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FREQUENCY AND MOTION OF WESTERN NORTH PACIFIC TROPICAL CYCLONES

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ABSTRACT. This study presents a statistical analysis of Western North Pacific tropical storms and typhoons over the 37-year period, 1946 - 1982. Emphasis is on frequency and motion charateristics. For various intraseasonal periods and storm intensities, charts and diagrams depict: (1) expected storm frequency per unit area per 100-year interval; (2) resultant speed and direction of storms; (3) mean and standard deviation of storm translational (forward) speed, and (4) storm tracks upon which (1), (2), and (3) are based. Examples of the utility of the data through the application of the Poisson and gamma distributions are presented.

1. INTRODUCTION

A statistical analysis of Western North Pacific tropical cyclones is presented. Emphasis is on their frequency and motion characteristics. The study was prompted by the: (1) visiting scientist programs between the United States (National Oceanographic and Atmospheric Administration (NOAA)) and the People's Republic of China (PRC) whereby PRC scientists were assigned to the United States National Hurricane Center (NHC) for extended periods and (2) usefulness of a similar, earlier study for the North Atlantic tropical cyclone basin (Neumann and Pryslak, 1981).

As shown, the data presented here have both meteorological and engineering utility. Meteorologists will find the storm track maps and their digitized versions particularly useful for the proper structuring of analog and CLIPER-class models (World Meteorological Organization, 1979). Such models are used by many meteorological ser-

[1]This study was researched while the author was temporarily assigned to the United States National Hurricane Center. A condensed version of the study was presented at a national conference (Xue and Neumann, 1984)

vices as objective guidance for operational prediction of tropical cyclone tracks. For engineering applications, the data will provide users with the ability to assess objectively, (through the Poisson and gamma distributions) site-specific probabilities of various frequency and motion storm parameters.

2. DATA

All data and analyses presented here are based on the 927 recorded Western Pacific tropical cyclone tracks and their associated maximum winds over the 37-year period 1946 - 1982. Tropical systems that failed to attain tropical storm[2] status were excluded from the analyses. The number of storms recorded each year is shown in Table 1a. Table 1b gives the cumulative monthly totals for these same storms. In the latter table, a storm was assigned to the month during which it first attained tropical storm strength. For example, a storm that became a tropical storm on 31 August, a typhoon on 1 September and a major typhoon on 2 September was assigned to August for all categories. Intraseasonal variation in the frequency of tropical storms and typhoons[3] is depicted in Figs. 1a and 1b. In these figures, data are given on a 100-year basis (section 3.4.1).

Table 1a. Number of tropical cyclones with winds of at least: (A) tropical storm intensity (34 kts), (B) typhoon intensity (64 kts) and (C) major typhoon intensity (100 kts) for each year, 1946-1982.

	A	B	C		A	B	C		A	B	C
1946	16	12	10	1959	21	16	13	1972	30	22	13
1947	24	16	7	1960	28	19	9	1973	21	12	4
1948	26	15	5	1961	30	20	9	1974	32	15	3
1949	23	14	7	1962	28	24	12	1975	20	14	5
1950	18	12	6	1963	25	19	12	1976	25	14	9
1951	18	16	10	1964	37	24	12	1977	19	11	4
1952	28	20	11	1965	32	21	15	1978	29	16	4
1953	24	17	14	1966	30	20	8	1979	22	13	7
1954	19	15	10	1967	35	20	11	1980	24	15	9
1955	22	18	10	1968	26	20	12	1981	28	16	6
1956	23	18	9	1969	18	13	7	1982	26	19	12
1957	21	18	14	1970	23	12	11	TOTAL	927	629	345
1958	23	20	15	1971	33	23	10	MEAN	25.1	17.0	9.3

[2] A tropical storm is technically defined as a warm-core tropical cyclone in which the maximum sustained wind (1-minute mean) ranges from 34 to 63 knots.

[3] A typhoon is technically defined as a warm-core tropical cyclone in which the maximum sustained wind (1-minute mean) equals or exceeds 64 knots.

The data used to construct Fig. 1b were identical to those used for Fig. 1a, except that a 15-day moving average was needed to remove some of the apparently random day-to-day variations. However, it can be noted in Fig. 1b that some longer period intraseasonal fluctuations remain. It has not been determined whether these variations are real or artificial.

Table 1b. Number of tropical cyclones of specified intensity beginning in each month, 1946 - 1982.

	J	F	M	A	M	J	J	A	S	O	N	D	ANN
≥34 kts	17	10	19	26	39	60	143	173	172	136	89	43	927
≥64 kts	10	2	10	20	29	38	90	115	123	105	60	27	629
≥100kts	5	2	6	11	13	19	45	53	63	69	43	16	345

Western North Pacific storm tracks, with 6-hourly positions and associated maximum winds, are recorded on a computer file that is maintained by the NHC. The NHC does not have forecast responsibility over this tropical cyclone basin; the file was created solely for the use of visiting scientists undertaking various research projects at the NHC. Originally, storm data at 12-hourly intervals were obtained from the United States National Climatic Center (NCC) in

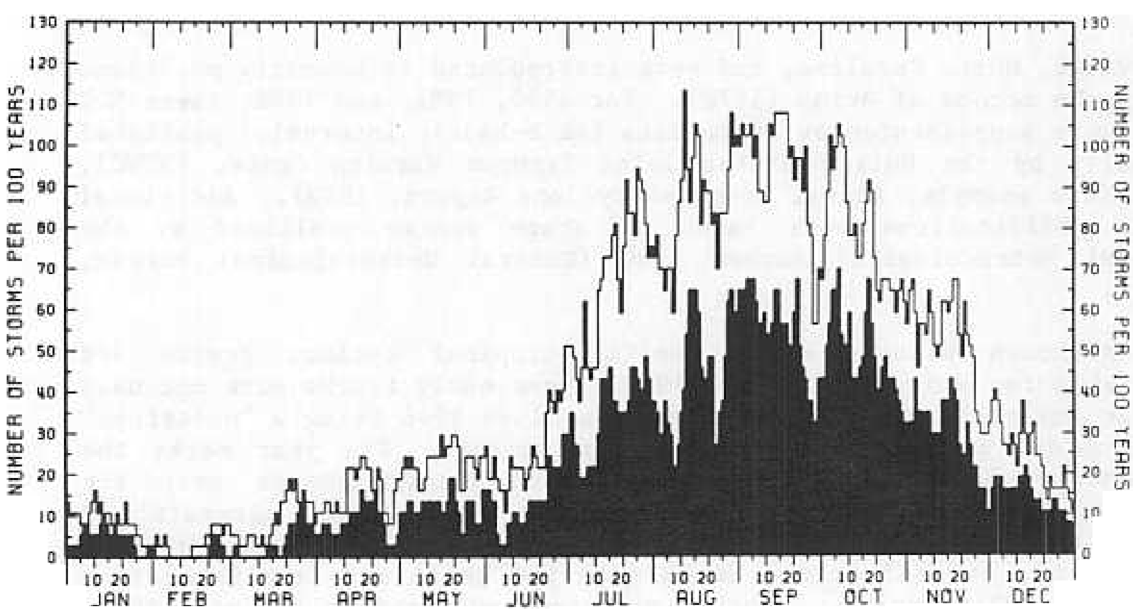


Fig. 1a. Number of tropical storms and typhoons (upper bar) and typhoons alone (lower bar) to be expected per 100-years on any given day. These frequencies are based on all observed occurrences over the 37-year period, 1946 - 1982.

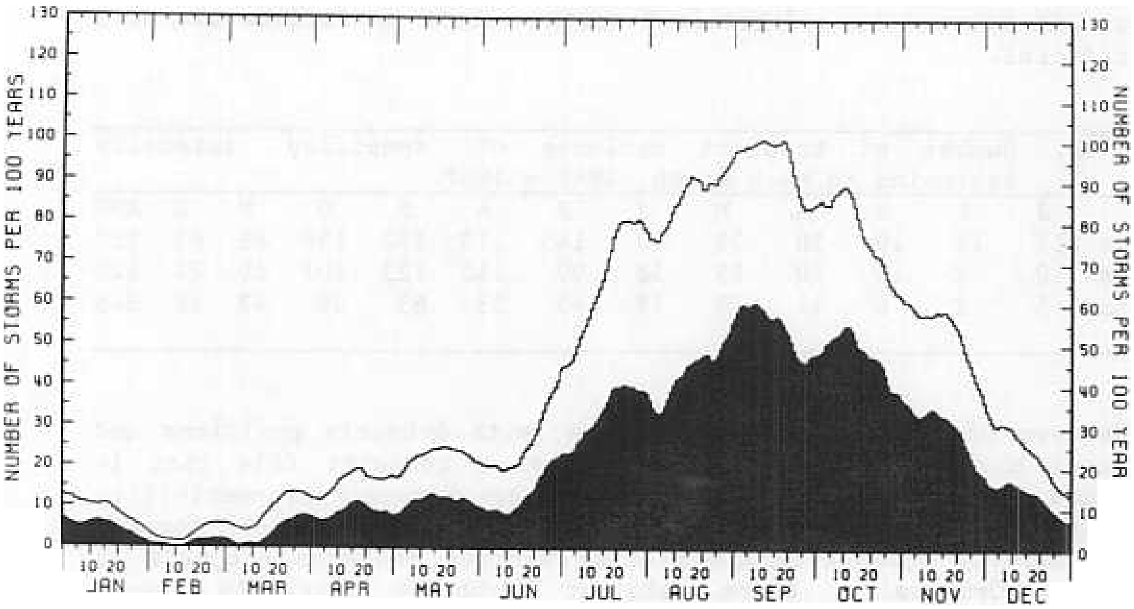


Fig. 1b. Same as Fig. 1a except that data were smoothed using a 15-day moving average.

Asheville, North Carolina, and were interpolated to 6-hourly positions using the method of Akima (1970). For 1980, 1981, and 1982, these NCC data were supplemented by storm data (at 6-hourly intervals) published annually by the United States Joint Typhoon Warning Center (JTWC), Guam (for example, Annual Tropical Cyclone Report, 1982). Additional minor modifications were based on storm tracks published by the Central Meteorological Bureau, PRC (Central Meteorological Bureau, 1972).

Although Western North Pacific tropical cyclone tracks are available for many years before 1946, these early tracks were not used in the analyses. This decision was based on 1946 being a "milestone" in tropical cyclone detection and monitoring. The year marks the beginning of dedicated aircraft typhoon reconnaissance over the Western North Pacific in which specially instrumented aircraft and specially trained flight crews were used. Hence, storm data of 1946 and beyond, as used here, can be expected to be more realistic than data for earlier years. Another milestone occurred in the mid-1960's with the introduction of the weather satellite for the detection and tracking of tropical cyclones and for the assessment of their intensity.

Storm intensities referred to in this study (footnotes 2 and 3) are technically defined by the maximum sustained 1-minute surface wind observed near the tropical cyclone center. However, the ability to measure winds with the precision implied by this definition rarely, if ever, exists. The meteorologist who is responsibie for tracking a storm must assign a maximum sustained surface wind, usually from fragmented or, in some cases, nonexisting, actual wind information. Users of tropical cyclone data should be aware of these practical limitations in the ability to specify maximum surface winds in tropical cyclones.

The tropical cyclone tracks in this study are known, technically, as "best tracks". These are the smoothed, archived renditions of storm tracks from which small-scale (10 to 30 n.mi.) oscillations of the "eye" about its mean track have been removed. These oscillations are not considered representative of the more conservative larger scale motion of the entire storm envelope (World Meteorological Organization, 1979, Chapter 9). Additional information on tracking tropical cyclones is in Crutcher and Quayle (1974), Neumann et al. (1981) and Jarvinen et al. (1984).

3. COMPUTATIONAL PROCEDURES

3.1 Interpolation to Hourly Storm Positions

The Western Pacific storm track computer file, referred to in the section 2, contains 6-hourly storm positions and associated winds at 0000, 0600, 1200 and 1800GMT. For this study, hourly positions and intensities were required. Therefore we used the bivariate interpolation scheme described by Akima (1970). The method has been found to give a more faithful rendition of storm tracks than other interpolation methods. An example of a storm track generated by this method is shown in Figs. 2 and 3.

3.2 The Grid System

The subject tropical cyclone basin extends from the International Dateline (180° longitude) westward through the Asian coastal areas and from a few degrees north of the equator to beyond 45° north latitude. For digital counting, a grid, having a 2½° latitude and longitude spacing, was constructed to cover this area. The grid extended from 101.25E, eastward to 173.75E (30 grid points) and from 1.25N, northward to 46.25N (19 grid points). Equal-area circles were centered at each of the (30 x 19) grid points. We chose a 75 n.mi. radius circle (139.5 km) for most computations in this study. Rationale for selecting this distance is discussed in this section. An illustration of the grid using the 75 n.mi. circles is included as Fig. 2. Each of the 927 storms over the period of record (in the form of hourly positions) was passed through the grid. Information was recorded for each of the circular areas for various seasonal and intraseasonal periods and storm intensities as follows:

1) The number of storms that passed through the circle. If a storm exited a circle and reentered (a rare occurrence), it was counted only once.

2) The average meridional component of storm motion while the storm was transiting the circular area.

3) The average zonal component of storm motion while the storm was transiting the circular area.

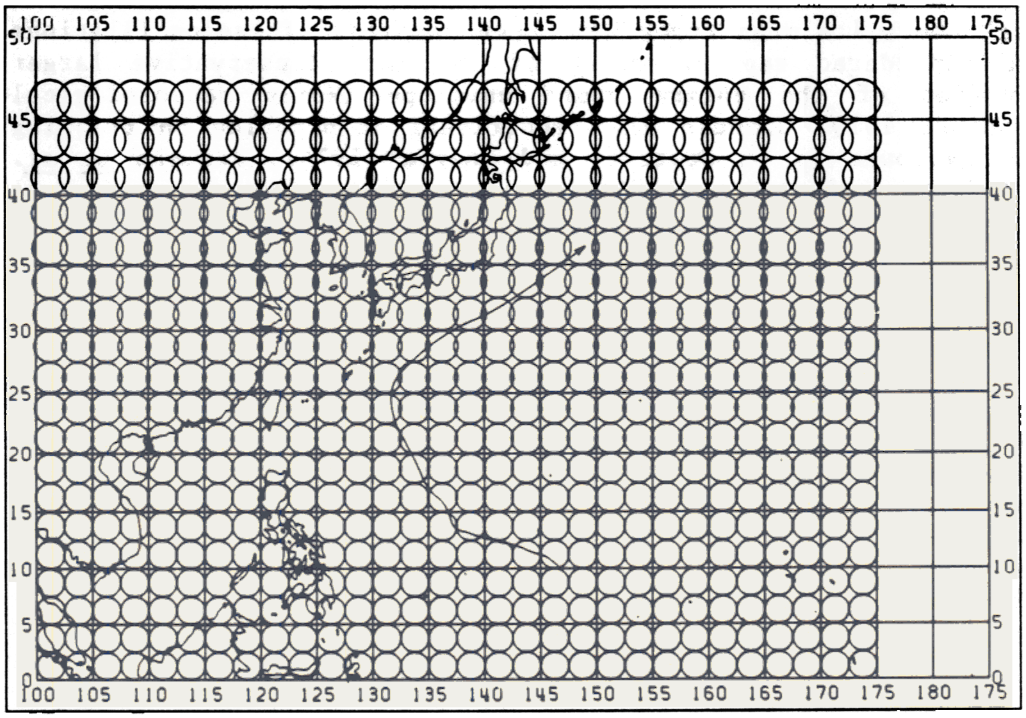


Fig. 2. Array of 75 n.mi. (139km) circles used in storm frequency and motion computations. Storm track is that of typhoon ELSIE, 1981.

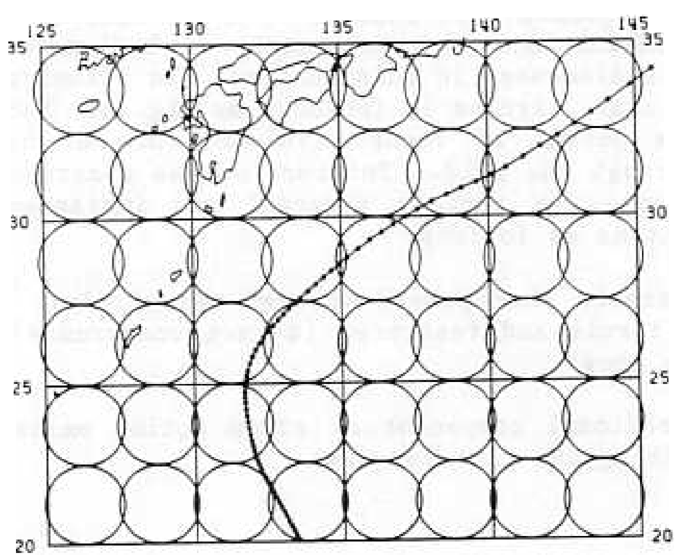


Fig. 3. Enlarged portion of Fig. 2 showing interpolated hourly positions of typhoon ELSIE, 1981.

4) The average translational (forward) speed while the storm was transiting the circular area.

5) The standard deviation of (4)

Note that the speeds in items (2), (3) and (4) were averaged over the time the storm was passing through the circle. This method, rather than one that simply accrues all speeds per circle, avoids a bias towards slower moving storms. For example, typhoon ELSIE, 1981 (Fig. 2) had 13 hourly positions within the circular area directly southeast of 25N, 130E, but only 4 hourly positions within the circular area directly northeast of 30N, 140E. Had each of these speeds been individually summed with the speeds of other storms that passed through the same circle, a bias toward the slower storms would have resulted.

3.3 Scan Distances Other Than 75 n.mi.

The statistical tabulations (1) through (5), above, were computed for areas having a 75 n.mi. radius (139.5 km), as depicted in Fig. 2. The choice of 75 n.mi. for these calculations was prompted by its nearness to the average radius that was associated with at least some damage, damage potential, or damage concern from the storm. However, the frequency of storms passing within other radii also may be of interest. Accordingly, the seasonal calculations in item (1), above, were repeated for radii of 25, 50, 100, 150, and 200 n.mi. with the same (30 x 19) grid shown in Fig. 2.

For some applications, it may be desirable to estimate annual tropical storm and typhoon frequency over radii of still other measurements than those cited above. This analysis could be accomplished with the method illustrated in Fig. 4. Here, the 100-year frequencies at the six data points were estimated from the six charts given in appendix A-IV, pages A69, A70 and A71. Note that the relationship between storm frequency and scan distance (radii) is linear and can be described by an equation of the form, $y = c_1 + c_2x$, where y is number of storms and x is radii. The constants c_1 and c_2 can be determined by the usual least-squares methods (Mills, 1955). At other sites, the relationship between x and y may not be linear and fitting of the six data points to an exponential curve or power function may be required.

3.4 Additional Computational Procedures

3.4.1 Storm Frequency - The tabulation procedure described in item 3.2 (1) yields the number of tropical cyclones of a specific intensity and over a specific time period that passed through the circular area over the 37-year period 1946 - 1982. For user convenience and for comparability with similar data for other tropical cyclone basins, a 100-year storm frequency was estimated by multiplying the 37-year frequencies by the factor 100/37. The storm frequency data were also passed through a nine-point smoothing-desmoothing filter, which is discussed by Gerrity (1977) and Shuman (1957). Next, the grid was scaled for plotting on a given Mercator map projection using Akima's (1973) bivariate interpolation scheme.

3.4.2 Vector Motions - Resultant storm direction and speeds were computed from items 3.2 (2) and 3.2 (3) whenever the raw storm count (before smoothing and expanding to the 100-year frequency) was at least 5 storms per 37 years. For the expanded 100-year period, this restriction is equivalent to about 14 storms.

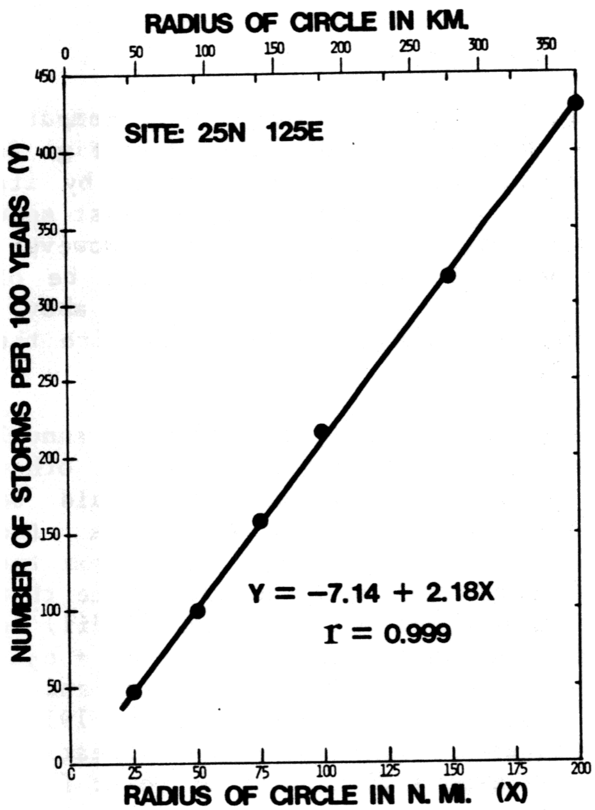


Fig.4. Relationship between circular scan distance (x) and number of storms per 100 years (y) at specified site.

4. CHARTS AND TABLES

Charts and tabular data depicting frequency and motion characteristics of various intensity Western North Pacific tropical cyclones are presented in appendix A for portions of the year as well as for the year as a whole. Chart Series A-I (pp. A4 through A38) is based on all tropical cyclone tracks or track segments having winds of at least tropical storm strength (footnote 2). Chart Series A-II (pp. A39 through A63) and A-III (pp. A65 through A67) are similar to Series A-I, except that they are based on track or track segments having winds of at least typhoon strength (footnote 3) or at least major typhoon strength ($\geq$ 100 kt.), respectively.

Chart Series A-IV (pp. A68 through A71) gives the estimated 100-year frequency of tropical storms and typhoons that passed within 25, 50, 75, 100, 150, and 200 n.mi. of any given point over the basin. Here, the chart for the 75 n.mi. radius is identical to that given earlier in Series A-I. Reinclusion here facilitates comparison with adjacent charts.

5. DISCUSSION

Data presented graphically and in tabular form in appendices A-I through A-IV have meteorological and engineering applications. Some of them are briefly discussed in this section.

5.1 Storm Tracks

An obvious meteorological application of the analyses is the determination of mean or "prevailing" storm tracks and the ways that they change during the January through December storm season. Knowledge of these patterns will often assist operational forecasters in assessing the climatological credibility of a forecast track.

In the broadest sense, Western North Pacific tropical cyclones, similar to those in other tropical cyclone basins, consist of two classes -- those that spend their entire existence embedded in the easterlies (nonrecurvers) and those that eventually recurve into the westerlies (recurvers). These classes of storms are clearly identifiable in the mean annual depiction shown on pages A36 and A37. Nonrecurving storms advance west-northwestward at lower latitudes in response to a synoptic-scale ridge to their north. The mean track extends across the Northern and Central Philippines into the South China Sea across the Island of Hainan. Recurving storms, on the other hand, although starting out in the easterlies, are subject to more northerly motion in response to an advancing trough in the westerlies and eventually take on an easterly component of motion. This recurving takes place before storms reach as far west as the Philippines; it covers a wide area, but is somewhat concentrated in a southwest-to-northeast "channel", southeast of Japan. Whether a storm will be a recurver or nonrecurver is a recurring forecast problem in most tropical cyclone basins.

Although the broad-scale annual track patterns described above exist in the mean annual sense, they are made up from many intraseasonal patterns that can only be distinguished or inferred through study of shorter period intraseasonal stratifications. For example, one can note the intrusion of accelerating storms into the Yellow Sea, principally 16 July - 15 August (pp. A18 and A19); the southeastern shift of recurving storms away from the Japanese Islands after 15 October (beginning on page A30); the peak storm activity during September over the South China Sea (pp. A24 and A25); the tendency for two recurving zones in November (pp. A32 and A33) as well as during certain other months, etc.

These, and numerous other identifiable intraseasonal patterns, are closely related to seasonal changes in general circulation patterns and associated synoptic-scale events which, if properly identified, can assist the operational forecaster in assessing storm motion. Analog prediction models objectively identify these "families" of storm tracks. Proper structuring of analog prediction algorithms is facilitated by a knowledge of seasonal trends. Further discussion of analog models is beyond the scope of this study; the reader is referred to World Meteorological Organization, 1979, for additional information.

5.2 Variability of Tropical Cyclone Motion

It is known that tropical cyclone motion is much more persistent in some areas than in others. For example, visual inspection of storm tracks passing across the Central Philippines near 14N, 124E in July (page A17) shows these tracks to be moving toward the west-northwest. However, during this same period, storms in the area near 24N, 136E are seen to be moving from a variety of directions. An index of this "steadiness of motion" or "steadiness", as it is sometimes referred to, can be obtained by dividing mean resultant storm speed for a given site (column D) in the appendix tabular data (Chart 4) by the average (scalar) speed as given in column E. The scalar speeds are always greater or equal to the resultant vector speeds. When this ratio is high (approximately 0.90 or higher), the resultant direction given in column C can be relied upon to represent the most likely direction of motion for storms in that area. When this ratio is low (approximately 0.75 or less), the interpretation is that the resultant direction has been computed from storms that are moving in a variety of directions. Consequently, it is quite likely that a storm might move in a direction different from that of the resultant direction.

For example, consider the storms moving across the Central Philippines and those passing near 24N, 136E, referred to in the preceding paragraph. Fig. 9, on page A3, gives the index number for these locations as 88 and 197, respectively. For site 88, both the vector speed and the average storm translational speed (columns D and E, respectively, of tabular data, page A17) are given as 13 knots. The high value of the steadiness value (13/13 = 1.0) indicates that storms moving through this area are subject to only slight deviations from the vector direction of 295° given in column C of the tabular data.

For site 197, the resultant speed (column D) is given as 7 knots and mean speed (column E) is given as 12 knots. This low steadiness value (7/12 = 0.58) indicates that storms moving through this area can be expected to deviate considerably from the vector direction of 351° given under column C.

5.3 Storm Intensity

Not including the tropical depression stage, tropical cyclones over the Western North Pacific basin average about 5.6 days duration (Fig. 5) with occasional storms lasting up to 2, or even 3, weeks. During this period, storms go through periods of intensification, maturing and decay, with the duration of each stage and the maximum wind being a function of several of environmental and geographical factors. There are certain portions of the tropical cyclone basin where storms tend to be more intense. These areas can be identified by an "intensity index", which is computed by dividing the frequency of typhoons for a given site (Chart Series A-II) by the frequency of typhoons and tropical storms combined (Chart Series A-I) for that site.

For example, the 100-year annual frequency of storms that had at least tropical storm strength and that passed within 75 n.mi. of Guam (13.5N, 144.6E) and Okinawa (26.2N, 127.7E) are 120 and 165, respectively. These data are visually interpolated from the isoline analysis given on page A36 of Chart Series A-I. For the same sites, the frequency of storms having at least typhoon strength is read as 55 and 110, respectively (Chart Series A-II, page A62). The intensity index at Guam computes to 0.46 and at Okinawa, 0.67. Thus, storms that affect Okinawa, since they are closer to maturity than those that affect Guam, are, on the average, more intense.

Further calculations similar to the above show that highest intensity indices (near 80%) occur near 24N, 129E where storm motion averages slightly west of due north at about 8 knots. Depending upon user requirements, other indices can be computed from data given in Chart Series A-III.

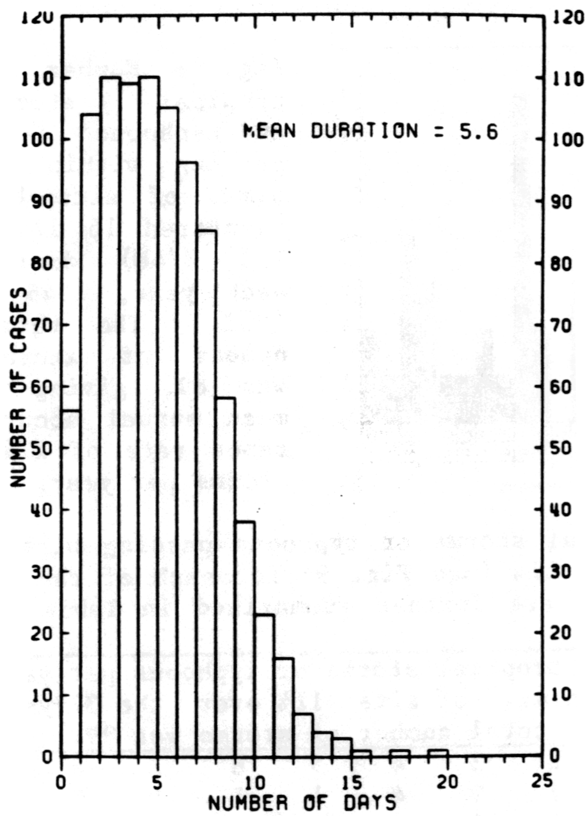


Fig. 5 Frequency distribution of tropical cyclone duration (excluding tropical depression stage). The mean duration is 5.6 days. Total number of storms is 927.

5.4 Poisson Probabilities of Storm Occurrence

One of the main uses of the data given in appendix A is in the determination of site-specific probabilities of storm occurrence. It has been shown for the Atlantic basin (Hope and Neumann, 1969) that the frequency of discrete numbers of storms passing through a given area over a given time interval is described by the Poisson distribution (Burington and May, 1958)

$$P(x) = e^{-m}m^{x}/x!,$$

where P(x) is the probability ($0 \leq P \leq 1$) of exactly x events over an interval, m is the mean of the event over the interval and e is the base of natural logarithms (2.71828+). For at least one occurrence of the event, it can be shown that (1a) becomes

$$P(x \geq 1) = 1.0 - e^{-m}$$

The Poisson distribution is particularly convenient to use, since the mean of an event[4] is the only parameter needed to define the distribution.

To test the applicability of the Poisson distribution over the Western North Pacific tropical cyclone basin, consider Fig. 6, which

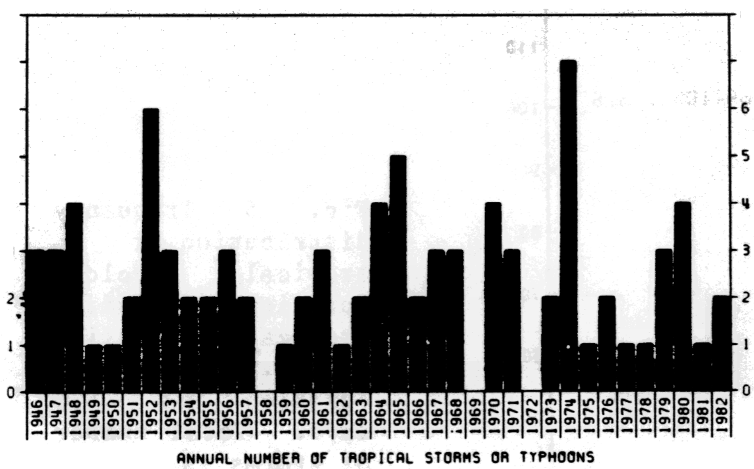


Fig. 6 Number of tropical storms and typhoons passing within 75 n.mi. of site 114 (centered 16 1/4N, 123 3/4E) during each year, 1946 - 1982. The total number of storms was 89, giving a mean annual occurrence rate of 2.41 storms per year.

gives the actual count of tropical storms or typhoons passing within 75 n.mi. of circular area number 114 (see Fig. 9) for each of the 37 years, 1946 - 1982. These data are further summarized in Table 2.

Table 2. Observed frequency of N tropical storms or typhoons per year that passed within 75 n.mi. of site 114 over the 37-year period 1946 - 1982. The total number of storms was 89.

NUMBER OF STORMS (N)	0	1	2	3	4	5	6	7	8	9
NUMBER OF OCCURRENCES	3	8	10	9	4	1	1	1	0	0
FREQUENCY ($0 \leq F \leq 1$)	.081	.216	.271	.243	.108	.027	.027	.027	.000	.000

[4]In the Poisson distribution, the mean and variance are equal.

Note that the number of storms that occur in any given year ranges from zero (1958, 1969, and 1972) to seven (1974). The Poisson probabilities of these events from (1a) are given in Table 3 with the mean of the event being taken as 89/37 = 2.41 storms per year. The observed frequencies given in Table 2 are in close agreement with the computed probabilities given in Table 3. The usual chi-square test (Burington and May, 1958) indicates a very high degree of certainty that Table 2 data are distributed according to Poisson expectations (null hypothesis not rejected).

Table 3. Computed Poisson probabilities of N tropical storms and typhoons passing within 75 n.mi. of site 114 in any given year.

NUMBER OF STORMS (N)	0	1	2	3	4	5	6	7	8	9
PROBABILITY ($0 \geq P \geq 1$)	.090	.217	.261	.209	.126	.061	.024	.008	.003	.001

The following examples illustrate additional uses of the Poisson distribution:

1 What is the probability of no typhoons or tropical storms passing within 75 n.mi. of Guam in September? Solution - From appendix A-I, page A24, the observed frequency of the event as estimated from the isoline analysis is 17 storms per 100 years or 0.17 storms per year. According to (1a) and since 0! = 1.0, there is a probability of 0.84 or 84 out of 100 years.

2) What is the probability of the same site observing no storms passing within 75 n.mi. over two consecutive Septembers? Solution - The 2-year mean, estimated to be twice the 1-year mean, is given by 2 x 0.17 = 0.34. Substituting m = 0.34 into (1a) gives a probability of 0.71.

3) What is the probability of at least 1 tropical storm or typhoon passing within 75 n.mi. of Shanghai (31.2N, 121.4E) in any given year? Solution - From appendix A-I, page A36, the 100-year frequency of the event is read as about 35 storms, giving an annual mean of 0.35 storms. From (1b), the probability of at least one storm in any given year is 1.0 - 0.70 or 0.30.

4) What is the probability of ≥ 5 tropical storms or typhoons passing within 200 n.mi. of 15N, 125E in any given year? Solution - From appendix A-IV, page A71 (bottom of page), the estimated mean number of storms per year is read as 5.6 (560 per 100 years). The desired probability can be obtained from

$$P(\geq 5) = 1.0 - P(0) - P(1) - P(2) - P(3) - P(4)$$
$$= 1.0 - .004 - .021 - .058 - .108 - .152 = 0.657$$

5) What is the probability of no tropical storms or typhoons being in existence over the Western North Pacific basin on September 15?
Solution - From Fig. 1b, the 100-year frequency of storms is read as 103. This is equivalent to a mean of 1.03 storms per year for that date. From (1a), the probability of no storms in existence on 15 September computes to 0.36 or 36 out of 100 years.

5.5 Storm Translational Speeds

For certain applications, (i.e., determination of storm surge probabilities), distributions of storm translational (forward) speeds are helpful. Storm translational speeds, being bounded at the lower end by zero and, theoretically, unbounded at the upper end, can be described by the gamma distribution (Burington and May, 1958)

$$P(v) = [b^{a+1}\Gamma(a+1)]^{-1} v^{a} e^{-v/b} \qquad b>0,\ a>-1,\ v\geq 0,$$

where a and b (referred to as shape and scale parameters, respectively) are constants, Γ is the gamma function, v is storm speed and p(v) is in units of probability ($0\leq p\leq 1$). The constants a and b are estimated from the mean (m) and standard deviation (s) of a sample of storms:

$$a = (m^2/s^2) - 1$$

and

$$b = s^2/m.$$

The mode of the distribution (value of v at maximum P(v)) is given by the product ab,

$$\text{mode} = ab = m - s^2/m.$$

Values of m and s, for samples of storms, are given by columns E and F, respectively, of the tabular data included in appendices A-I, A-II, and A-III.

As an example of the use of the gamma distribution, determine the probability of typhoons advancing on Southern Japan (near site 273 - see Fig. 9) during September with forward speeds > 30 knots. On page A53 (appendix A-II), note that the mean and standard deviation of the forward speed of the 13 storms that passed within 75 n.mi. of the site over the 37-year period (36 typhoons over a 100-year period) was 20 and 9.84, respectively. From (3) and (4), the parameters a and b are estimated from the data to be a = 3.13 and b = 4.84. From statistical tables (Burington and May, 1958), the value of $\Gamma(a+1) = \Gamma(4.131) = 7.090$. Eq. (2) becomes

$$p(v) = 0.000209 v^{3.13} e^{-v/4.84}$$

The probability of v>30 is given by

$$P(v>30) = 1.0 - \int_0^{30} p(v)dv.$$

Eq. 7 can be evaluated by solving for centered speed-class-intervals of 1 knot according to

$$p(v>30) = 1.0 - \sum_{v=0.5}^{29.5} p(v) = 0.148.$$

The procedure is graphically illustrated in Fig. 7.

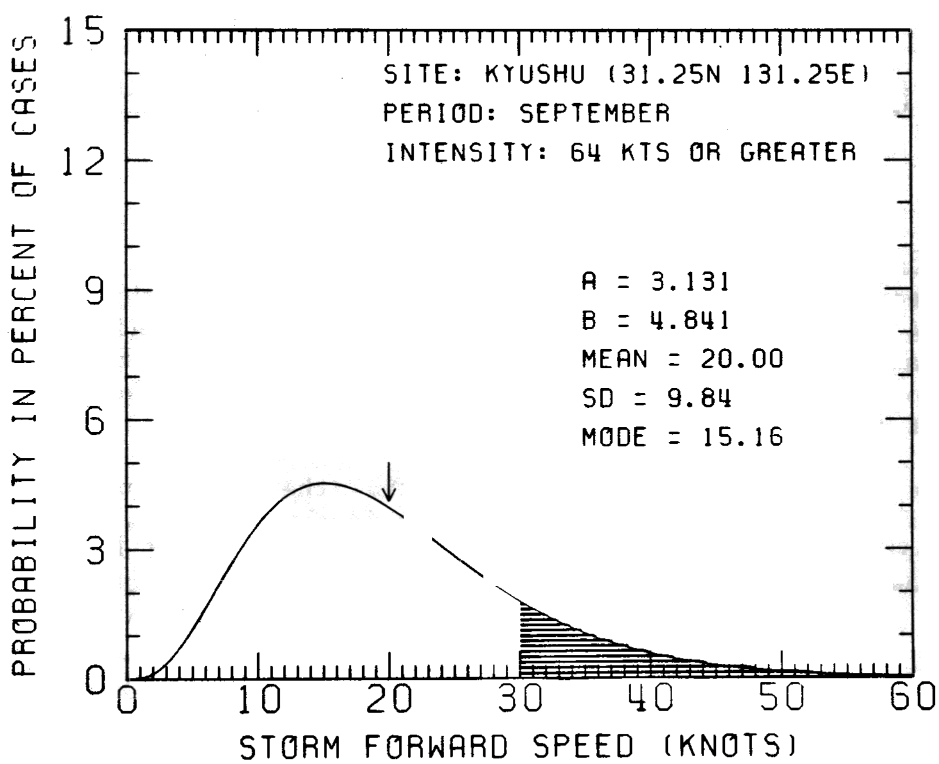
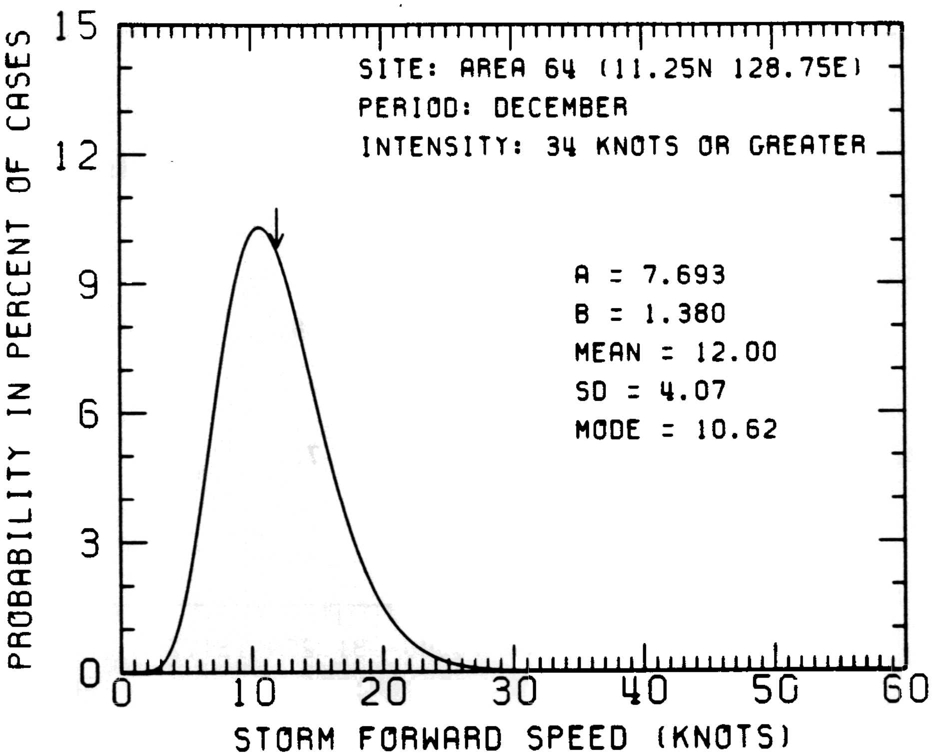


Fig. 7. Gamma distribution of the translational (forward) speeds of September typhoons that moved through site 273 (near Southern Japan). Constants a and b of the gamma distribution were estimated from the 13 September typhoons that moved through the area, 1946 - 1982. Shading, which depicts storm speeds exceeding 30 knots, represents 14.8% of the area under the curve. Arrow shows location of mean speed.



8. Gamma distribution of the translational (forward) speeds of December tropical storms and typhoons that moved through site 64 (east of Central Philippines). Constants a and b of the gamma distribution were estimated from the 13 storms that moved through the area, 1946 - 1982. Arrow shows location of mean speed.

Another example of a gamma distribution that represents a different regime of storm translational speeds is shown in Fig. 8. Here, off the Central Philippines, both the average storm speed (12 knots) and the standard deviation of the speeds (4.07 knots) are considerably less than those used to generate the gamma distribution shown in Fig. 7.

As in other distributions, the use of the gamma distribution requires that certain conditions be met. One of these conditions is that the data fitted to the distribution be homogeneous (i.e., not be a mixture of two or more distributions (Crutcher et al., 1982)). It is likely that annual data, as given on pages A36, A37, A38, A62, A63, A66, and A67 are, indeed, made up of mixtures of two or more speed distributions. This could occur, for example, where storms are under the control of different synoptic regimes. Thus, the use of annual data in determining parameters a and b is questionable over some portions of the basin.

Another consideration in using the gamma distribution relates to in the shape parameter a. The method of estimating the shape parameter as given by (3) is referred to as the "moment estimator" method. There are somewhat better "maximum likelihood estimators" of the shape parameter that can be used. However, both estimators are subject to bias for small sample sizes (n<30) in that the shape parameter is apt to be too large. A discussion of the problem and tables of corrections for both the moment estimator method and the maximum likelihood estimator method are given by Crutcher and Joiner, 1978, and Crutcher and Joiner, 1980.

6. ACKNOWLEDGMENTS

Microfilmed computer output from the NOAA FR-80 computer graphics system was accomplished by Thomas Tatnall of the Hurricane Research Division of AOML/NOAA. Also, Constance Arnhols of that organization provided an editorial review of the original manuscript. The lead author acknowledges considerable computer assistance from staff members of the National Hurricane Center.

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APPENDIX A -- CHARTS AND TABLES

A.1 Introduction

Charts and tabular data that depict frequency and motion characteristics are presented for various portions of the typhoon season and for three wind speed criteria. Chart Series A-I (pp. A4 through A38) is based on all tropical cyclone tracks or track segments having winds of at least tropical storm strength (1-minute sustained winds of at least 34 knots). Chart Series A-II (pp. A39 through A63) and A-III (pp A65 through A67) are similar to Series A-I, except that they are based on tracks or track segments that have at least 64 knots (typhoon strength) and 100 knots, respectively. Because sample sizes decrease with increasing wind speed limits, the number of stratifications in each series is greater in the case of the smaller wind speed limits (18 stratifications are given for Chart Series A-I, 12 for Chart Series A-II and 1 for Chart Series A-III). The final Chart Series A-IV (pp. A68 through A71) gives, for the entire year, the number of tropical storms and typhoons that passed within 25, 50, 75, 100, 150, and 200 n.mi. from any given point.

A.2 Chart Descriptions

The basic data set for each temporal stratification consists of four chart types, Chart 1, Chart 2, Chart 3, and Chart 4.

Chart 1 - Contours, at appropriately spaced intervals, depict the number of storms per 100 years that passed within various distances of any point in the basin. For Chart A-I, A-II, and A-III, this distance is 75 n.mi. For Chart Series A-IV, the distances are 25, 50, 75, 100, 150, and 200 n.mi. These distances, respectively, are equivalent to 46, 93, 139, 185, 278, and 371 km.

Chart 2 - Entries give resultant speed (knots) and direction (degrees) toward which storm is moving. Entries have been omitted when the storm frequency was $<$ 5 over the 37-year period of record (approximately 14 storms per 100 years).

Chart 3 - This chart gives specific storm tracks used in the computation of Charts 1 and 2. The entire storm track is shown, even though some portions may not have met the stratification criteria (time of year or intensity) and were not included in the computations.

Chart 4 - This panel gives miscellaneous tabular data A through F as follows:

Column A - The index number of circular area as defined in Fig. 9, page A3.

Column B - Expected number of tropical cyclones passing within 75 n.mi. of any grid point per 100 years. This is an unsmoothed value (see section 3.4.1) and may differ slightly from the smoothed analysis given in Chart 1.

Column C - Resultant (vector) direction in degrees towards which storm moved over the period of record. This is identical to the direction implied by the plotted arrow in Chart 2.

Column D - Resultant (vector) storm translational speed in knots. This is identical to the speed given in Chart 2.

Column E - Average translational speed of storms without regard to direction (scalar speed).

Column F - The standard deviation (knots) of Column E data.

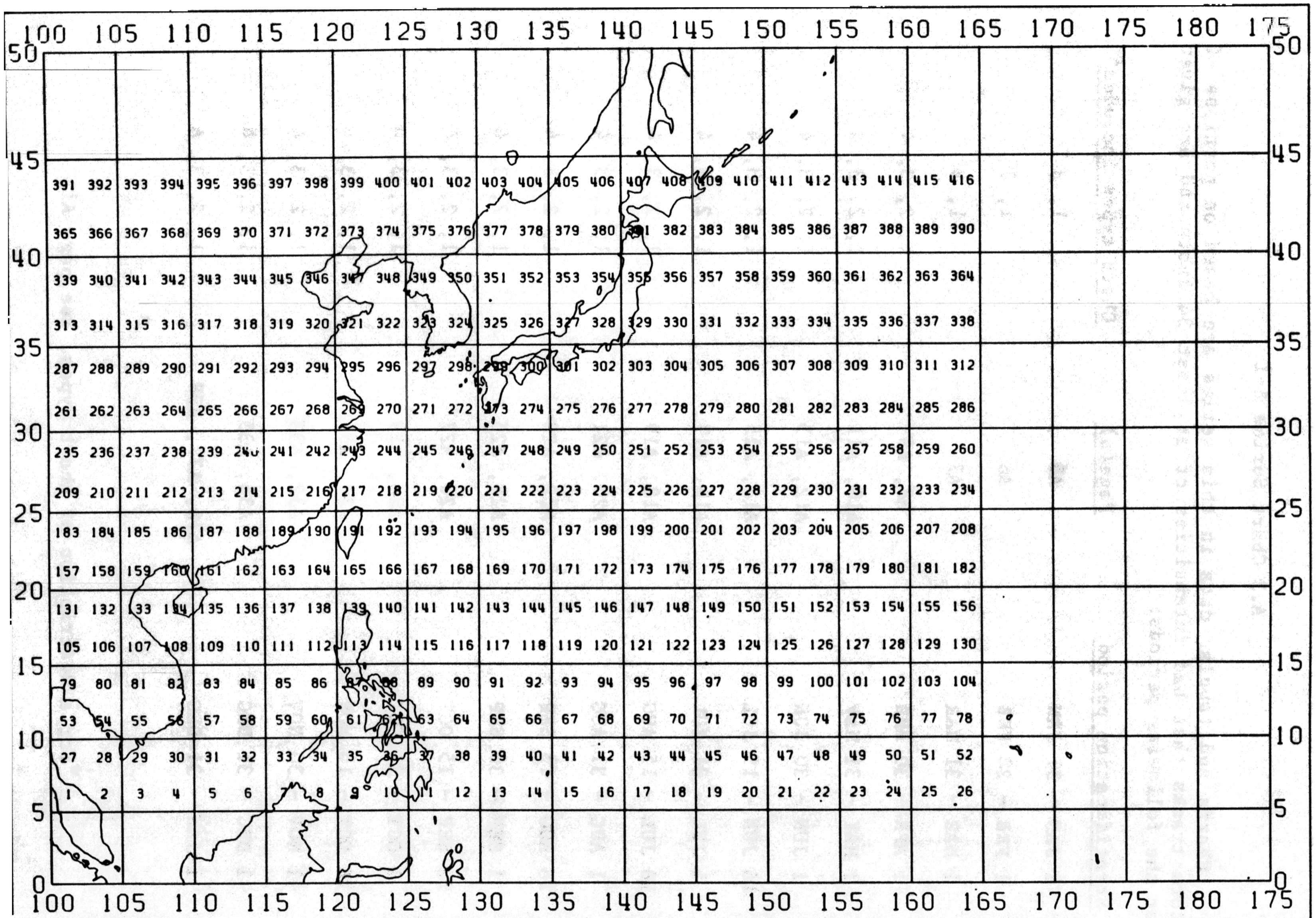


Fig. 9 Index numbers of circular scan areas

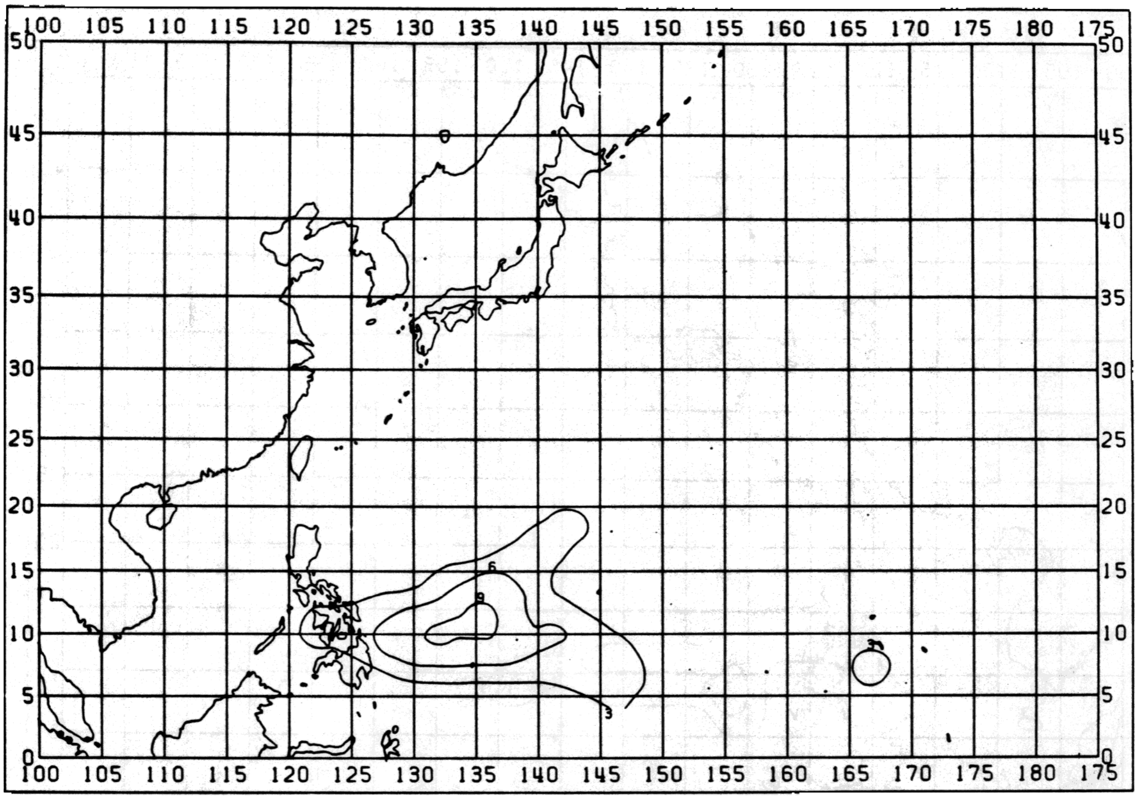
A.3 Chart Series A-I

Charts and tabular data in this series are based on portions of storm tracks that had intensities of at least 34 knots and are given for the following periods:

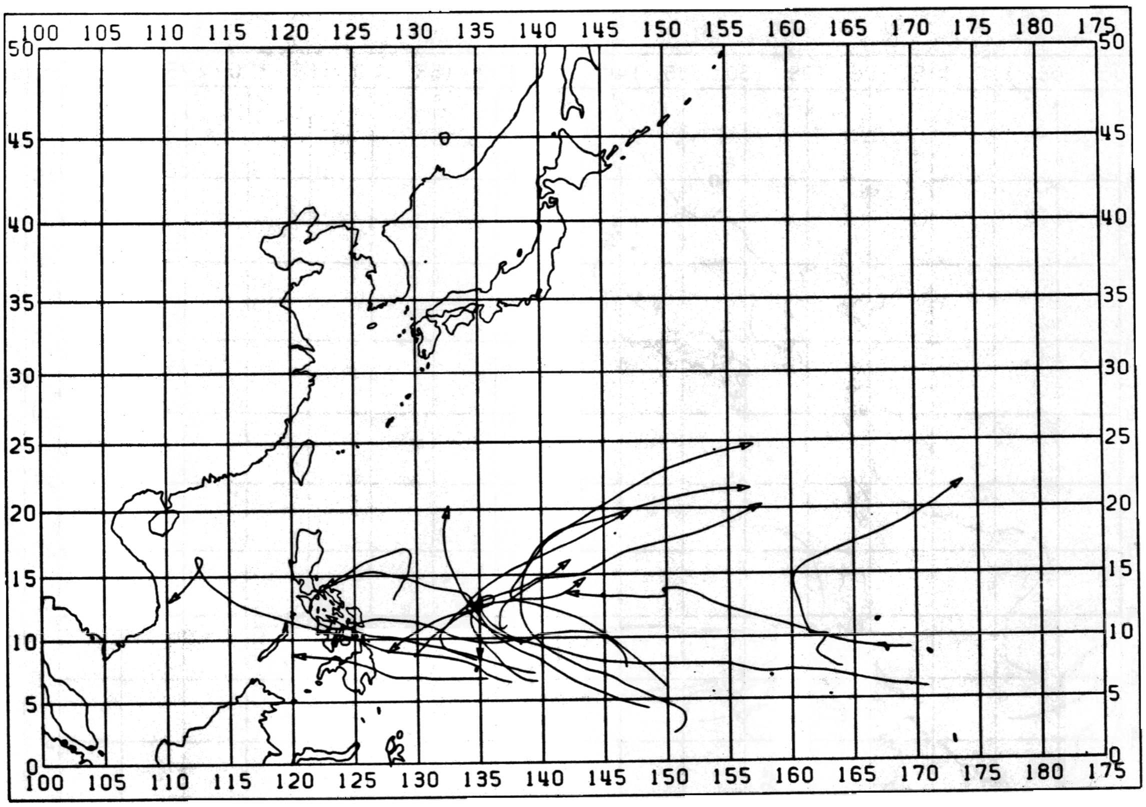
Stratification period	Page(s)	Chart types included*
1 JAN - 31 JAN	A5	
1 FEB - 28 FEB	A6	
1 MAR - 31 MAR	A7	1, 3
1 APR - 30 APR	A8, A9	1, 2, 3, 4
1 MAY - 31 May	A10, A11	1, 2, 3, 4
1 JUN - 30 JUN	A12, A13	1, 2, 3, 4
16 JUN - 15 JUL	A14, A15	1, 2, 3, 4
1 JUL - 31 JUL	A16, A17	1, 2, 3, 4
16 JUL - 15 AUG	A18, A19	1, 2, 3, 4
1 AUG - 31 AUG	A20, A21	1, 2, 3, 4
16 AUG - 15 SEP	A22, A23	1, 2, 3, 4
1 SEP - 30 SEP	A24, A25	1, 2, 3, 4
16 SEP - 15 OCT	A26, A27	1, 2, 3, 4
1 OCT - 31 OCT	A28, A29	1, 2, 3, 4
16 OCT - 15 NOV	A30, A31	1, 2, 3, 4
1 NOV - 30 NOV	A32, A33	1, 2, 3, 4
1 DEC - 31 DEC	A34, A35	1, 2, 3, 4
1 JAN - 31 DEC	A36, A37, A38	1, 2, 3 4

*For a description of chart types, see page A1.

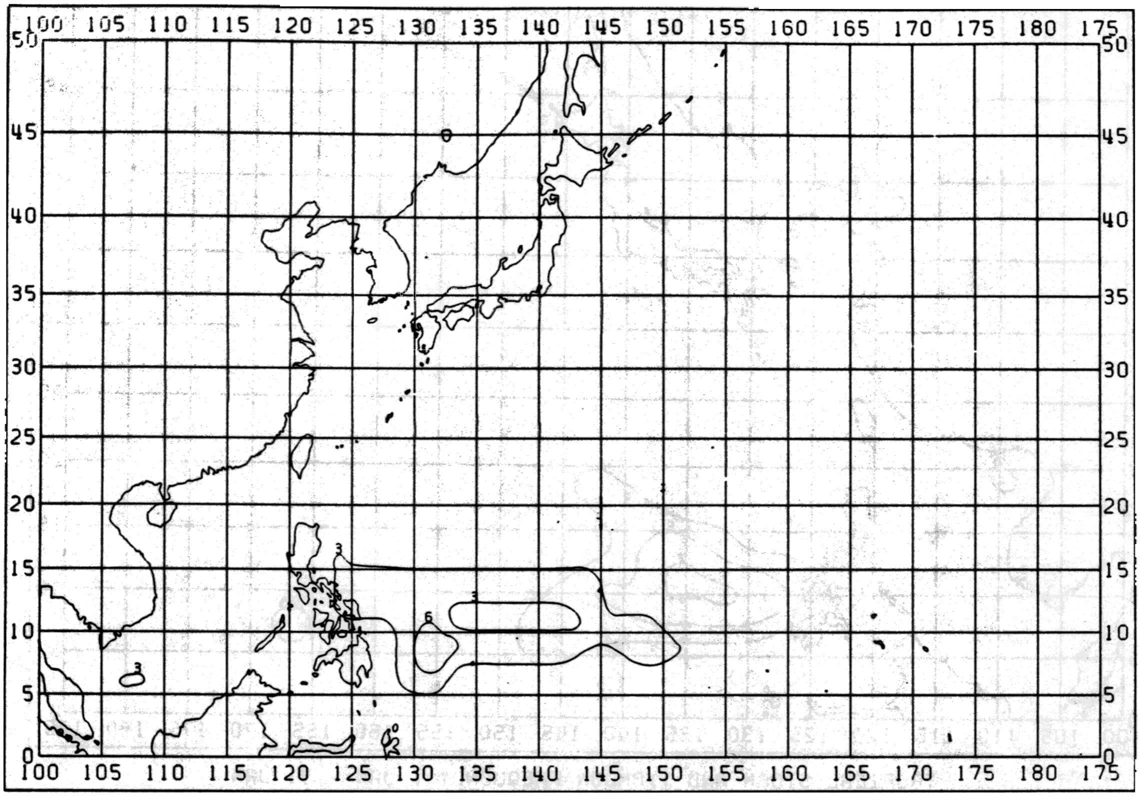
<u>Note</u>: All charts in this series are based on a scan-distance of 75 n.mi. (139.5 km)



TROPICAL STORM AND TYPHOON FREQUENCY JAN - 31 JAN



TROPICAL STORM AND TYPHOON TRACKS 1 JAN - 31 JAN



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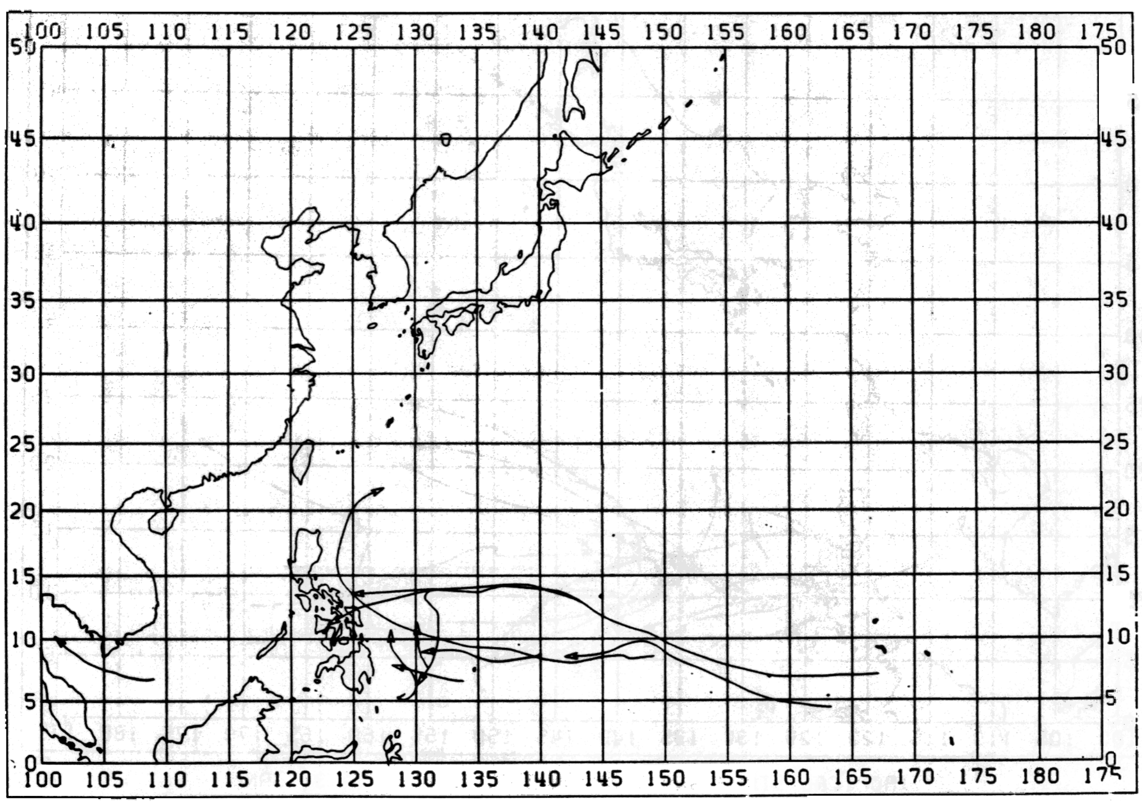

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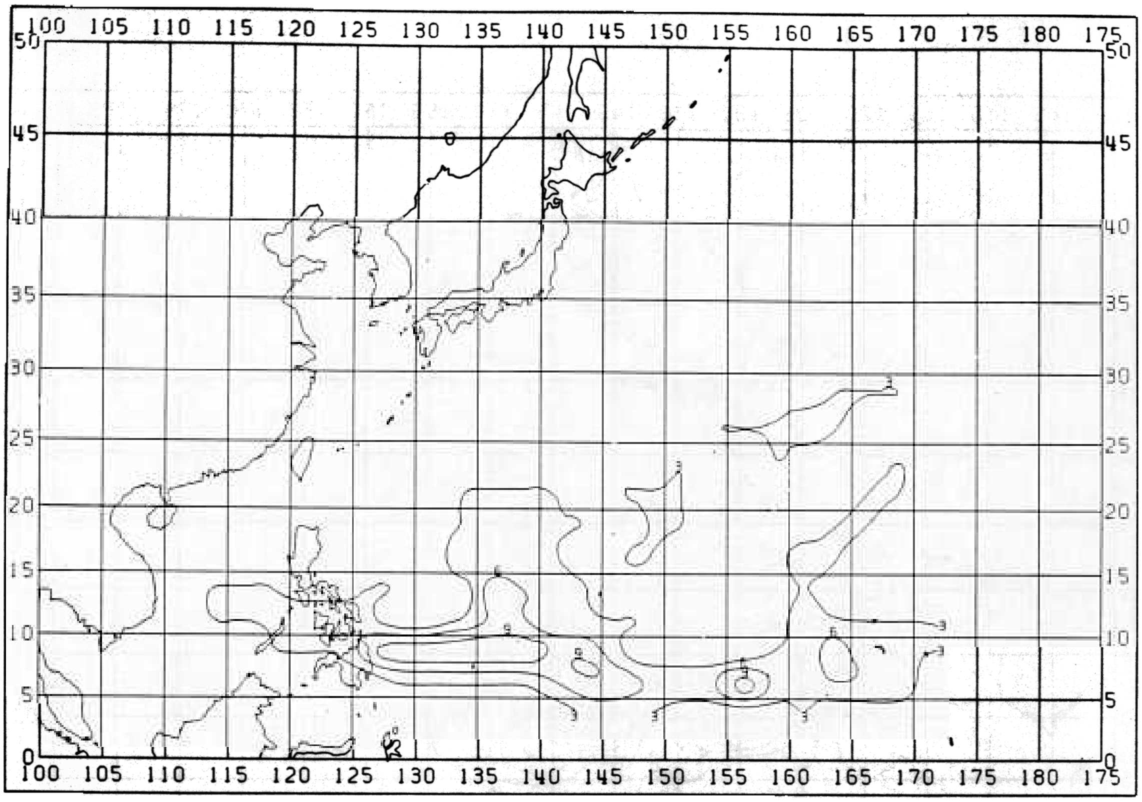

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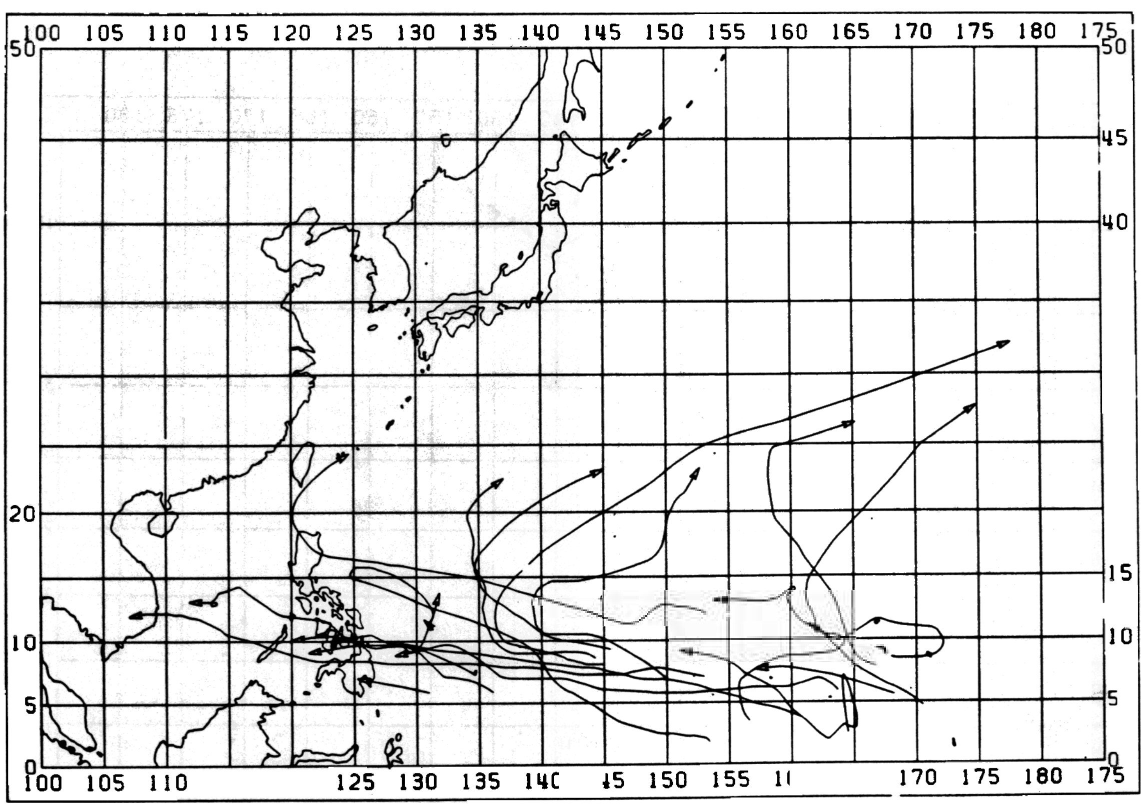

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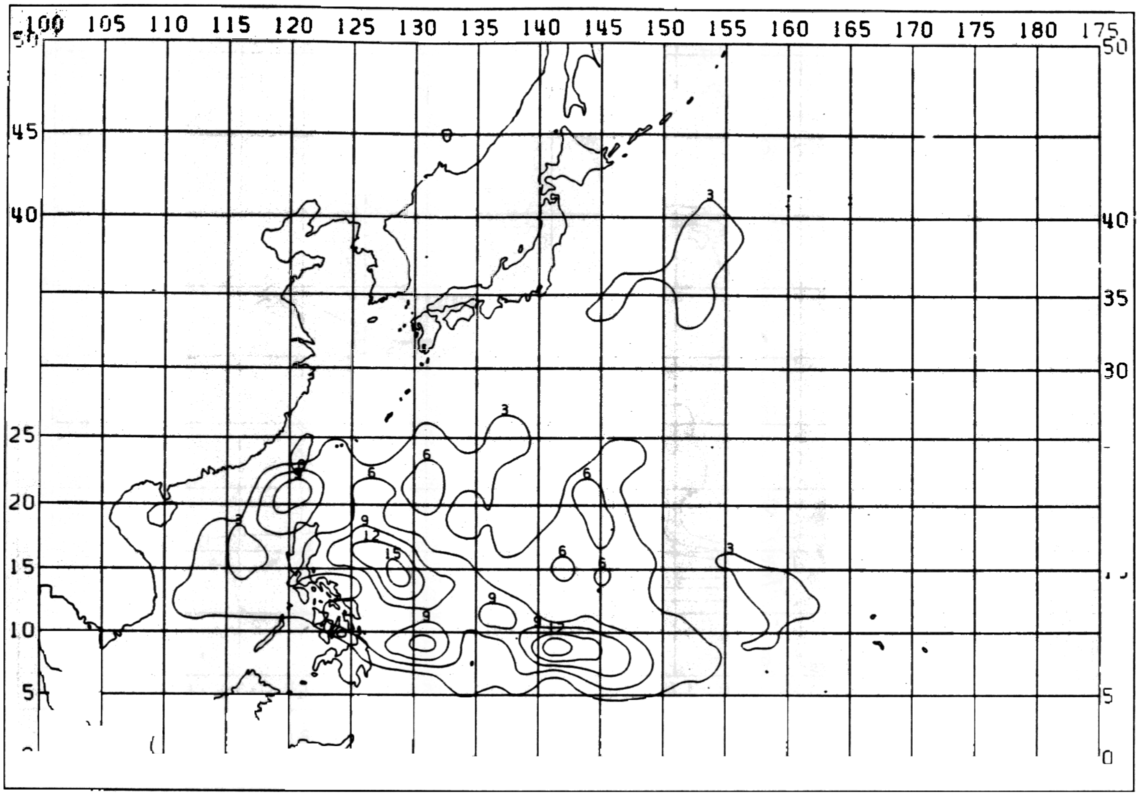
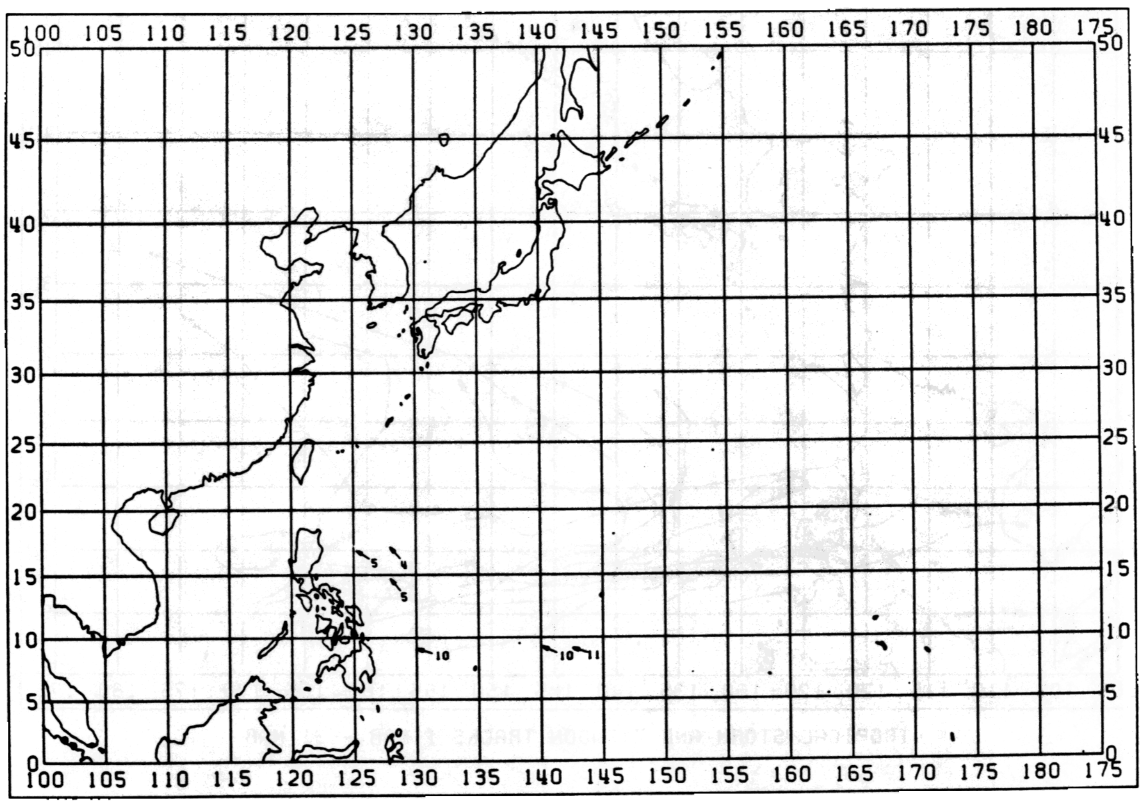
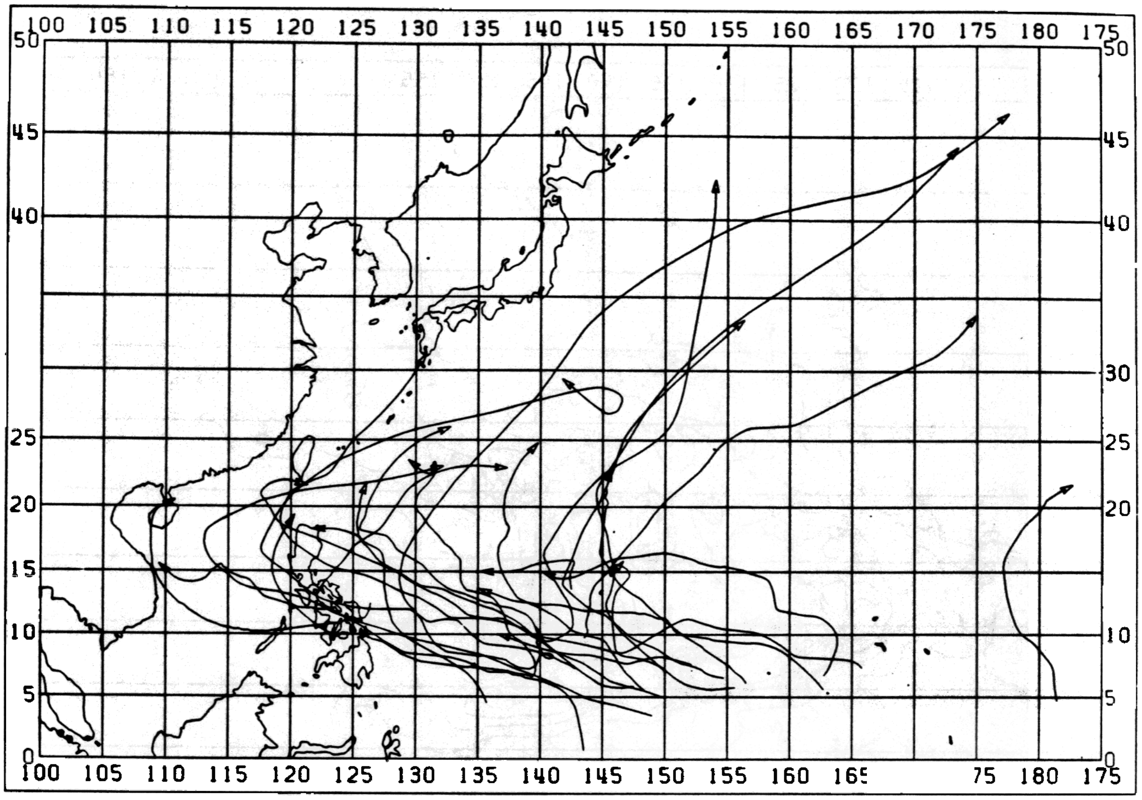


TROPICAL STORM AND TYPHOON FREQUENCY APR - 30 APR

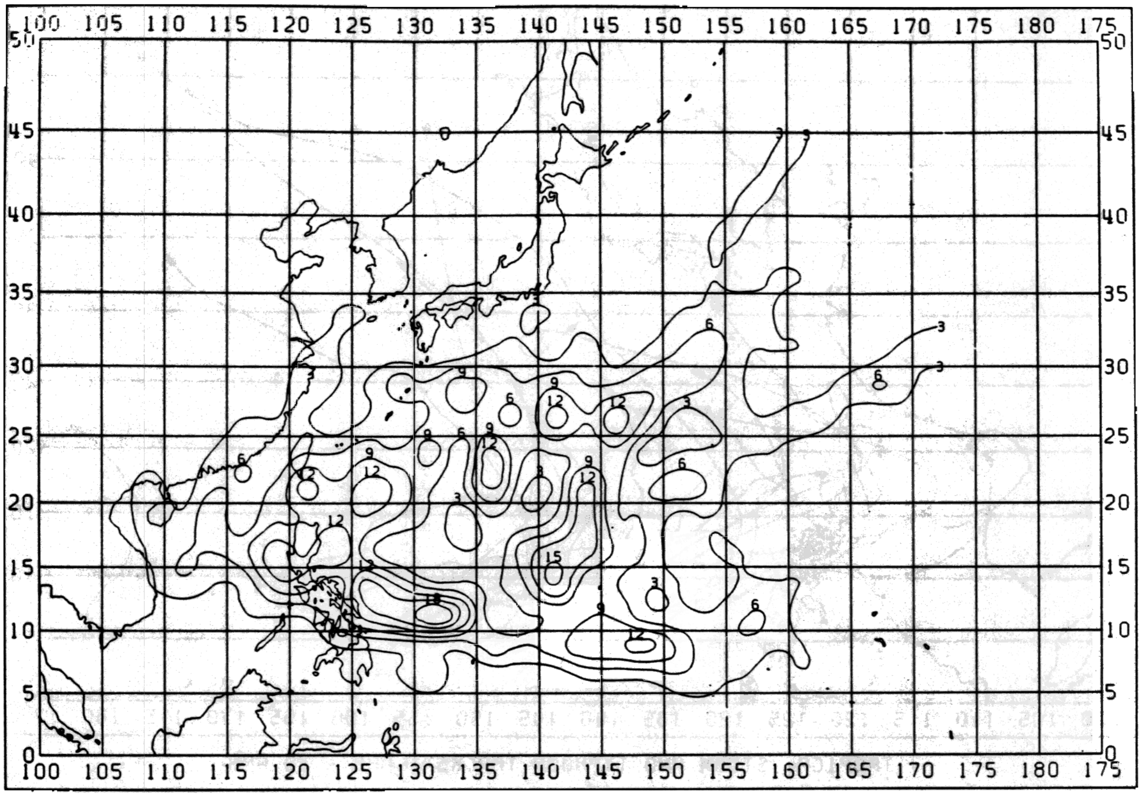


TROPICAL STORM AND TYPHOON MOTION 1 APR - 30 APR

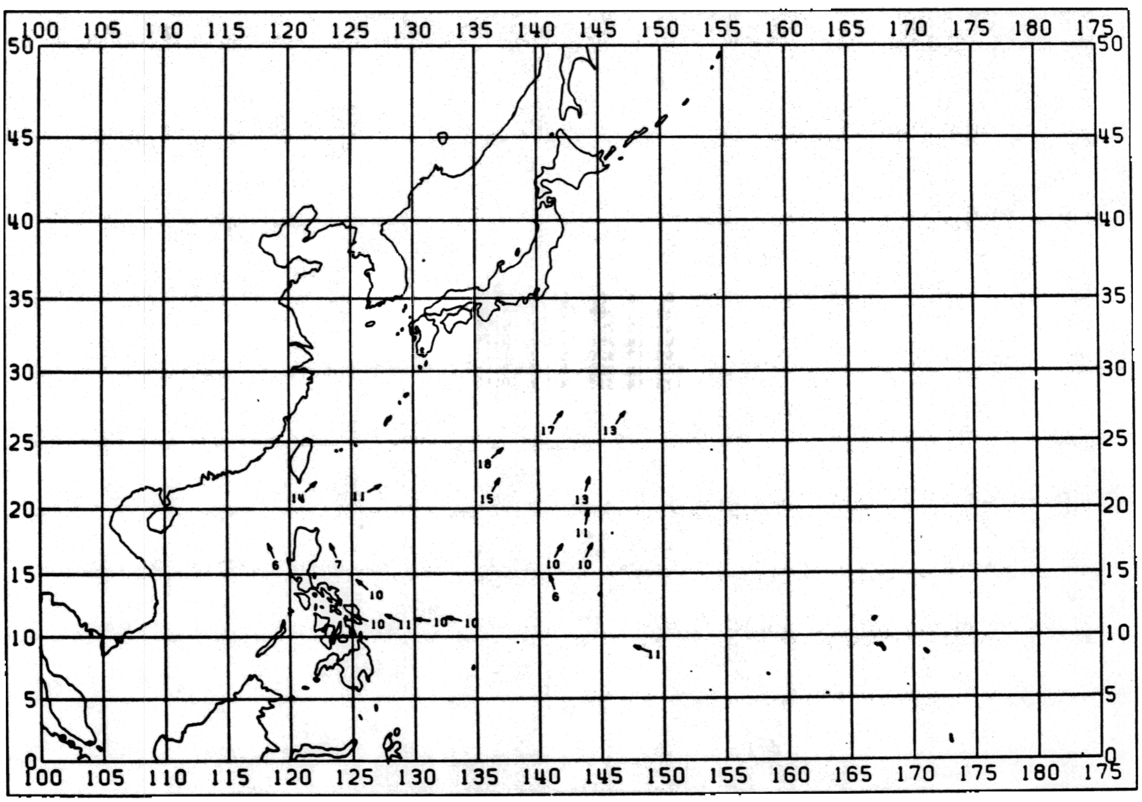


TROPICAL STORM AND TYPHOON TRACKS 1 APR - 30 APR

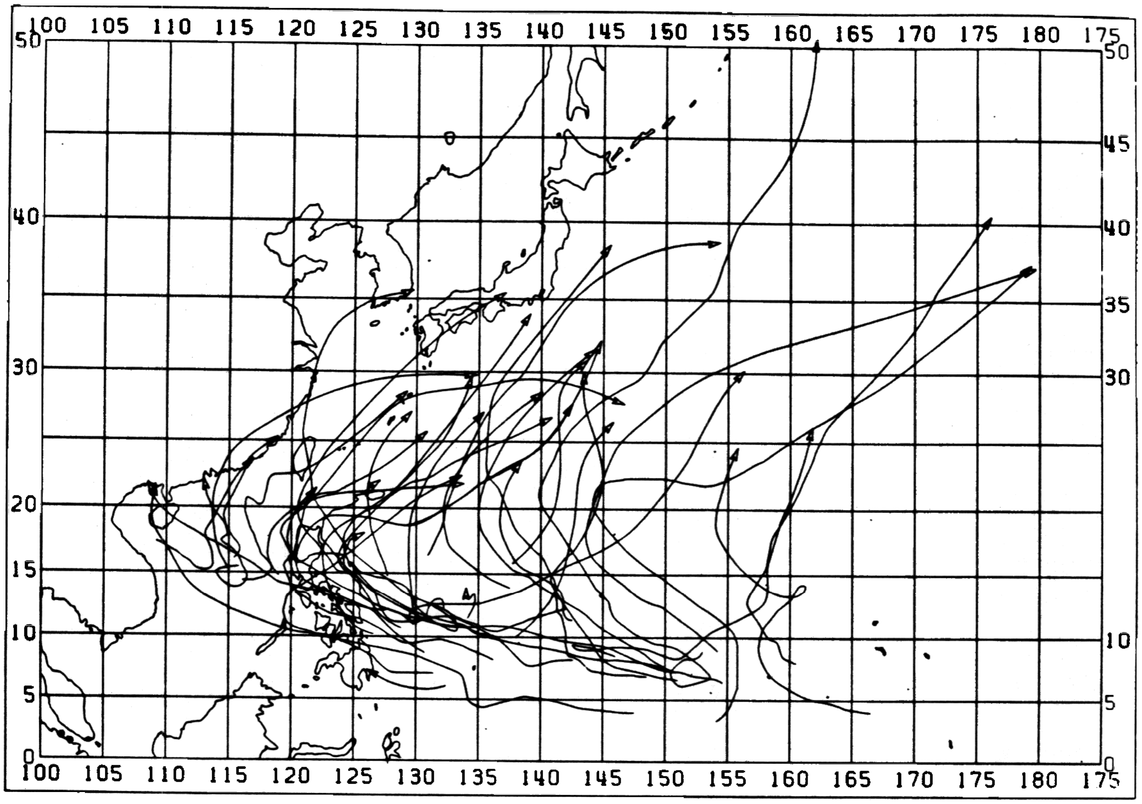
A	B	C	D	E	F
39	14	288	10	10	3.20
43	19	295	10	12	5.58
44	14	288	11	12	6.26
90	17	320	5	8	1.29
115	14	302	5	7	2.64
116	14	318	4	9	0.89



TROPICAL STORM AND TYPHOON FREQUENCY MAY - 31 MAY

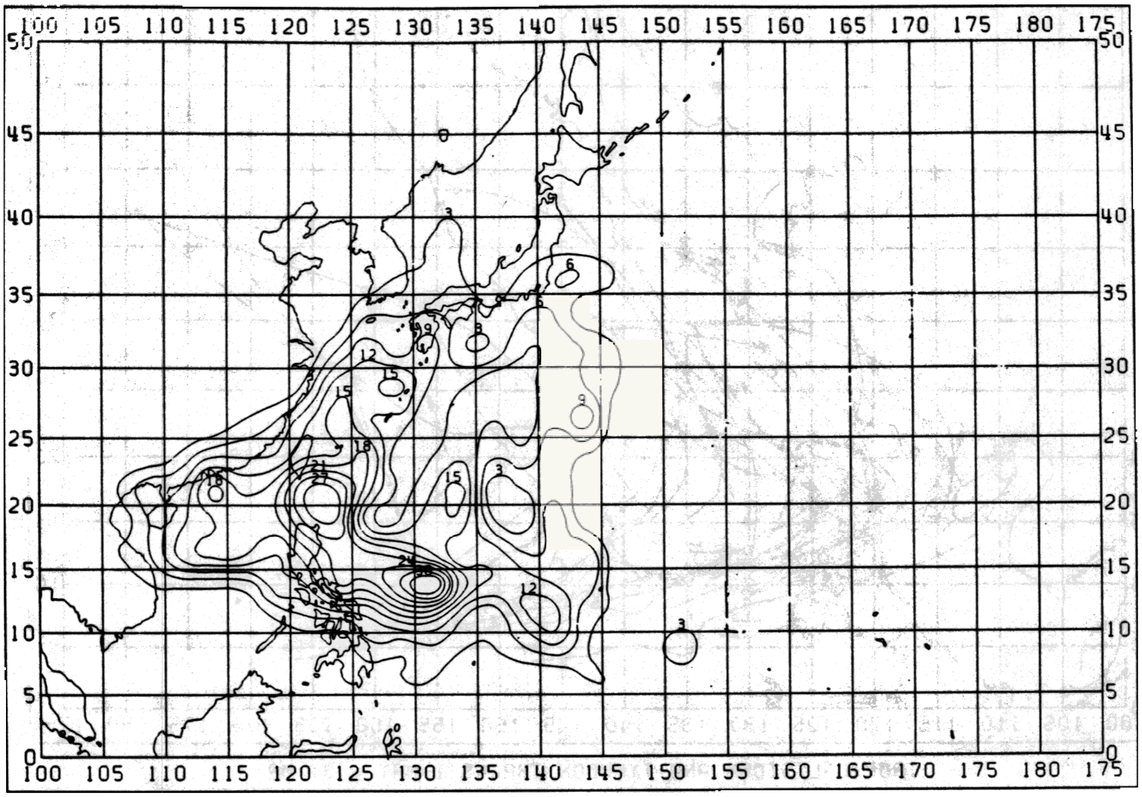


TROPICAL STORM AND TYPHOON MOTION 1 MAY - 31 MAY

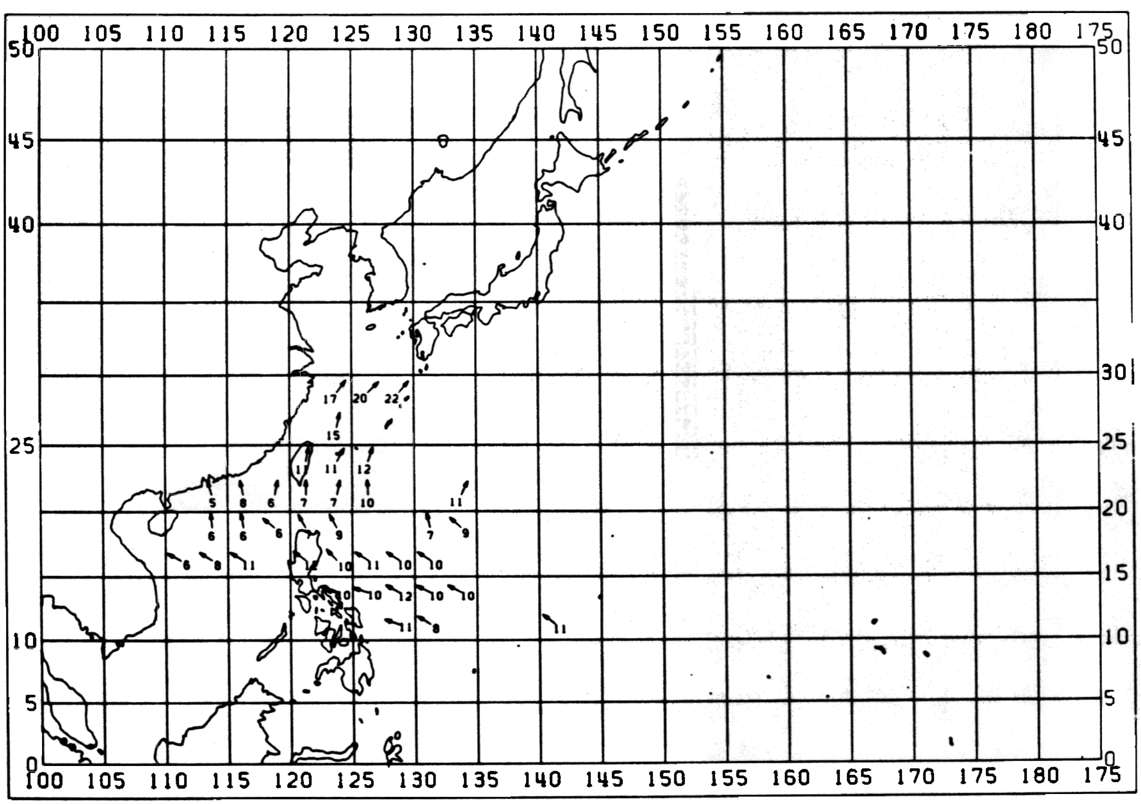


TROPICAL STORM AND TYPHOON TRACKS 1 MAY - 31 MAY

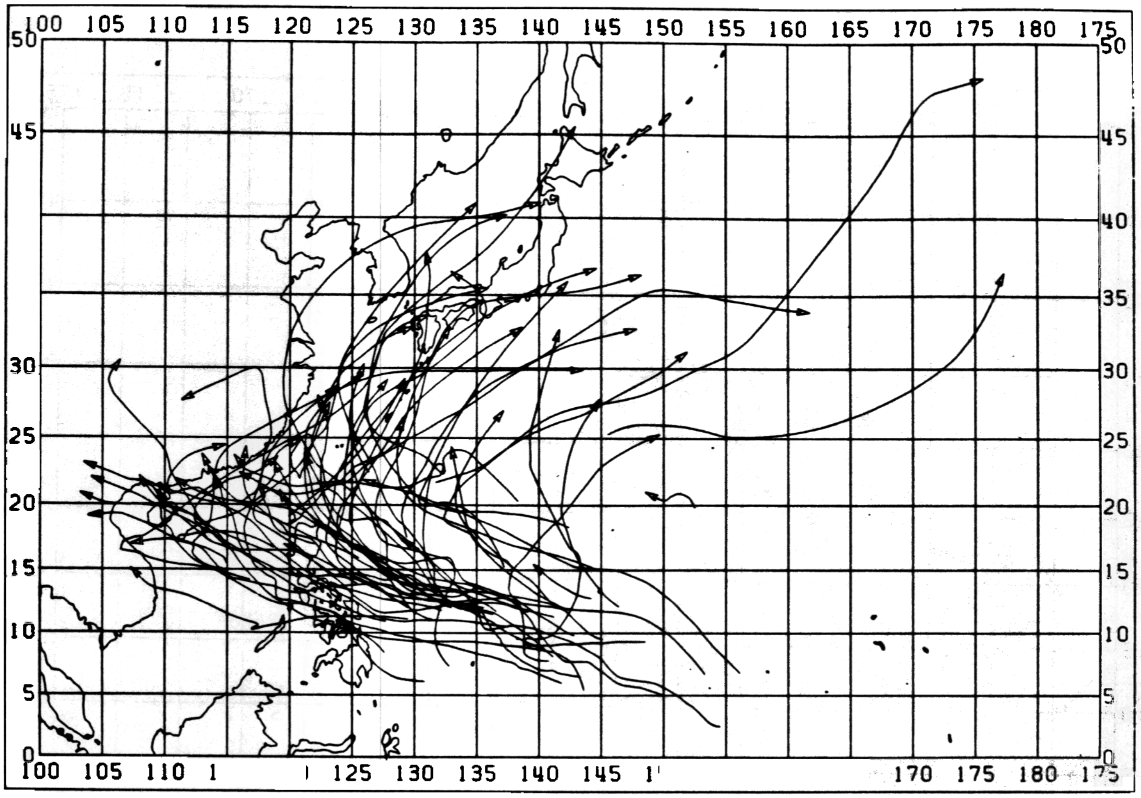
A	B	C	D	E	F
46	14	292	11	11	4.39
63	14	292	10	10	1.93
64	17	295	11	12	2.67
65	22	278	10	11	3.92
66	17	285	10	11	4.74
89	17	311	10	10	3.50
95	17	341	6	7	2.90
112	14	337	6	7	3.01
114	17	335	7	8	3.34
121	14	031	10	11	4.52
122	14	025	10	12	5.23
148	14	011	11	12	3.96
165	14	046	14	15	5.13
167	14	061	11	13	5.85
171	14	029	15	18	3.83
174	14	016	13	13	6.04
197	14	047	18	20	3.26
225	14	035	17	19	6.36
227	14	036	13	16	5.46



TROPICAL STORM AND TYPHOON FREQUENCY 1 JUN - 30 JUN

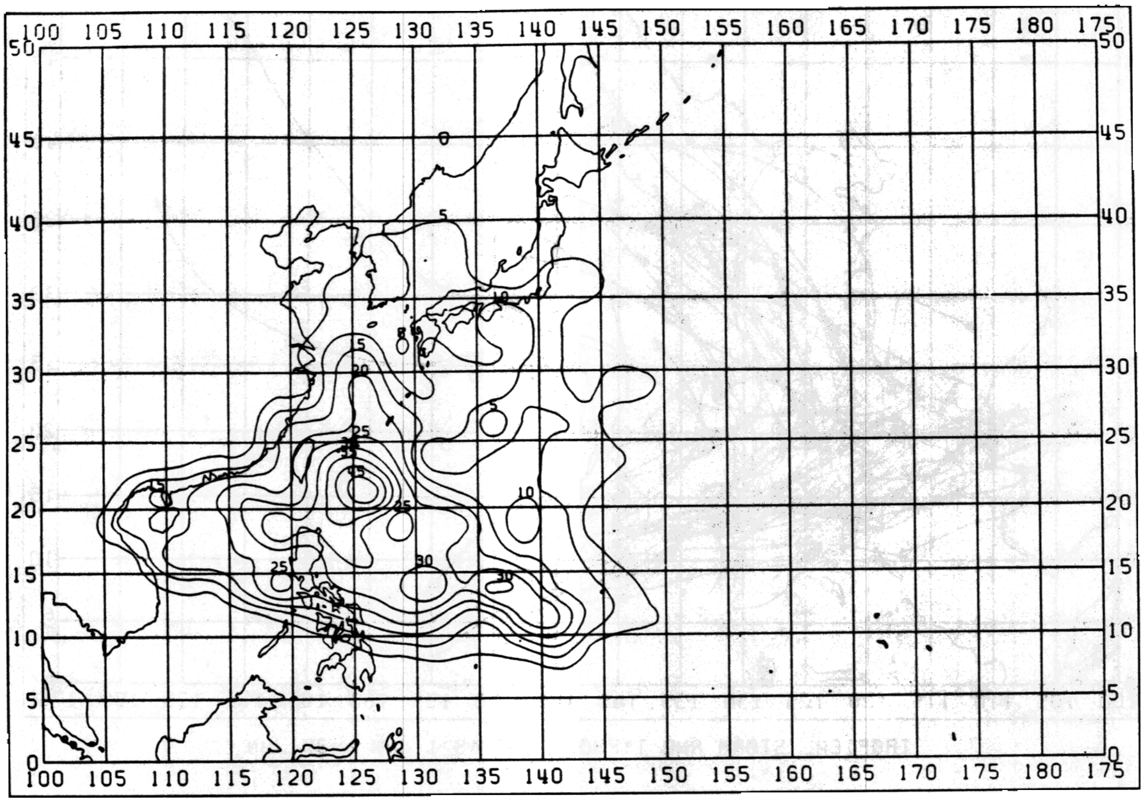


TROPICAL STORM AND TYPHOON MOTION 1 JUN - 30 JUN

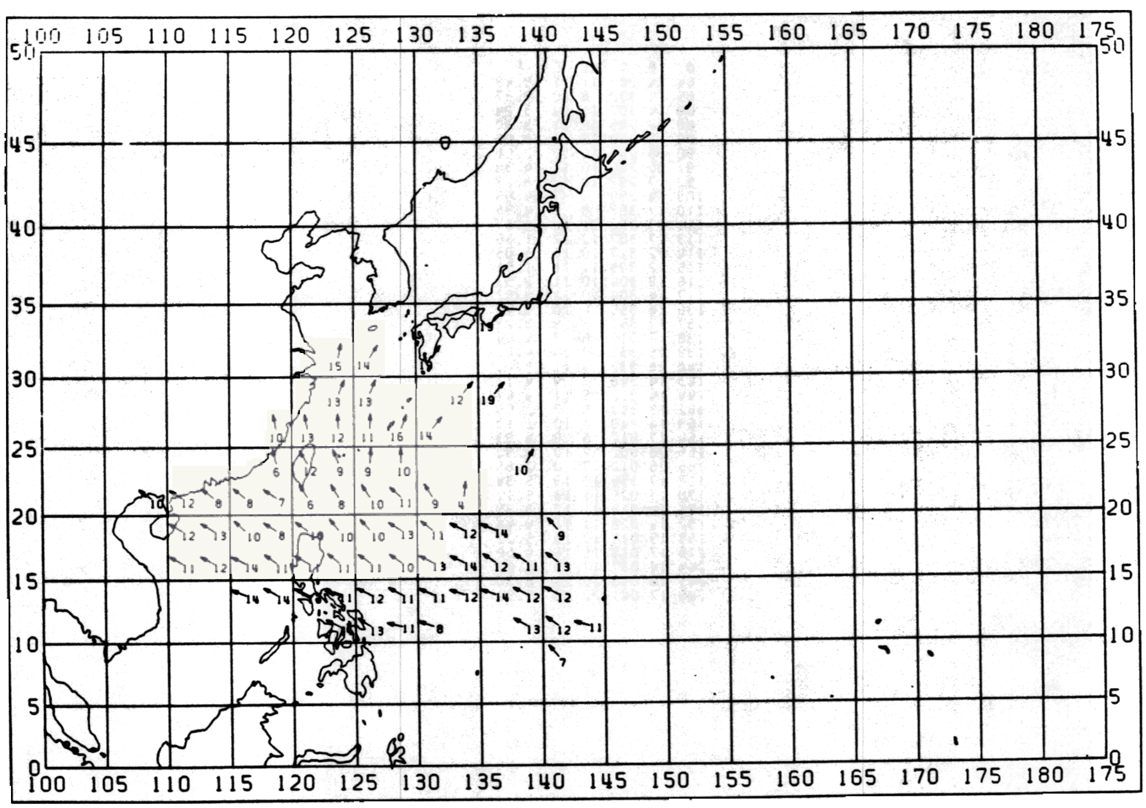


TROPICAL STORM AND TYPHOON TRACKS 1 JUN - 30 JUN

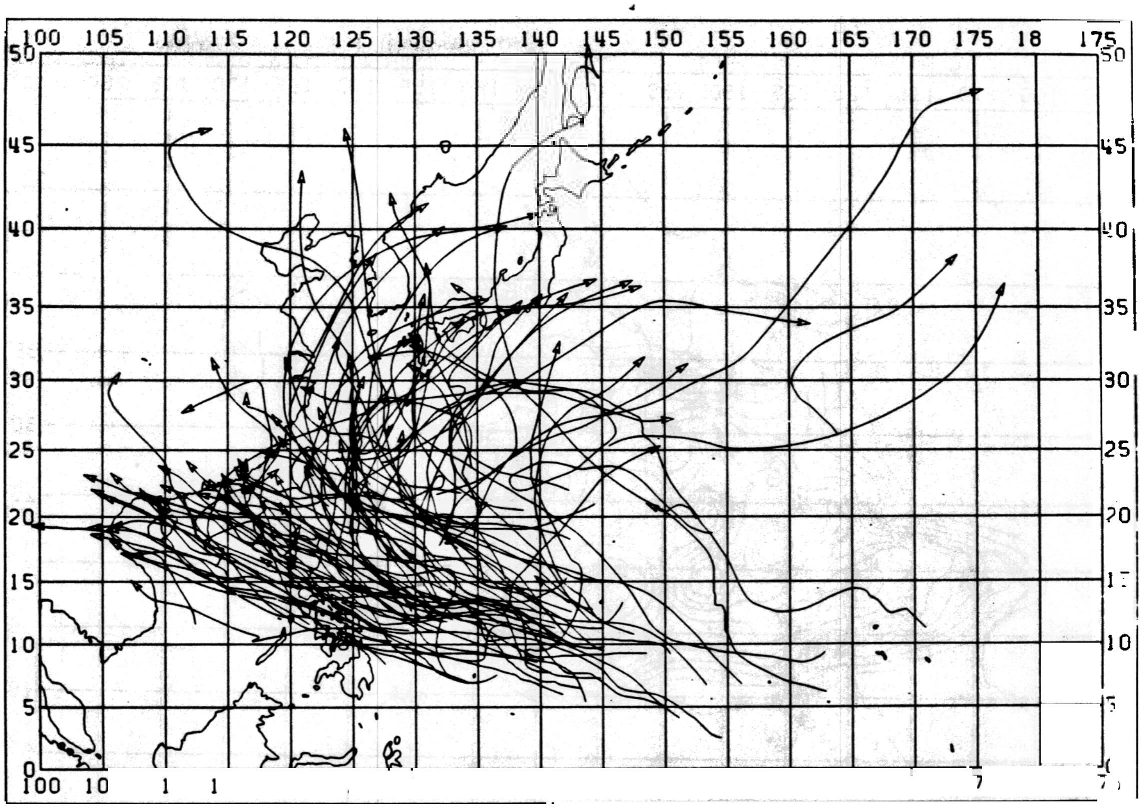
A	B	C	D	E	F
64	14	289	11	11	3.49
65	14	302	8	10	3.37
69	14	307	11	14	3.24
88	22	286	10	11	3.30
89	19	288	10	11	2.60
90	28	299	12	12	2.68
91	36	296	10	11	4.38
92	17	297	10	13	3.23
109	14	299	6	7	4.09
110	17	303	8	9	4.38
111	17	302	11	12	4.87
113	17	307	12	12	1.96
114	22	317	10	11	3.05
115	22	303	11	11	1.96
116	19	304	10	11	2.53
117	14	304	10	12	3.52
136	14	355	6	10	3.43
137	17	351	6	9	3.23
138	17	310	6	7	4.64
139	25	331	7	10	4.01
140	28	332	9	11	3.02
143	14	348	7	9	4.13
144	14	312	9	11	4.44
162	19	343	5	7	2.55
163	14	349	8	10	2.13
164	17	012	6	9	4.33
165	28	002	7	10	3.32
166	28	012	7	10	2.85
167	17	356	10	13	5.34
170	17	025	11	13	5.12
191	14	013	11	12	3.35
192	14	028	11	11	4.44
193	19	019	12	14	5.22
218	17	013	15	16	4.60
244	14	037	17	19	6.41
245	14	046	20	21	8.30
246	17	041	22	23	5.94



TROPICAL STORM AND TYPHOON FREQUENCY 16 JUN - 15 JUL



TROPICAL STORM AND TYPHOON MOTION 16 JUN - 15 JUL



TROPICAL STORM AND TYPHOON TRACKS 16 JUN - 15 JUL

A	B	C	D	E	F
43	14	320	7	10	1.32
62	14	297	14	14	2.02
63	17	303	13	14	4.58
64	22	284	11	11	2.91
65	19	290	8	10	4.45
68	28	299	13	13	3.75
69	28	307	12	13	3.53
70	14	286	11	11	3.87
85	17	292	14	14	2.76
86	28	299	14	15	2.98
87	22	296	13	14	3.01
88	25	288	11	12	3.02
89	28	297	12	13	3.10
90	30	299	11	12	2.61
91	36	294	11	12	3.69
92	25	289	12	14	3.27
93	33	289	14	14	4.25
94	28	297	12	12	5.02
95	14	298	12	12	2.59
109	19	299	11	11	1.98
110	19	298	12	13	5.05
111	19	296	14	15	4.36
112	22	306	11	12	4.64
113	19	299	11	12	2.52
114	30	309	11	12	2.63
115	30	305	11	11	2.33
116	28	305	10	11	3.67
117	28	298	13	15	3.78
118	19	296	14	14	4.46
119	19	305	12	12	3.72
120	14	303	11	13	4.99
121	14	308	13	13	3.89
135	14	300	12	12	4.04
136	17	301	13	14	5.37
137	25	313	10	11	4.14
138	36	303	8	10	4.52
139	30	306	10	11	4.05
140	36	321	10	11	3.09
141	28	319	10	11	2.76
142	22	302	13	13	4.72
143	30	308	11	12	5.23
144	28	297	12	12	5.65
145	14	294	14	14	1.67
147	14	320	9	13	3.85
160	17	306	10	10	2.45
161	14	302	12	12	2.94
162	19	309	8	9	2.10
163	25	309	8	9	2.96
164	19	304	7	9	4.47
165	25	327	6	9	2.74
166	41	329	8	11	3.00
167	52	327	10	12	3.69

A	B	C	D	E	F
168	30	312	11	13	4.72
169	19	328	9	14	3.56
170	14	007	4	10	5.71
190	14	347	6	10	5.61
191	25	329	12	13	3.41
192	36	338	9	10	3.34
193	33	004	9	12	4.75
194	22	359	10	13	4.87
198	14	028	10	14	4.73
216	14	350	10	12	1.88
217	17	351	13	15	5.60
218	17	357	12	12	6.15
219	22	003	11	12	7.08
220	19	021	16	17	7.57
221	14	039	14	15	6.77
244	17	023	13	15	8.42
245	22	022	13	15	7.24
248	14	038	12	15	9.23
249	14	040	19	23	5.62
270	14	012	15	16	6.13
271	17	032	14	14	5.12
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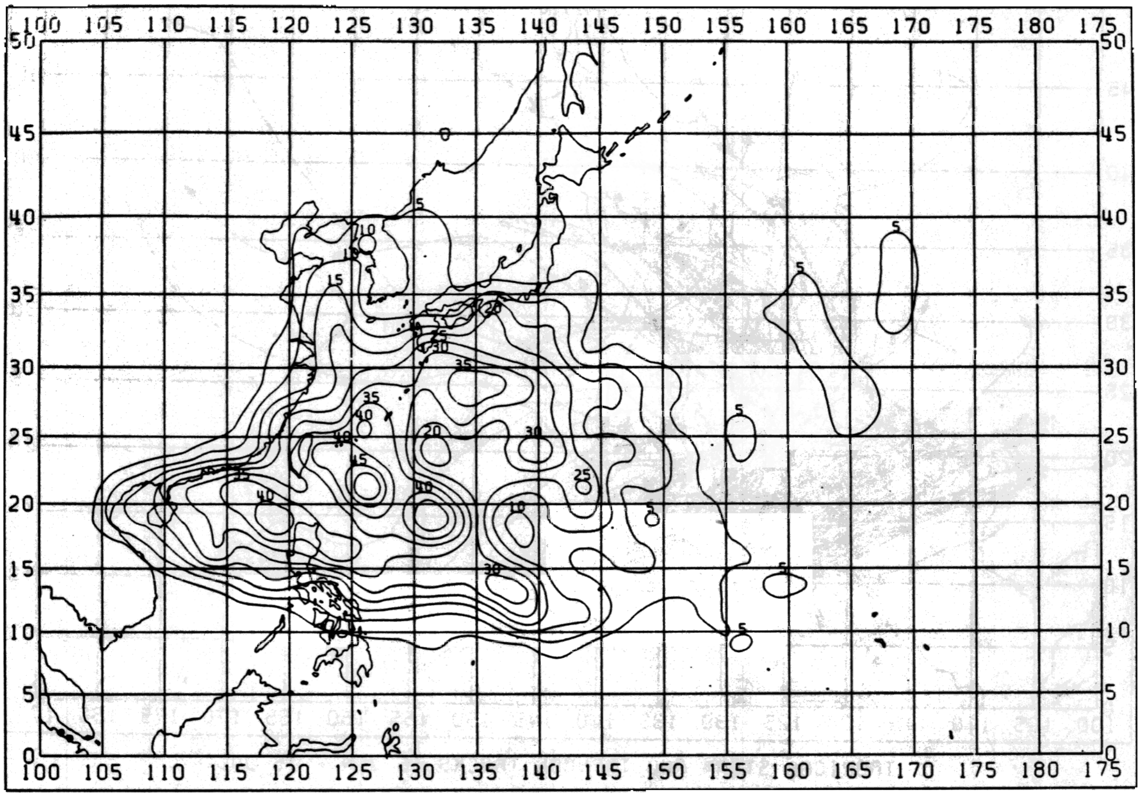
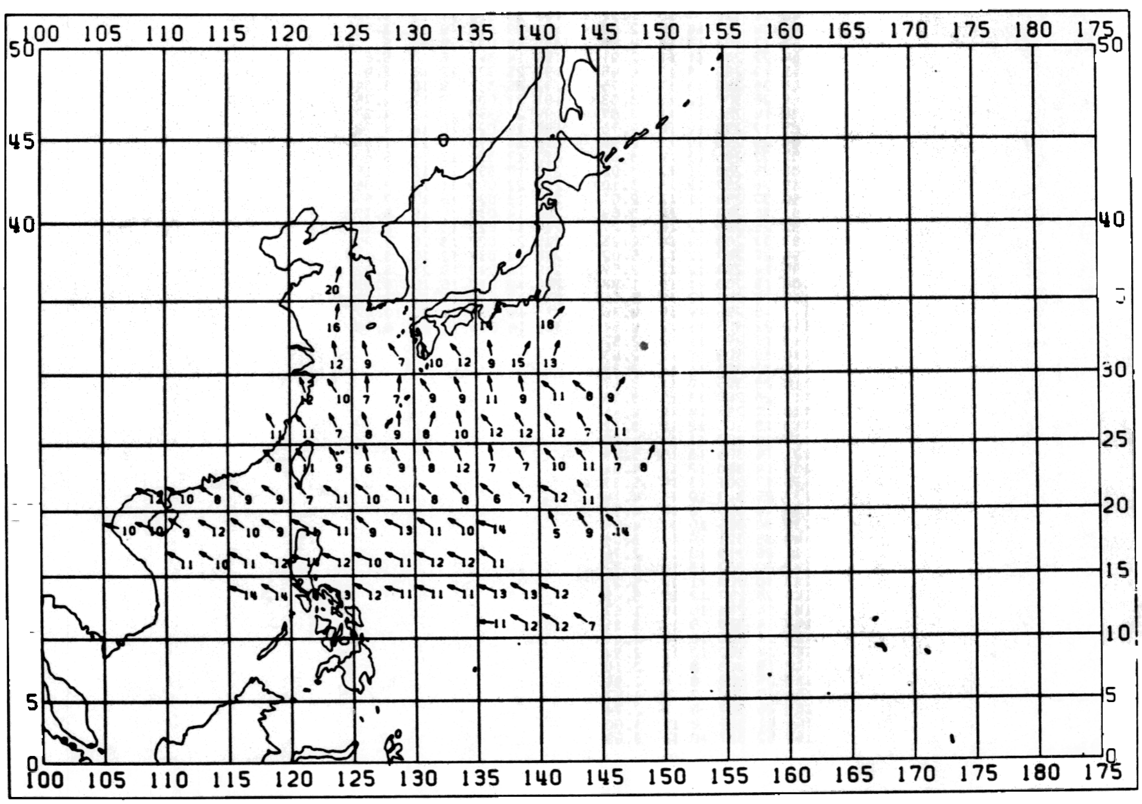
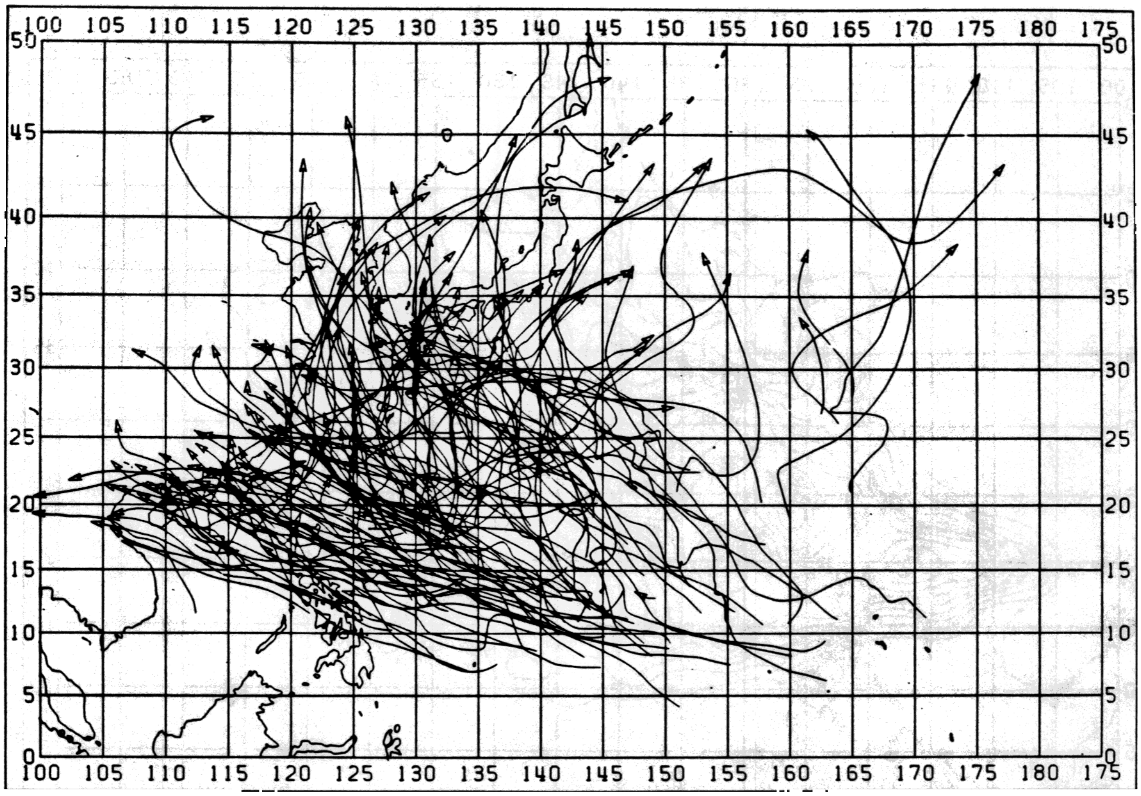
301	14	046	19	23	8.73



TROPICAL STORM AND TYPHOON FREQUENCY JUL - 31 JUL



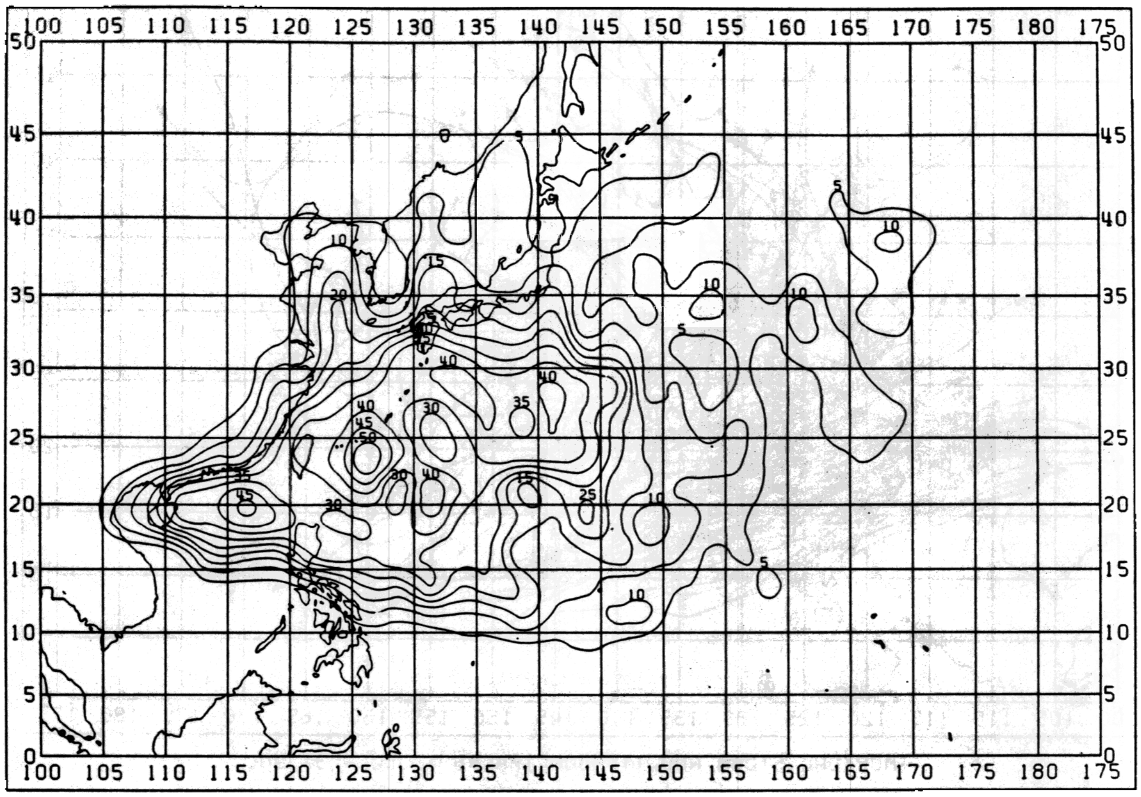


TROPICAL STORM AND TYPHOON TRACKS 1 JUL - 31 JUL

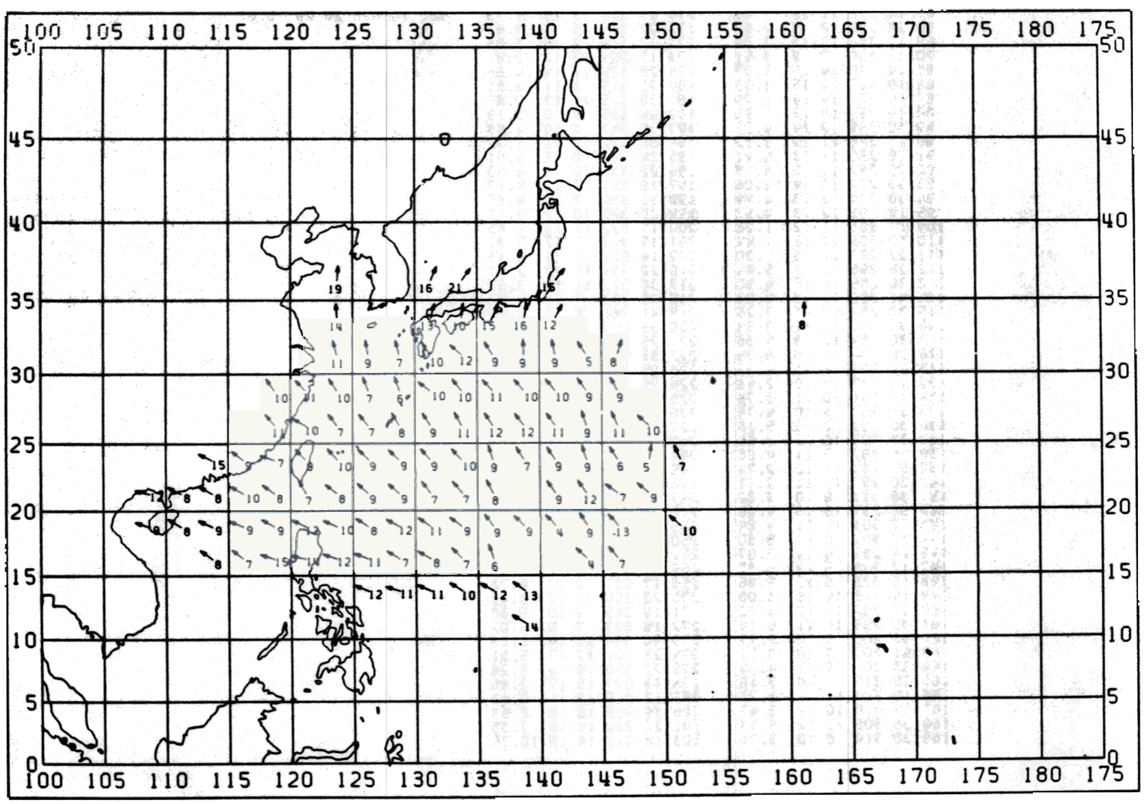
A	B	C	D	E	F
67	14	276	11	12	3.40
68	28	299	12	13	2.95
69	17	303	12	13	3.84
70	17	306	7	9	3.51
85	14	290	14	15	3.07
86	19	300	14	15	3.33
87	14	301	14	14	1.79
88	14	295	13	13	1.96
89	30	299	12	14	4.27
90	25	288	11	12	3.12
91	28	290	11	13	4.41
92	25	292	11	15	3.18
93	33	292	13	14	4.06
94	30	299	13	13	4.99
95	14	296	12	13	4.53
109	17	301	11	12	1.28
110	30	303	10	11	4.44
111	22	297	11	13	5.00
112	28	296	12	14	5.84
113	30	285	14	15	4.90
114	41	292	12	13	4.03
115	33	294	10	11	3.25
116	30	295	11	11	3.94
117	30	294	12	13	5.38
118	28	295	12	13	5.04
119	22	303	11	11	4.52
133	14	287	10	10	2.46
134	17	291	10	11	3.74
135	25	307	9	10	4.78
136	30	299	12	13	5.16
137	33	307	10	12	3.65
138	46	302	9	11	4.06
139	38	299	11	12	2.74
140	30	297	11	11	2.71
141	38	313	9	10	3.62
142	38	297	13	13	4.26
143	52	303	11	11	4.84
144	38	302	10	12	5.30
145	14	289	14	14	2.07
147	17	338	5	13	6.37
148	19	328	9	12	5.86
149	14	315	14	15	3.08
160	17	297	12	12	3.22
161	30	299	10	11	4.14
162	33	303	8	10	2.77
163	41	307	9	10	3.71
164	33	307	9	11	4.04
165	28	319	7	10	3.16
166	38	304	11	11	3.71
167	57	310	10	11	3.47
168	36	306	11	12	4.57
169	38	314	8	10	3.76

A	B	C	D	E	F
170	25	320	8	10	4.73
171	22	311	6	9	3.41
172	17	318	7	10	3.98
173	17	299	12	12	3.82
174	28	329	11	14	4.66
190	22	317	8	11	3.81
191	38	325	11	13	2.80
192	44	333	9	10	3.19
193	38	347	6	10	4.48
194	36	332	9	11	5.22
195	14	337	8	8	2.61
196	22	337	12	13	6.53
197	19	351	7	12	4.17
198	33	330	7	11	4.45
199	30	320	10	12	3.66
200	17	322	11	13	4.65
201	17	343	7	12	7.37
202	14	021	8	12	8.13
216	22	331	11	12	2.47
217	30	322	11	12	3.37
218	28	333	7	11	4.77
219	41	341	8	10	5.24
220	33	000	9	12	6.22
221	25	016	8	12	6.44
222	33	348	10	13	6.11
223	25	318	12	14	5.93
224	25	330	12	14	5.15
225	25	323	12	13	3.83
226	14	330	7	14	3.86
227	14	316	11	12	5.38
243	14	341	12	15	6.53
244	19	327	10	11	4.15
245	30	357	7	12	6.13
246	30	004	7	12	5.93
247	30	325	9	13	5.63
248	38	337	9	14	7.77
249	38	349	11	17	7.10
250	33	349	9	15	6.08
251	25	309	11	13	3.40
252	17	311	8	11	1.74
253	17	031	9	17	6.76
270	22	350	12	12	6.41
271	19	345	9	10	5.66
272	19	323	7	9	4.02
273	30	330	10	14	5.23
274	28	321	12	17	5.91
275	22	350	9	14	8.24
276	19	027	15	17	7.85
277	17	019	13	15	6.43
296	19	009	16	18	8.53
301	22	030	14	16	7.33
303	14	042	18	19	10.75

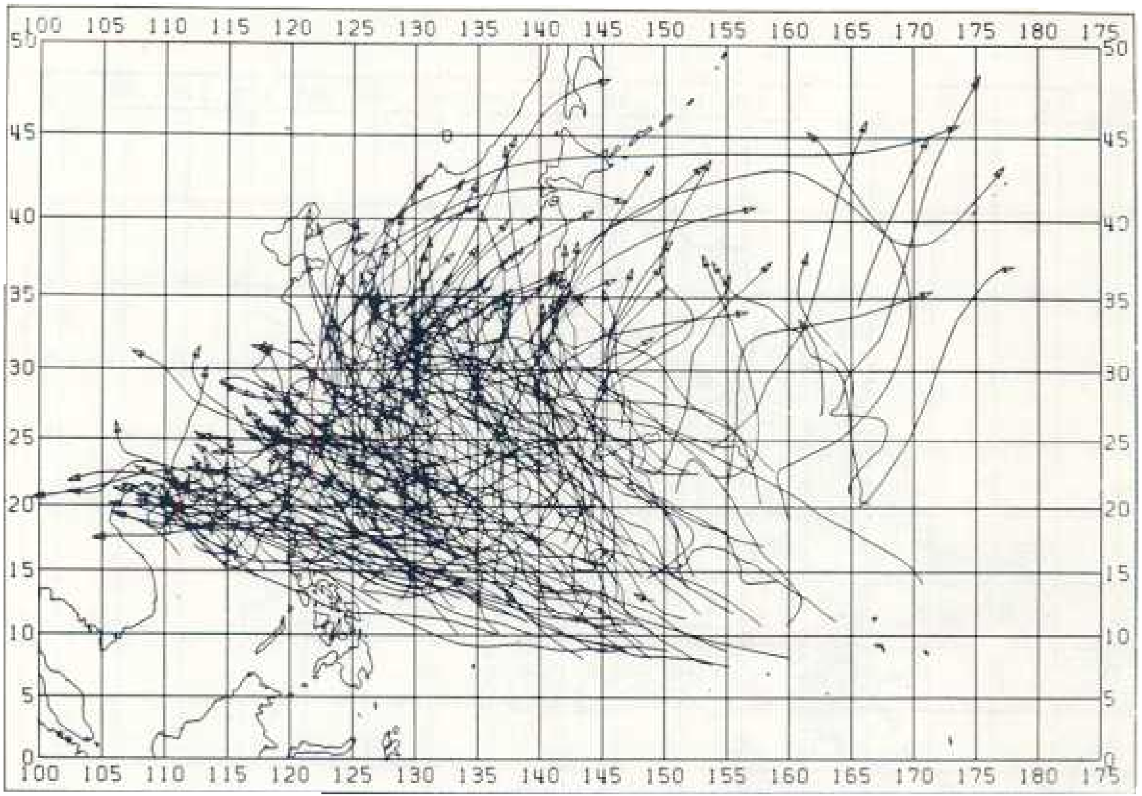
A	B	C	D	E	F
322	14	016	20	23	5.88



TROPICAL STORM AND TYPHOON FREQUENCY 16 JUL - 15 AUG



TROPICAL STORM AND TYPHOON MOTION 16 JUL - 15 AUG

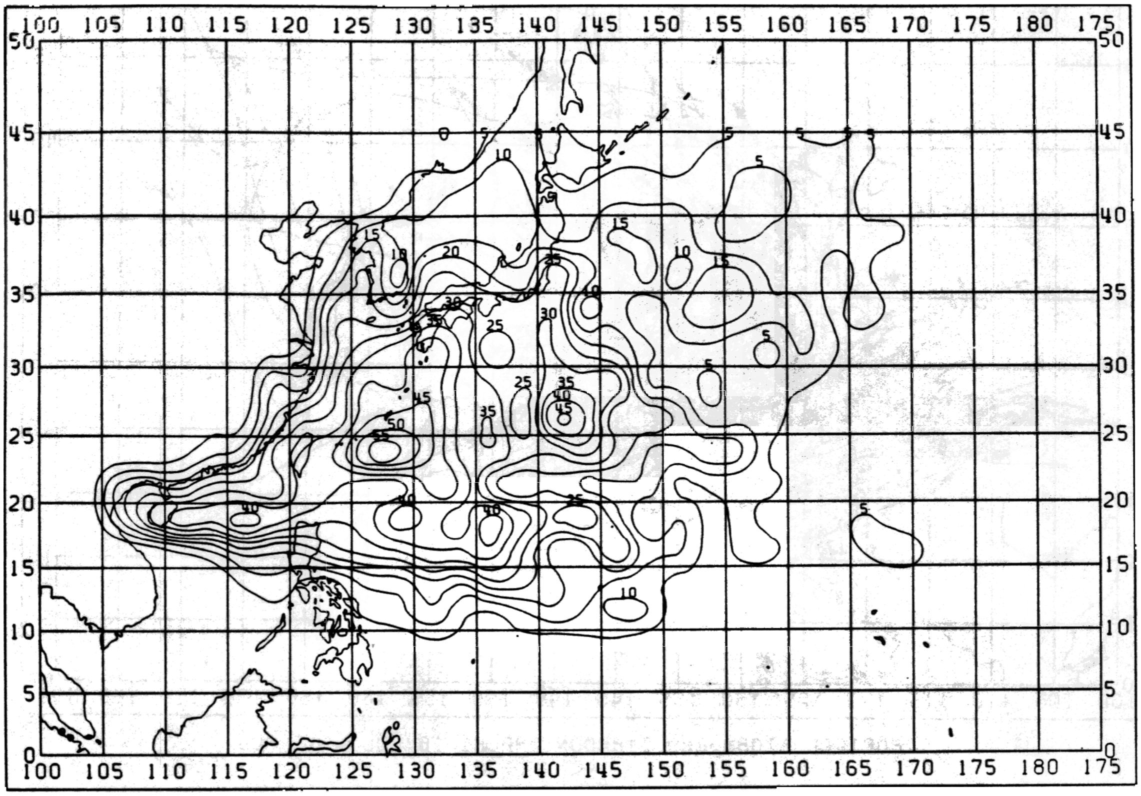


TROPICAL STORM AND TYPHOON TRACKS 16 JUL - 15 AUG

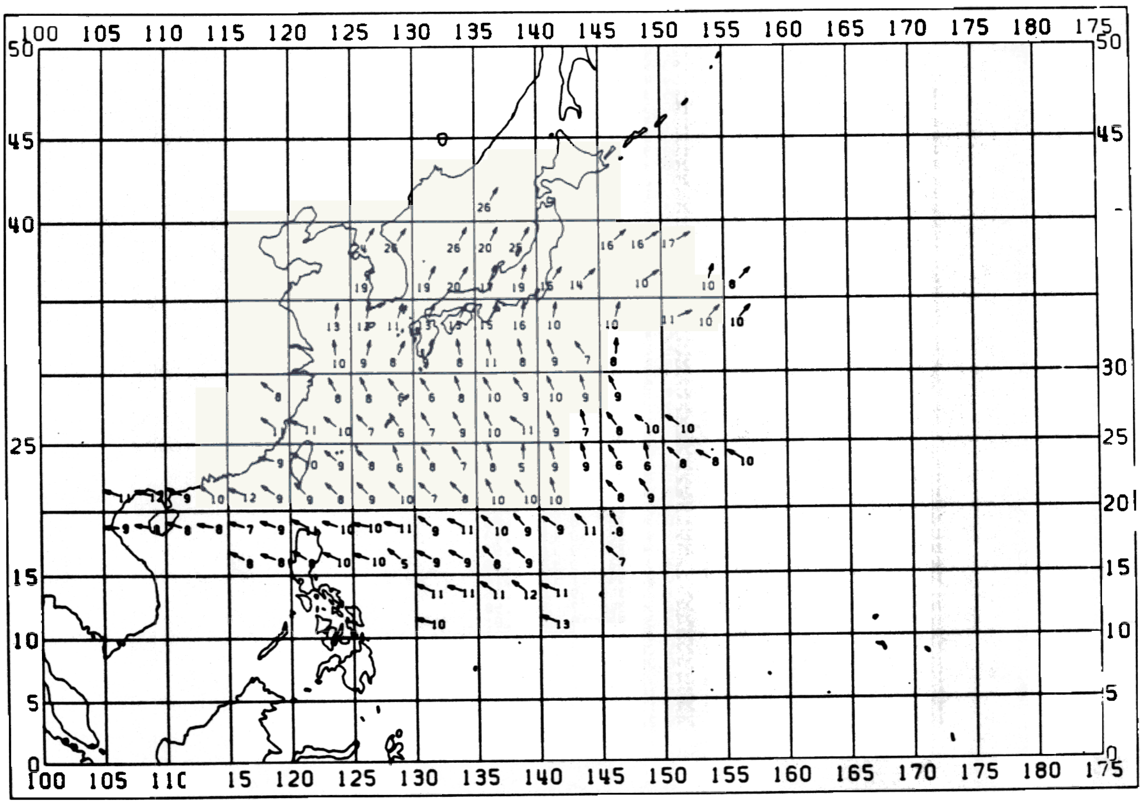
A	B	C	D	E	F
68	17	301	14	14	2.89
89	22	293	12	13	4.64
90	19	288	11	13	3.50
91	33	294	11	13	4.05
92	19	303	10	15	3.61
93	25	300	12	13	5.33
94	19	307	13	14	4.85
110	22	306	8	10	3.58
111	19	308	7	10	5.47
112	17	288	15	15	5.71
113	30	284	14	15	4.76
114	36	289	12	12	4.55
115	30	291	11	11	3.42
116	36	301	7	11	5.66
117	28	300	8	13	5.72
118	28	317	7	12	5.78
119	25	341	6	13	6.12
122	14	314	4	7	3.34
123	19	321	7	8	3.37
134	19	289	9	10	3.05
135	36	301	8	9	3.50
136	36	295	9	10	3.94
137	44	292	9	11	4.12
138	41	298	9	11	3.60
139	33	295	12	12	2.96
140	28	294	10	10	2.67
141	30	302	8	9	4.02
142	30	298	12	13	3.32
143	41	304	11	11	4.37
144	28	306	9	11	4.61
145	28	322	9	12	4.75
146	19	313	9	12	4.06
147	14	318	4	9	4.62
148	28	332	9	11	4.61
149	17	320	13	14	3.41
151	14	312	10	10	6.24
160	17	285	12	13	5.08
161	33	298	8	9	3.85
162	36	300	8	10	3.11
163	41	301	10	11	4.35
164	33	306	8	12	4.02
165	30	331	7	11	2.75
166	36	308	8	10	3.82
167	44	313	9	10	4.36
168	25	311	9	10	4.87
169	44	323	7	10	3.09
170	36	322	7	10	4.01
171	28	334	8	11	5.10
173	19	326	9	13	4.34
174	25	325	12	13	4.15
175	17	307	7	8	3.90
176	17	310	9	9	5.49

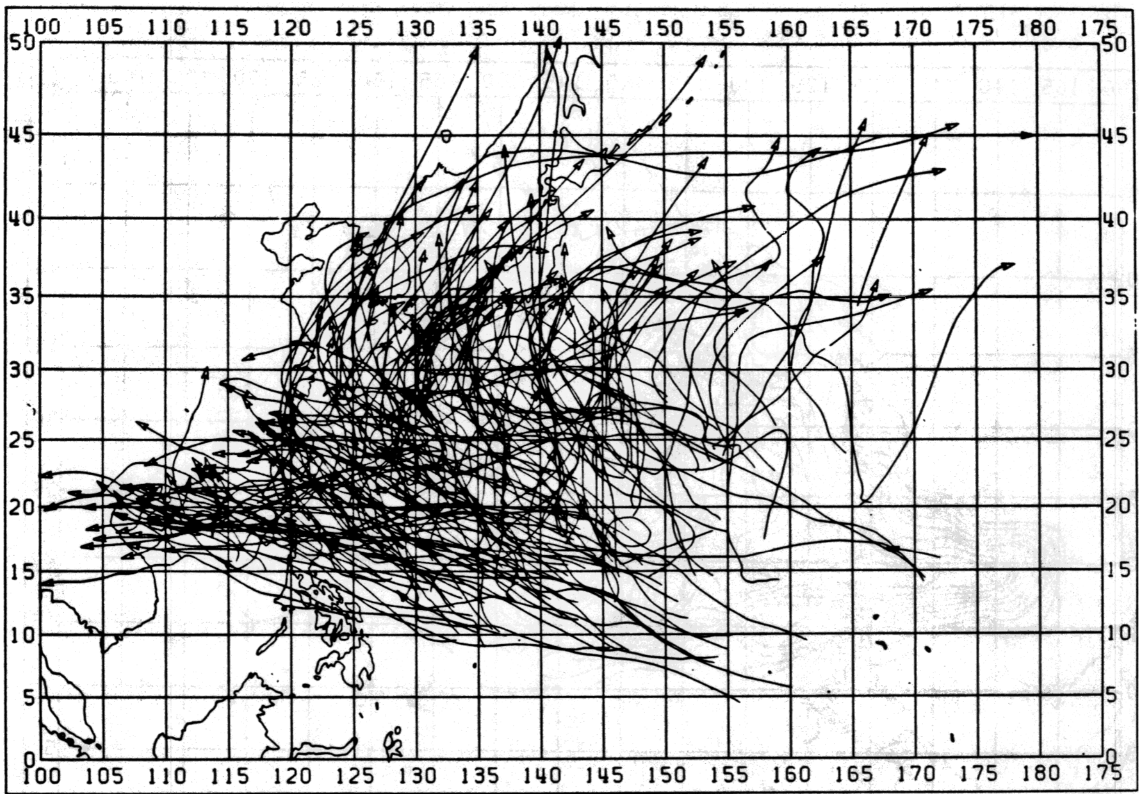
A	B	C	D	E	F
188	14	297	15	16	5.85
189	14	308	9	13	5.65
190	30	290	7	11	4.85
191	38	317	9	12	3.10
192	41	320	10	11	4.09
193	55	317	9	11	5.31
194	44	314	9	10	4.80
195	30	319	9	10	5.53
196	30	318	10	11	4.99
197	38	342	9	13	5.02
198	38	328	7	11	3.93
199	38	327	9	12	3.77
200	36	342	9	12	5.31
201	22	328	6	11	3.70
202	14	009	5	10	5.21
203	14	337	7	9	4.40
216	19	321	11	12	3.23
217	36	301	10	12	2.78
218	36	323	7	11	4.65
219	44	323	7	9	4.80
220	36	330	8	10	4.24
221	28	328	9	10	3.62
222	36	332	11	12	6.10
223	41	328	12	14	5.90
224	30	323	12	15	5.64
225	41	325	11	13	5.92
226	33	343	9	12	5.38
227	22	336	11	13	5.04
228	14	313	10	11	5.73
242	17	326	10	11	1.78
243	17	317	11	13	2.83
244	30	327	10	11	4.12
245	33	340	7	12	5.68
246	38	341	6	10	4.92
247	38	308	10	12	4.74
248	44	323	10	13	6.19
249	38	318	11	14	5.09
250	38	320	10	13	5.06
251	41	321	10	13	4.43
252	36	326	9	11	3.57
253	33	331	9	12	4.90
270	22	345	11	12	5.19
271	22	350	9	11	5.76
272	36	346	7	9	3.58
273	38	328	10	13	5.01
274	33	313	12	15	6.22
275	28	328	9	13	5.92
276	28	358	9	12	7.51
277	33	349	9	12	4.65
278	14	328	5	9	2.91
279	17	016	8	9	3.20
296	22	356	14	15	7.13

A	B	C	D	E	F
299	22	015	13	14	5.22
300	14	005	10	13	4.31
301	19	018	15	16	8.72
302	14	013	16	17	8.87
303	22	027	12	13	4.85
311	14	002	8	12	5.35
322	17	005	19	21	8.94
325	19	023	16	17	8.40
326	14	035	21	22	6.74
329	14	037	15	16	1.50



TROPICAL STORM AND TYPHOON FREQUENCY   AUG - 31 AUG



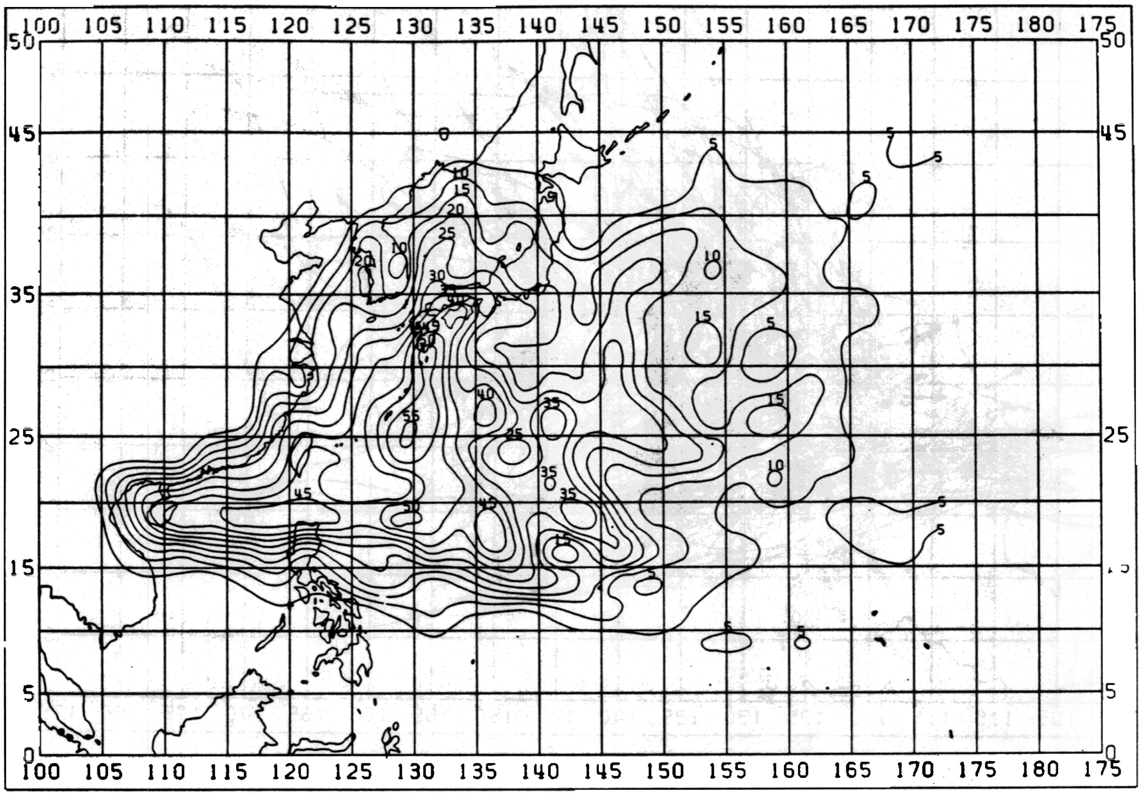


TROPICAL STORM AND TYPHOON TRACKS 1 AUG - 31 AUG

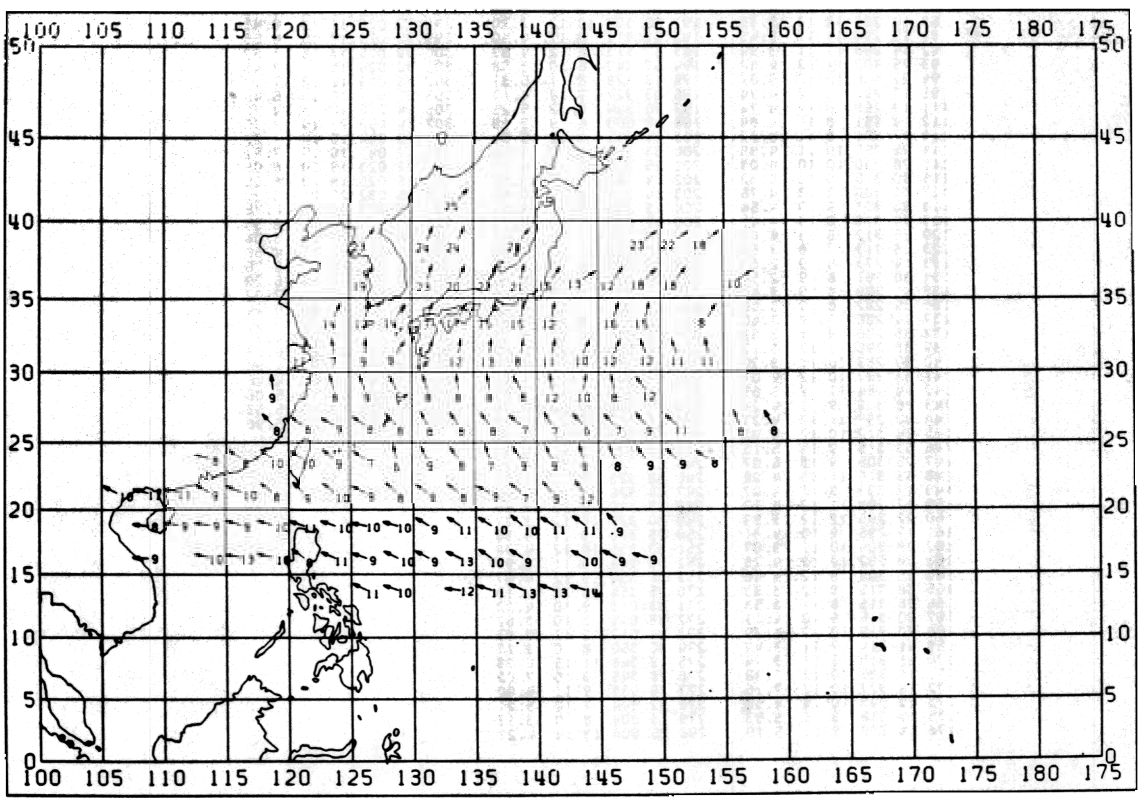
A	B	C	D	E	F
65	14	284	10	10	4.25
69	14	292	13	13	3.38
91	19	294	11	11	3.45
92	14	288	11	11	3.80
93	25	302	11	12	4.82
94	22	306	12	12	3.01
95	17	292	11	12	4.74
111	17	298	8	11	4.74
112	14	291	8	11	4.89
113	17	301	8	11	3.82
114	25	295	10	11	4.99
115	28	290	10	10	4.03
116	30	310	5	10	6.32
117	36	300	9	13	4.76
118	36	303	9	13	4.54
119	38	319	8	13	4.41
120	25	312	9	13	4.01
123	28	313	7	8	3.59
133	14	273	9	9	2.85
134	30	281	8	9	2.56
135	41	289	8	9	3.47
136	36	282	8	9	3.40
137	44	288	7	9	3.40
138	38	290	9	11	3.93
139	33	296	11	12	3.13
140	30	289	10	11	3.30
141	33	282	10	12	4.07
142	44	284	11	12	3.63
143	38	309	9	11	4.24
144	30	297	11	12	4.27
145	44	312	10	12	4.42
146	33	319	9	14	5.15
147	25	305	9	13	6.07
148	33	316	11	13	4.28
149	17	333	8	11	4.07
159	17	288	11	12	4.67
160	22	286	12	12	3.99
161	17	295	9	10	4.31
162	28	304	10	11	3.07
163	28	292	12	12	4.28
164	25	304	9	12	4.46
165	38	315	9	12	3.93
166	36	315	8	11	3.53
167	30	316	9	10	4.11
168	30	319	10	12	4.39
169	41	314	7	11	3.42
170	41	316	8	11	3.74
171	19	336	10	12	7.38
172	14	327	10	12	7.16
173	19	345	10	14	4.58
175	14	318	8	9	3.53
176	14	328	9	11	5.19

A	B	C	D	E	F
190	33	285	9	11	5.08
191	36	300	10	12	3.70
192	41	311	9	11	4.40
193	57	313	8	12	4.93
194	57	340	6	10	3.98
195	46	328	8	11	5.31
196	33	327	7	10	4.17
197	36	344	8	12	5.25
198	28	000	5	9	3.19
199	25	345	9	12	5.34
200	33	346	9	13	5.68
201	25	330	6	11	4.20
202	14	350	6	12	3.80
203	14	314	8	11	2.84
204	19	299	8	11	4.51
205	17	299	10	13	7.14
216	19	306	11	11	2.41
217	30	293	11	12	2.69
218	30	309	10	11	3.46
219	44	318	7	10	4.82
220	46	326	6	10	5.12
221	46	329	7	11	4.47
222	33	332	9	11	5.42
223	36	332	10	12	5.30
224	19	306	11	12	6.04
225	46	333	9	12	6.00
226	41	346	7	11	5.41
227	19	323	8	11	5.15
228	25	308	10	12	4.18
229	19	305	10	11	5.13
242	17	308	8	10	3.60
244	30	332	8	10	4.33
245	41	335	8	10	4.12
246	38	323	6	9	3.22
247	44	326	6	9	3.44
248	33	340	8	10	3.89
249	30	329	10	12	3.77
250	25	326	9	11	5.38
251	33	335	10	12	4.38
252	33	344	9	11	3.97
253	36	334	9	12	4.67
270	25	354	10	10	4.13
271	33	013	9	10	4.22
272	38	025	8	10	3.62
273	44	012	9	11	3.93
274	36	350	8	10	3.17
275	19	348	11	15	6.79
276	28	345	8	10	7.02
277	30	338	9	11	4.90
278	22	324	7	10	5.21
279	19	004	8	9	3.13
296	25	008	13	14	4.27

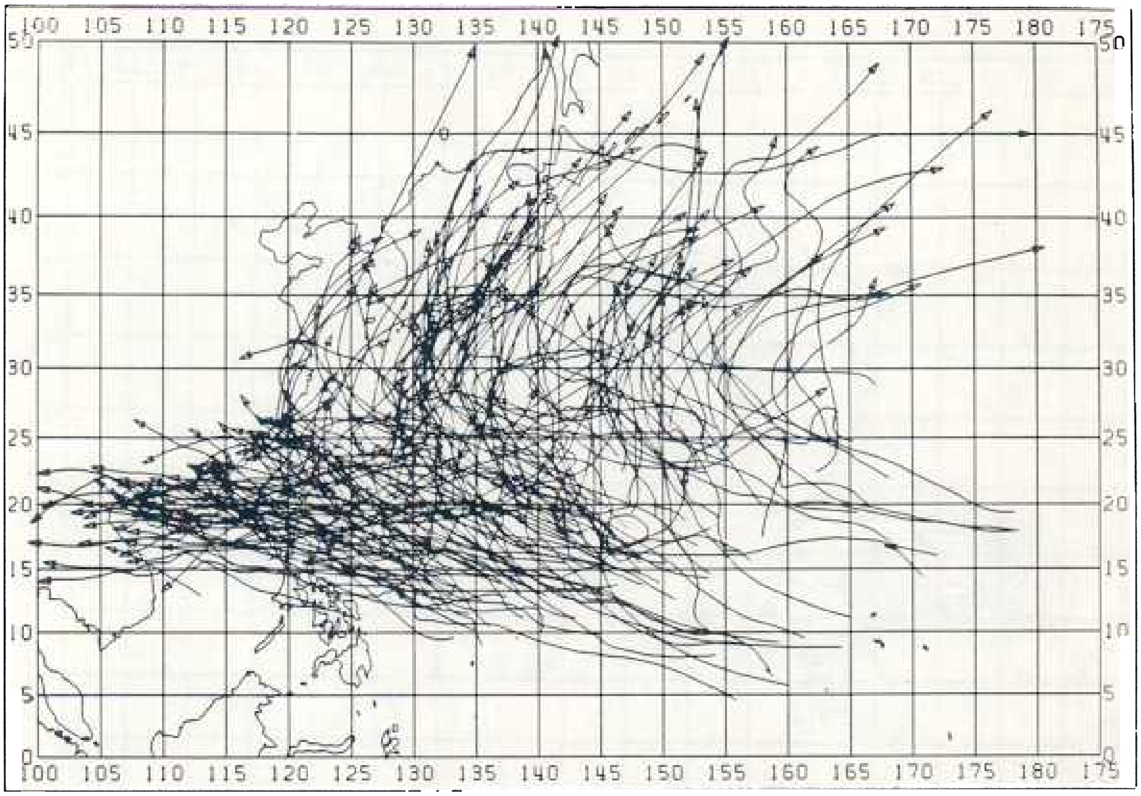
A	B	C	D	E	F
297	22	012	12	13	4.76
298	17	020	11	13	8.45
299	30	022	13	15	4.65
300	30	026	13	15	3.57
301	30	024	15	16	7.49
302	28	009	16	18	7.17
303	30	011	10	13	6.40
305	14	016	10	11	4.79
307	14	068	11	14	7.39
308	19	044	10	14	7.52
309	17	041	10	15	7.81
323	22	028	19	20	8.08
325	25	026	19	20	8.66
326	25	032	20	21	5.29
327	19	018	17	20	6.78
328	14	015	19	22	8.55
329	30	035	15	16	6.08
330	19	047	14	15	4.58
332	19	055	10	13	6.76
334	17	018	10	14	6.29
335	17	042	8	11	7.02
349	14	032	24	25	10.24
350	14	034	26	28	7.30
352	14	029	26	26	4.77
353	14	027	20	22	6.03
354	14	030	25	28	4.64
357	17	047	16	18	4.46
358	14	057	16	17	5.06
359	14	059	17	18	5.53
379	14	031	26	30	5.90



TROPICAL STORM AND TYPHOON FREQUENCY 16 AUG - 15 SEP



TROPICAL STORM AND TYPHOON MOTION 16 AUG - 15 SEP

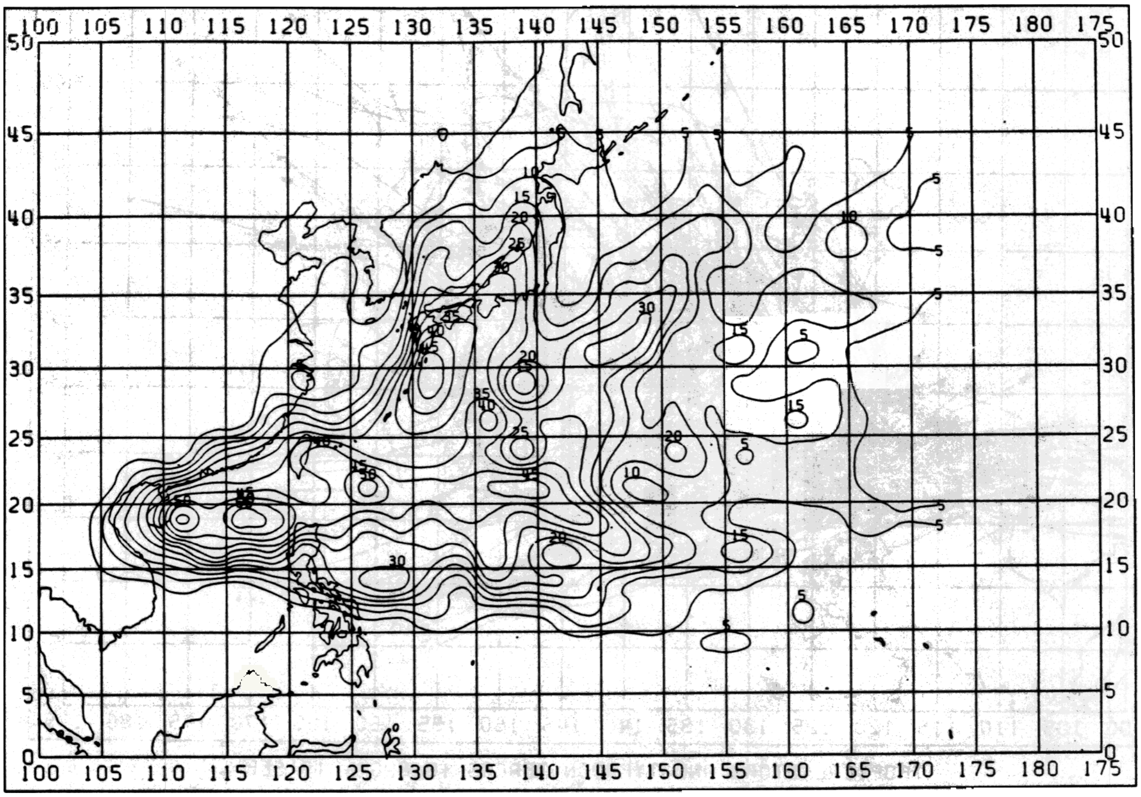


TROPICAL STORM AND TYPHOON TRACKS 16 AUG 15 SEP

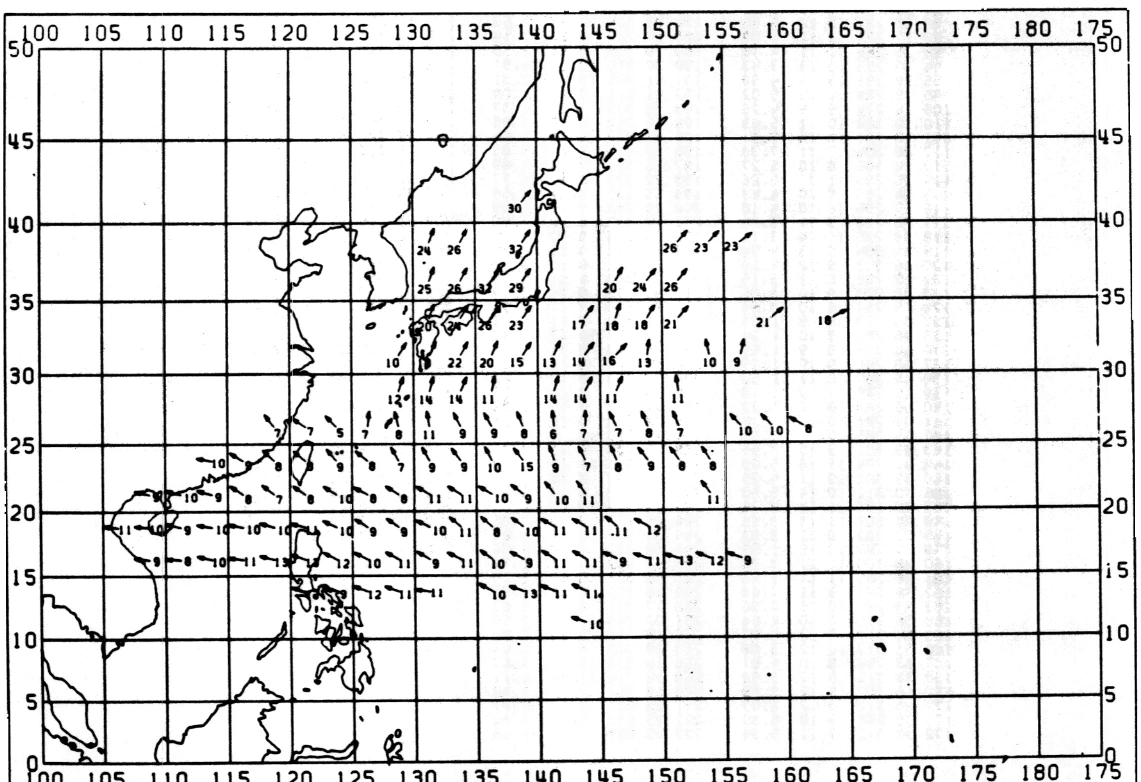
A	B	C	D	E	F
89	22	296	11	14	6.80
90	22	289	10	12	5.96
92	17	278	12	12	6.09
93	25	289	11	11	4.18
94	30	295	13	13	3.43
95	28	291	13	13	4.30
96	19	288	14	14	5.02
108	14	274	9	9	4.20
110	19	283	10	11	5.69
111	19	281	13	14	7.21
112	28	284	10	11	7.38
113	14	306	8	10	5.27
114	25	293	11	11	5.06
115	28	289	9	10	4.48
116	25	296	10	10	4.10
117	38	298	9	11	3.89
118	33	295	13	14	3.11
119	46	304	10	13	4.94
120	36	303	9	12	4.60
122	17	298	10	11	3.15
123	33	299	9	10	3.85
124	19	287	9	10	3.89
134	33	277	8	9	3.33
135	46	281	9	10	4.24
136	44	278	9	9	4.45
137	49	286	9	10	3.79
138	49	287	10	11	4.50
139	49	288	11	12	3.70
140	46	288	10	11	3.22
141	41	281	10	11	4.24
142	55	285	10	11	3.91
143	49	301	9	10	3.55
144	41	304	11	13	5.00
145	49	302	10	11	4.25
146	30	312	10	14	5.50
147	30	303	11	14	4.36
148	44	308	11	13	3.96
149	22	322	9	12	3.83
159	17	297	10	10	1.95
160	28	285	11	11	3.35
161	28	285	11	11	3.45
162	36	297	9	11	2.69
163	33	294	10	11	2.96
164	36	310	8	10	4.64
165	44	313	9	12	4.07
166	33	312	10	12	3.03
167	38	298	9	10	4.01
168	33	315	8	12	3.92
169	46	307	9	12	3.88
170	46	310	8	12	4.07
171	36	298	9	10	5.30
172	33	312	7	11	5.34

A	B	C	D	E	F
173	36	320	9	12	4.43
174	25	326	12	14	2.50
188	17	287	8	10	3.14
189	19	308	8	11	2.50
190	28	310	10	11	4.91
191	41	305	10	12	3.31
192	41	311	9	11	4.04
193	38	305	7	10	4.37
194	55	347	6	10	3.98
195	49	332	9	12	4.64
196	38	325	8	11	5.03
197	25	343	7	10	4.89
198	22	326	9	12	4.72
199	33	333	9	11	5.56
200	19	343	9	11	5.49
201	19	337	8	10	3.40
202	25	325	9	10	3.45
203	25	313	9	11	3.79
204	19	304	8	11	5.58
216	25	318	8	11	4.56
217	30	305	8	10	2.42
218	28	300	9	11	2.94
219	41	304	8	11	4.55
220	52	317	8	12	5.95
221	55	333	8	11	6.16
222	38	326	8	11	5.02
223	44	323	8	10	3.42
224	28	311	7	10	4.35
225	41	327	7	10	5.29
226	28	318	6	10	3.61
227	30	316	7	9	3.39
228	28	320	9	11	4.32
229	17	311	11	12	5.79
231	14	338	8	14	3.13
232	19	332	8	13	5.43
242	14	354	9	12	6.07
244	25	342	8	9	3.56
245	36	337	9	11	5.66
246	38	332	6	9	6.08
247	52	342	8	11	4.79
248	33	351	8	10	5.19
249	36	350	8	11	4.36
250	17	331	8	9	3.83
251	22	353	12	15	7.69
252	19	012	10	14	6.82
253	28	347	8	10	5.03
254	14	323	12	14	3.67
269	14	014	11	14	4.11
270	19	352	7	9	3.44
271	33	001	9	11	4.27
272	33	032	9	10	3.84
273	55	021	12	14	5.68

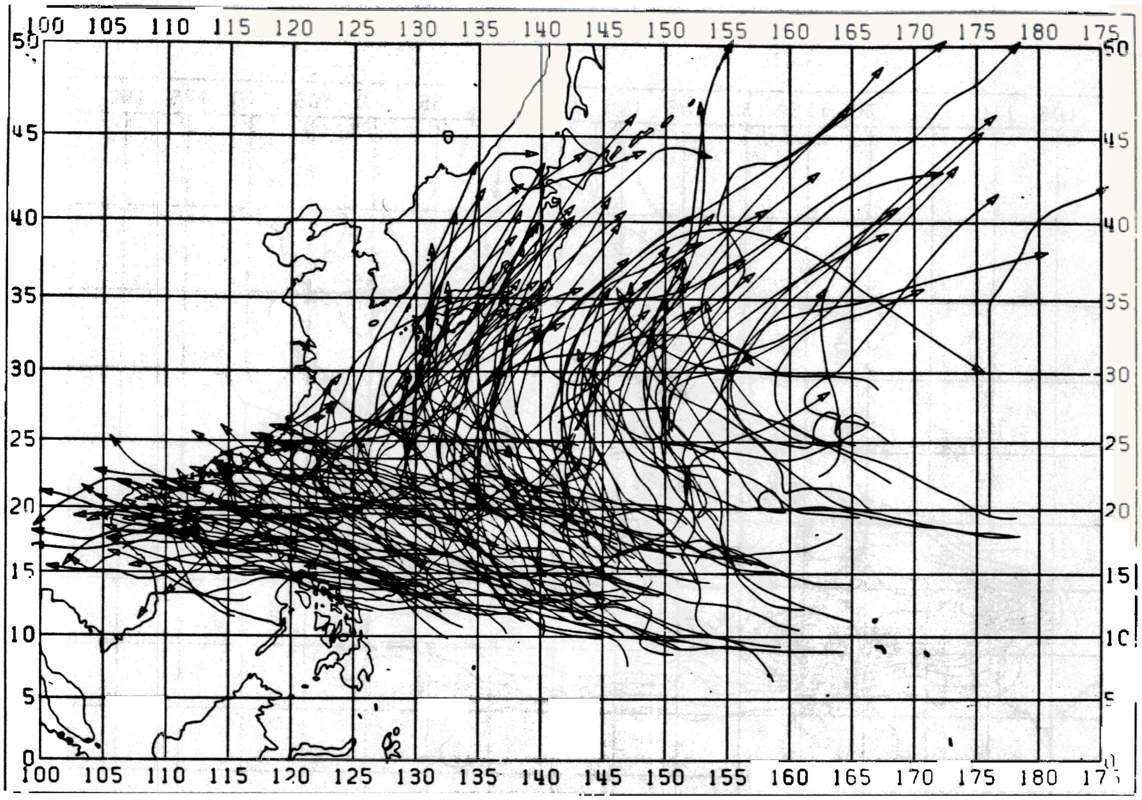
A	B	C	D	E	F
274	33	009	12	13	6.50
275	19	006	13	15	5.57
276	19	010	8	10	3.77
277	19	013	11	14	7.66
278	19	026	10	15	7.68
279	28	020	12	14	5.86
280	14	342	12	14	5.85
281	14	341	11	14	7.15
282	19	351	11	15	7.34
296	22	025	14	14	4.97
297	19	018	12	13	5.13
298	19	033	14	15	9.07
299	36	020	17	18	5.94
300	44	031	17	18	6.06
301	30	023	15	16	6.55
302	28	015	15	18	6.58
303	22	012	12	15	8.44
305	22	016	16	18	5.76
306	14	016	15	17	3.03
308	14	032	8	10	4.21
323	22	030	19	20	8.38
325	30	017	23	24	6.91
326	22	026	20	21	2.94
327	28	025	22	24	8.10
328	14	015	21	22	9.68
329	19	034	15	16	7.79
330	14	057	13	14	5.04
331	19	037	12	17	6.53
332	22	047	18	21	10.54
333	17	038	18	20	8.30
335	14	057	10	11	7.66
349	17	036	23	24	9.86
351	22	020	24	26	7.21
352	25	023	24	25	5.85
354	19	036	28	30	5.34
358	14	050	23	24	10.25
359	17	053	22	23	6.15
360	14	049	18	21	12.07
378	17	040	25	27	7.24



TROPICAL STORM AND TYPHOON FREQUENCY SEP - 30 SEP

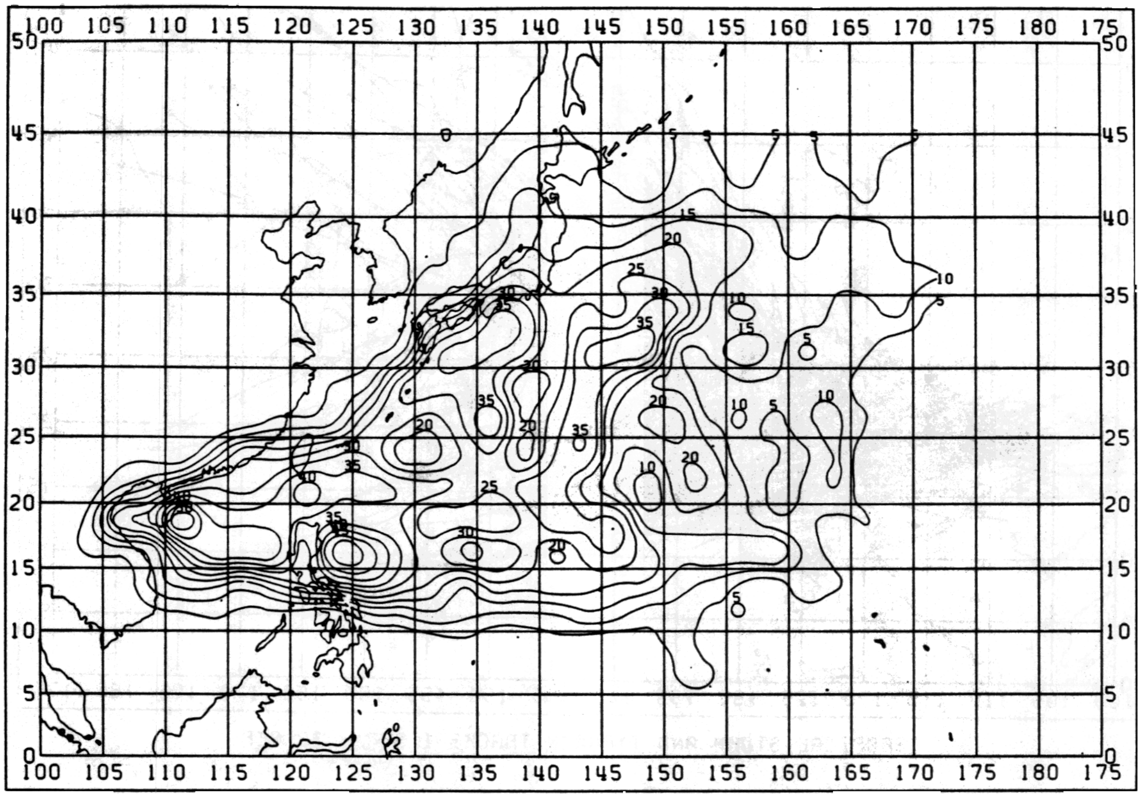


TROPICAL STORM AND TYPHOON MOTION 1 SEP - 30 SEP

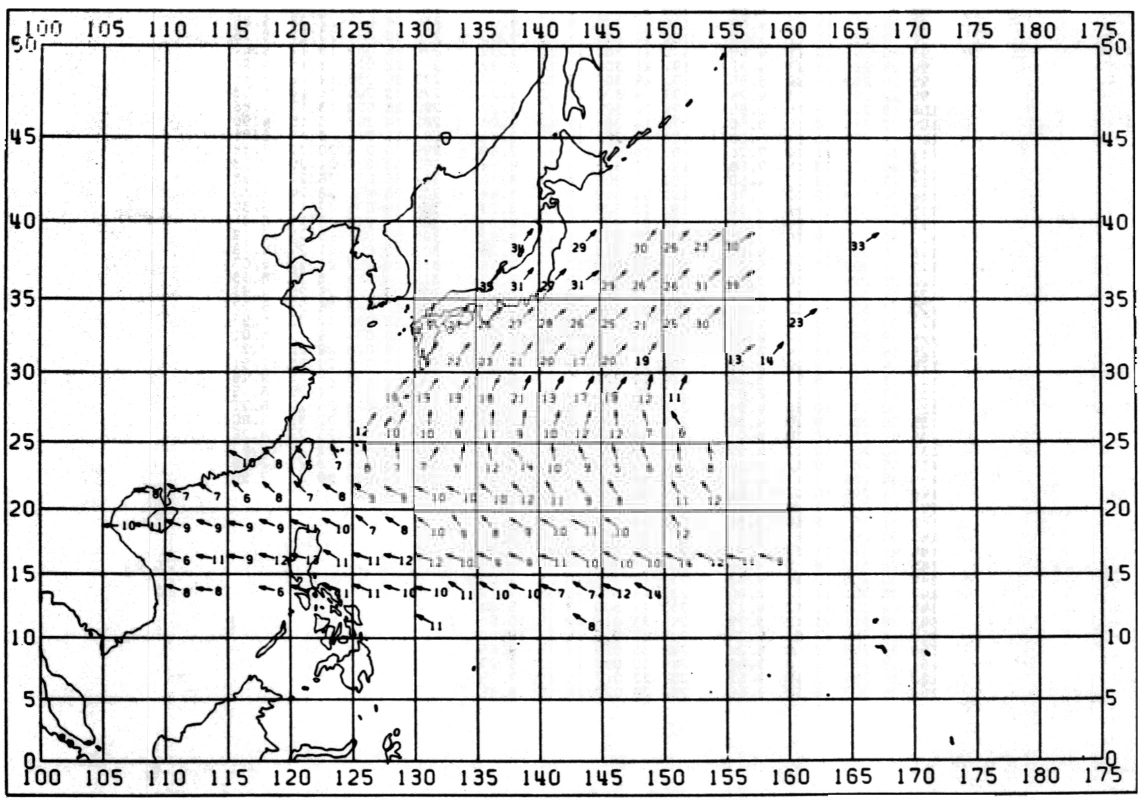


TROPICAL STORM AND TYPHOON TRACKS 1 SEP - 30 SEP

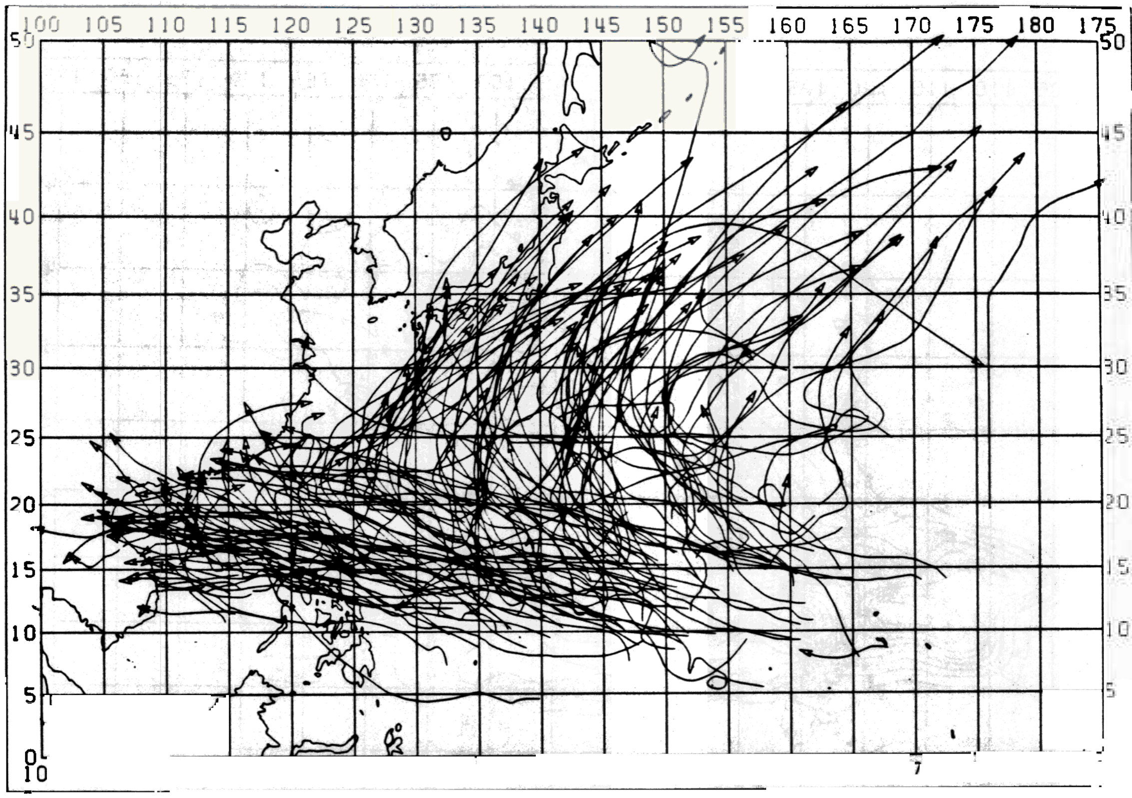
A	B	C	D	E	F
70	17	289	10	10	3.37
87	17	287	12	12	7.12
88	25	288	9	12	5.42
89	33	291	12	14	5.88
90	36	291	11	12	4.63
91	19	278	11	12	5.20
93	30	299	10	11	4.63
94	25	290	13	13	4.32
95	28	292	11	12	3.85
96	22	295	11	13	4.24
108	19	276	9	10	3.95
109	22	275	8	10	3.50
110	41	284	10	11	5.06
111	30	279	11	12	7.26
112	36	285	13	14	7.58
113	17	289	13	13	4.50
114	30	298	12	12	3.76
115	25	297	10	11	3.30
116	25	299	11	11	3.14
117	30	301	9	10	3.97
118	25	297	11	12	4.85
119	41	307	10	11	5.07
120	28	299	9	10	3.68
121	14	303	11	12	4.02
122	22	301	11	12	4.52
123	33	295	9	10	4.45
124	28	290	11	12	4.07
125	19	287	13	14	3.89
126	14	291	12	12	2.88
127	19	292	9	11	3.26
133	17	277	11	11	2.87
134	30	277	10	10	4.31
135	60	284	9	10	4.30
136	44	281	10	10	4.01
137	60	282	10	11	4.30
138	55	287	10	11	4.48
139	44	286	11	11	4.22
140	41	296	10	11	3.44
141	33	303	9	10	4.59
142	41	306	9	10	3.55
143	33	296	10	11	3.14
144	41	312	11	13	4.64
145	38	312	8	9	3.96
146	30	308	10	11	4.42
147	38	301	11	12	3.00
148	44	301	11	12	4.27
149	30	311	11	12	3.79
150	14	300	12	12	5.75
160	22	283	9	9	4.24
161	33	287	10	10	3.62
162	38	286	9	10	3.52
163	36	303	8	10	3.66
164	38	307	7	9	4.59
165	36	304	8	11	4.69
166	41	301	10	11	4.22
167	55	298	8	10	4.07
168	41	302	8	12	4.01
169	44	301	11	13	3.36
170	41	301	11	12	3.35
171	46	301	10	11	3.92
172	49	307	9	12	3.99
173	44	322	10	12	4.24
174	28	325	11	12	3.27
178	14	324	11	12	6.06
188	19	282	10	11	3.83
189	28	301	9	12	2.89
190	30	313	8	10	4.54
191	41	309	8	11	3.10
192	44	319	9	13	3.44
193	33	309	8	10	3.23
194	33	331	7	11	4.24
195	30	330	9	12	4.92
196	36	323	9	11	5.26
197	33	333	10	12	4.66
198	19	323	15	16	4.03
199	33	341	9	12	4.39
200	30	334	7	9	3.56
201	19	337	8	9	3.18
202	17	323	9	10	3.52
203	22	324	8	9	4.65
204	14	327	8	10	6.06
216	19	322	7	10	5.13
217	25	304	7	10	2.60
218	17	316	5	11	3.70
219	28	006	7	14	6.48
220	36	346	8	13	6.56
221	38	351	11	14	8.45
222	33	333	9	11	5.25
223	44	331	9	11	4.29
224	30	338	8	12	6.73
225	30	354	6	11	5.63
226	30	002	7	10	4.14
227	25	334	7	9	3.22
228	14	337	8	10	3.90
229	17	338	7	10	4.49
231	14	316	10	14	2.85
232	14	315	10	14	4.19
233	17	300	8	12	5.94
246	33	019	12	14	10.54
247	49	015	14	17	10.88
248	36	023	14	16	9.65
249	30	013	11	12	5.27
251	22	017	14	17	7.75
252	28	027	14	16	8.35
253	22	023	11	13	9.03
255	14	352	11	14	3.93
272	14	032	10	11	3.04
273	46	026	18	18	9.05
274	38	029	22	23	6.85
275	30	023	20	21	8.25
276	25	033	15	17	9.67
277	22	025	13	15	6.91
278	30	036	14	16	5.86
279	33	044	16	18	8.53
280	28	009	13	17	7.86
282	14	348	10	19	4.90
283	19	014	9	17	6.81
299	30	019	20	21	5.38
300	33	031	24	25	9.03
301	36	034	26	27	5.98
302	28	035	23	24	9.12
304	14	035	17	17	9.30
305	22	018	18	19	6.31
306	30	031	18	20	10.19
307	22	041	21	24	14.19
310	14	052	21	21	6.07
312	14	063	18	20	8.13
325	25	020	25	26	4.91
326	17	028	26	27	9.22
327	30	032	32	32	5.97
328	28	034	29	30	8.01
331	19	028	20	22	7.31
332	17	038	24	24	11.51
333	25	038	26	27	9.49
351	17	021	24	25	8.15
352	19	028	26	26	6.71
354	25	034	32	33	5.80
359	17	041	26	27	4.26
360	19	044	23	25	10.87
361	14	054	23	27	12.48
380	14	038	30	31	7.96



TROPICAL STORM AND TYPHOON FREQUENCY 16 SEP - 15 OCT



TROPICAL STORM AND TYPHOON MOTION 16 SEP - 15 OCT

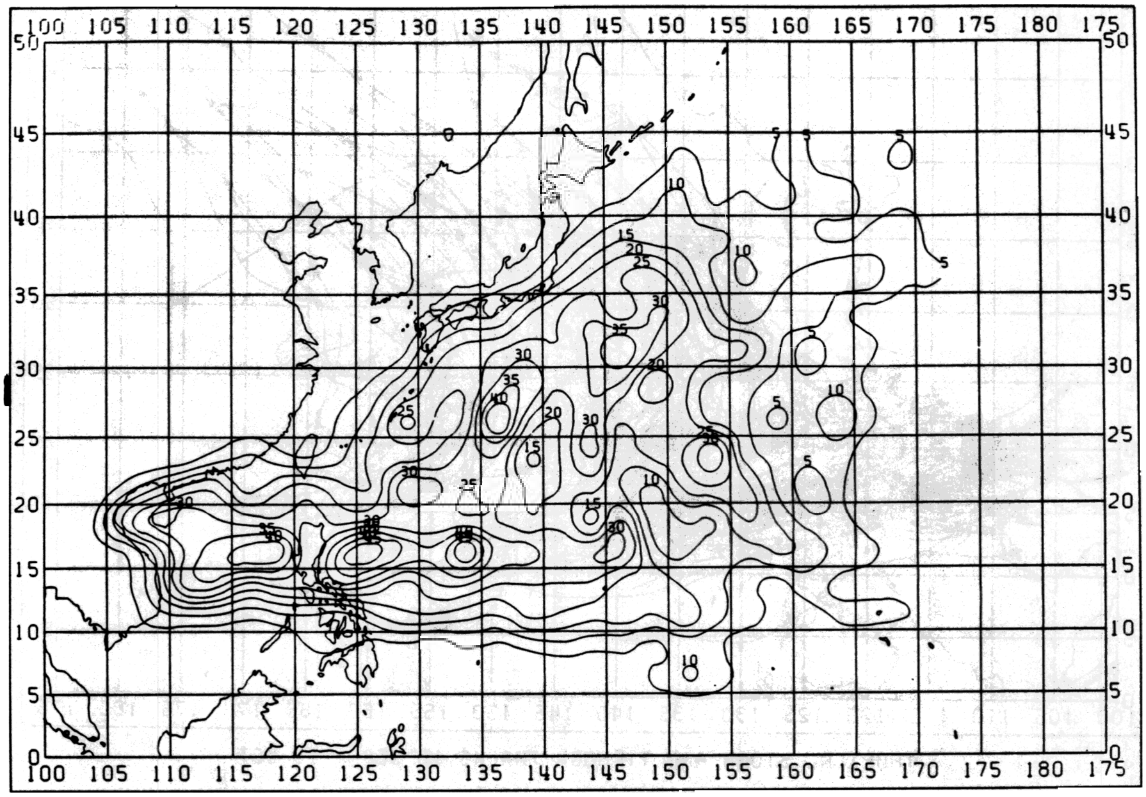


TROPICAL STORM AND TYPHOON TRACKS 16 SEP   15 OCT

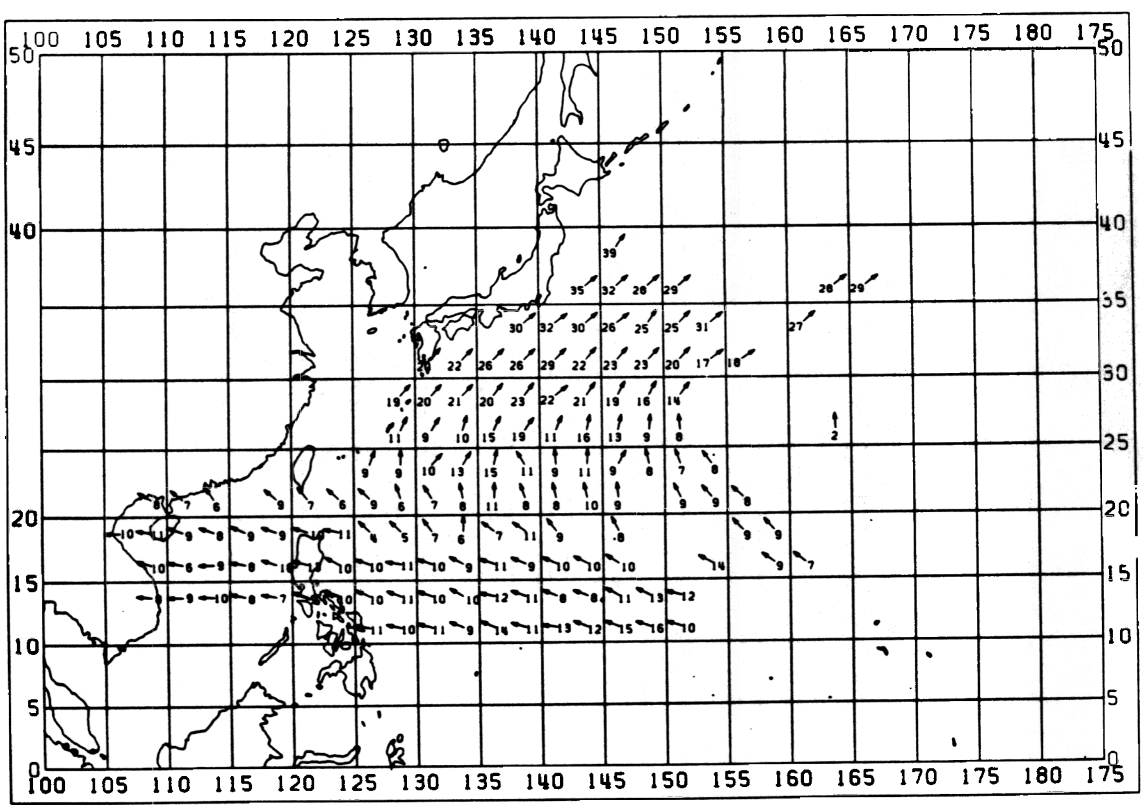
A	B	C	D	E	F
65	14	298	11	12	4.48
70	14	302	8	9	3.27
83	17	289	8	10	4.40
84	17	277	8	9	4.17
86	19	283	6	8	3.56
87	28	287	11	13	5.23
88	33	292	11	11	2.93
89	38	291	11	12	3.90
90	30	286	10	10	2.58
91	25	283	10	11	2.60
92	14	304	11	13	3.96
93	25	302	10	11	3.88
94	22	293	10	10	3.87
95	25	292	7	9	2.50
96	22	304	7	9	3.77
97	19	294	12	13	3.89
98	19	298	14	14	5.23
109	30	287	6	9	2.72
110	44	280	11	12	3.69
111	44	280	9	10	4.67
112	44	285	12	13	5.04
113	25	283	13	14	2.75
114	57	301	11	12	3.18
115	49	287	11	11	5.07
116	36	284	12	13	3.35
117	28	289	12	12	3.28
118	38	290	10	11	3.41
119	36	294	9	10	3.90
120	30	293	9	11	3.72
121	17	289	11	12	4.75
122	28	298	10	11	7.00
123	30	302	10	10	6.49
124	22	297	10	11	4.41
125	17	293	14	15	3.22
126	19	295	12	13	3.33
127	19	286	11	12	3.76
128	22	289	9	12	4.87
133	30	271	10	10	3.29
134	33	275	11	11	4.76
135	57	289	9	10	3.86
136	38	289	9	10	3.10
137	38	283	9	10	4.66
138	38	291	9	10	4.55
139	33	290	11	11	4.33
140	33	296	10	11	2.87
141	30	311	7	10	4.79
142	30	302	8	11	3.63
143	19	309	10	10	3.27
144	22	327	9	11	3.01
145	19	320	8	9	3.93
146	25	306	9	10	3.88
147	36	303	10	11	3.44

A	B	C	D	E	F
148	30	298	11	11	4.76
149	33	308	10	12	3.95
151	14	328	12	13	7.14
160	14	282	8	9	3.89
161	25	303	7	9	3.96
162	30	304	7	9	3.94
163	28	317	6	8	4.50
164	33	312	8	10	4.28
155	44	314	7	11	4.72
166	36	300	8	11	4.73
167	38	303	9	11	3.72
168	36	300	9	12	3.45
169	33	299	10	12	3.70
170	30	300	10	12	3.04
171	25	312	10	12	2.95
172	33	316	12	13	3.83
173	33	326	11	13	3.58
174	22	328	9	9	2.60
175	14	328	8	9	2.54
177	19	328	11	12	5.86
178	19	325	12	13	5.11
189	25	300	10	11	3.75
190	22	312	8	10	3.26
191	25	323	5	9	2.93
192	30	339	7	11	4.19
193	30	345	8	11	3.67
194	17	356	7	11	3.36
195	17	034	7	11	6.17
196	25	014	9	12	5.74
197	30	347	12	15	4.90
198	17	319	14	15	5.50
199	30	352	10	12	4.67
200	36	336	9	11	4.43
201	17	345	5	7	4.23
202	14	335	6	8	3.27
203	19	355	6	9	3.41
204	17	352	8	13	4.50
219	25	036	12	14	5.95
220	28	028	10	12	7.22
221	22	005	10	14	8.82
222	30	006	9	12	3.88
223	41	005	11	14	5.17
224	19	009	9	14	8.51
225	28	019	10	14	6.02
226	36	017	12	14	6.06
227	17	355	12	14	4.09
228	22	342	7	10	2.07
229	22	330	6	10	3.48
246	30	036	16	17	9.89
247	33	033	19	20	11.63
248	30	030	19	20	8.99
249	30	028	18	19	5.82

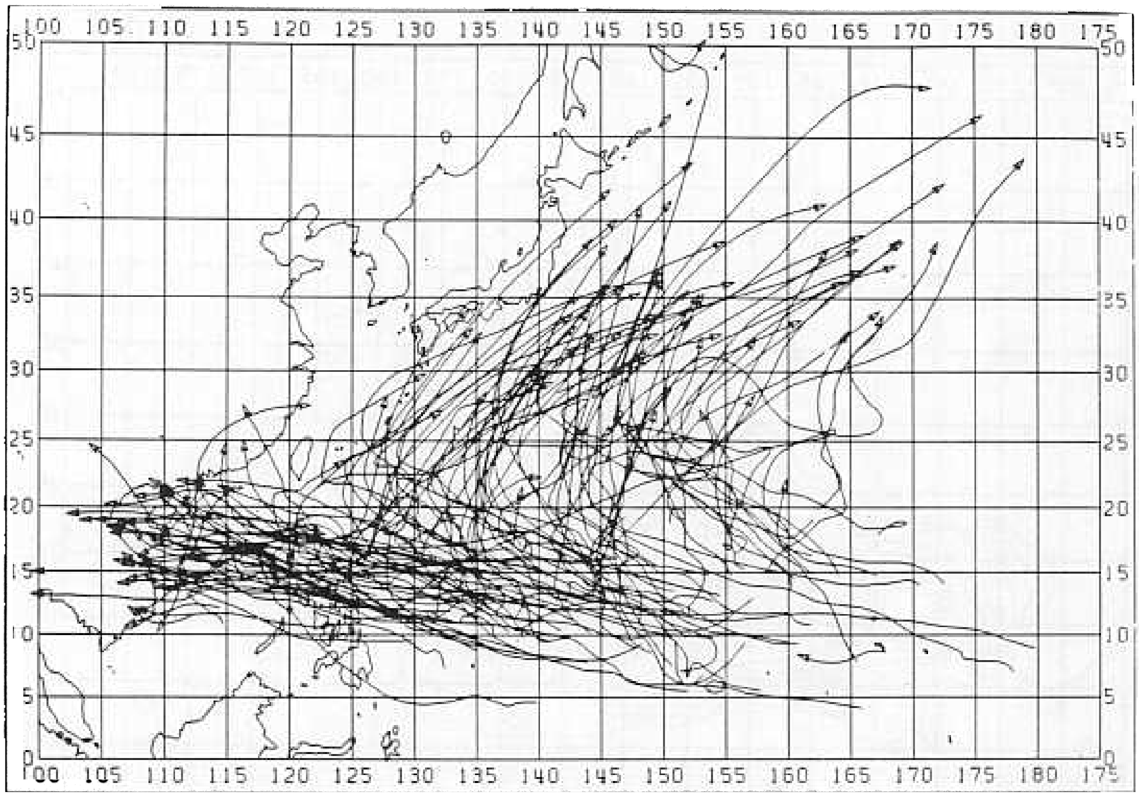
A	B	C	D	E	F
250	14	023	21	23	9.23
251	22	029	13	15	6.16
252	33	027	17	19	8.84
253	25	034	19	21	8.33
254	14	011	12	13	1.47
255	14	024	11	14	4.25
273	30	033	19	20	10.22
274	38	036	22	23	7.21
275	36	034	23	25	6.60
276	33	037	21	23	9.79
277	19	042	20	22	8.42
278	36	032	17	18	7.21
279	38	045	20	22	8.65
280	38	038	19	21	9.43
283	19	050	13	17	6.91
284	14	040	14	17	5.72
299	14	018	19	20	6.85
300	19	032	27	28	10.66
301	36	041	26	27	6.29
302	33	044	27	28	7.36
303	22	052	28	29	11.48
304	28	048	26	27	11.55
305	22	046	25	27	12.96
306	33	034	21	22	11.04
307	30	047	25	26	13.48
308	14	043	30	33	10.23
311	14	054	23	23	2.19
327	17	035	35	35	5.77
328	22	037	31	32	6.32
329	17	044	27	27	5.47
330	19	053	31	31	10.79
331	25	047	29	30	11.91
332	25	050	26	29	10.77
333	22	043	26	27	9.89
334	17	046	31	31	9.33
335	14	053	39	39	7.06
354	14	034	34	34	4.96
356	14	041	29	30	3.86
358	17	037	30	31	8.41
359	19	043	26	28	6.69
360	17	052	23	24	6.76
361	17	055	30	31	10.11



TROPICAL STORM AND TYPHOON FREQUENCY OCT - 31 OCT



TROPICAL STORM AND TYPHOON MOTION 1 OCT - 31 OCT

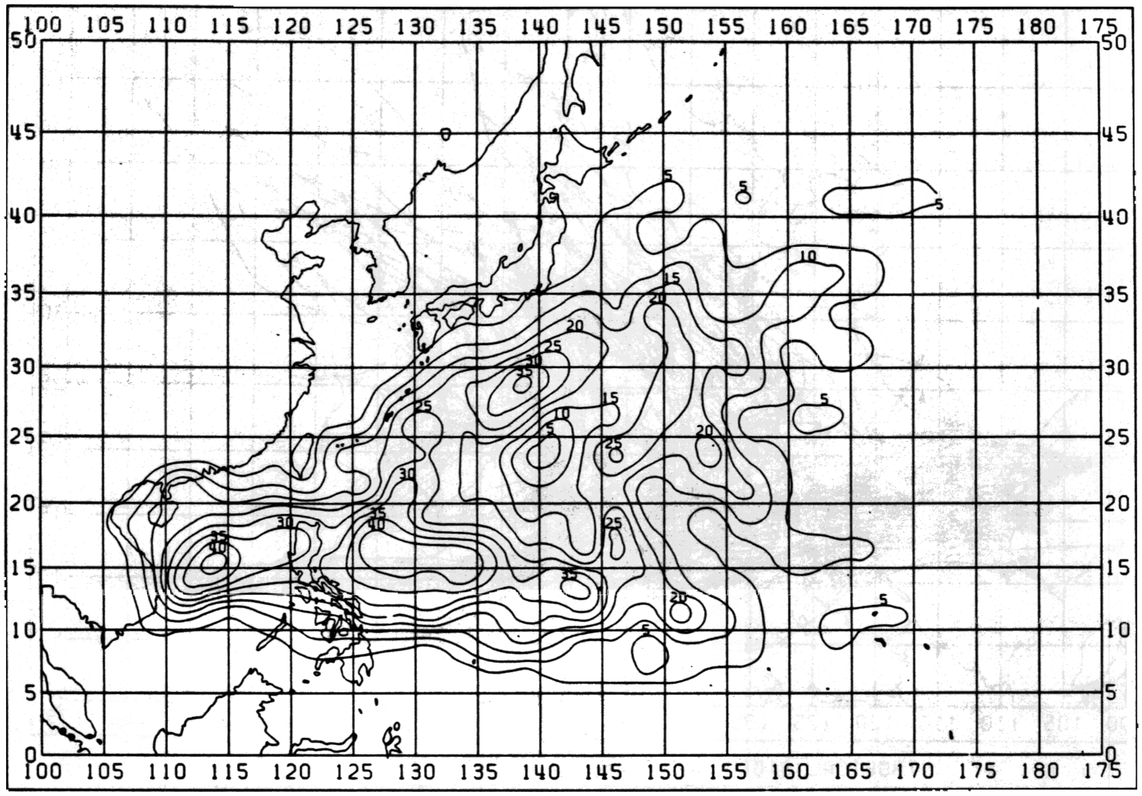


TROPICAL STORM AND TYPHOON TRACKS 1 OCT 31 OCT

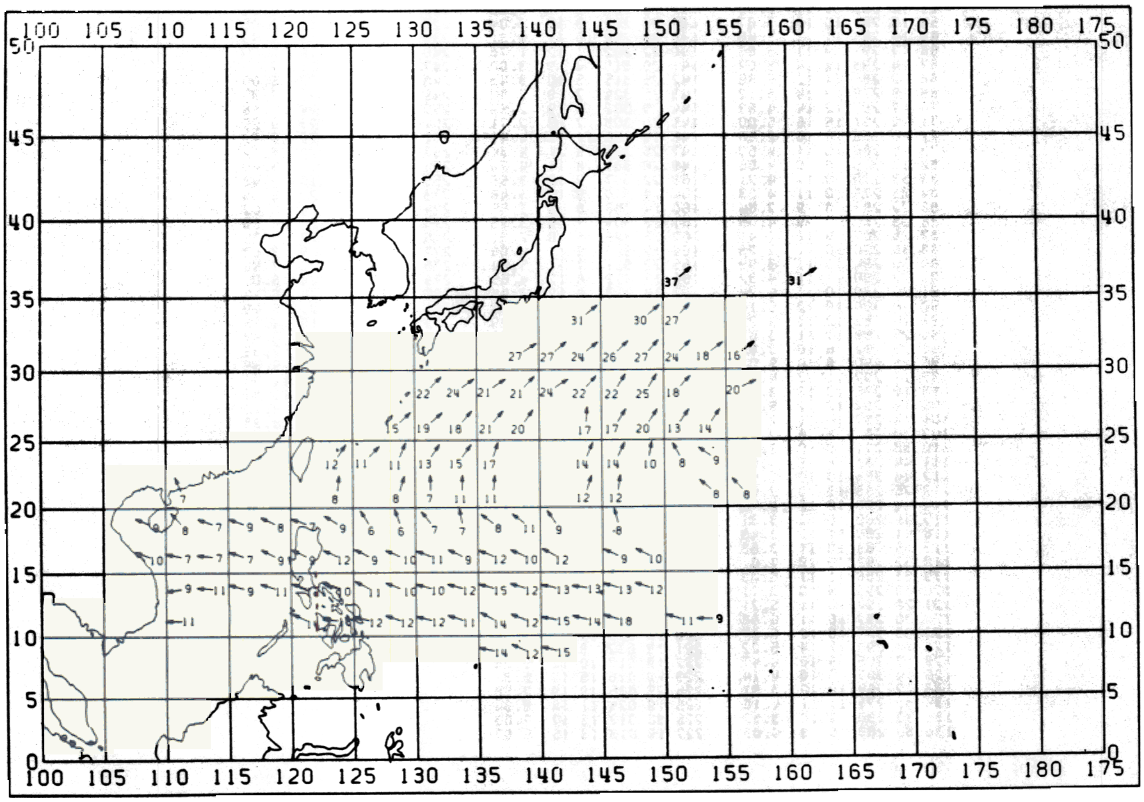
A	B	C	D	E	F
63	14	282	11	11	2.53
64	19	282	10	11	3.87
65	19	285	11	11	5.48
66	17	291	9	11	6.85
67	14	293	14	14	5.07
68	22	286	11	12	5.80
69	19	279	13	14	5.12
70	17	291	12	14	4.89
71	19	291	15	16	5.00
72	14	288	16	16	2.58
73	19	288	10	11	4.69
82	14	275	8	9	4.06
83	33	270	9	11	4.21
84	33	273	10	11	4.63
85	22	283	8	9	2.84
86	28	280	7	9	4.06
87	28	287	9	11	2.41
88	36	290	10	11	2.28
89	30	294	10	11	3.99
90	22	290	11	11	4.32
91	30	290	10	11	4.74
92	30	300	10	12	5.16
93	25	282	12	13	4.21
94	25	289	11	11	3.69
95	25	292	8	10	3.86
96	25	290	8	10	5.03
97	17	297	11	12	4.79
98	19	296	13	13	3.53
99	14	284	12	12	5.08
108	14	287	10	11	2.64
109	30	281	6	8	2.10
110	38	271	9	10	3.28
111	44	281	8	9	4.04
112	44	288	10	10	2.56
113	25	285	13	13	2.69
114	44	298	10	12	2.72
115	49	289	10	12	3.31
116	41	280	11	12	3.49
117	36	289	10	11	3.83
118	52	298	9	10	4.01
119	33	288	11	11	5.03
120	33	293	9	10	3.71
121	28	294	10	11	5.21
122	30	297	10	11	6.88
123	33	303	10	12	6.27
126	14	298	14	14	5.22
128	17	306	9	10	4.47
129	14	307	7	10	4.14
133	22	269	10	10	3.81
134	33	279	11	11	4.16
135	33	290	9	10	3.42
136	30	289	8	9	4.03

A	B	C	D	E	F
137	28	293	9	9	2.66
138	25	289	9	10	3.04
139	28	288	10	11	4.21
140	22	282	11	12	1.78
141	25	315	4	9	3.00
142	25	315	5	10	3.43
143	25	324	7	9	2.80
144	25	002	6	9	2.52
145	25	308	7	9	2.71
146	19	305	11	12	4.41
147	25	323	9	11	4.34
149	28	333	8	11	4.24
153	22	317	9	10	3.53
154	14	318	9	10	3.46
160	14	299	8	9	3.56
161	22	309	7	9	3.95
162	25	326	6	8	2.91
164	19	310	9	11	4.09
165	22	321	7	11	5.04
166	17	312	6	12	4.65
167	14	313	9	12	3.44
168	36	341	6	10	3.50
169	33	328	7	10	2.99
170	25	349	8	12	4.73
171	28	002	11	12	4.33
172	19	342	8	11	4.26
173	19	348	8	11	4.01
174	22	349	10	12	4.42
175	14	356	9	10	5.89
177	22	334	9	12	5.57
178	25	319	9	11	3.47
179	22	313	8	9	3.84
193	17	020	9	11	5.17
194	17	002	9	10	3.91
195	19	043	10	13	6.04
196	28	031	13	15	6.12
197	30	013	15	17	5.66
198	14	329	11	14	4.99
199	19	356	9	11	5.58
200	33	004	11	13	5.83
201	17	029	9	10	8.49
202	22	347	8	11	5.26
203	25	341	7	11	1.95
204	36	324	8	13	4.10
220	28	026	11	13	6.10
221	19	032	9	13	7.45
222	19	017	10	12	5.39
223	49	026	15	17	6.31
224	25	035	19	19	7.58
225	19	024	11	14	8.34
226	30	013	16	17	7.03
227	19	013	13	15	5.87

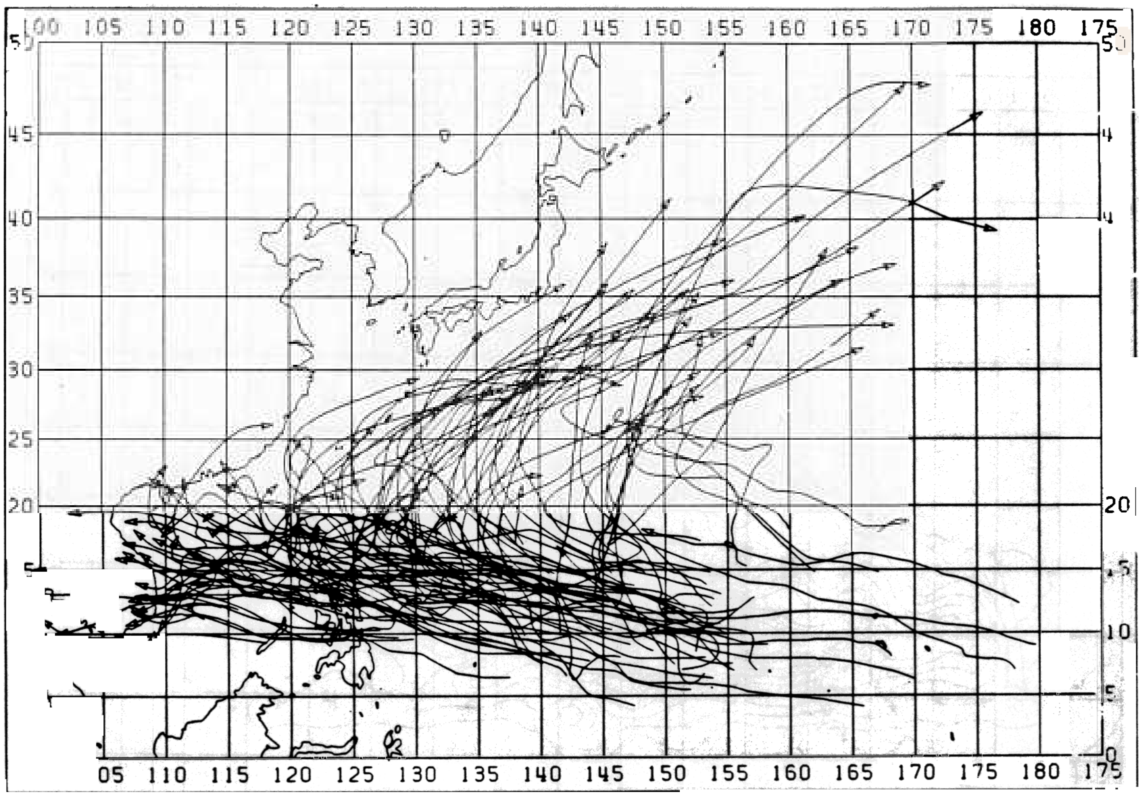
A	B	C	D	E	F
228	25	005	9	11	4.94
229	22	356	8	11	2.65
234	14	357	2	8	3.49
246	14	042	19	19	6.65
247	22	042	20	21	7.10
248	19	043	21	22	8.00
249	30	038	20	21	7.35
250	36	037	23	24	7.58
251	25	052	22	23	9.25
252	30	034	21	22	8.72
253	30	029	19	20	8.12
254	14	029	16	17	5.40
255	22	037	14	15	3.43
273	17	039	20	22	6.36
274	22	044	22	24	6.62
275	25	045	26	27	6.65
276	28	045	26	27	8.75
277	25	045	29	29	3.63
278	30	040	22	23	7.98
279	41	041	23	24	8.05
280	30	044	23	24	8.14
281	22	042	20	21	5.69
282	22	054	17	19	4.35
283	22	057	18	19	6.97
302	19	051	30	30	7.33
303	25	054	32	33	9.59
304	30	049	30	31	11.93
305	19	053	26	28	13.35
306	30	035	25	26	9.12
307	28	044	25	26	8.93
308	14	051	31	33	7.01
311	17	047	27	27	8.49
330	19	051	35	36	12.58
331	25	049	32	34	15.35
332	28	049	28	31	11.84
333	19	050	29	30	12.80
338	14	052	28	29	11.09
357	14	036	39	40	10.19



TROPICAL STORM AND TYPHOON FREQUENCY 16 OCT - 15 NOV



TROPICAL STORM AND TYPHOON MOTION 16 OCT - 15 NOV

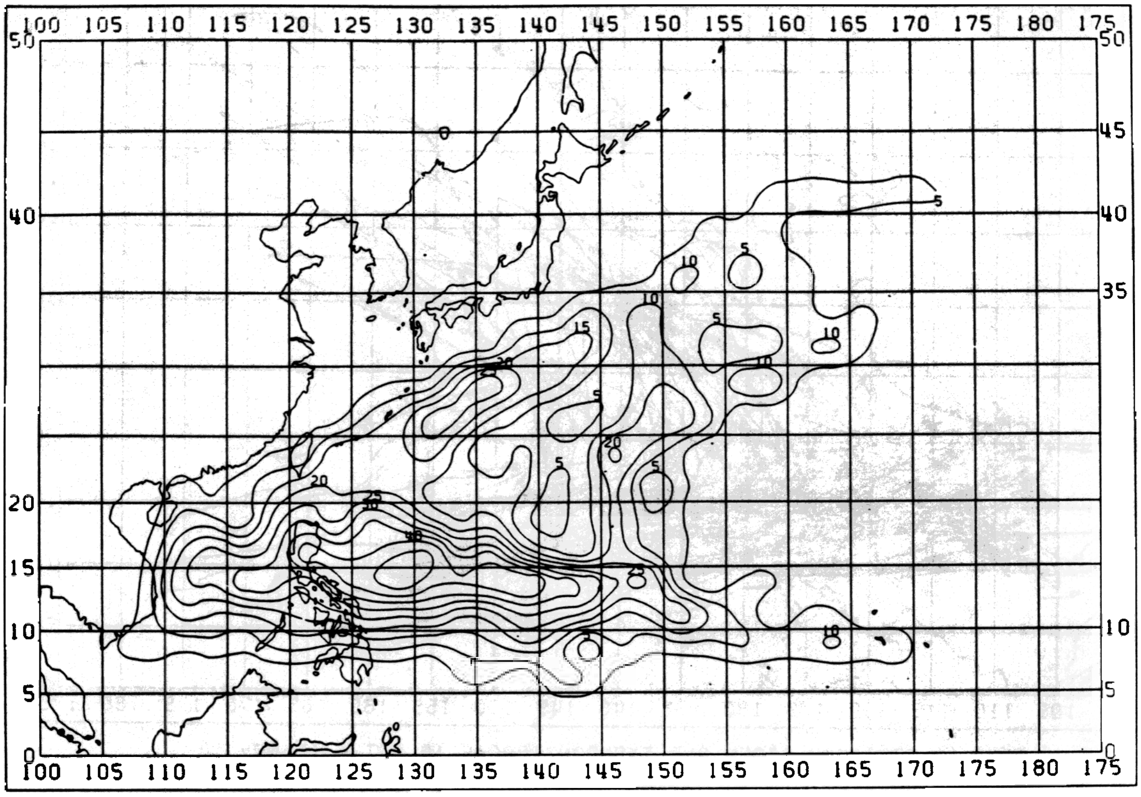


TROPICAL STORM AND TYPHOON TRACKS 16 OCT - 15 NOV

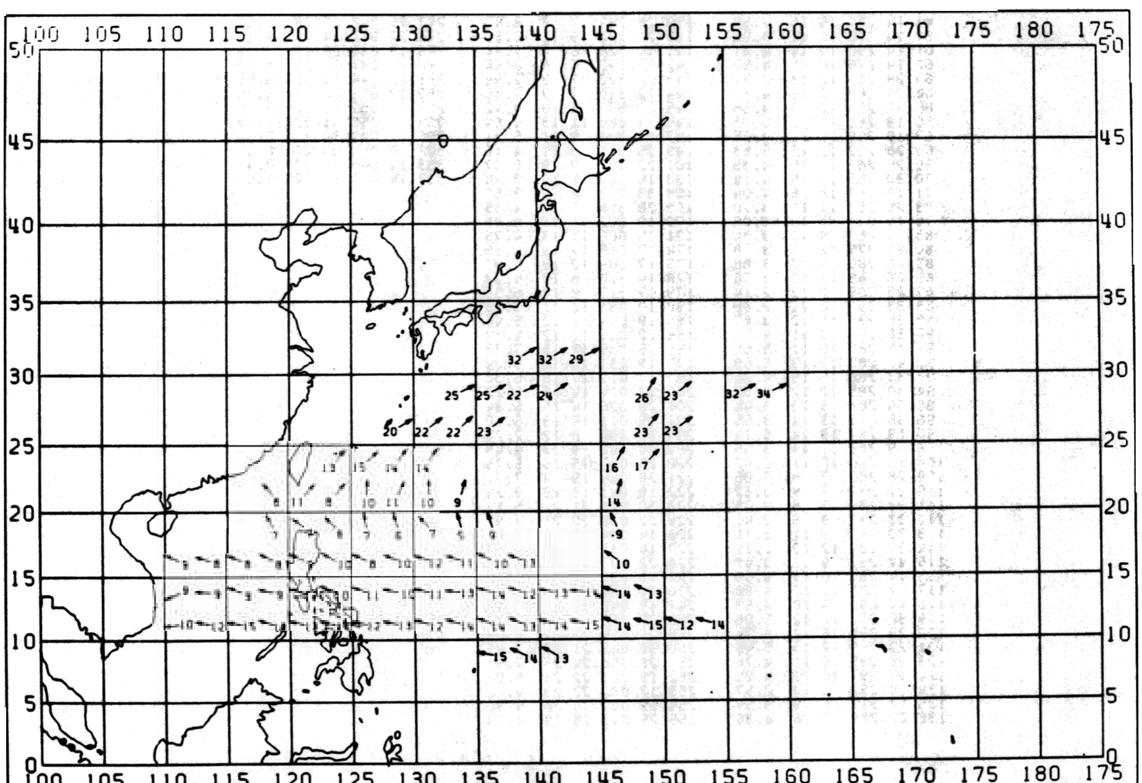
A	B	C	D	E	F
41	17	282	14	14	5.38
42	19	295	12	13	4.59
43	14	284	15	15	2.58
57	14	270	11	11	3.06
61	14	296	14	14	4.41
62	14	276	16	16	4.52
63	28	285	12	13	2.97
64	25	288	12	12	4.30
65	30	284	12	12	4.58
66	19	288	11	12	6.13
67	19	299	14	15	4.25
68	28	292	12	13	5.63
69	25	282	15	15	4.39
70	30	285	14	15	4.14
71	17	287	18	18	4.04
73	25	287	11	11	3.10
74	14	272	9	10	3.09
83	36	262	9	12	3.34
84	36	275	11	12	3.76
85	28	286	9	10	3.88
86	25	288	11	12	3.56
87	25	289	12	12	2.14
88	33	290	10	11	2.38
89	36	298	11	12	3.87
90	38	292	10	11	4.73
91	36	285	10	11	5.56
92	41	286	12	13	5.69
93	33	286	15	15	4.26
94	30	288	12	12	4.02
95	36	283	13	13	3.44
96	36	279	13	14	3.55
97	19	287	13	14	5.14
98	19	288	12	13	3.55
108	14	290	10	11	2.62
109	28	282	7	8	3.05
110	41	277	7	9	3.32
111	33	289	7	8	2.75
112	33	297	9	9	2.41
113	30	296	9	11	3.11
114	30	294	12	12	2.11
115	44	297	9	11	3.48
116	44	294	10	11	4.59
117	44	291	11	12	4.98
118	44	296	9	10	4.53
119	36	292	12	12	5.05
120	22	295	10	12	4.74
121	22	299	12	13	5.44
123	28	295	9	11	4.76
124	17	297	10	11	4.04
134	14	292	9	10	2.57
135	17	317	8	9	3.57
136	22	289	7	8	4.36

A	B	C	D	E	F
137	22	289	9	10	2.06
138	28	295	8	10	3.34
139	28	289	7	9	3.66
140	22	302	9	[illegible]	3.60
141	36	328	6	[illegible]	2.34
142	33	340	6	[illegible]	3.56
143	22	322	7	[illegible]	2.94
144	22	350	7	[illegible]	2.66
145	22	307	8	[illegible]	4.12
146	14	308	11	[illegible]	4.84
147	17	326	9	11	5.31
149	25	345	8	11	4.16
161	22	337	7	9	5.07
166	14	007	8	10	3.24
168	33	018	8	9	3.56
169	28	358	7	10	4.35
170	19	002	11	12	4.90
171	19	006	11	13	4.75
174	17	018	12	13	4.16
175	17	009	12	13	4.97
178	14	310	8	10	4.33
179	17	317	8	10	5.59
192	17	033	12	12	3.58
193	19	044	11	12	5.46
194	22	023	11	12	4.34
195	25	035	13	15	7.73
196	19	037	15	16	6.34
197	17	019	17	18	5.30
200	17	024	14	15	5.22
201	28	026	14	15	6.34
202	19	011	10	13	6.10
203	14	332	8	12	2.28
204	25	306	9	13	4.69
220	25	047	15	15	6.76
221	28	049	19	19	7.72
222	19	041	18	19	9.24
223	30	041	21	21	5.11
224	22	036	20	21	4.97
226	14	004	17	18	7.42
227	14	032	17	19	8.07
228	22	033	20	20	9.18
229	19	036	13	15	4.64
230	14	034	14	17	8.04
247	17	045	22	22	7.16
248	25	055	24	24	4.85
249	28	056	21	22	8.21
250	38	043	21	22	7.46
251	28	058	24	25	7.91
252	19	041	22	24	8.92
253	17	032	22	23	9.60
254	19	032	25	26	5.90
255	25	043	18	19	6.59

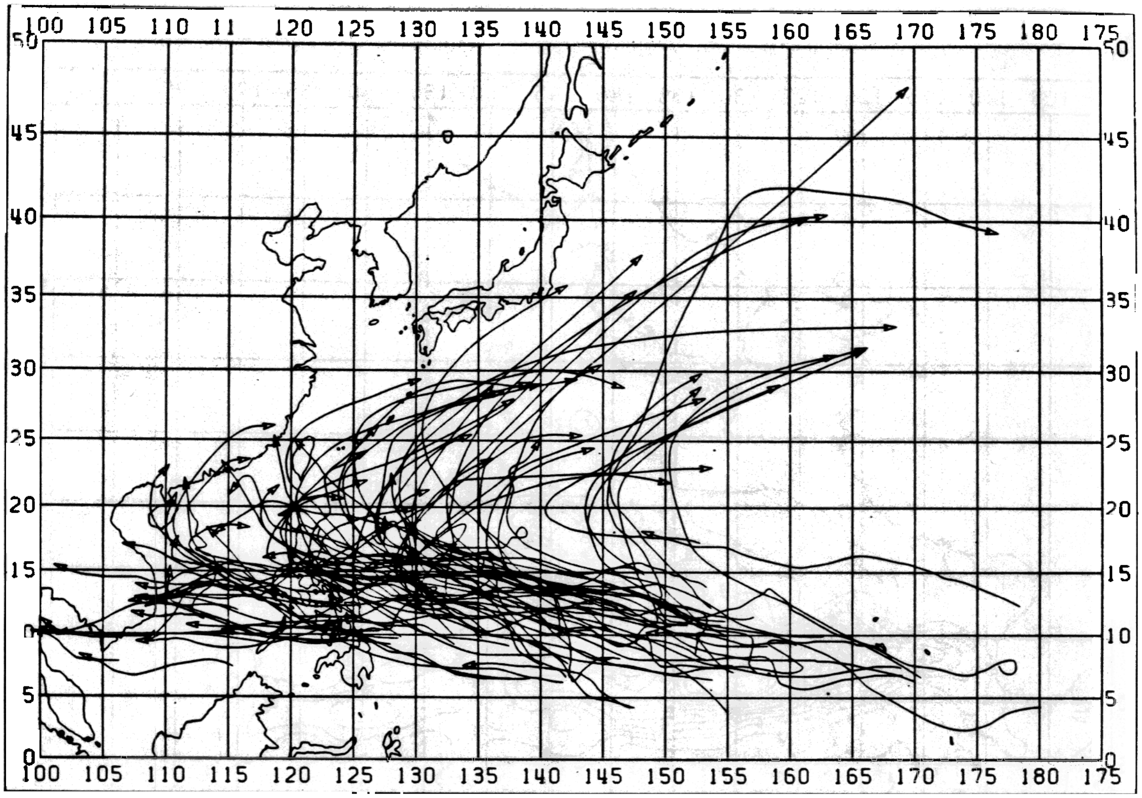
A	B	C	D	E	F
257	14	065	20	23	9.55
276	17	056	27	28	6.56
277	25	048	27	28	6.62
278	22	051	24	26	9.16
279	19	045	26	27	7.29
280	17	041	27	29	8.83
281	22	044	24	26	9.65
282	17	053	18	19	5.15
283	17	052	16	18	7.54
304	17	050	31	32	13.28
306	22	049	30	32	6.33
307	19	043	27	28	6.46
333	14	048	37	38	7.41
337	14	057	31	32	8.45



TROPICAL STORM AND TYPHOON FREQUENCY 1 NOV - 30 NOV

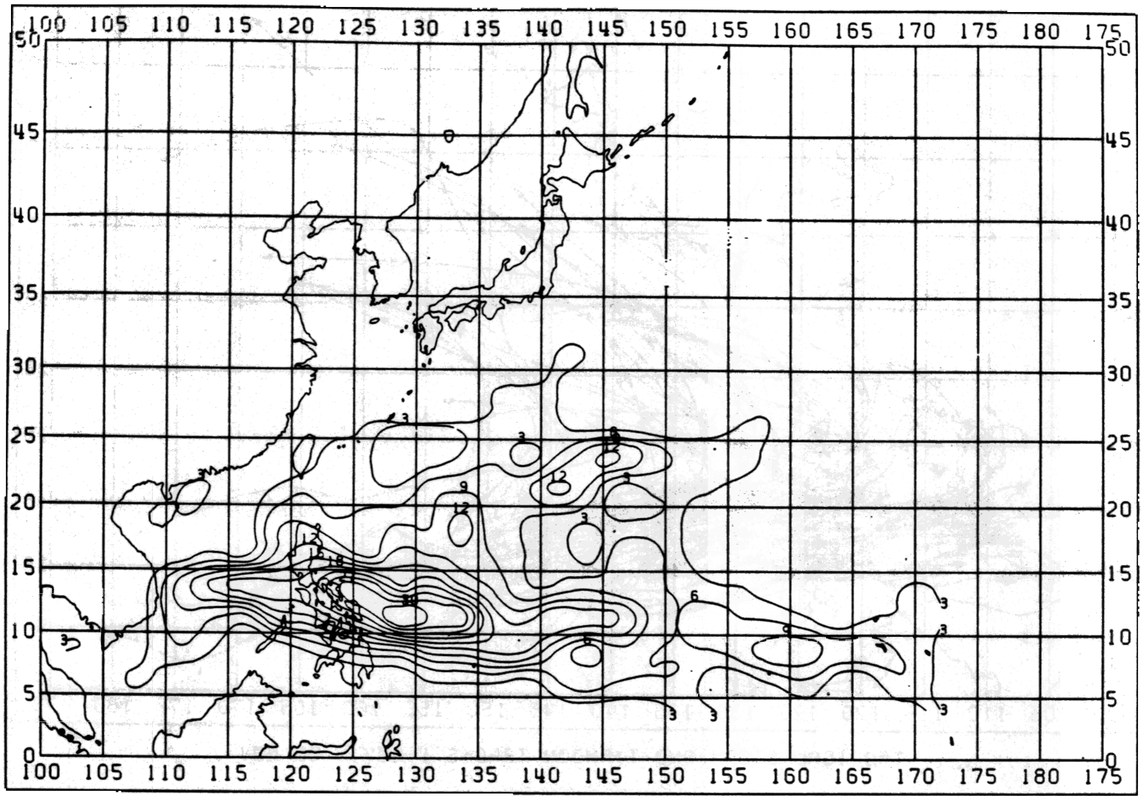


TROPICAL STORM AND TYPHOON MOTION 1 NOV - 30 NOV

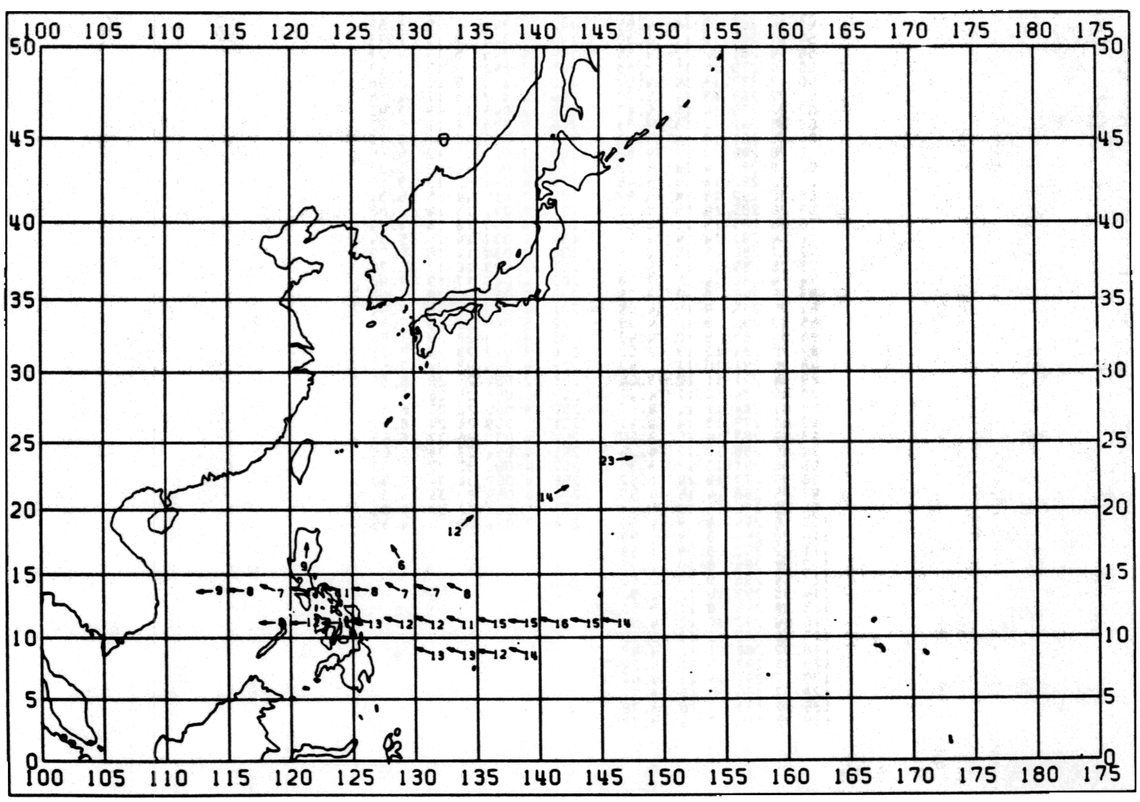


TROPICAL STORM AND TYPHOON TRACKS 1 NOV - 30 NOV

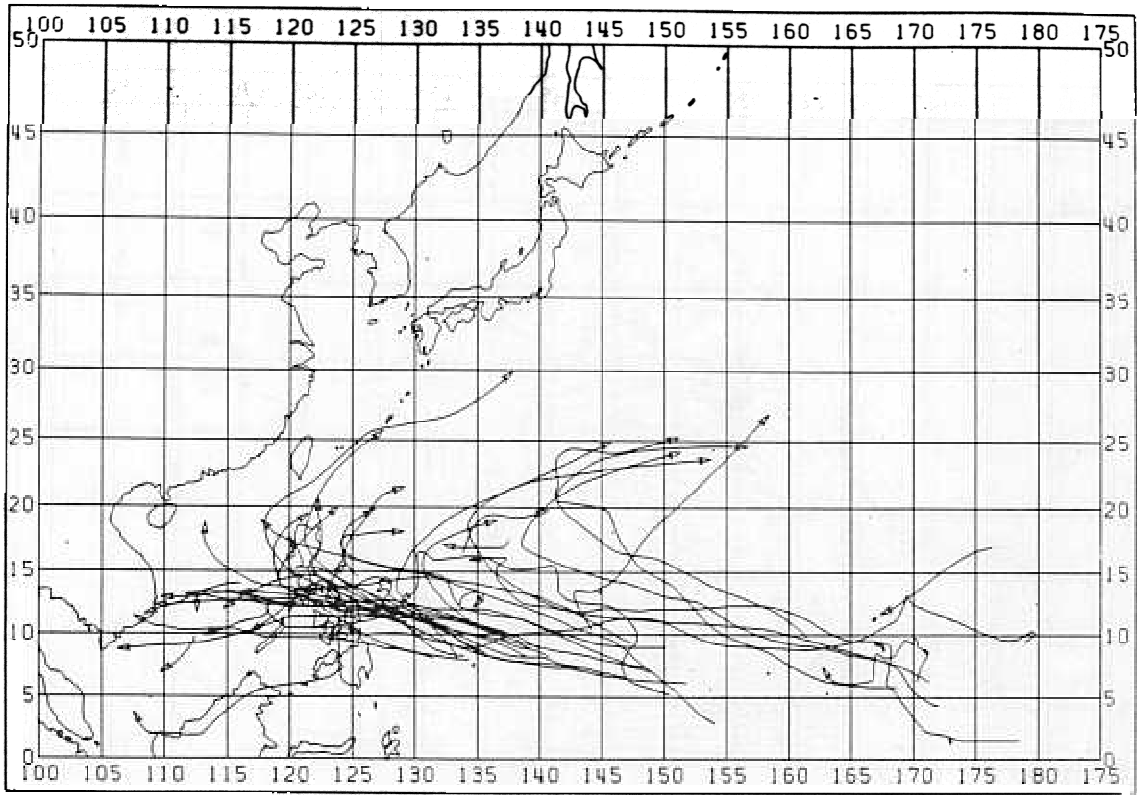
A	B	C	D	E	F
41	14	281	15	16	3.25
42	19	296	14	15	3.28
43	14	300	13	14	4.05
57	17	265	10	11	3.30
58	14	281	12	12	4.55
59	14	279	15	15	3.83
60	17	287	13	14	4.51
61	22	283	13	14	5.72
62	22	279	14	15	5.47
63	28	282	12	13	3.73
64	25	281	13	14	5.48
65	28	286	12	13	4.89
66	19	287	14	14	4.12
67	22	292	14	15	3.48
68	30	292	13	14	3.97
69	28	285	14	15	5.10
70	25	283	15	15	3.62
71	14	291	14	14	4.91
72	17	286	15	15	5.65
73	25	289	12	13	5.63
74	14	286	14	15	7.08
83	25	246	9	10	3.75
84	25	275	9	10	4.05
85	33	292	9	10	4.39
86	33	283	9	10	4.40
87	25	284	12	13	2.52
88	38	291	10	11	2.42
89	44	291	11	12	3.64
90	49	284	10	11	4.47
91	41	284	11	11	4.67
92	41	277	13	14	4.41
93	44	287	14	15	3.60
94	46	288	12	12	4.25
95	38	281	13	13	3.35
96	36	277	14	14	2.62
97	25	288	14	15	4.59
98	28	294	13	13	5.47
109	19	295	9	9	4.50
110	28	286	8	9	3.99
111	22	292	8	9	1.99
112	28	298	8	10	1.95
113	44	296	9	10	2.56
114	38	299	10	11	2.90
115	38	295	8	11	3.56
116	44	292	10	12	4.91
117	46	289	12	13	5.12
118	30	288	11	12	4.47
119	36	297	10	11	4.24
120	17	291	13	13	4.09
123	17	306	10	12	3.72
138	22	333	7	10	3.78
139	30	310	7	9	3.73
140	22	319	8	11	3.92
141	36	350	7	10	2.94
142	30	344	6	9	3.85
143	19	320	7	11	2.79
144	14	345	5	10	4.27
145	17	342	9	10	4.43
149	17	335	9	11	2.96
164	14	322	8	11	4.58
165	19	043	11	13	3.95
166	19	038	8	11	5.70
167	17	005	10	11	3.29
168	17	027	11	12	5.56
169	14	000	10	12	5.23
170	14	016	9	12	3.50
175	17	015	14	15	5.31
192	19	041	13	14	2.88
193	19	050	15	16	3.34
194	19	037	14	16	5.54
195	22	034	14	18	6.79
201	22	029	16	17	5.78
202	14	045	17	19	8.90
220	17	059	20	20	7.63
221	28	053	22	23	7.94
222	25	048	22	23	7.30
223	14	053	23	23	3.78
228	17	042	23	24	7.23
229	19	055	23	24	7.57
248	22	064	25	26	6.88
249	30	063	25	26	8.14
250	19	065	22	23	8.37
251	17	059	24	24	8.67
254	14	031	26	27	6.63
255	14	054	23	23	6.66
257	14	066	32	32	7.37
258	14	067	34	34	7.40
276	14	059	32	33	15.30
277	17	061	32	32	15.09
278	17	064	29	30	14.35



TROPICAL STORM AND TYPHOON FREQUENCY 1 DEC - 31 DEC

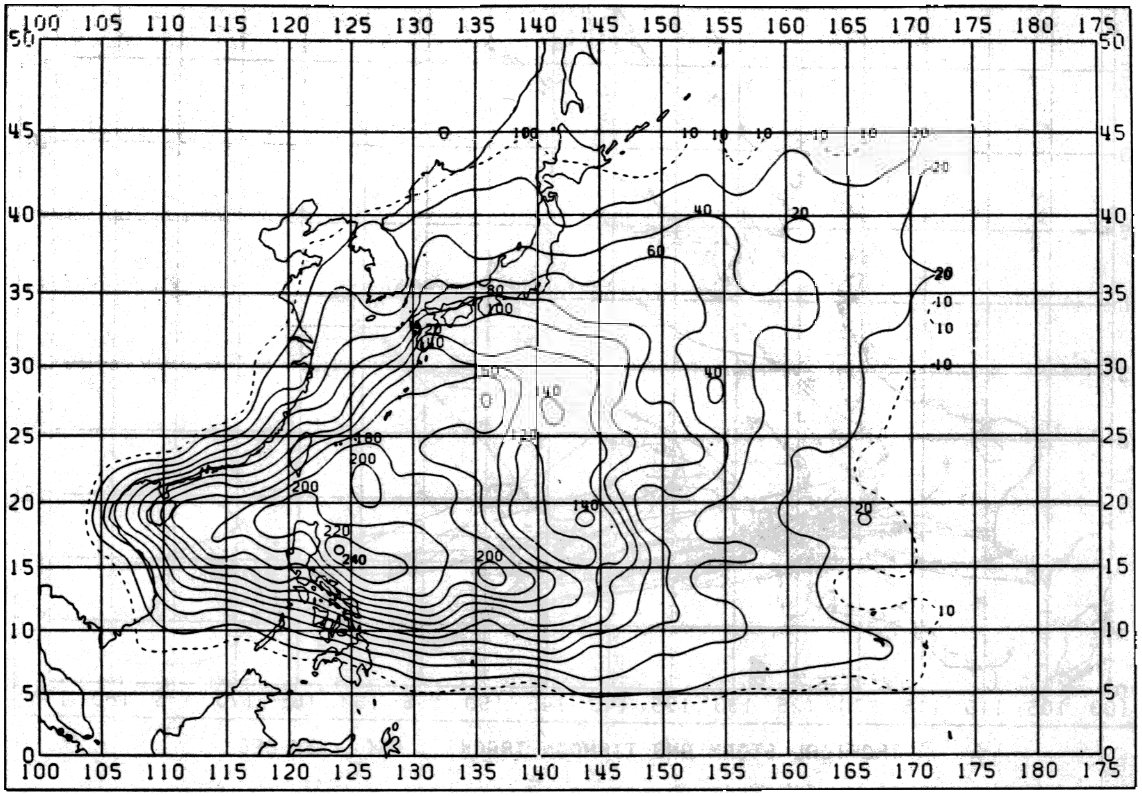


TROPICAL STORM AND TYPHOON MOTION DEC - 31 DEC

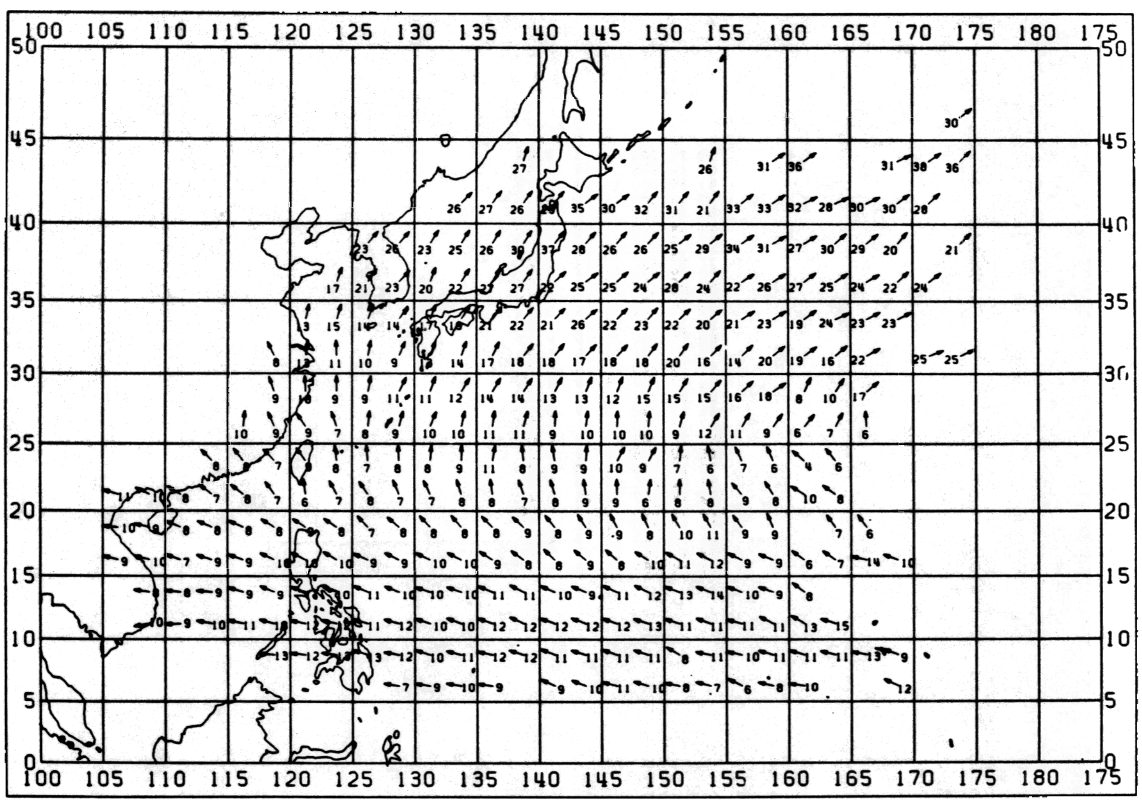


TROPICAL STORM AND TYPHOON TRACKS 1 DEC - 31 DEC

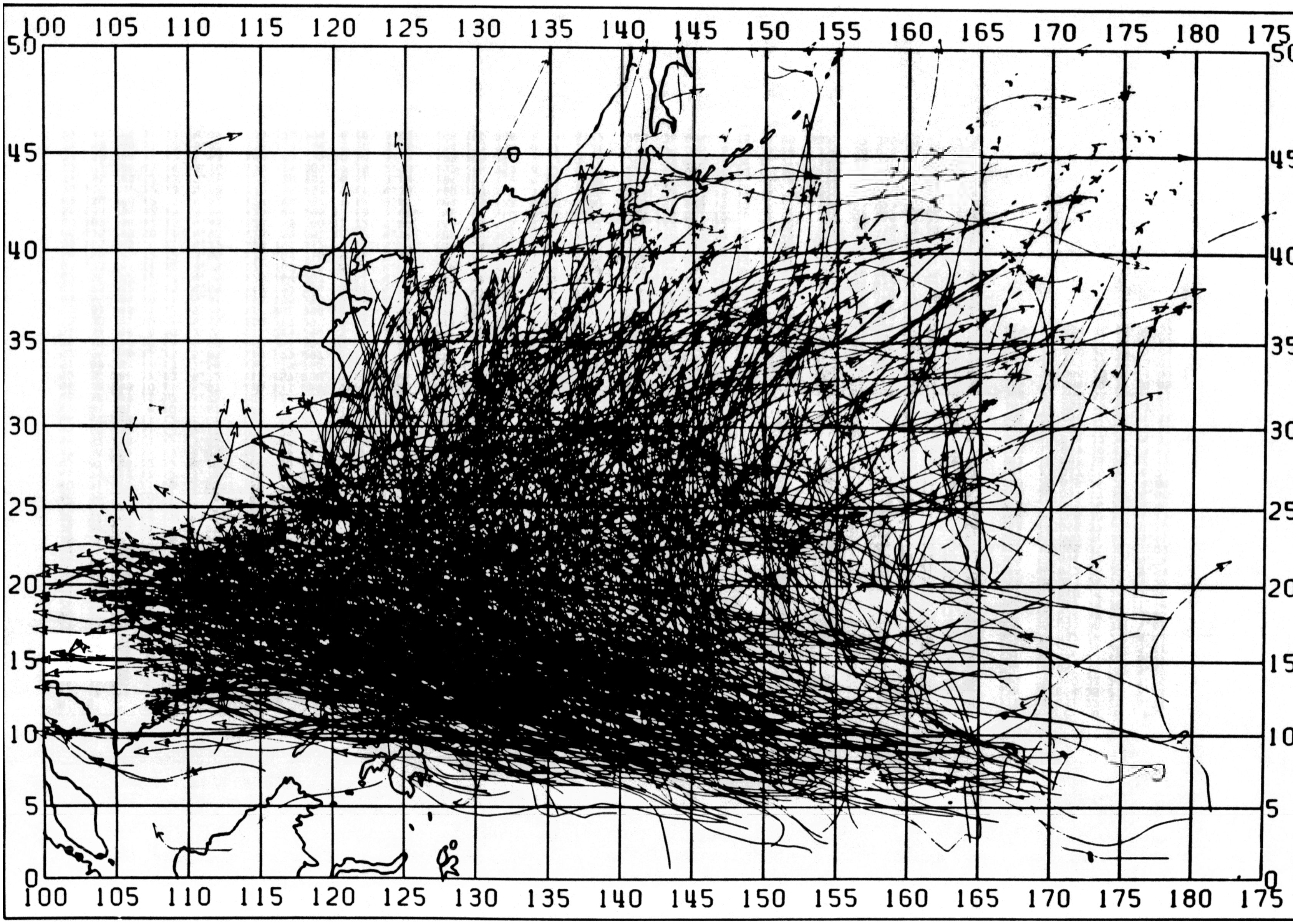
A	B	C	D	E	F
39	14	289	13	13	2.08
40	14	288	13	14	1.36
41	17	280	12	13	3.29
42	17	288	14	14	4.94
60	14	269	8	8	5.32
61	[illegible]	268	12	12	4.61
62	[illegible]	267	11	12	5.08
63	[illegible]	283	13	13	3.99
64	[illegible]	286	12	12	4.07
65	[illegible]	289	12	12	3.03
66	[illegible]	290	11	11	4.43
67	17	283	15	16	3.93
68	14	276	15	15	1.81
69	15	284	16	16	4.27
70	17	281	15	16	5.20
71	17	280	14	15	8.27
84	17	267	9	9	4.15
85	[illegible]	274	8	9	2.52
86	19	292	7	9	3.50
87	19	280	11	11	4.93
88	28	286	11	12	4.66
89	[illegible]	279	8	9	4.00
90	17	300	7	8	2.93
91	22	290	7	9	2.80
92	14	297	8	10	5.48
113	14	004	9	12	8.60
116	14	330	6	11	3.32
144	14	047	12	13	4.99
173	14	061	14	17	7.14
201	14	082	23	23	5.37



TROPICAL STORM AND TYPHOON FREQUENCY 1 JAN - 31 DEC



TROPICAL STORM AND TYPHOON MOTION 1 JAN - 31 DEC



TROPICAL STORM AND TYPHOON TRACKS, 1 JAN - 31 DEC, 1946 - 1982 (927 STORMS)

A	B	C	D	E	F
12	14	281	7	8	3.51
13	22	280	9	11	2.88
14	19	281	10	11	4.25
15	17	279	9	9	5.32
17	22	296	9	10	5.47
18	44	292	10	10	5.07
19	38	286	11	11	3.85
20	33	288	10	10	3.31
21	30	283	8	10	3.87
22	22	286	7	9	4.61
23	17	298	6	9	4.69
24	17	284	8	8	3.83
25	14	279	10	11	2.92
34	14	276	13	13	4.12
35	25	277	12	13	2.83
36	28	278	13	14	2.83
37	52	288	13	13	4.07
38	63	281	12	12	4.27
39	79	288	10	11	4.09
40	71	285	11	12	3.46
41	79	283	12	12	3.74
42	87	288	12	13	4.20
43	98	292	11	13	4.09
44	57	288	11	12	3.92
45	60	290	11	12	4.11
46	44	289	11	12	3.61
47	44	301	8	10	4.69
48	38	283	11	12	3.75
49	38	283	10	11	4.07
50	36	286	11	13	5.72
51	33	287	11	13	7.64
52	36	284	11	13	5.83
56	19	261	10	11	1.90
57	38	268	9	10	3.35
58	30	281	10	11	4.36
59	33	283	11	12	5.74
60	55	284	10	11	5.31
61	73	282	12	13	4.68
62	95	282	12	13	4.79
63	128	287	11	12	3.74
64	146	285	12	12	3.95
65	165	288	10	11	4.22
66	125	290	10	11	4.46
67	103	290	12	13	4.45
68	133	295	12	13	3.99
69	130	290	12	13	4.61
70	125	291	12	13	4.88
71	98	289	12	13	5.94
72	71	288	13	14	5.16
73	63	288	11	12	5.83
74	49	290	11	12	5.26
75	41	286	11	13	4.36

A	B	C	D	E	F
76	28	297	11	13	5.93
77	30	301	13	13	4.87
78	17	288	15	15	4.51
82	33	279	8	8	3.48
83	84	277	8	10	3.76
84	95	276	9	10	4.03
85	111	288	9	10	4.05
86	144	293	9	10	4.34
87	130	290	11	12	4.21
88	171	291	10	11	3.50
89	222	293	11	12	4.24
90	217	292	10	11	3.90
91	211	289	10	11	4.32
92	173	289	10	12	4.79
93	206	293	11	12	4.50
94	192	297	11	12	4.10
95	165	294	10	11	4.08
96	138	293	9	12	4.05
97	87	295	11	13	4.74
98	79	296	12	13	5.09
99	46	292	13	13	5.48
100	30	291	14	15	6.26
101	33	291	10	12	4.77
102	28	290	9	10	5.01
103	28	307	8	11	4.21
107	17	285	9	9	3.65
108	55	285	10	10	2.94
109	111	290	7	9	3.41
110	173	288	9	10	4.25
111	157	290	9	10	4.95
112	179	296	10	12	5.18
113	173	297	10	12	4.34
114	241	301	10	11	3.63
115	219	294	9	11	3.25
116	217	297	9	11	4.09
117	206	296	10	12	4.49
118	198	298	10	11	4.49
119	192	304	9	11	4.56
120	144	307	8	11	4.03
121	109	315	8	12	4.60
122	103	310	9	11	5.40
123	141	312	8	11	5.03
124	84	302	10	12	4.18
125	55	300	11	12	5.55
126	44	298	12	13	4.09
127	44	297	9	11	3.85
128	38	293	9	11	4.35
129	30	307	6	11	3.48
130	19	305	7	15	2.70
133	68	275	10	10	3.37
134	117	284	9	10	3.58
135	176	294	8	10	3.88

A	B	C	D	E	F
136	173	294	8	10	4.13
137	187	295	8	10	3.76
138	222	303	8	10	4.00
139	211	304	9	11	4.17
140	190	305	8	11	3.15
141	195	318	7	10	3.75
142	198	311	8	11	4.15
143	195	318	8	11	4.04
144	171	320	8	12	4.45
145	155	316	8	11	4.13
146	103	314	9	12	4.59
147	128	322	8	12	4.16
148	146	328	9	12	4.69
149	117	333	9	12	4.59
150	41	336	8	13	6.05
151	52	331	10	12	6.35
152	30	332	11	12	3.41
153	28	324	9	10	3.63
154	22	337	9	11	3.56
156	14	325	7	12	6.67
159	41	287	11	12	3.56
160	87	295	10	11	3.78
161	119	301	8	10	3.87
162	149	308	7	9	3.10
163	138	308	8	10	3.81
164	157	324	7	11	4.45
165	195	352	6	12	4.36
166	184	332	7	11	4.16
167	214	326	8	11	4.12
168	182	338	7	12	4.68
169	198	335	7	12	4.11
170	179	343	8	12	4.33
171	152	353	8	13	5.31
172	117	342	7	12	5.50
173	125	344	8	13	4.61
174	125	353	9	13	5.04
175	76	359	9	12	6.59
176	57	009	6	14	7.49
177	68	001	8	12	6.44
178	57	351	8	14	7.27
179	38	320	9	10	3.99
180	28	328	8	11	5.93
181	17	302	10	13	4.74
182	14	306	8	10	4.61
188	57	315	8	13	4.76
189	73	322	8	12	3.82
190	103	315	7	11	4.65
191	141	324	9	12	3.38
192	184	353	8	12	5.40
193	190	355	7	12	5.17
194	173	358	8	12	5.21
195	152	006	8	13	6.22

A	B	C	D	E	F
196	141	002	9	13	5.77
197	146	010	11	14	5.48
198	114	355	8	13	5.11
199	125	352	9	12	5.38
200	133	004	9	13	5.81
201	117	028	10	14	7.47
202	92	029	9	15	8.82
203	87	007	7	13	7.74
204	82	350	6	14	7.88
205	44	335	7	15	8.21
206	28	337	6	10	3.74
207	17	310	4	12	5.50
208	19	322	6	11	4.23
215	14	007	10	16	3.93
216	68	336	9	12	4.50
217	98	325	9	12	4.10
218	92	340	7	12	4.40
219	152	007	8	13	7.06
220	173	015	9	14	7.08
221	168	023	10	15	8.16
222	163	014	10	14	7.21
223	179	009	11	15	6.58
224	128	016	11	16	7.46
225	144	003	9	14	6.57
226	128	008	10	14	6.14
227	95	002	10	14	6.24
228	95	006	10	14	7.30
229	84	016	9	15	8.17
230	46	033	12	18	9.25
231	49	031	11	16	7.33
232	38	036	9	17	8.94
233	36	040	6	14	7.92
234	38	028	7	11	5.38
242	33	340	9	11	3.87
243	38	357	10	15	6.41
244	76	360	9	13	6.00
245	106	011	9	13	6.85
246	146	028	11	15	8.81
247	157	020	11	16	8.72
248	163	032	12	17	9.46
249	176	032	14	19	8.47
250	138	033	14	19	8.80
251	136	028	13	18	9.26
252	125	023	13	17	8.46
253	114	021	12	16	8.13
254	63	023	15	19	7.27
255	73	032	15	18	8.39
256	36	042	15	17	8.56
257	44	046	16	20	10.38
258	33	055	18	24	11.21
259	25	025	8	14	8.18
260	36	034	10	15	7.60

A	B	C	D	E	F
268	14	334	8	12	3.30
269	33	009	13	15	5.52
270	57	358	11	12	5.79
271	71	011	10	12	5.30
272	79	023	9	11	5.44
273	146	020	13	16	8.10
274	125	020	14	19	8.18
275	103	026	17	20	9.16
276	122	038	18	20	11.52
277	117	037	18	21	12.35
278	114	042	17	20	11.57
279	109	043	18	20	10.93
280	84	036	18	21	10.45
281	57	035	20	22	10.05
282	57	044	16	20	7.90
283	52	044	14	18	7.52
284	28	050	20	22	7.48
285	30	053	19	21	14.08
286	36	049	16	20	12.01
295	19	013	13	14	3.90
296	52	016	15	17	6.93
297	41	021	14	17	7.26
298	38	035	14	16	9.07
299	76	021	17	18	6.77
300	84	033	19	21	10.06
301	101	036	21	23	10.92
302	95	038	22	25	9.46
303	87	042	21	23	13.35
304	68	048	26	27	14.06
305	68	043	22	24	12.90
306	73	039	23	25	11.67
307	76	046	22	24	11.54
308	57	048	20	24	12.39
309	44	057	21	25	12.46
310	46	058	23	25	11.78
311	52	053	19	22	12.02
312	28	065	24	25	13.82
322	33	019	17	19	7.74
323	33	033	21	22	8.12
324	19	043	23	25	4.82
325	60	021	20	21	7.95
326	46	031	22	24	7.62
327	55	029	27	29	11.44
328	49	034	27	29	11.45
329	63	046	22	23	9.47
330	55	053	25	26	12.29
331	63	047	25	27	13.96
332	73	049	24	26	13.68
333	68	047	28	30	13.28
334	46	040	24	27	14.94
335	38	056	22	24	14.89
336	33	056	26	27	12.91

A	B	C	D	E	F
337	44	051	27	28	10.74
338	28	054	25	29	8.23
349	30	040	23	24	7.74
350	19	041	26	28	5.97
351	38	032	23	26	6.47
352	38	032	25	26	5.61
353	25	032	26	27	8.42
354	38	033	30	31	5.63
355	22	038	37	38	10.25
356	25	042	28	28	11.18
357	36	040	26	28	12.56
358	38	043	26	28	11.27
359	46	052	25	27	9.63
360	57	051	29	31	16.74
361	38	055	34	36	17.03
362	25	060	31	33	13.11
363	17	058	27	29	10.10
364	28	048	30	31	11.13
378	22	045	26	28	6.46
379	22	037	27	30	5.50
380	25	035	26	29	8.68
381	17	037	29	33	8.71
382	14	053	35	38	12.16
383	17	053	30	33	13.60
384	17	039	32	34	14.37
385	25	039	31	32	13.18
386	25	036	21	24	11.33
387	19	052	33	34	13.71
388	25	056	33	34	21.61
389	25	064	32	34	20.89
390	25	066	28	31	13.00
406	14	017	27	29	13.97
412	17	020	26	27	11.04
414	17	055	31	33	13.82
415	22	054	36	38	20.57

TABULAR DATA, TROPICAL STORMS AND TYPHOONS, JAN - 31 DEC

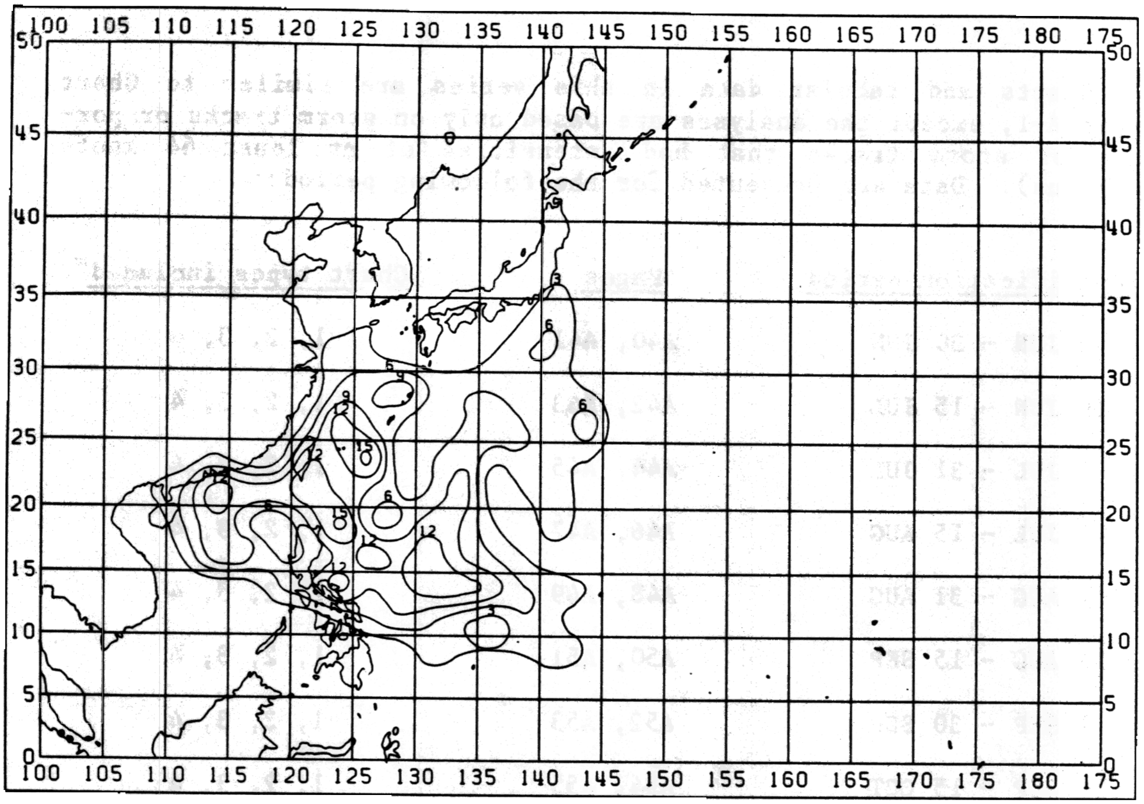
A.4 Chart Series A-II

Charts and tabular data in this series are similar to Chart Series A-I, except the analyses are based only on storm tracks or portions of storm tracks that had intensities of at least 64 knots (typhoons). Data are presented for the following periods:

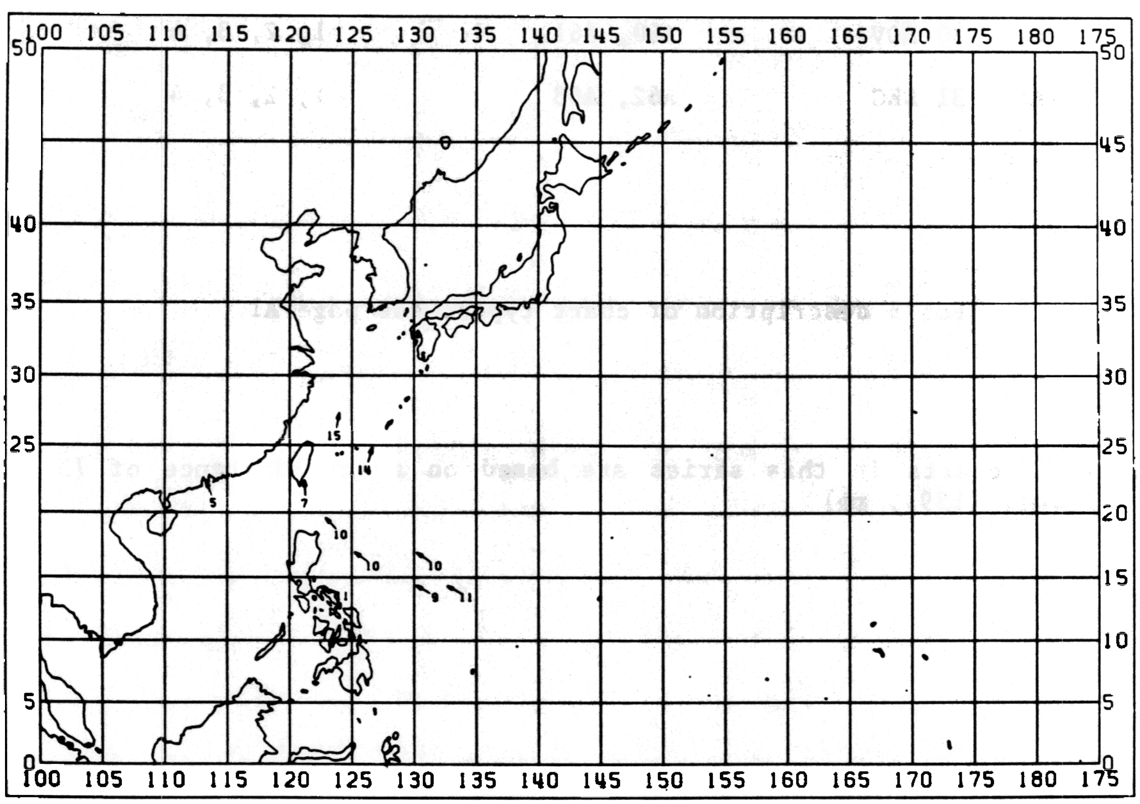
Stratification period	Pages	Chart types included*
1 JUN - 30 JUN	A40, A41	1, 2, 3, 4
16 JUN - 15 JUL	A42, A43	1, 2, 3, 4
1 JUL - 31 JUL	A44, A45	1, 2, 3, 4
16 JUL - 15 AUG	A46, A47	1, 2, 3, 4
1 AUG - 31 AUG	A48, A49	1, 2, 3, 4
16 AUG - 15 SEP	A50, A51	1, 2, 3, 4
1 SEP - 30 SEP	A52, A53	1, 2, 3, 4
16 SEP - 15 OCT	A54, A55	1, 2, 3, 4
1 OCT - 31 OCT	A56, A57	1, 2, 3, 4
16 OCT - 15 NOV	A58, A59	1, 2, 3, 4
1 NOV - 30 NOV	A60, A61	1, 2, 3, 4
1 JAN - 31 DEC	A62, A63	1, 2, 3, 4

*For a description of chart types, see page A1.

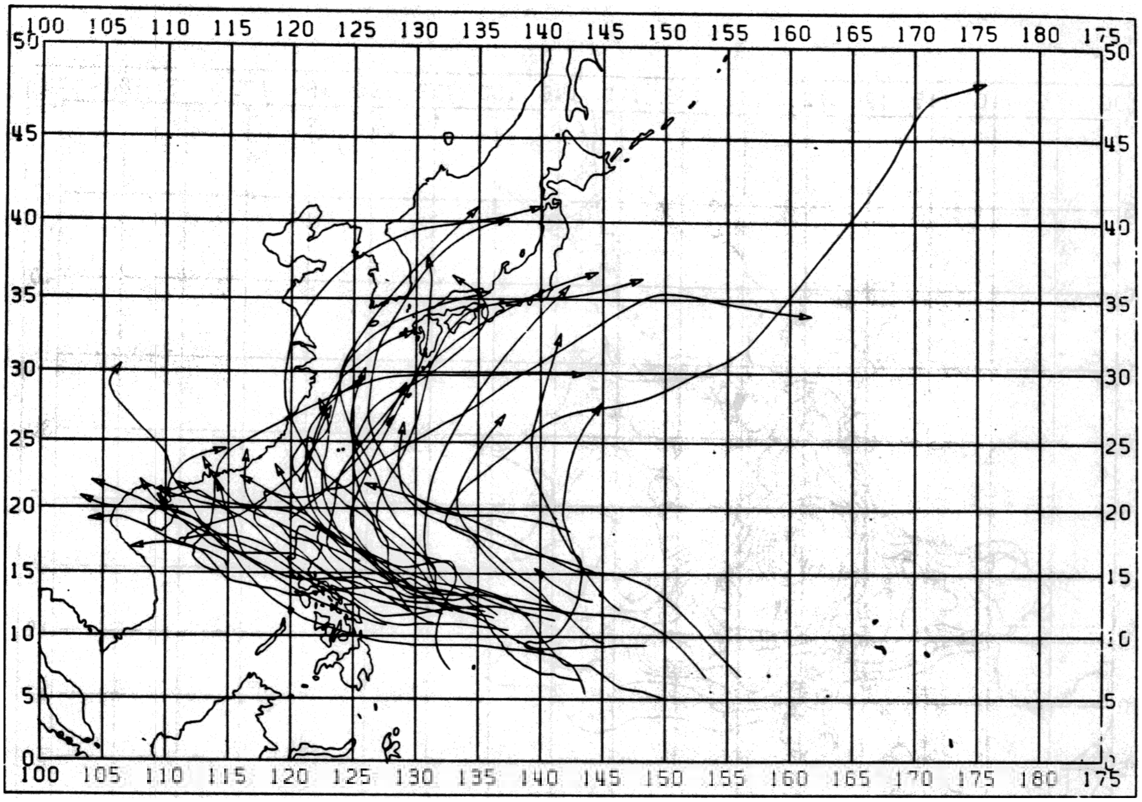
Note: All charts in this series are based on a scan-distance of 75 n.mi. (139.5 km)



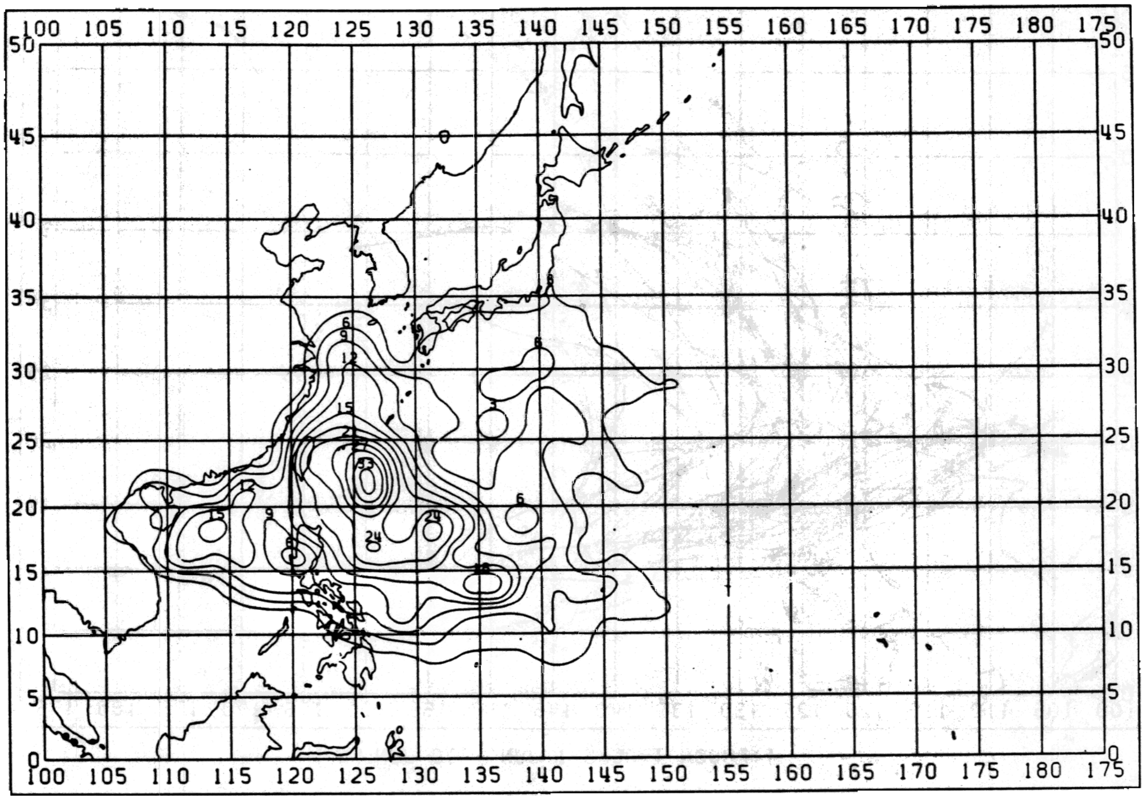
TYPHOON FREQUENCY JUN - 30 JUN



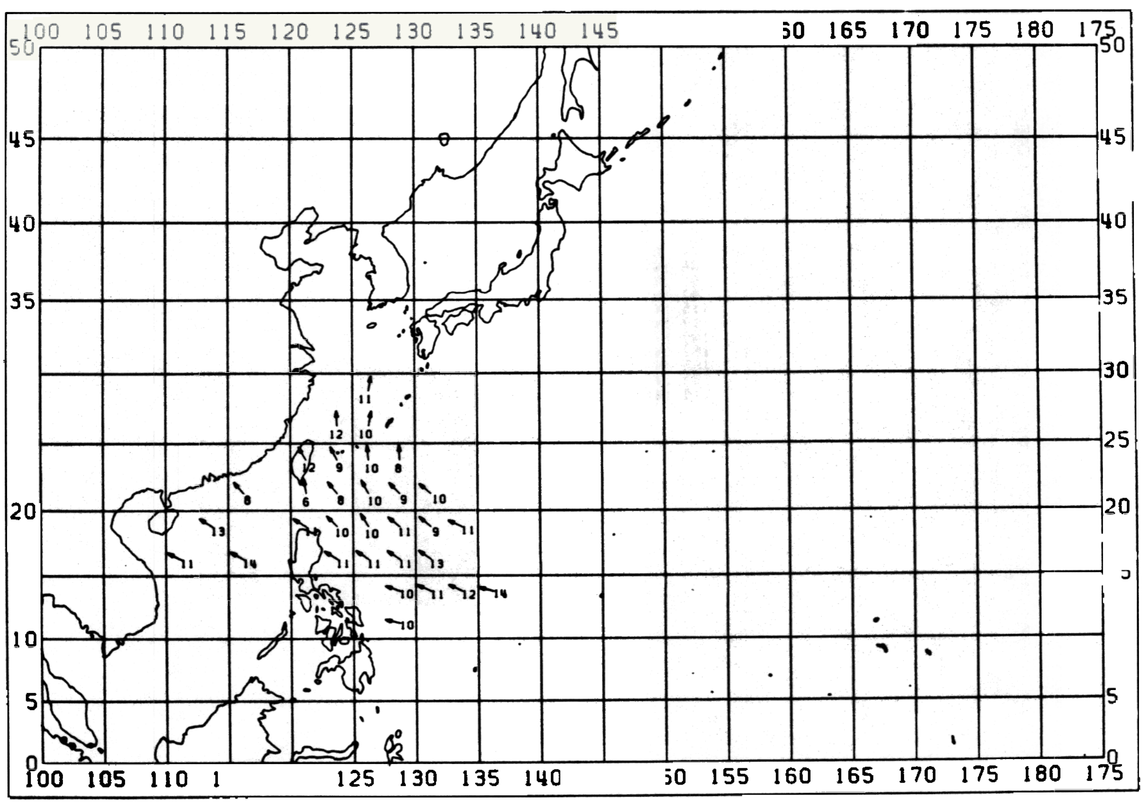
TYPHOON MOTION 1 JUN - 30 JUN



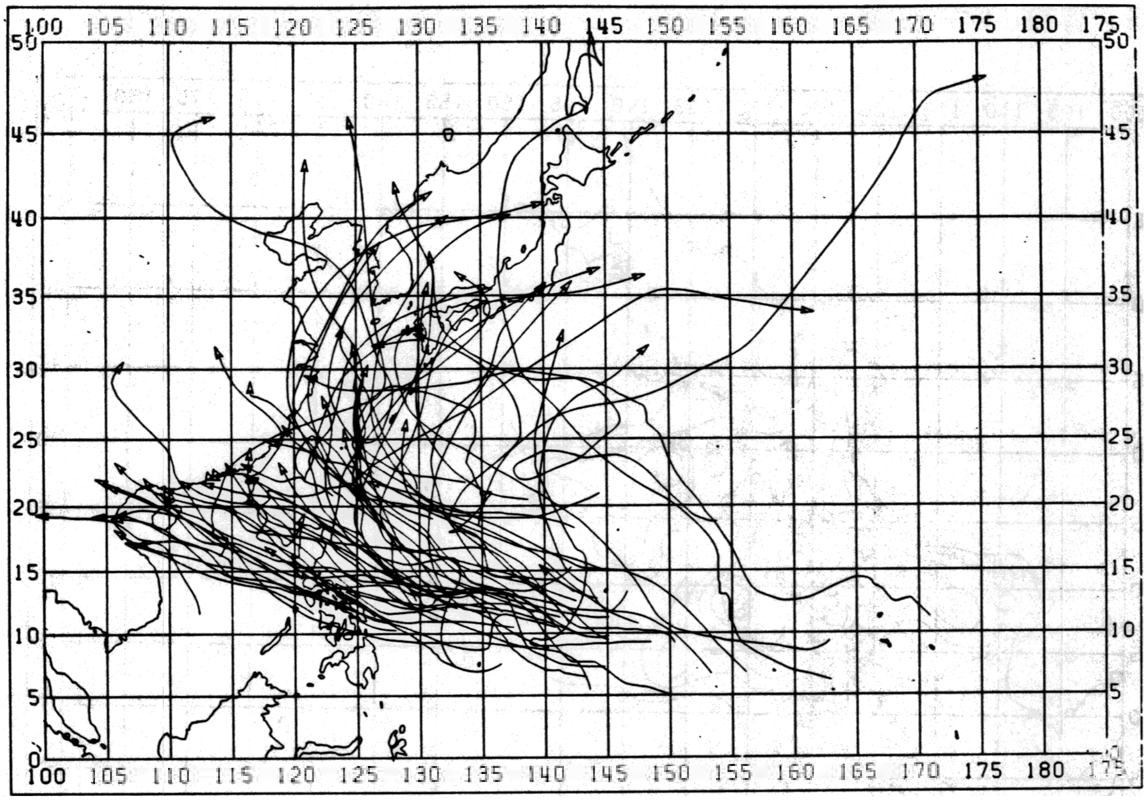
88		290	11	11	3.76
91			9	10	5.14
92					2.46
115	14	306			2.04
117	14	304			3.52
140	17	316			2.93
162	14	338			2.94
165	14	357			1.97
193	17	016	14	16	3.96
218		011	15	16	



TYPHOON FREQUENCY 16 JUN - 15 JUL

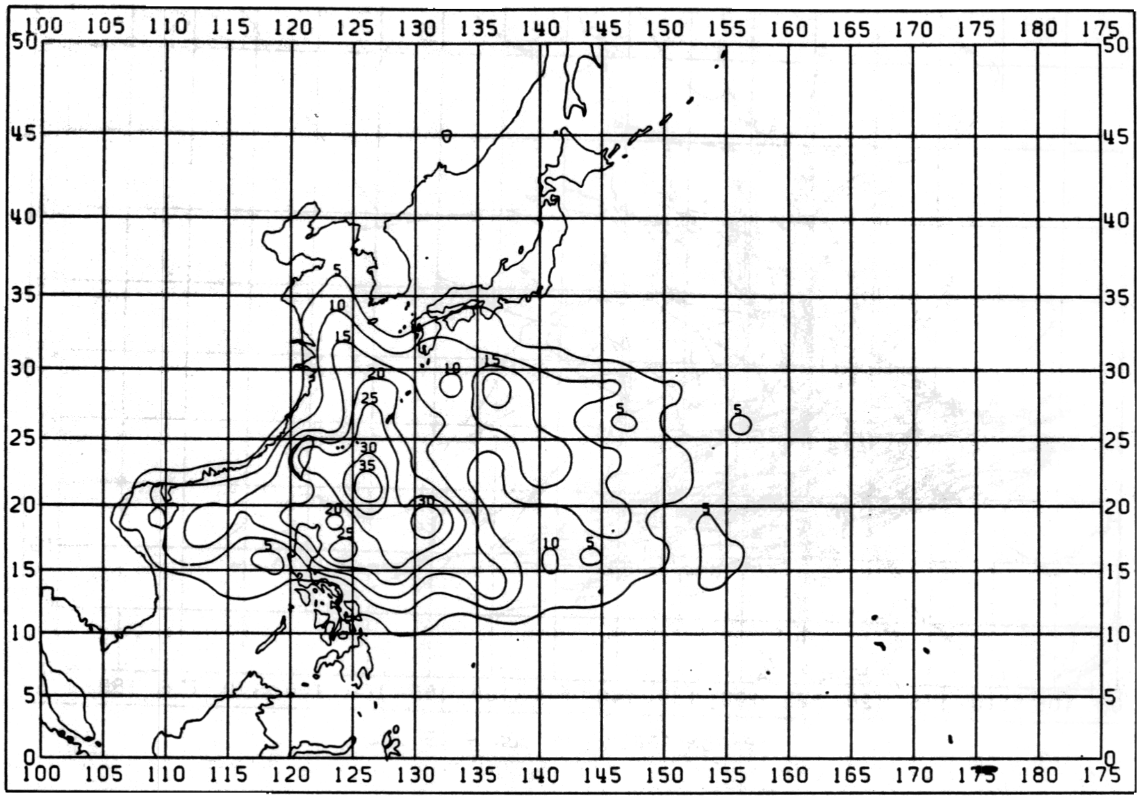


TYPHOON MOTION 16 JUN - 15 JUL

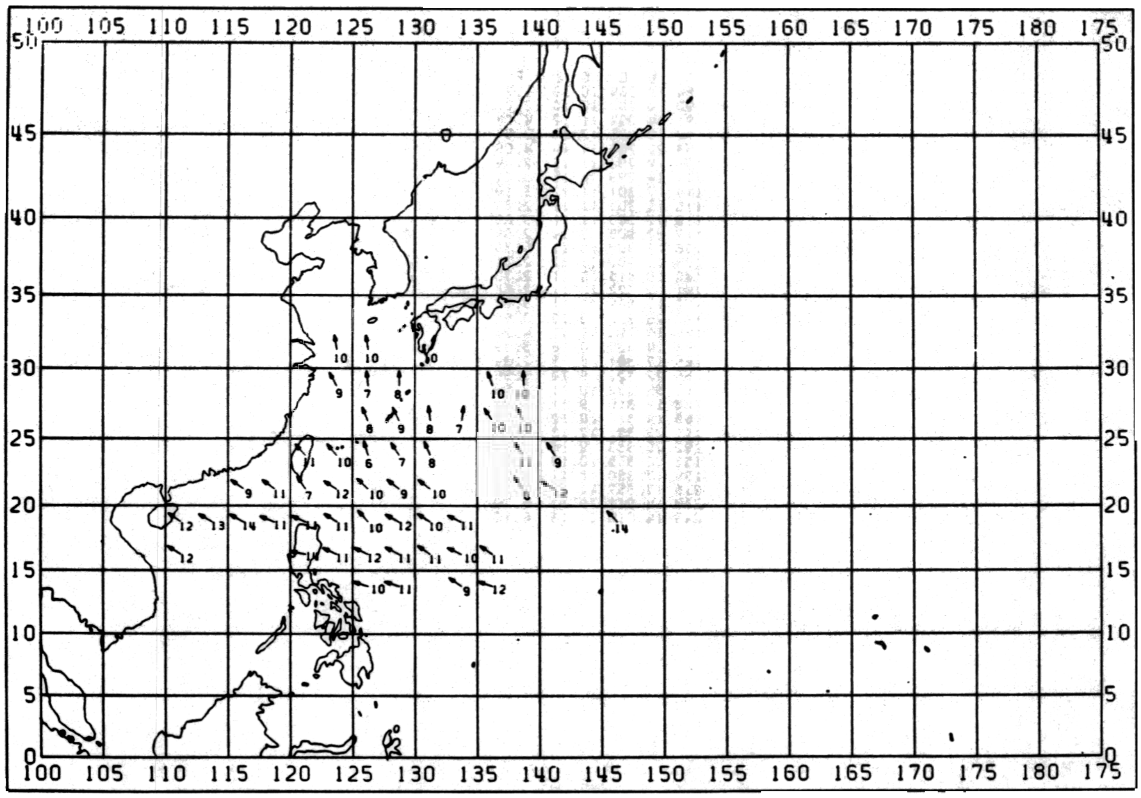


TPHOON TRACKS 15

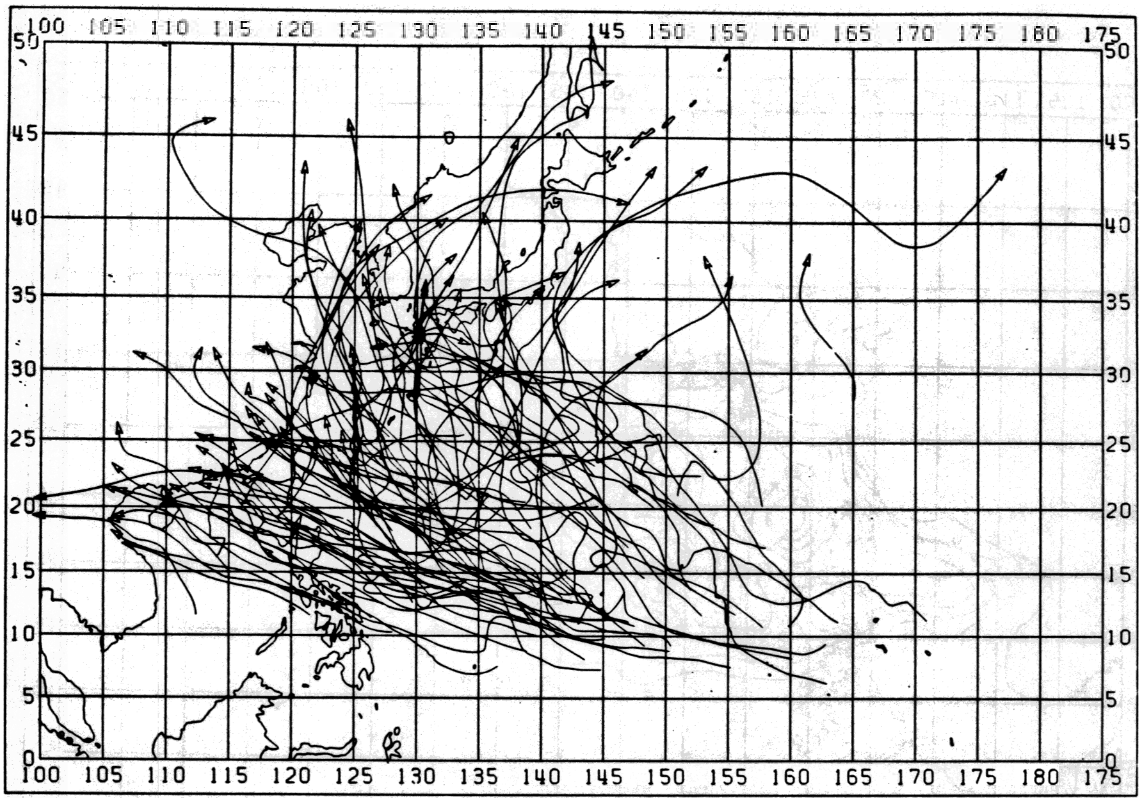
	B	C		E	
64	14	284		10	
90	14	290			2.01
91	14	294			4.28
92		295			2.57
93		286			4.09
109		296			2.04
111		299		15	3.01
114		301		12	3.18
115		303			2.37
116		303			3.80
117		305	13		2.59
136		303	13		5.30
	17		11		2.31
	19		10		2.70
			10		2.68
			11		3.50
	25	310			
144	19	295	11		4.28
163	14	320	8		3.39
165	17	351			2.34
166	22	321			3.56
167	36	332	10		2.59
168	19	316	9		2.80
169	14			12	2.79
191	22			13	3.57
	25	333			3.12
	30	355			4.52
194	17	358			3.19
218	17	357			6.15
219	19	011			5.79
245					



TYPHOON FREQUENCY JUL - 31 JUL



TYPHOON MOTION 1 JUL - 31 JUL



YPHOON TRACKS

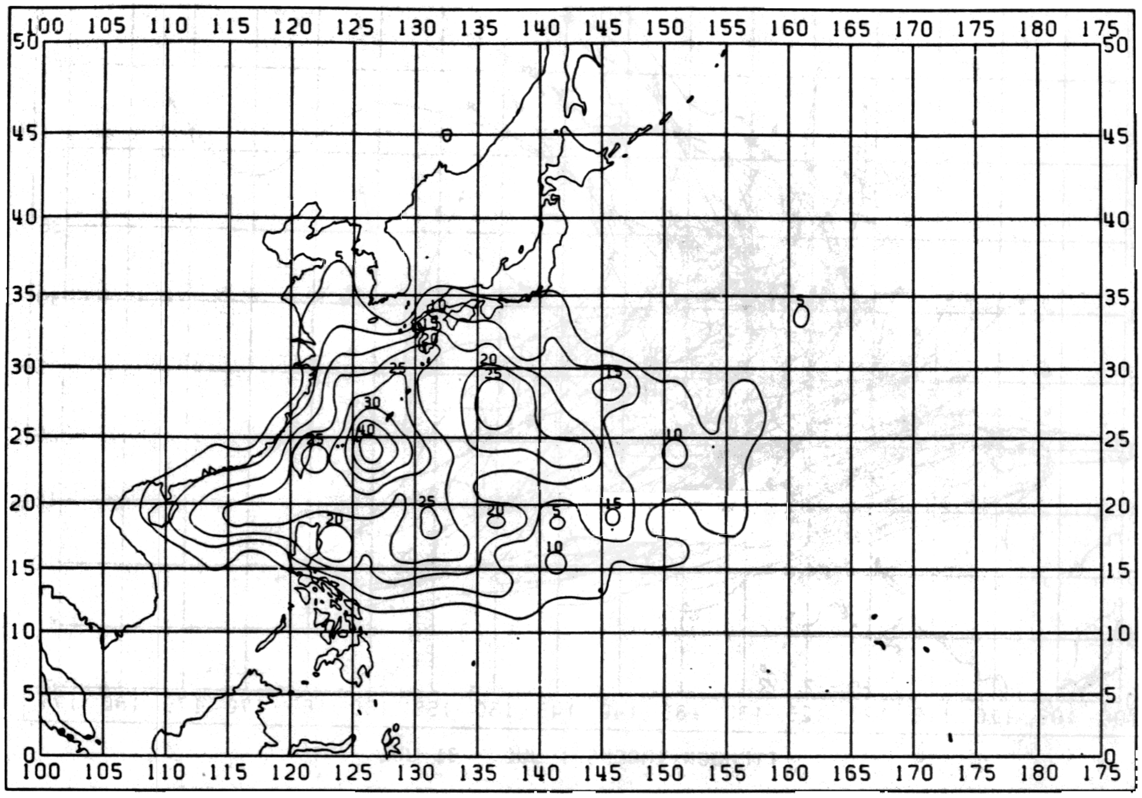
89 90 92 93 114 115 116 118 119 135 136 137 138 149 163 164 169 172 173 193 194 195 219 220 221 222 223 224 244 245 246 249 250 [illegible]

14 19 14 30 22 28 14 19 14 19 25 17 28 25 17 28 30 25 30 25 14 17 19 30 17 17 14 22 19 25 17 17

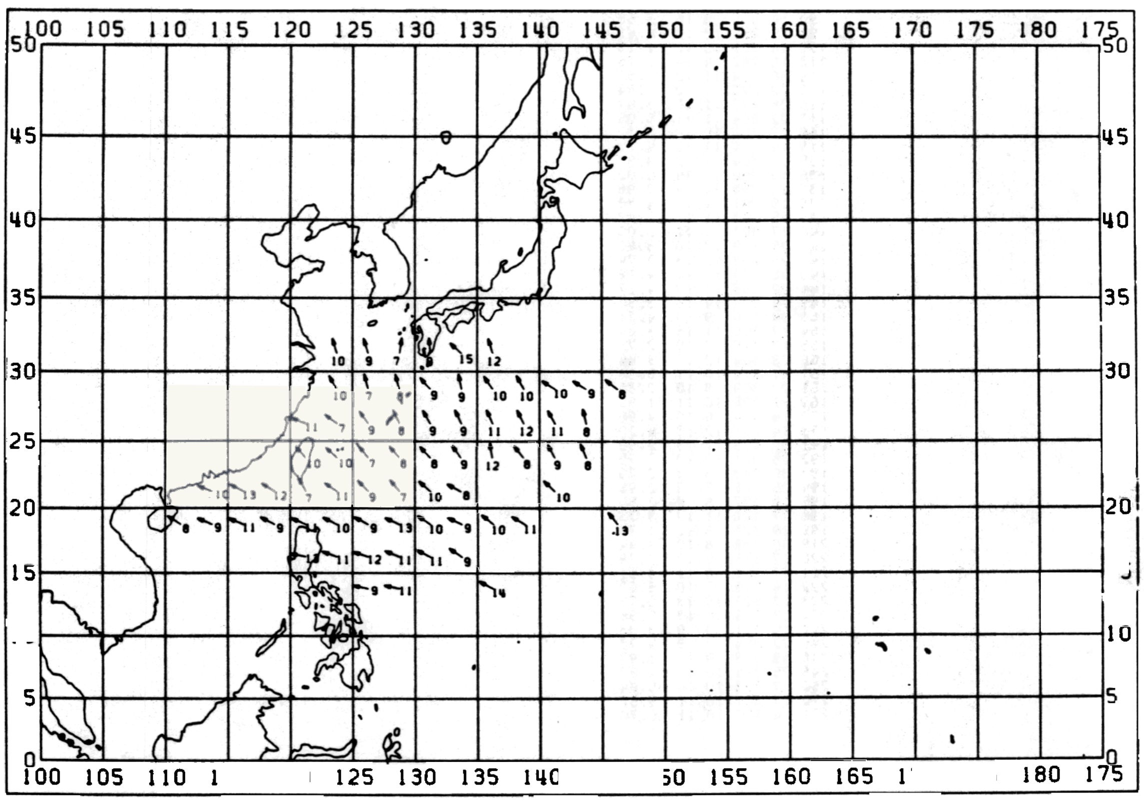
290 291 293 303 319 314 309 308 319 321 343 326 337 329 326 338 339 331 354

0 10 11 9 11 12 13 14 14 9 9 10 10 6 8 12 12 10 13 13 8 10

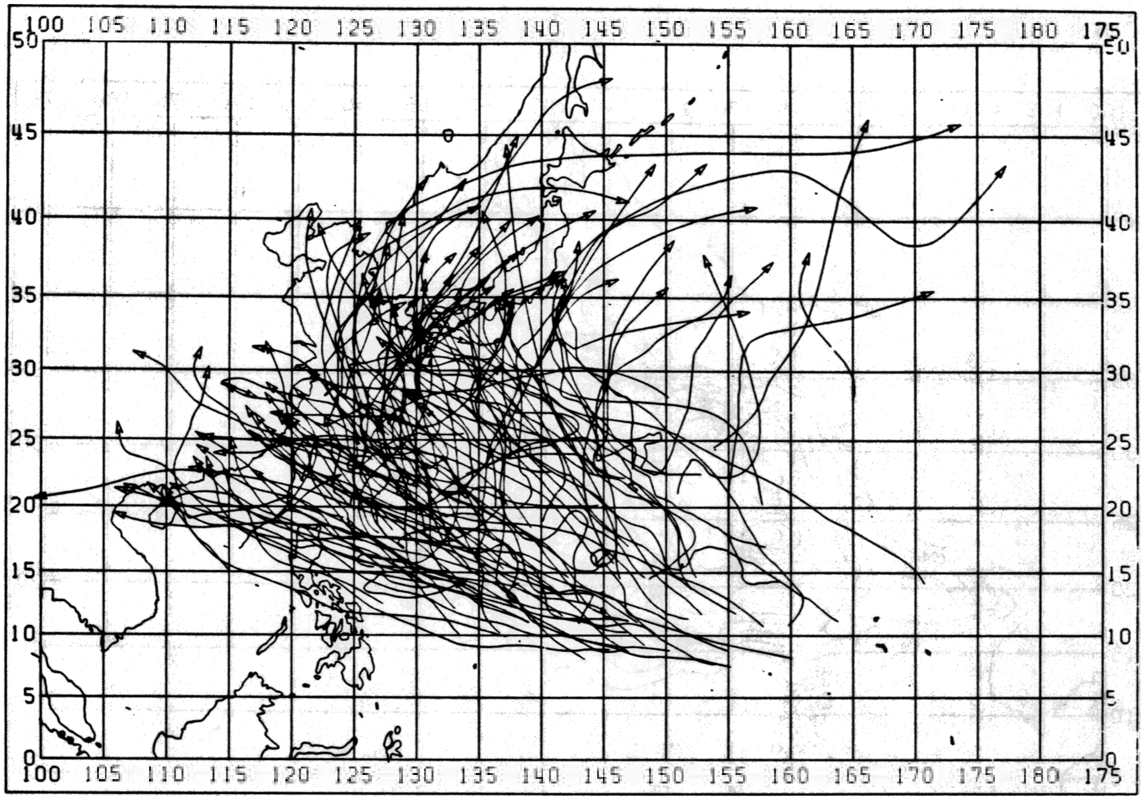
3.34 3.00 3.13 3.16 2.94 3.67 5.05 3.32 4.14 3.97 5.02 2.98 2.42 2.09 3.30 4.71 3.44 2.72 3.44 3.58 1.95 4.96 4.20 2.99 2.79 2.94 2.56 3.73 3.44 2.79 3.11 3.07 5.75 5.96 3.33 4.78 3.97 4.97 5.84 5.52 5.70



TYPHOON FREQUENCY 16 JUL - 15 AUG



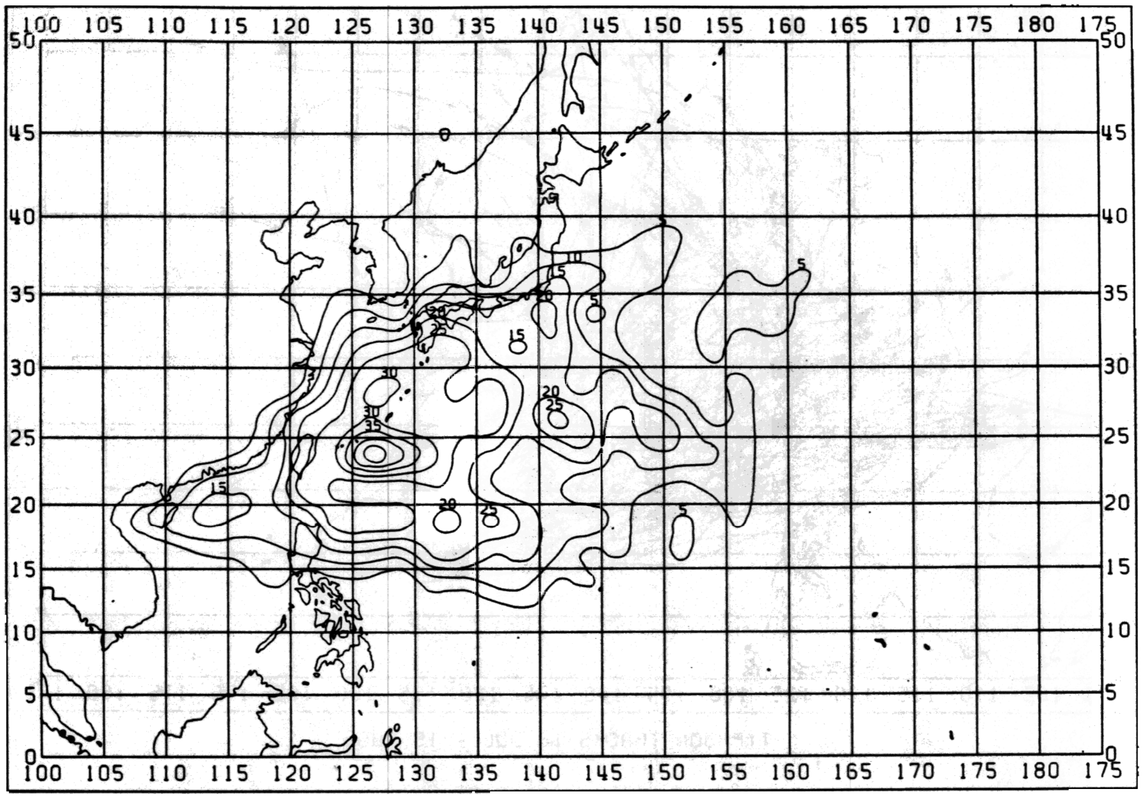
TYPHOON MOTION 16 JUL - 15 AUG



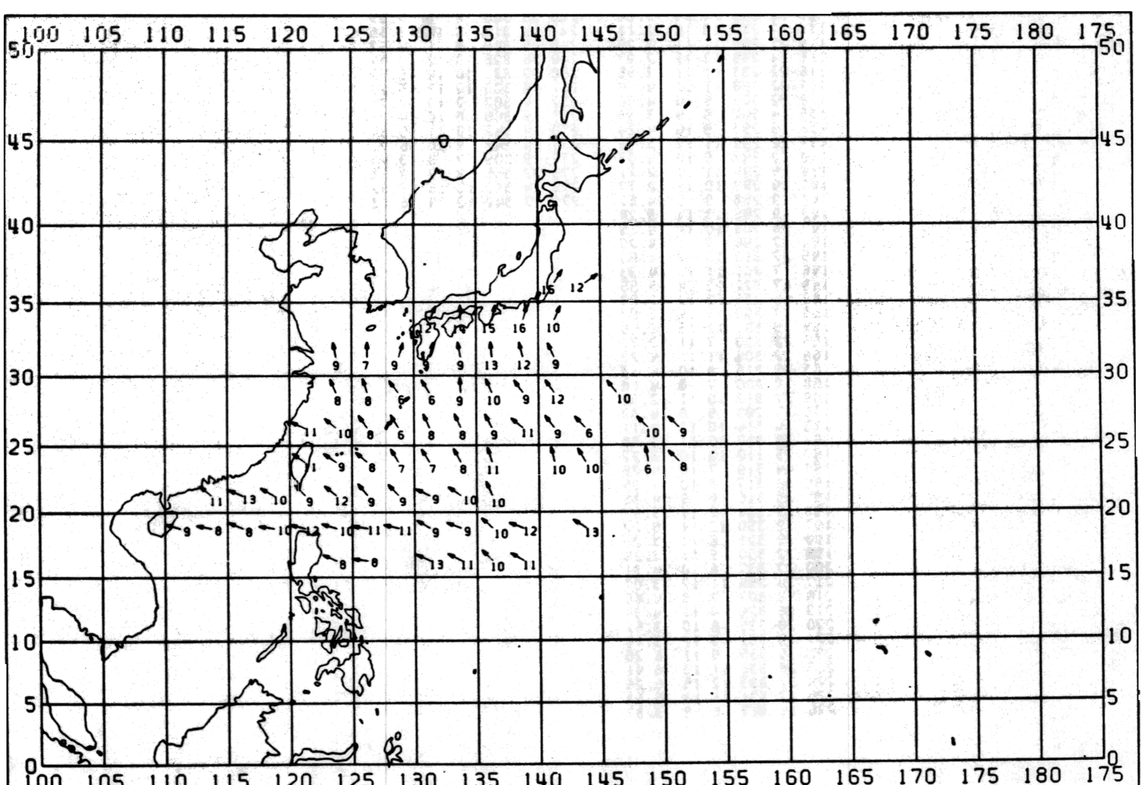
YPHOON TRACKS

		C	D	
89		283	9	3.43
90		283	.	2.96
		299		5.64
		282		2.11
		290		3.29
		289		2.97
		293		3.55
		298		4.54
118		305		4.30
135		302		3.39
136		293		4.24
137		292		3.96
138		297		4.33
		294		2.21
		297		2.77
141	19	298		4.62
142	19	295		3.28
143	28	304		4.15
144	17	296		4.20
145	22	310		4.88
146	17	301		4.33
149	17	322		3.65
	14	293		2.03
	17	298		3.87
164	19	302		3.58
165	22	330		2.75
166	22	304		4.22
167	28			4.13
168	19			4.18
169		312		2.32
170		299		
173		314		4.11
191		317		3.38
192		312		3.22
193		319		4.79
194		317		4.36
195		316		4.35
196		324		5.57
197		350		6.22
198		321		3.29
199		330		3.24
200		337		4.31
217		294		3.07
218	19	307		
219	36	324	9	4.34
220	28	335	8	3.52
221	19	331	9	3.14
222	19	335	9	6.26
223	28	336	11	6.41
224	22	333	12	6.26
225	17		11	6.53
226			8	3.37

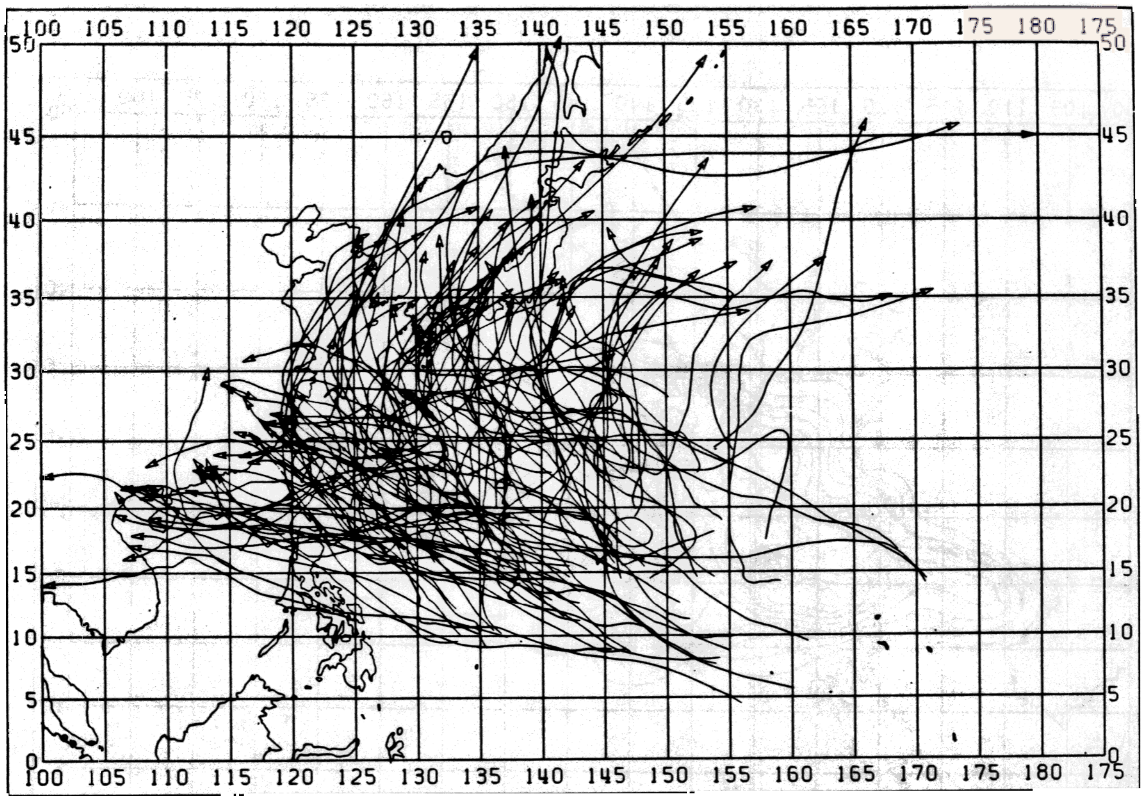
	B	C	D	
	22	329	:0	4.20
	22			4.88
246	28			2.65
247	14			2.88
248	19			4.97
249	28			3.87
250	22			5.52
251		303		5.23
252		302		2.71
253		308		4.31
270	14	342		5.34
271	14	343		6.71
272	19	009		3.43
273	22	355		3.93
274	14			5.32
	17			



TYPHOON FREQUENCY 1 AUG - 31 AUG



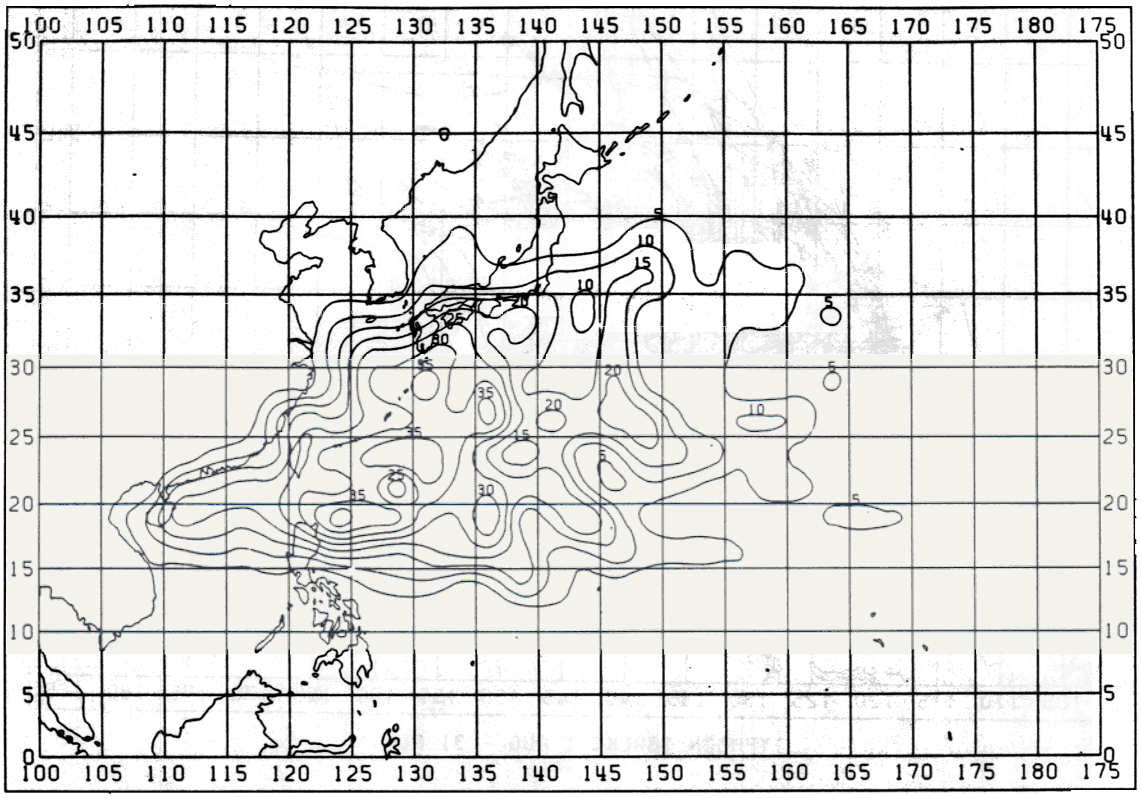
TYPHOON MOTION 1 AUG - 31 AUG



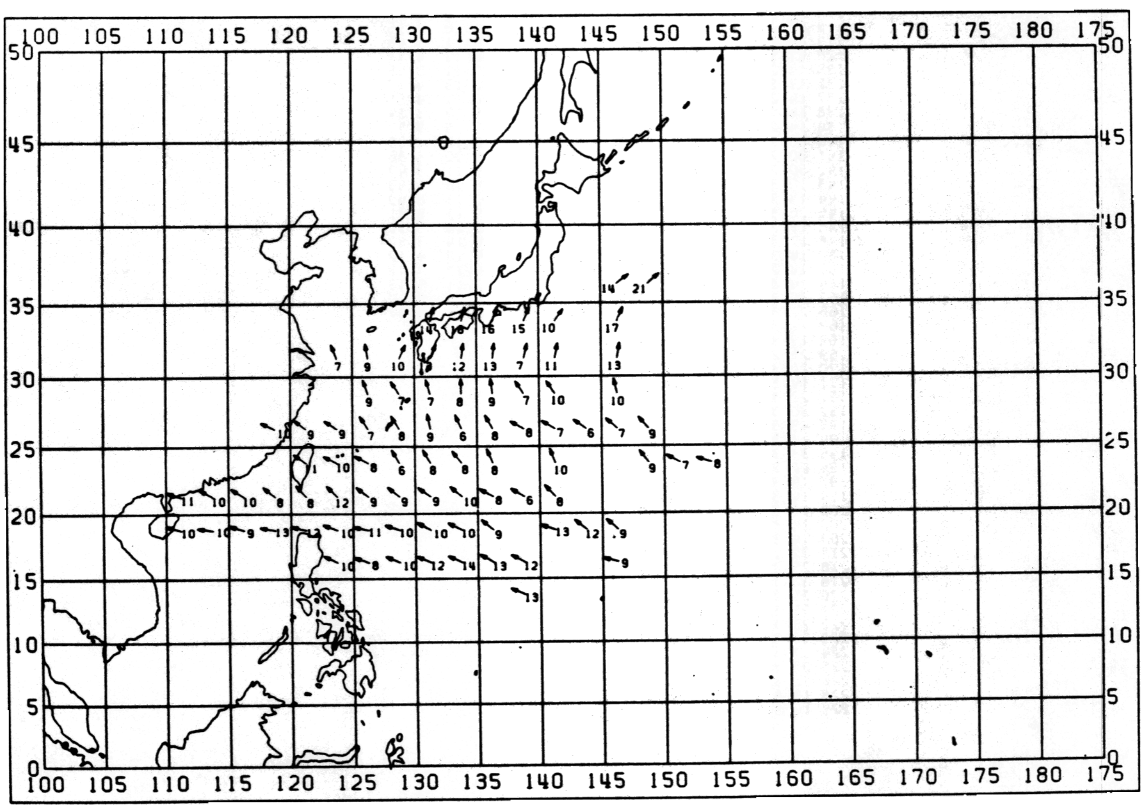
TYPHOON TRACKS 1 AUG - 31 AUG

A	B	C	D	E	F
114	14	295	8	9	5.12
115	14	279	8	8	3.71
117	22	290	13	13	2.93
118	22	298	11	12	3.98
119	14	315	10	12	3.19
120	17	301	11	12	2.95
135	14	287	9	9	3.74
136	17	282	8	9	3.77
137	14	293	8	10	3.55
138	14	279	10	12	4.61
139	14	284	12	13	1.41
140	30	287	10	11	3.26
141	30	279	11	12	4.01
142	30	284	11	13	3.63
143	19	301	9	11	3.84
144	19	292	9	11	3.64
145	28	313	10	11	4.02
146	19	291	12	13	5.61
148	17	304	13	14	4.56
162	14	310	11	12	3.10
163	14	293	13	14	4.39
164	14	300	10	13	4.73
165	30	316	9	12	4.32
166	22	309	12	12	4.40
167	19	321	9	11	3.31
168	19	317	9	9	4.04
169	25	296	9	10	3.86
170	22	304	10	11	4.42
171	14	336	10	13	8.52
191	22	304	11	12	4.21
192	30	304	9	11	3.62
193	49	310	8	11	4.60
194	44	329	7	10	4.06
195	33	328	7	9	4.06
196	22	331	8	9	3.78
197	19	342	11	12	6.68
199	14	347	10	11	4.31
200	19	330	10	11	4.80
202	14	350	6	12	3.78
203	14	314	8	11	2.79
217	22	295	11	12	2.80
218	25	311	10	11	3.73
219	30	325	8	10	4.50
220	25	329	6	9	4.05
221	25	336	6	11	3.06
222	28	336	8	11	5.91
223	30	333	9	11	5.61
224	17	309	11	12	6.46
225	28	323	9	11	5.17
226	22	317	6	8	3.73
228	19	315	10	11	4.55
229	14	315	9	10	5.52

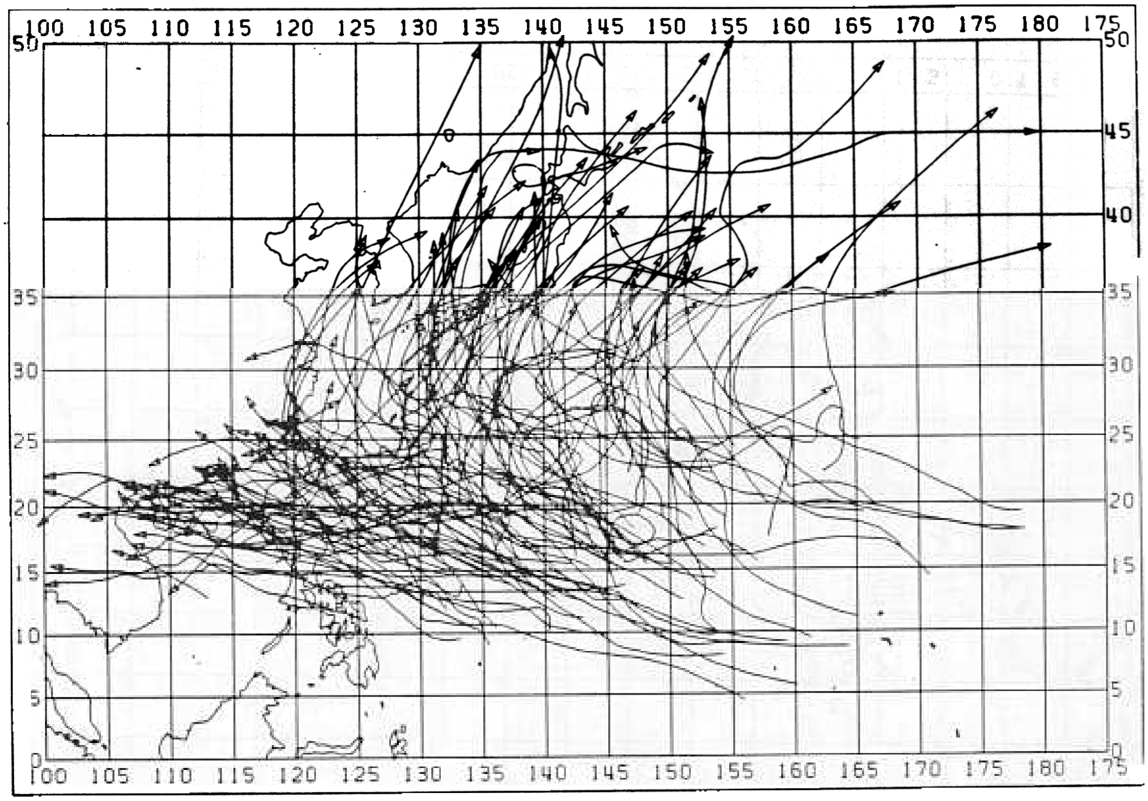
A	B	C	D	E	F
244	19	337	8	9	5.14
245	30	343	8	10	4.28
246	30	324	6	9	3.20
247	28	329	6	8	2.95
248	22	357	9	11	5.48
249	28	337	10	13	4.47
250	19	325	9	11	5.45
251	17	326	12	13	4.37
253	22	323	10	11	4.51
270	14	349	9	9	3.34
271	22	360	7	9	3.57
272	25	017	9	10	4.09
273	28	014	9	10	3.86
274	28	350	9	11	3.47
275	17	355	13	16	6.93
276	14	345	12	13	8.49
277	19	336	9	12	5.31
299	19	023	12	14	5.36
300	17	359	14	14	3.82
301	17	013	15	17	8.22
302	19	015	16	17	7.73
303	22	023	10	11	5.58
329	14	032	15	16	8.60
330	14	055	12	13	3.97



TYPHOON FREQUENCY 16 AUG - 15 SEP



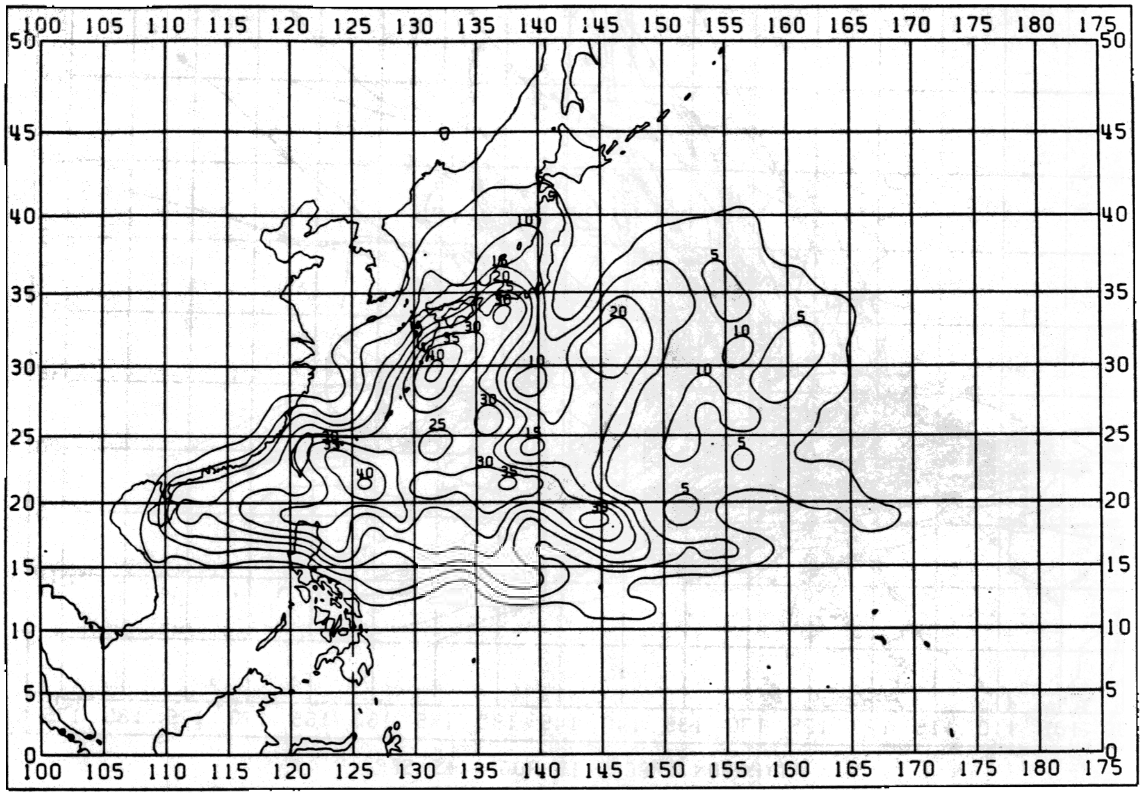
TYPHOON MOTION 16 AUG - 15 SEP



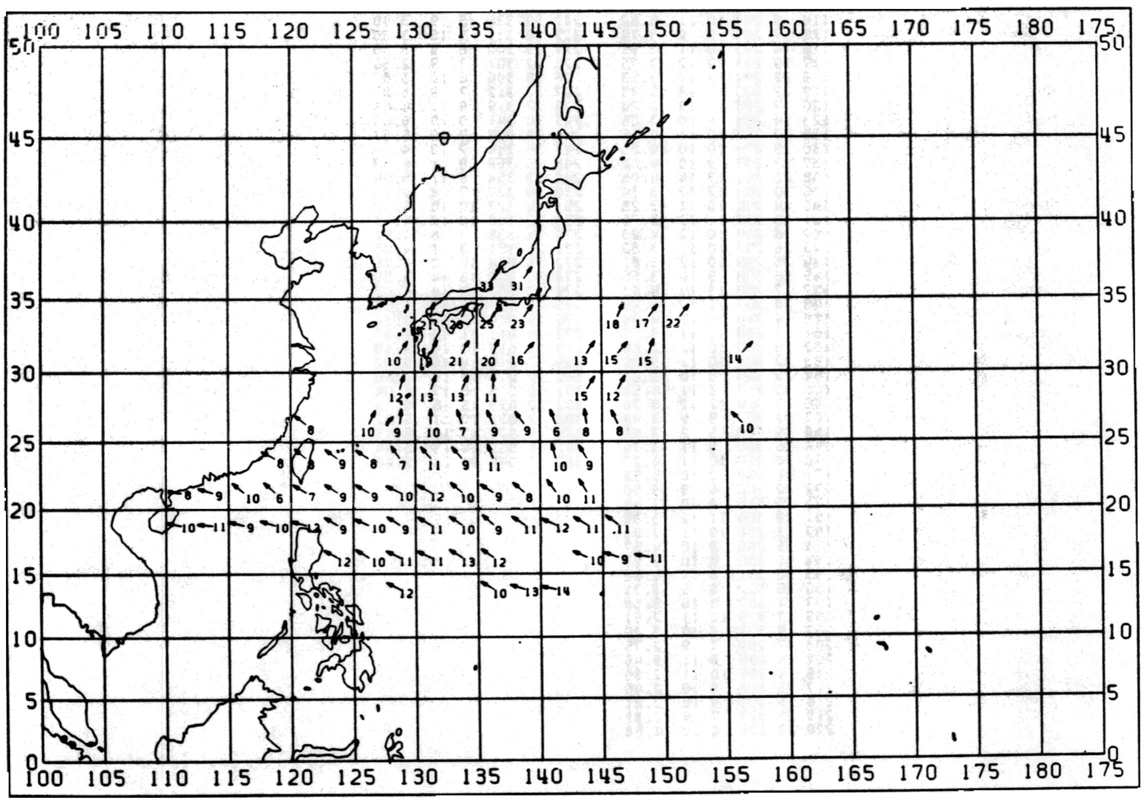
TYPHOON TRACKS 16 AUG - 15 SEP

A	B	C			
94	17	293			
114	19	295			
115	17	289	8	9	3.74
116	14	293	10	11	3.95
117	19	293	12	12	3.75
118	22	294	14	14	3.53
119	22	300	13	13	3.38
120	17	298	12	13	2.24
123	14	284	9	10	3.06
135	22	286	10	11	4.76
136	19	279	10	10	4.85
137	17	287	9	10	4.62
138	22	281	13	14	4.06
139	30	284	12	12	3.34
140	44	290	10	11	3.28
141	38	283	11	12	3.79
142	38	288	10	12	4.23
143	25	297	10	11	3.82
144	25	295	10	12	3.81
145	36	308	9	10	3.50
147	17	288	13	14	4.83
148	28	307	12	12	4.49
149	14	310	9	11	4.24
161	17	289	11	11	3.77
162	19	300	10	11	2.84
163	22	302	10	11	3.06
164	22	309	8	10	3.61
165	30	317	8	11	4.59
166	25	314	12	12	3.26
167	33	307	9	9	3.48
168	19	308	9	9	3.48
169	36	305	9	11	3.74
170	28	310	10	11	4.22
171	28	299	8	10	5.52
172	22	300	6	9	3.00
173	25	315	8	10	2.48
191	28	306	11	12	3.38
192	33	298	10	11	3.61
193	36	299	8	10	4.57
194	41	330	6	10	3.93
195	38	331	8	11	4.60
196	30	322	8	9	3.31
197	17	337	8	10	5.58
199	17	339	10	11	2.51
202	19	323	9	10	3.20
203	17	299	7	9	2.75
204	14	288	8	11	5.46
216	14	296	10	11	2.36
217	25	308	9	10	2.46
218	19	304	9	10	2.21
219	25	327	7	9	2.31
220	28	329	8	10	4.68

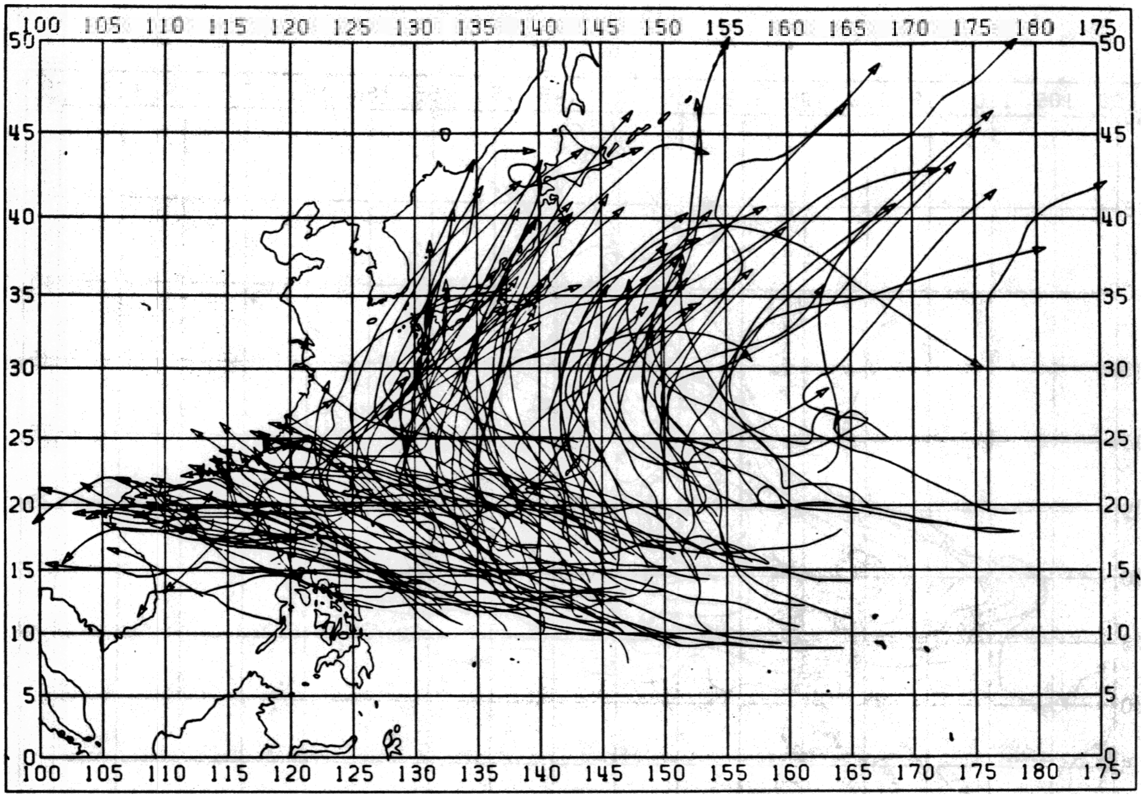
A	B	C	D	E	F
221	30	349	9	12	5.35
222	30	336	6	9	3.48
223	38	331	8	10	3.06
224	19	300	8	9	3.35
225	22	301	7	9	2.36
226	19	306	6	10	3.87
227	22	312	7	9	3.85
228	22	319	9	11	4.61
245	30	341	9	10	6.03
246	33	328	7	10	6.37
247	38	344	7	10	4.98
248	25	359	8	11	6.57
249	33	354	9	11	5.04
250	14	327	7	8	2.63
251	14	327	10	10	3.19
253	22	348	10	12	4.73
270	14	339	7	8	2.84
271	25	351	9	11	4.65
272	25	024	10	10	4.15
273	30	022	13	14	6.59
274	30	008	12	14	6.62
275	19	007	13	15	5.55
276	19	014	7	10	3.54
277	14	011	11	13	5.87
279	19	010	13	14	4.49
299	17	015	14	15	5.82
300	22	015	18	18	6.66
301	19	018	16	17	6.04
302	22	023	15	16	6.73
303	17	033	10	11	5.82
305	19	023	17	18	6.16
331	14	052	14	18	6.24
332	17	048	21	24	9.48

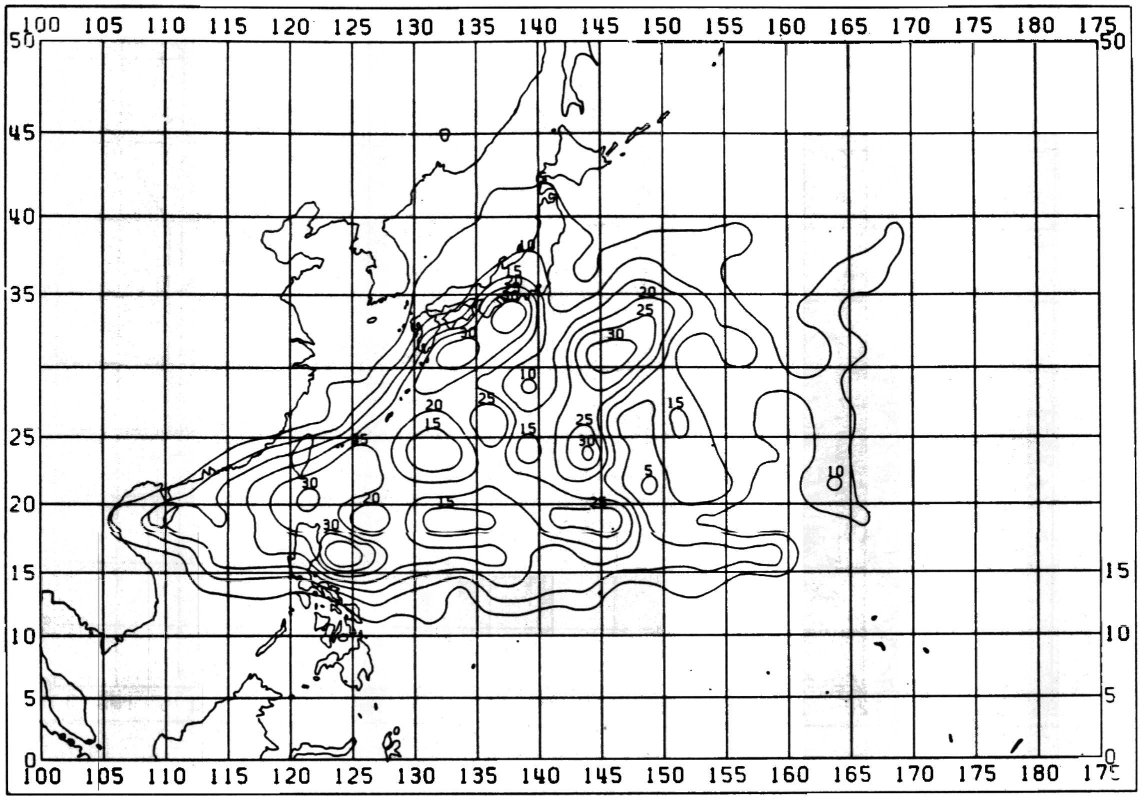


TYPHOON FREQUENCY 1 SEP - 30 SEP

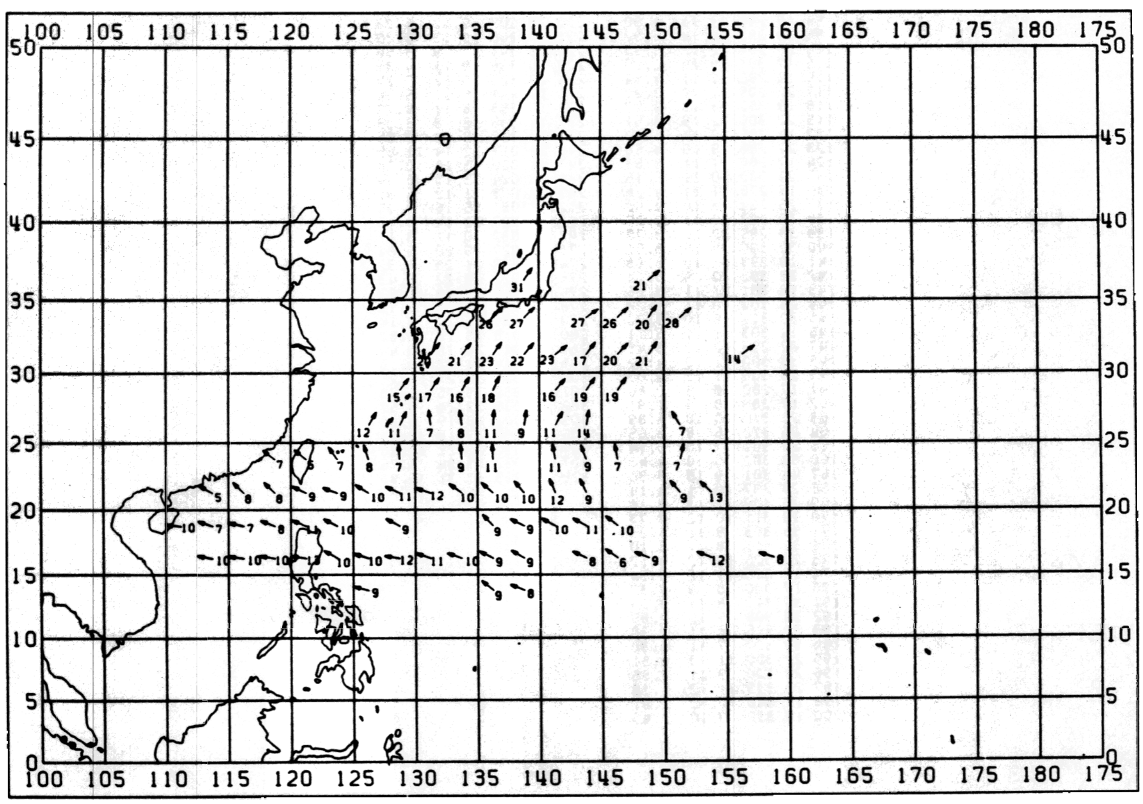


TYPHOON MOTION 1 SEP - 30 SEP

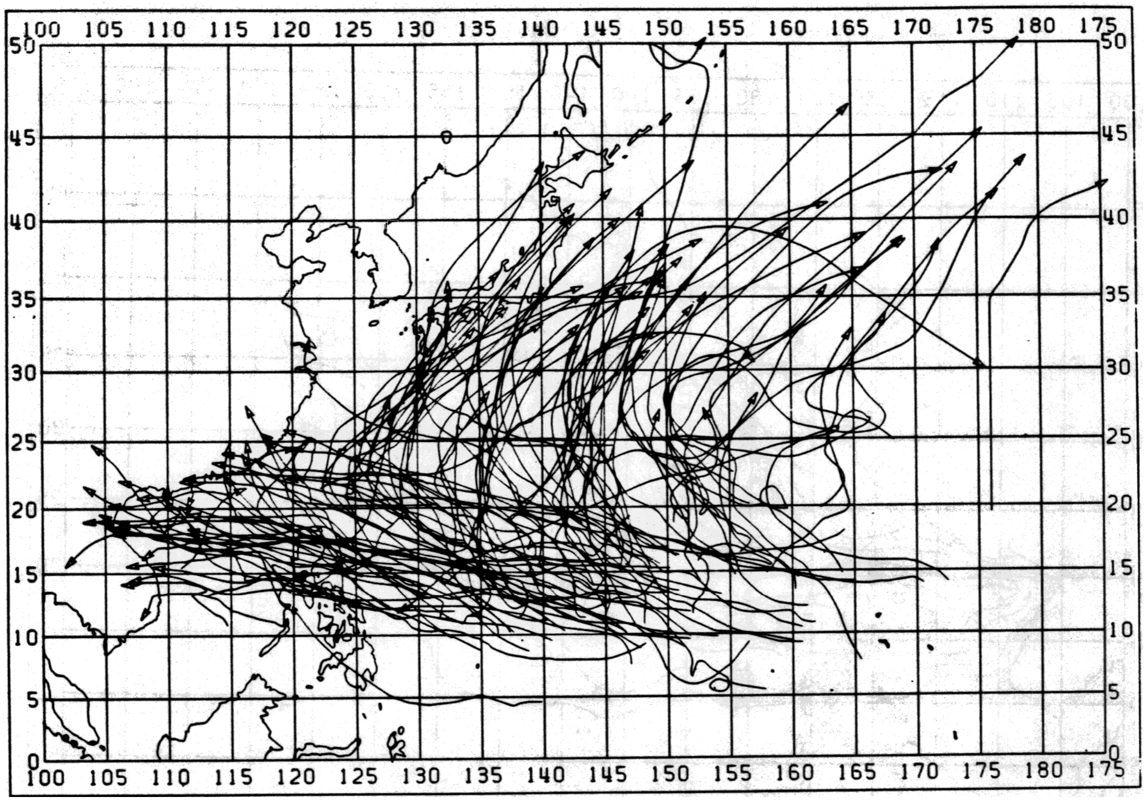

100 105 110 115 120 125 130 135 140 145 150 155 160 165 170 175 180 175
50 45 40 35 30 25 20 15 10 5 0



TYPHOON FREQUENCY 16 SEP - 15 OCT



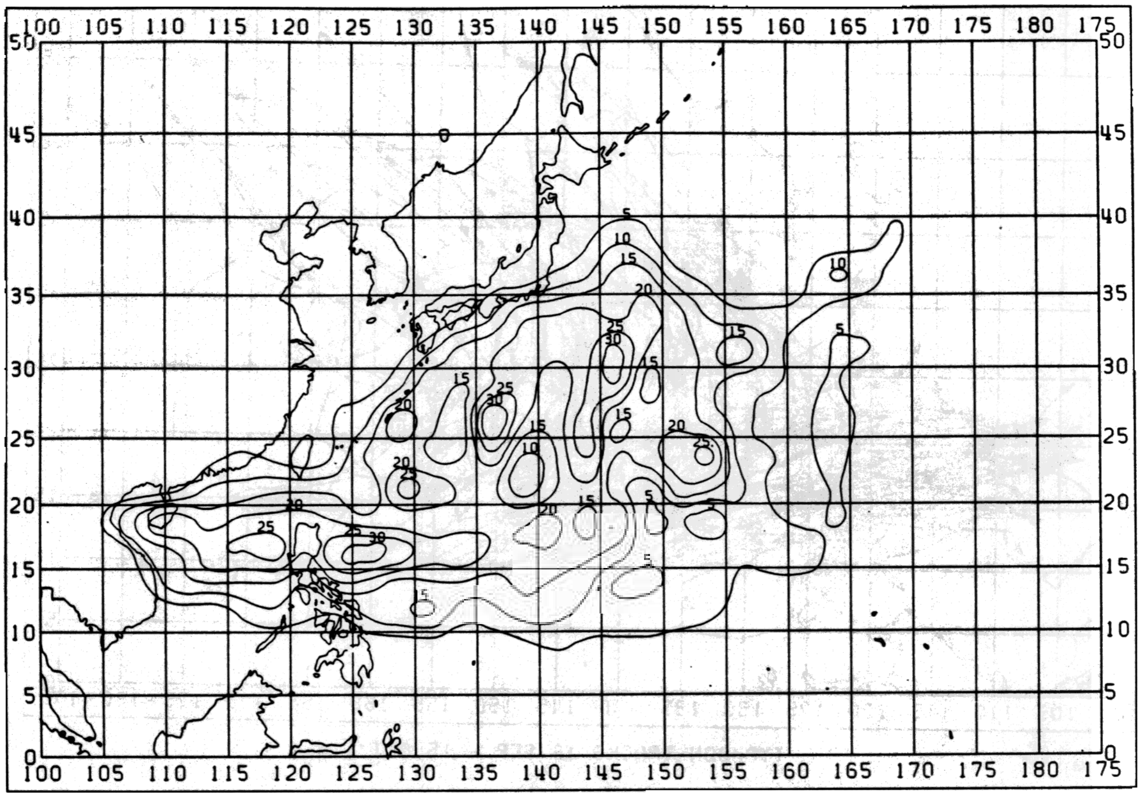
TYPHOON MOTION 16 SEP - 15 OCT



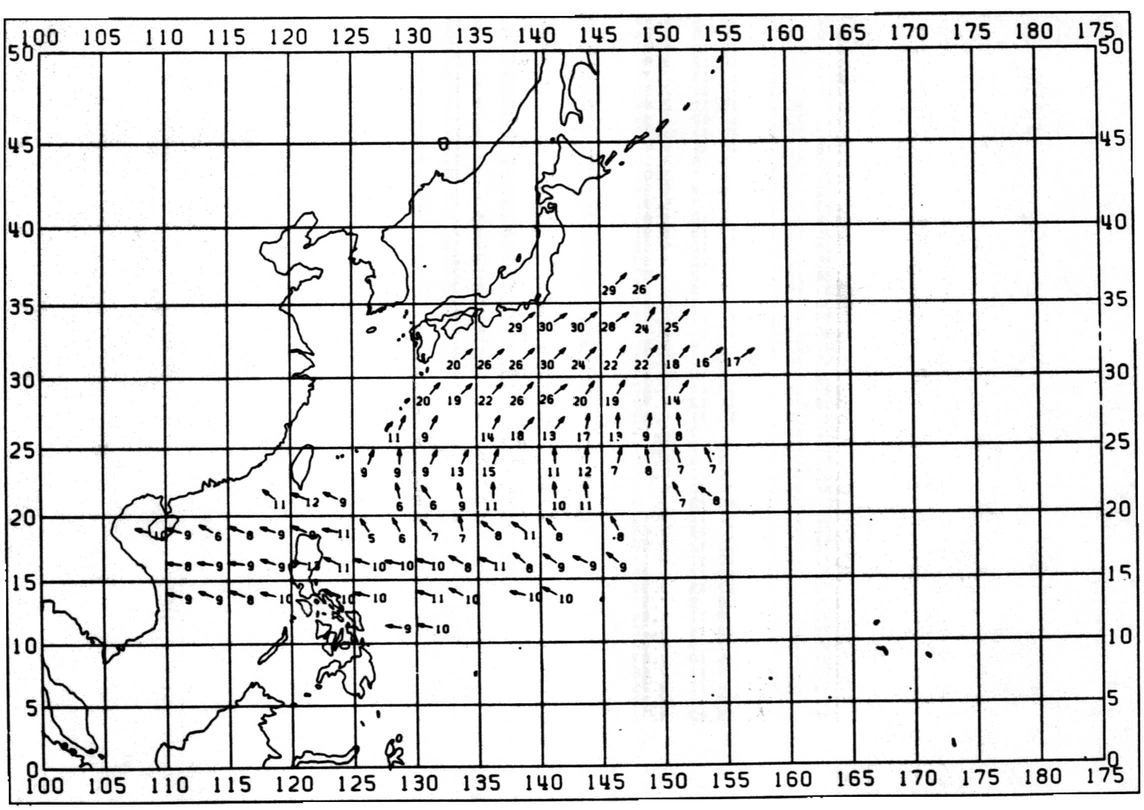
TYPHOON TRACKS 16 SEP - 15 OCT

A	B	C	D	E	F
89	17	285	9	9	3.84
93	14	310	9	10	4.50
94	14	293	8	8	3.99
110	17	281	10	10	2.94
111	19	279	10	10	3.47
112	19	281	10	12	3.80
113	19	280	13	13	2.35
114	44	300	10	11	2.93
115	36	288	10	11	2.94
116	22	280	12	12	3.39
117	22	289	11	11	3.38
118	22	290	10	11	3.40
119	22	297	9	10	3.06
120	17	301	9	10	3.01
122	17	296	8	8	5.98
123	17	306	6	7	5.31
124	14	292	9	10	3.85
126	14	291	12	13	3.91
128	14	287	8	10	5.66
135	22	278	10	10	3.30
136	14	289	7	9	3.65
137	17	284	7	8	4.02
138	25	291	8	9	3.83
139	28	293	11	11	2.77
140	25	297	10	11	2.72
142	22	298	9	9	3.00
145	14	316	9	10	3.23
146	17	296	9	10	3.87
147	28	298	10	11	3.60
148	28	299	11	12	4.78
149	30	308	10	11	4.13
162	14	300	5	7	2.55
163	19	315	8	9	5.11
164	25	314	8	9	4.79
165	30	296	9	12	4.86
166	28	291	9	10	4.92
167	28	302	10	12	3.73
168	22	295	11	12	3.19
169	22	289	12	13	3.66
170	22	306	10	12	2.80
171	19	311	10	11	3.11
172	25	320	10	12	3.36
173	13	338	12	13	3.92
174	17	335	9	9	2.99
177	14	320	9	11	4.84
178	14	314	13	14	5.20
190	14	309	7	9	1.82
191	17	310	5	10	2.87
192	25	325	7	11	2.66
193	28	342	8	11	3.75
194	17	356	7	11	3.36
196	14	355	9	12	3.71

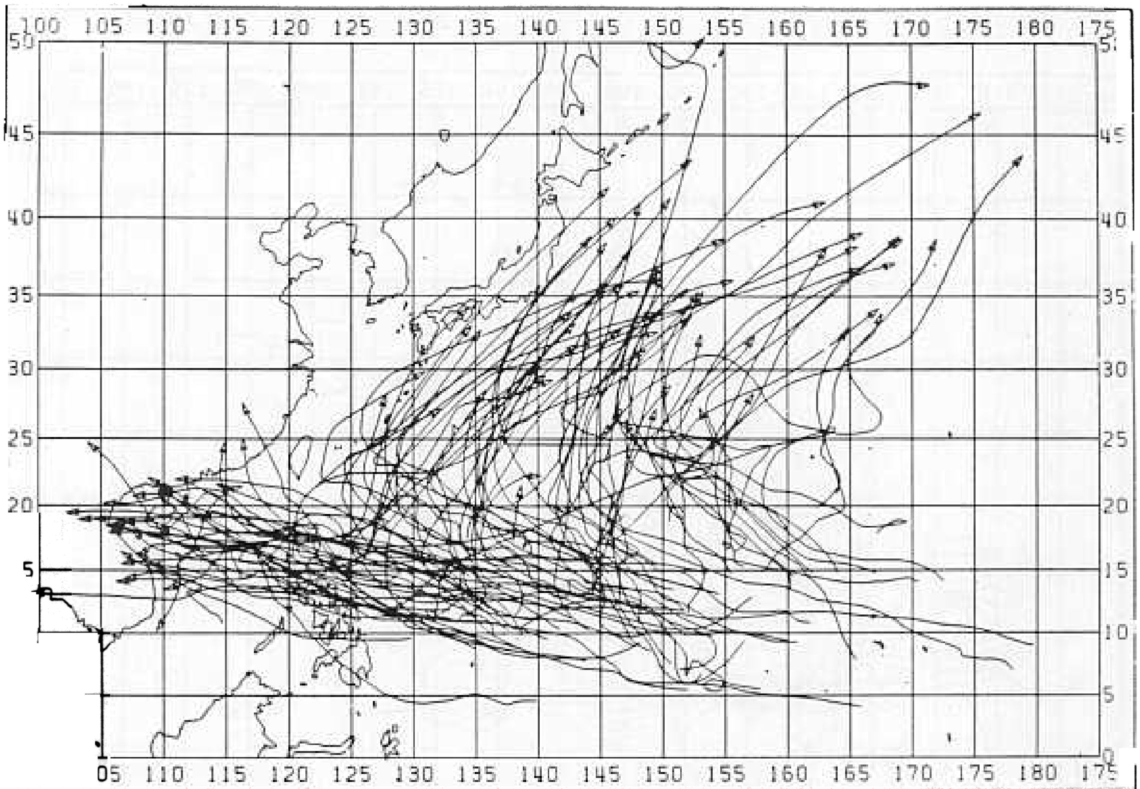
A	B	C	D	E	F
197	25	358	11	14	4.53
199	19	350	11	14	4.61
200	33	339	9	11	4.38
201	14	350	7	8	4.28
203	14	013	7	10	3.04
219	19	030	12	14	6.65
220	22	025	11	13	7.74
221	17	354	7	11	2.92
222	22	353	8	11	4.15
223	33	005	11	14	5.40
224	17	009	9	14	9.18
225	19	027	11	14	7.21
226	25	010	14	15	6.36
229	17	330	7	10	4.07
246	19	036	15	16	11.79
247	28	034	17	19	11.66
248	22	029	16	18	8.29
249	17	025	18	20	5.33
251	14	040	16	18	4.87
252	25	034	19	21	9.22
253	25	034	19	21	8.33
273	25	037	20	20	11.19
274	36	037	21	22	6.75
275	28	035	23	25	6.76
276	19	039	22	24	8.34
277	14	051	23	24	9.18
278	30	036	17	18	7.86
279	33	043	20	21	9.17
280	28	033	21	22	10.19
283	14	053	14	16	6.23
301	30	041	26	26	6.25
302	33	044	27	28	7.46
304	14	053	27	28	8.89
305	19	045	26	28	13.47
306	25	032	20	21	8.98
307	19	048	28	29	12.33
328	14	033	31	31	6.91
332	14	049	21	23	11.11



TYPHOON FREQUENCY 1 OCT - 31 OCT



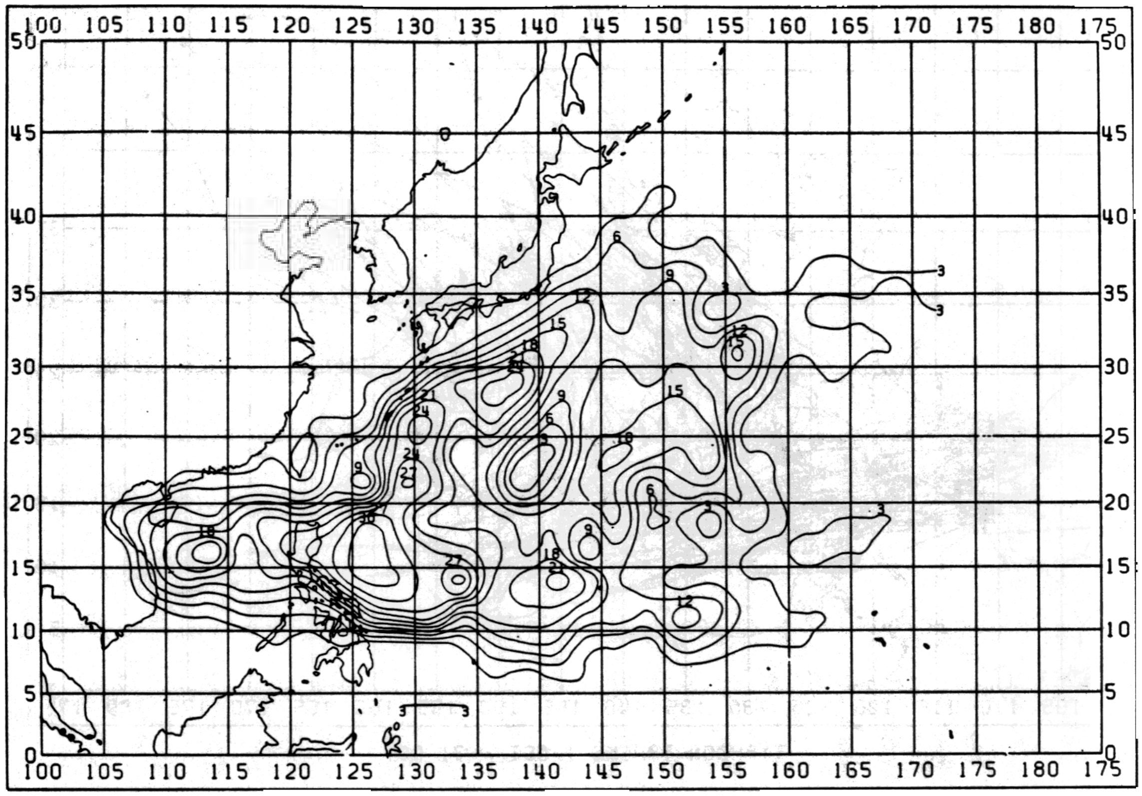
TYPHOON MOTION OCT - 31 OCT



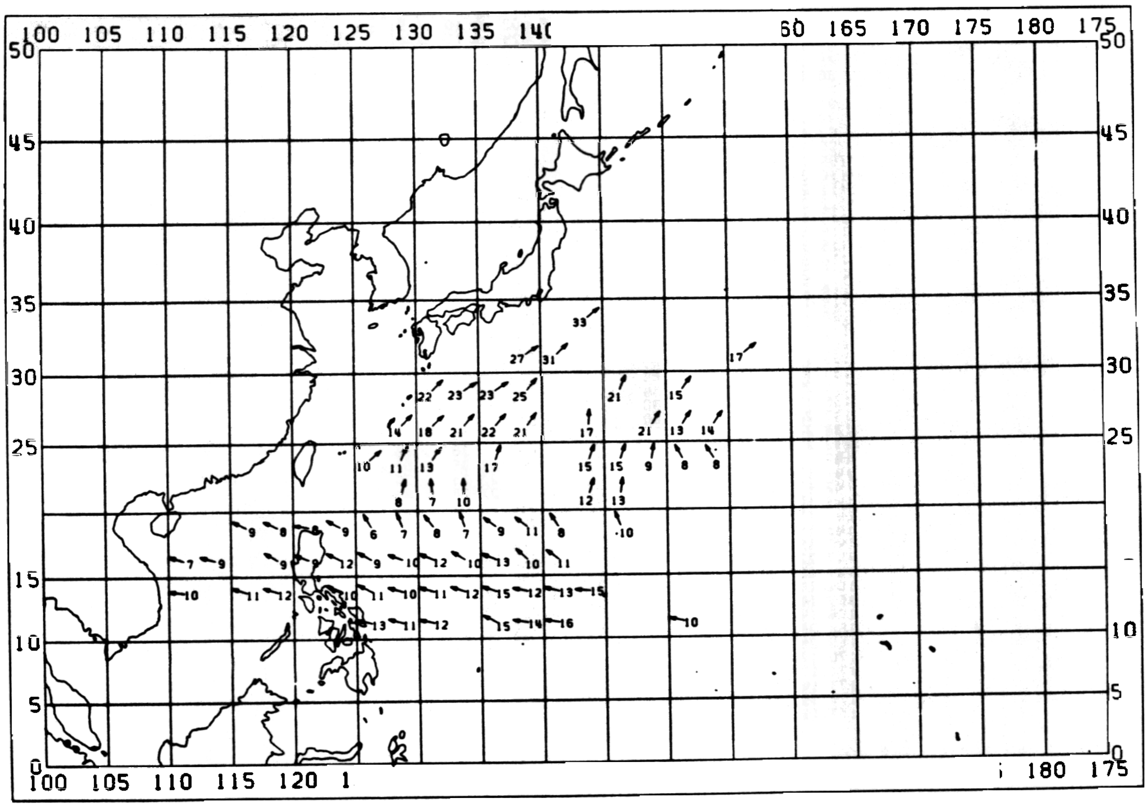
TYPHOON TRACKS 1 OCT - 31 OCT

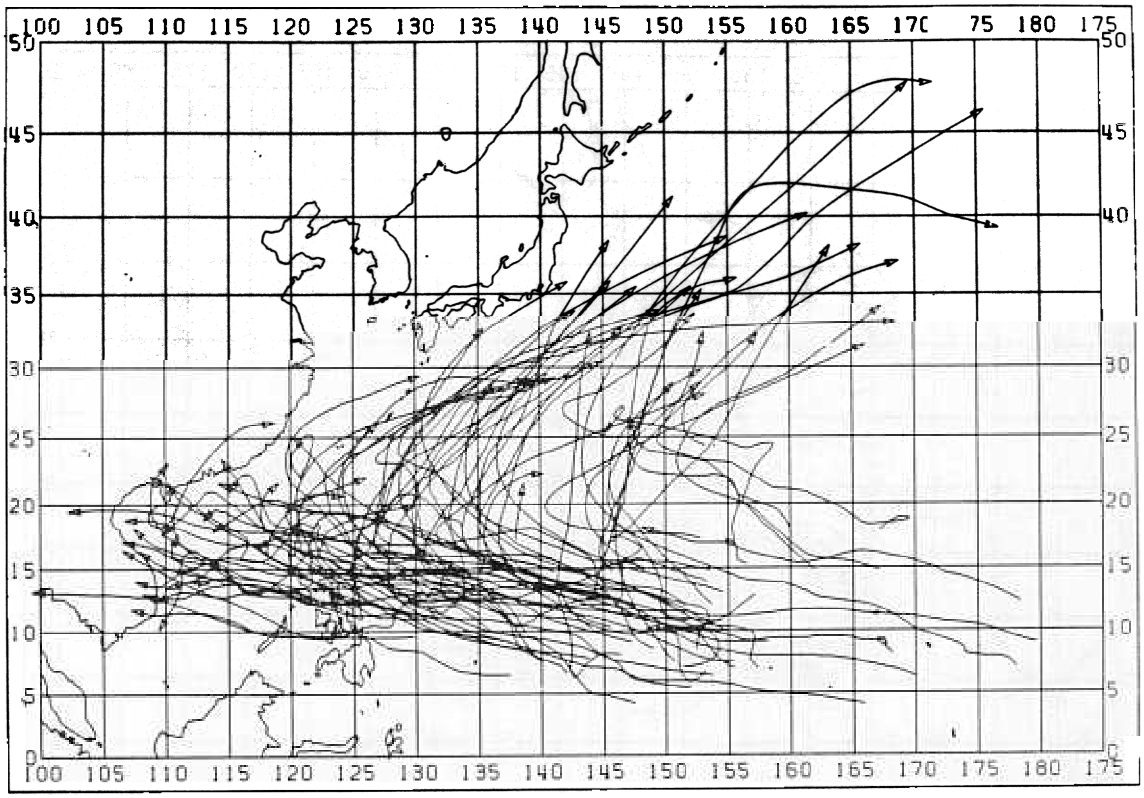
A	B	C	D	E	F
64	14	280	9	10	3.85
65	17	282	10	10	5.51
83	14	285	9	10	3.68
84	14	291	9	10	5.23
85	14	292	8	9	3.82
86	14	285	10	11	4.08
88	19	291	10	10	2.58
89	17	283	10	10	5.09
91	14	289	11	12	6.02
92	14	299	10	11	6.97
94	17	284	10	10	4.33
95	14	300	10	11	4.23
109	14	279	8	8	2.45
110	25	279	9	10	3.04
111	25	278	9	9	3.98
112	28	288	9	10	3.47
113	19	281	13	13	2.53
114	30	296	11	11	2.42
115	33	289	10	11	3.63
116	30	282	10	11	3.54
117	22	287	10	11	3.89
118	25	300	8	10	4.27
119	19	291	11	11	5.73
120	19	311	8	10	2.38
121	19	305	9	11	5.22
122	17	295	9	10	6.78
123	14	310	9	12	6.85
134	22	286	10	10	1.84
135	25	286	9	10	2.64
136	17	299	6	7	3.80
137	22	291	8	9	2.80
138	22	288	9	9	2.90
139	22	291	9	10	2.29
140	19	282	11	12	1.66
141	17	328	5	9	2.84
142	17	332	6	9	3.28
143	17	319	7	8	2.14
144	17	350	7	9	3.07
145	19	308	8	9	3.12
146	19	304	11	12	4.43
147	22	323	8	10	4.34
149	22	332	8	11	4.63
164	14	308	11	12	4.51
165	14	292	12	12	5.35
166	14	295	9	11	4.57
168	28	348	6	10	3.54
169	25	326	6	10	3.14
170	19	348	9	11	4.18
171	17	000	11	12	4.92
173	14	355	10	10	3.68
174	19	356	11	12	4.70
177	19	333	7	10	3.86

A	B	C	D	E	F
178	17	306	8	10	3.16
193	17	020	9	11	5.17
194	17	002	9	10	3.91
195	14	024	9	11	5.26
196	14	025	13	15	4.49
197	25	020	15	16	5.90
199	14	358	11	13	5.25
200	28	003	12	14	5.76
201	14	013	7	8	8.14
202	19	350	8	11	5.62
203	22	344	7	12	2.01
204	28	338	7	12	2.97
220	25	023	11	13	6.09
221	17	026	9	14	7.93
223	38	027	14	17	7.00
224	19	040	18	19	8.32
225	17	036	13	14	9.08
226	28	010	17	18	6.84
227	14	004	13	14	5.32
228	17	008	9	12	6.13
229	19	354	8	11	2.82
247	19	040	20	20	7.63
248	14	045	19	20	8.57
249	19	041	22	23	6.38
250	25	038	26	27	5.73
251	14	051	26	26	8.00
252	25	032	20	22	9.26
253	30	029	19	20	8.12
255	19	035	14	15	3.21
274	17	047	20	22	7.24
275	19	049	26	27	7.66
276	22	046	26	26	6.92
277	22	045	30	30	2.86
278	22	042	24	25	9.02
279	33	034	22	23	7.75
280	19	036	22	23	9.85
281	17	040	18	19	3.85
282	14	051	16	17	3.07
283	19	055	17	19	6.45
302	19	050	29	30	7.62
303	19	056	30	31	9.03
304	22	050	30	31	11.73
305	17	052	28	30	13.54
306	22	029	24	25	10.54
307	17	042	25	25	10.38
331	17	042	29	30	17.96
332	17	051	26	28	14.32



TYPHOON FREQUENCY 16 OCT - 15 NOV

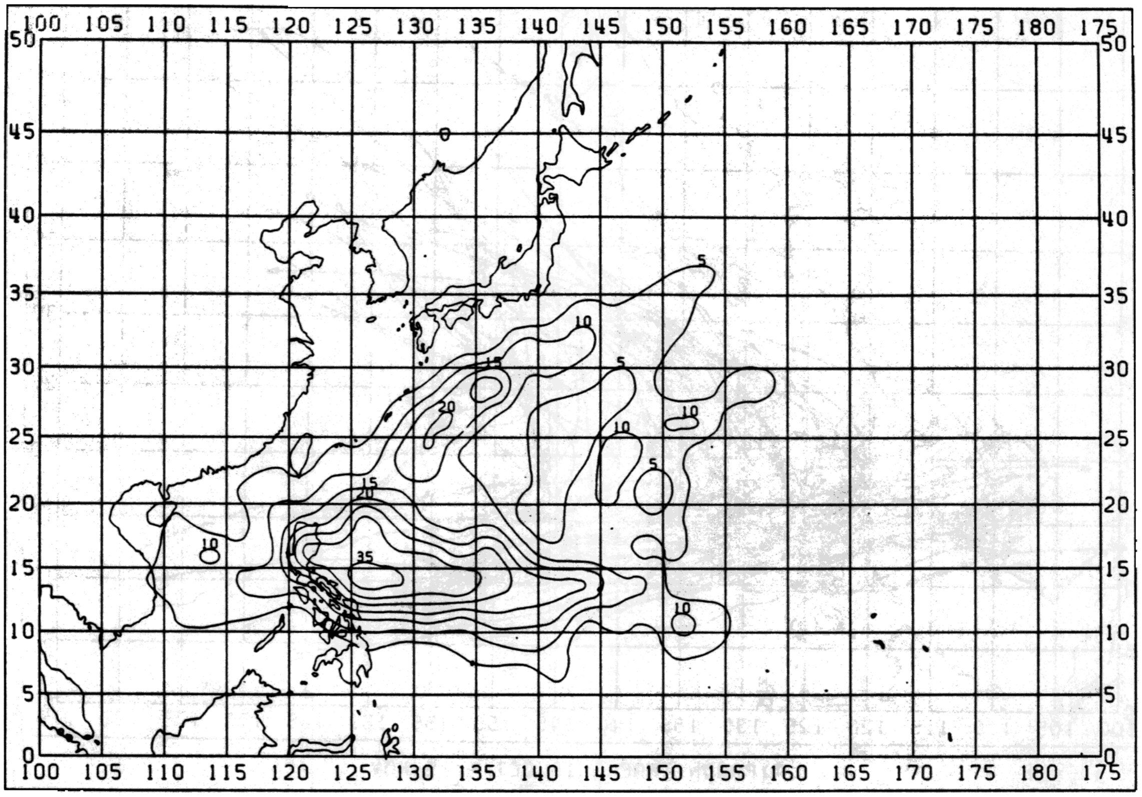




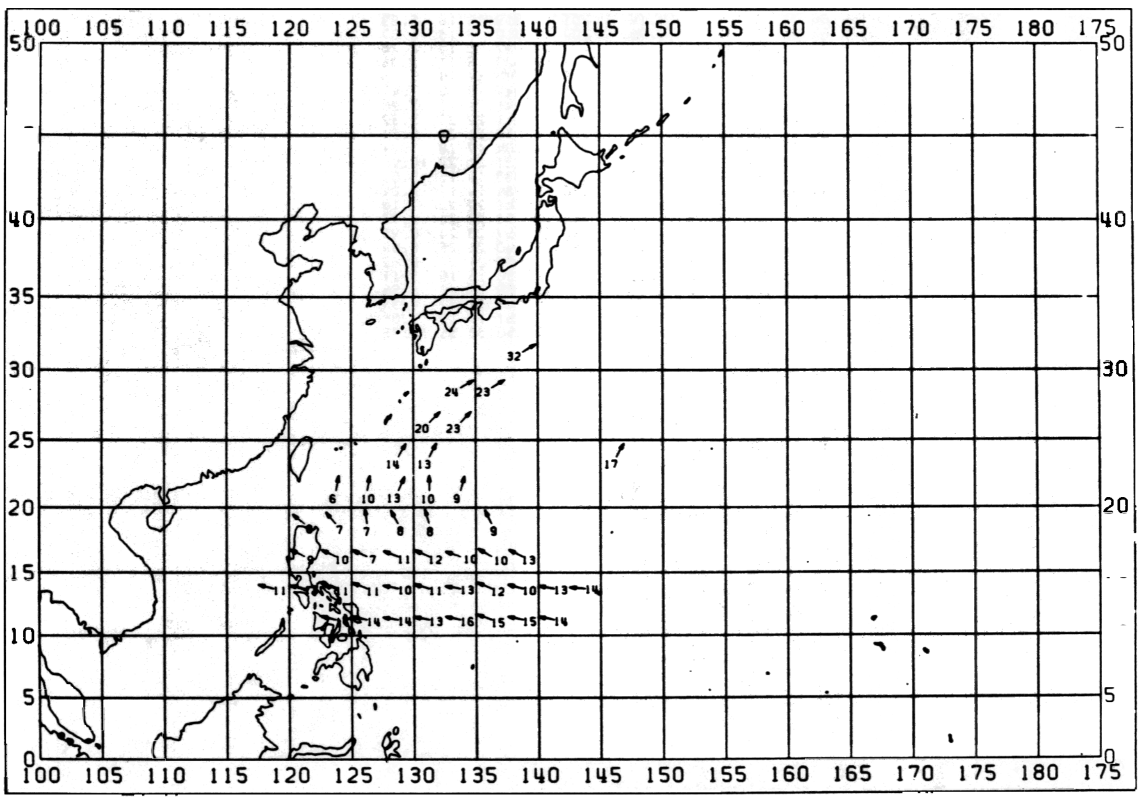
TYPHOON TRACKS 16 OCT - 15 NOV

A	B	C	D	E	F
63	19	284	13	13	2.91
64	22	286	11	12	4.14
65	25	283	12	12	4.95
67	17	298	15	16	3.46
68	17	280	14	14	4.91
69	17	280	16	17	4.04
73	14	284	10	10	2.99
83	14	278	10	11	2.57
85	14	288	11	11	2.49
86	14	287	12	12	3.60
88	25	294	10	10	2.21
89	30	298	11	11	3.92
90	30	286	10	11	4.99
91	25	286	11	11	5.42
92	33	288	12	13	5.97
93	17	288	15	16	5.05
94	19	283	12	12	4.17
95	22	284	13	15	3.01
96	19	276	15	16	2.62
109	19	288	7	8	3.30
110	25	285	9	9	3.57
112	19	299	9	9	2.58
113	25	290	9	10	3.18
114	28	295	12	12	2.16
115	33	298	9	11	4.03
116	28	289	10	11	5.17
117	25	292	12	13	5.82
118	22	301	10	11	5.12
119	19	291	13	14	5.57
120	14	311	10	12	4.32
121	17	305	11	13	4.95
137	17	296	9	10	2.16
138	19	295	8	9	1.82
139	17	281	8	10	3.83
140	22	299	9	11	3.59
141	30	330	6	9	2.29
142	25	338	7	9	3.43
143	17	322	8	10	3.15
144	17	341	7	9	3.04
145	17	307	9	10	4.84
146	14	308	11	13	4.89
147	14	327	8	10	5.57
149	17	338	10	13	4.36
168	28	015	8	10	3.68
169	25	354	7	10	4.60
170	17	359	10	11	3.99
174	17	017	12	14	3.90
175	14	009	13	13	5.26
193	14	047	10	11	5.21
194	22	023	11	12	4.34
195	22	033	13	16	7.99
197	14	019	17	18	5.92

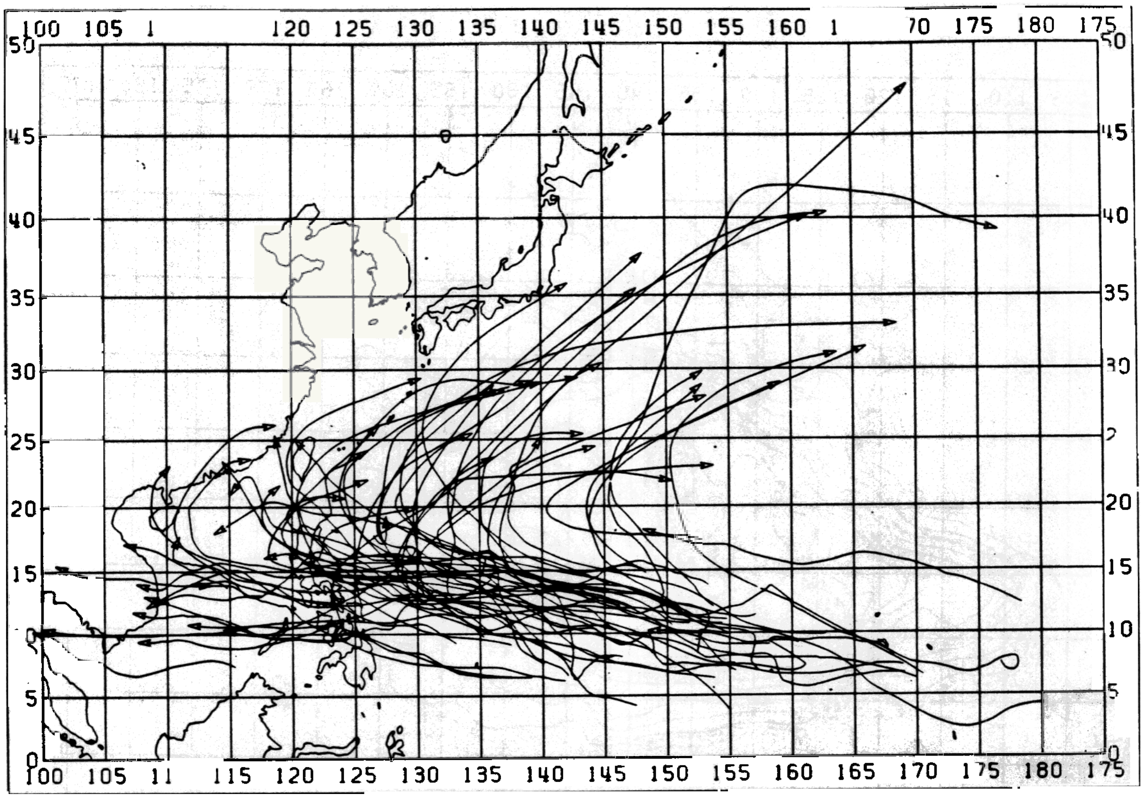
A	B	C	D	E	F
200	14	020	15	17	4.65
201	19	019	15	16	6.99
202	17	010	9	13	6.67
203	14	332	8	12	2.28
204	19	329	8	11	2.98
220	22	044	14	14	5.73
221	25	047	18	18	7.47
222	17	041	21	21	7.28
223	22	041	22	23	5.32
224	14	036	21	21	5.61
226	14	004	17	18	7.44
228	17	031	21	22	10.43
229	17	033	13	15	5.01
230	14	034	14	17	8.04
247	17	045	22	22	7.18
248	22	058	23	24	4.73
249	25	057	23	24	6.99
250	25	040	25	26	6.00
253	14	023	21	22	9.62
255	14	036	15	16	3.11
276	17	056	27	28	6.56
277	17	045	31	32	4.33
283	17	051	17	19	7.06
304	14	050	33	35	12.76



TYPHOON FREQUENCY 1 NOV - 30 NOV

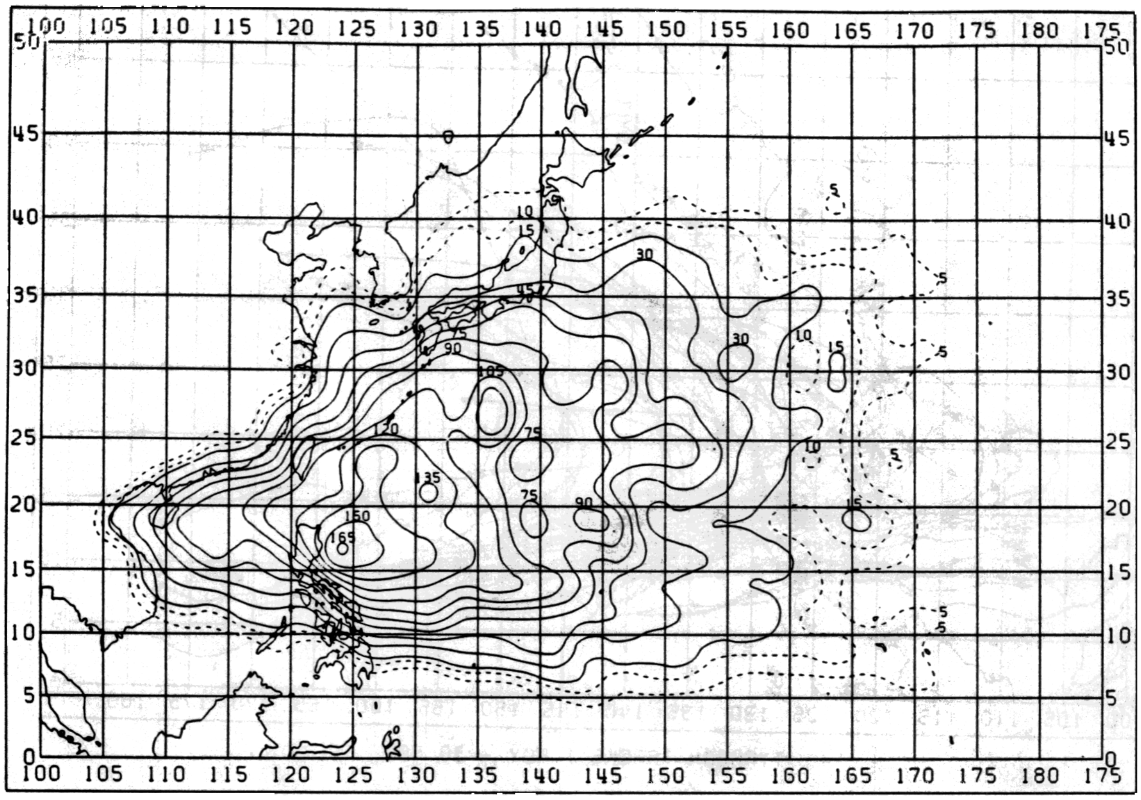


TYPHOON MOTION 1 NOV - 30 NOV

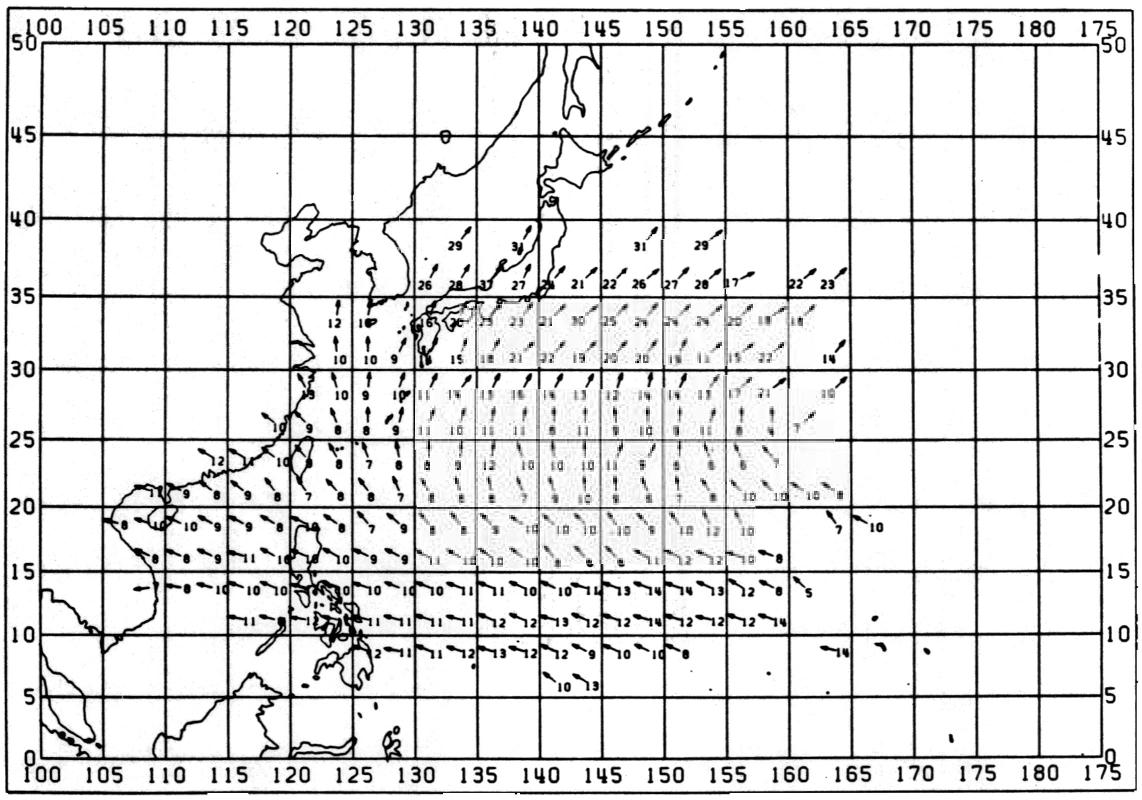


TYPHOON TRACKS 1 NOV - 30 NOV

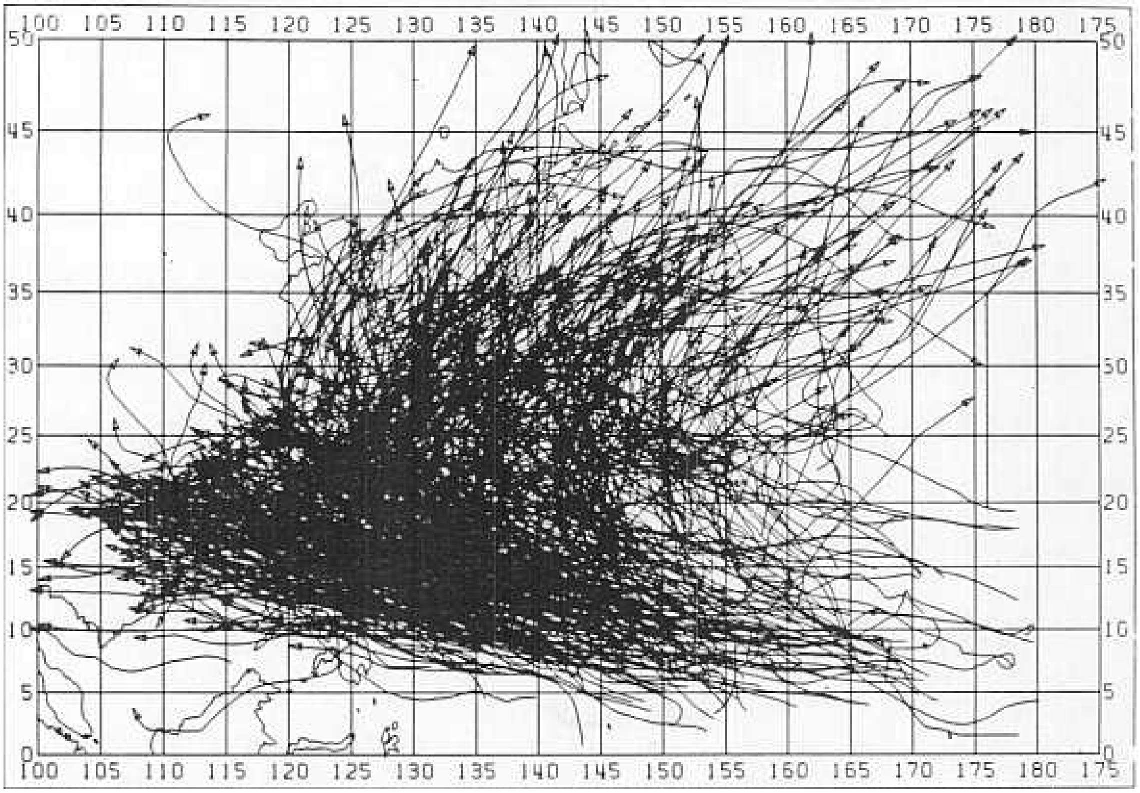
A	B	C	D	E	F
62	14	284	14	14	5.37
63	17	283	14	15	3.19
64	17	279	14	14	5.04
65	19	281	13	14	5.16
66	14	283	16	16	3.09
67	19	291	15	16	2.61
68	17	283	15	15	2.86
69	17	281	14	16	3.95
86	14	284	11	11	4.81
87	14	282	13	13	2.81
88	28	289	11	11	2.54
89	38	291	11	12	3.65
90	36	282	10	11	4.88
91	33	286	11	12	3.93
92	36	280	13	13	4.37
93	28	293	12	14	3.53
94	25	285	10	11	3.94
95	22	281	13	13	3.25
96	22	275	14	14	2.19
113	33	296	9	10	2.80
114	33	295	10	11	2.97
115	33	293	7	11	3.70
116	30	291	11	12	4.72
117	30	294	12	13	5.68
118	22	289	10	11	4.15
119	28	300	10	11	4.48
120	14	296	13	13	4.08
139	17	309	8	10	3.70
140	19	320	7	10	3.79
141	33	353	7	10	3.06
142	22	332	8	10	3.33
143	14	344	8	11	3.19
145	14	334	9	10	4.76
166	14	011	6	9	2.96
167	14	010	10	11	3.67
168	14	024	13	13	5.14
169	14	000	10	12	5.23
170	14	016	9	12	3.50
194	17	030	14	15	5.70
195	19	027	13	17	7.15
201	17	029	17	19	5.04
221	19	045	20	21	6.75
222	13	044	23	24	7.73
248	17	061	24	25	4.34
249	25	059	23	24	7.78
276	14	059	32	33	15.31



TYPHOON FREQUENCY 1 JAN - 31 DEC



TYPHOON MOTION JAN - 31 DEC



TYPHOON TRACKS 1 JAN - 31 DEC

A	B	C	D	E	F
17	14	309	10	11	5.72
18	14	301	13	14	4.43
37	25	290	12	12	4.27
38	22	281	11	12	4.41
39	25	292	11	12	3.68
40	33	287	12	12	3.22
41	36	286	13	13	4.42
42	46	286	12	12	3.81
43	52	293	12	13	3.68
44	14	296	9	10	2.49
45	25	294	10	11	3.42
46	19	296	10	11	3.19
47	22	294	8	9	4.80
52	14	283	14	14	5.43
59	17	283	11	11	5.95
60	22	285	8	9	5.32
61	19	280	12	12	3.44
62	49	283	11	12	4.32
63	73	285	11	12	3.49
64	79	285	11	11	3.67
65	87	288	11	12	4.28
66	60	285	11	12	4.01
67	57	292	12	13	4.13
68	57	293	12	14	3.79
69	55	286	13	14	5.56
70	49	294	12	13	4.58
71	46	290	12	13	5.11
72	36	286	14	15	4.58
73	30	288	12	12	6.93
74	22	284	12	13	6.01
75	25	289	12	12	4.74
76	17	289	14	15	6.07
82	19	263	7	8	2.86
83	30	279	8	9	2.88
84	36	285	10	10	4.02
85	46	291	10	10	4.31
86	55	294	10	11	5.06
87	52	283	11	11	3.90
88	98	291	10	11	3.35
89	128	290	10	11	3.92
90	122	292	10	11	4.05
91	119	292	10	12	4.59
92	103	290	11	13	5.03
93	117	293	11	12	4.78
94	106	295	10	12	4.41
95	98	296	10	11	4.49
96	68	287	11	12	4.27
97	36	292	13	14	5.52
98	30	292	14	15	6.21
99	28	290	14	14	5.42
100	25	295	13	14	6.86
101	14	303	12	14	6.37

A	B	C	D	E	F
102	14	297	8	9	4.20
103	14	314	5	10	3.93
108	28	295	8	9	2.77
109	52	292	8	9	3.22
110	82	294	9	10	3.74
111	63	286	11	12	5.59
112	76	298	10	12	5.07
113	111	293	10	11	3.49
114	171	298	10	11	3.41
115	152	294	9	10	3.28
116	149	297	9	11	3.66
117	138	297	11	12	4.20
118	128	300	10	11	3.98
119	109	305	10	12	4.10
120	87	306	10	11	3.53
121	79	319	8	12	4.29
122	57	317	8	11	5.54
123	68	315	8	11	5.24
124	44	299	11	12	3.68
125	36	297	12	13	5.74
126	30	295	12	13	4.20
127	25	289	10	12	4.53
128	19	289	8	11	5.12
133	25	284	8	9	2.77
134	44	287	10	10	2.57
135	82	294	10	11	3.69
136	90	298	9	10	4.55
137	87	296	9	10	3.75
138	114	299	8	11	3.83
139	125	295	10	11	2.93
140	146	304	8	11	3.04
141	149	319	7	10	3.67
142	133	309	9	11	3.93
143	125	320	8	11	3.97
144	111	321	8	11	3.82
145	111	315	9	11	4.04
146	68	303	10	12	4.46
147	79	311	10	12	4.02
148	98	316	10	12	4.36
149	87	324	10	12	4.47
150	25	317	9	14	4.67
151	22	324	10	11	4.60
152	14	331	12	12	2.14
153	14	335	10	11	3.77
156	14	325	7	12	6.68
160	17	288	11	12	3.47
161	44	297	9	11	4.03
162	71	307	8	10	3.13
163	79	309	9	10	4.19
164	95	324	8	11	4.28
165	111	327	7	11	4.32
166	117	317	8	11	4.16

A	B	C	D	E	F
167	138	324	8	11	3.47
168	119	337	7	11	4.32
169	141	330	8	12	3.98
170	117	341	8	11	4.26
171	95	347	8	13	5.80
172	79	340	7	12	5.48
173	87	342	9	12	4.37
174	79	356	10	13	4.66
175	49	355	9	11	5.50
176	33	338	6	10	5.95
177	46	350	7	11	4.90
178	36	325	8	12	4.54
179	25	317	10	11	3.83
180	14	317	10	12	7.89
181	14	306	10	13	5.26
182	14	304	8	10	4.69
188	17	300	12	15	6.04
189	22	300	11	12	4.66
190	41	307	10	12	3.71
191	98	319	9	12	3.33
192	119	330	8	11	3.47
193	146	340	7	11	4.89
194	136	350	8	11	4.90
195	117	001	8	12	6.14
196	95	005	9	13	5.22
197	98	010	12	15	5.87
198	57	342	10	13	4.09
199	76	354	10	13	4.76
200	92	359	10	13	5.46
201	71	022	11	15	8.06
202	65	029	9	14	8.10
203	65	004	6	12	6.22
204	55	337	6	12	4.53
205	25	334	6	15	6.73
206	19	321	7	11	4.15
216	22	307	10	11	3.11
217	55	317	9	12	3.39
218	63	338	8	11	4.65
219	101	000	8	12	5.16
220	109	013	9	12	6.36
221	109	020	11	14	6.79
222	106	018	10	14	7.64
223	138	012	11	15	6.99
224	90	012	11	16	8.16
225	79	000	8	13	5.94
226	82	002	11	13	6.31
227	52	354	9	12	6.61
228	57	001	10	14	8.41
229	60	006	9	14	7.89
230	36	018	11	1C	7.68
231	36	003	8	13	2.63
232	17	357	4	12	4.37

A	B	C	D	E	F
233	19	043	7	13	4.03
243	14	332	13	15	6.40
244	44	343	10	11	4.81
245	76	006	9	12	6.58
246	98	019	10	13	8.44
247	106	025	11	15	8.81
248	92	037	14	17	9.23
249	122	026	13	17	8.22
250	84	028	16	20	8.87
251	71	027	14	19	10.17
252	73	027	13	18	9.02
253	87	019	12	16	8.08
254	38	012	14	18	7.62
255	41	024	14	17	9.51
256	30	032	13	14	4.40
257	28	044	17	19	8.69
258	14	051	21	22	8.43
260	17	045	10	12	2.90
270	38	356	10	11	5.12
271	46	000	10	12	5.77
272	49	025	9	10	4.09
273	84	026	14	16	8.43
274	90	022	15	19	7.44
275	79	028	18	21	9.13
276	76	042	21	23	11.49
277	73	042	22	25	13.84
278	71	042	19	23	13.36
279	71	039	20	22	11.19
280	44	033	20	23	10.39
281	30	026	19	20	8.99
282	28	047	13	16	4.77
283	36	050	15	17	6.86
284	17	047	22	23	4.81
286	17	038	14	17	11.85
296	19	007	12	13	4.21
297	19	013	16	18	6.27
299	36	019	16	17	6.51
300	44	023	20	22	12.38
301	60	035	23	25	11.29
302	71	037	23	25	9.68
303	52	046	21	22	14.63
304	41	051	30	31	13.89
305	46	045	25	28	13.95
306	44	038	24	26	12.12
307	41	046	24	26	11.54
308	19	050	24	25	14.94
309	14	C45	20	20	7.61
310	19	056	18	18	5.87
311	17	047	18	20	6.05
325	17	027	26	27	4.09
326	14	030	28	28	9.57
327	19	035	37	38	11.87

A	B	C	D	E	F
328	22	025	27	29	8.91
329	28	039	24	25	11.66
330	22	046	21	21	14.95
331	33	045	22	25	14.15
332	41	050	26	29	13.55
333	28	042	27	29	13.85
334	14	049	28	31	11.19
335	14	063	17	19	15.40
337	14	051	22	23	9.23
338	14	046	23	24	4.20
352	14	036	29	30	5.09
354	17	028	31	33	5.16
358	17	035	31	32	13.09
360	14	050	29	32	16.05

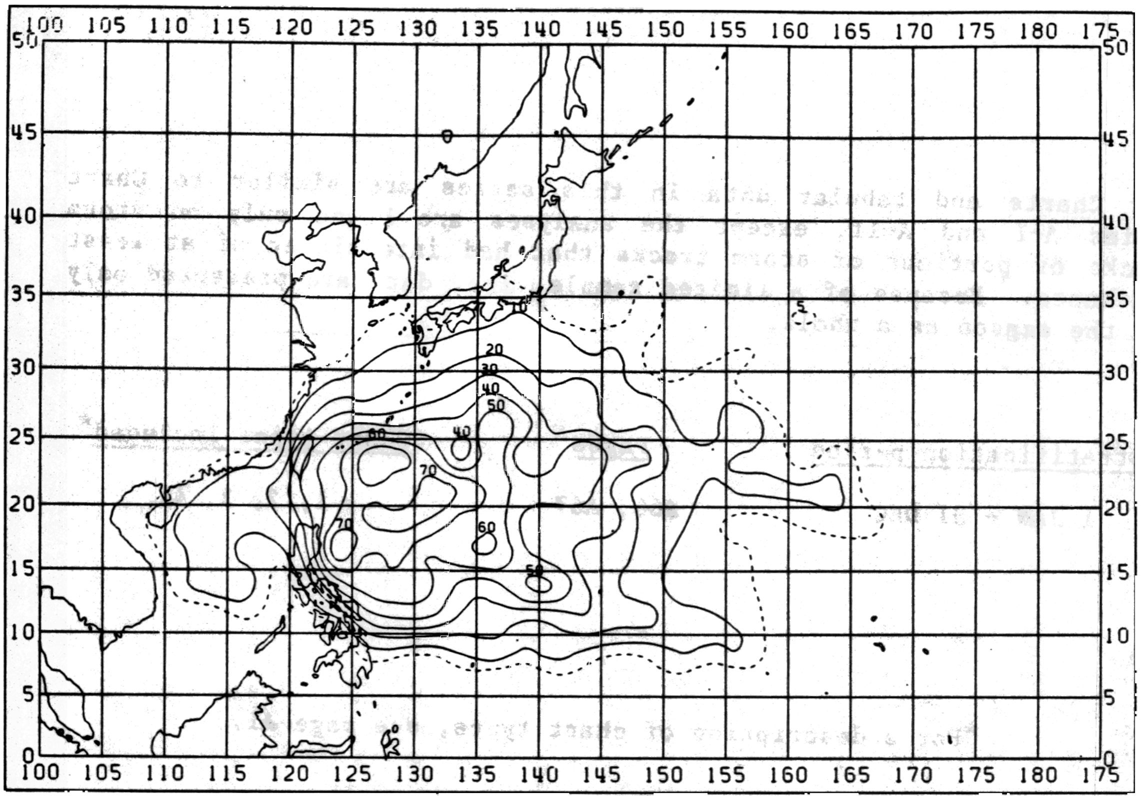
A.5 Chart Series A-III

Charts and tabular data in this series are similar to Chart Series A-I and A-II, except the analyses are based only on storm tracks or portions of storm tracks that had intensities of at least 100 knots. Because of a limited sample size, data are presented only for the season as a whole.

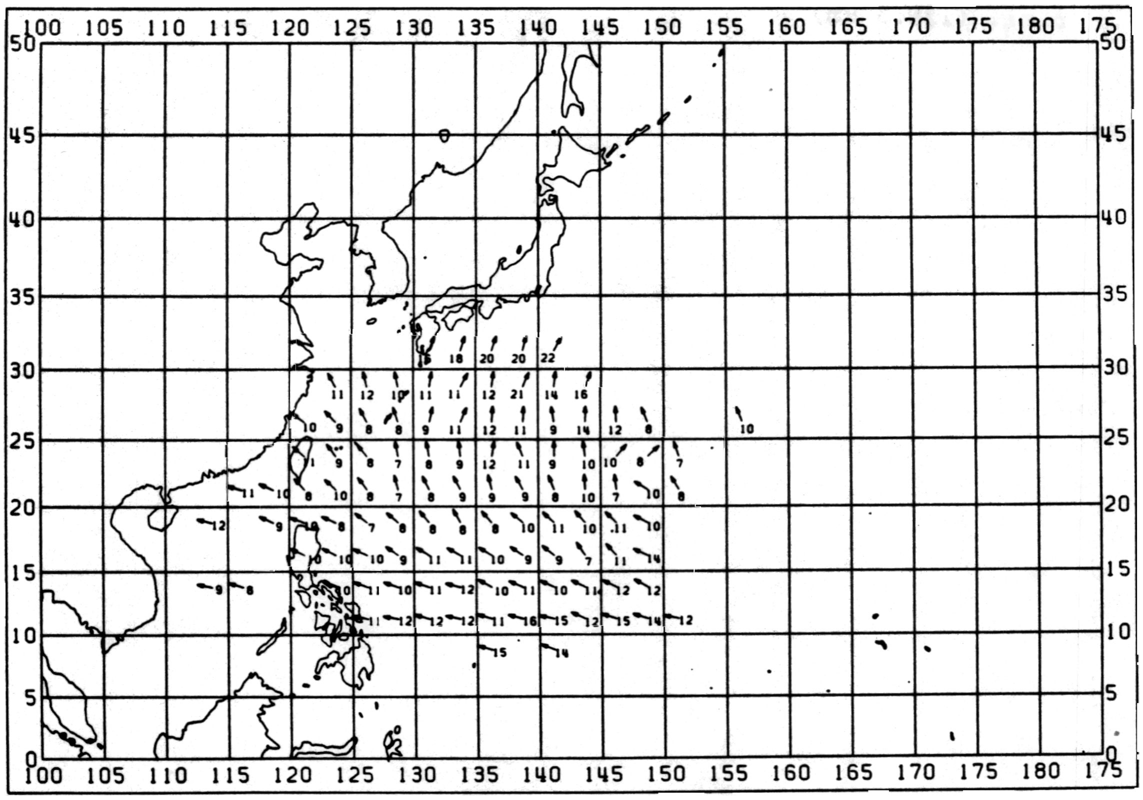
Stratification period	Pages	Chart types included*
1 JAN - 31 DEC	A66, A67	1, 2, 3, 4

*For a description of chart types, see page A1

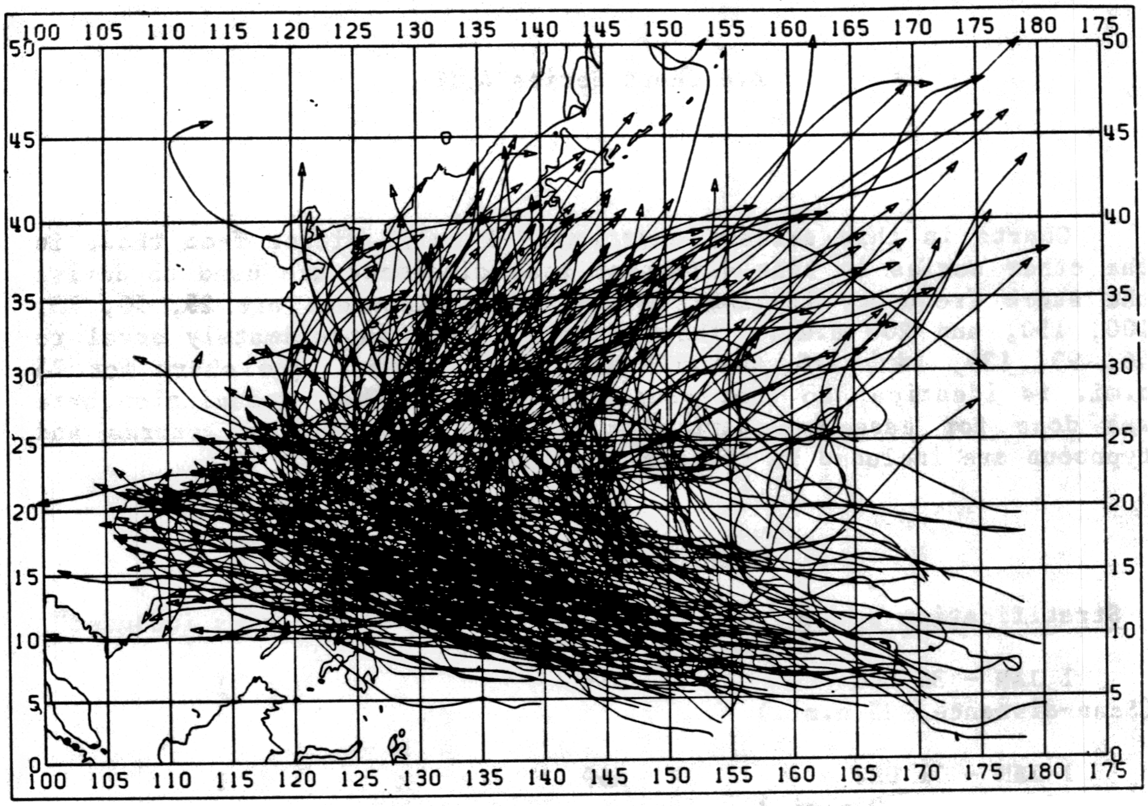
Note: All charts in this series are based on a scan-distance of 75 n.mi. (139.5 km)



TYPHOON (≥ 100 KTS) FREQUENCY 1 JAN - 31 DEC



TYPHOON (≥ 100 KTS) MOTION 1 JAN - 31 DEC



TYPHOON (≥ 100 KTS) TRACKS 1 JAN - 31 DEC

A	B	C	D	E	F
41	17	287	15	15	4.28
43	14	293	14	15	2.94
63	36	283	11	11	4.02
64	41	281	12	12	4.38
65	41	286	12	13	5.35
66	28	282	12	13	4.73
67	28	287	11	12	4.56
68	19	285	16	17	2.16
69	22	283	15	16	6.03
70	30	295	12	13	5.48
.71	25	288	15	15	5.59
72	25	288	14	15	5.28
73	14	282	12	12	6.91
84	14	283	9	9	2.81
85	14	287	8	9	3.45
88	44	292	10	11	2.80
89	55	290	11	12	3.54
90	57	290	10	11	4.11
91	52	289	11	12	4.37
92	36	285	12	14	3.78
93	33	299	10	12	4.95
94	52	293	11	11	3.85
95	52	295	10	11	4.07
96	30	296	11	12	4.06
97	19	296	12	13	4.48
98	14	299	12	12	2.57
113	25	297	10	10	3.33
114	79	298	10	10	3.25
115	57	296	10	10	2.64
116	63	306	9	11	3.01
117	49	301	11	12	3.50
118	57	300	11	11	4.00
119	63	302	10	11	3.91
120	41	305	9	10	3.63
121	36	309	9	11	4.31
122	25	326	7	10	5.14
123	25	318	11	12	4.55
124	14	295	14	14	2.53
136	17	285	12	13	4.08
138	17	295	9	9	3.77
139	33	291	10	11	3.10
140	63	295	8	10	3.11
141	71	310	7	11	3.46
142	73	311	8	11	3.57
143	68	321	8	11	3.47
144	55	331	8	11	4.12
145	60	319	8	10	3.88
146	36	310	10	11	4.16
147	38	313	11	13	3.67
148	36	319	10	12	4.96
149	33	314	11	12	3.98
150	14	298	10	13	3.64

A	B	C	D	E	F
163	17	287	11	12	5.20
164	22	294	10	11	3.96
165	44	317	8	11	3.21
166	55	313	10	11	3.72
167	71	324	8	10	3.00
168	57	345	7	10	4.07
169	76	334	8	12	3.92
170	71	333	9	13	4.00
171	57	347	9	14	5.54
172	46	332	9	12	5.76
173	41	339	8	12	4.49
174	44	357	10	13	5.42
175	25	353	7	9	2.27
176	14	303	10	11	5.06
177	14	330	8	9	3.90
191	41	310	11	13	2.67
192	57	324	9	11	3.07
193	76	321	8	11	3.84
194	76	349	7	12	5.07
195	60	350	8	12	4.13
196	33	354	9	13	4.41
197	60	010	12	15	5.95
198	30	338	11	12	3.36
199	38	000	9	13	5.86
200	52	353	10	13	4.26
201	36	039	10	15	9.07
202	33	047	8	13	8.18
203	14	342	7	12	4.02
217	19	306	10	11	2.73
218	36	316	9	10	3.19
219	38	332	8	10	3.71
220	36	341	8	10	3.86
221	44	014	9	12	6.08
222	41	024	11	15	8.57
223	57	005	12	15	7.10
224	46	004	11	15	9.73
225	25	351	9	12	3.59
226	25	002	14	16	5.89
227	14	358	12	16	5.95
228	19	338	8	10	4.05
231	19	339	10	14	2.09
244	14	332	11	12	3.05
245	14	347	12	14	6.55
246	22	349	10	12	6.25
247	22	010	11	13	4.88
248	30	029	11	15	8.55
249	38	009	12	16	6.10
250	25	024	21	24	9.28
251	19	007	14	17	7.42
252	25	018	16	20	7.70
273	14	021	16	18	5.45
274	17	019	18	20	6.86

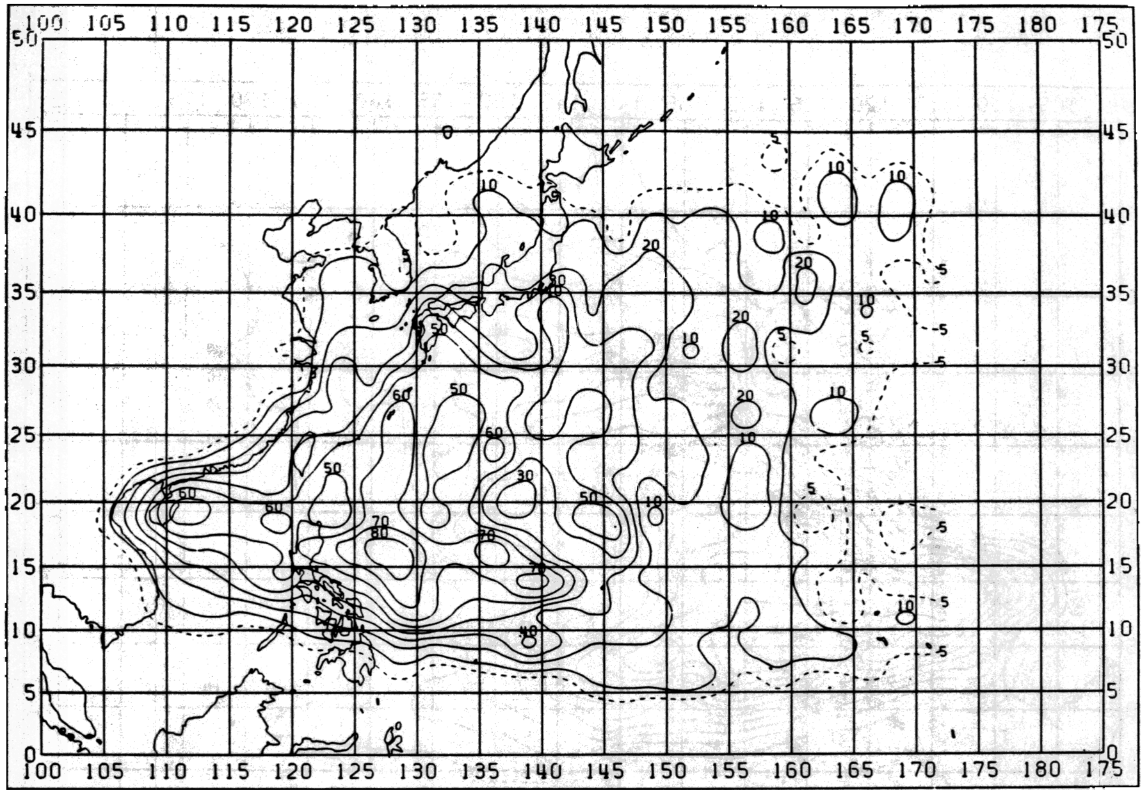
A	B	C	D	E	F
275	19	019	20	22	8.42
276	17	015	20	22	9.42
277	19	030	22	25	7.84

A.6 Chart Series A-IV

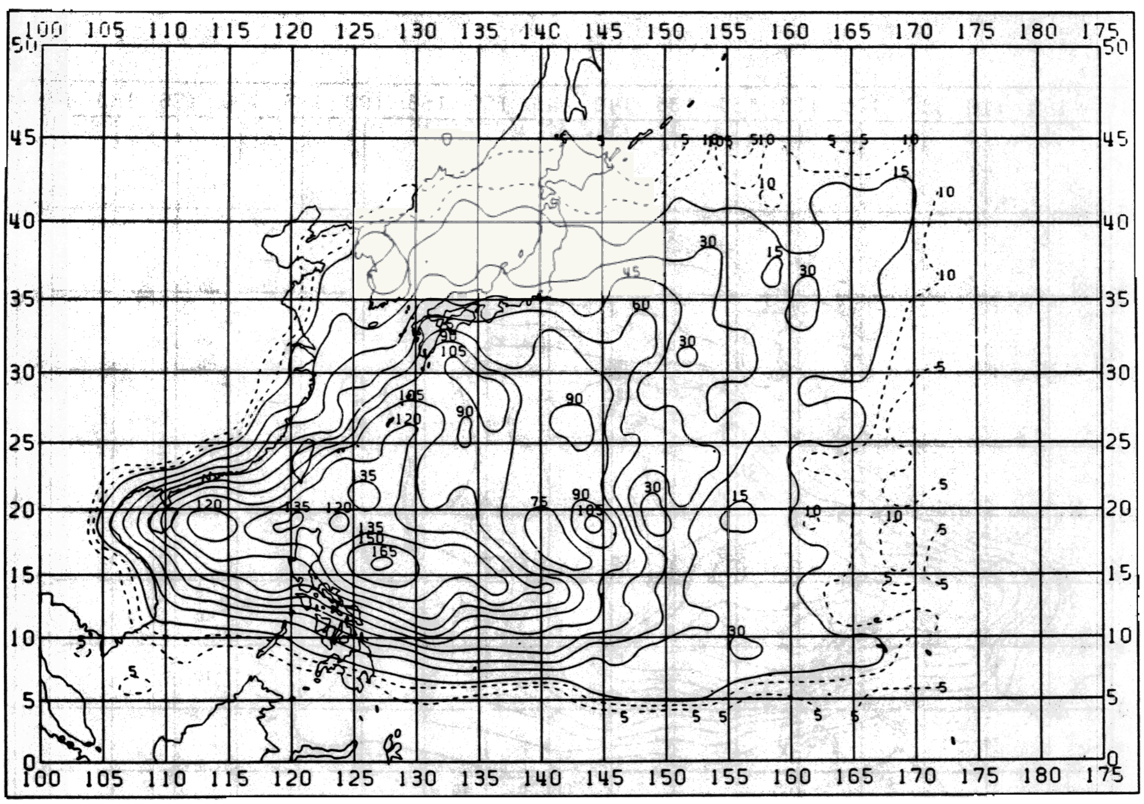
Charts in this series (Chart type 1 only) differ from those in the other series in that different scan distances are used to derive the storm frequency isoline charts. Scan distances are 25, 50, 75, 100, 150, and 200 n.mi. These distances are approximately equal to 46, 93, 139, 185, 278, and 371 km, respectively. The chart for 75 n.mi. is identical to that presented on page A36. Reinclusion here was done for ease in chart comparison. Both tropical storms and typhoons are included in the analyses.

Stratification period	Page	Chart types included*
1 JAN - 31 DEC (Scan-distance, 25 n.mi.)	A69	1
1 JAN - 31 DEC (Scan-distance, 50 n.mi.)	A69	1
1 JAN - 31 DEC (Scan-distance, 75 n.mi.)	A70	1
1 JAN - 31 DEC (Scan-distance, 100 n.mi.)	A70	1
1 JAN - 31 DEC (Scan-distance, 150 n.mi.)	A71	1
1 JAN - 31 DEC (Scan-distance, 200 n.mi.)	A71	1

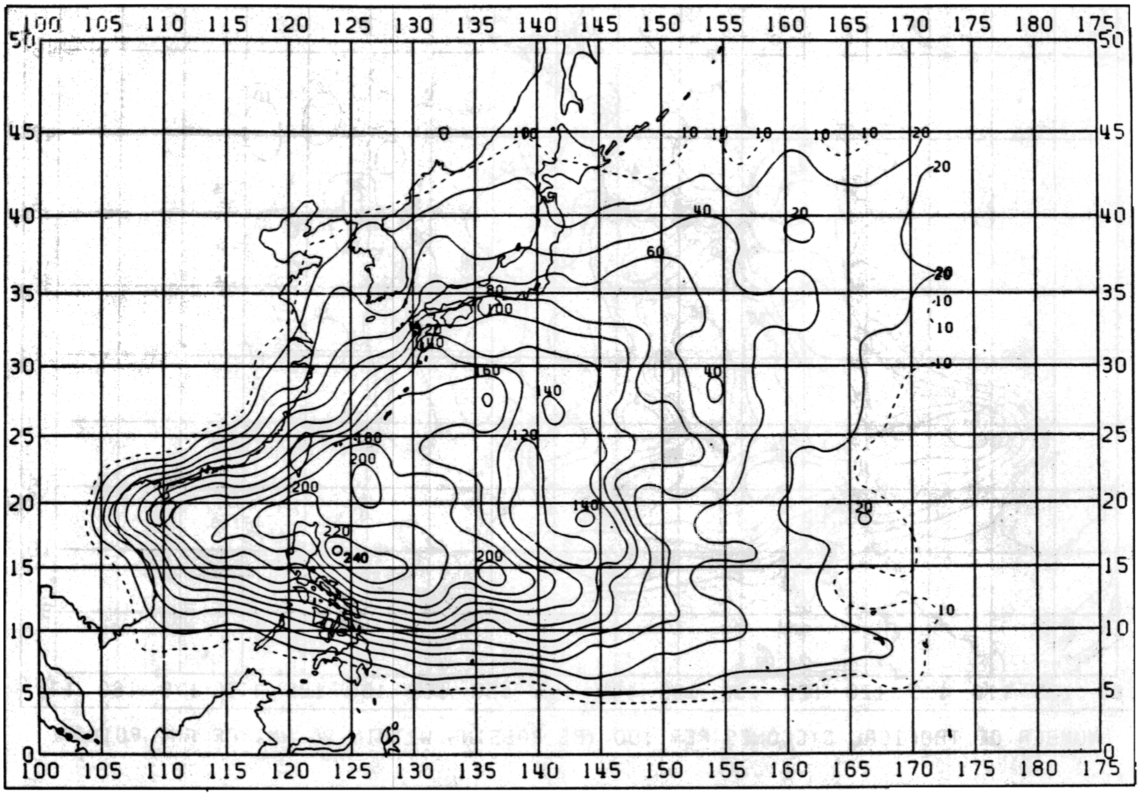
*For a description of chart types, see page A1.



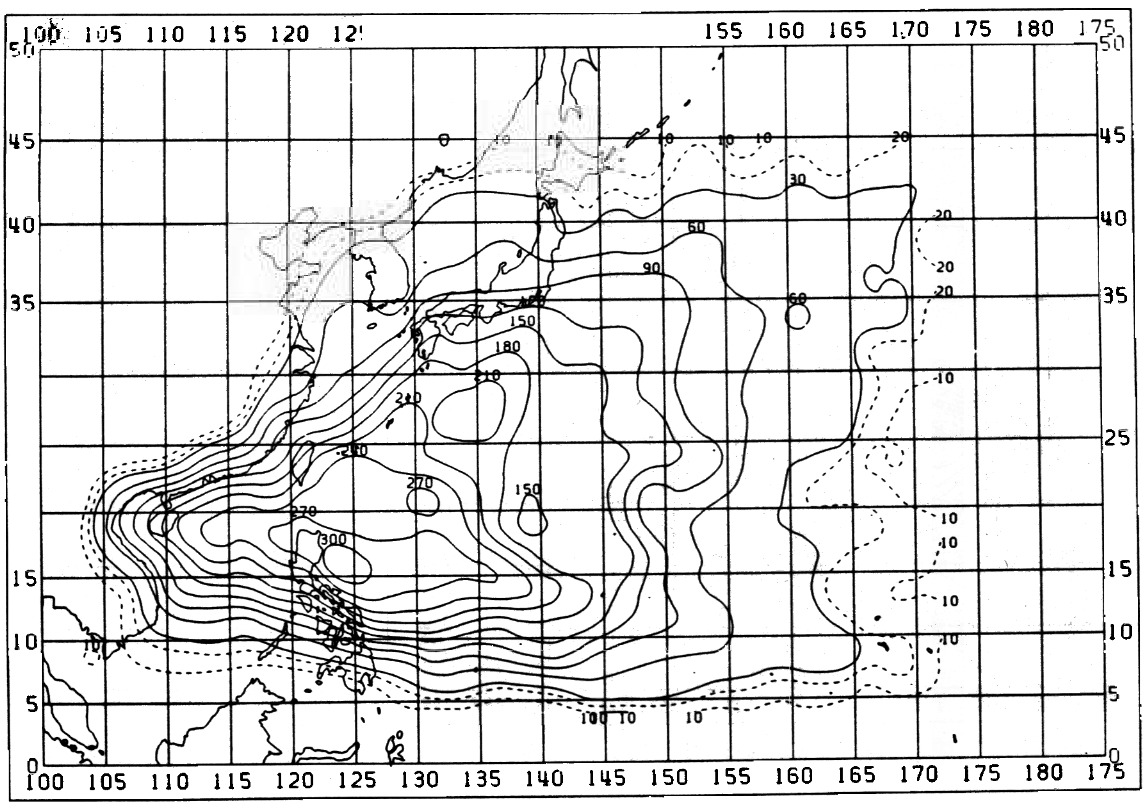
NUMBER OF TROPICAL CYCLONES PER 100 YRS PASSING WITHIN 25 NMI OF ANY POINT



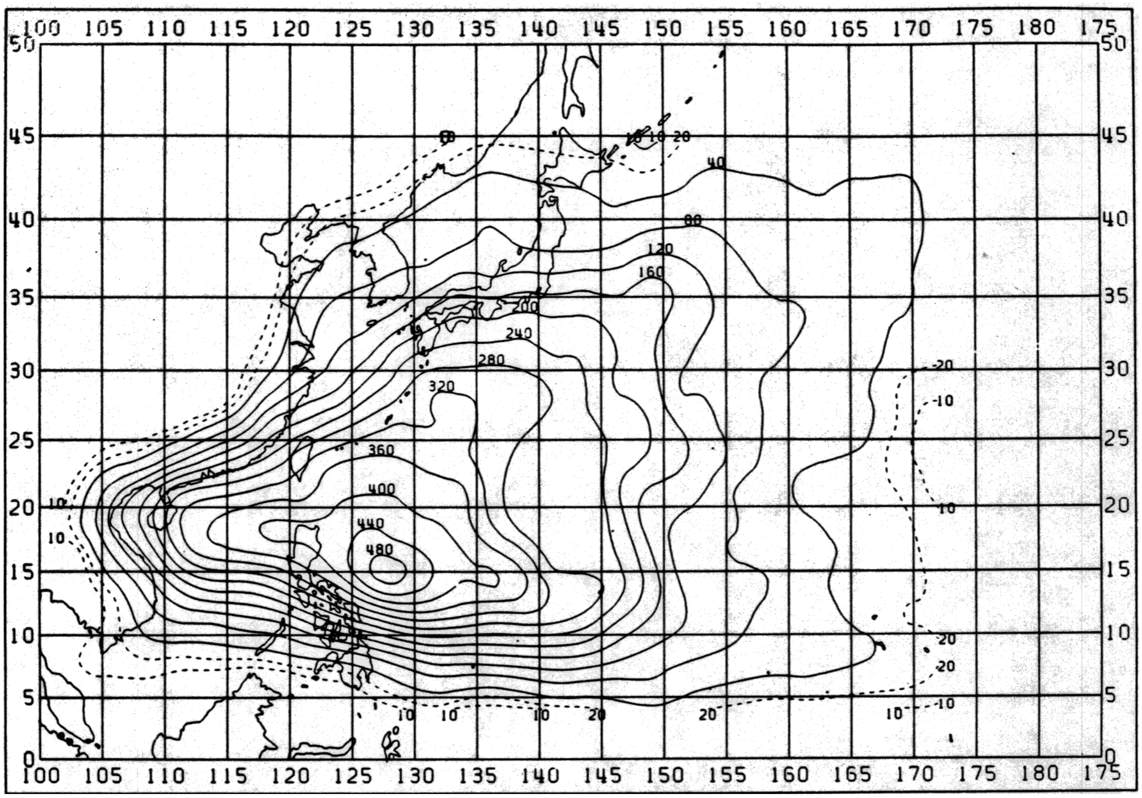
NUMBER OF TROPICAL CYCLONES PER 100 YRS PASSING WITHIN 50 NMI OF ANY POINT



NUMBER OF TROPICAL CYCLONES PER 100 YRS PASSING WITHIN 75 NMI OF ANY POINT



NUMBER OF TROPICAL CYCLONES PER 100 YRS PASSING WITHIN 100 NMI OF ANY POINT



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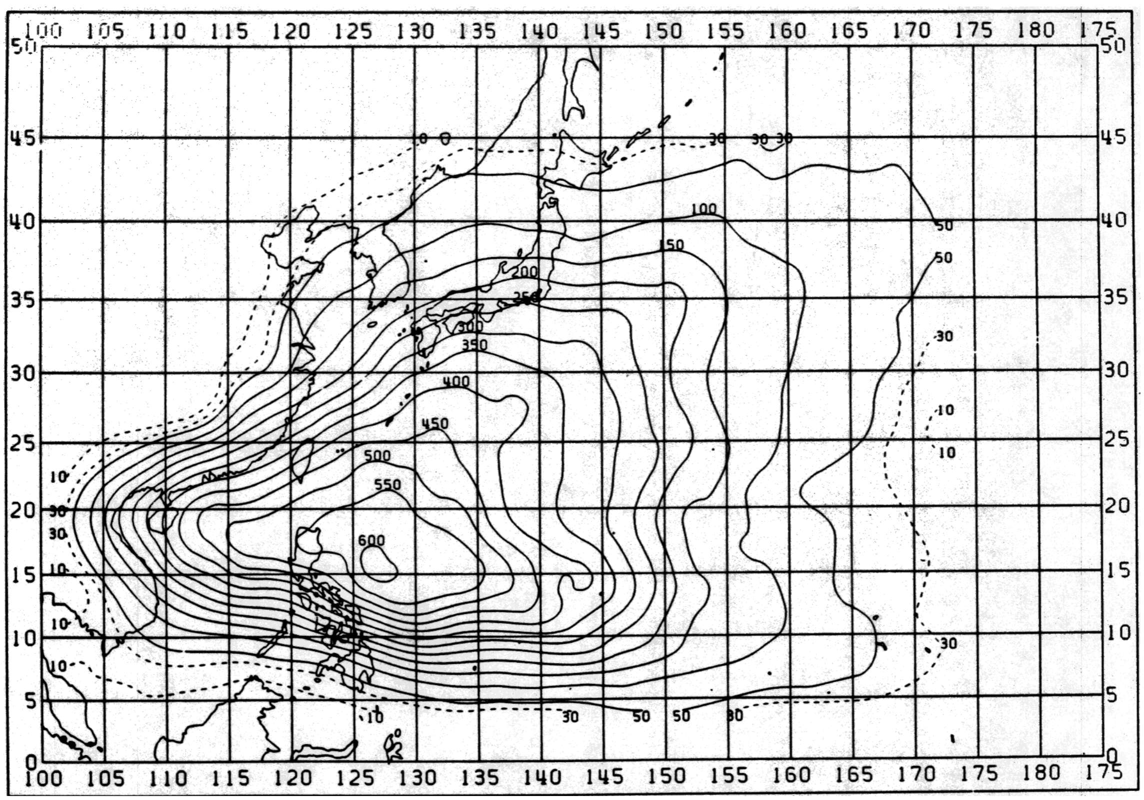

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