AD-A183 376   CUMULUS CLOUD DIMENSION STATISTICS FOR NEW ORLEANS   1/1
ESSEN AND HANNOVER(U) AIR FORCE ENVIRONMENTAL TECHNICAL
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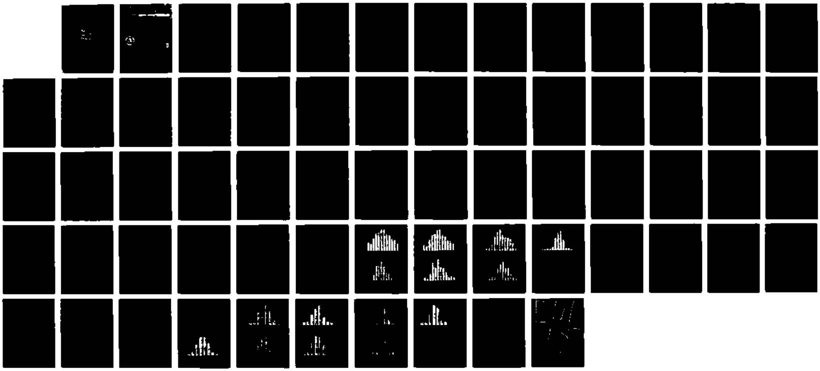

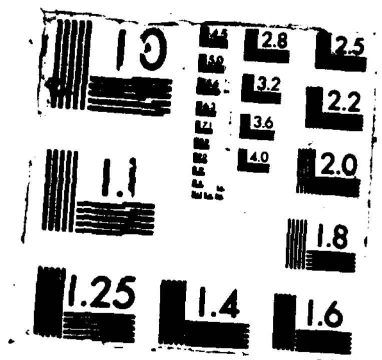
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CUMULUS CLOUD DIMENSION STATISTICS
for
NEW ORLEANS, ESSEN, AND HANNOVER

by

Captain Randell J. Barry

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JUNE 1987

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19. Abstract: Cumulus clouds at New Orleans, Louisiana, and at Essen and Hannover, West Germany, are analyzed for mean, maximum, and minimum cloud base heights, cloud top heights, and cloud cover amounts using 10 years of USAFETAC DATSAV data. Frequency of occurrence statistics are also calculated. Statistics are produced for each of three different cumulus types (cumulus humulis/fractus, cumulus mediocris/congestus, and cumulonimbus) in two categories: monthly, and hourly by season. Cloud tops are determined from a simple one-dimensional cumulus cloud model. All other cloud dimensions are obtained from surface weather observations. Methods used in determining the statistics are discussed and statistical limitations are noted.

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PREFACE

This report was prepared for ASD/WE under USAFETAC Project Number 60706 to satisfy a request by ASD/ENSSA for a three-dimensional representation of cloud dimensions for use in support of the Infrared Tracking System. Using USAFETAC's surface and upper-air databases, cumulus clouds at Essen and Hannover, West Germany, and at New Orleans, Louisiana, were studied to produce statistical values for the specific dimensions of maximum, minimum, and mean cloud base height, cloud top height, and cloud amount. Frequency of occurrence statistics were also produced. Most of the data was derived from surface observations only and is therefore as accurate as the surface observations themselves. Cloud top information was obtained from a one-dimensional cumulus cloud model; because of the inherent limitations of the model, the cloud top statistics so obtained should be used with caution, and as a "first guess" only. Detailed technical limitations on the statistics given in the appendices, and reasons therefore, are described in the report.

CONTENTS

INTRODUCTION

In the past, considerable effort has been given to quantifying certain cloud dimensions such as height and width. Examples are works by Plank (1969), Lopez (1977), and Warner and Grumm (1984). Methods used in the study of cloud dimensions have included analyses of aircraft and satellite stereographic photos, use of radar echo data, and numerical simulation of growing clouds. This kind of research is important from a military perspective because of the effects clouds can have on remote sensing devices such as the Infrared Search and Tracking System.

With this in mind, USAFETAC developed a new and simple method to quantify selected cumulus cloud dimensions. Using a 10-year sample from the USAFETAC surface and upper-air databases, statistics for minimum, maximum, mean cloud base height, cloud top height, and cloud cover amount were produced for three locations: Essen and Hannover, West Germany, and New Orleans, Louisiana. Statistics were compiled for three different cumulus cloud types (cumulus humulis/fractus, cumulus mediocris/congestus, and cumulonimbus) in two categories: monthly, and hourly by season. The frequency and percent frequency occurrence of cumulus cloud types were also calculated. Most statistics were produced from surface observations, but cloud top statistics were obtained from a one-dimensional cumulus cloud model that uses both surface and upper-air data.

The intent of this project report, in addition to providing the statistical summaries produced (see Appendix A) is to document the methods used to obtain the statistics and discuss their limitations. Graphic illustrations of selected cloud dimensions appear as figures in Appendix B.

DATASETS USED

LOCATION	LAT	LON	TYPE OF REPORT	PERIOD OF RECORD
New Orleans	30.00N	90.15W	Airways	1973 - 1983
Essen	51.24N	6.59E	Synoptic	1973 - 1983
Hannover	52.27N	9.44E	Synoptic	1973 - 1983

STATISTICS FROM SURFACE OBSERVATIONS

Surface Observation Elements Used; Description of Statistics.

Statistics obtained from 6-hourly airways and 3-hourly synoptic surface observations include the minimum, maximum, and mean cumulus cloud base height and sky cover amount; the frequency distribution of cloud base height and sky cover amount; and the frequency and percent frequency occurrence of cumulus clouds by type. Input elements of cloud type, cloud base height, and cloud cover amount were taken directly from 10 years of surface observations. After extracting these elements, the minimums, maximums, means, frequencies, and percent frequencies were determined.

These statistics were derived for three types of cumulus clouds by month and by season/hour. Cumulus cloud types are defined in Federal Meteorological Handbook 1B (FMH-1B) as:

Cumulus humulis/fractus (CH), Low Cloud (CL = 1)

Cumulus mediocris/congestus (CC), CL = 2

Cumulonimbus (CB); CL = 3 or 9.

Seasons are defined as:

Winter: December through February
Spring: March through May
Summer: June through August
Fall: September through November.

All times are Greenwich Mean Time (GMT). Cloud base heights are meters above ground level (AGL). Sky cover amounts are in eighths. The number of observations (#OBS) is the total number of times a particular cloud type was reported during the specified period (month or season/hour). The percent frequency (%FREQ) is the frequency divided by the total surface observations available during the specified time period (e.g., for New Orleans in January, CH occurred 22 times out of a total of 1,466 surface observations, or 1.5% of the time).

Limitations.

There is always some degree of uncertainty in determining cloud base height and sky cover amount from the surface. Ceilometers make cloud base height measurements relatively accurate, but sky cover amount estimation is subjective.

Additional uncertainty is added when the cloud base height is encoded into USAFETAC's database. Because height observations are encoded for a particular range of heights (bins) rather than for a specific height, some accuracy is lost. Synoptic observation accuracy is better than airways because its bin resolution is 30 meters as opposed to 50 to 500 meters for airways. This difference in resolution can be seen when comparing the frequency distribution of cloud base heights for an airways station to the frequency distribution for a synoptic station. The encoding of cloud base heights in bins also creates an artificial representation of maximum and minimum values. For example, a maximum cloud base value may be given as 1750 m, but the actual value could fall anywhere in the bin represented by 1750 m.

The "percent frequency of occurrence" statistic is limited by the possibility that no continuous observation exists or is possible at a given location. If a large enough data set is available at regular intervals, however, inferences can be made as to the percent frequency occurrence of cloud types. Since the data used in this project is fairly complete (i.e., there were only a small number of missing observations), this statistic should closely approximate the percent of time cumulus clouds are actually present.

Statistics are also affected by reporting procedures and local reporting biases. As can be seen from the data, clouds are reported every 6 hours in airways code and every 3 hours in synoptic. This, especially with airways data, does not give us the resolution in time that we would like for examining diurnal changes.

Finally, there are reporting biases in the data. Although CH is not prevalent in Germany, the fact that it does not show up at all in this dataset is questionable. Its absence is most likely due to reporting bias on the part of German observers. When it does occur, CH is probably reported as stratocumulus (CL = 4 or 5).

STATISTICS FROM A CUMULUS CONVECTION MODEL

Procedure.

To obtain statistics on cloud tops, a numerical model of cumulus convection developed by Nordquist and Johnson (1970) was modified to use the USAFETAC surface and upper-air databases. In its original form, the model used upper-air data only. It was modified here to read surface data so that cloud top calculations would occur only when cumulus clouds were being reported. Surface temperature and dewpoint observations were also incorporated into the calculations. A brief discussion on how the model produces cloud top values follows.

The model first reads a surface observation. If a cumulus cloud is reported (CL = 1, 2, 3, or 9), the appropriate upper-air data is read. The upper-air data includes the pressure, height, temperature, and dewpoint at each reported level. To better represent the moisture available in the boundary layer at the time of convection, the dewpoint from the surface observation that contains the cloud report is used to update the surface dewpoint of the sounding.

The upper-air data is then interpolated at 50-meter height increments from the surface to the top of the sounding, usually to the tropopause level. This interpolation creates a pressure, height, temperature, and dewpoint value for each 50-meter level. Mixing ratios are then calculated at each level.

Next, the observed surface temperature at the time of cumulus convection replaces the rawinsonde surface temperature of the interpolated sounding. This is the convective temperature. The sounding is then adjusted dry adiabatically in the lower layers to account for the warming of the surface temperature.

The lifting condensation level (LCL) is now calculated using an algebraic approximation based on the observed surface pressure, temperature, and dewpoint. If a parcel of air being lifted dry adiabatically is positively buoyant at this LCL, this level is assumed to be the cloud base. If the parcel is not positively buoyant, the LCL is recalculated using the next level of incremented data. This process is repeated until a valid cloud base is found, or until the level being lifted is more than 1 km above the surface. If a cloud base is not obtained, calculations on that particular set of observations cease and the program processes a new set of observations.

If a valid cloud base is determined, the parcel is given an initial updraft velocity and radius. These are assigned based on the type of cloud reported. If the cloud type was cumulus humulis/fractus, an updraft velocity of 2 m/s and an updraft radius of .35 km are used. For cumulus mediocris/congestus, values of 7 m/s and .5 km are entered. Cumulonimbus has initial values of 15 m/s and .75 km. These updraft radius values are based on one-half the observed visual radii as reported by Allen, Malick, and Serebreny (1984). Nordquist and Johnson suggested using one-half the visible cloud radius as a valid updraft radius. Initial updraft velocities were obtained from Scorer and Wexler (1967), "Cloud Studies in Colour."

Having given the model an initial updraft velocity and radius, an updraft velocity and radius are next calculated at subsequent data levels based on the buoyancy of the cloud parcel using a calculated cloud temperature, mixing ratio, liquid water content, and entrainment rate. This process continues until the updraft velocity goes to zero. At this point it is assumed that the cloud top has been reached.

The input of surface and upper-air data and the calculating of cloud top values continue until all data is processed. In addition to cloud top values, vertical cloud thickness is also determined. This is used as a check on cumulonimbus cloud top values. If a cumulonimbus is found to be less than 2 km thick the calculation is not used. All other cloud top calculations are retained.

Description of Statistics.

Statistics calculated for the cloud top dataset include mean, maximum, and minimum values. The frequency distribution of cloud top values are also displayed for the three types of cumulus clouds, by month and diurnally by season. Cloud types and seasons are defined as before. Mean, maximum, and minimum values are in meters (AGL), while frequency distribution bins are in kilometers. All times are GMT. The frequency distribution was displayed to show how cloud top values are distributed across the range of values and should not be interpreted as information on how often a certain cloud type occurs.

Limitations.

Error is introduced into cloud top calculations in various ways. Because this is a steady state, one-dimensional model, the upper-air data, except in the lower layers, does not change with time. Advective changes in moisture and temperature aloft are not accounted for. Therefore, the atmospheric profile used to make the cloud top calculation may not be representative of the actual atmospheric profile at the time of cumulus convection.

A second source of error is with the entrainment hypothesis. This model uses the 1/R entrainment hypothesis which simply states that the amount of entrainment is inversely proportional to the radius of the cloud. Because it is impossible to get an accurate initial radius for each cumulus cloud observed, the entrainment rate may not be totally representative. In addition to the uncertainty created by an inaccurate cloud radius, it has been shown that this entrainment hypothesis is not always valid, especially with strong vertical shear. The entrainment rate plays an important role in cloud growth (the greater the entrainment, the greater the reduction in buoyancy); if entrainment rate is inaccurate, cloud top values will also be inaccurate.

Another uncertainty inherent in the model lies in the assumption that the pressure distribution at any point within the cloud is exactly equal to the hydrostatic environmental pressure at the same level. It has been shown, however, that there is a substantial pressure perturbation within the cloud. This perturbation pressure field acts to suppress the growth of clouds due to mixing with the environment; without its inclusion in this one-dimensional model, cloud top calculations are probably larger than actually observed.

The last potential error source is in the data itself. As mentioned earlier, most upper-air datasets end at the tropopause. With this model, all calculations cease at the top of the dataset whether the actual cloud top has been reached or not. Cumulonimbus clouds, therefore, which have been known to penetrate 3-4 km into the stratosphere, may have been truncated below their actual heights.

As can be seen from this discussion, cloud top calculations are meant to be approximate values only. To quote Nordquist and Johnson, "the basic model provides a 'ball park' estimate of the gross characteristics of isolated cumulus clouds." These limitations should always be considered when using such cloud top statistics.

RESULTS

Results From Surface Observations.

Statistics obtained from elements extracted directly from surface observations appear reasonable. As expected, cumulus clouds at all three locations have a maximum frequency of occurrence during summer and minimum during winter. Because of the frequency with which observations are taken (every 6 hours for airways and every 3 hours for synoptic) we were not able to be as precise as we would like when determining the diurnal trend for cumulus activity. For example, although New Orleans statistics (based on airways) show an 1800Z maximum, the actual maximum could be as early as 1500Z or as late as 2100Z. Since 3-hourly synoptic observations provide us with better time resolution, we were able to determine diurnal variations for the German stations more precisely.

The results of cloud base statistics can only be as accurate as the surface observations themselves. The surface observations used in this study seem reasonable. To summarize cloud base statistics: At New Orleans the mean cloud base of CH has a constant value of 800 meters through the year. CC goes from an average of 700 meters in winter to 1,000 meters in summer. Transition during spring and fall is gradual. CB cloud bases are, on average, 500 meters in winter and 800 meters in summer. There are very sharp transitions between these two values in early spring and late fall. In Germany, average cloud bases for both reported cumulus clouds (CCs and CBs), vary from about 500 meters in winter to 800 meters in summer. There is a gradual transition between these values during spring and fall.

As expected, the diurnal trend for cloud bases shows them to be generally higher during daytime heating and lower during nighttime cooling. The maximum and minimum values for cloud bases are somewhat more suspect because of the binning of values. For example, although statistics for Essen show that CC has a maximum cloud base of 1,800 meters from March to September, the actual maximum cloud base probably shows more variation during this period.

Statistics for cloud cover, as was the case with cloud bases, are only as good as the subjective abilities of the observer to determine cloud cover. The statistics seem reasonable, with cumulus coverage usually averaging two to three eighths and the general diurnal trend showing greater coverage during the day than at night. Nighttime values should be used with caution, however, because of the increased difficulty in evaluating cloud cover in darkness.

In general, the use of surface observations to determine statistics for cumulus cloud frequency, as well as for maximum, minimum, and mean cloud base and cloud cover, is valid. The limitations previously described do affect the dataset, but not so much as to make it unrepresentative.

Results From a Cumulus Convective Model.

The results produced by the cumulus cloud model must be used with care because we are deriving the cloud top values numerically and not observing actual cloud tops from satellite or aircraft photos. Although cloud top values produced by the model seem generally reasonable, we have no way of verifying them on an individual basis. In some cases we were able to show significant differences when comparing our overall results with the results of other studies.

Examining our results, we see that CB at New Orleans generally has higher tops than CC (which has higher tops than CH), but there are exceptions. In February the mean value of CB tops is less than the value for CC. This is because only one CB top was calculated during that month. The reasons for that could include the lack of upper-air data when CBs were reported or the inability of the model to calculate a cloud top because of an inversion. (Note: If there is an inversion in the lower levels of the atmosphere, calculations could be stopped at the level of the inversion and this point would be taken as the cloud top. Because CBs less than 2 km thick are discarded from the dataset, these values are often not retained.)

Computed CB cloud tops are highly susceptible to the error of data truncation. Because cloud tops can only go as high as the upper-air reports, values are often produced that are probably less than what actually occurred. At New Orleans, for example, the maximum CB cloud top calculated was 13,905 m. Although this value appears to be realistic, the actual maximum cloud top for this location could have been different. By examining radar echo data, Kantor et. al. found that CBs have gone as high as 20 km at New Orleans. The conclusion is that maximum tops for CBs at all three study locations are probably invalid in most cases.

The entrainment hypothesis used in the model also creates problems when calculating CB tops. This hypothesis was meant to be used for small, isolated cumulus clouds in an unsheared or weakly sheared environment (i.e., CH or smaller CC). If the pressure perturbation term is included in the model (the model used in this study did not include the pressure perturbation term), then this entrainment hypothesis could be applied to larger CC. Because thunderstorms often occur in a highly sheared environment, using this entrainment scheme to calculate CB tops is at best a simple attempt to obtain an approximate cloud top value or, at worst, is totally invalid. As stated earlier, CB growth was stopped prematurely (as in the New Orleans example) producing erroneous results. Improper application of the entrainment hypothesis would cause this.

In summary, cloud top values produced for CH and CC should be marginally accurate because these were the types of cumulus that the original model (Nordquist and Johnson) was developed to simulate. CB cloud tops so computed, however, should be considered suspect.

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APPENDIX A

Cloud Dimension Statistical Tables

TABLE A-1. ESSEN: CUMULUS CLOUD BASE HEIGHTS BY MONTH.

STATION: ESSEN
BLKSTN : 104100
LAT : 51.24 N
LON : 6.59 E
ELEV : 129 M

BY MONTH, TYPE					FREQUENCY DISTRIBUTION(M)									
MONTH	TYPE	MEAN(M)	MAX(M)	MIN(M)	0-249	250-499	500-749	750-999	1000-1249	1250-1499	1500-1749	1750+	#OBS	%FREQ
JAN	CC	454.5	1200	120	56	230	135	36	1	0	0	0	458	17.3
JAN	CB	446.7	600	270	0	8	1	0	0	0	0	0	9	0.3
FEB	CC	538.3	1200	30	28	175	101	47	3	0	0	0	355	14.6
FEB	CB	400.0	480	300	0	3	0	0	0	0	0	0	3	0.1
MAR	CC	500.8	1900	90	40	225	250	158	19	2	1	1	716	26.9
MAR	CB	541.2	990	180	2	23	15	9	0	0	0	0	48	1.8
APR	CC	724.1	1900	120	31	255	257	243	96	23	32	9	946	36.6
APR	CB	595.9	1290	240	1	35	28	13	3	1	0	0	81	3.1
MAY	CC	848.9	1300	60	34	170	213	336	120	42	64	32	1011	38.0
MAY	CB	783.1	1900	300	0	15	28	31	5	0	4	2	86	3.2
JUN	CC	838.6	1900	60	25	215	290	352	147	39	64	16	1148	44.5
JUN	CB	815.3	1900	30	1	14	29	40	14	4	1	1	104	4.0
JUL	CC	809.2	1900	120	18	201	316	398	123	39	62	20	1177	44.6
JUL	CB	827.3	1500	60	1	5	19	44	5	1	3	0	78	3.0
AUG	CC	847.7	1800	150	19	131	224	336	118	38	52	22	940	35.3
AUG	CB	790.8	1500	390	0	5	16	26	1	4	1	0	53	2.0
SEP	CC	726.7	1800	90	32	190	205	301	69	25	11	2	837	32.5
SEP	CB	570.0	1200	240	1	9	13	12	3	0	0	0	38	1.5
OCT	CC	579.8	1350	60	50	224	213	156	9	2	0	0	664	24.9
OCT	CB	577.8	990	300	0	11	6	6	0	0	0	0	23	0.9
NOV	CC	498.0	990	30	58	278	176	55	0	0	0	0	577	22.3
NOV	CB	430.7	600	90	1	9	4	0	0	0	0	0	14	0.5
DEC	CC	471.5	900	150	27	238	129	25	0	0	0	0	419	15.7
DEC	CB	445.0	590	150	1	3	2	0	0	0	0	0	6	0.2

KEY:
CLOUD TYPES-
CH = CUMULUS HUMILIS
CC = CUMULUS MEDIOCRIS/CONGESTUS
CB = CUMULONIMBUS
CLOUD BASE HEIGHTS ARE IN METERS.

TABLE A-2. ESSEN: CUMULUS CLOUD BASE HEIGHTS BY SEASON AND HOUR.

BY SEASON, TYPE, HOUR						FREQUENCY DISTRIBUTION(M)									
SEASON	TYPE	HOUR(Z)	MEAN(M)	MAX(M)	MIN(M)	0-249	250-499	500-749	750-999	1000-1249	1250-1499	1500-1749	1750+	#OBS	%FREQ
WINTER	CC	03	655.9	900	150	5	27	17	4	0	0	0	0	53	5.5
WINTER	CC	06	660.4	790	150	5	40	19	5	0	0	0	0	69	7.1
WINTER	CC	09	625.7	900	120	29	137	44	9	0	0	0	0	187	19.2
WINTER	CC	12	675.9	1200	30	29	160	94	24	2	0	0	0	309	31.7
WINTER	CC	15	519.5	1200	150	24	164	122	45	2	0	0	0	357	36.9
WINTER	CC	18	678.7	900	90	10	82	35	14	0	0	0	0	142	14.6
WINTER	CC	21	660.5	900	180	4	39	21	2	0	0	0	0	65	6.8
WINTER	CC	00	683.7	990	90	5	25	13	6	0	0	0	0	49	5.1
WINTER	CB	06	225.0	300	150	1	1	0	0	0	0	0	0	2	0.2
WINTER	CB	09	480.0	480	480	0	2	0	0	0	0	0	0	2	0.2
WINTER	CB	12	525.0	690	300	0	3	3	0	0	0	0	0	6	0.6
WINTER	CB	15	437.1	480	390	0	7	0	0	0	0	0	0	7	0.7
WINTER	CB	18	270.0	270	270	0	1	0	0	0	0	0	0	1	0.1
SPRING	CC	03	502.2	1500	120	7	23	15	7	0	0	1	0	54	5.5
SPRING	CC	06	510.0	1200	150	12	84	45	17	5	0	0	0	164	16.6
SPRING	CC	09	593.9	1800	90	21	169	140	87	9	3	2	1	431	43.6
SPRING	CC	12	794.5	1800	90	15	125	192	225	77	19	29	13	696	70.1
SPRING	CC	15	950.3	1800	60	19	107	158	219	93	29	42	24	690	69.7
SPRING	CC	18	771.0	1800	150	21	85	125	149	40	16	21	4	463	46.6
SPRING	CC	21	589.6	1500	150	9	37	43	30	0	0	2	0	121	12.3
SPRING	CC	00	585.3	1000	210	1	20	19	13	1	0	0	0	54	5.5
SPRING	CB	03	450.0	450	450	0	1	0	0	0	0	0	0	1	0.1
SPRING	CB	06	587.0	900	390	0	2	0	1	0	0	0	0	3	0.3
SPRING	CB	09	540.0	750	270	0	3	3	1	0	0	0	0	7	0.7
SPRING	CB	12	614.3	1290	180	1	15	20	7	1	1	0	0	46	4.6
SPRING	CB	15	679.0	1800	270	0	28	25	21	3	0	3	1	82	8.3
SPRING	CB	18	650.5	1800	180	2	19	19	17	3	0	0	1	61	6.1
SPRING	CB	21	654.5	1500	300	0	5	2	2	1	0	1	0	11	1.1
SPRING	CB	00	947.5	900	690	0	0	1	3	0	0	0	0	4	0.4
SUMMER	CC	03	631.6	1800	210	2	28	25	20	3	1	0	1	80	8.2
SUMMER	CC	06	585.2	1500	150	11	88	80	45	5	2	2	0	234	23.7
SUMMER	CC	09	640.2	1800	120	21	143	197	139	23	1	5	2	531	53.7
SUMMER	CC	12	953.5	1800	150	9	99	172	303	102	33	48	14	780	78.5
SUMMER	CC	15	968.3	1800	150	6	68	145	276	156	50	81	28	810	82.0
SUMMER	CC	18	992.4	1800	180	8	55	118	232	80	27	39	13	583	59.2
SUMMER	CC	21	714.7	1500	210	2	38	63	67	15	0	3	0	188	19.3
SUMMER	CC	00	635.5	1320	60	3	15	20	13	4	1	0	0	59	6.0
SUMMER	CB	03	764.4	1200	390	0	1	3	5	1	0	0	0	11	1.1
SUMMER	CB	06	750.0	780	690	0	0	1	2	0	0	0	0	3	0.3
SUMMER	CB	09	732.9	990	360	0	2	0	5	0	0	0	0	7	0.7
SUMMER	CB	12	726.7	1380	390	0	5	18	13	2	1	0	0	40	4.0
SUMMER	CB	15	843.3	1500	390	0	9	15	28	6	2	4	0	63	6.4
SUMMER	CB	18	905.1	1800	420	0	3	17	37	9	6	1	1	74	7.5
SUMMER	CB	21	757.2	1200	300	0	3	9	15	2	0	0	0	29	3.0
SUMMER	CB	00	640.0	990	30	2	1	1	4	0	0	0	0	8	0.8

FALL	CC	03	509.2	990	150	5	25	11	7	0	0	0	0	49	5.0
FALL	CC	06	537.6	1500	90	13	53	35	26	0	1	1	0	139	14.2
FALL	CC	09	507.9	1500	60	38	145	83	54	2	0	2	0	325	33.4
FALL	CC	12	541.1	1500	120	32	169	184	179	25	4	2	0	595	60.7
FALL	CC	15	580.3	1800	90	30	150	169	158	39	17	5	2	570	58.2
FALL	CC	18	541.3	1500	30	15	82	83	76	10	6	1	0	273	27.7
FALL	CC	21	565.1	1200	150	3	30	19	14	1	0	0	0	67	6.8
FALL	CC	00	564.0	1200	120	4	25	11	18	1	0	0	0	60	6.1
FALL	CB	03	450.0	600	300	0	2	1	0	0	0	0	0	3	0.3
FALL	CB	06	520.0	690	390	0	2	1	0	0	0	0	0	3	0.3
FALL	CB	09	390.0	450	300	0	3	0	0	0	0	0	0	3	0.3
FALL	CB	12	560.0	1110	330	0	5	2	1	1	0	0	0	9	0.9
FALL	CB	15	588.2	990	300	0	11	11	5	0	0	0	0	28	2.9
FALL	CB	18	518.0	990	90	2	4	7	7	0	0	0	0	20	2.0
FALL	CB	21	799.7	1200	450	0	2	1	4	1	0	0	0	8	0.8
FALL	CB	00	1200.0	1200	1200	0	0	0	0	1	0	0	0	1	0.1

KEY:
SEASONS-
WINTER = DEC,JAN,FEB
SPRING = MAR,APR,MAY
SUMMER = JUN,JUL,AUG
FALL = SEP,OCT,NOV
CLOUD TYPES-
CH = CUMULUS HUMULIS
CC = CUMULUS MEDIOCRIS/CONGESTUS
CB = CUMULONIMBUS
CLOUD BASE HEIGHTS ARE IN METERS.
TIME IS IN ZULU.

TABLE A-3. ESSEN: CUMULUS CLOUD SKY COVER BY MONTH.

BY MONTH, TYPE

					FREQUENCY DISTRIBUTION									
MONTH	TYPE	MEAN	MAX	MIN	1/8	2/8	3/8	4/8	5/8	6/8	7/8	8/8	#OBS	%FREQ
JAN	CC	3.3	7	1	75	31	109	73	71	31	19	0	458	17.3
JAN	CB	2.6	5	1	2	3	2	1	1	0	0	0	9	0.3
FEB	CC	3.2	7	1	70	67	75	55	49	27	12	0	355	14.6
FEB	CB	3.7	7	2	0	2	0	0	0	0	1	0	3	0.1
MAR	CC	3.2	7	1	151	154	115	117	80	79	21	0	715	26.8
MAR	CB	3.1	7	1	9	17	5	5	4	1	5	0	48	1.8
APR	CC	3.2	8	1	205	193	167	145	125	71	35	1	945	35.6
APR	CB	2.9	8	1	23	20	17	7	5	9	0	1	91	3.1
MAY	CC	2.9	7	1	283	133	199	147	115	63	16	0	1011	38.0
MAY	CB	2.3	7	1	36	27	9	6	4	5	2	0	95	3.2
JUN	CC	2.9	7	1	319	233	220	164	117	77	13	0	1148	44.5
JUN	CB	2.9	6	1	33	31	11	9	5	7	6	2	104	4.0
JUL	CC	2.9	7	1	309	251	230	172	134	69	14	0	1177	44.6
JUL	CB	2.4	8	1	32	22	7	7	4	2	3	1	78	3.0
AUG	CC	2.9	7	1	243	203	187	164	89	48	7	0	940	35.3
AUG	CB	3.1	8	1	19	8	5	6	5	4	5	1	53	2.0
SEP	CC	2.7	7	1	247	179	155	115	81	40	11	0	837	32.5
SEP	CB	2.4	7	1	15	9	6	3	1	2	2	0	38	1.5
OCT	CC	2.9	7	1	190	131	119	87	77	49	12	0	664	24.9
OCT	CB	2.5	6	1	4	10	5	2	1	1	0	0	23	0.9
NOV	CC	3.0	7	1	133	129	113	95	50	45	11	0	577	22.3
NOV	CB	3.1	7	1	4	3	2	1	1	2	1	0	14	0.5
DEC	CC	3.2	7	1	79	75	100	65	47	40	12	0	419	15.7
DEC	CB	3.3	7	1	3	0	1	0	0	0	2	0	5	0.2

KEY:
CLOUD TYPES-
CH = CUMULUS HUMULIS
CC = CUMULUS MEDIOCRIS/CONGESTUS
CB = CUMULONIMBUS
SKY COVER STATISTICS ARE IN EIGHTHS.

TABLE A-6. ESSEN: CUMULUS CLOUD SKY COVER BY SEASON AND HOUR.

BY SEASON, TYPE, HOUR						FREQUENCY DISTRIBUTION									
SEASON	TYPE	HOUR(Z)	MEAN	MAX	MIN	1/8	2/8	3/8	4/8	5/8	6/8	7/8	8/8	#OBS	%FREQ
WINTER	CC	03	2.9	7	1	7	14	18	8	4	1	1	0	53	5.5
WINTER	CC	06	3.0	7	1	12	18	16	12	3	6	2	0	69	7.1
WINTER	CC	09	3.3	7	1	39	29	38	34	25	16	5	0	187	19.2
WINTER	CC	12	3.4	7	1	63	47	50	52	44	28	15	0	299	31.7
WINTER	CC	15	3.4	7	1	63	58	74	51	61	37	13	0	357	36.9
WINTER	CC	18	3.0	7	1	23	34	39	22	15	6	3	0	142	14.6
WINTER	CC	21	3.1	7	1	10	11	24	8	10	2	1	0	65	6.8
WINTER	CC	00	3.0	7	1	7	12	15	7	5	2	1	0	49	5.1
WINTER	CB	06	2.0	3	1	1	0	1	0	0	0	0	0	2	0.2
WINTER	CB	09	3.0	4	2	0	1	0	1	0	0	0	0	2	0.2
WINTER	CB	12	3.8	7	1	2	1	0	0	1	0	2	0	5	0.5
WINTER	CB	15	2.9	7	1	1	3	2	0	0	0	1	0	7	0.7
WINTER	CB	18	1.0	1	1	1	0	0	0	0	0	0	0	1	0.1
SPRING	CC	03	2.7	7	1	13	19	8	5	5	1	2	0	54	5.5
SPRING	CC	06	2.9	7	1	50	28	30	24	16	9	7	0	164	16.6
SPRING	CC	09	3.3	7	1	102	74	50	53	63	51	18	0	431	43.6
SPRING	CC	12	3.4	7	1	133	110	110	130	117	74	22	0	595	70.1
SPRING	CC	15	3.1	7	1	162	143	142	105	86	60	12	0	690	69.7
SPRING	CC	18	2.5	7	1	158	109	90	60	23	15	8	0	463	46.6
SPRING	CC	21	2.5	8	1	30	34	31	15	9	0	1	1	121	12.3
SPRING	CC	00	2.7	7	1	17	13	9	7	3	2	3	0	54	5.5
SPRING	CB	03	3.0	3	3	0	0	1	0	0	0	0	0	1	0.1
SPRING	CB	06	1.7	2	1	1	2	0	0	0	0	0	0	3	0.3
SPRING	CB	09	2.0	4	1	3	2	1	1	0	0	0	0	7	0.7
SPRING	CB	12	2.6	6	1	11	21	3	4	1	6	0	0	45	4.6
SPRING	CB	15	2.5	6	1	24	23	15	7	7	6	0	0	82	8.3
SPRING	CB	18	2.9	8	1	19	14	9	5	7	1	5	1	51	5.1
SPRING	CB	21	3.2	7	1	4	2	1	1	0	1	2	0	11	1.1
SPRING	CB	00	1.0	1	1	4	0	0	0	0	0	0	0	4	0.4
SUMMER	CC	03	2.4	7	1	24	25	13	9	6	1	1	0	80	8.2
SUMMER	CC	06	2.4	7	1	95	45	39	25	16	13	1	0	234	23.7
SUMMER	CC	09	3.2	7	1	133	99	75	102	52	60	10	0	531	53.7
SUMMER	CC	12	3.3	7	1	142	123	174	153	124	54	10	0	780	78.6
SUMMER	CC	15	2.9	7	1	170	199	193	129	95	35	9	0	810	82.0
SUMMER	CC	18	2.3	7	1	222	143	107	55	34	21	1	0	583	59.2
SUMMER	CC	21	2.4	7	1	65	48	34	23	9	8	1	0	189	19.3
SUMMER	CC	00	2.3	7	1	19	19	12	4	3	1	1	0	59	6.0
SUMMER	CB	03	4.4	7	2	0	1	5	1	0	1	3	0	11	1.1
SUMMER	CB	06	2.0	3	1	1	1	1	0	0	0	0	0	3	0.3
SUMMER	CB	09	1.1	2	1	6	1	0	0	0	0	0	0	7	0.7
SUMMER	CB	12	2.1	6	1	15	17	5	3	3	1	0	0	40	4.0
SUMMER	CB	15	2.6	8	1	29	13	3	5	5	4	3	1	63	6.4
SUMMER	CB	18	2.7	7	1	23	21	11	8	3	4	4	0	74	7.5
SUMMER	CB	21	3.9	8	1	4	7	3	4	3	3	3	2	29	3.0
SUMMER	CB	00	3.0	8	1	5	0	0	1	0	0	1	1	8	0.8

FALL	CC	03	2.5	7	1	15	12	8	10	2	1	1	0	49	5.0
FALL	CC	06	2.5	7	1	52	29	21	18	10	5	3	0	139	14.2
FALL	CC	09	2.8	7	1	106	62	53	36	35	26	7	0	325	33.4
FALL	CC	12	3.2	7	1	123	107	111	109	82	54	9	0	595	60.7
FALL	CC	15	2.9	7	1	137	125	122	86	55	34	11	0	570	58.2
FALL	CC	18	2.3	6	1	106	63	53	25	18	7	0	0	273	27.7
FALL	CC	21	2.5	6	1	15	23	17	8	2	2	0	0	67	6.8
FALL	CC	00	2.8	7	1	16	15	12	5	4	4	3	0	50	5.1
FALL	CB	03	6.3	7	5	0	0	0	0	1	0	2	0	3	0.3
FALL	CB	06	3.7	5	2	0	1	1	0	0	1	0	0	3	0.3
FALL	CB	09	2.3	4	1	1	1	0	1	0	0	0	0	3	0.3
FALL	CB	12	2.3	5	1	3	2	3	0	1	0	0	0	9	0.9
FALL	CB	15	2.1	6	1	12	9	3	2	0	2	0	0	28	2.9
FALL	CB	18	2.5	7	1	5	7	4	0	1	1	1	0	20	2.0
FALL	CB	21	3.3	6	1	2	0	2	3	0	1	0	0	8	0.8
FALL	CB	00	2.0	2	2	0	1	0	0	0	0	0	0	1	0.1

KEY:
SEASONS-
WINTER = DEC,JAN,FEB
SPRING = MAR,APR,MAY
SUMMER = JUN,JUL,AUG
FALL = SEP,OCT,NOV
CLOUD TYPES-
CH = CUMULUS HUMULIS
CC = CUMULUS MEDIOCRIS/CONGESTUS
CB = CUMULONIMBUS
SKY COVER STATISTICS ARE IN EIGHTHS.
TIME IS IN ZULU.

TABLE A-5. ESSEN: CUMULUS CLOUD TOP HEIGHTS BY MONTH.

BY MONTH, TYPE

MONTH	TYPE	MEAN(M)	MAX(M)	MIN(M)	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9+
					FREQUENCY DISTRIBUTION(KM)									
JAN	CC	1440.5	5102	352	74	41	28	4	5	1	0	0	0	0
JAN	CB	3503.0	4252	2754	0	0	1	0	1	0	0	0	0	0
FEB	CC	1401.5	5351	304	44	47	20	4	1	0	1	0	0	0
FEB	CB	2778.0	2852	2704	0	0	2	0	0	0	0	0	0	0
MAR	CC	1975.5	8104	452	25	88	50	14	3	3	2	0	1	0
MAR	CB	3637.8	6811	2611	0	0	3	1	0	0	1	0	0	0
APR	CC	1994.5	5152	452	33	81	50	19	4	4	1	0	0	0
APR	CB	4292.9	5852	2661	0	0	1	2	2	2	0	0	0	0
MAY	CC	2552.2	7652	354	20	55	83	53	5	5	4	3	0	0
MAY	CB	4495.5	6351	2904	0	0	1	2	0	1	2	0	0	0
JUN	CC	2534.1	9352	311	18	74	71	58	16	4	4	5	0	2
JUN	CB	5762.3	12052	2861	0	0	3	0	3	2	1	1	0	2
JUL	CC	2533.0	9704	502	22	78	131	54	21	6	4	3	3	0
JUL	CB	4555.9	9354	2961	0	0	1	4	0	2	0	0	0	1
AUG	CC	2522.9	9152	452	10	78	55	47	8	4	1	2	0	2
AUG	CB	6252.0	11952	2802	0	0	1	0	1	0	0	0	0	1
SEP	CC	2125.6	7451	452	27	79	81	21	6	0	3	2	0	0
SEP	CB	4018.7	4352	3852	0	0	0	2	1	0	0	0	0	0
OCT	CC	1934.0	5402	452	49	96	50	20	2	3	0	0	0	0
OCT	CB	4215.0	5352	2902	0	0	1	1	2	0	1	0	0	0
NOV	CC	1413.0	5011	352	75	70	40	3	0	0	2	0	0	0
NOV	CB	2752.0	2752	2752	0	0	1	0	0	0	0	0	0	0
DEC	CC	1225.5	3154	402	58	44	22	1.	0	0	0	0	0	0

KEY:
CLOUD TYPES-
CH = CUMULUS HUMULIS
CC = CUMULUS MEDIOCRIS/CONGESTUS
CB = CUMULONIMBUS
MEAN, MAXIMUM, AND MINIMUM VALUES ARE IN METERS.
FREQUENCY BINS ARE IN KILOMETERS.

TABLE A-6. ESSEN: CUMULUS CLOUD TOP HEIGHTS BY SEASON AND HOUR.

BY SEASON, TYPE, HOUR						FREQUENCY DISTRIBUTION(KM)									
SEASON	TYPE	HOUR(Z)	MEAN(M)	MAX(M)	MIN(M)	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9+
WINTER	CC	03	1254.0	2561	504	7	1	3	0	0	0	0	0	0	0
WINTER	CC	06	831.5	2502	402	14	2	1	0	0	0	0	0	0	0
WINTER	CC	09	1018.3	4852	361	29	10	3	0	1	0	0	0	0	0
WINTER	CC	12	1494.4	5102	304	42	50	23	4	3	1	0	0	0	0
WINTER	CC	15	1422.6	6361	402	58	60	27	3	1	0	1	0	0	0
WINTER	CC	18	1250.9	3111	402	22	18	5	1	0	0	0	0	0	0
WINTER	CC	21	1598.1	4211	552	7	6	3	1	1	0	0	0	0	0
WINTER	CC	00	1383.6	2702	461	7	5	5	0	0	0	0	0	0	0
WINTER	CB	12	3236.7	4252	2704	0	0	2	0	1	0	0	0	0	0
WINTER	CB	15	2852.0	2852	2852	0	0	1	0	0	0	0	0	0	0
SPRING	CC	03	1292.4	2402	452	2	2	1	0	0	0	0	0	0	0
SPRING	CC	06	1345.0	2952	452	5	7	2	0	0	0	0	0	0	0
SPRING	CC	09	1636.8	5454	452	37	46	45	17	2	1	0	0	0	0
SPRING	CC	12	2420.7	8104	354	13	65	55	22	6	5	4	1	1	0
SPRING	CC	15	2334.6	7102	502	9	59	61	31	3	5	0	1	0	0
SPRING	CC	18	2319.7	7102	752	8	35	38	15	1	0	3	1	0	0
SPRING	CC	21	1939.1	5911	861	3	5	1	1	0	1	0	0	0	0
SPRING	CC	00	1137.8	1461	804	1	4	0	0	0	0	0	0	0	0
SPRING	CB	12	4105.7	5452	2904	0	0	1	1	0	1	0	0	0	0
SPRING	CB	15	3984.4	6911	2611	0	0	3	4	2	0	2	0	0	0
SPRING	CB	18	5853.7	6052	5702	0	0	0	0	0	2	1	0	0	0
SPRING	CB	21	2551.0	2661	2651	0	0	1	0	0	0	0	0	0	0
SUMMER	CC	03	2029.2	3252	1452	0	3	0	1	0	0	0	0	0	0
SUMMER	CC	06	1527.4	3252	311	6	7	3	1	0	0	0	0	0	0
SUMMER	CC	09	2345.0	7461	702	16	61	60	35	7	0	0	4	0	0
SUMMER	CC	12	2856.5	9352	602	11	60	54	51	20	5	3	5	1	2
SUMMER	CC	15	2756.6	9352	661	7	55	60	49	13	4	5	1	1	1
SUMMER	CC	18	2550.5	9102	602	7	38	55	27	5	5	1	0	1	1
SUMMER	CC	21	1883.1	3852	611	3	2	3	2	0	0	0	0	0	0
SUMMER	CC	00	2259.0	3261	1204	0	4	3	3	0	0	0	0	0	0
SUMMER	CB	12	4647.0	7261	2802	0	0	2	0	2	1	0	1	0	0
SUMMER	CB	15	5687.6	12052	2851	0	0	2	2	1	2	0	0	0	2
SUMMER	CB	18	5650.1	10452	2902	0	0	1	2	1	1	1	0	0	2
FALL	CC	03	1275.9	2852	504	4	4	1	0	0	0	0	0	0	0
FALL	CC	06	1131.0	2454	452	7	7	1	0	0	0	0	0	0	0
FALL	CC	09	1484.5	4602	352	36	36	14	3	2	0	0	0	0	0
FALL	CC	12	1941.1	7254	452	48	87	79	22	2	1	4	1	0	0
FALL	CC	15	1913.5	7461	402	39	92	75	15	4	2	1	1	0	0
FALL	CC	18	1548.2	3561	502	12	14	9	3	0	0	0	0	0	0
FALL	CC	21	1445.7	2852	652	3	2	2	0	0	0	0	0	0	0
FALL	CC	00	1873.0	3051	902	2	3	2	1	0	0	0	0	0	0
FALL	CB	12	4955.0	6352	3852	0	0	0	1	1	0	1	0	0	0
FALL	CB	15	3503.3	4352	2752	0	0	2	2	2	0	0	0	0	0

KEY:

SEASONS-
- WINTER = DEC,JAN,FEB
- SPRING = MAR,APR,MAY
- SUMMER = JUN,JUL,AUG
- FALL = SEP,OCT,NOV

CLOUD TYPES-
- CH = CUMULUS HUMULIS
- CC = CUMULUS MEDIOCRIS/CONGESTUS
- CB = CUMULONIMBUS

MEAN, MAXIMUM, AND MINIMUM VALUES AREA IN METERS.
FREQUENCY BINS ARE IN KILOMETERS.
TIME IS IN ZULU.

TABLE A-7. HANNOVER: CUMULUS CLOUD BASE HEIGHTS BY MONTH.

STATION: HANNOVER
BLKSTN : 103380
LAT : 52.27 N
LON : 9.44 E
ELEV : 56 M

BY MONTH. TYPE

MONTH	TYPE	MEAN(M)	MAX(M)	MIN(M)	FREQUENCY DISTRIBUTION(M) 0-249	250-499	500-749	750-999	1000-1249	1250-1499	1500-1749	1750+	#OBS	%FREQ
JAN	CC	552.5	1200	90	11	137	130	73	12	0	0	0	363	13.6
JAN	CB	471.0	900	270	0	14	4	2	0	0	0	0	20	0.7
FEB	CC	570.5	1350	150	14	98	78	57	10	2	0	0	259	10.7
FEB	CB	500.0	750	300	0	6	4	2	0	0	0	0	12	0.5
MAR	CC	590.0	1500	180	9	173	182	229	74	10	3	0	690	25.5
MAR	CB	617.7	1140	150	1	12	16	13	2	0	0	0	44	1.7
APR	CC	778.7	1900	180	24	203	186	272	130	25	57	14	911	35.7
APR	CB	637.2	1200	300	0	32	40	30	7	0	0	0	109	4.3
MAY	CC	895.0	1800	120	19	159	152	300	211	48	88	37	1014	38.5
MAY	CB	832.9	1500	300	0	9	16	37	11	4	3	0	80	3.0
JUN	CC	856.8	1900	90	20	203	216	345	242	63	69	30	1188	46.4
JUN	CB	816.7	1500	300	0	21	22	50	27	5	1	0	126	4.9
JUL	CC	844.9	1800	150	20	199	232	439	216	54	63	38	1261	48.7
JUL	CB	795.4	1350	300	0	8	16	46	11	1	0	0	92	3.2
AUG	CC	896.7	1900	150	16	134	159	302	175	54	60	42	953	36.4
AUG	CB	859.9	1500	300	0	6	14	33	19	4	2	0	77	2.9
SEP	CC	770.9	1900	90	13	156	157	306	147	18	14	2	823	31.9
SEP	CB	754.2	1500	300	0	7	17	18	7	0	1	0	50	1.9
OCT	CC	545.0	1350	150	13	180	152	219	39	4	0	0	617	23.3
OCT	CB	540.4	1050	360	0	5	10	7	1	0	0	0	23	0.9
NOV	CC	545.8	1500	120	19	239	156	114	12	1	1	0	542	21.2
NOV	CB	507.7	1200	240	2	13	8	2	1	0	0	0	26	1.0
DEC	CC	520.8	1200	90	18	185	146	53	5	0	0	0	418	15.7
DEC	CB	555.0	1050	300	0	9	7	3	1	0	0	0	20	0.9

KEY:
CLOUD TYPES-
CH = CUMULUS HUMULIS
CC = CUMULUS MEDIOCRIS/CONGESTUS
CB = CUMULONIMBUS
CLOUD BASE STATISTICS ARE IN METERS.

TABLE A-8. HANNOVER: CUMULUS CLOUD BASE HEIGHTS BY SEASON AND HOUR.

BY SEASON, TYPE, HOUR							FREQUENCY DISTRIBUTION(M)								
SEASON	TYPE	HOUR(Z)	MEAN(M)	MAX(M)	MIN(M)	0-249	250-499	500-749	750-999	1000-1249	1250-1499	1500-1749	1750+	#OBS	%FREQ
WINTER	CC	03	521.3	1200	150	3	20	15	6	1	0	0	0	45	4.6
WINTER	CC	06	477.8	1200	120	6	29	11	8	1	0	0	0	55	5.7
WINTER	CC	09	509.7	1050	150	10	83	54	24	3	0	0	0	174	18.1
WINTER	CC	12	558.1	1200	90	8	126	115	60	8	0	0	0	318	32.5
WINTER	CC	15	510.2	1350	150	5	80	108	70	14	2	0	0	279	28.6
WINTER	CC	18	499.1	900	180	4	39	22	12	0	0	0	0	77	8.0
WINTER	CC	21	461.9	900	90	5	27	17	5	0	0	0	0	56	5.8
WINTER	CC	00	533.3	900	240	1	17	11	7	0	0	0	0	36	3.7
WINTER	CB	03	525.0	600	450	0	1	1	0	0	0	0	0	2	0.2
WINTER	CB	09	555.0	750	300	0	3	3	2	0	0	0	0	8	0.8
WINTER	CB	12	502.5	750	300	0	5	2	1	0	0	0	0	8	0.8
WINTER	CB	15	492.3	900	300	0	14	5	3	0	0	0	0	22	2.3
WINTER	CB	18	525.0	750	300	0	2	1	1	0	0	0	0	4	0.4
WINTER	CB	21	516.0	1050	270	0	3	1	0	1	0	0	0	5	0.5
WINTER	CB	00	500.0	600	350	0	1	2	0	0	0	0	0	3	0.3
SPRING	CC	03	501.0	900	210	2	12	13	3	0	0	0	0	30	3.0
SPRING	CC	06	558.9	1500	120	9	69	35	30	9	0	2	0	155	15.8
SPRING	CC	09	626.8	1500	150	11	163	154	138	31	2	5	0	504	51.3
SPRING	CC	12	857.5	1800	180	7	111	133	247	127	35	45	17	722	73.4
SPRING	CC	15	728.5	1800	180	14	80	98	217	160	35	64	27	695	70.8
SPRING	CC	18	851.5	1800	150	7	65	61	125	77	9	30	7	382	39.2
SPRING	CC	21	711.2	1500	210	2	21	15	31	8	2	2	0	82	8.4
SPRING	CC	00	612.0	1200	300	0	14	9	9	3	0	0	0	35	3.6
SPRING	CB	03	450.0	750	300	0	2	0	1	0	0	0	0	3	0.3
SPRING	CB	06	500.0	900	300	0	2	0	1	0	0	0	0	3	0.3
SPRING	CB	09	582.9	750	450	0	2	3	2	0	0	0	0	7	0.7
SPRING	CB	12	689.0	1500	300	0	10	24	21	2	1	1	0	59	6.0
SPRING	CB	15	658.2	1350	150	1	23	31	20	7	2	0	0	84	8.6
SPRING	CB	18	753.4	1500	300	0	13	13	24	9	1	1	0	61	6.3
SPRING	CB	21	962.5	1200	450	0	1	0	10	1	0	0	0	12	1.2
SPRING	CB	00	1035.0	1500	540	0	[illegible]	1	1	1	0	1	0	4	0.4
SUMMER	CC	03	628.0	1200	210	4	27	29	22	9	0	0	0	91	9.3
SUMMER	CC	06	578.0	1500	150	16	93	53	41	19	3	1	0	226	23.2
SUMMER	CC	09	663.7	1800	90	11	161	213	221	46	5	5	1	663	67.6
SUMMER	CC	12	924.5	1800	180	8	91	107	315	202	63	46	25	857	87.2
SUMMER	CC	15	1032.7	1800	190	7	67	90	240	206	77	96	58	841	87.5
SUMMER	CC	18	950.4	1800	210	5	50	75	172	123	22	43	23	513	53.3
SUMMER	CC	21	740.9	1800	150	3	35	35	60	23	1	1	3	161	16.7
SUMMER	CC	00	658.2	1200	240	2	12	15	15	6	0	0	0	50	5.2
SUMMER	CB	03	813.7	1200	350	0	2	0	4	2	0	0	0	8	0.8
SUMMER	CB	06	762.0	1200	300	0	2	0	1	2	0	0	0	5	0.5
SUMMER	CB	09	675.4	1500	300	0	5	2	2	1	0	1	0	11	1.1
SUMMER	CB	12	771.0	1350	360	0	7	12	22	8	1	0	0	50	5.1
SUMMER	CB	15	922.3	1500	300	0	6	24	39	16	4	1	0	90	9.4
SUMMER	CB	18	945.2	1500	300	0	8	11	38	16	4	1	0	78	8.1
SUMMER	CB	21	919.3	1350	450	0	1	2	17	7	1	0	0	28	2.9
SUMMER	CB	00	919.0	1200	350	0	4	1	5	4	0	0	0	15	1.6

FALL	CC	03	481.2	900	120	5	27	5	10	0	0	0	0	48	5.0
FALL	CC	06	579.0	1200	180	5	57	31	29	10	0	0	0	133	13.6
FALL	CC	09	552.4	1200	90	10	159	118	79	9	0	0	0	374	39.2
FALL	CC	12	709.4	1500	150	9	152	142	231	77	12	5	0	628	54.6
FALL	CC	15	767.0	1800	150	13	75	113	207	82	11	7	1	509	52.5
FALL	CC	18	713.0	1800	270	0	37	44	62	18	0	1	1	163	16.8
FALL	CC	21	585.5	1500	210	1	39	20	17	2	0	2	0	81	8.3
FALL	CC	00	489.5	900	120	1	30	11	4	0	0	0	0	46	4.7
FALL	CB	03	345.0	450	240	1	1	0	0	0	0	0	0	2	0.2
FALL	CB	06	787.5	1200	300	0	2	0	0	2	0	0	0	4	0.4
FALL	CB	09	485.0	900	300	0	4	1	1	0	0	0	0	5	0.6
FALL	CB	12	583.5	1200	300	0	8	8	3	1	0	0	0	20	2.1
FALL	CB	15	589.3	1500	240	1	5	18	15	3	0	1	0	44	4.5
FALL	CB	18	903.5	1200	450	0	1	4	5	3	0	0	0	14	1.4
FALL	CB	21	530.0	690	450	0	2	1	0	0	0	0	0	3	0.3
FALL	CB	00	575.0	900	450	0	1	3	2	0	0	0	0	6	0.6

KEY:
SEASONS-
WINTER = DEC,JAN,FEB
SPRING = MAR,APR,MAY
SUMMER = JUN,JUL,AUG
FALL = SEP,OCT,NOV
CLOUD TYPES-
CH = CUMULUS HUMULIS
CC = CUMULUS MEDIOCRIS/CONGESTUS
CB = CUMULONIMBUS
CLOUD BASE STATISTICS ARE IN METERS.
TIME IS IN ZULU.

TABLE A-9. HANNOVER: CUMULUS CLOUD SKY COVER BY MONTH.

BY MONTH, TYPE					FREQUENCY DISTRIBUTION									
MONTH	TYPE	MEAN	MAX	MIN	1/8	2/8	3/8	4/8	5/8	6/8	7/8	8/8	#OBS	%FREQ
JAN	CC	3.1	7	1	82	74	74	43	51	30	9	0	363	13.6
JAN	CB	2.3	8	1	3	5	4	0	1	0	0	1	20	0.7
FEB	CC	2.8	7	1	74	49	52	35	32	14	4	0	259	10.7
FEB	CB	1.4	4	1	10	0	1	1	0	0	0	0	12	0.5
MAR	CC	3.0	7	1	164	132	150	76	102	52	4	0	680	25.5
MAR	CB	1.9	7	1	21	13	5	2	1	0	1	0	44	1.7
APR	CC	3.0	7	1	231	177	190	104	127	71	11	0	911	35.7
APR	CB	1.9	7	1	51	41	9	2	2	3	1	0	109	4.3
MAY	CC	2.6	7	1	333	214	182	132	107	41	5	0	1014	38.5
MAY	CB	2.1	8	1	37	22	11	5	1	2	0	2	80	3.0
JUN	CC	2.6	7	1	381	249	251	130	135	35	6	0	1188	46.4
JUN	CB	2.0	7	1	59	41	12	4	5	3	2	0	125	4.9
JUL	CC	2.7	7	1	393	239	287	157	131	51	3	0	1261	48.7
JUL	CB	1.9	7	1	40	23	12	4	0	1	2	0	82	3.2
AUG	CC	2.5	7	1	310	187	215	102	102	33	4	0	953	36.4
AUG	CB	1.8	8	1	43	22	6	0	3	2	0	1	77	2.9
SEP	CC	2.5	7	1	282	136	148	98	77	27	5	0	823	31.9
SEP	CB	2.1	8	1	21	15	8	1	1	1	1	1	50	1.9
OCT	CC	2.7	8	1	133	147	114	66	57	41	6	3	617	23.3
OCT	CB	1.4	3	1	14	8	1	0	0	0	0	0	23	0.9
NOV	CC	2.9	8	1	149	115	102	59	69	34	13	1	542	21.2
NOV	CB	2.3	7	1	10	9	2	2	0	2	1	0	26	1.0
DEC	CC	3.0	7	1	112	77	90	41	57	32	9	0	418	15.7
DEC	CB	1.9	4	1	9	5	3	2	0	0	0	0	20	0.8

KEY:
CLOUD TYPES-
CH = CUMULUS HUMULIS
CC = CUMULUS MEDIOCRIS/CONGESTUS
CB = CUMULONIMBUS
SKY COVER STATISTICS ARE IN EIGHTHS.

TABLE A-10. HANNOVER: CUMULUS CLOUD SKY COVER BY SEASON AND HOUR.

BY SEASON, TYPE, HOUR						FREQUENCY DISTRIBUTION									
SEASON	TYPE	HOUR(Z)	MEAN	MAX	MIN	1/8	2/8	3/8	4/8	5/8	6/8	7/8	8/8	#OBS	%FREQ
WINTER	CC	03	3.3	6	1	5	11	13	5	5	6	0	0	45	4.6
WINTER	CC	06	2.9	6	1	14	10	13	4	11	3	0	0	55	5.7
WINTER	CC	09	3.1	7	1	48	35	26	15	25	17	8	0	174	18.1
WINTER	CC	12	3.1	7	1	90	56	62	43	40	29	8	0	318	32.5
WINTER	CC	15	2.8	7	1	86	51	58	30	34	16	4	0	279	28.6
WINTER	CC	18	2.8	5	1	17	19	18	10	13	0	0	0	77	8.0
WINTER	CC	21	3.0	7	1	11	11	17	4	9	3	1	0	56	5.9
WINTER	CC	00	3.1	7	1	7	6	9	8	3	2	1	0	36	3.7
WINTER	CB	03	2.0	3	1	1	0	1	0	0	0	0	0	2	0.2
WINTER	CB	09	1.4	3	1	6	1	1	0	0	0	0	0	8	0.8
WINTER	CB	12	1.9	3	1	4	1	3	0	0	0	0	0	8	0.8
WINTER	CB	15	1.8	5	1	11	7	3	0	1	0	0	0	22	2.3
WINTER	CB	18	1.8	4	1	3	0	0	1	0	0	0	0	4	0.4
WINTER	CB	21	2.2	4	1	1	3	0	1	0	0	0	0	5	0.5
WINTER	CB	00	4.3	8	1	1	0	0	1	0	0	0	1	3	0.3
SPRING	CC	03	2.9	6	1	7	5	9	4	4	1	0	0	30	3.0
SPRING	CC	06	2.7	7	1	56	29	27	9	16	16	2	0	155	15.8
SPRING	CC	09	3.1	7	1	133	92	81	57	87	47	7	0	504	51.3
SPRING	CC	12	3.2	7	1	151	136	143	102	123	59	8	0	722	73.4
SPRING	CC	15	2.8	7	1	162	146	180	101	71	34	1	0	695	70.9
SPRING	CC	18	2.1	7	1	176	93	54	29	24	5	1	0	382	39.2
SPRING	CC	21	2.3	5	1	28	27	12	7	6	2	0	0	82	8.4
SPRING	CC	00	2.5	7	1	15	5	6	3	5	0	1	0	35	3.6
SPRING	CB	03	2.0	3	1	1	1	1	0	0	0	0	0	3	0.3
SPRING	CB	06	1.7	2	1	1	2	0	0	0	0	0	0	3	0.3
SPRING	CB	09	2.7	6	1	2	1	3	0	0	1	0	0	7	0.7
SPRING	CB	12	1.7	6	1	28	23	6	1	0	1	0	0	59	6.0
SPRING	CB	15	2.1	7	1	37	24	11	5	3	2	2	0	84	8.5
SPRING	CB	18	1.5	4	1	36	20	4	1	0	0	0	0	61	6.3
SPRING	CB	21	2.7	8	1	4	4	1	1	1	0	0	1	12	1.2
SPRING	CB	00	5.0	8	2	0	1	0	1	0	1	0	1	4	0.4
SUMMER	CC	03	2.2	6	1	38	23	13	5	11	1	0	0	91	9.3
SUMMER	CC	06	2.2	7	1	109	34	44	14	18	4	3	0	226	23.2
SUMMER	CC	09	3.0	7	1	164	117	125	89	120	45	3	0	663	67.6
SUMMER	CC	12	2.9	7	1	194	157	227	129	115	32	3	0	857	87.2
SUMMER	CC	15	2.6	7	1	232	189	209	104	76	28	3	0	841	87.5
SUMMER	CC	18	1.9	6	1	271	96	93	31	16	6	0	0	513	53.3
SUMMER	CC	21	2.2	7	1	53	44	30	9	11	3	1	0	151	15.7
SUMMER	CC	00	2.4	5	1	13	15	12	8	2	0	0	0	50	5.2
SUMMER	CB	03	2.8	7	1	2	2	3	0	0	0	1	0	8	0.8
SUMMER	CB	06	2.2	4	1	2	1	1	1	0	0	0	0	5	0.5
SUMMER	CB	09	1.4	3	1	8	2	1	0	0	0	0	0	11	1.1
SUMMER	CB	12	1.7	8	1	29	13	5	1	1	0	0	1	50	5.1
SUMMER	CB	15	1.8	5	1	46	28	11	2	2	1	0	0	90	9.4
SUMMER	CB	18	1.9	7	1	39	26	6	3	1	2	1	0	78	8.1
SUMMER	CB	21	2.5	7	1	10	9	3	1	2	2	1	0	28	2.9
SUMMER	CB	00	2.6	7	1	6	5	0	0	2	1	1	0	15	1.5

FALL	CC	03	2.8	7	1	13	13	8	2	8	3	1	0	48	5.0
FALL	CC	06	2.4	7	1	54	28	22	14	7	5	3	0	133	13.6
FALL	CC	09	2.9	7	1	125	68	70	32	48	25	6	0	374	38.2
FALL	CC	12	2.9	8	1	152	136	119	101	70	39	8	3	628	64.6
FALL	CC	15	2.4	7	1	171	129	103	53	36	18	2	0	509	52.5
FALL	CC	18	2.3	7	1	70	38	20	10	17	5	2	0	153	15.8
FALL	CC	21	3.0	8	1	19	20	14	8	14	5	0	1	81	8.3
FALL	CC	00	2.7	7	1	10	16	8	6	3	1	2	0	45	4.7
FALL	CB	03	1.5	2	1	1	1	0	0	0	0	0	0	2	0.2
FALL	CB	06	2.0	4	1	2	1	0	1	0	0	0	0	4	0.4
FALL	CB	09	3.5	8	1	2	2	0	0	0	0	1	1	5	0.6
FALL	CB	12	2.3	7	1	4	10	4	1	0	0	1	0	20	2.1
FALL	CB	15	1.7	6	1	27	11	2	1	1	2	0	0	44	4.5
FALL	CB	18	1.7	3	1	7	4	3	0	0	0	0	0	14	1.4
FALL	CB	21	2.3	3	2	0	2	1	0	0	0	0	0	3	0.3
FALL	CB	00	2.5	6	1	2	2	1	0	0	1	0	0	5	0.6

KEY:
SEASONS-
   WINTER = DEC,JAN,FEB
   SPRING = MAR,APR,MAY
   SUMMER = JUN,JUL,AUG
   FALL = SEP,OCT,NOV
CLOUD TYPES-
   CH = CUMULUS HUMULIS
   CC = CUMULUS MEDIOCRIS/CONGESTUS
   CB = CUMULONIMBUS
SKY COVER STATISTICS ARE IN EIGHTHS.
TIME IS IN ZULU.

TABLE A-11. HANNOVER: CUMULUS CLOUD TOP HEIGHTS BY MONTH.

BY MONTH, TYPE

MONTH	TYPE	MEAN(M)	MAX(M)	MIN(M)	FREQUENCY DISTRIBUTION(KM) 0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9+
JAN	CC	1425.0	4355	405	32	42	12	3	2	0	0	0	0	0
JAN	CB	4605.0	4605	4605	0	0	0	0	1	0	0	0	0	0
FEB	CC	1731.7	5389	705	20	35	13	2	3	0	1	0	0	0
FEB	CB	2502.0	2502	2502	0	0	1	0	0	0	0	0	0	0
MAR	CC	2121.2	6355	355	28	100	55	17	8	2	9	0	0	0
MAR	CB	4712.1	7055	2905	0	0	1	2	1	1	1	1	0	0
APR	CC	2170.1	5952	455	36	110	133	35	13	7	0	0	0	0
APR	CB	4433.2	6352	2652	0	0	1	6	5	3	2	0	0	0
MAY	CC	2580.3	9955	355	25	92	137	71	15	4	3	6	3	3
MAY	CB	5159.0	7805	3555	0	0	0	2	2	1	1	1	0	0
JUN	CC	2713.0	8905	455	25	119	125	82	44	14	9	1	4	0
JUN	CB	5331.7	11055	3405	0	0	0	7	5	5	3	0	0	2
JUL	CC	2555.3	9002	352	16	103	154	91	32	6	4	4	1	0
JUL	CB	5834.7	10752	3305	0	0	0	4	3	3	1	0	4	1
AUG	CC	2923.2	9452	552	13	96	101	72	28	11	3	6	3	0
AUG	CB	5315.9	11755	3105	0	0	0	4	2	1	1	2	1	2
SEP	CC	2405.5	5755	355	24	71	94	40	13	7	2	0	0	0
SEP	CB	6121.7	7455	4205	0	0	0	0	1	0	1	1	0	0
OCT	CC	1927.4	5655	305	36	96	56	22	4	1	1	0	0	0
OCT	CB	4179.2	5355	2905	0	0	1	1	1	1	0	0	0	0
NOV	CC	1441.4	4952	352	70	51	33	7	3	0	0	0	0	0
NOV	CB	6505.0	6505	6505	0	0	0	0	0	0	1	0	0	0
DEC	CC	1224.9	3055	355	46	33	15	5	0	0	0	0	0	0

KEY:
CLOUD TYPES-
CH = CUMULUS HUMULIS
CC = CUMULUS MEDIOCRIS/CONGESTUS
CB = CUMULONIMBUS
MEAN, MAXIMUM, AND MINIMUM VALUES ARE IN METERS.
FREQUENCY BINS ARE IN KILOMETERS.

TABLE A-12. HANNOVER: CUMULUS CLOUD TOP HEIGHTS BY SEASON AND HOUR.

BY SEASON, TYPE, HOUR						FREQUENCY DISTRIBUTION(KM)									
SEASON	TYPE	HOUR(Z)	MEAN(M)	MAX(M)	MIN(M)	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9+
WINTER	CC	03	1183.6	3105	605	4	2	0	1	0	0	0	0	0	0
WINTER	CC	06	1185.0	2255	505	2	2	1	0	0	0	0	0	0	0
WINTER	CC	09	1137.1	3355	355	13	5	4	1	0	0	0	0	0	0
WINTER	CC	12	1555.0	6389	405	35	55	20	6	1	0	1	0	0	0
WINTER	CC	15	1480.6	4902	355	29	42	12	2	4	0	0	0	0	0
WINTER	CC	18	1055.0	1655	655	3	1	0	0	0	0	0	0	0	0
WINTER	CC	21	1019.3	2705	405	5	1	1	0	0	0	0	0	0	0
WINTER	CC	00	1054.4	2505	455	5	2	2	0	0	0	0	0	0	0
WINTER	CB	15	3553.5	4605	2502	0	0	1	0	1	0	0	0	0	0
SPRING	CC	03	930.0	1505	505	3	1	0	0	0	0	0	0	0	0
SPRING	CC	06	1314.3	2705	455	5	4	4	0	0	0	0	0	0	0
SPRING	CC	09	2037.5	8305	355	43	65	69	25	7	4	1	1	1	0
SPRING	CC	12	2376.7	9855	555	19	105	108	50	13	3	4	2	0	1
SPRING	CC	15	2529.5	9955	705	9	101	112	49	14	5	4	2	2	1
SPRING	CC	18	2538.5	9355	755	8	23	43	20	2	1	2	1	0	1
SPRING	CC	21	2821.7	6355	655	1	1	0	0	0	0	1	0	0	0
SPRING	CC	00	1505.0	1505	1505	0	1	0	0	0	0	0	0	0	0
SPRING	CB	09	5355.0	5355	5355	0	0	0	0	0	1	0	0	0	0
SPRING	CB	12	4850.7	7905	3405	0	0	0	4	6	2	2	1	0	0
SPRING	CB	15	4079.2	7355	2652	0	0	2	5	1	2	0	1	0	0
SPRING	CB	18	5819.7	6405	4952	0	0	0	0	1	0	2	0	0	0
SUMMER	CC	03	2502.0	2502	2502	0	0	1	0	0	0	0	0	0	0
SUMMER	CC	06	1845.3	4421	352	4	5	3	2	1	0	0	0	0	0
SUMMER	CC	09	2332.6	8055	455	27	70	65	47	12	3	2	0	1	0
SUMMER	CC	12	2901.5	8355	605	11	89	129	69	40	12	8	5	5	0
SUMMER	CC	15	2951.8	8905	605	8	67	122	83	35	14	5	5	2	0
SUMMER	CC	18	2665.7	7305	905	2	44	59	33	16	2	1	1	0	0
SUMMER	CC	21	1542.5	2755	1055	0	3	1	0	0	0	0	0	0	0
SUMMER	CC	00	2091.7	3255	355	1	1	1	1	0	0	0	0	0	0
SUMMER	CB	09	4485.3	6502	3402	0	0	0	2	0	0	1	0	0	0
SUMMER	CB	12	5415.5	10752	3105	0	0	0	5	2	3	0	0	2	1
SUMMER	CB	15	5002.0	10955	3305	0	0	0	4	5	4	2	1	3	2
SUMMER	CB	18	5918.4	11755	3452	0	0	0	4	3	2	2	1	0	2
FALL	CC	03	657.9	1905	352	11	1	0	0	0	0	0	0	0	0
FALL	CC	06	1268.9	3355	355	9	3	2	1	0	0	0	0	0	0
FALL	CC	09	1639.9	5655	305	27	33	29	13	0	2	0	0	0	0
FALL	CC	12	2179.7	6755	455	44	89	86	31	15	4	3	0	0	0
FALL	CC	15	2020.7	5755	502	25	75	61	24	5	2	0	0	0	0
FALL	CC	18	1356.0	2902	405	4	2	2	0	0	0	0	0	0	0
FALL	CC	21	1518.9	2902	605	4	3	3	0	0	0	0	0	0	0
FALL	CC	00	736.2	1755	455	5	2	0	0	0	0	0	0	0	0
FALL	CB	12	5505.0	7455	5355	0	0	0	0	0	1	2	1	0	0
FALL	CB	15	3955.0	4855	2805	0	0	1	0	2	0	0	0	0	0
FALL	CB	18	3702.0	3702	3702	0	0	0	1	0	0	0	0	0	0

KEY:

SEASONS-
- WINTER = DEC,JAN,FEB
- SPRING = MAR,APR,MAY
- SUMMER = JUN,JUL,AUG
- FALL = SEP,OCT,NOV

MEAN, MAXIMUM, AND MINIMUM VALUES ARE IN METERS.
FREQUENCY BINS ARE IN KILOMETERS.
TIME IS IN ZULU.
CLOUD TYPES-
- CH = CUMULUS HUMULIS
- CC = CUMULUS MEDIOCRIS/CONGESTUS
- CB = CUMULONIMBUS

TABLE A-13. NEW ORLEANS: CUMULUS CLOUD BASE HEIGHTS BY MONTH.

STATION: NEW ORLEANS
WBSTN : 722310
LAT : 30.00 N
LON : 90.15 W
ELEV : 9 M

BY MONTH, TYPE

					FREQUENCY DISTRIBUTION(M)									
MONTH	TYPE	MEAN(M)	MAX(M)	MIN(M)	0-249	250-499	500-749	750-999	1000-1249	1250-1499	1500-1749	1750+	#OBS	%FREQ
JAN	CH	854.5	1250	450	0	3	0	14	0	5	0	0	22	1.5
JAN	CC	725.0	1250	150	1	1	0	7	0	1	0	0	10	0.7
JAN	CB	537.5	1750	75	3	7	0	2	0	1	0	1	14	1.0
FEB	CH	853.3	1250	450	0	3	0	26	0	7	0	0	36	2.8
FEB	CC	775.0	1250	150	1	2	0	13	0	2	0	0	18	1.4
FEB	CB	[illegible]	900	75	3	9	0	4	0	0	0	0	16	1.3
MAR	CH	835.5	1250	150	1	3	0	40	0	15	0	0	59	4.1
MAR	CC	871.2	1250	250	0	6	0	27	0	7	0	0	40	2.9
MAR	CB	500.0	1750	150	7	11	0	6	0	5	0	1	30	2.1
APR	CH	953.5	1750	75	1	9	0	54	0	44	0	3	121	9.1
APR	CC	878.3	1250	250	0	11	0	37	0	21	0	0	69	5.2
APR	CB	543.0	1250	150	3	12	0	9	0	1	0	0	25	1.9
MAY	CH	959.5	1750	250	0	11	0	95	0	64	0	3	173	12.2
MAY	CC	979.5	1750	250	0	12	0	70	0	60	0	4	146	10.3
MAY	CB	817.2	1750	150	1	19	0	28	0	18	0	1	67	4.7
JUN	CH	922.5	1750	250	0	25	0	100	0	64	0	4	193	13.9
JUN	CC	924.1	1750	150	1	18	0	106	0	67	0	1	193	13.9
JUN	CB	849.5	1750	75	5	39	0	133	0	60	0	3	239	17.2
JUL	CH	975.8	1750	150	1	15	0	87	0	39	0	4	146	10.9
JUL	CC	959.9	1750	450	0	13	0	120	0	83	0	5	221	15.3
JUL	CB	874.1	1750	150	2	34	0	211	0	82	0	1	330	24.3
AUG	CH	879.6	1750	450	0	13	0	80	0	30	0	1	124	8.7
AUG	CC	901.6	1250	150	2	11	0	104	0	49	0	0	156	11.7
AUG	CB	839.2	1750	150	4	50	0	241	0	79	0	0	374	26.3
SEP	CH	850.7	1250	250	0	15	0	58	0	28	0	0	112	8.5
SEP	CC	878.2	1250	150	1	20	0	104	0	21	0	0	146	11.1
SEP	CB	815.9	1750	150	2	34	0	117	0	34	0	2	189	14.3
OCT	CH	943.8	1250	250	0	2	0	52	0	33	0	0	97	7.9
OCT	CC	887.3	1250	450	0	8	0	43	0	20	0	0	71	5.7
OCT	CB	720.3	1250	150	3	7	0	17	0	5	0	0	32	2.5
NOV	CH	857.7	1750	150	1	5	0	45	0	13	0	1	65	5.2
NOV	CC	744.5	1250	150	1	8	0	24	0	4	0	0	37	2.9
NOV	CB	574.4	1250	150	3	21	0	9	0	1	0	0	34	2.7
DEC	CH	855.0	1250	450	0	2	0	14	0	4	0	0	20	1.5
DEC	CC	581.2	1250	75	1	6	0	12	0	1	0	0	20	1.6
DEC	CB	475.8	1250	75	4	5	0	3	0	1	0	0	14	1.1

KEY:
CLOUD TYPES-
CH = CUMULUS HUMILIS
CC = CUMULUS MEDIOCRIS/CONGESTUS
CB = CUMULONIMBUS
CLOUD BASE STATISTICS ARE IN METERS.

TABLE A-14. NEW ORLEANS: CUMULUS CLOUD BASE HEIGHTS BY SEASON AND HOUR.

BY SEASON, TYPE, HOUR

						FREQUENCY DISTRIBUTION(M)									
SEASON	TYPE	HOUR(Z)	MEAN(M)	MAX(M)	MIN(M)	0-249	250-499	500-749	750-999	1000-1249	1250-1499	1500-1749	1750+	#OBS	%FREQ
WINTER	CM	05	800.0	800	800	0	0	0	1	0	0	0	0	1	0.2
WINTER	CM	12	1250.0	1250	1250	0	0	0	0	0	1	0	0	1	0.2
WINTER	CM	18	839.7	1250	450	0	5	0	44	0	9	0	0	58	10.1
WINTER	CM	00	991.7	1250	450	0	3	0	9	0	6	0	0	18	3.5
WINTER	CC	05	800.0	800	800	0	0	0	1	0	0	0	0	1	0.2
WINTER	CC	12	75.0	75	75	1	0	0	0	0	0	0	0	1	0.2
WINTER	CC	18	595.0	1250	150	3	5	0	21	0	1	0	0	30	5.2
WINTER	CC	00	919.7	1250	450	0	3	0	10	0	3	0	0	16	3.1
WINTER	CB	05	319.2	450	75	5	6	0	0	0	0	0	0	11	2.2
WINTER	CB	12	407.3	1250	75	5	3	0	1	0	1	0	0	11	2.0
WINTER	CB	18	500.0	1250	150	2	3	0	3	0	1	0	0	9	1.6
WINTER	CB	00	507.7	1750	150	4	3	0	5	0	0	0	1	13	2.5
SPRING	CM	05	727.8	1250	150	2	1	0	4	0	2	0	0	9	1.8
SPRING	CM	12	737.5	1750	250	1	12	0	14	0	4	0	1	32	5.4
SPRING	CM	18	963.5	1750	75	1	5	0	118	0	62	0	3	189	24.9
SPRING	CM	00	1009.1	1750	450	0	3	0	63	0	55	0	2	123	18.0
SPRING	CC	05	525.0	800	250	1	0	0	1	0	0	0	0	2	0.4
SPRING	CC	12	545.7	800	250	2	7	0	14	0	0	0	0	23	3.9
SPRING	CC	18	952.5	1750	250	1	5	0	79	0	45	0	3	134	17.7
SPRING	CC	00	957.7	1750	450	0	12	0	40	0	43	0	1	96	14.0
SPRING	CB	05	541.7	1750	150	5	6	0	5	0	0	0	1	18	3.7
SPRING	CB	12	461.5	1250	150	8	13	0	4	0	1	0	0	26	4.4
SPRING	CB	18	744.9	1250	150	4	5	0	15	0	6	0	0	31	4.1
SPRING	CB	00	934.0	1750	150	3	8	0	19	0	17	0	1	47	6.9
SUMMER	CM	05	822.2	1750	250	1	4	0	25	0	4	0	1	36	12.3
SUMMER	CM	12	701.5	1250	150	1	44	0	79	0	7	0	0	131	21.1
SUMMER	CM	18	952.9	1750	450	0	1	0	110	0	56	0	3	170	19.2
SUMMER	CM	00	1055.1	1750	450	0	3	0	52	0	66	0	5	126	15.8
SUMMER	CC	05	945.2	1750	450	0	1	0	11	0	0	0	1	13	4.5
SUMMER	CC	12	712.6	1750	150	4	32	0	84	0	4	0	1	125	20.1
SUMMER	CC	18	978.5	1250	450	0	5	0	157	0	113	0	0	275	31.1
SUMMER	CC	00	1037.4	1750	450	0	3	0	78	0	82	0	4	167	21.0
SUMMER	CB	05	763.0	1250	75	5	8	0	26	0	9	0	0	48	15.4
SUMMER	CB	12	587.5	1250	150	7	59	0	125	0	6	0	0	195	31.6
SUMMER	CB	18	950.8	1750	150	7	27	0	229	0	74	0	1	338	38.2
SUMMER	CB	00	949.0	1750	150	4	17	0	205	0	132	0	3	361	45.4

FALL	CH	06	858.7	1250	450	0	1	0	5	0	2	0	0	9	2.3
FALL	CH	12	700.0	1250	250	1	9	0	13	0	1	0	0	29	5.9
FALL	CH	15	1070.0	150	150	1	0	0	0	0	0	0	0	1	0.2
FALL	CH	18	901.6	1750	250	1	10	0	113	0	47	0	0	178	27.2
FALL	CH	00	974.1	1250	450	0	2	0	32	0	24	0	1	58	10.8
FALL	CC	06	531.2	900	250	2	3	0	3	0	0	0	0	9	2.3
FALL	CC	12	540.5	1250	150	3	13	0	15	0	4	0	0	42	8.6
FALL	CC	18	945.9	1250	250	7	7	0	95	0	21	0	0	126	19.2
FALL	CC	00	935.4	1250	450	0	2	0	56	0	20	0	0	78	14.5
FALL	CB	06	595.6	500	250	3	7	0	4	0	0	0	0	11	3.1
FALL	CB	12	527.3	1250	150	3	16	0	27	0	3	0	0	55	11.2
FALL	CB	18	742.7	1250	150	4	22	0	44	0	12	0	0	82	12.5
FALL	CB	00	955.0	1750	150	5	9	0	66	0	25	0	2	107	19.9

KEY:
SEASONS-
WINTER = DEC,JAN,FEB
SPRING = MAR,APR,MAY
SUMMER = JUN,JUL,AUG
FALL = SEP,OCT,NOV
CLOUD TYPES-
CH = CUMULUS HUMULIS
CC = CUMULUS MEDIOCRIS/CONGESTUS
CB = CUMULONIMBUS
CLOUD BASE STATISTICS ARE IN METERS.
TIME IS IN ZULU.

TABLE A-15. NEW ORLEANS: CUMULUS CLOUD SKY COVER BY MONTH.

BY MONTH, TYPE — FREQUENCY DISTRIBUTION

MONTH	TYPE	MEAN	MAX	MIN	1/8	2/8	3/8	4/8	5/8	6/8	7/8	8/8	#OBS	%FREQ
JAN	CH	2.9	6	1	9	4	1	3	3	3	0	0	22	1.5
JAN	CC	4.9	5	1	1	2	0	0	4	2	0	1	10	0.7
JAN	CB	5.4	8	1	1	3	0	0	2	2	1	5	14	1.0
FEB	CH	2.6	8	1	15	9	4	1	5	1	0	1	36	2.8
FEB	CC	3.9	8	1	1	7	1	1	3	3	1	1	18	1.4
FEB	CB	5.4	8	3	0	0	4	0	1	1	0	10	15	1.3
MAR	CH	2.2	6	1	26	19	6	2	5	3	0	0	59	4.1
MAR	CC	4.0	8	1	5	9	6	2	4	10	1	3	40	2.8
MAR	CB	5.9	8	1	1	4	3	1	4	2	1	14	30	2.1
APR	CH	2.1	7	1	57	36	7	8	9	2	2	0	121	9.1
APR	CC	3.9	8	1	3	13	5	5	14	13	2	2	69	5.2
APR	CB	5.2	8	2	0	3	4	3	5	3	0	7	25	1.9
MAY	CH	1.9	5	1	82	50	17	8	3	3	0	0	173	12.2
MAY	CC	2.9	8	1	31	43	25	17	21	5	3	1	146	10.3
MAY	CB	3.3	8	1	13	17	4	3	14	6	3	7	67	4.7
JUN	CH	1.5	5	1	115	54	11	4	5	2	0	0	193	13.9
JUN	CC	2.6	7	1	73	58	29	10	15	11	1	0	193	13.9
JUN	CB	2.9	8	1	73	76	24	13	23	23	4	5	239	17.2
JUL	CH	1.5	5	1	93	45	3	2	2	0	0	0	146	10.8
JUL	CC	2.2	7	1	75	83	26	15	15	6	1	0	221	16.3
JUL	CB	2.5	8	1	119	94	46	13	39	23	1	5	330	24.3
AUG	CH	1.5	5	1	75	30	12	3	3	0	0	0	124	8.7
AUG	CC	2.3	8	1	55	57	17	9	10	6	1	1	155	11.7
AUG	CB	2.5	8	1	139	113	37	19	41	17	0	7	374	26.3
SEP	CH	1.5	7	1	63	40	4	3	1	0	1	0	112	8.5
SEP	CC	2.5	6	1	43	47	17	5	17	9	0	0	145	11.1
SEP	CB	2.3	8	1	57	57	18	10	24	14	4	5	199	14.3
OCT	CH	1.5	6	1	55	33	2	2	3	1	0	0	97	7.8
OCT	CC	2.8	6	1	20	17	9	8	7	8	0	0	71	5.7
OCT	CB	3.3	8	1	5	9	6	2	5	3	0	2	32	2.6
NOV	CH	2.1	6	1	32	15	8	4	3	3	0	0	65	5.2
NOV	CC	3.9	8	1	5	6	7	2	7	5	1	3	37	2.9
NOV	CB	4.7	8	1	3	7	3	2	3	7	2	7	34	2.7
DEC	CH	1.6	3	1	9	10	1	0	0	0	0	0	20	1.6
DEC	CC	3.7	8	1	5	2	5	2	0	2	2	2	20	1.6
DEC	CB	5.3	8	1	1	0	2	0	2	0	1	8	14	1.1

KEY:
CLOUD TYPES-
CH = CUMULUS HUMULIS
CC = CUMULUS MEDIOCRIS/CONGESTUS
CB = CUMULONIMBUS
SKY COVER STATISTICS ARE IN EIGHTHS.

TABLE A-15. NEW ORLEANS: CUMULUS CLOUD SKY COVER BY SEASON AND HOUR.

BY SEASON, TYPE, HOUR — FREQUENCY DISTRIBUTION

SEASON	TYPE	HOUR(Z)	MEAN	MAX	MIN	1/8	2/8	3/8	4/8	5/8	6/8	7/8	8/8	#OBS	%FREQ
WINTER	CH	06	8.0	8	8	0	0	0	0	0	0	0	1	1	0.2
WINTER	CH	12	1.0	1	1	1	0	0	0	0	0	0	0	1	0.2
WINTER	CH	18	2.4	6	1	21	18	5	2	8	4	0	0	59	10.1
WINTER	CH	00	1.7	4	1	10	5	1	2	0	0	0	0	19	3.5
WINTER	CC	06	1.0	1	1	1	0	0	0	0	0	0	0	1	0.2
WINTER	CC	12	8.0	8	8	0	0	0	0	0	0	0	1	1	0.2
WINTER	CC	18	4.0	8	1	2	7	6	1	6	5	2	1	30	5.2
WINTER	CC	00	3.3	8	1	4	4	0	2	1	2	1	2	16	3.1
WINTER	CB	06	5.5	8	1	2	0	0	0	1	0	0	8	11	2.2
WINTER	CB	12	6.2	8	3	0	0	3	0	1	1	0	6	11	2.0
WINTER	CB	18	5.1	8	2	0	1	0	0	3	0	2	3	9	1.6
WINTER	CB	00	5.5	8	2	0	2	3	0	0	2	0	6	13	2.5
SPRING	CH	06	2.0	4	1	4	3	0	2	0	0	0	0	9	1.8
SPRING	CH	12	1.5	5	1	23	3	5	0	1	0	0	0	32	6.4
SPRING	CH	18	2.3	6	1	70	61	24	12	15	7	0	0	189	24.9
SPRING	CH	00	1.7	7	1	66	46	3	4	1	1	2	0	123	19.0
SPRING	CC	06	2.5	3	2	0	1	1	0	0	0	0	0	2	0.4
SPRING	CC	12	2.5	5	1	9	5	3	1	2	3	0	0	23	3.9
SPRING	CC	18	4.0	8	1	7	28	23	17	31	20	4	4	134	17.7
SPRING	CC	00	2.5	8	1	30	34	9	7	6	6	2	2	96	14.0
SPRING	CB	06	5.7	8	1	1	1	2	0	5	2	0	7	18	3.7
SPRING	CB	12	5.5	8	1	3	1	2	3	4	1	2	10	26	4.4
SPRING	CB	18	4.3	8	1	2	6	3	1	7	5	0	7	31	4.1
SPRING	CB	00	3.5	8	1	8	16	4	3	7	3	2	4	47	5.9
SUMMER	CH	06	1.5	5	1	23	9	2	0	2	0	0	0	35	12.3
SUMMER	CH	12	1.3	3	1	98	31	2	0	0	0	0	0	131	21.1
SUMMER	CH	18	1.9	6	1	76	55	22	8	7	2	0	0	170	19.2
SUMMER	CH	00	1.4	5	1	88	35	0	1	2	0	0	0	126	15.9
SUMMER	CC	06	2.5	5	1	4	4	2	0	2	1	0	0	13	4.5
SUMMER	CC	12	1.5	8	1	79	37	2	2	1	2	1	1	125	20.1
SUMMER	CC	18	2.8	7	1	45	102	51	25	31	18	2	0	274	31.1
SUMMER	CC	00	1.8	5	1	74	65	16	5	7	0	0	0	167	21.0
SUMMER	CB	06	2.5	4	1	21	12	2	3	6	3	0	1	48	16.4
SUMMER	CB	12	1.9	5	1	115	46	15	3	6	9	1	1	196	31.5
SUMMER	CB	18	3.5	8	1	32	100	66	25	62	37	4	12	338	39.2
SUMMER	CB	00	2.1	8	1	162	123	24	13	20	15	0	3	351	45.4
FALL	CH	06	1.5	3	1	5	2	1	0	0	0	0	0	8	2.3
FALL	CH	12	1.1	2	1	25	4	0	0	0	0	0	0	29	5.9
FALL	CH	15	3.0	3	3	0	0	1	0	0	0	0	0	1	0.2
FALL	CH	18	1.9	7	1	94	66	9	9	5	4	1	0	188	27.2
FALL	CH	00	1.5	5	1	37	16	3	0	2	0	0	0	58	10.9
FALL	CC	06	4.1	4	1	1	2	1	0	1	2	0	1	8	2.3
FALL	CC	12	2.4	8	1	17	12	4	1	5	2	0	1	42	8.5
FALL	CC	18	3.3	5	1	18	33	23	15	22	15	0	0	126	19.2
FALL	CC	00	2.0	5	1	38	25	7	0	3	3	1	1	78	14.5
FALL	CB	06	3.8	4	1	2	2	2	0	2	2	0	1	11	3.1
FALL	CB	12	2.8	8	1	23	15	1	3	3	4	1	5	55	11.2
FALL	CB	18	4.1	8	1	2	21	15	6	19	9	5	5	82	12.5
FALL	CB	00	2.5	8	1	39	34	9	5	8	9	0	3	107	19.9

KEY:
SEASONS-
WINTER = DEC, JAN, FEB
SPRING = MAR, APR, MAY
SUMMER = JUN, JUL, AUG
FALL = SEP, OCT, NOV

CLOUD TYPES-
CH = CUMULUS HUMILIS
CC = CUMULUS MEDIOCRIS/CONGESTUS
CB = CUMULONIMBUS
SKY COVER STATISTICS ARE IN EIGHTHS.
TIME IS IN ZULU.

TABLE A-17. NEW ORLEANS: CUMULUS CLOUD TOP HEIGHTS BY MONTH.

BY MONTH, TYPE

MONTH	TYPE	MEAN(M)	MAX(M)	MIN(M)	FREQUENCY DISTRIBUTION(KM) 0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9+
JAN	CH	2017.5	4575	1051	0	8	4	0	1	0	0	0	0	0
JAN	CC	3201.5	5751	1501	0	1	3	1	1	1	0	0	0	0
JAN	CB	7455.0	9355	5055	0	0	0	0	0	1	0	0	0	1
FEB	CH	1725.9	5875	801	2	13	1	0	0	1	0	0	0	0
FEB	CC	2940.0	4451	955	1	1	1	4	1	0	0	0	0	0
FEB	CB	2501.0	2501	2501	0	0	1	0	0	0	0	0	0	0
MAR	CH	1953.7	5505	701	3	18	1	2	1	2	0	0	0	0
MAR	CC	2797.0	9651	1251	0	6	11	4	1	0	0	0	0	1
MAR	CB	8259.0	9951	5501	0	0	0	0	0	1	0	0	0	2
APR	CH	1781.7	2951	755	1	35	14	0	0	0	0	0	0	0
APR	CC	3016.0	9951	1051	0	14	17	8	2	3	1	0	2	0
APR	CB	6193.9	9901	3151	0	0	0	1	1	3	0	0	0	2
MAY	CH	2034.9	5105	901	2	46	20	10	1	1	0	0	0	0
MAY	CC	3978.3	10255	851	1	14	23	20	12	7	3	5	4	5
MAY	CB	7743.2	11651	3055	0	0	0	2	2	3	1	0	2	11
JUN	CH	2345.6	6051	751	4	25	28	11	2	0	2	0	0	0
JUN	CC	5122.7	10455	1501	0	2	12	17	18	12	12	10	1	7
JUN	CB	9937.4	12601	3151	0	0	0	3	1	1	3	3	7	47
JUL	CH	2754.5	5251	501	1	11	27	13	6	2	0	0	0	0
JUL	CC	6259.2	11801	2551	0	0	1	9	19	27	22	15	5	11
JUL	CB	10783.2	13905	3201	0	0	0	2	1	2	2	4	4	91
AUG	CH	2868.7	6401	1301	0	7	18	13	3	1	1	0	0	0
AUG	CC	6450.9	11051	1851	0	2	1	4	8	21	17	10	2	13
AUG	CB	11091.9	13805	3101	0	0	0	1	2	1	2	2	4	106
SEP	CH	2453.0	5451	651	1	18	22	6	5	1	0	0	0	0
SEP	CC	4925.0	10051	555	1	5	10	8	11	13	16	5	0	4
SEP	CB	10303.7	13605	2955	0	0	1	0	2	2	2	1	0	39
OCT	CH	2035.0	5005	1151	0	25	14	3	0	0	1	0	0	0
OCT	CC	4335.2	10105	1501	0	1	9	11	5	4	2	0	2	2
OCT	CB	8720.3	11405	3501	0	0	0	1	1	0	0	0	0	4
NOV	CH	1795.7	3055	551	1	18	11	2	0	0	0	0	0	0
NOV	CC	3590.3	9156	1351	0	3	5	9	1	2	1	0	0	1
NOV	CB	8255.9	10355	2401	0	0	1	0	1	1	0	0	0	8
DEC	CH	1713.3	2755	1001	0	8	4	0	0	0	0	0	0	0
DEC	CC	4435.2	10301	2001	0	0	4	1	1	1	0	1	0	1
DEC	CB	7264.5	10051	3701	0	0	0	1	0	1	0	0	0	2

KEY:
CLOUD TYPES-
CH = CUMULUS HUMULIS
CC = CUMULUS MEDIOCRIS/CONGESTUS
CB = CUMULONIMBUS
MEAN, MAXIMUM, AND MINIMUM VALUES ARE IN METERS.
FREQUENCY BINS ARE IN KILOMETERS.

TABLE A-13. NEW ORLEANS: CUMULUS CLOUD TOP HEIGHTS BY SEASON AND HOUR.

BY SEASON, TYPE, HOUR

SEASON	TYPE	HOUR(Z)	MEAN(M)	MAX(M)	MIN(M)	FREQUENCY DISTRIBUTION(KM) 0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9+
WINTER	CH	18	1872.5	5905	801	2	23	9	0	1	1	0	0	0	0
WINTER	CH	00	1453.0	1805	1101	0	6	0	0	0	0	0	0	0	0
WINTER	CC	18	3744.2	10301	855	1	1	5	5	2	2	0	1	0	1
WINTER	CC	00	2941.8	4451	1501	0	1	2	1	1	0	0	0	0	0
WINTER	CB	06	3701.0	3701	3701	0	0	0	1	0	0	0	0	0	0
WINTER	CB	18	5583.4	10051	2501	0	0	1	0	0	2	0	0	0	2
WINTER	CB	00	9851.0	9851	9851	0	0	0	0	0	0	0	0	0	1
SPRING	CH	18	2348.5	5505	901	2	64	23	10	2	2	0	0	0	0
SPRING	CH	00	1733.8	5055	701	4	35	12	2	0	1	0	0	0	0
SPRING	CC	12	2251.5	5001	1051	0	4	2	1	0	1	0	0	0	0
SPRING	CC	18	3859.2	10255	1101	0	19	32	20	10	8	1	5	5	6
SPRING	CC	00	3057.7	8951	851	1	11	17	11	5	1	3	0	1	0
SPRING	CB	06	9951.0	9951	9951	0	0	0	0	0	0	0	0	0	1
SPRING	CB	12	6876.0	9701	4051	0	0	0	0	1	0	0	0	0	1
SPRING	CB	18	7776.9	11005	3055	0	0	0	1	0	5	0	0	1	7
SPRING	CB	00	7322.7	11651	3151	0	0	0	2	2	2	1	0	1	6
SUMMER	CH	12	1820.8	6001	601	5	5	1	0	1	0	1	0	0	0
SUMMER	CH	18	2845.7	6401	1451	0	21	47	30	8	3	2	0	0	0
SUMMER	CH	00	2343.0	4551	1001	0	17	25	7	2	0	0	0	0	0
SUMMER	CC	12	5892.7	9551	4451	0	0	0	0	1	1	2	0	1	1
SUMMER	CC	18	5132.2	10801	1601	0	3	9	20	27	42	39	30	7	25
SUMMER	CC	00	5334.5	11901	1901	0	1	6	10	17	17	10	5	0	5
SUMMER	CB	12	11456.5	12801	10051	0	0	0	0	0	0	0	0	0	10
SUMMER	CB	18	10778.3	13905	3101	0	0	0	4	3	3	1	8	9	195
SUMMER	CB	00	10233.8	13101	3201	0	0	0	2	1	1	6	1	6	59
FALL	CH	12	1539.5	1901	651	1	3	0	0	0	0	0	0	0	0
FALL	CH	15	2001.0	2001	2001	0	0	1	0	0	0	0	0	0	0
FALL	CH	18	2143.3	6006	651	1	56	43	9	5	0	1	0	0	0
FALL	CH	00	2578.8	5451	1201	0	3	3	2	0	1	0	0	0	0
FALL	CC	12	4651.7	6951	555	1	0	0	1	0	2	2	0	0	0
FALL	CC	18	4555.0	10105	1351	0	9	20	23	16	15	14	5	1	7
FALL	CC	00	4318.1	8705	1501	0	1	4	4	1	2	3	0	1	0
FALL	CB	06	8351.0	10951	5751	0	0	0	0	0	1	0	0	0	1
FALL	CB	12	10334.3	12301	6801	0	0	0	0	0	0	1	0	0	2
FALL	CB	18	10043.0	13505	2401	0	0	1	1	3	1	0	1	0	38
FALL	CB	00	9126.6	12701	2955	0	0	1	0	1	1	1	0	0	10

KEY:
SEASONS-
WINTER = DEC,JAN,FEB
SPRING = MAR,APR,MAY
SUMMER = JUN,JUL,AUG
FALL = SEP,OCT,NOV
CLOUD TYPES-
CH = CUMULUS HUMULIS
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CB = CUMULONIMBUS
MEAN, MAXIMUM, AND MINIMUM VALUES ARE IN METERS.
FREQUENCY BINS ARE IN KILOMETERS.
TIMES ARE IN ZULU.

APPENDIX B

Selected Cloud Dimension Graphs

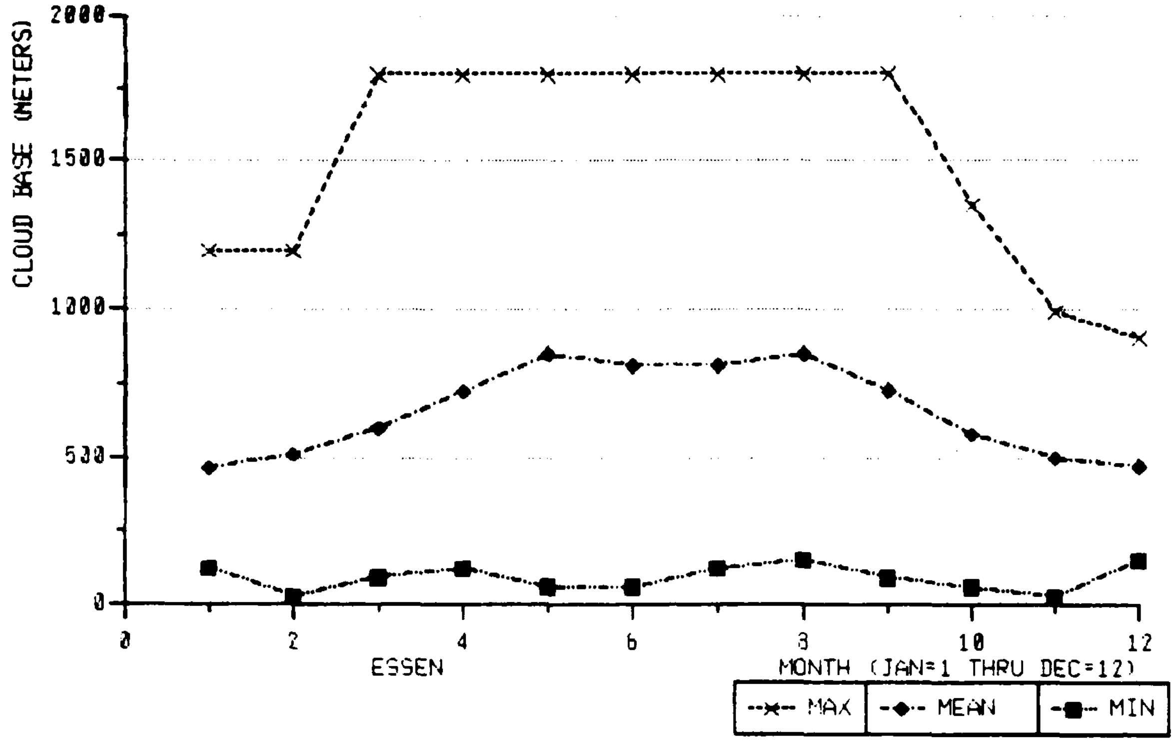

Figure B-1. ESSEN: Maximum, Minimum, and Mean Cloud Bases for Cumulus Mediocris/Congestus by Month.

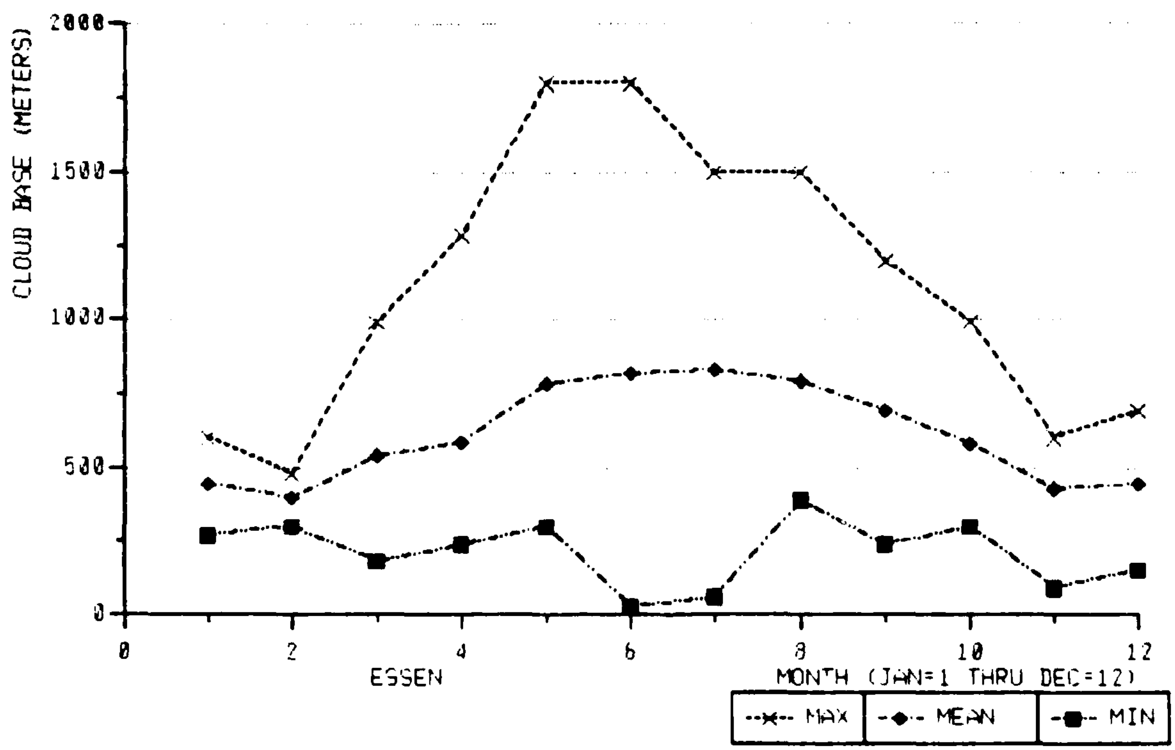

Figure B-2. ESSEN: Maximum, Minimum, and Mean Cloud Bases for Cumulonimbus by Month.

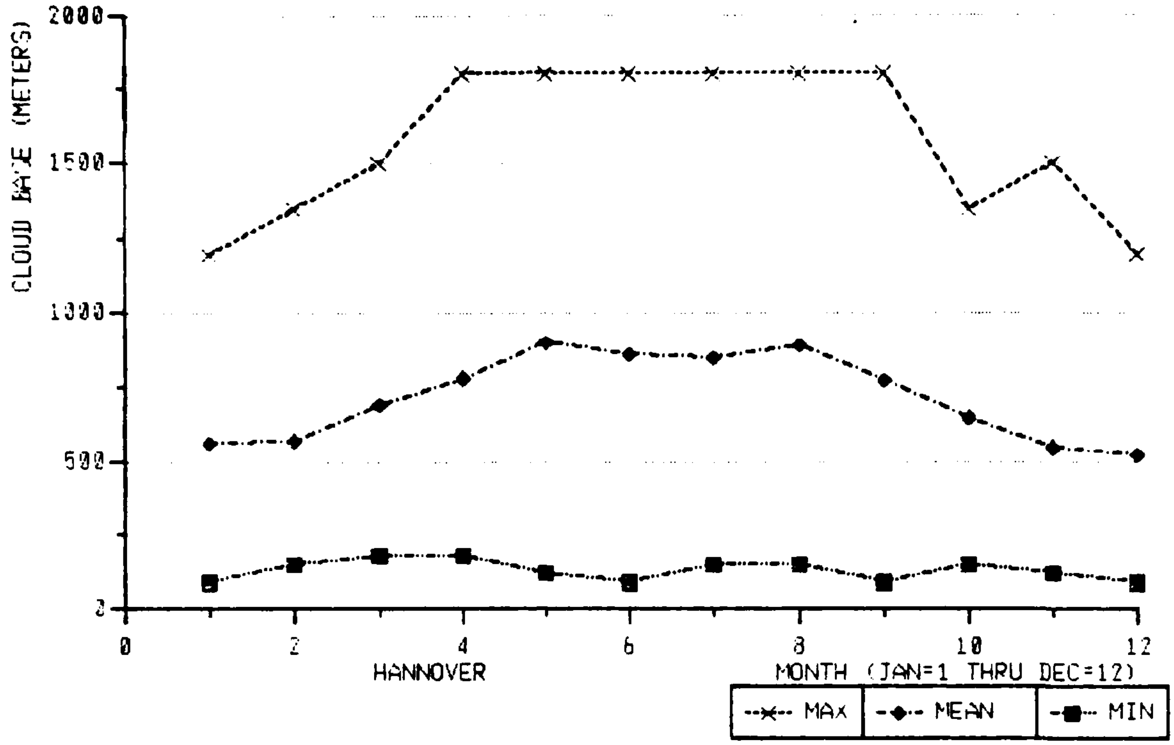

Figure B-3. HANNOVER: Maximum, Minimum, and Mean Cloud Base for Cumulus Mediocris/Congestus by Month.

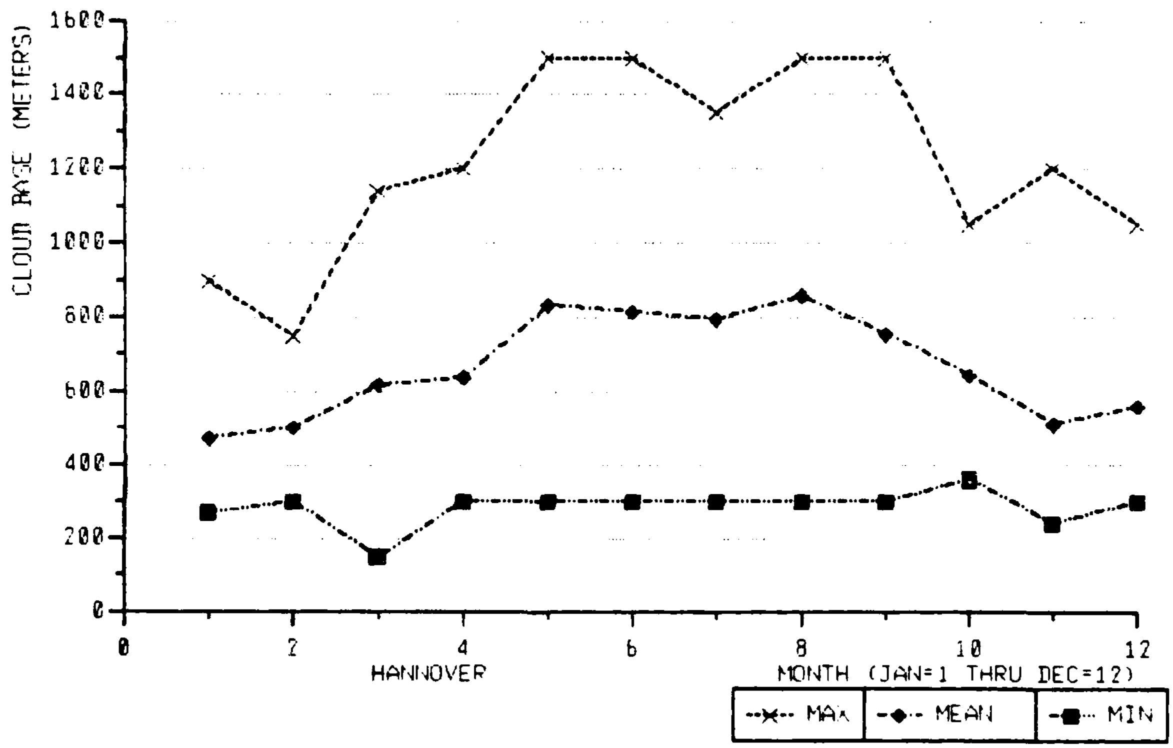

Figure B-4. HANNOVER: Maximum, Minimum, and Mean Cloud Base for Cumulonimbus by Month.

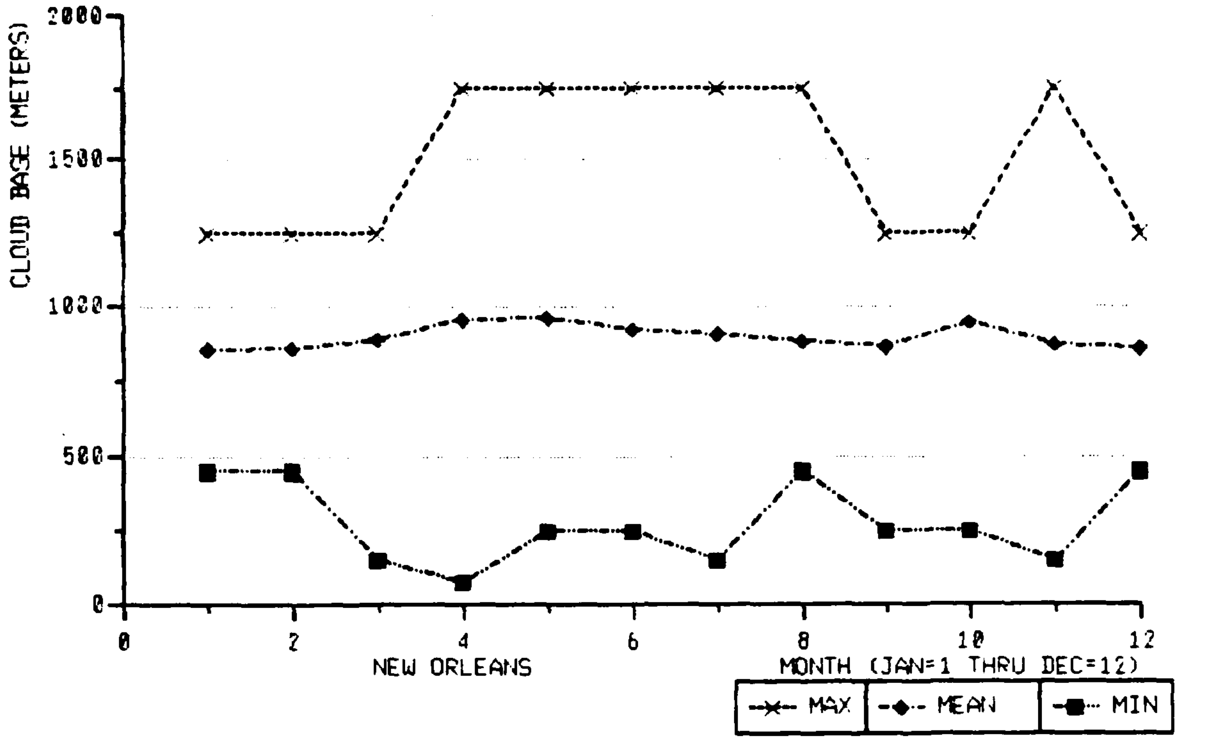

Figure B-5. NEW ORLEANS: Maximum, Minimum, and Mean Cloud Base for Cumulus Humulis/Fractus by Month.

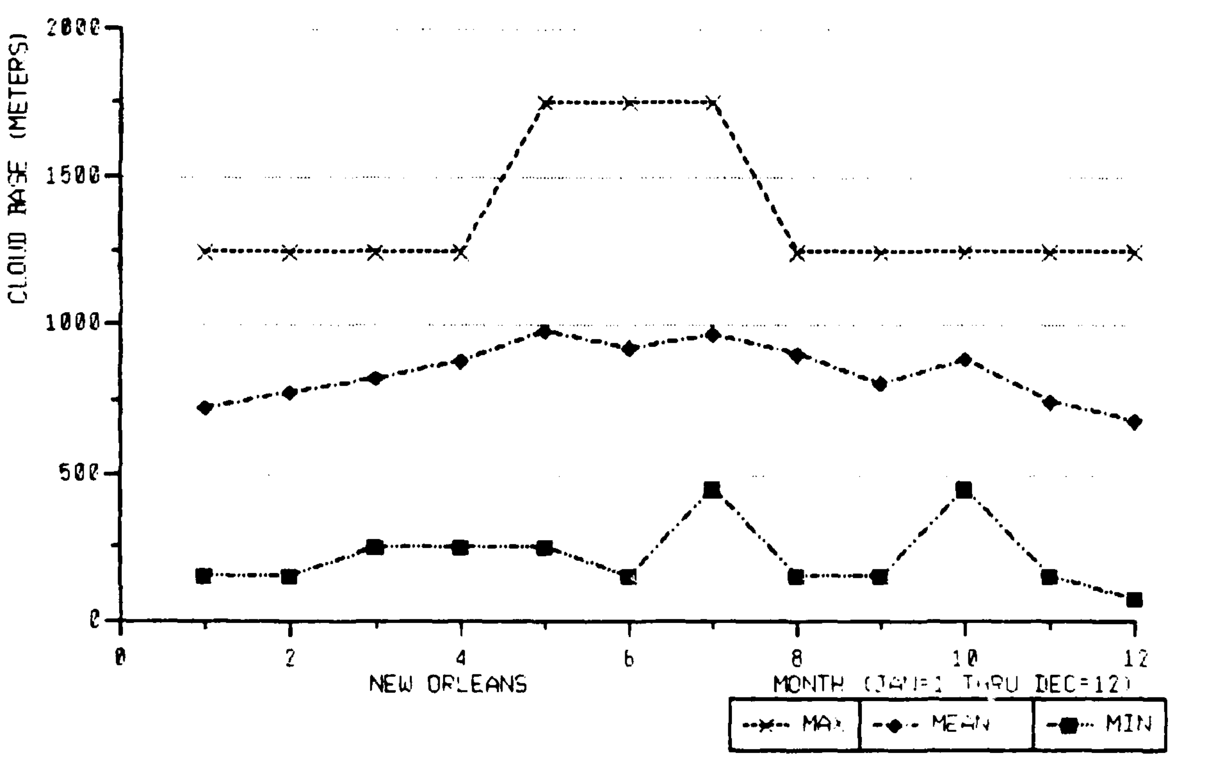

Figure B-6. NEW ORLEANS: Maximum, Minimum, and Mean Cloud Base for Cumulus Mediocris/Congestus by Month.

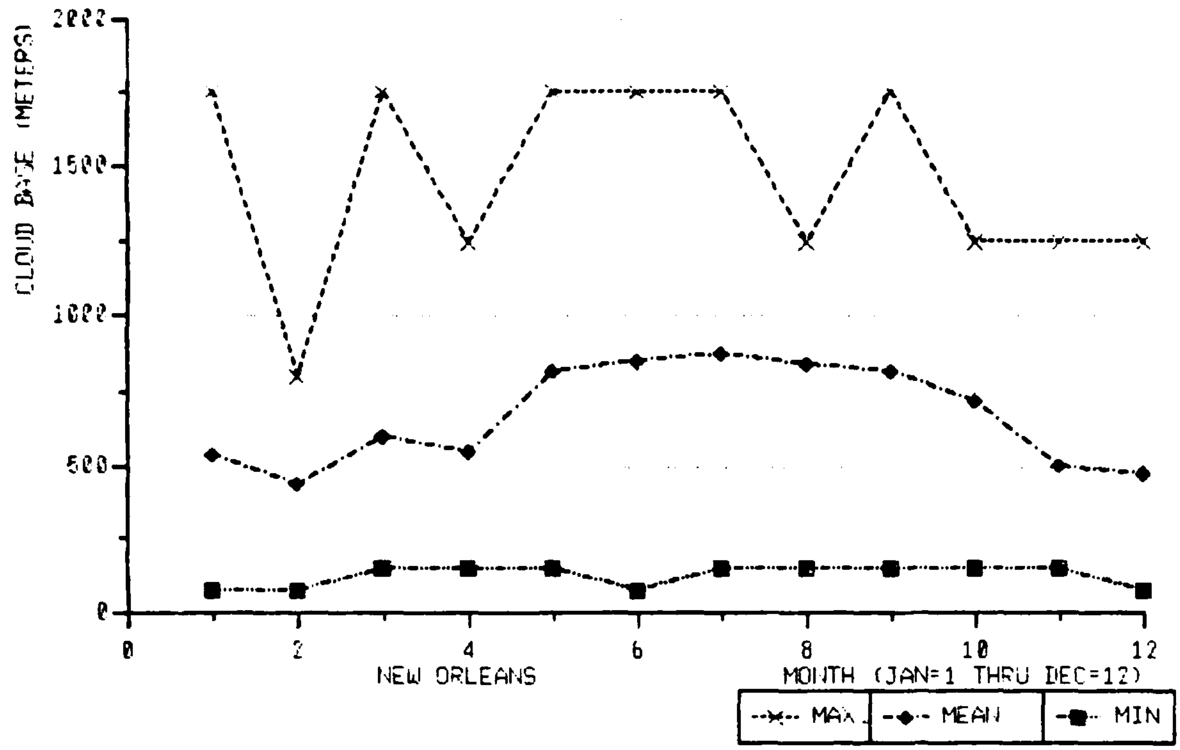

Figure B-7. NEW ORLEANS: Maximum, Minimum, and Mean Cloud Base for Cumulonumbus by Month.

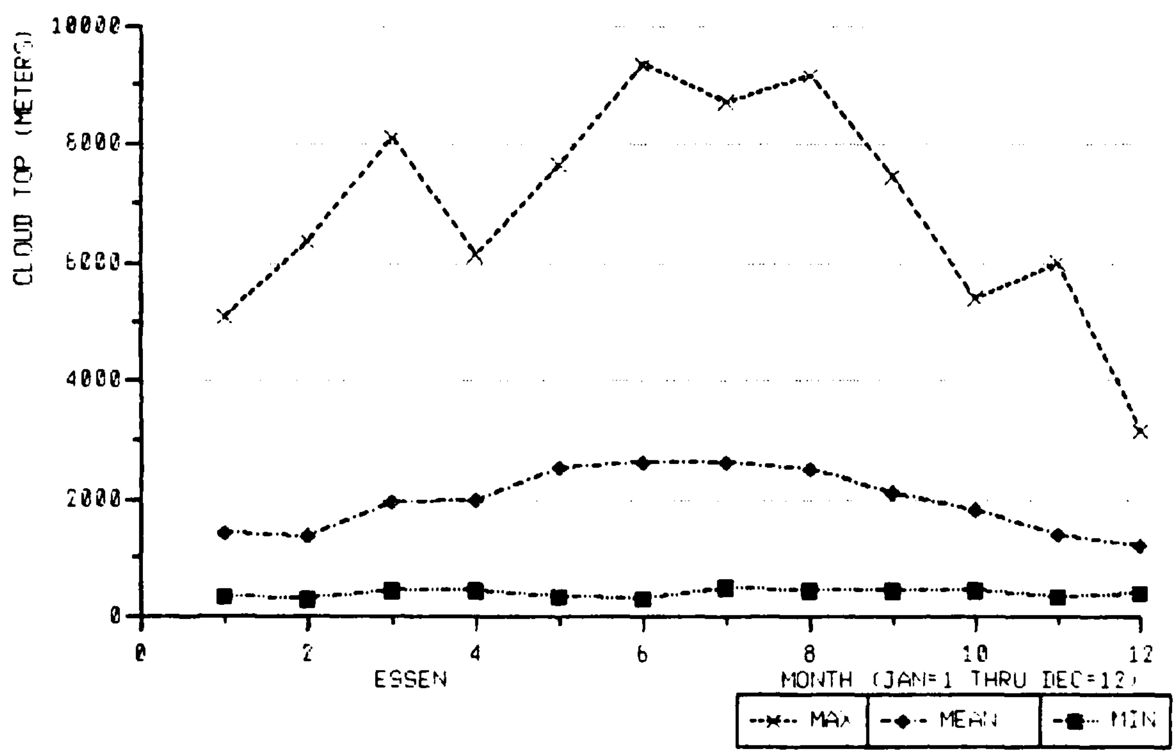

Figure B-8. ESSEN: Maximum, Minimum, and Mean Cloud Top for Cumulus Mediocris/Congestus by Month.

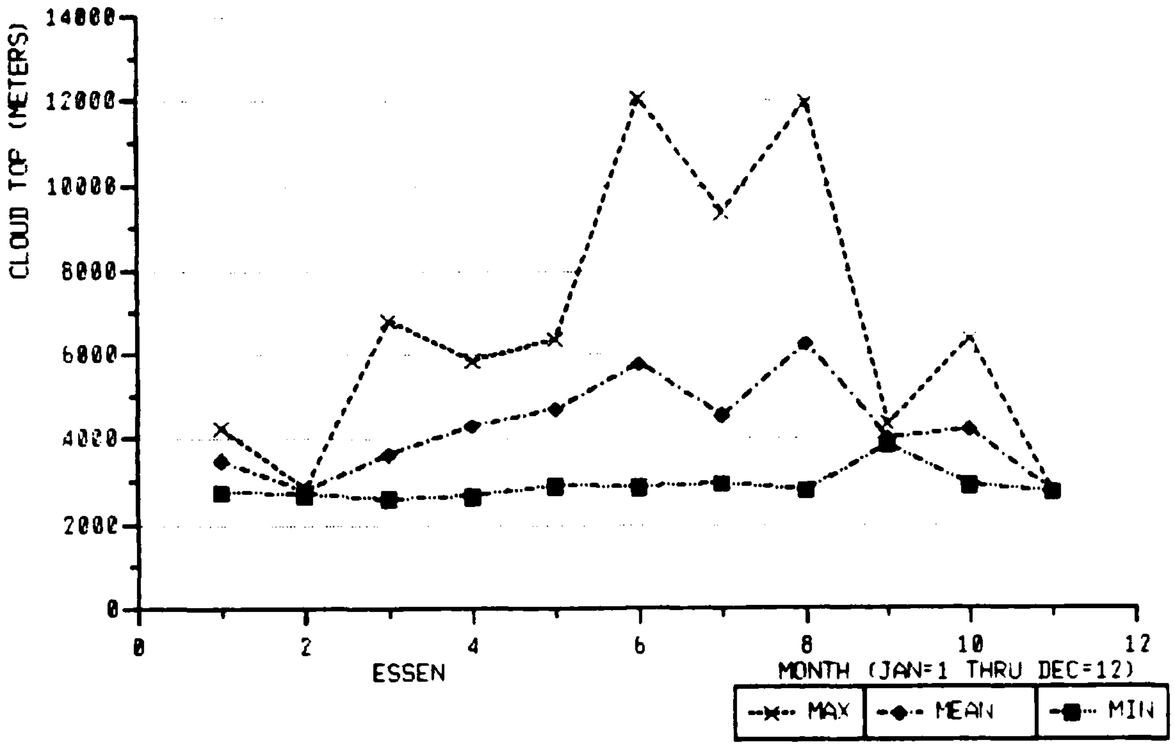

Figure B-9. ESSEN: Maximum, Minimum, and Mean Cloud Top for Cumulonimbus by Month.

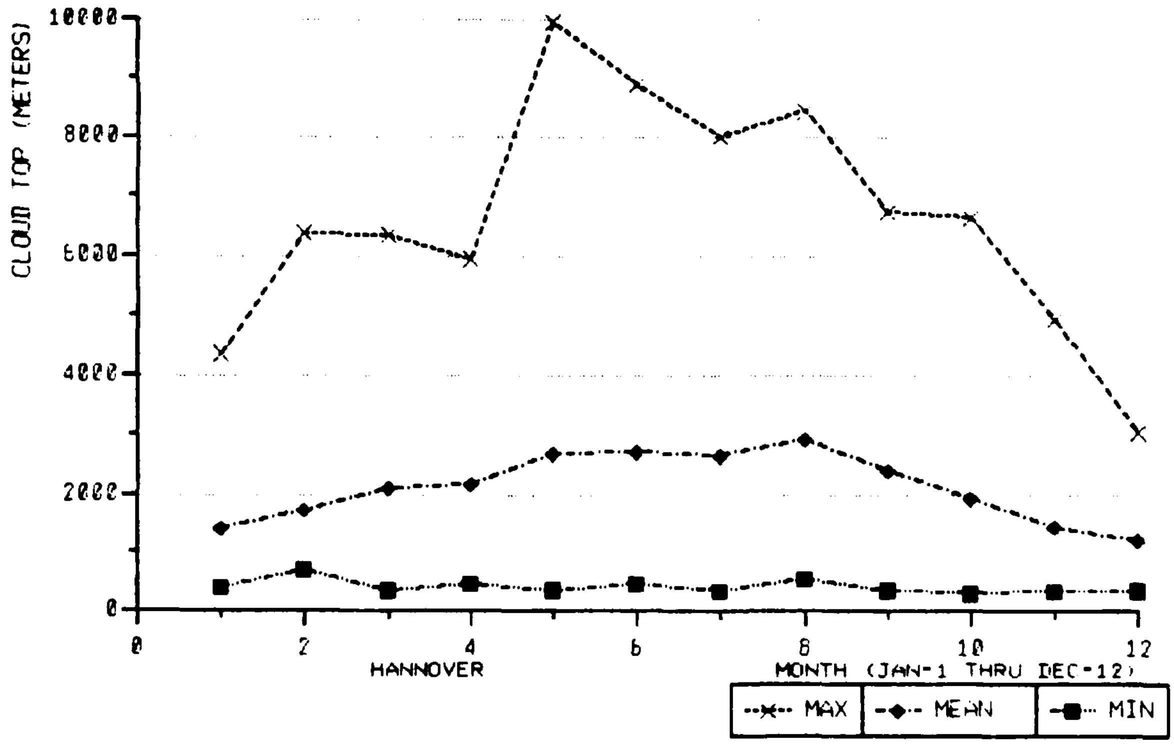

Figure B-10. HANNOVER: Maximum, Minimum, and Mean Cloud Top for Cumulus Mediocris/Congestus by Month.

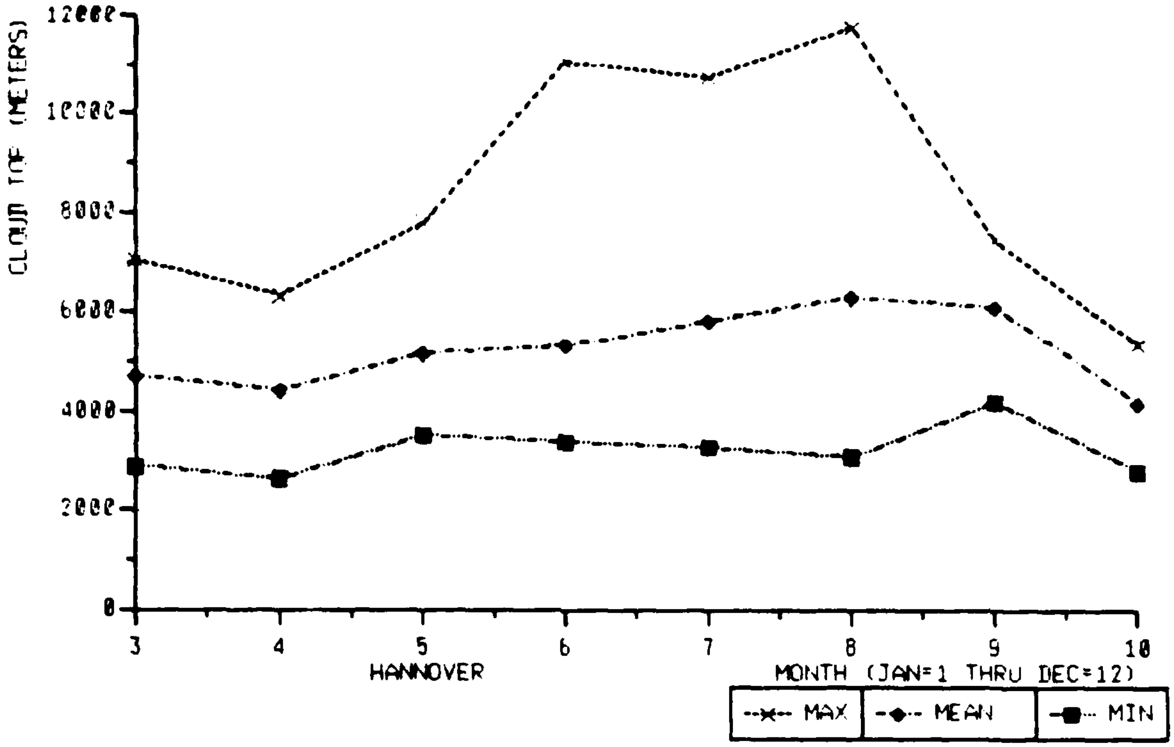

Figure B-11. HANNOVER: Maximum, Minimum, and Mean Cloud Top for Cumulonimbus by Month.

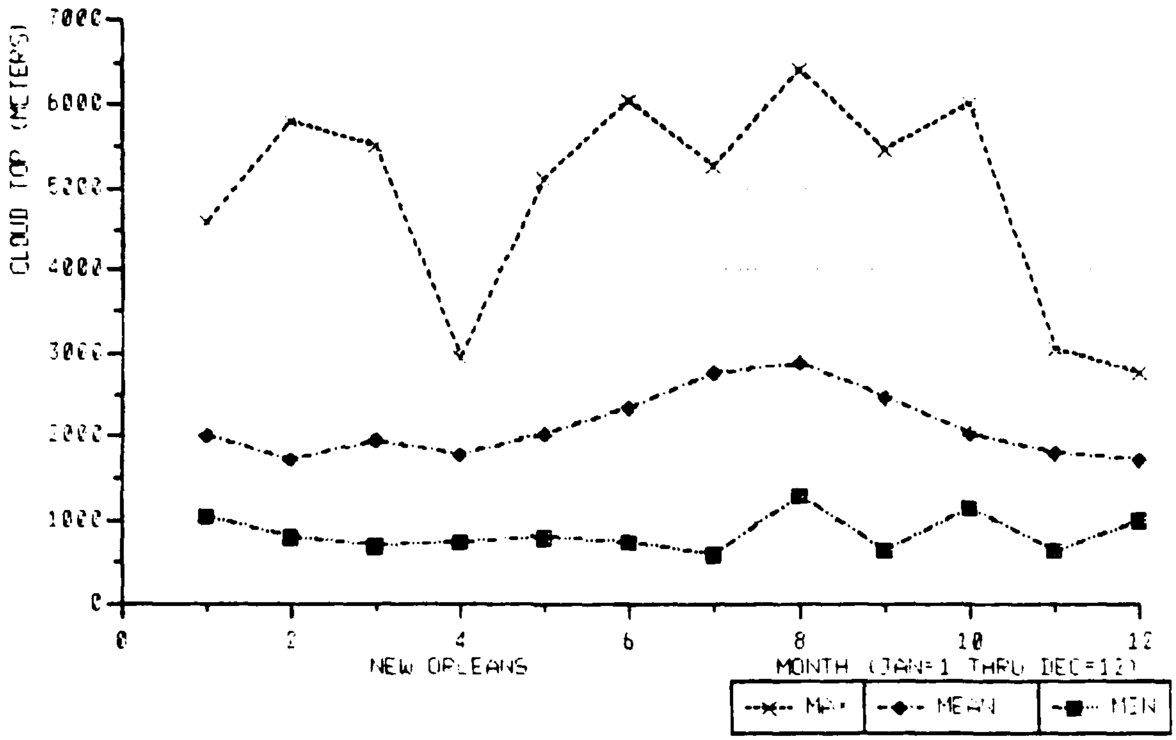

Figure B-12. NEW ORLEANS: Maximum, Minimum, and Mean Cloud Top for Cumulus Humulis/Fractus by Month.

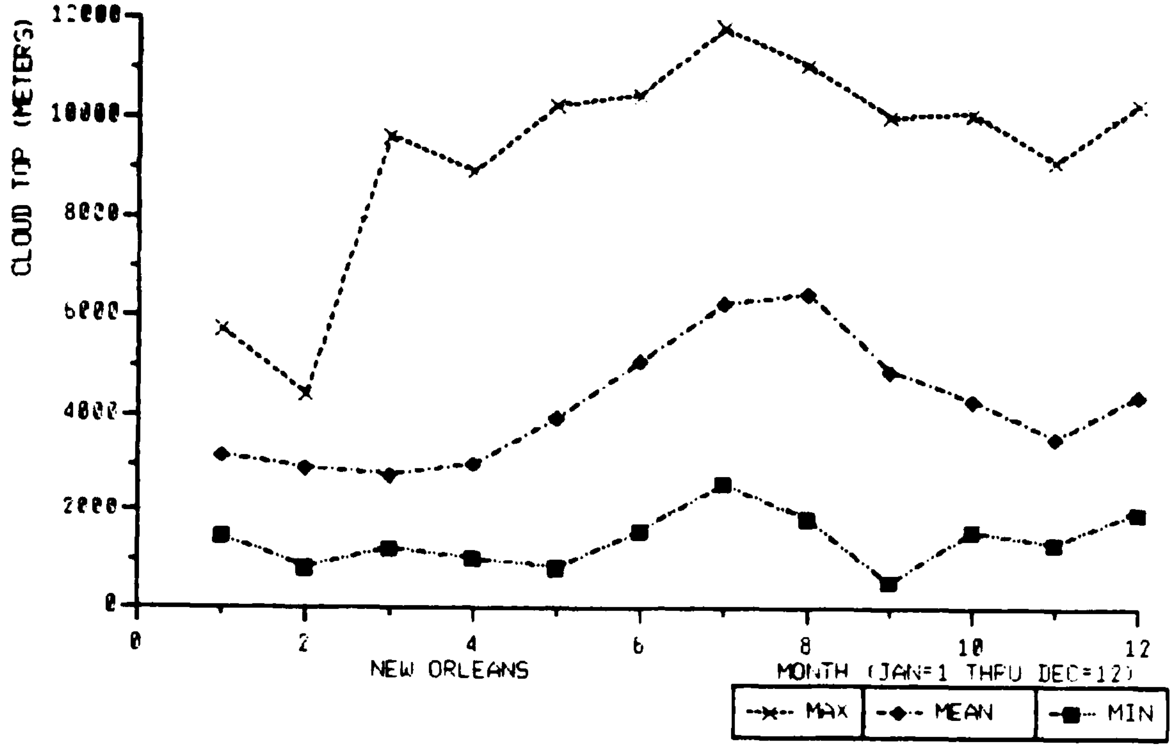

Figure B-13. NEW ORLEANS: Maximum, Minimum, and Mean Cloud Top for Cumulus Mediocris/Congestus by Month.

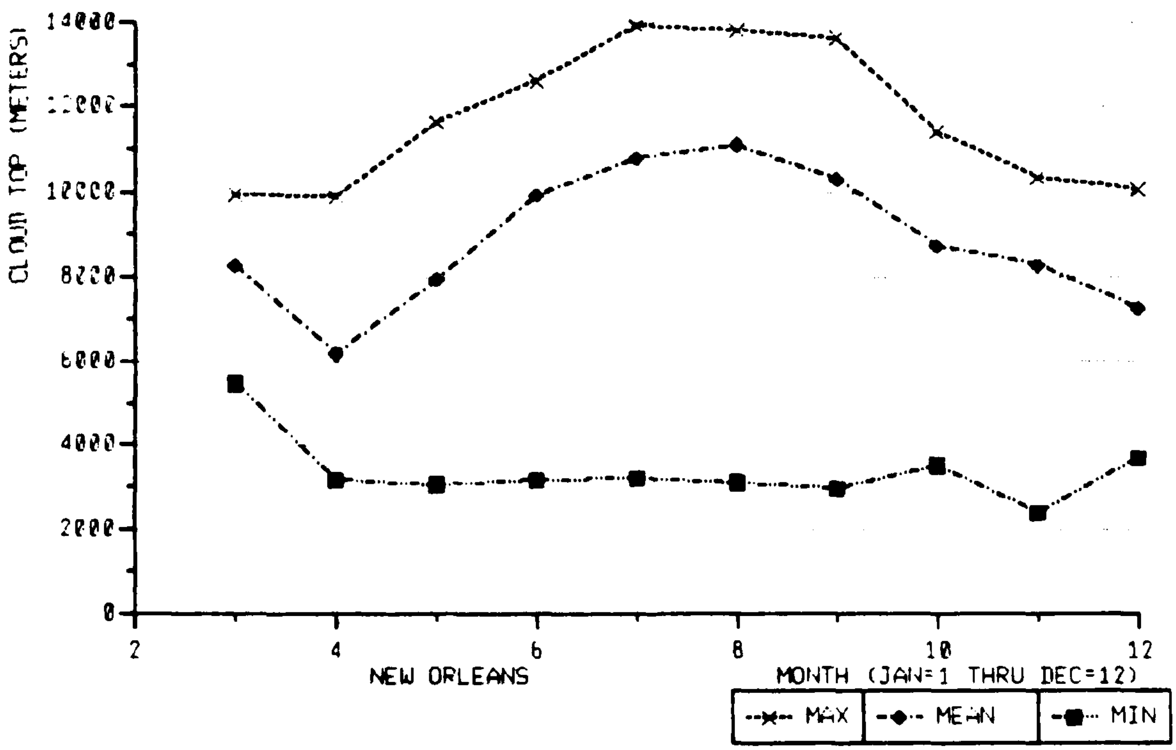

Figure B-14. NEW ORLEANS: Maximum, Minimum, and Mean Cloud Top for Cumulonimbus by Month.

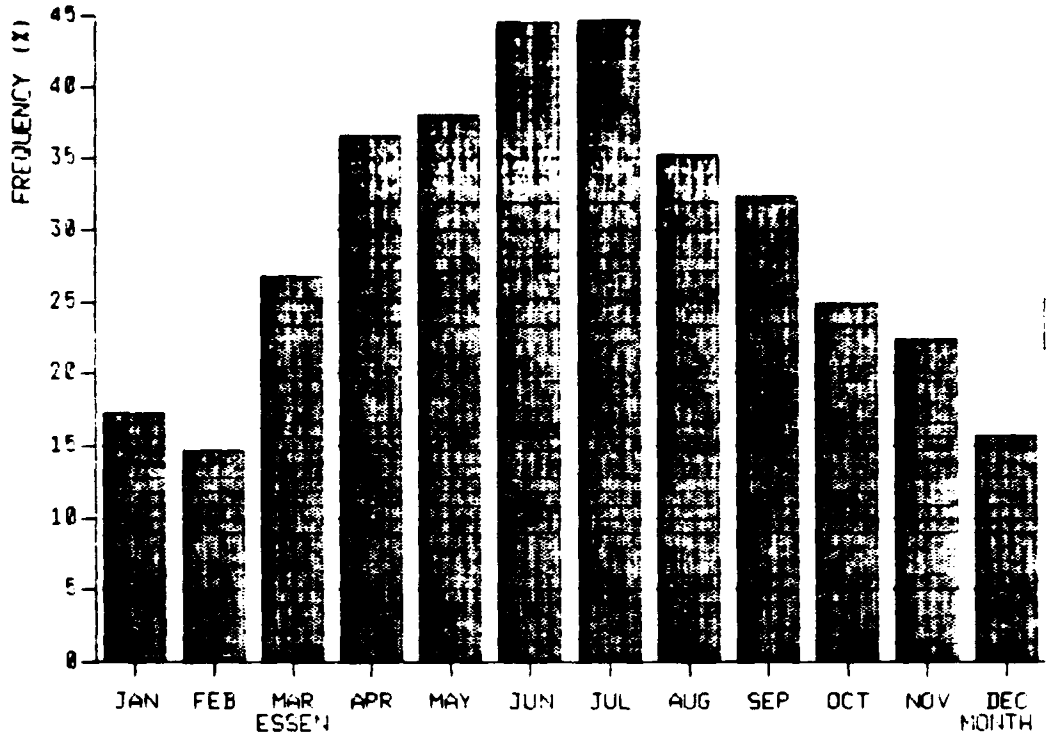

Figure B-15. ESSEN: Frequency of Cumulus Mediocris/Congestus by Month.

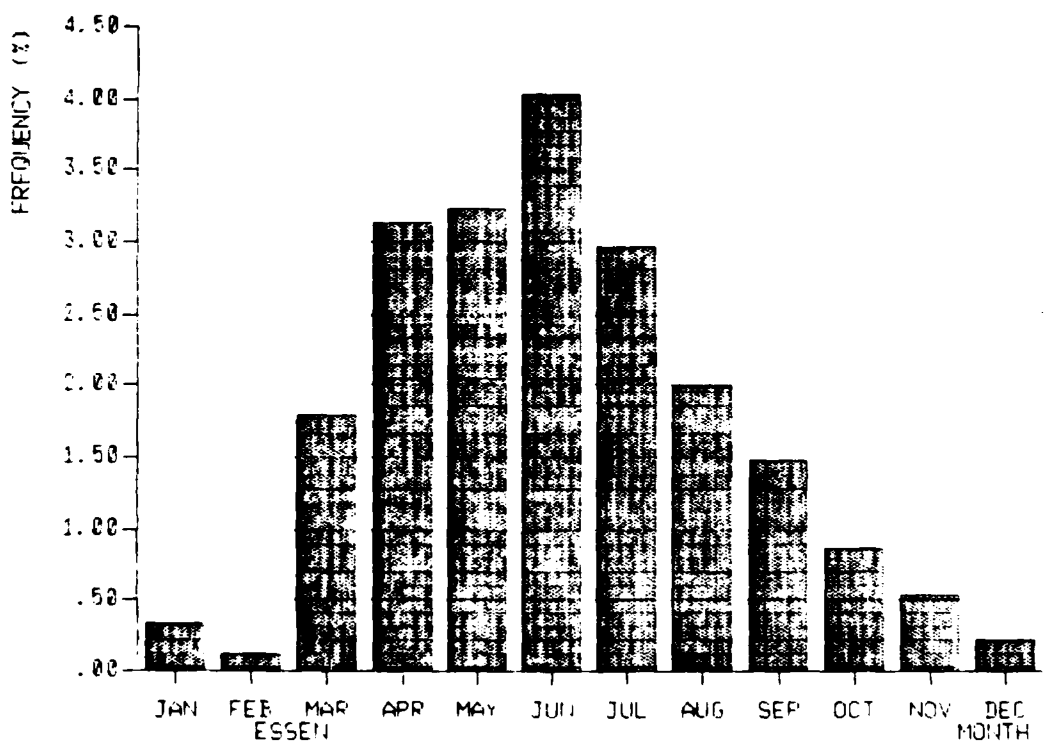

Figure B-16. ESSEN: Frequency of Cumulonimbus by Month.

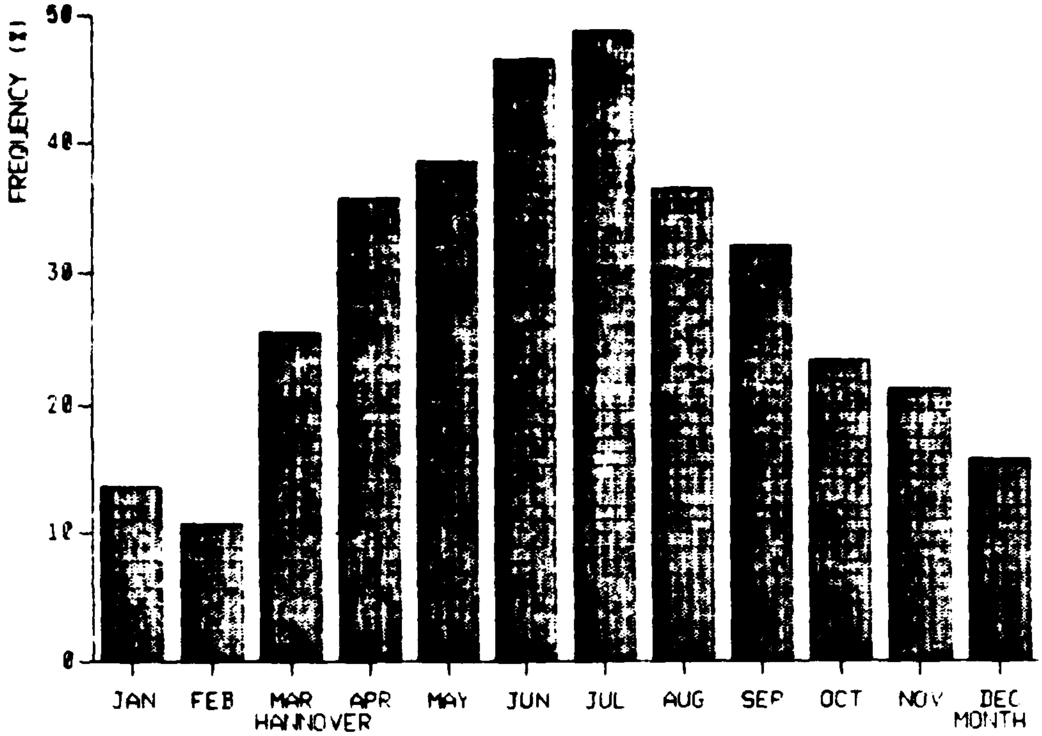

Figure B-17. HANNOVER: Frequency of Cumulus Mediocris/Congestus by Month.

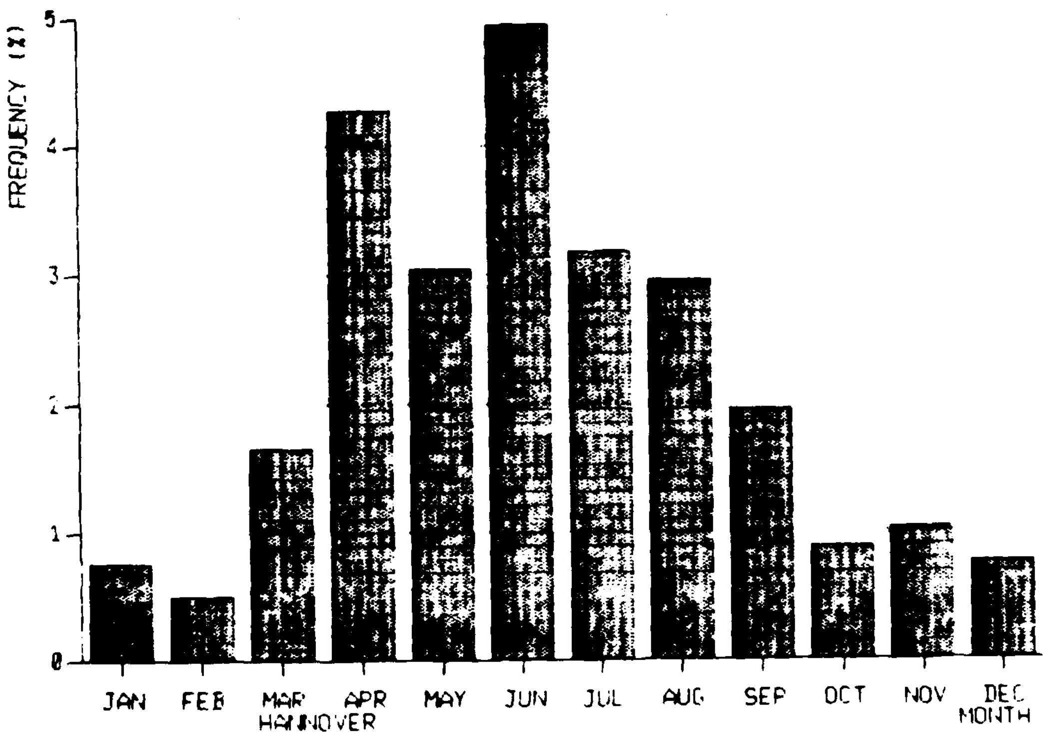

Figure B-18. HANNOVER: Frequency of Cumulonimbus by Month.

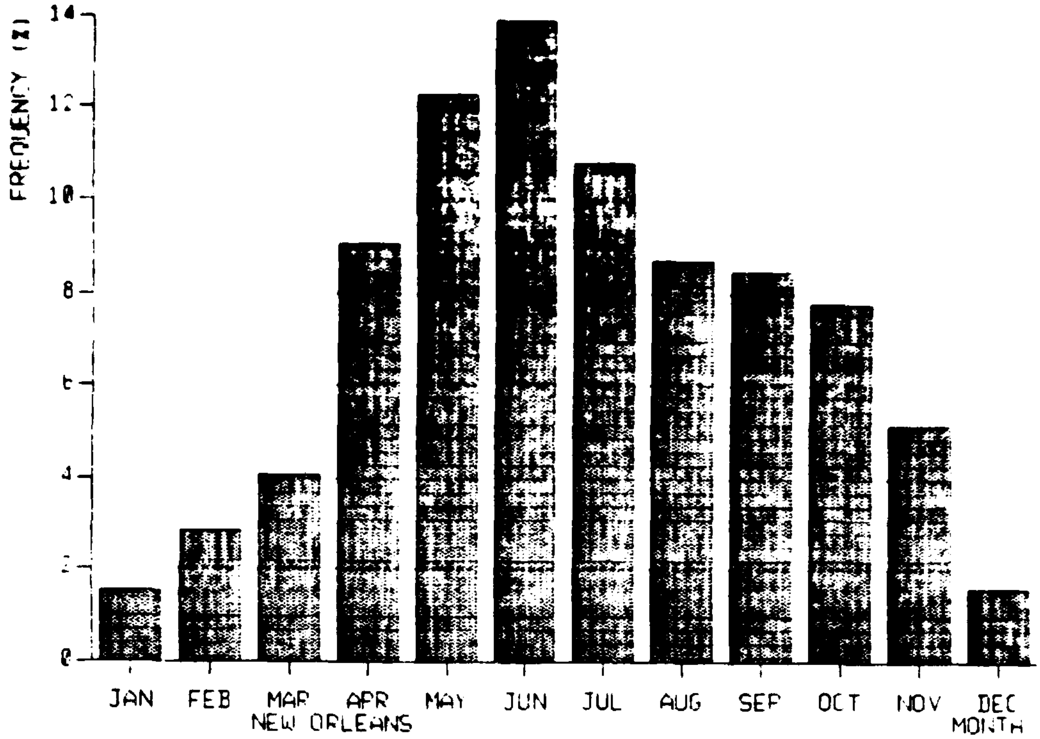

Figure B-19. NEW ORLEANS: Frequency of Cumulus Humulis/Fractus by Month.

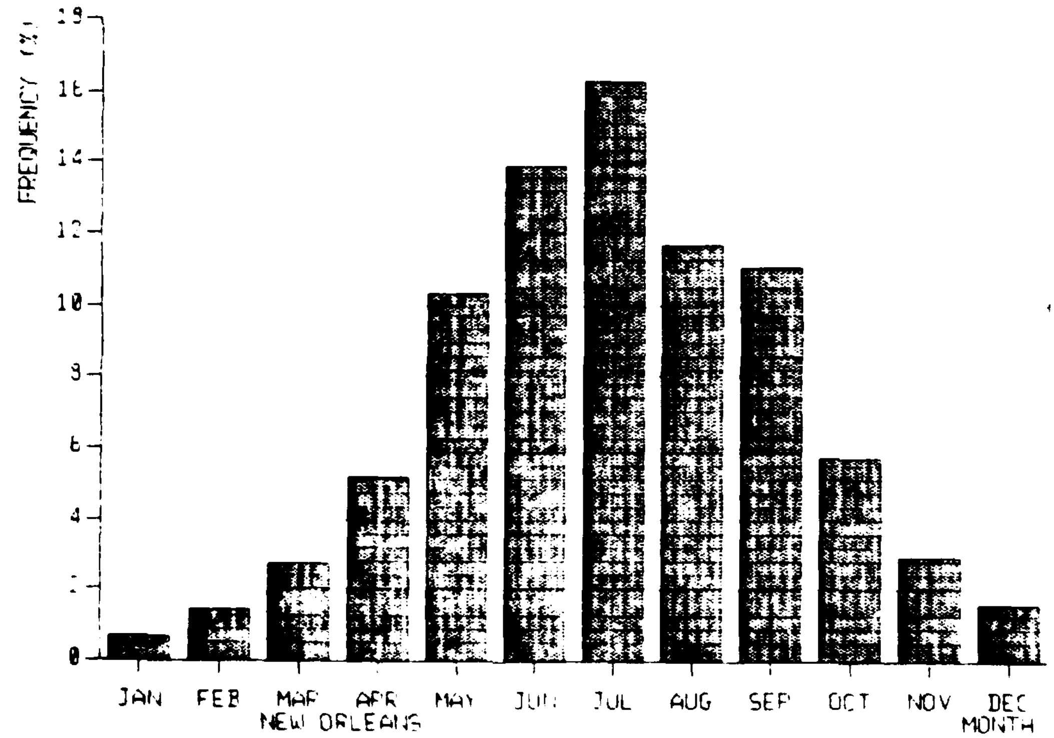

Figure B-20. NEW ORLEANS: Frequency of Cumulus Medicocris/Congestus by Month.

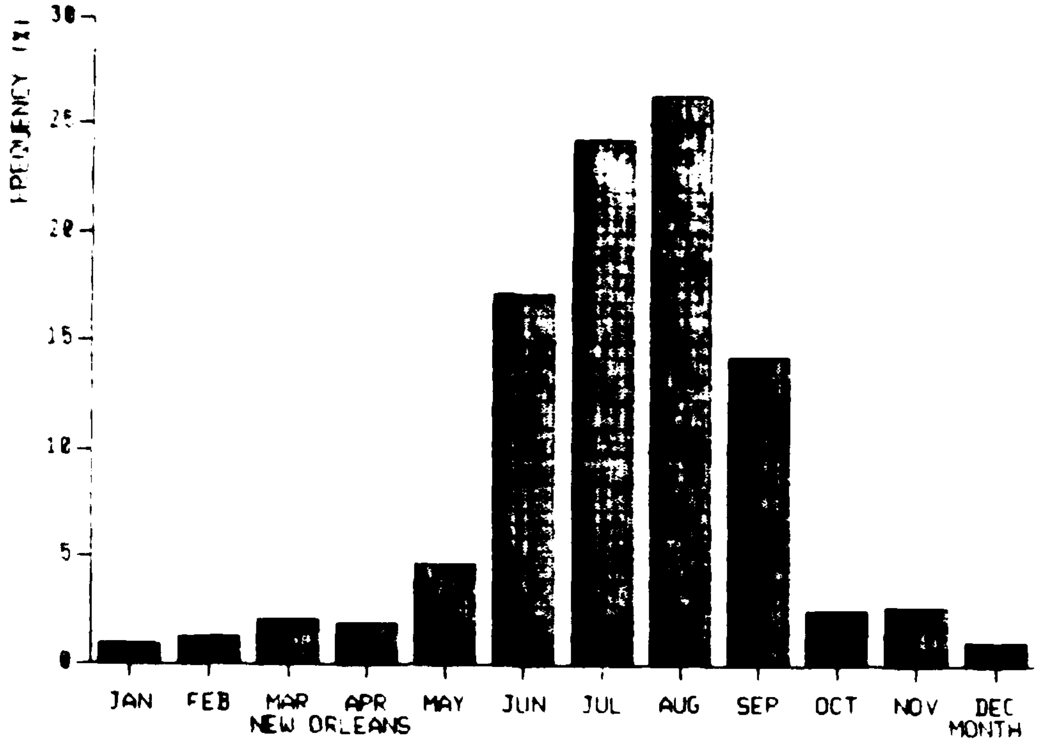

Figure B-21. NEW ORLEANS: Frequency of Cumulonimbus by Month.

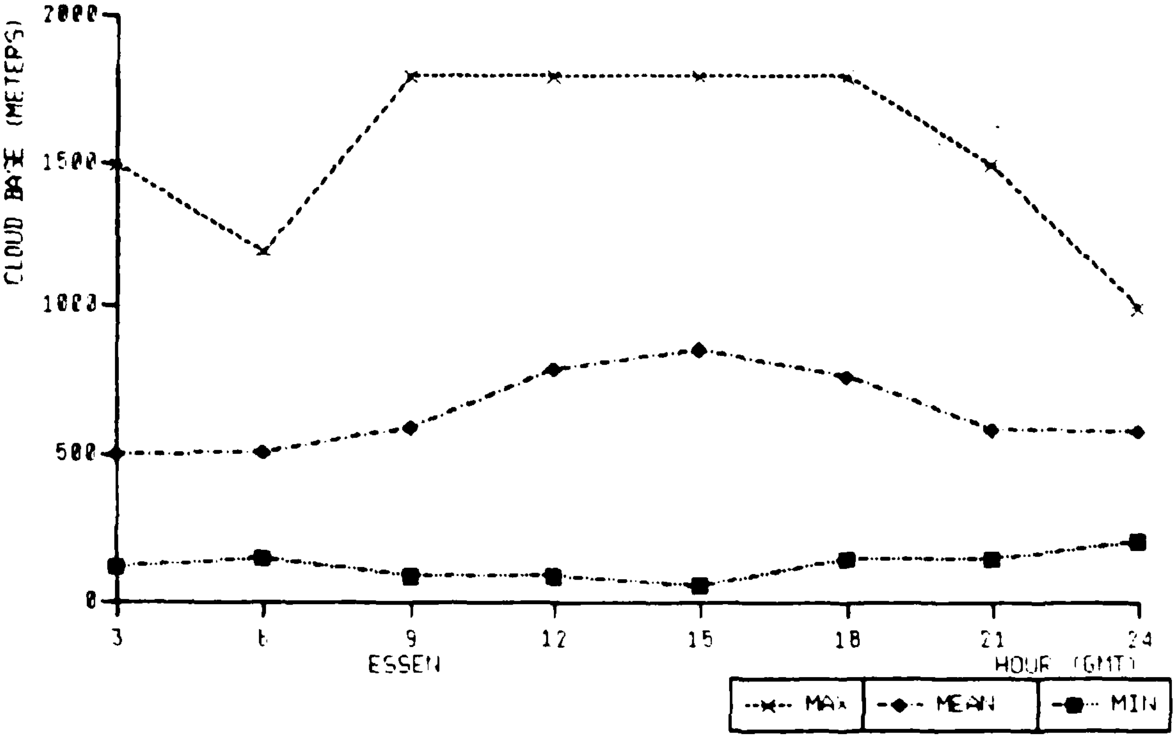

Figure B-22. ESSEN: Maximum, Minimum, and Mean Cloud Base for Cumulus Mediocris/Congestus--Spring, by Hour.

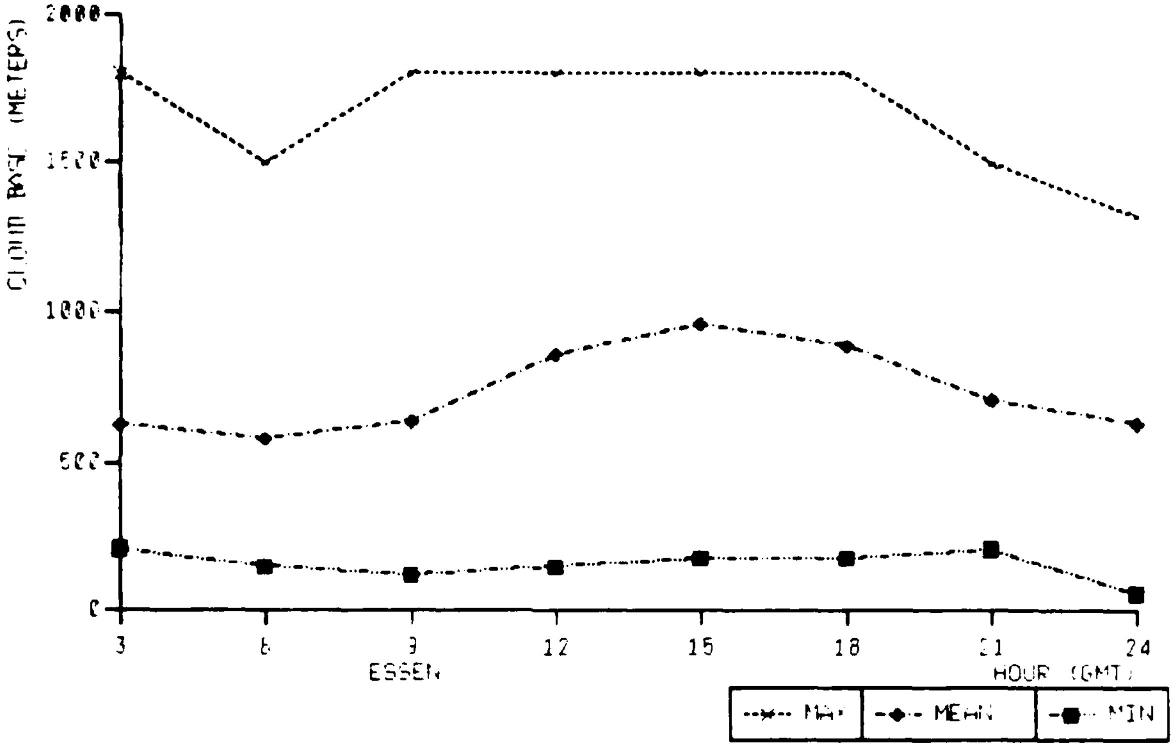

Figure B-23. ESSEN: Maximum, Minimum, and Mean Cloud Base for Cumulus Mediocris/Congestus--Summer, by Hour.

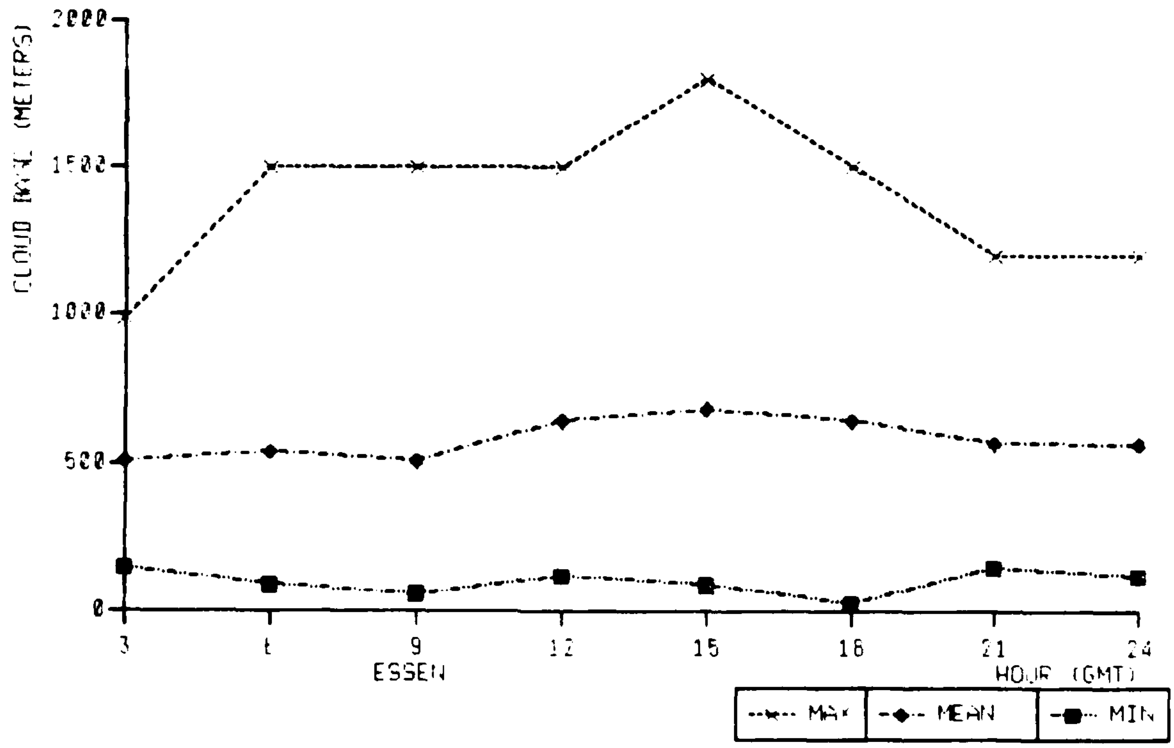

Figure B-24. ESSEN: Maximum, Minimum, and Mean Cloud Base for Cumulus Mediocris/Congestus--Fall, by Hour.

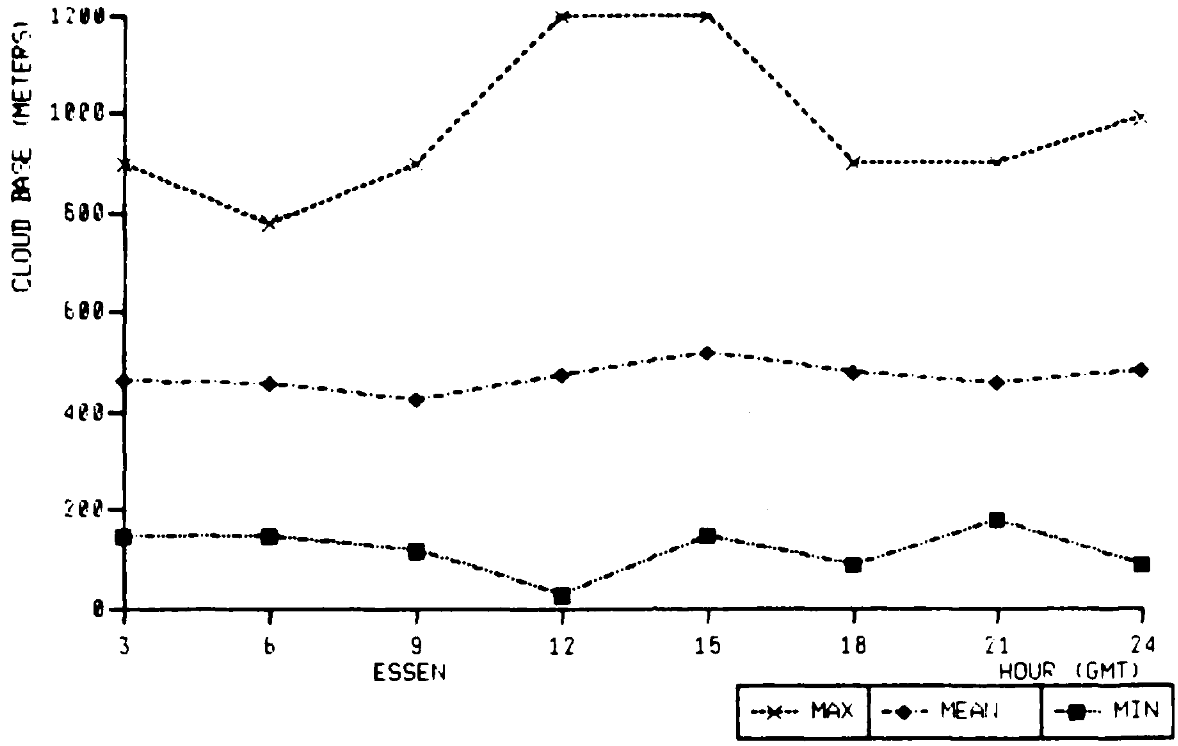

Figure B-25. ESSEN: Maximum, Minimum, and Mean Cloud Base for Cumulus Mediocris/Congestus--Winter, by Hour.

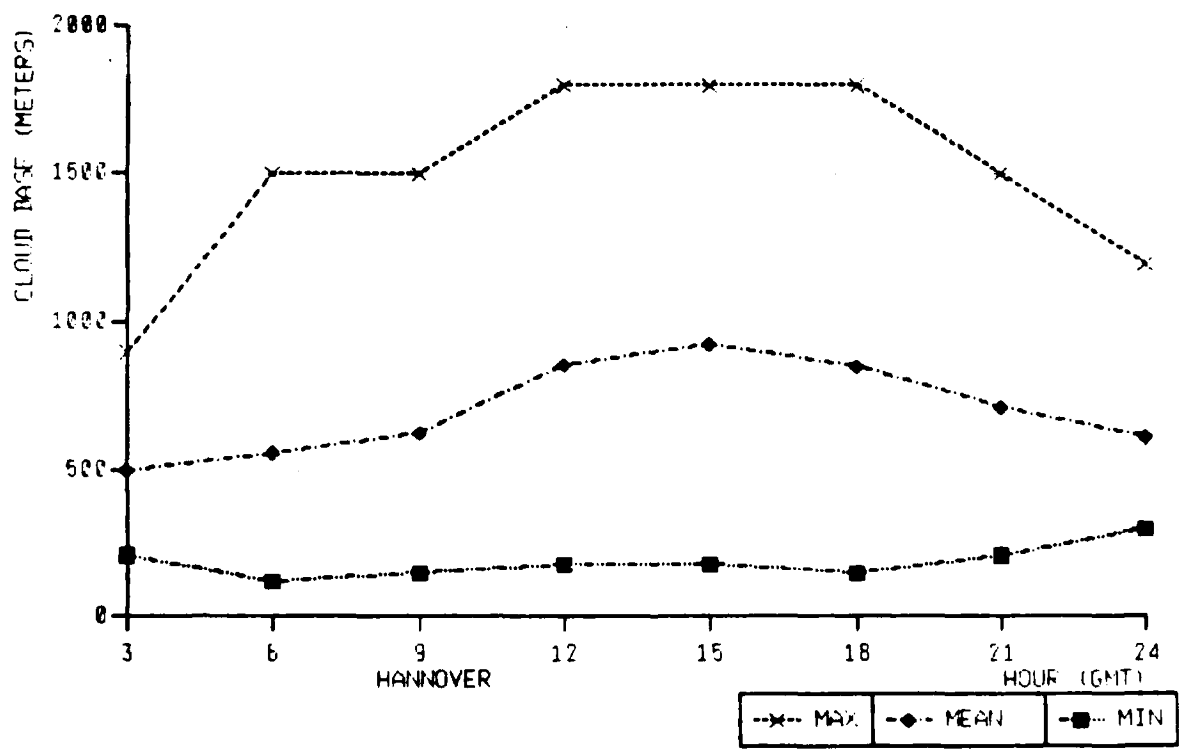

Figure B-26. HANNOVER: Maximum, Minimum, and Mean Cloud Base for Cumulus Mediocris/Congestus--Spring, by Hour.

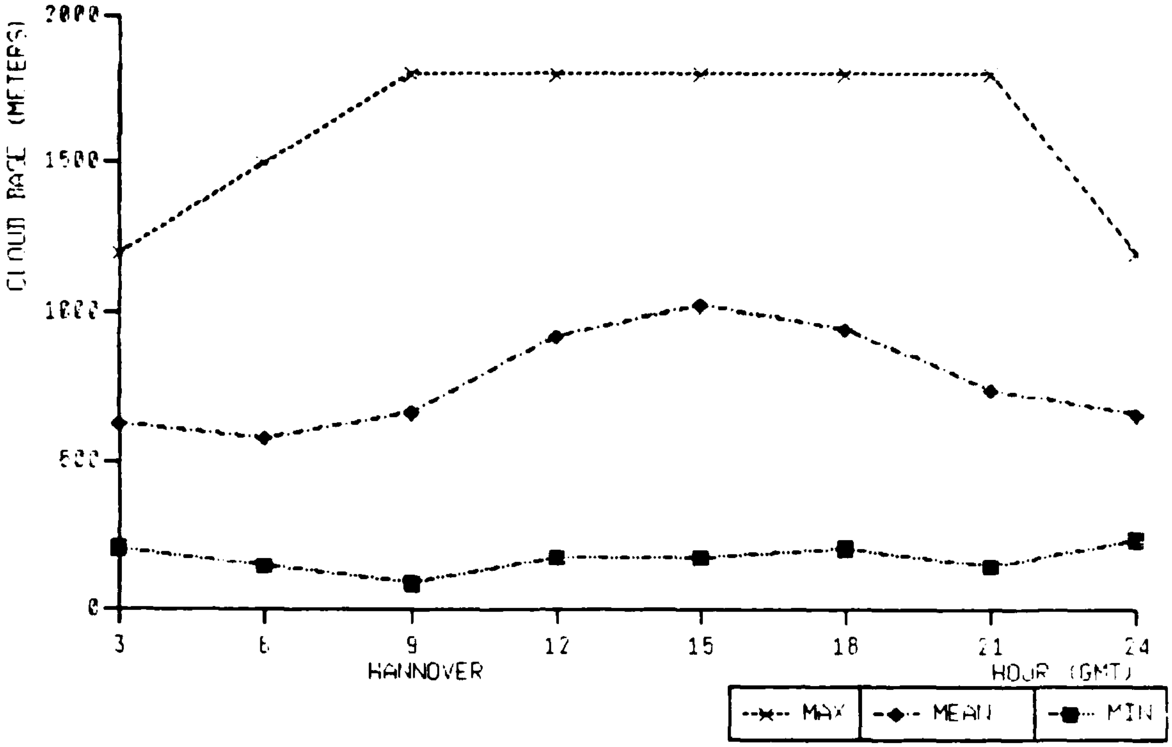

Figure B-27. HANNOVER: Maximum, Minimum, and Mean Cloud Base for Cumulus Mediocris/Congestus--Summer, by Hour.

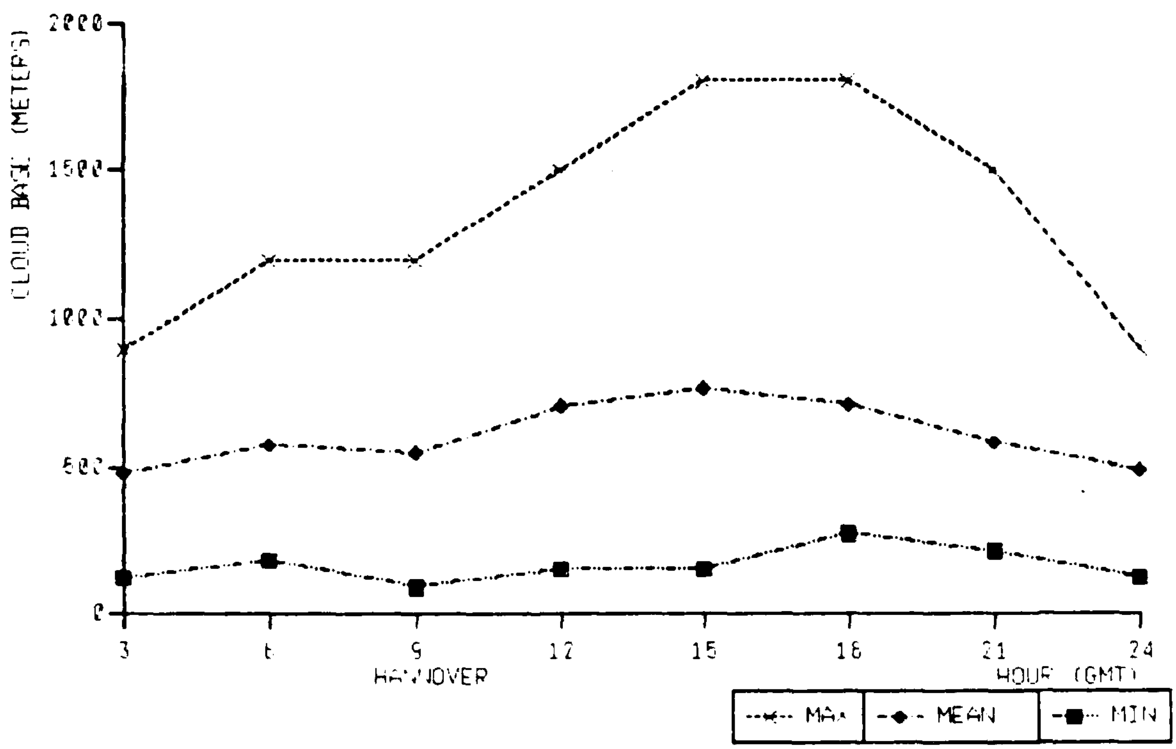

Figure B-28. HANNOVER: Maximum, Minimum, and Mean Cloud Base for Cumulus Mediocris/Congestus--Fall, by Hour.

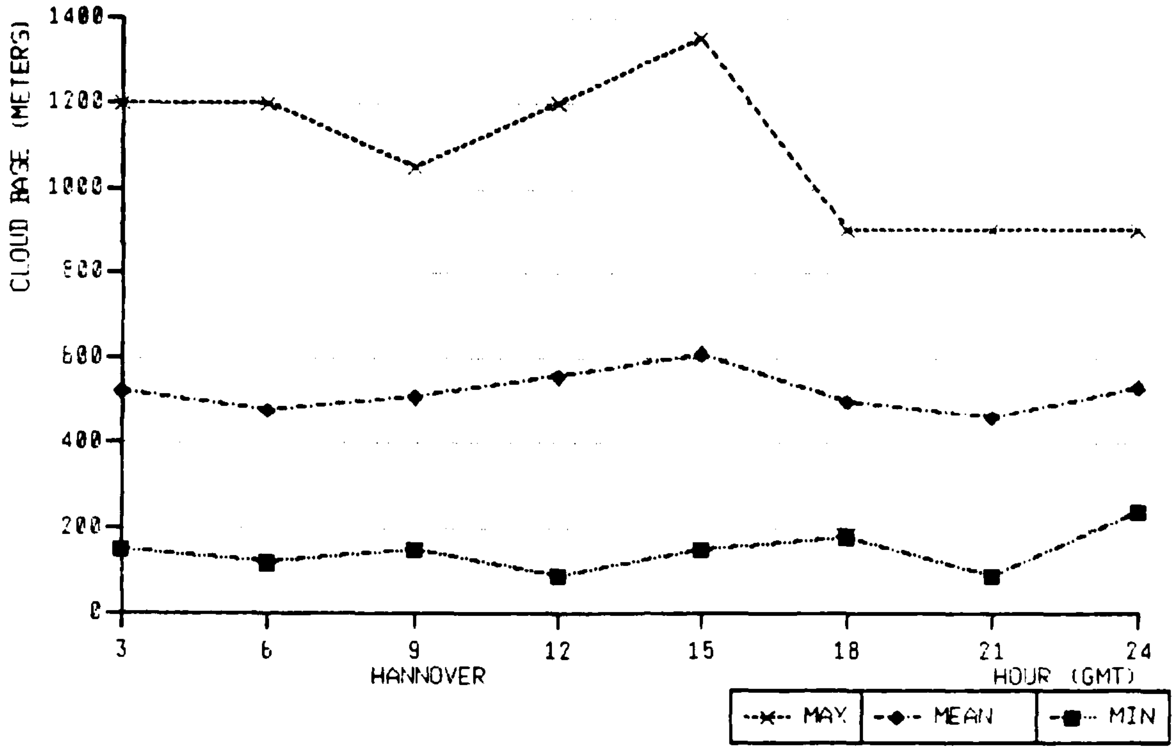

Figure B-29. HANNOVER: Maximum, Minimum, and Mean Cloud Base for Cumulus Mediocris/Congestus--Winter, by Hour.

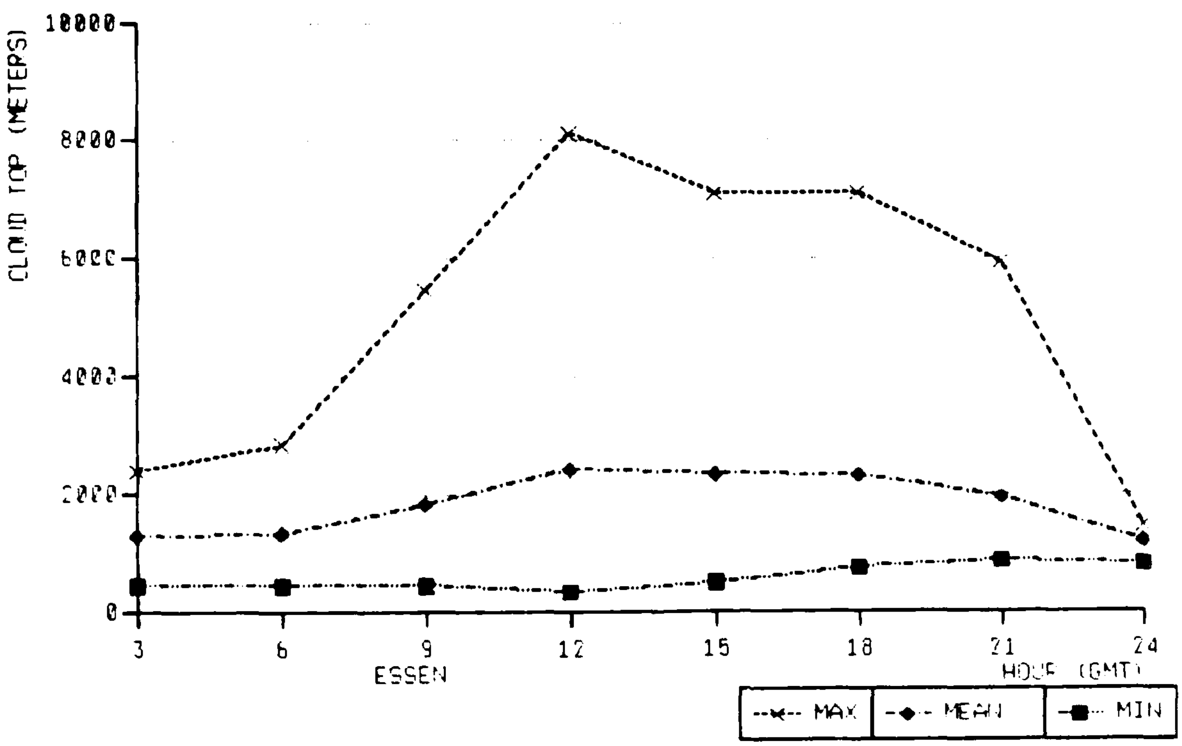

Figure B-30. ESSEN: Maximum, Minimum, and Mean Cloud Top for Cumulus Mediocris/Congestus--Spring, by Hour.

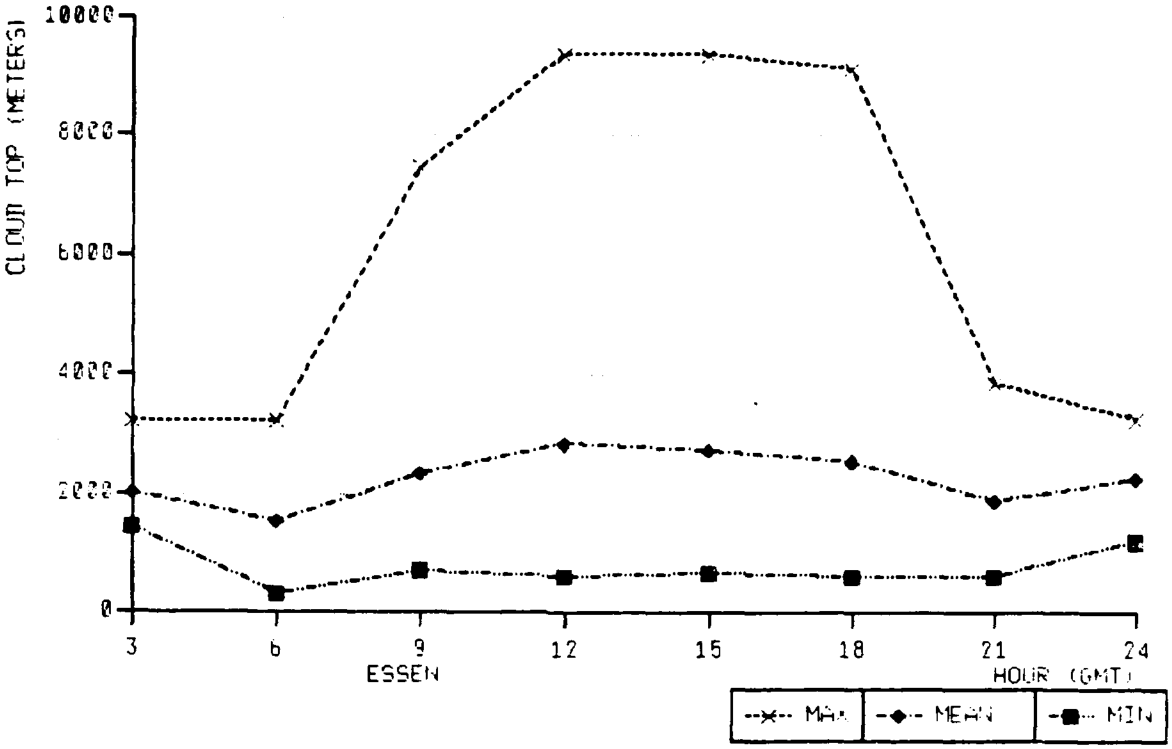

Figure B-31. ESSEN: Maximum, Minimum, and Mean Cloud Top for Cumulus Mediocris/Congestus--Summer, by Hour.

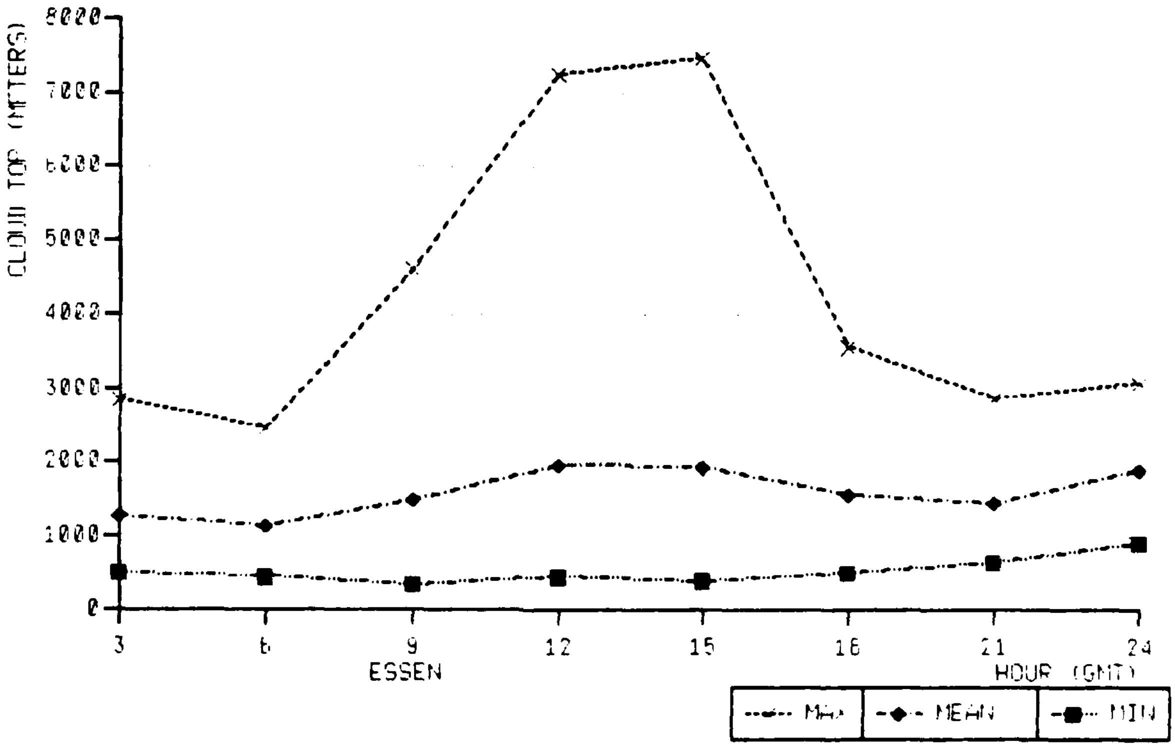

Figure B-32. ESSEN: Maximum, Minimum, and Mean Cloud Top for Cumulus Mediocris/Congestus--Fall, by Hour.

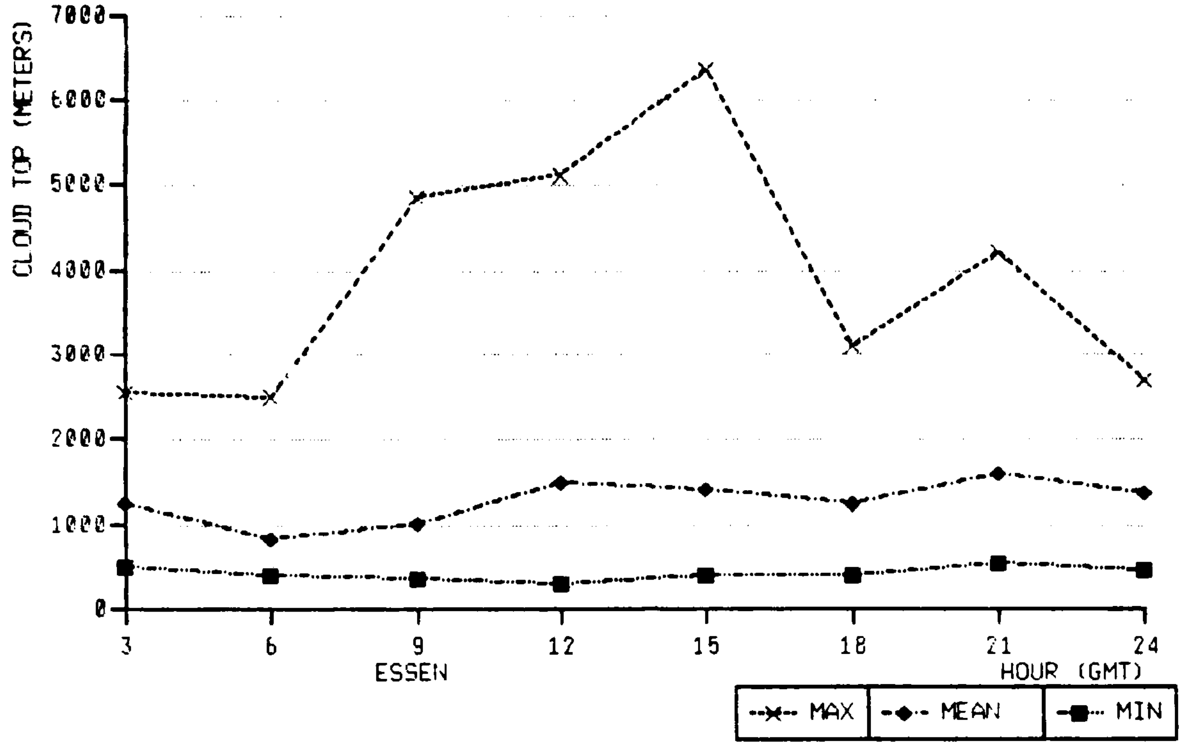

Figure B-33. ESSEN: Maximum, Minimum, and Mean Cloud Top for Cumulus Mediocris/Congestus--Winter, by Hour.

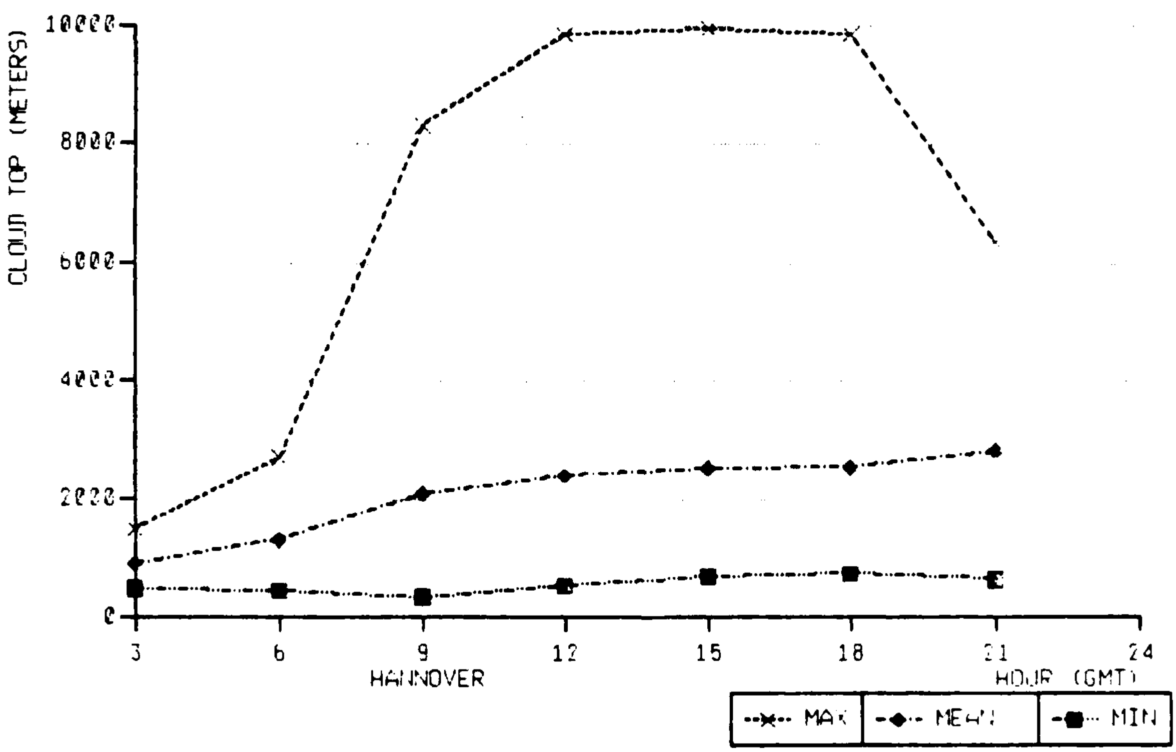

Figure B-34. HANNOVER: Maximum, Minimum, and Mean Cloud Top for Cumulus Mediocris/Congestus--Spring, by Hour.

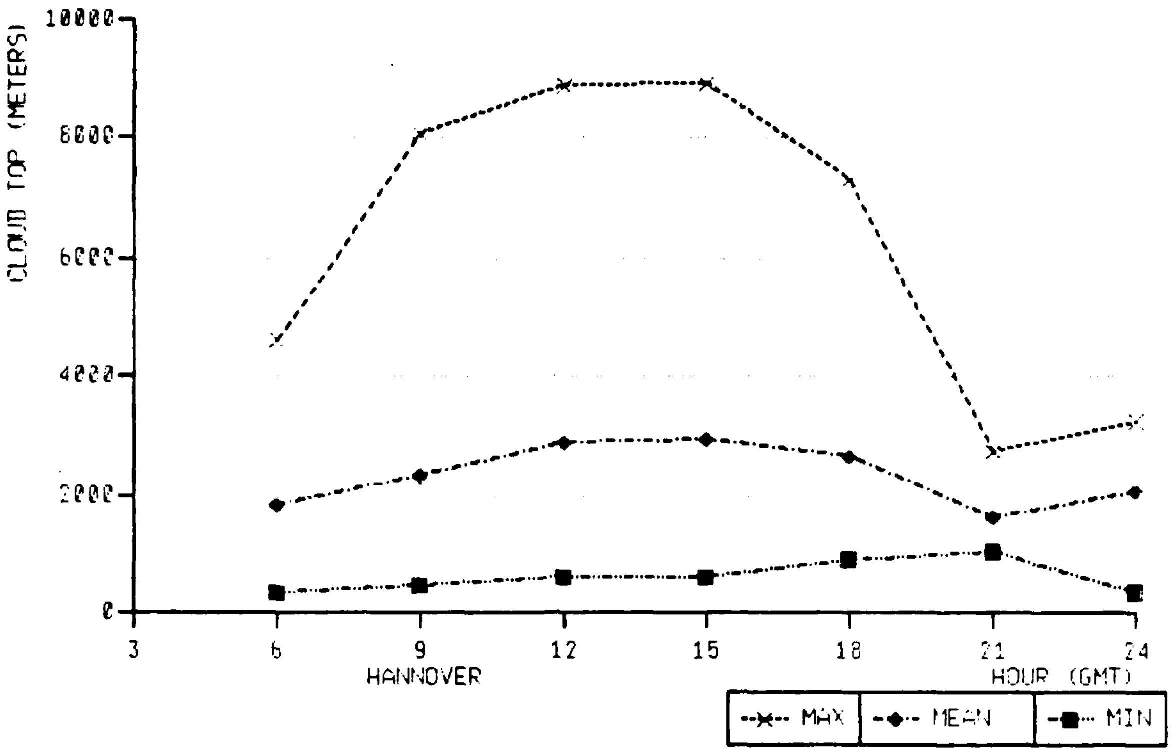

Figure B-35. HANNOVER: Maximum, Minimum, and Mean Cloud Top for Cumulus Mediocris/Congestus--Summer, by Hour.

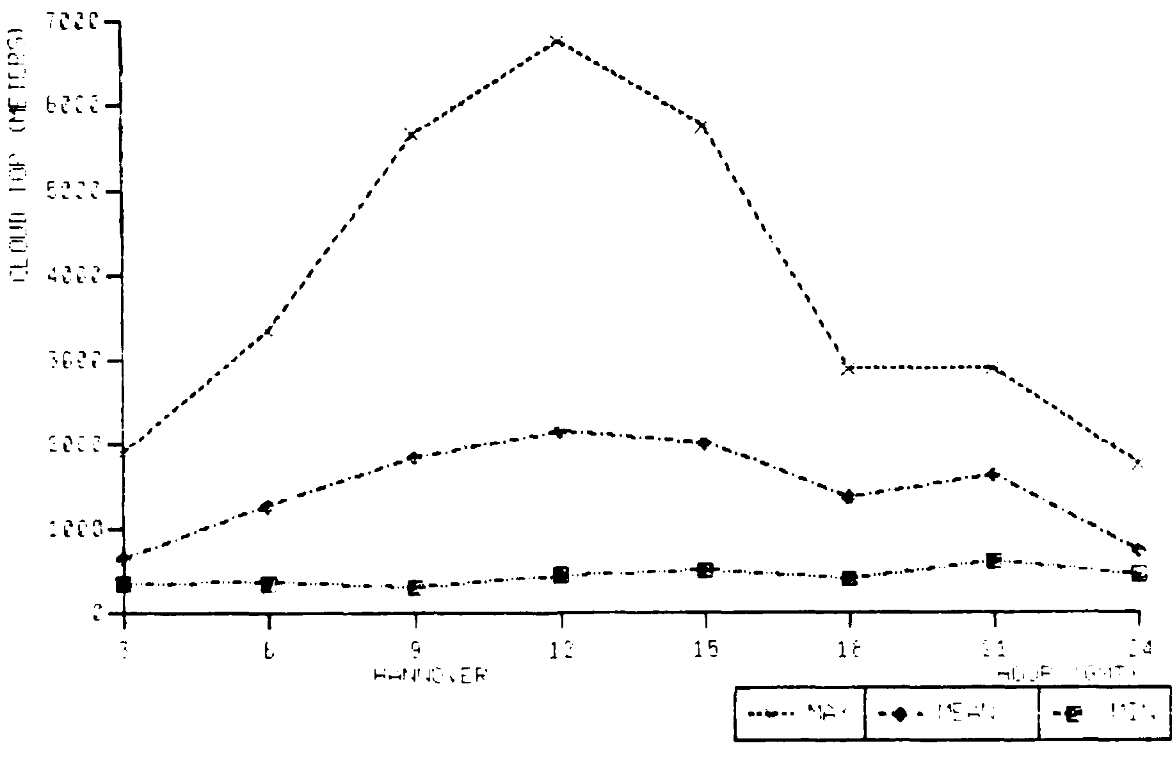

Figure B-36. HANNOVER: Maximum, Minimum, and Mean Cloud Top for Cumulus Mediocris/Congestus--Fall, by Hour.

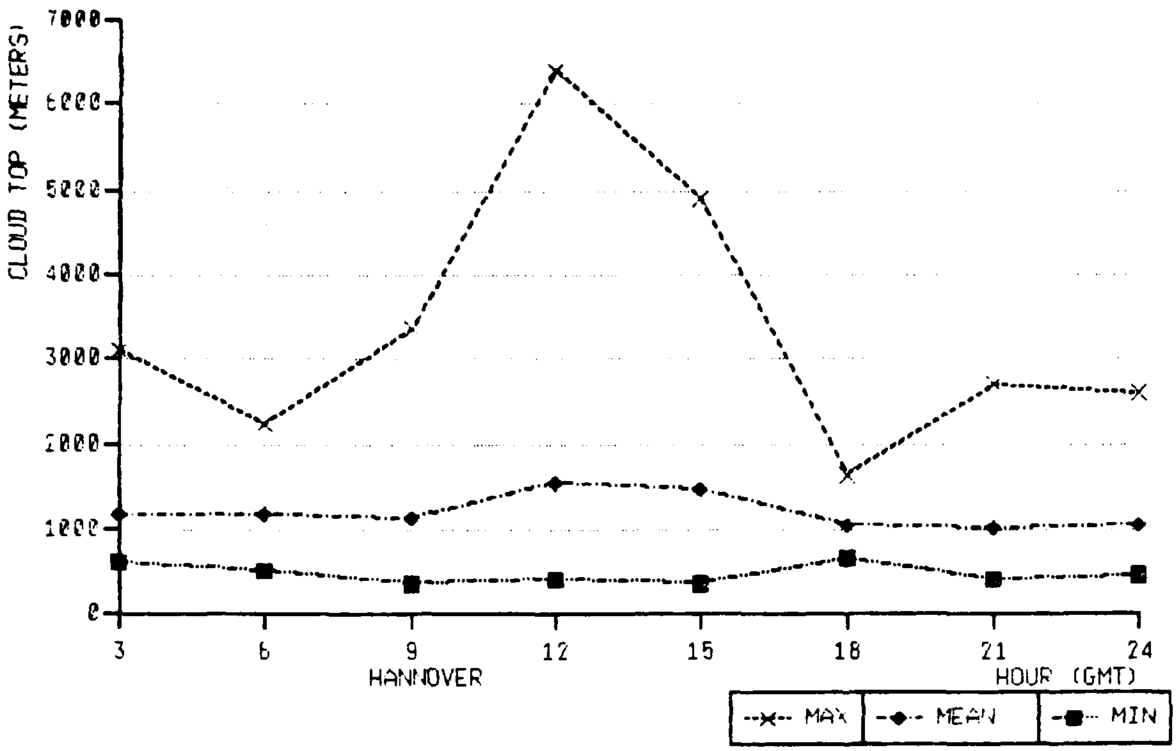

Figure B-37. HANNOVER: Maximum, Minimum, and Mean Cloud Top for Cumulus Mediocris/Congestus--Winter, by Hour.

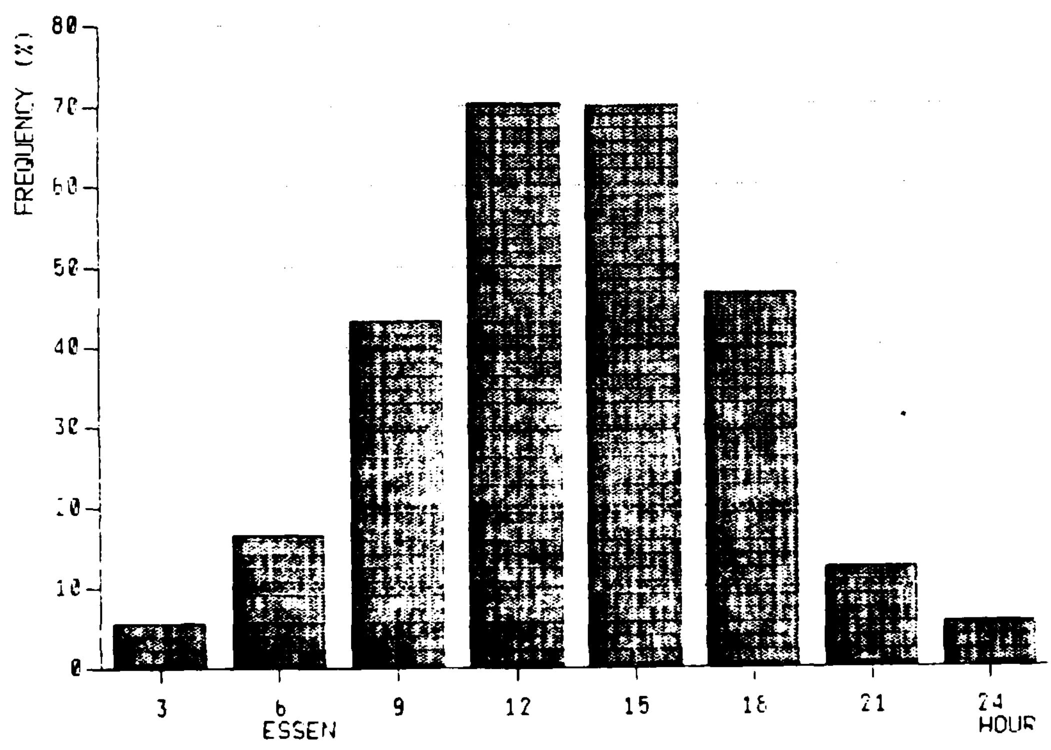

Figure B-38. ESSEN: Frequency of Cumulus Mediocris/Congestus--Spring, by Hour.

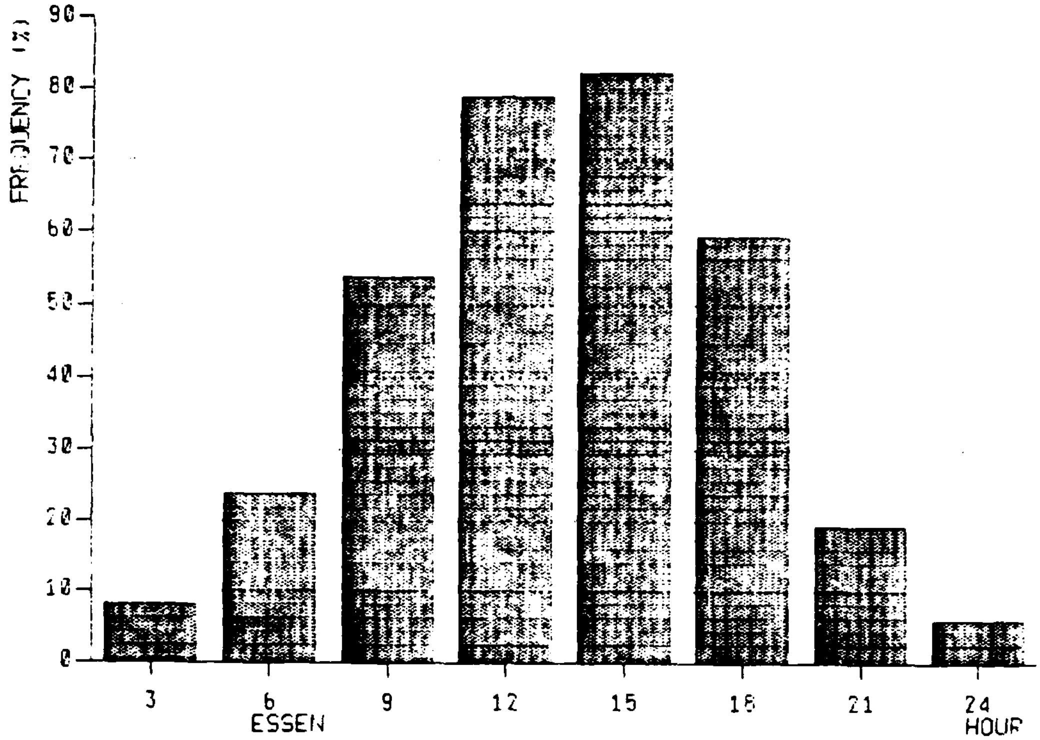

Figure B-39. ESSEN: Frequency of Cumulus Mediocris/Congestus--Summer, by Hour.

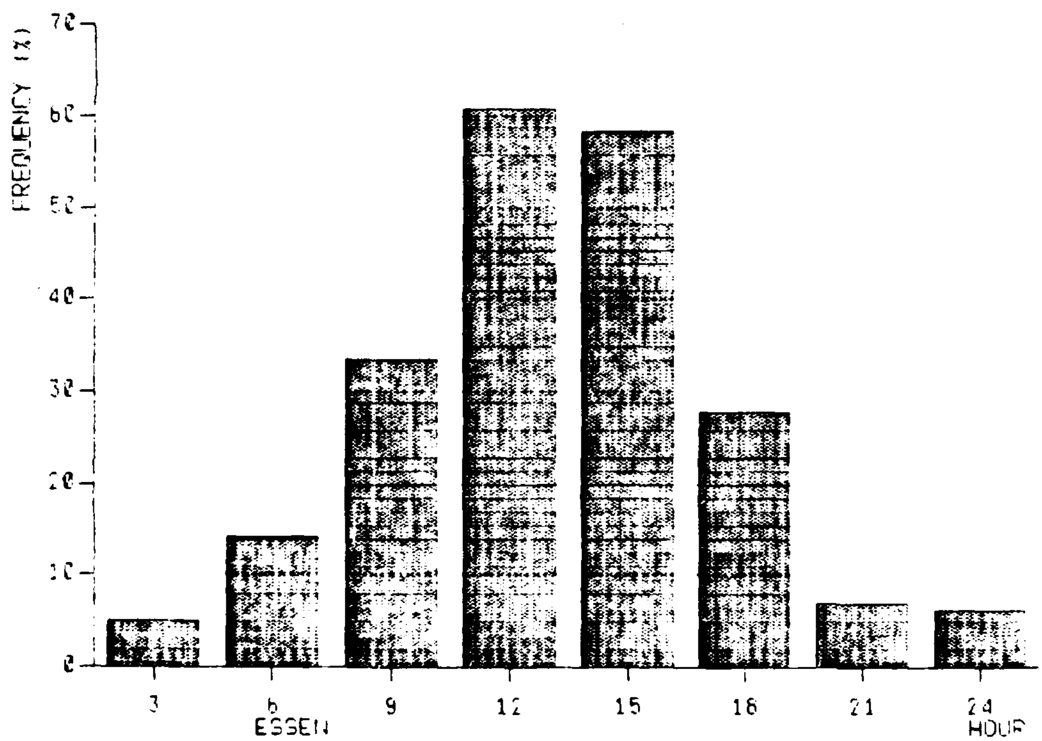

Figure B-40. ESSEN: Frequency of Cumulus Mediocris/Congestus--Fall, by Hour.

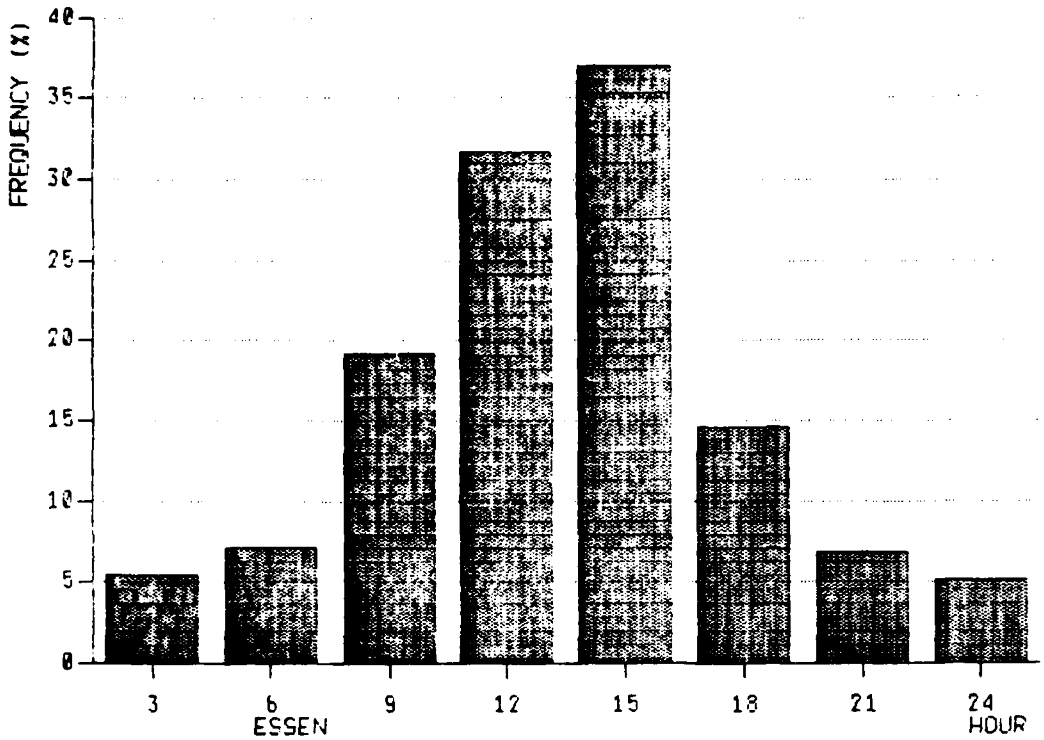

Figure B-41. ESSEN: Frequency of Cumulus Mediocris/Congestus--Winter, by Hour.

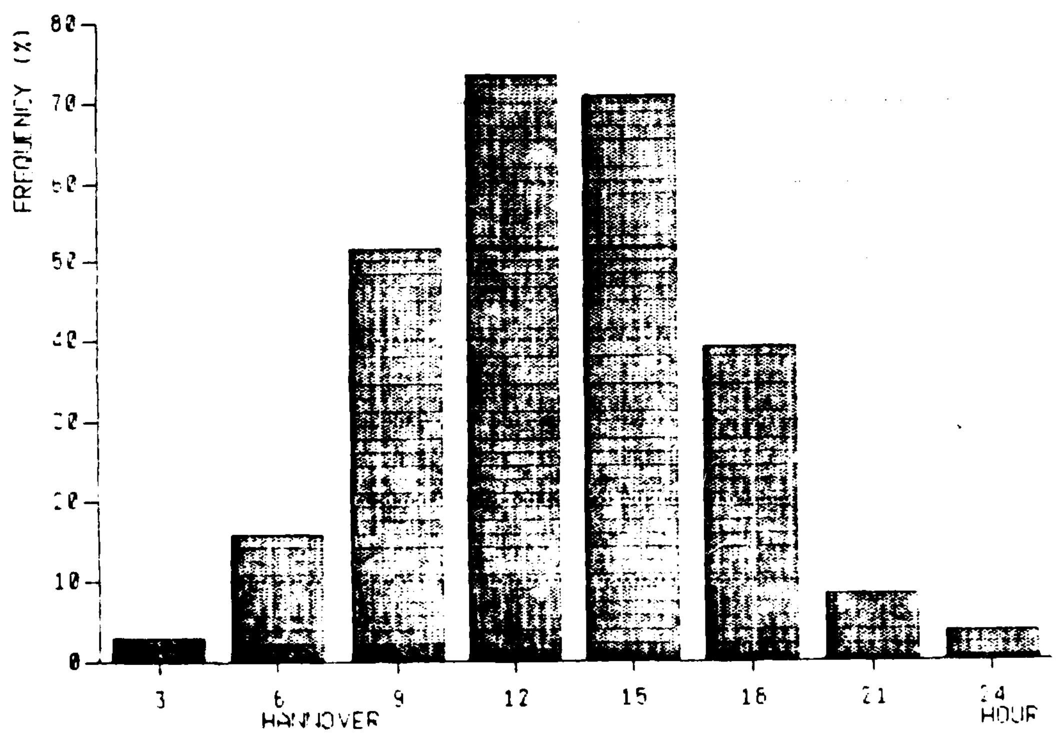

Figure B-42. HANNOVER: Frequency of Cumulus Mediocris/Congestus--Spring, by Hour.

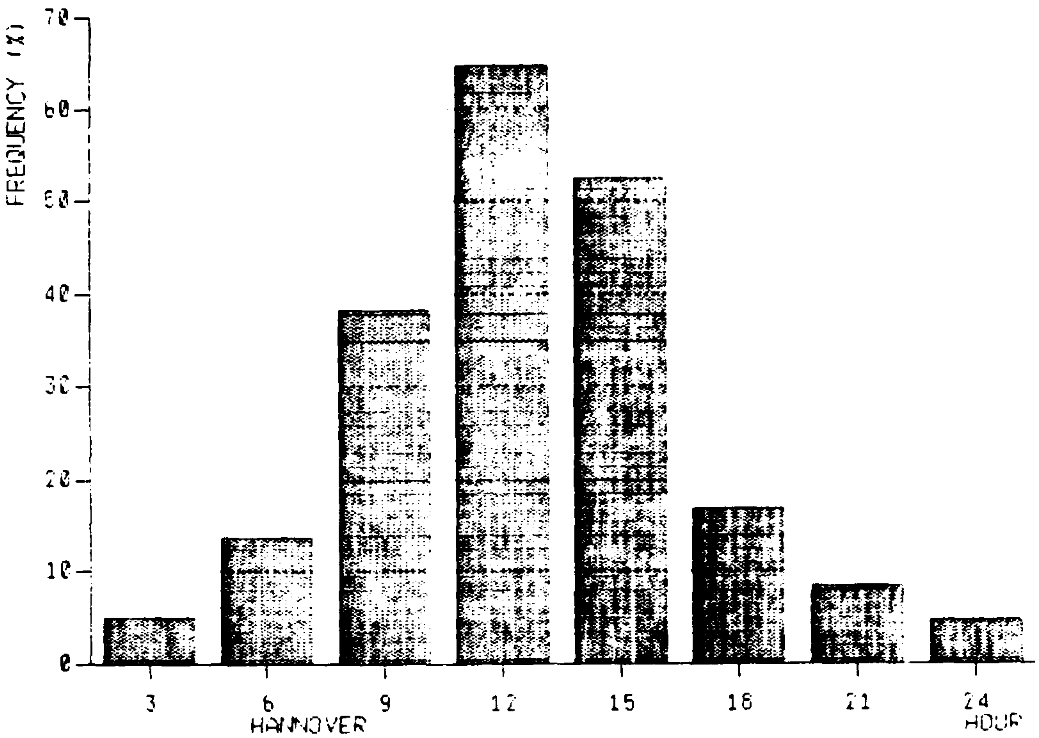

Figure B-43. HANNOVER: Frequency of Cumulus Mediocris/Congestus--Summer, by Hour.

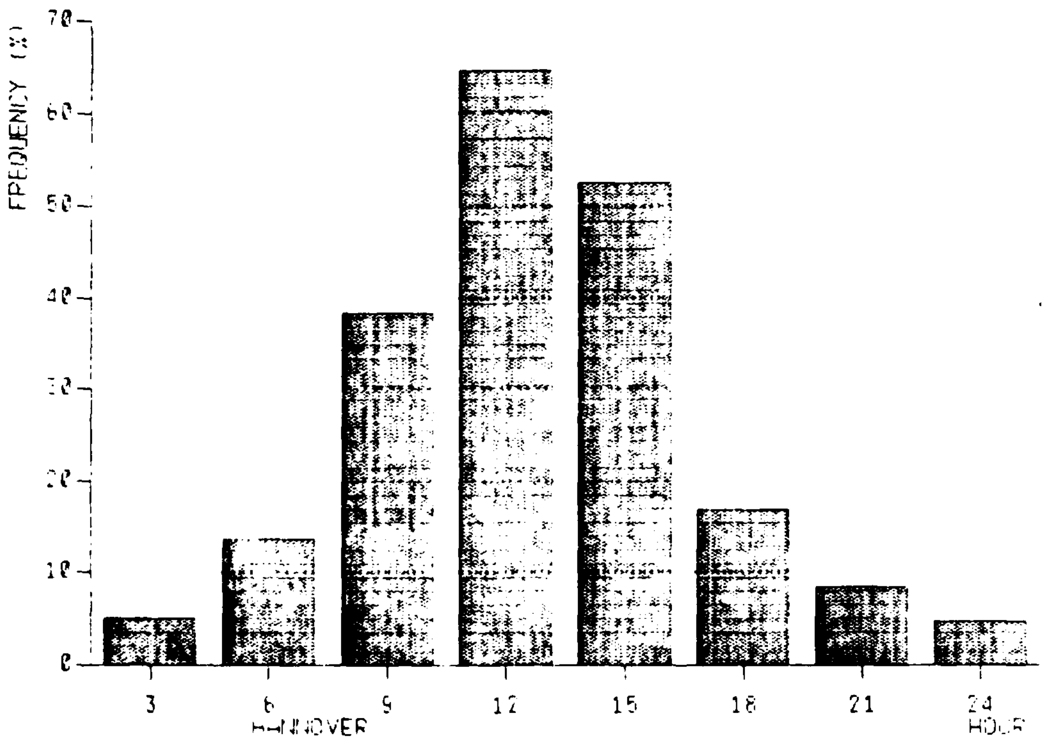

Figure B-44. HANNOVER: Frequency of Cumulus Mediocris/Congestus--Fall, by Hour.

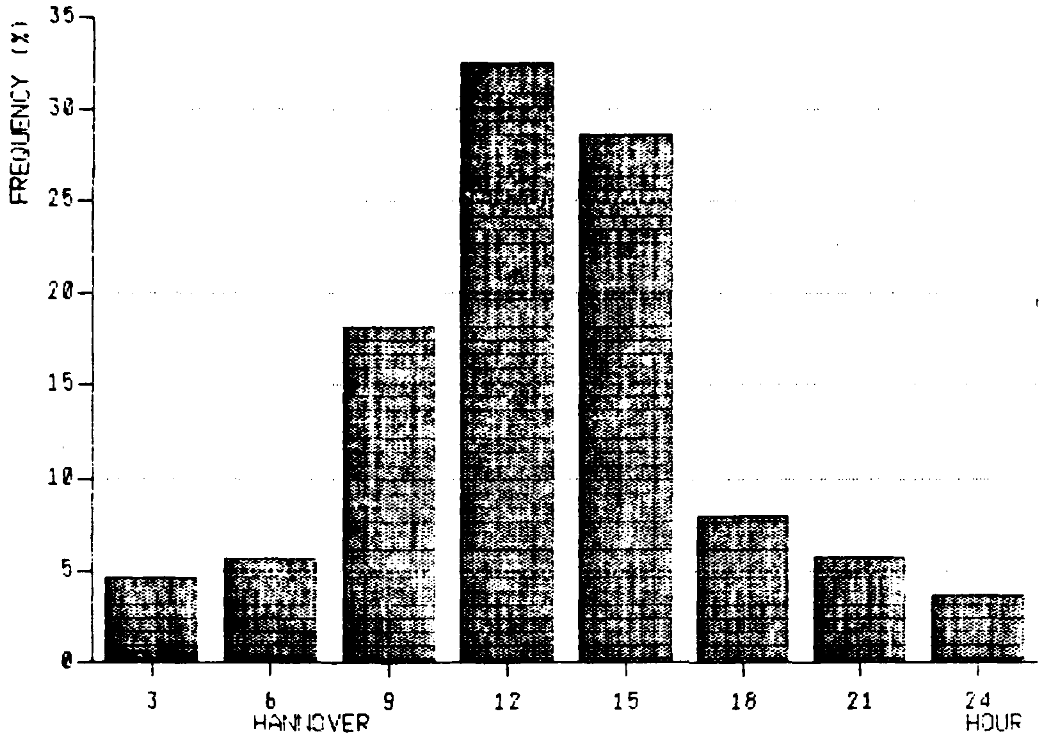

Figure B-45. HANNOVER: Frequency of Cumulus Mediocris/Congestus--Winter, by Hour.

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