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FREQUENCY OF ADVERSE WEATHER CONDITIONS AFFECTING HIGH ENERGY LASER SYSTEMS OPERATIONS

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Naval Environmental Prediction Research Facility

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Certain graphs of cumulative frequencies of rainrates
(bottom graphs on pages listed below) are incorrectly
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on the affected graphs, however, are correct.

The following changes should be made:

Pp 18, 50-57, 70-81:

Change scale 81.0 to read 84.0
82.0 88.0
83.0 92.0
84.0 96.0
85.0 100.0

Pp 58-61, 66-69, 86-93:

Change scale 91.0 to read 92.0
92.0 94.0
93.0 96.0
94.0 98.0
95.0 100.0

Pp 62-65, 82-85:

Change scale 82.0 to read 84.0
84.0 88.0
86.0 92.0
88.0 96.0
90.0 100.0

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20. Abstract (continued)

The most fundamental environmental conditions inhibiting laser use are high rain rates and low visibility due to fog, haze or dust. This report calculates the frequency of occurrence of these conditions as a function of geographic location. The geographical locations chosen were those which may have possible laser operations, and include the Persian Gulf, North Atlantic, Mediterranean, Southeast Asia, Korea, and the Caribbean Sea.

With a limiting 3 hour average rain rate of 3 mm/hr, the frequency of occurrence of the rain limitation is no greater than 3%. This depends on latitude - higher latitudes having lesser rain rates - as well as time of year. The limiting visibility condition was considered to be 1 km. Visibility less than 1 km was generally related to fog and as such is also related to latitude. In the tropical areas the visibility limitation occurred less than 1% of the time regardless of time of year. In polar and subpolar locales, limited visibility occurred over 20% of the time (Kamchatka, in July).

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1. INTRODUCTION

1.1 PURPOSE

The purpose of this effort was to determine the frequency of occurrence of weather conditions which preclude operation of the high energy laser system (HELS) in real operational conditions.

The limitations include range obscuration by rain, fog and haze, as well as the humidity and aerosols.

1.2 OBJECTIVE

The objective of this project was to produce a climatology of the following variables for various Marsden Squares: rainrate; visibility; total extinction coefficient over the wavelength band used by the HELS pointer-tracker (8-12 μm); molecular extinction coefficient for the mid-range infrared advanced chemical laser (MIRACL) spectrum. The climatology was expressed in terms of the average frequency with which specified values of the above variables were reported.

1.3 BACKGROUND

The decision to deploy a High Energy Laser System (HELS) as part of a weapon suite depends on the vulnerability of the HELS to expected weather conditions. The environmental factors which influence the system are scattering and absorption by atmospheric aerosols and molecules, nonlinear effects, such as thermal blooming, and turbulence-induced laser beam wander. These effects are not directly measurable with standard meteorological instrumentation, but correlation models can be used to relate archived

meteorological measurements to the desired meteorological parameters. The collected and analyzed results predict the frequency of occurrence of weather conditions affecting the HELS.

2. DATA

2.1 DATA BASE

A consolidated Data Set (CDS) has been created at Fleet Numerical Oceanography Center (FNOC) using the National Climatic Center's marine surface observation archives (TDF-11) and FNOC's surface observation archives (SPOT). These data have been organized by Marsden Square and are stored on magnetic tape. Each tape consists of multiple files of Marsden Squares. Within each Marsden Square data are ordered by 1-degree subsquare. Within each subsquare data are ordered chronologically over the period 1946-1977.

2.2 SOURCE DATA

Data used in the analysis was a subset of the CDS. The period 1963-1973 inclusive was chosen as the analysis period. Therefore, up to eleven years of observations have been used to calculate a set of environmental statistics.

The analysis concentrated on geographic areas which were considered possible future HELS operating areas. These areas were the Persian Gulf (Marsden Sq. 102-103), North Atlantic (Marsden Sq. 145-147), Southeast Asia (Marsden Sq. 26), Korea (Marsden Sq. 131-132), and the Caribbean (Marsden Sq. 44). These locations are described in Figure 1 and Table 1.

As each record was processed the data were checked for (1) parity errors, (2) correct packing arrangement of the observations (i.e., the number of words in the record must be equal to some multiple of 5), and (3) agreement of the air-sea temperature

Number of Marsden square in which the station is situated at the time of observation

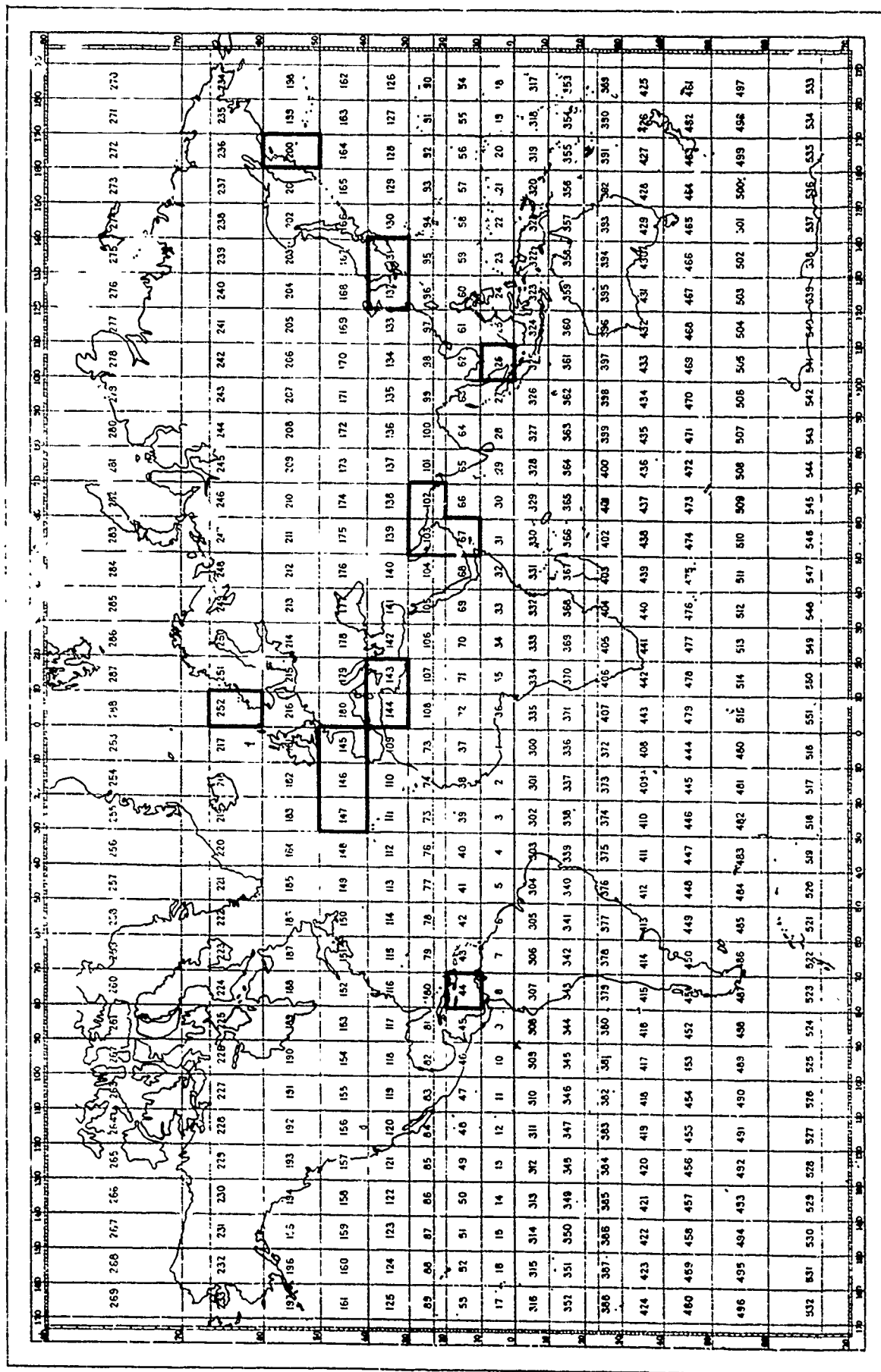


Figure 1. Study area by Marsden Square number.

difference with the difference of air temperature and sea surface temperature. Records which failed these checks were dropped from the analyzed data base.

Table 1. List of Marsden Squares analyzed.

<u>Square</u>	<u>Geographic Area</u>
102-103	Persian Gulf
67	Arabian Sea
26	Southeast Asia
131-132	Korea
200	Kamchatka Peninsula
44	Caribbean Sea
145-147	North Atlantic Ocean
252	Norway
143-144	Mediterranean Sea

2.3 DISTRIBUTION OF OBSERVATIONS

A wide variation in the temporal distribution of the observations was noted. A given month of some years had few or no reports while the same month of other years had many reports. The temporal distribution varied for each Marsden Square analyzed. It was determined that a simple averaging of the data over the entire analysis period would yield mean values that would be biased by the data from years with many observations. An alternate method of computing mean values was chosen in which monthly averages were calculated for each year with one or more reports for the given month. These monthly averages were then averaged to obtain mean values for the entire analysis period. This method of computing the means had the effect of limiting the bias introduced by years that had many reports relative to other years. The averages of the parameters were averaged over the Marsden subsquare averages to produce a Marsden square average. The procedure for calculating mean values for each Marsden square gave equal weight to all subsquares with reports.

3. METHODOLOGY

3.1 OVERVIEW

The parameter correlation models described in this section were used to calculate the HEL's characteristics associated with each observation recorded on the CDS tapes. The resulting values for the HEL's variables were grouped by month and Marsden subsquare and averaged. The resulting means then were grouped by Marsden square for the entire analysis period and averaged.

3.2 COMPUTER PROCESSING

A computer program was developed to process the thousands of weather observations that formed the data base for the analysis. The data recorded on the CDS tapes was known to be relatively free of data gaps and errors so only a few quality control checks were included in the program. Speed in operation and the production of conveniently formatted output (tables and graphs) were the main features of the program.

Below is a list of the primary functions of MARPLT (Marsden Square Plotting) program:

1. Read the data from the CDS tape.
2. Establish that the record is acceptable for processing (check for parity error, EOF marker, packing arrangement of the observations).
3. Unpack the coded data using a masking expression and the SHIFT intrinsic function.
4. Select only those observations taken during the 1963-1973 time period.

5. Calculate values for the following variables: visibility, rainrate, molecular absorption coefficient, molecular extinction coefficient, and extinction coefficient for the MIRACL spectrum.

6. Calculate the cumulative frequency of occurrence of: visibility less than or equal to 1 km, rainrate greater than or equal to 2 millimeters per hour (mm/hr), molecular extinction coefficient (8-12 μm) greater than or equal to 0.8 per kilometer, and MIRACL spectrum extinction coefficient greater than or equal to 0.28 per kilometer.

7. Calculate the frequency of occurrence of rainrates for 21 intervals ranging from 0 to greater than 10 mm/hr in 0.5 mm/hr increments and grouped by month.

8. Calculate the cumulative frequency of occurrence of rainrates for the 21 intervals for the months of March, June, September, and December.

9. Calculate the mean and standard deviation, grouped by month and Marsden subsquare, of the following parameters: molecular extinction coefficient (8-12 μm), and MIRACL spectrum extinction coefficient.

10. Produce an output of tables and graphs summarizing the statistics.

The flow chart in Figure 2 illustrates the flow of data through MARPLT, showing a closed loop which will analyze all observations within a Marsden square file before terminating. The numbers appearing at the upper right corner of each box relate the operation to one of the ten functions outlined above. Details of the

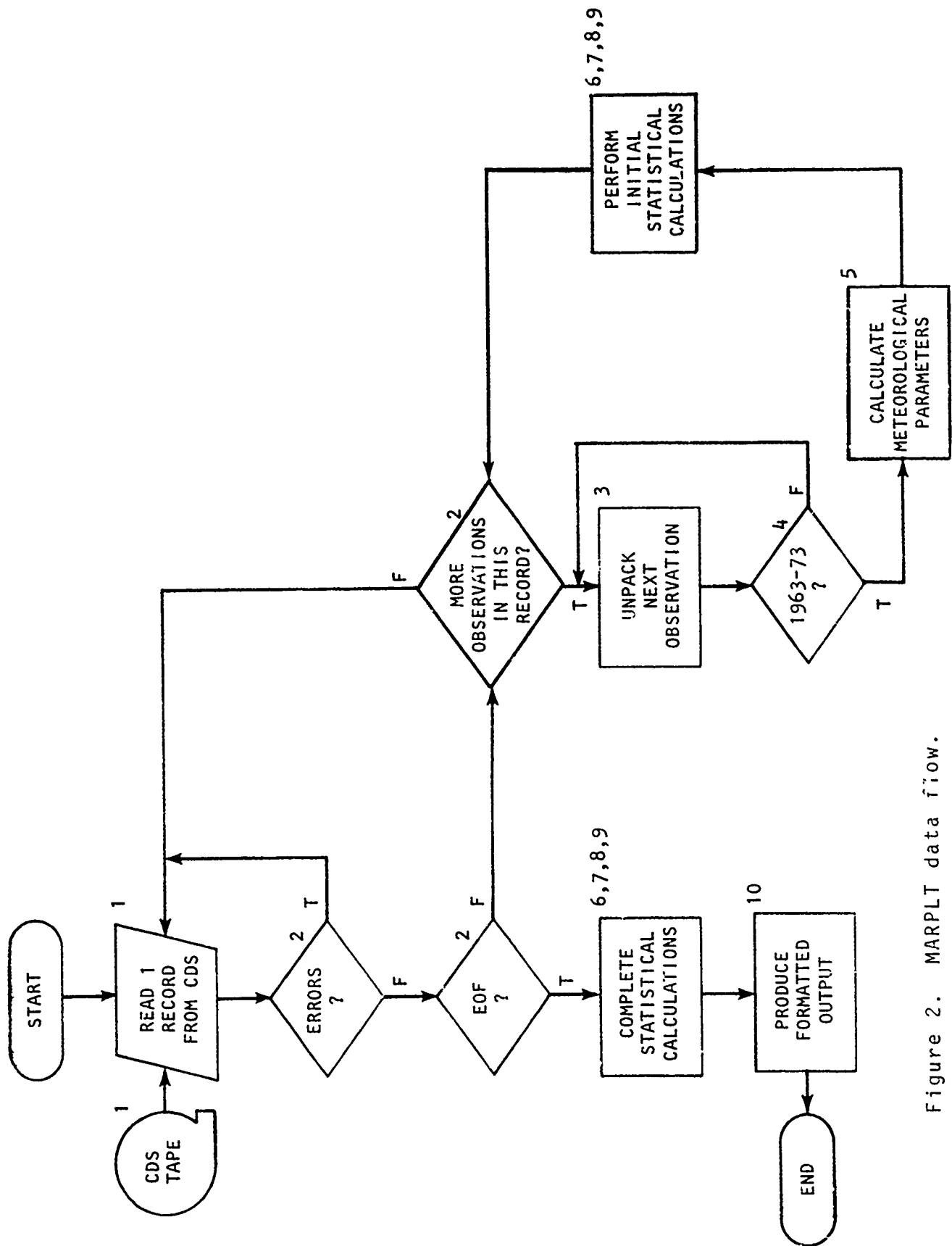


Figure 2. MARPLT data flow.

execution of each of the ten primary functions is given in the following sections. The parenthetical numbers following each heading indicate the relationship to the above functions.

3.3 DATA INPUT AND VERIFICATION (1,2)

A buffer input statement was used to transfer data from a file to a block of memory one record at a time. Then the status of the buffer input operation was checked for an EOF or parity error condition. If a parity error was noted the record was discarded. If an EOF was encountered, end-product statistics for the Marsden square were calculated. If no parity error or EOF was noted, the number of words in the record was determined. If the number of words was a multiple of 5, the packing arrangement of the record was acceptable. Otherwise, the record was discarded. Acceptable records were processed observation by observation. The above procedure was repeated until all observations for a Marsden square were analyzed and an EOF was encountered.

3.4 DATA DECODING (3)

Each observation was first unpacked from a binary form. Each observation was then checked for data source (SPOT or TDF-11). The appropriate scaling for pressure was applied depending on the data source. Air temperature, dew point and sea surface temperature were corrected for sign. Latitude and longitude were decoded with the convention that positive (negative) latitude was North (South). Positive (negative) longitude was east (west). The remaining data were decoded with scaling and bias factors described in MII (1975).

3.5 ANALYSIS PERIOD (4)

Only those observations taken during the eleven year period 1963-1973 were analyzed. Selection of the desired observations required a simple check that the year of the observation was within 5 years of 1968.

3.6 METEOROLOGICAL CALCULATIONS (5)

Visibility values were taken directly from the CDS tapes. The four remaining variables were calculated using correlation models and the reported weather data.

3.6.1 Rainrate

The rainrate was evaluated using the relation of the present weather code (IPW) to rainrate, originally derived by Tucker (1971) and subsequently modified by Bourke and Dorman (1977). These derivations were specifically derived to determine three hour precipitation totals, rather than rainrates. This work infers an average precipitation rate from the three hour total. It must be stressed that this rate is often less than the possible instantaneous rainrate within the three hour period of observation.

3.6.2 Molecular Extinction Coefficient

The molecular extinction coefficient was calculated for the thermal infrared wavelength band (8-12 μm). The extinction coefficient was calculated using a polynomial fit to the LOWTRAN 3B molecular transmittance code. In translating from transmittance to extinction a 10 km range was used to approximate the range dependence of the extinction coefficient.

3.6.3 MIRACL Spectrum Absorption Coefficient

Molecular absorption for the proposed MIRACL spectrum was evaluated using an algorithm developed by Science Applications, Inc. (SAI). The absorption coefficient for each observation was determined through the solution of a polynomial which is a function of water vapor pressure (Torr) and temperature (K) and has the following form:

$$f(T,P) = a_1 + a_2T + a_3P + a_4P^2 + a_5TP^2 \\ + a_6TP + a_7T^2 + a_8PT^2 + a_9P^2T^2$$

where T is temperature and P is vapor pressure. Values for the coefficients a_i , $i = 1, 2, \dots, 9$ were determined by SAI using a least squares fitting procedure and are listed below:

$$\begin{array}{ll} a_1 = 9.4351 \times 10^{-2} & a_6 = -1.0417 \times 10^{-3} \\ a_2 = -3.2344 \times 10^{-4} & a_7 = 2.6804 \times 10^{-7} \\ a_3 = 1.7890 \times 10^{-1} & a_8 = 1.5392 \times 10^{-6} \\ a_4 = 1.0080 \times 10^{-3} & a_9 = 1.2311 \times 10^{-8} \\ a_5 = -7.0357 \times 10^{-6} & \end{array}$$

The polynomial is valid for temperatures ranging from 240 K to 320 K and water vapor pressures from 0 to 79 Torr.

3.7 STATISTICAL CALCULATIONS (6,7,8,9)

The magnitude of the values calculated above was checked against specified limits. If these threshold values were met or exceeded the appropriate frequency of occurrence counters were incremented. Other counters recorded the number of observations for a given month and the number of observations for a given

Marsden subsquare. The computed values for the two attenuation coefficients were summed before calculating the mean and standard deviation of the coefficient data.

Data on the CDS tape are chronologically ordered within each Marsden subsquare. The processing described above continued until all observations for a given month, year and subsquare were analyzed. Then program control was transferred to the subroutine MNAVG. When program control was returned to the main program, the processing of observations for the next month but same year and subsquare was begun. (If observations from December were the last data analyzed, the month and year would have changed when program control reverted to the main program.)

After all observations for a given Marsden subsquare were processed, program control was transferred to the subroutine SUBAVG.

3.7.1 Monthly Averaging

The subroutine MNAVG grouped information by month and performed some analysis of the data accumulated in the main program. No end-product statistics were calculated in MNAVG. Values computed in MNAVG were based on observations from a single month, year and subsquare.

Using visibility as an example, the frequency of occurrence for a given month and year was calculated as follows:

$$FVIS1 = NVIS/NDMN$$

where:

FVIS1 is the frequency of occurrence of visibility
 ≤ 1 km for a given month,

NVIS is the number of observations that had a reported visibility less than or equal to 1 km, NDMN is the total number of observations reported for the month.

The results of the calculations were identified by month and grouped with the results based on data from the same month of other years. (Recall that all of this data is from the same Marsden subsquare.) Newly computed values of frequency of occurrence were summed with previously computed values each time MNAVG was called. The summed totals for the two attenuation coefficients were similarly grouped by month and summed over the entire data analysis period.

3.7.2 Marsden Subsquare Averages

In the subroutine SUBAVG, the various summations computed in MNAVG were averaged to calculate the means and standard deviations of the attenuation coefficients and the mean frequencies of occurrence described previously. These statistics were grouped by month and subsquare. Using visibility as an example, the process was as follows:

$$FVIS2 = \frac{1}{N} \sum_{i=1}^N FVIS1_i$$

where:

FVIS2 is the mean frequency of occurrence of visibility ≤ 1 km in the subsquare for a given month over the entire analysis period,

$\sum_{i=1}^n FVIS1_i$ is the summation of the individual frequencies of occurrence computed for a given month and year,

N is the number of years that had reports for the given month and had a possible range of 0 to 11.

These mean subsquare values were then summed and eventually a mean value for the entire Marsden Square was calculated.

3.7.3 Marsden Square Averages

When all data for a Marsden Square had been processed, the program encountered an EOF. Program control was transferred to a different section of the main program and the summations of subsquare means were averaged to produce the required mean frequencies of occurrence for the entire Marsden Square. Again using visibility as an example, the computations were done as follows:

$$FVIS3 = \frac{1}{N} \sum_{i=1}^N FVIS2_i$$

where:

FVIS3 is the mean frequency of occurrence of visibility ≤ 1 km in the Marsden Square for a given month over the entire analysis period,

$\sum_{i=1}^N FVIS2_i$ is the summation of the mean frequencies of occurrence of visibility ≤ 1 km in each subsquare with reports,

N is the number of subsquares that had reports during the analysis period.

The processing described in this and the preceeding sections can be summarized as follows:

- * Monthly means were calculated for each E-0-met variable
- * The monthly means were averaged to produce mean values for the subsquares
- * The subsquare means were averaged to produce mean values that were grouped by month but applied to the entire Marsden Square and analysis period.

This method of computing the average of means had the effect of limiting the bias introduced by years and subsquares that had many observations relative to others.

3.8 FORMATTED OUTPUT (10)

Output from the computer program included tables organized by month which listed the statistics described in previous sections. Table 2 is a sample of the tabular output. Histograms and graphs of cumulative frequency for the rainrate data were plotted as shown in Figure 3.

The output of MARPLT contained the mean latitude, mean longitude, standard deviation of the latitude and standard deviation of the longitude of the Marsden subsquares analyzed for each Marsden Square. Subsquares with no reports were identified by subsquare number. The number of subsquares with reports and the number of observations analyzed for the Marsden Square during the 1963-1973 period were given. The output also

MARSDEN SQUARE 145	QUADRANT 7	MEAN LAT 45.1	SD LAT. 2.9	MEAN LON -5.1	SD LON 2.0	SUBSQUARES 95	OBSERVATIONS 92561														
DISTRIBUTION OF RAINRATE FREQUENCIES (PERCENT)																					
MONTH	<0.5	<1.0	<1.5	<2.0	<2.5	<3.0	<3.5	<4.0	<4.5	<5.0	<5.5	<6.0	<6.5	<7.0	<7.5	<8.0	<8.5	<9.0	<9.5	<10.0	>=10.0
JAN	91.5	3.9	1.2	1.3	.8	.1	.2	.8	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
FEB	94.4	1.9	1.4	1.2	.2	.2	.3	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
MAR	95.1	1.3	2.4	.1	.6	.3	.0	.0	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
APR	94.7	1.5	2.8	.1	.3	.2	.3	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
MAY	96.8	.9	.8	.1	.6	.1	.7	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
JUN	98.3	1.2	.2	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
JUL	98.2	.7	.1	.8	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
AUG	97.2	1.4	.7	.3	.1	.3	.8	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SEP	91.8	3.4	.8	.9	1.7	.2	.6	.1	.1	.0	.0	.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
OCT	94.1	2.3	.8	.9	.6	.1	.1	.1	.8	.0	.0	.0	.1	.0	.1	.8	.0	.0	.0	.0	.0
NOV	90.4	3.7	.8	1.6	.5	.1	.2	.4	.7	.9	.0	.4	.1	.0	.0	.0	.0	.0	.0	.0	.0
DEC	89.7	4.1	.8	3.8	.2	.8	.1	.3	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

RAINRATE CUMULATIVE FREQUENCIES (PERCENT)

MONTH	<0.5	<1.0	<1.5	<2.0	<2.5	<3.0	<3.5	<4.0	<4.5	<5.0	<5.5	<6.0	<6.5	<7.0	<7.5	<8.0	<8.5	<9.0	<9.5	<10.0	>=10.0
JAN	91.5	95.3	96.5	97.0	97.8	98.7	98.9	99.7	99.9	99.9	99.9	99.9	99.9	99.9	99.9	100.0	100.0	100.0	100.0	100.0	100.0
FEB	94.4	96.4	97.7	99.0	99.2	99.4	99.7	99.8	99.9	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
MAR	95.1	96.4	98.8	99.0	99.5	99.8	99.8	99.8	99.8	99.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
APR	94.7	96.2	99.0	99.1	99.4	99.6	99.9	99.9	99.9	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
MAY	96.8	97.6	98.5	99.0	99.2	99.9	99.9	99.9	99.9	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
JUN	98.3	99.5	99.7	99.9	99.9	99.9	99.9	99.9	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
JUL	98.2	99.7	99.1	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
AUG	97.2	98.5	99.3	99.6	99.6	99.9	99.9	99.9	99.9	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
SEP	91.8	95.2	96.0	96.9	98.5	98.8	99.3	99.4	99.4	99.5	99.5	99.9	99.9	99.9	99.9	100.0	100.0	100.0	100.0	100.0	100.0
OCT	94.1	96.4	97.2	98.1	98.7	98.8	99.9	99.9	99.8	99.8	99.9	99.9	99.9	99.9	99.9	100.0	100.0	100.0	100.0	100.0	100.0
NOV	90.4	94.1	95.0	96.6	97.1	97.2	97.4	97.8	98.5	99.4	99.4	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
DEC	89.7	93.8	94.7	98.4	98.6	99.4	99.5	99.8	99.9	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

CUMULATIVE FREQUENCIES FOR VISIBILITY, DETECTOR, MIRACL AND RAINRATE PARAMETERS (PERCENT)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
VIS <= 1.0	.21	.08	1.42	.76	1.18	.67	1.11	.54	.85	.65	.28	.32
DET >= 0.8	1.70	2.33	1.55	.94	.46	.66	.22	.43	3.15	1.40	4.12	1.99
MIR >= .28	8.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RNR >= 2.0	2.16	1.03	1.11	.88	1.45	.14	.11	.45	3.15	1.92	3.42	1.57

Table 2. Monthly climatological values for Marsden Square 145.

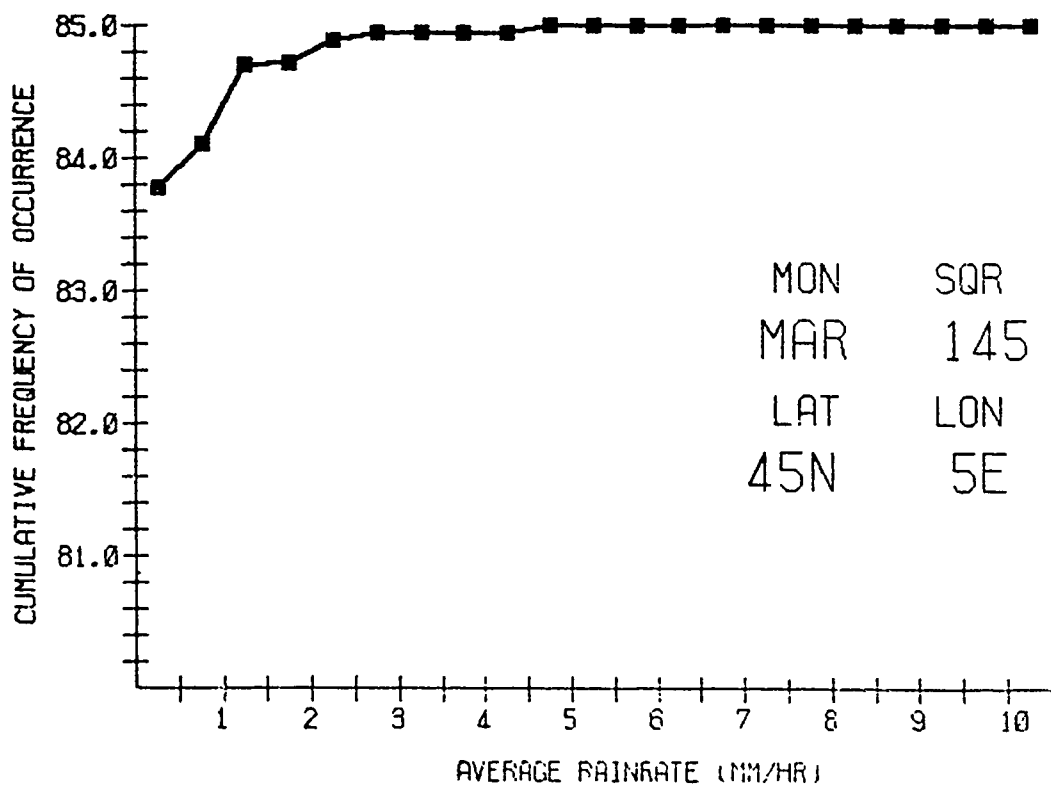
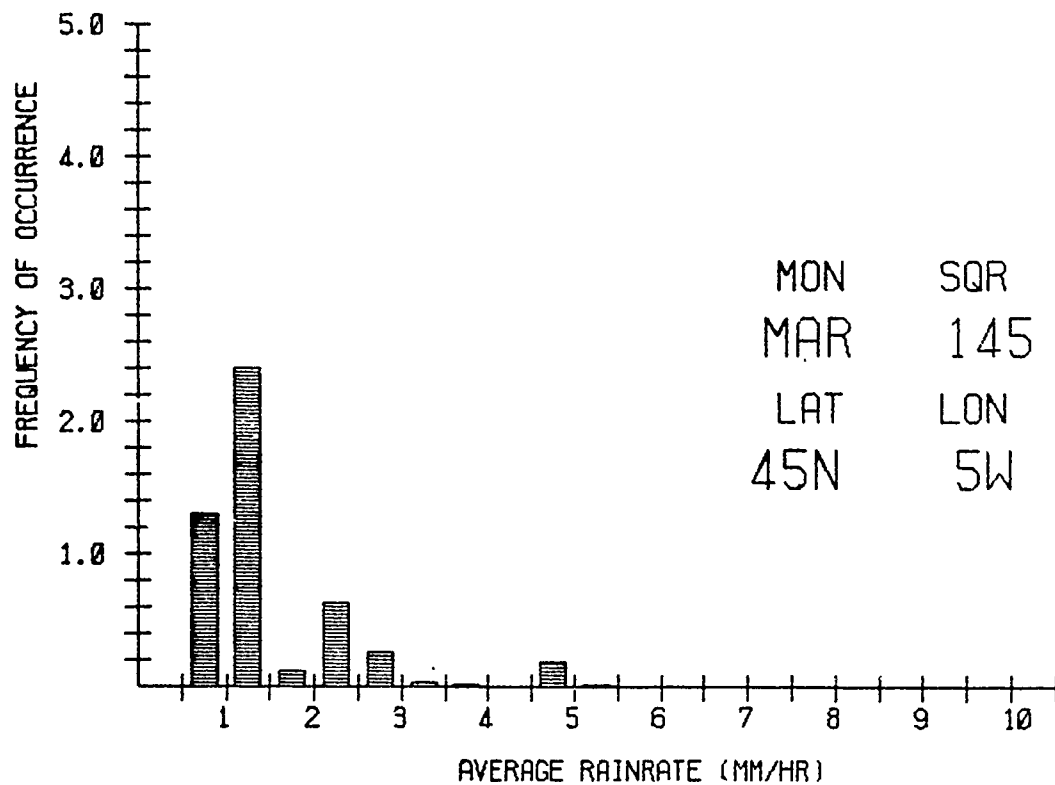


Figure 3. Frequency (top) and cumulative frequency (bottom) of occurrence of rainrates for March for Marsden Square 145.

listed the identifying number of each Marsden Square analyzed and the quadrant of the globe in which the square is located. All standard deviations were calculated using N weighting.

The subroutine HISTPLT contained the code used to produce the graphs on the Varian plotter. Extended Core Storage (ECS) was required for the plotting operation. The graphs were produced by a simple bin sort. A total of 21 intervals of rainrate were specified, ranging from 0 to greater than 10 mm/hr in 0.5 mm/hr increments. Referring to Figure 3(a), the histogram should be interpreted as the frequency of occurrence (percent) of rainrates falling into each interval. Reports were included in a bin when the observed rainrate was greater than or equal to the lower bin boundary value and less than the higher bin boundary. All observations of rainrate greater than or equal to 10 mm/hr were grouped together and displayed in the 21st interval. For this interval the histogram should be interpreted as the frequency of occurrence (percent) of rainrates greater than or equal to 10 mm/hr.

A variable vertical scale was used to provide maximum resolution of the displayed data. The three vertical scales incorporated into the program had maximums of 5, 10, and 20 percent. Data for the interval 0.0 to 0.5 mm/hr were not plotted since the overwhelming majority of observations fell into this category. Any attempt to plot on the same graph the data for all of the intervals would have lead to scaling problems and difficulty in using the plots. Values for the data associated with the first interval were listed in the tabular output.

The cumulative frequency of occurrence (percent) corresponding to a particular bin boundary value was derived by summing all bin elements less than the bin boundary value and dividing this sum by the total number of bin elements. Referring to Figure 3(b), the graph should be interpreted as the frequency (percent) with which a rainrate less than the indicated value was reported. Again, one of three vertical scales was used to enhance the useability of the graph.

4. RESULTS

The collected statistics of rainfall, detector total extinction coefficient and MIRACL molecular extinction are included in Appendix A. These are in the form described in Section 3.8. Within each geographical area statistics are provided for each month. In addition frequency statistics of visibility and rainrate exceeding their critical values are provided for each month.

Program listings of programs relating archived meteorological data to rainrates and extinction coefficients are provided in Appendix B.

5. CONCLUSIONS

The environmental conditions limiting use of a high energy laser system are basically high rain rate and low visibility. These conditions limit the use of the HEL system in all regions except Korea less than 6% of the time. In the Korean area, visibility is limited by frequent fog conditions. These low visibility conditions are less frequent in winter (below 2%) than in summer when they occur about 10% of the time.

The highest average rain rate limitation occurs in the tropical zones (for example S.E. Asia when rain limits laser use 5% of the time in November). We again stress the limitations of the rain rate algorithm however. The algorithm is accurate in northern latitudes which have long periods of relatively light rain. The tropics, however, often have short periods of very intense rain, exceeding 25 mm/hr. The averaging techniques used here "smears" such intense occurrences over an entire three hour period. An average rain of 3 mm/hr in three hours, may just as well mean that the entire rain fell in a half hour, and is characterized by a rain rate of 18 mm/hr for a short period.

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APPENDIX A
TABLES AND GRAPHS

The data in this appendix are presented in two groups: first, tables of rainrates and bad weather statistics; and second, paired graphs of rainrate frequencies of occurrence (top) and cumulative frequencies of occurrence (bottom). One table and eight graphs are included for each of the 14 Marsden Squares analyzed.

The graphs summarize their respective rainrate statistics for the months of March, June, September, and December, in that order. These months were chosen to represent the four climatic seasons of spring, summer, fall, and winter.

Within each of the two groups, tables/graphs are ordered by Marsden Square number in the sequence shown below.

<u>Square</u>	<u>Geographic Area</u>
102-103	Persian Gulf
67	Arabian Sea
26	Southeast Asia
131-132	Korea
200	Kamchatka Peninsula
44	Caribbean Sea
145-147	North Atlantic Ocean
252	Norway
143-144	Mediterranean Sea

MARSDEN SQUARE 102	QUADRANT 1	MEAN LAT 22.9	SD LAT 1.9	MEAN LON 64.6	SD LON 2.7	SUBSQUARES 57	OBSERVATIONS 8042	DISTRIBUTION OF RAINRATE FREQUENCIES (PERCENT)													
MONTH	<0.5	<1.0	<1.5	<2.0	<2.5	<3.0	<3.5	<4.0	<4.5	<5.0	<5.5	<6.0	<6.5	<7.0	<7.5	<8.0	<8.5	<9.0	<9.5	<10.0	>=10.0
JAN	99.9	0.0	0.0	0.0	.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FEB	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MAR	99.6	.3	.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
APR	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MAY	99.9	.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
JUN	99.2	0.0	.3	.3	0.8	.1	0.0	0.0	.1	0.0	0.0	0.0	0.0	0.0	0.0	.1	0.0	0.0	0.0	0.0	0.0
JUL	95.3	.1	1.4	.2	.9	6.0	.1	1.2	.0	.5	.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AUG	98.8	.1	.6	0.0	.1	0.0	.4	.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SEP	100.0	0.0	0.0	.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OCT	99.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NOV	99.8	0.0	0.0	.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DEC	99.3	.7	0.0	.3	.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

RAINRATE CUMULATIVE FREQUENCIES (PERCENT)

MONTH	<0.5	<1.0	<1.5	<2.0	<2.5	<3.0	<3.5	<4.0	<4.5	<5.0	<5.5	<6.0	<6.5	<7.0	<7.5	<8.0	<8.5	<9.0	<9.5	<10.0	>=10.0
JAN	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9
FEB	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
MAR	99.6	99.6	99.6	99.6	99.6	99.6	99.6	99.6	99.6	99.6	99.6	99.6	99.6	99.6	99.6	99.6	99.6	99.6	99.6	99.6	99.6
APR	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
MAY	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9
JUN	99.2	99.2	99.2	99.2	99.2	99.2	99.2	99.2	99.2	99.2	99.2	99.2	99.2	99.2	99.2	99.2	99.2	99.2	99.2	99.2	99.2
JUL	95.3	95.3	95.3	95.3	95.3	95.3	95.3	95.3	95.3	95.3	95.3	95.3	95.3	95.3	95.3	95.3	95.3	95.3	95.3	95.3	95.3
AUG	98.8	98.8	98.8	98.8	98.8	98.8	98.8	98.8	98.8	98.8	98.8	98.8	98.8	98.8	98.8	98.8	98.8	98.8	98.8	98.8	98.8
SEP	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
OCT	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9
NOV	99.8	99.8	99.8	99.8	99.8	99.8	99.8	99.8	99.8	99.8	99.8	99.8	99.8	99.8	99.8	99.8	99.8	99.8	99.8	99.8	99.8
DEC	99.3	99.3	99.3	99.3	99.3	99.3	99.3	99.3	99.3	99.3	99.3	99.3	99.3	99.3	99.3	99.3	99.3	99.3	99.3	99.3	99.3

CUMULATIVE FREQUENCIES FOR VISIBILITY, DETECTOR, MIRACL AND RAINRATE PARAMETERS (PERCENT)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
VIS <= 1.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DET >= 0.8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MIR >= .28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RNR >= 2.1	.15	0.00	0.00	0.00	0.00	.25	3.03	.60	0.00	.88	.05	0.00

MARSDEN SQUARE 103 QUADRANT 1 MEAN LAT 25.3 SD LAT 2.1 MEAN LON 55.5 SD LON 3.1 SUBSQUARES 50 OBSERVATIONS 18726

DISTRIBUTION OF RAINRATE FREQUENCIES (PERCENT)

MONTH	<0.5	<1.0	<1.5	<2.0	<2.5	<3.0	<3.5	<4.0	<4.5	<5.0	<5.5	<6.0	<6.5	<7.0	<7.5	<8.0	<8.5	<9.0	<9.5	<10.0	>=10.0
JAN	98.0	.4	1.1	0.0	.2	.0	.1	0.0	0.0	0.0	.1	0.0	0.0	.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FEB	98.6	1.3	.9	.5	.1	.3	.0	0.0	.0	0.0	0.0	.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MAR	99.4	.3	.1	.0	.0	0.0	.1	0.0	.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
APR	98.7	3.0	.1	.2	.0	.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MAY	100.0	.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
JUN	100.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
JUL	99.8	0.0	.1	.0	.0	0.0	0.0	.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AUG	99.8	.2	0.0	0.0	.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SEP	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OCT	100.0	0.0	.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NOV	99.0	0.0	0.0	0.0	0.0	0.0	.5	.1	.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.1	0.0	0.0	0.0
DEC	99.5	.3	0.0	0.0	0.0	0.0	0.0	0.0	.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

RAINRATE CUMULATIVE FREQUENCIES (PERCENT)

MONTH	<0.5	<1.0	<1.5	<2.0	<2.5	<3.0	<3.5	<4.0	<4.5	<5.0	<5.5	<6.0	<6.5	<7.0	<7.5	<8.0	<8.5	<9.0	<9.5	<10.0	>=10.0
JAN	98.0	98.4	99.4	99.4	99.4	99.7	99.7	99.8	99.8	99.8	99.9	99.9	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
FEB	98.6	97.4	98.7	99.3	99.3	99.7	99.7	99.7	99.7	99.7	99.7	99.7	99.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
MAR	99.4	99.7	99.9	99.9	99.9	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
APR	98.7	99.7	99.8	99.9	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
MAY	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
JUN	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
JUL	99.8	99.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
AUG	99.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
SEP	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
OCT	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
NOV	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0
DEC	99.5	99.5	99.5	99.5	99.5	99.5	99.5	99.5	99.5	99.5	99.5	99.5	99.5	99.5	99.5	99.5	99.5	99.5	99.5	99.5	99.5

CUMULATIVE FREQUENCIES FOR VISIBILITY, DETECTOR, MIRACL AND FAIRRATE PARAMETERS (PERCENT)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
VIS <= 1.0	.02	.65	.01	.02	.41	.08	.12	.19	.11	.10	.01	.77
DET >= 0.8	.11	.49	.11	.23	0.00	.08	.55	.02	.33	0.00	.03	.17
MIR >= .24	0.00	0.00	.12	.07	2.25	3.12	10.80	10.20	7.28	.66	0.00	0.00
RNR >= 2.0	.56	.74	.10	.06	0.00	0.00	.03	0.00	0.00	0.00	1.01	.17

MARSDEN SQUARE 67	QUADRANT 1	MEAN LAT 14.2	SD LAT 2.6	MEAN LON 55.4	SD LON 2.8	SUBSQUARES 82	OBSERVATIONS 27159	DISTRIBUTION OF RAINRATE FREQUENCIES (PERCENT)											
MONTH	<0.5	<1.0	<2.0	<3.0	<3.5	<4.0	<4.5	<5.0	<5.5	<6.0	<6.5	<7.0	<7.5	<8.0	<9.0	<9.5	<10.0	>=10.0	
JAN	39.8	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
FEB	98.9	0.1	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
MAR	39.9	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
APR	39.7	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
MAY	94.5	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
JUN	94.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
JUL	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
AUG	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
SEP	94.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
OCT	94.7	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
NOV	94.5	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
DEC	94.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

RAINRATE CUMULATIVE FREQUENCIES (PERCENT)

MONTH	<0.5	<1.0	<2.0	<3.0	<3.5	<4.0	<4.5	<5.0	<5.5	<6.0	<6.5	<7.0	<7.5	<8.0	<9.0	<9.5	<10.0	>=10.0
JAN	39.8	43.4	44.5	44.5	44.5	44.5	44.5	44.5	44.5	44.5	44.5	44.5	44.5	44.5	44.5	44.5	44.5	100.0
FEB	98.9	99.7	99.8	99.8	99.8	99.8	99.8	99.8	99.8	99.8	99.8	99.8	99.8	99.8	99.8	99.8	99.8	100.0
MAR	98.9	99.7	99.7	99.7	99.7	99.7	99.7	99.7	99.7	99.7	99.7	99.7	99.7	99.7	99.7	99.7	99.7	100.0
APR	98.9	99.7	99.7	99.7	99.7	99.7	99.7	99.7	99.7	99.7	99.7	99.7	99.7	99.7	99.7	99.7	99.7	100.0
MAY	98.5	99.3	99.6	99.6	99.6	99.6	99.6	99.6	99.6	99.6	99.6	99.6	99.6	99.6	99.6	99.6	99.6	100.0
JUN	94.8	94.8	94.8	94.8	94.8	94.8	94.8	94.8	94.8	94.8	94.8	94.8	94.8	94.8	94.8	94.8	94.8	100.0
JUL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
AUG	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
SEP	94.9	94.9	94.9	94.9	94.9	94.9	94.9	94.9	94.9	94.9	94.9	94.9	94.9	94.9	94.9	94.9	94.9	100.0
OCT	94.7	94.7	94.7	94.7	94.7	94.7	94.7	94.7	94.7	94.7	94.7	94.7	94.7	94.7	94.7	94.7	94.7	100.0
NOV	94.5	94.5	94.5	94.5	94.5	94.5	94.5	94.5	94.5	94.5	94.5	94.5	94.5	94.5	94.5	94.5	94.5	100.0
DEC	94.2	94.2	94.2	94.2	94.2	94.2	94.2	94.2	94.2	94.2	94.2	94.2	94.2	94.2	94.2	94.2	94.2	100.0

CUMULATIVE FREQUENCIES FOR VISIBILITY, DETECTOR, MIRACUL AND RAINRATE PARAMETERS (PERCENT)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
VIS <= 1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DET >= 0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MIR >= 0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RAIN >= 0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

MARSDEN SQUARE 26	QUADRANT 1	MEAN LAT 5.2	SD LAT 2.0	MEAN LON 105.2	SD LON 2.0	SUBSQUARES 92	OBSERVATIONS 52910																								
DISTRIBUTION OF RAINRATE FREQUENCIES (PERCENT)																															
MONTH	<0.5	<1.0	<1.5	<2.0	<2.5	<3.0	<3.5	<4.0	<4.5	<5.0	<5.5	<6.0	<6.5	<7.0	<7.5	<8.0	<8.5	<9.0	<9.5	<10.0	>=10.0										
JAN	95.7	0.0	1.6	.8	.0	.3	.0	.0	1.2	.1	0.0	0.0	.0	.0	.0	.0	.1	.0	.0	.1	0.0										
FEB	97.3	.4	1.1	.0	.2	.2	.3	.0	0.0	.0	0.0	.2	.1	0.0	0.0	.0	.0	0.0	0.0	0.0	0.0										
MAR	96.6	2.2	.3	.6	.1	.0	.0	.1	0.0	0.0	.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0										
APR	97.9	1.1	.4	0.0	.3	0.0	.1	0.0	.0	0.0	.0	.1	.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0										
MAY	95.8	2.4	.4	.1	.7	.0	.2	.0	.3	.0	.0	.0	.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0										
JUN	91.8	.0	2.6	.4	.7	1.5	.8	.4	1.0	.2	.1	.1	.1	.2	.0	.0	.1	.1	.0	.0	.0										
JUL	93.0	.2	1.0	.1	1.2	1.0	.7	.4	.2	.2	.0	.4	.2	.1	.3	.0	.0	.0	.0	.0	0.0										
AUG	92.5	.3	3.2	.1	1.4	.6	.5	.1	.0	.1	.0	.4	.3	.2	.0	.0	.2	.2	.0	.0	.0										
SEP	91.7	0.0	3.7	.3	.7	1.4	.2	.3	.4	.1	.1	.2	.0	.0	.2	.2	.0	0.0	.1	.0	.0										
OCT	89.5	0.0	4.2	.0	1.5	.1	2.6	.9	.2	.2	.3	.0	.0	.2	.2	.0	.0	0.0	.1	.1	.1										
NOV	89.3	0.0	4.1	.1	1.7	.1	2.1	.5	.0	.6	.2	0.0	.3	.3	.0	.0	.1	.3	.2	.1	.1										
DEC	90.4	.1	4.7	1.3	.6	.8	1.2	.1	.0	.2	0.0	.1	.6	.2	.0	0.0	.1	.4	.1	.0	.0										
RAINRATE CUMULATIVE FREQUENCIES (PERCENT)																															
JAN	95.7	97.4	97.7	98.2	98.2	98.4	98.5	98.5	99.7	99.7	99.7	99.7	99.7	99.8	99.8	99.8	99.9	99.9	99.9	99.9	100.0										
FEB	97.3	98.8	99.1	99.7	99.7	99.7	99.6	99.6	99.7	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0										
MAR	96.6	98.0	98.5	99.1	99.7	99.7	99.8	99.8	99.9	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0										
APR	97.9	99.0	99.5	99.8	99.9	99.9	99.9	99.9	99.9	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0										
MAY	95.8	98.2	98.6	98.7	99.4	99.4	99.1	99.1	99.3	99.4	99.5	99.5	99.6	99.6	99.6	99.6	99.9	99.9	99.9	99.9	100.0										
JUN	91.8	94.4	95.0	95.5	96.3	96.3	97.0	98.2	98.2	98.9	99.3	99.3	99.3	99.6	99.6	99.6	99.9	99.9	99.9	99.9	100.0										
JUL	93.0	95.0	95.2	95.7	96.3	96.3	96.8	96.8	98.6	98.9	99.4	99.4	99.4	99.5	99.5	99.5	99.5	99.5	99.5	99.5	100.0										
AUG	92.5	95.9	96.0	96.4	96.4	96.4	96.5	96.5	98.7	98.9	99.1	99.1	99.1	99.3	99.3	99.3	99.6	99.6	99.6	99.6	100.0										
SEP	91.7	95.4	95.7	96.4	96.4	96.4	96.7	96.7	98.9	99.1	99.4	99.4	99.4	99.5	99.5	99.5	99.5	99.5	99.5	99.5	100.0										
OCT	89.5	93.6	93.6	95.1	95.2	95.2	96.0	96.0	99.1	99.4	99.4	99.4	99.4	99.5	99.5	99.5	99.5	99.5	99.5	99.5	100.0										
NOV	89.3	93.4	93.5	95.2	95.2	95.3	96.4	96.4	99.4	99.4	99.4	99.4	99.4	99.5	99.5	99.5	99.5	99.5	99.5	99.5	100.0										
DEC	90.4	95.1	95.4	96.4	96.4	96.4	97.4	97.4	99.4	99.4	99.4	99.4	99.4	99.5	99.5	99.5	99.5	99.5	99.5	99.5	100.0										
CUMULATIVE FREQUENCIES FOR VISIBILITY, DETECTOR, MIRACL AND RAINRATE PARAMETERS (PERCENT)																															
JAN	95.7	97.4	97.7	98.2	98.2	98.4	98.5	98.5	99.7	99.7	99.7	99.7	99.7	99.8	99.8	99.8	99.9	99.9	99.9	99.9	100.0										
FEB	97.3	98.8	99.1	99.7	99.7	99.7	99.6	99.6	99.7	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0										
MAR	96.6	98.0	98.5	99.1	99.7	99.7	99.8	99.8	99.9	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0										
APR	97.9	99.0	99.5	99.8	99.9	99.9	99.9	99.9	99.9	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0										
MAY	95.8	98.2	98.6	98.7	99.4	99.4	99.1	99.1	99.3	99.4	99.5	99.5	99.6	99.6	99.6	99.6	99.9	99.9	99.9	99.9	100.0										
JUN	91.8	94.4	95.0	95.5	96.3	96.3	97.0	98.2	98.2	98.9	99.3	99.3	99.3	99.6	99.6	99.6	99.9	99.9	99.9	99.9	100.0										
JUL	93.0	95.0	95.2	95.7	96.3	96.3	96.8	96.8	98.6	98.9	99.4	99.4	99.4	99.5	99.5	99.5	99.5	99.5	99.5	99.5	100.0										
AUG	92.5	95.9	96.0	96.4	96.4	96.4	96.5	96.5	98.7	98.9	99.1	99.1	99.1	99.3	99.3	99.3	99.6	99.6	99.6	99.6	100.0										
SEP	91.7	95.4	95.7	96.4	96.4	96.4	96.7	96.7	98.9	99.1	99.4	99.4	99.4	99.5	99.5	99.5	99.5	99.5	99.5	99.5	100.0										
OCT	89.5	93.6	93.6	95.1	95.2	95.2	96.0	96.0	99.1	99.4	99.4	99.4	99.4	99.5	99.5	99.5	99.5	99.5	99.5	99.5	100.0										
NOV	89.3	93.4	93.5	95.2	95.2	95.3	96.4	96.4	99.4	99.4	99.4	99.4	99.4	99.5	99.5	99.5	99.5	99.5	99.5	99.5	100.0										
DEC	90.4	95.1	95.4	96.4	96.4	96.4	97.4	97.4	99.4	99.4	99.4	99.4	99.4	99.5	99.5	99.5	99.5	99.5	99.5	99.5	100.0										
VIS								DET								MIR								RNR							
<= 1.0								<= 1.0								<= 1.0								<= 1.0							
>= 0.6								>= 0.6								>= 0.6								>= 0.6							
>= 0.28								>= 0.28								>= 0.28								>= 0.28							
>= 2.0								>= 2.0								>= 2.0								>= 2.0							

MARSDEN SQUARE 131	QUADRANT 1	MEAN LAT 34.9	SD LAT 2.9	MEAN LON 134.9	SD LON 2.9	SUBSQUARES 99	OBSERVATIONS 51036													
DISTRIBUTION OF RAINRATE FREQUENCIES (PERCENT)																				
MONTH	<0.5	<1.0	<2.0	<2.5	<3.0	<3.5	<4.0	<4.5	<5.0	<5.5	<6.0	<6.5	<7.0	<7.5	<8.0	<8.5	<9.0	<9.5	<10.0	>=10.0
JAN	92.9	4.5	1.0	.3	.7	.1	.0	.1	.1	.1	.0	0.0	.0	.0	0.0	0.0	0.0	0.0	0.0	0.0
FEB	93.7	3.7	1.2	.4	.3	.3	.1	.2	.1	.0	.0	0.0	.0	.0	0.0	0.0	0.0	0.0	0.0	0.0
MAR	94.1	3.5	.8	.1	1.1	.2	.0	.0	.0	0.0	.0	0.0	0.0	.0	0.0	0.0	0.0	0.0	0.0	0.0
APR	90.5	5.0	2.0	.7	.4	.5	.5	.3	.0	.0	.0	0.0	0.0	.0	0.0	0.0	0.0	0.0	0.0	0.0
MAY	91.0	3.2	2.0	.7	.1	.4	.8	.6	.0	.1	.0	0.0	.0	.0	0.0	.0	0.0	0.0	0.0	0.0
JUN	91.3	2.8	1.5	1.8	.4	.4	.2	.2	.3	.6	.2	.2	.1	.0	.0	.0	0.0	0.0	0.0	0.0
JUL	92.8	1.6	2.2	1.1	.4	.2	.3	.1	.2	.5	.2	.0	.1	.0	0.0	.0	.0	.0	.0	.0
AUG	95.8	.8	1.4	.5	.2	.2	.1	.1	.1	.1	.2	.0	.0	.1	.0	.0	.0	.0	.0	.0
SEP	89.4	3.3	2.3	1.1	.6	.2	.5	.4	.5	.4	.3	.1	.2	.0	.0	.1	.0	.0	.0	.0
OCT	94.0	2.2	.9	.8	.4	.3	.5	.1	.1	.2	.3	.1	.0	.0	.0	.0	.0	.0	.0	.0
NOV	93.5	1.9	1.6	.8	.1	.3	.2	.1	.3	.8	.7	.1	.0	.2	.0	.0	.0	.0	.0	.0
DEC	92.6	3.5	2.1	.6	.4	.1	.1	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

RAINRATE CUMULATIVE FREQUENCIES (PERCENT)																					
JAN	92.9	97.3	98.4	98.7	99.5	99.6	99.6	99.7	99.8	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
FEB	93.7	97.3	98.5	98.9	99.2	99.5	99.6	99.6	99.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
MAR	94.1	97.7	98.5	98.6	99.7	99.9	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
APR	90.5	95.5	97.5	98.2	98.5	99.1	99.6	99.9	99.9	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
MAY	91.0	94.2	97.0	97.8	97.9	98.2	99.1	99.7	99.7	99.8	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
JUN	91.3	94.1	95.5	97.3	97.7	98.1	98.2	98.4	98.7	99.3	99.5	99.7	99.8	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9
JUL	92.8	94.4	96.6	97.7	98.2	98.4	98.7	98.9	99.0	99.3	99.4	99.5	99.6	99.7	99.8	99.9	99.9	99.9	99.9	99.9	99.9
AUG	95.8	96.7	98.1	98.5	98.8	99.0	99.1	99.2	99.3	99.4	99.5	99.6	99.7	99.8	99.9	99.9	99.9	99.9	99.9	99.9	99.9
SEP	89.4	92.7	95.0	96.1	96.7	96.8	97.3	97.7	98.2	98.6	98.7	98.8	99.1	99.2	99.4	99.5	99.5	99.5	99.5	99.5	99.5
OCT	94.0	96.2	97.1	97.9	98.3	98.6	99.0	99.1	99.2	99.3	99.4	99.5	99.6	99.7	99.8	99.9	99.9	99.9	99.9	99.9	99.9
NOV	93.5	95.4	97.0	97.8	98.0	98.3	98.4	98.6	98.9	99.0	99.3	99.6	99.7	99.8	99.9	99.9	99.9	99.9	99.9	99.9	99.9
DEC	92.6	96.1	98.2	98.9	99.3	99.5	99.5	99.6	99.7	99.8	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

CUMULATIVE FREQUENCIES FOR VISIBILITY, DETECTOR, MIRACL AND RAINRATE PARAMETERS (PERCENT)											
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV
VIS <= 1.0	1.23	.66	.65	1.36	2.47	1.57	1.86	.29	.22	.14	.42
DET >= 0.8	.50	.80	.53	1.46	1.74	2.24	2.20	1.29	3.18	1.73	1.69
MIR >= .28	0.00	0.00	0.00	.00	0.00	.05	.43	.07	.01	0.00	0.00
RNR >= 2.0	1.29	1.08	1.39	1.85	2.24	2.71	2.25	1.49	3.92	2.87	2.15

MARSDEN SQUARE 132	QUADRANT 1	MEAN LAT 34.6	SD LAT 2.7	MEAN LON 124.9	SD LON 3.0	SUBSQUARES 88	DISTRIBUTION OF RAINRATE FREQUENCIES (PERCENT)															OBSERVATIONS 12495				
MONTH	<0.5	<1.0	<1.5	<2.0	<2.5	<3.0	<3.5	<4.0	<4.5	<5.0	<5.5	<6.0	<6.5	<7.0	<7.5	<8.0	<8.5	<9.0	<9.5	<10.0	>=10.0					
JAN	96.1	1.5	.9	.7	.1	0.0	.2	.4	0.0	0.0	.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
FEB	96.5	1.8	.5	.4	.1	.1	.5	.0	.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
MAR	94.9	2.2	1.0	0.0	1.5	.4	0.0	0.0	.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
APR	93.6	3.1	1.1	.5	.6	.7	.3	.1	.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
MAY	94.2	2.3	1.7	.5	0.0	.8	.1	.1	0.0	0.0	0.0	.0	.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
JUN	92.9	3.8	.9	.7	.3	.2	.0	.1	.0	.3	.5	.1	.1	.0	0.0	.1	.0	0.0	0.0	0.0	0.0					
JUL	92.7	2.2	.7	1.9	.4	.1	.5	.1	.6	.0	.5	.0	.0	.0	.0	.0	0.0	0.0	0.0	0.0	0.0					
AUG	92.5	.8	2.3	.9	2.1	.6	.1	.1	0.0	.2	.3	0.0	.1	0.0	.1	0.0	0.0	0.0	0.0	0.0	0.0					
SEP	94.2	.7	1.7	.3	.6	.7	.9	.2	.0	.5	.0	.1	.1	0.0	0.0	0.0	0.0	.1	0.0	0.0	.1					
OCT	92.5	4.5	.1	2.1	.2	.1	.1	.0	.1	.0	.0	.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
NOV	96.6	1.8	.2	.5	.1	.2	0.0	.0	.2	.0	.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
DEC	94.3	3.4	1.2	.3	.1	.0	0.0	0.0	.1	.1	0.0	.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					

RAINRATE CUMULATIVE FREQUENCIES (PERCENT)

MONTH	<0.5	<1.0	<1.5	<2.0	<2.5	<3.0	<3.5	<4.0	<4.5	<5.0	<5.5	<6.0	<6.5	<7.0	<7.5	<8.0	<8.5	<9.0	<9.5	<10.0	>=10.0
JAN	96.1	97.6	98.3	99.3	99.3	99.3	99.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
FEB	96.5	98.3	98.6	99.2	99.2	99.4	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
MAR	94.9	97.1	98.1	98.1	98.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
APR	93.6	96.7	97.8	98.3	98.8	99.5	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
MAY	94.2	96.6	98.3	98.8	99.5	99.6	99.6	99.7	99.7	99.7	99.7	99.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
JUN	92.9	96.6	97.5	98.2	98.5	98.7	98.7	98.8	98.9	99.2	99.7	99.7	99.7	99.8	99.8	99.8	99.8	99.8	99.8	99.8	99.8
JUL	92.7	95.0	95.7	96.5	96.8	97.4	98.2	98.3	98.4	99.4	99.9	99.9	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
AUG	92.5	93.3	95.6	96.5	96.8	97.4	98.2	98.3	98.4	99.4	99.9	99.9	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
SEP	94.2	94.8	96.5	96.8	97.4	98.0	98.9	99.1	99.1	99.6	99.6	99.7	99.8	99.8	99.8	99.8	99.8	99.8	99.8	99.8	99.8
OCT	92.5	97.1	97.1	98.2	99.4	99.4	99.6	99.6	99.7	99.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
NOV	96.6	98.4	98.6	99.1	99.2	99.4	99.4	99.4	99.6	99.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
DEC	94.3	97.7	98.9	99.2	99.3	99.3	99.3	99.3	99.4	99.5	99.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

CUMULATIVE FREQUENCIES FOR VISIBILITY, DETECTOR, MIRACL AND RAINRATE PARAMETERS (PERCENT)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
VIS <= 1.0	.32	.49	2.76	3.84	8.42	18.43	7.40	.40	2.24	.21	0.08	.14
DET >= 0.8	1.86	.11	.19	.92	.32	1.20	3.07	3.53	1.52	.36	.60	.20
MIR >= .28	0.80	0.00	0.00	0.00	0.00	0.60	0.00	.32	0.00	0.00	0.00	0.00
RNR >= 2.0	.76	.63	1.94	1.23	1.25	1.78	2.36	3.52	3.24	.78	.85	.83

MARSDEN SQUARE 200	QUADRANT 1	MEAN LAT 54.4	SD LAT 2.8	MEAN LON 165.5	SD LON 2.7	SUBSQUARES 86	OBSERVATIONS 6059														
DISTRIBUTION OF RAINRATE FREQUENCIES (PERCENT)																					
MONTH	<0.5	<1.0	<1.5	<2.0	<2.5	<3.0	<3.5	<4.0	<4.5	<5.0	<5.5	<6.0	<6.5	<7.0	<7.5	<8.0	<8.5	<9.0	<9.5	<10.0	>=10.0
JAN	98.3	1.3	.3	.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FEB	97.3	0.0	.5	1.5	.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MAR	94.1	2.8	.3	2.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
APR	92.4	1.7	5.5	0.0	.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MAY	92.6	2.6	3.6	.3	.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
JUN	97.4	1.0	1.3	.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
JUL	98.3	.6	.6	.1	.4	.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AUG	98.5	.7	.6	.0	.0	.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SEP	92.4	4.6	.4	1.4	1.1	.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OCT	95.9	1.9	1.3	.1	.5	.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NOV	92.3	2.0	2.6	0.0	2.6	.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DEC	86.7	5.3	2.5	1.5	.6	2.5	.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RAINRATE CUMULATIVE FREQUENCIES (PERCENT)																					
JAN	91.3	99.5	93.9	100.0	105.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
FEB	37.3	97.3	97.8	99.3	107.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
MAR	94.1	97.0	97.3	100.0	105.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
APR	92.4	94.1	99.5	10.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
MAY	92.6	95.1	98.8	99.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
JUN	97.4	96.5	99.8	100.0	103.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
JUL	98.3	99.2	99.6	99.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
AUG	98.5	99.3	99.9	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
SEP	92.4	97.0	97.4	98.4	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
OCT	95.9	97.8	99.1	99.2	99.7	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
NOV	92.3	94.2	96.9	98.9	99.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
DEC	86.7	92.5	95.0	96.5	97.1	99.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

RAINRATE CUMULATIVE FREQUENCIES (PERCENT)

MONTH	<0.5	<1.0	<1.5	<2.0	<2.5	<3.0	<3.5	<4.0	<4.5	<5.0	<5.5	<6.0	<6.5	<7.0	<7.5	<8.0	<8.5	<9.0	<9.5	<10.0	>=10.0
JAN	93.3	99.5	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
FEB	97.3	97.3	97.8	99.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
MAR	94.1	97.0	97.3	98.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
APR	92.4	94.1	99.5	99.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
MAY	92.6	95.1	98.8	99.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
JUN	97.4	98.5	99.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
JUL	98.3	99.3	99.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
AUG	98.5	99.3	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
SEP	92.4	97.0	97.4	98.8	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
OCT	95.9	97.8	99.1	99.2	99.7	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
NOV	92.3	94.2	96.9	98.9	99.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
DEC	86.7	92.5	95.0	96.5	97.1	99.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

CUMULATIVE FREQUENCIES FOR VISIBILITY, DETECTOR, MIRACL AND RAINRATE PARAMETERS (PERCENT)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
VIS <= 1.0	.96	.98	1.35	15.25	16.17	12.93	22.53	17.45	2.35	2.11	2.75	5.12
DET >= 0.0	2.58	5.00	1.93	1.14	2.75	1.35	.23	.19	.16	2.66	3.16	3.60
MIR >= 0.0	0.00	3.00	0.00	9.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RNR >= 2.0	0.00	.74	0.00	.45	.80	0.00	.36	.11	1.17	.80	3.15	3.54

WARDEN SQUARE
 44
 QUADRANT
 7
 MEAN LAT
 15.0
 SD LAT
 2.9
 MEAN LON
 -74.9
 SD LON
 2.9
 SUBSQUARES
 100
 OBSERVATIONS
 93949

DISTRIBUTION OF RAINRATE FREQUENCIES (PERCENT)

MONTH	<3.5	<4.0	<4.5	<5.0	<5.5	<6.0	<6.5	<7.0	<7.5	<8.0	<8.5	<9.0	<9.5	<10.0	>=10.0
JAN	98.1	0.0	.4	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1
FEB	97.9	.8	.7	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
MAR	98.9	.6	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
APR	98.9	.6	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
MAY	97.5	1.5	.2	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1
JUN	97.5	6.0	1.0	.3	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1
JUL	97.6	.0	.6	.0	.0	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1
AUG	98.0	.1	.7	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1
SEP	96.5	0.0	1.3	.2	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1
OCT	94.9	0.0	1.9	0.0	.3	.4	1.3	.2	.1	.1	.1	.1	.1	.1	.1
NOV	94.6	.0	2.3	0.0	.0	1.2	.6	1.0	.1	.1	.1	.1	.1	.1	.1
DEC	97.3	.1	1.4	.0	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1

RAINRATE CUMULATIVE FREQUENCIES (PERCENT)

MONTH	<3.5	<4.0	<4.5	<5.0	<5.5	<6.0	<6.5	<7.0	<7.5	<8.0	<8.5	<9.0	<9.5	<10.0	>=10.0
JAN	98.1	98.1	98.5	98.7	98.8	98.8	98.8	98.8	98.8	98.8	98.8	98.8	98.8	98.8	98.8
FEB	98.6	98.6	98.4	98.4	98.4	98.4	98.4	98.4	98.4	98.4	98.4	98.4	98.4	98.4	98.4
MAR	98.9	98.9	98.9	98.9	98.9	98.9	98.9	98.9	98.9	98.9	98.9	98.9	98.9	98.9	98.9
APR	98.9	98.9	98.9	98.9	98.9	98.9	98.9	98.9	98.9	98.9	98.9	98.9	98.9	98.9	98.9
MAY	97.5	97.5	97.5	97.5	97.5	97.5	97.5	97.5	97.5	97.5	97.5	97.5	97.5	97.5	97.5
JUN	97.5	97.5	97.5	97.5	97.5	97.5	97.5	97.5	97.5	97.5	97.5	97.5	97.5	97.5	97.5
JUL	97.6	97.6	97.6	97.6	97.6	97.6	97.6	97.6	97.6	97.6	97.6	97.6	97.6	97.6	97.6
AUG	98.0	98.0	98.0	98.0	98.0	98.0	98.0	98.0	98.0	98.0	98.0	98.0	98.0	98.0	98.0
SEP	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5
OCT	94.9	94.9	94.9	94.9	94.9	94.9	94.9	94.9	94.9	94.9	94.9	94.9	94.9	94.9	94.9
NOV	94.6	94.6	94.6	94.6	94.6	94.6	94.6	94.6	94.6	94.6	94.6	94.6	94.6	94.6	94.6
DEC	97.3	97.3	97.3	97.3	97.3	97.3	97.3	97.3	97.3	97.3	97.3	97.3	97.3	97.3	97.3

CUMULATIVE FREQUENCIES FOR VISIBILITY, DETECTOR, MIRACL AND RAINRATE PARAMETERS (PERCENT)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
VIS <= 1.0	.11	.01	.01	.02	0.00	.07	.06	.03	.08	.26	.19	.05
OLT >= 0.0	1.18	.01	.58	.44	.75	.83	.97	.99	1.22	2.26	2.23	1.18
MIR >= .28	.01	.06	.01	.04	.18	.49	.45	.34	.23	.16	.15	.27
RNR >= 2.0	1.35	.58	.11	.42	.67	1.21	1.81	1.16	1.96	3.13	3.06	1.26

MARSDEN SQUARE 145 QUADRANT 7 MEAN LAT 45.1 SD LAT 2.9 MEAN LON -5.1 SD LON 2.3 SUBSQUARES 95 OBSERVATIONS 92561

DISTRIBUTION OF RAINRATE FREQUENCIES (PERCENT)

MONTH	<0.5	<1.0	<1.5	<2.0	<2.5	<3.0	<3.5	<4.0	<4.5	<5.0	<5.5	<6.0	<6.5	<7.0	<7.5	<8.0	<8.5	<9.0	<9.5	<10.0	>=10.0
JAN	91.5	3.9	1.2	1.3	.8	.1	.2	.8	.2	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0
FEB	94.4	1.9	1.4	1.2	.2	.2	.3	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
MAR	95.1	1.3	2.4	.1	.6	.3	.0	.0	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
APR	94.7	1.5	2.8	.1	.3	.2	.3	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
MAY	96.8	.9	.9	.1	.6	.7	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
JUN	98.3	1.2	.2	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
JUL	98.2	.7	.1	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
AUG	97.2	1.4	.7	.3	.1	.3	.8	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SEP	91.8	3.4	.8	.9	1.7	.2	.6	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
OCT	94.1	2.3	.8	.9	.6	.1	.1	.1	.8	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0
NOV	90.4	3.7	.8	1.6	.5	.1	.2	.4	.7	.9	.0	.4	.1	.0	.0	.0	.0	.0	.0	.0	.0
DEC	89.7	4.1	.8	3.9	.2	.8	.1	.3	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

RAINRATE CUMULATIVE FREQUENCIES (PERCENT)

MONTH	<0.5	<1.0	<1.5	<2.0	<2.5	<3.0	<3.5	<4.0	<4.5	<5.0	<5.5	<6.0	<6.5	<7.0	<7.5	<8.0	<8.5	<9.0	<9.5	<10.0	>=10.0
JAN	91.5	95.3	96.5	97.8	98.6	98.7	98.9	99.7	99.9	99.9	99.9	99.9	99.9	99.9	99.9	100.0	100.0	100.0	100.0	100.0	100.0
FEB	94.4	96.4	97.7	99.0	99.2	99.4	99.7	99.8	99.9	99.9	99.9	99.9	99.9	99.9	99.9	100.0	100.0	100.0	100.0	100.0	100.0
MAR	95.1	96.4	98.0	98.9	99.5	99.8	99.8	99.8	99.8	99.8	99.8	99.8	99.8	99.8	99.8	100.0	100.0	100.0	100.0	100.0	100.0
APR	94.7	96.2	99.0	99.1	99.4	99.6	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	100.0	100.0	100.0	100.0	100.0	100.0
MAY	96.8	97.6	98.5	98.5	98.2	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	100.0	100.0	100.0	100.0	100.0	100.0
JUN	98.3	99.5	99.7	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	100.0	100.0	100.0	100.0	100.0	100.0
JUL	98.2	99.0	99.1	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
AUG	97.2	98.5	99.3	99.6	99.6	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	100.0	100.0	100.0	100.0	100.0	100.0
SEP	91.8	95.2	96.0	96.9	98.5	98.8	99.3	99.4	99.4	99.5	99.5	99.5	99.5	99.5	99.5	100.0	100.0	100.0	100.0	100.0	100.0
OCT	94.1	96.4	97.2	98.1	98.7	98.8	98.9	99.0	99.8	99.8	99.9	99.9	99.9	99.9	99.9	100.0	100.0	100.0	100.0	100.0	100.0
NOV	90.4	94.1	95.0	96.6	97.1	97.2	97.4	97.8	98.5	99.4	99.4	99.9	99.9	99.9	99.9	100.0	100.0	100.0	100.0	100.0	100.0
DEC	89.7	93.8	94.7	98.4	98.6	99.4	99.5	99.8	99.9	99.9	99.9	99.9	99.9	99.9	99.9	100.0	100.0	100.0	100.0	100.0	100.0

CUMULATIVE FREQUENCIES FOR VISIBILITY, DETECTOR, MIRACL AND RAINRATE PARAMETERS (PERCENT)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
VIS <= 1.0	.21	.08	1.42	.76	1.18	.67	1.11	.54	.85	.65	.28	.32
DET >= 0.8	1.70	2.33	1.55	.94	.46	.66	.22	.43	3.15	1.40	4.12	1.99
MIR >= .28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.00	0.00	0.00	0.00
RMR >= 2.0	2.18	1.03	1.11	.88	1.45	.14	.11	.45	3.15	1.92	3.42	1.57

MARSDEN SQUARE 146 QUADRANT 7 MEAN LAT 44.9 SD LAT 2.9 MEAN LONG -15.9 SD LONG 7.6 SUBSQUARES 103 OBSERVATIONS 101530

DISTRIBUTION OF RAINRATE FREQUENCIES (PERCENT)

MONTH	<0.5	<1.0	<1.5	<2.0	<2.5	<3.0	<3.5	<4.0	<4.5	<5.0	<5.5	<6.0	<6.5	<7.0	<7.5	<8.0	<8.5	<9.0	<9.5	<10.0	>=10.0
JAN	90.0	4.1	1.6	1.7	1.3	.4	.2	.3	.2	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
FEB	90.1	3.6	1.8	2.0	.4	.7	.5	.4	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
MAR	95.9	1.1	1.7	.2	.3	.5	.1	.1	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
APR	95.5	1.6	1.7	.2	.1	.6	.2	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0
MAY	96.6	1.3	1.0	.2	.2	.4	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
JUN	98.0	1.1	.5	.2	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
JUL	98.0	1.1	.4	.2	.1	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
AUG	96.3	1.8	.9	.6	.1	.2	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SEP	93.8	3.2	.9	.6	.5	.2	.2	.1	.2	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
OCT	92.6	3.5	1.3	1.0	.4	.2	.2	.1	.2	.1	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
NOV	91.0	4.3	1.1	1.4	.9	.4	.2	.3	.3	.0	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0
DEC	91.8	4.1	.8	1.6	.6	.2	.1	.6	.3	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

RAINRATE CUMULATIVE FREQUENCIES (PERCENT)

MONTH	<0.5	<1.0	<1.5	<2.0	<2.5	<3.0	<3.5	<4.0	<4.5	<5.0	<5.5	<6.0	<6.5	<7.0	<7.5	<8.0	<8.5	<9.0	<9.5	<10.0	>=10.0
JAN	90.0	94.1	95.7	97.4	98.7	99.1	99.2	99.5	99.8	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	100.0
FEB	90.1	94.0	95.8	97.8	98.2	98.9	99.4	99.8	99.9	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
MAR	95.9	97.0	98.7	98.9	99.3	99.8	99.8	99.9	99.9	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
APR	95.5	97.1	98.9	99.0	99.1	99.7	99.8	99.9	99.9	99.9	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
MAY	96.6	97.9	98.9	99.2	99.4	99.7	99.8	99.9	99.9	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
JUN	98.0	99.1	99.6	99.8	99.9	99.9	99.9	99.9	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
JUL	98.0	99.1	99.6	99.7	99.9	99.9	99.9	99.9	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
AUG	96.3	98.1	99.0	99.5	99.6	99.8	99.9	99.9	99.9	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
SEP	93.8	97.1	97.9	98.5	99.0	99.2	99.4	99.5	99.7	99.8	99.8	99.8	99.8	99.8	99.8	99.8	99.8	99.8	99.8	99.8	100.0
OCT	92.6	96.3	97.6	98.5	99.0	99.2	99.3	99.5	99.7	99.8	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	100.0
NOV	91.0	95.3	96.3	97.7	98.6	98.9	99.1	99.4	99.8	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	100.0
DEC	91.8	95.9	96.6	98.2	98.8	99.0	99.1	99.6	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

CUMULATIVE FREQUENCIES FOR VISIBILITY, DETECTOR, MIRACL AND RAINRATE PARAMETERS (PERCENT)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
VIS <= 1.0	.28	.18	.27	.48	.80	1.14	1.09	.59	.62	.45	.33	.34
DET >= 0.8	3.80	3.22	2.15	1.46	.86	.51	.29	.98	1.21	1.89	2.22	2.42
MIR >= .20	0.00	0.00	0.00	.00	.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RNR >= 2.0	2.59	2.16	1.06	.96	.62	.22	.26	.47	1.48	1.47	2.29	1.79

MARSDEN SQUARE 147	QUADRANT 7	MEAN LAT 44.9	SD LAT 2.9	MEAN LON -24.9	SD LON 2.9	SUBSQUARES 100	OBSERVATIONS 84225														
DISTRIBUTION OF RAINRATE FREQUENCIES (PERCENT)																					
MONTH	<0.5	<1.0	<1.5	<2.0	<2.5	<3.0	<3.5	<4.0	<4.5	<5.0	<5.5	<6.0	<6.5	<7.0	<7.5	<8.0	<8.5	<9.0	<9.5	<10.0	>=10.0
JAN	67.5	4.0	1.8	2.2	1.7	.4	.3	.3	.3	.3	.1	.1	.1	.1	.0	.0	.1	.0	.0	.0	.0
FEB	91.0	4.0	1.0	1.6	.4	.4	.3	.3	.1	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
MAR	95.1	1.5	1.8	.4	.5	.5	.1	.1	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
APR	95.4	1.4	1.7	.4	.2	.5	.2	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
MAY	95.8	1.7	1.4	.1	.3	.4	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
JUN	96.1	2.1	.8	.3	.1	.3	.1	.1	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0
JUL	97.3	1.2	.6	.3	.1	.1	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
AUG	95.3	2.6	.7	.6	.3	.2	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SEP	93.4	3.0	1.2	.7	.5	.3	.2	.1	.1	.2	.1	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0
OCT	92.1	3.9	.9	1.0	.7	.2	.2	.3	.2	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0
NOV	90.1	4.2	1.1	1.4	1.4	.3	.3	.3	.2	.3	.1	.1	.1	.0	.0	.0	.1	.0	.0	.0	.0
DEC	91.4	4.7	1.7	.9	.4	.1	.2	.3	.3	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

RAINRATE CUMULATIVE FREQUENCIES (PERCENT)

JAN	87.5	92.3	94.1	96.3	98.0	98.4	98.7	98.9	99.2	99.5	99.6	99.7	99.8	99.9	99.9	99.9	99.9	99.9	99.9	100.0
FEB	91.0	95.0	96.8	98.3	98.7	99.1	99.4	99.7	99.8	99.9	99.9	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
MAR	95.1	96.5	98.3	98.7	99.1	99.6	99.9	99.9	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
APR	95.4	96.8	98.5	98.9	99.1	99.6	99.9	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
MAY	95.8	97.5	98.9	99.0	99.4	99.8	99.8	99.9	99.9	99.9	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
JUN	96.1	98.2	99.0	99.3	99.4	99.7	99.8	99.9	99.9	99.9	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
JUL	97.3	98.6	99.2	99.5	99.6	99.8	99.8	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
AUG	95.3	97.9	98.6	99.1	99.4	99.6	99.8	99.9	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
SEP	93.4	96.4	97.6	98.3	98.8	99.1	99.3	99.4	99.4	99.7	99.8	99.8	99.8	99.8	99.9	100.0	100.0	100.0	100.0	100.0
OCT	92.1	96.0	96.9	97.8	98.5	98.8	99.0	99.3	99.6	99.7	99.8	99.8	99.9	99.9	99.9	100.0	100.0	100.0	100.0	100.0
NOV	90.1	94.3	95.4	96.8	98.2	98.5	98.8	99.1	99.4	99.7	99.8	99.8	99.9	99.9	99.9	100.0	100.0	100.0	100.0	100.0
DEC	91.4	96.0	97.7	98.6	99.0	99.1	99.3	99.6	99.9	99.9	99.9	99.9	99.9	99.9	100.0	100.0	100.0	100.0	100.0	100.0

CUMULATIVE FREQUENCIES FOR VISIBILITY, DETECTOR, MIRACL AND RAINRATE PARAMETERS (PERCENT)

VIS	DET	MIR	RNR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
<= 1.0	>= 0.8	>= 0.28	>= 2.0	.27	.17	.28	.75	1.02	2.47	2.33	1.26	1.25	.03	.52	.61
>= 0.8	>= 0.28	>= 0.00	>= 0.00	4.30	3.39	2.48	2.08	1.14	1.06	.60	1.17	1.54	2.66	3.97	1.87
>= 0.28	>= 0.00	>= 0.00	>= 0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
>= 2.0	>= 0.00	>= 0.00	>= 0.00	3.66	1.68	1.31	1.06	.97	.70	.47	.66	1.72	2.15	3.19	1.37

MARS DEN SQUARE	QUADRANT	MEAN LAT	SD LAT	MEAN LON	SD LON	SUBSQUARES	OBSERVATIONS
252	1	65.2	2.8	4.6	2.8	92	23989

MONTH	<0.5	<1.0	<1.5	<2.0	<2.5	<3.0	<3.5	<4.0	<4.5	<5.0	<5.5	<6.0	<6.5	<7.0	<7.5	<8.0	<8.5	<9.0	<9.5	<10.0	>=10.0
JAN	61.5	1.7	5.3	3.2	1.6	2.3	2.1	0.0	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FEB	61.5	1.9	6.9	2.2	1.8	3.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MAR	68.1	6.0	3.3	1.3	1.1	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
APR	94.5	2.6	1.3	0.9	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MAY	97.4	2.0	1.3	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
JUN	94.5	4.5	0.9	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
JUL	97.0	1.8	1.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AUG	97.9	1.8	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SEP	89.3	6.2	2.6	1.4	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OCT	93.4	3.1	1.9	0.1	1.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NOV	93.2	2.0	2.3	0.1	1.0	1.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DEC	88.6	2.2	3.9	0.8	2.7	1.3	0.2	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DISTRIBUTION OF RAINRATE FREQUENCIES (PERCENT)

RAINRATE CUMULATIVE FREQUENCIES (PERCENT)

MONTH	<0.5	<1.0	<1.5	<2.0	<2.5	<3.0	<3.5	<4.0	<4.5	<5.0	<5.5	<6.0	<6.5	<7.0	<7.5	<8.0	<8.5	<9.0	<9.5	<10.0	>=10.0
JAN	61.5	83.3	89.6	91.8	93.4	95.8	97.9	97.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
FEB	88.6	98.7	97.6	97.9	99.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
MAR	88.1	94.1	97.4	98.7	99.7	99.8	99.8	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
APR	94.5	97.1	98.4	99.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
MAY	97.4	99.4	99.5	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
JUN	94.5	99.0	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
JUL	97.0	98.8	99.9	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
AUG	97.9	99.7	99.8	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
SEP	89.3	95.4	98.0	99.4	99.6	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
OCT	93.4	96.5	98.4	98.5	99.5	99.9	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
NOV	93.2	95.2	97.5	97.6	98.6	99.7	99.9	99.9	99.9	99.9	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
DEC	88.6	90.9	94.8	95.6	98.2	99.5	99.7	99.8	99.8	99.8	99.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

CUMULATIVE FREQUENCIES FOR VISIBILITY, DETECTOR, MIRACL AND RAINRATE PARAMETERS (PERCENT)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
VIS <= 1.0	3.45	2.02	1.09	1.03	1.66	1.63	3.24	2.42	1.48	.59	.17	4.79
DET >= 0.8	7.65	1.68	2.54	1.81	.35	.13	.69	.21	1.22	2.23	3.12	5.52
MIR >= 0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.00	0.00
RNR >= 2.0	8.17	2.12	1.31	.75	.11	.01	.12	.06	.63	1.54	2.37	4.42

MARS DEN SQUARE 143	QUADRANT 1	MEAN LAT 35.5	SD L 2.1	MEAN LON 15.2	SD LON 2.9	SUBSQUARES 89	OBSERVATIONS 46617														
DISTRIBUTION OF RAINRATE FREQUENCIES (PERCENT)																					
MONTH	<0.5	<1.0	<1.5	<2.0	<2.5	<3.0	<3.5	<4.0	<4.5	<5.0	<5.5	<6.0	<6.5	<7.0	<7.5	<8.0	<8.5	<9.0	<9.5	<10.0	>=10.0
JAN	94.1	3.6	.4	.5	.7	.2	.0	.1	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
FEB	94.9	2.1	1.3	.9	.3	.2	.3	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
MAR	98.6	.6	.3	.0	.0	.4	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
APR	97.3	1.7	.7	.1	0.0	.1	.0	.1	0.0	0.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
MAY	99.1	.5	.1	.3	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
JUN	99.4	.1	.3	.1	.1	0.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
JUL	100.0	.0	0.0	0.0	0.0	0.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
AUG	99.3	.5	.0	.1	0.0	.1	0.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SEP	97.8	.3	.9	.1	.4	.0	.2	.0	.0	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
OCT	96.4	1.2	.1	.5	.6	.5	.2	.0	.3	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
NOV	96.7	1.9	.1	.2	.4	.1	.0	.0	.4	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
DEC	93.1	1.8	1.0	1.4	.8	.4	.1	.3	1.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

RAINRATE CUMULATIVE FREQUENCIES (PERCENT)

MONTH	<0.5	<1.0	<1.5	<2.0	<2.5	<3.0	<3.5	<4.0	<4.5	<5.0	<5.5	<6.0	<6.5	<7.0	<7.5	<8.0	<8.5	<9.0	<9.5	<10.0	>=10.0
JAN	94.1	97.7	93.1	98.6	99.3	99.5	99.5	99.7	99.7	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
FEB	94.9	97.0	98.2	99.1	99.4	99.6	99.6	99.7	99.7	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
MAR	98.6	99.2	99.5	99.6	99.6	99.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
APR	97.3	99.0	99.7	99.8	99.8	99.8	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
MAY	99.1	99.6	99.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
JUN	99.4	99.5	99.8	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
JUL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
AUG	99.3	99.7	99.7	99.9	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
SEP	97.8	98.1	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9
OCT	96.4	97.6	97.7	98.2	98.8	99.3	99.5	99.5	99.7	99.7	99.7	99.7	99.7	99.7	99.7	99.7	99.7	99.7	99.7	99.7	99.7
NOV	96.7	98.6	98.7	98.9	99.4	99.5	99.5	99.5	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
DEC	93.1	95.0	96.0	97.4	98.2	98.5	98.6	98.6	98.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

CUMULATIVE FREQUENCIES FOR VISIBILITY, DETECTOR, MIRACL AND RAINRATE PARAMETERS (PERCENT)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
VIS <= 1.0	.02	.08	.18	.10	.23	.03	.06	.04	.18	.04	.01	0.00
DET >= 0.8	.59	.65	.44	.23	.16	.28	.02	.11	.45	1.26	.65	.97
MIR >= .28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	.19	0.00	0.00	0.00	0.00
RNR >= 2.0	1.40	.91	.42	.23	.03	.08	.02	.11	.96	1.84	1.06	2.64

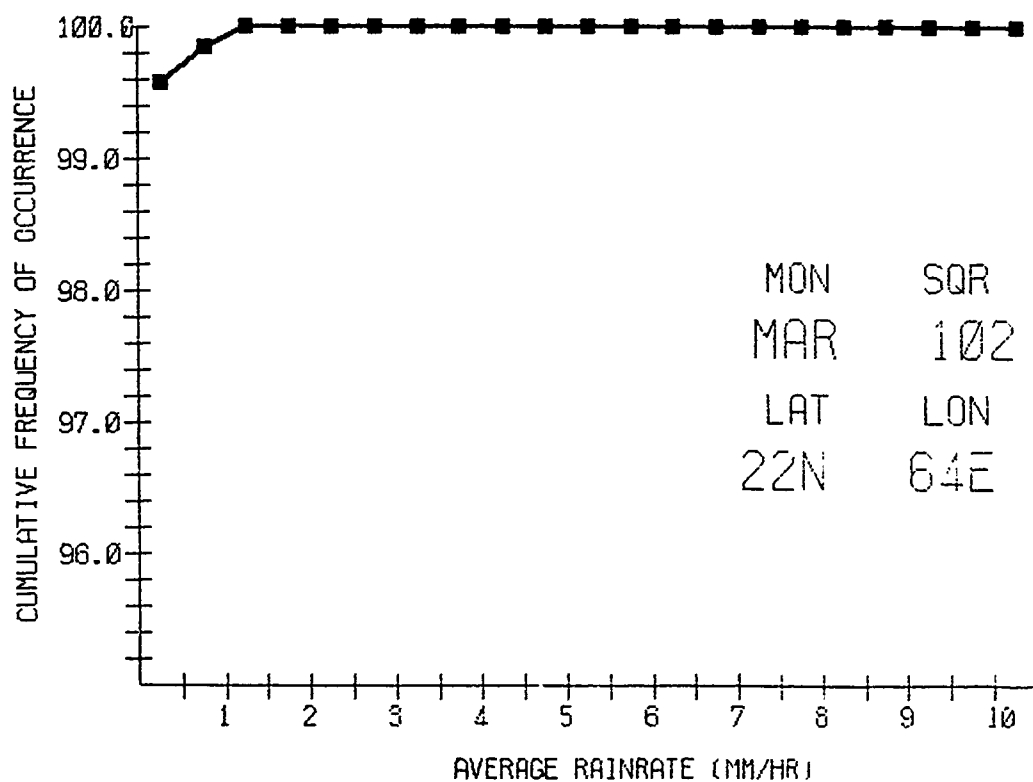
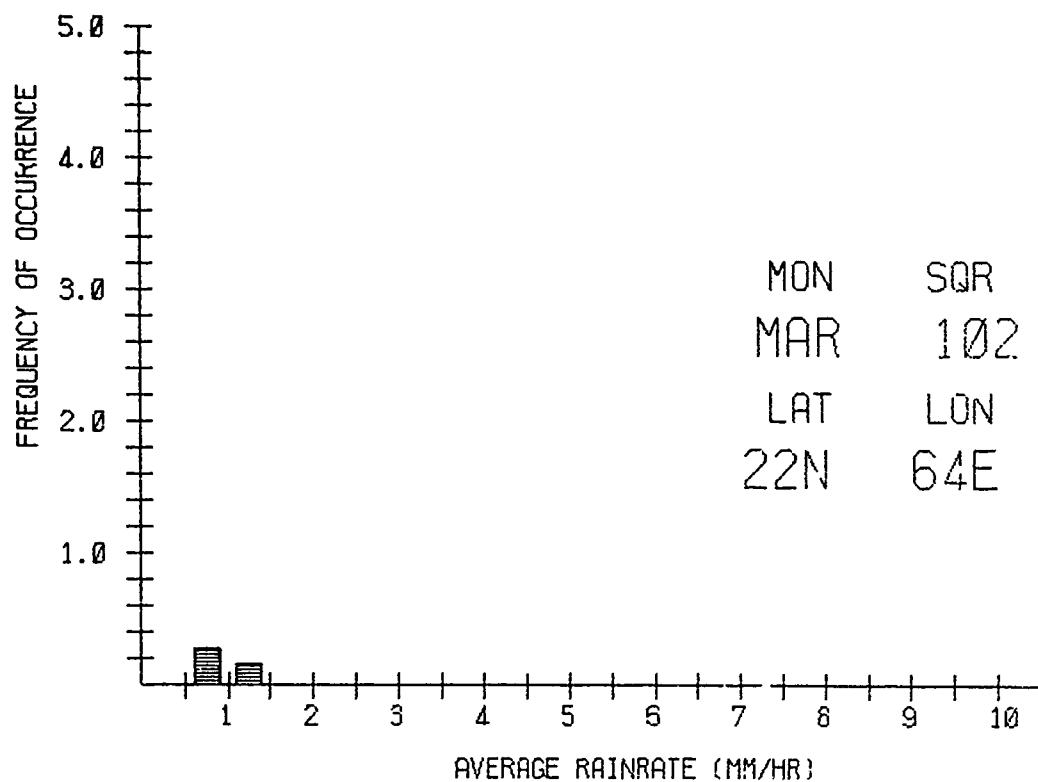
MARSDEN SQUARE 144	QUADRANT 1	MEAN LAT 36.6	SD LAT 2.2	MEAN LON 4.9	SD LON 2.9	SUBSQUARES 58	OBSERVATIONS 54721													
DISTRIBUTION OF RAINRATE FREQUENCIES (PERCENT)																				
MONTH	<1.0	<1.5	<2.0	<2.5	<3.0	<3.5	<4.0	<4.5	<5.0	<5.5	<6.0	<6.5	<7.0	<7.5	<8.0	<8.5	<9.0	<9.5	<10.0	>=10.0
JAN	96.0	1.9	.4	.5	.3	.1	.0	.2	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
FEB	96.5	1.7	.9	.5	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
MAR	98.2	.7	.8	.1	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
APR	95.1	4.0	.5	.1	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
MAY	98.3	.8	.4	.3	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
JUN	98.5	1.1	.2	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
JUL	99.7	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
AUG	99.3	.5	.1	.0	.3	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SEP	97.5	1.5	.2	.1	.1	.3	.1	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
OCT	97.6	1.4	.1	.1	.3	.2	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
NOV	96.2	1.5	.2	.6	.7	.1	.1	.1	.5	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
DEC	94.7	2.2	1.2	1.0	.3	.1	.3	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

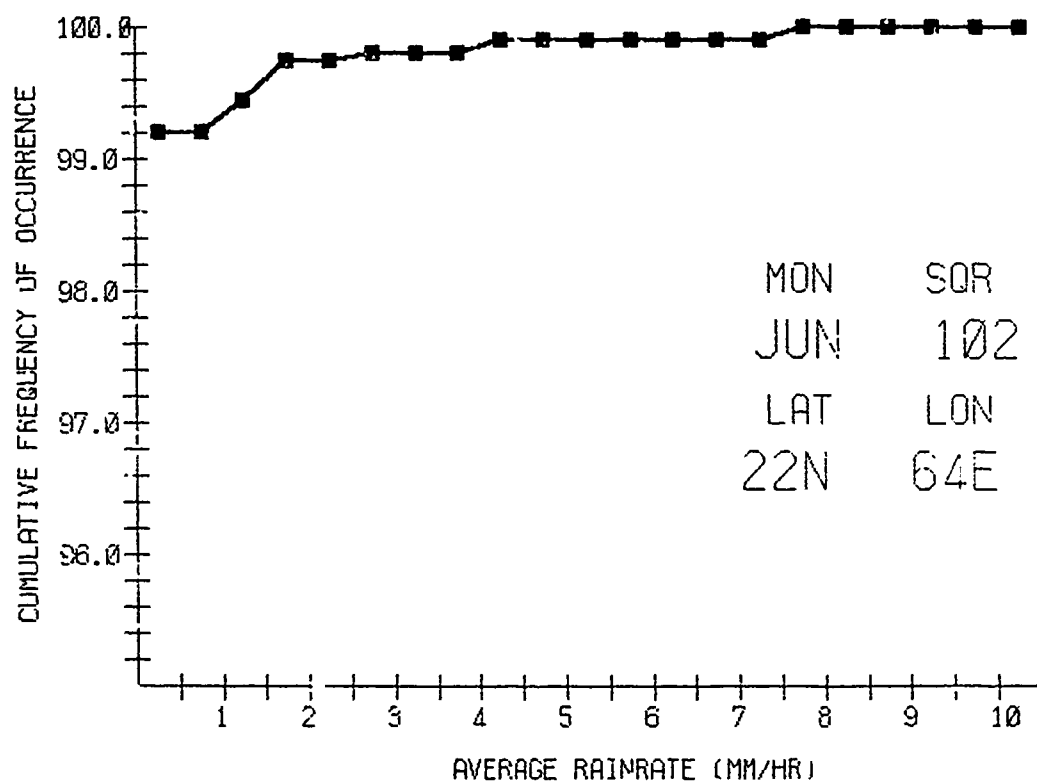
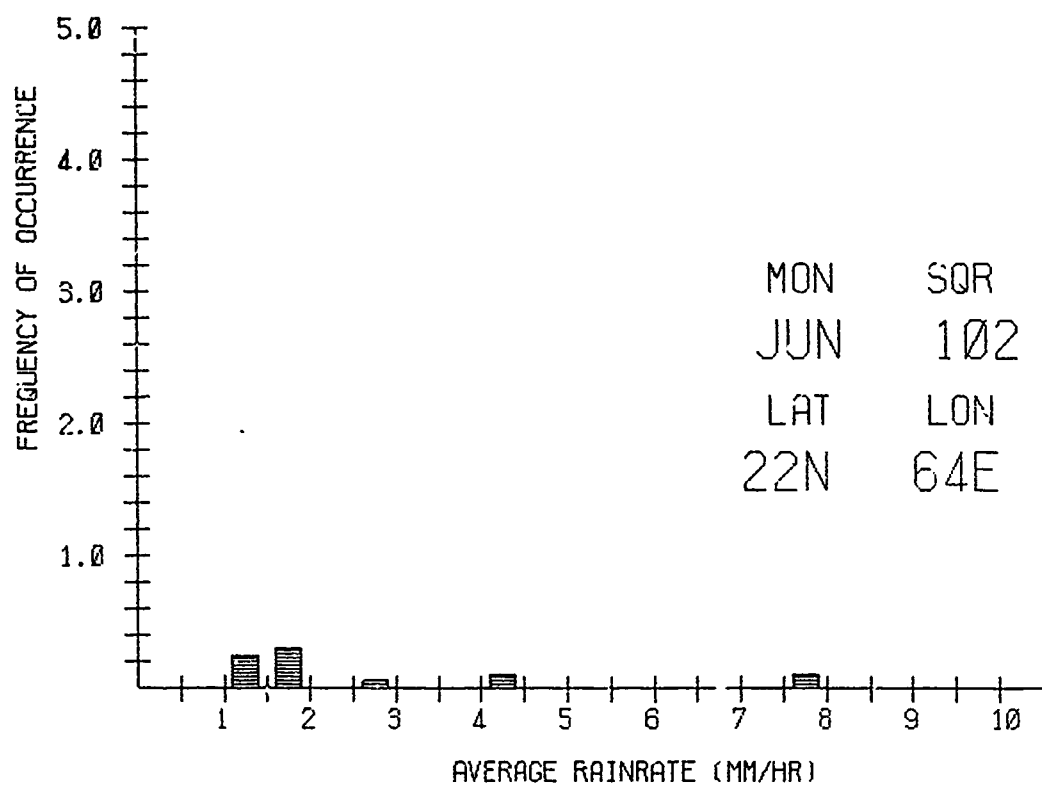
RAINRATE CUMULATIVE FREQUENCIES (PERCENT)

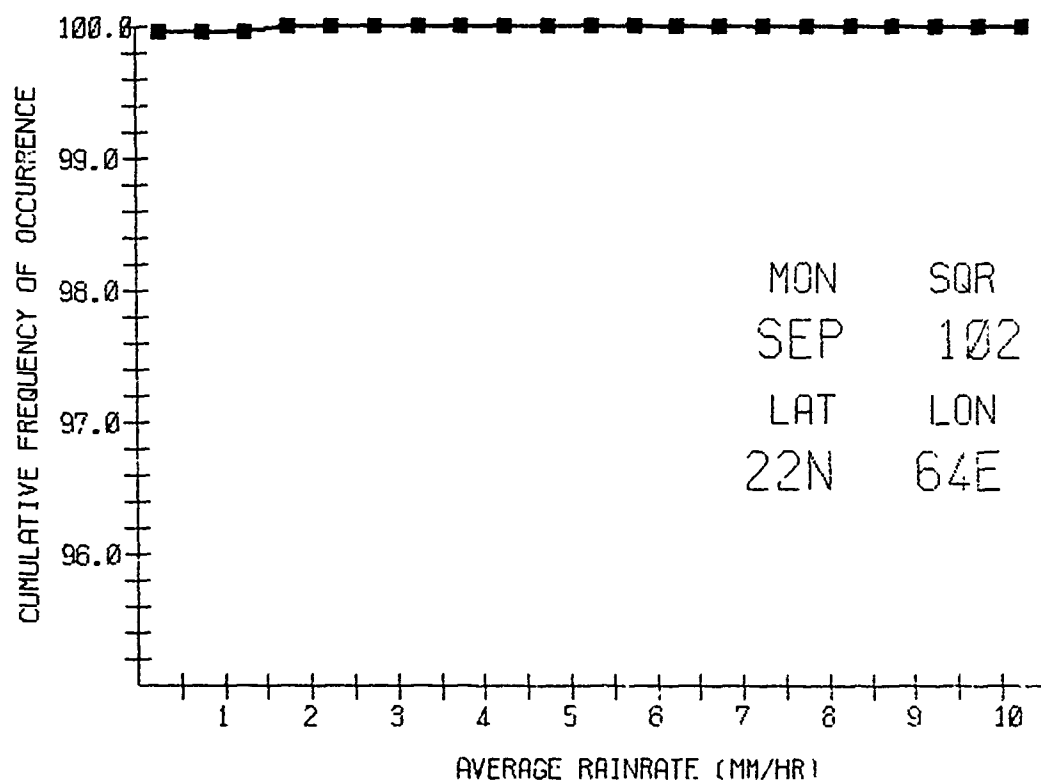
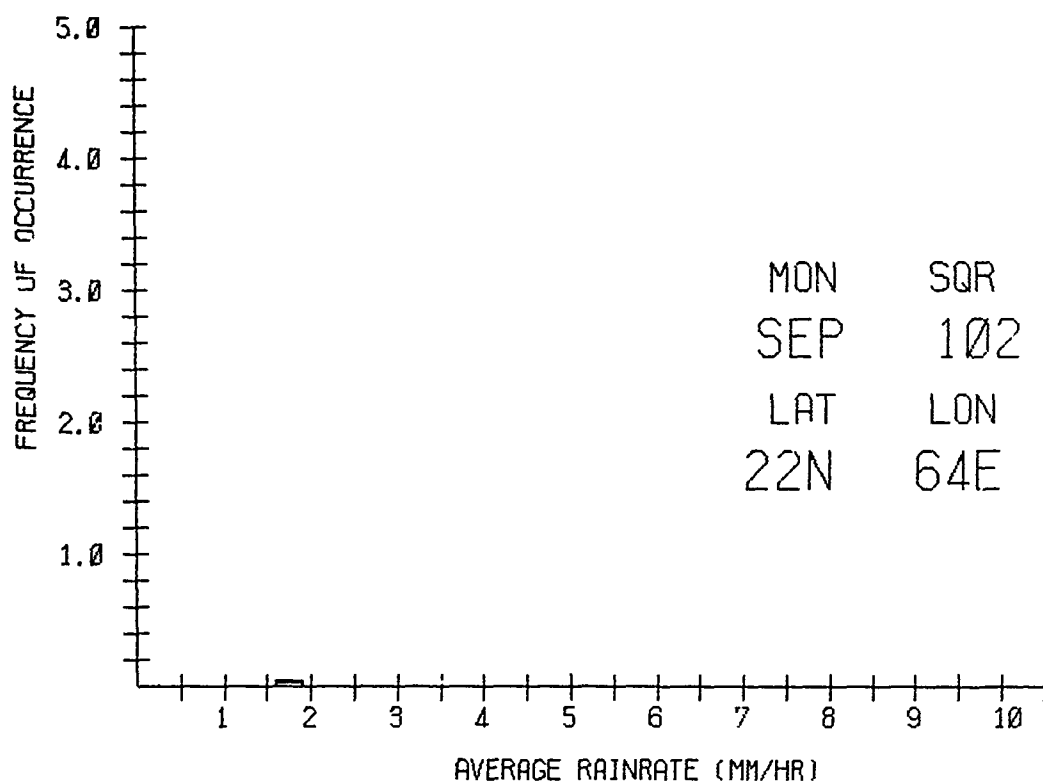
JAN	96.0	97.9	98.3	98.8	99.1	99.2	99.2	99.4	99.5	99.9	99.9	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
FEB	96.5	98.2	99.1	99.6	99.7	99.8	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
MAR	98.2	98.9	99.7	99.8	99.8	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
APR	95.1	99.1	99.5	99.7	99.7	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
MAY	98.3	99.1	99.5	99.8	99.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
JUN	98.5	99.6	99.8	99.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
JUL	99.7	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
AUG	99.3	99.8	99.8	99.8	99.8	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
SEP	97.5	99.1	99.3	99.3	99.5	99.7	99.8	99.8	99.8	99.9	99.9	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
OCT	97.6	98.9	99.0	99.1	99.5	99.7	99.8	99.8	99.8	99.9	99.9	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
NOV	96.2	97.7	97.8	98.4	99.1	99.2	99.3	99.3	99.3	99.9	99.9	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
DEC	94.7	96.9	98.1	99.1	99.4	99.5	99.6	99.6	99.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

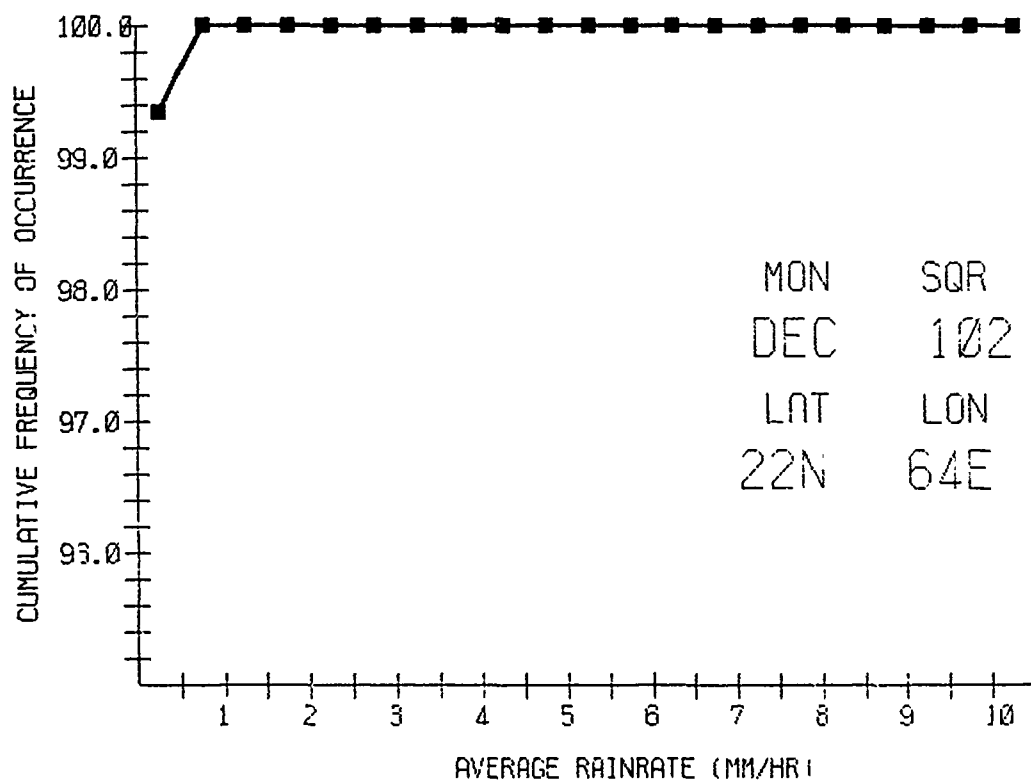
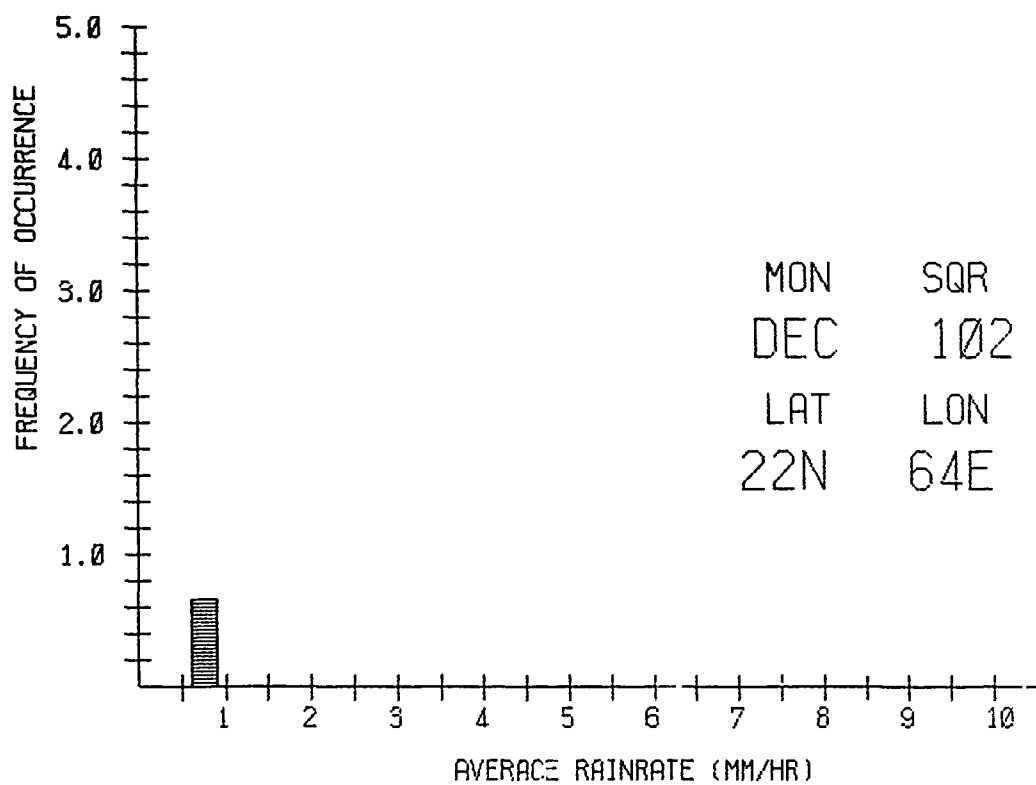
CUMULATIVE FREQUENCIES FOR VISIBILITY, DETECTOR, MIRACL AND RAINRATE PARAMETERS (PERCENT)

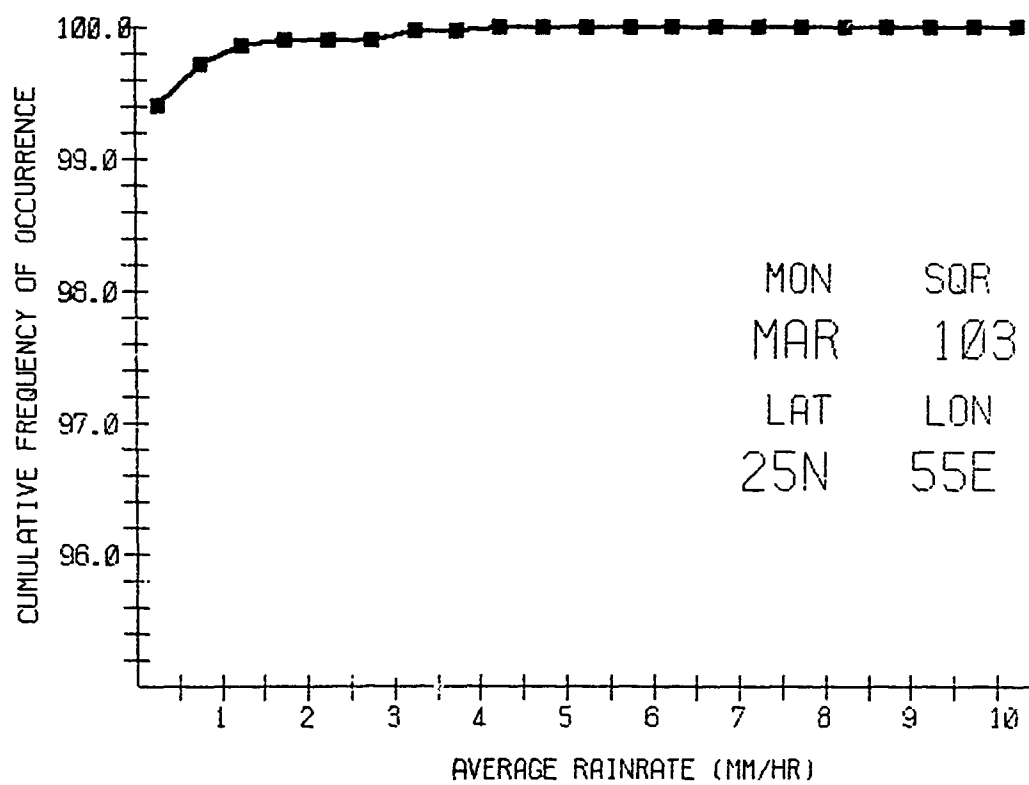
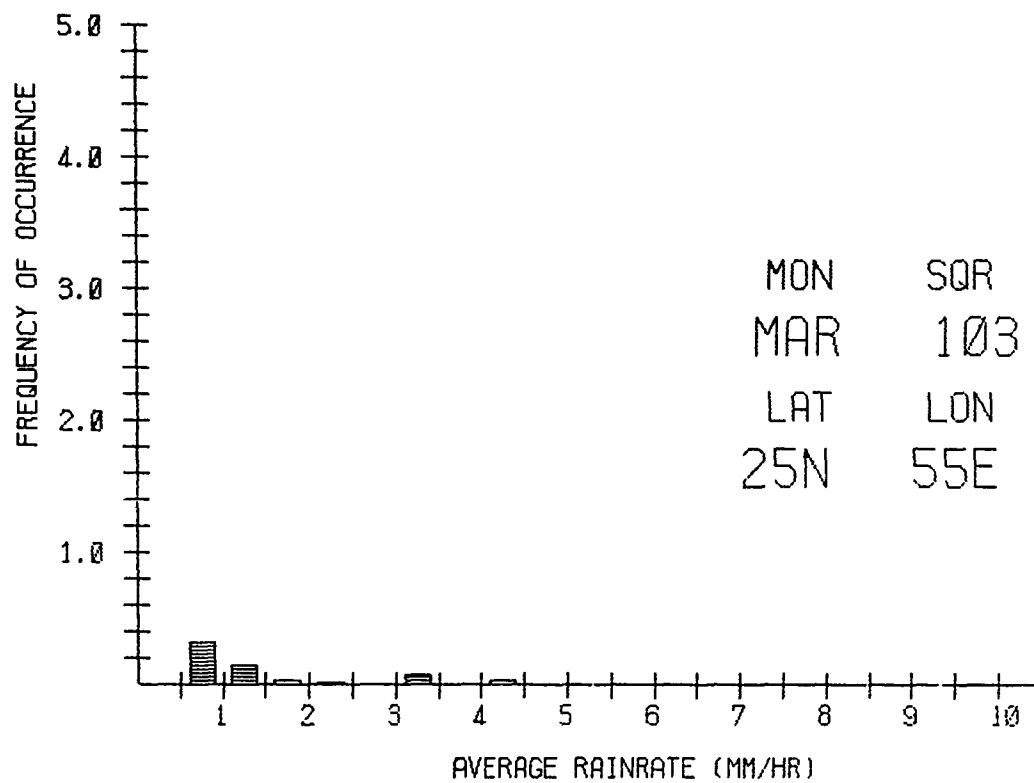
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
VIS <= 1.0	.05	.06	.03	.16	.22	.21	.13	.15	.03	1.16	0.00	.05
DET >= 0.6	.64	.3	.47	.17	.16	.17	.08	.15	.34	.48	.46	.67
MIR >= .20	0.00	0.00	0.00	0.00	0.00	.04	.08	.04	.07	0.00	0.00	0.00
RNR >= 2.0	1.21	.38	.20	.31	.19	.21	.03	.15	.67	.86	1.59	.92

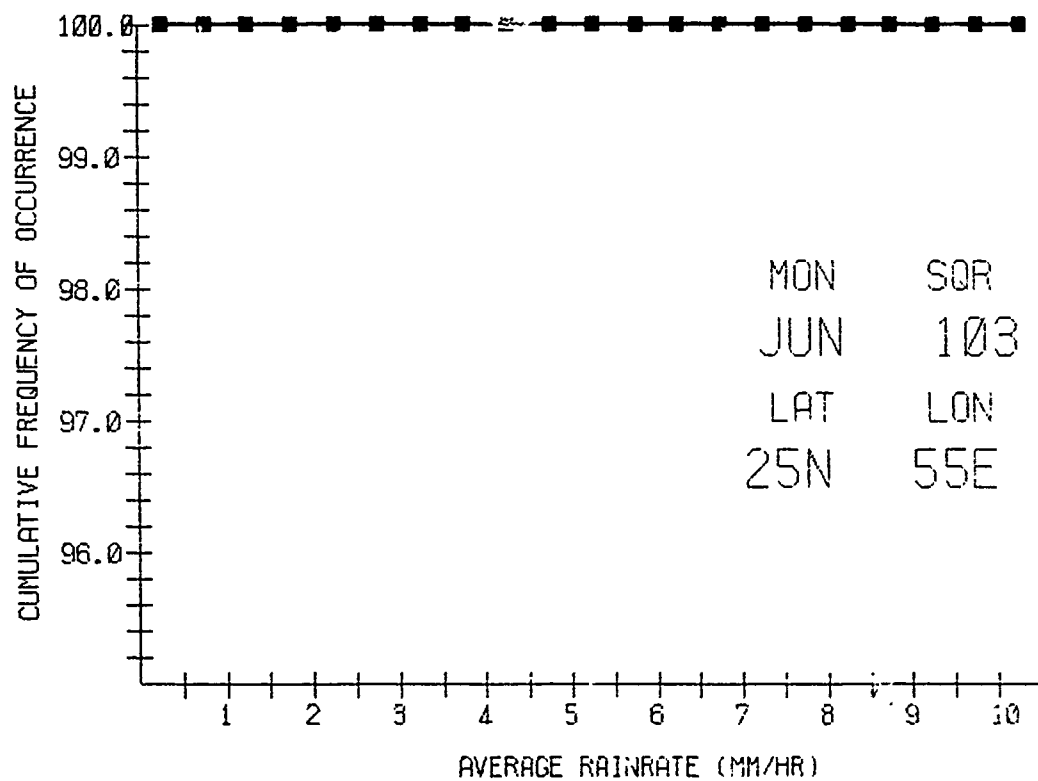
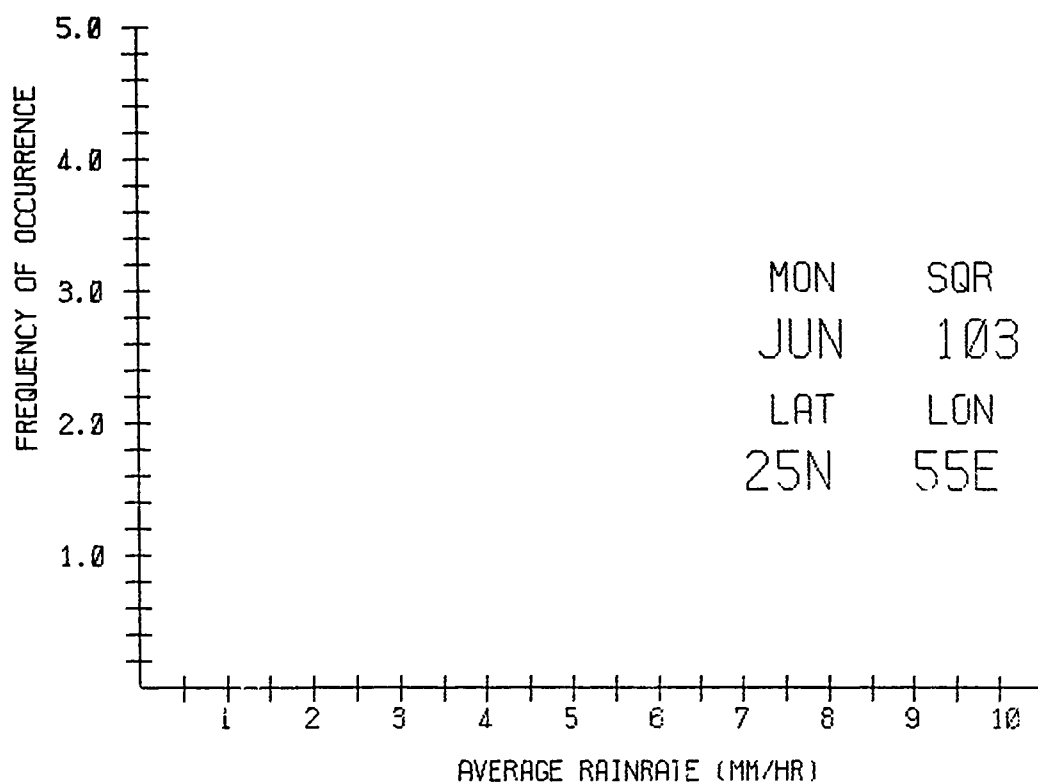


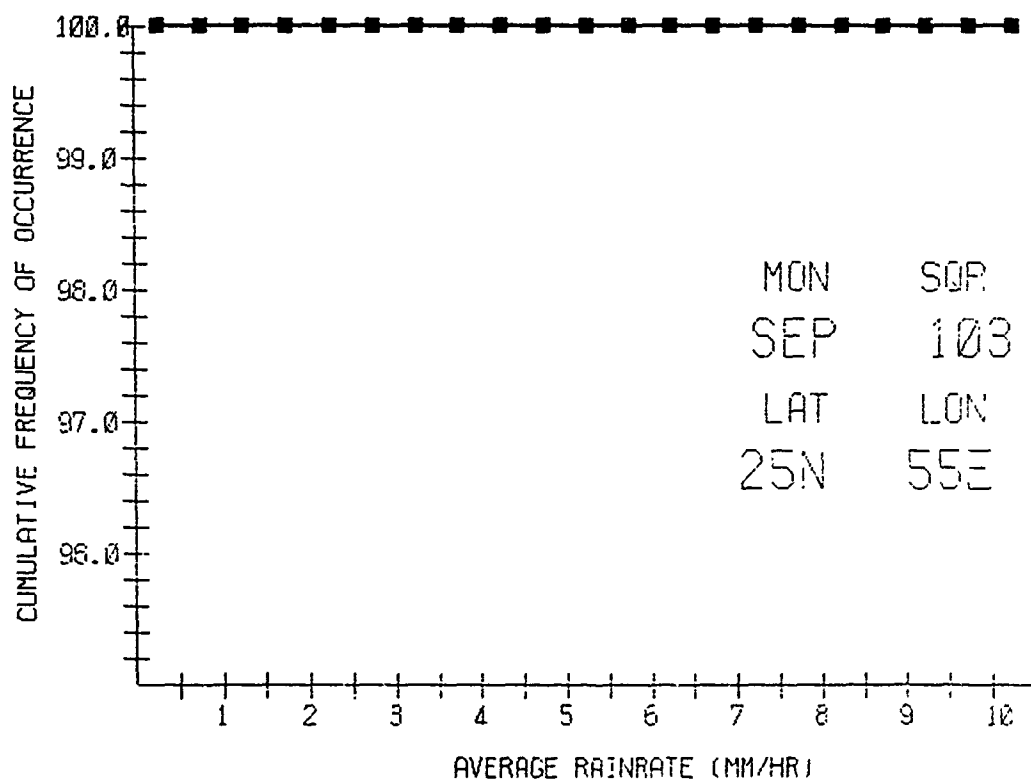
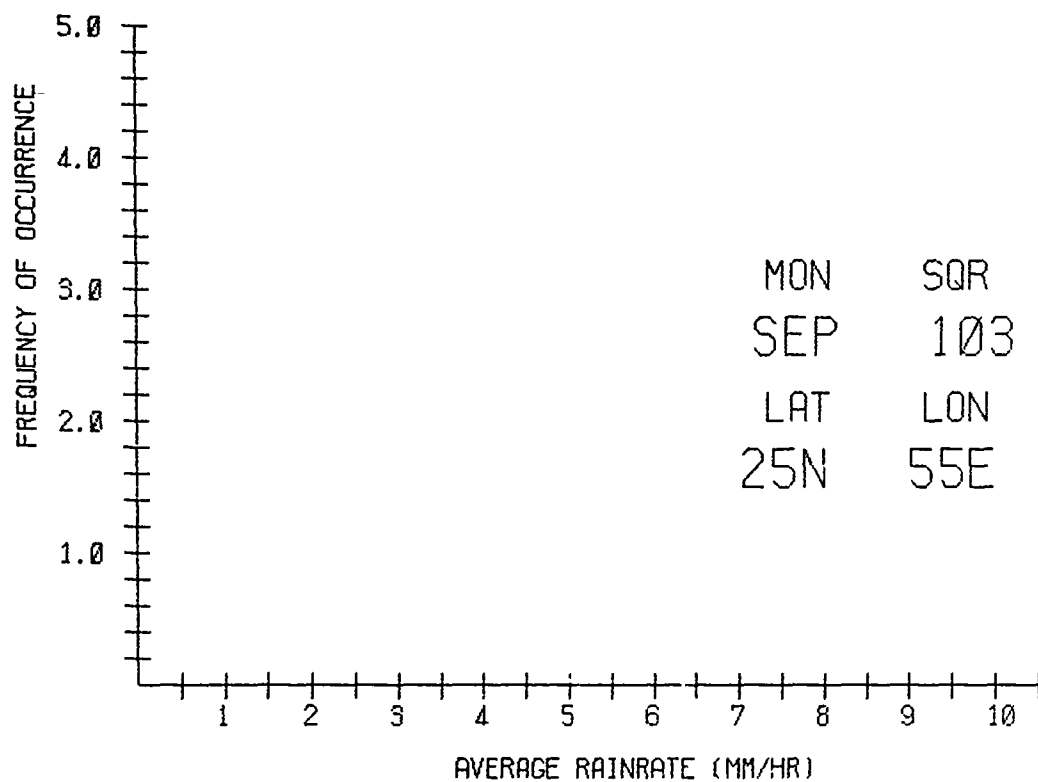


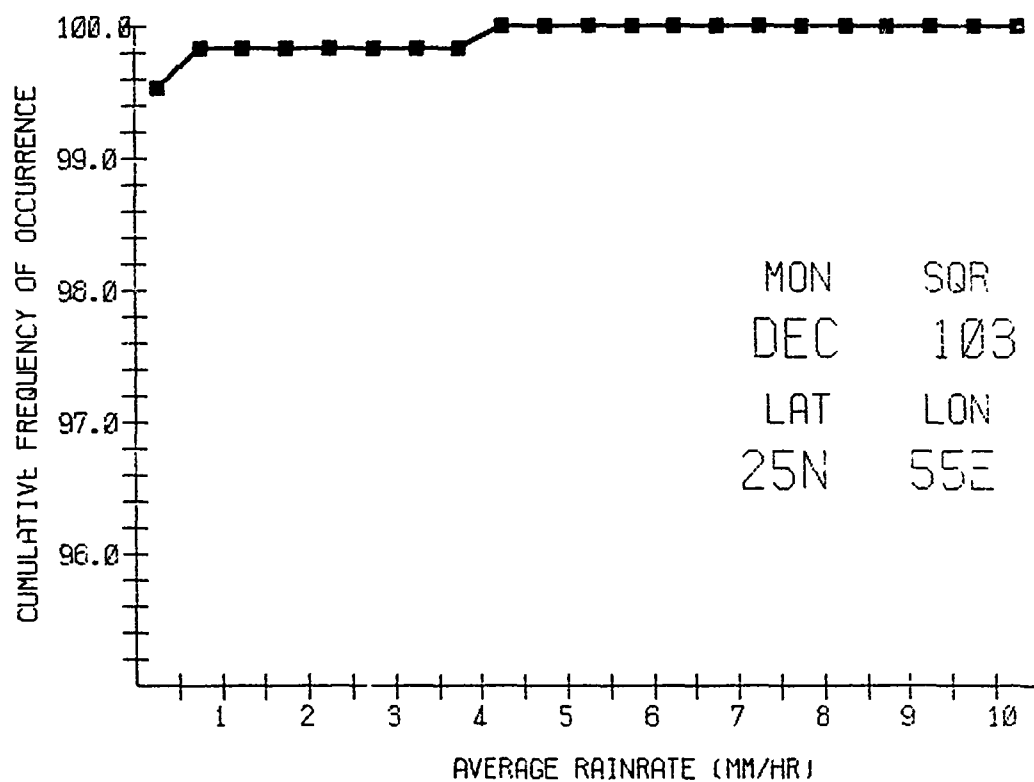
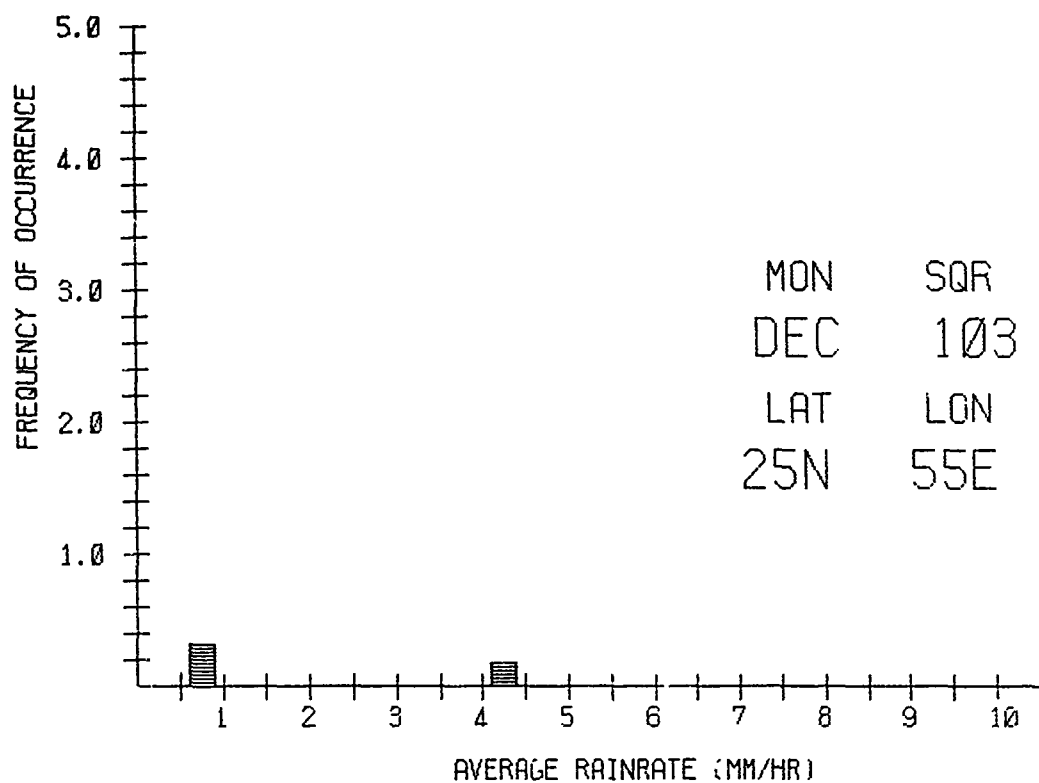


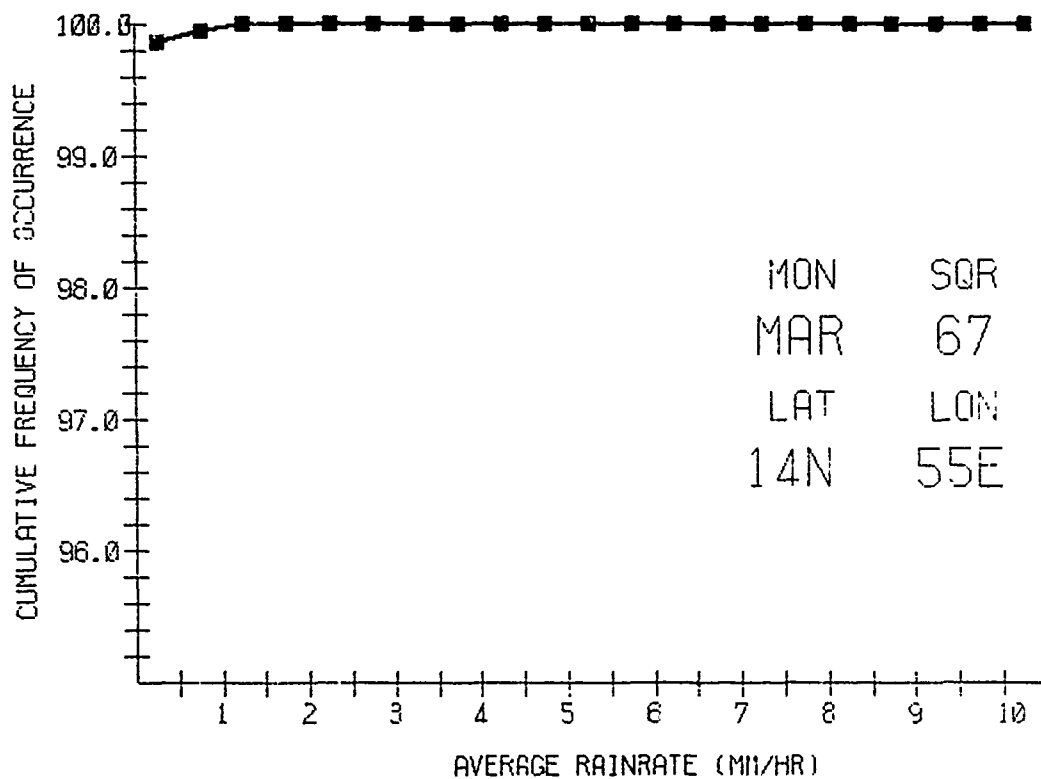
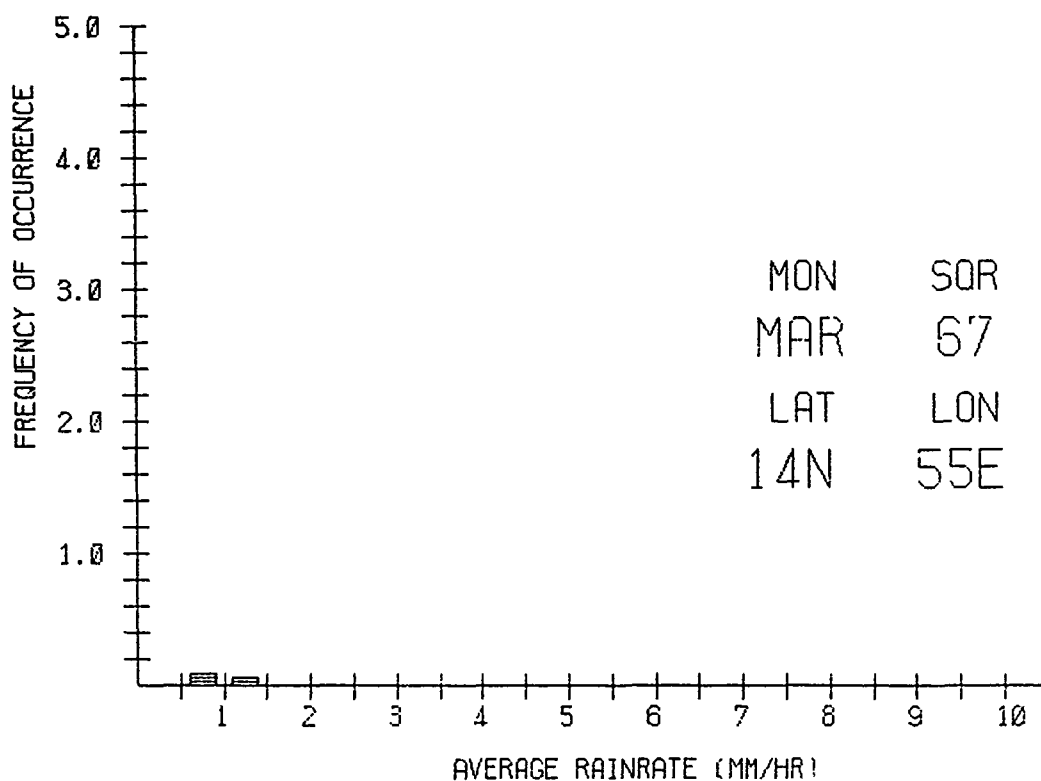


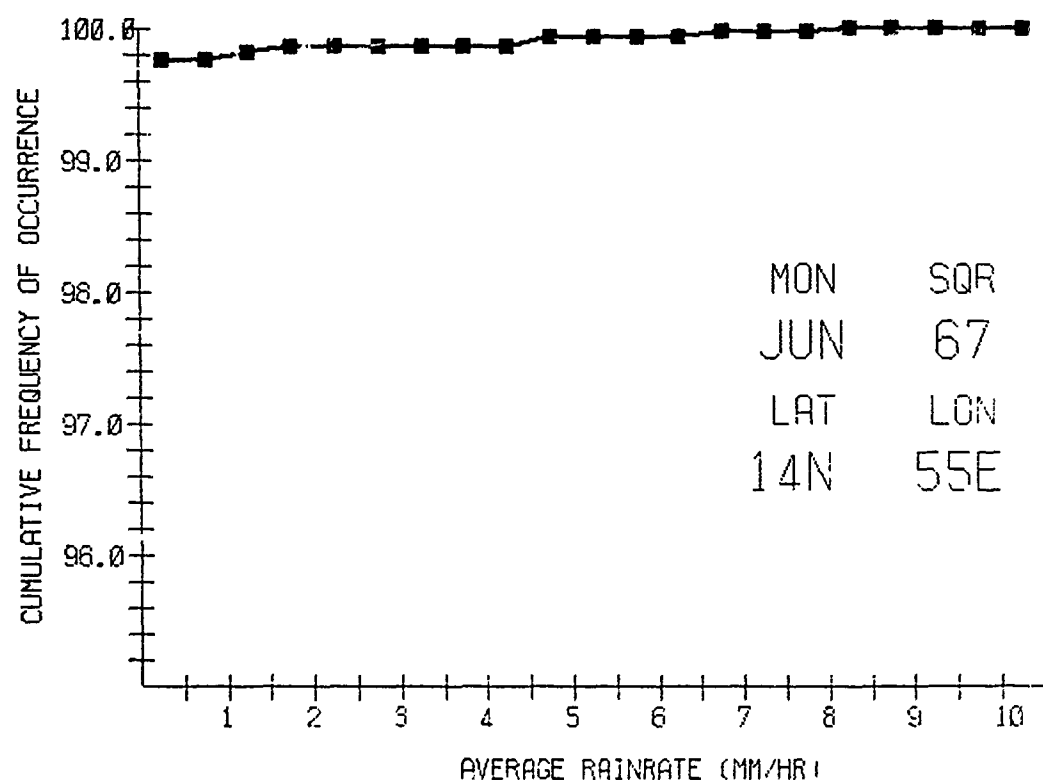
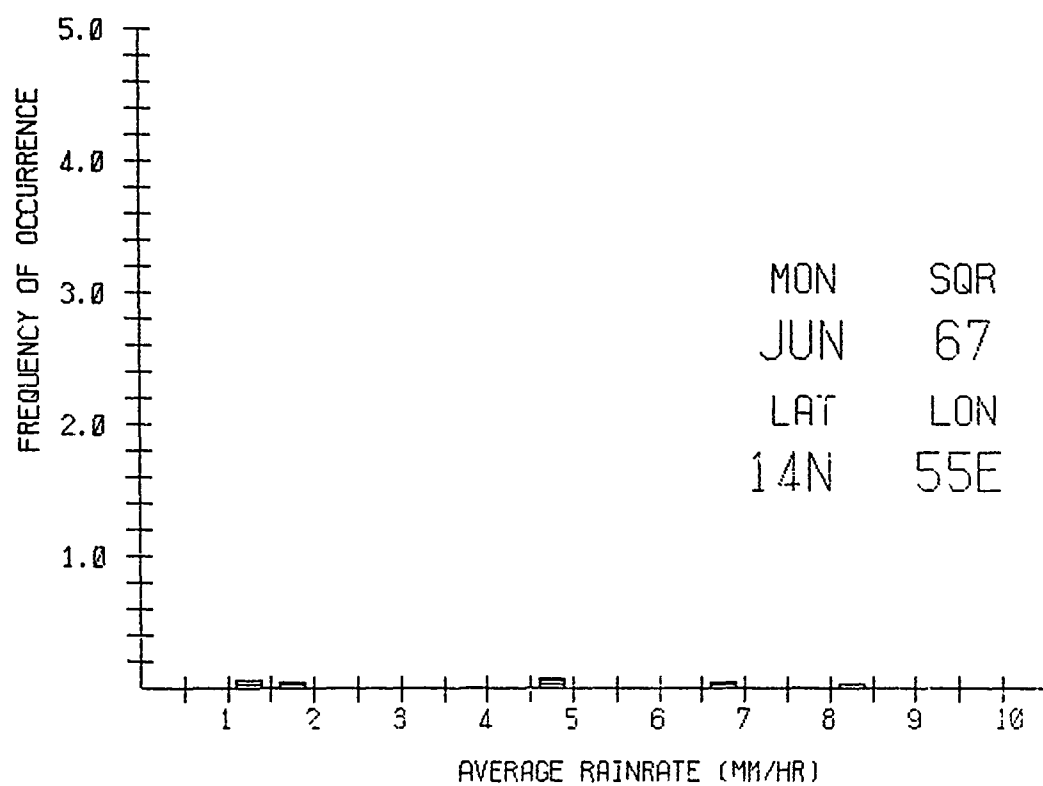


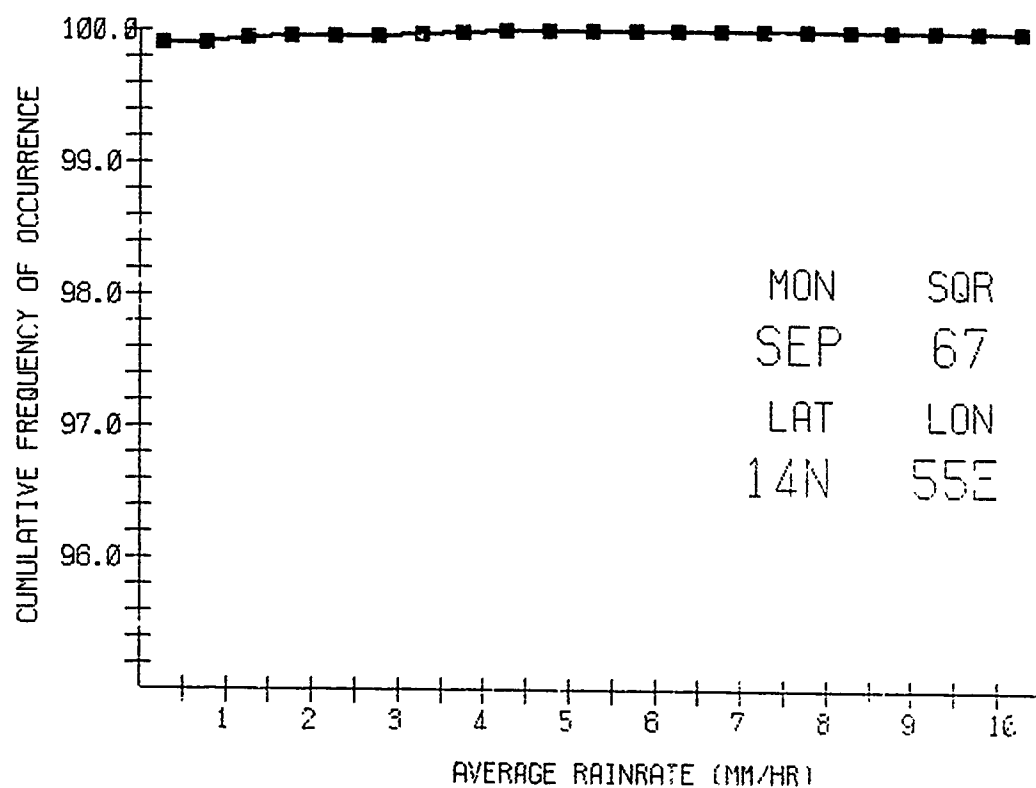
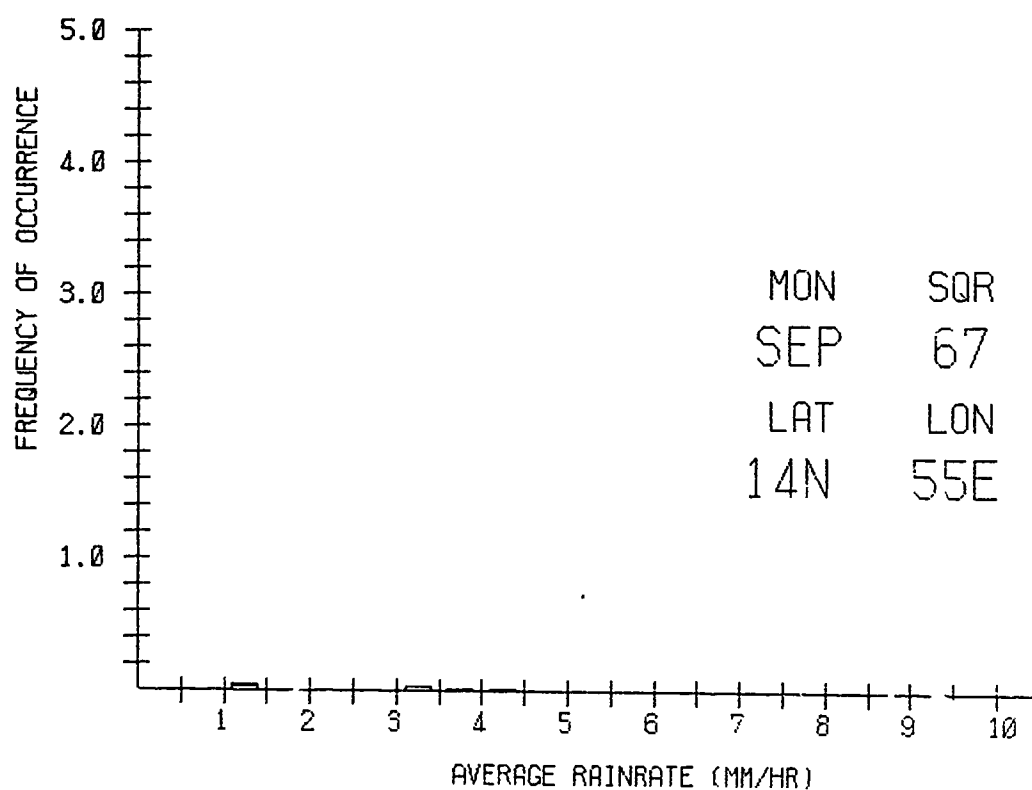


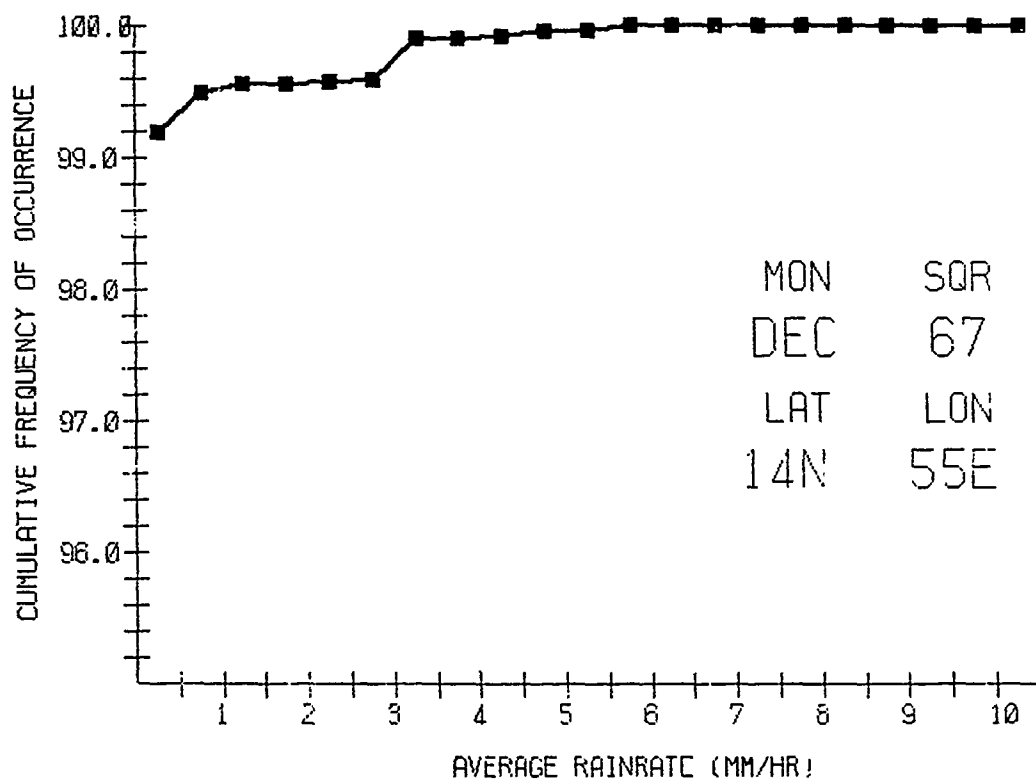
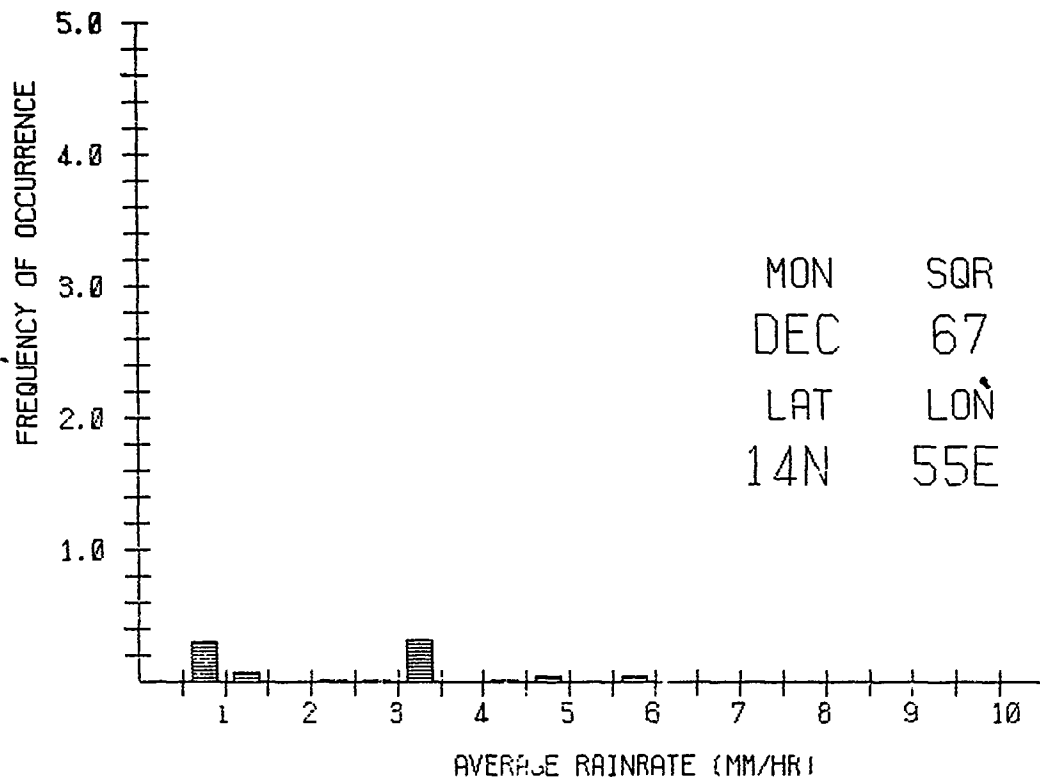


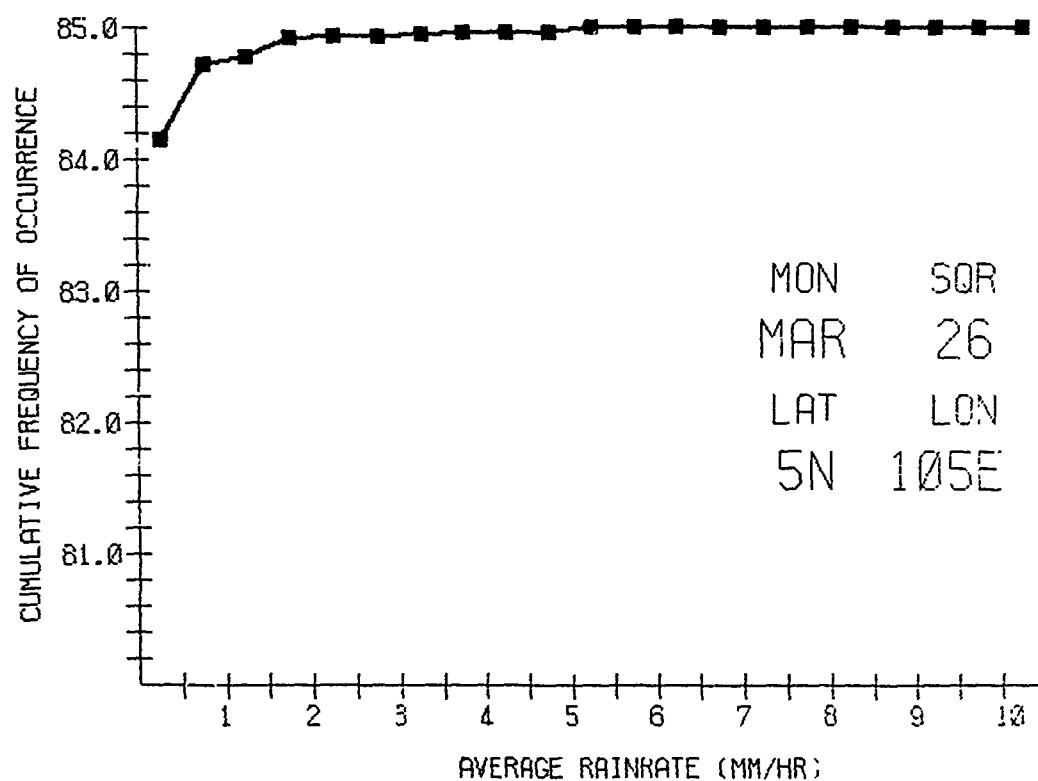
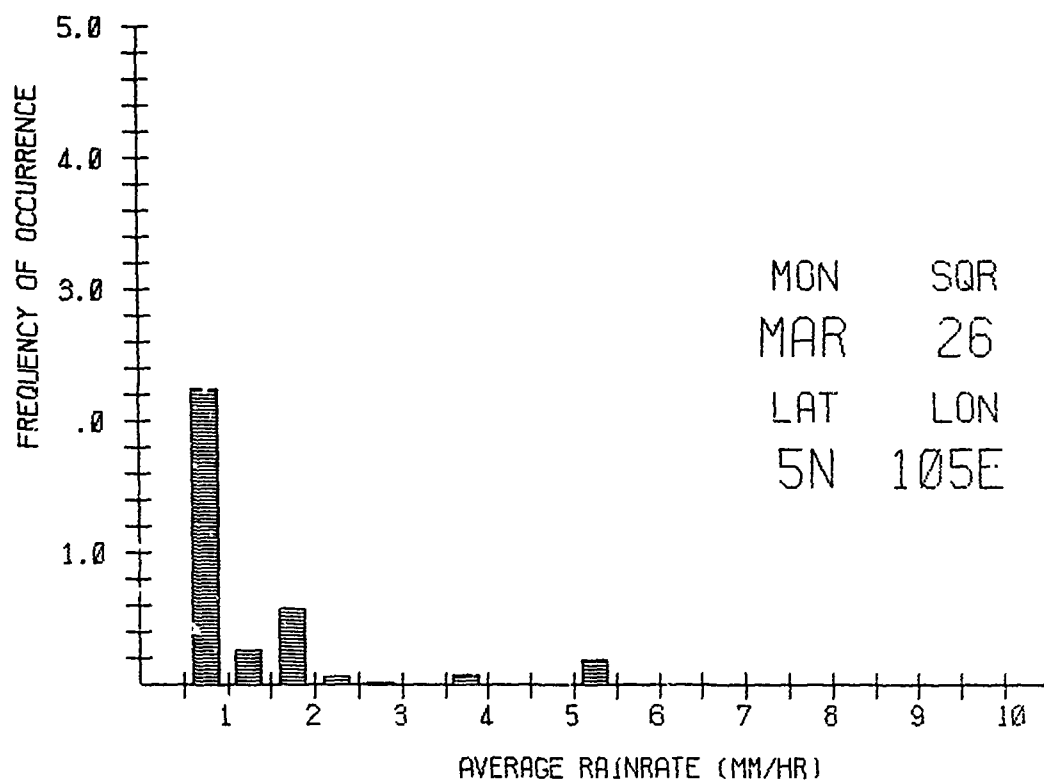


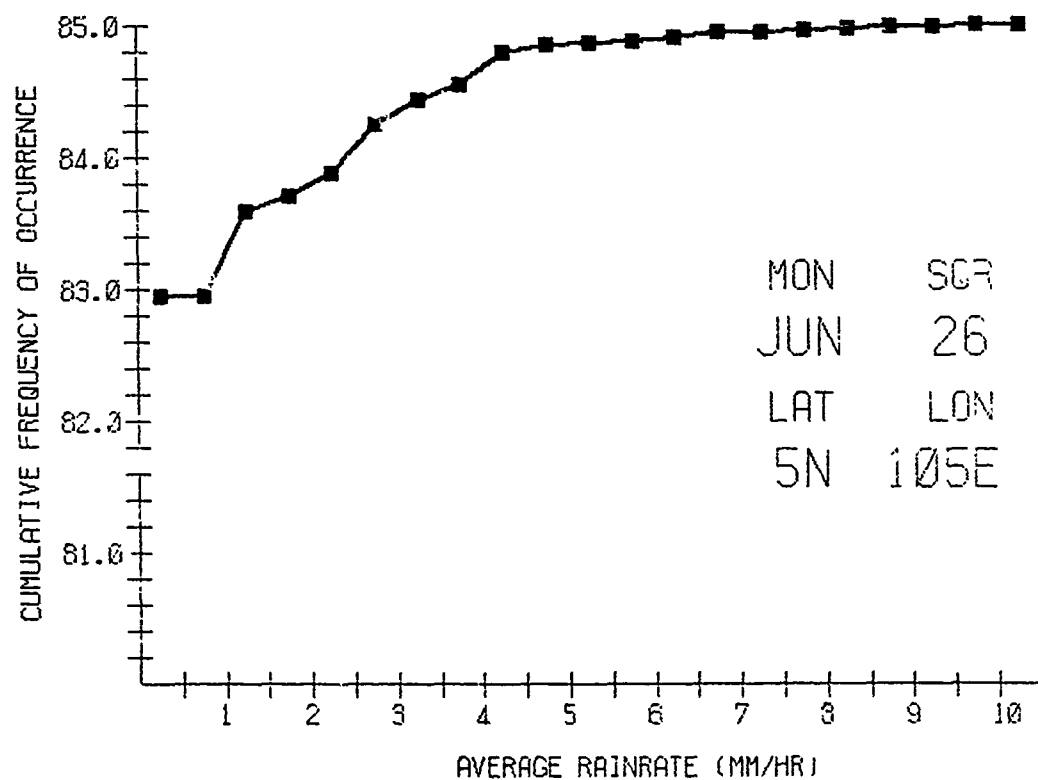
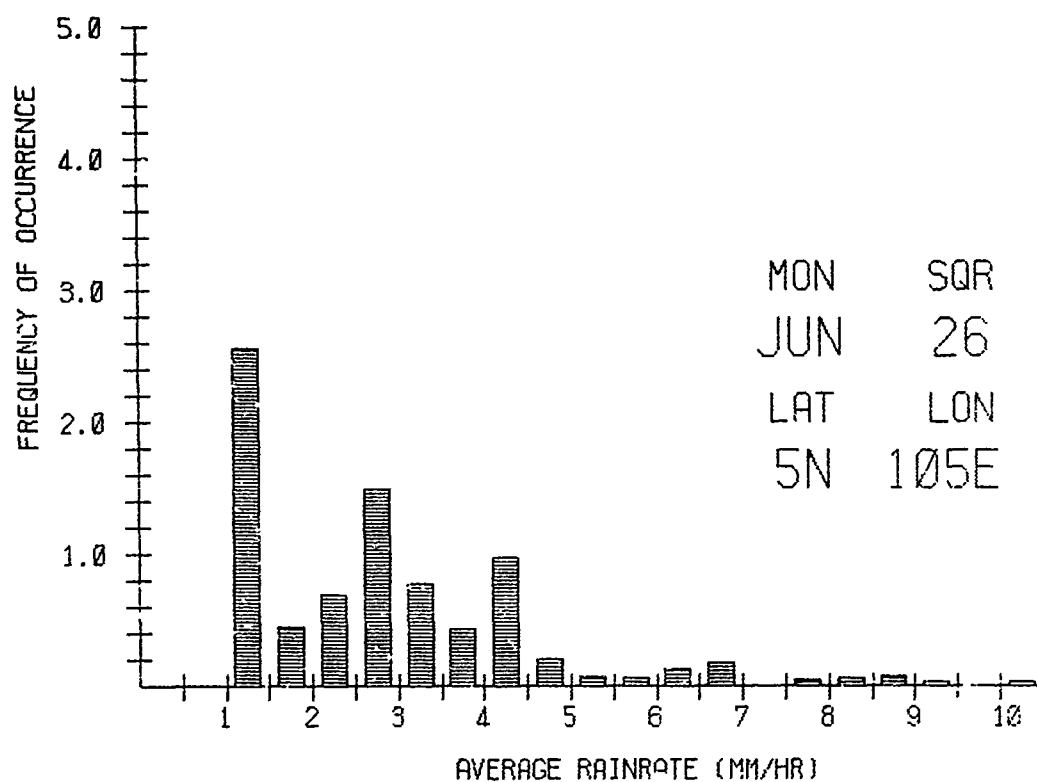


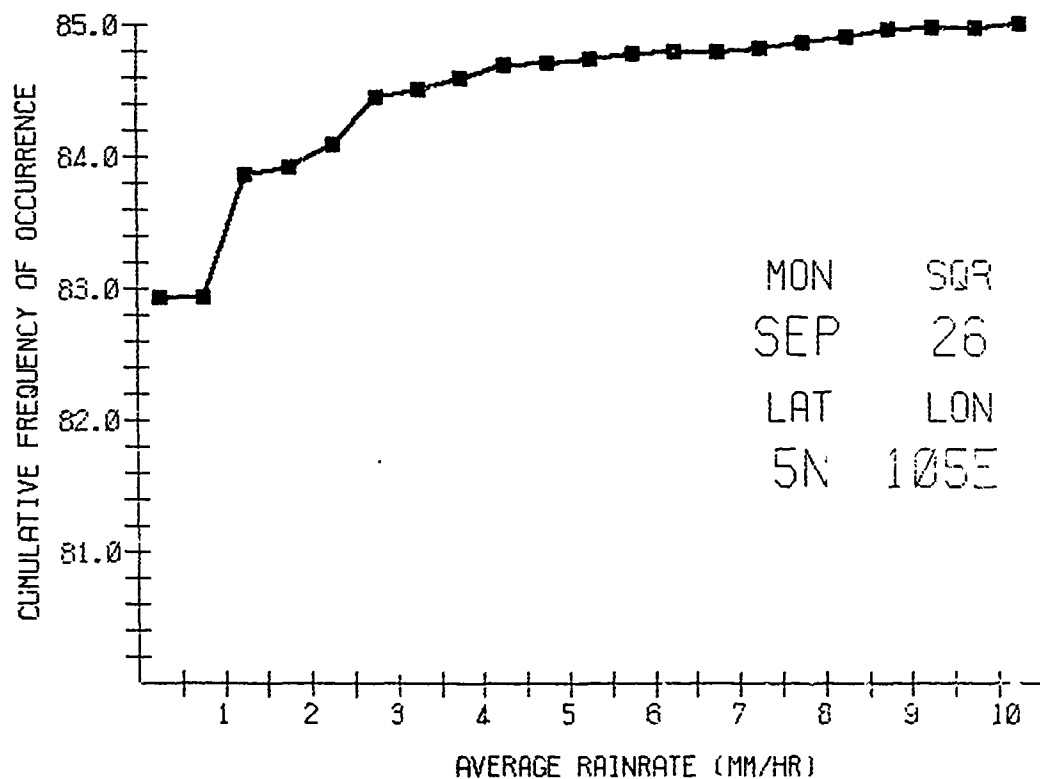
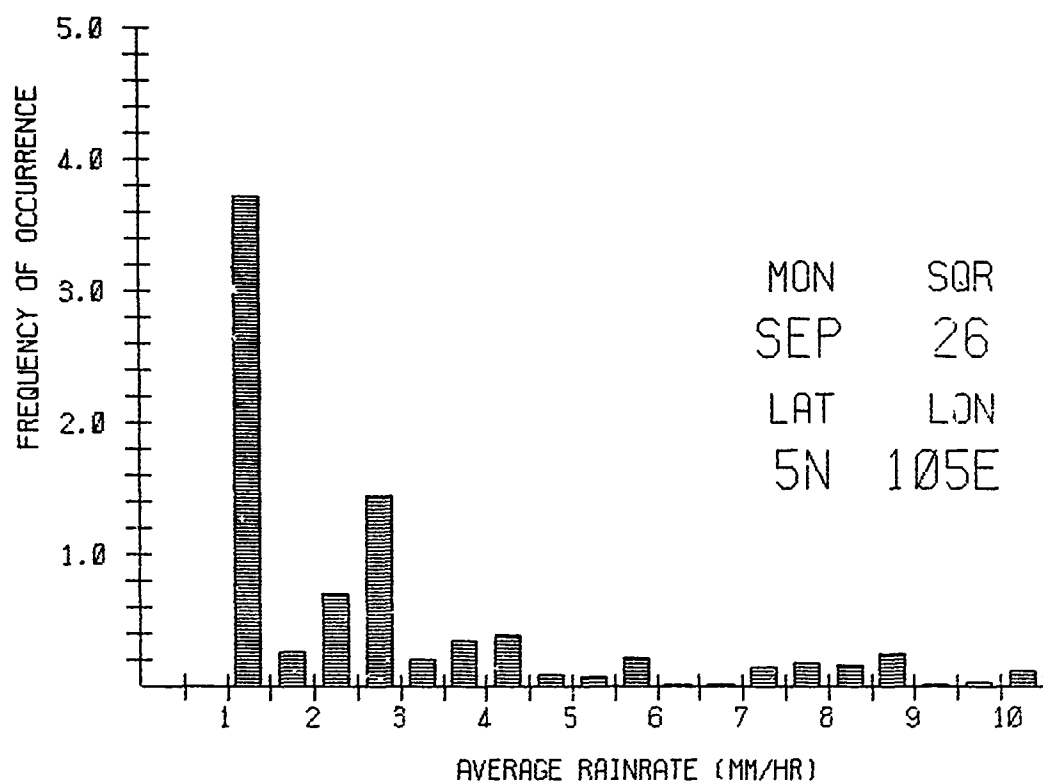


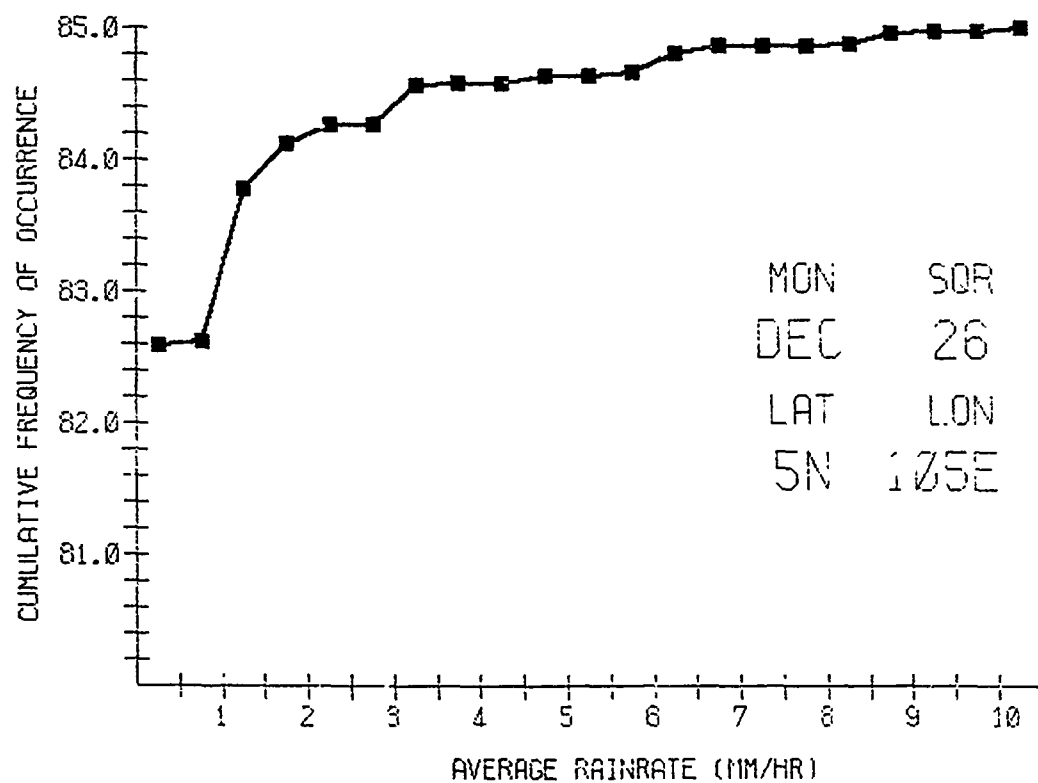
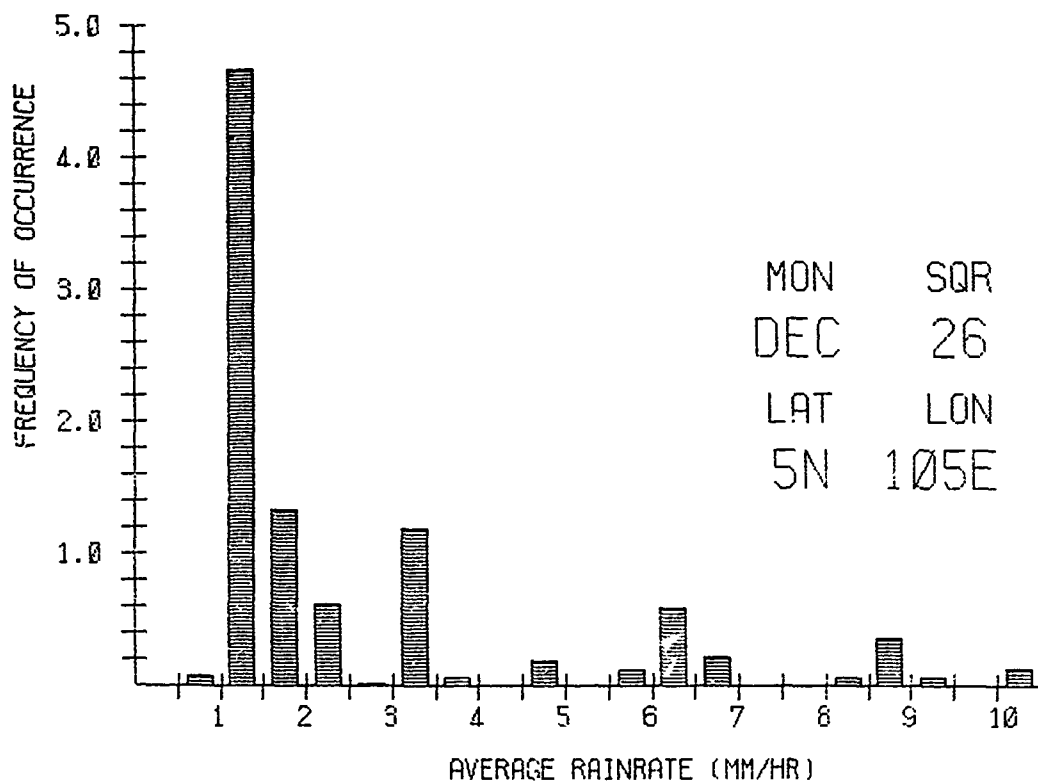


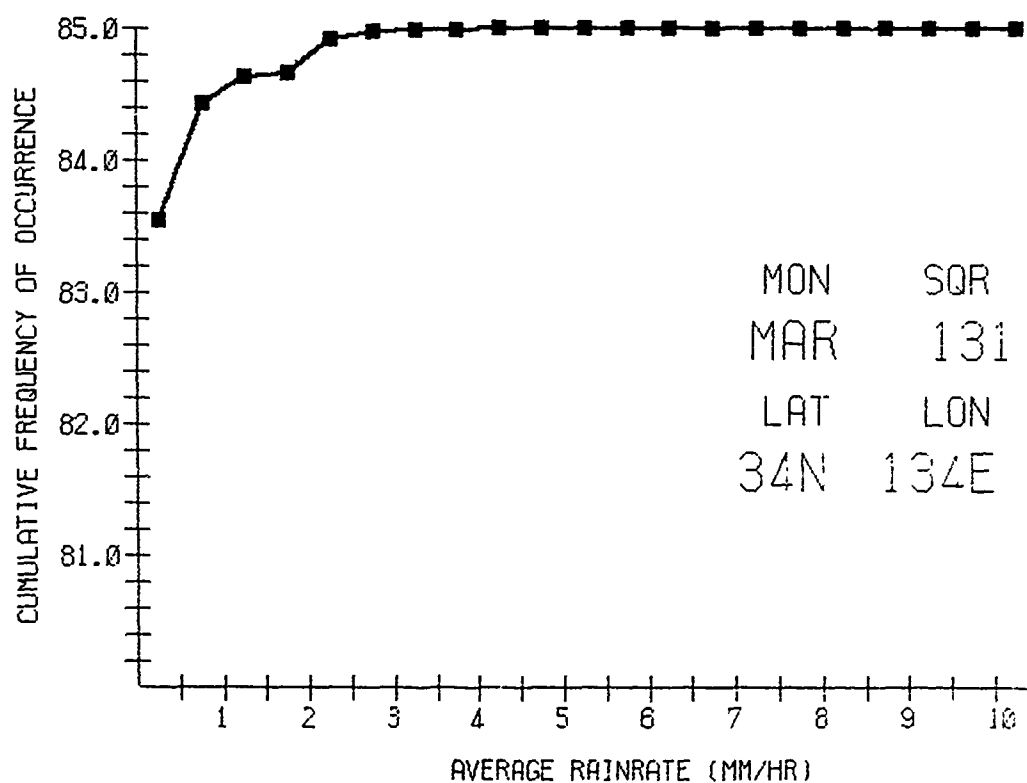
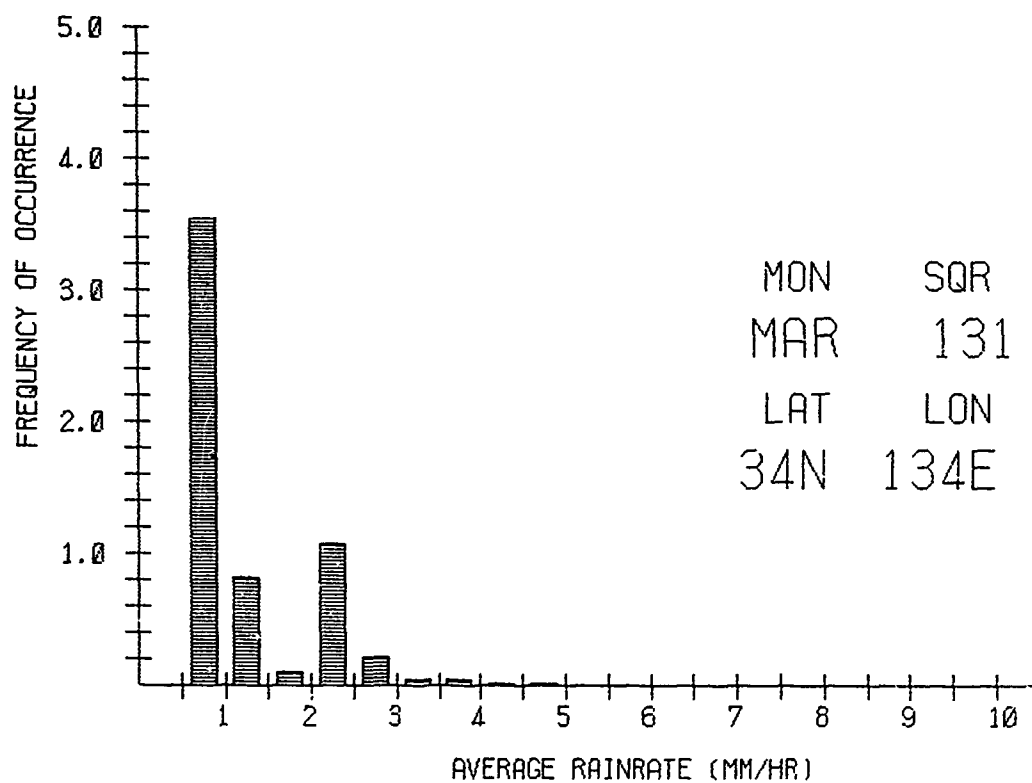


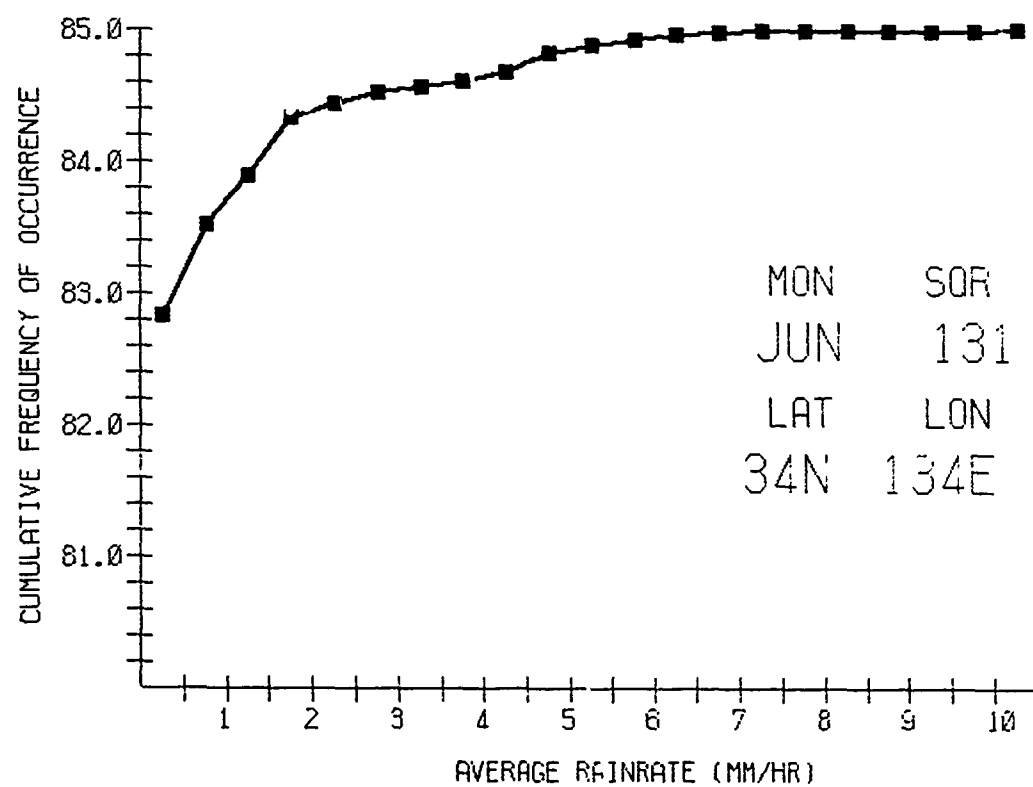
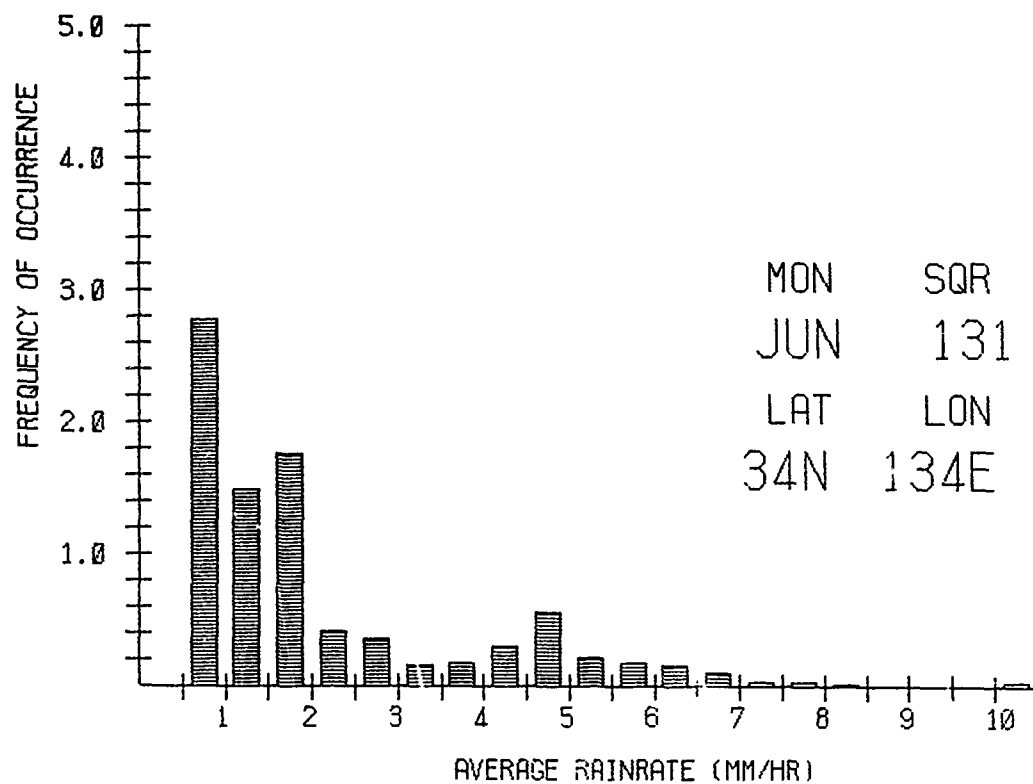


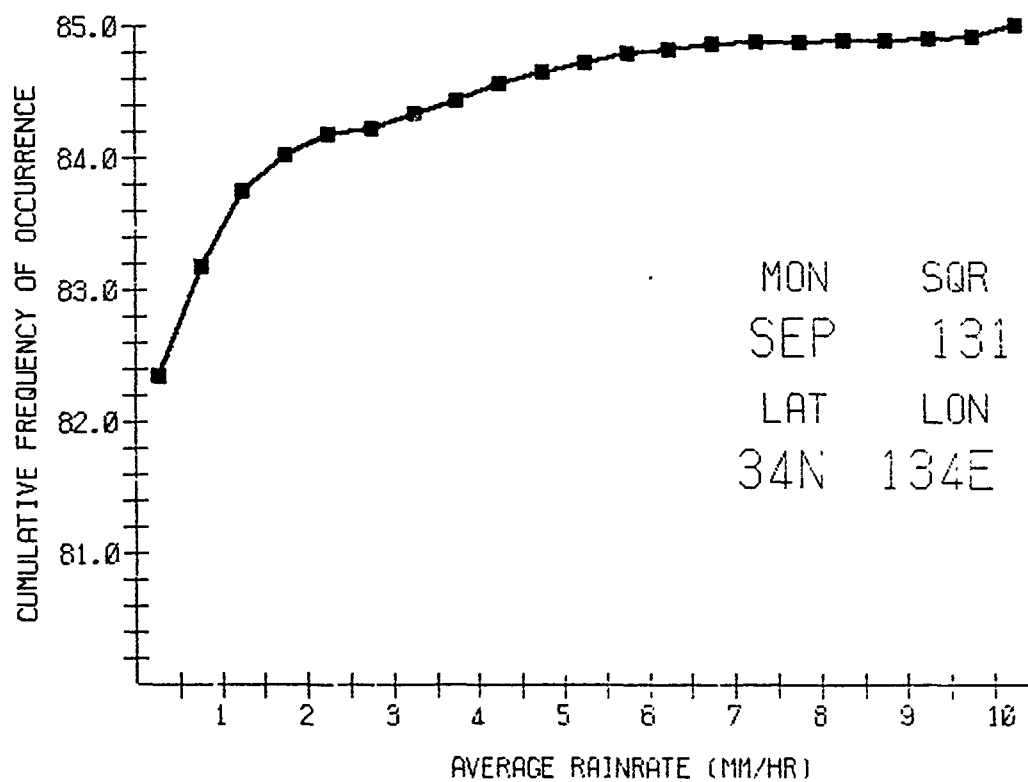
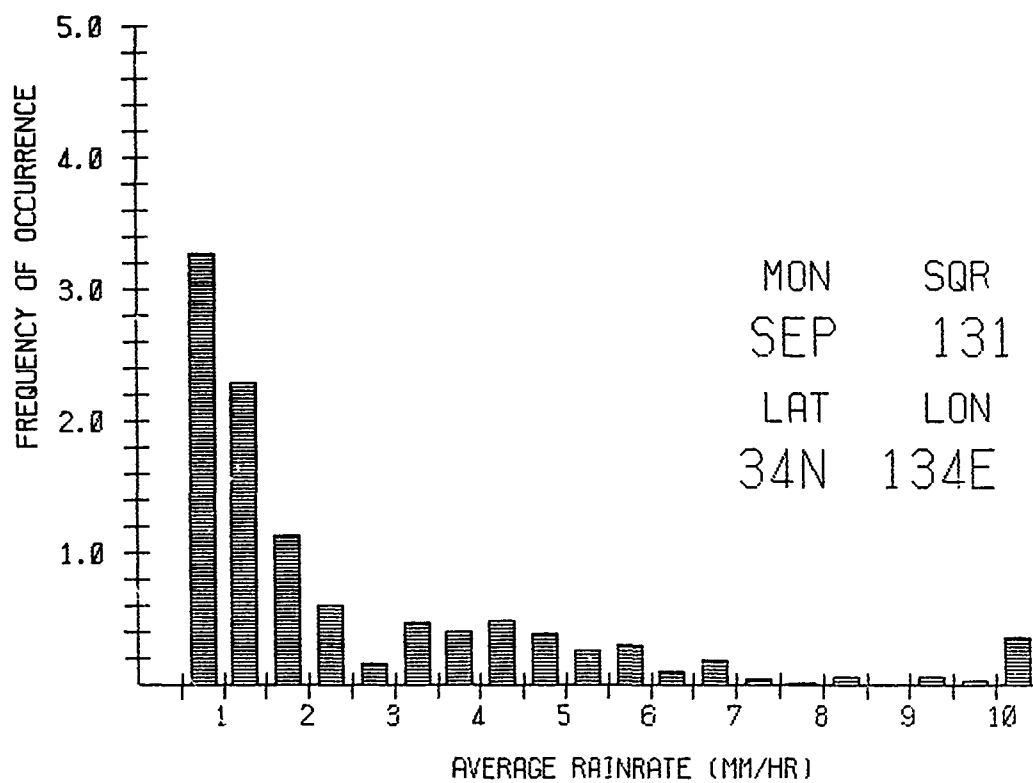


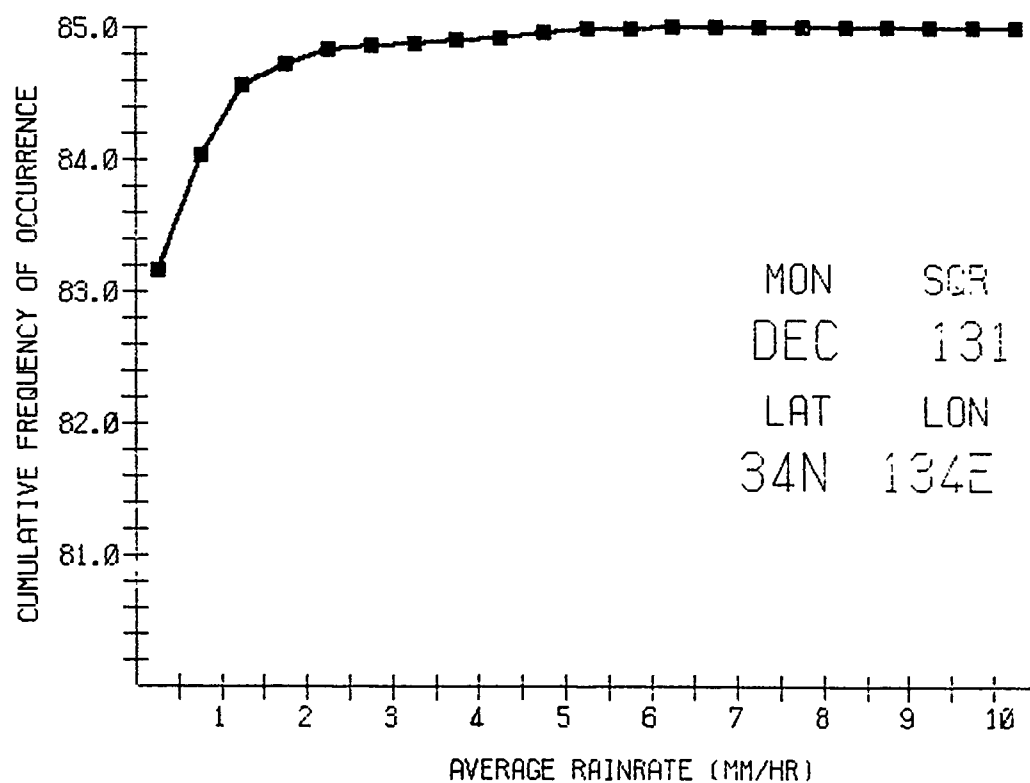
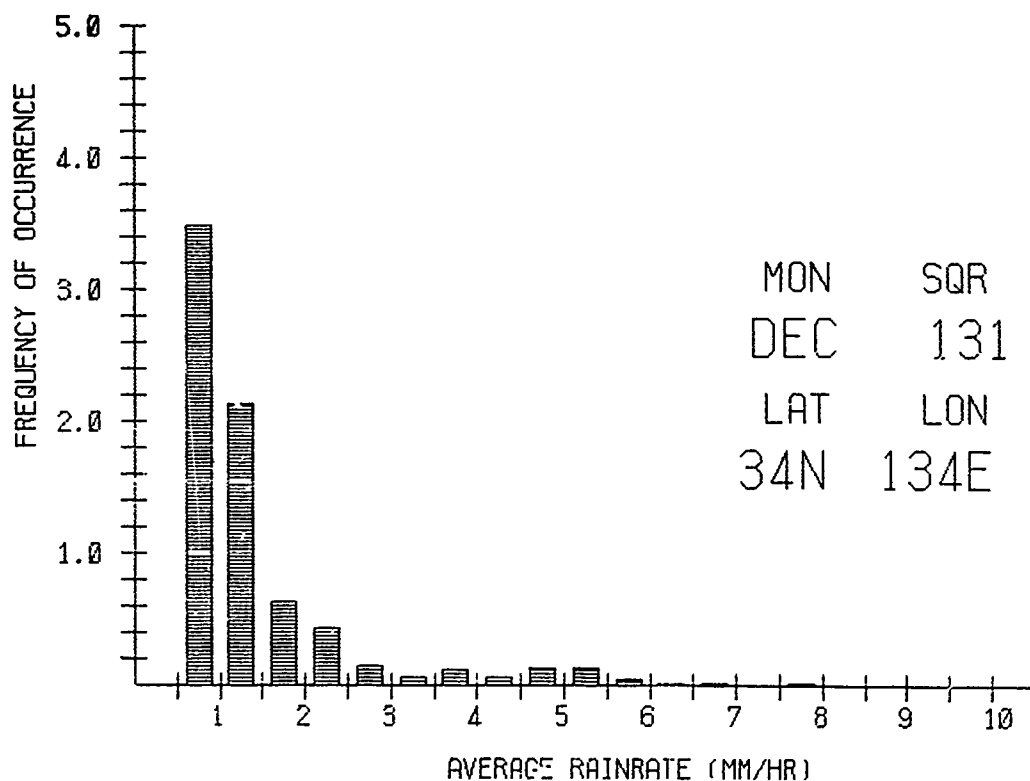


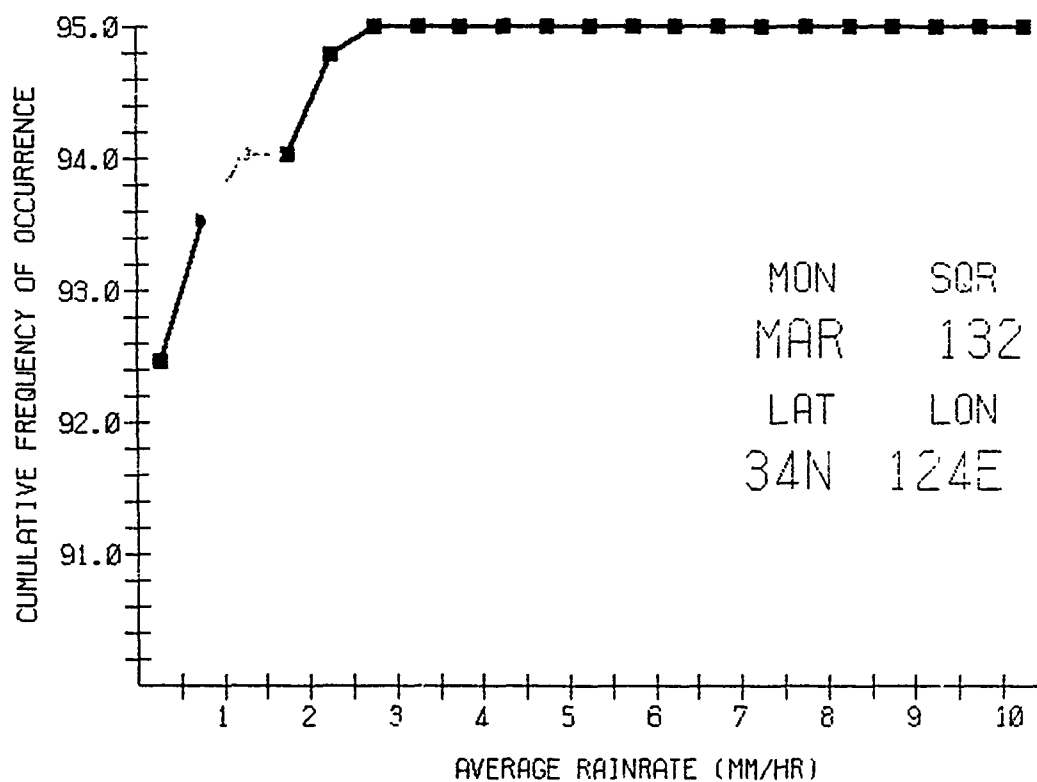
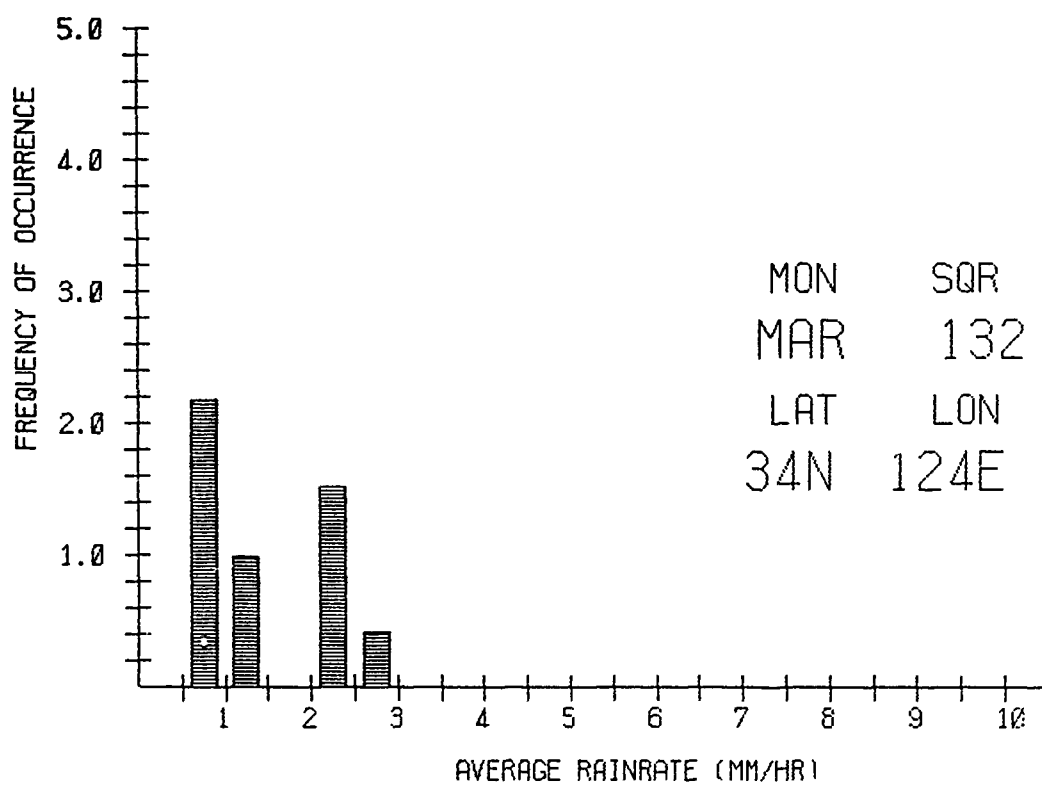


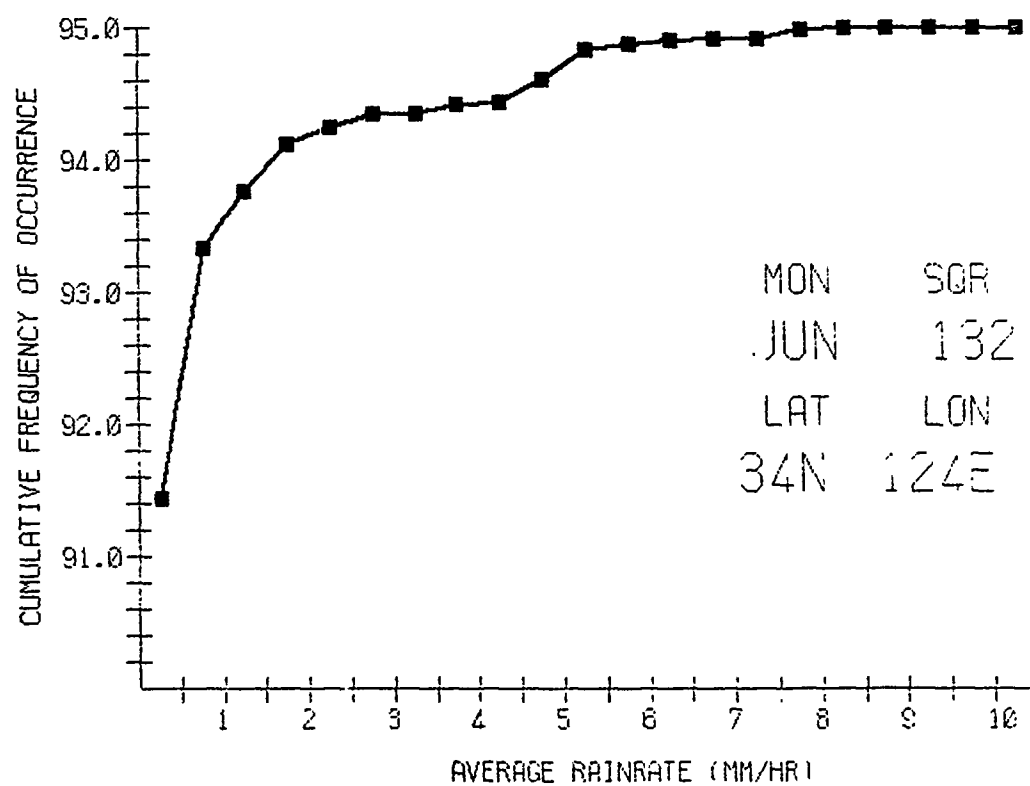
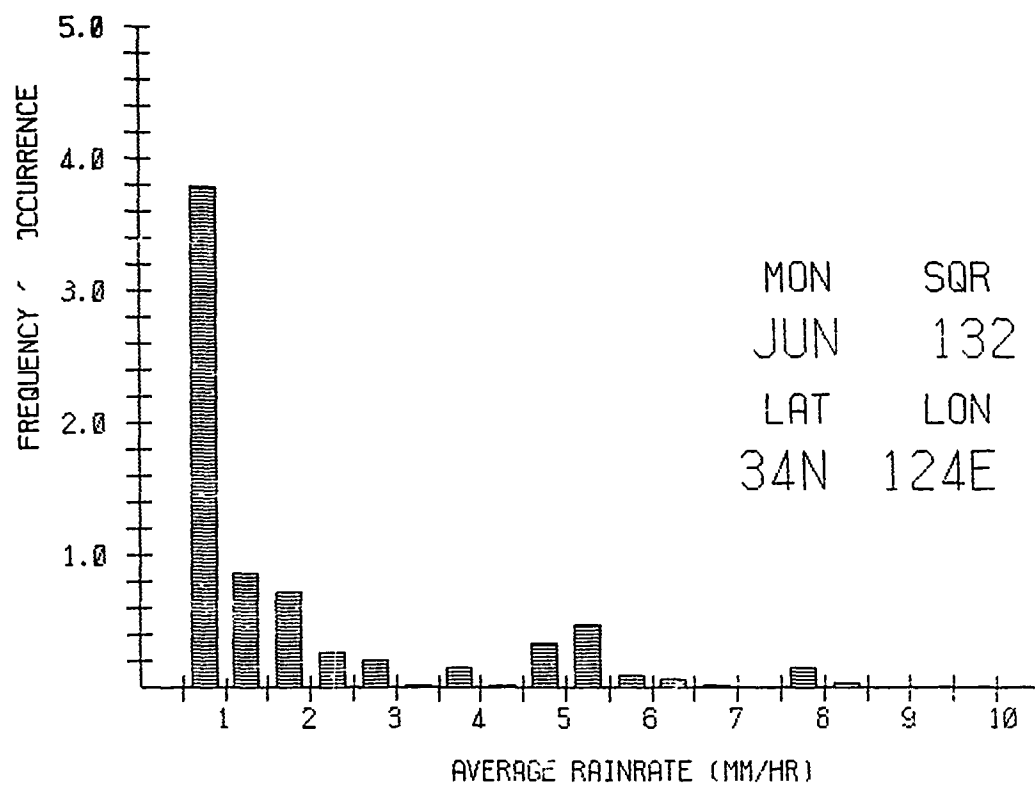


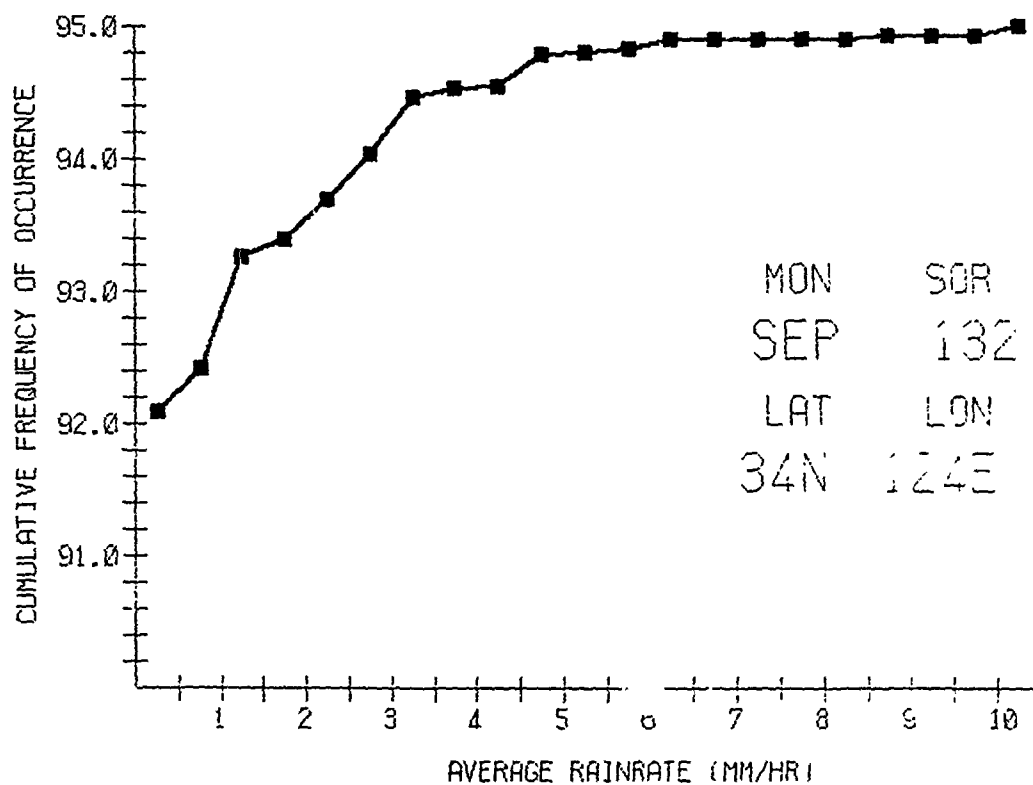
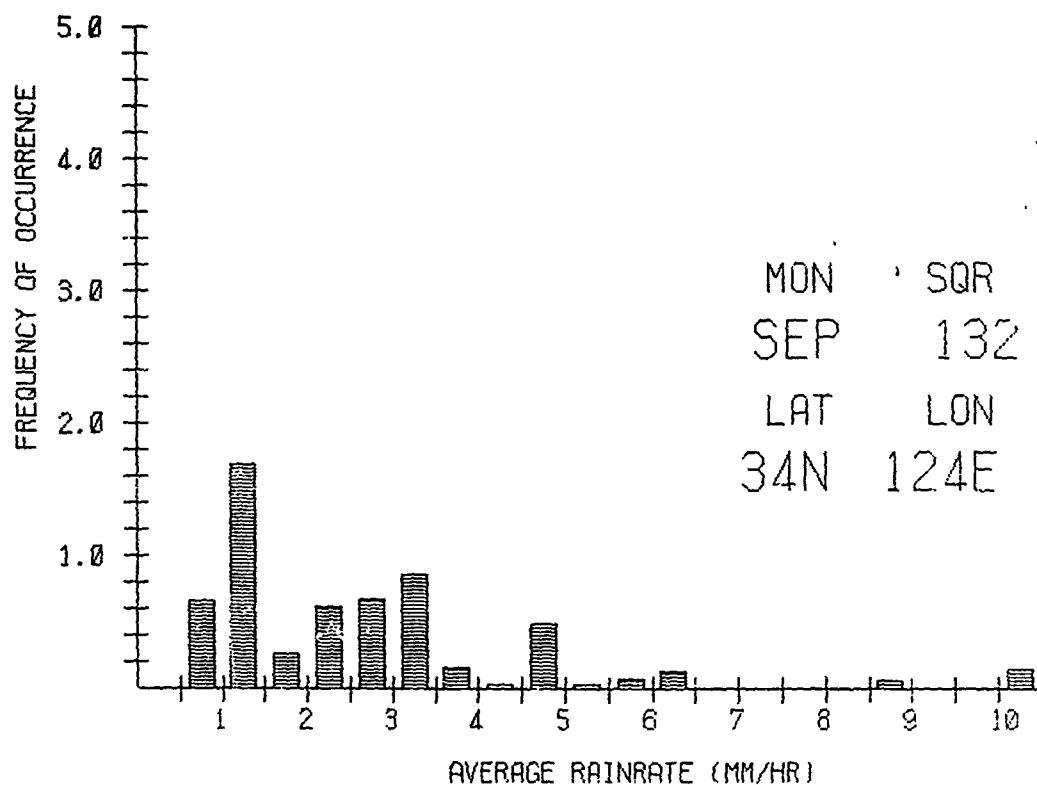


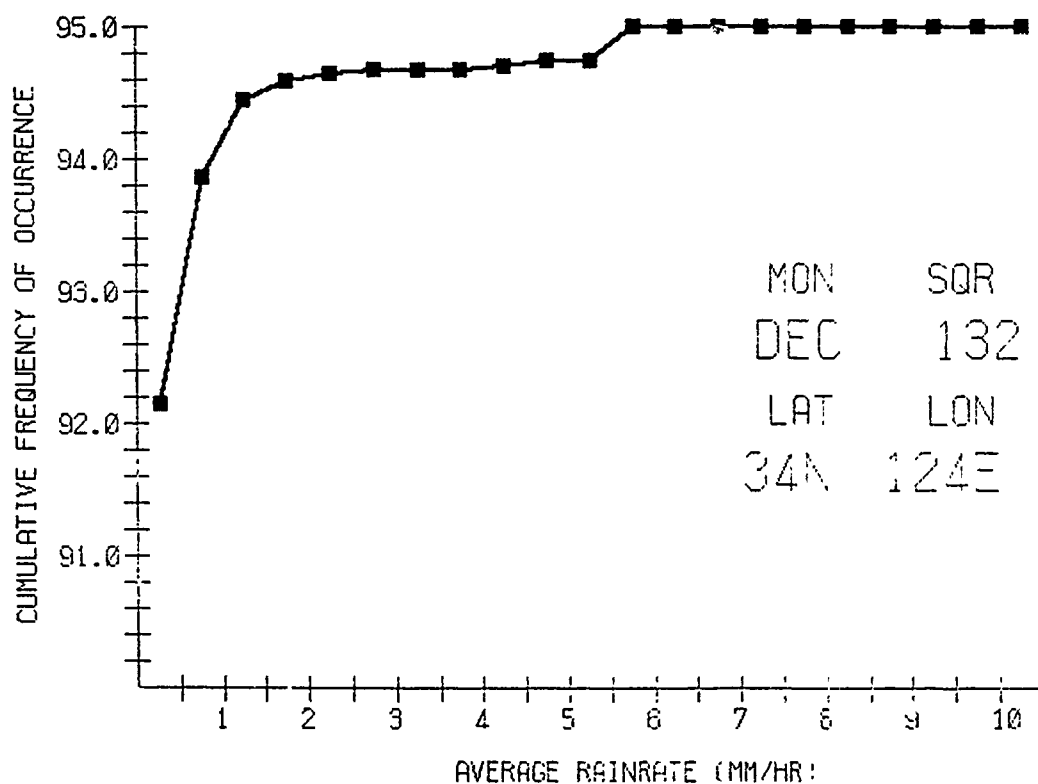
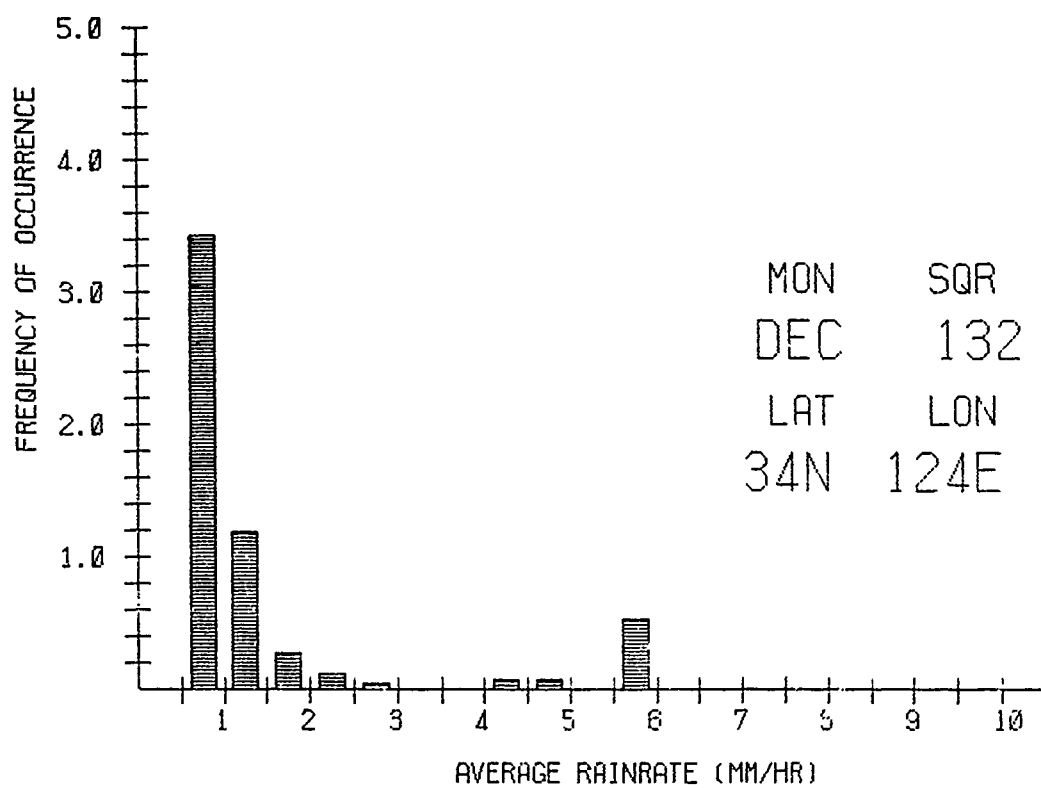


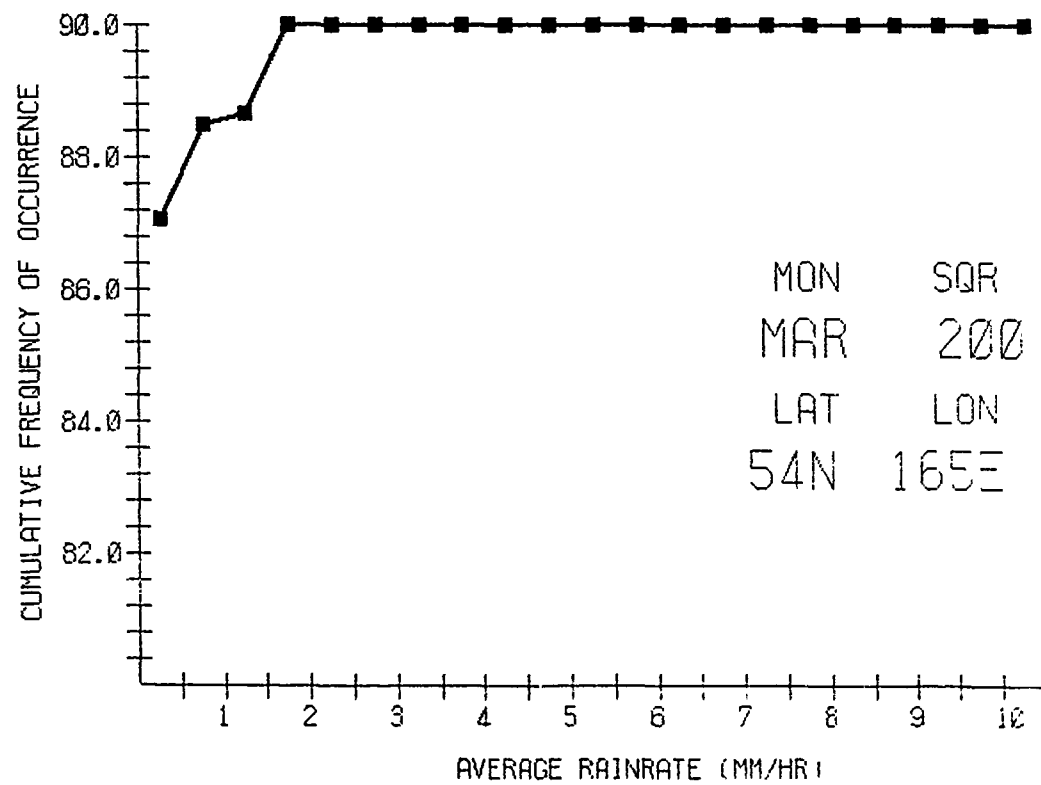
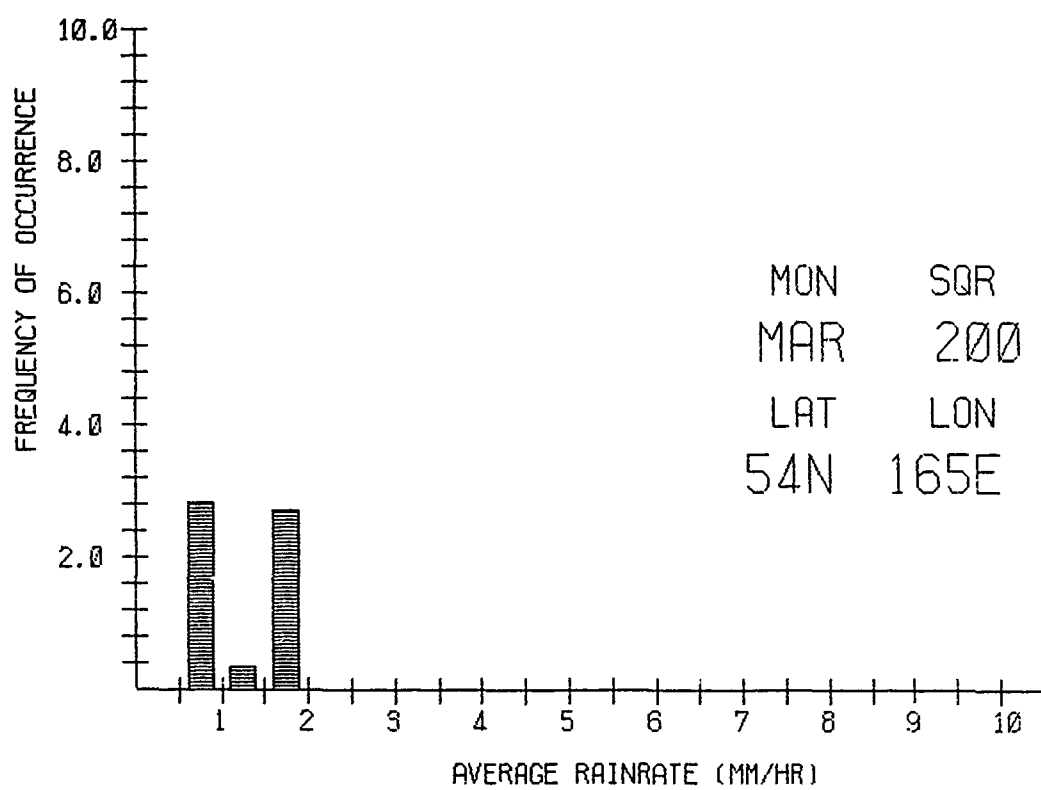


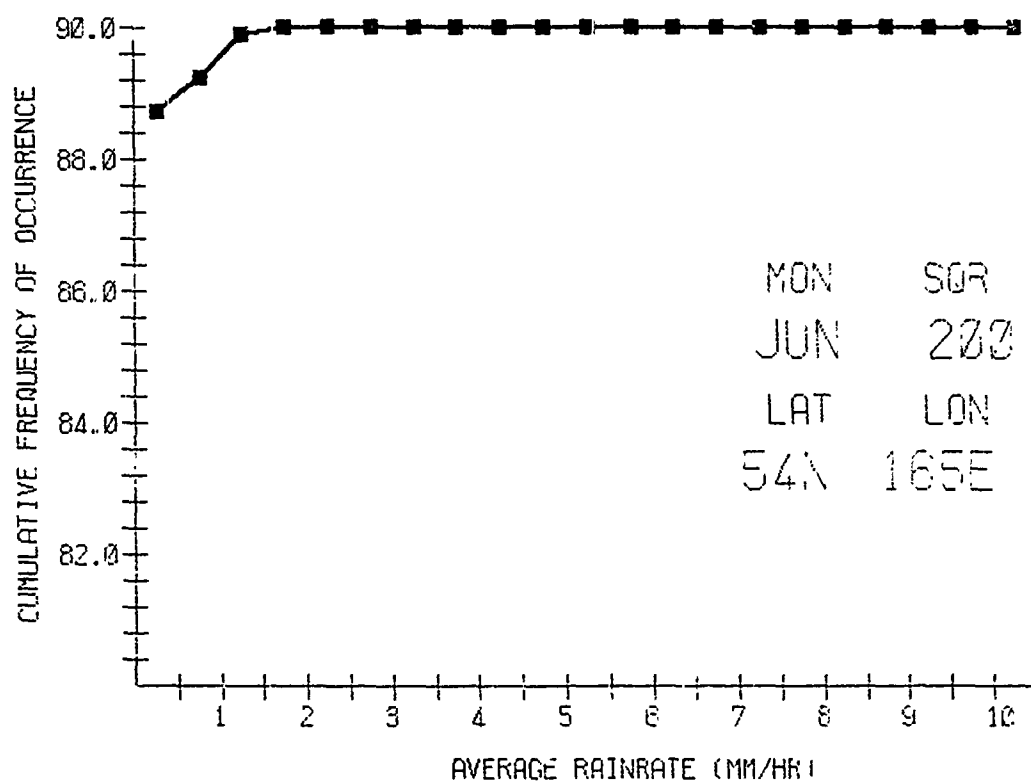
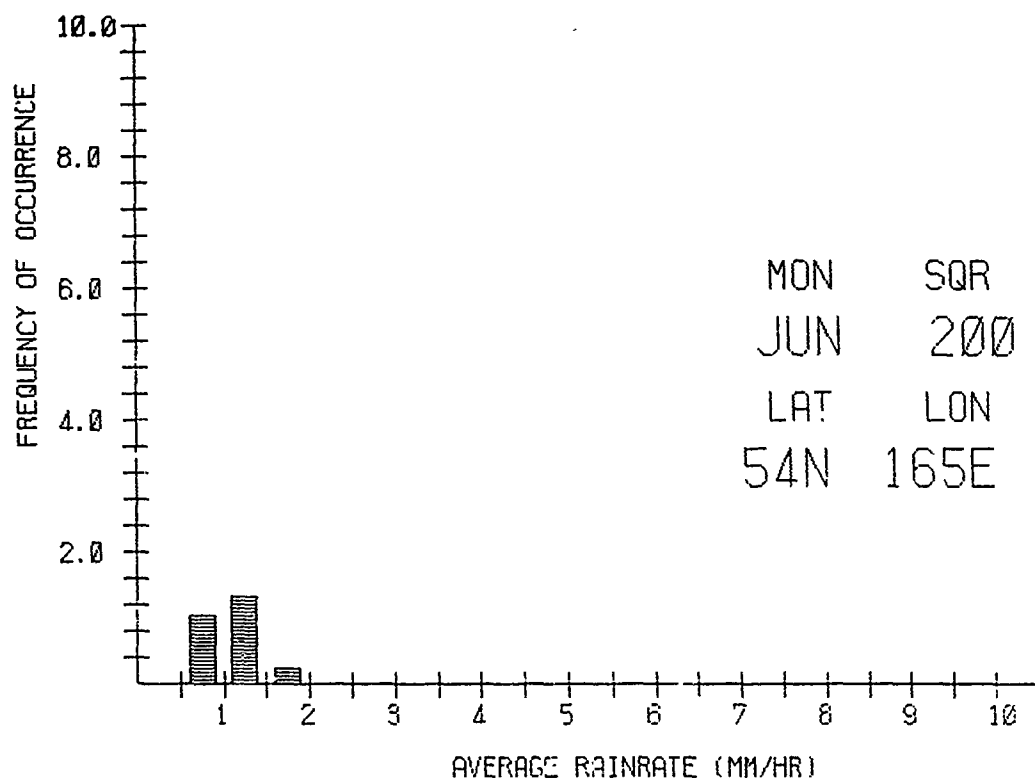


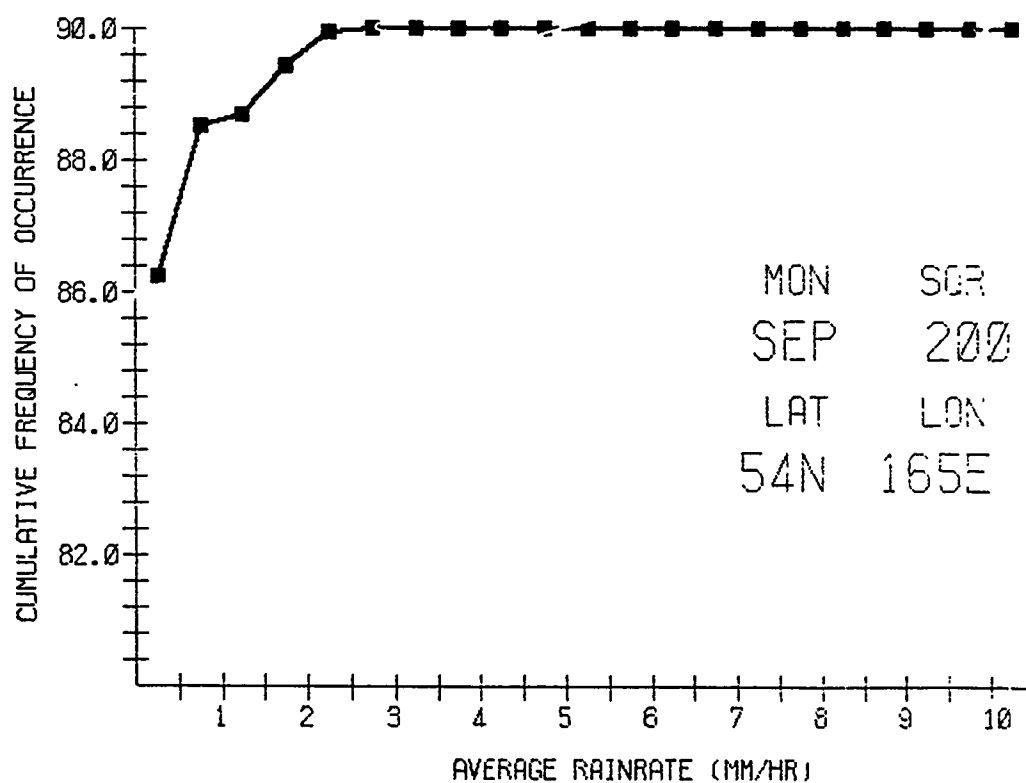
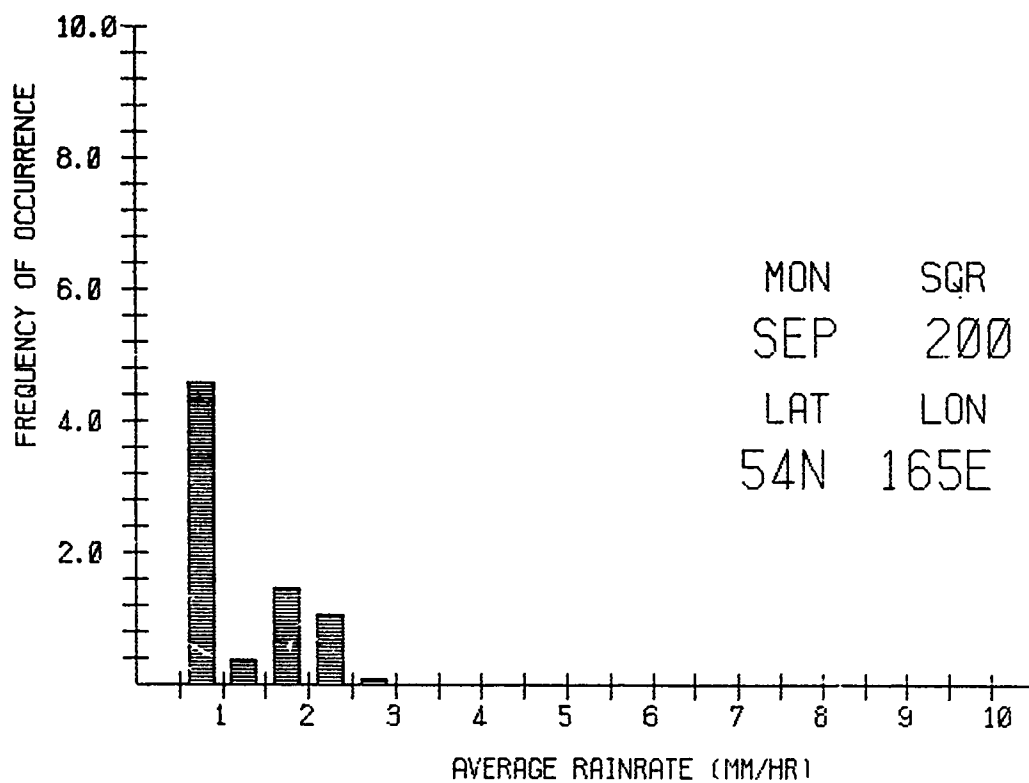


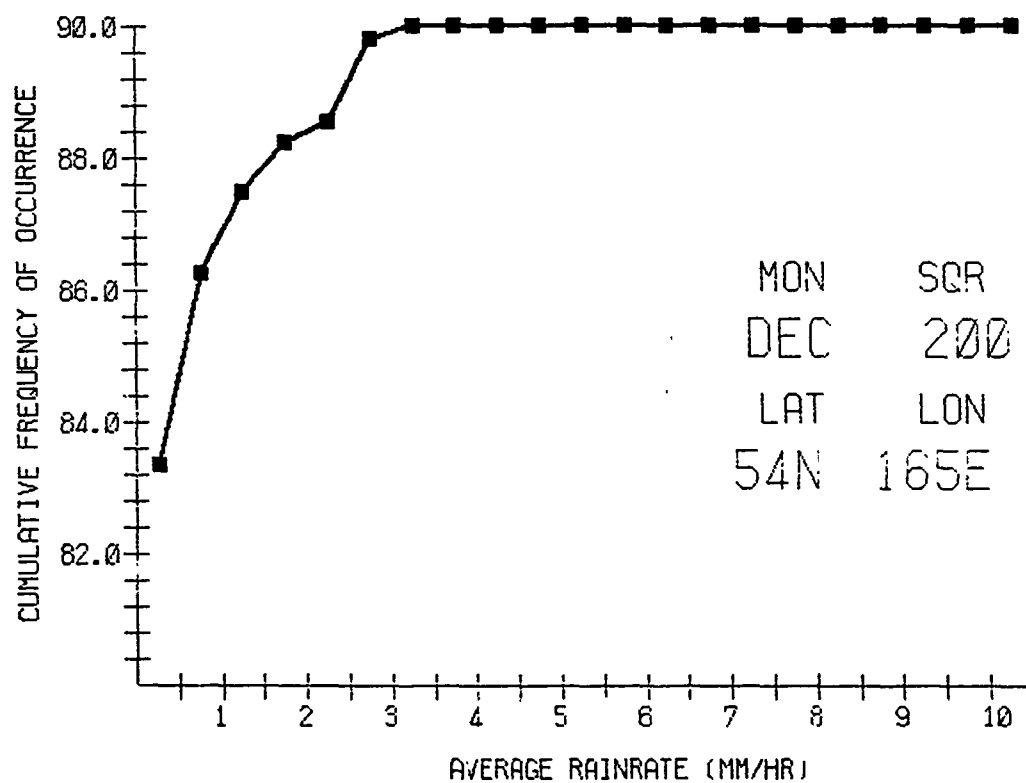
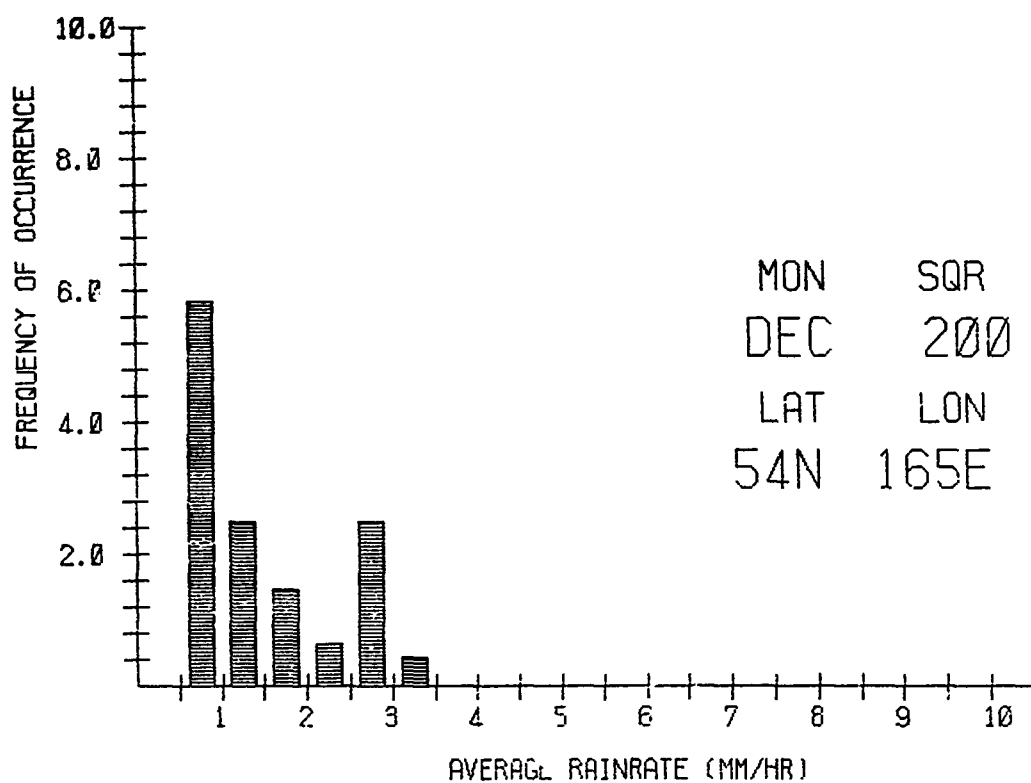


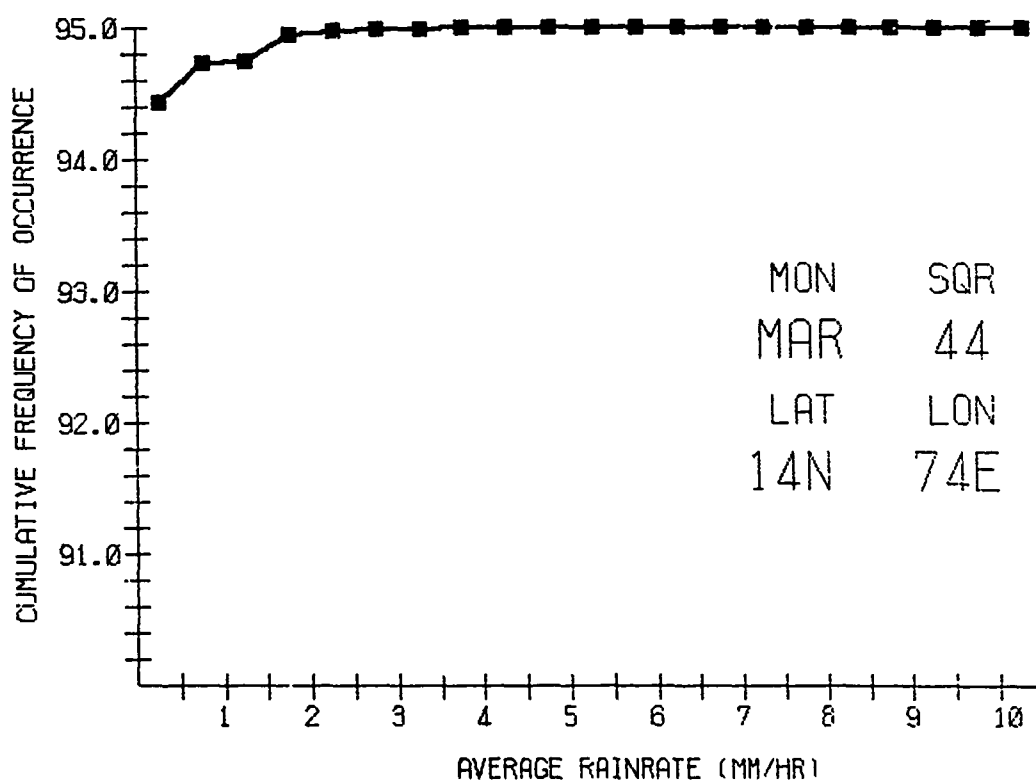
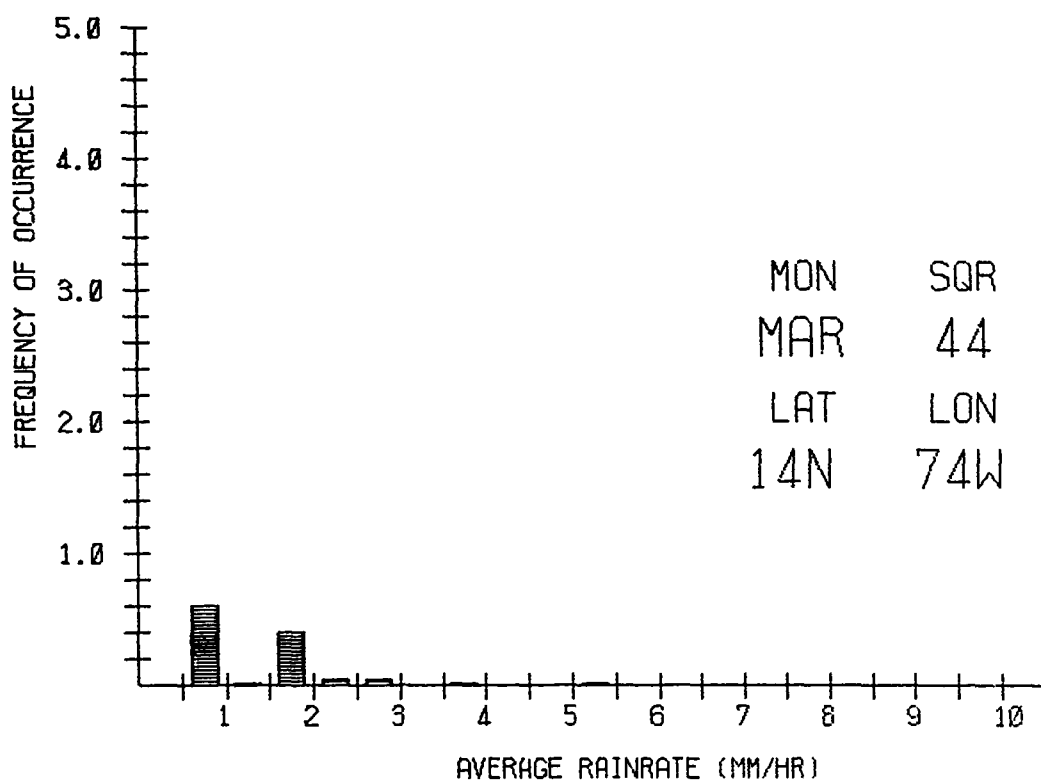


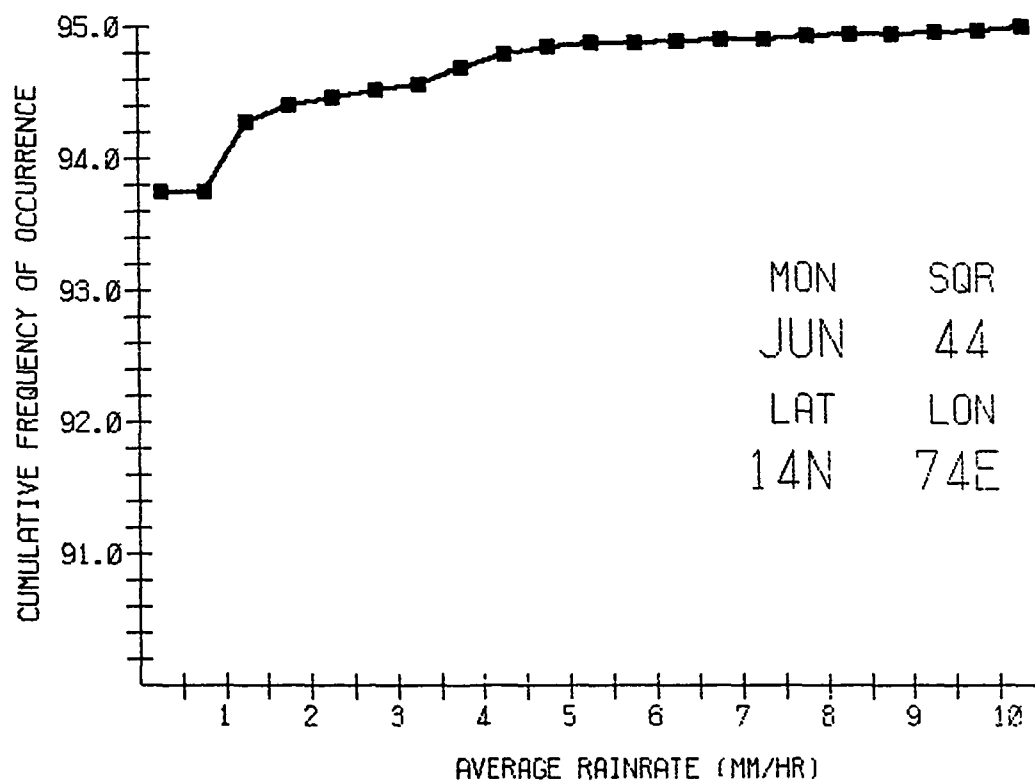
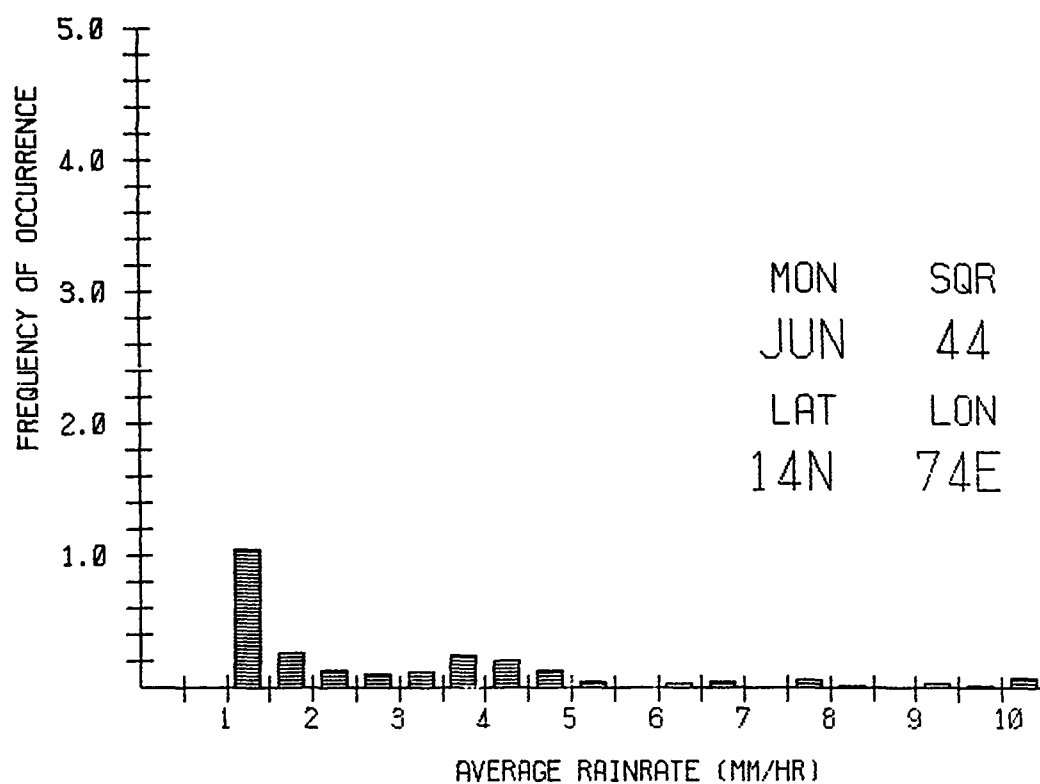


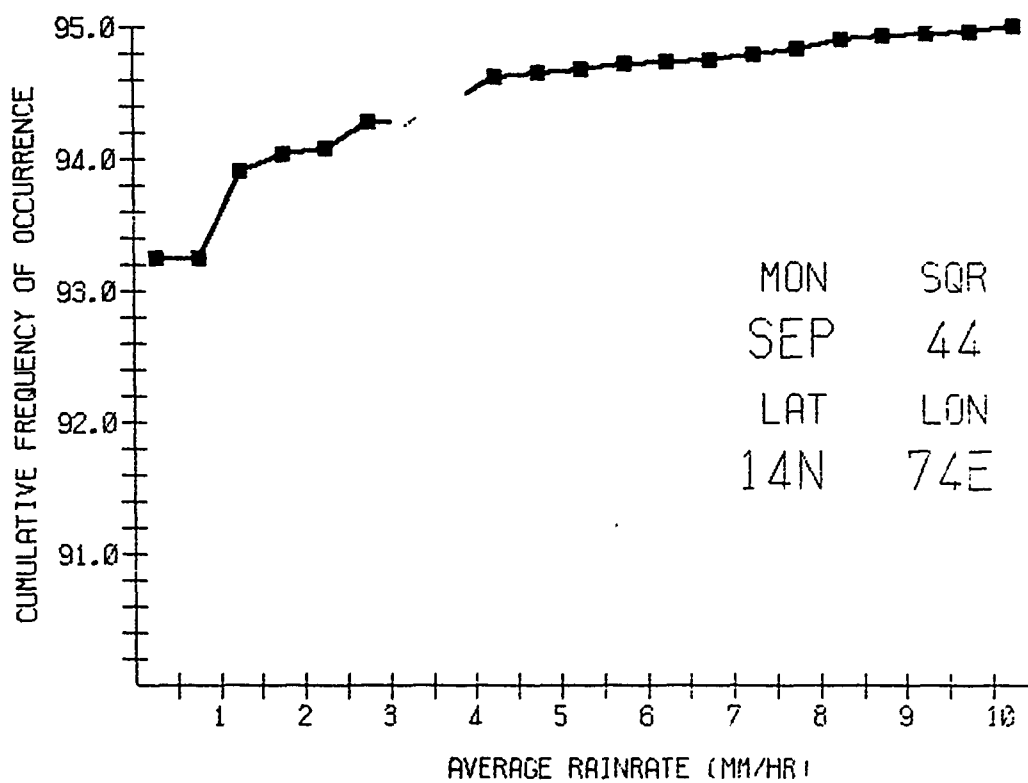
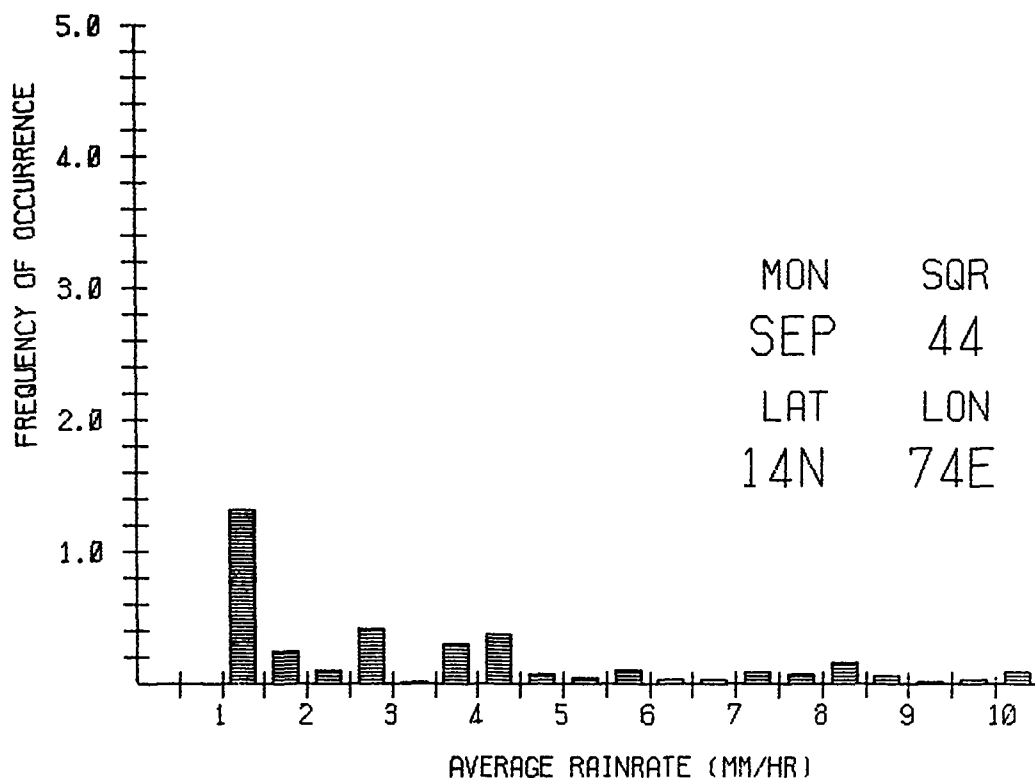


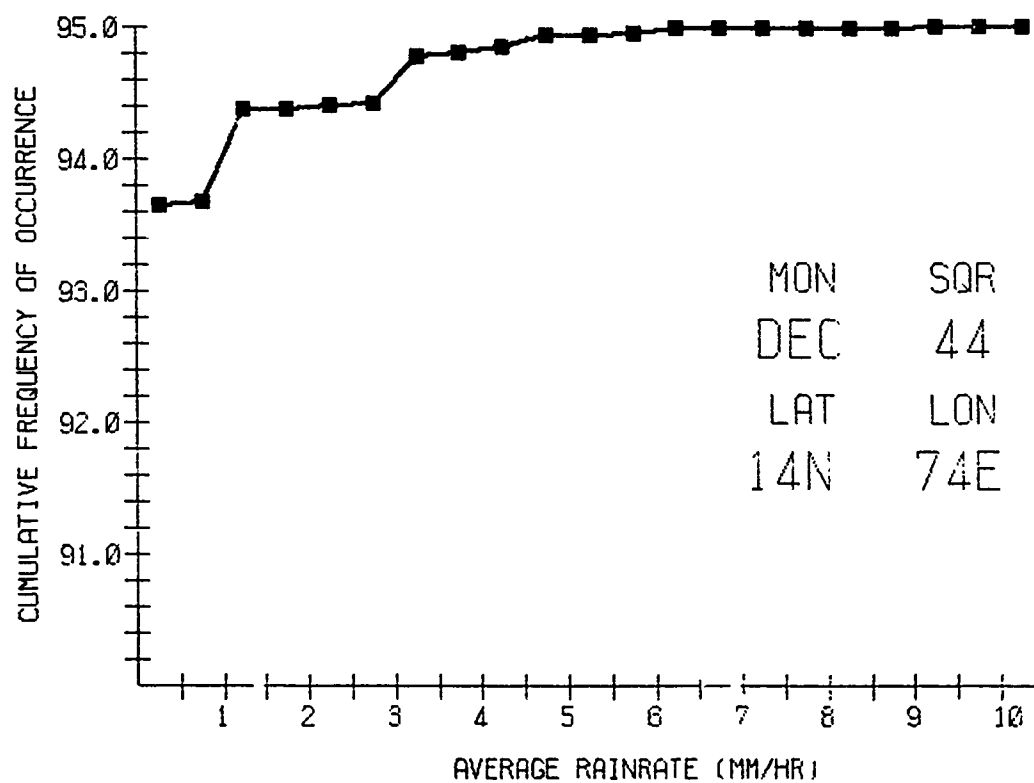
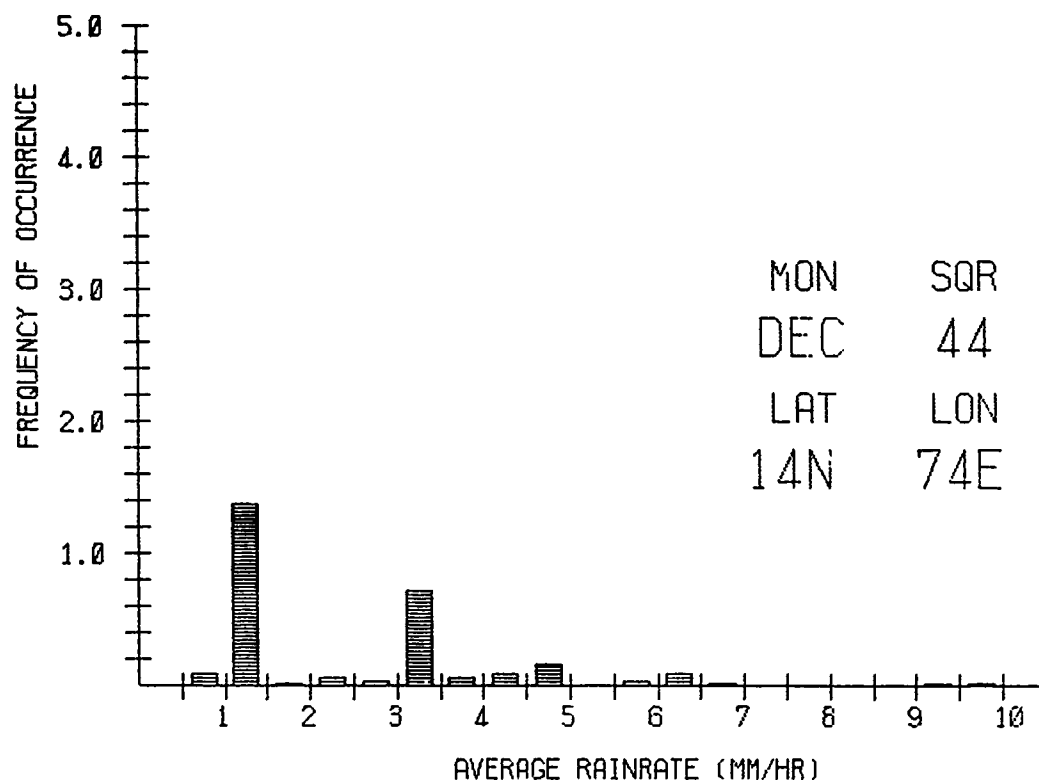


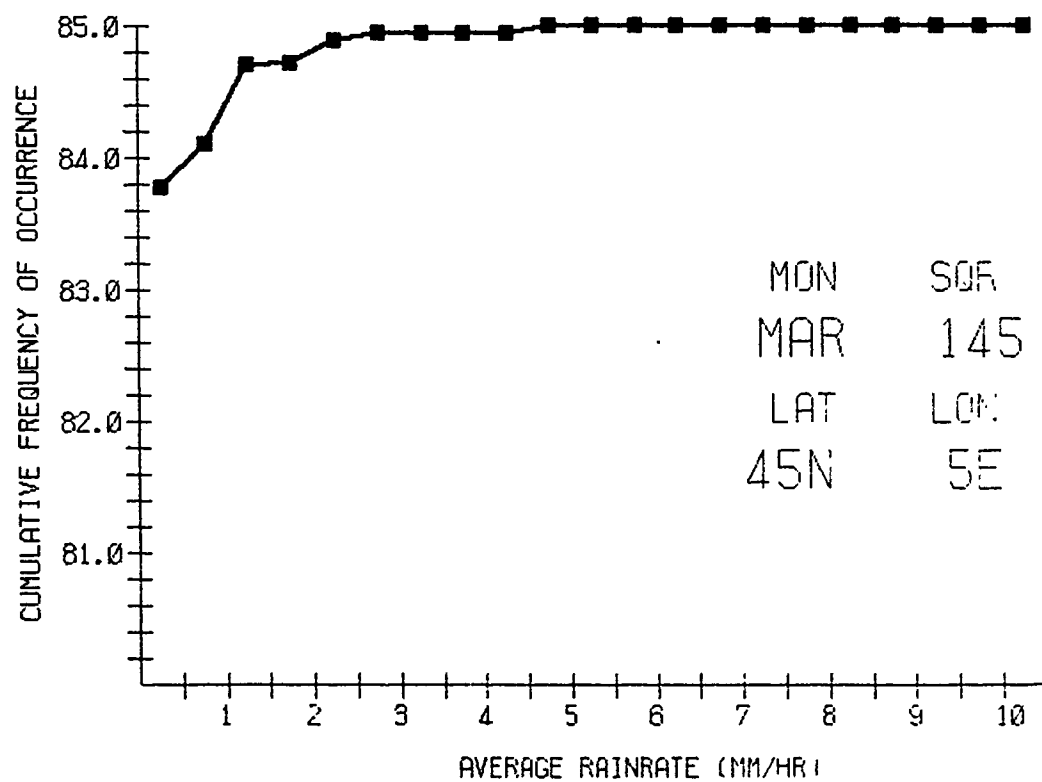
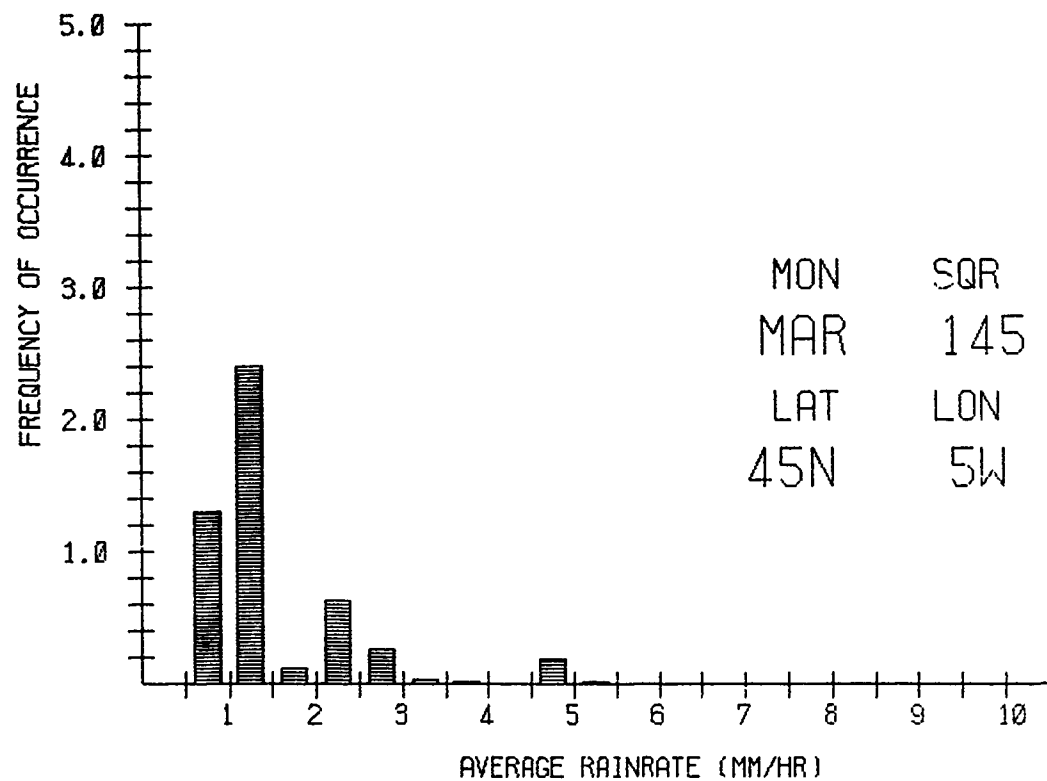


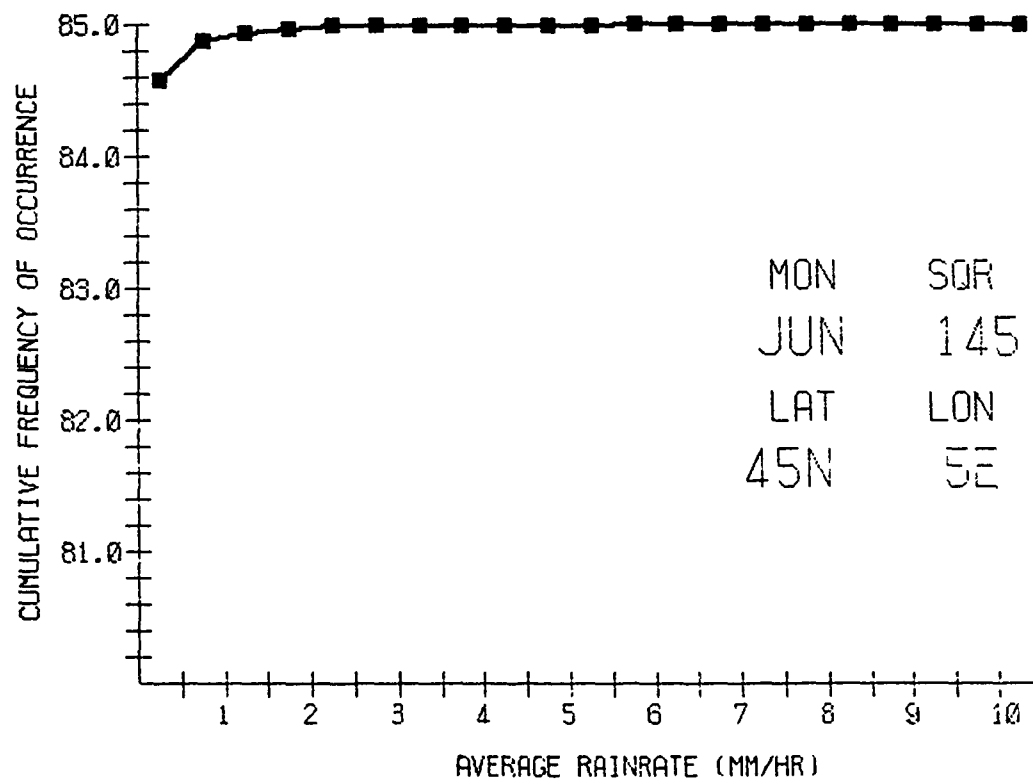
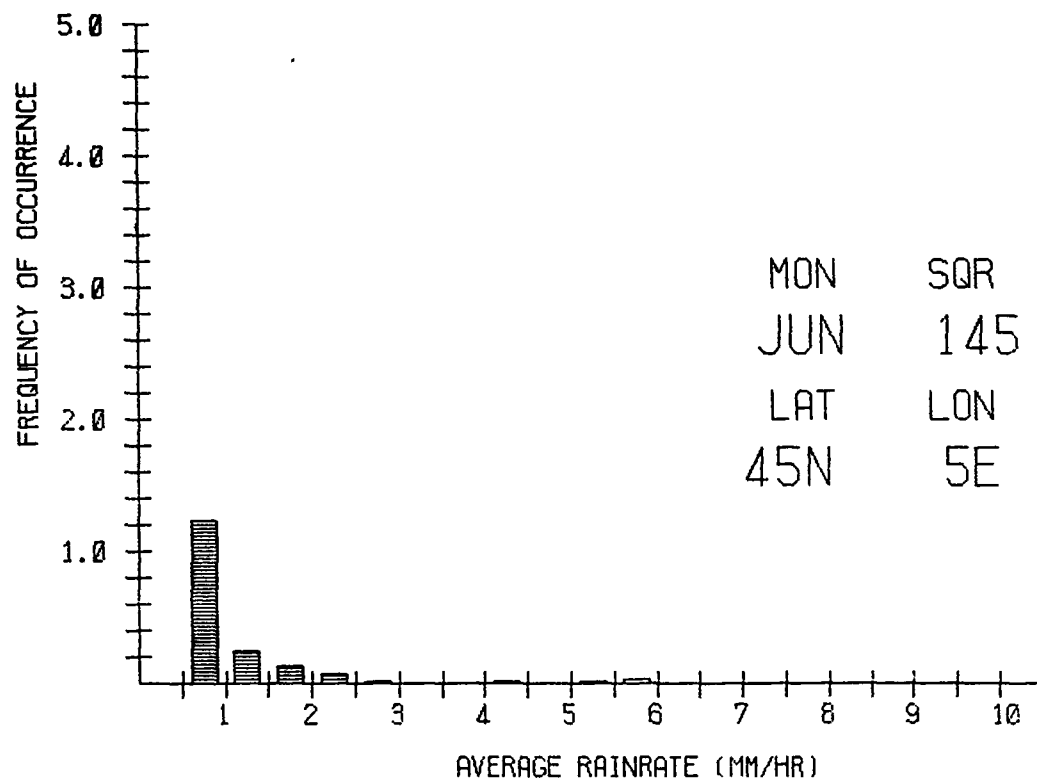


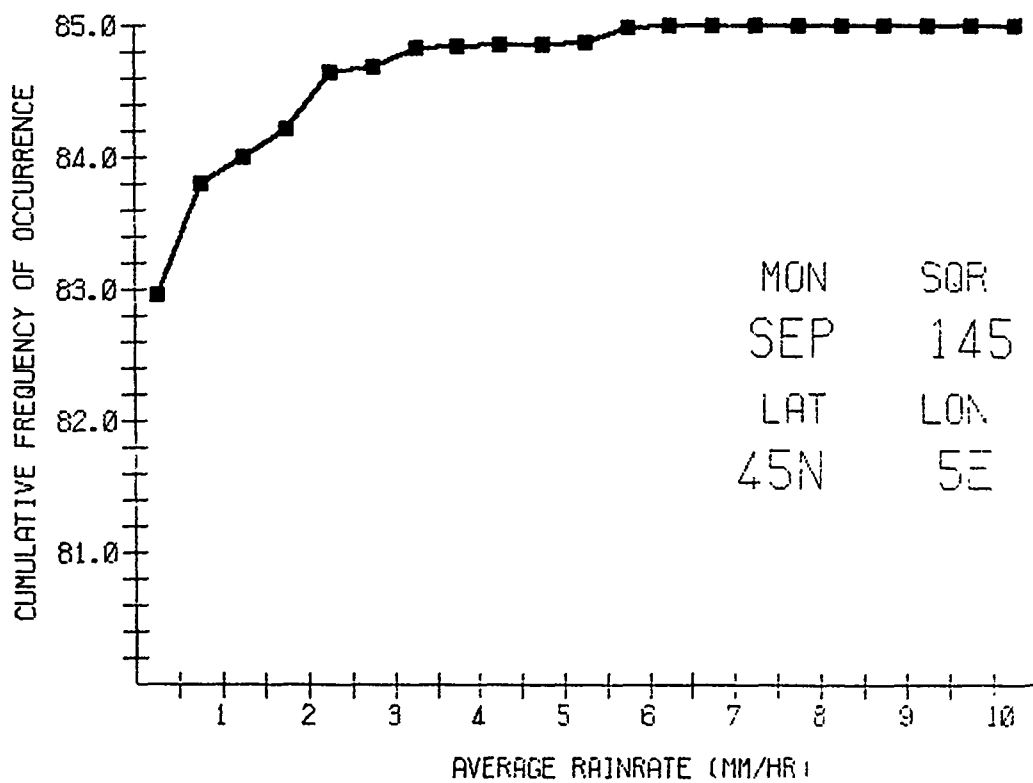
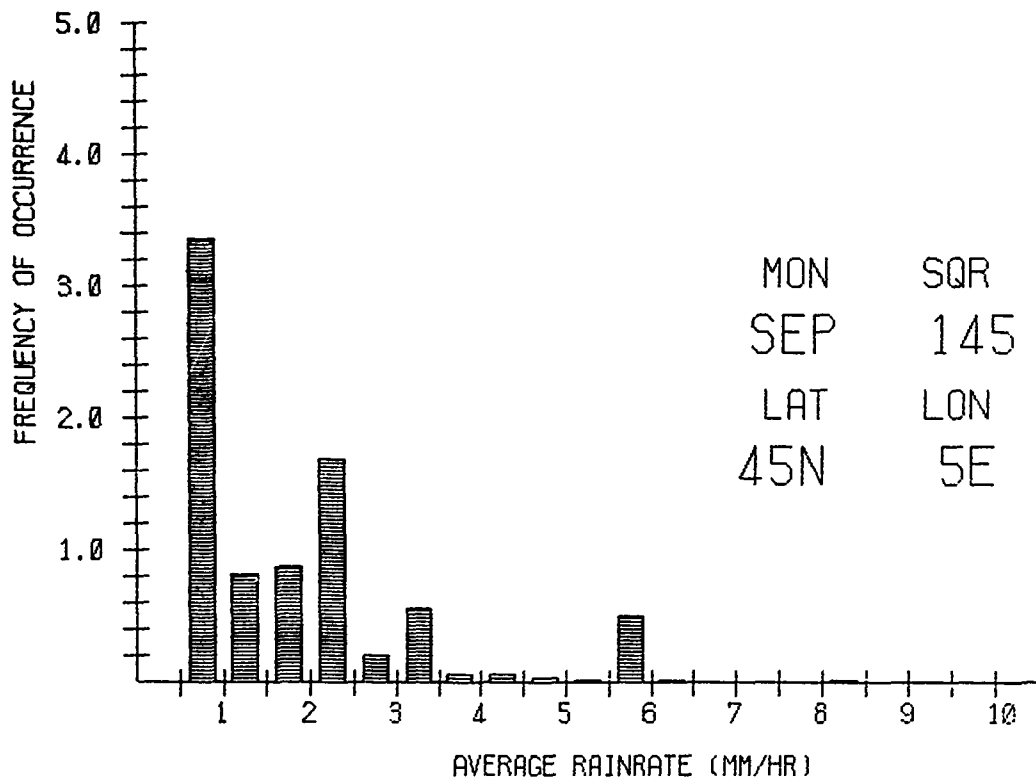


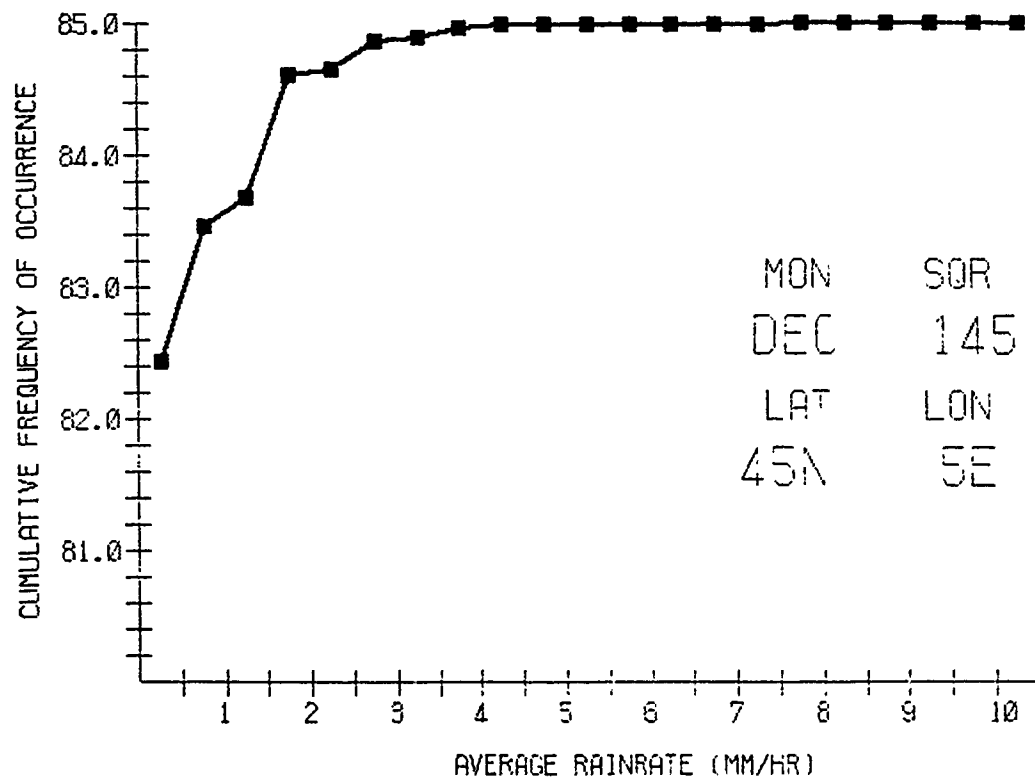
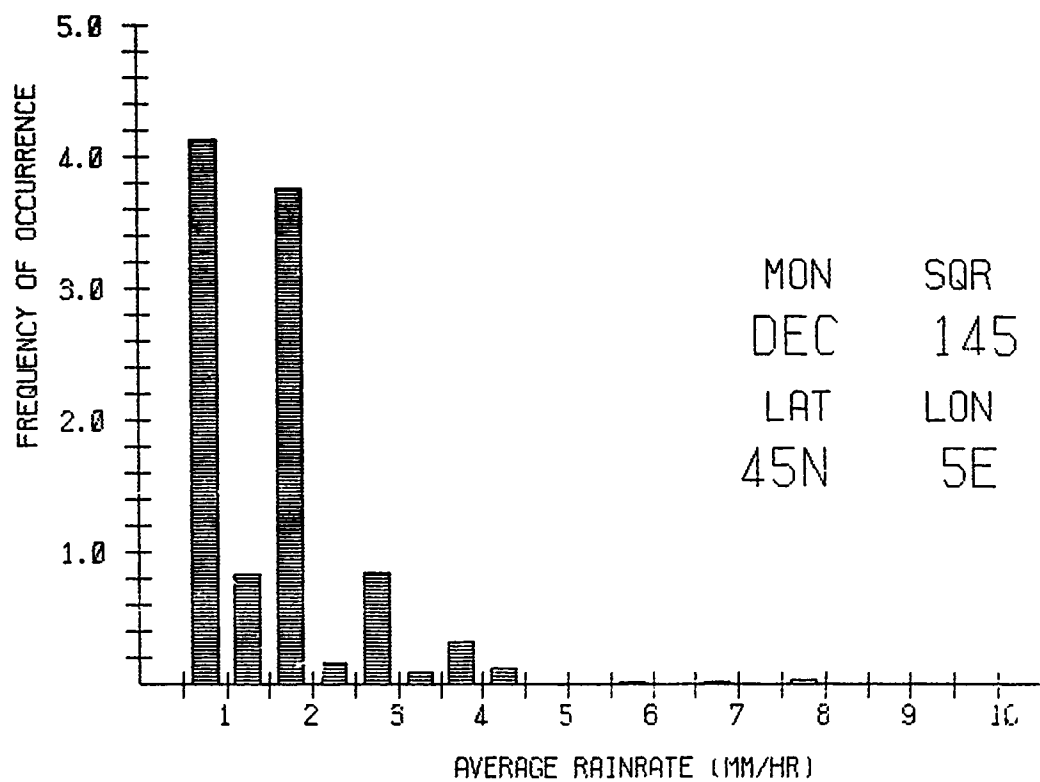


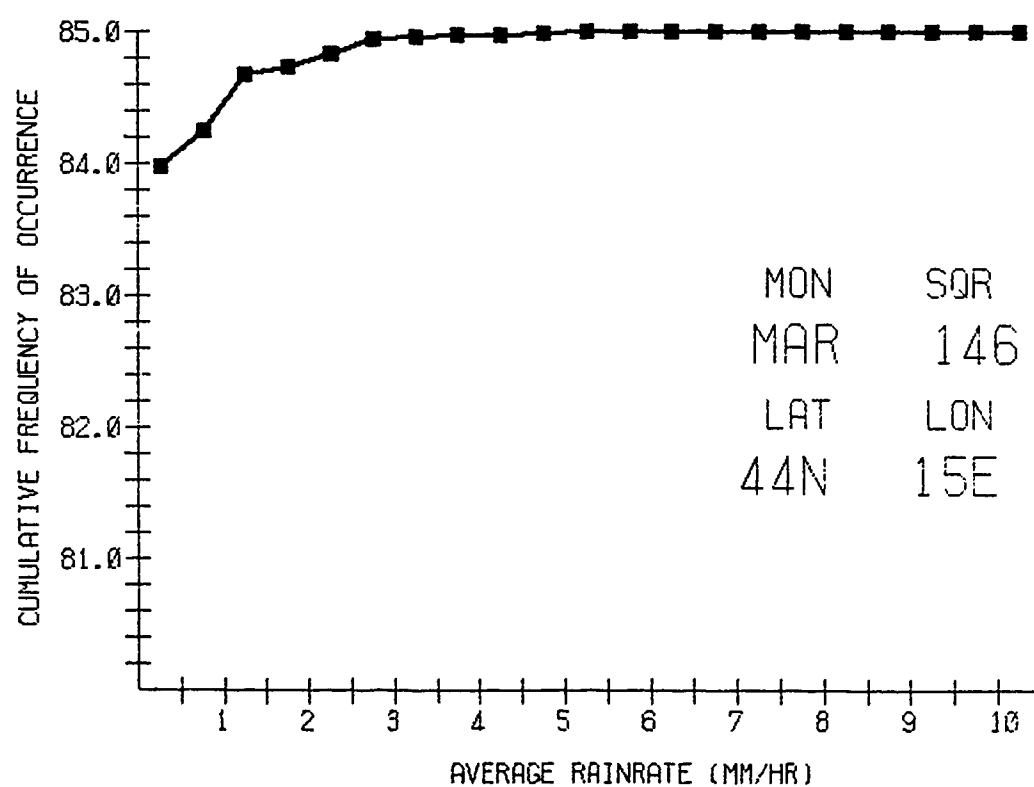
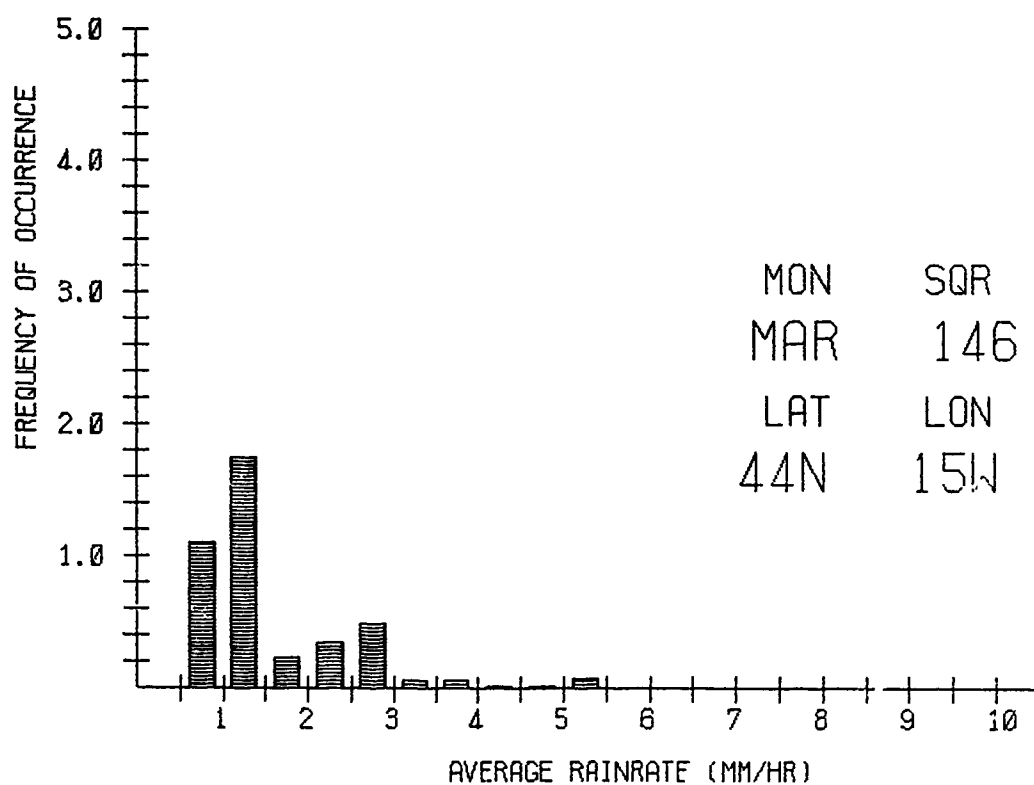


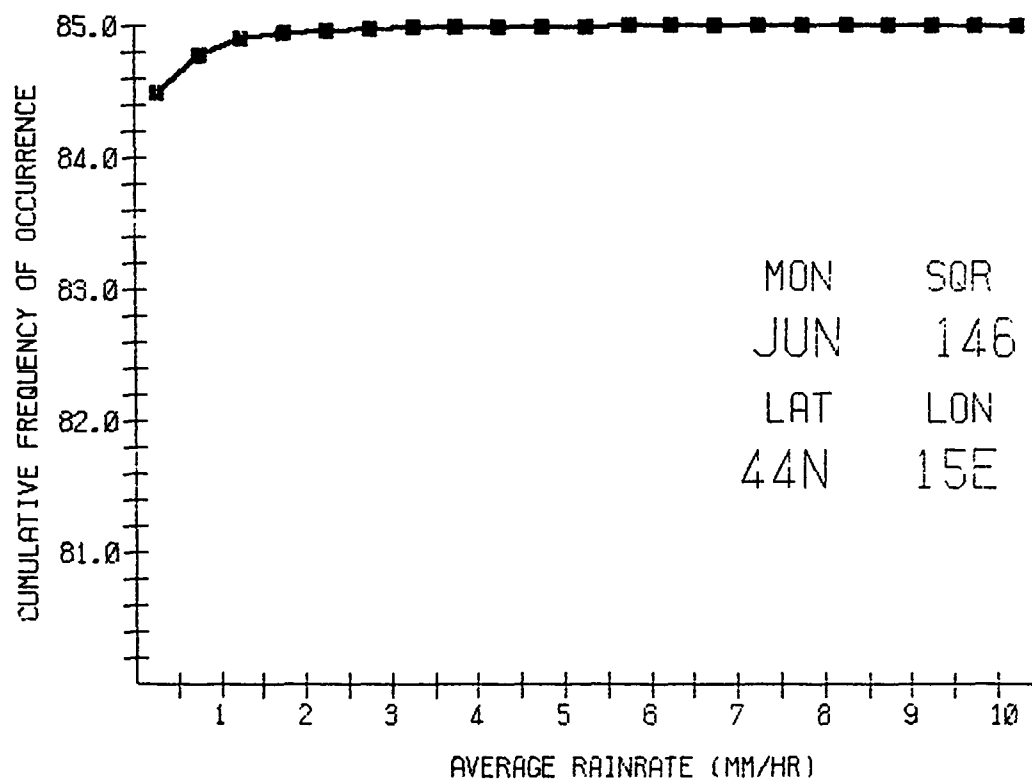
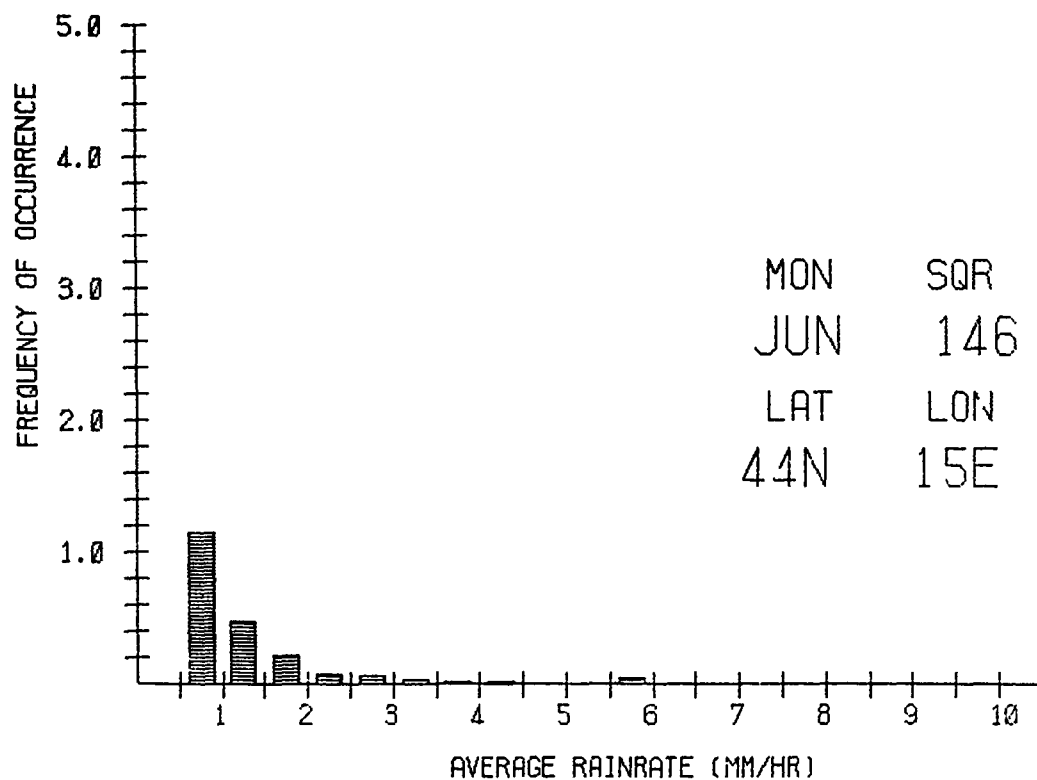


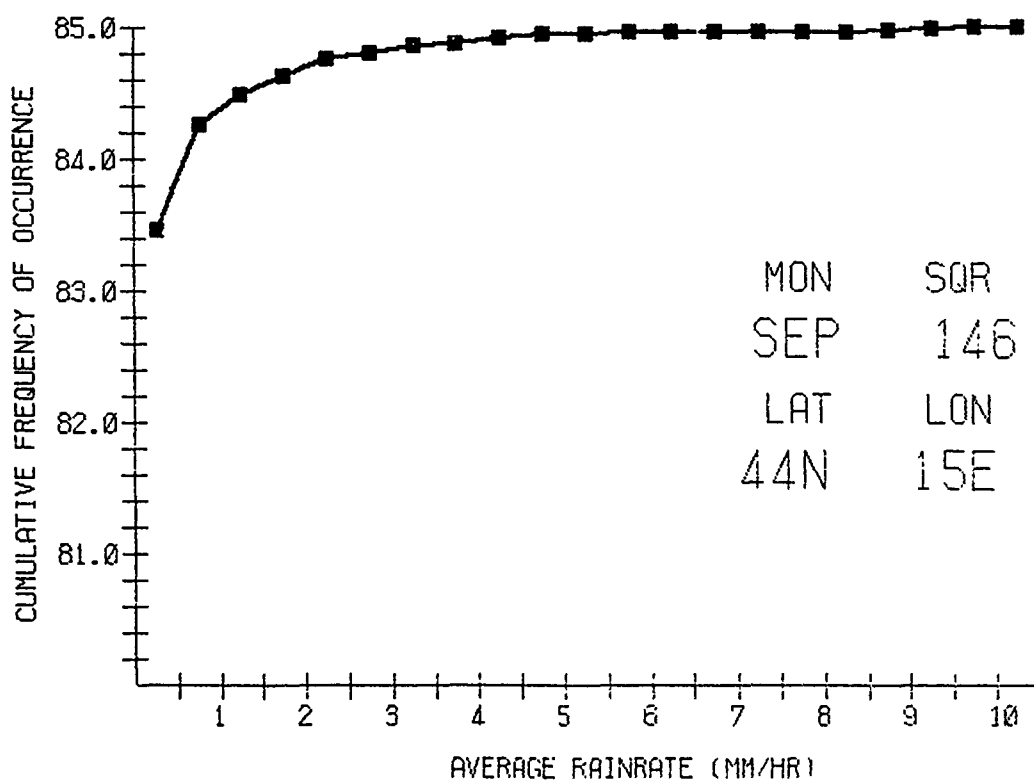
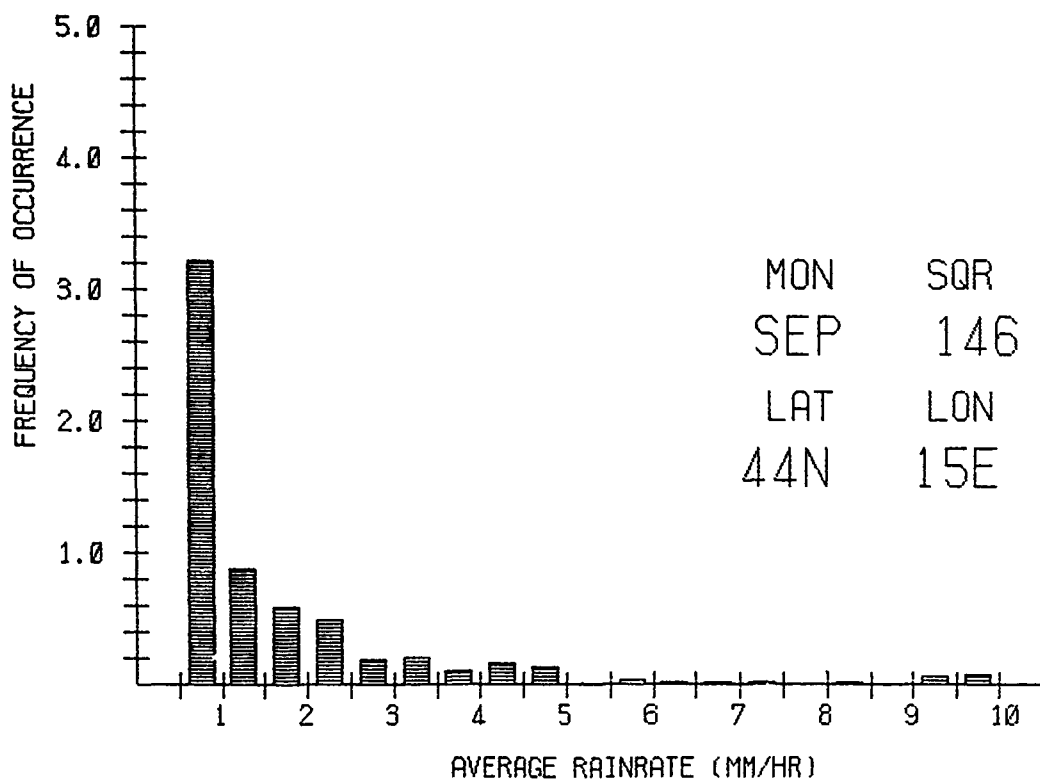


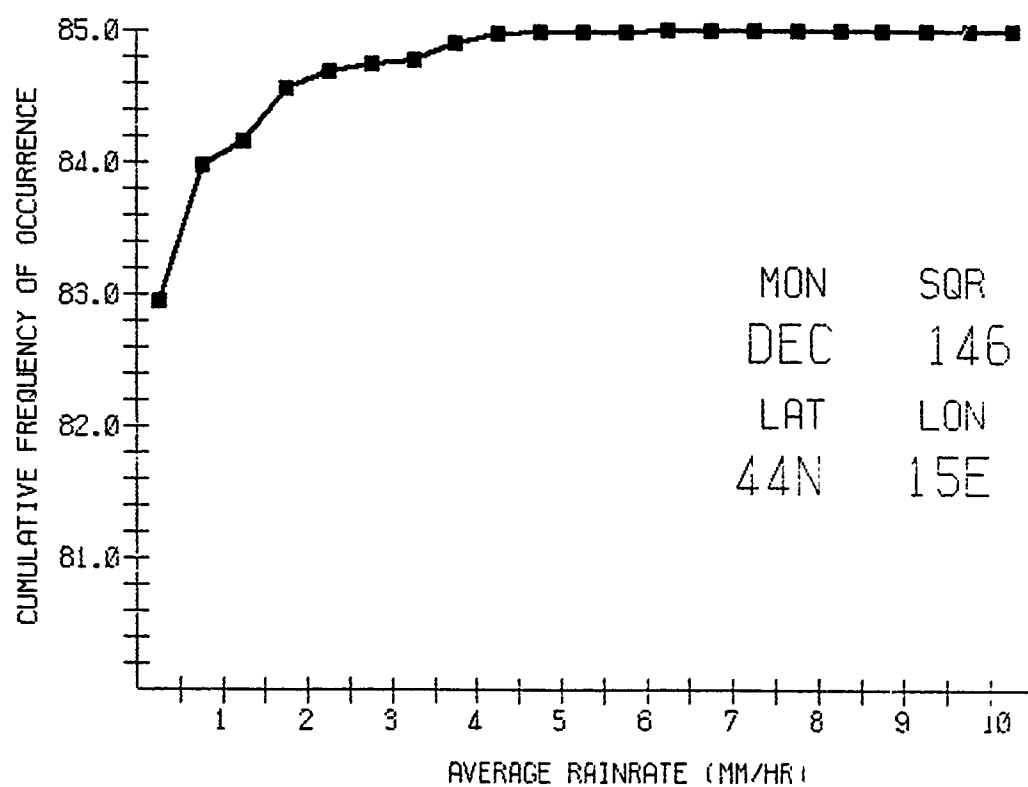
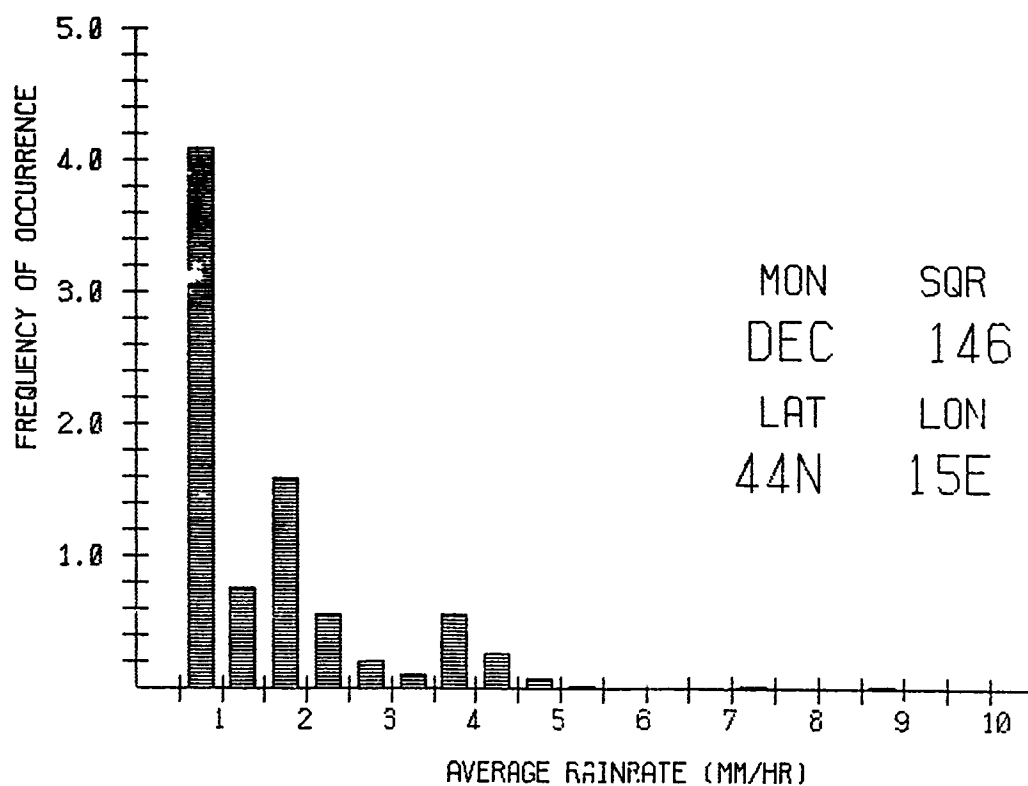


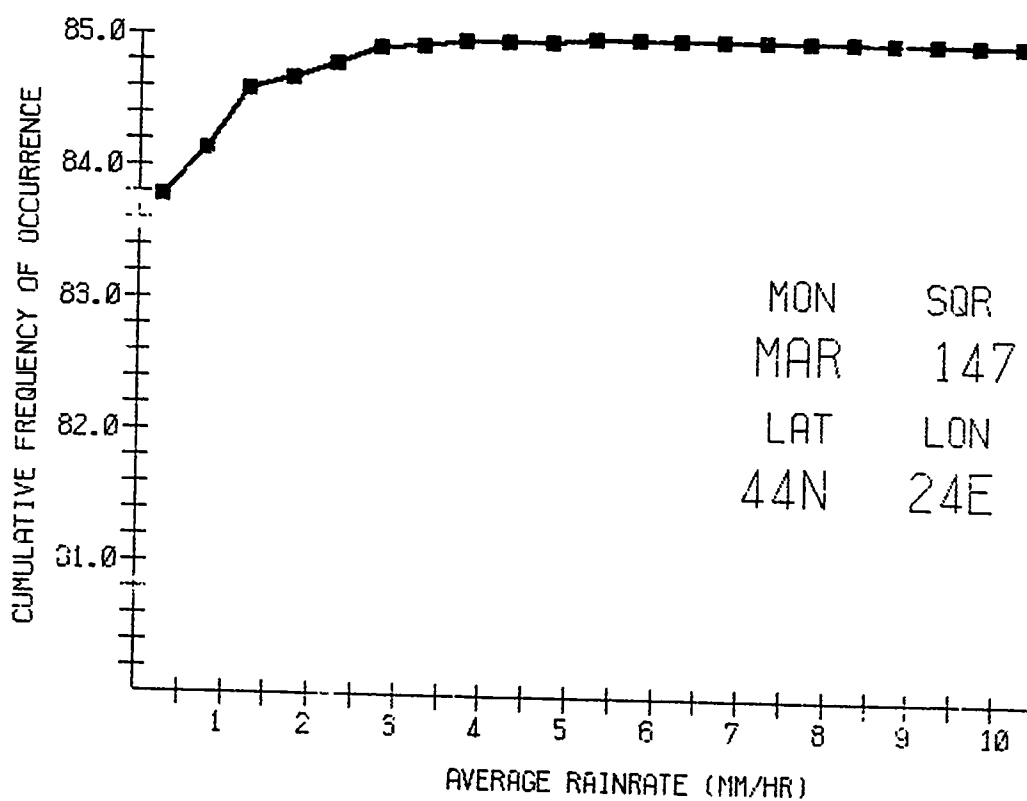
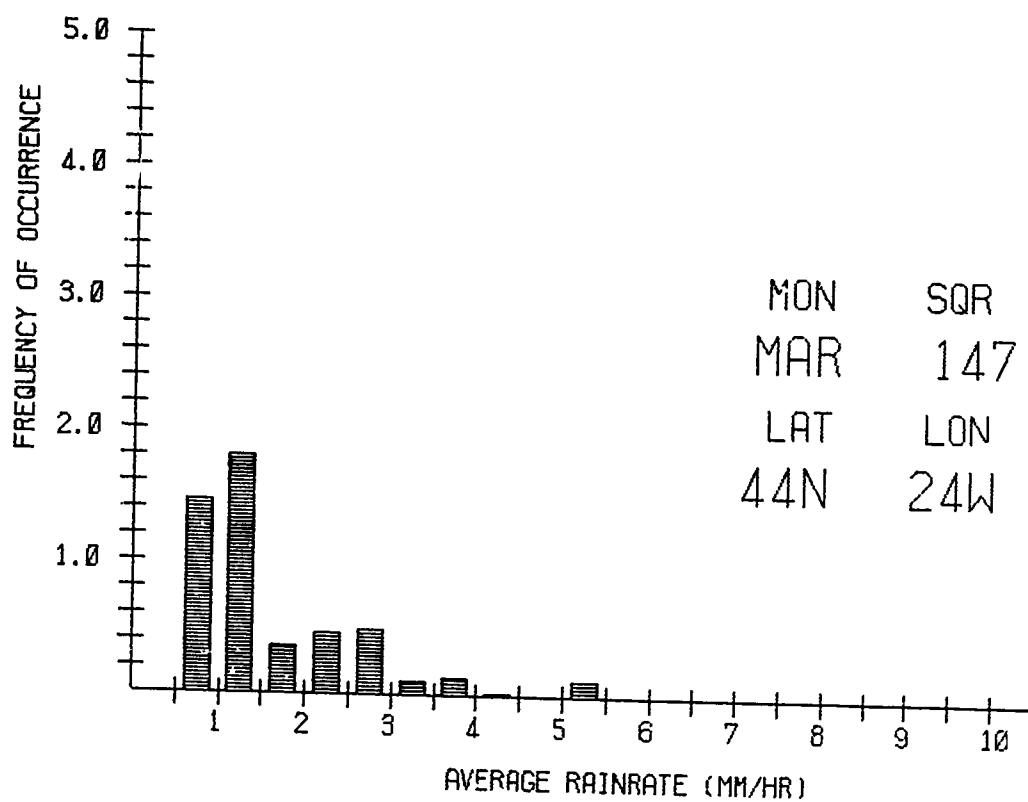


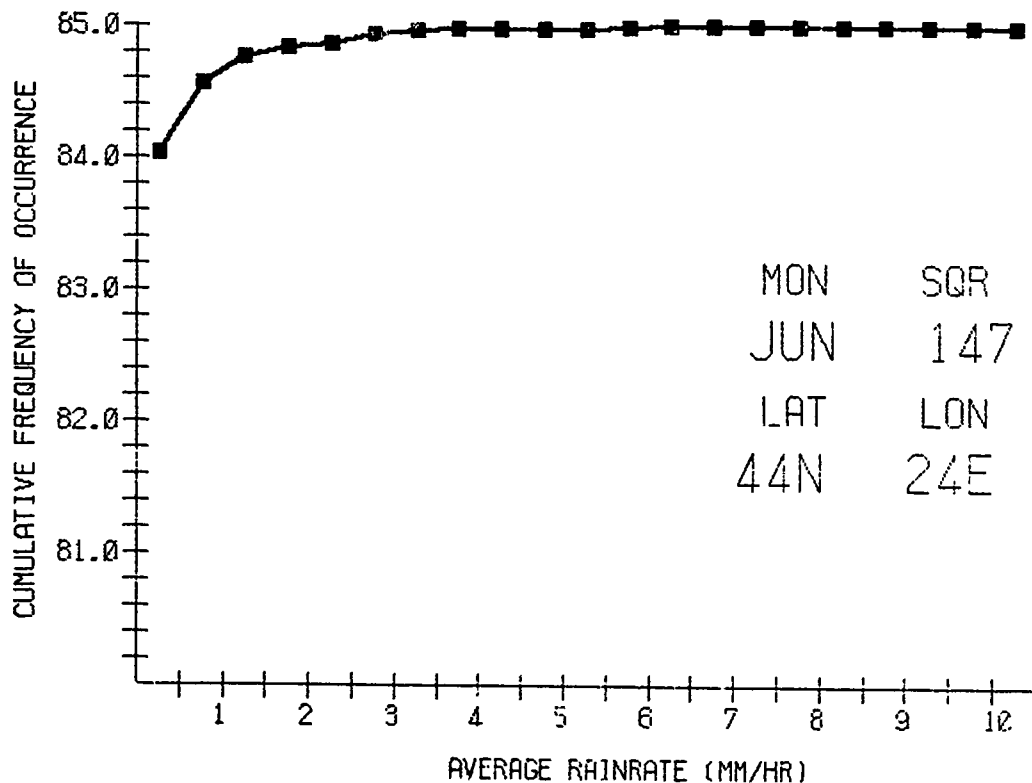
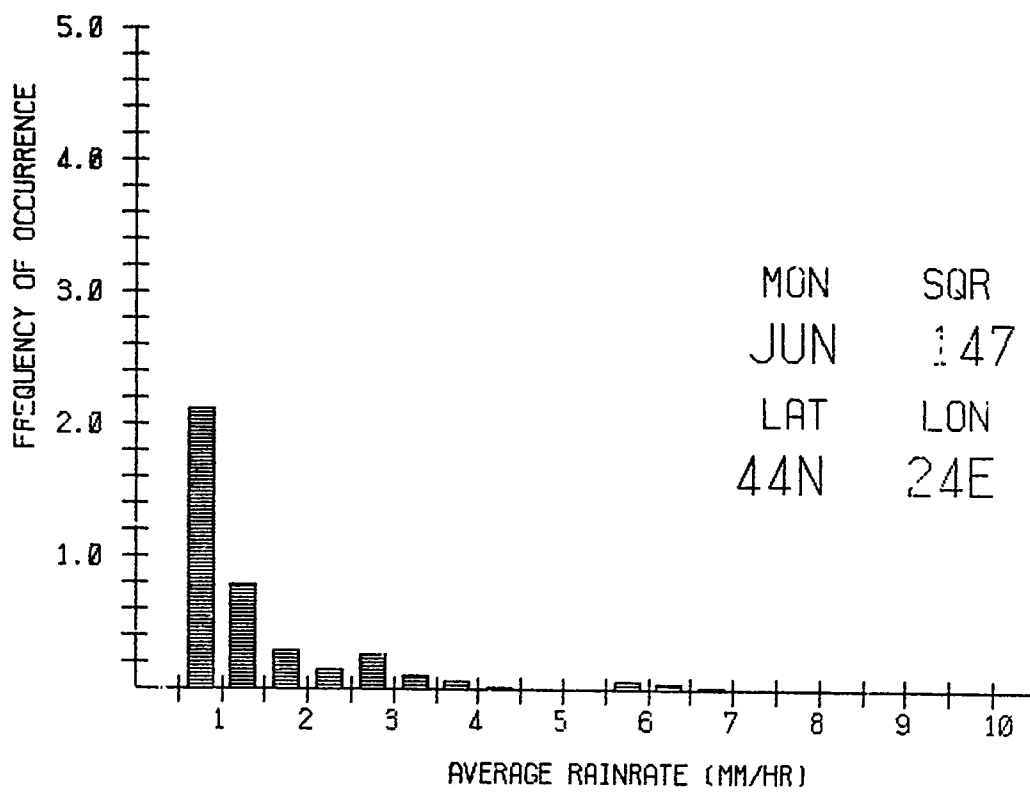


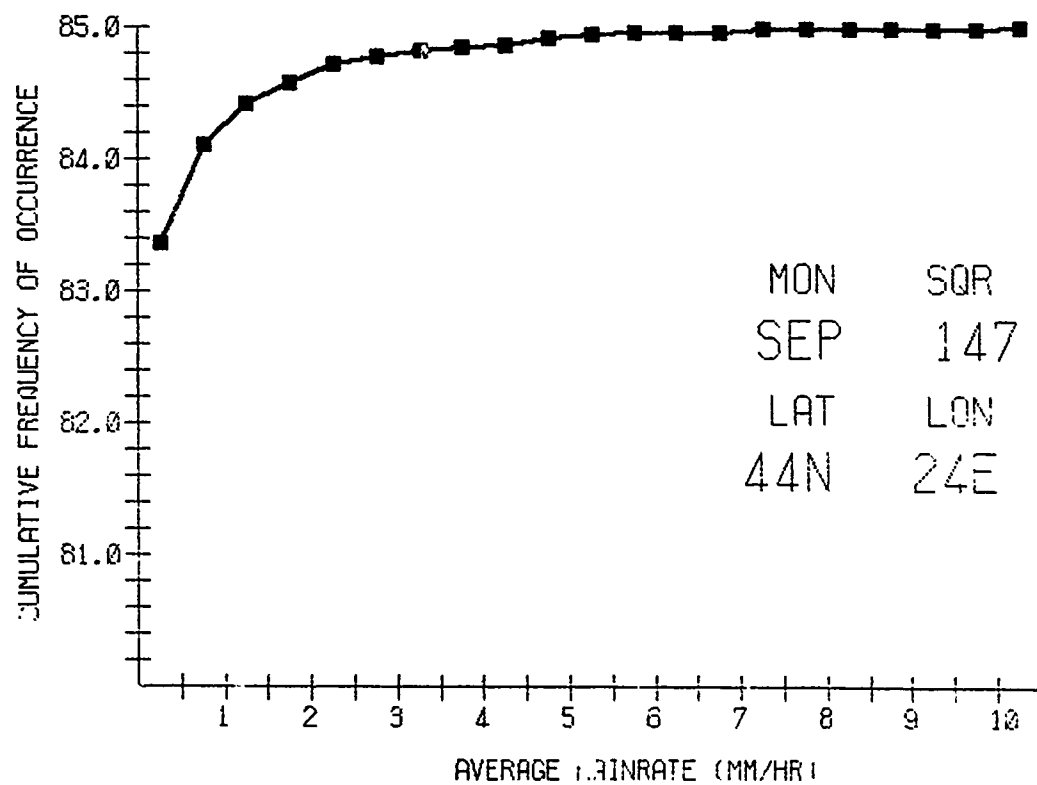
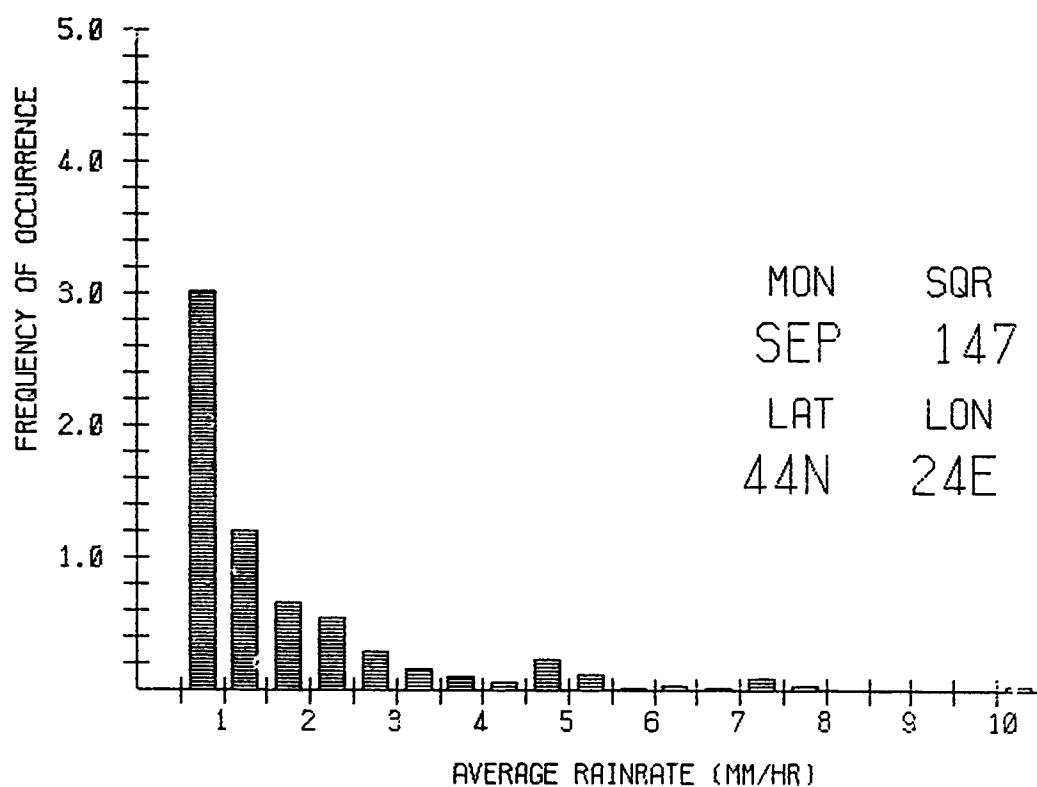


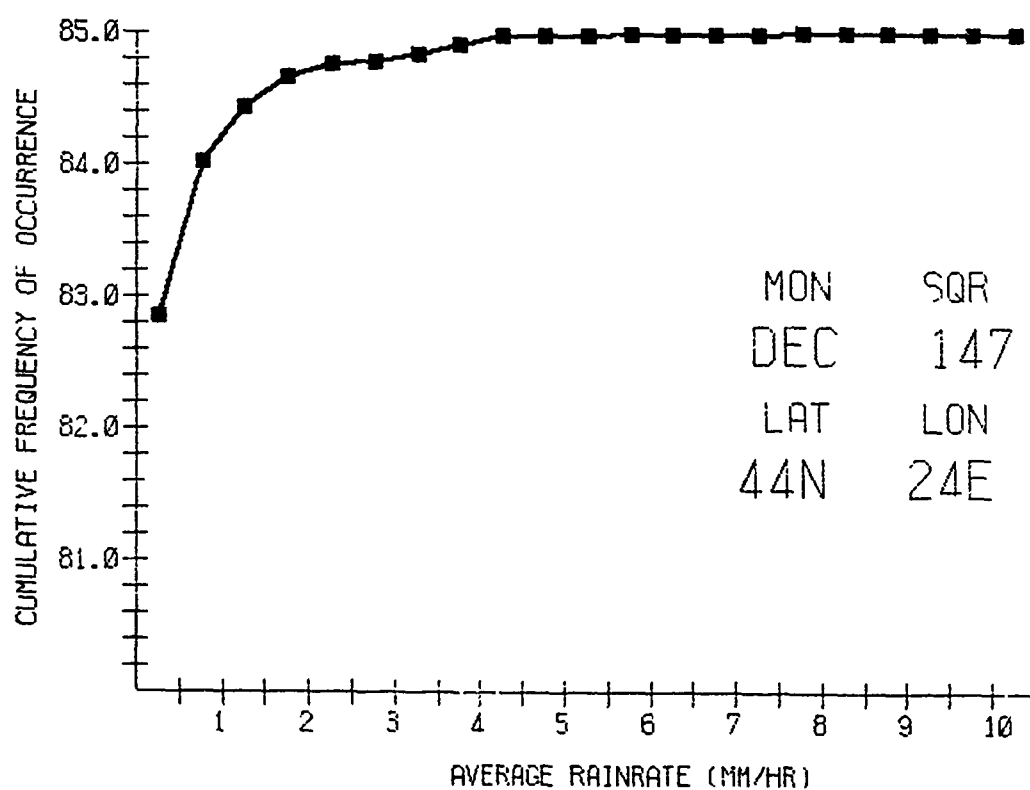
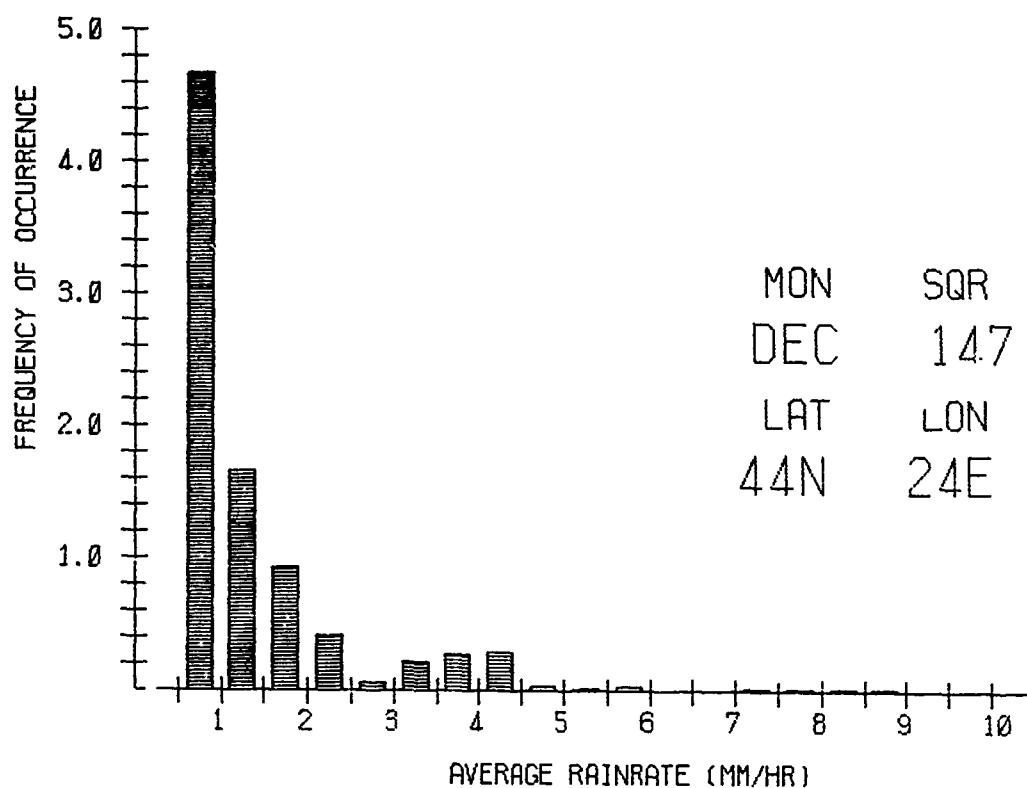


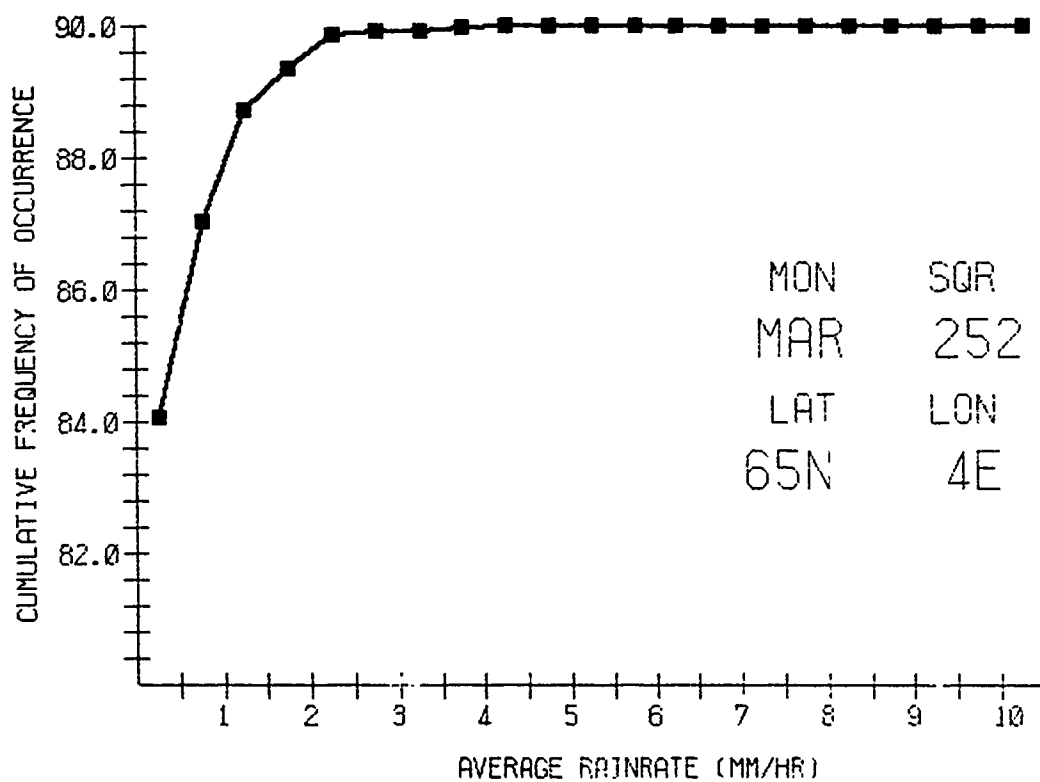
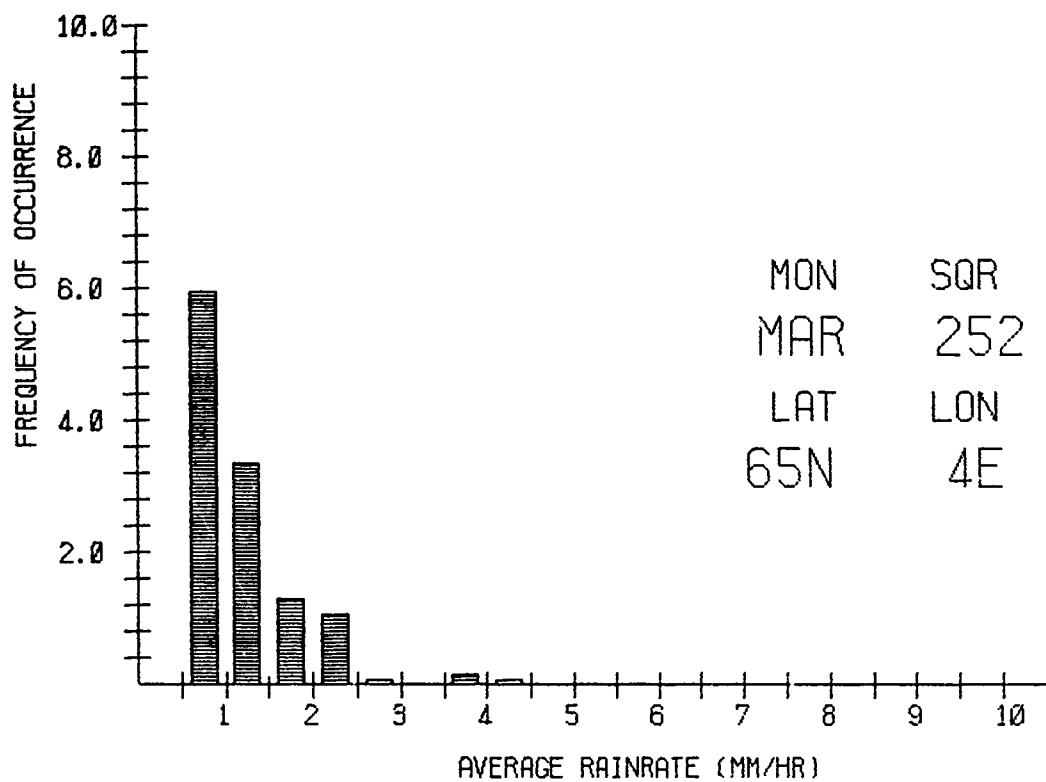


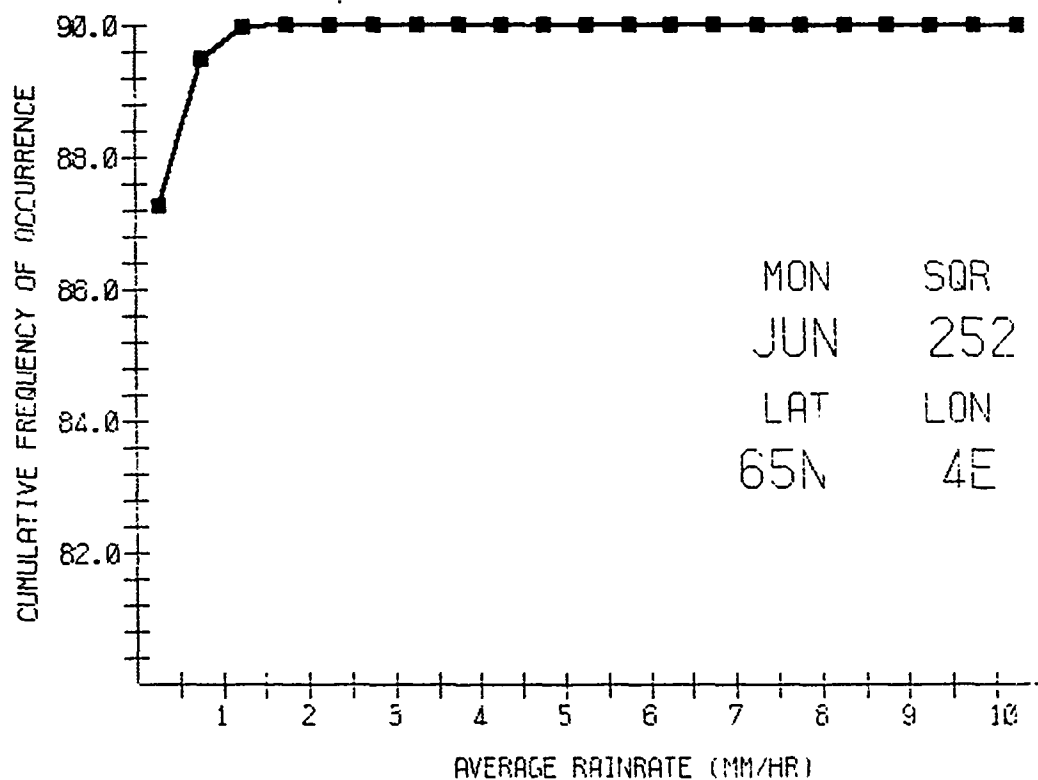
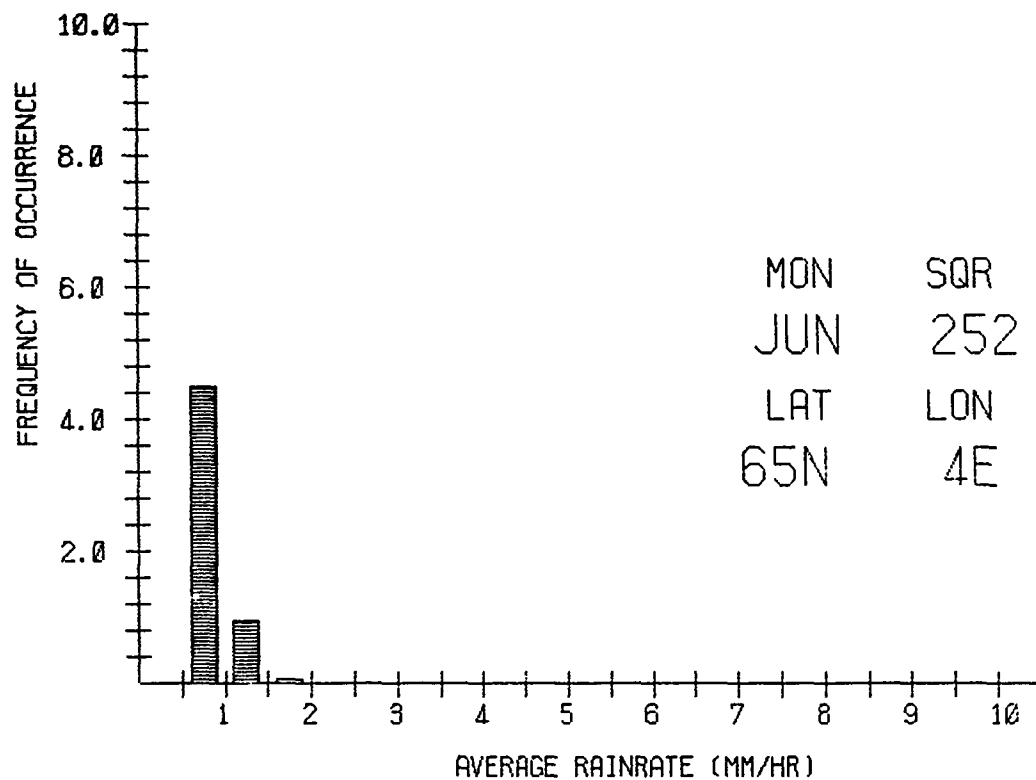


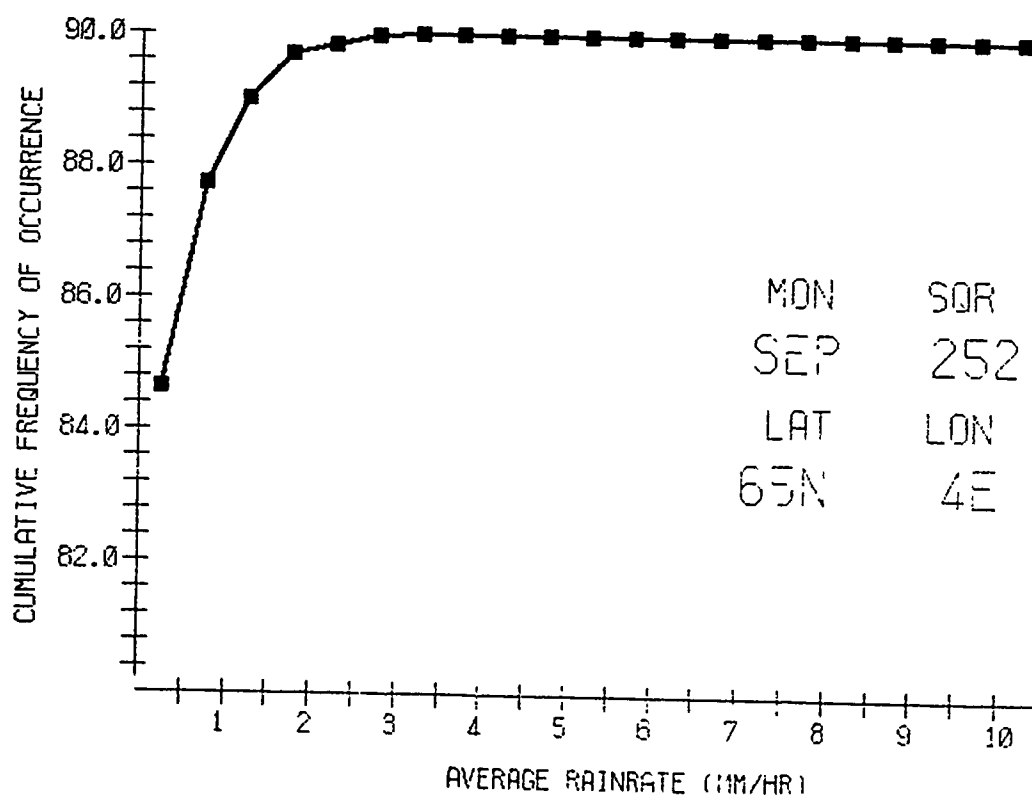
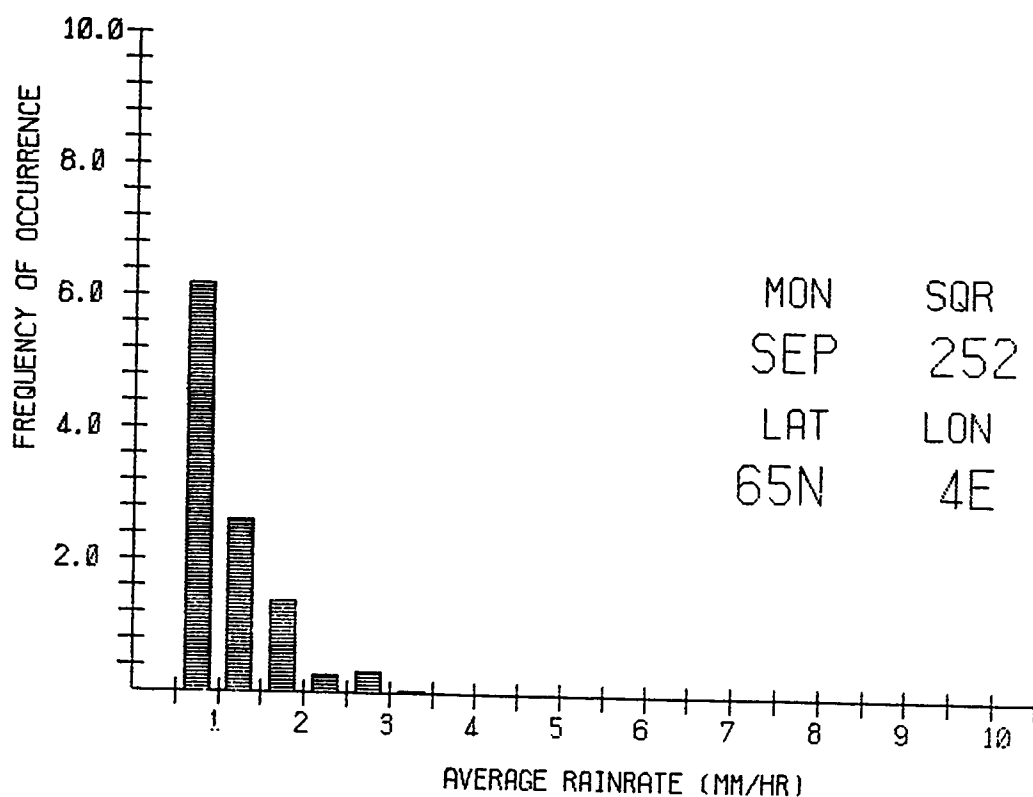


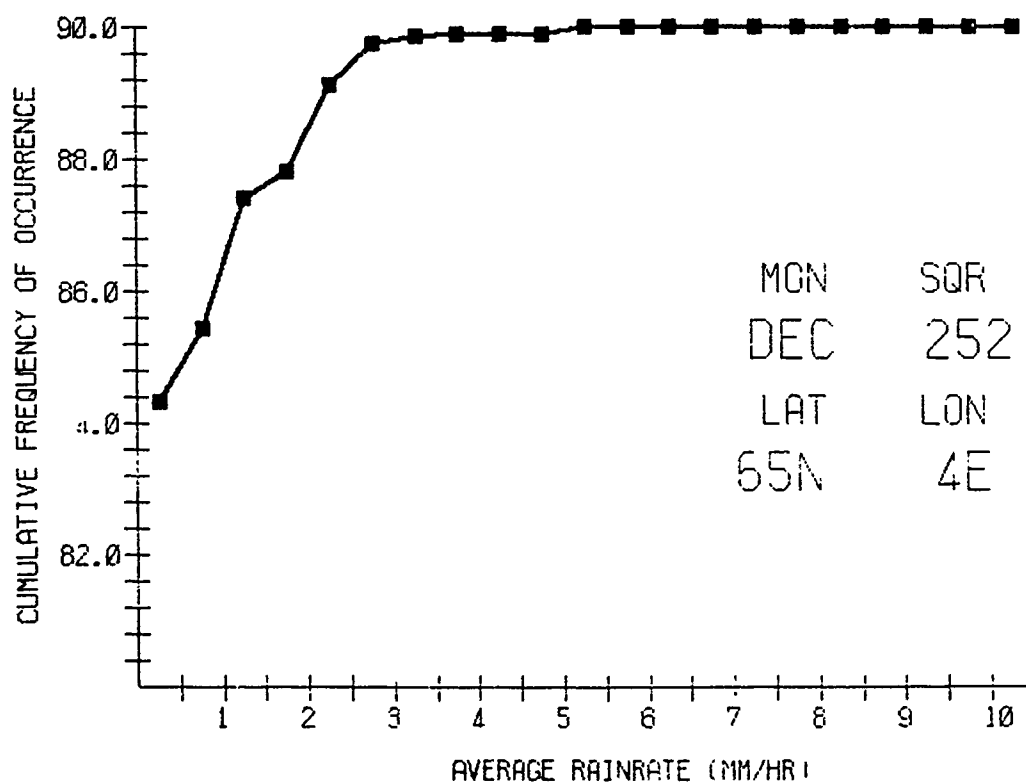
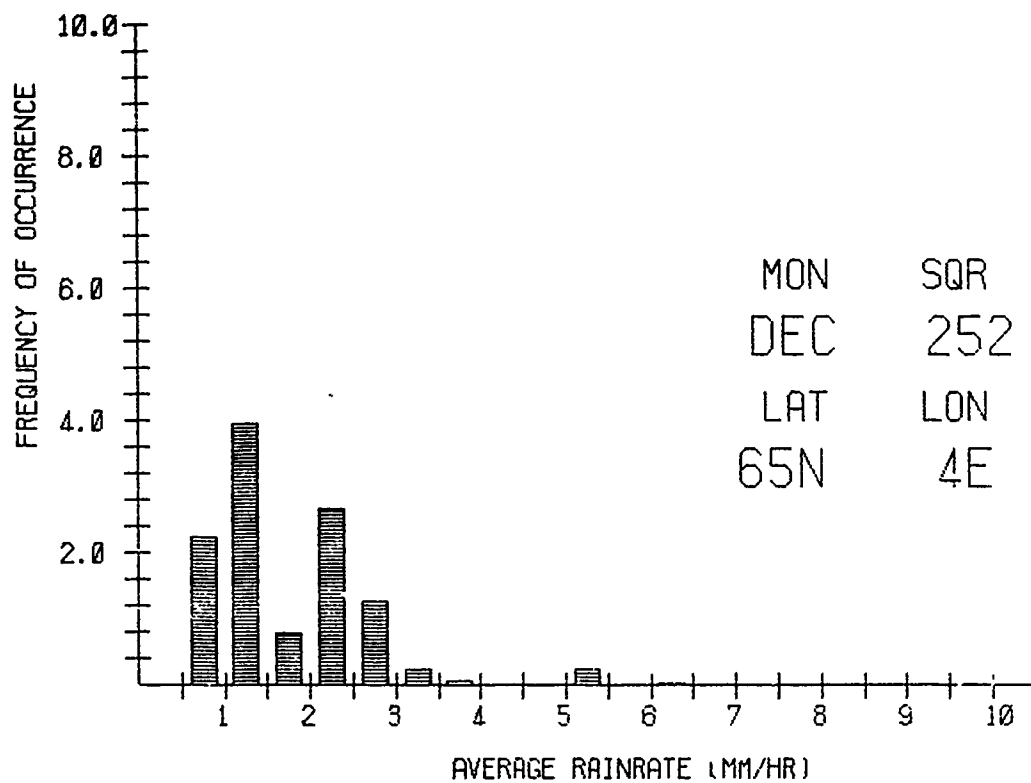


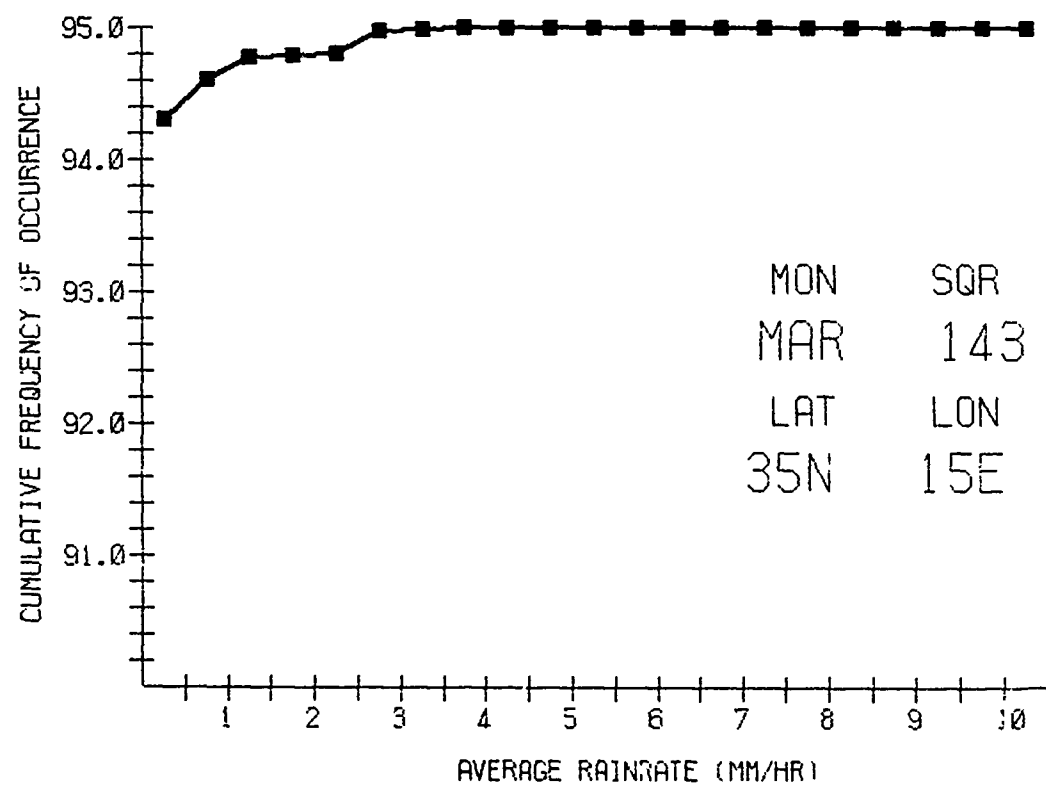
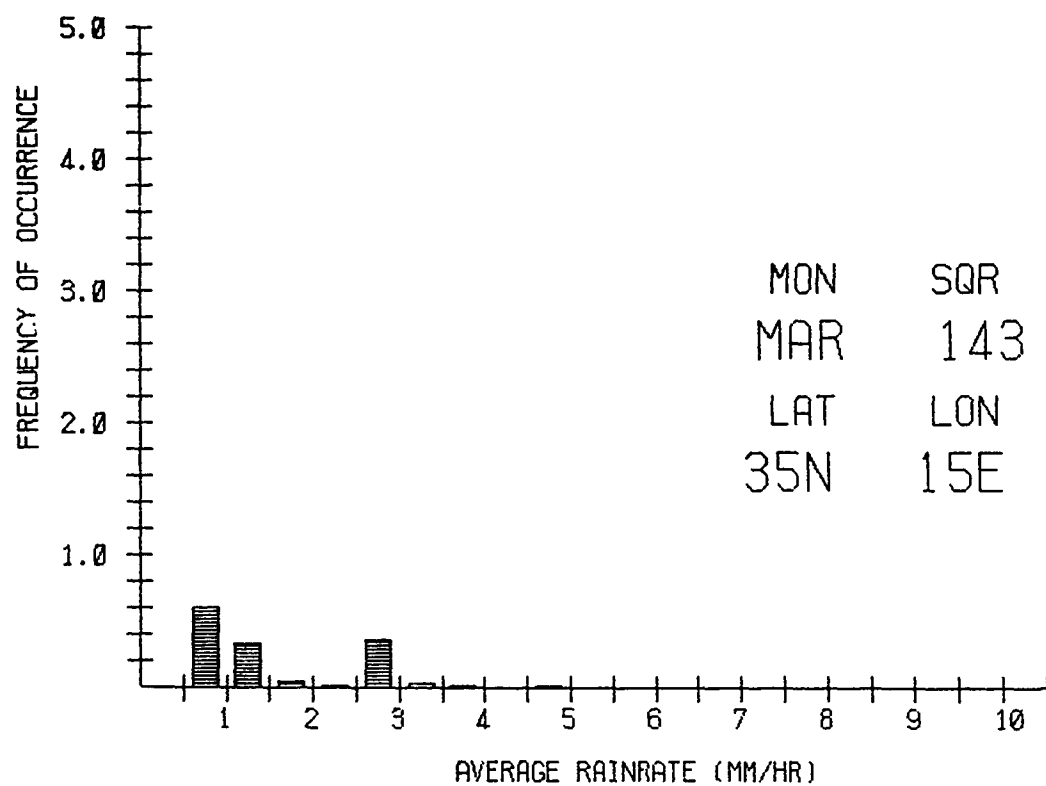


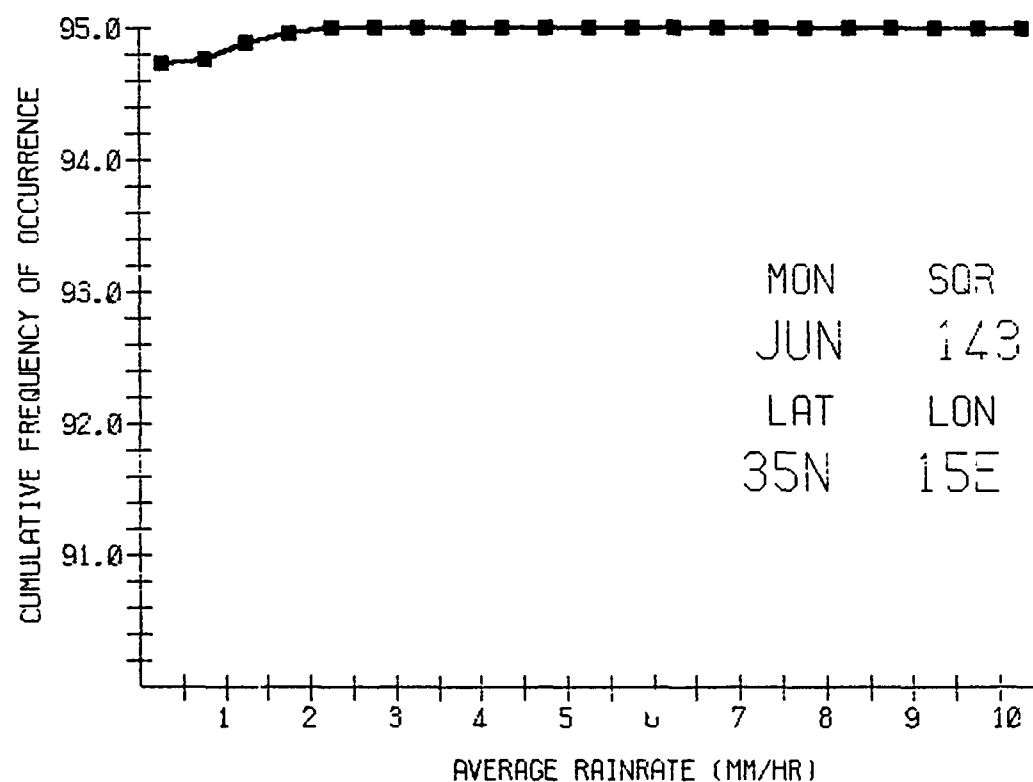
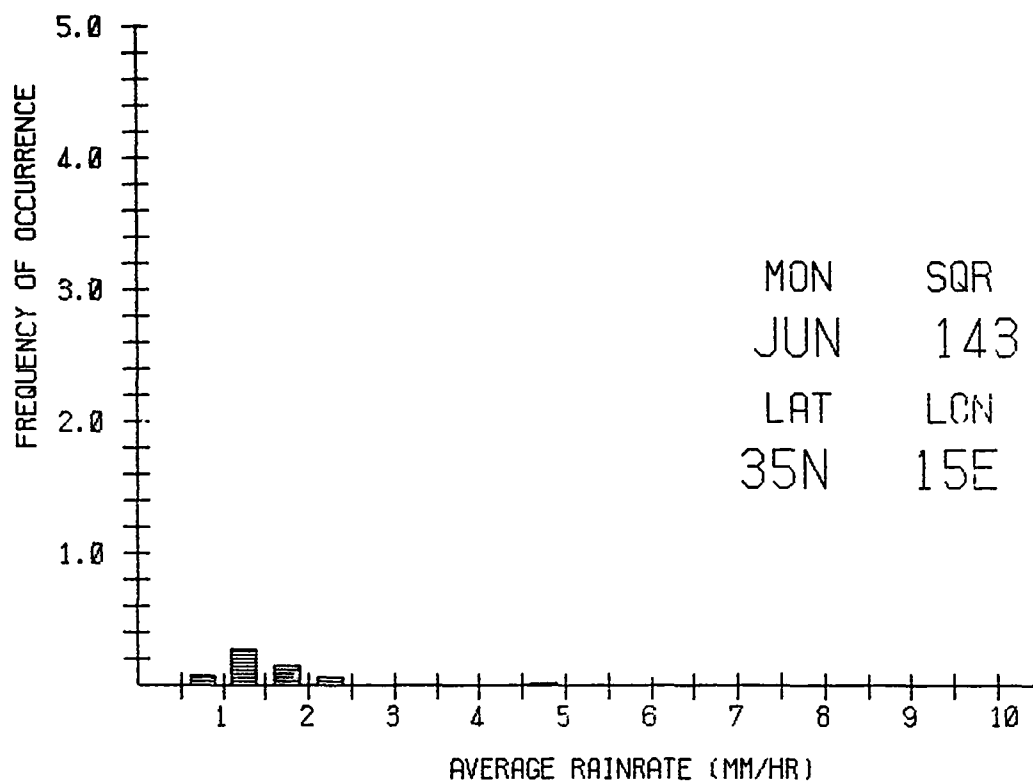


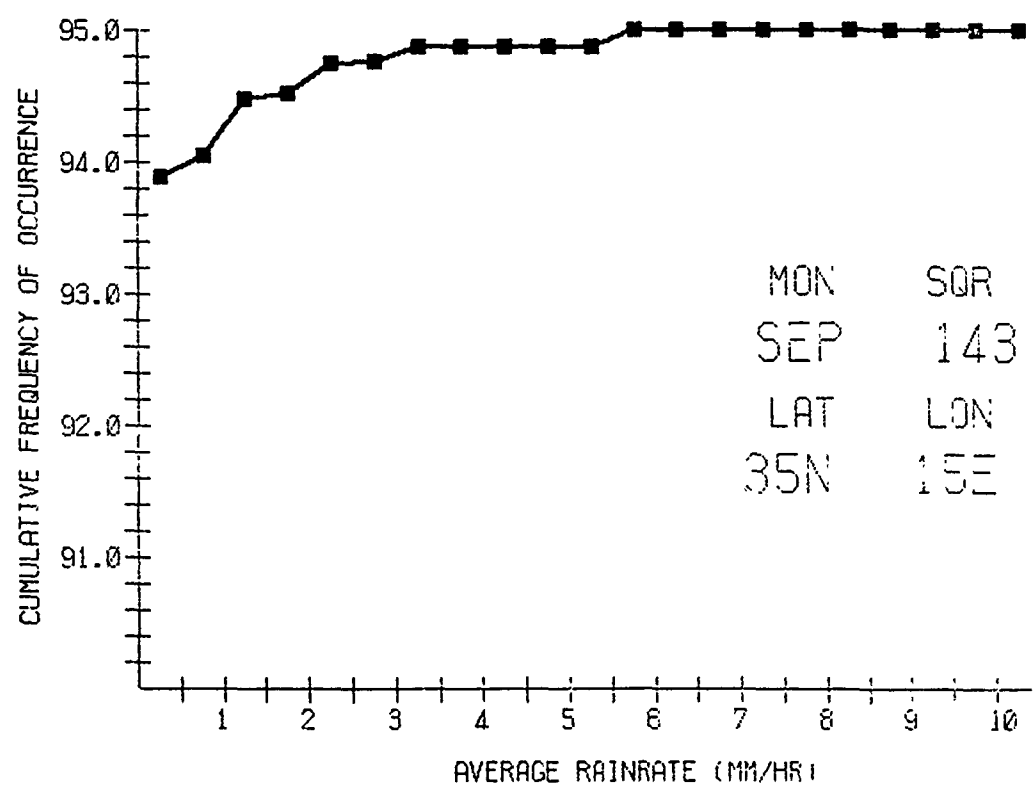
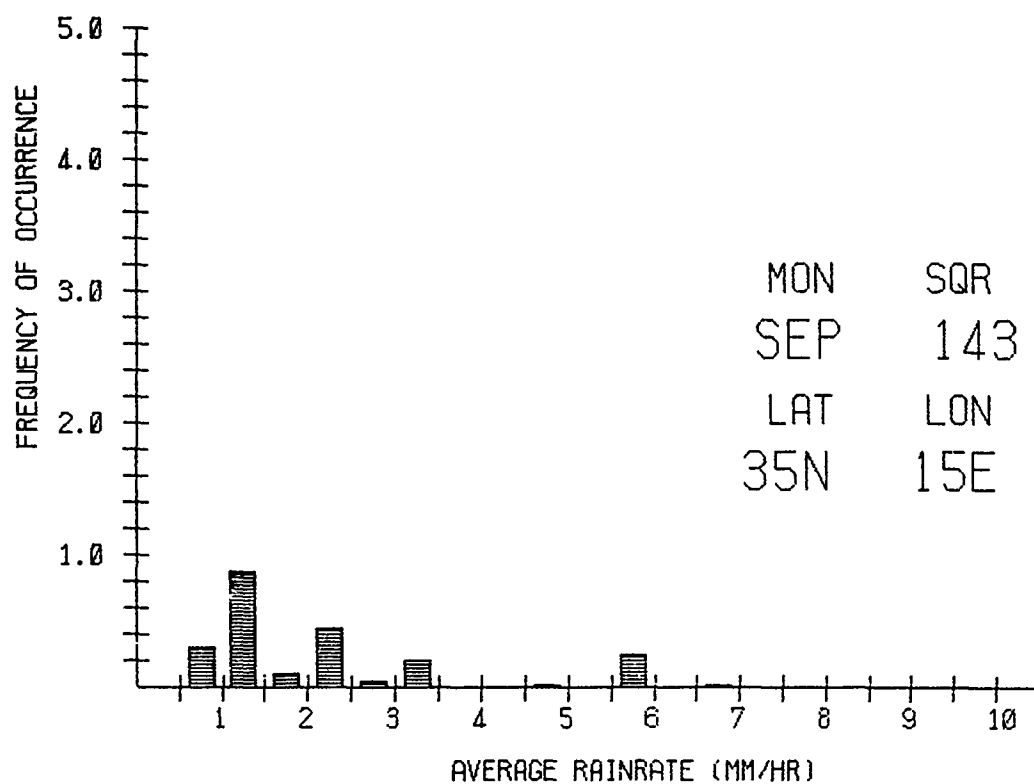


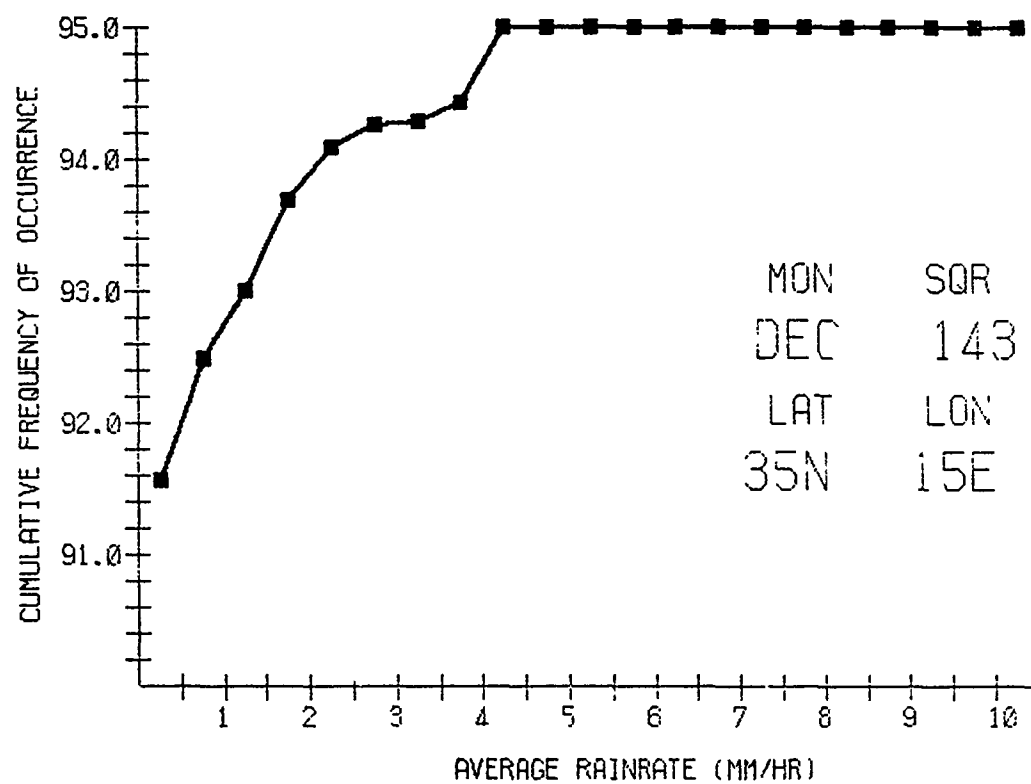
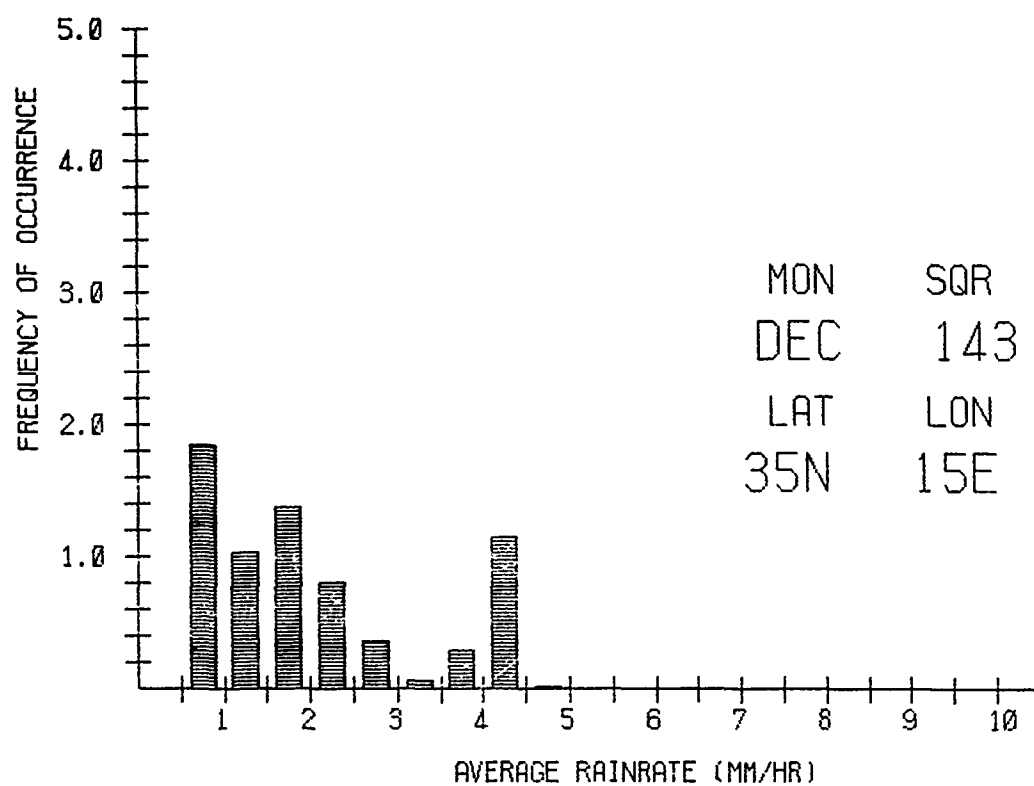


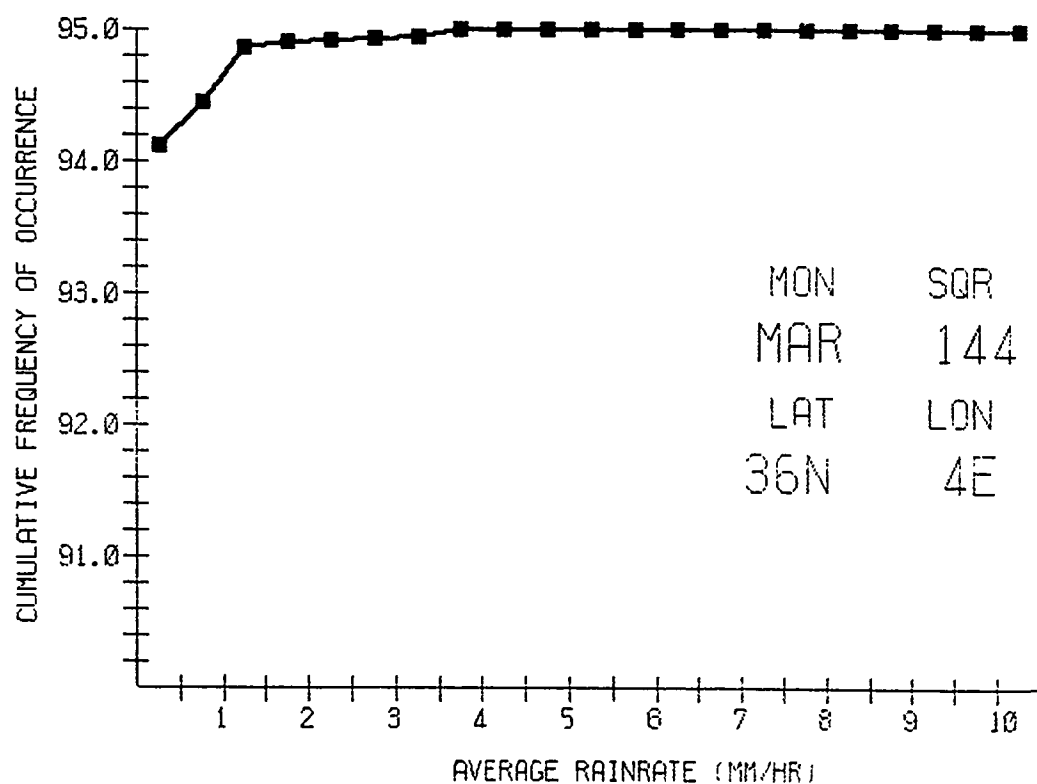
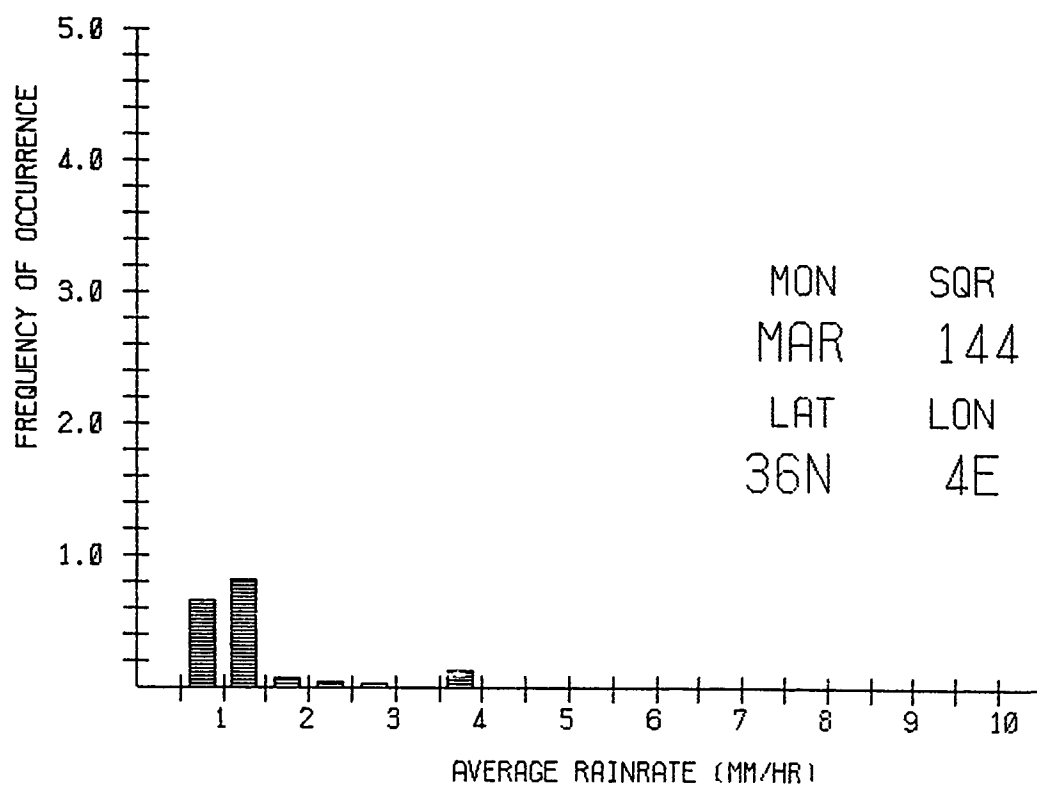


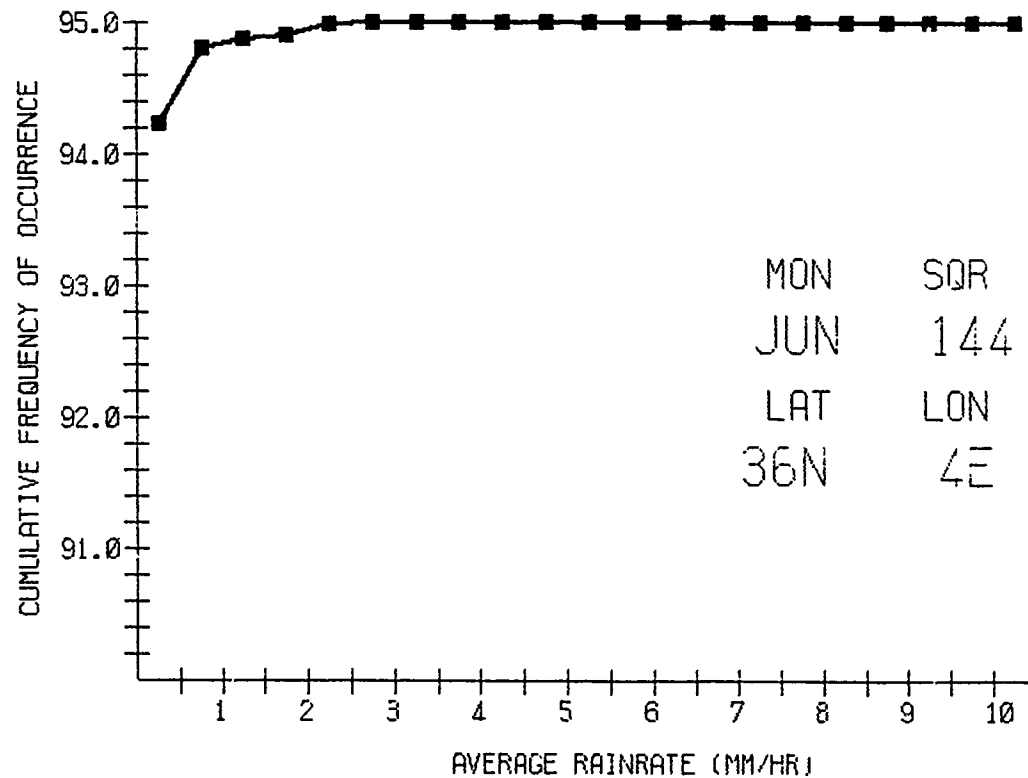
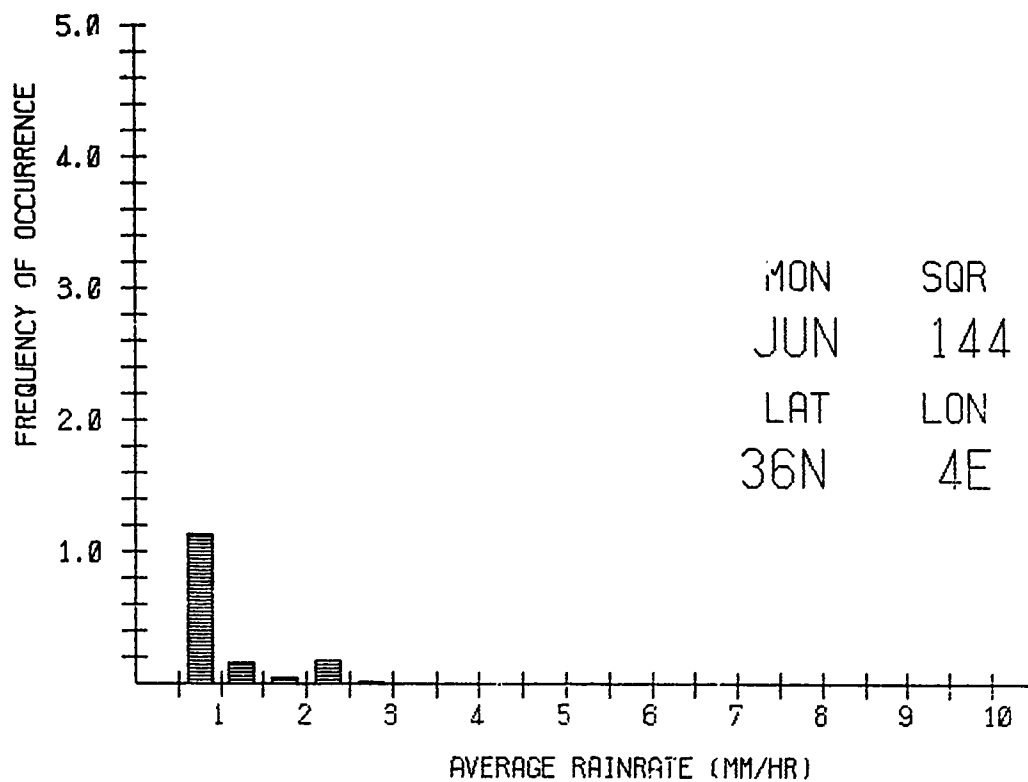


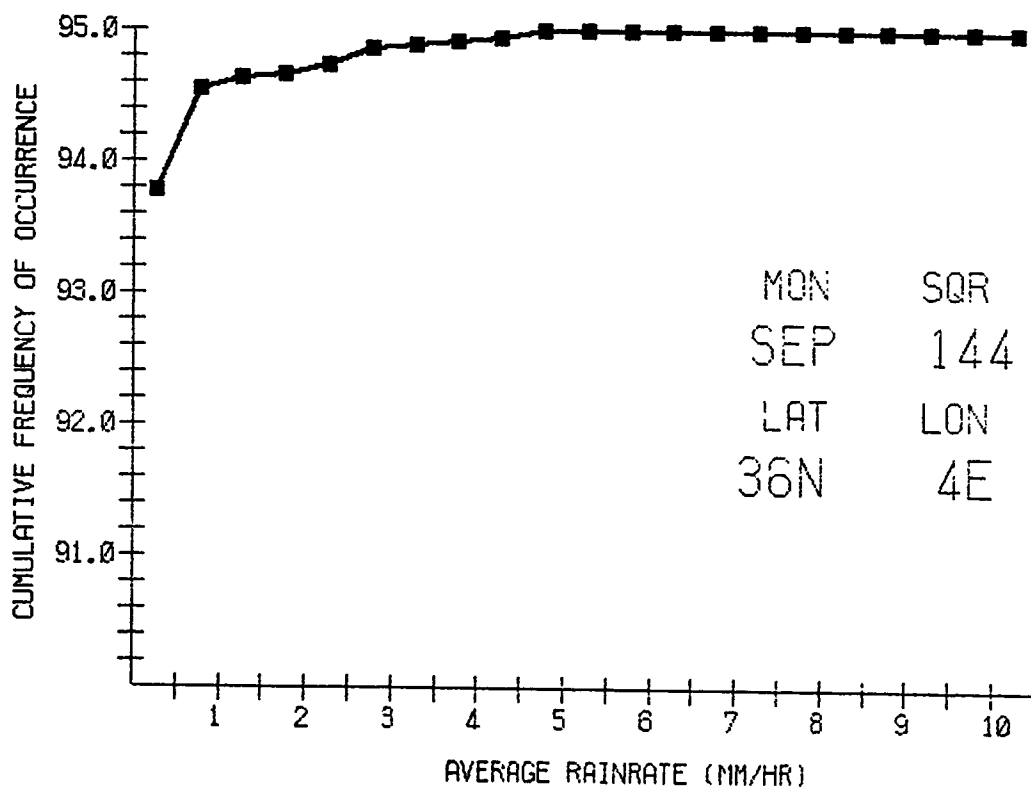
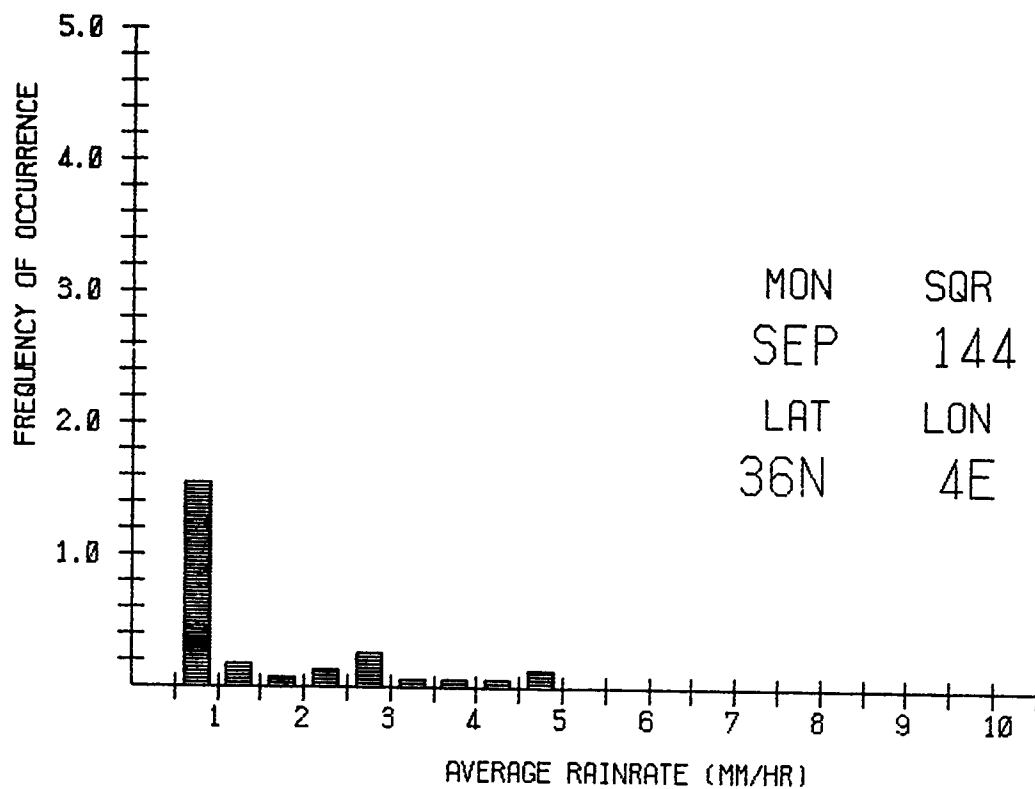


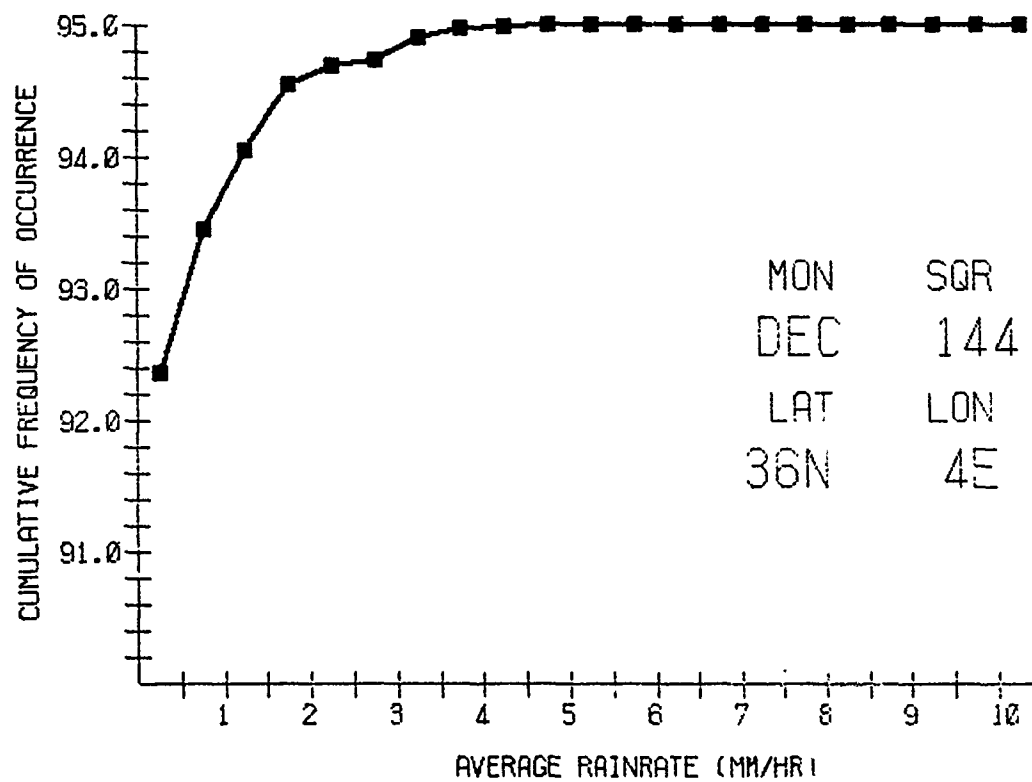
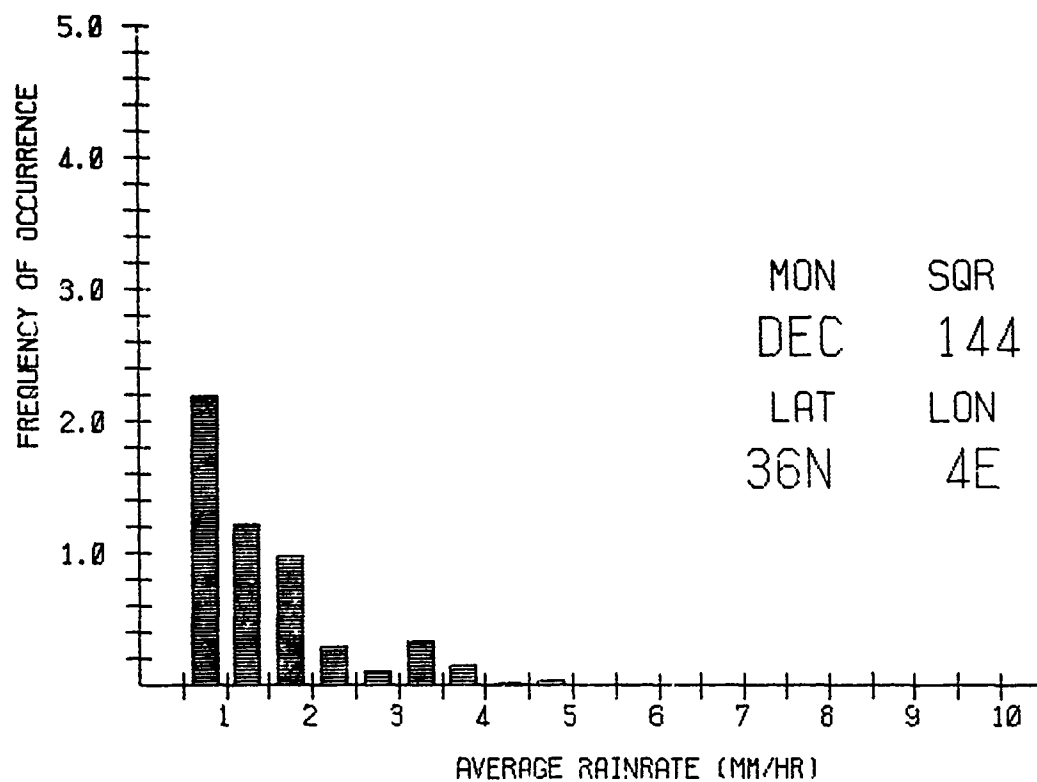












APPENDIX B
MARPLT PROGRAM LISTINGS

This appendix contains program listings of programs relating
archived meteorological data to rain rates and extinction coefficients.

```

1  C
2  C
3  C
4  C
5  COMMON/BLIND/MASKR(45),LSHFT(45)
   COMMON/AVG/FVIS1(12),FRAIN1(12),FOET1(12),FMIR1(12),
   ANVIS,NPAIN,NDET,NHPR,NRRT(21,12),
   ANYN(12),NDMN,SUMLAT,SUMLON,SOLAT,SOLON,
   ANPFC,NDATA,ILAT,ILAT,ILON,ILON,MONTH(12),
   AFMRAT1(21,12),FRNRT2(21,12),NHARSS(12),NMSUB,
   ASUMLAT2,SUMLON2,SOLAT2,SOLON2,NDATTO,
   AFVIS3(12),FOET3(12),FMIR3(12),FRAIN3(12),
   AYEAN(3,100,12),STDEV(3,100,12),MOBS(3,100,12),
   ASUMUM(3),SUMUM(3)
15 DIMENSION AWORD(45),INTER(45),INBUF(500)
   DIMENSION FRNRT3(21,12)
   DIMENSION INWTSUR(100)
   LOGICAL LCHK(45),LTEST,FIRST
   EQUIVALENCE (IPH,INTER(20)),(IVIS,INTER(29)),(IERR,INTER(30)),
   A(OSV,INTER(31)),(IMN,INTER(41)),(IDV,INTER(42)),(IMR,INTER(43))
20 DATA AWORD/9*0.0,10*1.0,14*2.0,10*3.0,4*0.4,0/
   DATA LCHK/(.T.),2*(.F.),3*(.T.),5*(.F.),7*(.T.),2*(.F.),
   A7*(.T.),2*(.F.),9*(.T.),7*(.F.)/
   DATA FVIS1/12*0.0/
   DATA FRAIN1/12*0.0/
   DATA FOET1/12*0.0/
   DATA FMIR1/12*0.0/
   DATA NNM/12*0/
   DATA NPVRT/252*0/
   DATA FRNRT1/252*0.0/
   DATA FRNRT2/252*0.0/
   DATA NHARSS/12*0/
   DATA MONTH/JAN*,FEB*,MAR*,APR*,MAY*,JUN*,JUL*,
   A,AUG*,SEP*,OCT*,NOV*,DEC*/
35 NFILCS=1
   NDATA=C
   NRAIN=C
   NVIS=0
   NDET=0
   FMIR=0
   NRFC=0
40
45 FIRST=.TRUE.
   NDMN=0
   FVIS2=FRAIN2=FOET2=FMIR2=0.0
50
55 10 NREC=NREC+1
   BUFFER IN (1,1)(INBUF(1),INBUF(500))
   IF (UNIT(1))20,30,40
   20 LEN=LENGTH(1)
   RECORD HAS BEEN READ, AND LENGTH RECORDED IN LEN
   GO TO 1000
   30 PRINT 35,NREC,NFILES
   35 FORMAT(1H0,*EOF ENCOUNTERED AT RECORD NO.15,* IN FILE NO.1,13)

```

```

60      GO TO 777
      4) PRINT*,* PARITY ERROR AT RECORD NO.,NREC,*SKIP*
      GO TO 10
1000  CONTINUE
      C      NUMBER OF OBSERVATIONS EQUALS (NO OF WORDS/5)
      NOUS=LEN/5
      IF(LEN.EQ.NOUS*5)GO TO 1010
      C      ODD NUMBER OF RECORDS ENCOUNTERED GO TO NEXT RECORD.
      PRINT*,* ODD NUMBER OF RECORDS, NREC=*NREC
      GO TO 10
1010  CONTINUE
      N2=0
1200  N2=N2+1
      IF(N2.GT.NOUS)GO TO 10
      C      UNPACK THE 5 WORD DATA RECORD AND PUT INTO INTER(45)
      DO 121 I=1, 45
      N=5*N2-4+AWORD(I)
      IDUM=MASKR(I).AND.INBUF(N)
      ISHIFT=LSHFT(I)
      IF(LCHK(I))GO TO 1210
      IDUM2=MASKR(I).AND..NOT.INBUF(N)
      IF(IDUM2.NE.08)GO TO 1210
      GO TO 1200
1210  INTER(I)=SHIFT(IDUM,ISHIFT)
      C
      IYR=INTER(42)+1800
      CALL CHECK(IYR,LTEST)
      IF(LTEST) GO TO 1250
      C      FIX LATITUDE (- IS SOUTH)
      C
      XLAT=FLOAT(SHIFT(SHIFT(INTER(2),49),-49))/10.0
      C
      C      FIX LONGITUDE (- IS WEST)
      C
      XLON=FLOAT(SHIFT(SHIFT(INTER(3),48),-48))/10.0
      JPR=INTER(1)
      IF (JPR) 1240,1250
1240  CONTINUE
      C      DATA SOURCE IS SPOT DATA
      C
      PR1=FLOAT(INTER(7))/10.0
      PR2=1./E3
      IF(PR1.GT.70.0)PR2=900.0
      PRESS=PR1+PR2
      GO TO 1250
1250  CONTINUE
      C      DATA SOURCE IS TOF-11
      C
      PRESS=(FLOAT(INTER(7))+9.0E3)/10.0
1260  CONTINUE
      C      CORRECT FOR SIGN OF AIR TEMPERATURE
      C
      TAIR=FLOAT(SHIFT(SHIFT(INTER(8),49),-49))/10.0

```

```

115      C      C      CORRECT FOR SIGN OF DEWPOINT TEMPERATURE
      TD=FLOAT(SHIFT(INTER(11),53),-53))
      TOUTP=T0
120      IF(T0.LE.TAIR.AND.T0.LT.40.0)GO TO 1270
      GO TO 1200
      1270 CONTINUE
      WNUSP0=INTER(20)
      C      NOTE WIND IS MN METERS PER SECOND
      IMN=INTER(41)
      ILAT=XLAT
      ILON=XLON
      IF(.NOT.FIRST)GO TO 1280
      C      C      INITIALIZE FOR FIRST FILE
      JLAT=ILAT      JLon=ILON
      00 1272 I=1,3
      SUNDUM(I)=0.0
      SODUM(I)=0.0
      00 1272 J=1,100
      00 1272 K=1,12
      RMEAN(I,J,K)=0.0
      STDEV(I,J,K)=0.0
      1272 MORF(I,J,K)=0
      00 1273 K=1,12
      FVIS3(K)=0.0
      FDOT(K)=0.0
      FMIR3(K)=0.0
      1273 FRAIN3(K)=0.0
      1274 I=1,100
      IMAISUB(I)=0
      NMSUB=
      NDAT0=0
      JMN=IMN
      JYR=IYR
      SLATMN=0
      SLONMN=0
      SUMLAT2=0
      SUMLON2=0
      SOLAT2=0
      SRLON2=0
      155      FIRST=.FALSE.
      C      1200 CONTINUE
      C      C      CHECK WHETHER MONTH HAS CHANGED
      IF(IMN.NE.JMN.OR.IYR.NE.JYR.OR.ILAT.NE.JLAT.OR.ILON.NE.JLON)
      *CALL MRAVG(IMN,JMN,IYR,JYR)
      C      C      CHECK WHETHER MARSDEN SUBSQUARE HAS CHANGED
      IF(ILAT.NE.JLAT.OR.ILON.NE.JLON)CALL SUBAVG(IMN,JMN,IYR,JYR,
      *IMATSUB,(MSUBSQ)
      C      C      NDHN=NDHM+1
      NDATA=NDATA+1
      170

```



```

CALL MARSDENISLATM,N,SLOMMN,IQUAD,MSQ)
PRINT 771,MSQ,IQUAD,SLATM,N,SOLAT2,SLOMMN,SOLON2,NHSUR,NOATTO
779 FOPMAT(1,Z,I9,12X,I2,8X,2(F6,1,5X),2X,2(F6,1,5X),4X,I3,10X,I7)
PRINT 780
780 FOPMAT(1H0,4JX,#DISTRIBUTION OF RAINRATE FREQUENCIES (PERCENT)%,/)
PRINT 785
785 FOPMAT(2X,#MONTH#,Z #0.5#,Z #1.0#,Z #1.5#,Z #2.0#,Z
#Z #2.5#,Z #3.0#,Z #3.5#,Z #4.0#,Z #4.5#,Z #5.0#,Z
#Z #5.5#,Z #6.0#,Z #6.5#,Z #7.0#,Z #7.5#,Z #8.0#,Z
#Z #8.5#,Z #9.0#,Z #9.5#,Z #10.0#,Z #10.5#,Z #11.0#,Z
LTEST=.FALSE.
DO 900 K=1,12
DO 790 JJ=1,21
FNRRT3(JJ,K)=1.0
IF(NMARSS(K).EQ.0) GO TO 790
KFLAG=K/3
IF(K.EQ.KFLAG*3)LTEST=.TRUE.
FNRRT3(JJ,K)=FNRRT2(JJ,K)/FLOAT(NMARSS(K))
FNRPT2(JJ,K)=0.0
790 CONTINUE
PRINT 800,MONTH(K),(FNRRT3(JJ,K), JJ=1,21)
800 FOPMAT(3X,A3,1X,2P2U,F6,1,2X,F6,1)
900 CONTINUE
IF(LTEST) CALL HTSTPLT(FNRRT3,SLATM,SLOMMN,MSQ)
PRINT 910
910 FOPMAT (1H0,28X,#CUMULATIVE FREQUENCIES FOR VISIBILITY. DETECTOR,
#MIQACL AND RAINRATE PARAMETERS (PERCENT)%,/)
PRINT 920,(MONTH(K), K=1,12)
920 FOPMAT(15X,I2(A3,7X),/)
DO 930 K=1,12
IF(NMARSS(K).NE.0) GO TO 925
FVIS3(K)=-1.0
FOI3(K)=-1.0
FMIR3(K)=-1.0
FRAIN3(K)=-1.0
NMARSS(K)=1
925 FVIS3(K)=FVIS3(K)/NMARSS(K)
FOI3(K)=FOET3(K)/NMARSS(K)
FMIR3(K)=FMIR3(K)/NMARSS(K)
FRAIN3(K)=FRAIN3(K)/NMARSS(K)
NMARSS(K)=1
930 CONTINUE
PRINT 940,#VIS <= 1.0#, (FVIS3(K), K=1,12)
PRINT 941,#OET >= 0.8#, (FOET3(K), K=1,12)
PRINT 940,#MIR >= .28#, (FMIR3(K), K=1,12)
PRINT 941,#RNR >= 2.0#, (FRAIN3(K), K=1,12)
940 FOPMAT(1X,A10,2PF8,2,11F10,2)
DO 950 JJ=1,3
IF (JJ.EQ.1) PARA=# B3 #
IF (JJ.EQ.2) PARA=# B8 #
IF (JJ.EQ.3) PARA=#QMIRCL#
PRINT 942,PARA
942 FOPMAT(1H1,36X,#STATISTICAL VALUES FOR THE #,A6,# PARAMETER#,)
PRINT 943,(MONTH(K), K=1,12)
943 FOPMAT(1H0,#SQUARE#6X,I2(A3,7X),/)
DO 949 K=1,100
PRINT 946,K-1,(RMEAN(JJ,K,I), I=1,12)

```

```

290 946 FORMAT (1X,I6,2X,MEAN,F6.2,11F10.2)
    PRINT 947, (STDEV(JJ,K,I), I=1,12)
    947 FORMAT (9X,8SDEV,F6.2,11F10.2)
    PRINT 948, (M08S(JJ,K,I), I=1,12)
    948 FORMAT (9X,8OBS,I7,11(2X,I8),/)
    949 CONTINUE
    950 CONTINUE
    PRINT 952, MSQ
    952 FORMAT (1HC,8SUBSQUARES NOT REPORTING FOR SQUARE #,I4,/)
    DO 960 K=1,100
    IF(IWATSUB(K).EQ.1) GO TO 960
    PRINT *,#MARS DEN SUBSQUARE #,K-1,# HAD NO REPORTS#
    960 CONTINUE
    CALL WRITEND(0)
    7771 CONTINUE
    STOP
    END
300

```


12/04/80 22.06.16

FTN 4.6446

SUBROUTINE CHECK 73/74 OPT=1

```
1      SUBROUTINE CHECK(IYR,LTEST)
      C      CHECK THAT YR IS WITHIN 5 OF 1968
      C
      C      LOGICAL LTEST
      C
      IYR=IYR-1968
      IF(IYR)40,40,777
      40 CONTINUE
      LTEST=.FALSE.
      RETURN
      777 LTEST=.TRUE.
      RETURN
      END
```



```

1  SUBROUTINE SUBAVG (IMN, JMN, IYR, JYR, IMATSUR, LMSUBSQ)
   COMMON/AVG/FVIS1(12), FRAIN1(12), FDET1(12), FMIR1(12),
   & NVIS, NPAIN, NDET, NMIR, NRRT(12,12),
   & NMN(12), NDMN, SUHLAT, SUMLON, SOLAT, SOLON,
   & ANREG, NOATA, ILAT, JLAT, ILON, JLOH, MONTH(12),
   & FRNRT1(12,12), FRNRT2(21,12), NMARSS(12), NMSUB,
   & SUMLAT2, SUMLON2, SOLAT2, SOLON2, NDATTO,
   & FVIS3(12), FDET3(12), FMIR3(12), FRAIN3(12),
   & ARMEAN(3,100,12), STDEV(3,100,12), MOBS(3,100,12),
   & SUMOUM(3), SOOUM(3)
   DIMENSION IMATSUB(100)

   C
   C      ON AVERAGE FOR WHOLE MARSDEN SUBSQUARE
   C
15  NMSUB=NMSUB+1
   XLATHN=SUMLAT/NOATA
   XLONMN=SUMLON/NOATA

   C
20  LATHN=(XLATHN+90.0)*10.0
   LONMN=(XLONMN+360.0)*10.0
   IF (LONMN.GE.3600) LONMN=LONMN-3600

   C
25  SUMLAT2=SUMLAT2+XLATHN
   SUMLON2=SUMLON2+XLONMN
   SOLAT2=SOLAT2+XLATHN*XLATHN
   SOLON2=SOLON2+XLONMN*XLONMN

   C  DETERMINE MARSDEN SUBSQUARE
   LAT=ABS(XLATMN)
   LON=ABS(XLOHNMN)
   LAT=LAT-LAT/10*10
   LON=LON-LON/10*10
   MSUBSQ=LAT*10+LON+1
   IMATSUB(MSUBSQ)=1

   C  COMPUTE PARAMETER VALUES FOR SUBSQUARE
35  DO 95A, M=1,12
   IF (NMN(M).EQ.0) GO TO 9079
   NMARSS(M)=NMARSS(M)+1
   FVIS2=FVIS1(M)/NMN(M)
   FVIS3(M)=FVIS3(M)+FVIS2
   FRAIN2=FRAIN1(M)/NMN(M)
   FRAIN3(M)=FRAIN3(M)+FRAIN2
   FDET2=FDET1(M)/NMN(M)
   FDET3(M)=FDET3(M)+FDET2
   FMIR2=FMIR1(M)/NMN(M)
   FMIR3(M)=FMIR3(M)+FMIR2
   DO 9677, JJ=1,21
   FRNRT2(JJ,M)=FRNRT2(JJ,M)+FRNRT1(JJ,M)/FLOAT(NMN(M))
   FRNRT1(JJ,M)=0.0
9077 CONTINUE

50  DO 967A, JJ=1,3
   RMEAN(JJ,MSUBSQ,M)=RMEAN(JJ,100,M)/MOBS(JJ,100,M)
   R1=STDEV(JJ,100,M)/MOBS(JJ,100,M)
   R2=RMEAN(JJ,MSUBSQ,M)*RMEAN(JJ,MSUBSQ,M)
   IR1=R1*1000.0
   IR2=R2*1000.0
   R1=IR1/1000.0
   R2=IR2/1000.0
55

```

```

60      C      STDEV(JJ,MSURSQ,M)=SORT(R1-R2)
        C      MOBS(JJ,MSUBSQ,M)=MOBS(JJ,100,M)
        C      IF(MSURSQ.EQ.100) GO TO 9078
        C
        C      RMEAN(JJ,100,M)=0.0
        C      STDEV(JJ,100,M)=0.0
        C      MOBS(JJ,100,M)=0
        C      9078 CONTINUE
        C      9079 CONTINUE
        C      NMH(A)=J
        C      FVIS1(M)=0
        C      FRAIN1(M)=0
        C      FOET1(M)=0
        C      FMIR1(M)=0
        C      9080 CONTINUE
        C
        C      IF(NMSUR.EQ.1) LMSUBSQ=0
        C      CALL PACK(LATMN,LOMMN,MSUBSQ,RMEAN,STDEV,MOBS)
        C      LMSUBSQ=MSURSQ
        C
        C      NNATTO=NOATTO+NDATA
        C      SUMLAT=J
        C      SQLAT=0
        C      SUMLON=0
        C      SQLON=J
        C      NNATA="
        C      NVIS=NPAIN=NOET=NMIR=0
        C      NREC=0
        C
        C      RESET EVERYTHING FOR A NEW MARSDEN SUBSQUARE
        C
        C      NMN=0
        C      JLAT=ILAT$      JLON=ILON
        C      JYR=IYR
        C      JYN=IMN
        C      RETURN
        C      END
95

```

```

1  SUBROUTINE INFRA(MSHPS,IPW,TAIR,TOUPT,P,JVIS,BVIS,83,86,
   A BMIRCL,PNRT)
   COMMON /AA/C(20,6)
   DIMENSION VIS(10)
   DATA VIS/.025,.125,.35,.75,1.5,3.0,7.0,15.0,35.0,50.0/
   TOUPT= DEW POINT IN DEGREES C
   C
   C WSHPS= WIND SPEED IN M S-1
   C
   C IPW= PRESENT WEATHER INDICATOR (SEE TDF-11 DESCRIPTION)
   C
   C P= PRESSURE IN MILLIBARS
   JJJ= JVIS-89
   VIS19=VIS(JJJ)
   IF(JVIS.LT.10)VIS18=VIS(JVIS+1)
   CALL MWN(MSHPS,IPW,TAIR,TOUPT,P,VIS18,
   A ETR4,ET5,ES1,BMIRCL)
   BVIS=ES1
   A3=ETRA4
   A4=ET5
1000 FORMAT(1X,F4.1,I3,2F4.1,F6.1,F3.0,3E12.6)
100 CONTINUE
100 RETURN
20  END

```

```

1  SUBROUTINE MUNN(WIND,IWEAT,TAIR,TO,P,VISIB,ETR84,ET5,ES1,BMIRCL)
   DIMENSION WL(7),ALPHA3(8),ALPHA8(3),A(7)
   COMMON/AA/C(20,6)
   DATA WL/.55,1.56,.5,1.1,7.75,11.75,3.8/
   DATA A/6.17799961,4.436518521E-1,1.428945805E-2,2.605648471E-4,
5  A3.331243346E-6,2.034380948E-8,6.136820929E-11/
   EVAP(T)=A(1)+T*(A(2))+T*(A(3))+T*(A(4))+T*(A(5))+T*(A(6))+T*(A(7))))
   RELH (EDUPT,ETSAT,P)=100.*EDUPT/ETSAT*(P-ETSAT)/(P-EDUPT)
   C
   CONVERT TO M/SEC
10  AVMSD=WIND
   E1= EVAP(TO)
   E2=EVAP(TAIR)
   RH=RELH(E1,E2,P)
   IF(RH.GT.99.5) RH=99.5
15  CALL AEXTC(ES1,ES2,ES3,ES4,ES5,VISIB,IWEAT,AVMSD,RH)
      CALCULATE ABSOLUTE HUMIDITY
      AHGM=.622E3*E1/(P-E1)
      IF(AHGM.LT.0.0)PRINT*,AHGM,E1,TO
   CALL ABSOR8(TAIR,P,RH,ALPHA3,ALPHA8,AHGM)
   ETR84=ES4+ALPHA3(4)
   ET5=ES5+ALPHA8(3)
20  CALL MIRACL(TAIR,E1,BMIRCL)
      RETURN
      END

```

```

1  SUBROUTINE ABSORB(AIR,AP,RH,ALPHA3,ALPHA8,AHGM)
   DIMENSION ALPHA3(8),ALPHA8(3),E(4,3),T(4,8)
   DATA (E(1,1),I=1,4)/.4477E-07,1.930E-08,.6199E-08,.2597E-10/
5  DATA (E(1,2),I=1,4)/.024019,.003258,0.0,0./
   DATA (E(1,3),I=1,4)/.009909,.000605,0.0,0./
   DATA (T(1,1),I=1,4)/.1867E-08,.4210E-08,.7433E-10,.1310E-11/
   DATA (T(1,2),I=1,4)/.04609,1.8715E-04,0.0,0./
   DATA (T(1,3),I=1,4)/.05872,.00959,0.0,0./
10  DATA (T(1,4),I=1,4)/.01132,.00118,0.0,0./
   DATA (T(1,5),I=1,4)/.3599E-08,.1032E-07,.2037E-09,.2688E-11/
   DATA (T(1,6),I=1,4)/.02884,.5356E-04,0.0,0./
   DATA (T(1,7),I=1,4)/.0284,.00334,0.0,0./
   DATA (T(1,8),I=1,4)/.01078,.00910,0.0,0./
   THIS SUBROUTINE USES AIR TEMPERATURE (TAIR) AND AIR PRESSURE (AP)
15  AND RELATIVE HUMIDITY (RH) TO CALCULATE MOLECULAR ABSORPTION
   COEFFICIENT FOR 3.8, 5, AND 10.59 MICRONS
   TEMPERATURE DATA IN CENTIGRADE NEEDS CONVERSION TO BOTH KELVIN
   AND DEG.F
   T1=TAIR+273.
   T2=T1*EXP(1830./T1)
20  7.75-11.75 MOLECULAR ABS IN /KM AT 10KM 293KELVIN
   H2J CONTINUUM ABS.
   ALPHA8(1)=T2*(E(1,1)+AHGM*(E(2,1)+AHGM*(E(3,1)+E(4,1)*AHGM)))
25  TP=TAIR-20.
   ASQ=SQRT(AHGM)
   ALPHA8(2)=E(1,2)+TP*E(2,2)+E(1,3)-E(2,3)*TP)*ASQ
   TOTAL 7.75-11.75 MOLECULAR EXTINCTION
   ALPHA8(3)=ALPHA8(1)+ALPHA8(2)
30  3.4-5.0 MOLECULAR ABS. IN /KM AT 10KM 293 KELVIN
   H2J CONTINUUM ABS.
   ALFA3(1)=T2*(T(1,1)+AHGM*(T(2,1)+AHGM*(T(3,1)+T(4,1)*AHGM)))
   H2 CONTINUUM ABS.
35  ALPHA3(2)=T(1,2)+T(2,2)*T1
   MIXED GASES LINE ABS.
   ALPHA3(3)=T(1,3)+T(2,3)*TP+T(1,4)-T(2,4)*TP)*ASQ
   TOTAL 3.4-5.0 MOLECULAR EXTINCTION 293 KELVIN
   ALPHA3(4)=ALPHA3(1)+ALPHA3(2)+ALPHA3(3)
40  3.4-5.0 MOLECULAR ABS. IN /KM AT 10KM 6000 KELVIN
   H2O CONTINUUM ABSORPTION
   ALPHA3(5)=T2*(T(1,5)+AHGM*(T(2,5)+AHGM*(T(3,5)+T(4,5)*AHGM)))
   H2 CONTINUUM ABS.
   ALPHA3(6)=T(1,6)+T(2,6)*T1
45  MIXED GASES LINE ABS.
   ALPHA3(7)=T(1,7)+T(2,7)*TP+T(1,8)-T(2,8)*TP)*ASQ
   TOTAL 3.4-5 MOLECULAR EXTINCTION 6000 KELVIN
   ALPHA3(8)=ALPHA3(5)+ALPHA3(6)+ALPHA3(7)
   RETURN
   ENO

```

```

1      SUBROUTINE AEXTC(EC1,EC2,EC3,EC4,EC5,VIS,IM,AVREAL,RH)
      COMMON/AA/C(20,6)
      FU(X,C,1)=C(I,1)+X*(C(I,2)+X*(C(I,3)+X*(C(I,4)+X*(C(I,5)+C(I,6)*X)
      *)))
5      C      WIND RIAS CORRECTION
      AV=AVREAL-3.5
      IF(AV.LT.0.5)AV=.5
      IF(AV.GT.21.) AV=21.
10     C
10     C      NO RH BELOW 30.0 PERCENT
      IF (RH.LT.30.0)RH=30.0
      IF(VIS.LT.1.) GO TO 50
      IF(IM.LT.50) GO TO 10
      IF(IM.GE.50.AND.IM.LE.59) GO TO 15
      IF(IM.GE.60.AND.IM.LE.61.OR.IM.EQ.60) GO TO 16
      IF(IM.GE.62.AND.IM.LE.63.OR.IM.EQ.61) GO TO 17
      IF(IM.GE.64.AND.IM.LE.65.OR.IM.EQ.62) GO TO 18
15     S1=S2-S3=S4=S5=.035
      GO TO 10
16     S1=S2-S3=S4=S5=.02
      GO TO 10
17     S1=S2-S3=S4=S5=.60
      GO TO 10
18     S1=1.14
      S2=1.27
      S3=1.27
      S4=1.14
      S5=1.6
30     IF(1AV.GE.7.) GO TO 20
      EC1=FU(1AV,C,1)*FU(RH,C,2)
      EC2=FU(1AV,C,5)*FU(RH,C,6)
      EC3=FU(1AV,C,9)*FU(RH,C,10)
      EC4=FU(1AV,C,13)*FU(RH,C,14)
      EC5=FU(1AV,C,17)*FU(RH,C,18)
      GO TO 150
20     EC1=FU(1AV,C,3)*FU(RH,C,4)
      EC2=FU(1AV,C,7)*FU(RH,C,8)
      EC3=FU(1AV,C,11)*FU(RH,C,12)
      EC4=FU(1AV,C,15)*FU(RH,C,16)
      EC5=FU(1AV,C,19)*FU(RH,C,20)
      IF(IM.LT.50) GO TO 200
150    EC1=EC1+S1
      EC2=EC2+S2
      EC3=EC3+S3
      EC4=EC4+S4
      EC5=EC5+S5
      GO TO 200
50     EXT=3.91/VIS
      EC1=EC2=EC3=EC4=EC5=EXT
200    CONTINUE
990    FORMAT(2 BIASED WND,2F6.1,5E10.3)
      RETURN
      END

```

```

1  BLOCK DATA AEROSOL
COMMON/AA/C(20,6)
DATA ((C(II,JJ),JJ=1,6),II=1,5)/
A .8065629E+01,
A 0.
A .4972407E+01,
A .3865717E+00,
A .2496362E-03,
A .2168010E-05,
A .8504248E+01,
A .3782149E+01,
A .4835776E-01,
A .1915719E-02,
A .6135706E+01,
A .5839620E+00,
A .3777016E-03,
A .3284040E-05,
A .7657225E+00,
A .7225769E-01,
A 0.
A/
15 DATA ((C(II,JJ),JJ=1,6),II=6,10)/
A .2932706E+01,
A .277654E+00,
A .1797614E-03,
A .1557875E-05,
A .1115328E+02,
A .4851545E+01,
A .6219585E-01,
A .2462248E-02,
A .4834422E+00,
A .5081195E+01,
A .4834422E+00,
A .3129826E-03,
A .2723047E-05,
A .6362647E+00,
A .8998343E-01,
A 0.
A .2439413E+01,
A .2282222E+00,
A .1473765E-03,
A .1280095E-05,
A/
30 DATA ((C(II,JJ),JJ=1,6),II=11,15)/
A .1191221E+02,
A .5131701E+01,
A .654140E-01,
A .2584433E-02,
A .4684813E+01,
A .4457416E+00,
A .2884387E-03,
A .2508542E-05,
A .4483040E+00,
A .9442862E-01,
A 0.
A .1395481E+01,
A .1033288E+00,
A .6671145E-04,
A .5794095E-06,
A .1539448E+02,
A .6565226E+01,
A .8645294E-01,
A .3472824E-02,
A/
40 DATA ((C(II,JJ),JJ=1,6),II=16,20)/
A .3626042E+01,
A .3432499E+00,
A .2219188E-03,
A .1929501E-05,
A .5729923E+00,
A .337501E-01,
A 0.
A .4900894E+00,
A .4627000E-01,
A .2986225E-04,
A .2591813E-06,
A .2255837E+02,
A .9991383E+01,
A .1462984E+00,
A .6203601E-02,
A .1985498E+01,
A .1872385E+00,
A .1209162E-03,
A .1050134E-05,
A/
50 END

```

1 SUBROUTINE MIRACL(T,E1,BMIRCL)
 C CALCULATION OF EXTINCTION COEFFICIENT FOR MIRACL SPECTRUM
 C BASED ON SAI ALGORITHMS
 C

5 DIMENSION A(9)
 DATA A/
 C

A 9.4351E-02, -3.2344E-04, 1.7890E-01,
 A 1.0086E-03, -7.0357E-06, -1.0417E-03,
 A 2.6894E-07, 1.5392E-06, 1.2311E-06/
 C

10 CONVERT WATER VAPOUR PRESSURE IN MB TO TORR
 C
 C

15 P=E1*1.33322
 TK=T+273.15
 BMIRCL= A(1) + A(2)*TK + A(3)*P +
 A (A(4)+A(5)*TK)*P*P + A(6)*TK*P +
 A (A(7)+P*(A(8)+P*A(9)))*TK*TK
 RETURN
 END

```

1  SUBROUTINE RNRATE(IPH,TAIR,IMN,RNRT)
   DIMENSION RR(10),AA(12),BB(12),CC(12)
   C  EVALUATION OF RAIN RATE USING
   C  TUCKER'S ALGORITHM, AND TEMPERATURE CORRECTION OF
   C  DORMAN AND BOURVES.
5  DATA AA / 0.973, 0.941, 0.804, 0.720, 0.489, 0.726,
   1.734, 1.115, 0.540, 0.671, 0.896, 0.985/
   DATA BB / 4.69E-2, 4.12E-2, 4.04E-2, 6.03E-2, 6.78E-2, -1.03E-1,
   -2.36E-1, -1.21E-1, .036, .042, .071, .0662/
10  DATA CC / 3.52E-3, 2.07E-3, 1.29E-4, 4.23E-5, 1.20E-5, 8.89E-3,
   1.19E-2, 8.15E-3, 5.14E-3, 2.934E-3, 1.35E-3, 1.15E-3/
   DATA RR / 5100.0,
   0.31, 0.31, 0.62, 1.88, 3.77, 0.31, 0.94, 0.31, 0.94,
   0.31, 0.62, 0.94, 1.88, 1.35, 2.71, 0.62, 2.29, 0.62, 2.29,
   0.31, 0.62, 0.94, 1.88, 1.35, 2.71, 0.00, 0.00, 0.00, 0.00,
   0.31, 0.94, 1.35, 0.31, 1.15, 0.31, 1.15, 0.31, 2.29, 0.31,
   2.29, 0.62, 2.29, 0.62, 2.29, 1.28, 1.28, 2.71, 0.00, 2.71/
   C  1 2 3 4 5 6 7 8 9
   RNRT=RR(IPH+1)*(AA(IMN)+TAIR*(BB(IMN)+TAIR*CC(IMN)))
   RETURN
   END
20

```

```

1  SUBROUTINE HISTPLT(FRNRT3,SLATMN,SLOMMN,MSQ)
   DIMENSION HLARL(3),VLARL(4)
   DIMENSION FRNRT3(21,12)
   DIMENSION MONTH(12)
   LOGICAL LTEST,CTEST
   DATA MONTH/1,JAN,2,FEB,3,MAR,4,APR,5,MAY,6,JUN,7,
   *JUL,8,AUG,9,SEP,10,OCT,11,NOV,12,DEC/
   HLARL(1)=AVERAGE RA#
   HLARL(2)=INRATE (MM#
   VLARL(3)=#/HR)*
   VLARL(1)=#
   VLARL(2)=# FREQUENCY#
   VLARL(3)=# OF OCCURR#
   VLARL(4)=#ENCE#
   RMSQ=MSQ
   ISLAT=SLATMN
   ISLON=SLOMMN

20  C
21  C
22  C
23  C
24  C
25  C
26  C
27  C
28  C
29  C
30  C
31  C
32  C
33  C
34  C
35  C
36  C
37  C
38  C
39  C
40  C
41  C
42  C
43  C
44  C
45  C
46  C
47  C
48  C
49  C
50  C
51  C
52  C
53  C
54  C
55  C

```

PLOT HISTOGRAMS OF RAINRATE FREQUENCIES FOR MARSSEN SQUARE

CTEST IS TRUE IF CUMULATIVE PLOTS CAN BE MADE
CTEST IS FALSE IF CUM FREQUENCY IS OUT OF RANGE: NO PLOTS

LTEST IS FALSE WHEN PLOTTING NONCUMULATIVE STATS
LTEST IS TRUE WHEN PLOTTING CUMULATIVE STATS

LTEST=.FALSE.
CTEST=.TRUE.

CALCULATE DATA MAXIMUM AND CONVERT RAINRATE TO PERCENT

P1=0.0
P2=100.0
DO 20 IM=1,12
FRNRT3(1,IM)=FRNRT3(1,IM)*100
IF(FRNRT3(1,IM).GT.100.0) FRNRT3(1,IM)=100.0
CRNRT3(1,IM)=FRNRT3(1,IM)
P1=AMIN1(P2,CRNRT3(1,IM))
DO 20 J=2,21
P1=AMAX1(P1,FRNRT3(J,IM))
FRNRT3(J,IM)=FRNRT3(J,IM)*100
IF(FRNRT3(J,IM).GT.100.0) FRNRT3(J,IM)=100.0
CRNRT3(J,IM)=FRNRT3(J,IM)+CRNRT3(J-1,IM)
IF(CRNRT3(J,IM).GT.100.0) CRNRT3(J,IM)=100.0
CONTINUE

PRODUCE TABLE OF CUMULATIVE RAINRATES

PRINT 105
FORMAT (1H0,45X,RRAINRATE CUMULATIVE FREQUENCIES (PERCENT)*,//)
DO 120 IM=1,12
PRINT 115, MONTH(IM), (CRNRT3(J,IM),J=1,21)
FORMAT (3X,A3,1X,20F6.1,2X,F6.1)
CONTINUE

CHOOSE THE PROPER SCALING FACTORS

SCALE=1.0

```

60 IF (P1.GT.0.05) VSCALE=0.5
   IF (P1.GT.0.10) VSCALE=0.25
   IF (P1.GE.0.7.AND.P1.LE.0.20) GO TO 30
   PRINT *,*NO PLOT, FREQUENCY OF RAINRATE = *,P1,* VSCALE = *,VSCALE
   RETURN
30 CONTINUE
65 CSCALE=1.0
   IF (P2.LT.95.0) CSCALE=0.5
   IF (P2.LT.90.0) CSCALE=0.25
   IF (P2.GE.80.0.AND.P2.LE.100.0) GO TO 35
   PRINT *,*NO CUMULATIVE PLOT, CUM FREQUENCY = *,P2
   CTEST=.FALSE.
70 CONTINUE
35 C
   C
   C      DRAW AXES OF GRAPH
   CALL VOPEN(9)
75 DO 100 IM=3,12,3
40 CONTINUE
   IF (.NOT.LTEST) CALL OFFSETV(-2.0,0.7,-9.2,0.7)
   IF (.NOT.LTEST) VLABL(1)=*
   IF (LTEST.AND.CTEST) VLABL(1)=*CUMULATIVE*
   IF (LTEST.AND.CTEST) CALL OFFSETV(-2.0,0.7,-2.6,0.7)
   IF (LTEST.AND..NOT.CTEST) GO TO 100
   VINT=0.2
   HINT=0.34
   C      DRAW X-AXIS
85 XGR=0.
   CALL VP(XGR,0.0,0)
   DO 70 IX=1,21
   INUM=IX/2
   XNUM=INUM
   XG=XGR+HINT
90 CALL VP(XGR,0.0,1)
   CALL VP(XGR,0.1,0)
   CALL VP(XGR,-0.1,1)
   IF (INUM*2.EQ.IX)CALL VNUM(XGR,-0.05,-0.3,.14,XNUM,0.0,-1)
   CALL VP(XGR,0.0,0)
95 CONTINUE
70 CONTINUE
   C      DRAW Y-AXIS
   YGP=0.
   CALL VP(0.0,YGR,0)
100 DO 81 IY=1,25
   YNUM=IY*.2/VSCALE
   IF (LTEST) YNUM=YNUM+(100-1/CSCALE*5)
   YGR=YGP+VINT
   CALL VP(0.0,YGR,1)
   CALL VP(0.1,YGR,0)
105 CALL VP(0.1,YGR,1)
   IF (MOD(IY,5).EQ.0)CALL VNUM(-.5,YGR-.07,.14,YNUM,0.0,1)
   CALL VP(0.1,YGR,0)
80 CONTINUE
110 C
   C      DRAW GRAPHS OF BOTH RAINRATES (FREQ AND CUM FREQ)
   C
   C      BGR=(CRNRT3(1,IM)-((100-1/CSCALE*5))*CSCALE
   C      IF(LTEST) CALL VP(0.17,BGR,0)

```



```

1      SUBROUTINE MARS DEN(SLATMN,SLOMN,IQUAD,MSQ)
      C DETERMINE MARS DEN SQUARE NUMBER BASED ON MEAN POSITION
      LAT=SLATMN
      IF (SLOMN) 30,30.40
5       30 LON=-SLOMN
      GO TO 50
      40 LON=359.999-SLOMN
      50 LON=LON/10
      LAT=LAT/10
      IF (SLATMN.LT.0.0.OR.SLATMN.GE.80.0) GO TO 60
      MSQ=1+LAT*36+LON
      GO TO 80
10      60 IF (SLATMN.LT.0.0) GO TO 70
      MSQ=901+LON
      GO TO 80
15      70 IF (LAT.LT.0) LAT=-LAT
      MSQ=305+LAT*36+LON
      C DETERMINE GLOBAL QUADRANT THAT THE SQUARE IS IN
      80 IF (SLATMN.GE.0.0.AND.SLOMN.GE.0.0) IQUAD=1
      IF (SLATMN.LT.0.0.AND.SLOMN.GE.0.0) IQUAD=3
      IF (SLATMN.LT.0.0.AND.SLOMN.LT.0.0) IQUAD=5
      IF (SLATMN.GE.0.0.AND.SLOMN.LT.0.0) IQUAD=7
      RETURN
      END
20

```

```

1  SUBROUTINE PACK(LATMN,LONMN,M,MSUBSQ,RMEAN,STDEV,HOBBS)
   DIMENSION IT(12)
   DIMENSION RMEAN(3,100,12)
   DIMENSION STDEV(3,100,12)
   DIMENSION HOBBS(3,100,12)
   IF(MSUBSQ.GT.100) GO TO 400

   C      PACK SUBSQUARE DATA ONTO TAPE FOR USE BY PROGRAM ANALYSIS
   C
   C      DATA FOR THREE PARAMETERS IS PACKED
   C      JJ=1 FOR THE B3 PARAMETER
   C      JJ=2 FOR THE B8 PARAMETER
   C      JJ=3 FOR THE BMIRCL PARAMETER
   C
15  L1=1795-LATMN/10*10
   L2=LONMN/10*10+5
   CALL RECOUTA(L1,L2,0)
   DO 150 JJ=1,3
   DO 100 M=1,12
   IF(RMEAN(JJ,MSUBSQ,M).EQ.0.0)99,95
90  IT(M)=C
   GO TO 100
95  IT(M)=RMEAN(JJ,MSUBSQ,M)*100.+200.
100 CONTINUE
150 CALL RECOUTB(0,JJ,IT)
   DO 250 M=1,12
250 IT(M)=HOBBS(1,MSUBSQ,M)
   CALL RECOUTB(1,1,IT)
   DO 350 JJ=1,3
   DO 300 M=1,12
   IF(STDEV(JJ,MSUBSQ,M).EQ.0.0)290,295
290 IT(M)=C
   GO TO 300
295 IT(M)=STDEV(JJ,MSUBSQ,M)*100.
300 CONTINUE
350 CALL RECOUTB(JJ,2,IT)
400 RETURN
   END

```

```

1  SUBROUTINE RECOUTA(L1,L2,T)
   DIMENSION IN(12),IT(4),T(12)
   COMMON/BUG/IBUG
   LOGICAL ISM
   INTEGER T
   DATA(IN=4,60,72,84,96,108,120,132,144,156,168,180 )
5  CALL SBIT(IT,L1,0,12)
   CALL SBIT(IT,L2,12,12)
   IF(IBUG.NE.0) PRINT 2000,900-L1,L2
10  RETURN
   FORMAT(IX,2I4)
   ENTRY RECOUTA
   CALL SBIT(IT,L1,24,6)
   CALL SBIT(IT,L2,30,6)
   IF(IBUG.NE.0) PRINT 3000, L1,L2,T
15  FORMAT(10X,2I3,12I6)
   IT(1)=IT(1).AND.7777 7777 0000 0000
   ISM=.F.
   IT(2)=IT(3)=0
   IT(4)=8R
   DO 50 I=1,12
   IF(IT(I))10,50,20
12  PRINT 1000,IT,T(I),I
   GO TO 40
25  FORMAT(1X VAL OUT OF RANGE#022,2I5)
   IF(IT(I).GT.4095 ) GO TO 10
   CALL SBIT(IT,T(I),IN(I),12)
   ISM=.T.
40  T(I)=0
50  CONTINUE
   IF(ISM) CALL WRITEP(IT)
   RETURN
   END

```

```

1  SUBROUTINE WRITETP(IT)
   DIMENSION IT(4),IBUF(400)
   COMMON/HUG/IRUG
   DATA (IREC=0), (IEND=0), (J8=0)
   DATA LU/3/
   DO 10 I=1,4
      10 IBUF(18+I)=IT(I)
      I3=10+4
   IF(I9.LT.400) RETURN
   20 BUFFER OUT(LU,1)(IBUF(1),IBUF(18))
      I2.C=IREC+1
      IF(I9UG.NE.0) PRINT 4000,(IBUF(I),I=1,18)
      I3=0
   4000 FORMAT(1X,4022)
      IF(UNIT(LU))90,60,50
   50 PRINT 1000,IREC
      STOP
   1000 FORMAT(2END OF TAPE ON LU   BEFORE END OF JOB AT REC=2,15)
      60 PRINT 2000,IREC
      STOP
   2000 FORMAT(1UNRECOVERED PARITY ERROR ON LU   JOB STOPPED AT REC=2,15)
      ENTRY WRITEND
      IEND=1
   IF(I9.NE.0)20,90
   90 IF(IEND.EQ.0) RETURN
   ENDFILELU
   ENDFILELU
   PRINT 3000,IREC
   RETURN
   3000 FORMAT(2END OF FILES WRITTEN ON LU   AFTER REC=2,15)
      END

```

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