DTIC FILE COPY

NAVAIR 50-1C-556

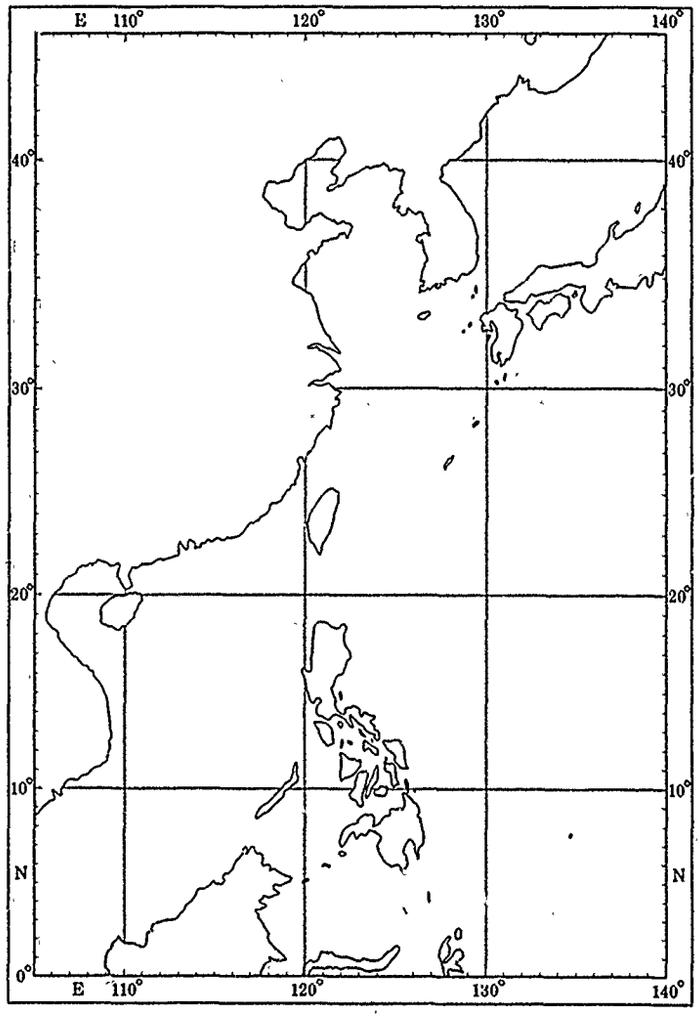
(1)

U.S. NAVY REGIONAL CLIMATIC STUDY OF THE CENTRAL EAST ASIAN COAST AND ASSOCIATED WATERS

AD-A217 448

NOVEMBER, 1989

DTIC
ELECTE
JAN 31 1990
S D
D



*Original contains color plates: All DTIC reproductions will be in black and white.

PREPARED BY
NAVAL OCEANOGRAPHY COMMAND DETACHMENT
ASHEVILLE, NC

PRODUCED BY
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL CLIMATIC DATA CENTER
ASHEVILLE, NC

PREPARED UNDER AUTHORITY OF
COMMANDER, NAVAL OCEANOGRAPHY COMMAND
STENNIS SPACE CENTER, MS 39529-5000

THIS DOCUMENT HAS BEEN APPROVED FOR PUBLIC RELEASE AND SALE: DISTRIBUTION IS UNLIMITED.

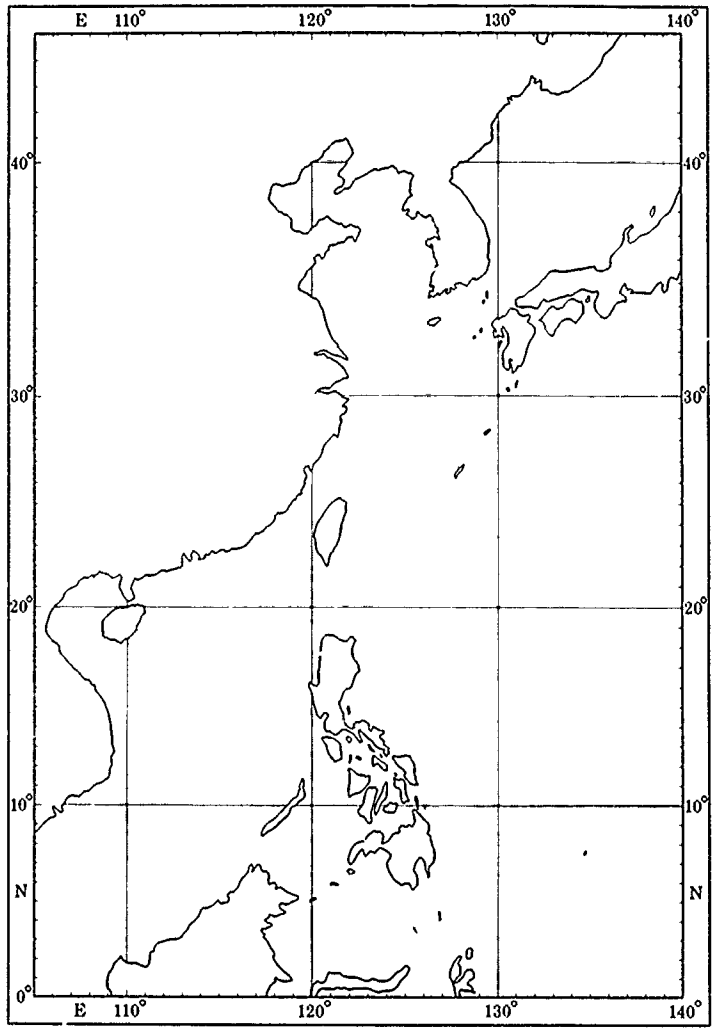
0850LP0161000

NAVAIR-50-1C-556

90 01 30 033

U.S. NAVY REGIONAL CLIMATIC STUDY OF THE CENTRAL EAST ASIAN COAST AND ASSOCIATED WATERS

NOVEMBER, 1989



DTIC COPY

Accesion For
NTIS CRA&I
DTIC TAB
Unannounced
Justification
By
Distribution/
Availability Codes
Dist | Avail and/or Special
A-1

PREPARED BY
NAVAL OCEANOGRAPHY COMMAND DETACHMENT
ASHEVILLE, NC

PRODUCED BY
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL CLIMATIC DATA CENTER
ASHEVILLE, NC

PREPARED UNDER AUTHORITY OF
COMMANDER, NAVAL OCEANOGRAPHY COMMAND
STENNIS SPACE CENTER, MS 39529-5000

THIS DOCUMENT HAS BEEN APPROVED FOR PUBLIC RELEASE AND SALE DISTRIBUTION IS UNLIMITED

0850LP0161000

NAVAIR-50-1C-556

UNCLASSIFIED
SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

1a REPORT SECURITY CLASSIFICATION Unclassified	1b RESTRICTIVE MARKINGS
2a. SECURITY CLASSIFICATION AUTHORITY	3 DISTRIBUTION/AVAILABILITY OF REPORT Public Release/Distribution Unlimited
2b DECLASSIFICATION/DOWNGRADING SCHEDULE	
4 PERFORMING ORGANIZATION REPORT NUMBER(S)	5. MONITORING ORGANIZATION REPORT NUMBER(S) NAVAIR 50-1C-556 S/N 0850-LP-016-1000
6a. NAME OF PERFORMING ORGANIZATION National Climatic Data Center Climate Support Branch 6b OFFICE SYMBOL (If applicable) E1CC22	7a. NAME OF MONITORING ORGANIZATION Naval Oceanography Command Detachment Asheville
6c. ADDRESS (City, State, and ZIP Code) Federal Building Asheville, NC 28801-2696	7b. ADDRESS (City, State, and ZIP Code) Federal Building Asheville, NC 28801-2696
8a. NAME OF FUNDING/SPONSORING ORGANIZATION Commander, Naval Oceanography Command 8b. OFFICE SYMBOL (If applicable)	9 PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER
8c. ADDRESS (City, State, and ZIP Code) Stennis Space Center, MS 39529-5000	10 SOURCE OF FUNDING NUMBERS PROGRAM ELEMENT NO / PROJECT NO / TASK NO. / WORK UNIT ACCESSION NO

11 TITLE (Include Security Classification)

U. S. Navy Regional Climatic Study of the Central East Asian Coast and Associated Waters

12 PERSONAL AUTHOR(S) Joe D. Elms

13a. TYPE OF REPORT	13b. TIME COVERED	14 DATE OF REPORT (Year, Month, Day)	15 PAGE COUNT
Final	FROM ___ TO ___	1990 January	320

16 SUPPLEMENTARY NOTATION

17 COSATI CODES			18 SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
FIELD	GROUP	SUB-GROUP	

19 ABSTRACT (Continue on reverse if necessary and identify by block number)

This climatic study of marine environment consists of monthly charts and tables of (1) clouds, (2) precipitation, (3) visibility-tables, (4) ceiling-visibility (mid-range/low range), (5) wind-visibility-cloudiness, (6) scalar mean wind speed, (7) wind speed less than 11 and greater or equal to 34 knots; (8) wind speed 11-21 and 22-33 knots, (9) surface wind roses, (10) air and sea temperature, (11) wave height-isopleths, (12) wave height-tables, (13) surface currents (seasonal).

20. DISTRIBUTION/AVAILABILITY OF ABSTRACT ☐ UNCLASSIFIED/UNLIMITED ☒ SAME AS RPT ☐ DTIC USERS	21. ABSTRACT SECURITY CLASSIFICATION Unclassified
22a. NAME OF RESPONSIBLE INDIVIDUAL Brian L. Wallace	22b. TELEPHONE (Include Area Code) (704) 252-7865 22c. OFFICE SYMBOL

DD FORM 1473, 84 MAR 83 APR edition may be used until exhausted
All other editions are obsolete.

SECURITY CLASSIFICATION OF THIS PAGE
UNCLASSIFIED

TABLE OF CONTENTS

Page

Introduction ..... iv - xii

References xiii

Element Index 1

Monthly Elements (Charts and Tables) ..... 2 - 313

FIGURES

FIGURE 1. Bathymetry and Geographical Coverage of Areas 1 - 4 (Tables and Roses) v

FIGURE 2. Mean Sea-Level Pressure (January and July) vi

FIGURE 3. Topographic Chart vii

FIGURE 4. Average Number of Tropical Cyclones per 5° Square per Year viii

FIGURE 5. Annual 12 Hourly Movements of Tropical Cyclone Centers with Tropical Storm Intensity or Greater ix

FIGURE 6. Mean Monthly Values of Air Temperature and Precipitation x

U.S. NAVY REGIONAL CLIMATIC STUDY OF THE CENTRAL EAST ASIAN COAST AND ASSOCIATED WATERS

The U.S. Navy Regional Climatic Study of the Central East Asian Coast and Associated Waters was prepared by the Officer in Charge, Naval Oceanography Command Detachment, Asheville, North Carolina, under authority of Commander, Naval Oceanography Command. The work was performed at the National Climatic Data Center (NCDC). A number of the charts utilized in this study were obtained from a joint project between NCDC and the State Meteorological Administration, Peoples Republic of China, through the assistance of two visiting scientists, Mr. Yan Jan Yue and Mr. Xie Qinghua. Mr. J. D. Elms of NCDC was project leader and was supported by many members of the NCDC staff. Specific acknowledgement is made to Messrs. C. N. Williams, Jr., R. G. Baldwin, and Ms. P. L. Franks for data processing and digital graphics; Mr. C. W. Thomason for quality control of data analysis; Messrs. M. G. Burgin, S. J. Miller, and D. A. McKittrick for their drafting skills; and Mr. M. J. Changery for technical review.

Geographical and Data Coverage

This marine study covers the region off the Pacific Coast of Asia from the equator to 45°N and from 105°E to 140°E, encompassing the South China Sea, Philippine Sea, East China Sea, Yellow Sea, and the southern portion of the Sea of Japan. The data came mostly from the observations collected by ships of opportunity of many different nations. Figure 1 outlines the summary area and provides some general bathymetry information.

Surface marine observation statistics are presented on monthly charts in the form of graphs, tables, and isopleth maps. The marine data were summarized and machine plotted by one-degree quadrangle for the isopleth analyses. The graphs and tables for the marine areas are also presented by one-degree quadrangle for visibility, wave heights, wind roses, and ocean currents. The geographical area for the roses and tables are divided into four regions, as outlined in Figure 1, and covers a smaller total area than the isopleth charts in order to ensure clarity. These roses and tables represent the objective compilation of available ship data; the data were not adjusted for suspected biases (low observation count, heavy weighting of observations during relatively short time intervals, biases in coding, etc.), and differences may be found when comparing the graphical data with isopleth analyses. The total number of observations for a given one degree quadrangle should always be considered when interpreting the data as there may be an insufficient number to permit representative statistics.

Approximately six and one-half million surface marine observations were used in computing the statistics. These data were collected by ships of various registry traveling in the area. Many of the ship's observations are presently transmitted over the Global Telecommunication System, captured and archived. However, many are digitized from ship log forms by various participating members of the World Meteorological Organization, and exchanged under international agreement among the various maritime nations of the world. Data for this study date from 1854 to 1987. Most of the observations have been collected in the past 40 years which is significant because recent observations contain more elements than pre-1948 reports. The density of observations is greatest along major shipping routes which, in this area, connect all the major ports of the region through the shipping corridors of the South China Sea, East China Sea, and Yellow Sea.

The mean sea current charts were derived from available ship's "set and drift" measurements that had been forwarded to the Naval Oceanographic Office from ships of various registry. The data were summarized to give the primary and secondary current directions and mean speeds.

Physical Features

The study area covers the entire coastline of China, the Korean Peninsula, the islands of Taiwan, Hainan, and the Philippines plus large portions of the coastal regions of southern Japan, Vietnam, some northern sections of the Greater Sunda Islands, and many smaller adjacent islands. The topography, large latitudinal extent, and differential heating between the oceans and the Asian continent are three major factors affecting the climate within the study area. The predominantly east-west oriented mountain ranges of Asia affect the regional climate to a significant degree. They act as a barrier to the cold air from the north even though they do not extend fully across the lowlands to the sea. It is along the lee side of these ranges that wave disturbances often form on a quasi-stationary front bringing some rain to the region during the dry season (winter and fall). Some authors consider the Chinling Hills as the division between the temperate zone to the north and the subtropical climate to the south. In fact, the mean wintertime isotherms on the continent parallel the ranges running east to west from the Mekong Delta

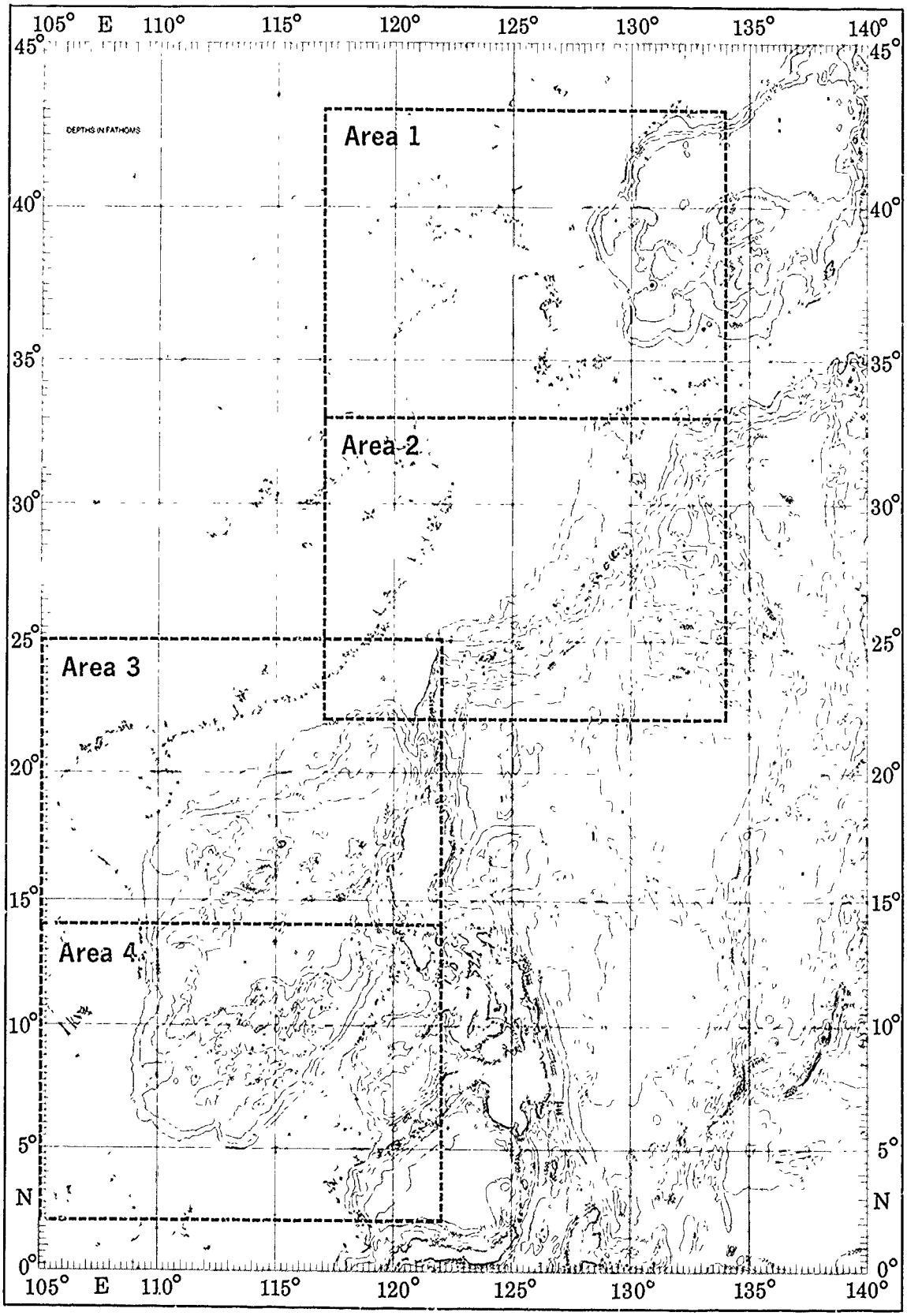


FIGURE 1. BATHYMETRY AND GEOGRAPHICAL COVERAGE OF AREAS 1-4 (TABLES AND ROSES)

to southern Siberia except in the highlands of Vietnam and the Sikhote Alin Mountain range along the Sea of Japan. Islands are much more affected by their own individual topography, latitudinal range, and influence of the Kuroshio Current.

Precipitation patterns are greatly influenced by the monsoon season which results directly from differential heating and the predominance of the Siberian High (northeast monsoon - dry season) and the southwest Asian Low (southwest monsoon - wet season). Reference Figure 2 for the mean sea-level pressure charts for January and July to see the significant difference in the seasonal patterns. Most all regions within the study area are affected by tropical cyclones, often with highly destructive results.

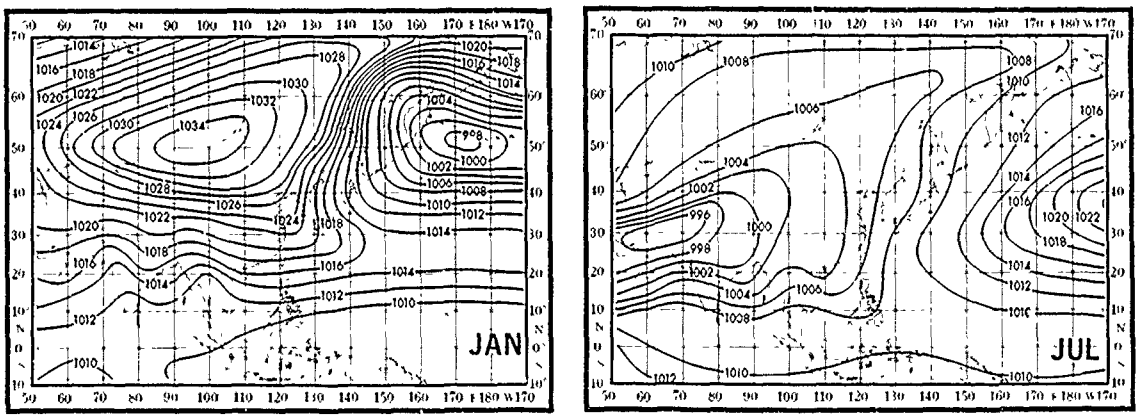


FIGURE 2. MEAN SEA-LEVEL PRESSURE (JANUARY AND JULY)

The topography, ocean currents, and locations of islands, straits, seas, and bays all impact the climate. Surface winds passing through the various straits, such as the Formosa Strait, are funneled and often strengthened by this effect.

Most of the islands in the study area (Japan, Taiwan, Philippines, and Celebres) fall on a major fault line of seismic activity and are volcanic in nature resulting in very mountainous terrain. The highest island peak is found on Taiwan at 13,113 feet (Mt. Hsinkao). Most rivers found on the islands are short and none are very suitable for navigation. The coast lines along this volcanic chain of islands are mostly irregular and provide many bays and excellent harbors. Much of the volcanic soil is rich and suitable for raising a wide variety of farm products.

On the portion of the Asian continent within the study area, there are five major peninsulas. The farthest east is the Korean Peninsula, a mountainous ridge with few large rivers, none of which are suitable for navigation except by small craft. The best harbors on the west coast are somewhat impaired by the large rise and fall of the tide. The Gulf of Po Hai, off the Yellow Sea, is formed by two of the peninsulas; the Liaotung on the north and the Shantung on the south. Farther south, the Luichow Peninsula, the smallest of the group, stretches toward the island of Hainan, separated by the narrow Hainan Strait (15 miles wide). The largest peninsula, the Indochina Peninsula, is made up of Vietnam, Laos, Cambodia, and Thailand.

Vast plains, made up of the Manchurian Plain and North China Plain, extend from northeastern China just east of Mongolia to the Tapieh Mountains located north of the Yangtze River. There are also three great commercial rivers in China, all basically flowing from west to east. The Yellow River in the north is nearly 3,000 miles long, originating in the Tibetan highlands and emptying into the Gulf of Po Hai. The principal river of the three is the Yangtze, located in central China, flowing nearly 3,500 miles from Tibet to the East China Sea near Shanghai. In the south, the major waterway is the Hsi River which flows some 1,200 miles before reaching the South China Sea near Macao and Hong Kong. China is rich in mountains, large plateaus, deserts, gulfs, bays, coastal islands, and fine harbors.

The northern Indochina Peninsula is mostly mountainous while in the south the Mekong Delta forms a large basin. A large, 87-mile long lake, Tonle Sap, located in central Cambodia, receives flood waters from the Mekong River, which meanders some 2,600 miles from its source in Tibet to the South China Sea. The Mekong Delta is mostly jungle but in the wide delta region, there is a fertile rice producing area. Figure 3 presents a generalized topographic view of the study area showing the great contrast across the large latitudinal extent.

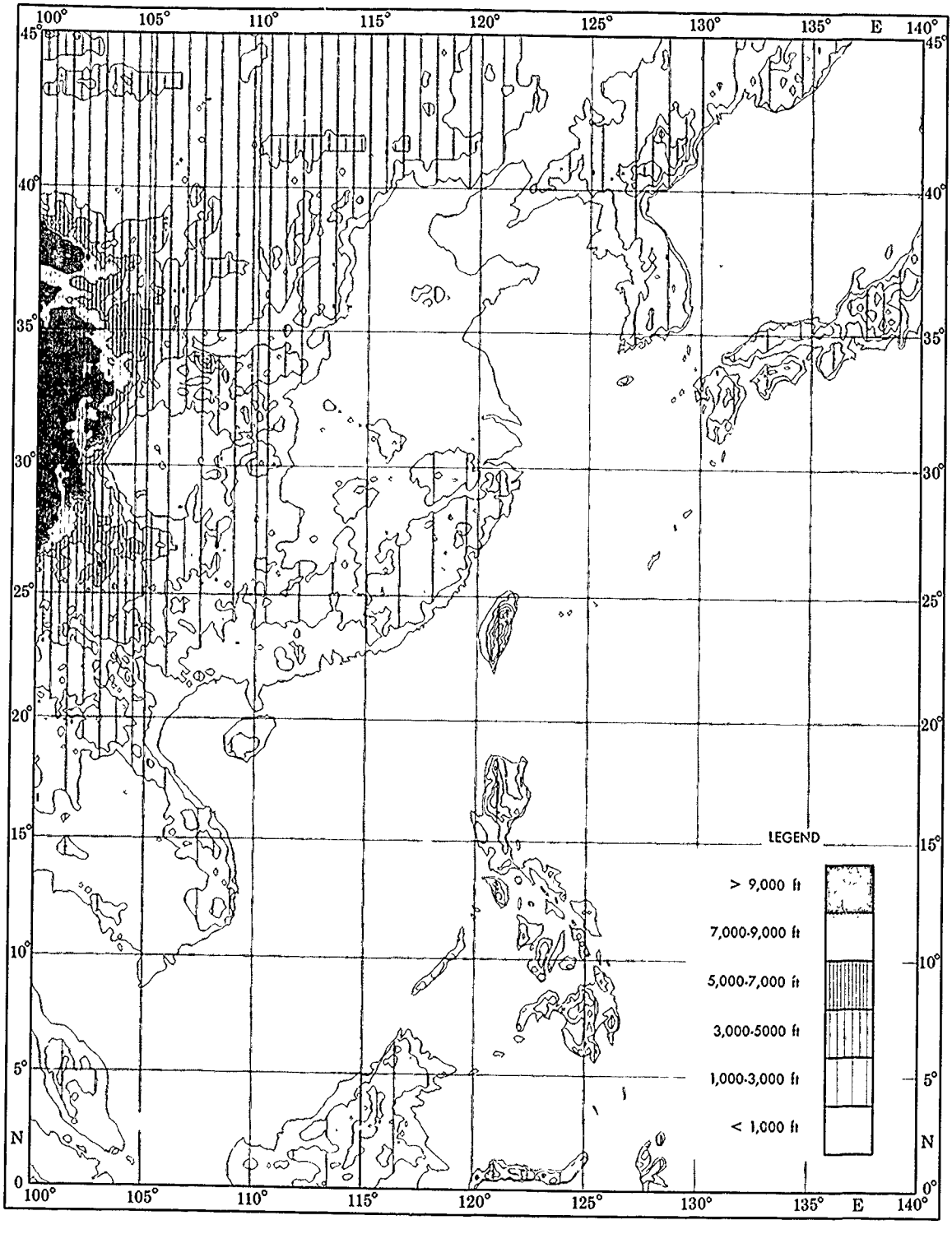


FIGURE 3. TOPOGRAPHIC CHART

Climate:

The climate of the study area is affected more by the summer and winter monsoon than any other factor. This seasonal shift in the wind direction is a direct result of the differential heating between the land and ocean. As the land begins to cool during autumn, the Siberian High begins to re-establish itself as the predominant pressure feature causing northerly winds to prevail over the region. This winter monsoon, lasting generally from October through March, is the stronger of the two in that it is more stable and maintains stronger winds. Superimposed upon these major features (the summer or winter monsoon) are the transitory depressions (including Tropical Cyclones) and anticyclones which modify the prevailing weather pattern on a near time and local scale. Transition from the summer monsoon to that of winter is reflected by the shift in the precipitation pattern that takes place during September and October. By November, most of the interior of the Asian Continent is receiving less than 2 inches of monthly precipitation on average. Significantly higher values are found along the east coast of Vietnam, the eastern Philippines, and west coast of Japan since they are exposed to the prevailing northerly winds and a good moisture source. By March all of the Indochina Peninsula is well into the dry season with the monthly averages generally ranging between 1 to 2 inches. Amounts increase over southeastern China to 6 to 8 inches and Japan, except for the northern islands, averages 4 to 8 inches. The Philippines remain dry on the west coast and wet in the east. During April and May, the establishment of the precipitation pattern associated with the developing southwest monsoon is apparent. Higher monthly precipitation values appear for most regions except for the desert interior of China. By June, monthly precipitation averages are approximately 30 inches on the southwest coast of the Indochina Peninsula and generally range from 4 to 16 inches for all other regions, except for those bordering the Gulf of Po Hai and the east coast of Vietnam, where monthly averages are 2 to 3 inches. However, across the North China Plain and inner Mongolia, amounts average 1 inch or less and even drier conditions are found farther west in Mongolia and Sinkiang. This pattern continues until the transition back to the winter monsoon takes place in September and October.

Tropical cyclones are a major influence within the region greatly affecting the entire marine area except for the Gulf of Po Hai and those regions near the equator. Figure 4 shows the average number of tropical cyclones per 5 degree square per year. Although a significant tropical cyclone can occur in any month, the main season runs from April through December with the greatest chance for a storm crossing the northern Philippines. Figure 5 illustrates the preferred movement of the storms as it presents the historical 12 hourly movement of tropical cyclone centers with winds estimated at 34 knots or greater.

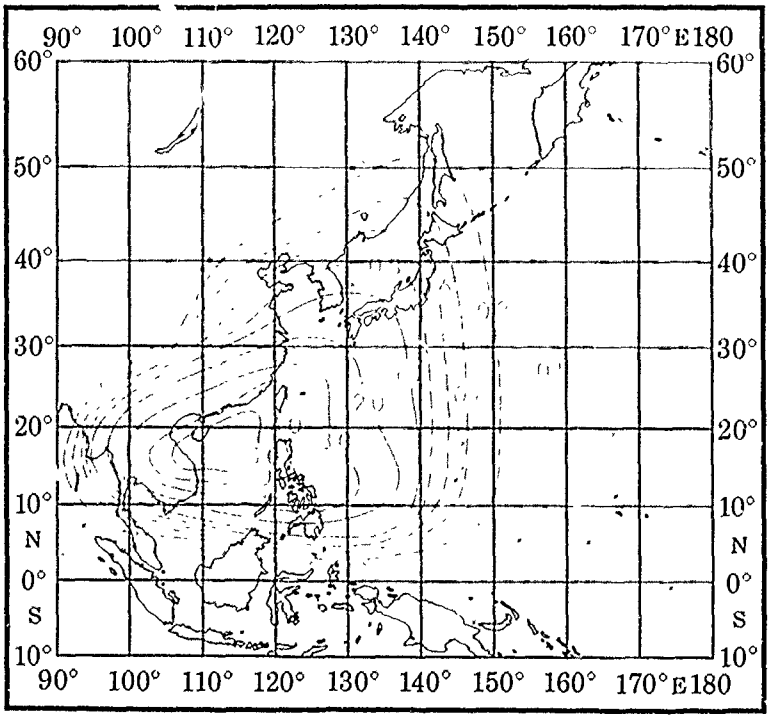


FIGURE 4. AVERAGE NUMBER OF TROPICAL CYCLONES PER 5° SQUARE PER YEAR

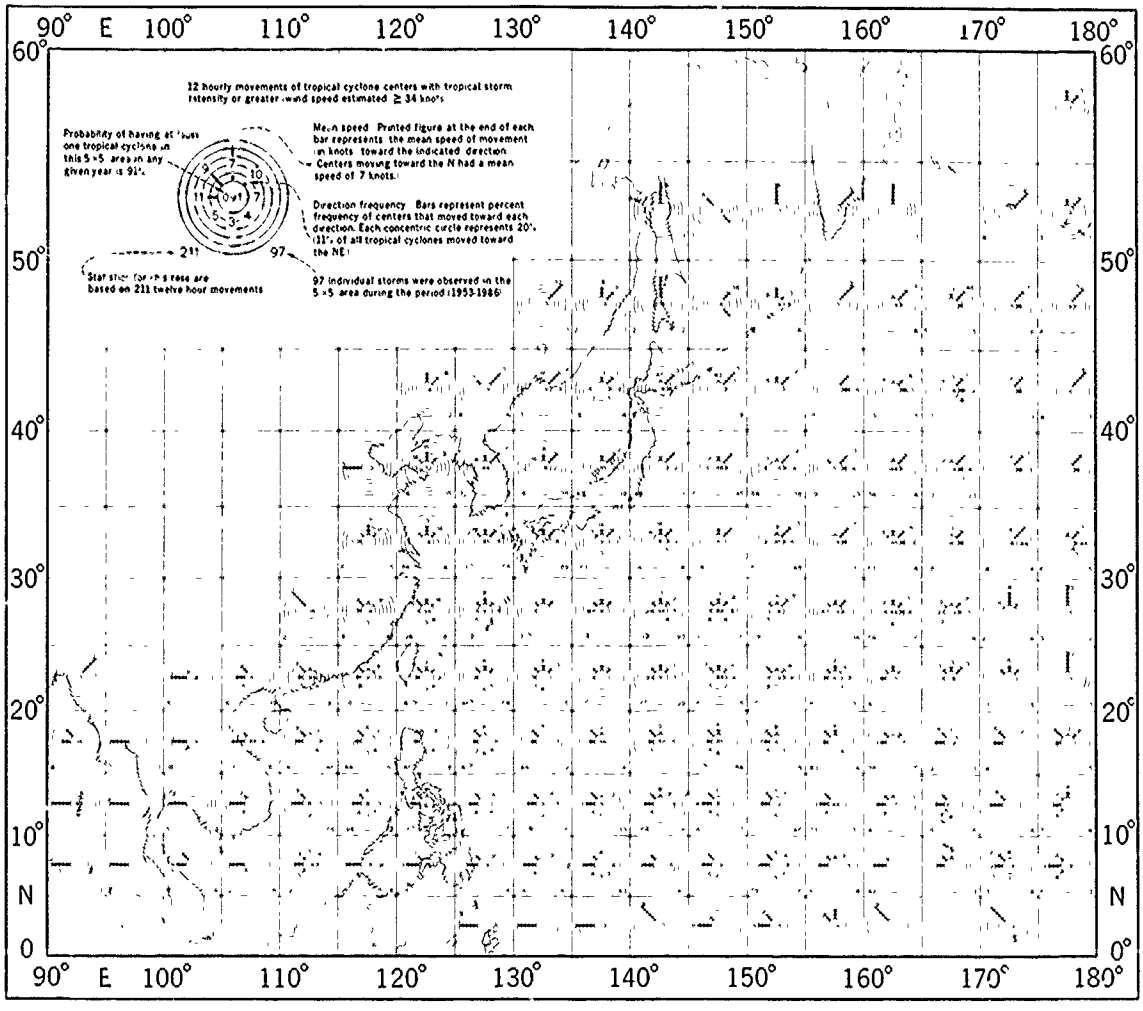


FIGURE 5. ANNUAL 12 HOURLY MOVEMENTS OF TROPICAL CYCLONE CENTERS WITH TROPICAL STORM INTENSITY OR GREATER

The average annual temperature and precipitation cycles for 15 stations across the study area are shown in Figure 6. While those in the tropics have a relatively small annual temperature range, those in the higher latitudes show it to be significantly large. In general, the tropical stations' mean daily range (5 to 8°F) is greater than their mean monthly range for the year (5 to 6°F). For those stations above 30°N, the mean daily range is on the order of 10 to 15°F while the annual range of mean monthly temperatures is 40°F to 60°F.

Most of the stations selected for Figure 6 receive a greater portion of their precipitation during the southwest monsoon. However, one station shows a fairly even monthly distribution with a slight bias towards the winter monsoon, a second shows a strong northeast monsoon influence and a third receives a significant portion of its annual precipitation during October and November, a period corresponding closely to the monsoon transition.

The Kuroshio Current has an important affect on the climate of the region throughout the year. It is a warm current extending from the north equatorial current and influences the climate much the same as the Gulf Stream does in the Atlantic Ocean, although the sea surface temperature discontinuity is not as great for the Kuroshio Current. During the summer monsoon, most of the flow is from south to north with the Kuroshio flowing east of Taiwan and Japan and the Tsushima Current flowing through the Formosa Strait and west of Japan. Sea surface temperatures are relatively warm all along the Asian coast ranging from 70°F to 80°F. With the strong northerly winds of the winter monsoon, the Tsushima Current weakens considerably and only appears north of the Korean Strait. South of the Korean Strait it is replaced by a southbound cold current with sea surface temperatures dropping rapidly after the shift. By mid-winter sea surface temperatures are near freezing in the Gulf of Po Hai and in the northern Sea of Japan with some ice forming near shore in these areas. Sea temperatures, although lower than during summer, still reach the 60°F and 70°F range south of the Formosa Strait and east of the Ryukyu Islands south of 30°N.

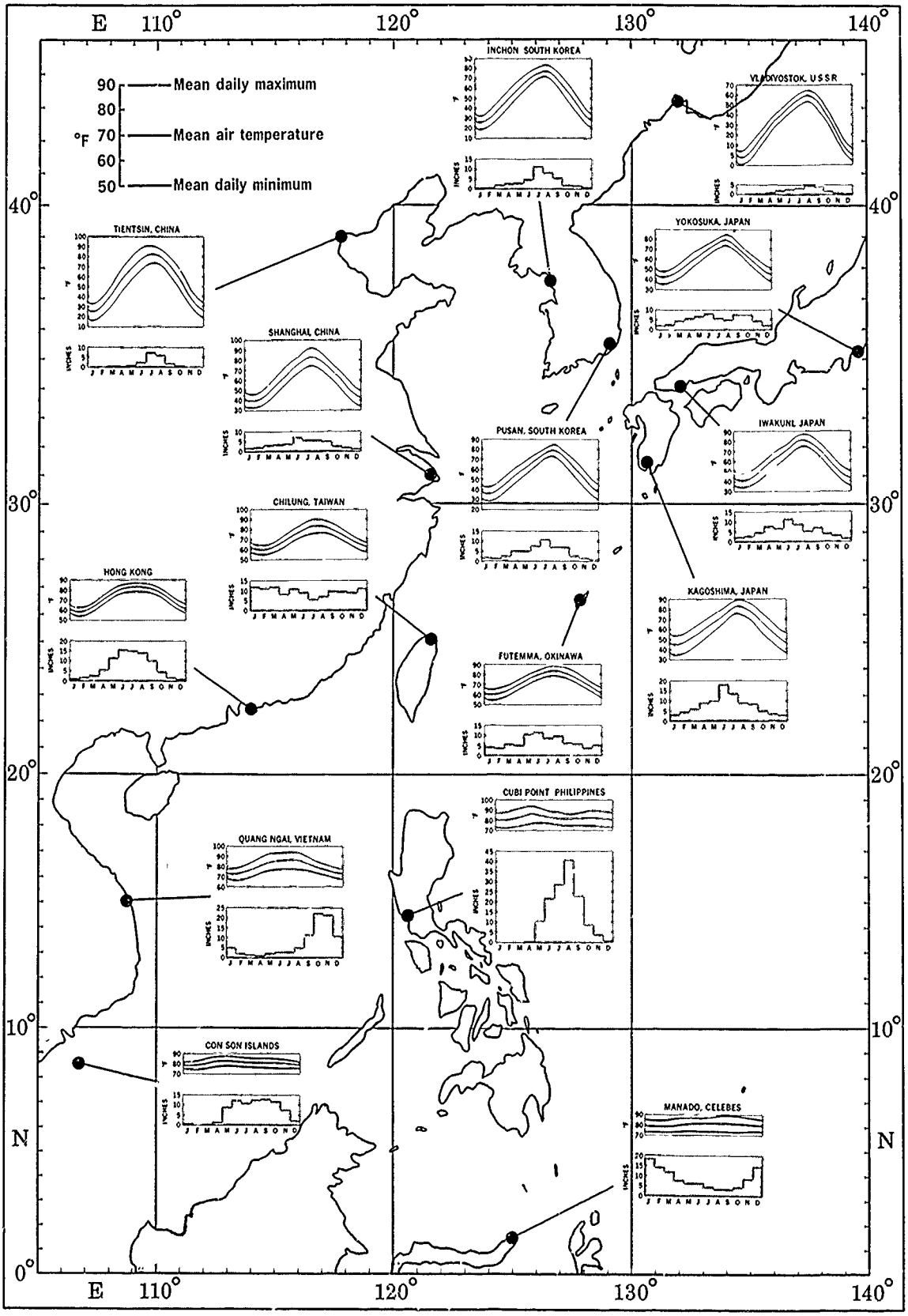


FIGURE 6. MEAN MONTHLY VALUES OF AIR TEMPERATURE AND PRECIPITATION

Marine Climatological Elements

Precipitation

Of the elements recorded in the marine data base, precipitation is the one most subject to error in both the way it is observed and the way it is interpreted. For example, it is often inferred in the literature that ships often try to avoid foul weather and thereby bias the data towards fair weather with fewer precipitation observations. Elms (1986) compared the Volunteer Observing Ship (VOS) observations to other sources of data such as Ocean Station Vessels (OSV) and buoys, finding little evidence that 'fair weather bias" is a serious problem for most applications of marine climatic data. With the introduction in 1982 of a present weather indicator (^{1}x) to the International Ship Synoptic Code FM13-VII, users have to be careful not to bias the data, especially that from between January 1982 and March 1985 when the indicator was inadvertently left out of the international data exchange format.

Assessing oceanic precipitation is always a major problem because transit ships are unable to take quantitative measurements. A number of studies have been conducted in an effort to predict precipitation amounts, or rates of fall based on estimates derived from the use of present weather observations from ships of opportunity (Gorock, et al., 1984) and readings from satellites (Rao, et al., 1976). For the monthly presentations of percent frequency of precipitation, the present weather codes 20-27 (precipitation within the past hour) were included with codes 50 through 99 to compute the percent frequency of precipitation in an effort to correct an apparent observational bias. This brings the frequencies more in line with results obtained from ocean weather station observations, the most reliable bench-mark for the open ocean.

Air Temperature

Air temperature is one of the elements most frequently observed by mariners. It should be noted that on many ships the heating effect of the ship's structure has a tendency to produce higher than actual ambient air temperature readings because of instrument exposure (Folland, et al., 1984; Wright, 1986). This is especially true under calm, sunny conditions. Therefore, some ship temperature observations have a warm bias; however, the aggregate is relatively representative after erroneous outliers have been eliminated and the numerous nighttime observations and unbiased daytime observations are included. Also, true extremes are rarely captured since continuous observations are not made at most ocean locations. It is highly unlikely that a ship-of-opportunity would be taking its synoptic weather observations at the exact time that an extreme was occurring.

Sea-Surface Temperature

Sea-surface temperatures are recorded with fairly high frequency in marine observations. The principle methods for sampling are with ship water-intake thermometers and by reading the temperature of sea water retrieved with buckets. Even though the two methods can produce slightly different results (Barnett, 1984), the data can be used with considerable confidence when examining the long-term means.

Surface Winds

Surface wind is one of the most commonly observed elements. Many of the observations from the NCDC data base are visual observations based on the roughness of the sea. In recent years, more ships acquired anemometers and reported measured winds. Prior to 1963, many observed wind speeds were recorded in the Beaufort scale; 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: the scalar mean speed and the percent frequency of winds less than 11 knots, from 11 to 21 knots, from 22 to 33 knots, and greater than or equal to 34 knots. Also given are wind roses for one-degree squares.

Visibility

Visibilities are difficult to measure at sea because of the lack of distance reference points. Climatically, many low visibility observations are probably missed because the observer is too busy with other duties (a contrasting form of fair weather bias). However, the coarseness of visibility (code) intervals helps to minimize the problem, thereby permitting the summarized data to be relatively consistent.

Clouds

A survey of the cloud data (total and low cloud amount) from the surface marine observation data base shows that the number of total cloud reports are significantly greater than that of low cloud amounts. This is because many of the early marine observations contain only total cloud amount. For the two presentations (total cloud amount $\leq$ 2/8, and low cloud amount $\geq$ 5/8), only those observations reporting both total and low cloud amounts were summarized. This helps eliminate problems introduced as a result of different size data sets (N-count). The use of satellite data helps to bolster confidence in the total cloud analyses because they show fairly close agreement with those observed on the surface (U.S. Department of Commerce and United States Air Force, 1971).

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. Mid-range ceiling 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) and low-range ceiling and visibility charts (ceiling less than 300 feet and/or visibility less than 1 nautical mile; ceiling less than 600 feet and/or visibility less than 2 nautical miles) are presented.

Wave-Heights

Wave-heights have been recorded in consistent quantitative code 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, make wave observations one of the least commonly observed elements. The observations are also subject to biases. Generally, the heights are too low, the periods too short, and the sea-swell discrimination poor (Quayle, 1980). The data in this study have not been adjusted for the suspected biases, but were processed through a quality control procedure wherein an internal check was made between wind speed and sea height. The data were also matrix-arrayed and apparent erroneous outlier data values were deleted from both the sea and swell data. Wave-height presentations include isopleth maps showing percent frequencies of wave-heights $\geq$ 3 feet and $\geq$ 8 feet. In addition, wave-height tables by one-degree square show frequencies by six wave-height categories. In these presentations, the higher of the sea or swell was selected for summarization. If heights were equal, the wave with the longer period was selected.

Ocean Currents

The ocean current charts were compiled from ship drift reports forwarded by the various merchant marines to the U.S. Naval Oceanographic Office. From those drift observations, the prevailing and secondary current directions, mean current speed, percent of total observations used to compute the primary and secondary directions, and the total observation count are presented by one-degree square. This information is presented on monthly charts with the study area divided into four sections (pages) to ensure readability. The density of the observations is greatest along the major shipping routes and the reliability of the current charts is best in those areas. The data are considered most useful when used collectively, such as in summaries where a large number of observations are available.

References

Barnett, T.P., 1984: Long-term Trends in Surface Temperature over the Oceans, Monthly Weather Review, Vol. 112, pp. 303-312.

Commander, Naval Weather Service Command, 1977: U.S. Navy Marine Atlas of the World, Vol. II, North Pacific Ocean, (Revised), NAVAIR 50-1C-529.

Elms, J.D., 1986: "Climatology of the Oceans - Do Transient Ships Introduce A Fair Weather Bias?" National Climatic Data Center, prepared for the World Meteorological Organization, (unpublished).

Folland, C.K., D.E. Parker, and F.E. Kates, 1984: Worldwide Marine Temperature Fluctuations 1856-1981, Nature, Vol. 310, pp. 670-673.

Goroch, A.K., T. Brown, and M.J. Vanderhill, 1984: Rain Rate Climatologies over Marine Regions, Naval Environmental Predictions Research Facility, T. R. 84-04, Monterey, CA.

Quayle, R.G., 1980: Climatic Comparisons of Estimated and Measured Winds from Ship, Journal of Applied Meteorology, Vol. 19, No. 2., pp. 142-156.

Rao, M.S.V., W.V. Abbott, III, and J.S. Theon, 1976: Satellite-Derived Global Oceanic Rainfall Atlas (1973 and 1974), NASA SP-410, National Aeronautics and Space Administration, Washington, DC.

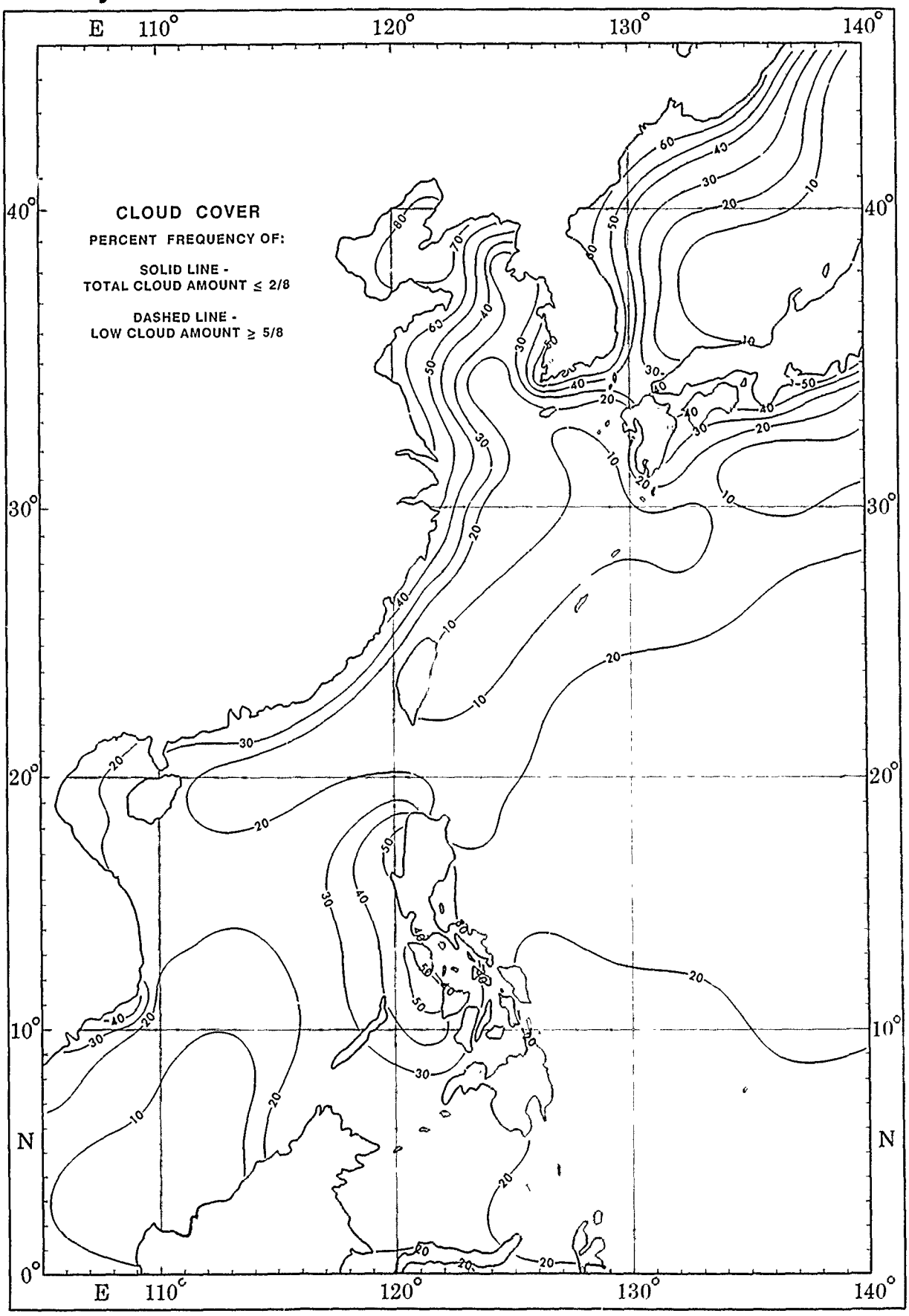
U.S. Department of Commerce and United States Air Force, 1971: Global Atlas of Relative Cloud Cover 1967-70, Washington, D.C.

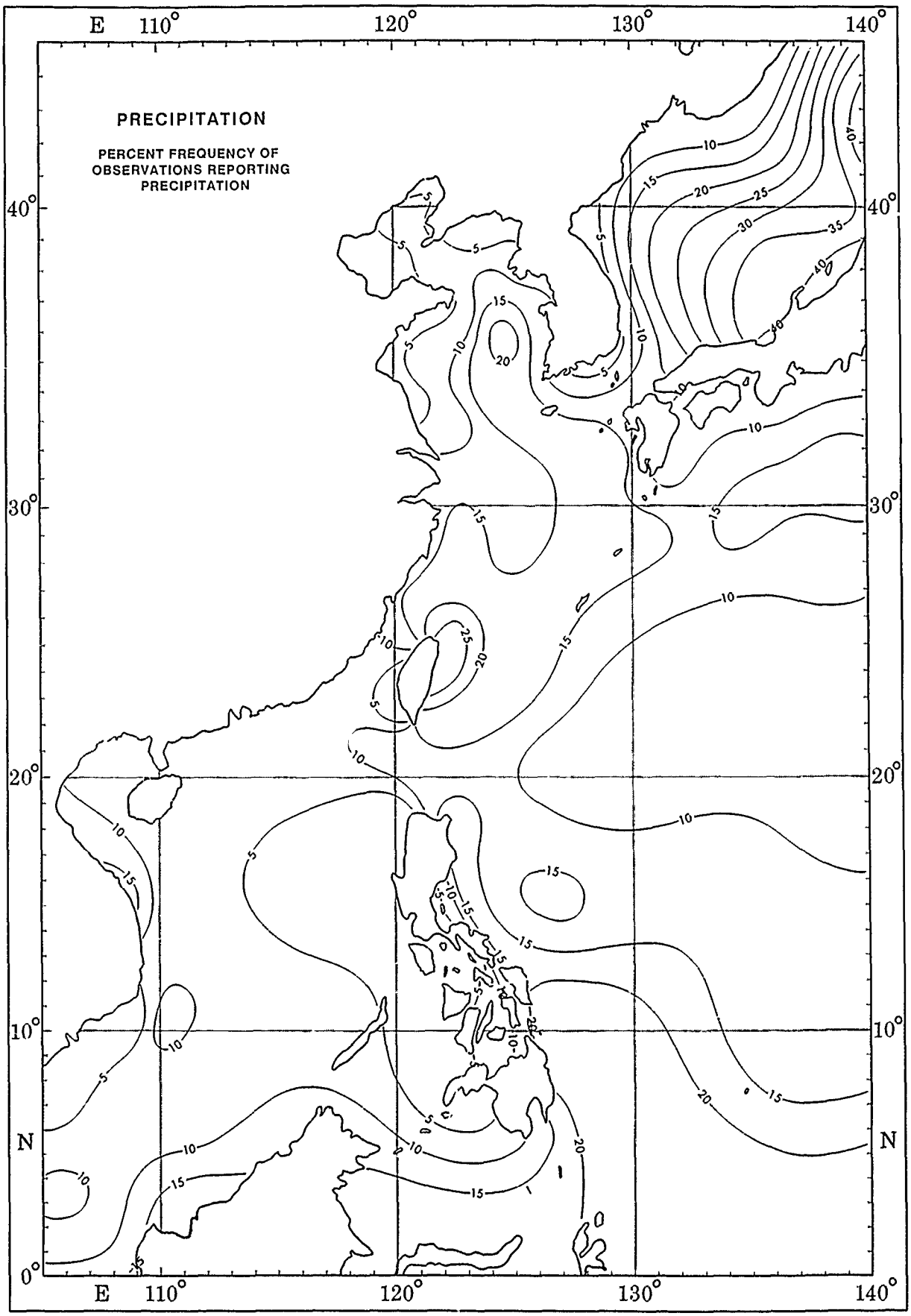
Wright, P.B., 1986: Problems in the Use of Ship Observations for the Study of Interdecadal Climate Changes, Monthly Weather Review, Vol. 114, pp. 1028-1034.

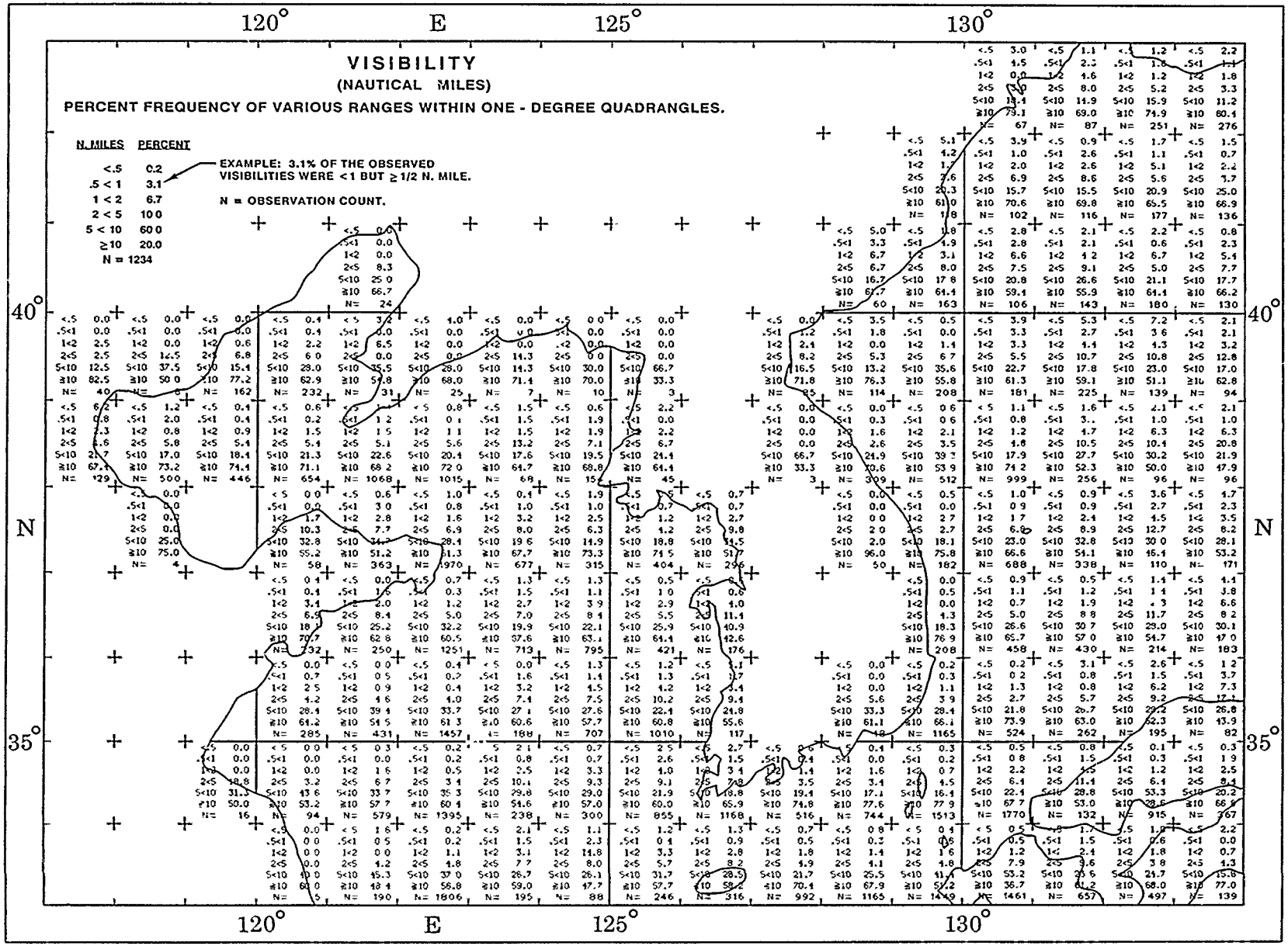
PAGE INDEX

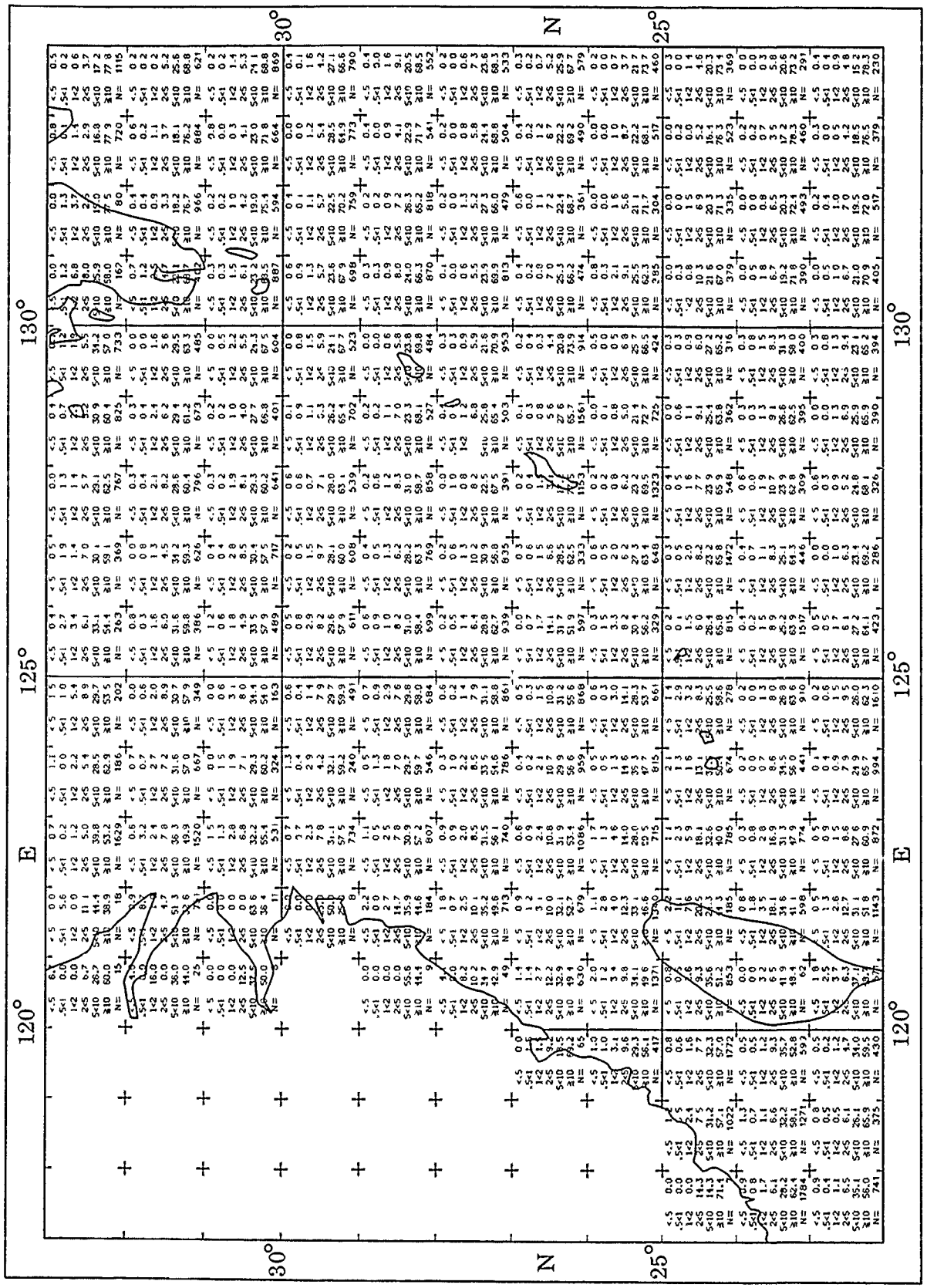
Example: The 'MEAN SCALAR WIND SPEED' for July is found on page 167

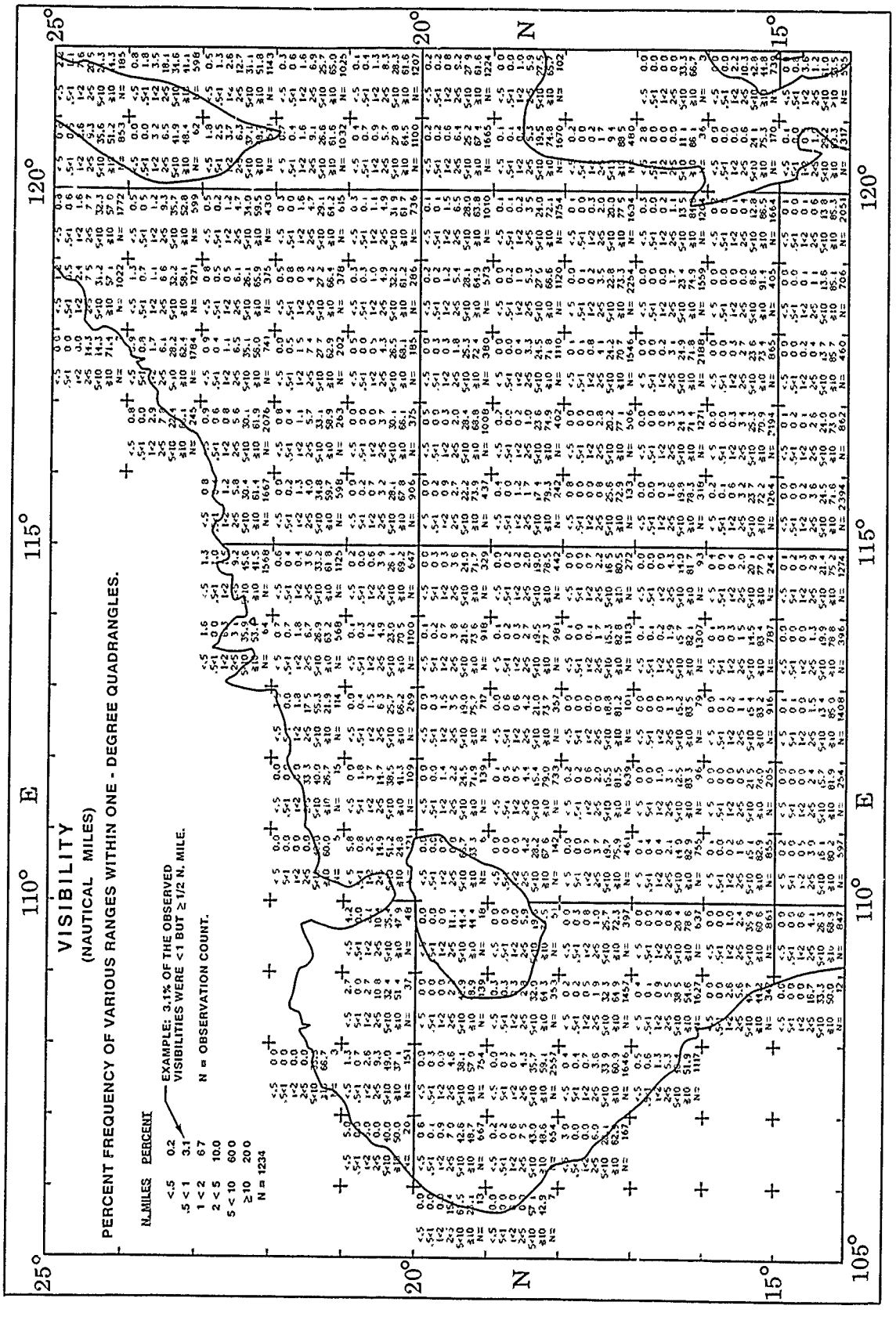
MONTH \ ELEMENT	CLOUDS	PRECIPITATION	VISIBILITY-TABLES	CEILING-VISIBILITY (mid range)	CEILING-VISIBILITY (low range)	WIND-VISIBILITY-CLOUDINESS	MEAN SCALAR WIND SPEED	WIND SPEED <11 and ≥ 34 KNOTS	WIND SPEED 11-21 and 22-33 KNOTS	SURFACE WIND ROSES	AIR AND SEA TEMPERATURE	WAVE HEIGHT-ISOPLETHS	WAVE HEIGHT-TABLES	SURFACE CURRENTS
JANUARY	2	3	4	8	9	10	11	12	13	14	18	19	20	24
FEBRUARY	28	29	30	34	35	36	37	38	39	40	44	45	46	50
MARCH	54	55	56	60	61	62	63	64	65	66	70	71	72	76
APRIL	80	81	82	86	87	88	89	90	91	92	96	97	98	102
MAY	106	107	108	112	113	114	115	116	117	118	122	123	124	128
JUNE	132	133	134	138	139	140	141	142	143	144	148	149	150	154
JULY	158	159	160	164	165	166	167	168	169	170	174	175	176	180
AUGUST	184	185	186	190	191	192	193	194	195	196	200	201	202	206
SEPTEMBER	210	211	212	216	217	218	219	220	221	222	226	227	228	232
OCTOBER	236	237	238	242	243	244	245	246	247	248	252	253	254	258
NOVEMBER	262	263	264	268	269	270	271	272	273	274	278	279	280	284
DECEMBER	288	289	290	294	295	296	297	298	299	300	304	305	306	310

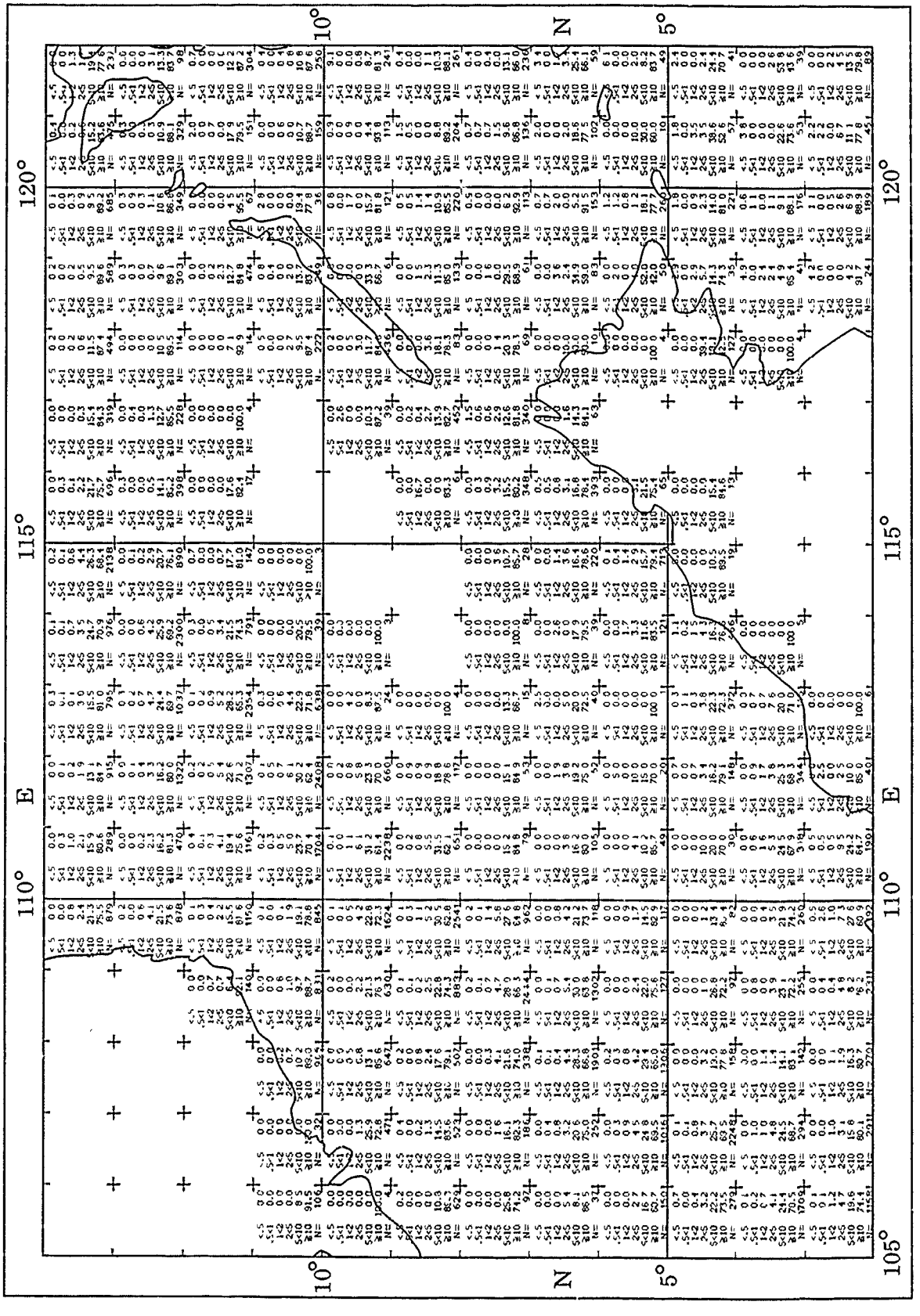

CLOUD COVER
PERCENT FREQUENCY OF:
SOLID LINE -
TOTAL CLOUD AMOUNT ≤ 2/8
DASHED LINE -
LOW CLOUD AMOUNT ≥ 5/8
E 110° 120° 130° 140°
40°
30°
20°
10°
N
0°


PRECIPITATION
PERCENT FREQUENCY OF OBSERVATIONS REPORTING PRECIPITATION
E 110°
120°
130°
140°
40°
30°
20°
10°
N
0°


VISIBILITY
(NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE - DEGREE QUADRANGLES.
N. MILES PERCENT
<.5 0.2
.5 < 1 3.1
1 < 2 6.7
2 < 5 10.0
5 < 10 60.0
≥10 20.0
N = 1234
EXAMPLE: 3.1% OF THE OBSERVED VISIBILITIES WERE <1 BUT ≥1/2 N. MILE.
N = OBSERVATION COUNT.
120° E 125° 130°
40°
35°
N

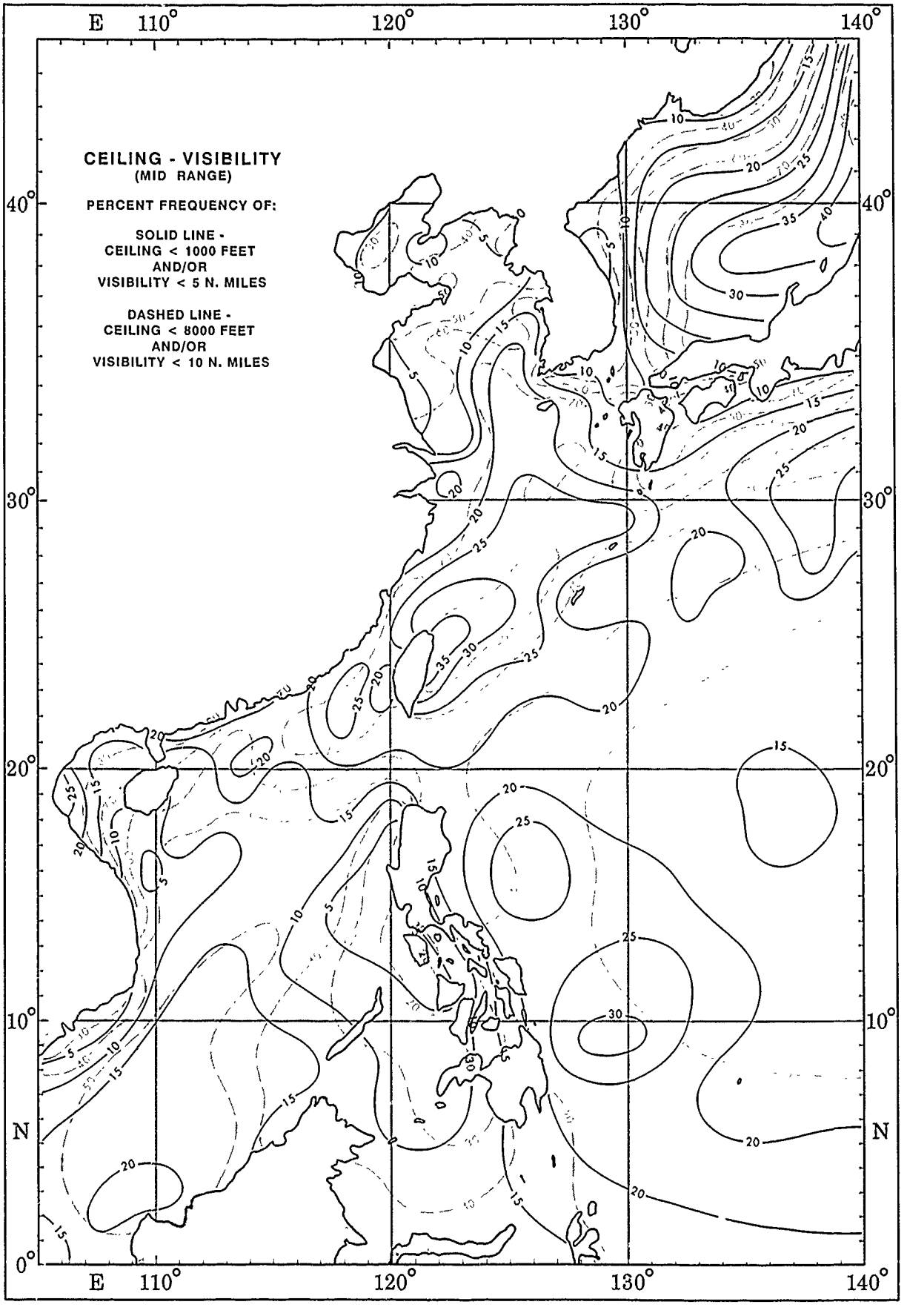

120°
125°
130°
E
30°
25°
N


VISIBILITY
(NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE - DEGREE QUADRANGLES.
N. MILES PERCENT
<.5 0.2
.5 < 1 3.1
1 < 2 6.7
2 < 5 10.0
5 < 10 60.0
≥ 10 20.0
N = 1234
EXAMPLE: 3.1% OF THE OBSERVED VISIBILITIES WERE <1 BUT ≥ 1/2 N. MILE.
N = OBSERVATION COUNT.
25°
20°
15°
105°
110°
115°
120°
N
E


105°
110°
115°
120°
E
10°
5°
N

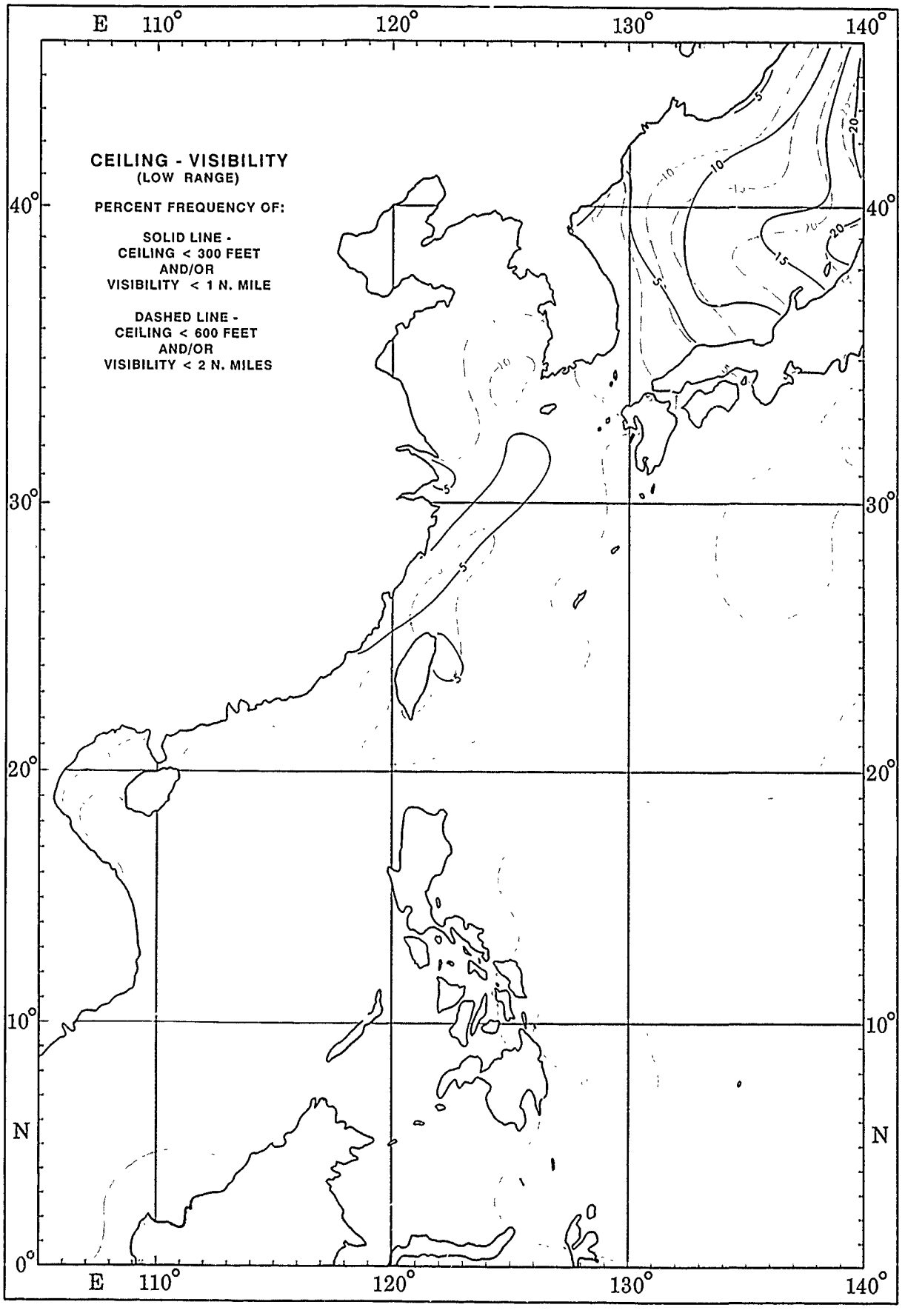
January

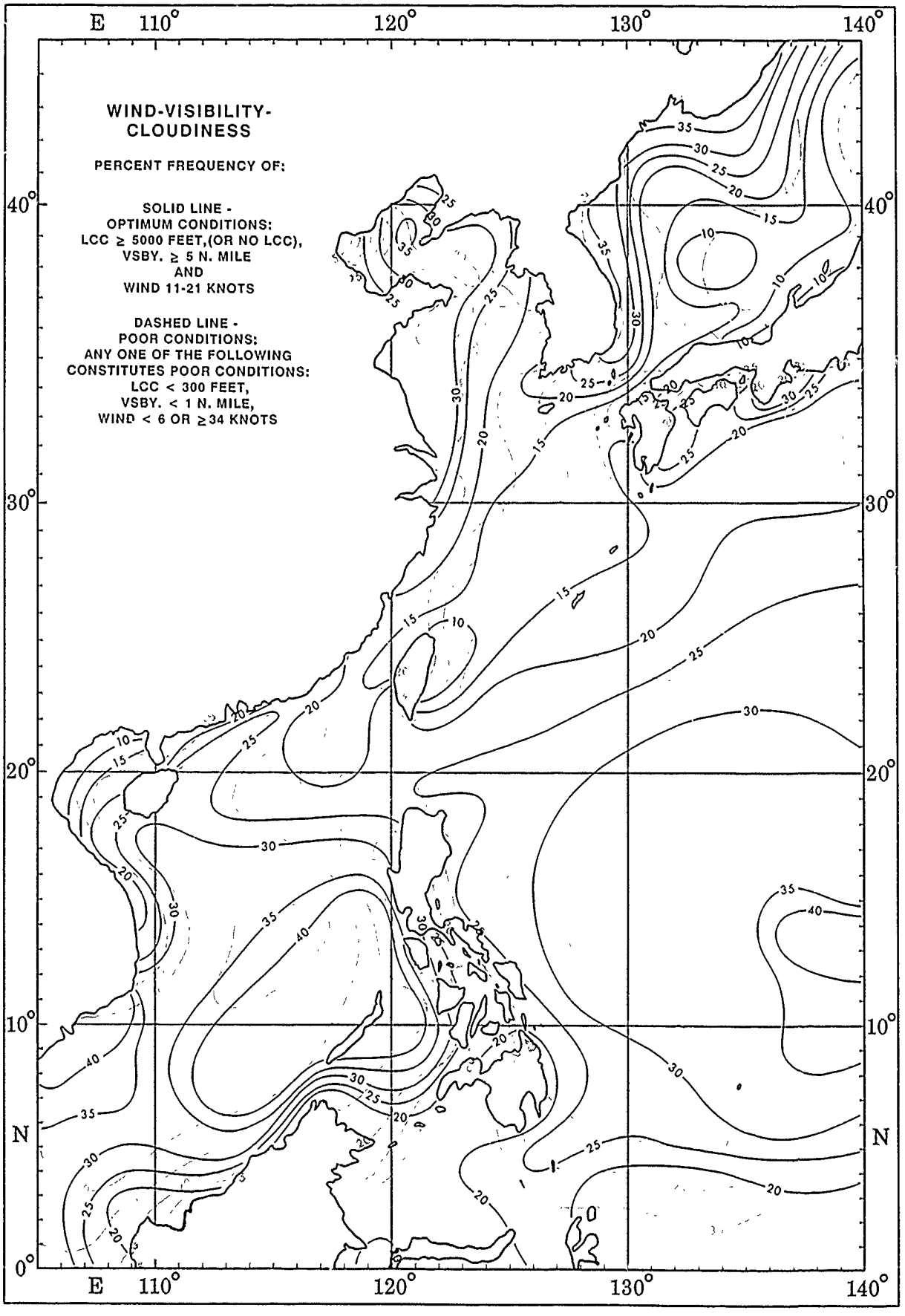
Ceiling - Visibility (Mid Range)

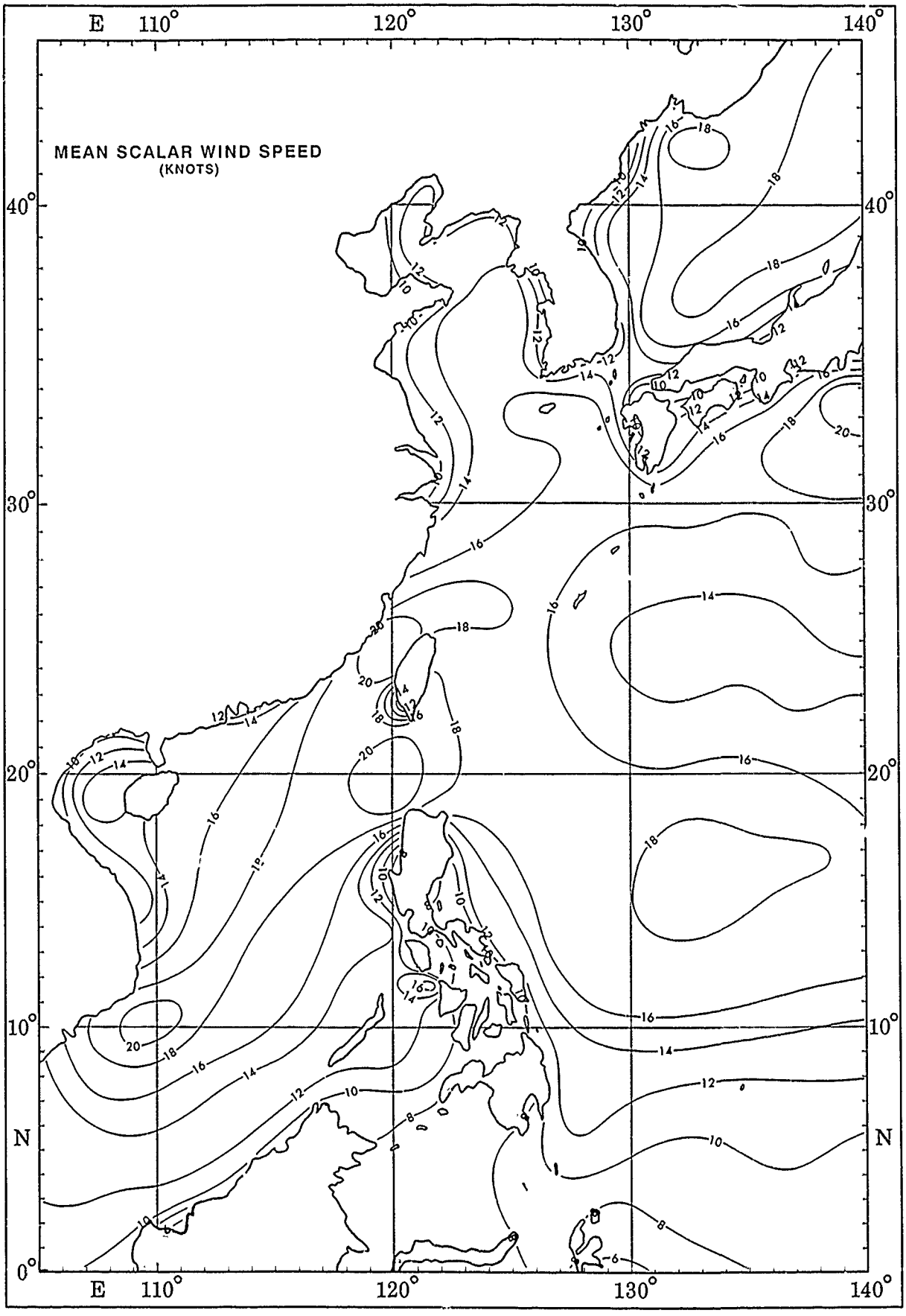


January

Ceiling - Visibility (Low Range)

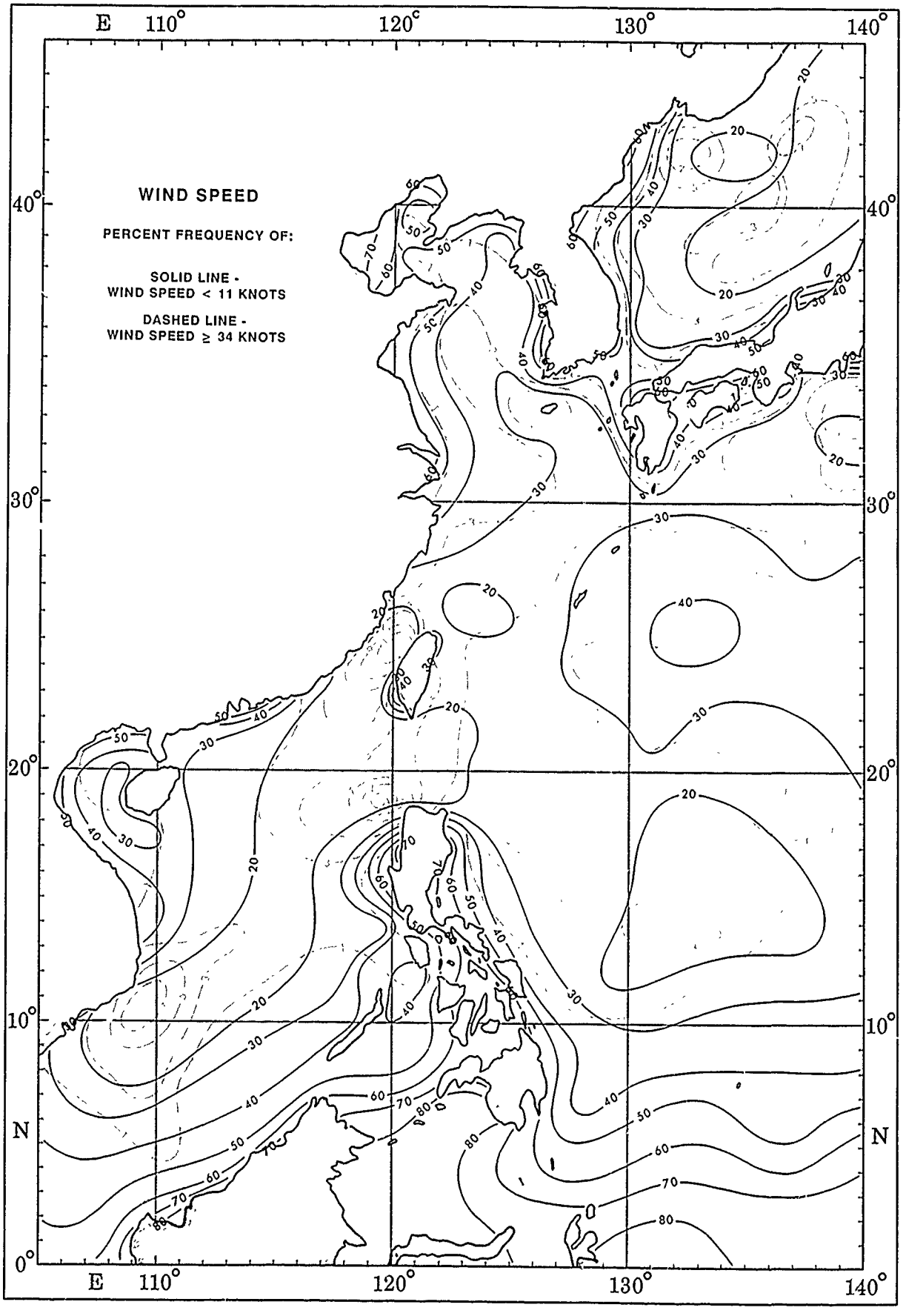



WIND-VISIBILITY-
CLOUDINESS
PERCENT FREQUENCY OF:
SOLID LINE -
OPTIMUM CONDITIONS:
LCC ≥ 5000 FEET,(OR NO LCC),
VSBY. ≥ 5 N. MILE
AND
WIND 11-21 KNOTS
DASHED LINE -
POOR CONDITIONS:
ANY ONE OF THE FOLLOWING
CONSTITUTES POOR CONDITIONS:
LCC < 300 FEET,
VSBY. < 1 N. MILE,
WIND < 6 OR ≥34 KNOTS
E 110°
120°
130°
140°
40°
30°
20°
10°
N
0°


MEAN SCALAR WIND SPEED
(KNOTS)
E 110°
120°
130°
140°
40°
30°
20°
10°
N
0°

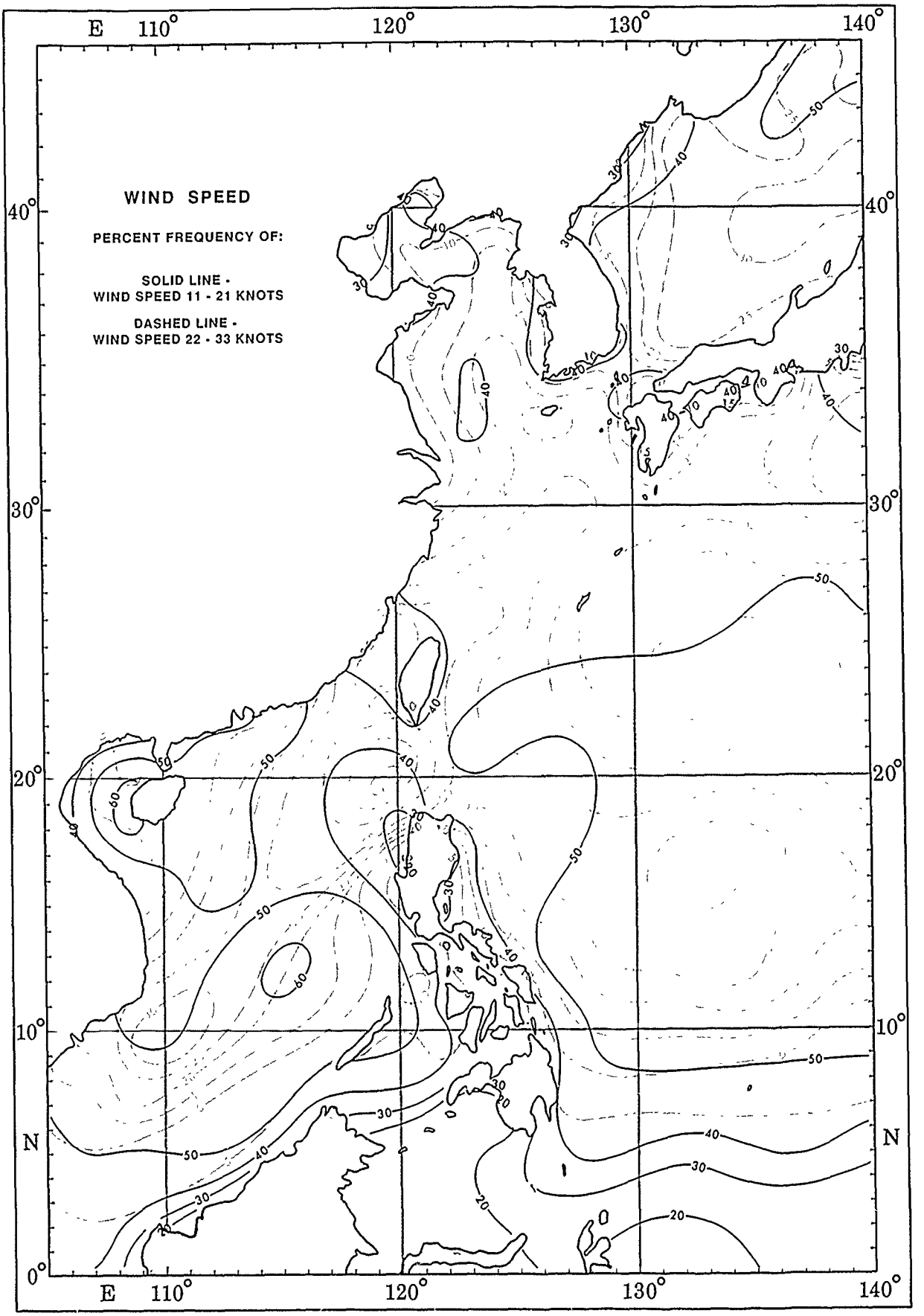
January

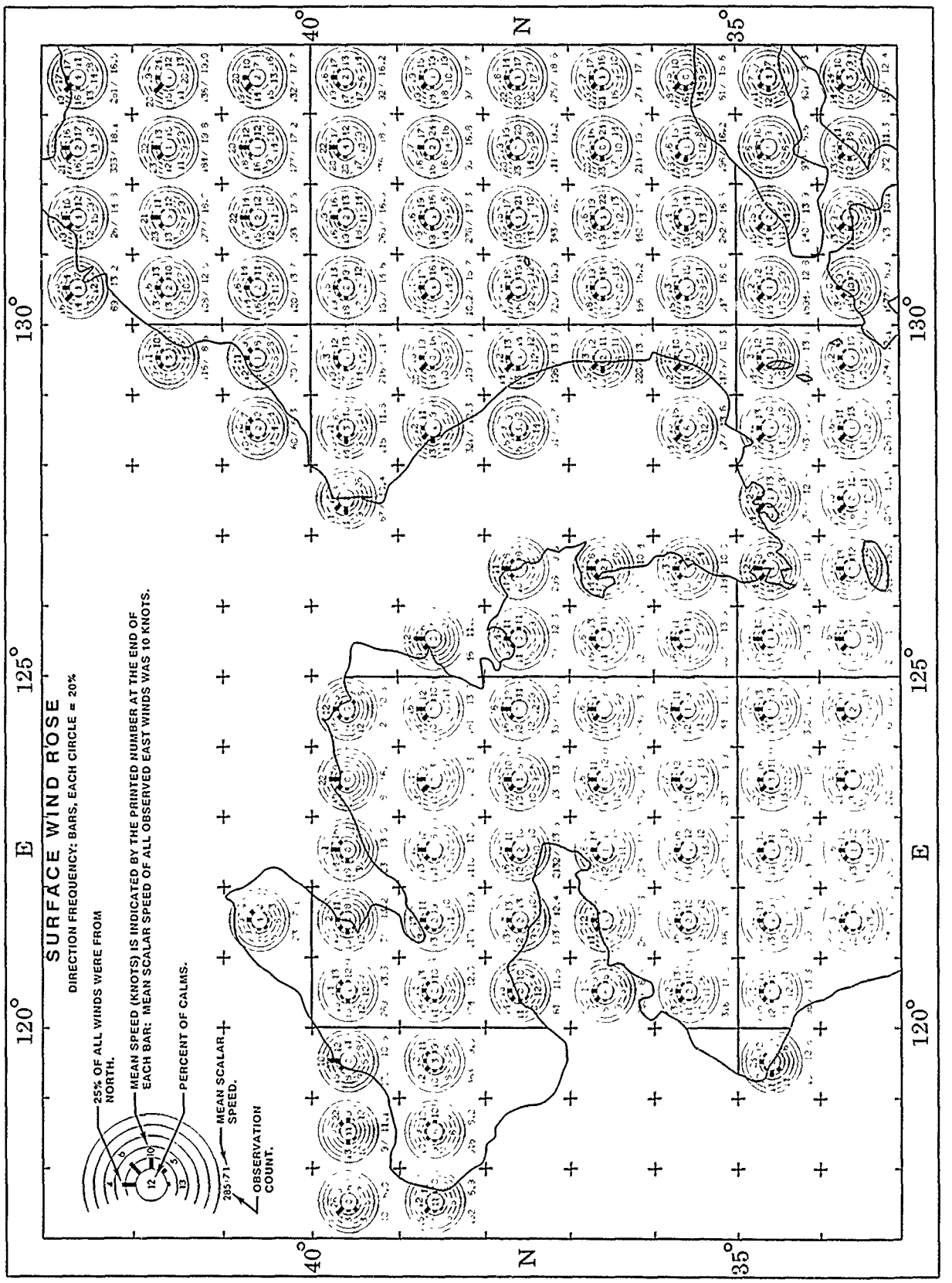
Wind Speed <11 and ≥34 Knots



January

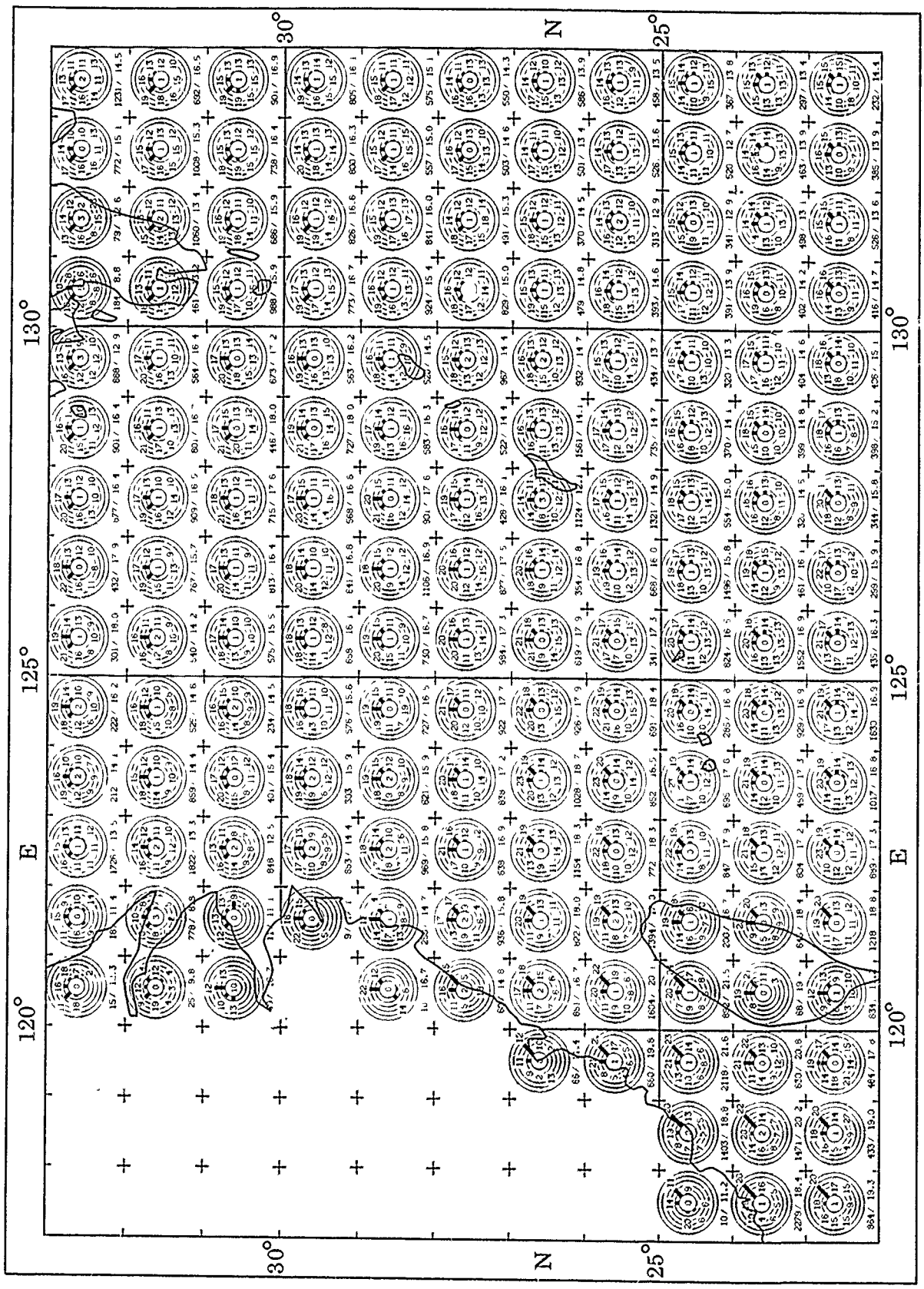
Wind Speed 11 - 21 and 22 - 33 Knots

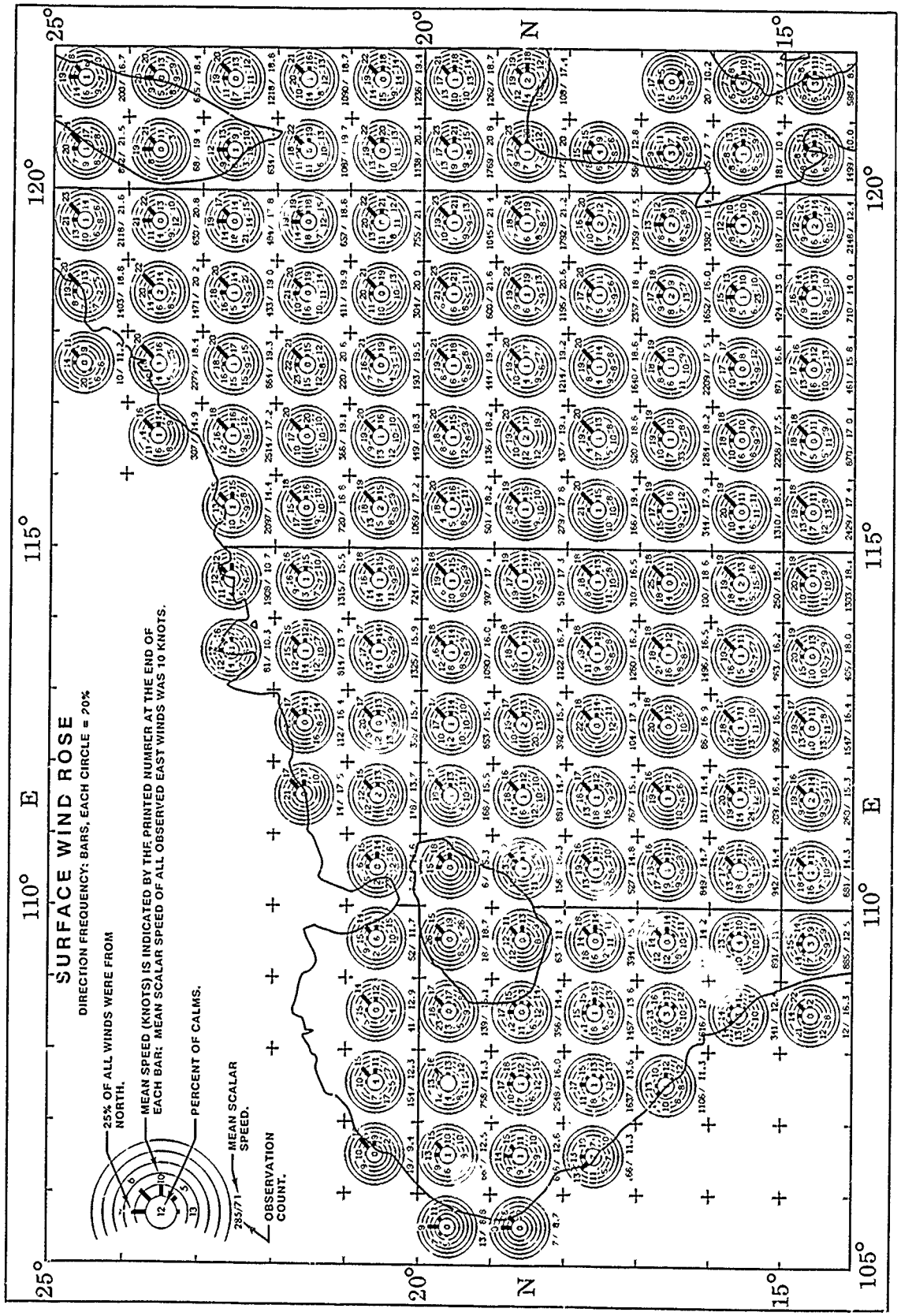



SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%
25% OF ALL WINDS WERE FROM NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR: MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
PERCENT OF CALMS.
MEAN SCALAR SPEED.
285/71
OBSERVATION COUNT.
120°
125°
130°
E
40°
35°
N

January

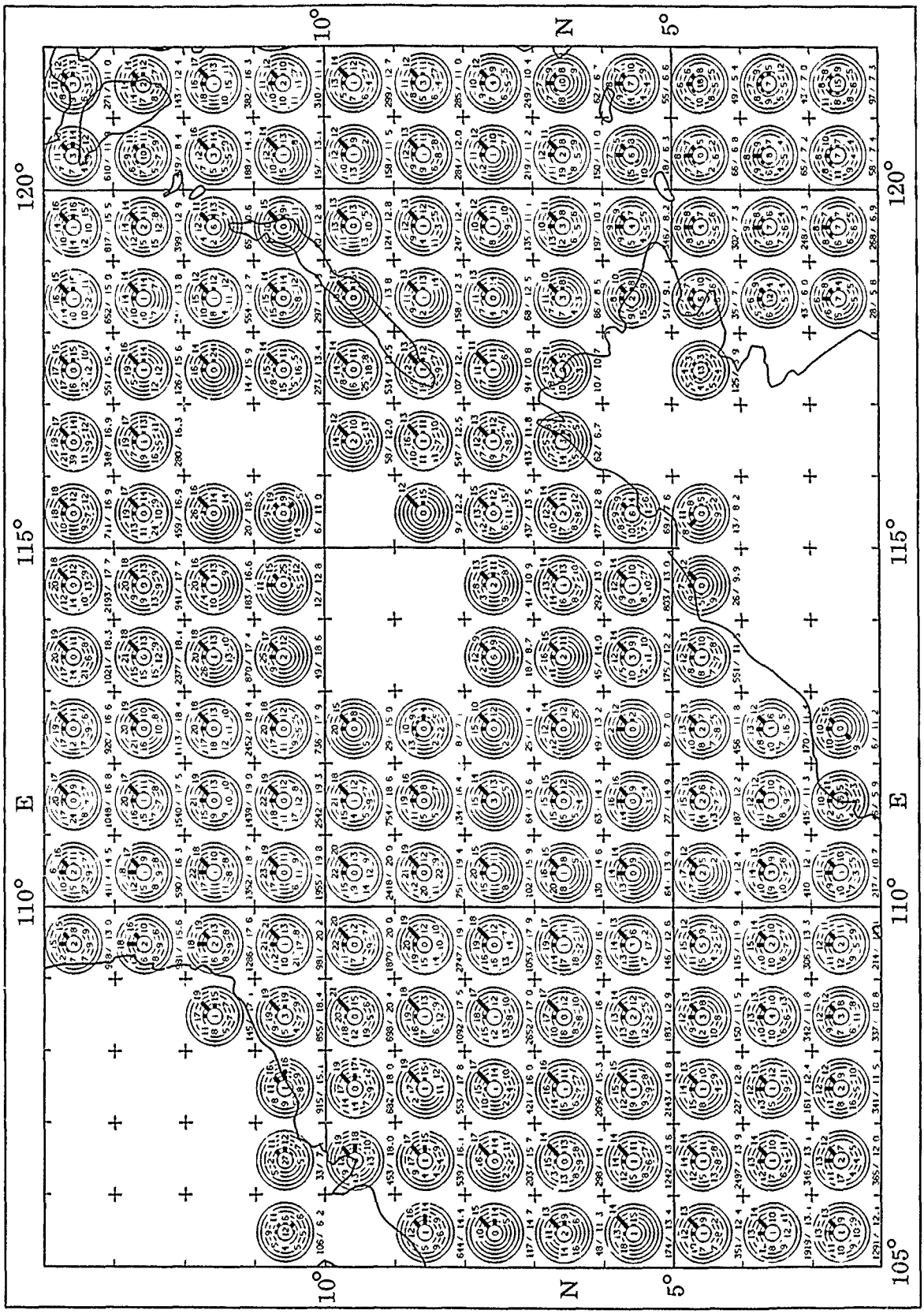
Surface Wind Roses




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.
PERCENT OF CALMS.
MEAN SCALAR SPEED.
OBSERVATION COUNT.
110° E
115°
120°
25°
20°
15°
N
105°

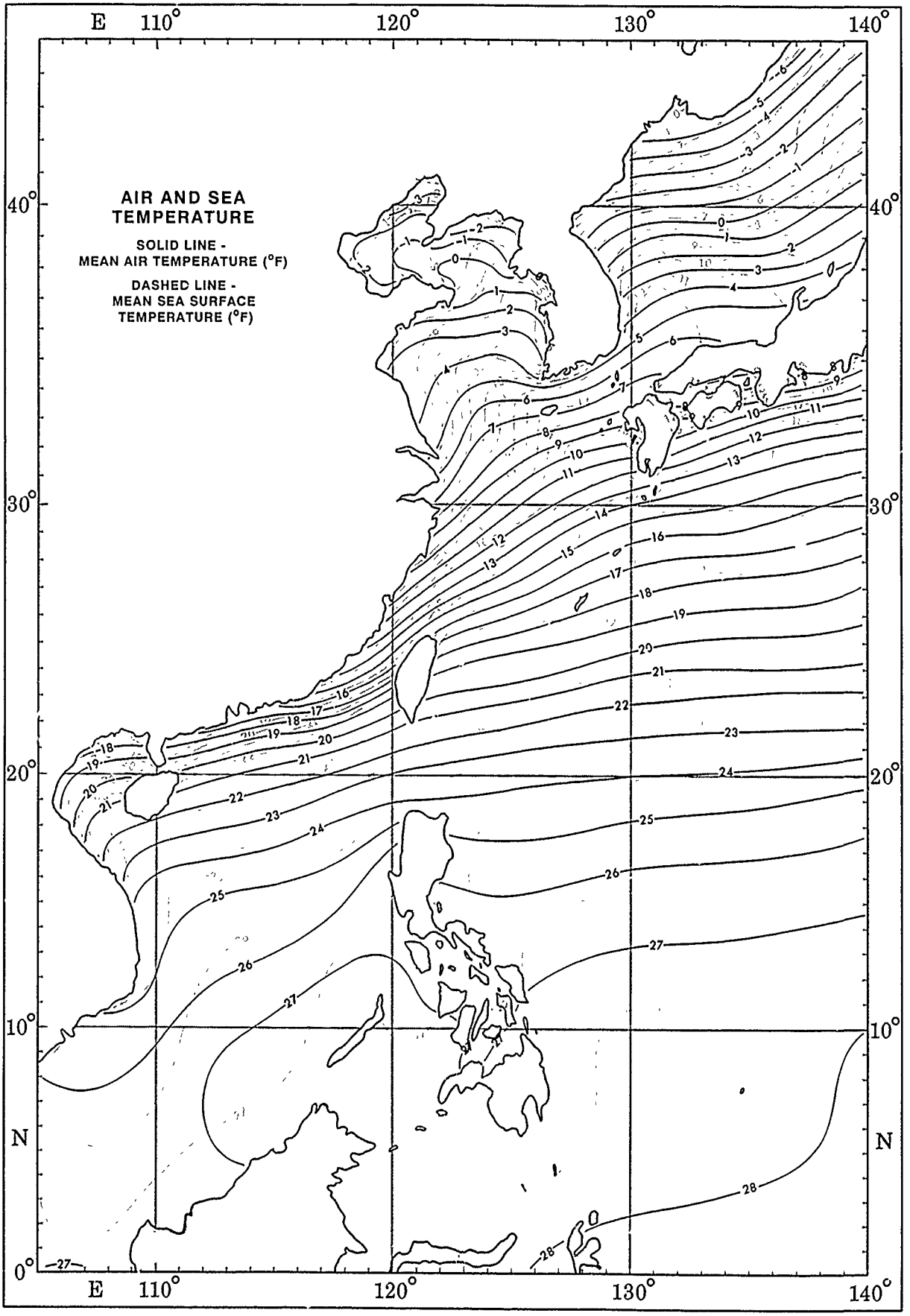
January

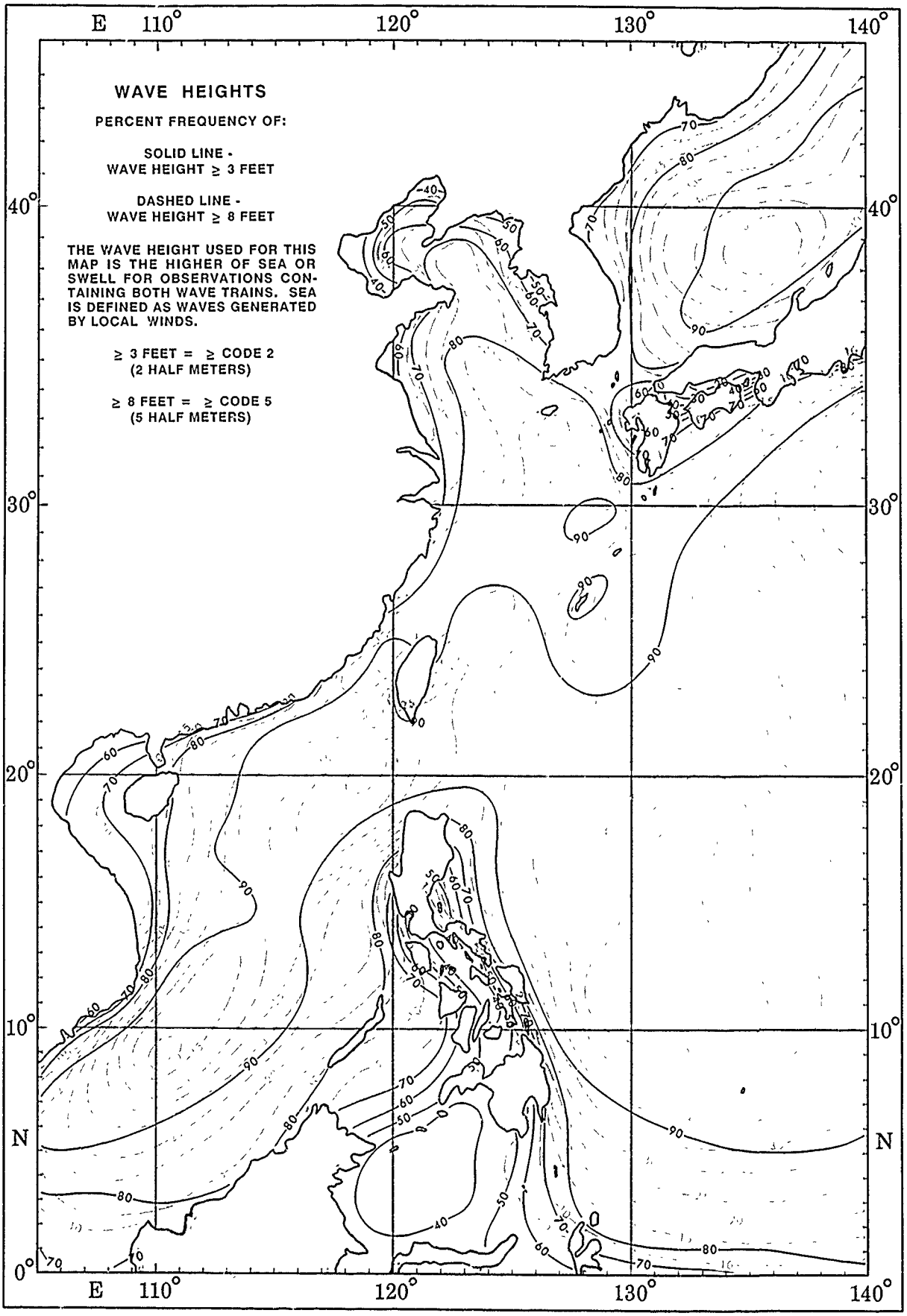
Surface Wind Roses

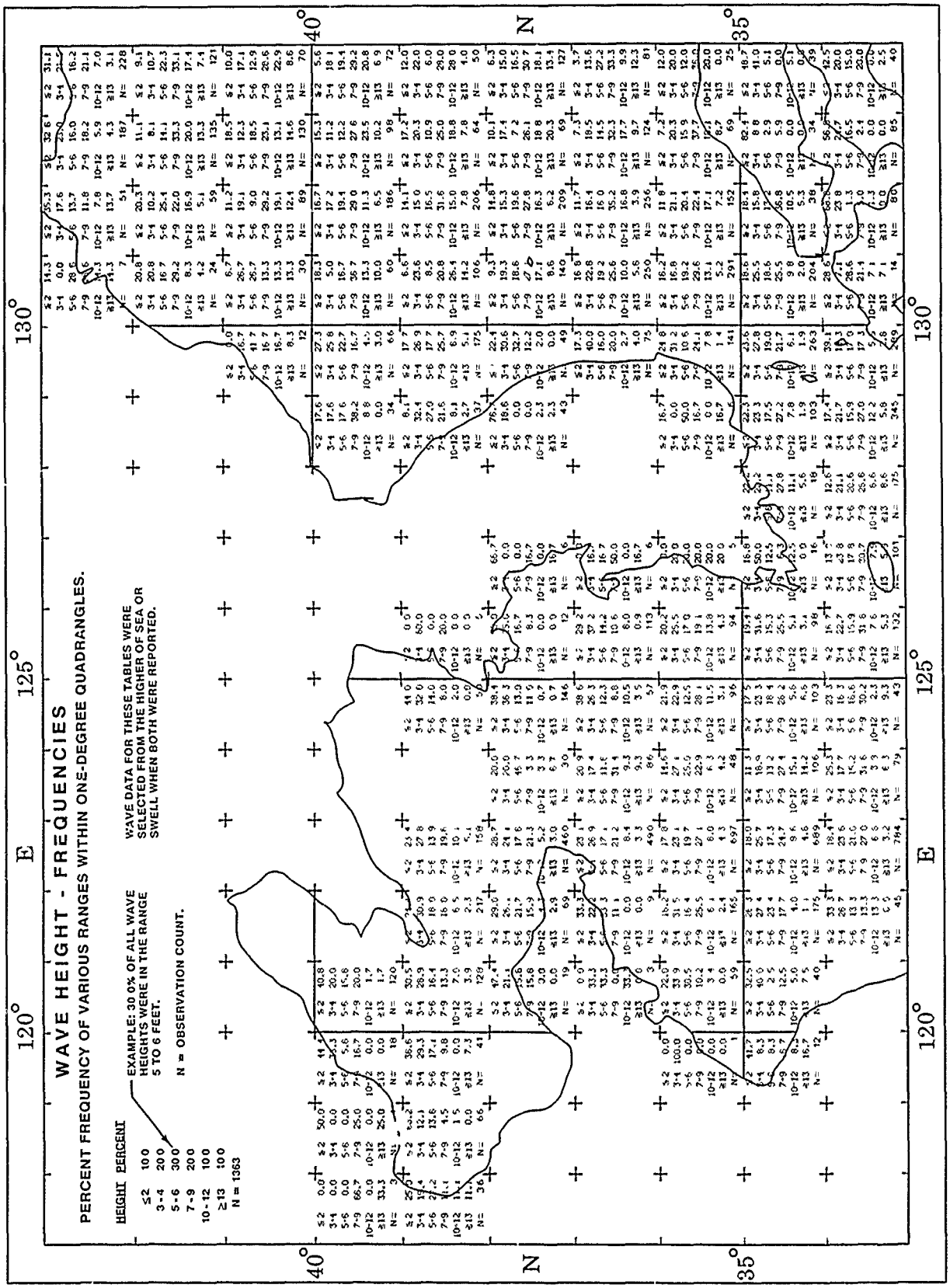


January

Air and Sea Temperature

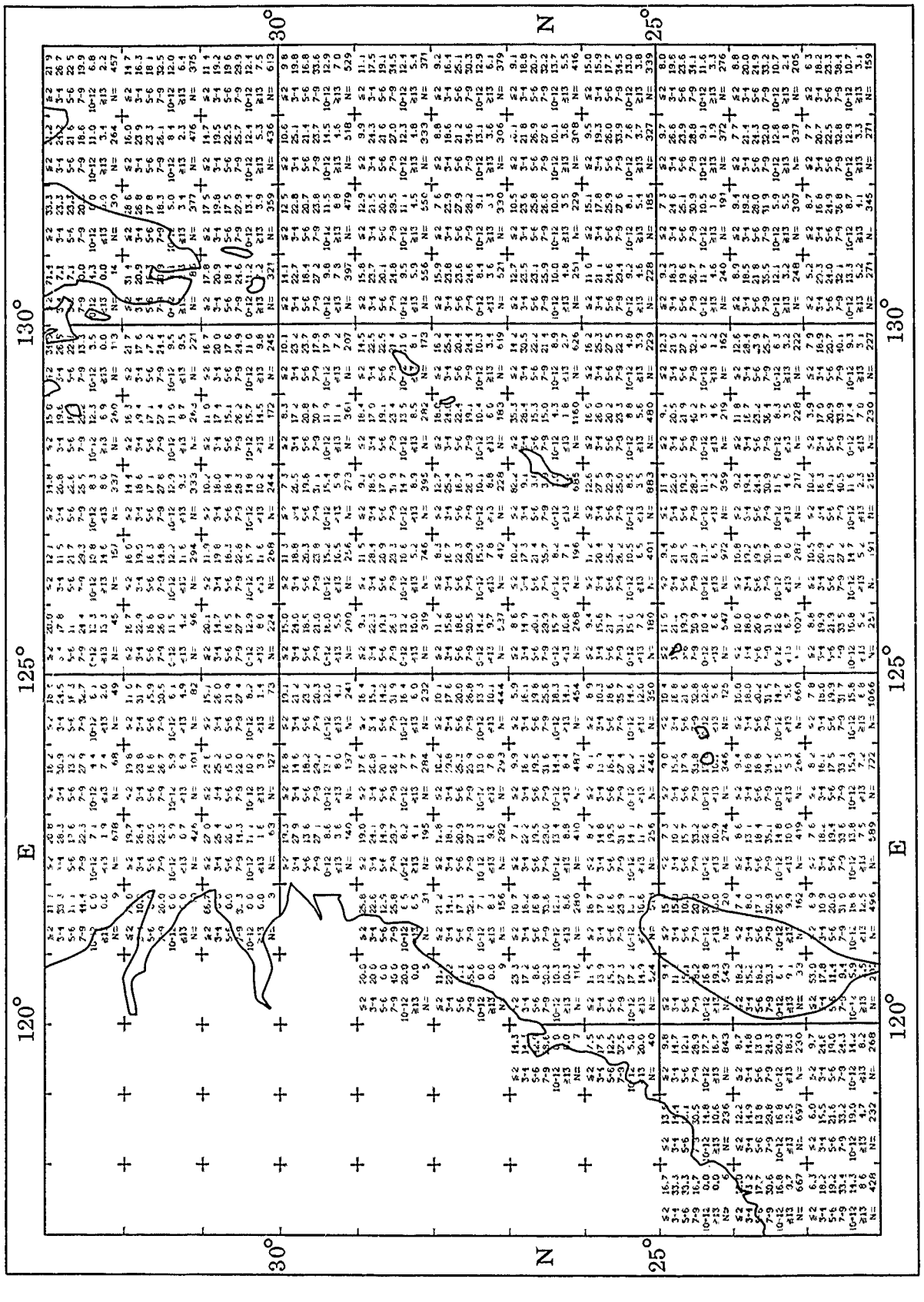


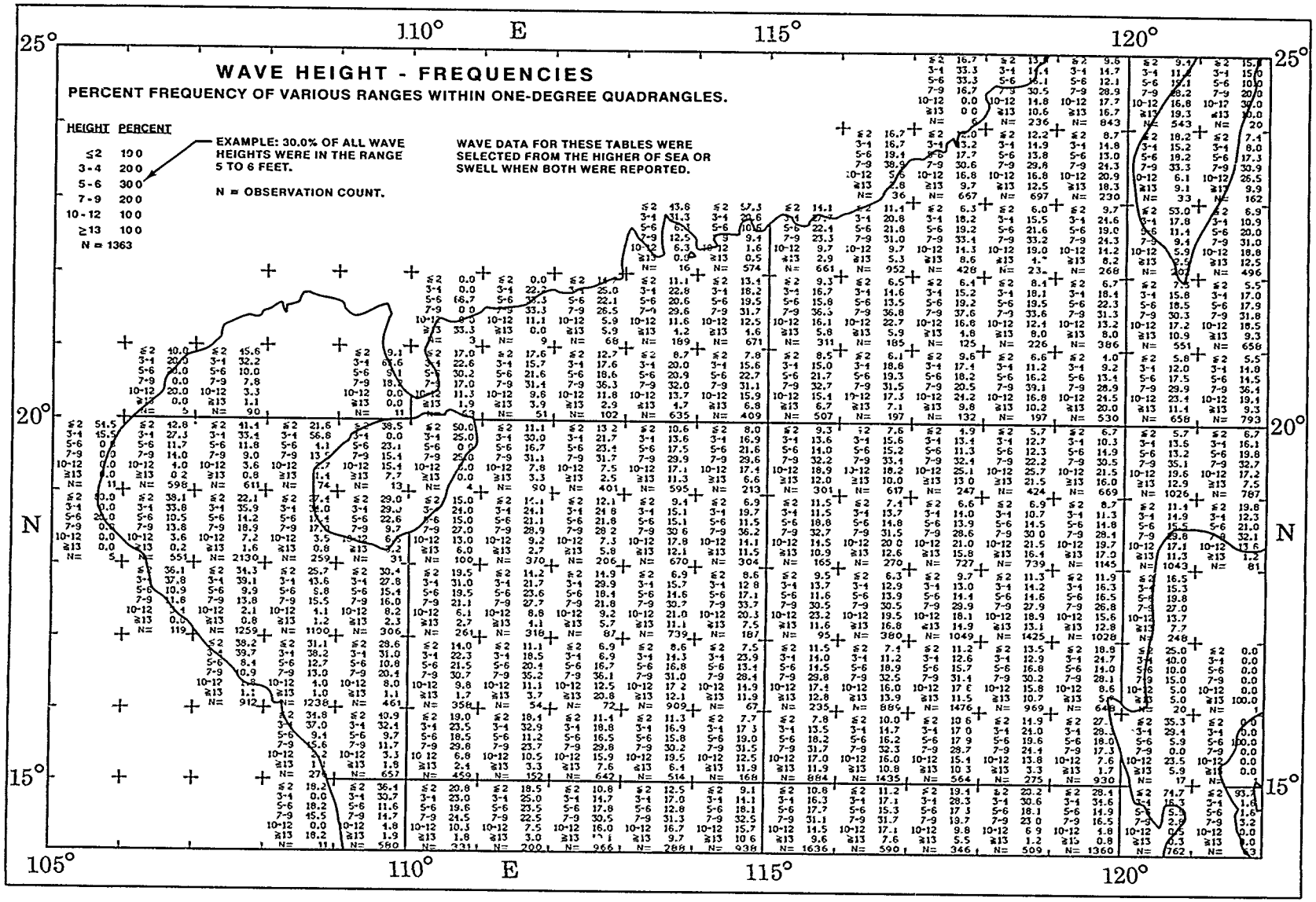

WAVE HEIGHTS
PERCENT FREQUENCY OF:
SOLID LINE -
WAVE HEIGHT ≥ 3 FEET
DASHED LINE -
WAVE HEIGHT ≥ 8 FEET
THE WAVE HEIGHT USED FOR THIS MAP IS THE HIGHER OF SEA OR SWELL FOR OBSERVATIONS CONTAINING BOTH WAVE TRAINS. SEA IS DEFINED AS WAVES GENERATED BY LOCAL WINDS.
≥ 3 FEET = ≥ CODE 2
(2 HALF METERS)
≥ 8 FEET = ≥ CODE 5
(5 HALF METERS)
E 110° 120° 130° 140°
40° 30° 20° 10° N 0°

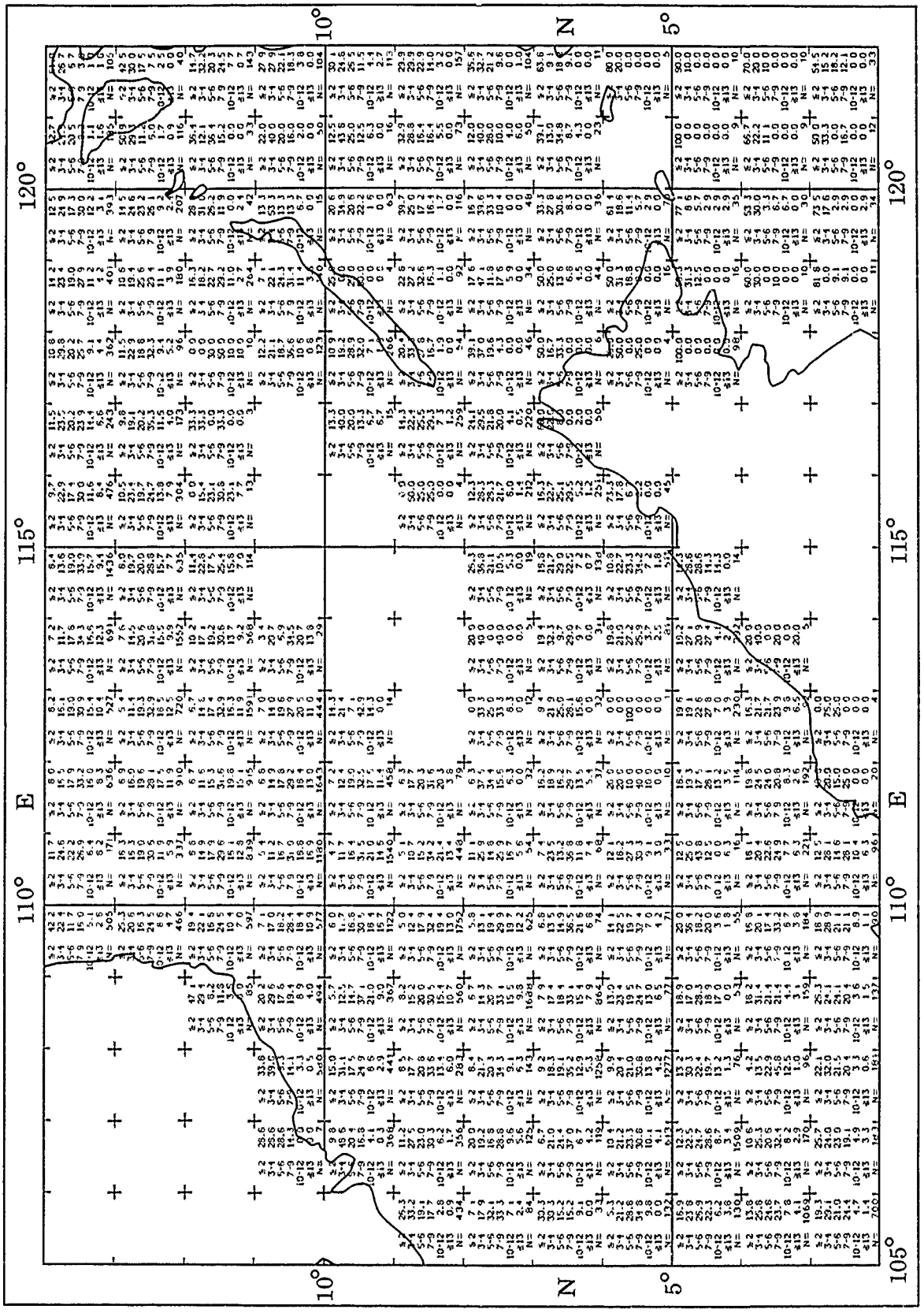

WAVE HEIGHT - FREQUENCIES
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
HEIGHT PERCENT
≤2 10
3-4 20
5-6 30
7-9 20
10-12 10
≥13 10
N = 1363
EXAMPLE: 30.0% OF ALL WAVE HEIGHTS WERE IN THE RANGE 5 TO 6 FEET.
N = OBSERVATION COUNT.
WAVE DATA FOR THESE TABLES WERE SELECTED FROM THE HIGHER OF SEA OR SWELL WHEN BOTH WERE REPORTED.
120°
125°
130°
35°
40°
N
E

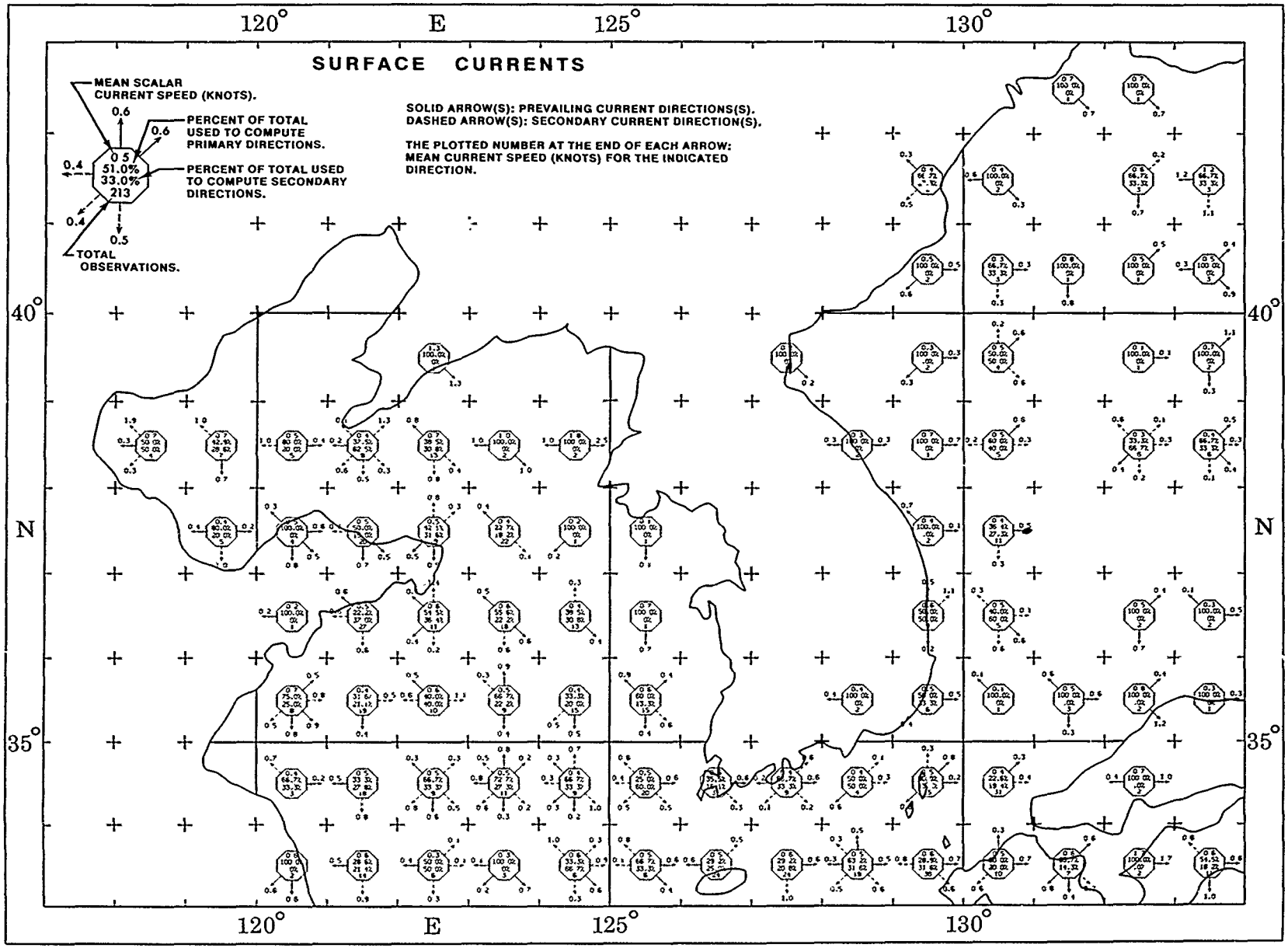
January

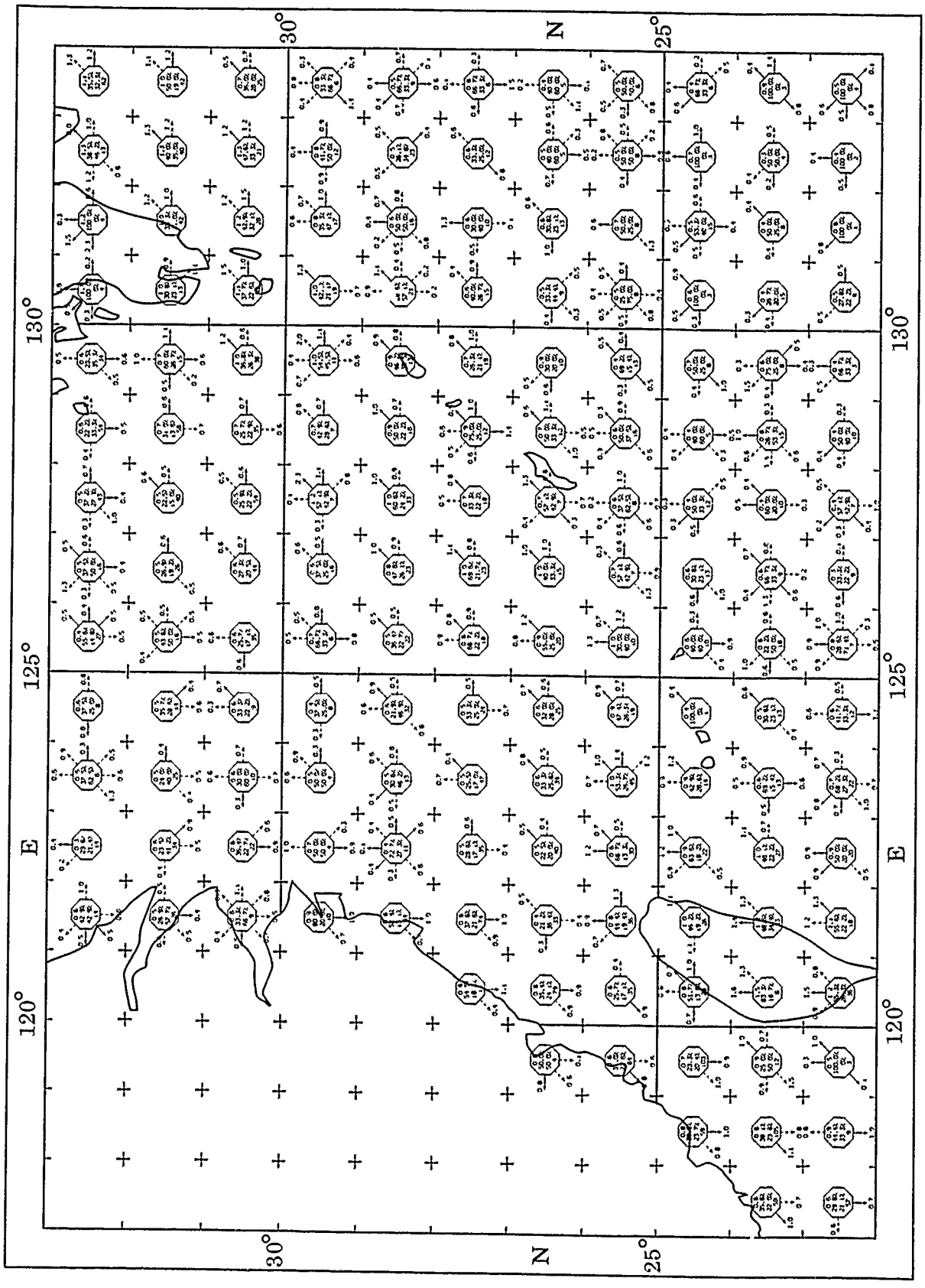
Wave Height

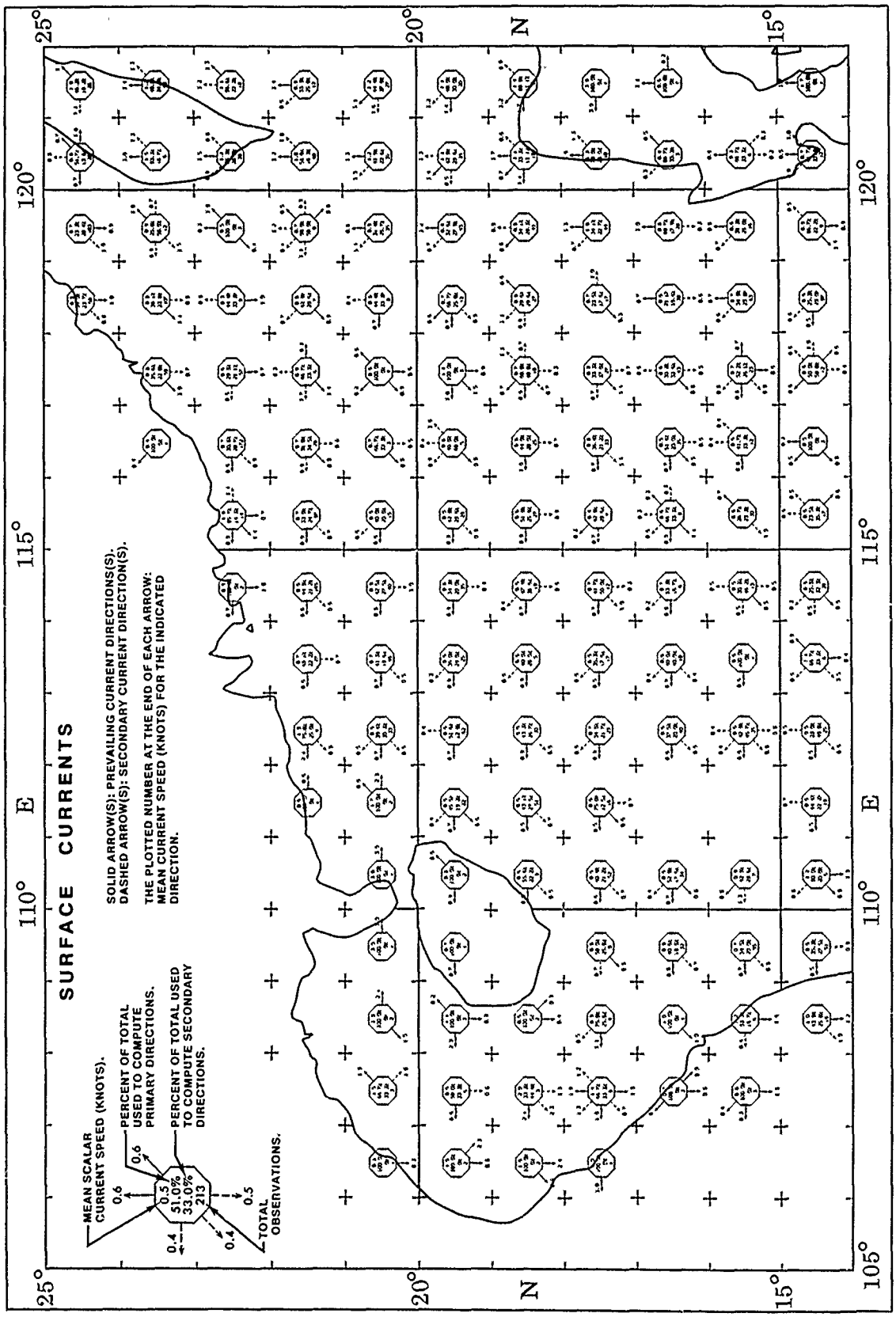


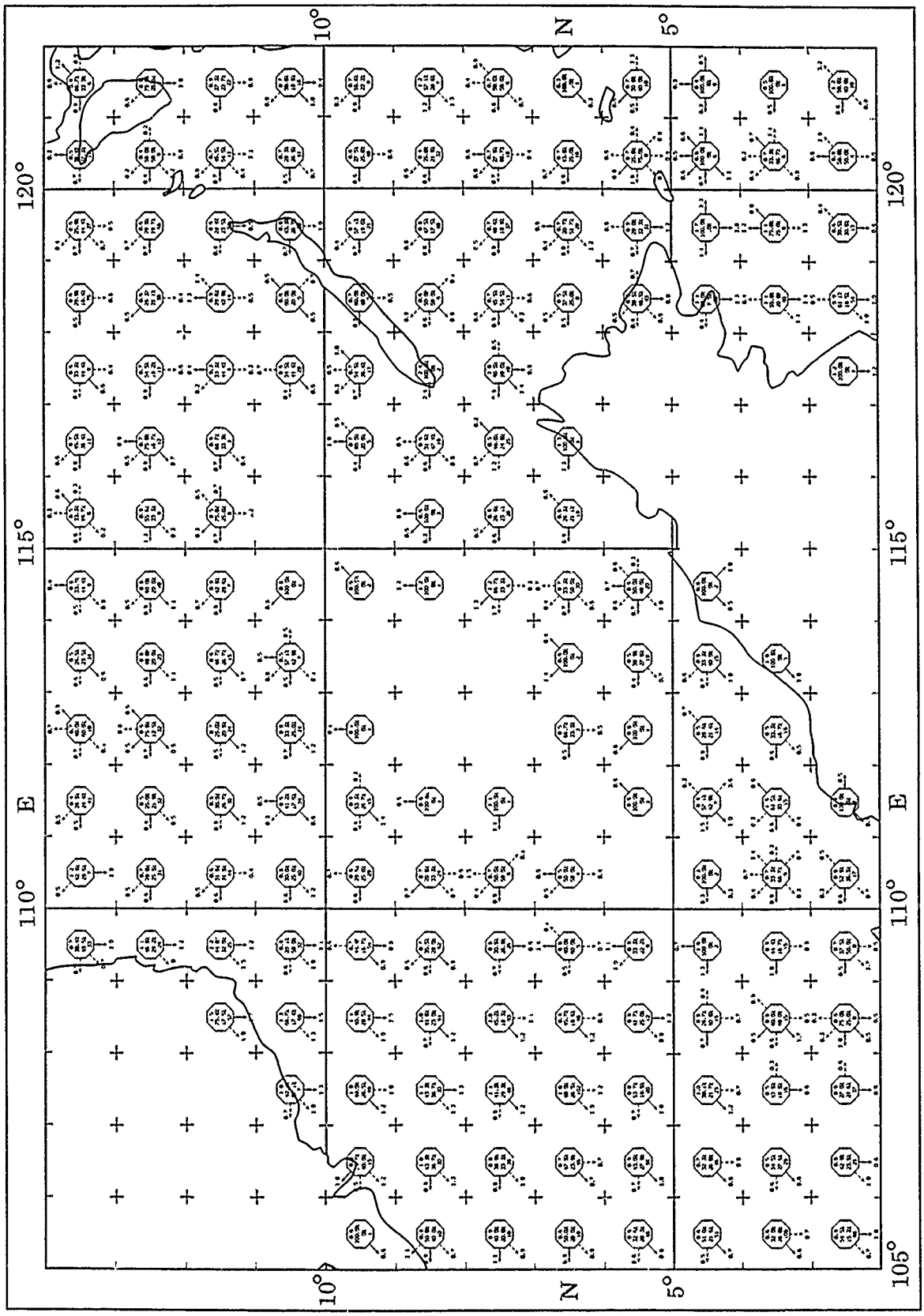

WAVE HEIGHT - FREQUENCIES
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
HEIGHT PERCENT
≤2 10 0
3-4 20 0
5-6 30 0
7-9 20 0
10-12 10 0
≥13 10 0
N = 1363
EXAMPLE: 30.0% OF ALL WAVE HEIGHTS WERE IN THE RANGE 5 TO 6 FEET.
N = OBSERVATION COUNT.
WAVE DATA FOR THESE TABLES WERE SELECTED FROM THE HIGHER OF SEA OR SWELL WHEN BOTH WERE REPORTED.
110° E
115°
120°
25°
20°
15°
N
105°

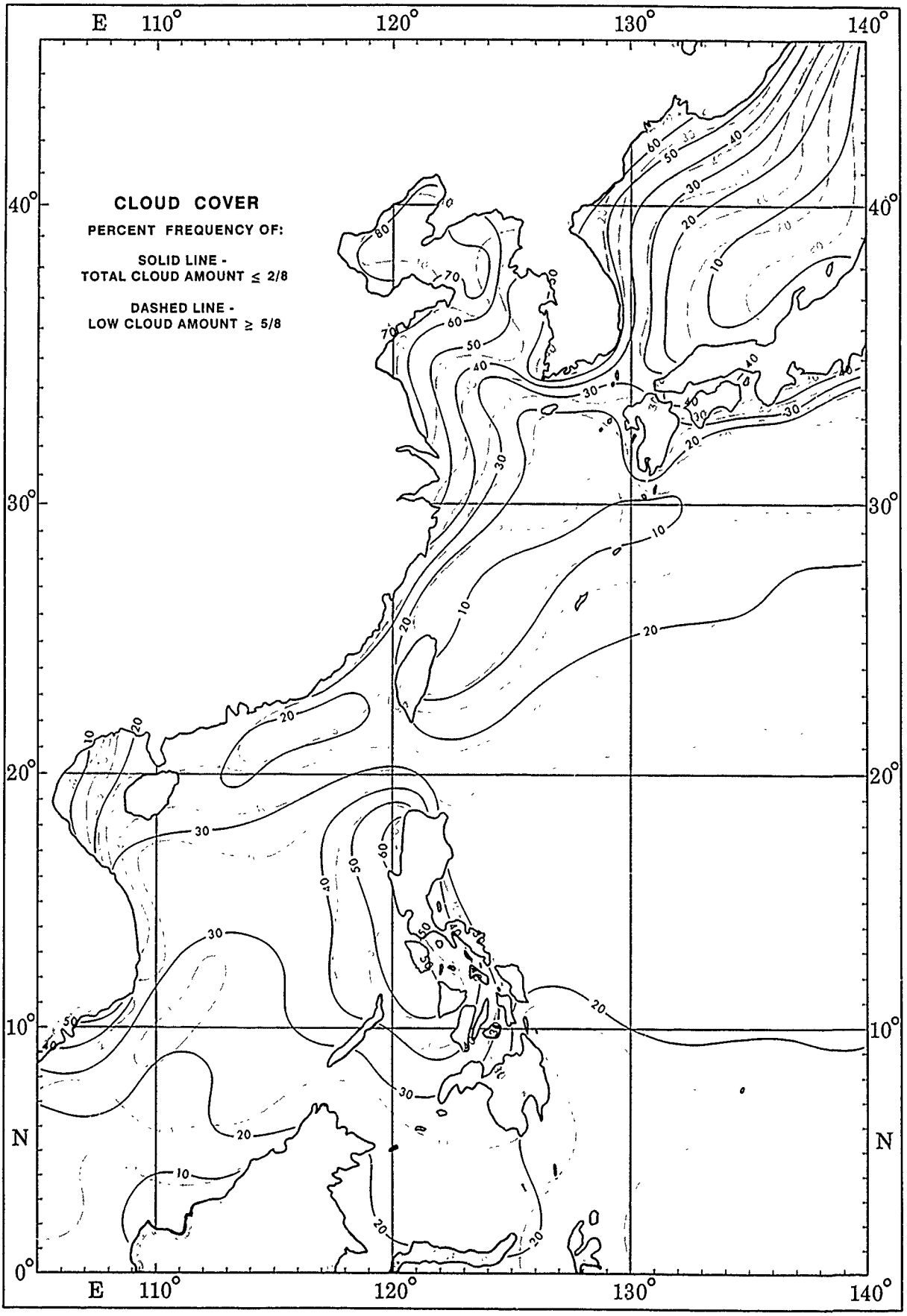

120°
115°
110°
105°
10°
5°
N
E

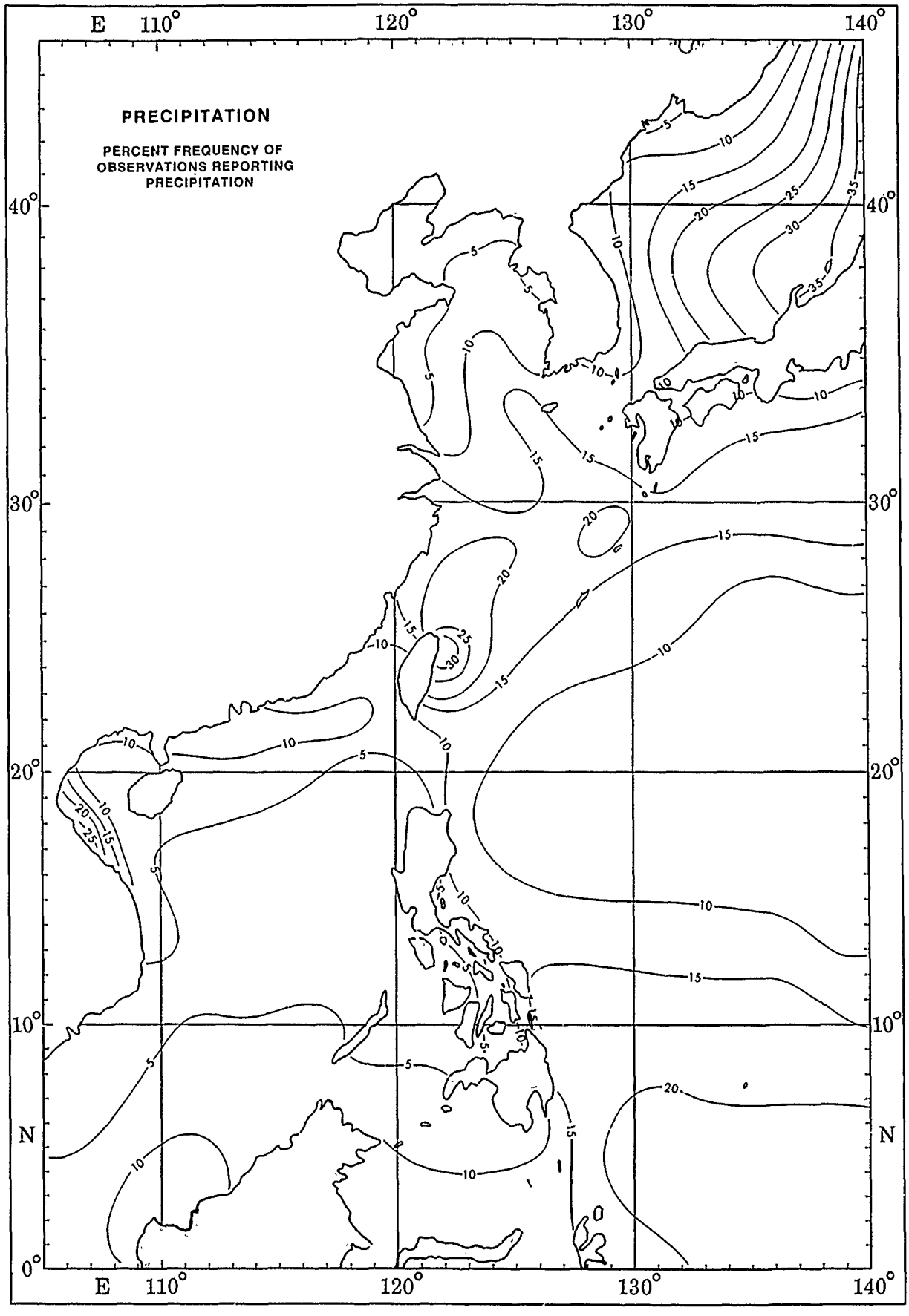

SURFACE CURRENTS
MEAN SCALAR CURRENT SPEED (KNOTS).
0.6
0.6
0.4
0 5
51.0%
33.0%
213
0.4
0.5
TOTAL OBSERVATIONS.
PERCENT OF TOTAL USED TO COMPUTE PRIMARY DIRECTIONS.
PERCENT OF TOTAL USED TO COMPUTE SECONDARY DIRECTIONS.
SOLID ARROW(S): PREVAILING CURRENT DIRECTIONS(S).
DASHED ARROW(S): SECONDARY CURRENT DIRECTION(S).
THE PLOTTED NUMBER AT THE END OF EACH ARROW: MEAN CURRENT SPEED (KNOTS) FOR THE INDICATED DIRECTION.
120° E
125°
130°
40° N
35° N

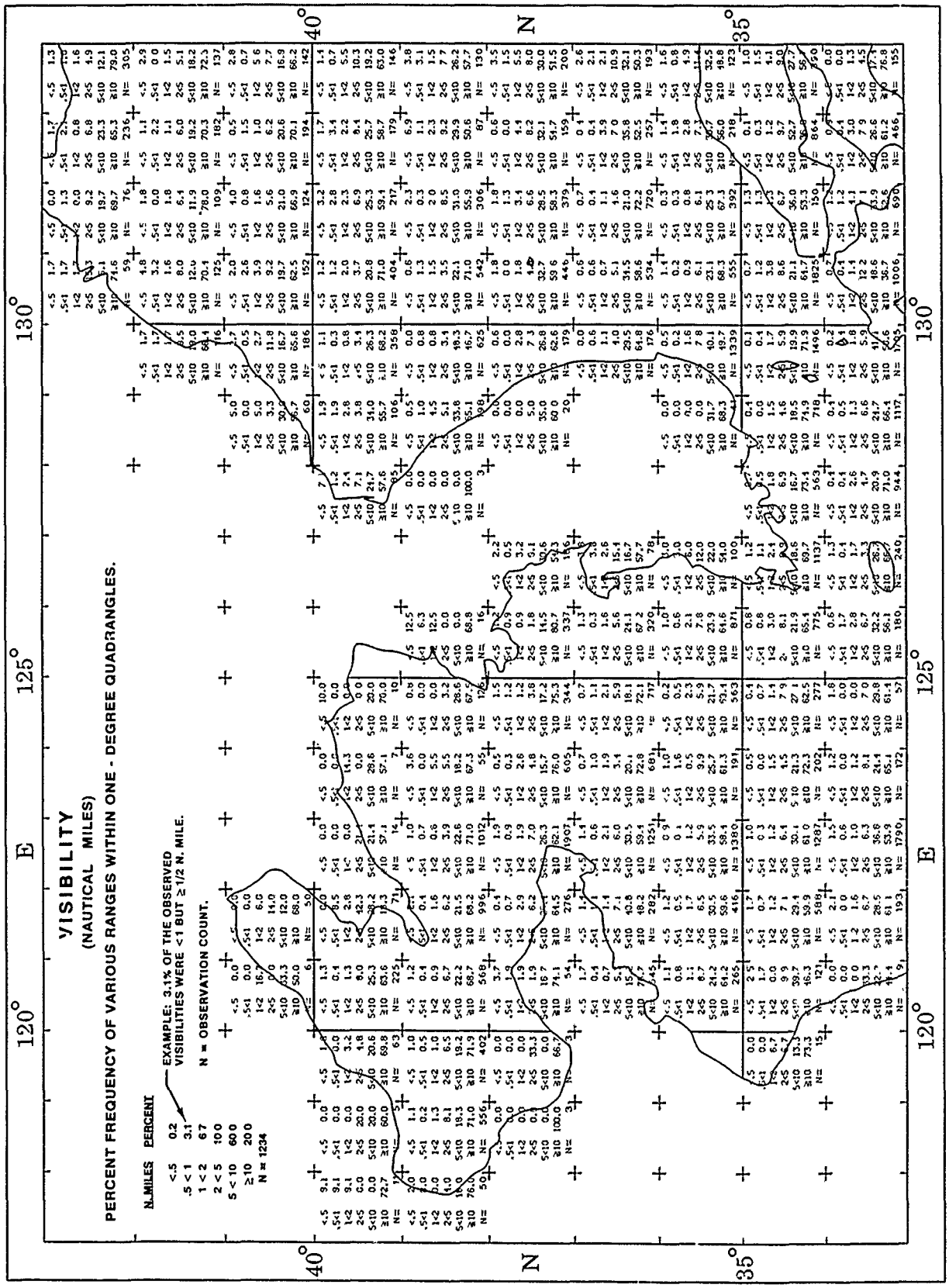

30°
N
25°
130°
125°
120°
E

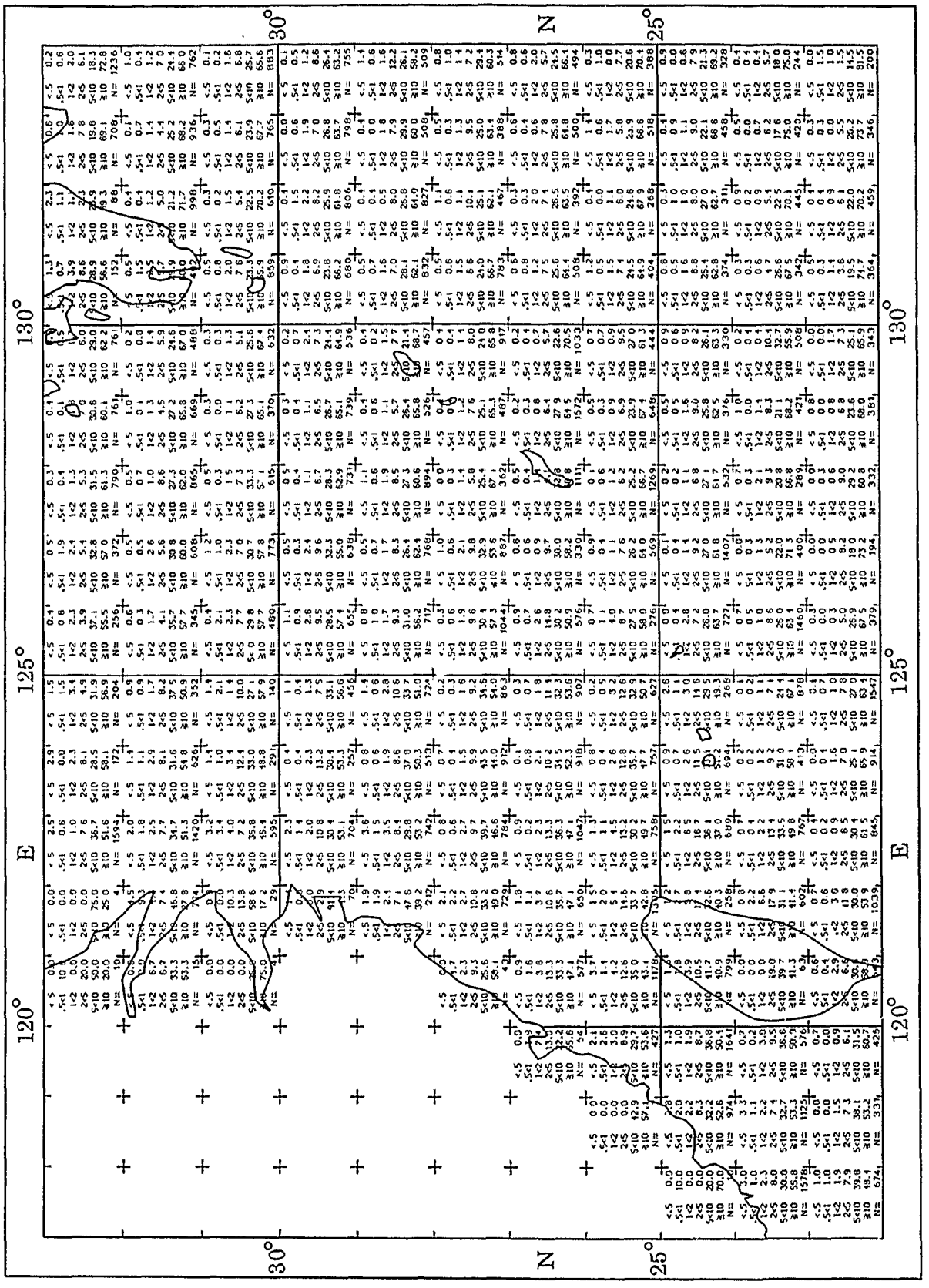

SURFACE CURRENTS
SOLID ARROW(S): PREVAILING CURRENT DIRECTIONS(S).
DASHED ARROW(S): SECONDARY CURRENT DIRECTION(S).
THE PLOTTED NUMBER AT THE END OF EACH ARROW: MEAN CURRENT SPEED (KNOTS) FOR THE INDICATED DIRECTION.
MEAN SCALAR CURRENT SPEED (KNOTS).
PERCENT OF TOTAL USED TO COMPUTE PRIMARY DIRECTIONS.
PERCENT OF TOTAL USED TO COMPUTE SECONDARY DIRECTIONS.
TOTAL OBSERVATIONS.
0.6
0.5
51.0%
33.0%
213
0.4
0.4
0.5
25°
20°
15°
N
105°
110° E
115°
120°

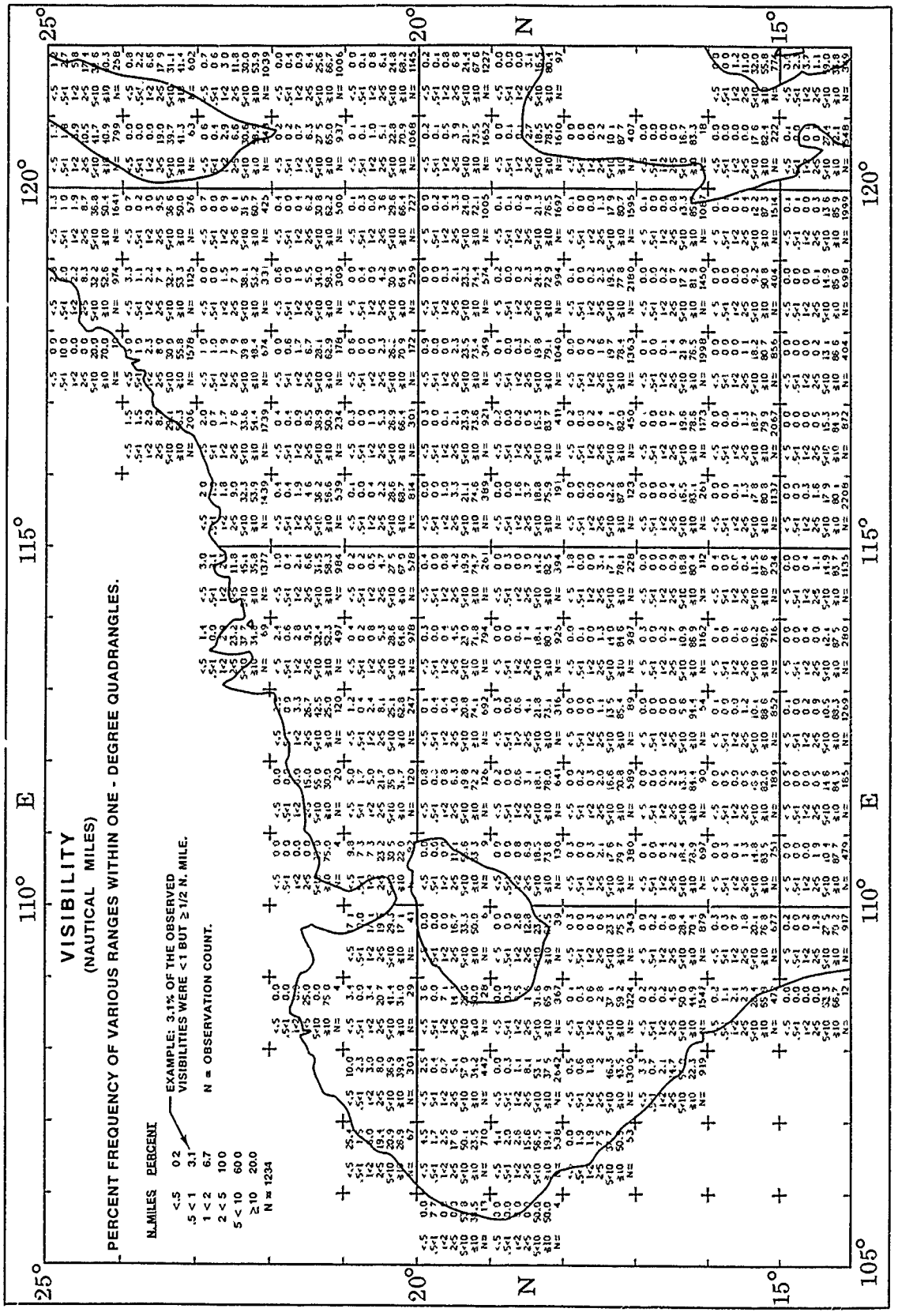

10° N
5°
120°
115°
110° E
105°
10° N
5°

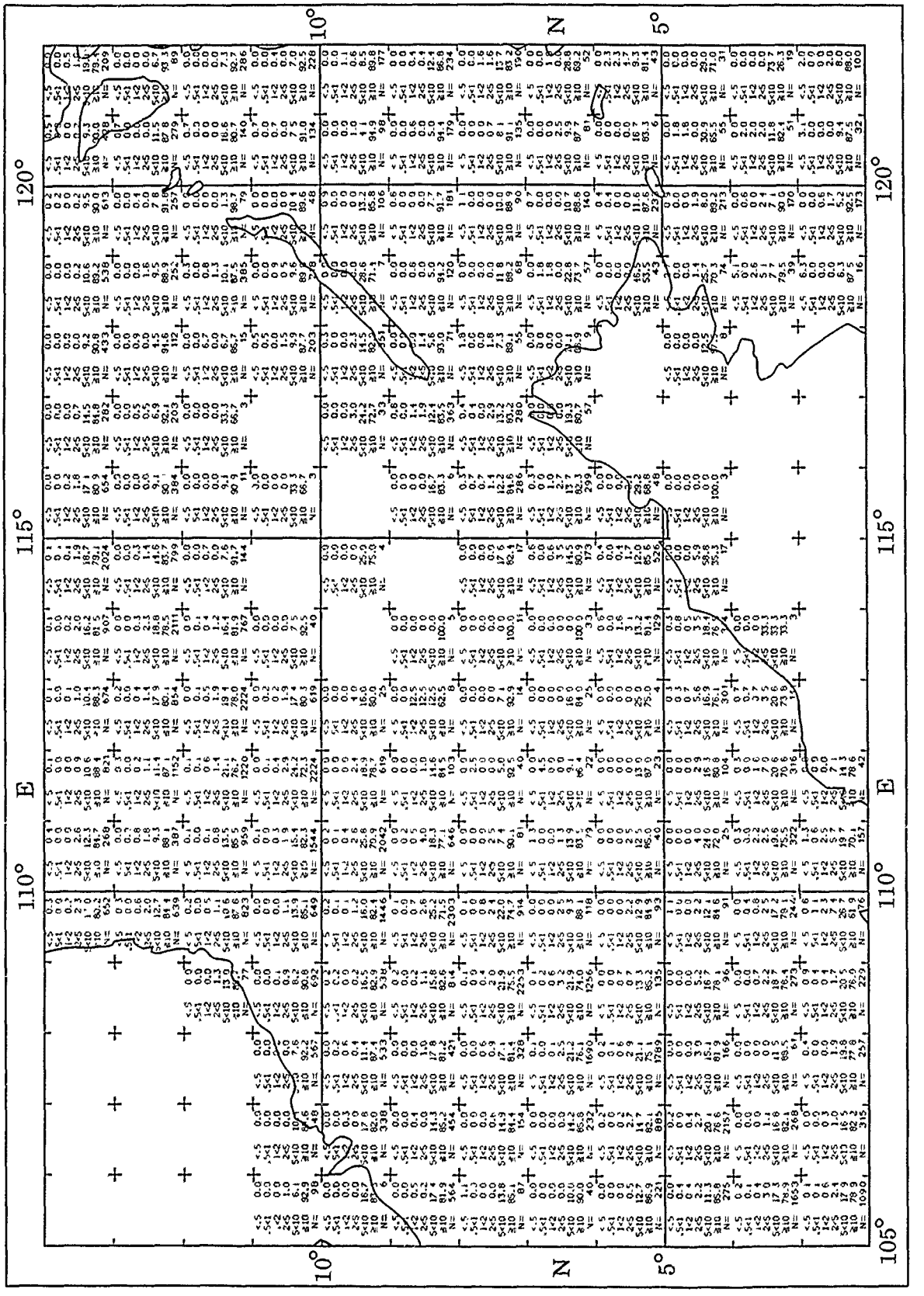

CLOUD COVER
PERCENT FREQUENCY OF:
SOLID LINE -
TOTAL CLOUD AMOUNT ≤ 2/8
DASHED LINE -
LOW CLOUD AMOUNT ≥ 5/8
E 110°
120°
130°
140°
40°
30°
20°
10°
N
0°


PRECIPITATION
PERCENT FREQUENCY OF OBSERVATIONS REPORTING PRECIPITATION
E 110°
120°
130°
140°
40°
30°
20°
10°
N
0°


VISIBILITY
(NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE - DEGREE QUADRANGLES.
N. MILES PERCENT
<.5 0.2
.5 < 1 3.1
1 < 2 6.7
2 < 5 10.0
5 < 10 60.0
≥10 20.0
N = 1234
EXAMPLE: 3.1% OF THE OBSERVED VISIBILITIES WERE <1 BUT ≥1/2 N. MILE.
N = OBSERVATION COUNT.
120°
125°
130°
35°
40°
N
E

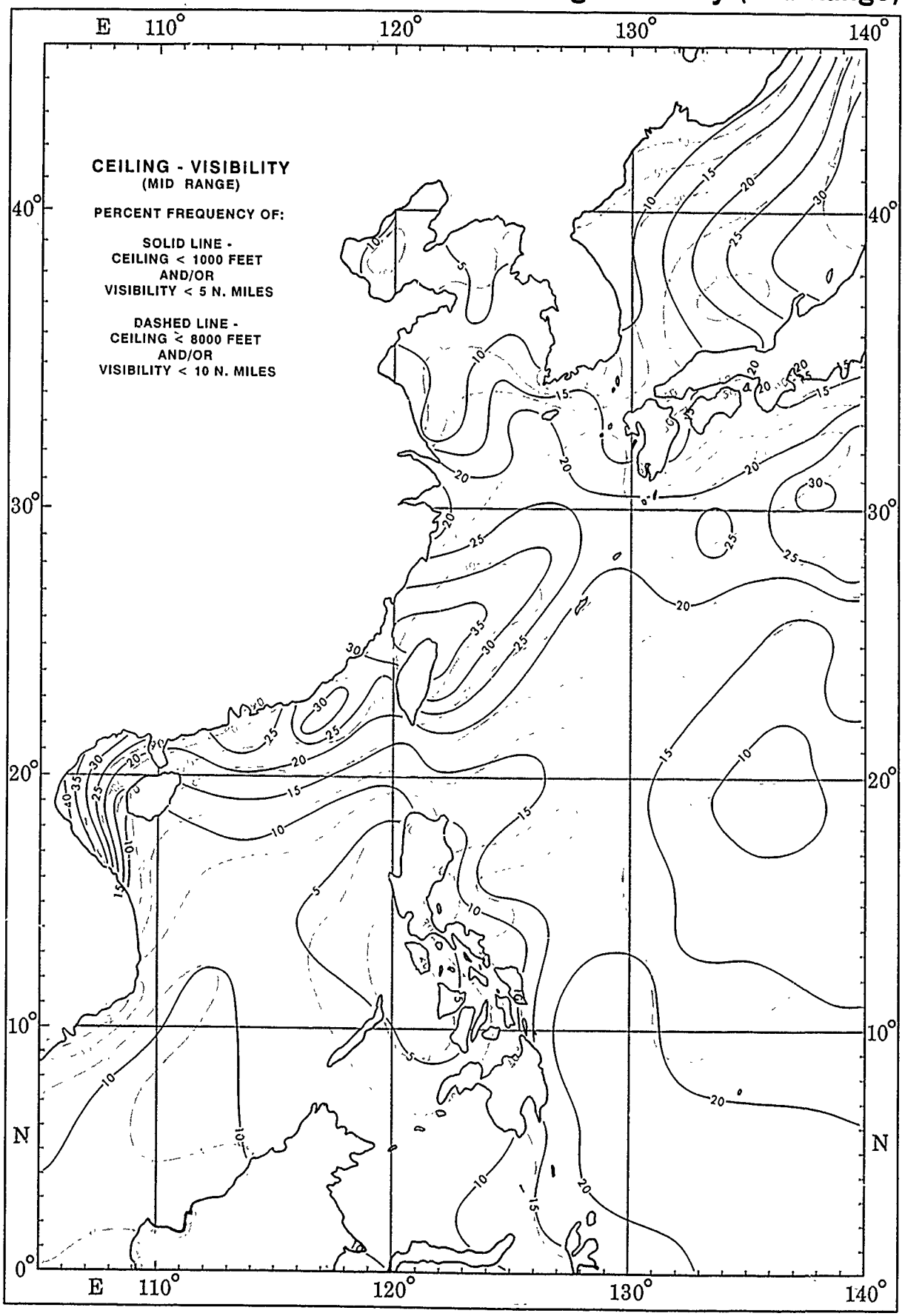

30°
25°
N
120°
125°
130°
E

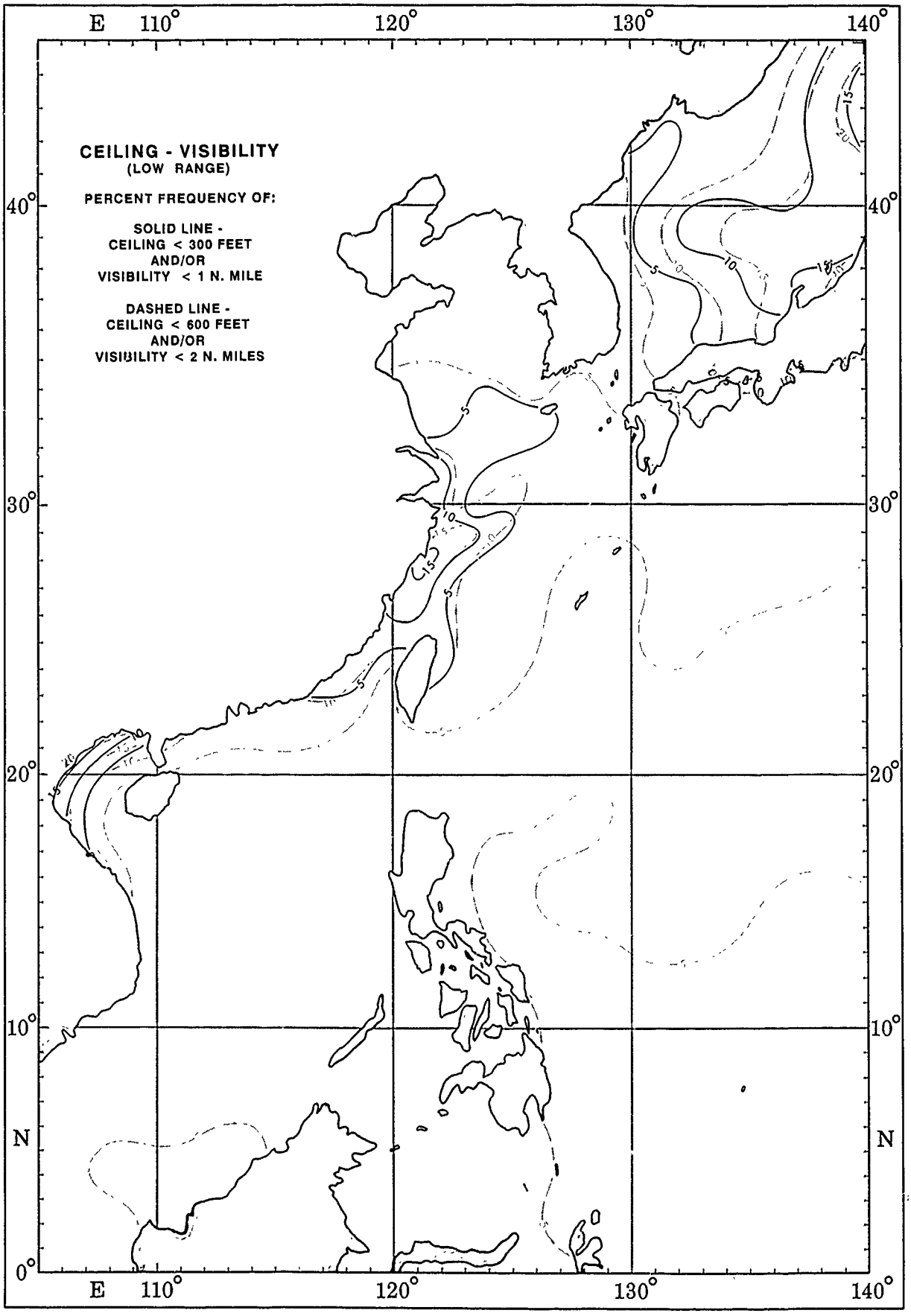

VISIBILITY
(NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE - DEGREE QUADRANGLES.
N MILES PERCENT
<.5 0 2
.5 < 1 3.1
1 < 2 6.7
2 < 5 10 0
5 < 10 60 0
≥10 20.0
N = 1234
EXAMPLE: 3.1% OF THE OBSERVED VISIBILITIES WERE <1 BUT ≥ 1/2 N. MILE.
N = OBSERVATION COUNT.
110° E
115°
120°
25°
20°
15°
N
105°

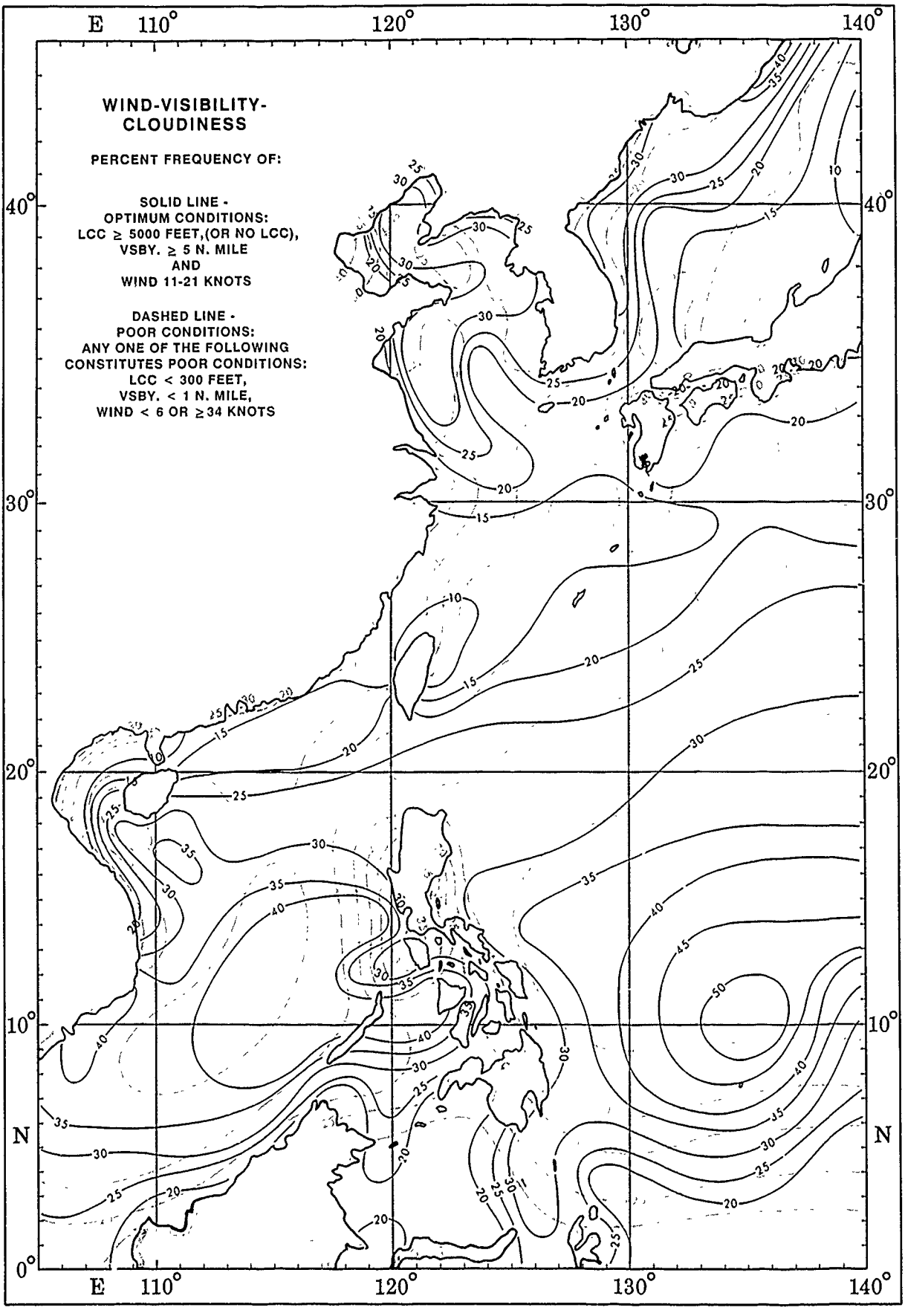

10° N
5° N
105° E
110° E
115° E
120° E

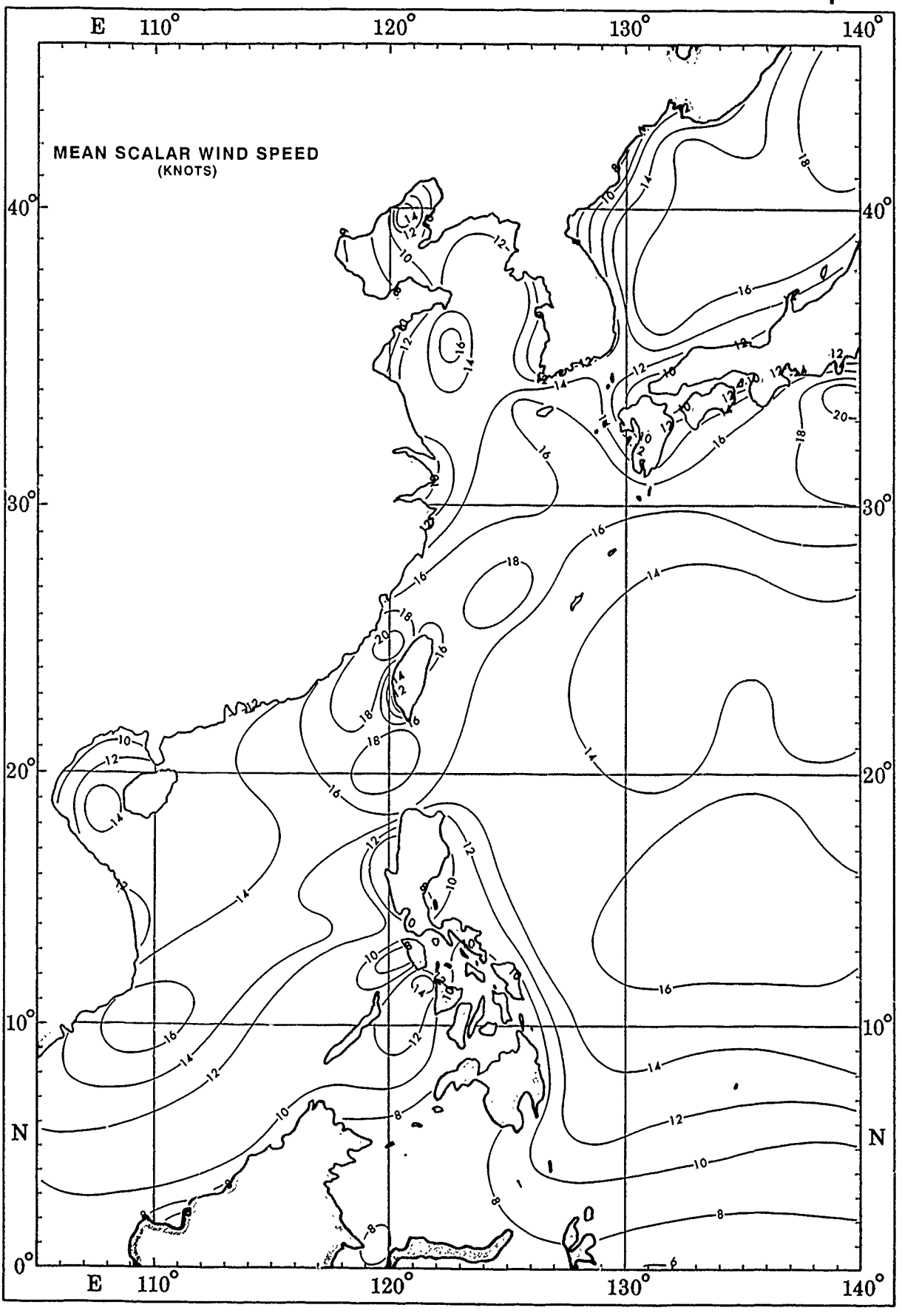
February

Ceiling - Visibility (Mid Range)



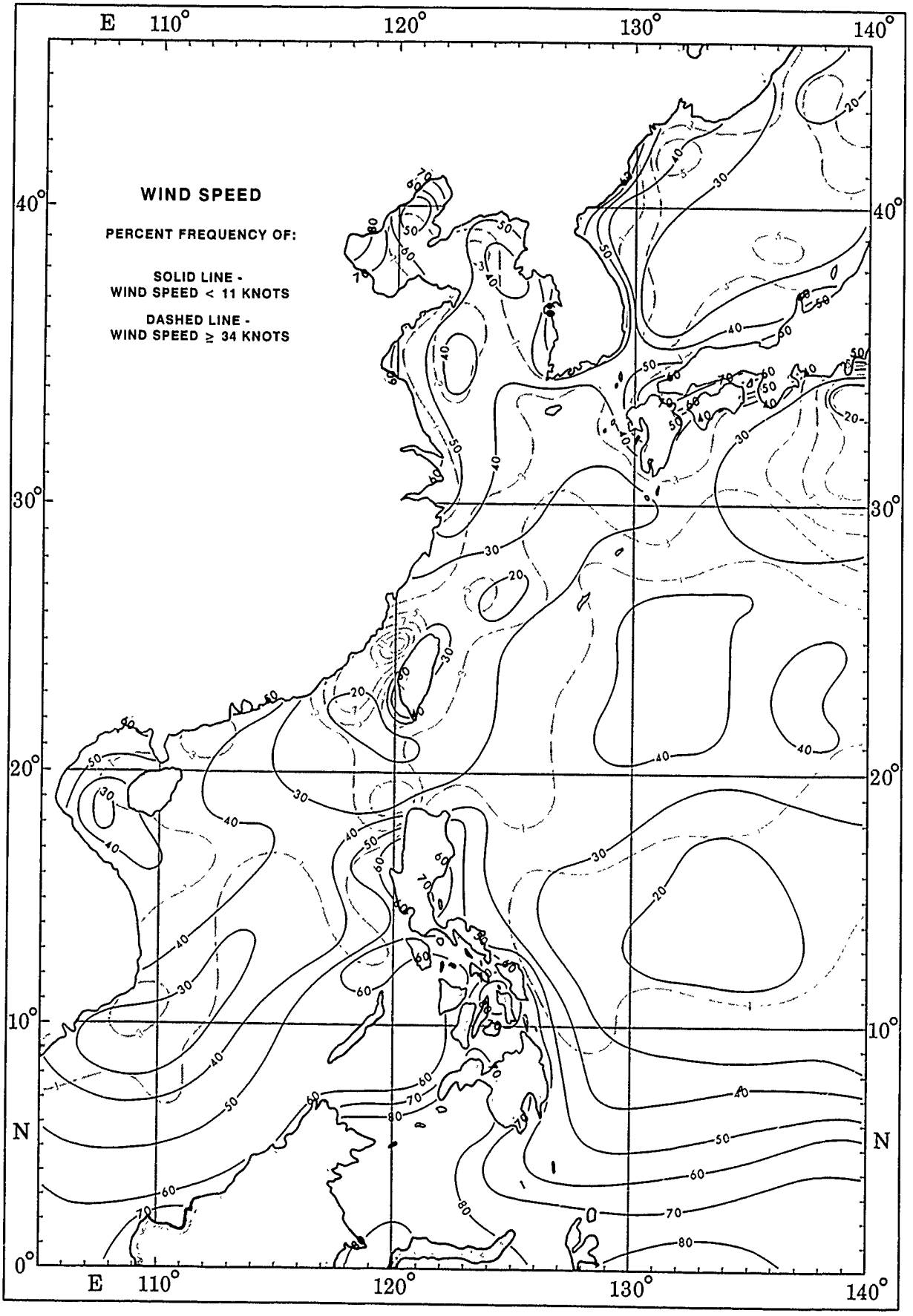

CEILING - VISIBILITY
(LOW RANGE)
PERCENT FREQUENCY OF:
SOLID LINE -
CEILING < 300 FEET
AND/OR
VISIBILITY < 1 N. MILE
DASHED LINE -
CEILING < 600 FEET
AND/OR
VISIBILITY < 2 N. MILES
E 110°
120°
130°
140°
40°
30°
20°
10°
N
0°


WIND-VISIBILITY-
CLOUDINESS
PERCENT FREQUENCY OF:
SOLID LINE -
OPTIMUM CONDITIONS:
LCC ≥ 5000 FEET,(OR NO LCC),
VSBY. ≥ 5 N. MILE
AND
WIND 11-21 KNOTS
DASHED LINE -
POOR CONDITIONS:
ANY ONE OF THE FOLLOWING
CONSTITUTES POOR CONDITIONS:
LCC < 300 FEET,
VSBY. < 1 N. MILE,
WIND < 6 OR ≥34 KNOTS
E 110°
120°
130°
140°
40°
30°
20°
10°
N
0°


MEAN SCALAR WIND SPEED
(KNOTS)
E 110°
120°
130°
140°
40°
30°
20°
10°
N
0°

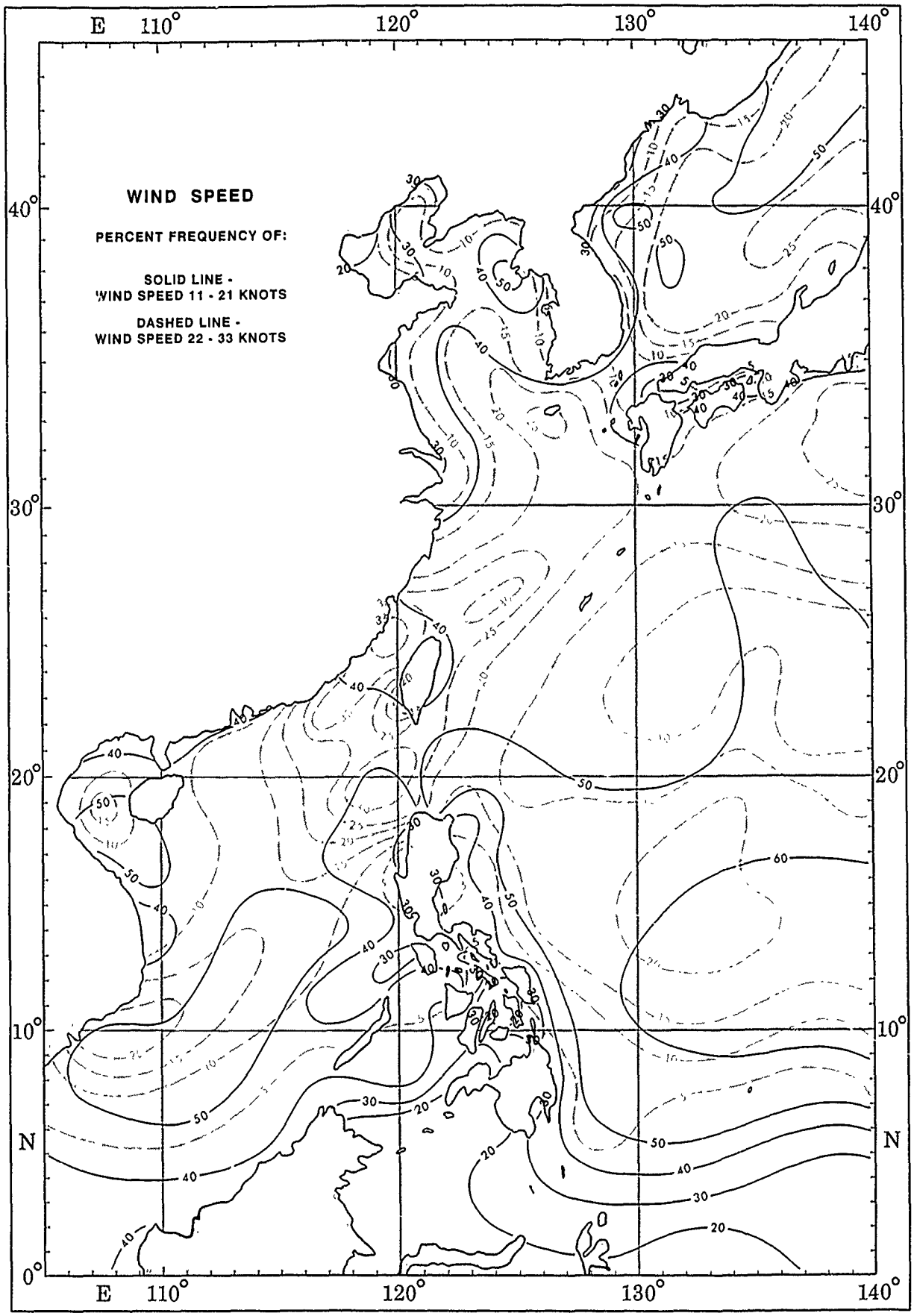
February

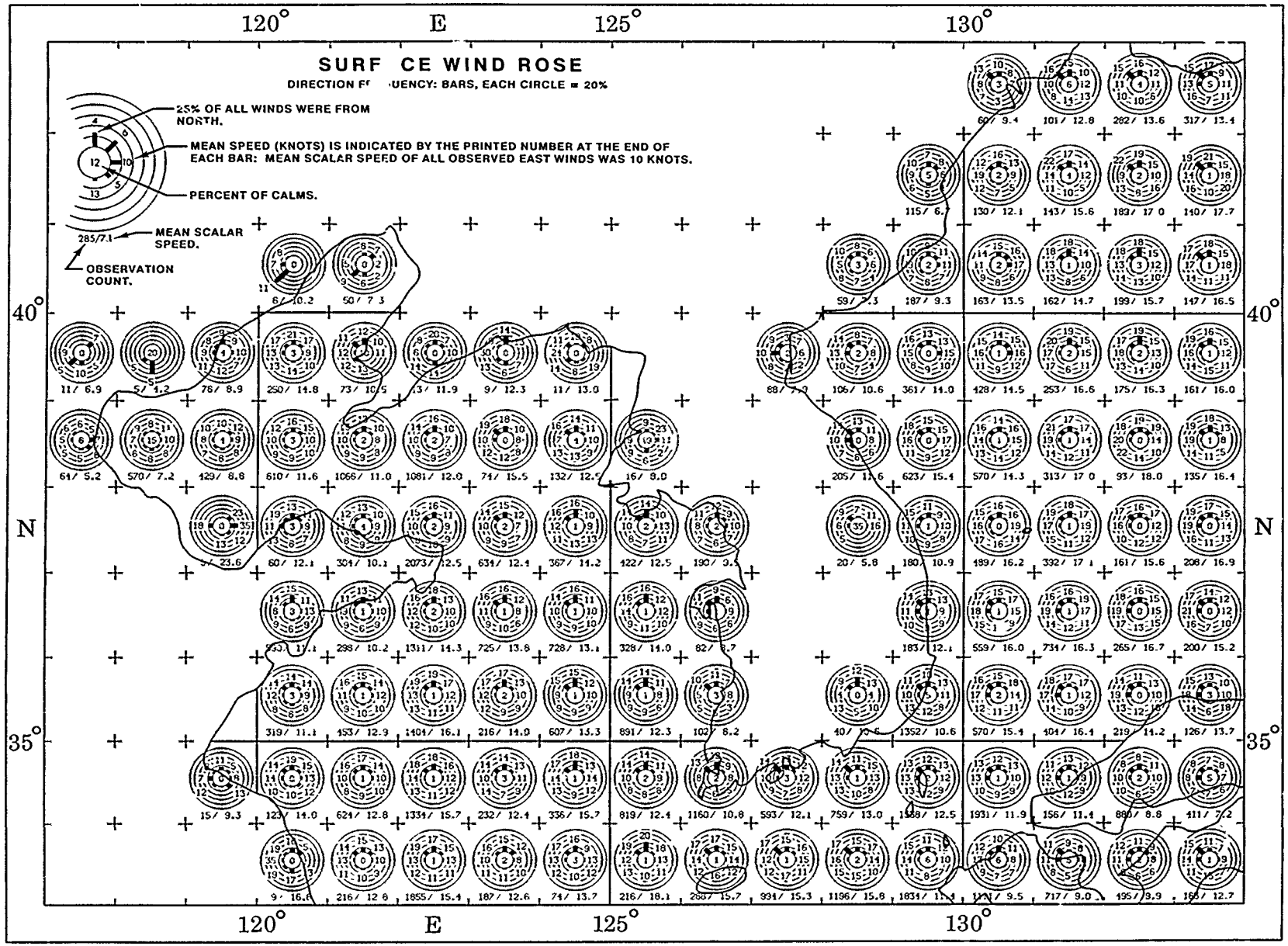
Wind Speed <11 and ≥34 Knots

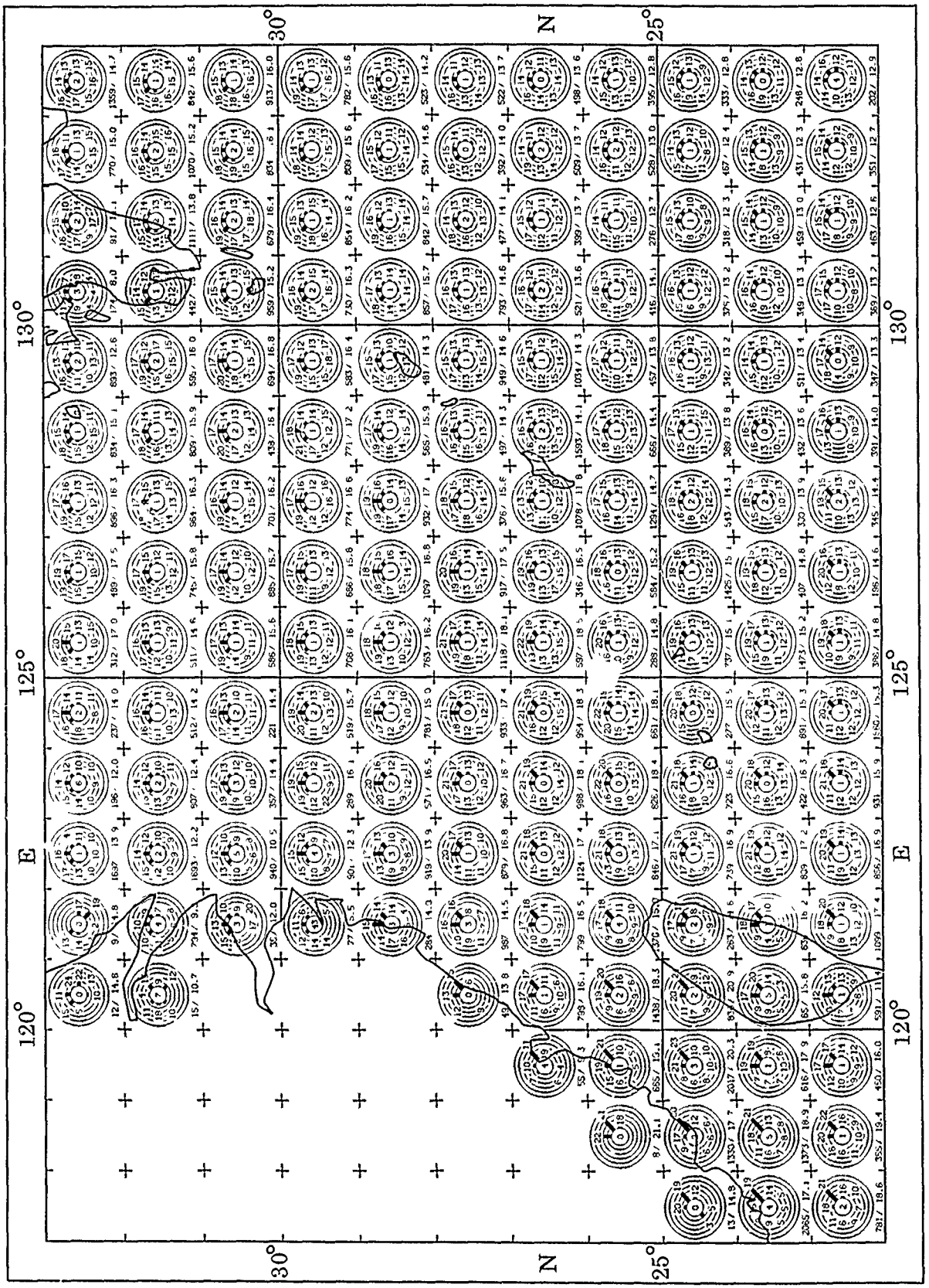


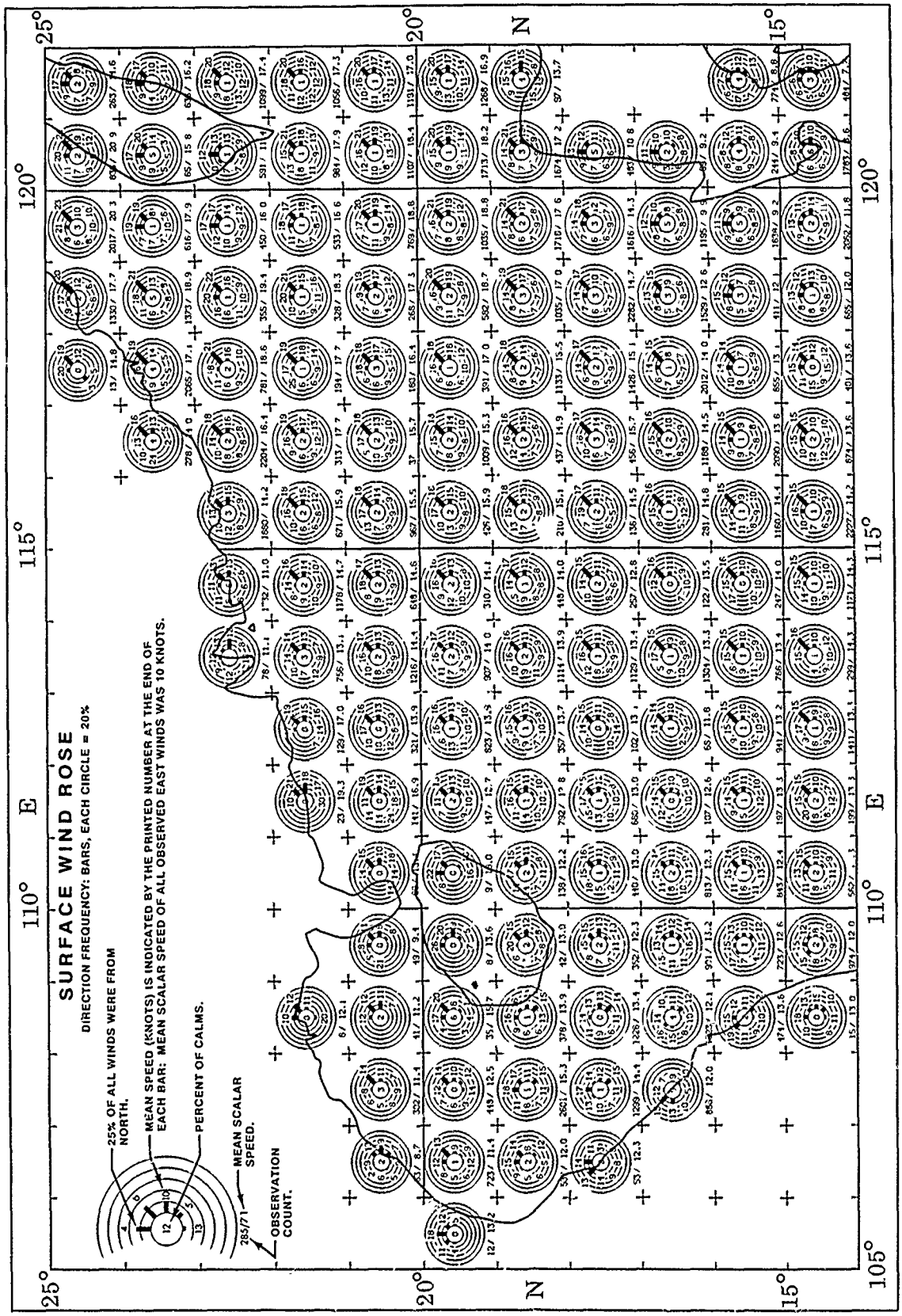
February

Wind Speed 11 - 21 and 22 - 33 Knots



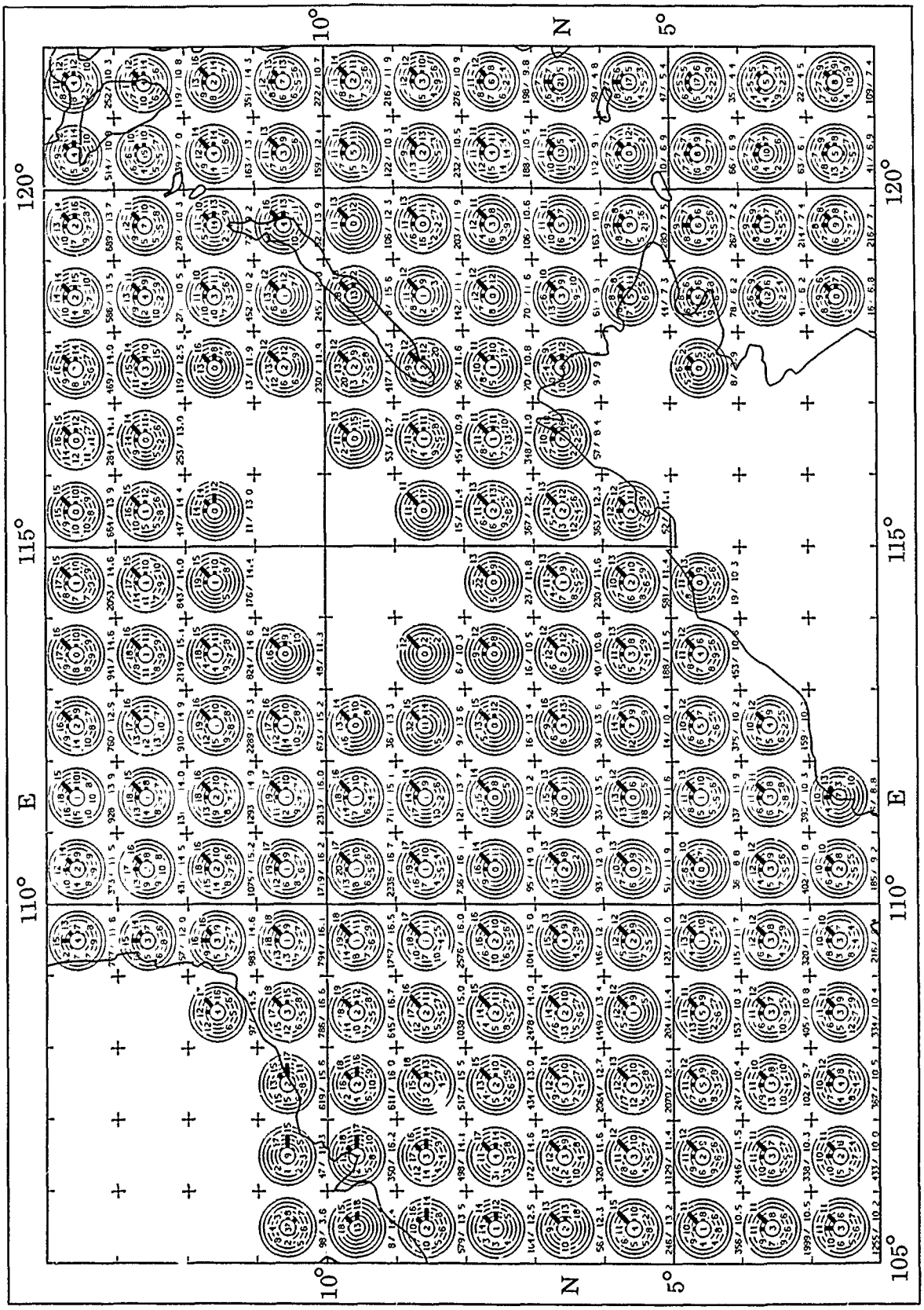

SURF CE WIND ROSE
DIRECTION FR UENCY: BARS, EACH CIRCLE = 20%
25% OF ALL WINDS WERE FROM NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR: MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
PERCENT OF CALMS.
285/7.1
MEAN SCALAR SPEED.
OBSERVATION COUNT.
120° E 125° 130°
40° N 35°

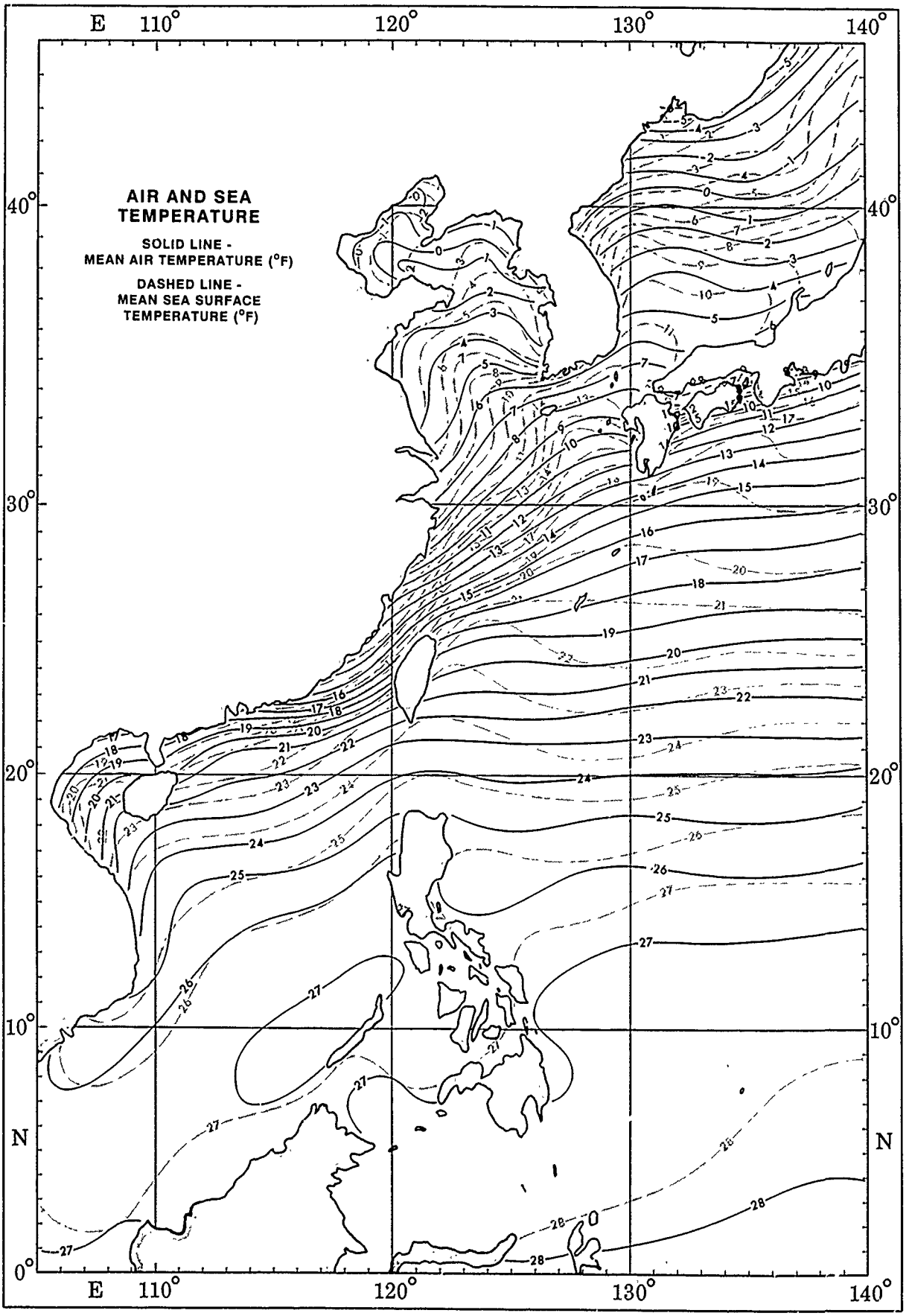

30°
N
25°
120°
E
125°
130°

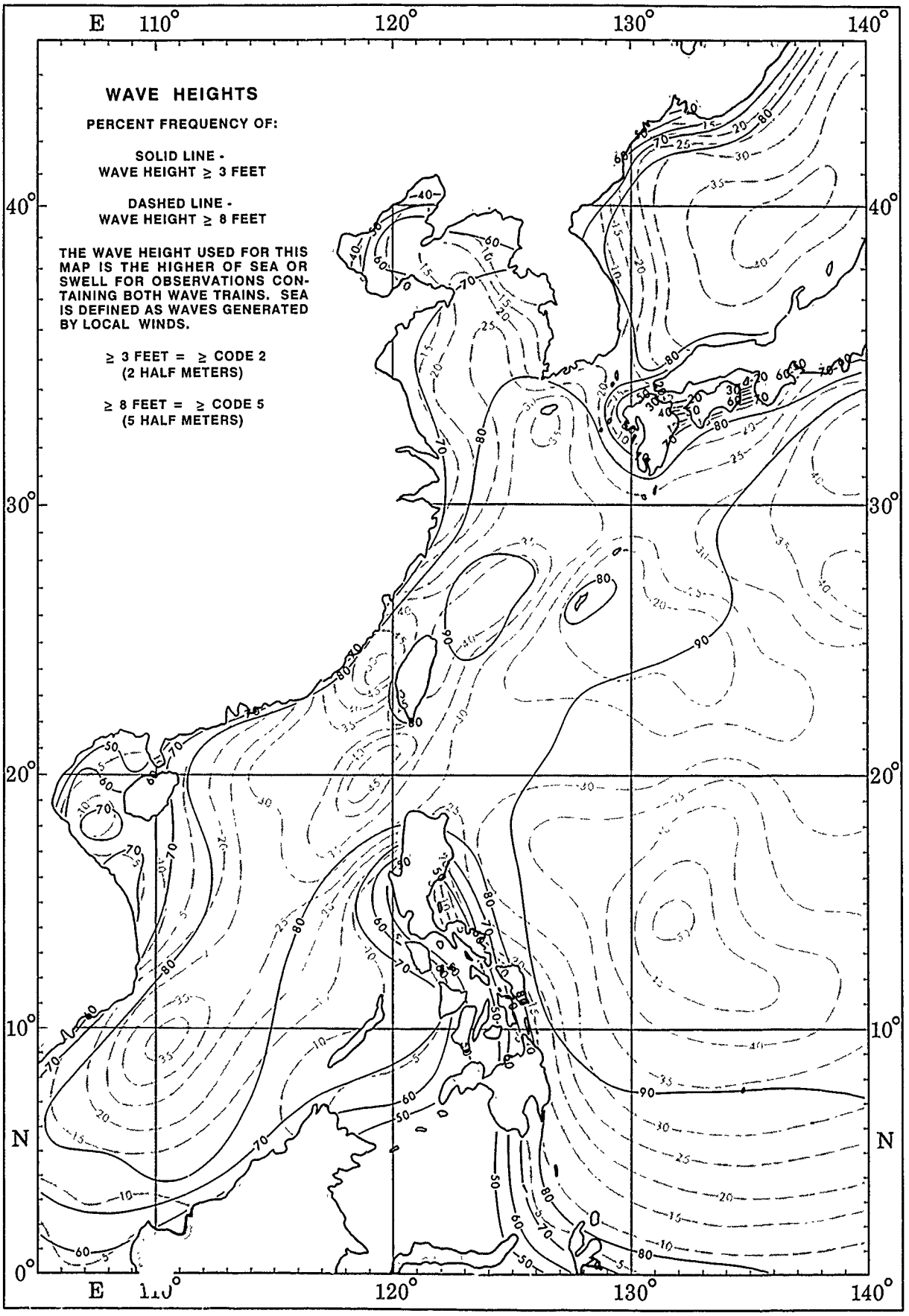

SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR: MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
25% OF ALL WINDS WERE FROM NORTH.
PERCENT OF CALMS.
MEAN SCALAR SPEED.
OBSERVATION COUNT.
285/71
110° E
115°
120°
25°
20°
15°
N

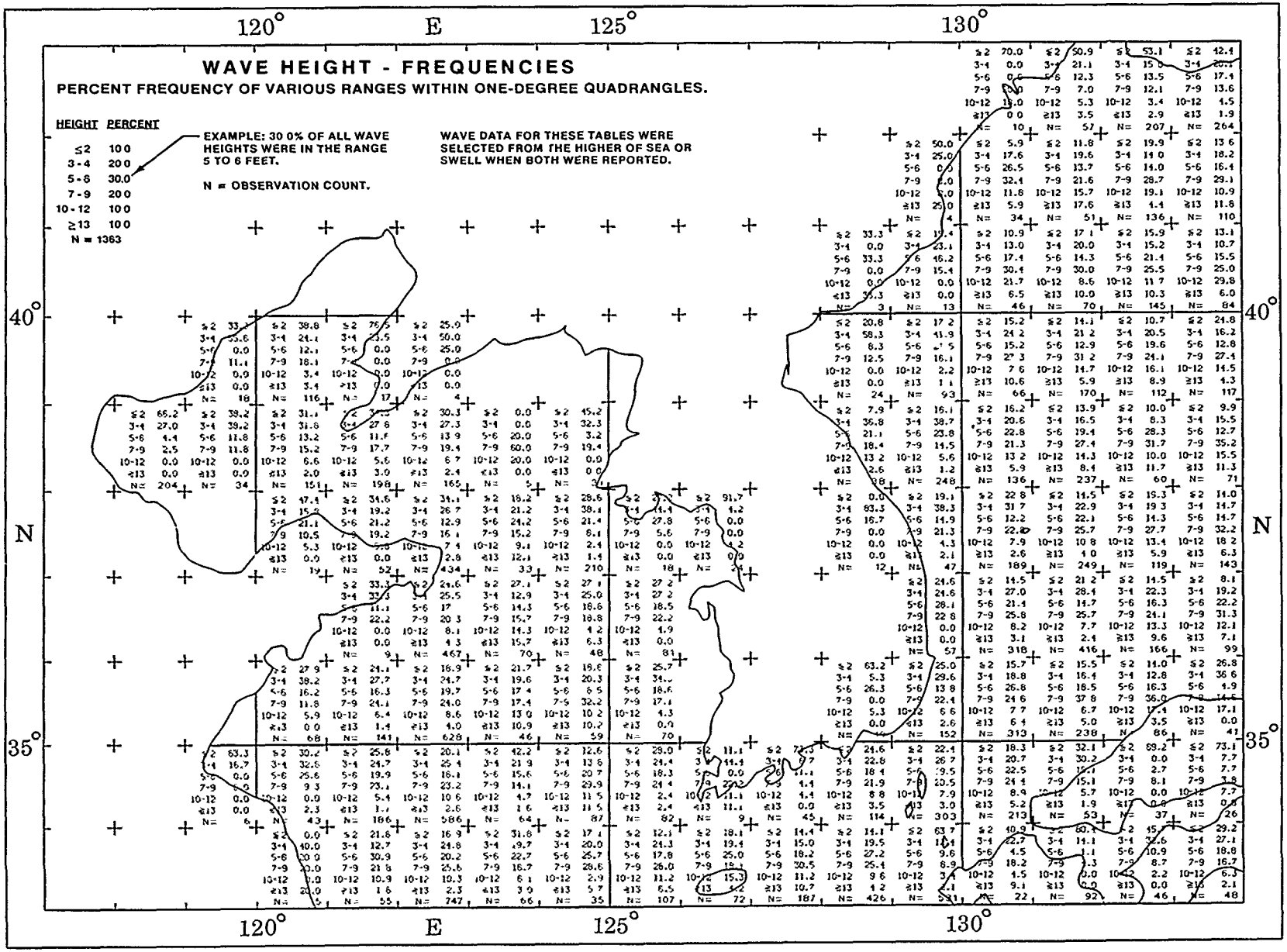
February

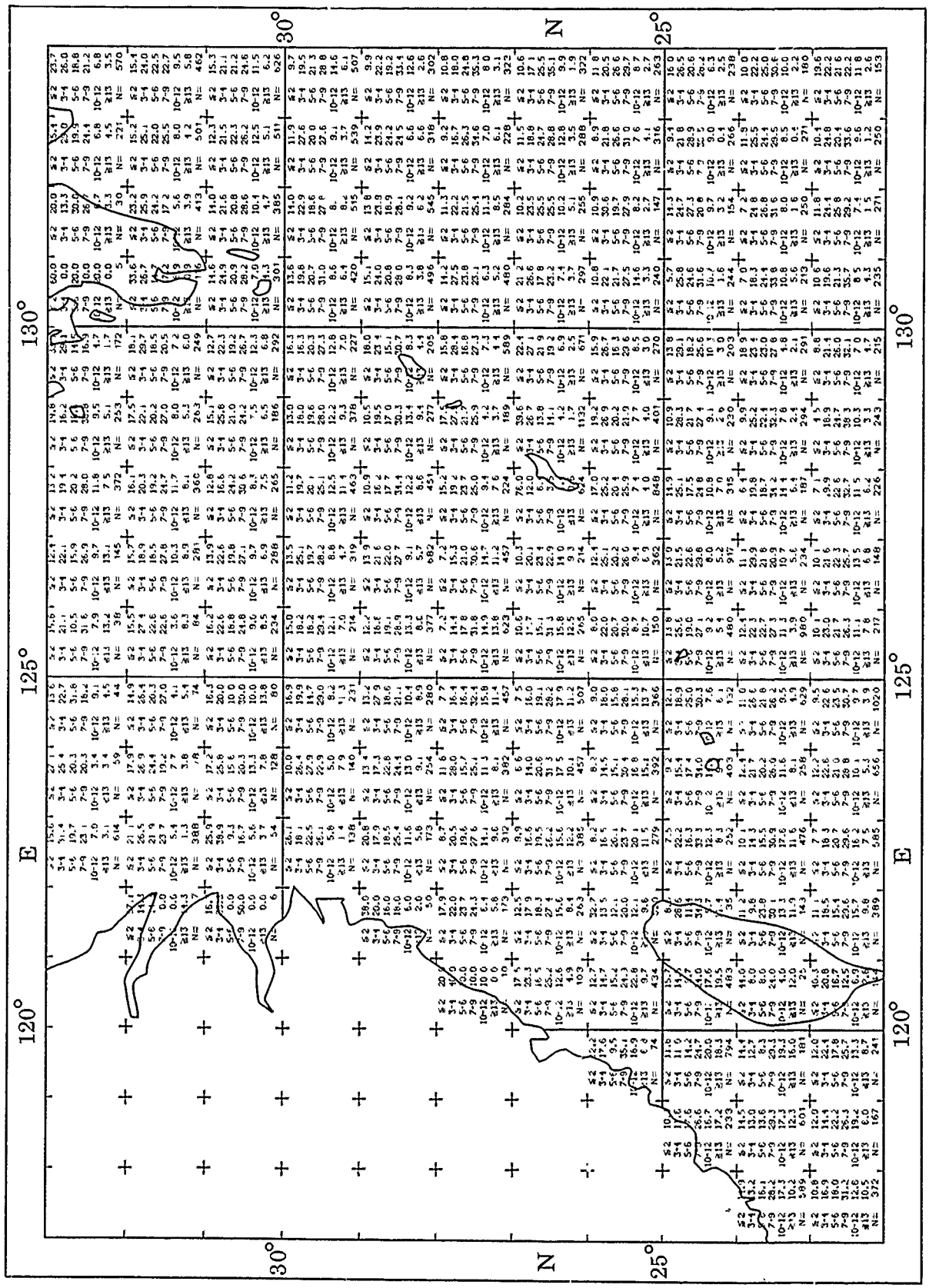
Surface Wind Roses

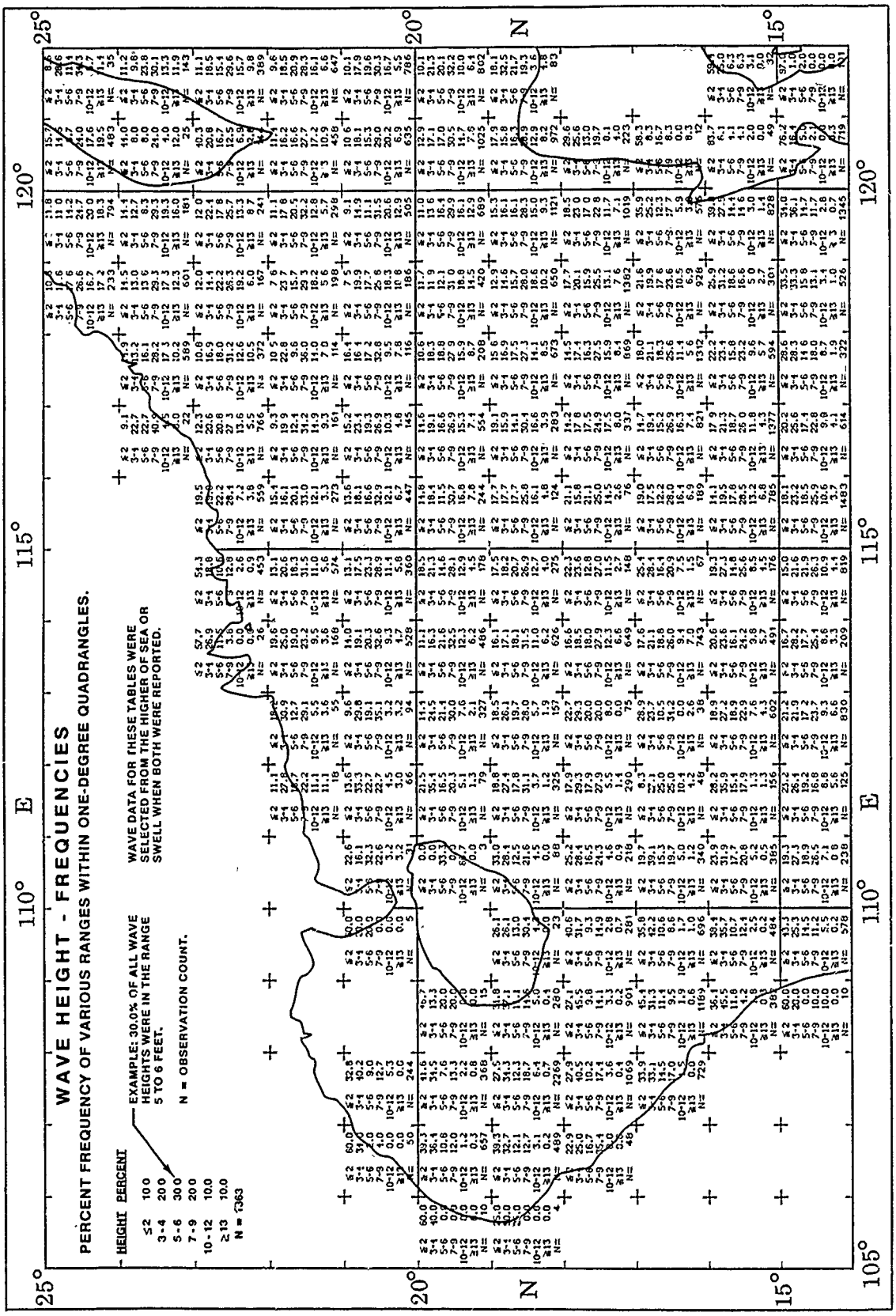



AIR AND SEA TEMPERATURE
SOLID LINE - MEAN AIR TEMPERATURE (°F)
DASHED LINE - MEAN SEA SURFACE TEMPERATURE (°F)
E 110° 120° 130° 140°
40°
30°
20°
10°
N
0°


WAVE HEIGHTS
PERCENT FREQUENCY OF:
SOLID LINE -
WAVE HEIGHT ≥ 3 FEET
DASHED LINE -
WAVE HEIGHT ≥ 8 FEET
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)
E 110°
120°
130°
140°
40°
30°
20°
10°
N
0°

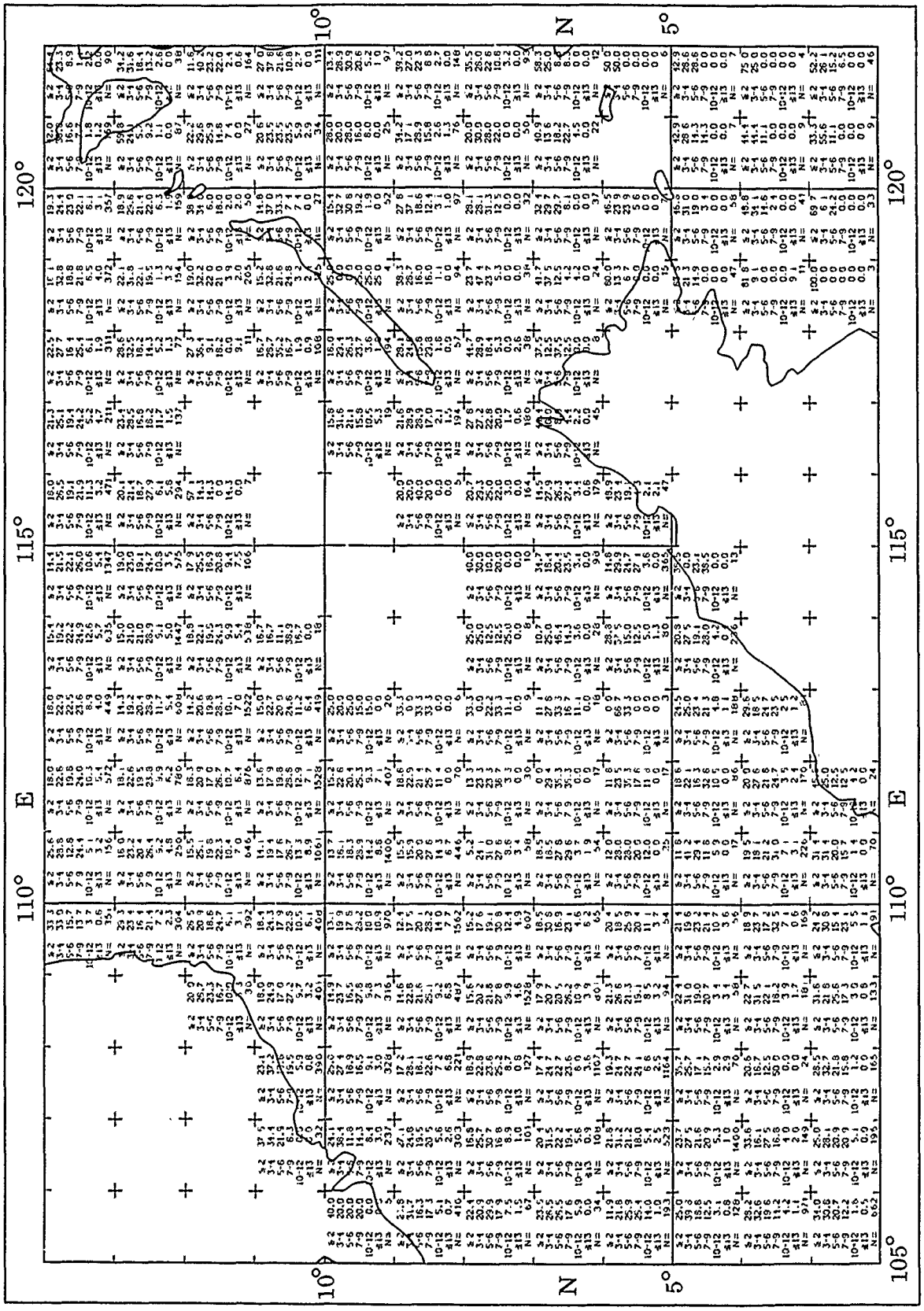

120° E 125° 130°
40°
N
35°
WAVE HEIGHT - FREQUENCIES
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
HEIGHT PERCENT
≤2 10 0
3-4 20 0
5-6 30.0
7-9 20 0
10-12 10 0
≥13 10 0
N = 1363
EXAMPLE: 30 0% OF ALL WAVE HEIGHTS WERE IN THE RANGE 5 TO 6 FEET.
N = OBSERVATION COUNT.
WAVE DATA FOR THESE TABLES WERE SELECTED FROM THE HIGHER OF SEA OR SWELL WHEN BOTH WERE REPORTED.

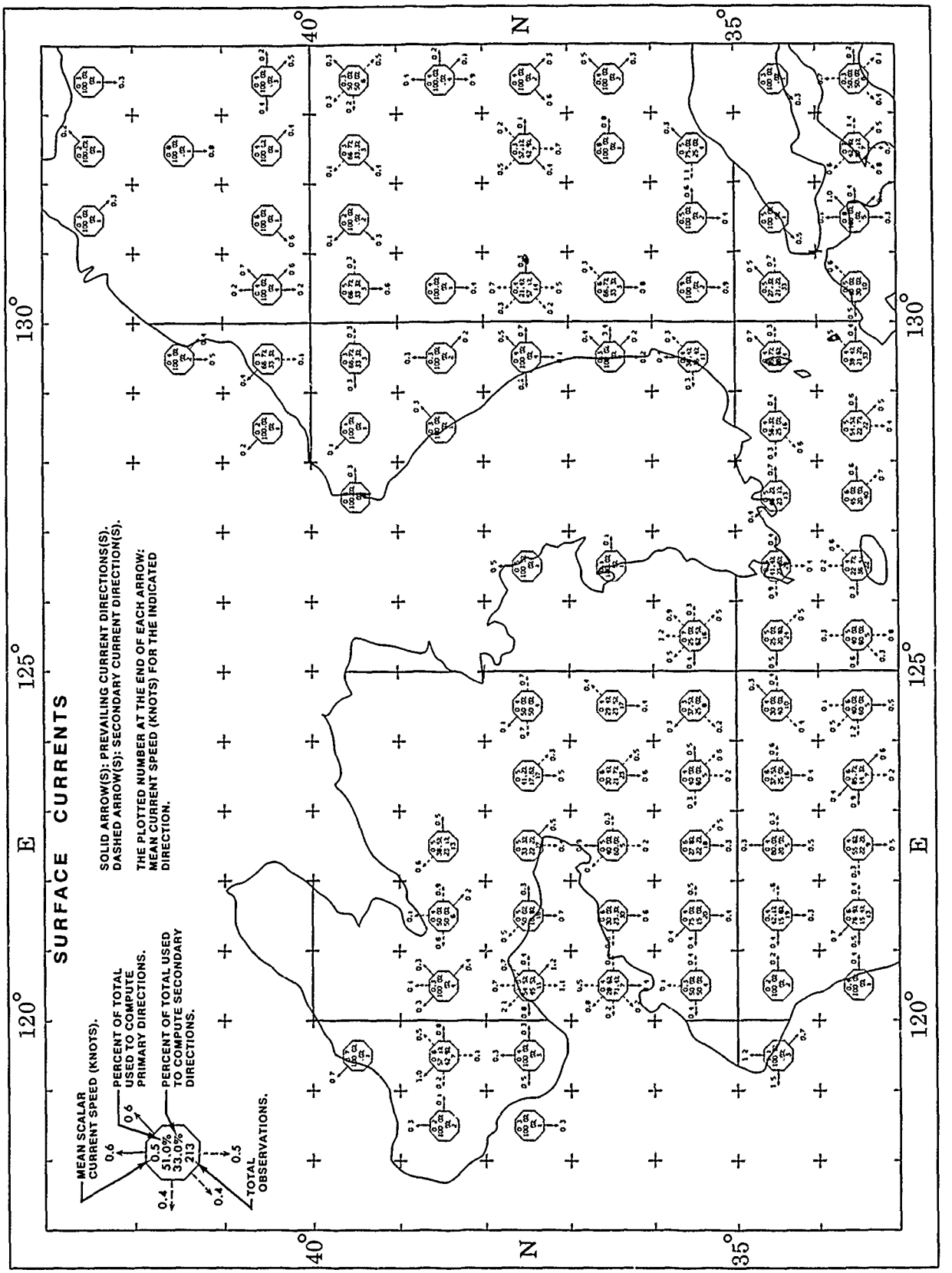

120°
125°
130°
E
30°
25°
N

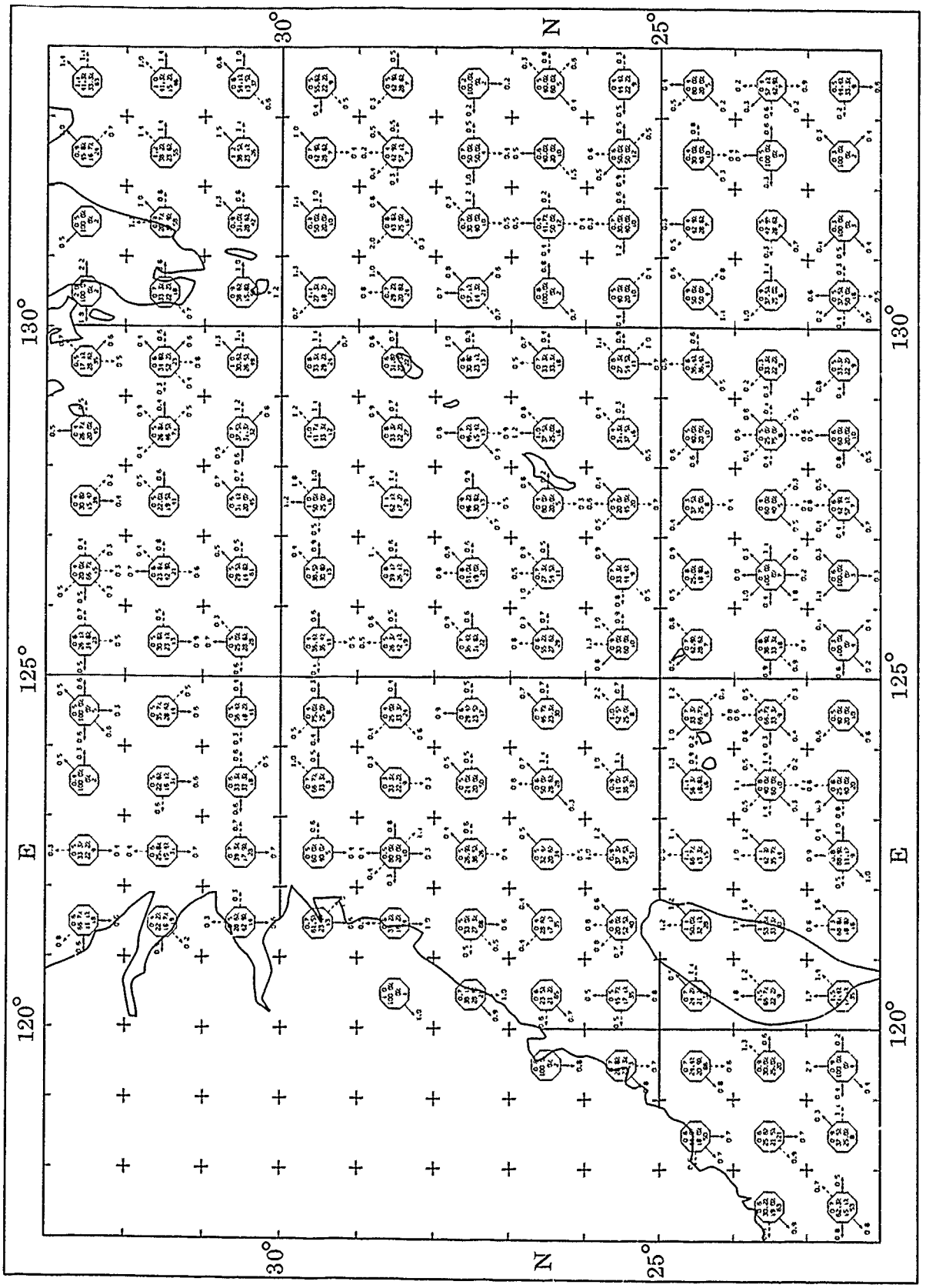

WAVE HEIGHT - FREQUENCIES
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
HEIGHT PERCENT
≤2 100
3-4 20.0
5-6 30.0
7-9 20.0
10-12 10.0
≥13 10.0
N = 1363
EXAMPLE: 30.0% OF ALL WAVE HEIGHTS WERE IN THE RANGE 5 TO 6 FEET.
N = OBSERVATION COUNT.
WAVE DATA FOR THESE TABLES WERE SELECTED FROM THE HIGHER OF SEA OR SWELL WHEN BOTH WERE REPORTED.
25°
20°
15°
N
105°
110°
115°
120°
E

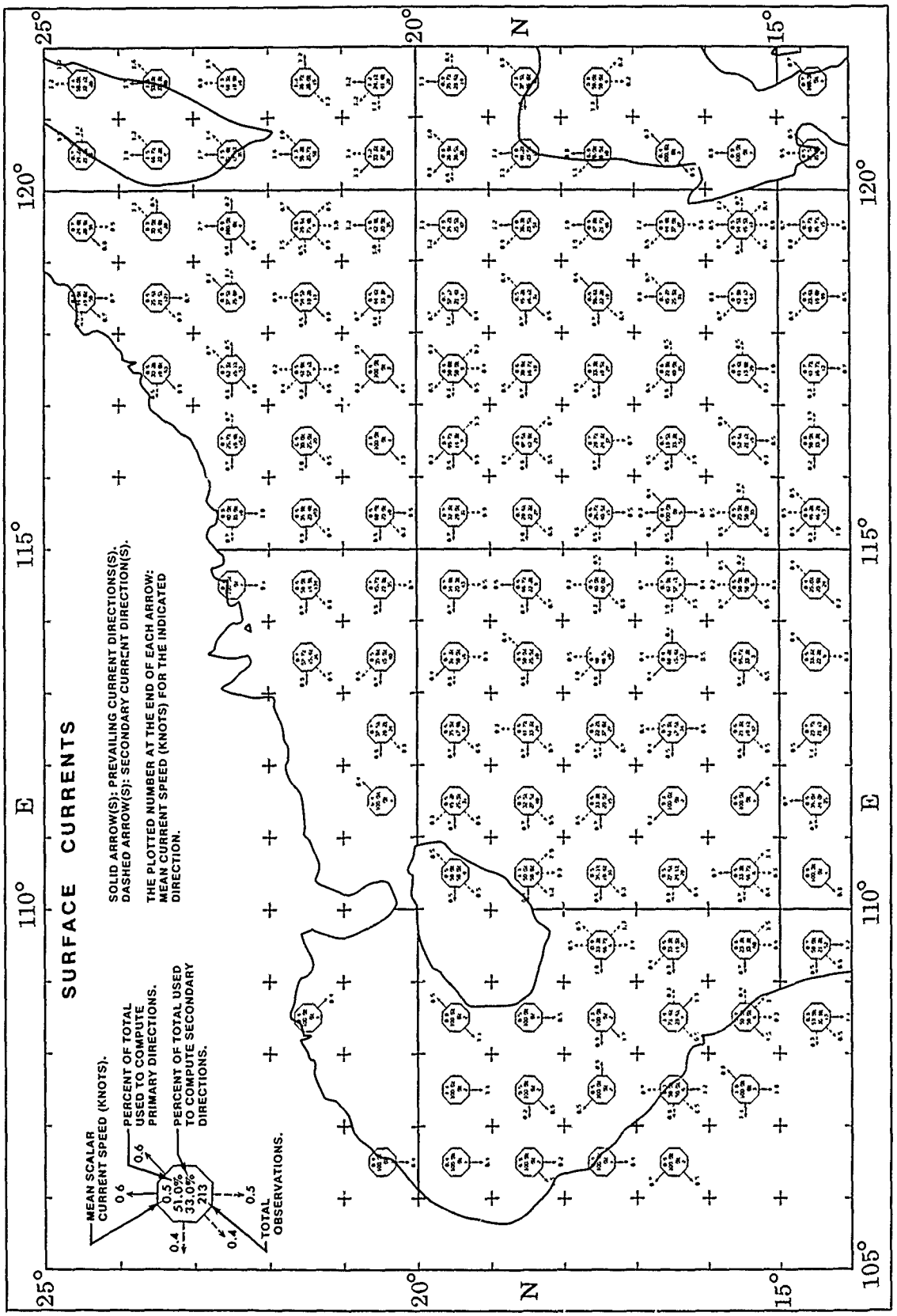
February

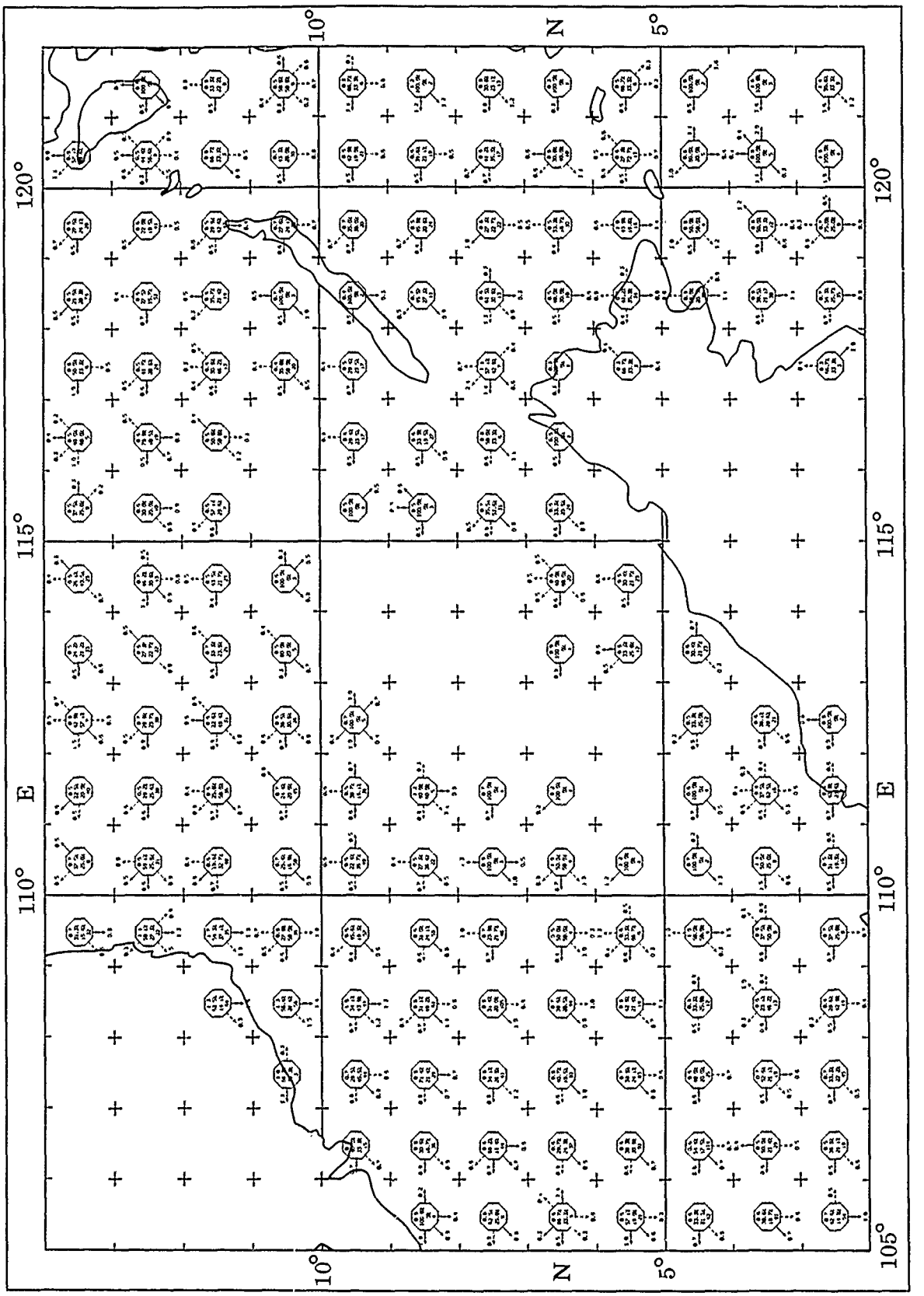
Wave Height

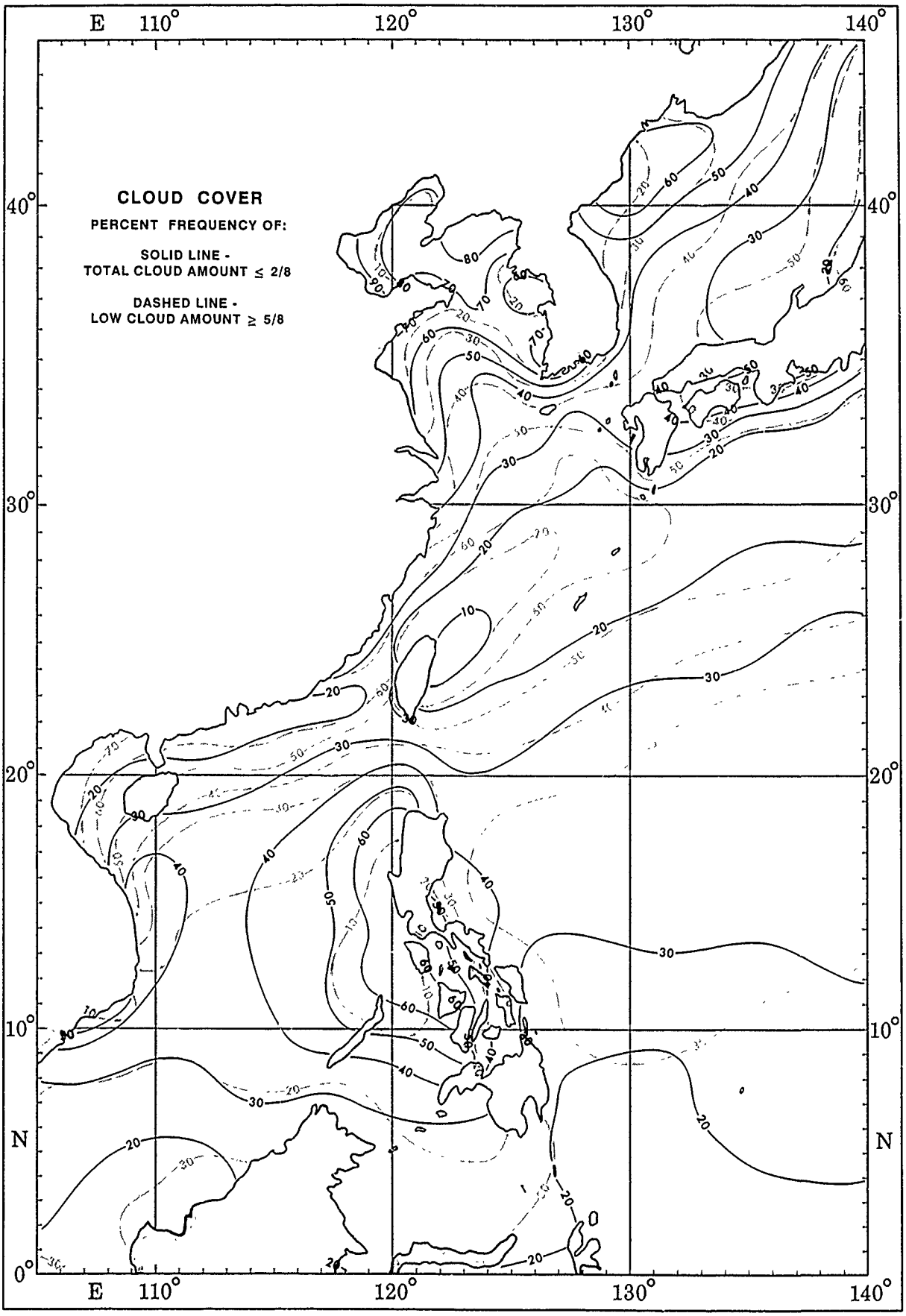


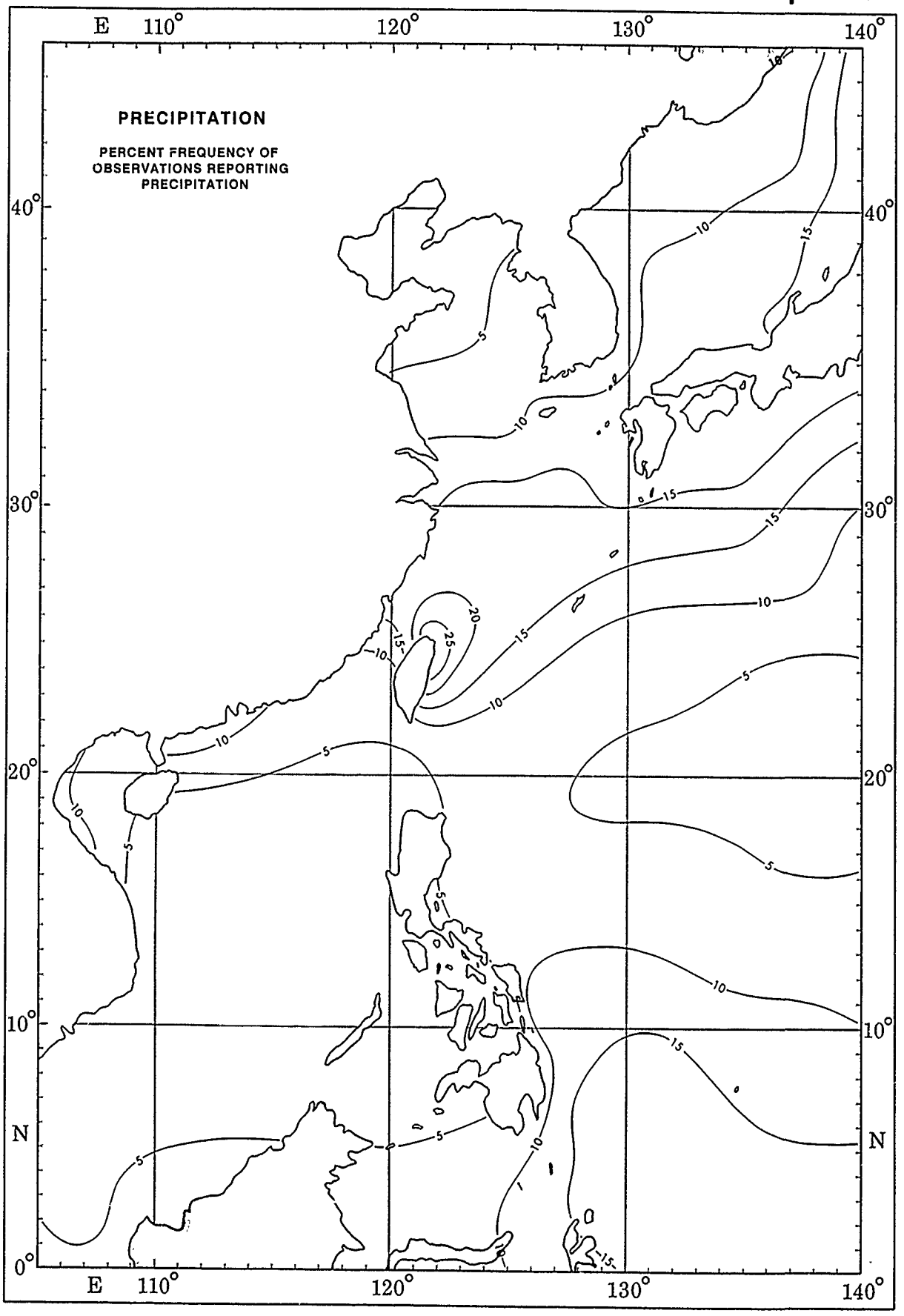

SURFACE CURRENTS
SOLID ARROW(S): PREVAILING CURRENT DIRECTIONS(S).
DASHED ARROW(S): SECONDARY CURRENT DIRECTION(S).
THE PLOTTED NUMBER AT THE END OF EACH ARROW:
MEAN CURRENT SPEED (KNOTS) FOR THE INDICATED DIRECTION.
MEAN SCALAR CURRENT SPEED (KNOTS).
PERCENT OF TOTAL USED TO COMPUTE PRIMARY DIRECTIONS.
PERCENT OF TOTAL USED TO COMPUTE SECONDARY DIRECTIONS.
TOTAL OBSERVATIONS.
0.6
0.5
51.0%
33.0%
213
0.4
0.5
0.4
120°
125°
130°
E
40°
35°
N

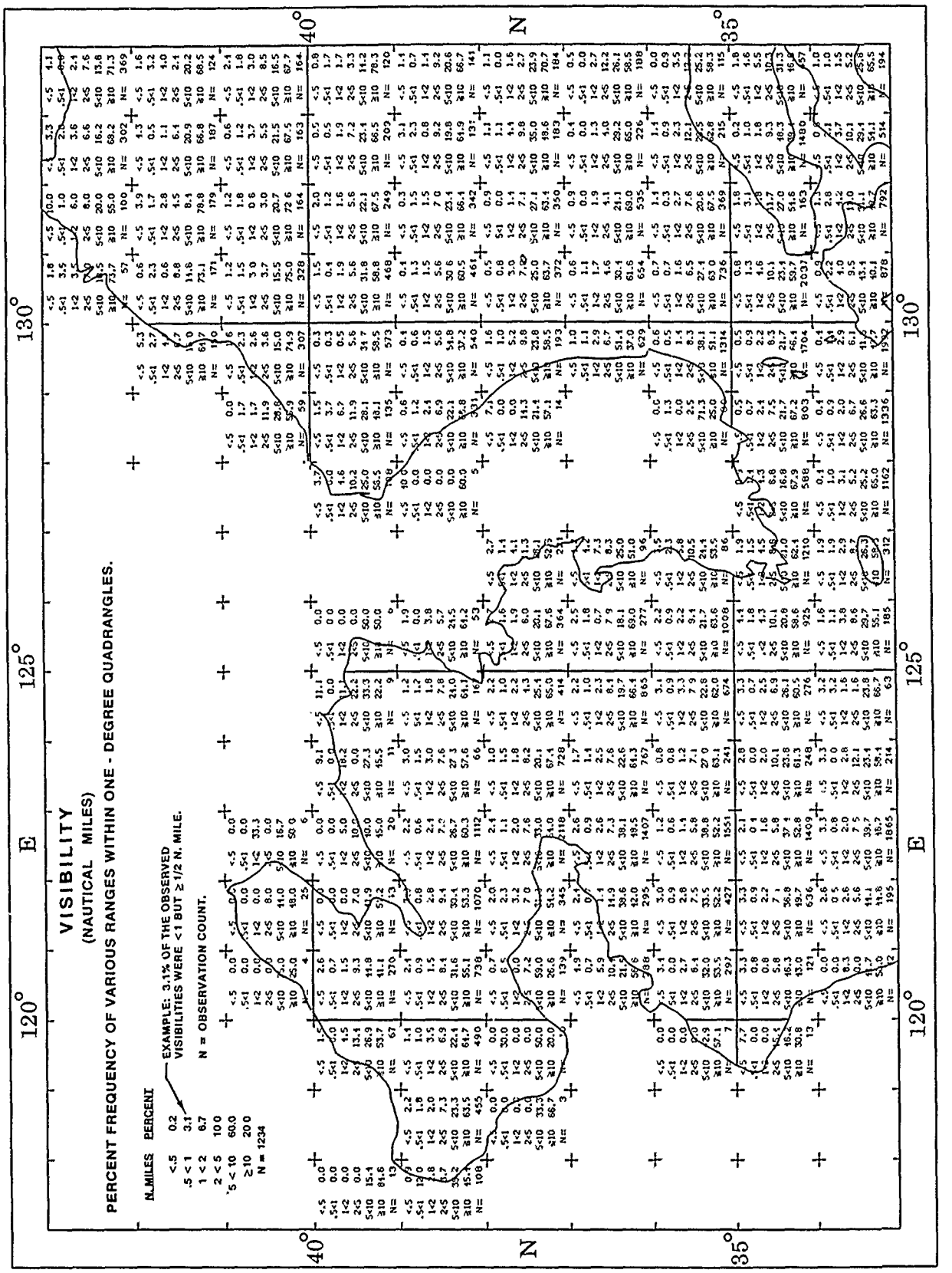

30°
N
25°
120°
E
125°
130°

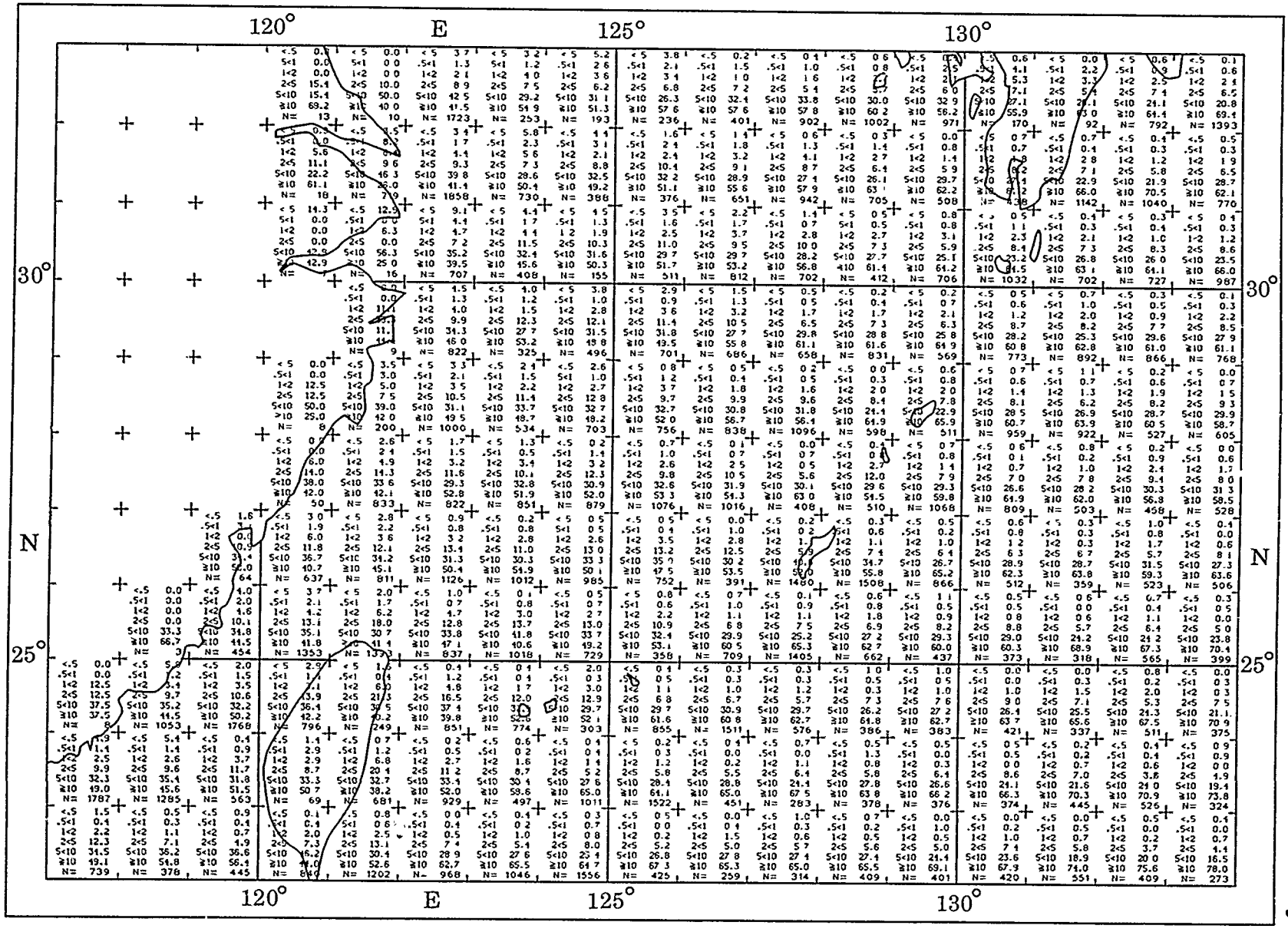

SURFACE CURRENTS
SOLID ARROW(S): PREVAILING CURRENT DIRECTIONS(S).
DASHED ARROW(S): SECONDARY CURRENT DIRECTION(S).
THE PLOTTED NUMBER AT THE END OF EACH ARROW:
MEAN CURRENT SPEED (KNOTS) FOR THE INDICATED
DIRECTION.
MEAN SCALAR CURRENT SPEED (KNOTS).
PERCENT OF TOTAL USED TO COMPUTE PRIMARY DIRECTIONS.
PERCENT OF TOTAL USED TO COMPUTE SECONDARY DIRECTIONS.
TOTAL OBSERVATIONS.
0.6
0.5
51.0%
33.0%
213
0.4
0.5
25°
20°
15°
N
110°
115°
120°
105°
E

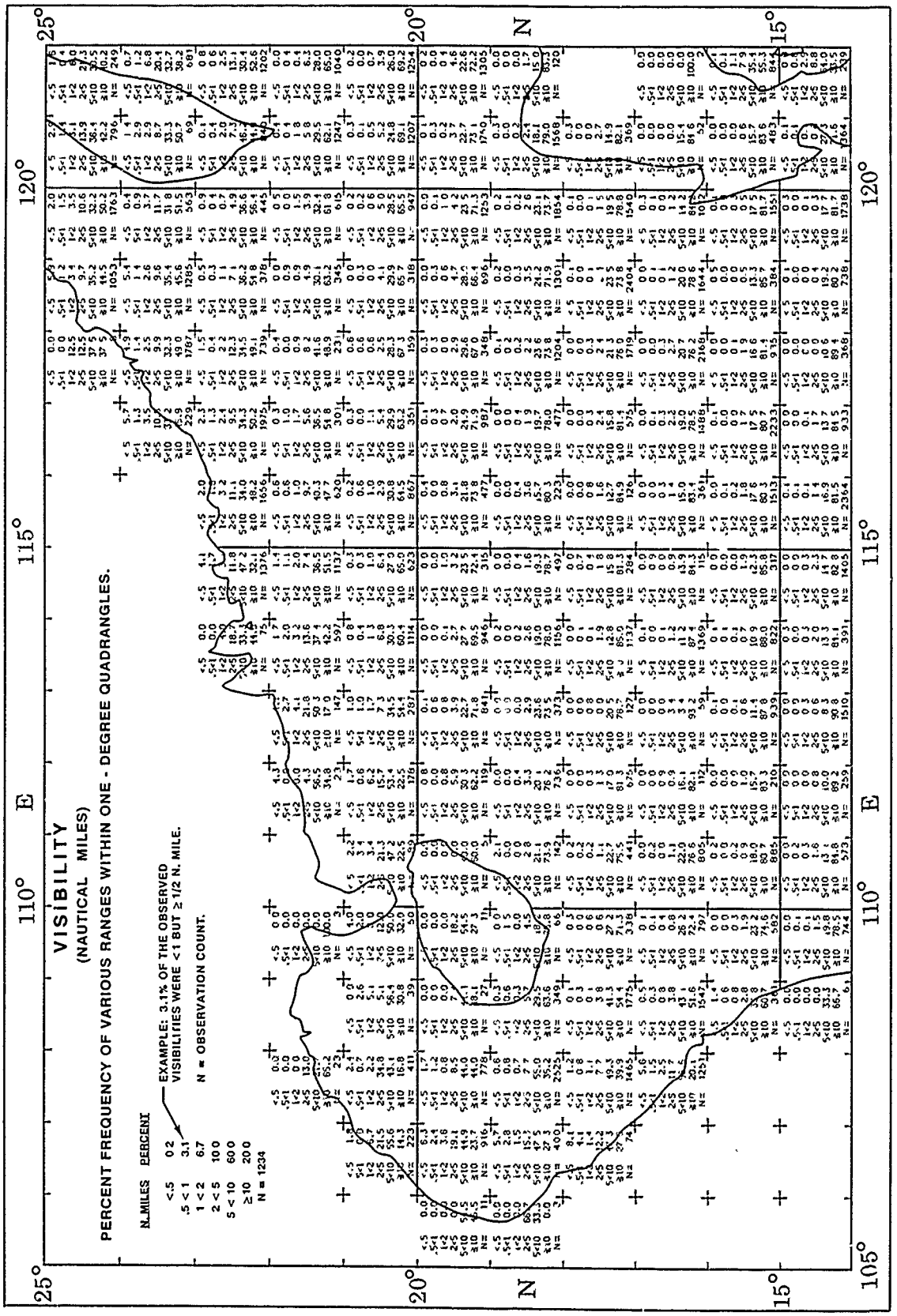

10°
N
5°
120°
115°
110°
E
105°

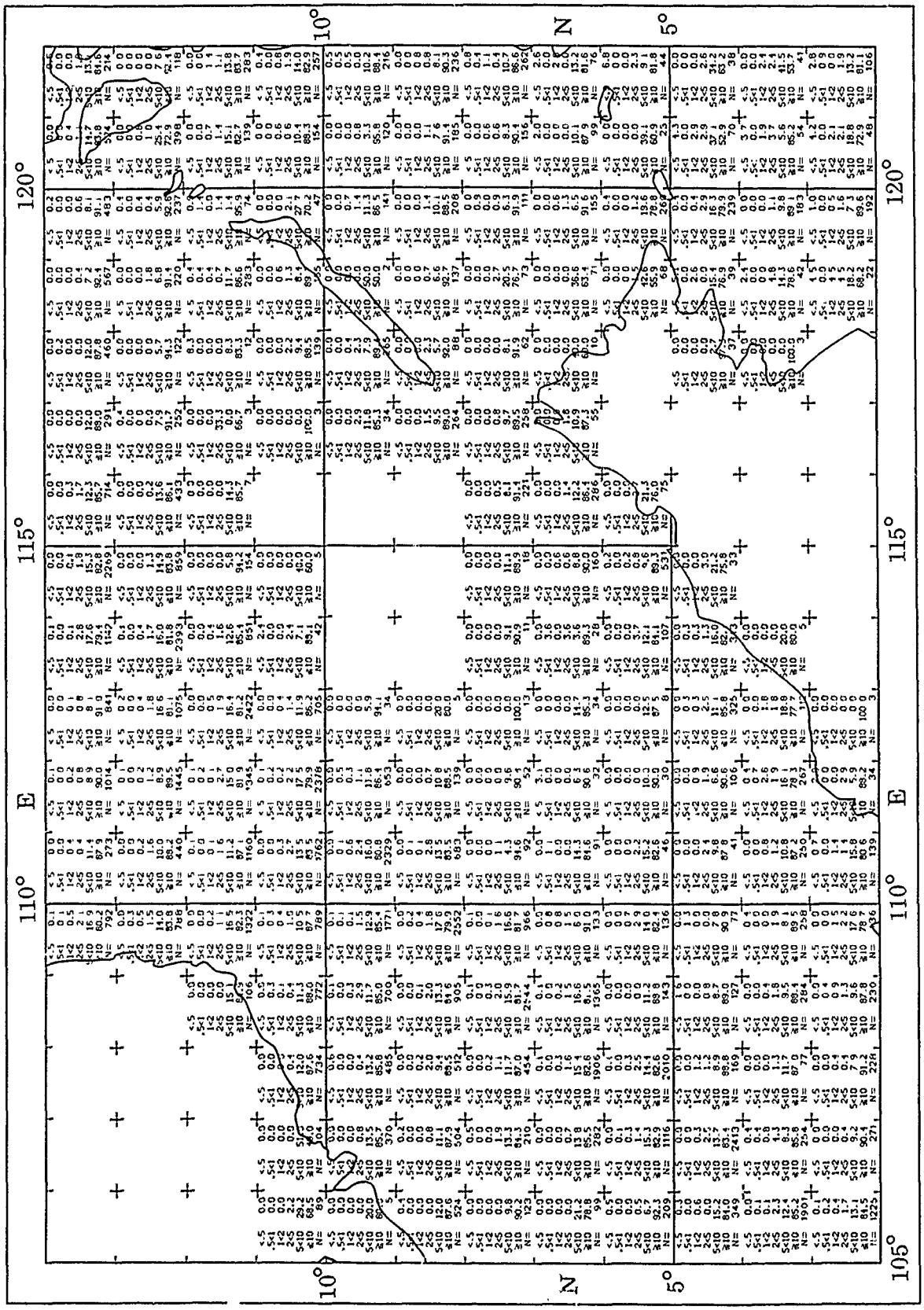

CLOUD COVER
PERCENT FREQUENCY OF:
SOLID LINE -
TOTAL CLOUD AMOUNT ≤ 2/8
DASHED LINE -
LOW CLOUD AMOUNT ≥ 5/8
E 110°
120°
130°
140°
40°
30°
20°
10°
N
0°


PRECIPITATION
PERCENT FREQUENCY OF OBSERVATIONS REPORTING PRECIPITATION
E 110°
120°
130°
140°
40°
30°
20°
10°
N
0°
5
10
15
20
25


VISIBILITY
(NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE - DEGREE QUADRANGLES.
N. MILES PERCENT
<.5 0.2
.5 < 1 3.1
1 < 2 6.7
2 < 5 10.0
5 < 10 60.0
≥10 20.0
N = 1234
EXAMPLE: 3.1% OF THE OBSERVED VISIBILITIES WERE <1 BUT ≥ 1/2 N. MILE.
N = OBSERVATION COUNT.
120°
125°
130°
40°
35°
N
E

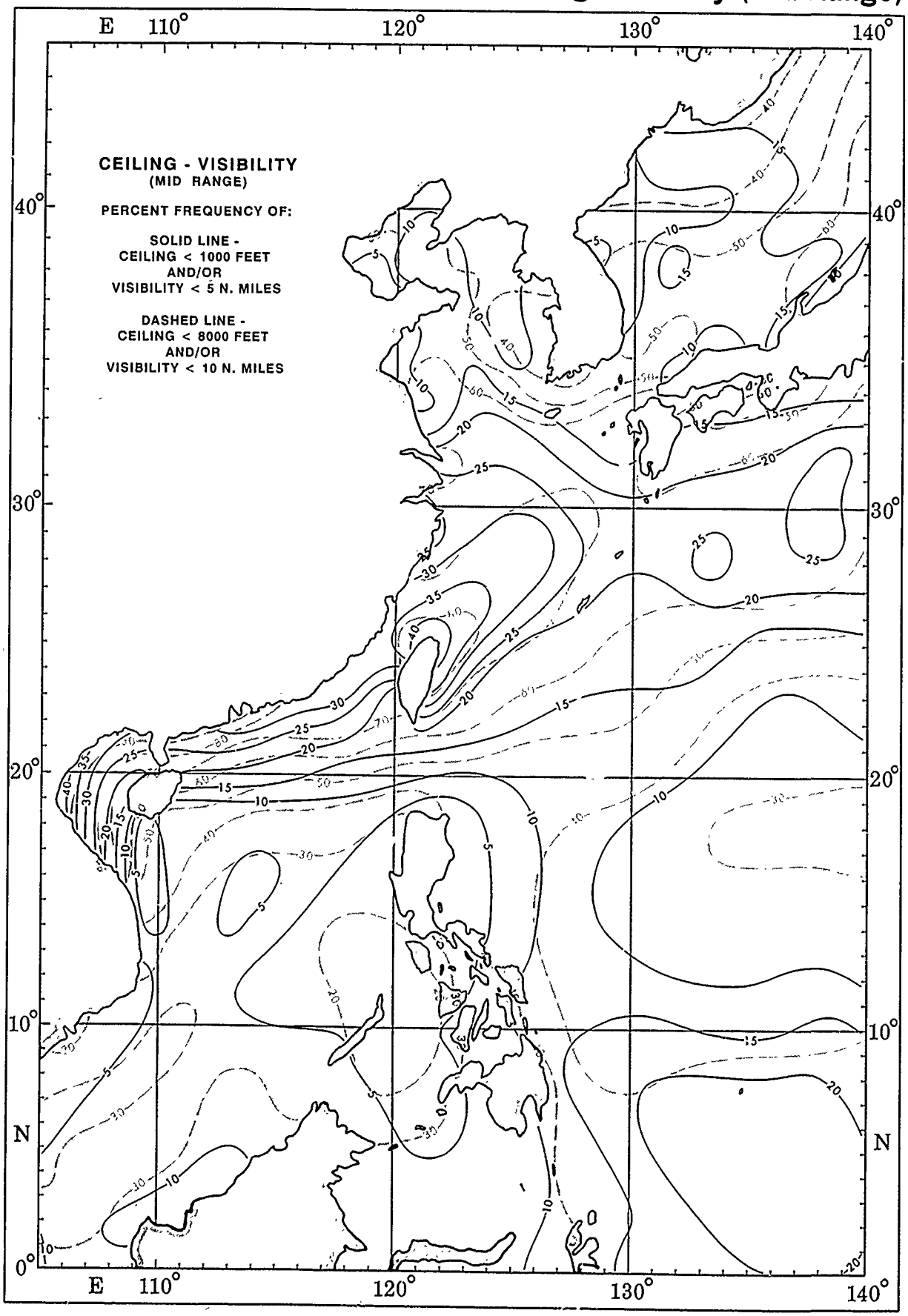

120°
E
125°
130°
30°
N
25°


VISIBILITY
(NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE - DEGREE QUADRANGLES.
N. MILES PERCENT
<.5 0.2
.5 < 1 3.1
1 < 2 6.7
2 < 5 10.0
5 < 10 60.0
≥10 20.0
N = 1234
EXAMPLE: 3.1% OF THE OBSERVED VISIBILITIES WERE <1 BUT ≥ 1/2 N. MILE.
N = OBSERVATION COUNT.
110° E
115° E
120° E
105° E
25° N
20° N
15° N


120°
115°
110°
105°
10°
5°
N
E

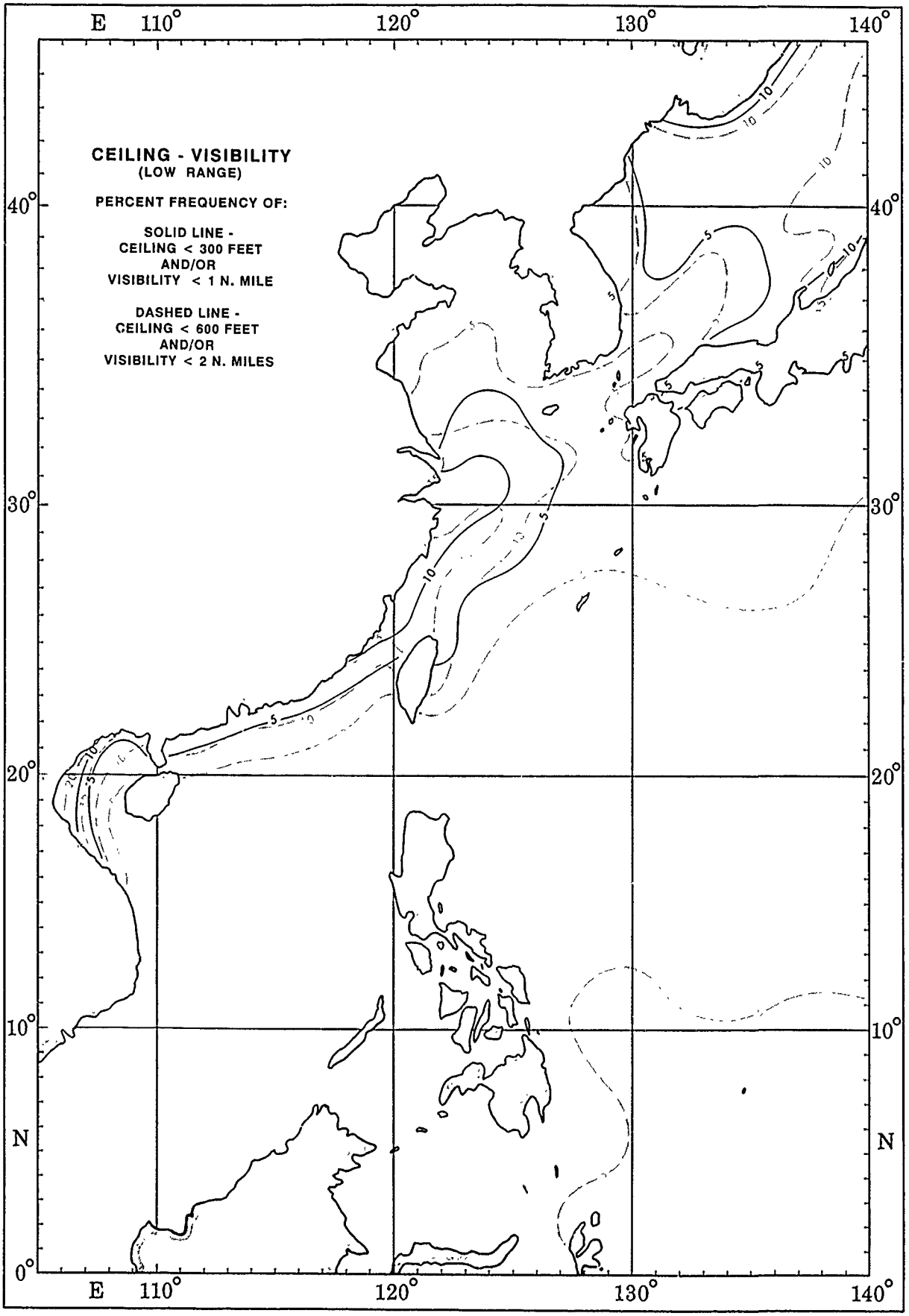
March

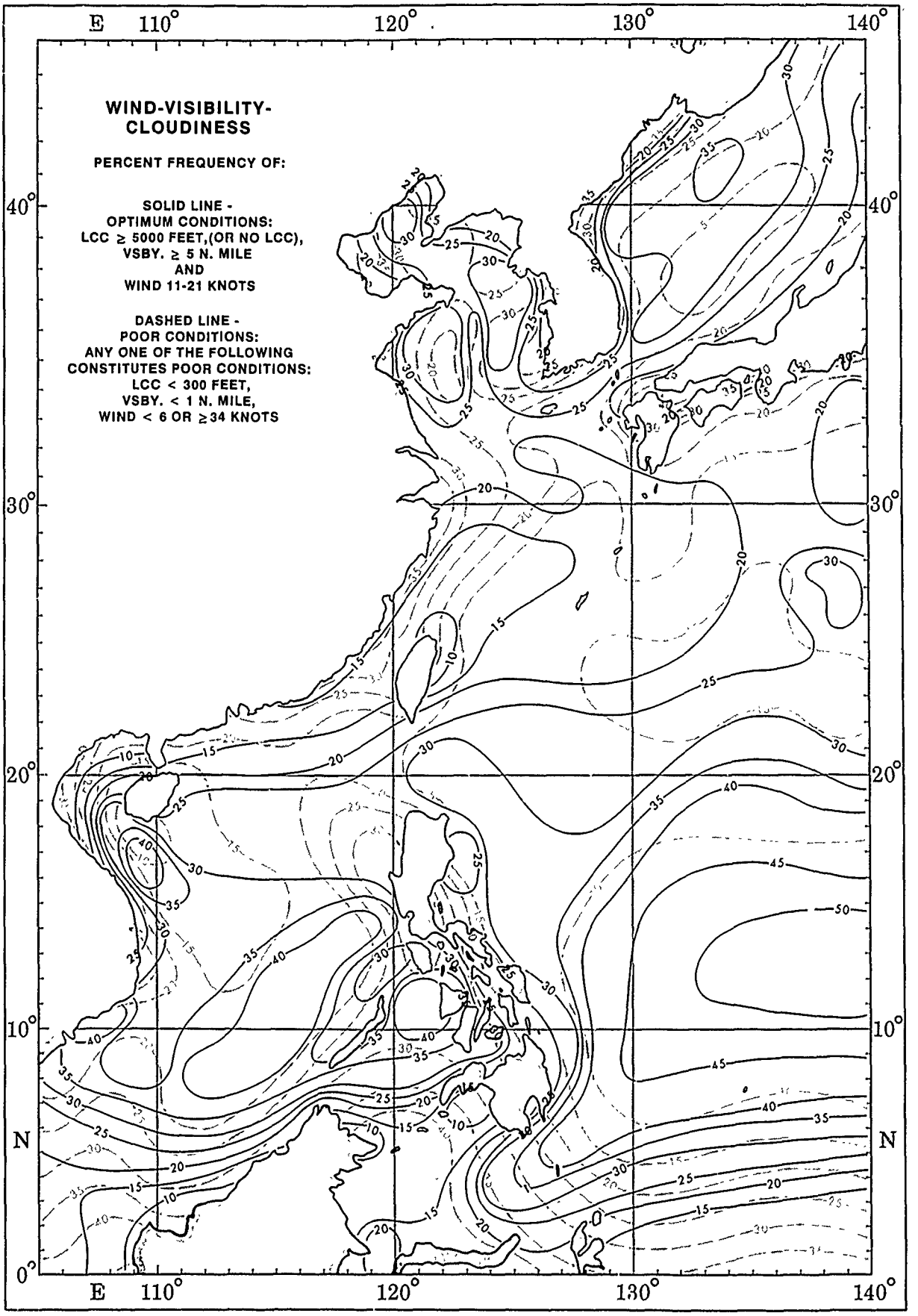
Ceiling - Visibility (Mid Range)



March

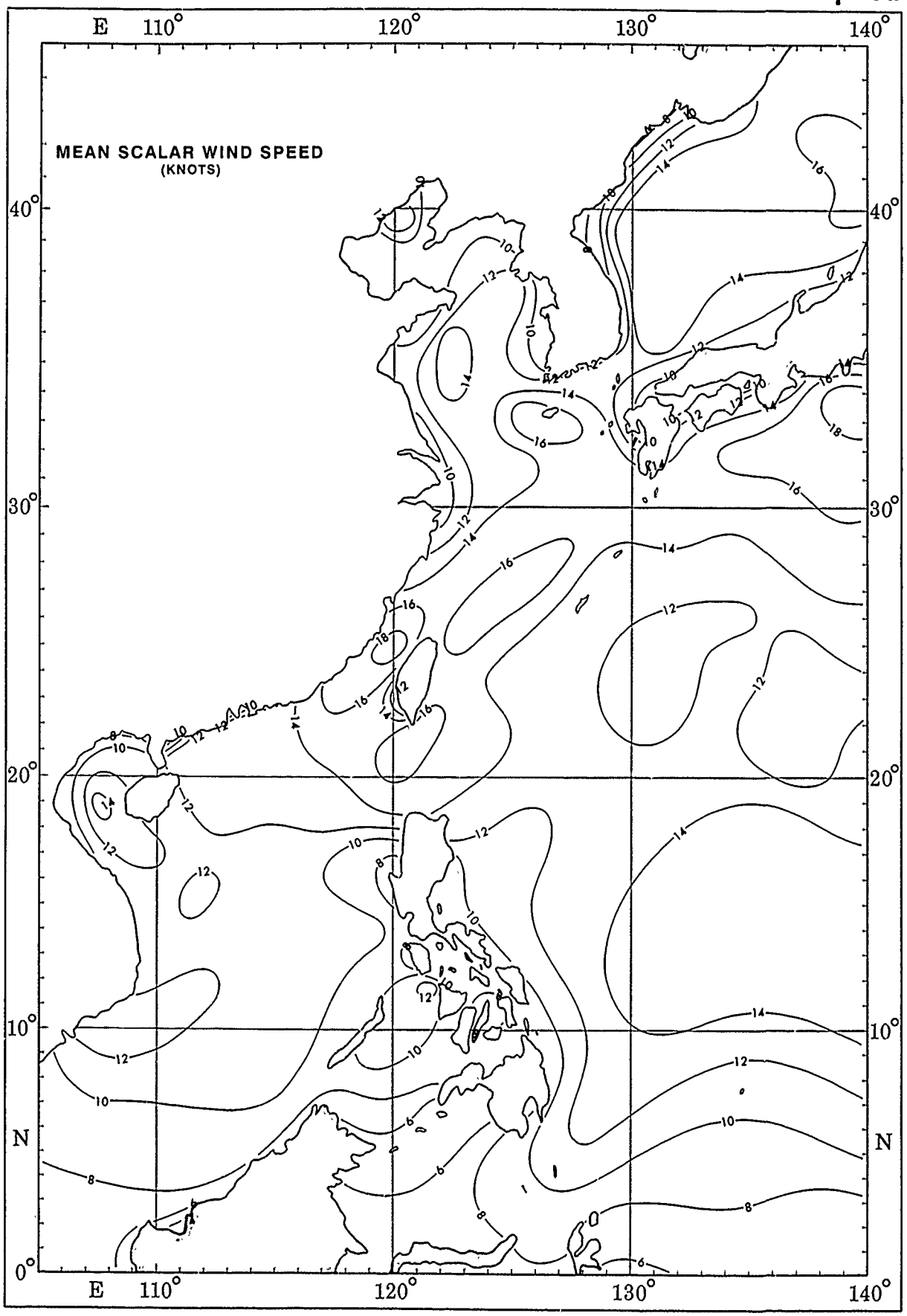
Ceiling - Visibility (Low Range)




WIND-VISIBILITY-
CLOUDINESS
PERCENT FREQUENCY OF:
SOLID LINE -
OPTIMUM CONDITIONS:
LCC ≥ 5000 FEET,(OR NO LCC),
VSBY. ≥ 5 N. MILE
AND
WIND 11-21 KNOTS
DASHED LINE -
POOR CONDITIONS:
ANY ONE OF THE FOLLOWING
CONSTITUTES POOR CONDITIONS:
LCC < 300 FEET,
VSBY. < 1 N. MILE,
WIND < 6 OR ≥34 KNOTS
E 110° 120° 130° 140°
40°
30°
20°
10°
N
0°

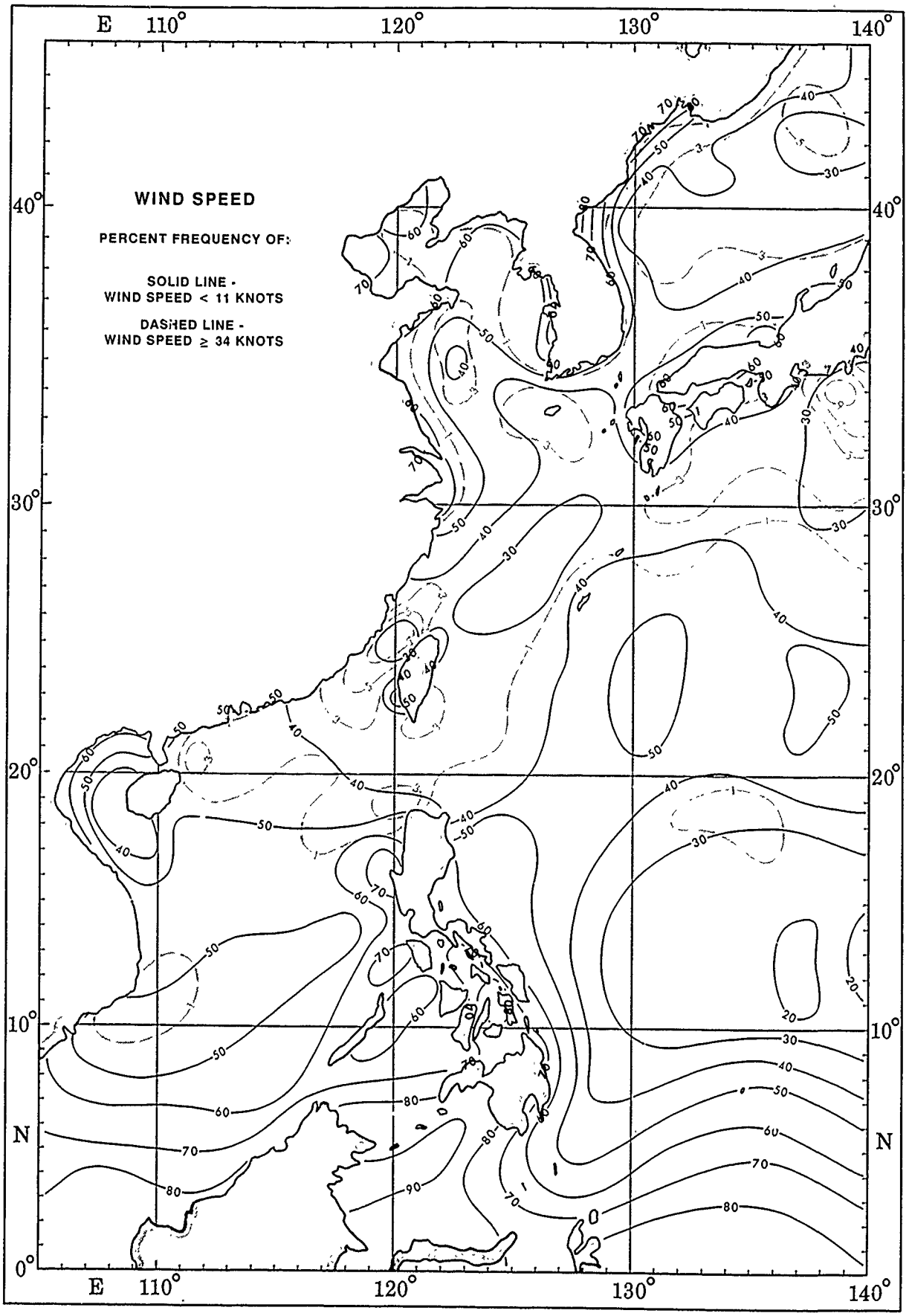
March

Mean Scalar Wind Speed



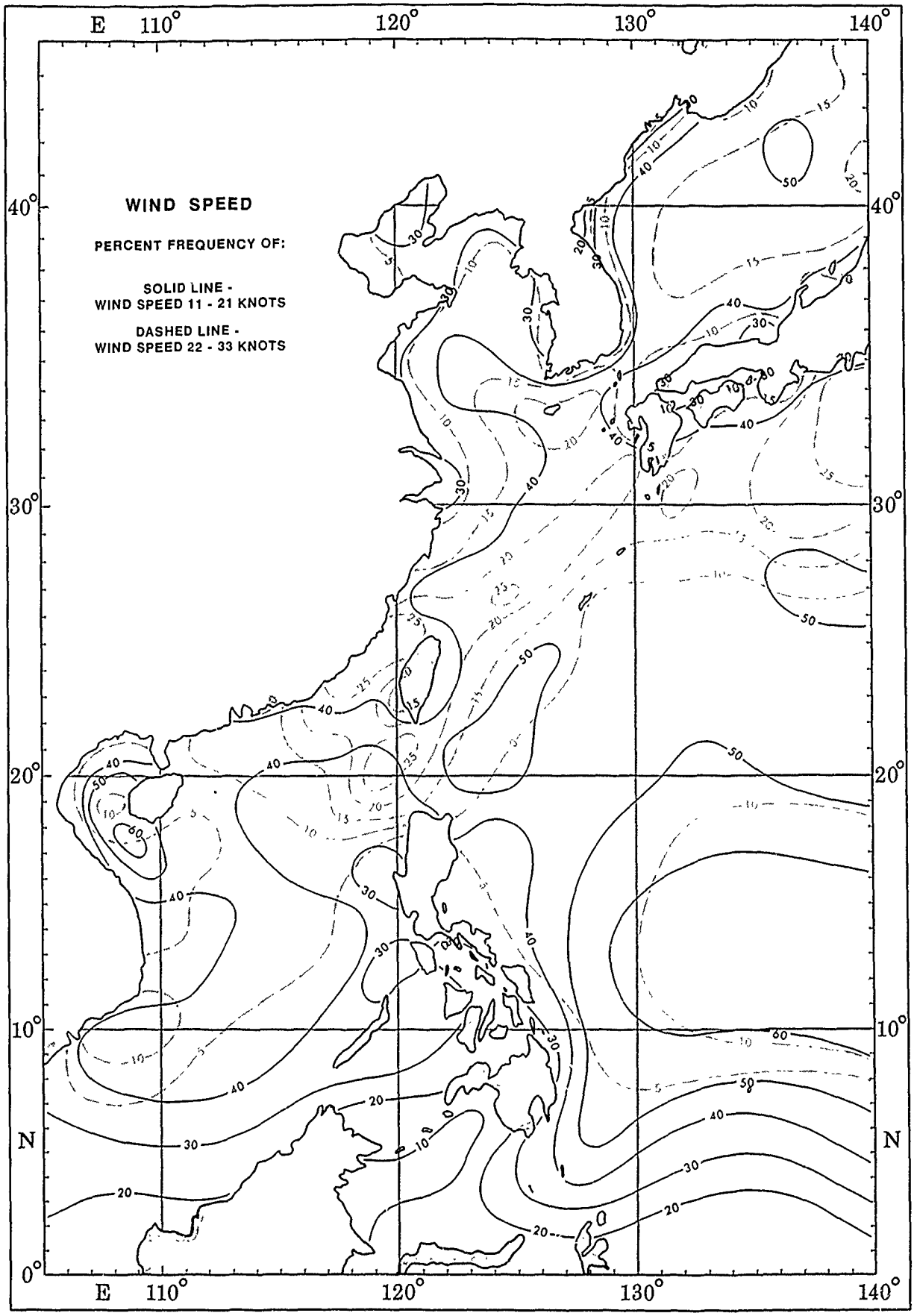
March

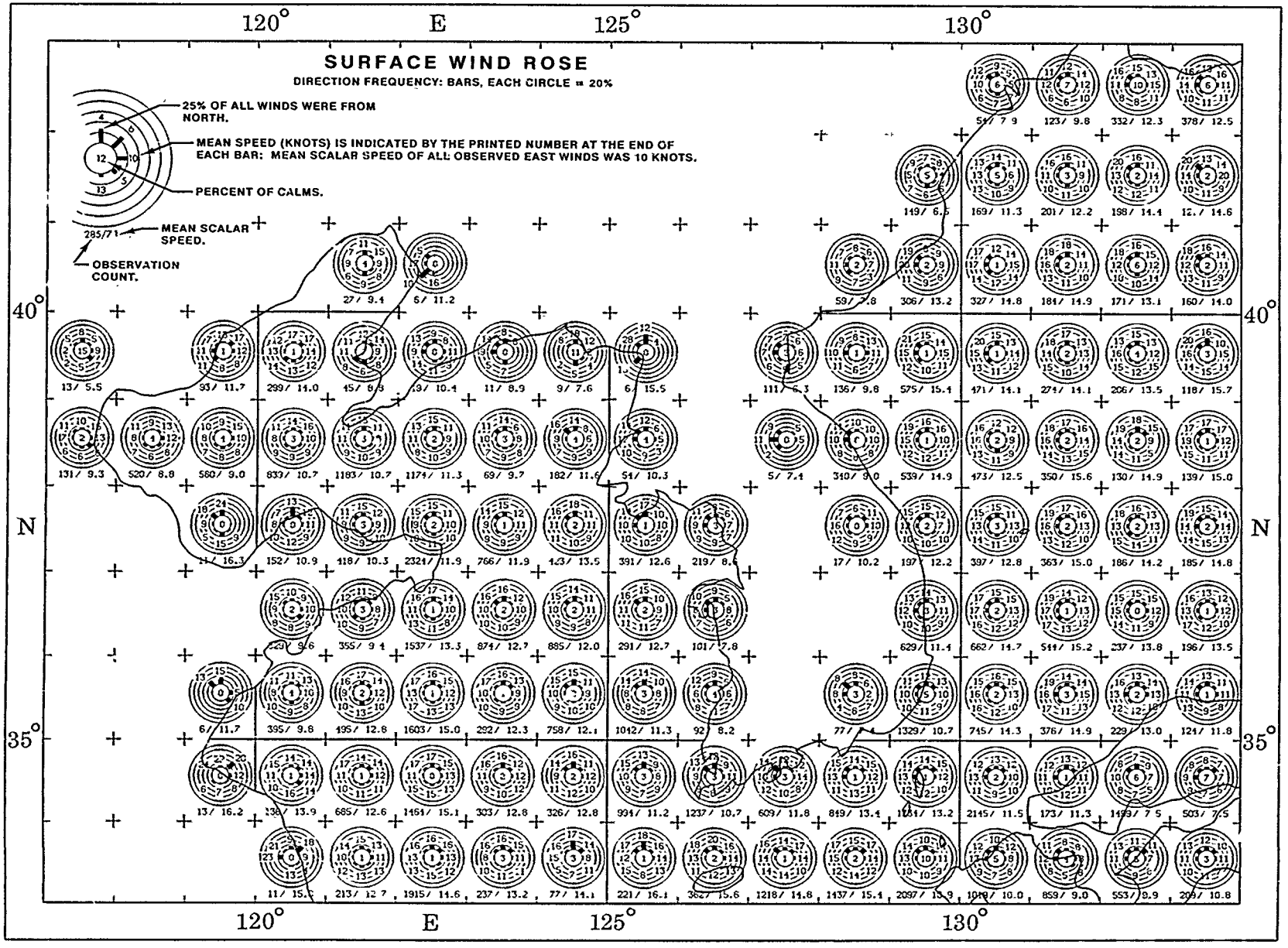
Wind Speed <11 and ≥34 Knots



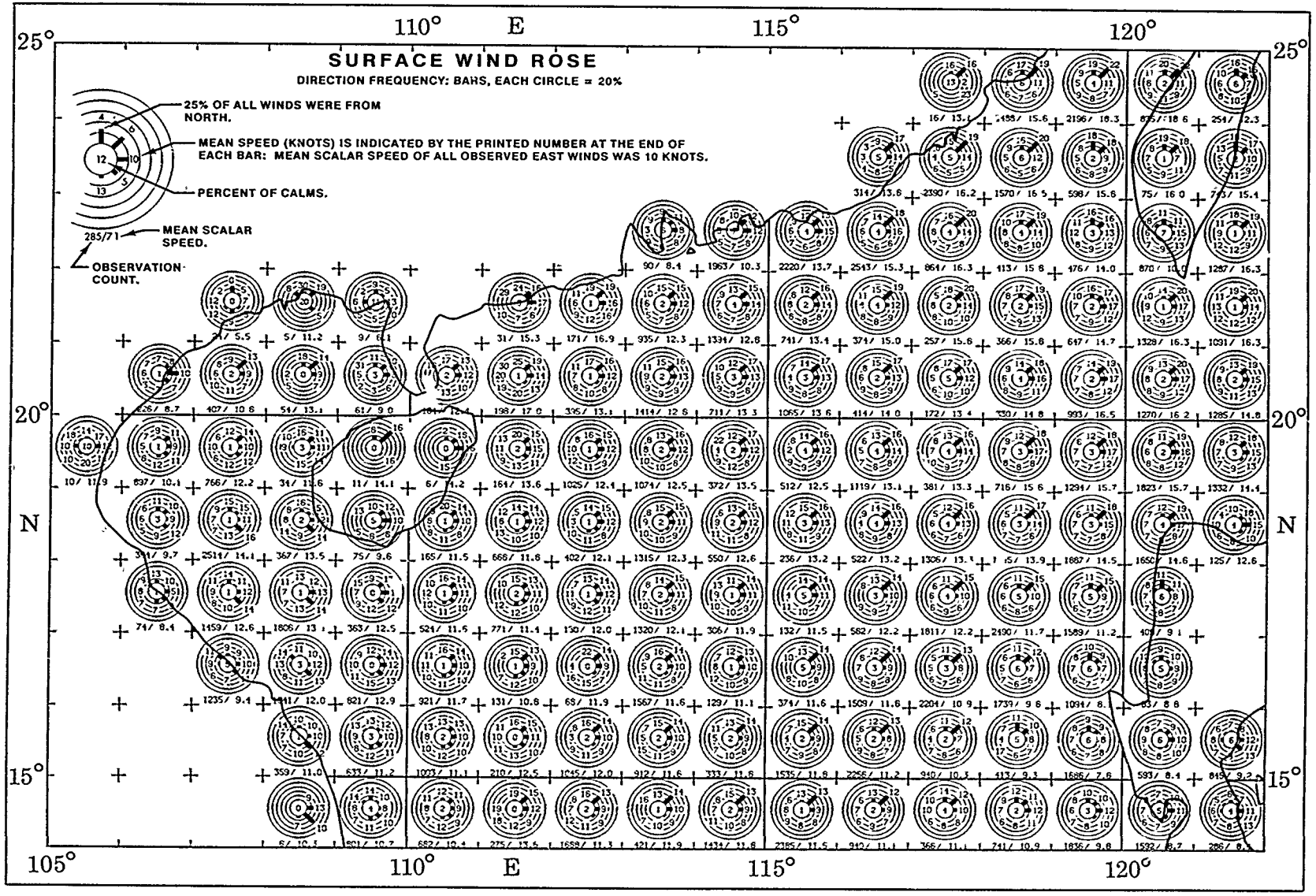
March

Wind Speed 11 - 21 and 22 - 33 Knots

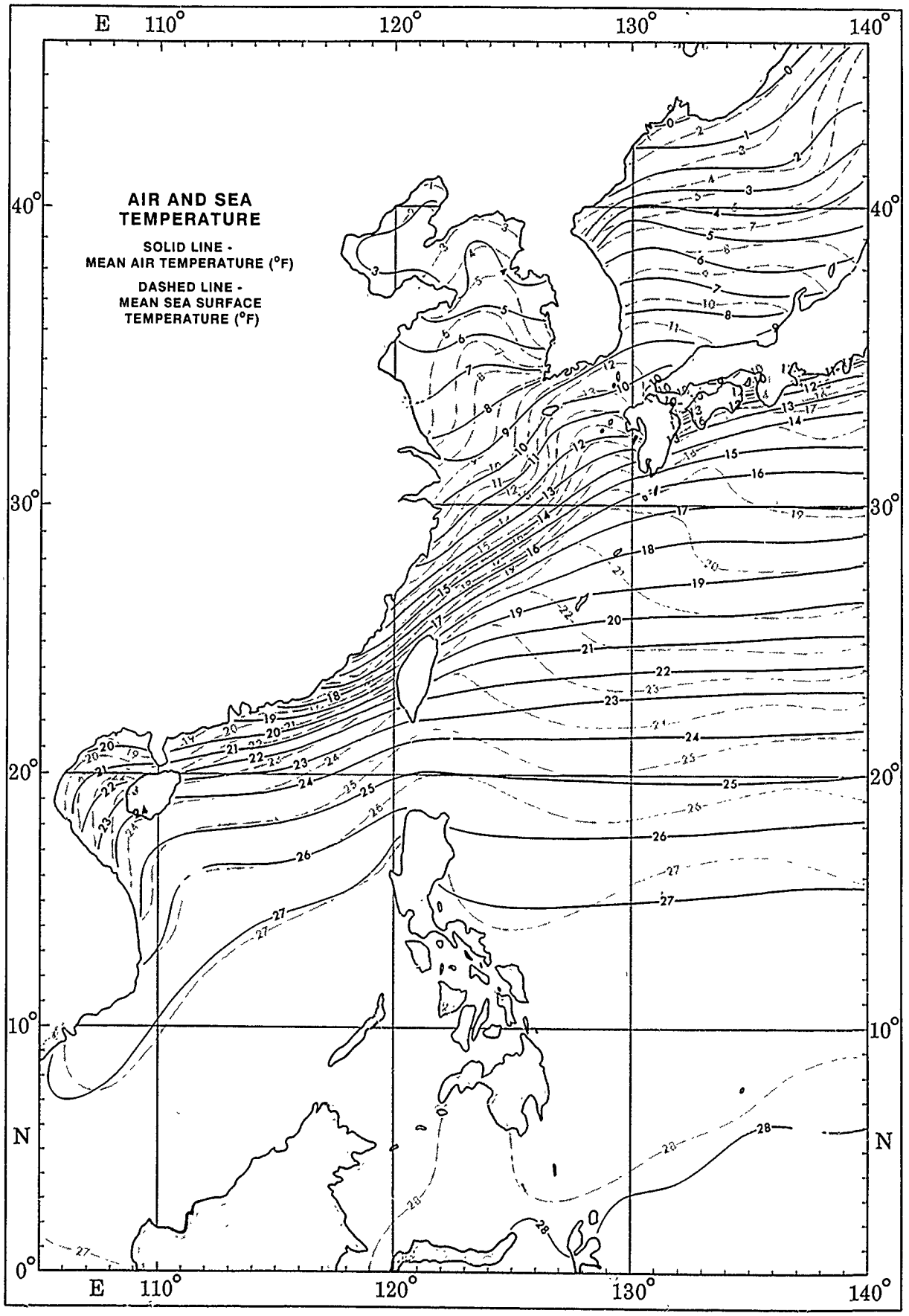


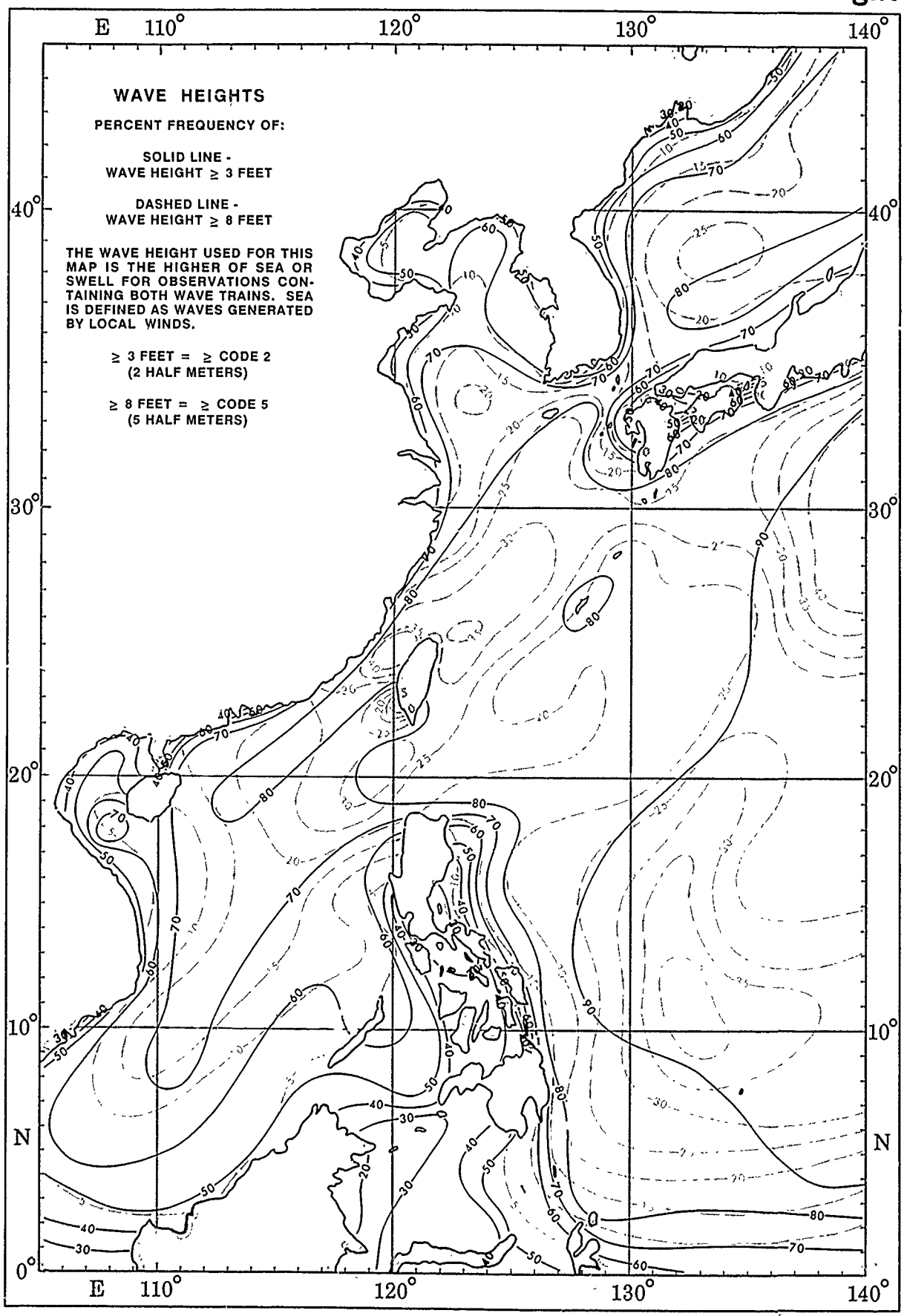

SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%
25% OF ALL WINDS WERE FROM NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR: MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
PERCENT OF CALMS.
285/71
MEAN SCALAR SPEED.
OBSERVATION COUNT.
120° E 125° 130°
40° N 35°

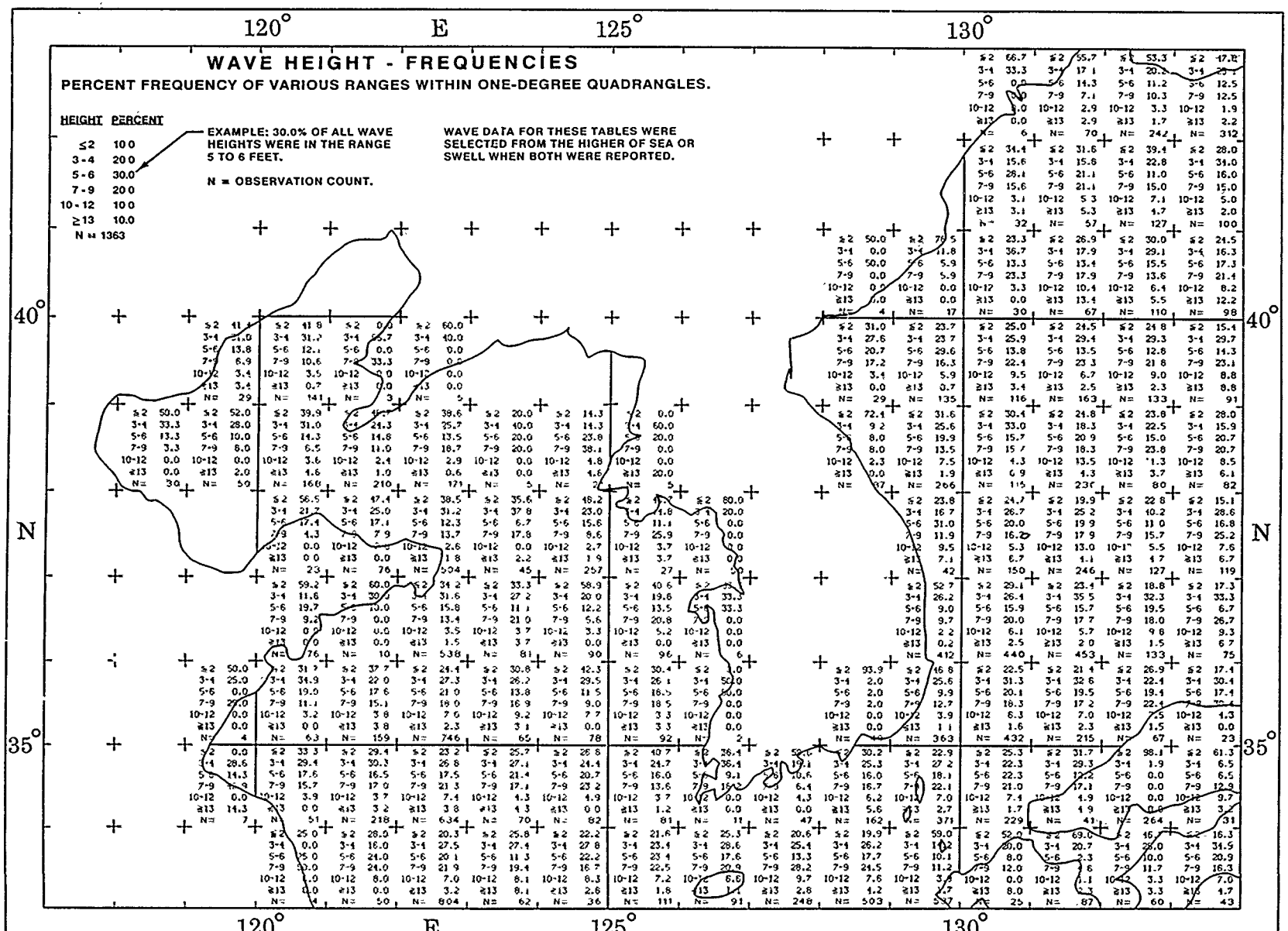
120°
125°
130°
E
30°
25°
N


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.
PERCENT OF CALMS.
285/71
MEAN SCALAR SPEED.
OBSERVATION COUNT.
110° E
115°
120°
105°
25°
20°
15°
N

10°
5°
N
105°
110°
115°
120°
E

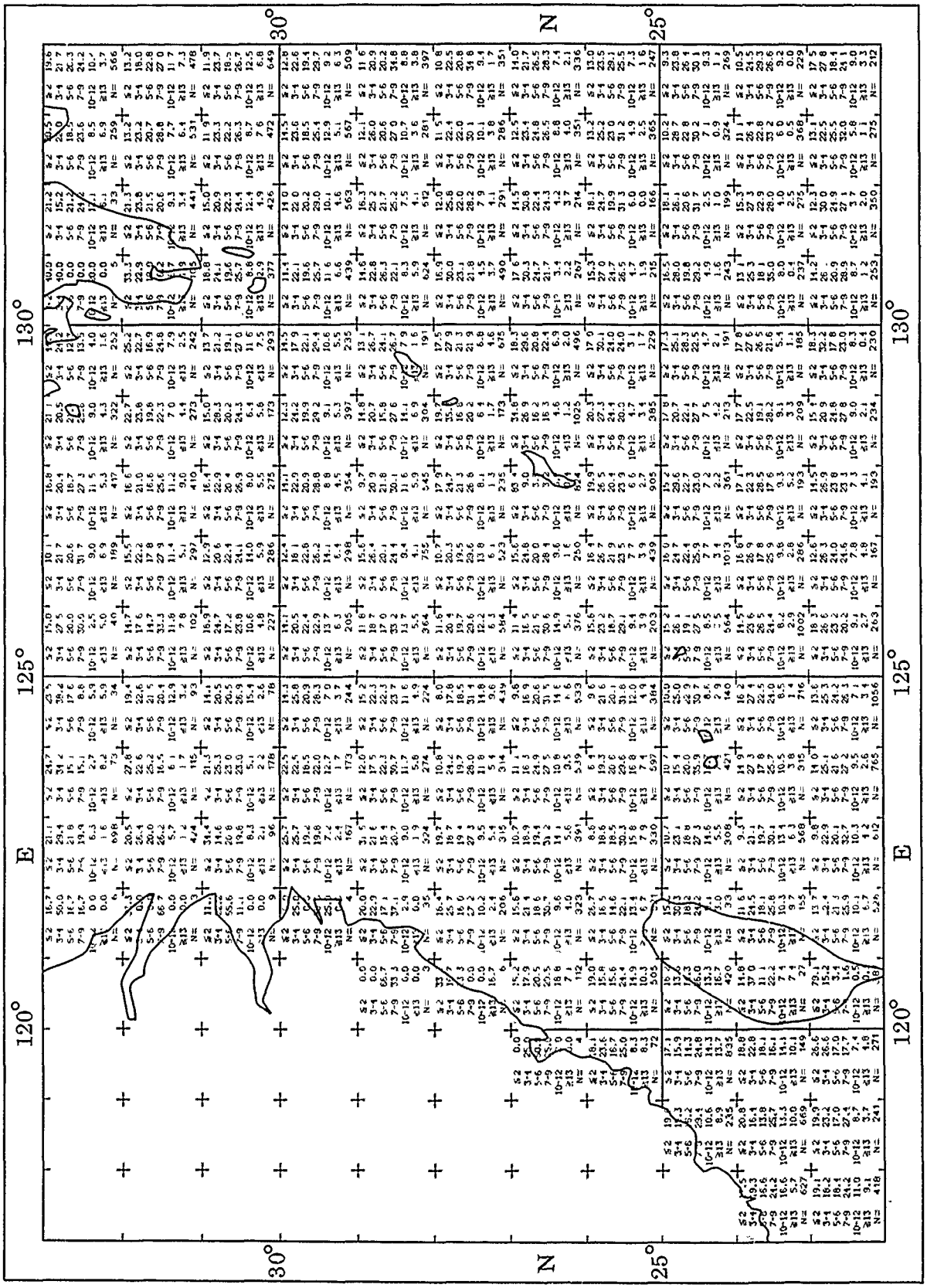

AIR AND SEA TEMPERATURE
SOLID LINE - MEAN AIR TEMPERATURE (°F)
DASHED LINE - MEAN SEA SURFACE TEMPERATURE (°F)
E 110°
120°
130°
140°
40°
30°
20°
10°
N
0°

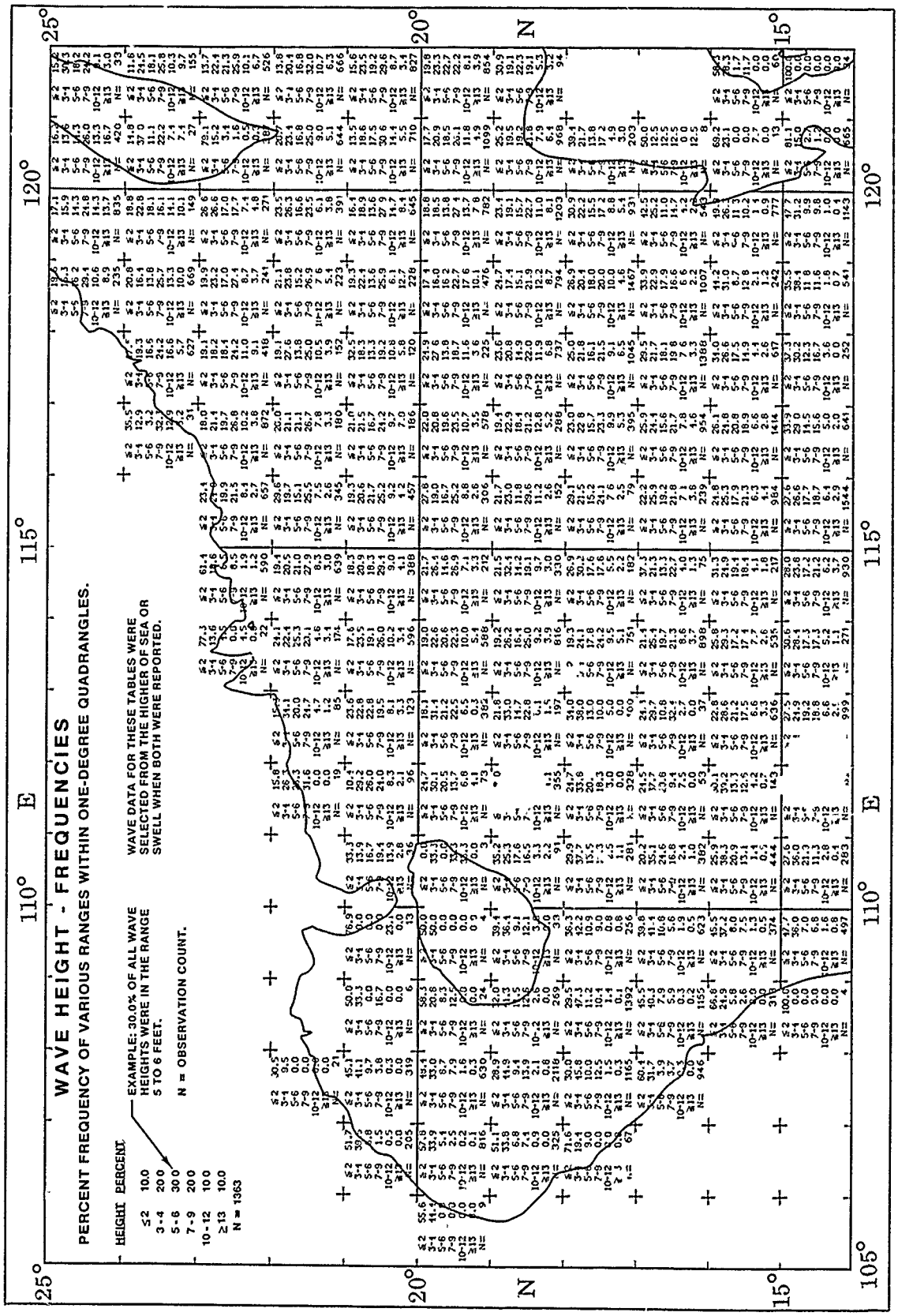

WAVE HEIGHTS
PERCENT FREQUENCY OF:
SOLID LINE -
WAVE HEIGHT ≥ 3 FEET
DASHED LINE -
WAVE HEIGHT ≥ 8 FEET
THE WAVE HEIGHT USED FOR THIS MAP IS THE HIGHER OF SEA OR SWELL FOR OBSERVATIONS CONTAINING BOTH WAVE TRAINS. SEA IS DEFINED AS WAVES GENERATED BY LOCAL WINDS.
≥ 3 FEET = ≥ CODE 2
(2 HALF METERS)
≥ 8 FEET = ≥ CODE 5
(5 HALF METERS)
E 110° 120° 130° 140°
40° 30° 20° 10° N 0°


120° E 125° 130°
40°
N
35°
WAVE HEIGHT - FREQUENCIES
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
HEIGHT PERCENT
≤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 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.

March

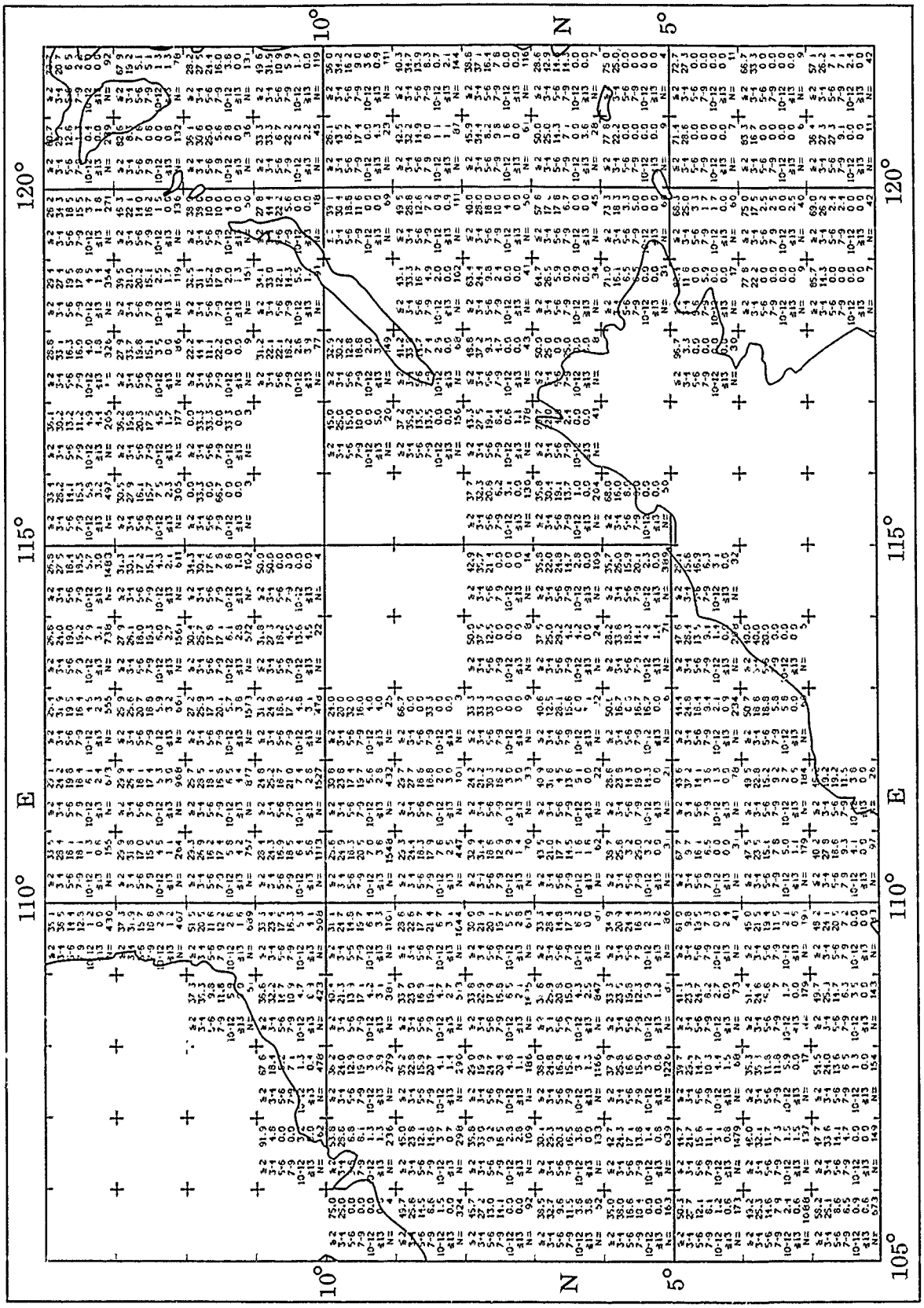
Wave Height

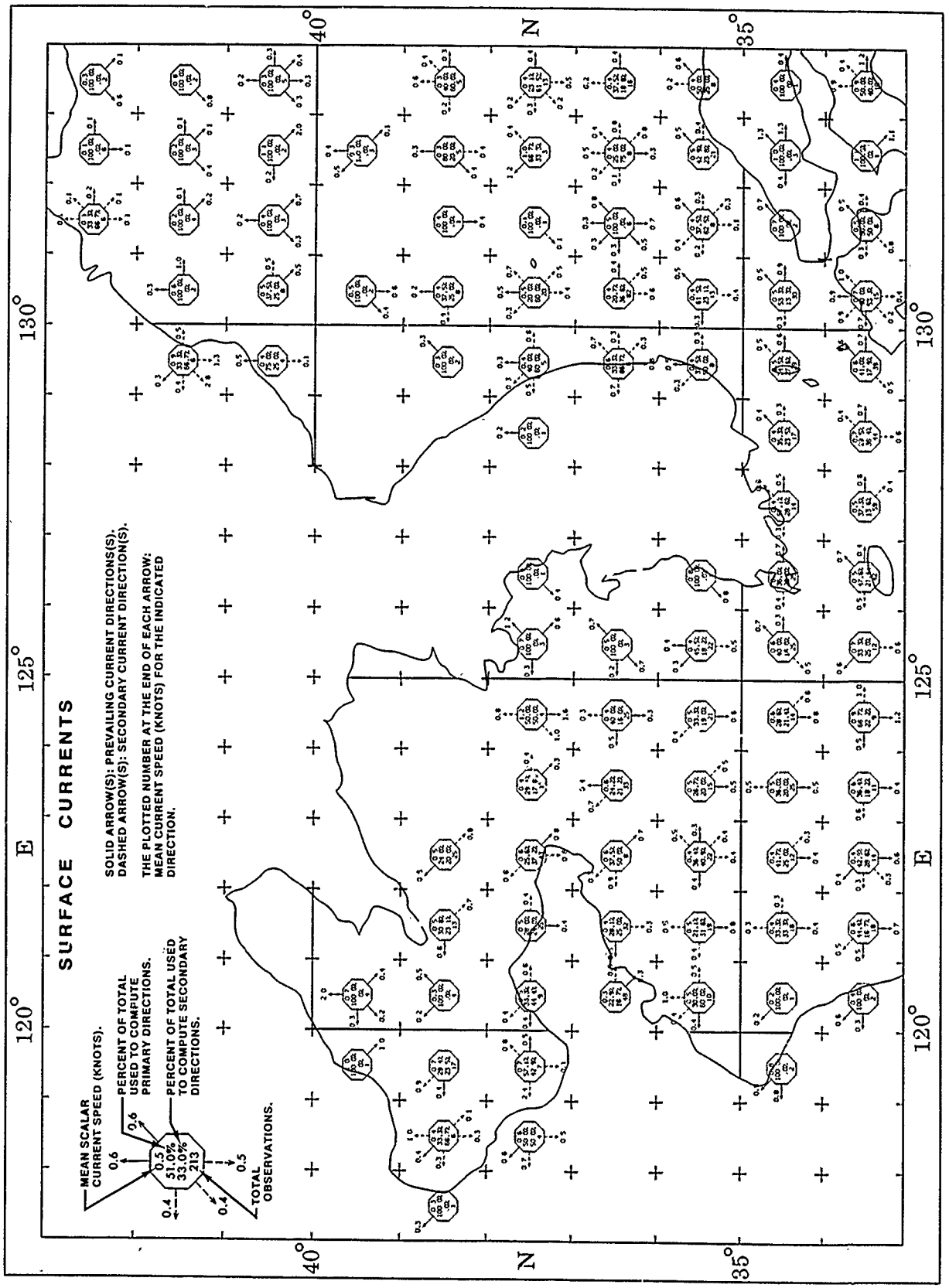


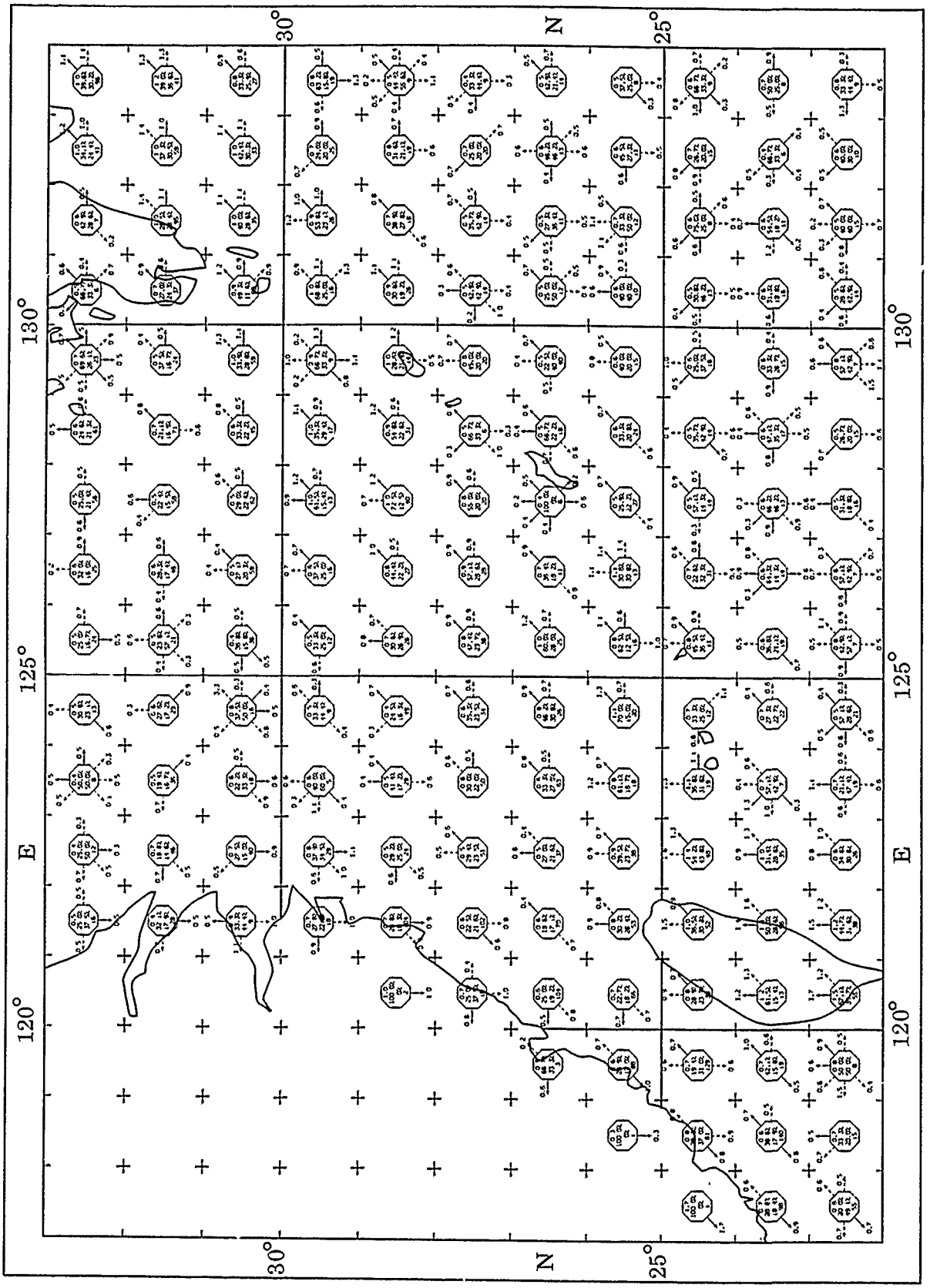

WAVE HEIGHT - FREQUENCIES
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
EXAMPLE: 30.0% OF ALL WAVE HEIGHTS WERE IN THE RANGE 5 TO 6 FEET.
N = OBSERVATION COUNT.
WAVE DATA FOR THESE TABLES WERE SELECTED FROM THE HIGHER OF SEA OR SWELL WHEN BOTH WERE REPORTED.
HEIGHT PERCENT
≤2 10.0
3-4 20.0
5-6 30.0
7-9 20.0
10-12 10.0
≥13 10.0
N = 1363
110°
115°
120°
25°
20°
15°
N
E

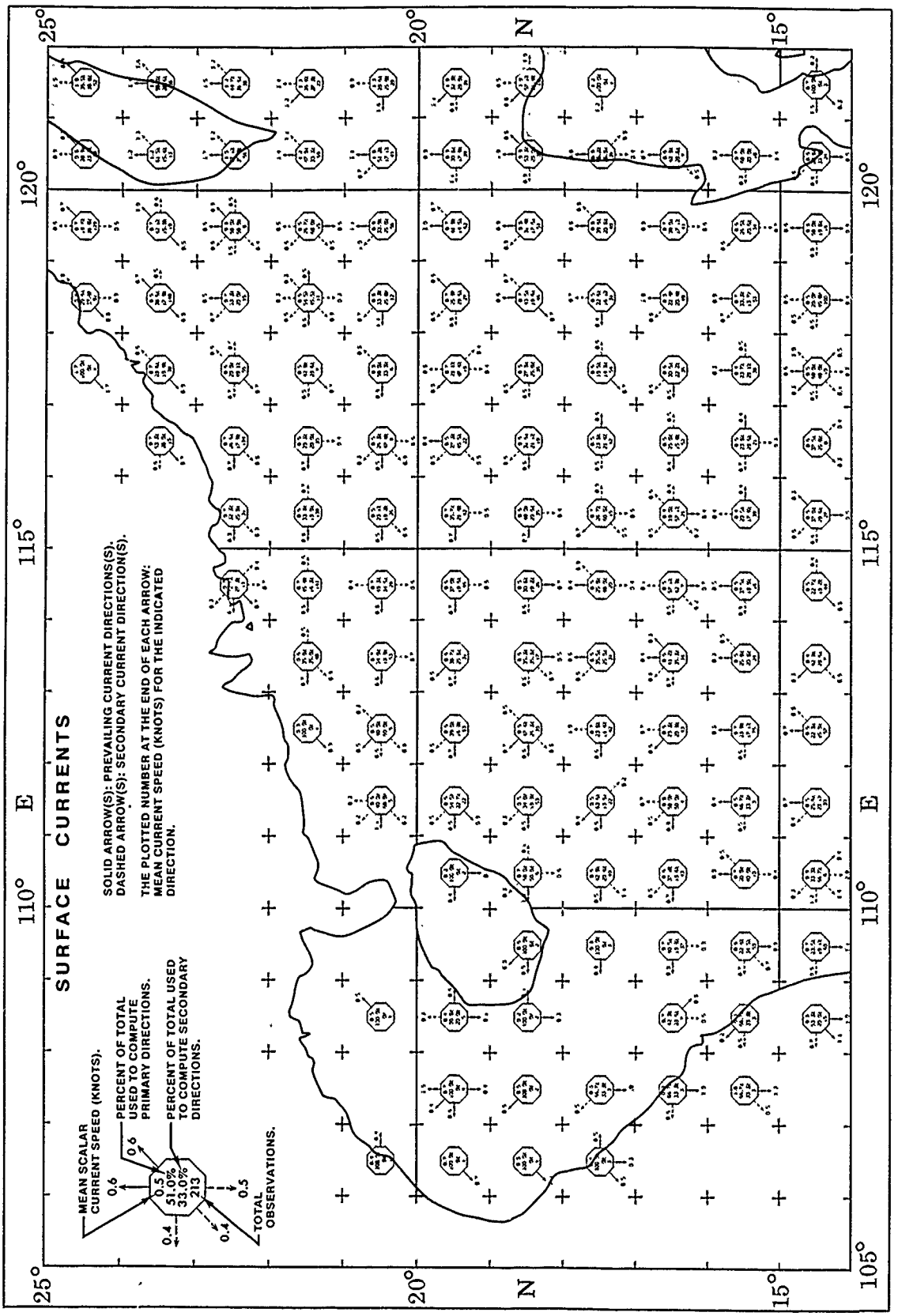
March

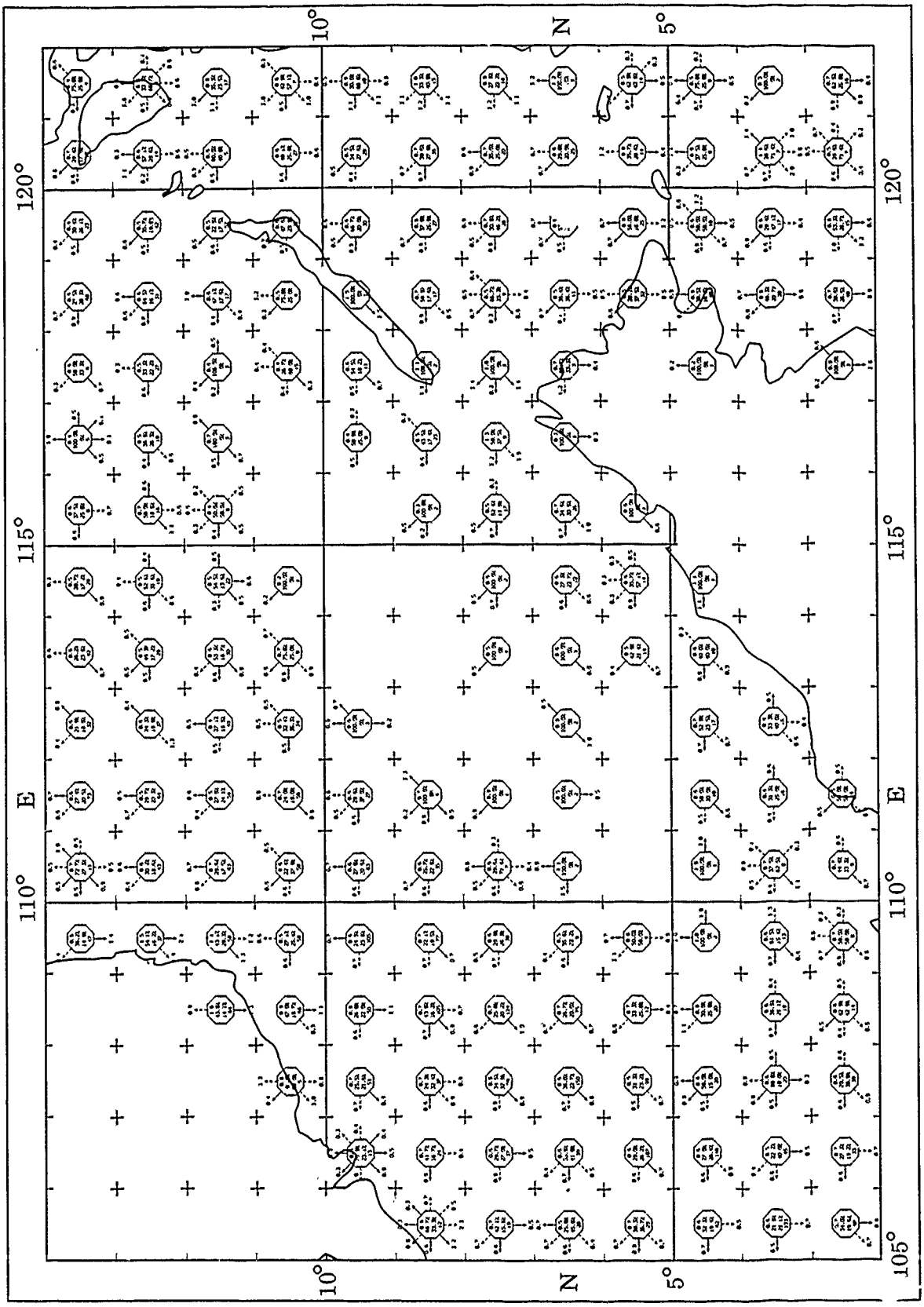
Wave Height

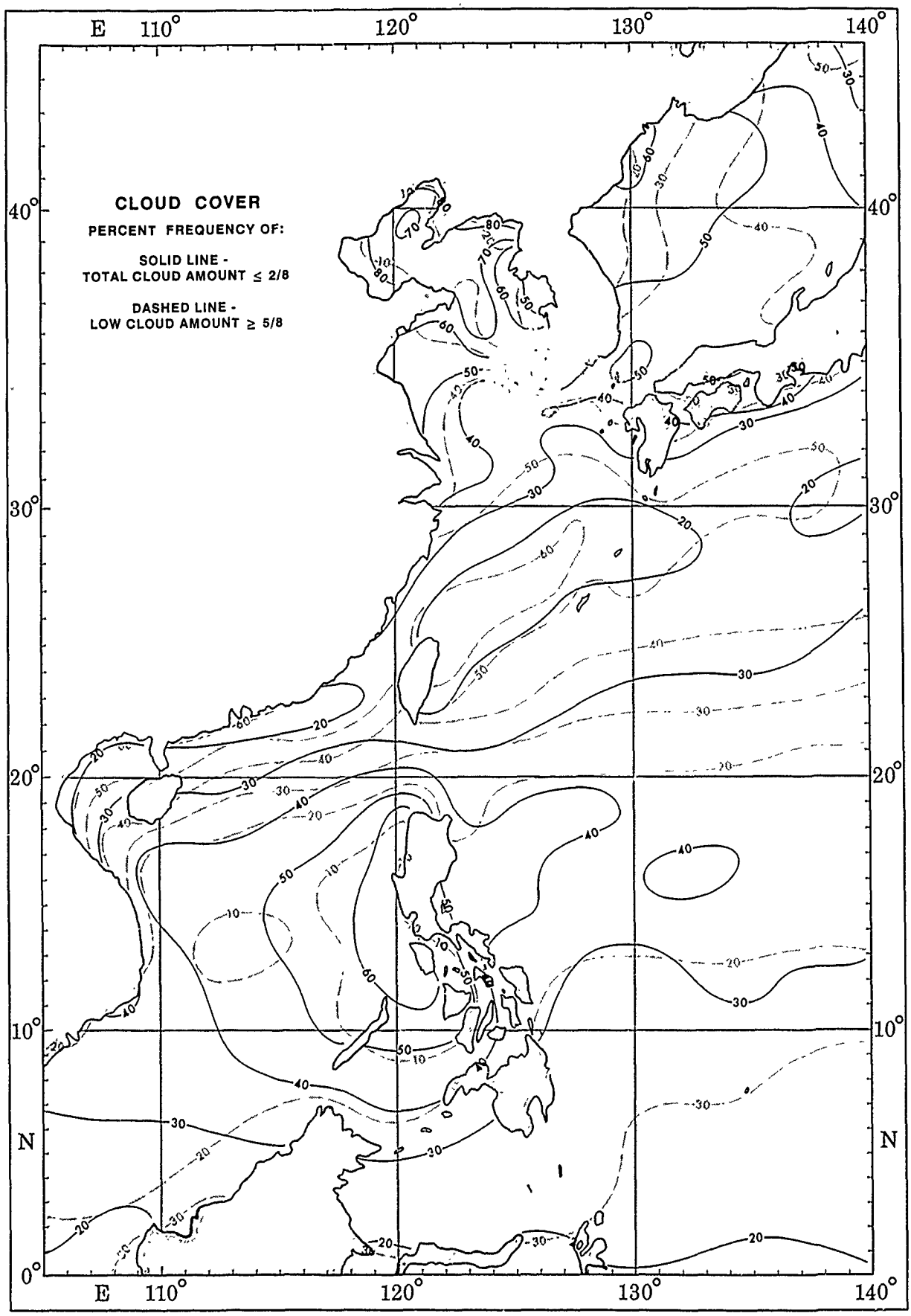


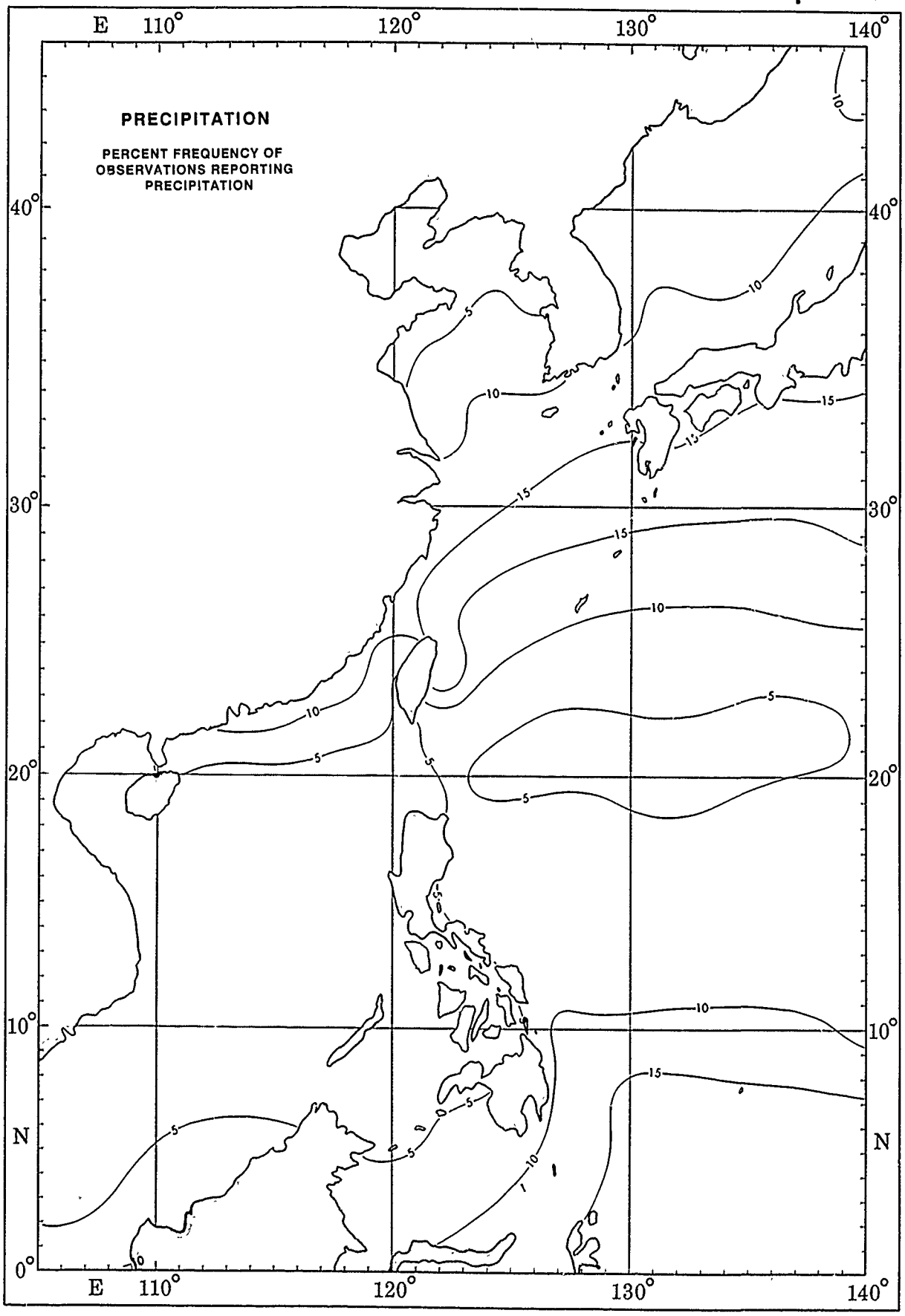

SURFACE CURRENTS
SOLID ARROW(S): PREVAILING CURRENT DIRECTIONS(S).
DASHED ARROW(S): SECONDARY CURRENT DIRECTION(S).
THE PLOTTED NUMBER AT THE END OF EACH ARROW: MEAN CURRENT SPEED (KNOTS) FOR THE INDICATED DIRECTION.
MEAN SCALAR CURRENT SPEED (KNOTS).
PERCENT OF TOTAL USED TO COMPUTE PRIMARY DIRECTIONS.
PERCENT OF TOTAL USED TO COMPUTE SECONDARY DIRECTIONS.
TOTAL OBSERVATIONS.
0.6
0.5
51.0%
33.0%
213
0.4
0.4
0.5
120°
125°
130°
E
40°
N
35°

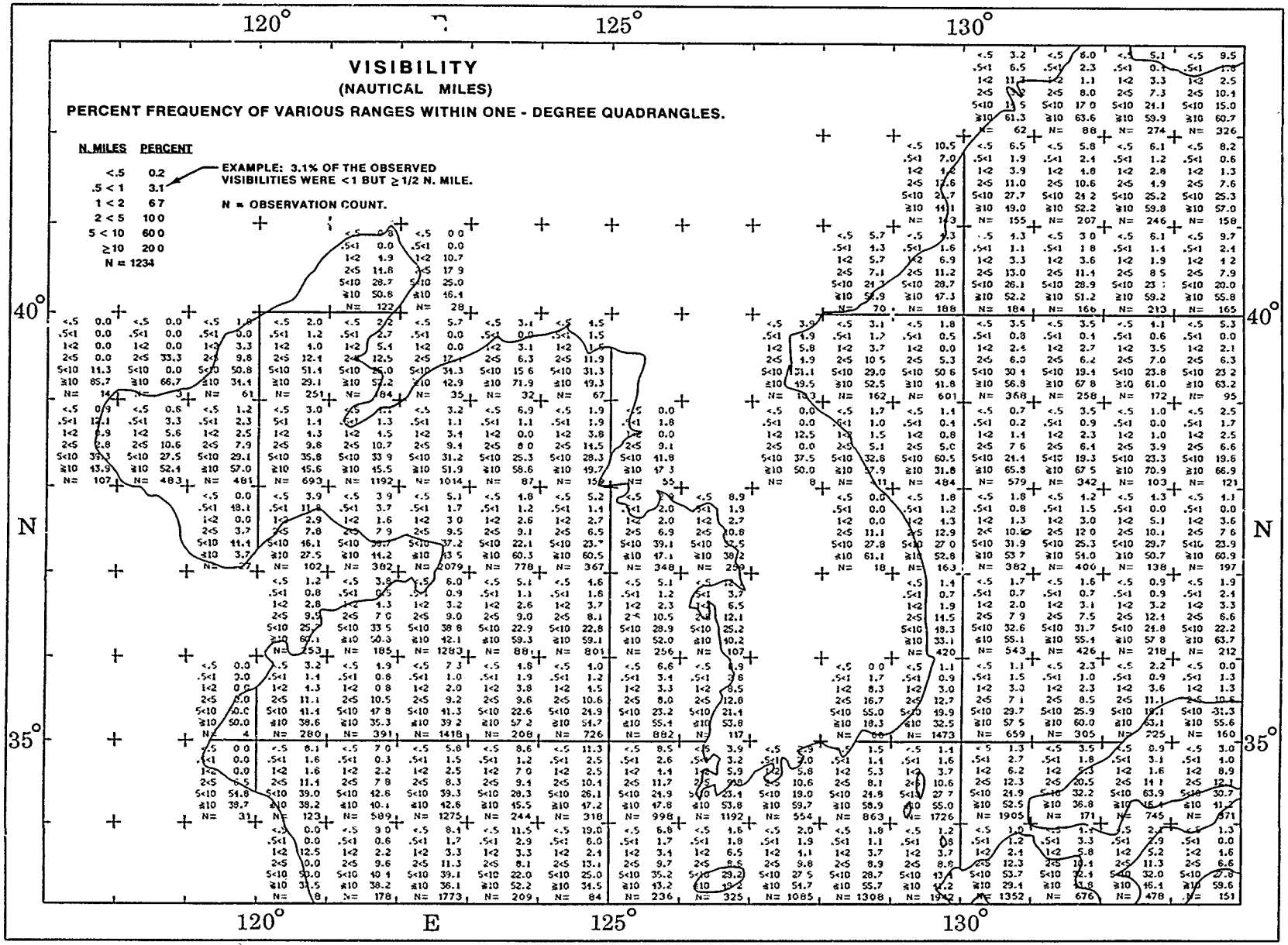

30° N
25° N
120° E
125° E
130° E

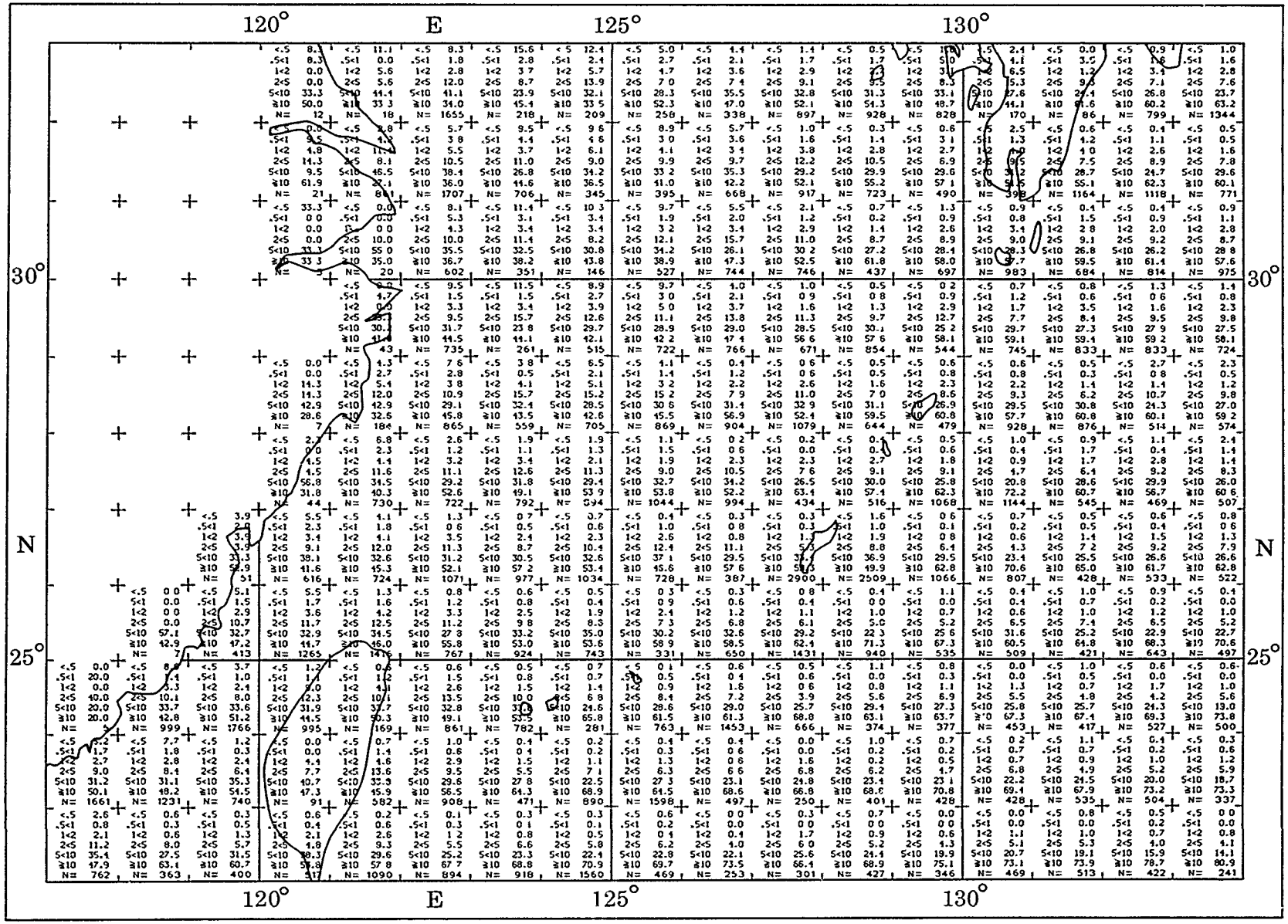

SURFACE CURRENTS
SOLID ARROW(S): PREVAILING CURRENT DIRECTIONS(S).
DASHED ARROW(S): SECONDARY CURRENT DIRECTION(S).
THE PLOTTED NUMBER AT THE END OF EACH ARROW: MEAN CURRENT SPEED (KNOTS) FOR THE INDICATED DIRECTION.
MEAN SCALAR CURRENT SPEED (KNOTS).
PERCENT OF TOTAL USED TO COMPUTE PRIMARY DIRECTIONS.
PERCENT OF TOTAL USED TO COMPUTE SECONDARY DIRECTIONS.
TOTAL OBSERVATIONS.
0.6
0.6
0.5
51.0%
33.0%
213
0.5
0.4
0.4
25°
20°
15°
N
105°
110°
115°
120°
E

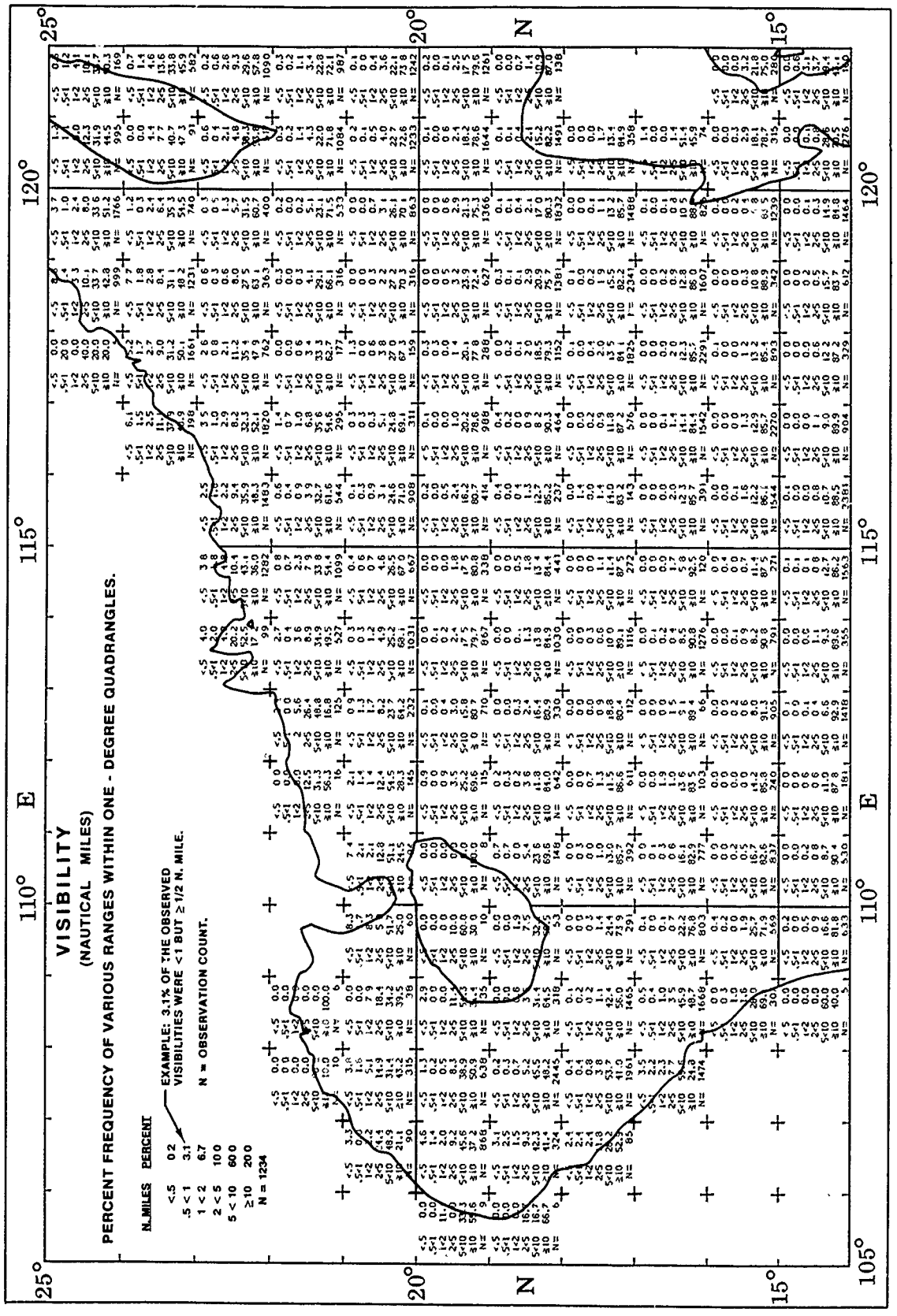

10° N
5°
120°
115°
110° E
105°
10°
N
5°

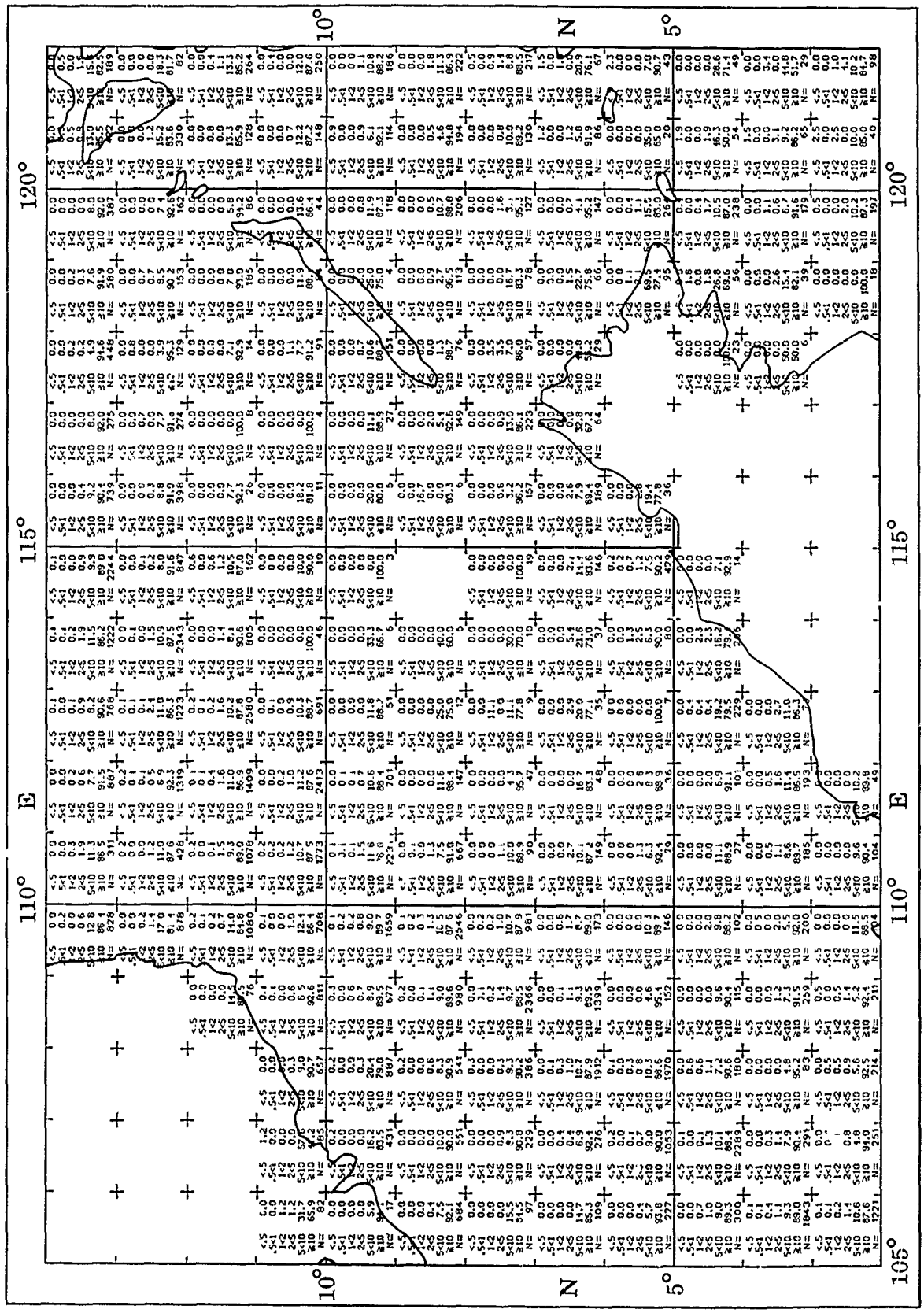

CLOUD COVER
PERCENT FREQUENCY OF:
SOLID LINE -
TOTAL CLOUD AMOUNT ≤ 2/8
DASHED LINE -
LOW CLOUD AMOUNT ≥ 5/8
E 110°
120°
130°
140°
40°
30°
20°
10°
N
0°


PRECIPITATION
PERCENT FREQUENCY OF OBSERVATIONS REPORTING PRECIPITATION
E 110°
120°
130°
140°
40°
30°
20°
10°
N
0°
5
10
15

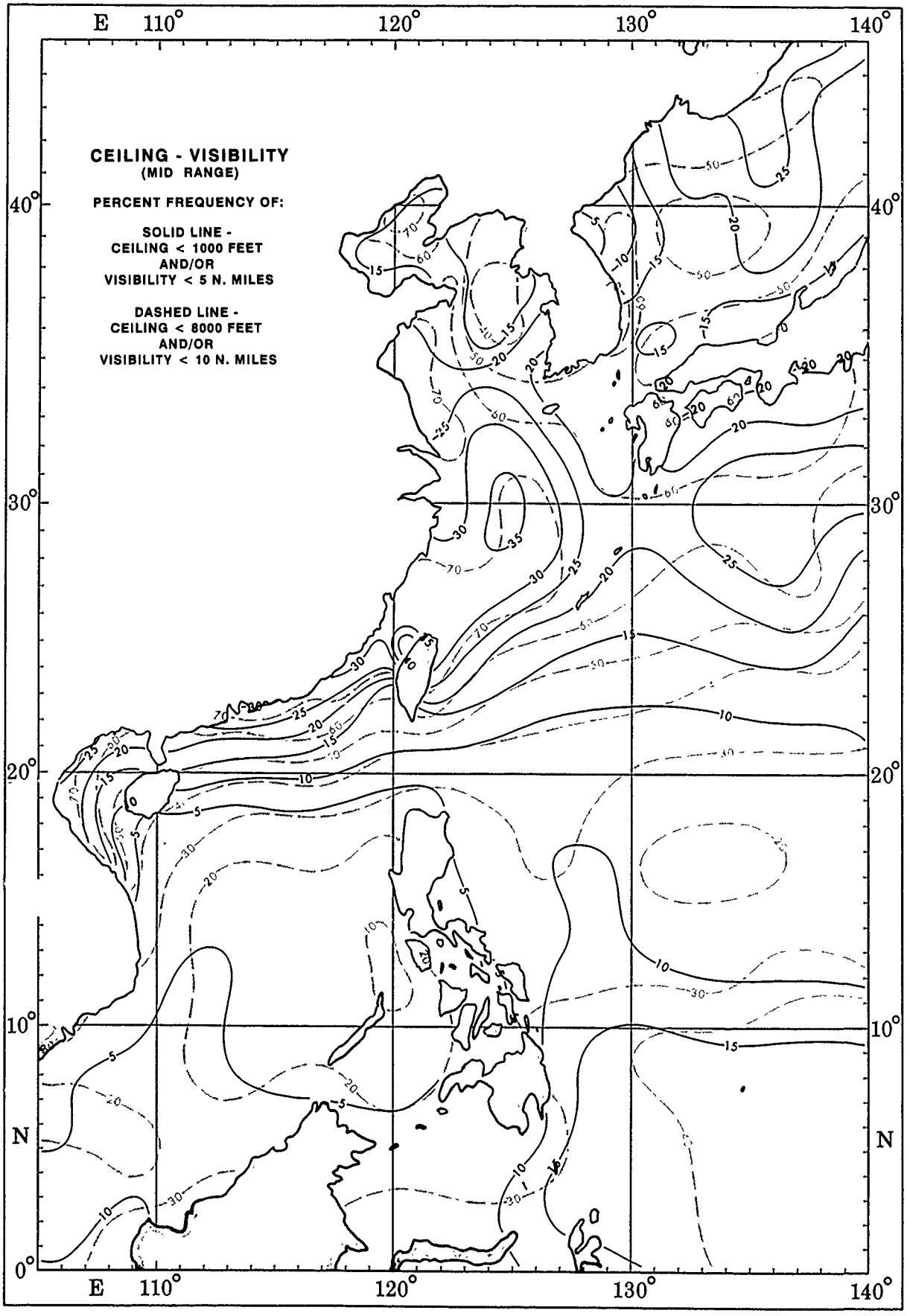

VISIBILITY
(NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE - DEGREE QUADRANGLES.
N. MILES PERCENT
<.5 0.2
.5 < 1 3.1
1 < 2 6.7
2 < 5 10.0
5 < 10 60.0
≥10 20.0
N = 1234
EXAMPLE: 3.1% OF THE OBSERVED VISIBILITIES WERE <1 BUT ≥1/2 N. MILE.
N = OBSERVATION COUNT.
120°
125°
130°
40°
35°
N
E


120°
E
125°
130°
30°
25°
N

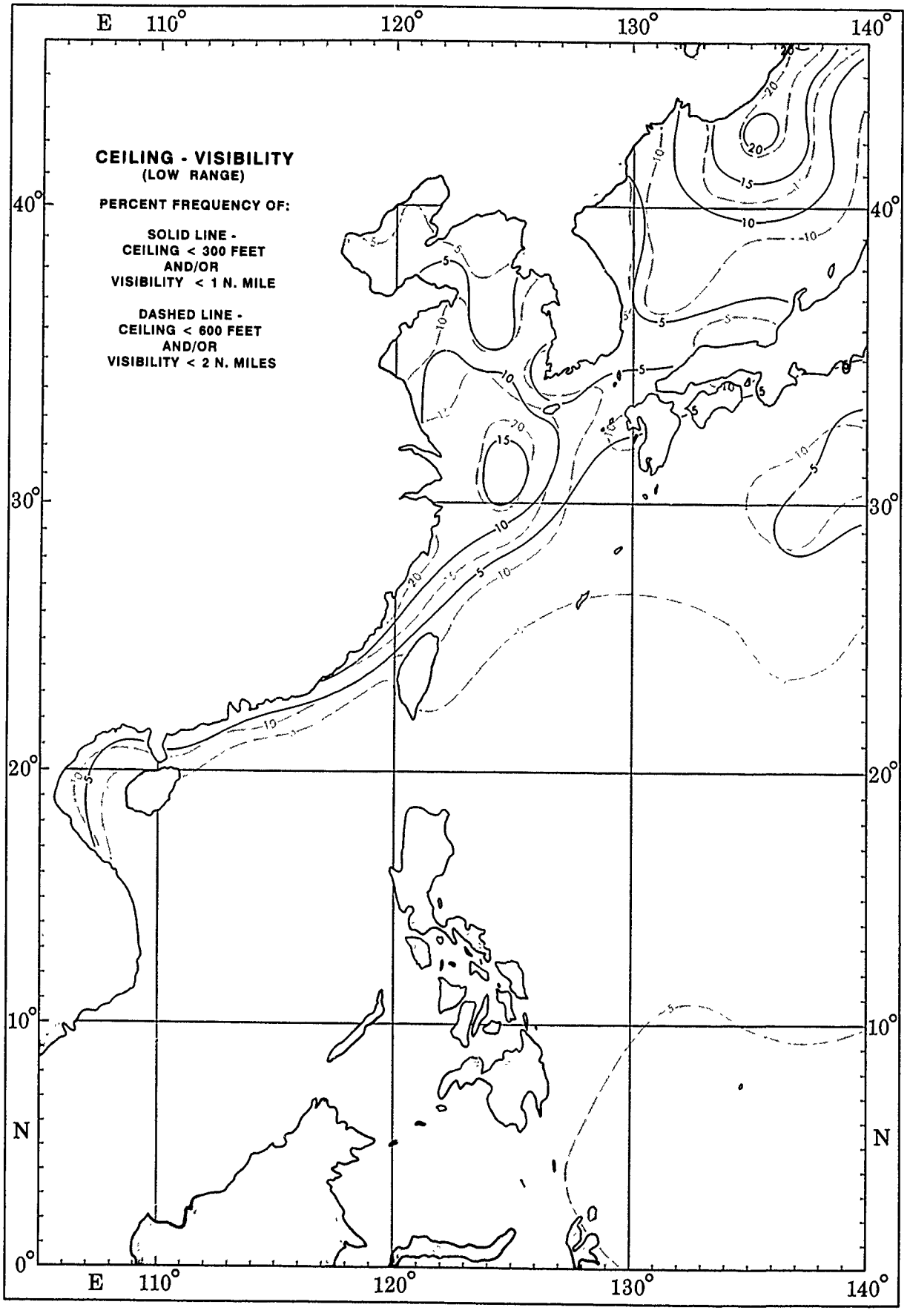

VISIBILITY
(NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE - DEGREE QUADRANGLES.
N. MILES PERCENT
<.5 0.2
.5 < 1 3.1
1 < 2 6.7
2 < 5 10.0
5 < 10 60.0
≥10 20.0
N = 1234
EXAMPLE: 3.1% OF THE OBSERVED VISIBILITIES WERE <1 BUT ≥1/2 N. MILE.
N = OBSERVATION COUNT.
25°
20°
15°
105°
110°
115°
120°
N
E

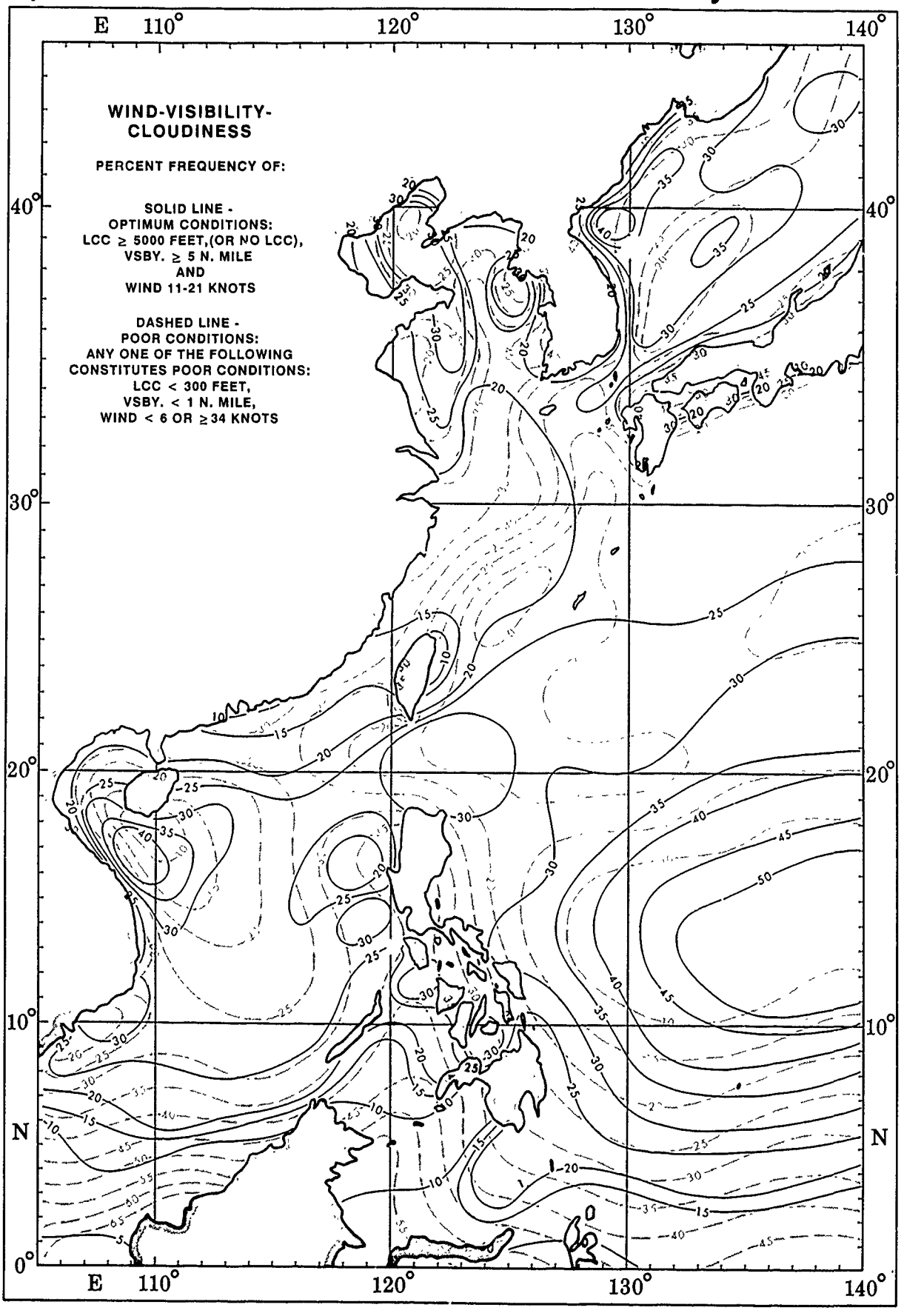

105°
110°
115°
120°
E
10°
5°
N

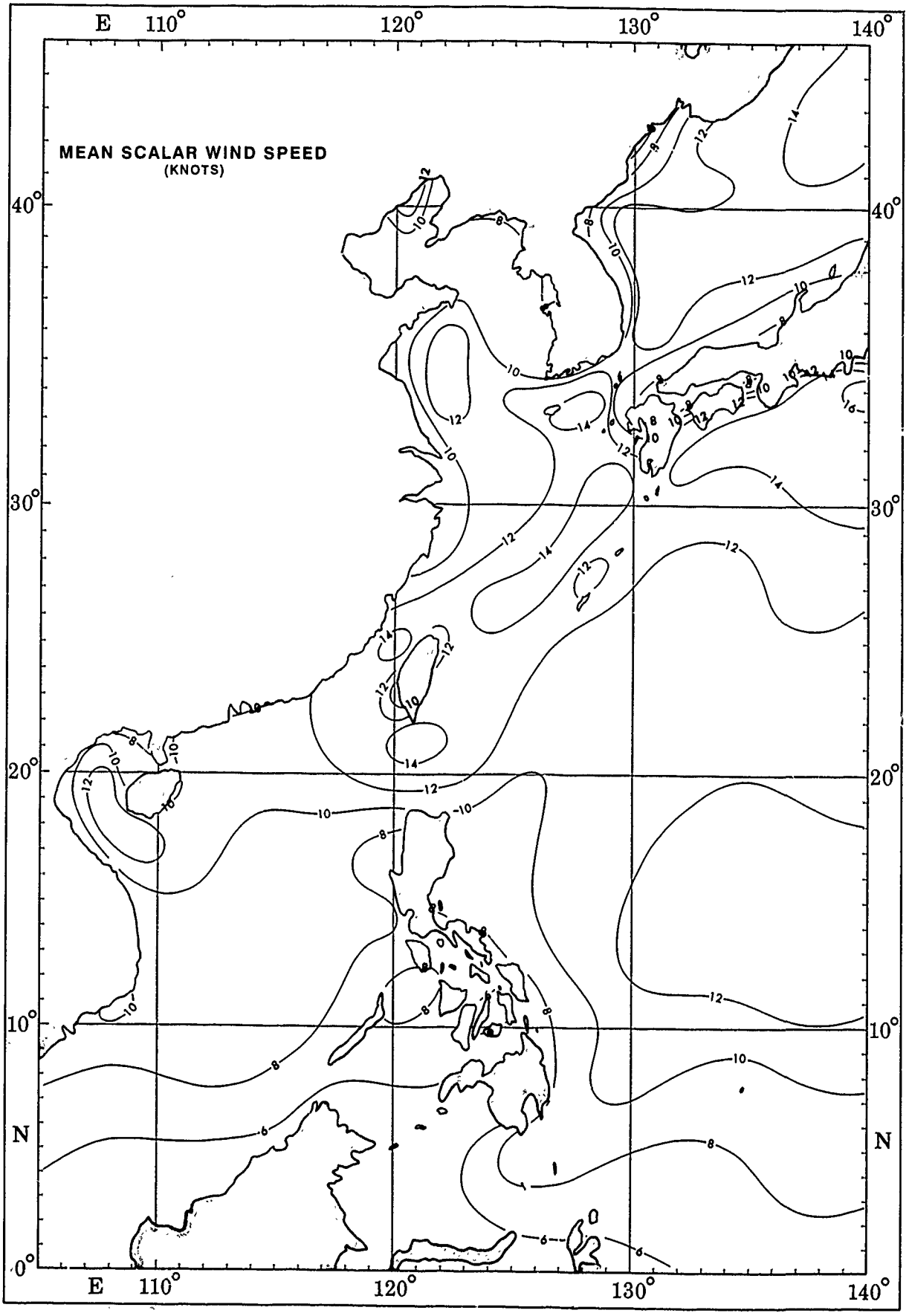
Ceiling - Visibility (Mid Range)



Ceiling - Visibility (Low Range)

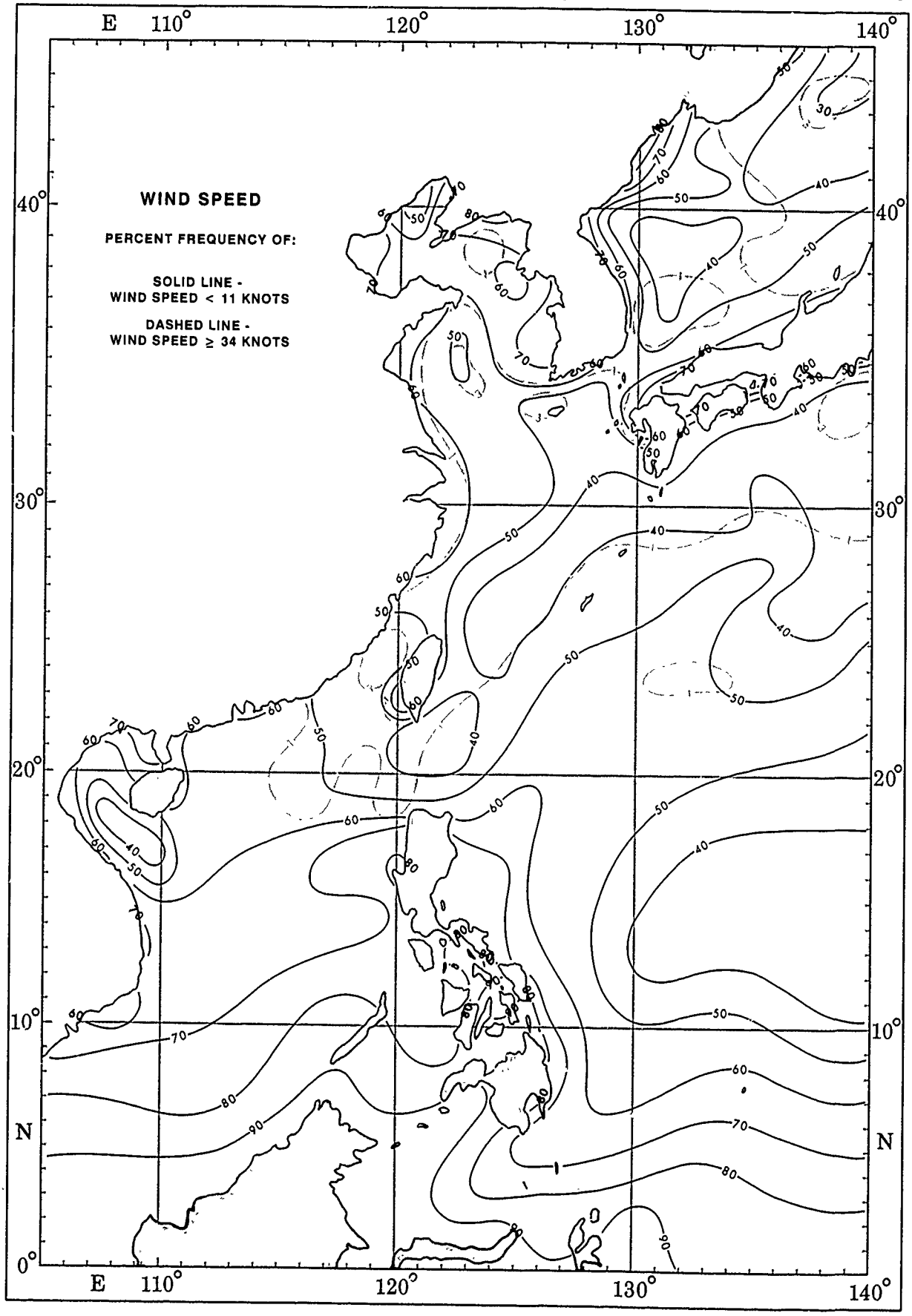



WIND-VISIBILITY-
CLOUDINESS
PERCENT FREQUENCY OF:
SOLID LINE -
OPTIMUM CONDITIONS:
LCC ≥ 5000 FEET,(OR NO LCC),
VSBY. ≥ 5 N. MILE
AND
WIND 11-21 KNOTS
DASHED LINE -
POOR CONDITIONS:
ANY ONE OF THE FOLLOWING
CONSTITUTES POOR CONDITIONS:
LCC < 300 FEET,
VSBY. < 1 N. MILE,
WIND < 6 OR ≥34 KNOTS
E 110°
120°
130°
140°
40°
30°
20°
10°
N
0°


MEAN SCALAR WIND SPEED
(KNOTS)
E 110°
120°
130°
140°
40°
30°
20°
10°
N
0°

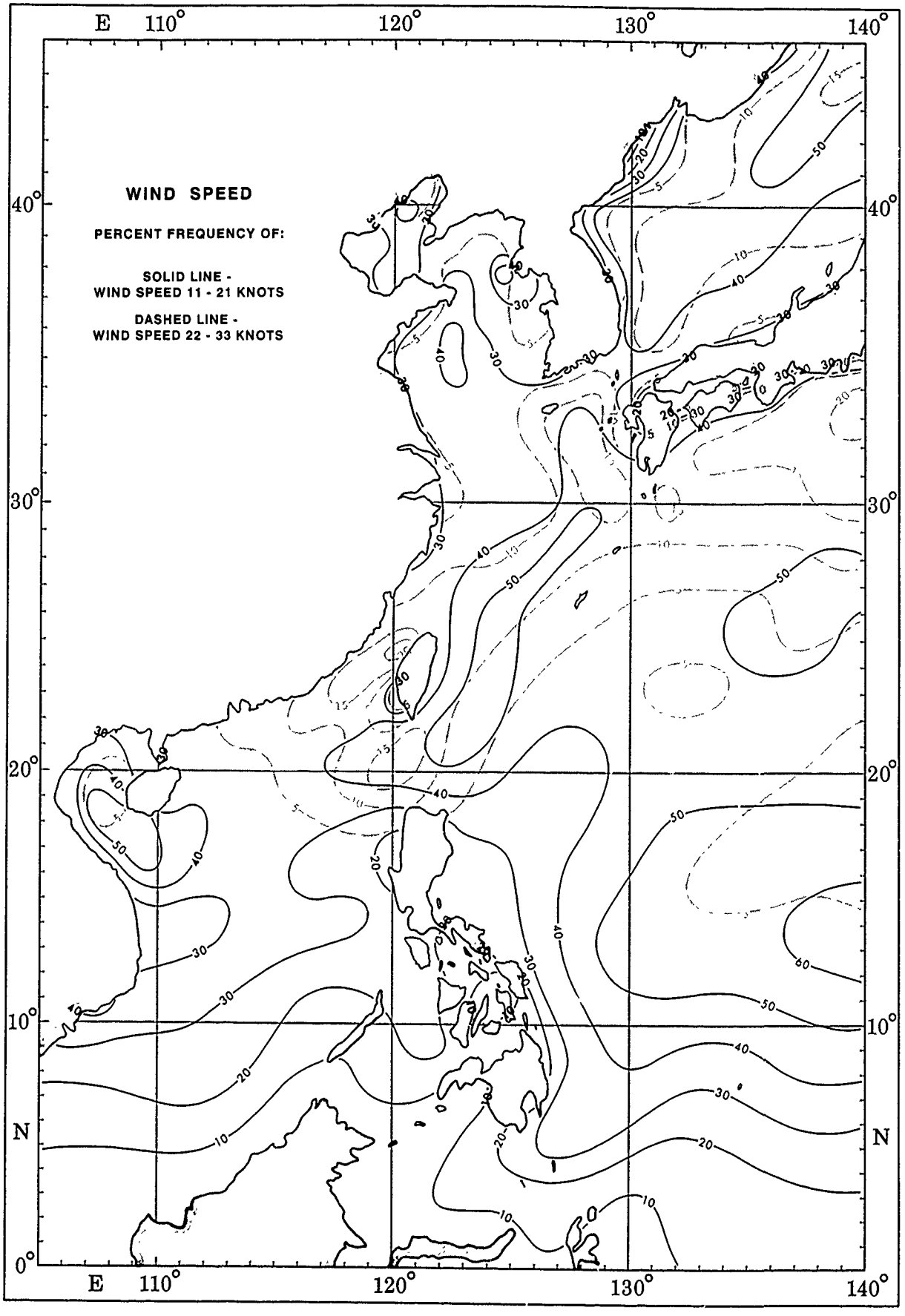
April

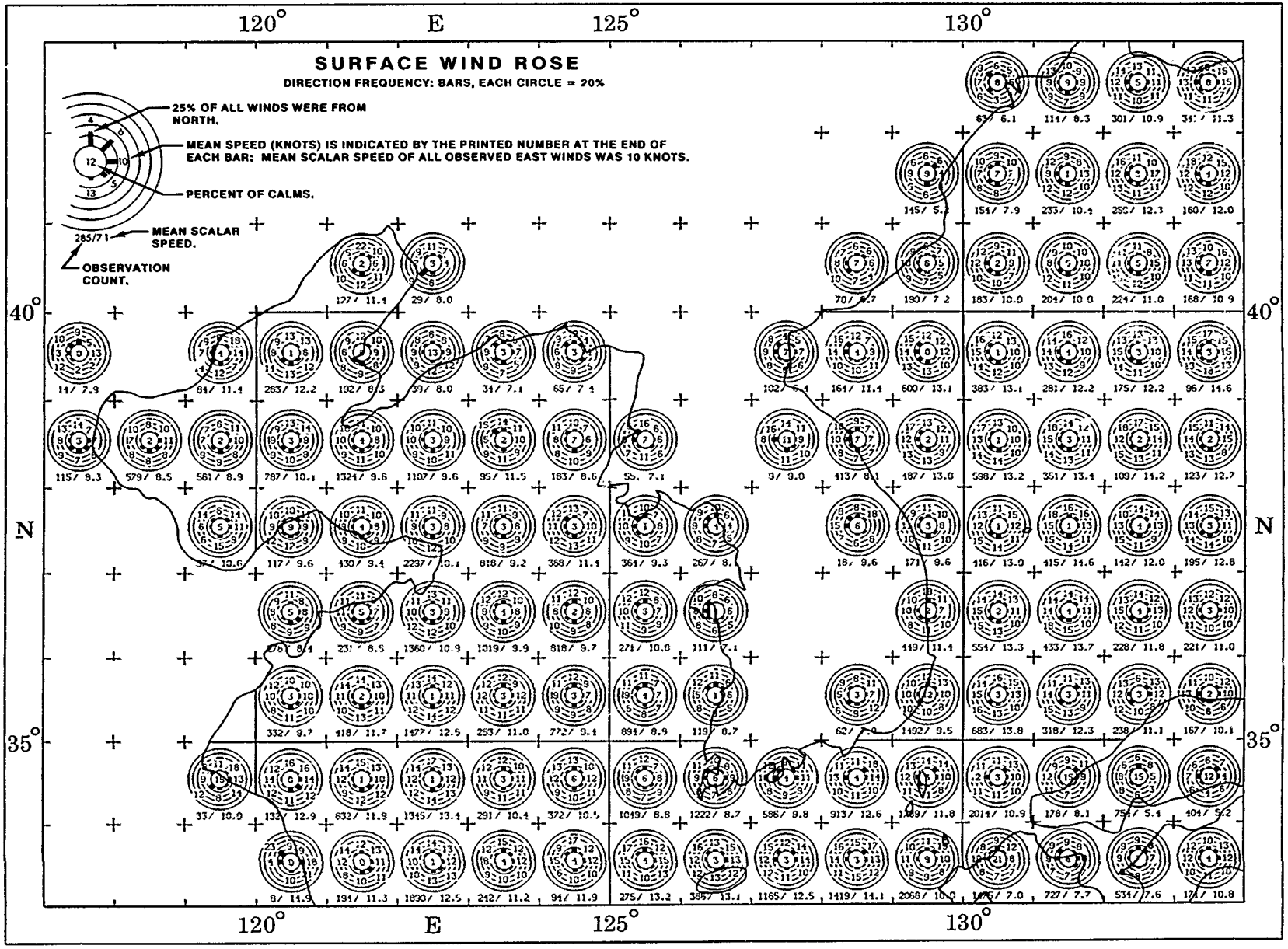
Wind Speed <11 and ≥34 Knots



April

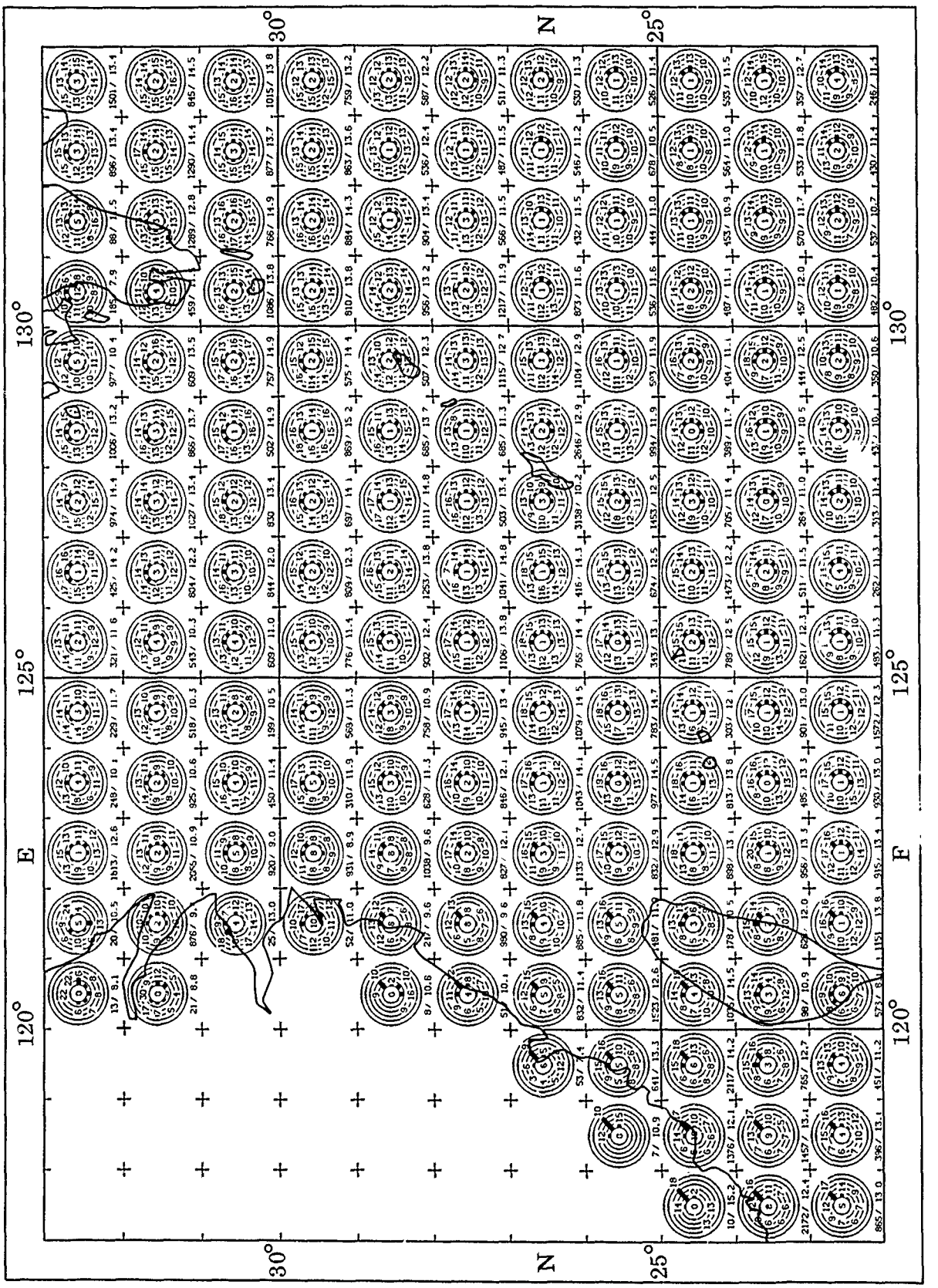
Wind Speed 11 - 21 and 22 - 33 Knots

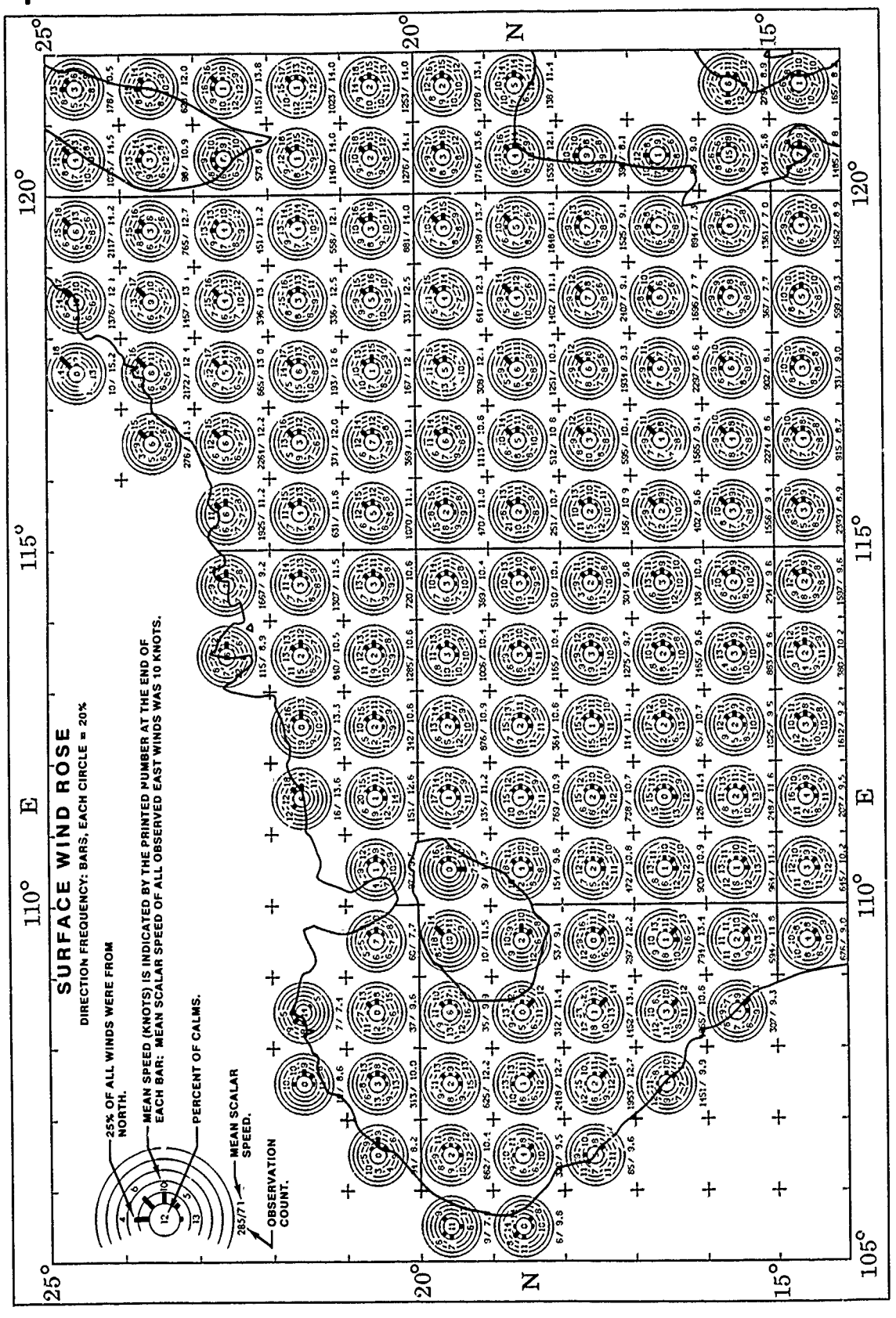


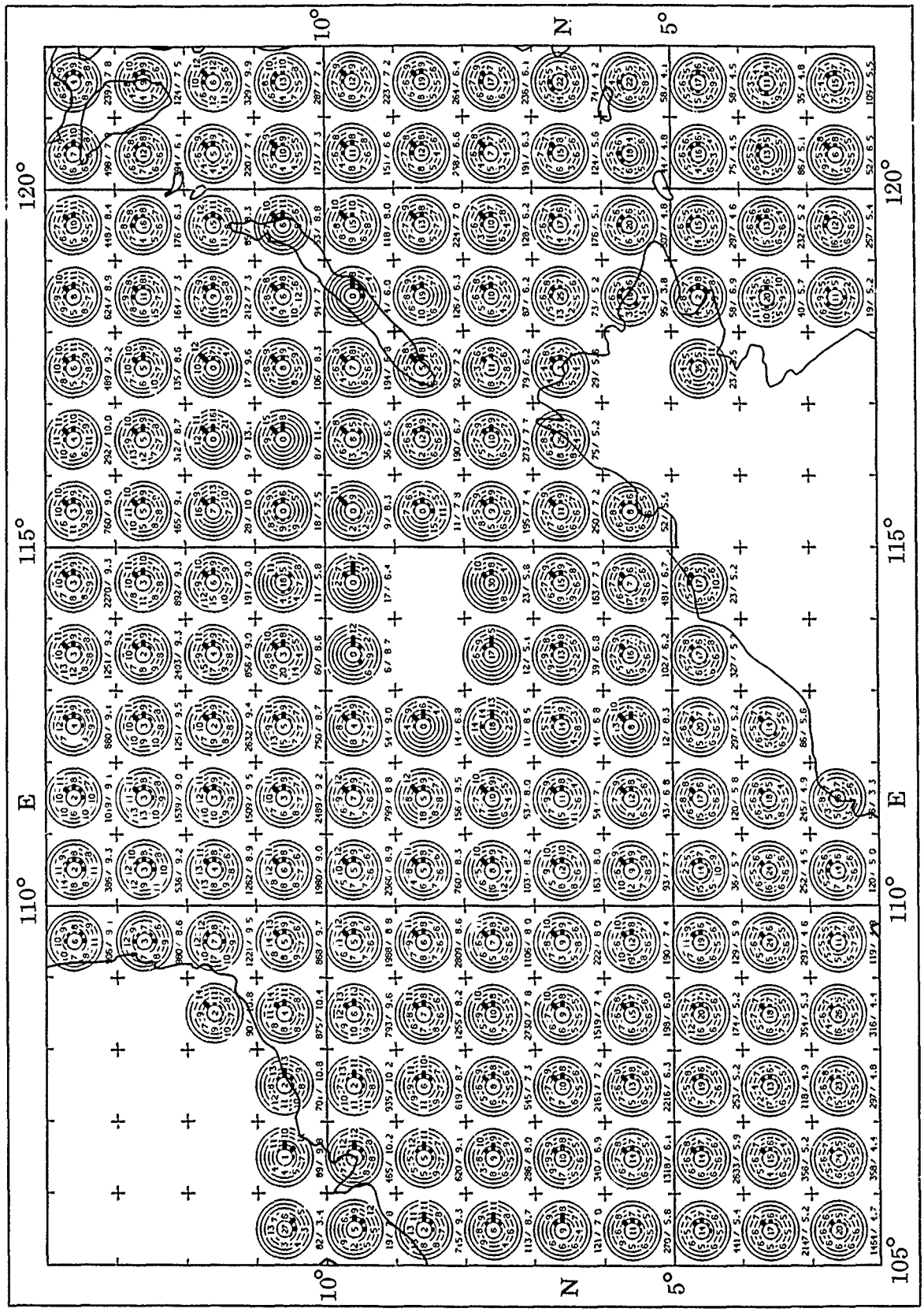

SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%
25% OF ALL WINDS WERE FROM NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR: MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
PERCENT OF CALMS.
285/71
MEAN SCALAR SPEED.
OBSERVATION COUNT.
120° E 125° 130°
40°
35°
N

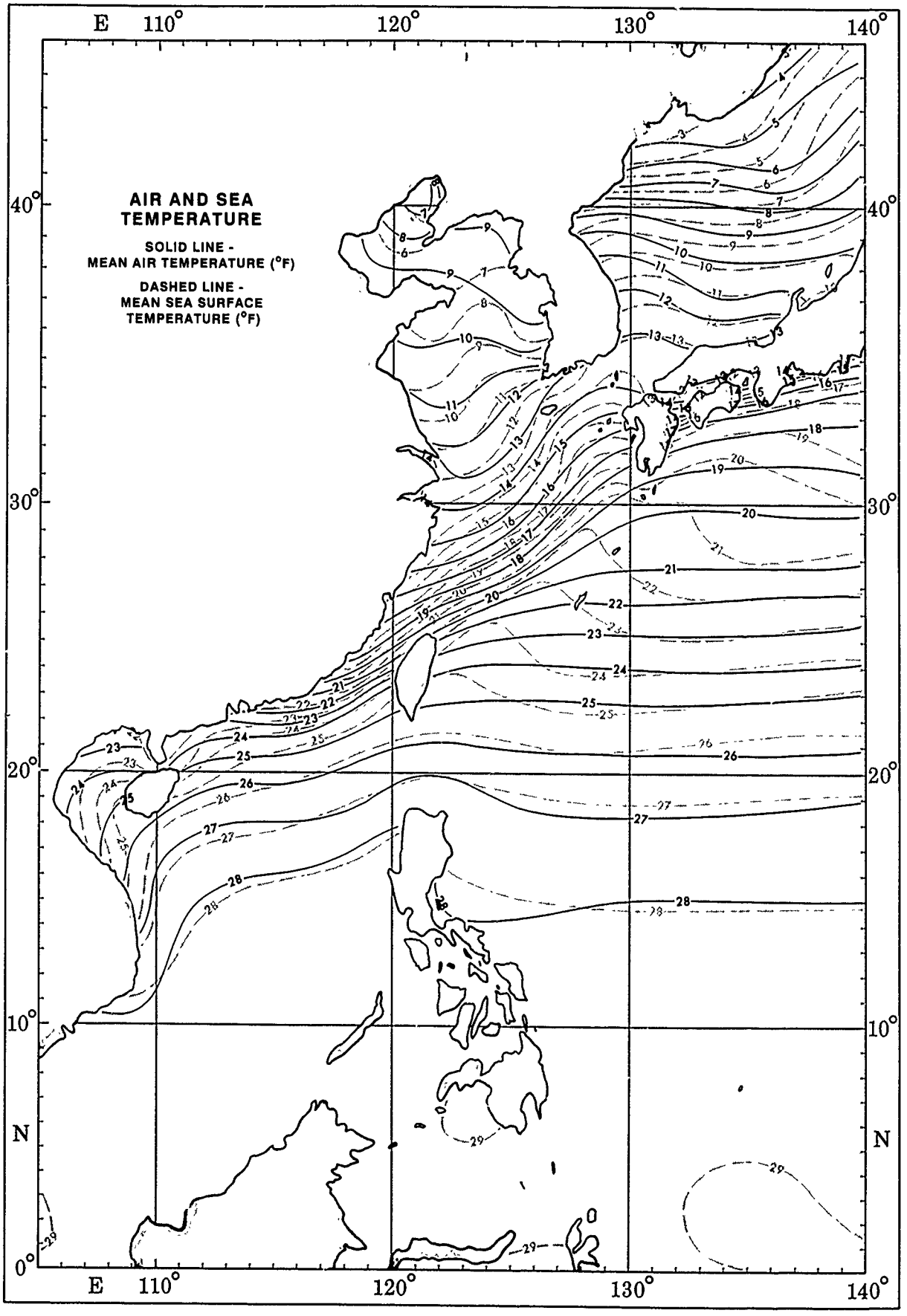
April

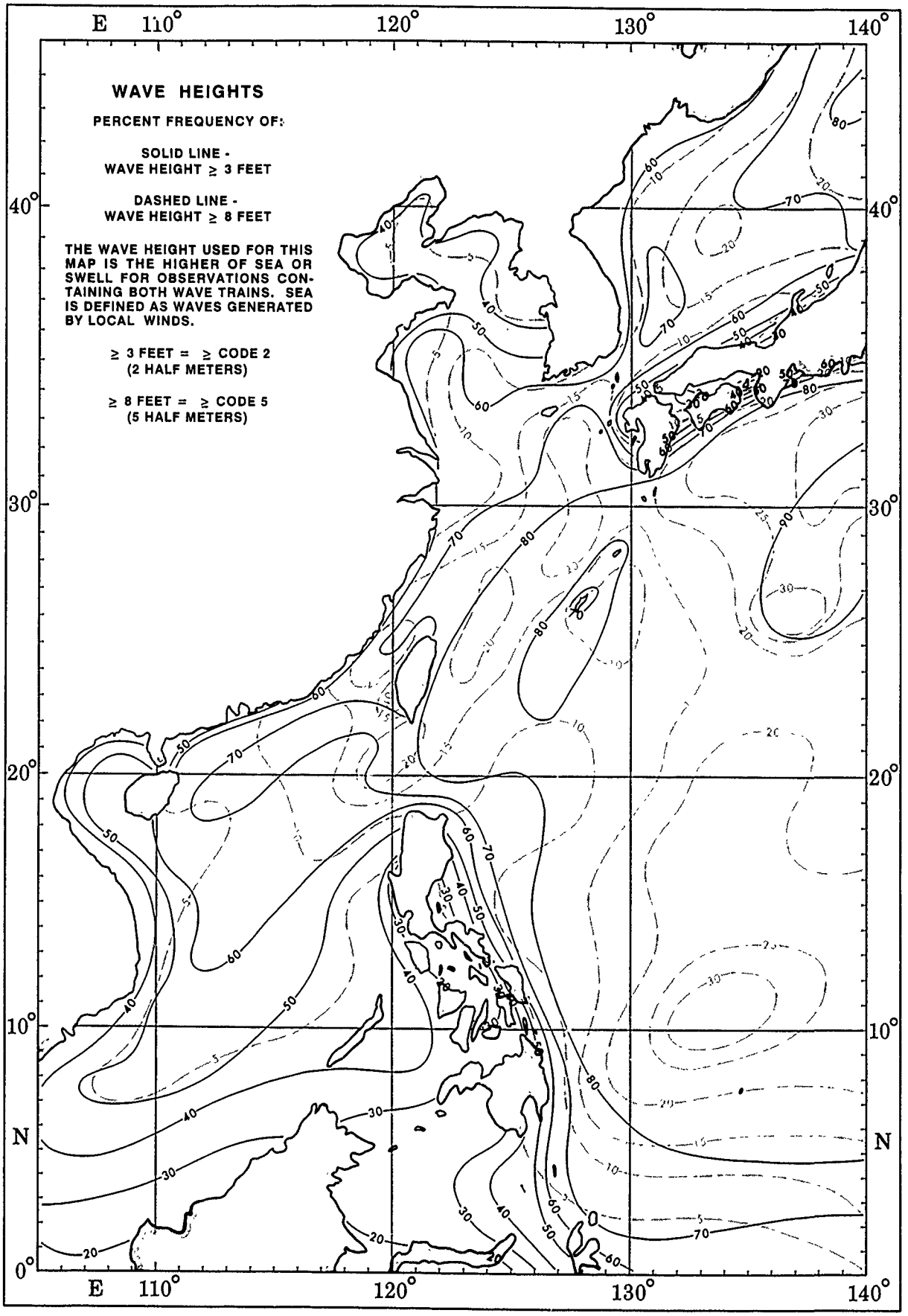
Surface Wind Roses

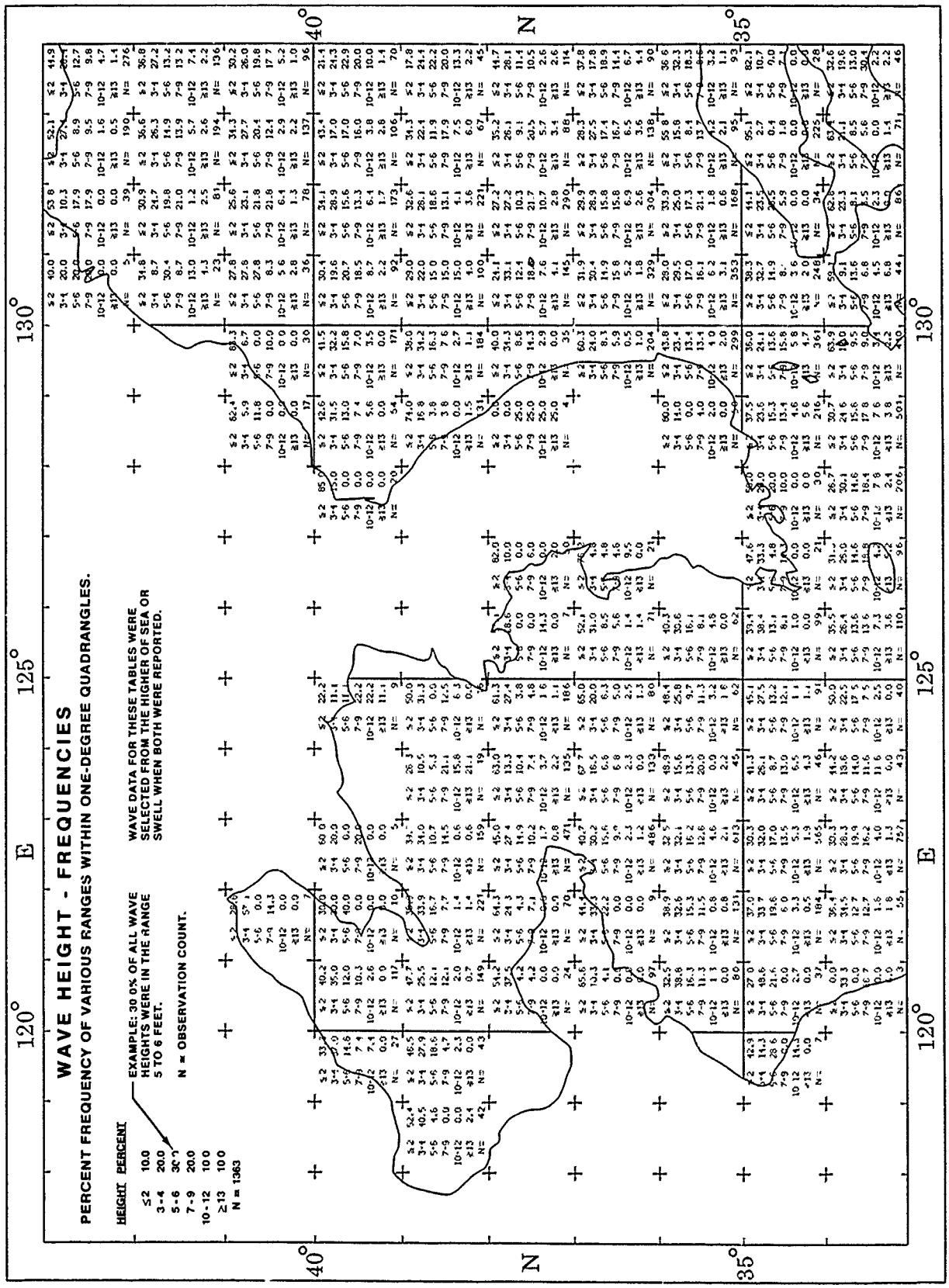


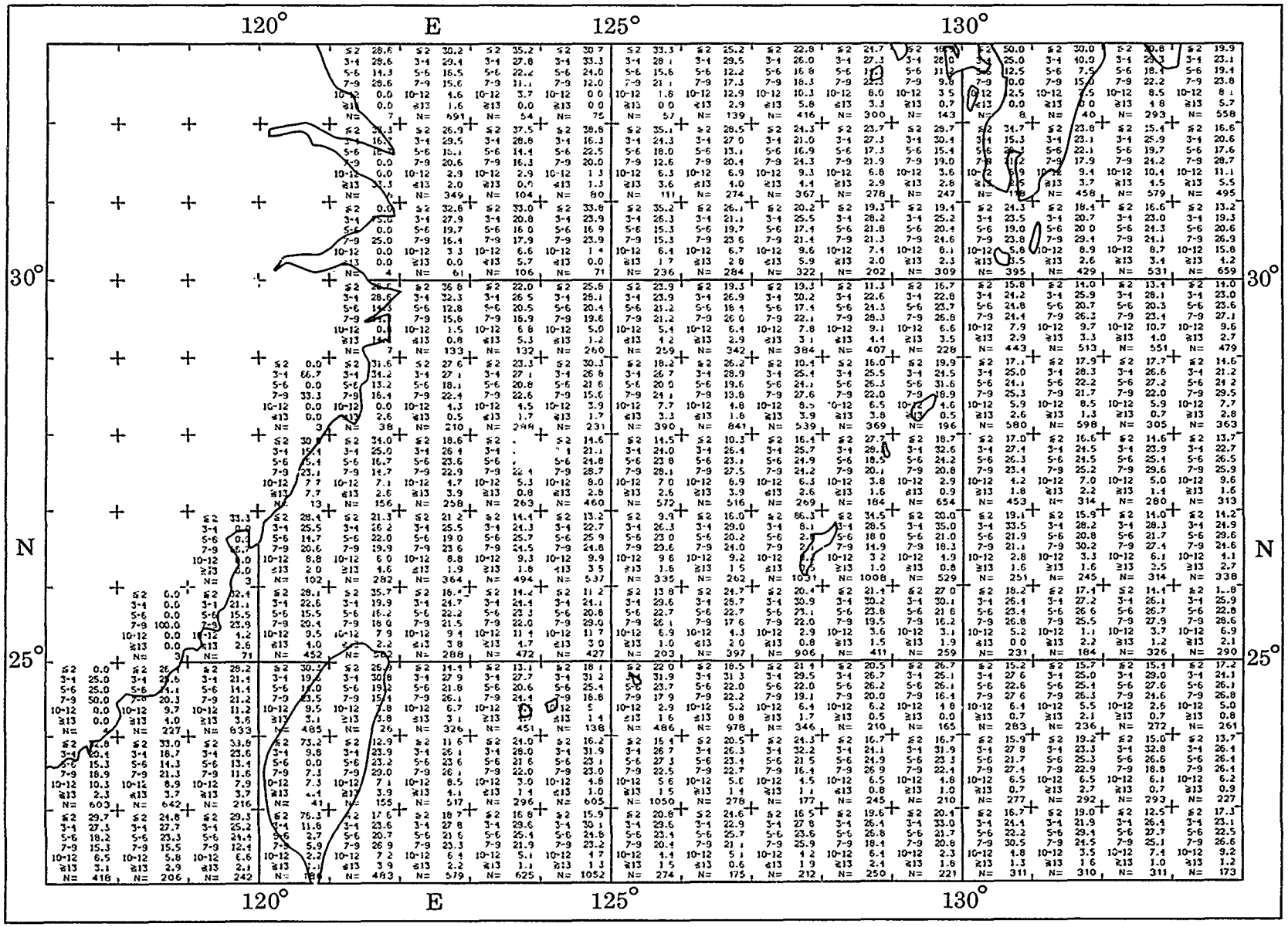

SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR: MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
25% OF ALL WINDS WERE FROM NORTH.
PERCENT OF CALMS.
MEAN SCALAR SPEED.
OBSERVATION COUNT.
285/71
110° E
115° E
120° E
105° E
25° N
20° N
15° N

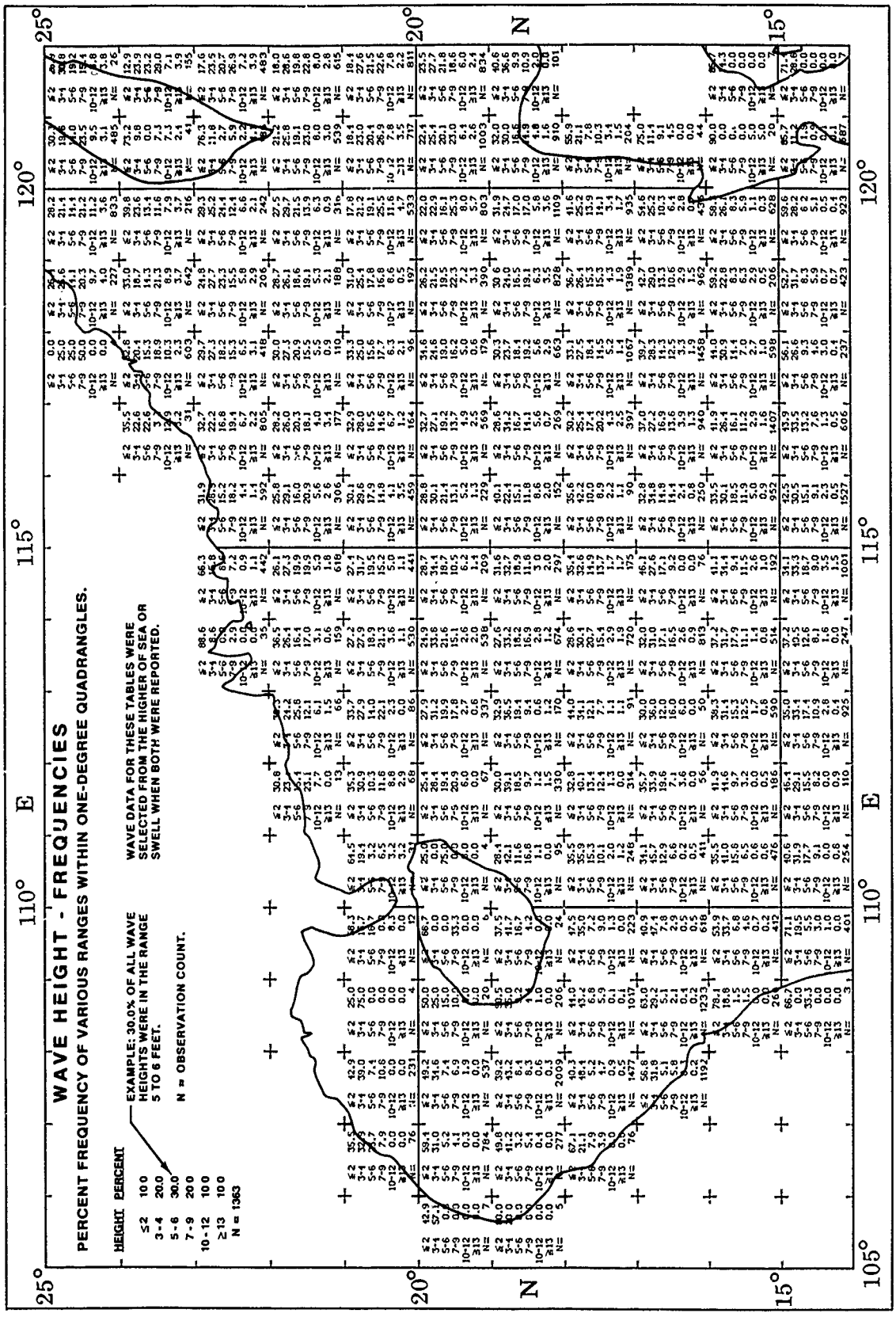

10° N
5° N
105° E
110° E
115° E
120° E


AIR AND SEA TEMPERATURE
SOLID LINE - MEAN AIR TEMPERATURE (°F)
DASHED LINE - MEAN SEA SURFACE TEMPERATURE (°F)
E 110°
120°
130°
140°
40°
30°
20°
10°
N
0°


WAVE HEIGHTS
PERCENT FREQUENCY OF:
SOLID LINE -
WAVE HEIGHT ≥ 3 FEET
DASHED LINE -
WAVE HEIGHT ≥ 8 FEET
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)
E 110°
120°
130°
140°
40°
30°
20°
10°
N
0°

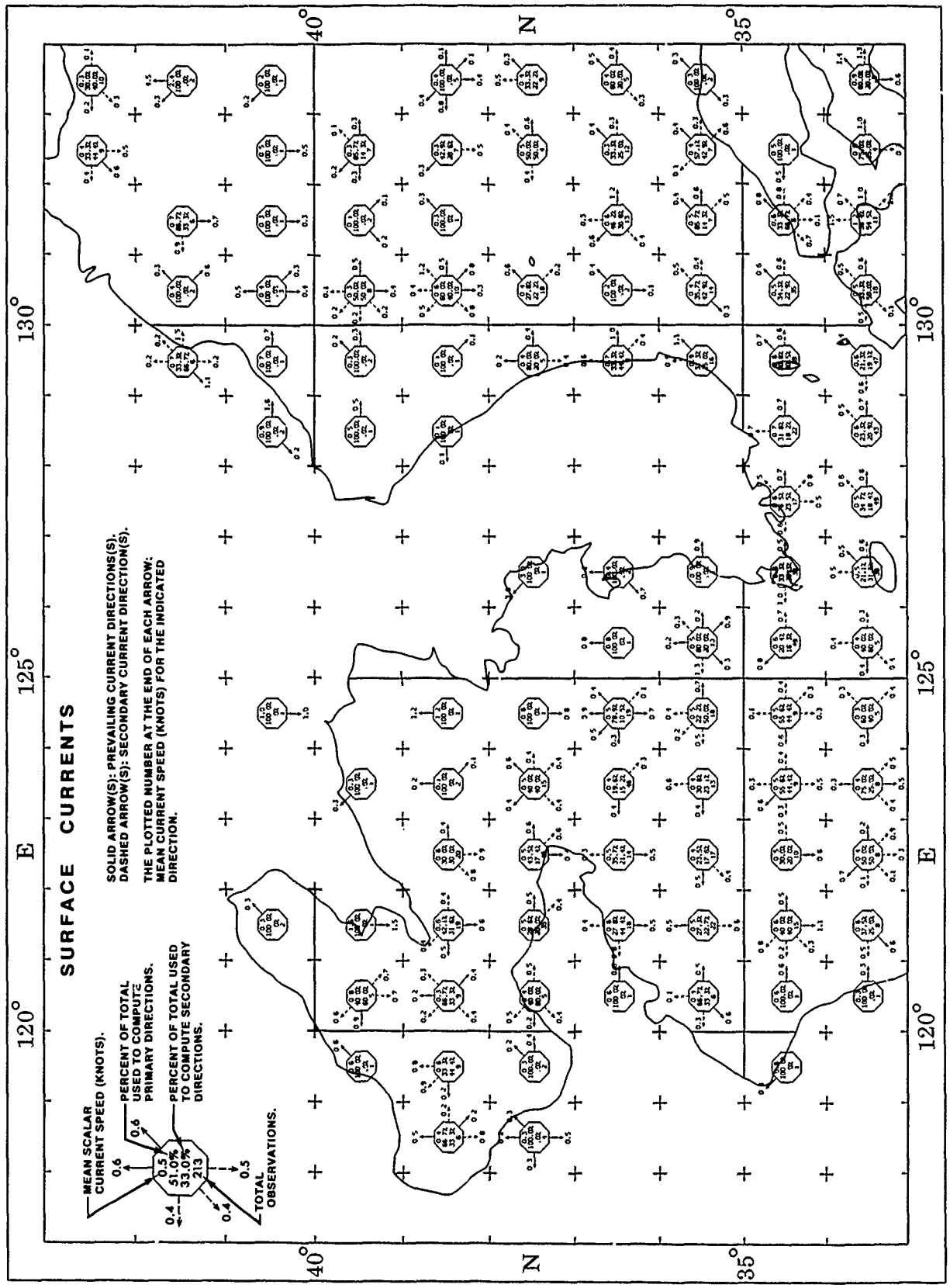

WAVE HEIGHT - FREQUENCIES
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
EXAMPLE: 30.0% OF ALL WAVE HEIGHTS WERE IN THE RANGE 5 TO 6 FEET.
N = OBSERVATION COUNT.
WAVE DATA FOR THESE TABLES WERE SELECTED FROM THE HIGHER OF SEA OR SWELL WHEN BOTH WERE REPORTED.
HEIGHT PERCENT
≤2 10.0
3-4 20.0
5-6 30.0
7-9 20.0
10-12 10.0
≥13 10.0
N = 1363
120°
125°
130°
40°
35°
N
E


120°
E
125°
130°
30°
N
25°


WAVE HEIGHT - FREQUENCIES
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
EXAMPLE: 30.0% OF ALL 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.
HEIGHT PERCENT
≤2 10.0
3-4 20.0
5-6 30.0
7-9 20.0
10-12 10.0
≥13 10.0
N = 1363
110° E
115° E
120° E
105° E
25° N
20° N
15° N

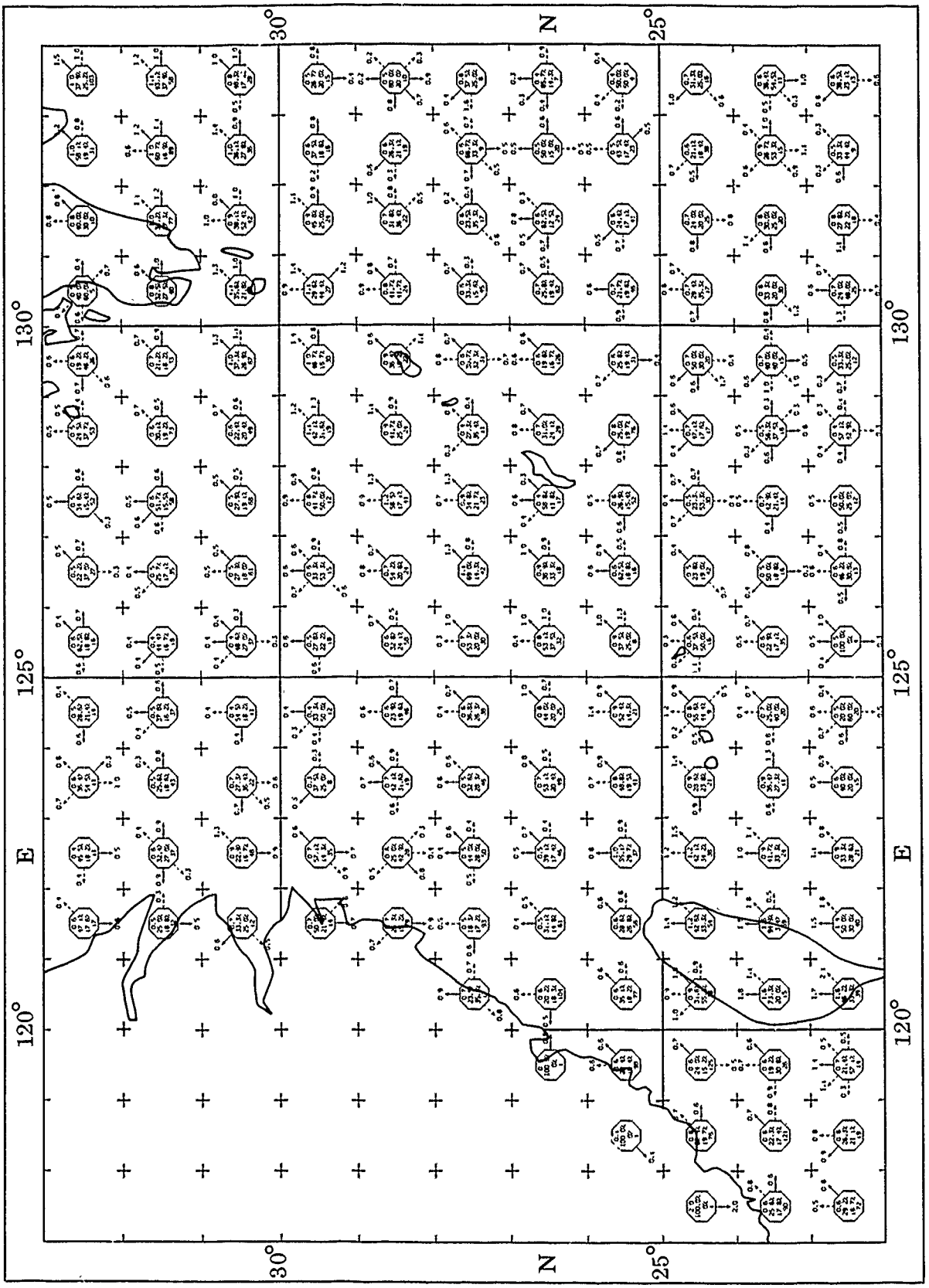
April

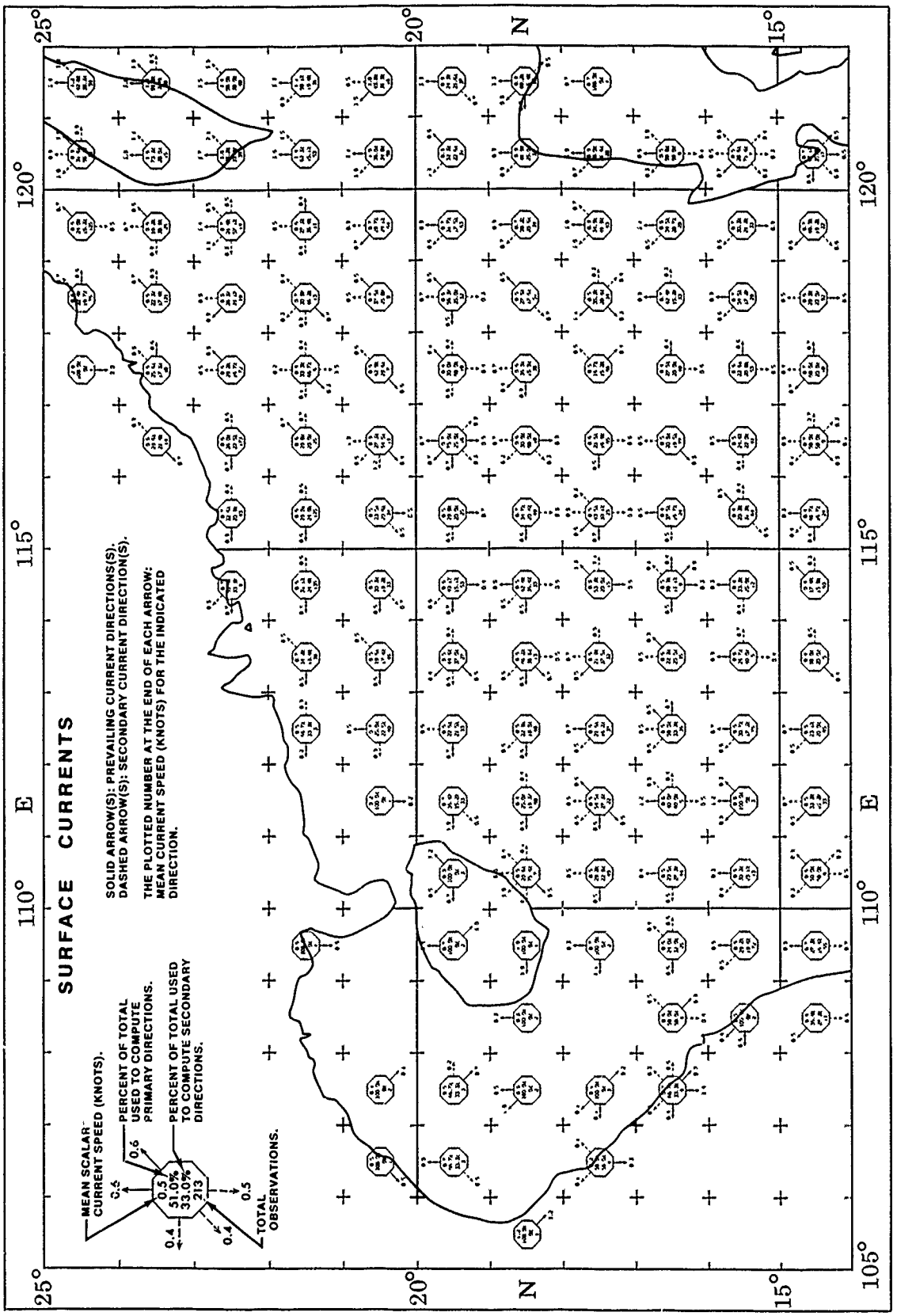
Wave Height

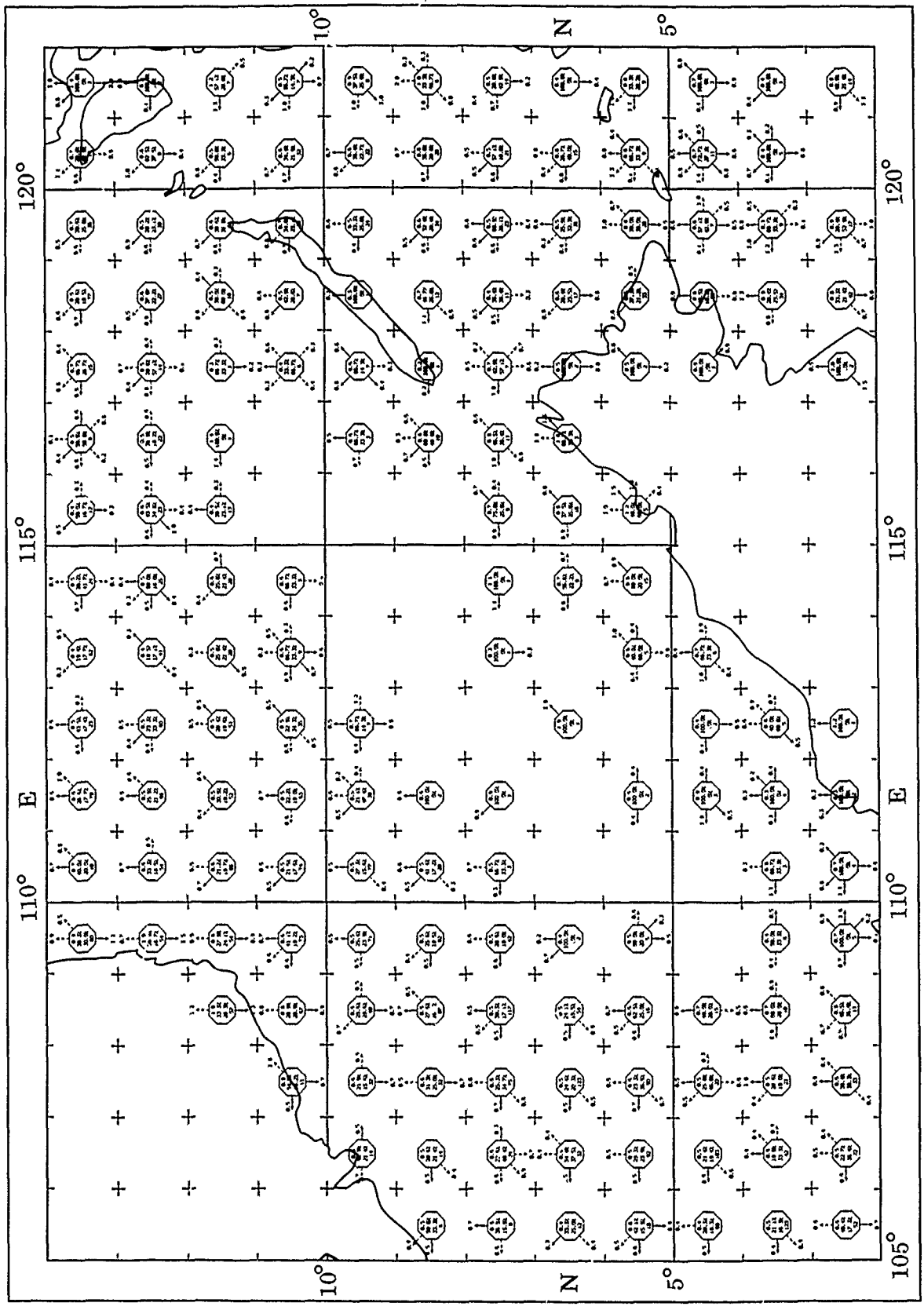

SURFACE CURRENTS
SOLID ARROW(S): PREVAILING CURRENT DIRECTIONS(S).
DASHED ARROW(S): SECONDARY CURRENT DIRECTION(S).
THE PLOTTED NUMBER AT THE END OF EACH ARROW:
MEAN CURRENT SPEED (KNOTS) FOR THE INDICATED DIRECTION.
MEAN SCALAR CURRENT SPEED (KNOTS).
PERCENT OF TOTAL USED TO COMPUTE PRIMARY DIRECTIONS.
PERCENT OF TOTAL USED TO COMPUTE SECONDARY DIRECTIONS.
TOTAL OBSERVATIONS.
0.6
0.5
51.0%
33.0%
213
0.4
0.5
120° E
125° E
130° E
40° N
35° N

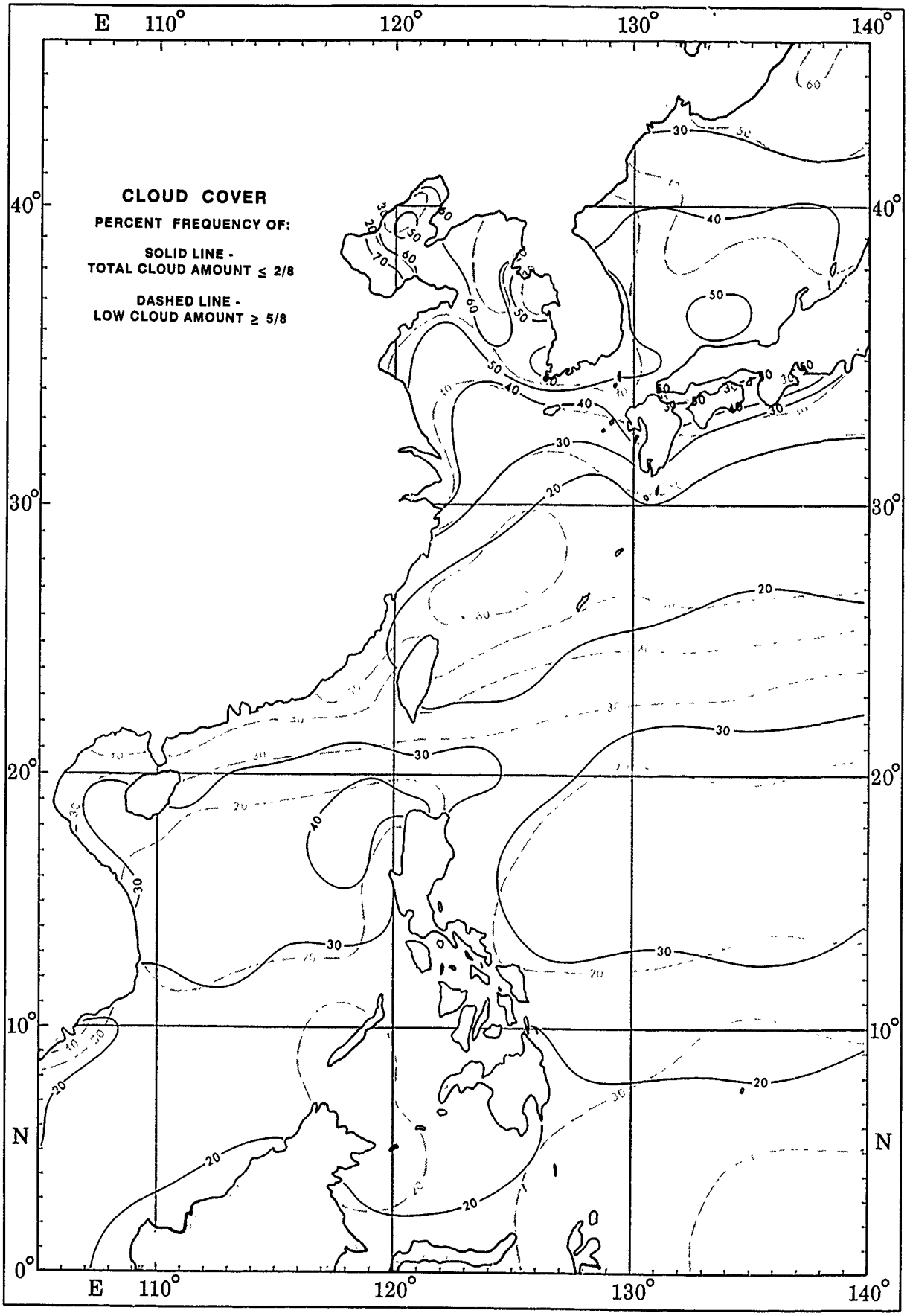
April

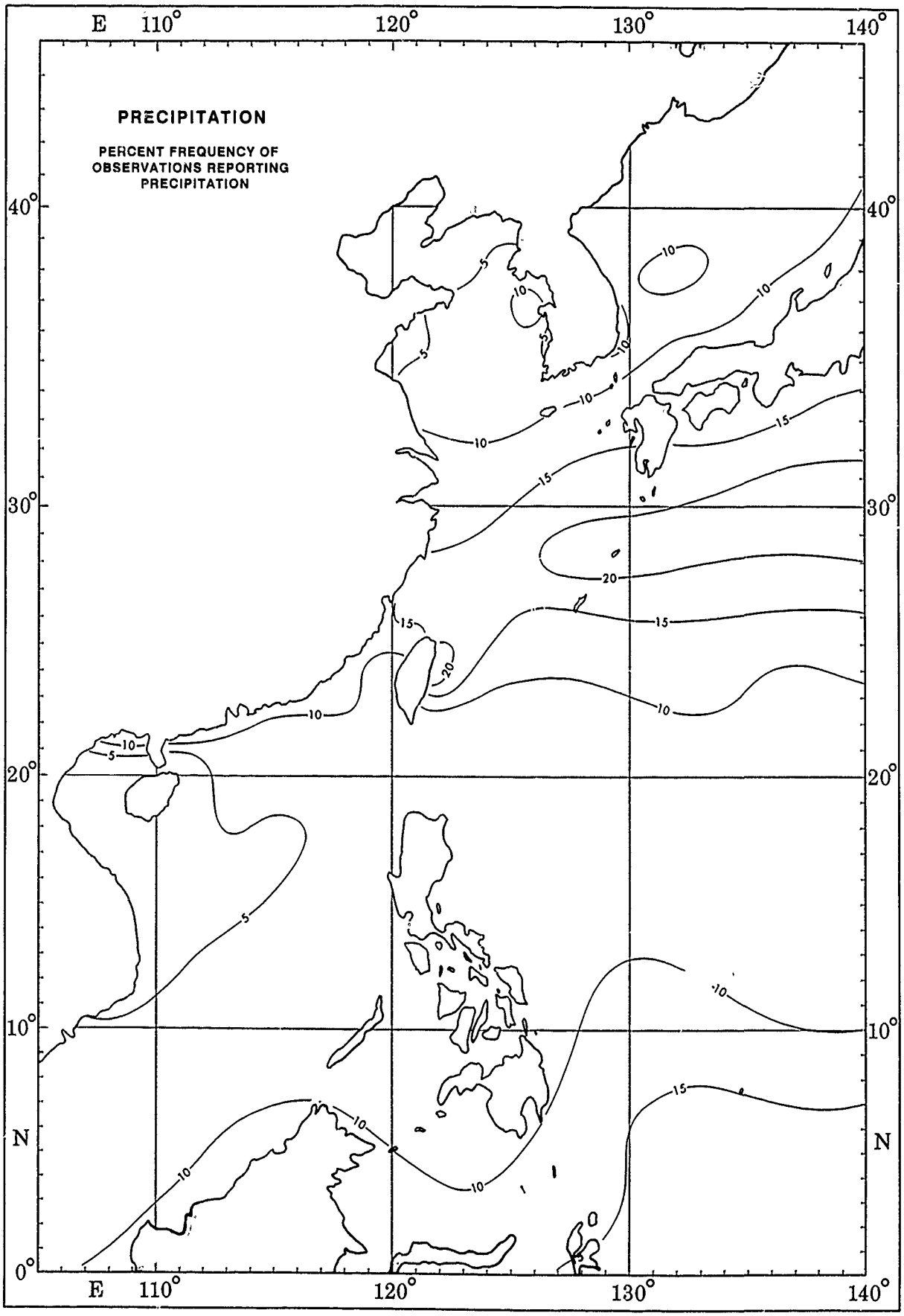
Surface Currents

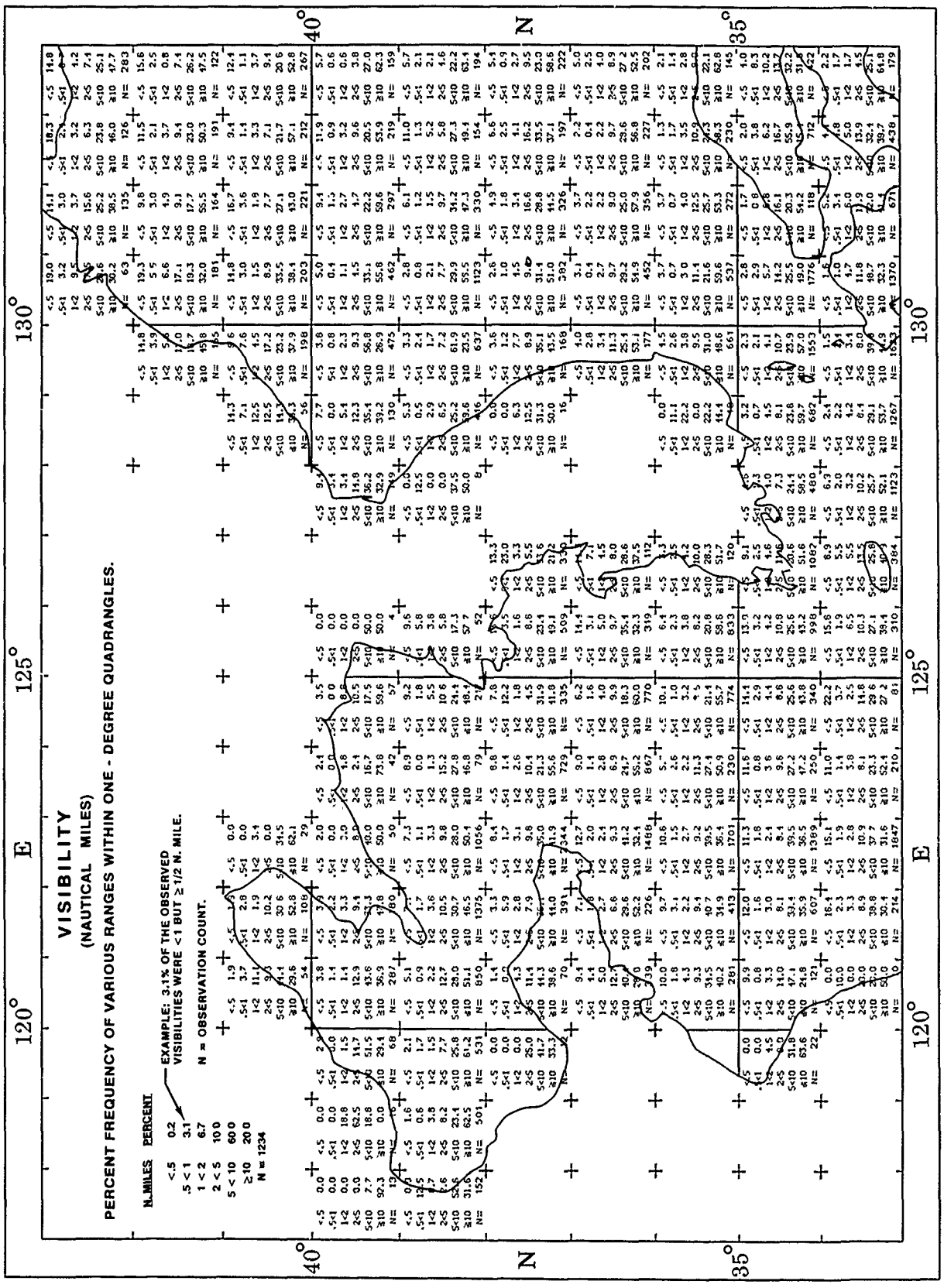


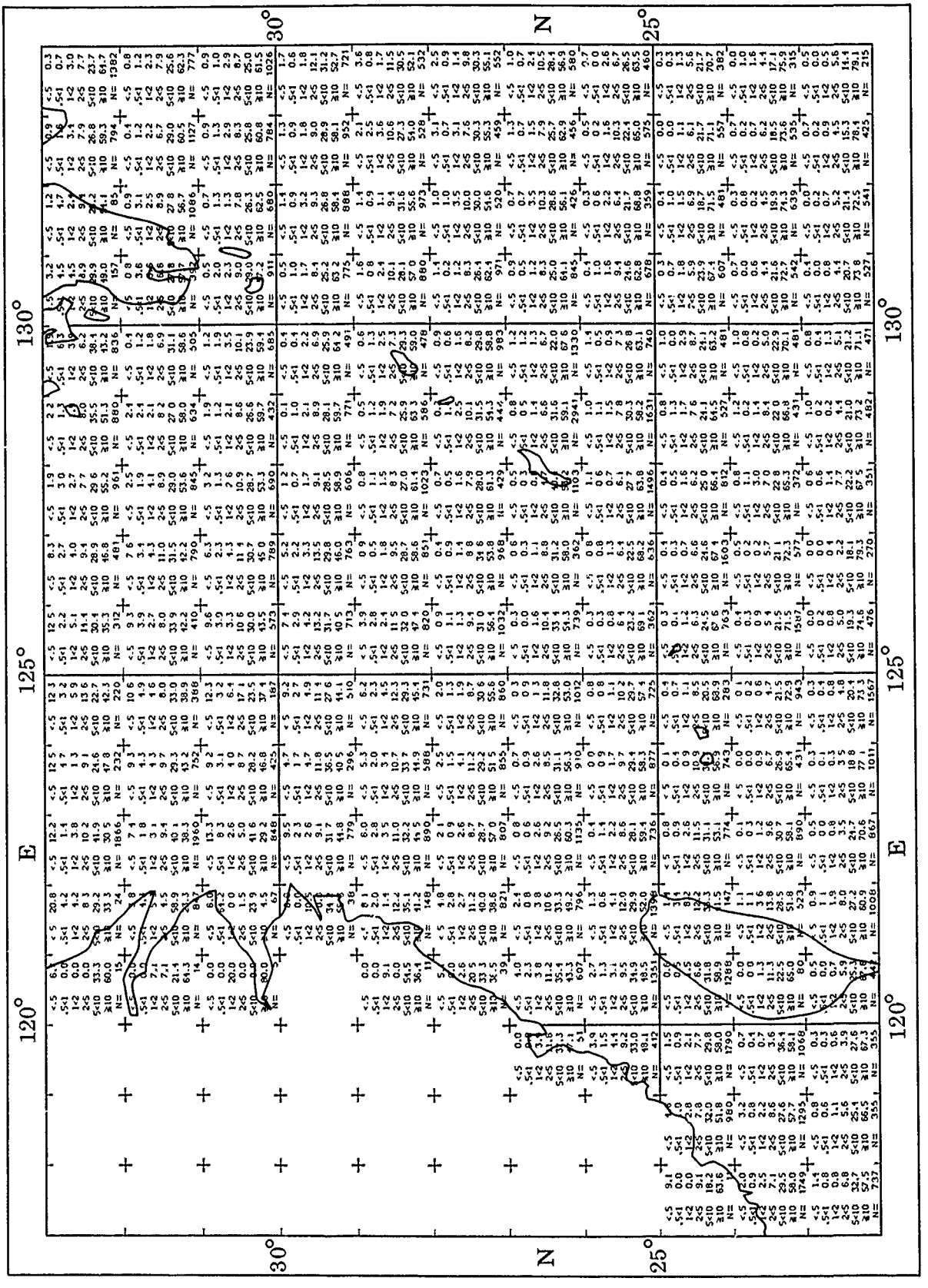

SURFACE CURRENTS
SOLID ARROW(S): PREVAILING CURRENT DIRECTIONS(S).
DASHED ARROW(S): SECONDARY CURRENT DIRECTION(S).
THE PLOTTED NUMBER AT THE END OF EACH ARROW:
MEAN CURRENT SPEED (KNOTS) FOR THE INDICATED
DIRECTION.
MEAN SCALAR CURRENT SPEED (KNOTS).
PERCENT OF TOTAL USED TO COMPUTE PRIMARY DIRECTIONS.
PERCENT OF TOTAL USED TO COMPUTE SECONDARY DIRECTIONS.
TOTAL OBSERVATIONS.
0.6
0.5
51.0%
33.0%
213
0.4
0.4
0.5
25°
20°
15°
N
105°
110°
115°
120°
E

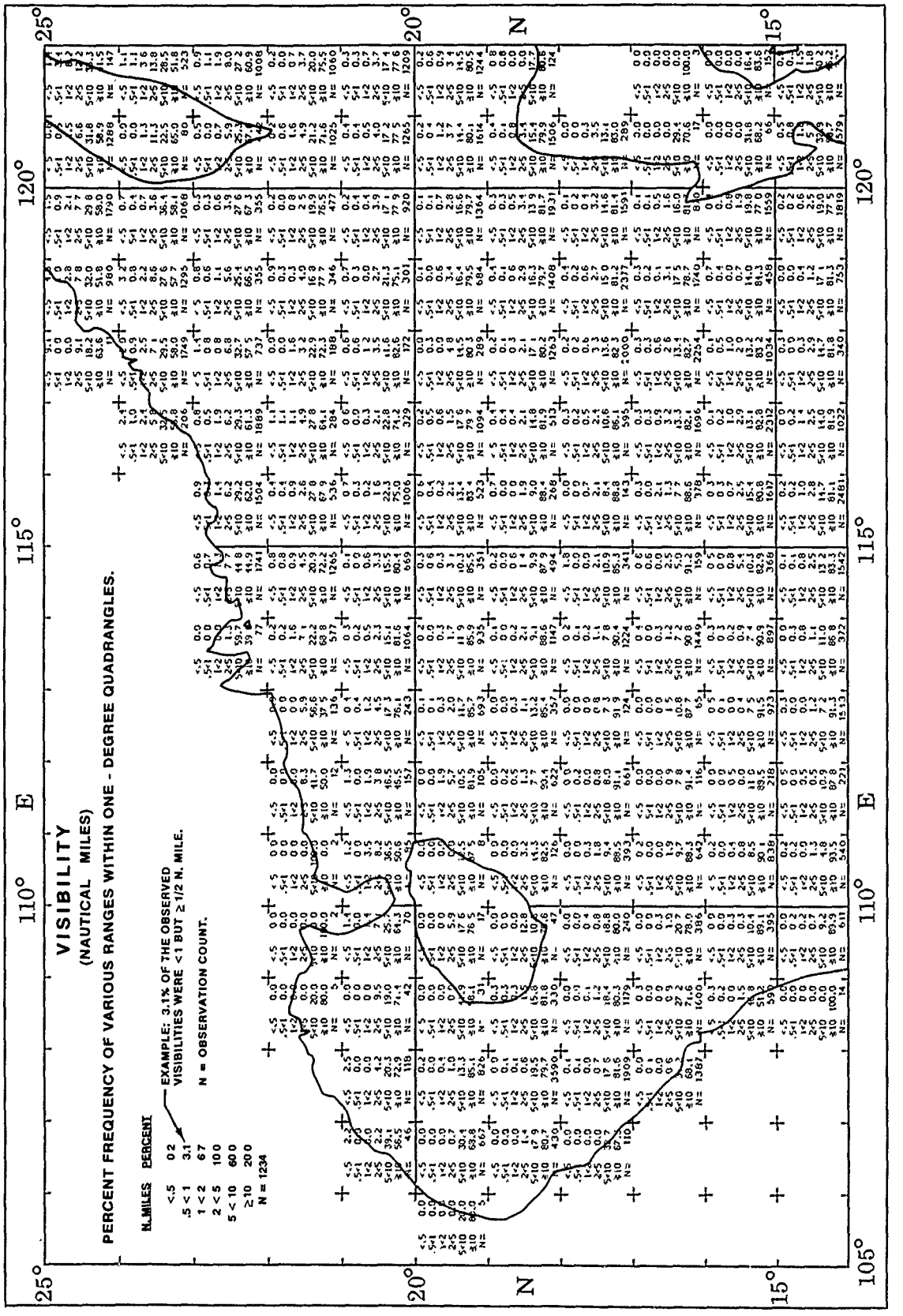

10° N
5°
120°
115°
110° E
105°

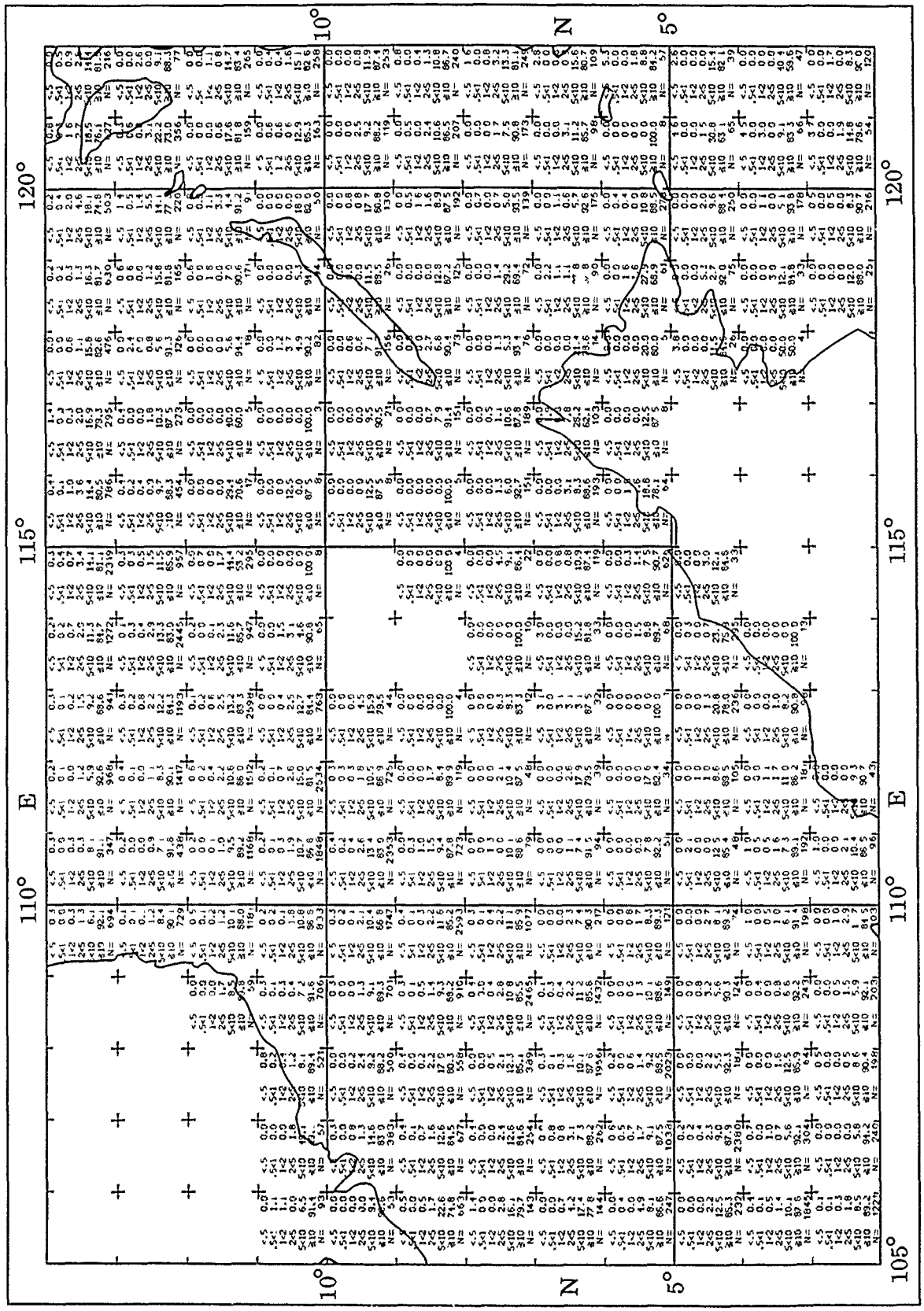

CLOUD COVER
PERCENT FREQUENCY OF:
SOLID LINE -
TOTAL CLOUD AMOUNT ≤ 2/8
DASHED LINE -
LOW CLOUD AMOUNT ≥ 5/8
E 110°
120°
130°
140°
40°
30°
20°
10°
N
0°


PRECIPITATION
PERCENT FREQUENCY OF OBSERVATIONS REPORTING PRECIPITATION
E 110° 120° 130° 140°
40°
30°
20°
10°
N
0°
5
10
15
20

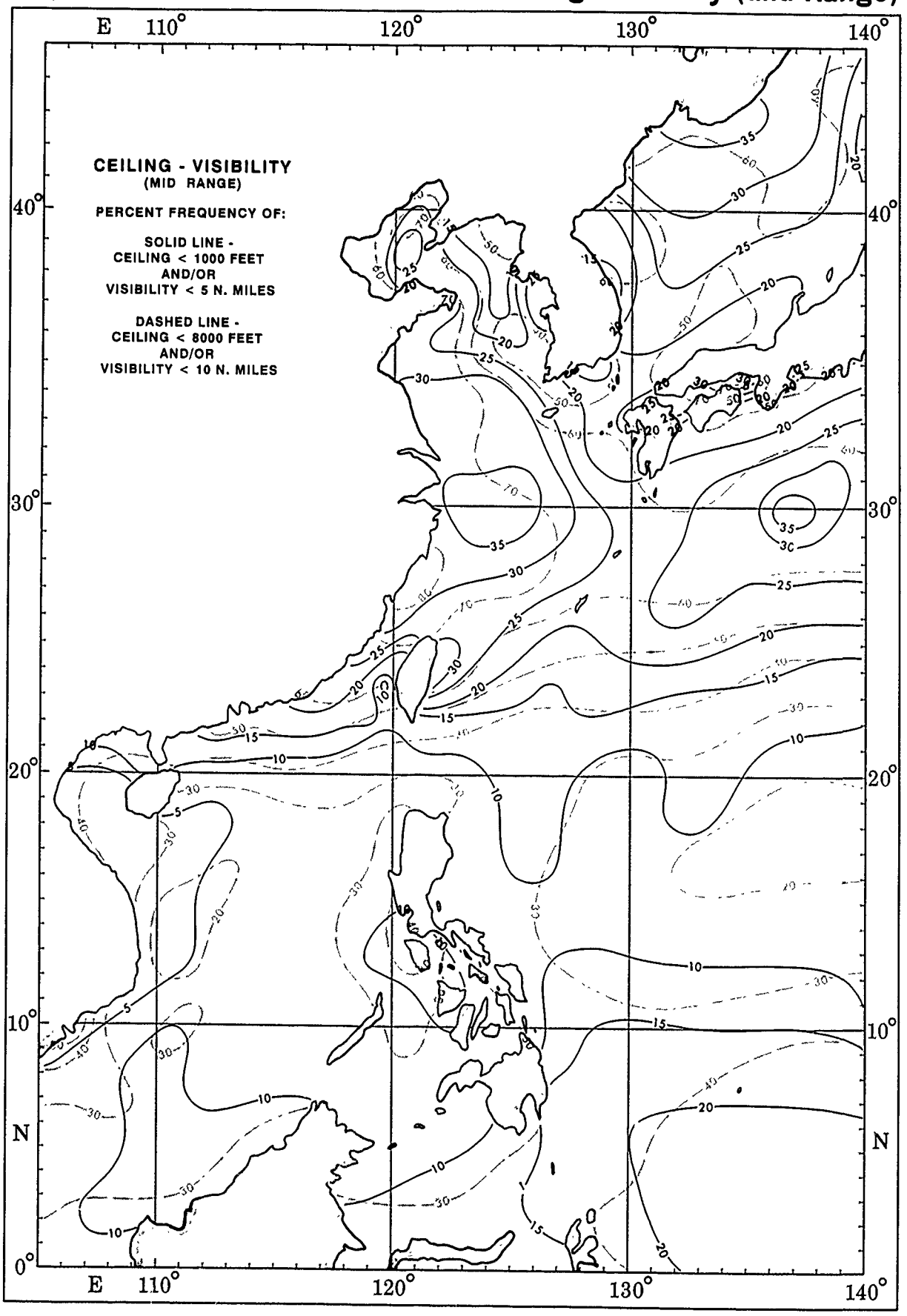

VISIBILITY
(NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE - DEGREE QUADRANGLES.
N_MILES PERCENT
<.5 0.2
.5 < 1 3.1
1 < 2 6.7
2 < 5 10.0
5 < 10 60.0
≥10 20.0
N = 1234
EXAMPLE: 3.1% OF THE OBSERVED VISIBILITIES WERE <1 BUT ≥1/2 N. MILE.
N = OBSERVATION COUNT.
120°
125°
130°
40°
35°
N
E


120°
125°
130°
30°
25°
N
E

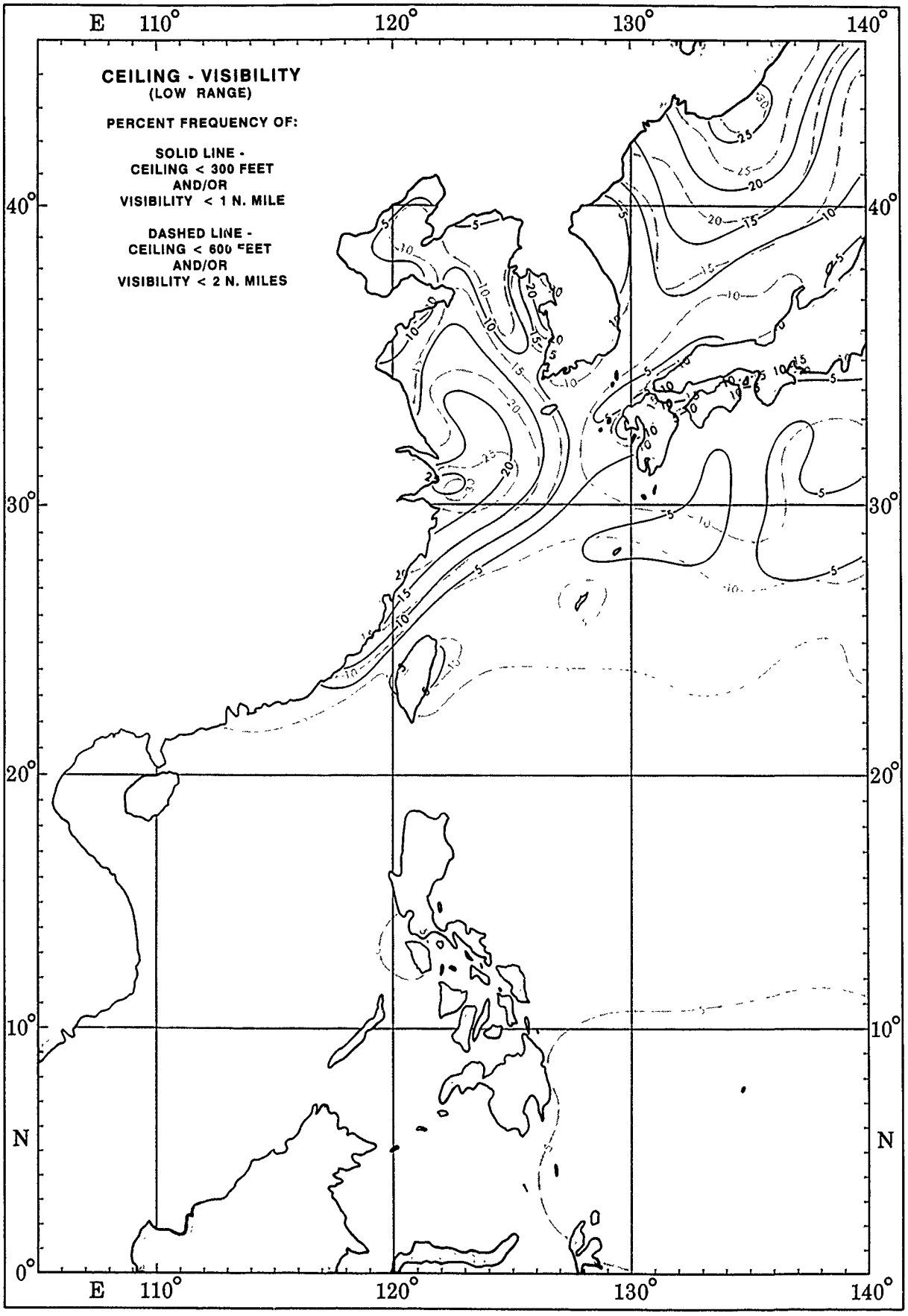

VISIBILITY
(NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE - DEGREE QUADRANGLES.
N. MILES PERCENT
<.5 0.2
.5 < 1 3.1
1 < 2 6.7
2 < 5 10.0
5 < 10 60.0
≥10 20.0
N = 1234
EXAMPLE: 3.1% OF THE OBSERVED VISIBILITIES WERE <1 BUT ≥ 1/2 N. MILE.
N = OBSERVATION COUNT.
25°
20°
15°
105°
110°
115°
120°
N
E

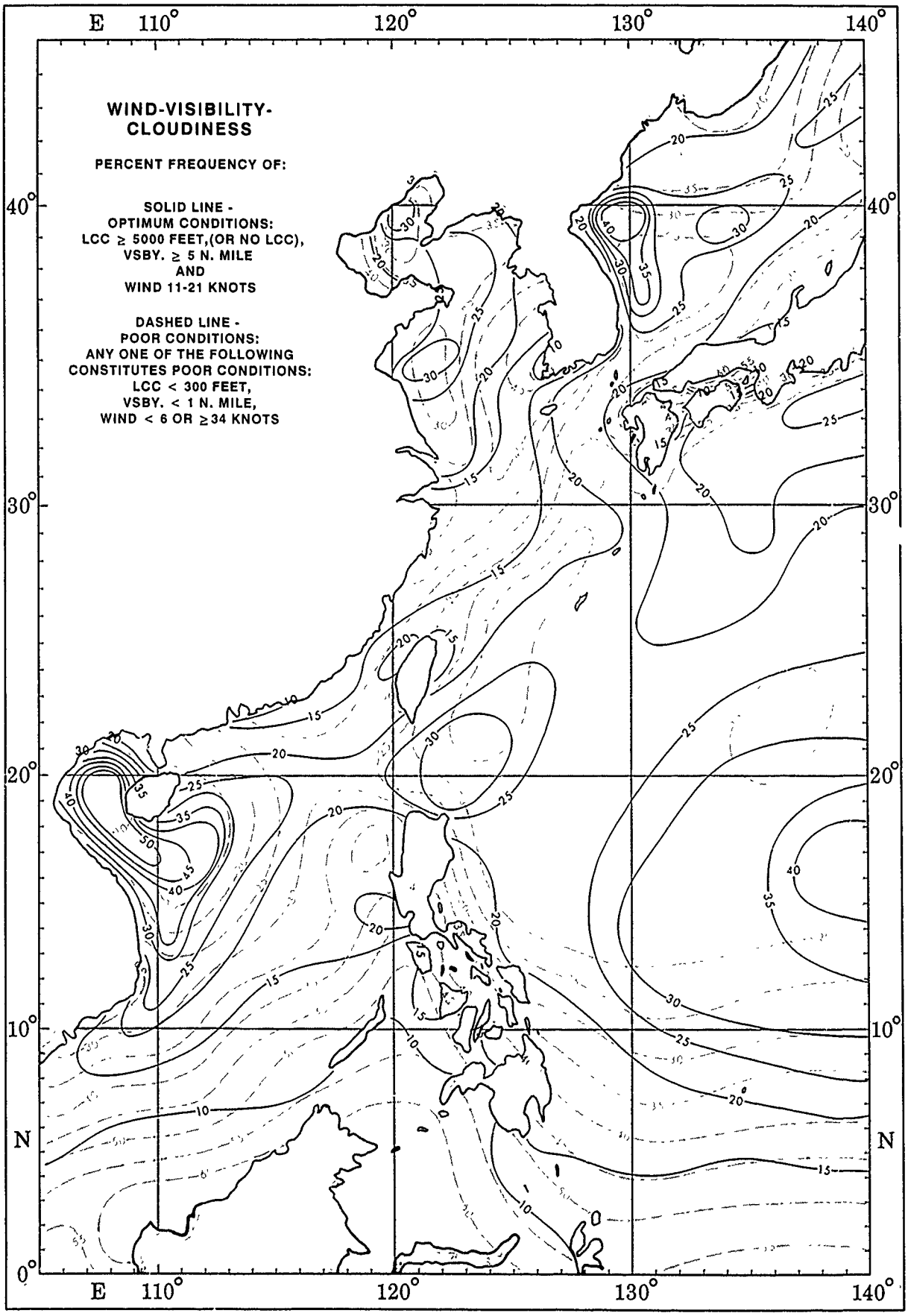

120°
115°
110°
105°
10°
5°
N
E

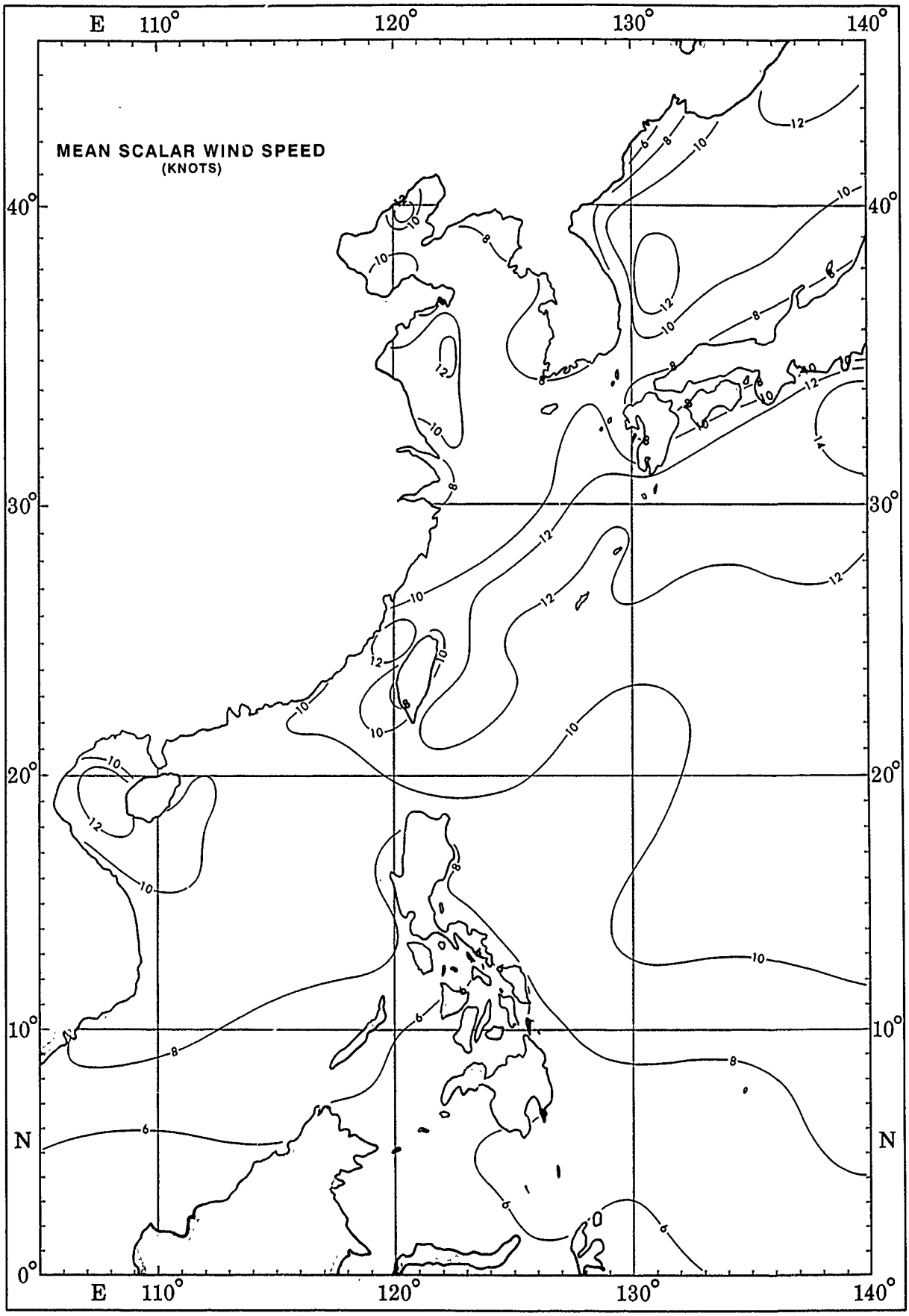
Ceiling - Visibility (Mid Range)



Ceiling - Visibility (Low Range)

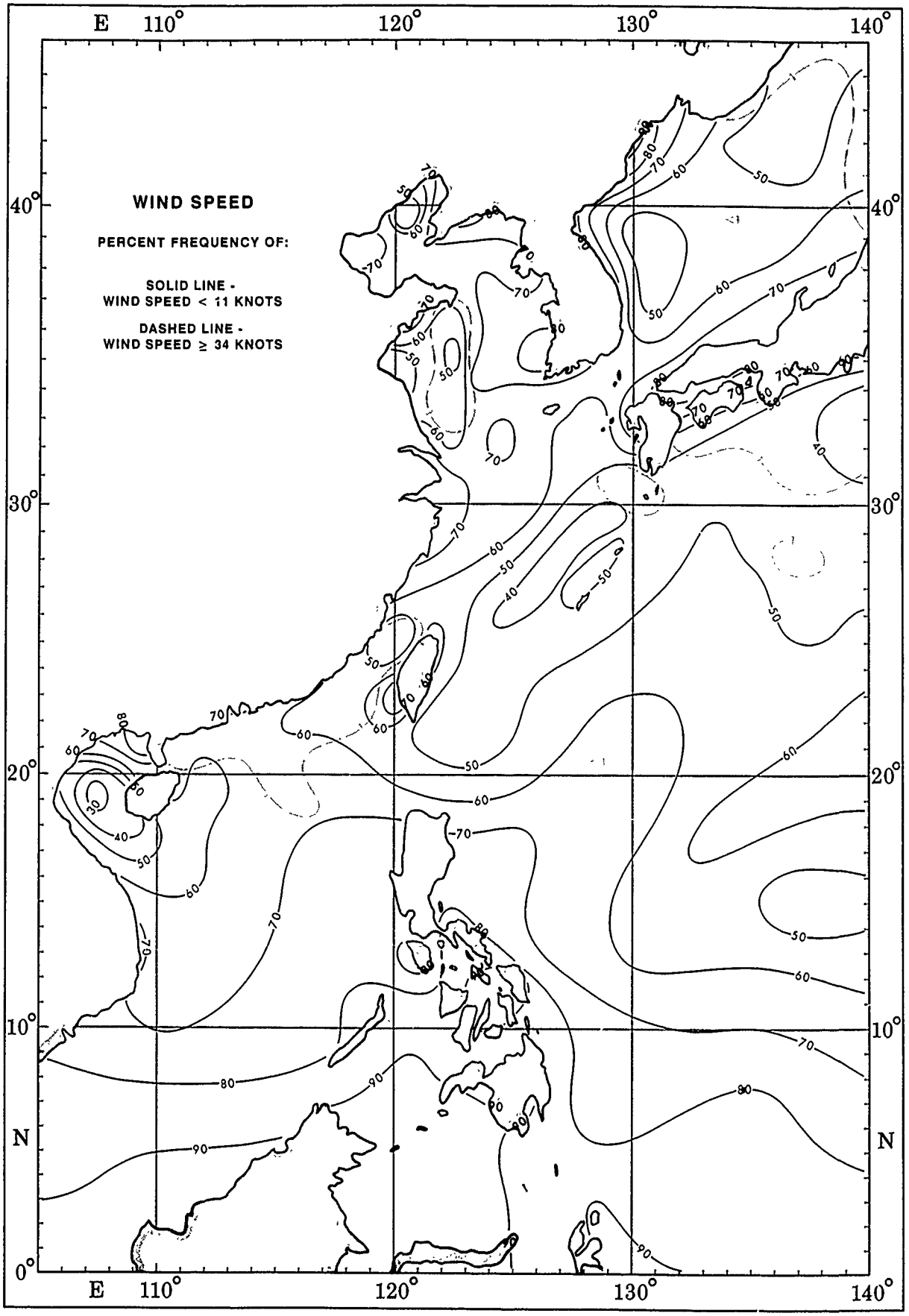



WIND-VISIBILITY-
CLOUDINESS
PERCENT FREQUENCY OF:
SOLID LINE -
OPTIMUM CONDITIONS:
LCC ≥ 5000 FEET,(OR NO LCC),
VSBY. ≥ 5 N. MILE
AND
WIND 11-21 KNOTS
DASHED LINE -
POOR CONDITIONS:
ANY ONE OF THE FOLLOWING
CONSTITUTES POOR CONDITIONS:
LCC < 300 FEET,
VSBY. < 1 N. MILE,
WIND < 6 OR ≥34 KNOTS
E 110° 120° 130° 140°
40°
30°
20°
10°
N
0°


MEAN SCALAR WIND SPEED
(KNOTS)
E 110°
120°
130°
140°
40°
30°
20°
10°
N
0°

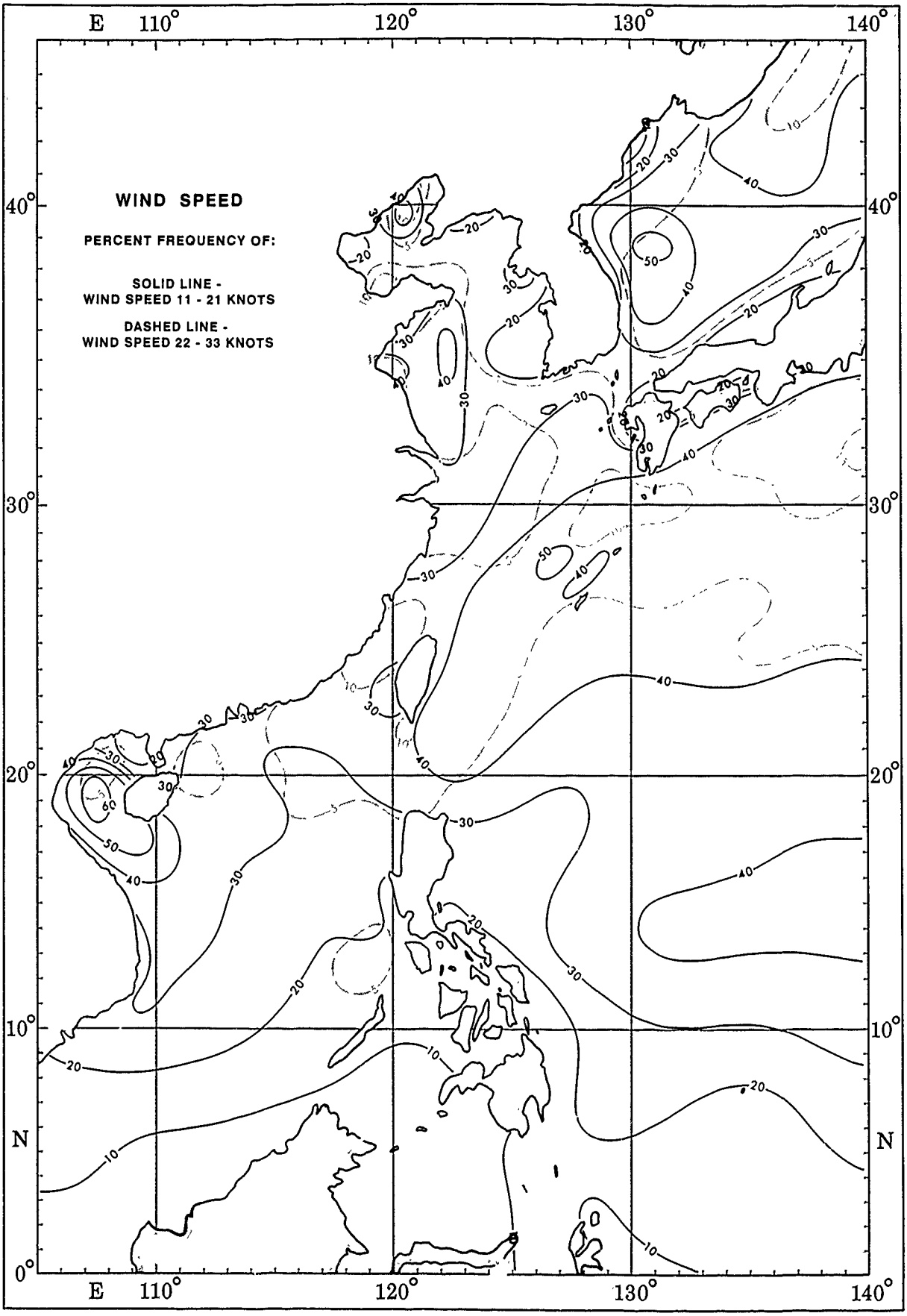
May

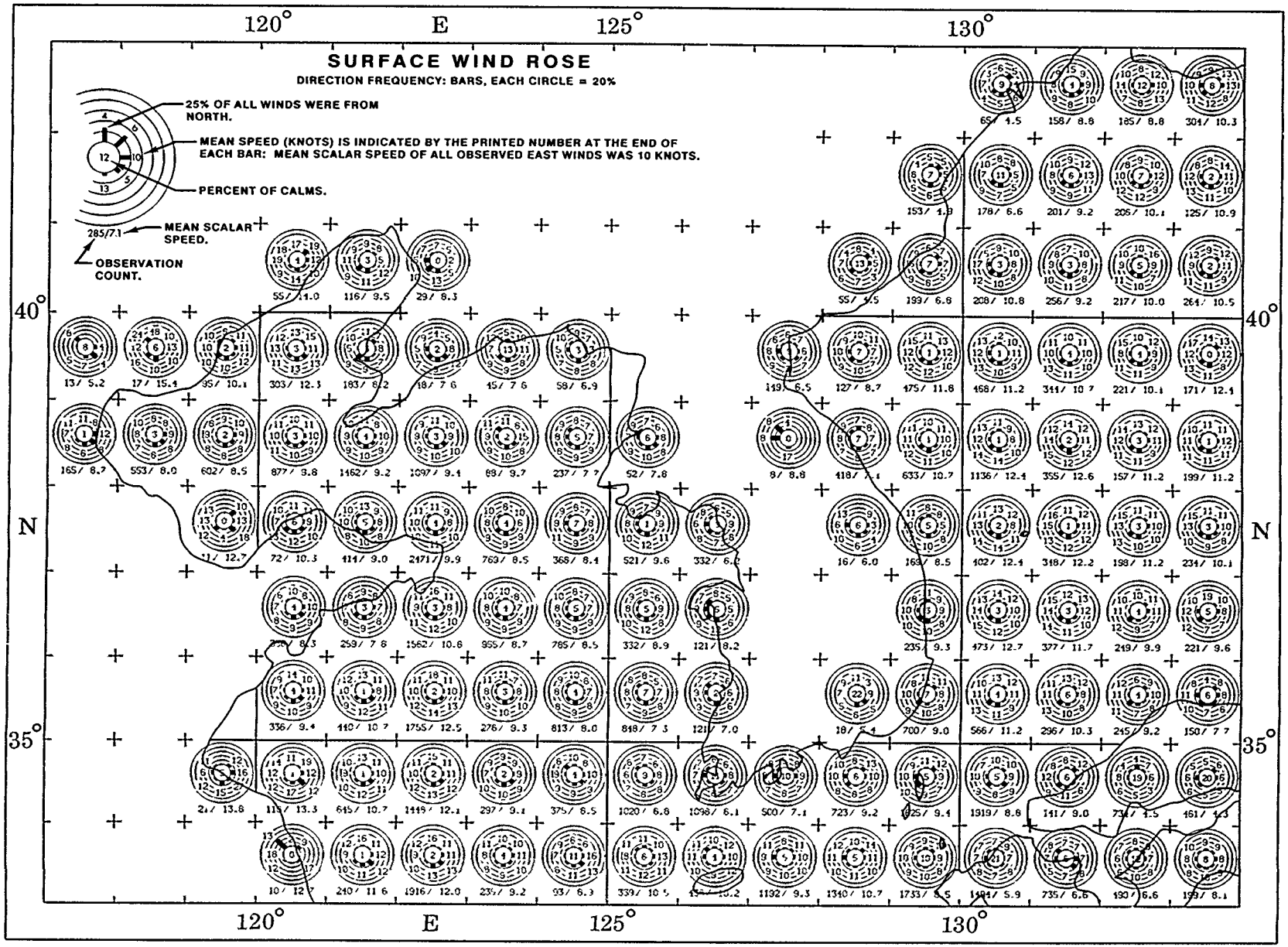
Wind Speed <11 and ≥34 Knots

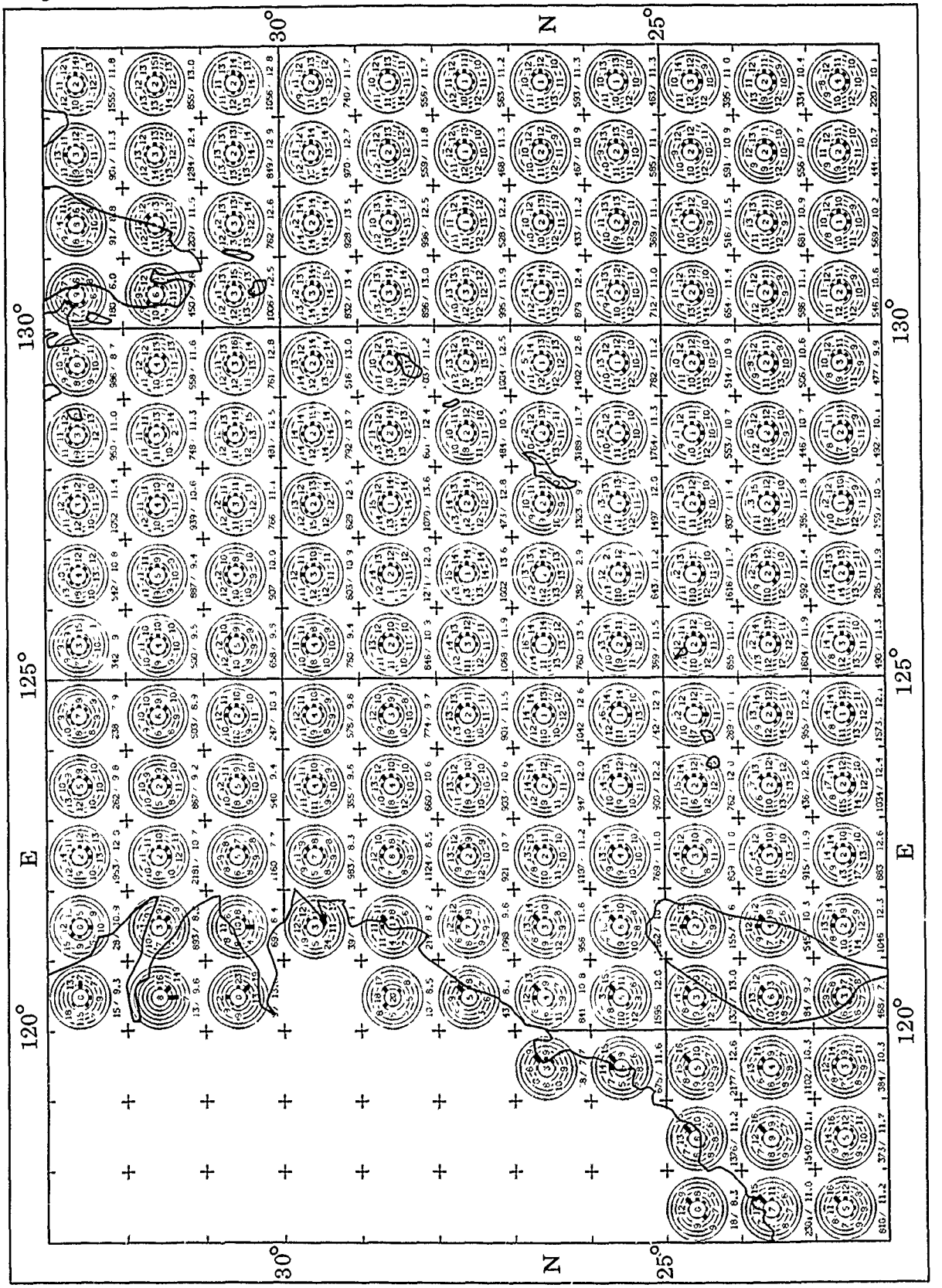


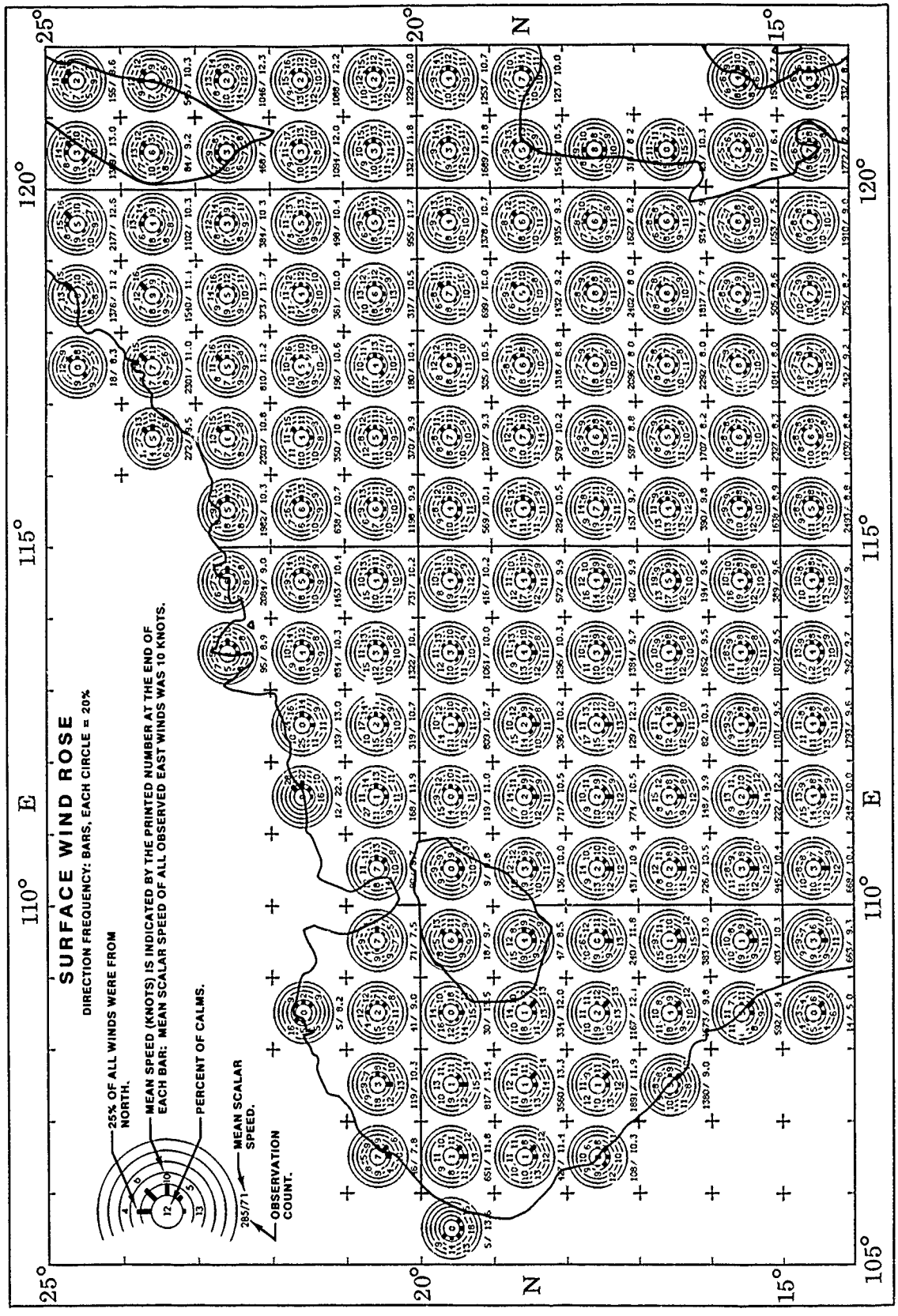
May

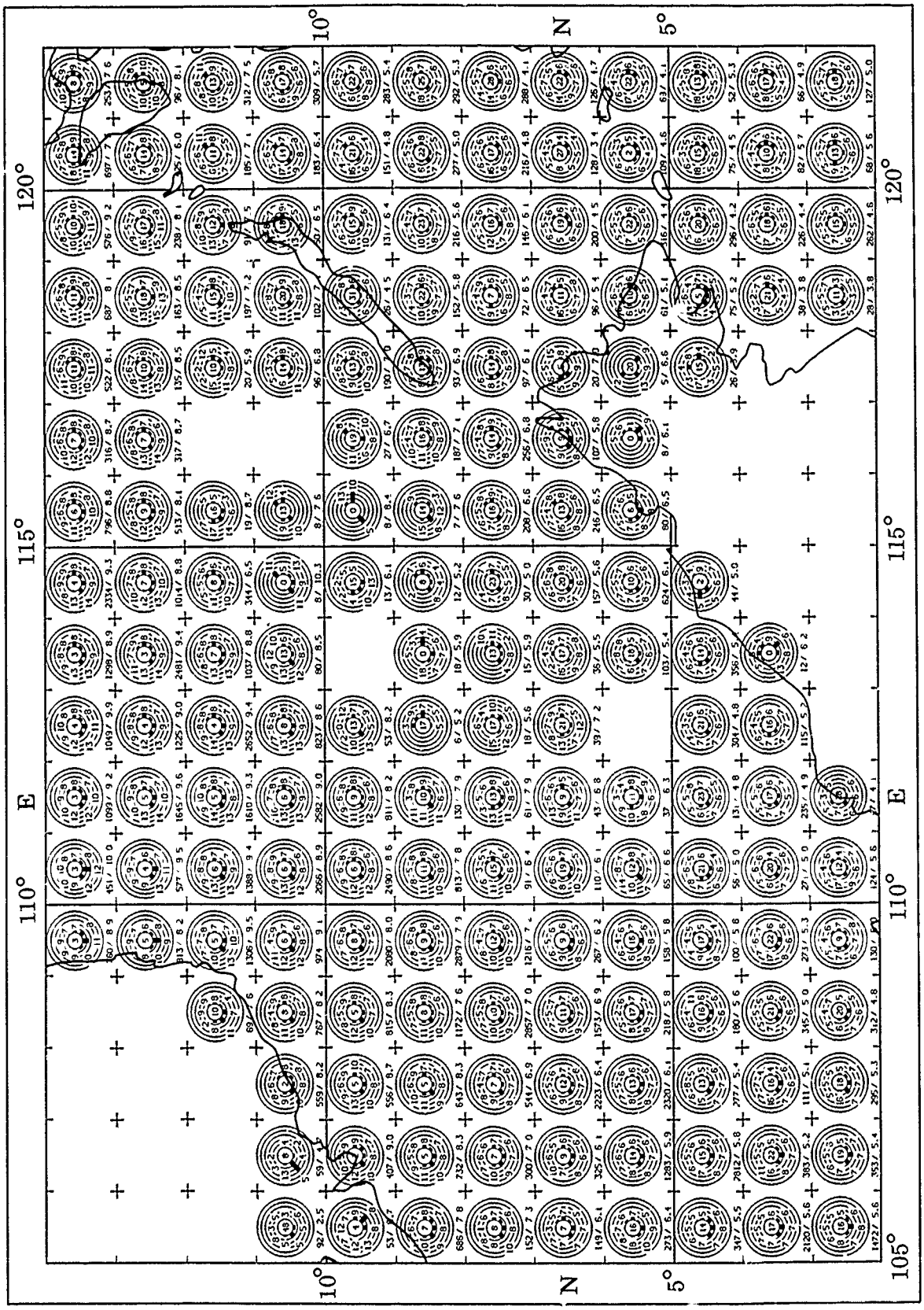
Wind Speed 11 - 21 and 22 - 33 Knots

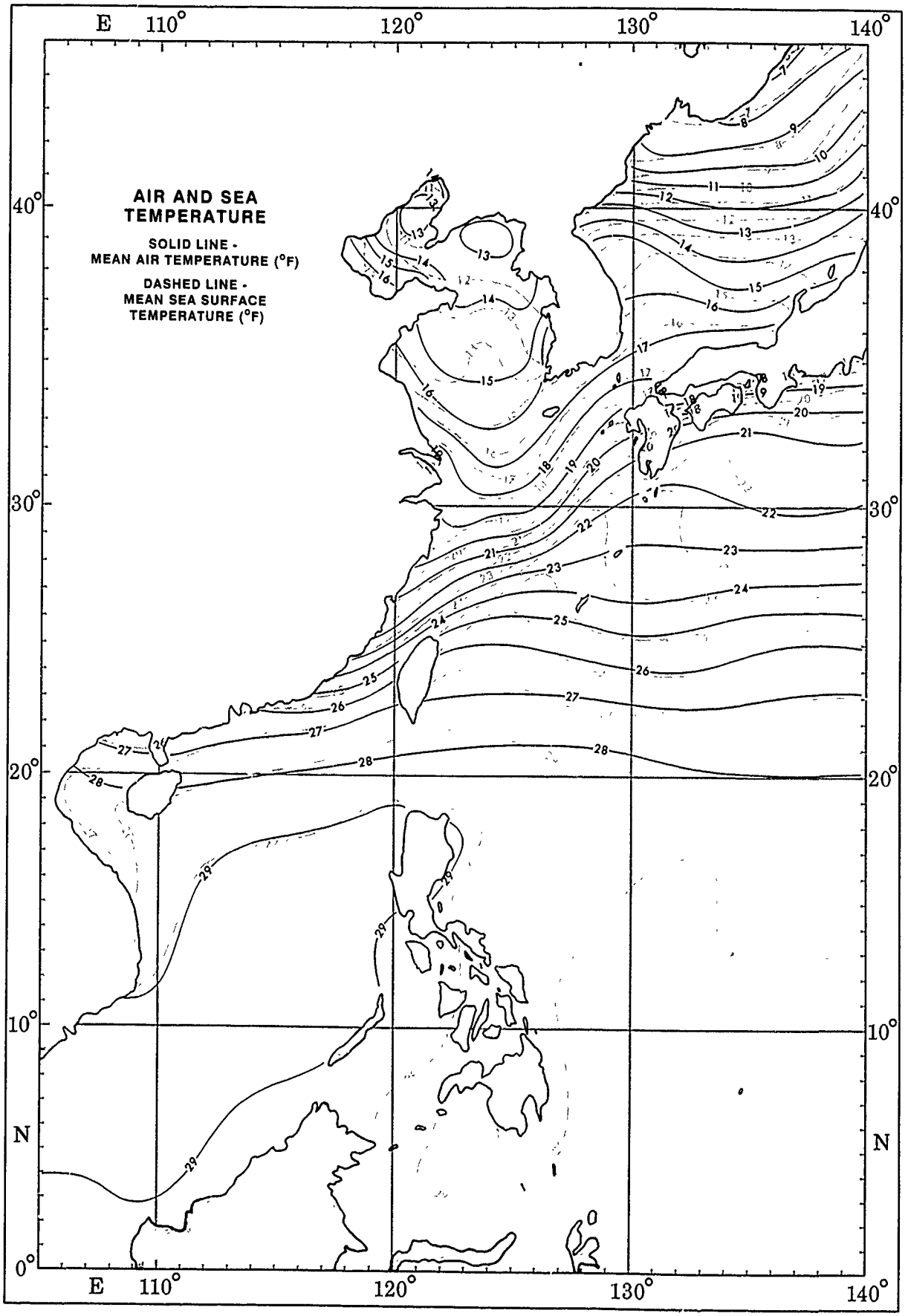


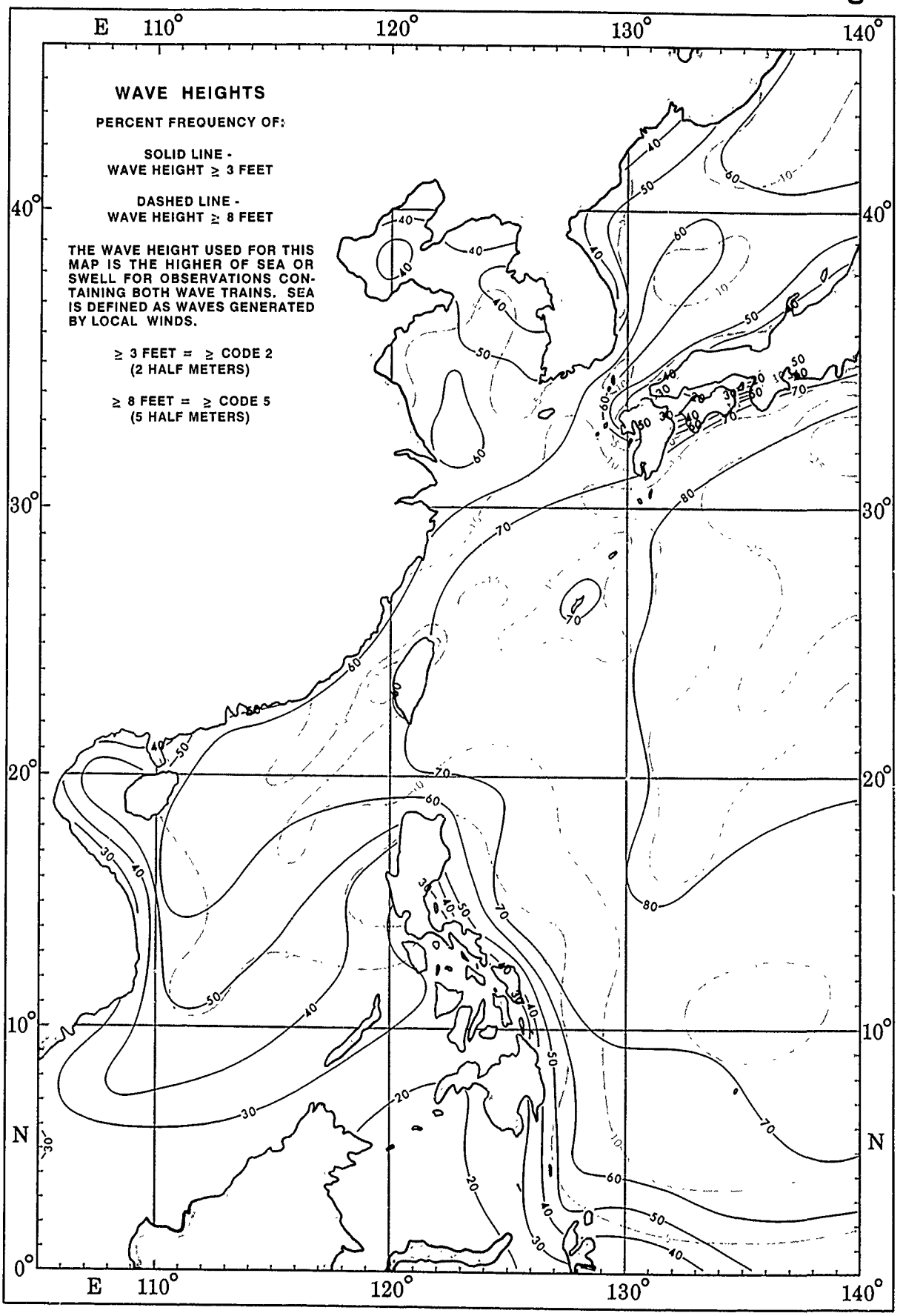

SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%
25% OF ALL WINDS WERE FROM NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR: MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
PERCENT OF CALMS.
285/7.1
MEAN SCALAR SPEED.
OBSERVATION COUNT.
120° E 125° 130°
40° N 35°

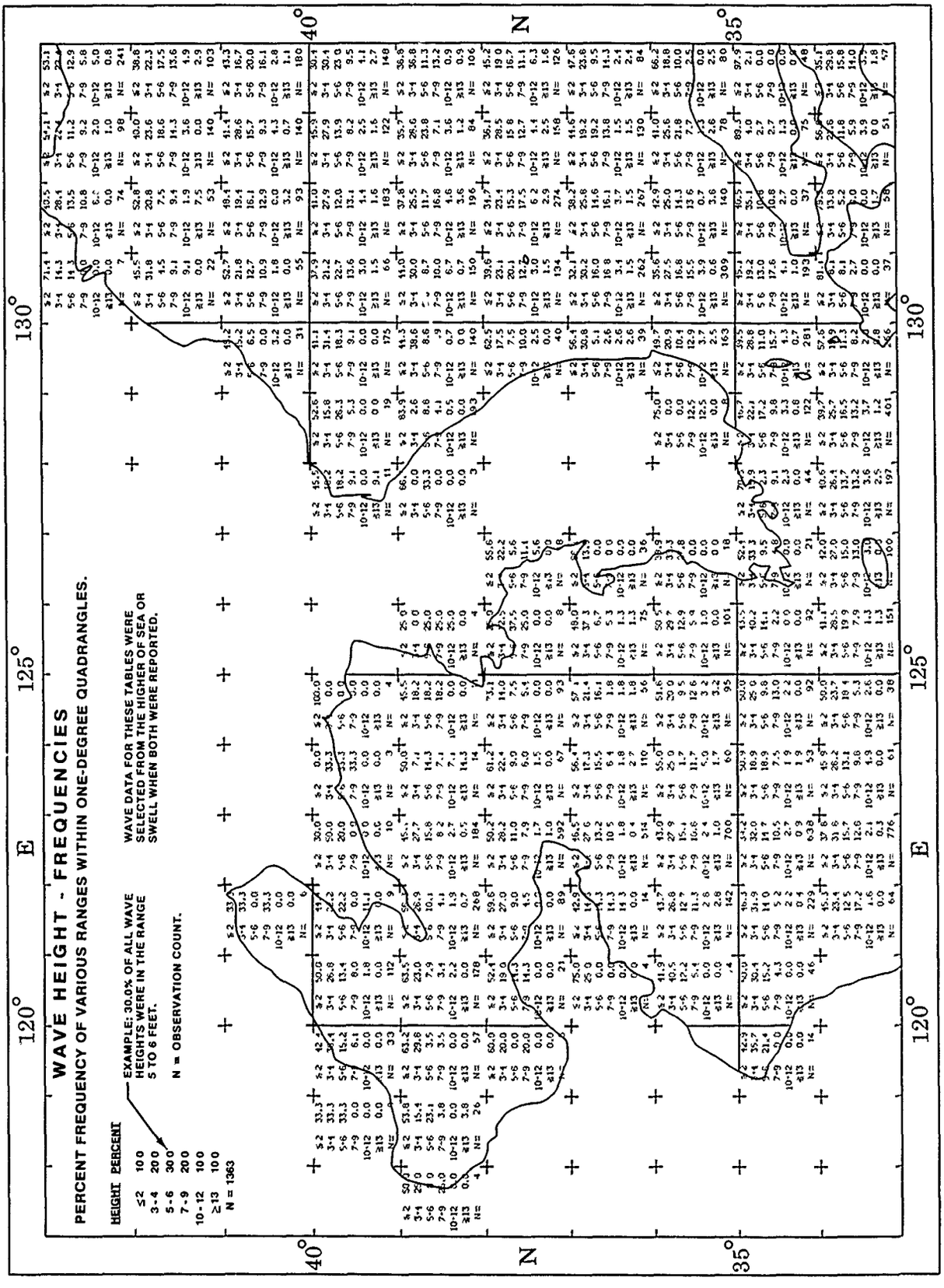

30°
N
25°
120°
E
125°
130°


SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%
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.
25% OF ALL WINDS WERE FROM NORTH.
PERCENT OF CALMS.
MEAN SCALAR SPEED.
OBSERVATION COUNT.
285/71
25°
20°
15°
105°
110° E
115°
120°
N


120°
115°
110°
105°
E
10°
5°
N

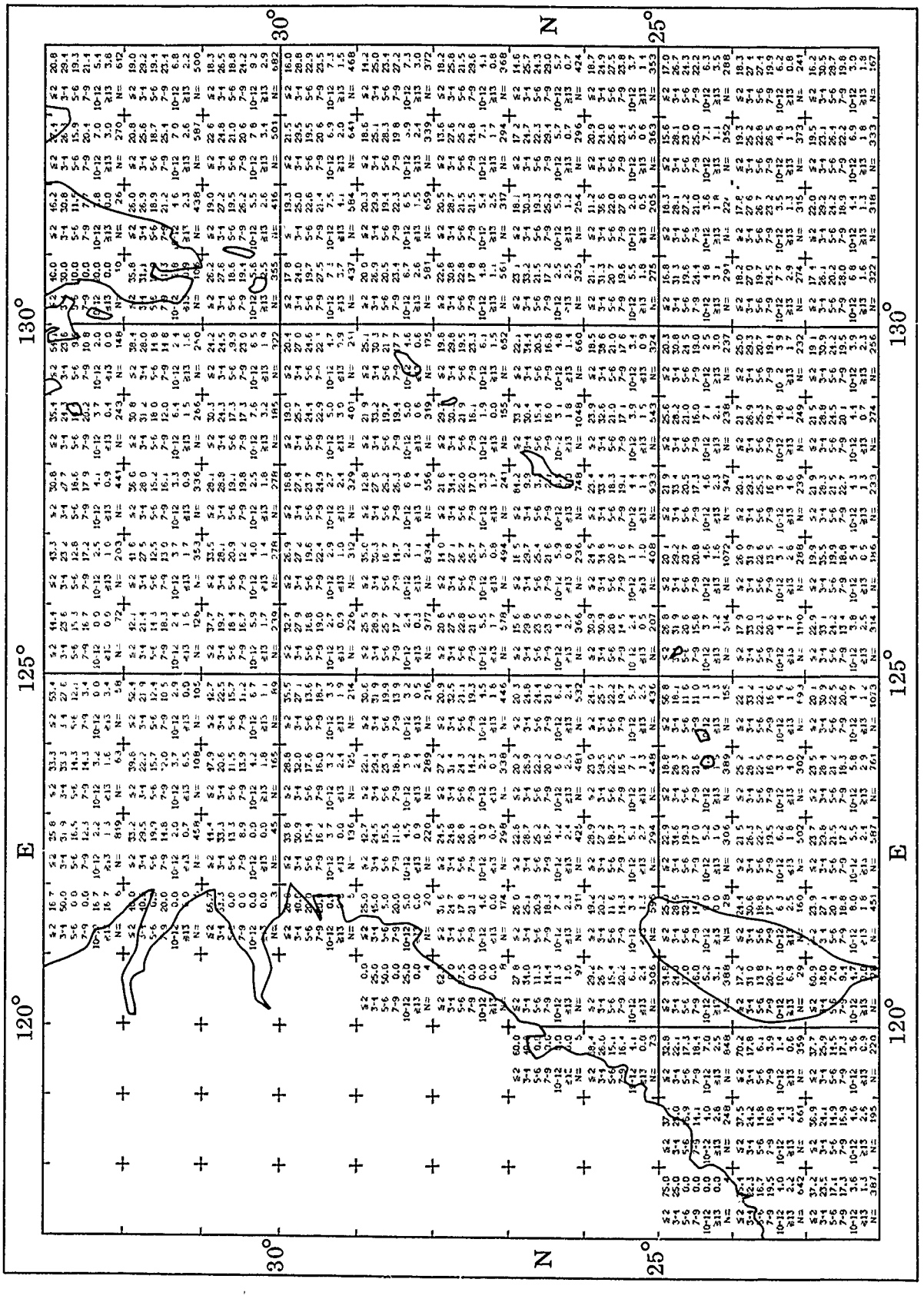

AIR AND SEA TEMPERATURE
SOLID LINE - MEAN AIR TEMPERATURE (°F)
DASHED LINE - MEAN SEA SURFACE TEMPERATURE (°F)
E 110°
120°
130°
140°
40°
30°
20°
10°
N
0°

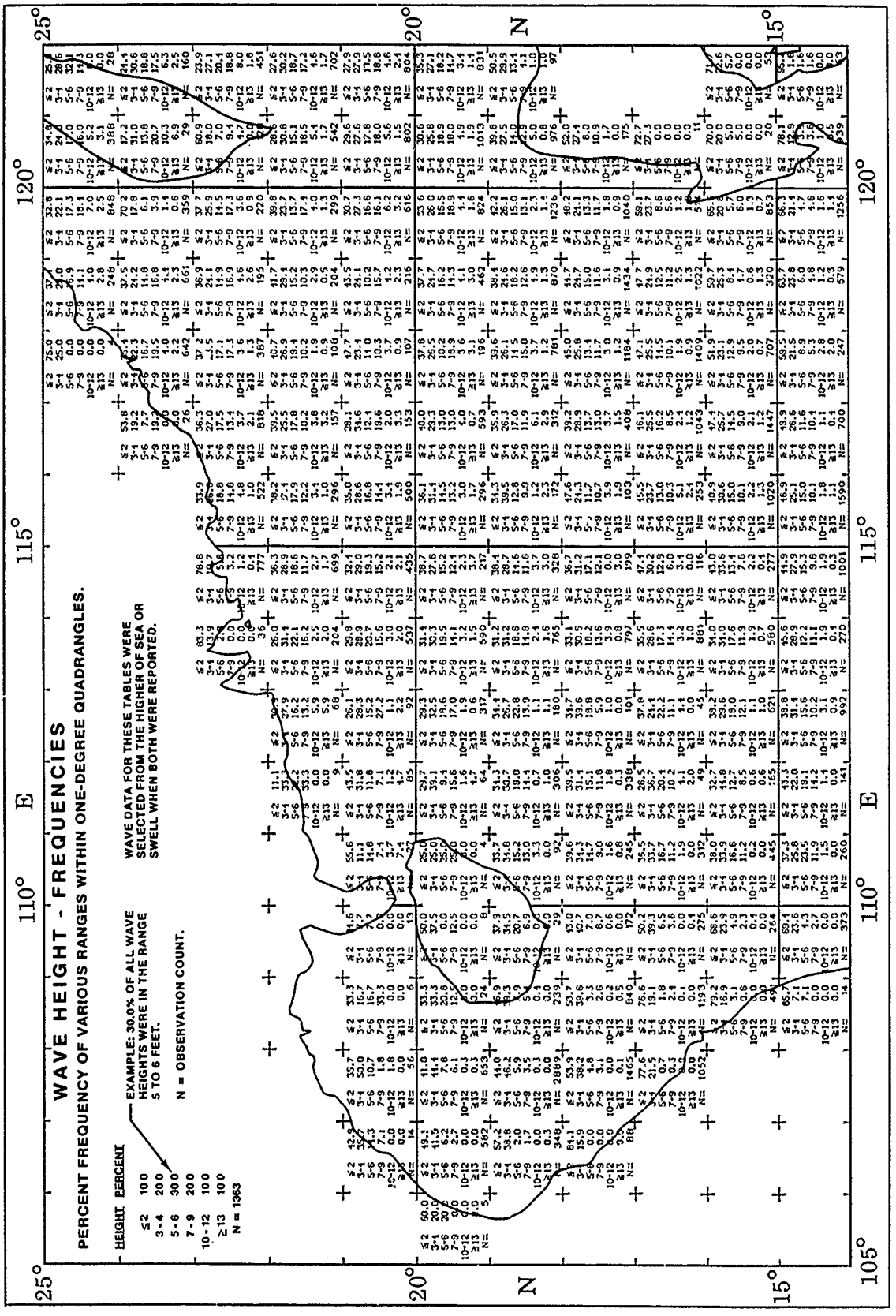

WAVE HEIGHTS
PERCENT FREQUENCY OF:
SOLID LINE -
WAVE HEIGHT ≥ 3 FEET
DASHED LINE -
WAVE HEIGHT ≥ 8 FEET
THE WAVE HEIGHT USED FOR THIS MAP IS THE HIGHER OF SEA OR SWELL FOR OBSERVATIONS CONTAINING BOTH WAVE TRAINS. SEA IS DEFINED AS WAVES GENERATED BY LOCAL WINDS.
≥ 3 FEET = ≥ CODE 2
(2 HALF METERS)
≥ 8 FEET = ≥ CODE 5
(5 HALF METERS)
E 110° 120° 130° 140°
40° 30° 20° 10° N 0°

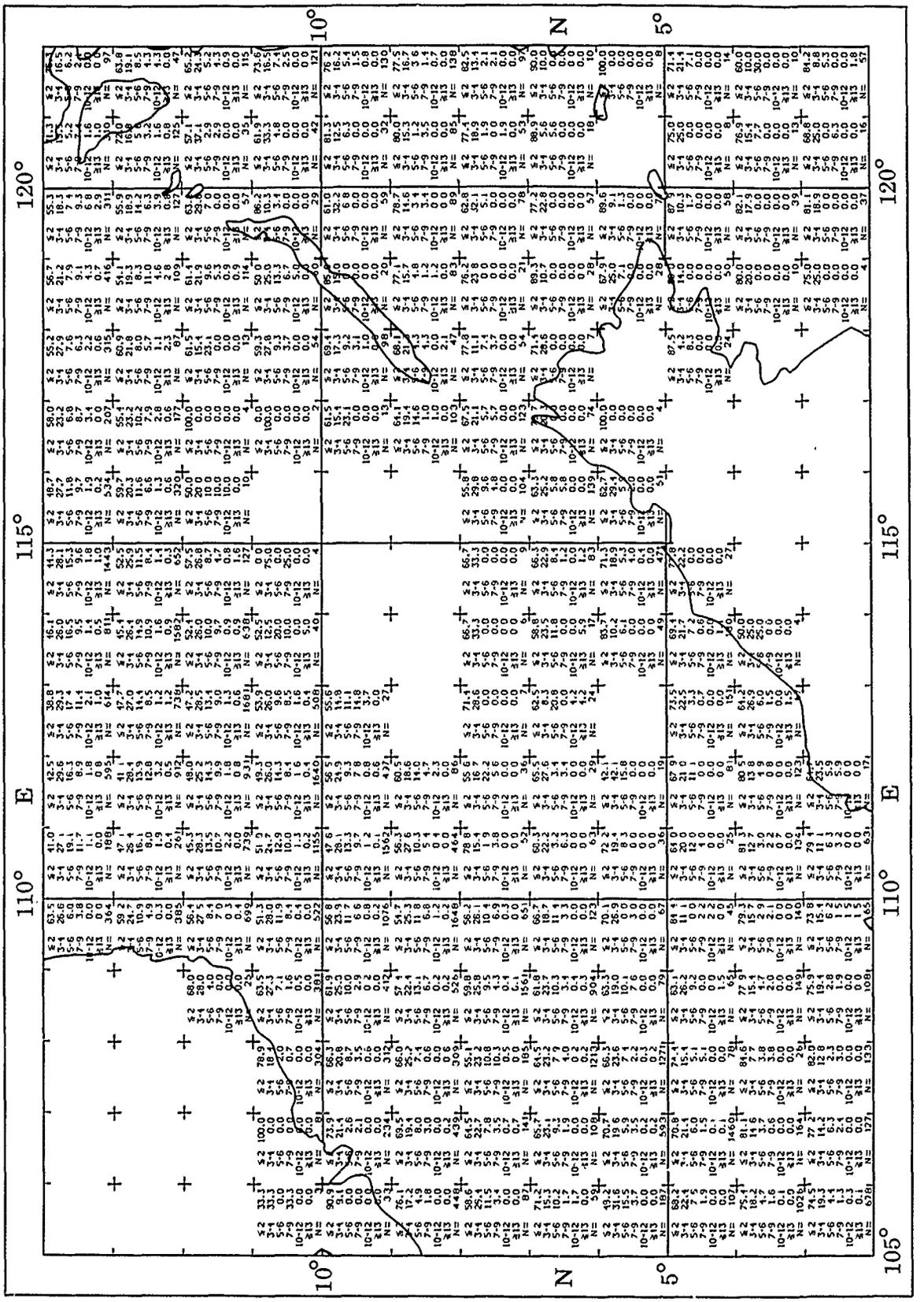

WAVE HEIGHT - FREQUENCIES
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
EXAMPLE: 30.0% OF ALL WAVE HEIGHTS WERE IN THE RANGE 5 TO 6 FEET.
N = OBSERVATION COUNT.
WAVE DATA FOR THESE TABLES WERE SELECTED FROM THE HIGHER OF SEA OR SWELL WHEN BOTH WERE REPORTED.
HEIGHT PERCENT
≤2 10 0
3-4 20 0
5-6 30 0
7-9 20 0
10-12 10 0
≥13 10 0
N = 1363
120°
125°
130°
40°
35°
N
E

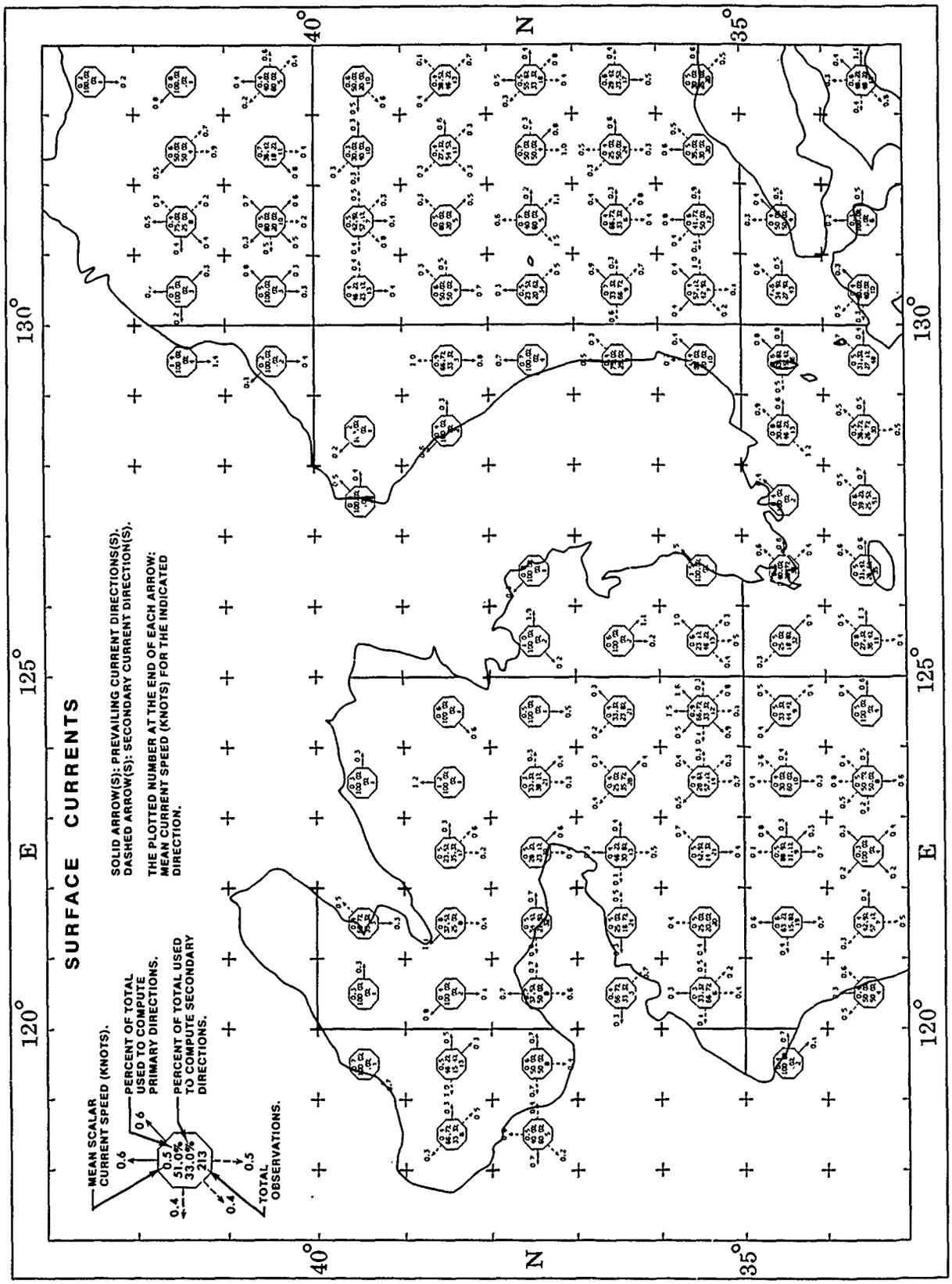
May

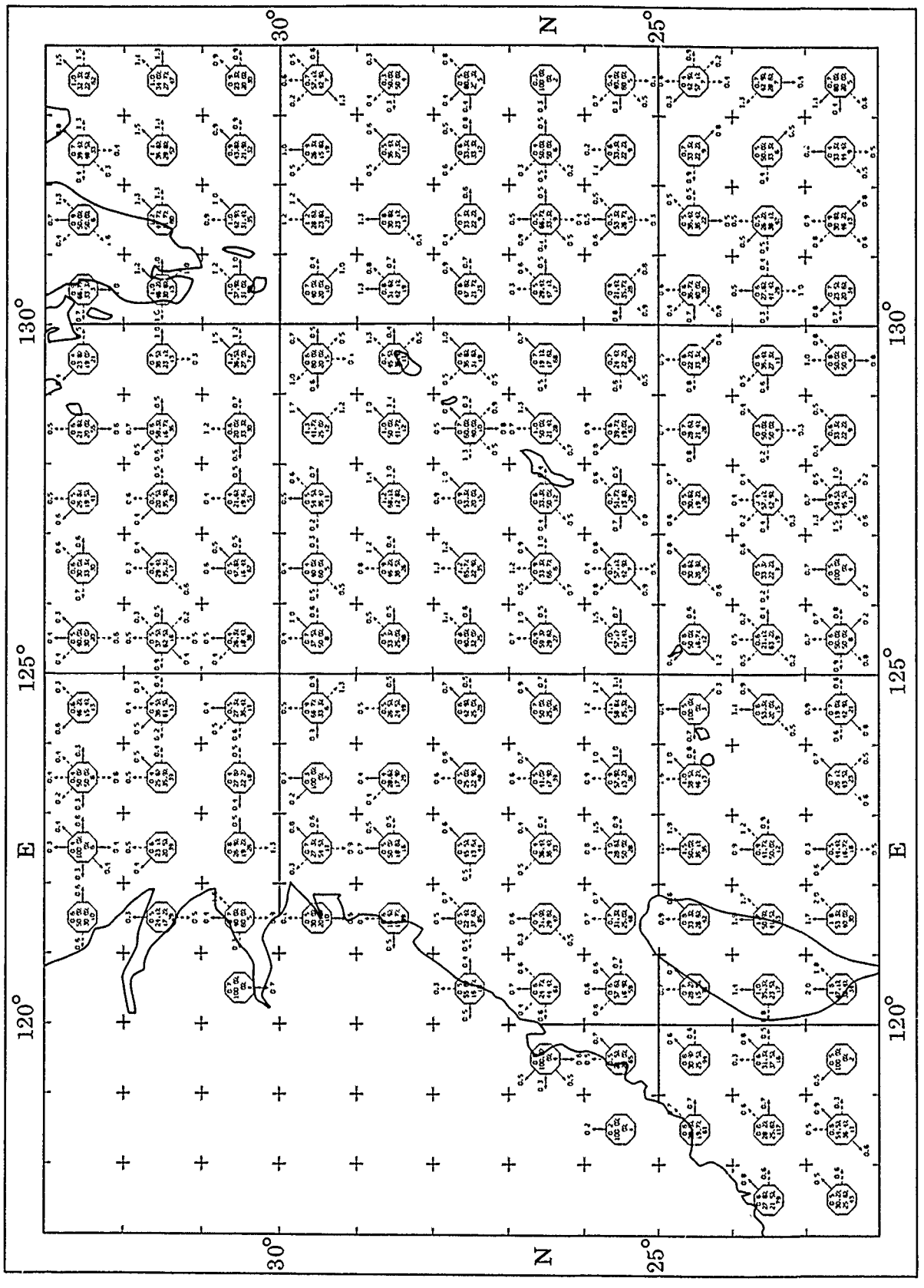
Wave Height

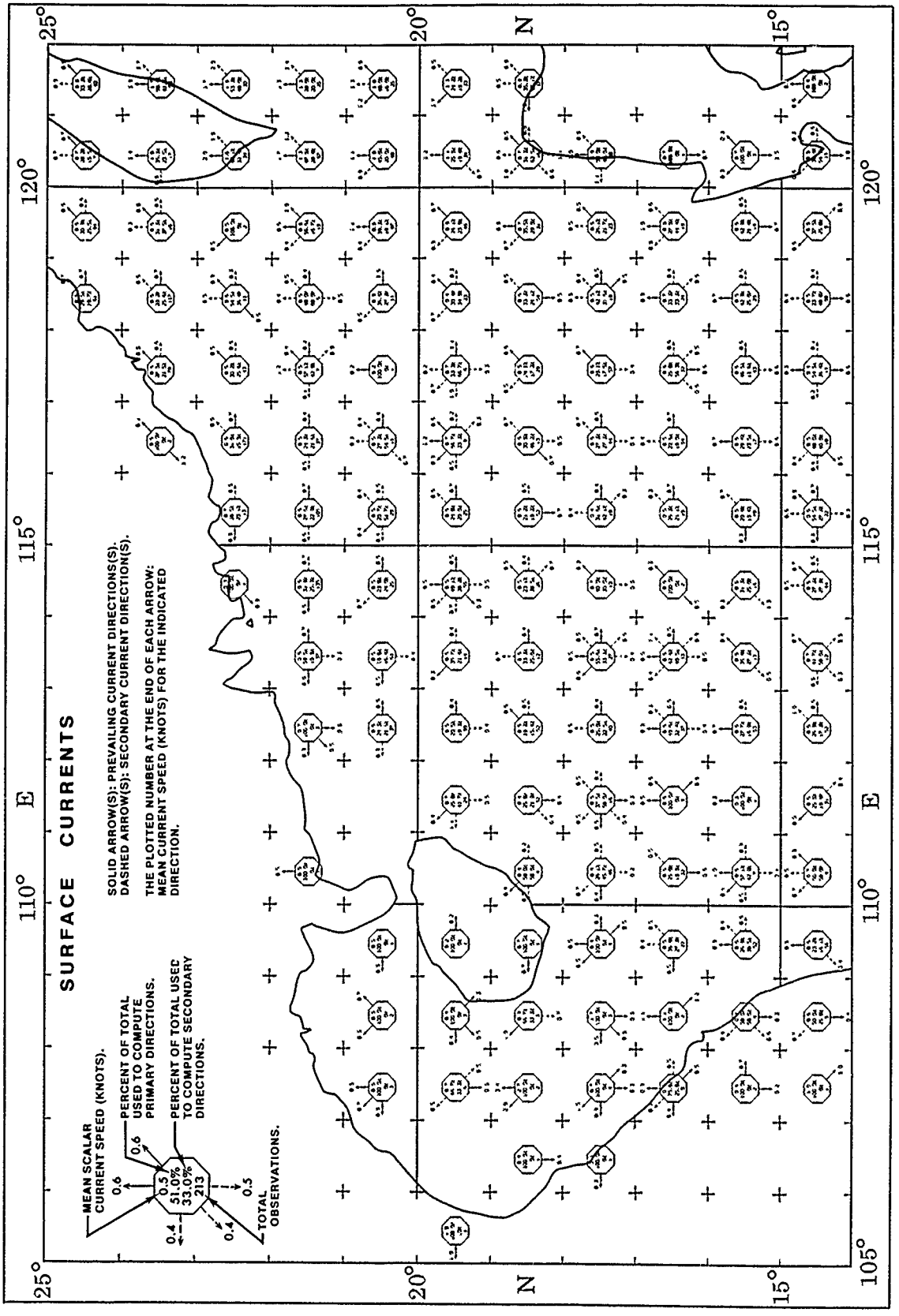


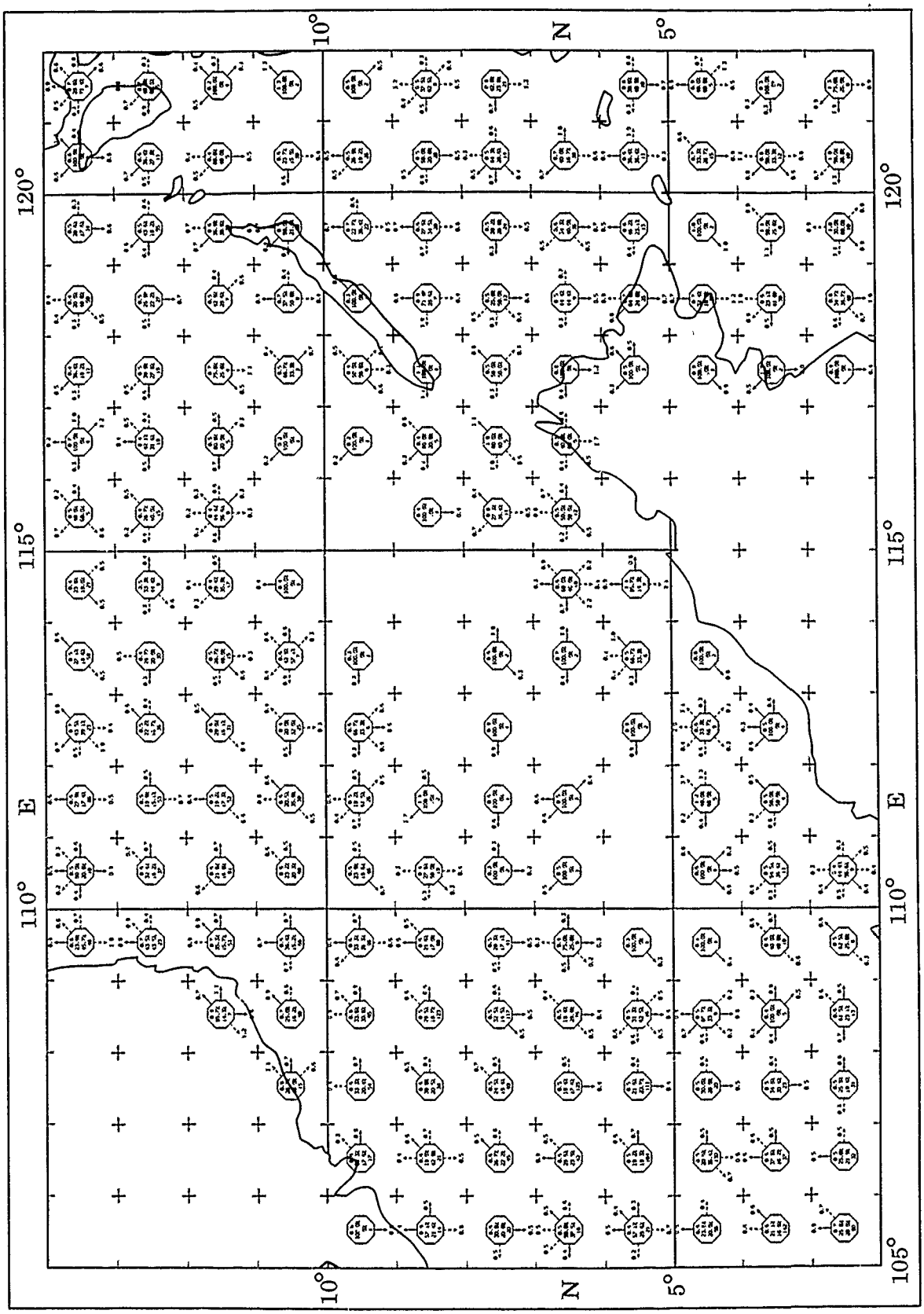

WAVE HEIGHT - FREQUENCIES
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
EXAMPLE: 30.0% OF ALL WAVE HEIGHTS WERE IN THE RANGE 5 TO 6 FEET.
N = OBSERVATION COUNT.
WAVE DATA FOR THESE TABLES WERE SELECTED FROM THE HIGHER OF SEA OR SWELL WHEN BOTH WERE REPORTED.
HEIGHT PERCENT
≤2 10
3-4 20
5-6 30
7-9 20
10-12 10
≥13 10
N = 1363
110° E
115° E
120° E
105° E
25° N
20° N
15° N

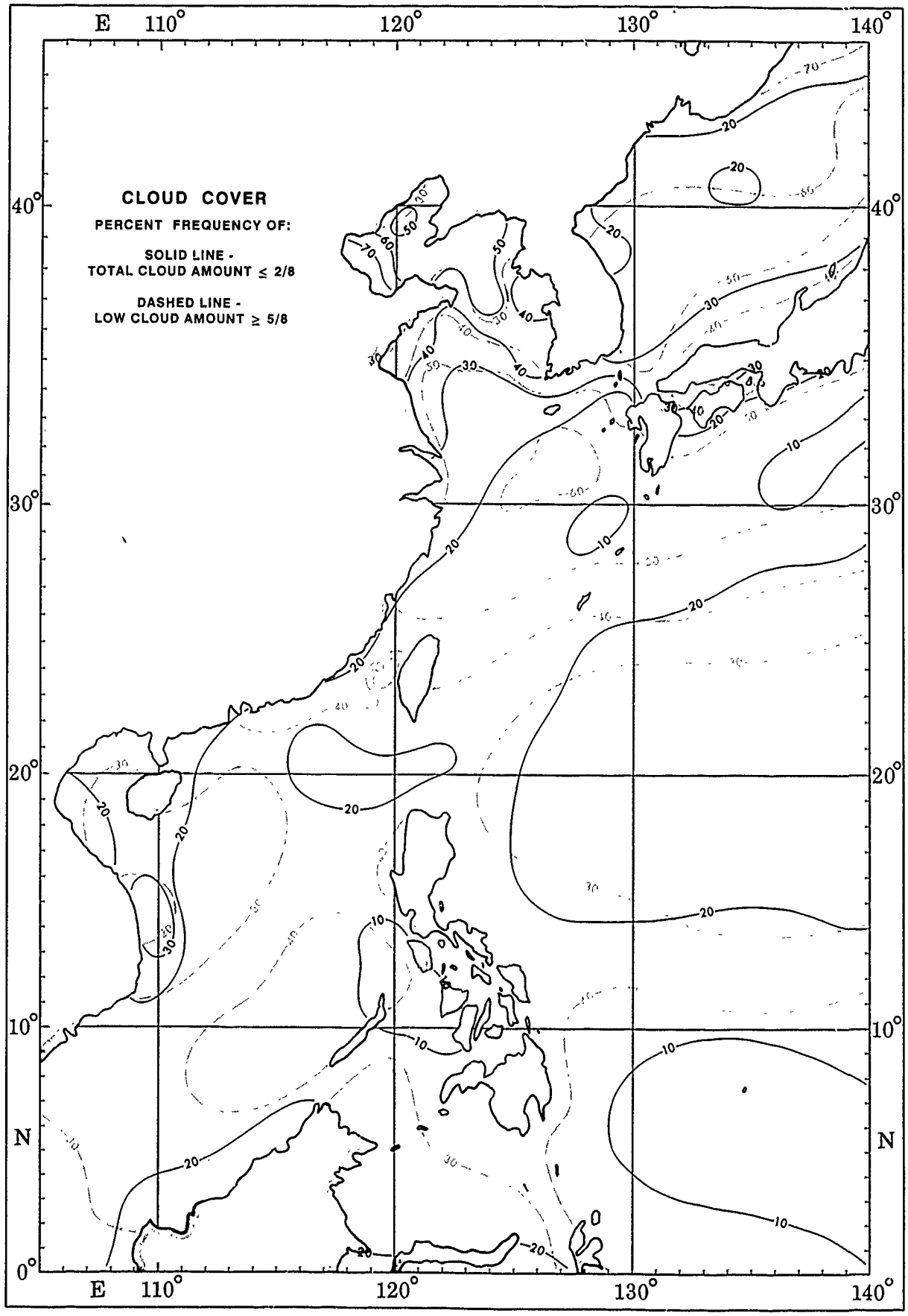

105°
110°
115°
120°
E
10°
5°
N

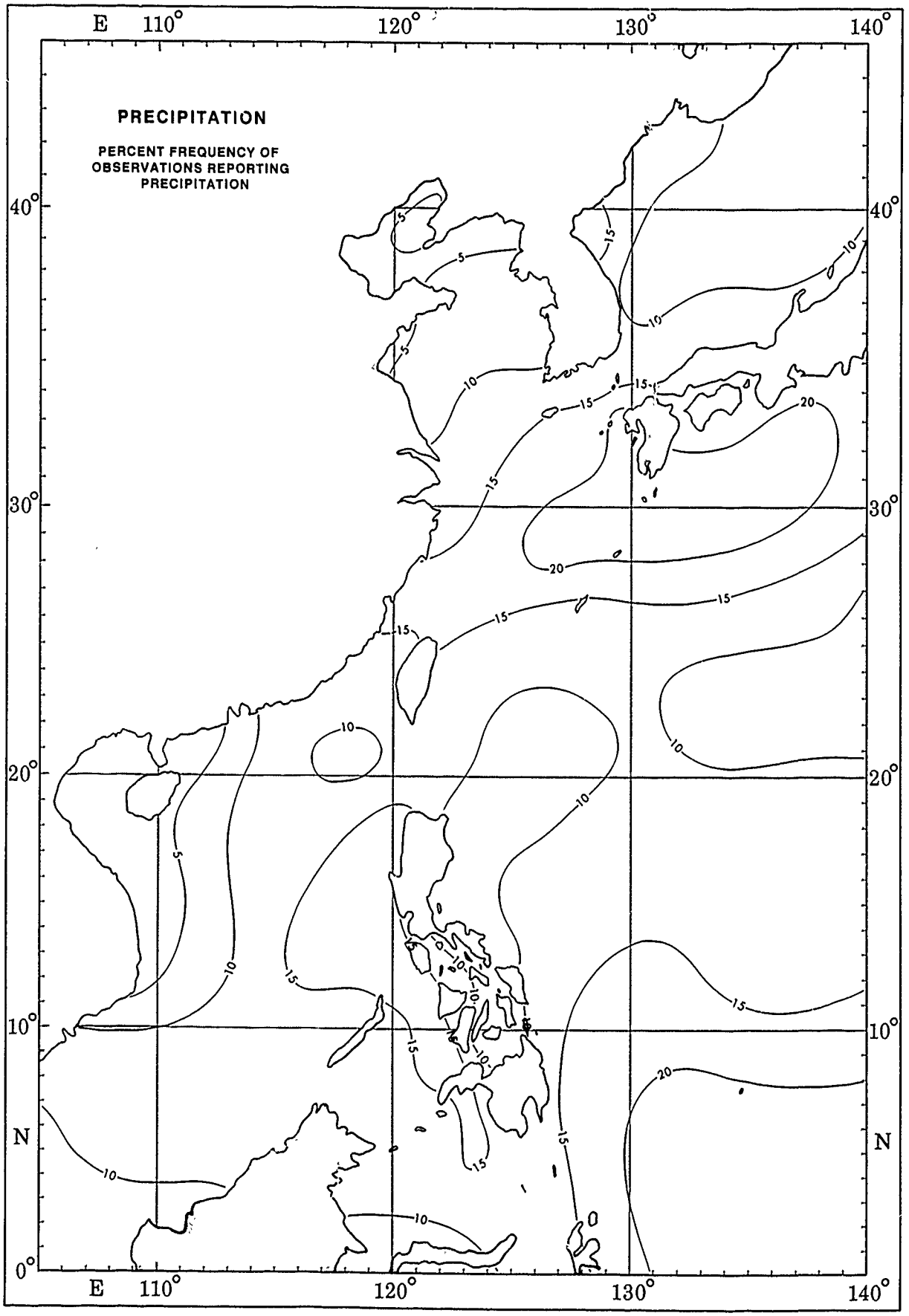

SURFACE CURRENTS
SOLID ARROW(S): PREVAILING CURRENT DIRECTIONS(S).
DASHED ARROW(S): SECONDARY CURRENT DIRECTION(S).
THE PLOTTED NUMBER AT THE END OF EACH ARROW: MEAN CURRENT SPEED (KNOTS) FOR THE INDICATED DIRECTION.
MEAN SCALAR CURRENT SPEED (KNOTS).
PERCENT OF TOTAL USED TO COMPUTE PRIMARY DIRECTIONS.
PERCENT OF TOTAL USED TO COMPUTE SECONDARY DIRECTIONS.
TOTAL OBSERVATIONS.
0.6
0.5
51.0%
33.0%
213
0.4
0.4
0.5
40° N
35° N
120° E
125° E
130° E

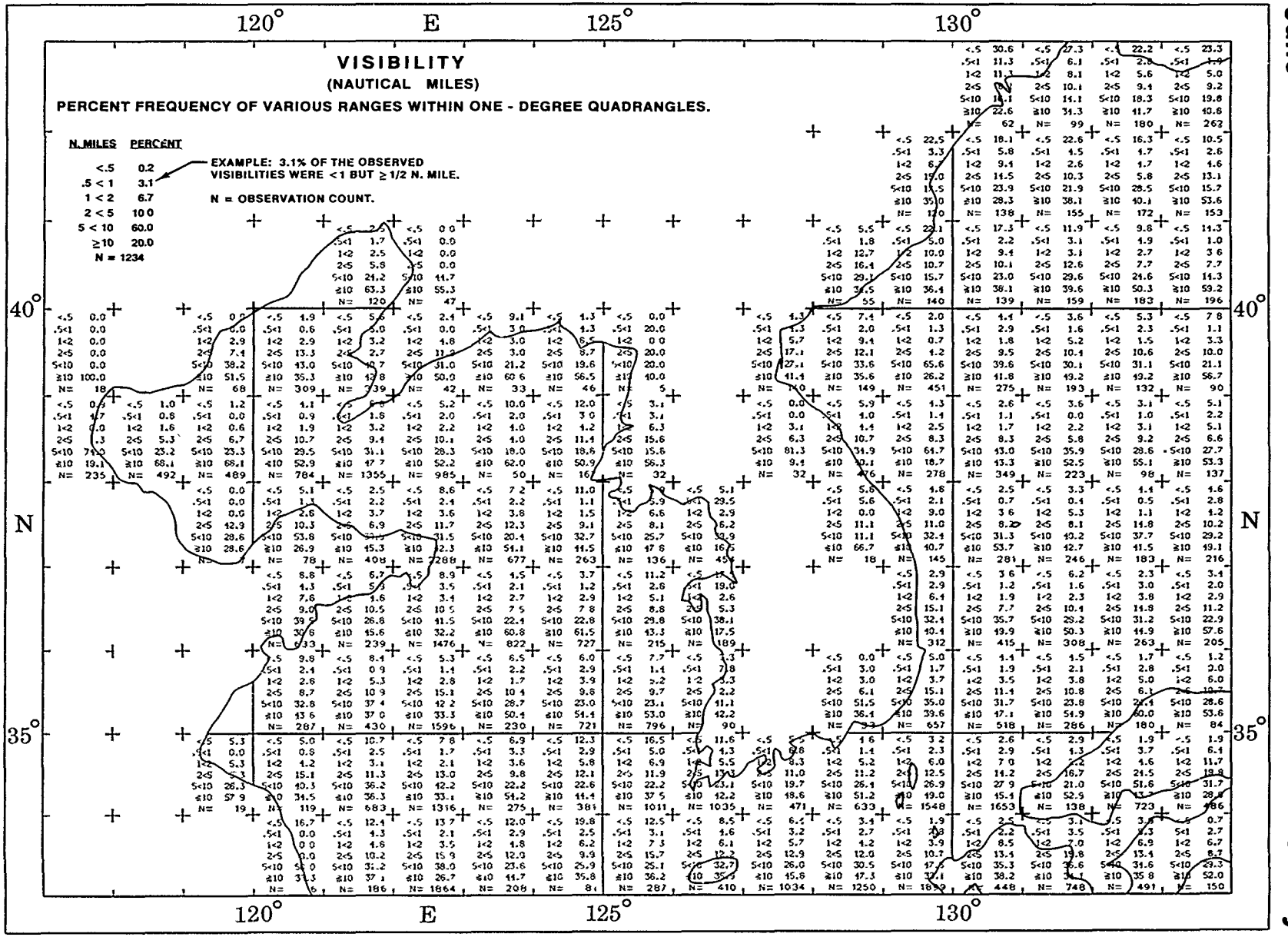

30°
N
25°
130°
125°
E
120°
30°
N
25°

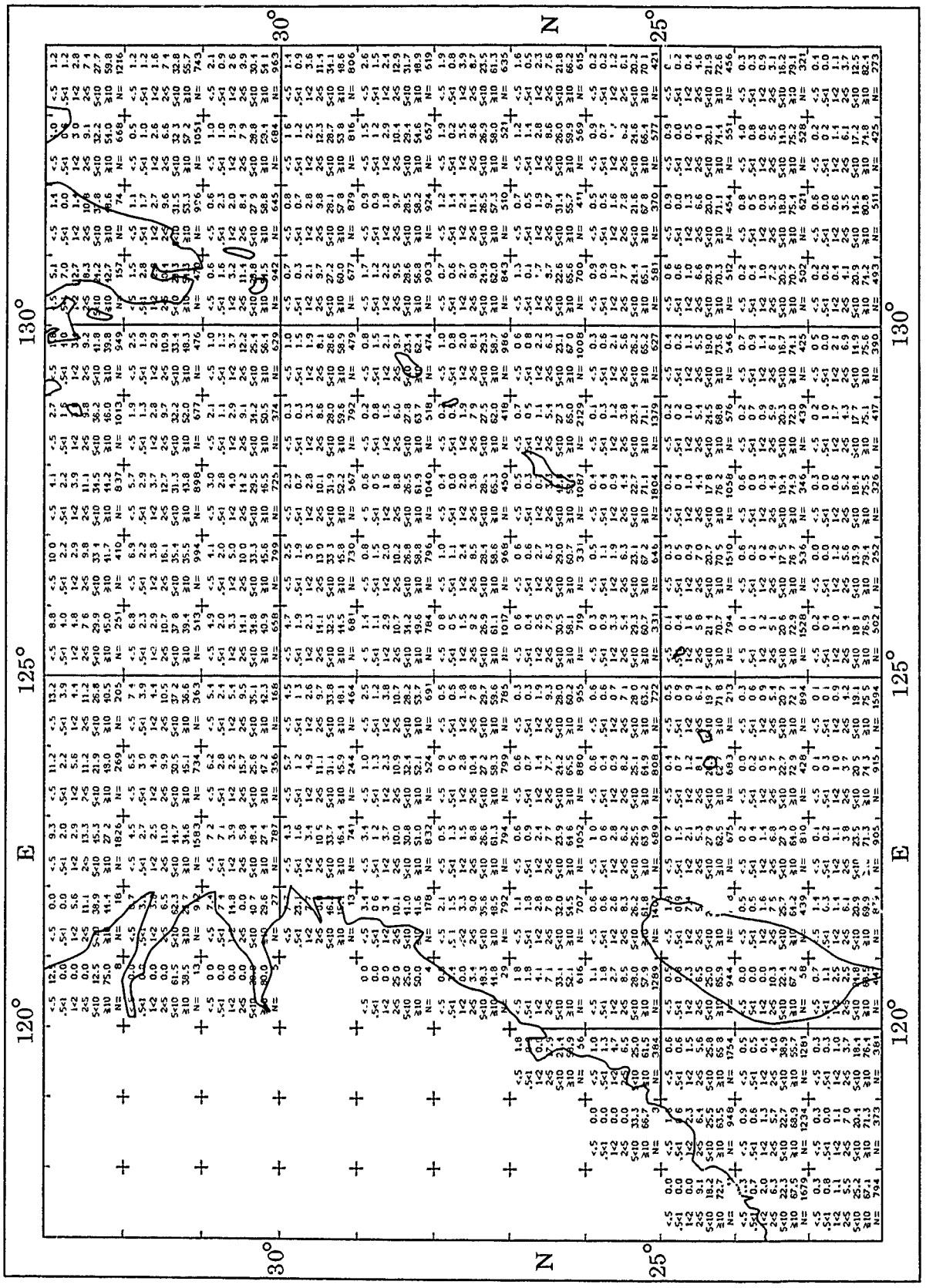

SURFACE CURRENTS
SOLID ARROW(S): PREVAILING CURRENT DIRECTIONS(S).
DASHED ARROW(S): SECONDARY CURRENT DIRECTION(S).
THE PLOTTED NUMBER AT THE END OF EACH ARROW: MEAN CURRENT SPEED (KNOTS) FOR THE INDICATED DIRECTION.
MEAN SCALAR CURRENT SPEED (KNOTS).
PERCENT OF TOTAL USED TO COMPUTE PRIMARY DIRECTIONS.
PERCENT OF TOTAL USED TO COMPUTE SECONDARY DIRECTIONS.
TOTAL OBSERVATIONS.
0.6
0.6
0.3
51.0%
33.0%
213
0.5
0.4
0.4
25°
20°
15°
N
110°
E
115°
120°
105°

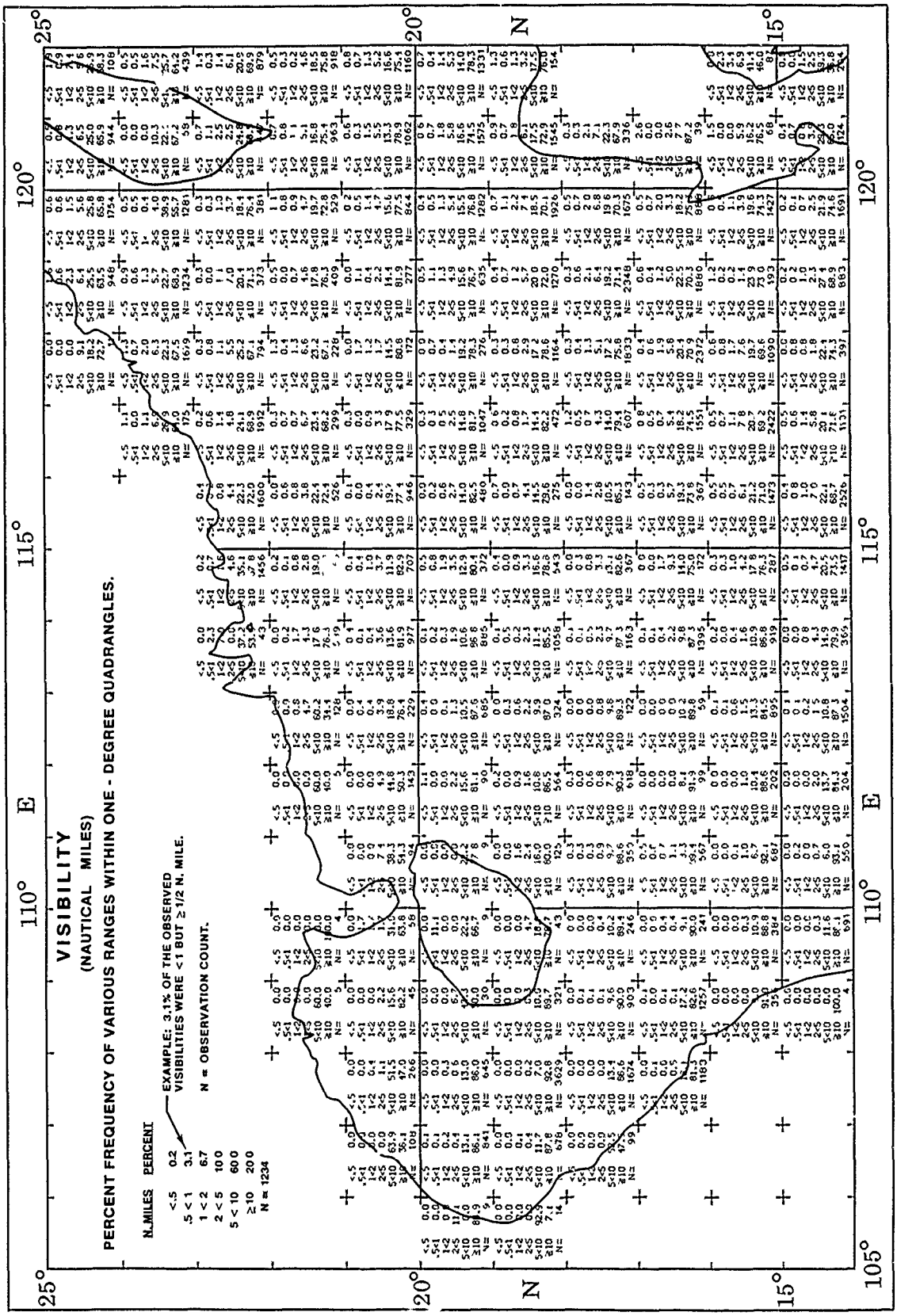

10° N
5° N
120° E
115° E
110° E
105° E

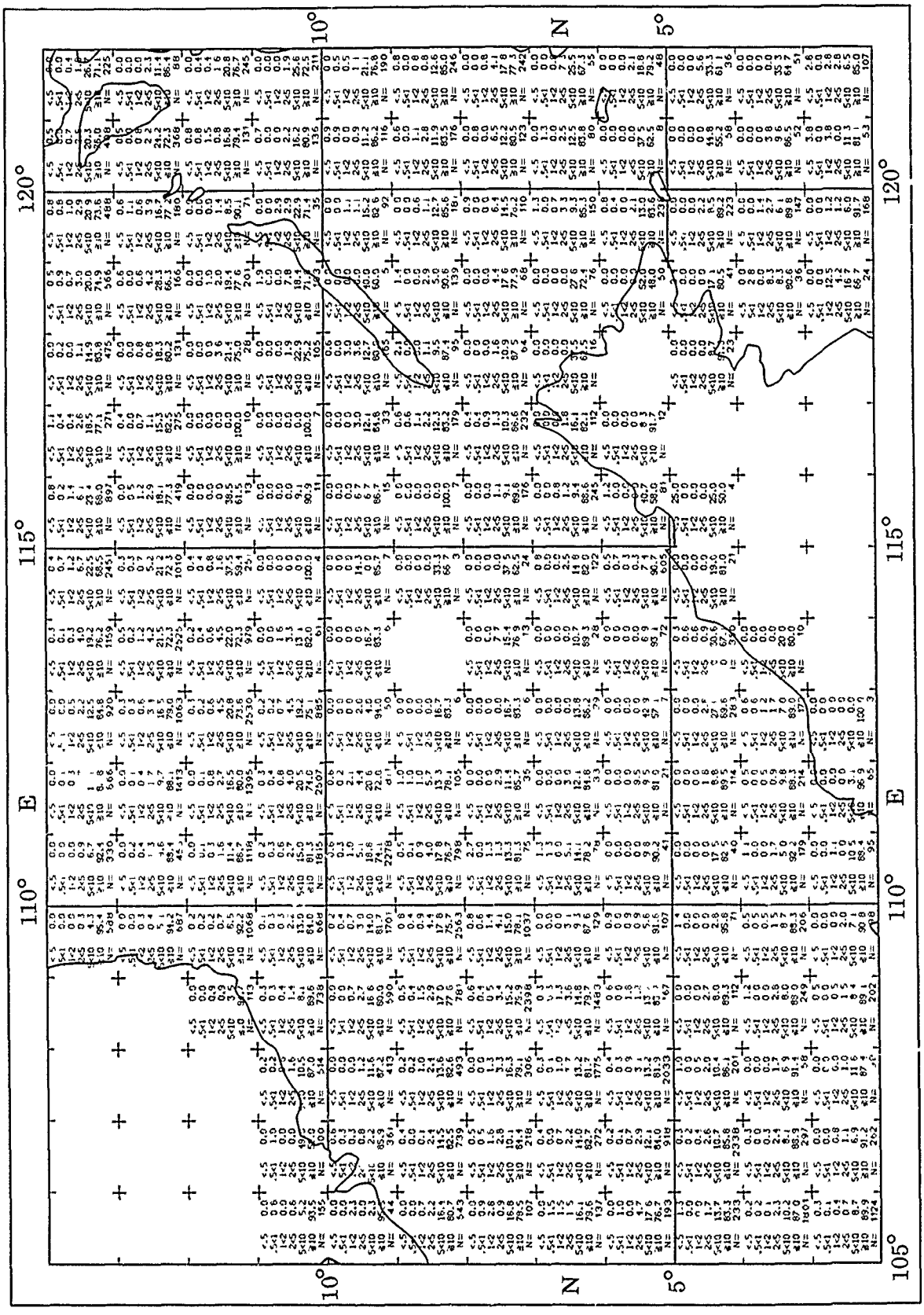

CLOUD COVER
PERCENT FREQUENCY OF:
SOLID LINE -
TOTAL CLOUD AMOUNT ≤ 2/8
DASHED LINE -
LOW CLOUD AMOUNT ≥ 5/8
E 110°
120°
130°
140°
40°
30°
20°
10°
N
0°


PRECIPITATION
PERCENT FREQUENCY OF OBSERVATIONS REPORTING PRECIPITATION
E 110°
120°
130°
140°
40°
30°
20°
10°
N
0°
5
10
15
20


VISIBILITY
(NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE - DEGREE QUADRANGLES.
N. MILES PERCENT
<.5 0.2
.5 < 1 3.1
1 < 2 6.7
2 < 5 10.0
5 < 10 60.0
≥10 20.0
N = 1234
EXAMPLE: 3.1% OF THE OBSERVED VISIBILITIES WERE <1 BUT ≥ 1/2 N. MILE.
N = OBSERVATION COUNT.
120° E 125° 130°
40° N 35°

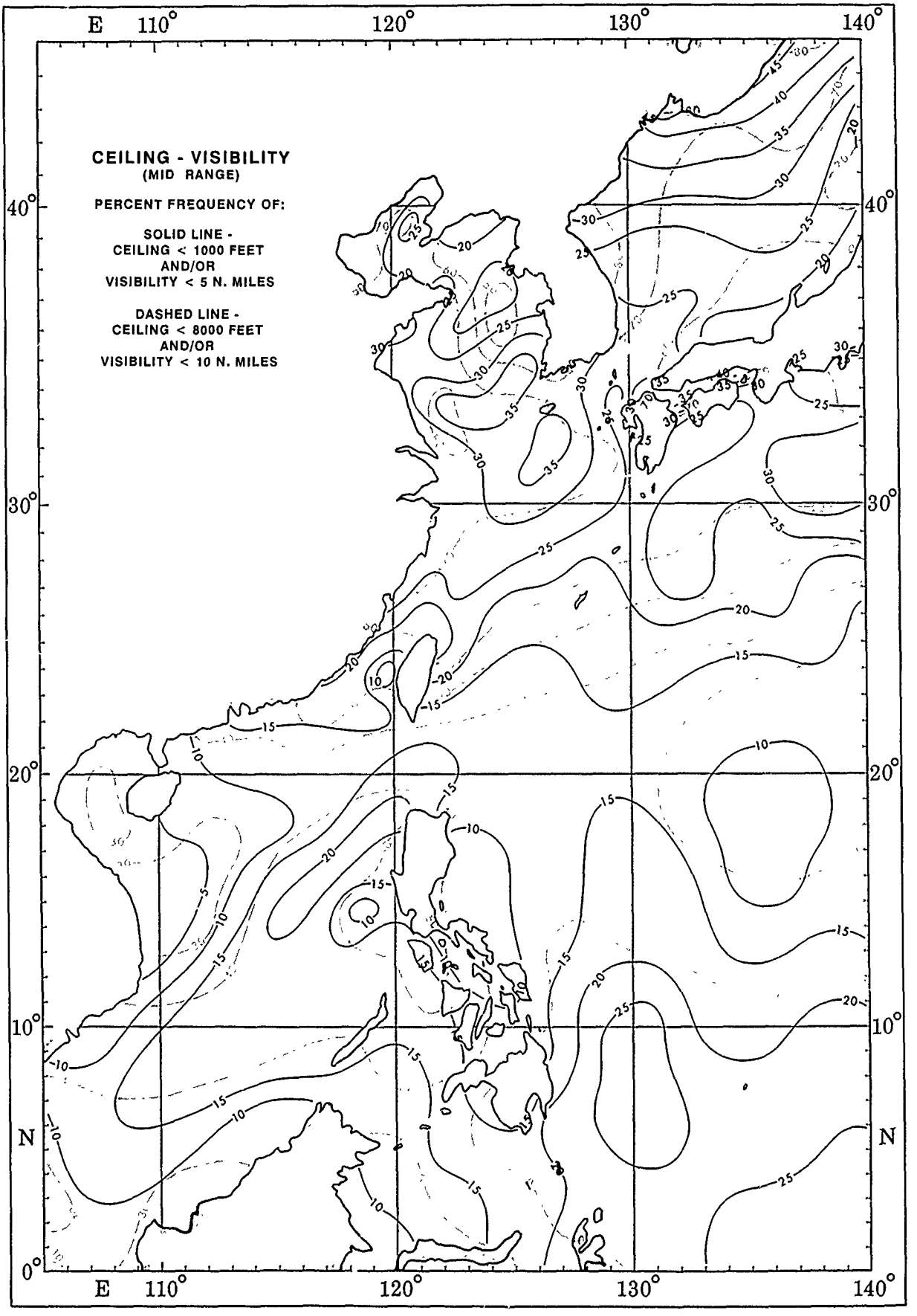

120°
125°
130°
30°
25°
N
E


VISIBILITY
(NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE - DEGREE QUADRANGLES.
N. MILES PERCENT
<.5 0.2
.5 < 1 3.1
1 < 2 6.7
2 < 5 10.0
5 < 10 60.0
≥10 20.0
N = 1234
EXAMPLE: 3.1% OF THE OBSERVED VISIBILITIES WERE <1 BUT ≥1/2 N. MILE.
N = OBSERVATION COUNT.
25°
20°
15°
120°
115°
110°
105°
N
E


10° N
5° N
120° E
115° E
110° E
105° E

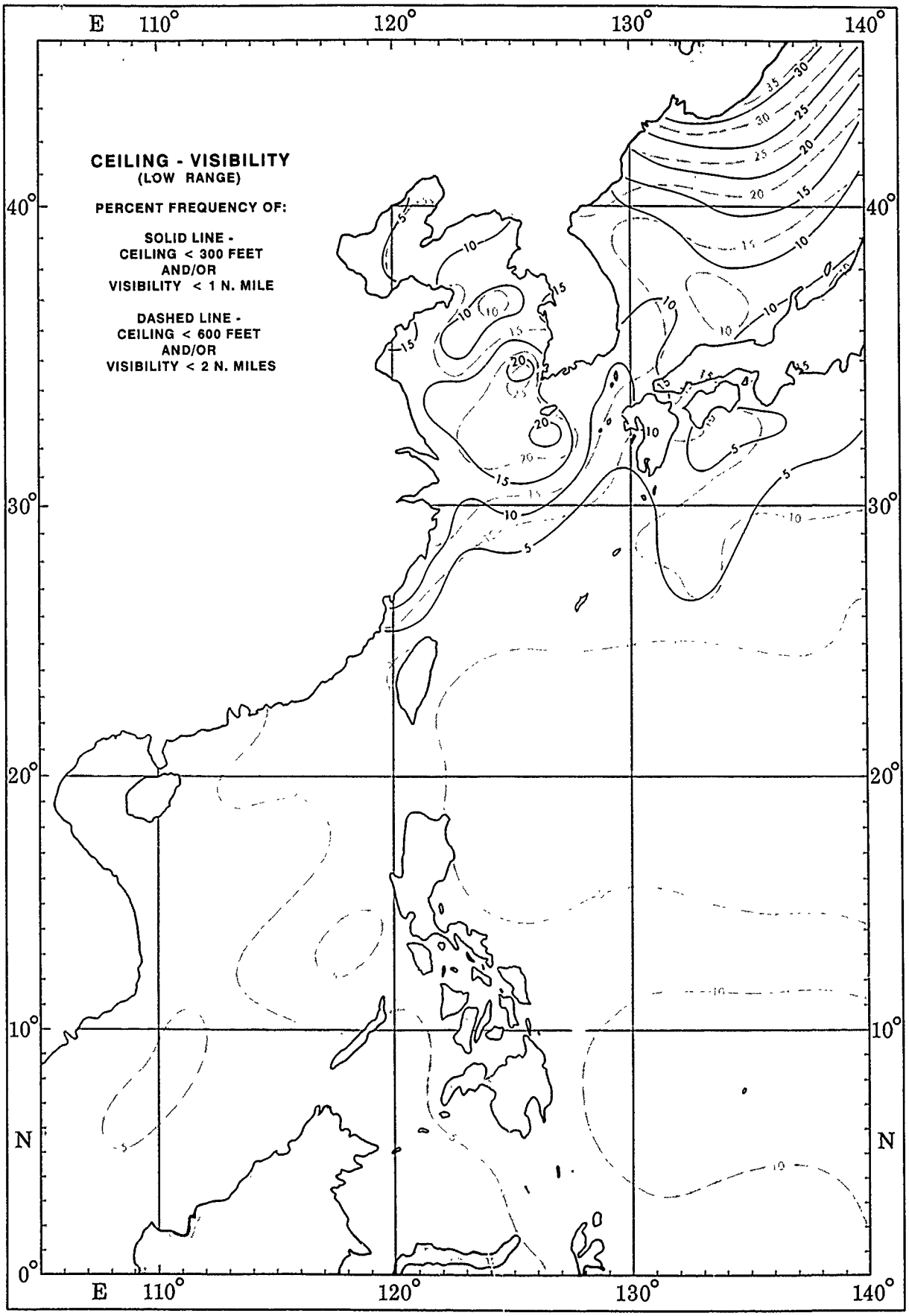
June

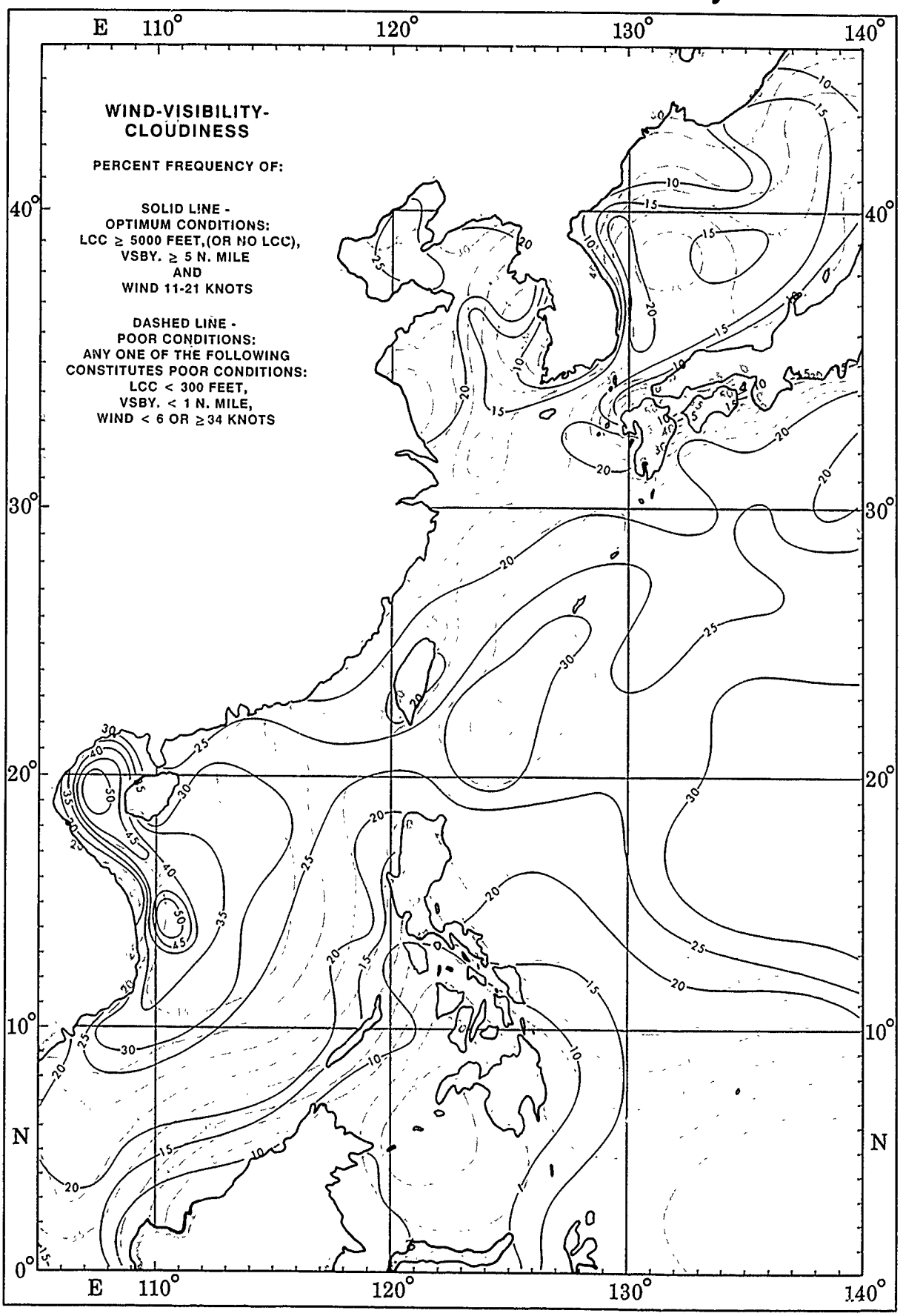
Ceiling - Visibility (Mid Range)



June

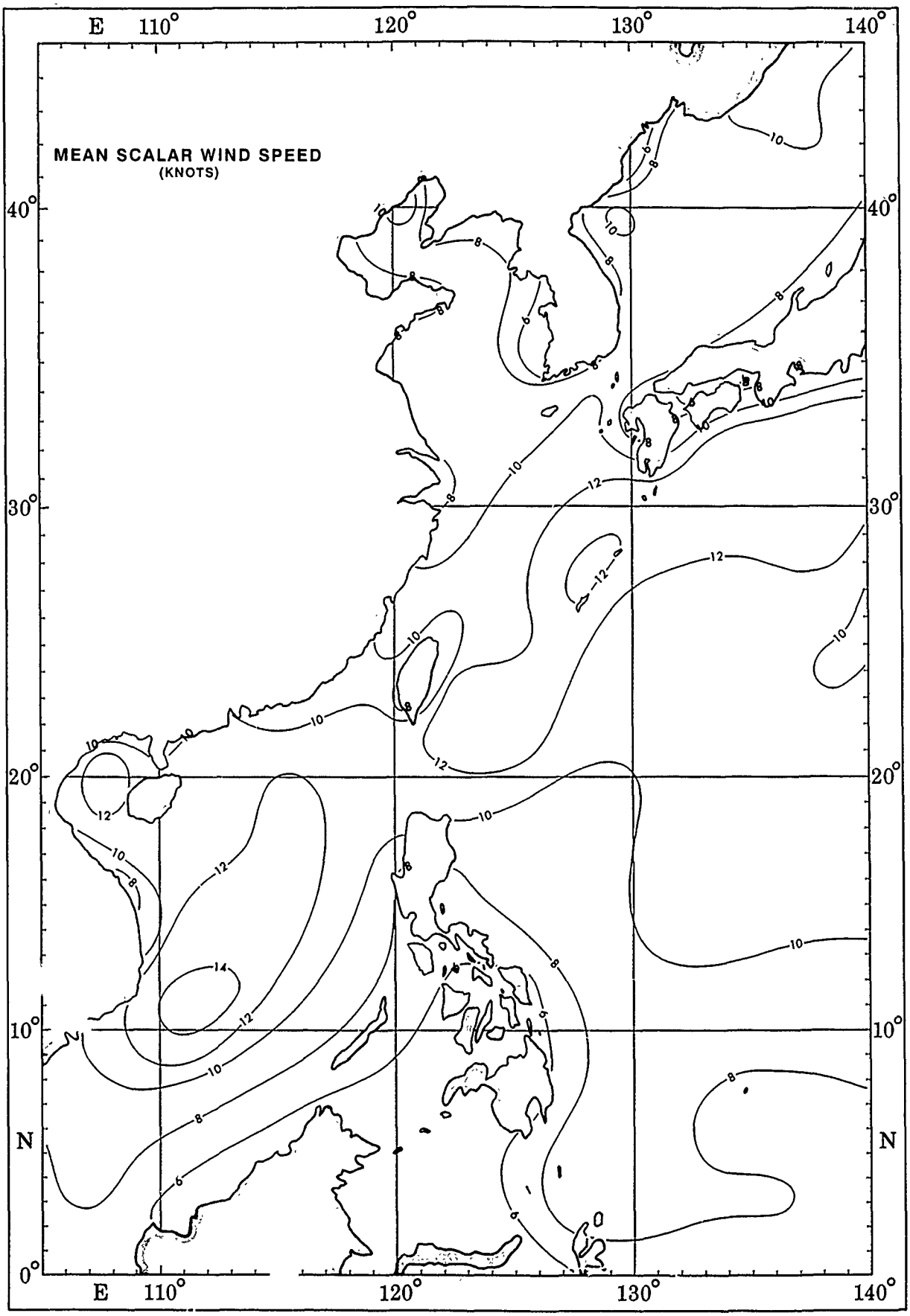
Ceiling - Visibility (Low Range)




WIND-VISIBILITY-
CLOUDINESS
PERCENT FREQUENCY OF:
SOLID LINE -
OPTIMUM CONDITIONS:
LCC ≥ 5000 FEET,(OR NO LCC),
VSBY. ≥ 5 N. MILE
AND
WIND 11-21 KNOTS
DASHED LINE -
POOR CONDITIONS:
ANY ONE OF THE FOLLOWING
CONSTITUTES POOR CONDITIONS:
LCC < 300 FEET,
VSBY. < 1 N. MILE,
WIND < 6 OR ≥ 34 KNOTS
E 110°
120°
130°
140°
40°
30°
20°
10°
N
0°

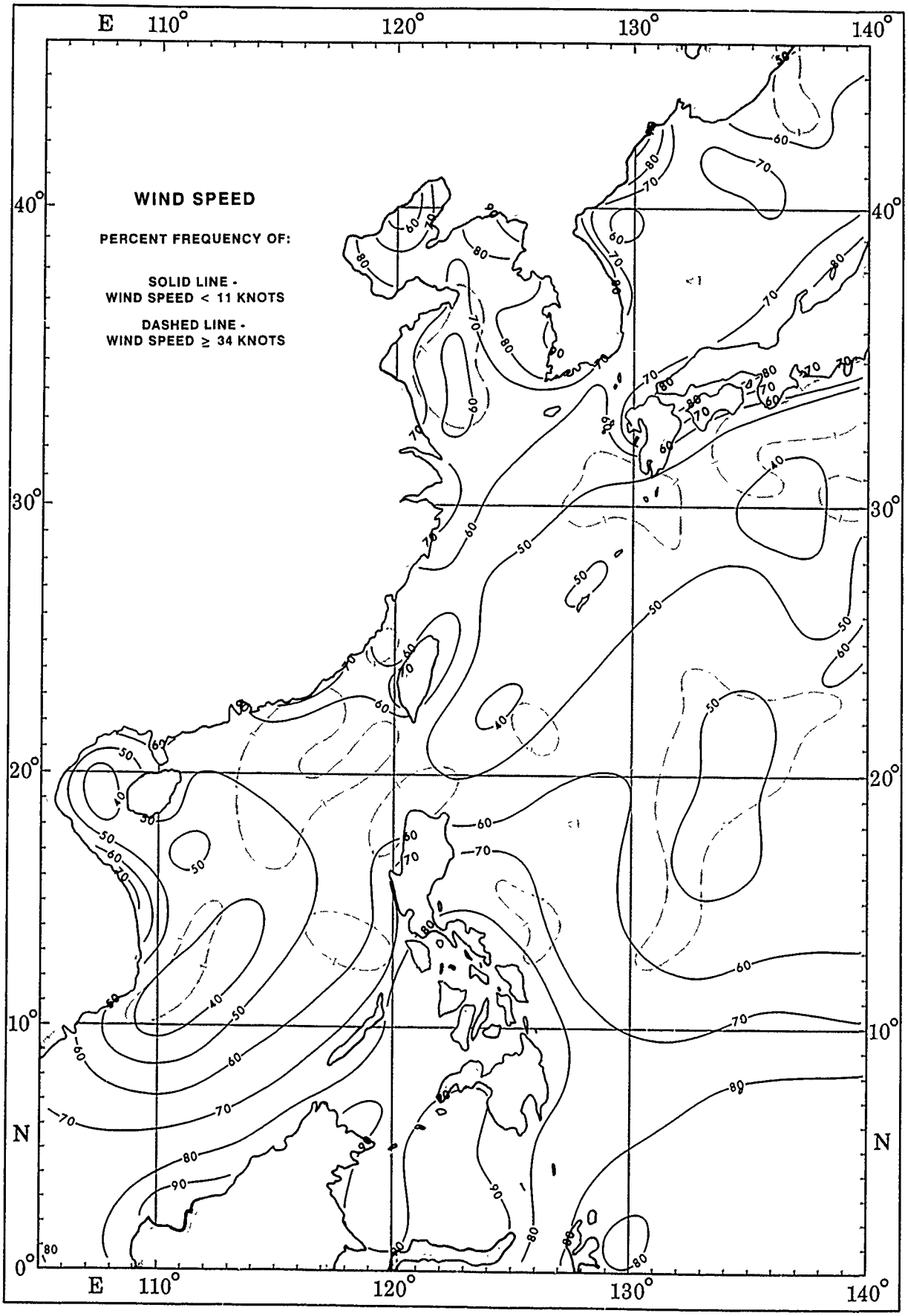
June

Mean Scalar Wind Speed



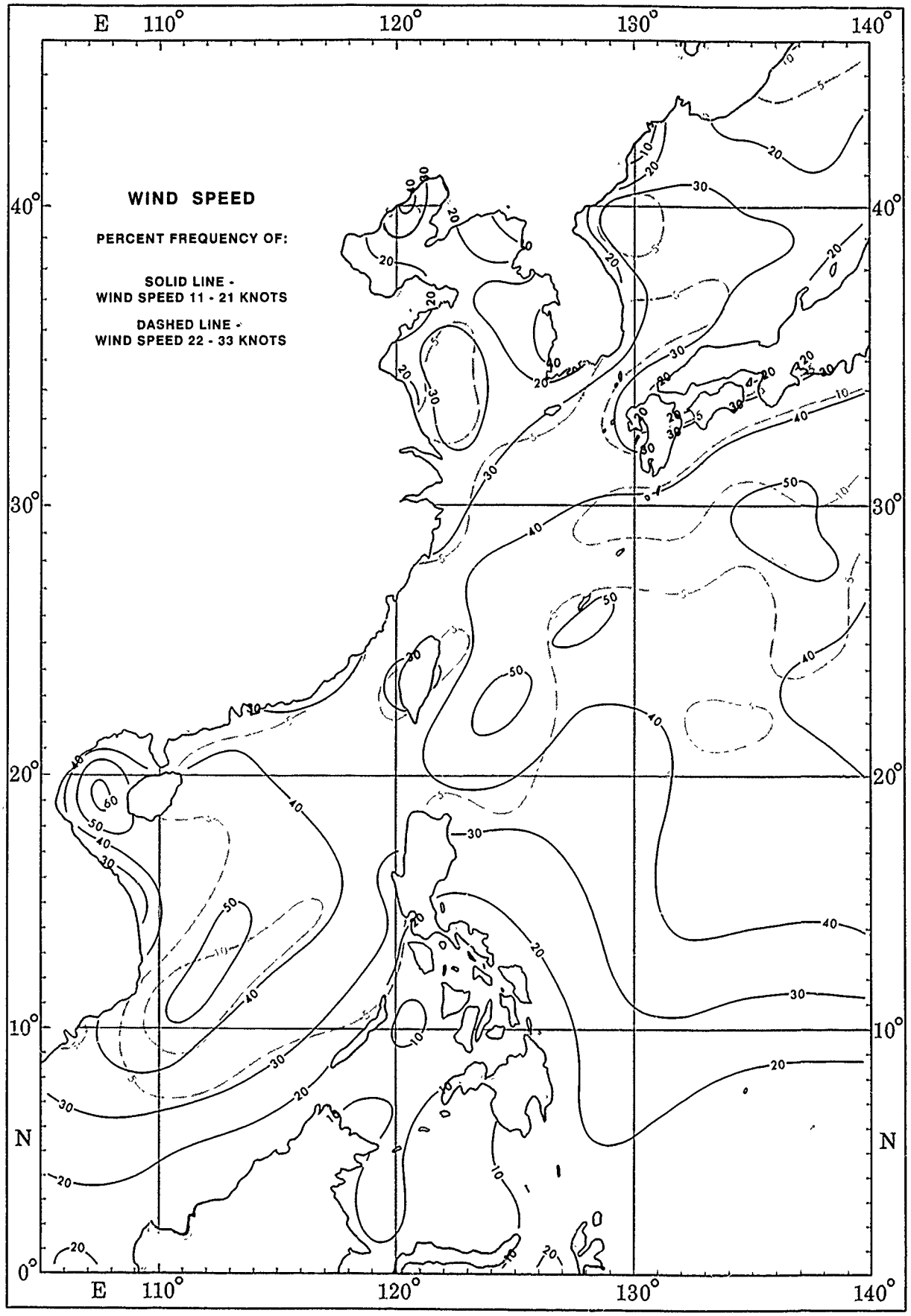
June

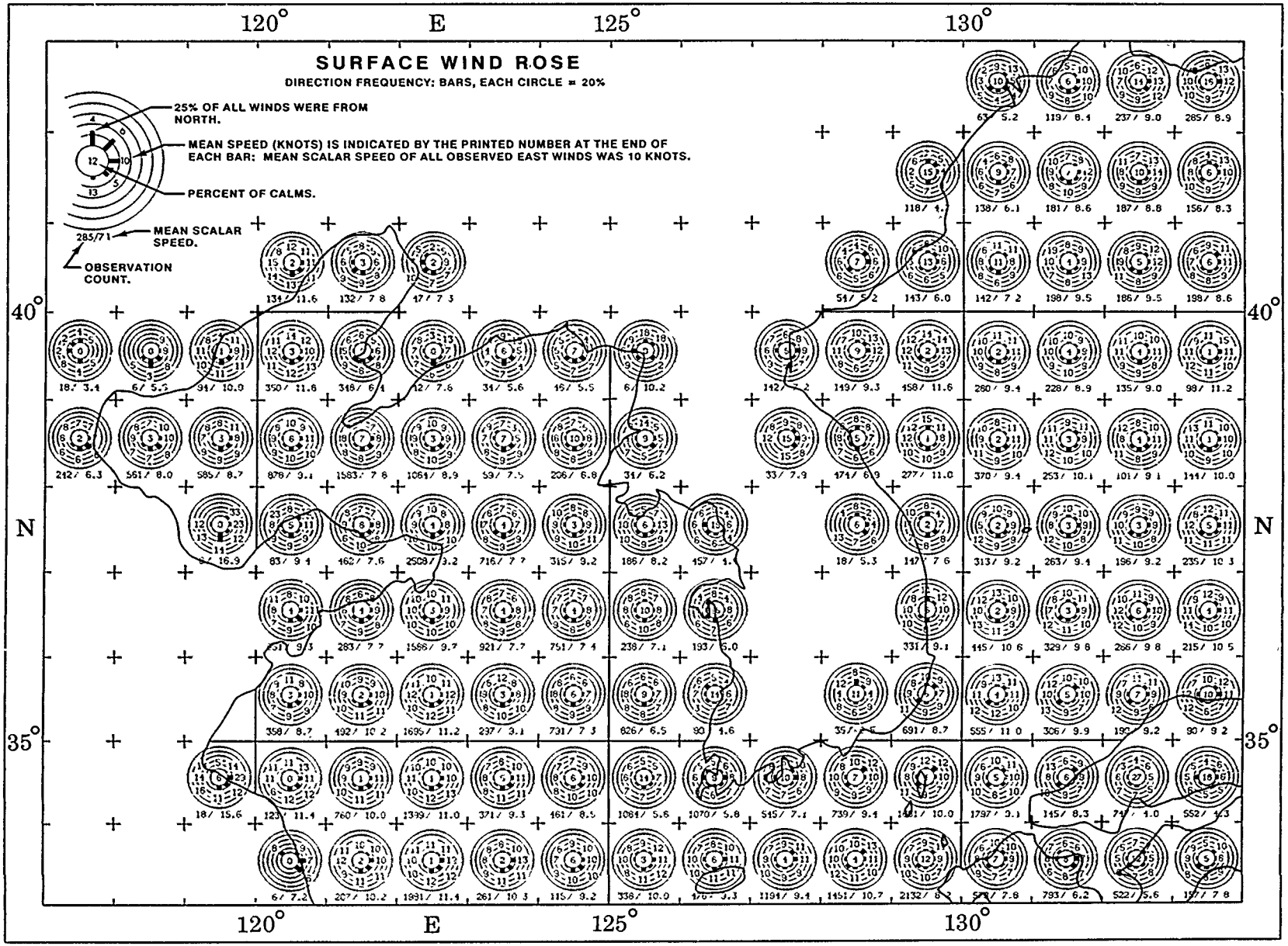
Wind Speed <11 and ≥34 Knots

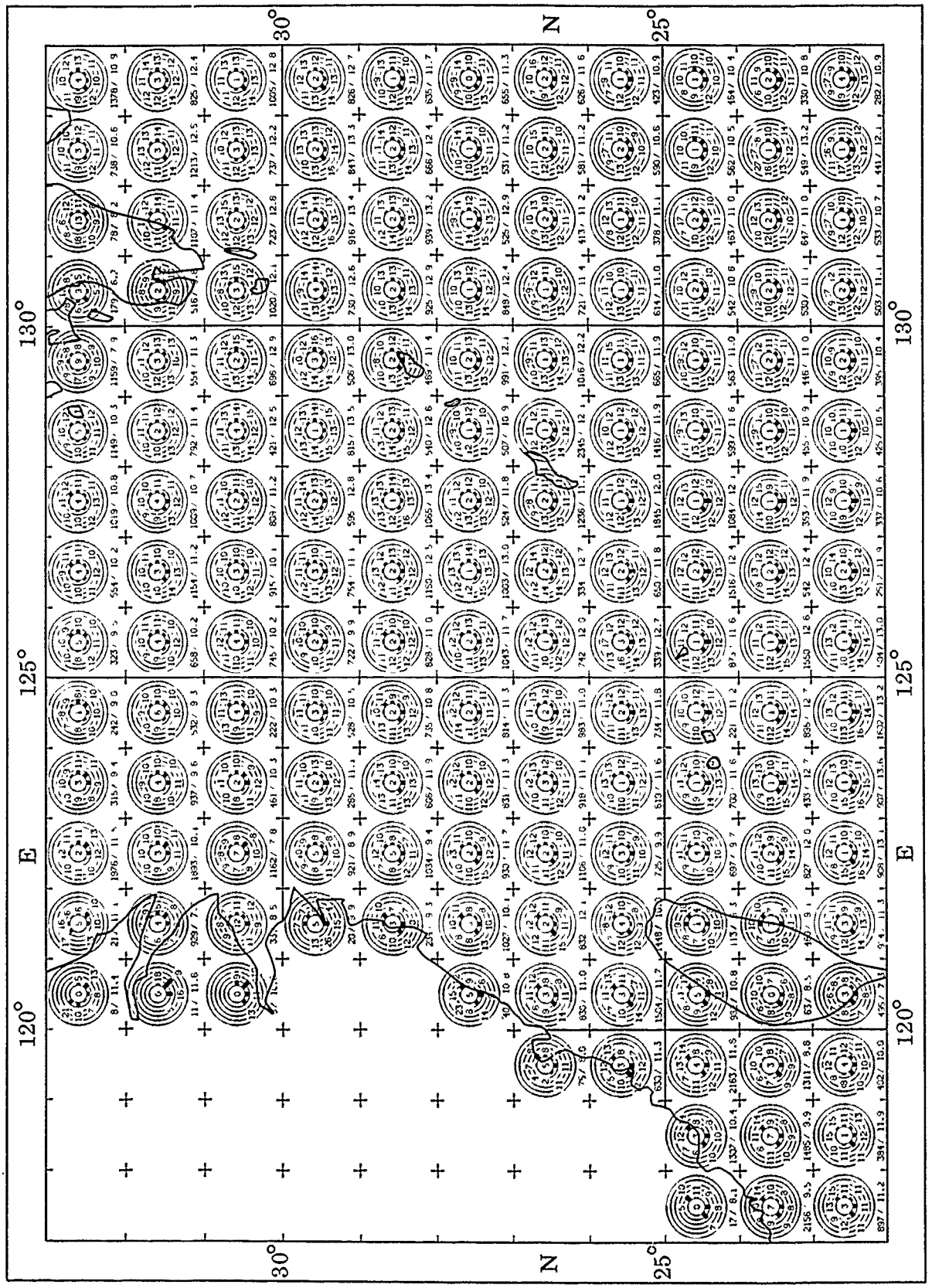


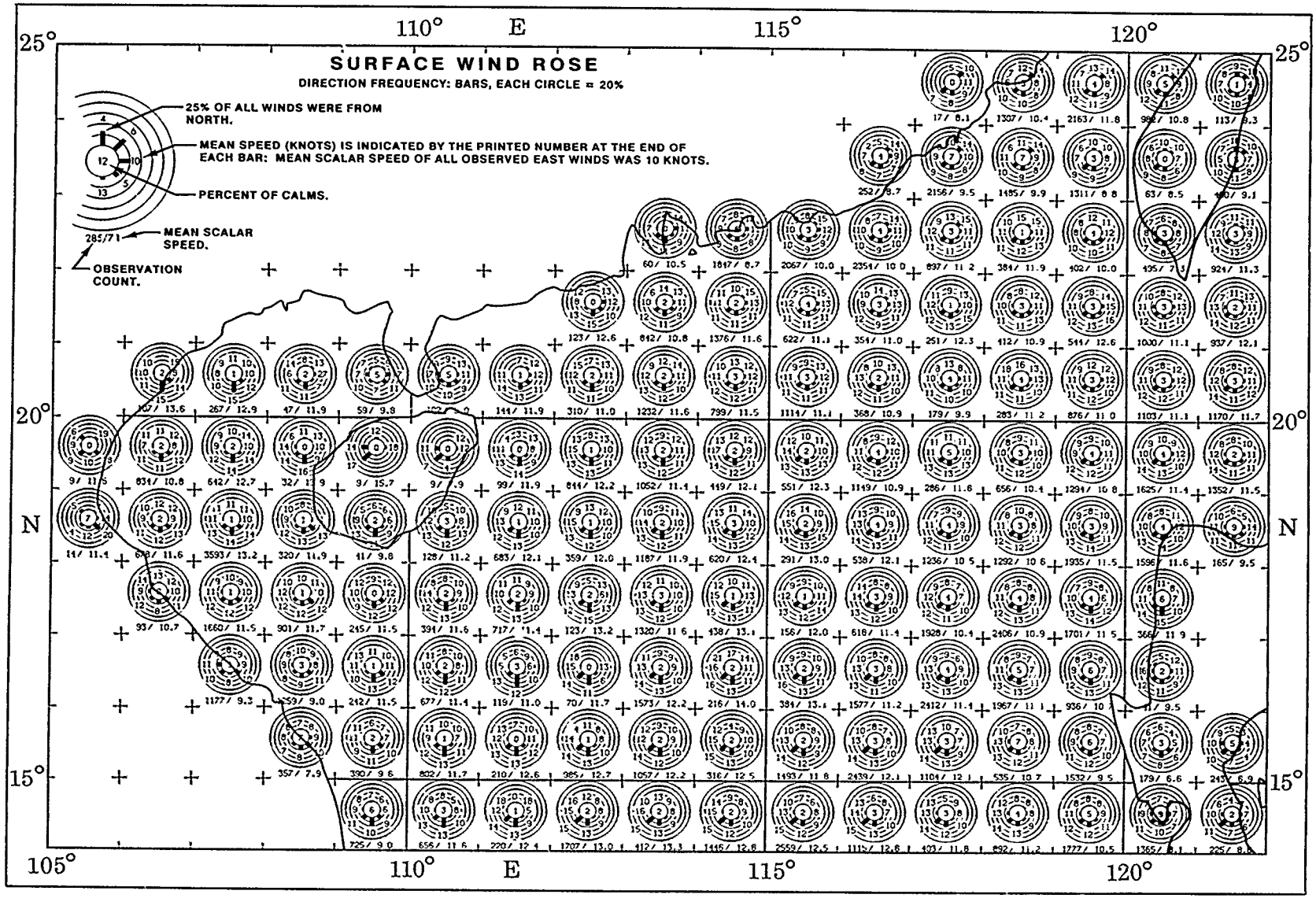
June

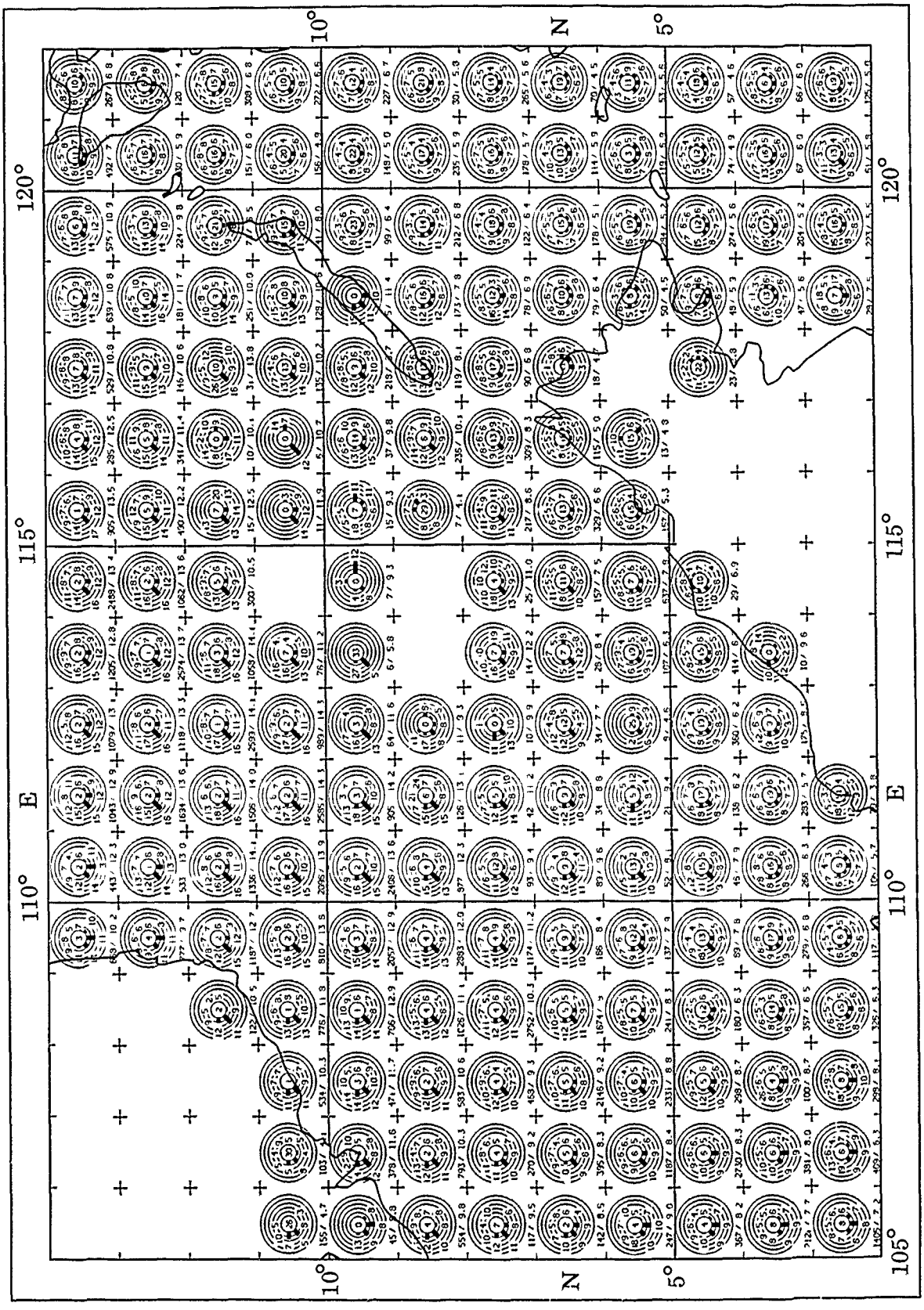
Wind Speed 11 - 21 and 22 - 33 Knots

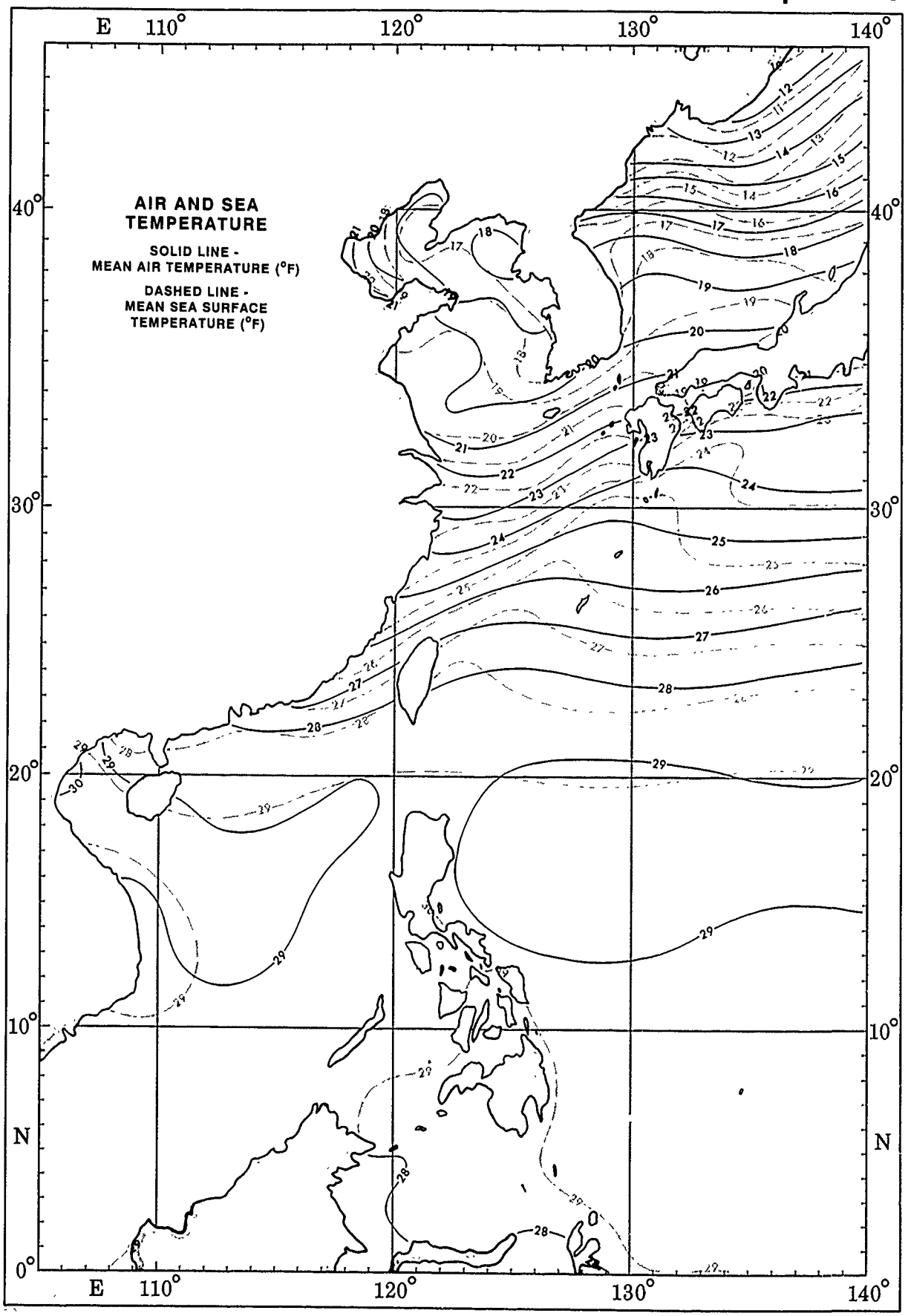


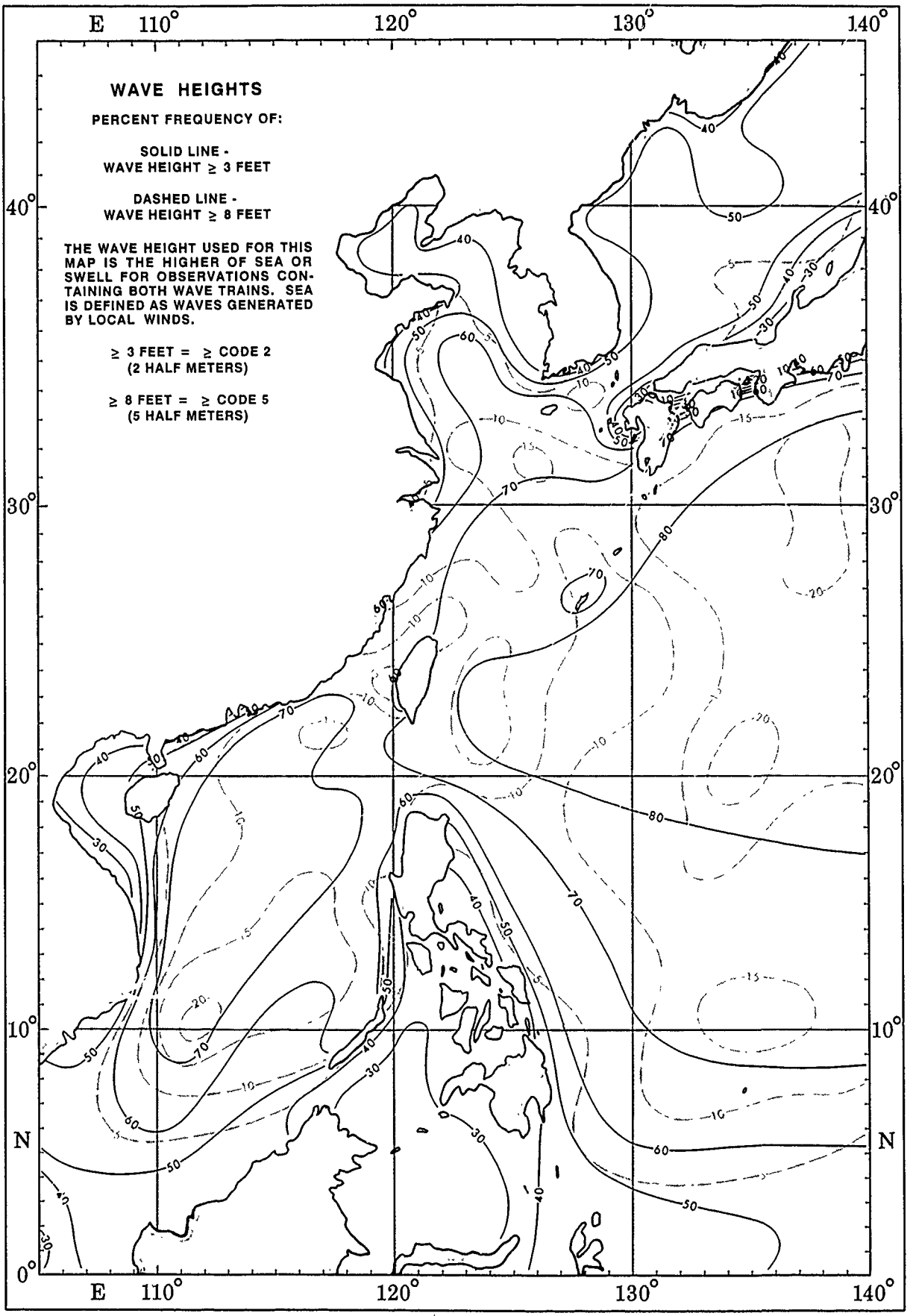

SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%
25% OF ALL WINDS WERE FROM NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR: MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
PERCENT OF CALMS.
285/71
MEAN SCALAR SPEED.
OBSERVATION COUNT.
120° E 125° 130°
40° N 35°

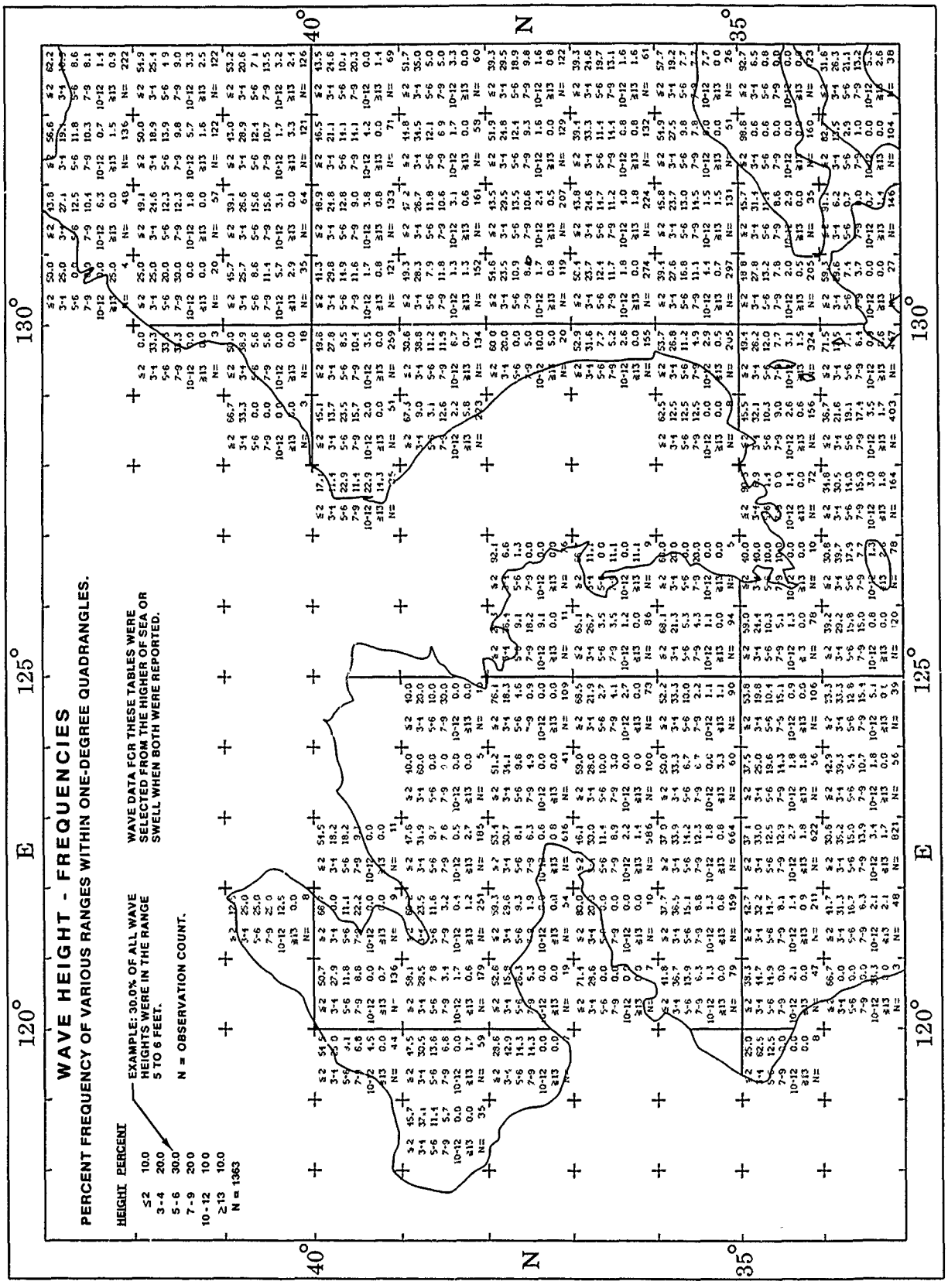

30°
N
25°
120°
E
125°
130°

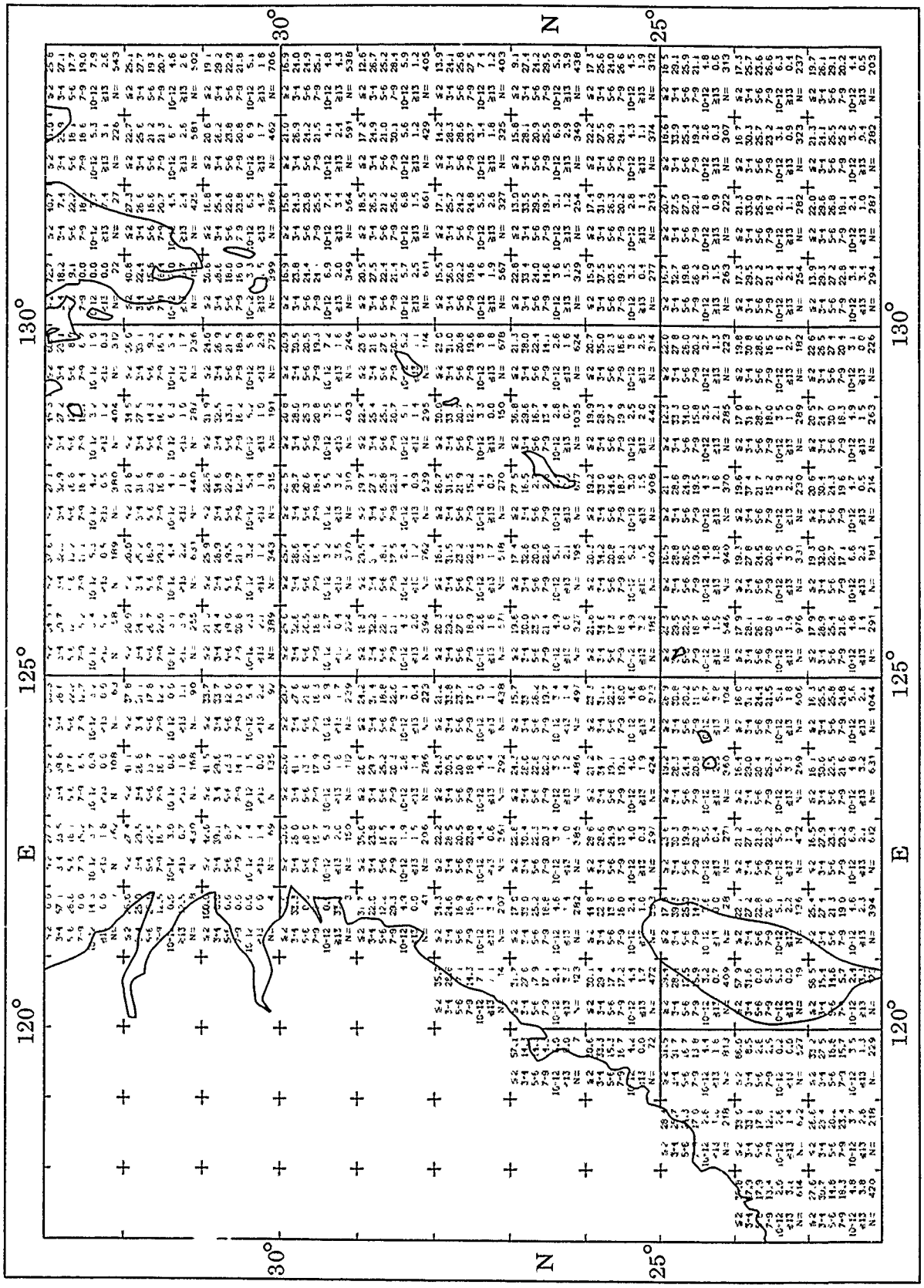

SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%
25% OF ALL WINDS WERE FROM NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR: MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
PERCENT OF CALMS.
285/71
MEAN SCALAR SPEED.
OBSERVATION COUNT.
110° E
115°
120°
25°
20°
15°
N
105°

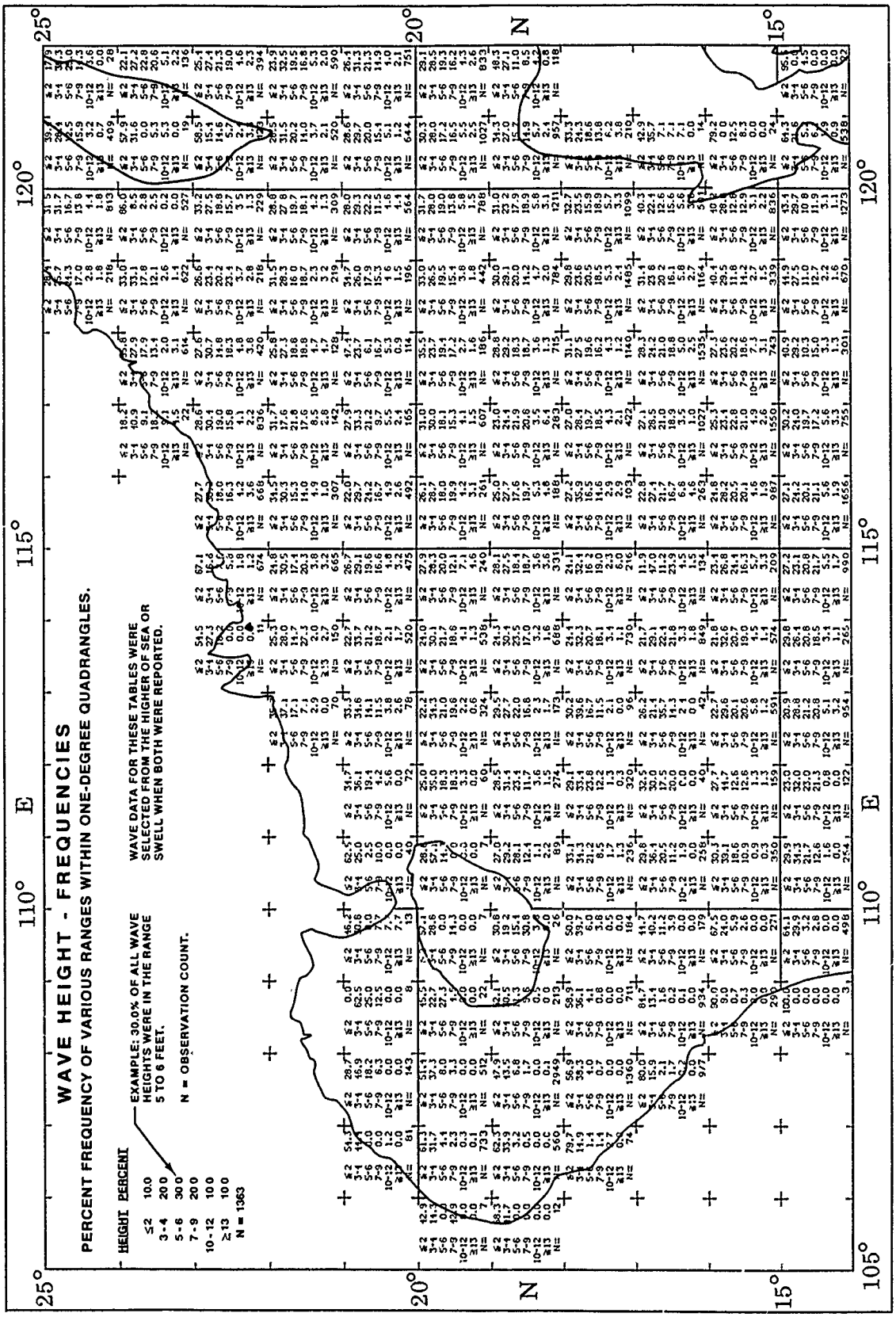

10°
5°
N
120°
115°
110°
105°
E

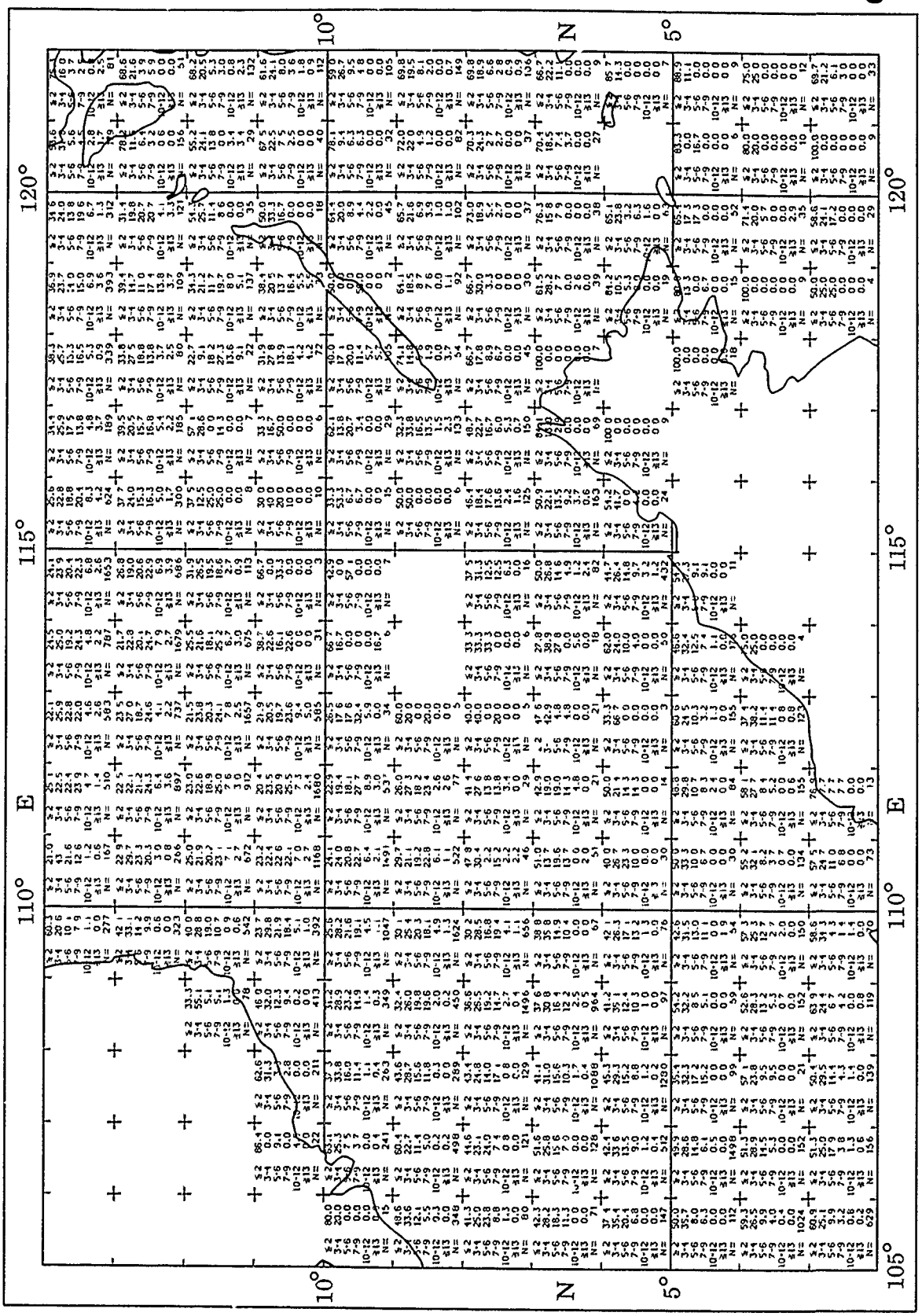

AIR AND SEA TEMPERATURE
SOLID LINE - MEAN AIR TEMPERATURE (°F)
DASHED LINE - MEAN SEA SURFACE TEMPERATURE (°F)
E 110°
120°
130°
140°
40°
30°
20°
10°
0°
N

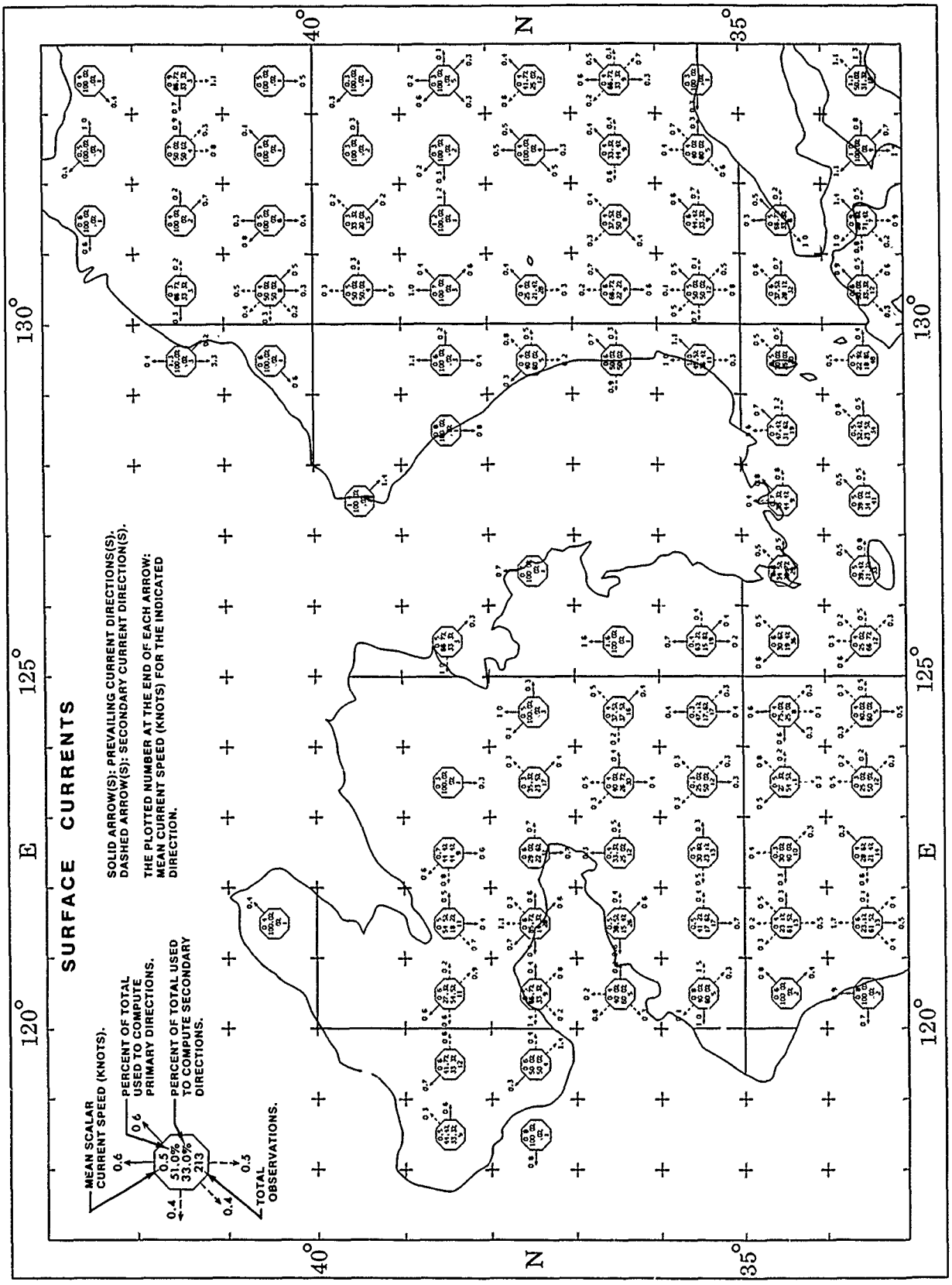

WAVE HEIGHTS
PERCENT FREQUENCY OF:
SOLID LINE -
WAVE HEIGHT ≥ 3 FEET
DASHED LINE -
WAVE HEIGHT ≥ 8 FEET
THE WAVE HEIGHT USED FOR THIS MAP IS THE HIGHER OF SEA OR SWELL FOR OBSERVATIONS CONTAINING BOTH WAVE TRAINS. SEA IS DEFINED AS WAVES GENERATED BY LOCAL WINDS.
≥ 3 FEET = ≥ CODE 2 (2 HALF METERS)
≥ 8 FEET = ≥ CODE 5 (5 HALF METERS)
E 110° 120° 130° 140°
40° 30° 20° 10° N 0°

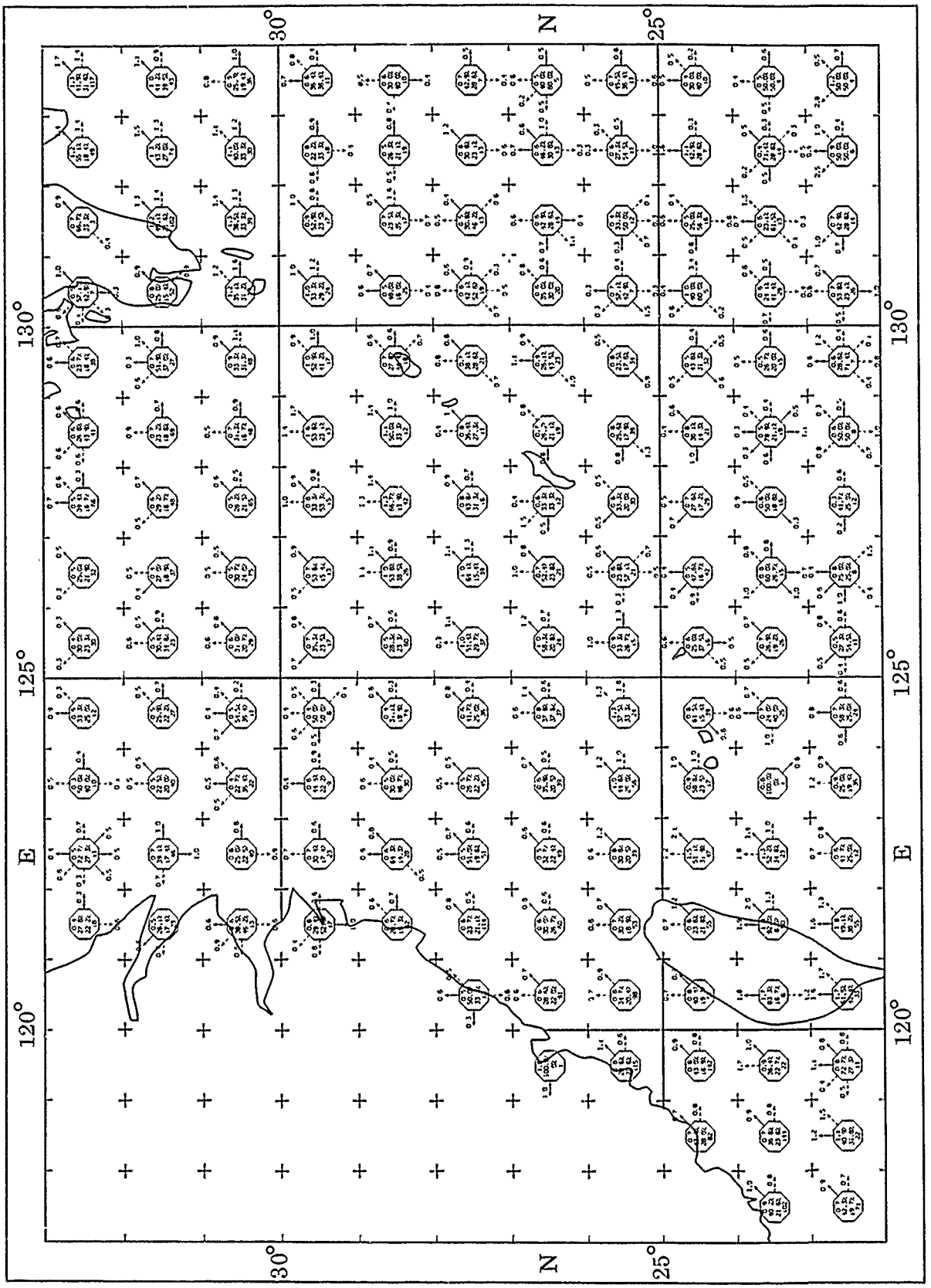

WAVE HEIGHT - FREQUENCIES
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
EXAMPLE: 30.0% OF ALL WAVE HEIGHTS WERE IN THE RANGE 5 TO 6 FEET.
N = OBSERVATION COUNT.
WAVE DATA FOR THESE TABLES WERE SELECTED FROM THE HIGHER OF SEA OR SWELL WHEN BOTH WERE REPORTED.
HEIGHT PERCENT
≤2 10.0
3-4 20.0
5-6 30.0
7-9 20.0
10-12 10.0
≥13 10.0
N = 1363
120°
125°
130°
35°
40°
N
E

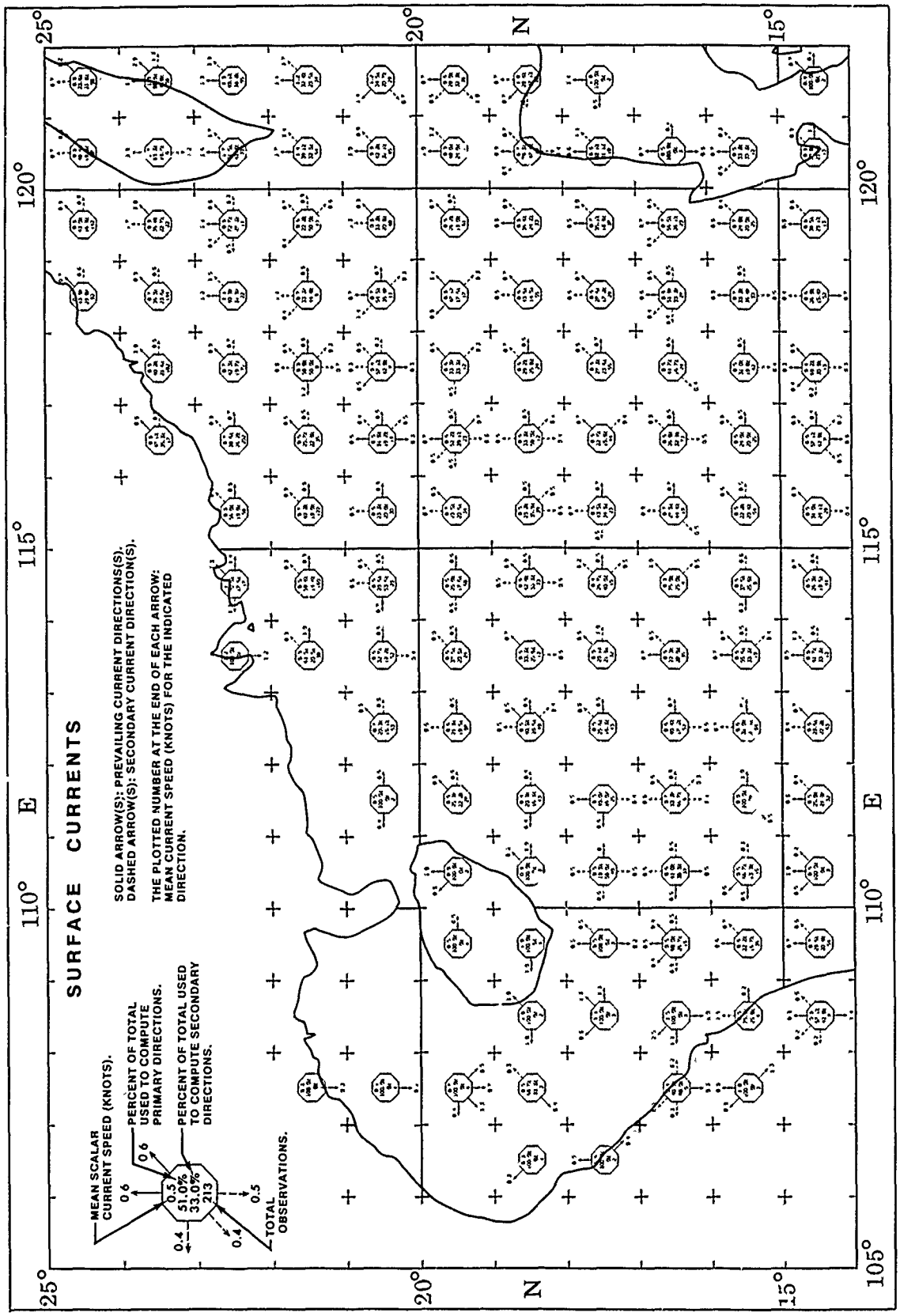

30°
N
25°
120°
125°
130°
E

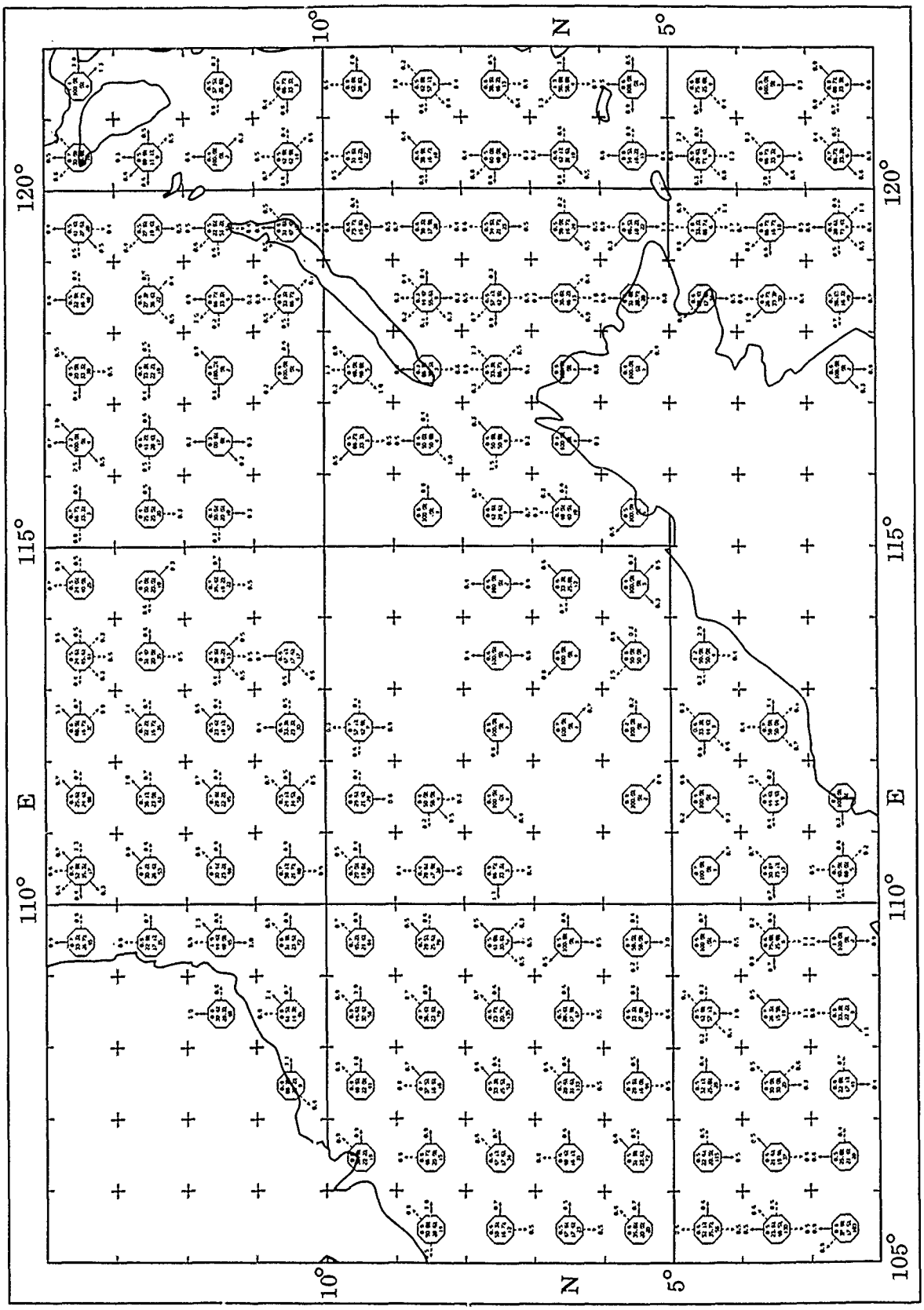

WAVE HEIGHT - FREQUENCIES
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
EXAMPLE: 30.0% OF ALL WAVE HEIGHTS WERE IN THE RANGE 5 TO 6 FEET.
N = OBSERVATION COUNT.
WAVE DATA FOR THESE TABLES WERE SELECTED FROM THE HIGHER OF SEA OR SWELL WHEN BOTH WERE REPORTED.
HEIGHT PERCENT
≤2 10.0
3-4 20.0
5-6 30.0
7-9 20.0
10-12 10.0
≥13 10.0
N = 1363
110° E
115°
120°
25°
20°
15°
N

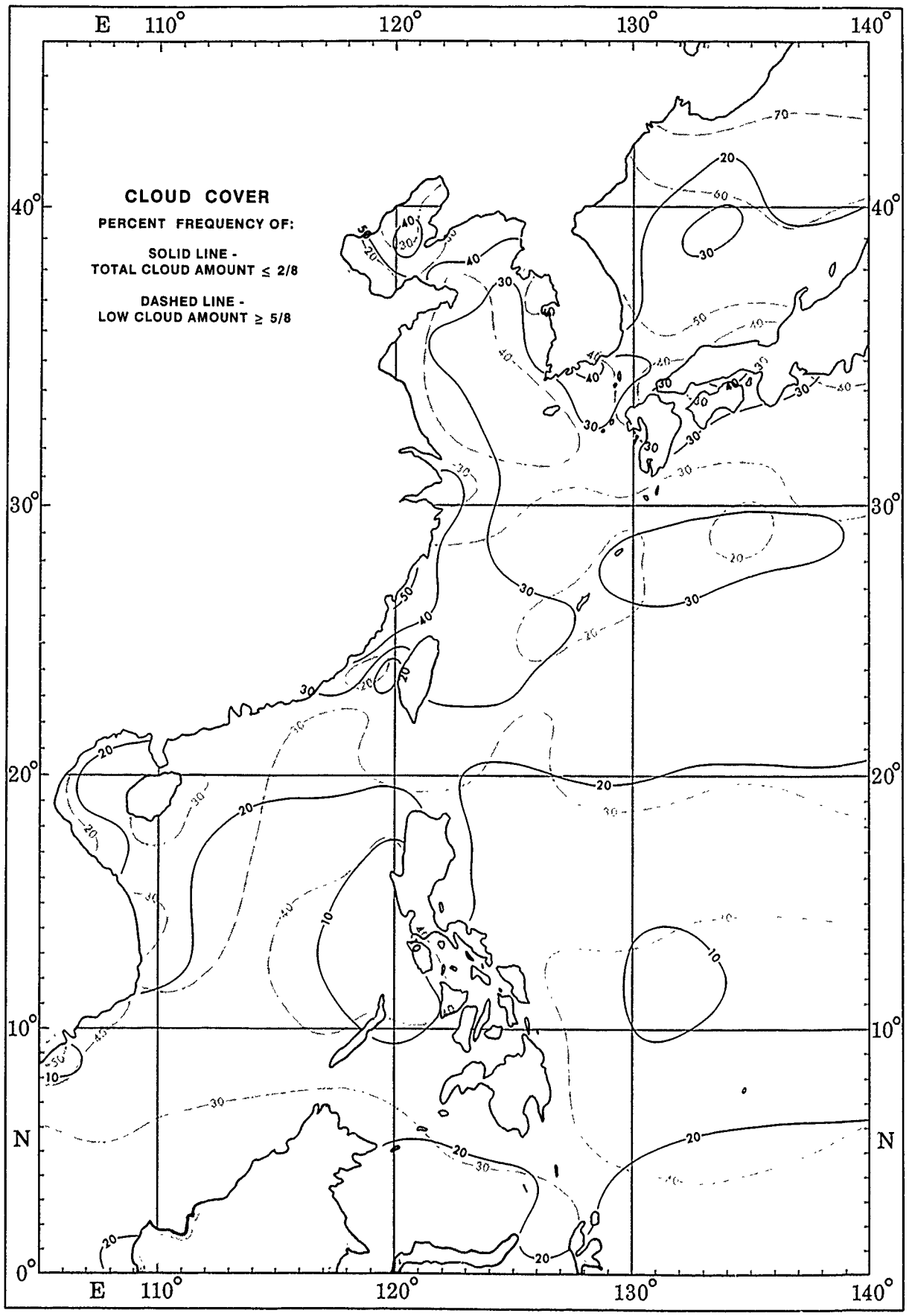

105°
110°
115°
120°
E
10°
N
5°

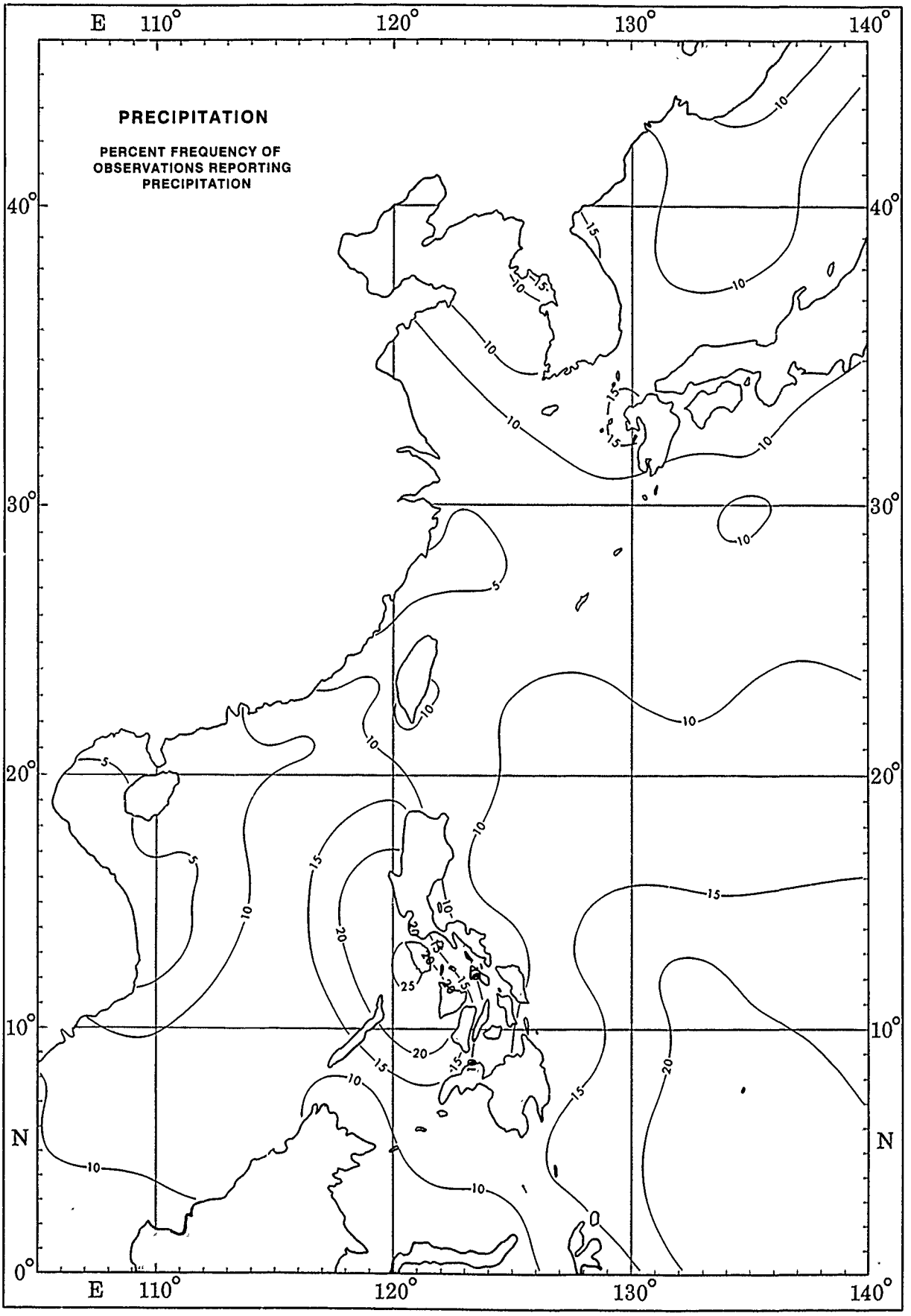

SURFACE CURRENTS
SOLID ARROW(S): PREVAILING CURRENT DIRECTIONS(S).
DASHED ARROW(S): SECONDARY CURRENT DIRECTION(S).
THE PLOTTED NUMBER AT THE END OF EACH ARROW: MEAN CURRENT SPEED (KNOTS) FOR THE INDICATED DIRECTION.
MEAN SCALAR CURRENT SPEED (KNOTS).
PERCENT OF TOTAL USED TO COMPUTE PRIMARY DIRECTIONS.
PERCENT OF TOTAL USED TO COMPUTE SECONDARY DIRECTIONS.
TOTAL OBSERVATIONS.
0.6
0.5
51.0%
33.0%
213
0.5
0.4
0.4
40° N
35° N
120° E
125° E
130° E

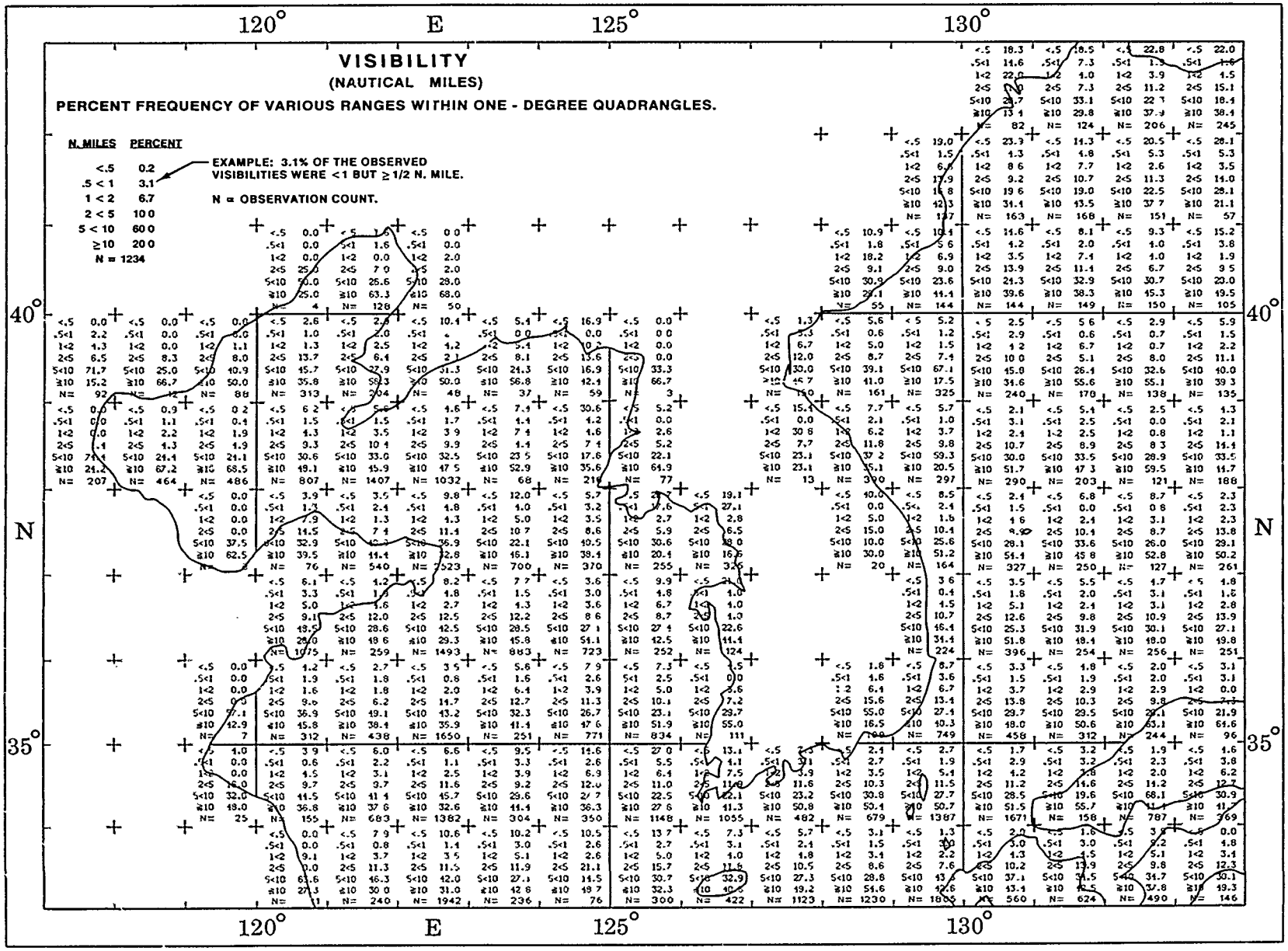

30° N
25°
130°
125°
120° E

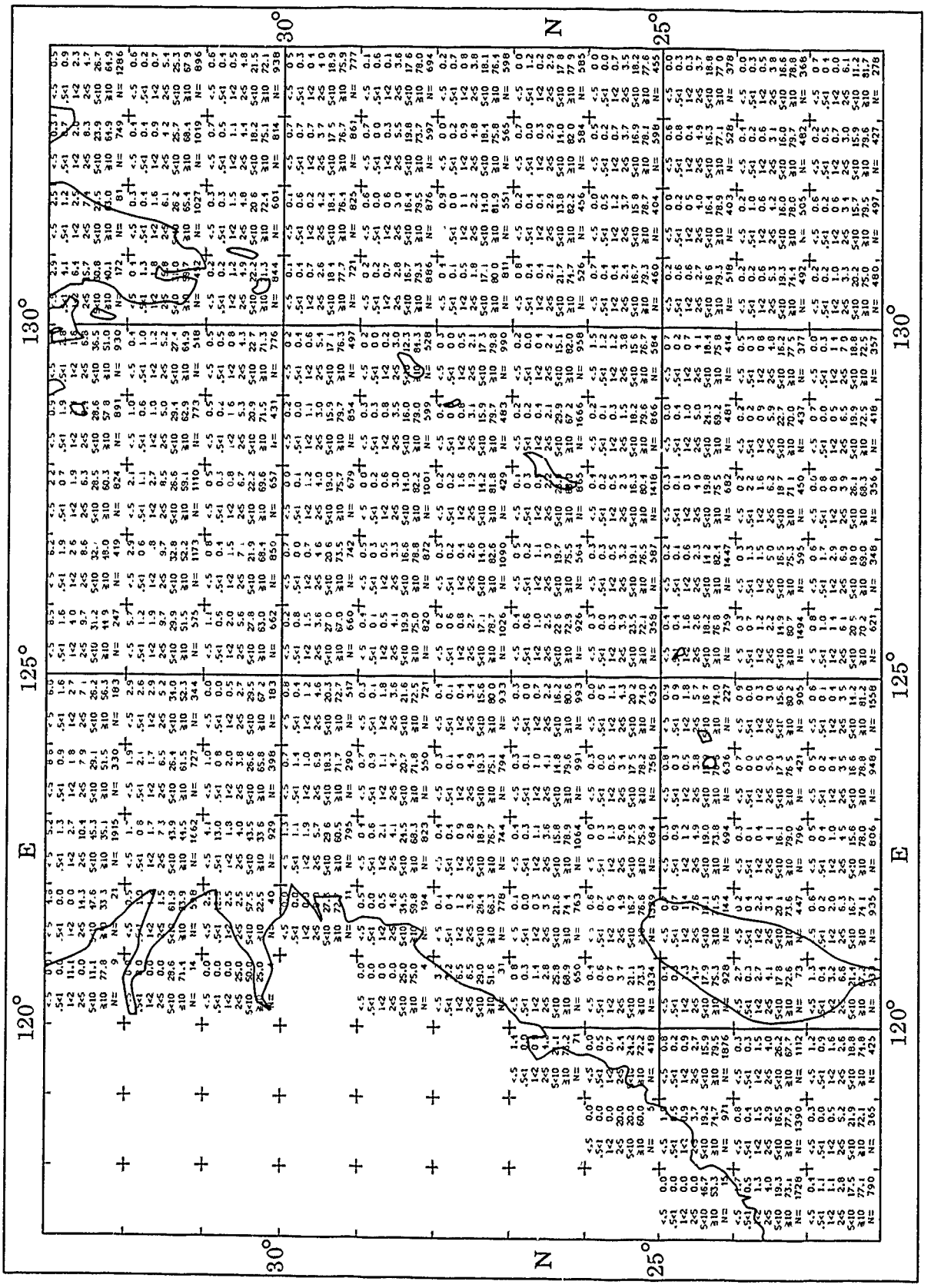

SURFACE CURRENTS
SOLID ARROW(S): PREVAILING CURRENT DIRECTIONS(S).
DASHED ARROW(S): SECONDARY CURRENT DIRECTION(S).
THE PLOTTED NUMBER AT THE END OF EACH ARROW: MEAN CURRENT SPEED (KNOTS) FOR THE INDICATED DIRECTION.
MEAN SCALAR CURRENT SPEED (KNOTS).
PERCENT OF TOTAL USED TO COMPUTE PRIMARY DIRECTIONS.
PERCENT OF TOTAL USED TO COMPUTE SECONDARY DIRECTIONS.
TOTAL OBSERVATIONS.
0.6
0.5
51.0%
33.0%
213
0.4
0.5
25°
20° N
15°
120°
115°
110° E
105°

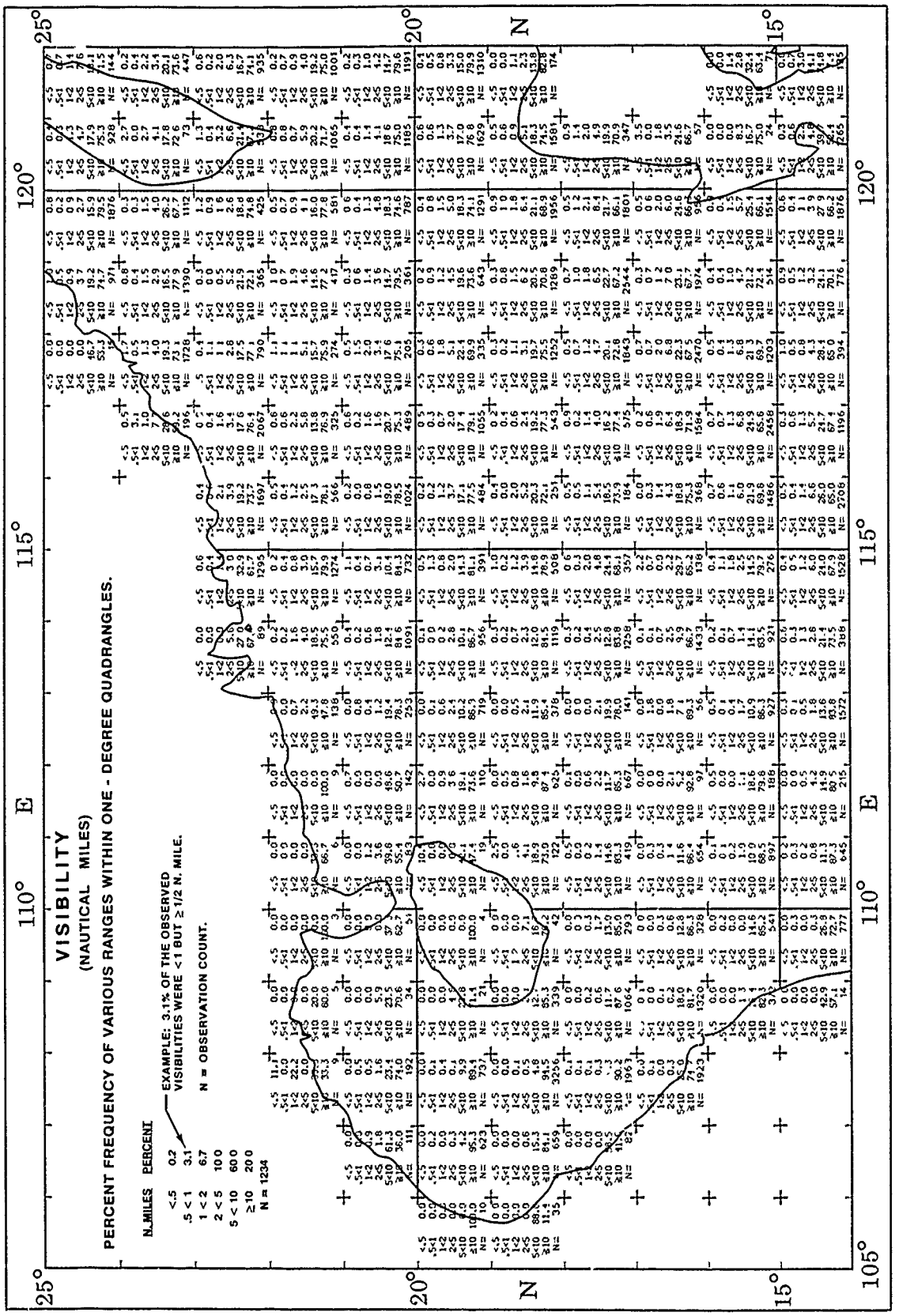

10° N
5°
120°
115°
110° E
105°


CLOUD COVER
PERCENT FREQUENCY OF:
SOLID LINE -
TOTAL CLOUD AMOUNT ≤ 2/8
DASHED LINE -
LOW CLOUD AMOUNT ≥ 5/8
E 110° 120° 130° 140°
40° 30° 20° 10° N 0°


PRECIPITATION
PERCENT FREQUENCY OF OBSERVATIONS REPORTING PRECIPITATION
E 110°
120°
130°
140°
40°
30°
20°
10°
N
0°


VISIBILITY
(NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE - DEGREE QUADRANGLES.
N. MILES PERCENT
<.5 0.2
.5 < 1 3.1
1 < 2 6.7
2 < 5 10.0
5 < 10 60.0
≥10 20.0
N = 1234
EXAMPLE: 3.1% OF THE OBSERVED VISIBILITIES WERE <1 BUT ≥1/2 N. MILE.
N = OBSERVATION COUNT.
120° E 125° 130°
40°
35°
N

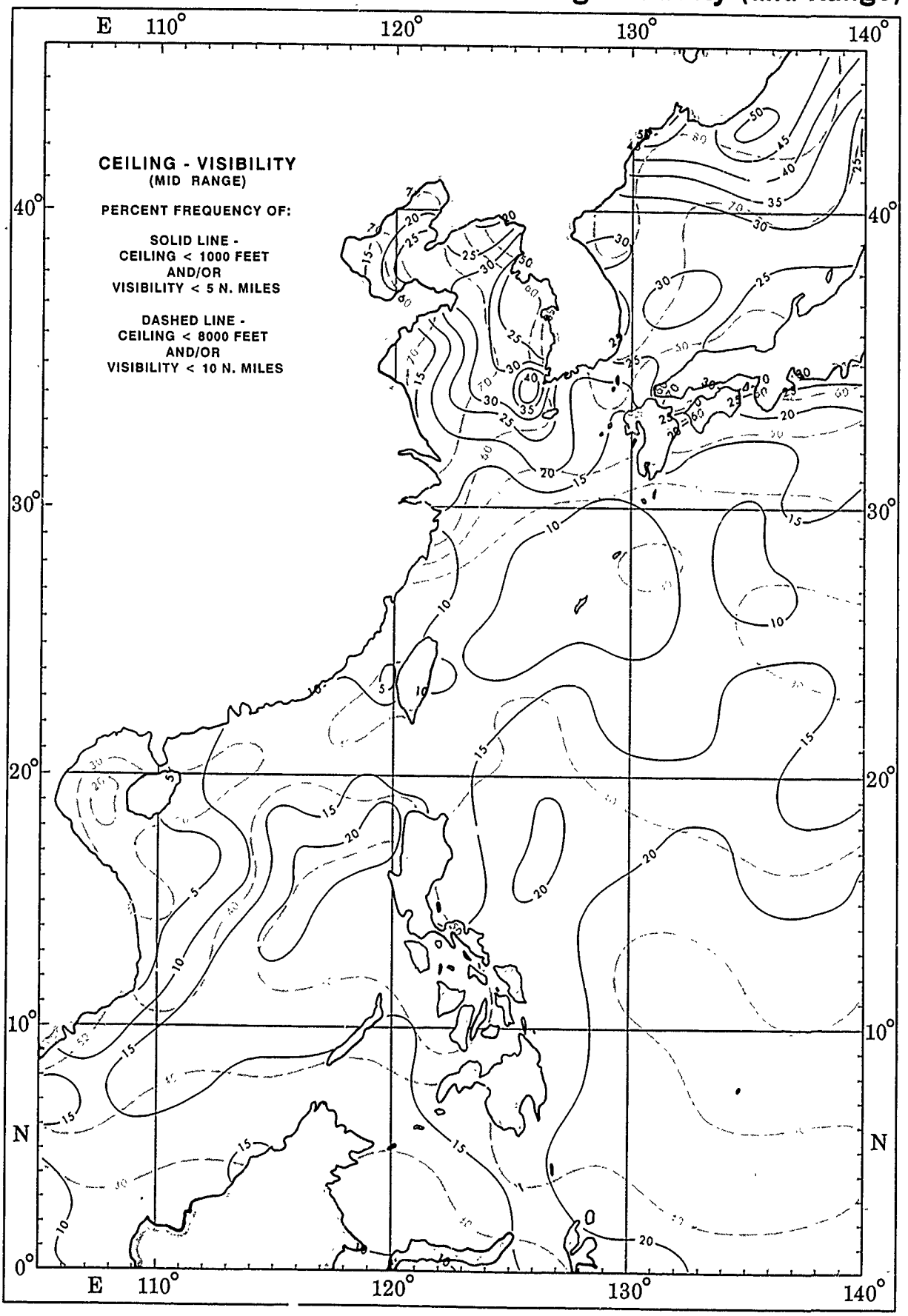

120°
125°
130°
25°
30°
N
E


VISIBILITY
(NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE - DEGREE QUADRANGLES.
N. MILES PERCENT
<.5 0.2
.5 < 1 3.1
1 < 2 6.7
2 < 5 10.0
5 < 10 60.0
≥10 20.0
N = 1234
EXAMPLE: 3.1% OF THE OBSERVED VISIBILITIES WERE <1 BUT ≥ 1/2 N. MILE.
N = OBSERVATION COUNT.
110° E
115° E
120° E
105° E
25° N
20° N
15° N

10° N
5° N
105° E
110° E
115° E
120° E

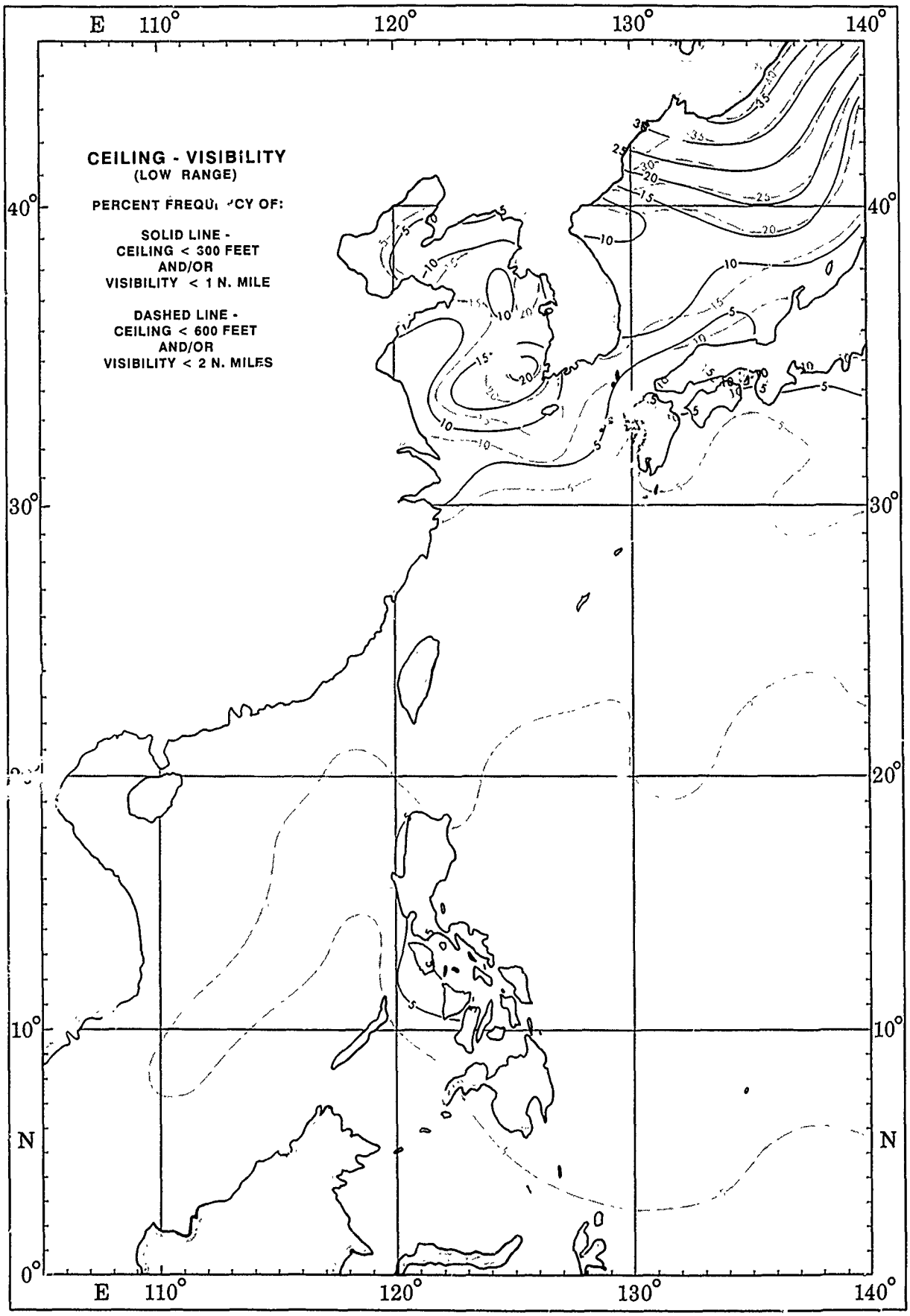
July

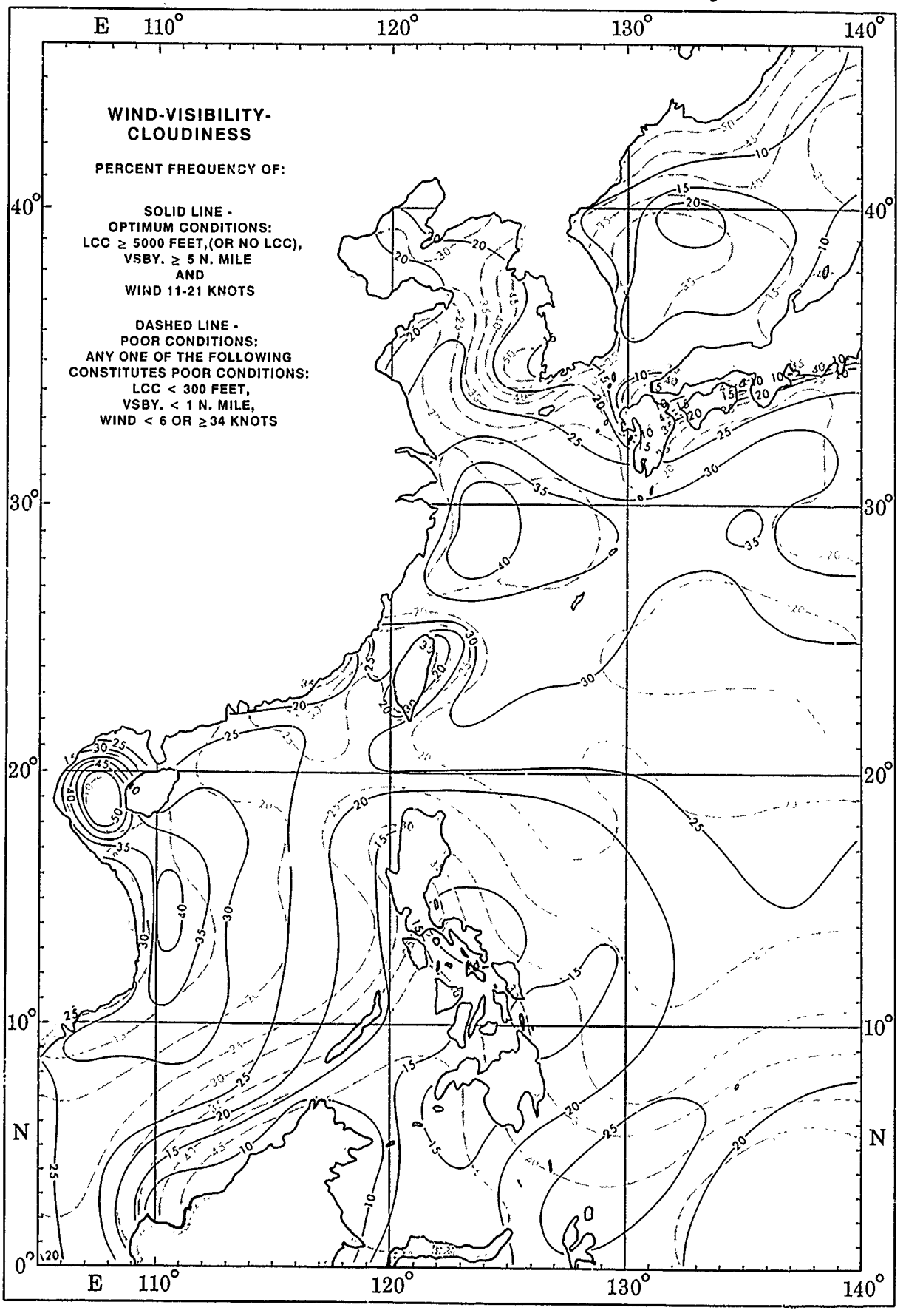
Ceiling - Visibility (Mid Range)



July

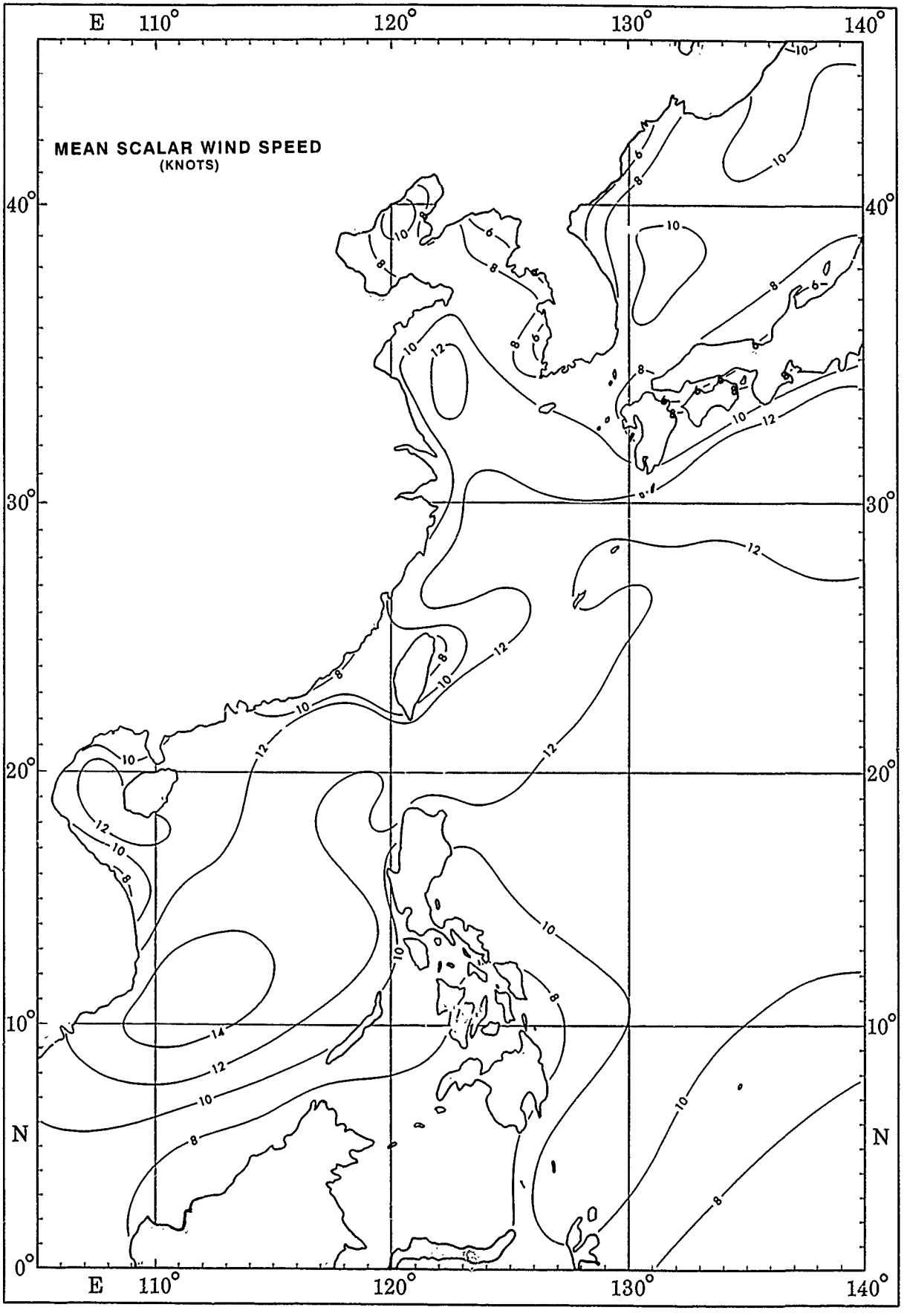
Ceiling - Visibility (Low Range)




WIND-VISIBILITY-
CLOUDINESS
PERCENT FREQUENCY OF:
SOLID LINE -
OPTIMUM CONDITIONS:
LCC ≥ 5000 FEET,(OR NO LCC),
VSBY. ≥ 5 N. MILE
AND
WIND 11-21 KNOTS
DASHED LINE -
POOR CONDITIONS:
ANY ONE OF THE FOLLOWING
CONSTITUTES POOR CONDITIONS:
LCC < 300 FEET,
VSBY. < 1 N. MILE,
WIND < 6 OR ≥34 KNOTS
E 110°
120°
130°
140°
40°
30°
20°
10°
N
0°

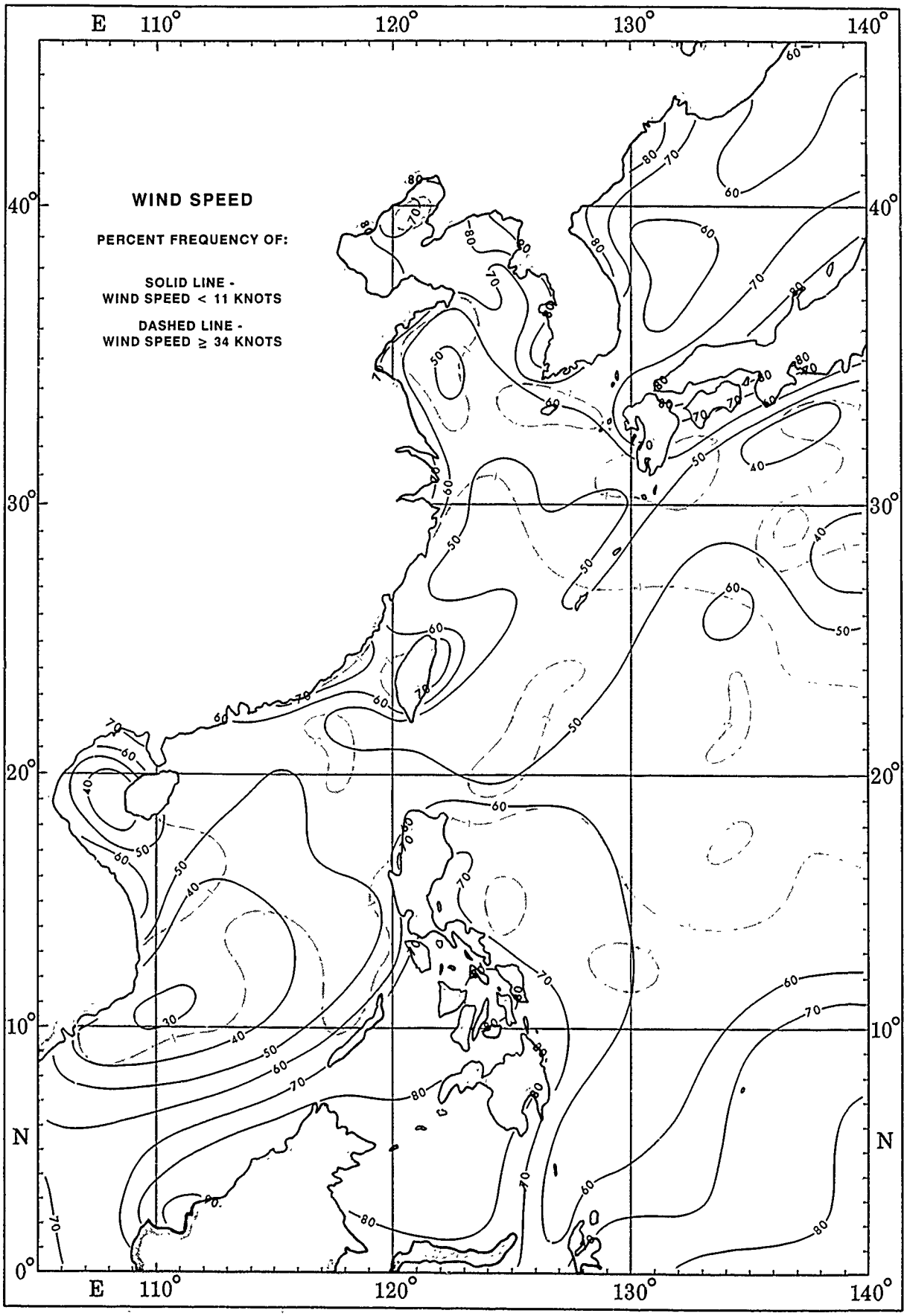
July

Mean Scalar Wind Speed



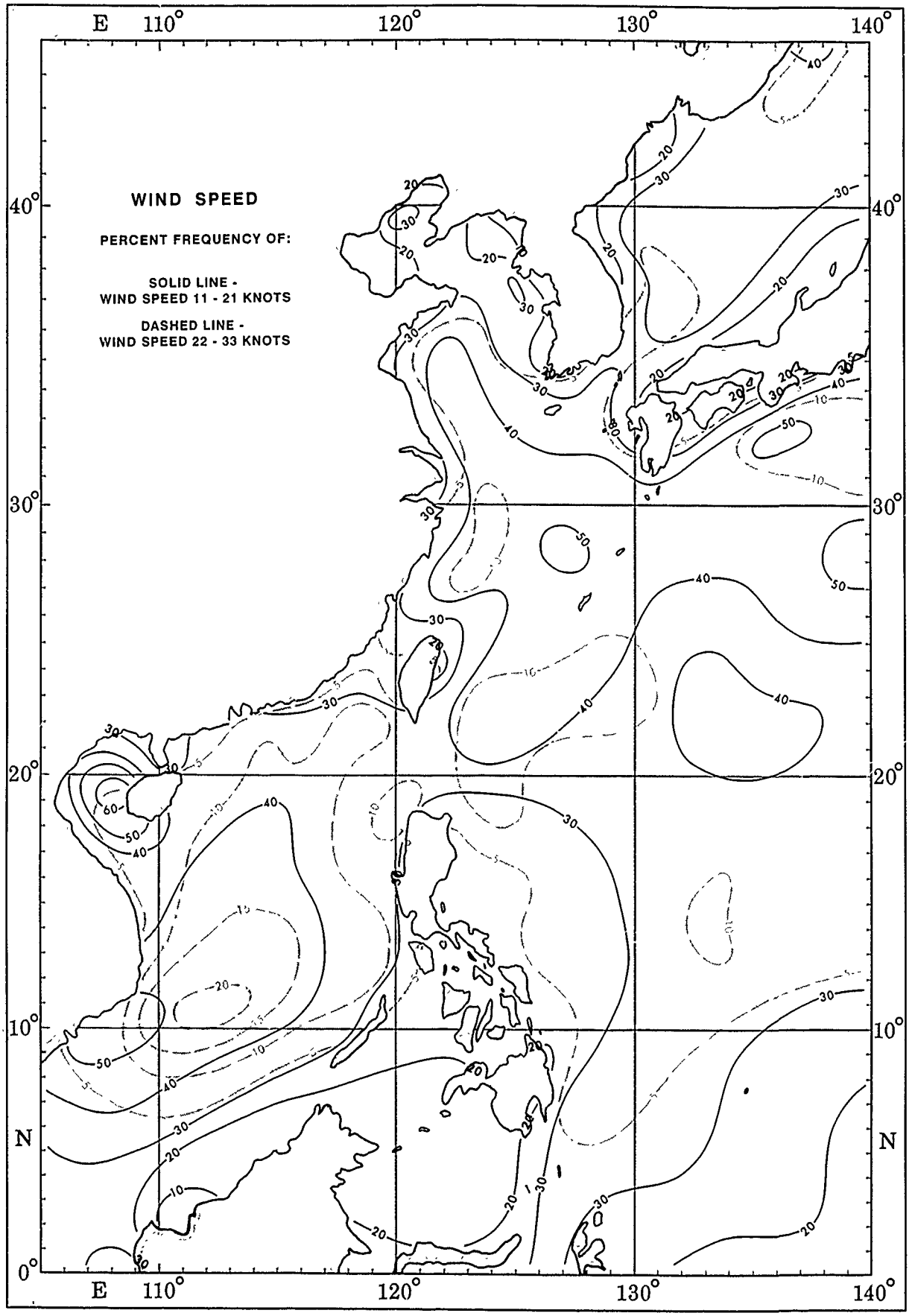
July

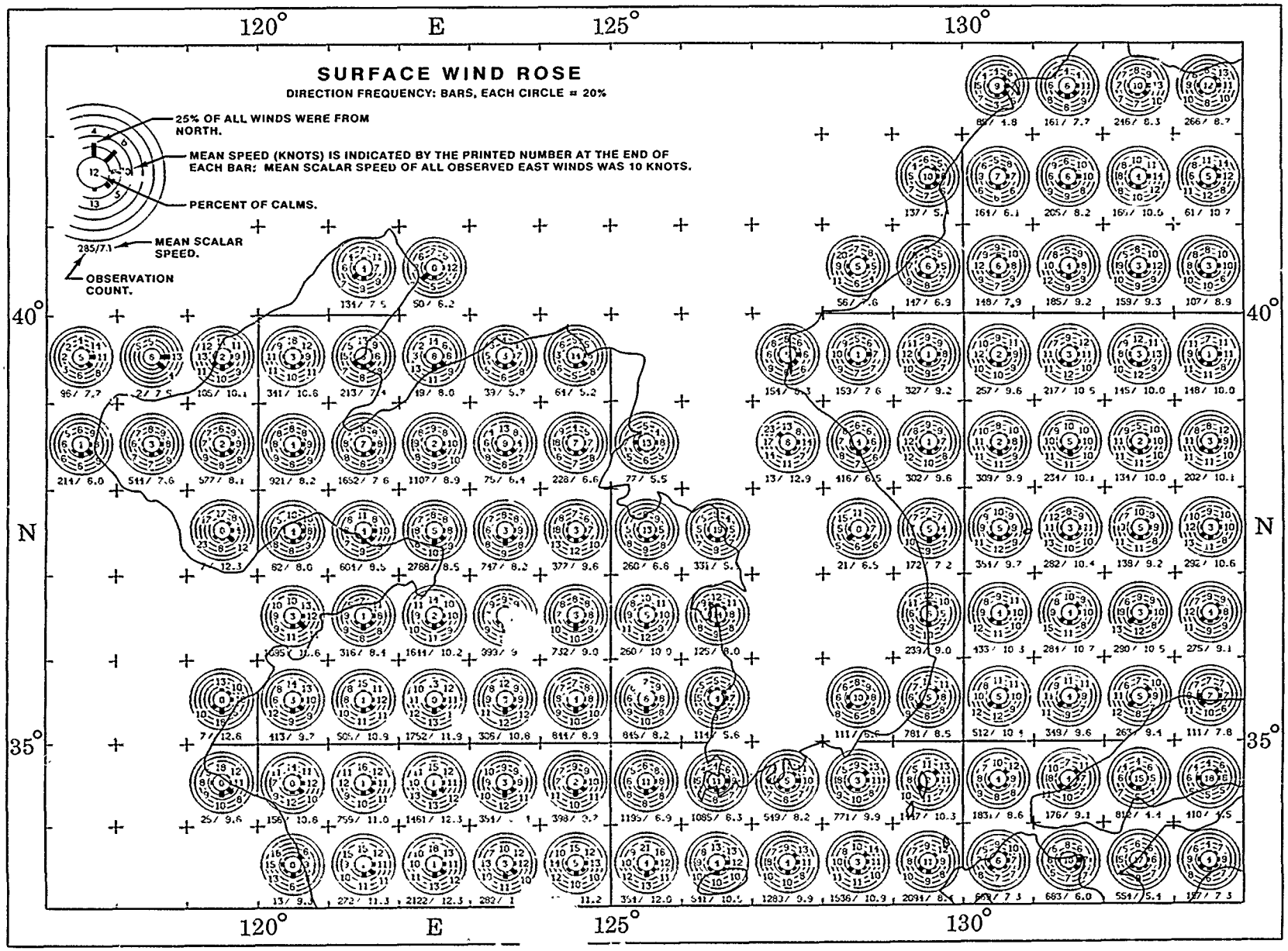
Wind Speed <11 and ≥34 Knots

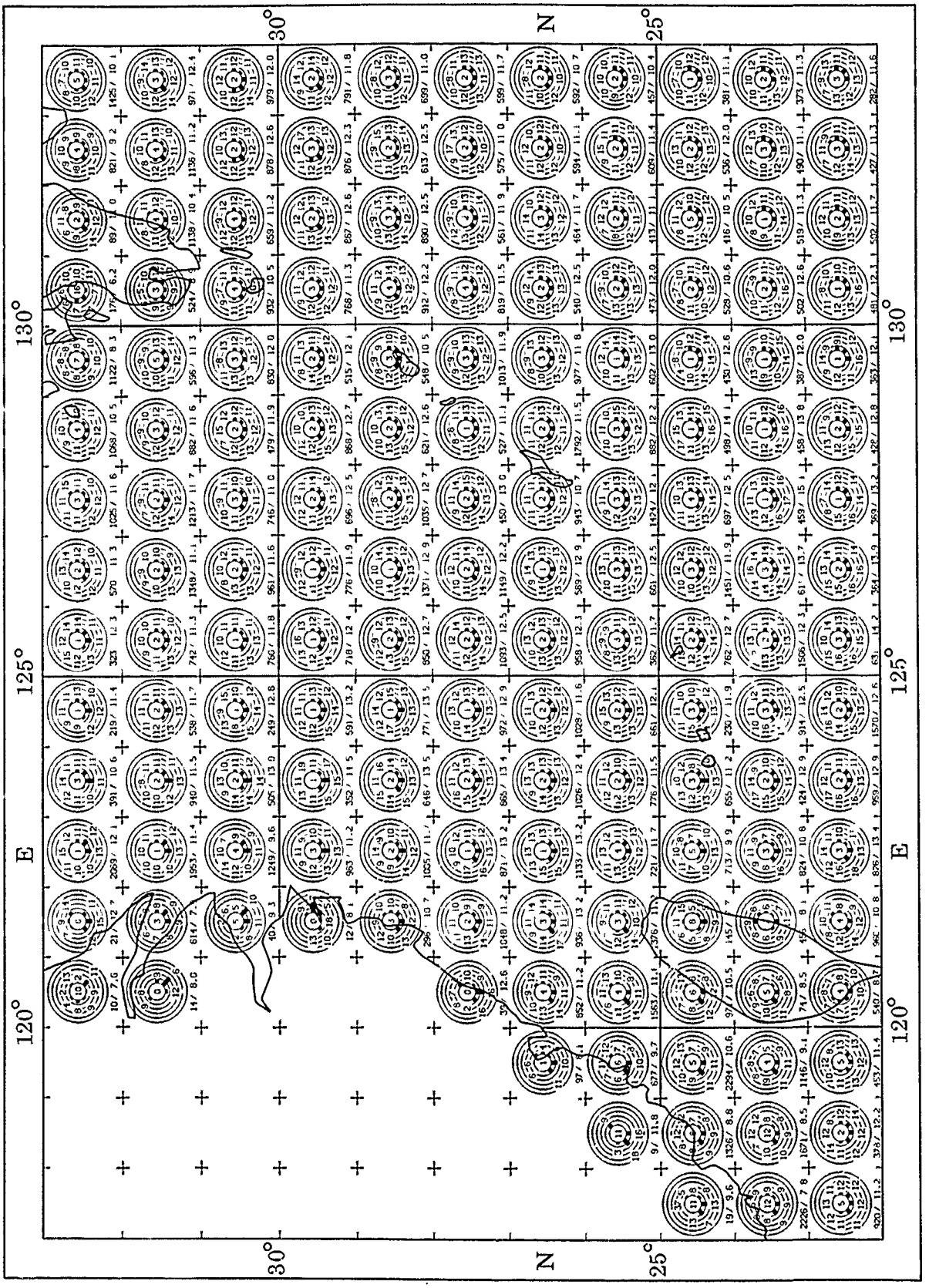


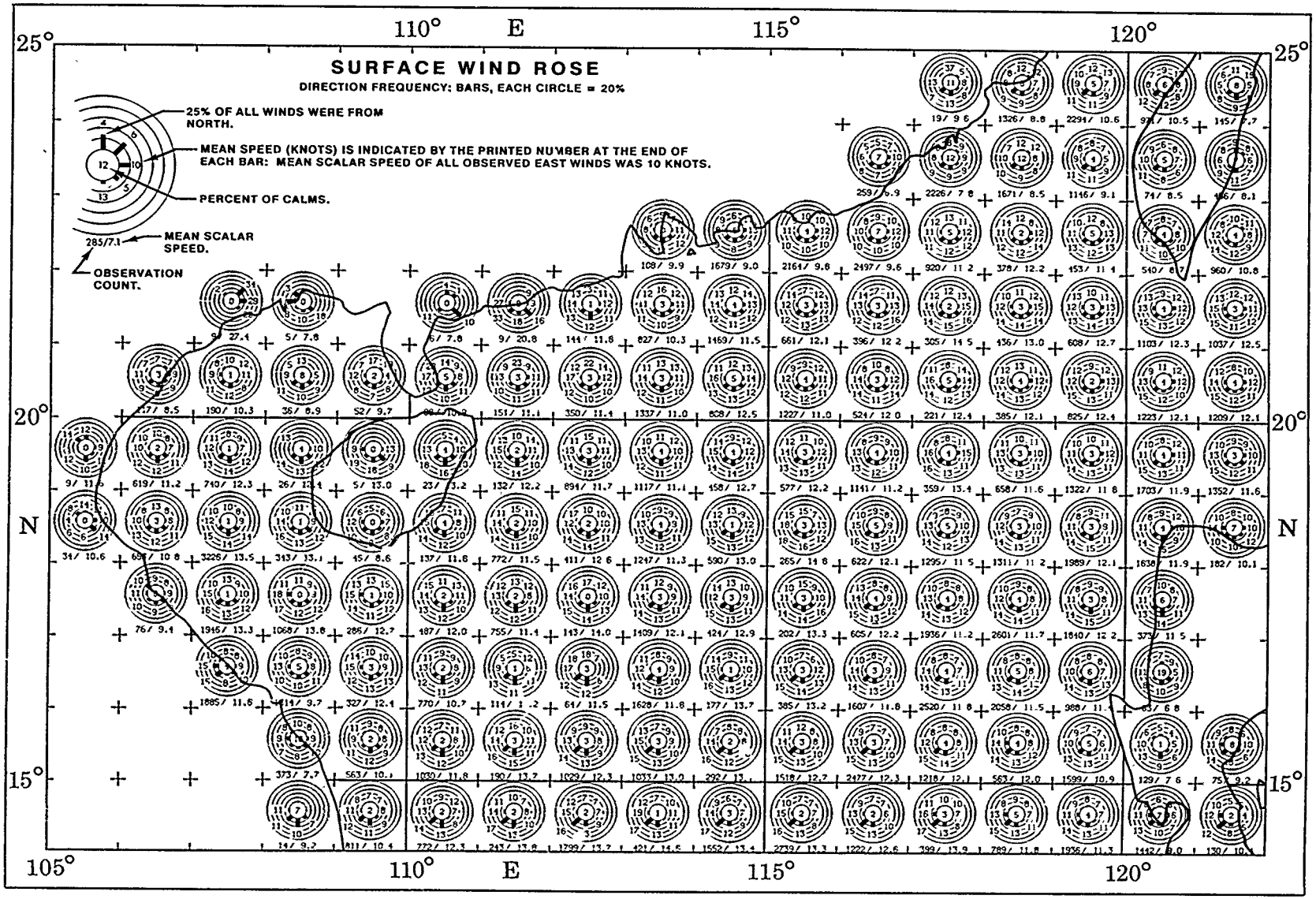
July

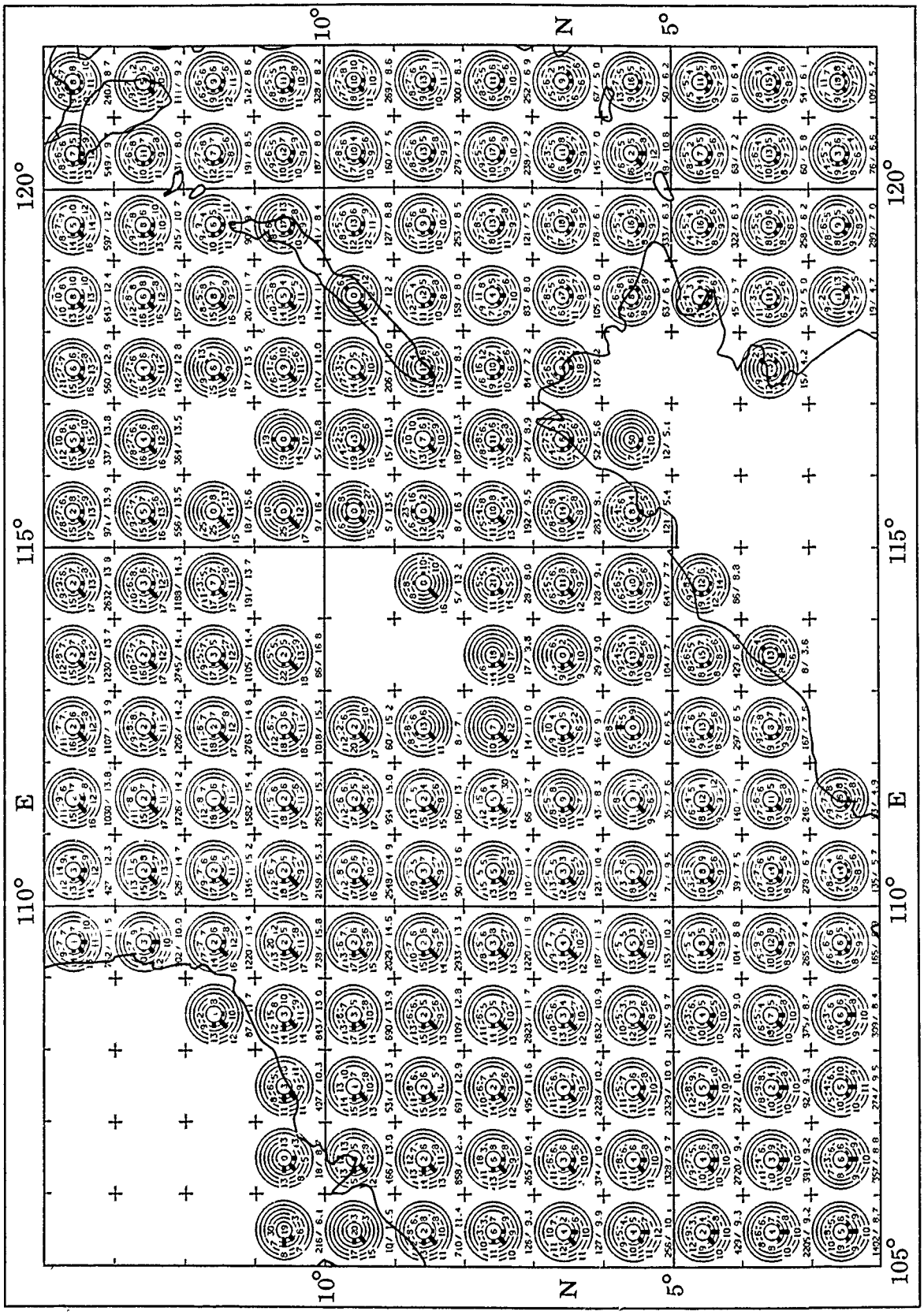
Wind Speed 11 - 21 and 22 - 33 Knots

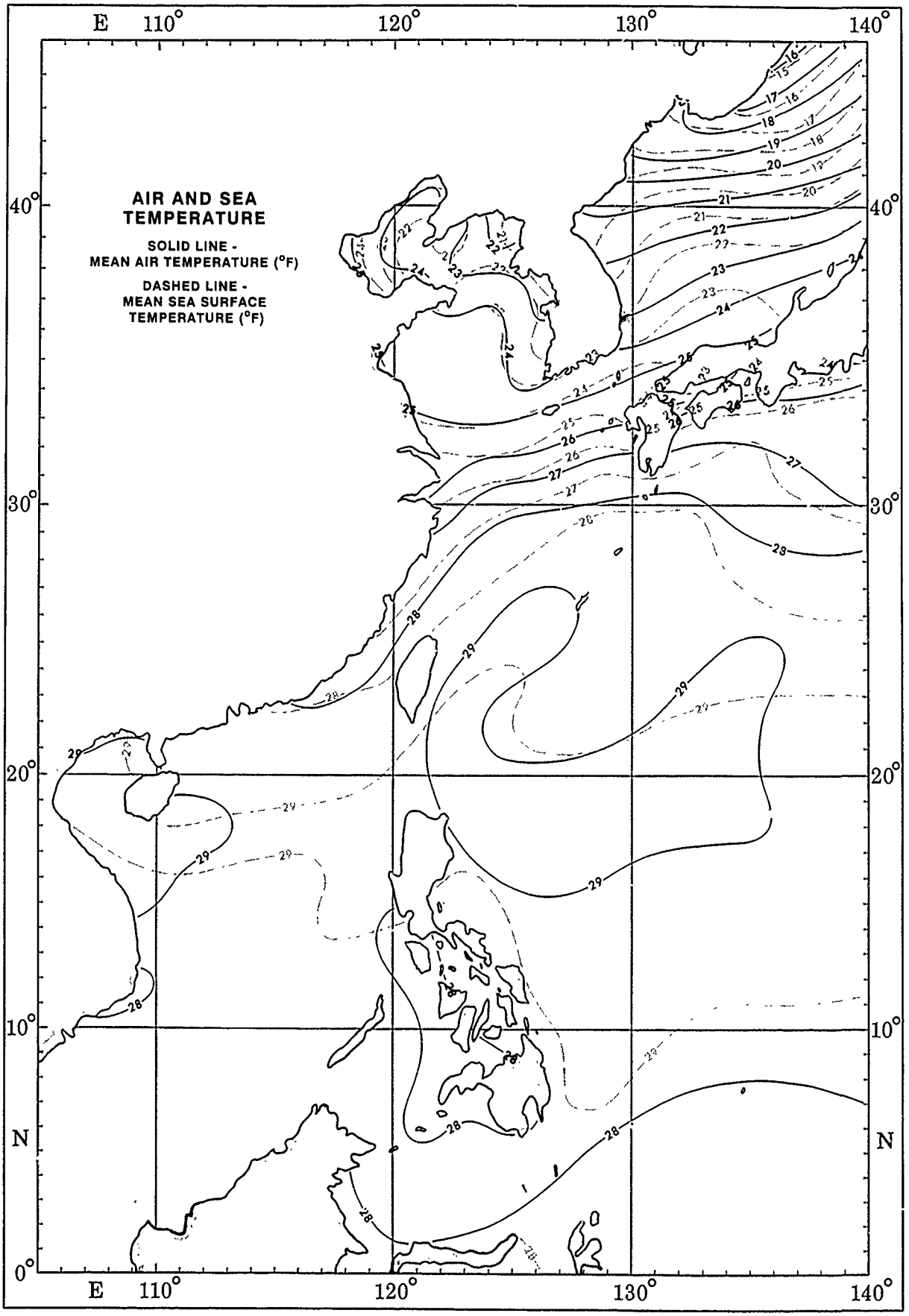


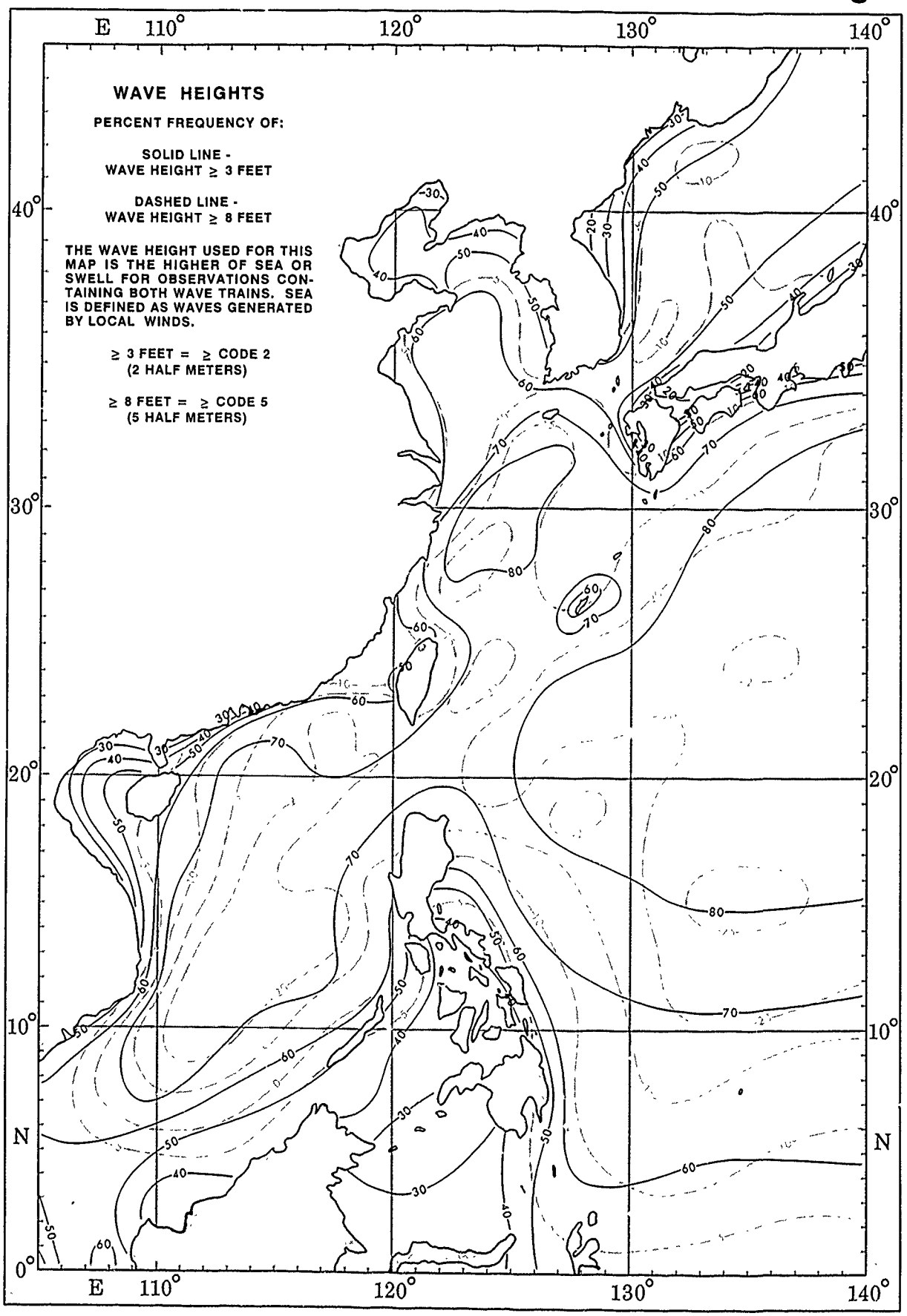

SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%
25% OF ALL WINDS WERE FROM NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR: MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
PERCENT OF CALMS.
285/7.1
MEAN SCALAR SPEED.
OBSERVATION COUNT.
120° E
125°
130°
40°
35°
N

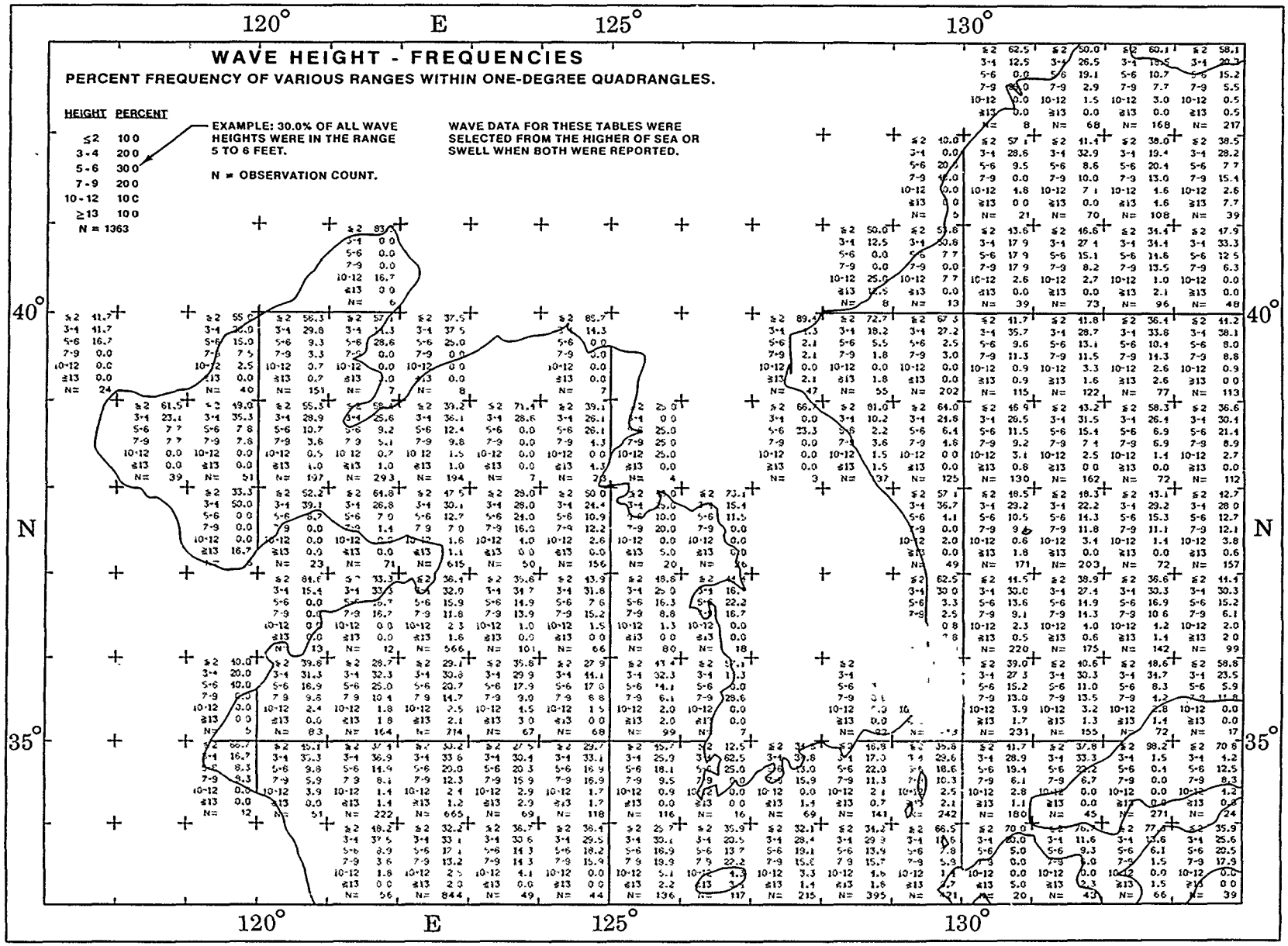

120°
125°
130°
E
30°
25°
N

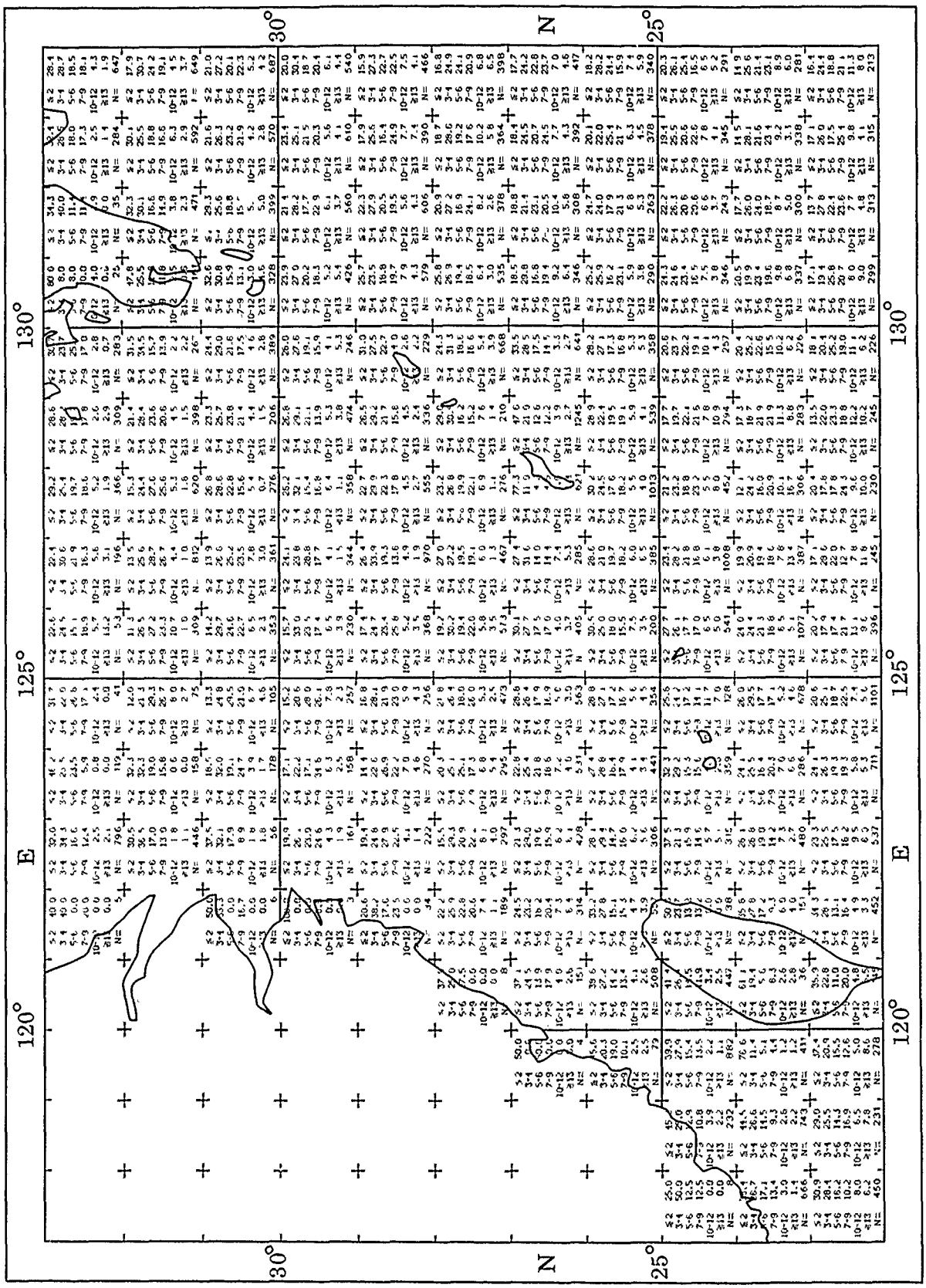

SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%
25% OF ALL WINDS WERE FROM NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR: MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
PERCENT OF CALMS.
285/7.1
MEAN SCALAR SPEED.
OBSERVATION COUNT.
110° E
115°
120°
25°
20°
15°
N
105°

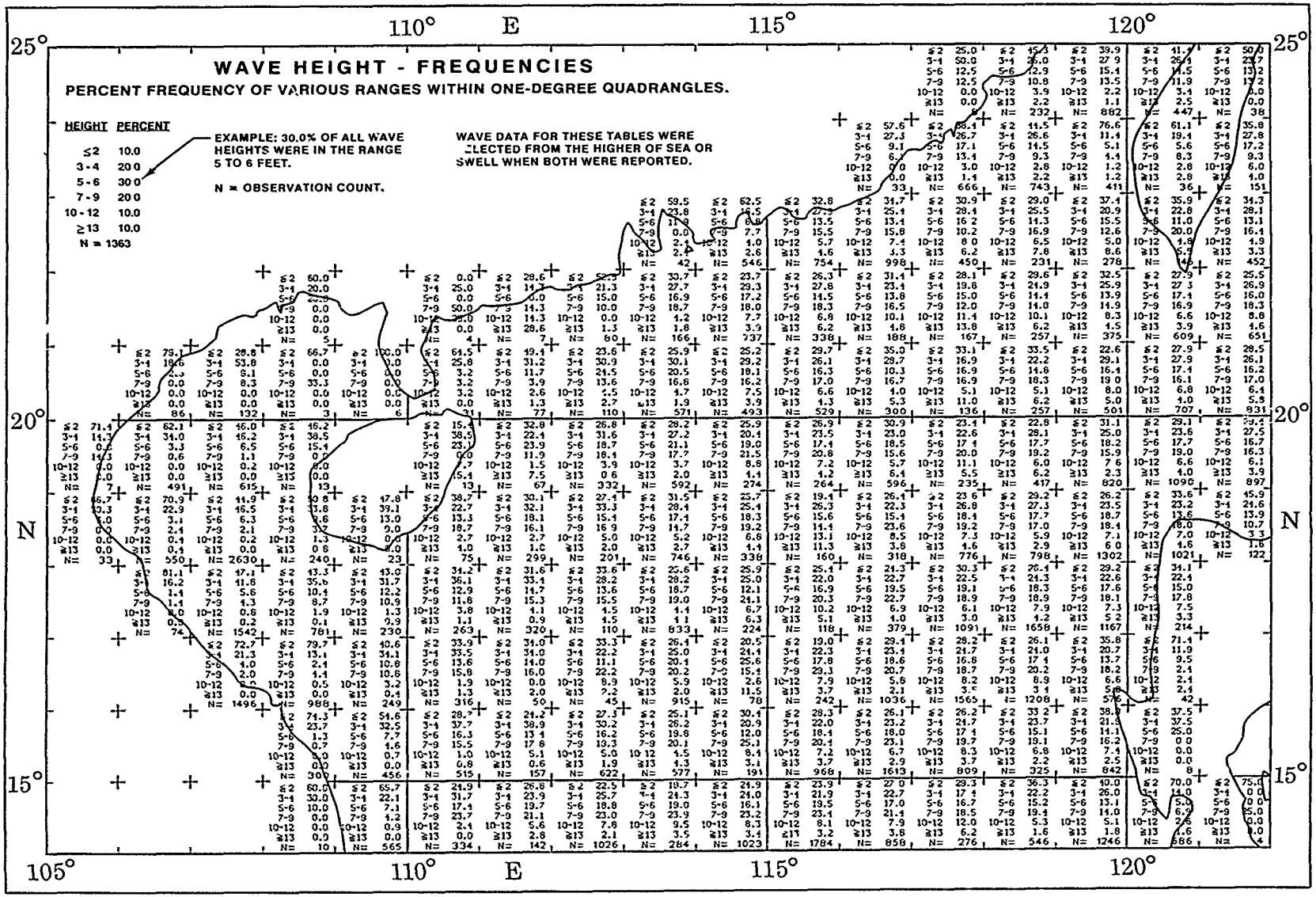

105°
110°
115°
120°
E
10°
5°
N

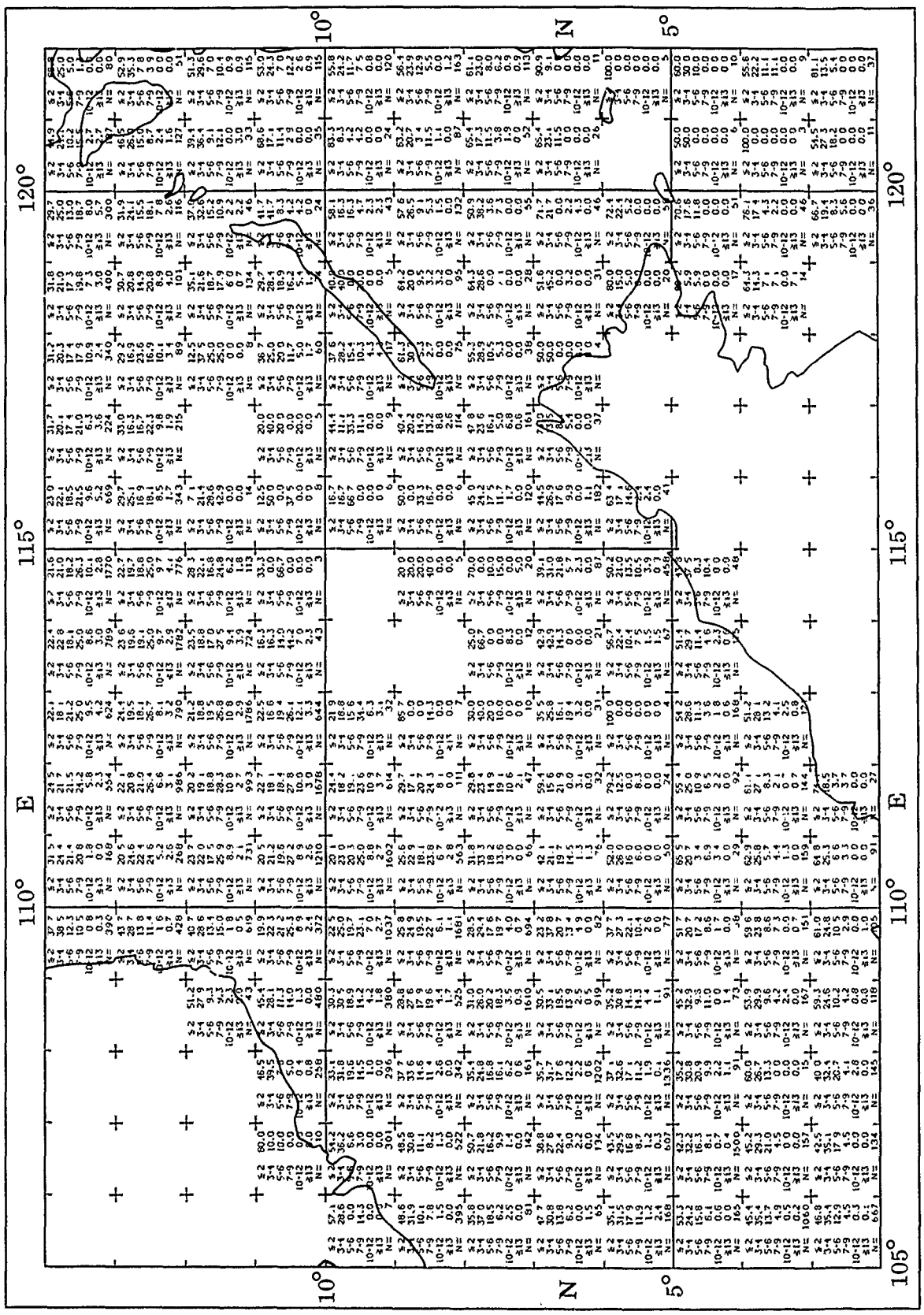

AIR AND SEA TEMPERATURE
SOLID LINE - MEAN AIR TEMPERATURE (°F)
DASHED LINE - MEAN SEA SURFACE TEMPERATURE (°F)
E 110° 120° 130° 140°
40°
30°
20°
10°
N
0°

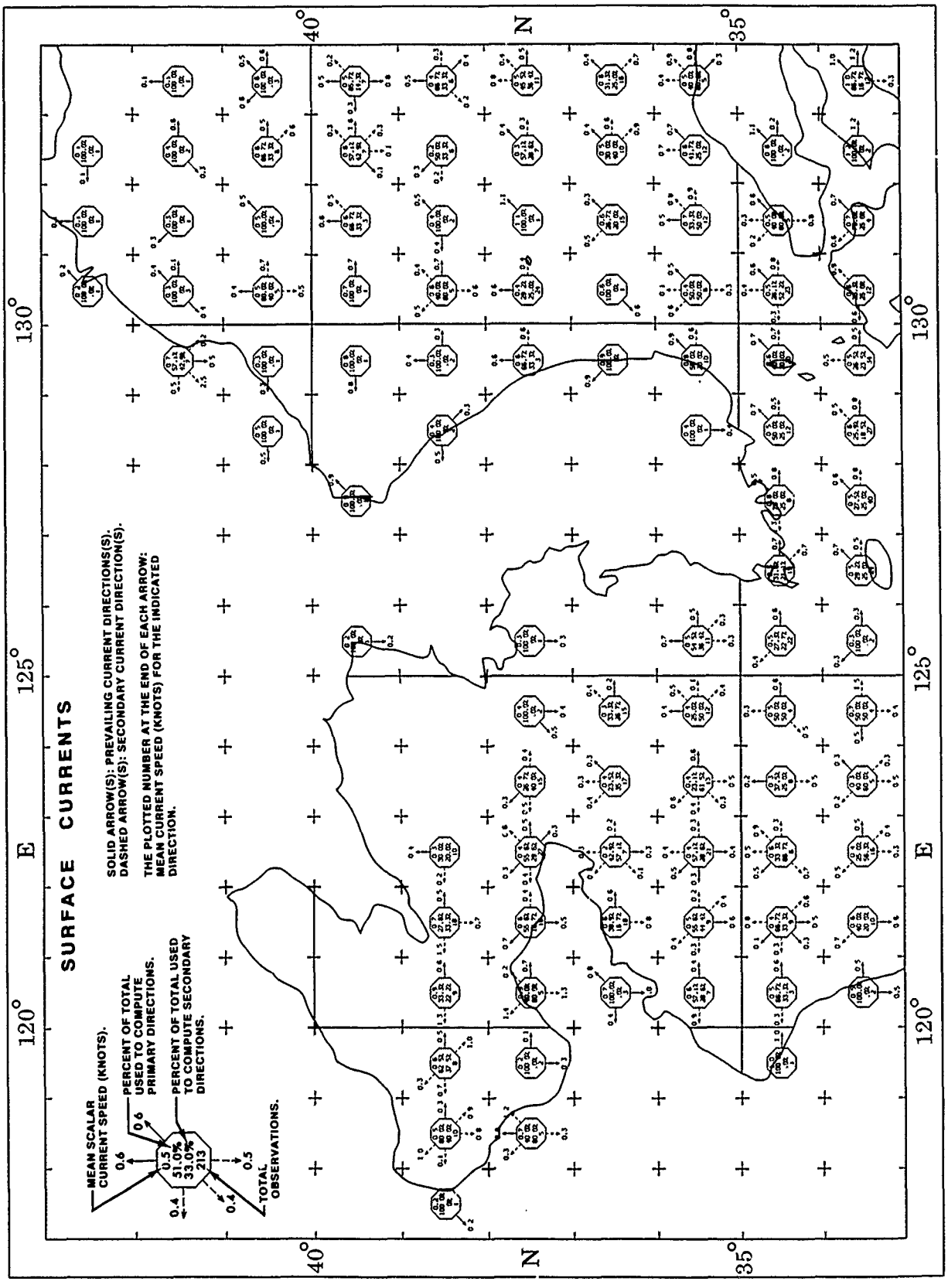

WAVE HEIGHTS
PERCENT FREQUENCY OF:
SOLID LINE -
WAVE HEIGHT ≥ 3 FEET
DASHED LINE -
WAVE HEIGHT ≥ 8 FEET
THE WAVE HEIGHT USED FOR THIS MAP IS THE HIGHER OF SEA OR SWELL FOR OBSERVATIONS CONTAINING BOTH WAVE TRAINS. SEA IS DEFINED AS WAVES GENERATED BY LOCAL WINDS.
≥ 3 FEET = ≥ CODE 2
(2 HALF METERS)
≥ 8 FEET = ≥ CODE 5
(5 HALF METERS)
E 110°
120°
130°
140°
40°
30°
20°
10°
N
0°

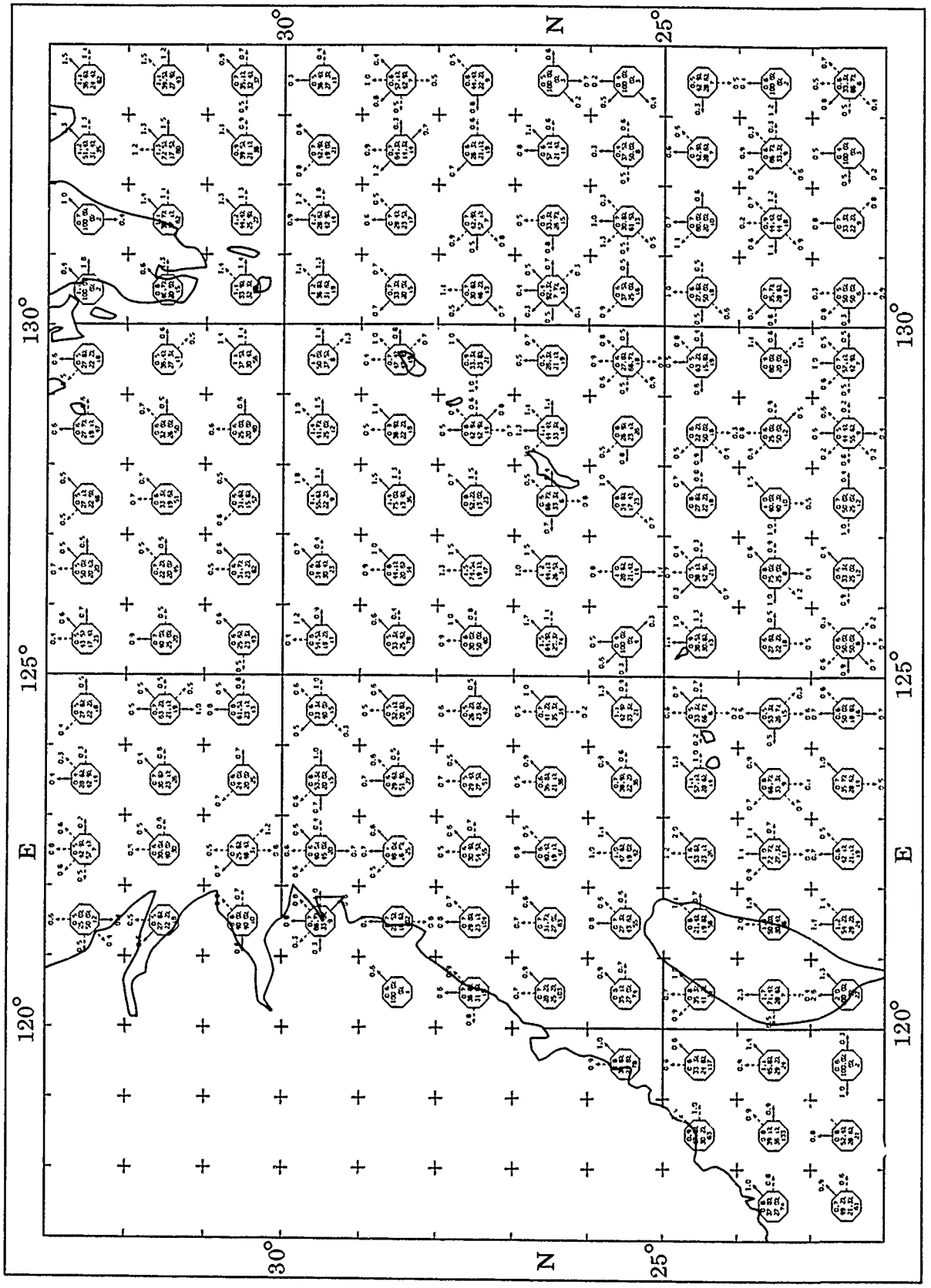

WAVE HEIGHT - FREQUENCIES
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
HEIGHT PERCENT
≤2 10 0
3-4 20 0
5-6 30 0
7-9 20 0
10-12 10 0
≥13 10 0
N = 1363
EXAMPLE: 30.0% OF ALL WAVE HEIGHTS WERE IN THE RANGE 5 TO 6 FEET.
N = OBSERVATION COUNT.
WAVE DATA FOR THESE TABLES WERE SELECTED FROM THE HIGHER OF SEA OR SWELL WHEN BOTH WERE REPORTED.
120° E 125° 130°
40°
N
35°

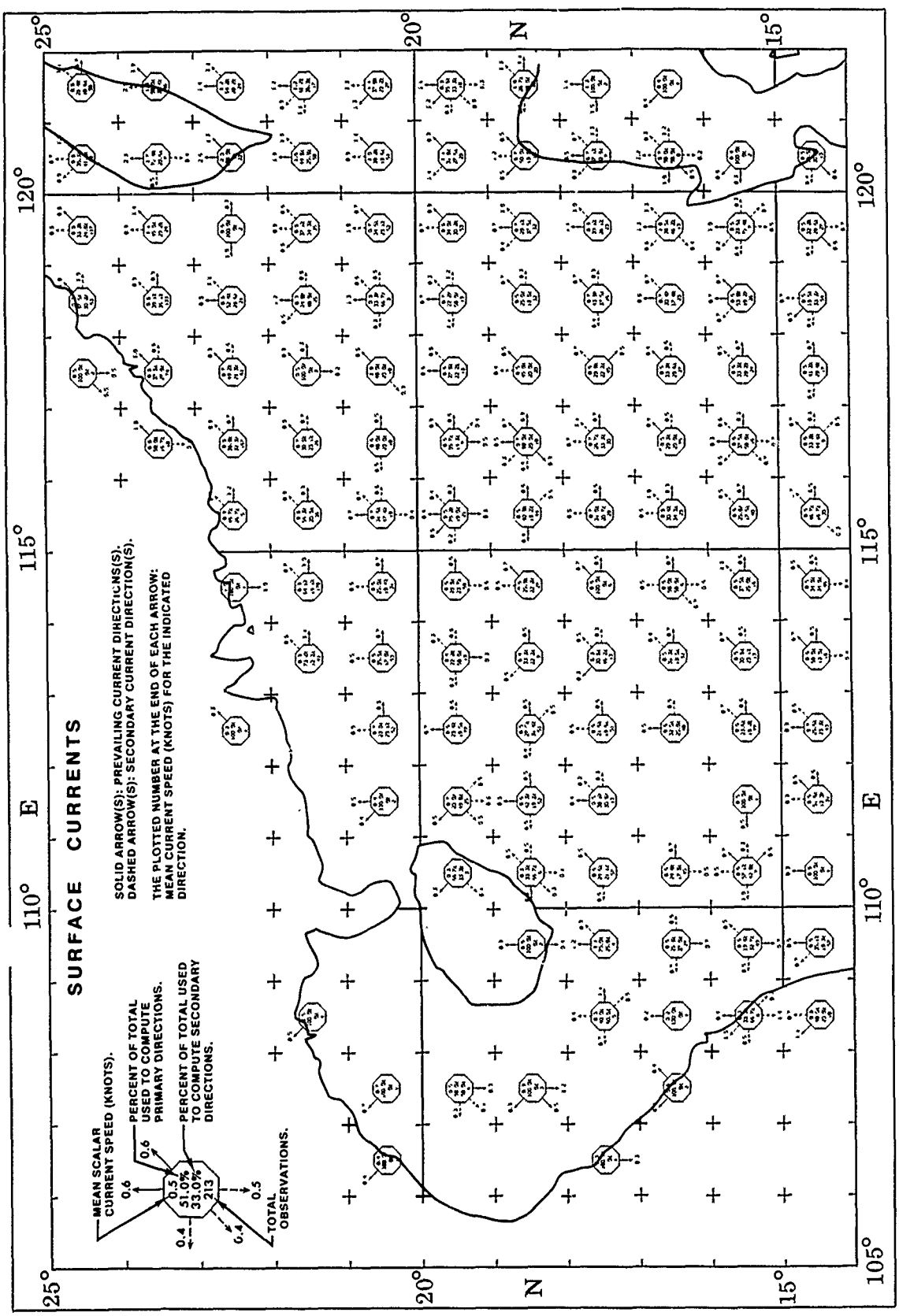

120°
125°
130°
25°
30°
N
E

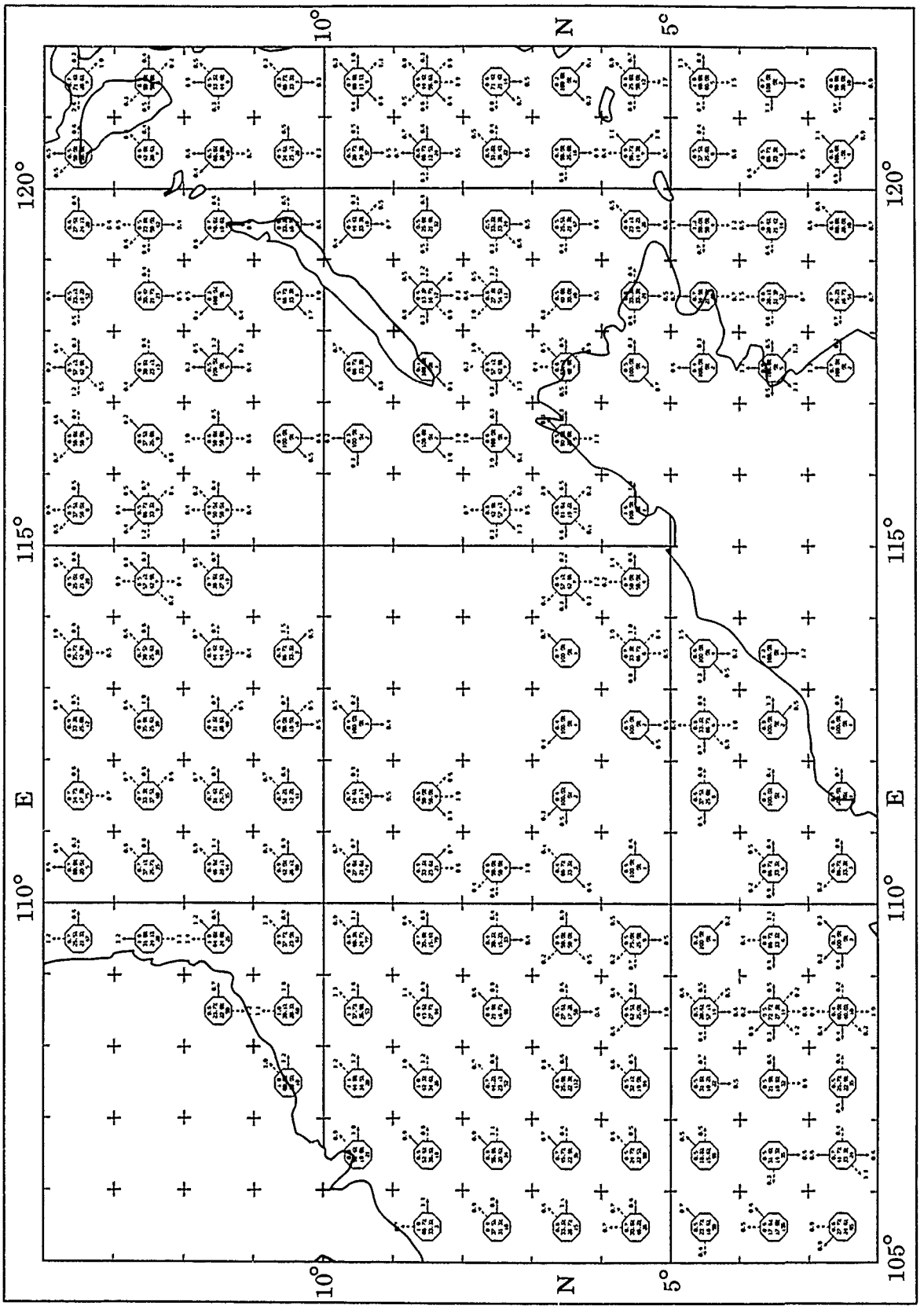

WAVE HEIGHT - FREQUENCIES
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
HEIGHT PERCENT
≤2 10.0
3-4 20.0
5-6 30.0
7-9 20.0
10-12 10.0
≥13 10.0
N = 1363
EXAMPLE: 30.0% OF ALL WAVE HEIGHTS WERE IN THE RANGE 5 TO 6 FEET.
N = OBSERVATION COUNT.
WAVE DATA FOR THESE TABLES WERE SELECTED FROM THE HIGHER OF SEA OR SWELL WHEN BOTH WERE REPORTED.
110° E
115°
120°
25°
20°
15°
N
105°

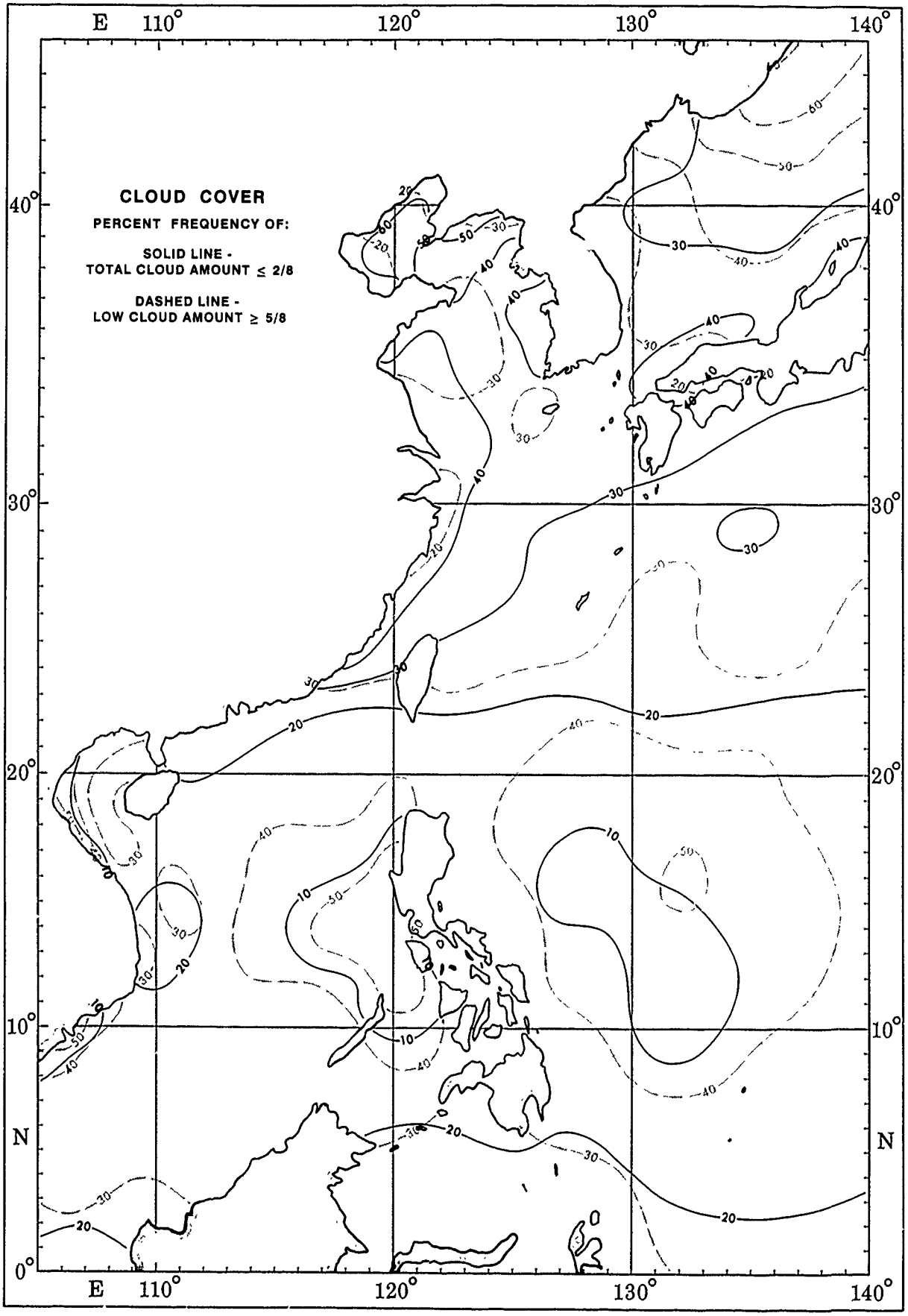

105°
110°
115°
120°
E
10°
5°
N

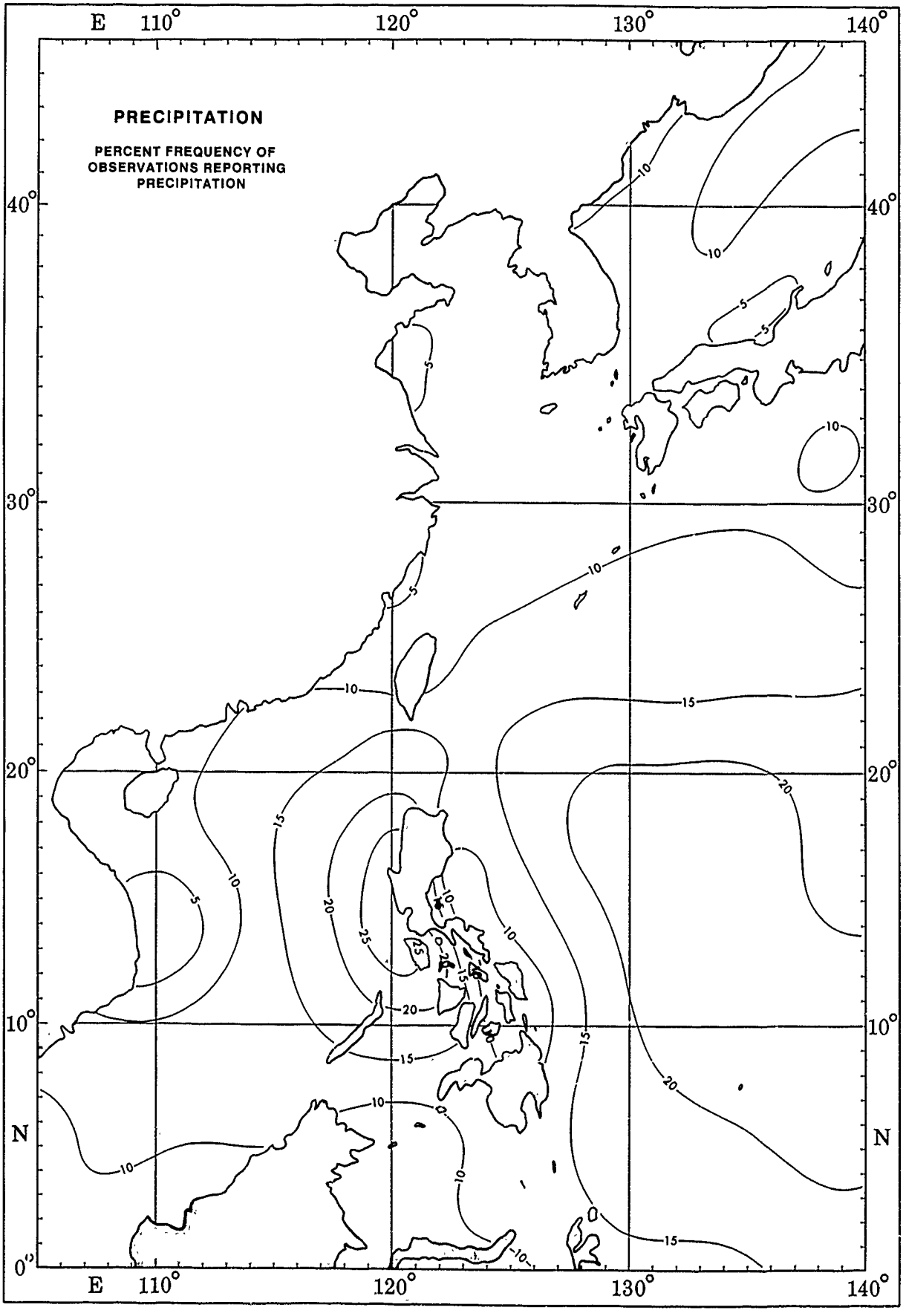

SURFACE CURRENTS
SOLID ARROW(S): PREVAILING CURRENT DIRECTIONS(S).
DASHED ARROW(S): SECONDARY CURRENT DIRECTION(S).
THE PLOTTED NUMBER AT THE END OF EACH ARROW:
MEAN CURRENT SPEED (KNOTS) FOR THE INDICATED
DIRECTION.
MEAN SCALAR CURRENT SPEED (KNOTS).
PERCENT OF TOTAL USED TO COMPUTE PRIMARY DIRECTIONS.
PERCENT OF TOTAL USED TO COMPUTE SECONDARY DIRECTIONS.
TOTAL OBSERVATIONS.
0.6
0.5
31.0%
33.0%
213
0.4
0.4
0.5
120°
125°
130°
E
40°
35°
N

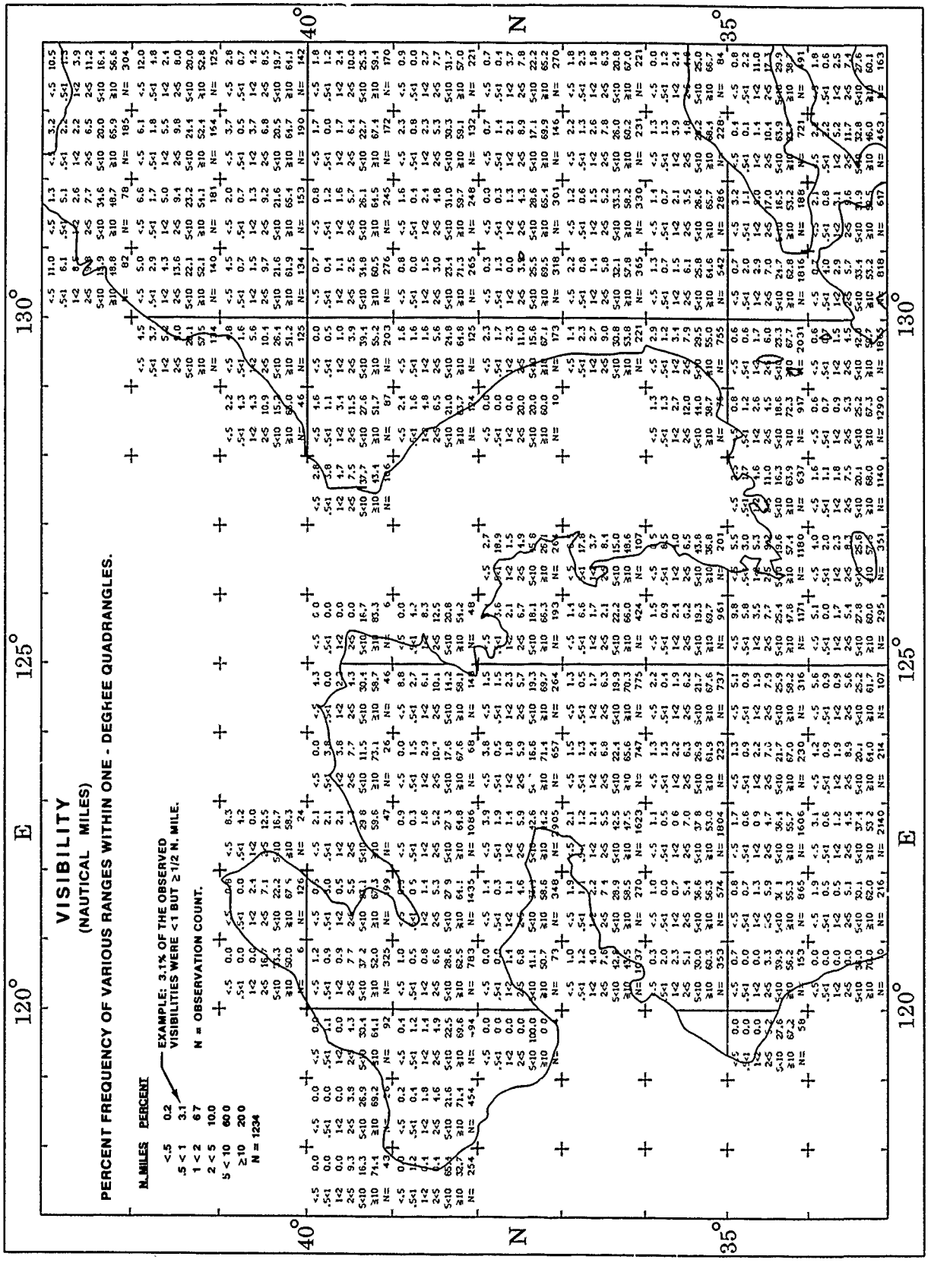

30° N
25° N
120° E
125° E
130° E

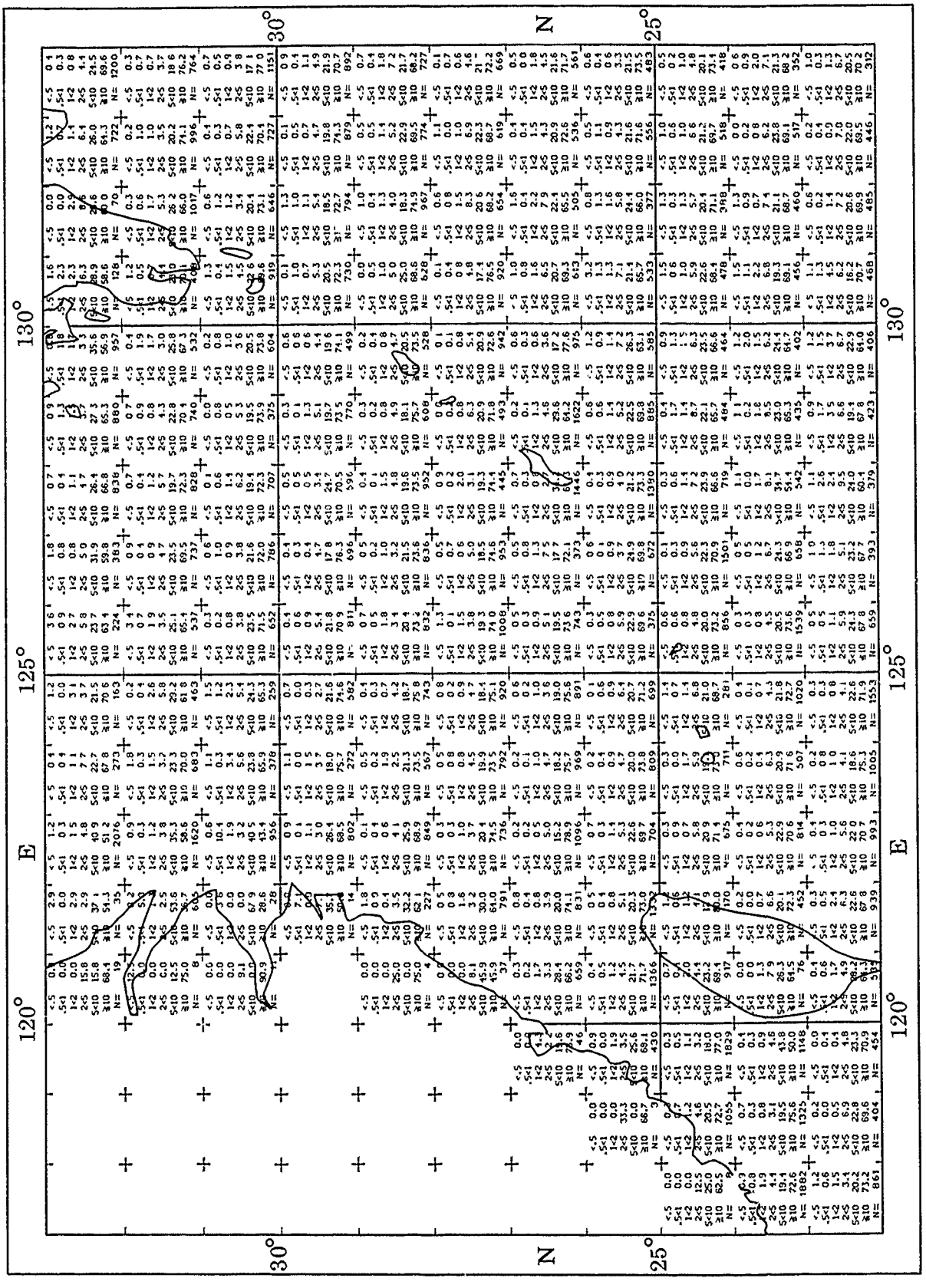

SURFACE CURRENTS
SOLID ARROW(S): PREVAILING CURRENT DIRECTIONS(S).
DASHED ARROW(S): SECONDARY CURRENT DIRECTION(S).
THE PLOTTED NUMBER AT THE END OF EACH ARROW: MEAN CURRENT SPEED (KNOTS) FOR THE INDICATED DIRECTION.
MEAN SCALAR CURRENT SPEED (KNOTS).
PERCENT OF TOTAL USED TO COMPUTE PRIMARY DIRECTIONS.
PERCENT OF TOTAL USED TO COMPUTE SECONDARY DIRECTIONS.
TOTAL OBSERVATIONS.
0.6
0.5
51.0%
33.0%
213
0.4
25°
20°
15°
N
105°
110°
115°
120°
E

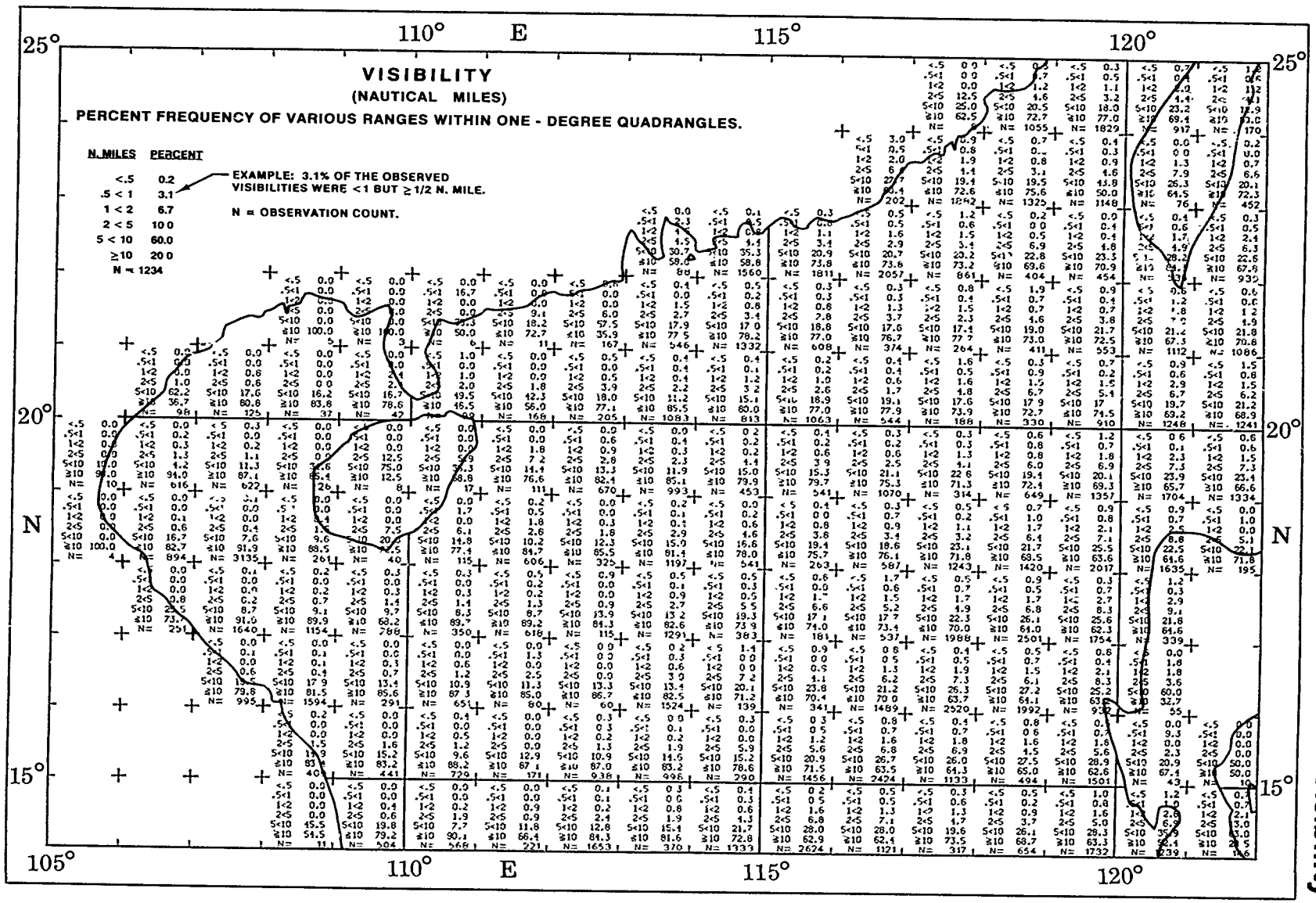

10° N
5°
120°
115°
110° E
105°
10° N
5°

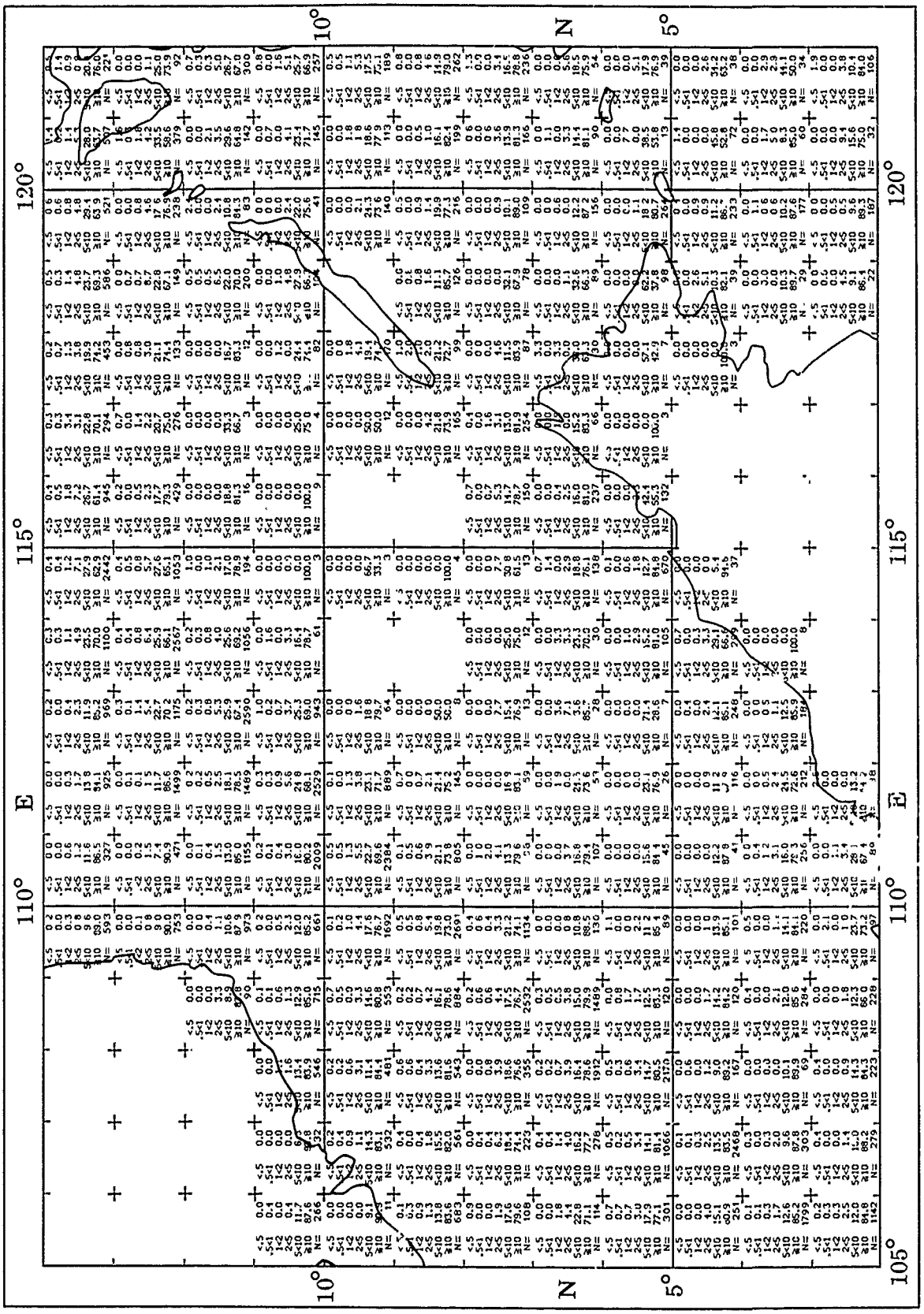

CLOUD COVER
PERCENT FREQUENCY OF:
SOLID LINE -
TOTAL CLOUD AMOUNT ≤ 2/8
DASHED LINE -
LOW CLOUD AMOUNT ≥ 5/8
E 110°
120°
130°
140°
40°
30°
20°
10°
N
0°


PRECIPITATION
PERCENT FREQUENCY OF OBSERVATIONS REPORTING PRECIPITATION
E 110°
120°
130°
140°
40°
30°
20°
10°
N
0°

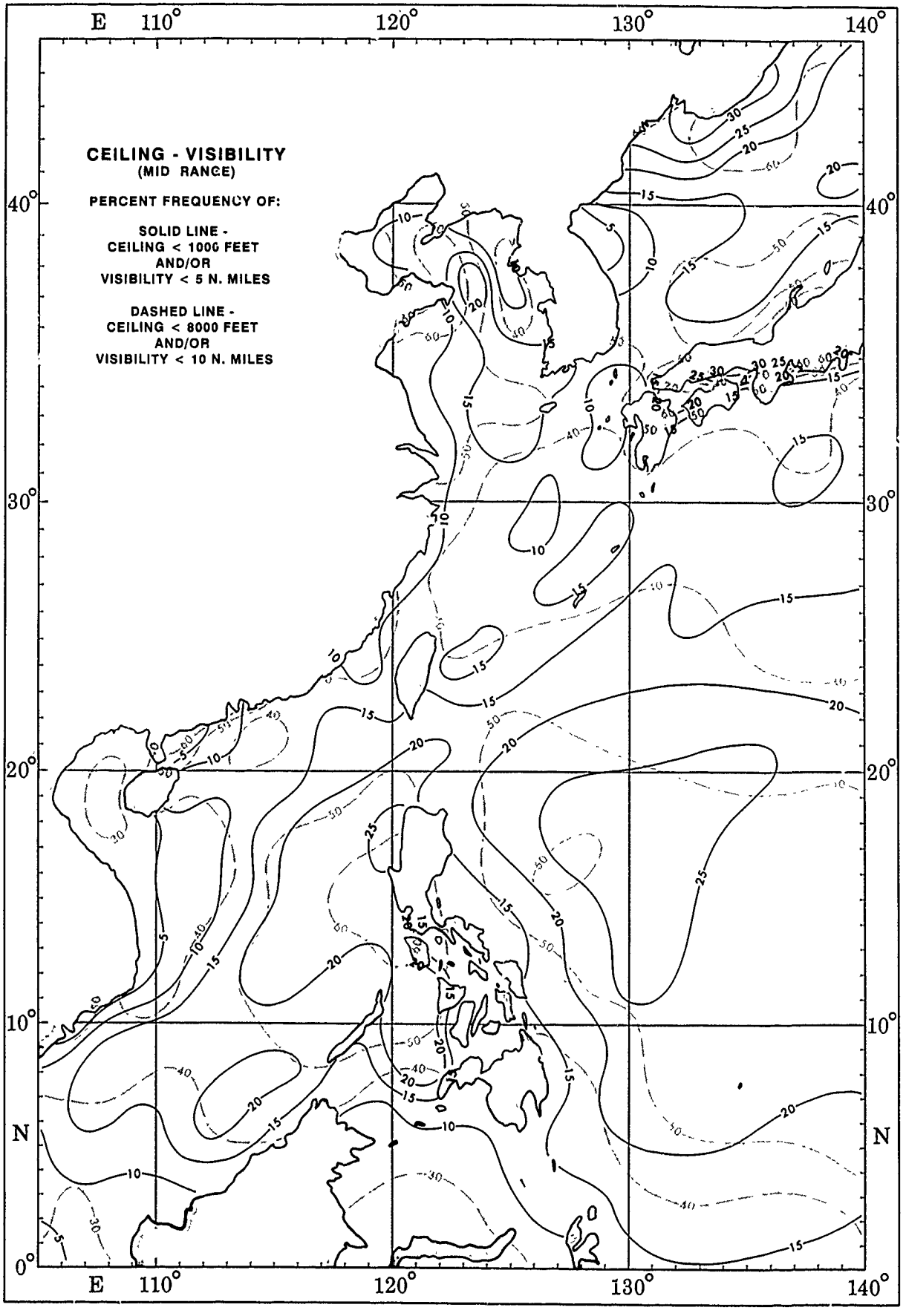

VISIBILITY
(NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE - DEGREE QUADRANGLES.
EXAMPLE: 3.1% OF THE OBSERVED VISIBILITIES WERE <1 BUT ≥1/2 N. MILE.
N = OBSERVATION COUNT.
N. MILES PERCENT
<.5 0.2
.5 < 1 3.1
1 < 2 6.7
2 < 5 10.0
5 < 10 60.0
≥10 20.0
N = 1234
120°
125°
130°
40°
35°
N


120°
125°
130°
30°
25°
N
E


VISIBILITY
(NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE - DEGREE QUADRANGLES.
N. MILES PERCENT
<.5 0.2
.5 < 1 3.1
1 < 2 6.7
2 < 5 10 0
5 < 10 60.0
≥10 20 0
N = 1234
EXAMPLE: 3.1% OF THE OBSERVED VISIBILITIES WERE <1 BUT ≥1/2 N. MILE.
N = OBSERVATION COUNT.
25°
20°
15°
105°
110° E
115°
120°
N

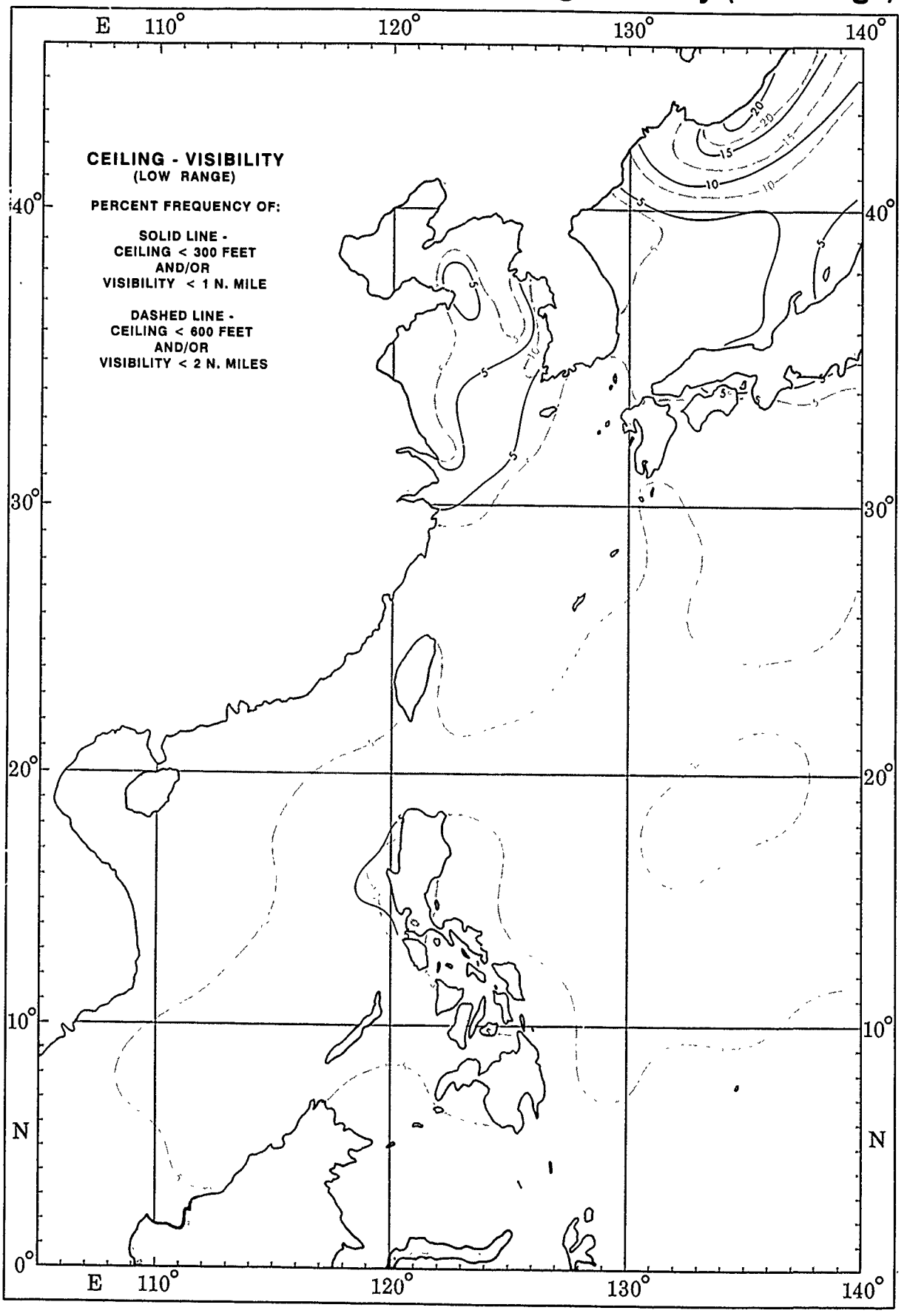

120°
115°
110°
105°
E
10°
5°
N

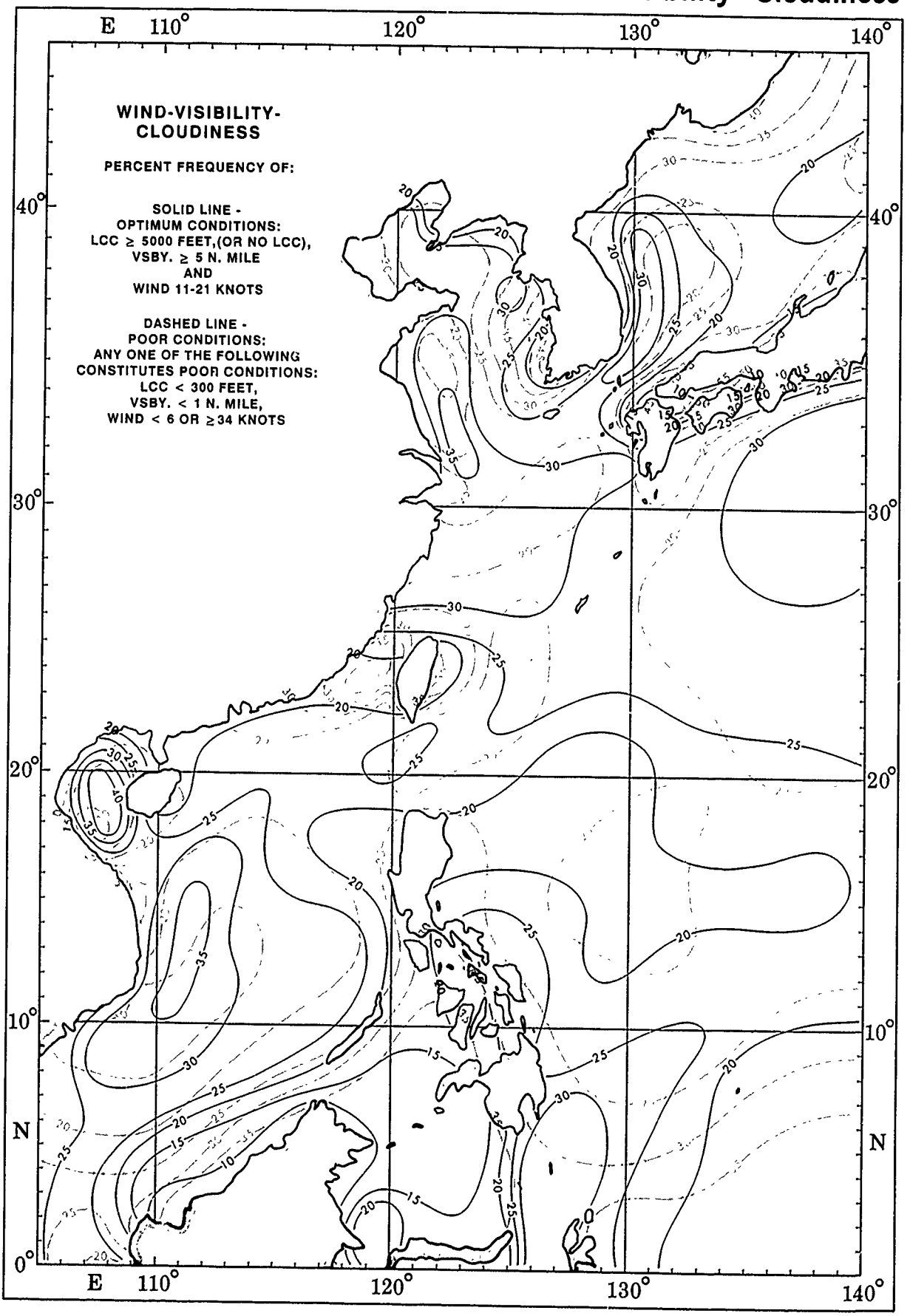
Ceiling - Visibility (Mid Range)

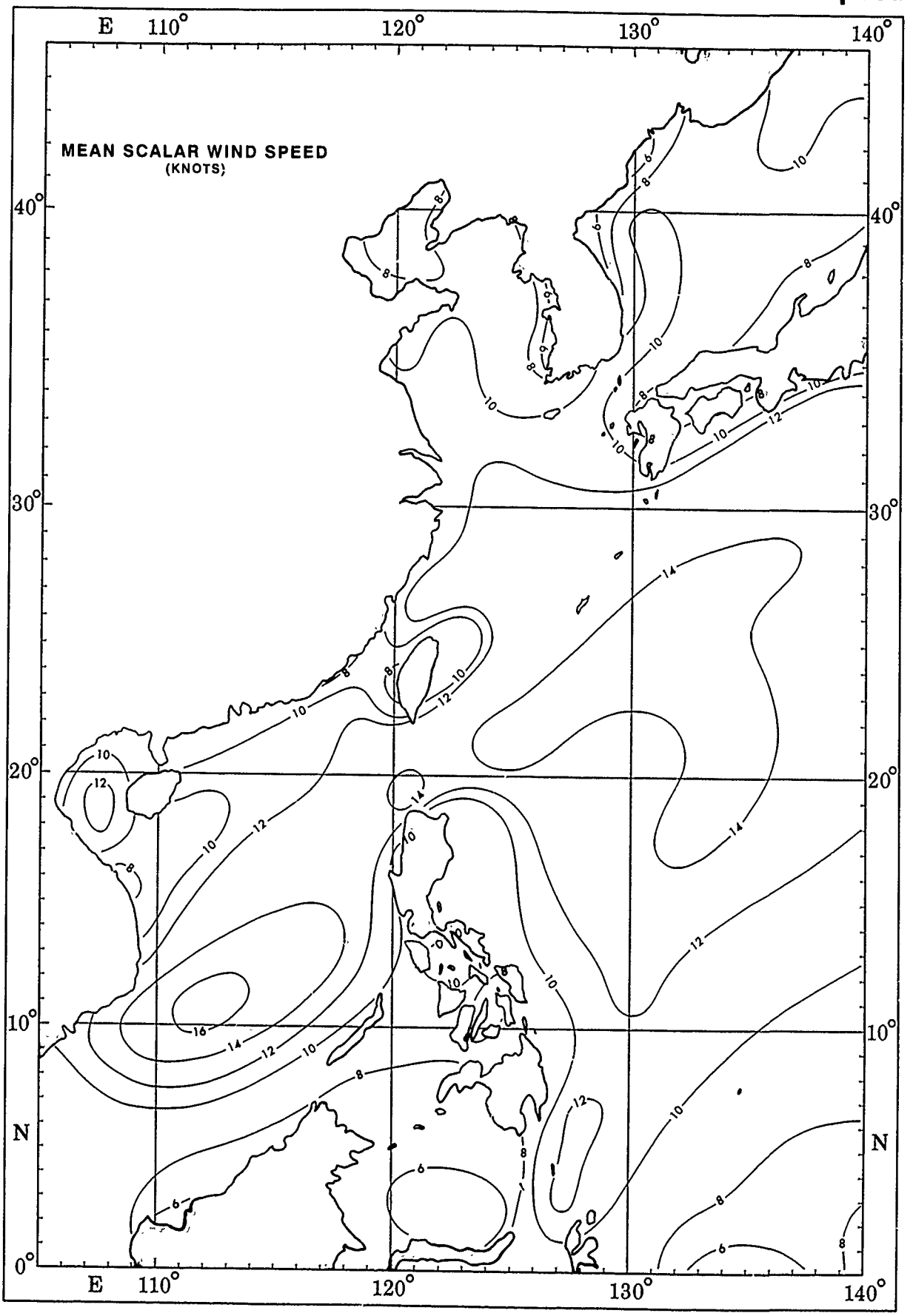


August

Ceiling - Visibility (Low Range)

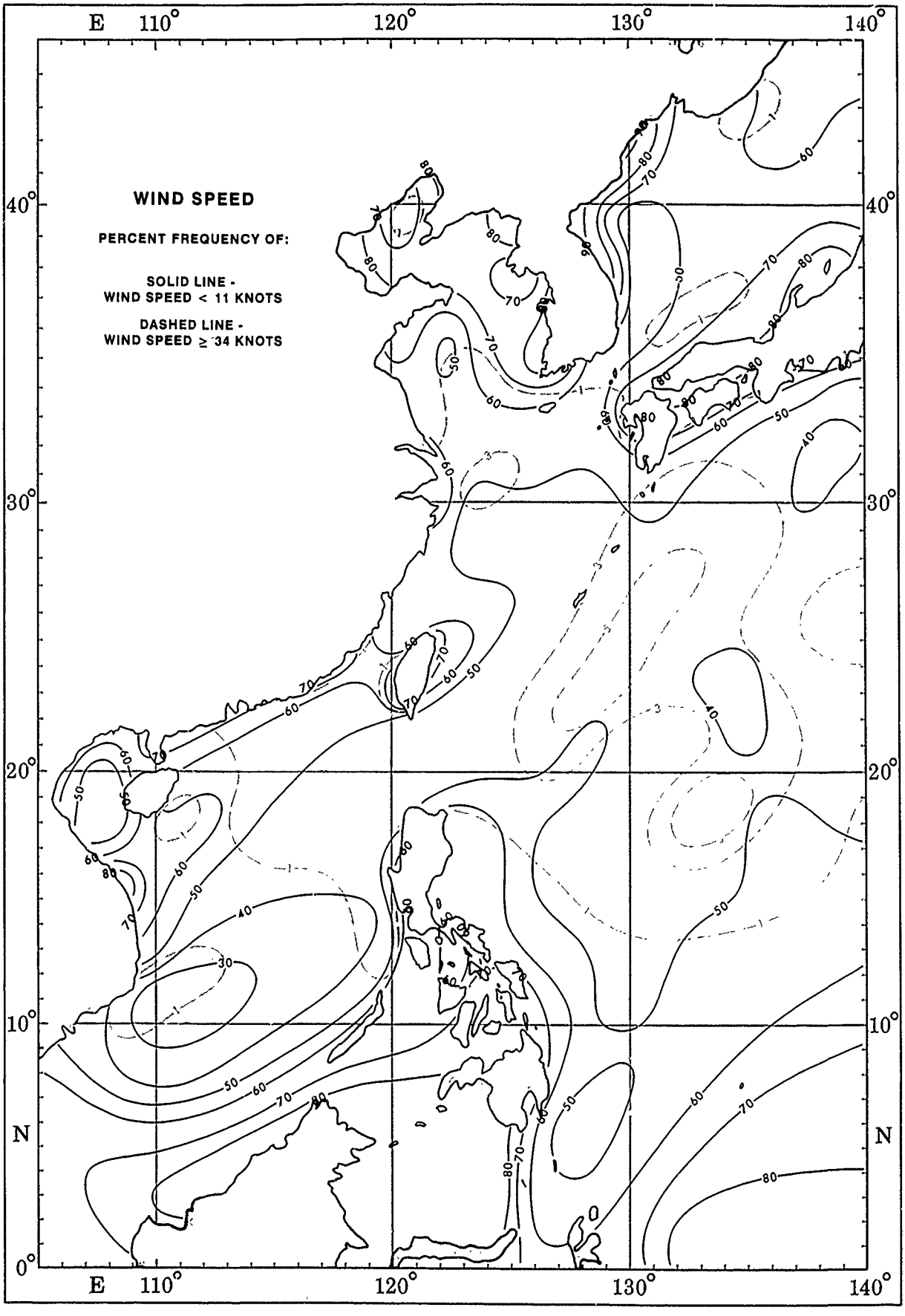



WIND-VISIBILITY-
CLOUDINESS
PERCENT FREQUENCY OF:
SOLID LINE -
OPTIMUM CONDITIONS:
LCC ≥ 5000 FEET,(OR NO LCC),
VSBY. ≥ 5 N. MILE
AND
WIND 11-21 KNOTS
DASHED LINE -
POOR CONDITIONS:
ANY ONE OF THE FOLLOWING
CONSTITUTES POOR CONDITIONS:
LCC < 300 FEET,
VSBY. < 1 N. MILE,
WIND < 6 OR ≥34 KNOTS
E 110°
120°
130°
140°
40°
30°
20°
10°
N
0°


MEAN SCALAR WIND SPEED
(KNOTS)
E 110° 120° 130° 140°
40°
30°
20°
10°
N
0°

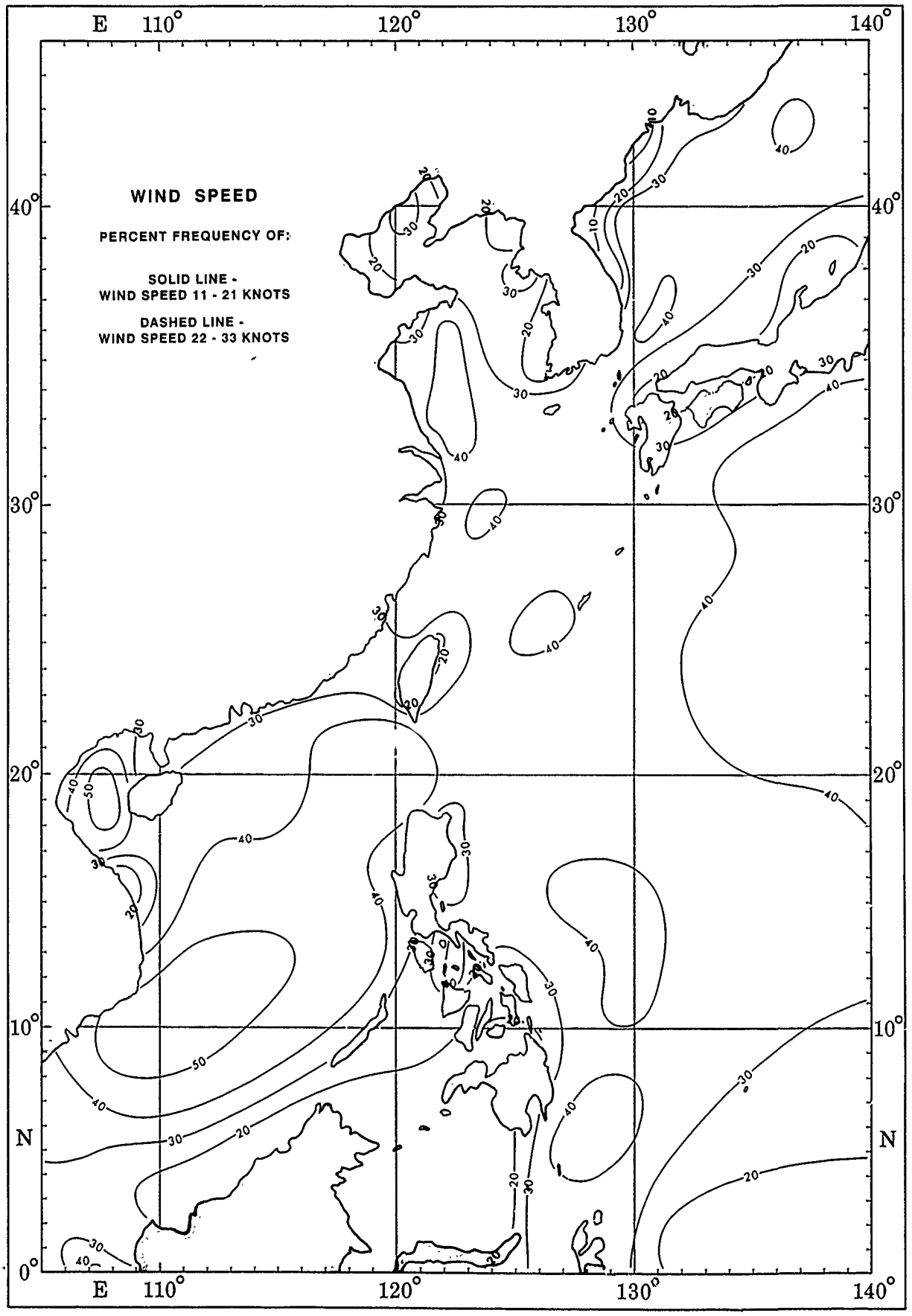
August

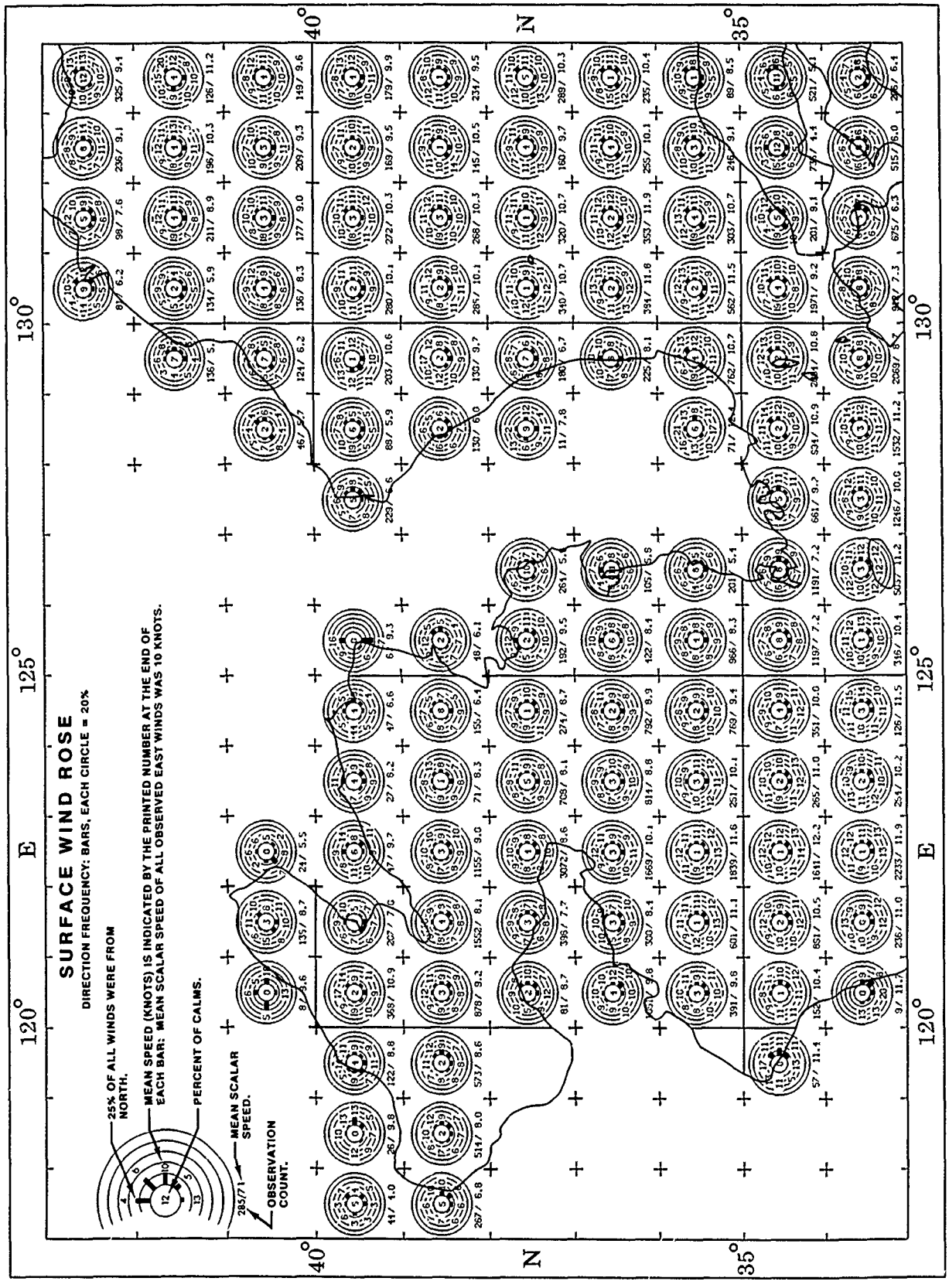
Wind Speed <11 and ≥34 Knots

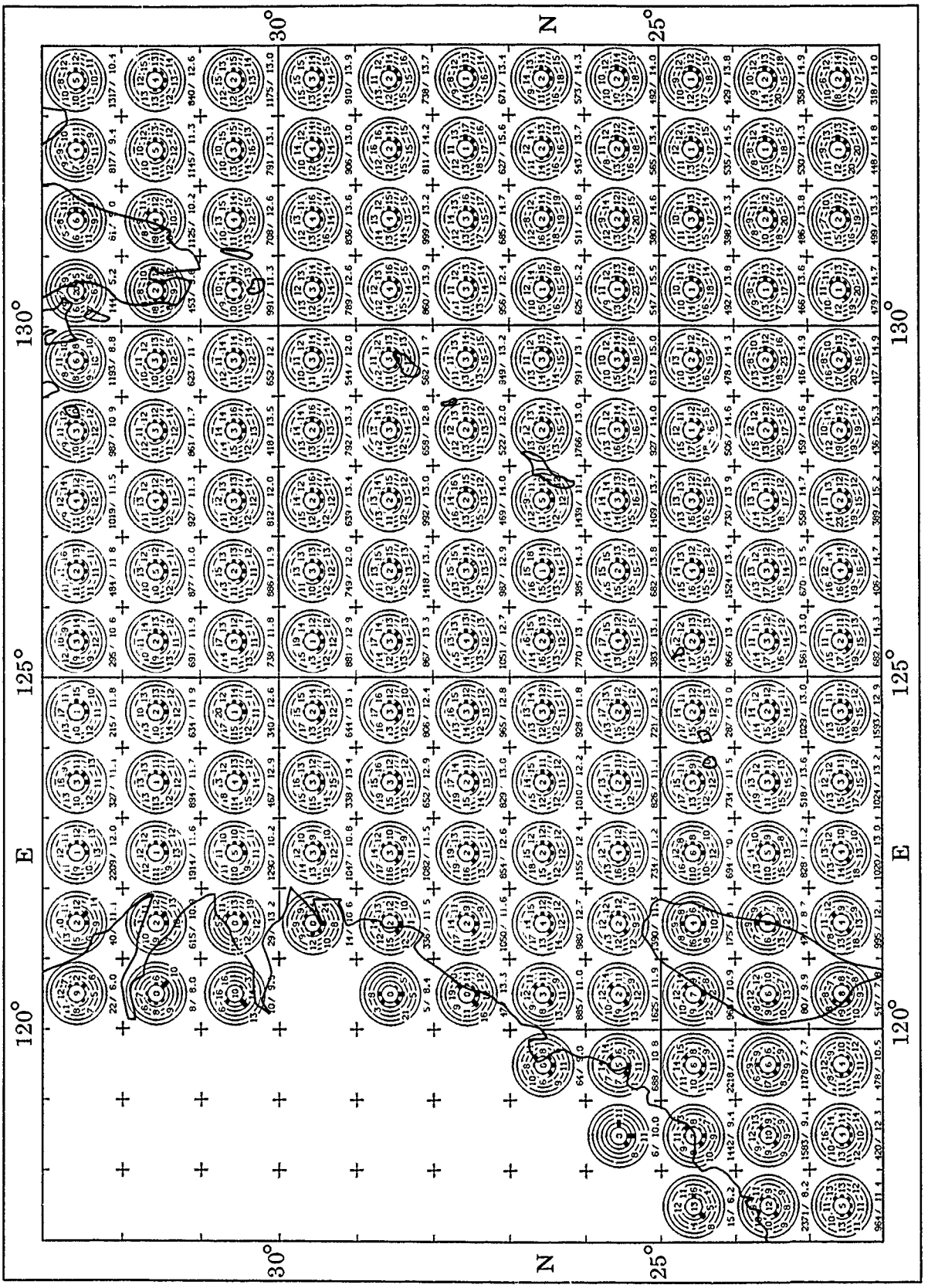


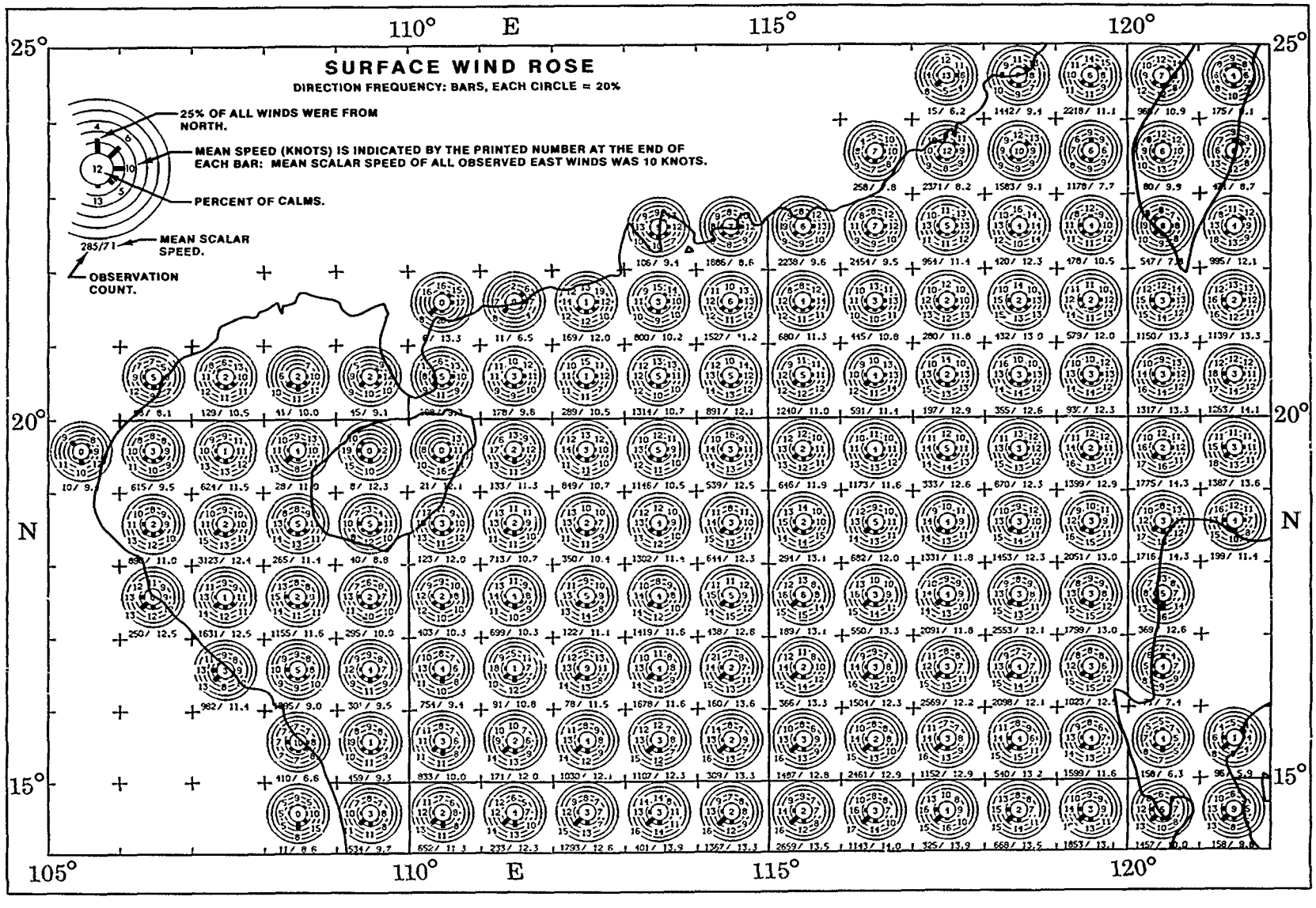
August

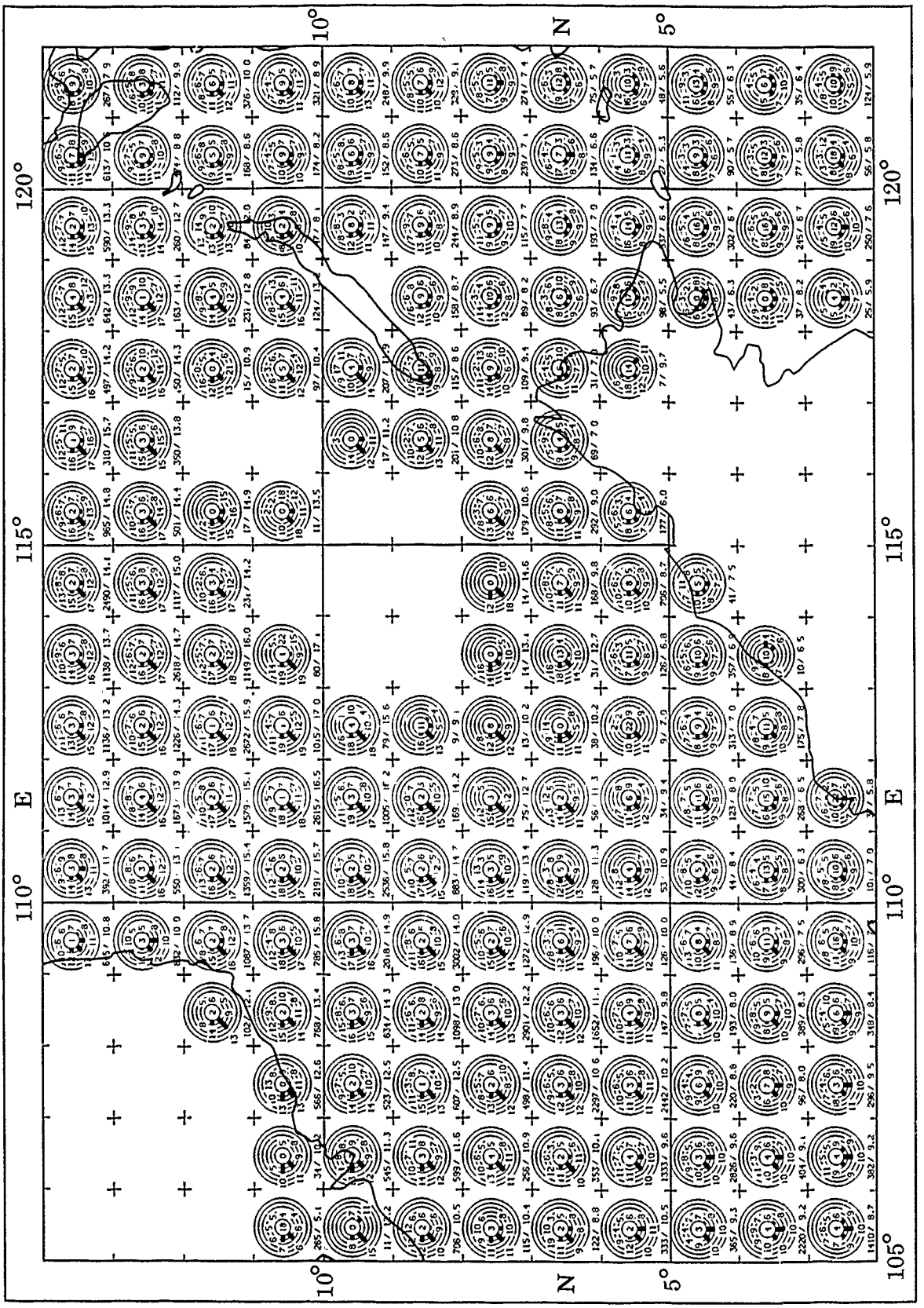
Wind Speed 11 - 21 and 22 - 33 Knots

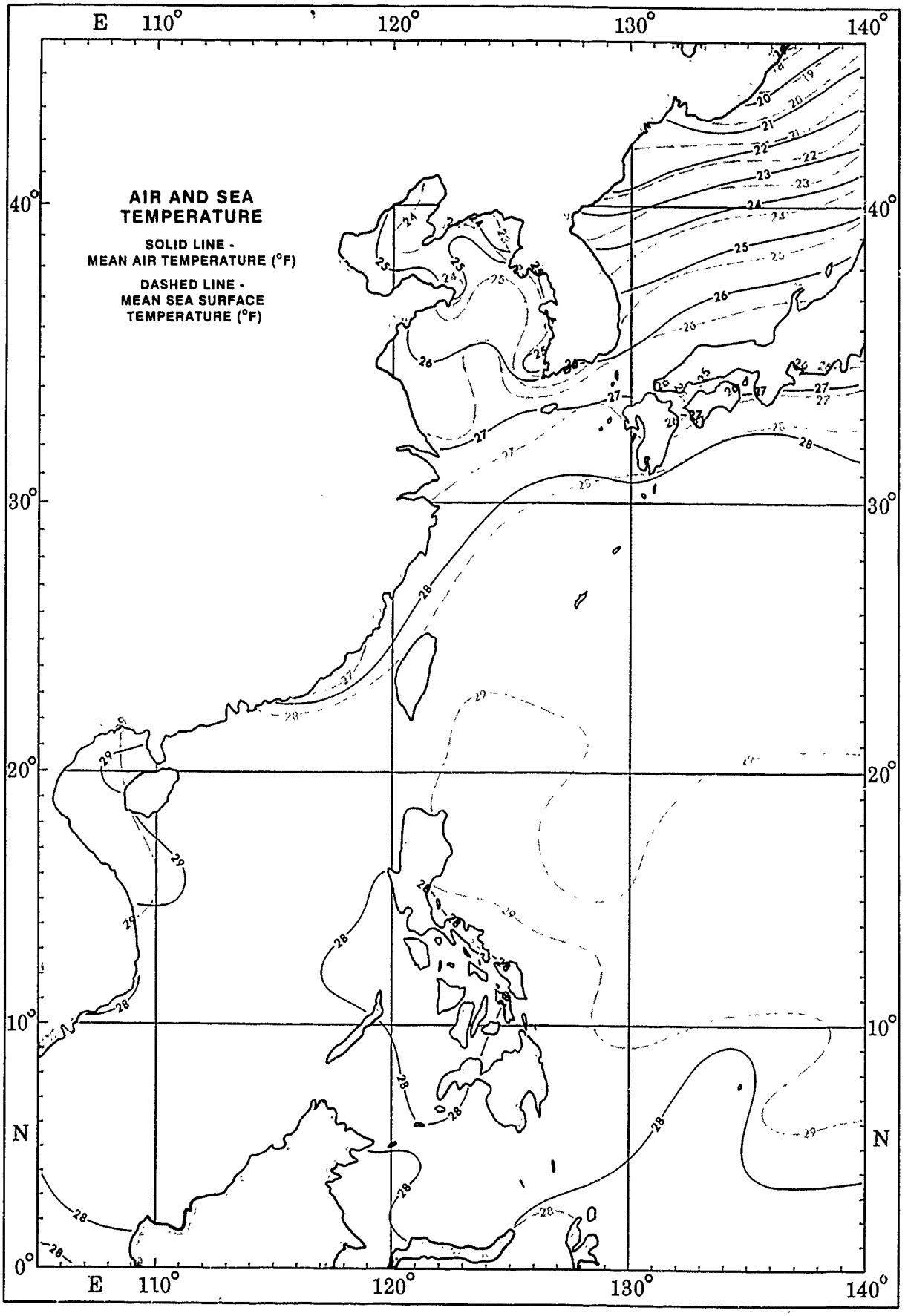


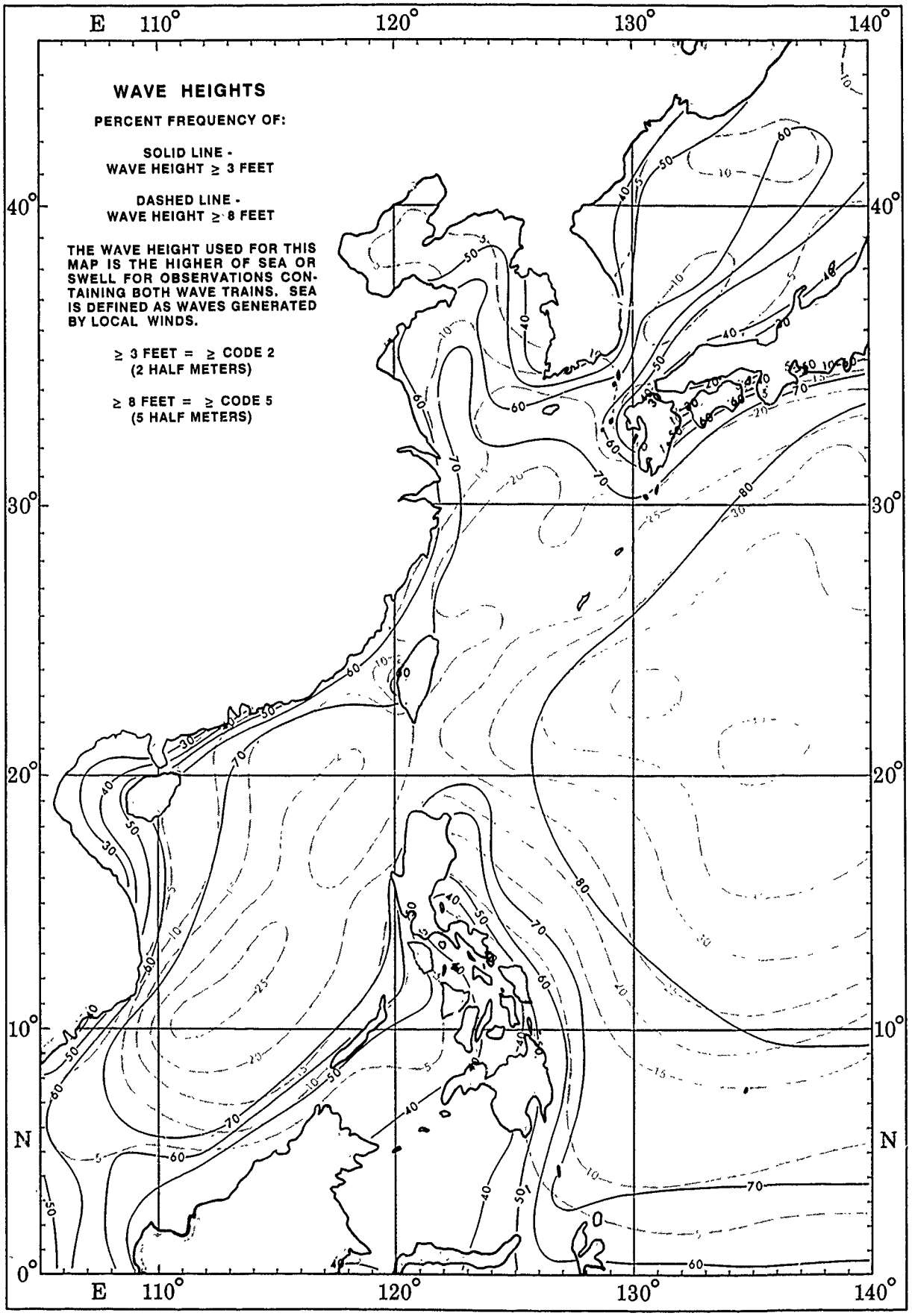

SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%
25% OF ALL WINDS WERE FROM NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR; MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
PERCENT OF CALMS.
MEAN SCALAR SPEED.
OBSERVATION COUNT.
120°
125°
130°
E
40°
35°
N

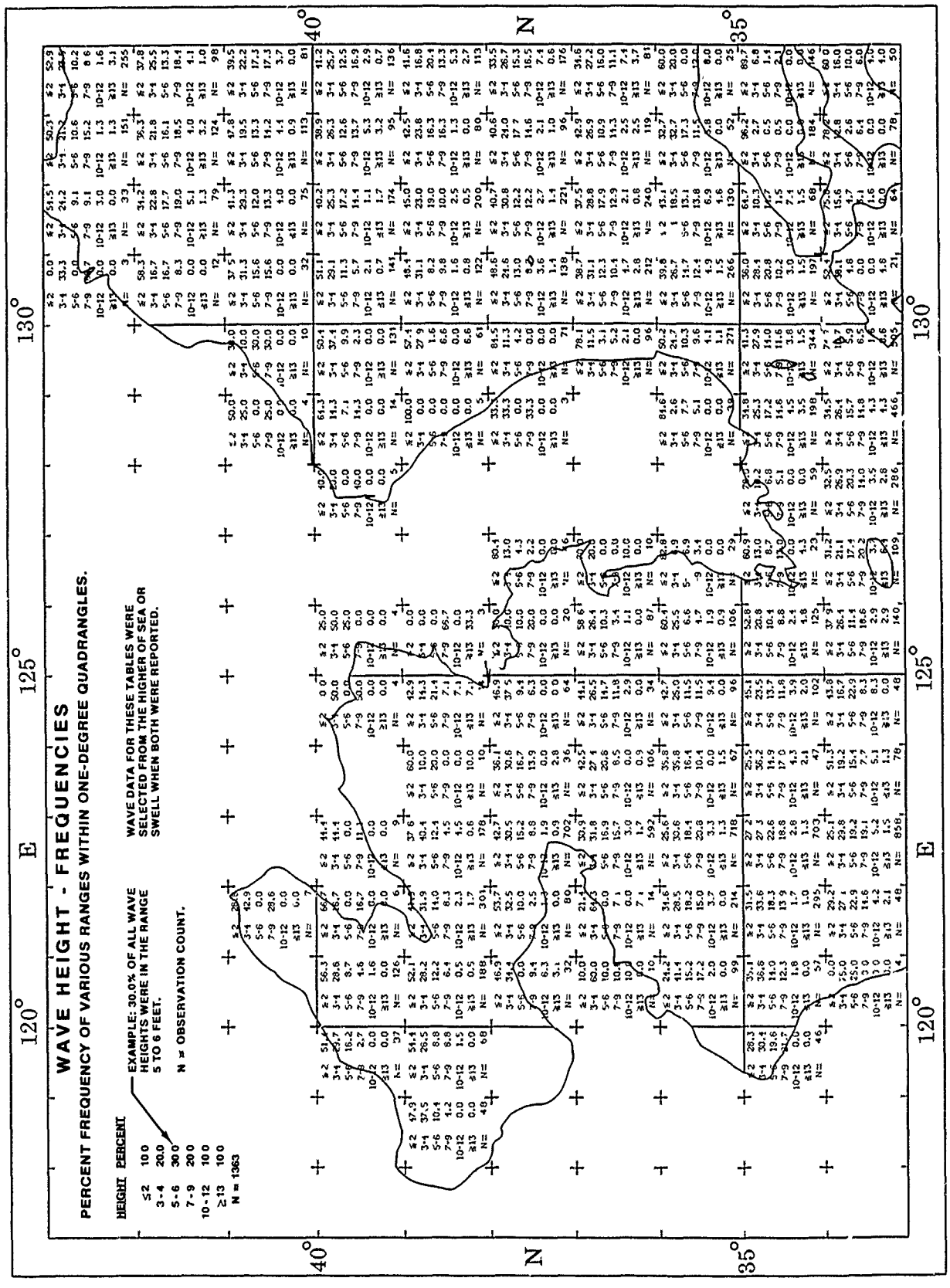

120°
125°
130°
E
30°
25°
N

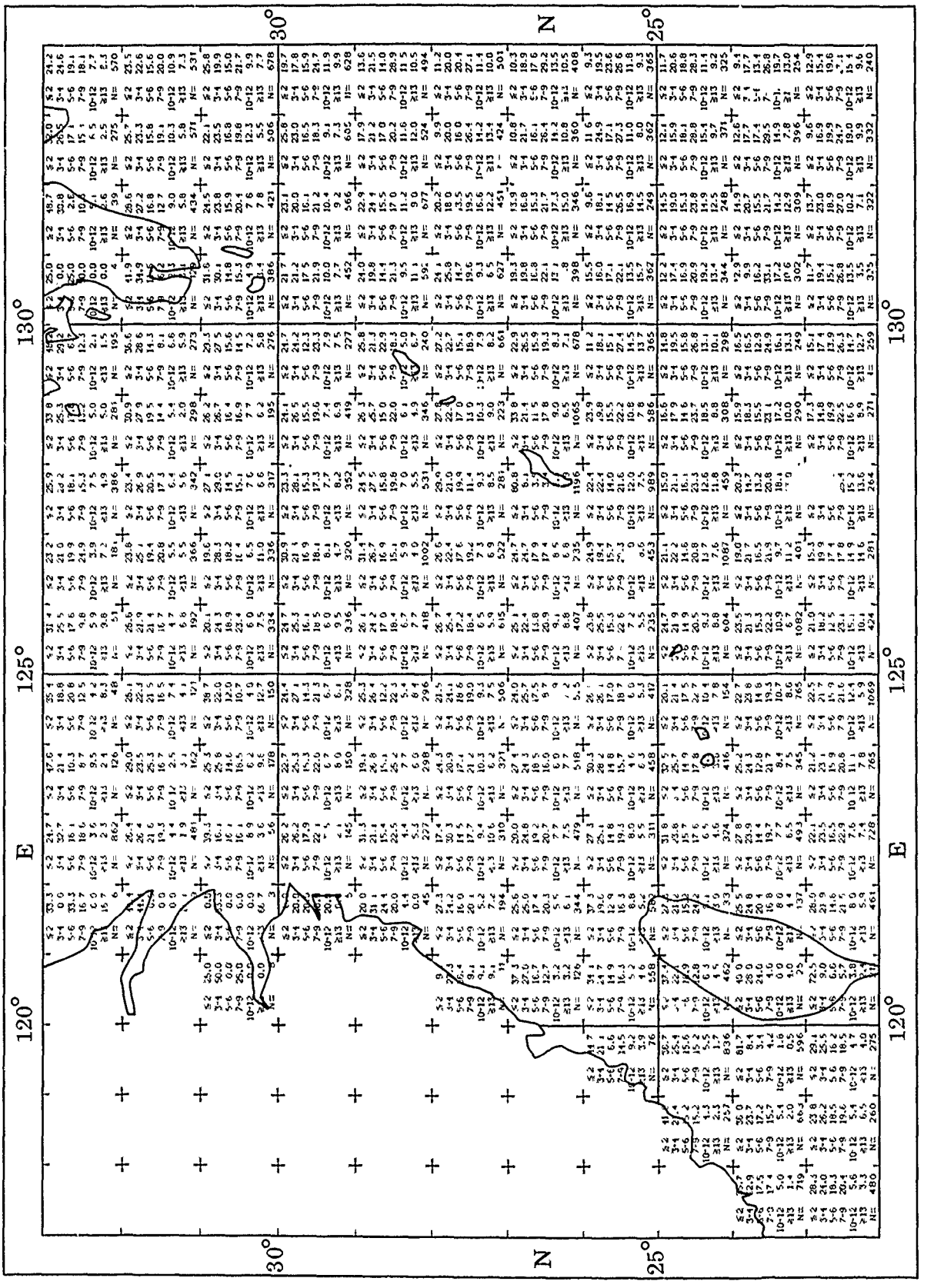

SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%
25% OF ALL WINDS WERE FROM NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR: MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
PERCENT OF CALMS.
285/71
MEAN SCALAR SPEED.
OBSERVATION COUNT.
110° E
115°
120°
25°
20°
15°
N
105°

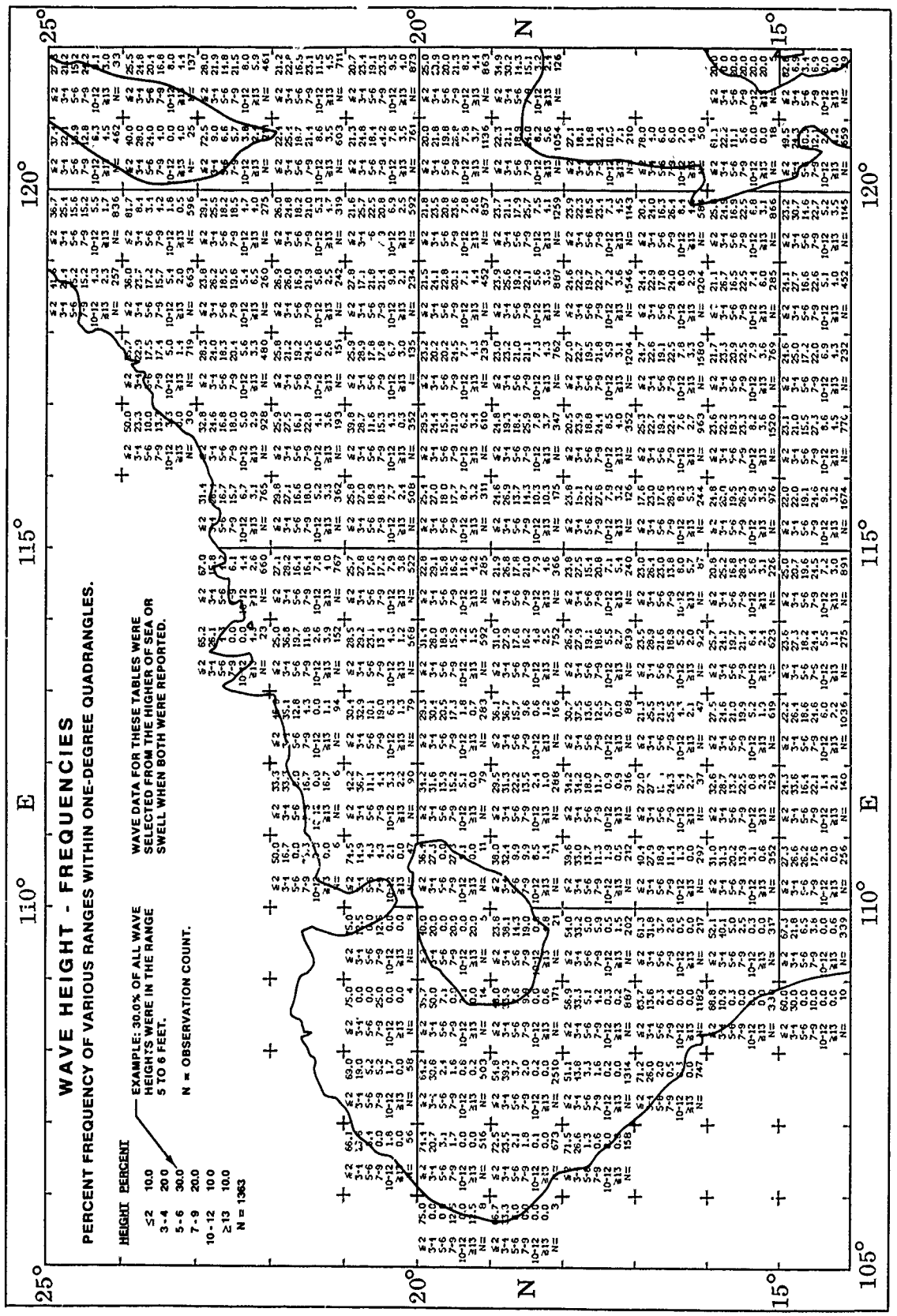

10°
N
5°
105°
110°
E
115°
120°

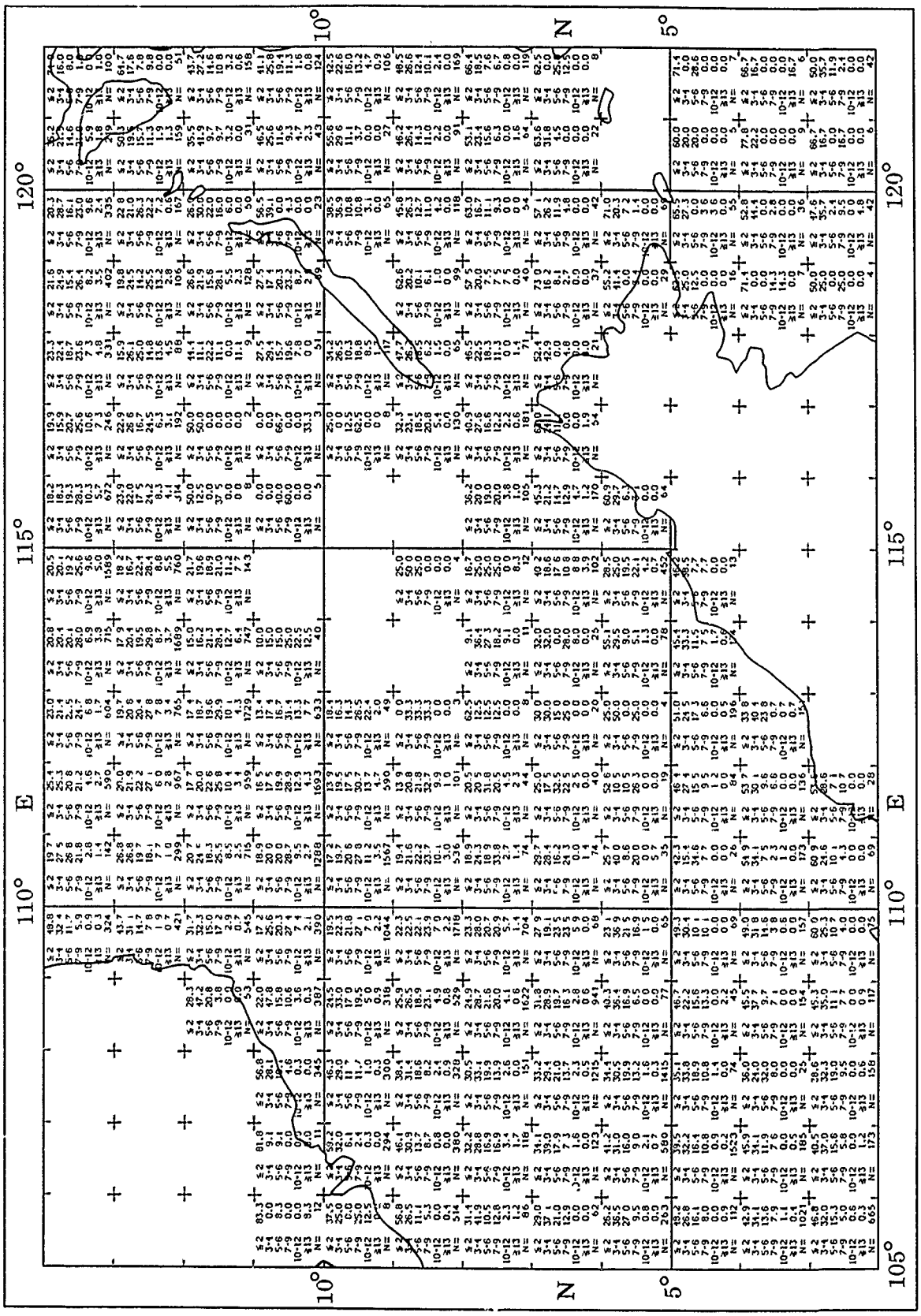

AIR AND SEA TEMPERATURE
SOLID LINE - MEAN AIR TEMPERATURE (°F)
DASHED LINE - MEAN SEA SURFACE TEMPERATURE (°F)
E 110°
120°
130°
140°
40°
30°
20°
10°
N
0°

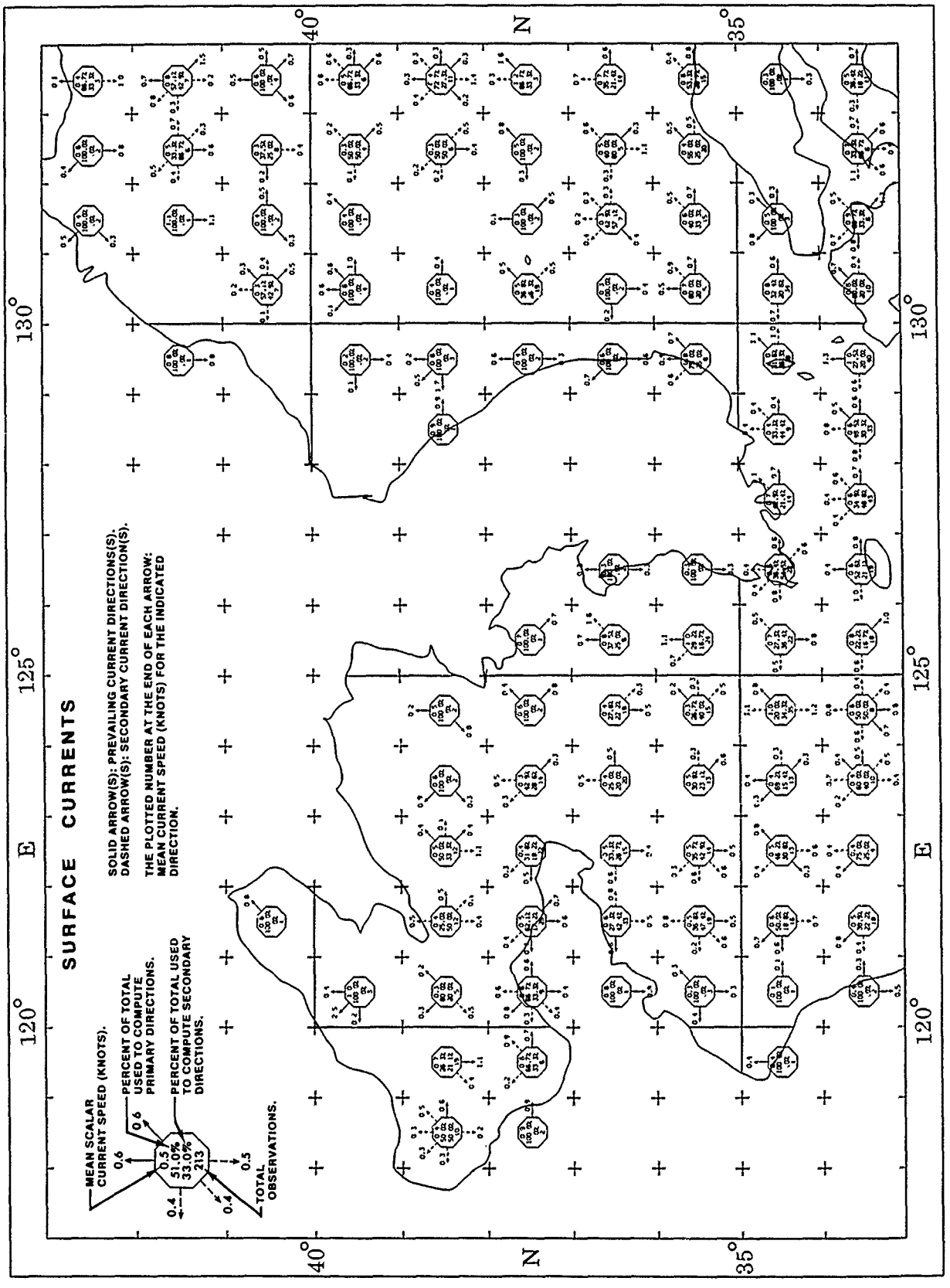

WAVE HEIGHTS
PERCENT FREQUENCY OF:
SOLID LINE -
WAVE HEIGHT ≥ 3 FEET
DASHED LINE -
WAVE HEIGHT ≥ 8 FEET
THE WAVE HEIGHT USED FOR THIS MAP IS THE HIGHER OF SEA OR SWELL FOR OBSERVATIONS CONTAINING BOTH WAVE TRAINS. SEA IS DEFINED AS WAVES GENERATED BY LOCAL WINDS.
≥ 3 FEET = ≥ CODE 2
(2 HALF METERS)
≥ 8 FEET = ≥ CODE 5
(5 HALF METERS)
E 110° 120° 130° 140°
40° 30° 20° 10° N 0°

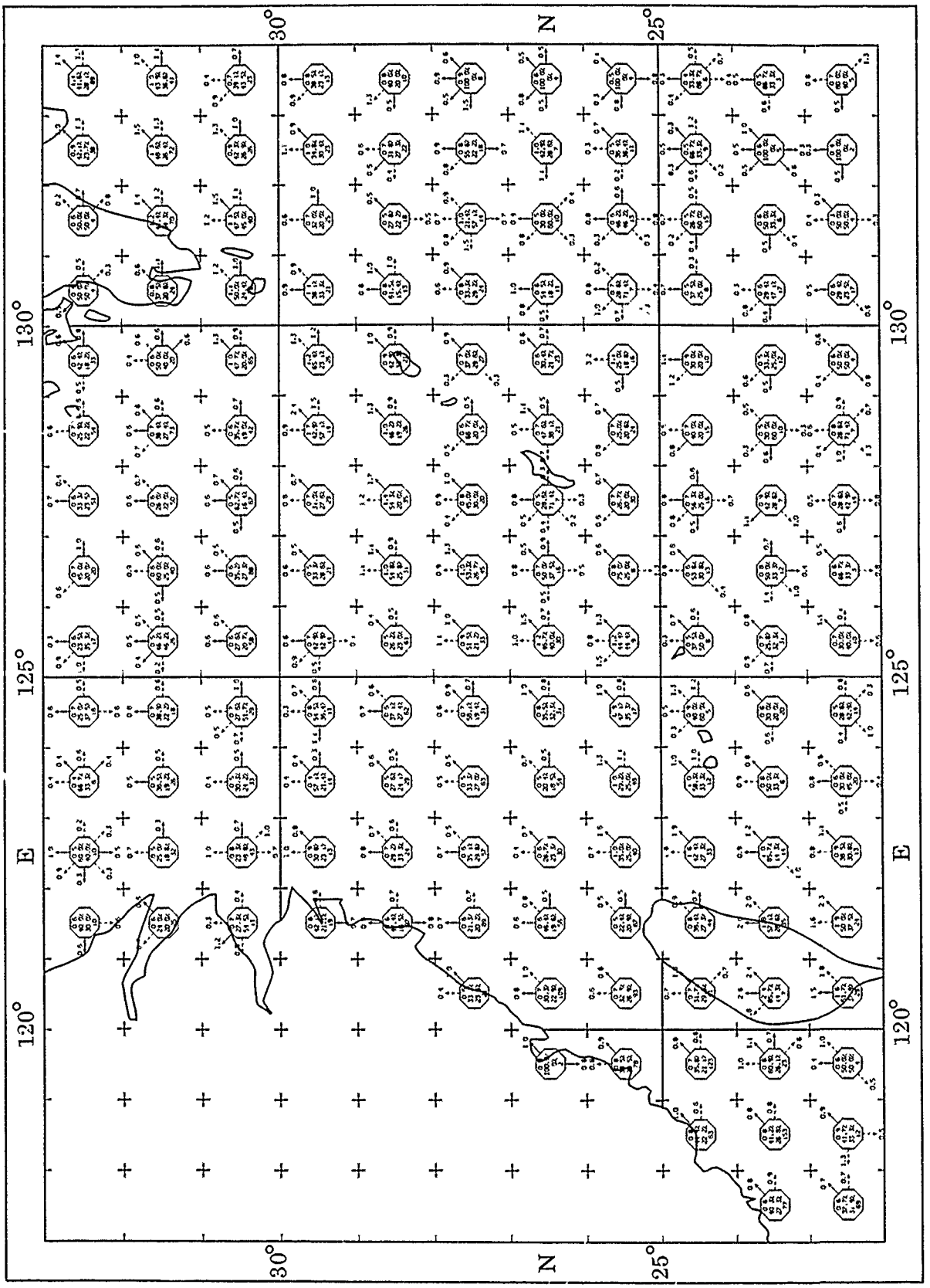

WAVE HEIGHT - FREQUENCIES
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
EXAMPLE: 30.0% OF ALL WAVE HEIGHTS WERE IN THE RANGE 5 TO 6 FEET.
N = OBSERVATION COUNT.
WAVE DATA FOR THESE TABLES WERE SELECTED FROM THE HIGHER OF SEA OR SWELL WHEN BOTH WERE REPORTED.
HEIGHT PERCENT
≤2 10 0
3-4 20 0
5-6 30 0
7-9 20 0
10-12 10 0
≥13 10 0
N = 1363
120°
125°
130°
35°
40°
N
E

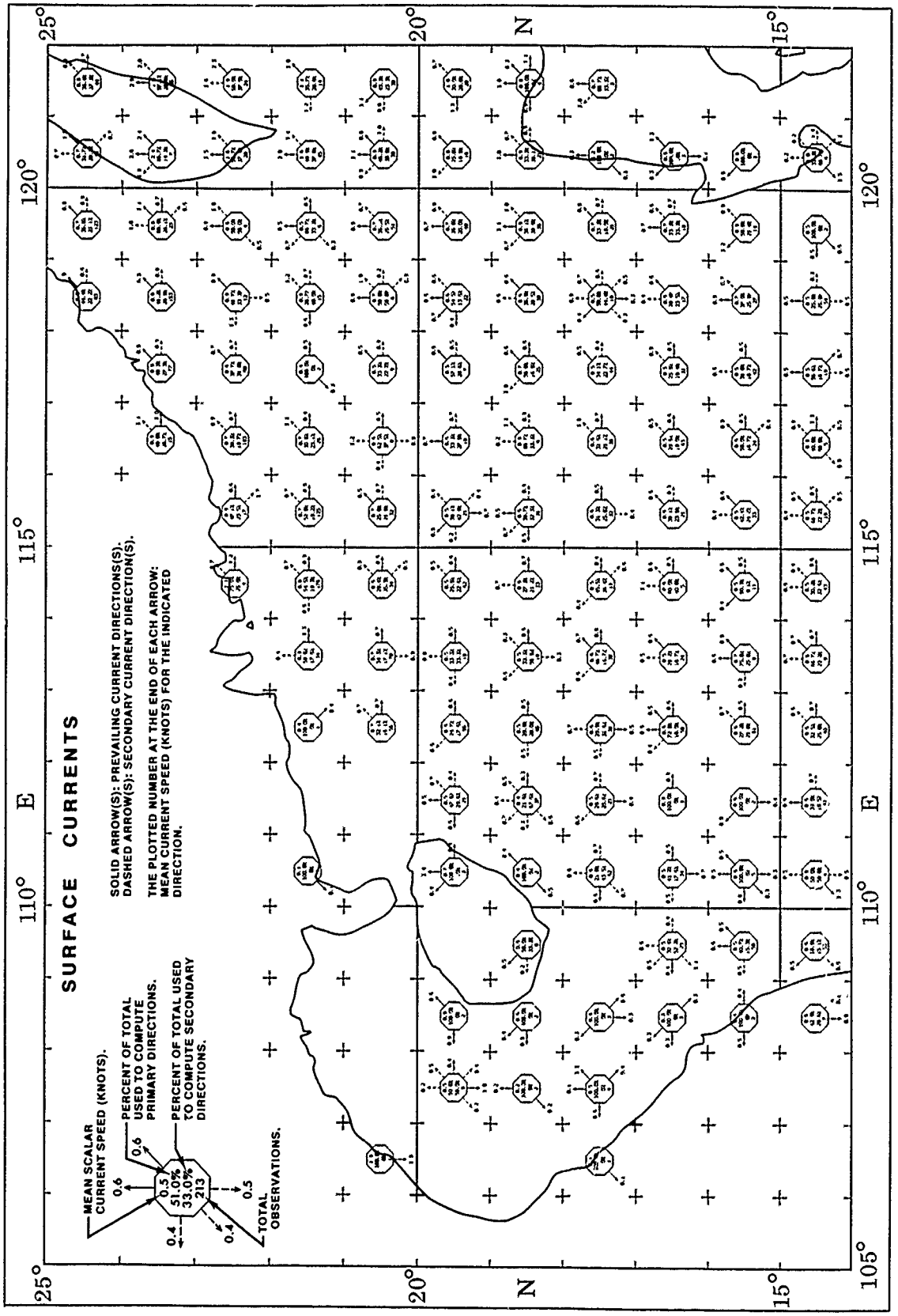

120°
125°
130°
E
30°
25°
N

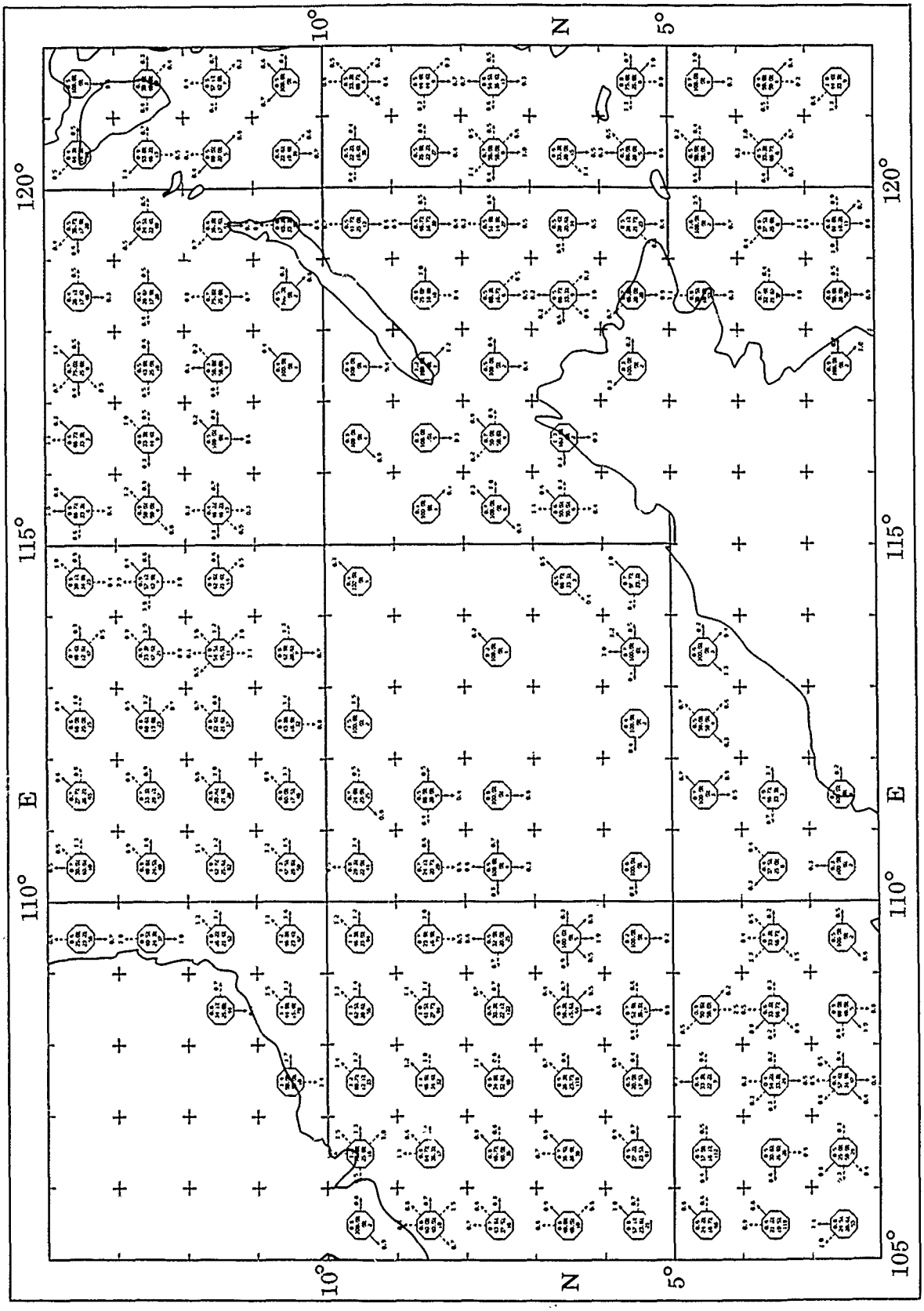

WAVE HEIGHT - FREQUENCIES
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
HEIGHT PERCENT
≤2 10.0
3-4 20.0
5-6 30.0
7-9 20.0
10-12 10.0
≥13 10.0
N = 1363
EXAMPLE: 30.0% OF ALL WAVE HEIGHTS WERE IN THE RANGE 5 TO 6 FEET.
N = OBSERVATION COUNT.
WAVE DATA FOR THESE TABLES WERE SELECTED FROM THE HIGHER OF SEA OR SWELL WHEN BOTH WERE REPORTED.
110° E
115° E
120° E
105° E
25° N
20° N
15° N

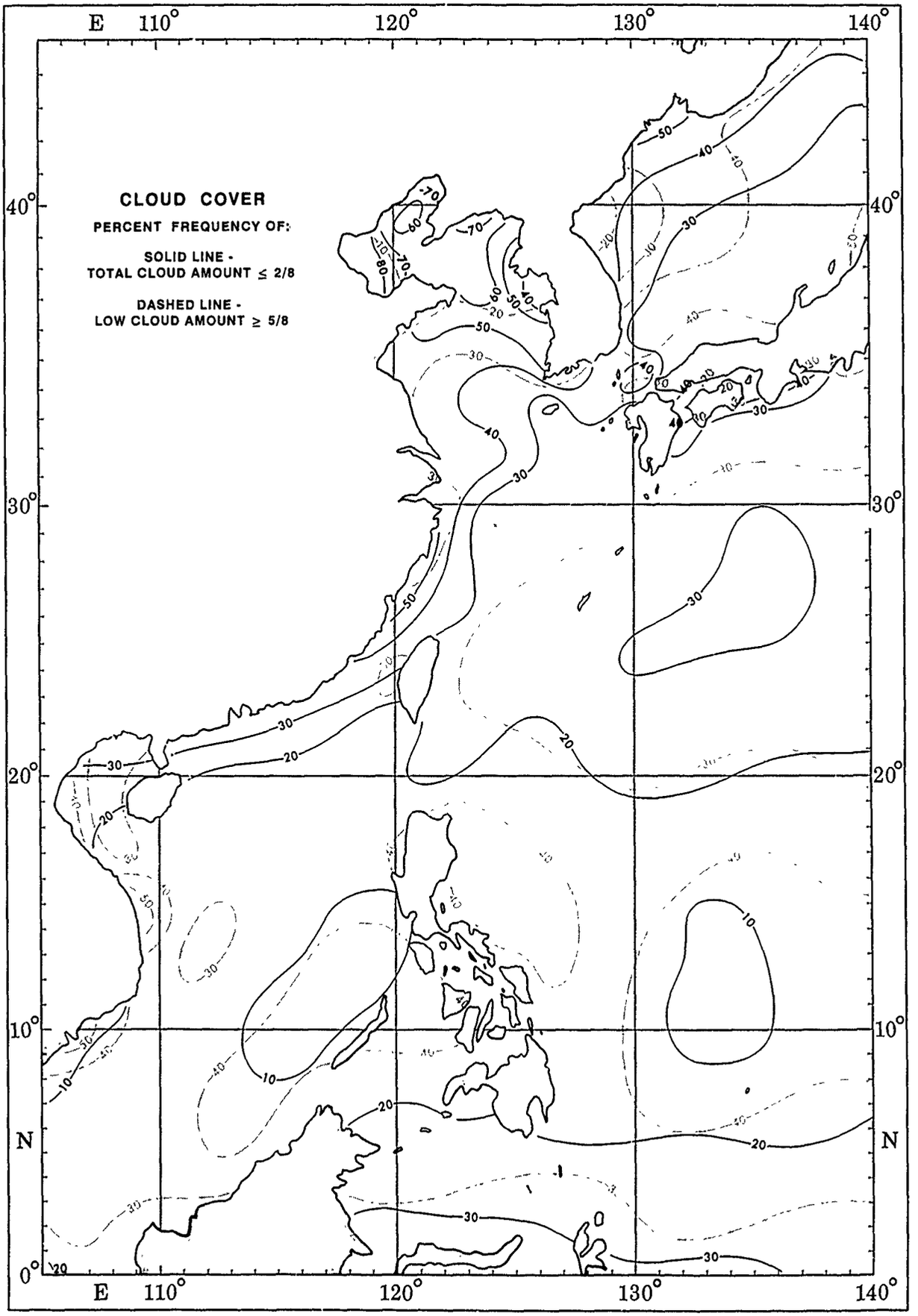

120°
115°
110°
105°
10° N
5° N
E

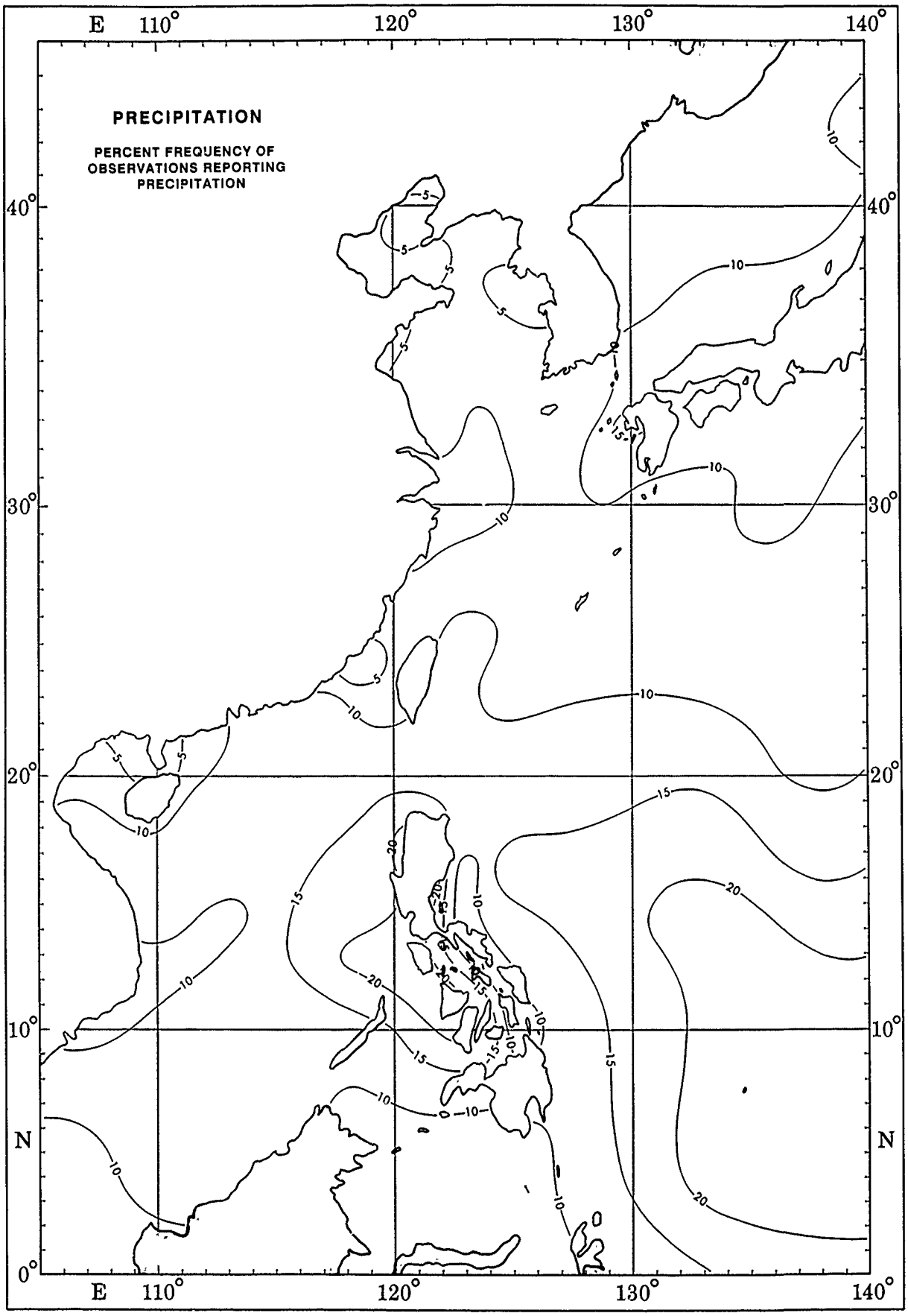

SURFACE CURRENTS
SOLID ARROW(S): PREVAILING CURRENT DIRECTIONS(S).
DASHED ARROW(S): SECONDARY CURRENT DIRECTION(S).
THE PLOTTED NUMBER AT THE END OF EACH ARROW:
MEAN CURRENT SPEED (KNOTS) FOR THE INDICATED
DIRECTION.
MEAN SCALAR CURRENT SPEED (KNOTS).
PERCENT OF TOTAL USED TO COMPUTE PRIMARY DIRECTIONS.
PERCENT OF TOTAL USED TO COMPUTE SECONDARY DIRECTIONS.
TOTAL OBSERVATIONS.
0.6
0.5
51.0%
33.0%
213
0.4
0.4
0.5
120°
125°
130°
E
40°
35°
N

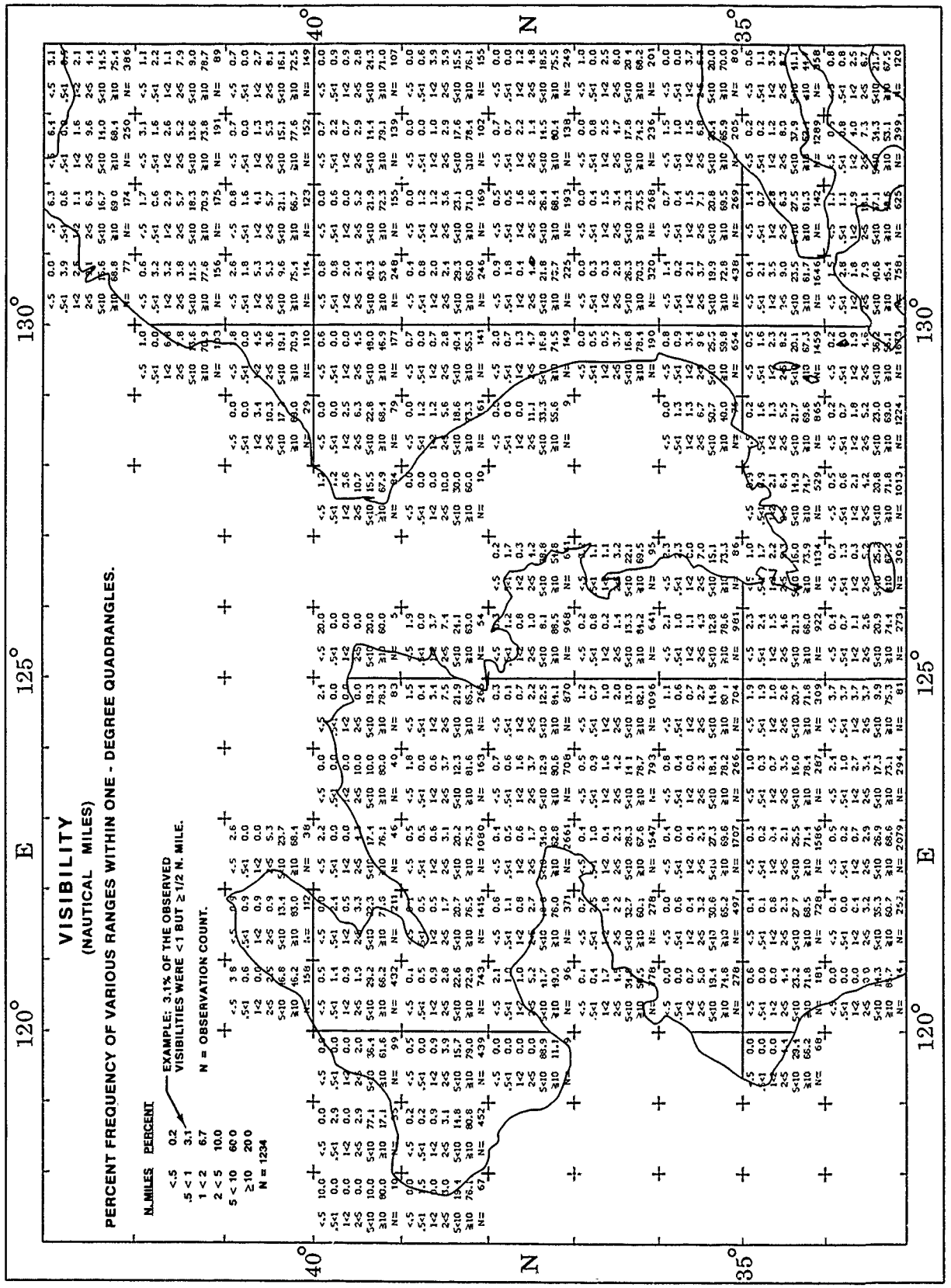

30° N
25°
130° E
125°
120°

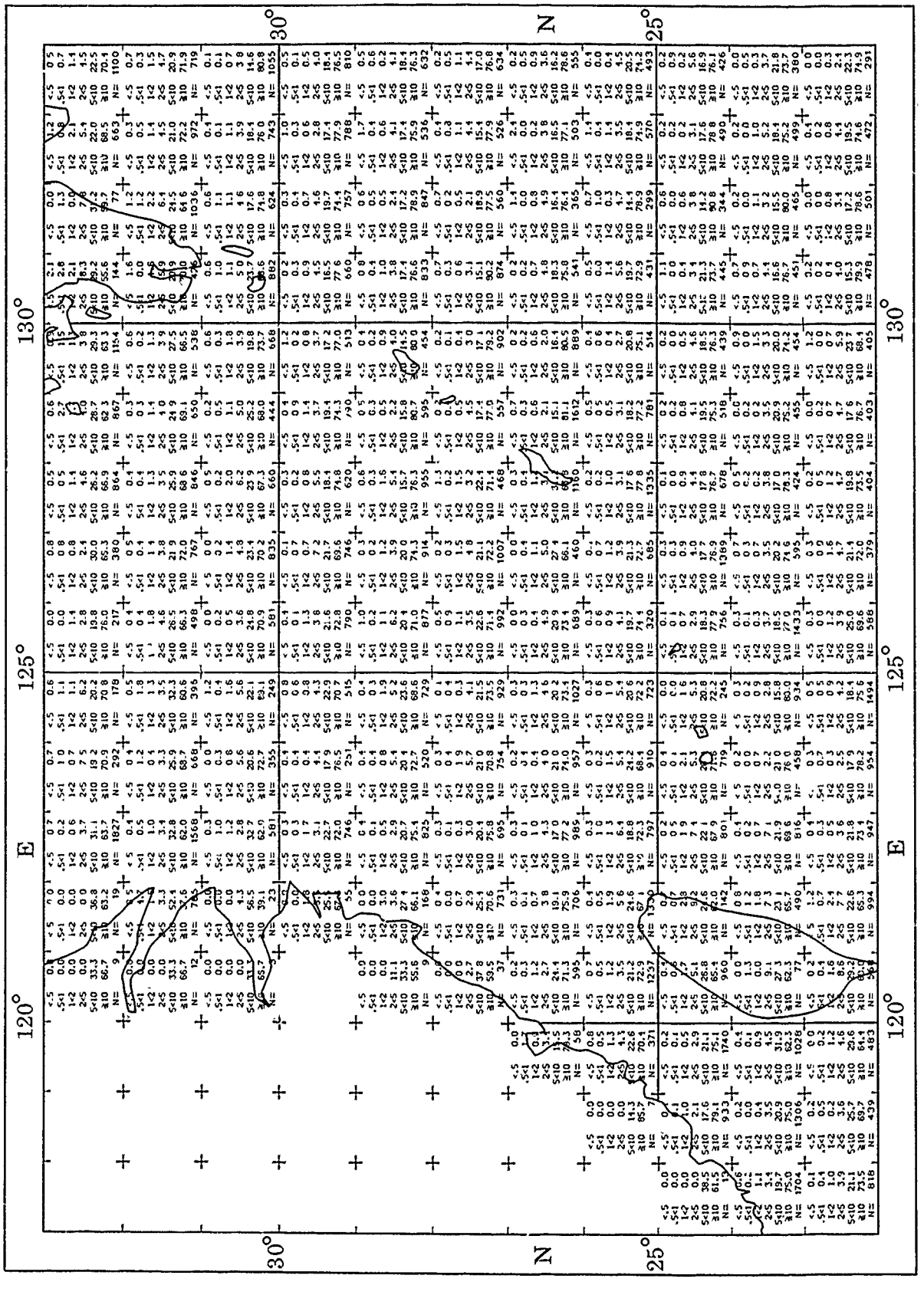

SURFACE CURRENTS
SOLID ARROW(S): PREVAILING CURRENT DIRECTIONS(S).
DASHED ARROW(S): SECONDARY CURRENT DIRECTION(S).
THE PLOTTED NUMBER AT THE END OF EACH ARROW:
MEAN CURRENT SPEED (KNOTS) FOR THE INDICATED
DIRECTION.
MEAN SCALAR CURRENT SPEED (KNOTS).
PERCENT OF TOTAL USED TO COMPUTE PRIMARY DIRECTIONS.
PERCENT OF TOTAL USED TO COMPUTE SECONDARY DIRECTIONS.
TOTAL OBSERVATIONS.
0.6
0.5
51.0%
33.0%
213
0.4
0.5
0.4
25°
20°
15°
N
105°
110°
115°
120°
E

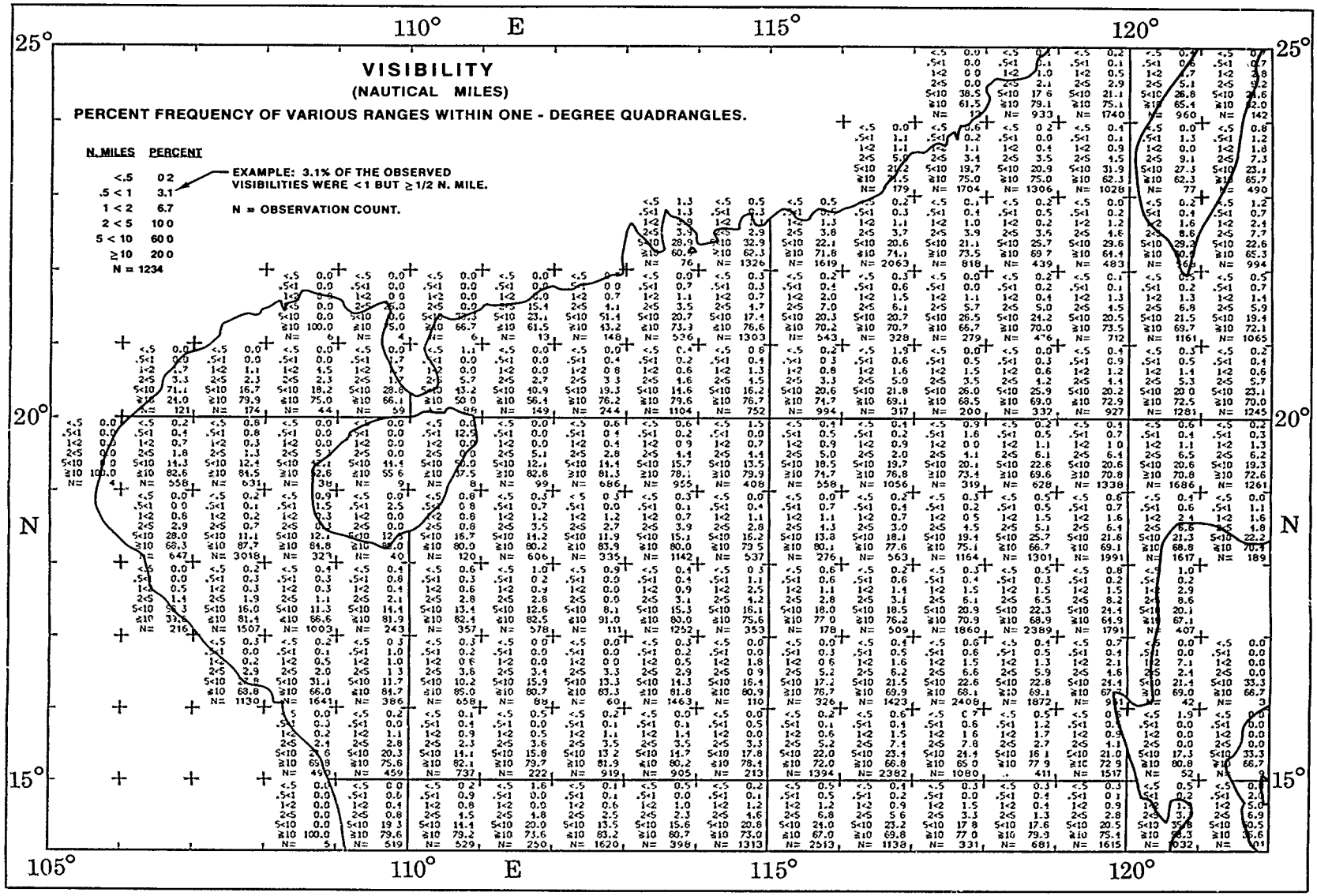

10° N
5°
120°
115°
110° E
105°

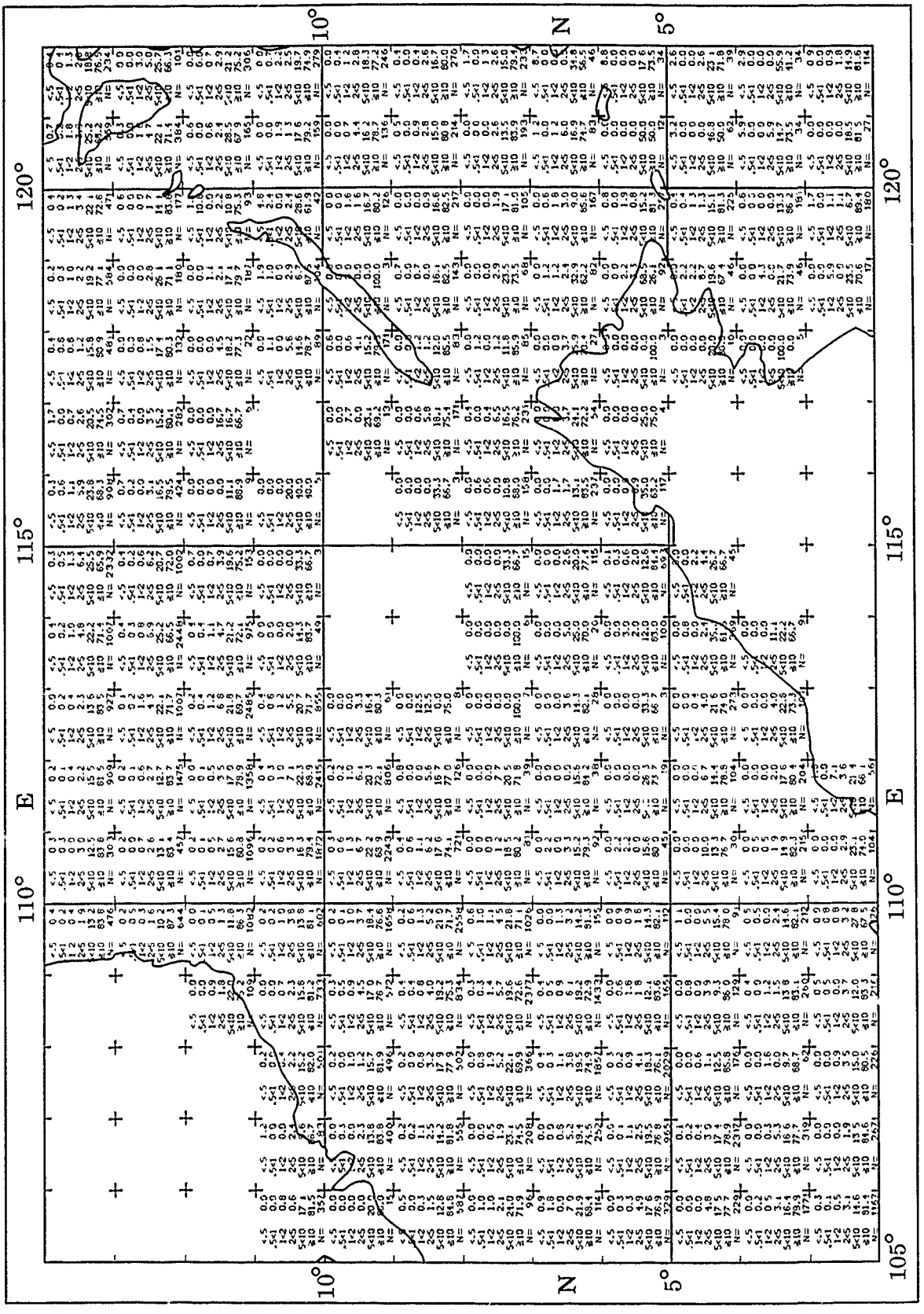

CLOUD COVER
PERCENT FREQUENCY OF:
SOLID LINE -
TOTAL CLOUD AMOUNT ≤ 2/8
DASHED LINE -
LOW CLOUD AMOUNT ≥ 5/8
E 110° 120° 130° 140°
40° 30° 20° 10° N 0°

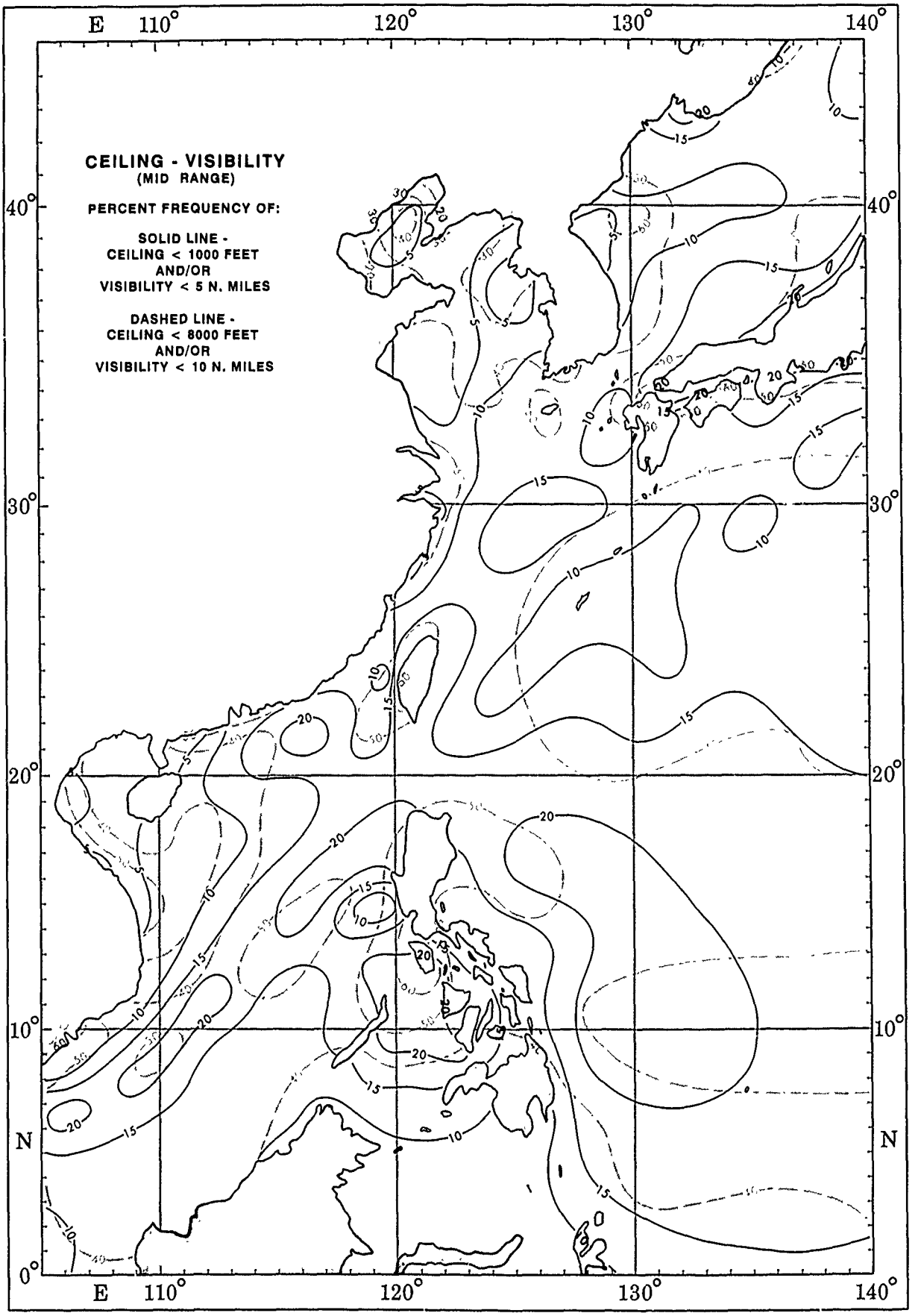

PRECIPITATION
PERCENT FREQUENCY OF OBSERVATIONS REPORTING PRECIPITATION
E 110°
120°
130°
140°
40°
30°
20°
10°
N
0°


VISIBILITY
(NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE - DEGREE QUADRANGLES.
N_MILES PERCENT
<.5 0.2
.5 < 1 3.1
1 < 2 6.7
2 < 5 10.0
5 < 10 60.0
≥10 20.0
N = 1234
EXAMPLE: 3.1% OF THE OBSERVED VISIBILITIES WERE <1 BUT ≥1/2 N. MILE.
N = OBSERVATION COUNT.
120°
125°
130°
40°
35°
N
E


120°
125°
130°
30°
25°
N
E

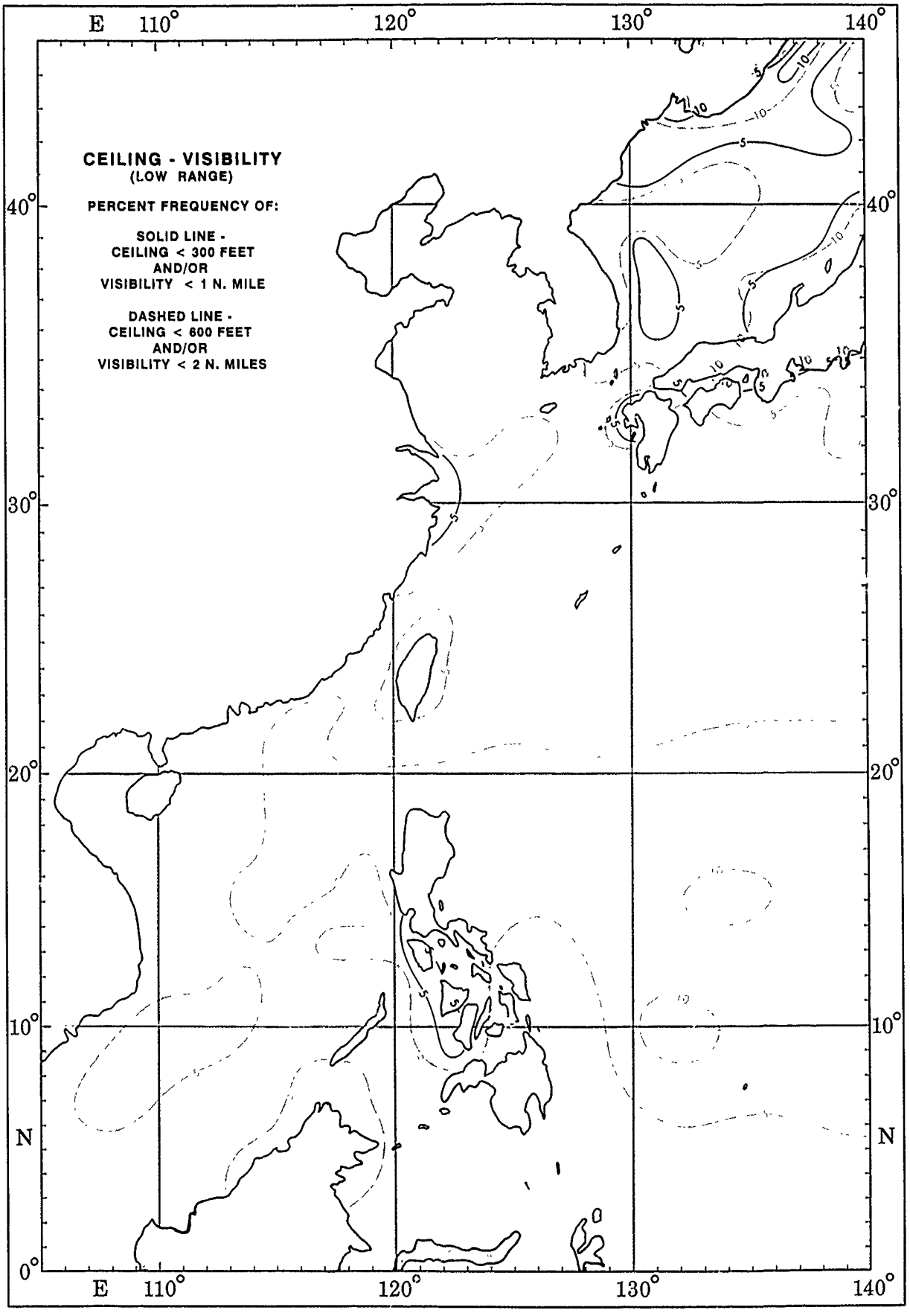

VISIBILITY
(NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE - DEGREE QUADRANGLES.
N. MILES PERCENT
<.5 0 2
.5 < 1 3.1
1 < 2 6.7
2 < 5 10 0
5 < 10 60 0
≥10 20 0
N = 1234
EXAMPLE: 3.1% OF THE OBSERVED VISIBILITIES WERE <1 BUT ≥1/2 N. MILE.
N = OBSERVATION COUNT.
110° E
115°
120°
25°
20°
15°
N
105°

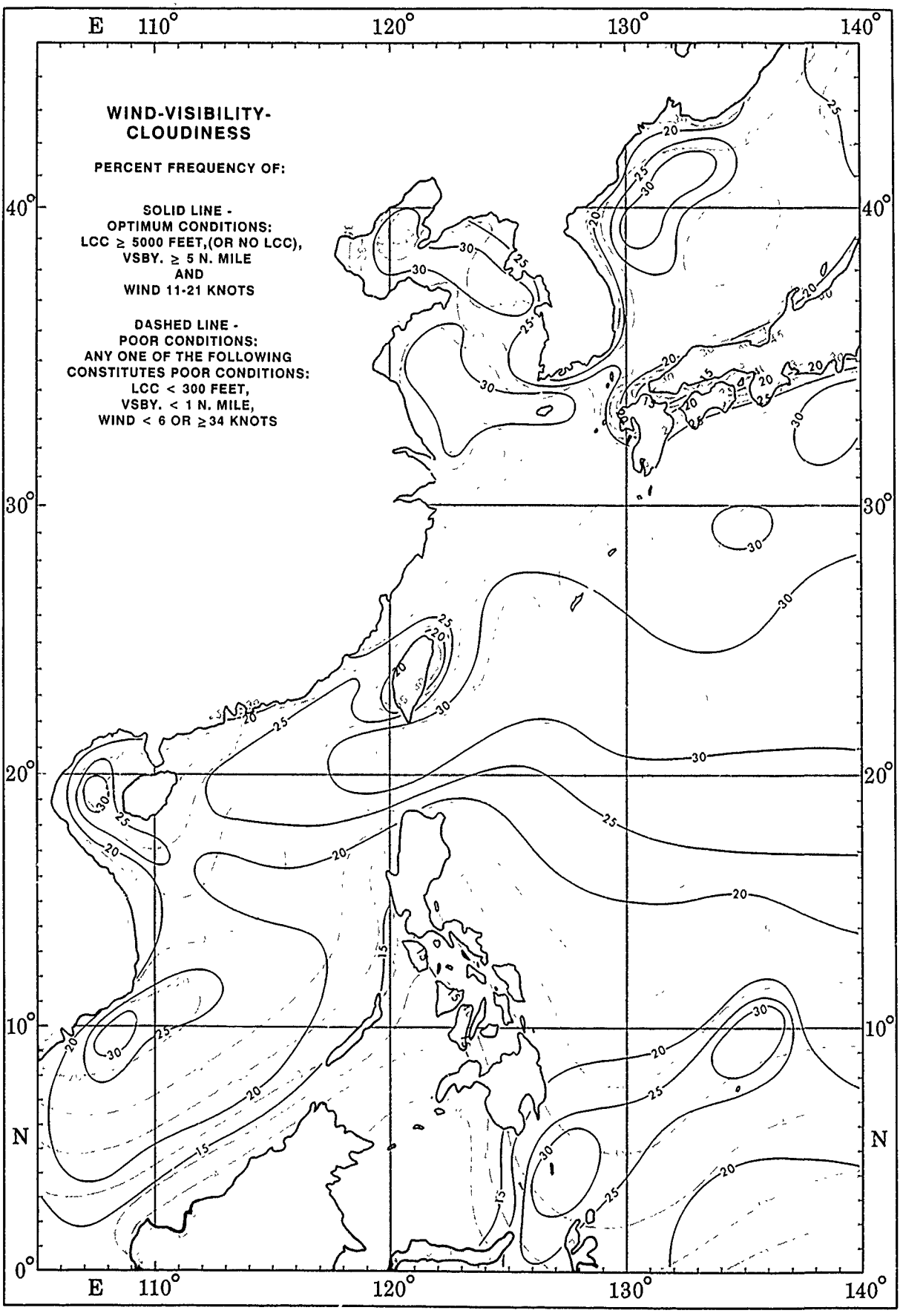

120°
115°
110°
105°
10°
5°
N
E

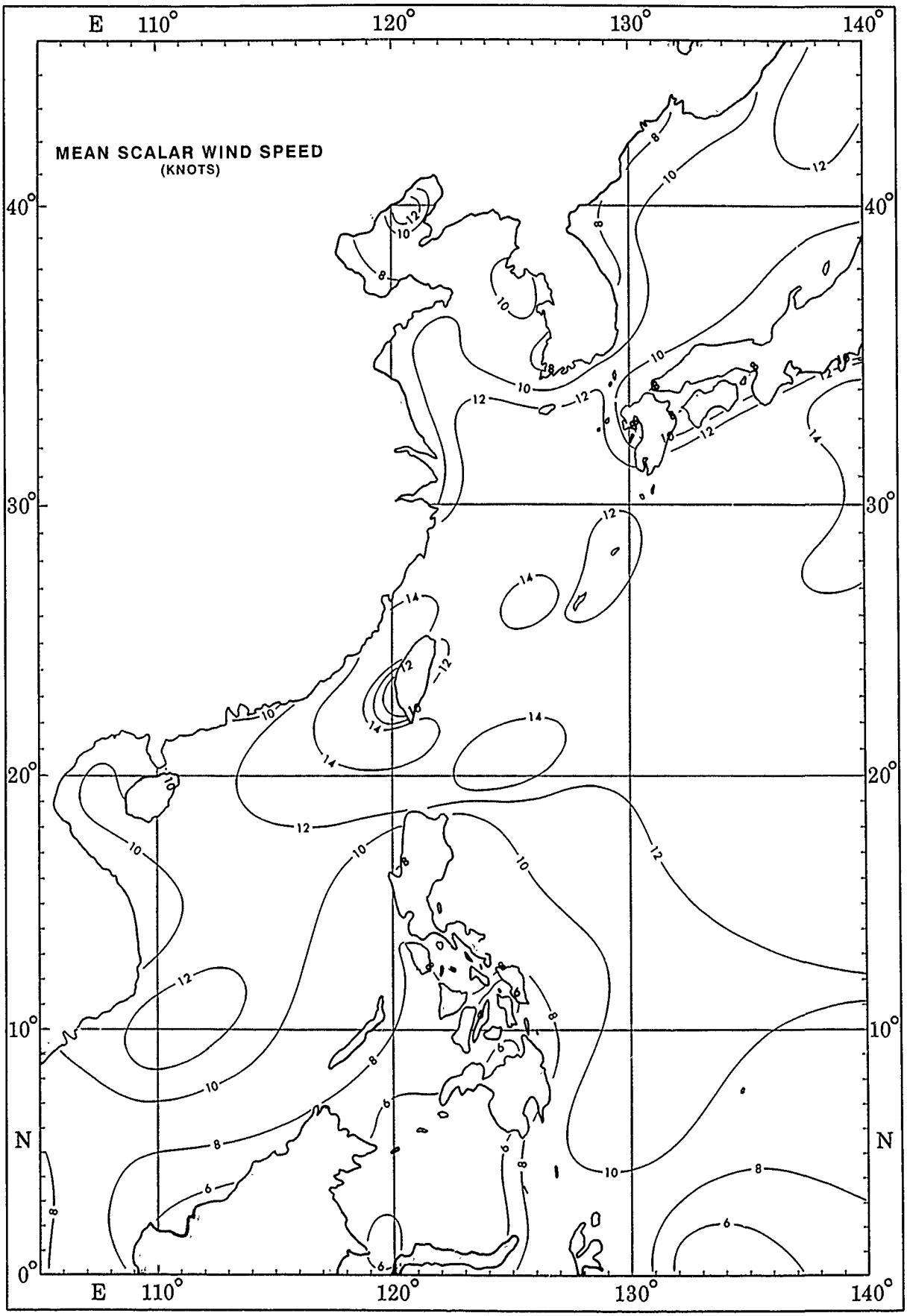

CEILING - VISIBILITY
(MID RANGE)
PERCENT FREQUENCY OF:
SOLID LINE -
CEILING < 1000 FEET
AND/OR
VISIBILITY < 5 N. MILES
DASHED LINE -
CEILING < 8000 FEET
AND/OR
VISIBILITY < 10 N. MILES
E 110°
120°
130°
140°
40°
30°
20°
10°
N
0°

September

Ceiling - Visibility (Low Range)

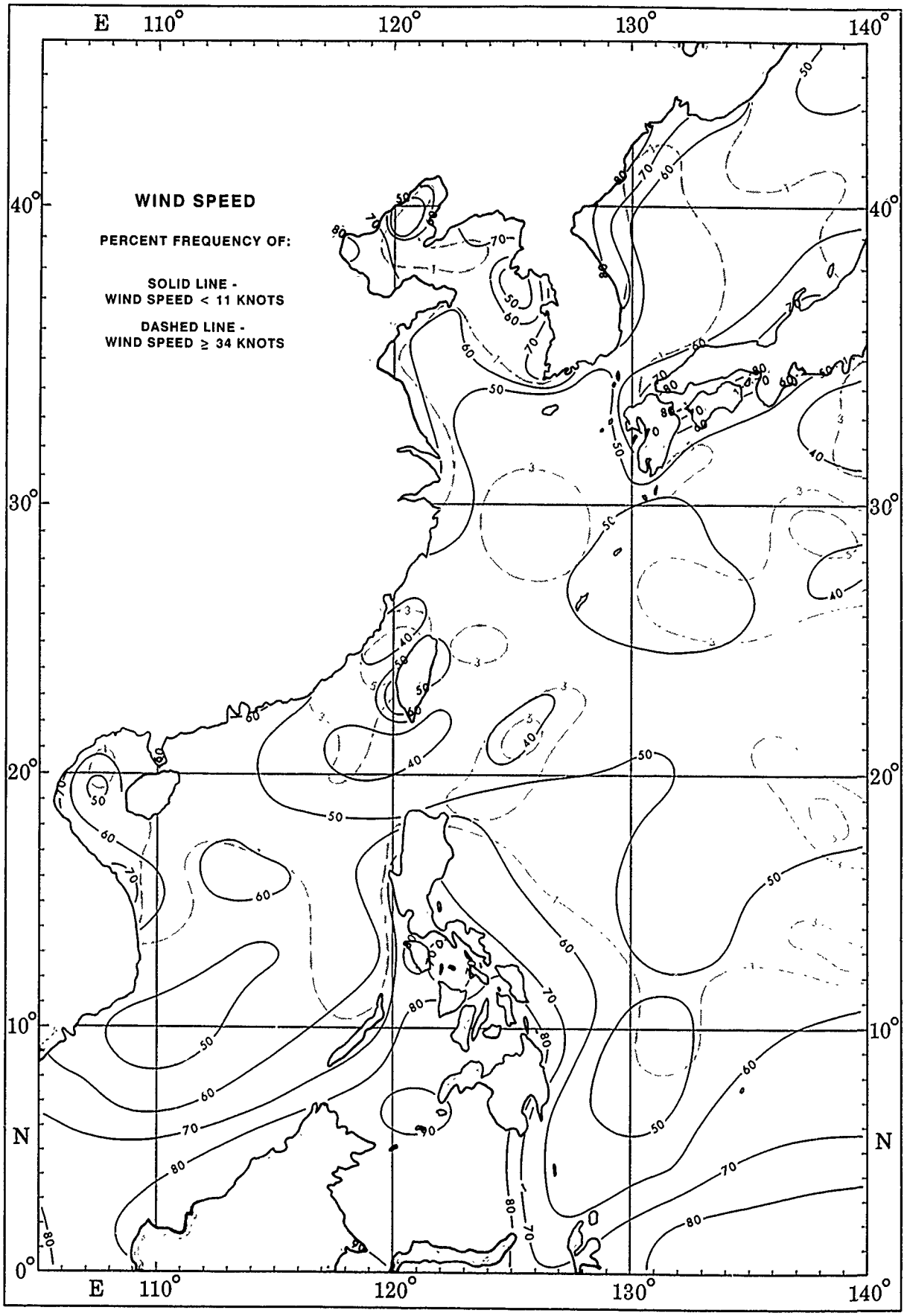



WIND-VISIBILITY-
CLOUDINESS
PERCENT FREQUENCY OF:
SOLID LINE -
OPTIMUM CONDITIONS:
LCC ≥ 5000 FEET,(OR NO LCC),
VSBY. ≥ 5 N. MILE
AND
WIND 11-21 KNOTS
DASHED LINE -
POOR CONDITIONS:
ANY ONE OF THE FOLLOWING
CONSTITUTES POOR CONDITIONS:
LCC < 300 FEET,
VSBY. < 1 N. MILE,
WIND < 6 OR ≥34 KNOTS
E 110°
120°
130°
140°
40°
30°
20°
10°
N
0°


MEAN SCALAR WIND SPEED
(KNOTS)
E 110°
120°
130°
140°
40°
30°
20°
10°
N
0°

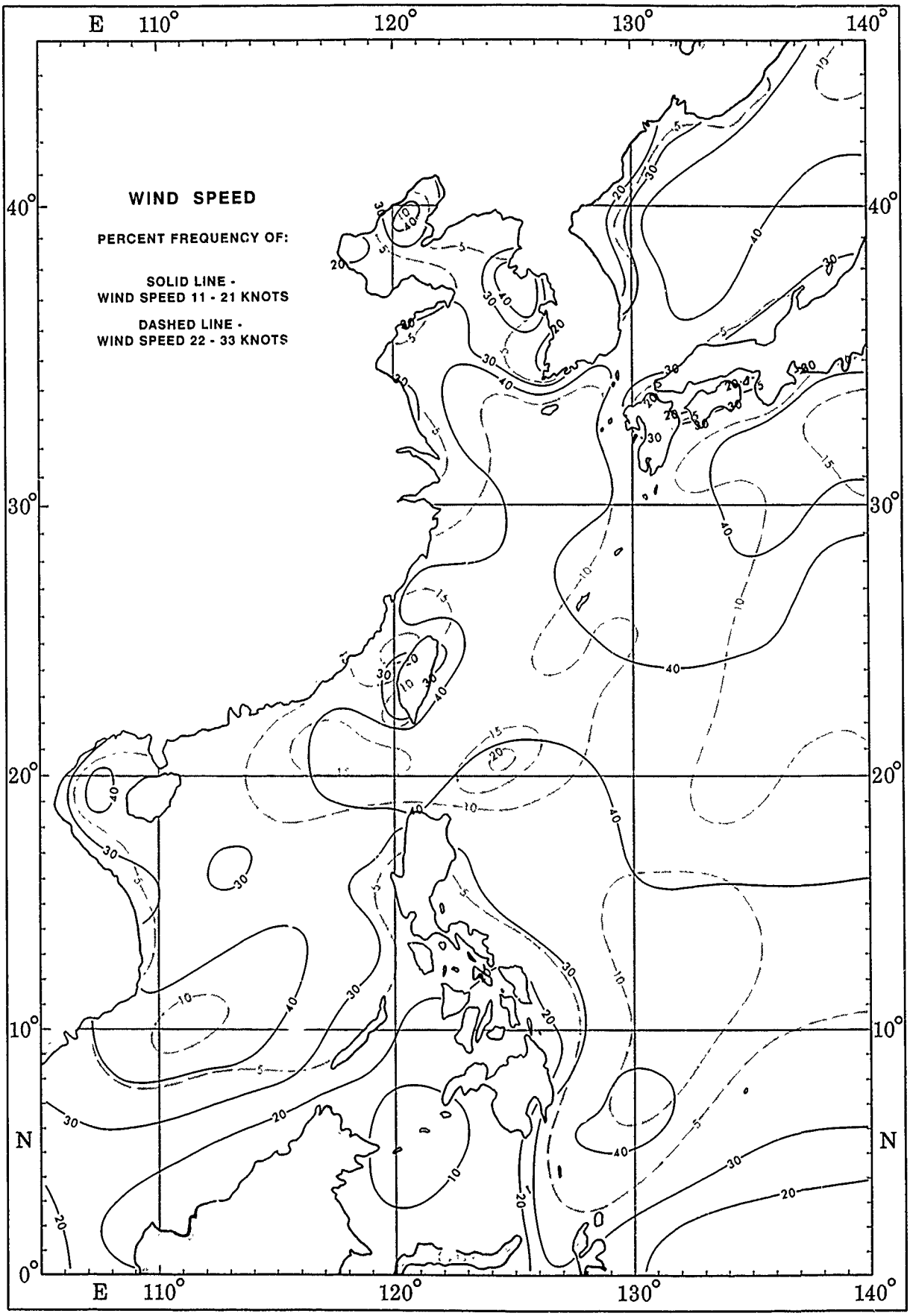
September

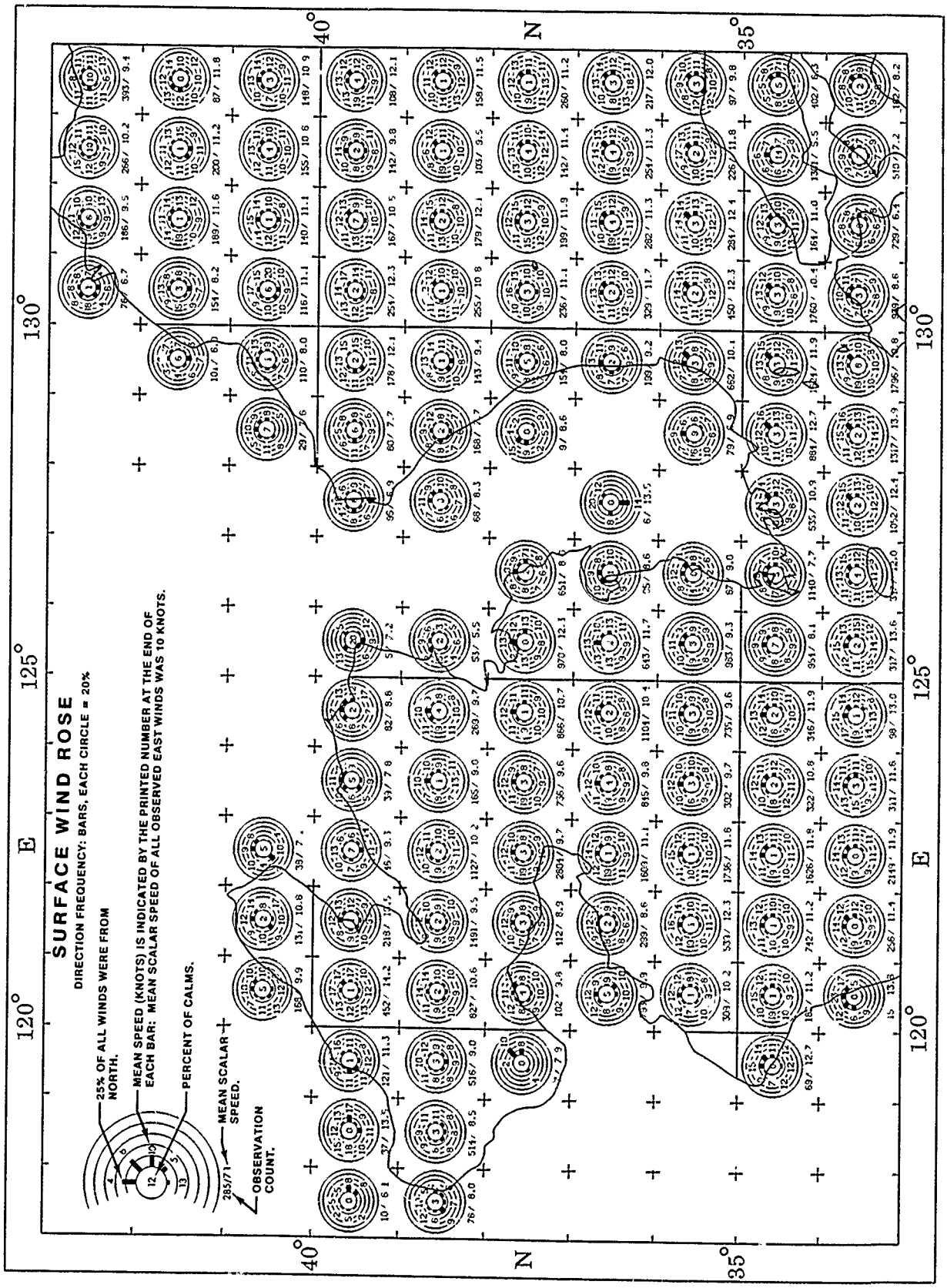
Wind Speed <11 and ≥34 Knots

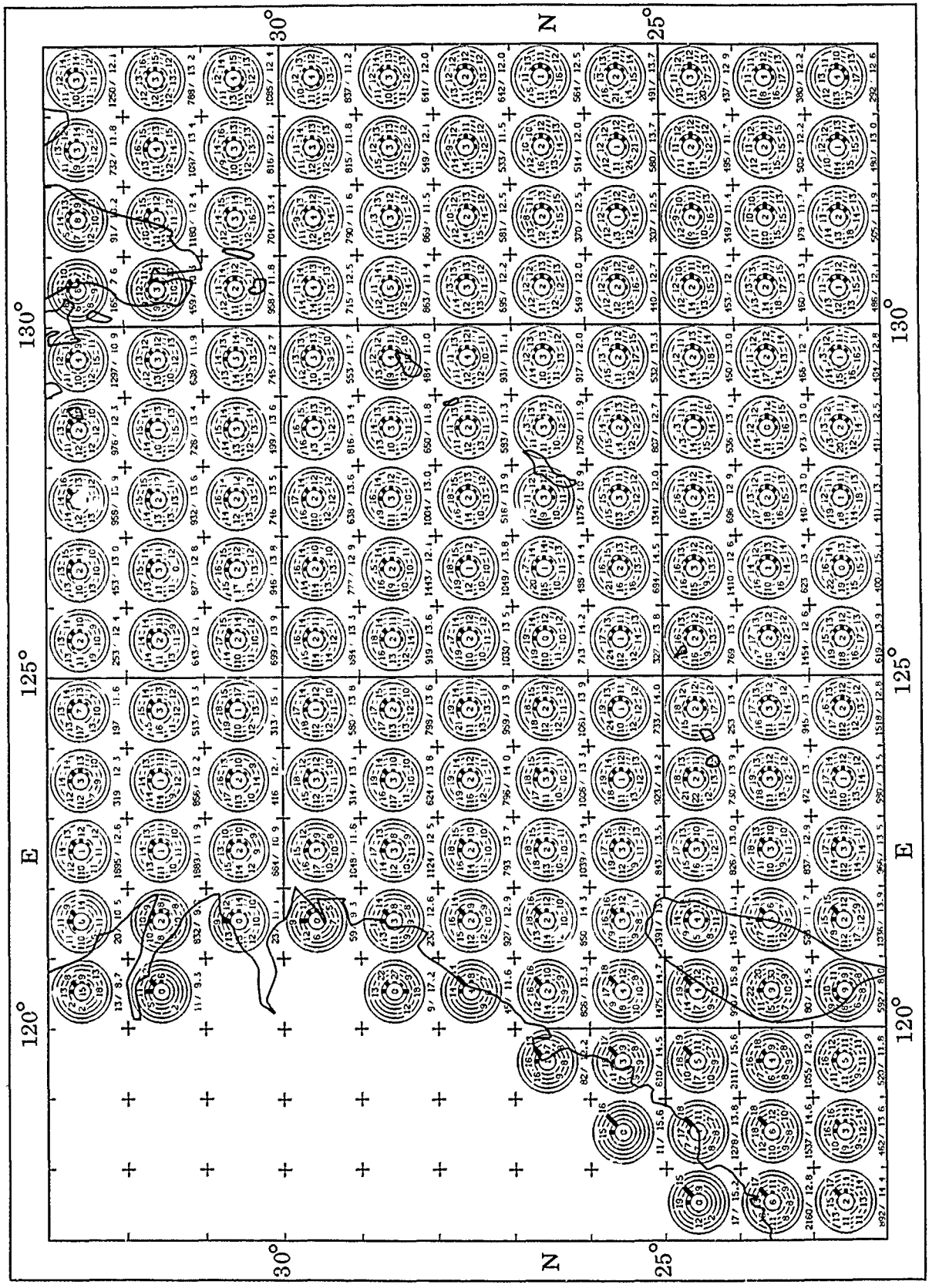


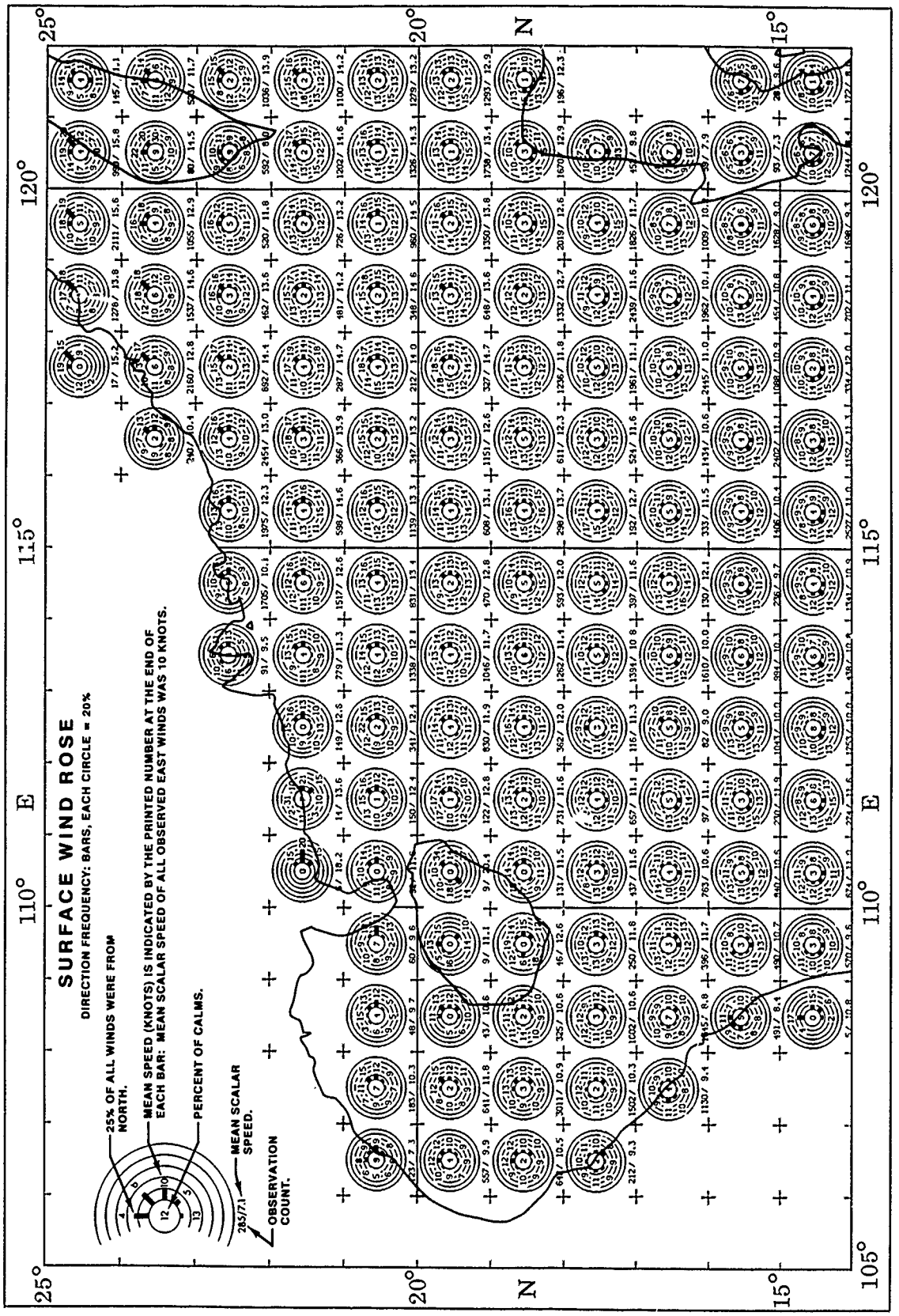
September

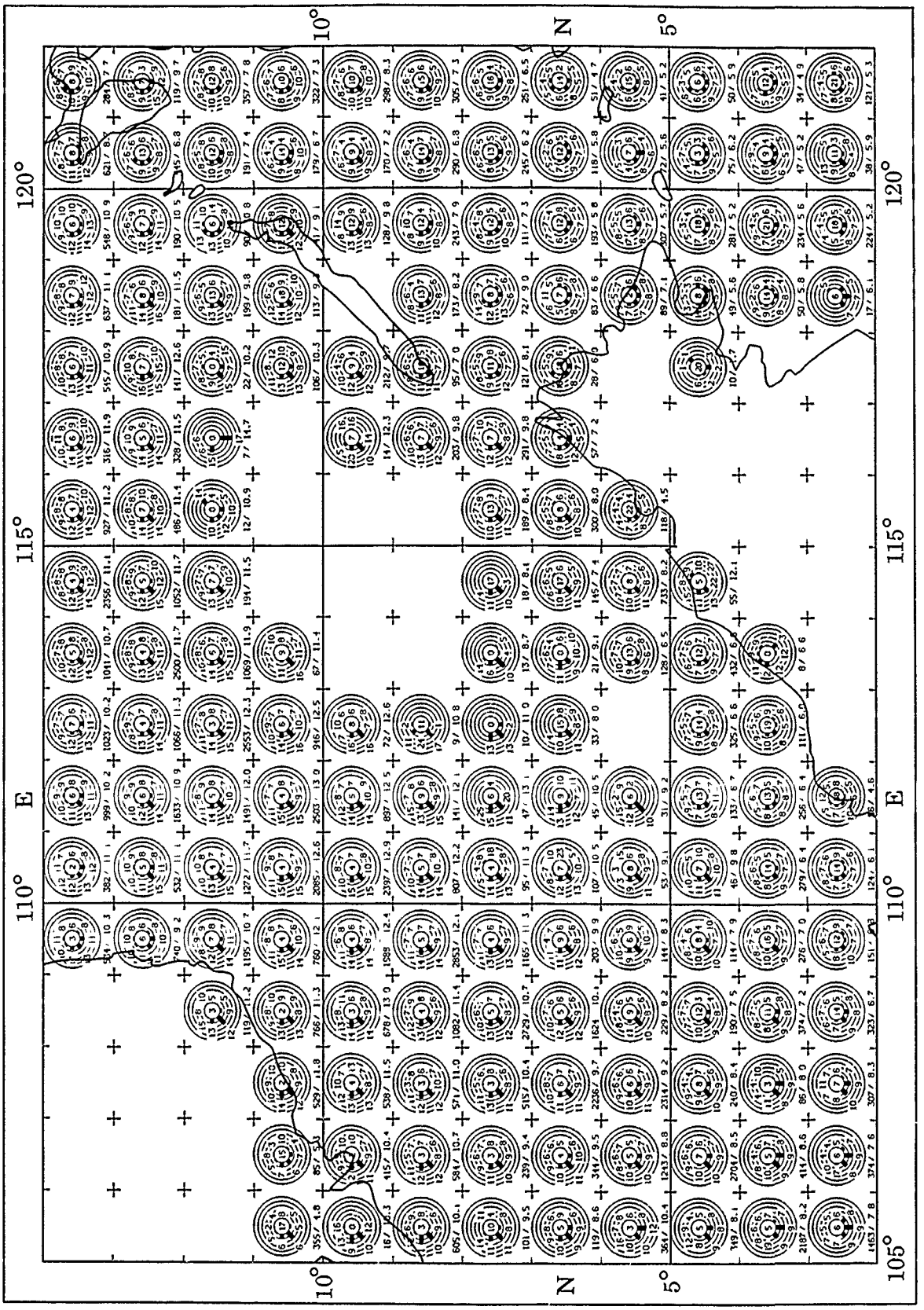
Wind Speed 11 - 21 and 22 - 33 Knots

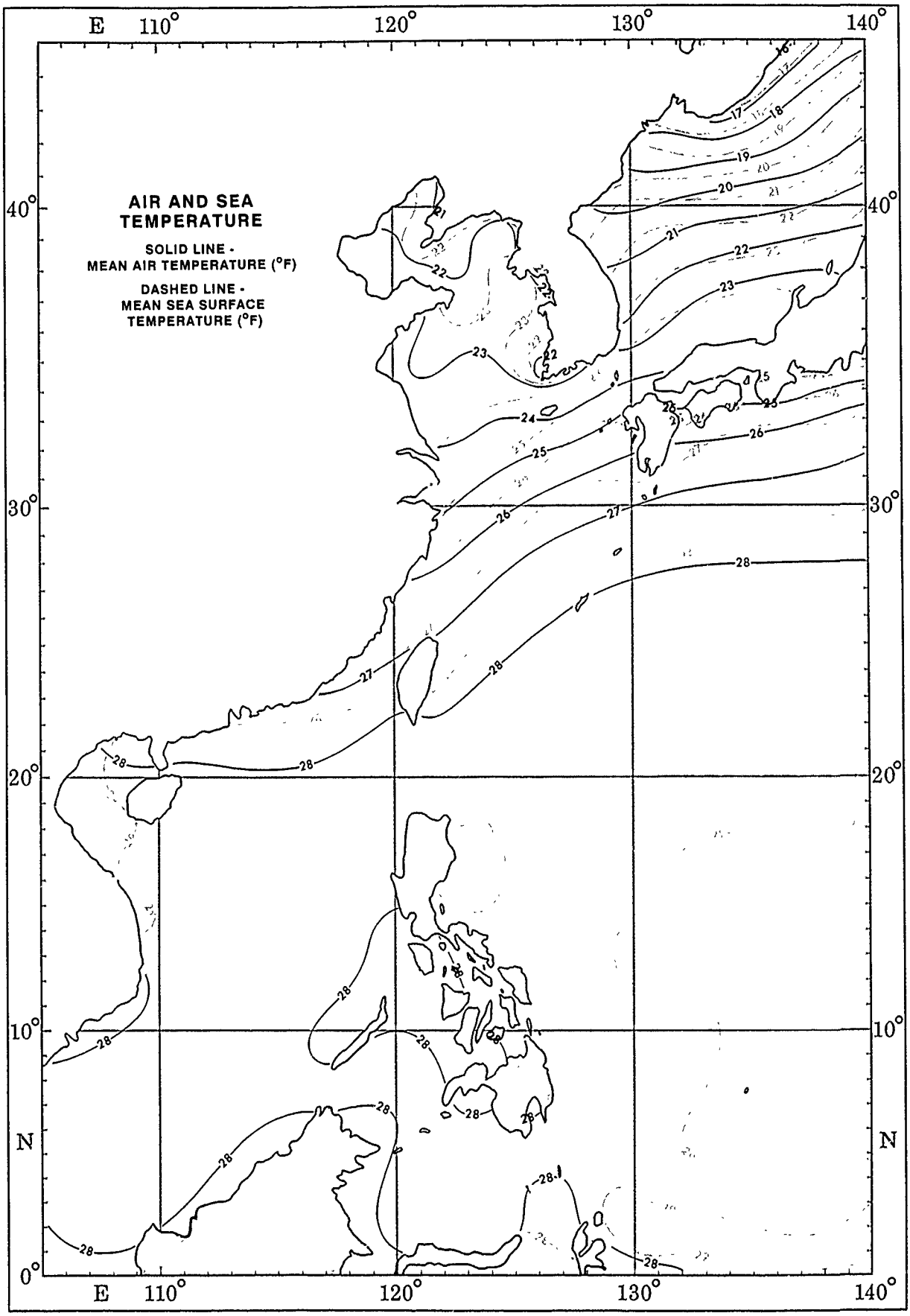


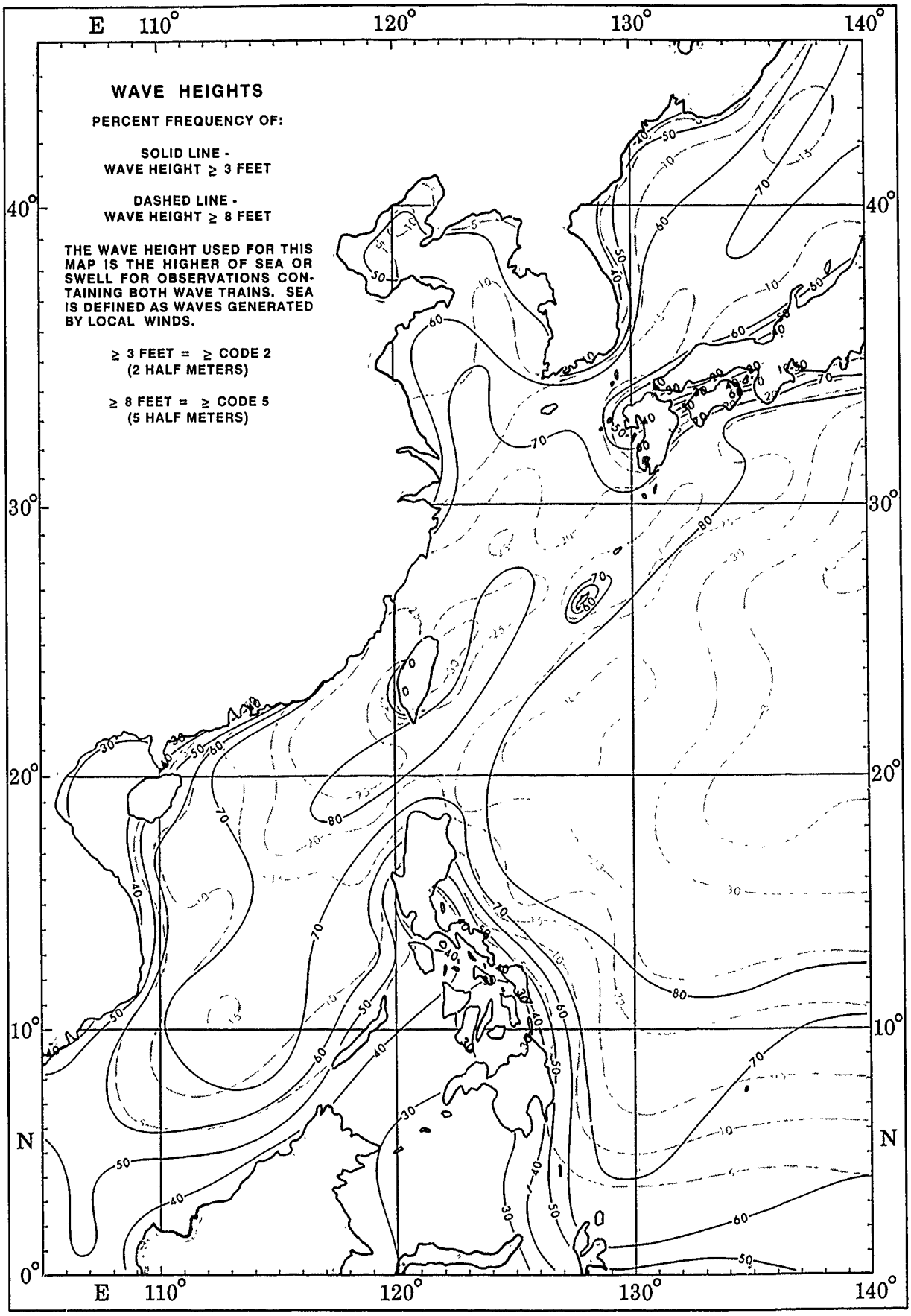

SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%
25% OF ALL WINDS WERE FROM NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR: MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
PERCENT OF CALMS.
MEAN SCALAR SPEED.
OBSERVATION COUNT.
120°
125°
130°
E
40°
35°
N

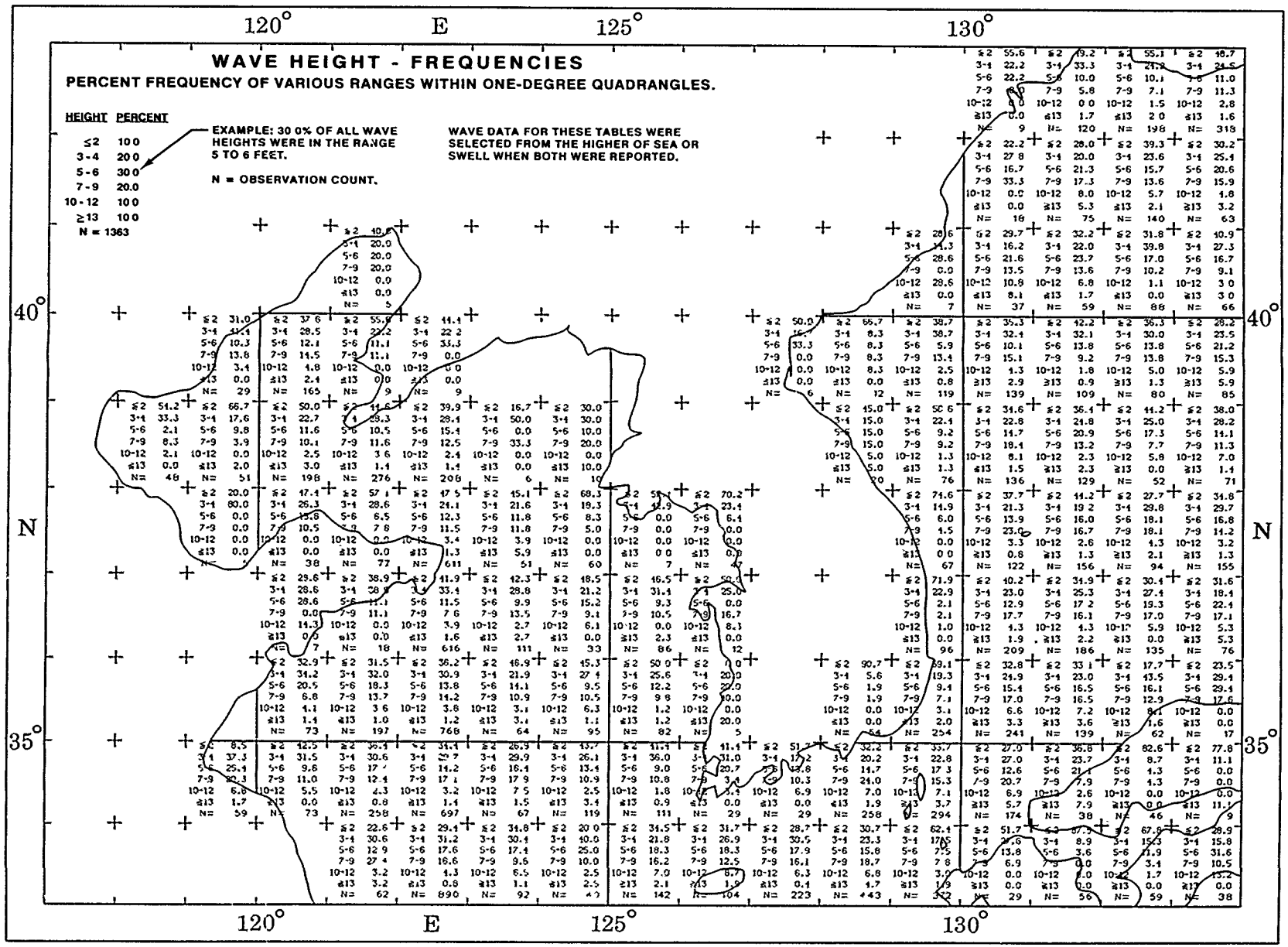

30°
N
25°
130°
125°
120°
E

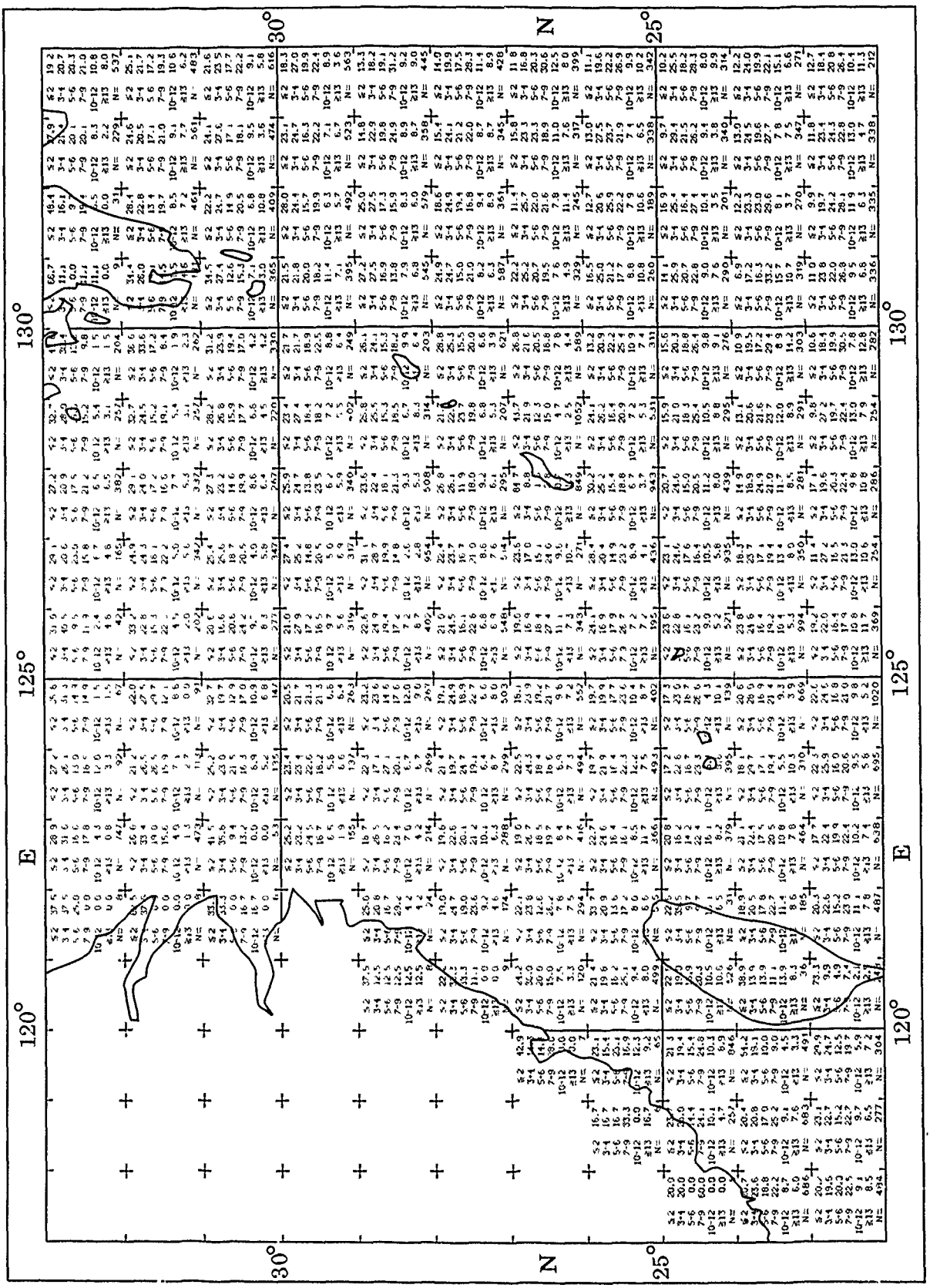

SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR: MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
25% OF ALL WINDS WERE FROM NORTH.
PERCENT OF CALMS.
MEAN SCALAR SPEED.
OBSERVATION COUNT.
110° E
115°
120°
25° N
20°
15°
105°

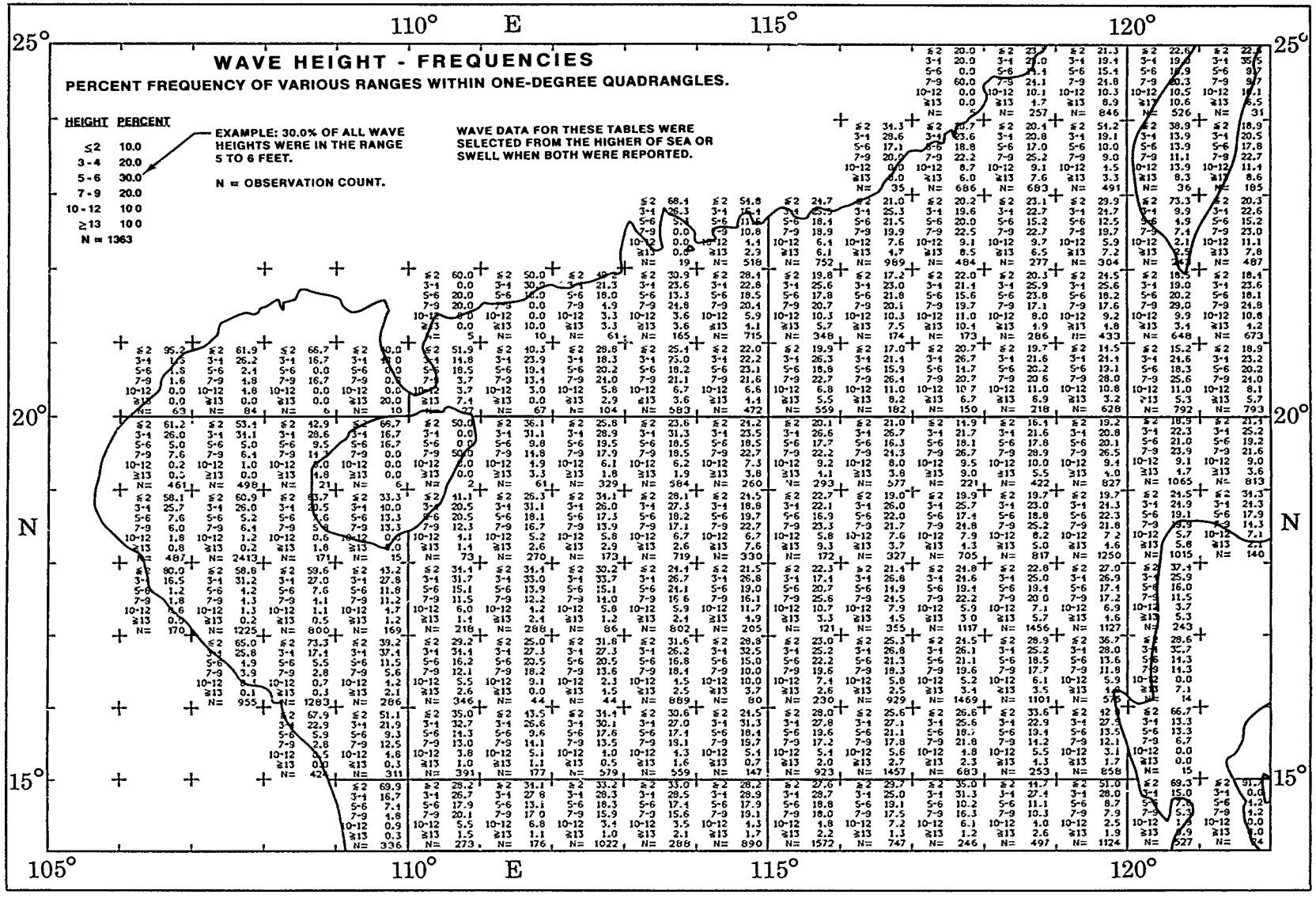

10°
N
5°
105°
110°
E
115°
120°

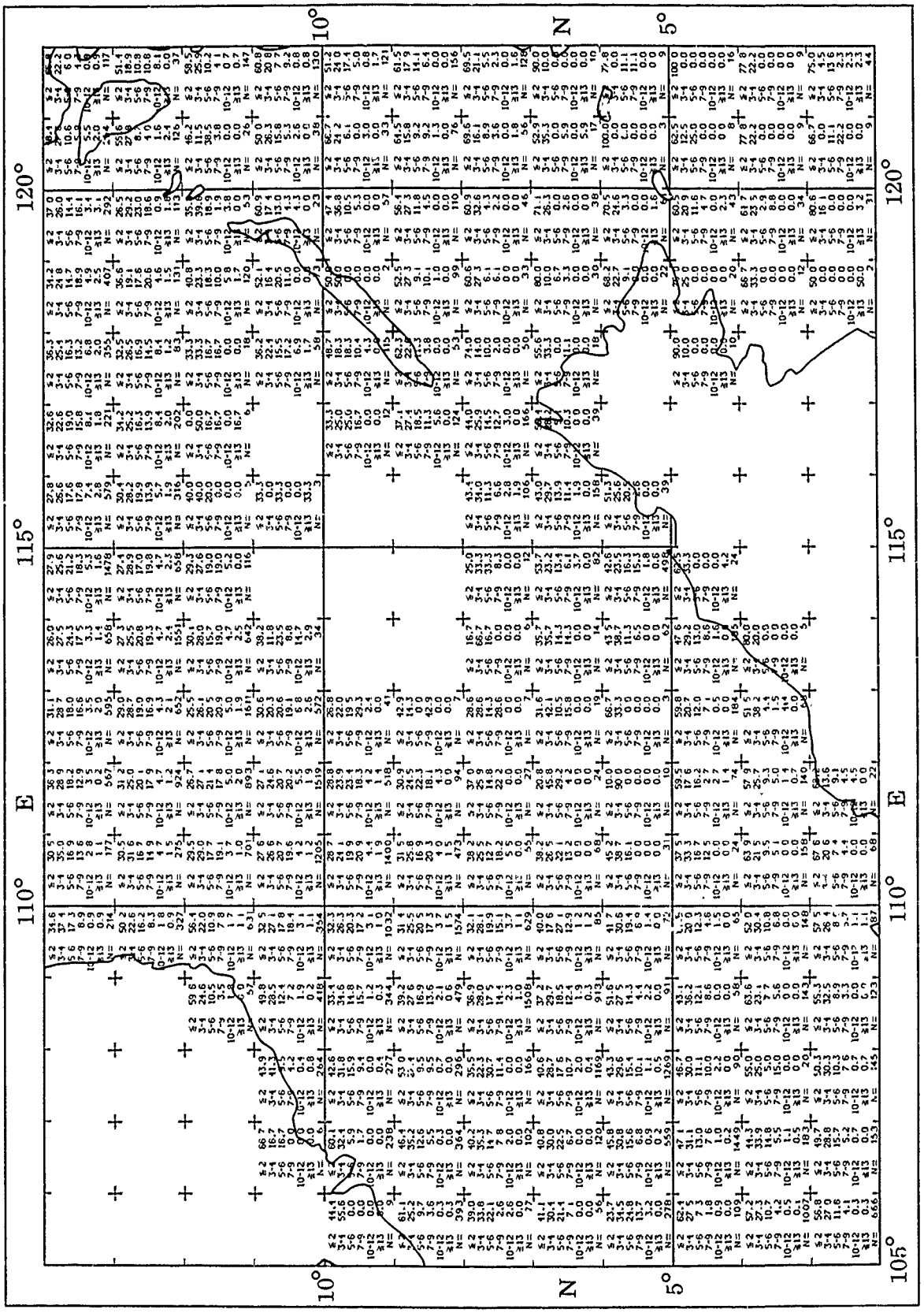

AIR AND SEA TEMPERATURE
SOLID LINE - MEAN AIR TEMPERATURE (°F)
DASHED LINE - MEAN SEA SURFACE TEMPERATURE (°F)
E 110°
120°
130°
140°
40°
30°
20°
10°
N
0°

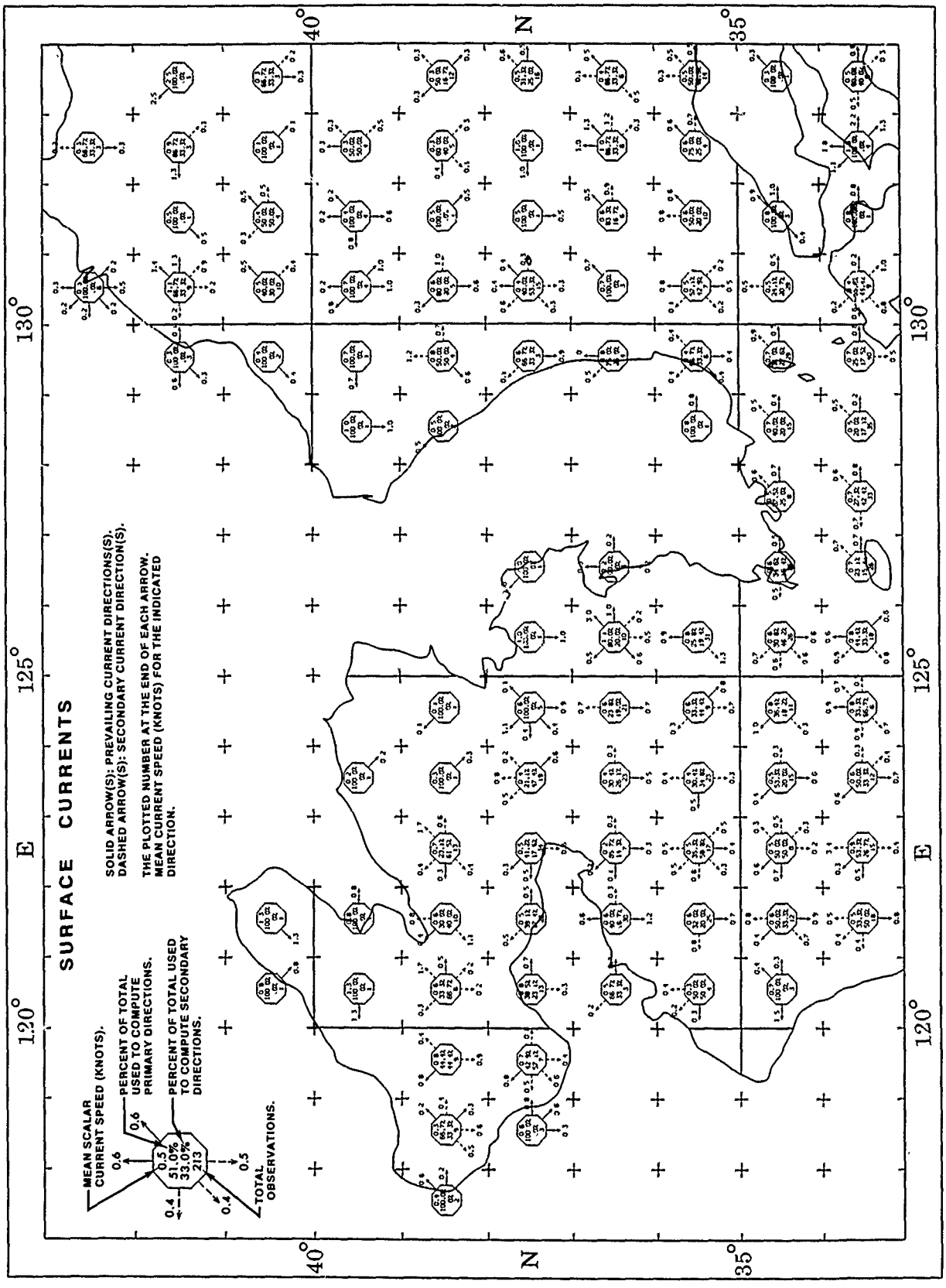

WAVE HEIGHTS
PERCENT FREQUENCY OF:
SOLID LINE -
WAVE HEIGHT ≥ 3 FEET
DASHED LINE -
WAVE HEIGHT ≥ 8 FEET
THE WAVE HEIGHT USED FOR THIS MAP IS THE HIGHER OF SEA OR SWELL FOR OBSERVATIONS CONTAINING BOTH WAVE TRAINS. SEA IS DEFINED AS WAVES GENERATED BY LOCAL WINDS.
≥ 3 FEET = ≥ CODE 2
(2 HALF METERS)
≥ 8 FEET = ≥ CODE 5
(5 HALF METERS)
E 110°
120°
130°
140°
40°
30°
20°
10°
N
0°

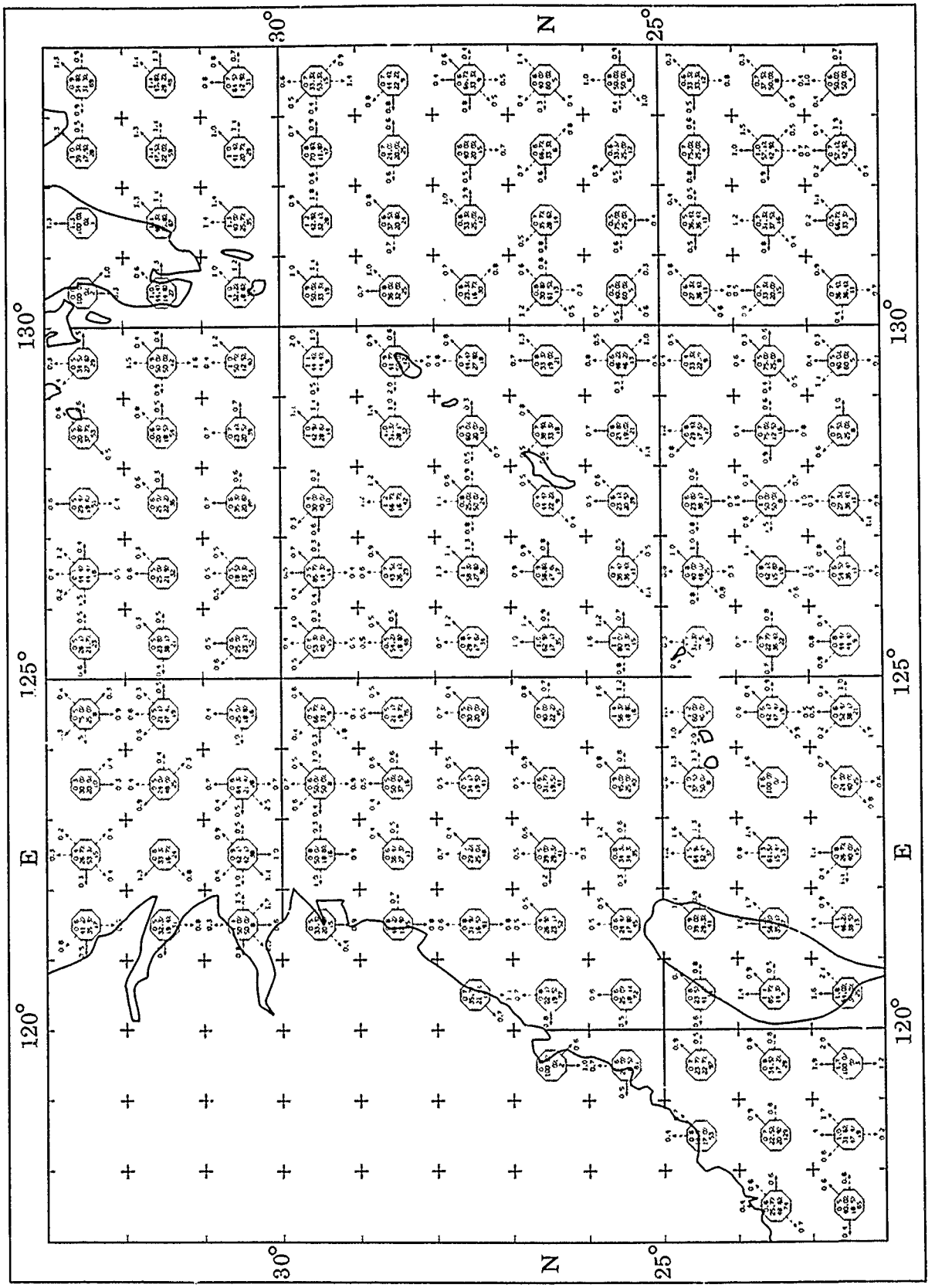

WAVE HEIGHT - FREQUENCIES
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
HEIGHT PERCENT
≤2 10 0
3-4 20 0
5-6 30 0
7-9 20.0
10-12 10 0
≥13 10 0
N = 1363
EXAMPLE: 30 0% OF ALL WAVE HEIGHTS WERE IN THE RANGE 5 TO 6 FEET.
N = OBSERVATION COUNT.
WAVE DATA FOR THESE TABLES WERE SELECTED FROM THE HIGHER OF SEA OR SWELL WHEN BOTH WERE REPORTED.
120° E 125° 130°
40° N 35°

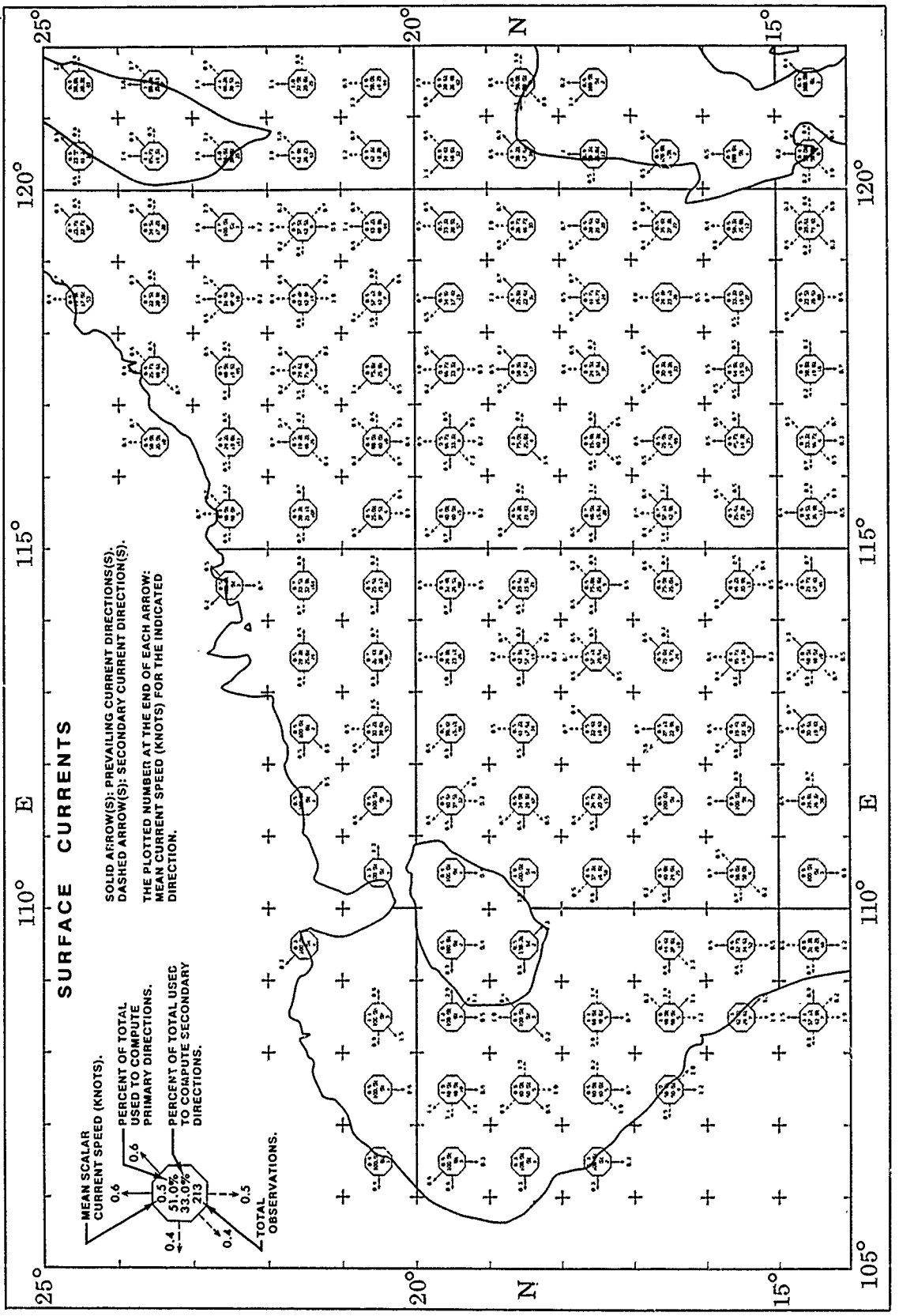

120°
125°
130°
E
30°
25°
N

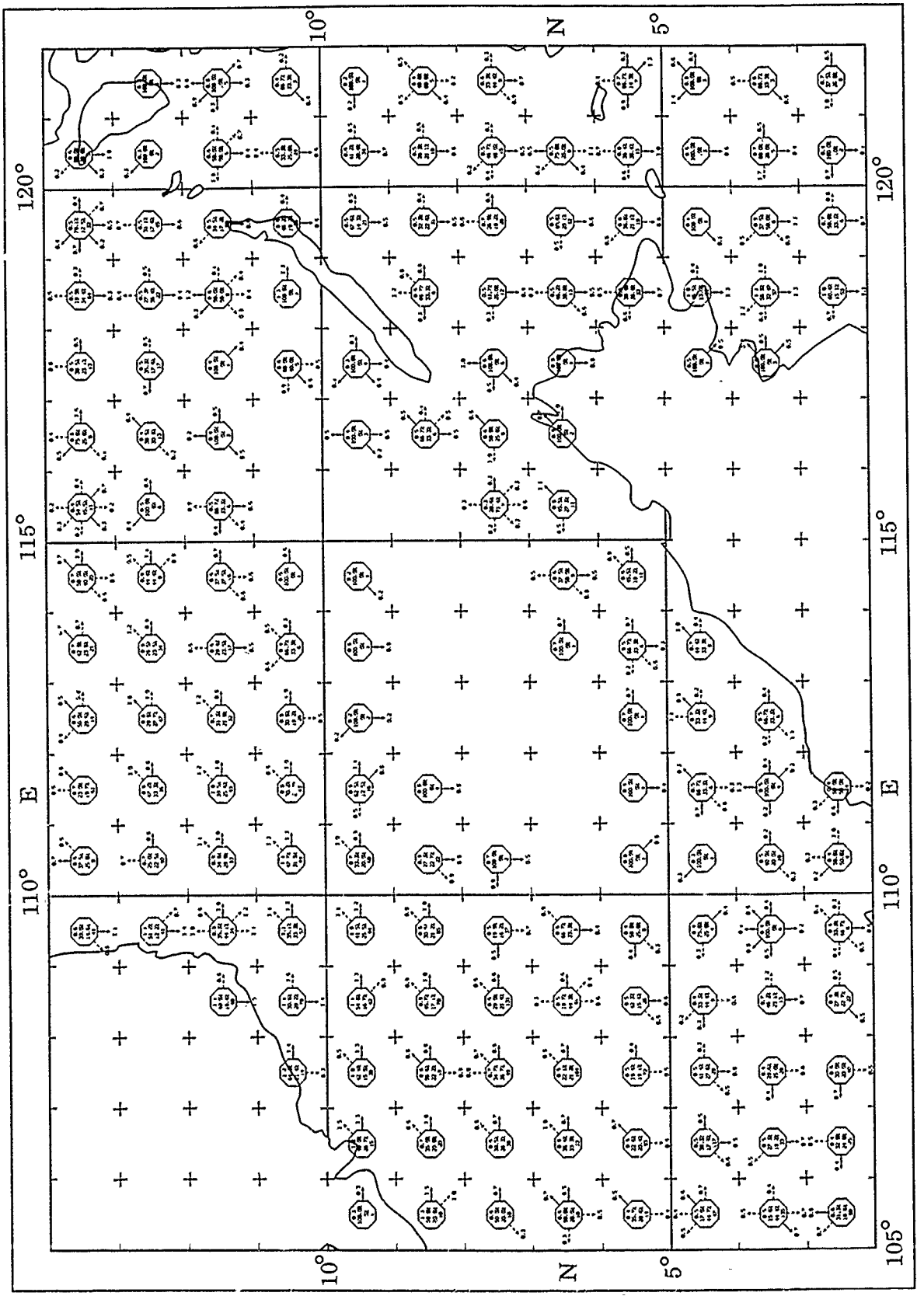

WAVE HEIGHT - FREQUENCIES
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
HEIGHT PERCENT
≤2 10.0
3 - 4 20.0
5 - 6 30.0
7 - 9 20.0
10 - 12 10.0
≥13 10.0
N = 1363
EXAMPLE: 30.0% OF ALL WAVE HEIGHTS WERE IN THE RANGE 5 TO 6 FEET.
N = OBSERVATION COUNT.
WAVE DATA FOR THESE TABLES WERE SELECTED FROM THE HIGHER OF SEA OR SWELL WHEN BOTH WERE REPORTED.
105°
110°
E
115°
120°
25°
20°
15°
N

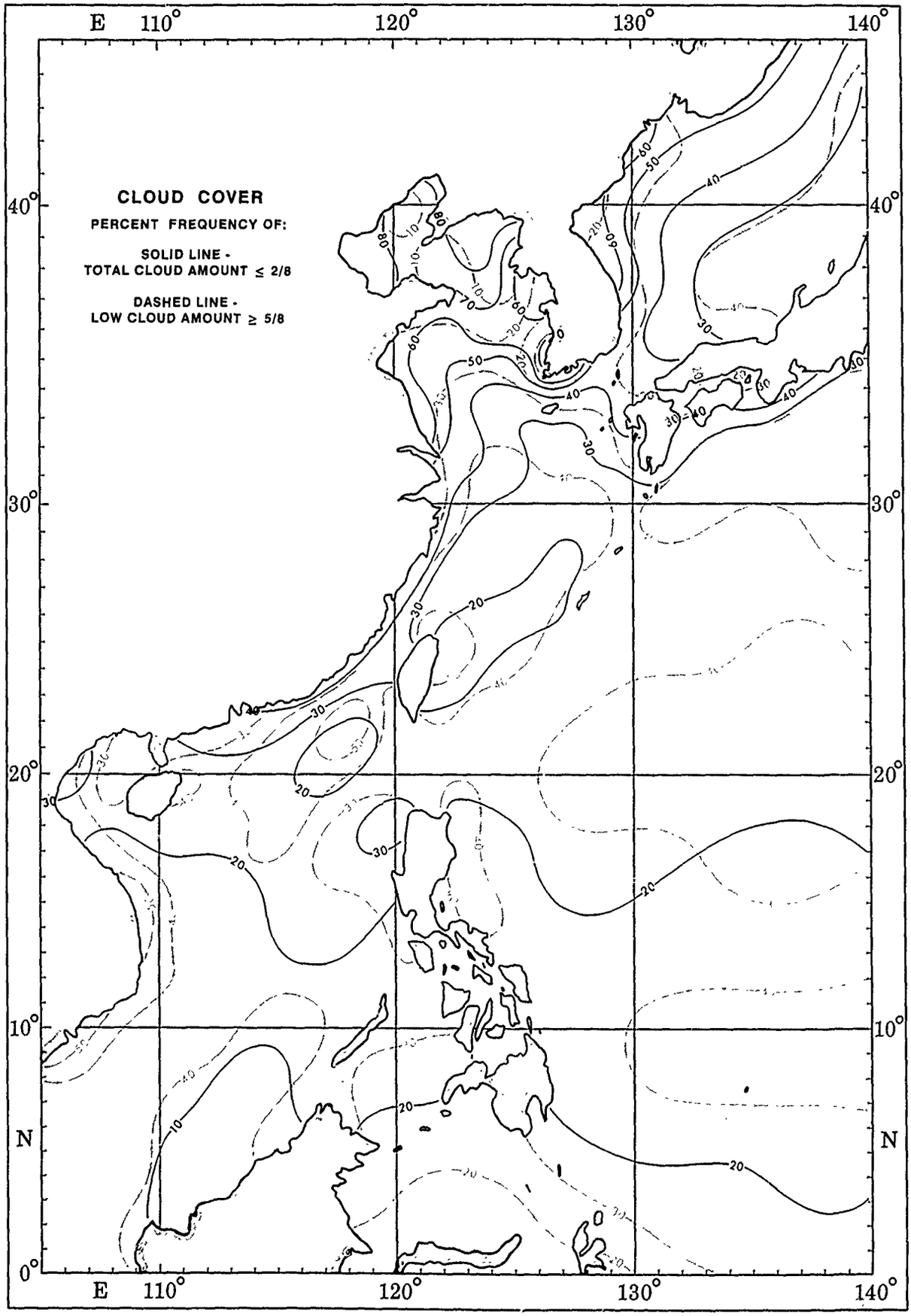

105°
110°
115°
120°
E
10°
5°
N

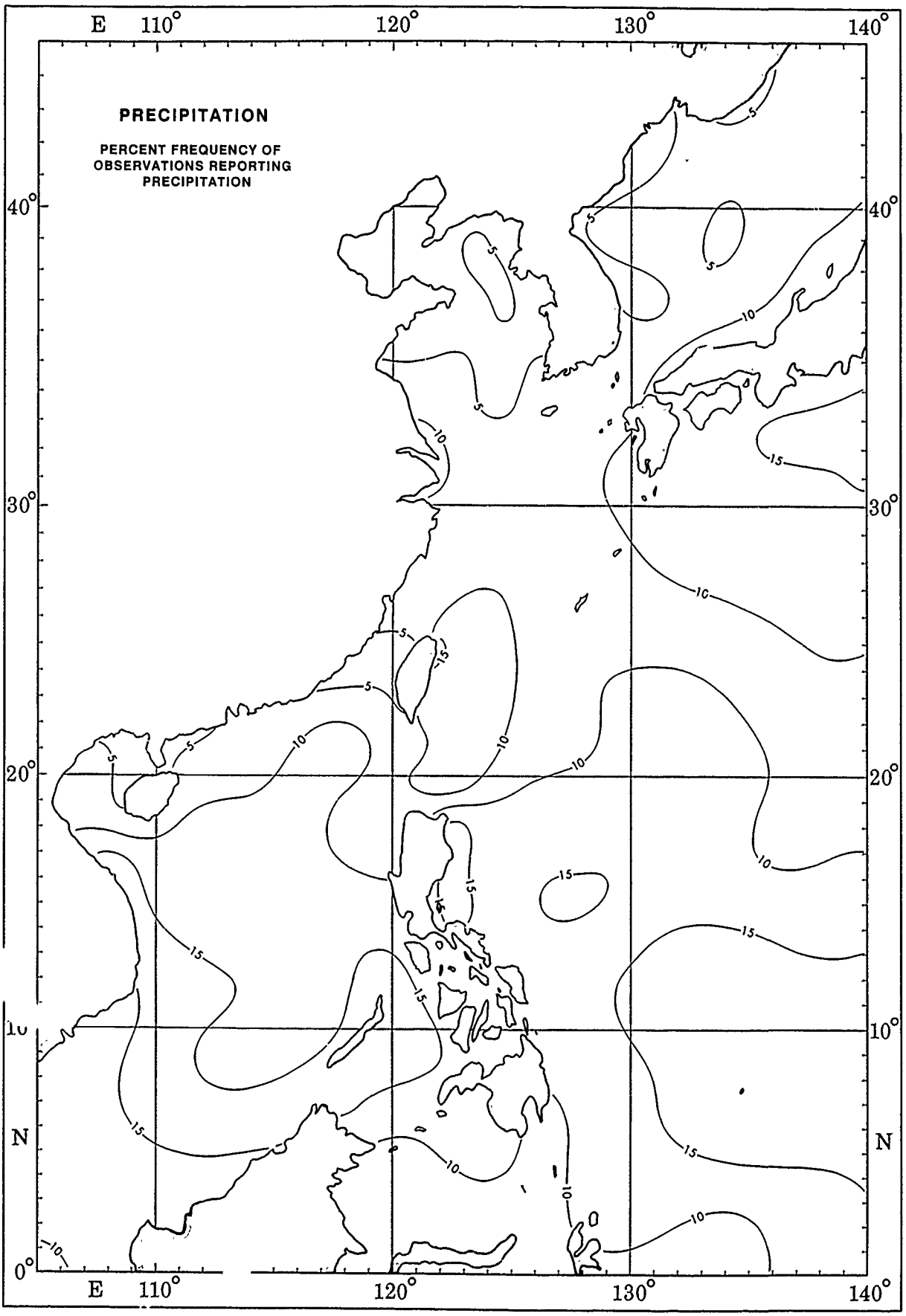

SURFACE CURRENTS
SOLID ARROW(S): PREVAILING CURRENT DIRECTIONS(S).
DASHED ARROW(S): SECONDARY CURRENT DIRECTION(S).
THE PLOTTED NUMBER AT THE END OF EACH ARROW.
MEAN CURRENT SPEED (KNOTS) FOR THE INDICATED
DIRECTION.
MEAN SCALAR
CURRENT SPEED (KNOTS).
PERCENT OF TOTAL
USED TO COMPUTE
PRIMARY DIRECTIONS.
PERCENT OF TOTAL USED
TO COMPUTE SECONDARY
DIRECTIONS.
TOTAL
OBSERVATIONS.
0.6
0.5
51.0%
33.0%
213
0.4
0.5
0.4
120° E
125° E
130° E
40° N
35° N

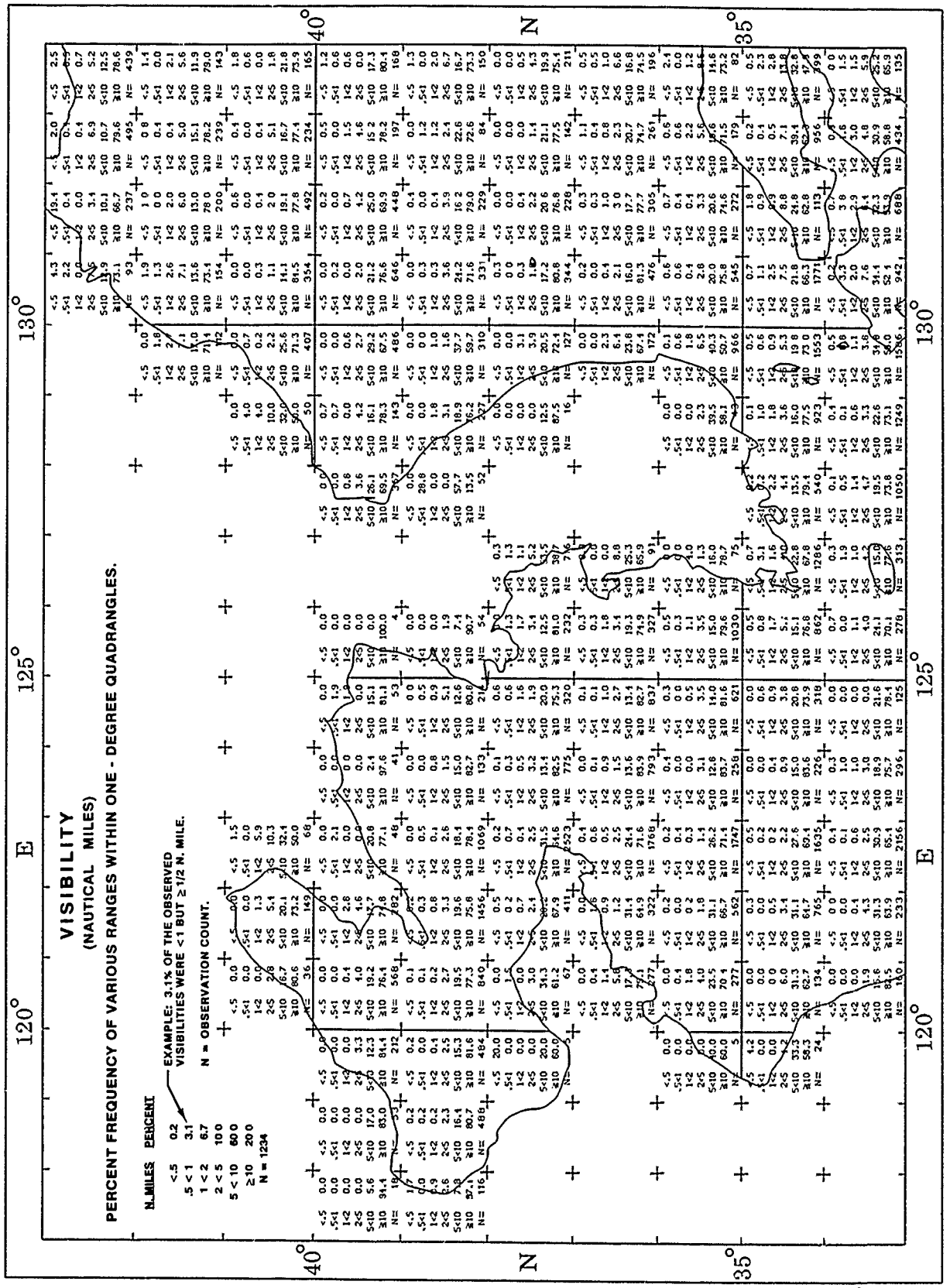

30° N
25° N
120° E
125° E
130° E

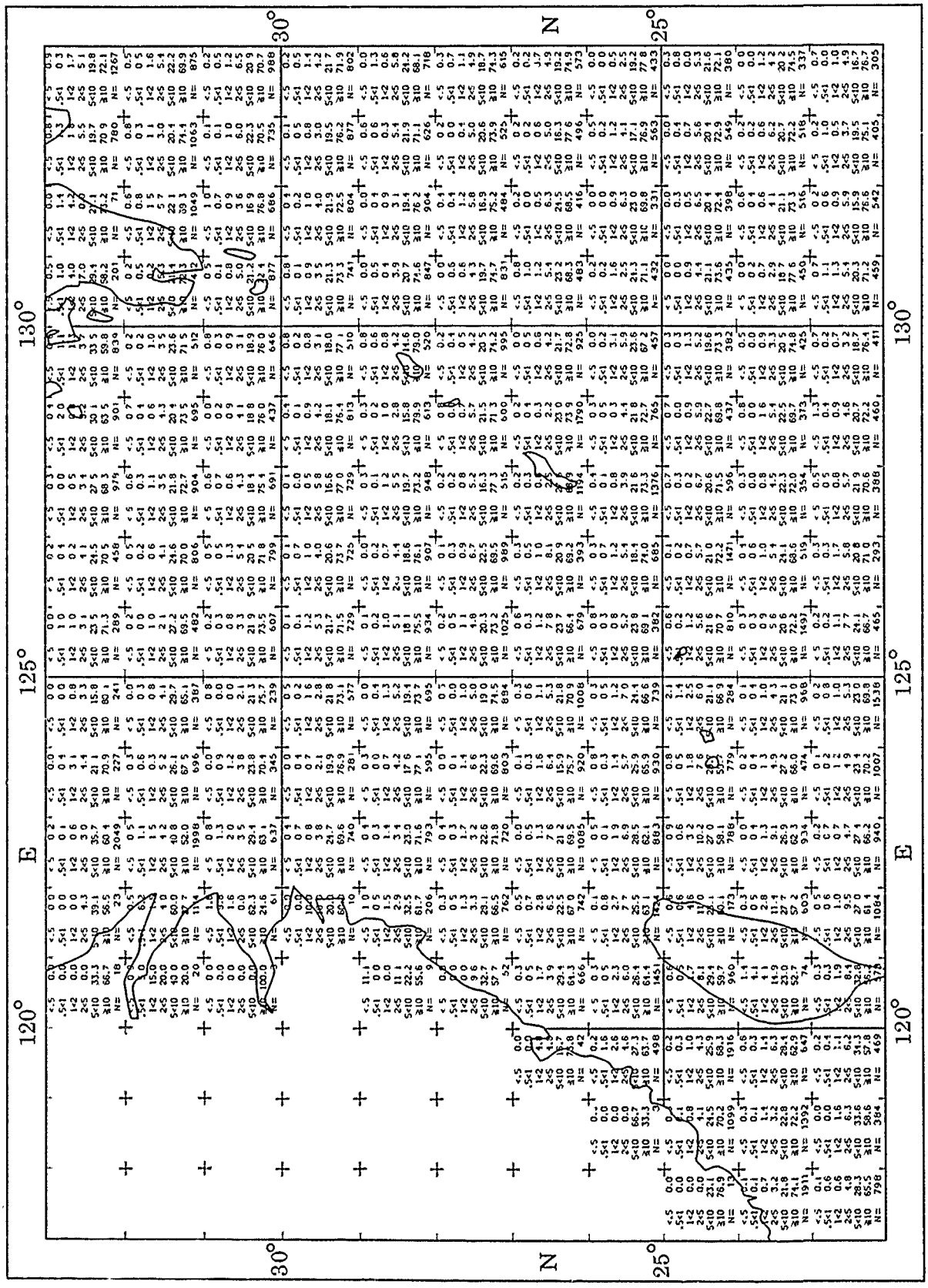

SURFACE CURRENTS
SOLID ARROW(S): PREVAILING CURRENT DIRECTIONS(S).
DASHED ARROW(S): SECONDARY CURRENT DIRECTION(S).
THE PLOTTED NUMBER AT THE END OF EACH ARROW:
MEAN CURRENT SPEED (KNOTS) FOR THE INDICATED
DIRECTION.
MEAN SCALAR CURRENT SPEED (KNOTS).
PERCENT OF TOTAL USED TO COMPUTE PRIMARY DIRECTIONS.
PERCENT OF TOTAL USED TO COMPUTE SECONDARY DIRECTIONS.
TOTAL OBSERVATIONS.
0.6
0.6
0.5
51.0%
33.0%
213
0.5
0.4
0.4
25°
20°
15°
N
105°
110°
E
115°
120°

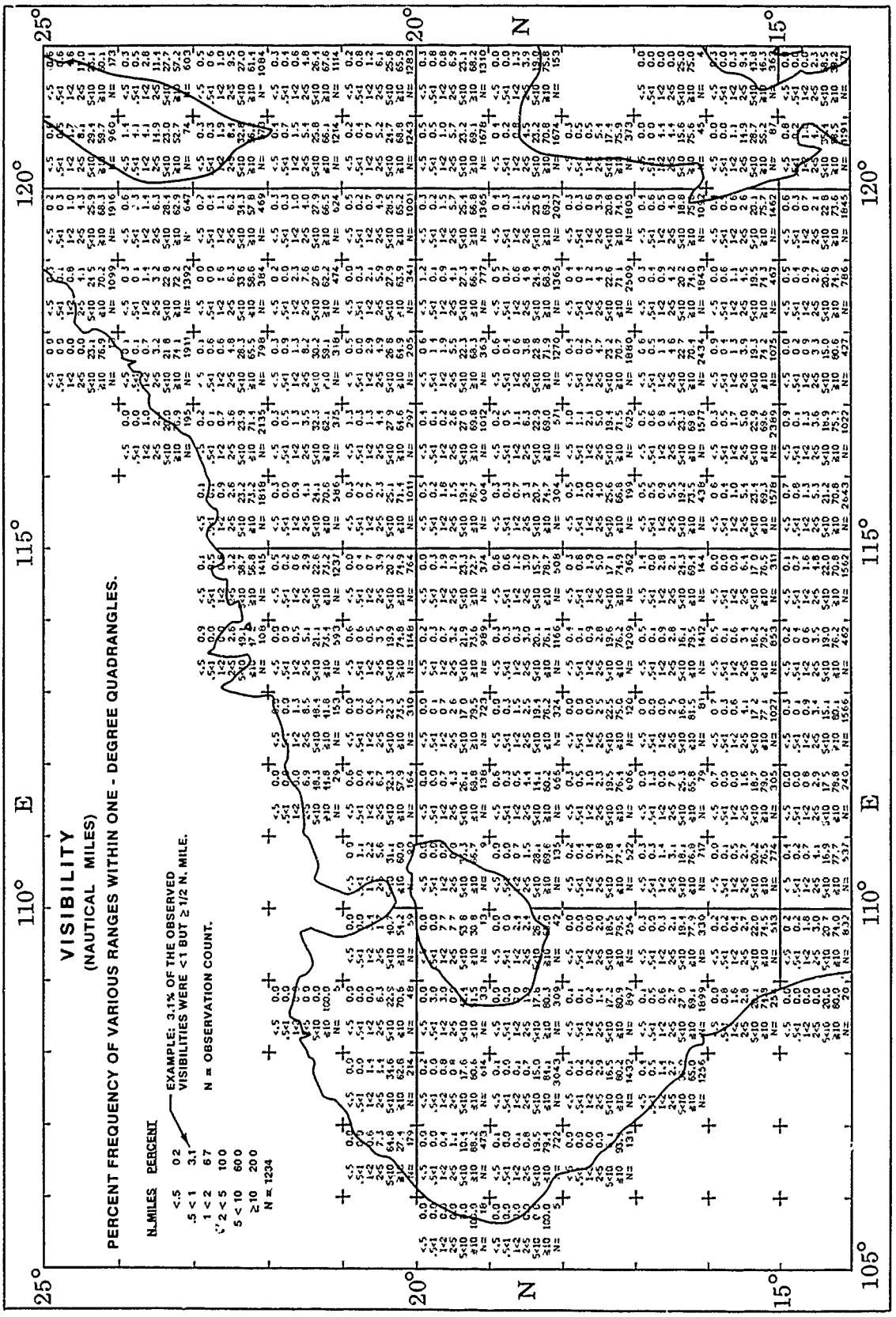

10° N
5°
120°
115°
110° E
105°
10° N
5°

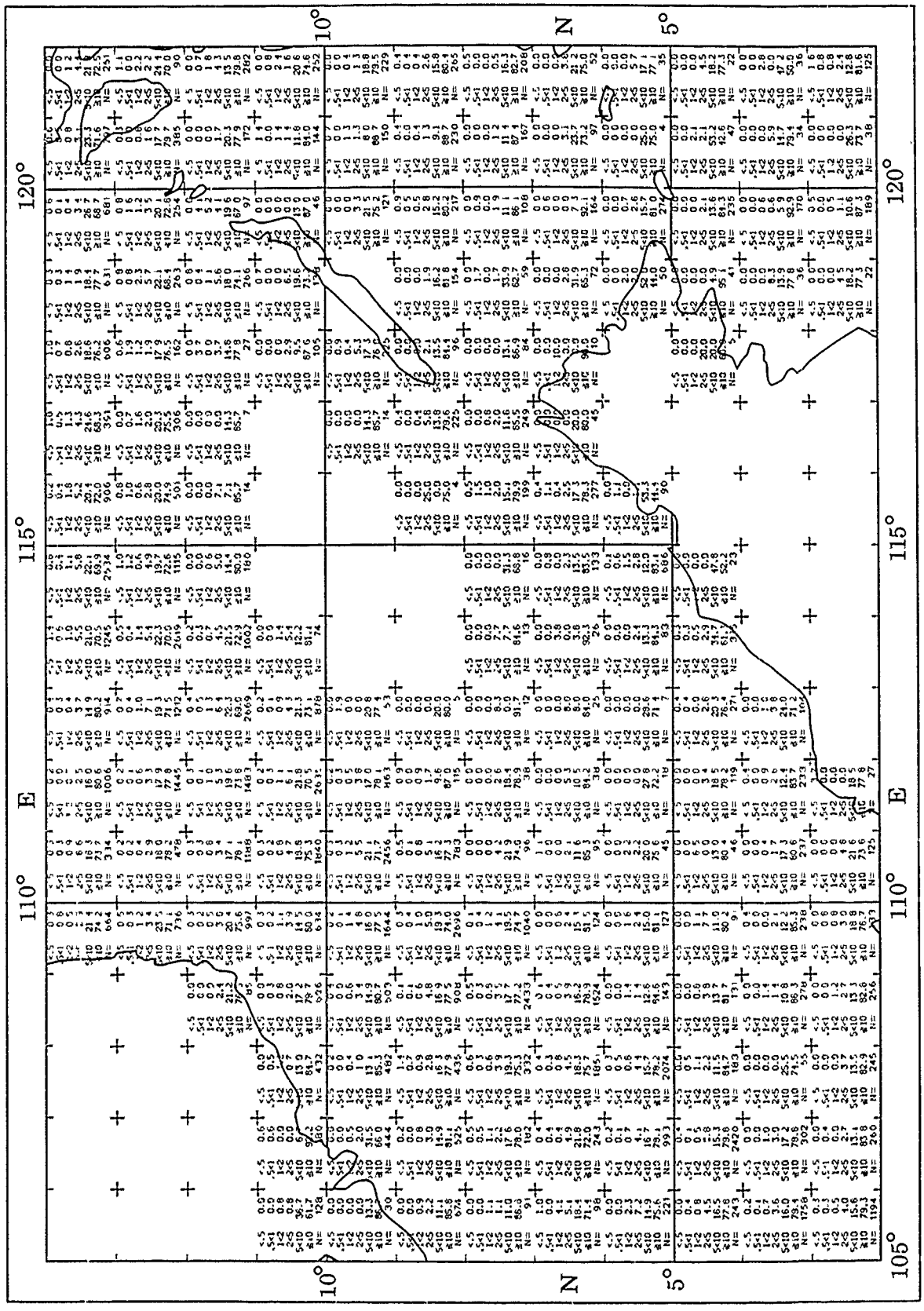

CLOUD COVER
PERCENT FREQUENCY OF:
SOLID LINE -
TOTAL CLOUD AMOUNT ≤ 2/8
DASHED LINE -
LOW CLOUD AMOUNT ≥ 5/8
E 110° 120° 130° 140°
40°
30°
20°
10°
N
0°


PRECIPITATION
PERCENT FREQUENCY OF OBSERVATIONS REPORTING PRECIPITATION
E 110°
120°
130°
140°
40°
30°
20°
10°
N
0°
5
10
15


VISIBILITY
(NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE - DEGREE QUADRANGLES.
N_MILES PERCENT
<.5 0.2
.5 < 1 3.1
1 < 2 6.7
2 < 5 10.0
5 < 10 60.0
≥10 20.0
N = 1234
EXAMPLE: 3.1% OF THE OBSERVED VISIBILITIES WERE <1 BUT ≥1/2 N. MILE.
N = OBSERVATION COUNT.
120°
125°
130°
E
40°
35°
N

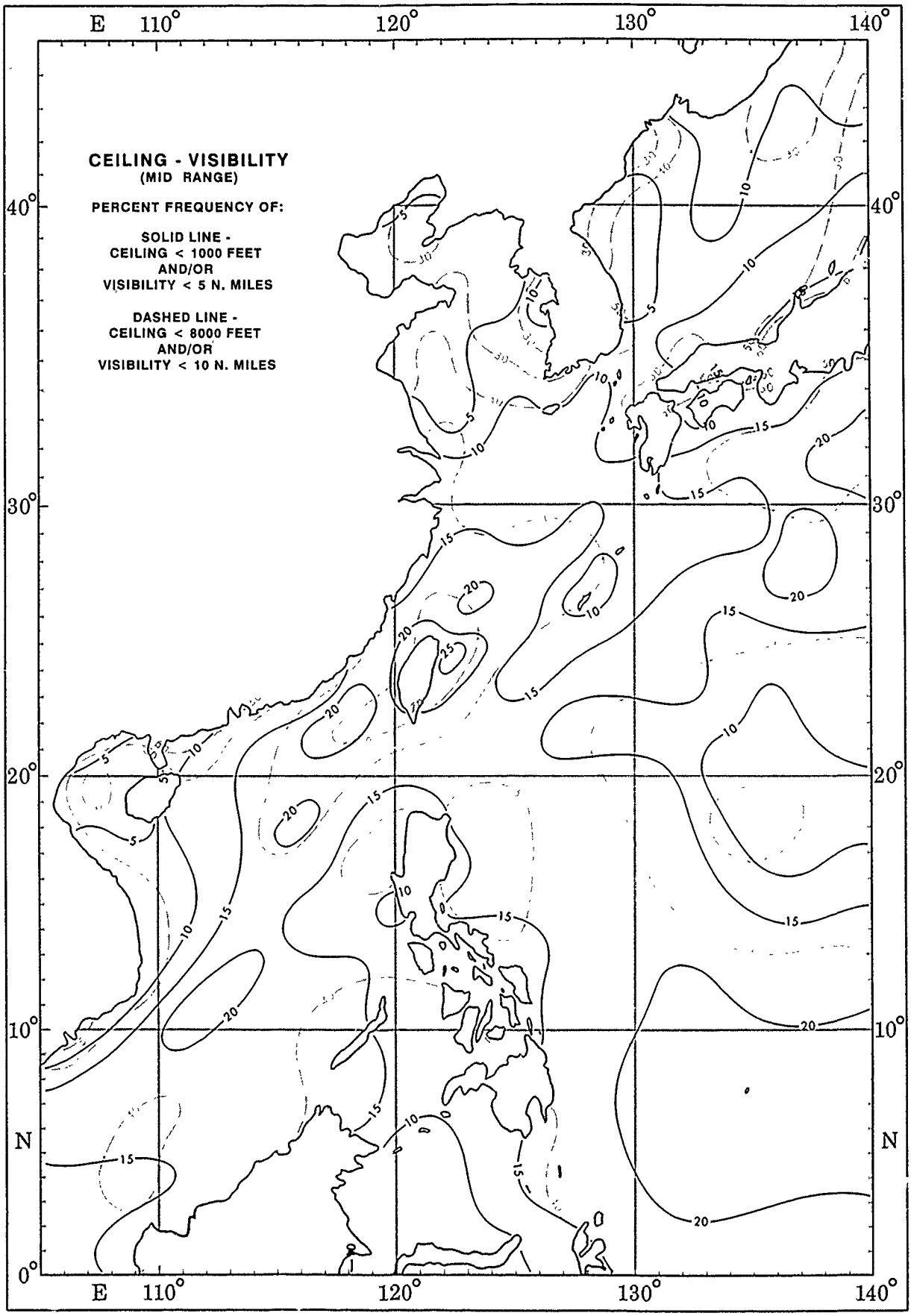

120°
125°
130°
30°
25°
N
E


VISIBILITY
(NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE - DEGREE QUADRANGLES.
N. MILES PERCENT
<.5 0.2
.5 < 1 3.1
1 < 2 6.7
2 < 5 10.0
5 < 10 60.0
≥10 20.0
N = 1234
EXAMPLE: 3.1% OF THE OBSERVED VISIBILITIES WERE <1 BUT ≥1/2 N. MILE.
N = OBSERVATION COUNT.
110° E
115° E
120° E
105° E
25° N
20° N
15° N


120°
115°
110°
105°
10°
5°
N
E

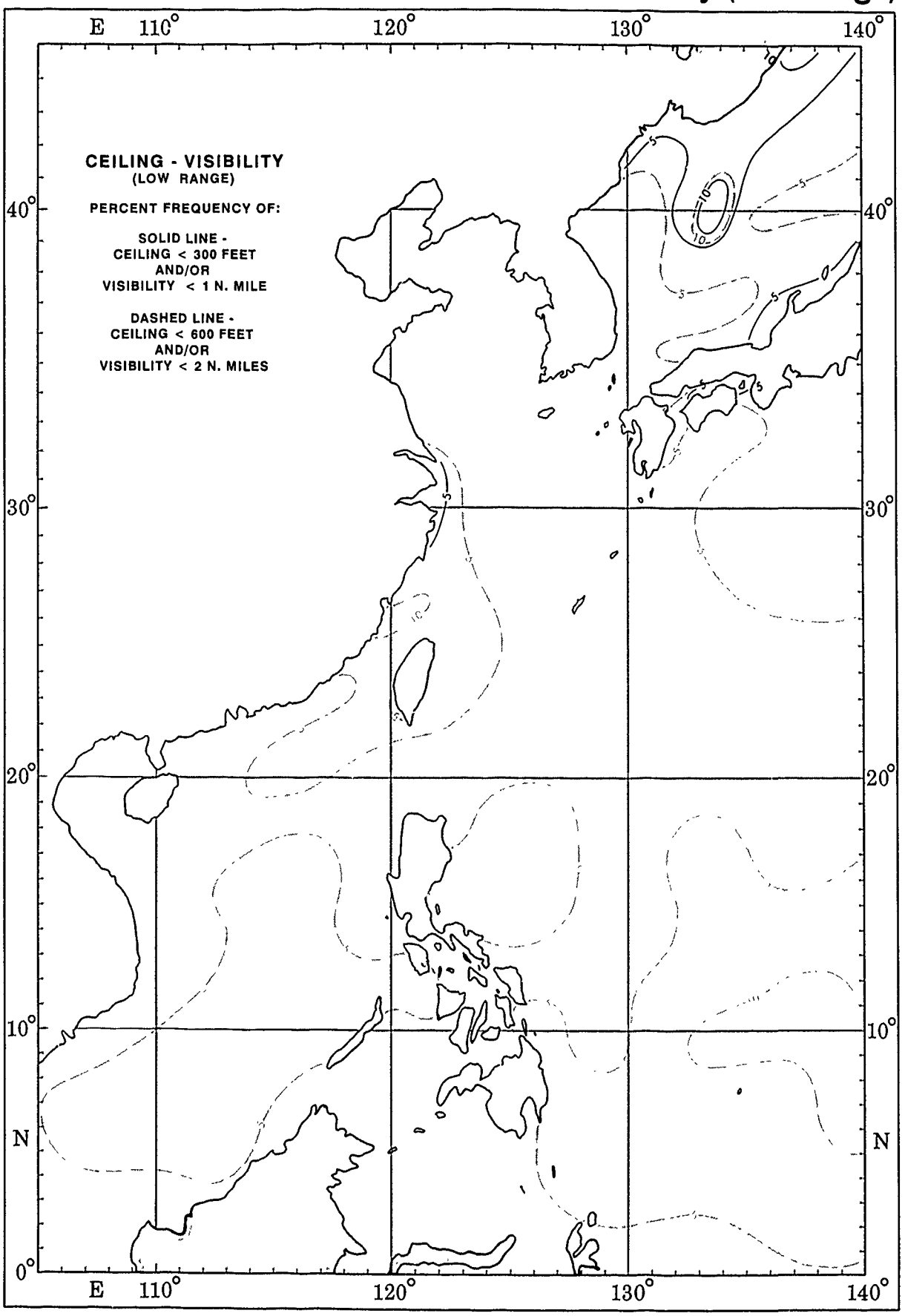
October

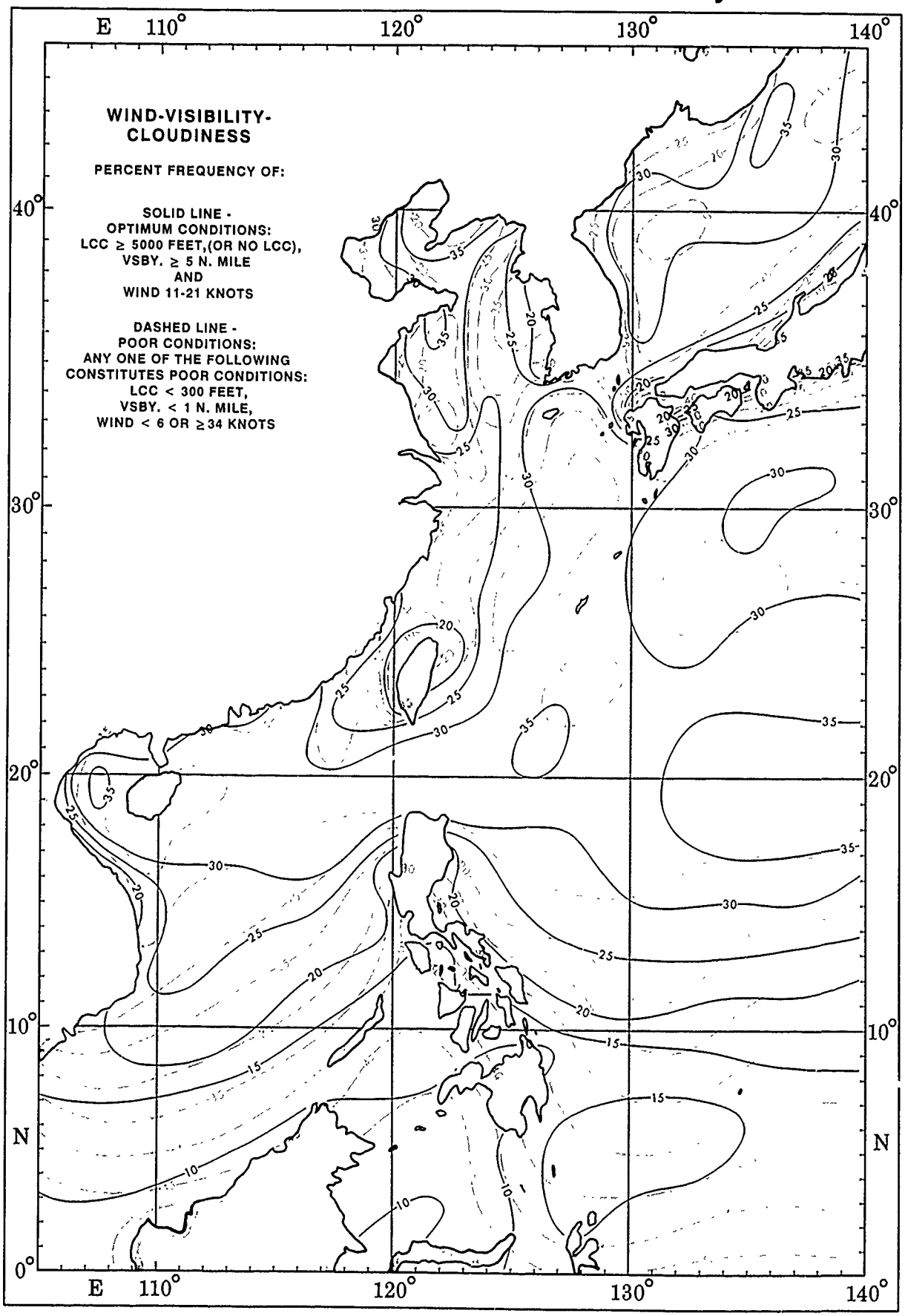
Ceiling - Visibility (Mid Range)

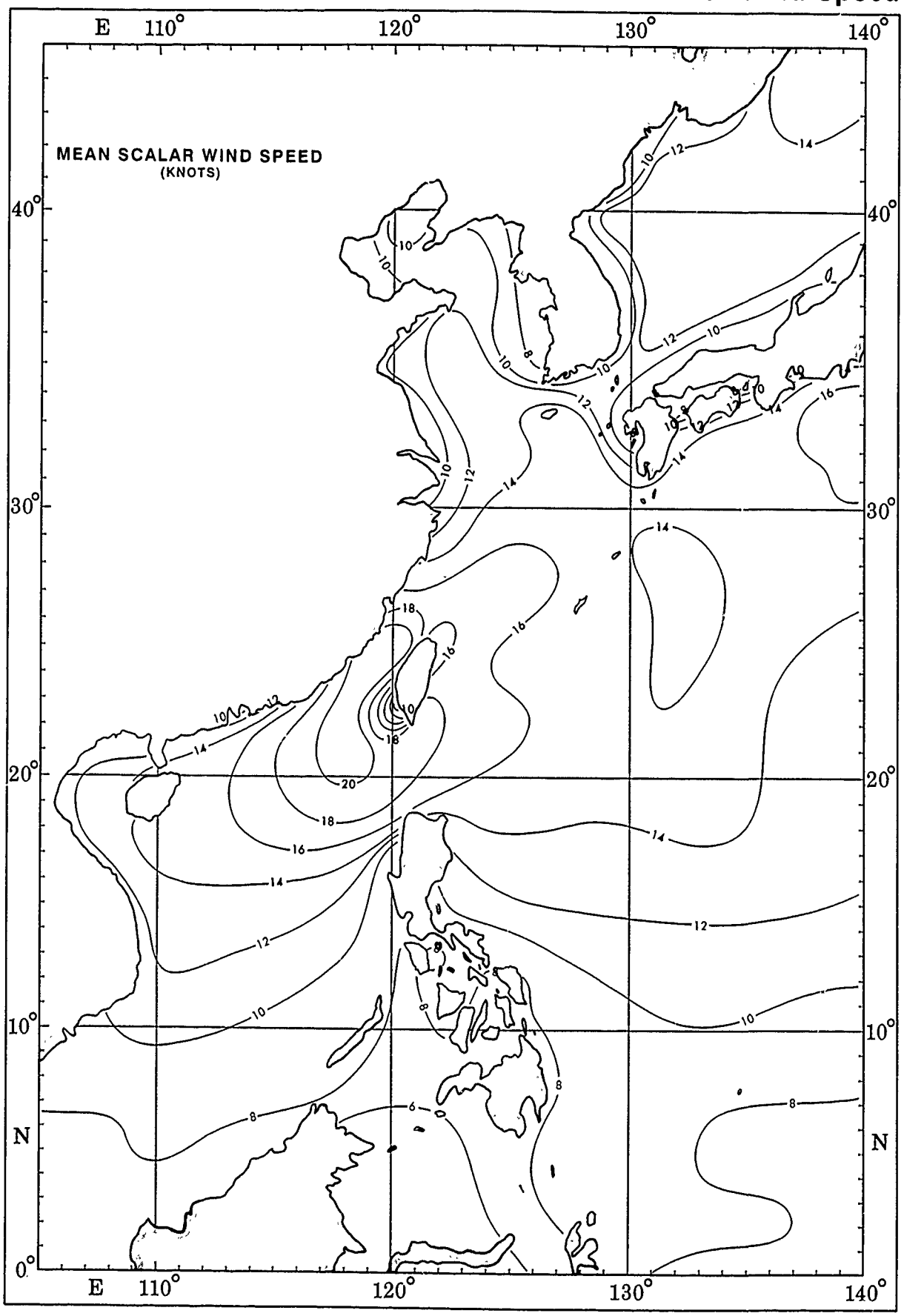


October

Ceiling - Visibility (Low Range)

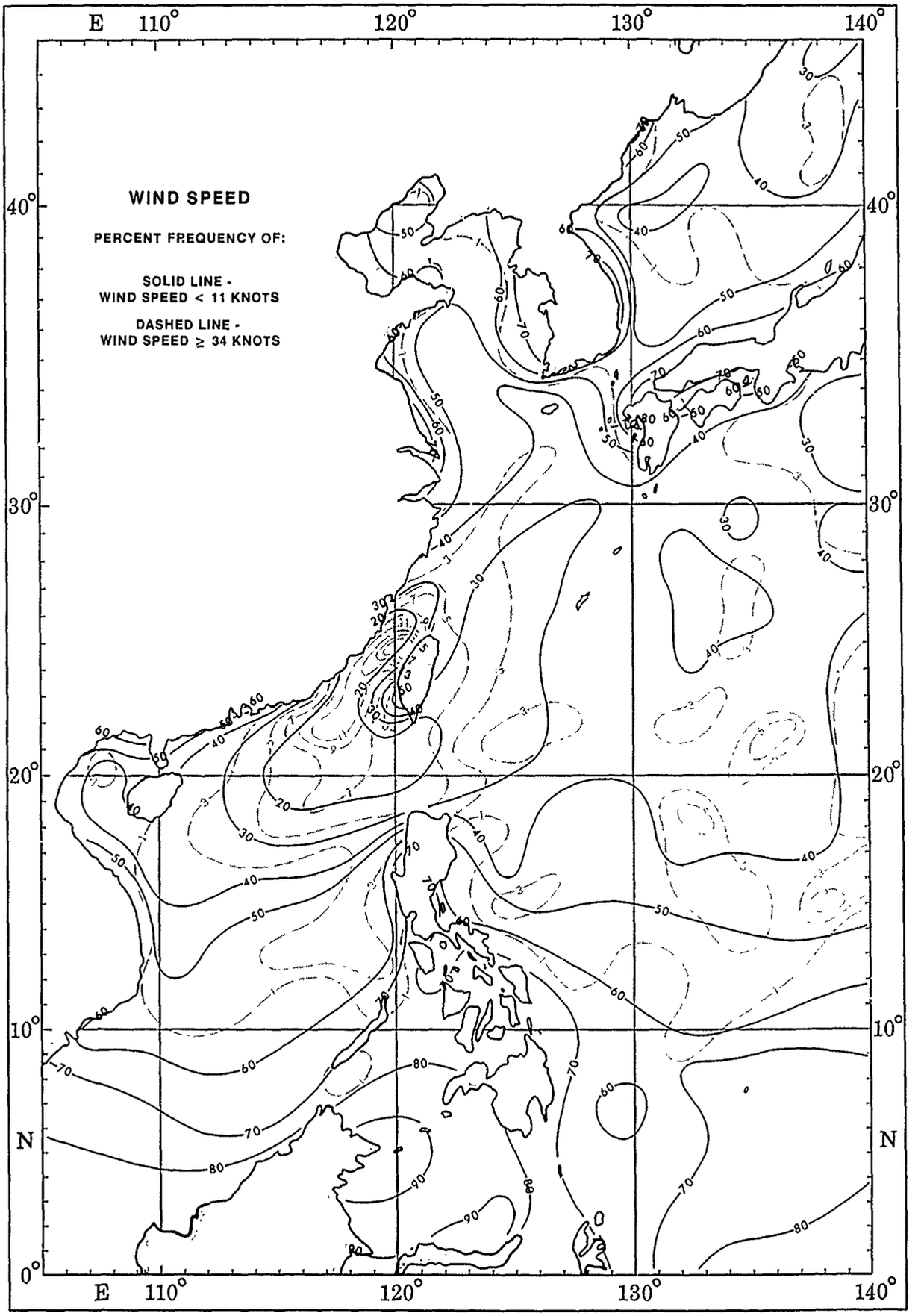



WIND-VISIBILITY-
CLOUDINESS
PERCENT FREQUENCY OF:
SOLID LINE -
OPTIMUM CONDITIONS:
LCC ≥ 5000 FEET,(OR NO LCC),
VSBY. ≥ 5 N. MILE
AND
WIND 11-21 KNOTS
DASHED LINE -
POOR CONDITIONS:
ANY ONE OF THE FOLLOWING
CONSTITUTES POOR CONDITIONS:
LCC < 300 FEET,
VSBY. < 1 N. MILE,
WIND < 6 OR ≥34 KNOTS
E 110°
120°
130°
140°
40°
30°
20°
10°
N
0°


MEAN SCALAR WIND SPEED
(KNOTS)
E 110°
120°
130°
140°
40°
30°
20°
10°
N
0°

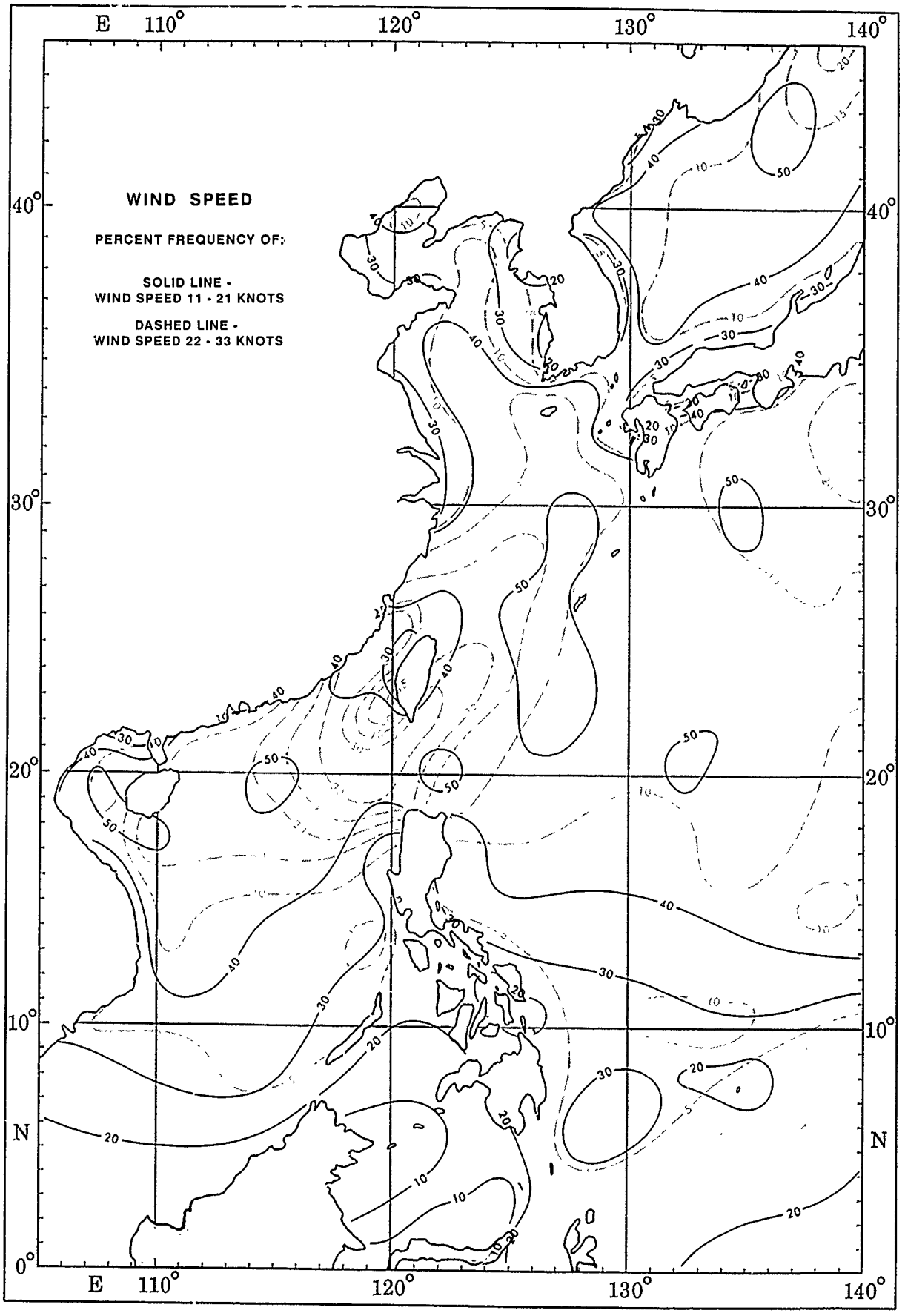
October

Wind Speed <11 and ≥34 Knots

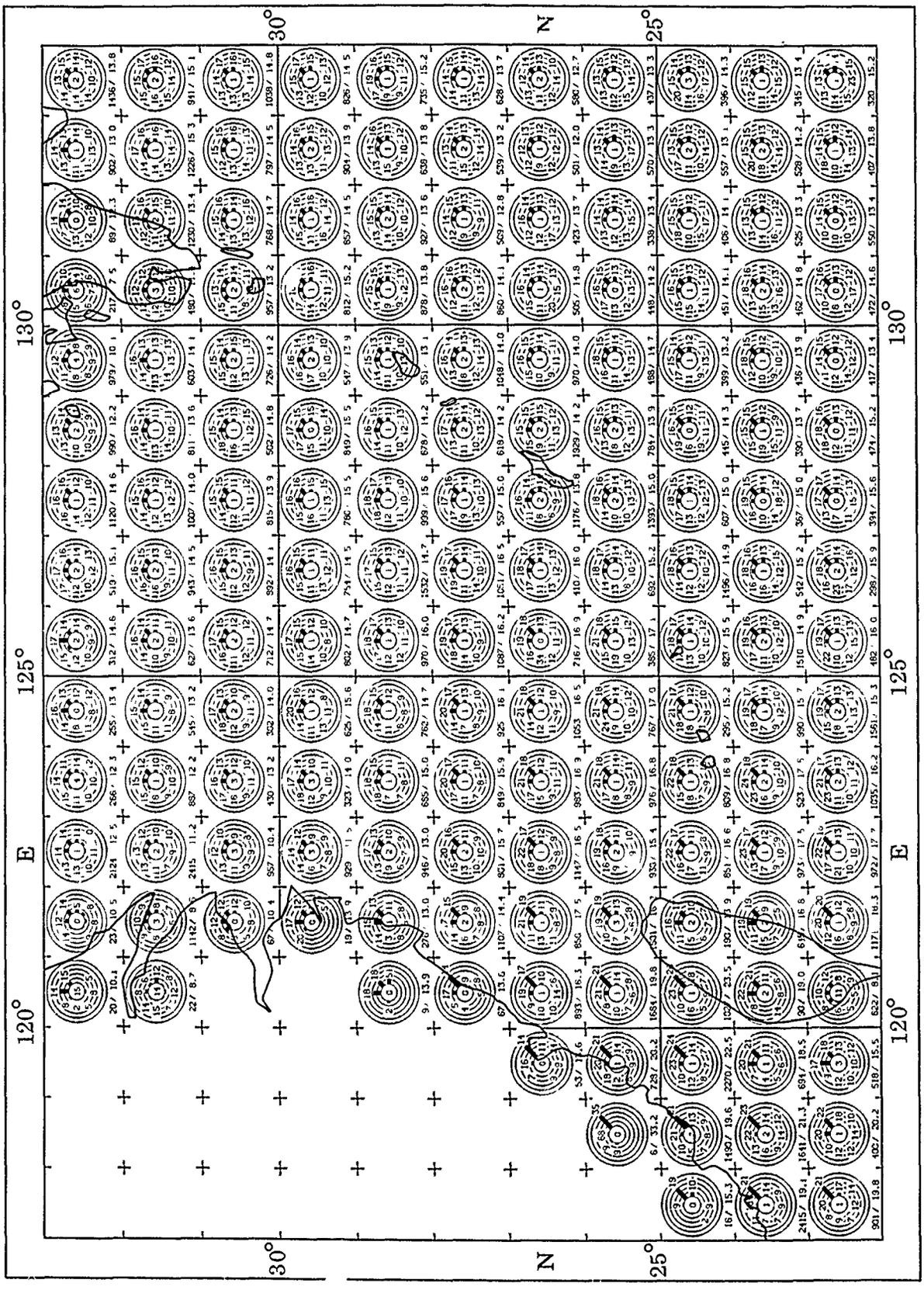


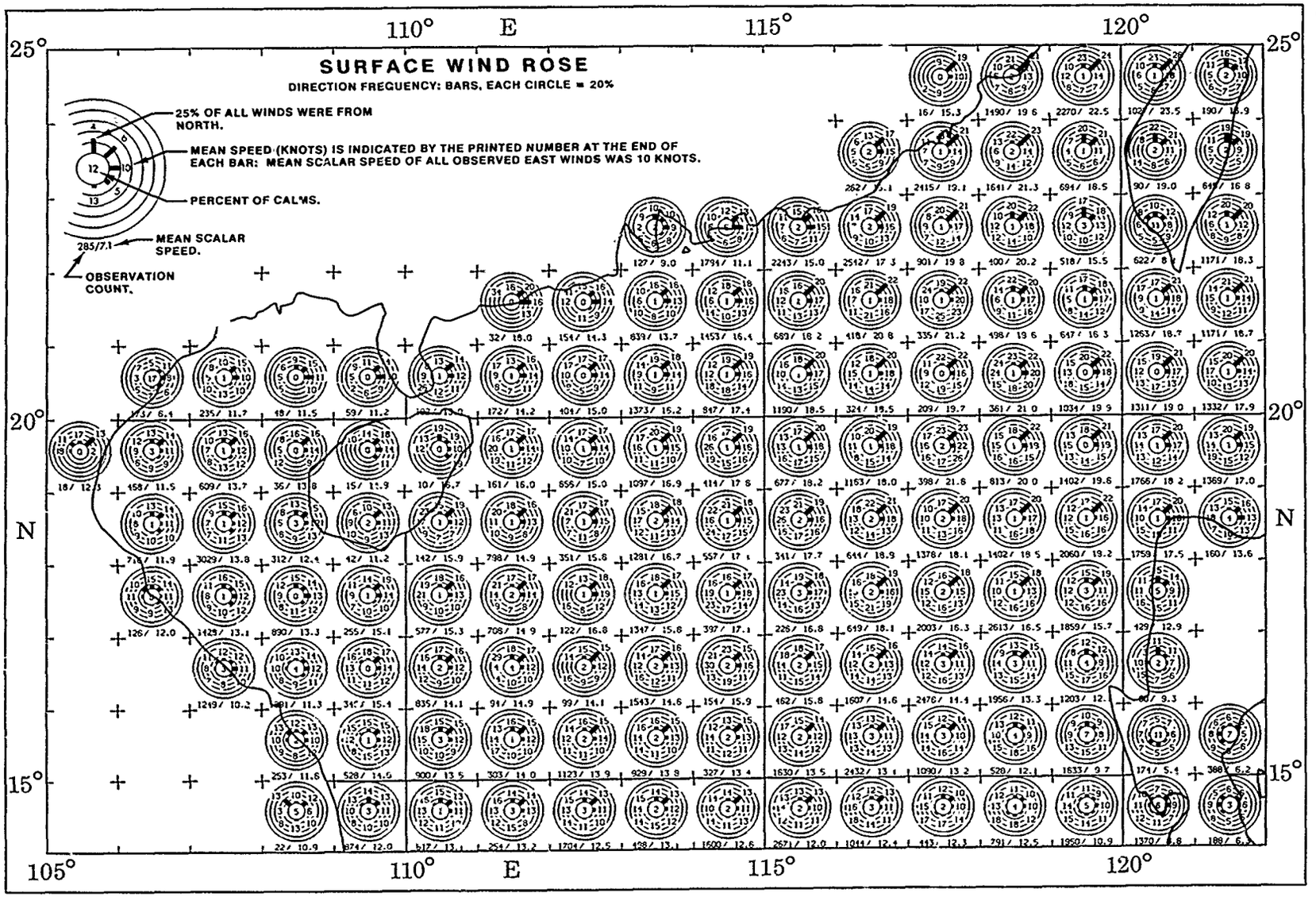
October

Wind Speed 11 - 21 and 22 - 33 Knots

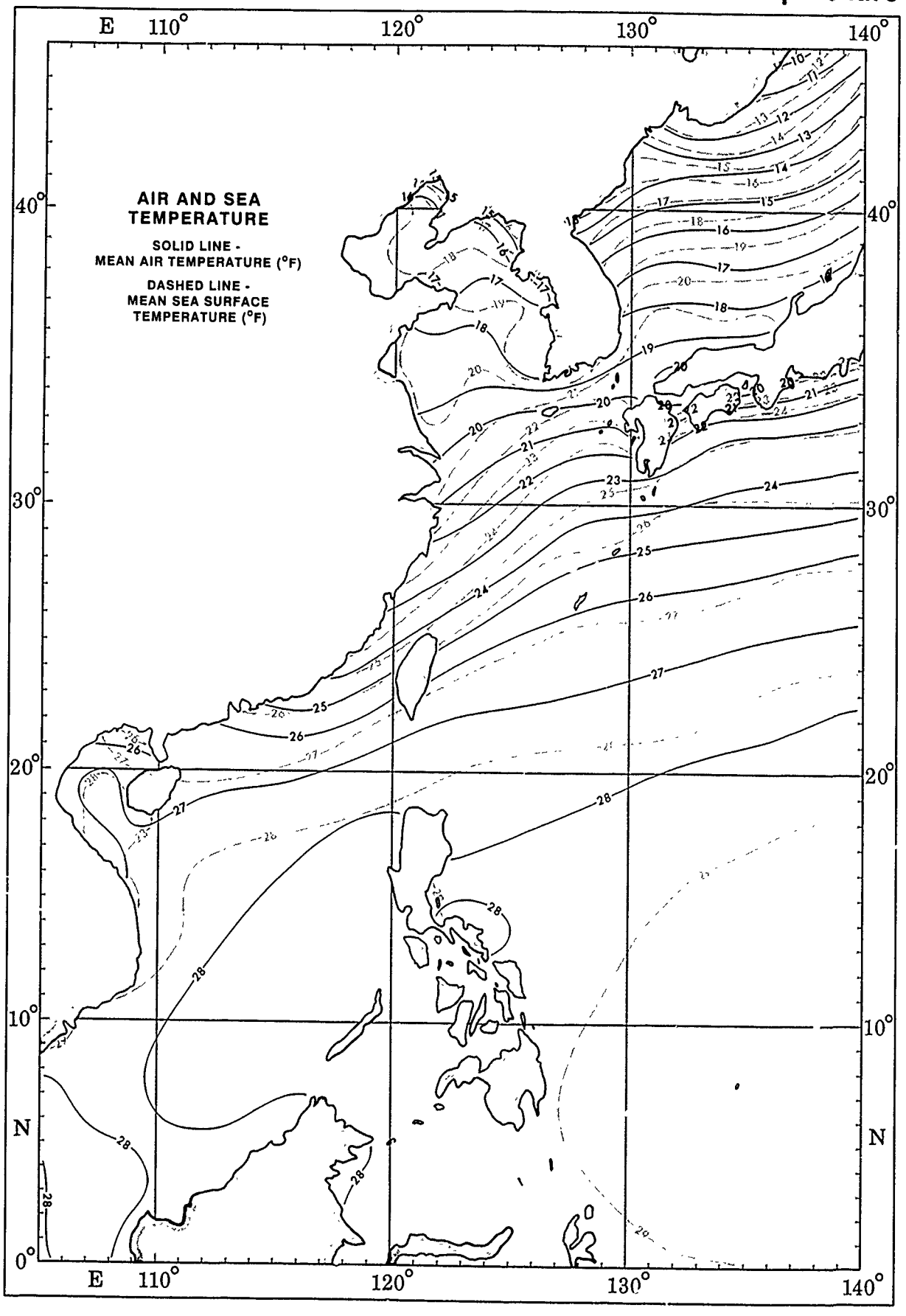


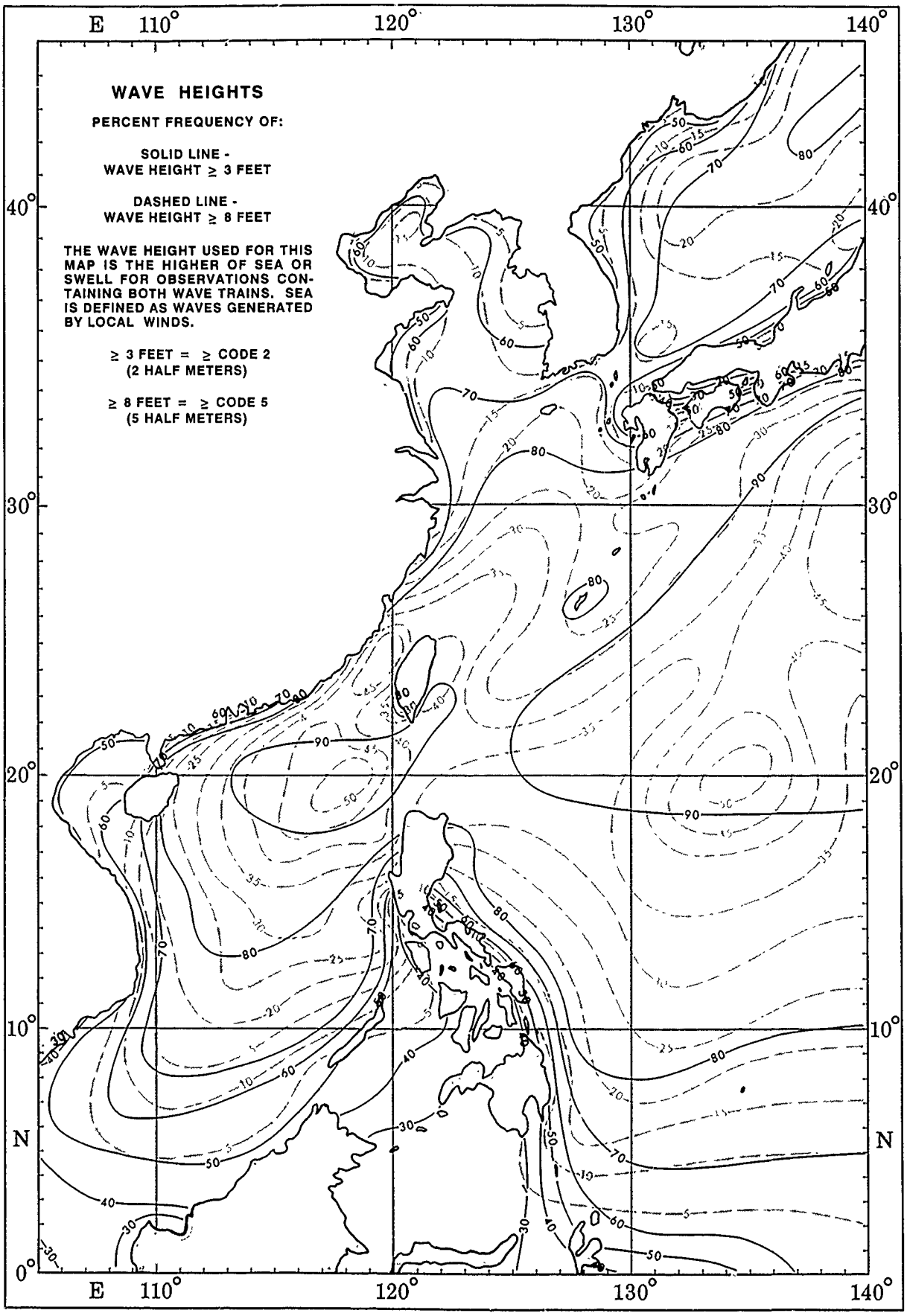
SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%
25% OF ALL WINDS WERE FROM NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR: MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
PERCENT OF CALMS.
MEAN SCALAR SPEED.
OBSERVATION COUNT.
120° E
125°
130°
40° N
35° N

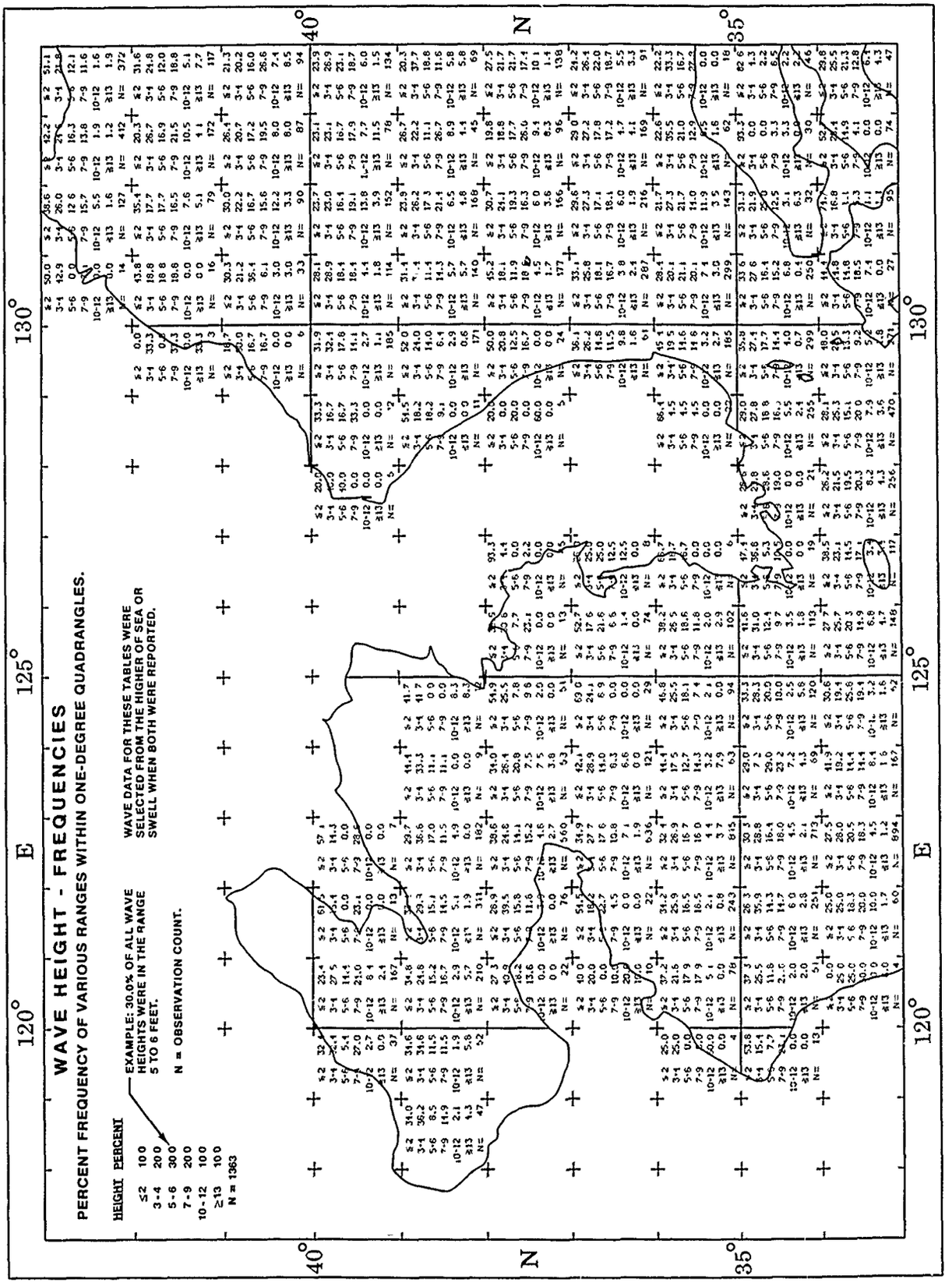

30°
N
25°
120°
E
125°
130°

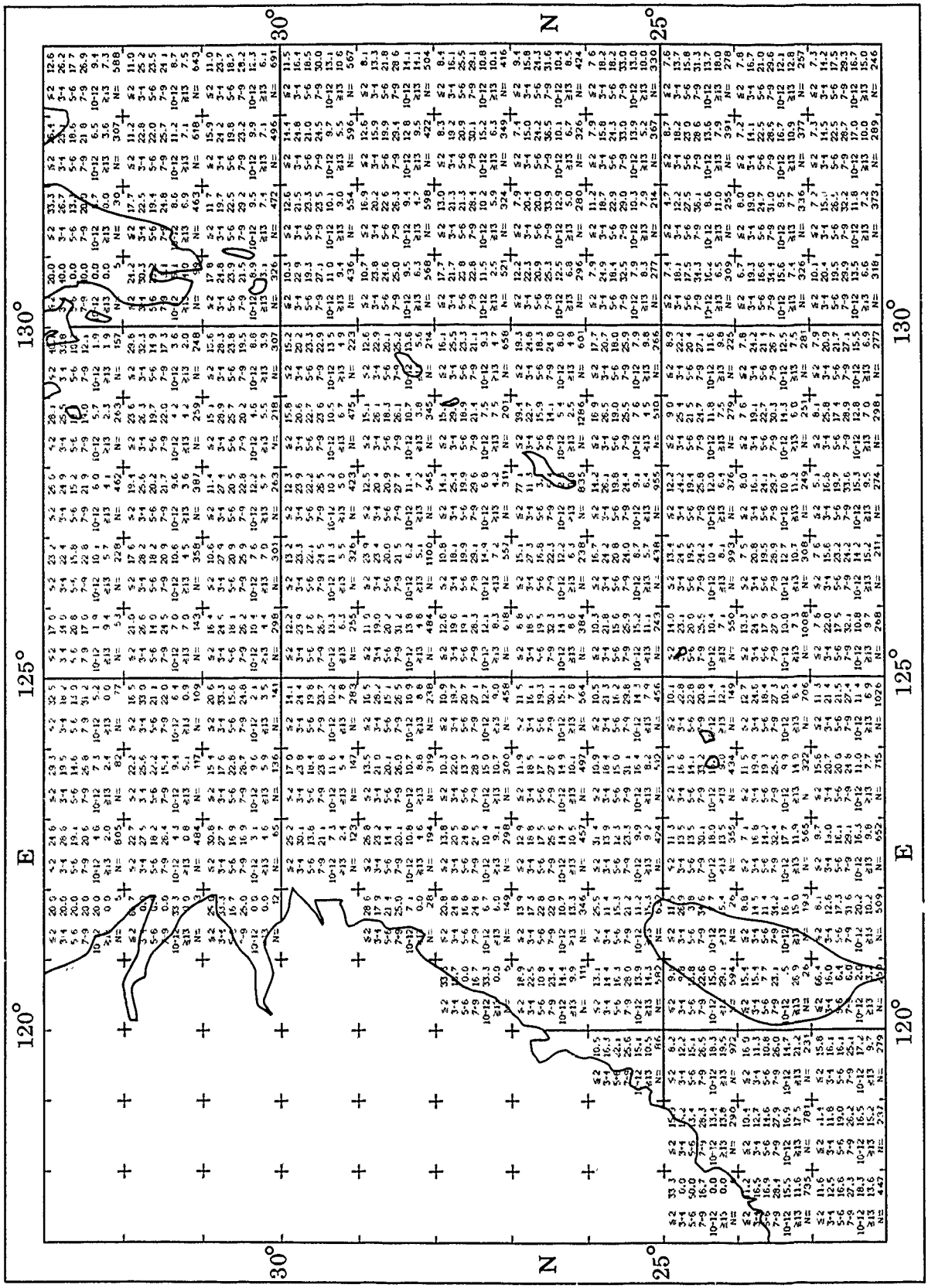

SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%
25% OF ALL WINDS WERE FROM NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR: MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
PERCENT OF CALMS.
285/7.1
MEAN SCALAR SPEED.
OBSERVATION COUNT.
110° E
115°
120°
105°
25°
20°
15°
N

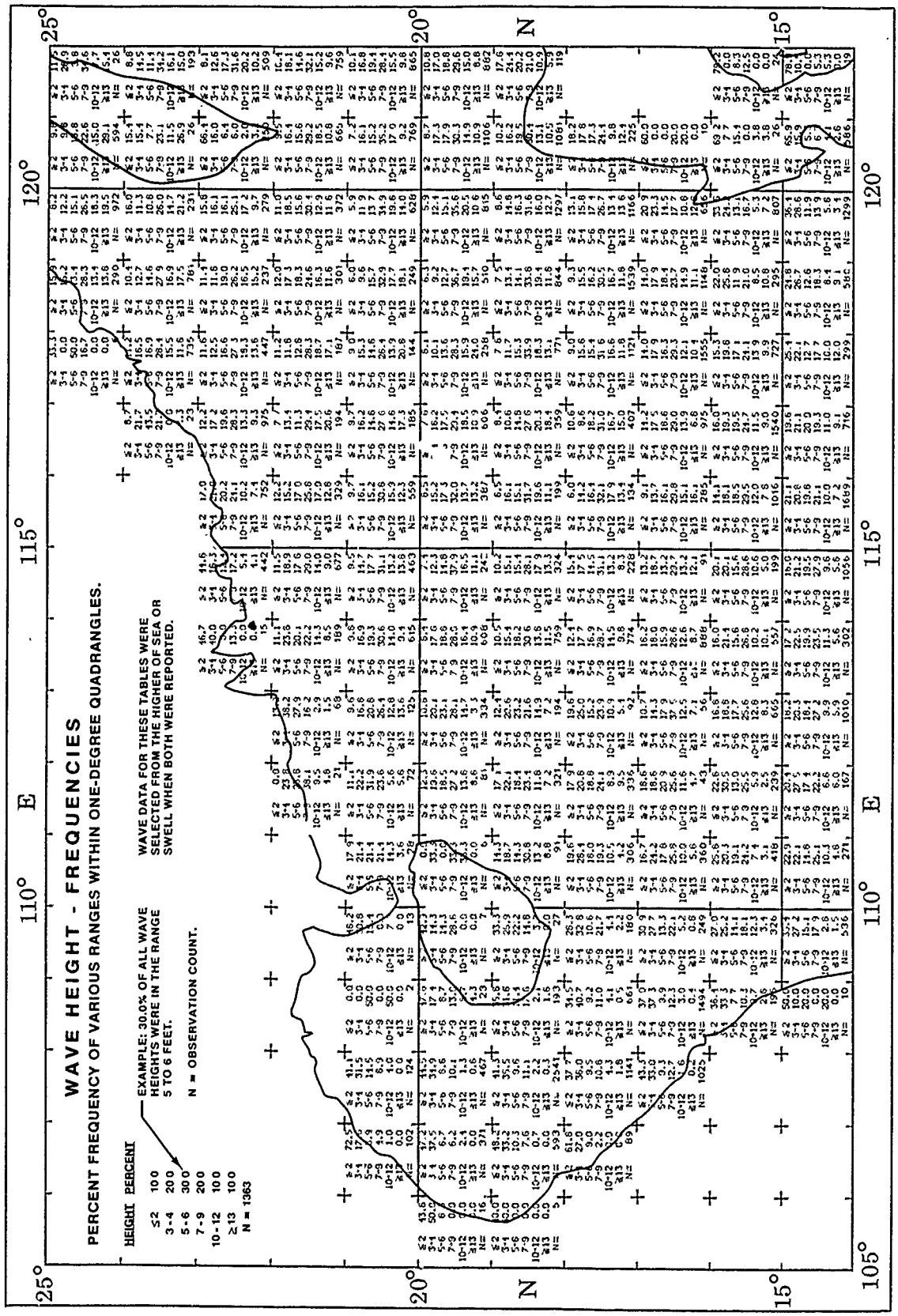
10°
5°
N
105°
110°
115°
120°
E

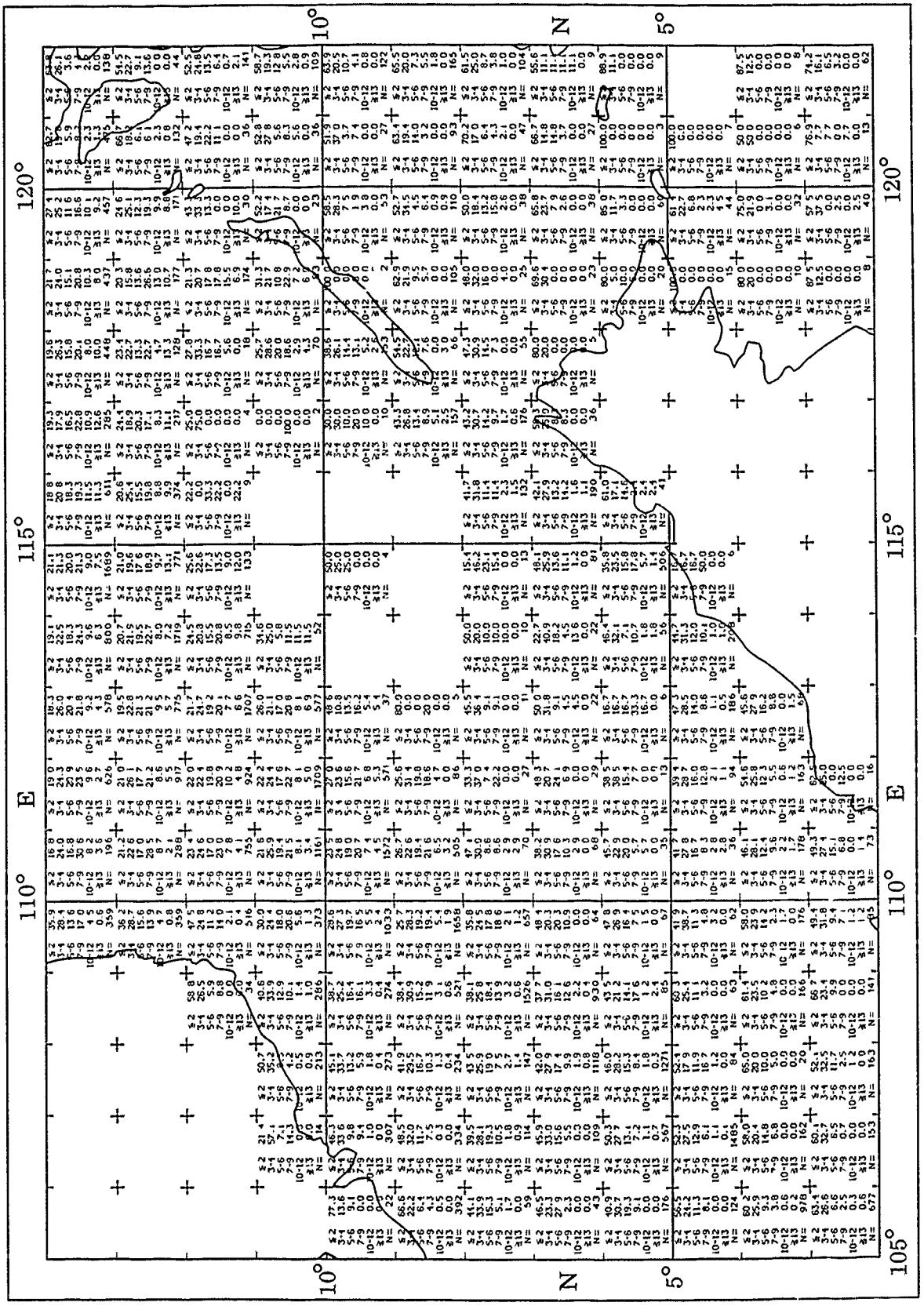

AIR AND SEA TEMPERATURE
SOLID LINE - MEAN AIR TEMPERATURE (°F)
DASHED LINE - MEAN SEA SURFACE TEMPERATURE (°F)
E 110°
120°
130°
140°
40°
30°
20°
10°
N
0°

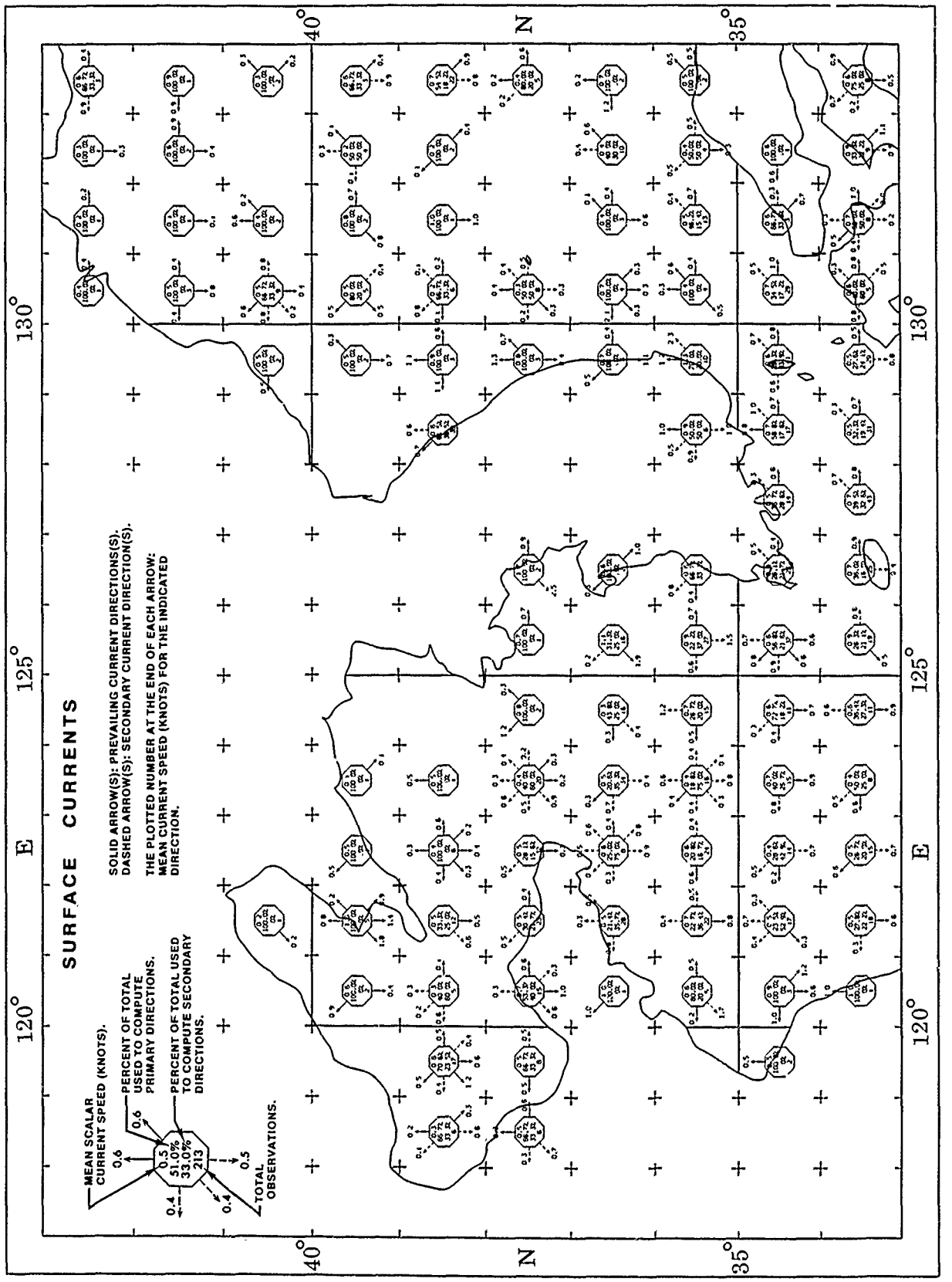

WAVE HEIGHTS
PERCENT FREQUENCY OF:
SOLID LINE -
WAVE HEIGHT ≥ 3 FEET
DASHED LINE -
WAVE HEIGHT ≥ 8 FEET
THE WAVE HEIGHT USED FOR THIS MAP IS THE HIGHER OF SEA OR SWELL FOR OBSERVATIONS CONTAINING BOTH WAVE TRAINS. SEA IS DEFINED AS WAVES GENERATED BY LOCAL WINDS.
≥ 3 FEET = ≥ CODE 2
(2 HALF METERS)
≥ 8 FEET = ≥ CODE 5
(5 HALF METERS)
E 110° 120° 130° 140°
40° 30° 20° 10° N 0°

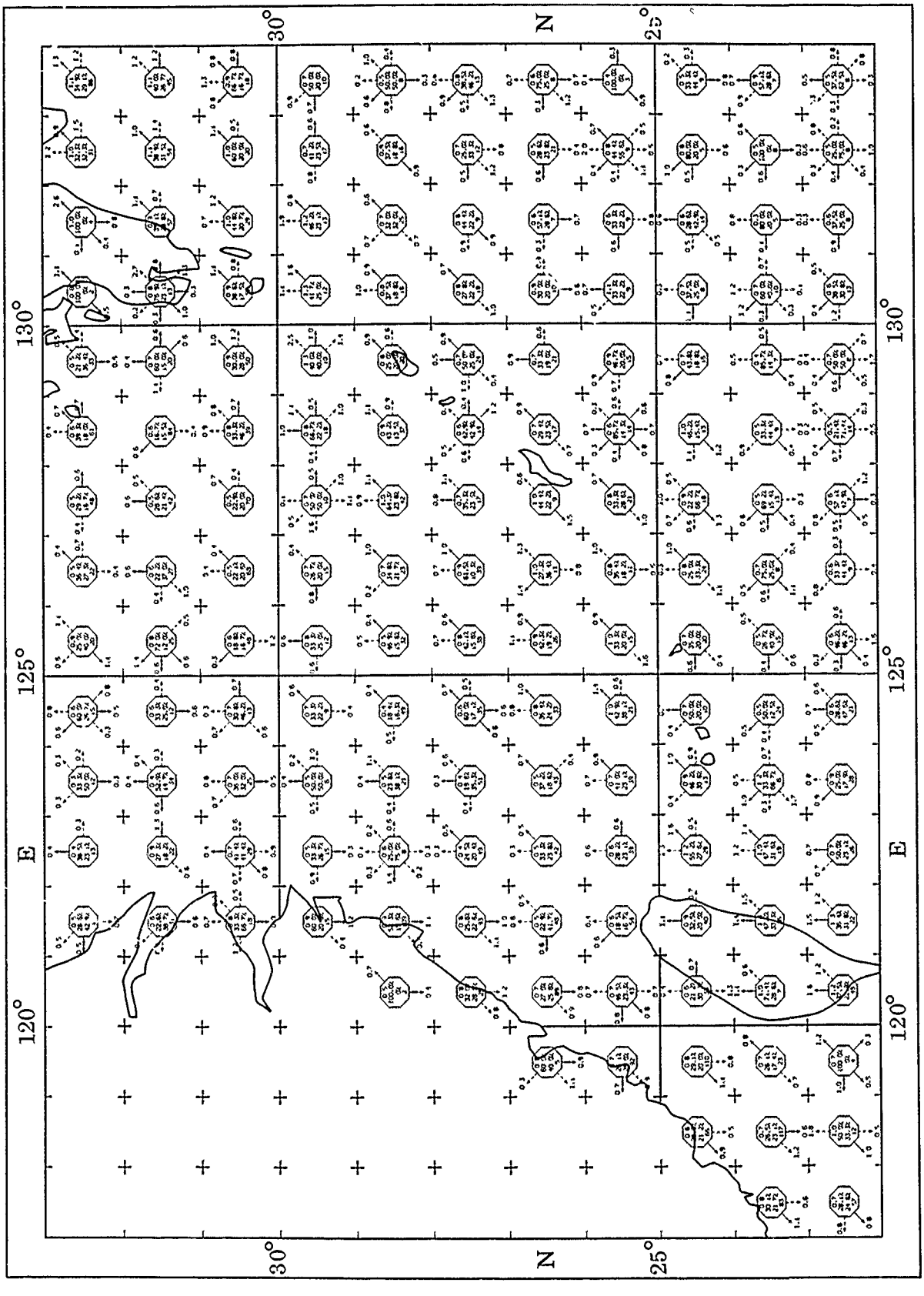

WAVE HEIGHT - FREQUENCIES
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
HEIGHT PERCENT
≤2 10
3-4 20
5-6 30
7-9 20
10-12 10
≥13 10
N = 1363
EXAMPLE: 30.0% OF ALL WAVE HEIGHTS WERE IN THE RANGE 5 TO 6 FEET.
N = OBSERVATION COUNT.
WAVE DATA FOR THESE TABLES WERE SELECTED FROM THE HIGHER OF SEA OR SWELL WHEN BOTH WERE REPORTED.
120°
125°
130°
E
40°
N
35°

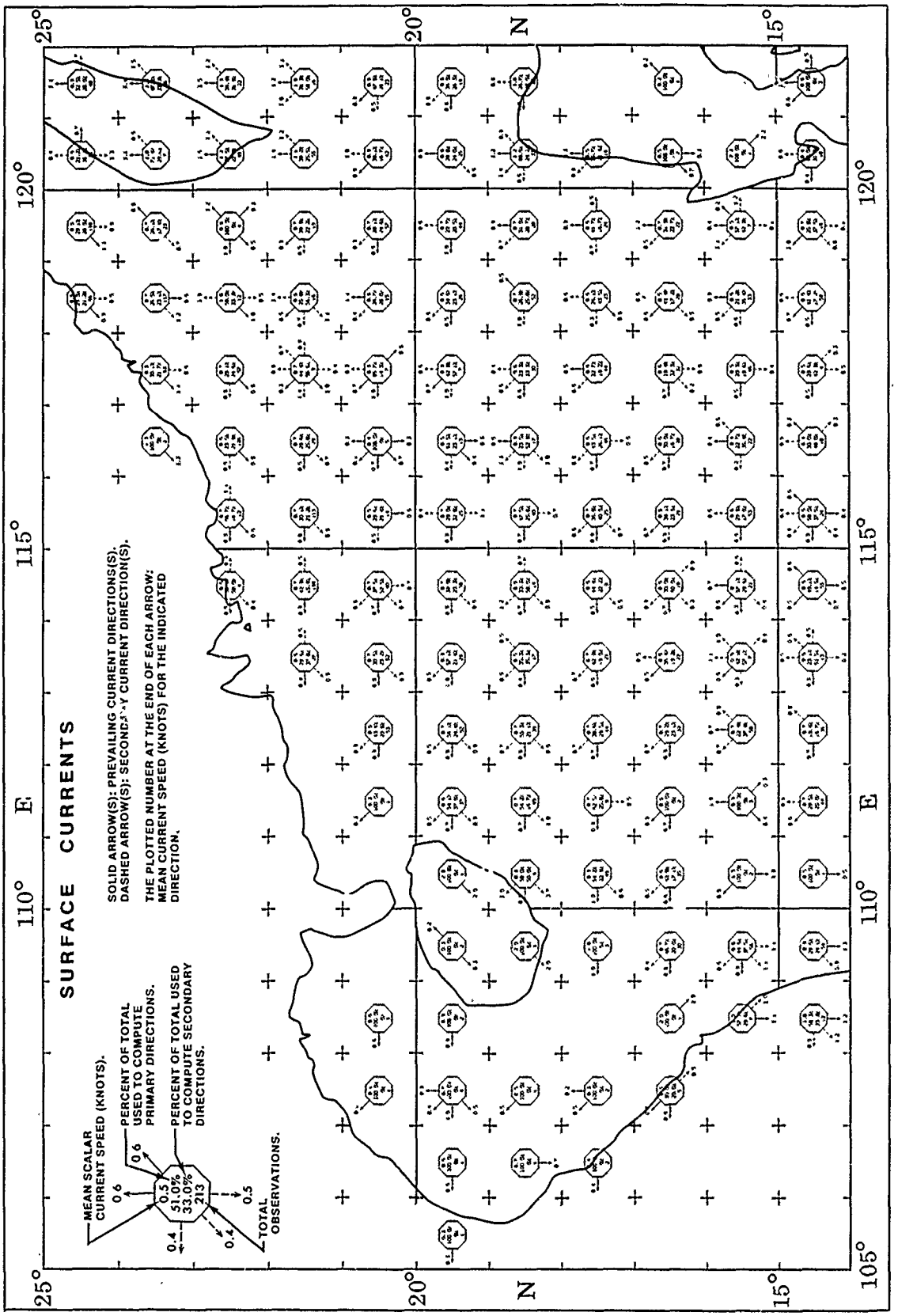

120°
125°
130°
25°
30°
N
E

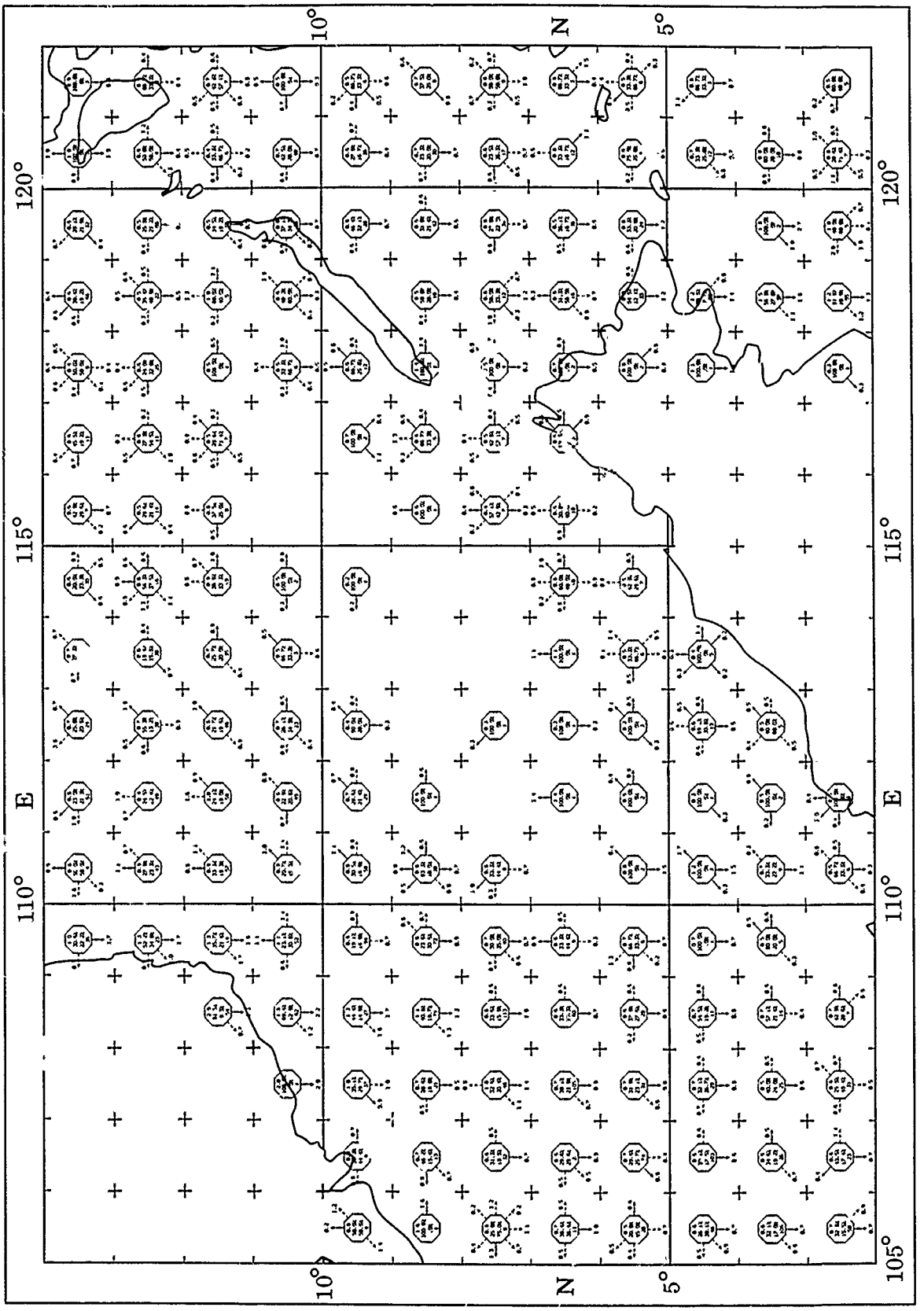

WAVE HEIGHT - FREQUENCIES
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
HEIGHT PERCENT
≤2 10
3-4 20
5-6 30
7-9 20
10-12 10
≥13 10
N = 1363
EXAMPLE: 30.0% OF ALL WAVE HEIGHTS WERE IN THE RANGE 5 TO 6 FEET.
N = OBSERVATION COUNT.
WAVE DATA FOR THESE TABLES WERE SELECTED FROM THE HIGHER OF SEA OR SWELL WHEN BOTH WERE REPORTED.
110° E
115° E
120° E
105° E
25° N
20° N
15° N

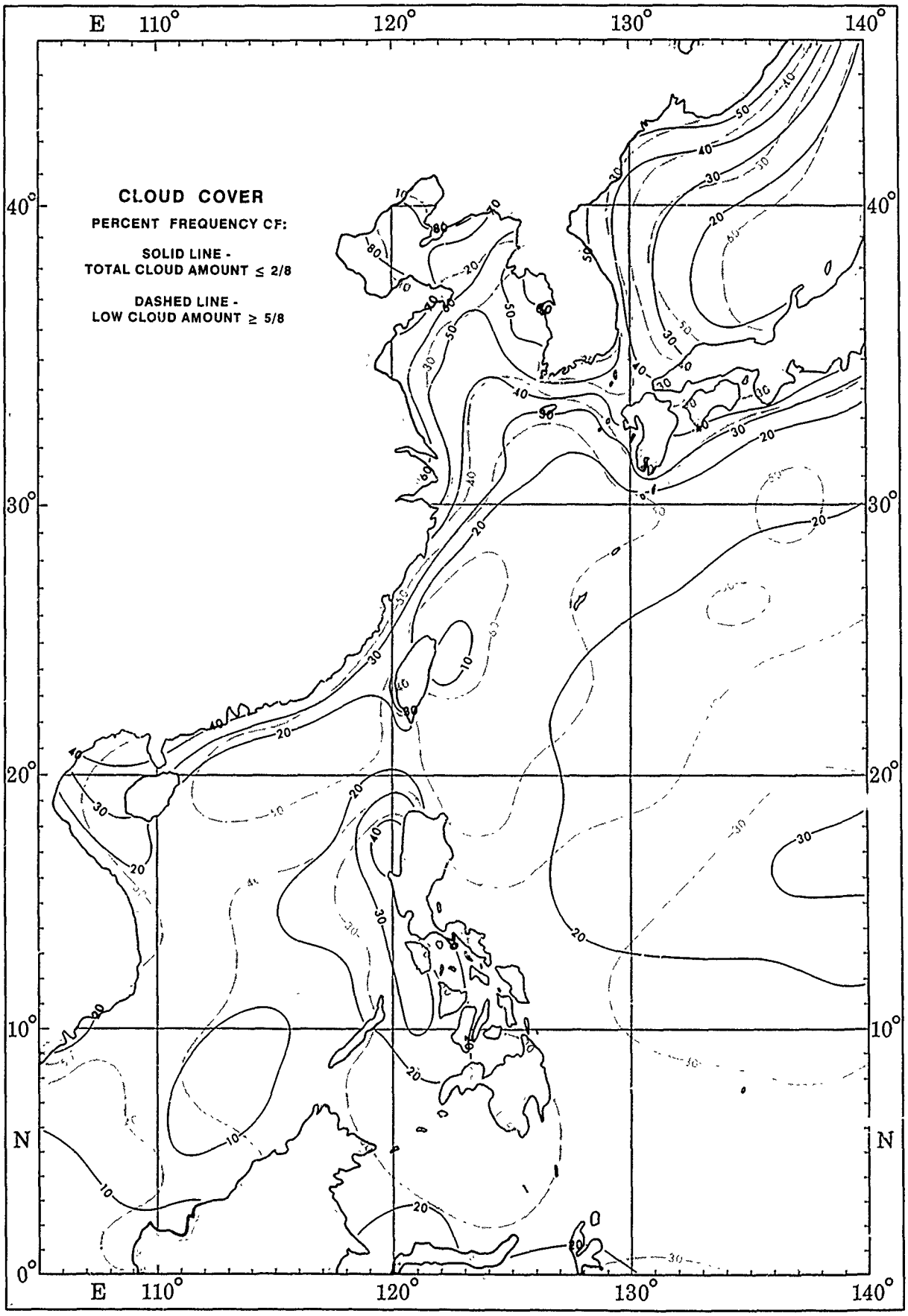

105°
110°
115°
120°
E
10°
5°
N

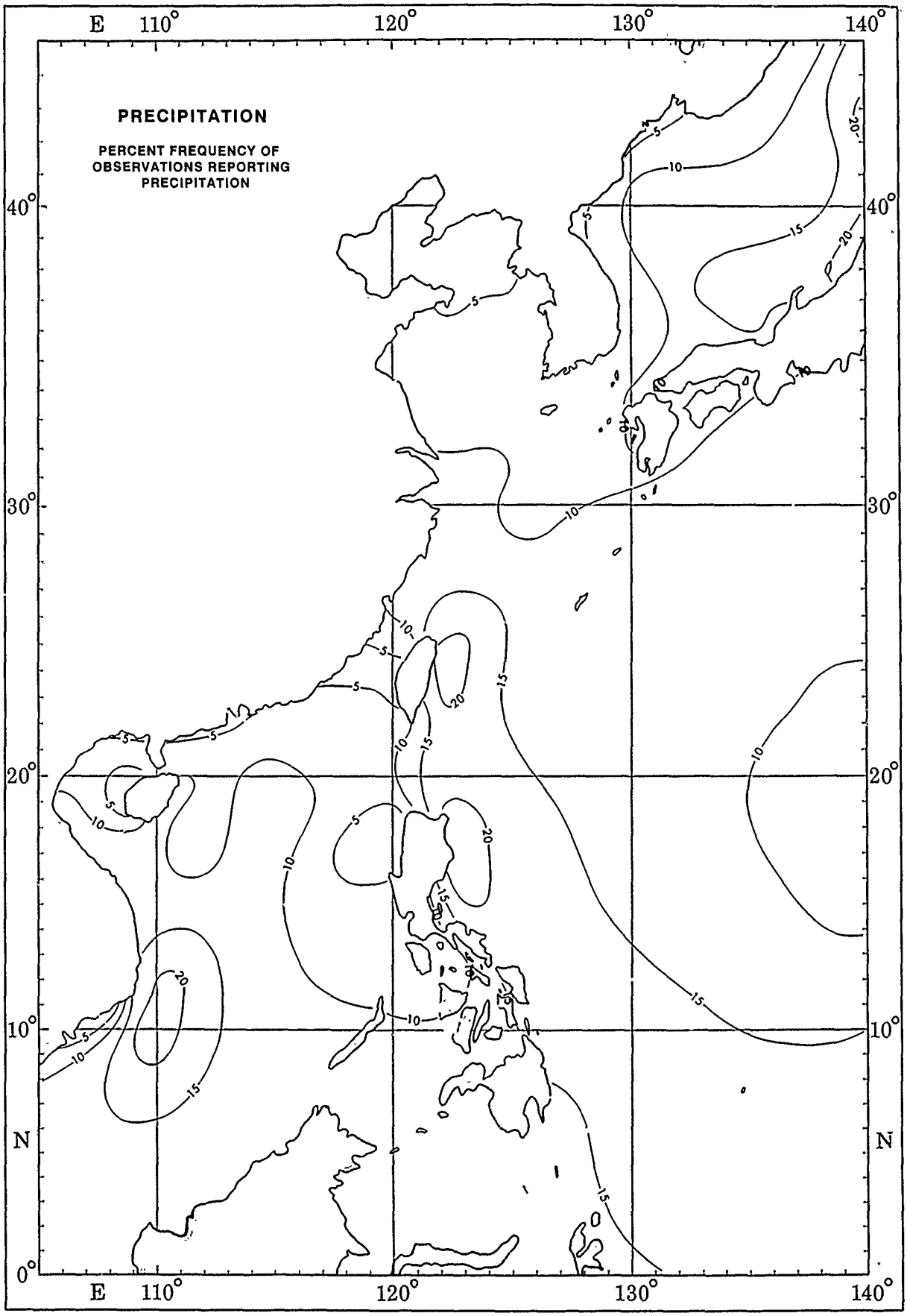

SURFACE CURRENTS
SOLID ARROW(S): PREVAILING CURRENT DIRECTIONS(S).
DASHED ARROW(S): SECONDARY CURRENT DIRECTION(S).
THE PLOTTED NUMBER AT THE END OF EACH ARROW: MEAN CURRENT SPEED (KNOTS) FOR THE INDICATED DIRECTION.
MEAN SCALAR CURRENT SPEED (KNOTS).
PERCENT OF TOTAL USED TO COMPUTE PRIMARY DIRECTIONS.
PERCENT OF TOTAL USED TO COMPUTE SECONDARY DIRECTIONS.
TOTAL OBSERVATIONS.
0.6
0.3
51.0%
33.0%
213
0.5
0.4
0.4
120°
125°
130°
E
40°
35°
N

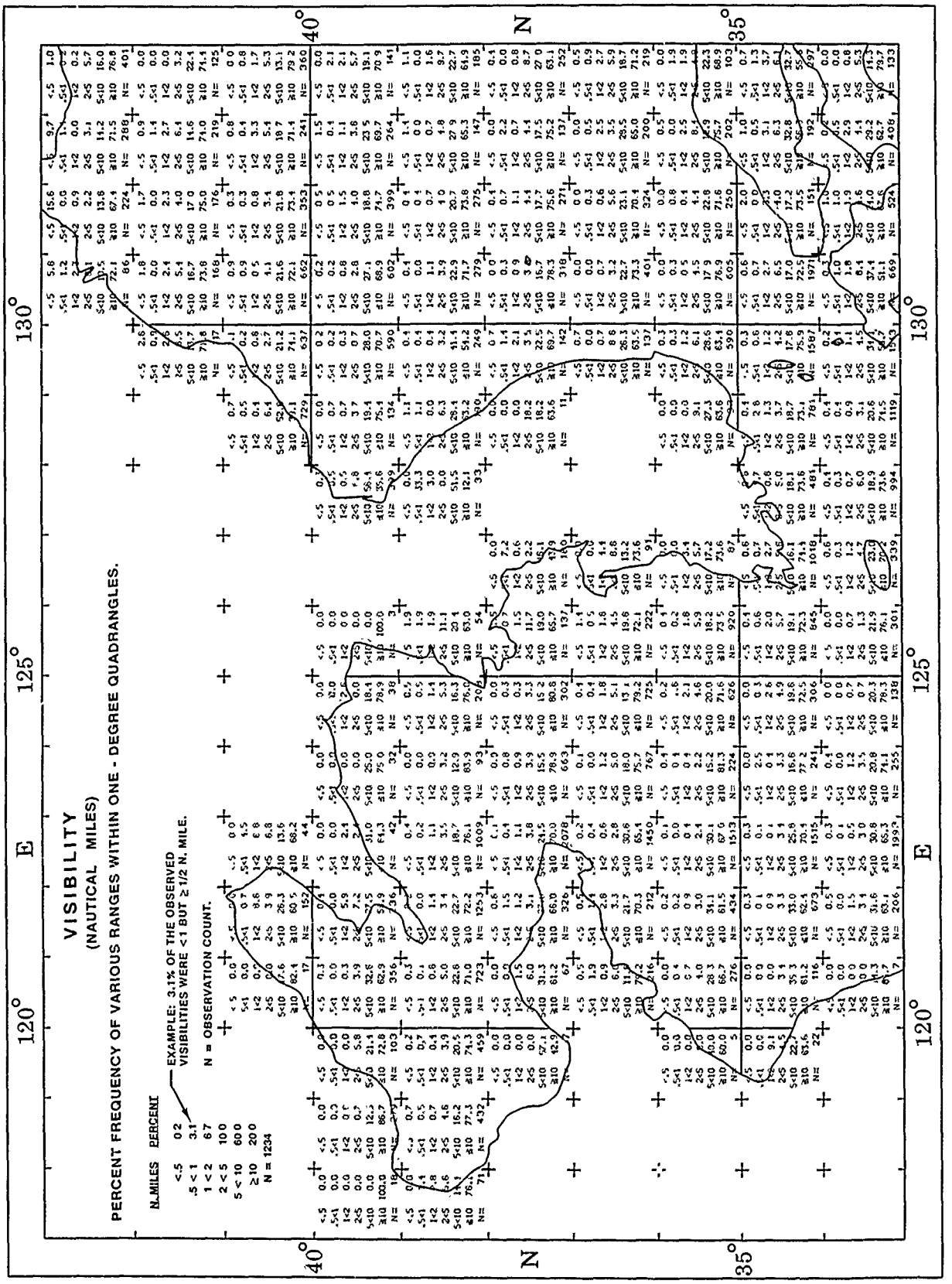

30° N
25°
130°
125°
120° E

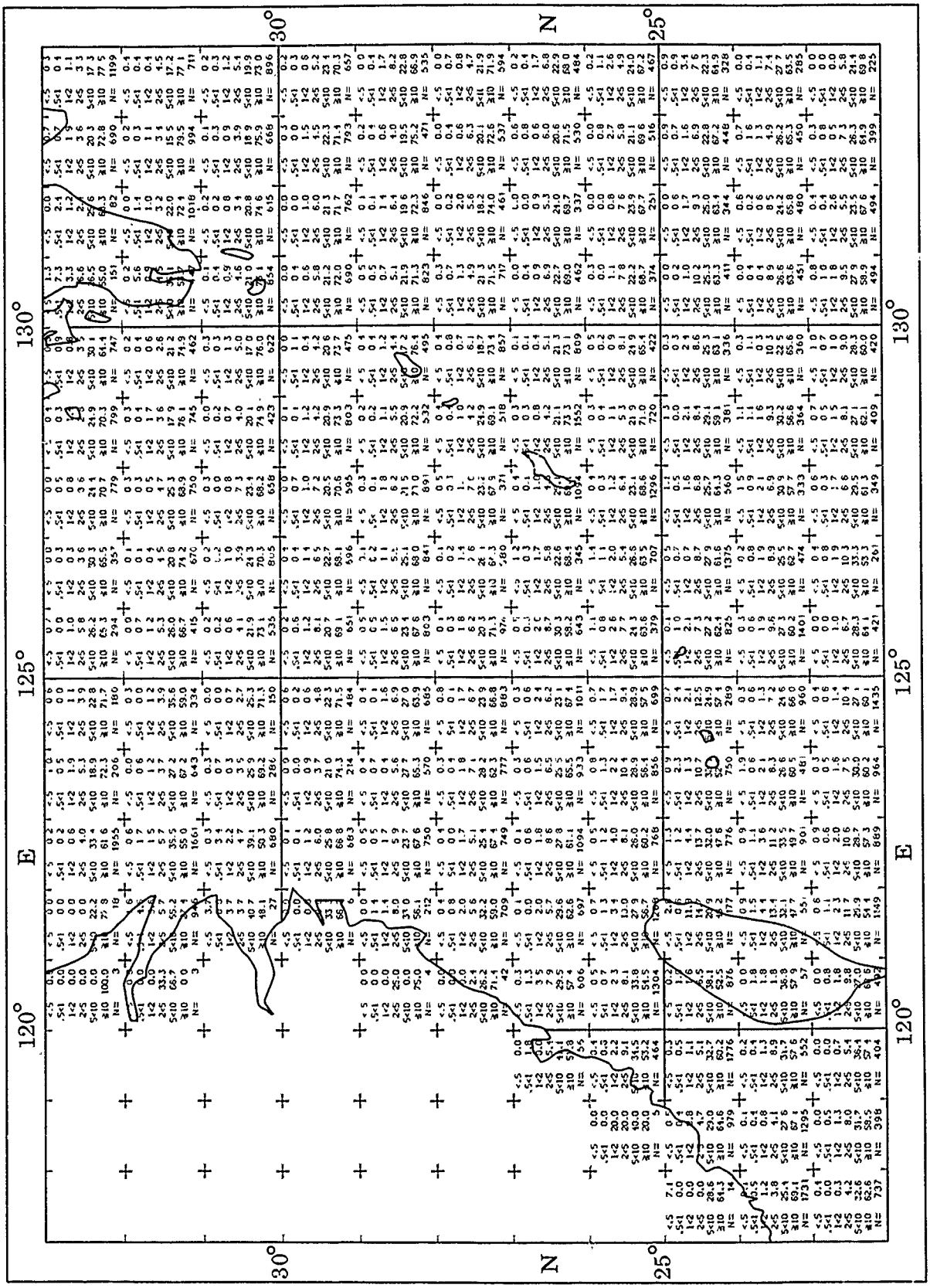

SURFACE CURRENTS
SOLID ARROW(S): PREVAILING CURRENT DIRECTIONS(S).
DASHED ARROW(S): SECONDARY CURRENT DIRECTION(S).
THE PLOTTED NUMBER AT THE END OF EACH ARROW:
MEAN CURRENT SPEED (KNOTS) FOR THE INDICATED DIRECTION.
MEAN SCALAR CURRENT SPEED (KNOTS).
PERCENT OF TOTAL USED TO COMPUTE PRIMARY DIRECTIONS.
PERCENT OF TOTAL USED TO COMPUTE SECONDARY DIRECTIONS.
TOTAL OBSERVATIONS.
0.6
0.5
51.0%
33.0%
213
0.4
0.5
0.4
25°
20°
15°
N
105°
110°
115°
120°
E

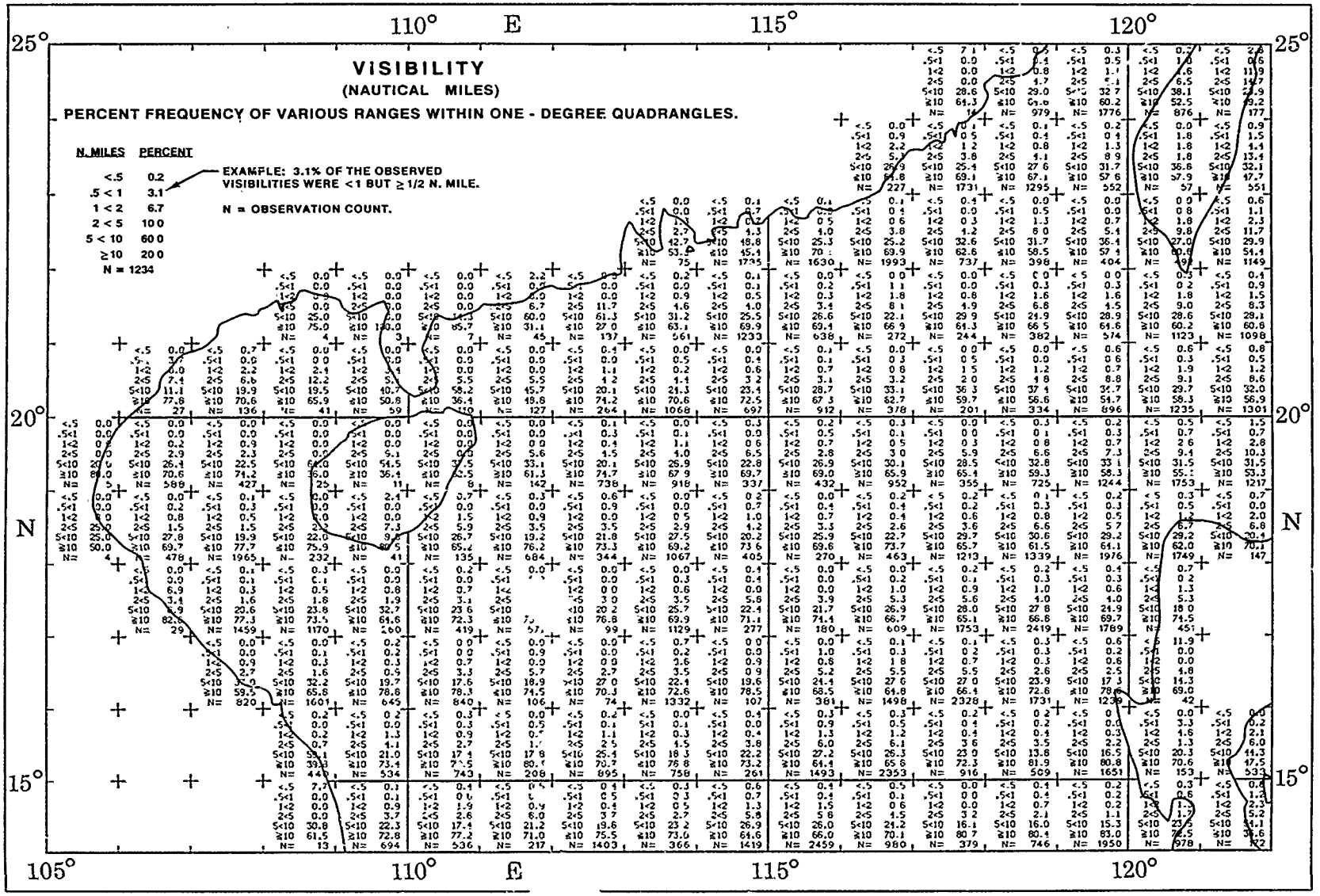

10° N
5°
120°
115°
110° E
105°
10° N
5°

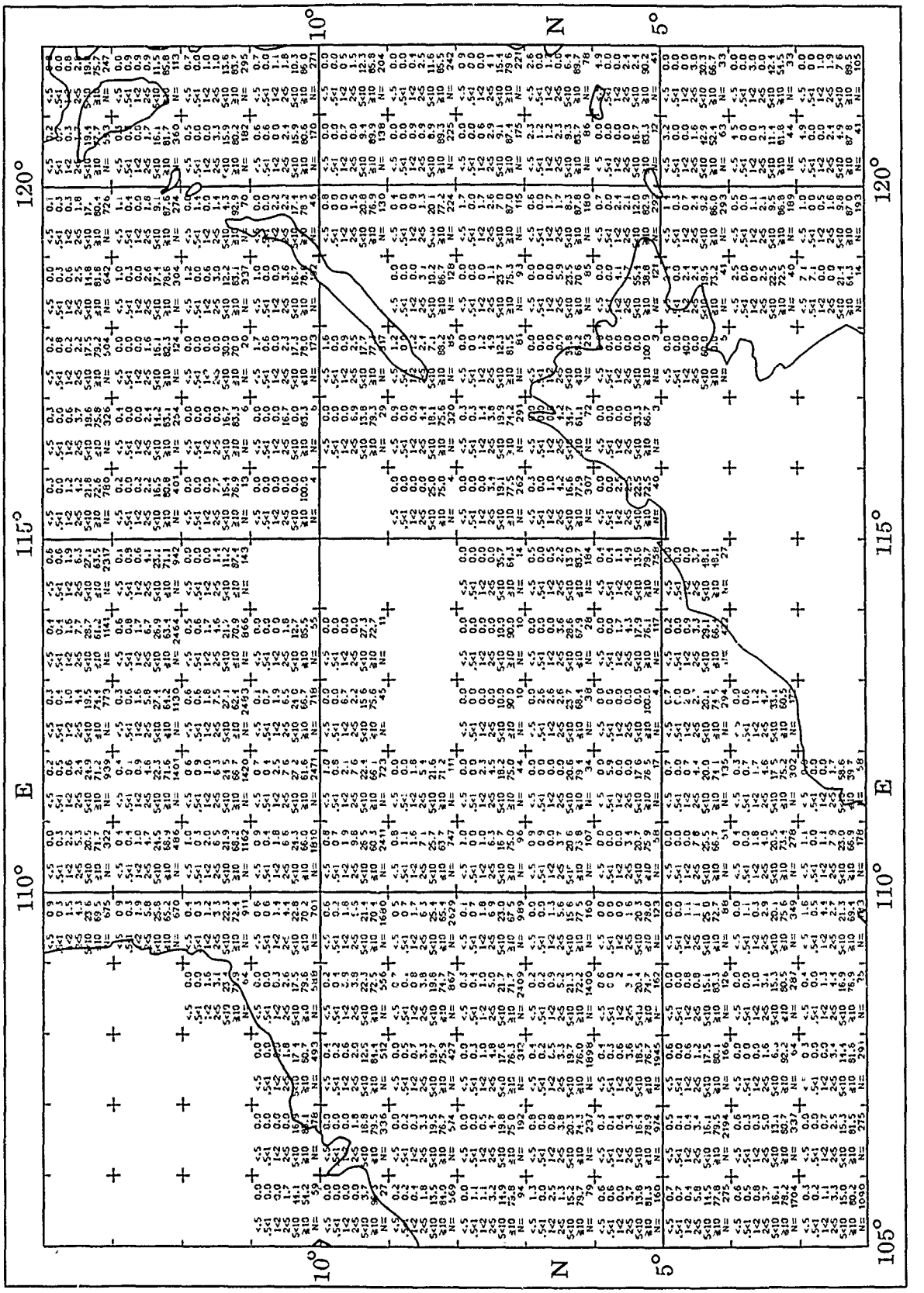

CLOUD COVER
PERCENT FREQUENCY OF:
SOLID LINE -
TOTAL CLOUD AMOUNT ≤ 2/8
DASHED LINE -
LOW CLOUD AMOUNT ≥ 5/8
E 110° 120° 130° 140°
40° 30° 20° 10° N 0°


PRECIPITATION
PERCENT FREQUENCY OF OBSERVATIONS REPORTING PRECIPITATION
E 110° 120° 130° 140°
40° 30° 20° 10° N 0°


VISIBILITY
(NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE - DEGREE QUADRANGLES.
N-MILES PERCENT
<.5 0 2
.5 < 1 3.1
1 < 2 6 7
2 < 5 10 0
5 < 10 6 0 0
≥10 2 0 0
N = 1234
EXAMPLE: 3.1% OF THE OBSERVED VISIBILITIES WERE <1 BUT ≥ 1/2 N. MILE.
N = OBSERVATION COUNT.
120°
125°
130°
40°
35°
N
E

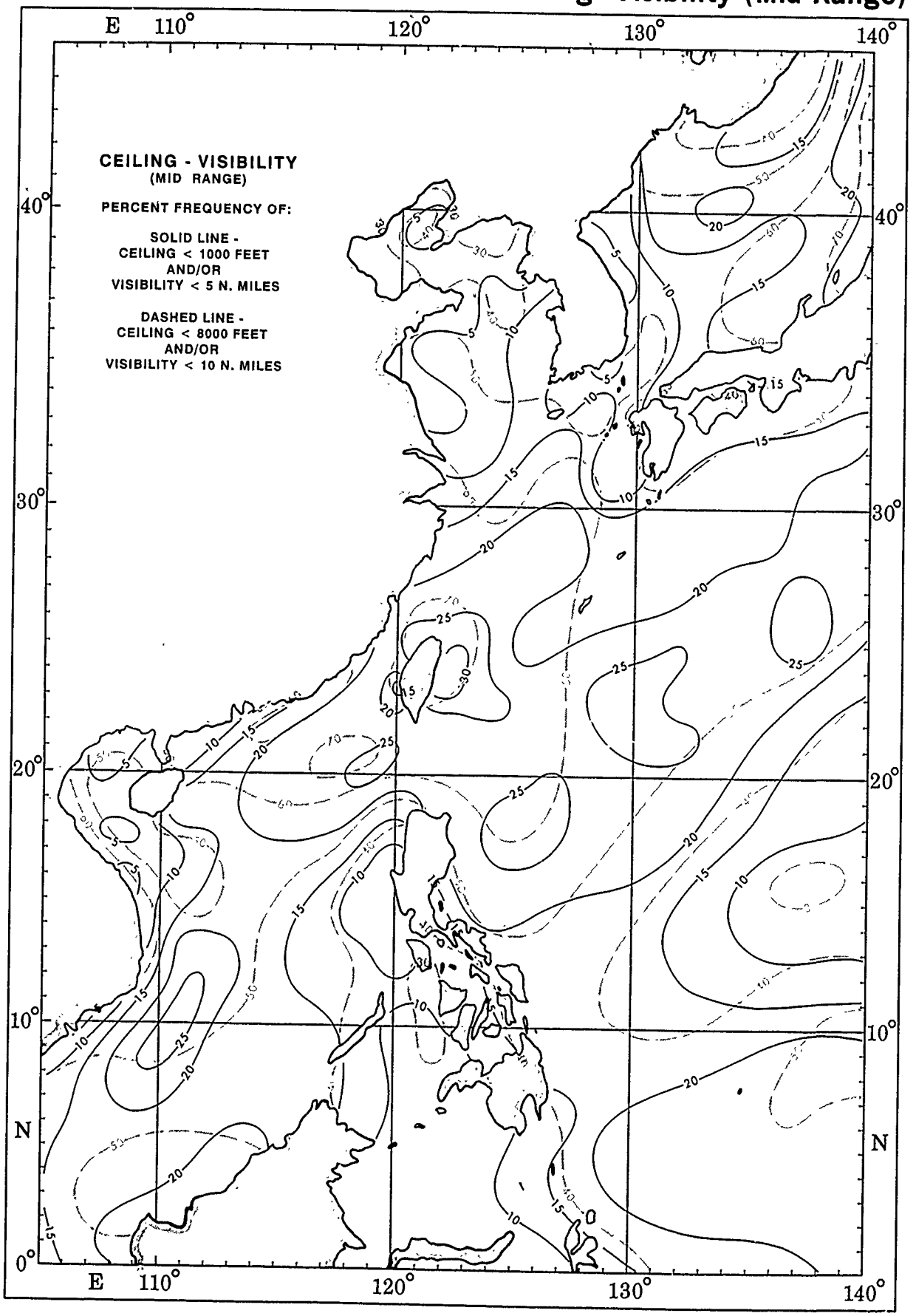

30°
N
25°
120°
E
125°
130°

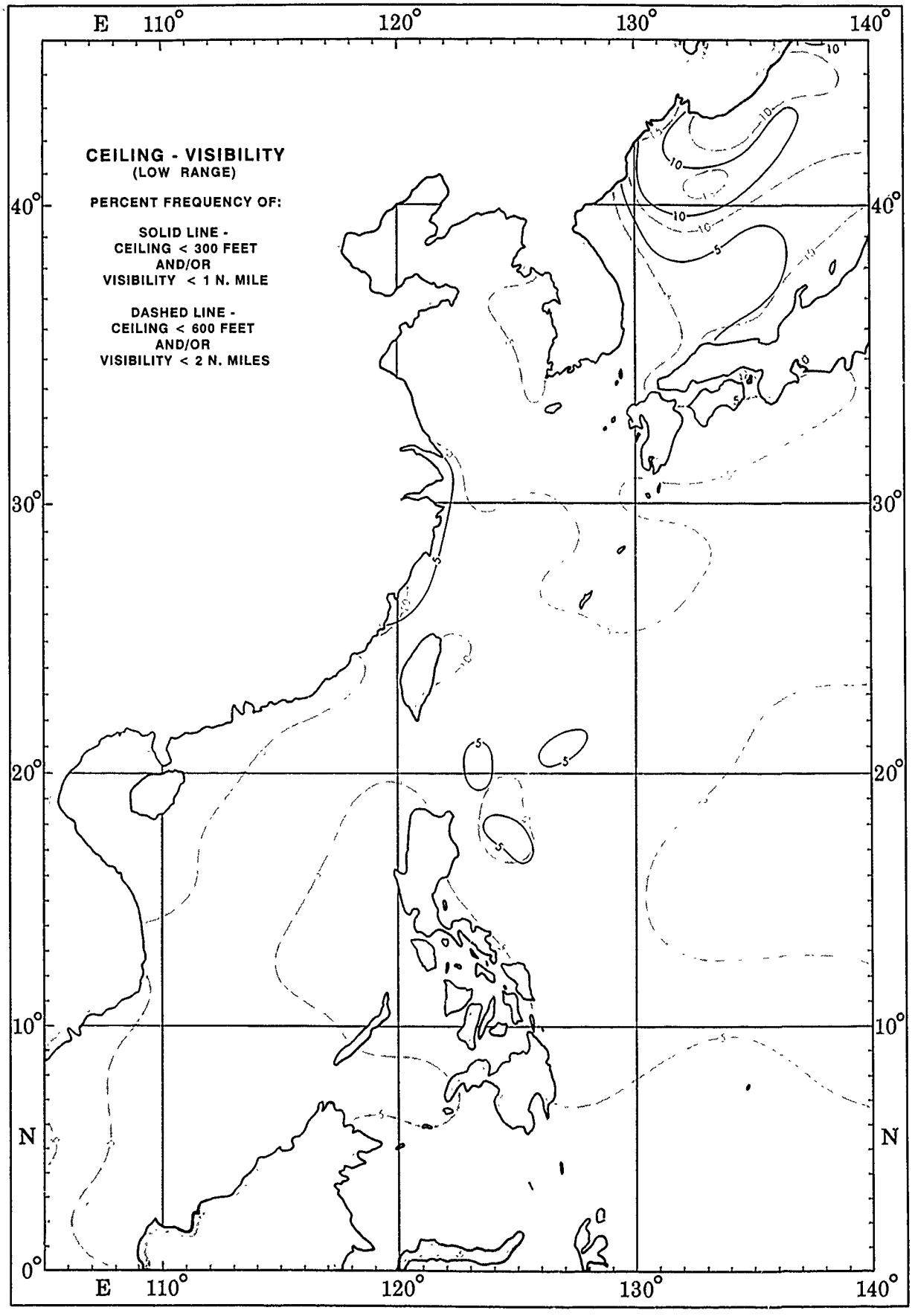

VISIBILITY
(NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE - DEGREE QUADRANGLES.
N. MILES PERCENT
<.5 0.2
.5 < 1 3.1
1 < 2 6.7
2 < 5 10 0
5 < 10 60 0
≥10 20 0
N = 1234
EXAMPLE: 3.1% OF THE OBSERVED VISIBILITIES WERE <1 BUT ≥ 1/2 N. MILE.
N = OBSERVATION COUNT.
110° E
115°
120°
25°
20°
15°
N
105°
110° E
115°
120°

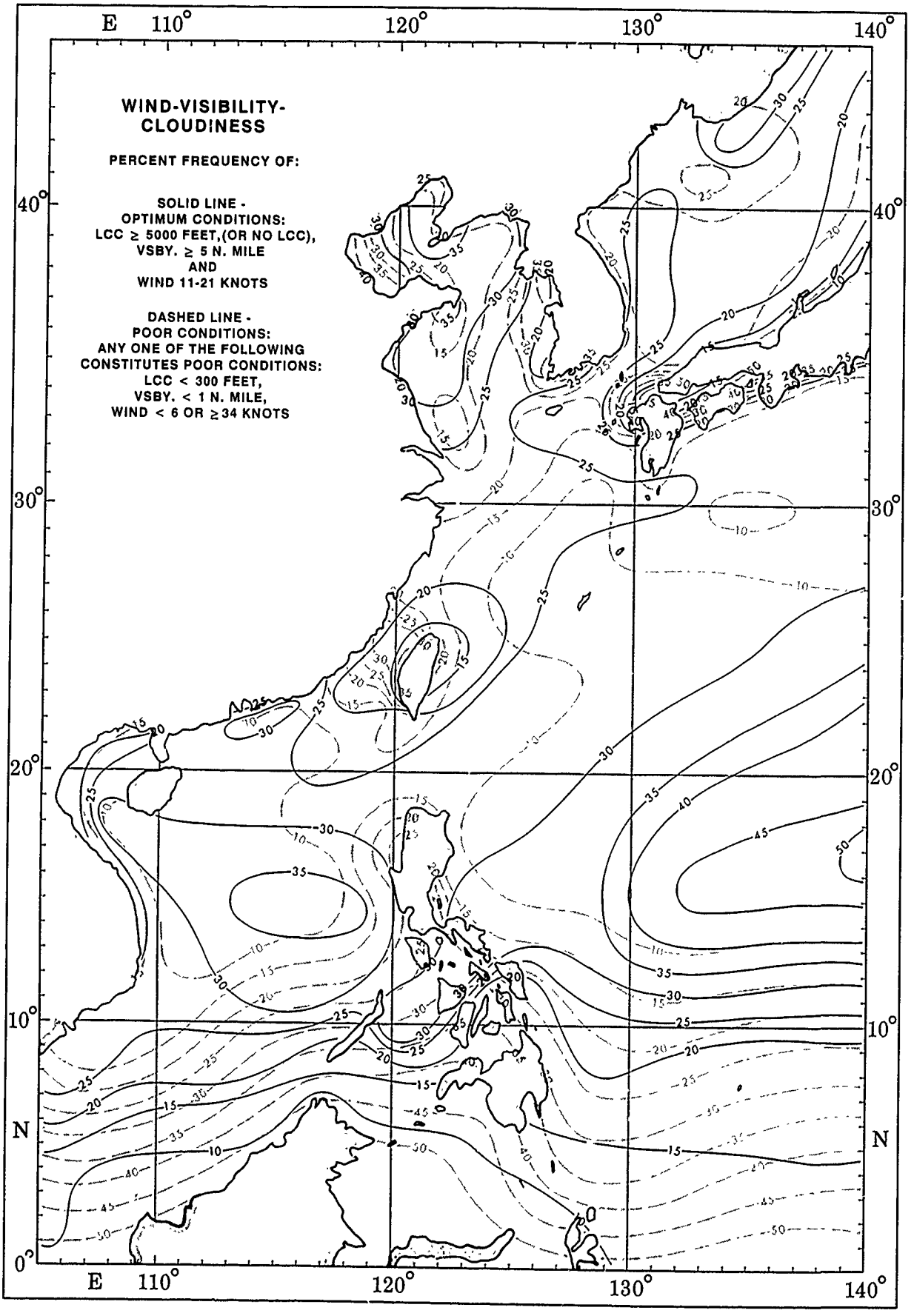

120°
115°
110°
105°
10°
5°
N
E

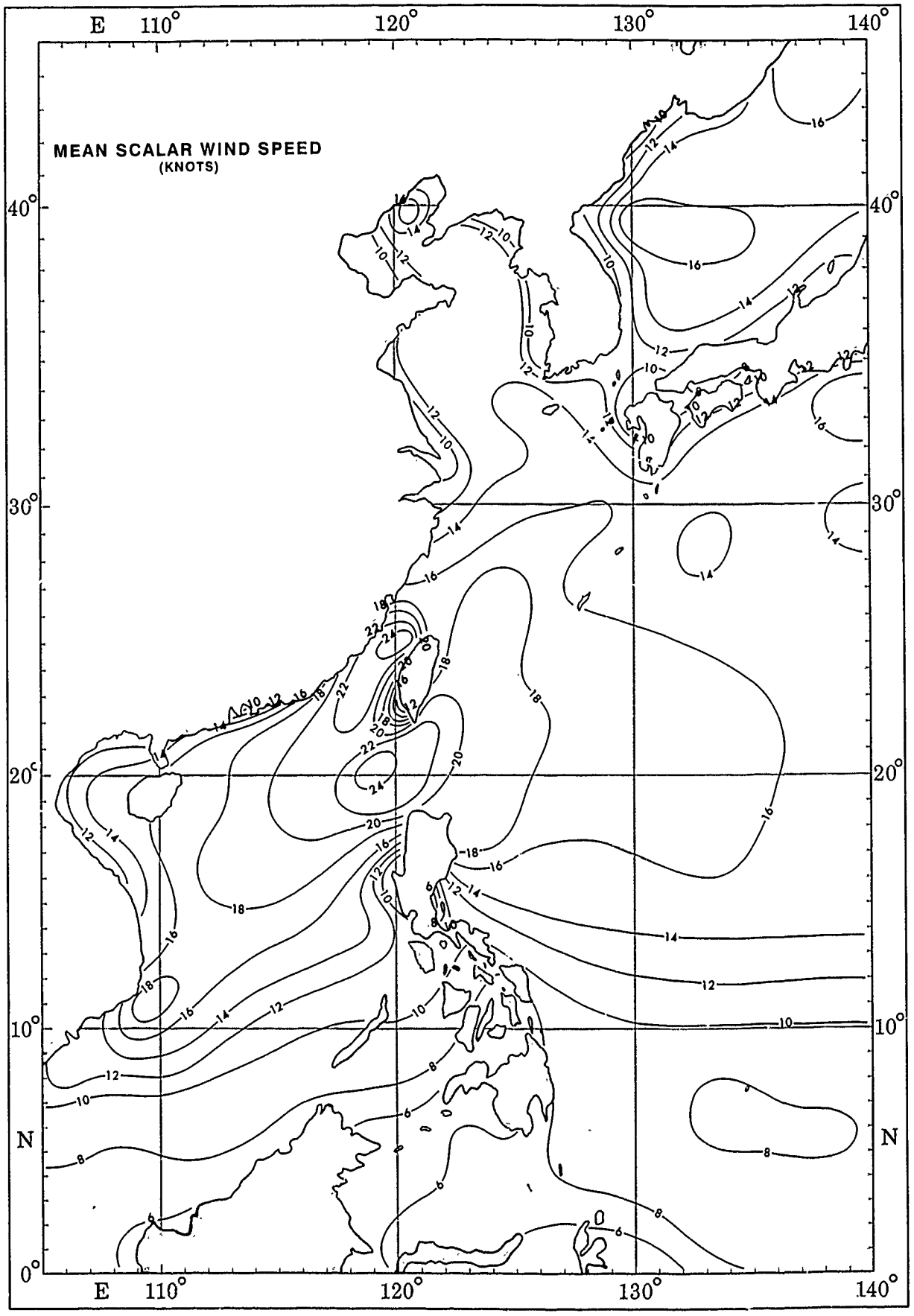
November

Ceiling - Visibility (Mid Range)



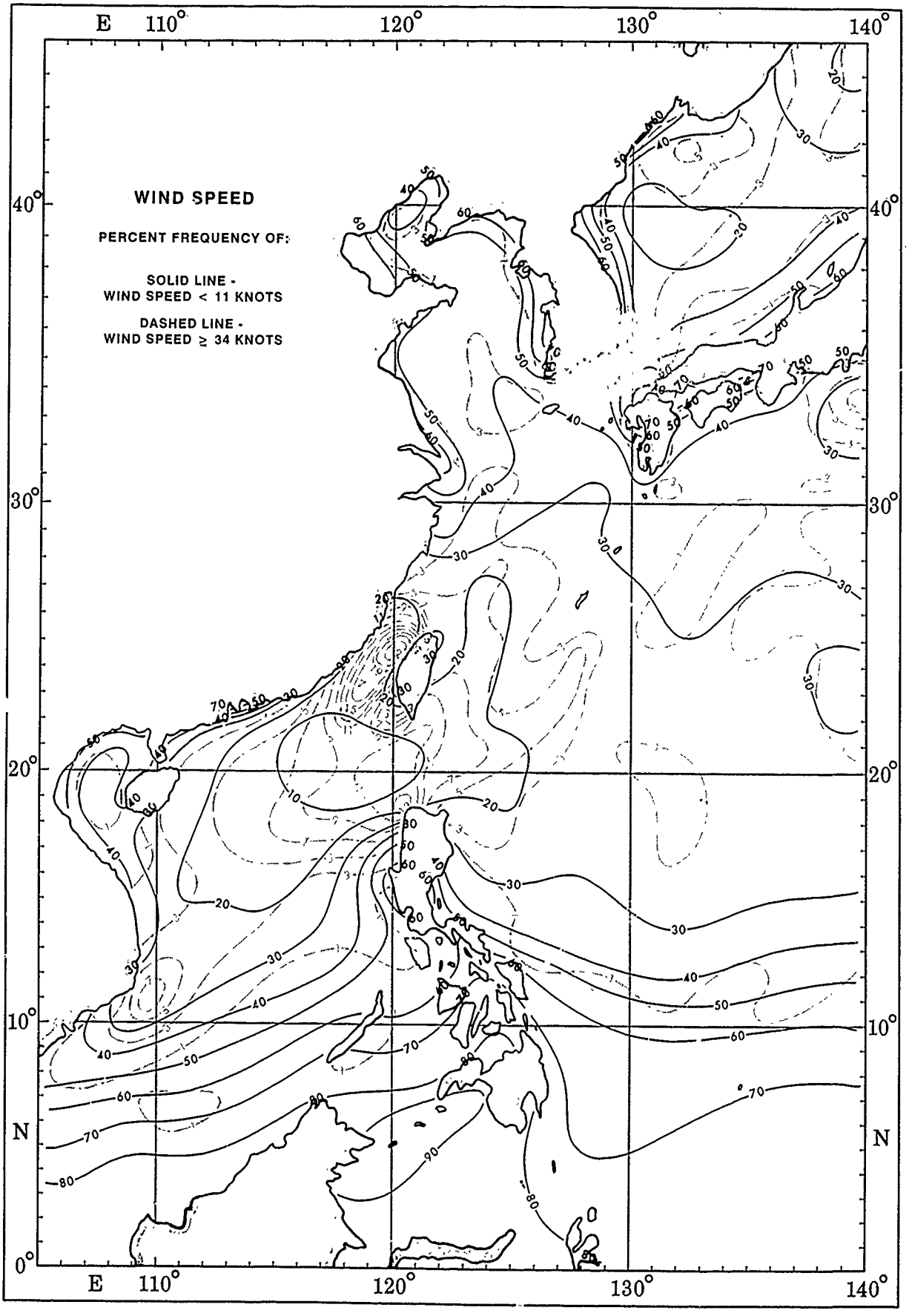

CEILING - VISIBILITY
(LOW RANGE)
PERCENT FREQUENCY OF:
SOLID LINE -
CEILING < 300 FEET
AND/OR
VISIBILITY < 1 N. MILE
DASHED LINE -
CEILING < 600 FEET
AND/OR
VISIBILITY < 2 N. MILES
E 110°
120°
130°
140°
40°
30°
20°
10°
N
0°


WIND-VISIBILITY-
CLOUDINESS
PERCENT FREQUENCY OF:
SOLID LINE -
OPTIMUM CONDITIONS:
LCC ≥ 5000 FEET,(OR NO LCC),
VSBY. ≥ 5 N. MILE
AND
WIND 11-21 KNOTS
DASHED LINE -
POOR CONDITIONS:
ANY ONE OF THE FOLLOWING
CONSTITUTES POOR CONDITIONS:
LCC < 300 FEET,
VSBY. < 1 N. MILE,
WIND < 6 OR ≥ 34 KNOTS
E 110°
120°
130°
140°
40°
30°
20°
10°
N
0°


MEAN SCALAR WIND SPEED
(KNOTS)
E 110°
120°
130°
140°
40°
30°
20°
10°
N
0°

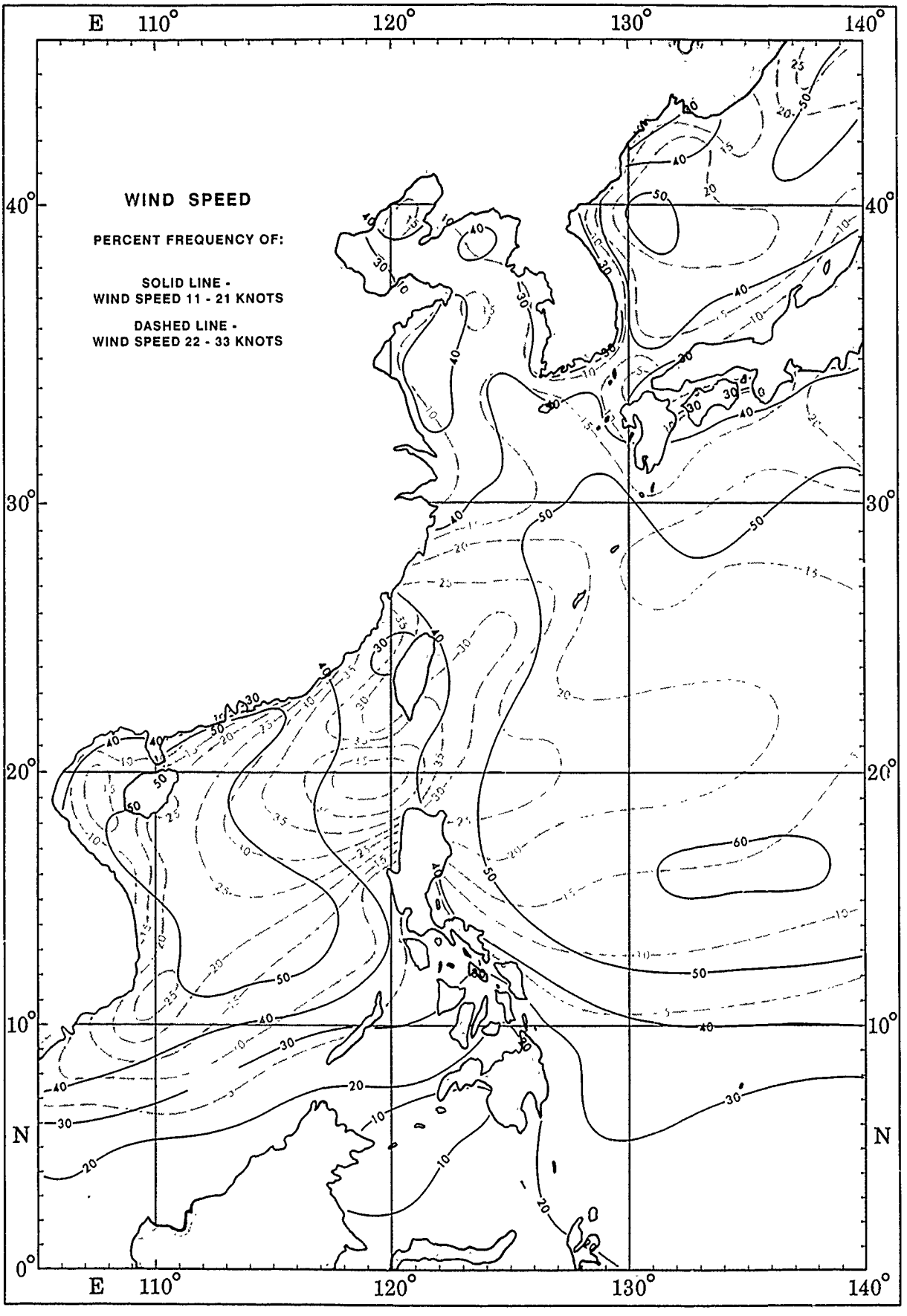
November

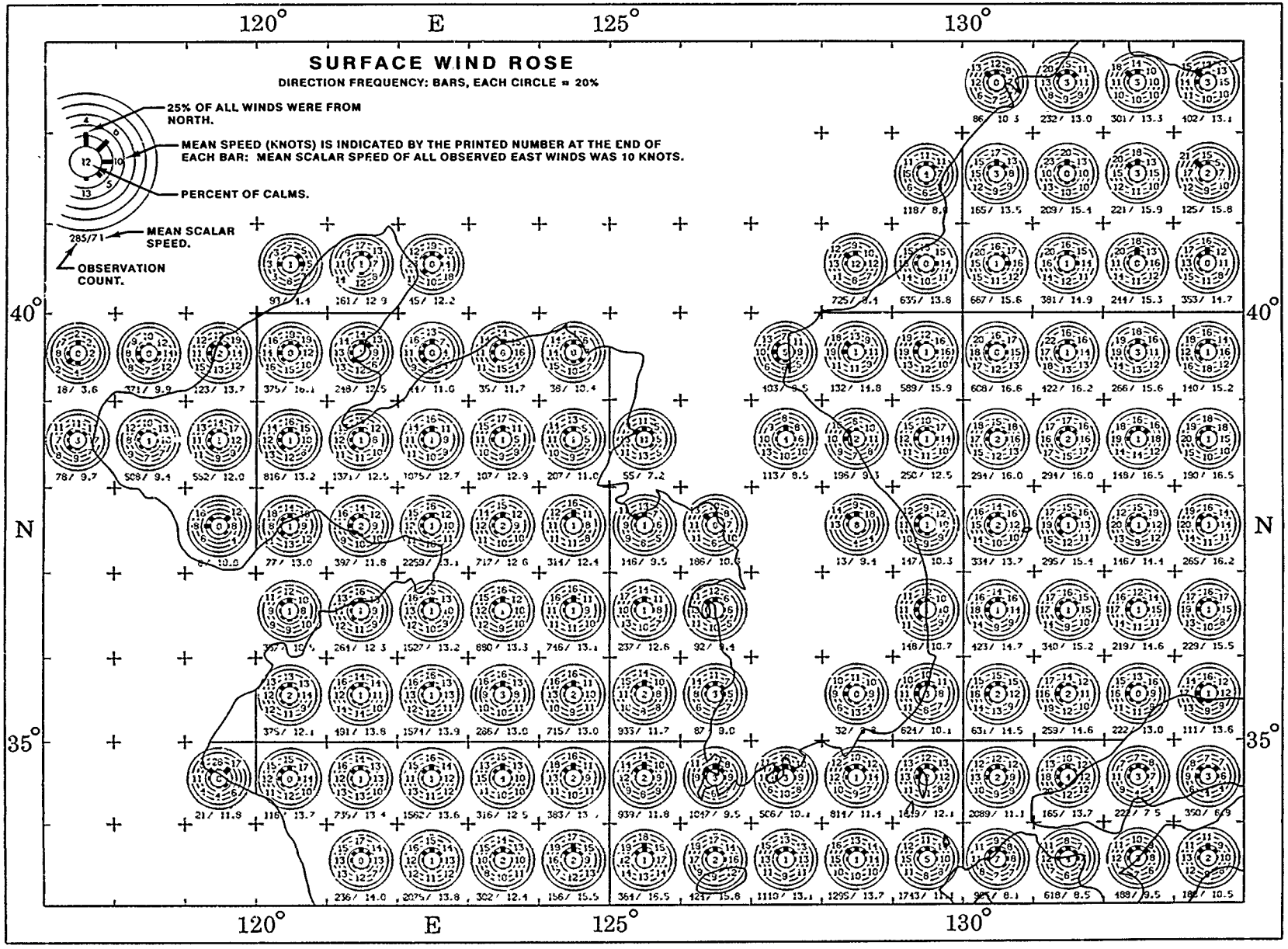
Wind Speed <11 and ≥34 Knots

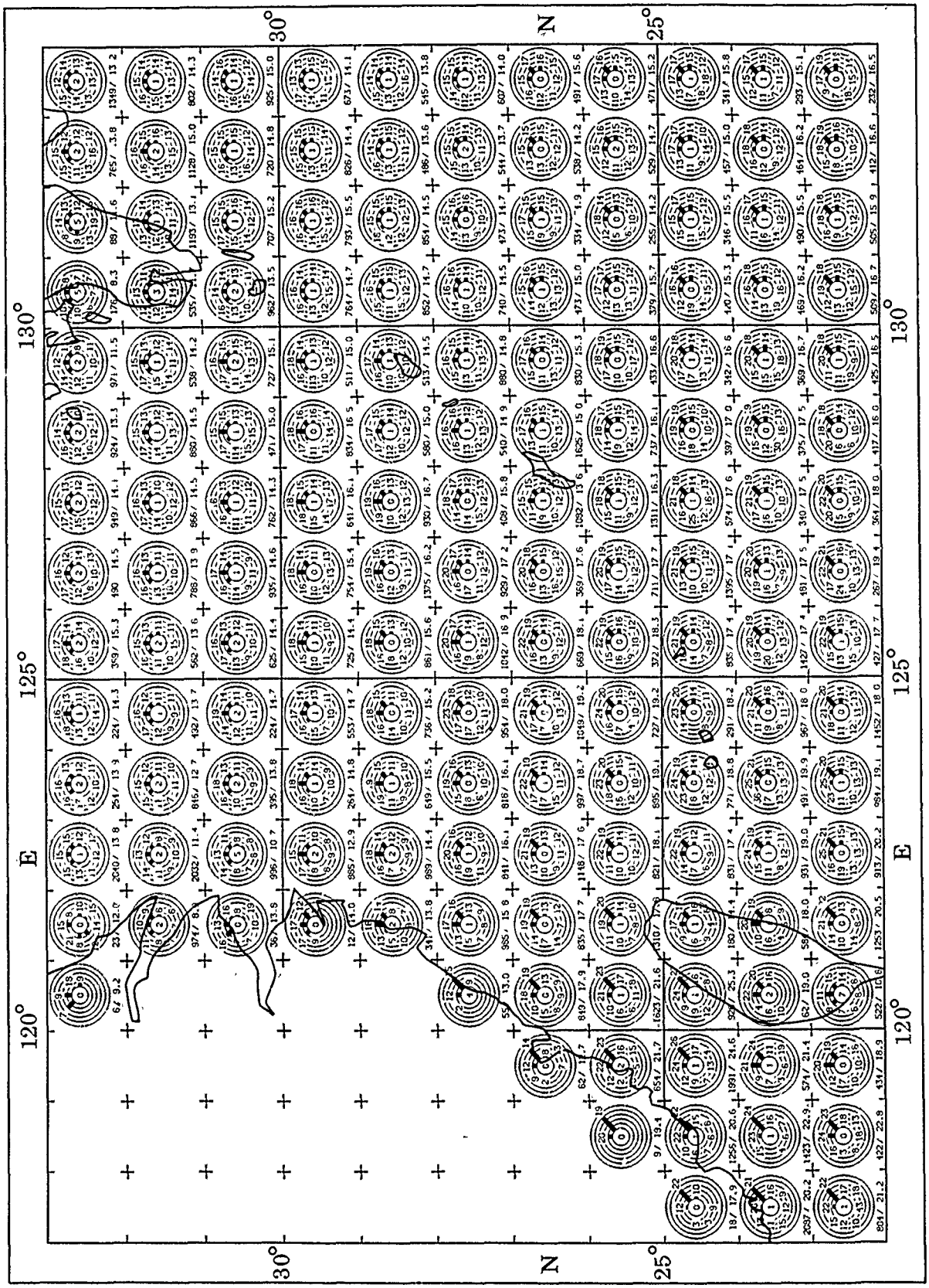


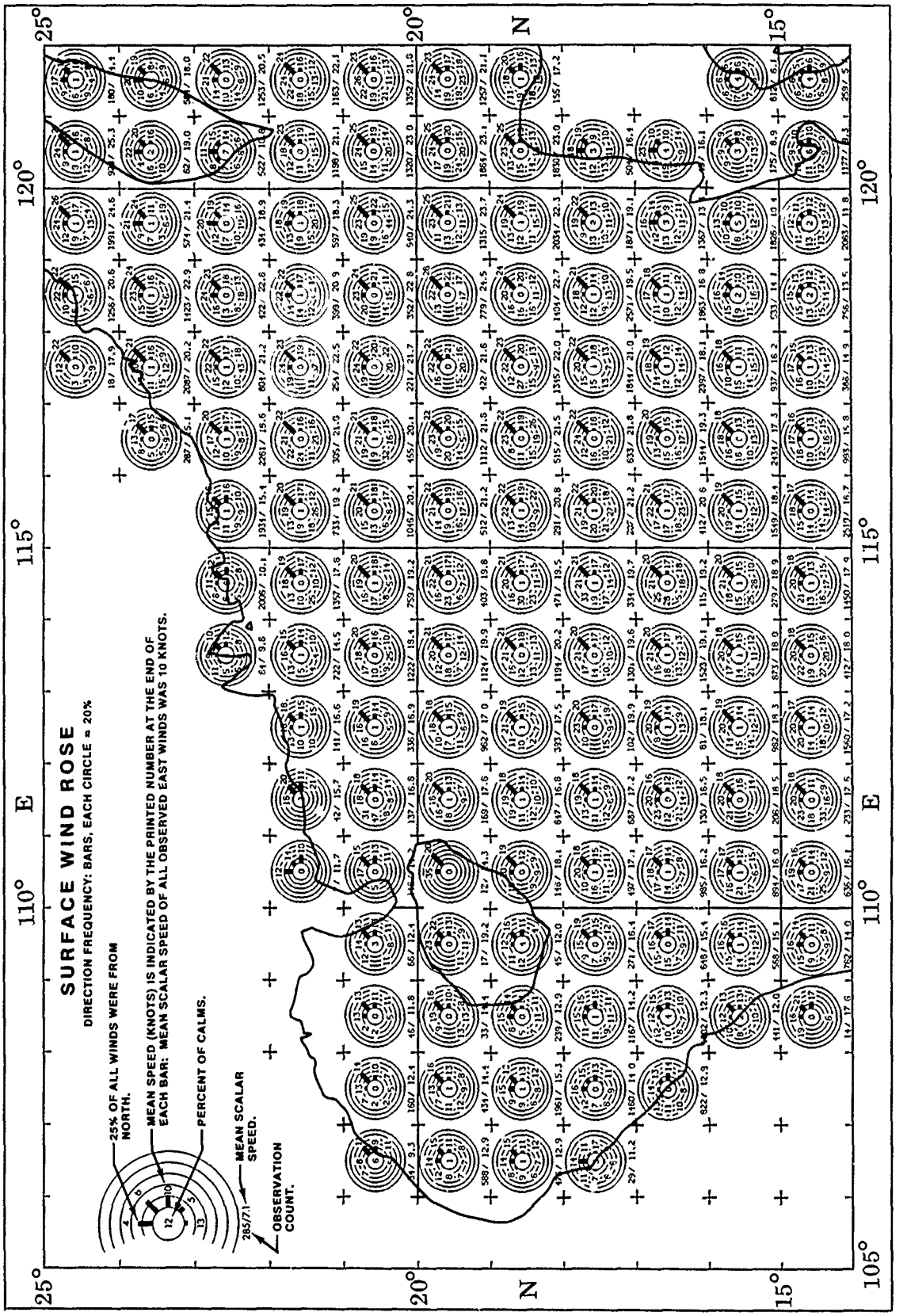
November

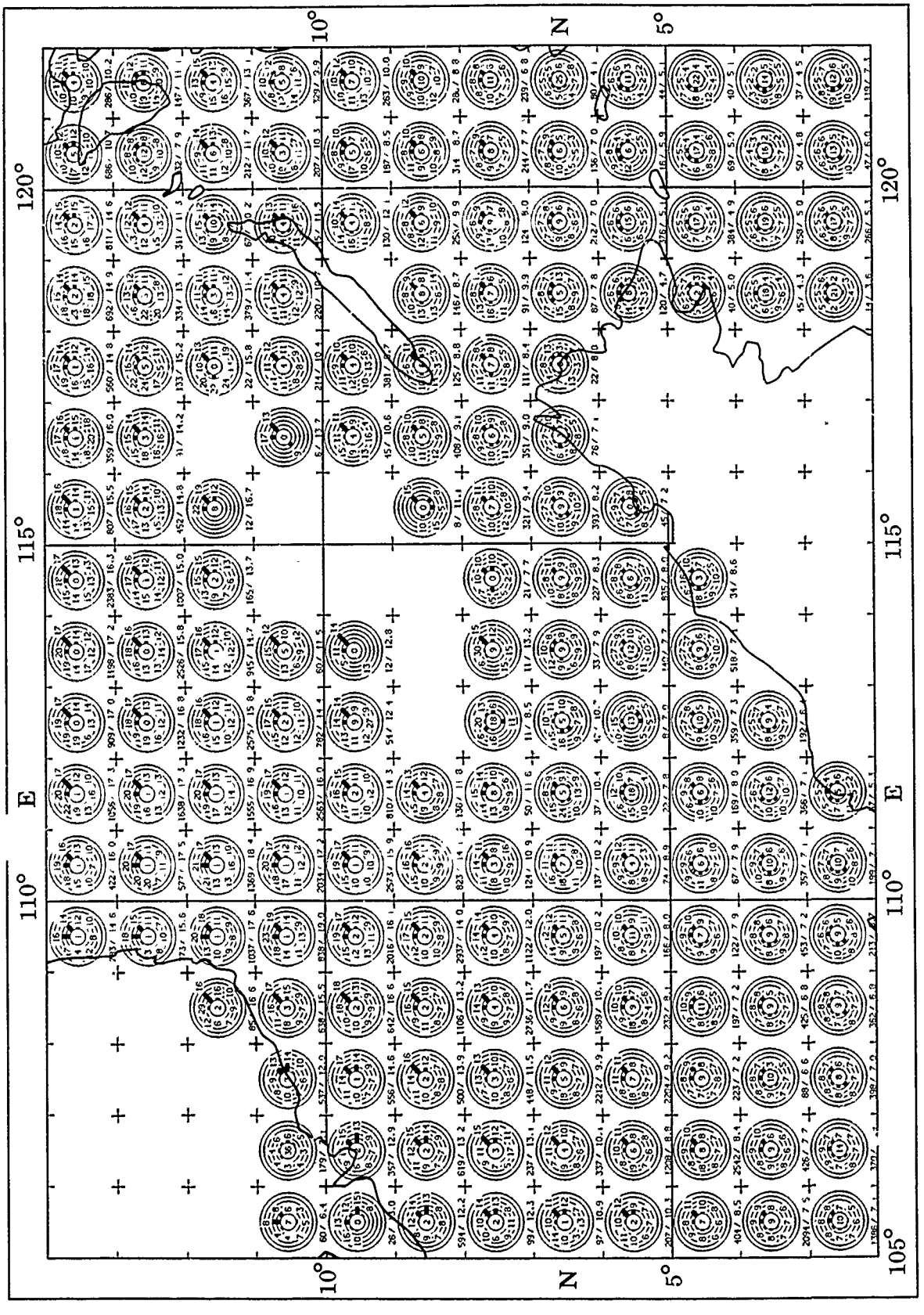
Wind Speed 11 - 21 and 22 - 33 Knots

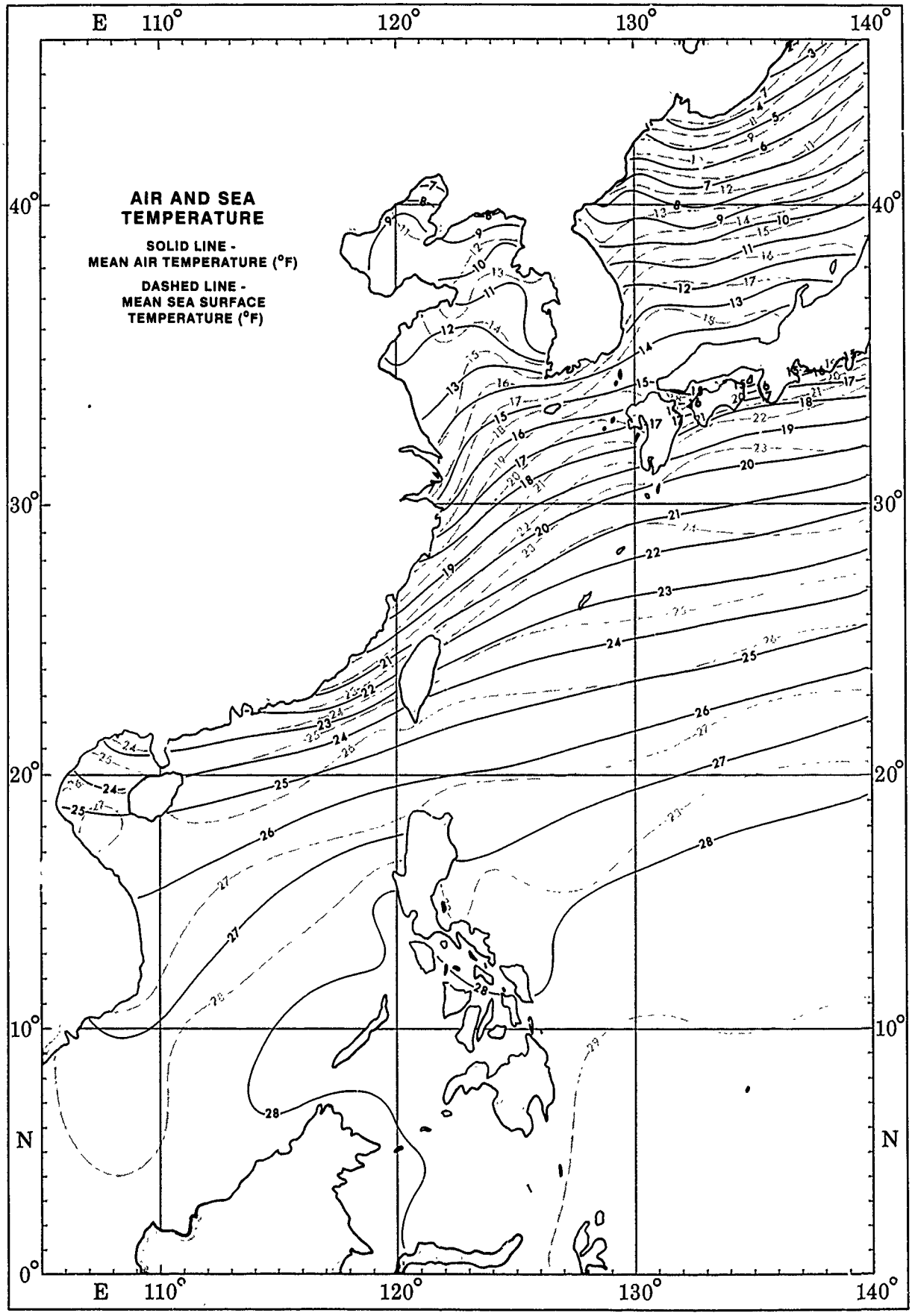


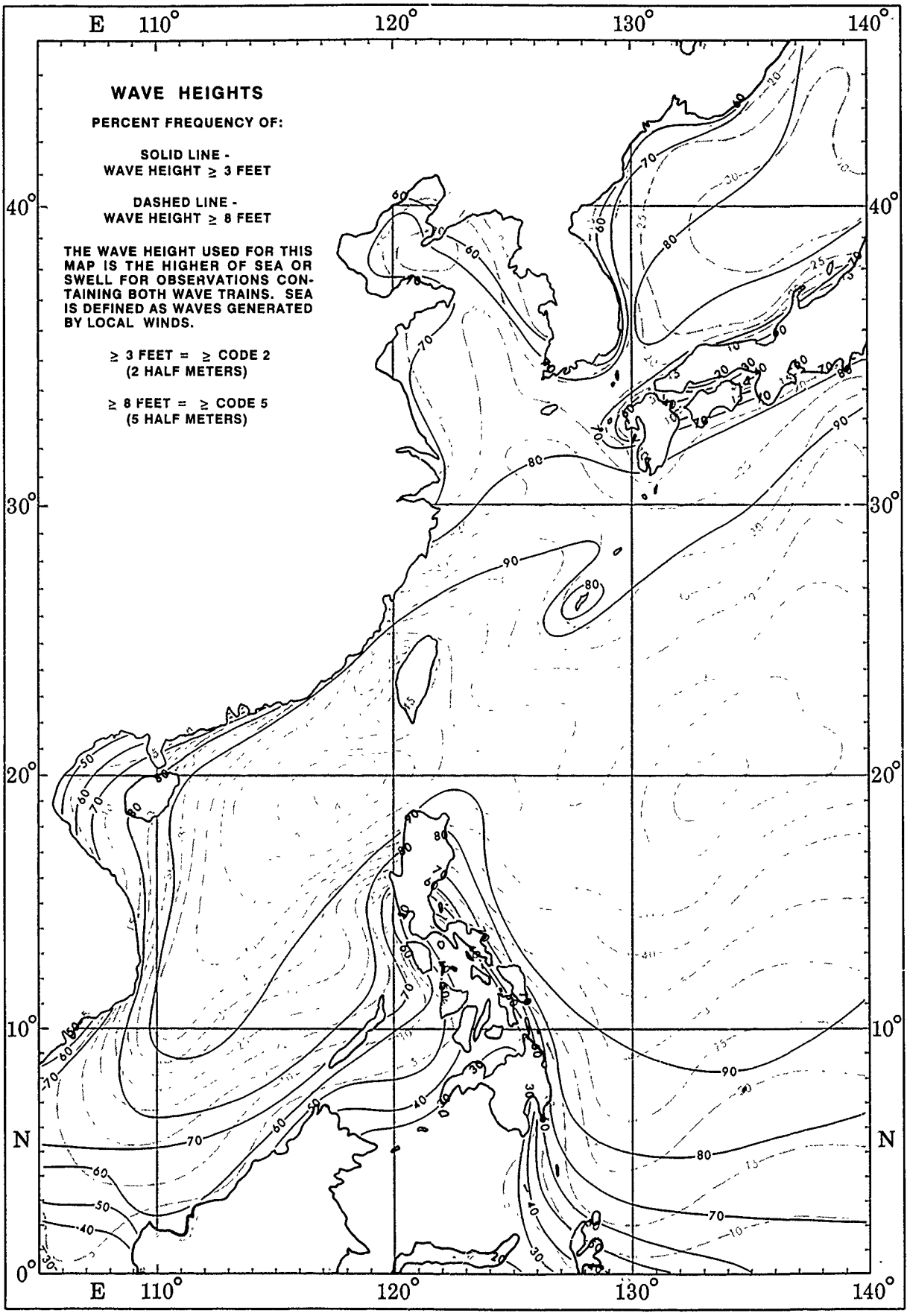

SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE ≈ 20%
25% OF ALL WINDS WERE FROM NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR: MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
PERCENT OF CALMS.
285/71
MEAN SCALAR SPEED.
OBSERVATION COUNT.
120° E 125° 130°
40°
35°
N

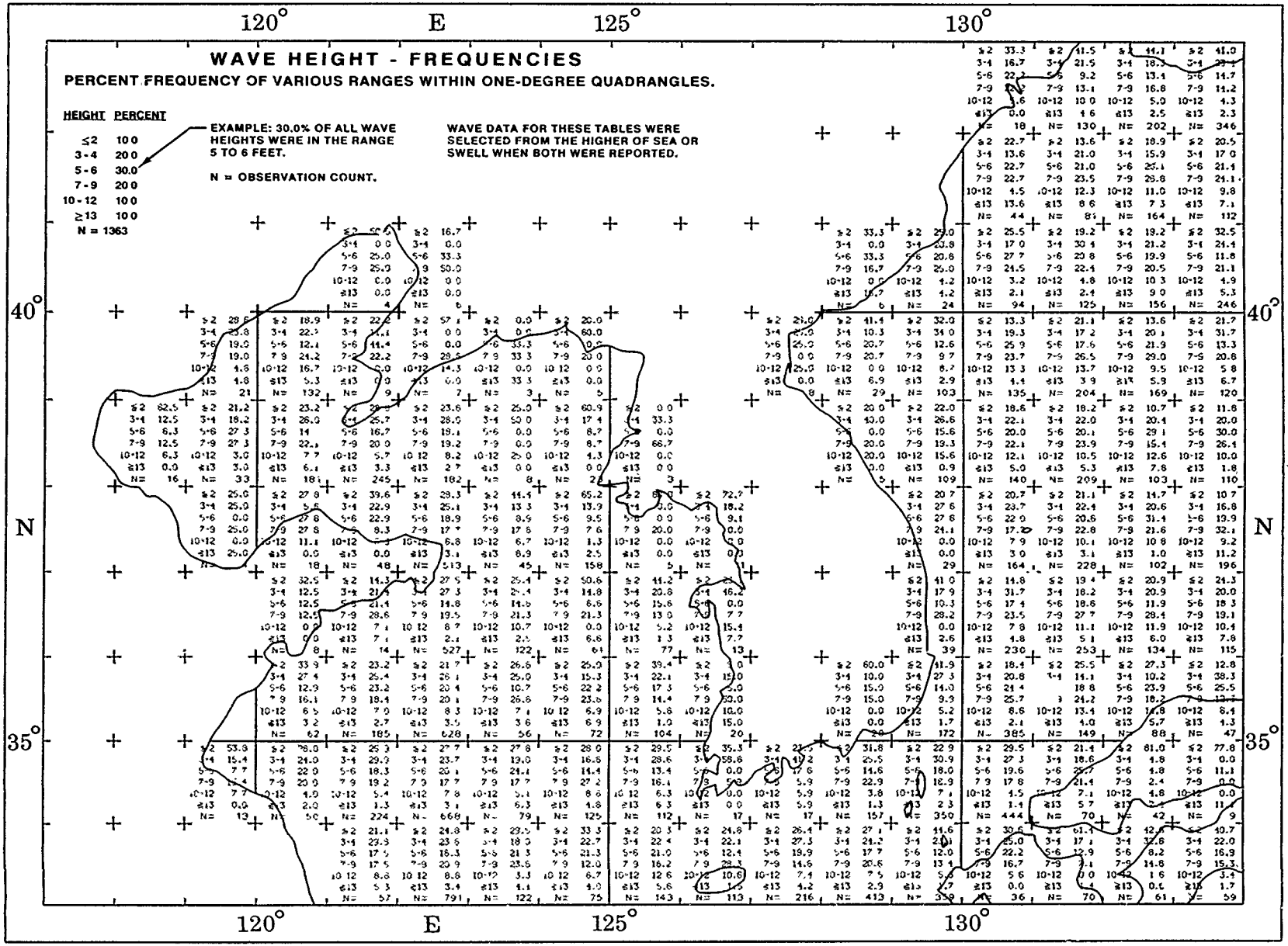

120°
125°
130°
E
30°
25°
N

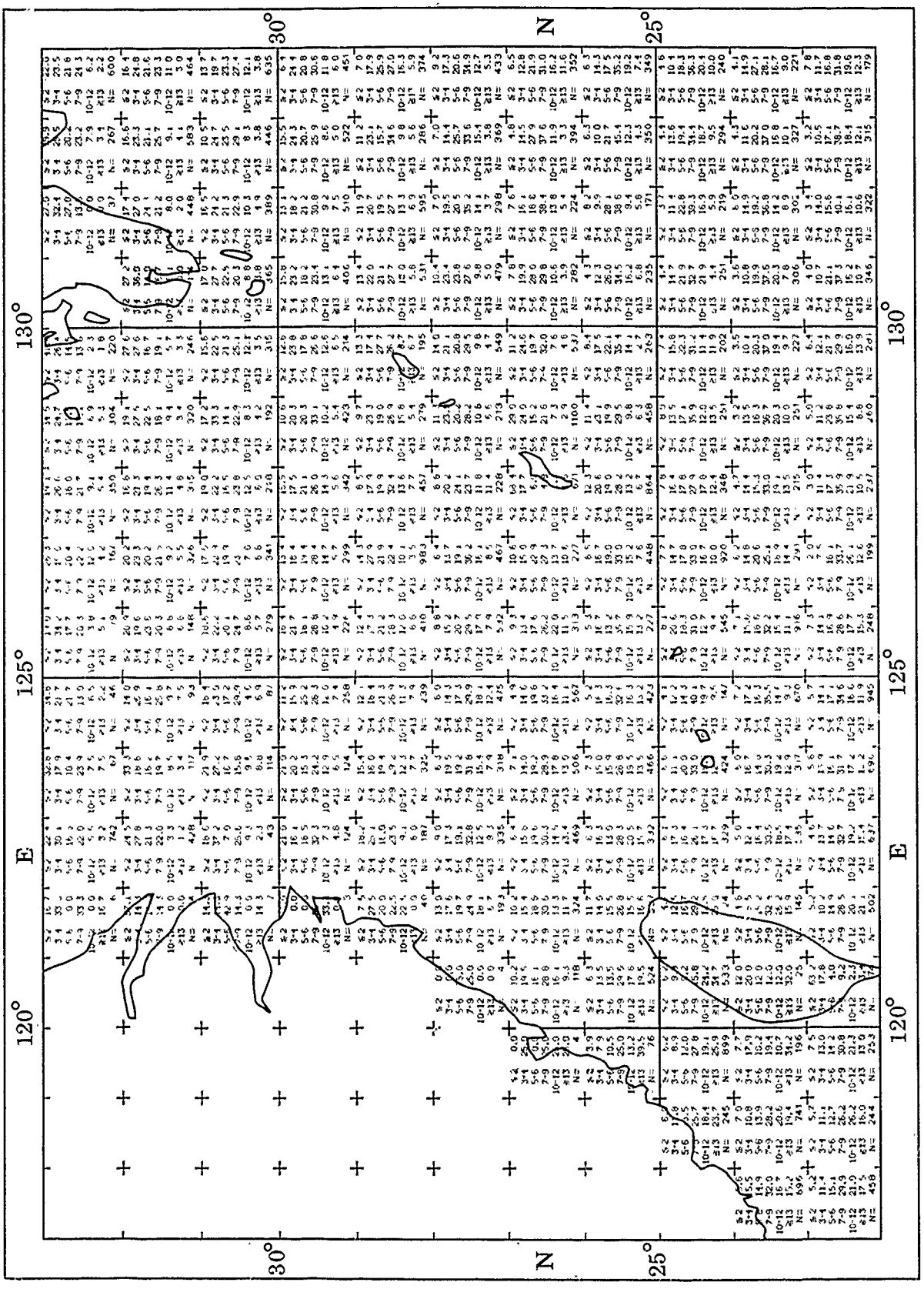

SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR: MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
25% OF ALL WINDS WERE FROM NORTH.
PERCENT OF CALMS.
MEAN SCALAR SPEED.
OBSERVATION COUNT.
285/7.1
110° E
115°
120°
105°
25°
20°
15°
N

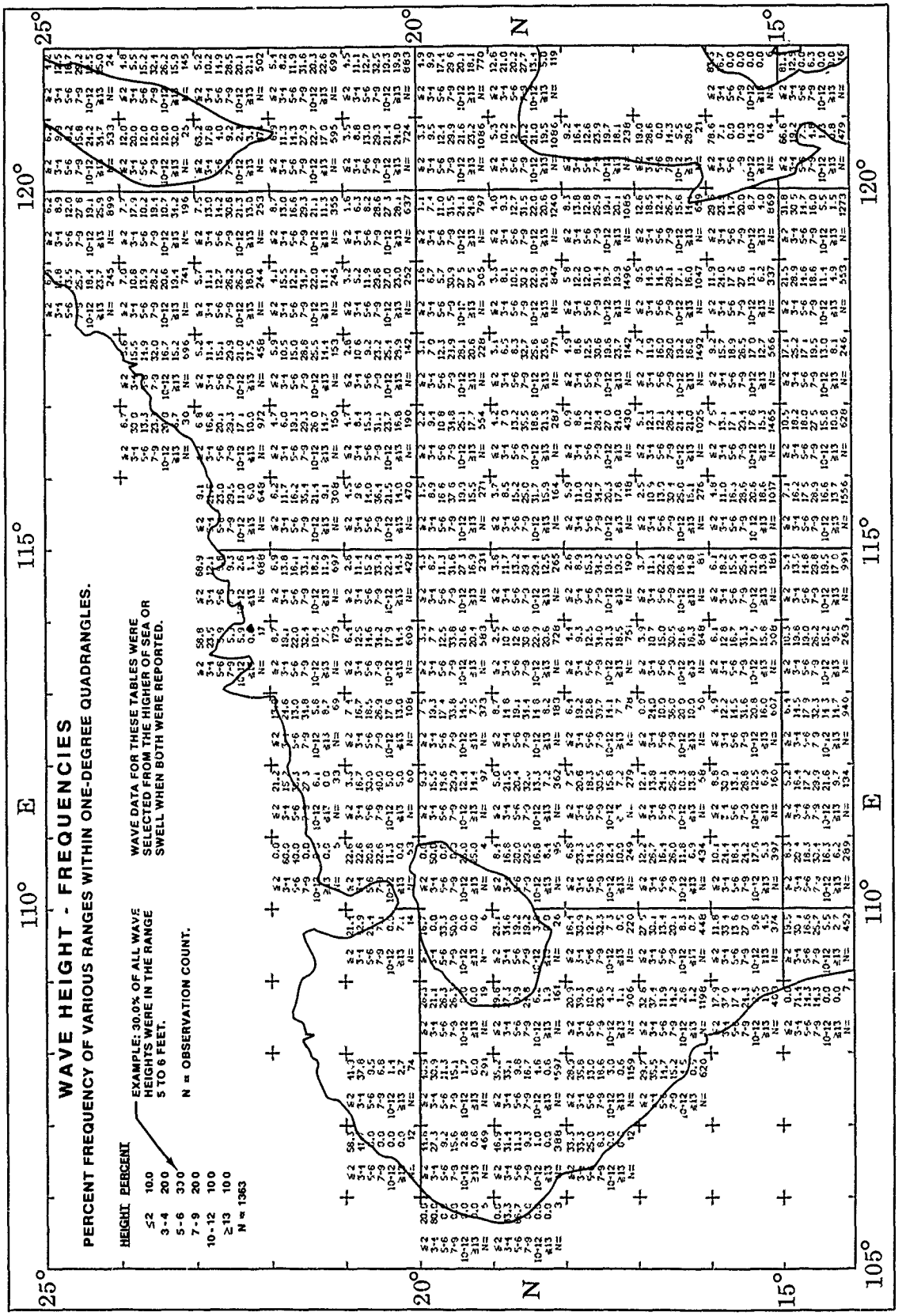

105°
110°
115°
120°
E
10°
5°
N

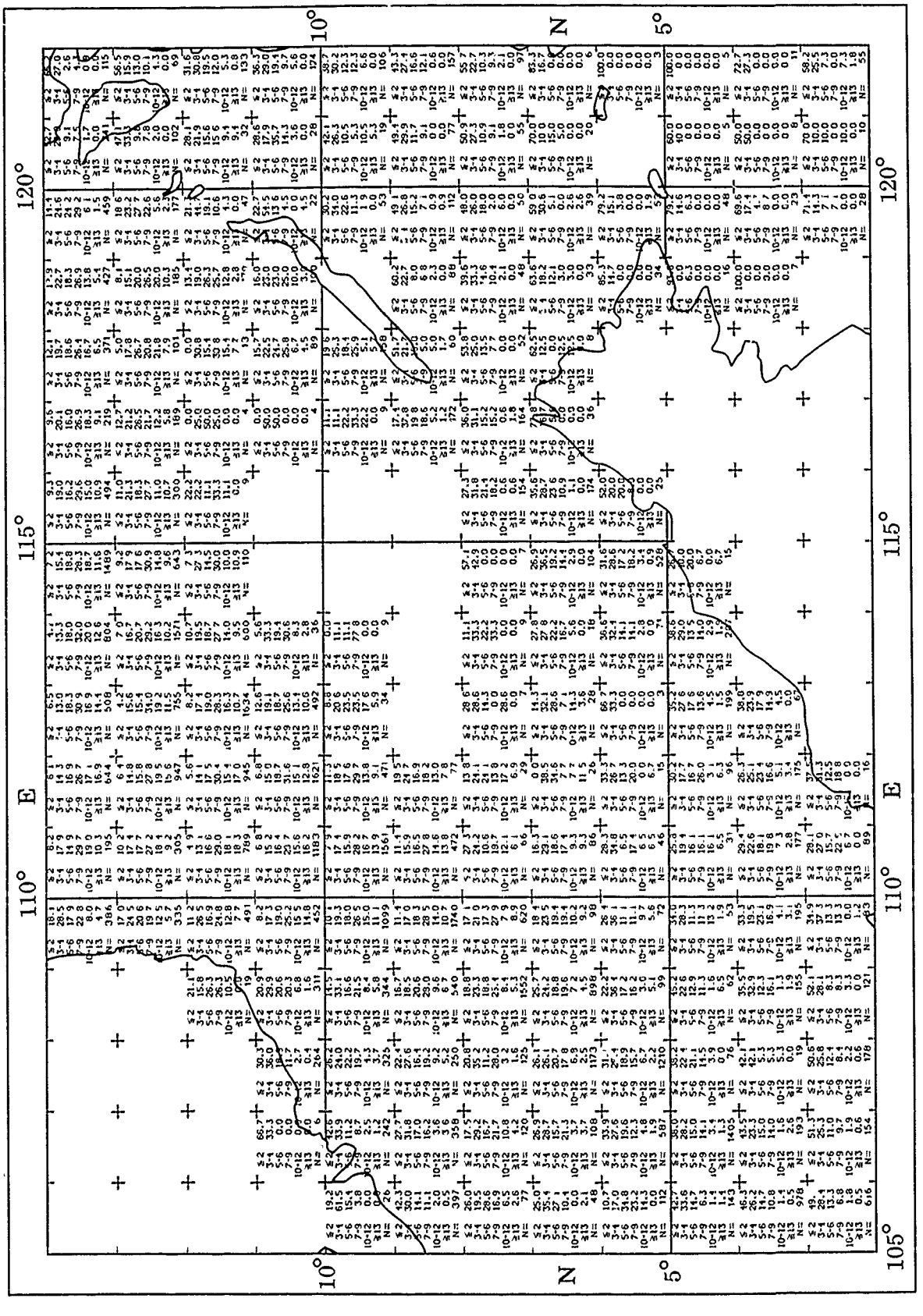

AIR AND SEA TEMPERATURE
SOLID LINE - MEAN AIR TEMPERATURE (°F)
DASHED LINE - MEAN SEA SURFACE TEMPERATURE (°F)
E 110°
120°
130°
140°
40°
30°
20°
10°
N
0°

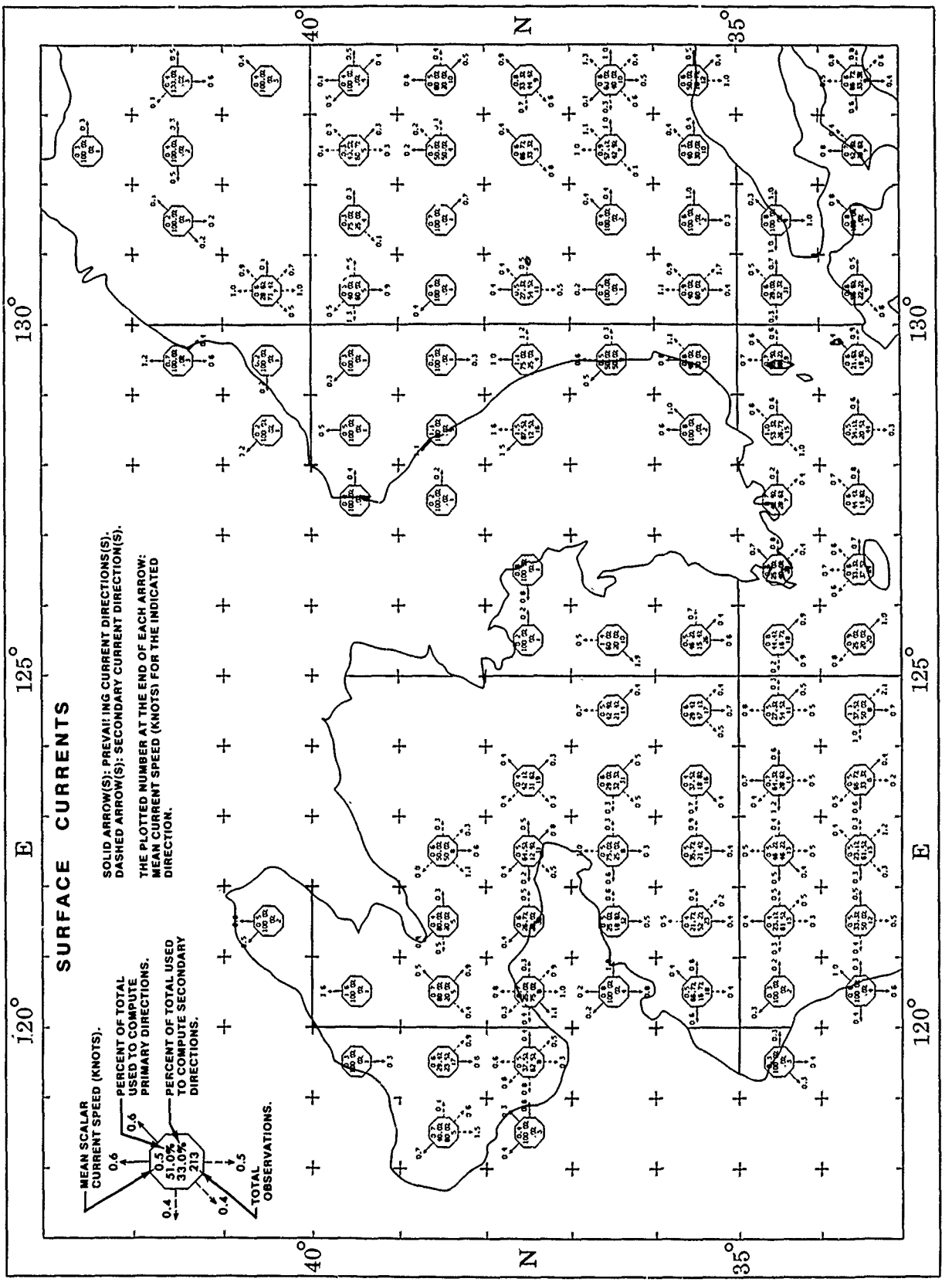

WAVE HEIGHTS
PERCENT FREQUENCY OF:
SOLID LINE -
WAVE HEIGHT ≥ 3 FEET
DASHED LINE -
WAVE HEIGHT ≥ 8 FEET
THE WAVE HEIGHT USED FOR THIS MAP IS THE HIGHER OF SEA OR SWELL FOR OBSERVATIONS CONTAINING BOTH WAVE TRAINS. SEA IS DEFINED AS WAVES GENERATED BY LOCAL WINDS.
≥ 3 FEET = ≥ CODE 2
(2 HALF METERS)
≥ 8 FEET = ≥ CODE 5
(5 HALF METERS)
E 110° 120° 130° 140°
40° 30° 20° 10° N 0°

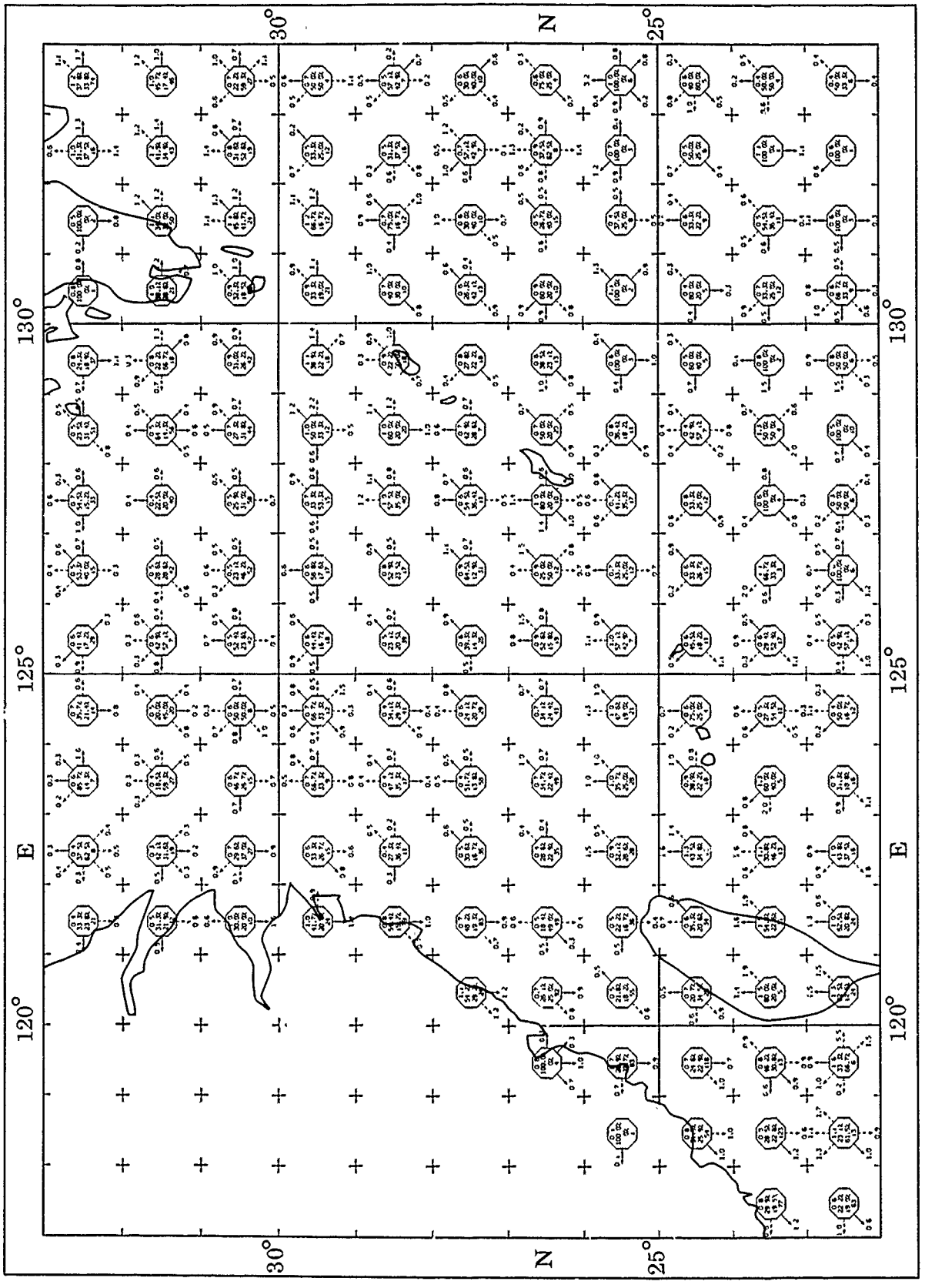

WAVE HEIGHT - FREQUENCIES
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
HEIGHT PERCENT
≤2 10.0
3-4 20.0
5-6 30.0
7-9 20.0
10-12 10.0
≥13 10.0
N = 1363
EXAMPLE: 30.0% OF ALL WAVE HEIGHTS WERE IN THE RANGE 5 TO 6 FEET.
N = OBSERVATION COUNT.
WAVE DATA FOR THESE TABLES WERE SELECTED FROM THE HIGHER OF SEA OR SWELL WHEN BOTH WERE REPORTED.
120° E 125° 130°
40° N 35°

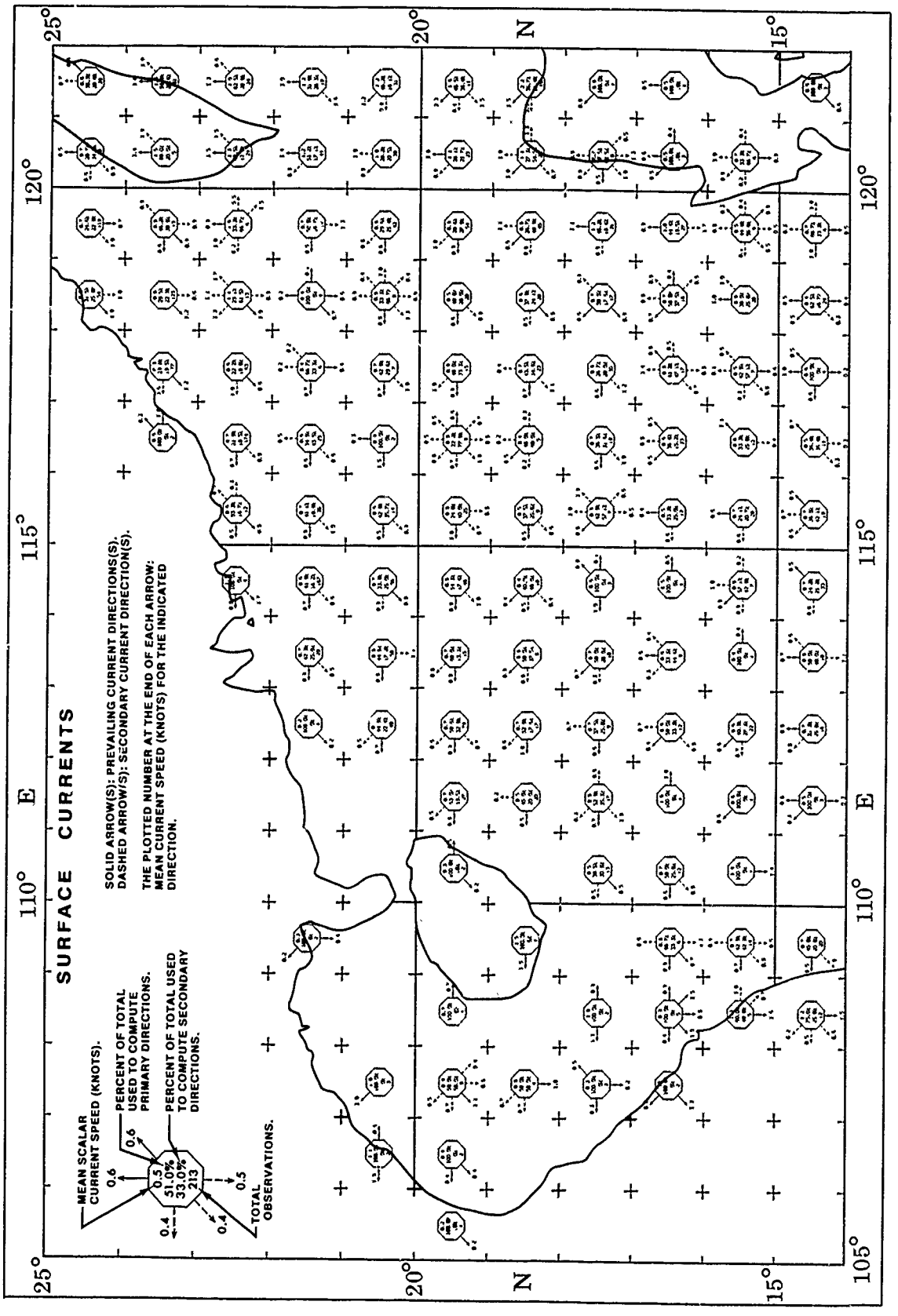

120°
125°
130°
E
30°
25°
N

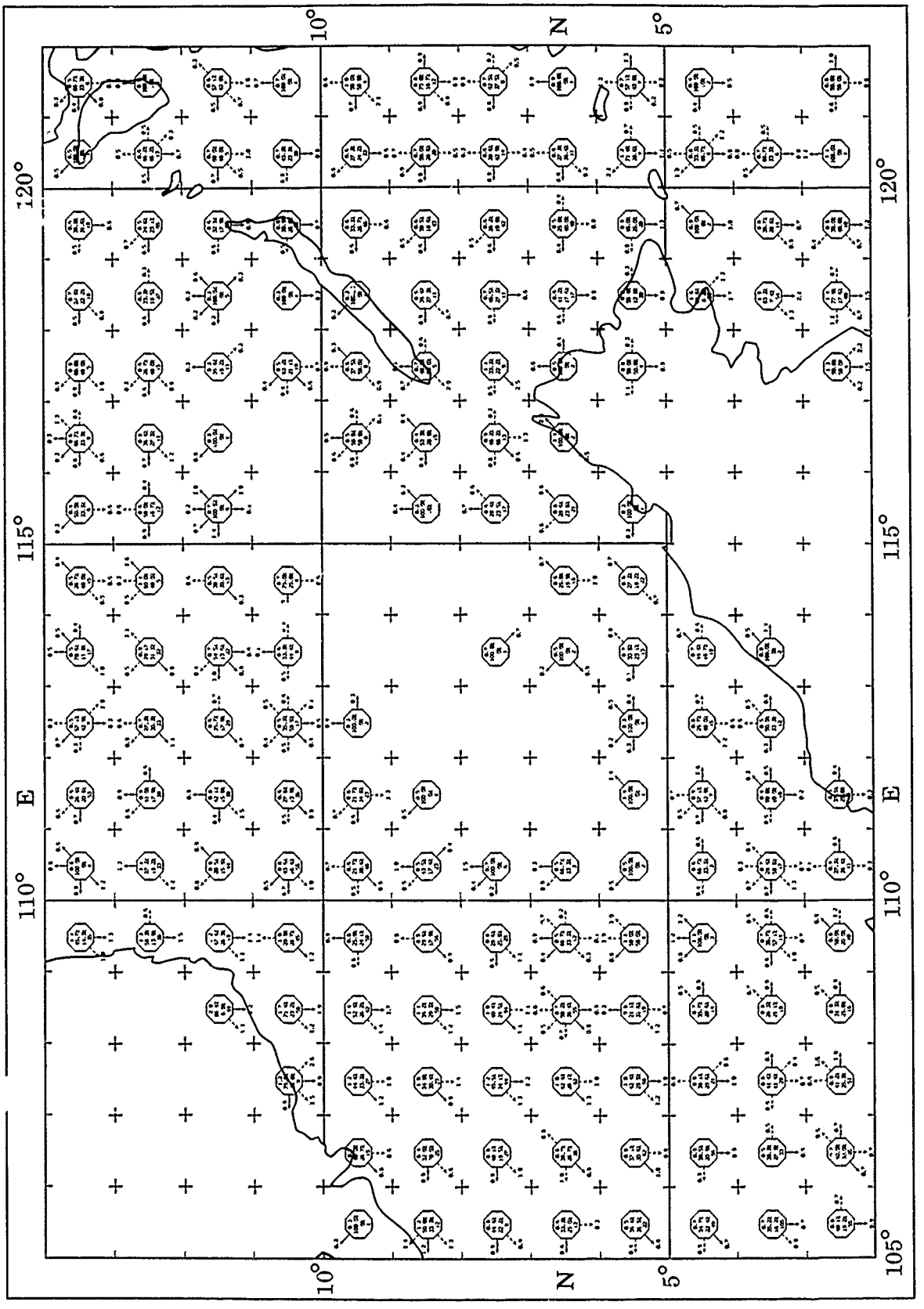

WAVE HEIGHT - FREQUENCIES
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
HEIGHT PERCENT
≤2 10.0
3-4 20.0
5-6 33.0
7-9 20.0
10-12 10.0
≥13 10.0
N = 1363
EXAMPLE: 30.0% OF ALL WAVE HEIGHTS WERE IN THE RANGE 5 TO 6 FEET.
N = OBSERVATION COUNT.
WAVE DATA FOR THESE TABLES WERE SELECTED FROM THE HIGHER OF SEA OR SWELL WHEN BOTH WERE REPORTED.
105°
110°
115°
120°
25°
20°
15°
N
E

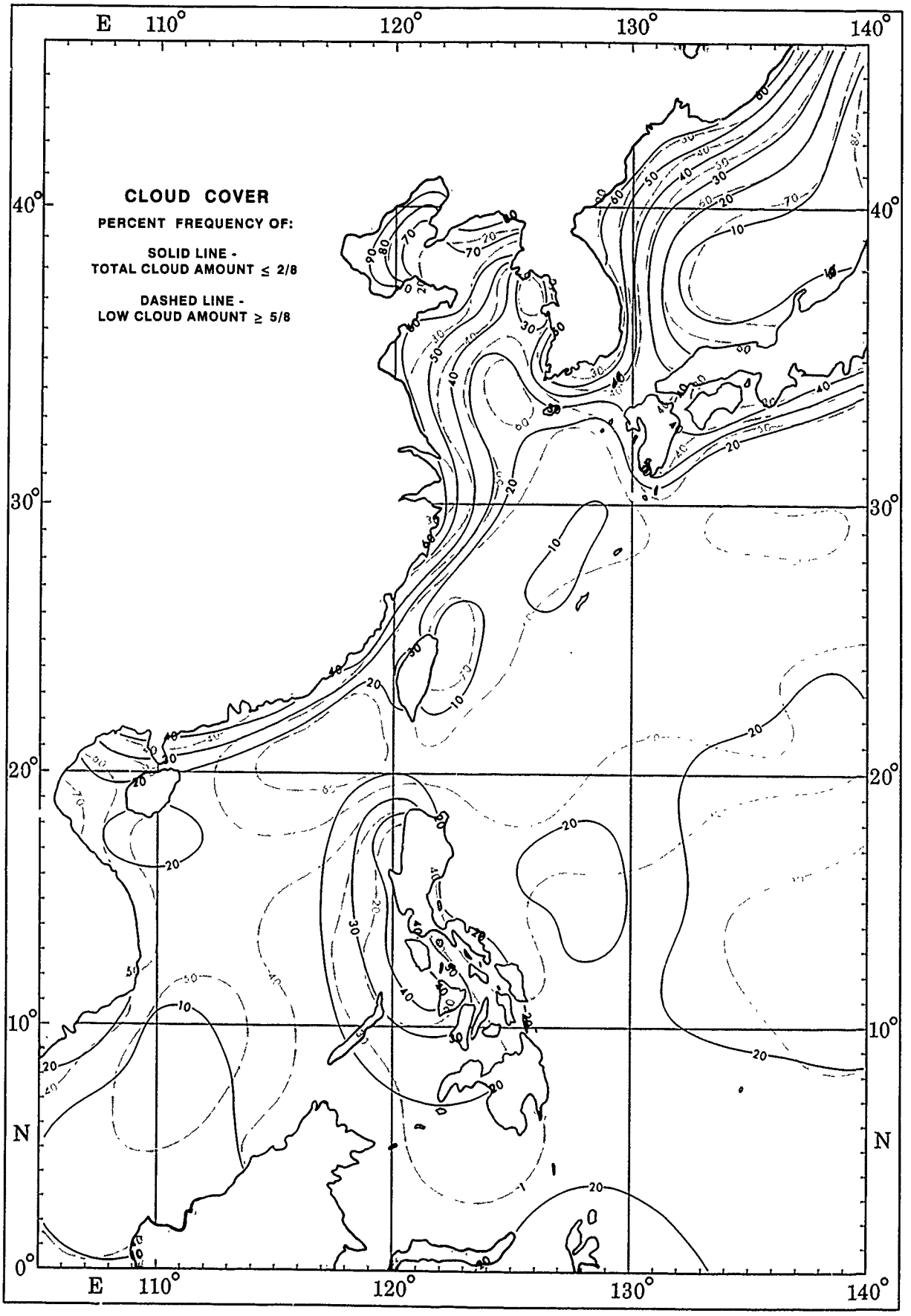

10°
N
5°
120°
115°
110°
E
105°

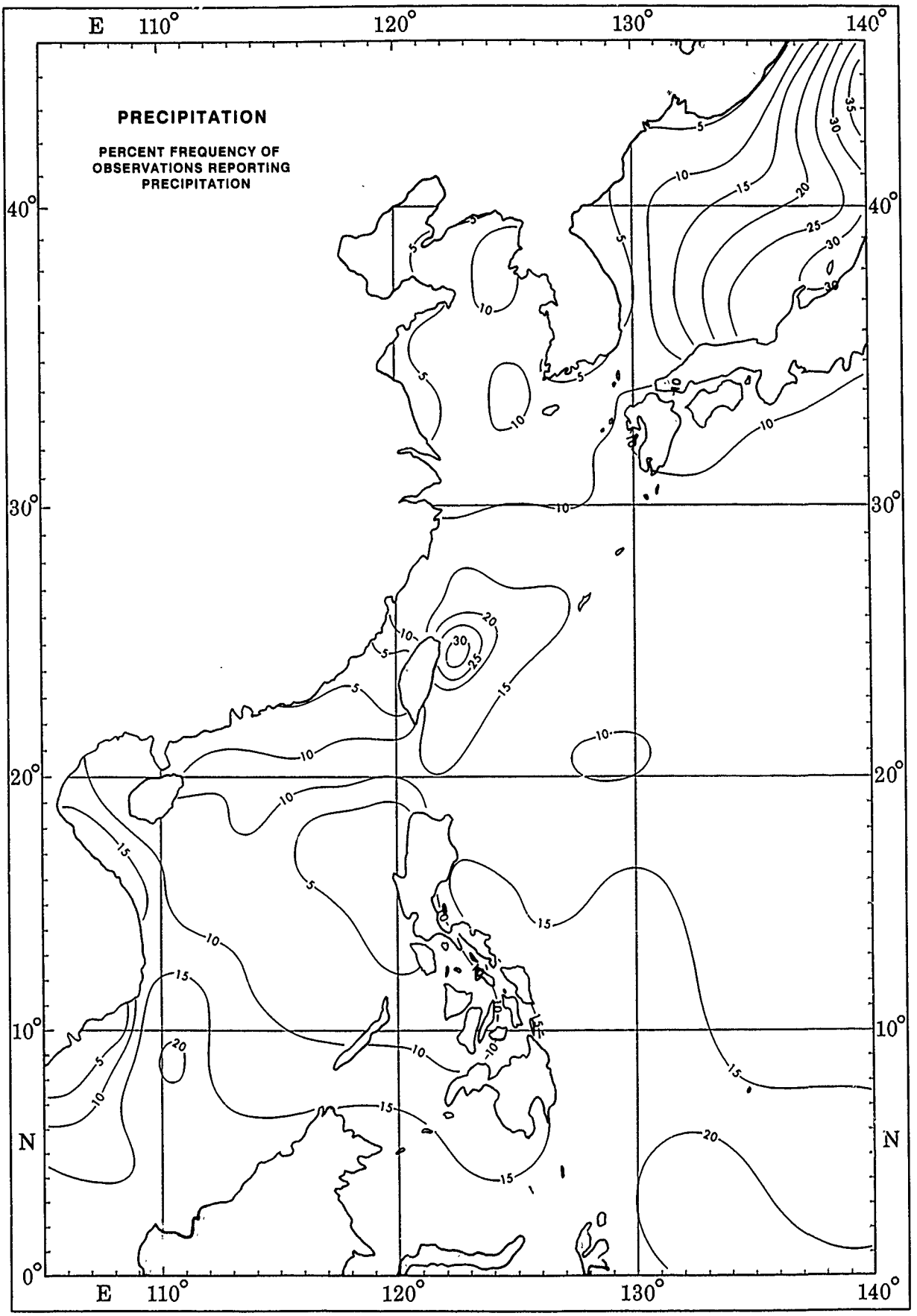

SURFACE CURRENTS
SOLID ARROW(S): PREVAILING CURRENT DIRECTIONS(S).
DASHED ARROW(S): SECONDARY CURRENT DIRECTION(S).
THE PLOTTED NUMBER AT THE END OF EACH ARROW: MEAN CURRENT SPEED (KNOTS) FOR THE INDICATED DIRECTION.
MEAN SCALAR CURRENT SPEED (KNOTS).
PERCENT OF TOTAL USED TO COMPUTE PRIMARY DIRECTIONS.
PERCENT OF TOTAL USED TO COMPUTE SECONDARY DIRECTIONS.
TOTAL OBSERVATIONS.
0.6
0.5
51.0%
33.0%
213
0.4
0.5
0.4
120° E
125° E
130° E
40° N
35° N

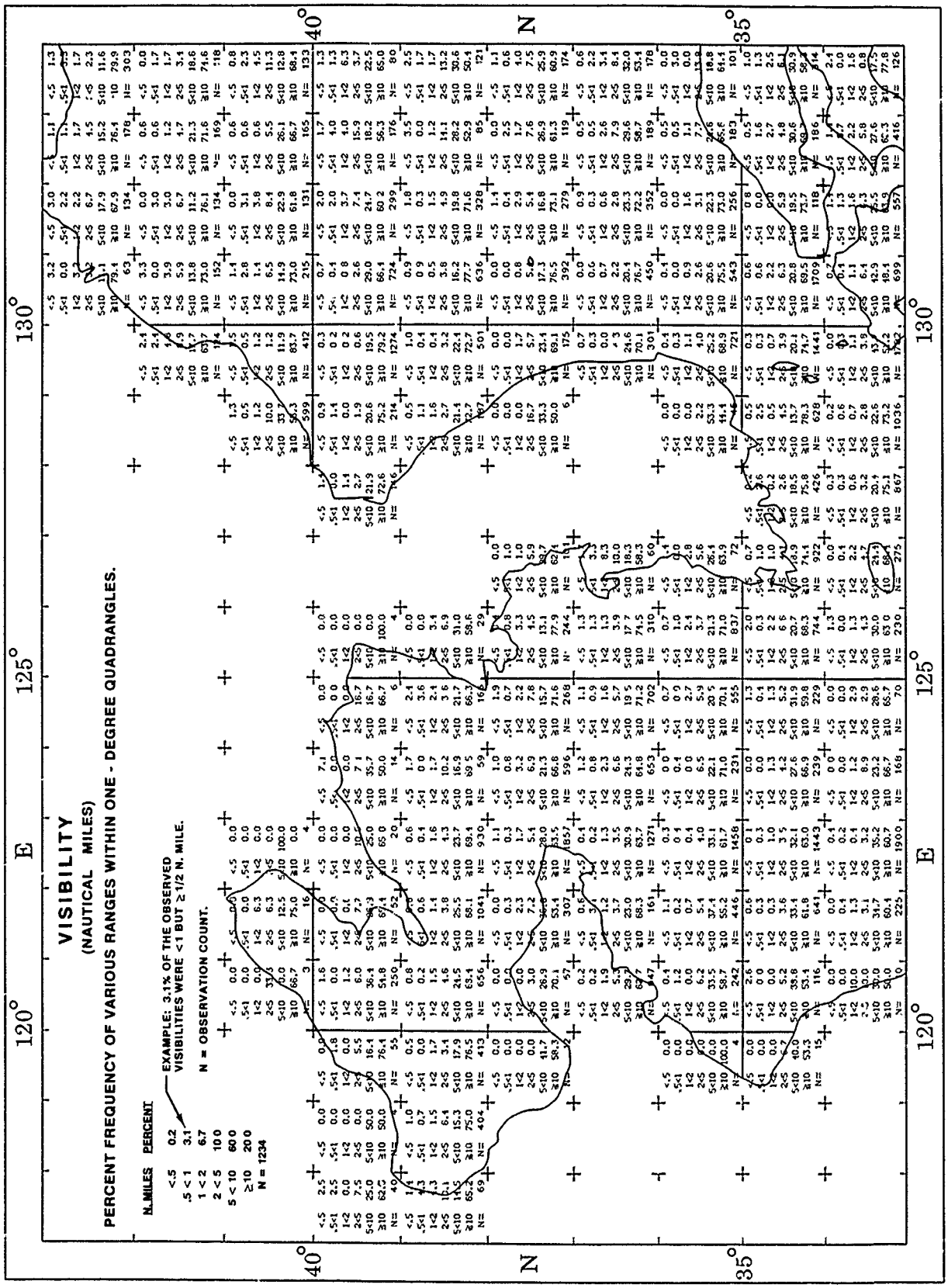

30° N
25°
130°
125°
120° E

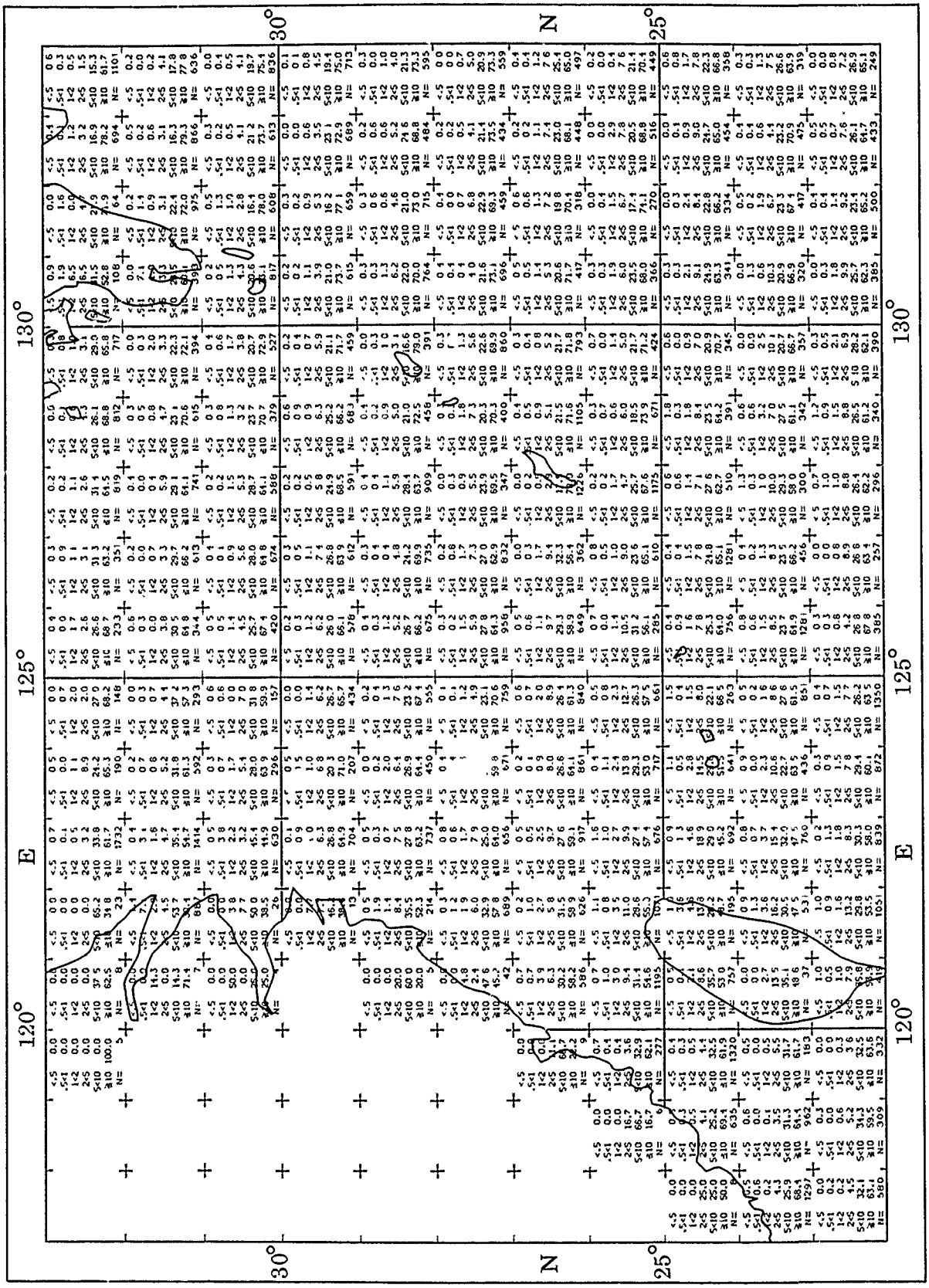

SURFACE CURRENTS
SOLID ARROW(S): PREVAILING CURRENT DIRECTIONS(S).
DASHED ARROW(S): SECONDARY CURRENT DIRECTION(S).
THE PLOTTED NUMBER AT THE END OF EACH ARROW: MEAN CURRENT SPEED (KNOTS) FOR THE INDICATED DIRECTION.
MEAN SCALAR CURRENT SPEED (KNOTS).
PERCENT OF TOTAL USED TO COMPUTE PRIMARY DIRECTIONS.
PERCENT OF TOTAL USED TO COMPUTE SECONDARY DIRECTIONS.
TOTAL OBSERVATIONS.
0.6
0.6
0.5
51.0%
33.0%
213
0.5
0.4
0.4
25°
20°
15°
N
120°
115°
110°
105° E

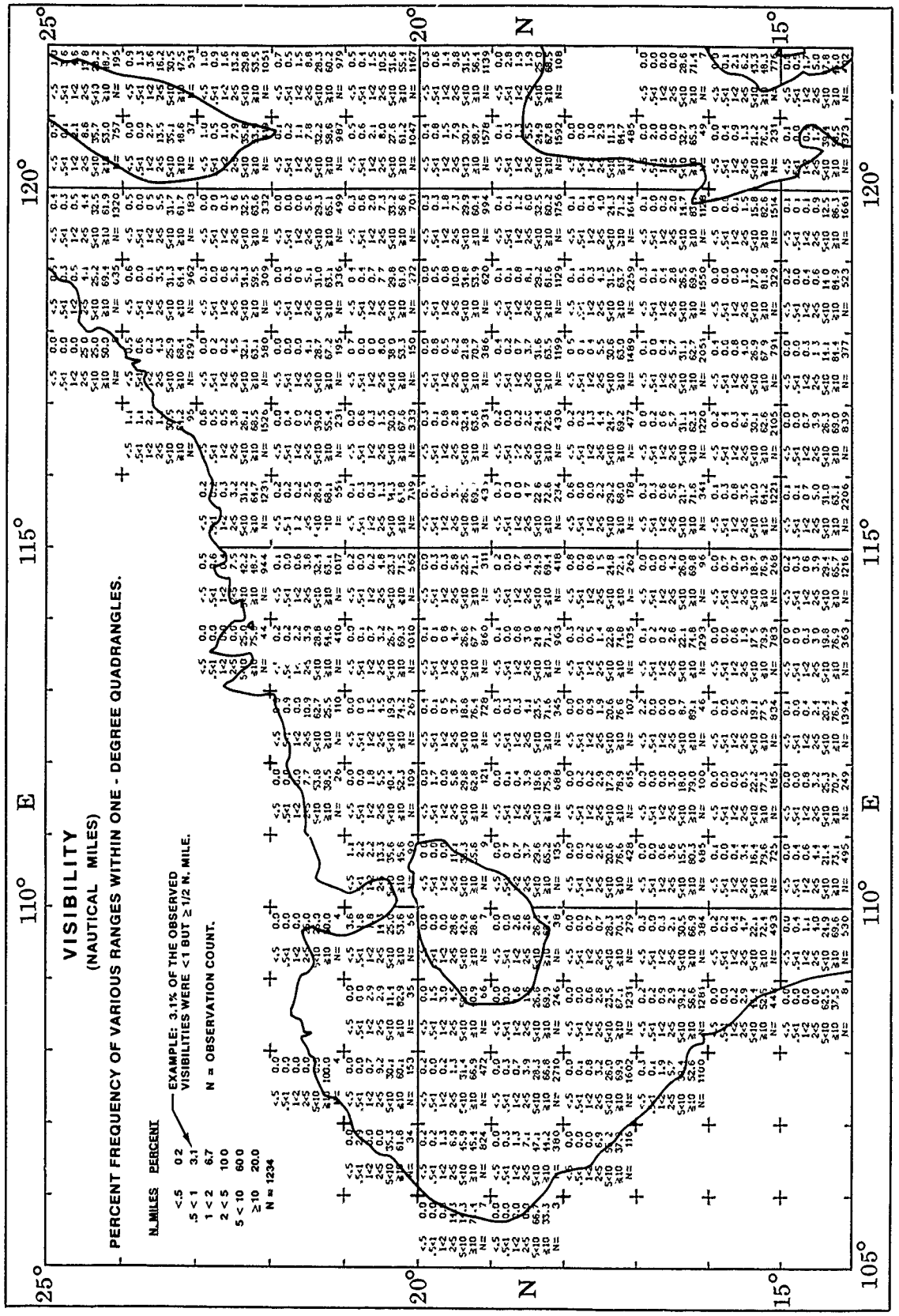

10° N
5°
120°
115°
110° E
105°
10° N
5°
120°
115°
110° E

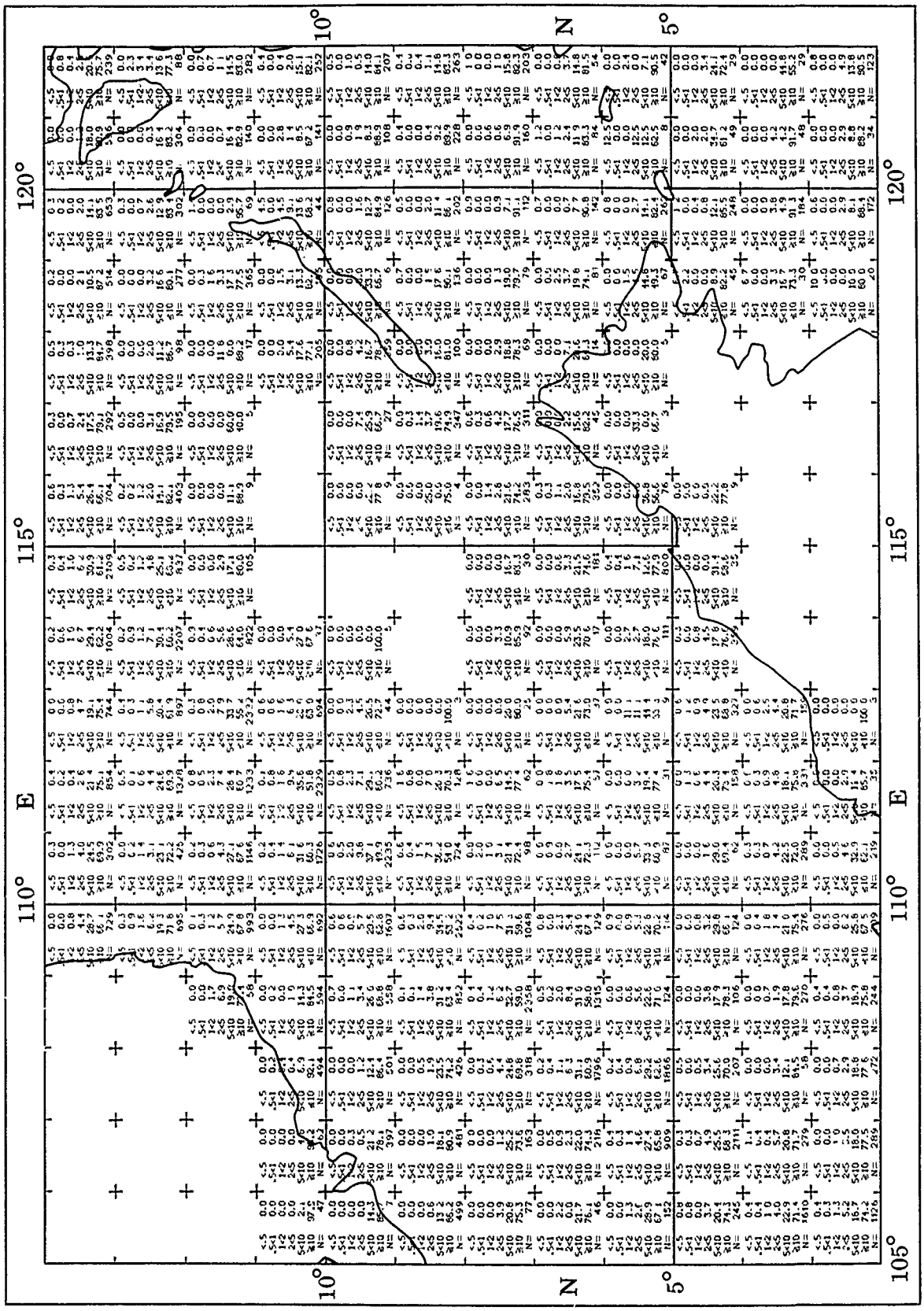

CLOUD COVER
PERCENT FREQUENCY OF:
SOLID LINE -
TOTAL CLOUD AMOUNT ≤ 2/8
DASHED LINE -
LOW CLOUD AMOUNT ≥ 5/8
E 110°
120°
130°
140°
40°
30°
20°
10°
N
0°


PRECIPITATION
PERCENT FREQUENCY OF OBSERVATIONS REPORTING PRECIPITATION
E 110°
120°
130°
140°
40°
30°
20°
10°
N
0°


VISIBILITY
(NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE - DEGREE QUADRANGLES.
N. MILES PERCENT
<.5 0.2
.5 < 1 3.1
1 < 2 6.7
2 < 5 10.0
5 < 10 60.0
≥10 20.0
N = 1234
EXAMPLE: 3.1% OF THE OBSERVED VISIBILITIES WERE <1 BUT ≥ 1/2 N. MILE.
N = OBSERVATION COUNT.
120°
125°
130°
35°
40°
N
E

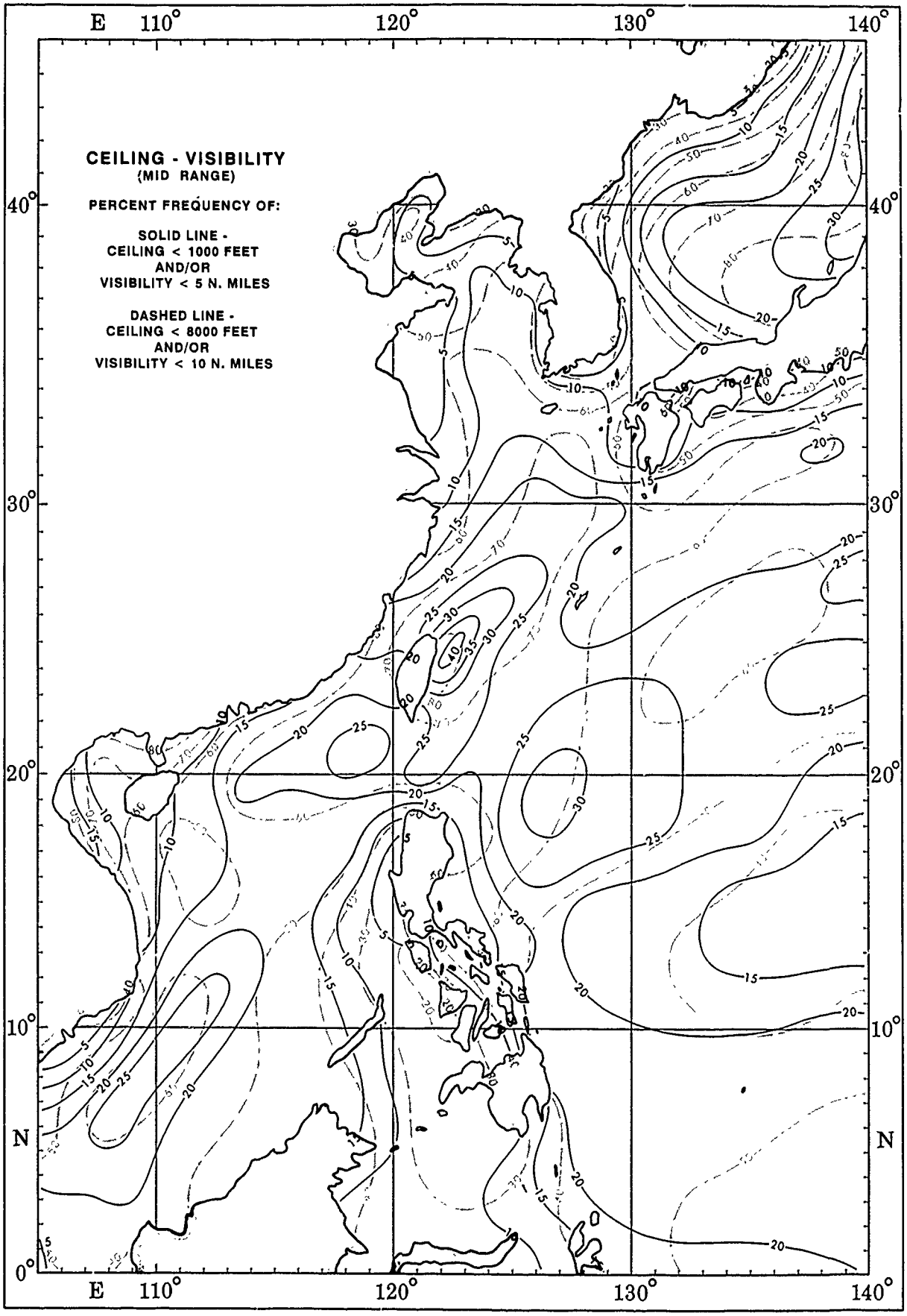

120°
125°
130°
E
30°
25°
N

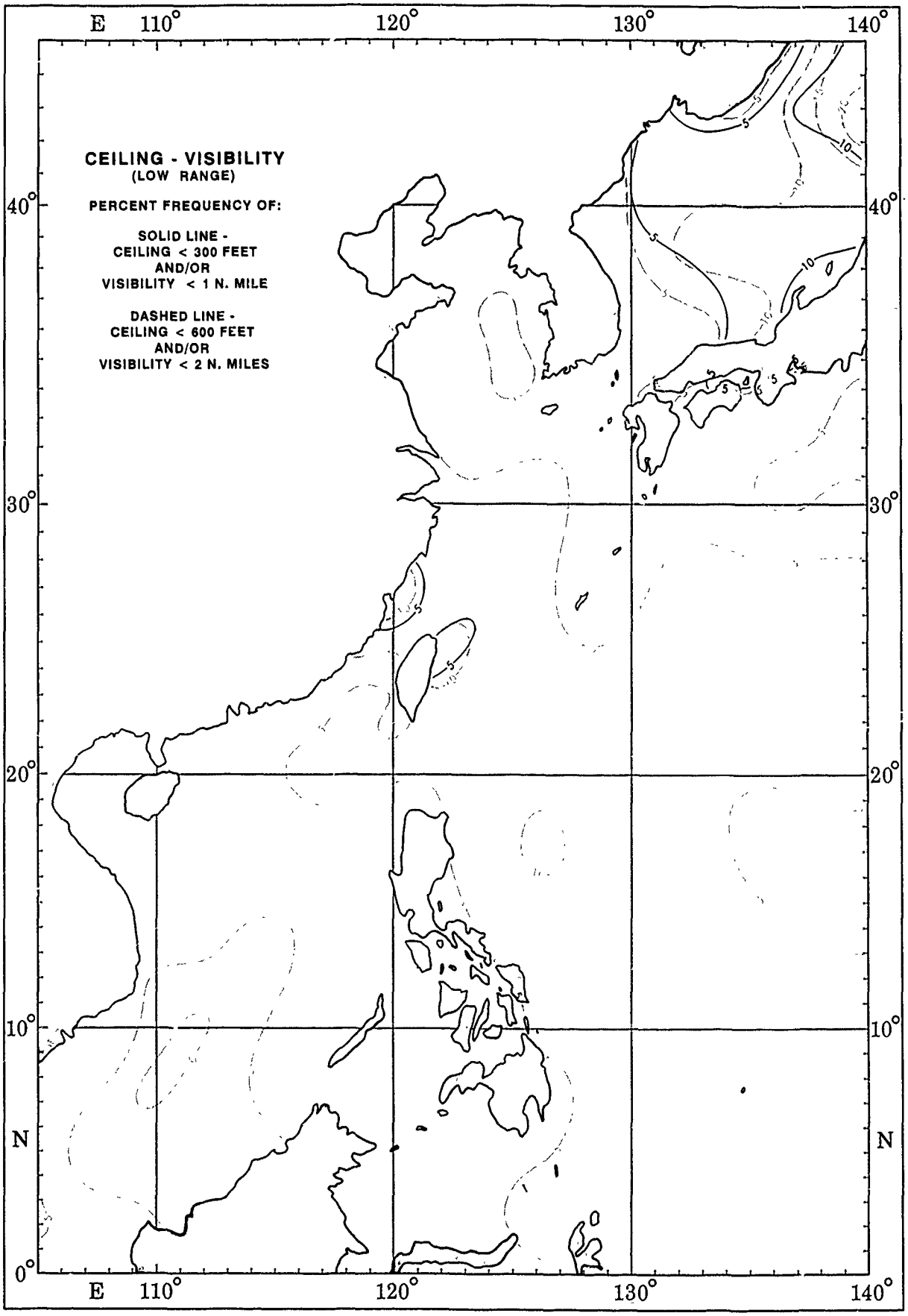

VISIBILITY
(NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE - DEGREE QUADRANGLES.
N. MILES PERCENT
<.5 0.2
.5 < 1 3.1
1 < 2 6.7
2 < 5 10.0
5 < 10 60.0
≥10 20.0
N = 1234
EXAMPLE: 3.1% OF THE OBSERVED VISIBILITIES WERE <1 BUT ≥1/2 N. MILE.
N = OBSERVATION COUNT.
25°
20°
15°
N
105°
110°
115°
120°
E

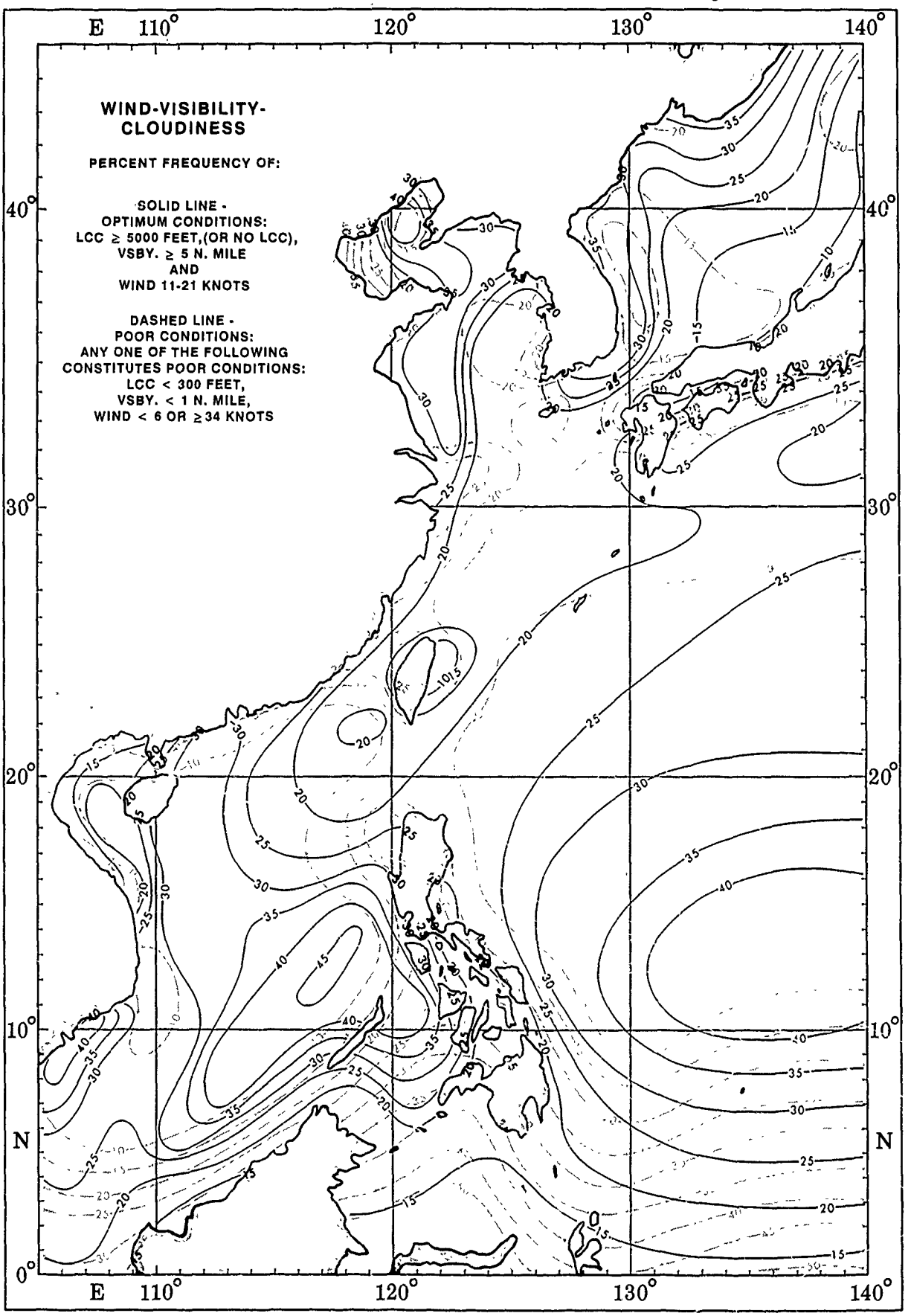

120°
115°
110°
105°
E
10°
5°
N

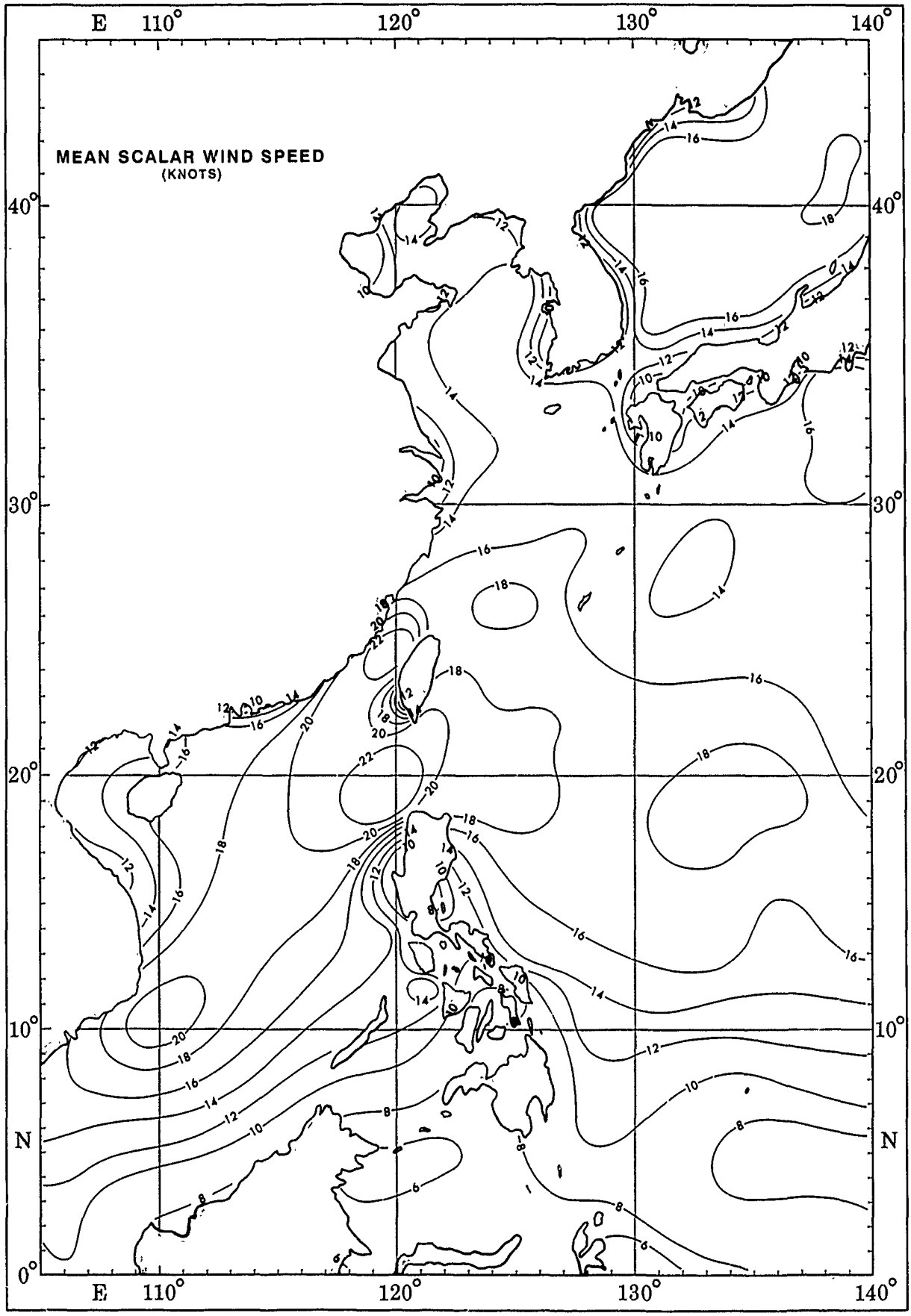
December

Ceiling - Visibility (Mid Range)



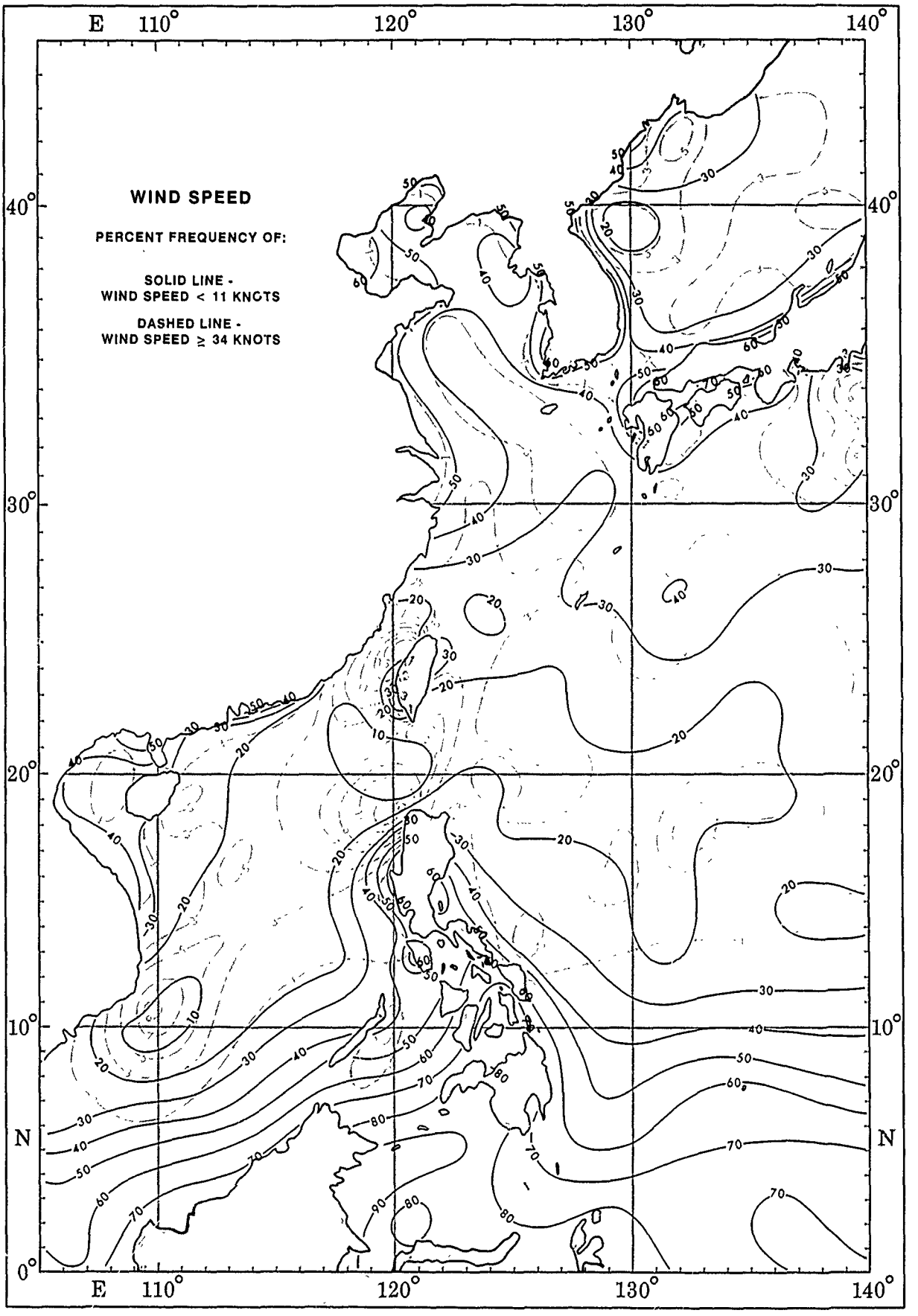

CEILING - VISIBILITY
(LOW RANGE)
PERCENT FREQUENCY OF:
SOLID LINE -
CEILING < 300 FEET
AND/OR
VISIBILITY < 1 N. MILE
DASHED LINE -
CEILING < 600 FEET
AND/OR
VISIBILITY < 2 N. MILES
E 110° 120° 130° 140°
40°
30°
20°
10°
N
0°
5
10


WIND-VISIBILITY-
CLOUDINESS
PERCENT FREQUENCY OF:
SOLID LINE -
OPTIMUM CONDITIONS:
LCC ≥ 5000 FEET,(OR NO LCC),
VSBY. ≥ 5 N. MILE
AND
WIND 11-21 KNOTS
DASHED LINE -
POOR CONDITIONS:
ANY ONE OF THE FOLLOWING
CONSTITUTES POOR CONDITIONS:
LCC < 300 FEET,
VSBY. < 1 N. MILE,
WIND < 6 OR ≥34 KNOTS
E 110°
120°
130°
140°
40°
30°
20°
10°
N
0°


MEAN SCALAR WIND SPEED
(KNOTS)
E 110°
120°
130°
140°
40°
30°
20°
10°
N
0°

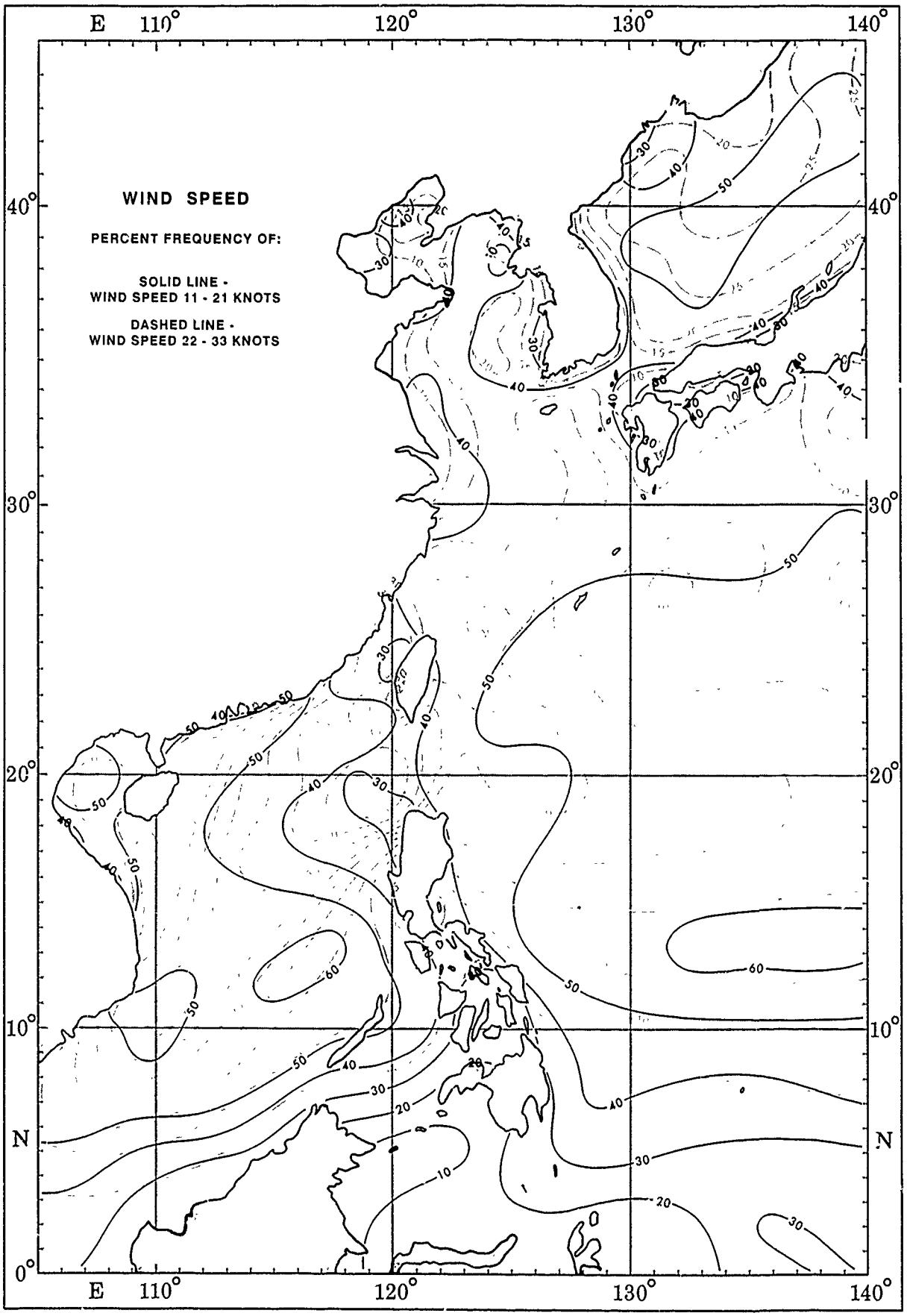
December

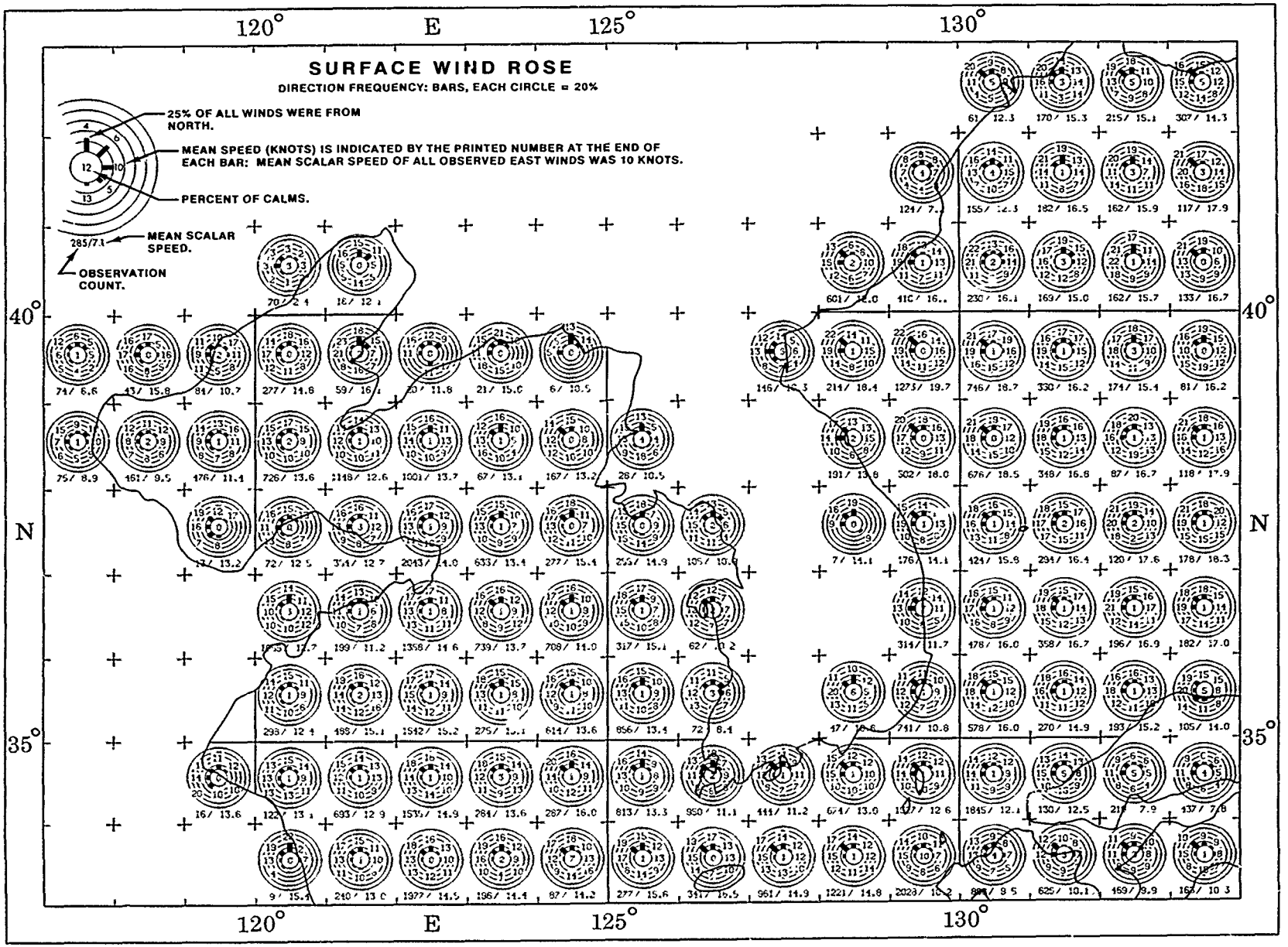
Wind Speed <11 and ≥34 Knots

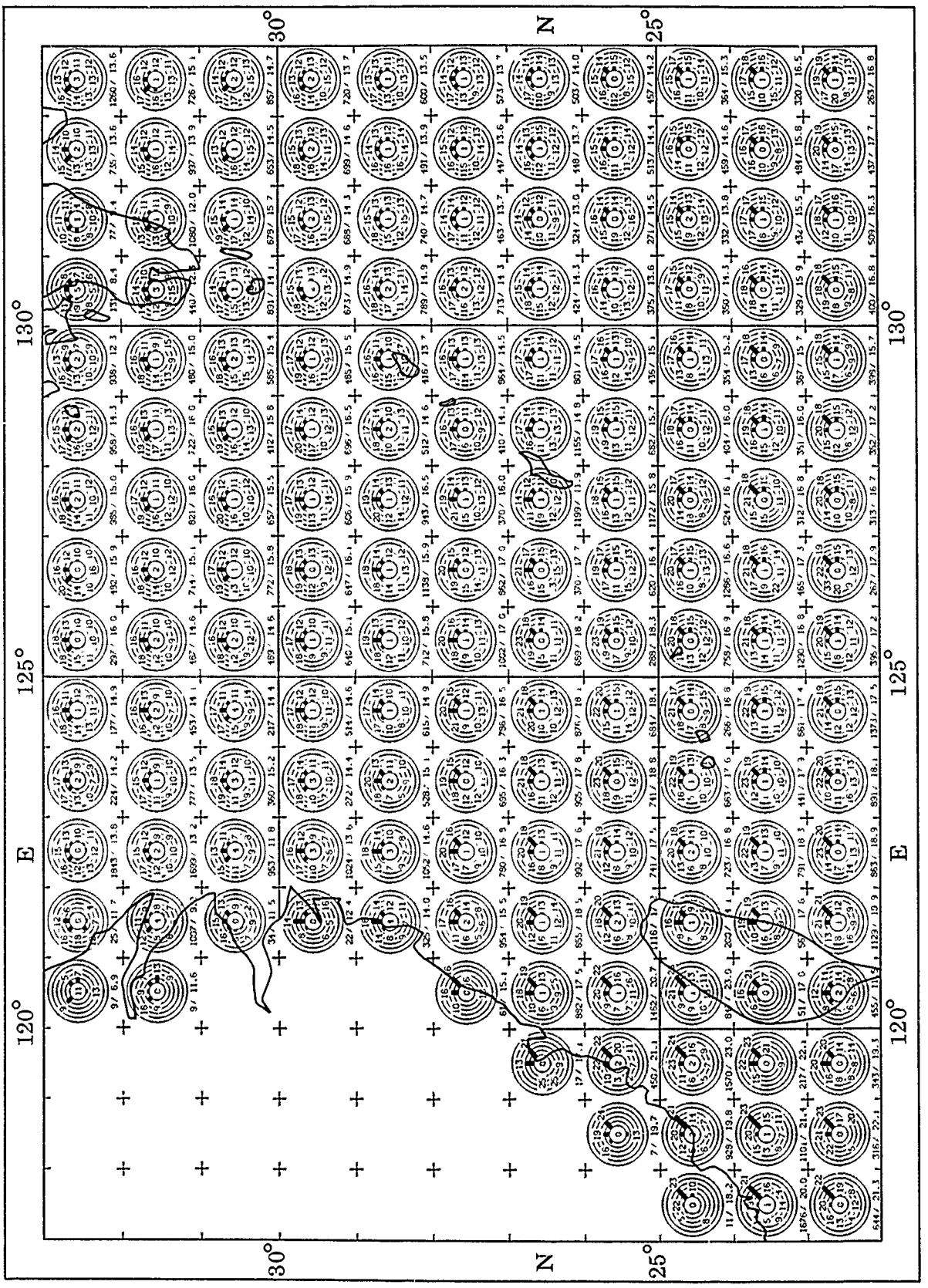


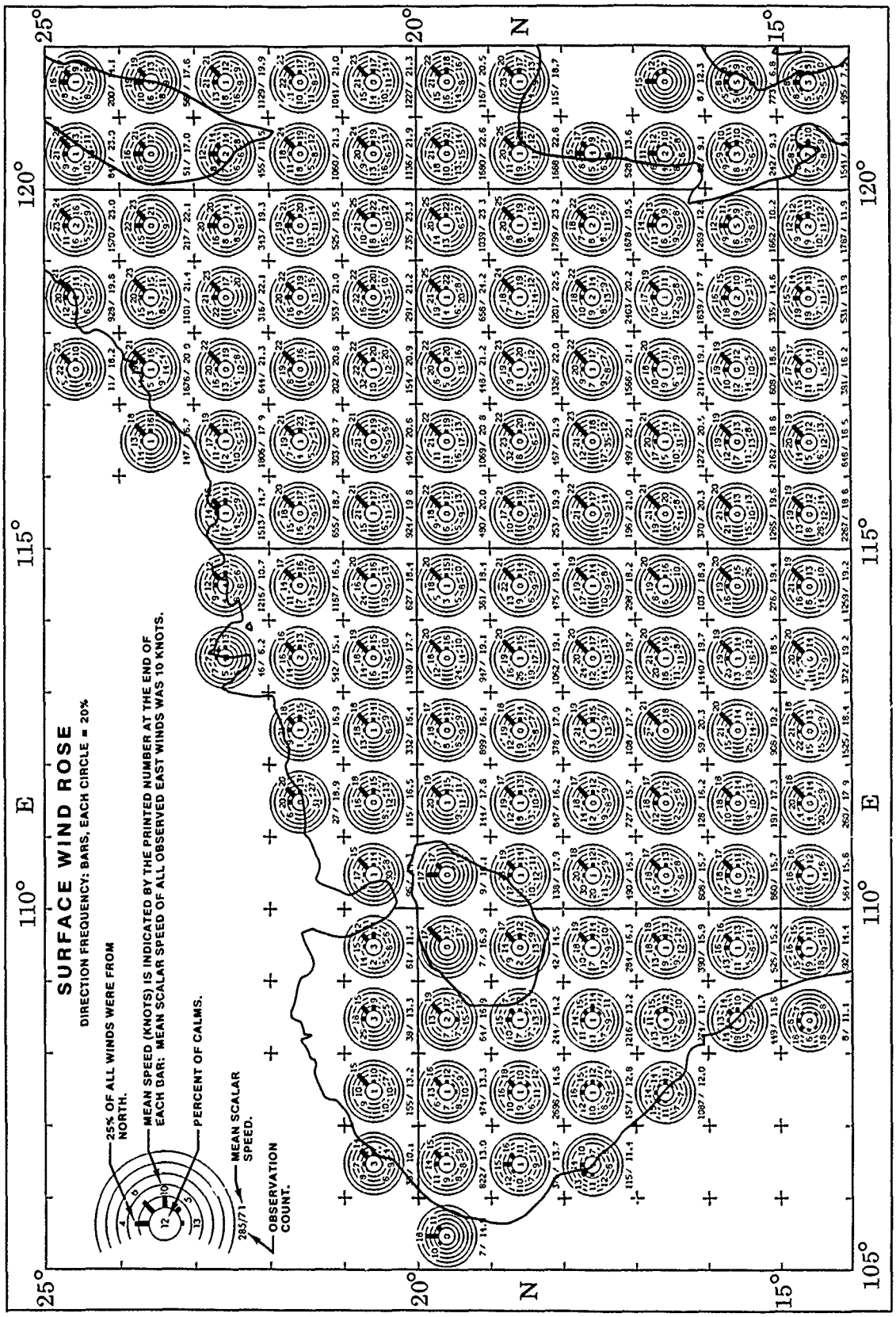
December

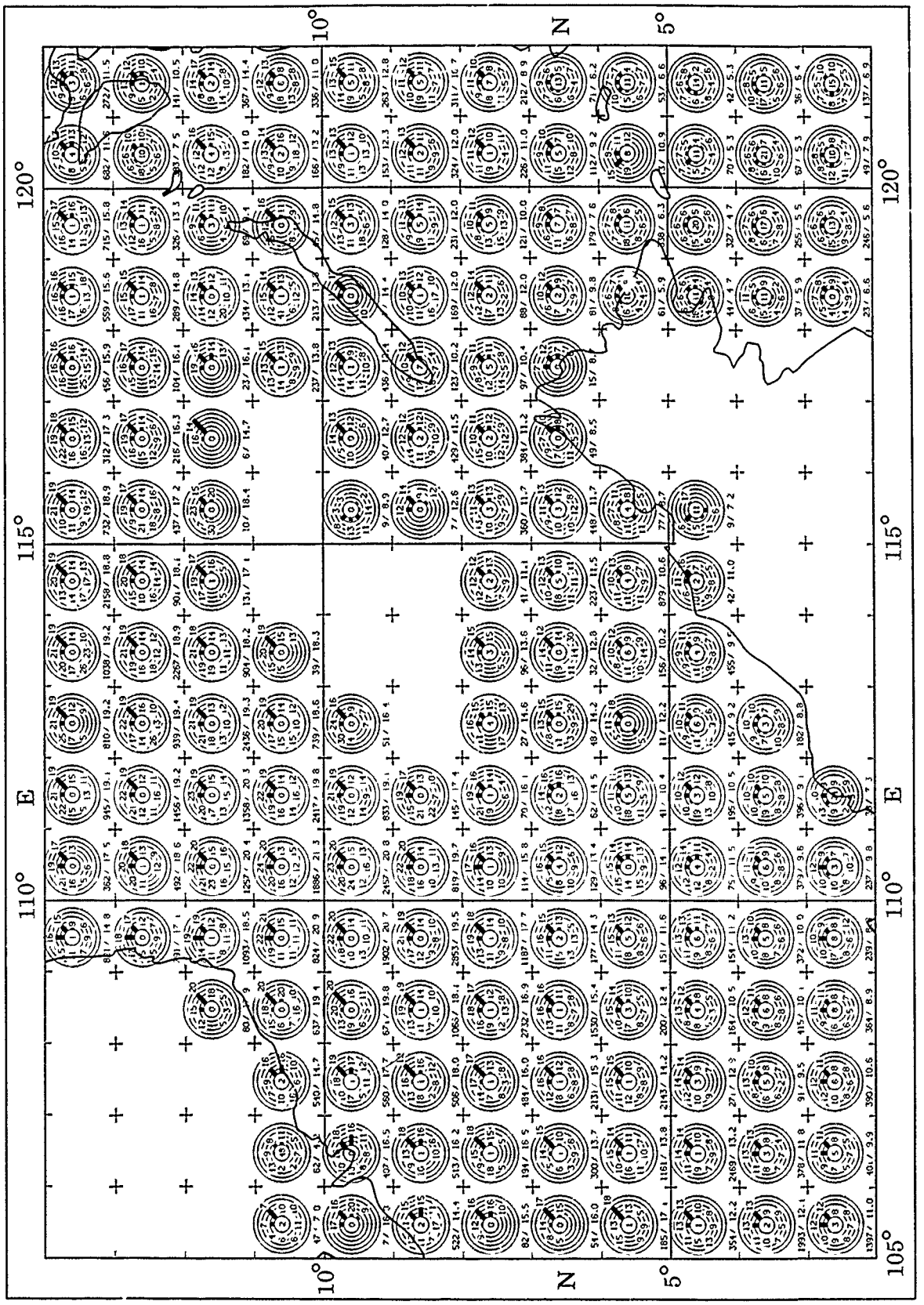
Wind Speed 11 - 21 and 22 - 33 Knots

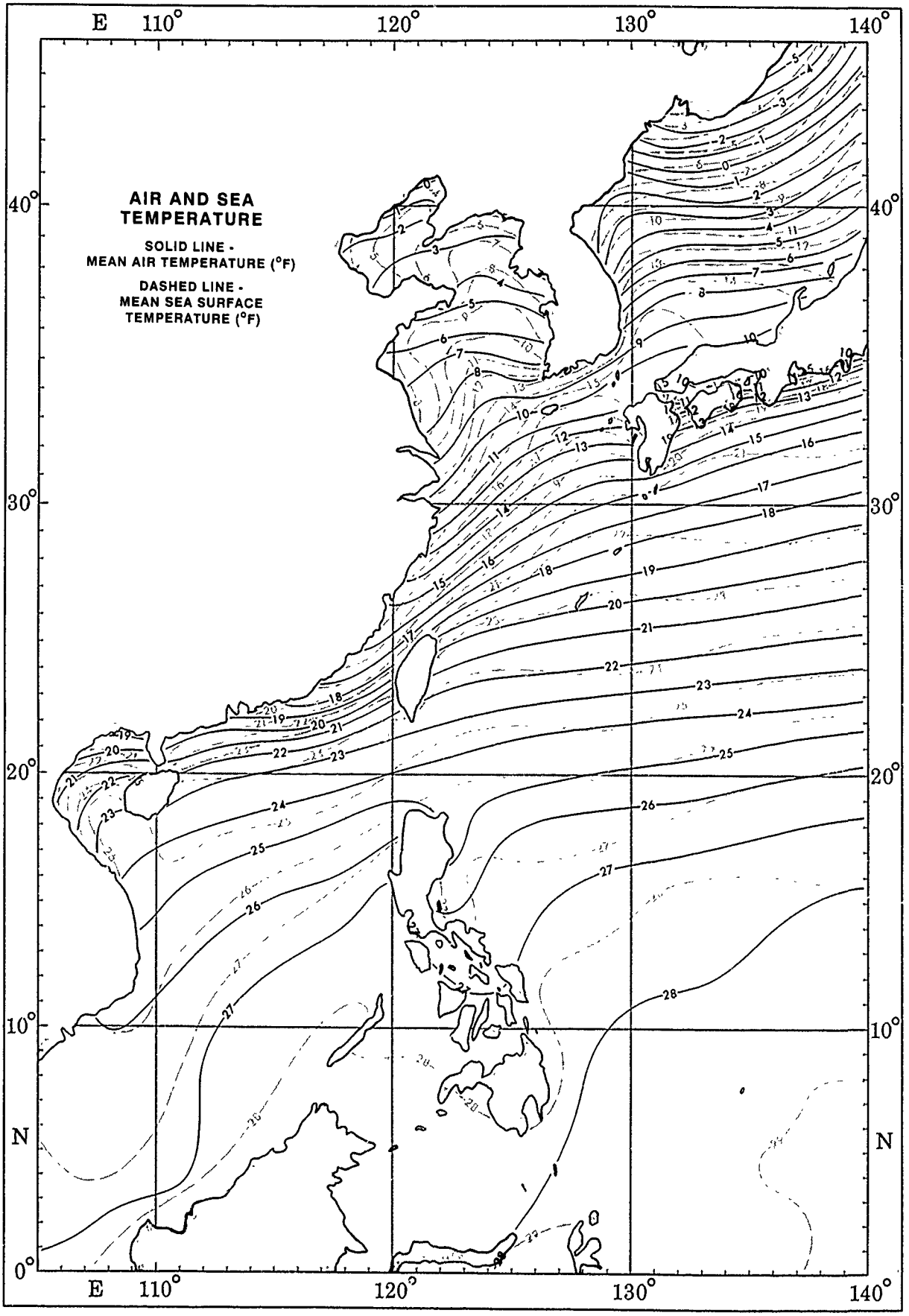


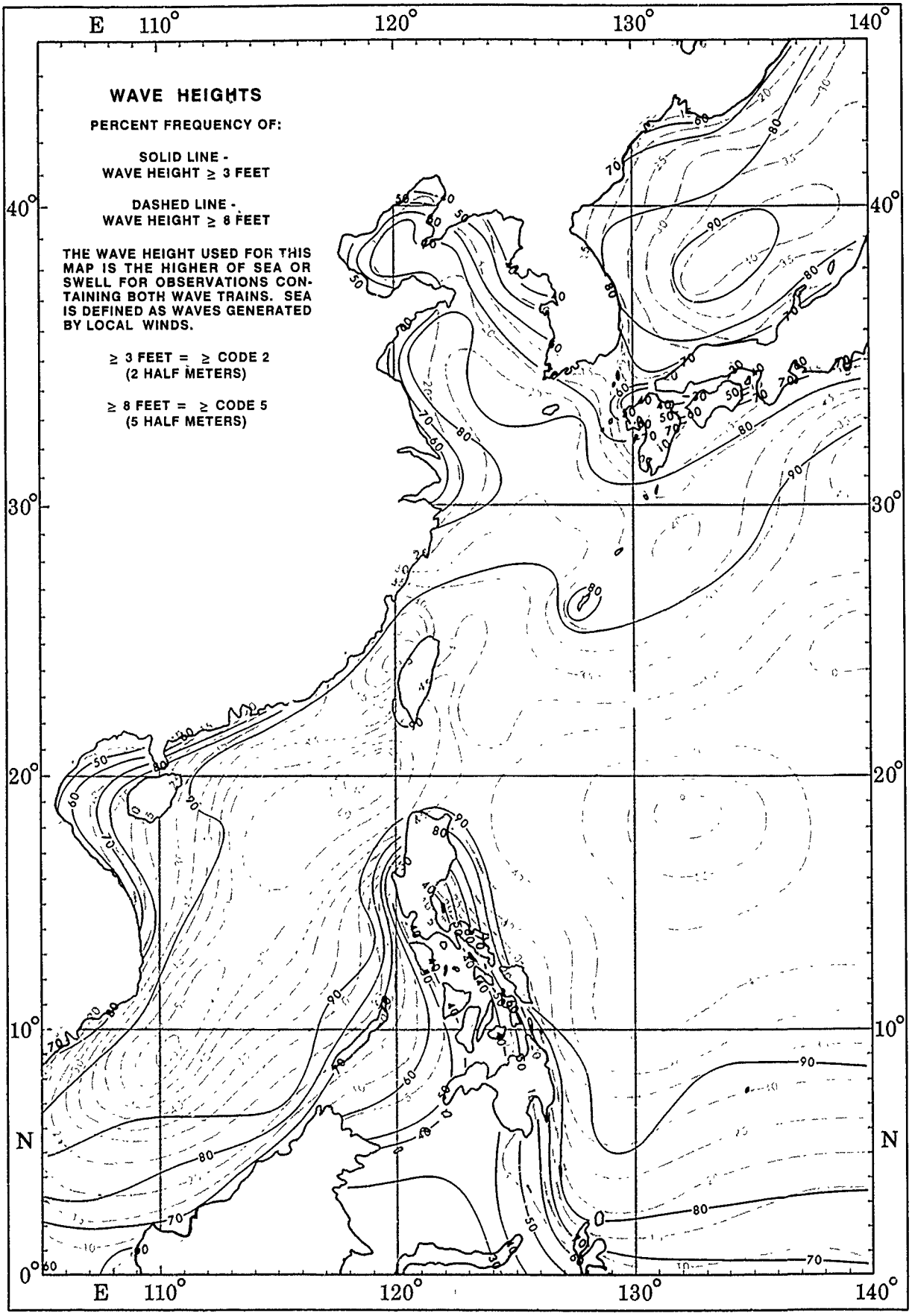

SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%
25% OF ALL WINDS WERE FROM NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR: MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
PERCENT OF CALMS.
MEAN SCALAR SPEED.
OBSERVATION COUNT.
120° E 125° 130°
40°
35°
N

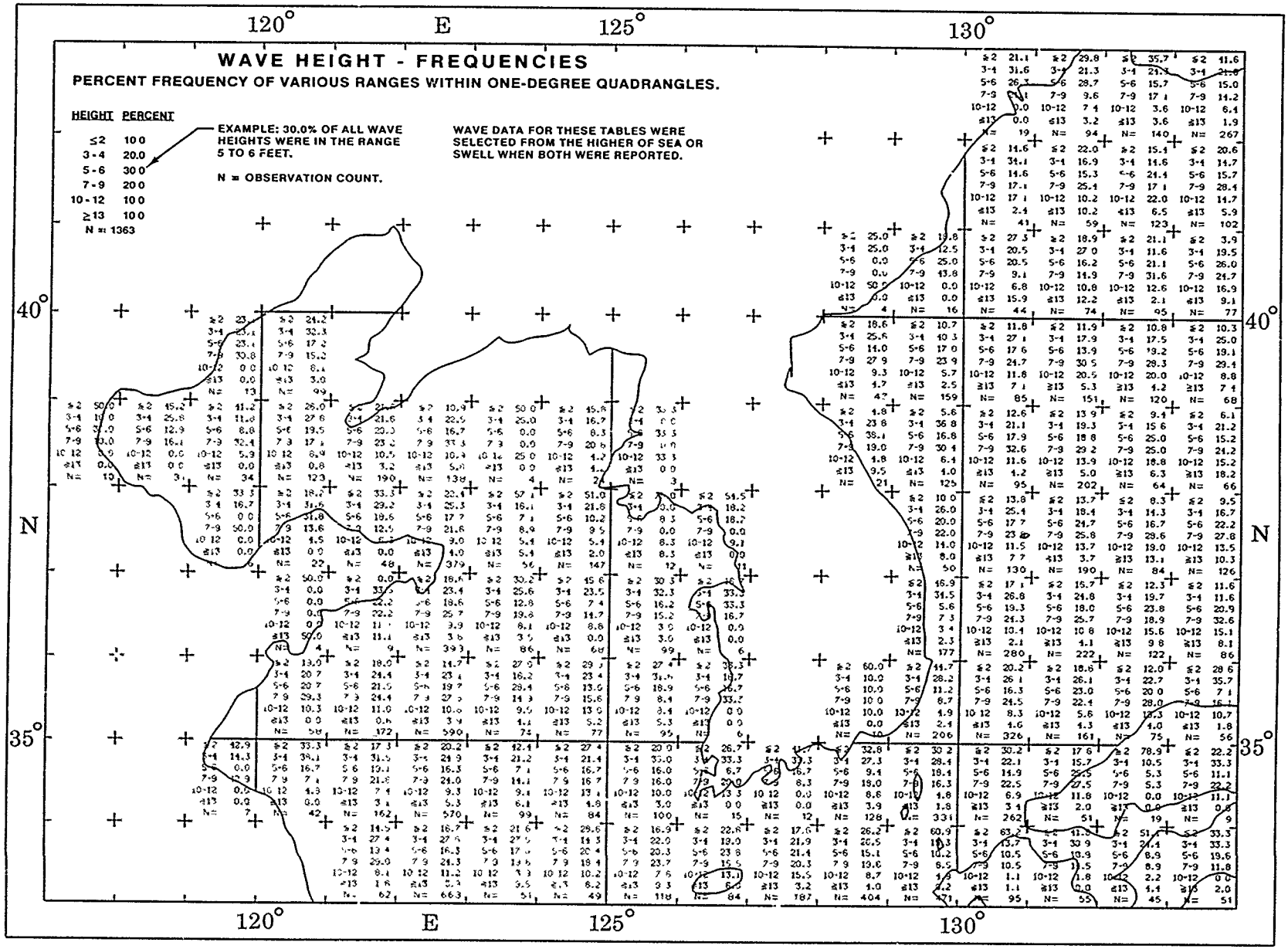

30°
N
25°
120°
E
125°
130°

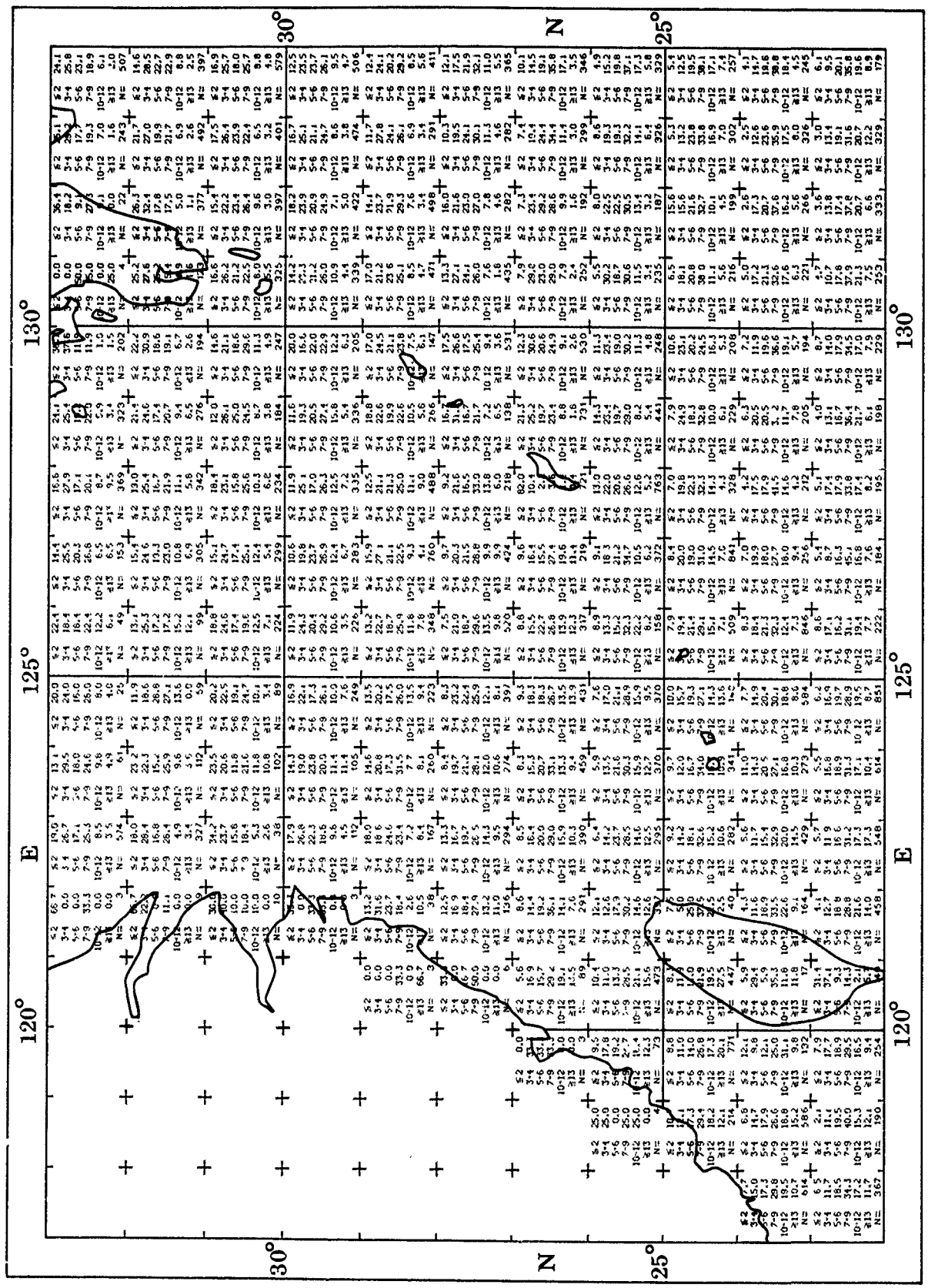

SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%
25% OF ALL WINDS WERE FROM NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR: MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
PERCENT OF CALMS.
MEAN SCALAR SPEED.
OBSERVATION COUNT.
285/71
25°
20°
15°
105°
110° E
115°
120°
N

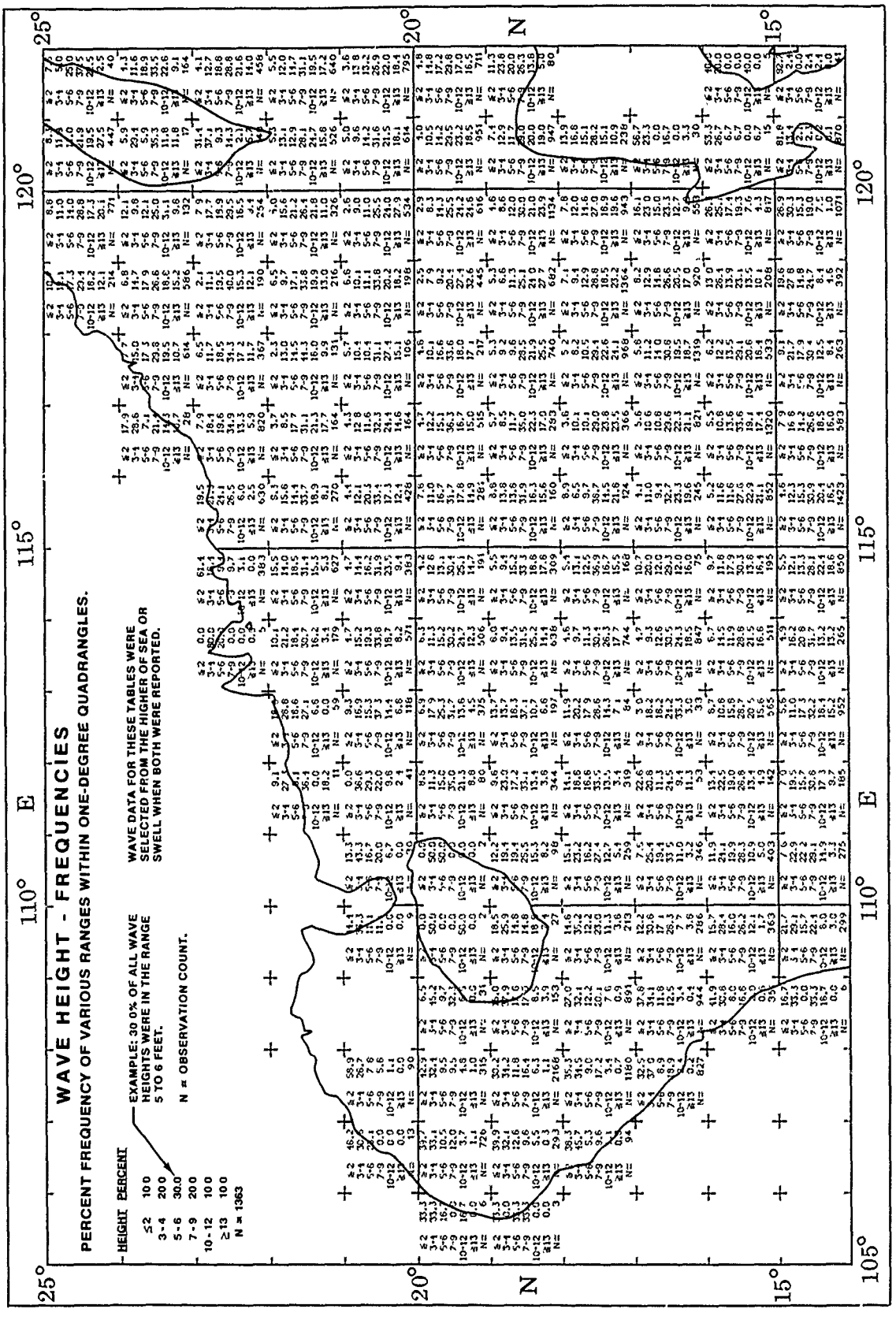

10°
N
5°
105°
110°
E
115°
120°

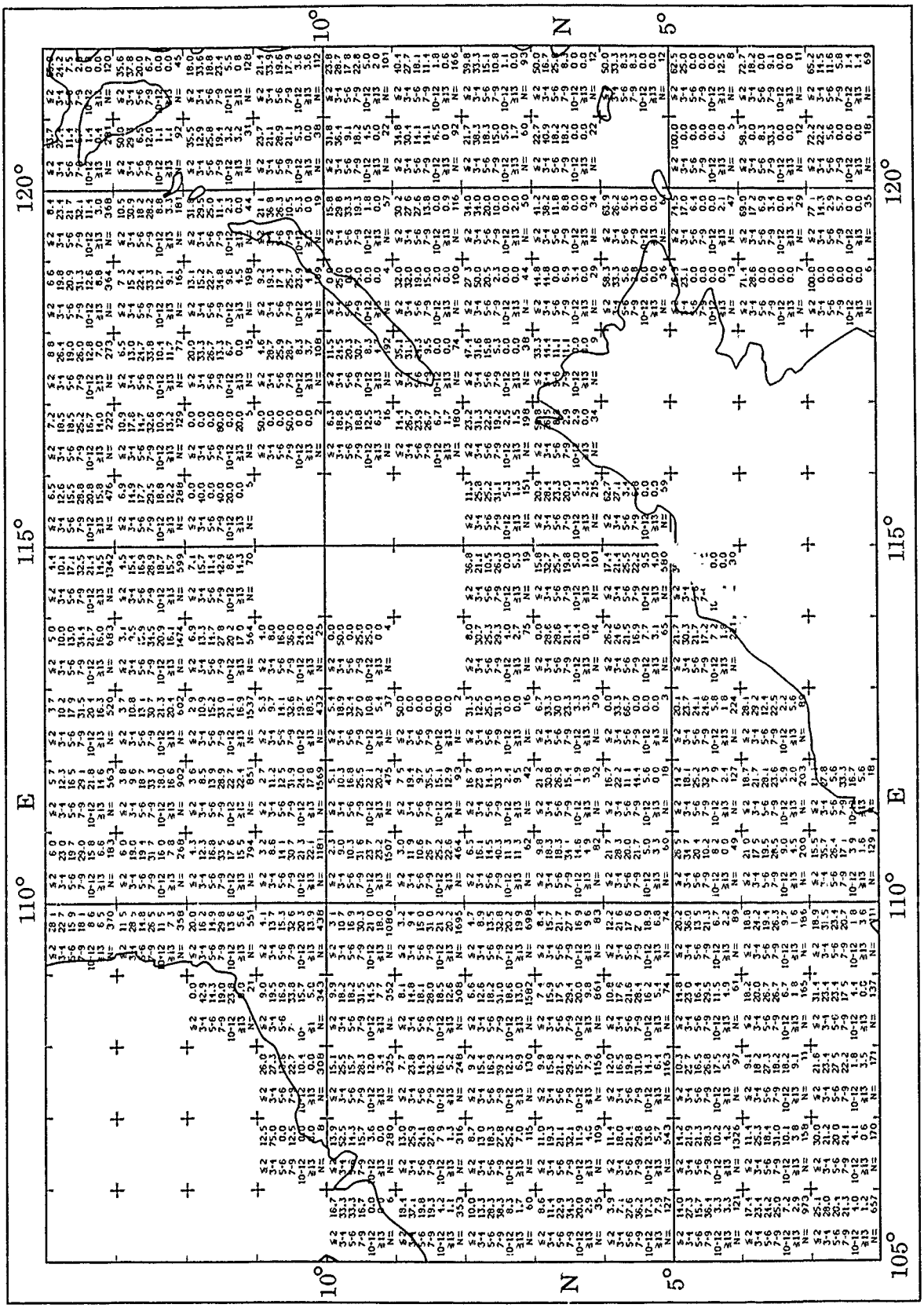

AIR AND SEA TEMPERATURE
SOLID LINE - MEAN AIR TEMPERATURE (°F)
DASHED LINE - MEAN SEA SURFACE TEMPERATURE (°F)
E 110°
120°
130°
140°
40°
30°
20°
10°
N
0°

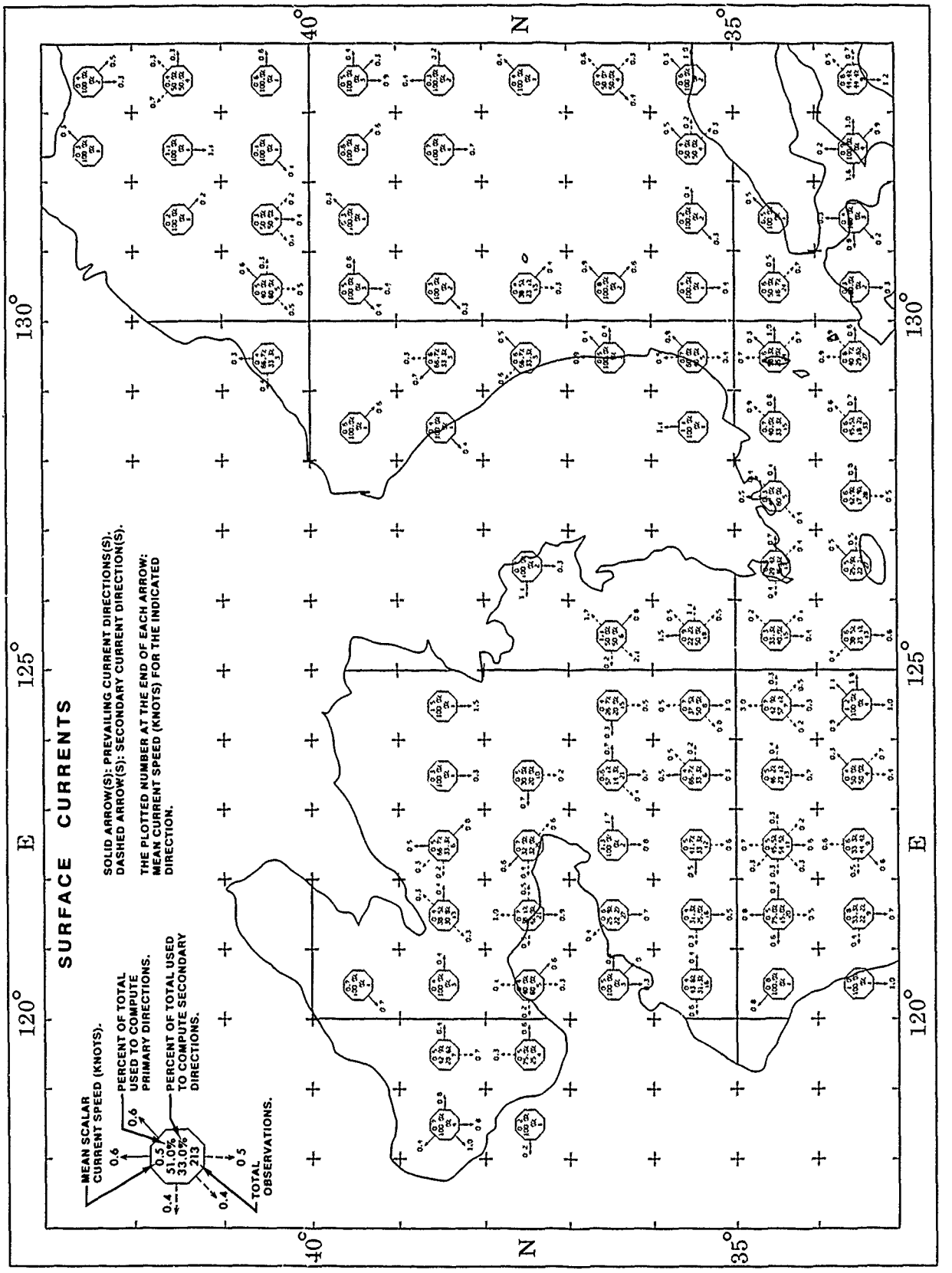

WAVE HEIGHTS
PERCENT FREQUENCY OF:
SOLID LINE -
WAVE HEIGHT ≥ 3 FEET
DASHED LINE -
WAVE HEIGHT ≥ 8 FEET
THE WAVE HEIGHT USED FOR THIS MAP IS THE HIGHER OF SEA OR SWELL FOR OBSERVATIONS CONTAINING BOTH WAVE TRAINS. SEA IS DEFINED AS WAVES GENERATED BY LOCAL WINDS.
≥ 3 FEET = ≥ CODE 2
(2 HALF METERS)
≥ 8 FEET = ≥ CODE 5
(5 HALF METERS)
E 110°
120°
130°
140°
40°
30°
20°
10°
N
0°

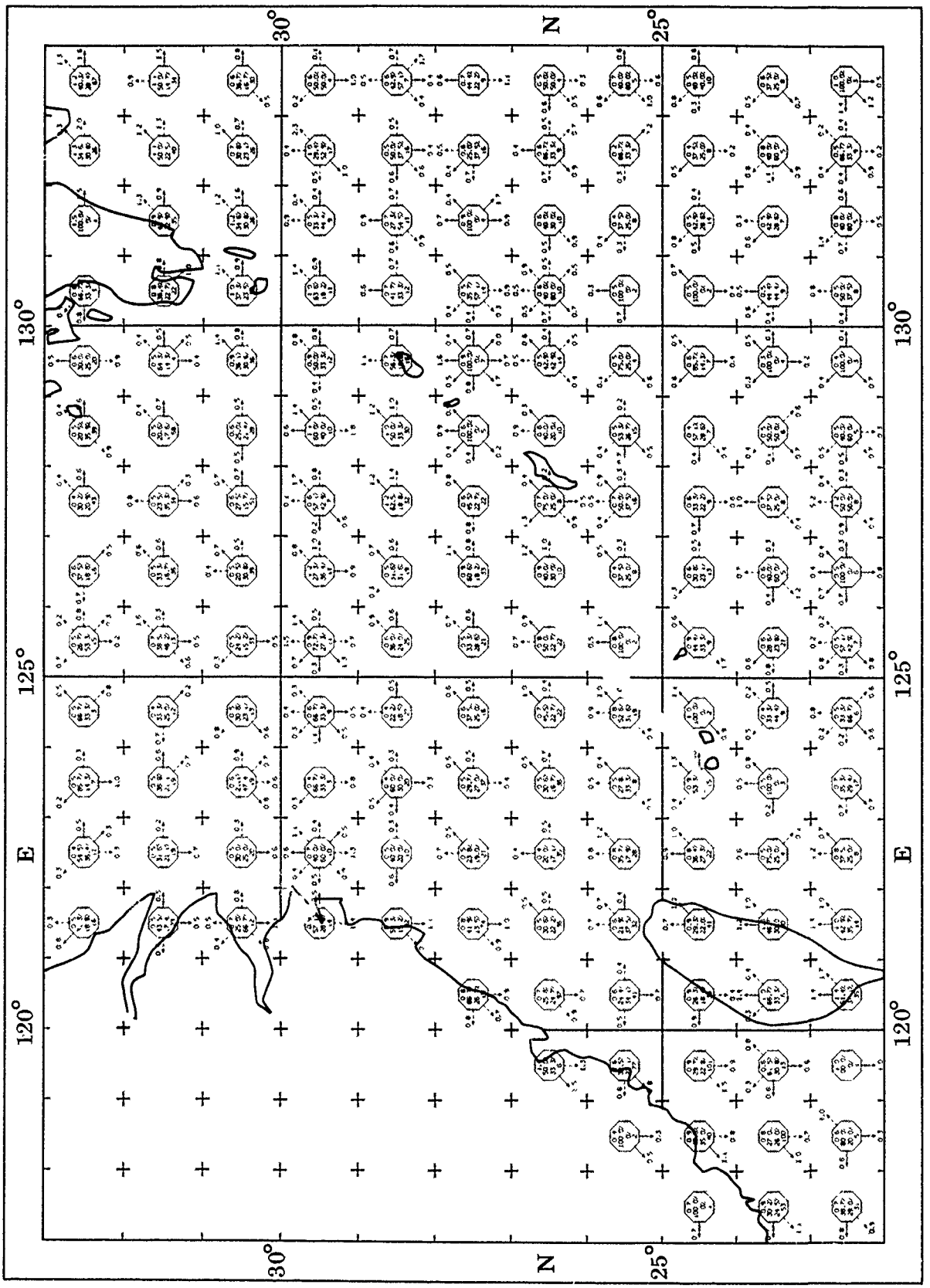

120° E 125° 130°
40°
35°
N
WAVE HEIGHT - FREQUENCIES
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
HEIGHT PERCENT
≤2 10.0
3-4 20.0
5-6 30.0
7-9 20.0
10-12 10.0
≥13 10.0
N = 1363
EXAMPLE: 30.0% OF ALL WAVE HEIGHTS WERE IN THE RANGE 5 TO 6 FEET.
N = OBSERVATION COUNT.
WAVE DATA FOR THESE TABLES WERE SELECTED FROM THE HIGHER OF SEA OR SWELL WHEN BOTH WERE REPORTED.

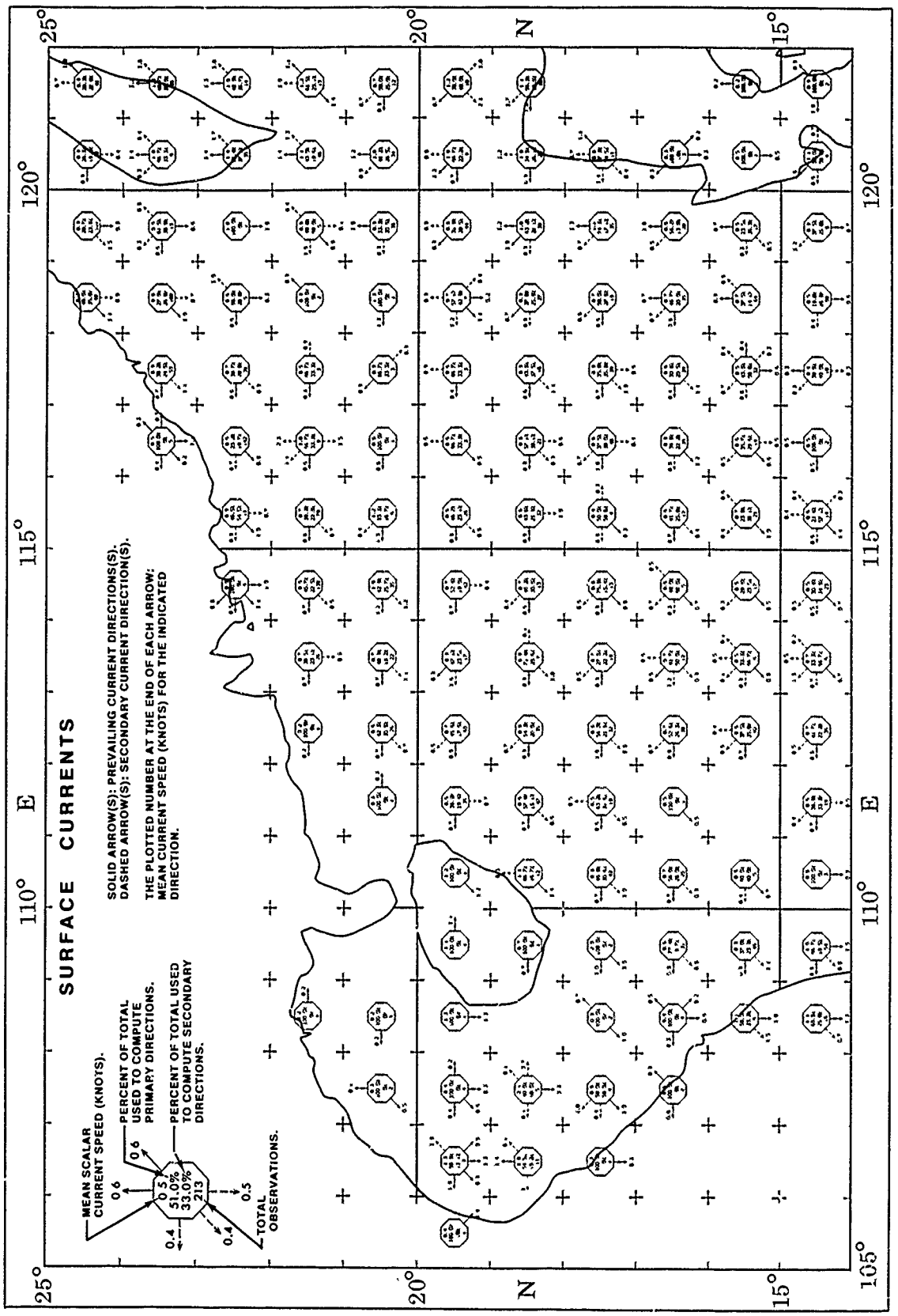

120°
125°
130°
E
30°
25°
N

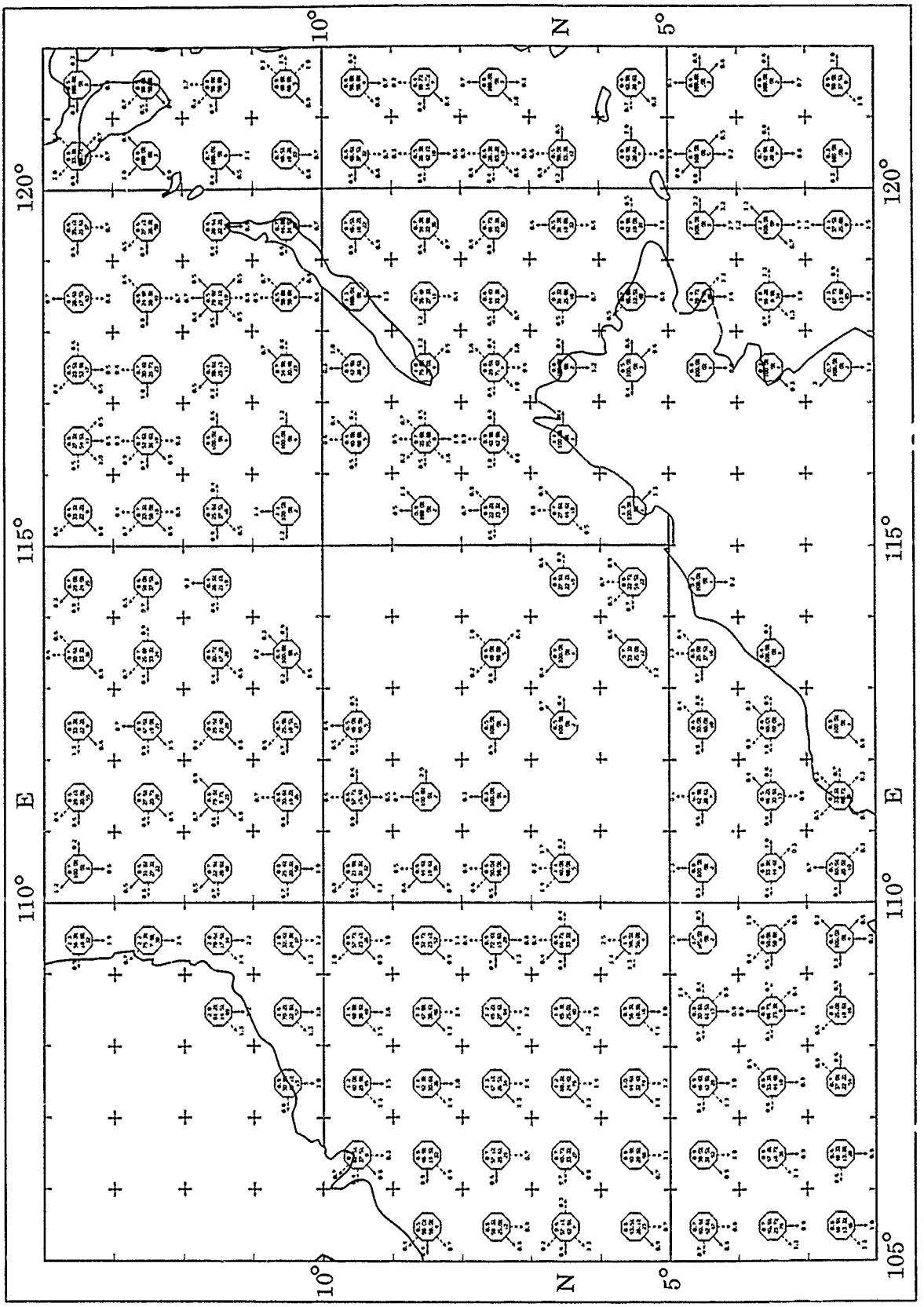

WAVE HEIGHT - FREQUENCIES
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
EXAMPLE: 30.0% OF ALL WAVE HEIGHTS WERE IN THE RANGE 5 TO 6 FEET.
WAVE DATA FOR THESE TABLES WERE SELECTED FROM THE HIGHER OF SEA OR SWELL WHEN BOTH WERE REPORTED.
N = OBSERVATION COUNT.
HEIGHT PERCENT
≤2 10.0
3-4 20.0
5-6 30.0
7-9 20.0
10-12 10.0
≥13 10.0
N = 1363
25°
20°
15°
N
110°
115°
120°
E


105°
110°
115°
120°
E
10°
5°
N


SURFACE CURRENTS
SOLID ARROW(S): PREVAILING CURRENT DIRECTIONS(S).
DASHED ARROW(S): SECONDARY CURRENT DIRECTION(S).
THE PLOTTED NUMBER AT THE END OF EACH ARROW: MEAN CURRENT SPEED (KNOTS) FOR THE INDICATED DIRECTION.
MEAN SCALAR CURRENT SPEED (KNOTS).
PERCENT OF TOTAL USED TO COMPUTE PRIMARY DIRECTIONS.
PERCENT OF TOTAL USED TO COMPUTE SECONDARY DIRECTIONS.
TOTAL OBSERVATIONS.
0.6
0.6
0.5
51.0%
33.0%
213
0.5
0.4
0.4
40° N
35°
120° E
125°
130°


30°
N
25°
130°
125°
120°
E


SURFACE CURRENTS
SOLID ARROW(S): PREVAILING CURRENT DIRECTIONS(S).
DASHED ARROW(S): SECONDARY CURRENT DIRECTION(S).
THE PLOTTED NUMBER AT THE END OF EACH ARROW: MEAN CURRENT SPEED (KNOTS) FOR THE INDICATED DIRECTION.
MEAN SCALAR CURRENT SPEED (KNOTS).
PERCENT OF TOTAL USED TO COMPUTE PRIMARY DIRECTIONS.
PERCENT OF TOTAL USED TO COMPUTE SECONDARY DIRECTIONS.
TOTAL OBSERVATIONS.
0.6
0.6
0.5
51.0%
33.0%
213
0.4
0.4
0.5
25°
20°
15°
N
105°
110° E
115°
120°



U S Government Printing Office: 1989 — 629-828