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(U) NAVAL OCEANOGRAPHY COMMAND DETACHMENT ASHEVILLE NC
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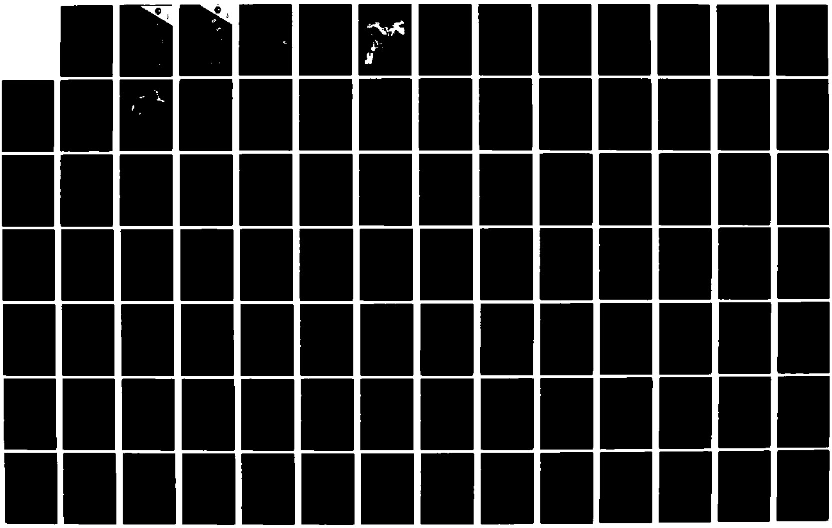

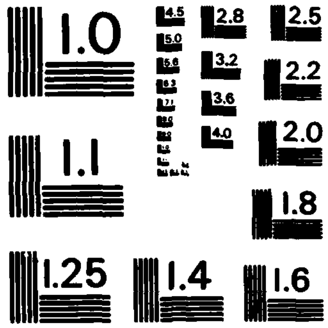

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Climatic Study of the Red Sea South and Gulf of Aden

Near Coastal Zone

SEPTEMBER 1982

PREPARED BY
NAVAL OCEANOGRAPHY
COMMAND DETACHMENT,
ASHEVILLE, N.C.

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COMMANDER
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NSTL STATION, BAY ST. LOUIS, MS 39529

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This climate study consists of monthly charts and tables of (1) clouds, (2) visibility-tables, (3) ceiling-visibility (mid range), (4) wind-visibility-cloudiness, (5) Scalar mean wind speed, (6) wind speed <11 and ≥ 34 knots, (7) wind speed 11-21 and 22-33 knots, (8) air and sea temperature, (9) surface wind roses, (10) wave height-isopleths, (11) wave height-tables and (12) surface currents (seasonal).

The Red Sea South and Gulf of Aden near-coastal zone study was prepared by direction of the Commander, Naval Oceanography Command and the Official in Charge, Naval Oceanography Command Detachment, Asheville, North Carolina. Work was performed by the National Climatic Center (NCC).

Introduction

The climate of the Red Sea South and Gulf of Aden area is the result of two distinct monsoon seasons: a northeast monsoon from about October to April and a southwest monsoon from May to September. Prevailing winds established by the seasonal monsoons allow little transport of moisture across the region resulting in an arid climate within tropical latitudes. Monthly variations in precipitation are large, hence long term monthly averages are much less representative of climatic characteristics than are those for non-desert regions.

Nearly any wind gust can raise dust in this arid region. The stronger dust storms occur during the cooler season and are usually from the north. However, the frequency of dust is greatest during the summer when the storms are generally much less intense and usually from the south. In many cases the summer storms are caused by convective phenomena. Dust and sand storms are the major weather events of military importance in the area, and only in the worst storms are visibilities reduced to dangerous levels.

Geographical and Data Coverage

The study area covers the southern part of the Red Sea and the Gulf of Aden (10N to 18N; 39E to 53E) (see Fig. 1). Surface marine statistics are presented on monthly charts in the form of graphs, tables and isopleth maps. The data were machine plotted by one degree quadrangle and then hand analyzed. The graphs and tables are also presented by one degree quadrangles (visibility, wave heights, and wind roses). These graphs and tables represent the objective compilation of available data; the data were not adjusted for suspected biases, (low observation count, heavy weighting of observations during a short time interval, biases in coding of observations from various source decks, etc.) and differences may be found when comparing the graphic data with isopleth analyses. The total number of observations for a given one degree square should always be considered when interpreting the data, as there may be an insufficient number to permit representative statistics. The wave height and visibility tables may contain only one observation and the wind roses were based on as few as five observations.

Approximately 3/4 million surface marine observations were used in computing the statistics. These data, taken from NCC's Tape Data Family 11 (TDF-11), were collected by ships of various registry traveling in the study area between the early 1870's and 1979. Inventories of the NCC data set show that most ocean regions of the world have the largest percentage of observations taken after World War II; however, in this region, 75% were taken prior to 1945. The closing of the Suez Canal from 1967 to 1975 because of war led to a decrease in the number of observations for this period. This is significant because recent observations contain more elements than pre-1948 reports.

The density of observations is greatest along the major shipping routes and this study area contains some of the busiest sea lanes in the world. The isopleth analyses are good approximations of climate over the data-rich open water areas, but one should use caution in interpreting the gradients and patterns over the relatively data-sparse zones immediately adjacent to the coast.

The sea surface current information was extracted from Naval Oceanographic Office Special Publication 1404-IN1, Surface Currents Northwest Indian Ocean Including the Arabian and Laccadine Seas.

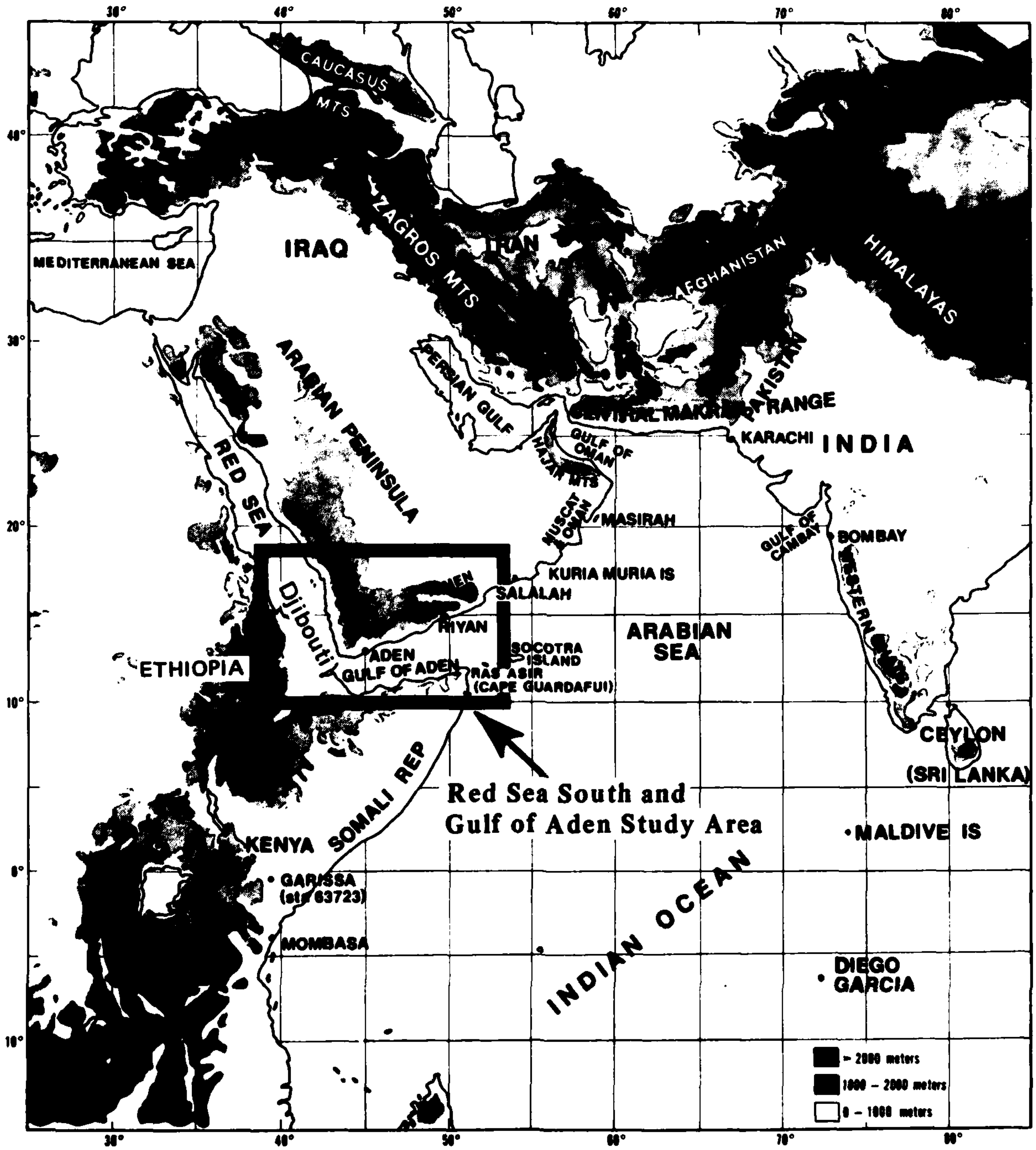


Fig. 1 Area map

Physical Features

The Gulf of Aden, which is approximately 550 miles long, connects the Indian Ocean (Arabian Sea) with the Red Sea (Fig. 1). It is bounded on the north by the Arabian Peninsula and on the south by the Somalia Peninsula, the eastern part of the Horn of Africa. On the southern coast of the Arabian Peninsula, along the Gulf of Aden, lies South Yemen, which has a relatively narrow coastal plain between the Gulf and the mountain range that parallels its coast. The height of the mountain range averages 3500 feet with its highest peaks running 8000 feet. The central part of South Yemen contains a fertile valley that receives enough precipitation for producing dates, honey and tobacco.

Across the Gulf lies Somalia, also an arid country with a dry coastal plain that averages only a little over 4 inches of precipitation a year. Some of the higher peaks in northern Somalia, however, receive an average of 20 inches per year which is used for irrigation along the coastal plains. Most of the semi-desert interior receives less than 8 inches.

The southern end of the Red Sea is bordered by Yemen (also known as North Yemen) and Saudi Arabia on the east and Djibouti and Ethiopia on the west. On the Arabian Peninsula side there is only a narrow coastal strip before the Red Sea escarpment. Many of the peaks in the range are above 5000 feet with several above 10,000 feet. The highest peak is just above 12,000 feet. On the African side, Ethiopia is also rather mountainous and many peaks range from 7000 to 13,000 feet. The highest point, located in the north, is 15,158 feet. The coastal plain is relatively wide on the southern end but narrows to the north. Djibouti, which lies at the entrance to the Red Sea, is lowland. Here, the lowest point in Africa is found at 512 feet below sea level. Djibouti and the coastal plain of Ethiopia are both very dry. During 60 years of record at Djibouti, annual rainfall has ranged from just over an inch in the driest of years to just over 10 inches in the wettest. The coastal plains of Ethiopia average 5 to 10 inches per year while the mountainous region averages over 80 inches per year (World Survey of Climatology, Volume 10).

Because of the narrow waterways through the Gulf of Aden and the Red Sea, weather can be especially significant to naval operations. Winds are important to flight operations, ballistics, and passive defense systems (chaff, smoke-screen, etc.) of any naval force. (Wells, 1982)

Climate

There are two distinct monsoon seasons governing the weather within the study area: the northeast monsoon (October through April) and the southwest monsoon (May through September) with April, May, September,and October being transition months. However, these transition periods do vary somewhat across the study area. The shift in wind direction can be deduced from the monthly wind rose charts presented in this publication.

Monsoon winds occur because of the differential heating between the land surface and the sea. Seasonality occurs because during the winter the land (in this case Asia) is much colder than the sea (Arabian Sea) setting up high pressure over the continent (Siberian High) and a low over the sea; the reverse occurs during the warm season. See Fig. 2 for the January and July mean pressure patterns.

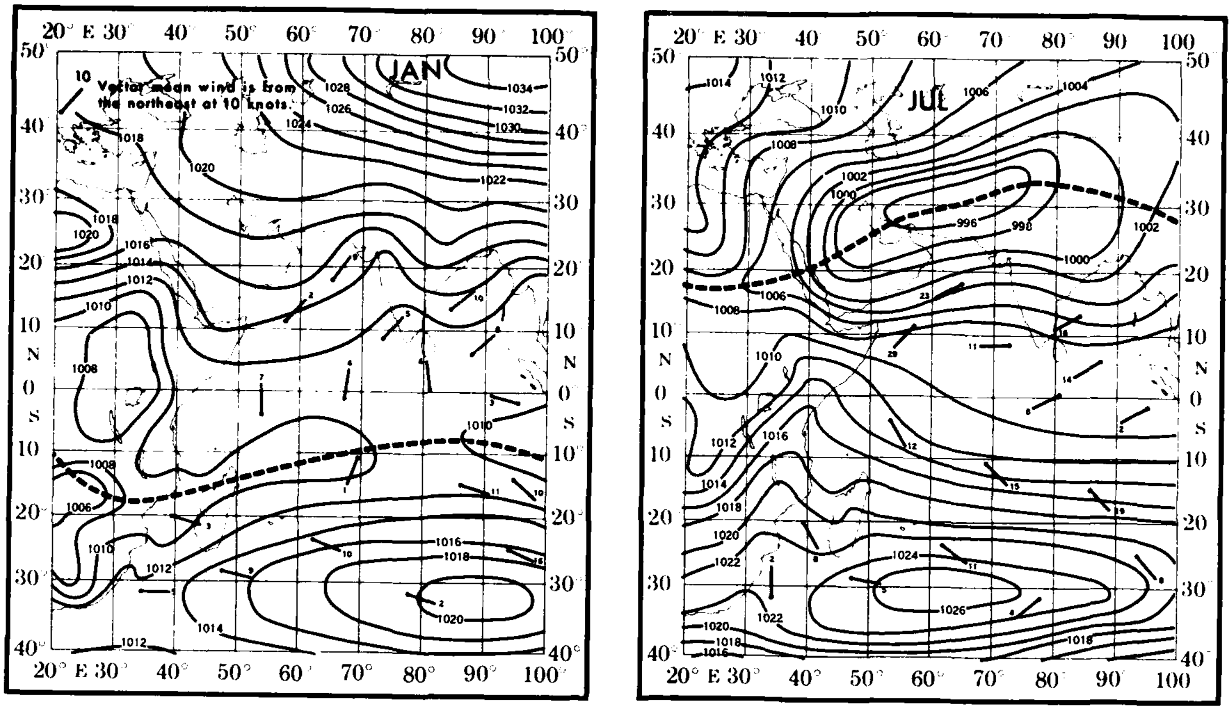


Fig. 2 Mean pressure, mean equatorial trough, and vector mean winds

A general definition of a monsoon has been adapted from Ramage (1971). It defines the monsoon area as encompassing regions with January and July surface circulations in which:

1. The prevailing wind direction shifts by at least 120 degrees between January and July.

2. The average frequency of prevailing wind directions (in quadrants) exceeds 40% in January and July.

3. The mean resultant wind speed in at least one of the months exceeds 3 m sec^{-1}; and

4. Fewer than one cyclone-anticyclone circulation alternation occurs every two years in either month in a 5-deg. latitude - longitude quadrangle.

By "squaring off" and using the South Asian mountains as a natural northern boundary, the region that meets all of the above criteria is enclosed by 35N, 25S, 30W, and 170E (Fig. 3). Although the term "monsoon" generally implies torrential seasonal rains, our monsoon study area is extremely dry. The prevailing winds are generally east-northeasterly or west-southwesterly and regardless of the monsoon season there is little transport of moisture into the region. The reason for this very limited transport of moisture is still not clearly defined. Trewartha (1961) states that a divergent character is present in both the northeast and southwest monsoon producing the arid climate. Flohn et al. (1970) described it as a result of the sinking motion down to the ground as a result of diffluence in the lower layers. These stabilizing conditions then prevent the moist air from the surrounding seas from producing rainfall.

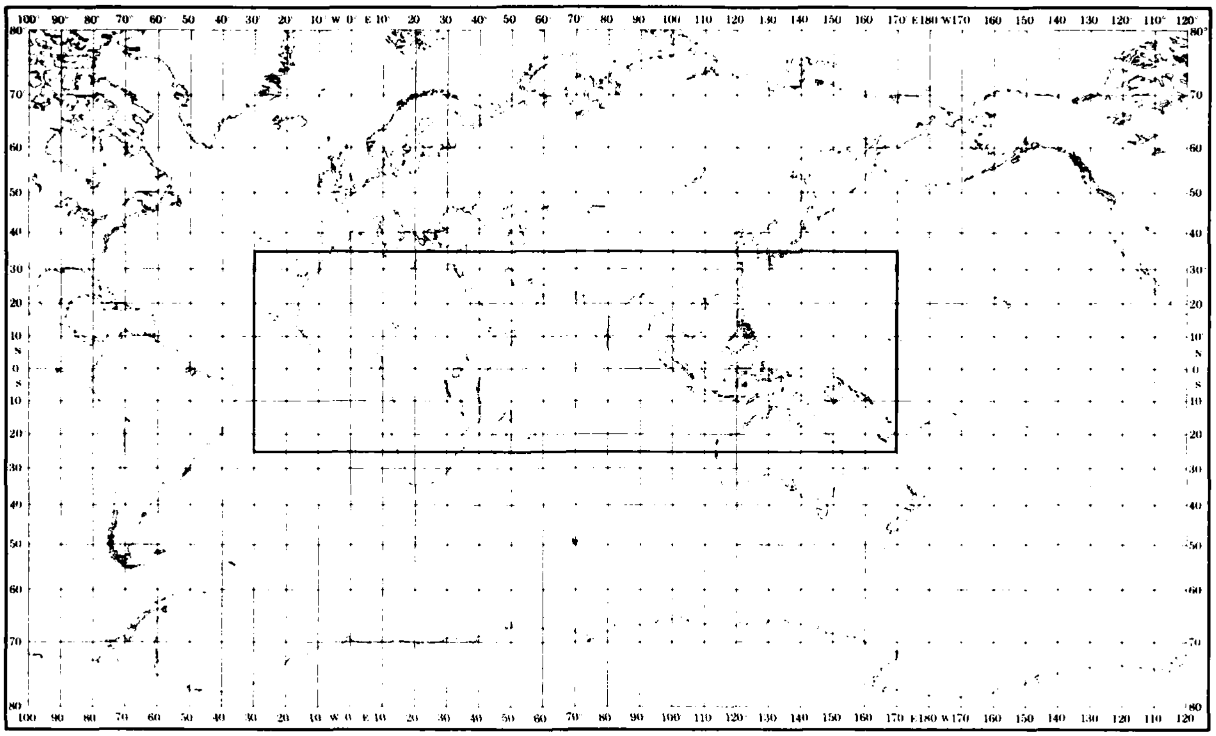


Fig. 3 Delineation of the monsoon region

This same reference also presents monthly charts of divergence over the Indian Ocean which show May and September (transition months) to be the only months to have negative divergence (convergence) over the Gulf of Aden. The Red Sea was not covered by the charts but it is likely to have conditions similar to those found in the Gulf of Aden. During the northeast monsoon the resultant gradient level winds by Atkinson (1970) show anticyclonic flow over the Arabian Peninsula with probable subsidence resulting in a stable atmosphere. The mean monthly airflow at 1 km (Findlater, 1971) during the winter monsoon indicates that most of the trajectories reaching the study area come from the desert region of Asia. Even though some of the airflow crosses the Arabian Sea the marine trajectory is relatively short in comparison to that traveled across the dry desert regions of the continent. This flow across the sea does however, seem to effect the rainfall amounts as most stations report their greatest monthly rainfall during the winter season. In summary, it is probable that the lack of substantial rainfall during the northeast monsoon is due to both the source region of the airflow and the stabilizing effect of the high pressure to the north and east of the study area. As for why the summer rains are missing in the region Flohn (1964) states: (1) overheating in the Ethiopian highlands produces directional divergence; (2) the northerly increase of the pressure gradient produces speed divergence; (3) winds parallel to the coast produce frictional divergence; (4) the deflection of the wind driven ocean surface current causes cold upwelling along the east Somalia coast.

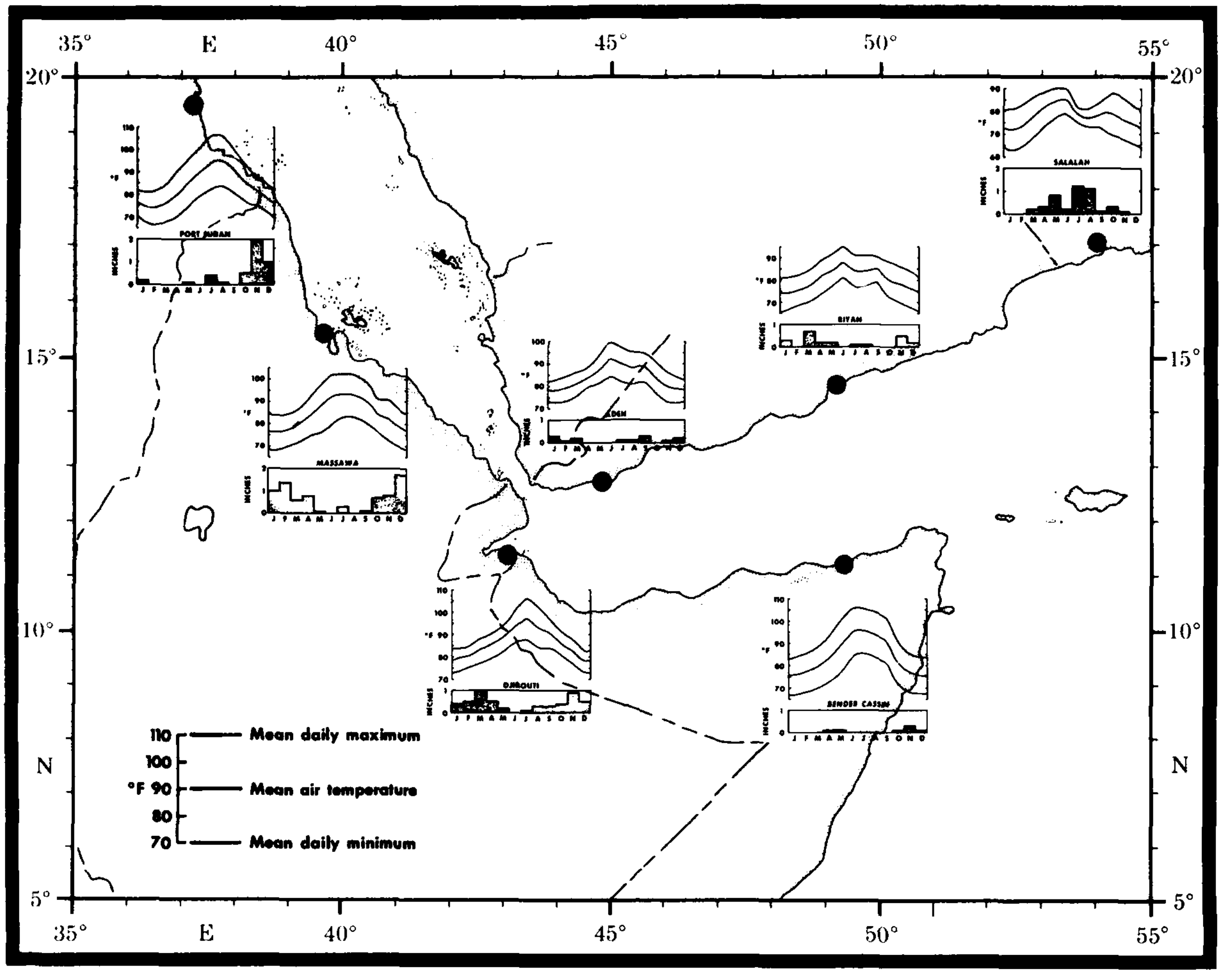


Fig. 4 Monthly means of air temperature and rainfall

In Fig. 4, which shows the monthly means of rainfall and air temperature, one can see that the winter season brings most of what little rain there is. In the typical rain-producing cases during winter, either the Sudan Low or a Mediterranean depression becomes reinforced by the outflow of polar air from the Siberian High and becomes relatively active as the associated cold front moves over the Arabian Peninsula. (Annual Environmental Report 1977, Saudi Arabia.) Usually, however, the precipitation is confined to the northern portion of the peninsula, especially with a Mediterranean depression.

During the summer and the southwest monsoon, the higher elevations on the southwest corner of the peninsula receive the higher rainfall amounts during thunderstorm activity.

With the upwelling off the east coast of Somalia, one might expect reduced visibilities due to fog, much the same as off the California coast. However, this is not the case as described by Ramage (1971). The summer fogs do not develop as a season-long surface subsidence inversion remains off the coast of Somalia. The parallel winds along the coast produce the upwelling of cold water which increases the downwind pressure gradient and thus helps to increase the winds and perpetuate the system. These actions produce low-level divergence, bringing the subsidence inversion down to the surface and thus ensuring an adequate supply of dry air to prevent fog formation.

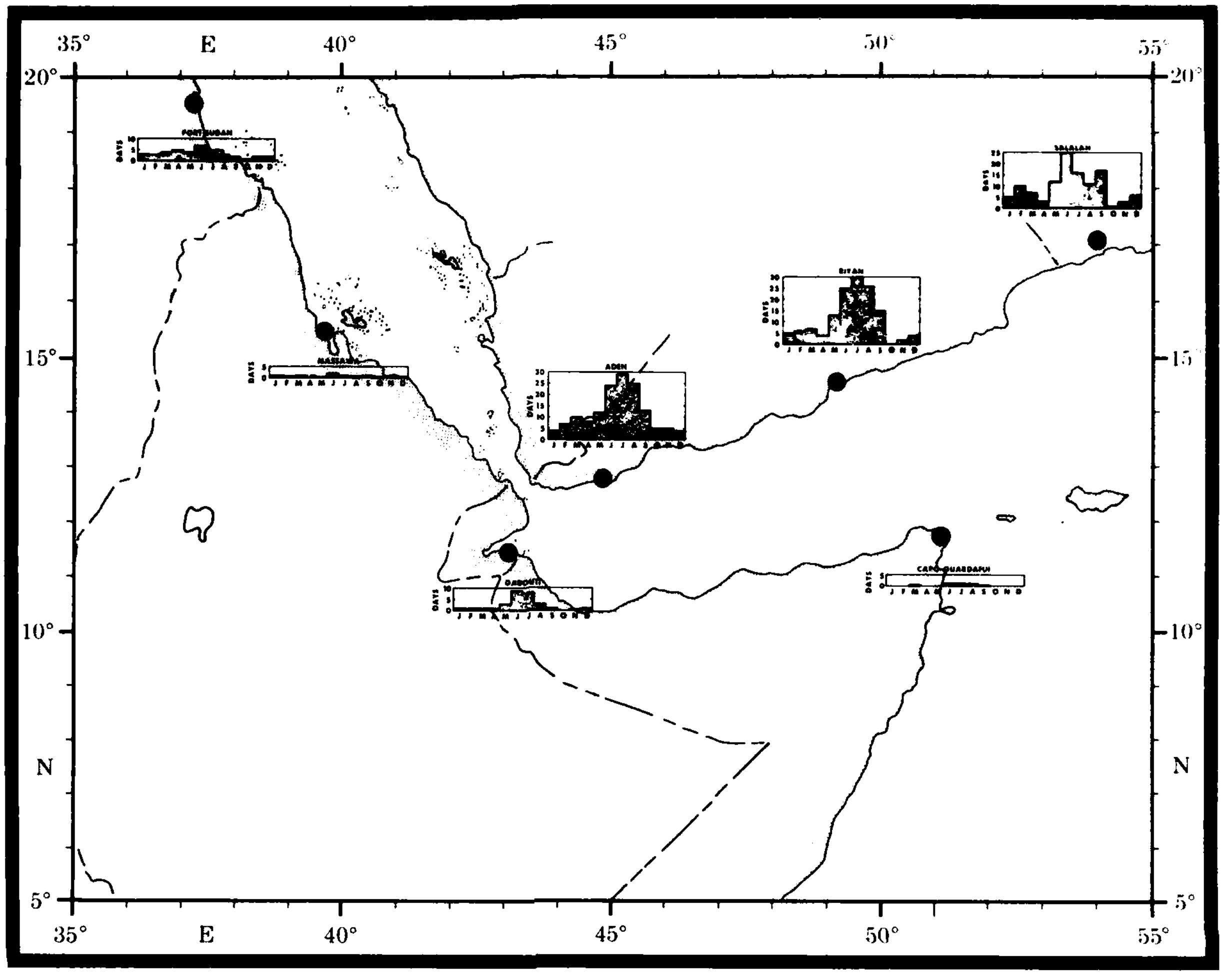
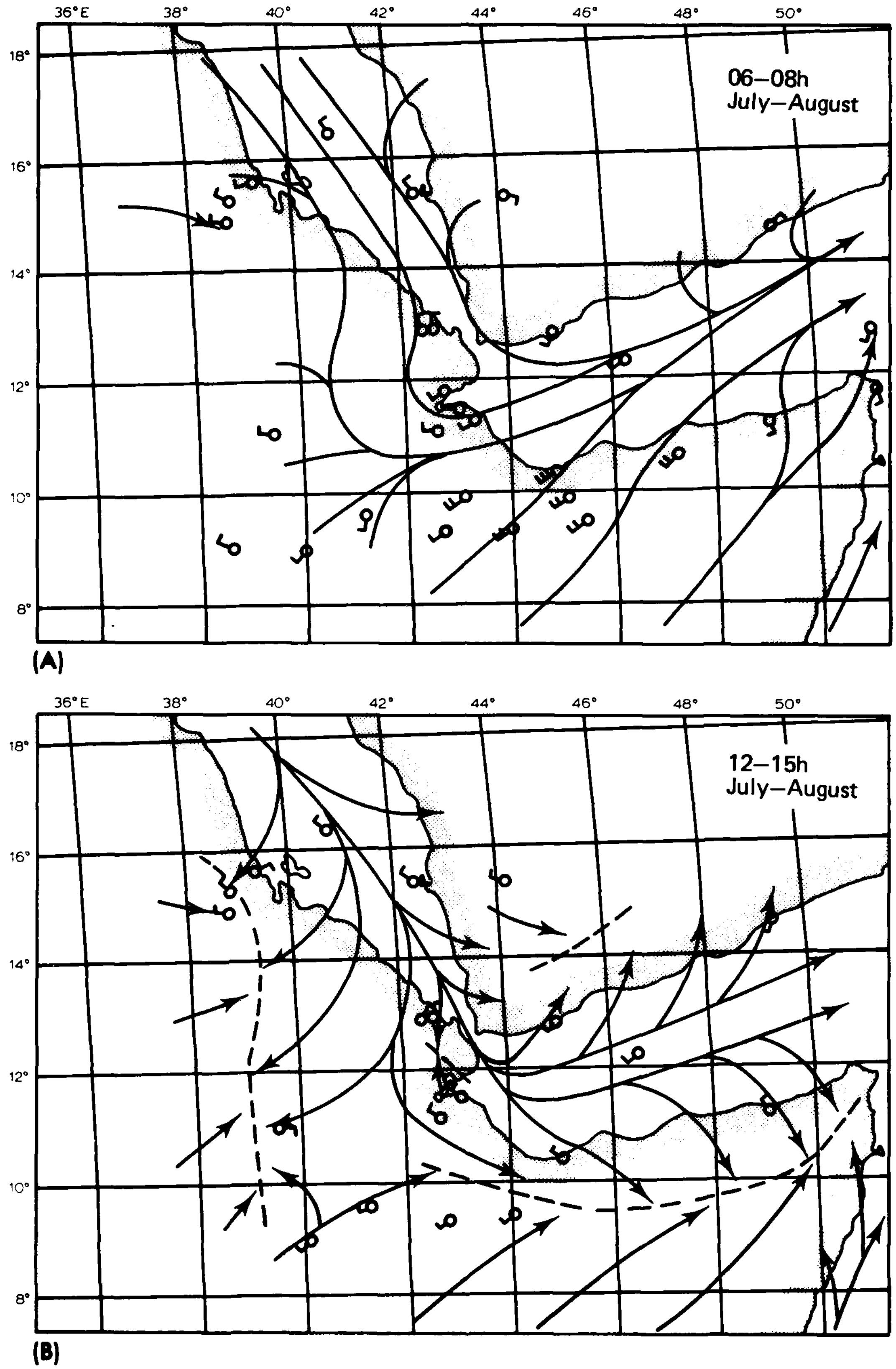


Fig. 5 Average number of days with reported dust or sand

Visibilities, however, are reduced somewhat across the study area by blowing sand and dust. A good account of this problem in the Gulf of Aden is given by Brody (1977). Fig. 5 shows the average number of days with dust or sand being reported. In all cases the frequencies are greatest during the summer months (the southwest monsoon). It is interesting that both Riyan and Aden experience dust nearly daily during the peak in July. By closer examination one finds little difference in the frequency of dust by hour (N-Summaries), ruling out diurnally induced sandstorms due to seabreeze or thunderstorm activity. During July the mean number of days with dust at the synoptic reporting times (8 obs per day) runs 23 to 25 days. In checking the July visibilities at Aden, they are equal to or greater than 6 miles nearly 80% of the time and only less than 2 1/2 miles just under 3% of the time. At Riyan visibilities are equal to or greater than 6 miles over 50% of the time and less than 2 1/2 miles approximately 7% of the time. These references show a high frequency of light dust but not many of the strong sandstorms that would reduce visibility and cause damage, as indicated in some of the literature. The stronger sandstorms, called belat, occur with the northeasterly winds of winter.



(A) 0600-0800 local time July-August.
(B) 1200-1500 local time, July-August;
convergence zones indicated by dashed lines.
Fig. 6 Streamlines and resultant surface winds (After Flohn, 1965.)

Because of the abundant daytime radiation within the study area, strong surface heating occurs over the land which sets up a strong sea breeze in the afternoon. At night a reversal takes place as the land has greater radiational cooling, thus setting up a land breeze. As illustrated by Flohn (1965) in Fig. 6, a divergence zone develops at sea during the day and a convergence zone at night. This sea-breeze effect produces rain showers in the higher plateau regions of the southwestern Arabian Peninsula and the interior plateau of Somalia. Over Somalia, a convergence zone is established at the point where the northerly sea-breeze meets the southwest monsoon winds. This enhances the effects of orographic lift over the highlands to produce rain showers and thunderstorms. Occasionally, the downdrafts from these seabreeze-induced thunderstorms will produce sandstorms which can sweep down over the open water of the Gulf of Aden and Red Sea.

On January 22, 1974 the pilot of Skylab 4 described a dust cloud in this region as follows:

"I've noticed on two days running, and this is a pervasive and extensive cirrus development - which extends from off of the coast of Somalia and the southern end of the Arabian Peninsula out into the Indian Ocean, for 1500 to 2000 miles, as far as you can see. The peculiar character of the cirrus clouds is that they are dirty looking, and appear much darker than the other clouds in the same area." The fact that the crewman could observe the dust cloud system move into the Indian Ocean is significant in that they were able to identify and differentiate the dust clouds from normal clouds and to locate the source and observe the distribution of the dust on a continental scale far out into the sea (NASA, 1977).

Sandstorms and the stronger winds of the southwest monsoon are basically the only weather phenomena which affect shipping in the Gulf of Aden and Red Sea . Most of the rather infrequent thunderstorms are confined to the higher plateau regions and rarely does a tropical cyclone affect shipping at the entrances to the Gulf.

Forecasting techniques can be reviewed in the Forecaster's Guide to Tropical Meteorology, AWS Technical Report 240 by Atkinson (1971) and the Handbook for Forecasters in the Mediterranean ENVPREDRSCHFAC Technical paper 5-75 by Reiter (1975). Also, the mean monthly low level wind flow patterns by Findlater (1971) illustrate the strength of the southwest monsoon and the mean directional flow of the two distinct monsoon seasons. These publications, along with other references describe general approaches to forecasting in the tropics. However, the sparsity of data and lack of research for the region make climatology an important tool for the forcaster. Although land station data are relatively sparse, marine data are fairly abundant because of shipping through the Gulf of Aden and Suez Canal.

Climatological Elements

Precipitation

Of the elements recorded in the marine data base, precipitation is one of those most subject to error in both the way it is observed and interpreted. In some areas of the world, especially in more recent years, ships try and avoid foul weather and thus bias the data base towards fair weather. Since there is little adverse weather to affect shipping in the Gulf of Aden and the Red Sea this is not a significant problem. The occurrence of precipitation and thunder are so infrequent that charts for neither of these elements are presented in this publication. The frequency of precipitation is less than 5% for each month except for November where a small area off eastern Somalia observed frequencies of just over 5%. As for the frequencies of thunderstorms, all the monthly charts showed frequencies of less than 1% except for off-Aden during August where the frequencies increase to nearly 2%.

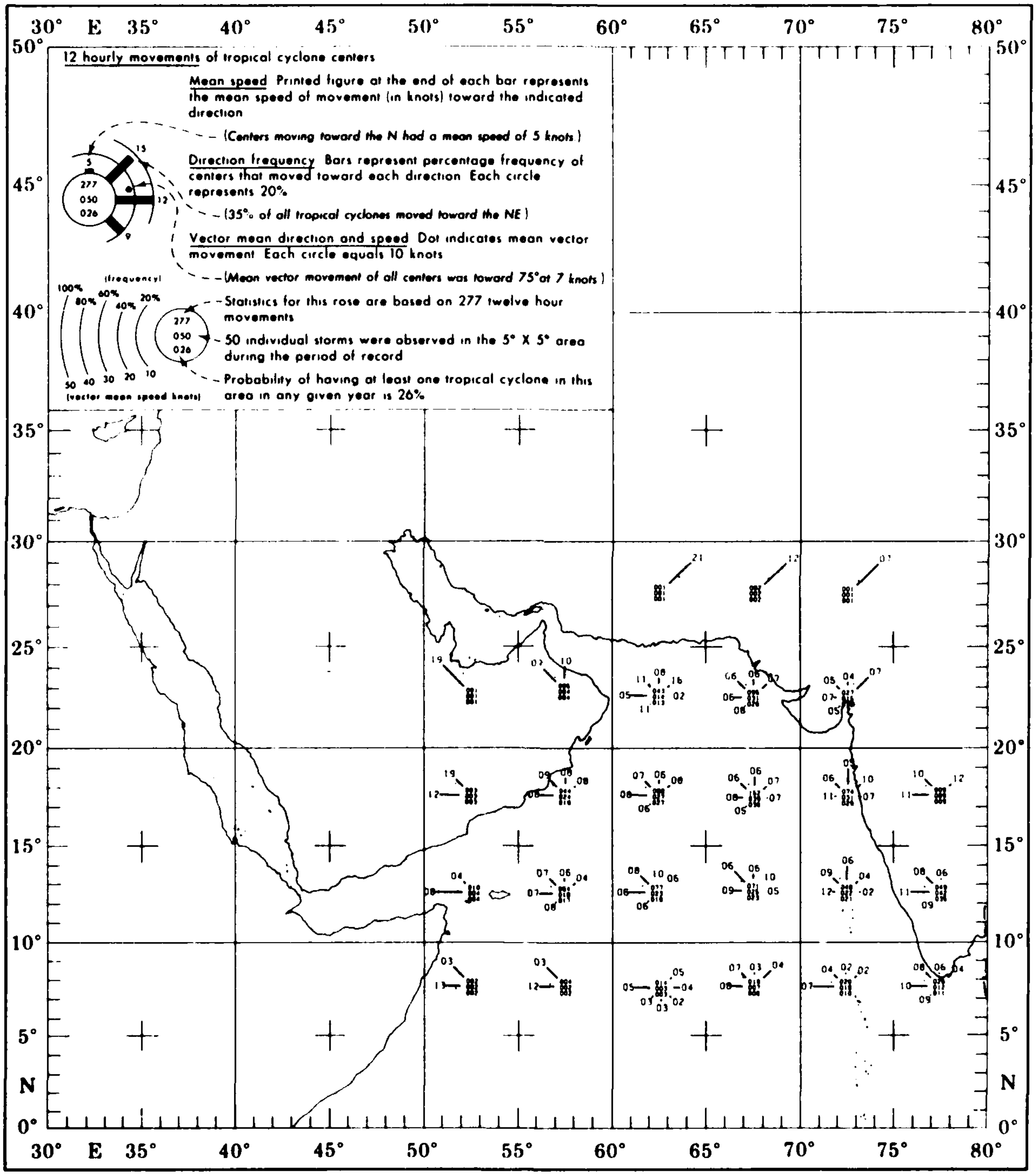


Fig. 7 Annual tropical cyclone (wind speed estimated ≥34 knots) 12 hourly movements

Tropical Cyclones

Tropical cyclones are a menace in the North Indian Ocean but the greatest number are confined to the Bay of Bengal. Of those that do occur in the Arabian Sea, they mostly make landfall across India or occasionally in the Persian Gulf region. Rarely is one observed at the entrance to the Gulf of Aden. (See Fig. 7.) The primary tropical storm seasons in the Arabian Sea are May through June and October through November. The greatest chance of encountering one outside the entrance to the Gulf of Aden is during November.

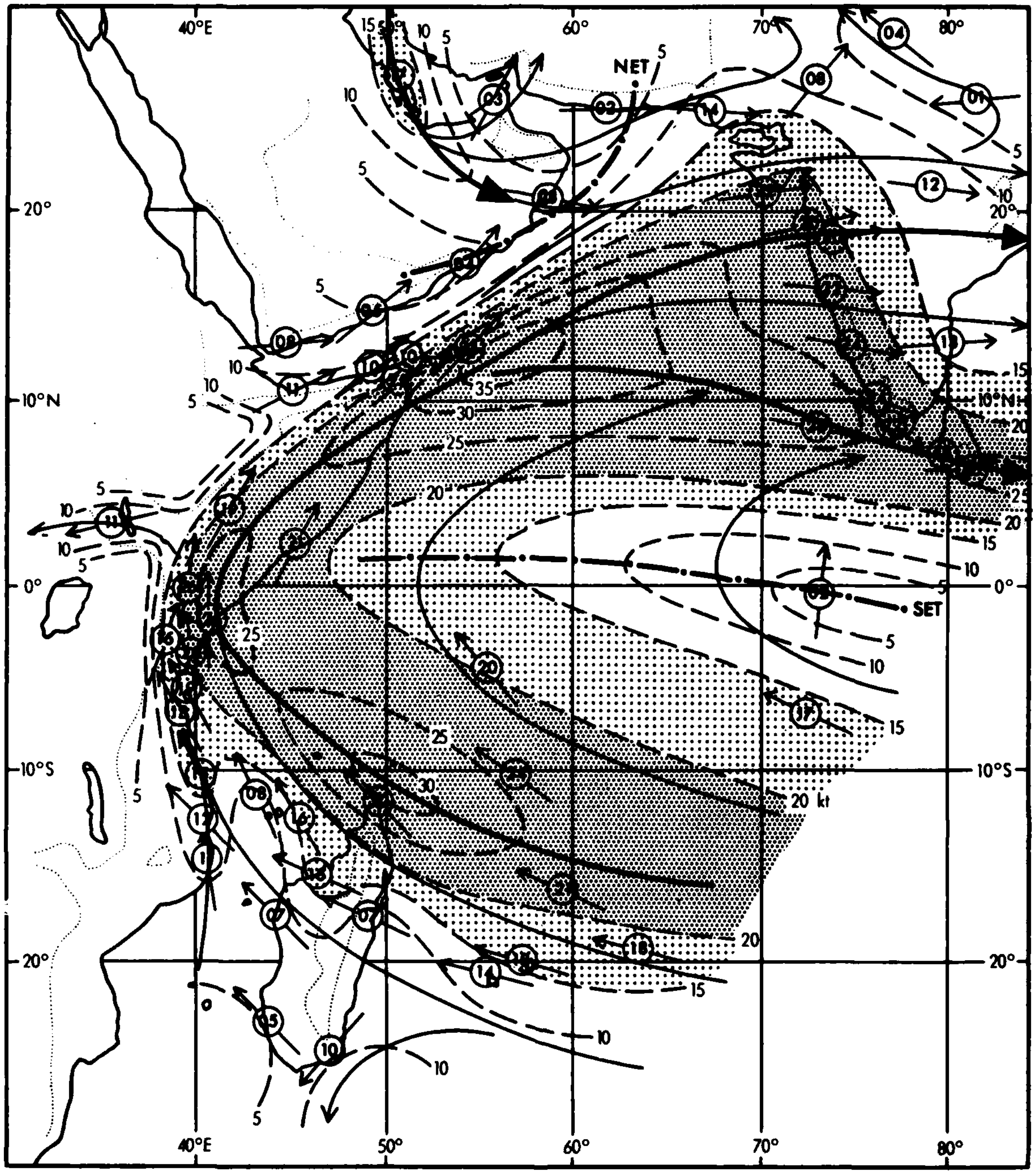
Air Temperature

Air temperature is one of the elements most frequently observed by mariners. Due to instrument exposure on many ships, the heating effects of the ship's structure tends to produce readings that are higher than the actual ambient air temperature. This is especially true in the Gulf of Aden and the Red Sea where sunny days with light winds are numerous.

During January and February, the coolest months for most of the area, the mean air temperatures are in the high 70's and by March the means are near 80F. By June the southwest monsoon is well entrenched and the mean air temperature over the Red Sea South and Gulf of Aden is in the high 80's. However, the stronger winds off Somalia are producing more upwelling, which leads to the lowering of the air temperature adjacent to the Somalia east coast. The means in this region, high 70's, are now slightly lower than they were in February. This trend continues through July and August with the means lowering to the mid-70's. The mean air temperatures are affected throughout the Gulf of Aden by the strong southwesterly flow as the means are lower in July and August than they are during June and September. However, where the flow is from the northwest quadrant in the Red Sea South these effects are not felt and the warmest mean air temperatures, lower 90's, are experienced during July and August. As the southwest monsoon begins to die out in September, the pattern begins to shift back to the normal north-south temperature gradient.

Sea Surface Temperature

Sea surface temperatures are recorded with a fairly high frequency in marine observations. Two principal methods for sampling are used: intake thermometers and buckets. Even though the two systems can produce slightly different results, the data may still be used with considerable confidence. The two distinct monsoon seasons affect the mean sea temperature patterns before those of the air temperature. The effects of the southwest monsoon (June to September) produce monthly mean sea temperatures as much as 4 to 5 degrees F less than the corresponding mean air temperatures throughout portions of the Gulf of Aden and along the east coast of Somalia. For the remaining 8 months the mean air-sea temperature differences are seldom more than 2 degrees F. Mean sea temperatures range from the high 70's to the low 80's during the northeast monsoon (winter). The southwest monsoon brings the stronger winds and more upwelling off Somalia and consequently the coolest mean sea temperatures off the east coast of Somalia during July and August (low 70's). Similarly, the mean sea temperatures in the Gulf of Aden drop into the low 80's during the peak of the southwest monsoon. As with the air temperature, the mean sea temperatures over the Red Sea South continue to increase during the summer into the low 90's.



——— Streamlines
– – – – Isotachs at 5 knot intervals
←⊙— Monthly mean wind speed and direction

Fig. 8 Mean July airflow at 1 km (Findlater, 1971.)

Surface Winds

The surface wind is one of the most commonly observed elements. Many of the observations from the NCC data base are visual observations based on the roughness of the sea. In more recent years more ships are acquiring anemometers and reporting measured winds. Prior to 1963 many of the wind speeds were recorded in the Beaufort scale; however, such estimates have proven to be quite reliable and can be used with a high degree of confidence. Five sets of wind speed isopleths are presented: mean scalar speed, the percent frequency of winds less than 11 knots, 11 to 21 knots, 22 to 33 knots and greater than or equal to 34 knots. Also included are wind roses by one degree square. From the wind roses it is easy to pick out the two distinct monsoon seasons by the directional shift. Winds of 34 knots or greater occur with a frequency of 5% or more only during the summer months June through August in the area to the east of Somalia. This illustrates how much stronger the southwest monsoon is compared to the northeast monsoon. This same pattern is also illustrated on the other presentations of wind. During the northeast monsoon the mean scalar winds are strongest over the Red Sea South just north of the Bab al Mandab Strait. During the southwest monsoon a reversal takes place as the winds over the Red Sea South decrease and those east of Somalia significantly increase. Within the study area, the highest mean winds are found in the area off the Somalia coast where wind speeds average over 30 knots during July. This feature is actually a downward extension of the Somalia Jet (Fig. 8) which develops during the southwest monsoon. The strongest wind speeds are generally found near the 5000 ft. level where they often reach 50 knots. Occasionally wind speeds in excess of 90 knots are found between 4000 ft. and 8000 ft (Findlater, 1969a). This low-level, cross-equatorial jet transports a large mass of air in the lower troposphere and is closely associated with the Intertropical Convergence zone over the southern Arabian Peninsula (Findlater, 1969b). It is an integral part of the general circulation pattern (see Fig. 2) and is confined to the east African area because of the western boundary established by the African topography, the highlands that extend through Kenya, Ethiopia and Somalia (See Fig. 1). A numerical model of the Somalia Jet has been developed by Krishnamurti, et al; (1976) which is primarily concerned with simulation of the following features:

1. A wind max near the northern tip of Madagascar,

2. A strong wind maximum just downstream from the Somalia coast,

3. A major cross-equatorial current from the southern Indian Ocean to the central Arabian Sea,

4. A relative minimum in speed along the axis of strong winds near the equator,

5. A split in the axis of the jet in the Arabian Sea.

These criteria were established using actual wind observations and Findlater's analysis.

Visibility

Visibilities are difficult to measure at sea because of the lack of reference points. Climatically, many low visibility observations are probably missed because the mate is too busy with navigation duties (fair weather bias). This is especially true in an area as narrow and constrictive as the Red Sea and the Gulf of Aden. However, the coarseness of the visibility code intervals tends to minimize the problem permitting the summarized data to be relatively consistent. The visibility tables that are presented by one-degree square show the entire region to have a high frequency of visibility of five miles or better. In all months except June through August these frequencies run better than 90% and only in these three summer months does the frequency drop between 80% and 90% for portions of the Red Sea South. As mentioned earlier, Aden reports dust nearly daily during July, yet the visibilities are still observed to be 6 miles or better 80% of the time.

Ceiling and Visibility

Aircraft - type ceilings are not available from marine observations. The ceilings are estimated from the height of the lowest cloud when low clouds cover more than half the sky. When the sky is totally obscured by rain, fog, dust or other phenomena, the total obscuration is considered a ceiling with a height of zero. The infrequent occurrence of poor conditions led us to exclude presentations of ceilings less than 600 feet and/or visibility less than two nautical miles and the lower category of less than 300 feet and/or less than one mile. For both categories the percent frequency of occurrence was less than 5% except along the coastal regions of Oman where frequencies just approach 5% for ceilings less than 600 feet and/or visibility less than two nautical miles during August and September. Mid range ceilings and visibility charts (ceiling less than 1000 feet and/or visibility less than 5 nautical miles; ceiling less than 8000 feet and/or visibility less than 10 nautical miles), however, are presented. Even the frequency of less than 1000 feet and/or less than 5 nautical miles rarely exceeds 10% except during July through September along the coast of Oman.

Wave Heights

Wave heights have been recorded in a consistent quantitative code only since the late 1940's. The reluctance of many observers to take wave observations in the earlier years and the difficulty in estimating waves, especially in confused seas, makes wave observations one of the least commonly observed elements. They are also subject to biases. (Quayle, 1980) Generally the heights are too low, the periods too short, and the sea swell discrimination poor . The data in this study have not been adjusted for the suspected biases other than being processed through a quality control procedure where an internal check was made between wind speed and sea height. The data were also arrayed and apparent erroneous outliers deleted in both the sea and swell data. As with the winds, the wave heights in the two thresholds presented (greater than or equal to three feet and greater than or equal to eight feet) show a slightly higher frequency over the southern end of the Red Sea than in the Gulf of Aden during the northeast monsoon. During the southwest monsoon a reversal occurs and a significant wave height increase is observed to the east of the entrance to the Gulf of Aden. The wave charts also illustrate how much stronger the southwest monsoon is compared to the northeast monsoon. However, one should keep in mind that the strongest part of the southwest monsoon is just to the east of the study area.

Ocean Currents

The ocean current charts are compiled principally from ship drift reports that were forwarded by the various merchant marines to the Naval Oceanographic Office. From these drift observations the set (direction) and drift (speed) of the prevailing currents are calculated for each one degree square. The density of observations is greatest along major shipping routes and reliability of the current charts is best in these areas. The data are considered most useful when used collectively as in summaries where a large number of observations are available.

The surface current charts displayed for the Red Sea South and Gulf of Aden, are winter (November through April), summer (May through October), and Annual (January through December).

SUMMARY

Without a good source of real time data (limited number of reporting surface and upper air stations) a forcaster will have to depend heavily upon climatology. Fortunately, climatology is generally a good representation of expected conditions for the tropics (this region included). Pilot reports, radar information, and satellite data can also be very useful in making short range forecasts for the Red Sea South and the Gulf of Aden.

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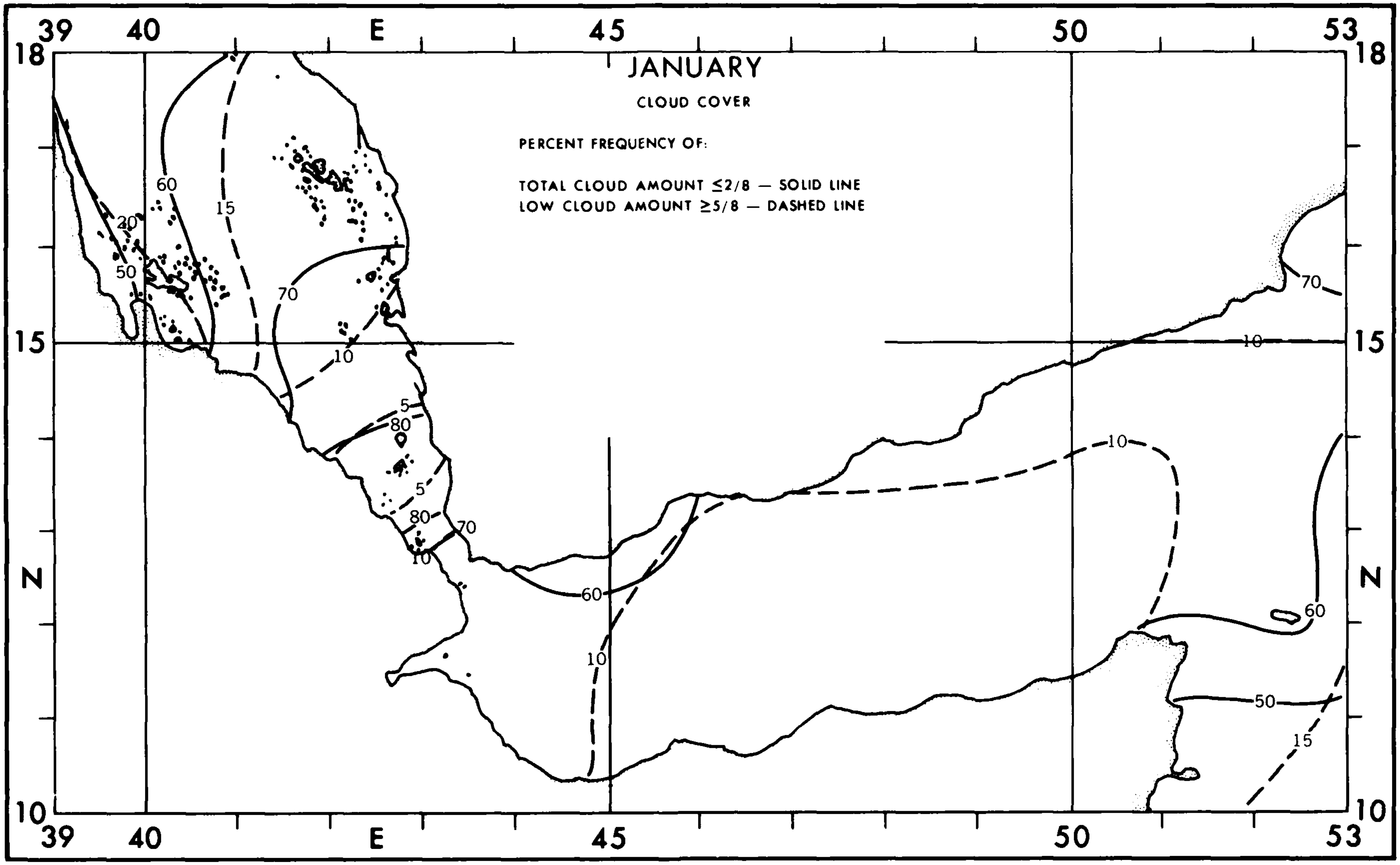
JANUARY
CLOUD COVER
PERCENT FREQUENCY OF:
TOTAL CLOUD AMOUNT ≤2/8 — SOLID LINE
LOW CLOUD AMOUNT ≥5/8 — DASHED LINE
39
40
E
45
50
53
18
15
N
10
60
15
20
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70
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5
80
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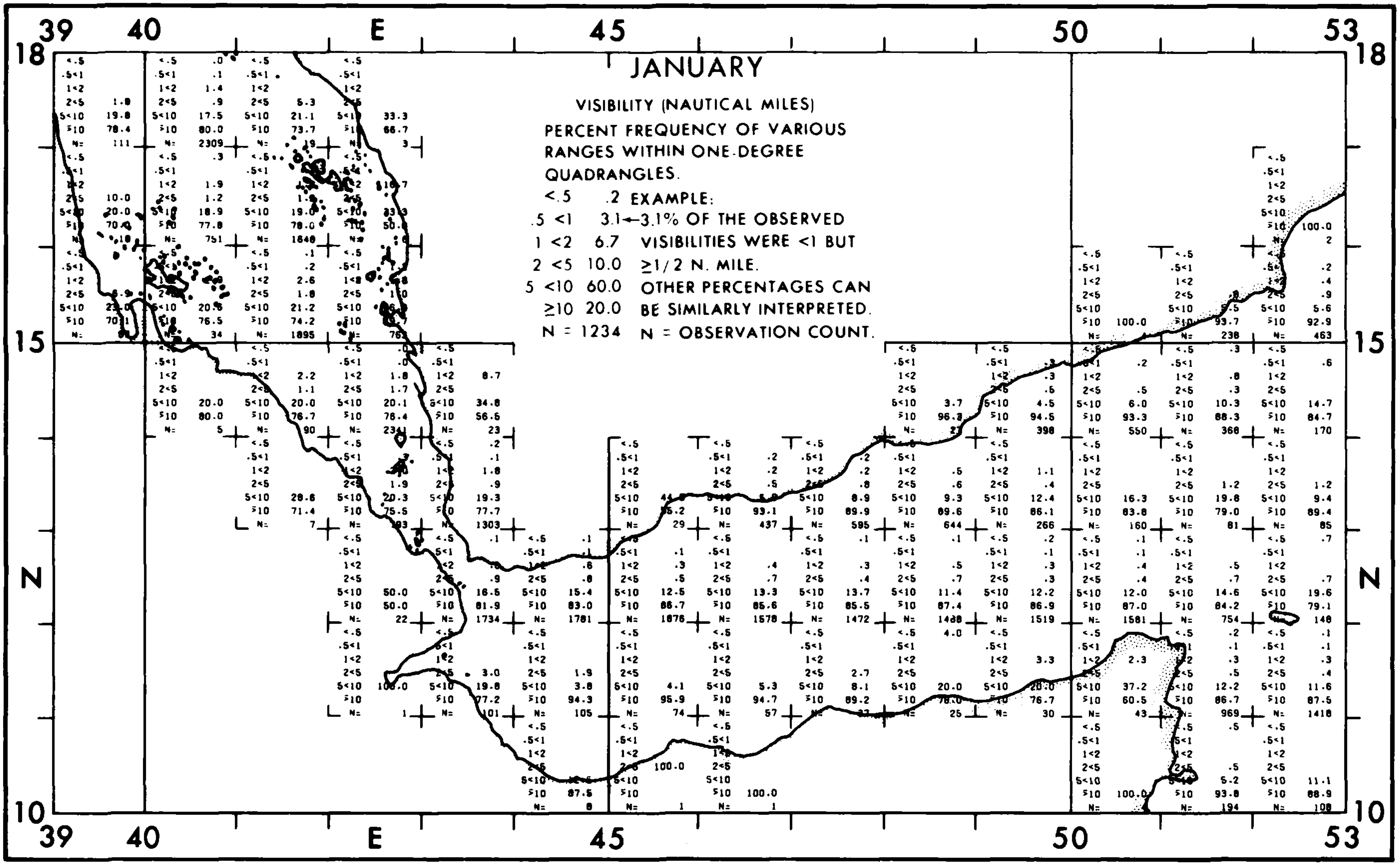
JANUARY
VISIBILITY (NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
<.5 .2 EXAMPLE:
.5 <1 3.1←3.1% OF THE OBSERVED
1 <2 6.7 VISIBILITIES WERE <1 BUT
2 <5 10.0 ≥1/2 N. MILE.
5 <10 60.0 OTHER PERCENTAGES CAN
≥10 20.0 BE SIMILARLY INTERPRETED.
N = 1234 N = OBSERVATION COUNT.
39
40
E
45
50
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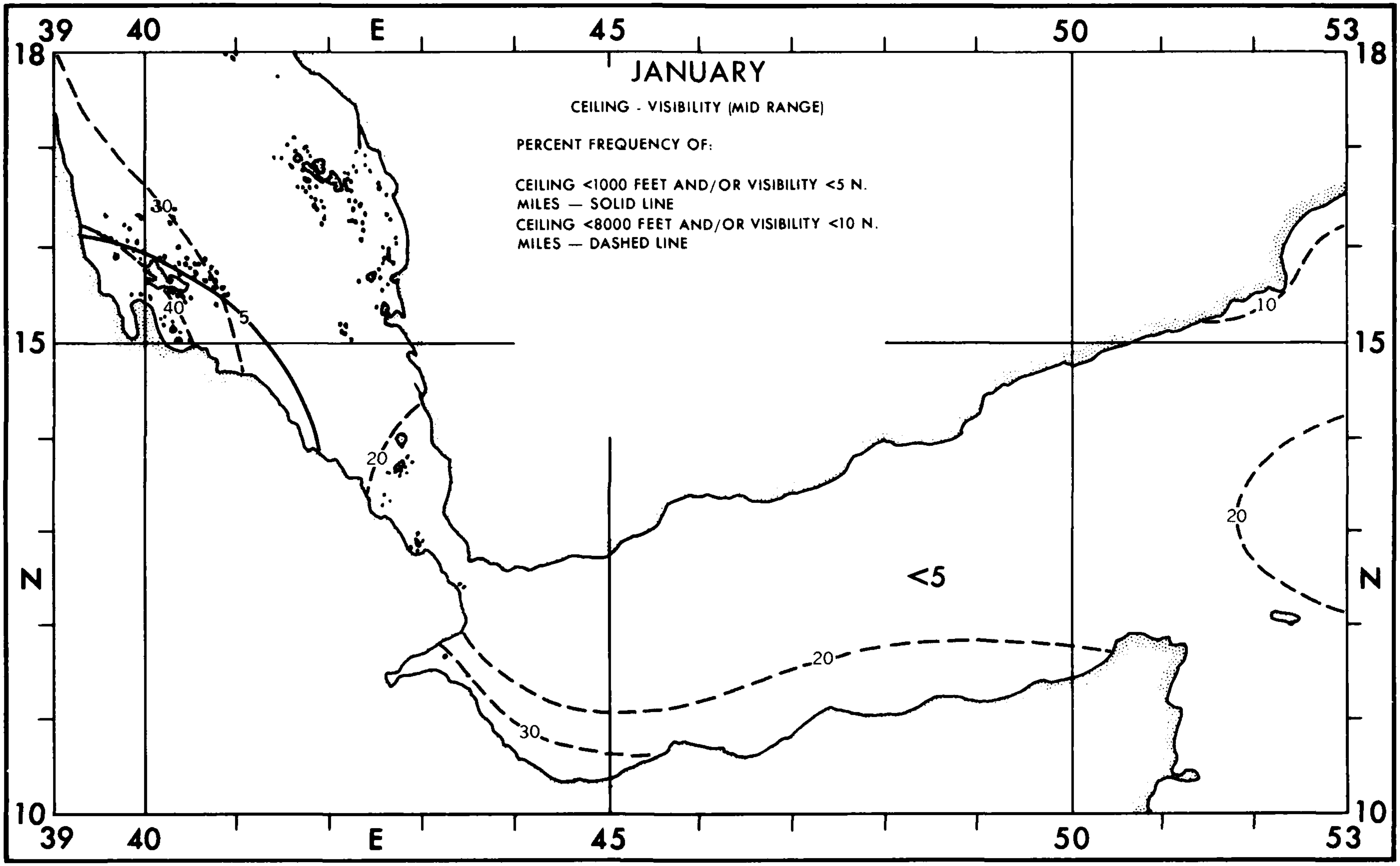
18
15
N
10


JANUARY
CEILING - VISIBILITY (MID RANGE)
PERCENT FREQUENCY OF:
CEILING <1000 FEET AND/OR VISIBILITY <5 N. MILES — SOLID LINE
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E
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18
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40
5
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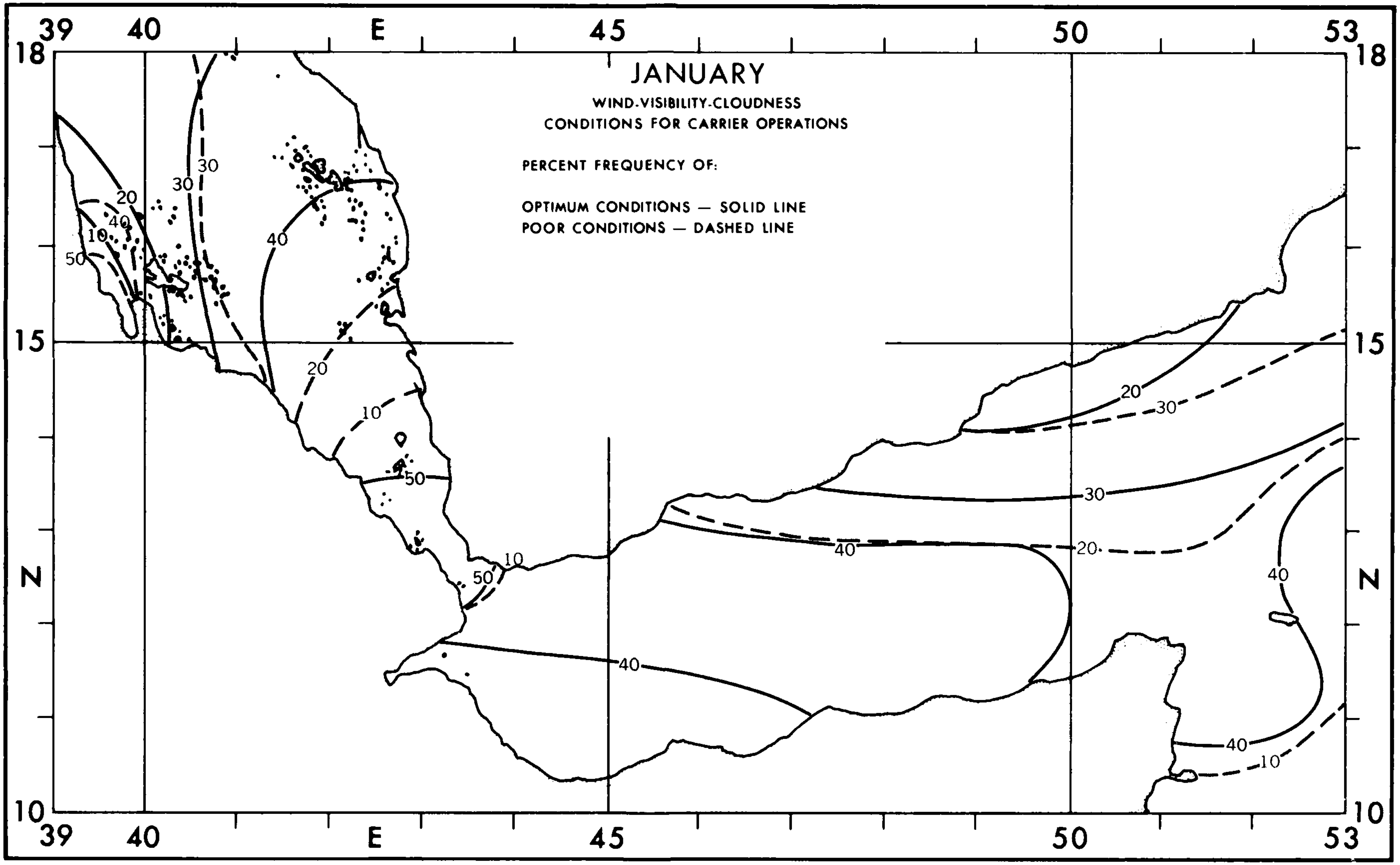
<5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CONDITIONS FOR CARRIER OPERATIONS
PERCENT FREQUENCY OF:
OPTIMUM CONDITIONS — SOLID LINE
POOR CONDITIONS — DASHED LINE
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E
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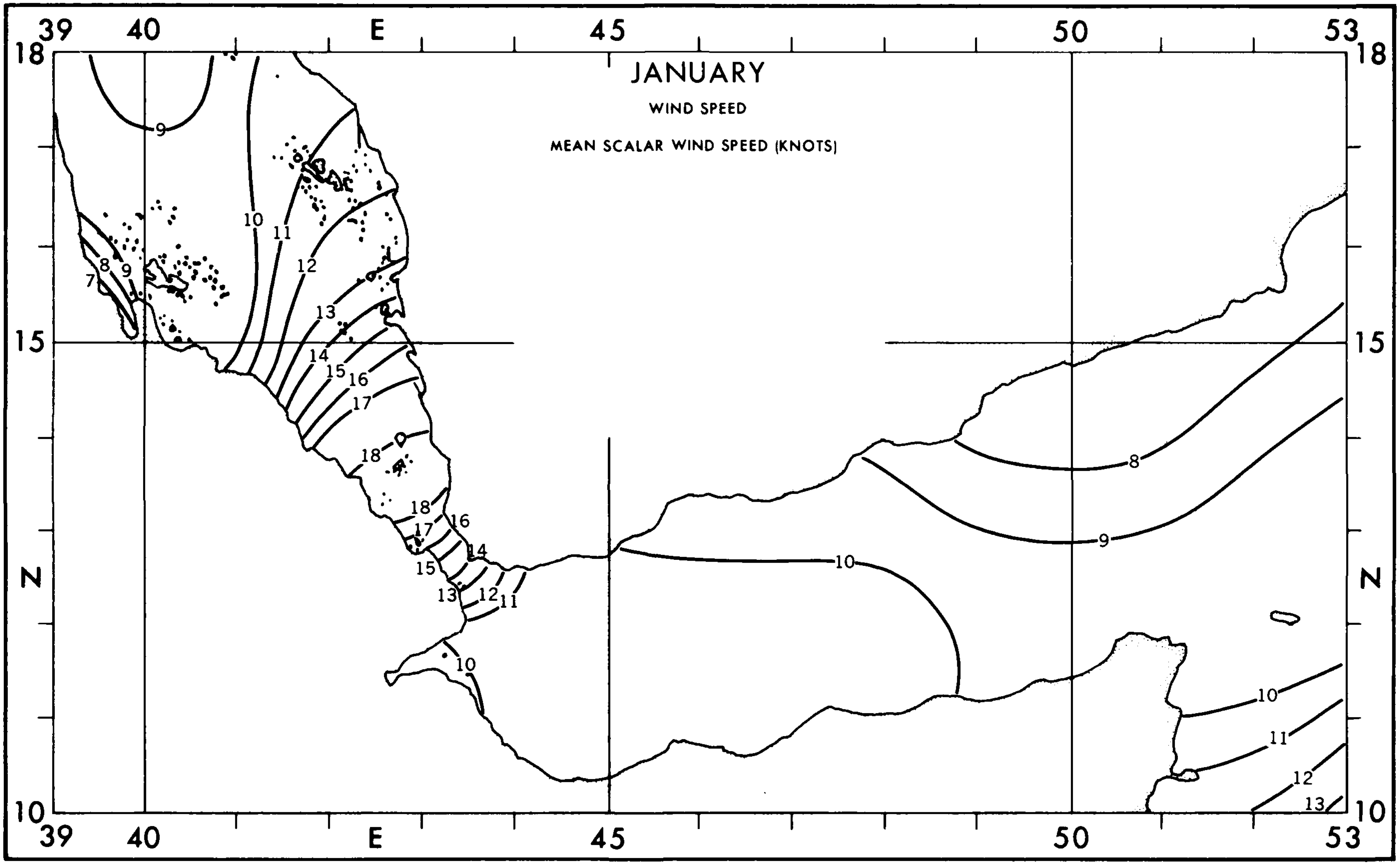
JANUARY
WIND SPEED
MEAN SCALAR WIND SPEED (KNOTS)
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16
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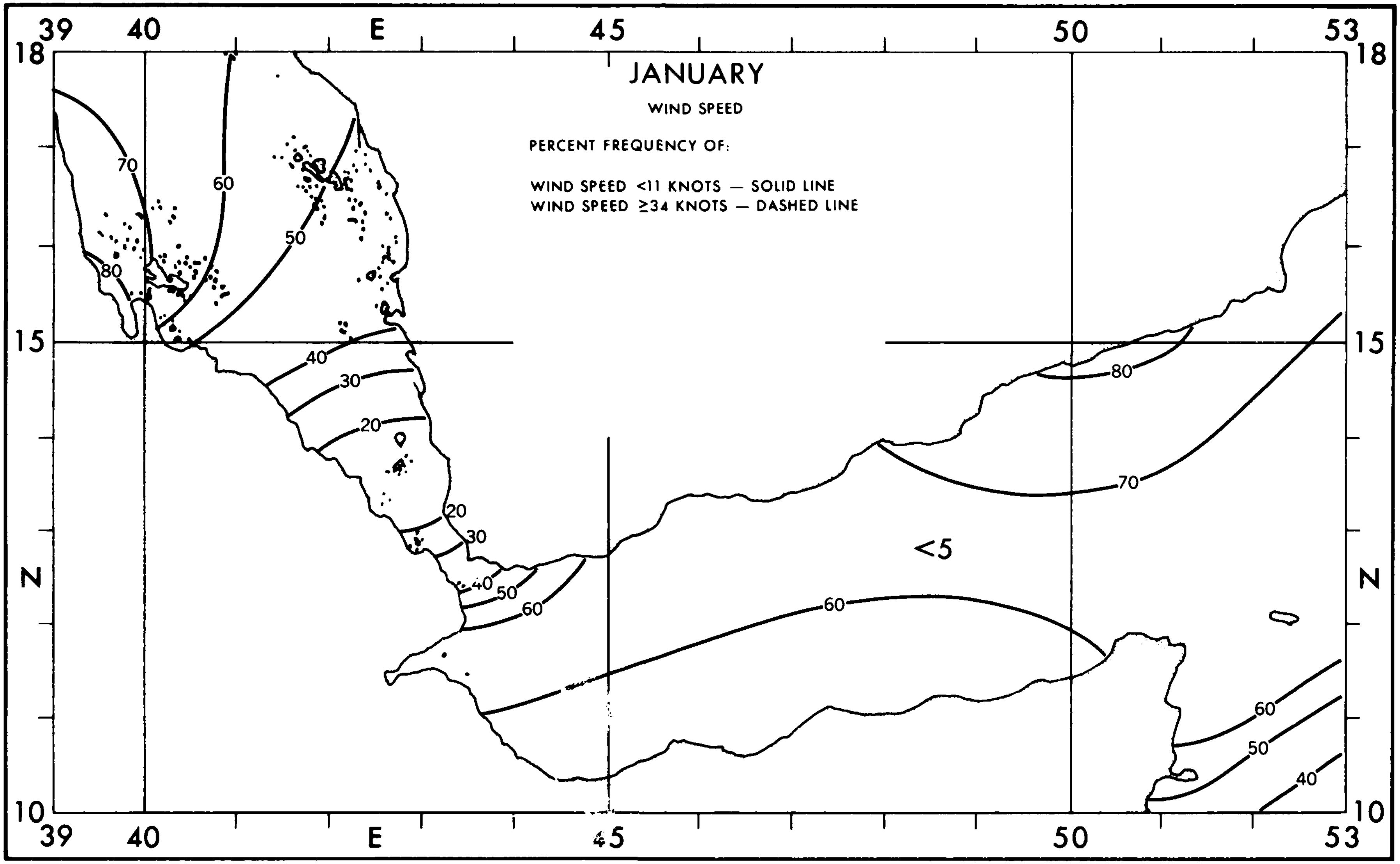
JANUARY
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PERCENT FREQUENCY OF:
WIND SPEED <11 KNOTS — SOLID LINE
WIND SPEED ≥34 KNOTS — DASHED LINE
<5
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40
E
45
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18
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N
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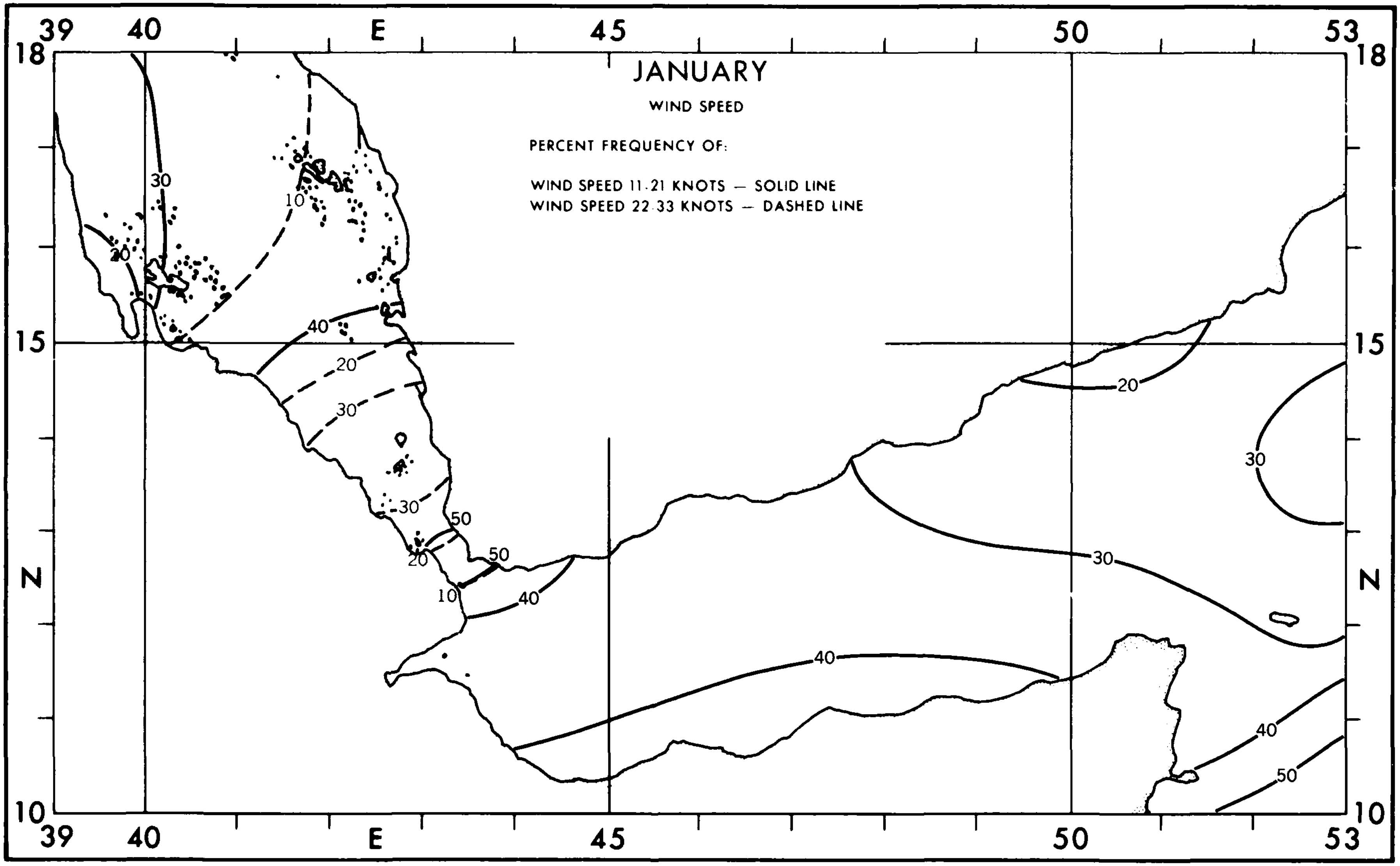
JANUARY
WIND SPEED
PERCENT FREQUENCY OF:
WIND SPEED 11-21 KNOTS — SOLID LINE
WIND SPEED 22-33 KNOTS — DASHED LINE
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45
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15
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20
10
40
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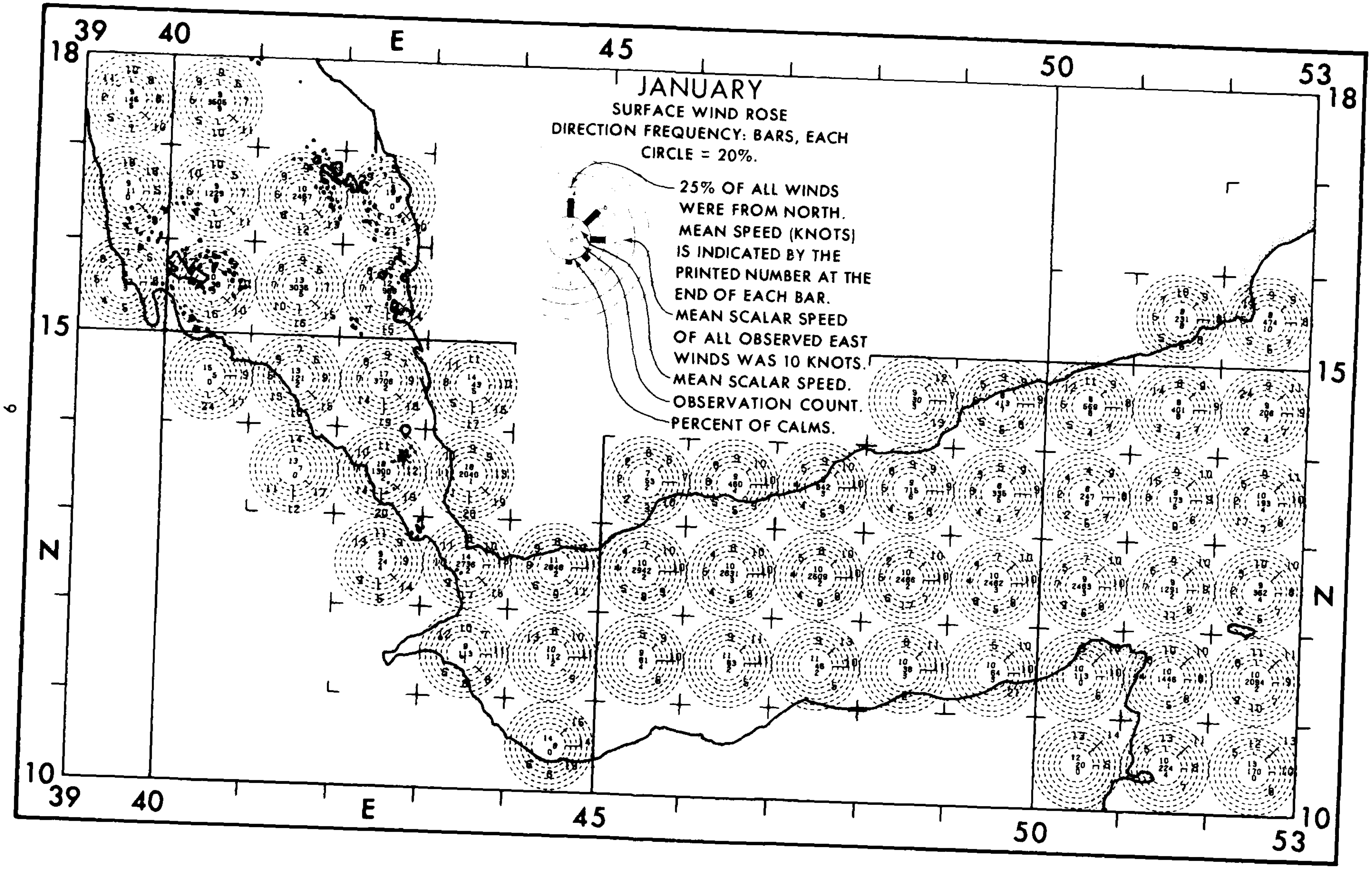
JANUARY
SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%.
25% OF ALL WINDS WERE FROM NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR.
MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
MEAN SCALAR SPEED.
OBSERVATION COUNT.
PERCENT OF CALMS.
E
N
39
40
45
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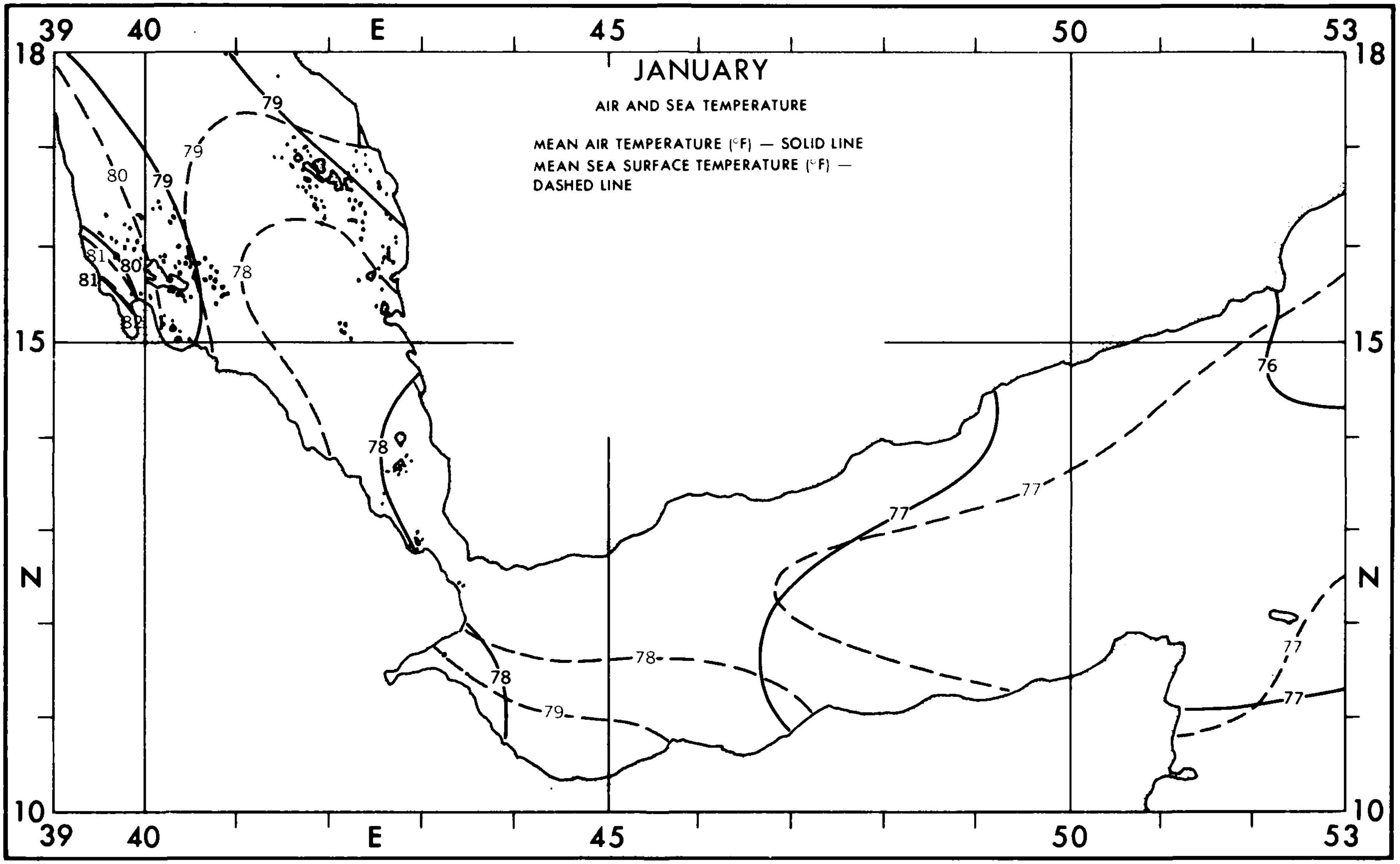
53
18
15
10


JANUARY
AIR AND SEA TEMPERATURE
MEAN AIR TEMPERATURE (°F) — SOLID LINE
MEAN SEA SURFACE TEMPERATURE (°F) —
DASHED LINE
39
40
E
45
50
53
18
15
N
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76
77
78
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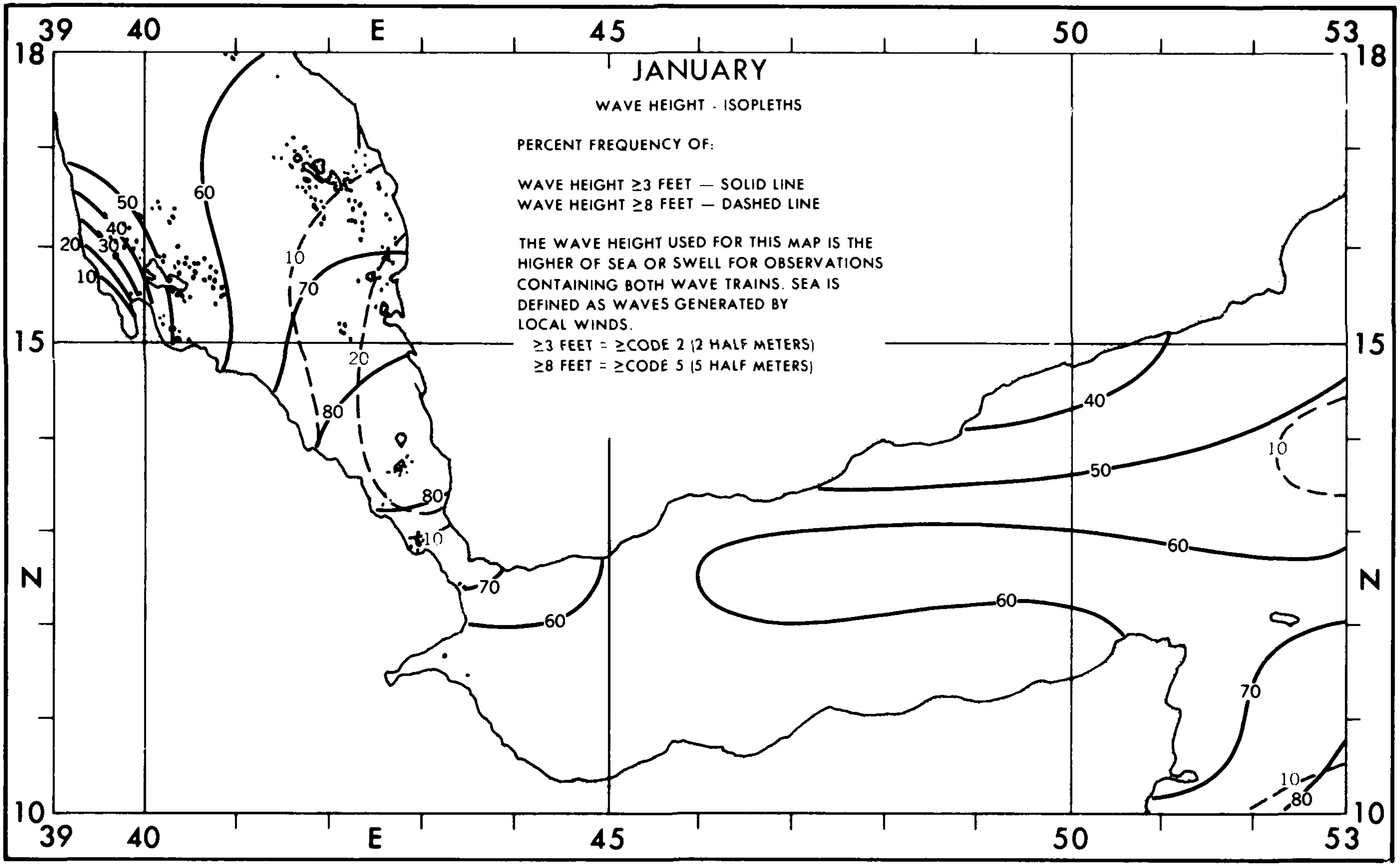
80
81
82


JANUARY
WAVE HEIGHT - ISOPLETHS
PERCENT FREQUENCY OF:
WAVE HEIGHT ≥3 FEET — SOLID LINE
WAVE HEIGHT ≥8 FEET — DASHED LINE
THE WAVE HEIGHT USED FOR THIS MAP IS THE HIGHER OF SEA OR SWELL FOR OBSERVATIONS CONTAINING BOTH WAVE TRAINS. SEA IS DEFINED AS WAVES GENERATED BY LOCAL WINDS.
≥3 FEET = ≥CODE 2 (2 HALF METERS)
≥8 FEET = ≥CODE 5 (5 HALF METERS)
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N
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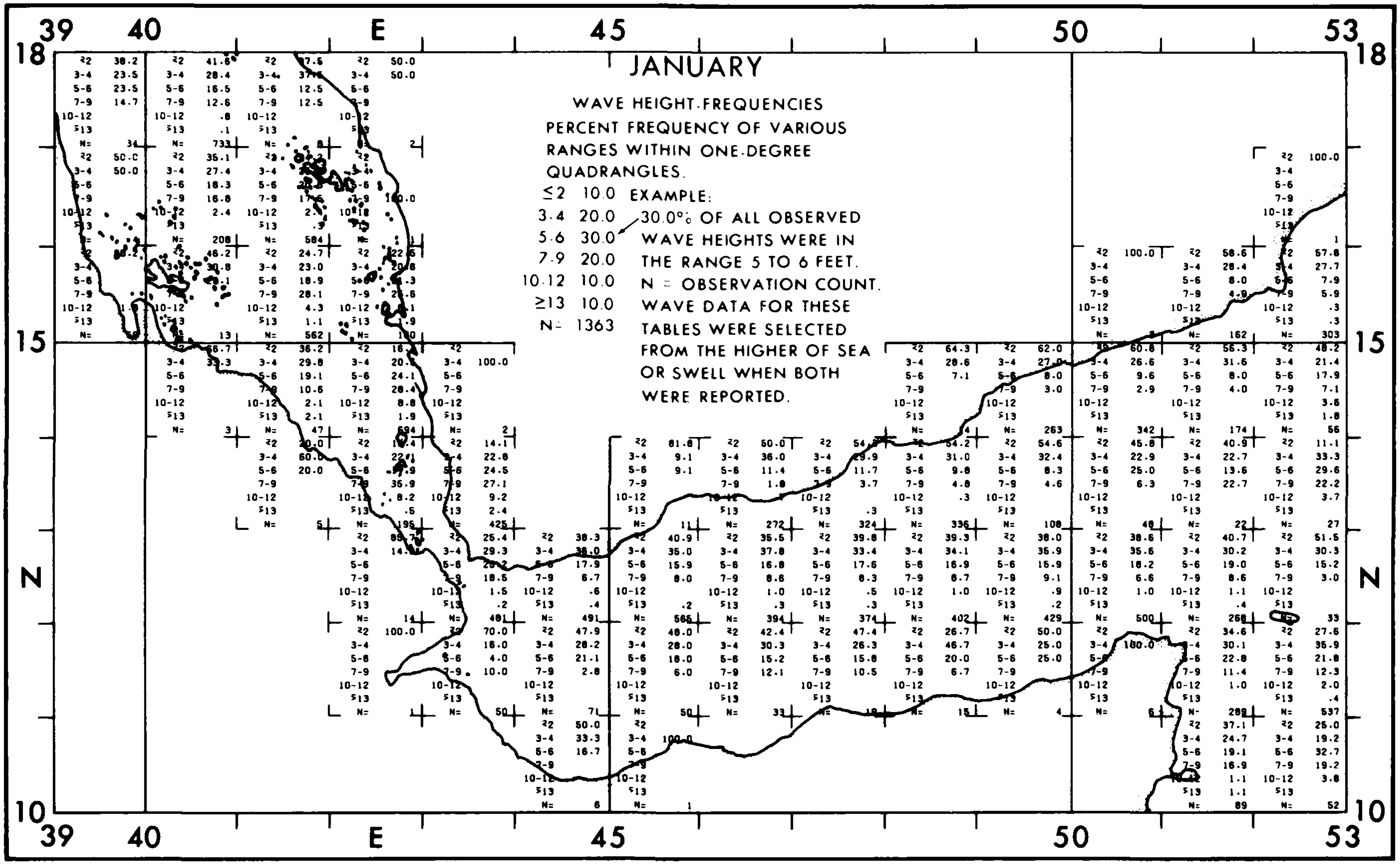
JANUARY
WAVE HEIGHT FREQUENCIES
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
≤2 10.0
3-4 20.0
5-6 30.0
7-9 20.0
10-12 10.0
≥13 10.0
N= 1363
EXAMPLE:
30.0% OF ALL OBSERVED WAVE HEIGHTS WERE IN THE RANGE 5 TO 6 FEET.
N = OBSERVATION COUNT.
WAVE DATA FOR THESE TABLES WERE SELECTED FROM THE HIGHER OF SEA OR SWELL WHEN BOTH WERE REPORTED.
39
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18
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N
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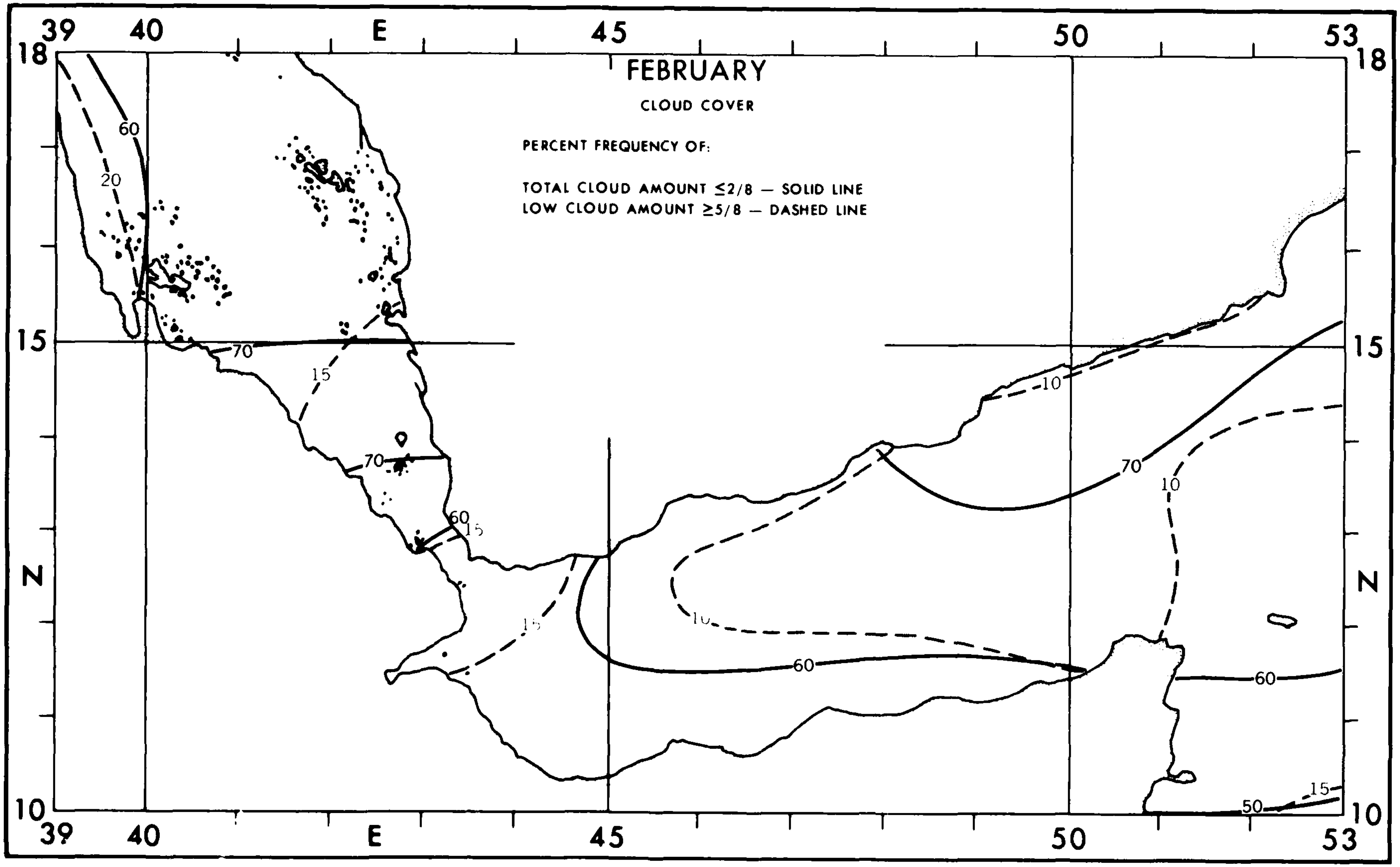
FEBRUARY
CLOUD COVER
PERCENT FREQUENCY OF:
TOTAL CLOUD AMOUNT ≤2/8 — SOLID LINE
LOW CLOUD AMOUNT ≥5/8 — DASHED LINE
39
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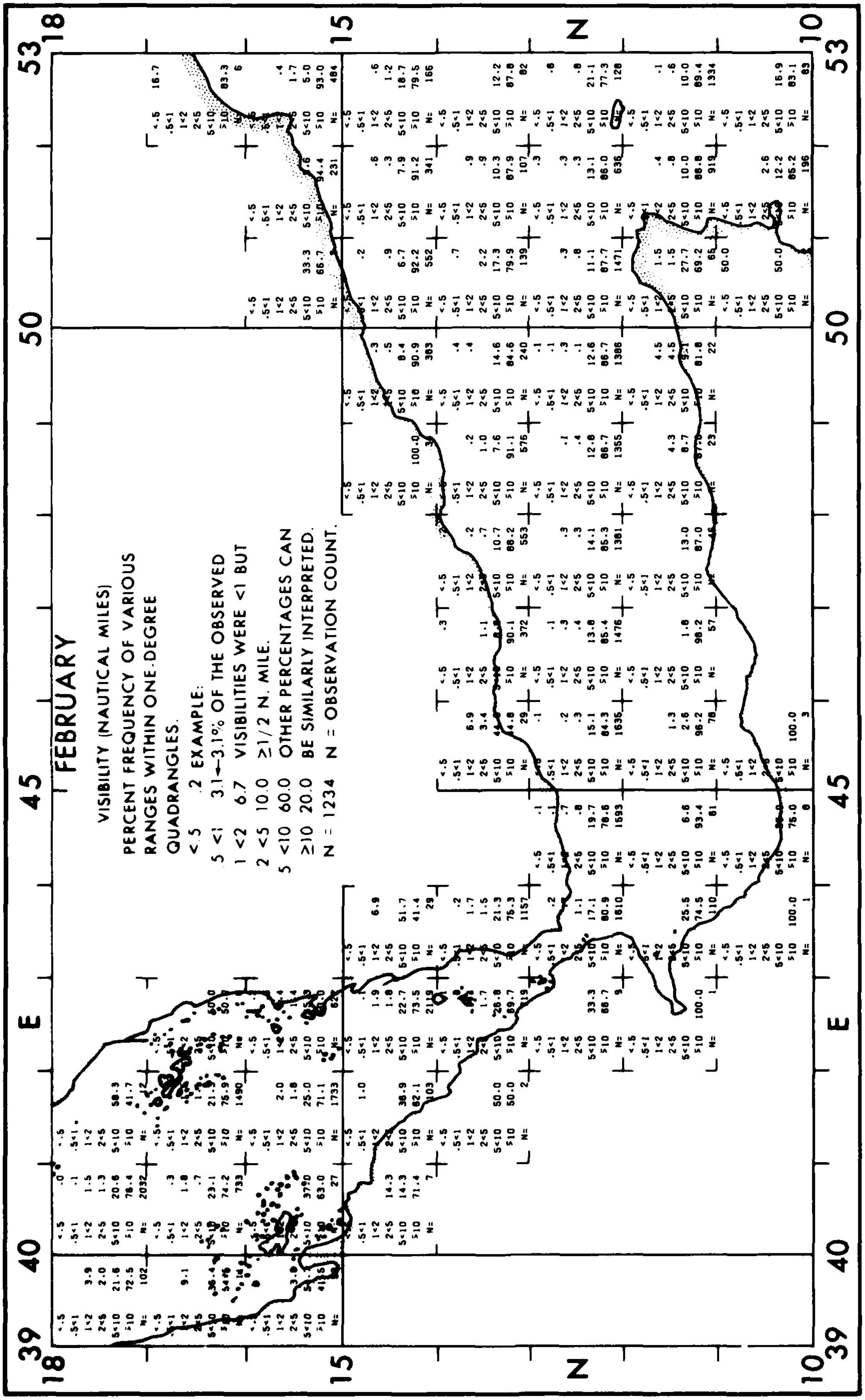
FEBRUARY
VISIBILITY (NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
<.5 .2 EXAMPLE:
.5 <1 3.1←3.1% OF THE OBSERVED
1 <2 6.7 VISIBILITIES WERE <1 BUT
2 <5 10.0 ≥1/2 N. MILE.
5 <10 60.0 OTHER PERCENTAGES CAN
≥10 20.0 BE SIMILARLY INTERPRETED.
N = 1234 N = OBSERVATION COUNT.
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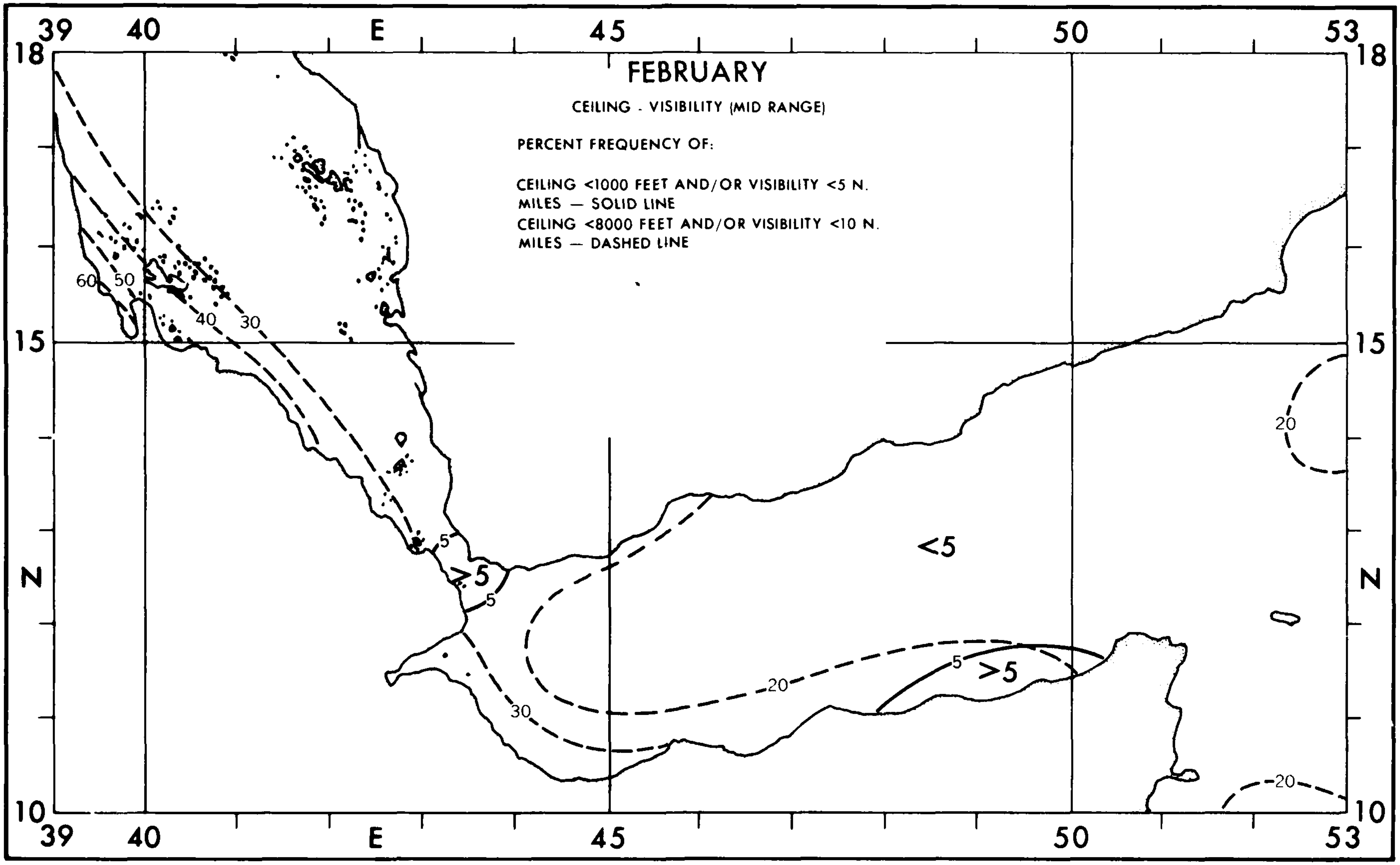
FEBRUARY
CEILING - VISIBILITY (MID RANGE)
PERCENT FREQUENCY OF:
CEILING <1000 FEET AND/OR VISIBILITY <5 N. MILES — SOLID LINE
CEILING <8000 FEET AND/OR VISIBILITY <10 N. MILES — DASHED LINE
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>5
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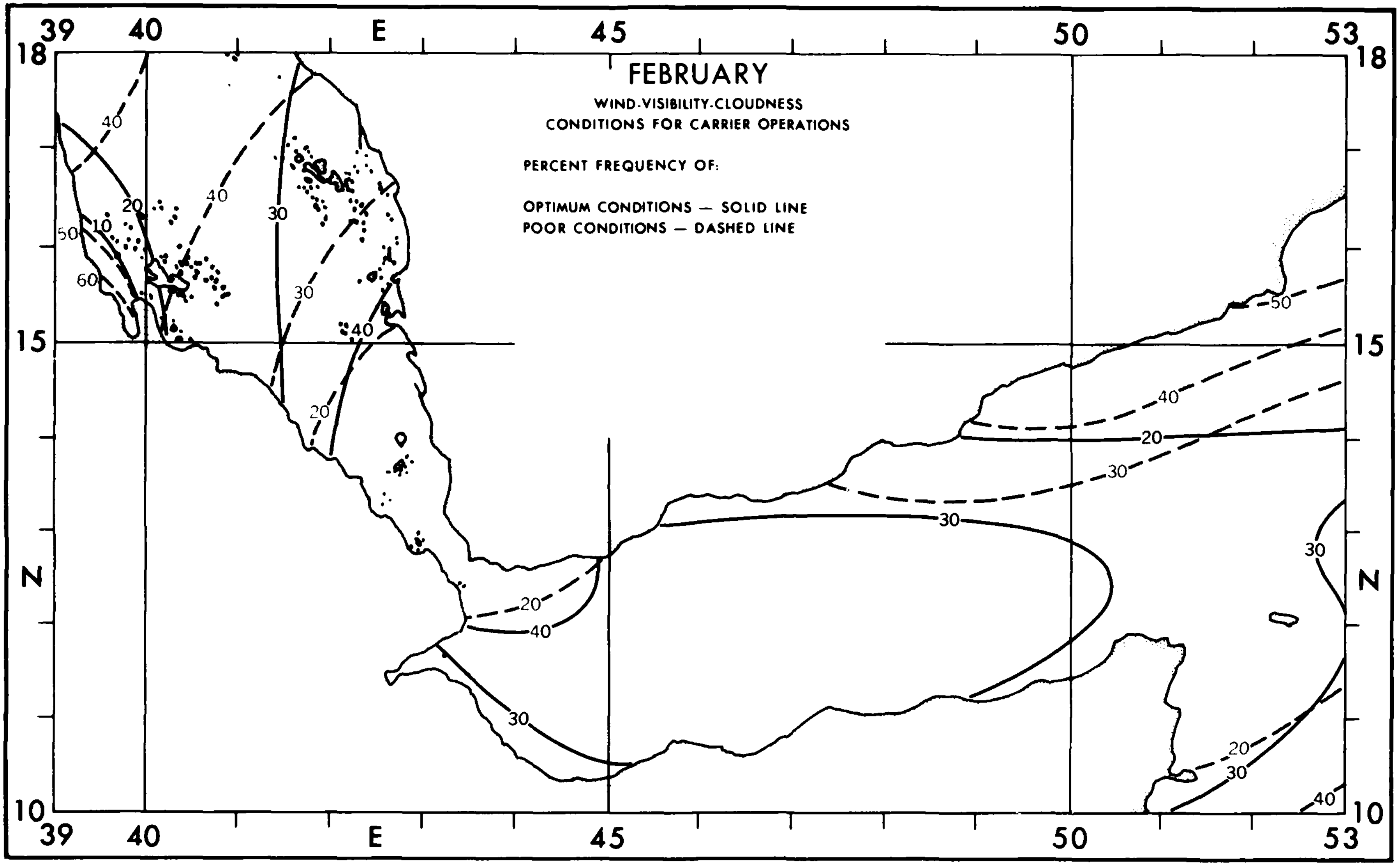
FEBRUARY
WIND-VISIBILITY-CLOUDNESS
CONDITIONS FOR CARRIER OPERATIONS
PERCENT FREQUENCY OF:
OPTIMUM CONDITIONS — SOLID LINE
POOR CONDITIONS — DASHED LINE
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53
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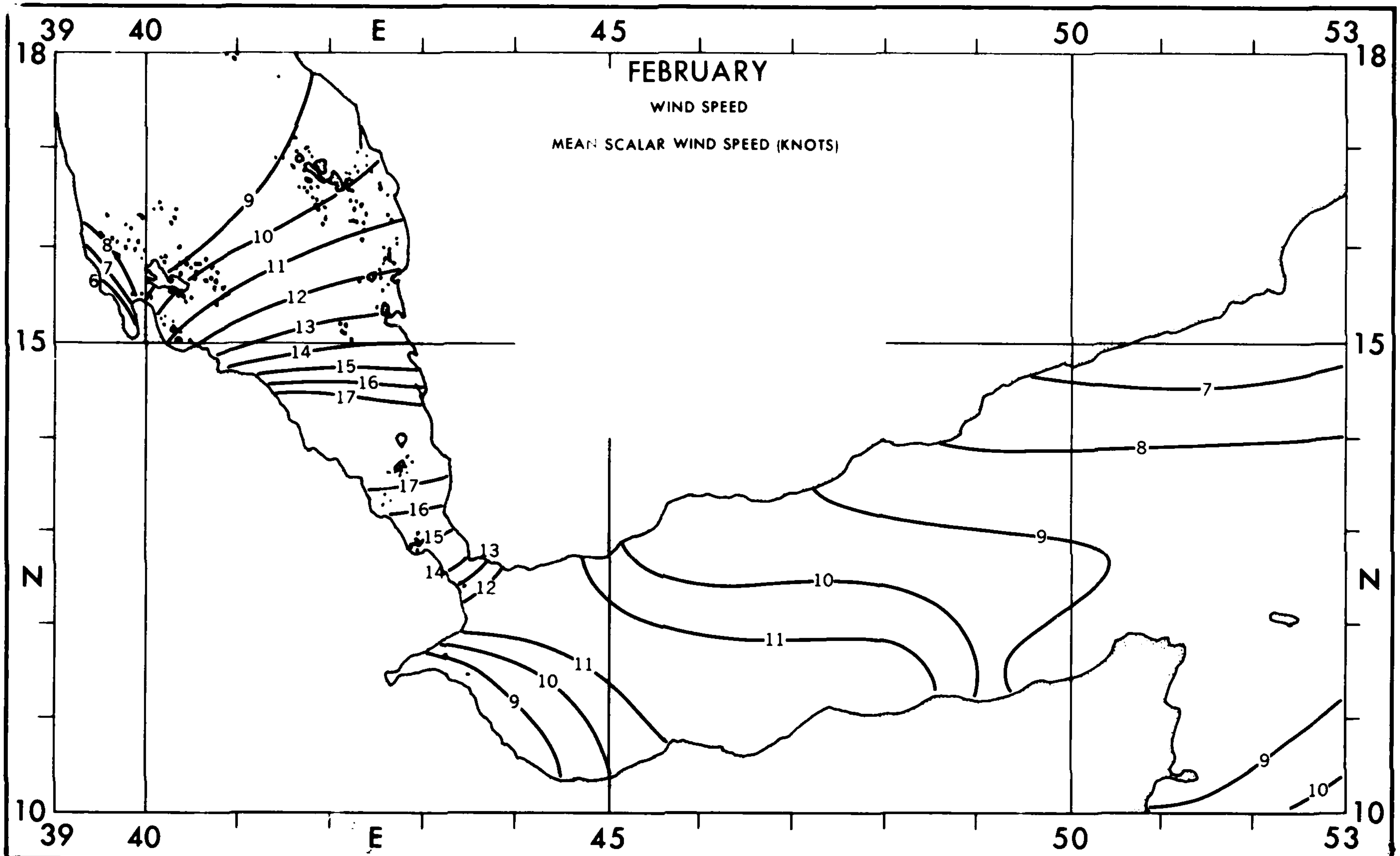
FEBRUARY
WIND SPEED
MEAN SCALAR WIND SPEED (KNOTS)
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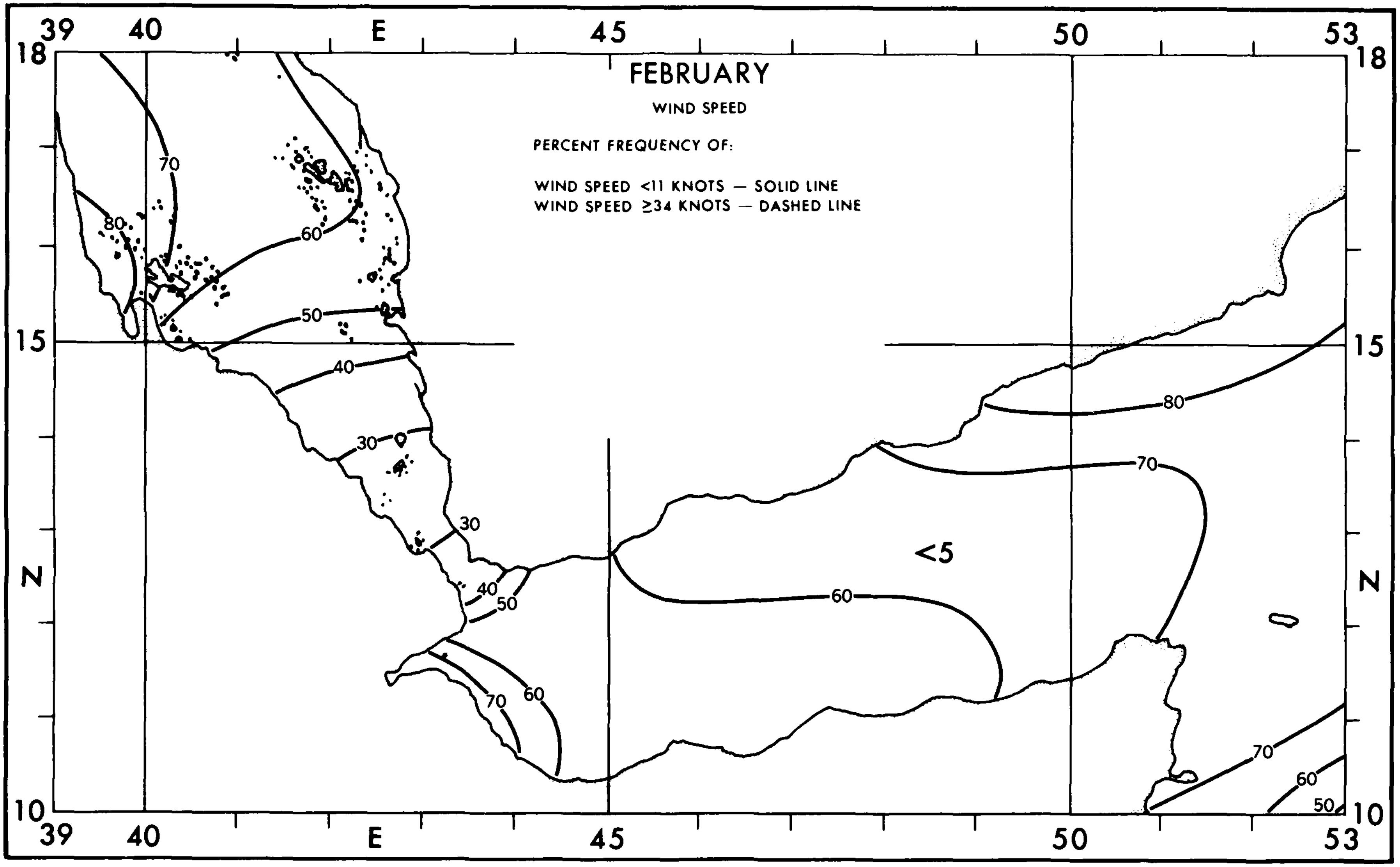
FEBRUARY
WIND SPEED
PERCENT FREQUENCY OF:
WIND SPEED <11 KNOTS — SOLID LINE
WIND SPEED ≥34 KNOTS — DASHED LINE
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10
80
70
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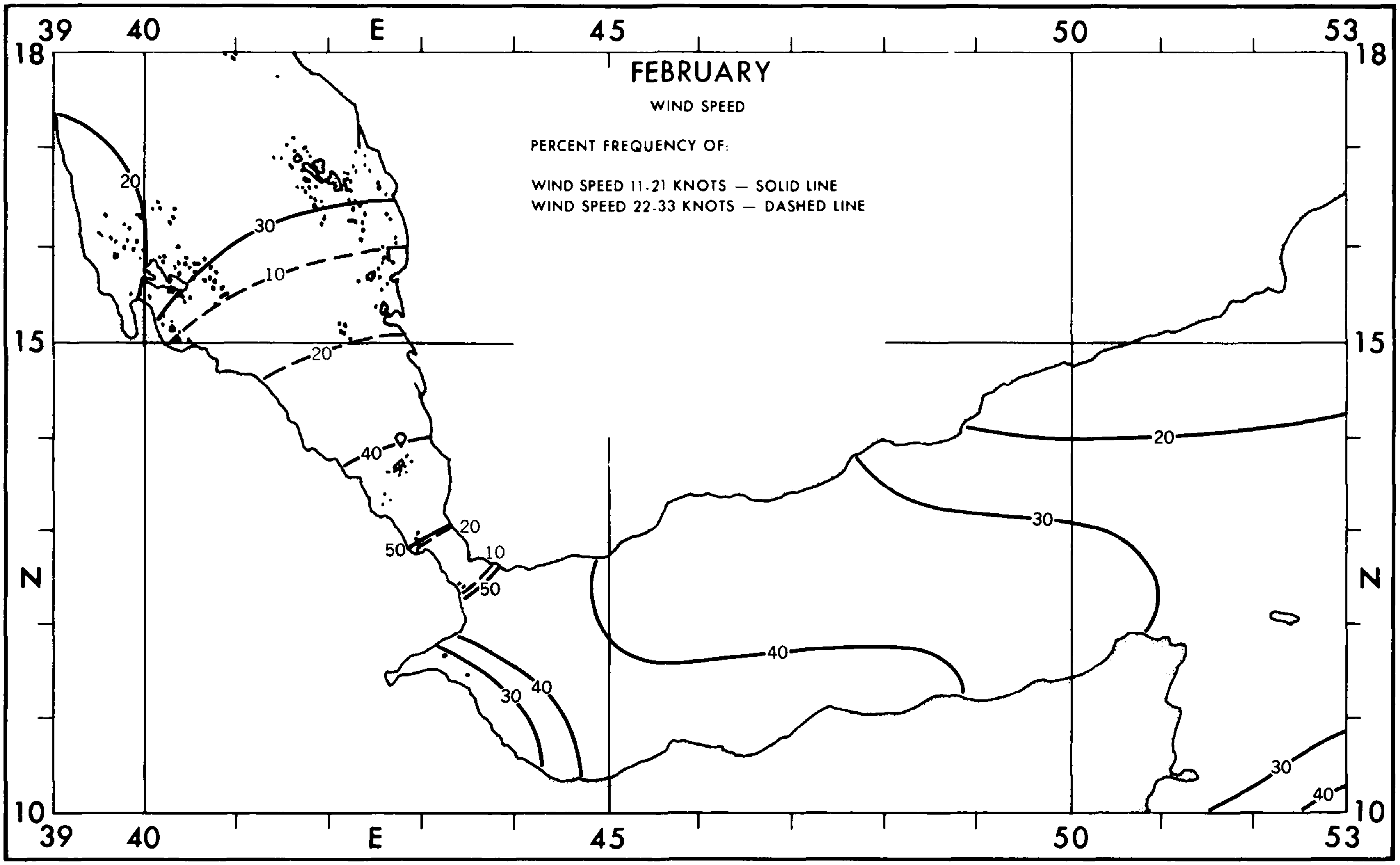
40
30


FEBRUARY
WIND SPEED
PERCENT FREQUENCY OF:
WIND SPEED 11-21 KNOTS — SOLID LINE
WIND SPEED 22-33 KNOTS — DASHED LINE
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20
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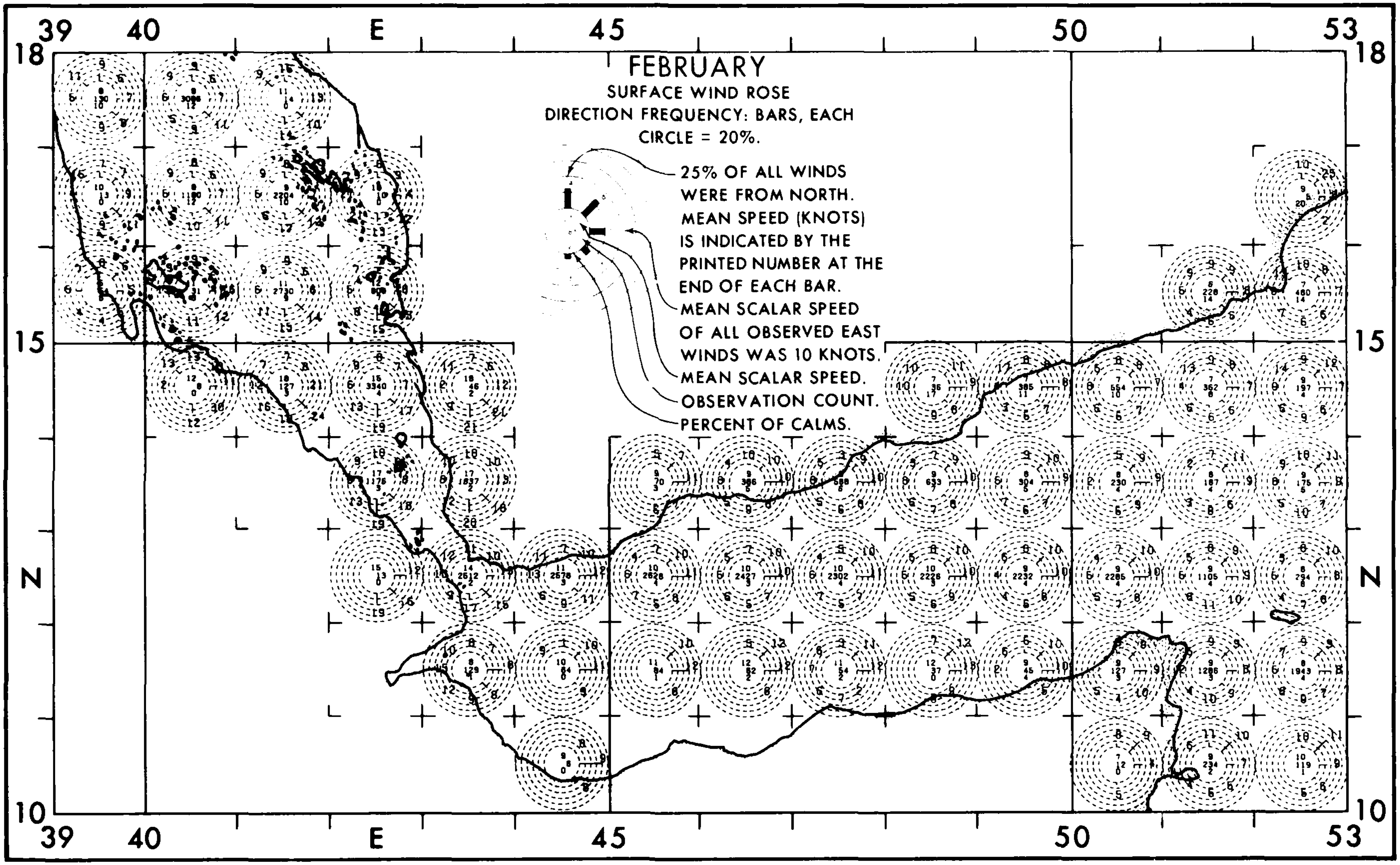
40
50
10


FEBRUARY
SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%.
25% OF ALL WINDS WERE FROM NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR.
MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
MEAN SCALAR SPEED.
OBSERVATION COUNT.
PERCENT OF CALMS.
39
40
E
45
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18
15
N
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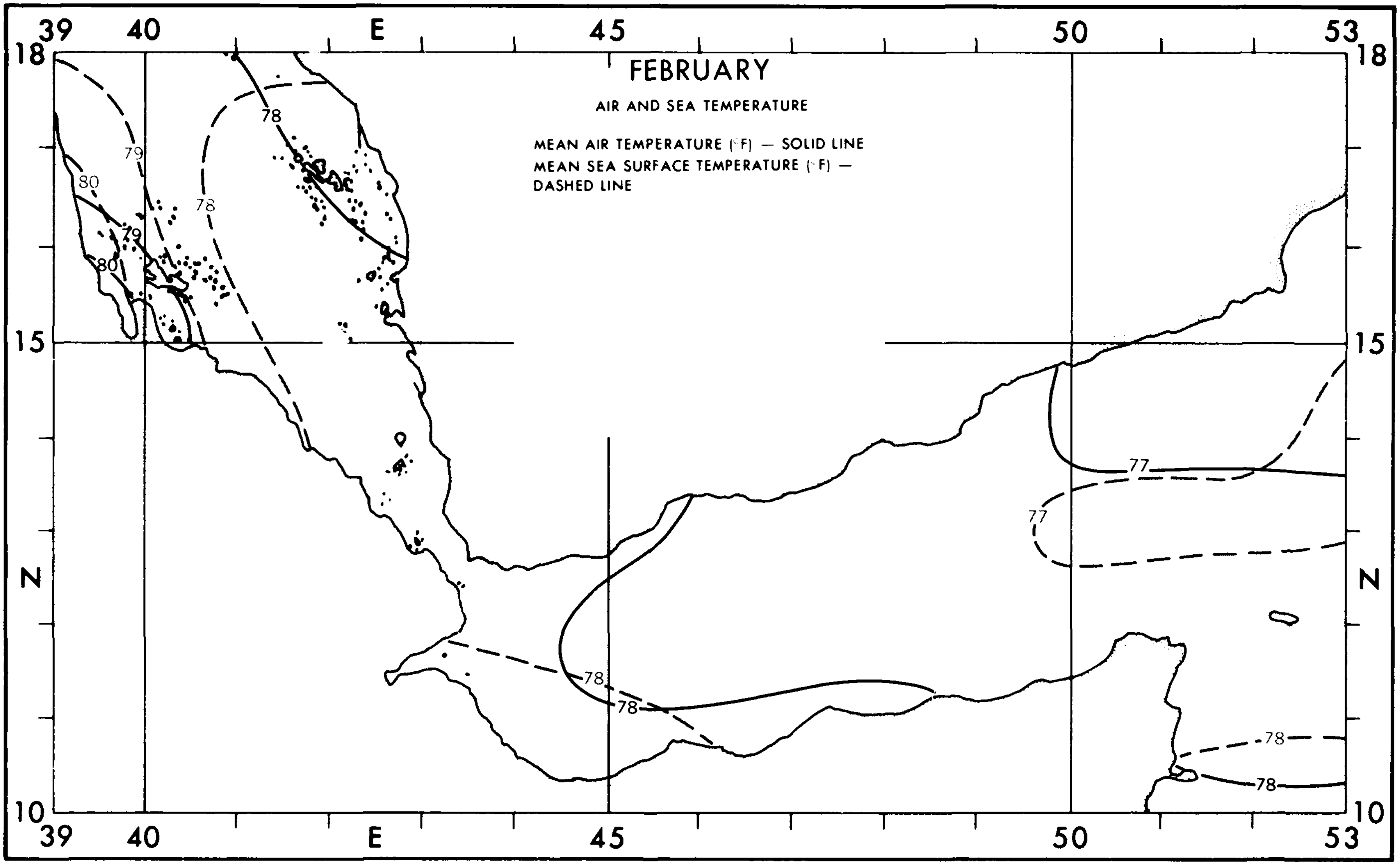

FEBRUARY
AIR AND SEA TEMPERATURE
MEAN AIR TEMPERATURE (°F) — SOLID LINE
MEAN SEA SURFACE TEMPERATURE (°F) — DASHED LINE
39
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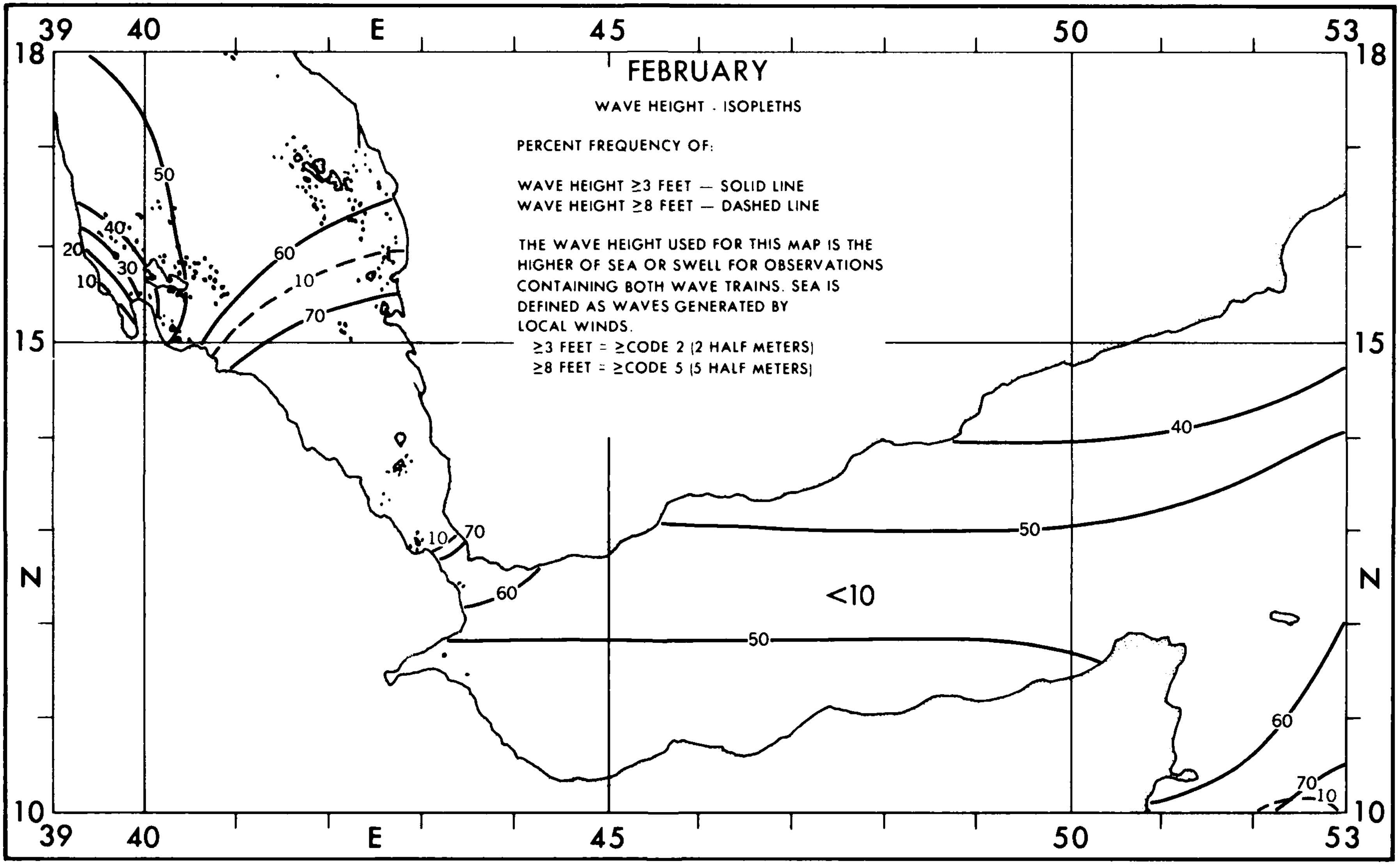
FEBRUARY
WAVE HEIGHT - ISOPLETHS
PERCENT FREQUENCY OF:
WAVE HEIGHT ≥3 FEET — SOLID LINE
WAVE HEIGHT ≥8 FEET — DASHED LINE
THE WAVE HEIGHT USED FOR THIS MAP IS THE HIGHER OF SEA OR SWELL FOR OBSERVATIONS CONTAINING BOTH WAVE TRAINS. SEA IS DEFINED AS WAVES GENERATED BY LOCAL WINDS.
≥3 FEET = ≥CODE 2 (2 HALF METERS)
≥8 FEET = ≥CODE 5 (5 HALF METERS)
<10
39
40
E
45
50
53
18
15
N
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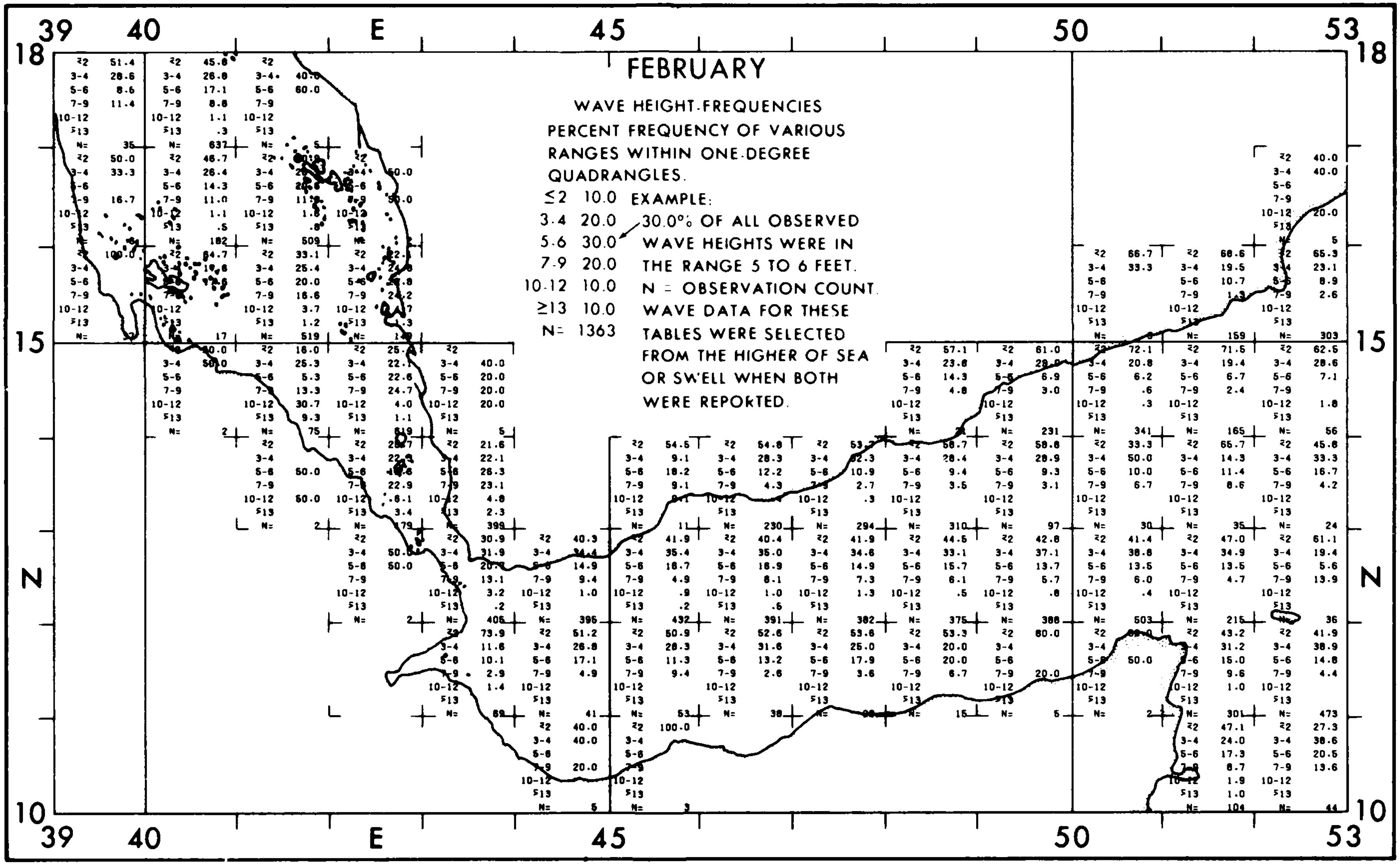
FEBRUARY
WAVE HEIGHT-FREQUENCIES
PERCENT FREQUENCY OF VARIOUS
RANGES WITHIN ONE-DEGREE
QUADRANGLES.
≤2 10.0 EXAMPLE:
3-4 20.0 30.0% OF ALL OBSERVED
5-6 30.0 WAVE HEIGHTS WERE IN
7-9 20.0 THE RANGE 5 TO 6 FEET.
10-12 10.0 N = OBSERVATION COUNT.
≥13 10.0 WAVE DATA FOR THESE
N= 1363 TABLES WERE SELECTED
FROM THE HIGHER OF SEA
OR SWELL WHEN BOTH
WERE REPORTED.
39
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18
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N
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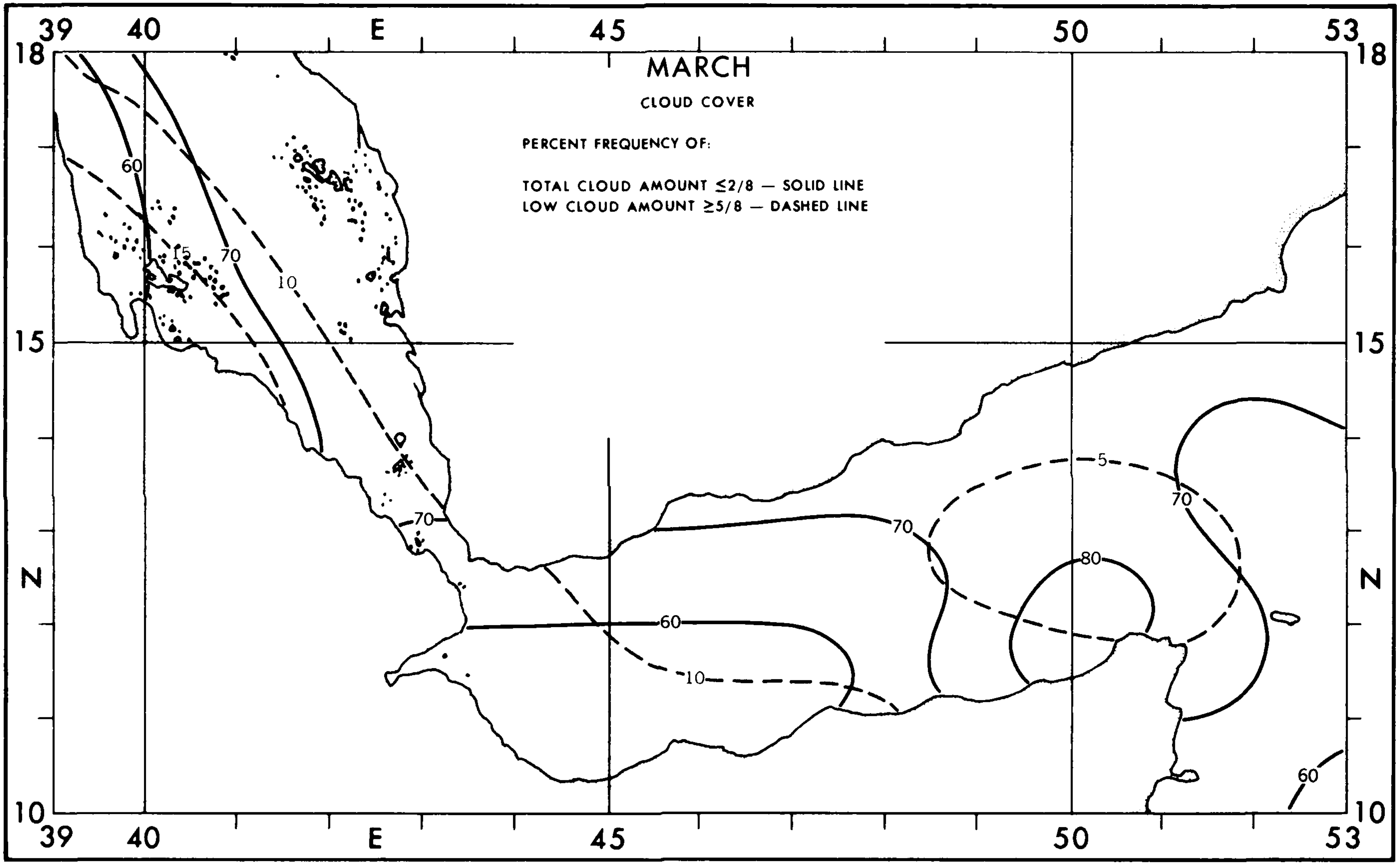
MARCH
CLOUD COVER
PERCENT FREQUENCY OF:
TOTAL CLOUD AMOUNT ≤2/8 — SOLID LINE
LOW CLOUD AMOUNT ≥5/8 — DASHED LINE
39
40
E
45
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53
18
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N
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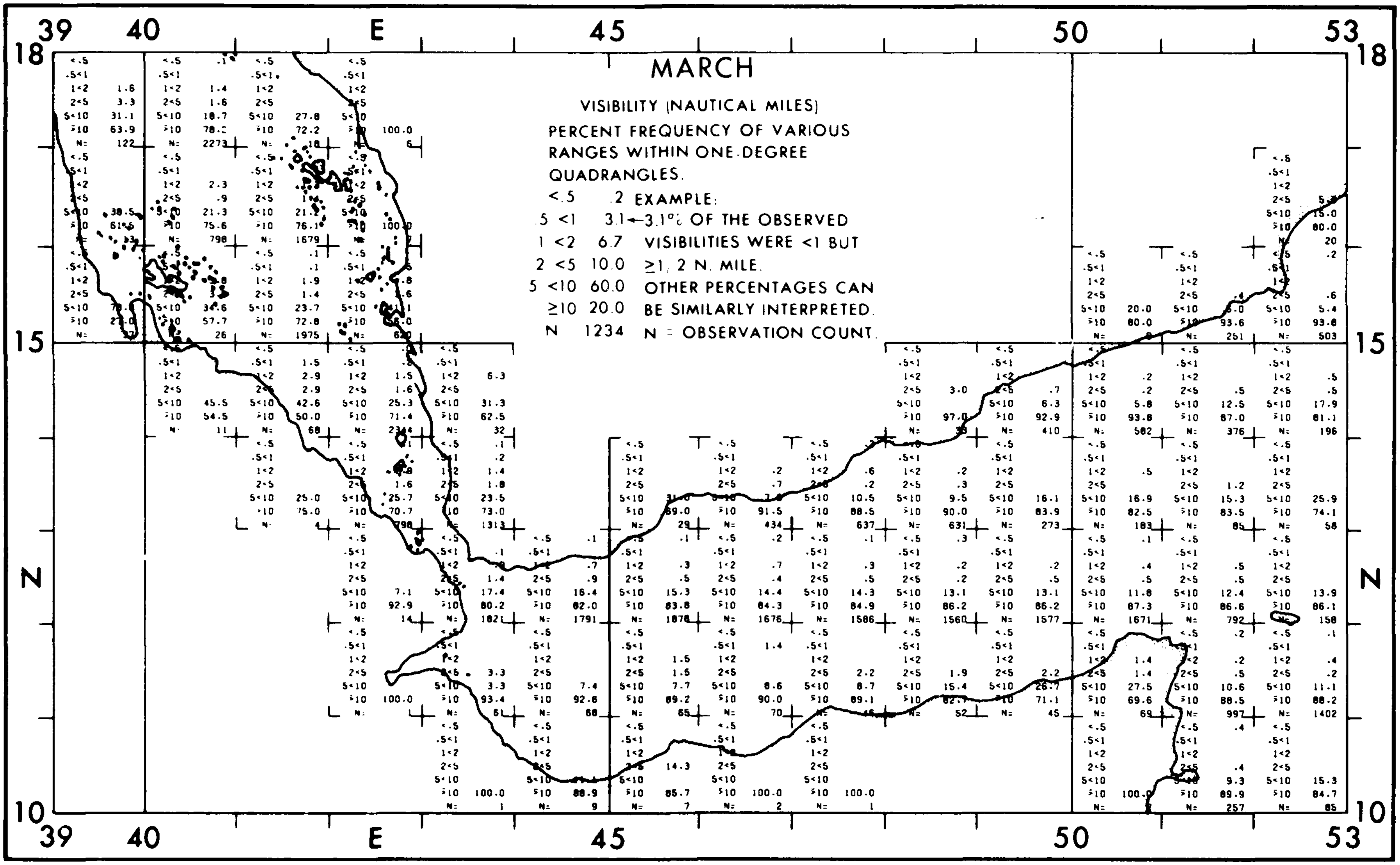
MARCH
VISIBILITY (NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
<.5 .2 EXAMPLE:
.5 <1 3.1←3.1% OF THE OBSERVED
1 <2 6.7 VISIBILITIES WERE <1 BUT
2 <5 10.0 ≥1, 2 N. MILE.
5 <10 60.0 OTHER PERCENTAGES CAN
≥10 20.0 BE SIMILARLY INTERPRETED.
N 1234 N = OBSERVATION COUNT.
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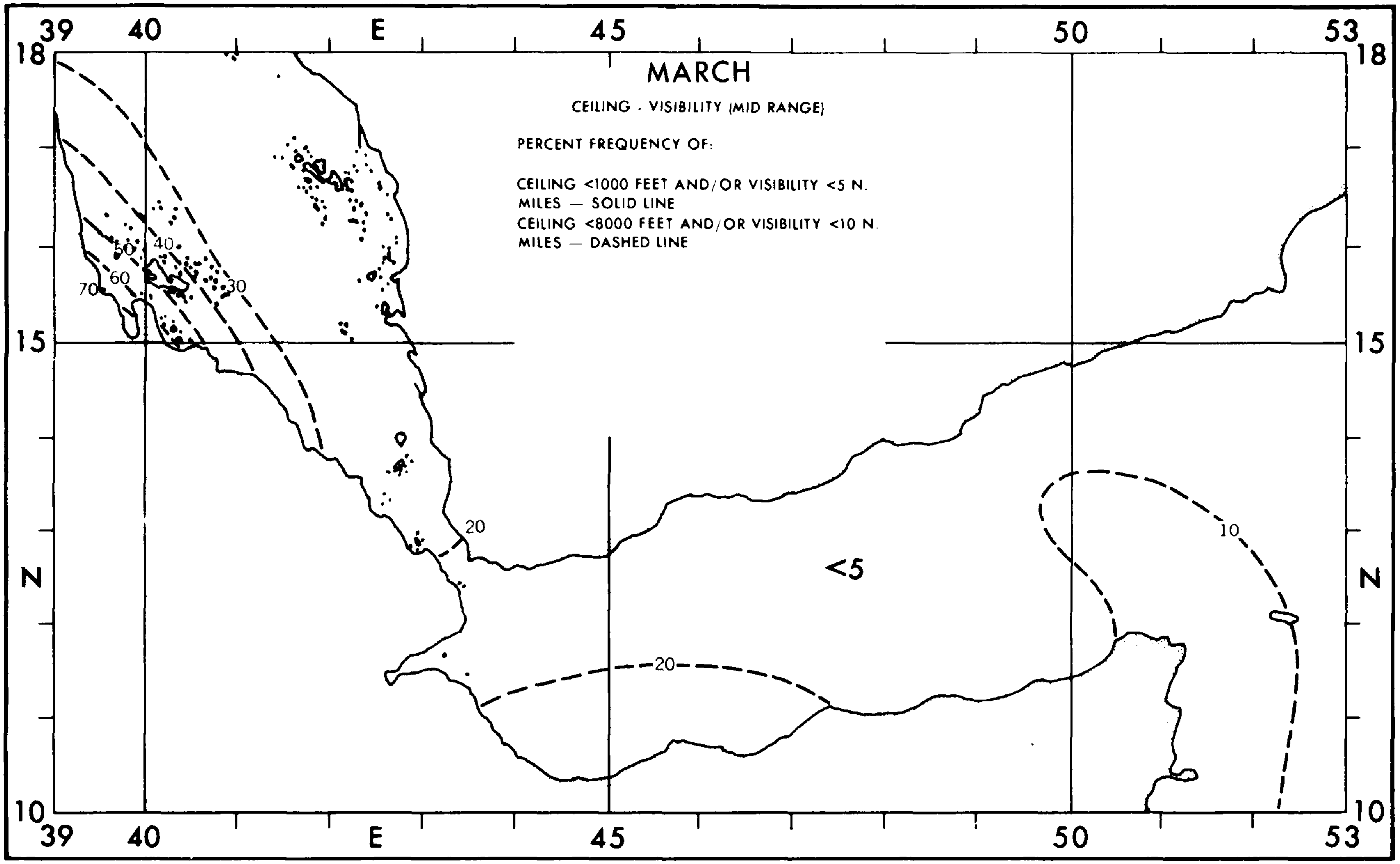
MARCH
CEILING - VISIBILITY (MID RANGE)
PERCENT FREQUENCY OF:
CEILING <1000 FEET AND/OR VISIBILITY <5 N. MILES — SOLID LINE
CEILING <8000 FEET AND/OR VISIBILITY <10 N. MILES — DASHED LINE
39
40
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15
N
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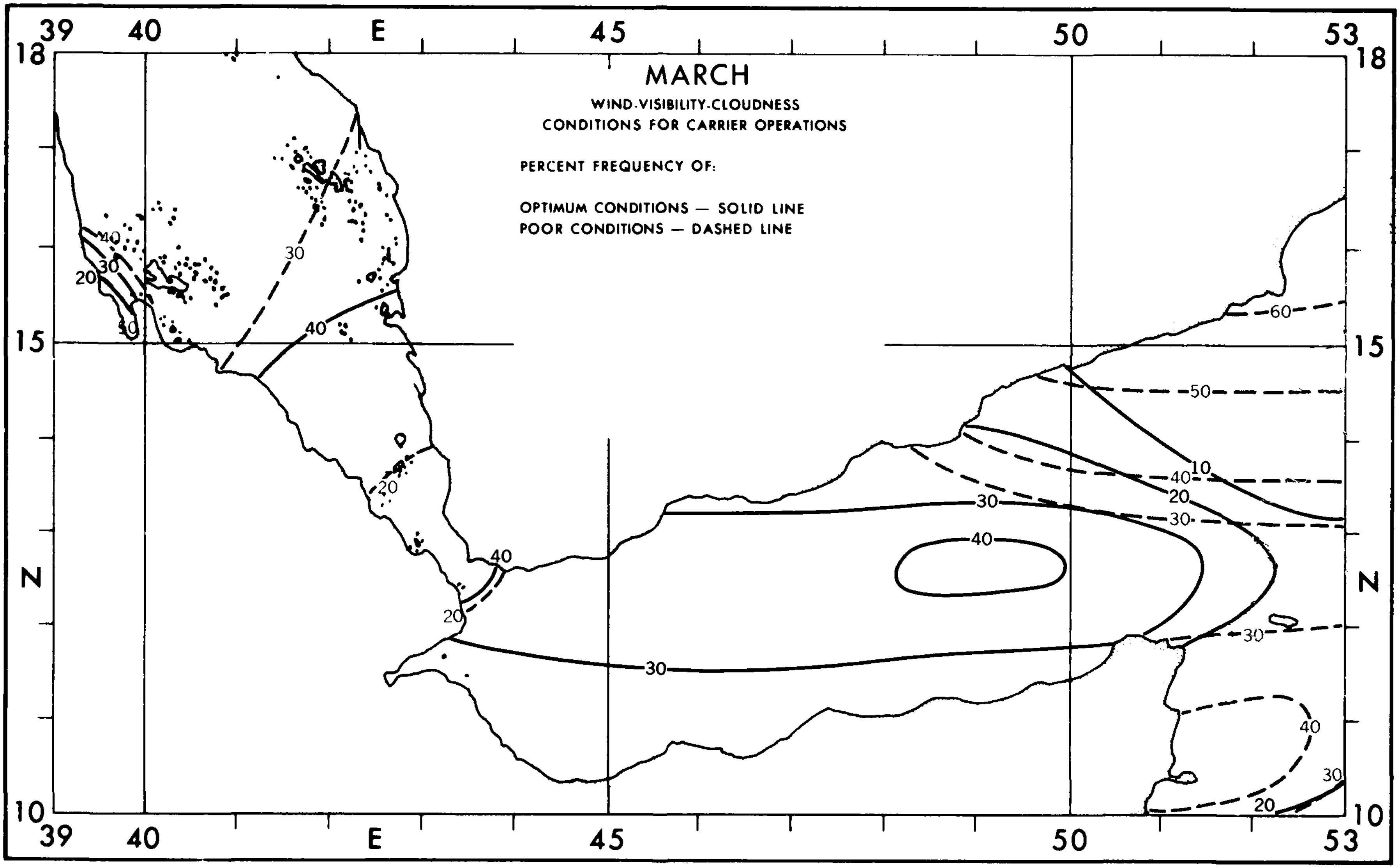
50
60
70


MARCH
WIND-VISIBILITY-CLOUDNESS
CONDITIONS FOR CARRIER OPERATIONS
PERCENT FREQUENCY OF:
OPTIMUM CONDITIONS — SOLID LINE
POOR CONDITIONS — DASHED LINE
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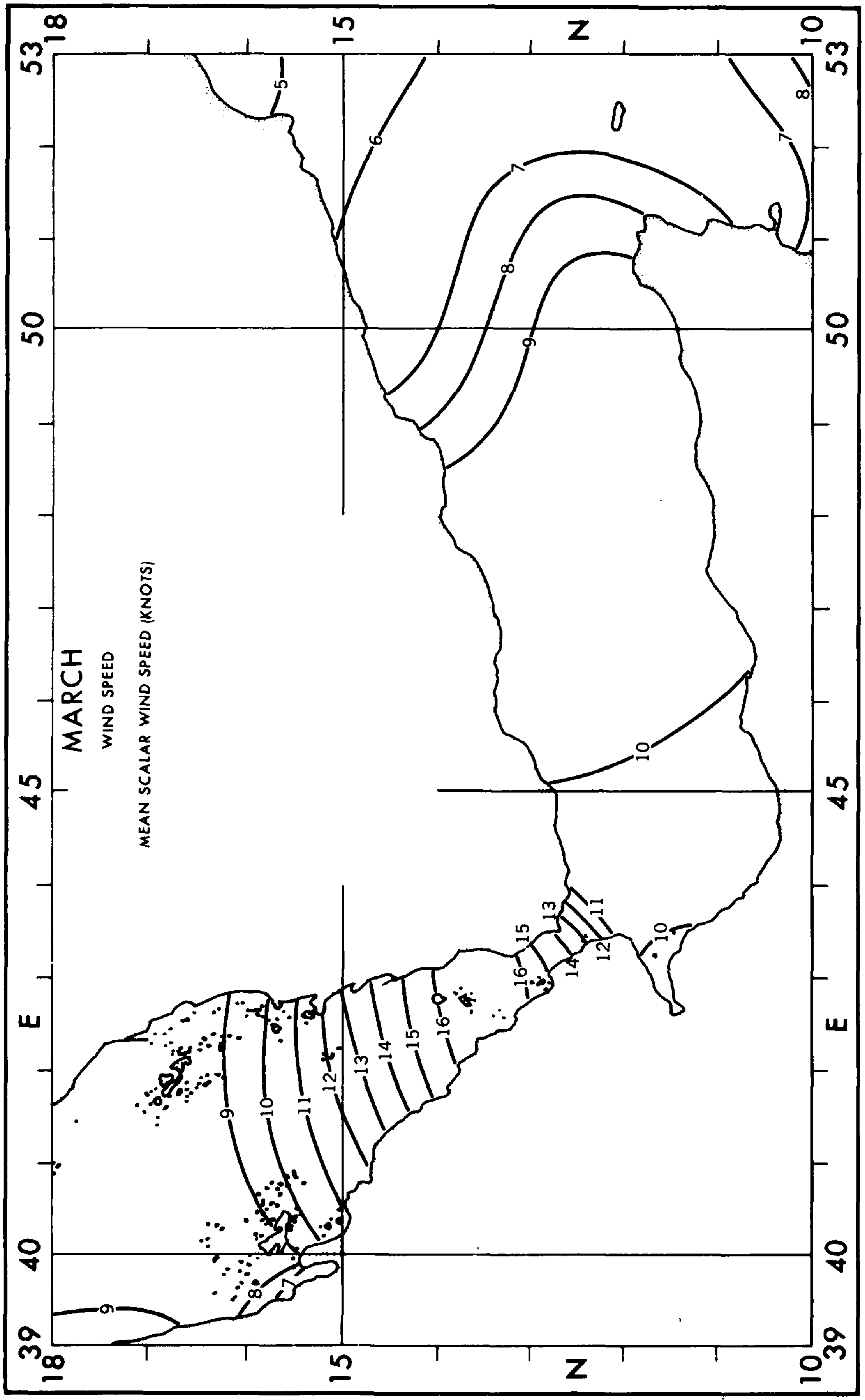
MARCH
WIND SPEED
MEAN SCALAR WIND SPEED (KNOTS)
E
N
15
18
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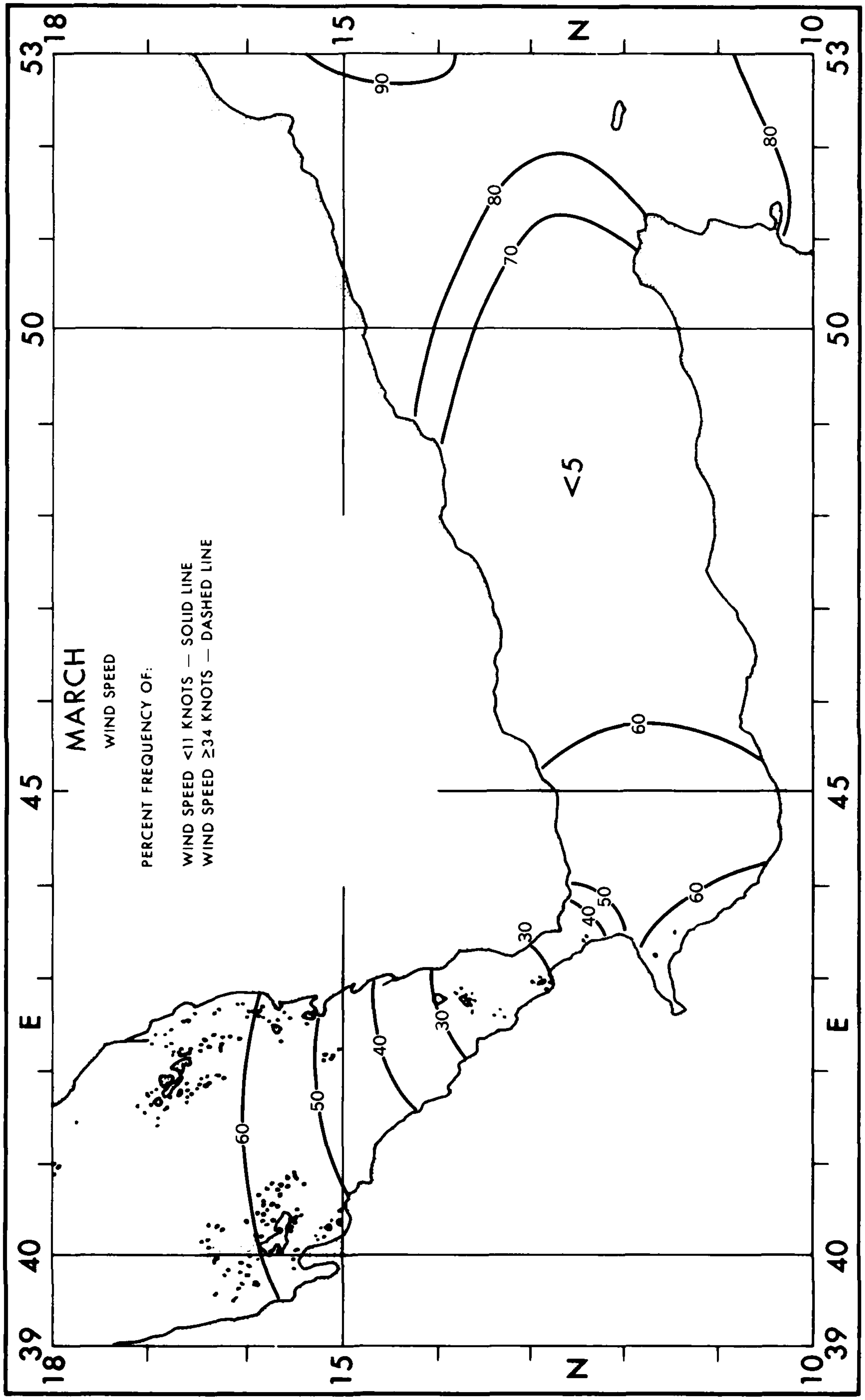
MARCH
WIND SPEED
PERCENT FREQUENCY OF:
WIND SPEED <11 KNOTS — SOLID LINE
WIND SPEED ≥34 KNOTS — DASHED LINE
<5
90
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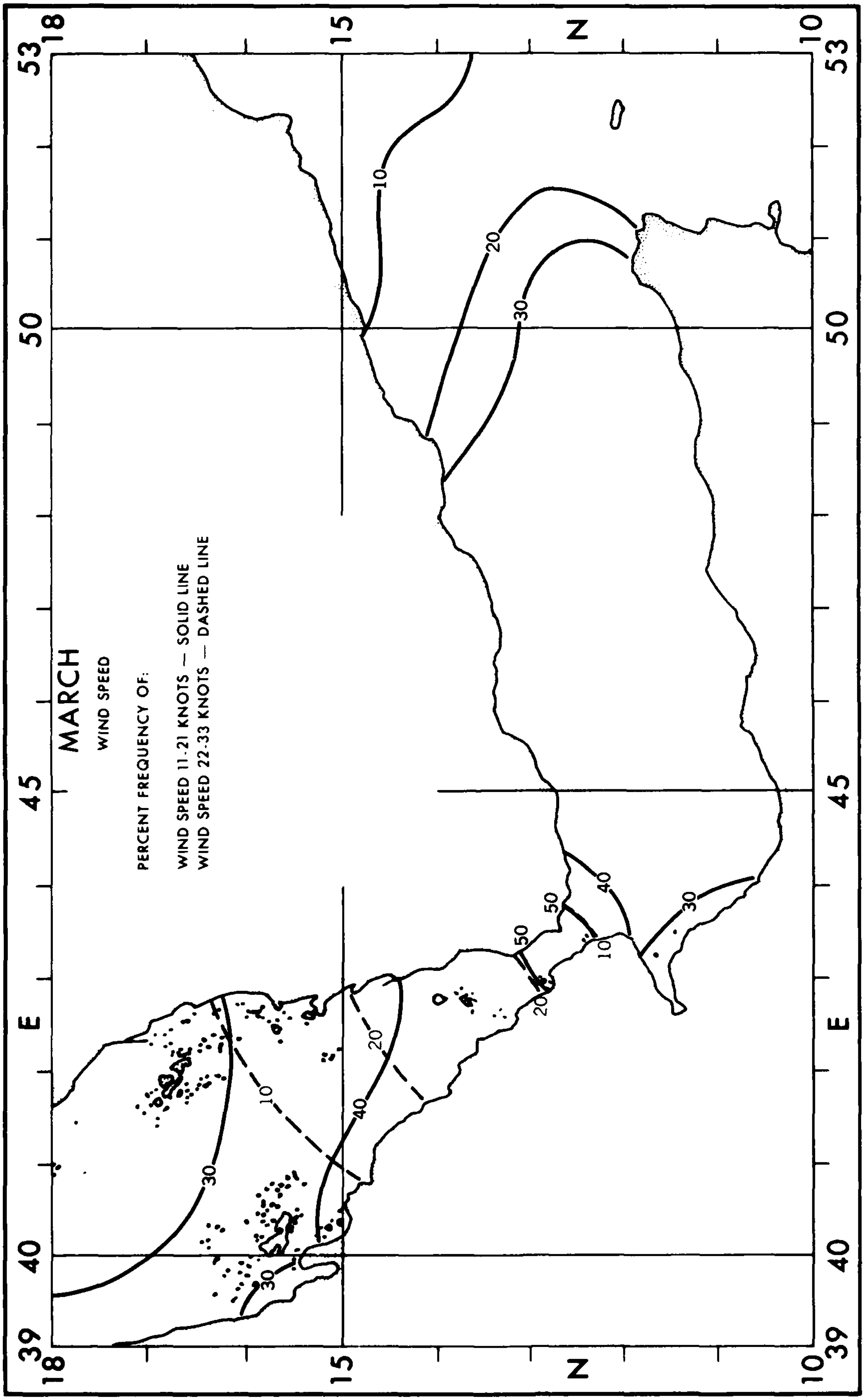
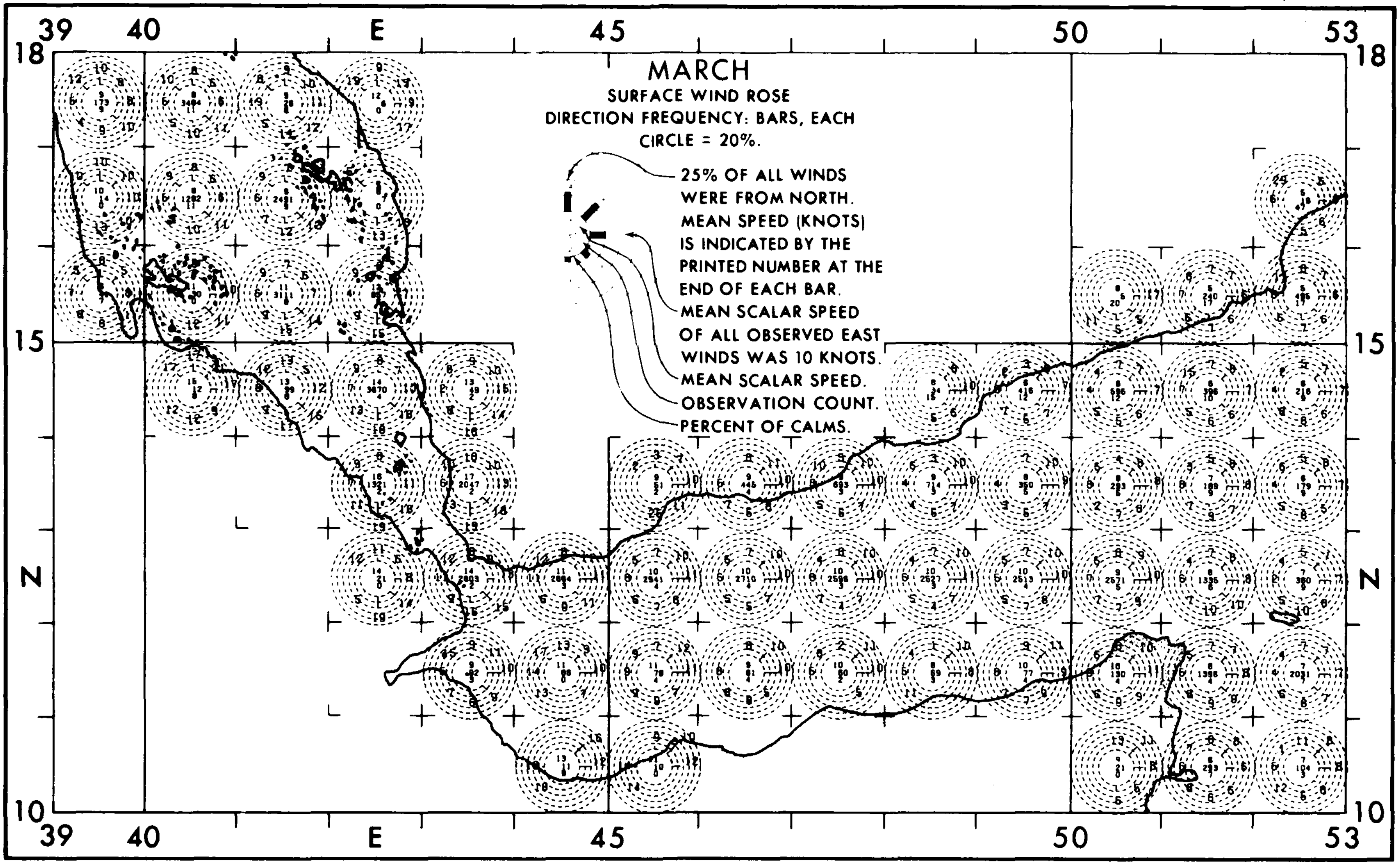
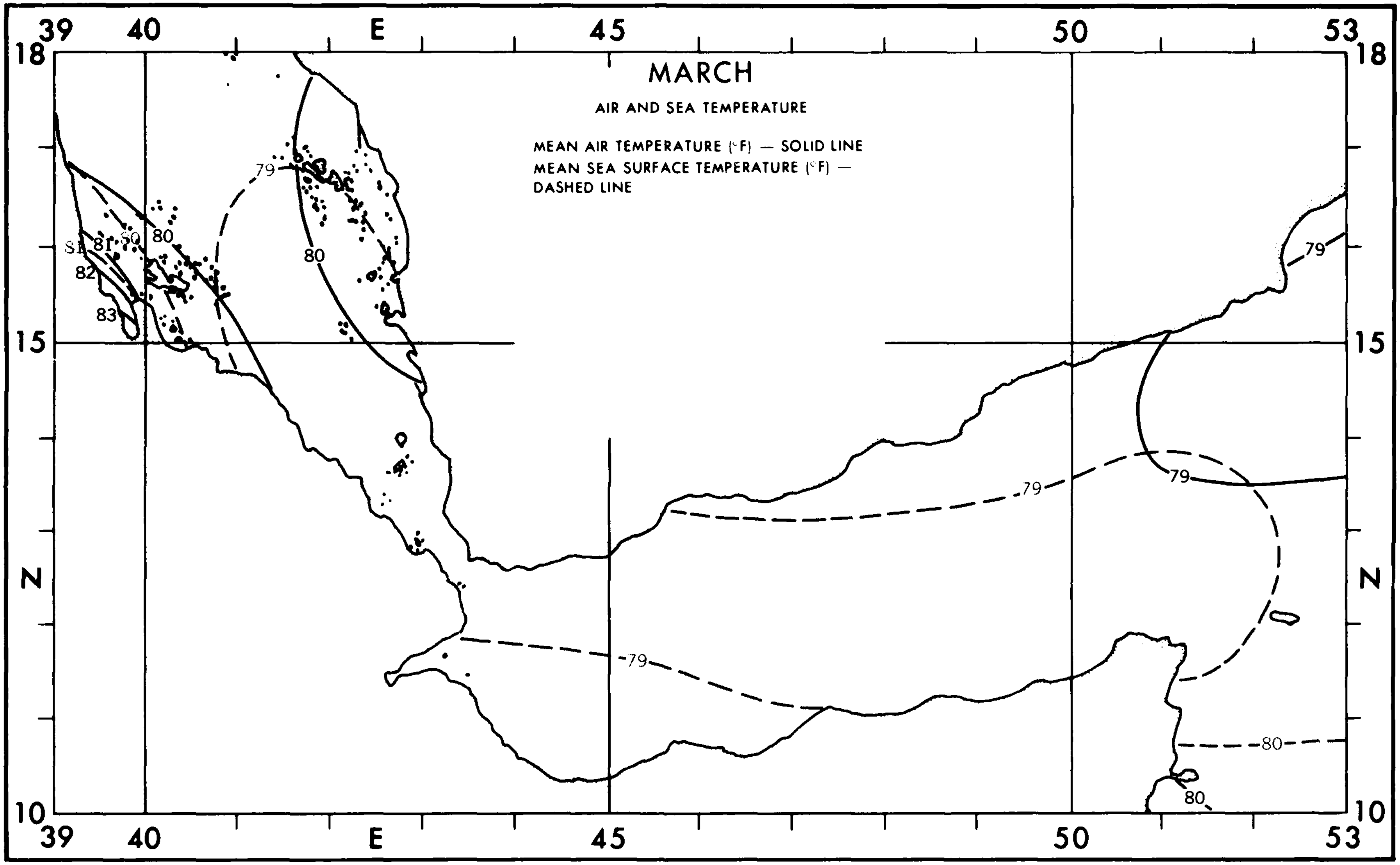
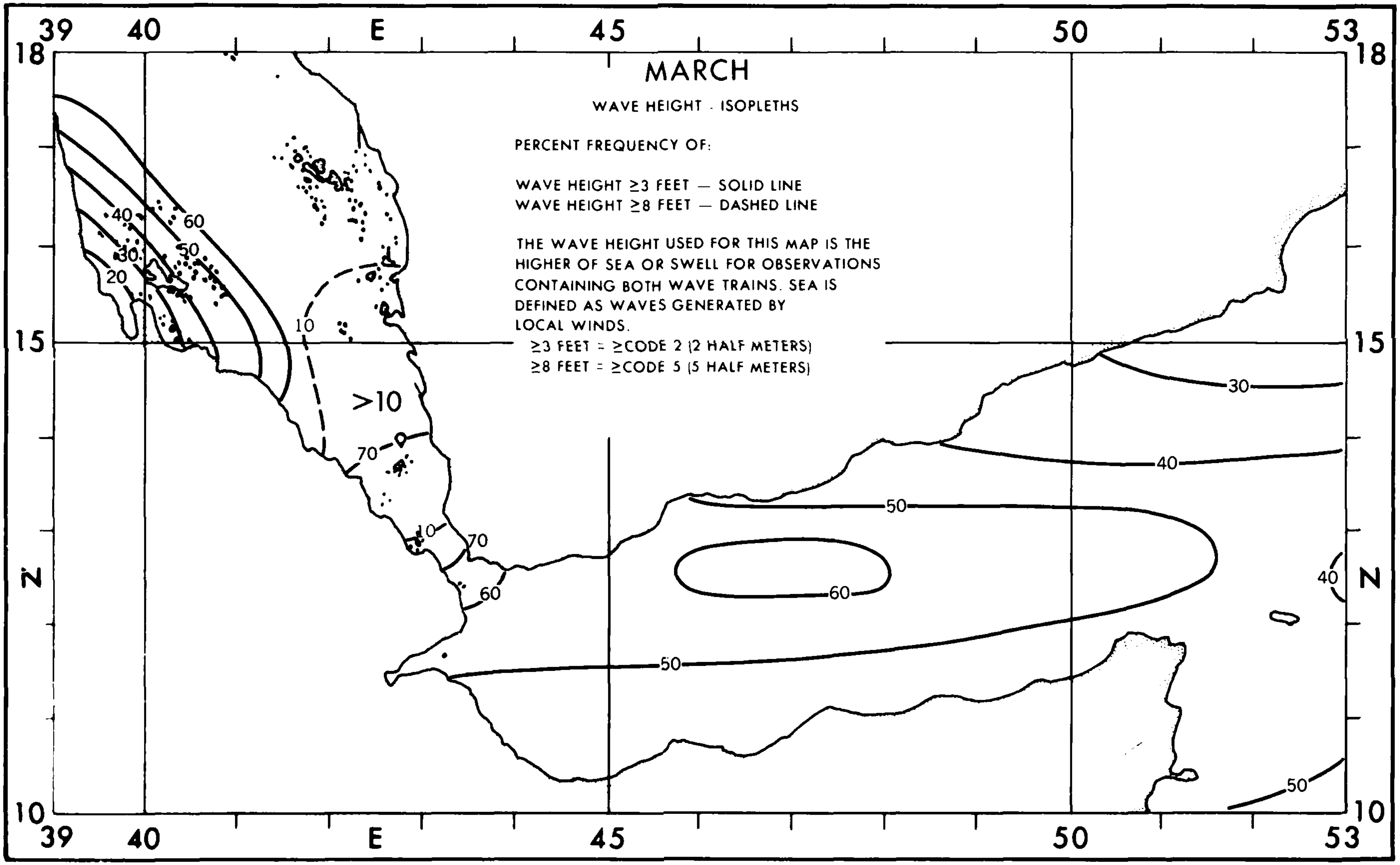
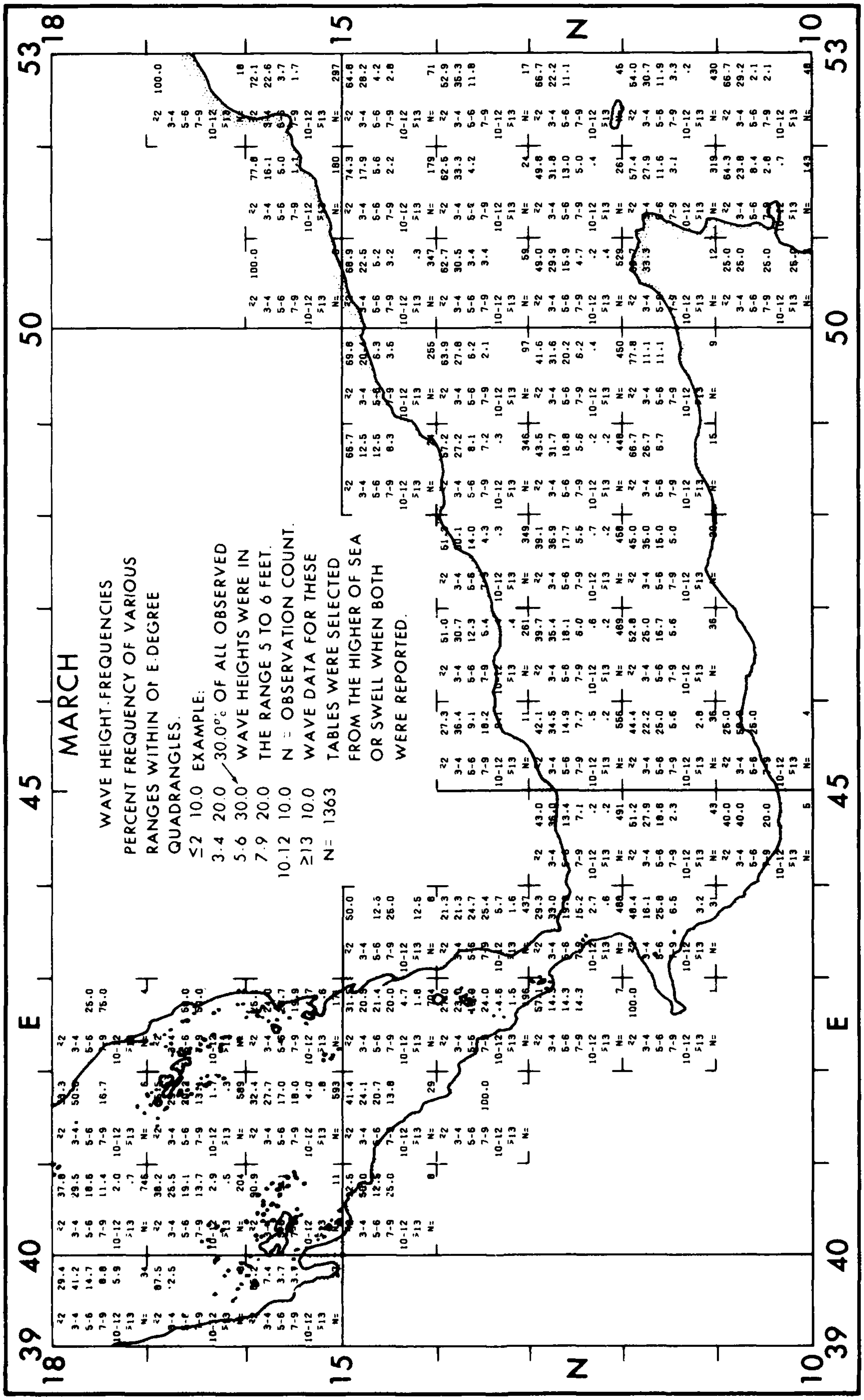
E


MARCH
WIND SPEED
PERCENT FREQUENCY OF:
WIND SPEED 11-21 KNOTS — SOLID LINE
WIND SPEED 22-33 KNOTS — DASHED LINE
53
50
45
40
39
18
15
10
N
E
10
20
30
40
50

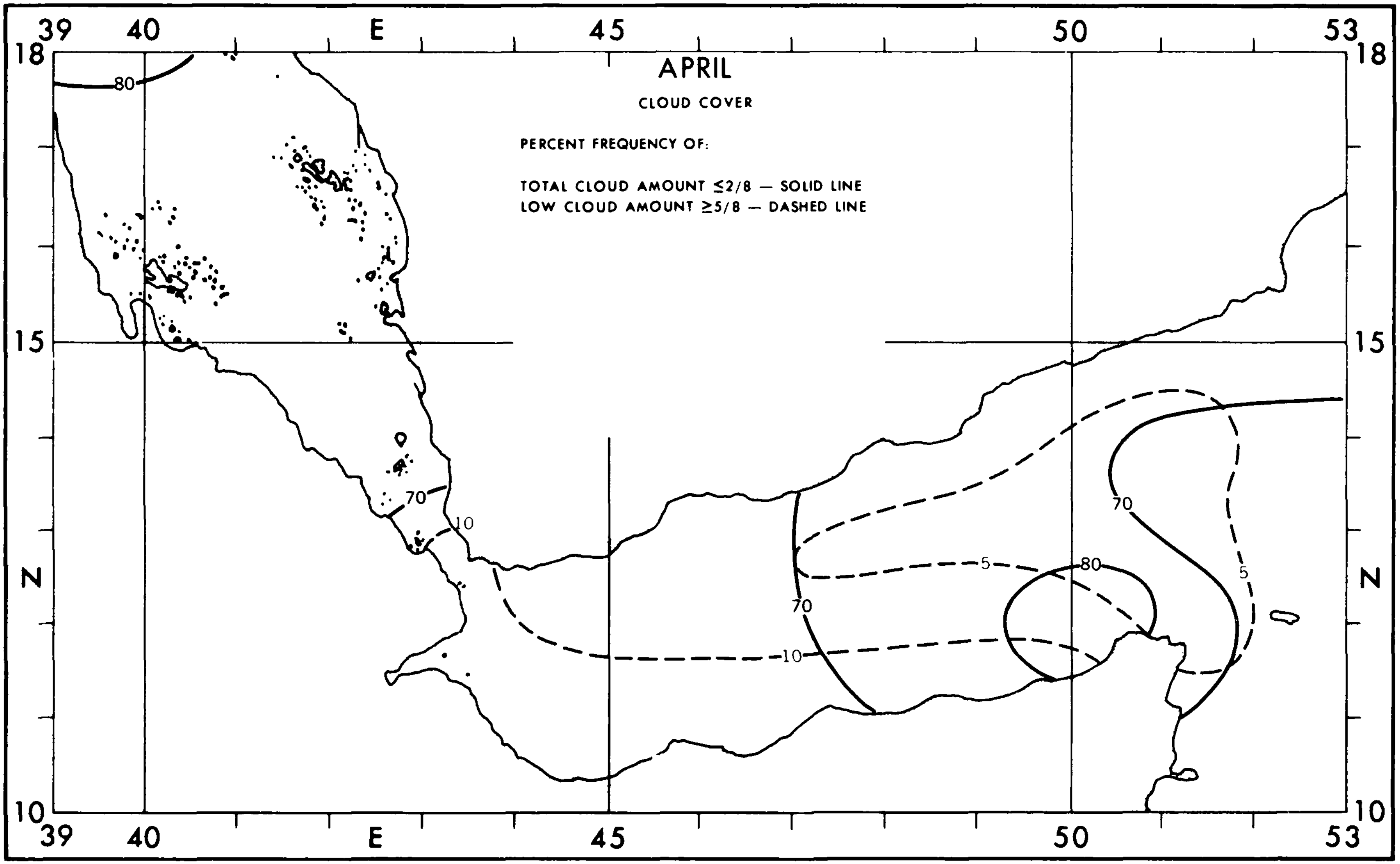

MARCH
SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%.
25% OF ALL WINDS WERE FROM NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR.
MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
MEAN SCALAR SPEED.
OBSERVATION COUNT.
PERCENT OF CALMS.
39
40
E
45
50
53
18
15
N
10

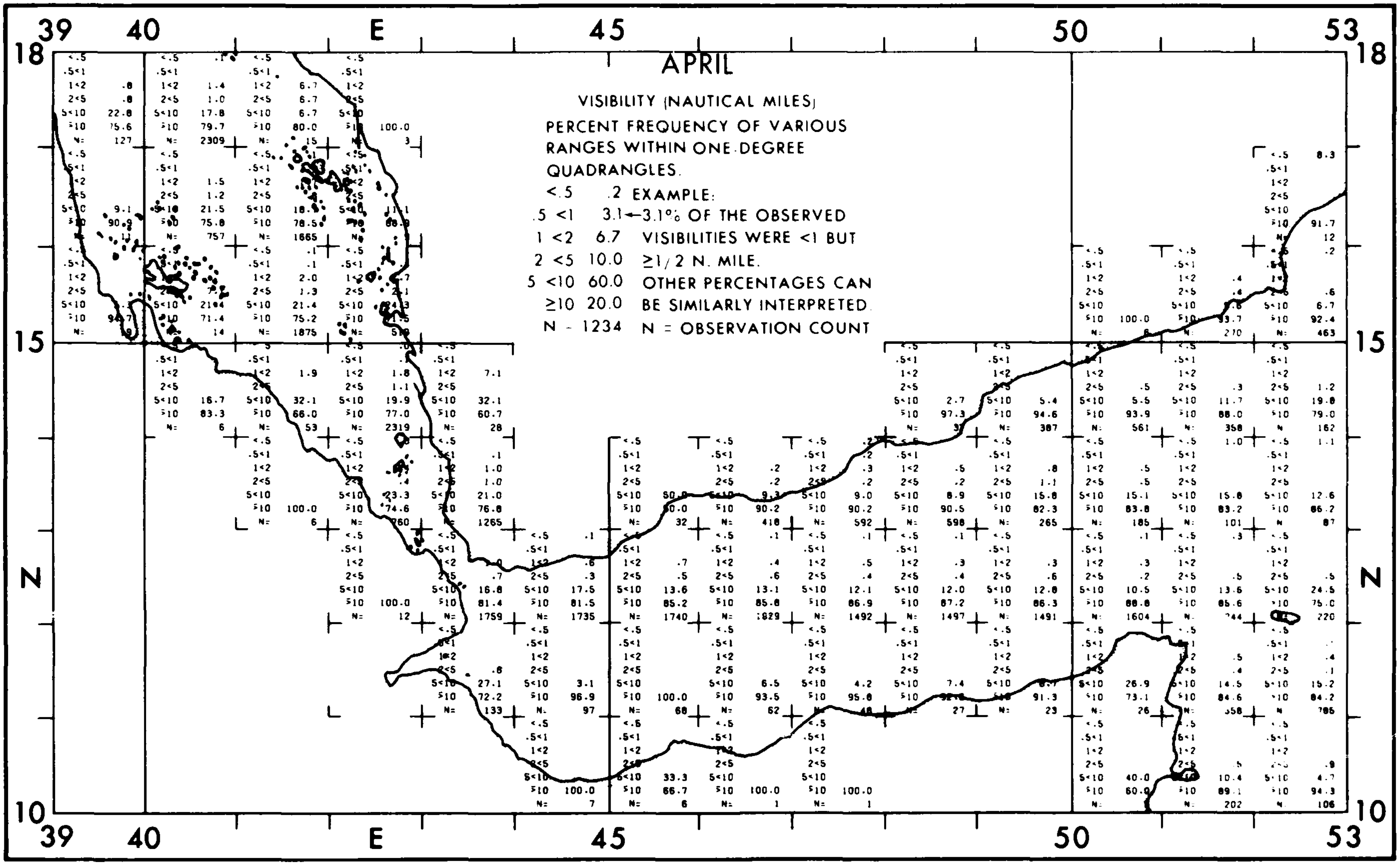

MARCH
AIR AND SEA TEMPERATURE
MEAN AIR TEMPERATURE (°F) — SOLID LINE
MEAN SEA SURFACE TEMPERATURE (°F) — DASHED LINE
39
40
E
45
50
53
18
15
N
10
79
80
81
82
83

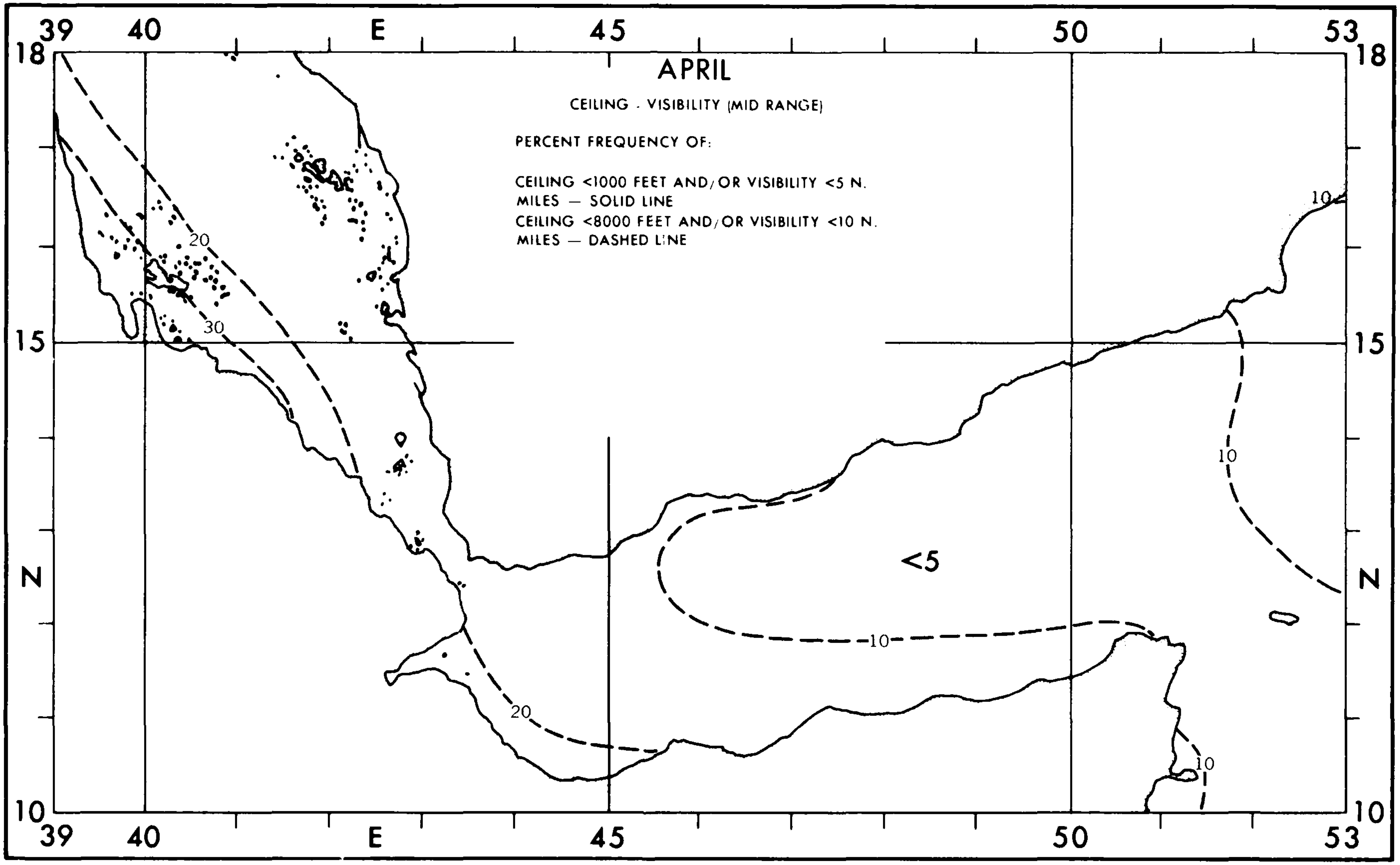

MARCH
WAVE HEIGHT - ISOPLETHS
PERCENT FREQUENCY OF:
WAVE HEIGHT ≥3 FEET — SOLID LINE
WAVE HEIGHT ≥8 FEET — DASHED LINE
THE WAVE HEIGHT USED FOR THIS MAP IS THE HIGHER OF SEA OR SWELL FOR OBSERVATIONS CONTAINING BOTH WAVE TRAINS. SEA IS DEFINED AS WAVES GENERATED BY LOCAL WINDS.
≥3 FEET = ≥CODE 2 (2 HALF METERS)
≥8 FEET = ≥CODE 5 (5 HALF METERS)
39
40
E
45
50
53
18
15
N
10
>10
10
20
30
40
50
60
70

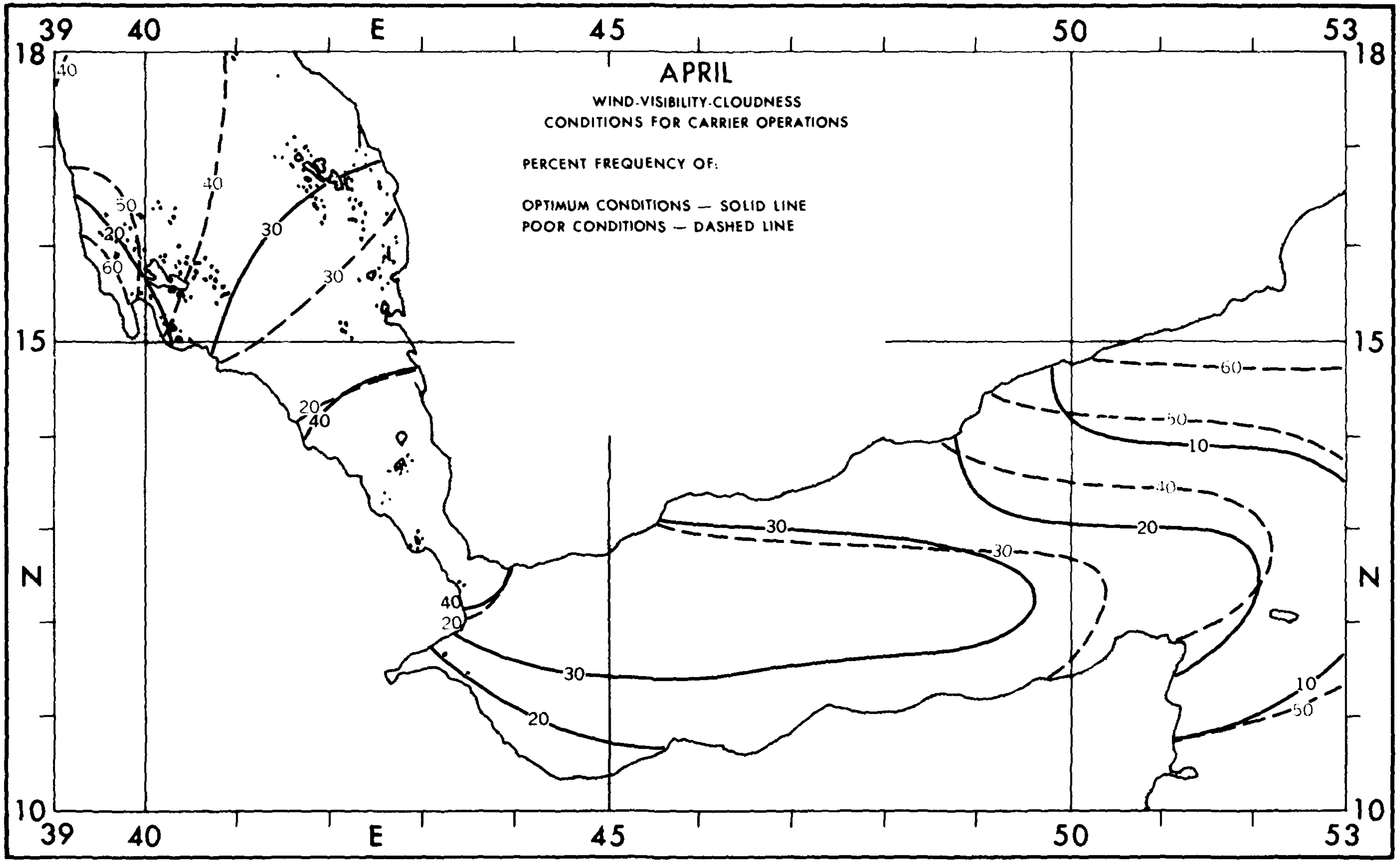


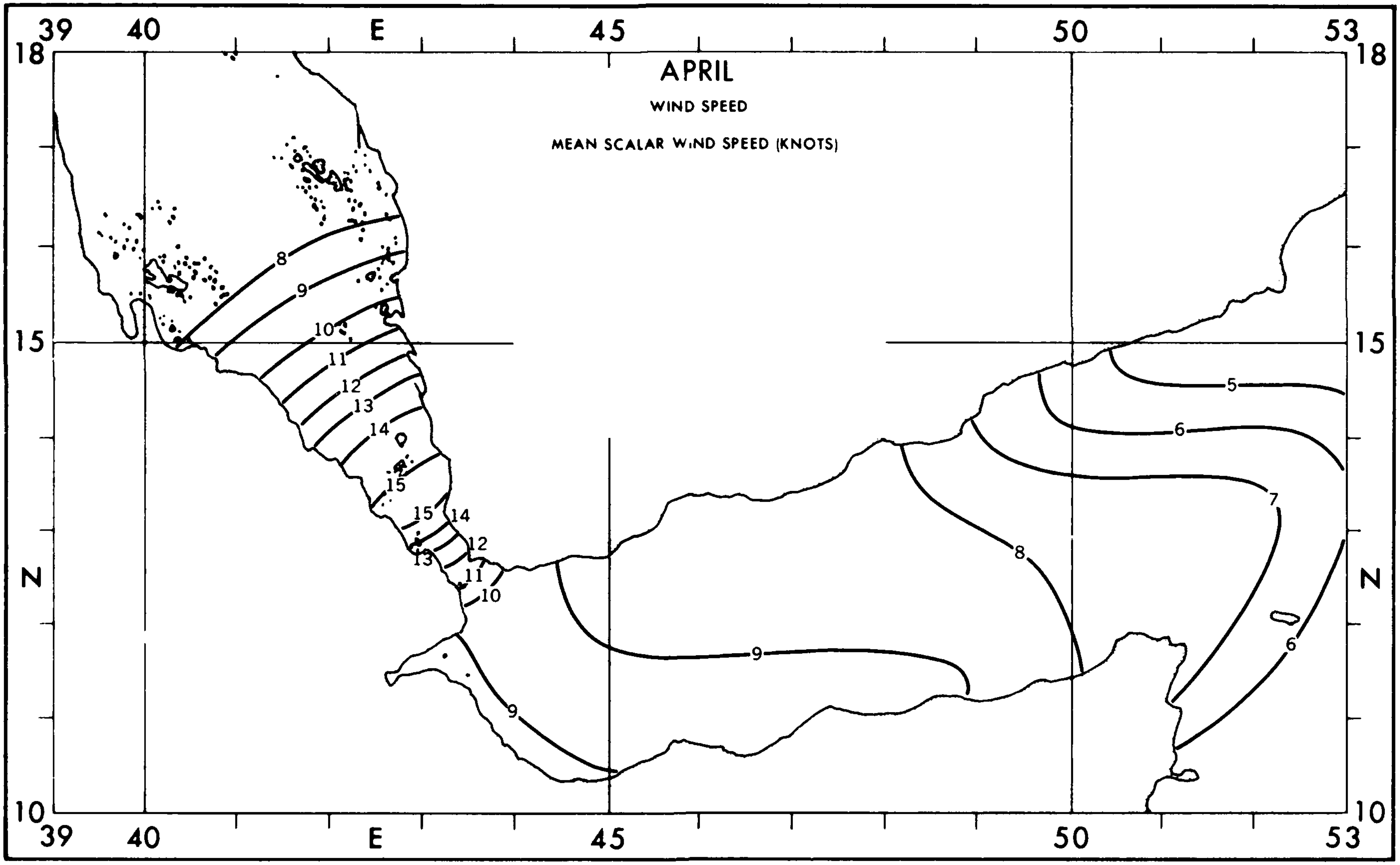
MARCH
WAVE HEIGHT FREQUENCIES
PERCENT FREQUENCY OF VARIOUS
RANGES WITHIN ONE DEGREE
QUADRANGLES.
≤2 10.0 EXAMPLE:
3-4 20.0 30.0% OF ALL OBSERVED
5-6 30.0 WAVE HEIGHTS WERE IN
7-9 20.0 THE RANGE 5 TO 6 FEET.
10-12 10.0 N = OBSERVATION COUNT.
≥13 10.0 WAVE DATA FOR THESE
N= 1363 TABLES WERE SELECTED
FROM THE HIGHER OF SEA
OR SWELL WHEN BOTH
WERE REPORTED.


APRIL
CLOUD COVER
PERCENT FREQUENCY OF:
TOTAL CLOUD AMOUNT ≤2/8 — SOLID LINE
LOW CLOUD AMOUNT ≥5/8 — DASHED LINE
39
40
E
45
50
53
18
15
N
10
80
70
10
5


APRIL
VISIBILITY (NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
<.5 .2 EXAMPLE:
.5 <1 3.1←3.1% OF THE OBSERVED
1 <2 6.7 VISIBILITIES WERE <1 BUT
2 <5 10.0 ≥1/2 N. MILE.
5 <10 60.0 OTHER PERCENTAGES CAN
≥10 20.0 BE SIMILARLY INTERPRETED.
N - 1234 N = OBSERVATION COUNT
39
40
E
45
50
53
18
15
N
10


APRIL
CEILING - VISIBILITY (MID RANGE)
PERCENT FREQUENCY OF:
CEILING <1000 FEET AND/OR VISIBILITY <5 N. MILES — SOLID LINE
CEILING <8000 FEET AND/OR VISIBILITY <10 N. MILES — DASHED LINE
<5
10
20
30
39
40
E
45
50
53
18
15
N
10


APRIL
WIND-VISIBILITY-CLOUDNESS
CONDITIONS FOR CARRIER OPERATIONS
PERCENT FREQUENCY OF:
OPTIMUM CONDITIONS — SOLID LINE
POOR CONDITIONS — DASHED LINE
39
40
E
45
50
53
18
15
N
10
40
50
20
60
30
10


APRIL
WIND SPEED
MEAN SCALAR WIND SPEED (KNOTS)
39
40
E
45
50
53
18
15
N
10
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6
7
8
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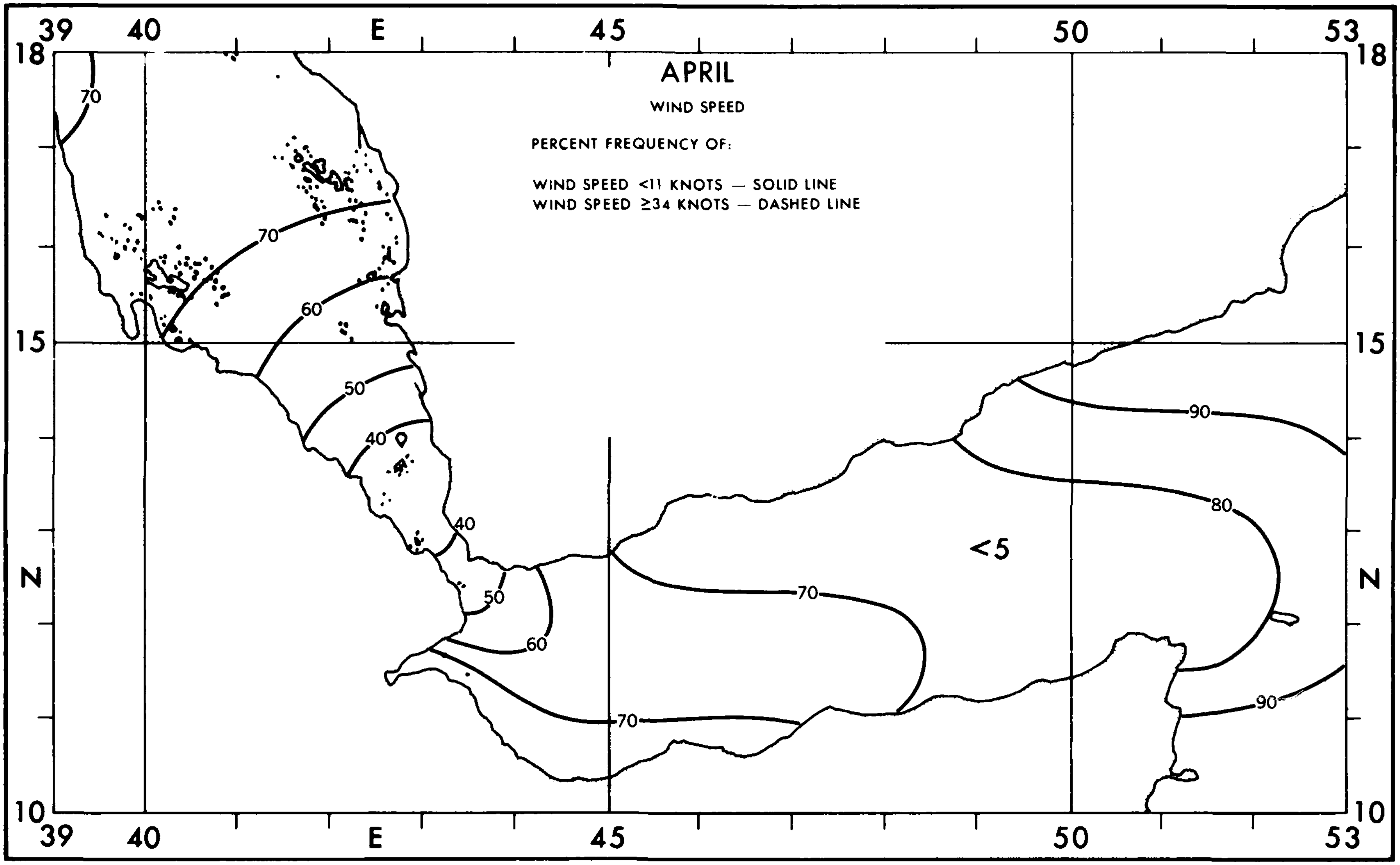
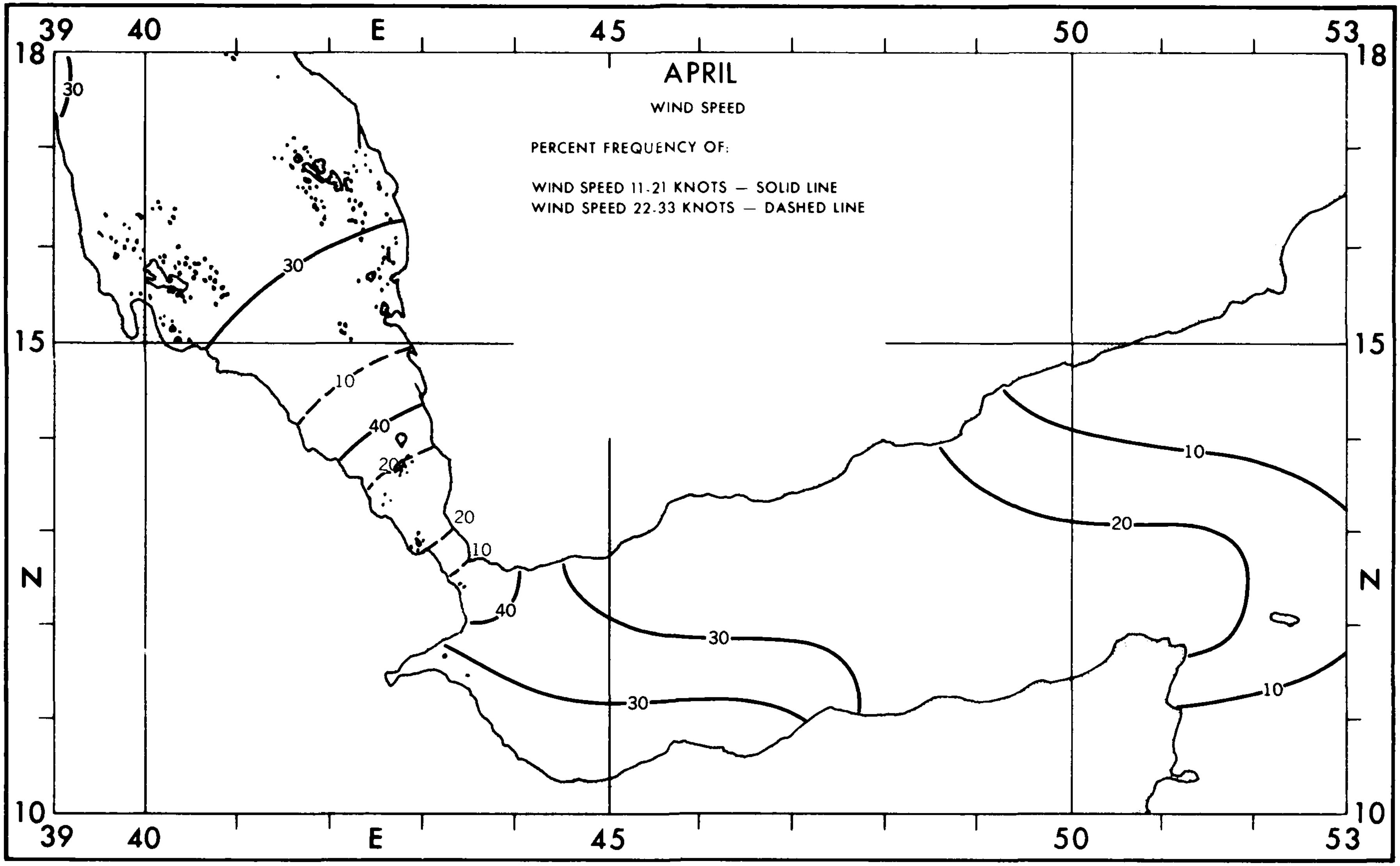
11
12
13
14
15



APRIL
WIND SPEED
PERCENT FREQUENCY OF:
WIND SPEED <11 KNOTS — SOLID LINE
WIND SPEED ≥34 KNOTS — DASHED LINE
<5
39
40
E
45
50
53
18
15
N
10
70
60
50
40
80
90


APRIL
WIND SPEED
PERCENT FREQUENCY OF:
WIND SPEED 11-21 KNOTS — SOLID LINE
WIND SPEED 22-33 KNOTS — DASHED LINE
39
40
E
45
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18
15
N
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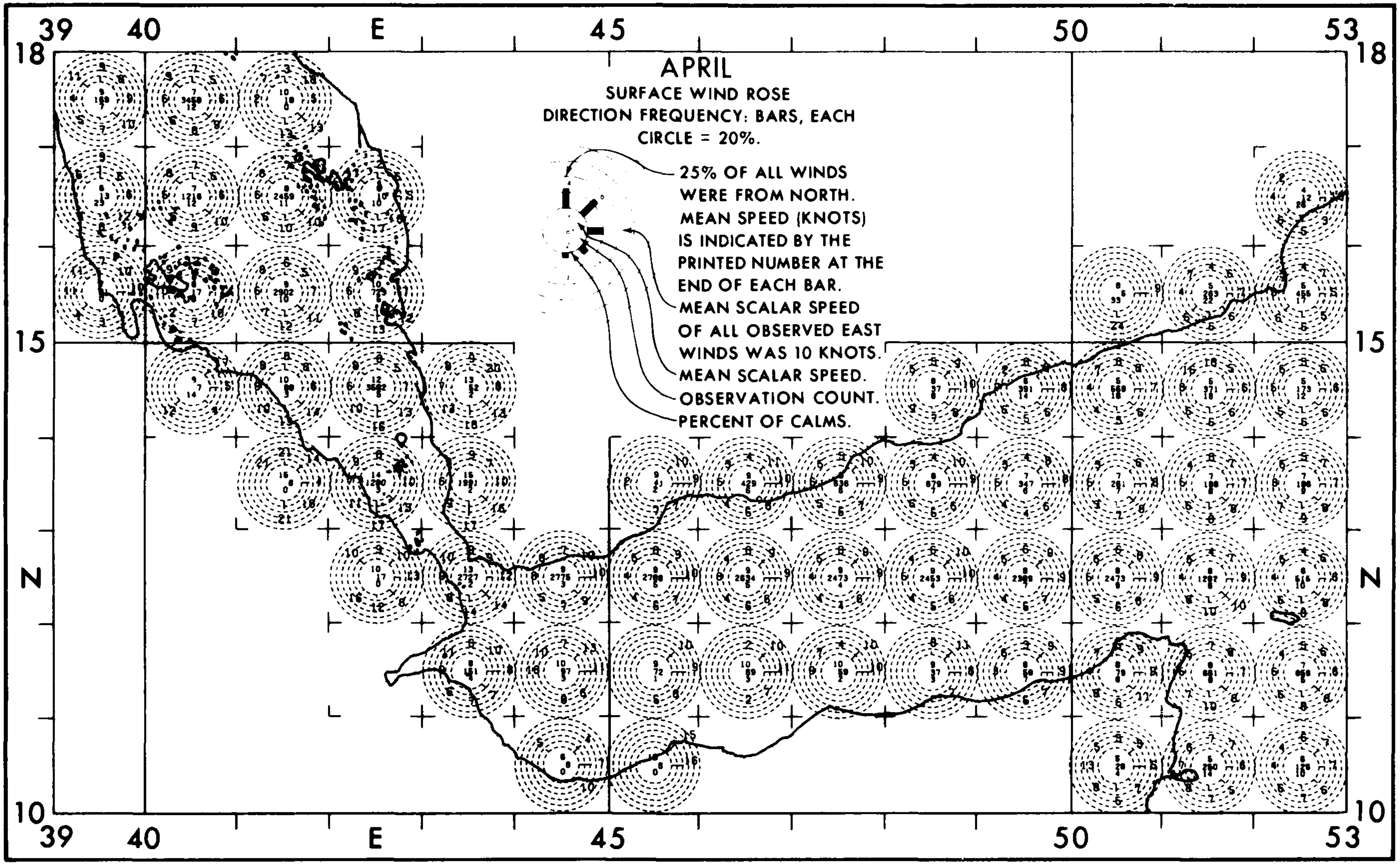
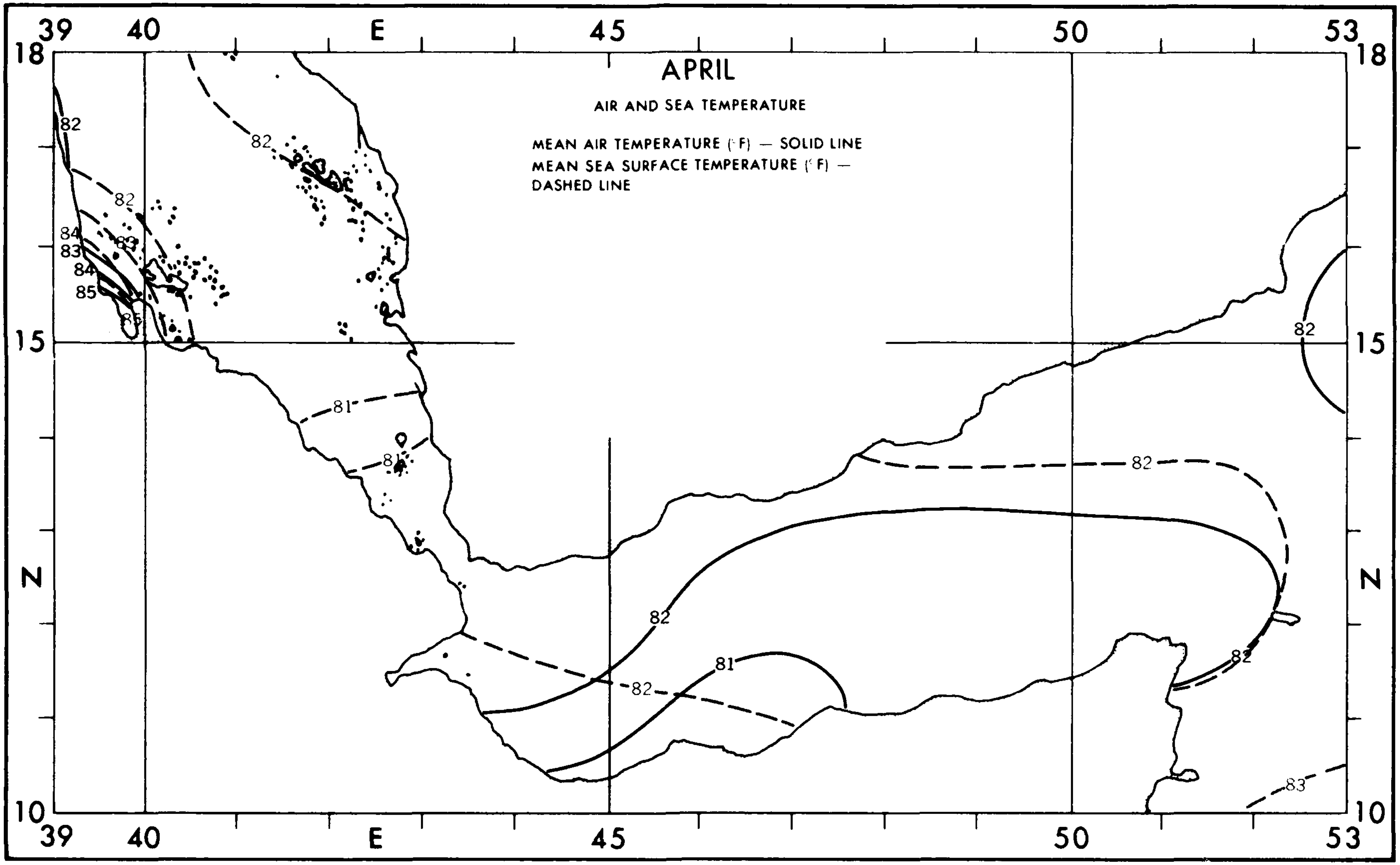
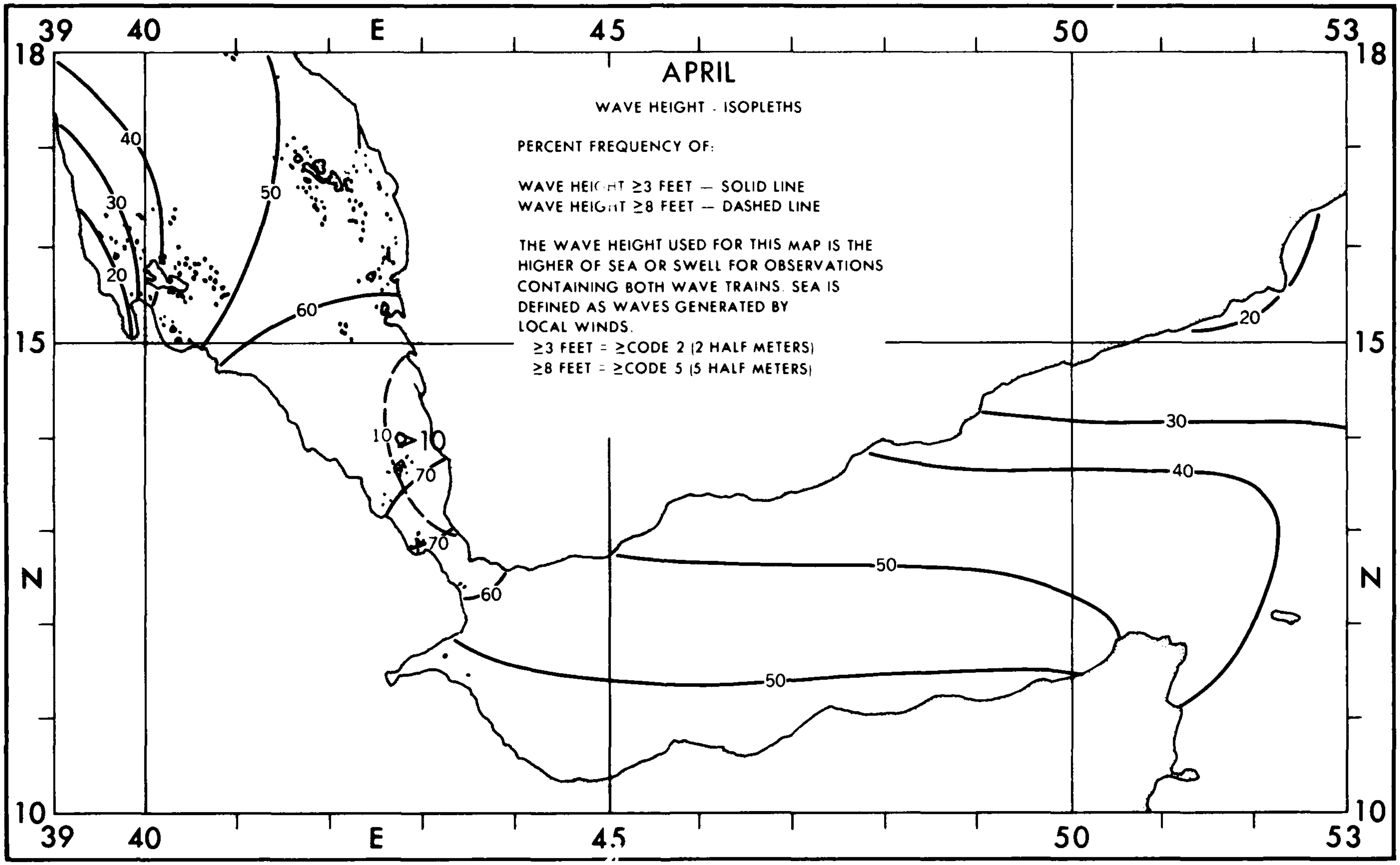
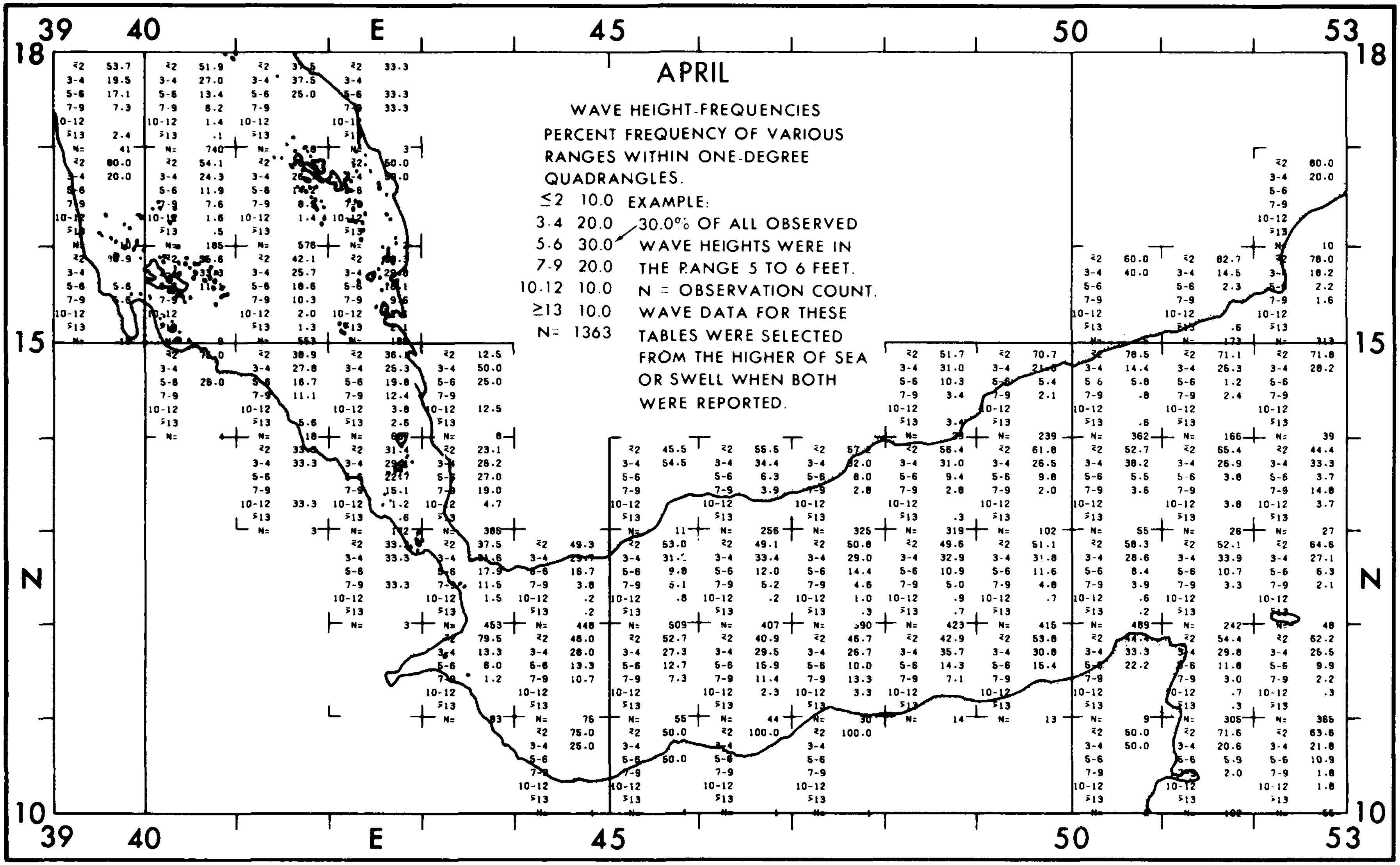
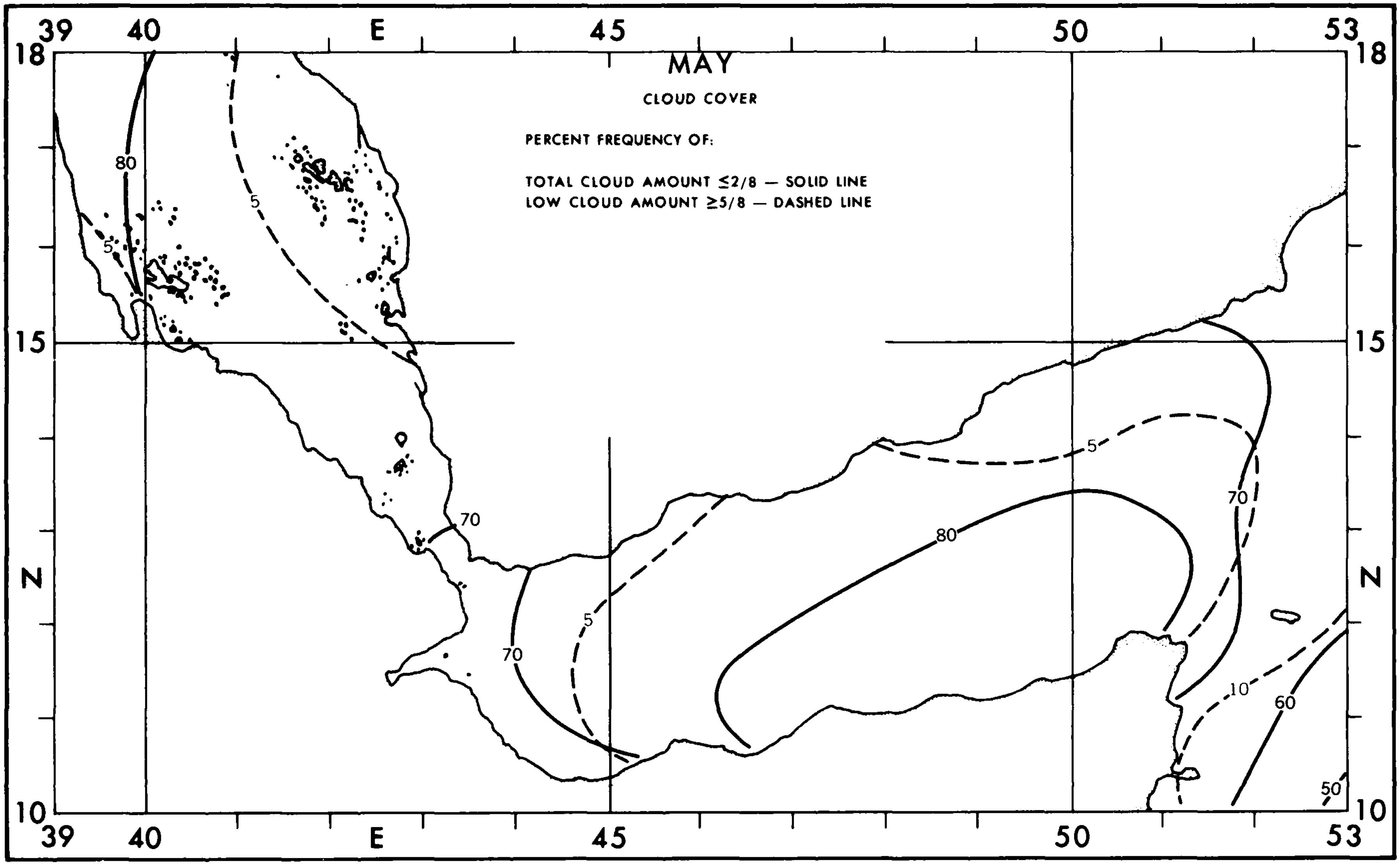
30
30
10
20
10


APRIL
SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%.
25% OF ALL WINDS WERE FROM NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR.
MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
MEAN SCALAR SPEED.
OBSERVATION COUNT.
PERCENT OF CALMS.
39
40
E
45
50
53
18
15
N
10


APRIL
AIR AND SEA TEMPERATURE
MEAN AIR TEMPERATURE (°F) — SOLID LINE
MEAN SEA SURFACE TEMPERATURE (°F) —
DASHED LINE
39
40
E
45
50
53
18
15
N
10
82
83
84
85
81


APRIL
WAVE HEIGHT - ISOPLETHS
PERCENT FREQUENCY OF:
WAVE HEIGHT ≥3 FEET — SOLID LINE
WAVE HEIGHT ≥8 FEET — DASHED LINE
THE WAVE HEIGHT USED FOR THIS MAP IS THE HIGHER OF SEA OR SWELL FOR OBSERVATIONS CONTAINING BOTH WAVE TRAINS. SEA IS DEFINED AS WAVES GENERATED BY LOCAL WINDS.
≥3 FEET = ≥CODE 2 (2 HALF METERS)
≥8 FEET = ≥CODE 5 (5 HALF METERS)
39
40
E
45
50
53
18
15
N
10
20
30
40
50
60
70
10


APRIL
WAVE HEIGHT-FREQUENCIES
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
≤2 10.0
3-4 20.0
5-6 30.0
7-9 20.0
10-12 10.0
≥13 10.0
N= 1363
EXAMPLE:
30.0% OF ALL OBSERVED WAVE HEIGHTS WERE IN THE RANGE 5 TO 6 FEET.
N = OBSERVATION COUNT.
WAVE DATA FOR THESE TABLES WERE SELECTED FROM THE HIGHER OF SEA OR SWELL WHEN BOTH WERE REPORTED.
39
40
E
45
50
53
18
15
N
10



MAY
CLOUD COVER
PERCENT FREQUENCY OF:
TOTAL CLOUD AMOUNT ≤2/8 — SOLID LINE
LOW CLOUD AMOUNT ≥5/8 — DASHED LINE
39
40
E
45
50
53
18
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N
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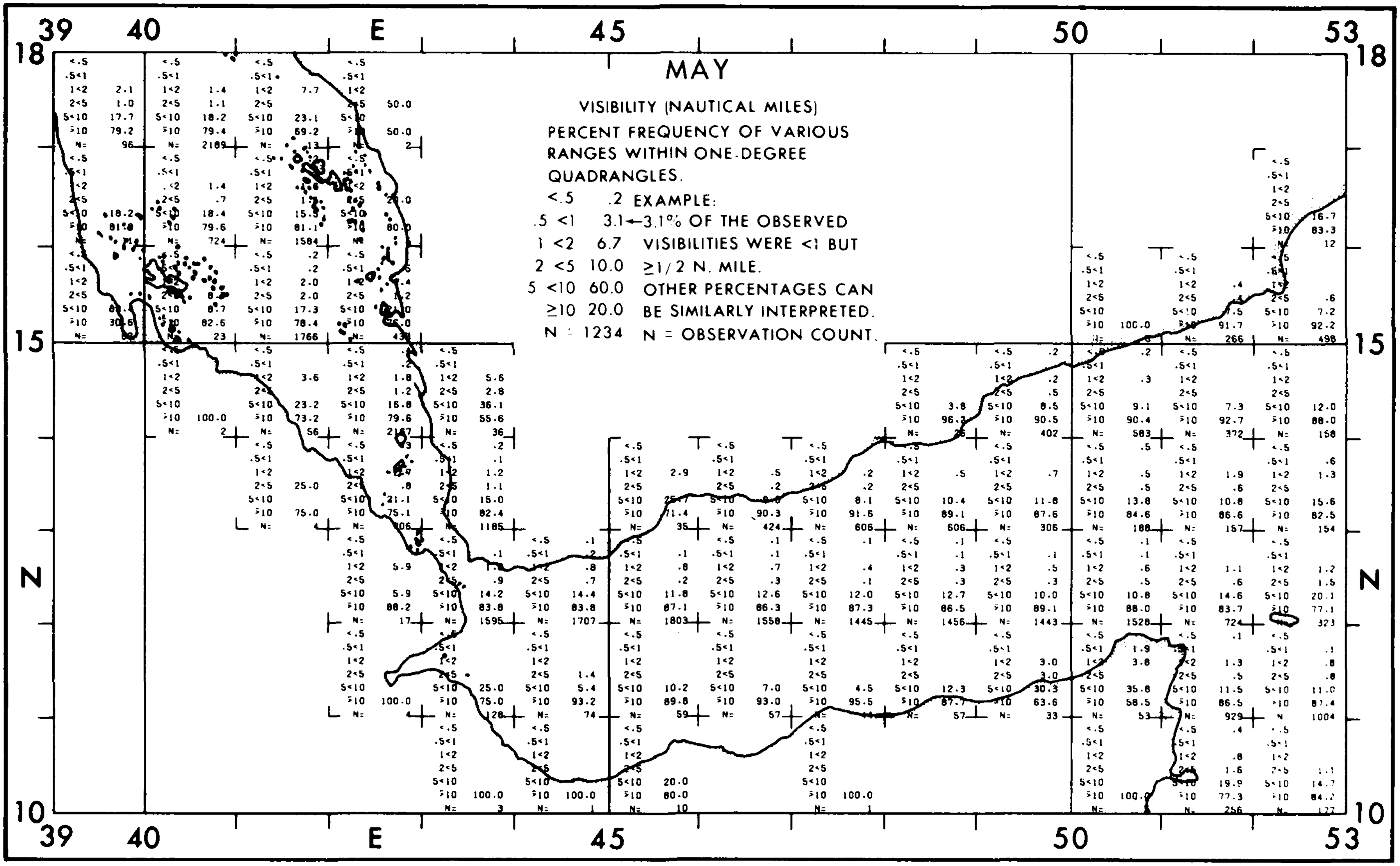
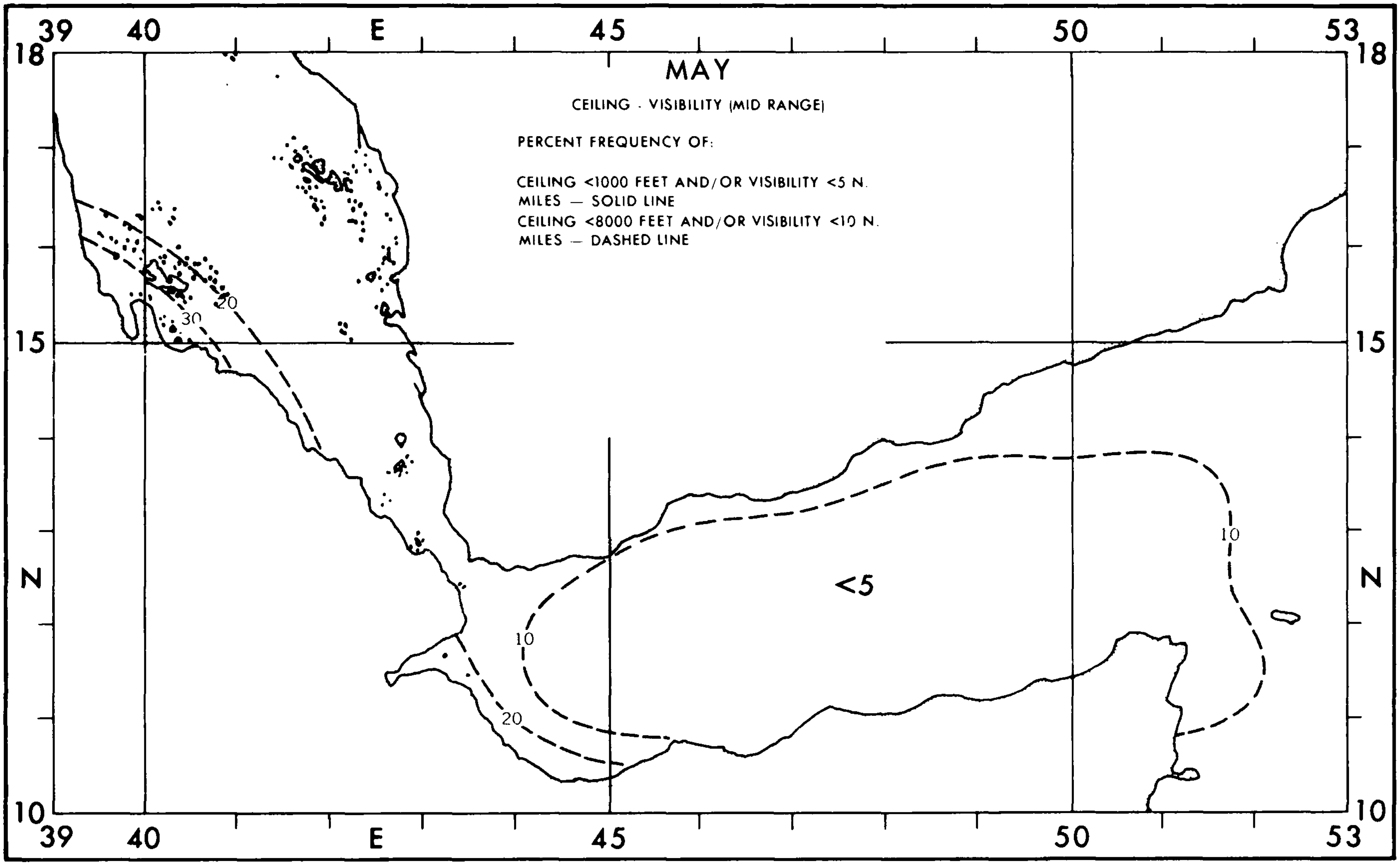
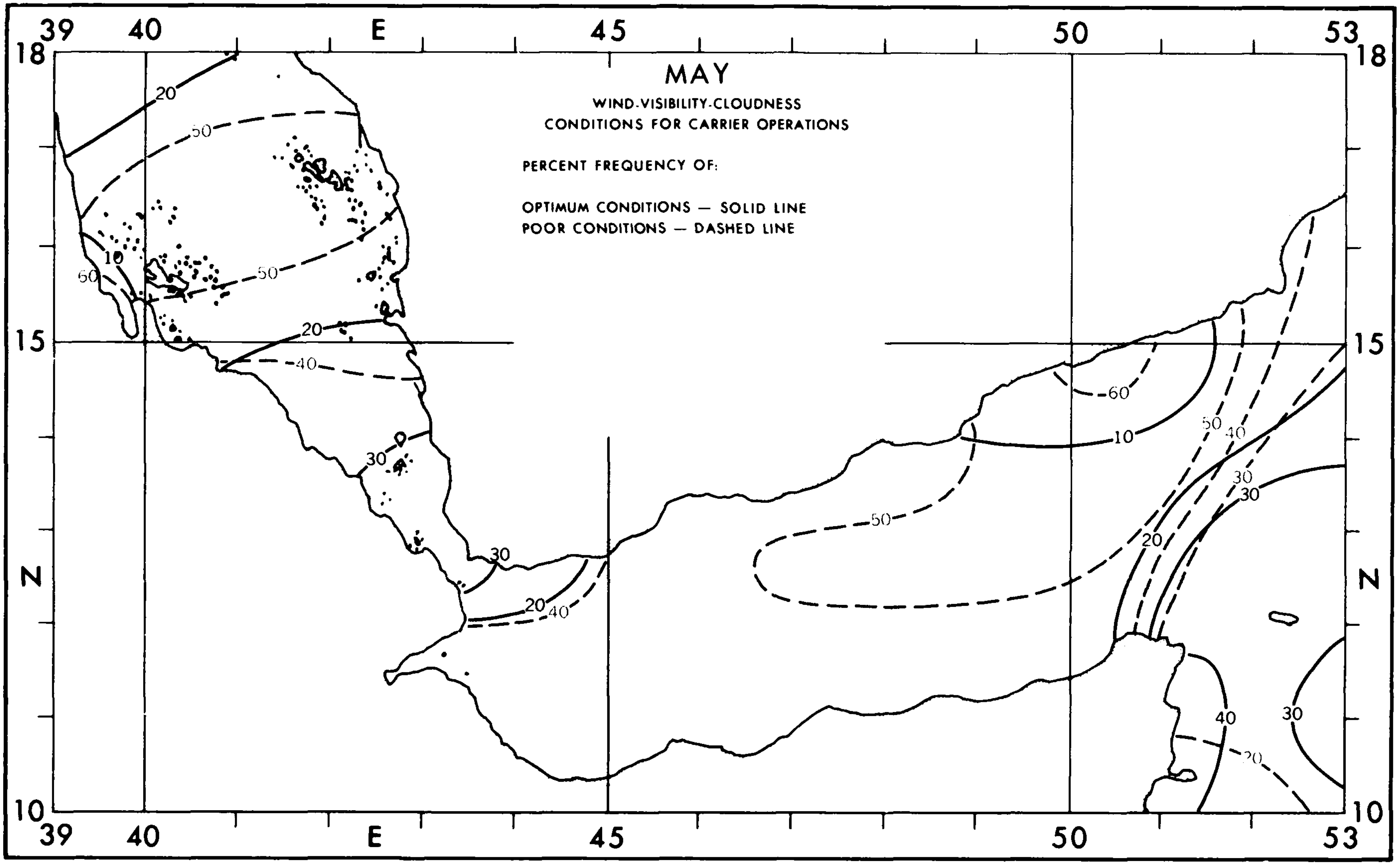
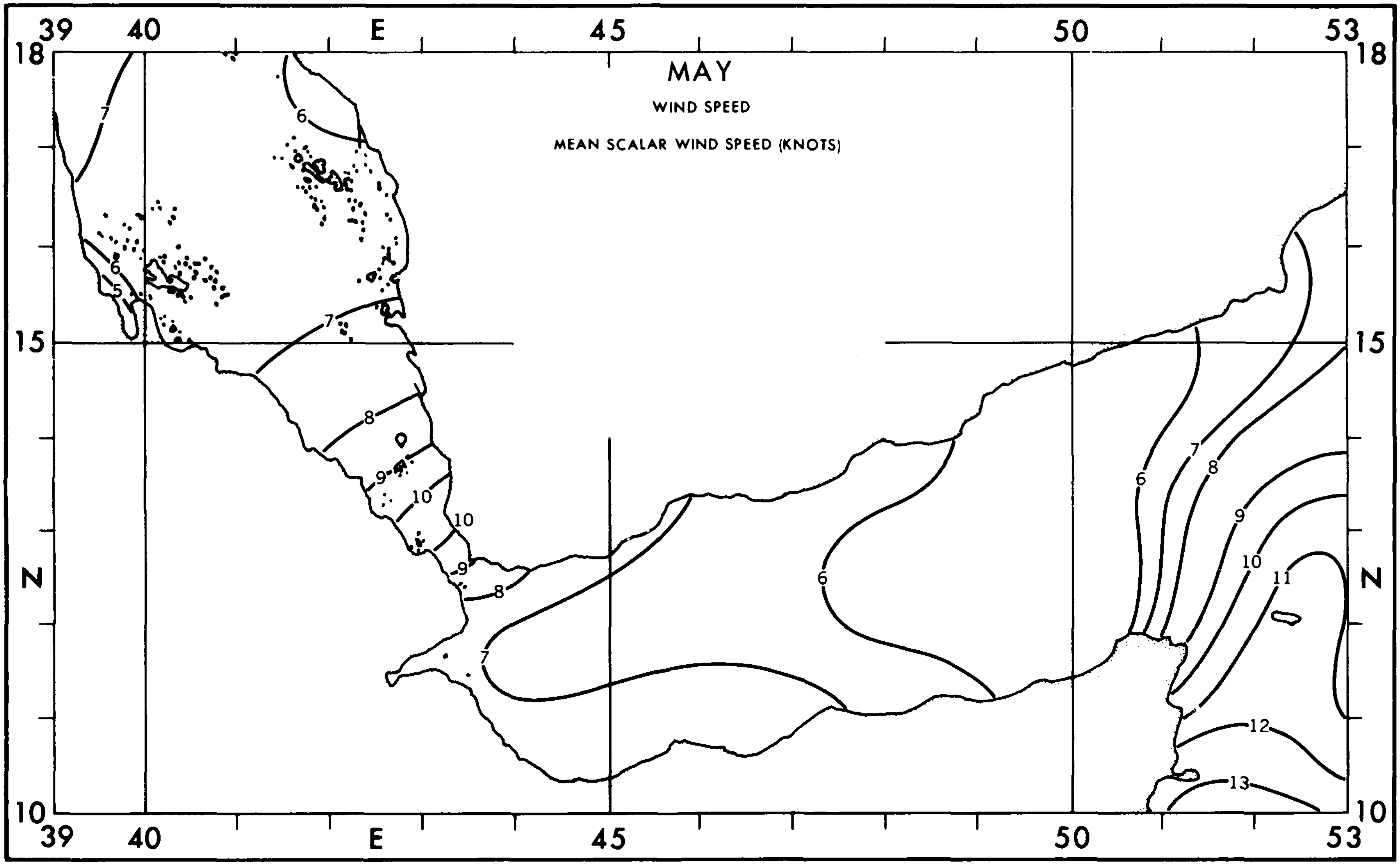
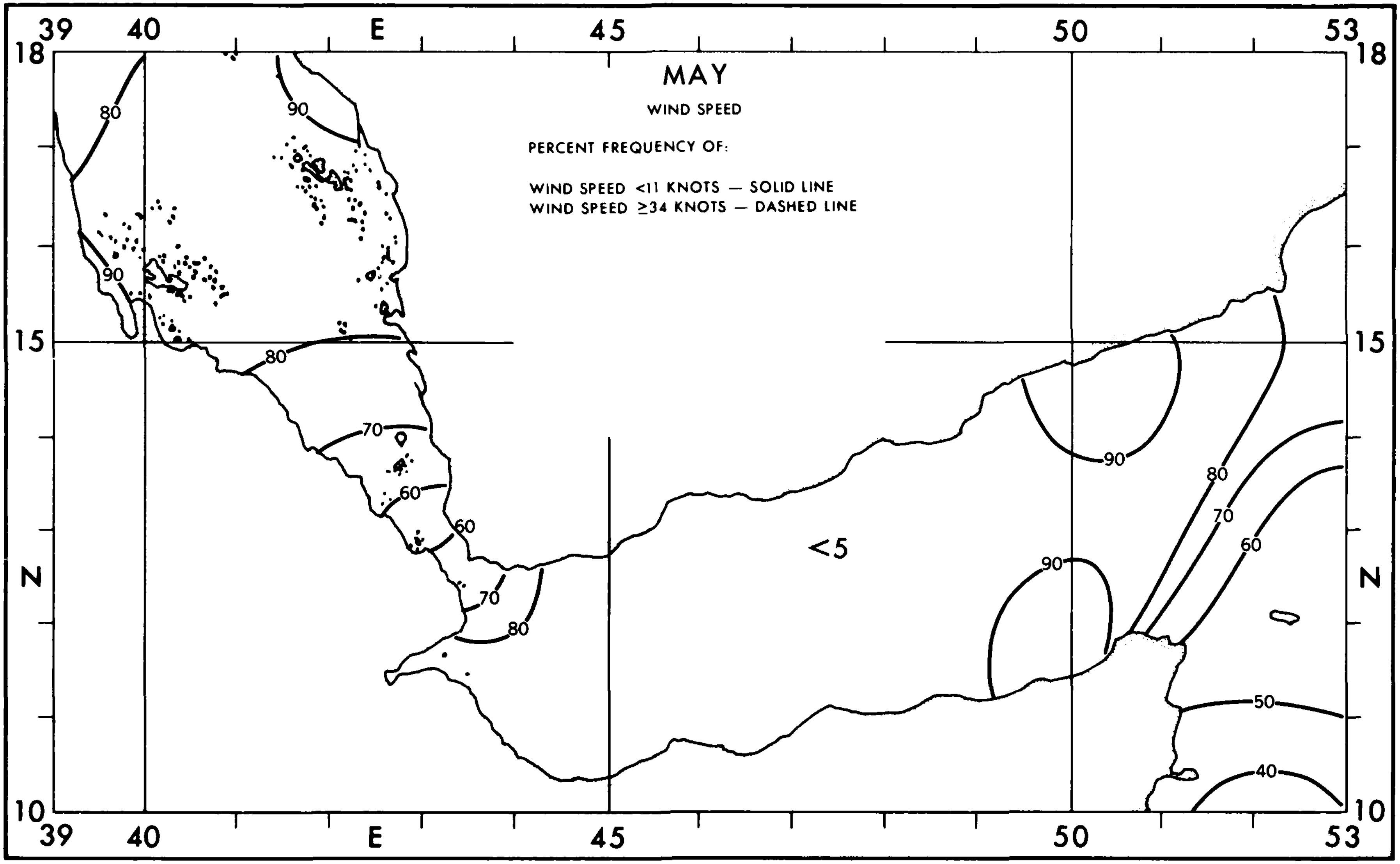
80
5
70
60
50
10

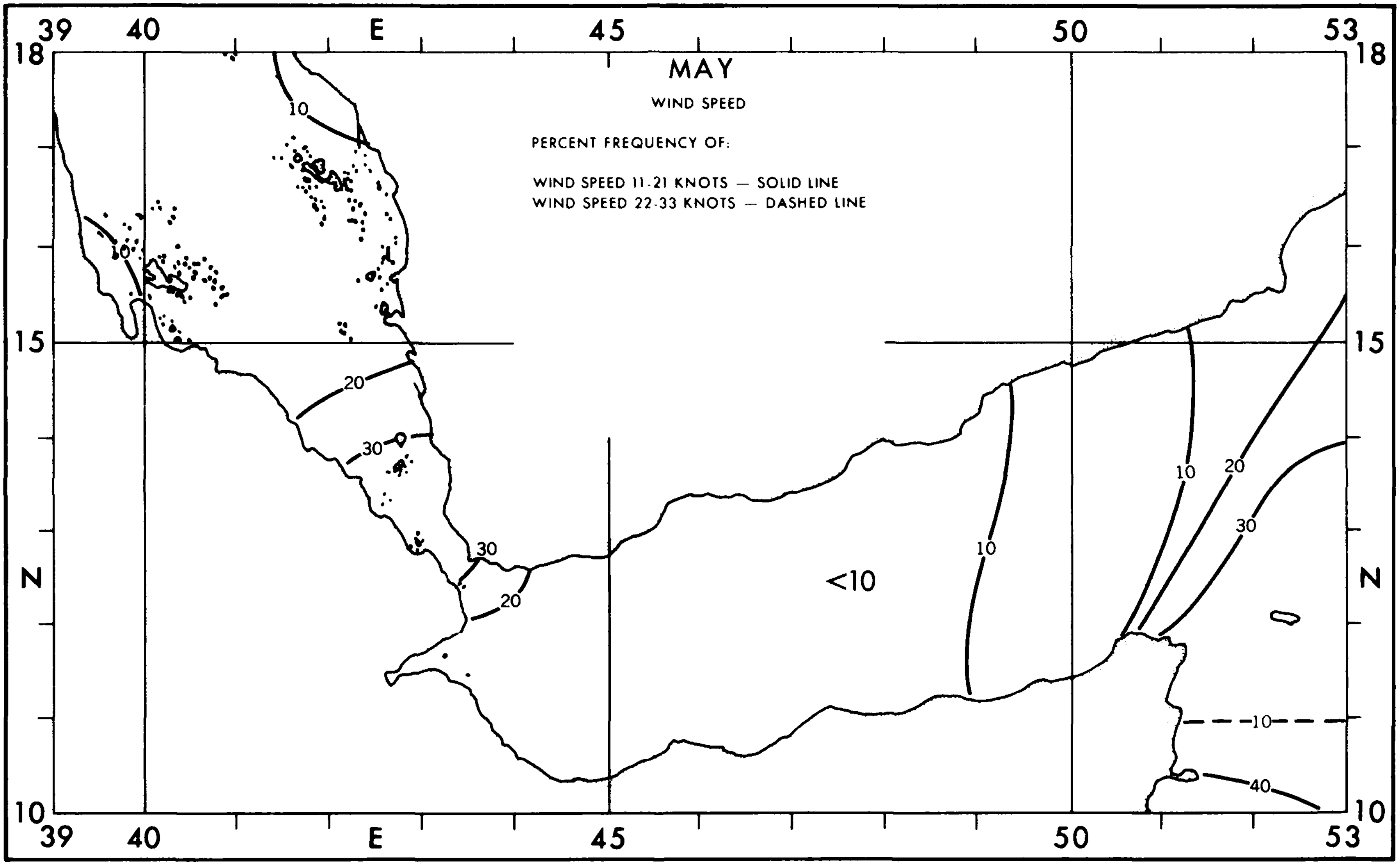

MAY
VISIBILITY (NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
<.5 .2 EXAMPLE:
.5 <1 3.1←3.1% OF THE OBSERVED
1 <2 6.7 VISIBILITIES WERE <1 BUT
2 <5 10.0 ≥1/2 N. MILE.
5 <10 60.0 OTHER PERCENTAGES CAN
≥10 20.0 BE SIMILARLY INTERPRETED.
N = 1234 N = OBSERVATION COUNT.
39
40
E
45
50
53
18
15
N
10

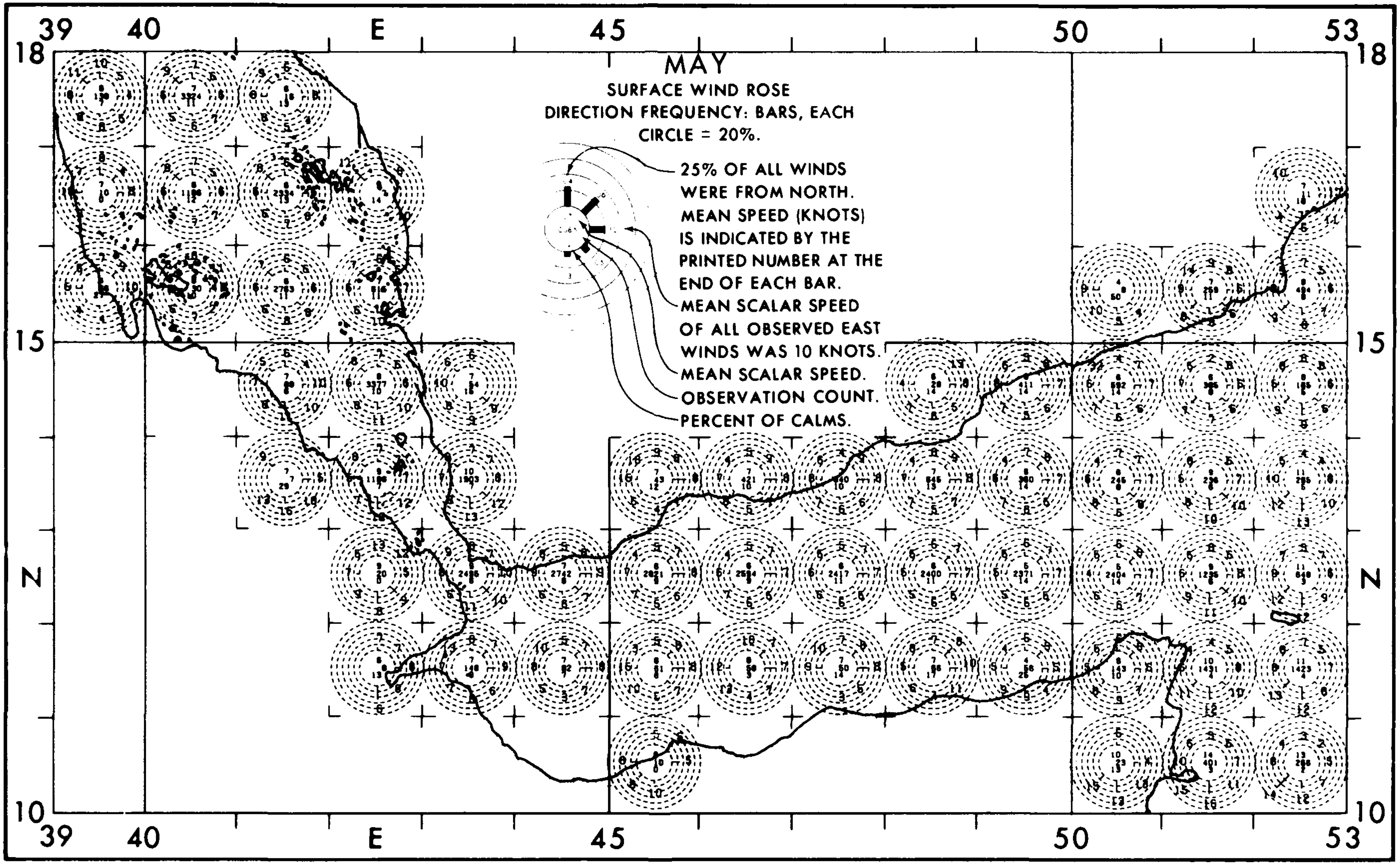

MAY
CEILING - VISIBILITY (MID RANGE)
PERCENT FREQUENCY OF:
CEILING <1000 FEET AND/OR VISIBILITY <5 N. MILES — SOLID LINE
CEILING <8000 FEET AND/OR VISIBILITY <10 N. MILES — DASHED LINE
<5
10
20
30
39
40
E
45
50
53
18
15
N
10

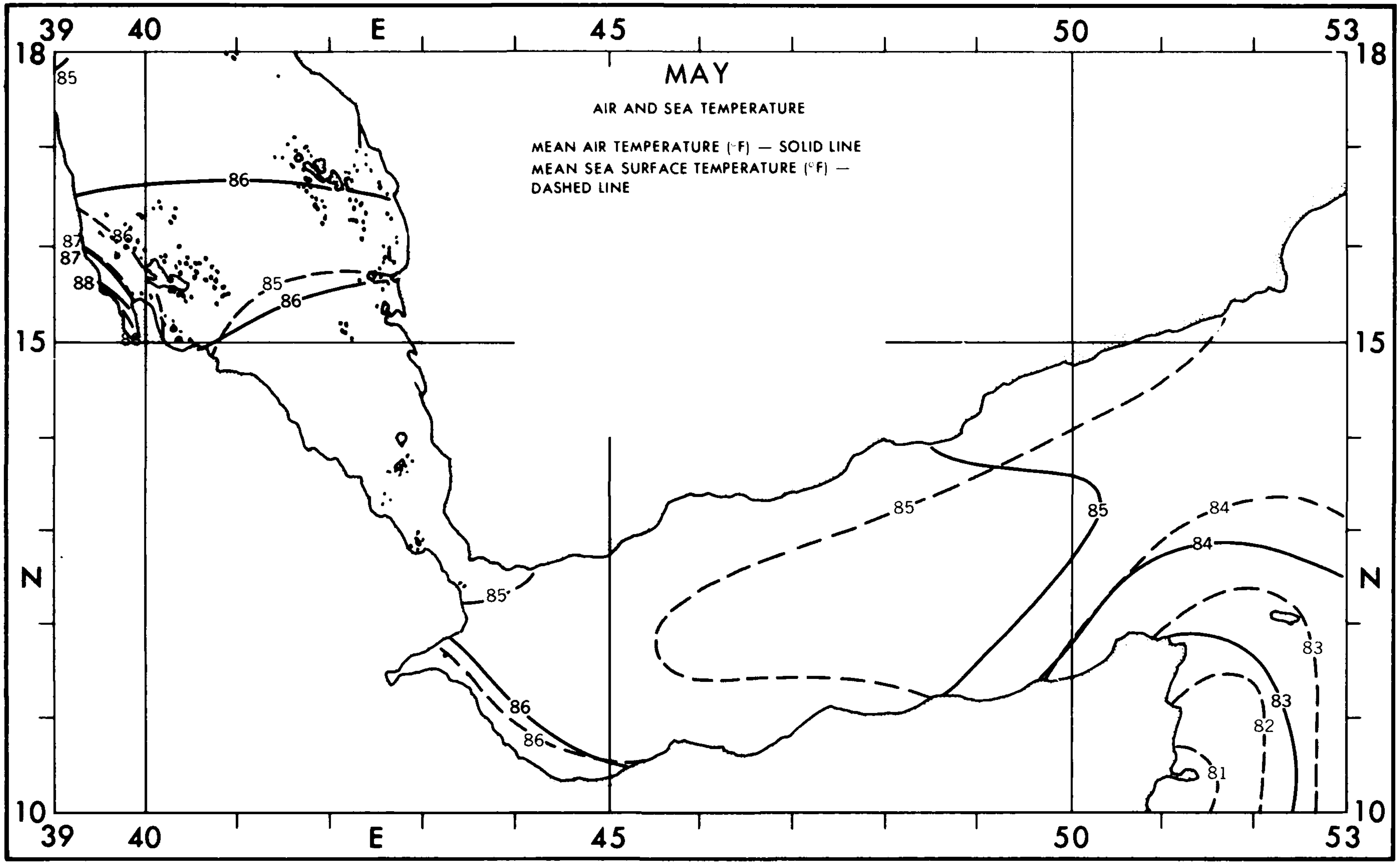

MAY
WIND-VISIBILITY-CLOUDNESS
CONDITIONS FOR CARRIER OPERATIONS
PERCENT FREQUENCY OF:
OPTIMUM CONDITIONS — SOLID LINE
POOR CONDITIONS — DASHED LINE
39
40
E
45
50
53
18
15
N
10


MAY
WIND SPEED
MEAN SCALAR WIND SPEED (KNOTS)
39
40
E
45
50
53
18
15
N
10
5
6
7
8
9
10
11
12
13


MAY
WIND SPEED
PERCENT FREQUENCY OF:
WIND SPEED <11 KNOTS — SOLID LINE
WIND SPEED ≥34 KNOTS — DASHED LINE
39
40
E
45
50
53
18
15
N
10
80
90
70
60
<5
50
40


MAY
WIND SPEED
PERCENT FREQUENCY OF:
WIND SPEED 11-21 KNOTS — SOLID LINE
WIND SPEED 22-33 KNOTS — DASHED LINE
<10
10
20
30
40
39
40
E
45
50
53
18
15
N
10


MAY
SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%.
25% OF ALL WINDS WERE FROM NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR.
MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
MEAN SCALAR SPEED.
OBSERVATION COUNT.
PERCENT OF CALMS.
39
40
E
45
50
53
18
15
N
10


MAY
AIR AND SEA TEMPERATURE
MEAN AIR TEMPERATURE (°F) — SOLID LINE
MEAN SEA SURFACE TEMPERATURE (°F) — DASHED LINE
39
40
E
45
50
53
18
15
N
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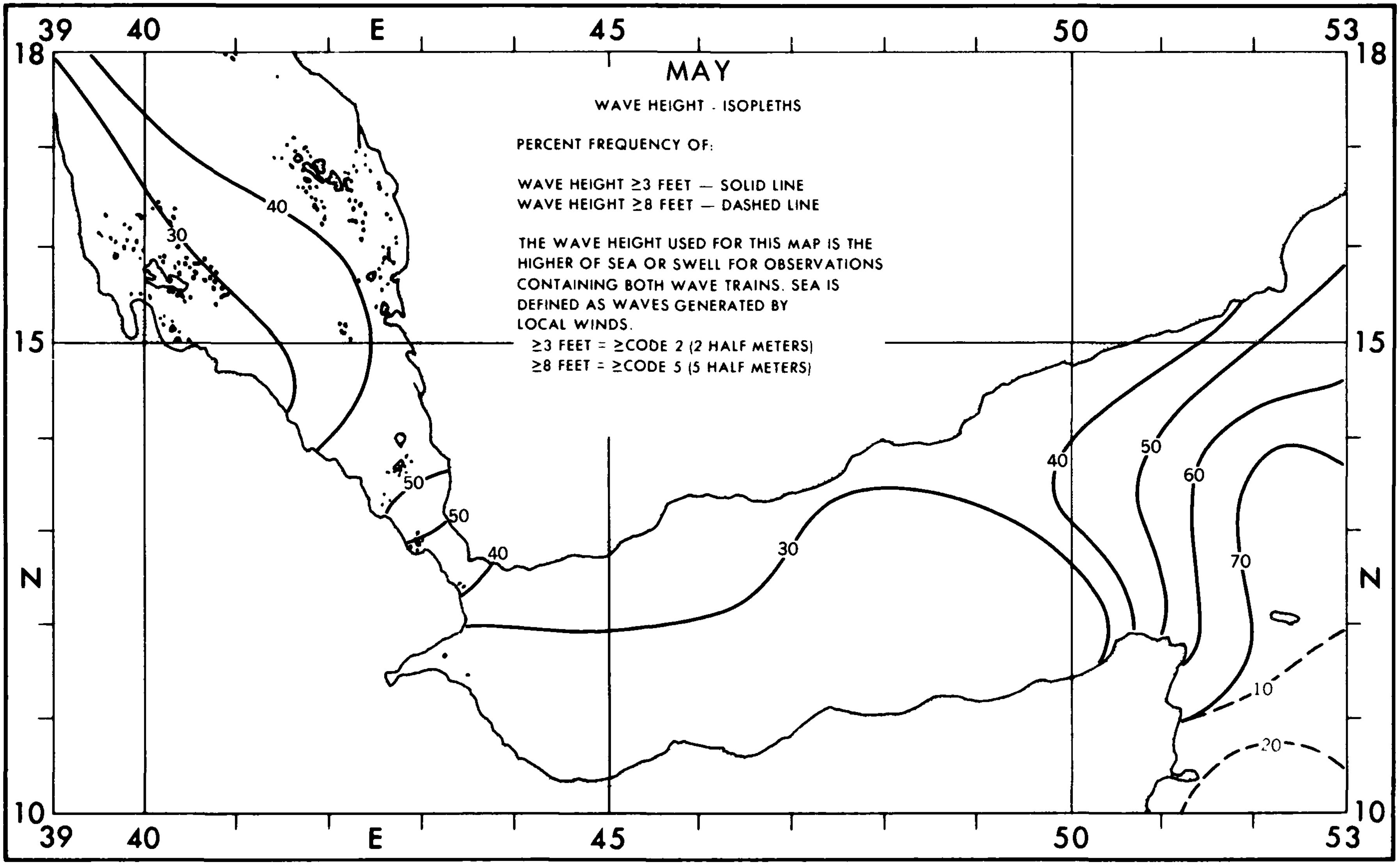
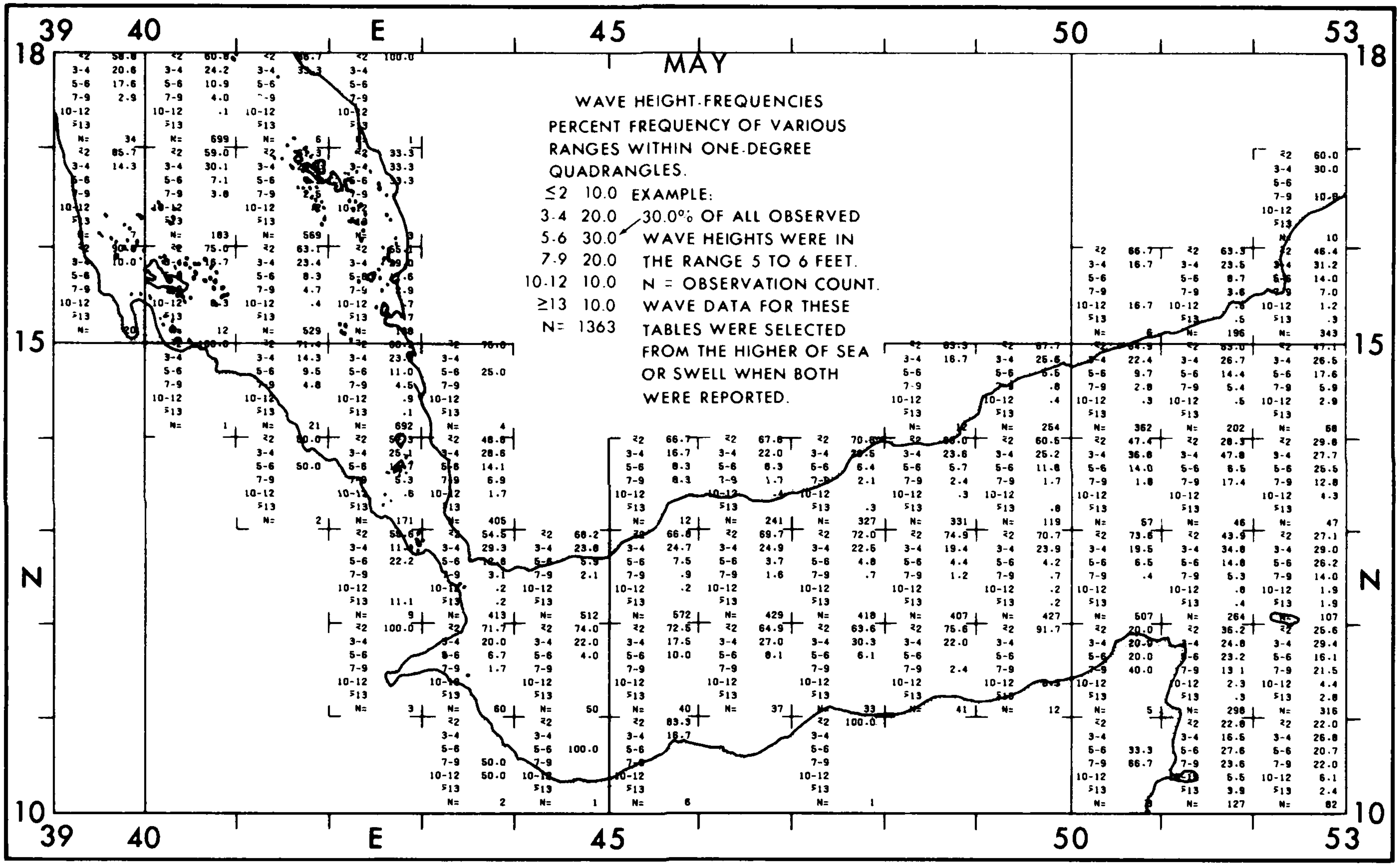
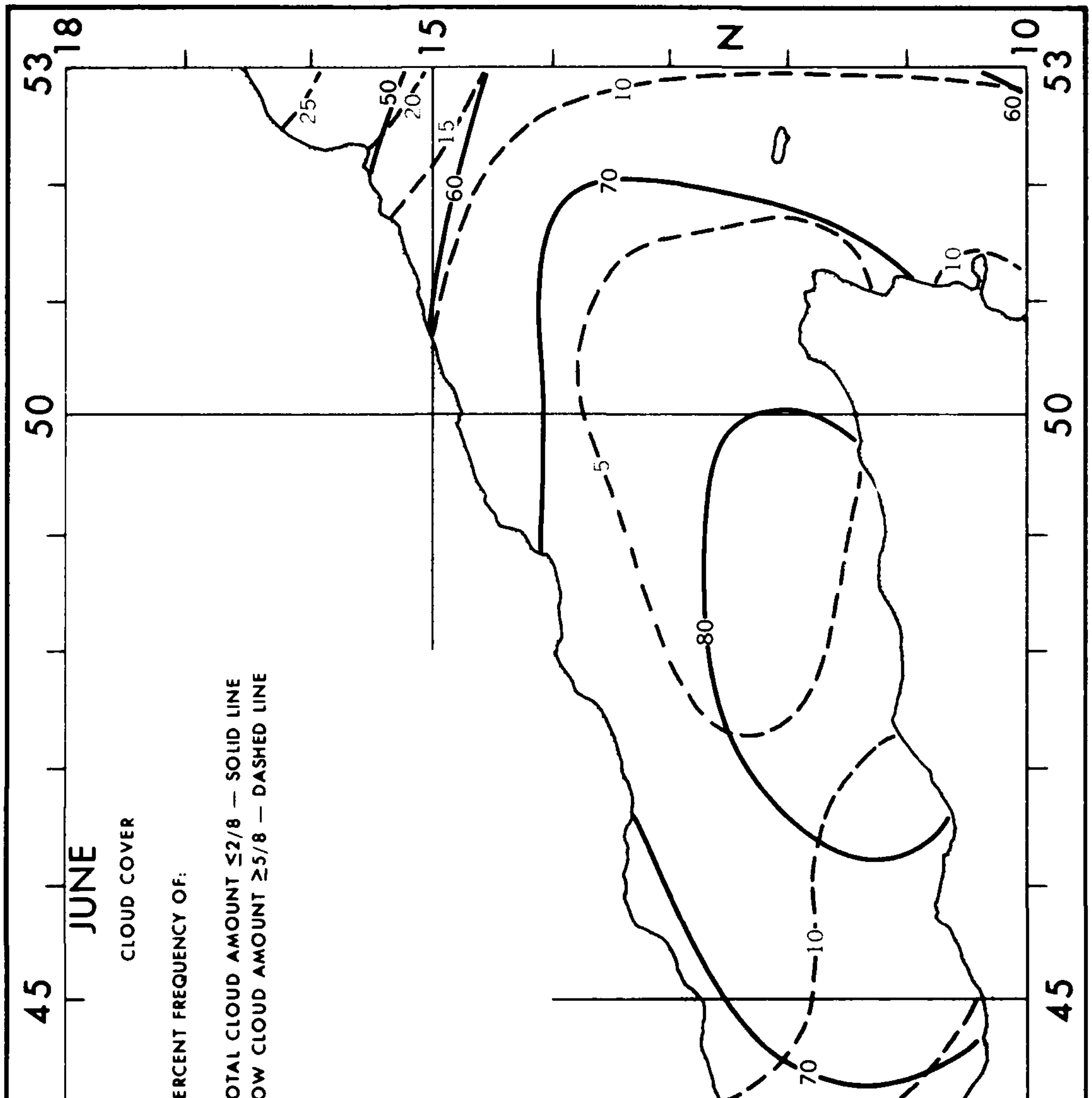
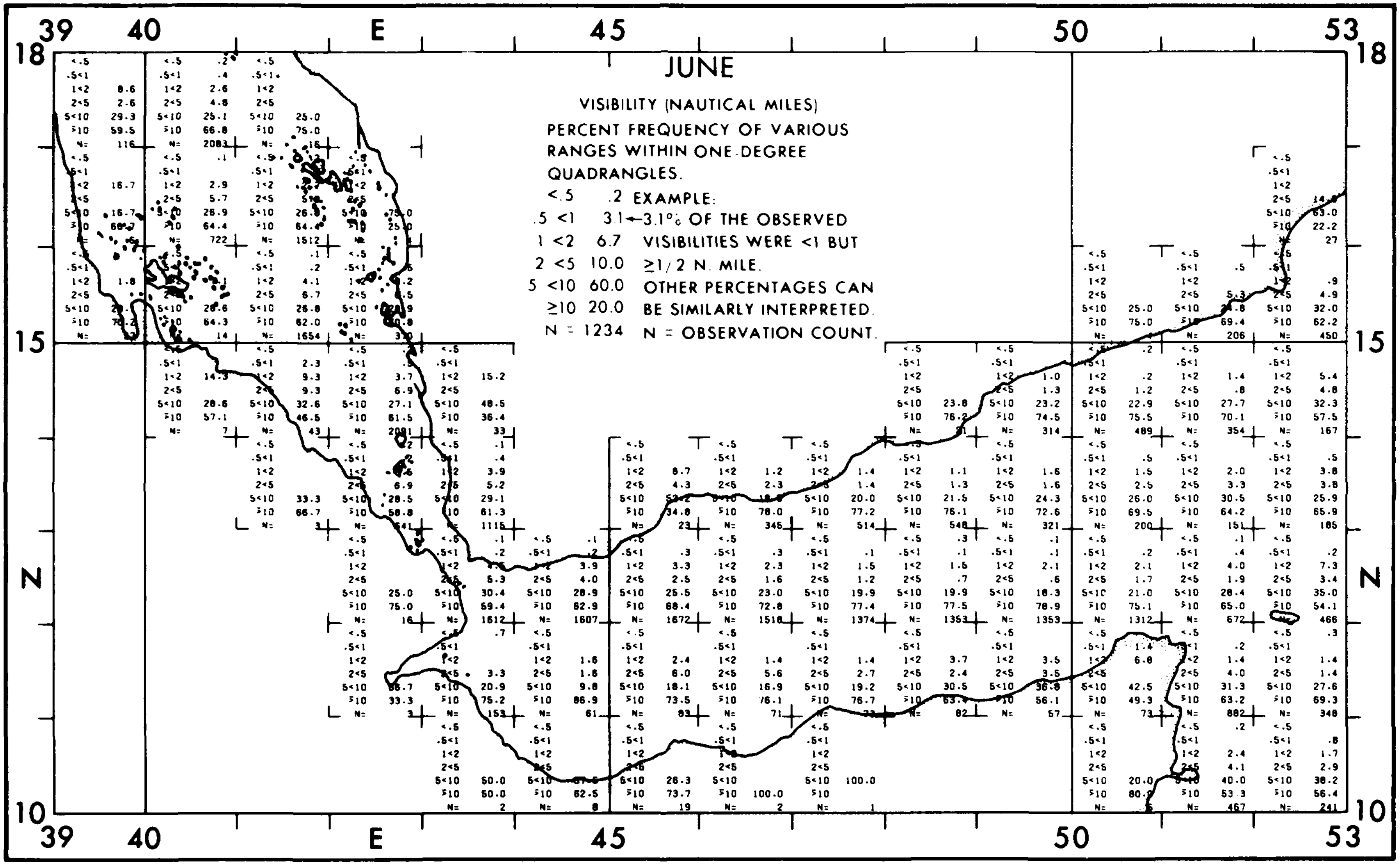
85
86
87
88
84
83
82
81


MAY
WAVE HEIGHT - ISOPLETHS
PERCENT FREQUENCY OF:
WAVE HEIGHT ≥3 FEET — SOLID LINE
WAVE HEIGHT ≥8 FEET — DASHED LINE
THE WAVE HEIGHT USED FOR THIS MAP IS THE HIGHER OF SEA OR SWELL FOR OBSERVATIONS CONTAINING BOTH WAVE TRAINS. SEA IS DEFINED AS WAVES GENERATED BY LOCAL WINDS.
≥3 FEET = ≥CODE 2 (2 HALF METERS)
≥8 FEET = ≥CODE 5 (5 HALF METERS)
39
40
E
45
50
53
18
15
N
10
30
40
50
60
70
10
20


MAY
WAVE HEIGHT-FREQUENCIES
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
≤2 10.0 EXAMPLE:
3-4 20.0
5-6 30.0
7-9 20.0
10-12 10.0
≥13 10.0
N= 1363
30.0% OF ALL OBSERVED WAVE HEIGHTS WERE IN THE RANGE 5 TO 6 FEET.
N = OBSERVATION COUNT.
WAVE DATA FOR THESE TABLES WERE SELECTED FROM THE HIGHER OF SEA OR SWELL WHEN BOTH WERE REPORTED.
39
40
E
45
50
53
18
15
N
10


JUNE
CLOUD COVER
PERCENT FREQUENCY OF:
TOTAL CLOUD AMOUNT ≤2/8 — SOLID LINE
LOW CLOUD AMOUNT ≥5/8 — DASHED LINE
39
40
E
45
50
53
18
15
N
10


JUNE
VISIBILITY (NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
<.5 .2 EXAMPLE:
.5 <1 3.1←3.1% OF THE OBSERVED
1 <2 6.7 VISIBILITIES WERE <1 BUT
2 <5 10.0 ≥1/2 N. MILE.
5 <10 60.0 OTHER PERCENTAGES CAN
≥10 20.0 BE SIMILARLY INTERPRETED.
N = 1234 N = OBSERVATION COUNT.
39
40
E
45
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18
15
N
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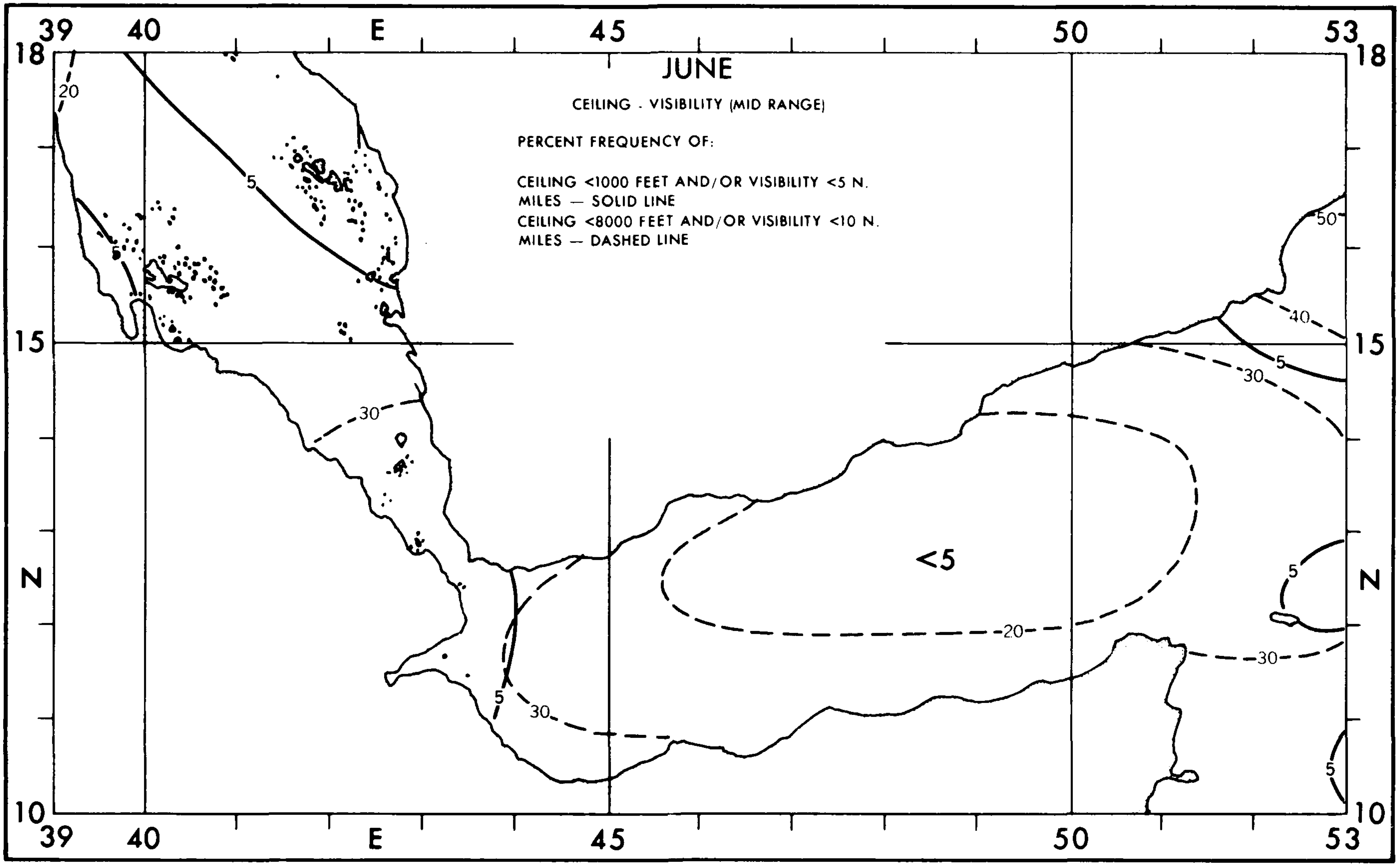
JUNE
CEILING - VISIBILITY (MID RANGE)
PERCENT FREQUENCY OF:
CEILING <1000 FEET AND/OR VISIBILITY <5 N. MILES — SOLID LINE
CEILING <8000 FEET AND/OR VISIBILITY <10 N. MILES — DASHED LINE
<5
39
40
E
45
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53
18
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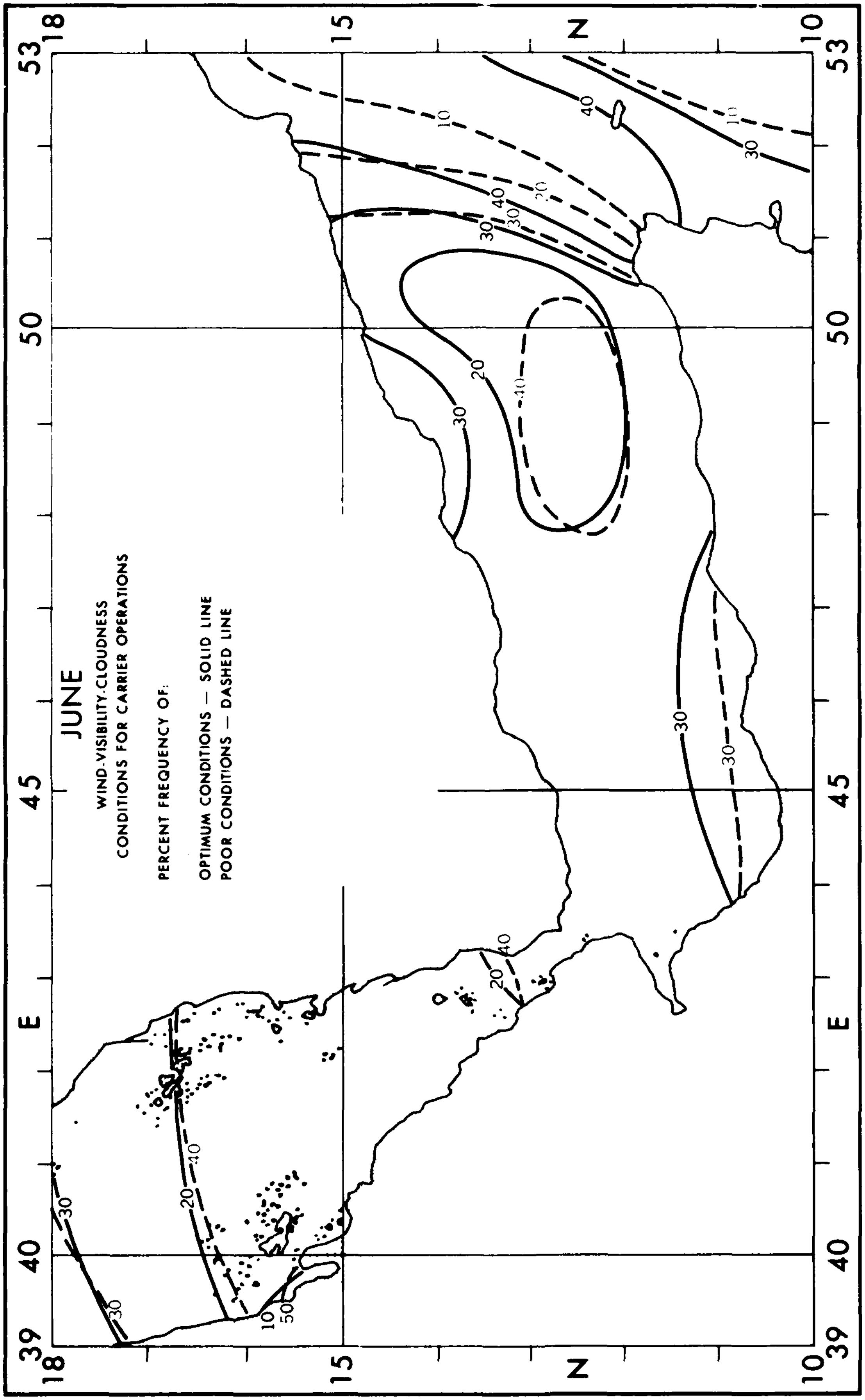
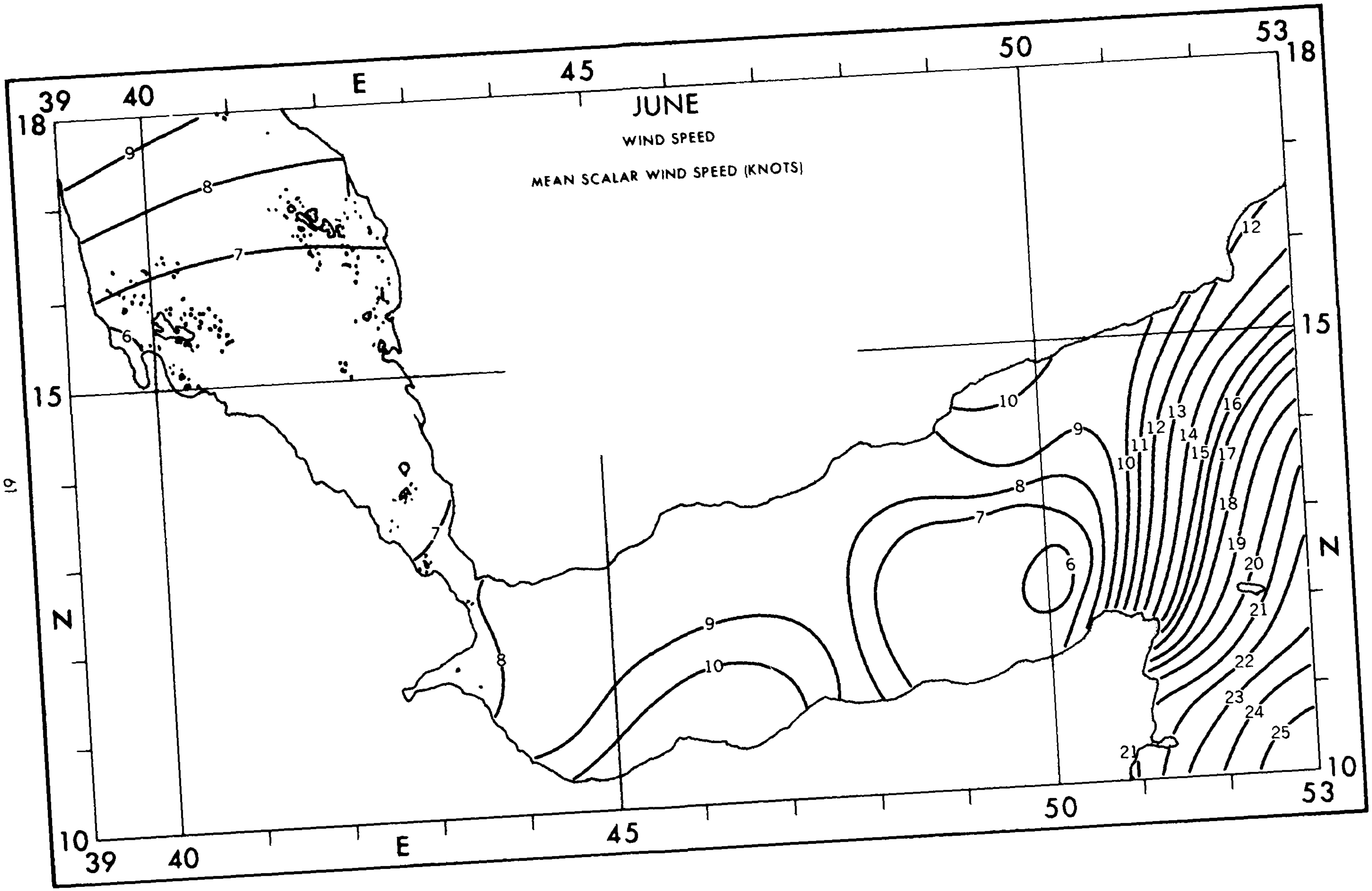
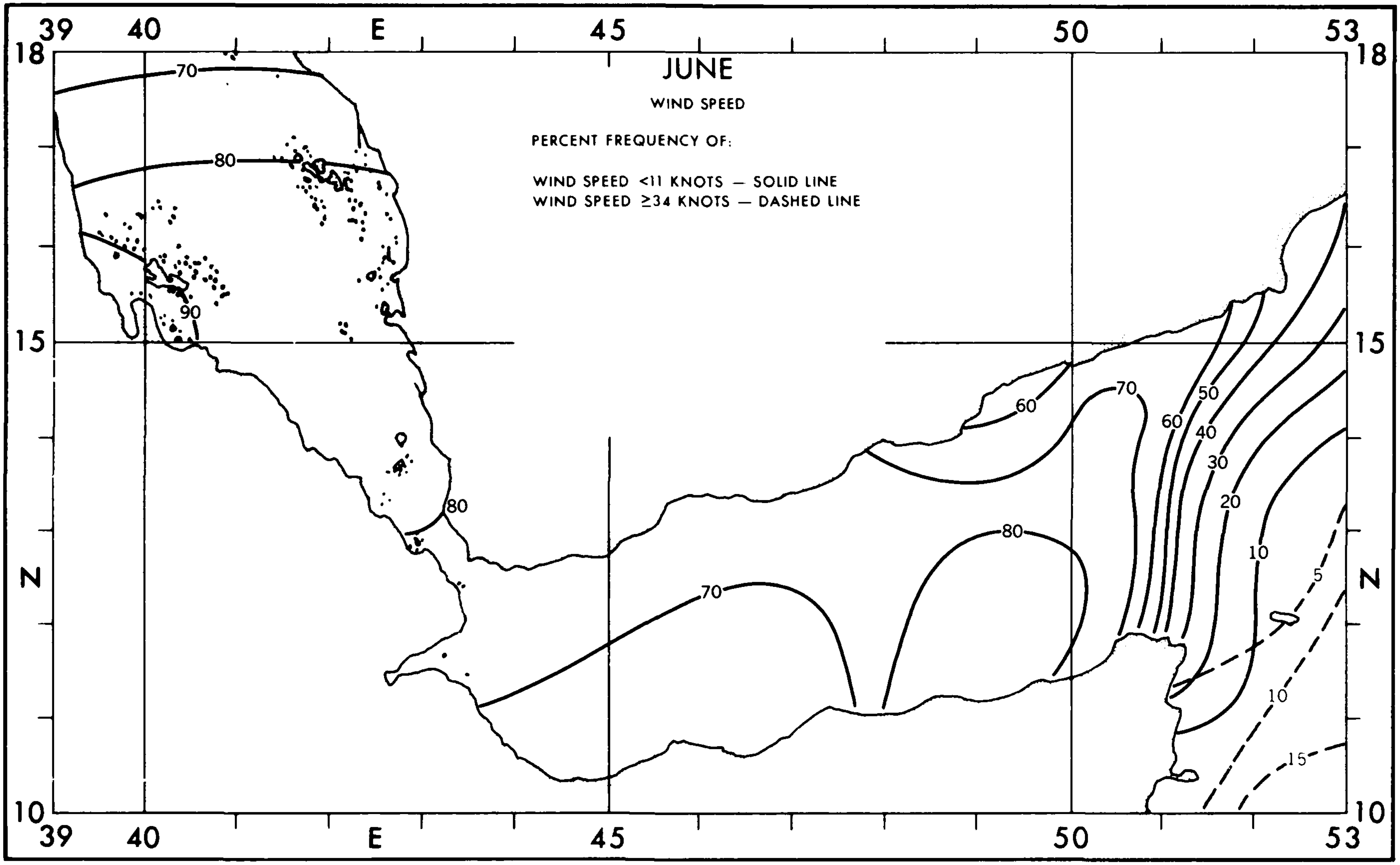
20
5
30
40
50


JUNE
WIND-VISIBILITY-CLOUDNESS
CONDITIONS FOR CARRIER OPERATIONS
PERCENT FREQUENCY OF:
OPTIMUM CONDITIONS — SOLID LINE
POOR CONDITIONS — DASHED LINE
39
40
45
50
53
18
15
10
N
E


JUNE
WIND SPEED
MEAN SCALAR WIND SPEED (KNOTS)
E
N
39
40
45
50
53
18
15
10


JUNE
WIND SPEED
PERCENT FREQUENCY OF:
WIND SPEED <11 KNOTS — SOLID LINE
WIND SPEED ≥34 KNOTS — DASHED LINE
39
40
E
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53
18
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N
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5
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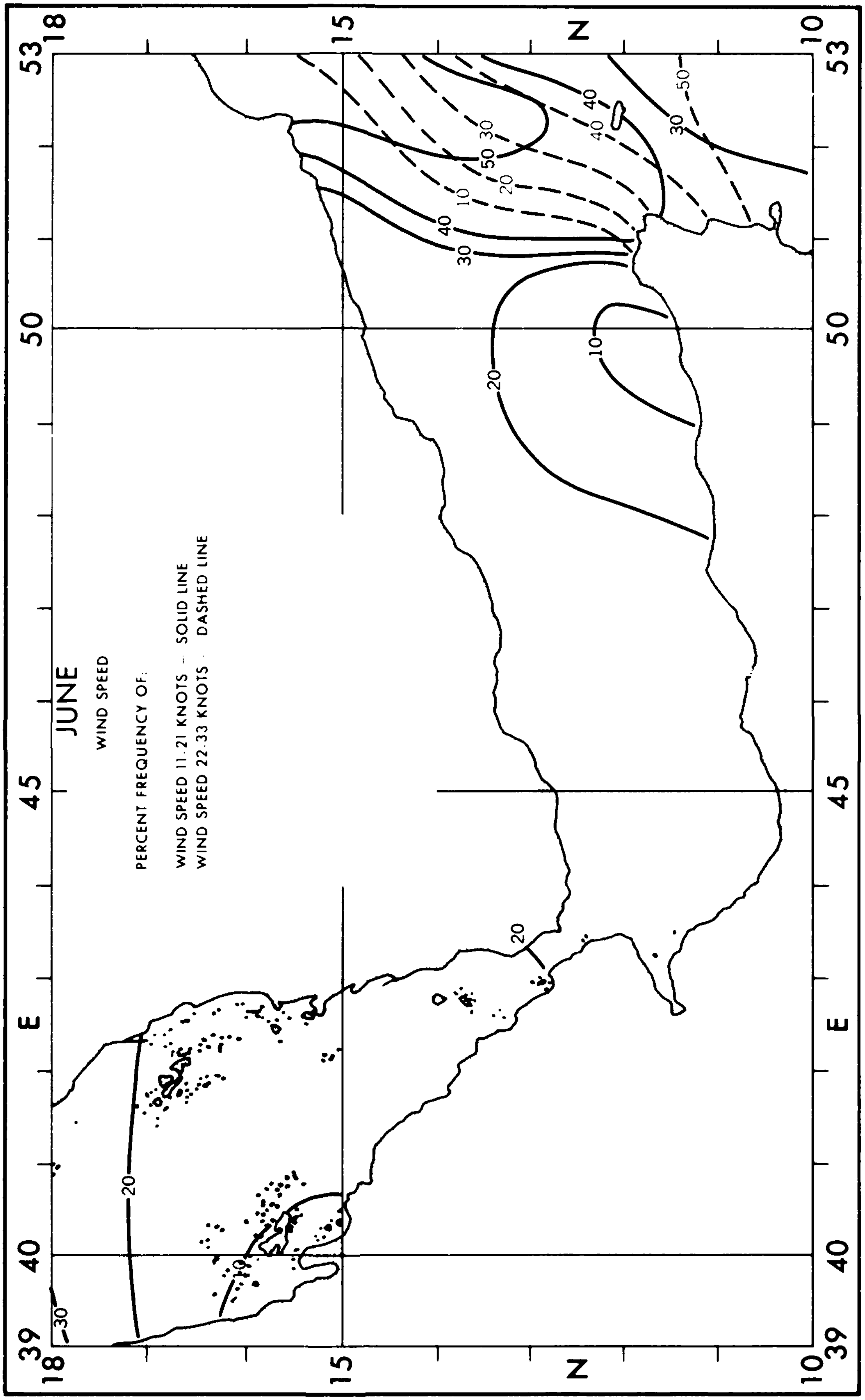
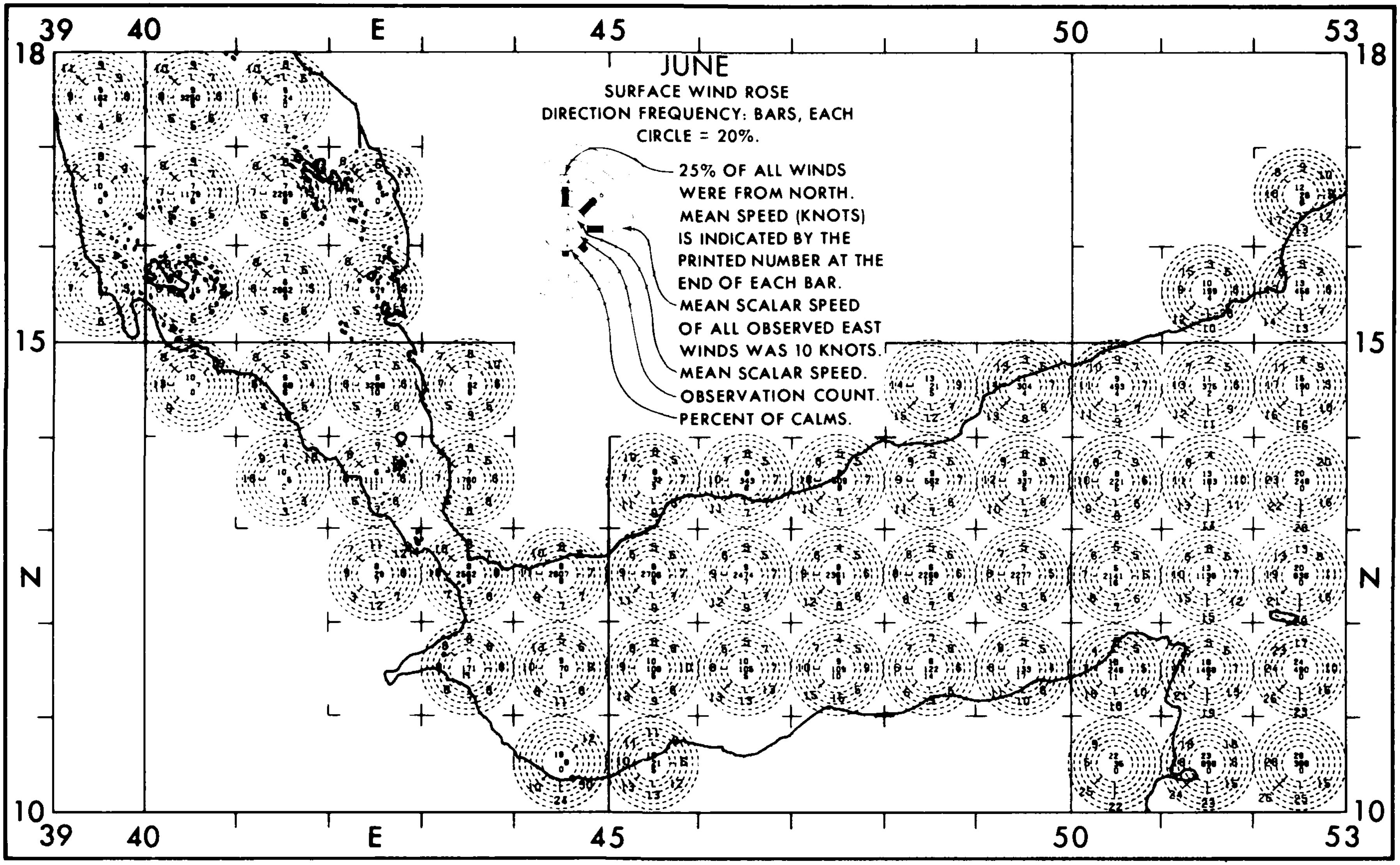
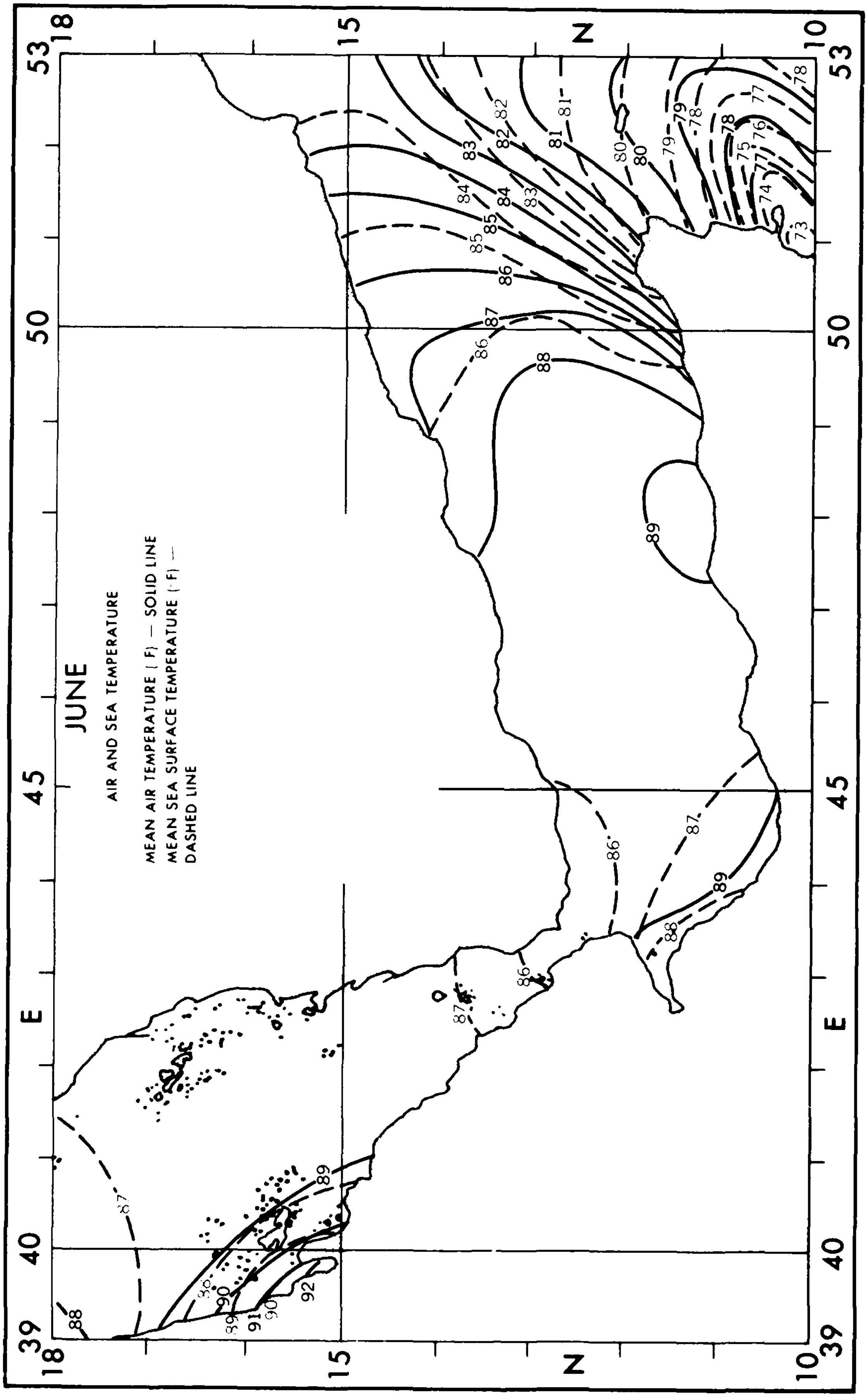
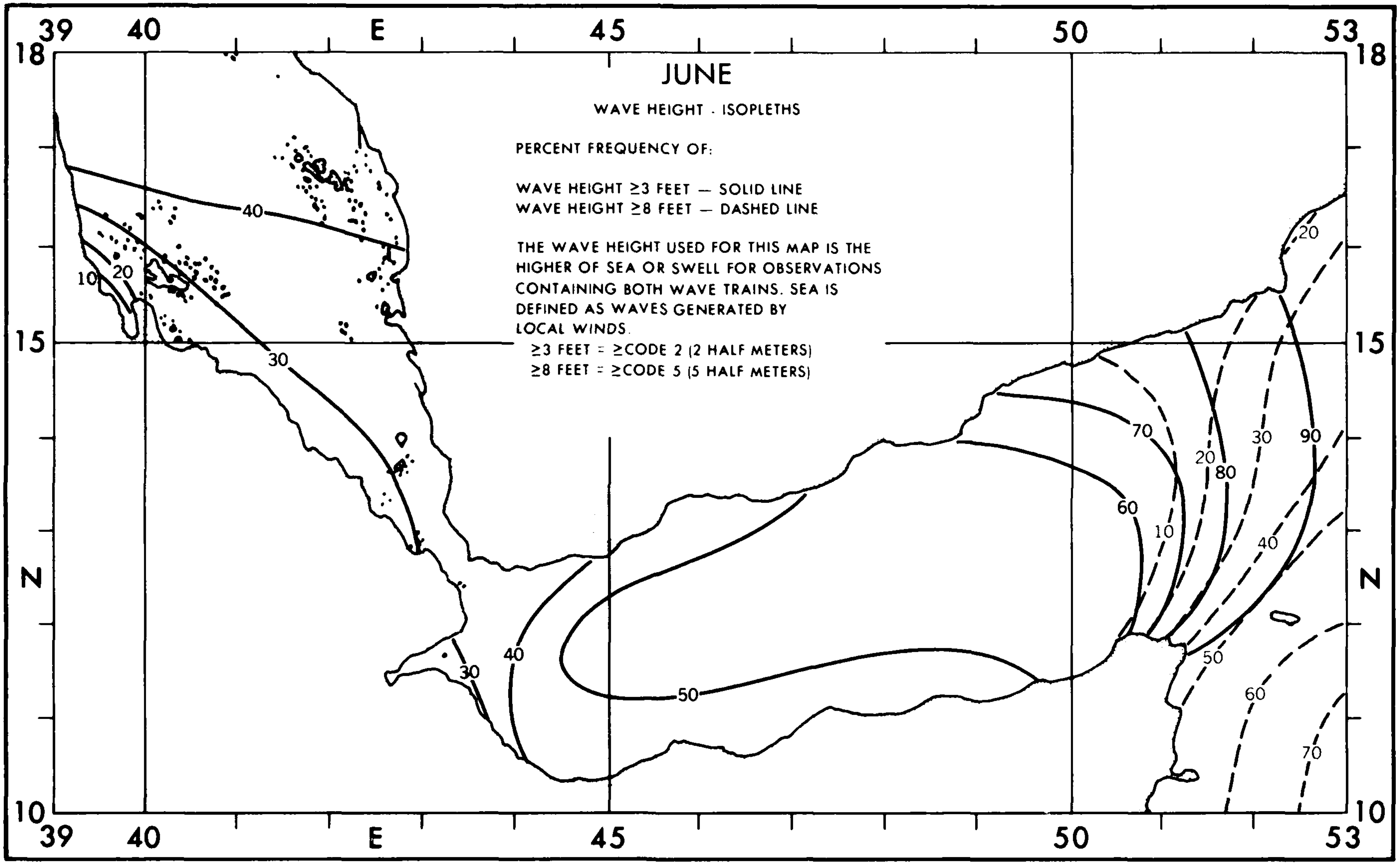
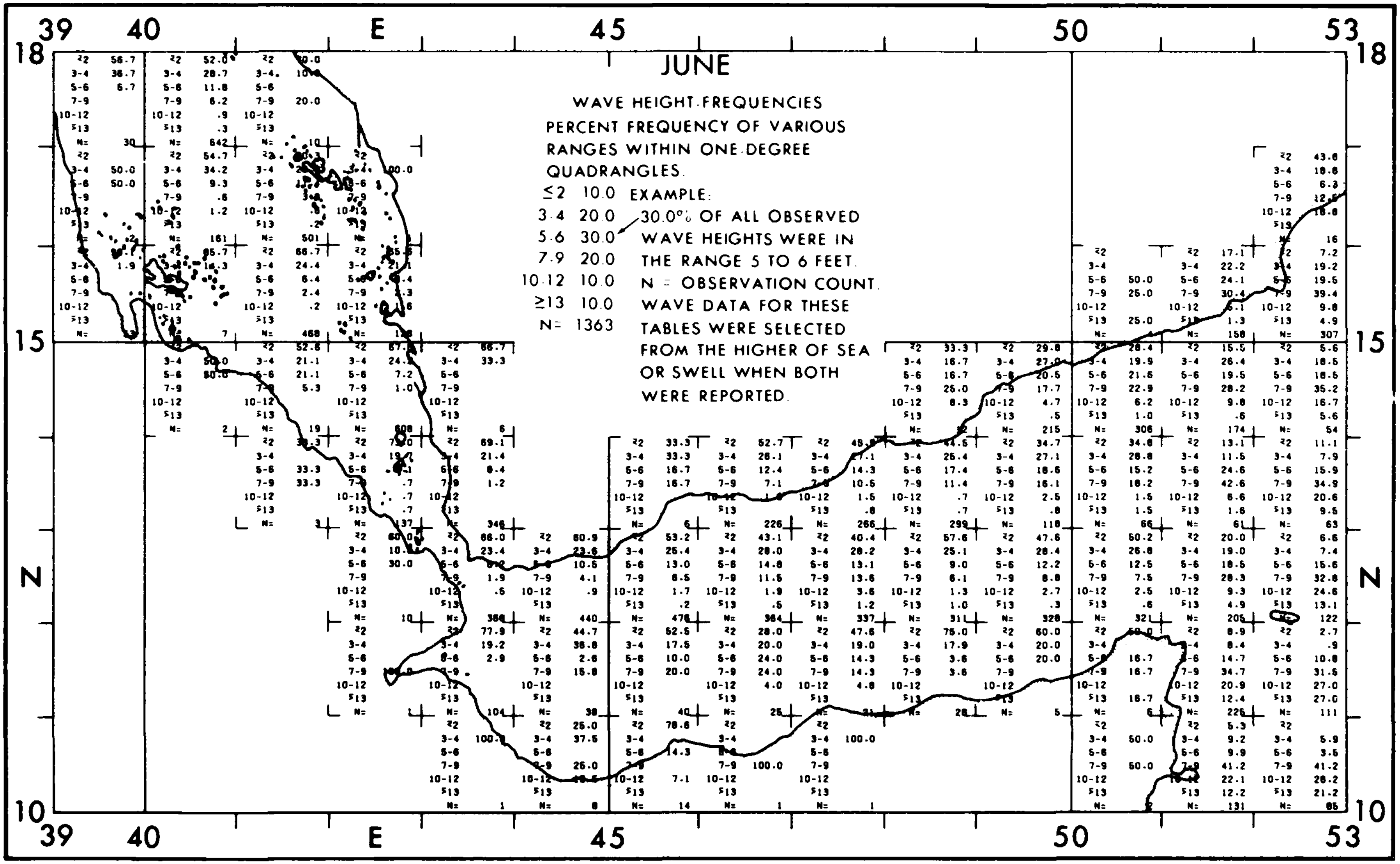


JUNE
WIND SPEED
PERCENT FREQUENCY OF:
WIND SPEED 11-21 KNOTS — SOLID LINE
WIND SPEED 22-33 KNOTS - - DASHED LINE
39
40
45
50
53
18
15
10
N
E
10
20
30
40
50

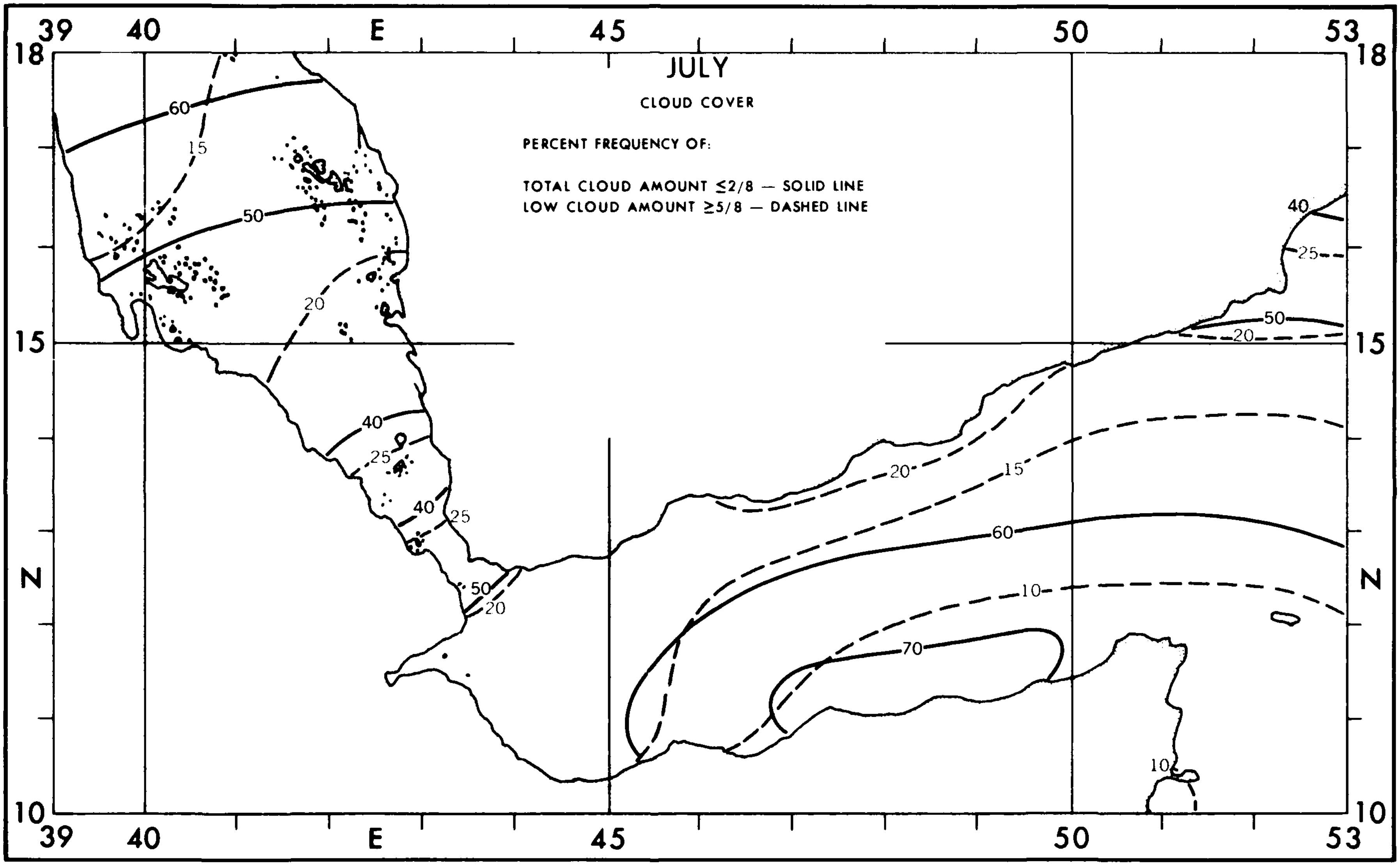

JUNE
SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%.
25% OF ALL WINDS WERE FROM NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR.
MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
MEAN SCALAR SPEED.
OBSERVATION COUNT.
PERCENT OF CALMS.
39
40
E
45
50
53
18
15
N
10

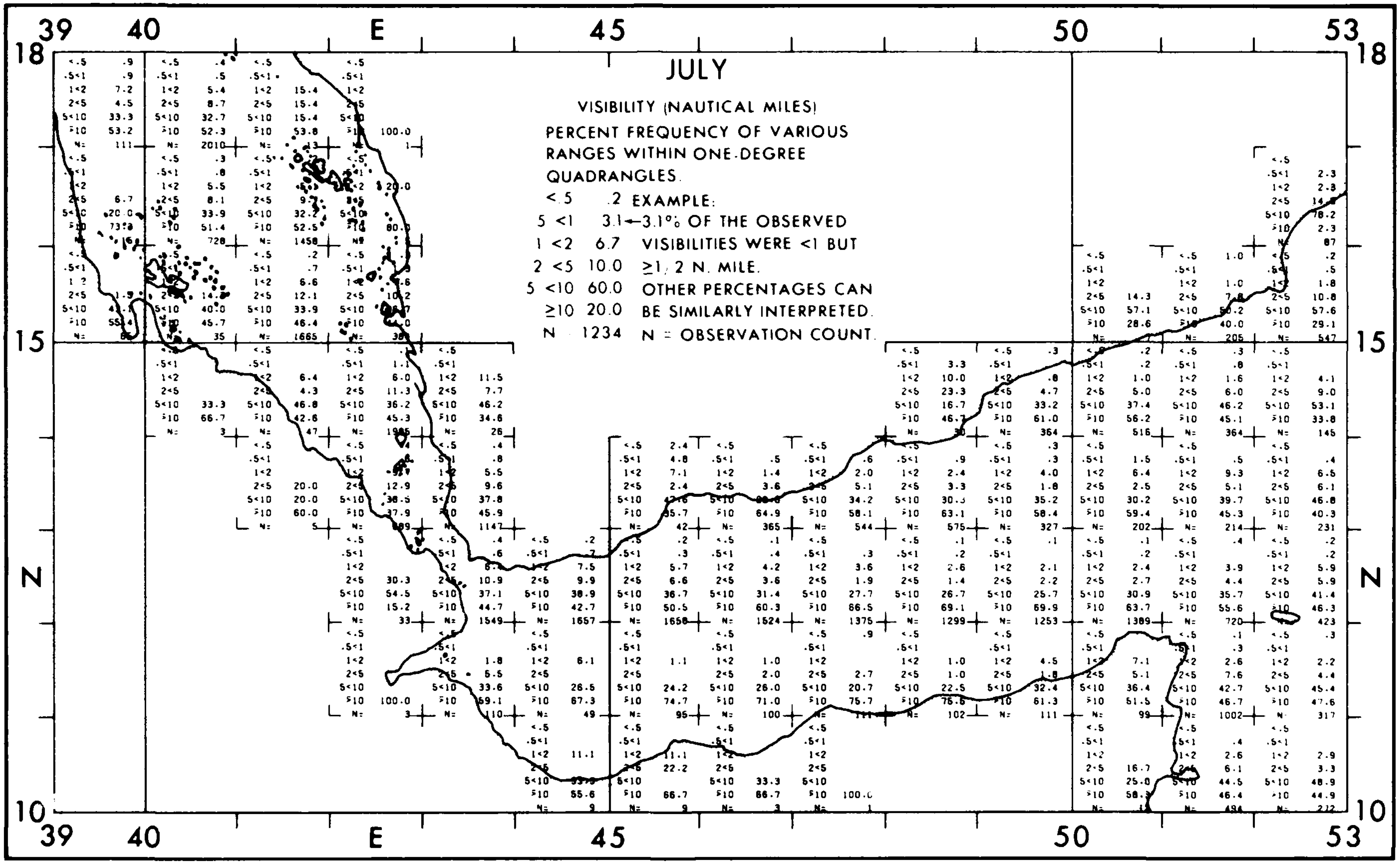

JUNE
AIR AND SEA TEMPERATURE
MEAN AIR TEMPERATURE (°F) — SOLID LINE
MEAN SEA SURFACE TEMPERATURE (°F) —
DASHED LINE
53
18
15
N
10
50
45
E
40
39
88
89
87
86
85
84
83
82
81
80
79
78
77
76
75
74
73
90
91
92

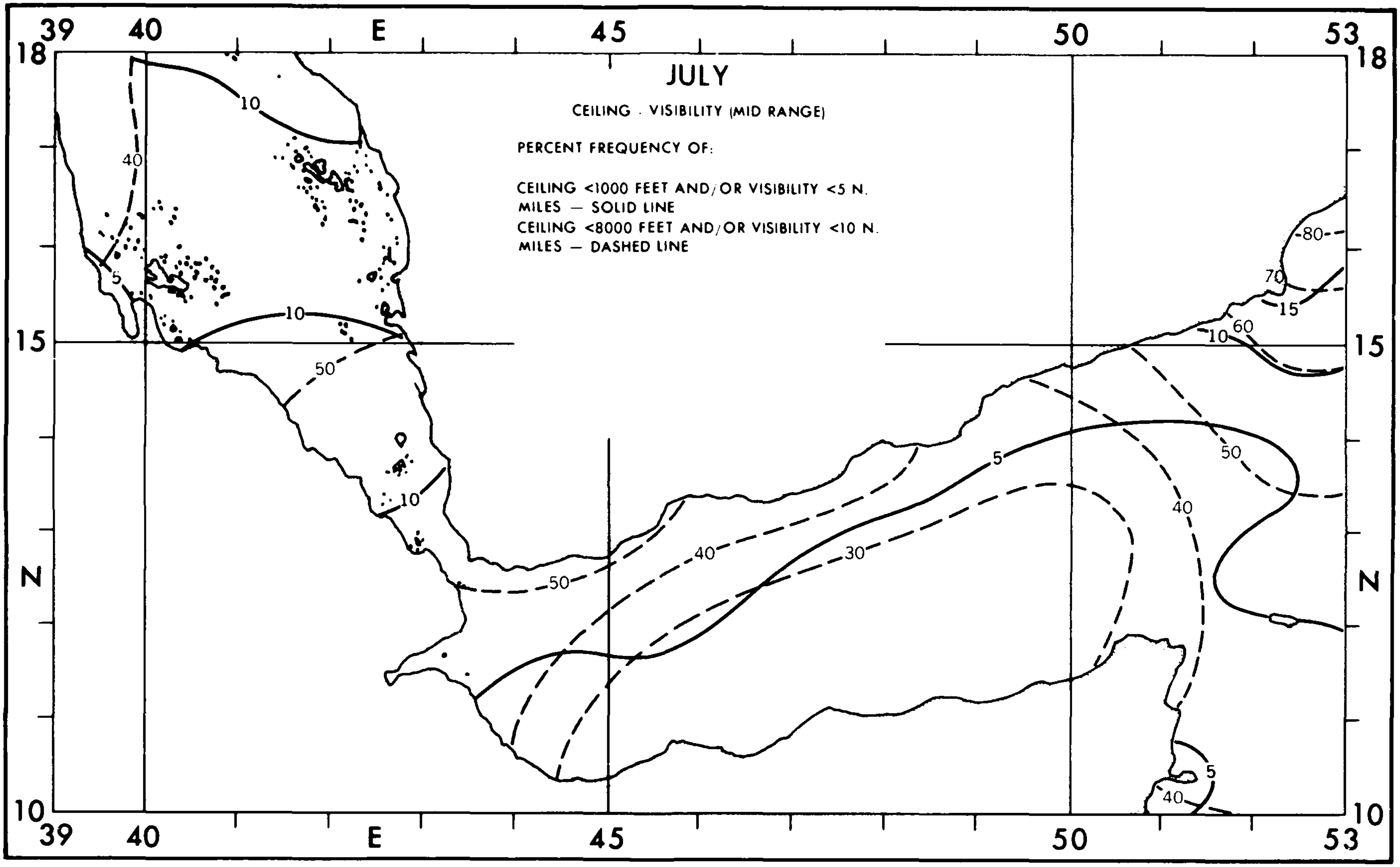

JUNE
WAVE HEIGHT - ISOPLETHS
PERCENT FREQUENCY OF:
WAVE HEIGHT ≥3 FEET — SOLID LINE
WAVE HEIGHT ≥8 FEET — DASHED LINE
THE WAVE HEIGHT USED FOR THIS MAP IS THE HIGHER OF SEA OR SWELL FOR OBSERVATIONS CONTAINING BOTH WAVE TRAINS. SEA IS DEFINED AS WAVES GENERATED BY LOCAL WINDS.
≥3 FEET = ≥CODE 2 (2 HALF METERS)
≥8 FEET = ≥CODE 5 (5 HALF METERS)
39
40
E
45
50
53
18
15
N
10
40
30
20
10
60
70
80
90



JUNE
WAVE HEIGHT FREQUENCIES
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
≤2 10.0
3-4 20.0
5-6 30.0
7-9 20.0
10-12 10.0
≥13 10.0
N= 1363
EXAMPLE:
30.0% OF ALL OBSERVED WAVE HEIGHTS WERE IN THE RANGE 5 TO 6 FEET.
N = OBSERVATION COUNT.
WAVE DATA FOR THESE TABLES WERE SELECTED FROM THE HIGHER OF SEA OR SWELL WHEN BOTH WERE REPORTED.
39
40
E
45
50
53
18
15
N
10


JULY
CLOUD COVER
PERCENT FREQUENCY OF:
TOTAL CLOUD AMOUNT ≤2/8 — SOLID LINE
LOW CLOUD AMOUNT ≥5/8 — DASHED LINE
39
40
E
45
50
53
18
15
N
10
60
15
50
20
40
25
40
25
50
20
20
15
60
10
70
10
40
25
50
20


JULY
VISIBILITY (NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
<.5 .2 EXAMPLE:
.5 <1 3.1←3.1% OF THE OBSERVED
1 <2 6.7 VISIBILITIES WERE <1 BUT
2 <5 10.0 ≥1/2 N. MILE.
5 <10 60.0 OTHER PERCENTAGES CAN
≥10 20.0 BE SIMILARLY INTERPRETED.
N 1234 N = OBSERVATION COUNT.
39
40
E
45
50
53
18
15
N
10


JULY
CEILING - VISIBILITY (MID RANGE)
PERCENT FREQUENCY OF:
CEILING <1000 FEET AND/OR VISIBILITY <5 N. MILES — SOLID LINE
CEILING <8000 FEET AND/OR VISIBILITY <10 N. MILES — DASHED LINE
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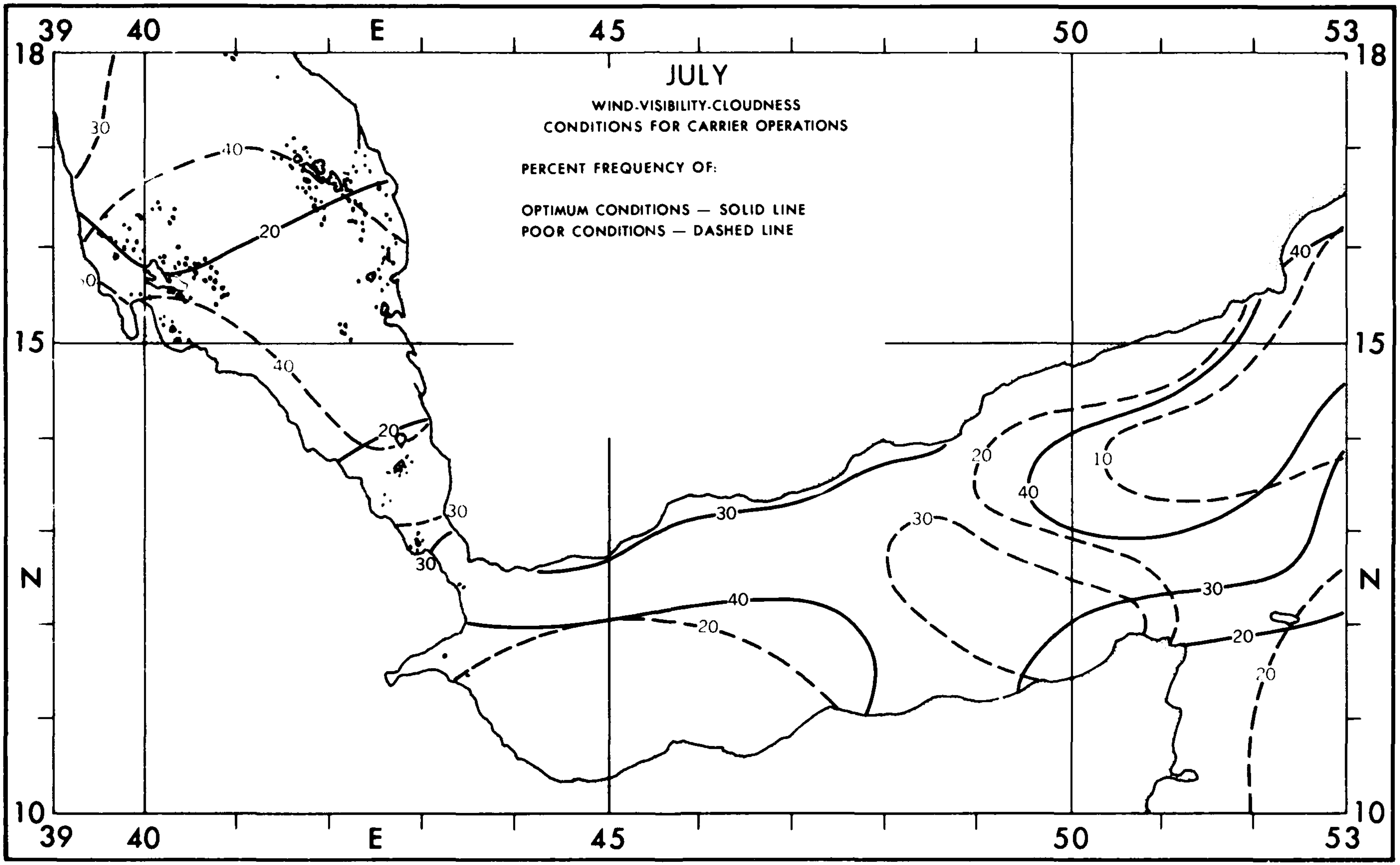
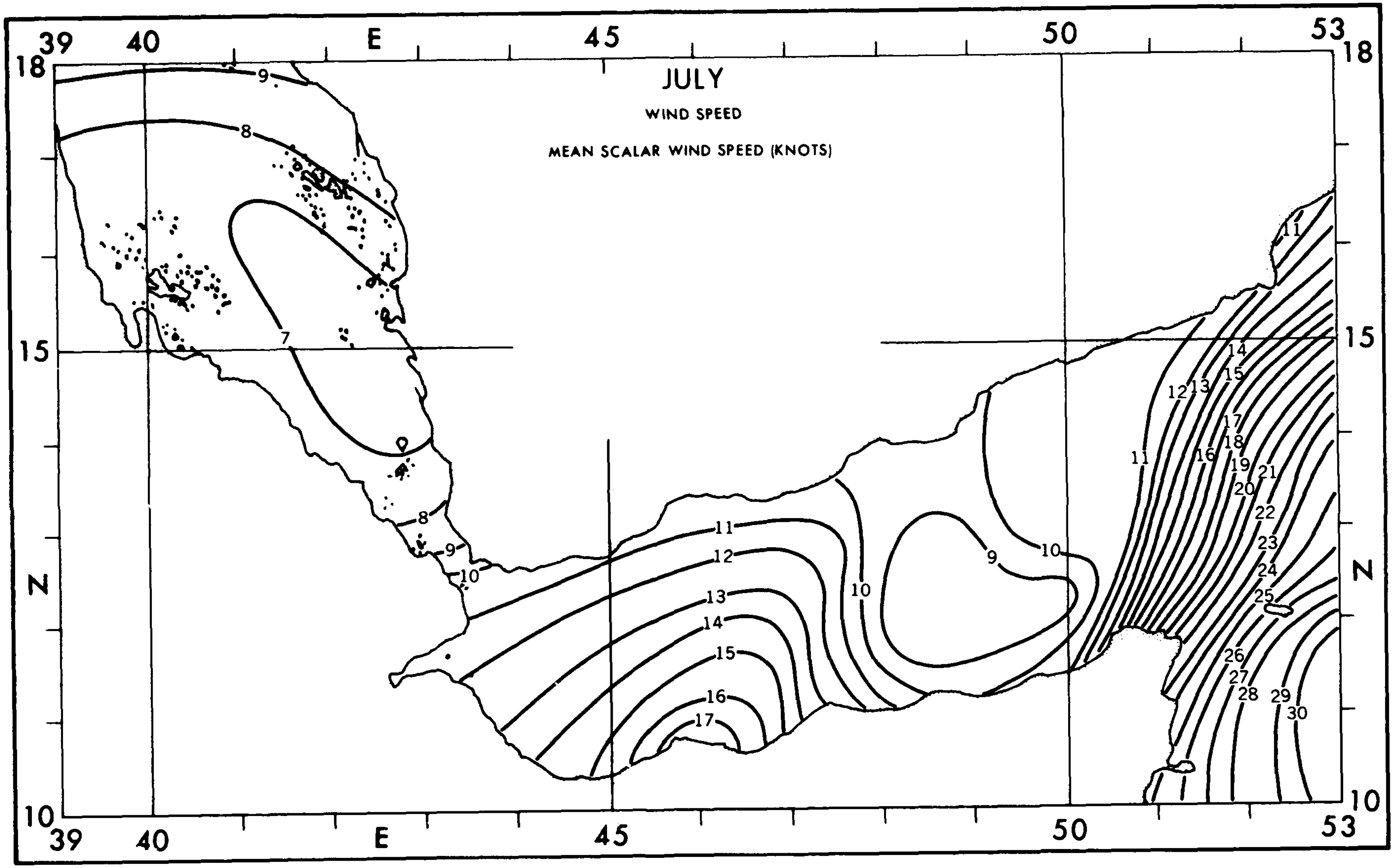
40
E
45
50
53
18
15
N
10
80
70
60
50
40
30
10
5


JULY
WIND-VISIBILITY-CLOUDNESS
CONDITIONS FOR CARRIER OPERATIONS
PERCENT FREQUENCY OF:
OPTIMUM CONDITIONS — SOLID LINE
POOR CONDITIONS — DASHED LINE
39
40
E
45
50
53
18
15
N
10


JULY
WIND SPEED
MEAN SCALAR WIND SPEED (KNOTS)
39
40
E
45
50
53
18
15
N
10
7
8
9
10
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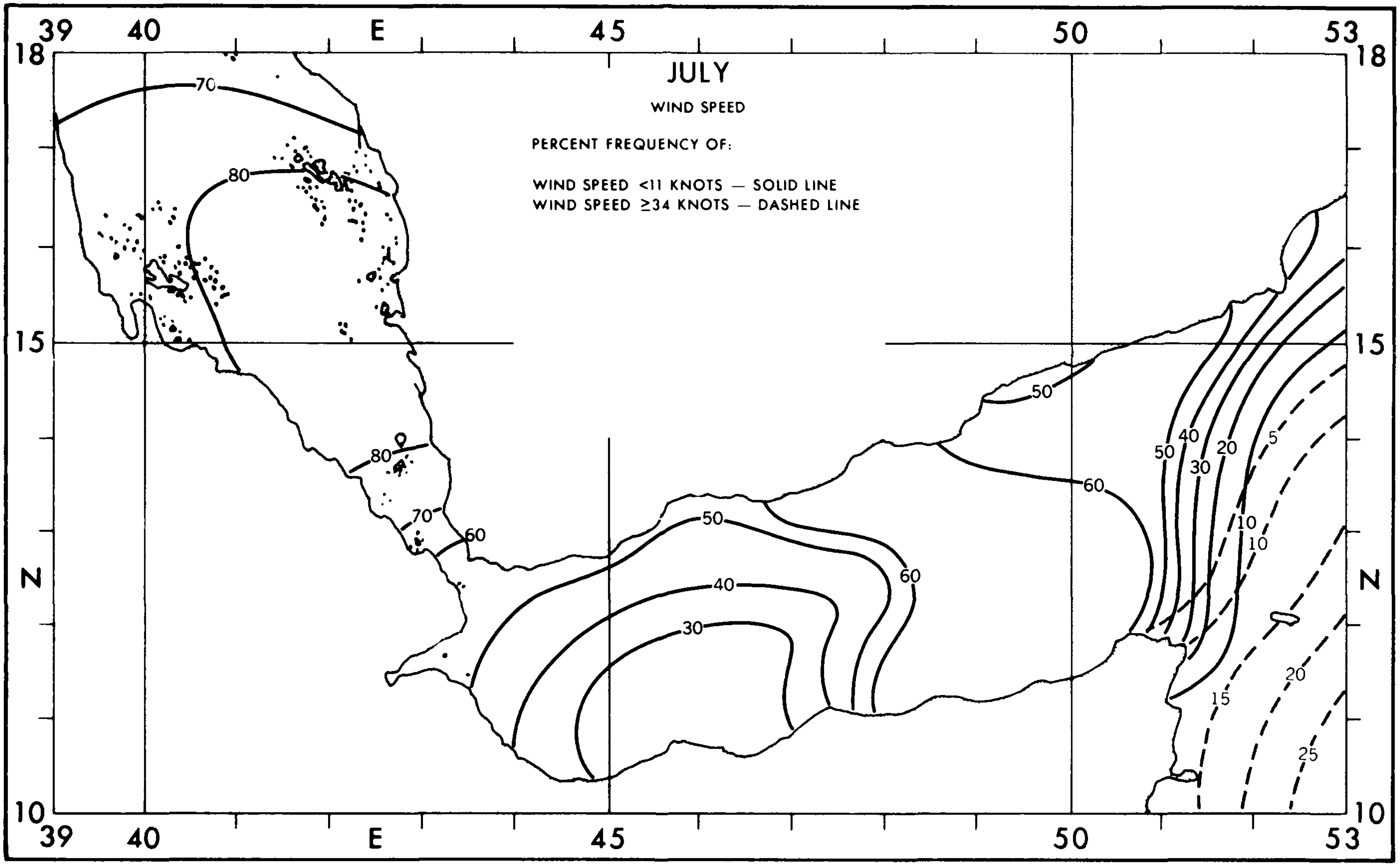
JULY
WIND SPEED
PERCENT FREQUENCY OF:
WIND SPEED <11 KNOTS — SOLID LINE
WIND SPEED ≥34 KNOTS — DASHED LINE
39
40
E
45
50
53
18
15
N
10
70
80
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50
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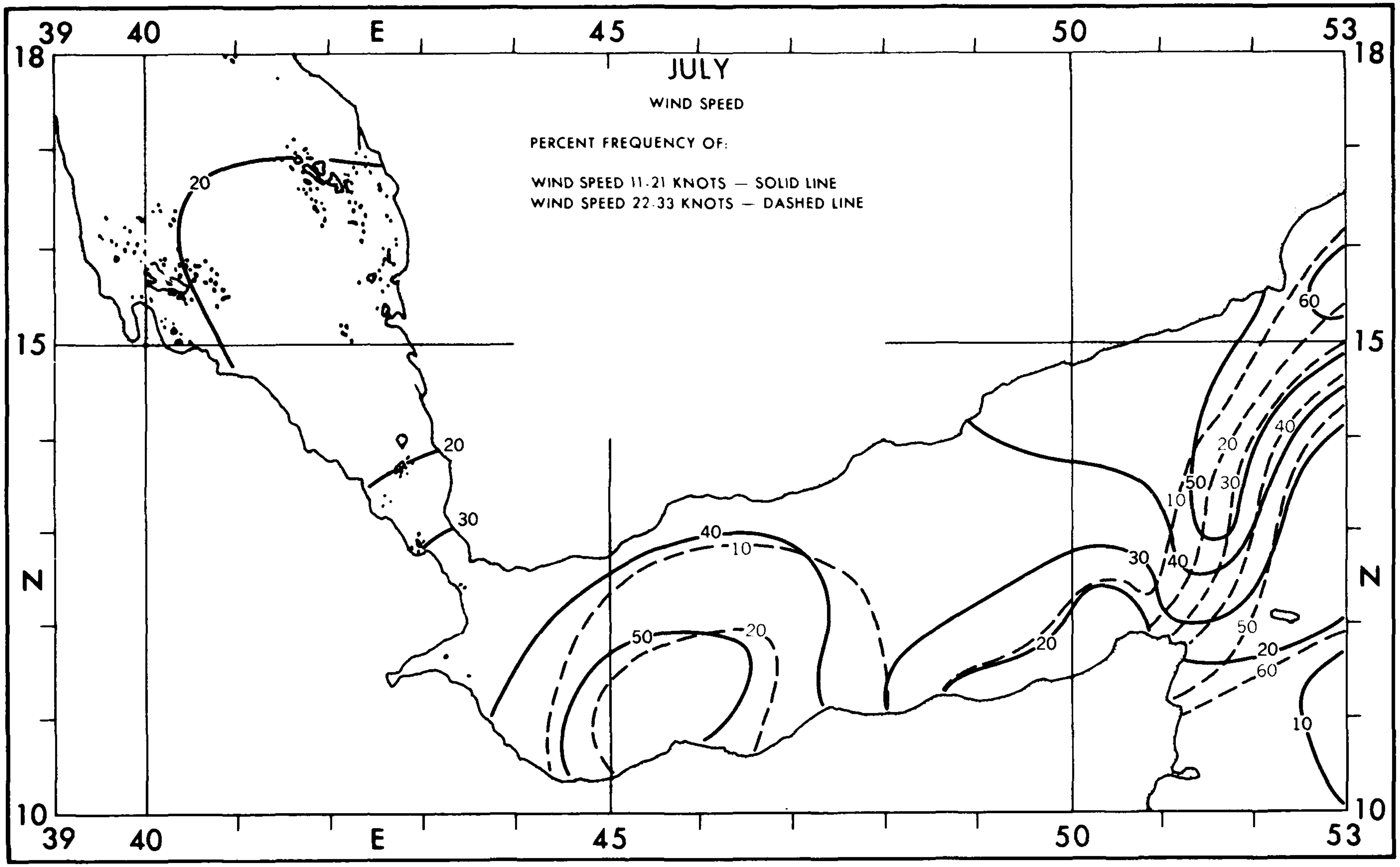
30
20
5
10
15
25


JULY
WIND SPEED
PERCENT FREQUENCY OF:
WIND SPEED 11-21 KNOTS — SOLID LINE
WIND SPEED 22-33 KNOTS — DASHED LINE
39
40
E
45
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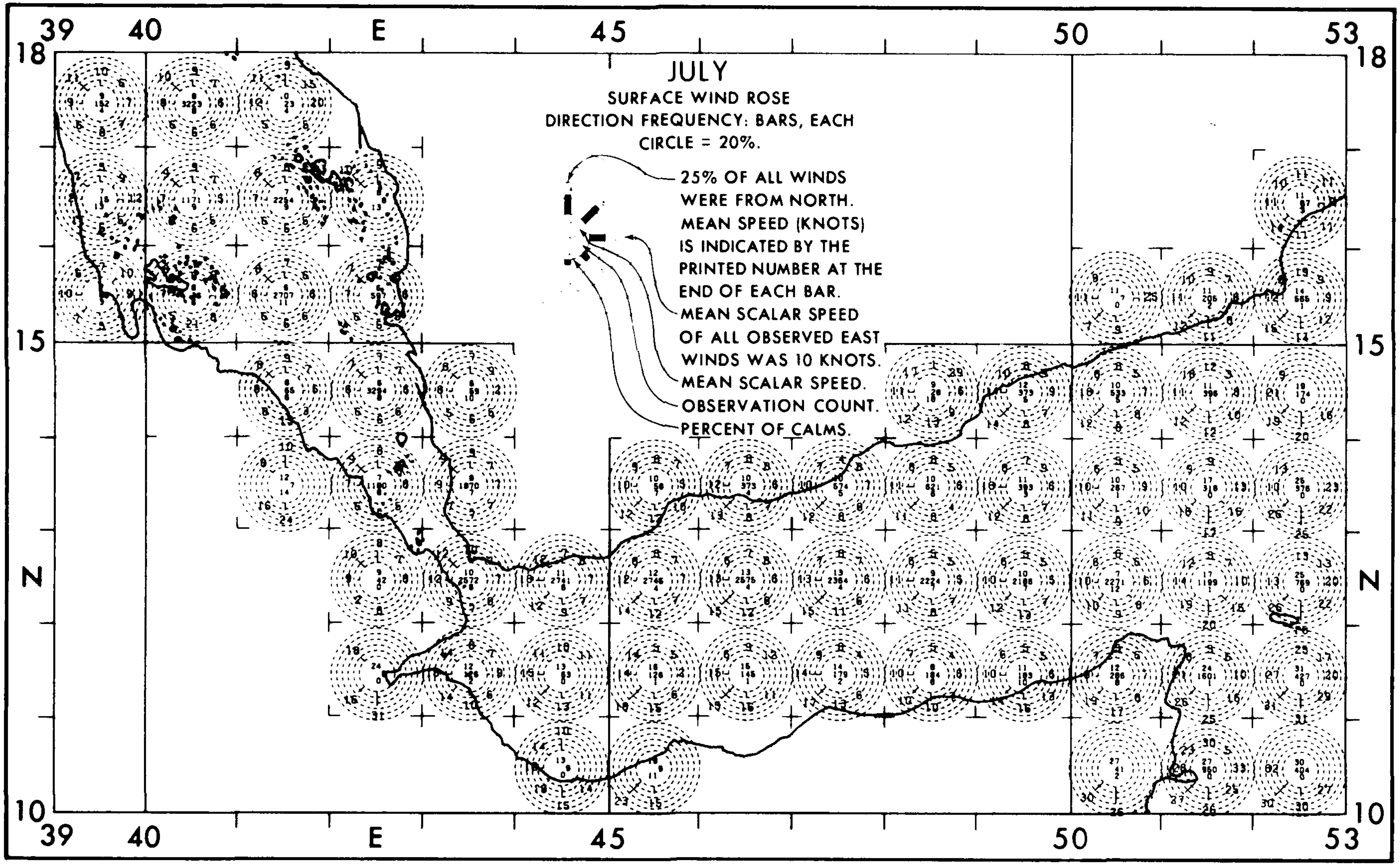
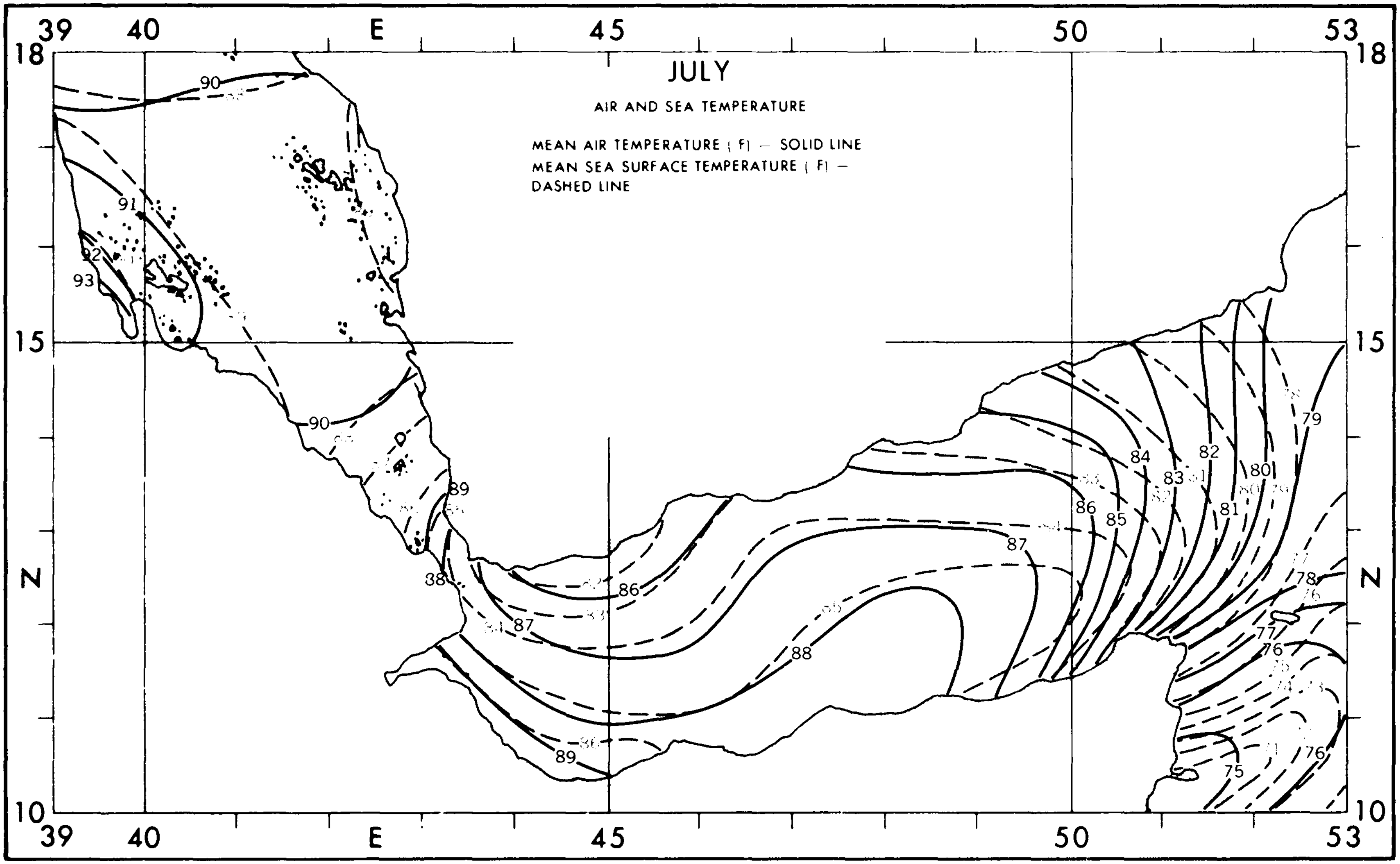
18
15
N
10
20
30
40
10
50
20
60


JULY
SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH
CIRCLE = 20%.
25% OF ALL WINDS
WERE FROM NORTH.
MEAN SPEED (KNOTS)
IS INDICATED BY THE
PRINTED NUMBER AT THE
END OF EACH BAR.
MEAN SCALAR SPEED
OF ALL OBSERVED EAST
WINDS WAS 10 KNOTS.
MEAN SCALAR SPEED.
OBSERVATION COUNT.
PERCENT OF CALMS.
39
40
E
45
50
53
18
15
N
10


JULY
AIR AND SEA TEMPERATURE
MEAN AIR TEMPERATURE (F) — SOLID LINE
MEAN SEA SURFACE TEMPERATURE (F) — DASHED LINE
39
40
E
45
50
53
18
15
N
10
90
91
92
93
89
88
87
86
85
84
83
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75

AD-A121 003 CLIMATIC STUDY OF THE RED SEA SOUTH AND GULF OF ADEN (U) NAVAL OCEANOGRAPHY COMMAND DETACHMENT ASHEVILLE NC SEP 82 2/2

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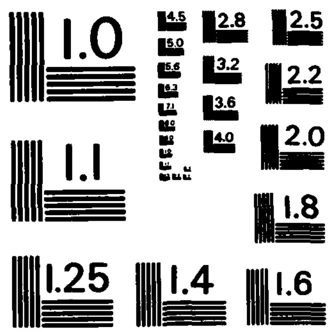

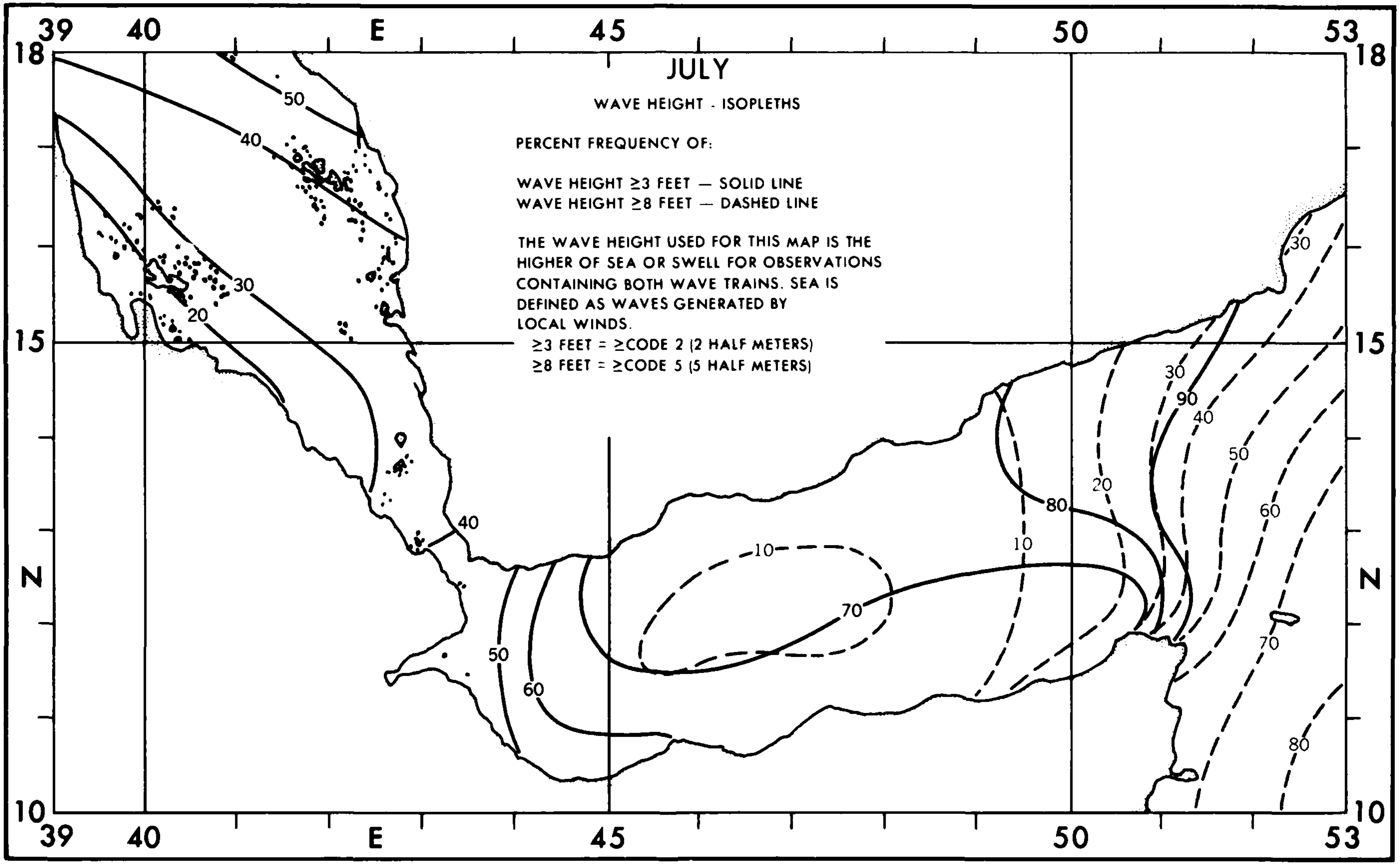
JULY
WAVE HEIGHT - ISOPLETHS
PERCENT FREQUENCY OF:
WAVE HEIGHT ≥3 FEET — SOLID LINE
WAVE HEIGHT ≥8 FEET — DASHED LINE
THE WAVE HEIGHT USED FOR THIS MAP IS THE HIGHER OF SEA OR SWELL FOR OBSERVATIONS CONTAINING BOTH WAVE TRAINS. SEA IS DEFINED AS WAVES GENERATED BY LOCAL WINDS.
≥3 FEET = ≥CODE 2 (2 HALF METERS)
≥8 FEET = ≥CODE 5 (5 HALF METERS)
39
40
E
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N
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80
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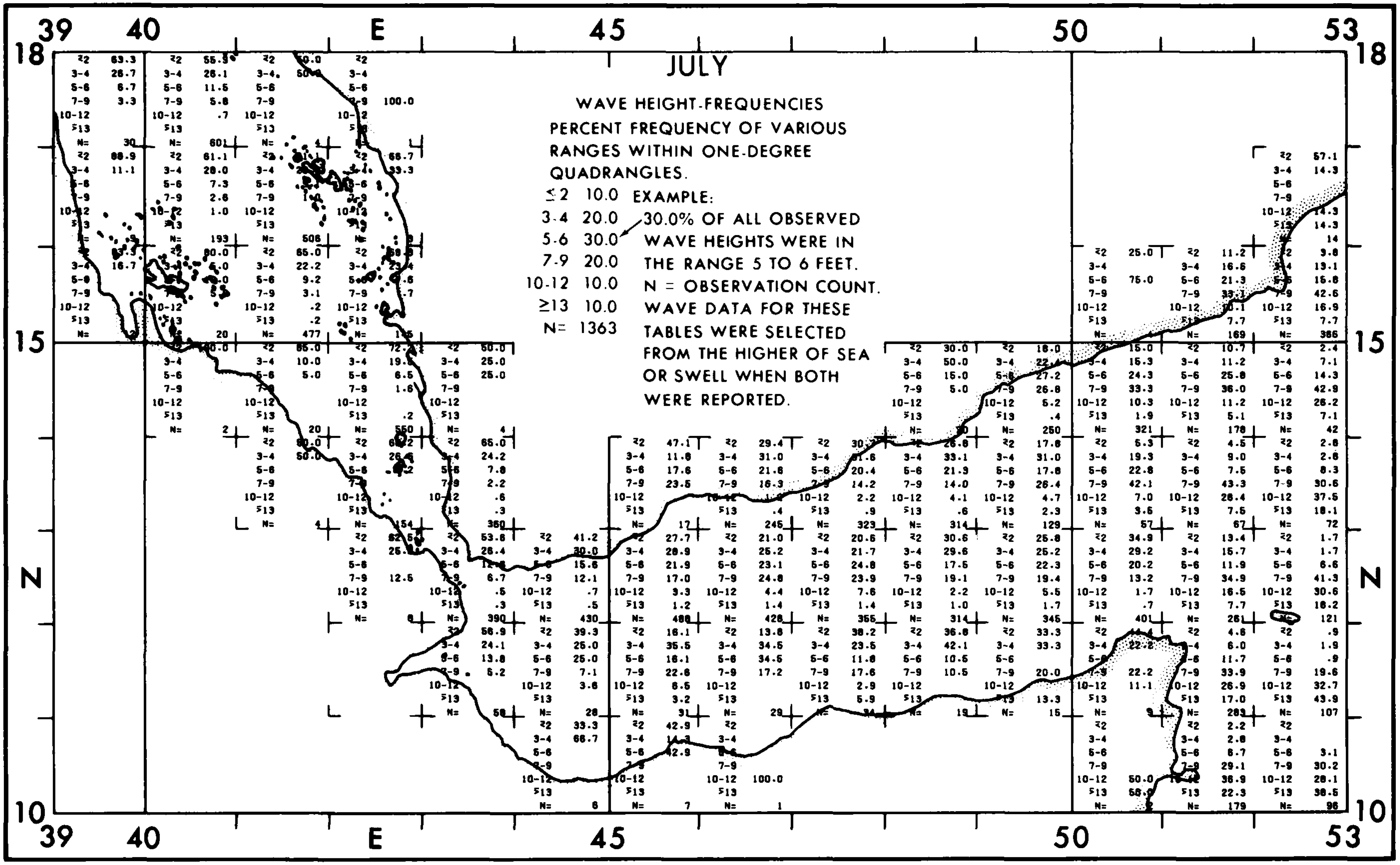
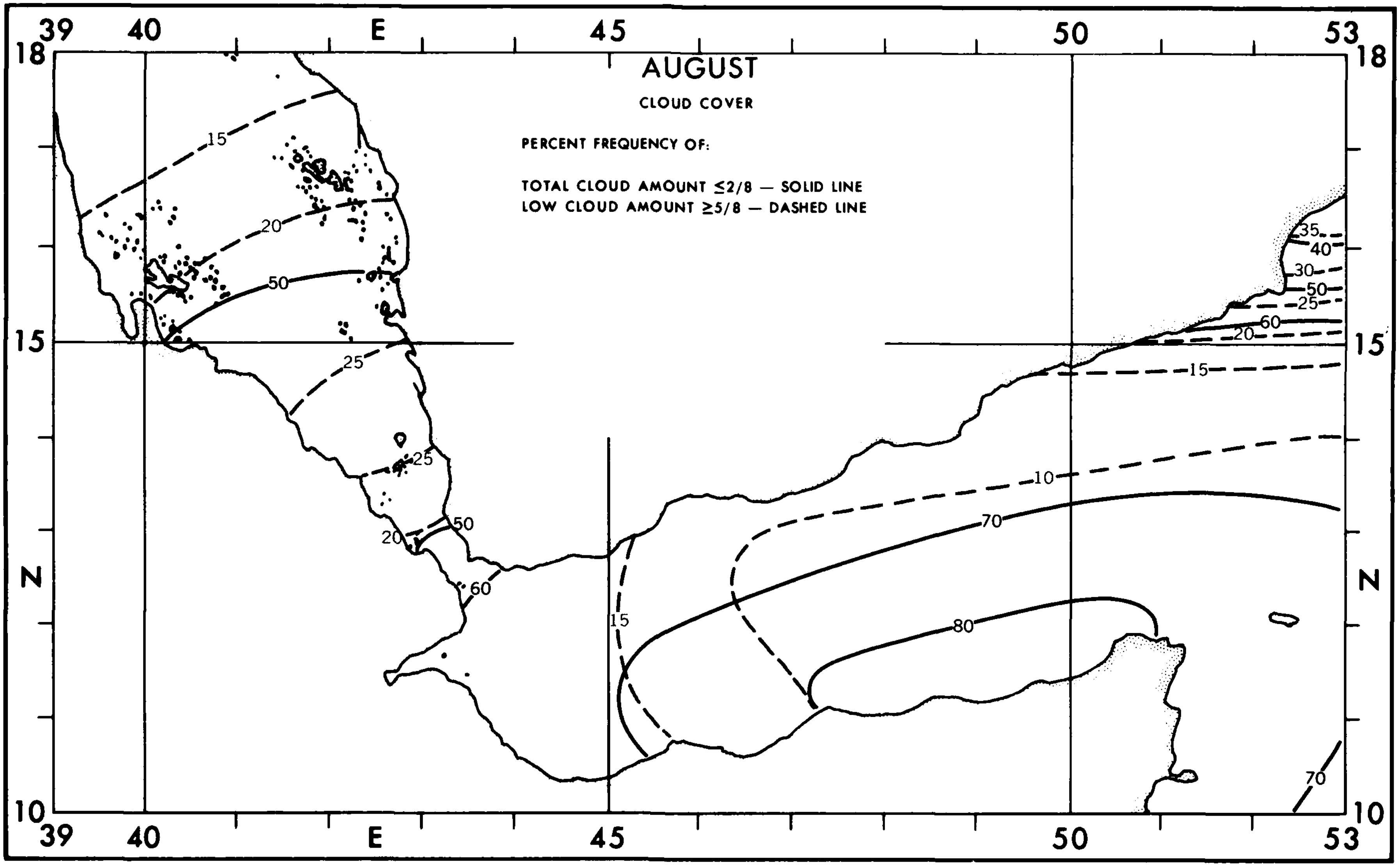

JULY
WAVE HEIGHT-FREQUENCIES
PERCENT FREQUENCY OF VARIOUS
RANGES WITHIN ONE-DEGREE
QUADRANGLES.
≤2 10.0
3-4 20.0
5-6 30.0
7-9 20.0
10-12 10.0
≥13 10.0
N= 1363
EXAMPLE:
30.0% OF ALL OBSERVED
WAVE HEIGHTS WERE IN
THE RANGE 5 TO 6 FEET.
N = OBSERVATION COUNT.
WAVE DATA FOR THESE
TABLES WERE SELECTED
FROM THE HIGHER OF SEA
OR SWELL WHEN BOTH
WERE REPORTED.
39
40
E
45
50
53
18
15
N
10


AUGUST
CLOUD COVER
PERCENT FREQUENCY OF:
TOTAL CLOUD AMOUNT ≤2/8 — SOLID LINE
LOW CLOUD AMOUNT ≥5/8 — DASHED LINE
39
40
E
45
50
53
18
15
N
10
15
20
50
25
25
50
20
60
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70
80
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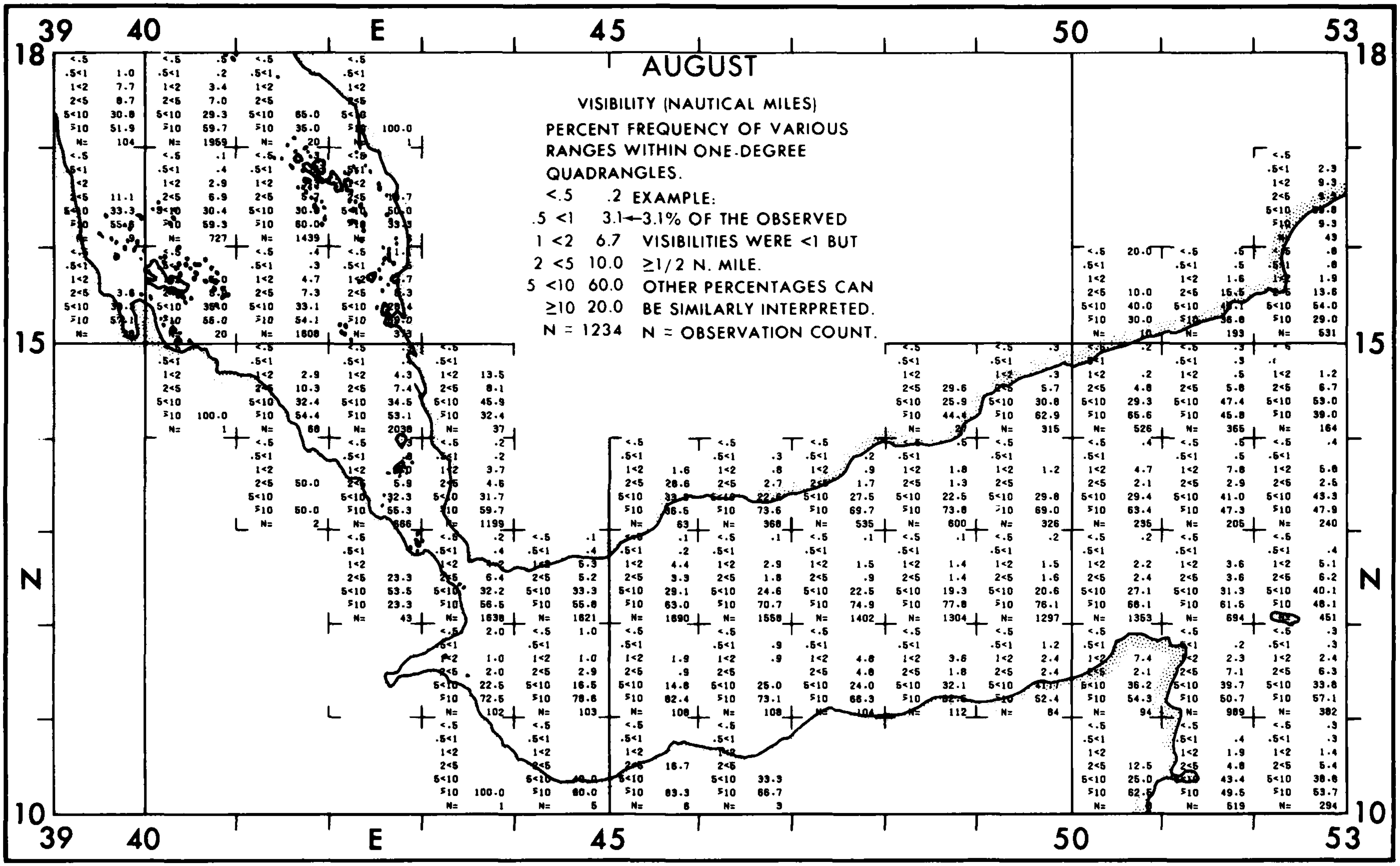
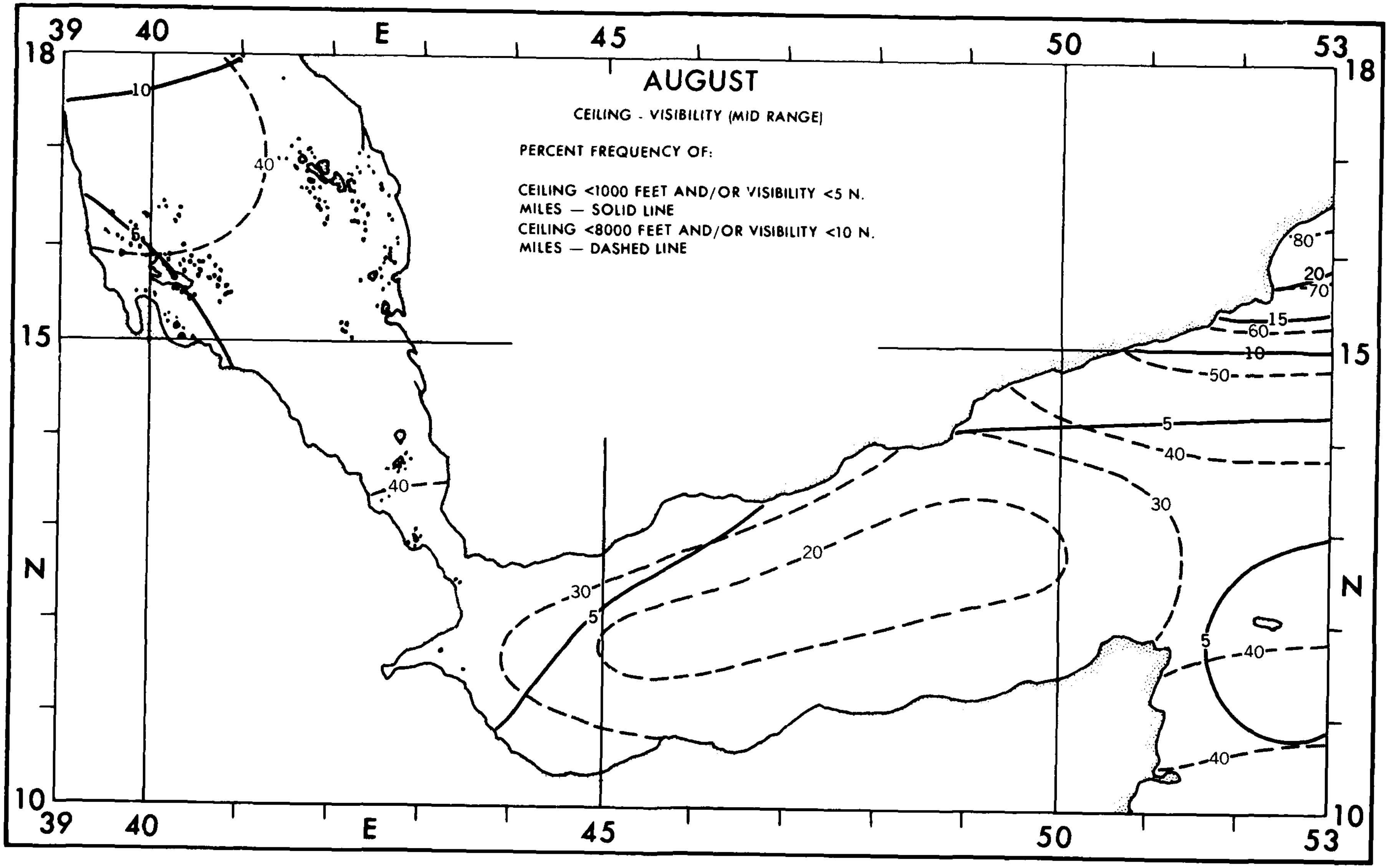
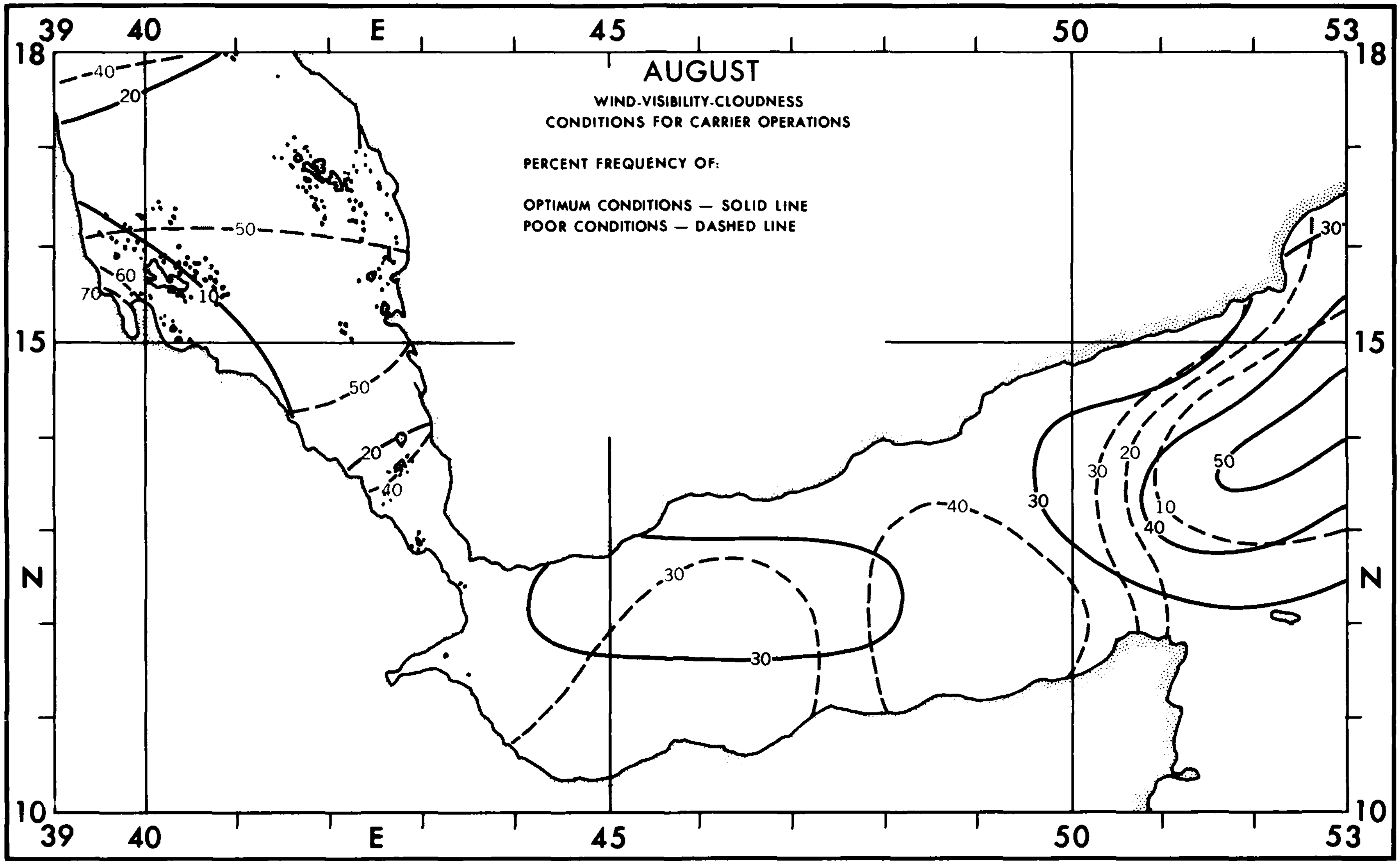
40
30
50
25
60
20
15
70


AUGUST
VISIBILITY (NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
<.5 .2 EXAMPLE:
.5 <1 3.1←3.1% OF THE OBSERVED
1 <2 6.7 VISIBILITIES WERE <1 BUT
2 <5 10.0 ≥1/2 N. MILE.
5 <10 60.0 OTHER PERCENTAGES CAN
≥10 20.0 BE SIMILARLY INTERPRETED.
N = 1234 N = OBSERVATION COUNT.
39
40
E
45
50
53
18
15
N
10



AUGUST
CEILING - VISIBILITY (MID RANGE)
PERCENT FREQUENCY OF:
CEILING <1000 FEET AND/OR VISIBILITY <5 N. MILES — SOLID LINE
CEILING <8000 FEET AND/OR VISIBILITY <10 N. MILES — DASHED LINE
39
40
E
45
50
53
18
15
N
10
80
20
70
15
60
10
50
5
40
30
20


AUGUST
WIND-VISIBILITY-CLOUDNESS
CONDITIONS FOR CARRIER OPERATIONS
PERCENT FREQUENCY OF:
OPTIMUM CONDITIONS — SOLID LINE
POOR CONDITIONS — DASHED LINE
39
40
E
45
50
53
18
15
N
10
40
20
50
60
70
10
50
20
40
30
30
40
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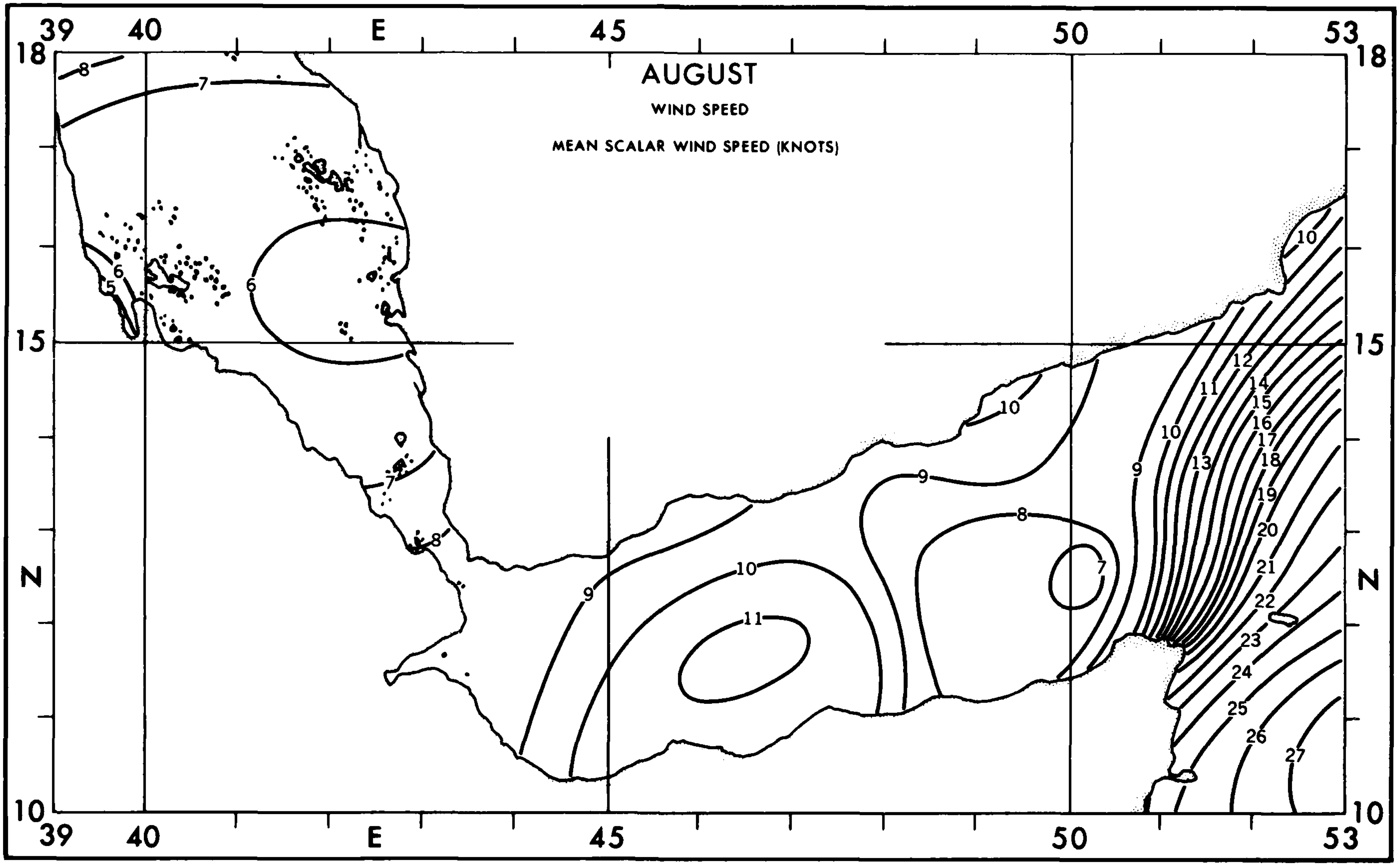
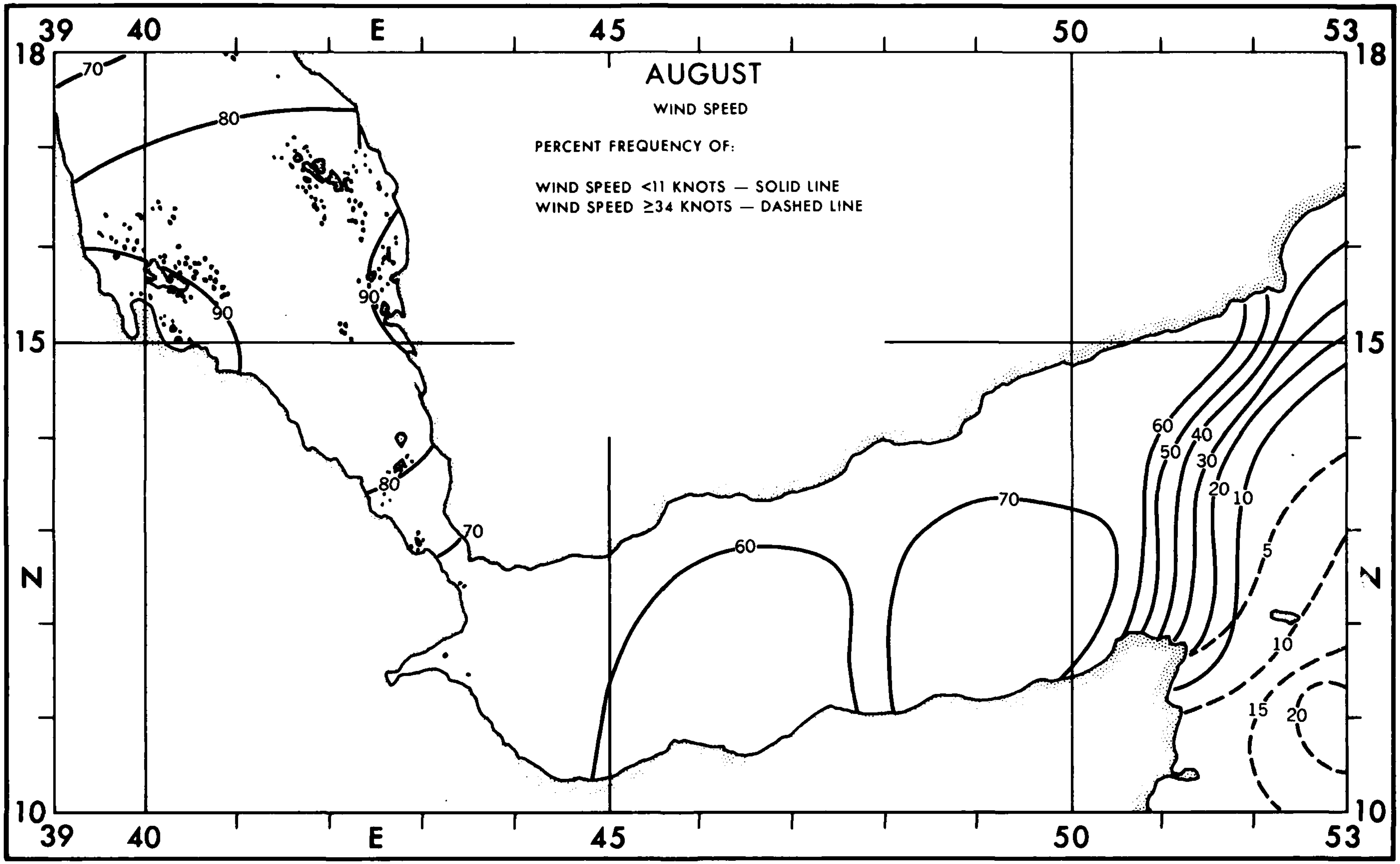
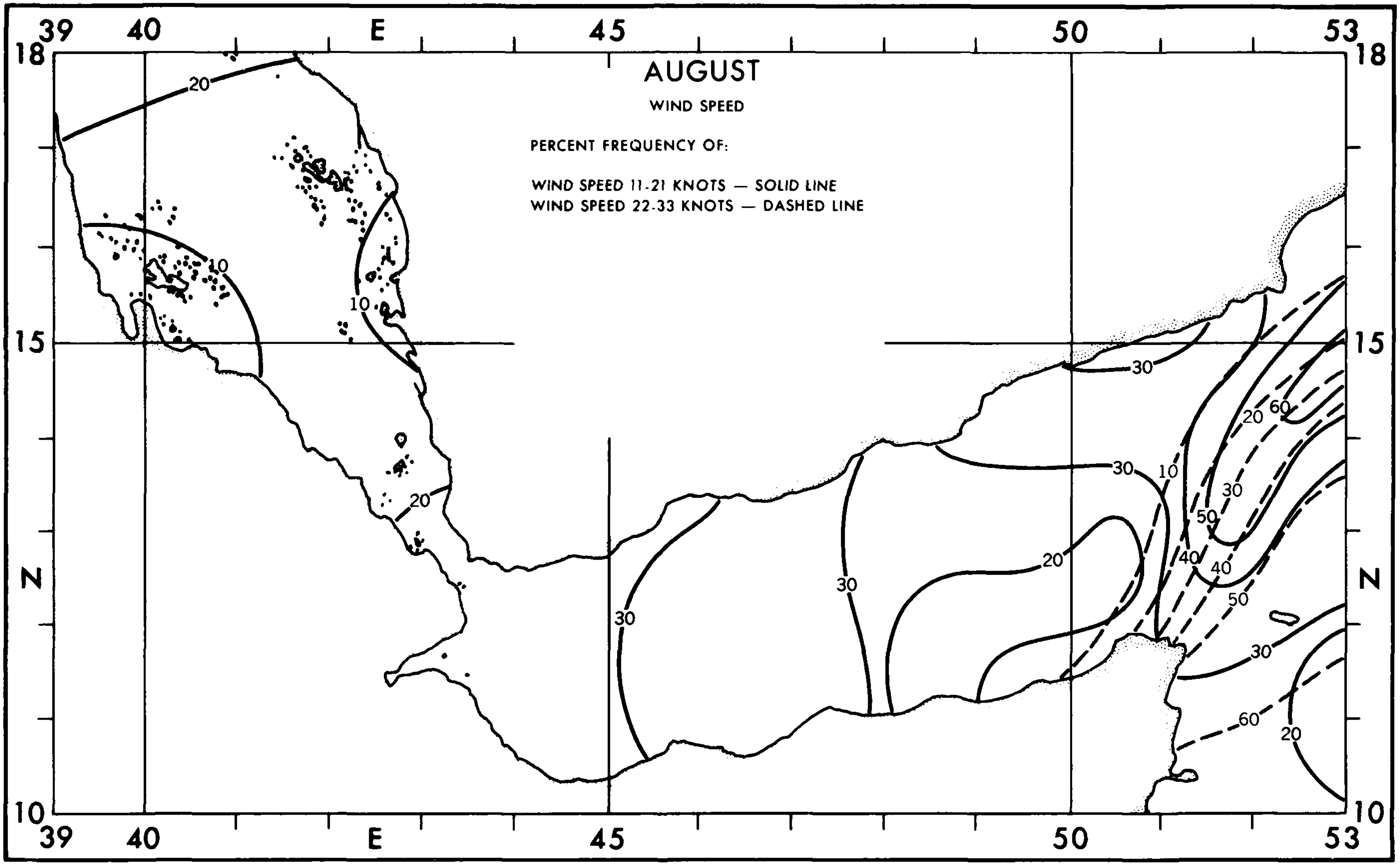
30
20
10
40
50
30


AUGUST
WIND SPEED
MEAN SCALAR WIND SPEED (KNOTS)
39
40
E
45
50
53
18
15
N
10


AUGUST
WIND SPEED
PERCENT FREQUENCY OF:
WIND SPEED <11 KNOTS — SOLID LINE
WIND SPEED ≥34 KNOTS — DASHED LINE
39
40
E
45
50
53
18
15
N
10
70
80
90
60
50
40
30
20
10
5
15
20


AUGUST
WIND SPEED
PERCENT FREQUENCY OF:
WIND SPEED 11-21 KNOTS — SOLID LINE
WIND SPEED 22-33 KNOTS — DASHED LINE
39
40
E
45
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18
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N
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10
30
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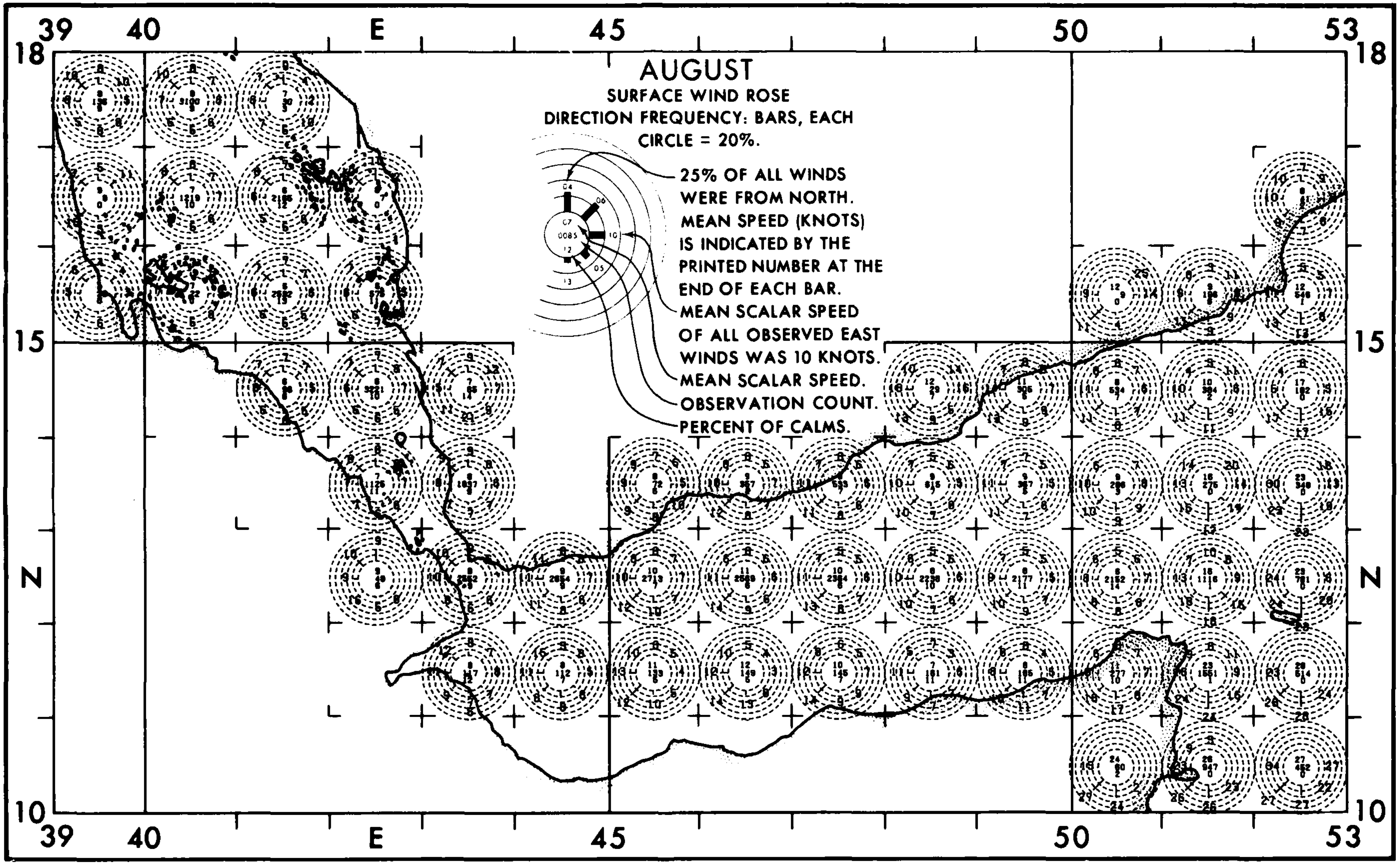
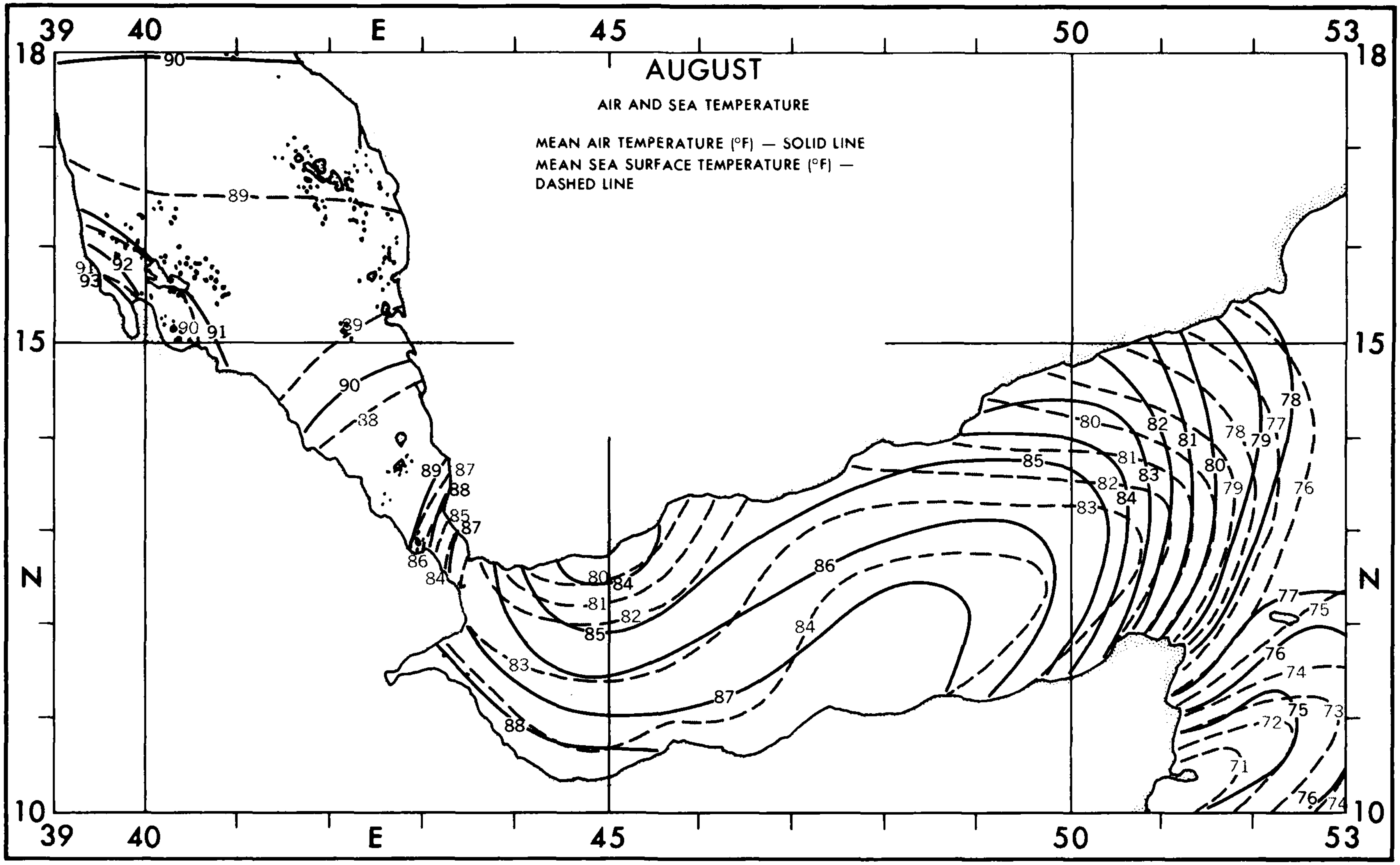
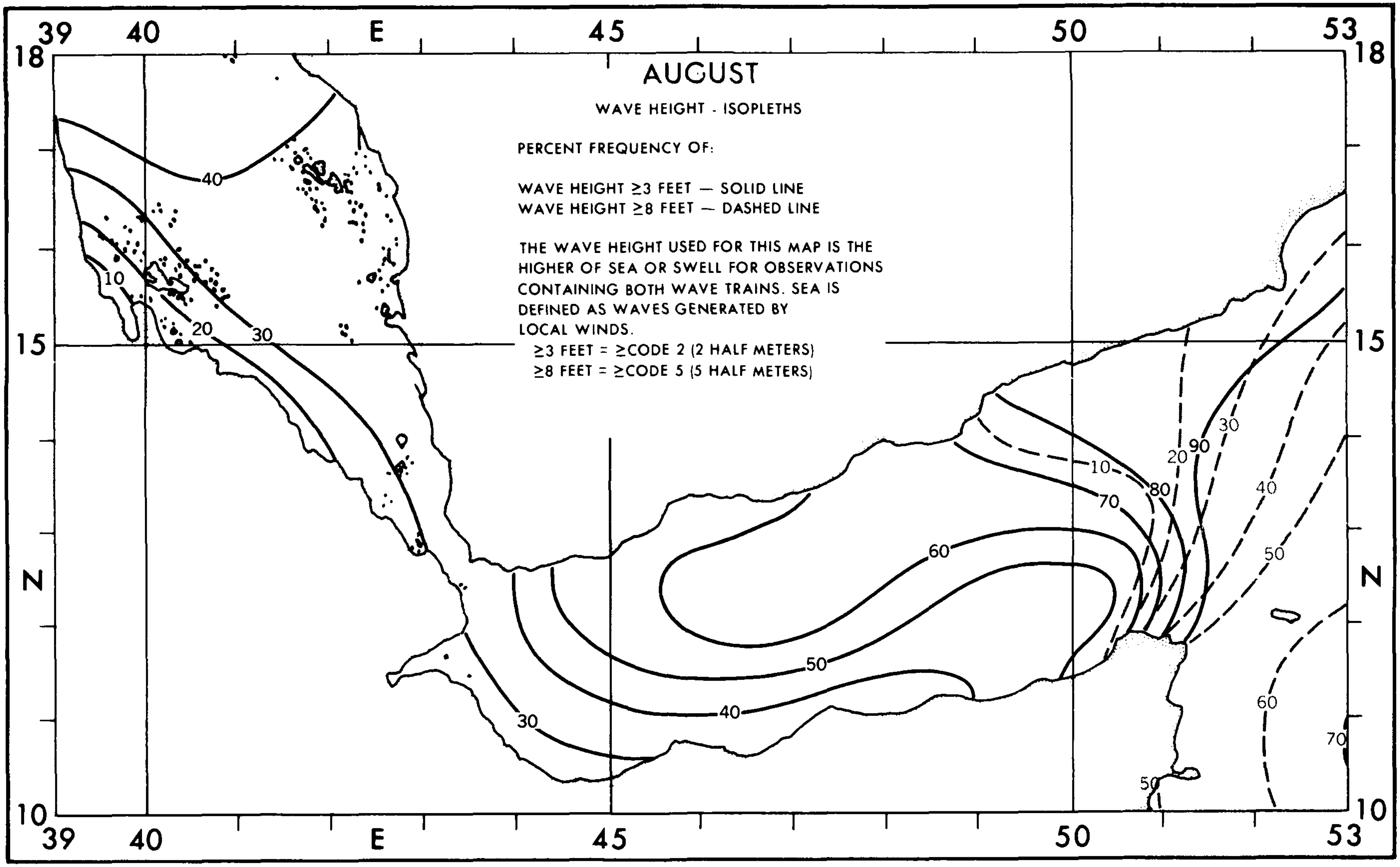
40
50


AUGUST
SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%.
25% OF ALL WINDS WERE FROM NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR.
MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
MEAN SCALAR SPEED.
OBSERVATION COUNT.
PERCENT OF CALMS.
39
40
E
45
50
53
18
15
N
10


AUGUST
AIR AND SEA TEMPERATURE
MEAN AIR TEMPERATURE (°F) — SOLID LINE
MEAN SEA SURFACE TEMPERATURE (°F) — DASHED LINE
39
40
E
45
50
53
18
15
N
10


AUGUST
WAVE HEIGHT - ISOPLETHS
PERCENT FREQUENCY OF:
WAVE HEIGHT ≥3 FEET — SOLID LINE
WAVE HEIGHT ≥8 FEET — DASHED LINE
THE WAVE HEIGHT USED FOR THIS MAP IS THE HIGHER OF SEA OR SWELL FOR OBSERVATIONS CONTAINING BOTH WAVE TRAINS. SEA IS DEFINED AS WAVES GENERATED BY LOCAL WINDS.
≥3 FEET = ≥CODE 2 (2 HALF METERS)
≥8 FEET = ≥CODE 5 (5 HALF METERS)
39
40
E
45
50
53
18
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N
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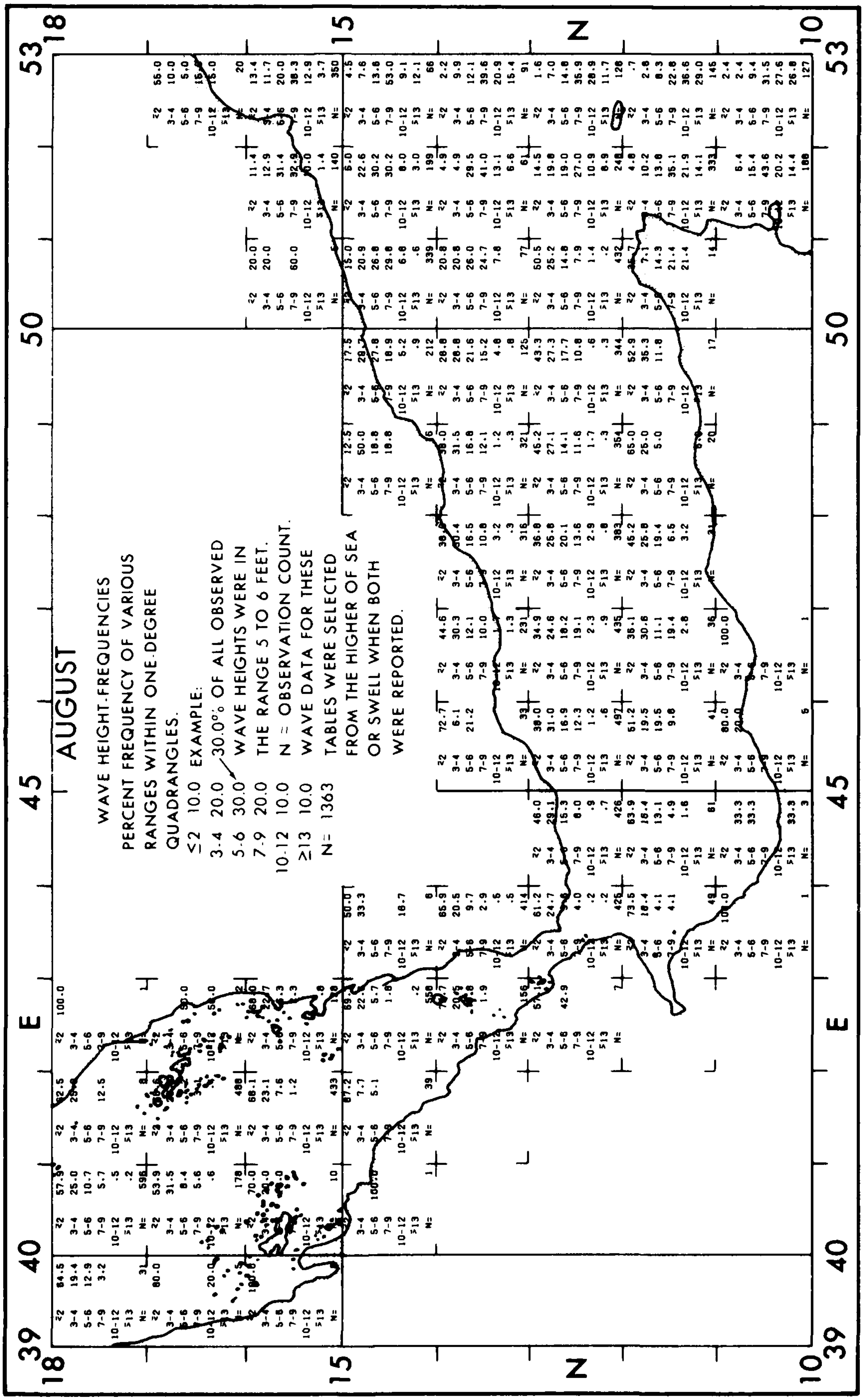
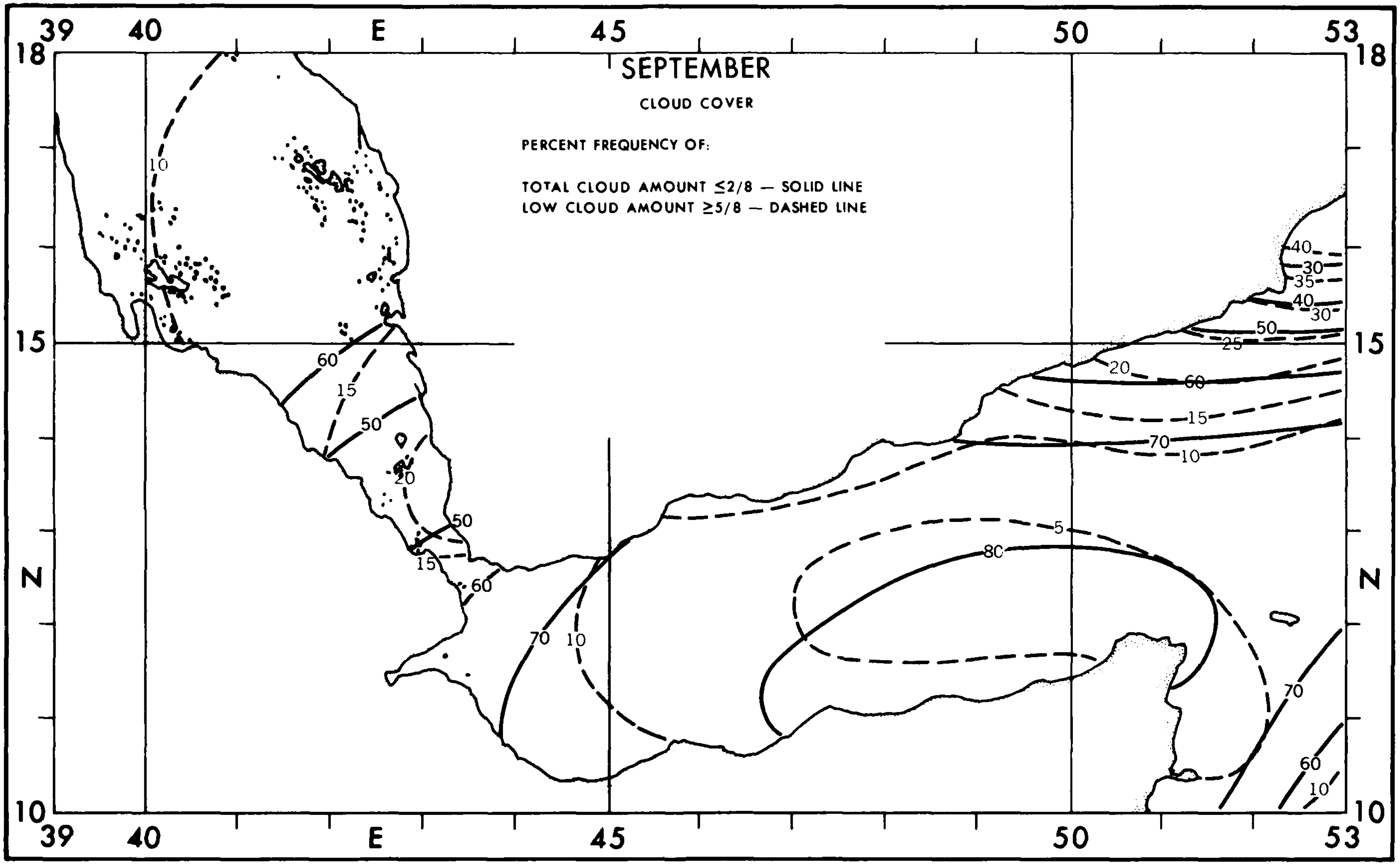

AUGUST
WAVE HEIGHT-FREQUENCIES
PERCENT FREQUENCY OF VARIOUS
RANGES WITHIN ONE-DEGREE
QUADRANGLES.
≤2 10.0 EXAMPLE:
3-4 20.0 30.0% OF ALL OBSERVED
5-6 30.0 WAVE HEIGHTS WERE IN
7-9 20.0 THE RANGE 5 TO 6 FEET.
10-12 10.0 N = OBSERVATION COUNT.
≥13 10.0 WAVE DATA FOR THESE
N= 1363 TABLES WERE SELECTED
FROM THE HIGHER OF SEA
OR SWELL WHEN BOTH
WERE REPORTED.
39
40
45
50
53
18
15
10
N
E


SEPTEMBER
CLOUD COVER
PERCENT FREQUENCY OF:
TOTAL CLOUD AMOUNT ≤2/8 — SOLID LINE
LOW CLOUD AMOUNT ≥5/8 — DASHED LINE
39
40
E
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18
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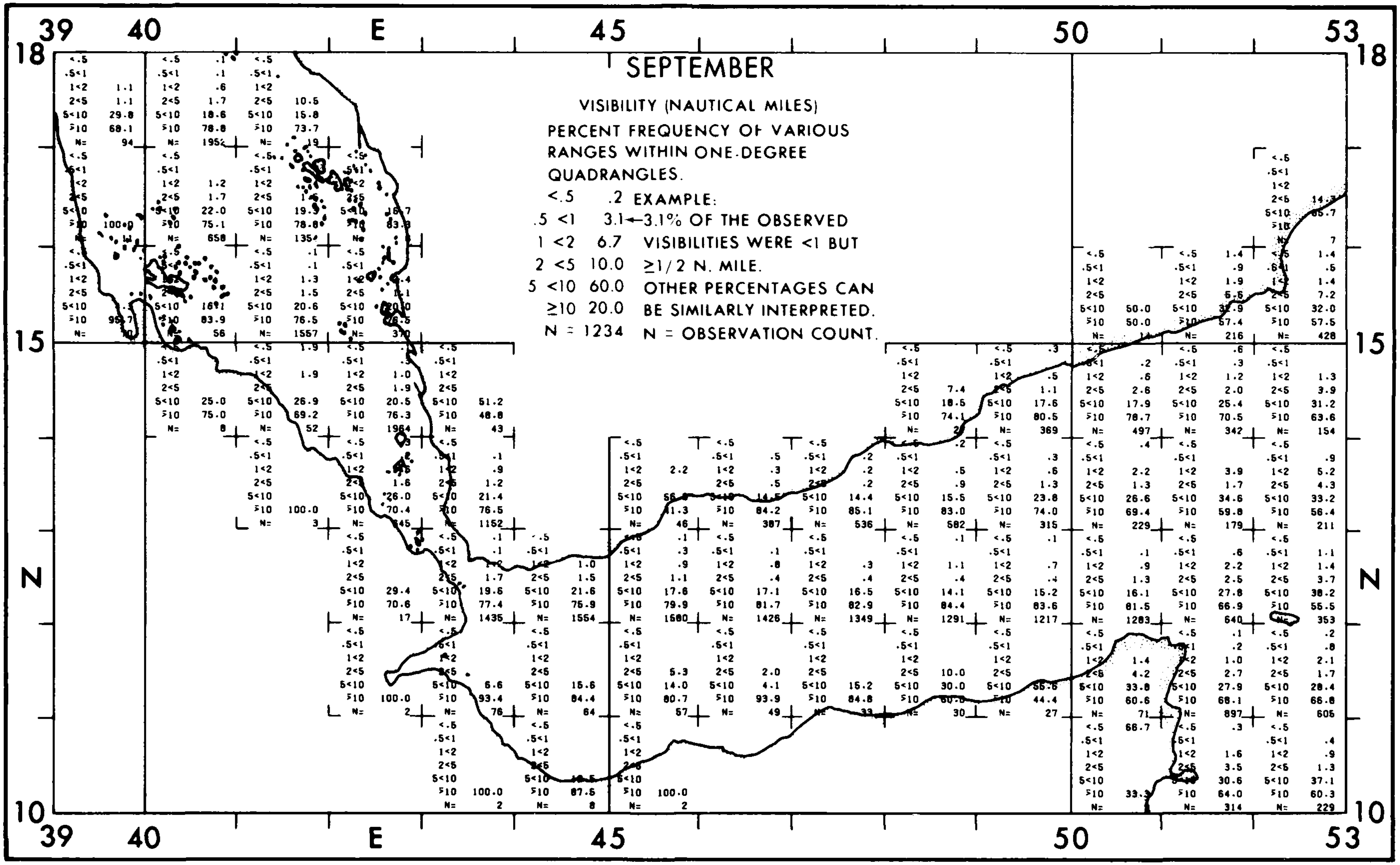
SEPTEMBER
VISIBILITY (NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
<.5 .2 EXAMPLE:
.5 <1 3.1←3.1% OF THE OBSERVED
1 <2 6.7 VISIBILITIES WERE <1 BUT
2 <5 10.0 ≥1/2 N. MILE.
5 <10 60.0 OTHER PERCENTAGES CAN
≥10 20.0 BE SIMILARLY INTERPRETED.
N = 1234 N = OBSERVATION COUNT.
39
40
E
45
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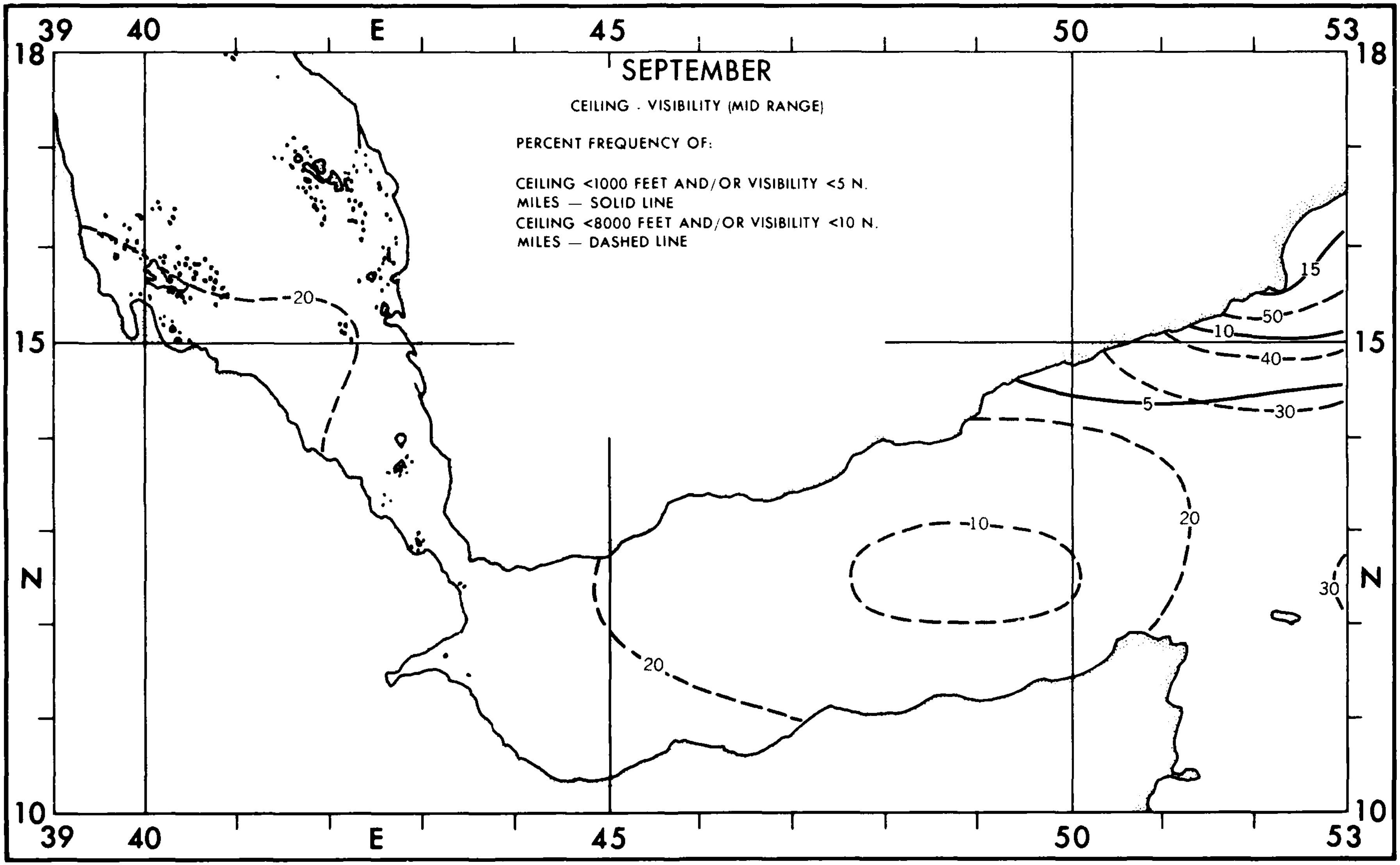
53
18
15
N
10


SEPTEMBER
CEILING - VISIBILITY (MID RANGE)
PERCENT FREQUENCY OF:
CEILING <1000 FEET AND/OR VISIBILITY <5 N. MILES — SOLID LINE
CEILING <8000 FEET AND/OR VISIBILITY <10 N. MILES — DASHED LINE
39
40
E
45
50
53
18
15
N
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10
5
30
40
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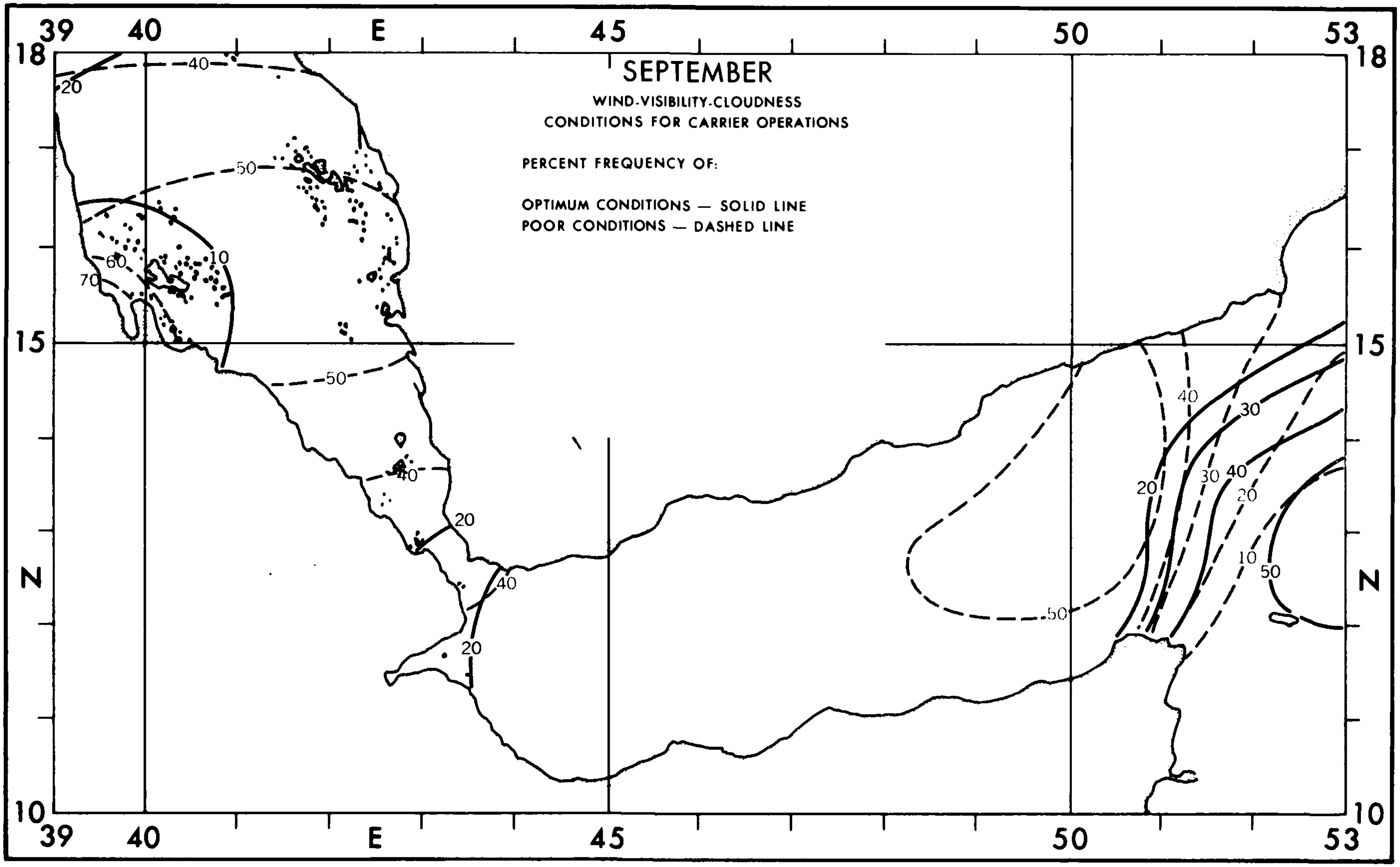
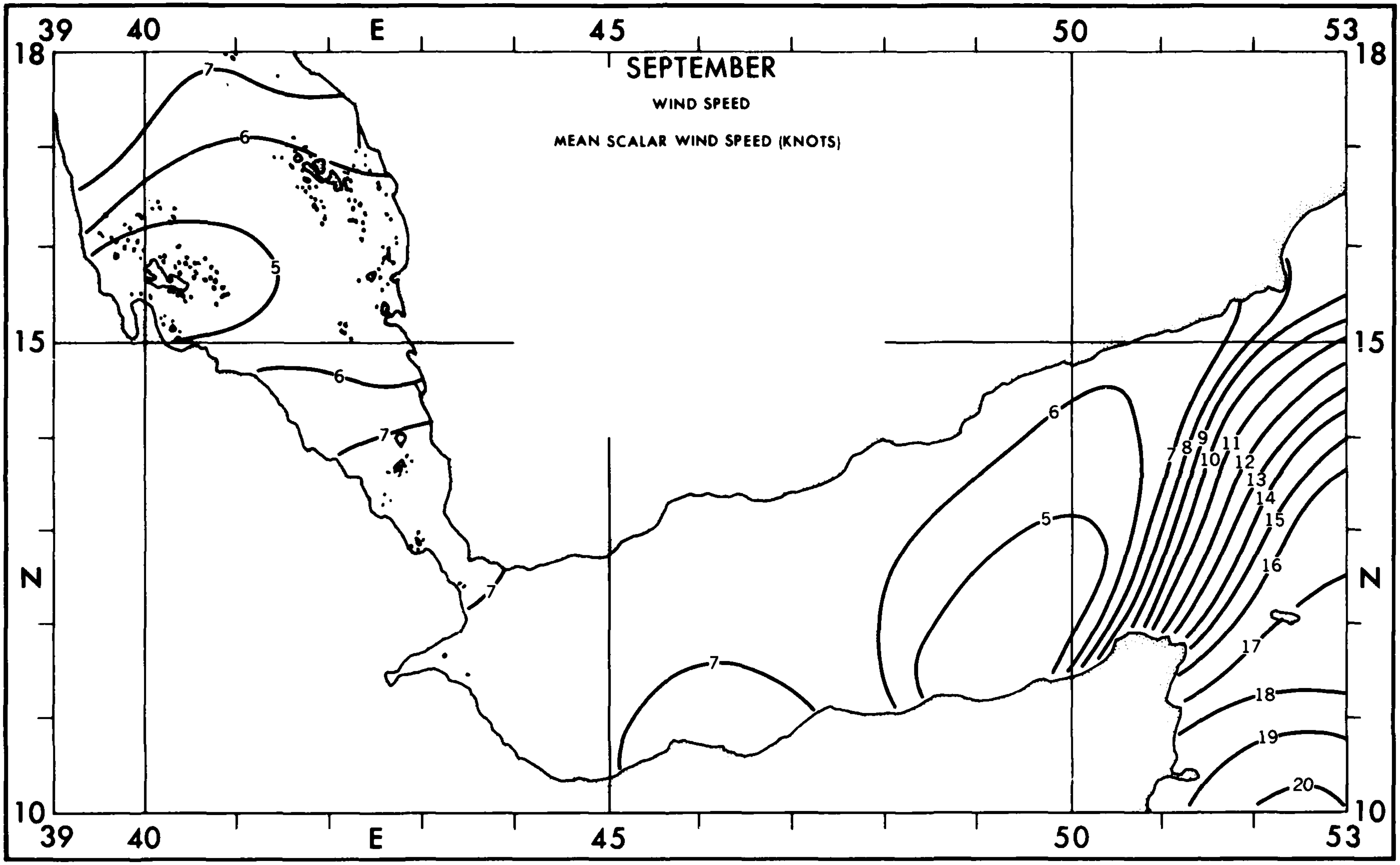

SEPTEMBER
WIND-VISIBILITY-CLOUDINESS
CONDITIONS FOR CARRIER OPERATIONS
PERCENT FREQUENCY OF:
OPTIMUM CONDITIONS — SOLID LINE
POOR CONDITIONS — DASHED LINE
39
40
E
45
50
53
18
15
N
10
20
40
50
60
70
10
30


SEPTEMBER
WIND SPEED
MEAN SCALAR WIND SPEED (KNOTS)
39
40
E
45
50
53
18
15
N
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5
6
7
8
9
10
11
12
13
14
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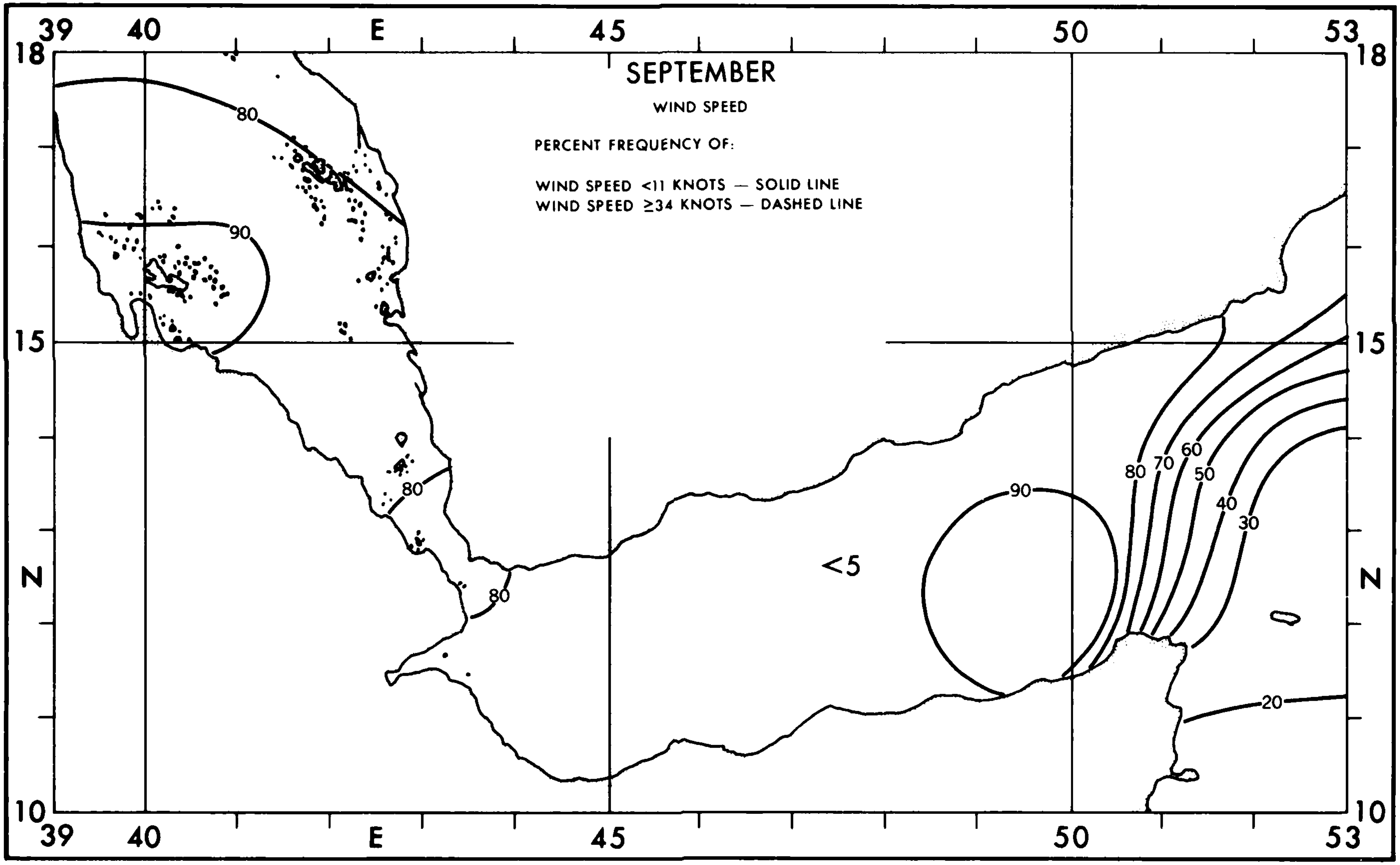
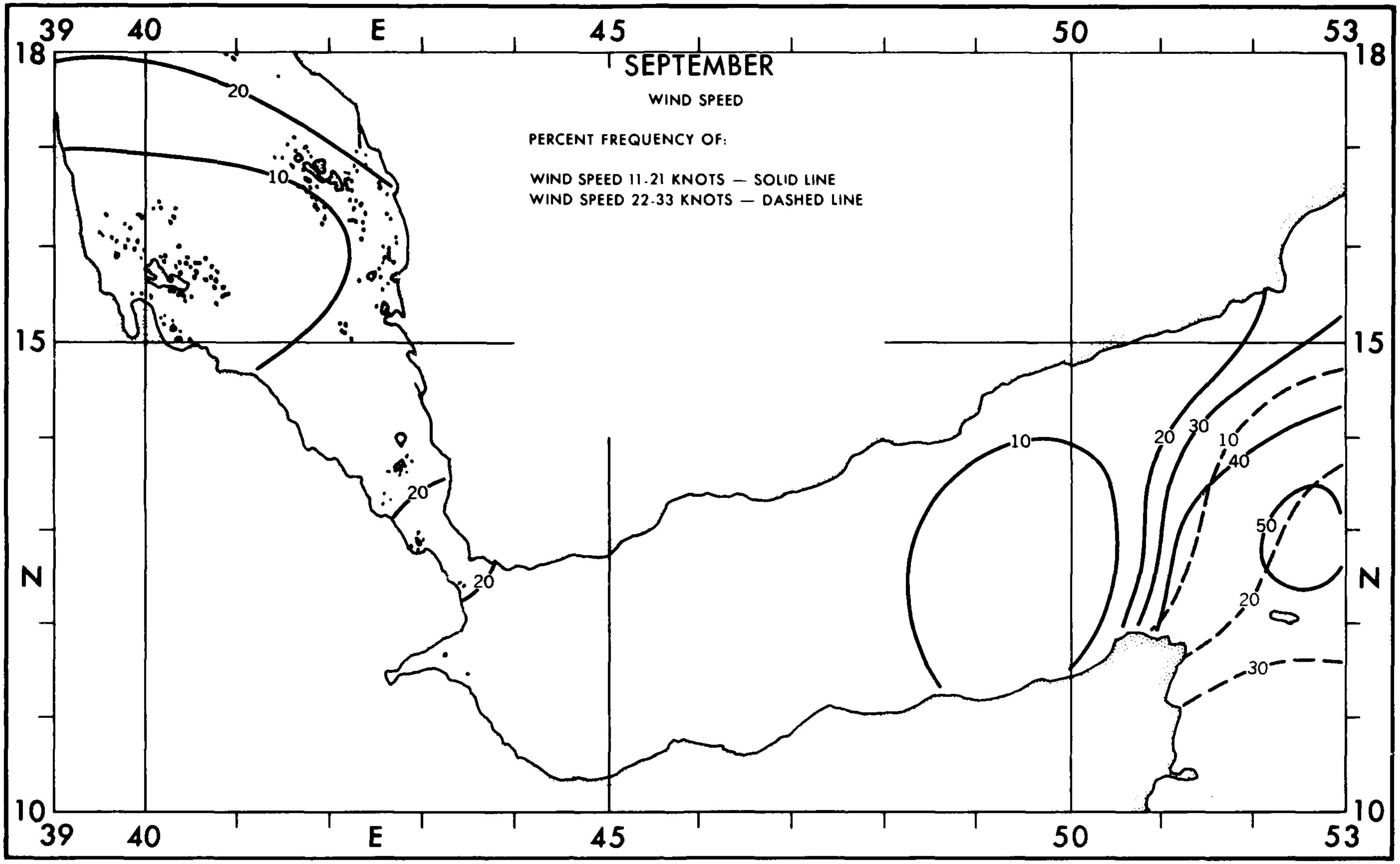

SEPTEMBER
WIND SPEED
PERCENT FREQUENCY OF:
WIND SPEED <11 KNOTS — SOLID LINE
WIND SPEED ≥34 KNOTS — DASHED LINE
39
40
E
45
50
53
18
15
N
10
80
90
<5
70
60
50
40
30
20


SEPTEMBER
WIND SPEED
PERCENT FREQUENCY OF:
WIND SPEED 11-21 KNOTS — SOLID LINE
WIND SPEED 22-33 KNOTS — DASHED LINE
39
40
E
45
50
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18
15
N
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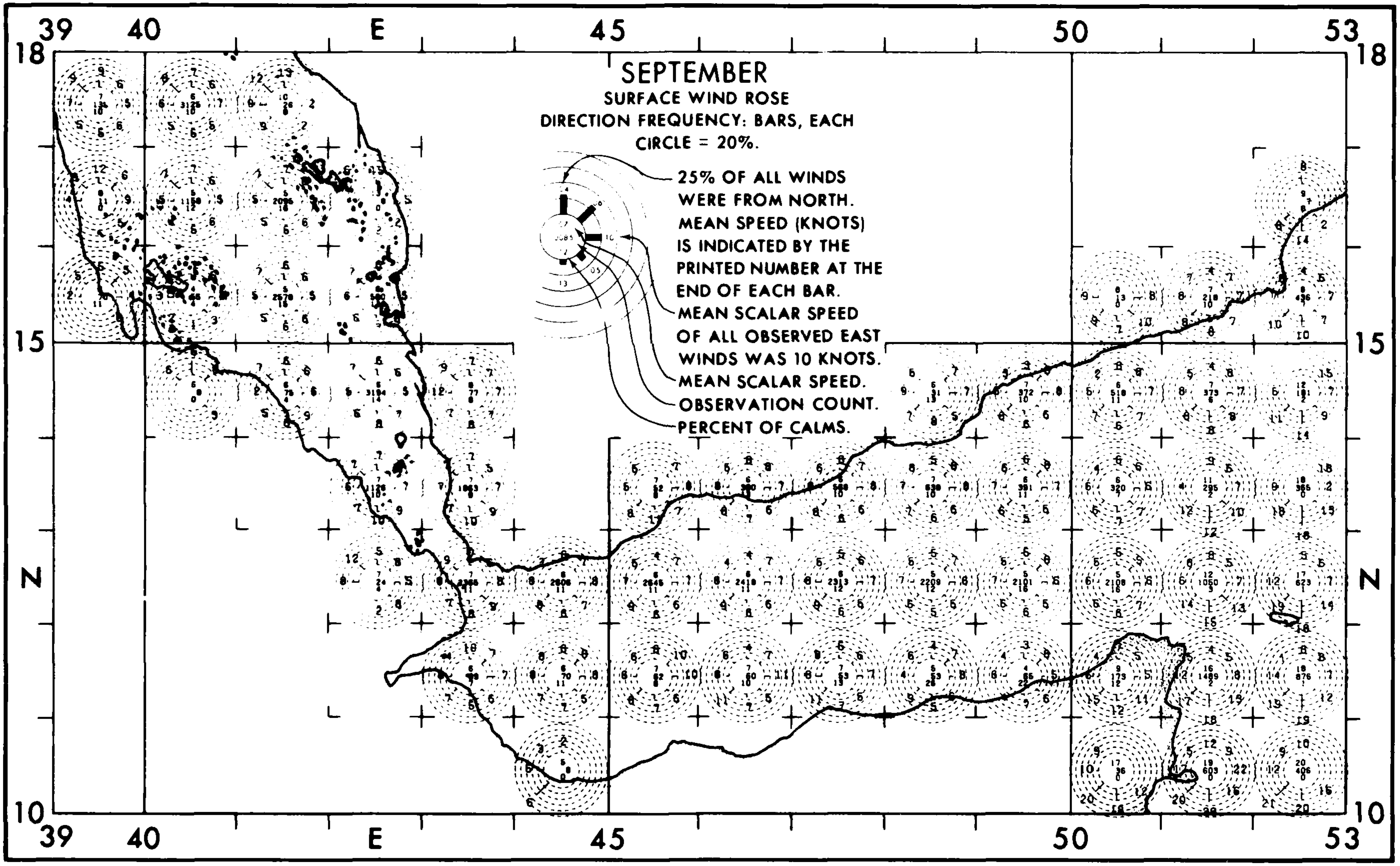
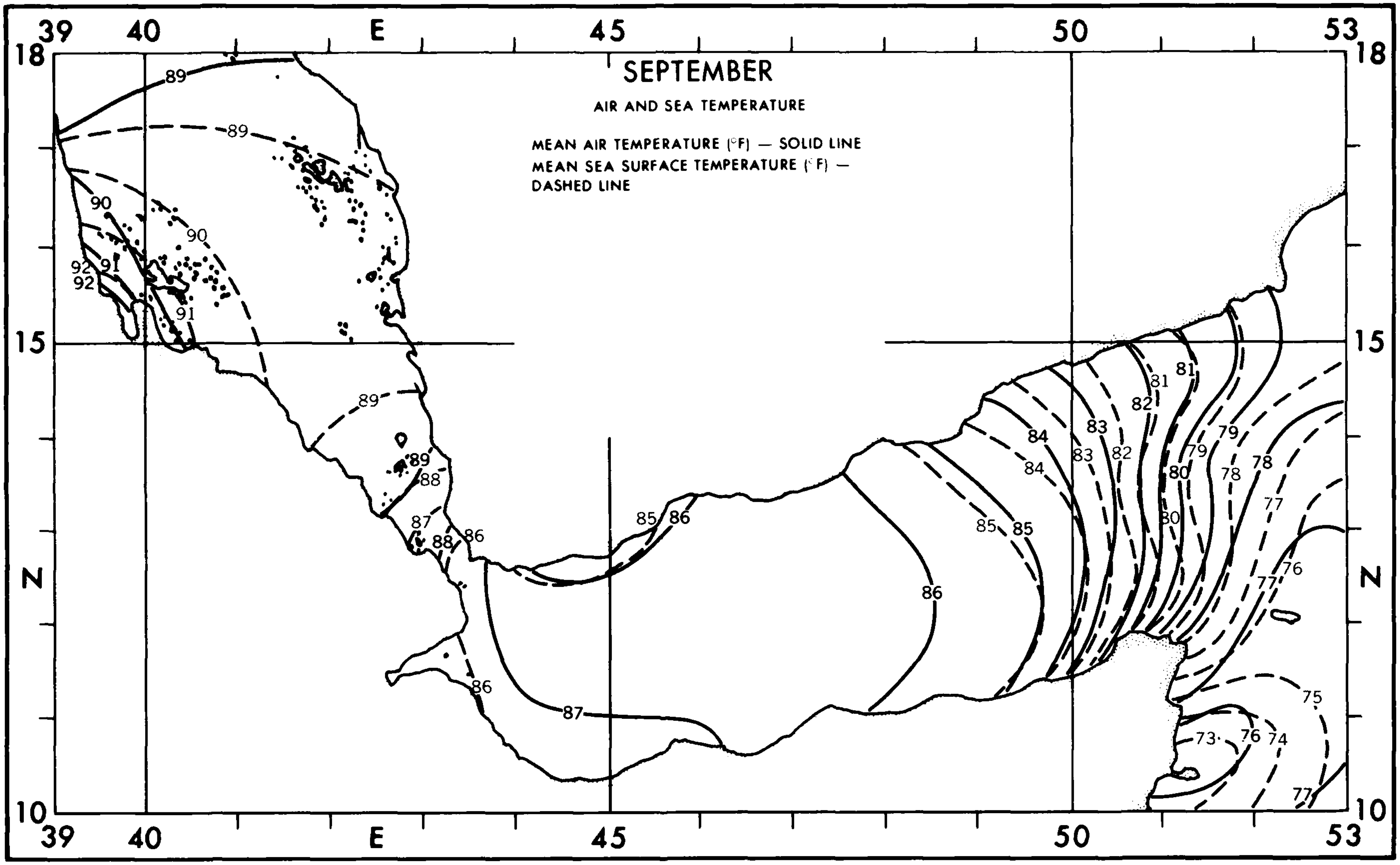
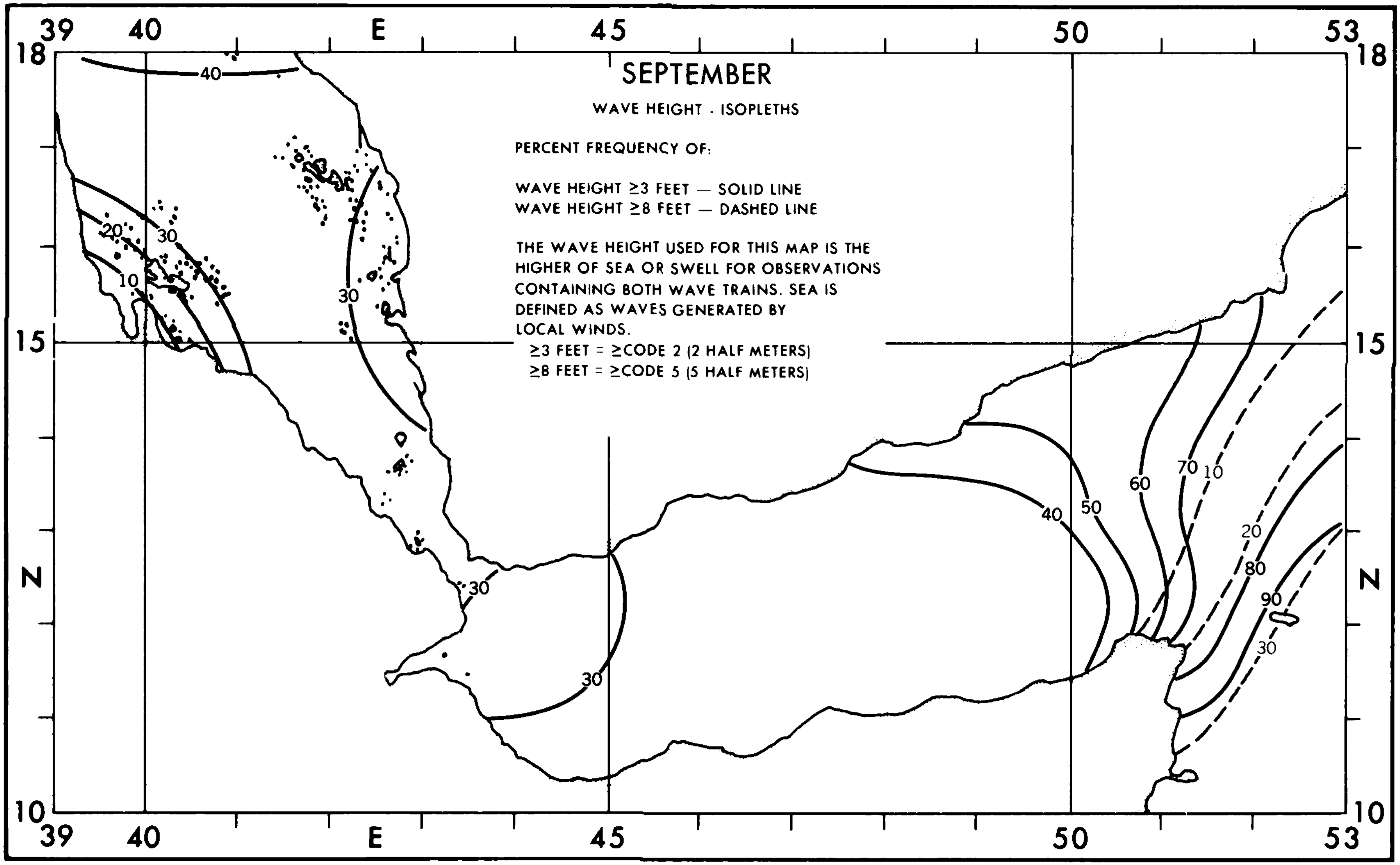
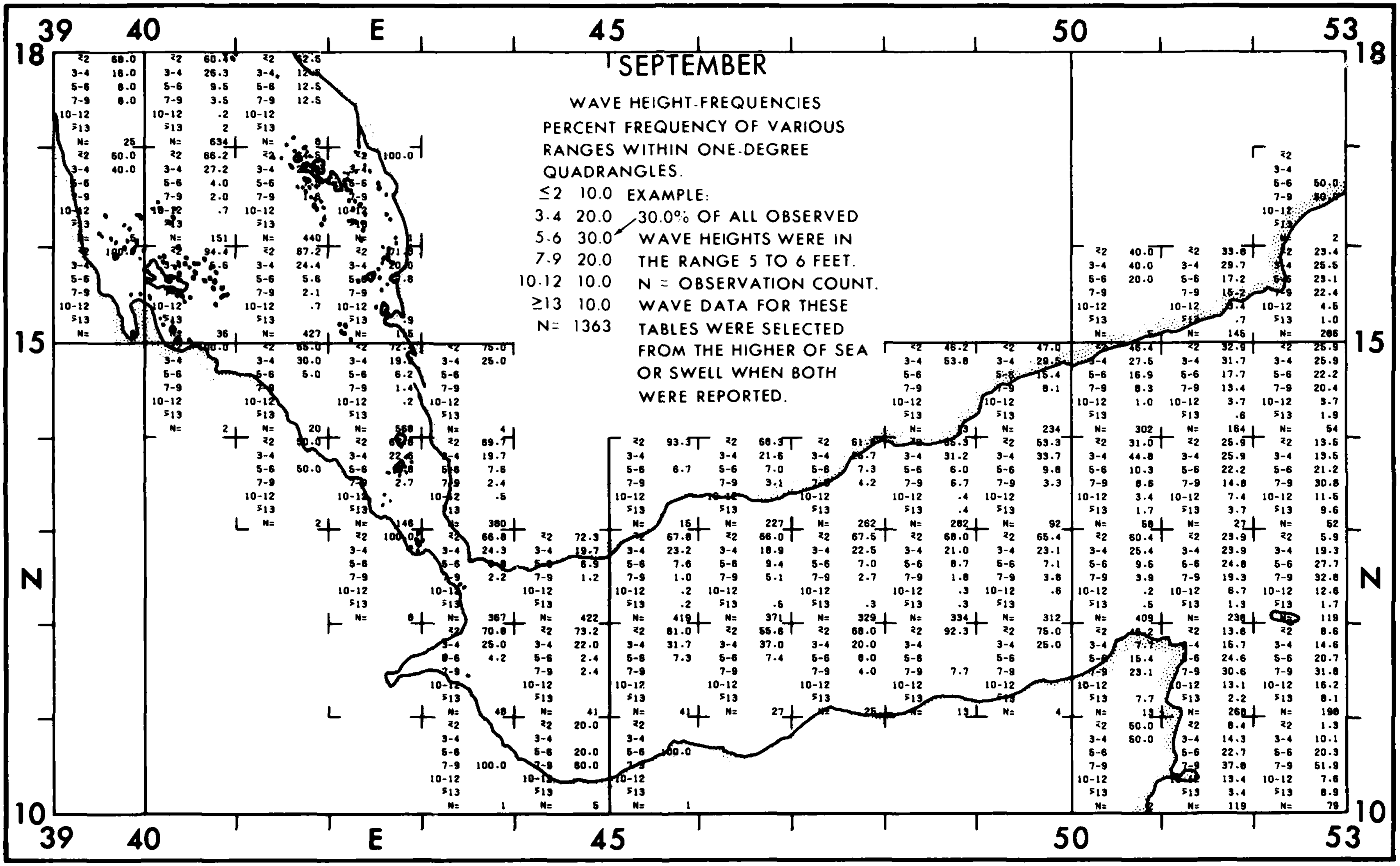
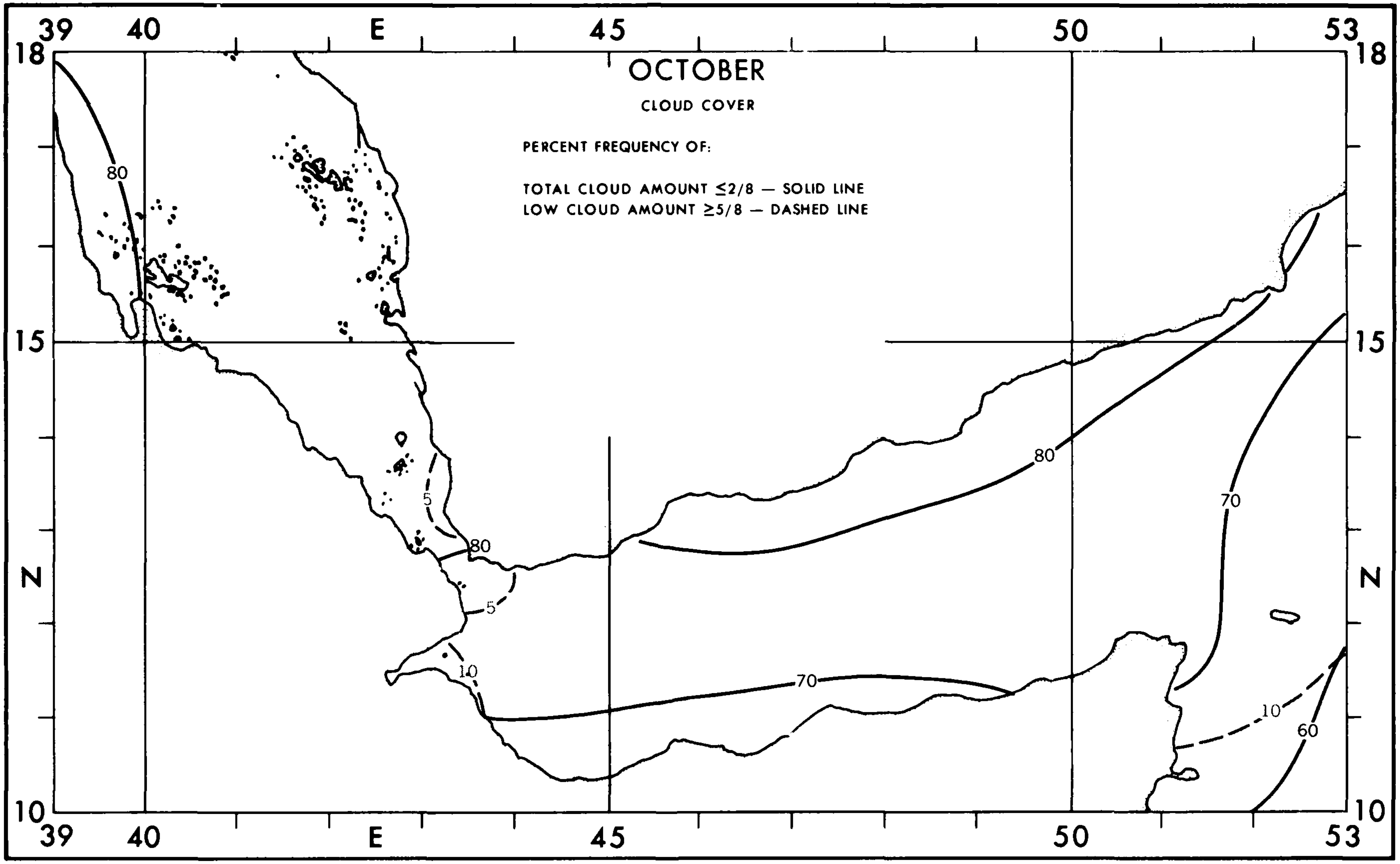
40
50
20
30

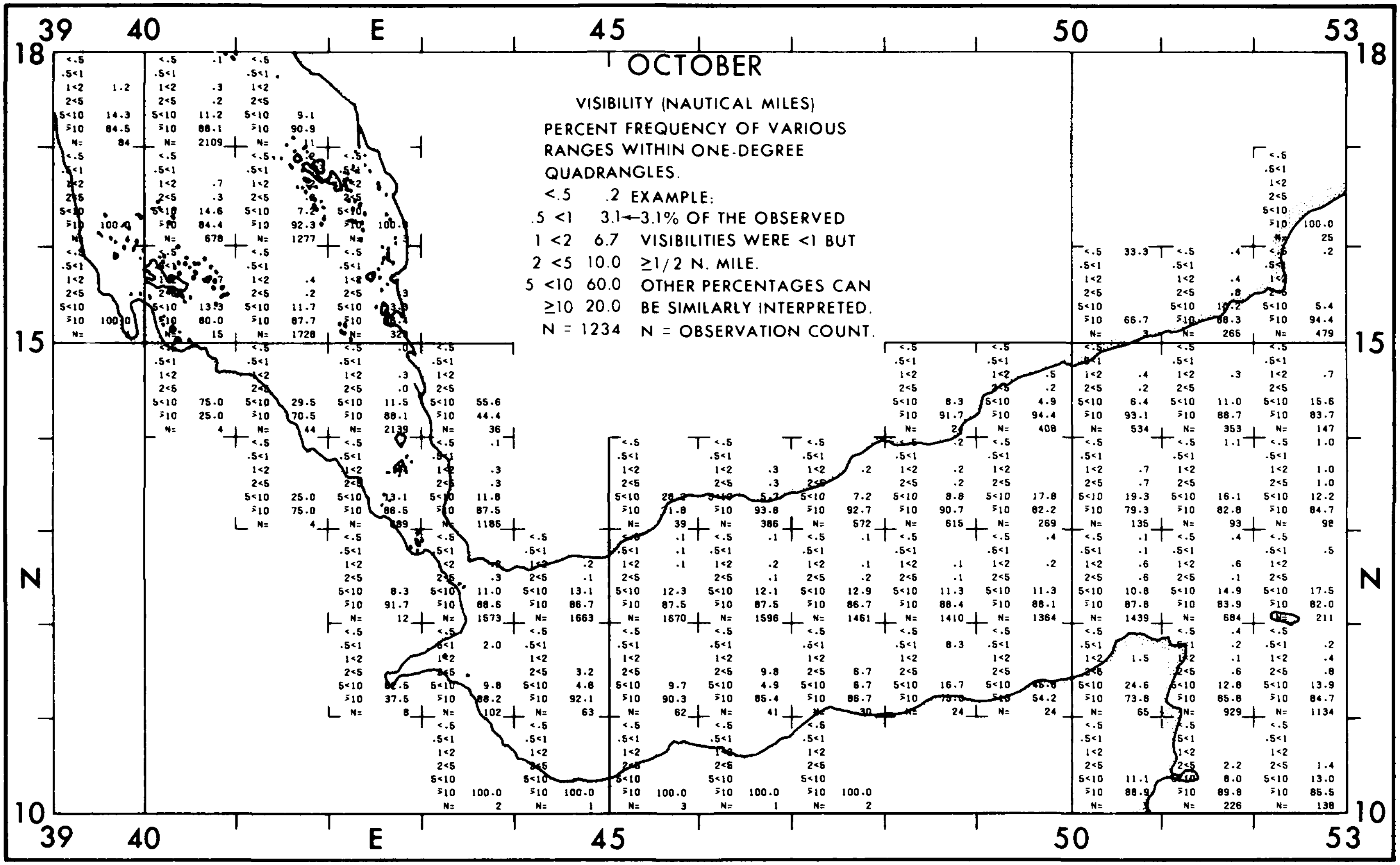

SEPTEMBER
SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%.
25% OF ALL WINDS WERE FROM NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR.
MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
MEAN SCALAR SPEED.
OBSERVATION COUNT.
PERCENT OF CALMS.
39
40
E
45
50
53
18
15
N
10

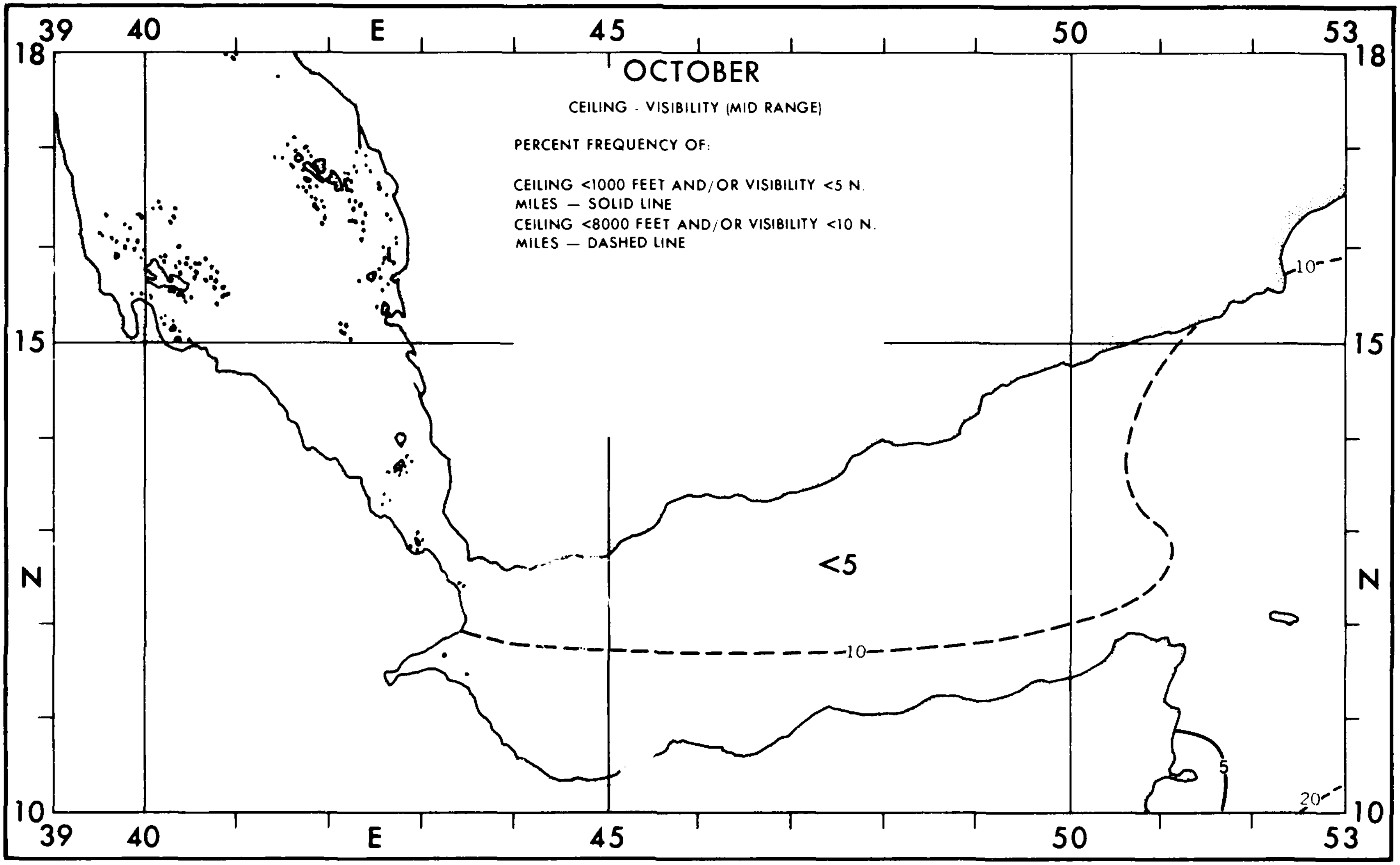

SEPTEMBER
AIR AND SEA TEMPERATURE
MEAN AIR TEMPERATURE (°F) — SOLID LINE
MEAN SEA SURFACE TEMPERATURE (°F) —
DASHED LINE
39
40
E
45
50
53
18
15
N
10
89
90
91
92
88
87
86
85
84
83
82
81
80
79
78
77
76
75
74
73

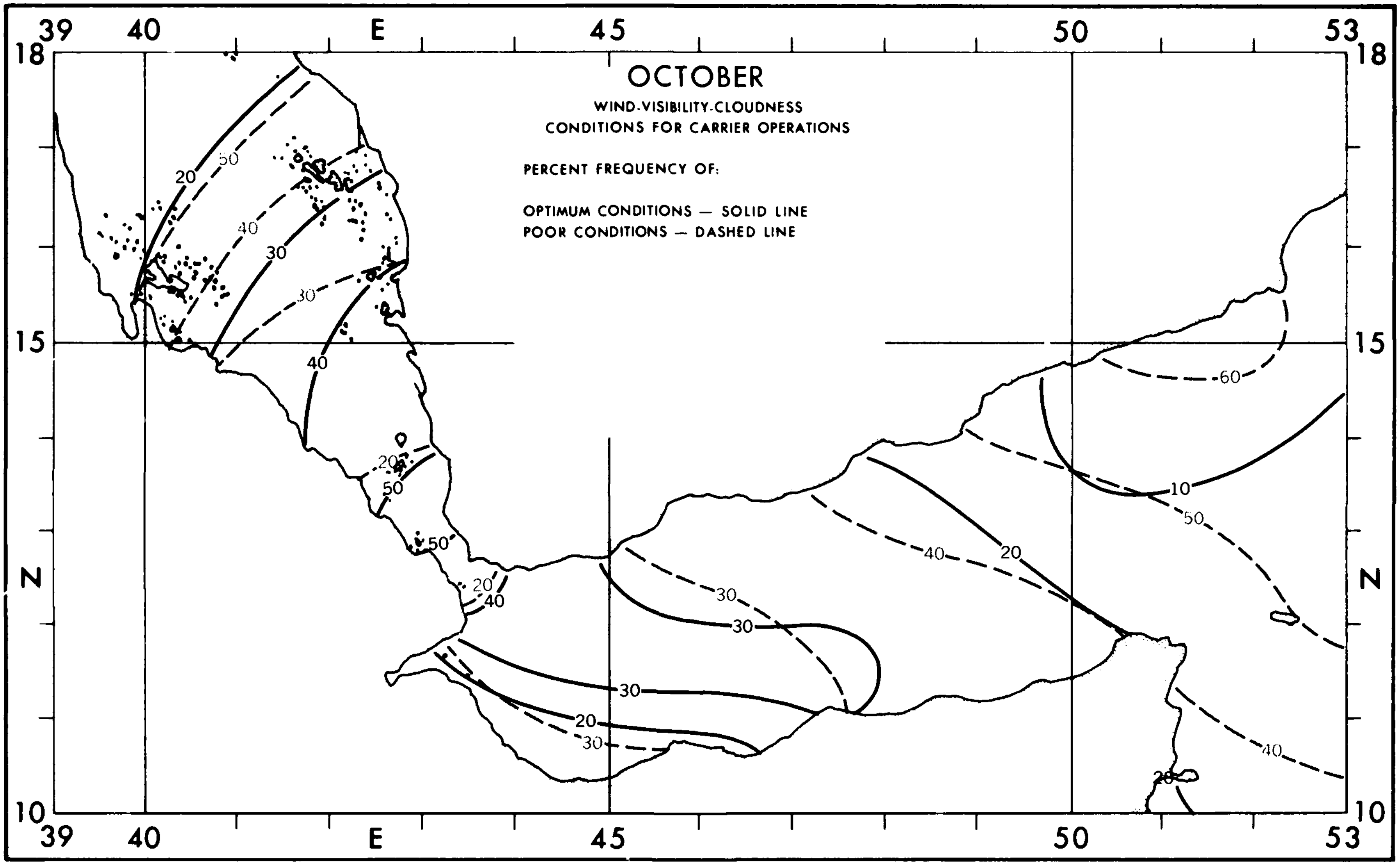

SEPTEMBER
WAVE HEIGHT - ISOPLETHS
PERCENT FREQUENCY OF:
WAVE HEIGHT ≥3 FEET — SOLID LINE
WAVE HEIGHT ≥8 FEET — DASHED LINE
THE WAVE HEIGHT USED FOR THIS MAP IS THE HIGHER OF SEA OR SWELL FOR OBSERVATIONS CONTAINING BOTH WAVE TRAINS. SEA IS DEFINED AS WAVES GENERATED BY LOCAL WINDS.
≥3 FEET = ≥CODE 2 (2 HALF METERS)
≥8 FEET = ≥CODE 5 (5 HALF METERS)
39
40
E
45
50
53
18
15
N
10


SEPTEMBER
WAVE HEIGHT-FREQUENCIES
PERCENT FREQUENCY OF VARIOUS
RANGES WITHIN ONE-DEGREE
QUADRANGLES.
≤2 10.0
3-4 20.0
5-6 30.0
7-9 20.0
10-12 10.0
≥13 10.0
N= 1363
EXAMPLE:
30.0% OF ALL OBSERVED
WAVE HEIGHTS WERE IN
THE RANGE 5 TO 6 FEET.
N = OBSERVATION COUNT.
WAVE DATA FOR THESE
TABLES WERE SELECTED
FROM THE HIGHER OF SEA
OR SWELL WHEN BOTH
WERE REPORTED.
39
40
E
45
50
53
18
15
N
10

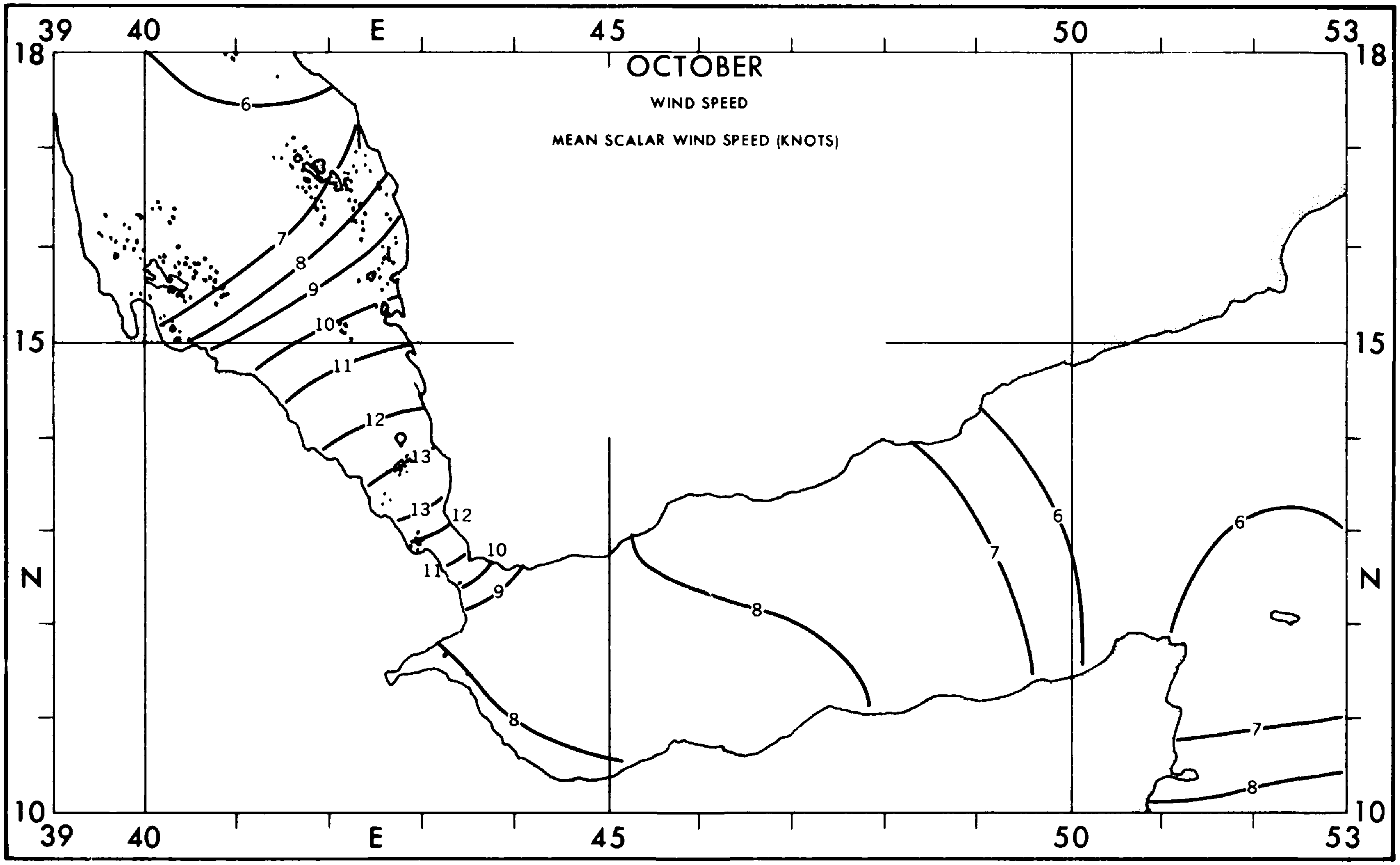

OCTOBER
CLOUD COVER
PERCENT FREQUENCY OF:
TOTAL CLOUD AMOUNT ≤2/8 — SOLID LINE
LOW CLOUD AMOUNT ≥5/8 — DASHED LINE
39
40
E
45
50
53
18
15
N
10
80
5
10
70
60

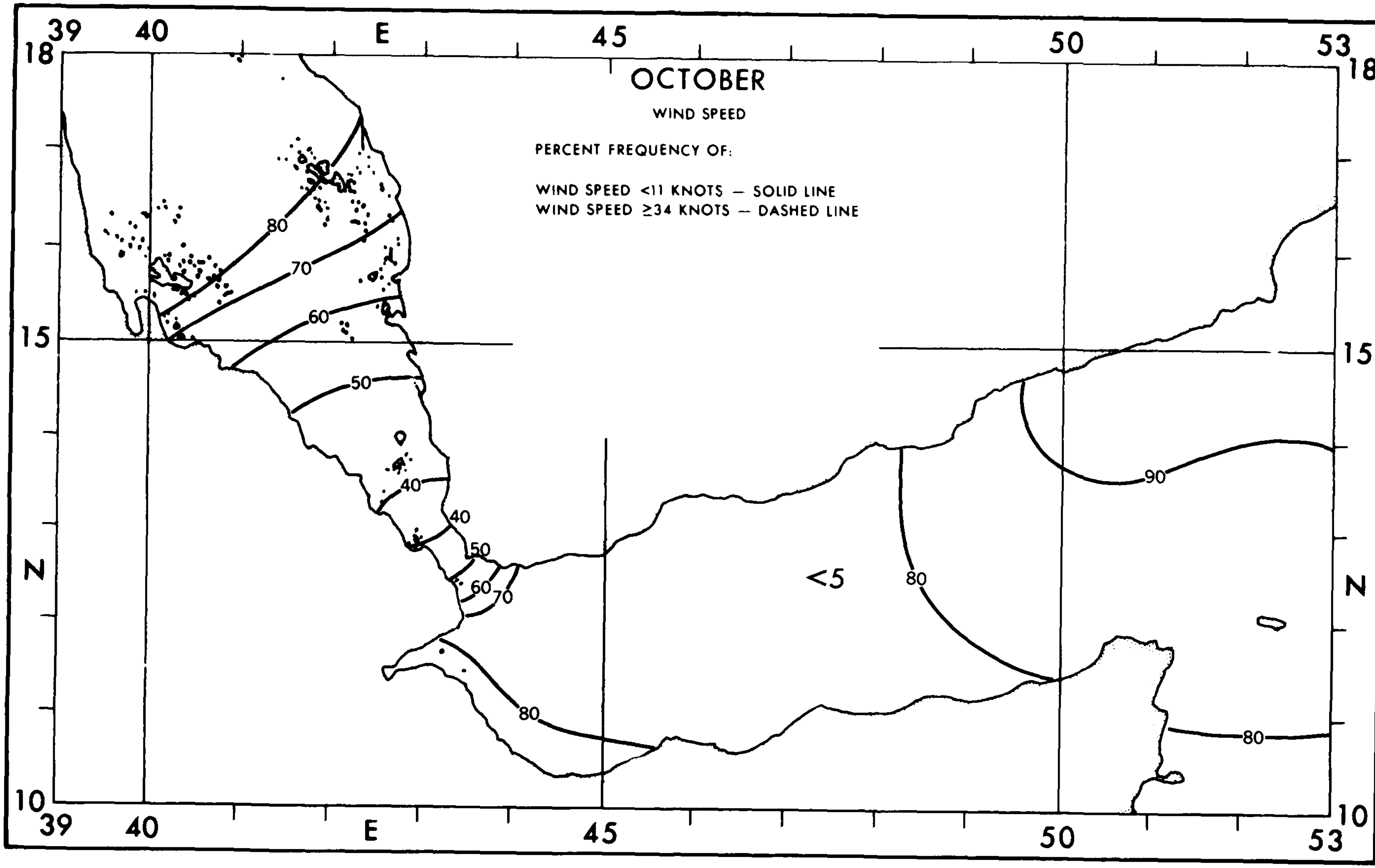

OCTOBER
VISIBILITY (NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS
RANGES WITHIN ONE-DEGREE
QUADRANGLES.
<.5 .2 EXAMPLE:
.5 <1 3.1←3.1% OF THE OBSERVED
1 <2 6.7 VISIBILITIES WERE <1 BUT
2 <5 10.0 ≥1/2 N. MILE.
5 <10 60.0 OTHER PERCENTAGES CAN
≥10 20.0 BE SIMILARLY INTERPRETED.
N = 1234 N = OBSERVATION COUNT.
39 40 E 45 50 53
18 15 N 10

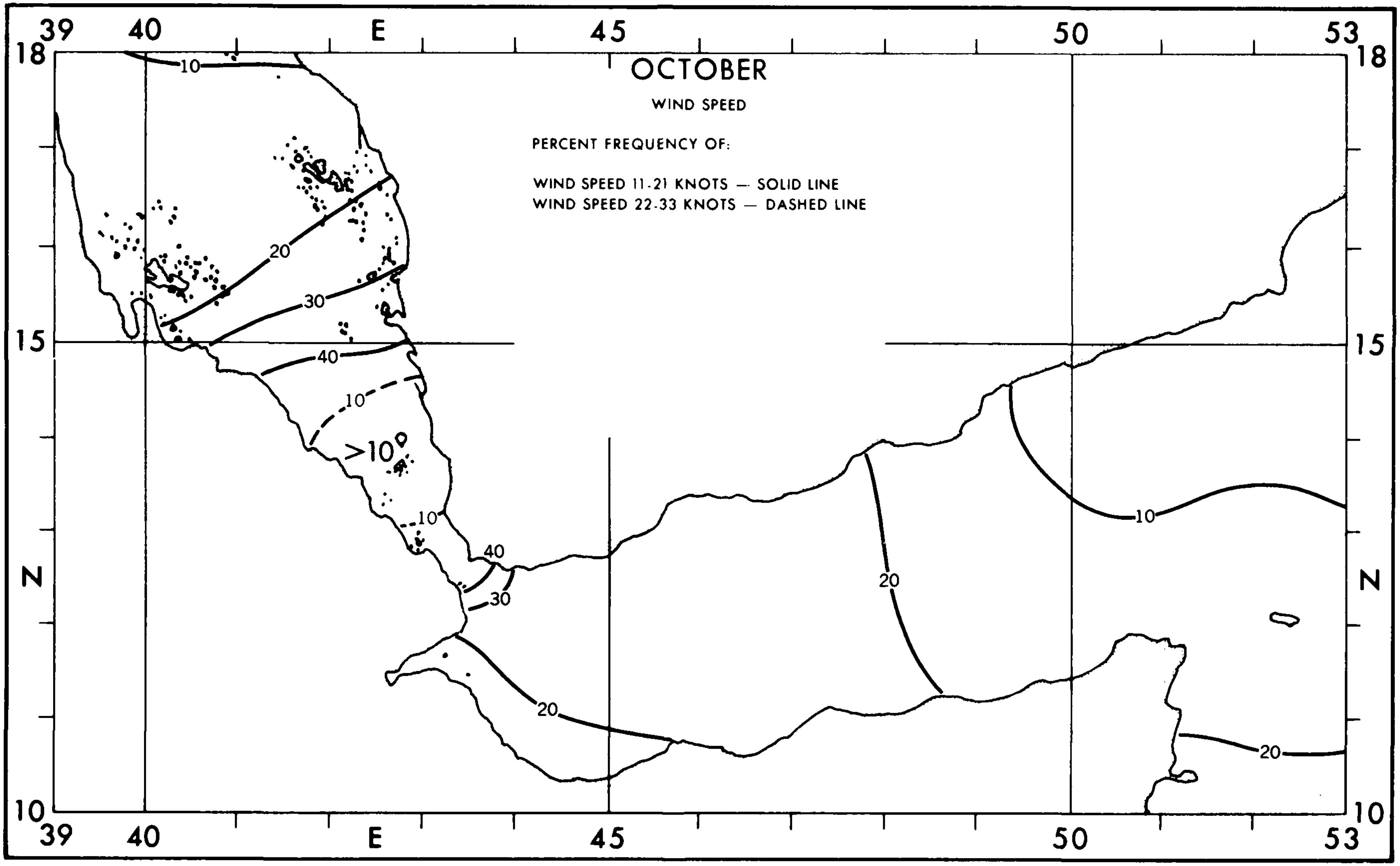

OCTOBER
CEILING - VISIBILITY (MID RANGE)
PERCENT FREQUENCY OF:
CEILING <1000 FEET AND/OR VISIBILITY <5 N. MILES — SOLID LINE
CEILING <8000 FEET AND/OR VISIBILITY <10 N. MILES — DASHED LINE
39
40
E
45
50
53
18
15
N
10
<5
5
20



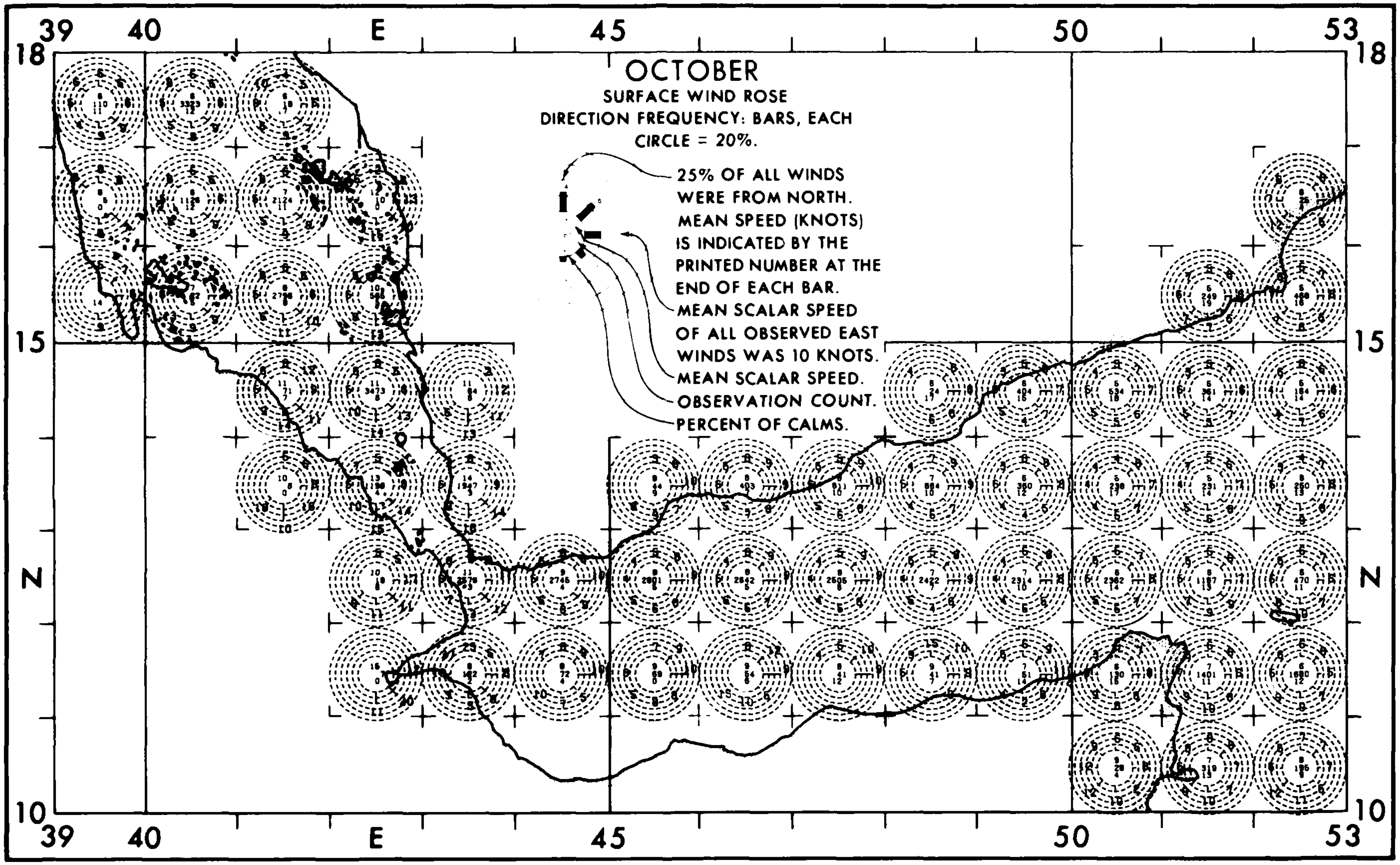
OCTOBER
WIND-VISIBILITY-CLOUDINESS
CONDITIONS FOR CARRIER OPERATIONS
PERCENT FREQUENCY OF:
OPTIMUM CONDITIONS — SOLID LINE
POOR CONDITIONS — DASHED LINE

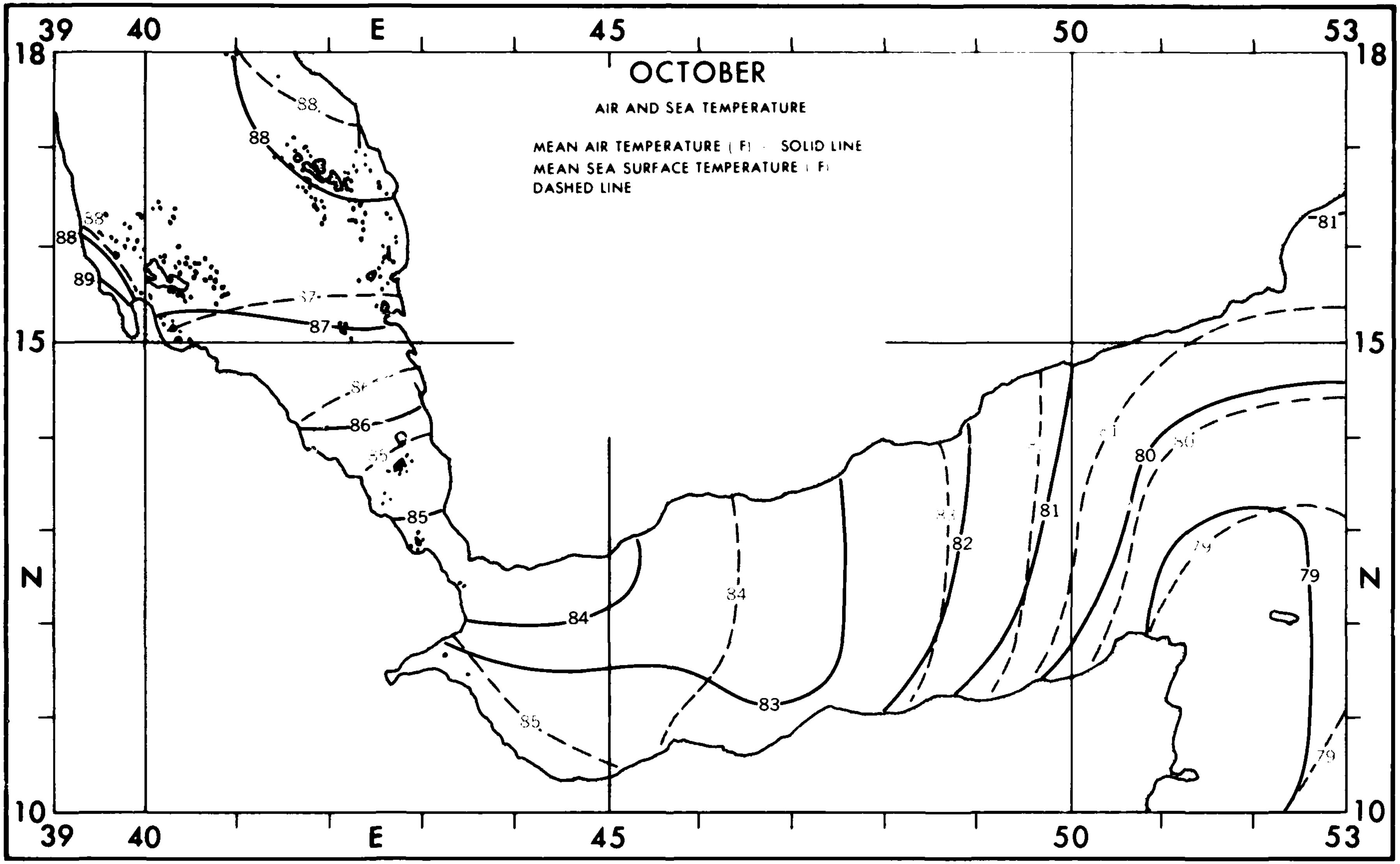

OCTOBER
WIND SPEED
MEAN SCALAR WIND SPEED (KNOTS)
39
40
E
45
50
53
18
15
N
10
6
7
8
9
10
11
12
13

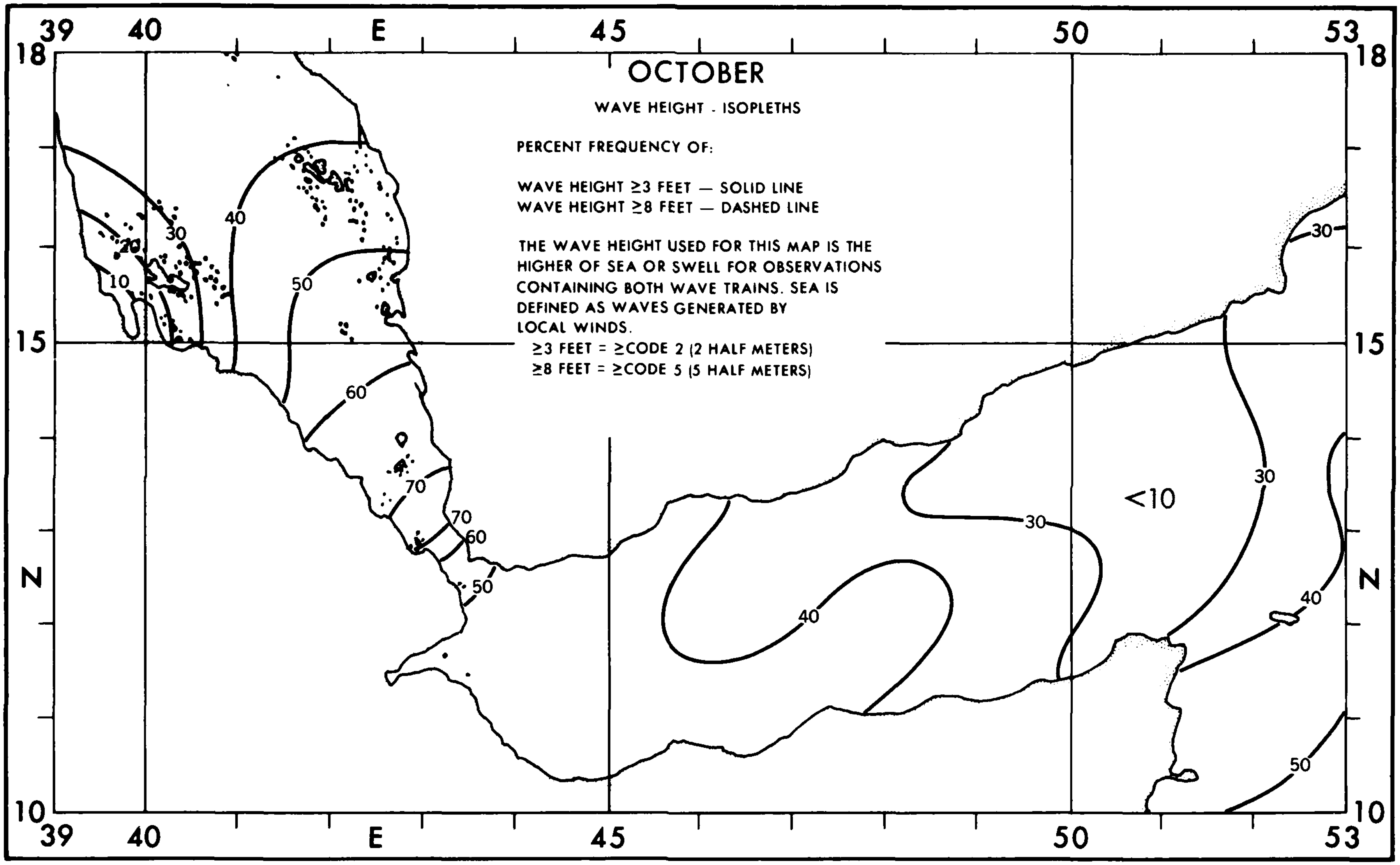

OCTOBER
WIND SPEED
PERCENT FREQUENCY OF:
WIND SPEED <11 KNOTS — SOLID LINE
WIND SPEED ≥34 KNOTS — DASHED LINE
<5
39
40
E
45
50
53
18
15
N
10
90
80
70
60
50
40

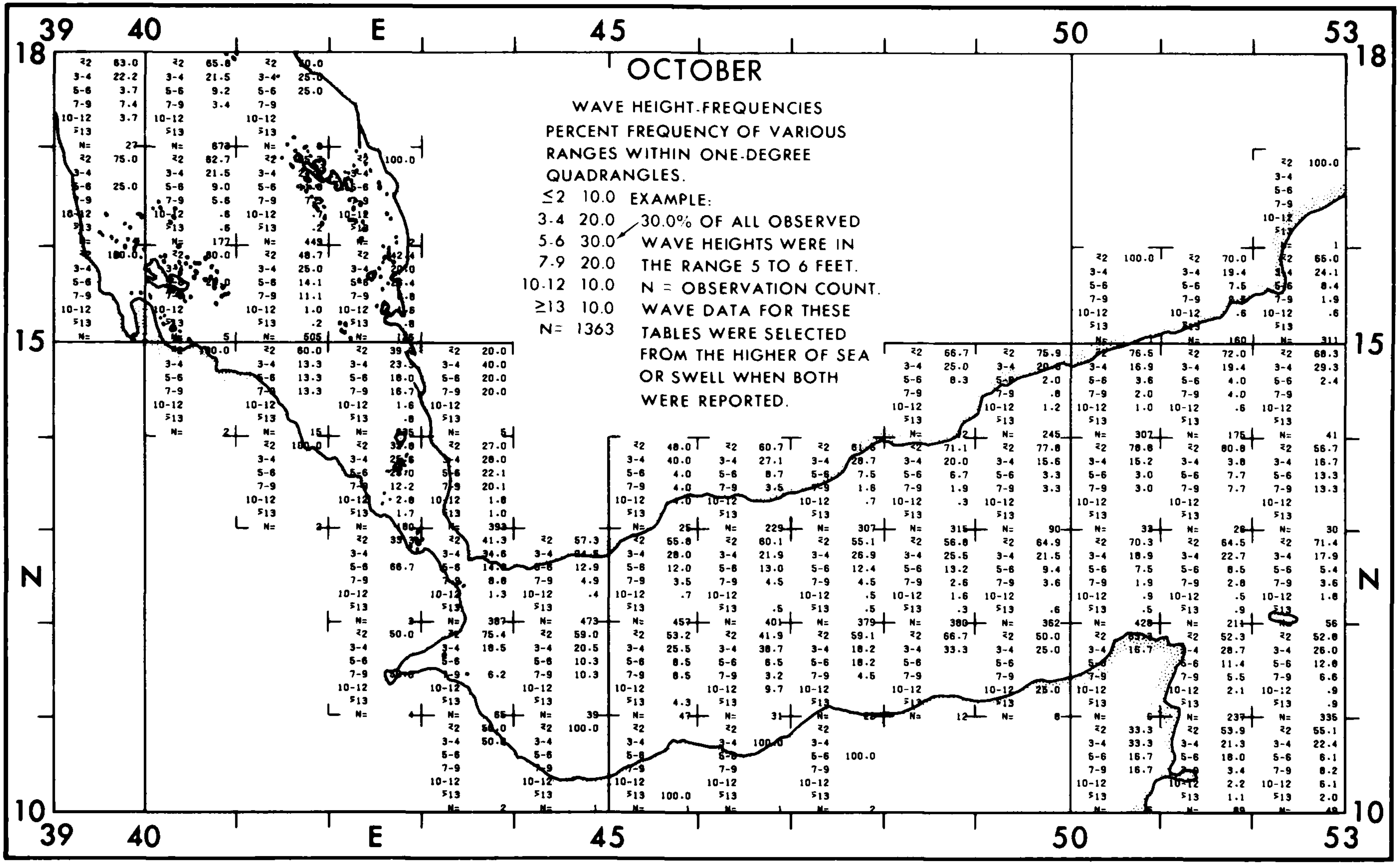


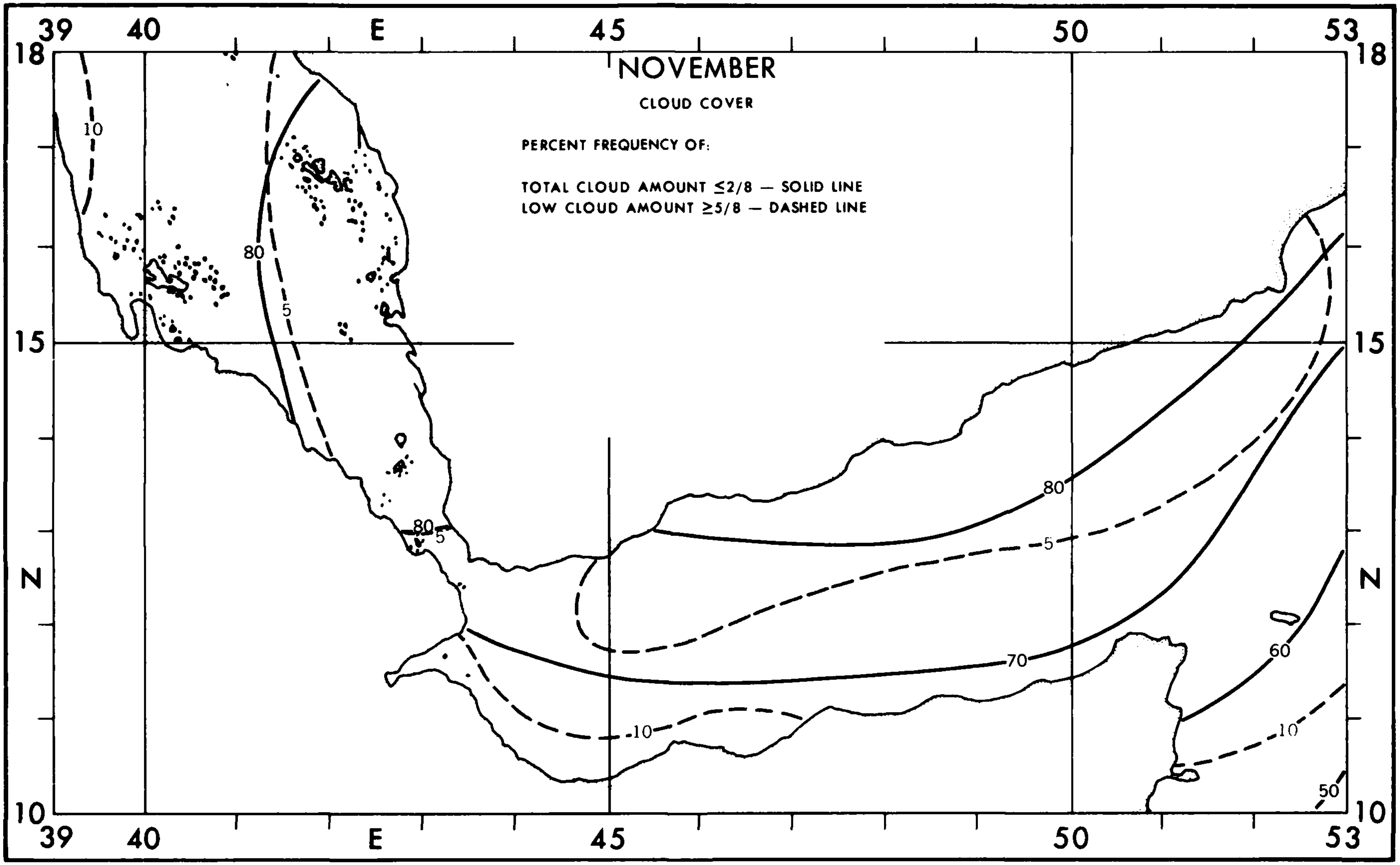
OCTOBER
WIND SPEED
PERCENT FREQUENCY OF:
WIND SPEED 11-21 KNOTS — SOLID LINE
WIND SPEED 22-33 KNOTS — DASHED LINE
39
40
E
45
50
53
18
15
N
10
>10


OCTOBER
SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%.
25% OF ALL WINDS WERE FROM NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR.
MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
MEAN SCALAR SPEED.
OBSERVATION COUNT.
PERCENT OF CALMS.
39
40
E
45
50
53
18
15
N
10

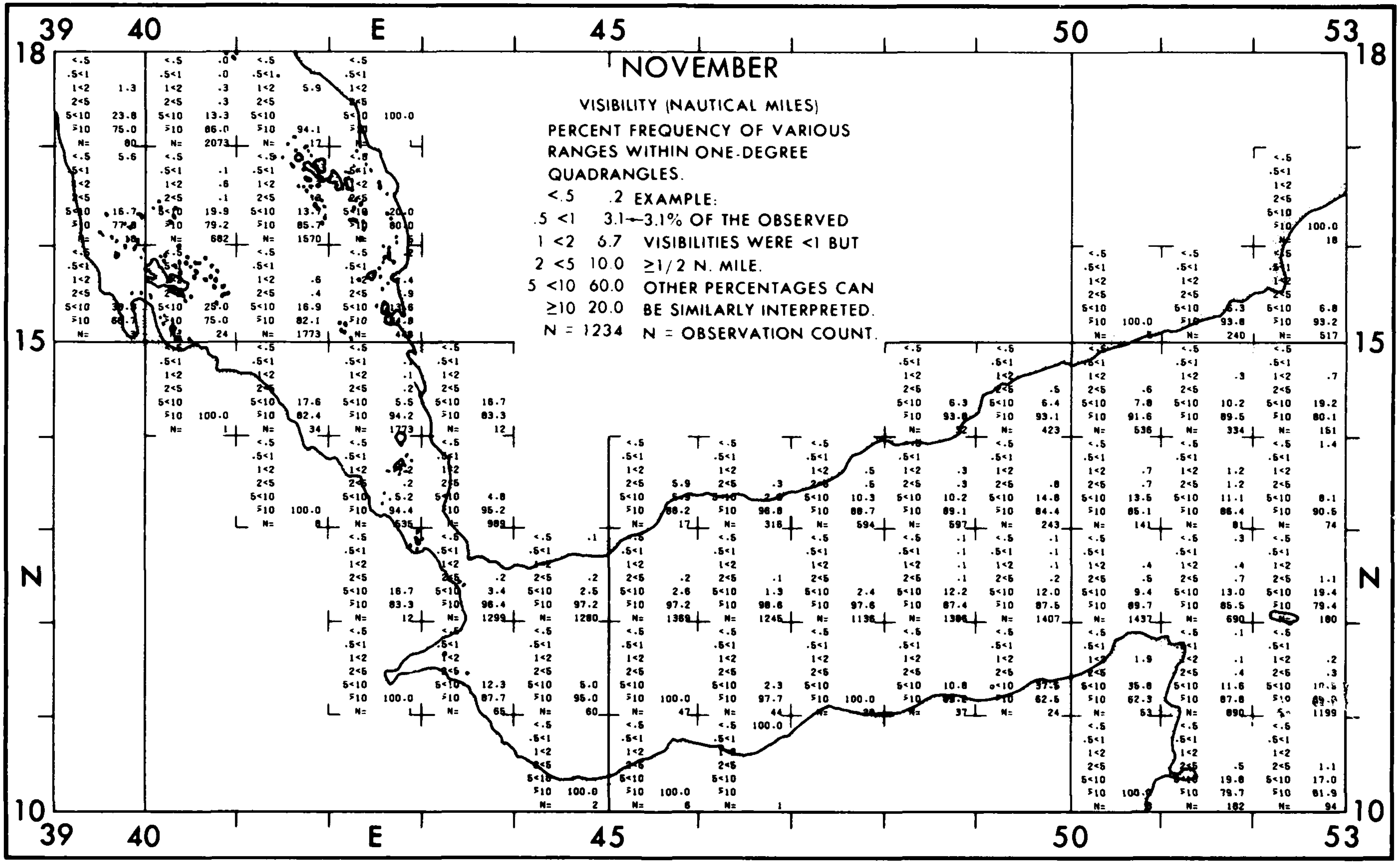

OCTOBER
AIR AND SEA TEMPERATURE
MEAN AIR TEMPERATURE (F) - SOLID LINE
MEAN SEA SURFACE TEMPERATURE (F)
DASHED LINE
39
40
E
45
50
53
18
15
N
10
88
89
87
86
85
84
83
82
81
80
79

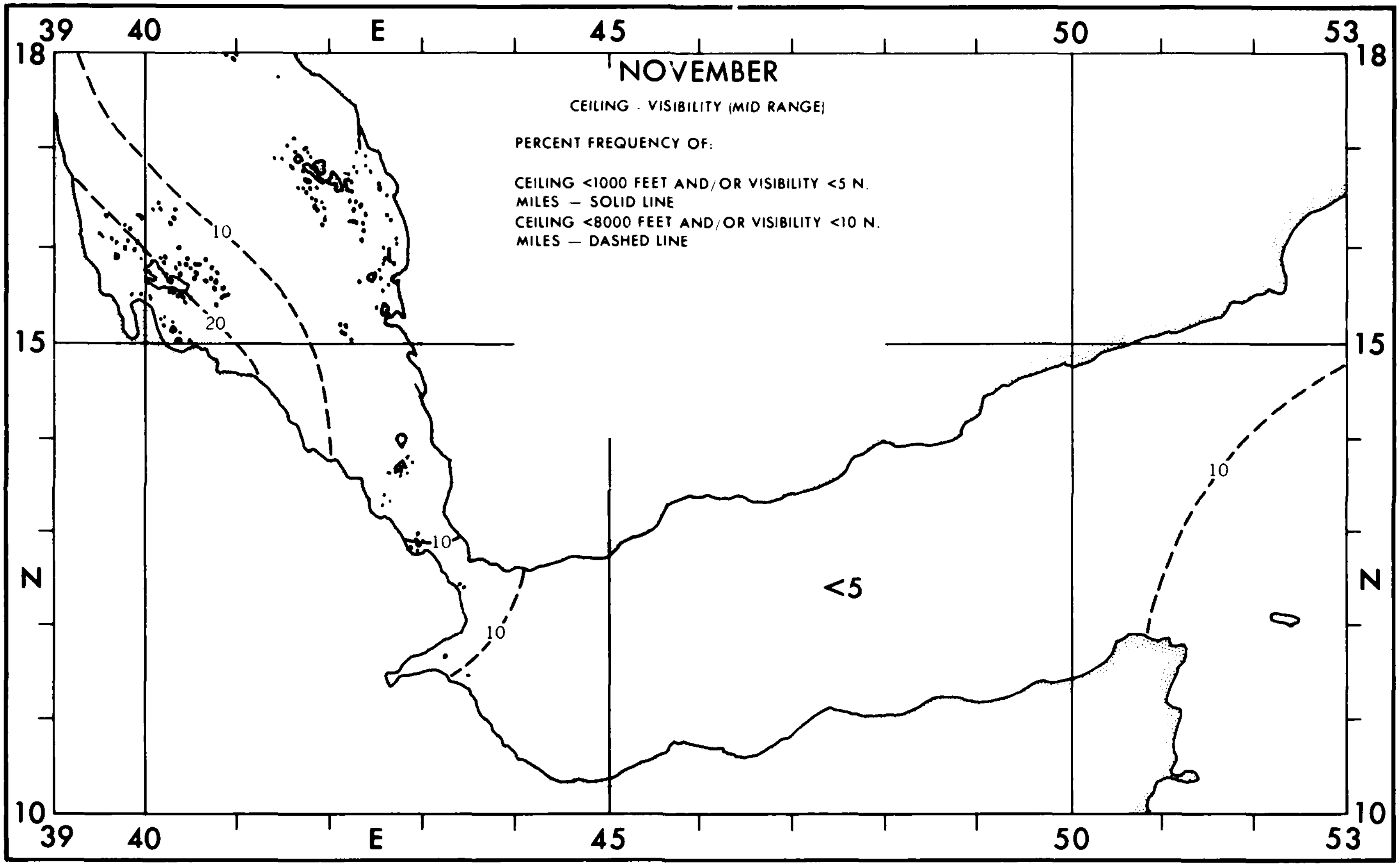

OCTOBER
WAVE HEIGHT - ISOPLETHS
PERCENT FREQUENCY OF:
WAVE HEIGHT ≥3 FEET — SOLID LINE
WAVE HEIGHT ≥8 FEET — DASHED LINE
THE WAVE HEIGHT USED FOR THIS MAP IS THE HIGHER OF SEA OR SWELL FOR OBSERVATIONS CONTAINING BOTH WAVE TRAINS. SEA IS DEFINED AS WAVES GENERATED BY LOCAL WINDS.
≥3 FEET = ≥CODE 2 (2 HALF METERS)
≥8 FEET = ≥CODE 5 (5 HALF METERS)
39
40
E
45
50
53
18
15
N
10
<10
10
20
30
40
50
60
70

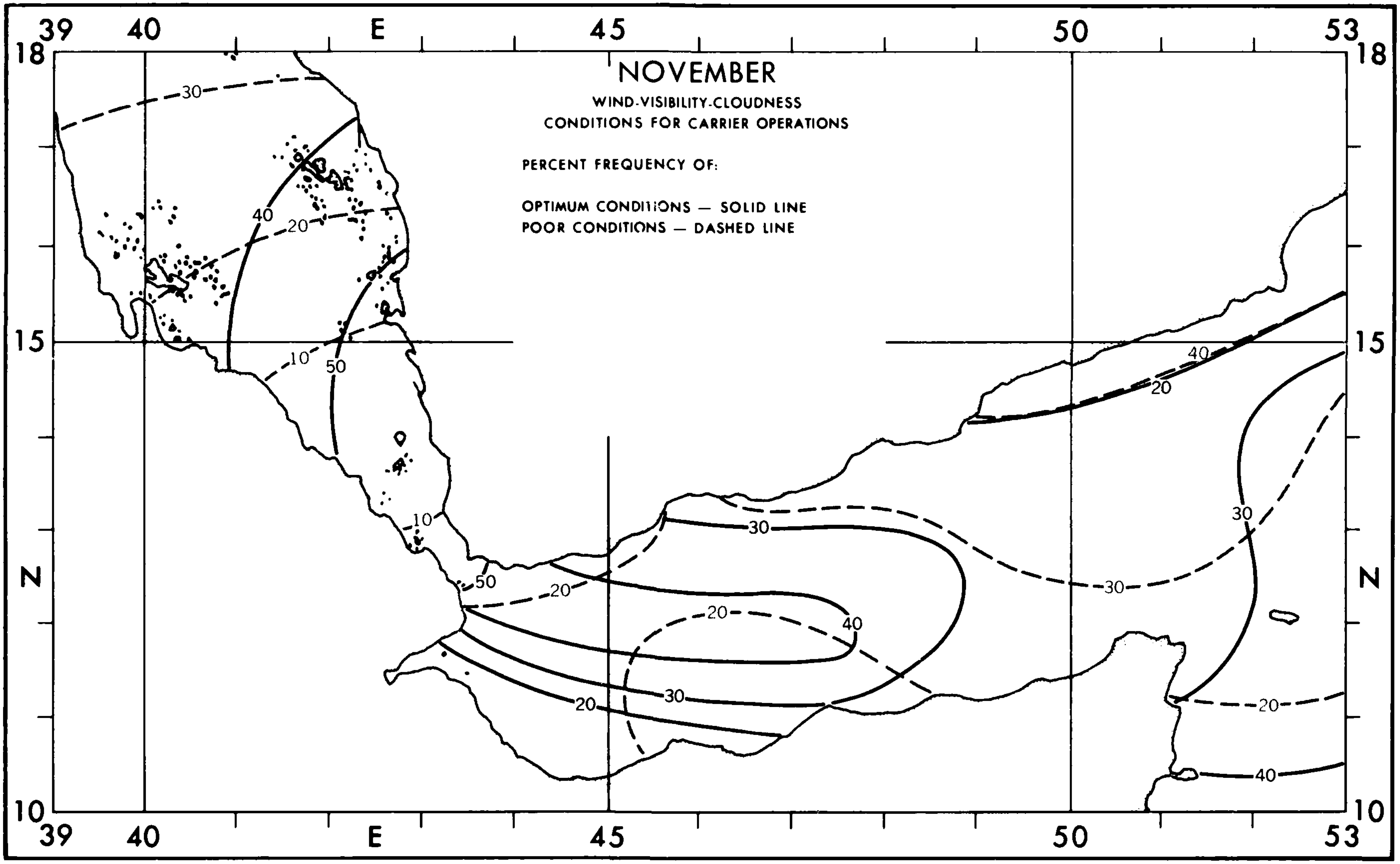

OCTOBER
WAVE HEIGHT-FREQUENCIES
PERCENT FREQUENCY OF VARIOUS
RANGES WITHIN ONE-DEGREE
QUADRANGLES.
≤2 10.0 EXAMPLE:
3-4 20.0 30.0% OF ALL OBSERVED
5-6 30.0 WAVE HEIGHTS WERE IN
7-9 20.0 THE RANGE 5 TO 6 FEET.
10-12 10.0 N = OBSERVATION COUNT.
≥13 10.0 WAVE DATA FOR THESE
N= 1363 TABLES WERE SELECTED
FROM THE HIGHER OF SEA
OR SWELL WHEN BOTH
WERE REPORTED.
39
40
E
45
50
53
18
15
N
10



NOVEMBER
CLOUD COVER
PERCENT FREQUENCY OF:
TOTAL CLOUD AMOUNT ≤2/8 — SOLID LINE
LOW CLOUD AMOUNT ≥5/8 — DASHED LINE
39
40
E
45
50
53
18
15
N
10
80
5
70
60
50


NOVEMBER
VISIBILITY (NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS
RANGES WITHIN ONE-DEGREE
QUADRANGLES.
<.5 .2 EXAMPLE:
.5 <1 3.1←3.1% OF THE OBSERVED
1 <2 6.7 VISIBILITIES WERE <1 BUT
2 <5 10.0 ≥1/2 N. MILE.
5 <10 60.0 OTHER PERCENTAGES CAN
≥10 20.0 BE SIMILARLY INTERPRETED.
N = 1234 N = OBSERVATION COUNT.
39
40
E
45
50
53
18
15
N
10


NOVEMBER
CEILING - VISIBILITY (MID RANGE)
PERCENT FREQUENCY OF:
CEILING <1000 FEET AND/OR VISIBILITY <5 N. MILES — SOLID LINE
CEILING <8000 FEET AND/OR VISIBILITY <10 N. MILES — DASHED LINE
<5
10
20
39
40
E
45
50
53
18
15
N
10


NOVEMBER
WIND-VISIBILITY-CLOUDINESS
CONDITIONS FOR CARRIER OPERATIONS
PERCENT FREQUENCY OF:
OPTIMUM CONDITIONS — SOLID LINE
POOR CONDITIONS — DASHED LINE
39
40
E
45
50
53
18
15
N
10
30
40
20
10
50
20
30
40
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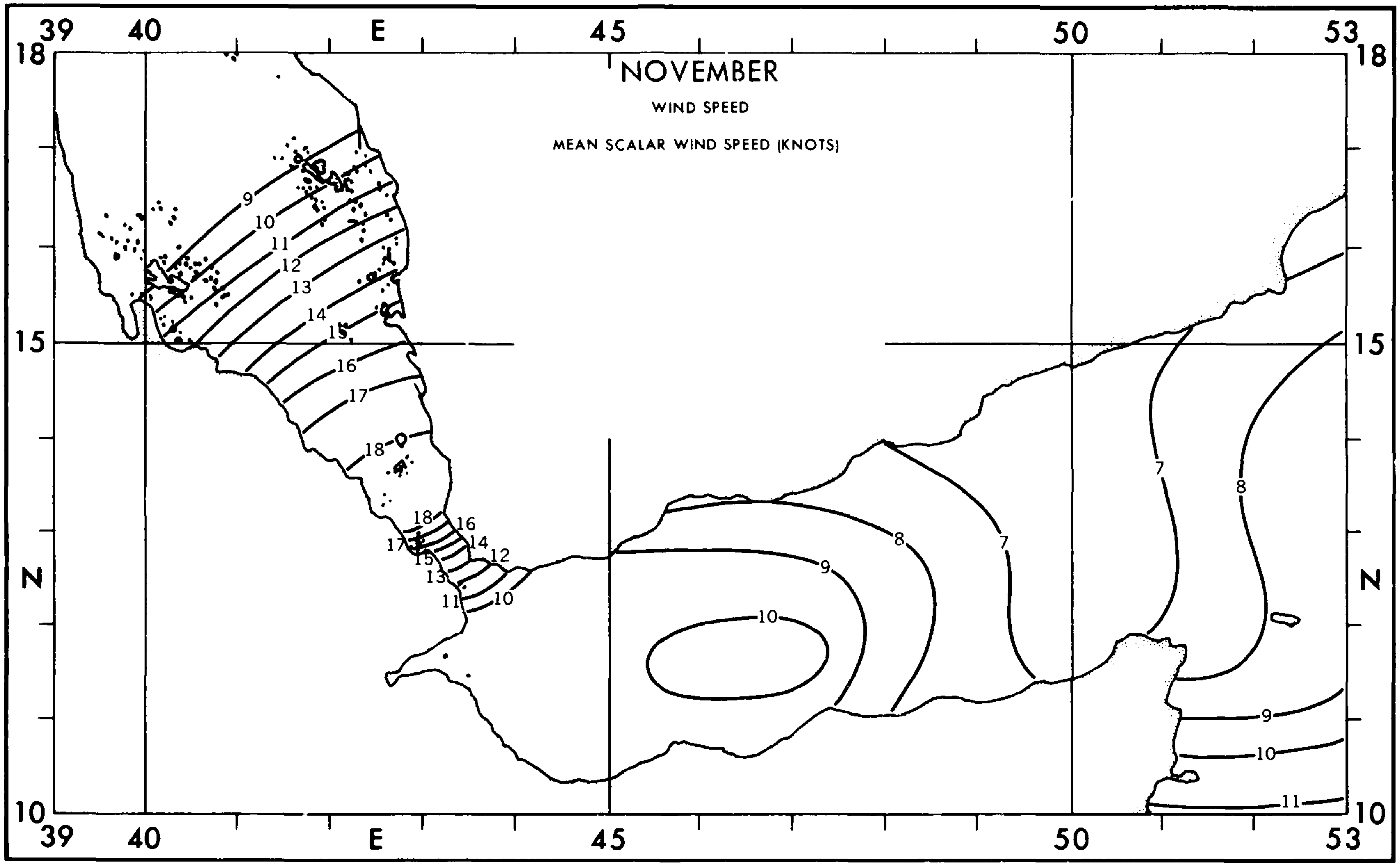
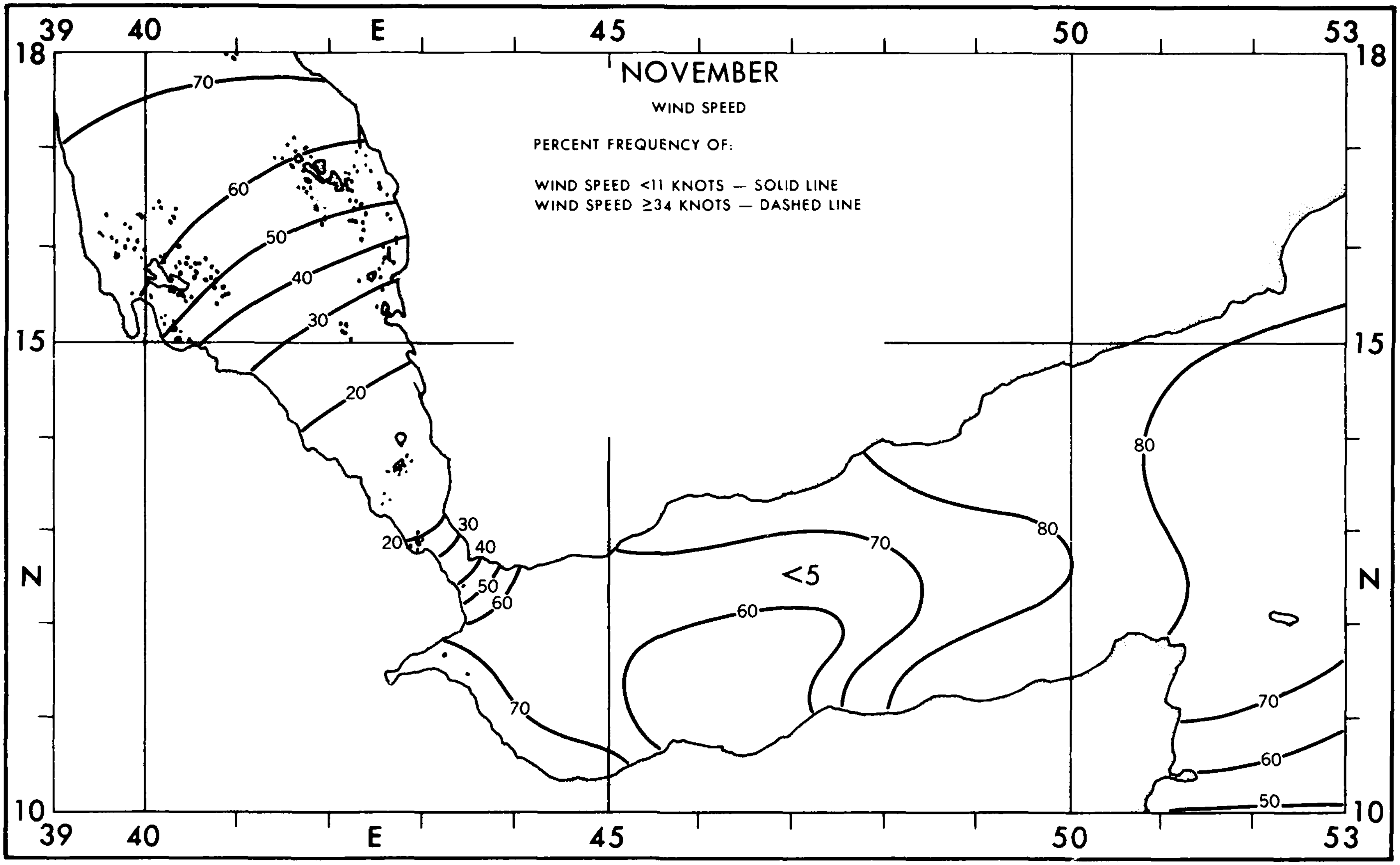
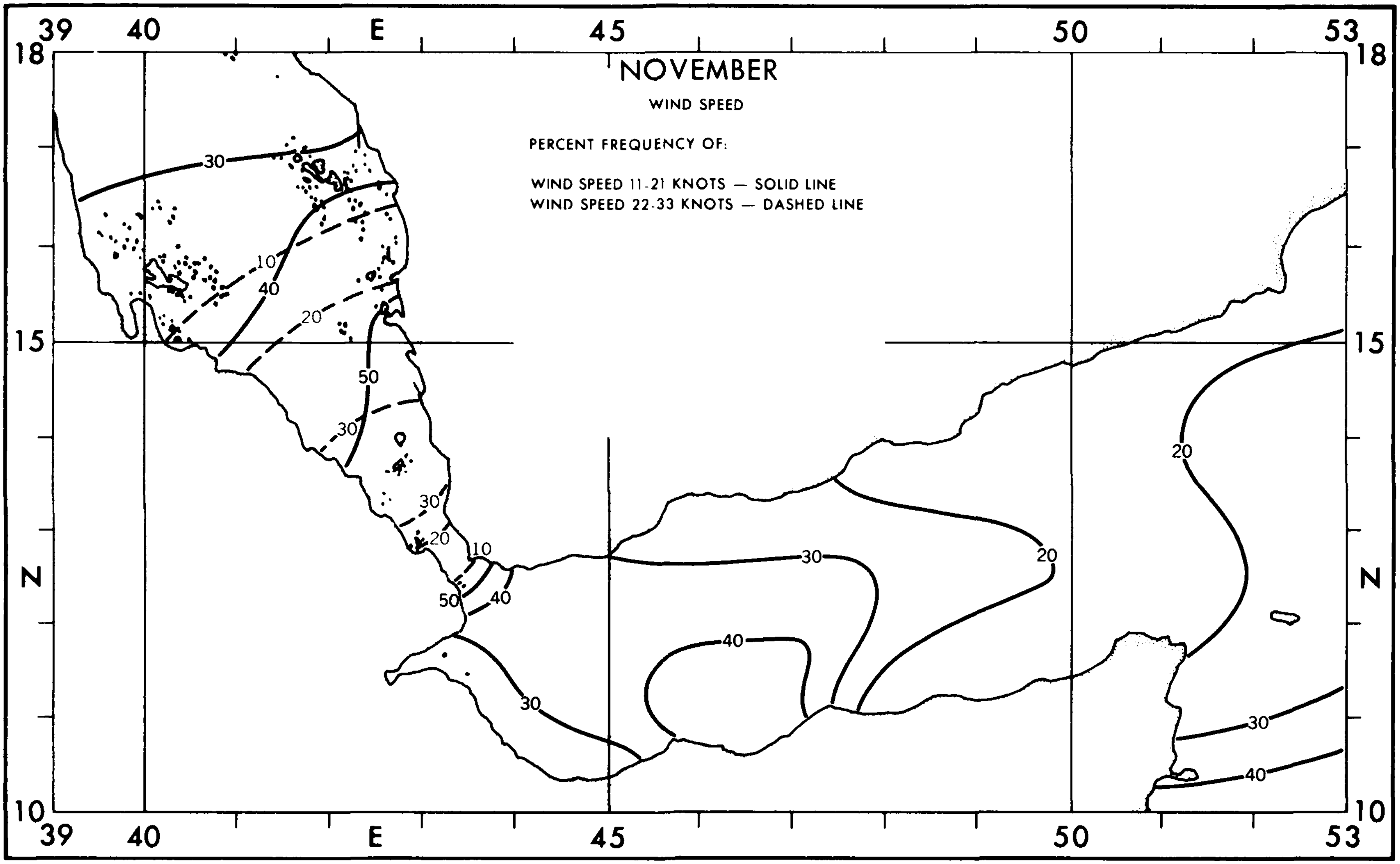
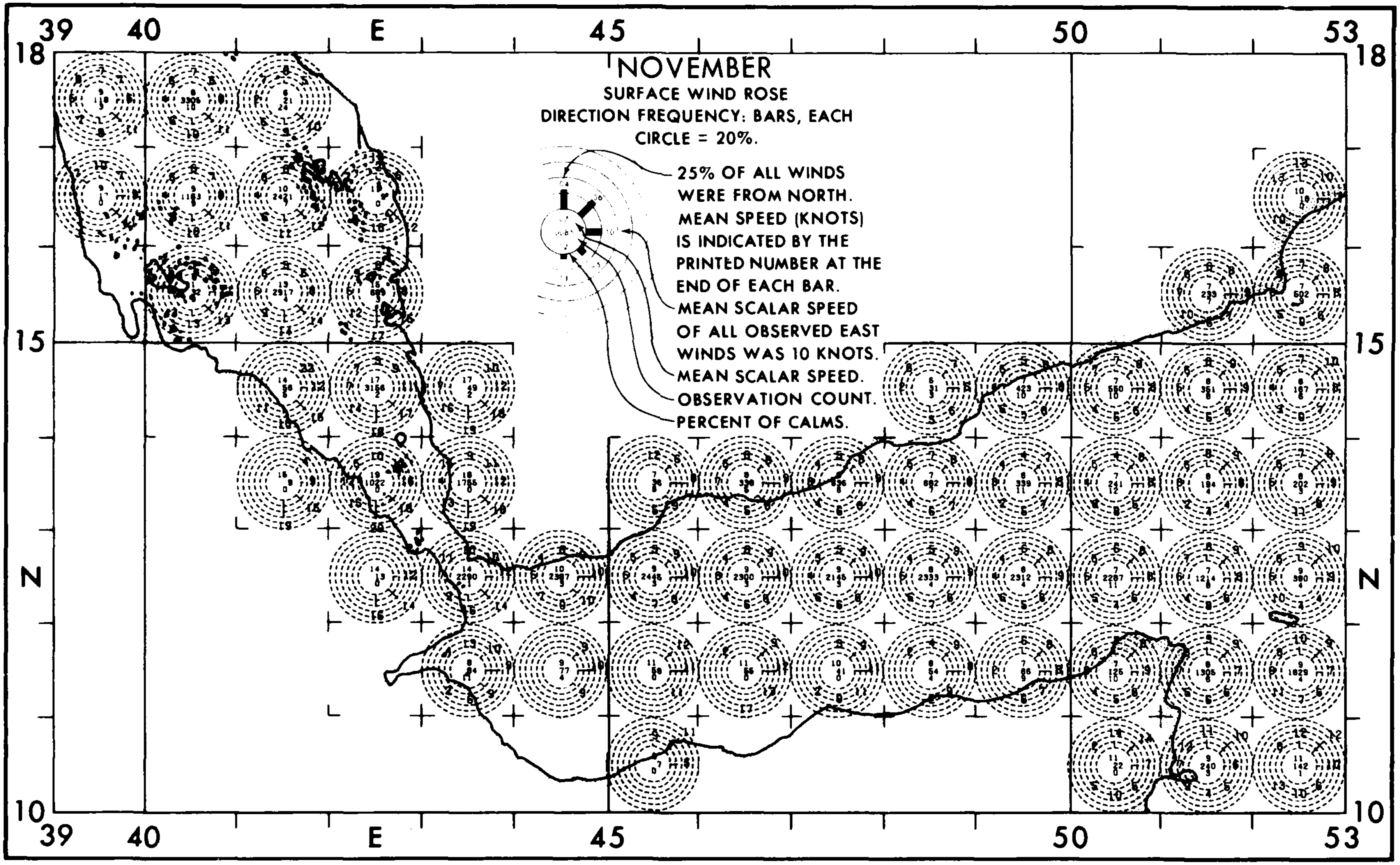
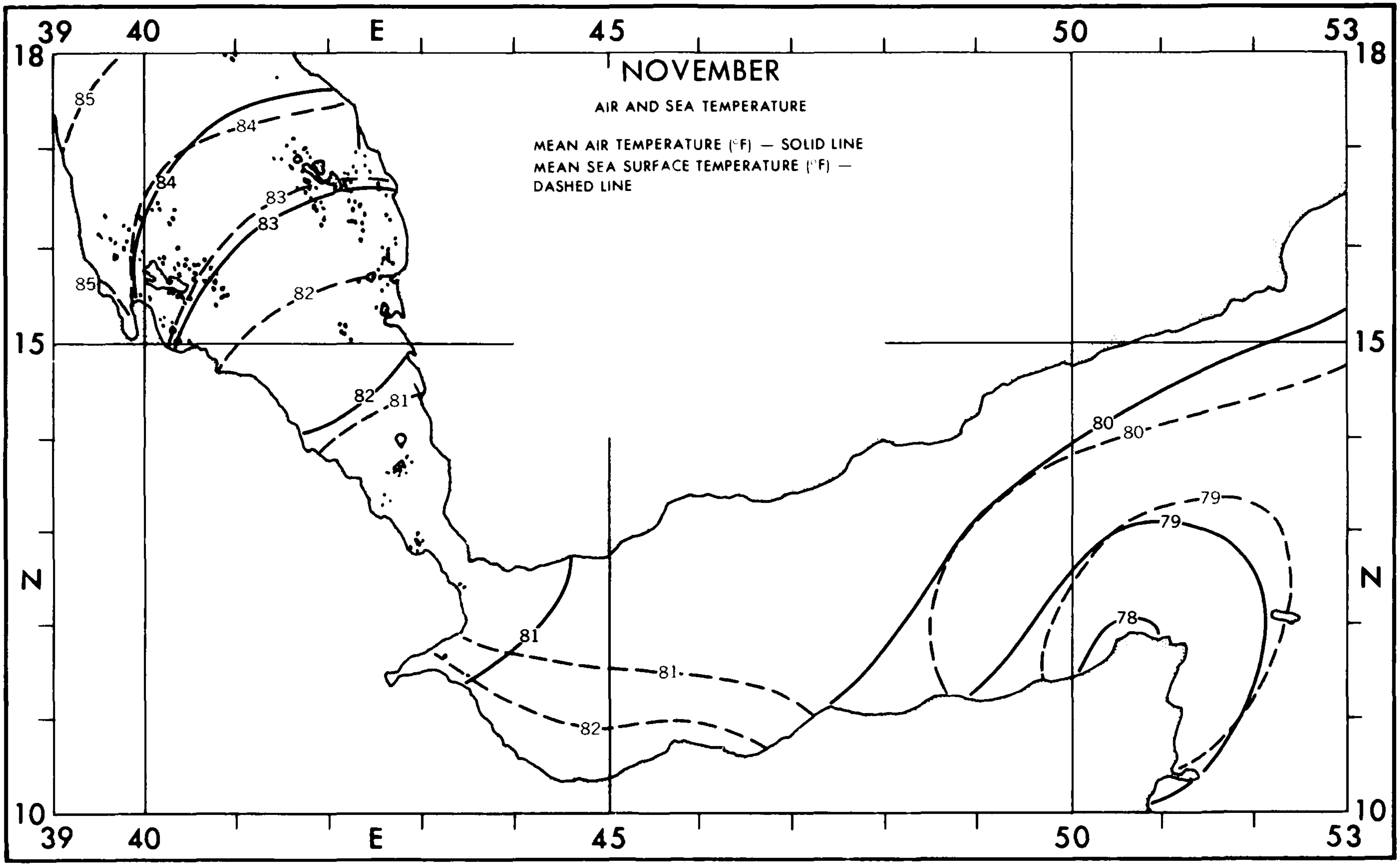
30
40
20
20
40

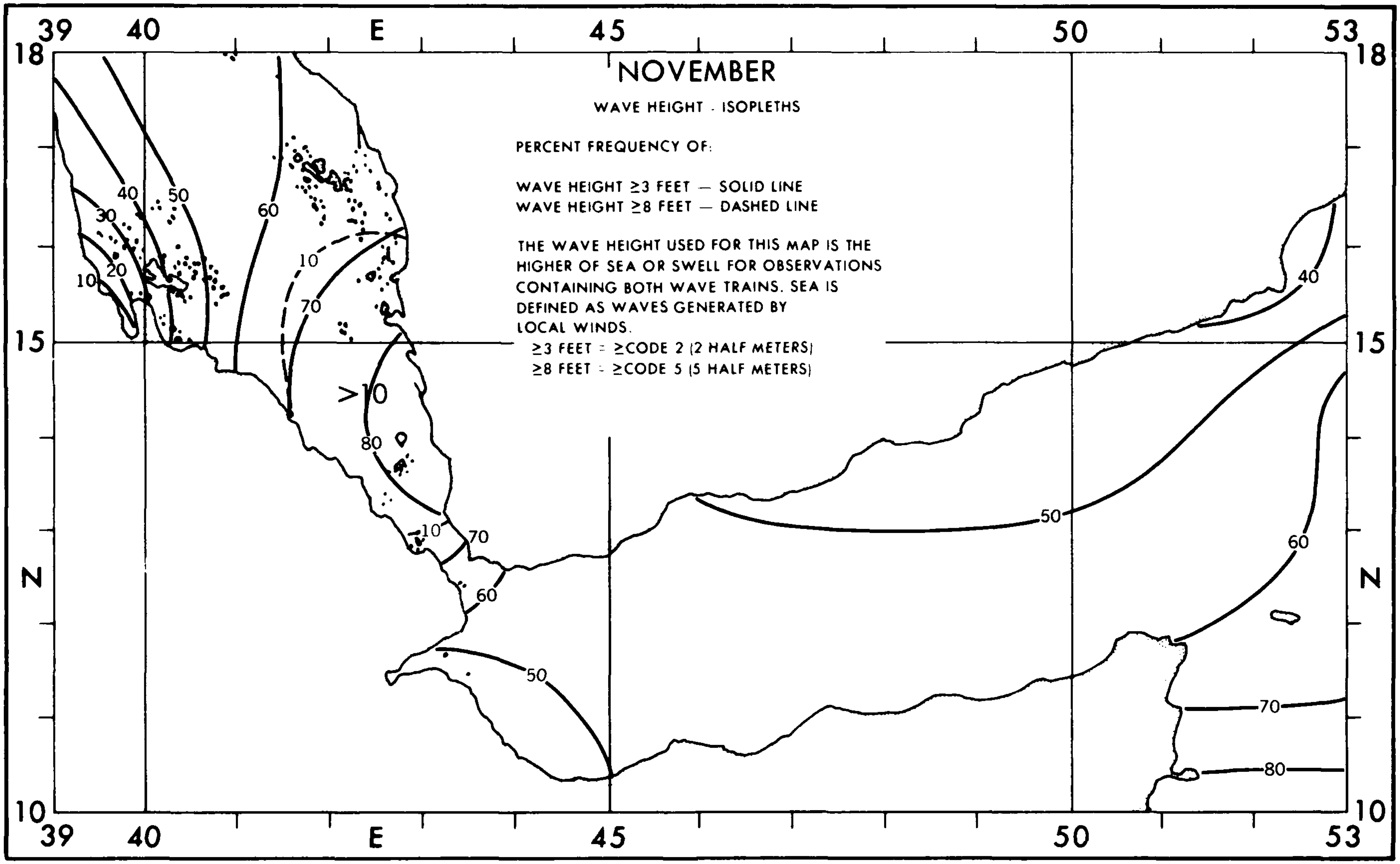

NOVEMBER
WIND SPEED
MEAN SCALAR WIND SPEED (KNOTS)
39
40
E
45
50
53
18
15
N
10
9
10
11
12
13
14
15
16
17
18
7
8

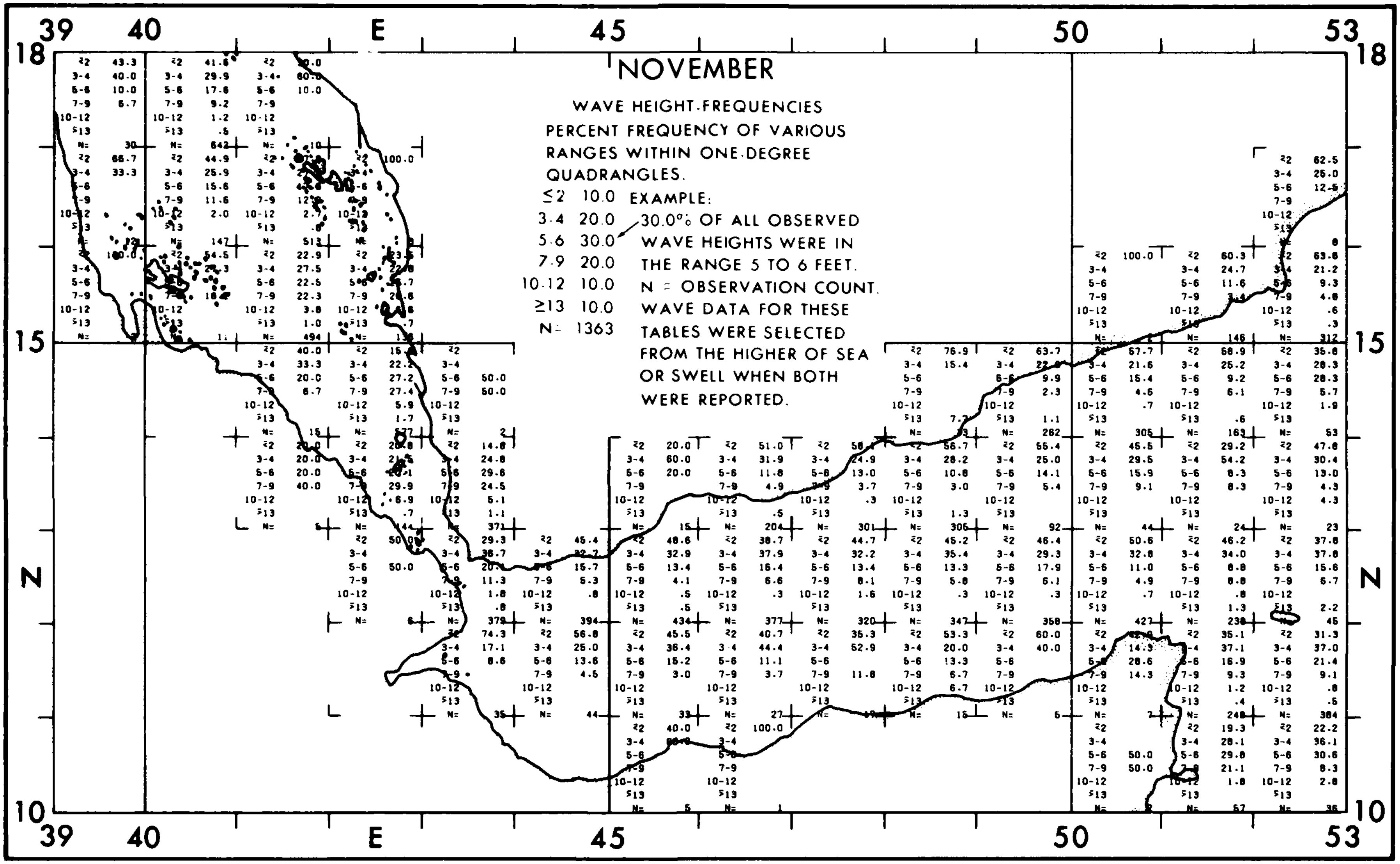

NOVEMBER
WIND SPEED
PERCENT FREQUENCY OF:
WIND SPEED <11 KNOTS — SOLID LINE
WIND SPEED ≥34 KNOTS — DASHED LINE
<5
39
40
E
45
50
53
18
15
N
10

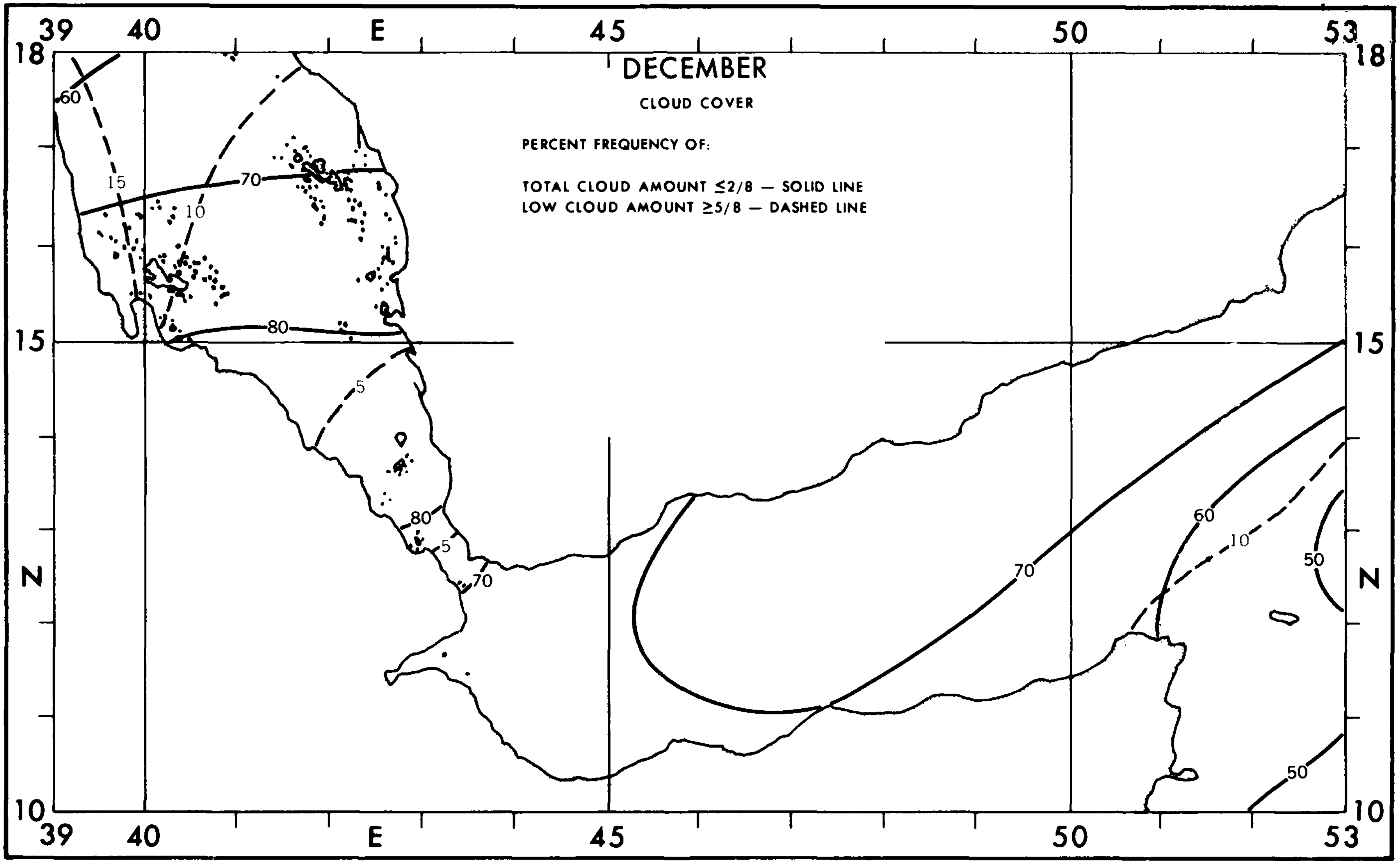

NOVEMBER
WIND SPEED
PERCENT FREQUENCY OF:
WIND SPEED 11-21 KNOTS — SOLID LINE
WIND SPEED 22-33 KNOTS — DASHED LINE

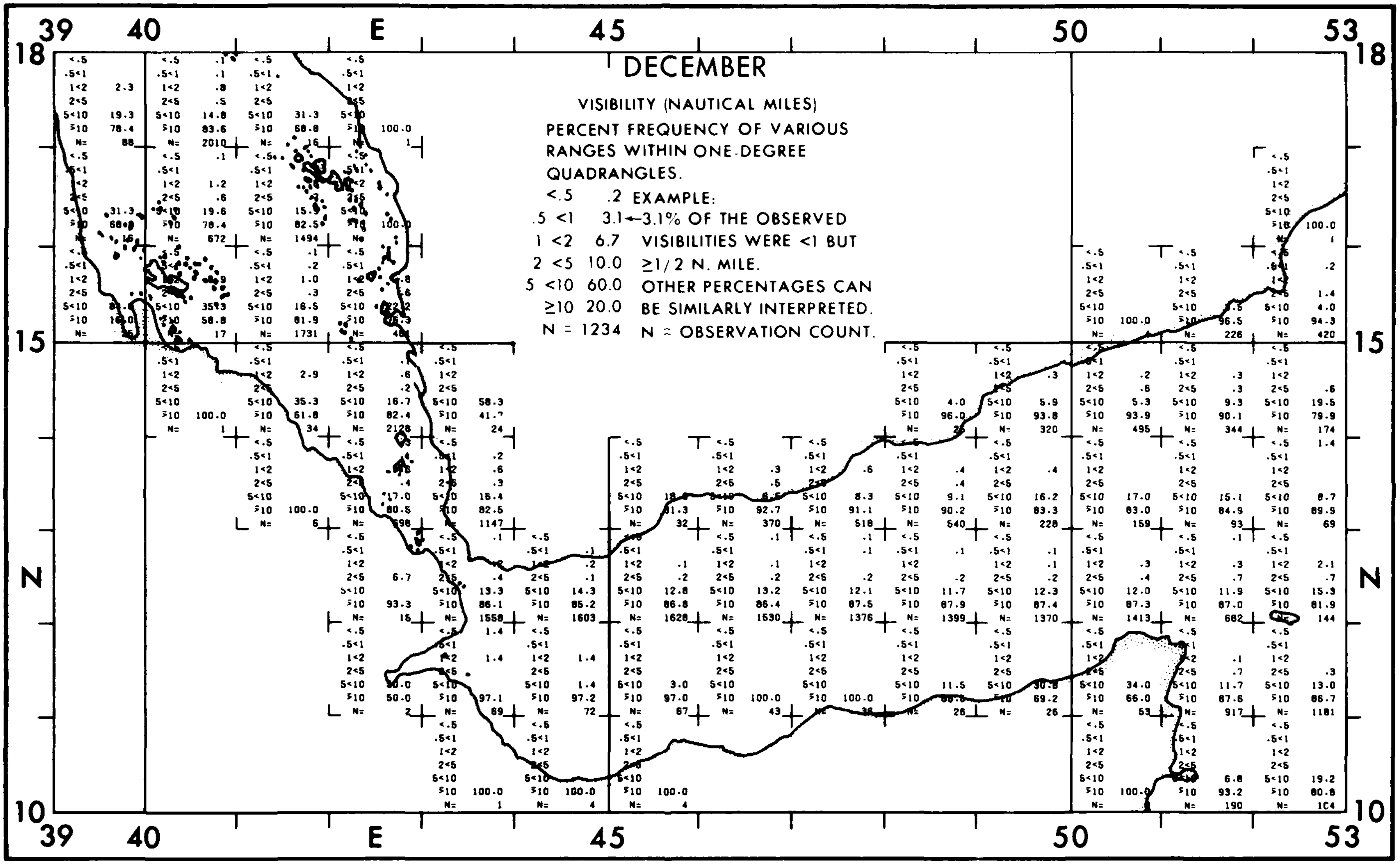

NOVEMBER
SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%.
25% OF ALL WINDS WERE FROM NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR.
MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
MEAN SCALAR SPEED.
OBSERVATION COUNT.
PERCENT OF CALMS.
39
40
E
45
50
53
18
15
N
10

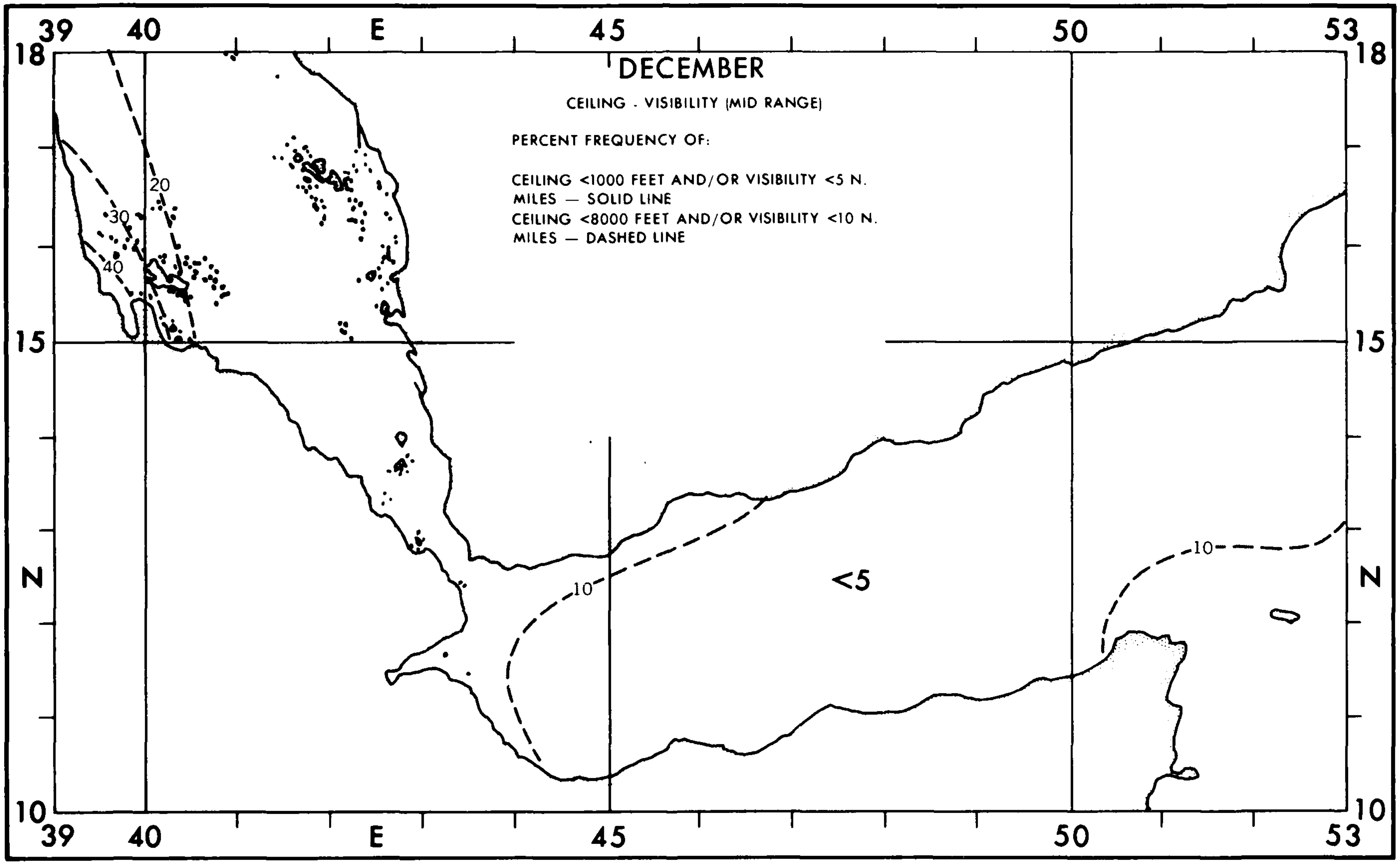

NOVEMBER
AIR AND SEA TEMPERATURE
MEAN AIR TEMPERATURE (°F) — SOLID LINE
MEAN SEA SURFACE TEMPERATURE (°F) — DASHED LINE
39
40
E
45
50
53
18
15
N
10
85
84
83
82
81
80
79
78


NOVEMBER
WAVE HEIGHT - ISOPLETHS
PERCENT FREQUENCY OF:
WAVE HEIGHT ≥3 FEET — SOLID LINE
WAVE HEIGHT ≥8 FEET — DASHED LINE
THE WAVE HEIGHT USED FOR THIS MAP IS THE HIGHER OF SEA OR SWELL FOR OBSERVATIONS CONTAINING BOTH WAVE TRAINS. SEA IS DEFINED AS WAVES GENERATED BY LOCAL WINDS.
≥3 FEET = ≥CODE 2 (2 HALF METERS)
≥8 FEET = ≥CODE 5 (5 HALF METERS)
39
40
E
45
50
53
18
15
N
10
10
20
30
40
50
60
70
80
>10

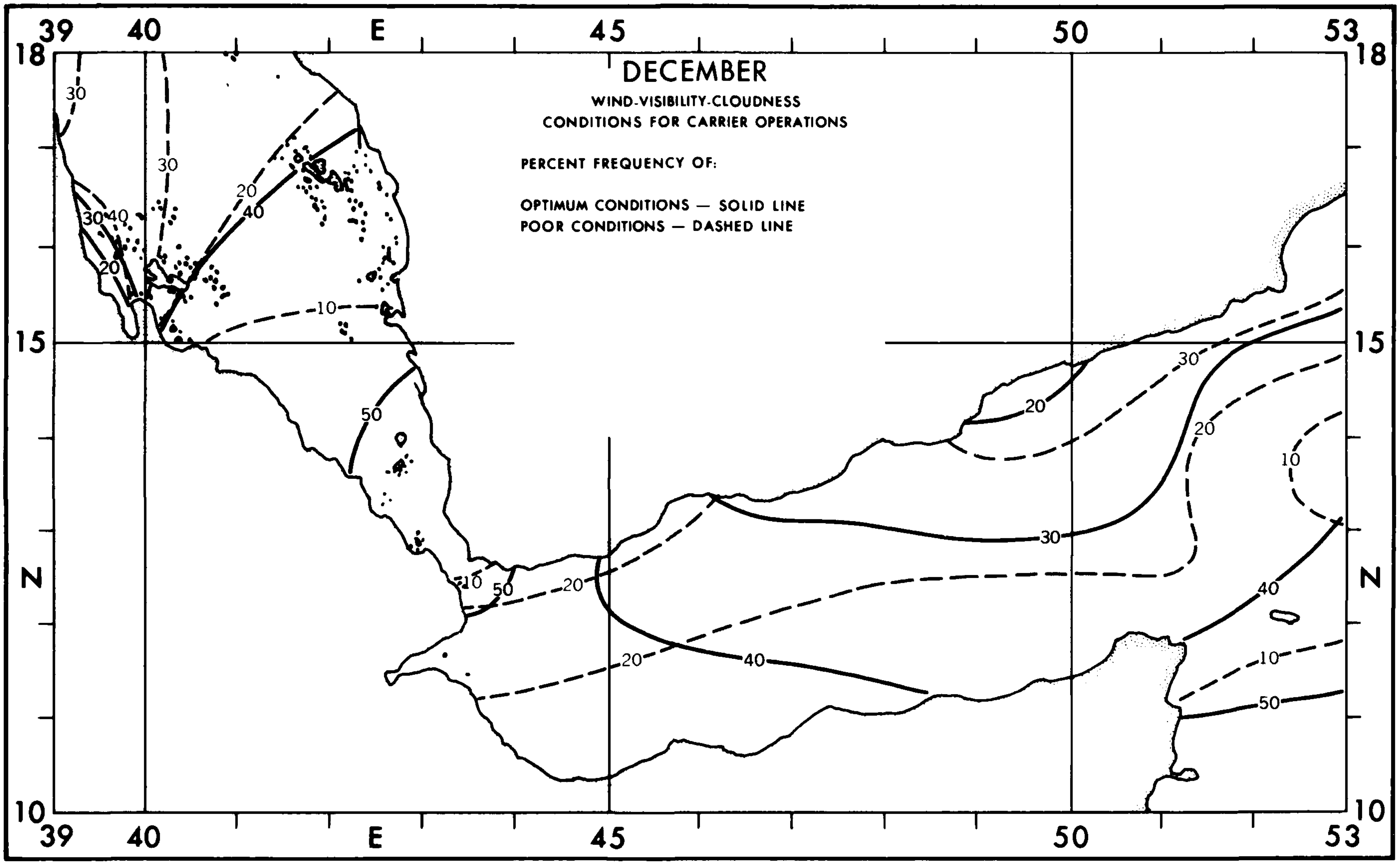

NOVEMBER
WAVE HEIGHT-FREQUENCIES
PERCENT FREQUENCY OF VARIOUS
RANGES WITHIN ONE-DEGREE
QUADRANGLES.
≤2 10.0 EXAMPLE:
3-4 20.0 30.0% OF ALL OBSERVED
5-6 30.0 WAVE HEIGHTS WERE IN
7-9 20.0 THE RANGE 5 TO 6 FEET.
10-12 10.0 N = OBSERVATION COUNT.
≥13 10.0 WAVE DATA FOR THESE
N= 1363 TABLES WERE SELECTED
FROM THE HIGHER OF SEA
OR SWELL WHEN BOTH
WERE REPORTED.
39
40
E
45
50
53
18
15
N
10

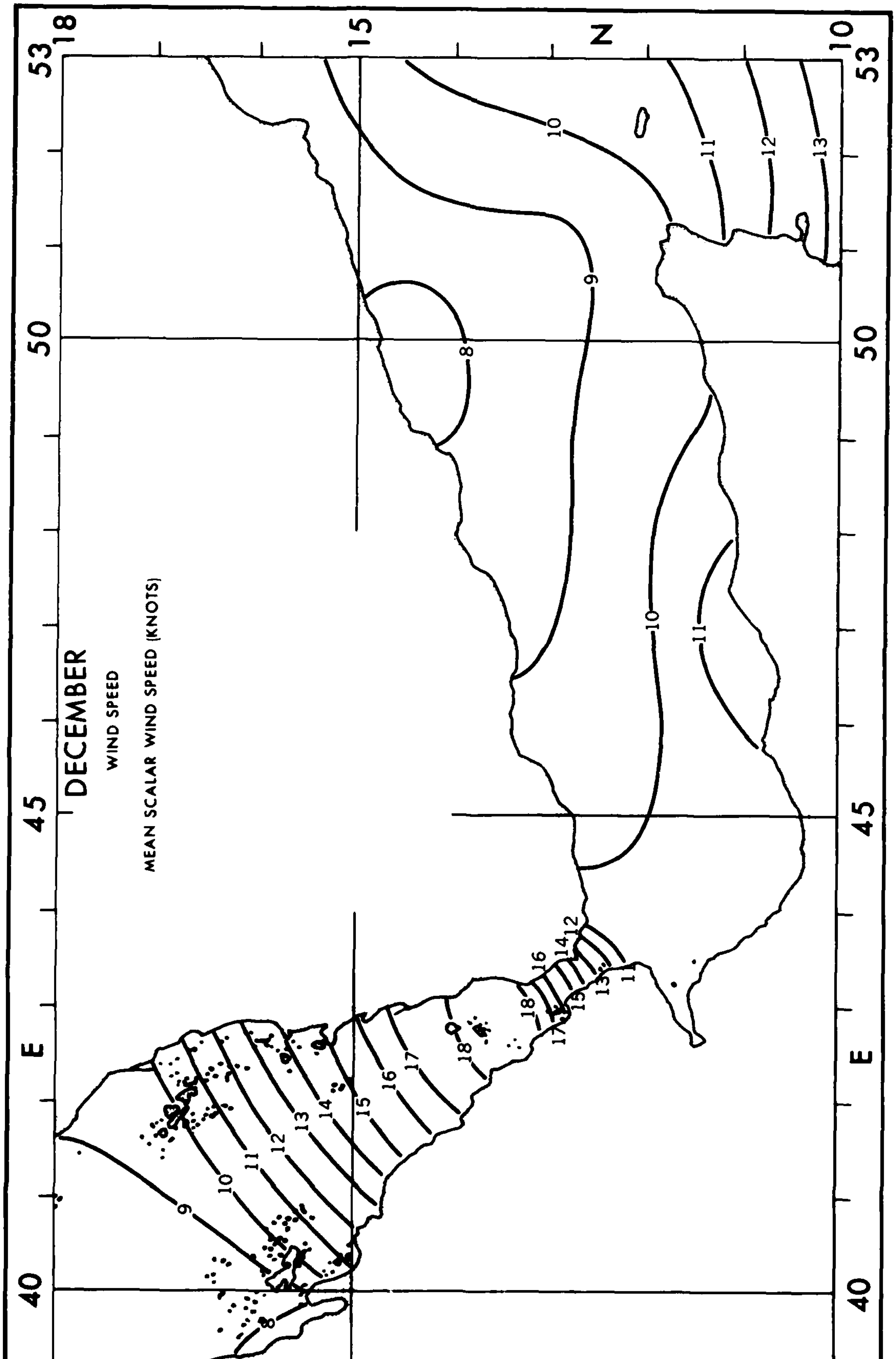

DECEMBER
CLOUD COVER
PERCENT FREQUENCY OF:
TOTAL CLOUD AMOUNT ≤2/8 — SOLID LINE
LOW CLOUD AMOUNT ≥5/8 — DASHED LINE
39
40
E
45
50
53
18
15
N
10
60
15
70
10
80
5
80
5
70
70
60
10
50
50

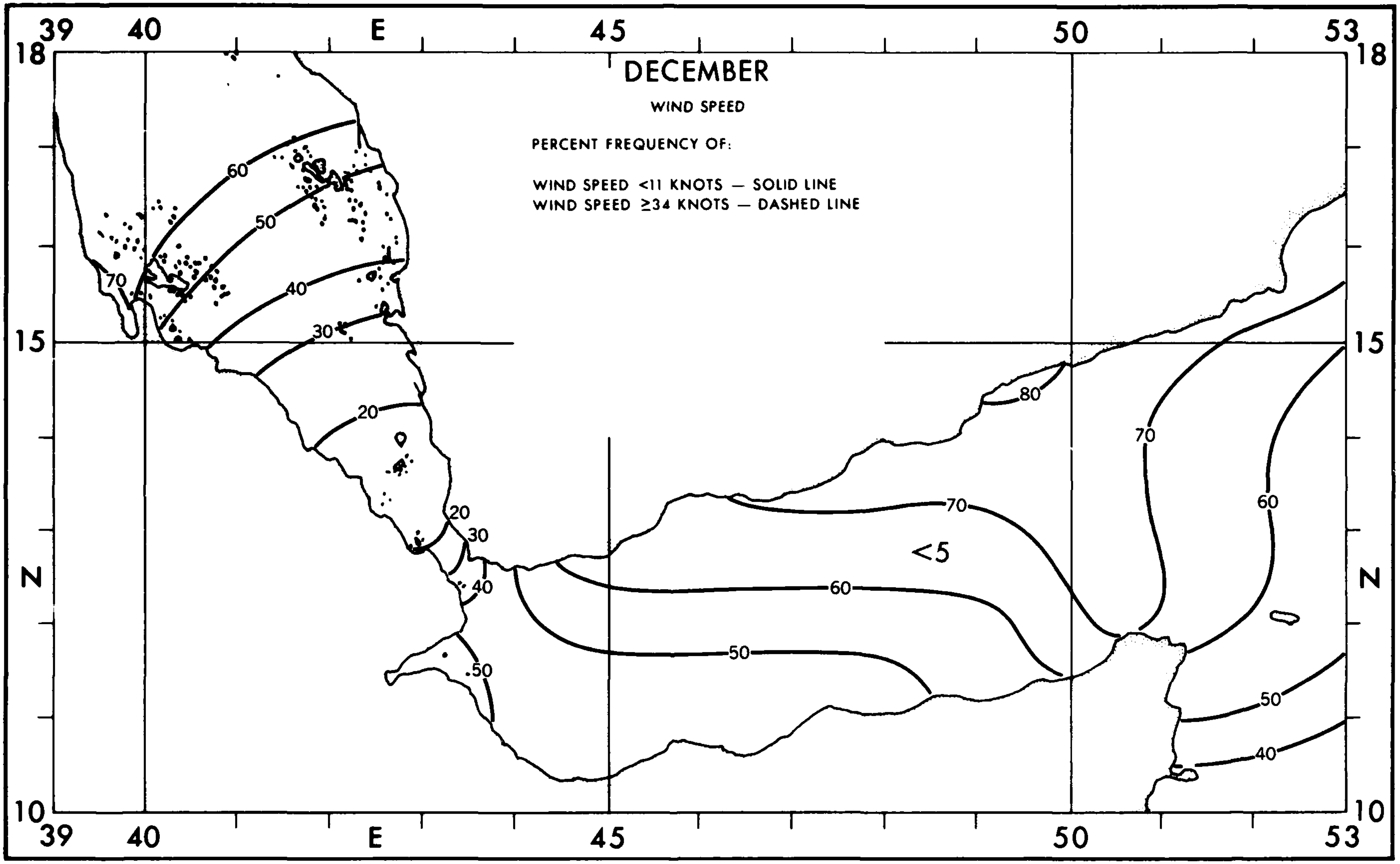

DECEMBER
VISIBILITY (NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
<.5 .2 EXAMPLE:
.5 <1 3.1←3.1% OF THE OBSERVED
1 <2 6.7 VISIBILITIES WERE <1 BUT
2 <5 10.0 ≥1/2 N. MILE.
5 <10 60.0 OTHER PERCENTAGES CAN
≥10 20.0 BE SIMILARLY INTERPRETED.
N = 1234 N = OBSERVATION COUNT.
39
40
E
45
50
53
18
15
N
10



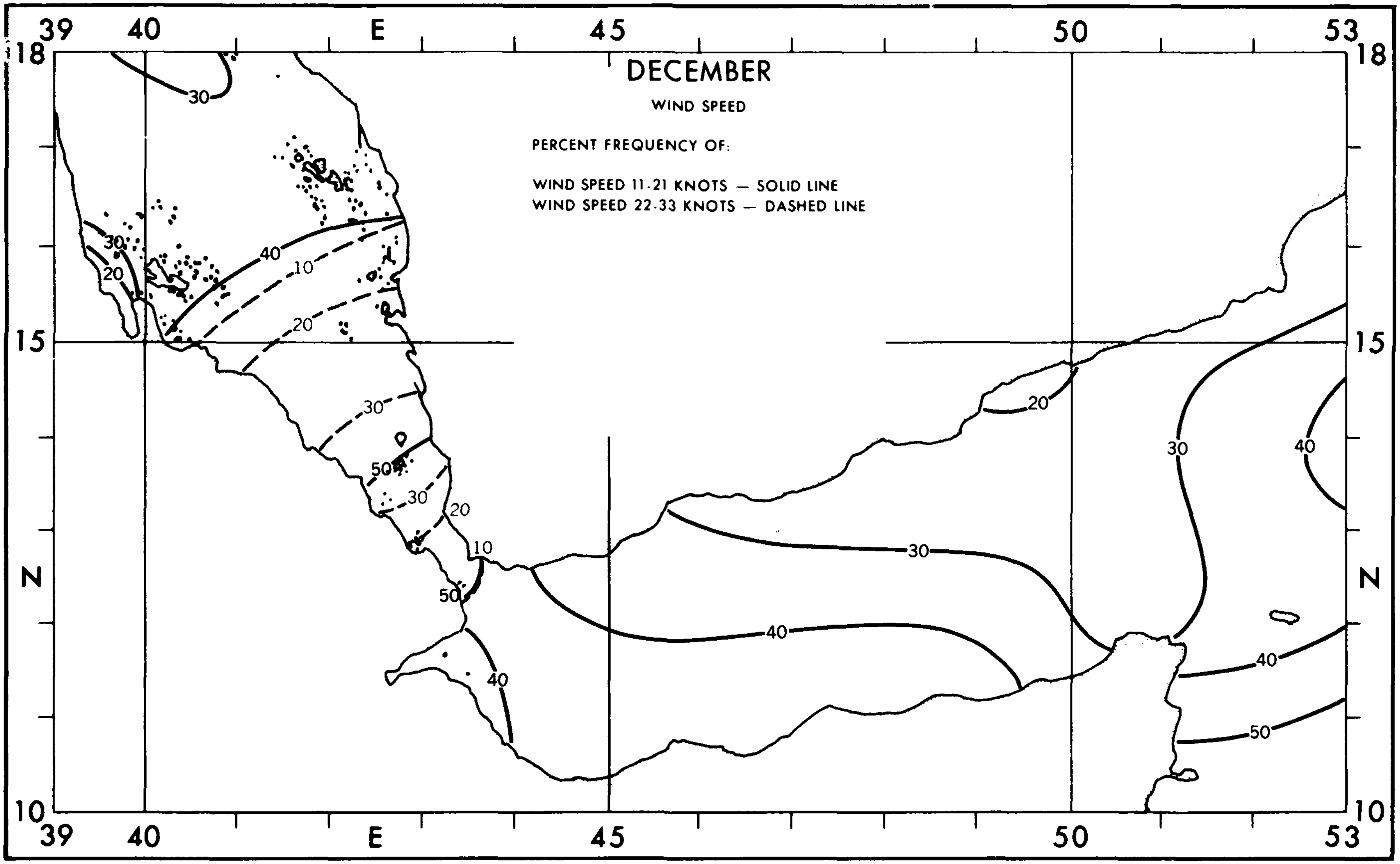
DECEMBER
CEILING - VISIBILITY (MID RANGE)
PERCENT FREQUENCY OF:
CEILING <1000 FEET AND/OR VISIBILITY <5 N. MILES — SOLID LINE
CEILING <8000 FEET AND/OR VISIBILITY <10 N. MILES — DASHED LINE
39
40
E
45
50
53
18
15
N
10
20
30
40
10
10
<5

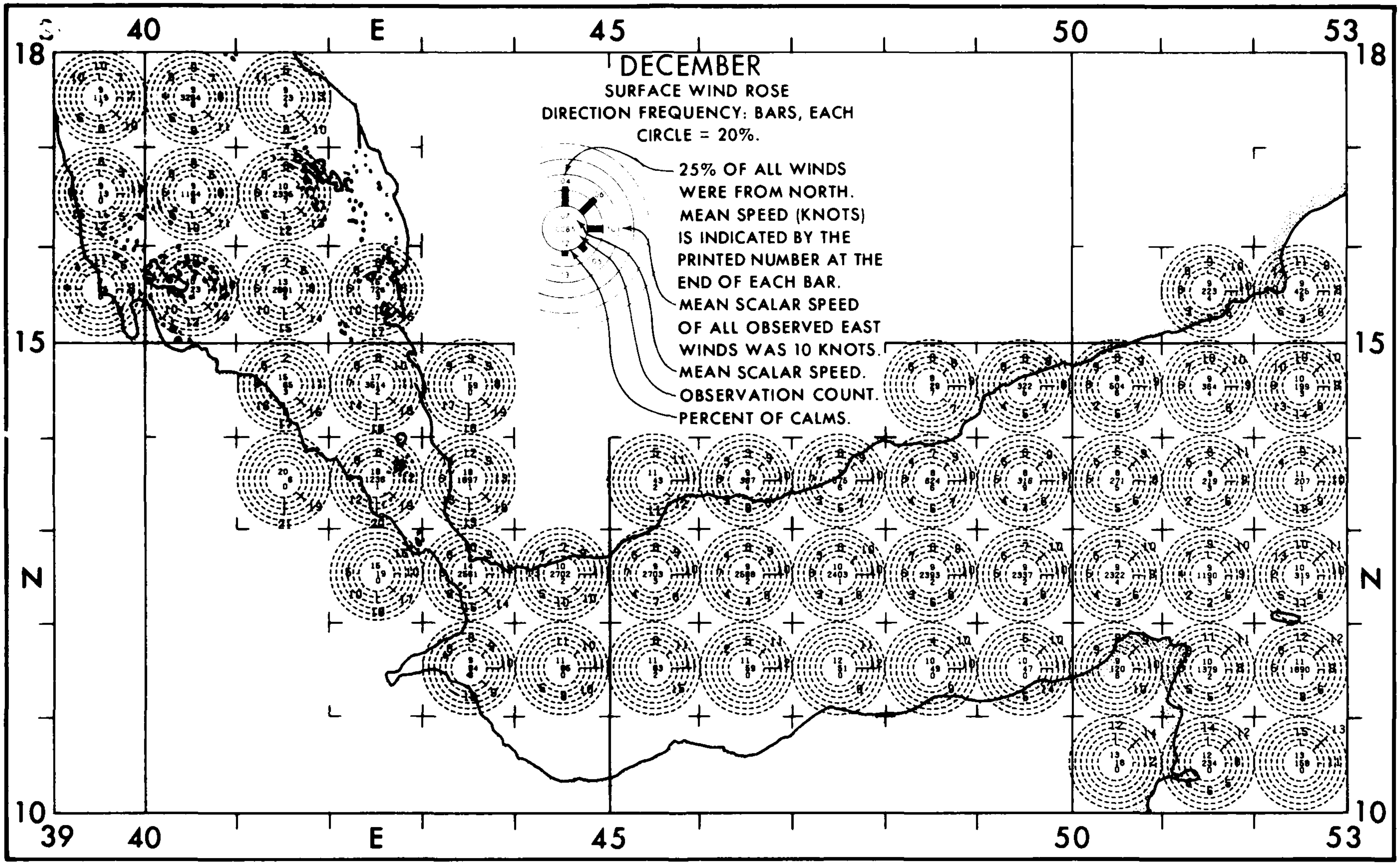

DECEMBER
WIND-VISIBILITY-CLOUDNESS
CONDITIONS FOR CARRIER OPERATIONS
PERCENT FREQUENCY OF:
OPTIMUM CONDITIONS — SOLID LINE
POOR CONDITIONS — DASHED LINE
39
40
E
45
50
53
18
15
N
10
30
20
40
10
50

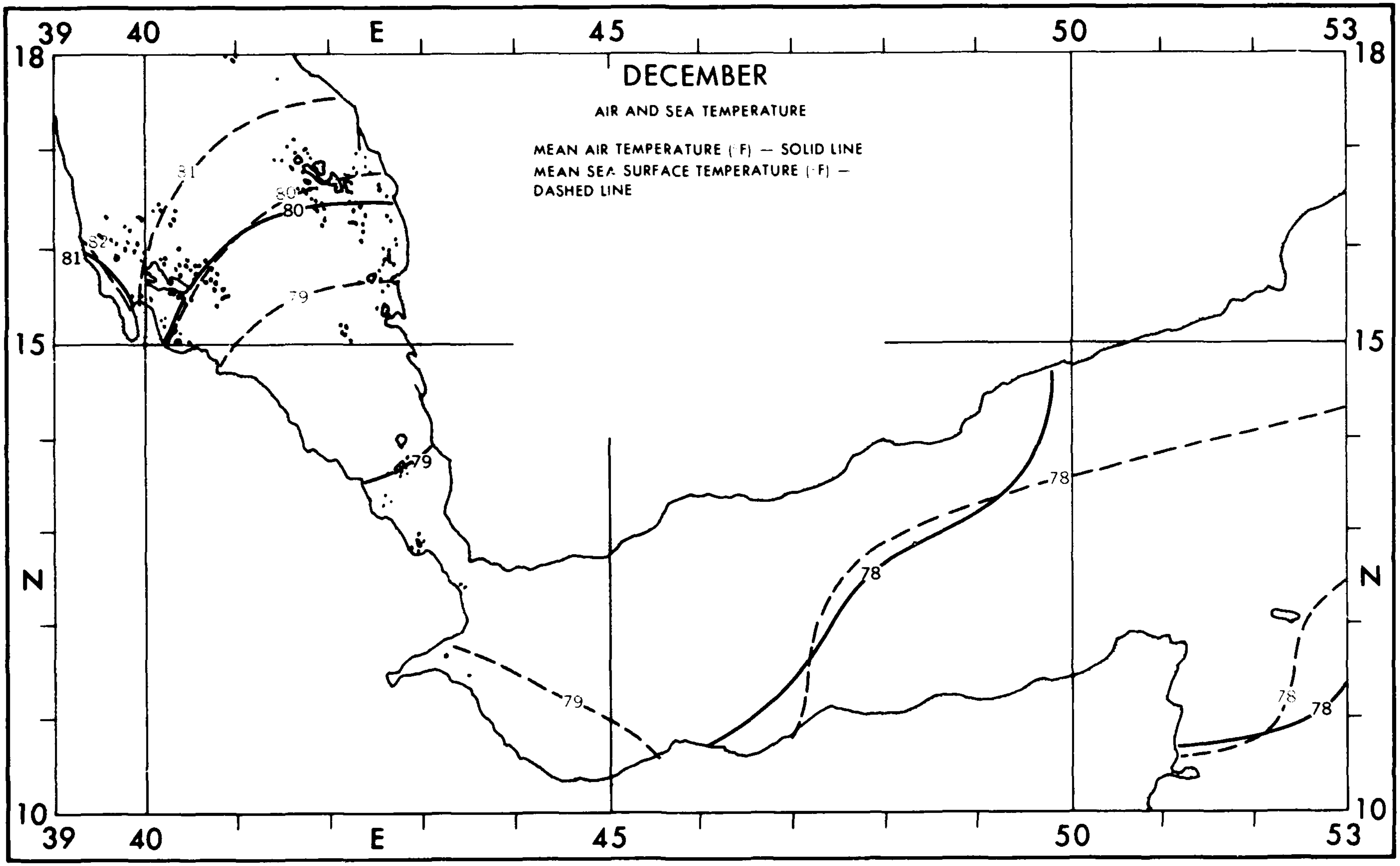

DECEMBER
WIND SPEED
MEAN SCALAR WIND SPEED (KNOTS)
39
40
45
50
53
18
15
N
10
E
8
9
10
11
12
13
14
15
16
17
18

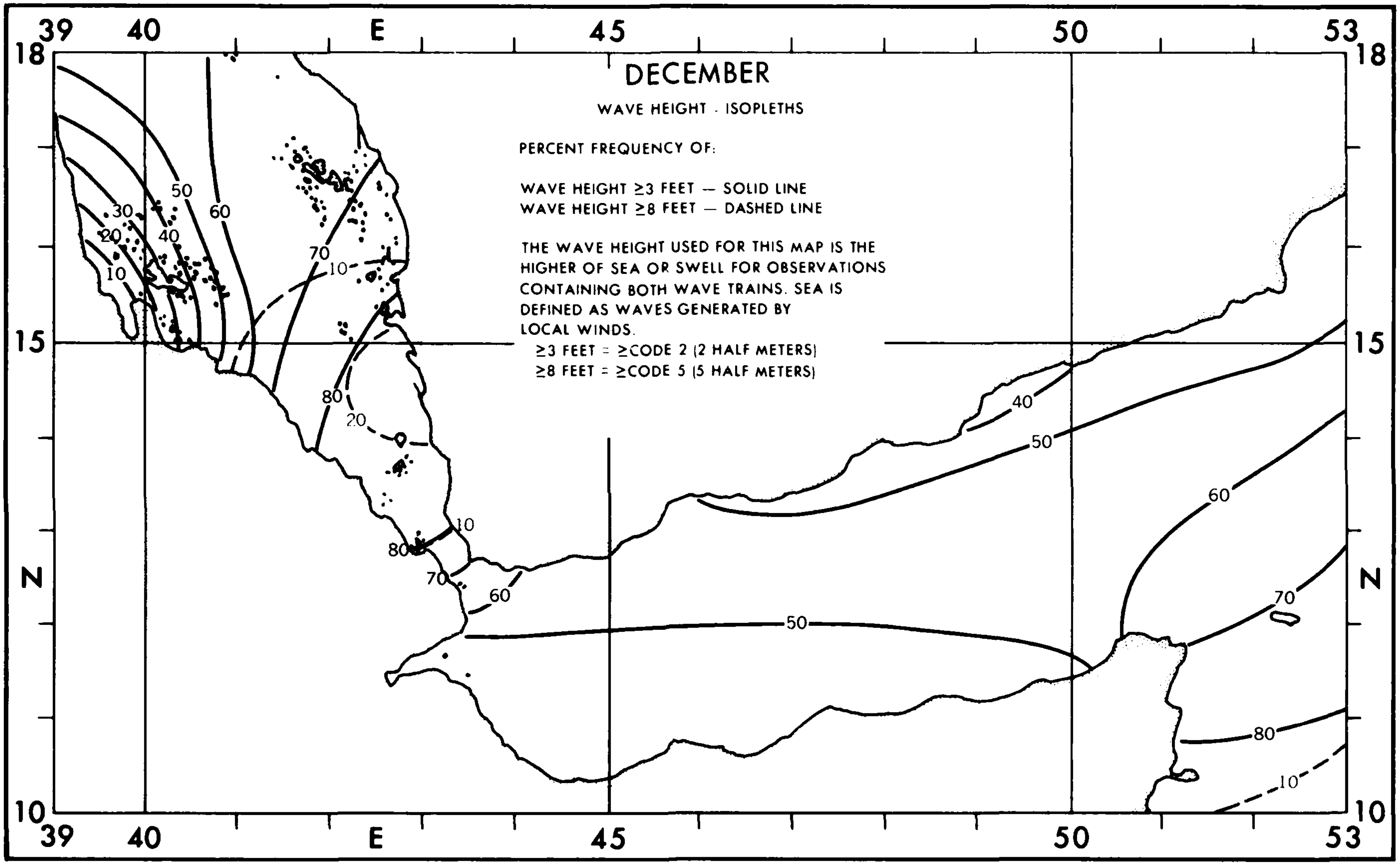


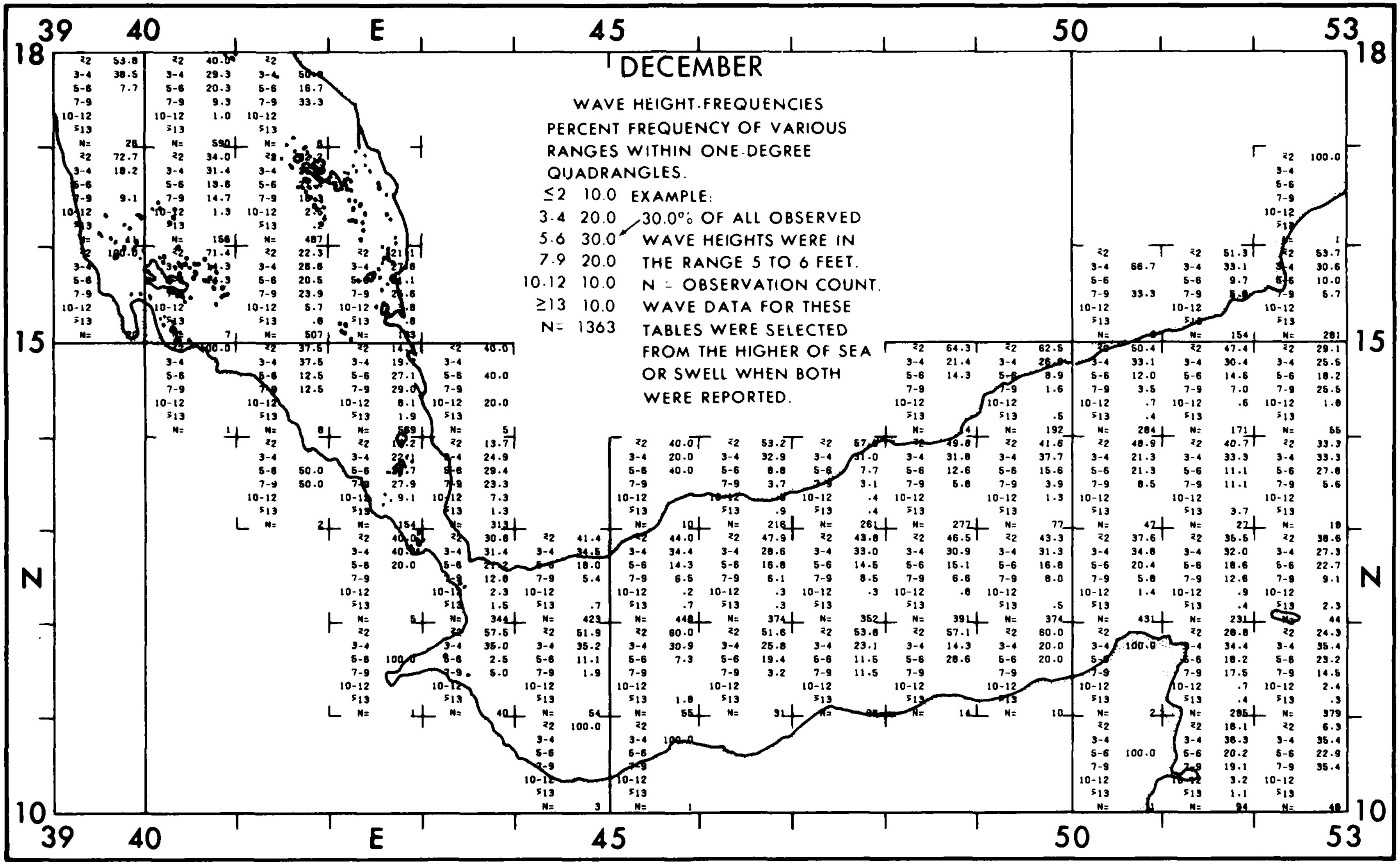
DECEMBER
WIND SPEED
PERCENT FREQUENCY OF:
WIND SPEED <11 KNOTS — SOLID LINE
WIND SPEED ≥34 KNOTS — DASHED LINE
39
40
E
45
50
53
18
15
N
10
<5
80
70
60
50
40
30
20


DECEMBER
WIND SPEED
PERCENT FREQUENCY OF:
WIND SPEED 11-21 KNOTS — SOLID LINE
WIND SPEED 22-33 KNOTS — DASHED LINE
39
40
E
45
50
53
18
15
N
10
30
40
10
20
50


DECEMBER
SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%.
25% OF ALL WINDS WERE FROM NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR.
MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
MEAN SCALAR SPEED.
OBSERVATION COUNT.
PERCENT OF CALMS.
39
40
E
45
50
53
18
15
N
10


DECEMBER
AIR AND SEA TEMPERATURE
MEAN AIR TEMPERATURE (°F) — SOLID LINE
MEAN SEA SURFACE TEMPERATURE (°F) —
DASHED LINE
39
40
E
45
50
53
18
15
N
10
81
82
80
79
78

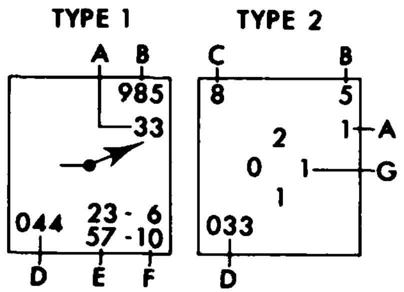

DECEMBER
WAVE HEIGHT - ISOPLETHS
PERCENT FREQUENCY OF:
WAVE HEIGHT ≥3 FEET — SOLID LINE
WAVE HEIGHT ≥8 FEET — DASHED LINE
THE WAVE HEIGHT USED FOR THIS MAP IS THE HIGHER OF SEA OR SWELL FOR OBSERVATIONS CONTAINING BOTH WAVE TRAINS. SEA IS DEFINED AS WAVES GENERATED BY LOCAL WINDS.
≥3 FEET = ≥CODE 2 (2 HALF METERS)
≥8 FEET = ≥CODE 5 (5 HALF METERS)
39
40
E
45
50
53
18
15
N
10
10
20
30
40
50
60
70
80


DECEMBER
WAVE HEIGHT-FREQUENCIES
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
≤2 10.0
3-4 20.0
5-6 30.0
7-9 20.0
10-12 10.0
≥13 10.0
N= 1363
EXAMPLE:
30.0% OF ALL OBSERVED WAVE HEIGHTS WERE IN THE RANGE 5 TO 6 FEET.
N = OBSERVATION COUNT.
WAVE DATA FOR THESE TABLES WERE SELECTED FROM THE HIGHER OF SEA OR SWELL WHEN BOTH WERE REPORTED.
39
40
E
45
50
53
18
15
N
10

SURFACE CURRENTS

Data Presentation

The following legend shows two types of surface current presentations by 1° quadrangle, type 1 with 12 or more observations and type 2 with fewer than 12 observations. Where there are 11 or fewer observations within a 1° quadrangle, the total number of observations is shown within the 90° quadrant containing the observations.



A Number of calms (included in total observations).

B Total observations

C Mean speed (0.8 knot) for all observations.

D Vector resultant direction (°T) for all observations.

E Percent frequencies (57% primary direction, 23% secondary direction).

F Mean speeds (1.0 knot primary direction, 0.6 knot secondary direction).

G Number of observations by quadrant.

Type 1 - If there are 12 or more non-calm observations in a 1° quadrangle, the surface current is depicted by vector resultants as follows:

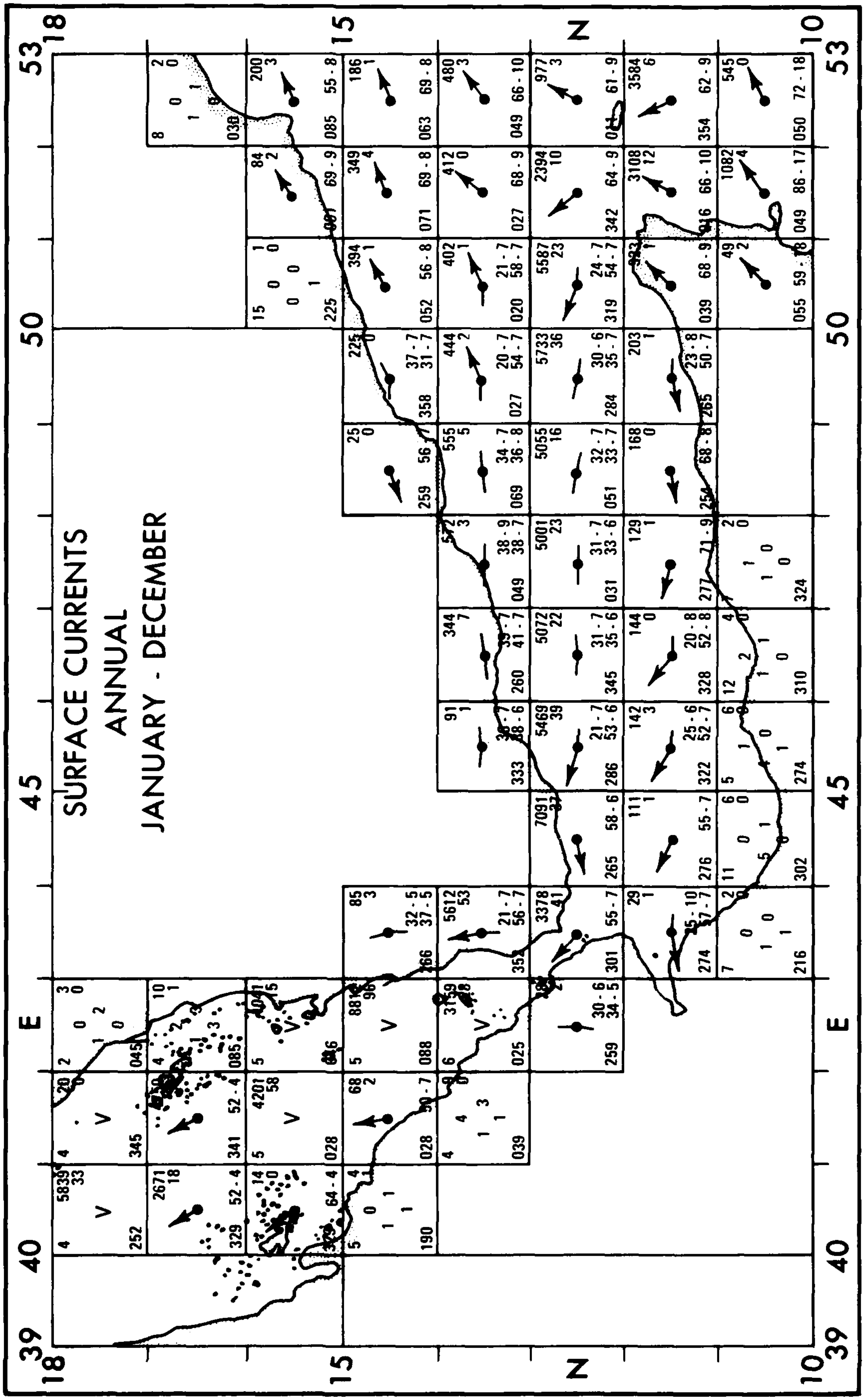
Persistent Current - 60 percent or more of all observations fall within a 45° sector of the 8-point compass.

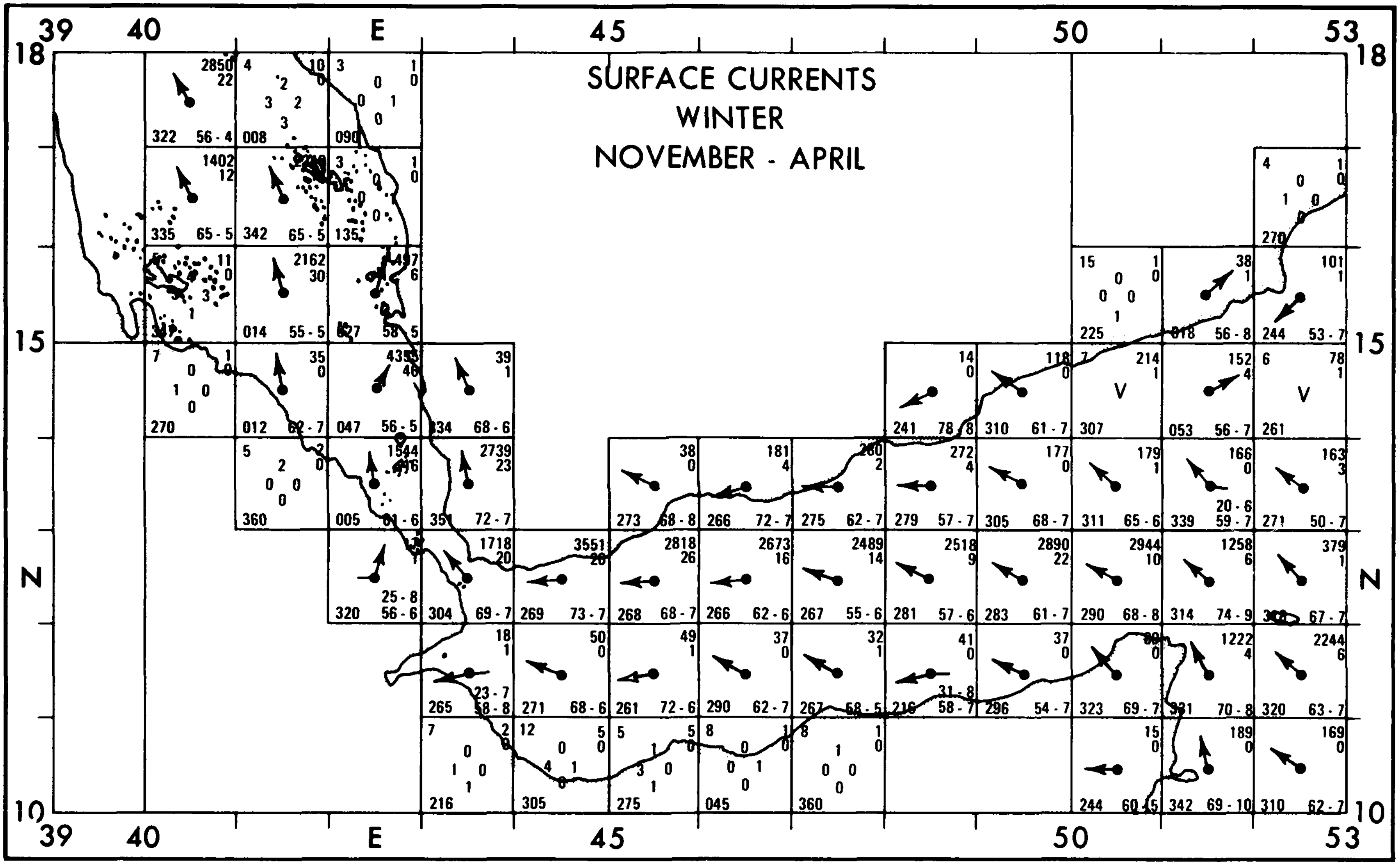
Primary Current with Secondary Direction -
Primary Current - 50 percent or more of all observations fall within three adjacent 45° sectors.
Secondary Direction - 20 percent or more of all observations fall within a 45° sector, and the two resultant vector directions are separated by more than 90° of arc.

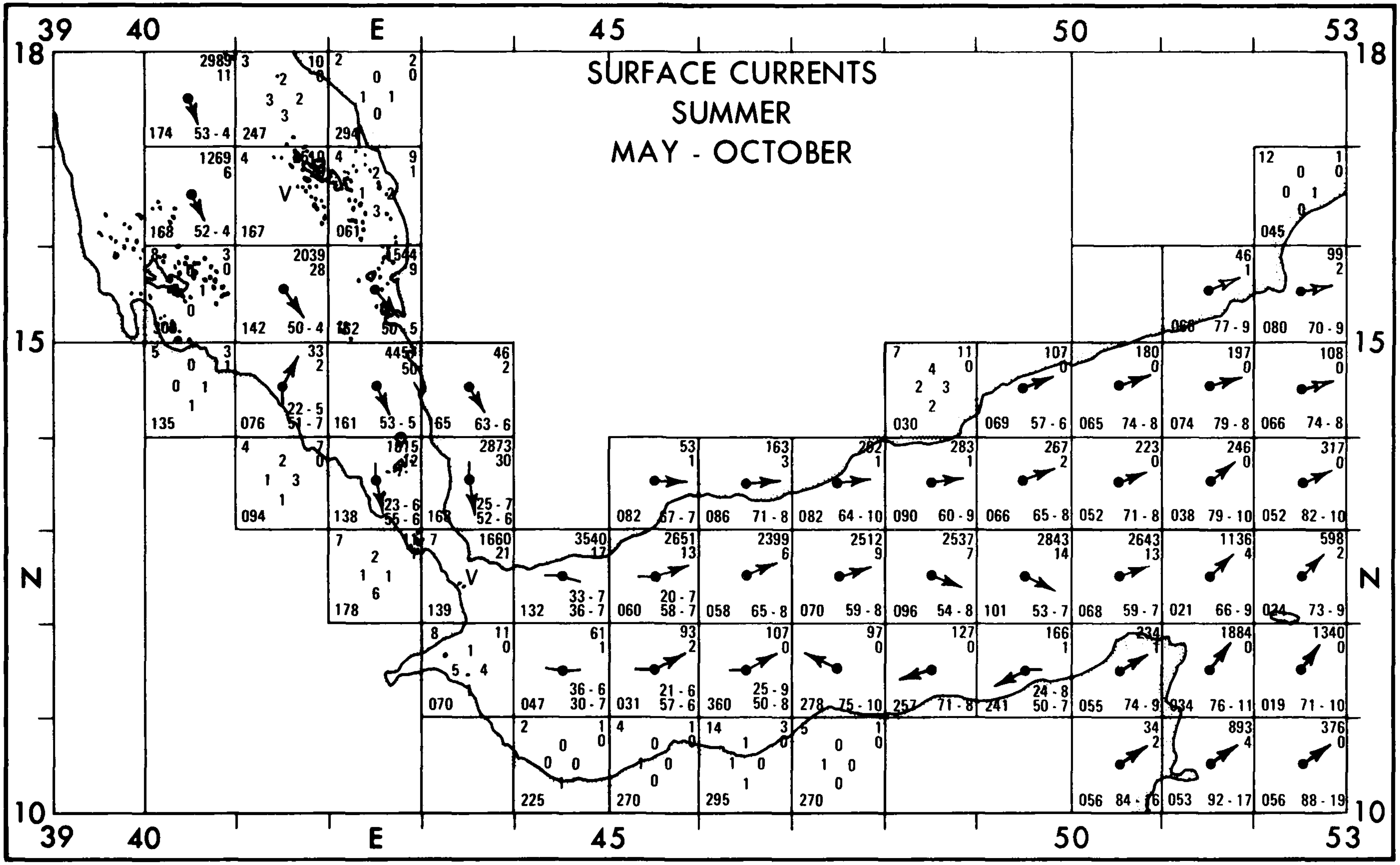
Prevailing Current - 70 percent or more of all observations fall within two adjacent 45° sectors.

Bizonal Flow - Practically all observations are concentrated in opposite pairs of 45° sectors, and one pair contains at least 80 percent as many observations as the opposite pair. This generally indicates variability that occurs in zones of entrainment between opposing currents.

V Variable Current - The 45° sector with most observations has less than 25 percent of all observations; direction is indeterminate.


SURFACE CURRENTS
ANNUAL
JANUARY - DECEMBER


SURFACE CURRENTS
WINTER
NOVEMBER - APRIL
39
40
E
45
50
53
18
15
N
10



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