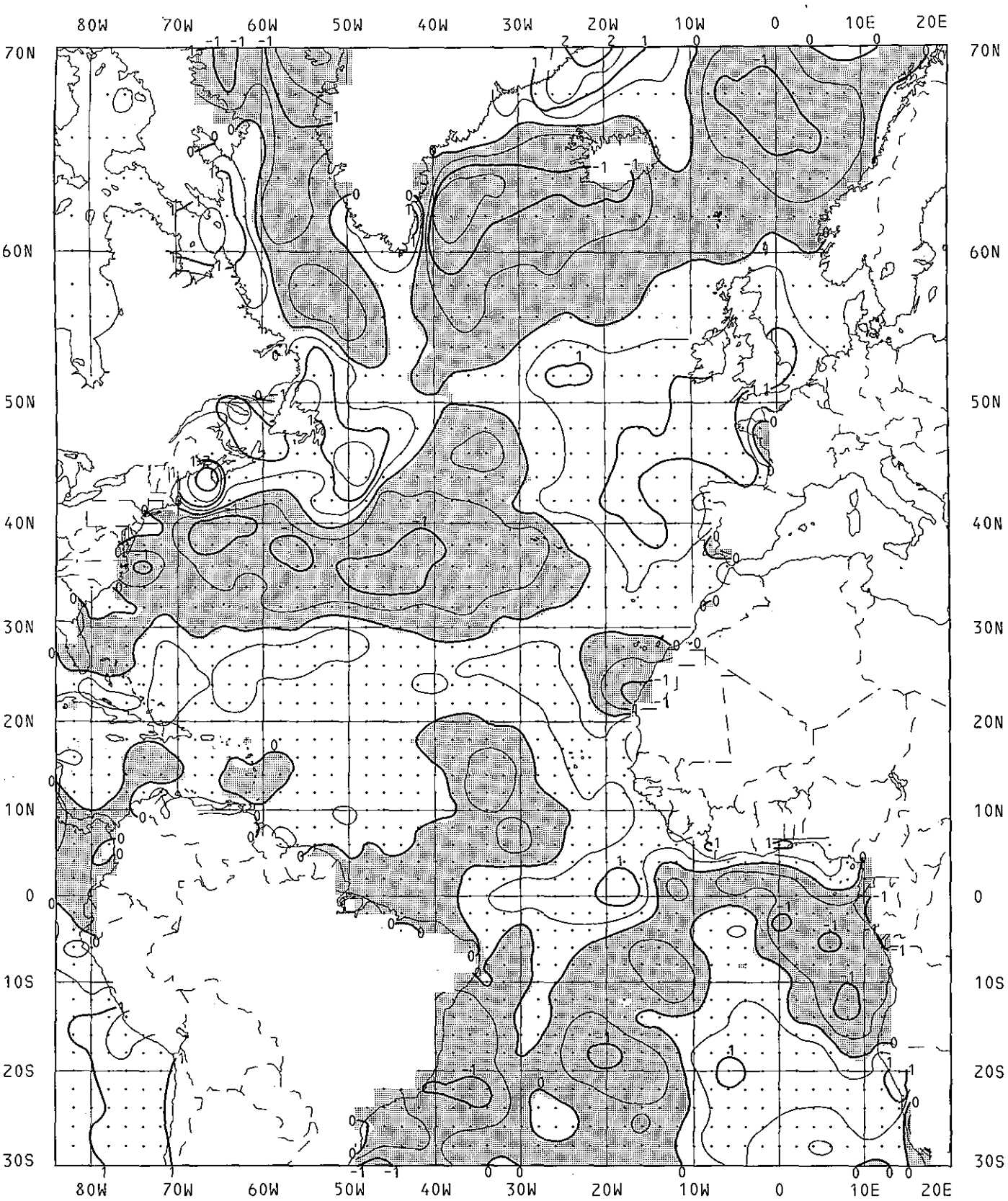

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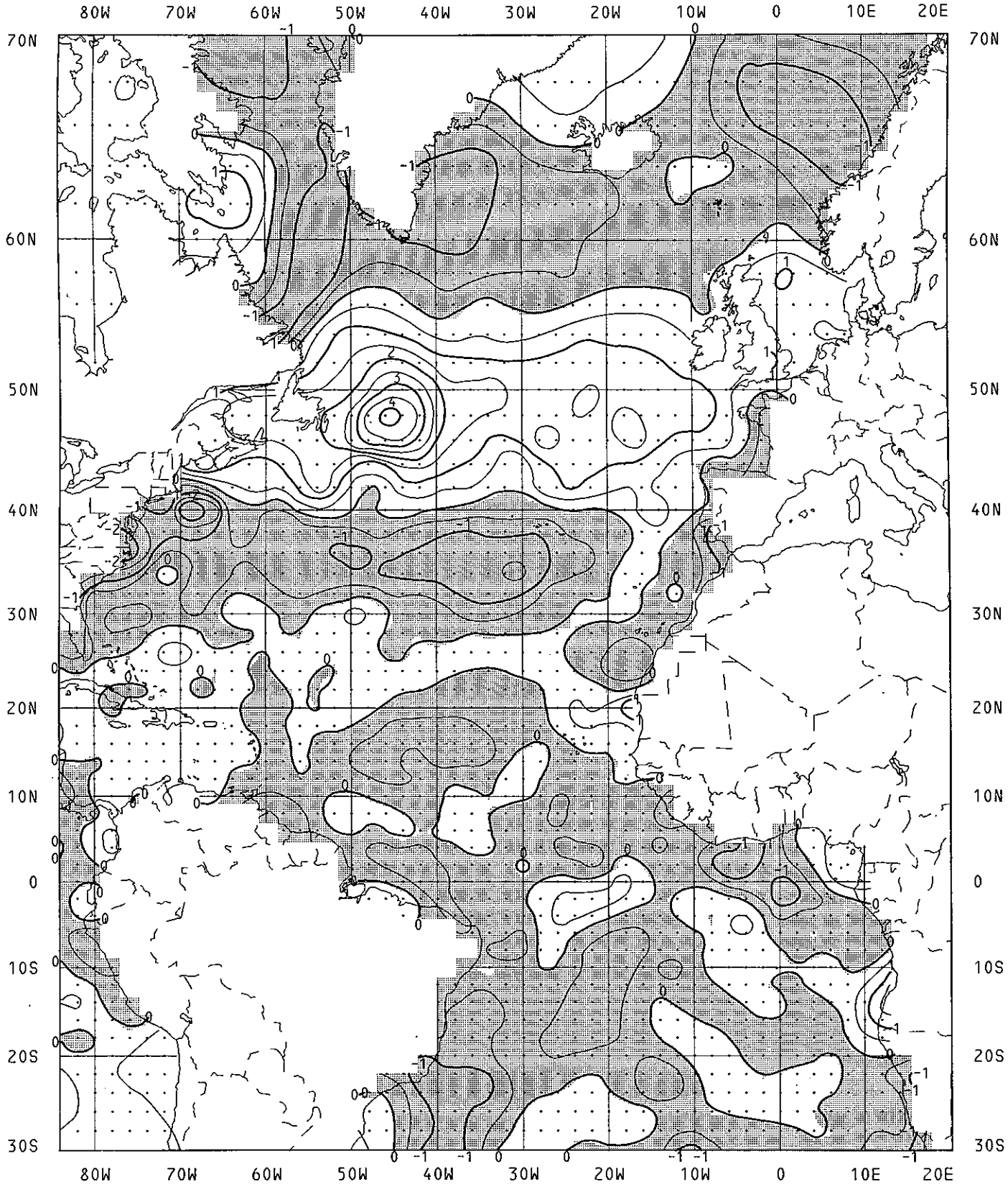

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REGIONAL ANALYSES

Bering Sea / North Slope Ice

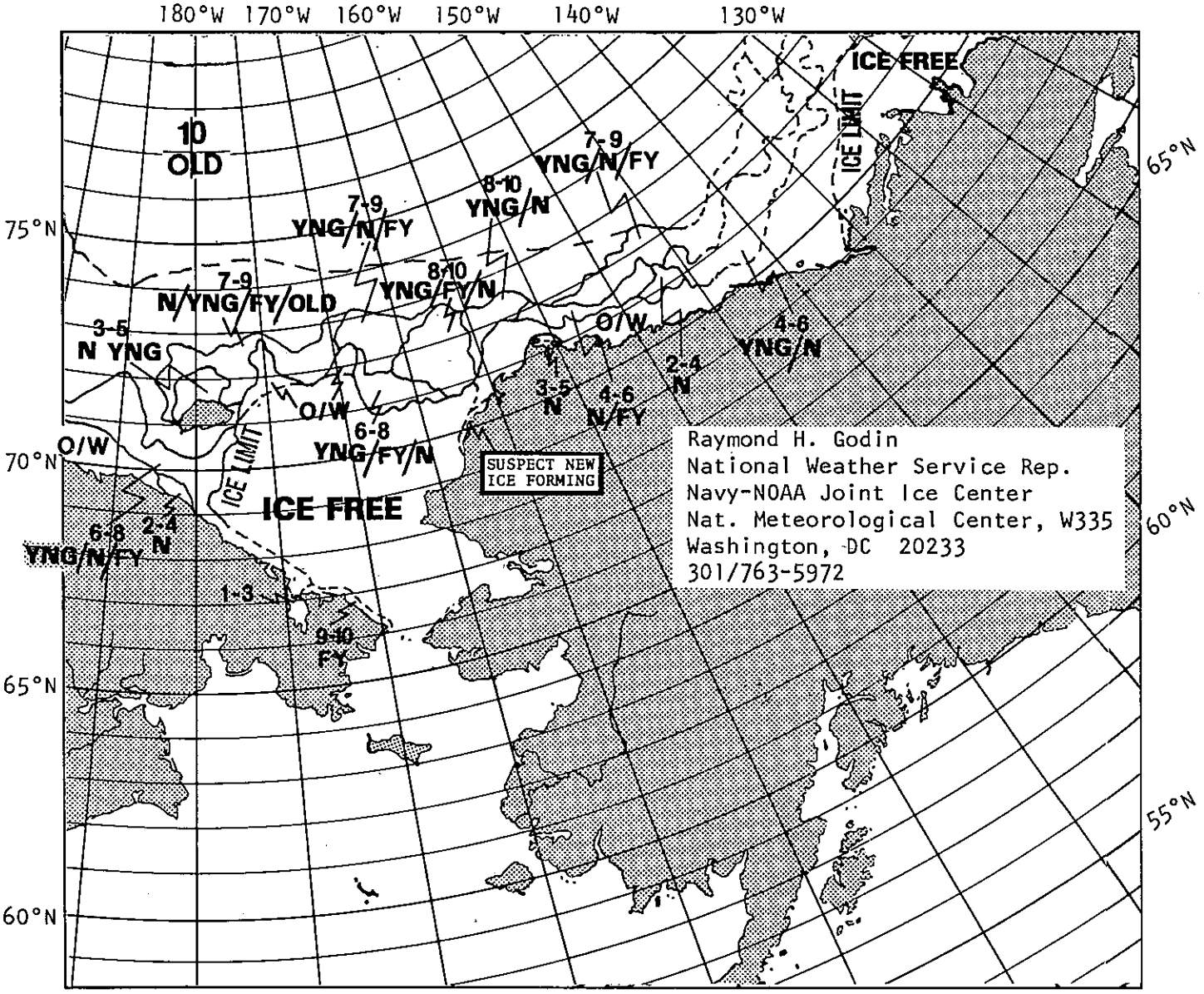
West Coast

- Ocean features
- Sea surface temperature
- SST anomaly

East Coast

- Ocean features
- Sea surface temperature
- SST anomaly

BERING SEA / NORTH SLOPE ICE ANALYSIS



Raymond H. Godin
National Weather Service Rep.
Navy-NOAA Joint Ice Center
Nat. Meteorological Center, W335
Washington, DC 20233
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KEY

ICE CONCENTRATION

4-6	Area 4-6 tenths ice-covered.
OW	Open water. Sea ice present in concentrations less than one tenth.
ICE-FREE	No sea ice. Ice of land origin (iceberg e.g.) may be present.

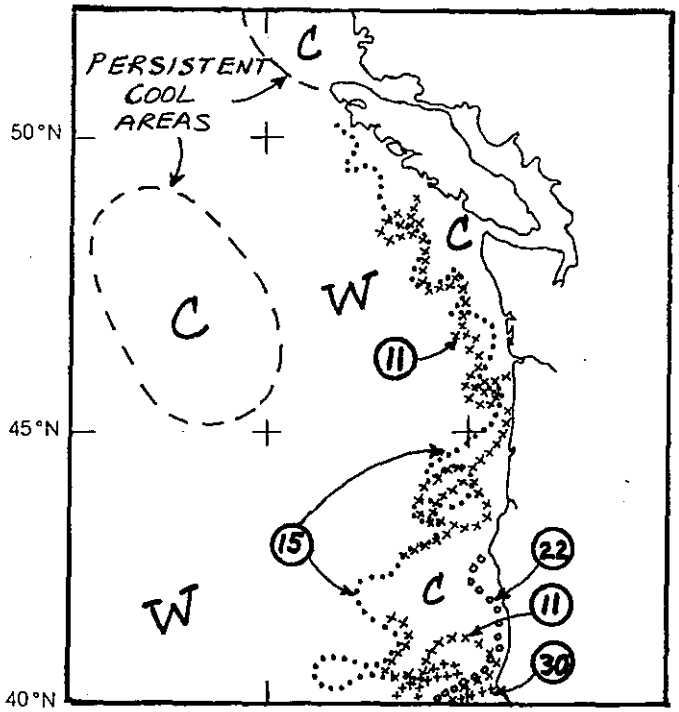
ICE THICKNESS (AGE)

OLD	Includes both multi-year and second-year ice. Generally 2-3.5m thick.
FY	Any or all first year ice types (30 cm - 2 m thick).
YNG	Young ice (10-30 cm thick).
N	New and nilas.
■	Fast ice. Sea ice which forms and remains fast along the coast.
120	Theoretical thickness of this season's growth (cm), based on freezing degree days (presented for first day of each month on first succeeding chart).
———	Ice boundary visually or satellite observed.
- - - -	Ice boundary estimated.

SEPTEMBER 1981

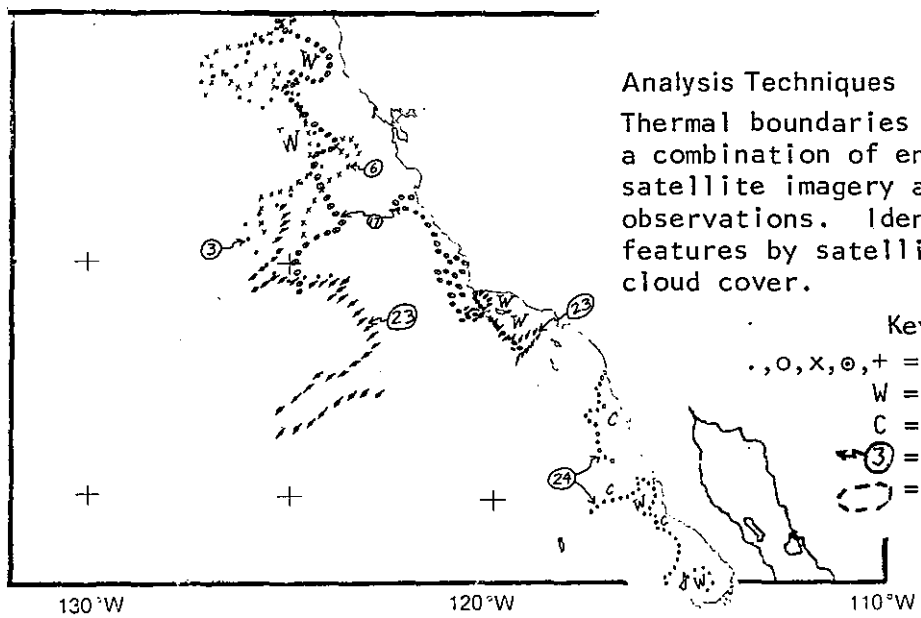
Easterly mean monthly geostrophic surface winds are observed in the north slope region. This approximates the direction of the climatological mean and is an abrupt shift from last month's anomolous westerly flow. Barrow (71°N 157°W) recorded a monthly mean air temperature of -4°C which is 3°C below normal. This is indicative of the temperatures affecting the north slope region. As a result of the easterly surface winds and local ocean currents, the lead southwest of Barrow has widened up to 100 km from last month's position. Within the ice pack, ice concentrations increased as new ice commenced forming in early September. By late September new ice is observed or suspected of forming in the shallow coastal areas between Barrow and Icy Cape (70°N 162°W). The shipping corridor along the Alaskan coast remained open throughout September. In the Chukchi Sea no significant changes in ice edge positions are observed.

WEST COAST OCEAN FEATURES



SEPTEMBER 1981

During September, SST's over the north panel area reached their maximum for the year, then began a slow decrease marking the onset of autumn transition. The offshore buoy at 46°N 131°W reached its monthly and seasonal maximum of about 17°C on September 8 and the buoy at 42°30N 130°W reached its maximum of 19°C on September 16. Persistent features include a cool coastal area northwest of and along Vancouver Island and a semi-stationary offshore cool body centered about 580 km west of the Washington coast. Coastal stations along Oregon and Washington showed a single cooling episode between September 12-16 due to a period of weak upwelling, the only such period during the month. During the same period, satellite imagery showed that the maximum monthly seaward extent of thermal boundary activity occurred from September 12-16.



Analysis Techniques

Thermal boundaries are determined from a combination of enhanced infrared satellite imagery and ship and buoy observations. Identification of these features by satellite is limited by cloud cover.

Key

.,o,x,⊙,+ = thermal boundaries
W = warm
C = cold
(3) = date of feature
(- - -) = outline of water mass feature

NORTH PANEL

Kent Short
Seattle Ocean Services Unit
National Weather Service/NOAA
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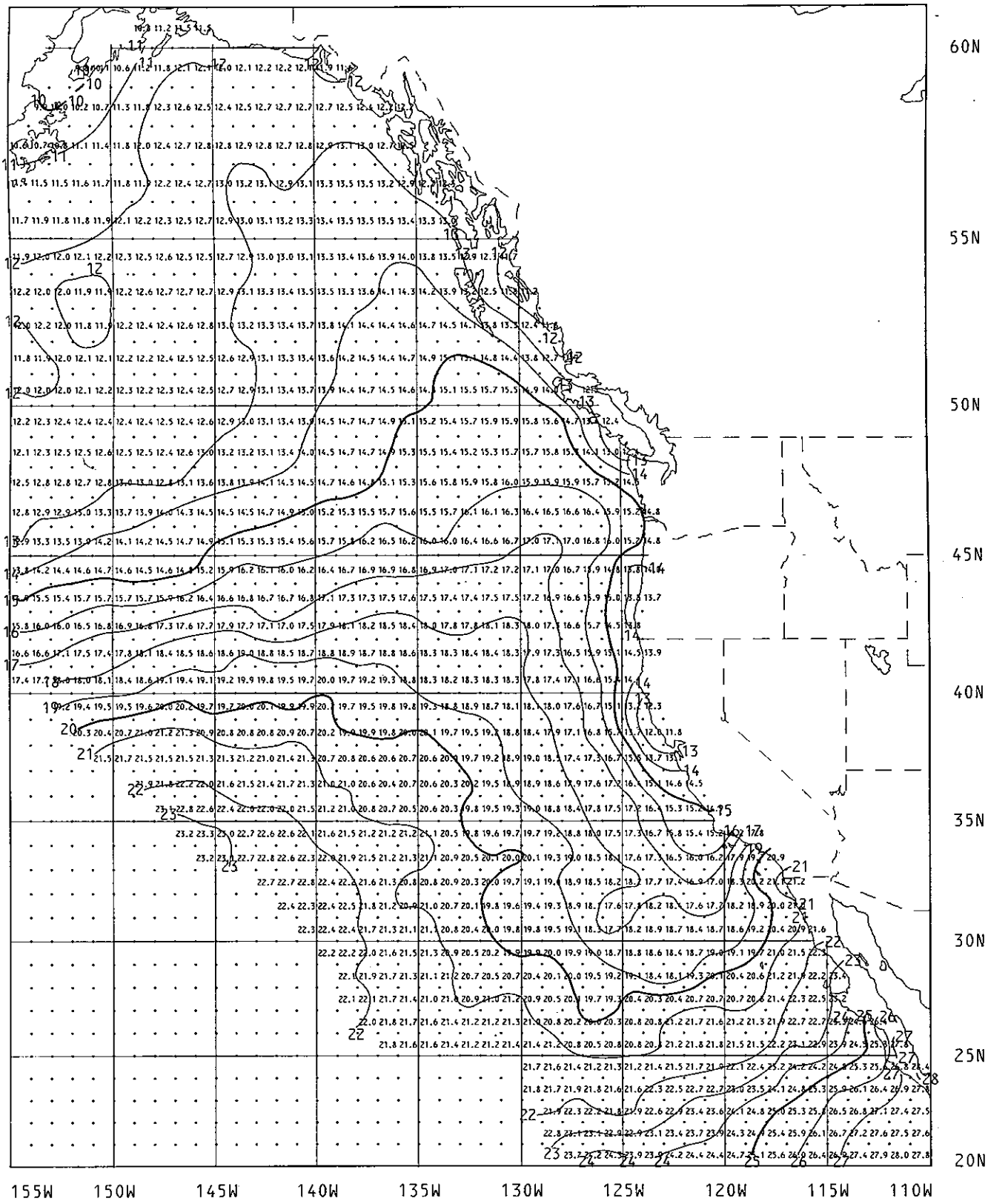
Bin C15700
Seattle, WA 98115
206/527-6105

SOUTH PANEL

Larry Breaker
Satellite Field Service Station
National Earth Satellite Service
NOAA
660 Price Avenue
Redwood City, CA 94063
415/364-2422

Sea surface temperatures generally increased in September, with the largest increases of about 0.5-1.5°C occurring over the northern half of the area. September SST's were below normal except in the area east of 121°W. Along the California coast north of Pt. Conception (35°N 121°W), winds were often weaker than normal causing slightly above average SST's locally. In the southern California Bight (between 32°N and 34°N), SST's were still 1-2°C above average, but nearshore upwelling reduced the persistent SST anomaly in this area. SST's ranged from about 12.7-16.7°C at the Pt. Sal buoy (35°N 121°W), from 10.9-15.0°C at Half Moon Bay (37°N 123°W), and from 9.6-14.5°C at Bodega Bay (38°N 123°W). Satellite imagery indicates continued coastal upwelling within about 100 km of the Baja coast.



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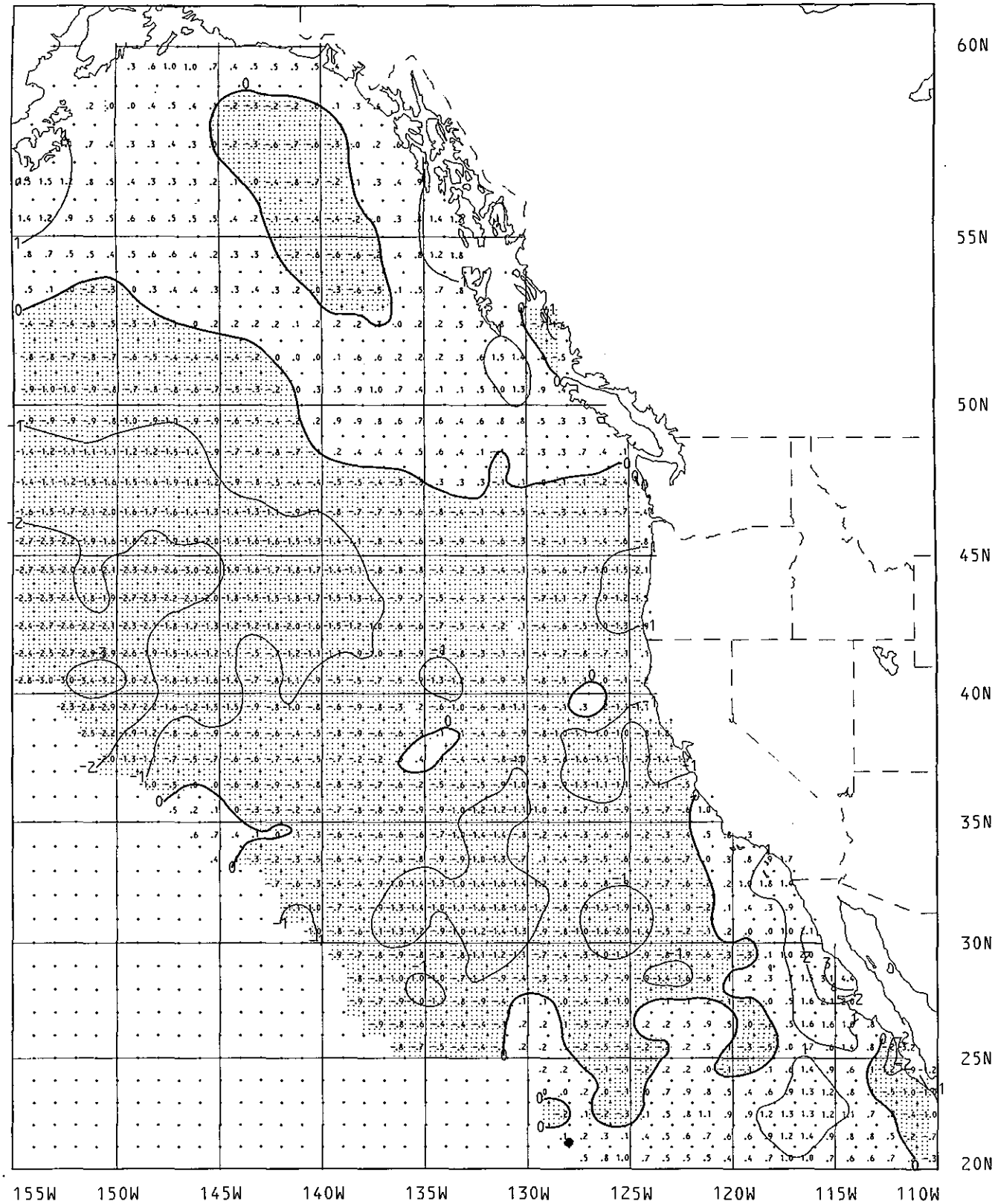

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EAST COAST OCEAN FEATURES

The end of this month's positions of the Gulf Stream System and its associated eddies are shown for the NW Atlantic and the Gulf of Mexico. The Gulf Stream and Loop Current boundaries are located by prominent sea surface temperature gradients or by the 15°C isotherm at 200m. Anticyclonic eddies are labeled a-z in the Gulf of Mexico and 1-99 in the NW Atlantic. Cyclonic eddies are labeled A-Z. Arrows on eddies indicate direction of circulation. Warm-core or anticyclonic eddies rotate clockwise; cold-core or cyclonic eddies rotate counter-clockwise. The long arrows indicate the date of data used.

Feature positions are drawn from:
NOAA satellite infrared imagery
Bathythermograph data,
National Meteorological Center of National Weather Service
Oceanographic Analysis (daily),
National Weather Service/National Earth Satellite Service

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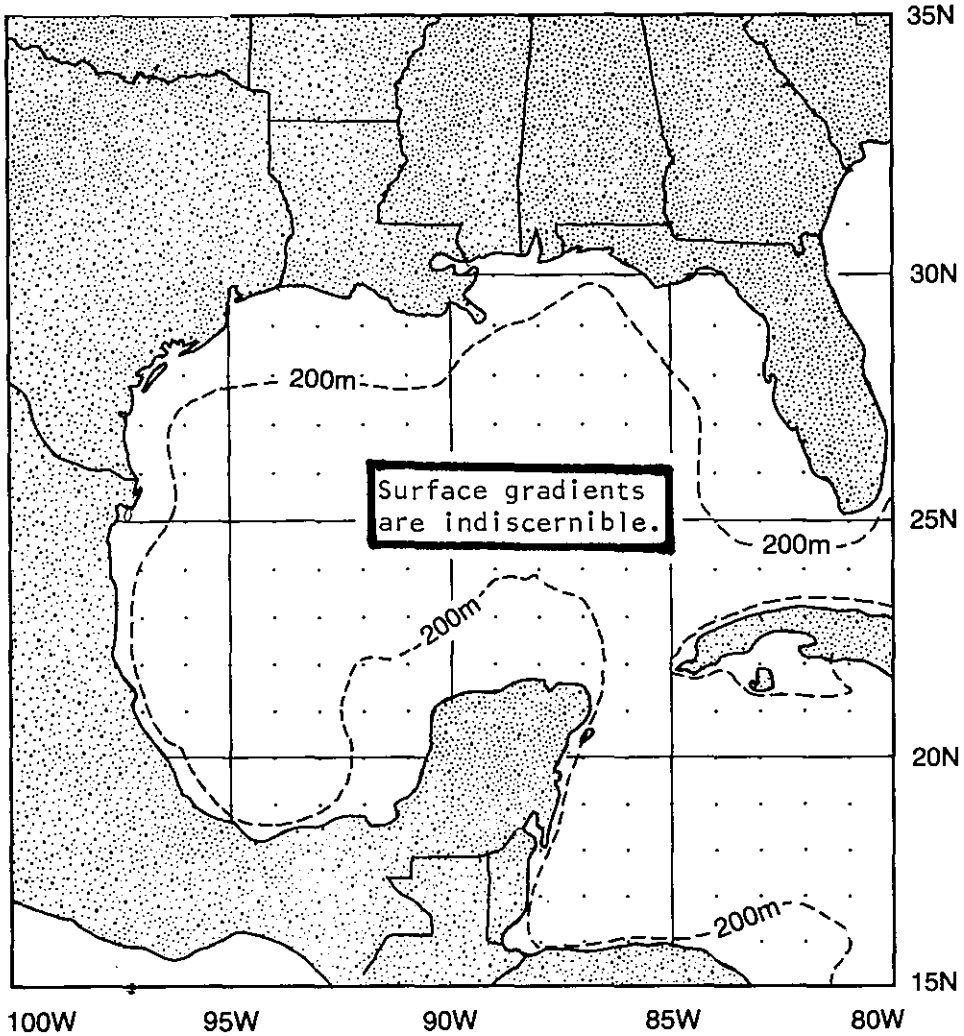
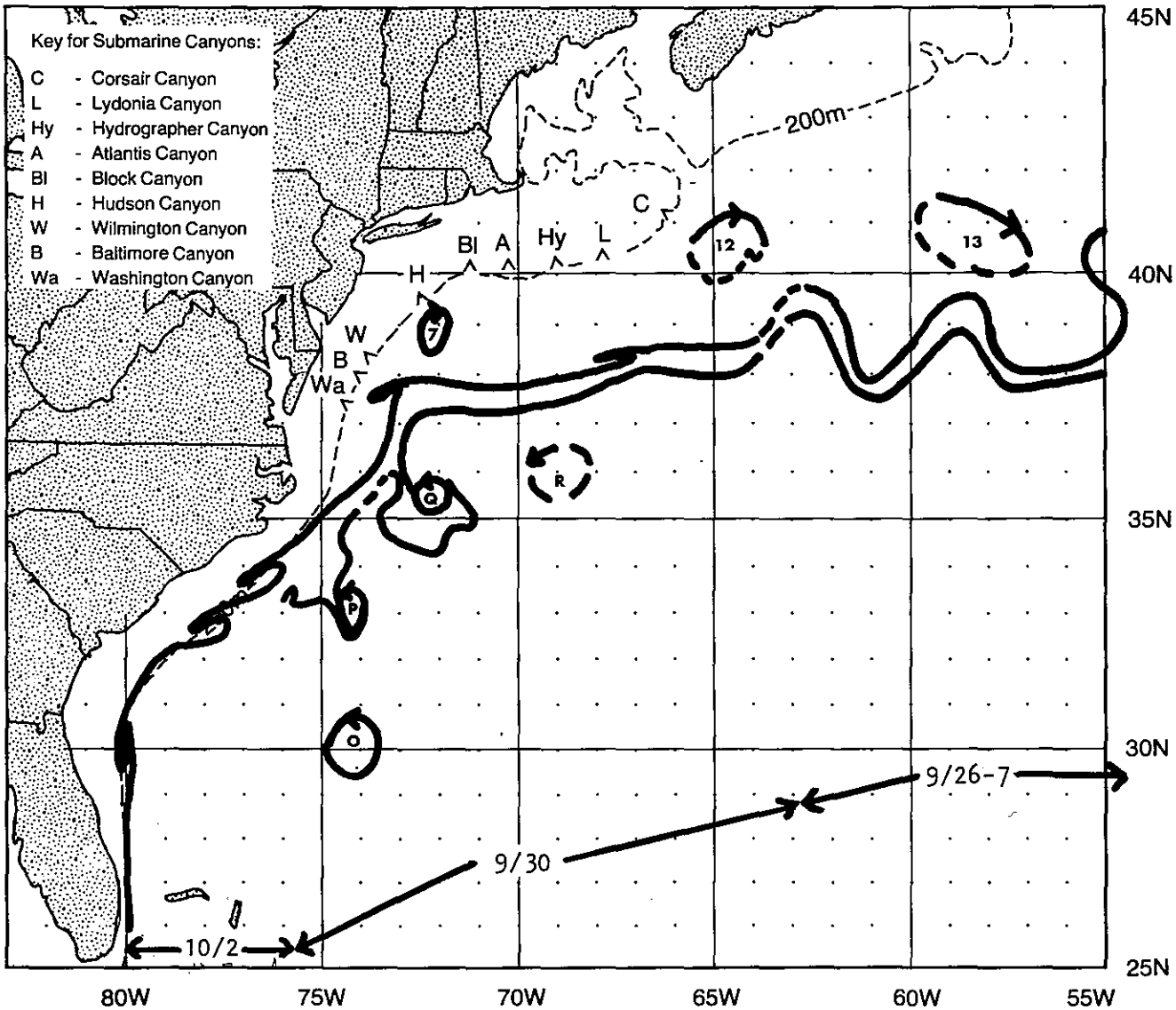


SEPTEMBER 1981

During September, Loop Current features in the Gulf of Mexico are not discernible by satellite imagery due to the seasonal warming of the surface waters. Therefore, the above chart does not contain end-of-September positions.

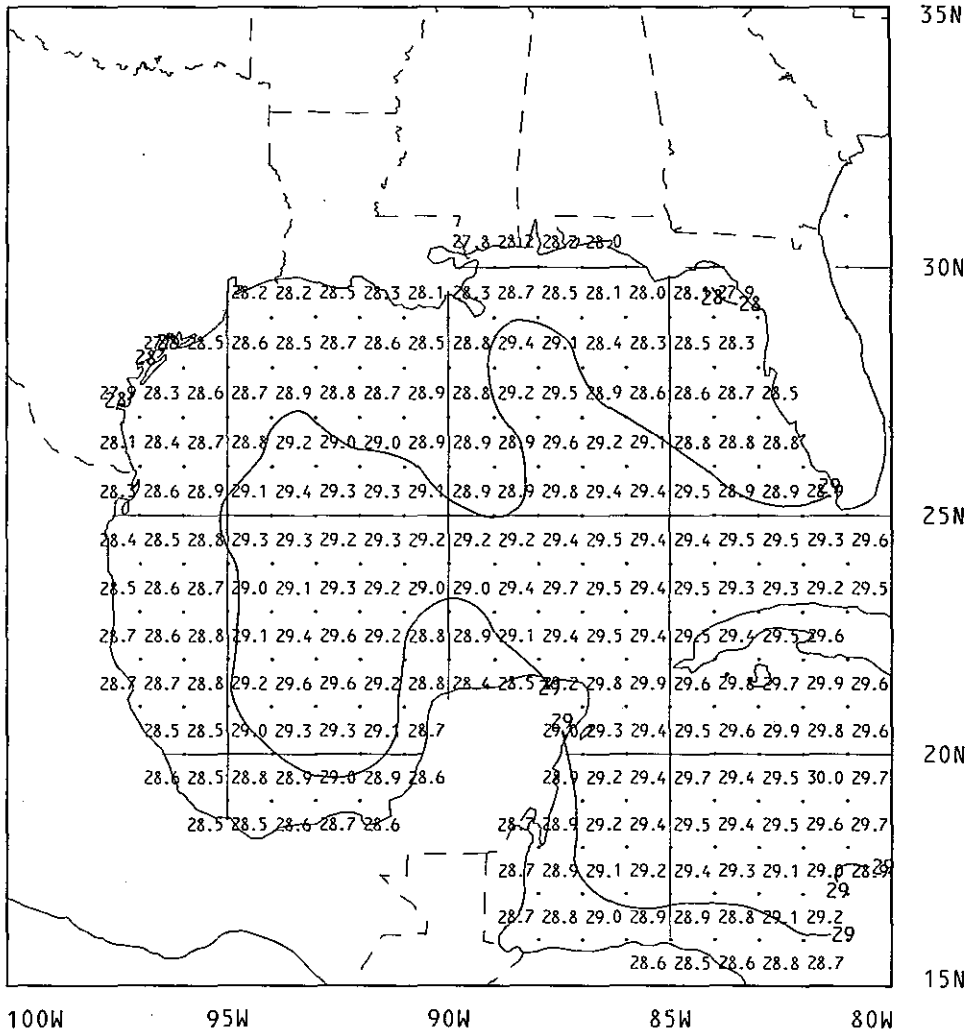


Prominent Gulf Stream features in the analysis are the unusual high amplitude wave in the Stream near 73°W and the two meanders in the Stream near 62°30 W and 59°W.

No anticyclonic eddies were formed or absorbed in the analysis area during September. Anticyclonic eddy 7 translated 150 km SW during September. Eddy 12 translated 195 km W. Eddy 13 was observed interacting with a Gulf Stream meander during mid-September, but has since broken away. Eddy 13 translated about 130 km NNW during the month.

The cyclonic eddies shown in the analysis may be previously observed eddies, but due to the long time lapse between observations, at least two months, they are given new names. Cyclonic eddy O was identified by the Naval Eastern Oceanography Center. Cyclonic eddy P was first observed on September 15 near 33°N 75°W and has since translated about 80 km E. Eddy Q was first observed on September 14 and has since translated about 90 km N. Eddy R is drawn from September 21 satellite imagery.

EAST COAST SST-
MONTHLY MEAN



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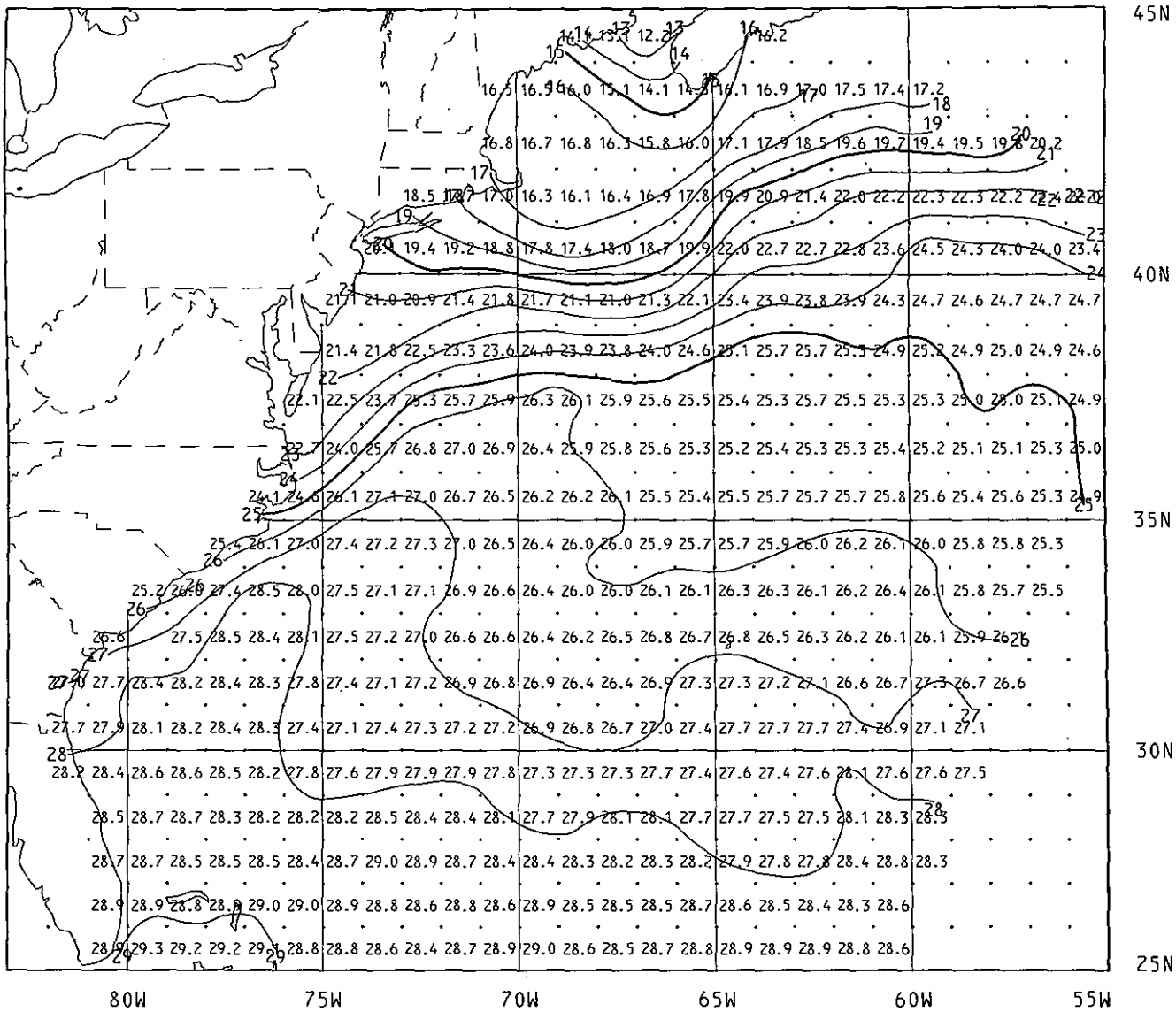

NW Atlantic Ocean
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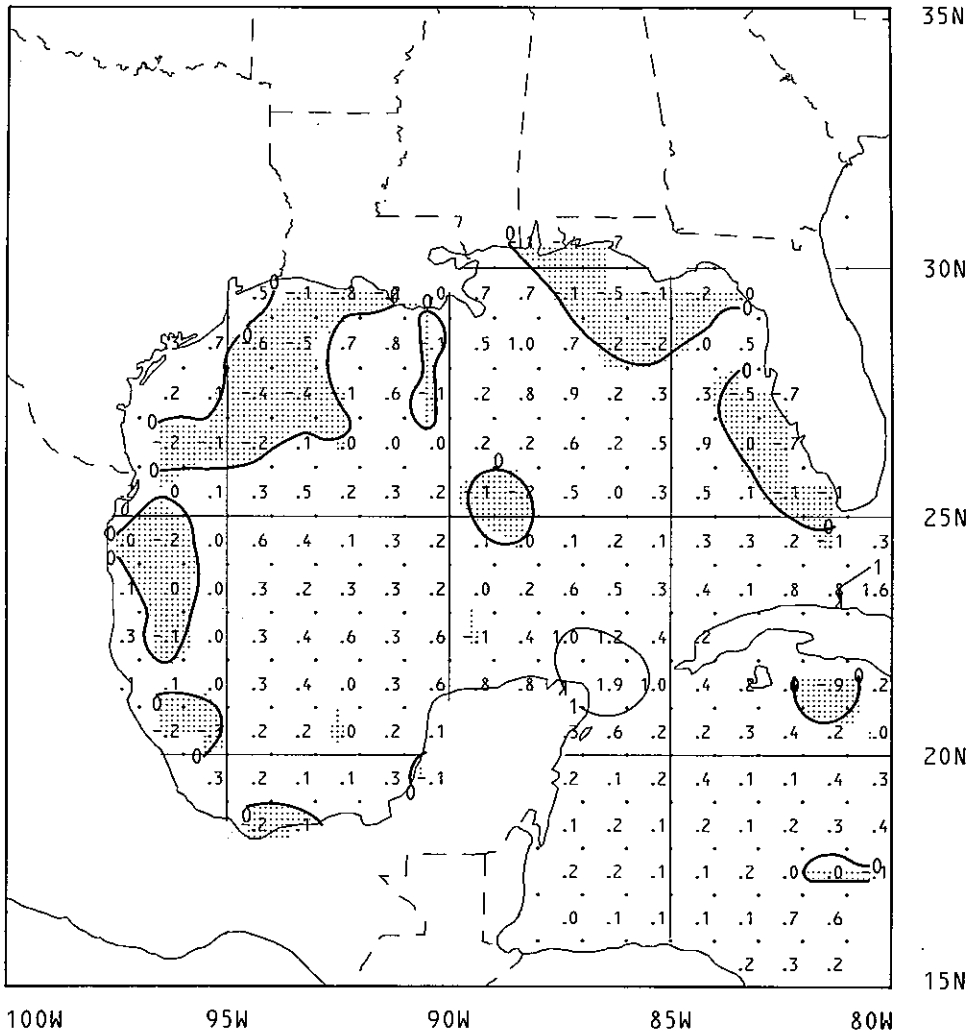
EAST COAST SST-ANOMALY



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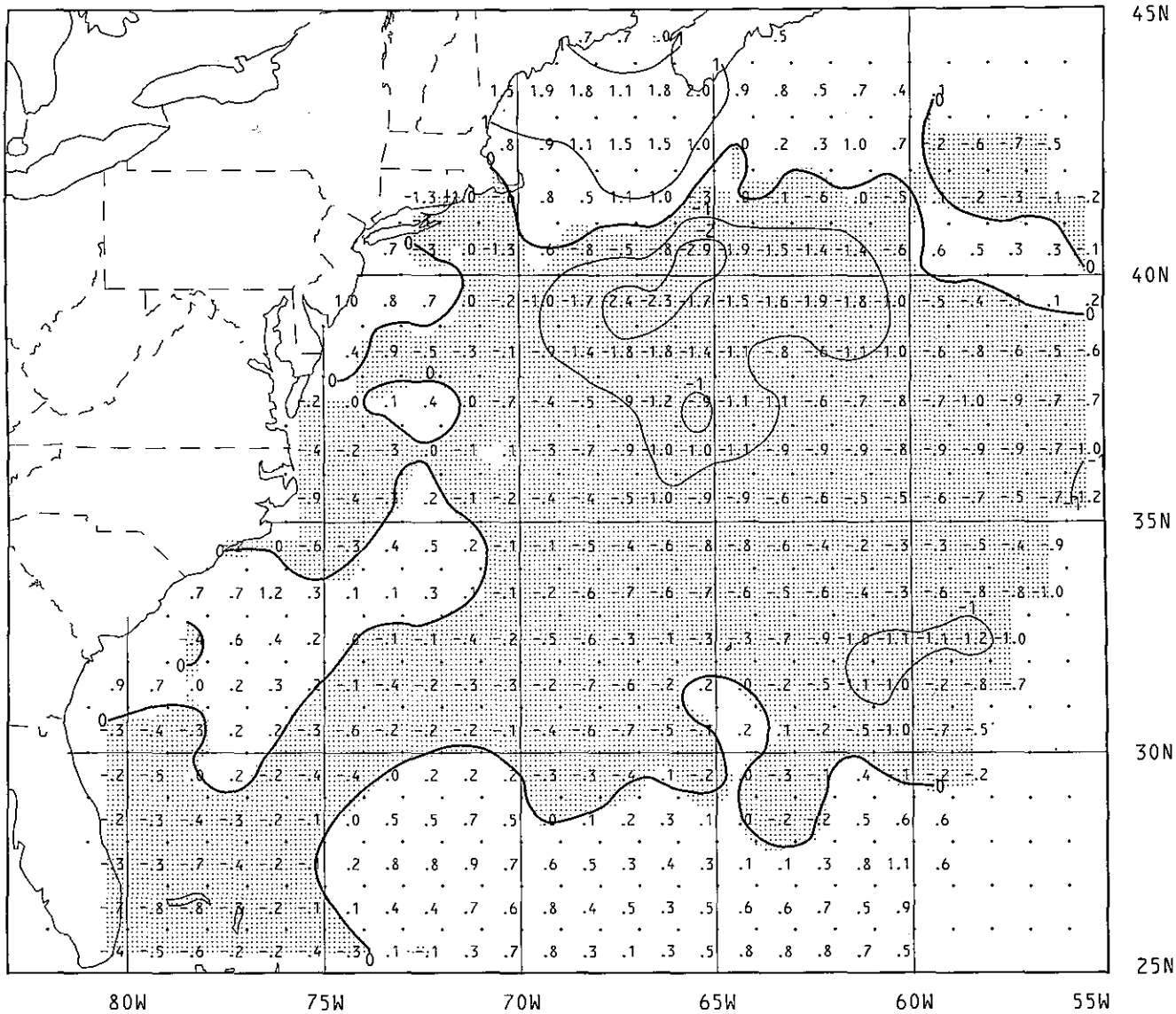

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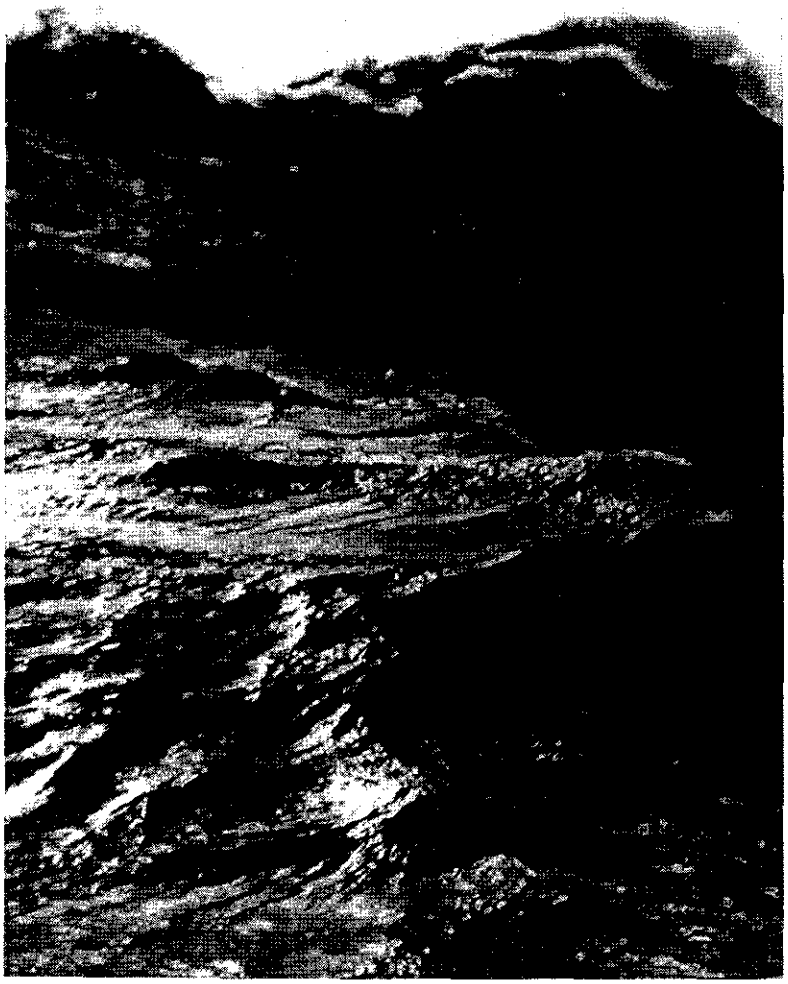

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16 West Coast SST - monthly mean
17 West Coast SST - anomaly
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20 East Coast SST - monthly mean
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24 Subscription information

U.S. DEPARTMENT OF COMMERCE • National Oceanic and Atmospheric Administration
National Weather Service/National Earth Satellite Service

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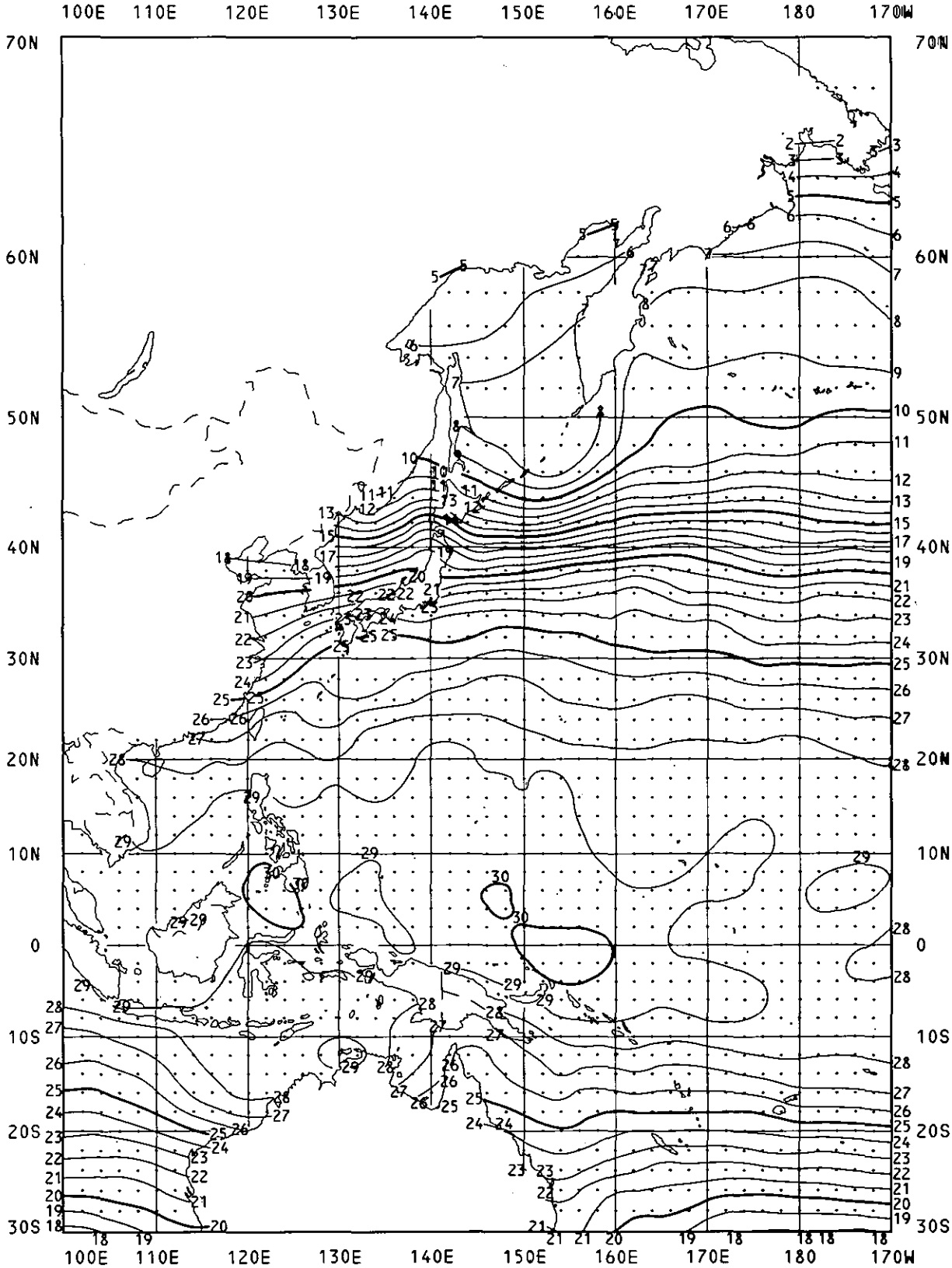

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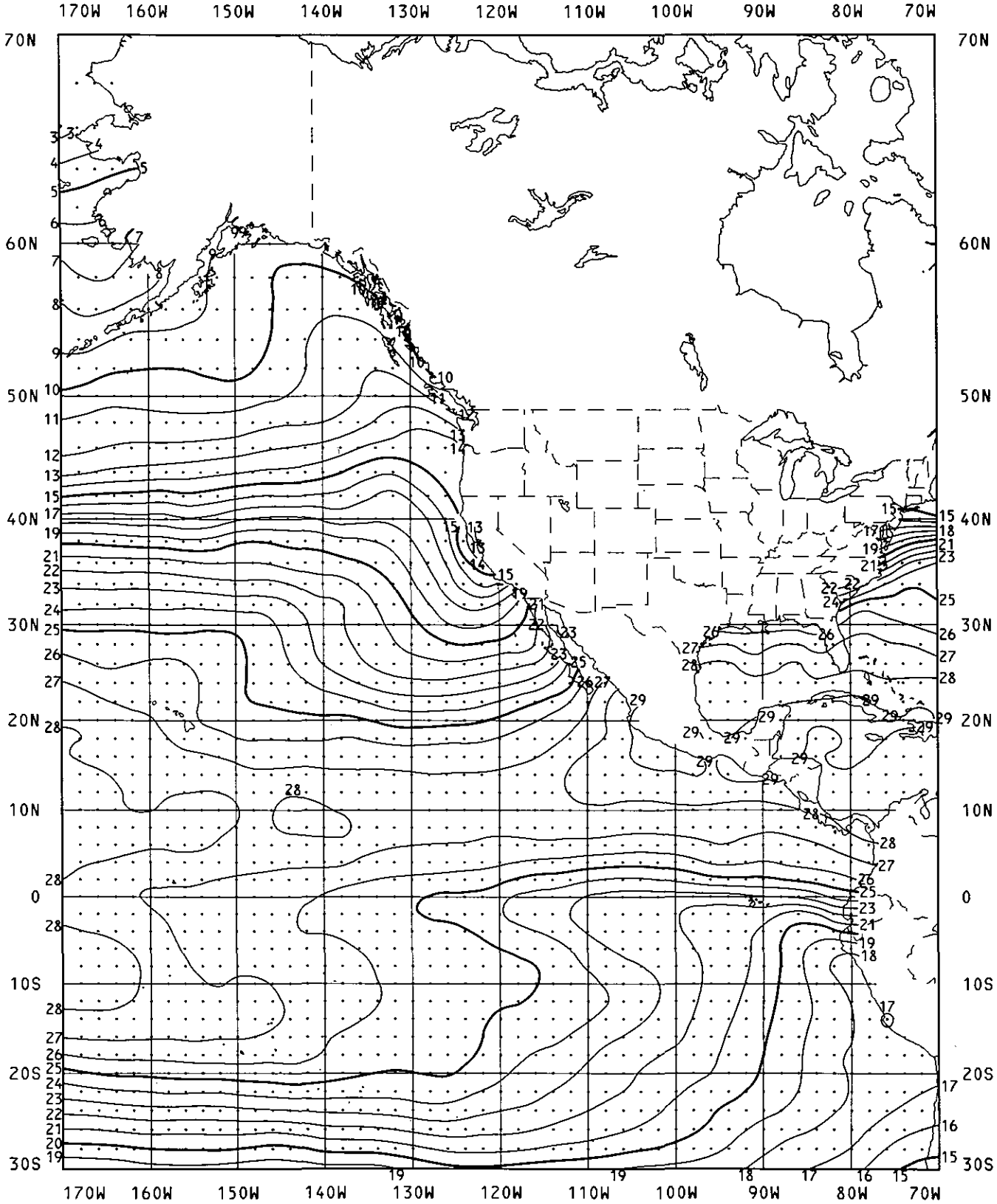

Eastern Pacific Ocean
SST--MONTHLY MEAN (°C)
October 1981

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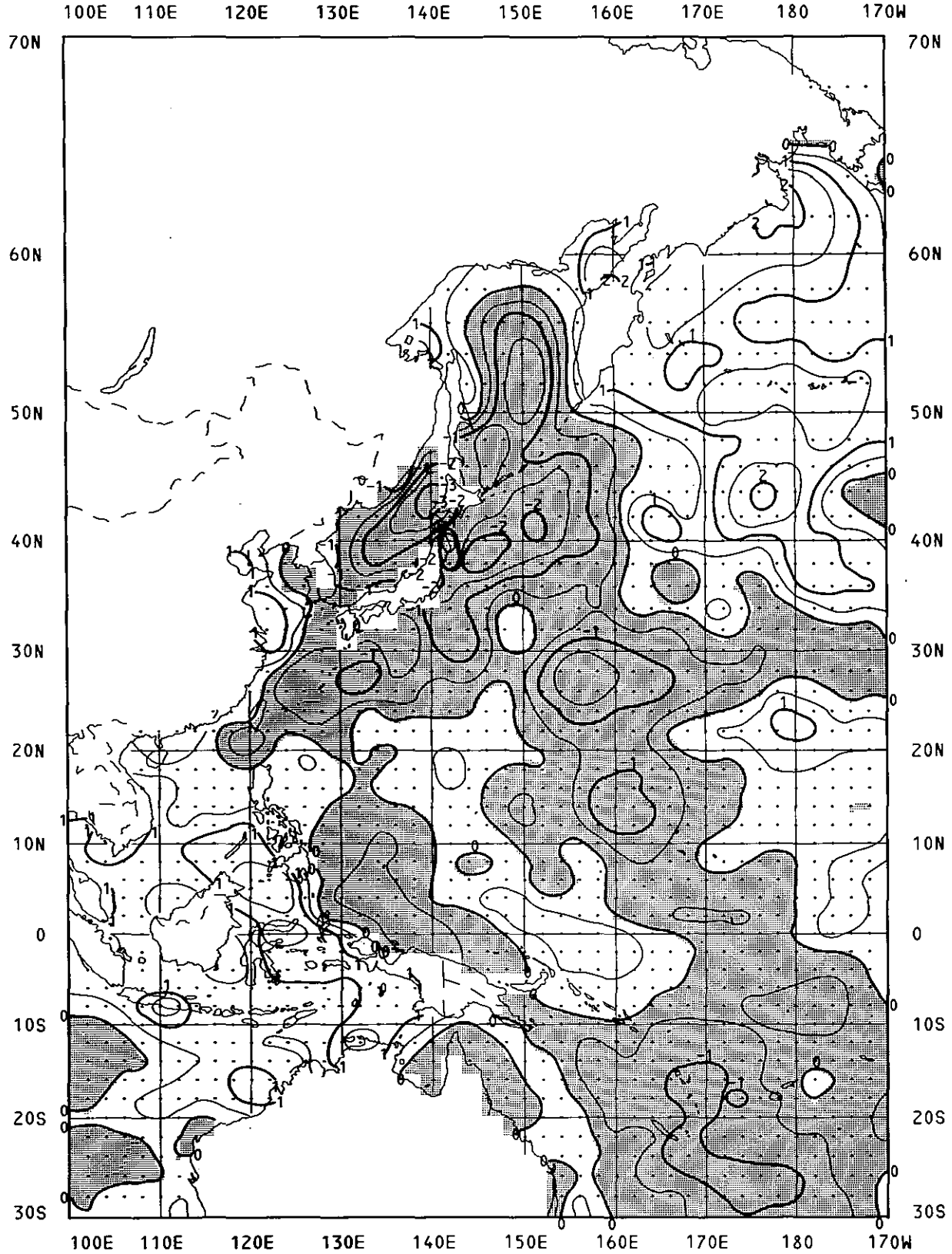

Western Pacific Ocean
SST--MONTHLY ANOMALY (°C)
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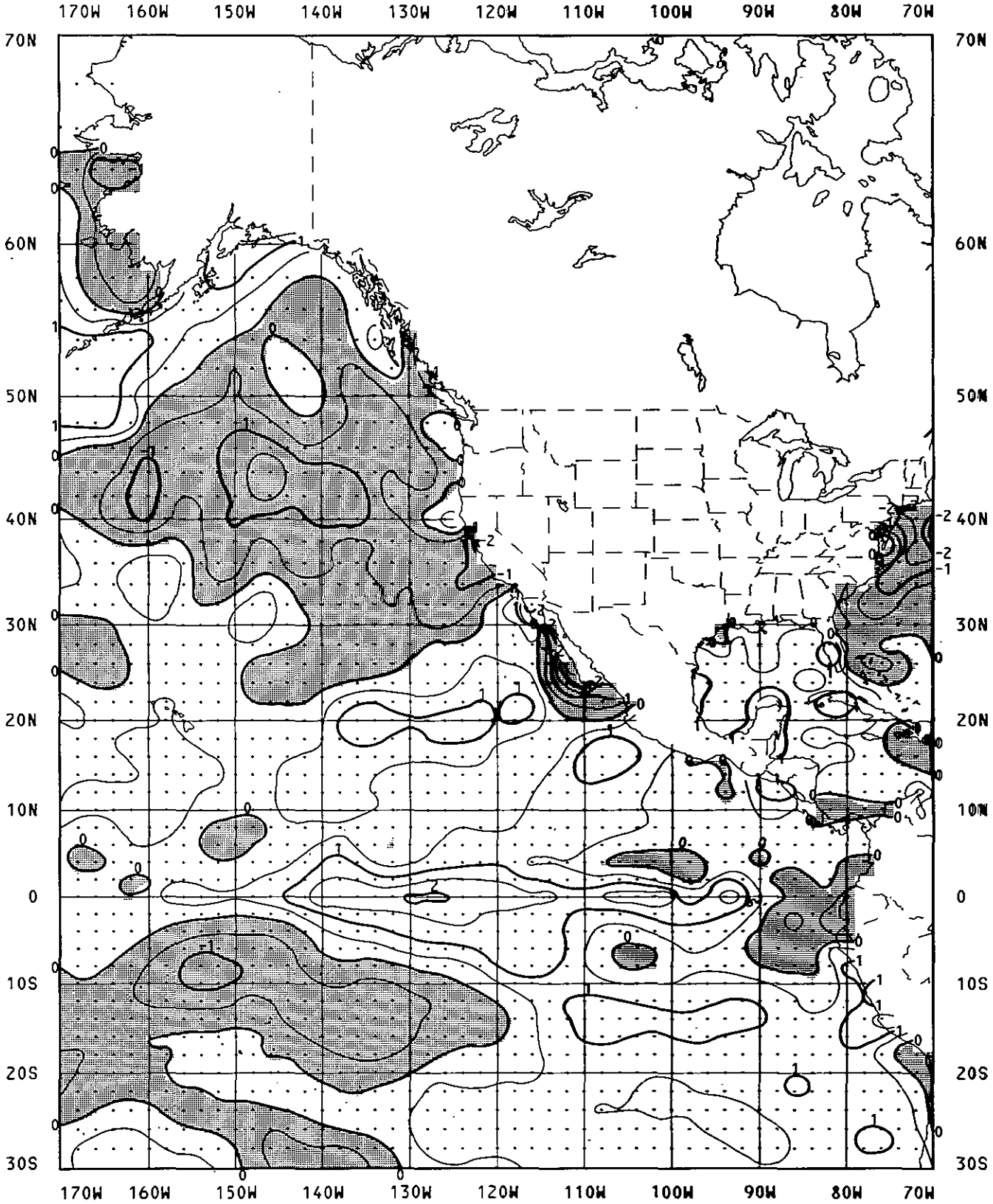

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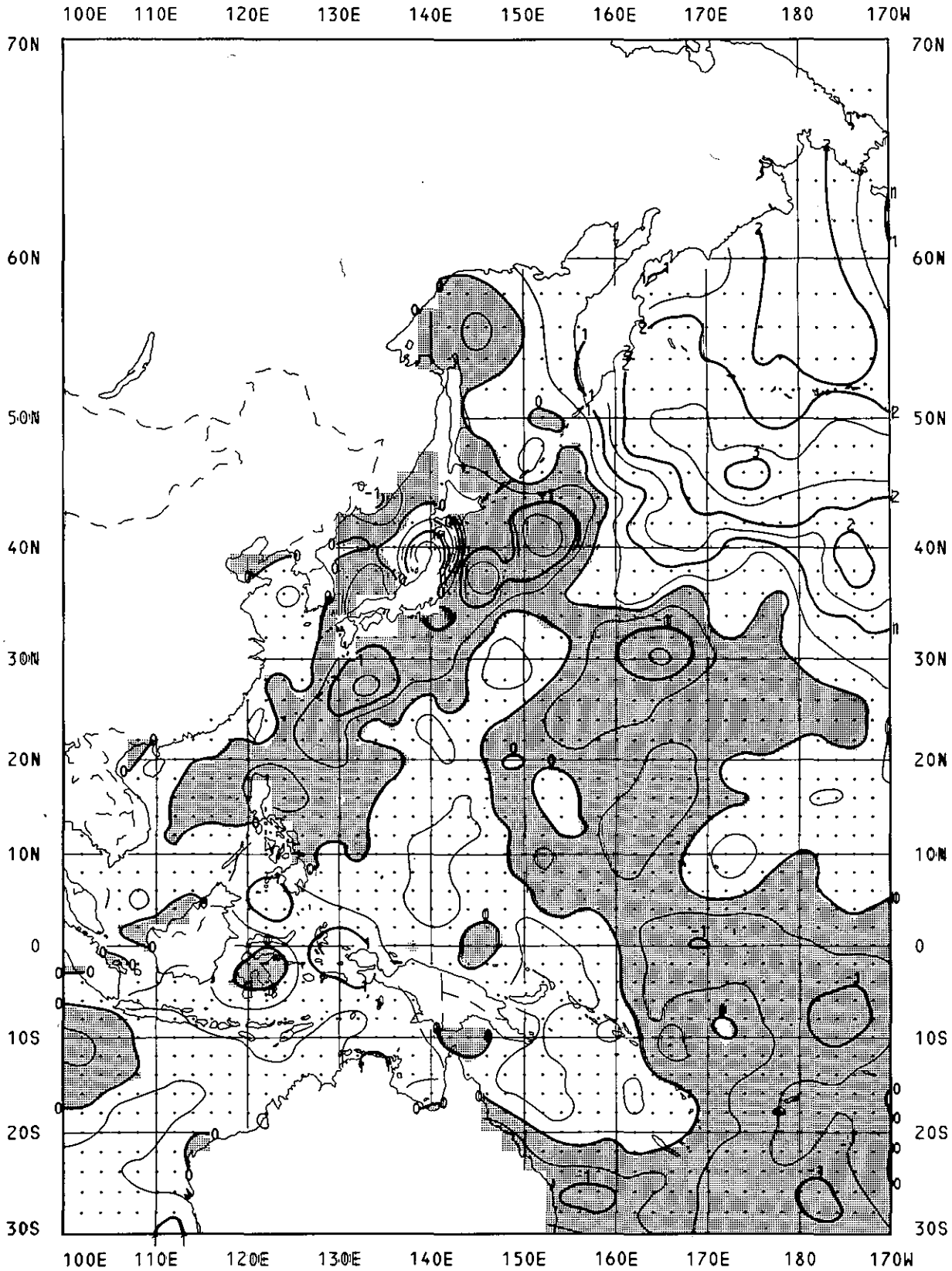
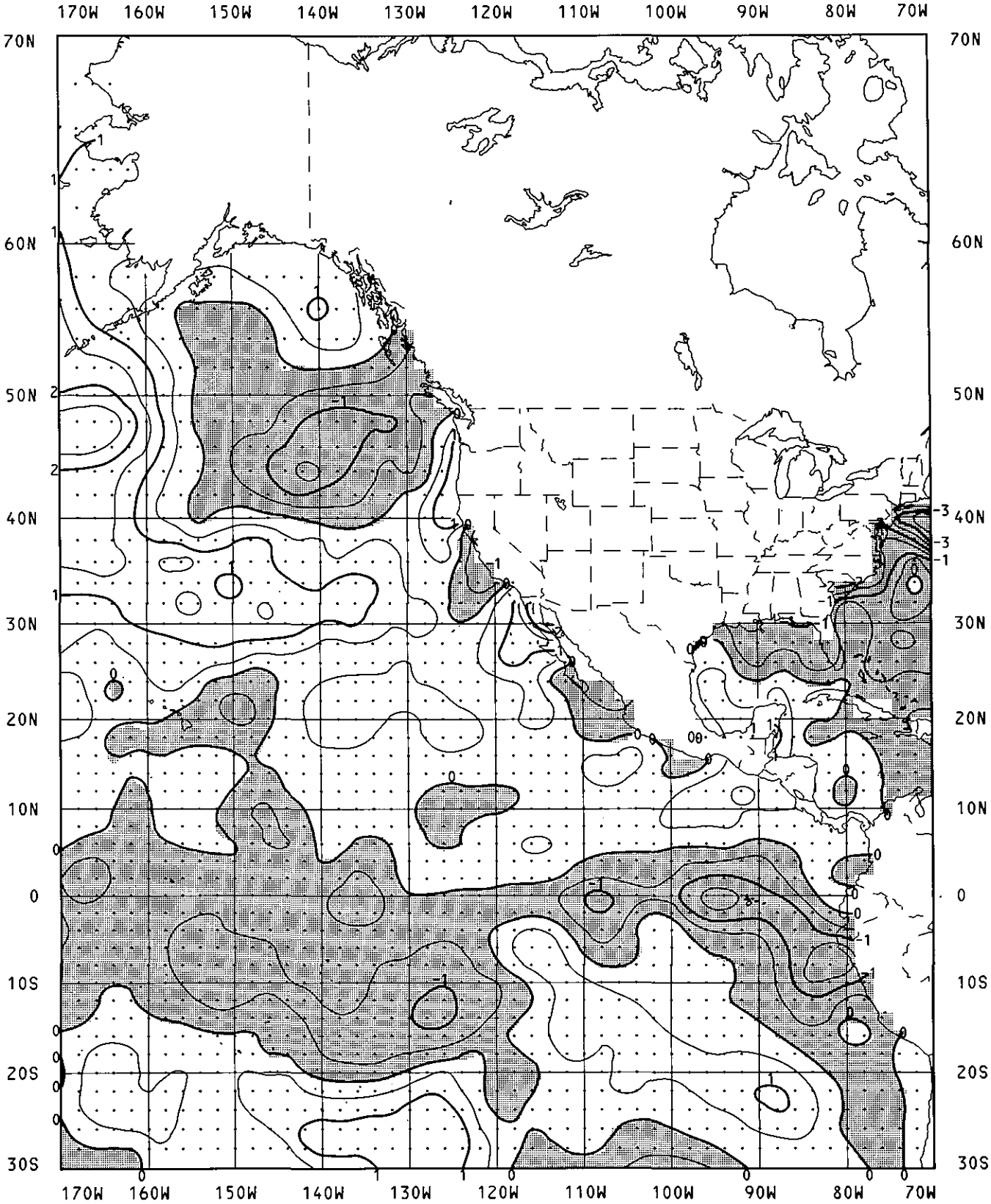


Western Pacific Ocean
SST--YEARLY CHANGE (°C)
October 1981

Yearly change is the difference between the monthly mean SST for this month and for the corresponding month last year -- shading shows where this year's monthly mean is colder than the corresponding monthly mean last year.



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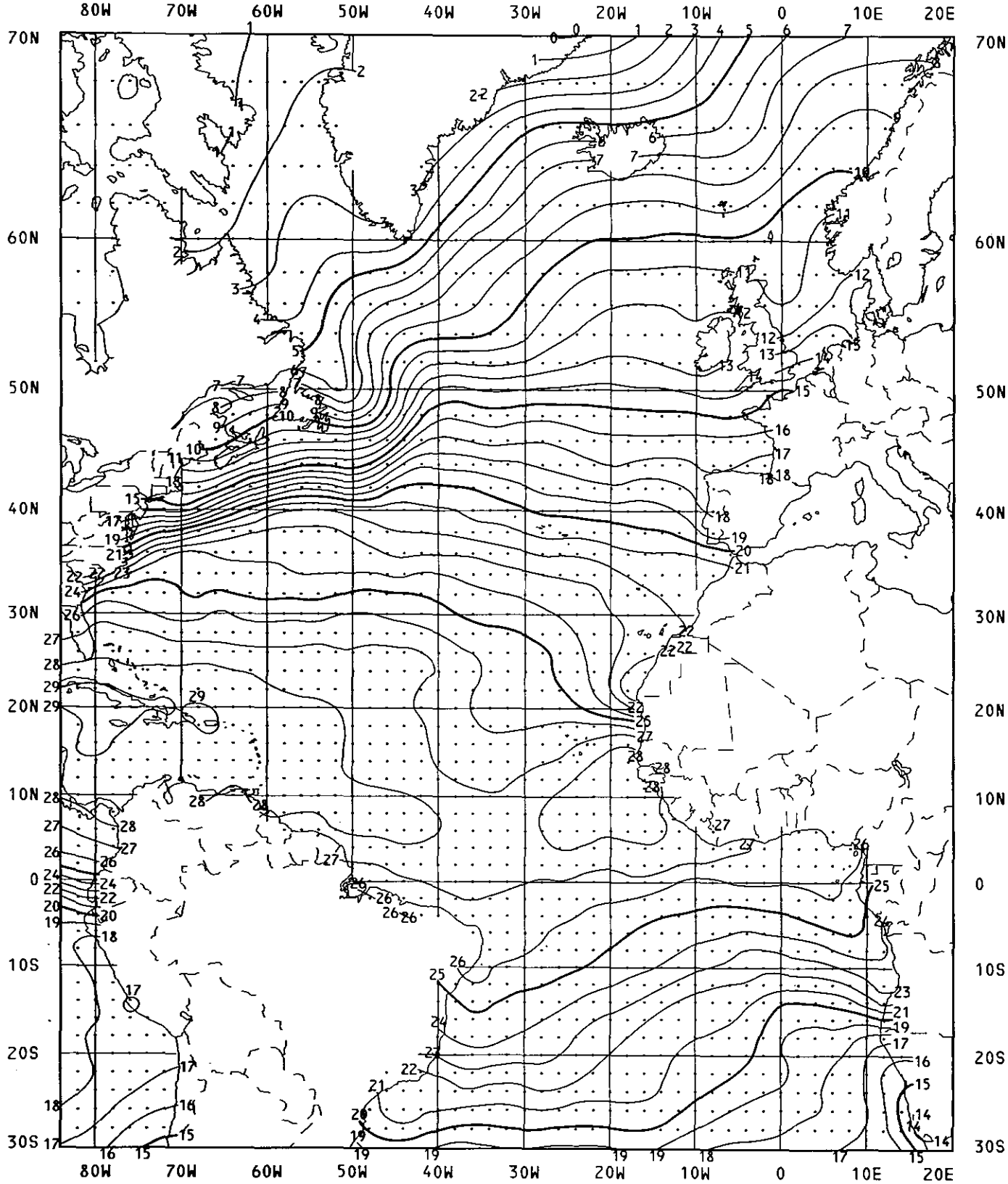

Atlantic Ocean
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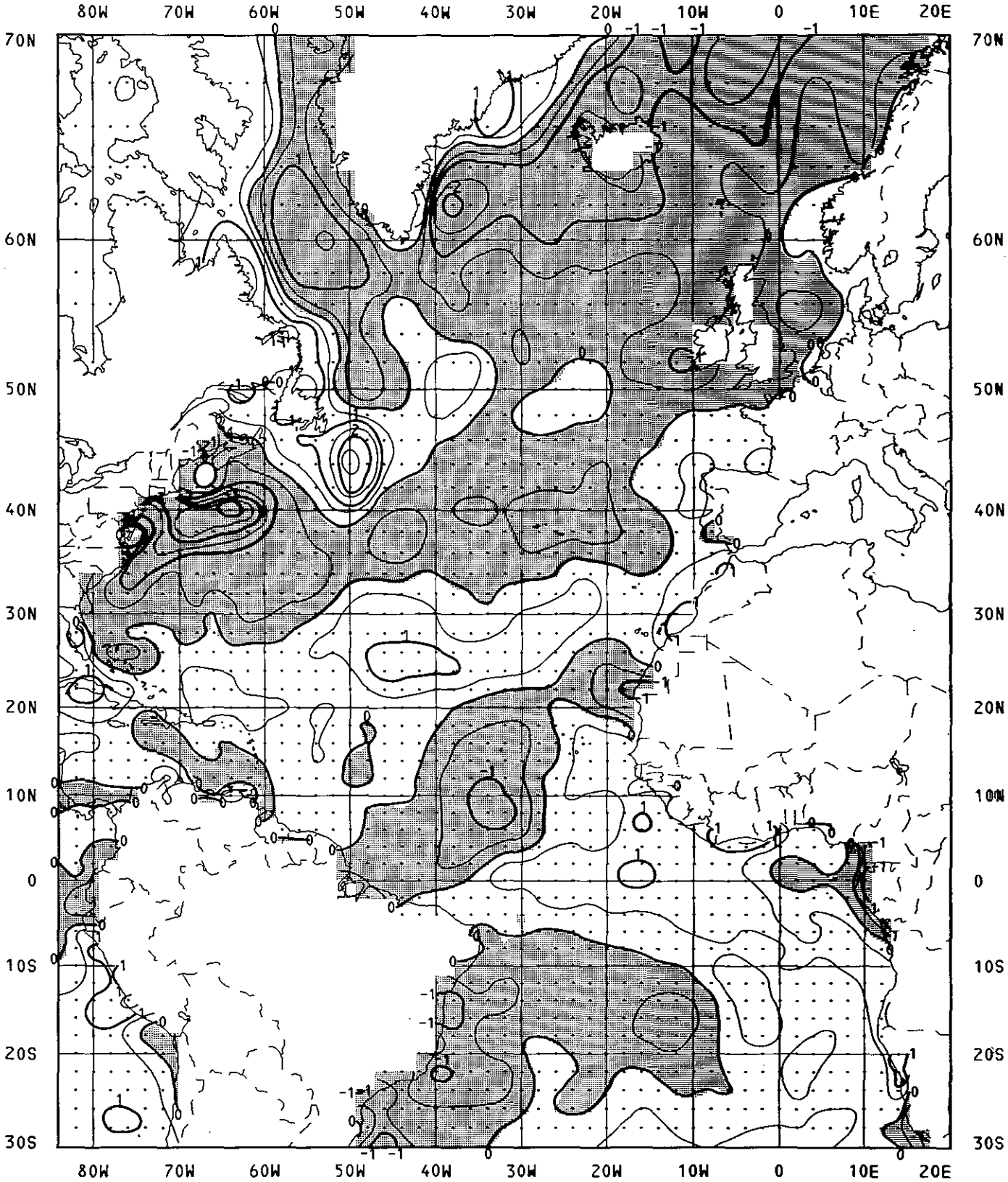

Atlantic Ocean
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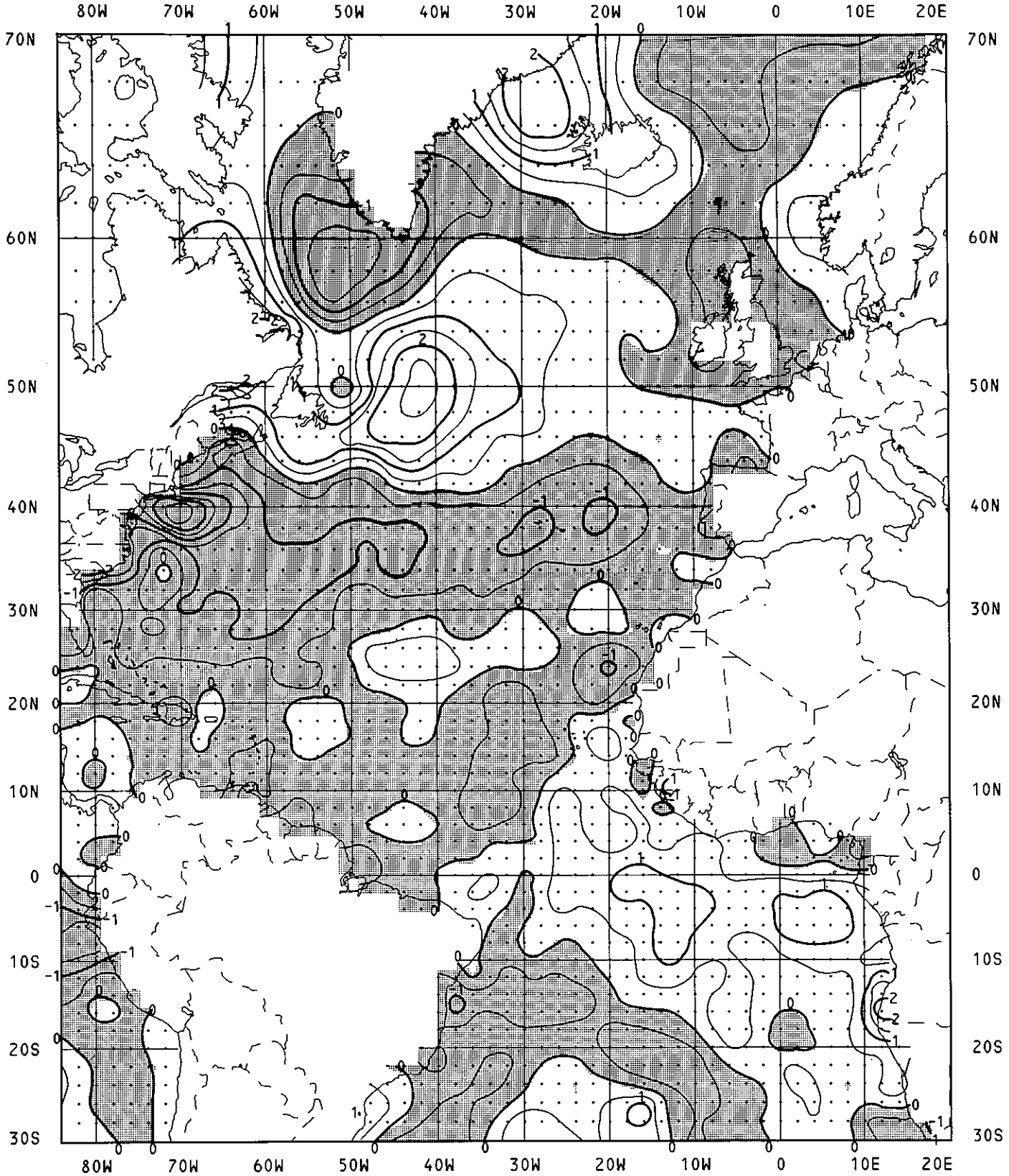

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REGIONAL ANALYSES

Bering Sea / North Slope Ice

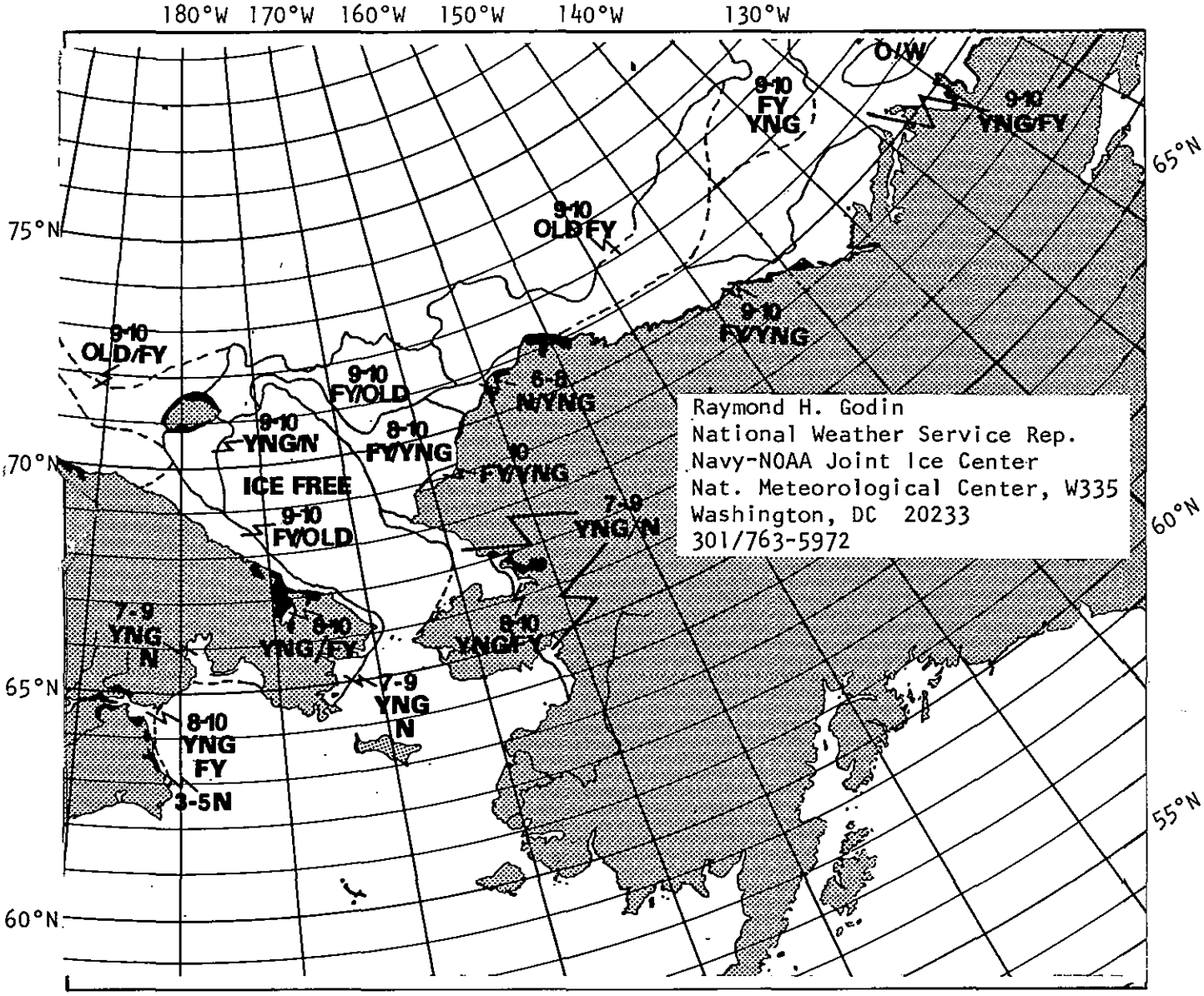
West Coast

Ocean features
Sea surface temperature
SST anomaly

East Coast

Ocean features
Sea surface temperature
SST anomaly

BERING SEA / NORTH SLOPE ICE ANALYSIS



KEY

ICE CONCENTRATION

4-6	Area 4-6 tenths ice-covered.
OW	Open water. Sea ice present in concentrations less than one tenth.
ICE-FREE	No sea ice. Ice of land origin (iceberg e.g.) may be present.

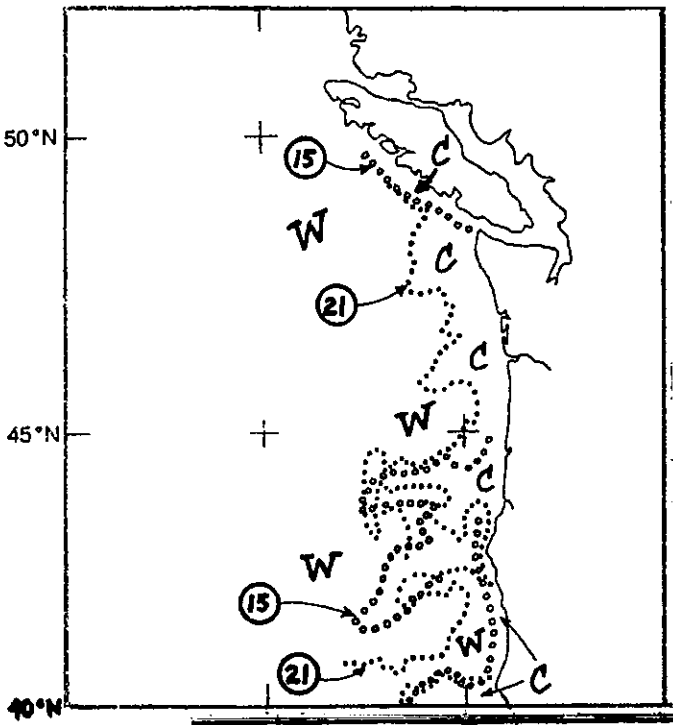
ICE THICKNESS (AGE)

OLD	Includes both multi-year and second-year ice. Generally 2-3.5m thick.
FY	Any or all first year ice types (30 cm - 2 m thick).
YNG	Young ice (10-30 cm thick).
N	New and nilas.
■	Fast ice. Sea ice which forms and remains fast along the coast.
120	Theoretical thickness of this season's growth (cm), based on freezing degree days (presented for first day of each month on first succeeding chart).
———	Ice boundary visually or satellite observed.
- - - -	Ice boundary estimated.

OCTOBER 1981

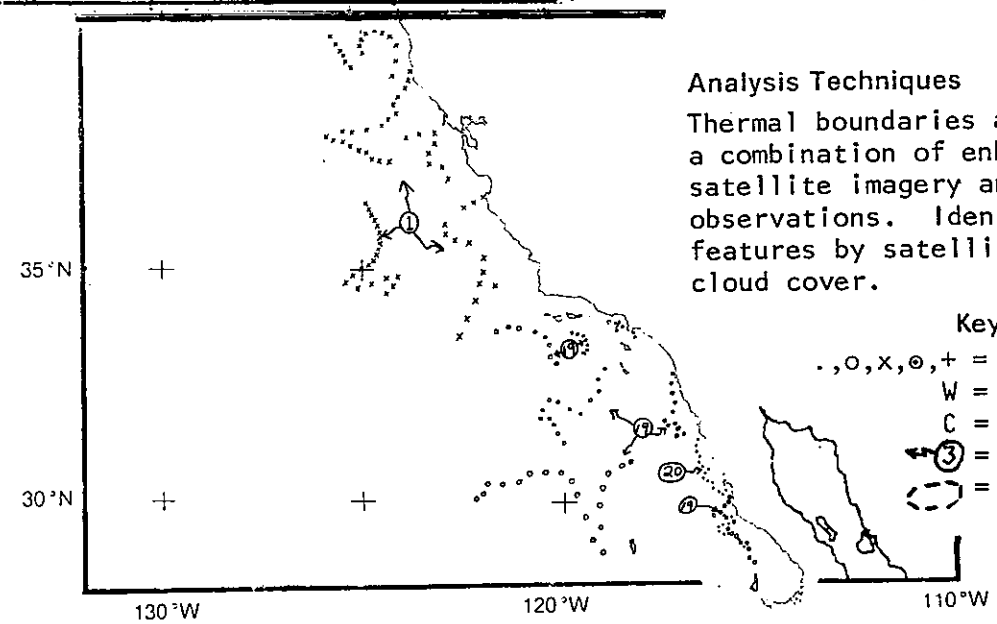
A 1030-mb high located near 82°N 180°W is the most prominent feature of the mean monthly surface pressure circulation affecting sea ice distribution. Northeasterly mean geostrophic winds and near normal surface temperatures are observed through much of the region. The shipping route from the Bering Strait to Prudhoe Bay (70°N 148°W) closed as a result of new ice formation on October 2. The 1981 ice season is ranked 14th out of a 29-year record of increasing severity. In early October the ice pack edge reverses direction and begins to move slowly southward as a result of southwestward drift and new ice formation. New and young ice are observed first in the shallow brackish coastal waters of the western shores of Alaska bordering the eastern Chukchi and northern Bering Seas. A large ice free area remains in the central Chukchi Sea as the process of convective mixing continues to cool the water toward its freezing temperature.

WEST COAST OCEAN FEATURES



OCTOBER 1981

SST's steadily decreased over the north panel area during October, continuing the pattern of autumn cooling. The average decrease over the area was about 2°C. Cool SST's generally persisted in nearshore areas, due in part to two late-season weak coastal upwelling episodes during October 10-13 and 20-25. More rapid seasonal cooling of land areas and river runoff also aided in maintaining cool nearshore temperatures. The only exception to the cool coastal water was an anomalous warming event observed during October 8-11 at Coos Bay (43°N 125°W). SST's were 14°C which was the highest for the year in that vicinity. This warming was likely due to onshore advection of warmer offshore water caused by three days of strong westerly winds prior to October 8-11. Two vigorous weather systems moved through the panel area on October 5-6 and 26-27.



Analysis Techniques

Thermal boundaries are determined from a combination of enhanced infrared satellite imagery and ship and buoy observations. Identification of these features by satellite is limited by cloud cover.

Key

.,o,x,⊙,+ = thermal boundaries
W = warm
C = cold
(3) = date of feature
= outline of water mass feature

SST's were lower than normal over most of the area. SST's decreased by 1°C or more in the NW portion of the area but decreased less elsewhere and even increased slightly near 30°N 125°W. Passage of a storm front October 27 caused additional cooling in the northern half of the area. The anomalously warm waters, which have persisted throughout the summer, in the Los Angeles Bight centered near 33°N 118°W decreased to near normal values by the end of October. SST's indicated a persistent warm intrusion toward the coast centered near 39°N 125°W. Three periods of upwelling favorable winds occurred on October 3-5, 10-13, and 18-24. Coastal SST's north of Pt. Conception (35°N 121°W) were generally lowest during these periods. SST ranges at the coastal buoys were: 12.5-15.9°C at Pt. Sal (35°N 121°W), 11.6-14.1°C at Half Moon Bay (37°N 123°W), 10.0-13.8°C at Bodega Bay (38°N 123°W), and 11.8-16.6°C at Pt. Arena (39°N 124°W).

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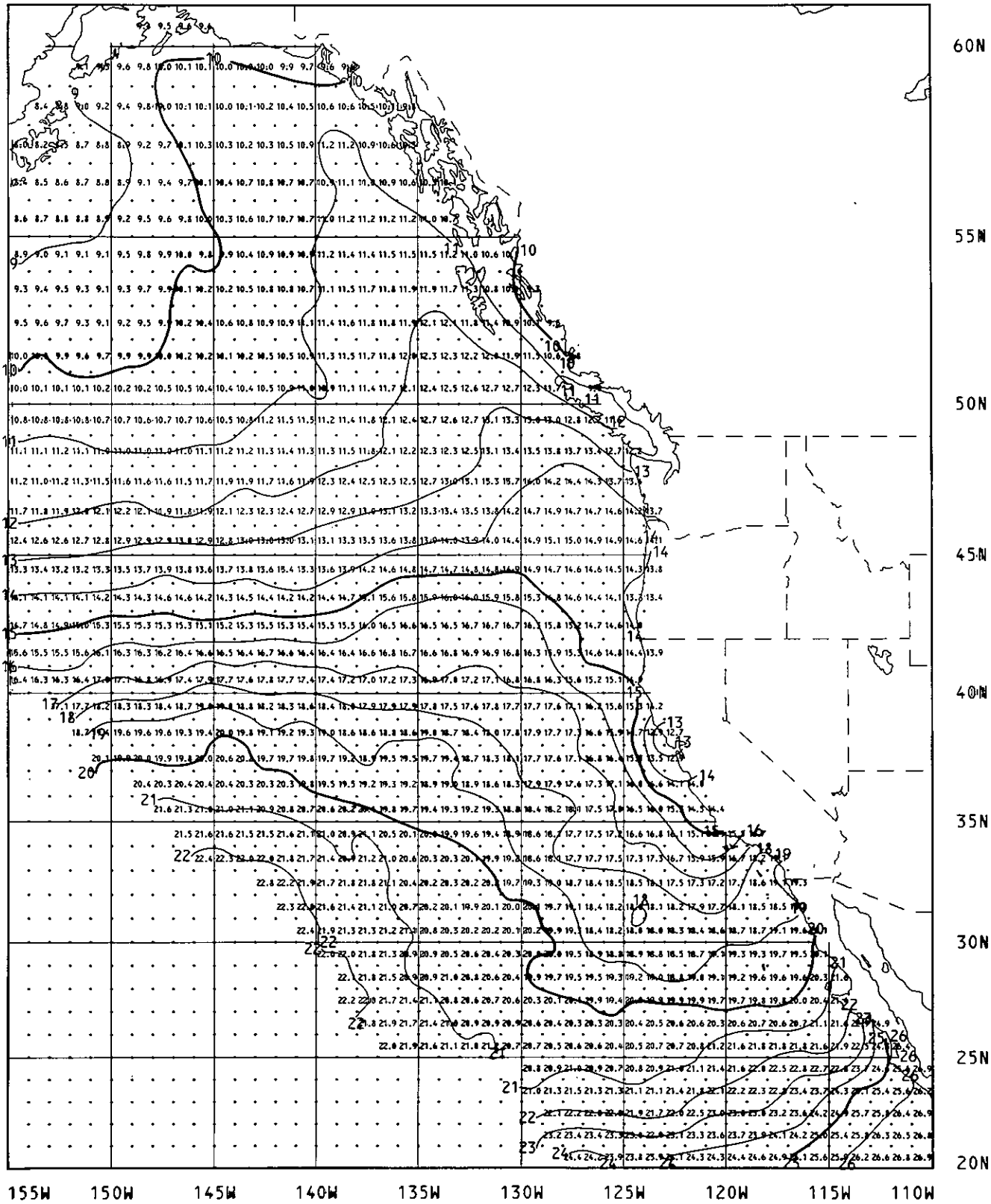

West Coast
SST--MONTHLY MEAN (°C)
October 1981

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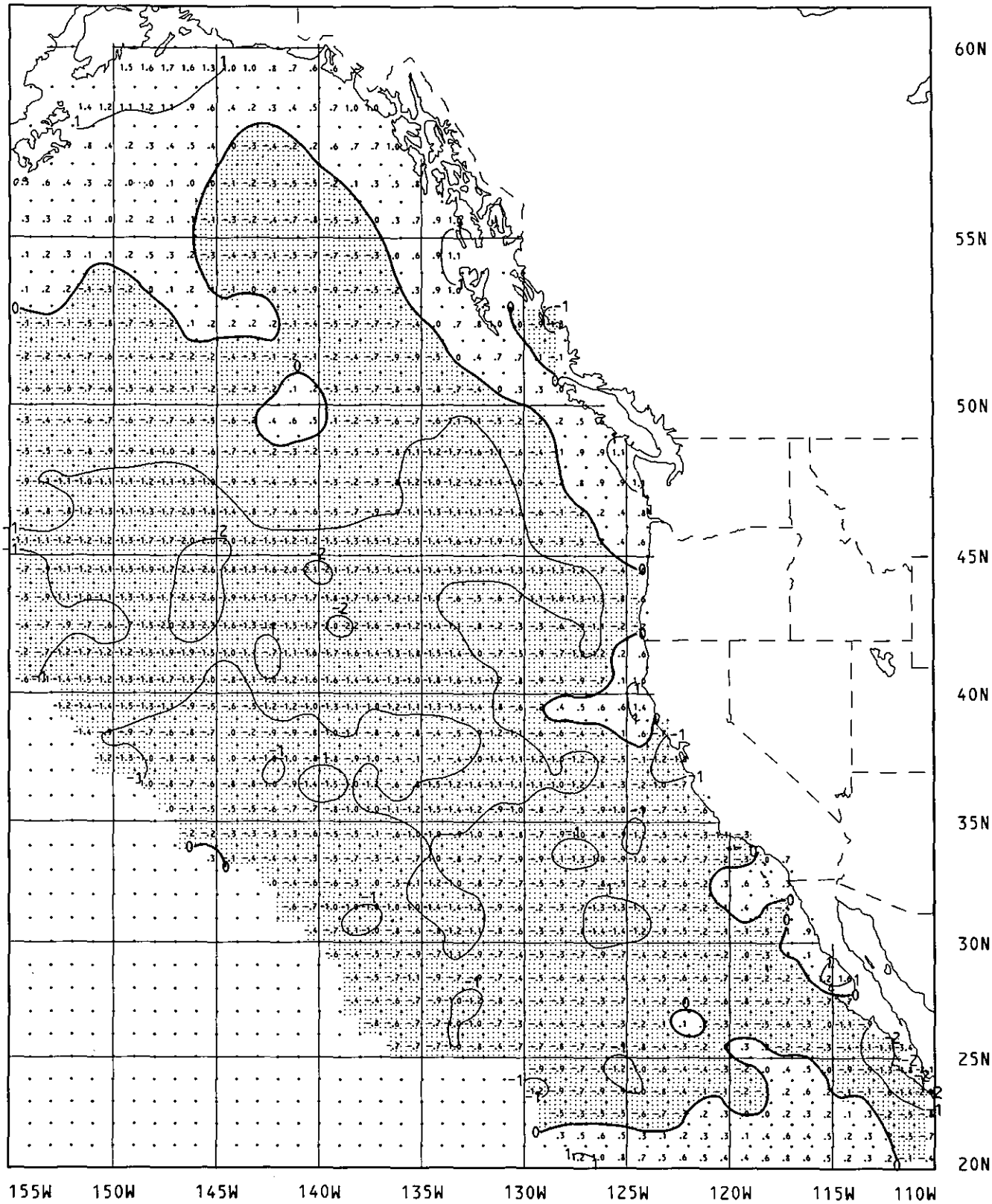

West Coast
SST--MONTHLY ANOMALY (°C)
October 1981

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EAST COAST OCEAN FEATURES

The end of this month's positions of the Gulf Stream System and its associated eddies are shown for the NW Atlantic and the Gulf of Mexico. The Gulf Stream and Loop Current boundaries are located by prominent sea surface temperature gradients or by the 15°C isotherm at 200m. Anticyclonic eddies are labeled a-z in the Gulf of Mexico and 1-99 in the NW Atlantic. Cyclonic eddies are labeled A-Z. Arrows on eddies indicate direction of circulation. Warm-core or anticyclonic eddies rotate clockwise; cold-core or cyclonic eddies rotate counterclockwise. The long arrows indicate the date of data used.

Feature positions are drawn from:
- NOAA-6 satellite infrared imagery
- Bathythermograph data,
  - National Meteorological Center of National Weather Service
- Oceanographic Analysis (daily),
  - National Weather Service/National Earth Satellite Service

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Jenifer Wartha Clark
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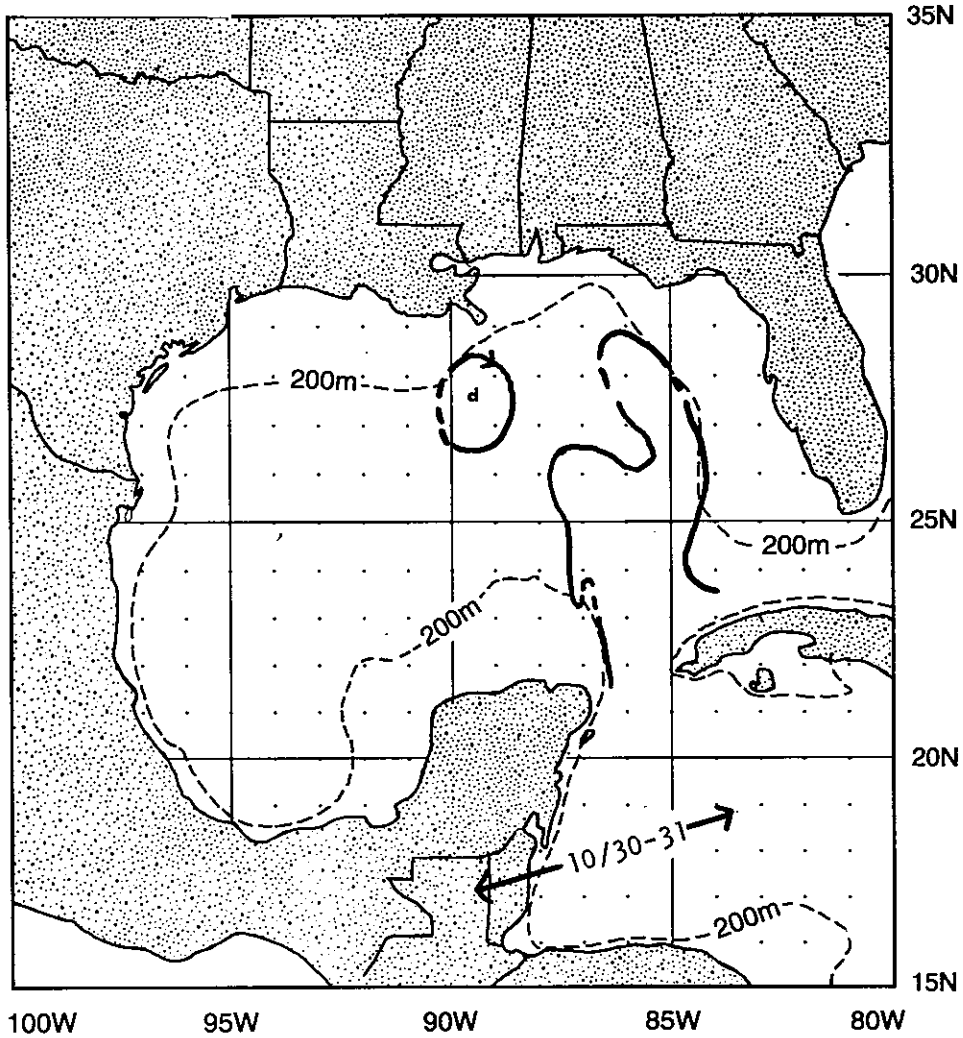
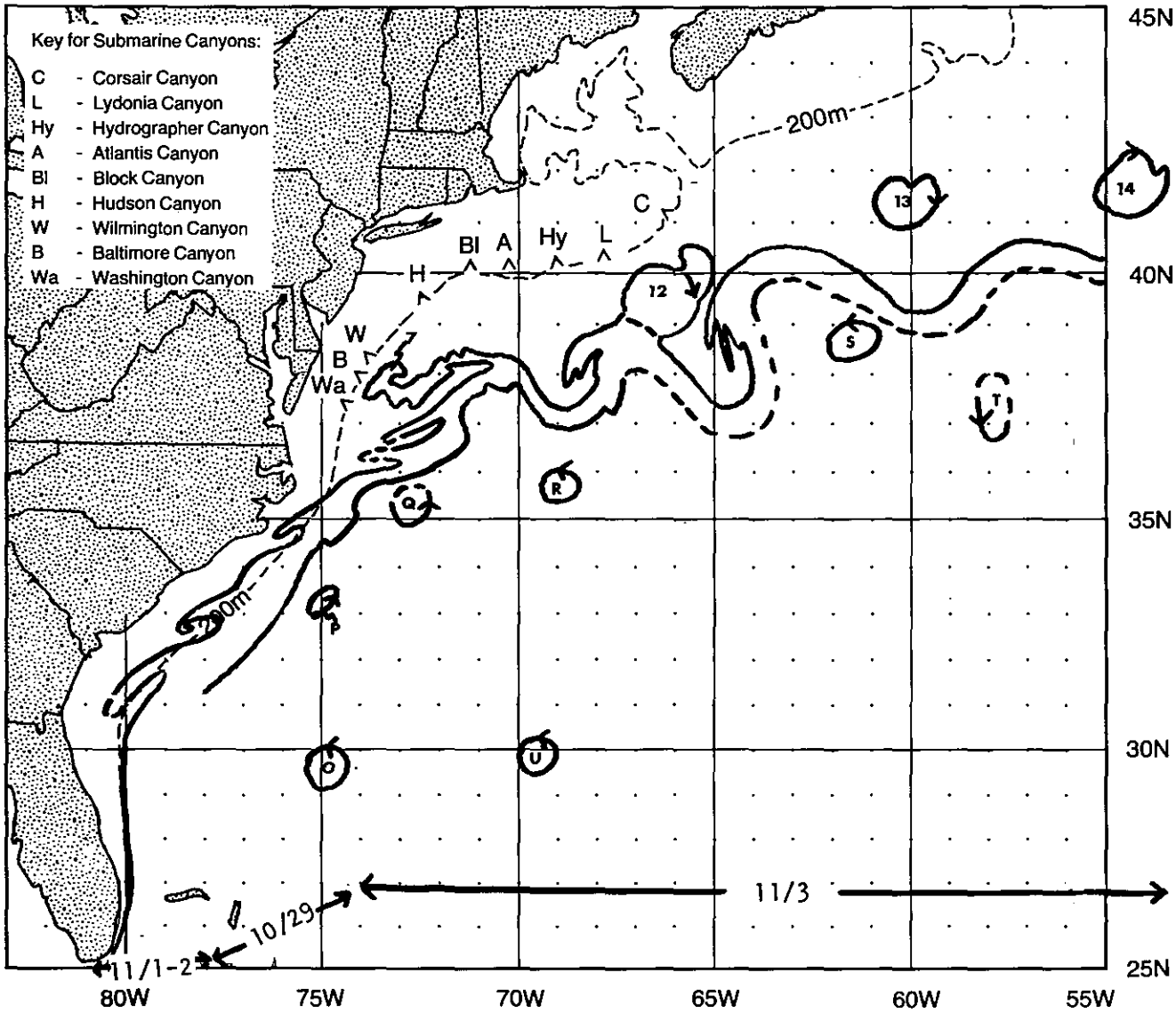


SEPTEMBER 1981

Loop Current features were faintly discernible on October 13 and 20, and then more clearly detected by October 30-31. Prominent Loop Current features include anticyclonic eddy d and the long filament of Loop Current water intruding to almost 29°N 86°W.

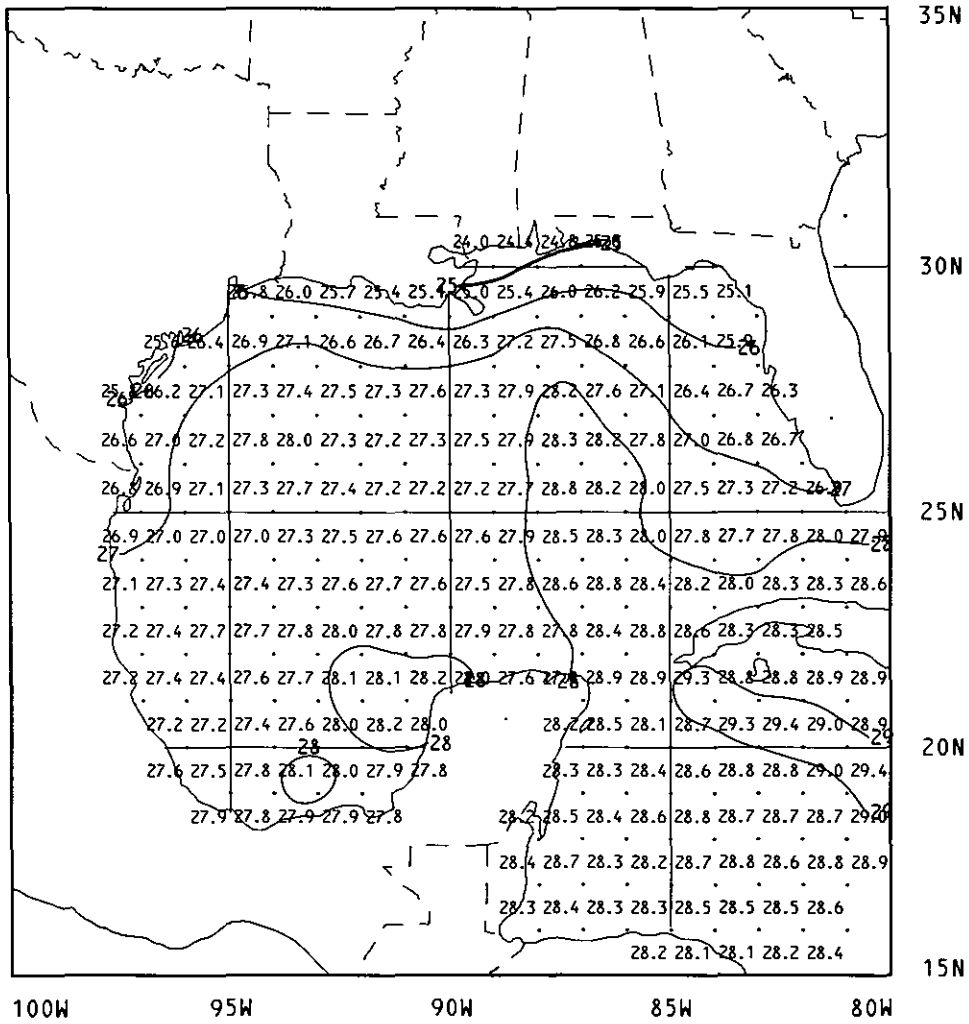


The prominent Gulf Stream feature was the high amplitude meander with its crest and trough near 40°30'N 63°30'W and 37°N 64°30'W, respectively.

Anticyclonic eddy 14 was first detected around August 24 near 41°30'N 53°30'W. It has since moved 110 km W where it was last discerned on November 3 centered at 41° 30'N 54°30'W. Eddy 7 translated 130 km SW and was resorbed by the Gulf Stream near October 20. The remnants observed on November 3 are shown in the above chart. Eddy 12 traveled 200 km SW and is interacting with a Gulf Stream meander near 39°30'N 66°30'W. Eddy 13 moved 160 km NW.

Three new cyclonic eddies were observed during October. Cyclonic eddy S formed from a Gulf Stream meander near 38°N 60°30'W around October 12 and moved 100 km NW to 38°30'N 61°30'W by November 3. Within a few days after Eddy S formed, Eddy T formed from a meander near 37°N 56°30'W on October 14 and has since traveled 120 km WNW. Eddy U, centered near 30°N 69°30'W, was identified by the Naval Eastern Oceanography Center. Eddy R only moved 20 km SSE during October. Eddy Q traveled 65 km WSW while Eddy P translated 75 km WNW. Eddy O moved 95 km SW.

EAST COAST SST-
MONTHLY MEAN



Gulf of Mexico
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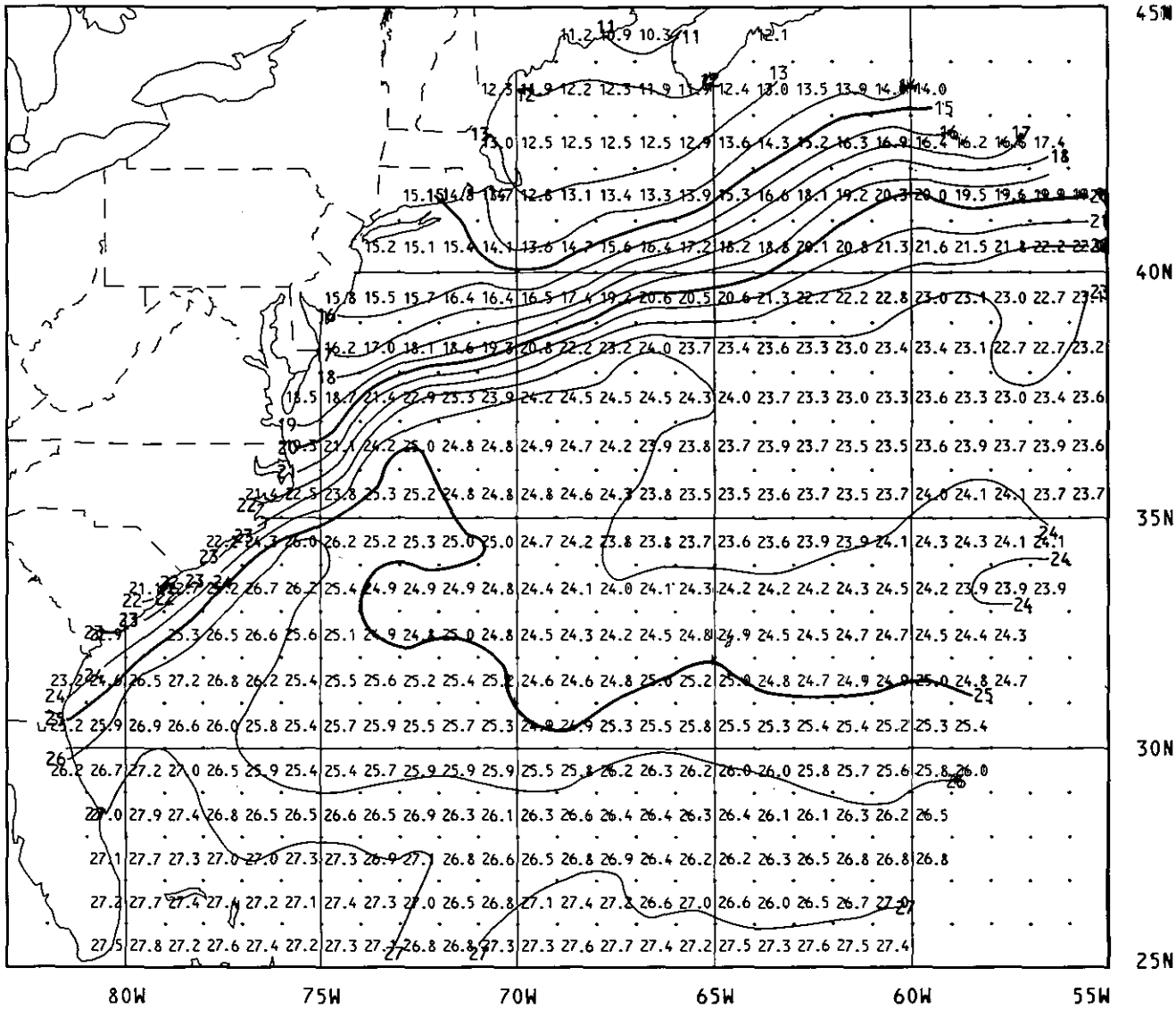

NW Atlantic Ocean
SST--MONTHLY MEAN (°C)
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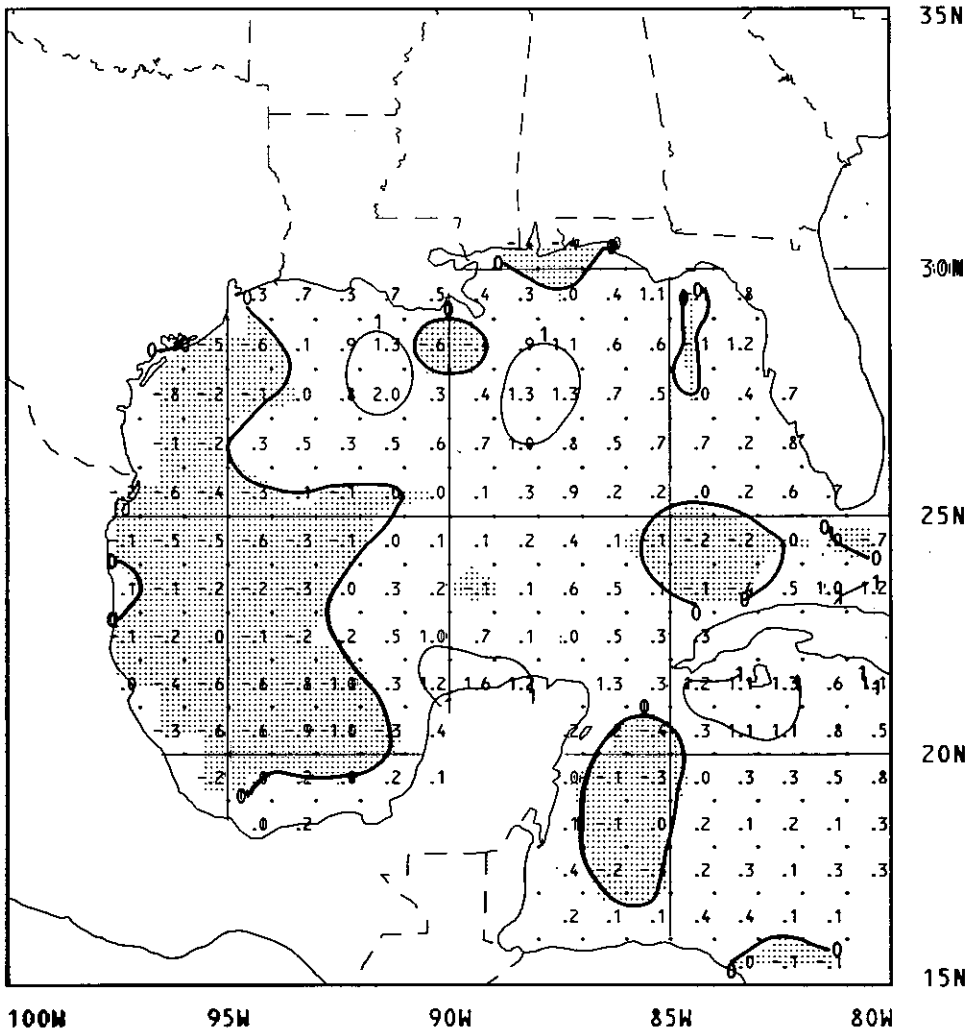
EAST COAST SST-ANOMALY



Gulf of Mexico
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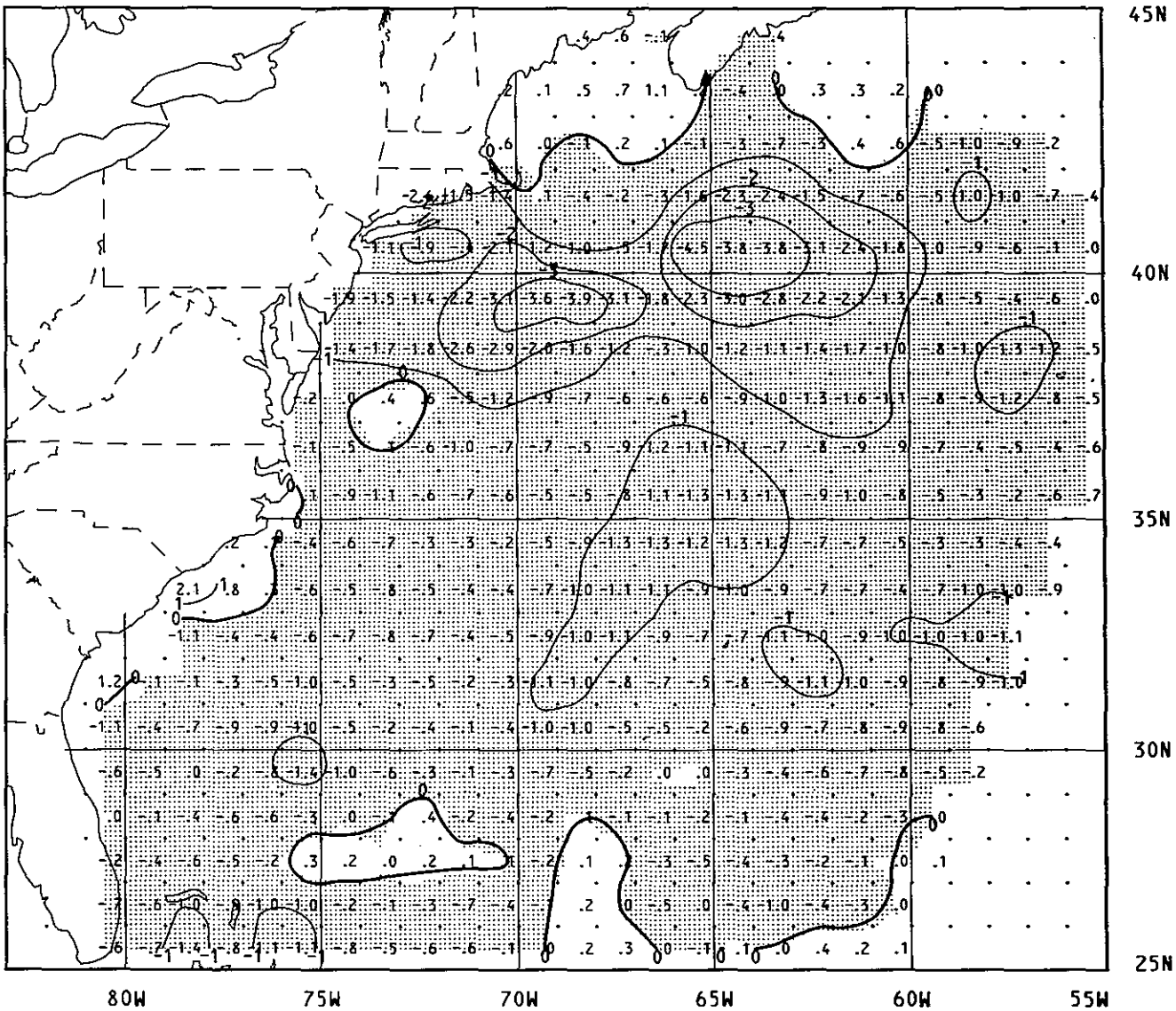

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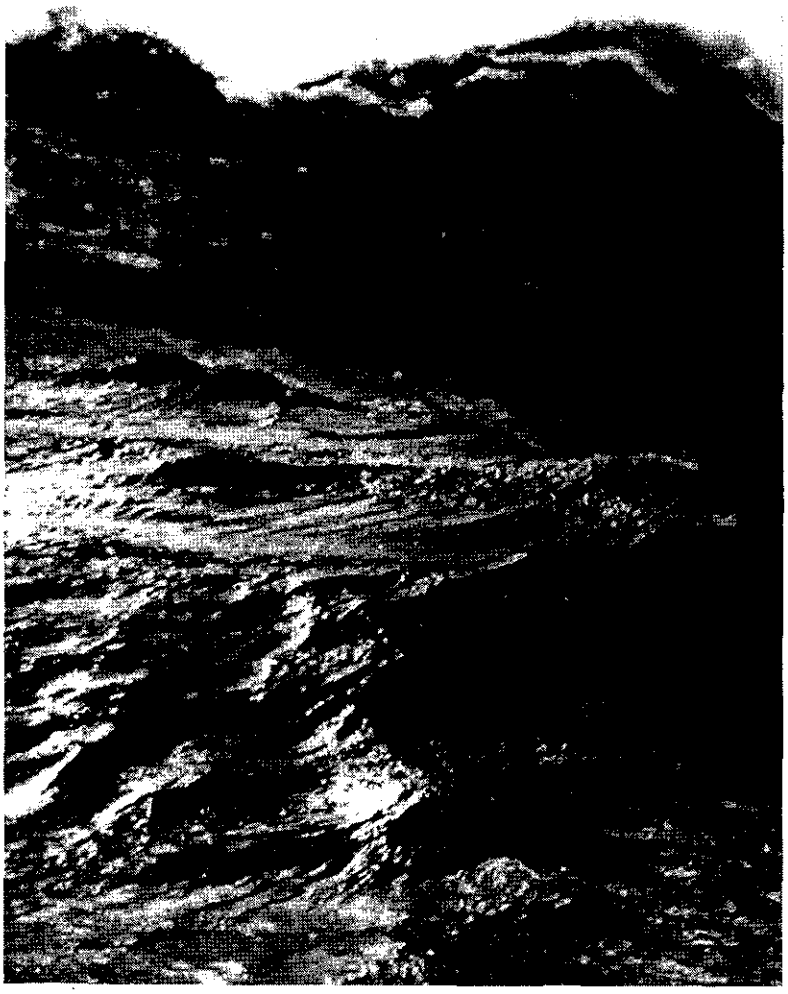
The Secretary of Commerce has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through September 1, 1983.

OCEANOGRAPHIC Monthly Summary

Volume I Number 11 November 1981



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U.S. DEPARTMENT OF COMMERCE • National Oceanic and Atmospheric Administration
National Weather Service/National Earth Satellite Service

Oceanographic Monthly Summary is a continuation of two NOAA oceanographic publications, *gulfstream* and *Fishing Information*.

The *gulfstream* magazine included charts of the Gulf Stream location and Northwest Atlantic monthly mean SST's and anomalies. It was originally published as *The Gulf Stream Monthly Summary* by the U.S. Naval Oceanographic Office from 1964 to 1975. NOAA's National Weather Service took over the magazine, changing the name to *gulfstream*, from 1975 to 1980. The two Gulf Stream magazines thus constitute an uninterrupted 16-year history of Gulf Stream meandering and associated eddy movements.

Fishing Information included monthly charts of North Pacific mean SST's and anomalies. It was first published as the *California Fishery Market News Monthly Summary Part II-Fishing Information* by the old Bureau of Commercial Fisheries' San Diego laboratory in 1960. The name was later shortened to *Fishing Information*, and was published until 1980 by NOAA's National Marine Fisheries Service. This publication represents a continuous 20-year climatology of North Pacific oceanographic conditions.

Oceanographic Monthly Summary continues these data series, as well as beginning standardized oceanographic data series in all other U.S. offshore areas. All of the SST analyses use the Robinson-Bauer climatology.* This is a computer-assisted subjective analysis of all vertical-profile temperature data: the entire mechanical and expendable bathythermograph (MBT and XBT) files; portions of the hydrocast, salinity/conductivity temperature depth (STD/CTD), radio message files; analysis of the Asheville Marine Deck; published data and analysis; and subjective interpretation of wind and current charts. Data comprise 381,199 North Pacific observations to 1969; 727,452 Atlantic/Indian Ocean observations to 1974; and 250,000 Southern Hemisphere observations to 1979. The majority of data are MBT's, so the climatology best represents conditions since 1942.

*Robinson, M.K., 1976. Atlas of North Pacific Ocean Monthly Mean Temperatures and Mean Salinities of the Surface Layer; *NavOceano Ref. Pub. 2.*
Robinson, M.K., R.A. Bauer and E.H. Schroeder, 1979. Atlas of North Atlantic-Indian Ocean Monthly Mean Temperatures and Mean Salinities of the Surface Layer; *NavOceano Ref. Pub. 18.*

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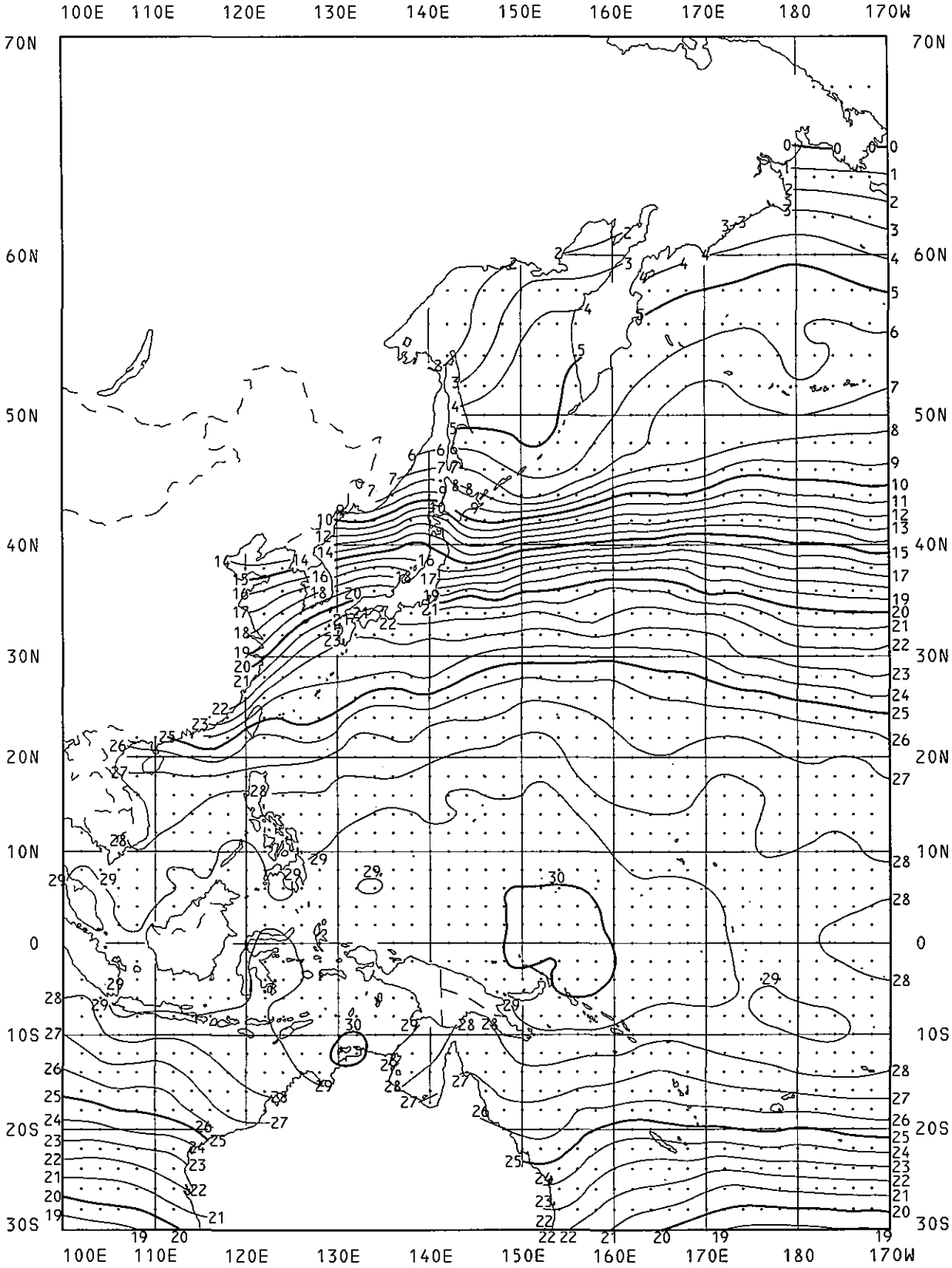
A New Satellite SST Retrieval Method

A newly employed satellite SST retrieval technique should improve the accuracy of the regional and hemispheric SST charts. On November 17, 1981, the National Earth Satellite Service implemented a multichannel technique for calculating SST. The technique utilized the 5 spectral channels of the Advanced Very High Resolution Radiometer (AVHRR) on board the NOAA-7 polar orbiting satellite. This new multichannel technique has noticeably improved the data coverage and accuracy of the SST retrievals. Data coverage is more extensive, particularly in the tropics. Accuracy of the multichannel observations is consistently superior to that of the old GOSSTCOMP method. A preliminary study compared high-quality data buoy temperatures to coincident satellite observations from the two retrieval methods. The results showed an improvement from the GOSSTCOMP to the multichannel method of -0.4°C to 0.02°C for the bias and from 1.46°C to 0.58°C for the Root Mean Square (RMS) difference. This comparison was derived from only a small sample of data; however, satellite and ship SST observations have been compared in all regions of the global ocean and the improvement in accuracy is substantial.

New Subscription Rates

The subscription rates on *Oceanographic Monthly Summary* have been changed by the U.S. Government Printing Office. The new prices are listed on the back cover.



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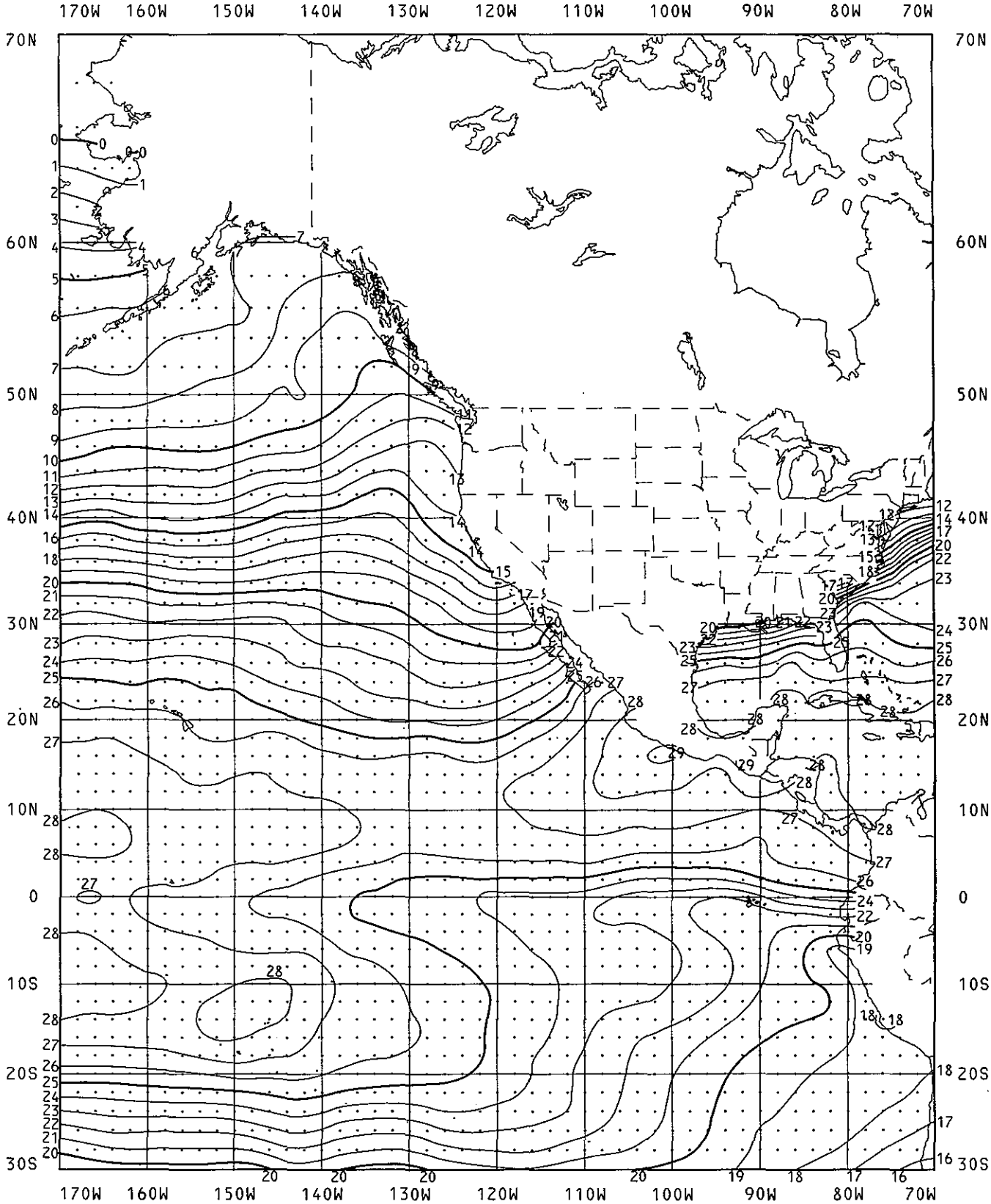

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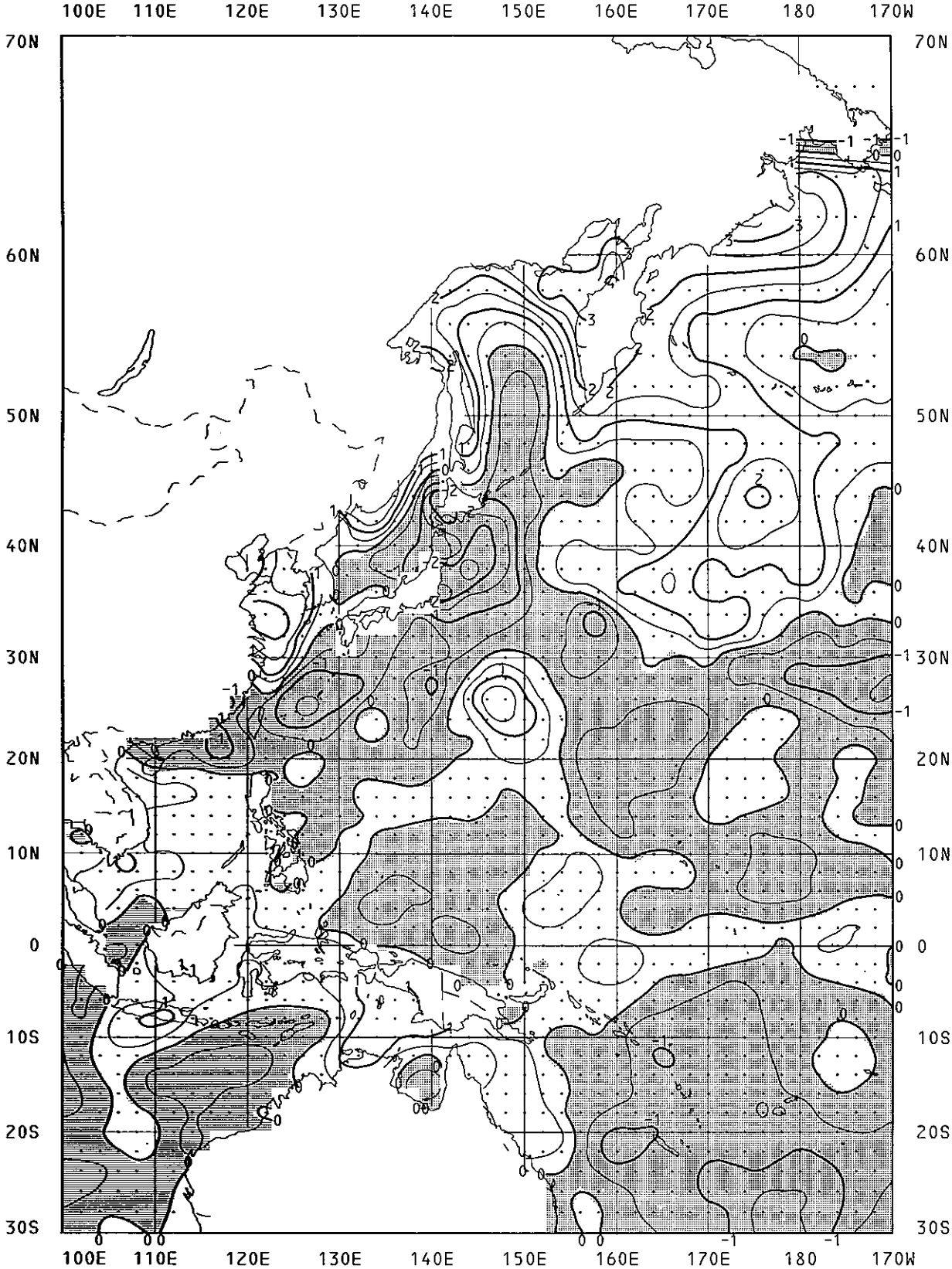

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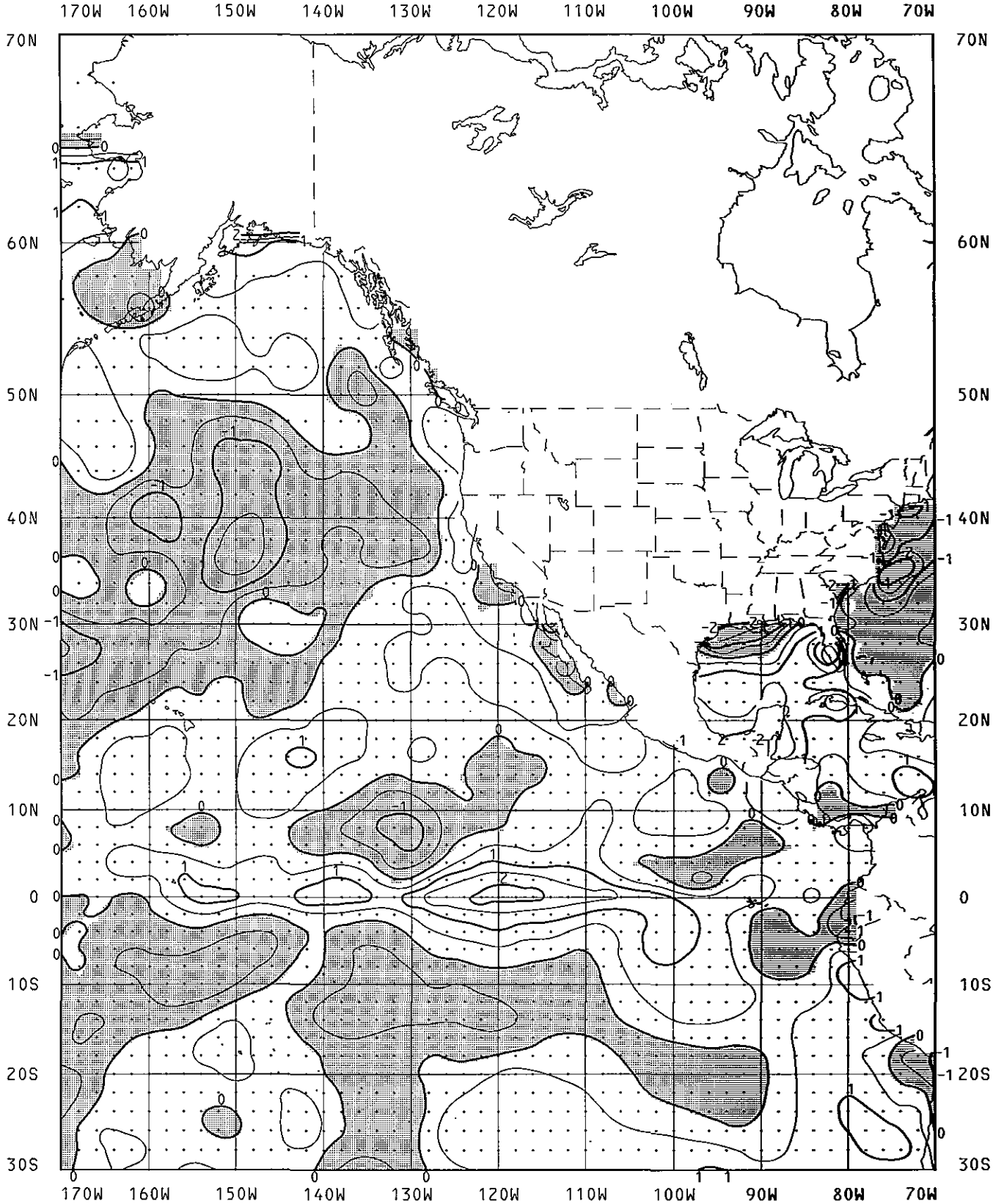

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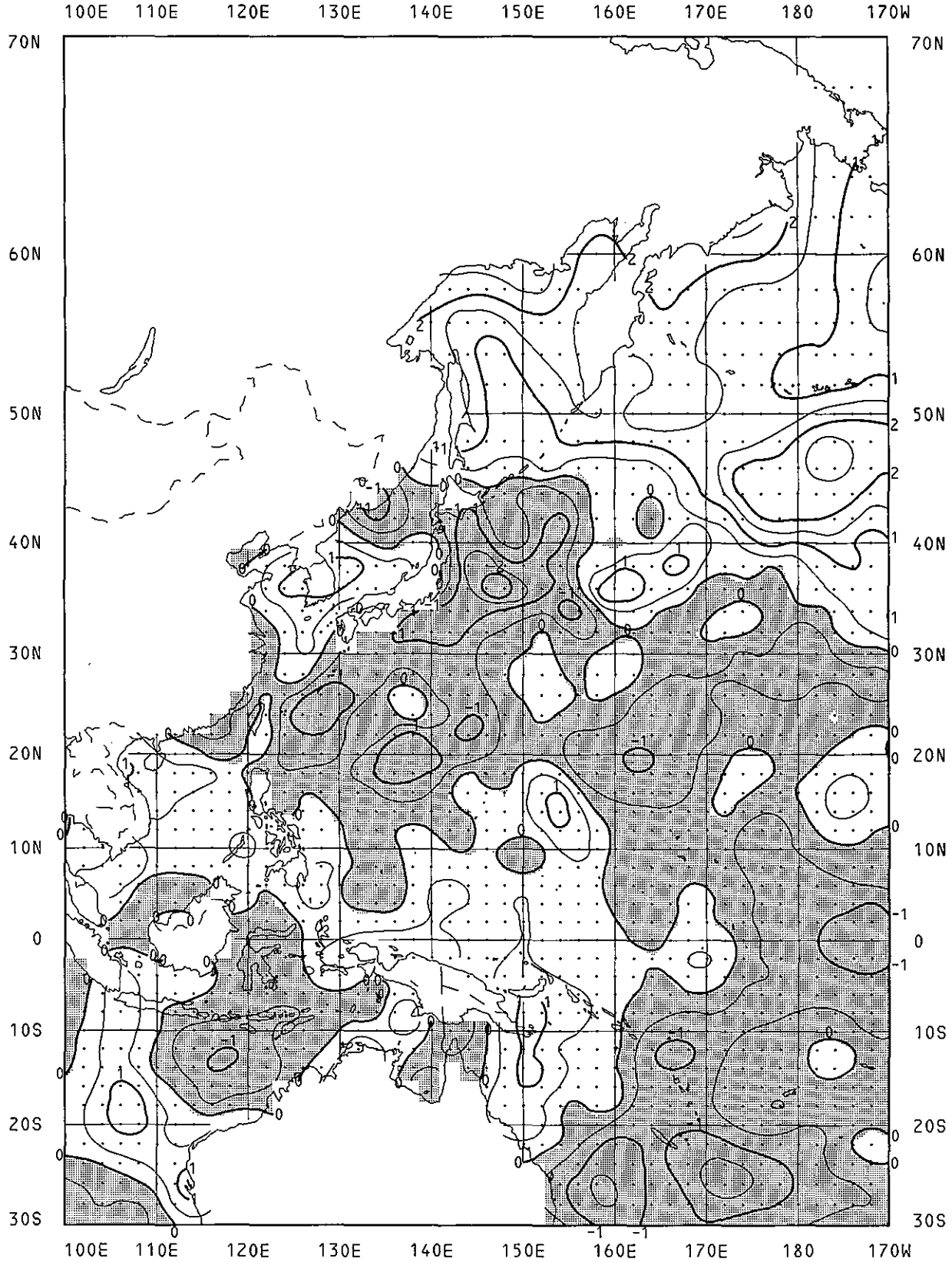

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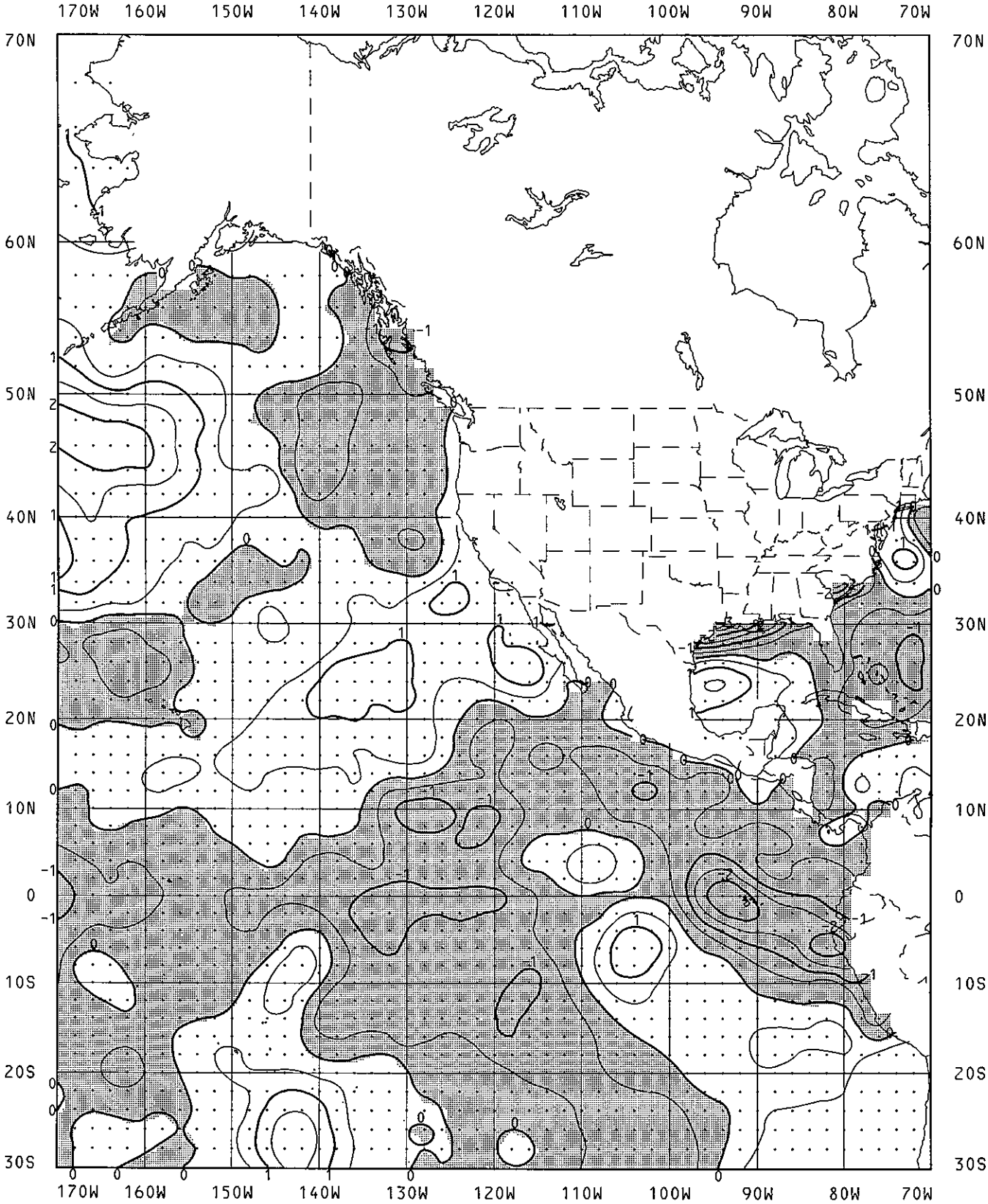

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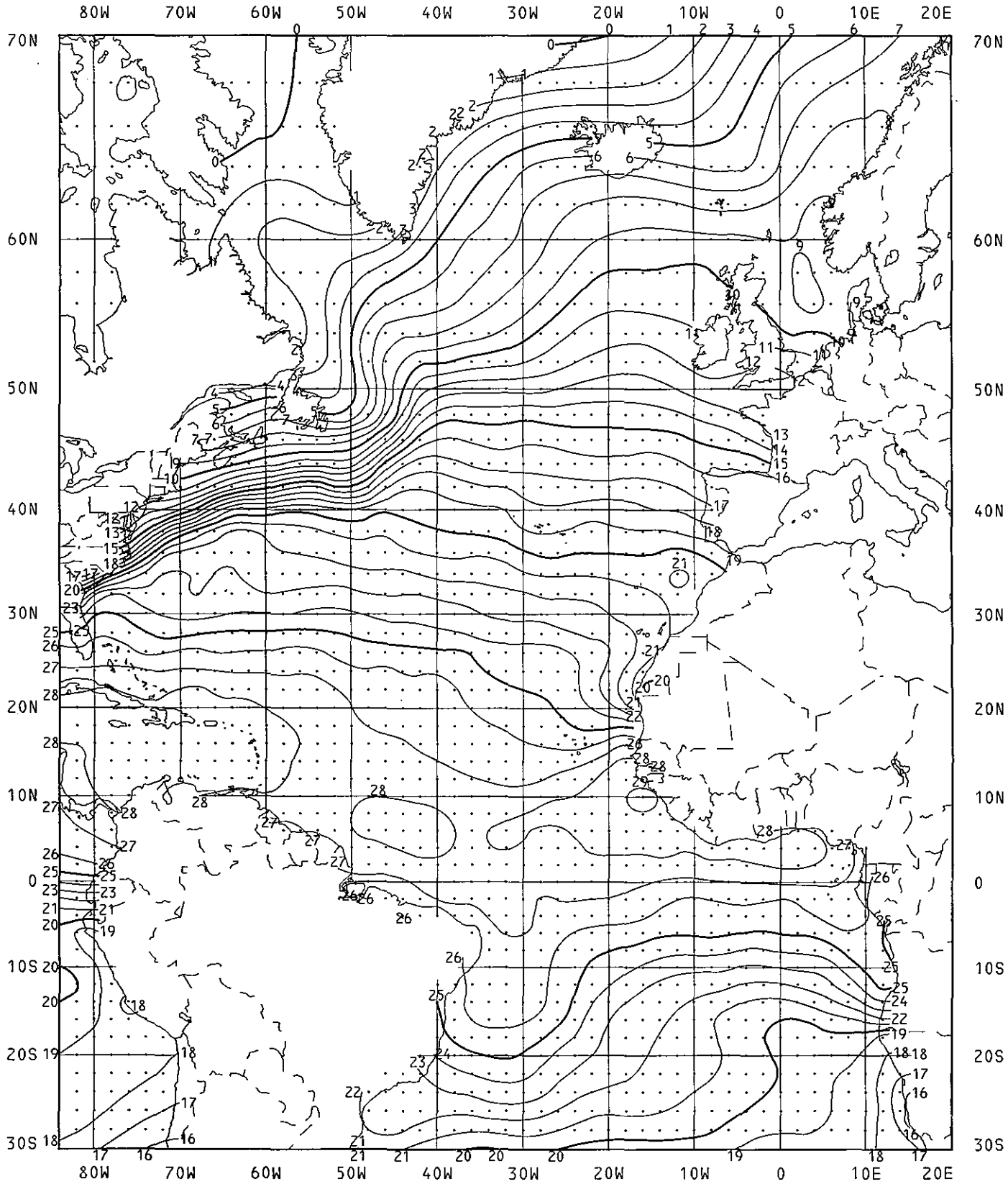
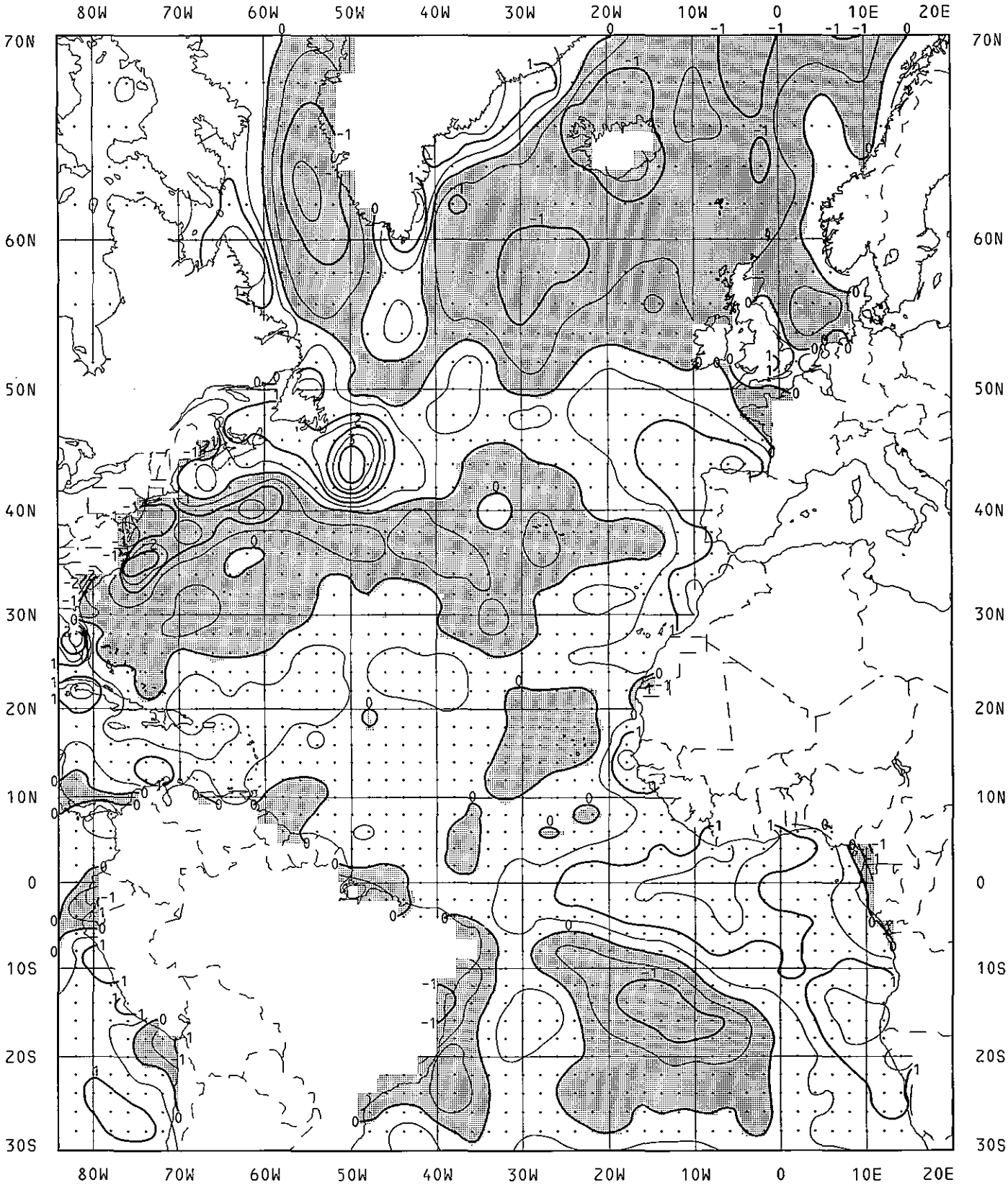


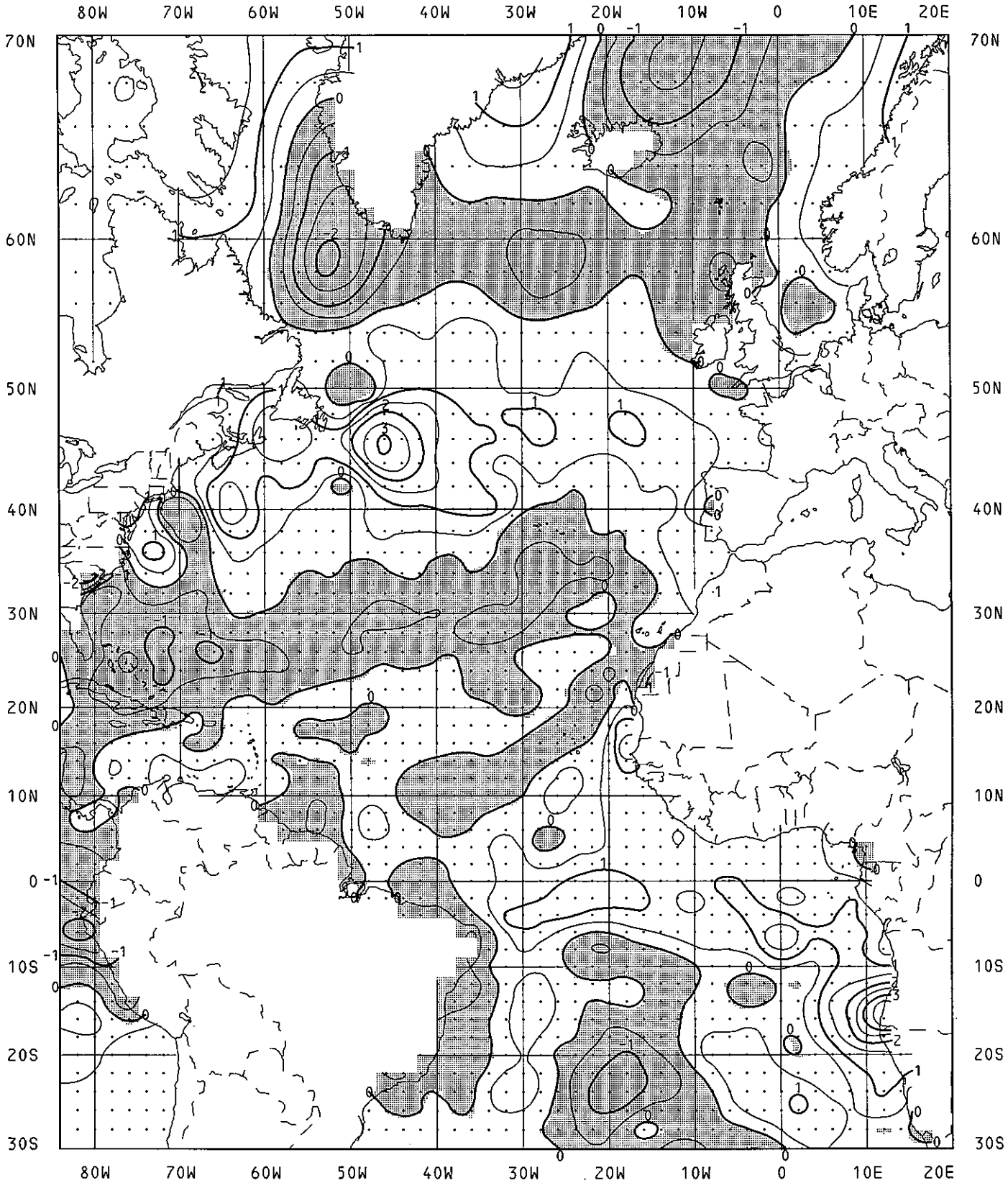
Atlantic Ocean
SST--MONTHLY MEAN (°C)
November 1981

Monthly mean sea surface temperature is the mean of two-day analyses using ship, buoy, and satellite observations. (See page 3.)



Atlantic Ocean
SST--MONTHLY ANOMALY (°C)
November 1981

Monthly anomaly is the difference between the monthly mean sea surface temperature and the climatological monthly mean value -- shading shows where the monthly mean is colder than climatology. (See page 3.)



Atlantic Ocean
SST--YEARLY CHANGE (°C)
November 1981

Yearly change is the difference between the monthly mean SST for this month and for the corresponding month last year -- shading shows where this year's monthly mean is colder than the corresponding monthly mean last year.

REGIONAL ANALYSES

Bering Sea / North Slope Ice

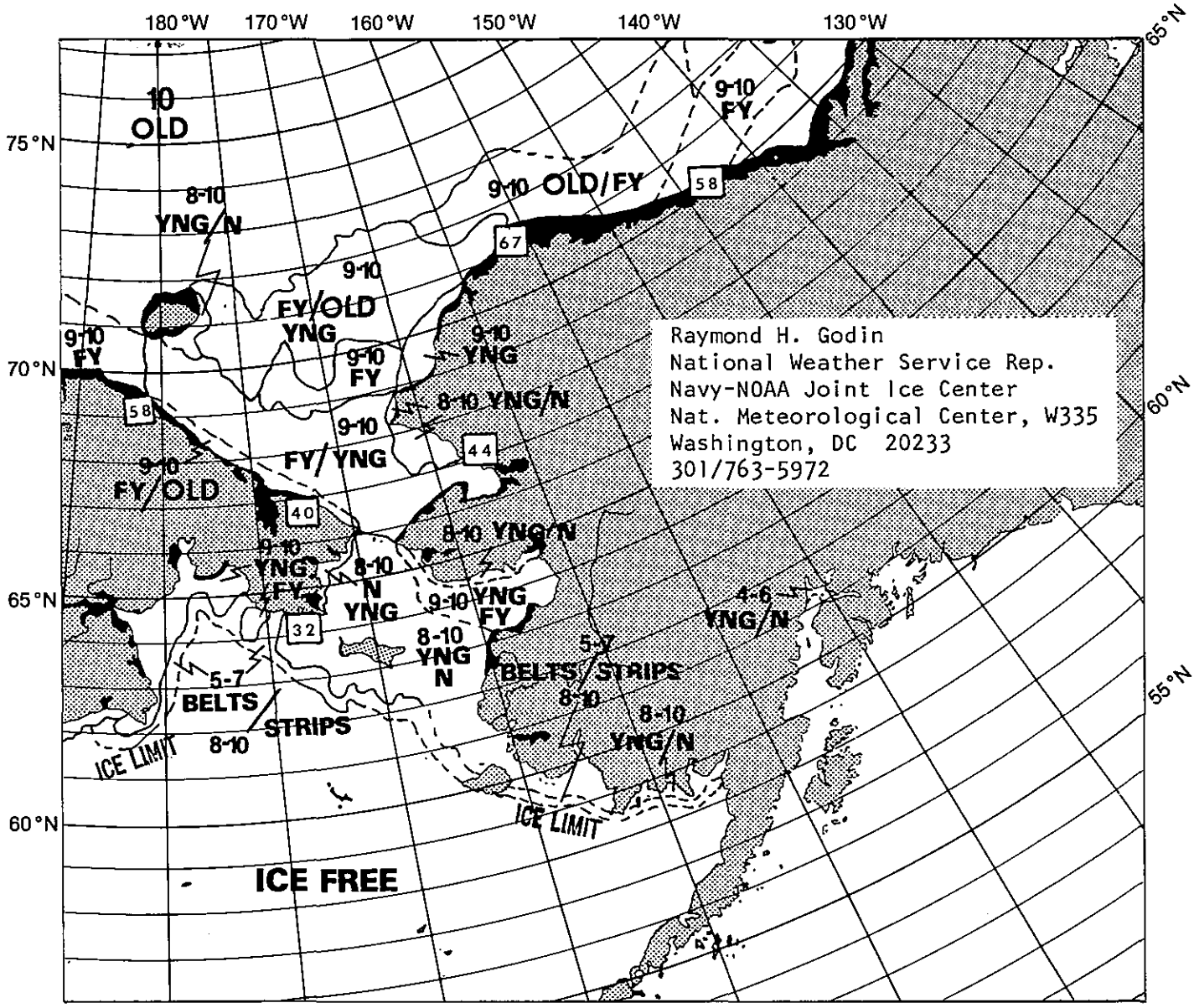
West Coast

- Ocean features
- Sea surface temperature
- SST anomaly

East Coast

- Ocean features
- Sea surface temperature
- SST anomaly

BERING SEA / NORTH SLOPE ICE ANALYSIS



KEY

ICE CONCENTRATION

4-6	Area 4-6 tenths ice-covered.
OW	Open water. Sea ice present in concentrations less than one tenth.
ICE-FREE	No sea ice. Ice of land origin (iceberg e.g.) may be present.

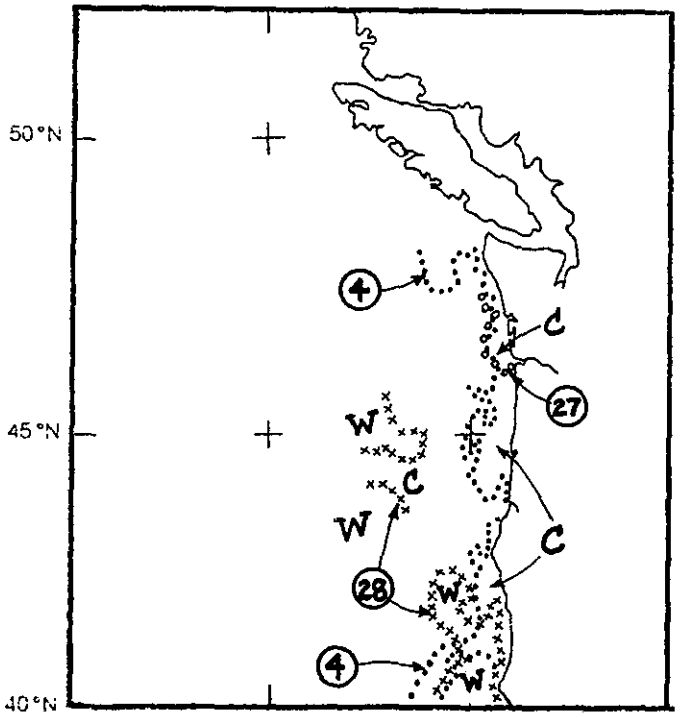
ICE THICKNESS (AGE)

OLD	Includes both multi-year and second-year ice. Generally 2-3.5m thick.
FY	Any or all first year ice types (30 cm - 2 m thick).
YNG	Young ice (10-30 cm thick).
N	New and nilas.
■	Fast ice. Sea ice which forms and remains fast along the coast.
120	Theoretical thickness of this season's growth (cm), based on freezing degree days (presented for first day of each month on first succeeding chart).
———	Ice boundary visually or satellite observed.
– – – –	Ice boundary estimated.

NOVEMBER 1981

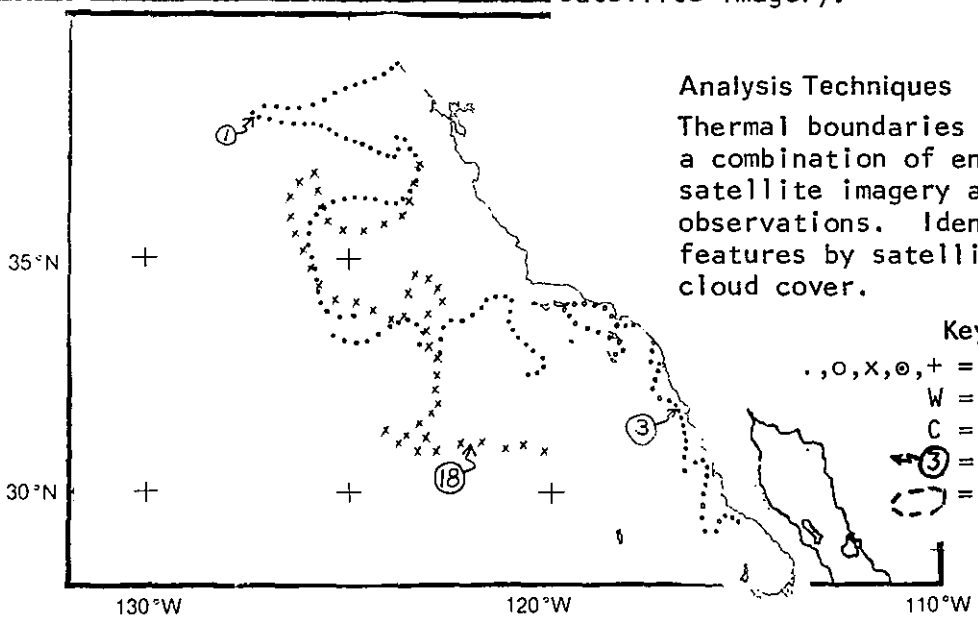
The mean monthly surface pressure circulation, which affects sea ice, is normal. Easterly flow is observed throughout the Chukchi and northern Bering Seas. Air temperatures averaged near normal along much of the Alaskan coastline. Theoretical ice thicknesses, which are indicative of seasonal temperatures, are also near normal. By mid-November the Chukchi Sea is frozen. In the Bering Sea new and young ice are observed forming throughout most of the Alaskan coastline extending as far south as 58°N. Fast ice is also observed in protected and shallow coastal areas as far south as 61°N. Significant expansion of the monthly ice edge occurred throughout Alaskan waters. Along the 168°W meridian the ice edge expanded over 4400 km. Such a large expansion is not uncommon. The current ice edge position is near the historical mean.

WEST COAST OCEAN FEATURES



NOVEMBER 1981

SST's continued to decrease over the entire area during November, with no significant departures in this trend seen in either coastal or offshore regions. The rate of decrease was greater during the second half of the month. SST decreases were approximately 2-3°C. In addition, SST gradients relaxed as a result of general seasonal cooling and enhanced turbulent mixing due to the passage of several severe weather systems. One of these, on November 14, was accompanied by winds as high as 35 m/s and seas to 10 m, and was the most severe storm to hit the Pacific Northwest in 19 years. Coldest SST's continued to be found nearshore, due to land cooling and river runoff. The cold plume of water originating at the Columbia River mouth and flowing northward along the Washington coast was especially apparent on satellite imagery.



Analysis Techniques

Thermal boundaries are determined from a combination of enhanced infrared satellite imagery and ship and buoy observations. Identification of these features by satellite is limited by cloud cover.

Key

.,o,x,⊙,+ = thermal boundaries
W = warm
C = cold
③ = date of feature
(dashed) = outline of water mass feature

Little SST cooling occurred over most of the south panel area in November, but SST's decreased by 1-2°C in the northern part. A cool anomaly (about 1°C) persists in the Northwest corner while a warm anomaly (more than 1°C) extends from 36°N to 40°N along the coast. SST's dropped suddenly by 1-2°C over most of the northern half of the area following the passage of the first major winter storm on November 13. Decreases in SST at the coastal buoys were small (1°C or less) in response to this storm. Persistent warm spots were observed near 37°N 124°W and 34°N 132°W. Satellite data show a decrease in SST gradients between nearshore and offshore waters, indicating some relaxation of coastal upwelling together with seasonal cooling of the waters offshore.

NORTH PANEL

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NOAA
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Redwood City, CA 94063
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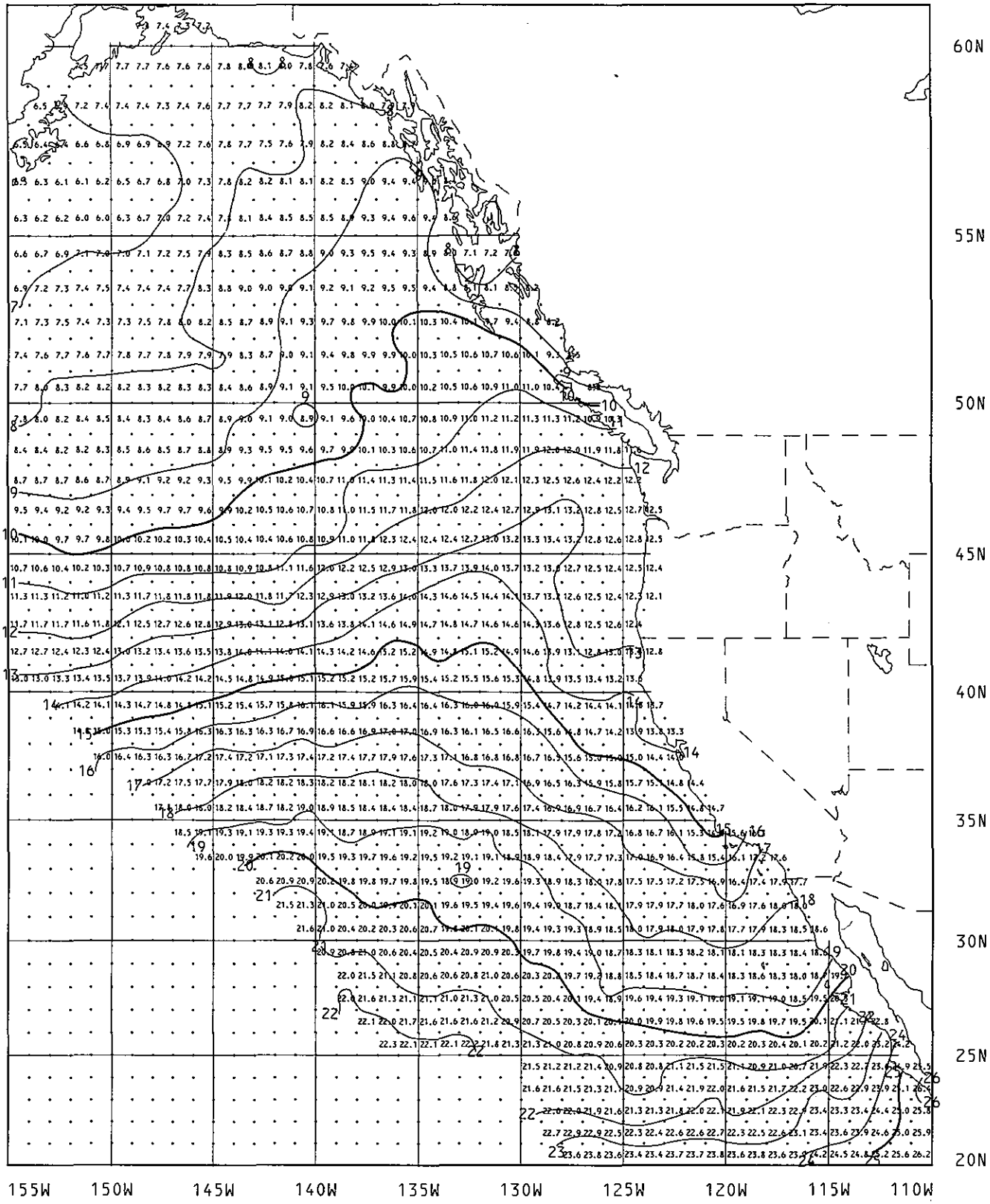

West Coast
SST--MONTHLY MEAN (°C)
November 1981

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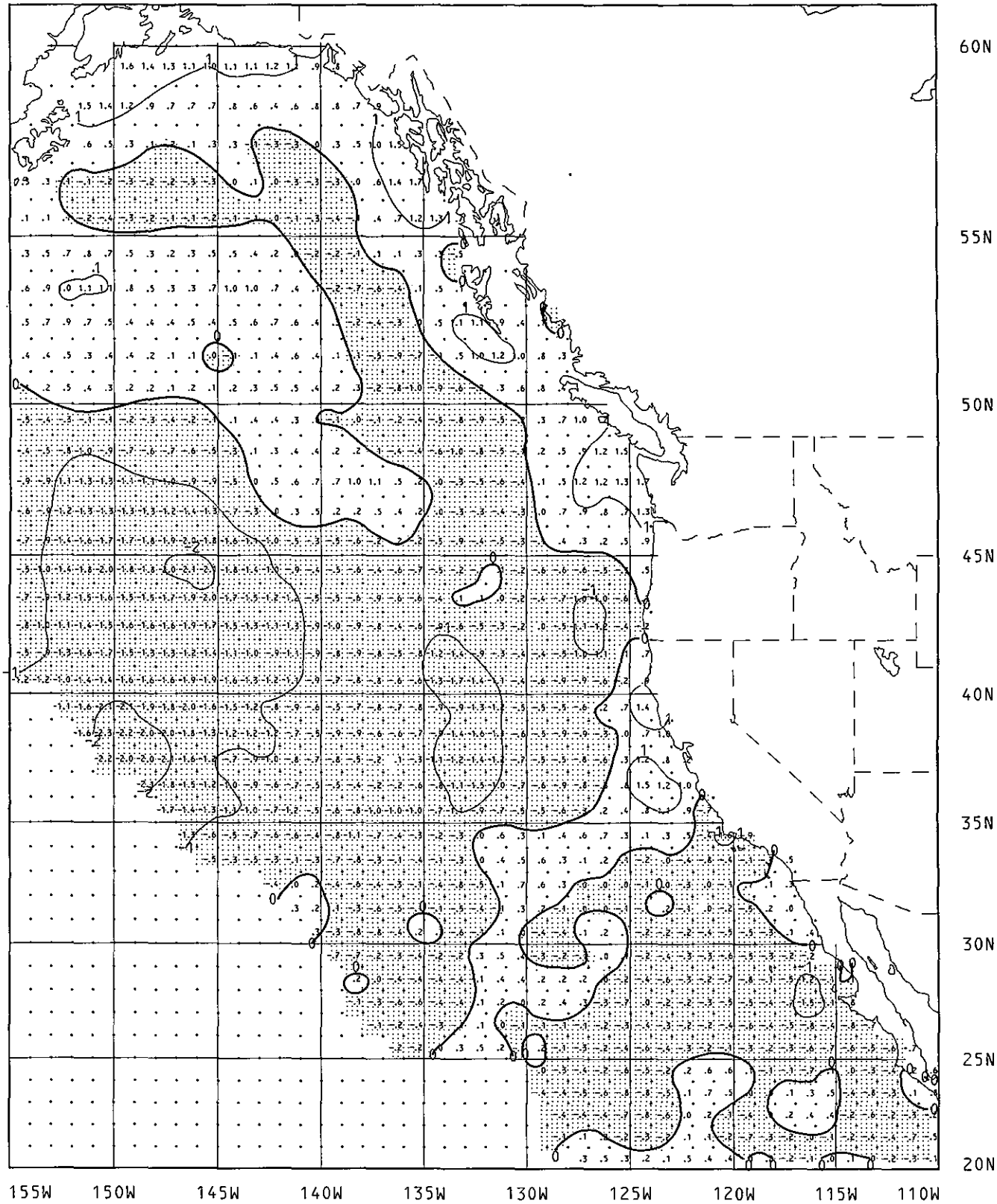

West Coast
SST--MONTHLY ANOMALY (°C)
November 1981

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EAST COAST OCEAN FEATURES

The end of this month's positions of the Gulf Stream System and its associated eddies are shown for the NW Atlantic and the Gulf of Mexico. The Gulf Stream and Loop Current boundaries are located by prominent sea surface temperature gradients or by the 15°C isotherm at 200m. Anticyclonic eddies are labeled a-z in the Gulf of Mexico and 1-99 in the NW Atlantic. Cyclonic eddies are labeled A-Z. Arrows on eddies indicate direction of circulation. Warm-core or anticyclonic eddies rotate clockwise; cold-core or cyclonic eddies rotate counterclockwise. The long arrows indicate the date of data used.

Feature positions are drawn from:
NOAA satellite infrared imagery
Bathythermograph data,
National Meteorological Center of National Weather Service
Oceanographic Analysis (daily),
National Weather Service/National Earth Satellite Service

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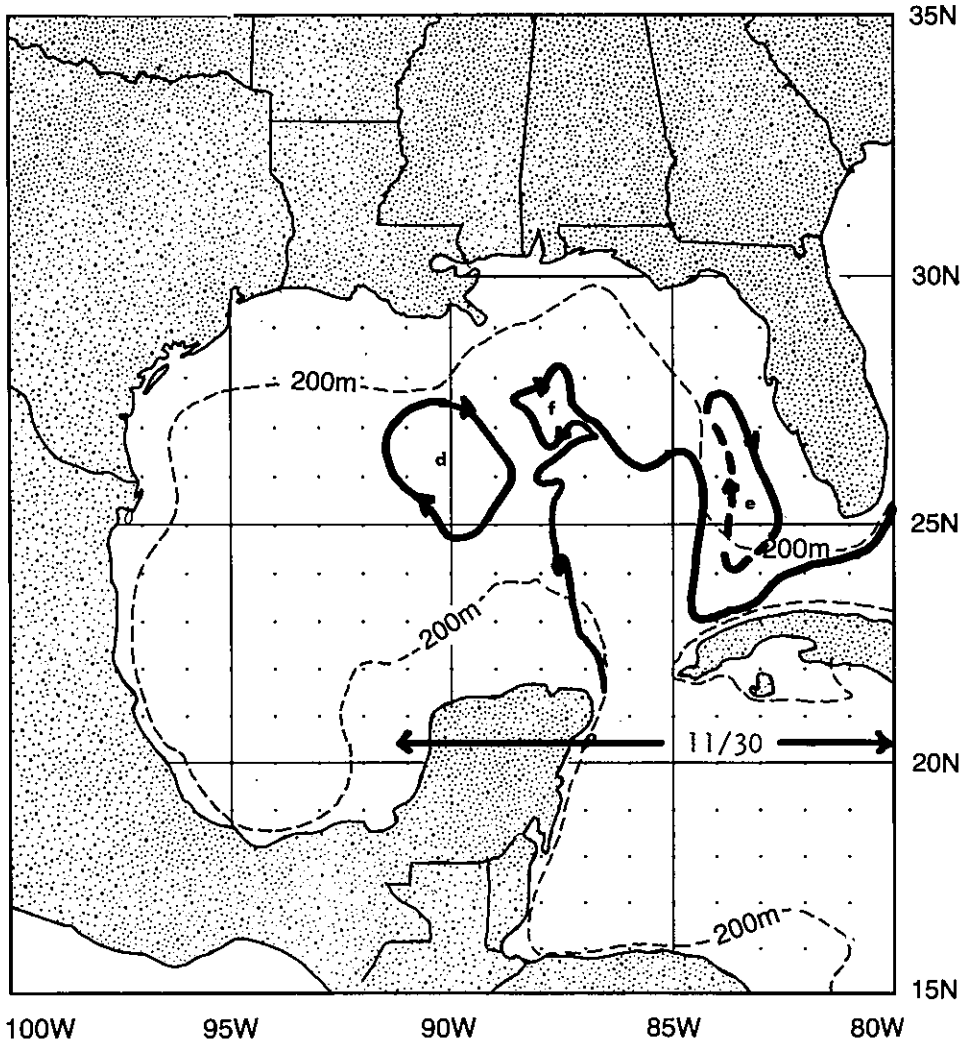
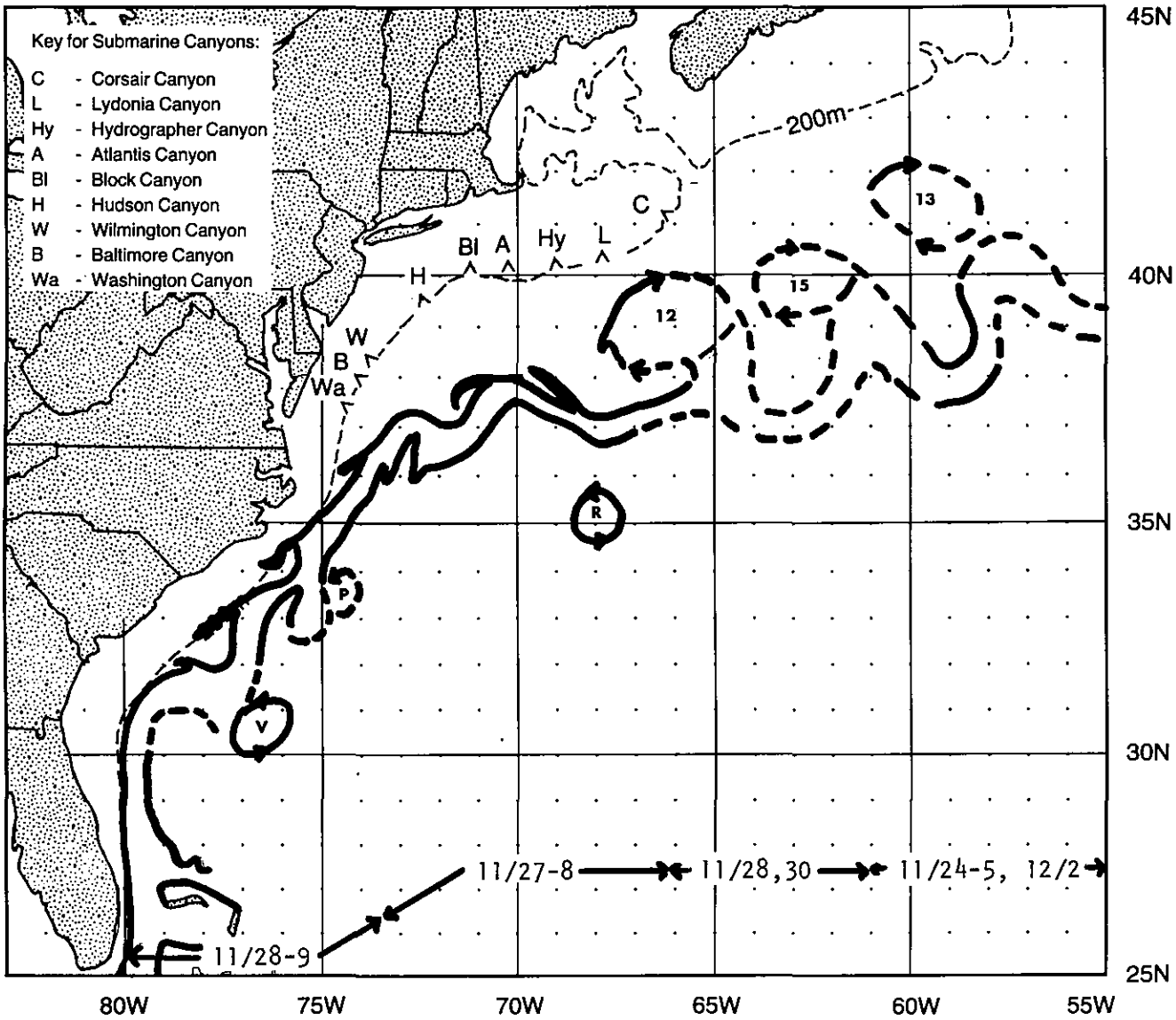


NOVEMBER 1981

The Loop Current and three anticyclonic eddies are observed in November satellite imagery of the Gulf of Mexico. Anticyclonic eddy d translated 145 km SW. Eddy f apparently formed in early November from a large protrusion in the northeastern Loop Current centered near 28°N 86°W. Eddy f has since translated about 200 km WSW. Eddy e was first observed on November 7 near its present position. The origin of this feature is unknown. Circulation of as much as 3 knots was reported in this feature by several commercial fishers. This feature is expected to rapidly spin down due to its shallow water-depth location (less than 200 m).

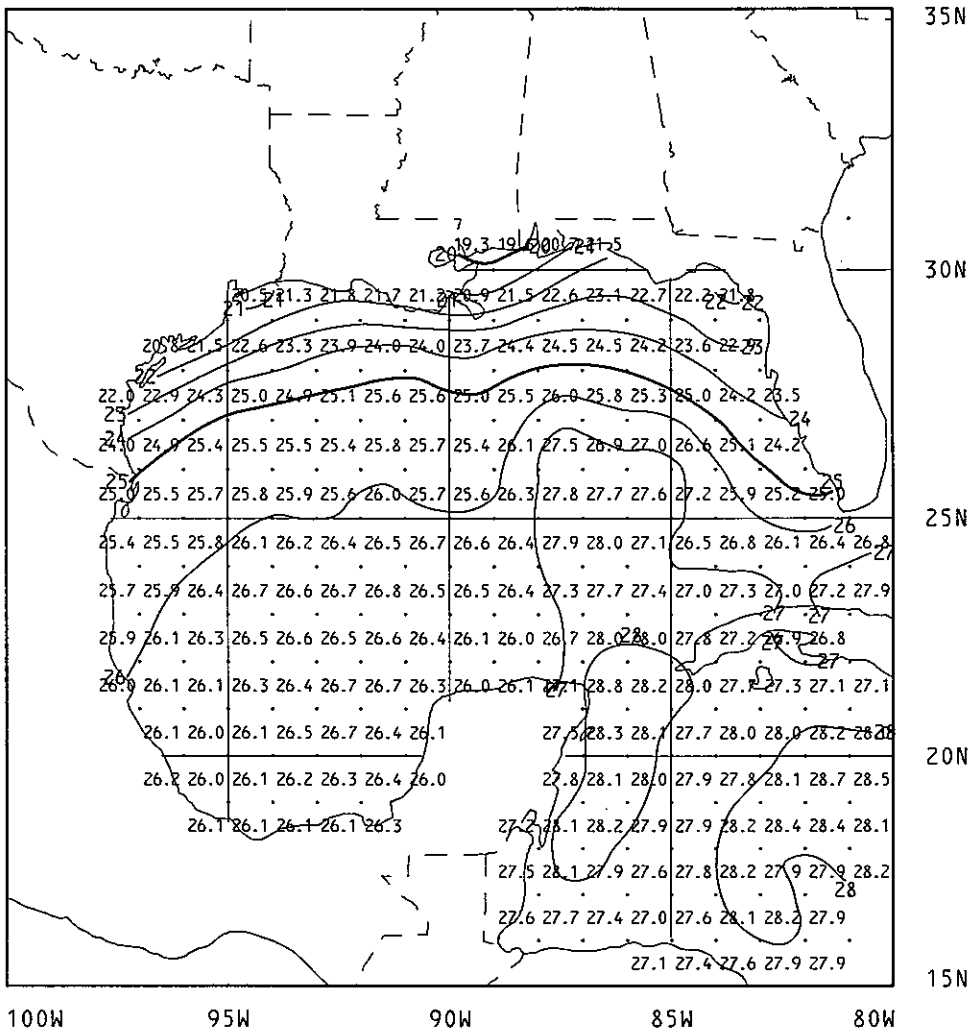


Satellite imagery of the Gulf Stream east of 70°W is poor this month due to much cloudiness. In the above chart, the dashed positions shown are good estimates of the features using a few satellite images and many XBT reports.

Apparently, anticyclonic eddy 12 translated 50 km S, while eddy 13 moved 45 km E. Eddy 15 probably formed during the first week of November. Eddy 14 was not observed.

Cyclonic eddy V was first observed on November 16; it may be a previously observed eddy. The eddy near 33°30N 74°30W is probably eddy P; the chart position shown is from November 16 satellite imagery. Eddy R apparently translated 100 km SE; its position was provided by the Naval Eastern Oceanography Center.

EAST COAST SST-
MONTHLY MEAN



Gulf of Mexico
SST--MONTHLY MEAN (°C)
November 1981

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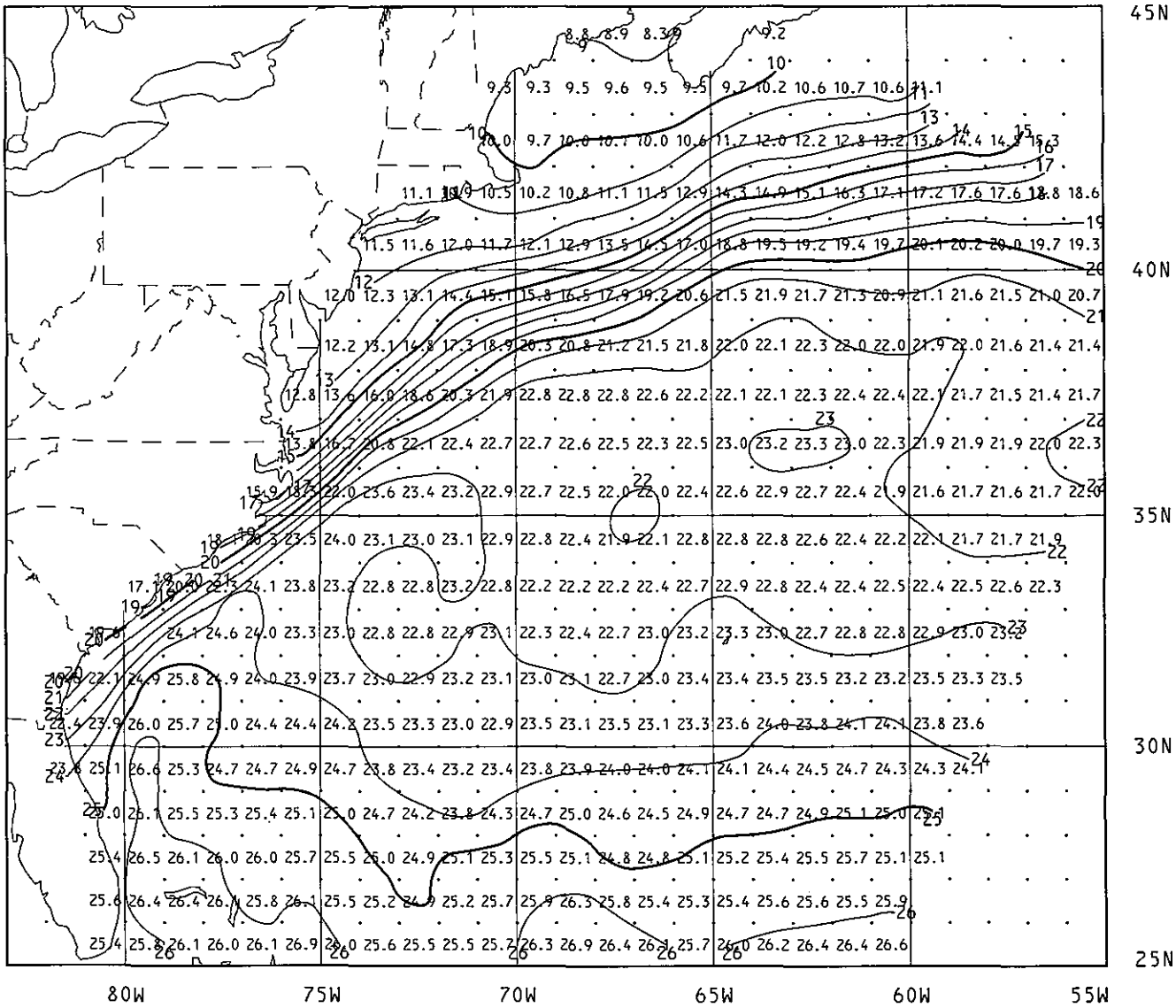

NW Atlantic Ocean
SST--MONTHLY MEAN (°C)
November 1981

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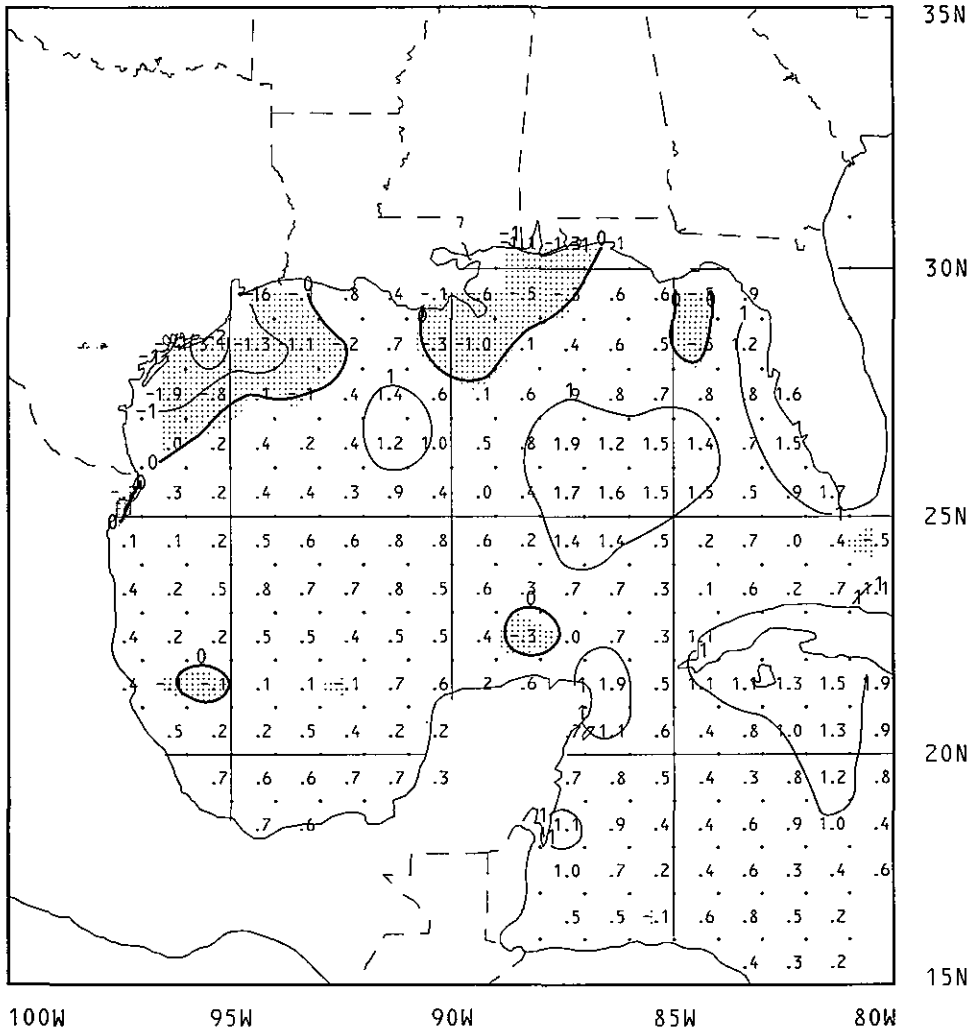
EAST COAST SST-ANOMALY



Gulf of Mexico
SST--MONTHLY ANOMALY (°C)
November 1981

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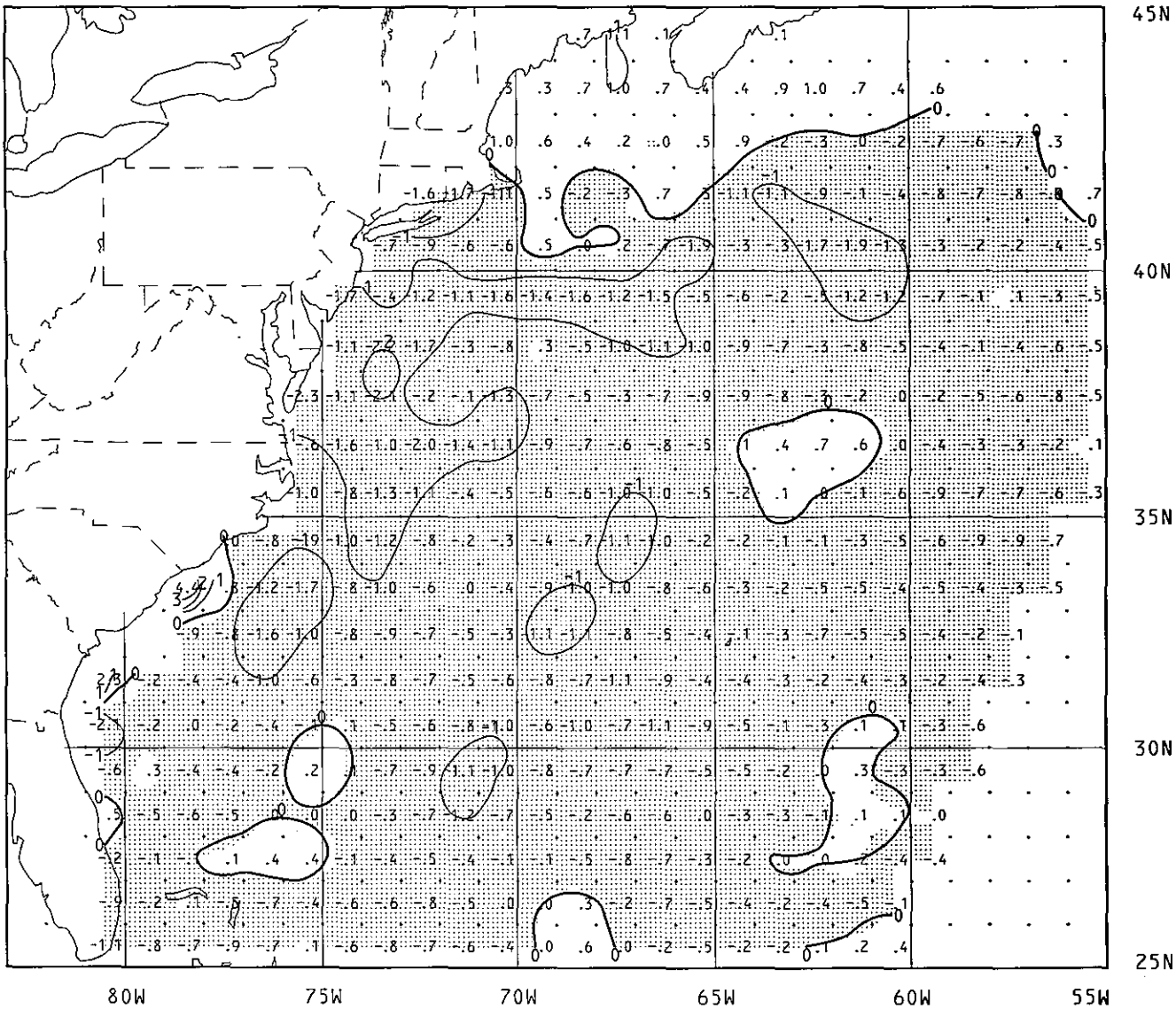

NW Atlantic Ocean
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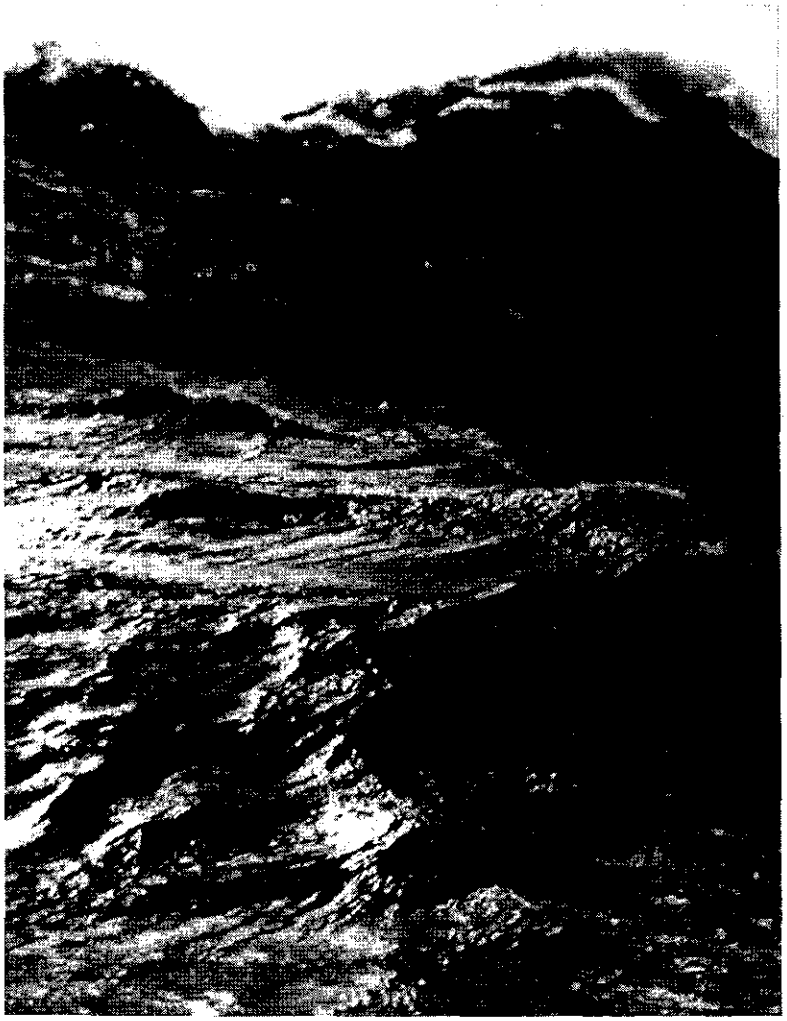
OCEANOGRAPHIC Monthly Summary

Volume I Number 12 December 1981



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U.S. DEPARTMENT OF COMMERCE • National Oceanic and Atmospheric Administration
National Weather Service/National Earth Satellite Service

Oceanographic Monthly Summary is a continuation of two NOAA oceanographic publications, *gulfstream* and *Fishing Information*.

The *gulfstream* magazine included charts of the Gulf Stream location and Northwest Atlantic monthly mean SST's and anomalies. It was originally published as *The Gulf Stream Monthly Summary* by the U.S. Naval Oceanographic Office from 1964 to 1975. NOAA's National Weather Service took over the magazine, changing the name to *gulfstream*, from 1975 to 1980. The two Gulf Stream magazines thus constitute an uninterrupted 16-year history of Gulf Stream meandering and associated eddy movements.

Fishing Information included monthly charts of North Pacific mean SST's and anomalies. It was first published as the *California Fishery Market News Monthly Summary Part II-Fishing Information* by the old Bureau of Commercial Fisheries' San Diego laboratory in 1960. The name was later shortened to *Fishing Information*, and was published until 1980 by NOAA's National Marine Fisheries Service. This publication represents a continuous 20-year climatology of North Pacific oceanographic conditions.

Oceanographic Monthly Summary continues these data series, as well as beginning standardized oceanographic data series in all other U.S. offshore areas. All of the SST analyses use the Robinson-Bauer climatology.* This is a computer-assisted subjective analysis of all vertical-profile temperature data: the entire mechanical and expendable bathythermograph (MBT and XBT) files; portions of the hydrocast, salinity/conductivity temperature depth (STD/CTD), radio message files; analysis of the Asheville Marine Deck; published data and analysis; and subjective interpretation of wind and current charts. Data comprise 381,199 North Pacific observations to 1969; 727,452 Atlantic/Indian Ocean observations to 1974; and 250,000 Southern Hemisphere observations to 1979. The majority of data are MBT's, so the climatology best represents conditions since 1942.

*Robinson, M.K., 1976. Atlas of North Pacific Ocean Monthly Mean Temperatures and Mean Salinities of the Surface Layer; *NavOceano Ref. Pub. 2*.
Robinson, M.K., R.A. Bauer and E.H. Schroeder, 1979. Atlas of North Atlantic-Indian Ocean Monthly Mean Temperatures and Mean Salinities of the Surface Layer; *NavOceano Ref. Pub. 18*.

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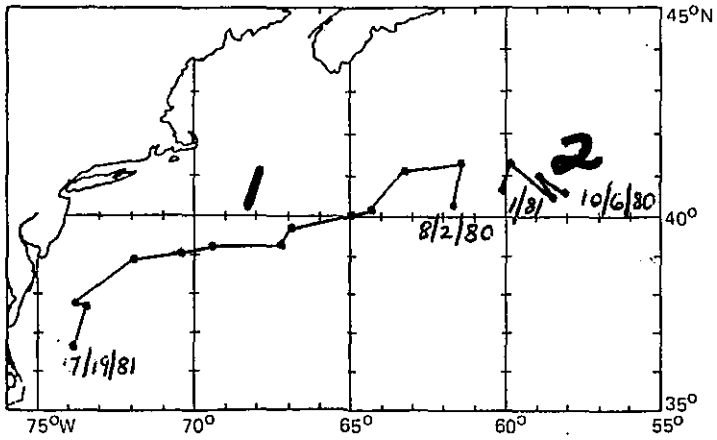
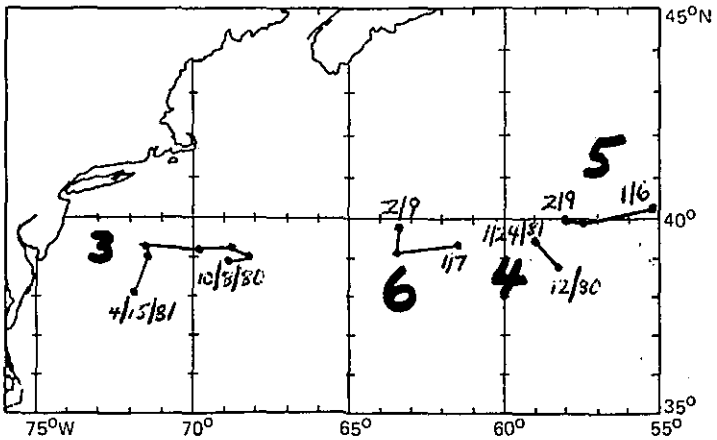
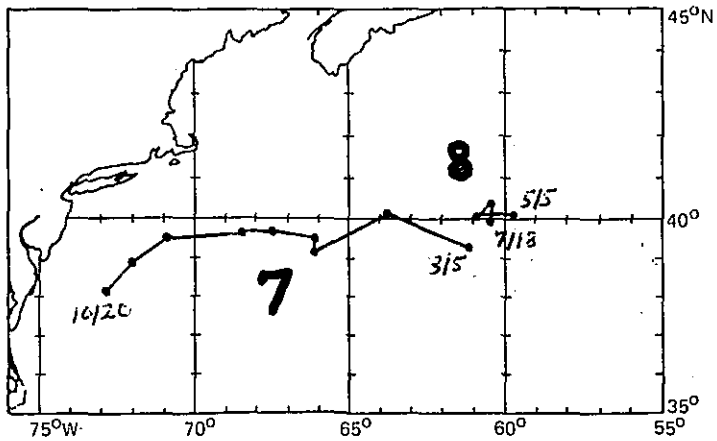
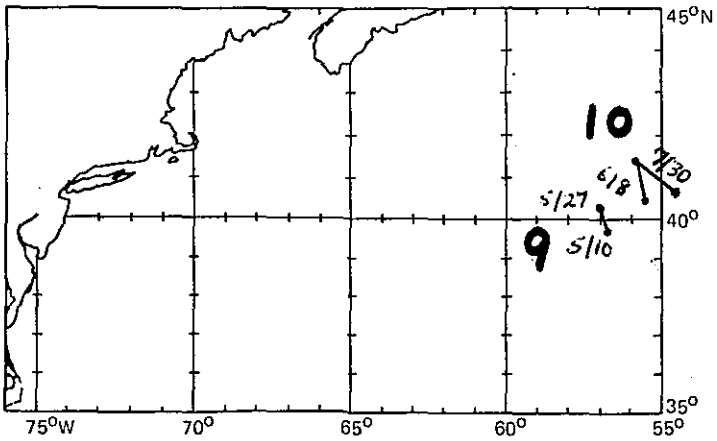


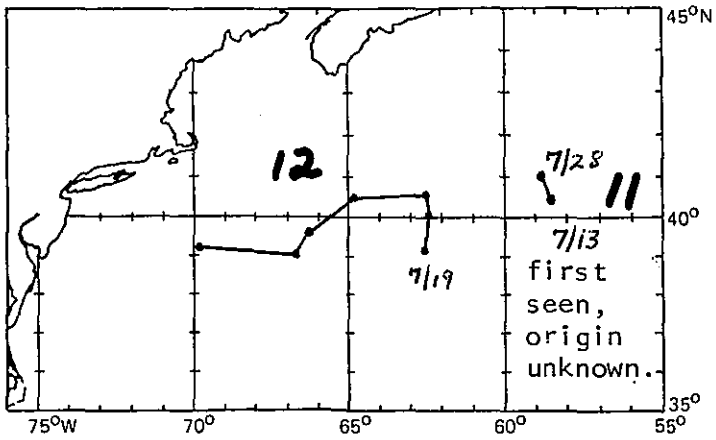
ANTICYCLONIC EDDY CENSUS--1981

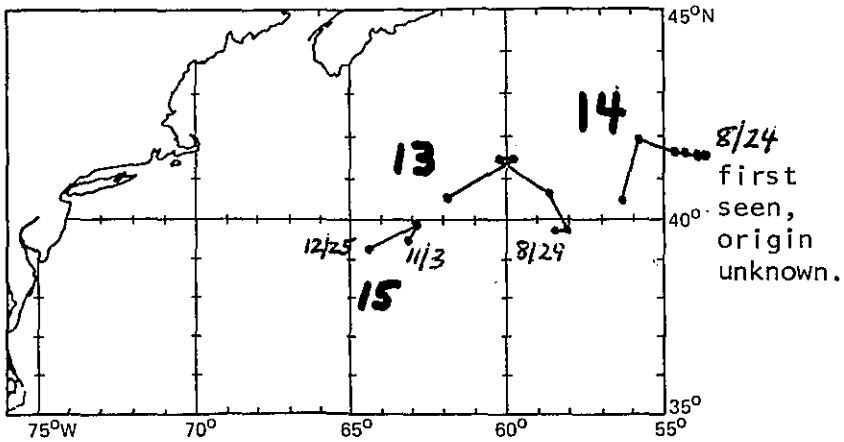
Plots show tracks of individual anticyclonic Gulf Stream eddies, from their formation (some prior to 1981) to their absorption or until their end-of-1981 position. Dots shown between formation and absorption dates represent intervening end-of-month positions. Eddy data is from *Oceanographic Monthly Summary* and, prior to 1981, *gulfstream*.

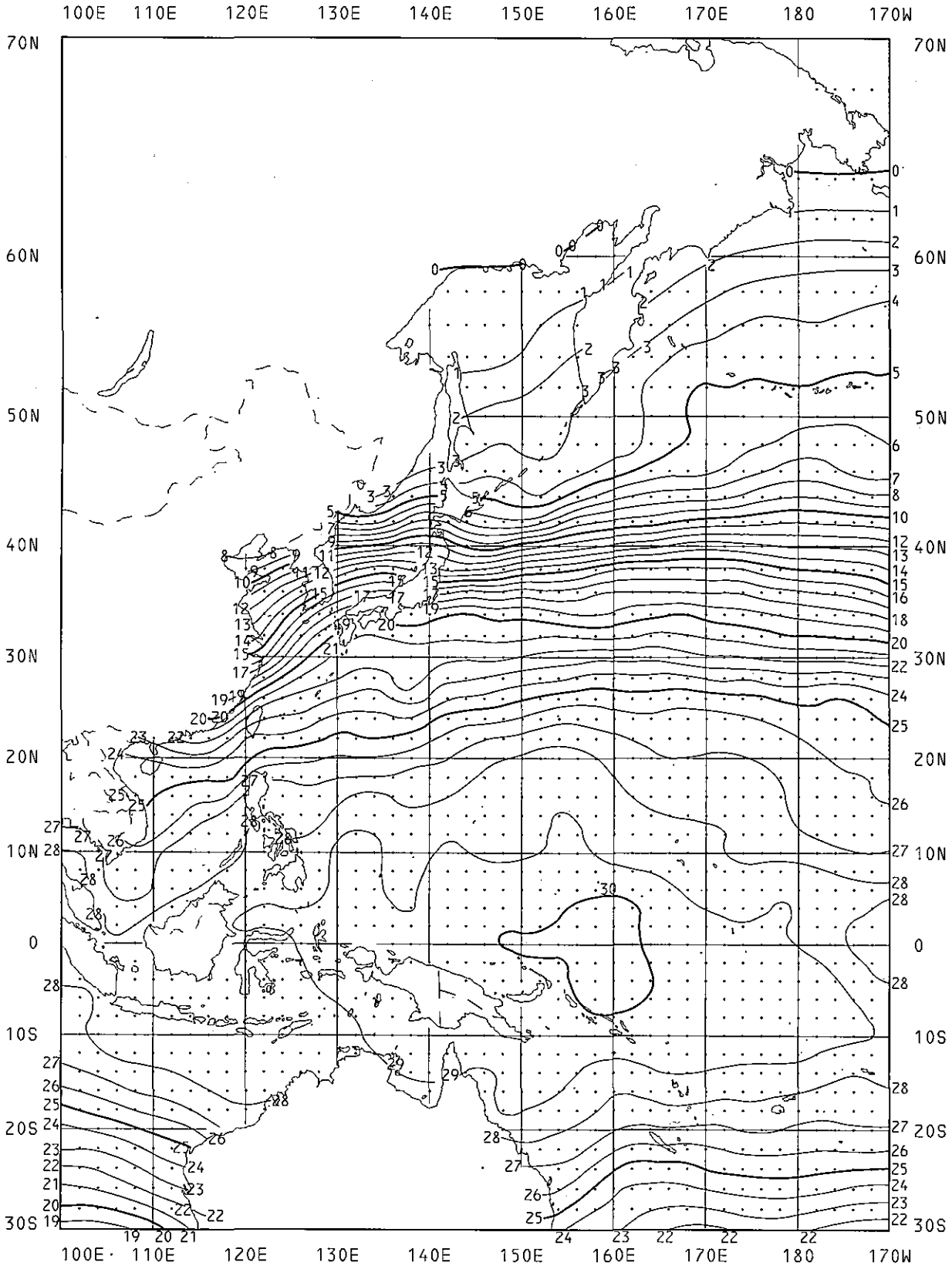












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December 1981

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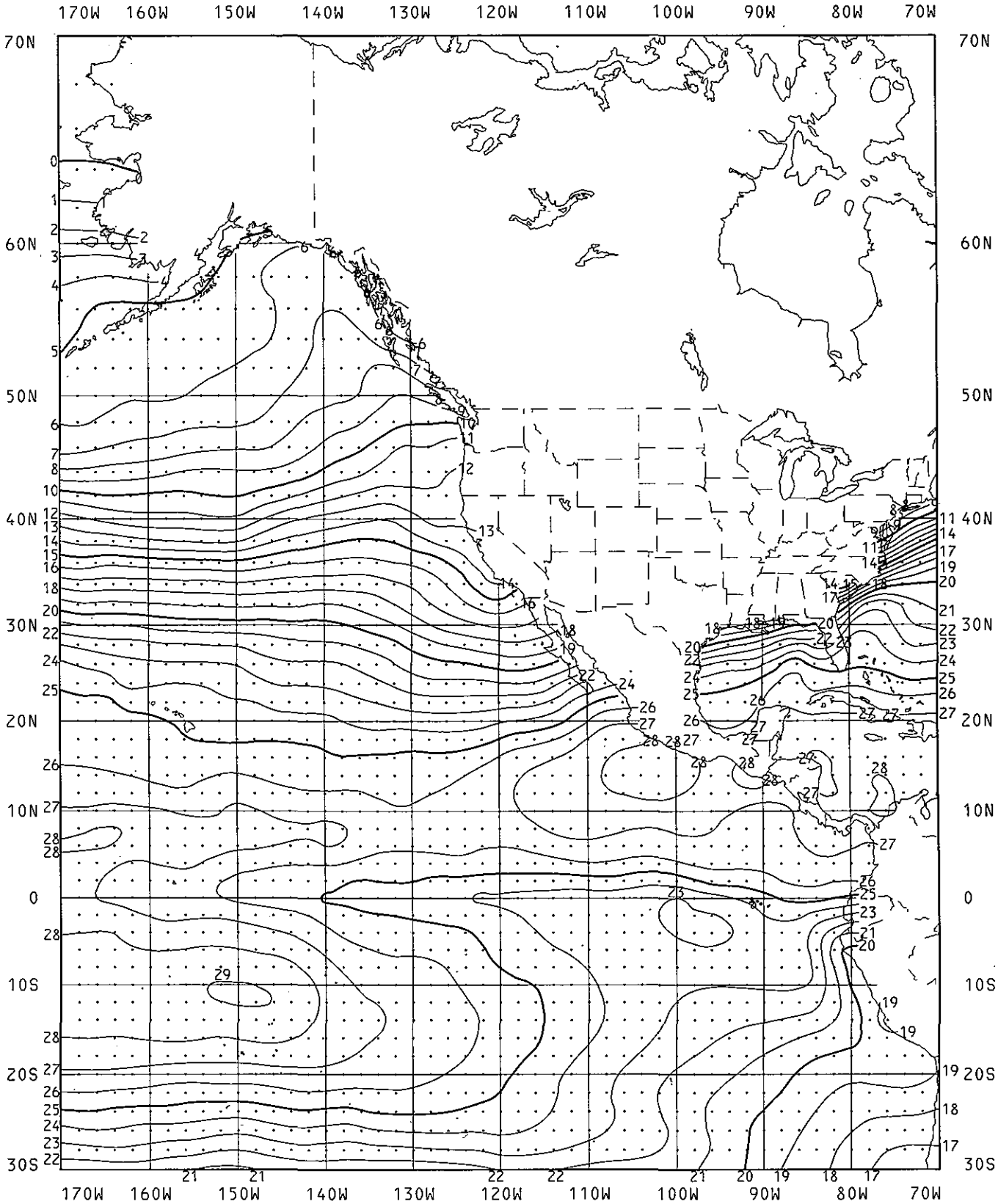

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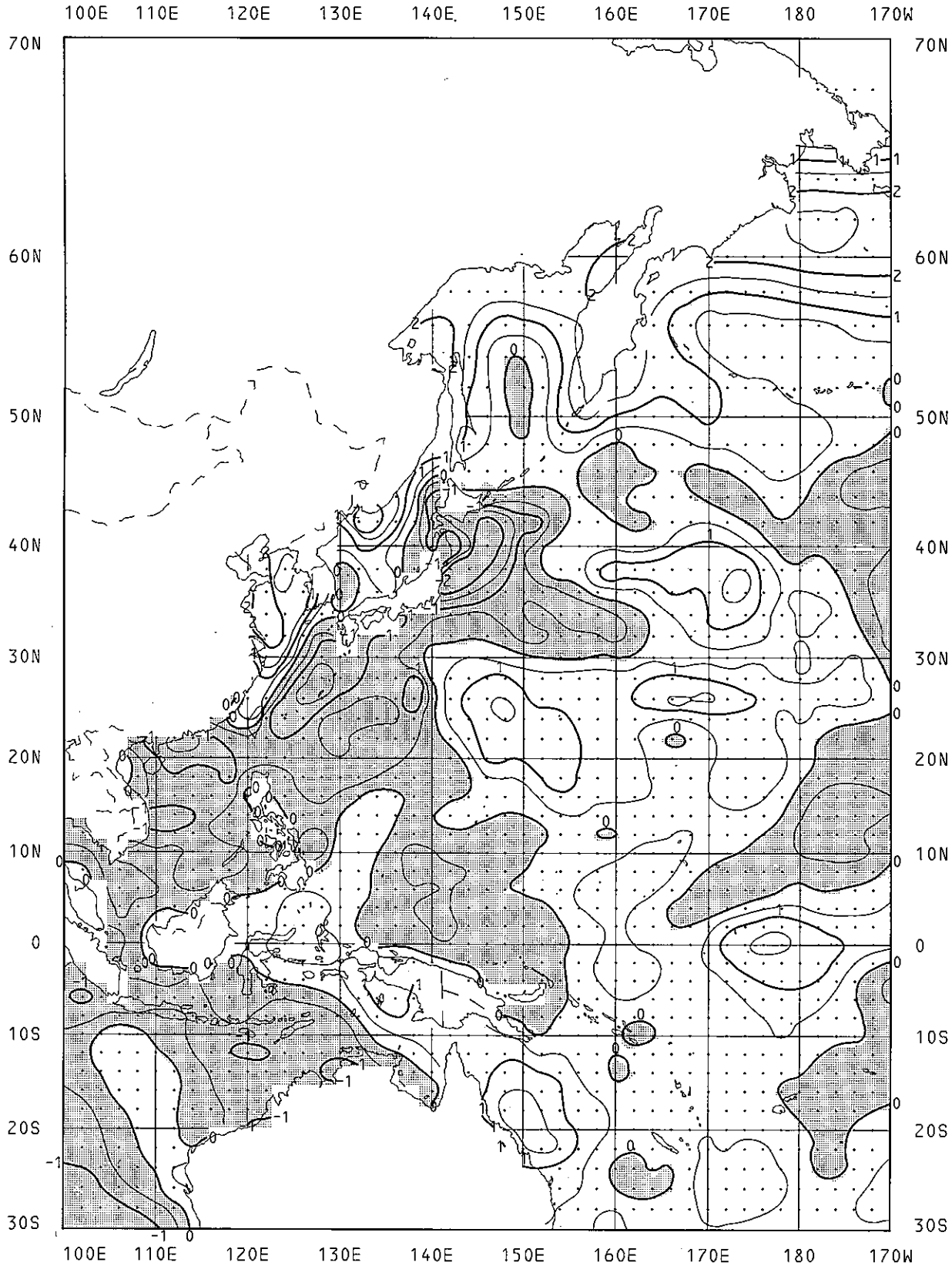

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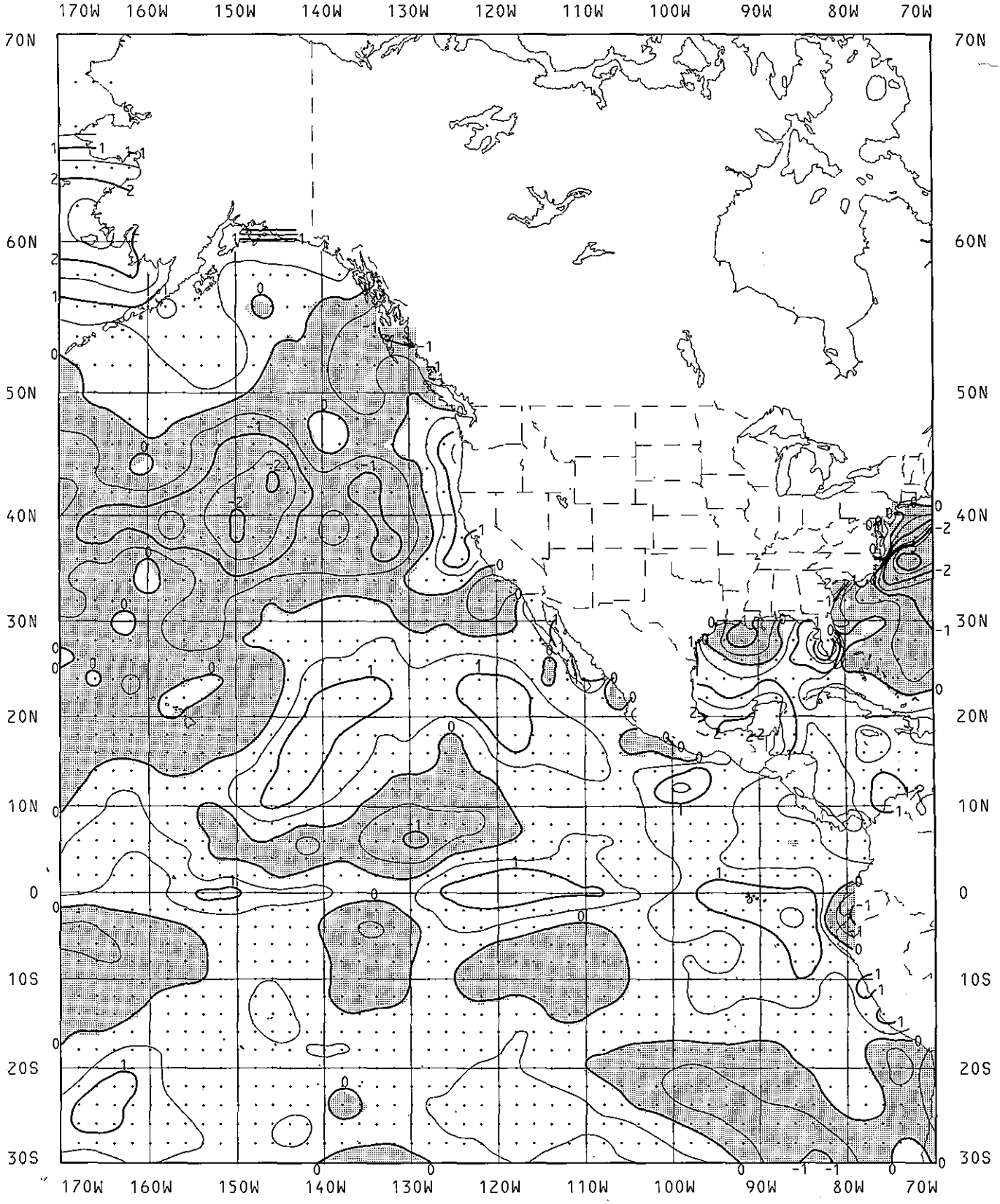

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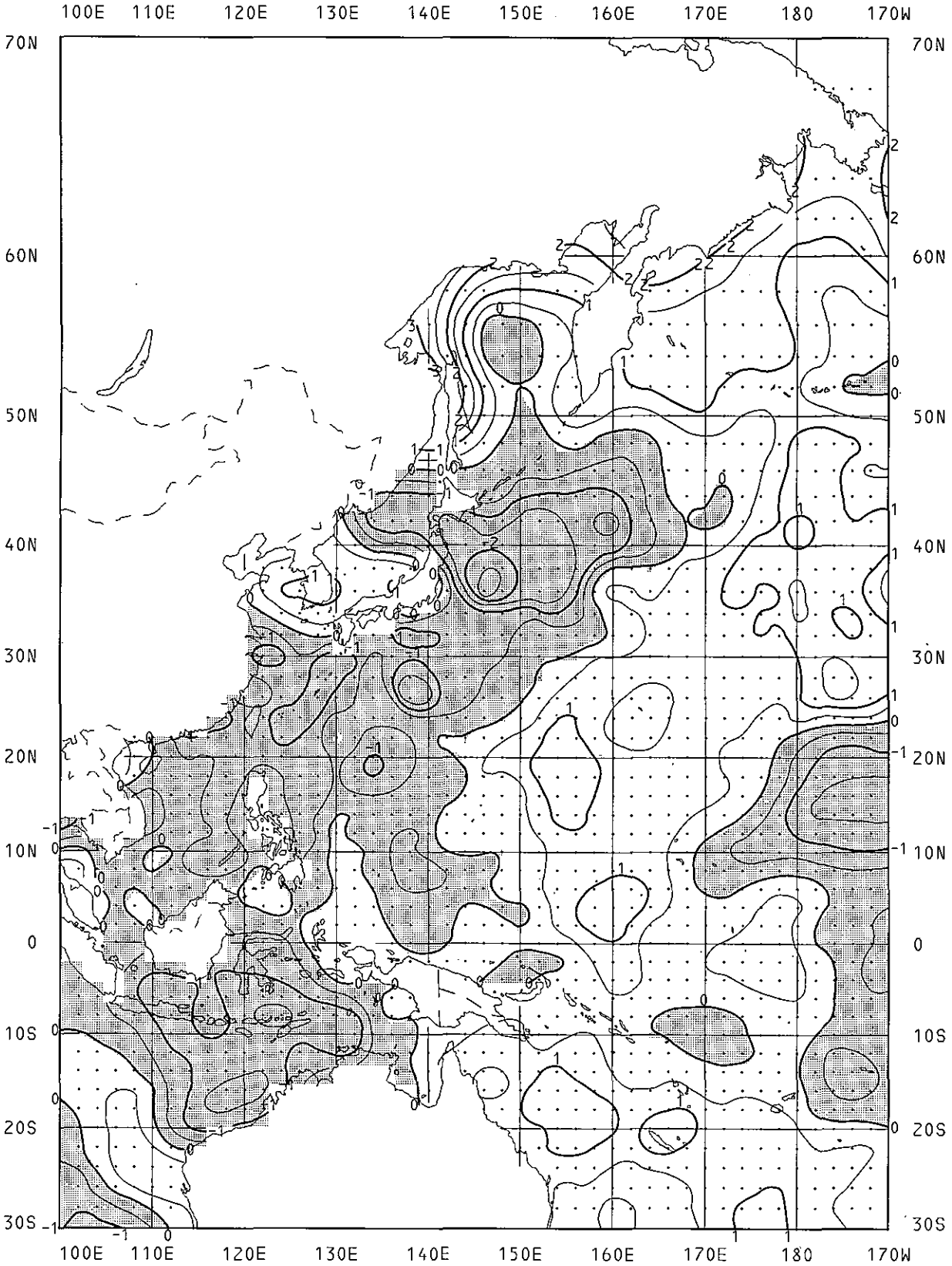

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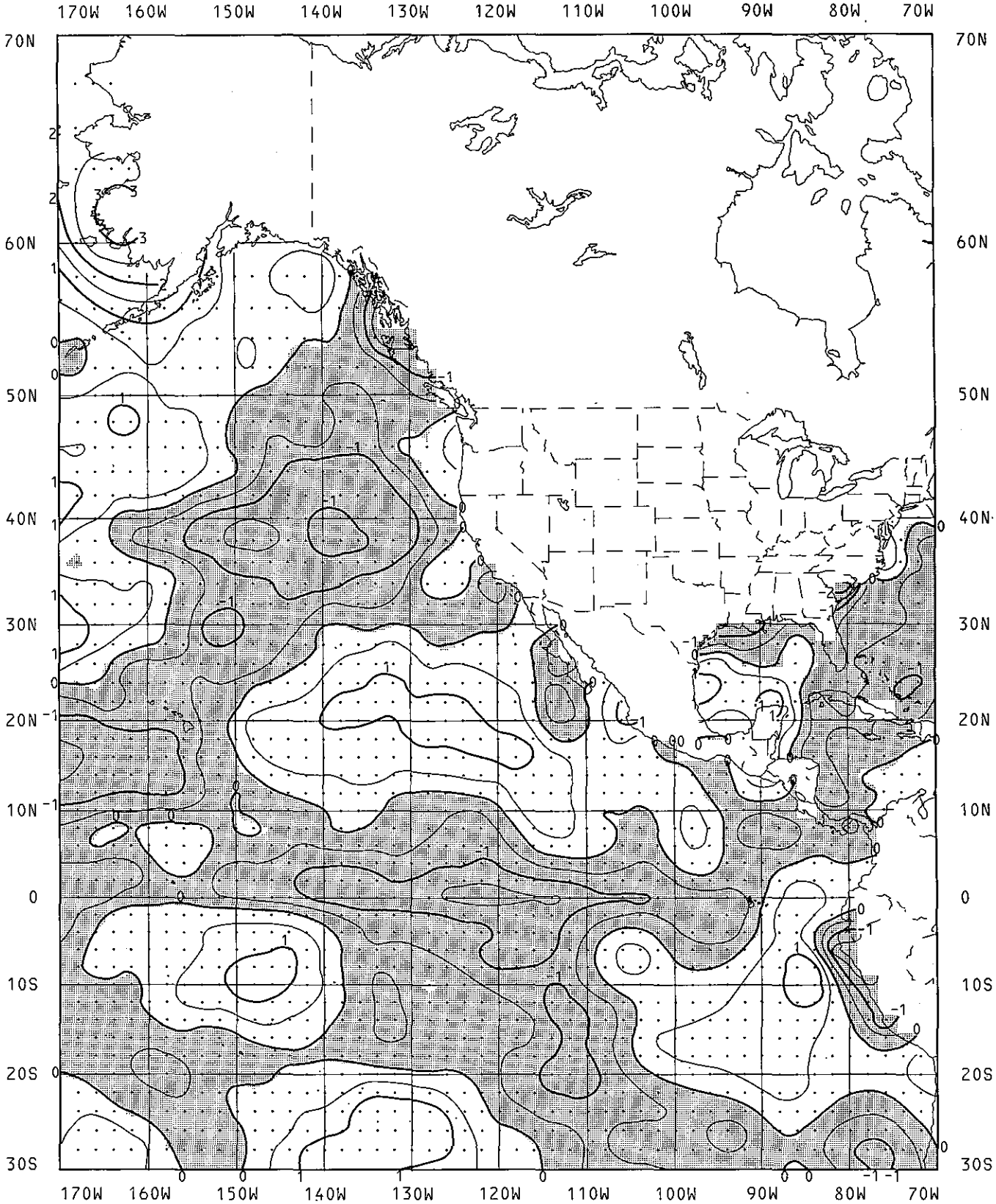

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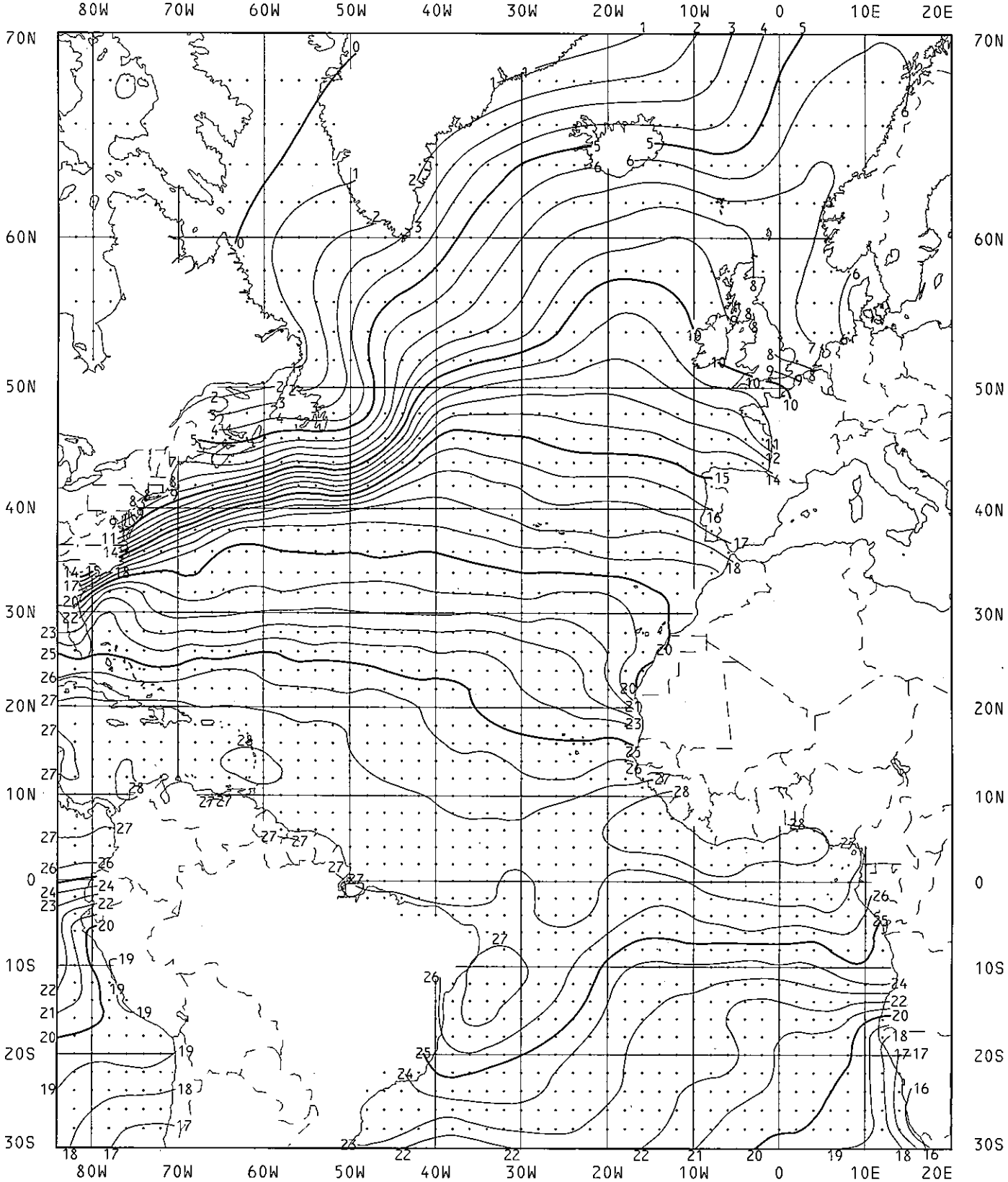

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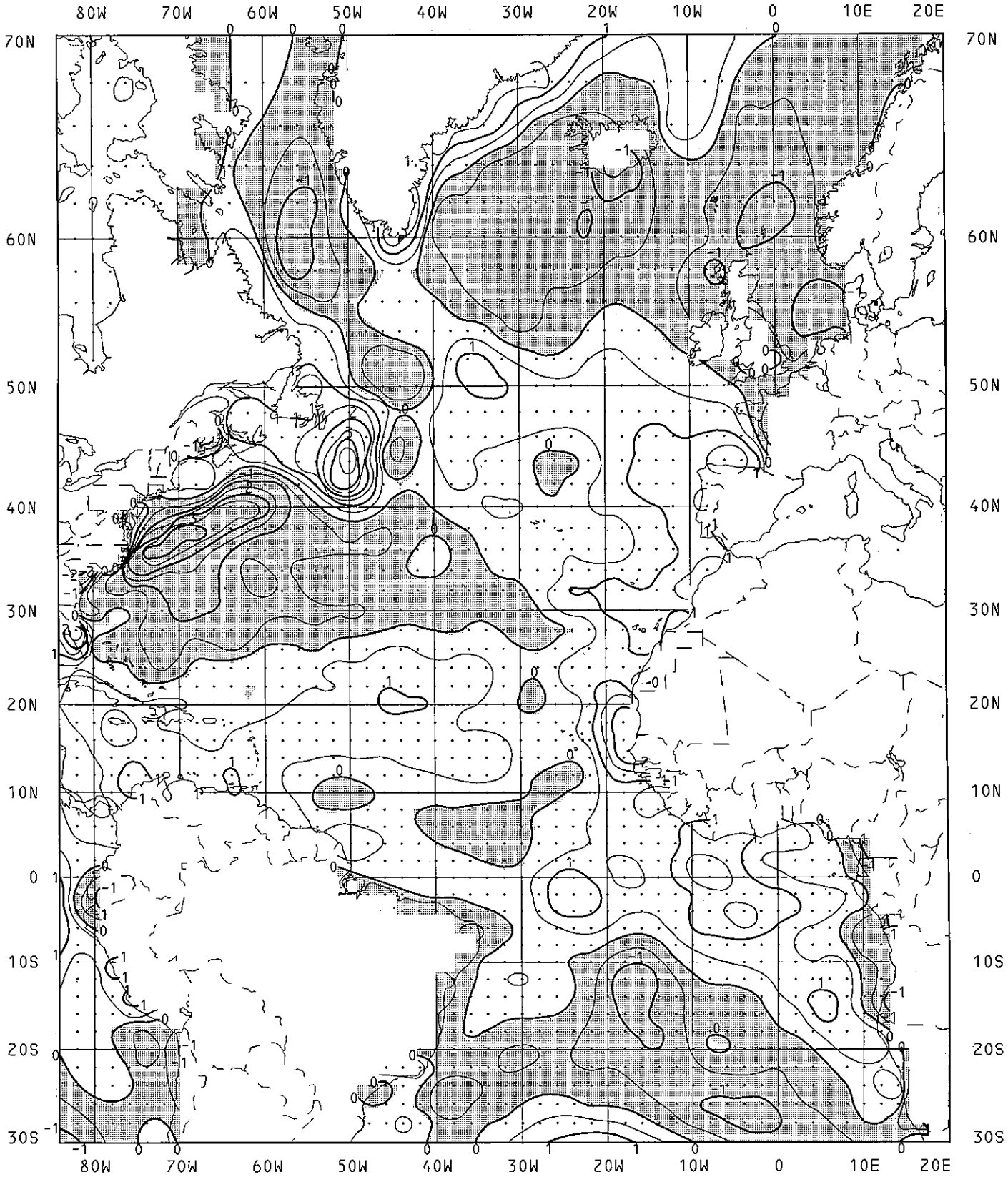

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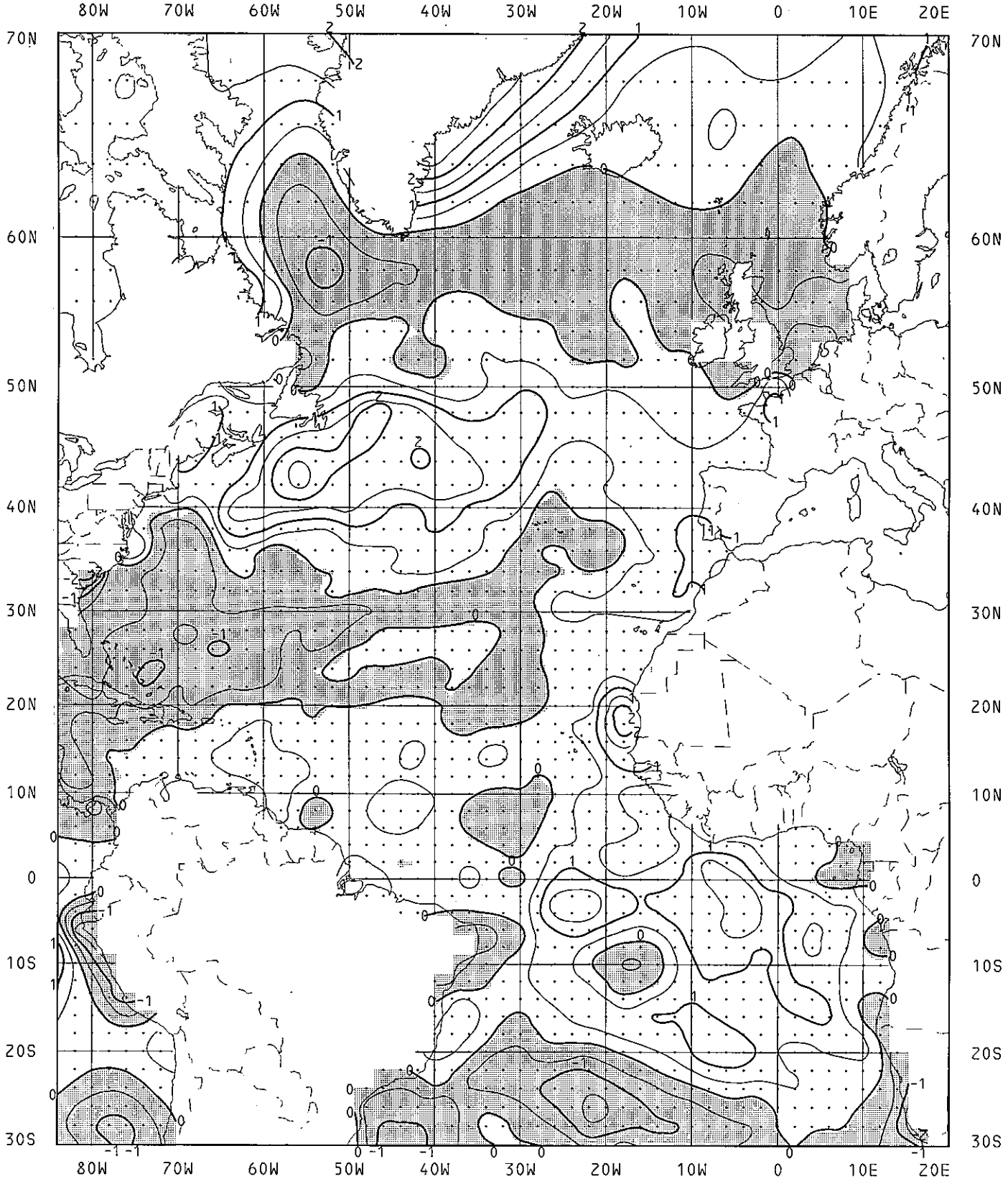

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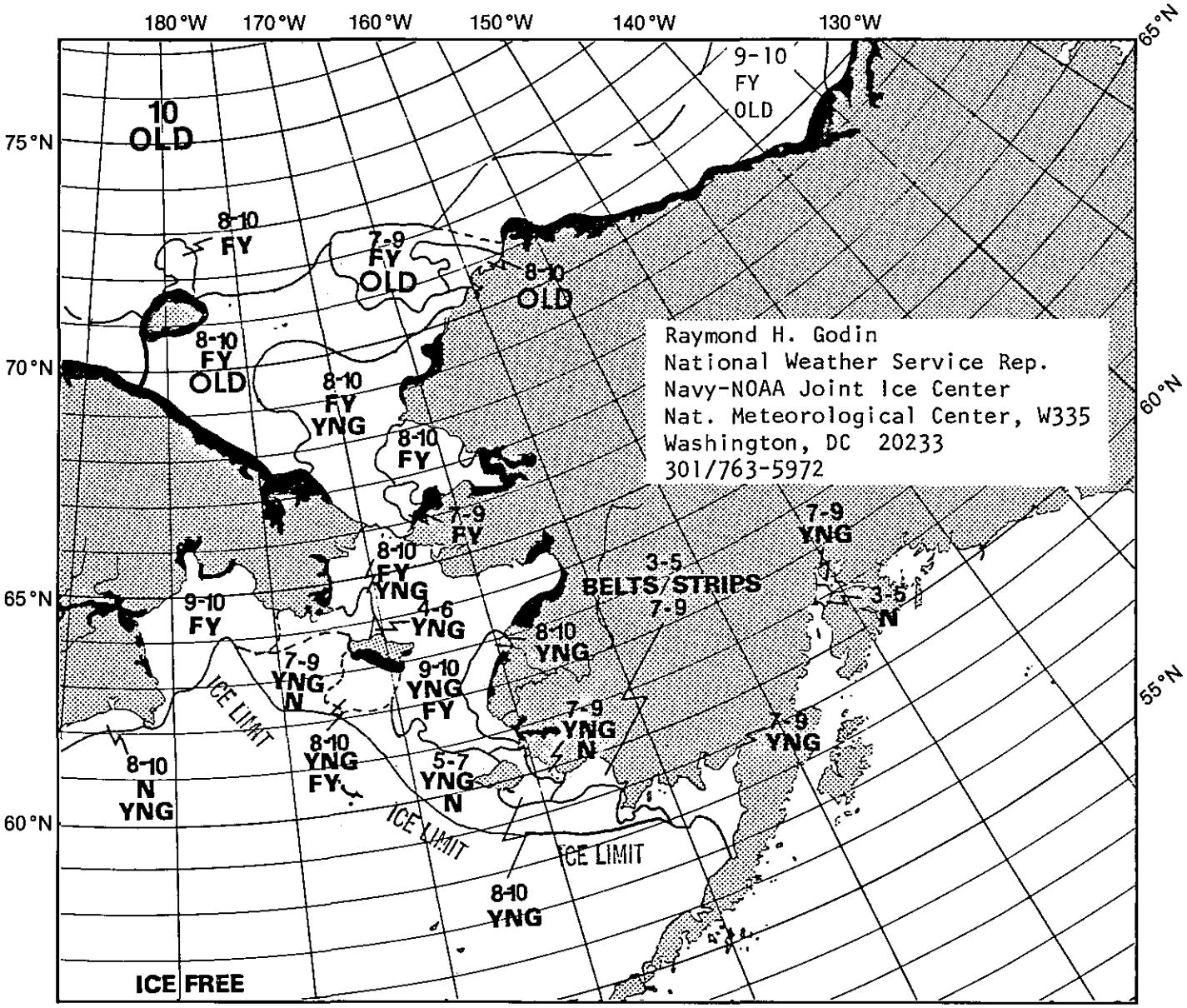
BERING SEA / NORTH SLOPE ICE ANALYSIS



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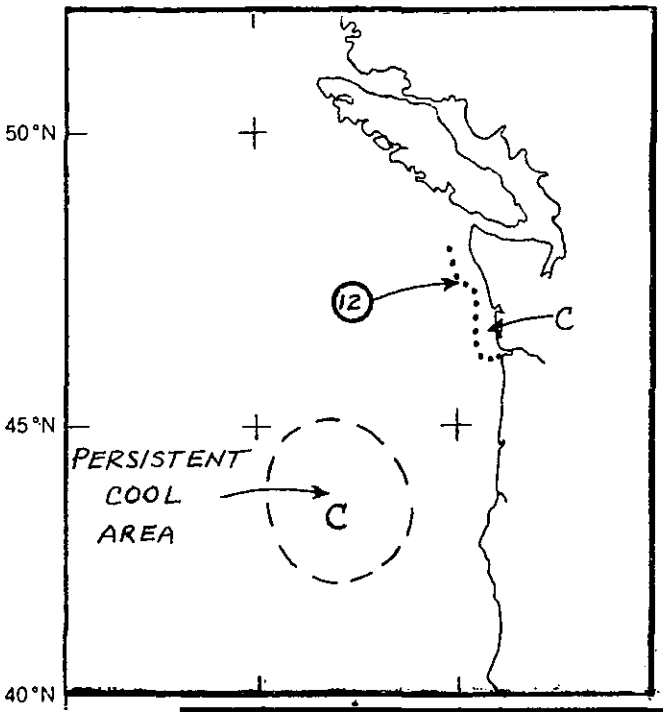
- - - -	Ice boundary estimated.

DECEMBER 1981

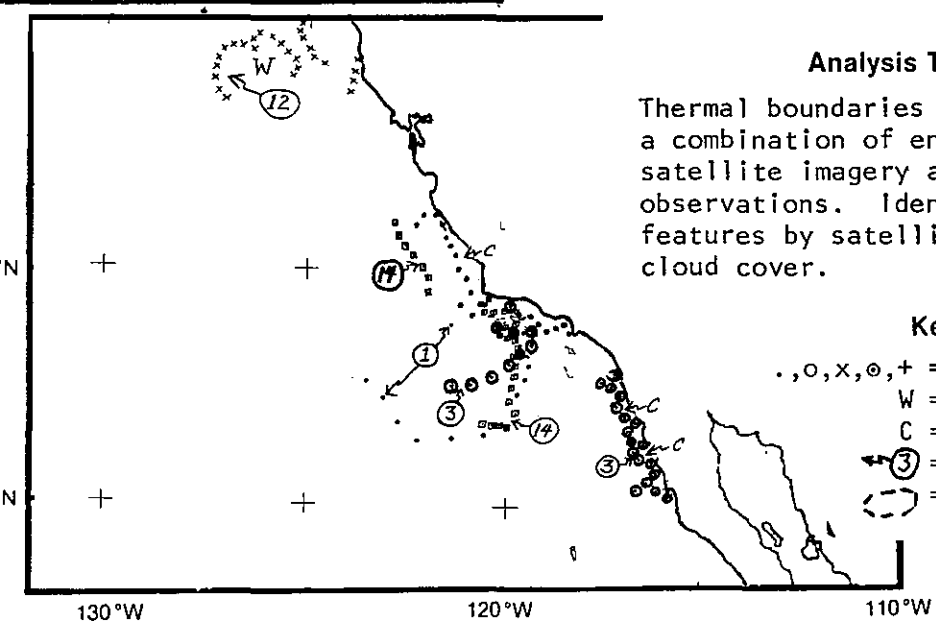
A 996 mb low located near 56°N 153°W is the most prominent feature of the mean monthly surface pressure circulation. The mean geostrophic flow affecting Alaskan sea ice distribution ranged from northeasterly in the southern Bering Sea to easterly north of 62°N. Observed average monthly air temperatures and theoretical ice thicknesses at Alaskan coastal stations are near normal. In the Bering Sea first year ice (FY) is observed as far south as 61°N. Young ice is observed extending to 57°N in Bristol Bay. An average monthly ice edge expansion of 100 km is observed throughout Alaskan waters. The current ice edge position is near the historical mean.

WEST COAST OCEAN FEATURES



DECEMBER 1981

Offshore areas of the north panel showed continued wintertime cooling during December, with SST decreases on the order of 1-1.5°C. Coastal stations recorded fluctuations of up to 1°C, but little net change through the month. The only exceptions to this were decreases of 1-2.5°C at stations along the southern Washington coast, which are strongly influenced by increasingly cold Columbia River discharge flowing northward along the coast in the Davidson Current. For the areas showing a decrease during the month, the SST cooling accelerated during the last five days of the month, particularly in the northern portion. This was due to the onset of cold modified arctic air flowing into the region from the north. Persistent cloud cover severely restricted the use of satellite imagery during the month.



Analysis Techniques

Thermal boundaries are determined from a combination of enhanced infrared satellite imagery and ship and buoy observations. Identification of these features by satellite is limited by cloud cover.

Key

.,o,x,⊙,+ = thermal boundaries
W = warm
C = cold
(3) = date of feature
(dashed) = outline of water mass feature

SST's decreased significantly over most of the south panel area during December. The largest decreases occurred in the northwest portion of the area where temperatures dropped up to 2°C. Within 500 km of the coast, decreases in SST were on the order of 1°C. However, SST's were generally 0.5-1.5°C warmer than normal north of 36°N near the California coast and 300-400 km seaward. SST's were up to 1°C cooler than normal near the western edge of the area. At the coastal buoys, SST's ranged from 12.7-14.1°C at Half Moon Bay (37°N 123°W), from 12.3-13.8°C at Bodega Bay (38°N 123°W), and from 12.6-13.8°C at Pt. Arena (39°N 124°W). These ranges are considerably reduced from previous monthly values and reflect the expected decrease in coastal temperature gradients associated with decreased upwelling and seasonal cooling. Satellite imagery show continued coastal upwelling in a narrow band (with 100 km of the coast) along the Baja Peninsula and extending up to 34°N.

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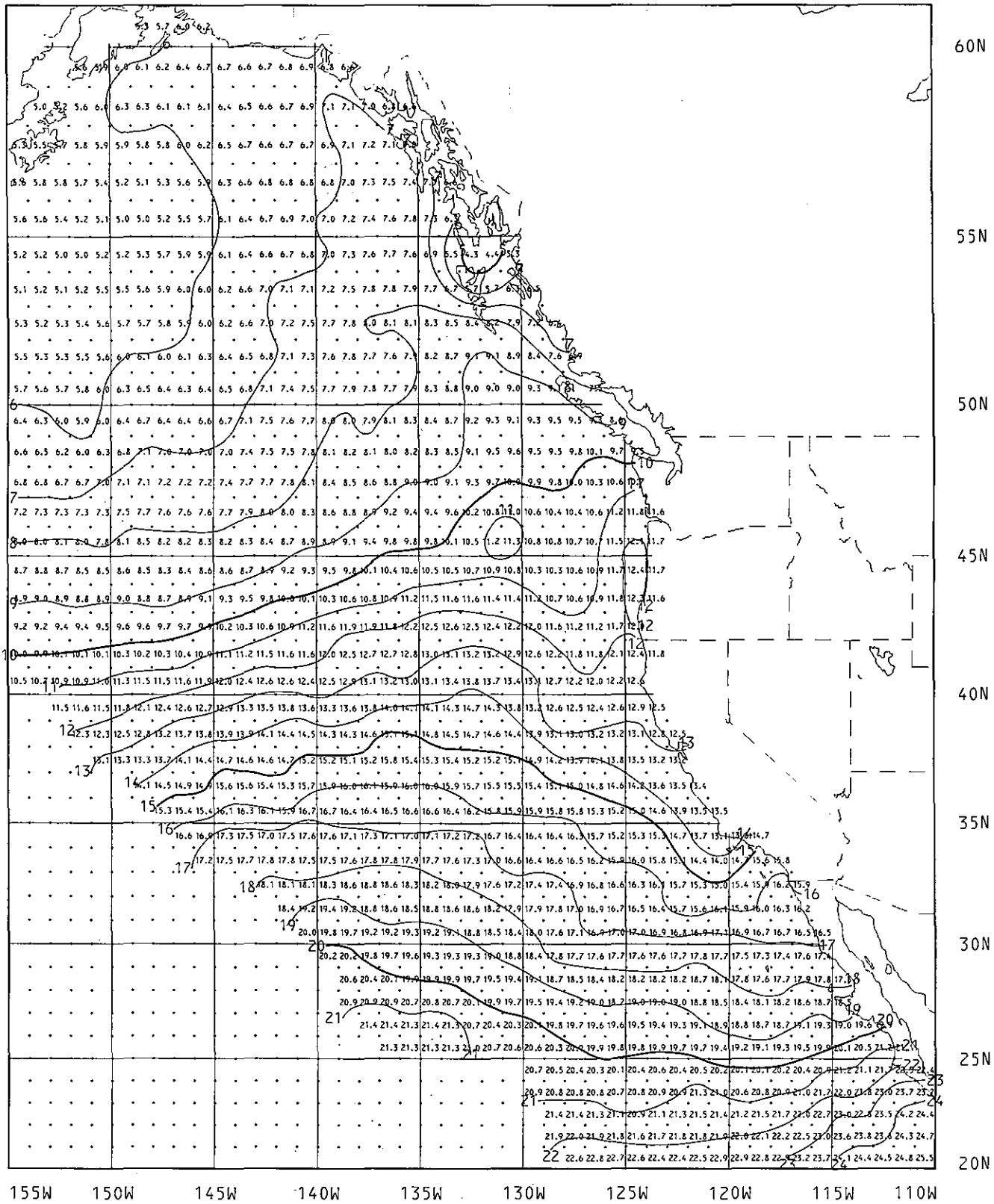
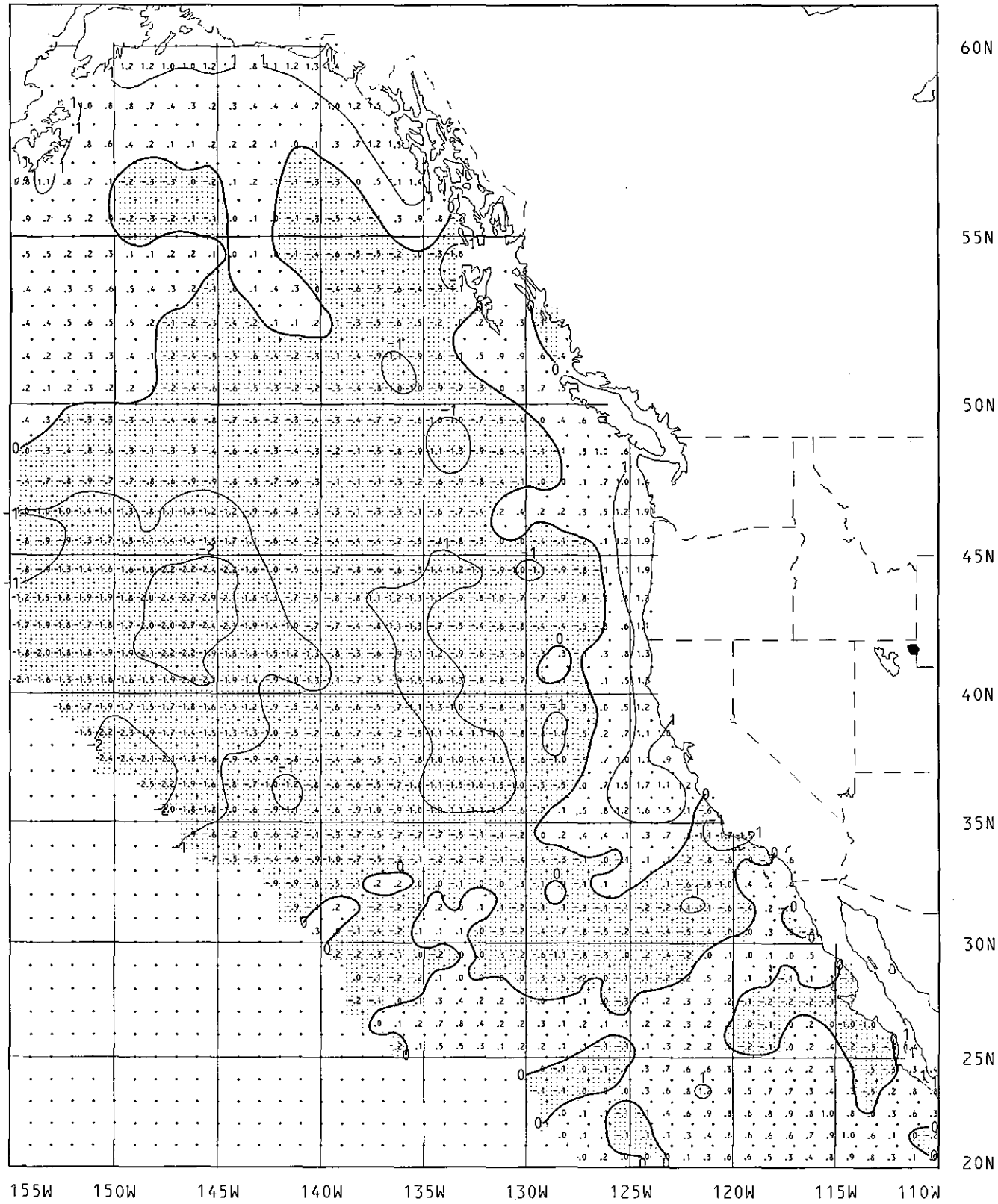


West Coast
SST--MONTHLY MEAN (°C)
December 1981

Monthly mean sea surface temperature is the mean of twice-weekly analyses using ship, buoy, and satellite observations.(See page 3.)



West Coast
SST--MONTHLY ANOMALY (°C)
December 1981

Monthly anomaly is the difference between the monthly mean sea surface temperature and the climatological monthly mean value -- shading shows where the monthly mean is colder than climatology. (See page 3.)

The end of this month's positions of the Gulf Stream System and its associated eddies are shown for the NW Atlantic and the Gulf of Mexico. The Gulf Stream and Loop Current boundaries are located by prominent sea surface temperature gradients or by the 15°C isotherm at 200m. Anticyclonic eddies are labeled a-z in the Gulf of Mexico and 1-99 in the NW Atlantic. Cyclonic eddies are labeled A-Z. Arrows on eddies indicate direction of circulation. Warm-core or anticyclonic eddies rotate clockwise; cold-core or cyclonic eddies rotate counterclockwise. The long arrows indicate the date of data used.

Feature positions are drawn from:
NOAA satellite infrared imagery
Bathythermograph data,
National Meteorological Center of National Weather Service
Oceanographic Analysis (daily),
National Weather Service/National Earth Satellite Service

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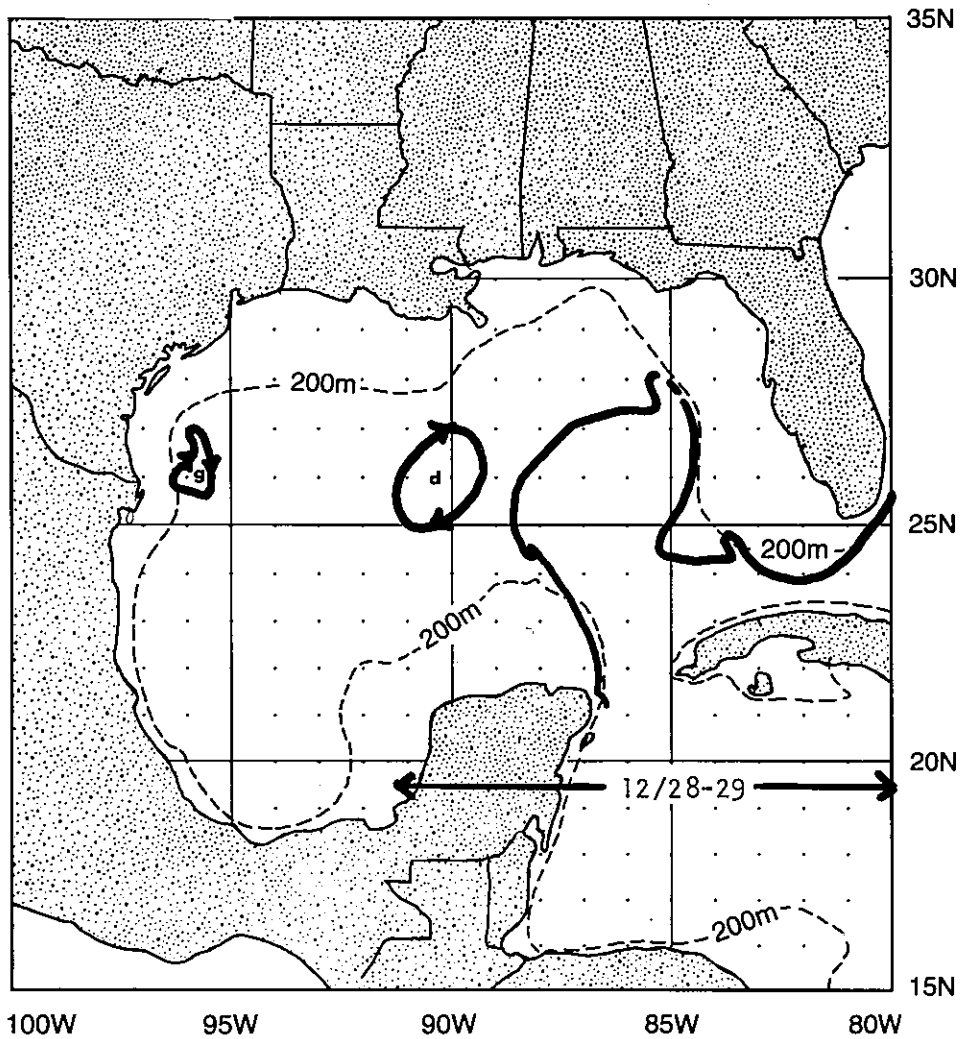
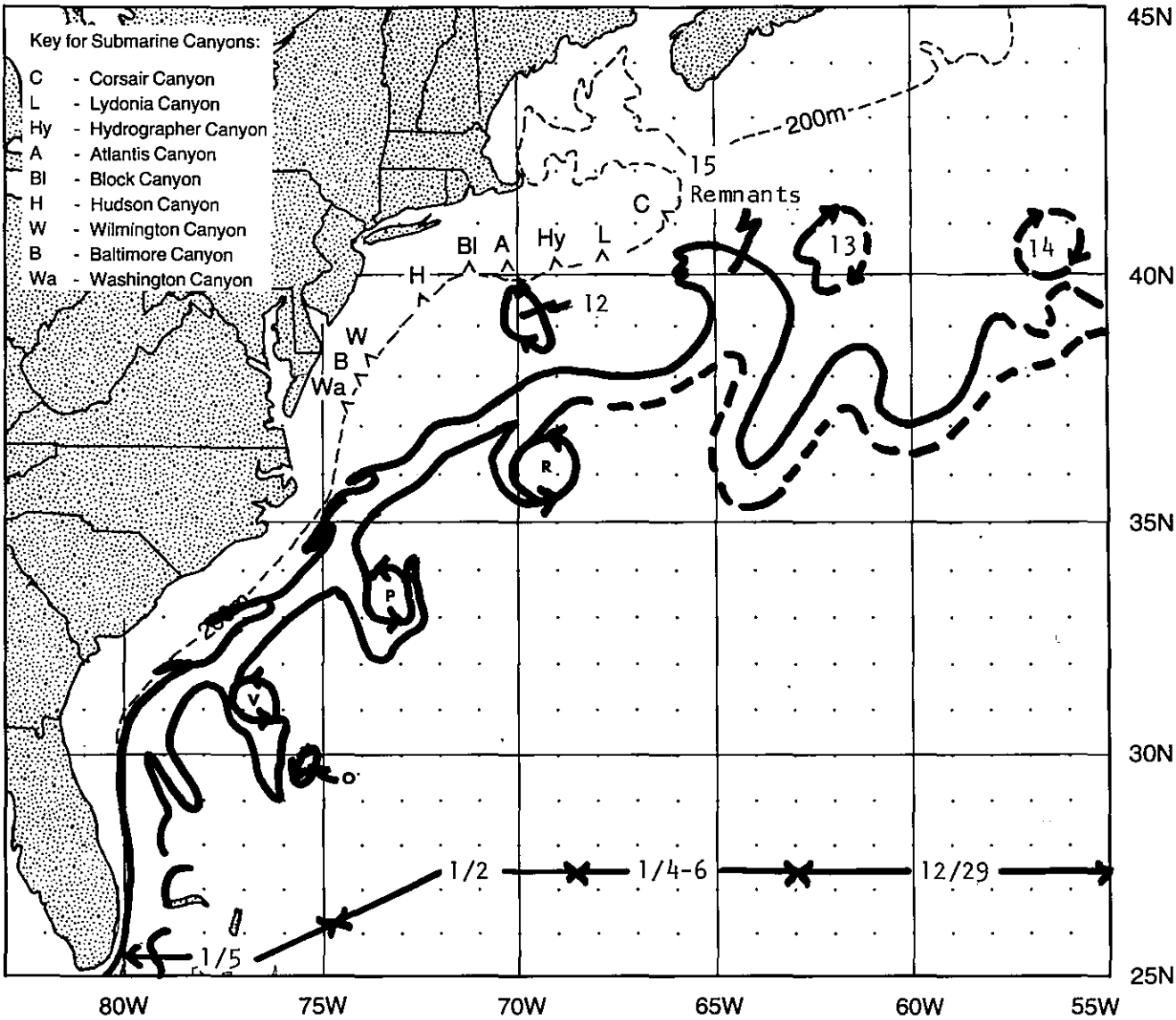


DECEMBER 1981

The amplitude of the Loop Current increased northward about 90 km into the Gulf of Mexico during December. This increase is probably somewhat due to the absorption of eddy f. The Loop Current began interacting with anticyclonic eddy f around December 5 and finally absorbed it around December 18 near 27°N 86°30W. Eddy e rapidly spinned down and dissipated by December 9 in the shallow shelf area near 26°N 83°W. Eddy d translated 45 km SW. The feature labeled eddy g near 26°N 96°W, observed on January 4-5 imagery, is probably an old, dissipating Loop Current eddy.

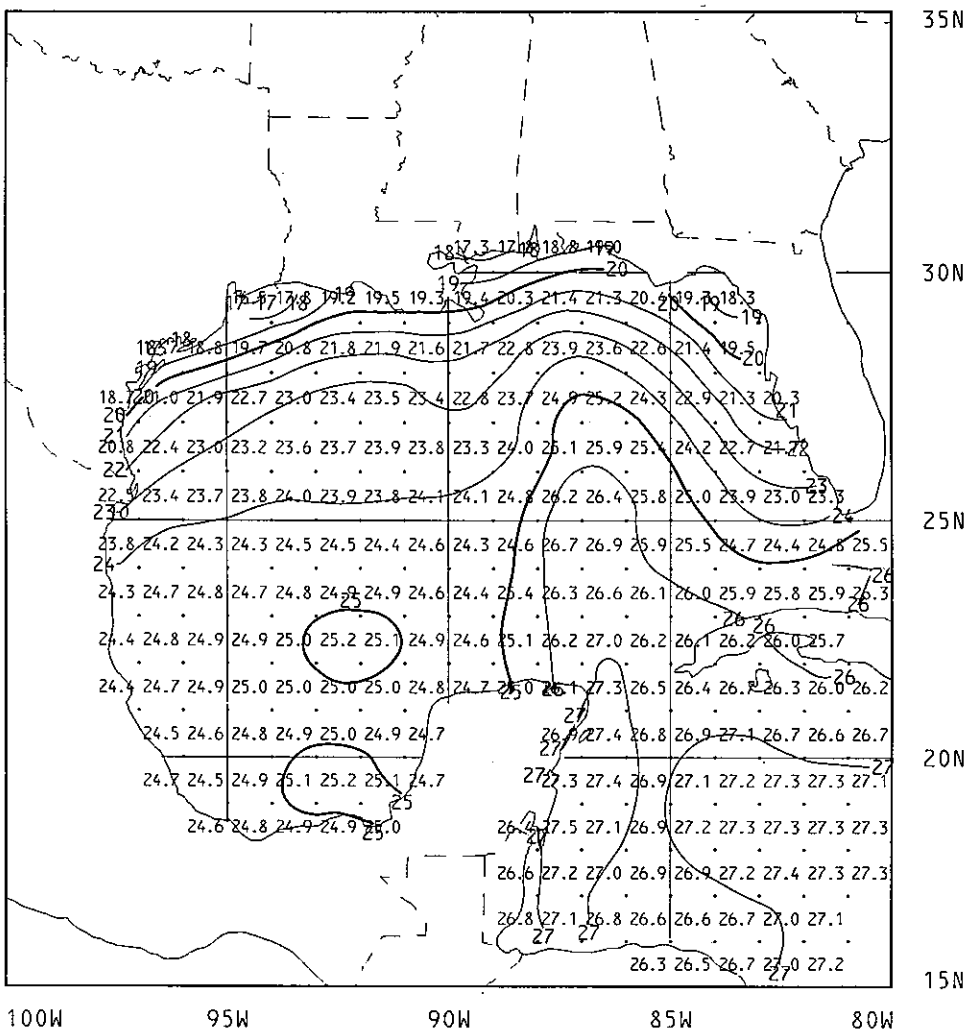


Satellite imagery of the Gulf Stream region is poor during December due to much cloudiness, especially in the area east of 65°W. A prominent feature of the Stream is the high amplitude meander located near 64°W.

One anticyclonic eddy was absorbed and three such eddies still exist. Anticyclonic eddy 12 interacted with the Stream early in the month and then broke away, rapidly moving 250 km WNW. The Stream apparently absorbed eddy 15 around December 25 near 39°N 65°W. December satellite imagery did not reveal the locations of eddies 13 and 14. The position of eddy 13 is from a partial observation on January 5 imagery. Eddy 13 has apparently translated 200 km WSW since November 25. AXBT (airborne expendable bathythermograph) reports taken on December 2 showed eddy 14 to be centered near 42°N 56°W. The above position of eddy 14 is estimated from satellite SST retrievals.

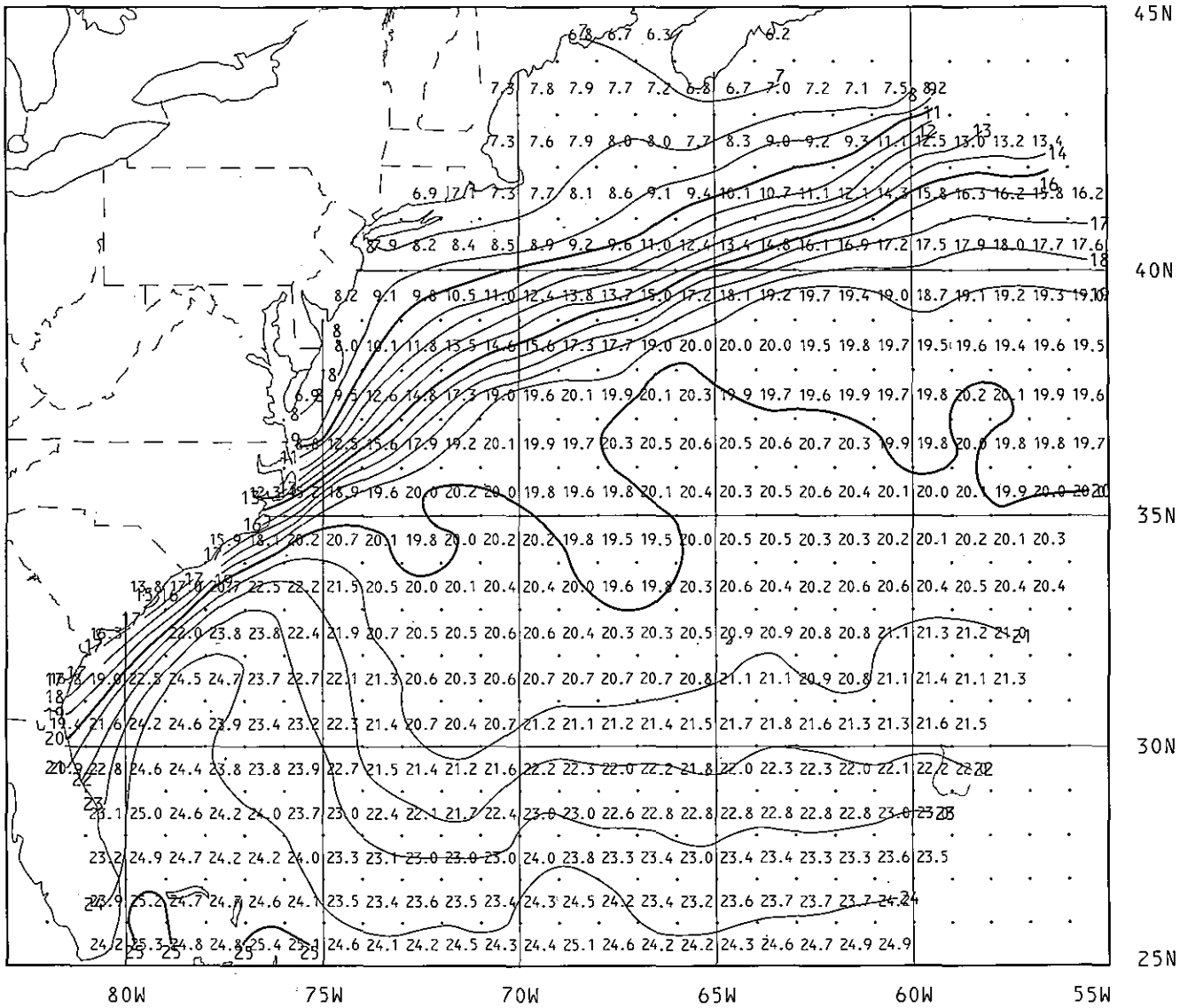
Four cyclonic eddies are identified in the analysis. Eddy R translated 140 km NW. The cyclonic eddy centered near 33°30N 73°30W is possibly the same eddy P last observed on November 16 near 33°30N 74°30W. Eddy V translated 65 km NNW. The eddy near 29°30N 75°30W is probably eddy O which was last observed on November 10 near 29°30N 75°W.

EAST COAST SST-
MONTHLY MEAN



Gulf of Mexico
SST--MONTHLY MEAN (°C)
December 1981

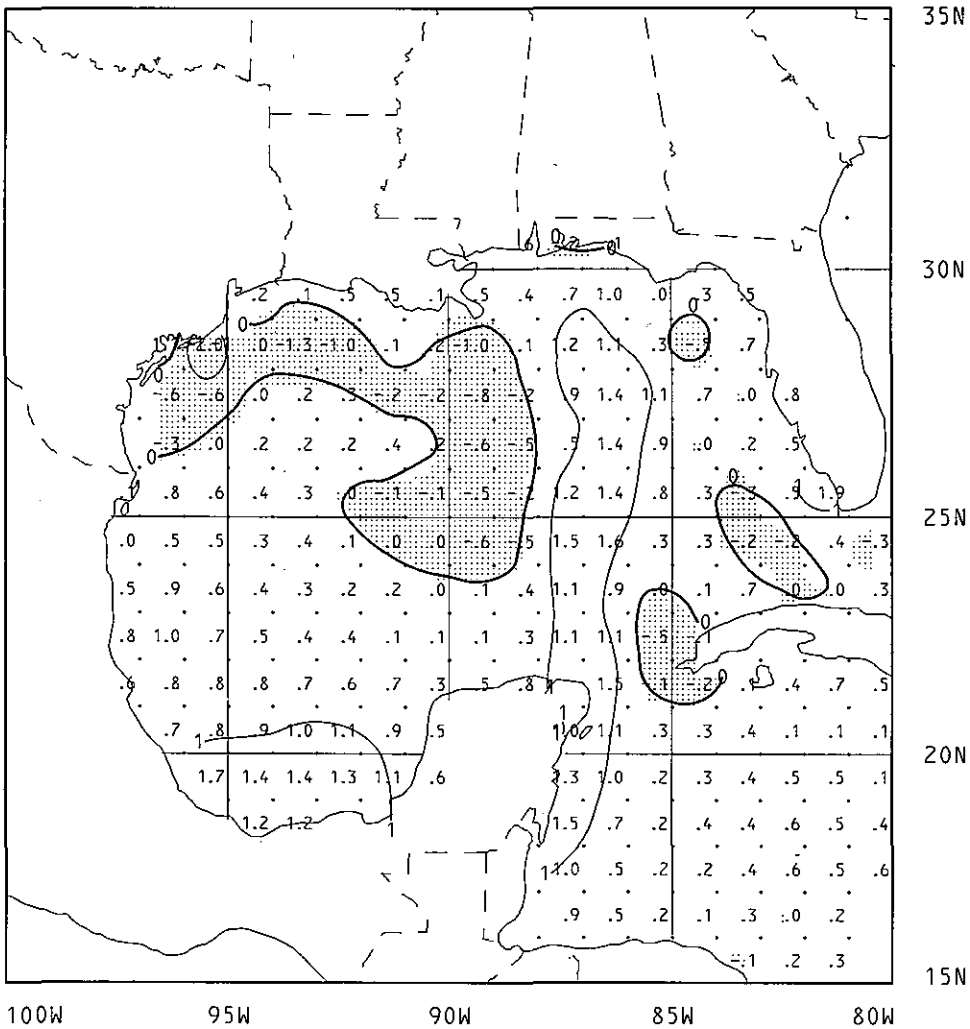
Monthly mean sea surface temperature is the mean of twice-weekly analyses using ship, buoy, and satellite observations.(See page 3.)



NW Atlantic Ocean
SST--MONTHLY MEAN (°C)
December 1981

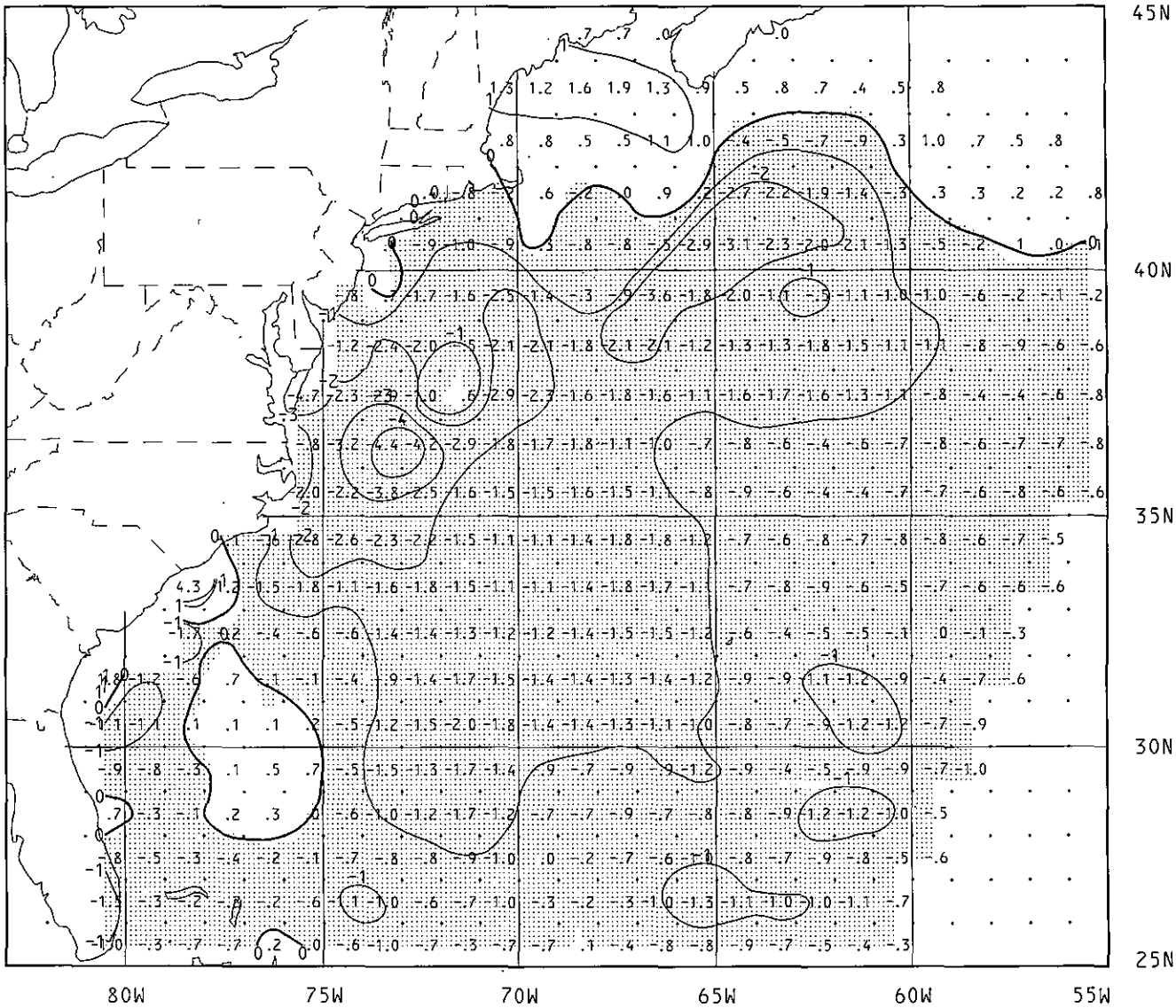
Monthly mean sea surface temperature is the mean of twice-weekly analyses using ship, buoy, and satellite observations.(See page 3.)

EAST COAST SST-ANOMALY



Gulf of Mexico
SST--MONTHLY ANOMALY (°C)
December 1981

Monthly anomaly is the difference between the monthly mean sea surface temperature and the climatological monthly mean value -- shading shows where the monthly mean is colder than climatology. (See page 3.)



NW Atlantic Ocean
SST--MONTHLY ANOMALY (°C)
December 1981

Monthly anomaly is the difference between the monthly mean sea surface temperature and the climatological monthly mean value -- shading shows where the monthly mean is colder than climatology. (See page 3.)

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