VECTOR WIND PROFILE GUST MODEL

MIDTERM REPORT

(For Period April 10 – October 10, 1979)

Prepared For

NATIONAL AERONAUTICS AND SPACE ADMINISTRAITON
George C. Marshall Space Fligth Center
Marshall Space Flight Center, Alabama 35812

Under Contract NAS8-33433

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COMPUTER SCIENCES CORPORATION

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Prepared By

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SECTION I. INTRODUCTION

This report documents and summarizes the work during the first half of a 12-month study to establish a Vector Wind Profile Gust Model for the Space Shuttle OFT Operations and Trade Studies. The body of the report is composed of five sections (II through VI). Section II describes various aspects of the basic and derived data used in this study. The accuracy of Jimsphere wind profile data used in this study is described in terms of the amplitude response of the measurement system. The theory and application of digital filters to Jimsphere profiles to derive residual profiles with wavelengths within specified ranges is discussed; a definition of gust is given for this report that is appropriate to the analysis of singularities and quasi-sinusoidal perturbations that are typically observed in vertical wind profiles.

Section III provides a brief description of the theoretical probability distributions proposed to represent the distribution of gust and gust length. No attempt is made to provide derivations of various aspects of these distributions. Appropriate references to the literature for these derivations and other background material will be provided in the final report under this contract.

Section IV contains an analysis of wind profile gust at Cape Kennedy within the theoretical framework set forth in Section III. The variability of theoretical and observed gust magnitude with filter type, altitude, and season is described. Various examples are presented which illustrate agreement between theoretical and observed gust percentiles.

These sections are followed by conclusions drawn from the study (Section V) and three appendices. Appendix A contains plots of gust and associated gust length to illustrate the data analyzed in this study. Appendix B contains statistics of gust data, including variance-covariance and correlation matrices and gamma distribution parameters. Appendix C contains theoretical probabilities calculated by numerical integration of the gamma probability density function. All the appendices provide complete data for the month of February at six reference altitudes (4, 6, ..., 14 km) at Cape Kennedy for four wavelength ranges.

SECTION II. DATA

Basic and derived properties of the data used in this study are described in this section. Jimsphere wind profiles expressed in component form at 25-meter intervals are the basic data. Derived properties of the data include amplitude response calculations for description of the accuracy of the Jimsphere system at small wavelengths and digital filtered profiles and gusts that are the subject of the detailed statistical analysis and modeling of this study. A detailed description of these data properties is given below.

A. WIND MEASURING SYSTEM AMPLITUDE RESPONSE

Wind profile data used in this study were obtained with the Jimsphere system. Since the small wavelength perturbations observed in these profiles are the subject of a detailed analysis, it is appropriate to specify the accuracy of the system for small wavelengths. A measure of the accuracy is the amplitude response, $G(\lambda)$, which is equivalent to the ratio $A(\lambda)/A^*(\lambda)$; where $A^*(\lambda)$ is the true amplitude of a perturbation in the wind profile at wavelength, λ, and $A(\lambda)$ is the amplitude measured with the Jimsphere system. The amplitude response of the Jimsphere system is limited by the size of the balloon (2-meter diameter), the balloon ascent rate (4-5 m/sec), the accuracy of the balloon tracking system (FPS-16), and the data smoothing technique. The balloon positions, determined every 0.1 second, are smoothed to provide mean positions at each 25-meter interval of ascent. Differences in position between alternate 25-meter levels indicate the mean wind for the corresponding 50-meter layer, and are reported as the wind at the 25-meter level in the middle of the 50-meter layer. Thus, the basic data analyzed here are wind speeds and directions for 50-meter layers, overlapping by 25 meters. Only when at least 25 meters intervene between two layers (i.e., winds reported for levels at least 75 meters apart) can two winds be considered independent observations (Ref. 1).

Expressions for the amplitude response, $G(\lambda)$, of the Jimsphere system to wind perturbation wavelengths that are small relative to the length of the wind profile have been derived by Luers and Engler (Ref. 2),

$$G(\lambda) = \frac{\cos\left(\frac{\pi S}{3\lambda}\right) \sin^2\left(\frac{\pi S}{3\lambda}\right)}{\left(\frac{\pi S}{3\lambda}\right)^2} \quad (1)$$

and by DeMandel and Krivo (Ref. 3),

$$G(\lambda) = \frac{\sin\left(\frac{4\pi w}{\lambda}\right) \sin\left(\frac{50\pi}{\lambda}\right)}{200w\left(\frac{\pi}{\lambda}\right)^2} \quad (2)$$

where

S = smoothing interval = 75m

λ = wavelength (m)

w = Jimsphere balloon ascent rate (m/s)

As illustrated in Fig. 1, the Jimsphere system does not measure wavelengths less than 50 meters; for λ=90m, the measured amplitude is one-half the true amplitude.

B. Data Sample

The data consist of 1800 Jimsphere profiles (150 per month) from Cape Kennedy, Florida (Ref. 4). The data were obtained under a Space Shuttle Level II directive that specifies the demonstration of vehicle design validity using 150 Jimsphere wind profiles representative of each month. Three months (February, April, and July) were chosen for analysis in this study. April data were used to develop and refine the analysis procedure which could be applied efficiently to other months when required. April was also of interest because it coincided with the planned[1] Orbital Flight Test Mission. The February and July data were chosen because they are representative of the seasonal extremes at Cape Kennedy. The number of soundings for each month for each year of the sampling period is illustrated in Figure 2.

[1] Rescheduled.

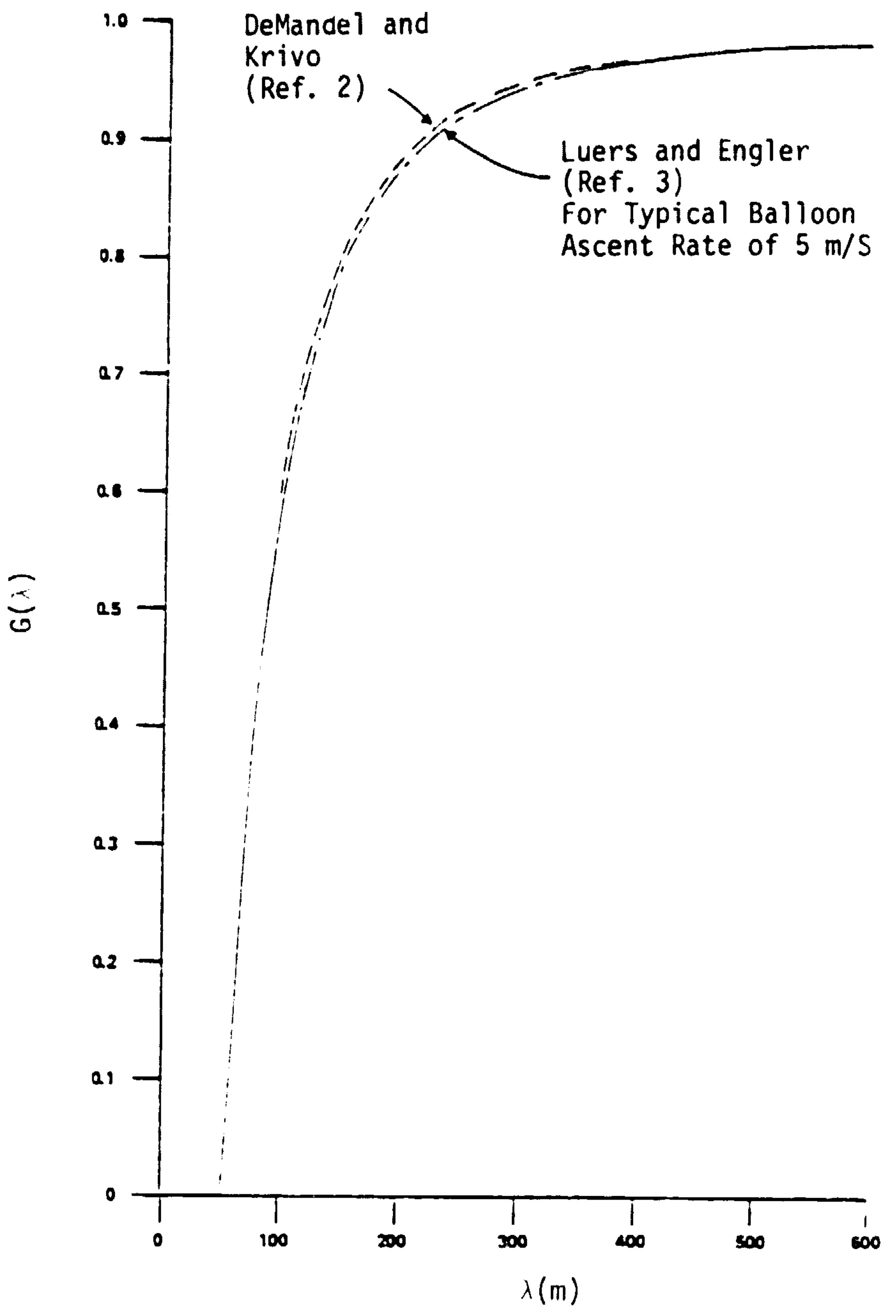


Figure 1. Amplitude Response of the Jimsphere System

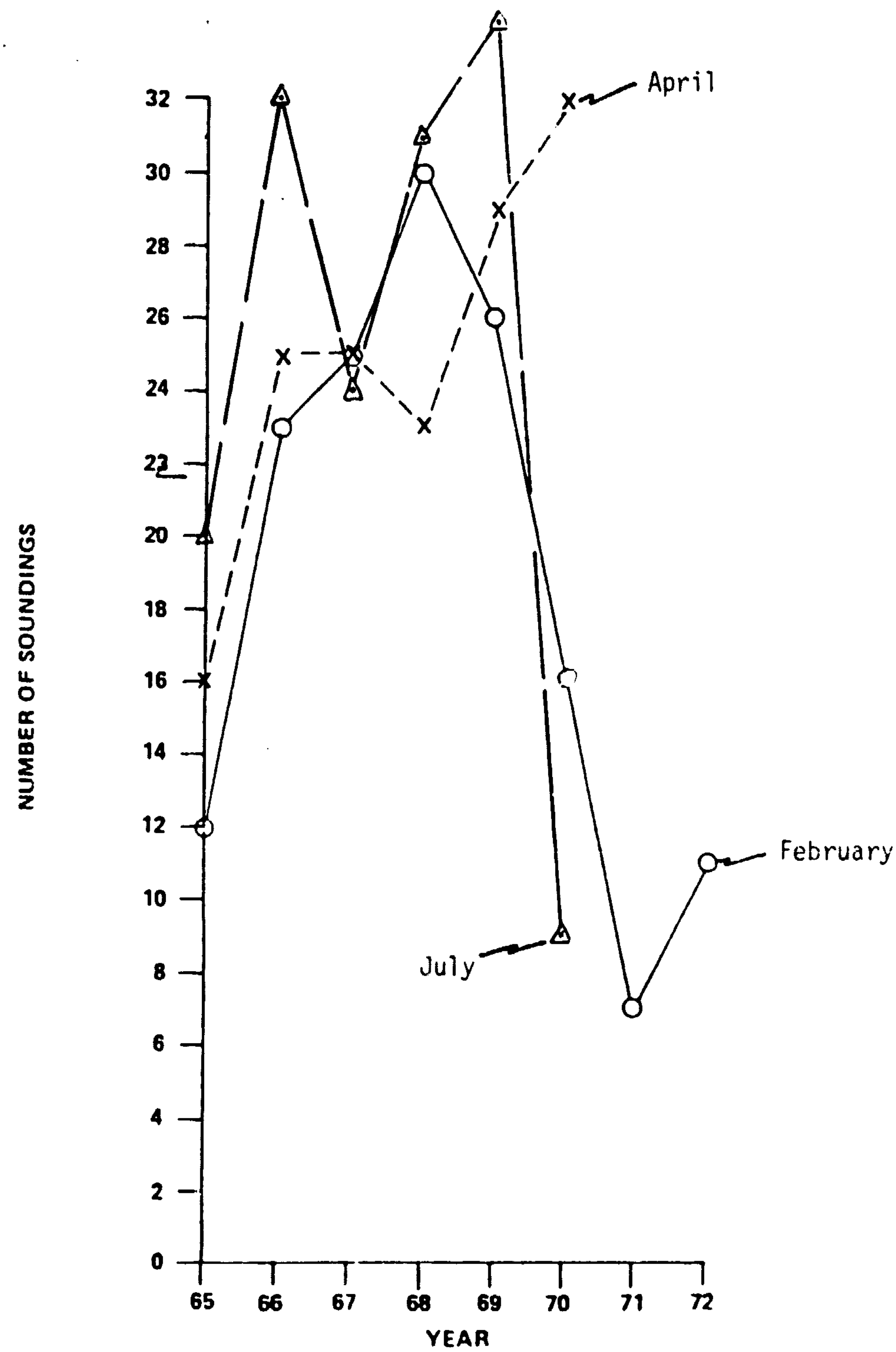


Figure 2. Distribution of February, April, and July Jimsphere Soundings from 150 per Month Sample (Ref. 4)

C. DIGITAL FILTERS

Vector wind gust statistics and models are based on data that have been obtained from filtered wind profiles. The filtering process provides profile data that contain perturbations within a range of wavelengths that is suitable for simulation studies of space vehicle ascent through the atmosphere. The design and application of these filters are described below.

1. Filter Design. The design of the digital filters is based on the Martin-Graham cosine rolloff model described by Demandel and Krivo (Ref. 5). A set of numerical smoothing weights is calculated for a low-pass filter from the equation

$$h(nT) = \frac{\sin(2\pi f_t nT) + \sin(2\pi f_c nT)}{\left[2\pi nT \quad 1 - 4n^2T^2(f_t - f_c)^2\right]} \tag{3}$$

where the filter design parameters are

T = altitude interval of wind profile data

n = weight index (-N, -N+1, ..., -1, 0, 1, ..., N-1, N)

N = (NW-1)/2

NW = number of weights

f_c = cutoff frequency = the highest frequency with associated amplitude passed with unity gain

f_t = termination frequency = the lowest frequency with associated amplitude passed with zero gain.

The center weight (n = 0) is given by:

$$h_0 = f_c + f_t. \tag{4}$$

When the weights, h_n, have been determined, they are normalized by applying the constraint

$$\sum_{N=-1}^{N} h_n = 1. \tag{5}$$

Only (N + 1) weights are calculated since $h_n = h_{-n}$. Since the filter function is symmetrical, no phase shift is produced.

The use of digital smoothing weights results in the loss of the first and last N data points of the original profile. Thus the filtered wind profile has an altitude range that is reduced by 2NT compared to the original profile.

The effective response of the low-pass filter, given the design parameters listed under equation (3) is

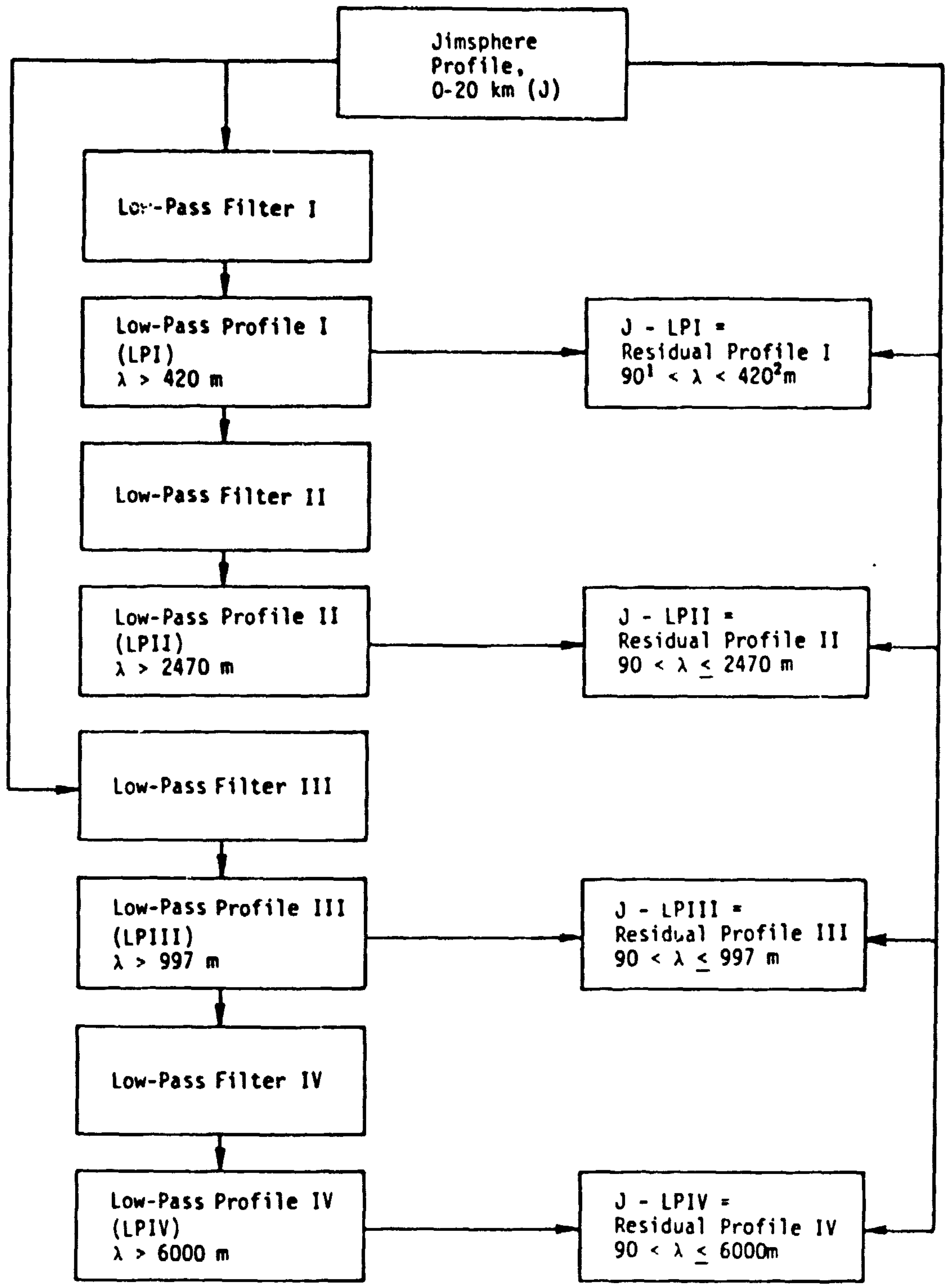
$$G_L(f) = h_0 + 2 \sum_{n=1}^{N} h_n \cos(2\pi f n T) . \qquad (6)$$

As the number of weights (NW) is increased, the response of the filter improves. However, computation time increases as does the number of points lost (the first and last N data points). In this study, NW was chosen to minimize data loss while maintaining a reasonably accurate filter response.

2. Filter Application. Jimsphere wind profiles from the surface to 20 km in component form (zonal and meridional) were decomposed into eight data bases by the filtering process diagrammed in Figure 3. Four of the data bases consist of low-pass profiles that can be used in analyses of steady state and wind bias profiles. The other data bases consist of high-pass profiles defined here as residual profiles; these profiles consist of perturbations with relatively small wavelengths that are of interest in evaluations of vehicle bending mode response. Gusts that are derived from residual profiles are the subject of the detailed statistical analysis described in subsequent sections of this report.

The design parameters and weighting functions of four low-pass filters and the altitude range of the filtered profiles used in this study are listed in Table 1.

The method of calculating high-pass profiles by subtraction of the low-pass filtered profiles from the original Jimsphere profile is equivalent to the execution of a high-pass filter. The effective amplitude response of the four high-pass filters that are appropriate for description of the upper end of the wavelength range of the residual profiles is illustrated in Figure 4. The nominal high wavelength limit for each set of residual profiles is the wavelength at which the amplitude response of the corresponding filter is .50.



[1]Nominal low wavelength limit of Jimsphere system
[2]Defined in text

Figure 3. Filtering Process

Table 1. Filter Design Parameters, Filter Weighting Functions of Four Filters Used for Calculation of Residual Profiles, and Altitude Range of Residual Profiles

Filter Design Parameters

Filter	T(m)	N	$f_c(m^{-1})$	$f_t(m^{-1})$
I	25	20	.00034	.00435
II	250	5	.00004	.00080
III	25	50	.00050	.00150
IV	250	10	0	.000342

Filter Weights

	I	II	III	IV
h_0	0.116360050	0.203331671	0.050406609	0.084765087
.	0.112681533	0.182602840	0.050170253	0.083178582
.	0.102183235	0.130080937	0.049465762	0.078561135
.	0.086369542	0.068650095	0.048306755	0.071321355
h_i	0.067415386	0.020649325	0.046715542	0.062084219
.	0.047750214	-0.003649032	0.044722562	0.051615690
.	0.029618173		0.042365613	0.040733073
.	0.014711243		0.039688904	0.030213801
.	0.003949043	1.000000000	0.036741958	0.020715102
.	-0.002560992		0.033578388	0.012714788
.	-0.005394941		0.030254595	0.006479712
.	-0.005565475		0.026828417	
.	-0.004229394		0.023357771	
.	-0.002423366		0.019899321	1.000000000
.	-0.000884042		0.016507215	
.	0.000021198		0.013231923	
.	0.000259004		0.010119200	
.	0.000022211		0.007209211	
.	-0.000405784		0.004535825	
.	-0.000771288		0.002126107	
h_N	-0.000925530		0.000000000	
			-0.001829786	
			-0.003357689	
$h_0 + 2 \sum_{1}^{N} h_i$	1.000000001		-0.004585029	
			-0.005519564	
			-0.006174897	
			-0.006569761	
			-0.006727193	
			-0.006673649	
			-0.006438065	
			-0.006050919	
			-0.005543301	
			-0.004946033	
			-0.004288852	
			-0.003599693	
			-0.002904062	
			-0.002224550	
			-0.001580449	
			-0.000987520	
			-0.000457877	
			.333639299-12	
			0.000381141	
			0.000683858	
			0.000909429	
			0.001061717	
			0.001146732	
			0.001172171	
			0.001146932	
			0.001080646	
			0.000983218	
			0.000864417	
			0.999999999	

Altitude Range of Residual Profiles

Filter	Z_{min} (km)	Z_{max} (km)
I	0.5	19.50
II	1.75	18.25
III	1.25	18.75
IV	3.75	16.25

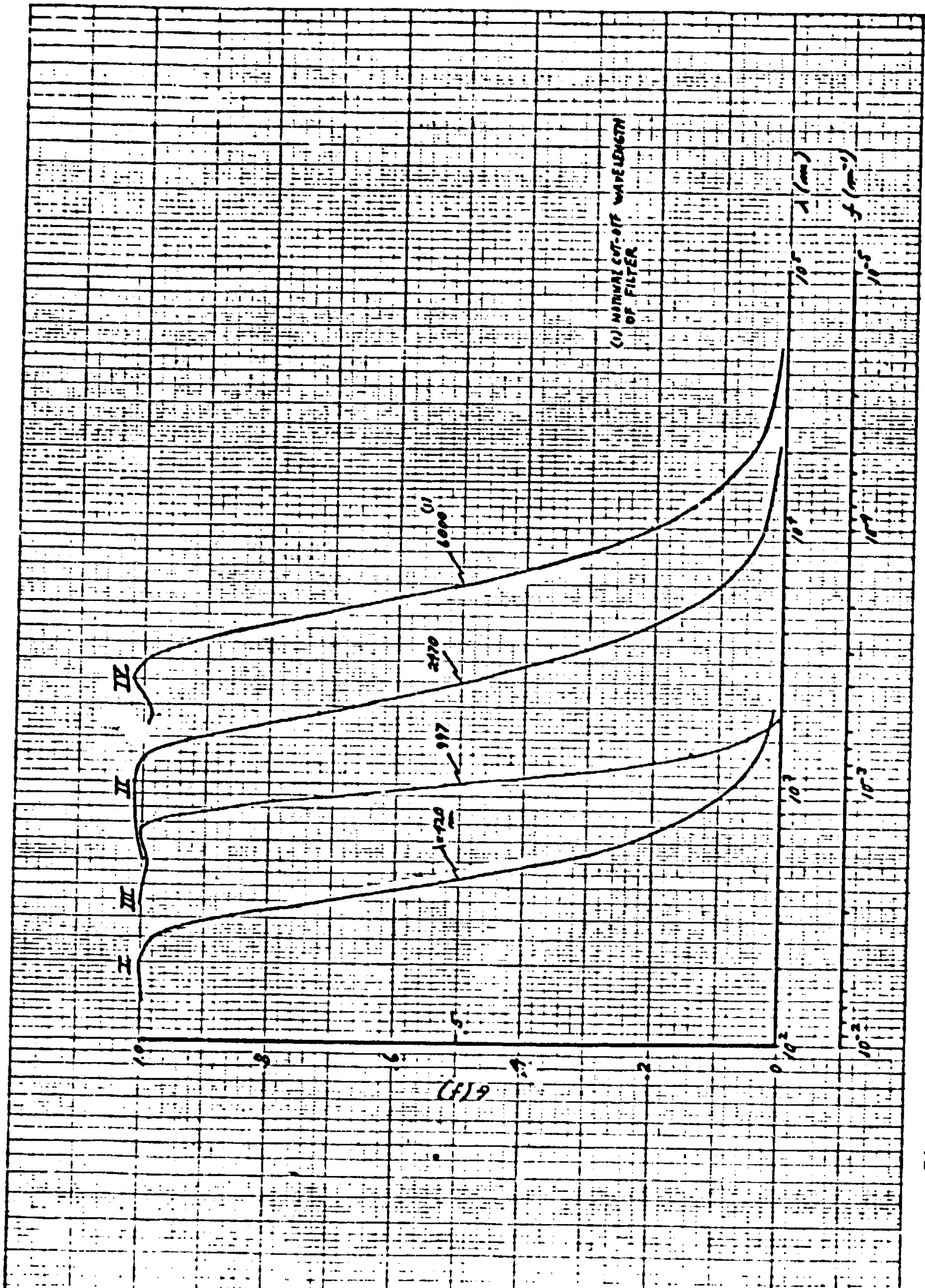


Figure 4. Amplitude Response of Four Digital Filters Used for Calculation of Residual Profiles

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A set of u component residual profiles calculated from the Jimsphere profile of 7 April 1966 (0955 Z) at Cape Kennedy is illustrated in Figure 5.

D. Definition of Gust

The definition of gust used in this study satisfies the objective to provide data that are suitable for a detailed statistical analysis of singularities and quasi-sinusoidal perturbations that are often observed in Jimsphere wind profiles. A statistical model of these gusts so defined will be developed that will be useful for certain types of flight simulations of space vehicle ascent through the perturbed atmosphere.

According to the conventional approach, a gust profile is calculated by applying a high-pass digital filter to a Jimsphere profile; all the speeds in the filtered profile are defined as gusts. In this study, these speeds are defined as residuals; the maximum positive or negative residual in the vicinity of a specified reference altitude is defined as a gust. A formal definition of gust is given below.

Let u' represent the zonal wind component at a specified reference altitude, H_o, in a residual profile. The zonal gust is defined as the maximum value of u' in the vicinity of altitude H_o with like sign to u' at H_o. The altitude interval associated with the gust is defined as the gust length, L, which is calculated by taking the altitude difference of the zero crossings on either side of the gust; i.e.,

$$L = H_2 - H_1 \tag{7}$$

The altitudes of the zero crossings, H_2 and H_1, are calculated by linear interpolation according to

$$H_2 = H_{j-1} - \frac{25}{u'_j - u'_{j-1}} u'_{j-1} \tag{8}$$

$$H_1 = J_{k+1} - \frac{25}{u'_{k+1} - u'_k} u'_{k+1} \tag{9}$$

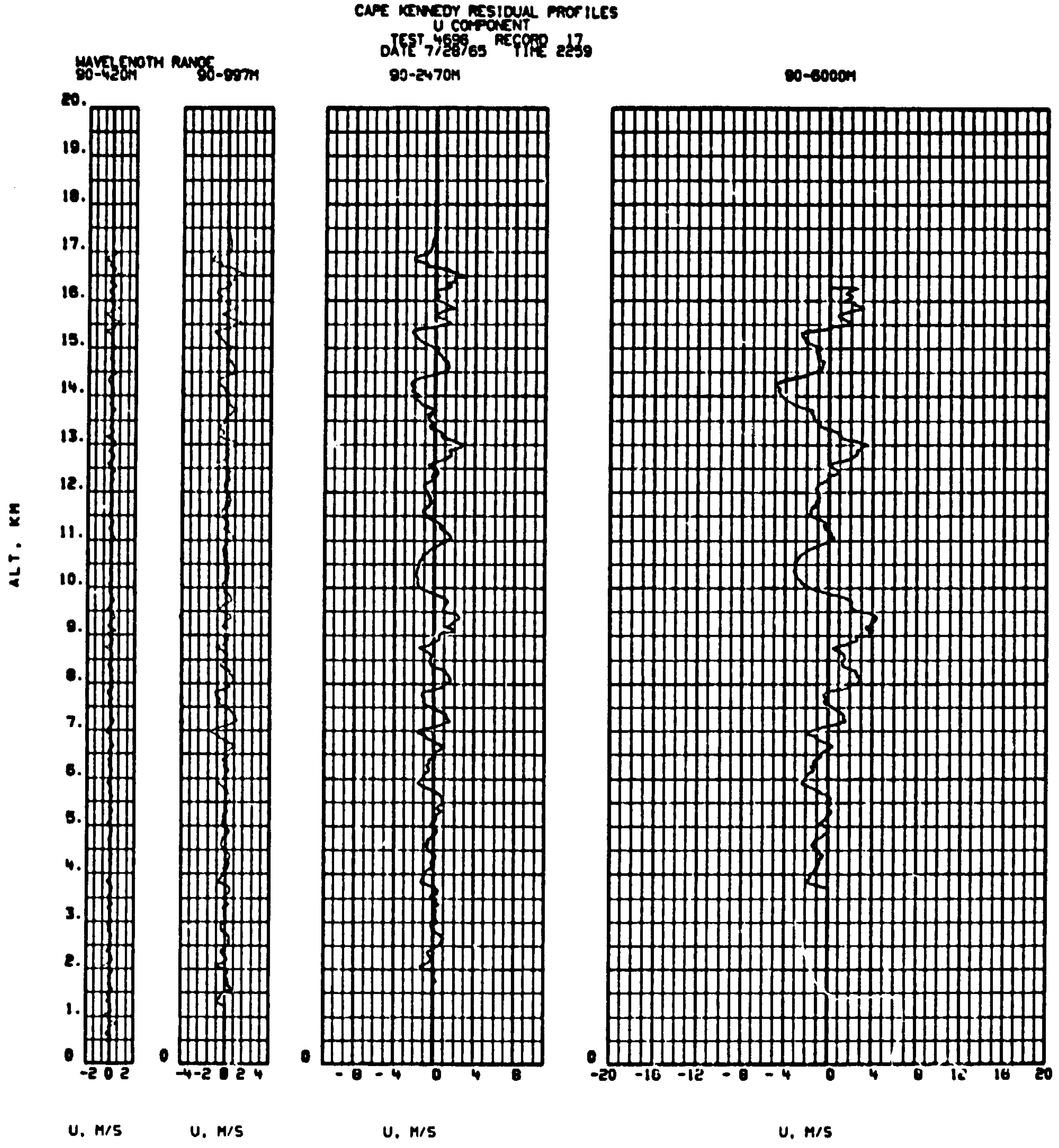

Figure 5. Cape Kennedy Residual Profiles

where

H_2 = altitude of the first zero crossing for the upward scan

u'_{j-1} = last value of u' with the like sign of u' at H_0 when scanning upward[1]

u'_j = first value of u' with sign opposite to sign of u' at H_0 when scanning downward

H_{j-1} = altitude of u'_{j-1}

H_1 = altitude of the first zero crossing for the downward scan

u'_{k+1} = last value of u' with like sign to sign of u' at H_0 when scanning downward

u'_k = first value of u' with sign opposite of u' at H_0 when scanning downward

H_{k+1} = altitude of u'_{k+1}

Similarly, the meridional gust component, v', is defined by substitution of v' for u' above. In most instances, the zonal and meridional component gusts defined in this manner do not occur at the same altitude. This altitude difference is a measure of the phase difference between the components.

A schematic definition of gust is given in Figure 6 .

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[1]The indices j and k increase upward.

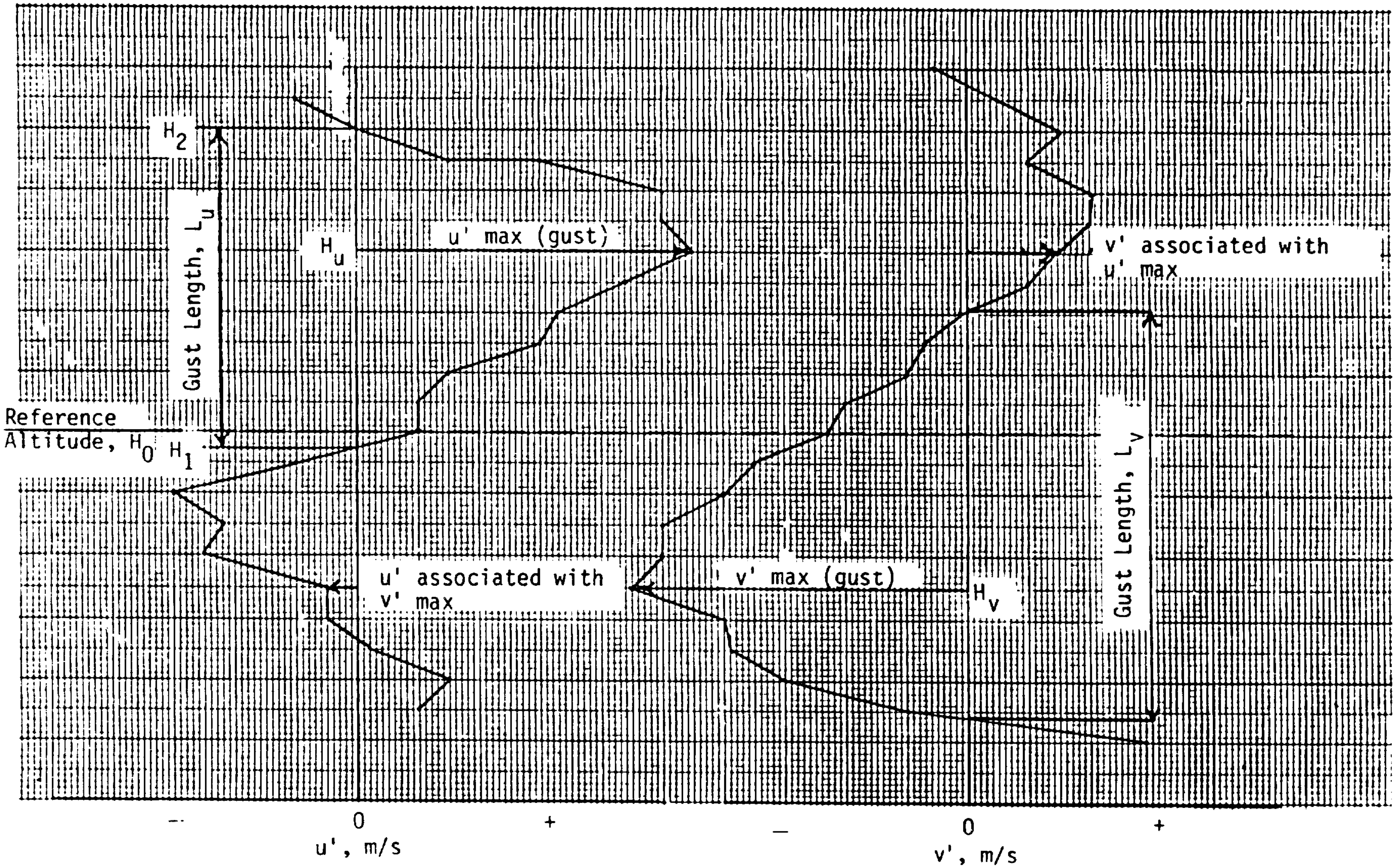


Figure 6. Schematic Definition of Gust

SECTION III. PROBABILITY DISTRIBUTIONS

In a previous study (Ref. 6), it was shown that the probability density function of absolute component gust or gust length is univariate gamma of the form

$$f(x) = \frac{\beta^{\gamma}}{\Gamma(\gamma)} x^{\gamma-1} \operatorname{EXP}(-\beta x) \qquad (10)$$

where $0 \leq x \leq \infty$

$\gamma > 0, \quad \beta > 0$

The parameters γ and β are estimated according to the method of maximum likelihood (Ref. 7) or from sample statistics. It can be shown that either method yields similar results for the monthly data sets of sample size equal to 150 that are used in this study. Since the sample statistics method involves a more straightforward calculation, it was chosen for this study; thus,

$$\gamma = (\bar{x}/\sigma)^2 \qquad (11)$$

$$\beta = \gamma/\bar{x} \qquad (12)$$

where $\bar{x}$ and σ are the sample mean and standard deviation. The parameter γ defines the form of the distribution function. When γ is large, the distribution is approximately normal. The parameter β is a scaling parameter.

The joint probability density function of absolute component gust and associated gust length is bivariate gamma of the form (for $\gamma_1 = \gamma_2 = \gamma$)

$$f(x,y) = \frac{\beta_1^{\gamma}\beta_2^{\gamma}}{(1-\rho)\Gamma(\gamma)} \left(\frac{xy}{\rho\beta_1\beta_2}\right)^{\frac{\gamma-1}{2}} \operatorname{EXP}\left(-\frac{\beta_1 x + \beta_2 y}{1-\rho}\right) \qquad (13)$$

$$\bullet \quad I_{\gamma-1}\left\{\frac{2\sqrt{\rho\beta_1\beta_2 xy}}{1-\rho}\right\}$$

where $0 \leq x \leq \infty$

$0 \leq y \leq \infty$

$\gamma > 0,\ \beta_1 > 0,\ \beta_2 > 0,\ 0 \leq \rho < 1$

$I_\nu\{\ \}$ is the modified Bessel function of order ν.

The conditional gamma probability density function is of particular interest since it provides an estimate of the probability that a certain gust magnitude will be exceeded at a particular gust length; the density function is

$$f(y|x=x^*) = \beta_2^\gamma \, EXP(-\rho\beta_1 x^*/1-\rho) \; y^{\frac{\gamma-1}{2}} \, EXP(-\beta_2 y/1-\rho) \quad (14)$$

$$\bullet \frac{I_{\gamma-1}\left\{\dfrac{2\sqrt{\rho\beta_1\beta_2 x^* y}}{1-\rho}\right\}}{1-\rho(\rho\beta_1\beta_2)^{\frac{\gamma-1}{2}} \; x^{*\frac{\gamma-1}{2}}}$$

It follows that the probability that y_1 is not exceeded given $x=x^*$ is

$$Pr\{y < y_1 \mid x = x^*\} = \int_0^{y_1} f(y|x = x^*)dy \quad (15)$$

where y = absolute gust component amplitude

x = gust length

Computer programs have been developed during this study for calculation of probabilities by numerical integration of the univariate and bivariate gamma distribution utilizing the Univac 1108 or Hewlett Packard HP-97. For calculation of conditional probabilities, library routines are used for evaluation of the modified Bessel function. The HP-97 program is not as general since it cannot calculate modified Bessel functions for fractional orders. However, it has been demonstrated that setting $\gamma_1 = \gamma_2 = 3$ is a reasonable assumption that permits straightforward evaluation of equation (14) which for this special case contains the Bessel function of second order.

SECTION IV. GUST ANALYSIS

The gust analysis is consistent with the theoretical model described in Section III. The validity of the model has been demonstrated in a previous study (Ref. 6). Additional examples that indicate close agreement between observed and theoretical probability distributions are presented in this section. The variation of these distributions as a function of altitude, filter, and month is described and a procedure for estimation of gust percentiles as a function of filter cut-off is developed. Ultimately, the analysis will be based on statistics that have been calculated for the months of February, April, and July; for the purpose of this interim report, emphasis is given to the months of February and July.

A. VARIABILITY OF GAMMA DISTRIBUTION PARAMETERS

Variability of the parameters γ and β defined in Section III is an indication of the variability of the theoretical gust distribution. As indicated earlier, γ determines the form of the distribution function and β is a scaling parameter. Gust percentiles are inversely related to β, or directly related to β^*, where $\beta^* = 1/\beta$.

The variability of γ and β^* as a function of filter cut-off wavelength, γ_c, and altitude is illustrated in Figures 7 and 9 for u component gust and in Figures 8 and 10 for v component gust. As illustrated in Figures 7 and 8, the value of γ is usually between 2.25 and 3.25 for both components; the variability within that range is not clearly systematic with respect to either altitude or filter cut-off frequency. As illustrated in Figures 9 and 10, the scaling parameter, β^*, is strongly influenced by filter cut-off frequency and, to a somewhat lesser extent, by altitude; β^* increases as γ_c increases; the increase of β^* with altitude is most pronounced between 8 and 10 km.

It may be necessary to estimate γ and β^* at altitudes from 0 to 20 km as part of the vector wind residual (gust) model. The parameters can be estimated from sample statistics between 4 and 14 km; for altitudes outside this range, the feasibility of using an extrapolation technique has been studied. The technique is based on calculation of fourth order polynomials that describe the sample mean and standard deviation as a function of altitude. These polynomials are used for calculation

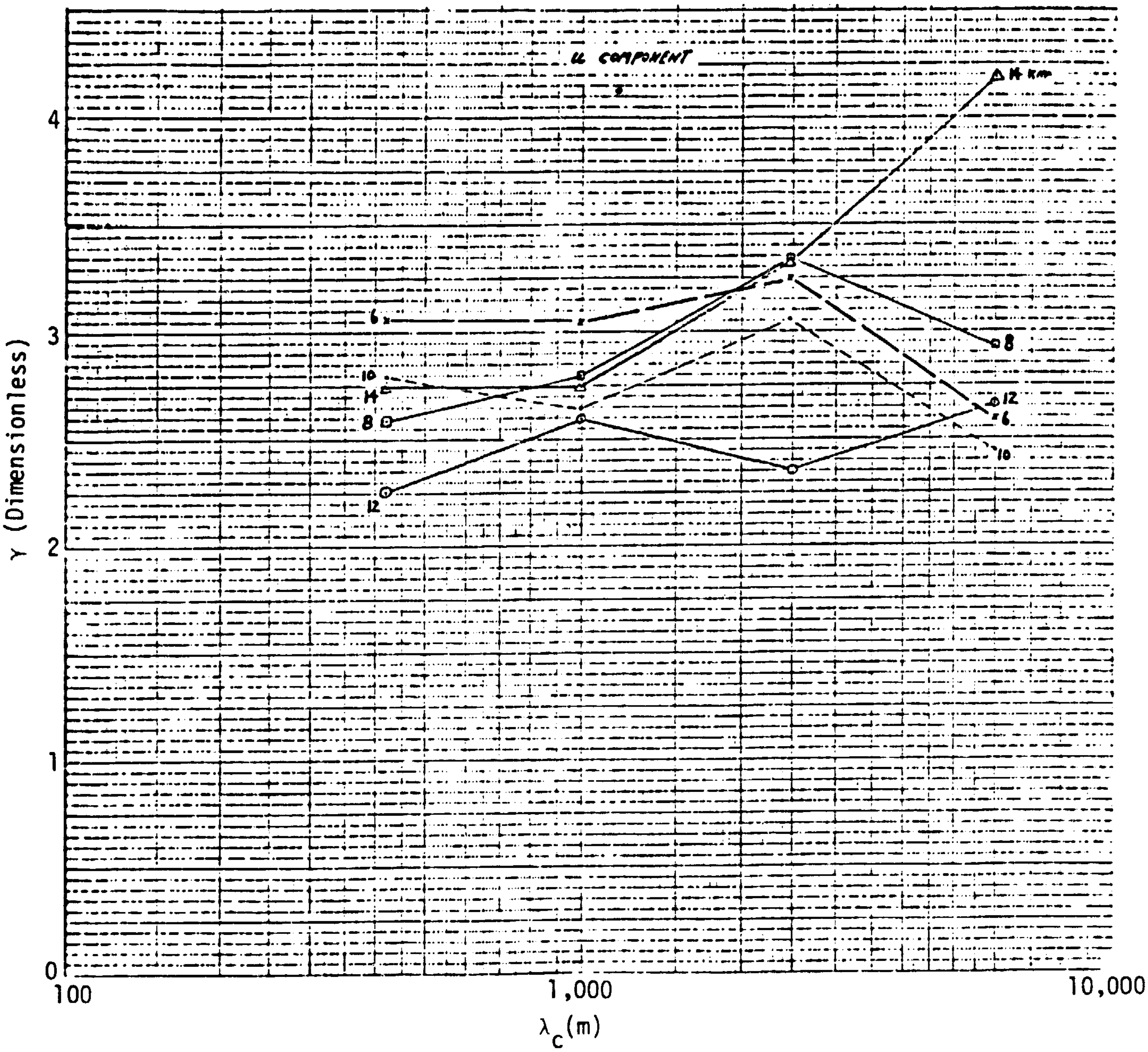


Figure 7. Parameter γ of the Gamma Distribution of Zonal Component Gust during February at Cape Kennedy as a Function of Filter Cut-Off Frequency, λ_c, and Altitude

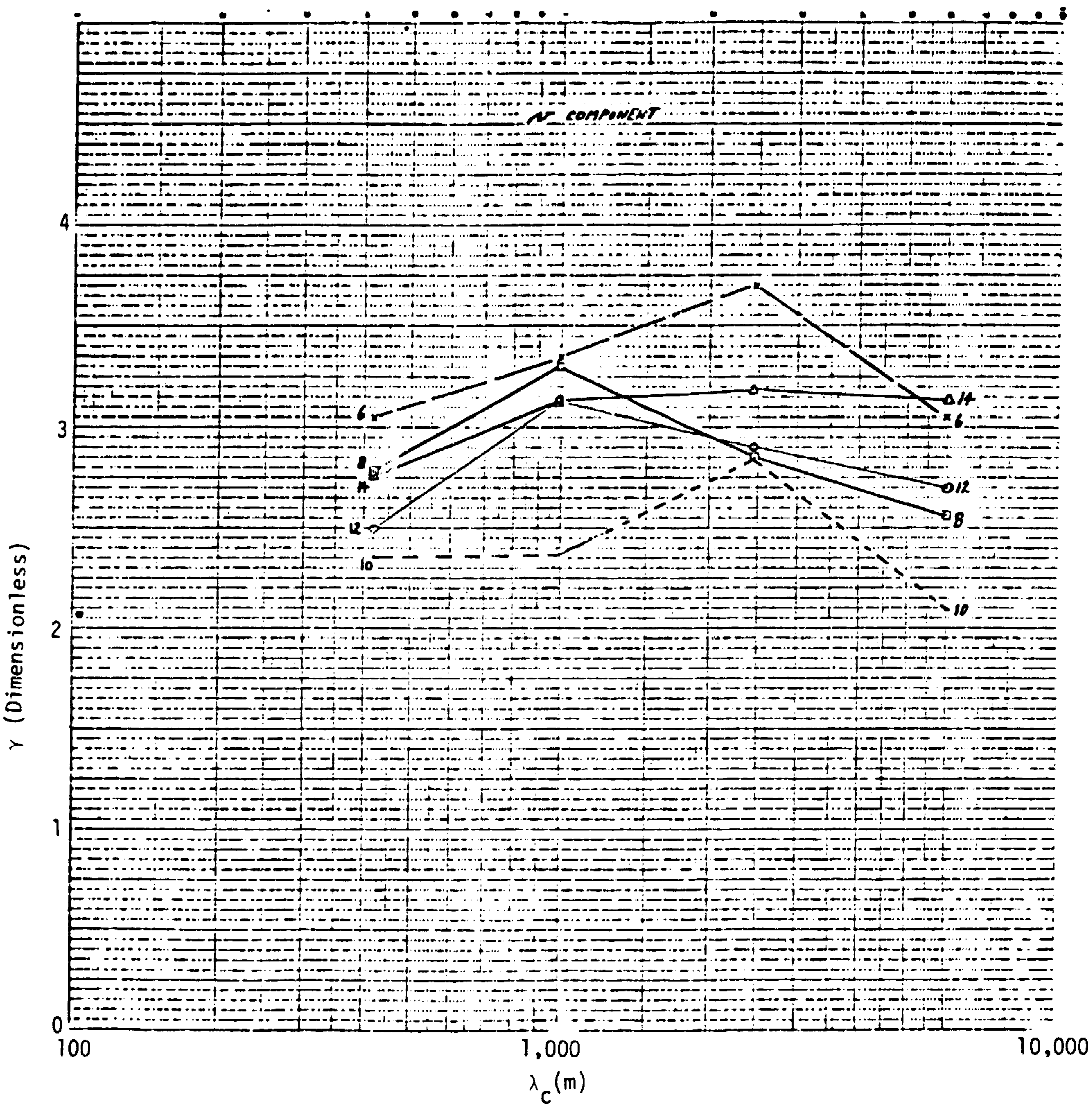


Figure 8. Parameter γ of the Gamma Distribution of Meridional Component Gust during February at Cape Kennedy as a Function of Filter Cut-Off Frequency, λ_c, and Altitude

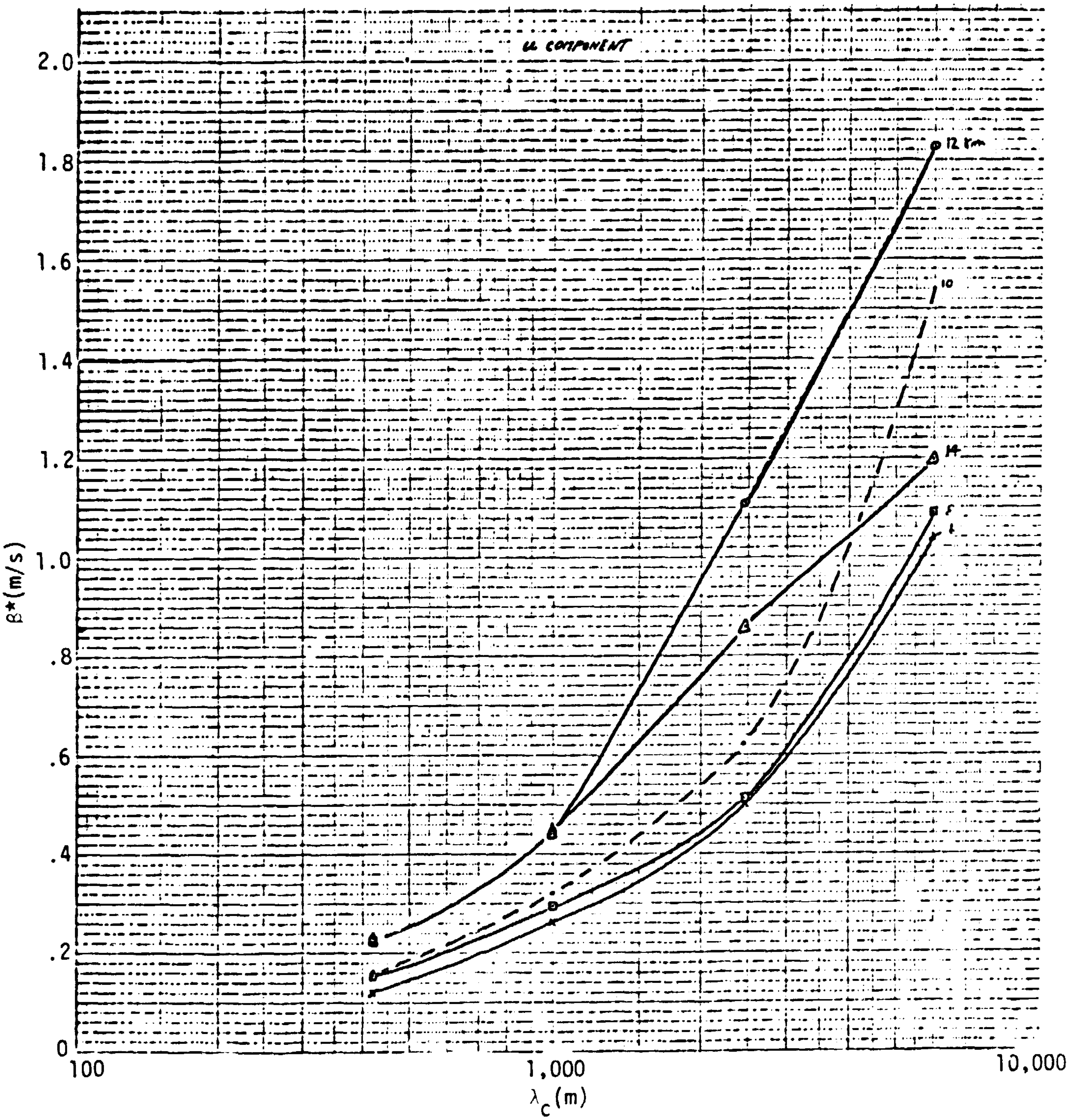


Figure 9. Parameter β* of the Gamma Distribution of Zonal Component Gust during February at Cape Kennedy as a Function of Filter Cut-Off Frequency, λ_c, and Altitude

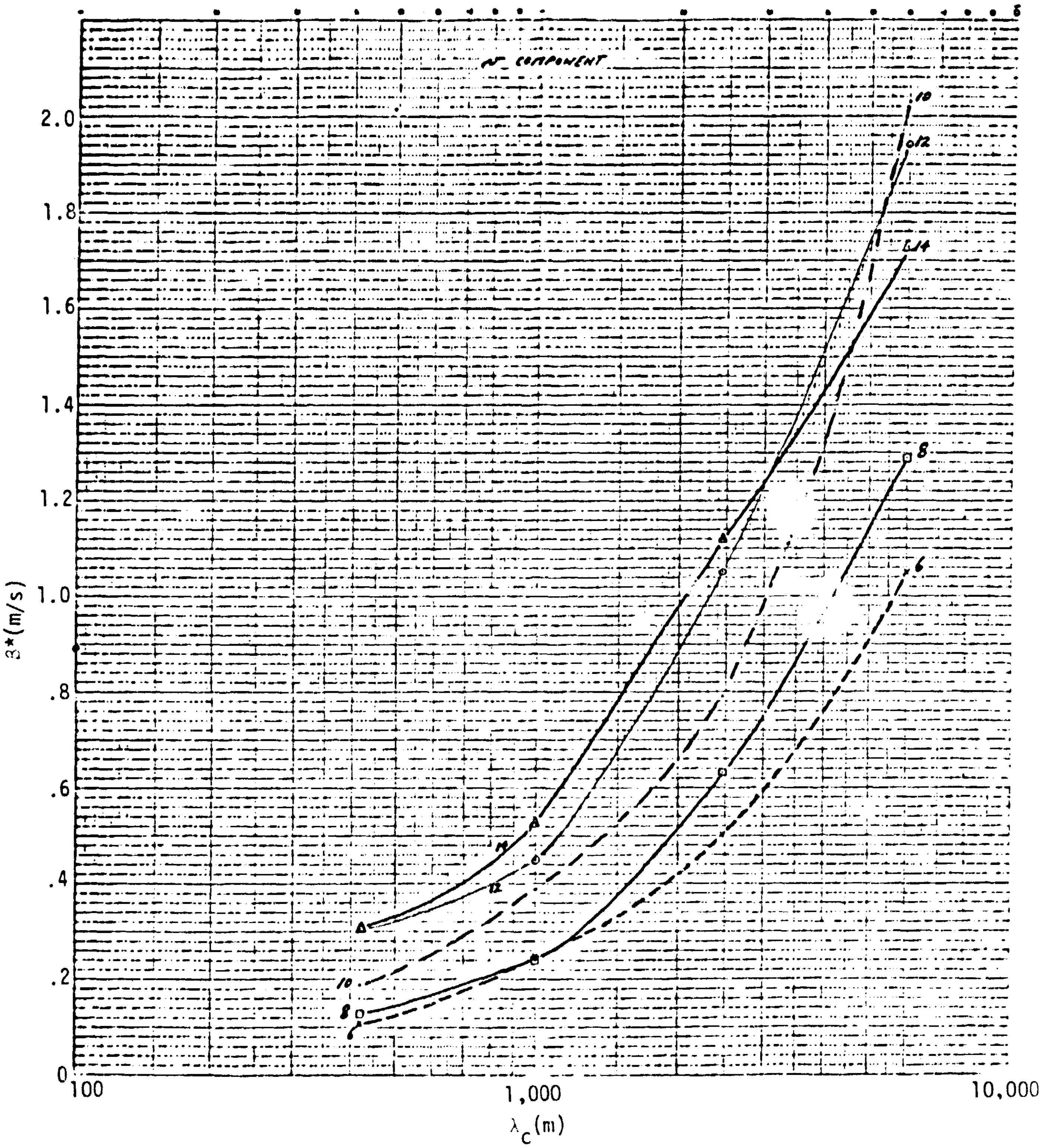


Figure 10. Parameter β* of the Gamma Distribution of Meridional Component Gust During February at Cape Kennedy as a Function of Filter Cut-Off Frequency, λ_c, and Altitude

of γ and β at all altitudes. To date, this approach has not yielded acceptable results; the calculated values at the extreme altitudes exhibit large fluctuations which are unrealistic.

B. Gust Variability

Gust variability is described here in terms of the variability of the theoretical univariate gamma distribution as a function of altitude, month, and filter type.

The maximum variation of gust amplitude in the 4-14 km altitude range occurs between 6 and 12 km; the variation, for u component February data in three wavelength ranges is illustrated in Figure 11. It is clearly indicated that gust magnitude is a function of altitude for all of the wavelength ranges.

February and July theoretical gamma distributions of u component gust at 12 km are illustrated in Figure 12 for four wavelength ranges. The larger gust magnitude during February at all percentiles is clearly shown. April distributions not plotted here have percentiles that are somewhat less than the February values, but are significantly larger when compared to July values.

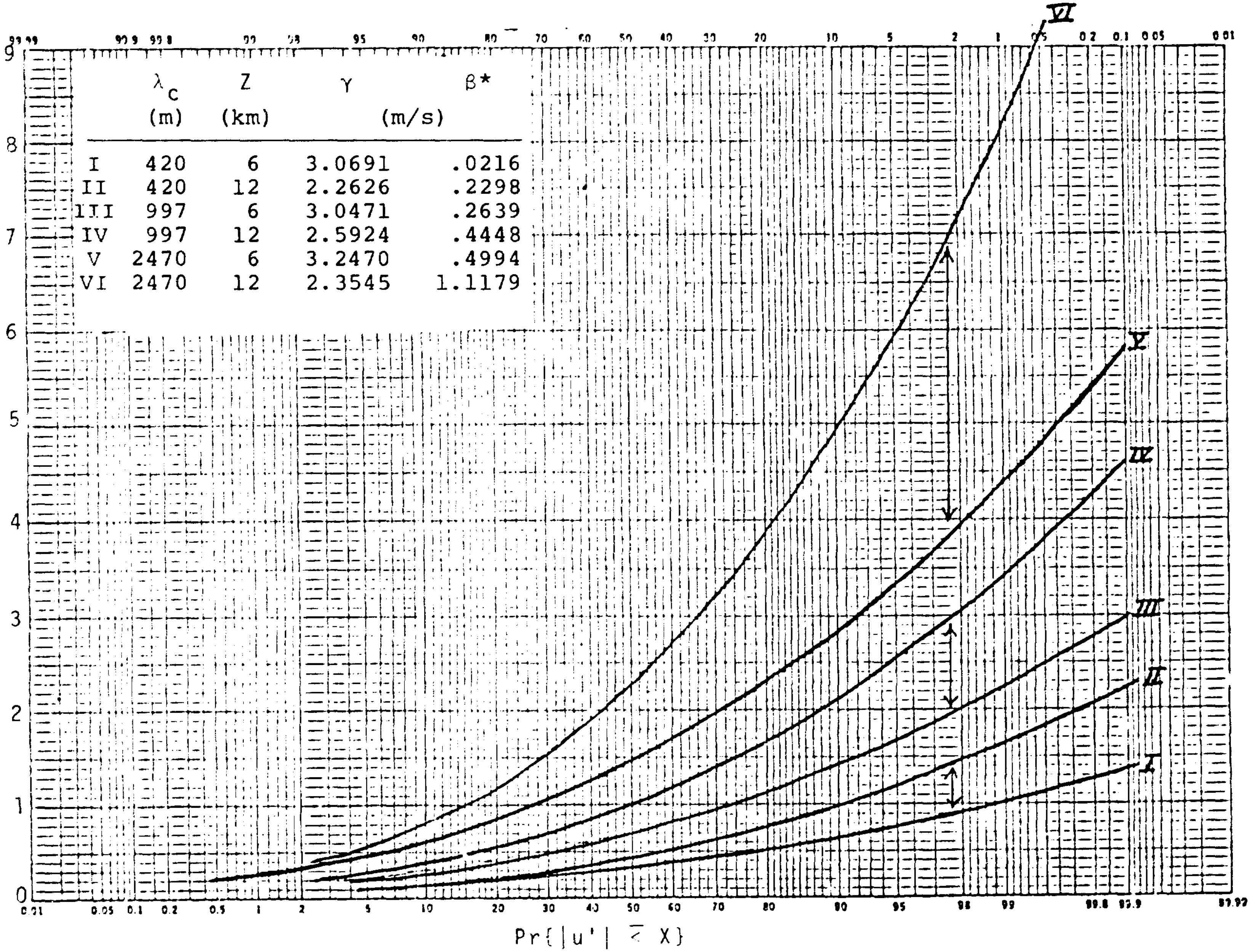
The variation of gust distribution with filter type for the months of February, April, and July is illustrated in Figures 13 through 15. As illustrated in Figures 16 through 18, percentiles of the distribution of u component gust for filtered Jimsphere data over a wavelength range from 90 to γ_c can be estimated from the empirical equation

$$|u'|_p = d_0 + d_1\gamma_c + d_2\gamma_c^2 \qquad (16)$$

where $|u'|_p$ is the gust percentile in meters per second and γ_c is in meters.

The constants d_0, d_1, and d_2 are listed in Table 2. Due to a lack of supporting data, Equation 16 is valid for γ_c from 100 meters to 6000 meters.

The plotted symbols in Figure 13 represent the observed gust distributions at 12 km during February for each wavelength band. It is indicated that there is a good agreement between the observed and theoretical distributions.



	λ_c (m)	Z (km)	γ (m/s)	β*
I	420	6	3.0691	.0216
II	420	12	2.2626	.2298
III	997	6	3.0471	.2639
IV	997	12	2.5924	.4448
V	2470	6	3.2470	.4994
VI	2470	12	2.3545	1.1179

Figure 11. Variability of Theoretical (Gamma) Distribution of Zonal Component Gust During February at Cape Kennedy as a Function of Altitude for Various Cut-Off Frequencies, λ_c

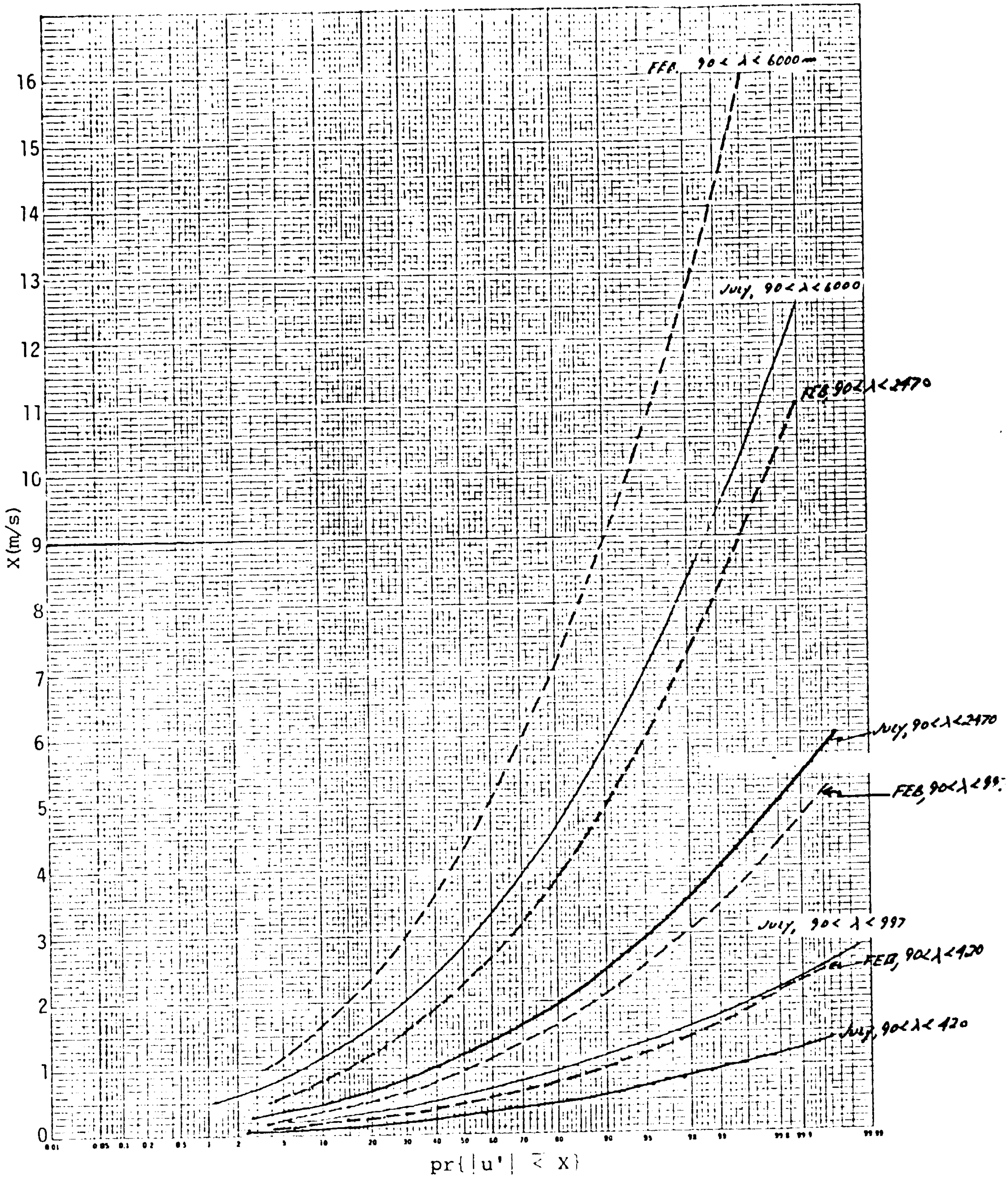


Figure 12. Theoretical (Gamma) Distribution of Zonal Component Gust at 12 km during July and February for λ_c = 997 and 6000 meters

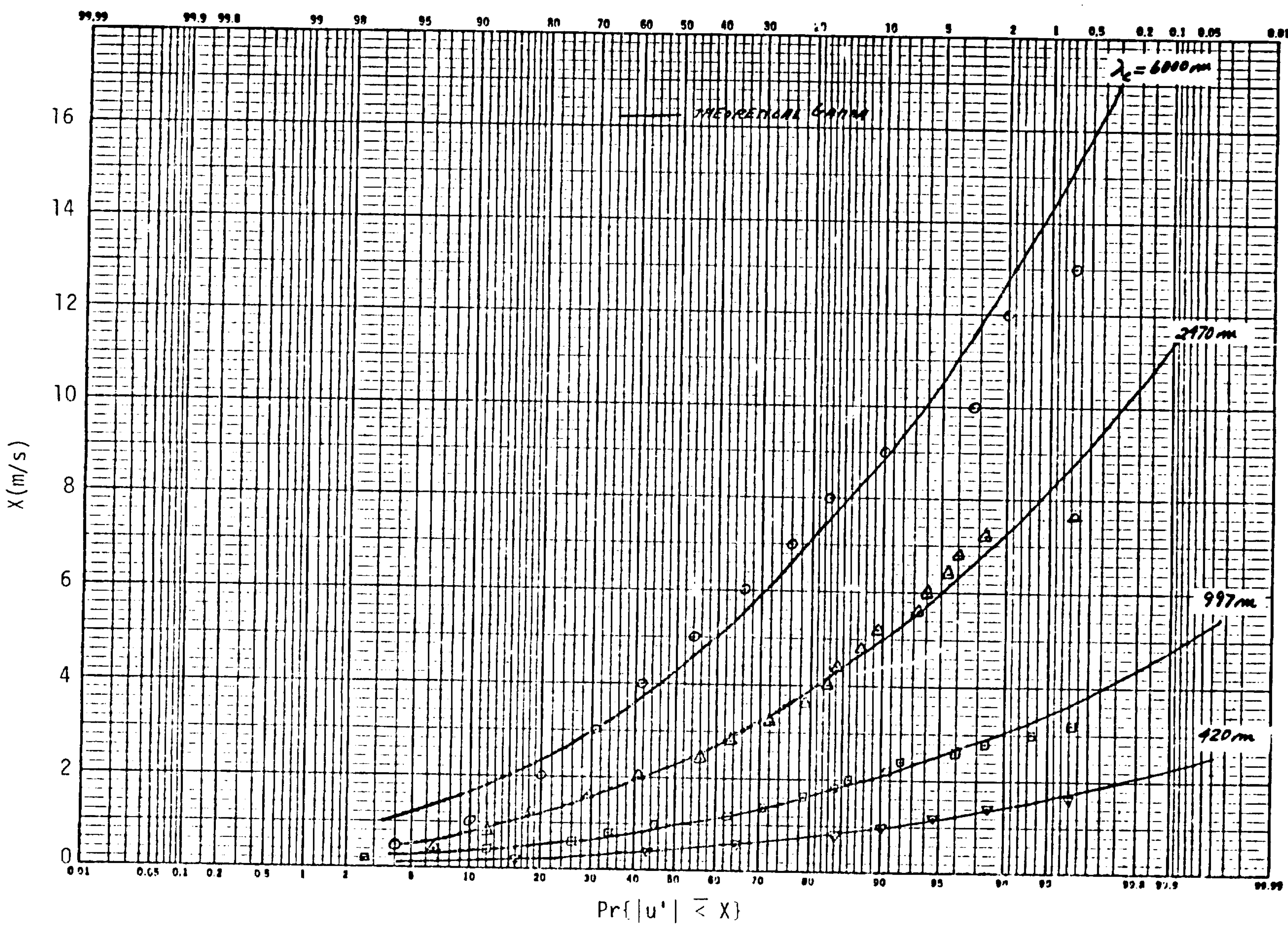


Figure 13. Theoretical (Gamma) and Observed Probability Distribution of u-Component Gust at 12 km During February at Cape Kennedy

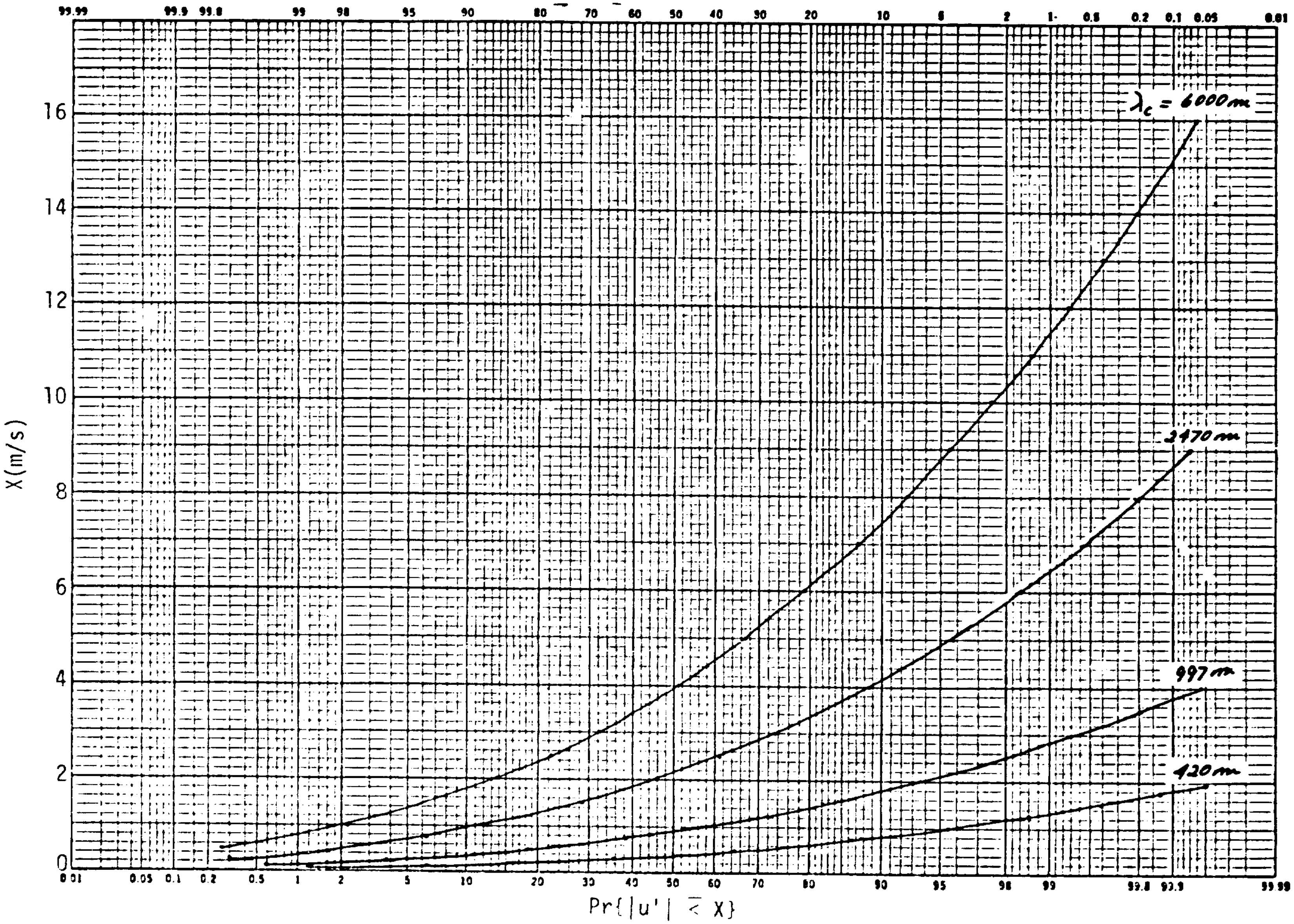


Figure 14. Theoretical (Gamma) Probability Distribution of u-Component Gust at 12 km During April at Cape Kennedy

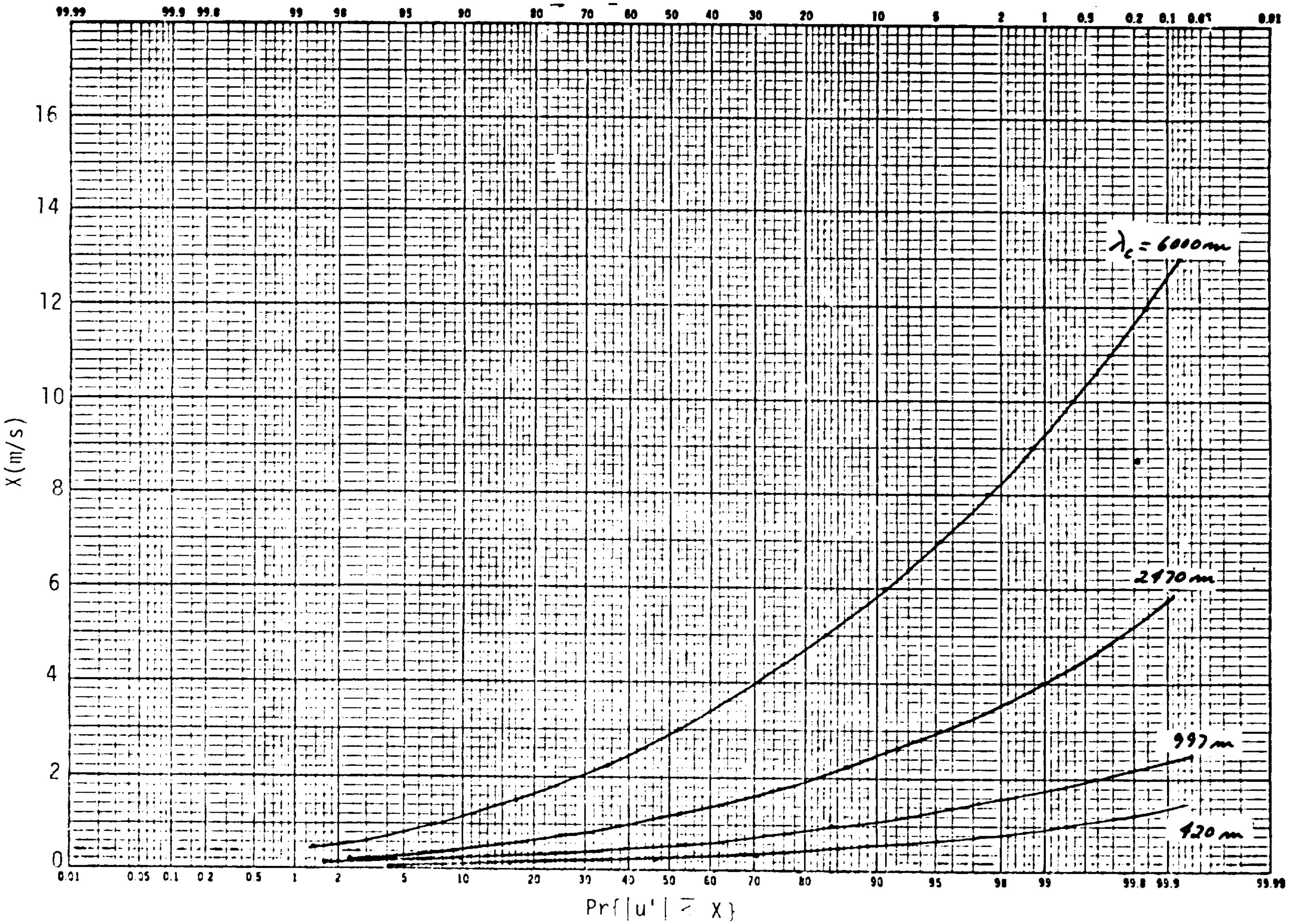


Figure 15. Theoretical (Gamma) Probability Distribution of u-Component Gust at 12 km During July at Cape Kennedy

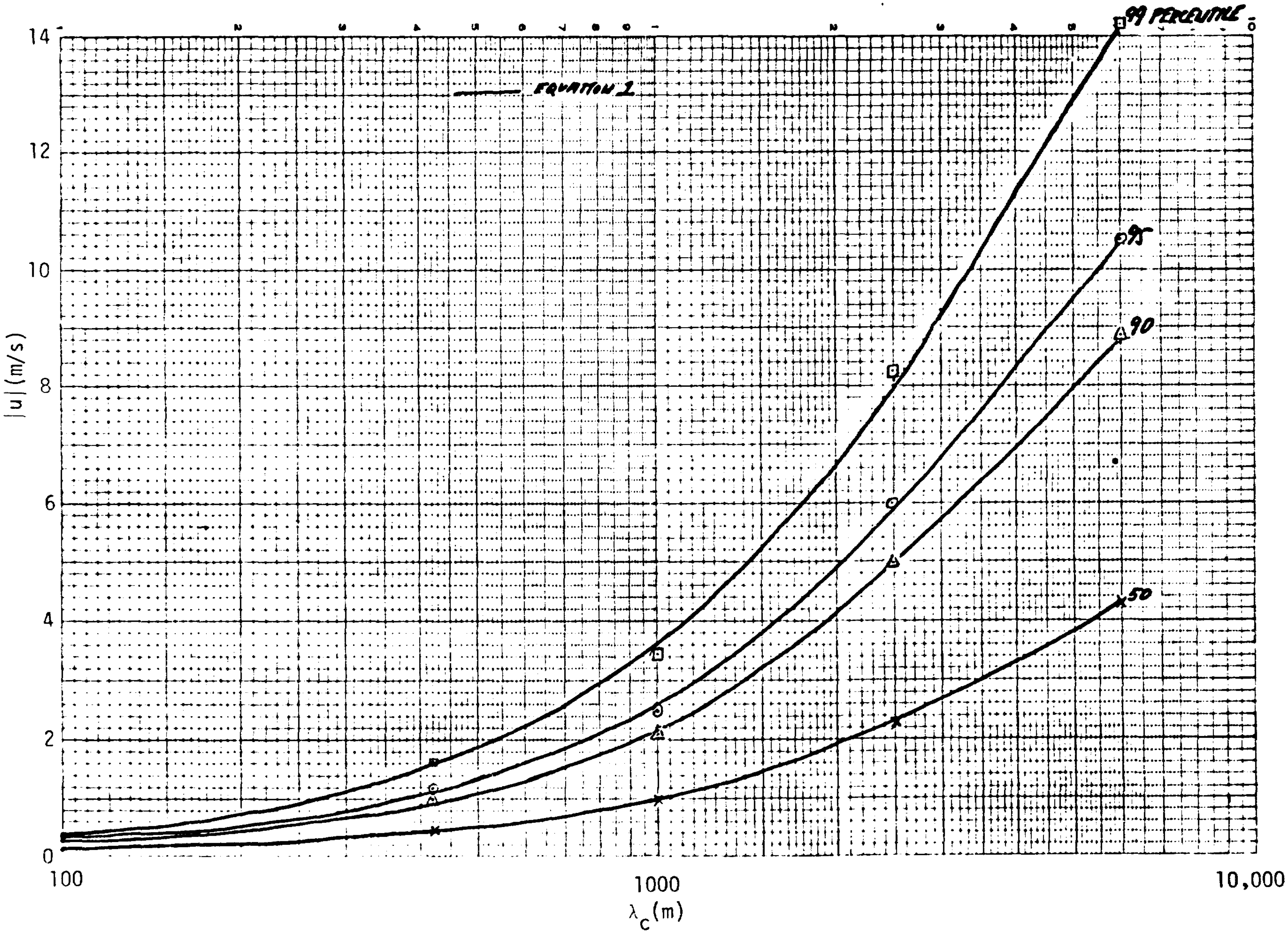


Figure 16. Empirical Functions (From Equation 16) for Percentiles of u-Component Gust at 12 km During February

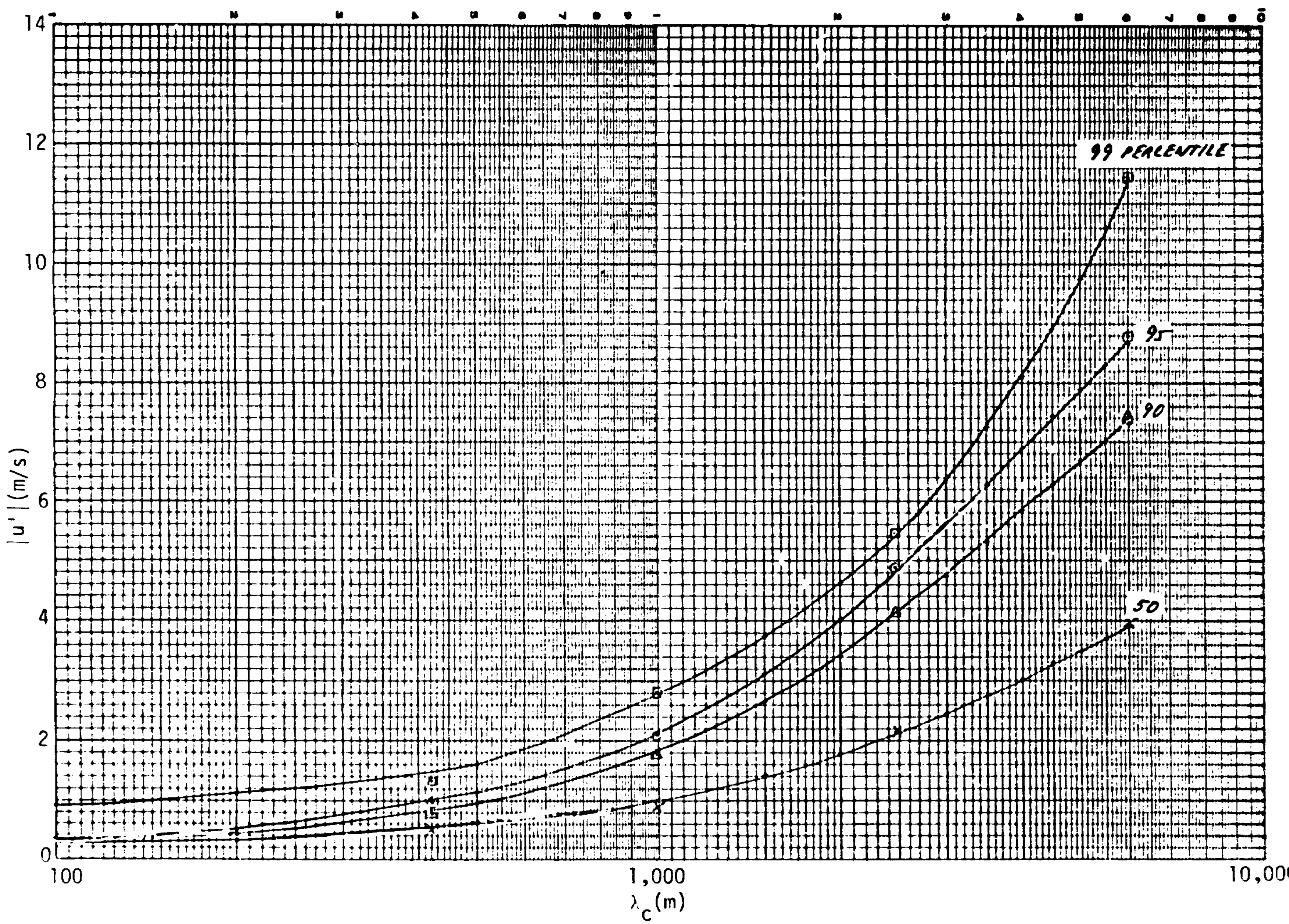


Figure 17. Empirical Functions (From Equation 16) for Percentiles of u-Component Gust at 12 km During April

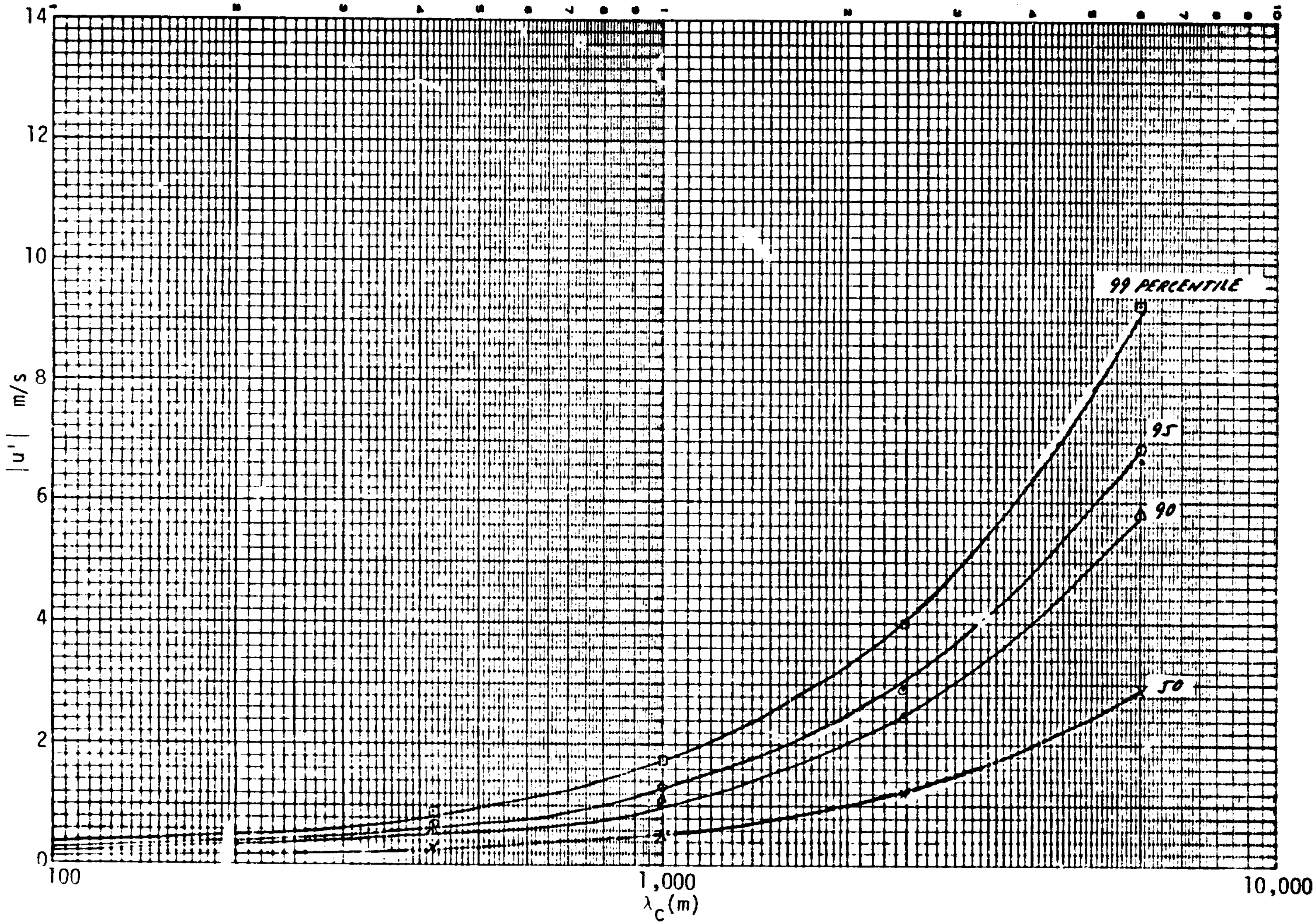


Figure 18. Empirical Functions (From Equation 16) of U-Component Gust at 12 km During July

Table 2. Parameters d_0, d_1, and d_2 of Equation 16 for the 50, 90, 95, and 99 Percentile of $|u'|$

Percentile	Month	$d_0 (ms^{-1})$	$d_1 (s^{-1})$	$d_2 (s^{-1} m^{-1})$
50	February	-.001591	.001067	-5.9011×10^{-8}
	April	.177955	.000889	-4.4465×10^{-8}
	July	.042273	.000491	-2.1179×10^{-9}
90	February	.051364	.002288	-1.4034×10^{-7}
	April	.035227	.001932	-1.2065×10^{-7}
	July	.095000	.000987	-5.2348×10^{-9}
95	February	.007045	.002776	-1.7370×10^{-7}
	April	.090227	.002229	-1.3334×10^{-7}
	July	.111364	.001209	-1.1429×10^{-8}
99	February	.030682	.003855	-2.5348×10^{-7}
	April	.767955	.001987	-3.6534×10^{-8}
	July	.197727	.001589	-1.4086×10^{-8}

SECTION V. CONCLUSIONS

This interim report has been prepared to document and briefly summarize the work performed during the first 6 months of this study. To date, all the statistical and computational techniques required to successfully complete the work under the contract have been established and partially implemented. The computer output given in the Appendices illustrates but does not represent all of the computations performed during the first half of the contract. From the results obtained so far, it is concluded that the objectives of the contract will be satisfied within the imposed time and budget constraints.

The preliminary analysis of the gust data indicates a strong variability with altitude, season, and wavelength regime. An extension of the analyses to include a number of additional months and to include conditional distributions of gust magnitude given gust length, distributions of gust modulus, and phase differences between gust components has begun and will be completed during the next 2 months. At that time, all the necessary data for the vector wind gust model will have been generated.

SECTION VI. FINANCIAL SUMMARY

	Exact; Based on Data through 9/28/69	Estimate; 6-Month Period Through 10/9/79
Cumulative Cost (For period beginning 10 April 1979)	$21,497.41	$22,730
Cost to Complete Contract:	28,487.59	27,255
Total Cost:	49,985.00	49,985
Total Negotiated Cost:	49,985.00	49,985
Estimated Percentage of Physical Completion of Contracted Effort	43	45

SECTION VII. REFERENCES

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2. Luers, J., and Engler, N.: On Optimum Methods for Obtaining Wind Data from Balloon Sensors. Journal of Applied Meteorology, Vol. 6, No. 5, October 1967, pp. 816-823.

3. DeMandel, R. E., and Krivo, S. J.: Study to Improve the Accuracy and Resolution of FPS-16 Radar/Jimsphere Wind Measurements. Lockheed Missiles and Space Company Final Report under NASA Contract NAS8-26128, June 1971.

4. Brown, S. C.: 150 Per Month Jimsphere Wind Speed Profiles for Aerospace Vehicle Design Capability Studies, KSC, Florida. NASA Document NASA/MSFC-ES81, February 1978.

5. DeMandel, R. E., and Krivo, S. J.: Selecting Digital Filters for Application to Detailed Wind Profiles. NASA CR-61325, 1971.

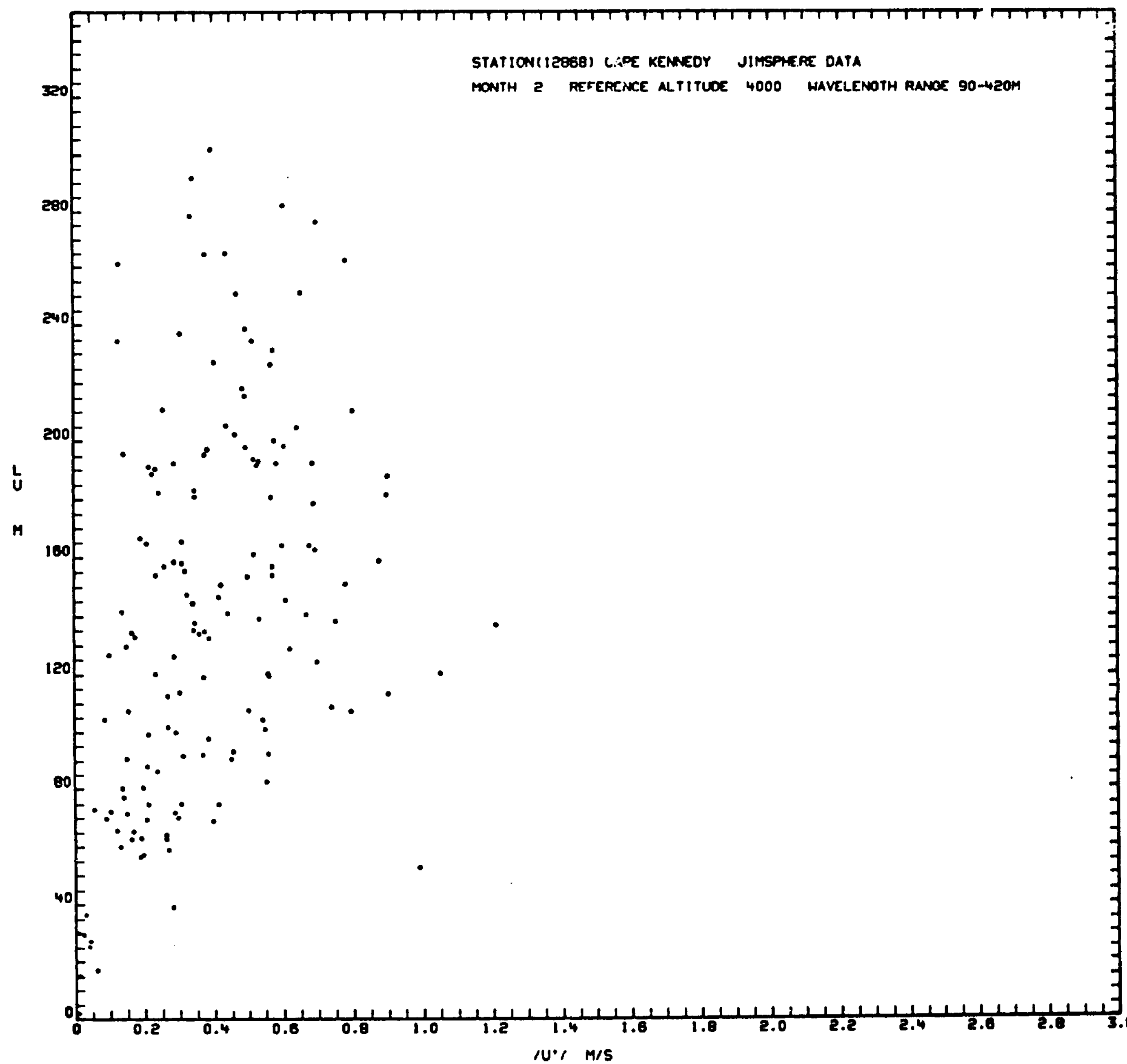
6. Adelfang, S. I.: Wind Profiles for Space Shuttle Loads Analysis. Science Applications Report SAI-79-819HV for NASA/MSFC under Contract NAS8-32839, December 1978.

7. Thom, H. C. S.: Some Methods of Climatological Analysis. WMO Technical Note 81, WMO-MO.199.TP.103, 1966.

APPENDIX A. DATA DISPLAY

This appendix consists of plots of the data analyzed in this study for the month of February at six reference altitudes (4, 6, 8, 10, 12, and 14 kilometers) and for four filters. For the sake of brevity, additional plots for April and July which have been completed are not included in this report.

Another type of data display which consists of plots of all the filtered profiles, four to a page, is under development and is near completion. These will be furnished to the contract monitor during the second half of the contract.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240
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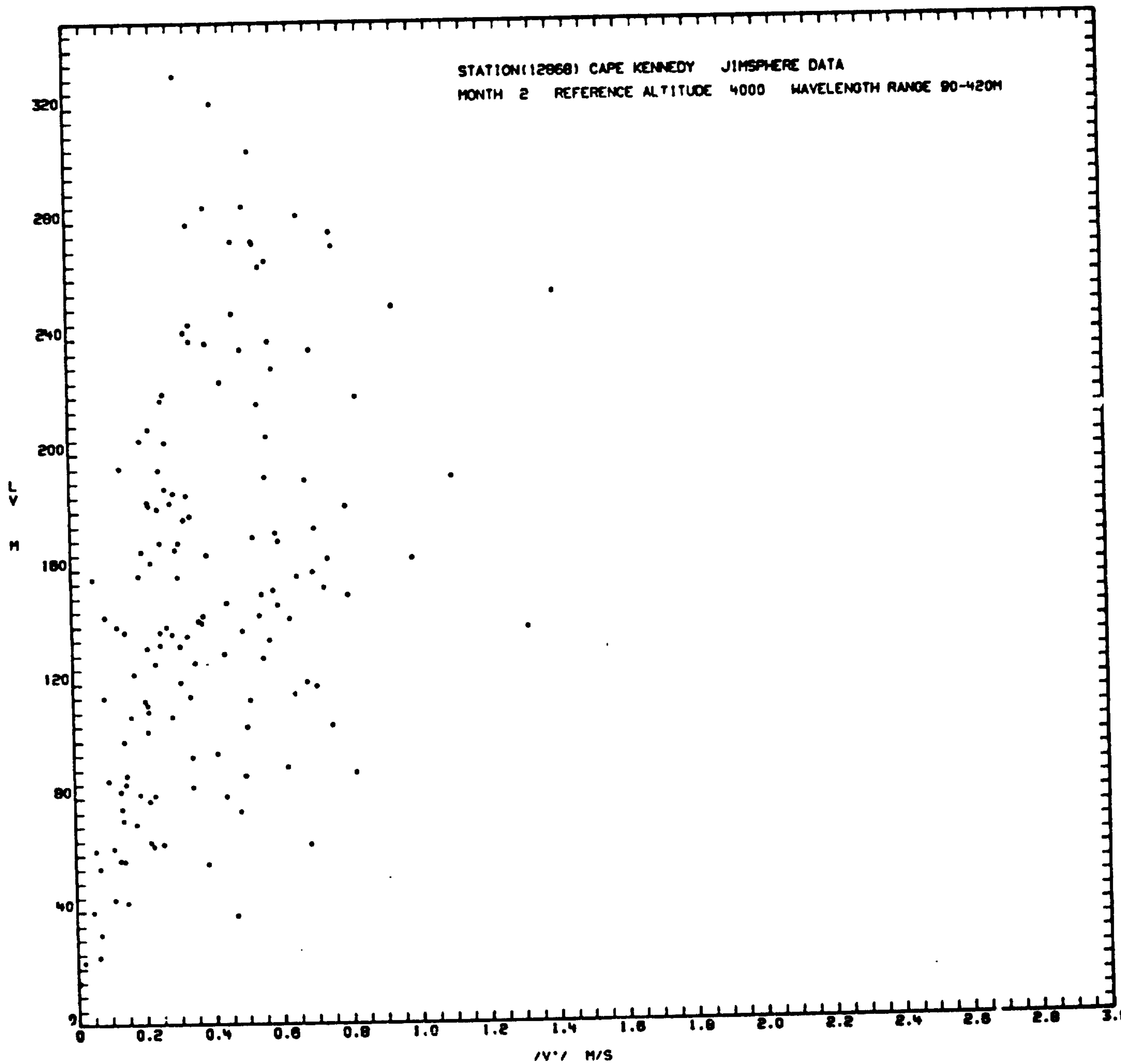
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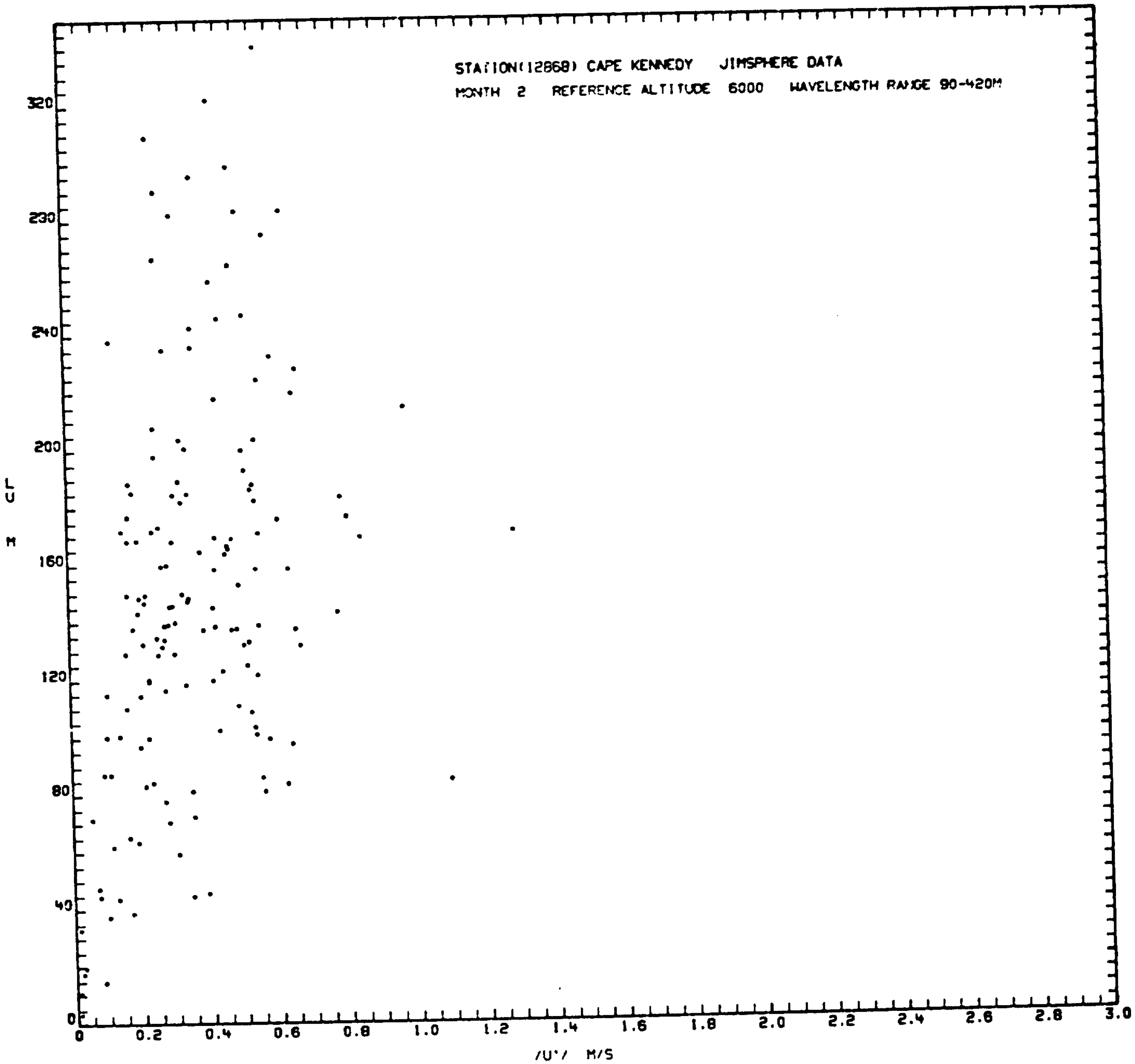
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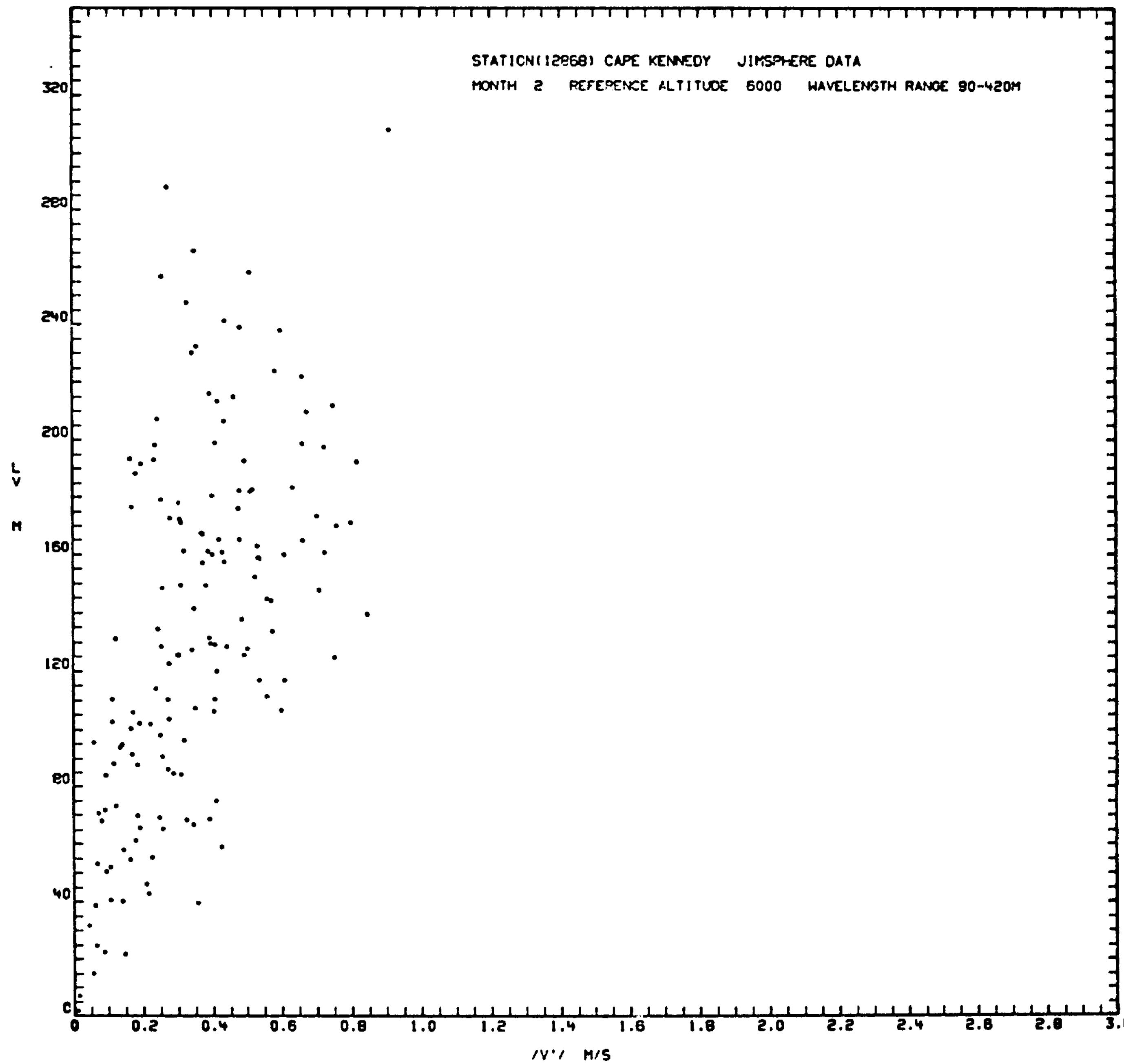
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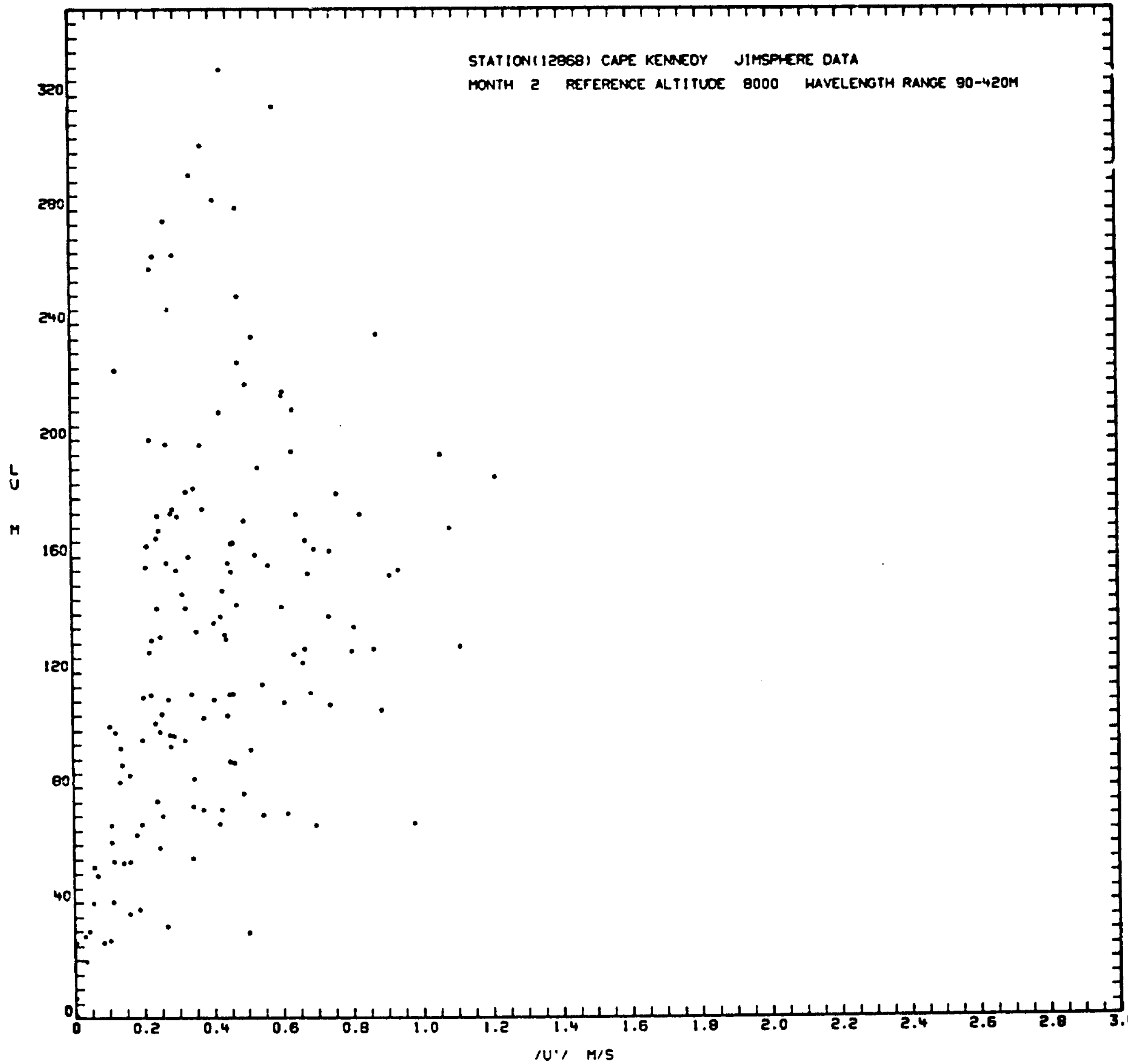
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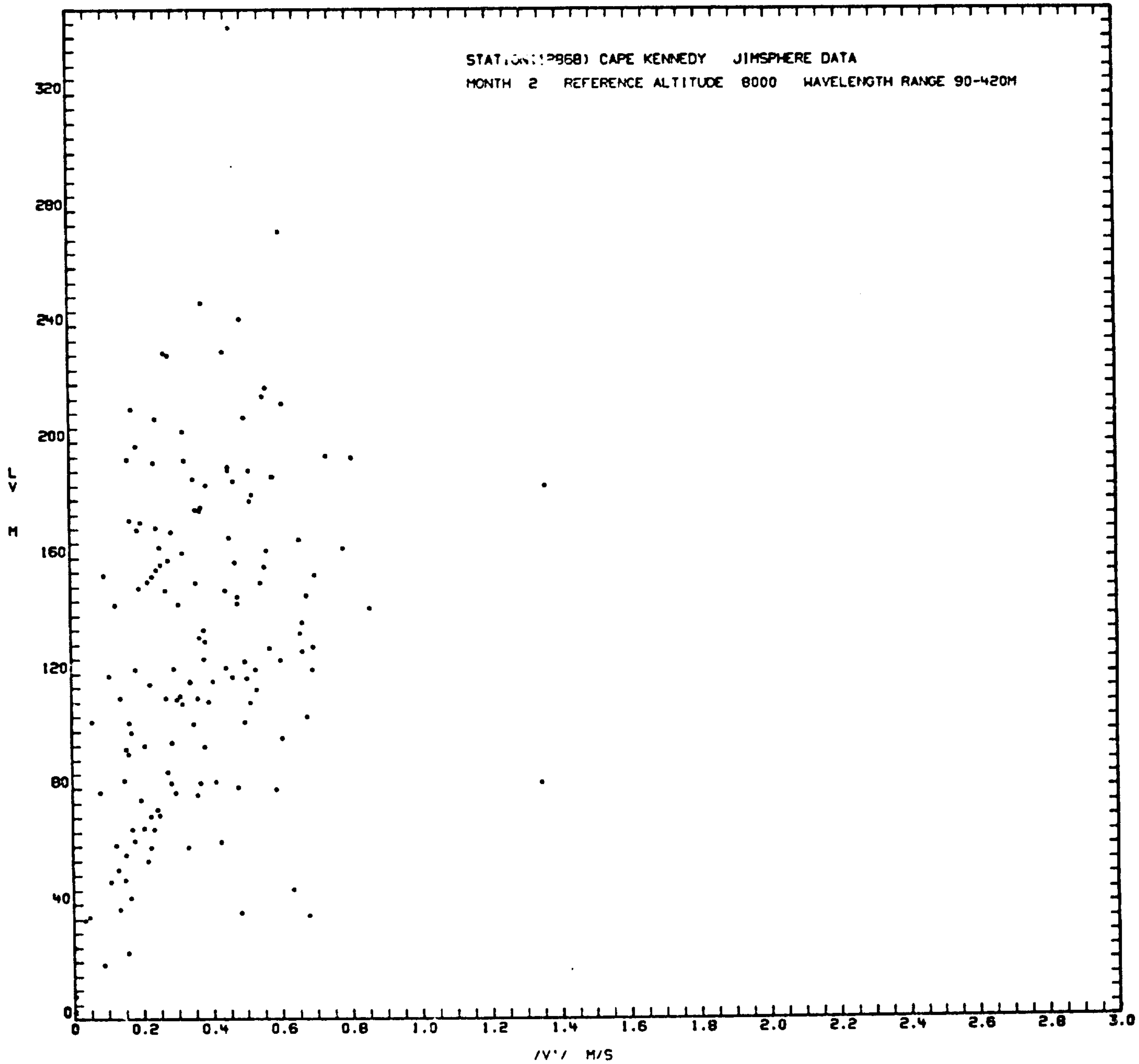
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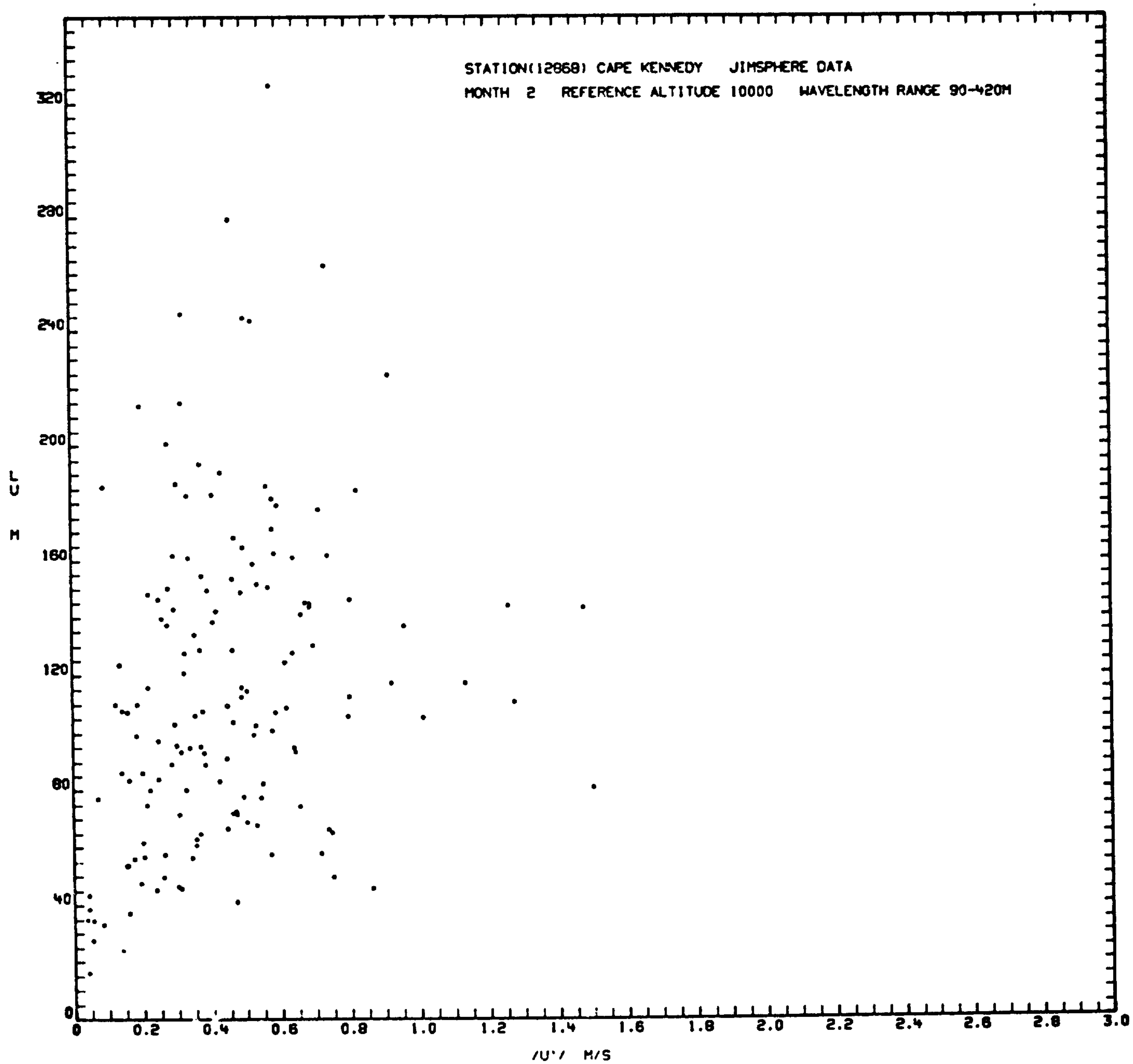
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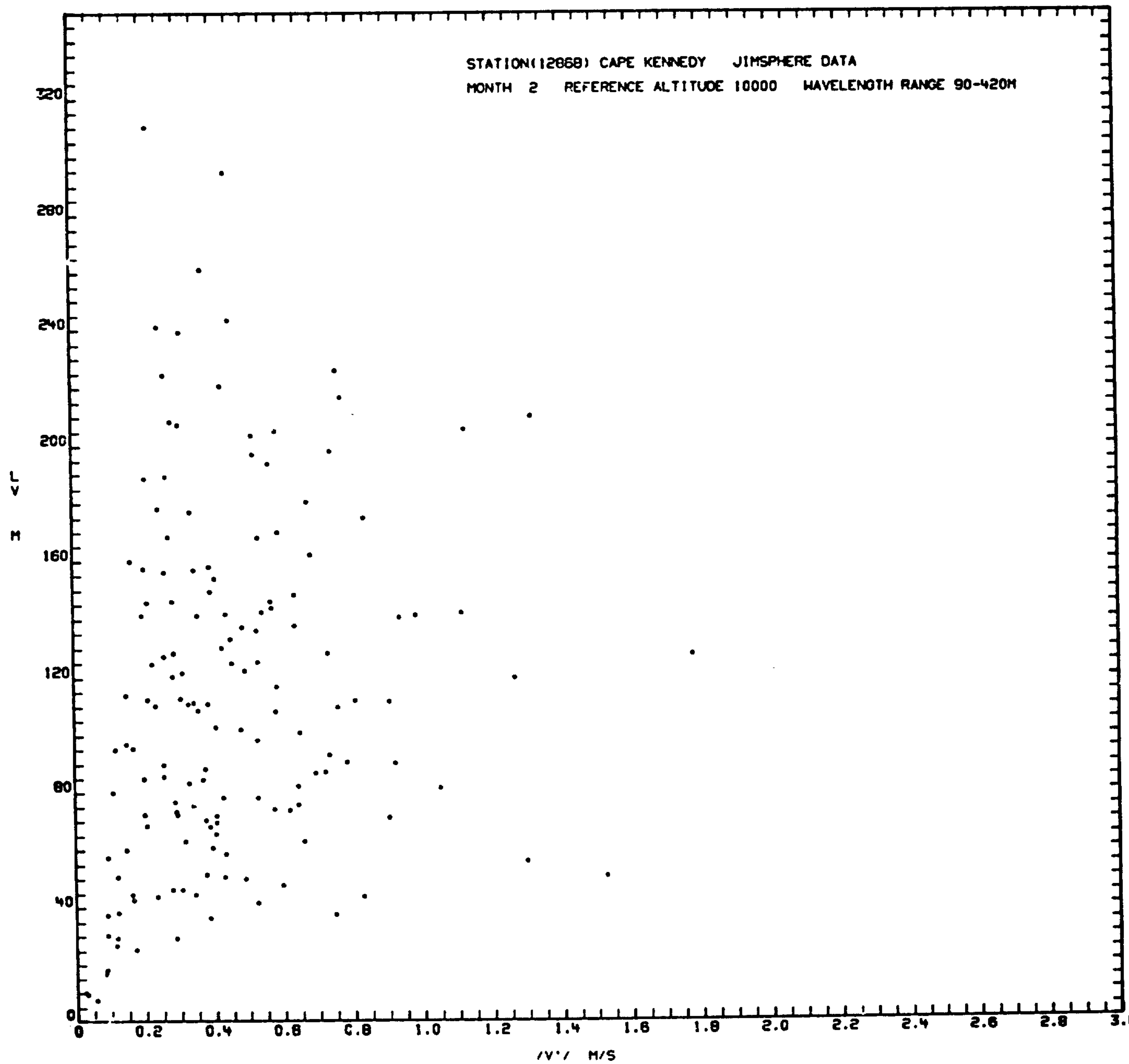
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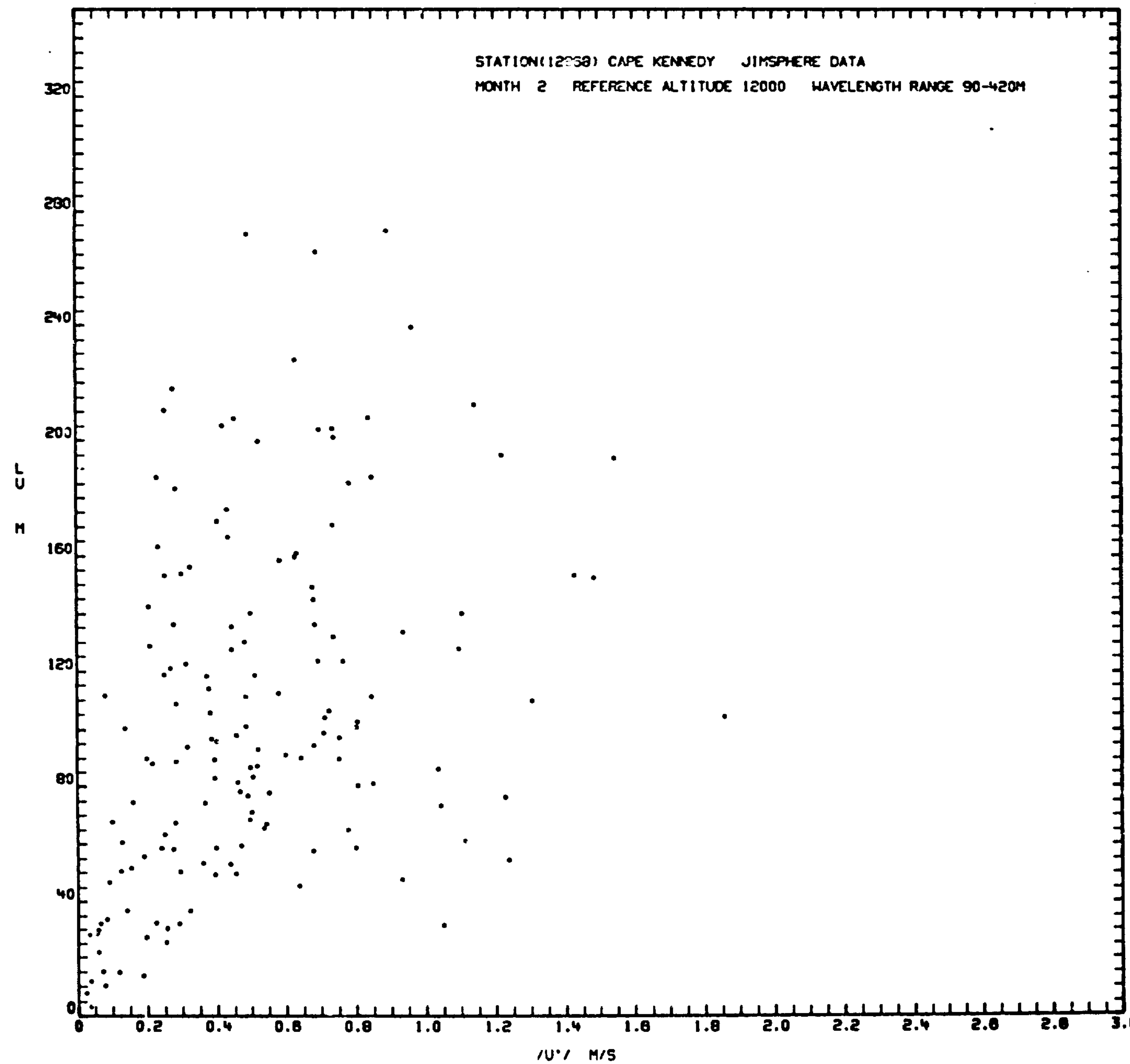
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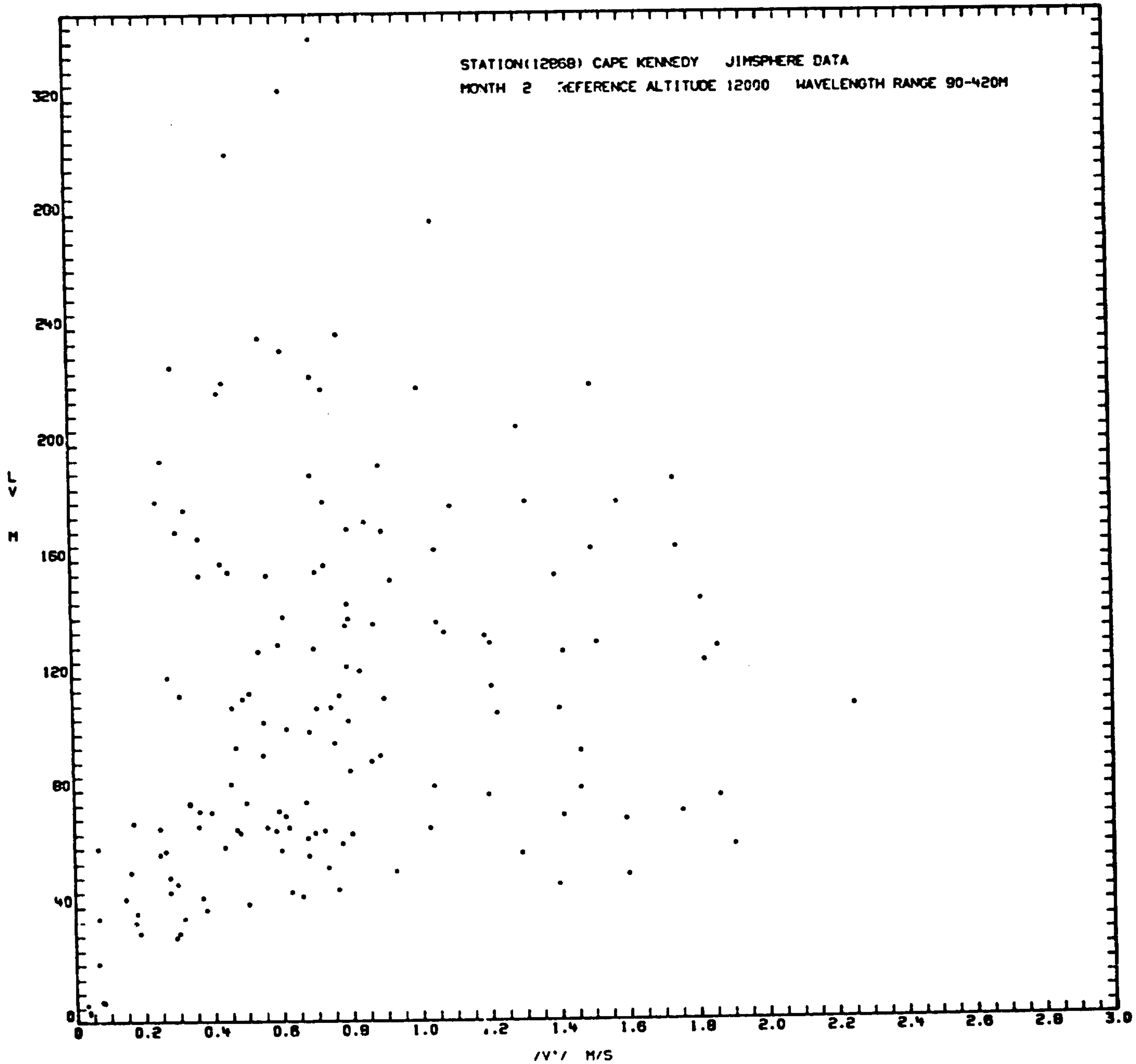
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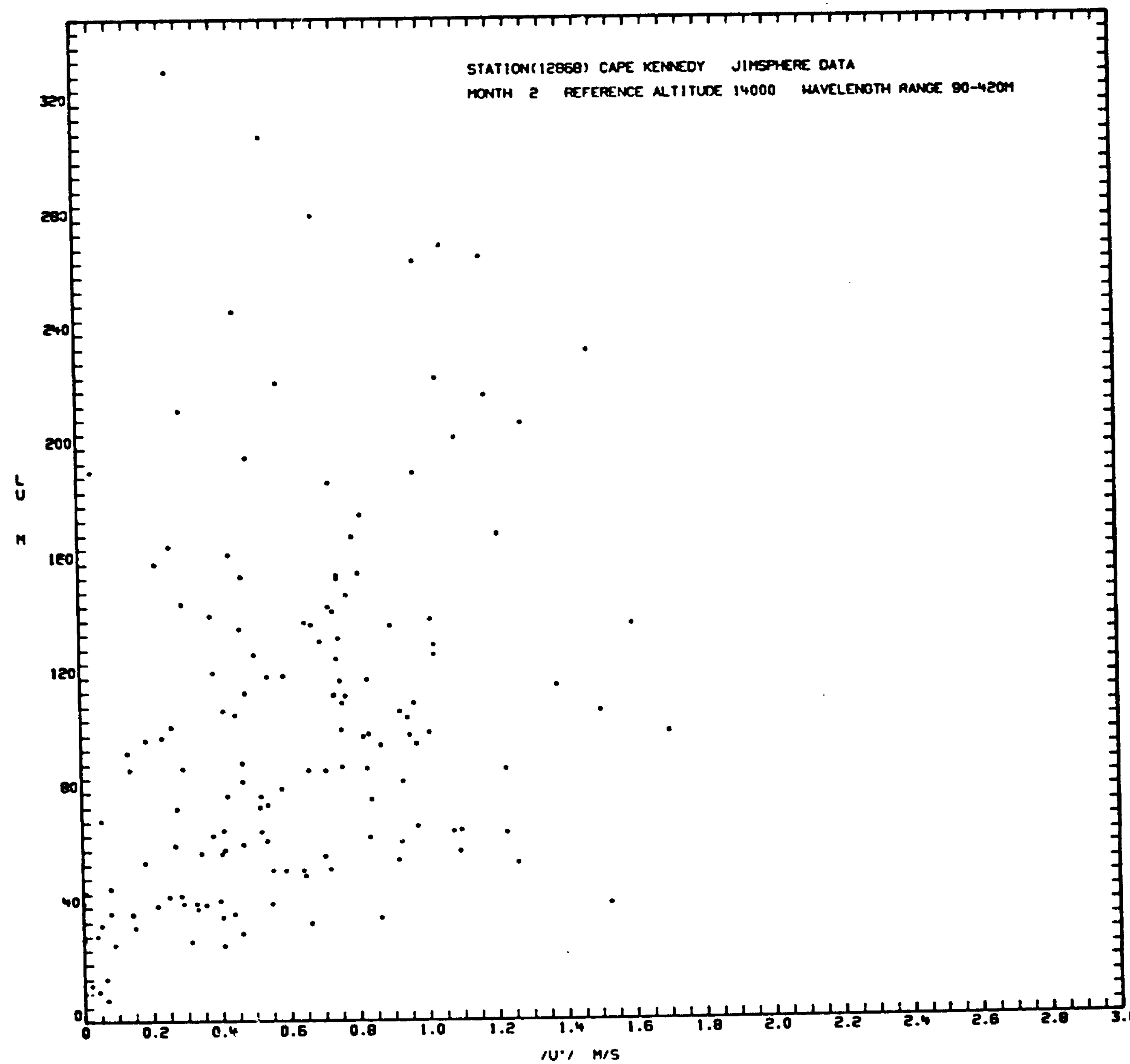
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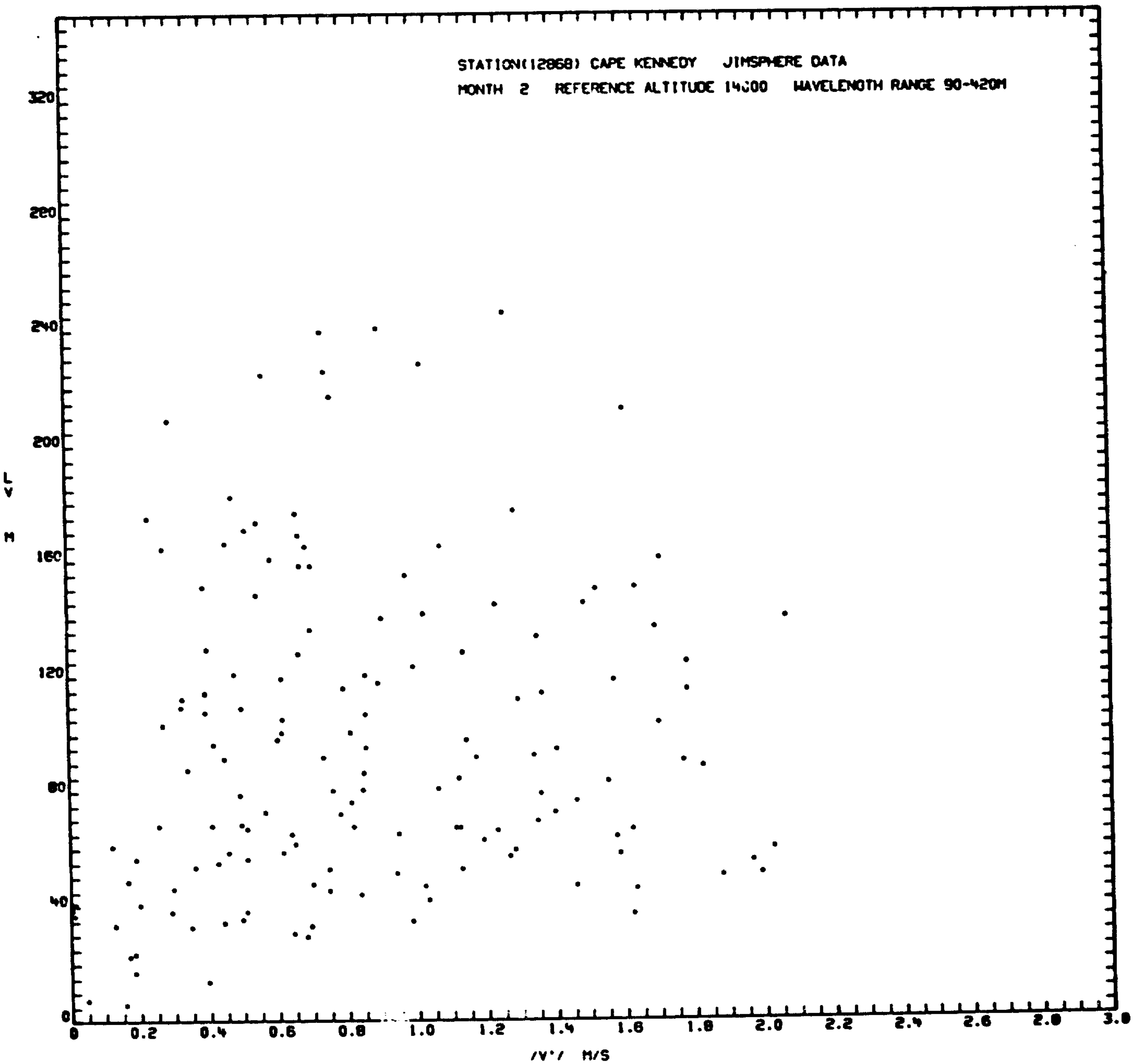

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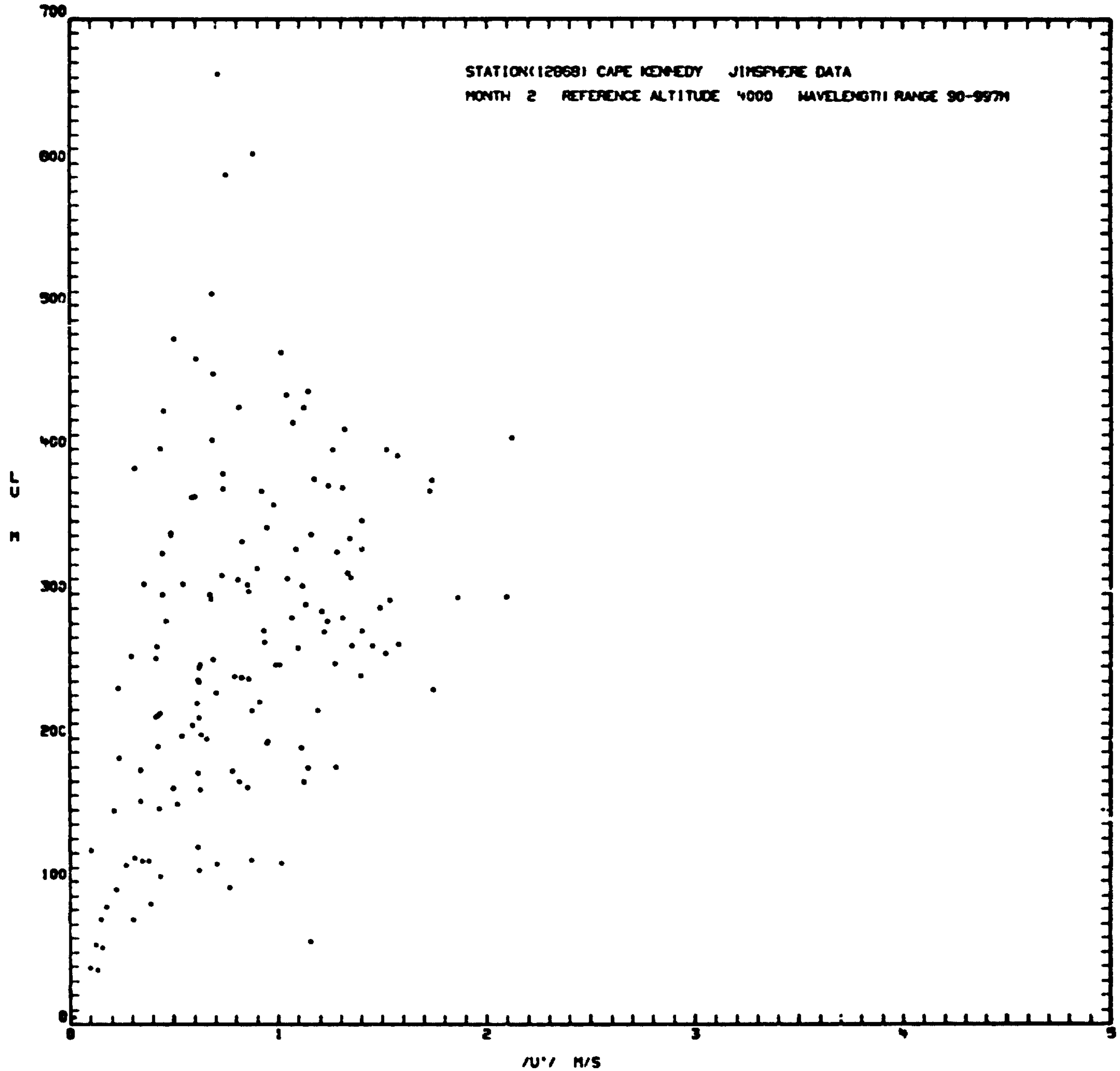
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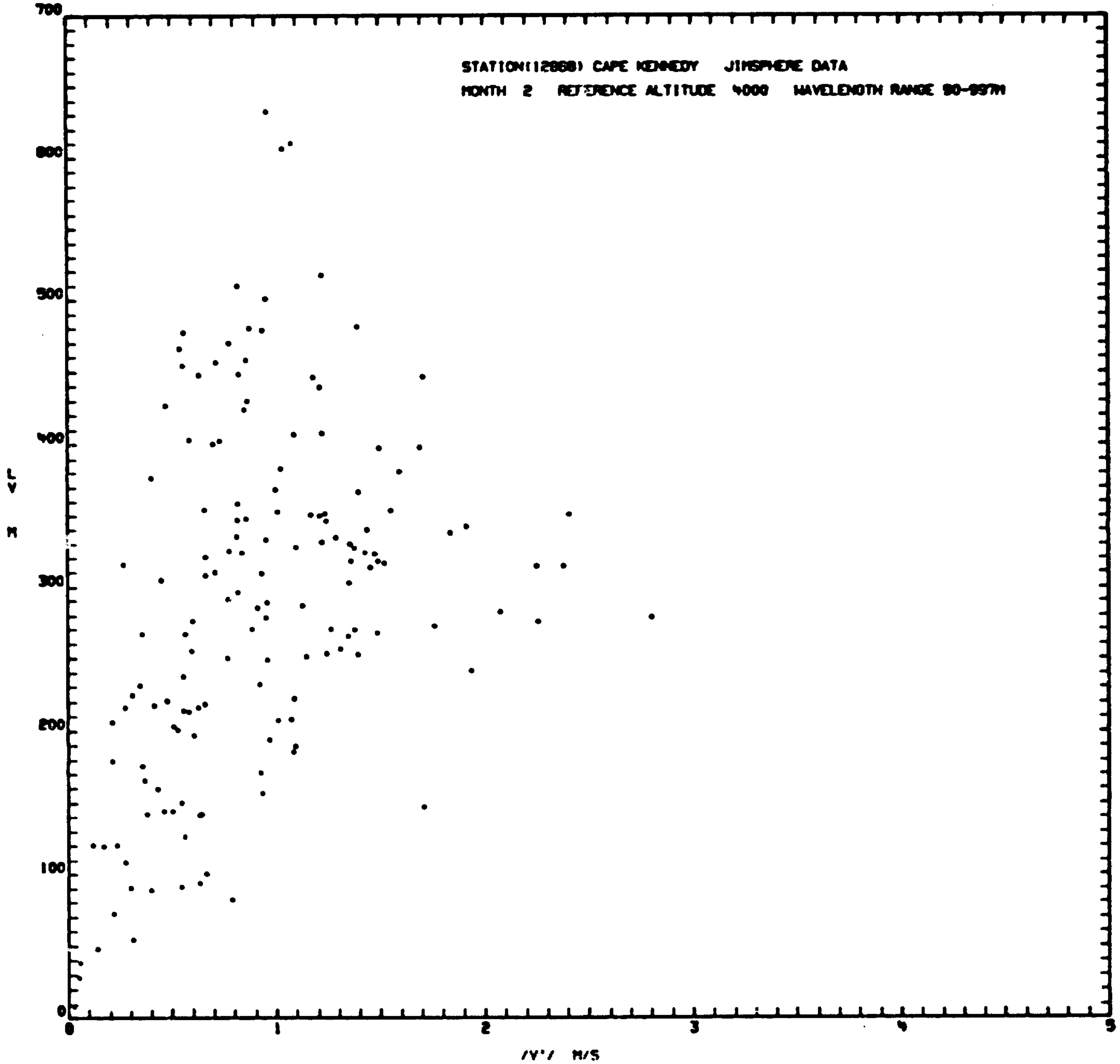
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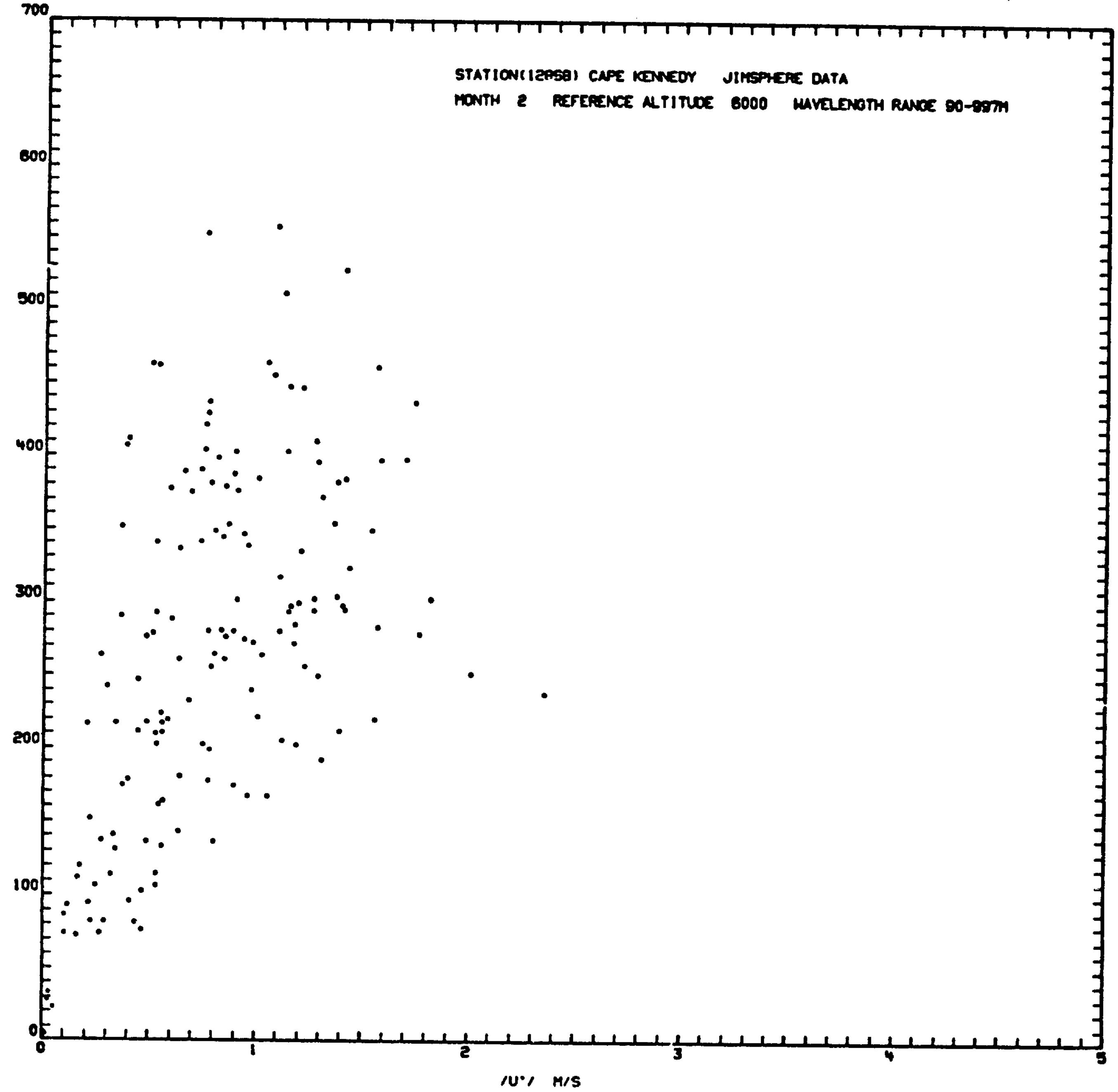
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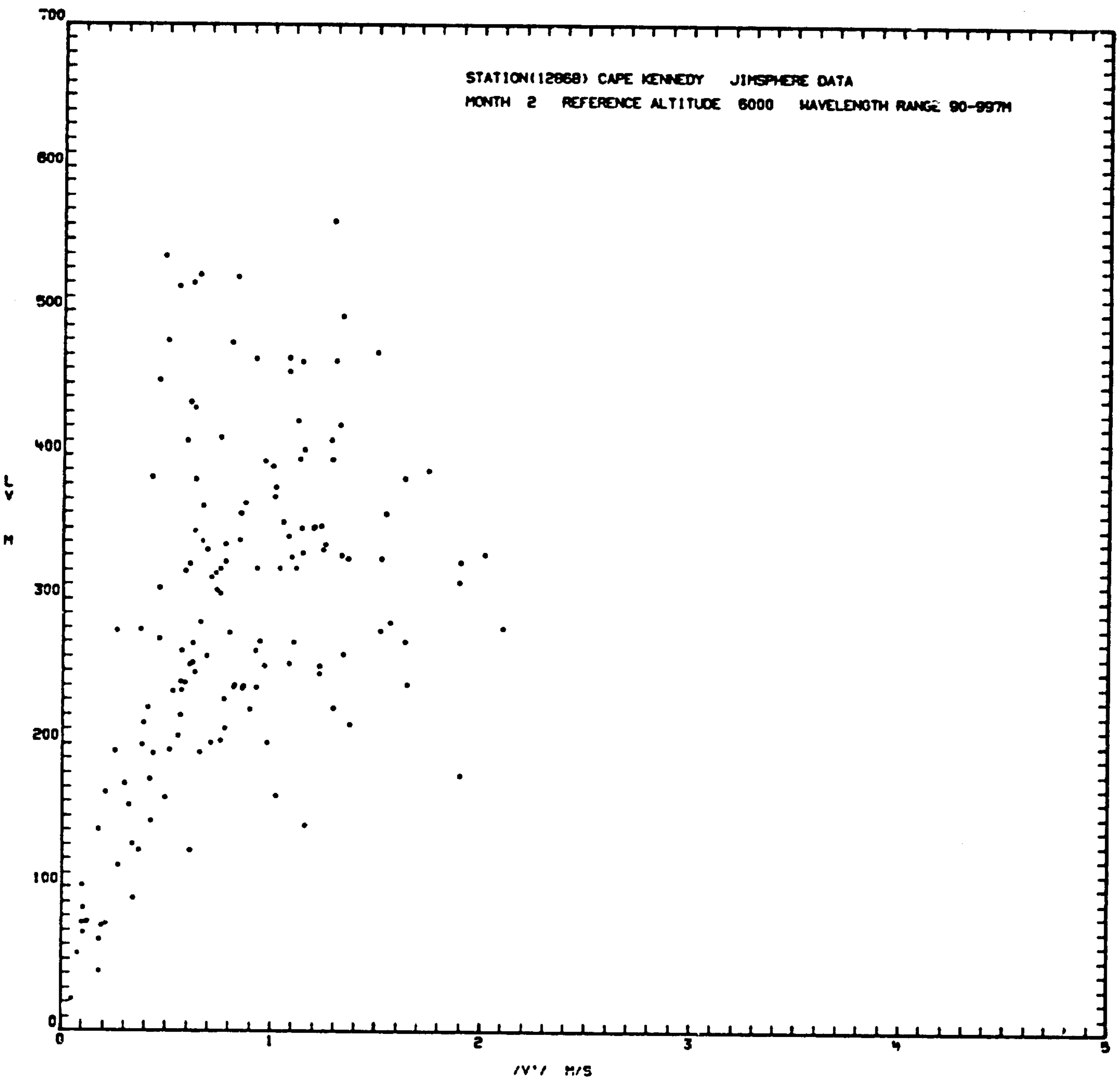

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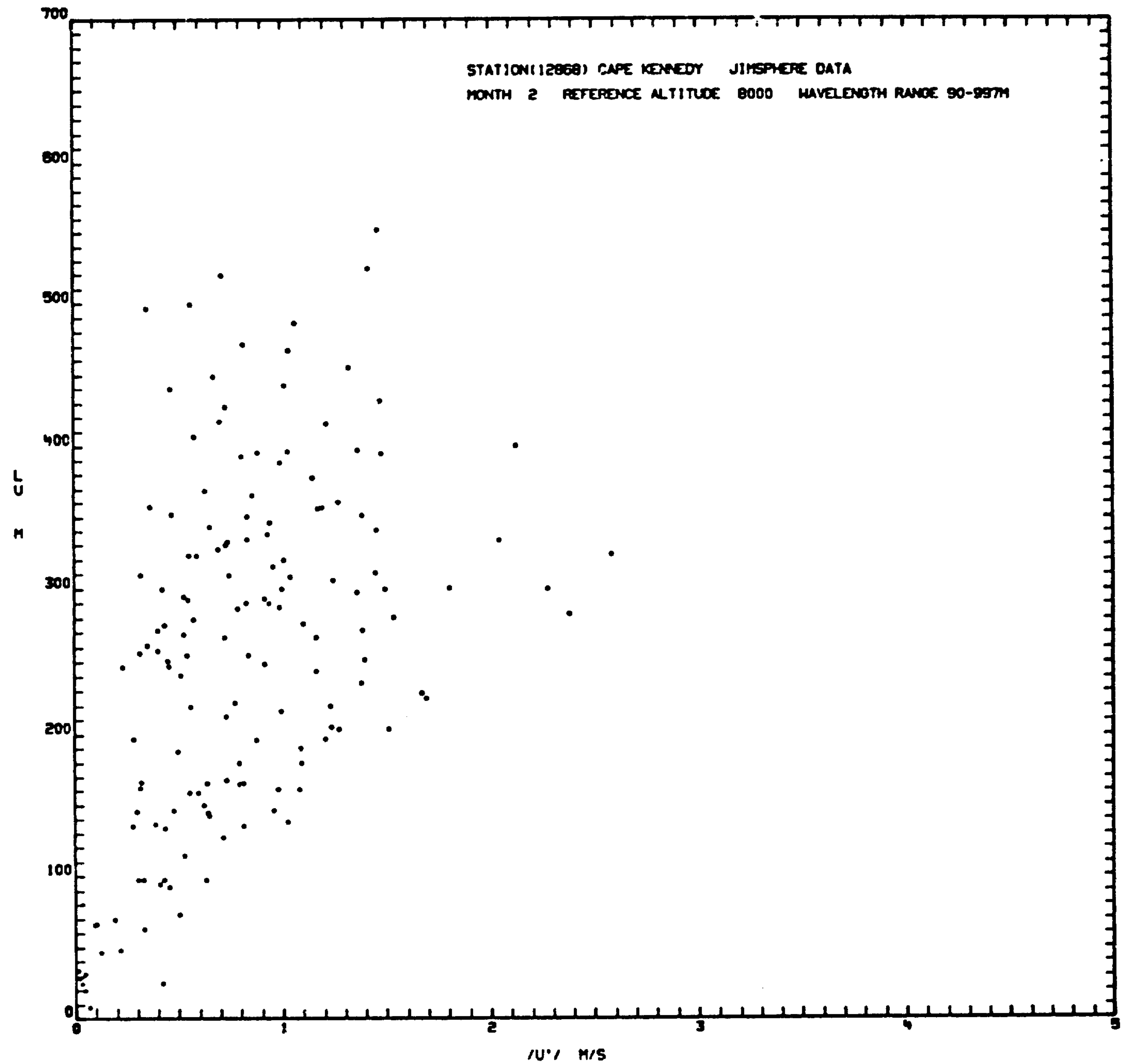
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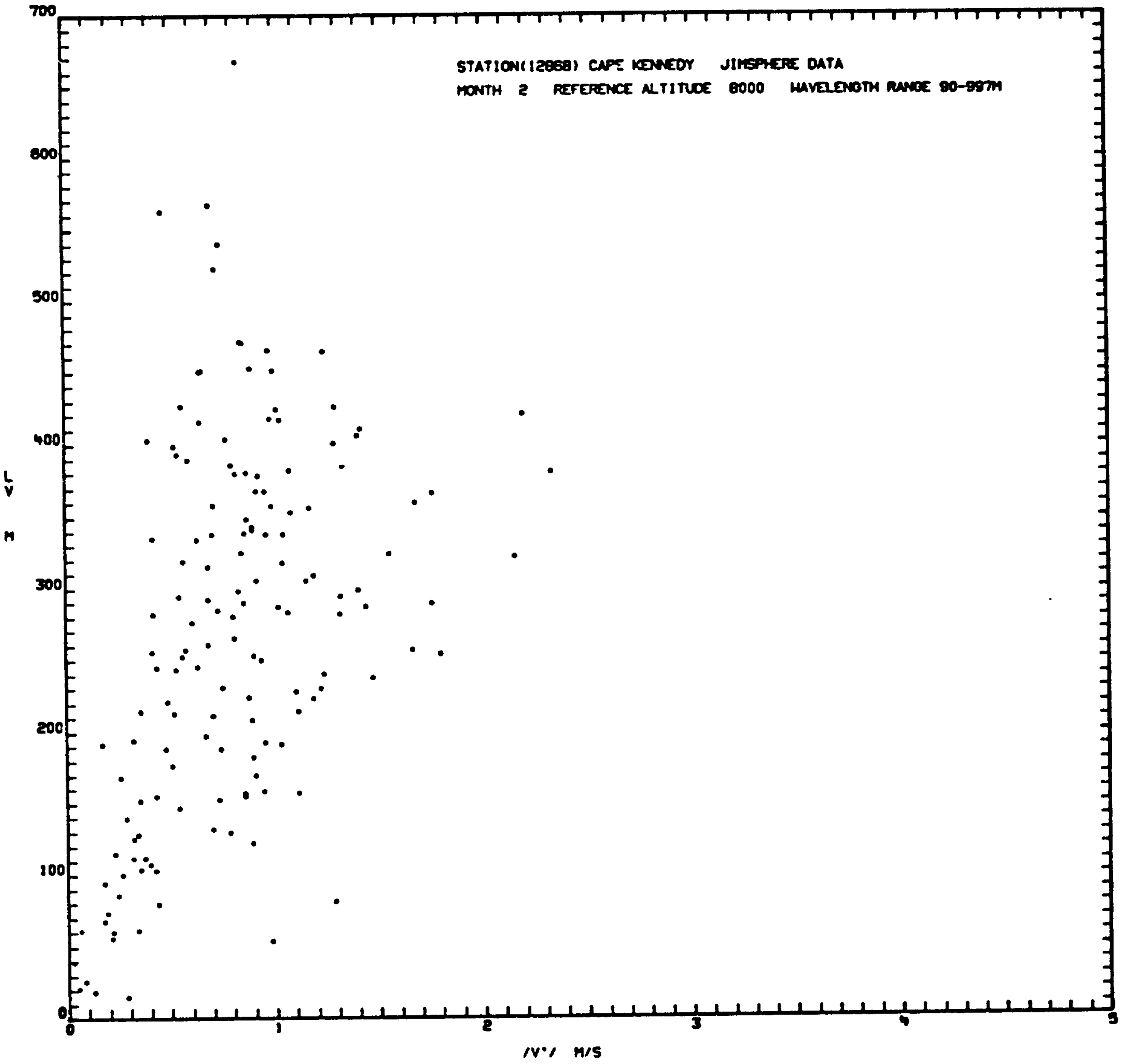
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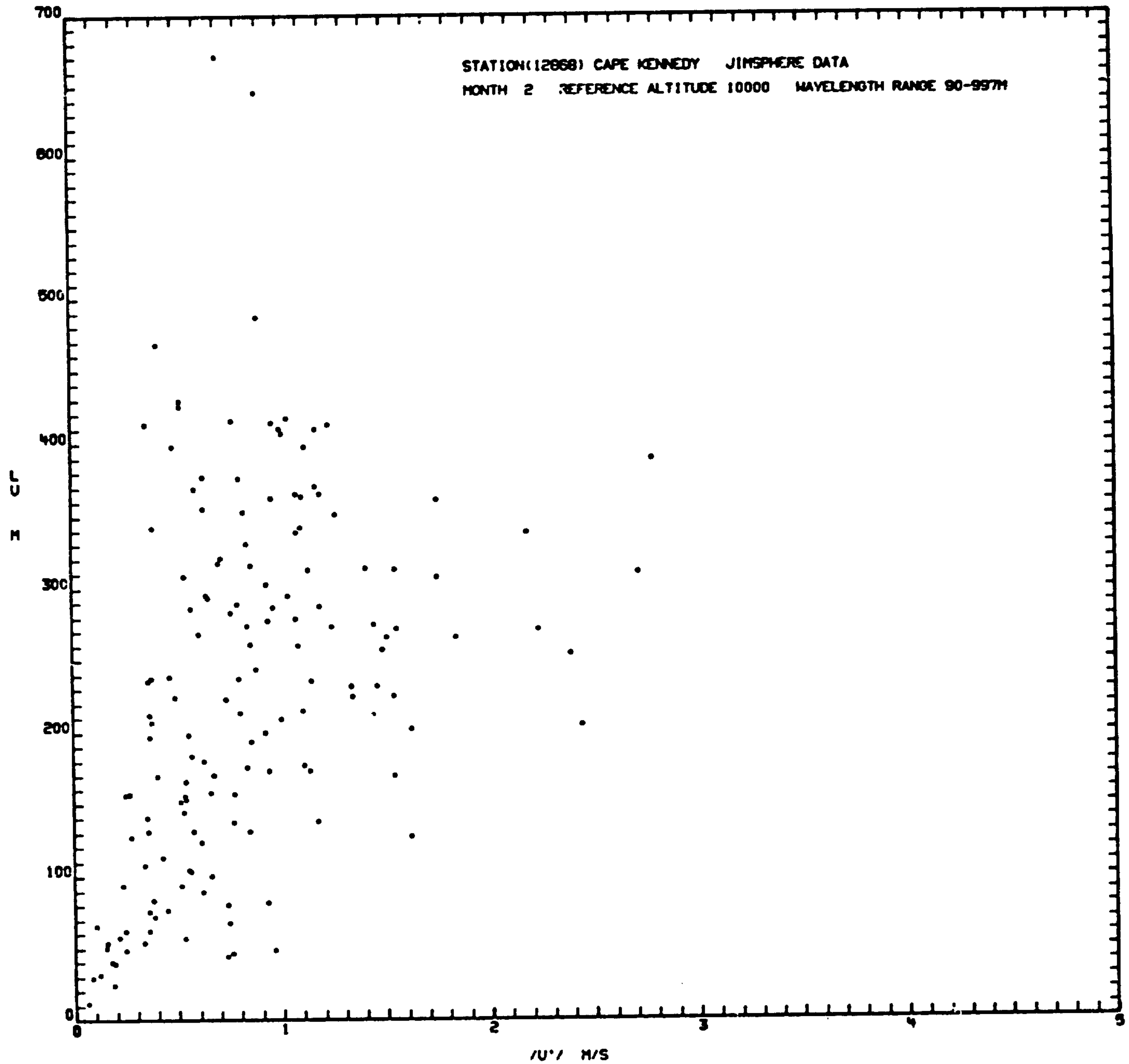
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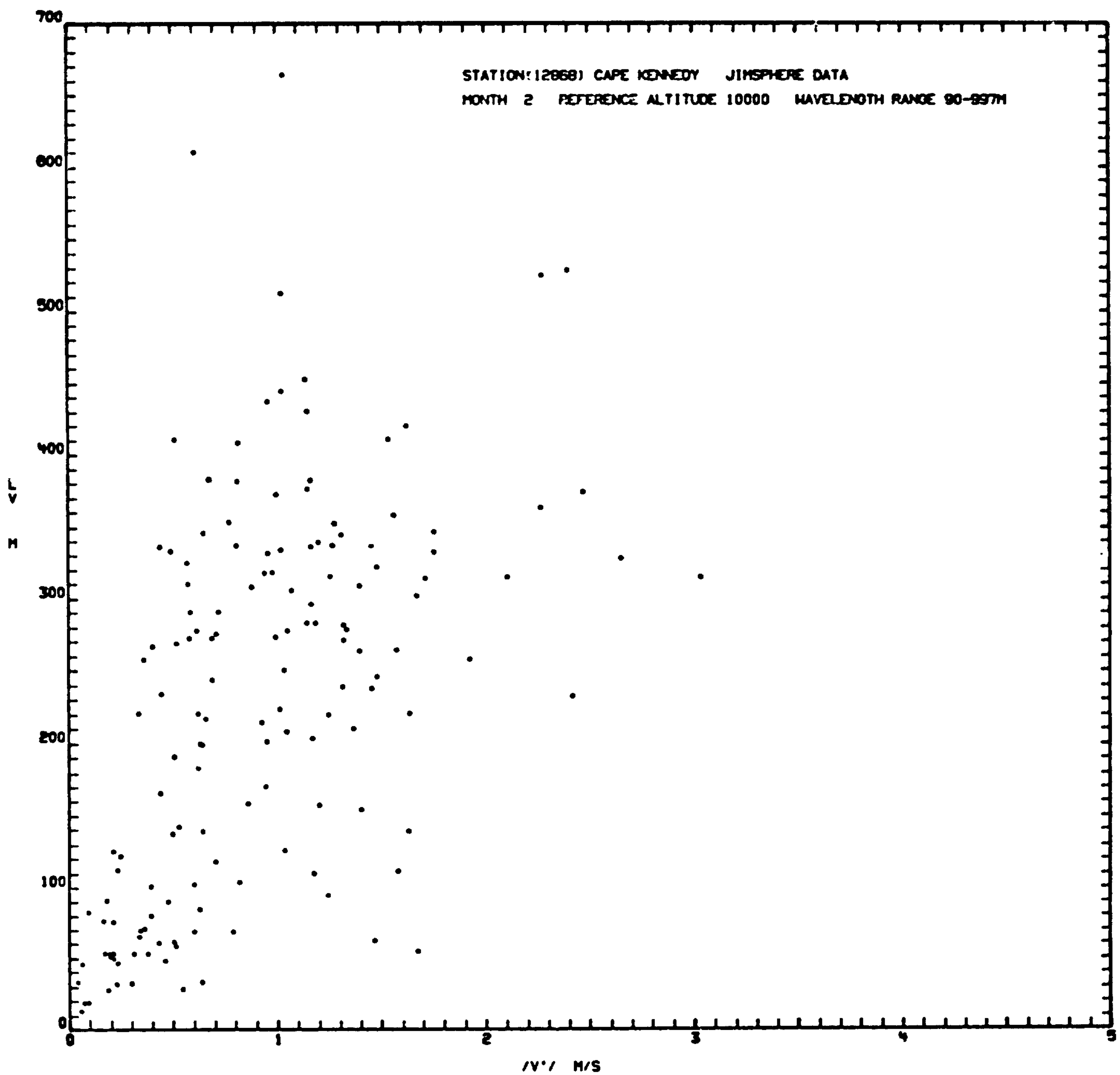
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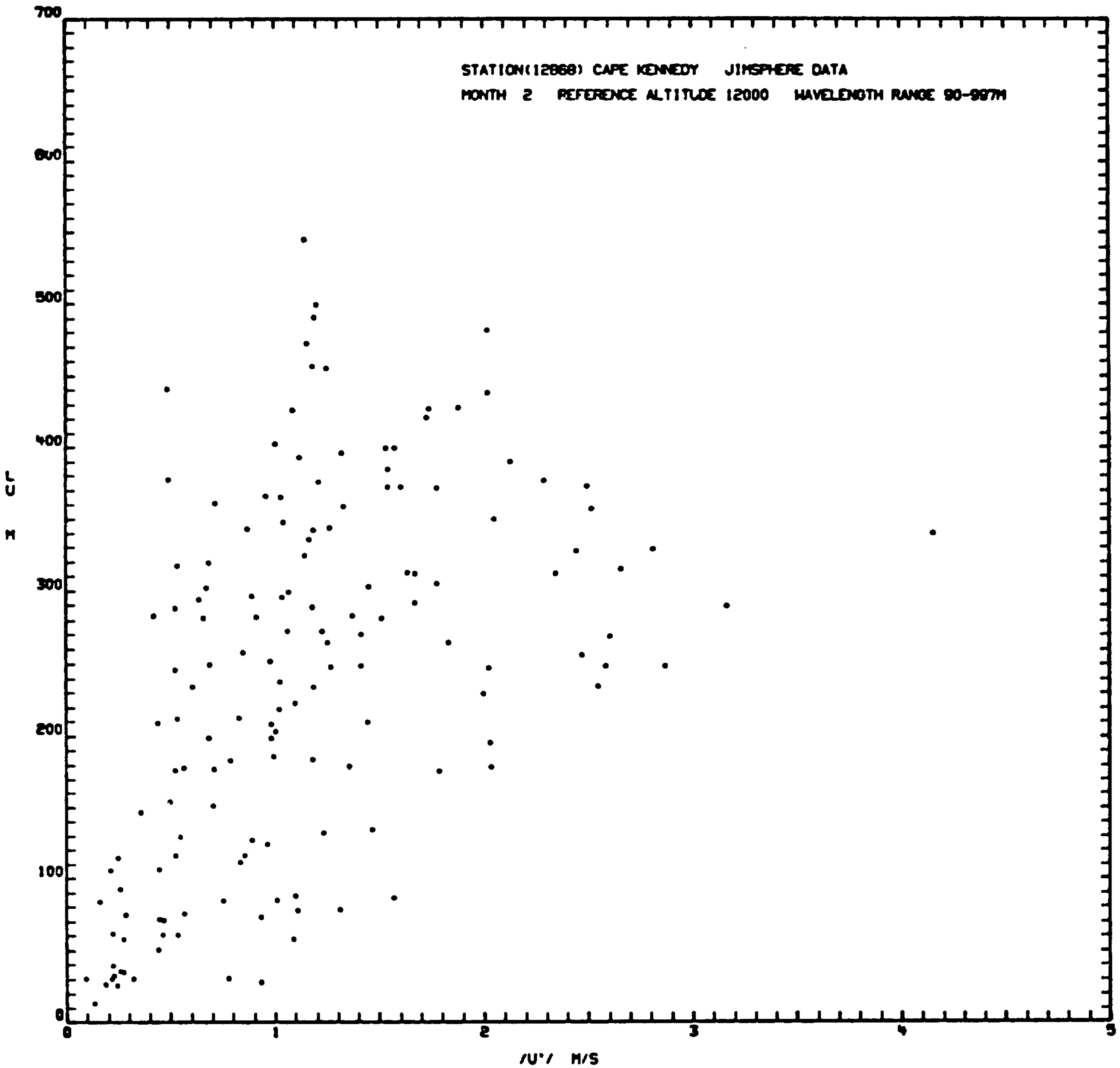
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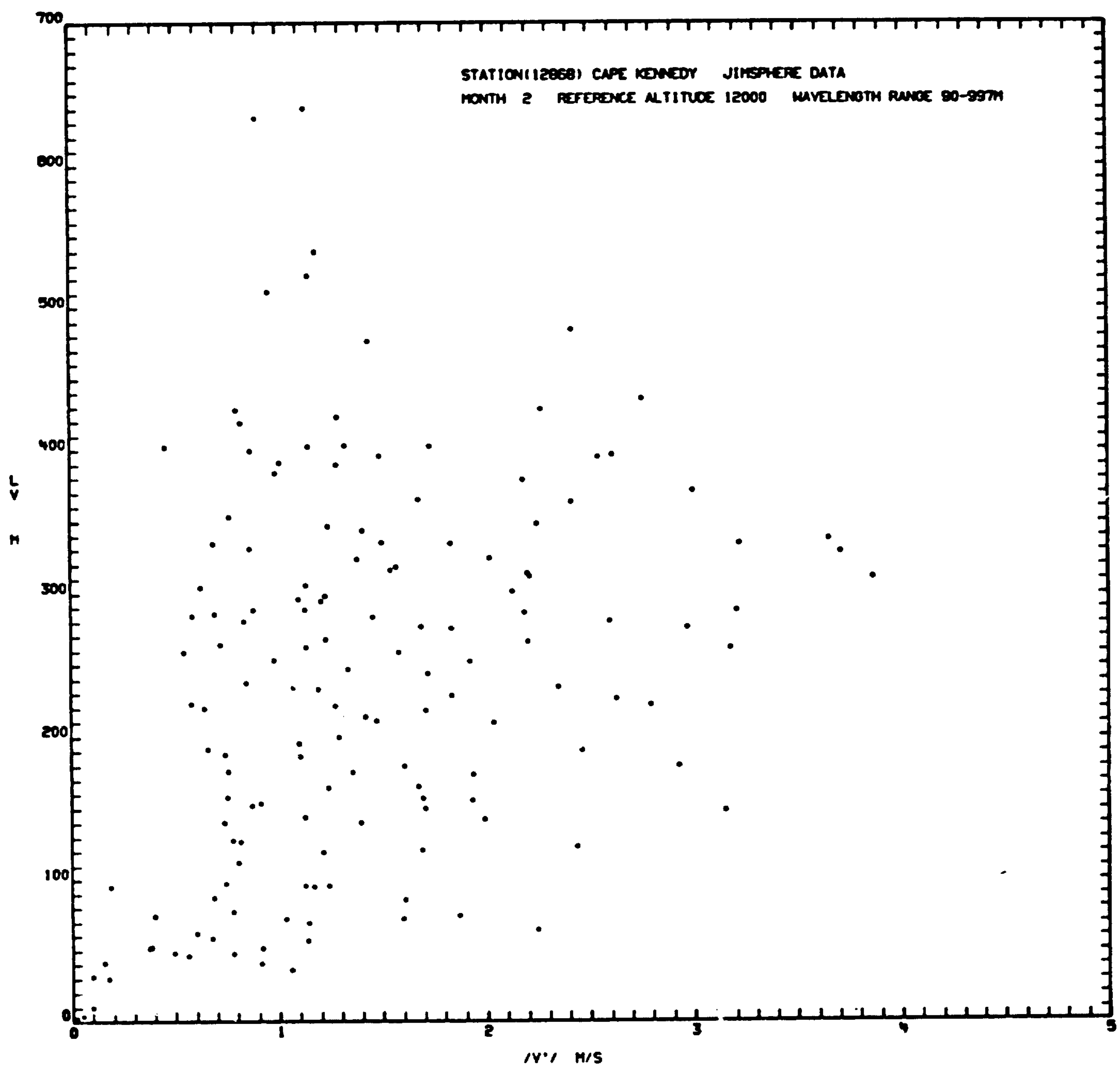
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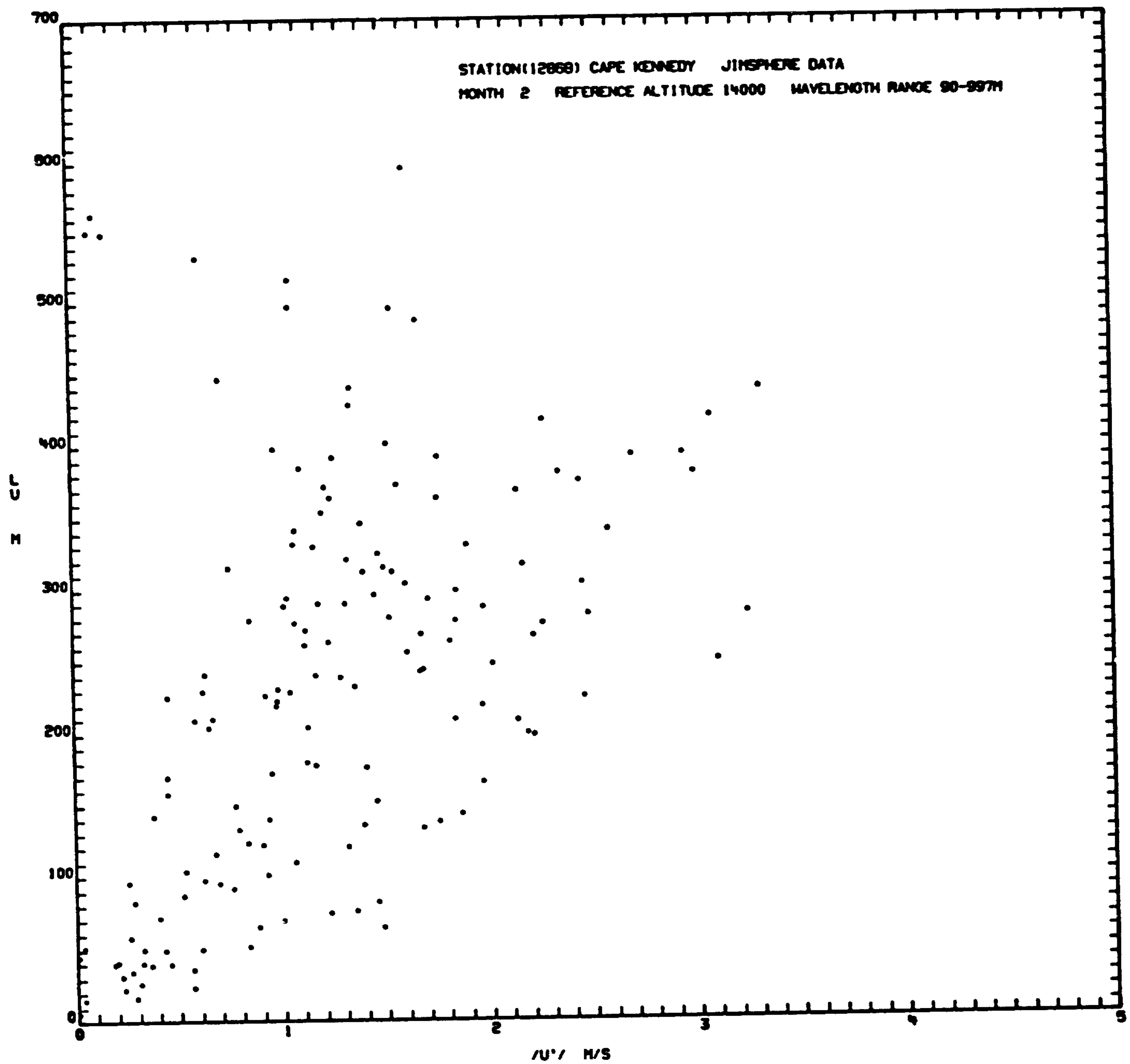
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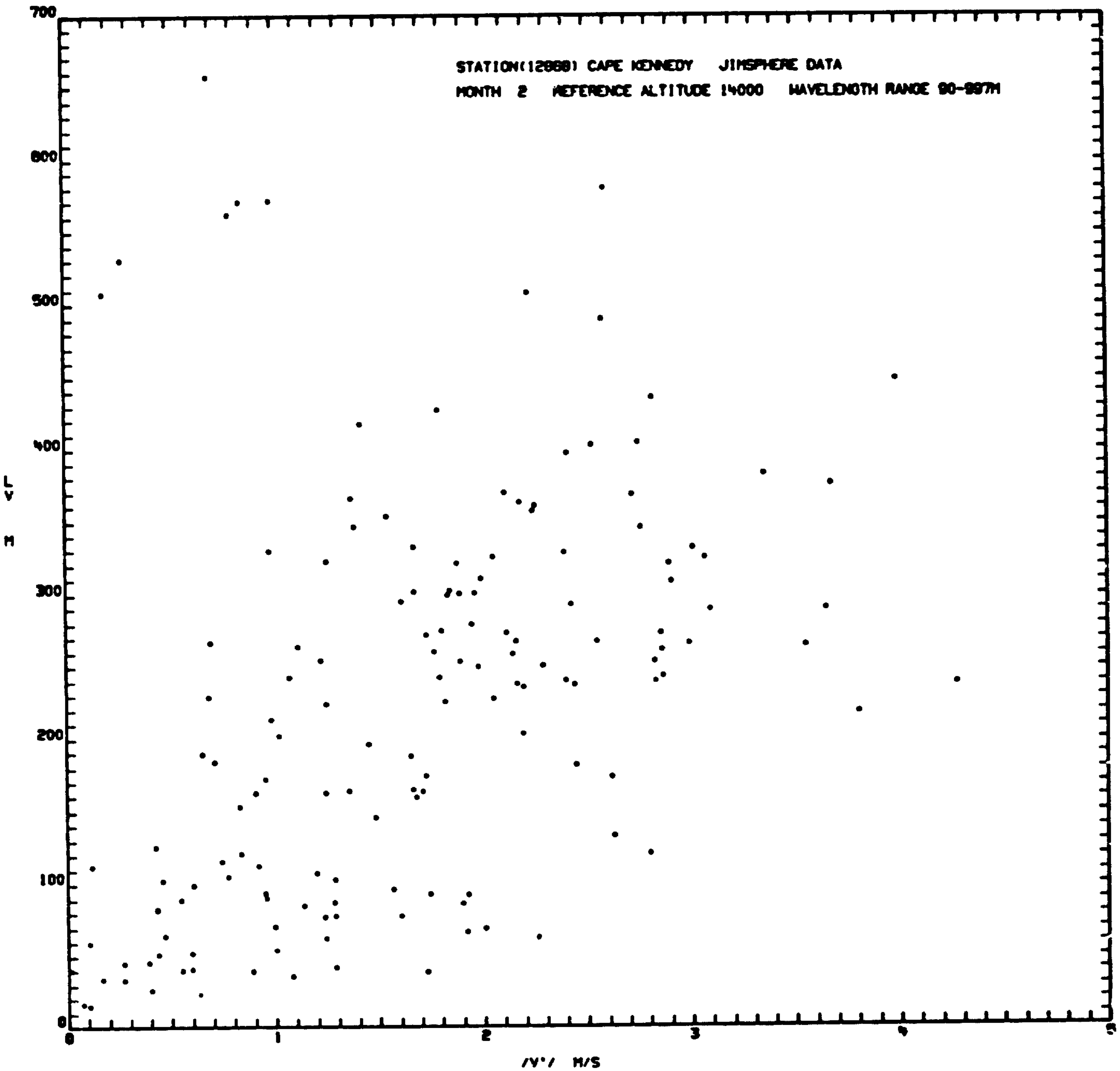
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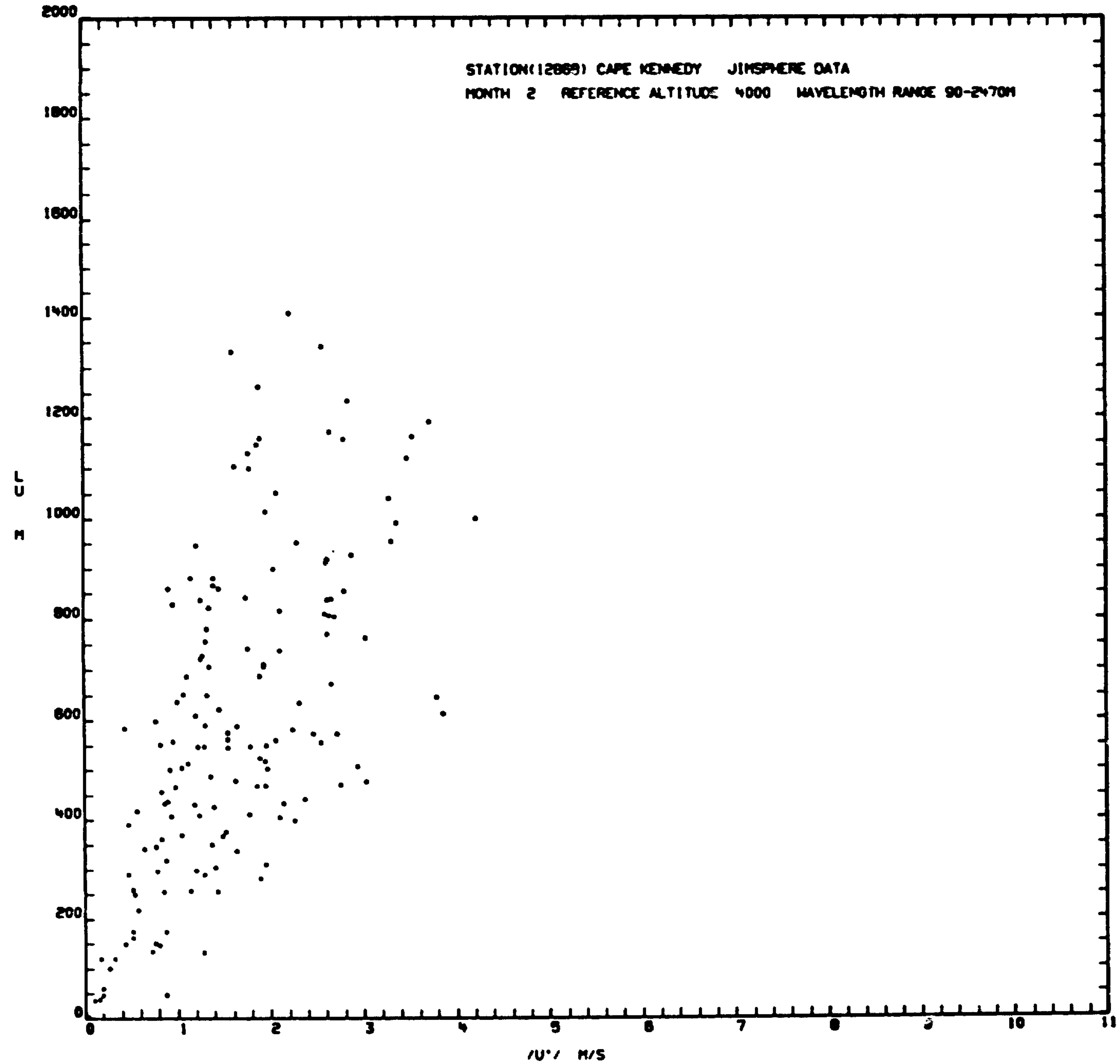
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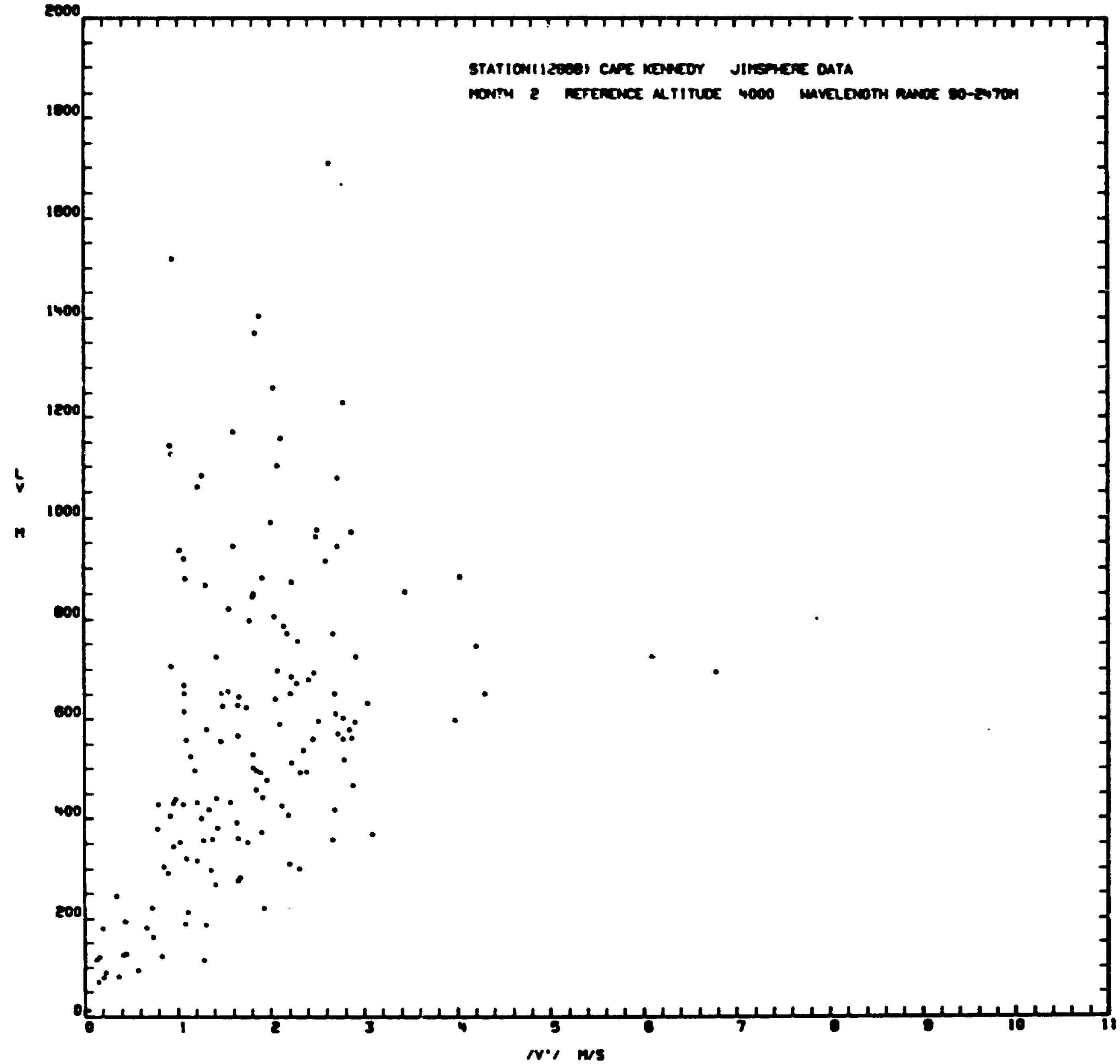
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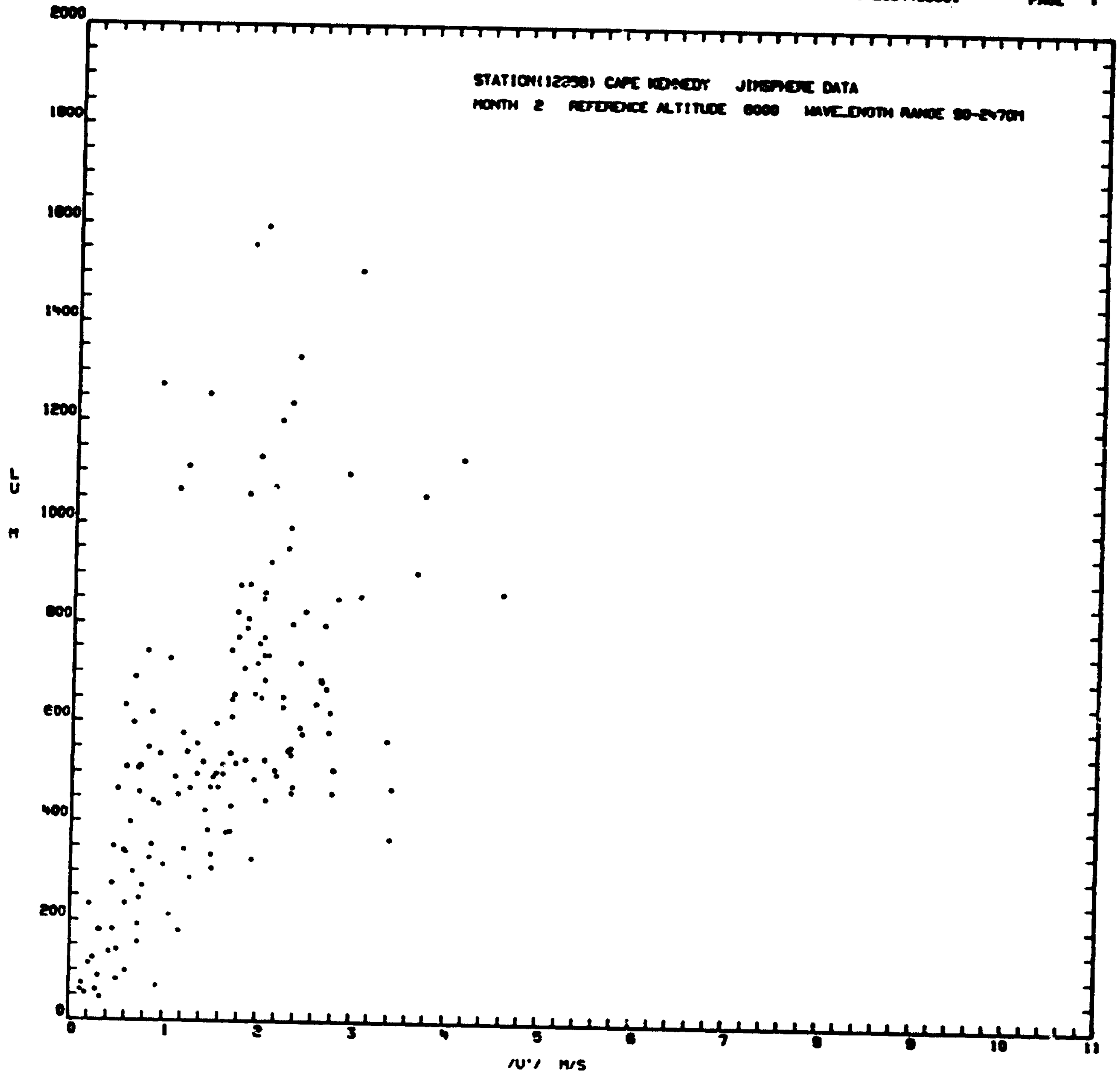
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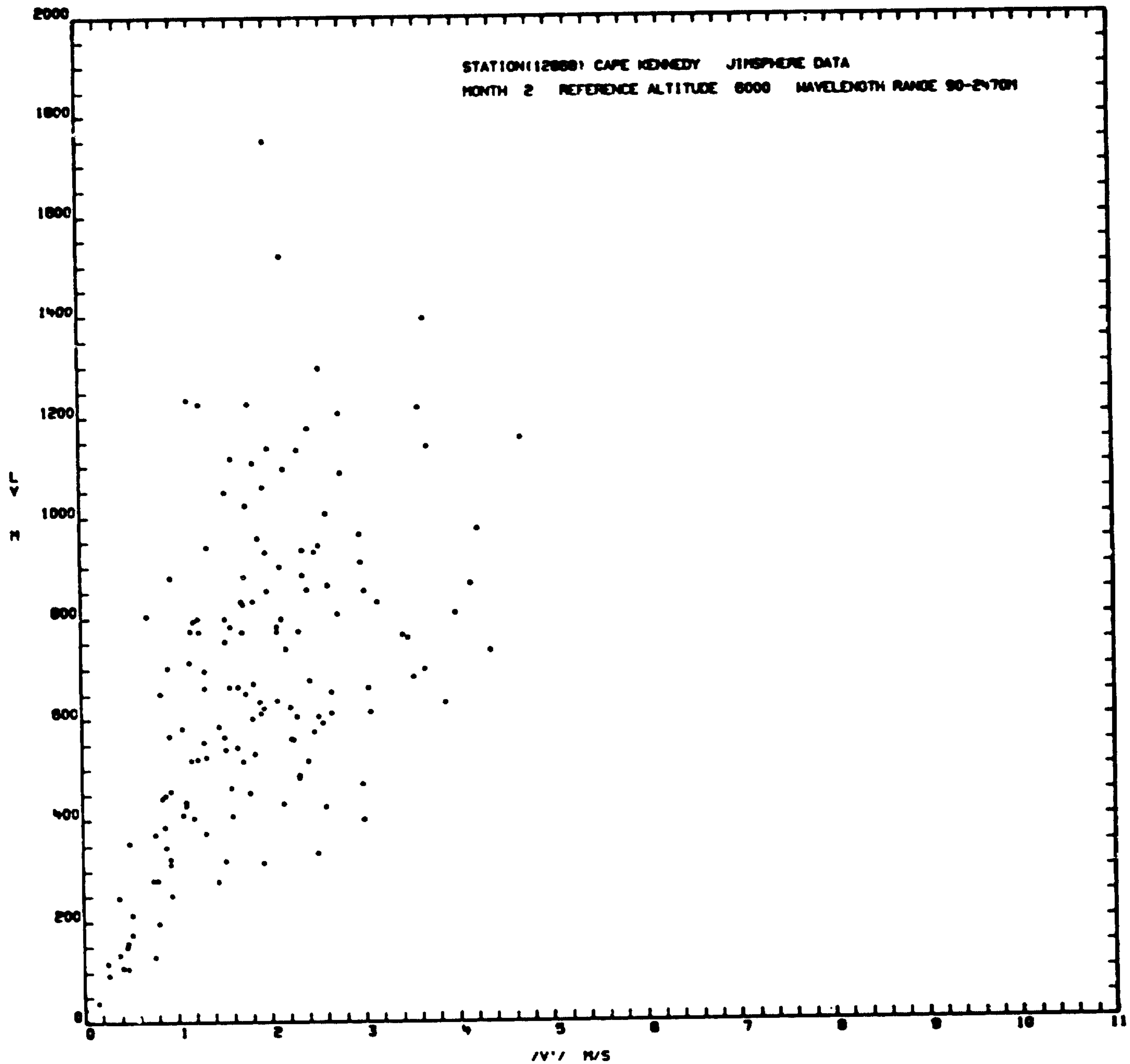
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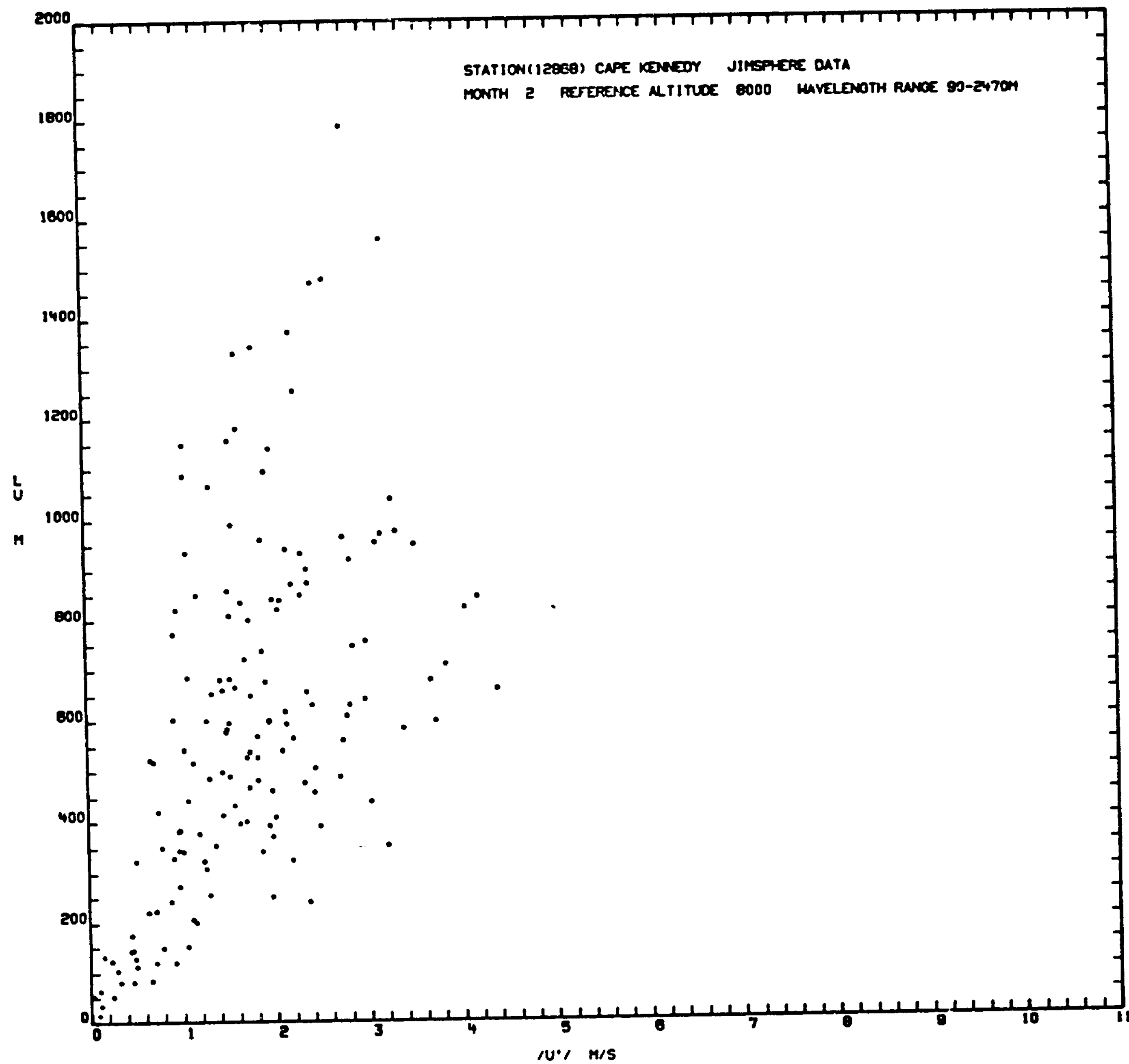
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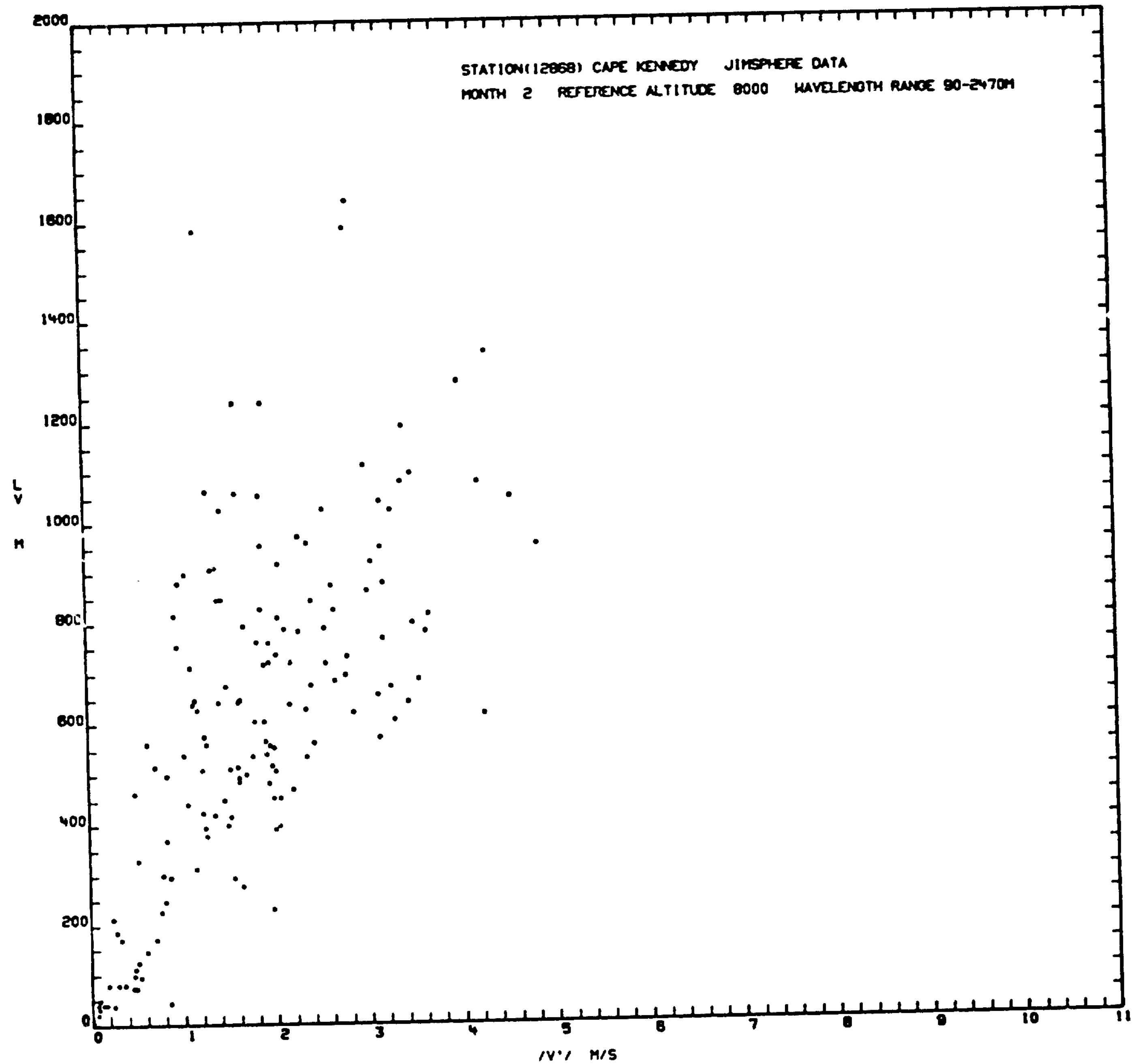
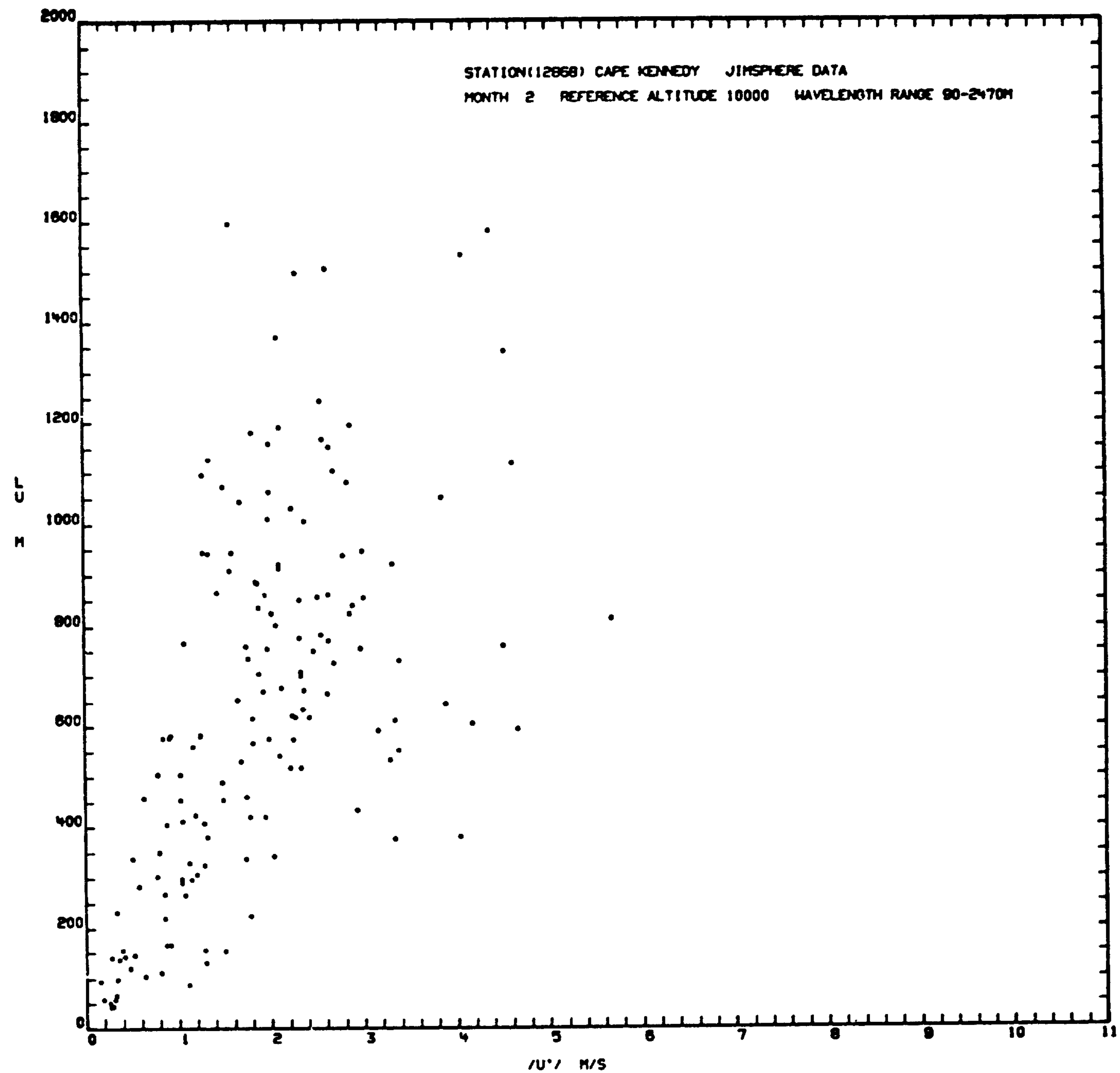
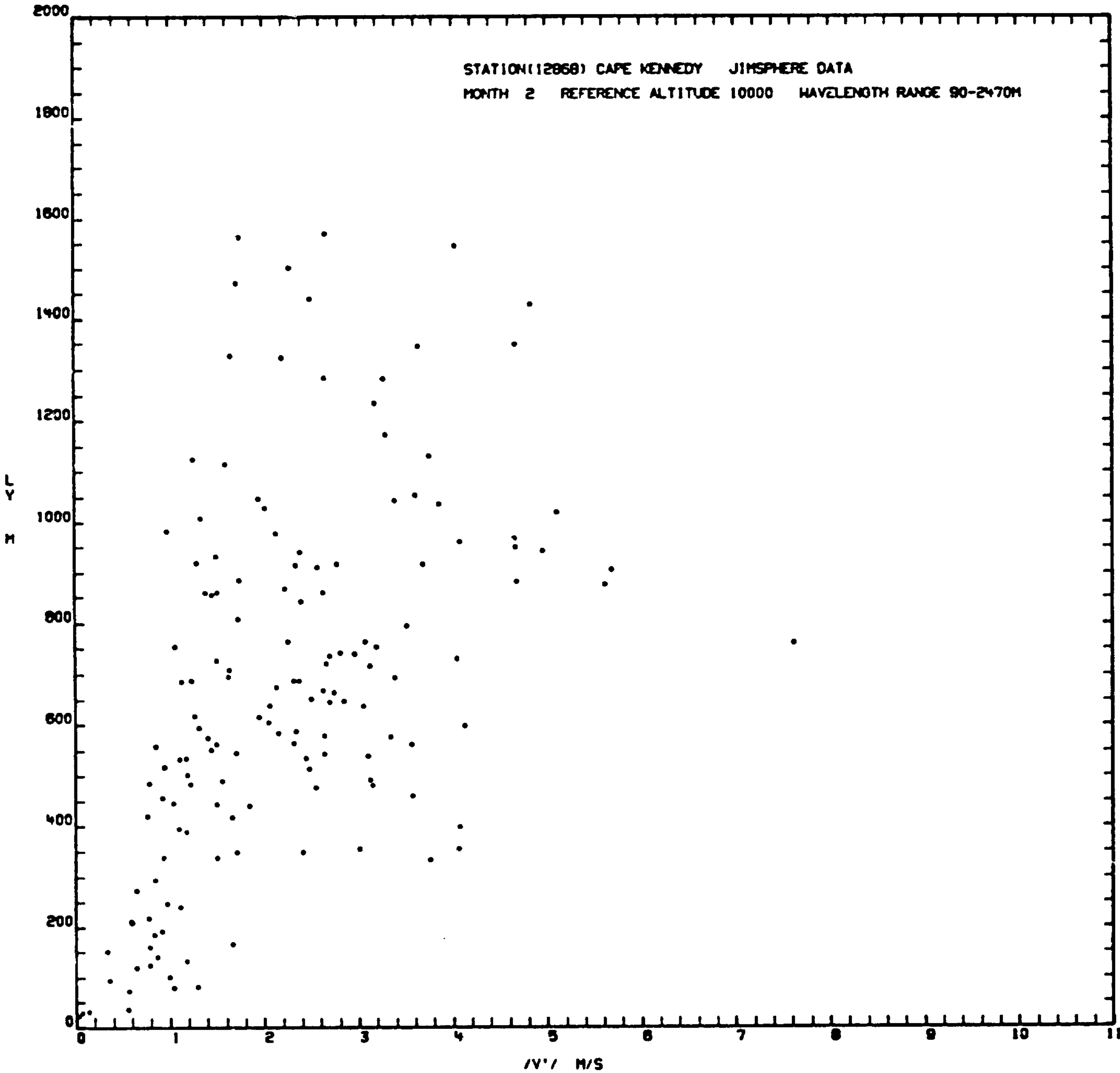
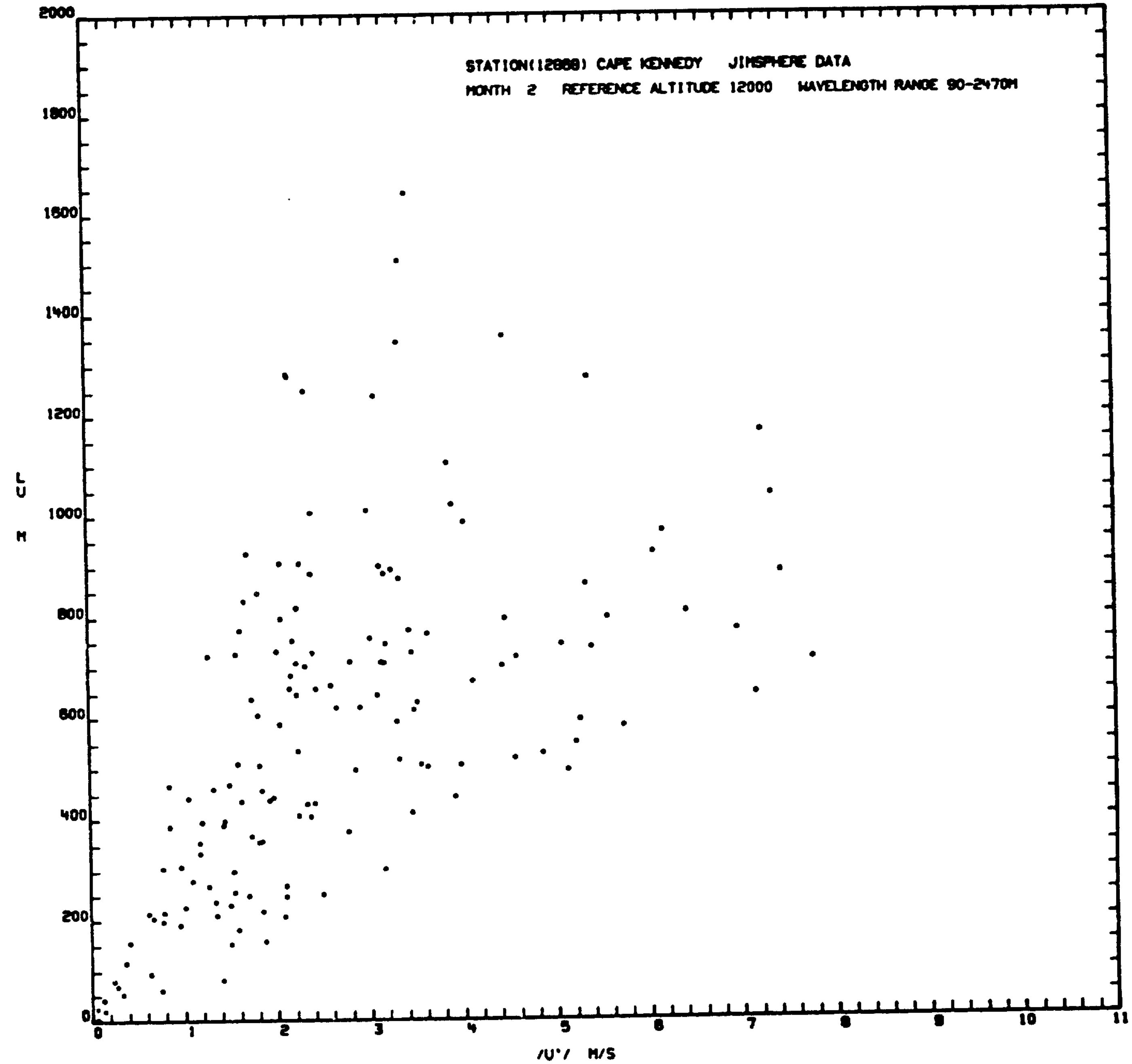
0 1 2 3 4 5 6 7 8 9 10 11
/U'/ M/S


STATION(12868) CAPE KENNEDY JIMSPHERE DATA
MONTH 2 REFERENCE ALTITUDE 8000 WAVELENGTH RANGE 90-2470M
L
V
M
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0
1
2
3
4
5
6
7
8
9
10
11
/V'/ M/S


STATION(12868) CAPE KENNEDY JIMSPHERE DATA
MONTH 2 REFERENCE ALTITUDE 10000 WAVELENGTH RANGE 90-2470M
L U M
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0
1
2
3
4
5
6
7
8
9
10
11
/U'/ M/S


STATION(12868) CAPE KENNEDY JIMSPHERE DATA
MONTH 2 REFERENCE ALTITUDE 10000 WAVELENGTH RANGE 90-2470M
LY M
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0 1 2 3 4 5 6 7 8 9 10 11
/V'/ M/S


STATION(12868) CAPE KENNEDY JIMSPHERE DATA
MONTH 2 REFERENCE ALTITUDE 12000 WAVELENGTH RANGE 90-2470M
2000
1800
1600
1400
1200
1000
800
600
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L U M
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3
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6
7
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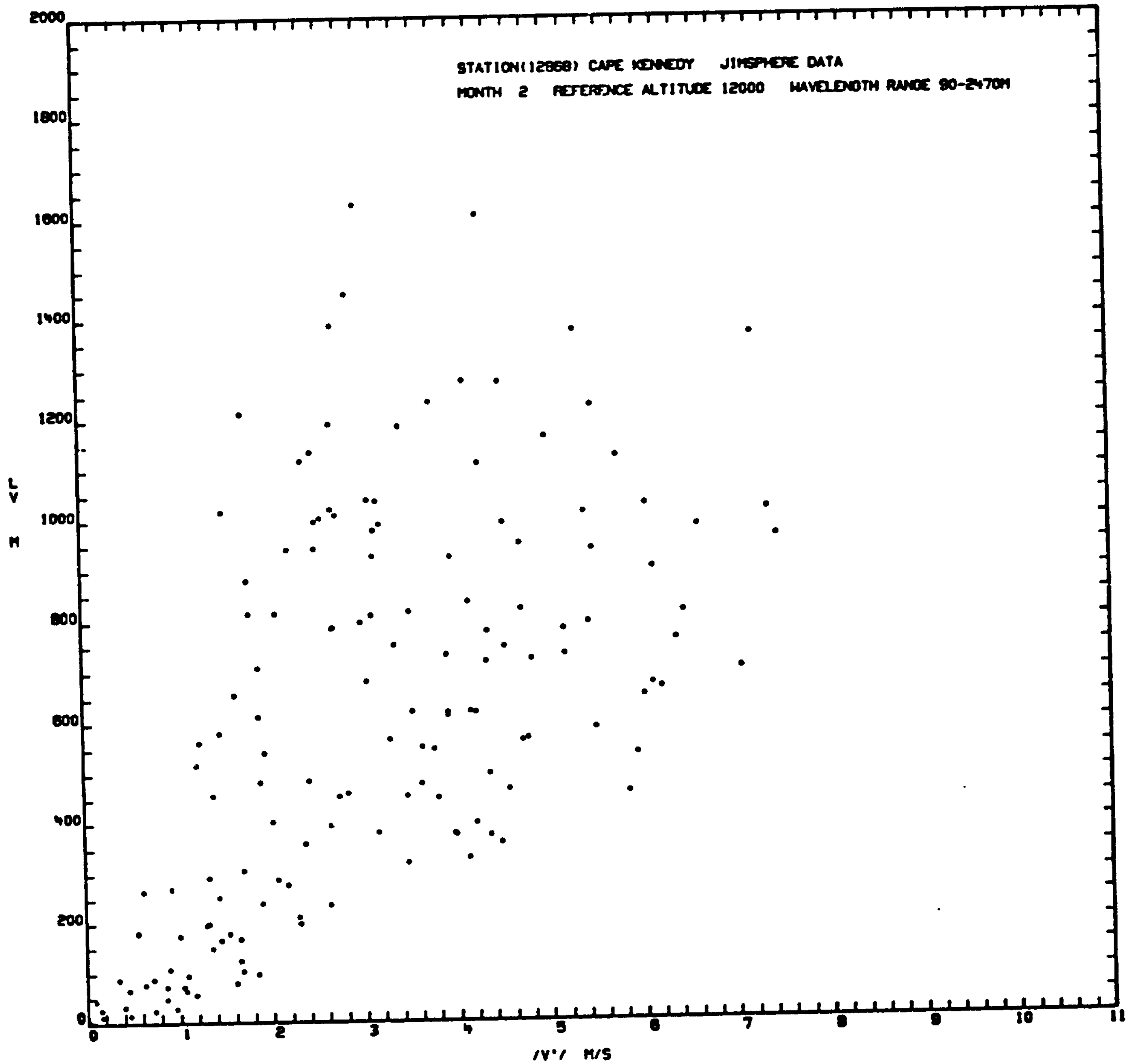
11
/U'/ M/S


STATION(12868) CAPE KENNEDY JIMSPHERE DATA
MONTH 2 REFERENCE ALTITUDE 12000 WAVELENGTH RANGE 90-2470M
L V
M
0
200
400
600
800
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1200
1400
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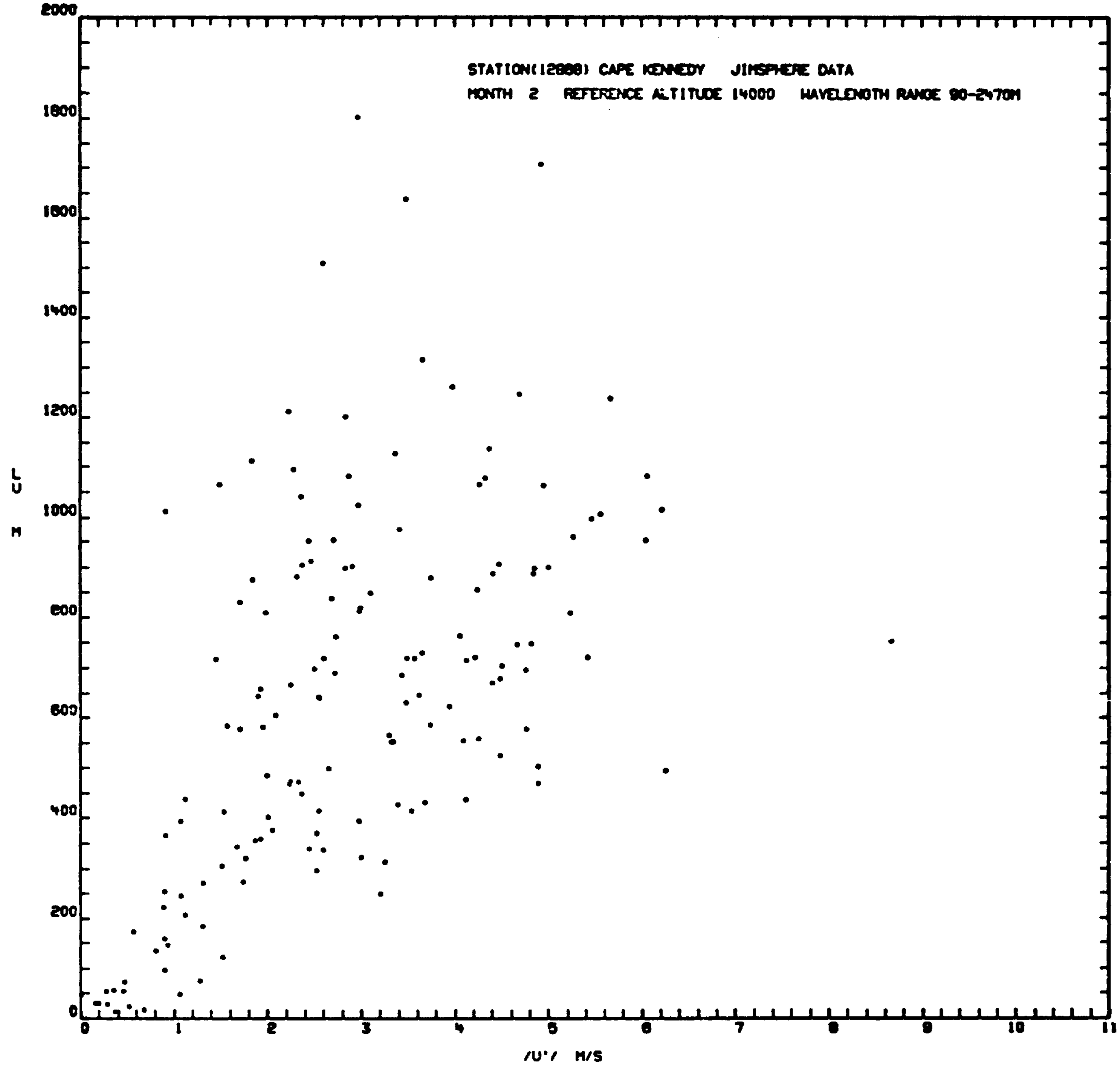
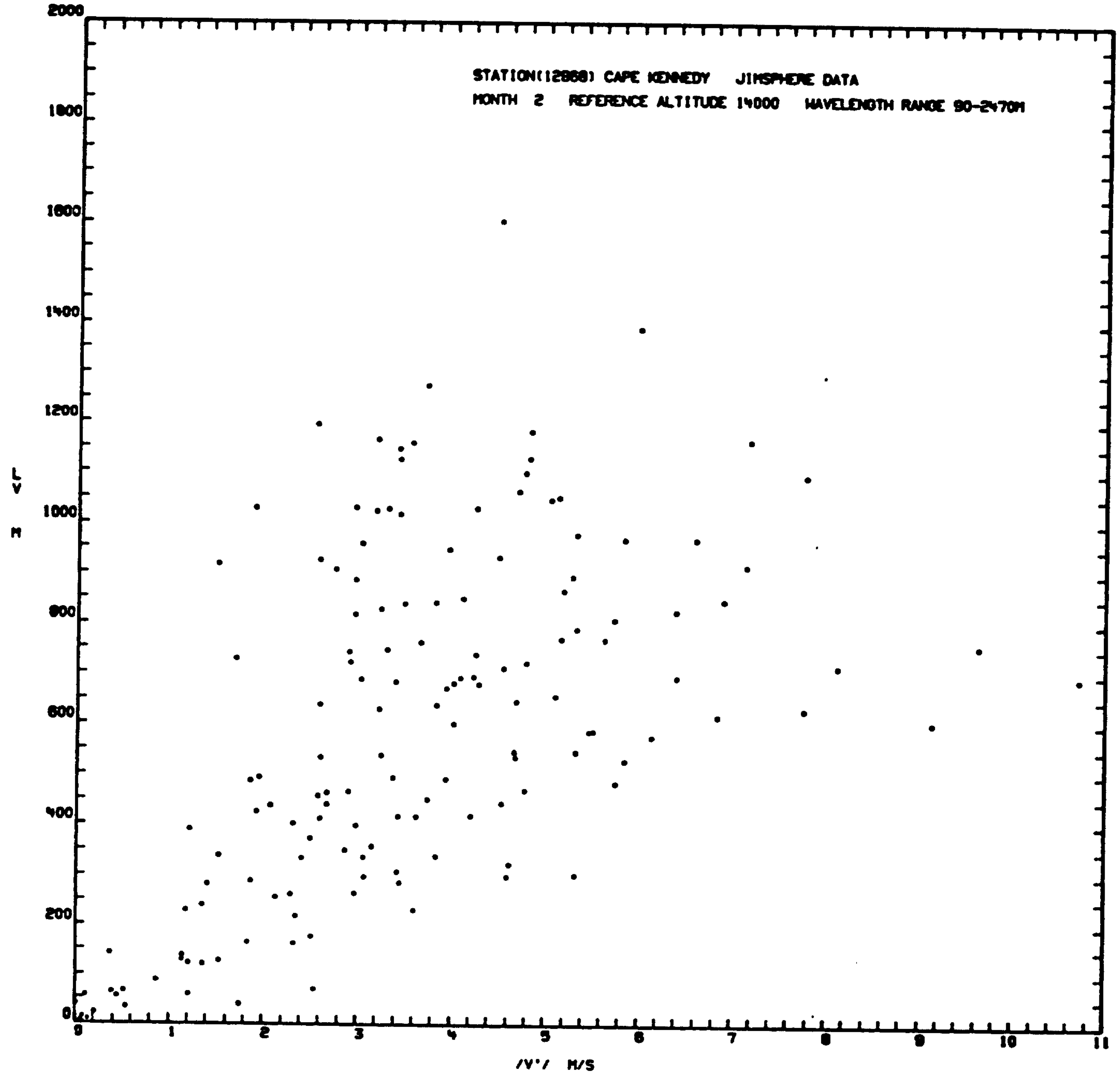
/V'/ M/S


STATION(12888) CAPE KENNEDY JIMSPHERE DATA
MONTH 2 REFERENCE ALTITUDE 14000 WAVELENGTH RANGE 90-2470M
2000
1800
1600
1400
1200
1000
800
600
400
200
0
L C M
0 1 2 3 4 5 6 7 8 9 10 11
/U'/ M/S


STATION(12868) CAPE KENNEDY JIMSPHERE DATA
MONTH 2 REFERENCE ALTITUDE 14000 WAVELENGTH RANGE 90-2470M
LV
M
0
200
400
600
800
1000
1200
1400
1600
1800
2000
0
1
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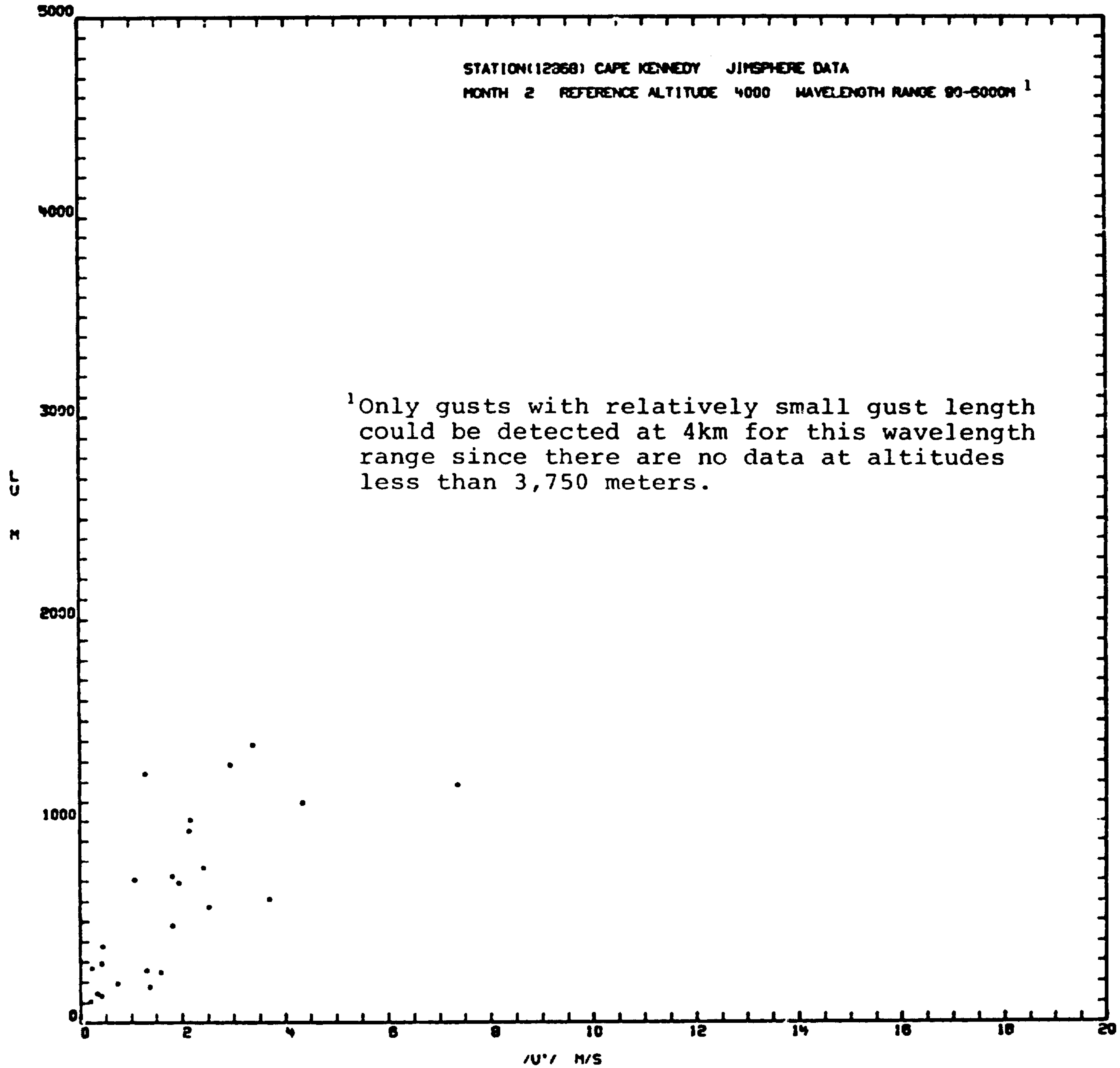
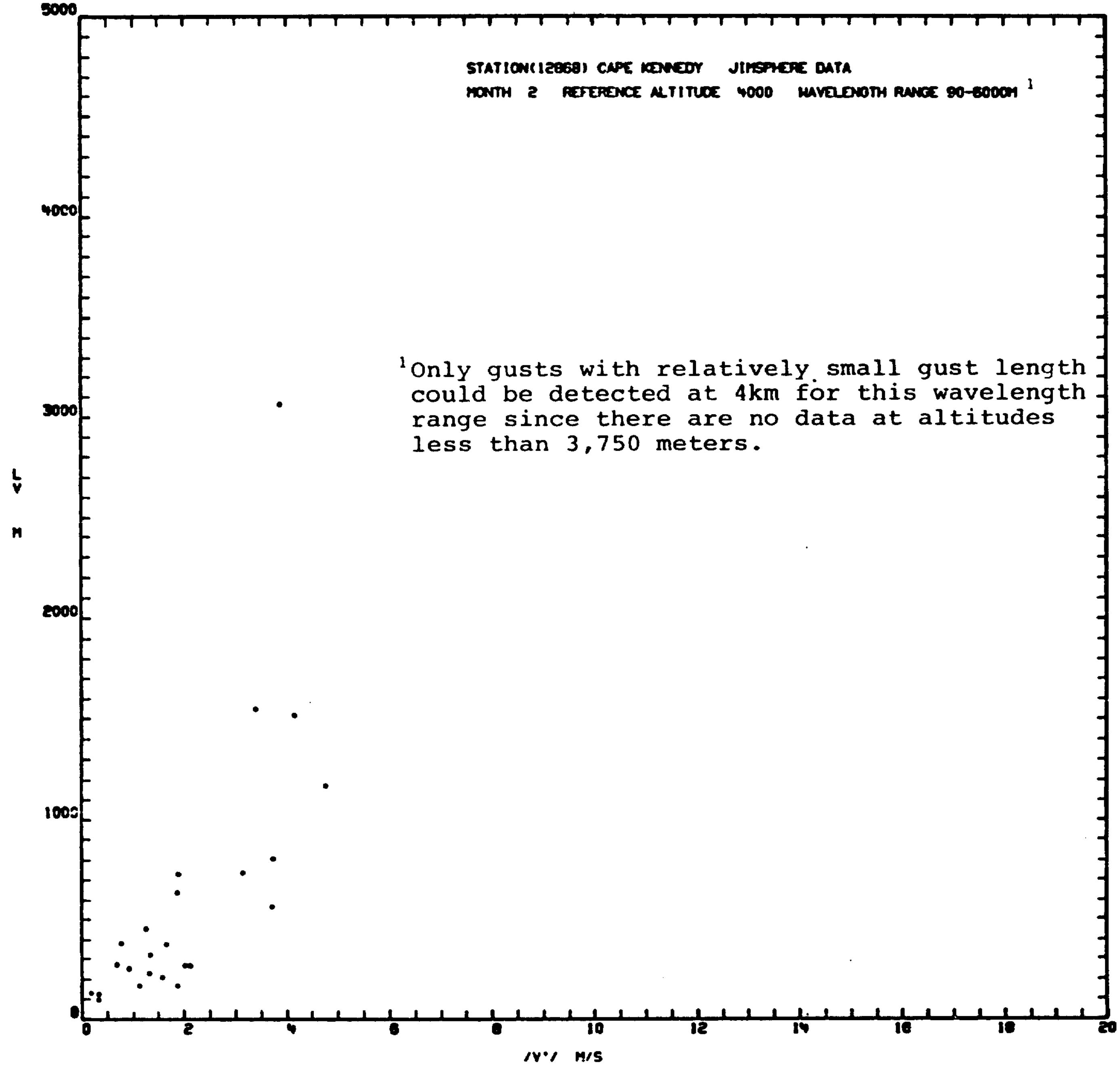
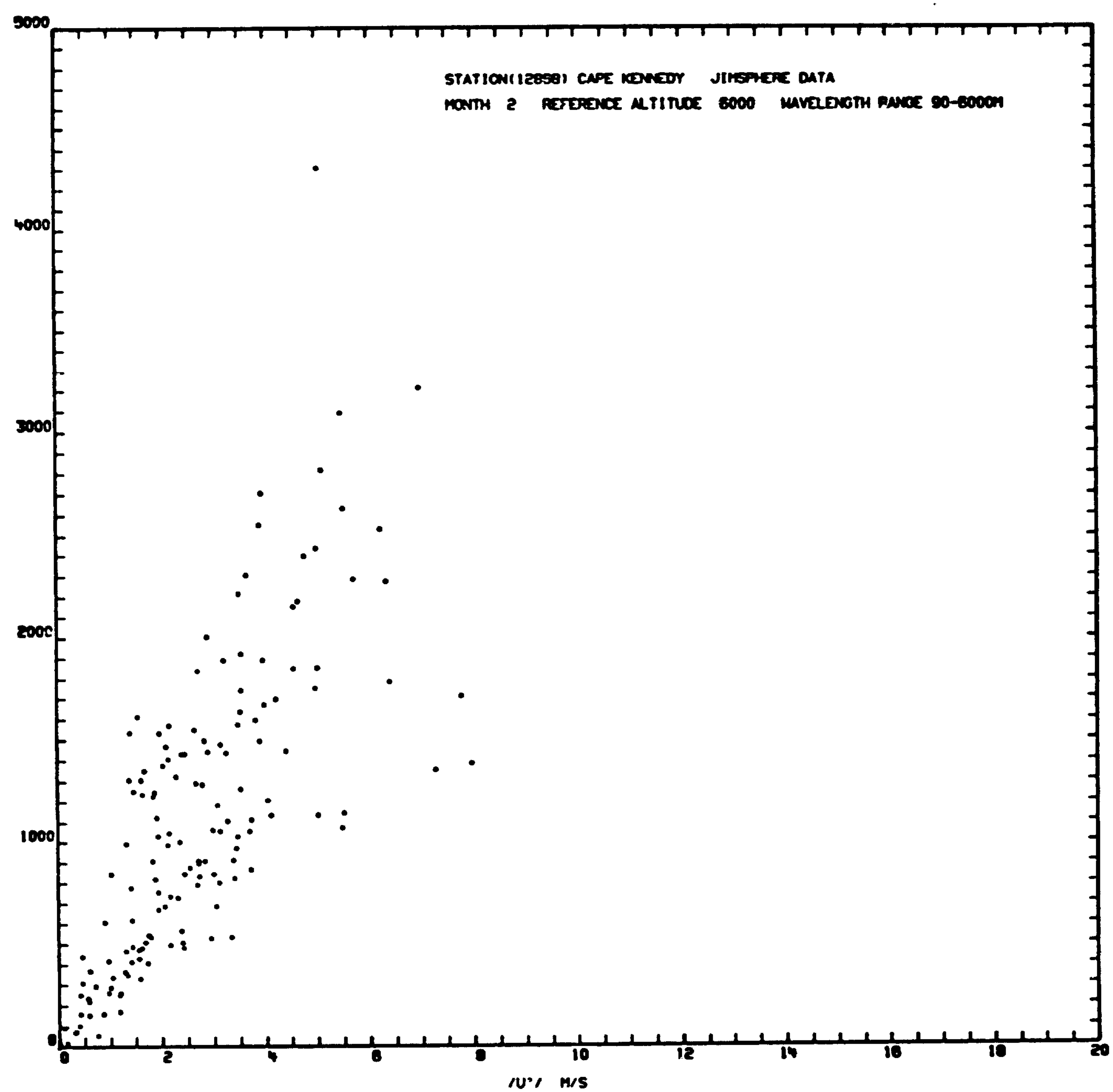
11
/V'/ M/S

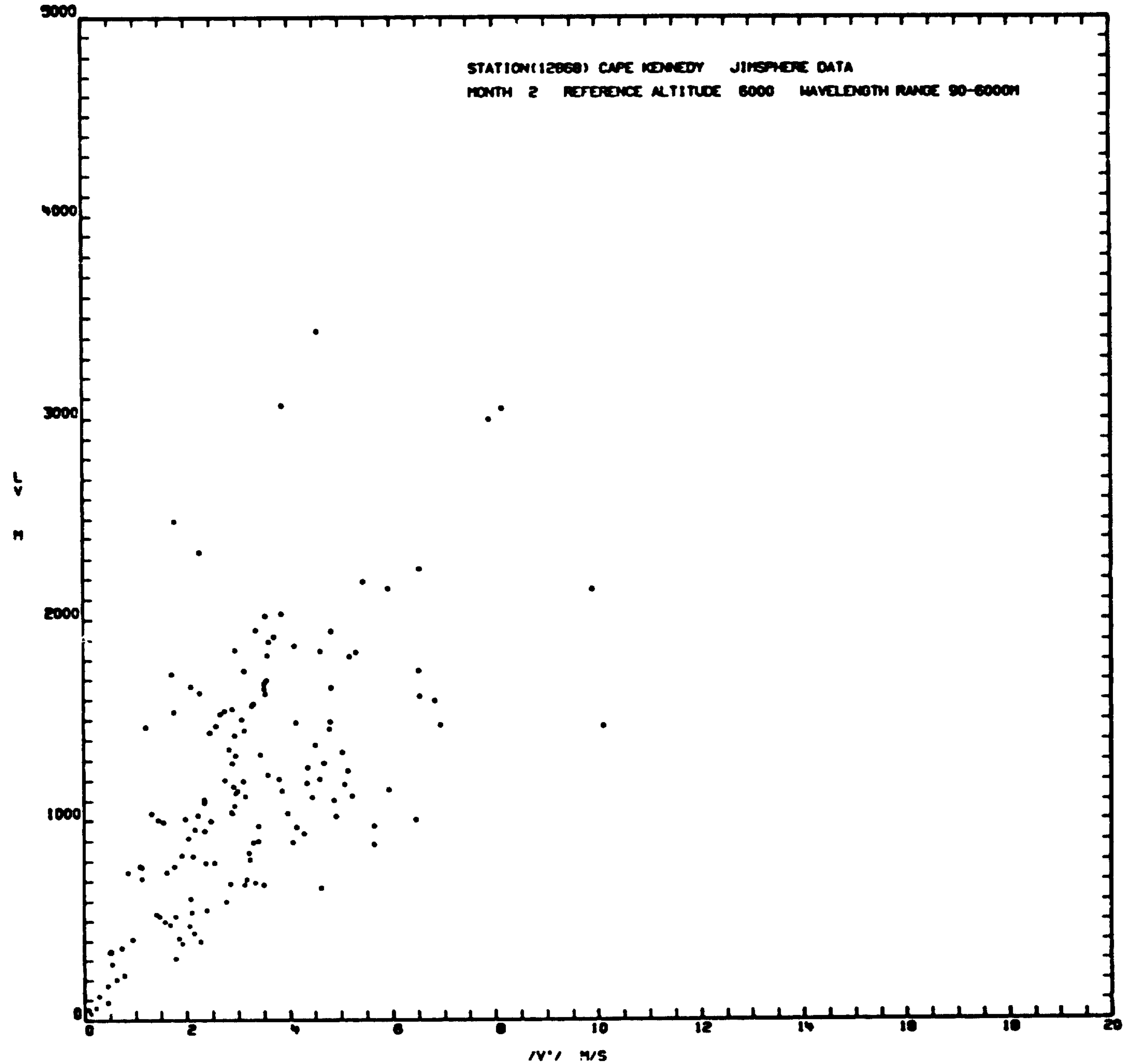


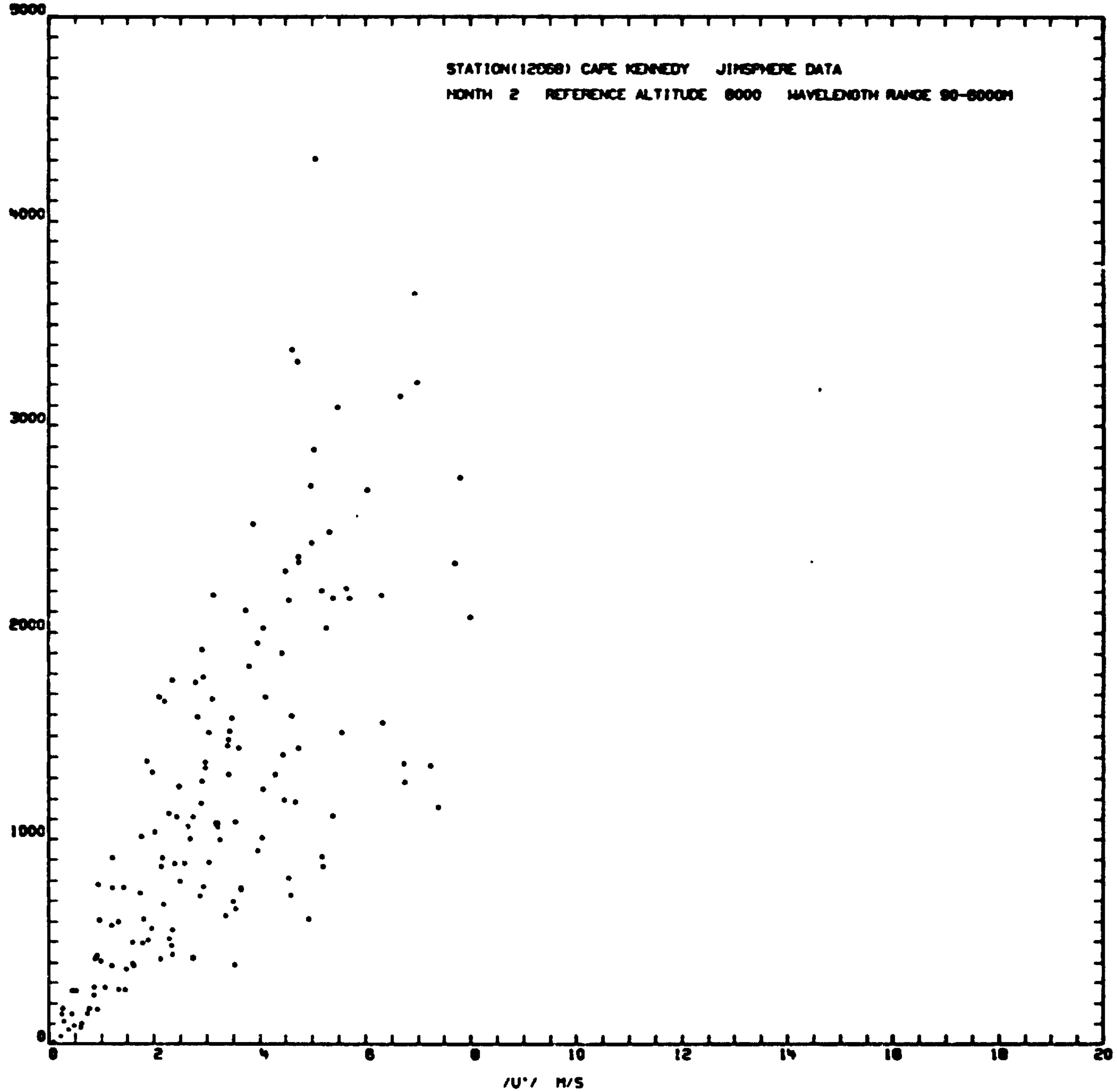
[1] Only gusts with relatively small gust length could be detected at 4km for this wavelength range since there are no data at altitudes less than 3,750 meters.

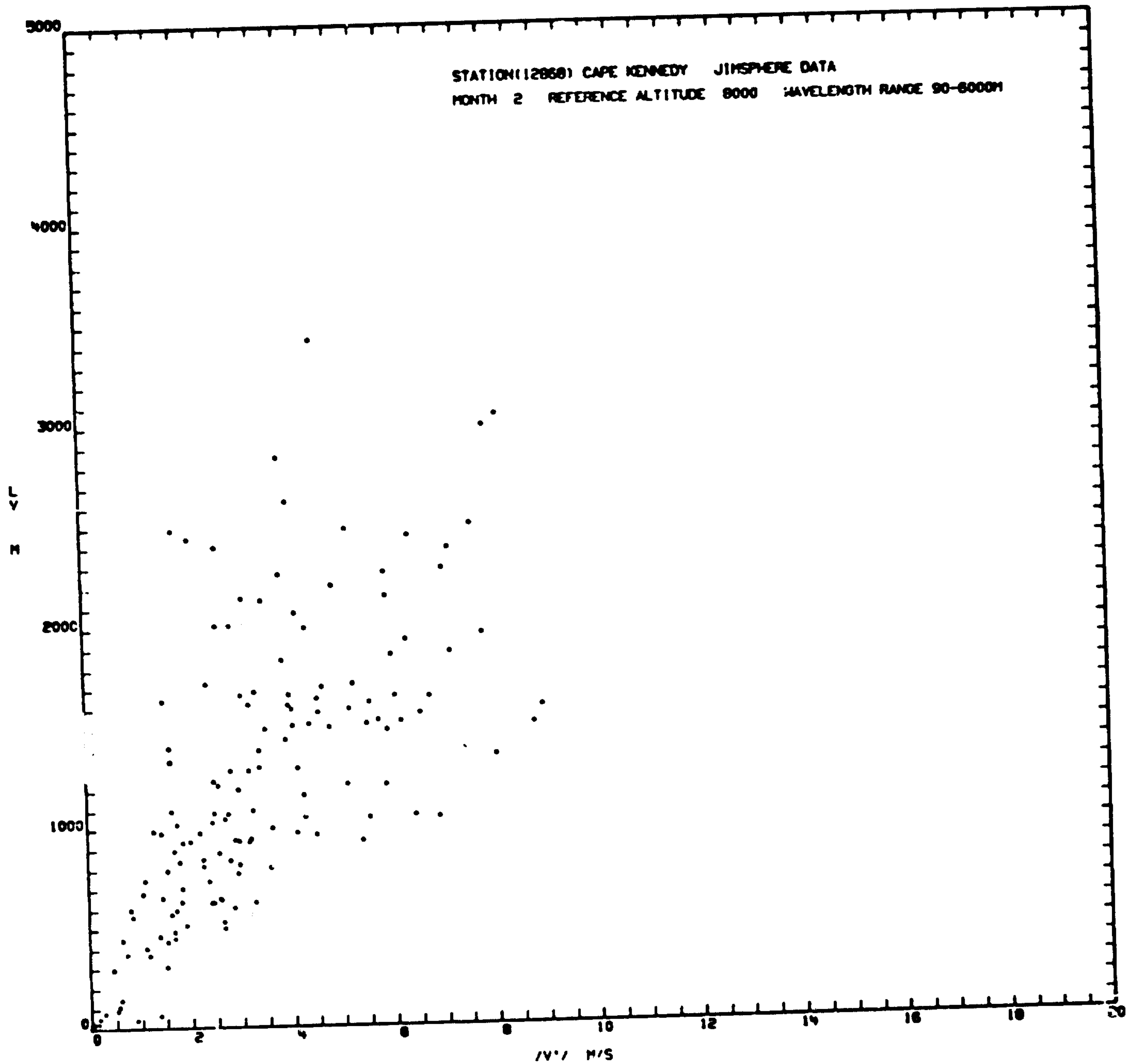


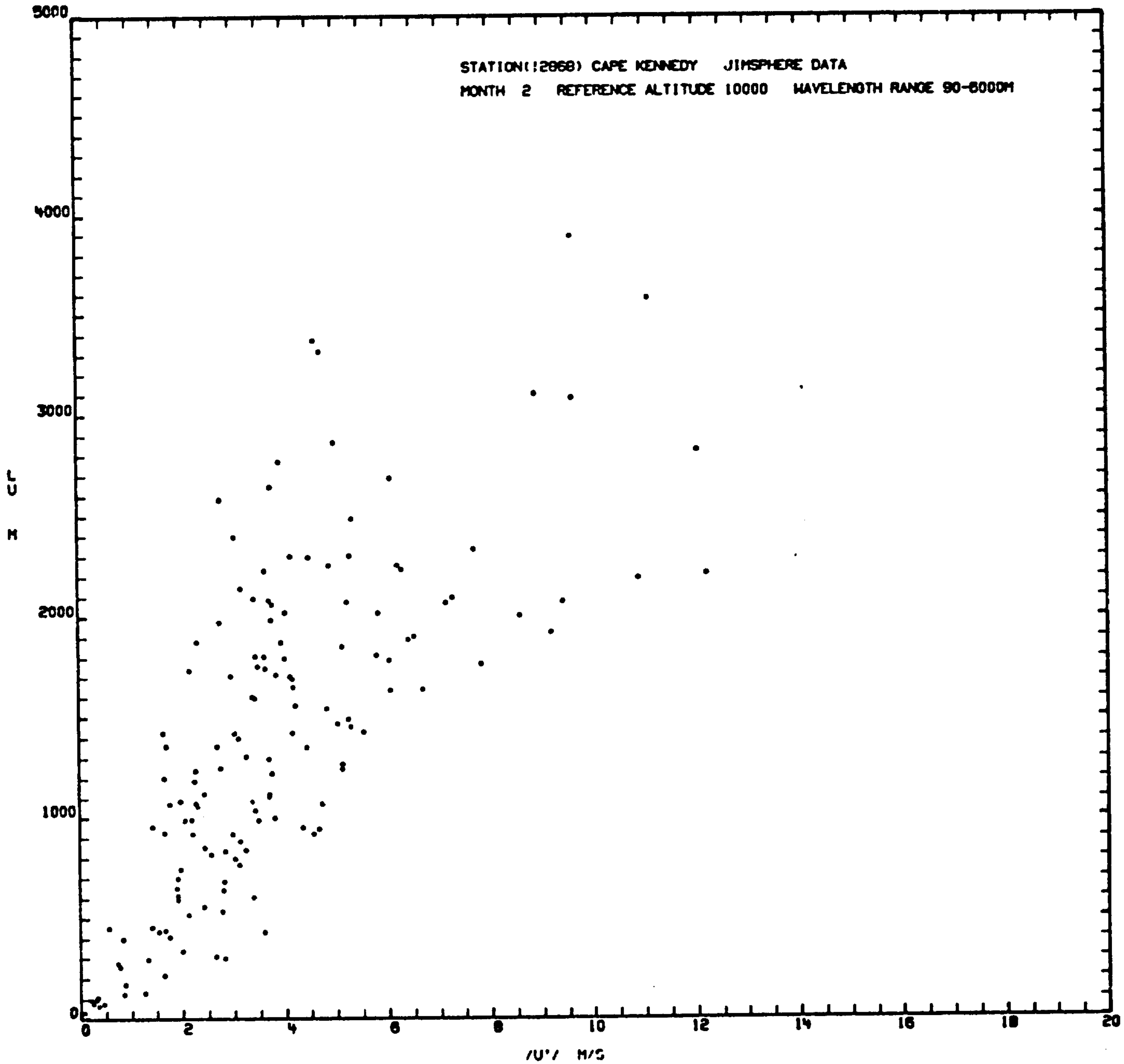
[1] Only gusts with relatively small gust length could be detected at 4km for this wavelength range since there are no data at altitudes less than 3,750 meters.


STATION(12858) CAPE KENNEDY JIMSPHERE DATA
MONTH 2 REFERENCE ALTITUDE 6000 WAVELENGTH RANGE 90-6000M
L U M
5000
4000
3000
2000
1000
0
0
2
4
6
8
10
12
14
16
18
20
/U'/ M/S


STATION(12868) CAPE KENNEDY JIMSPHERE DATA
MONTH 2 REFERENCE ALTITUDE 6000 WAVELENGTH RANGE 90-6000M
5000
4000
3000
2000
1000
0
L V
M
0
2
4
6
8
10
12
14
16
18
20
/V'/ M/S


STATION(12068) CAPE KENNEDY JIMSPHERE DATA
MONTH 2 REFERENCE ALTITUDE 8000 WAVELENGTH RANGE 90-6000M
L U M
0
1000
2000
3000
4000
5000
0 2 4 6 8 10 12 14 16 18 20
/U'/ M/S


STATION(12868) CAPE KENNEDY JIMSPHERE DATA
MONTH 2 REFERENCE ALTITUDE 8000 WAVELENGTH RANGE 90-6000M
5000
4000
3000
2000
1000
0
L
V
M
0
2
4
6
8
10
12
14
16
18
20
/V'/ M/S


STATION(12868) CAPE KENNEDY JIMSPHERE DATA
MONTH 2 REFERENCE ALTITUDE 10000 WAVELENGTH RANGE 90-6000M
5000
4000
3000
2000
1000
0
LU M
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4
6
8
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12
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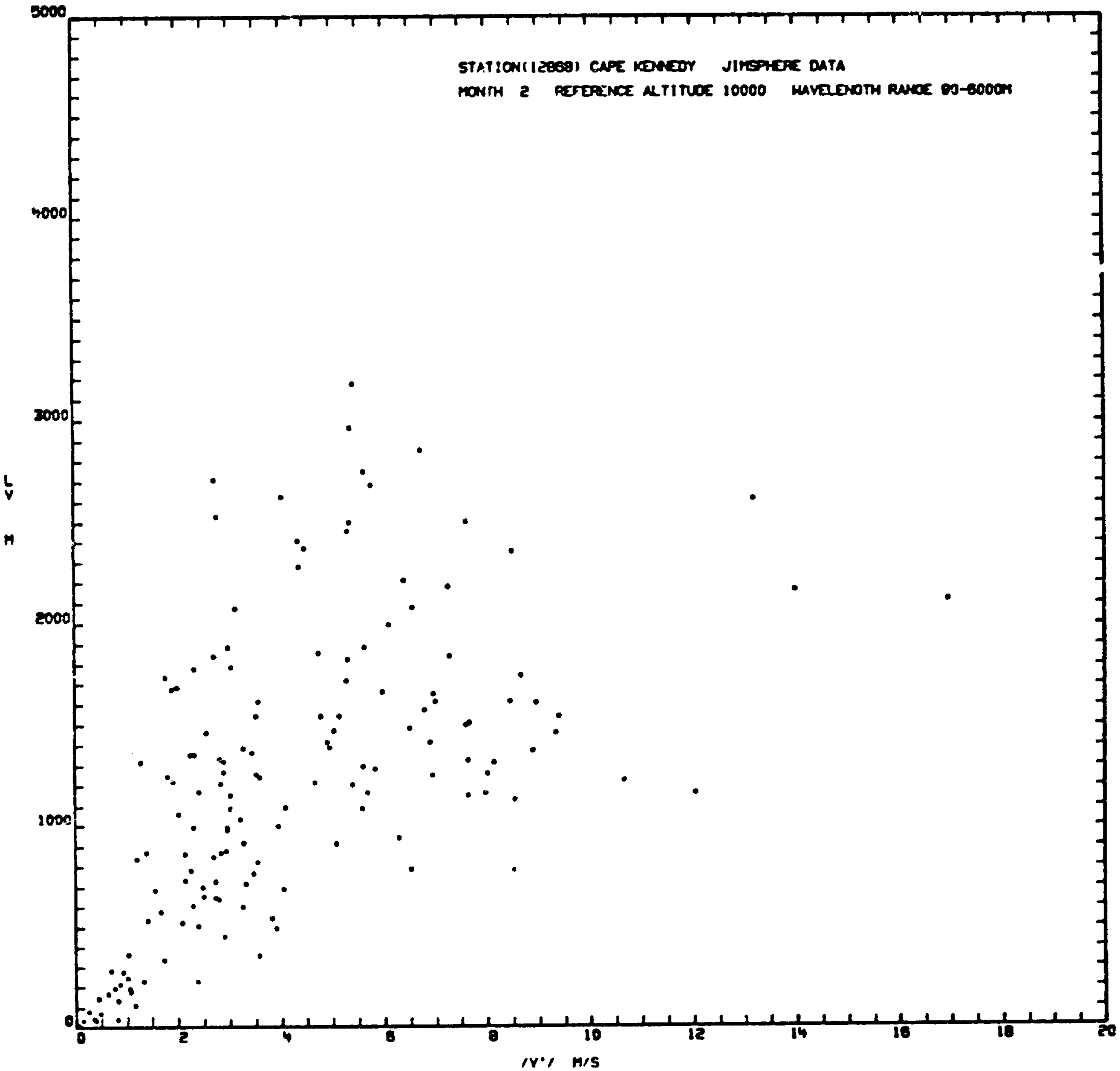
16
18
20
/U'/ M/S


STATION(12868) CAPE KENNEDY JIMSPHERE DATA
MONTH 2 REFERENCE ALTITUDE 10000 WAVELENGTH RANGE 90-6000M
5000
4000
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1000
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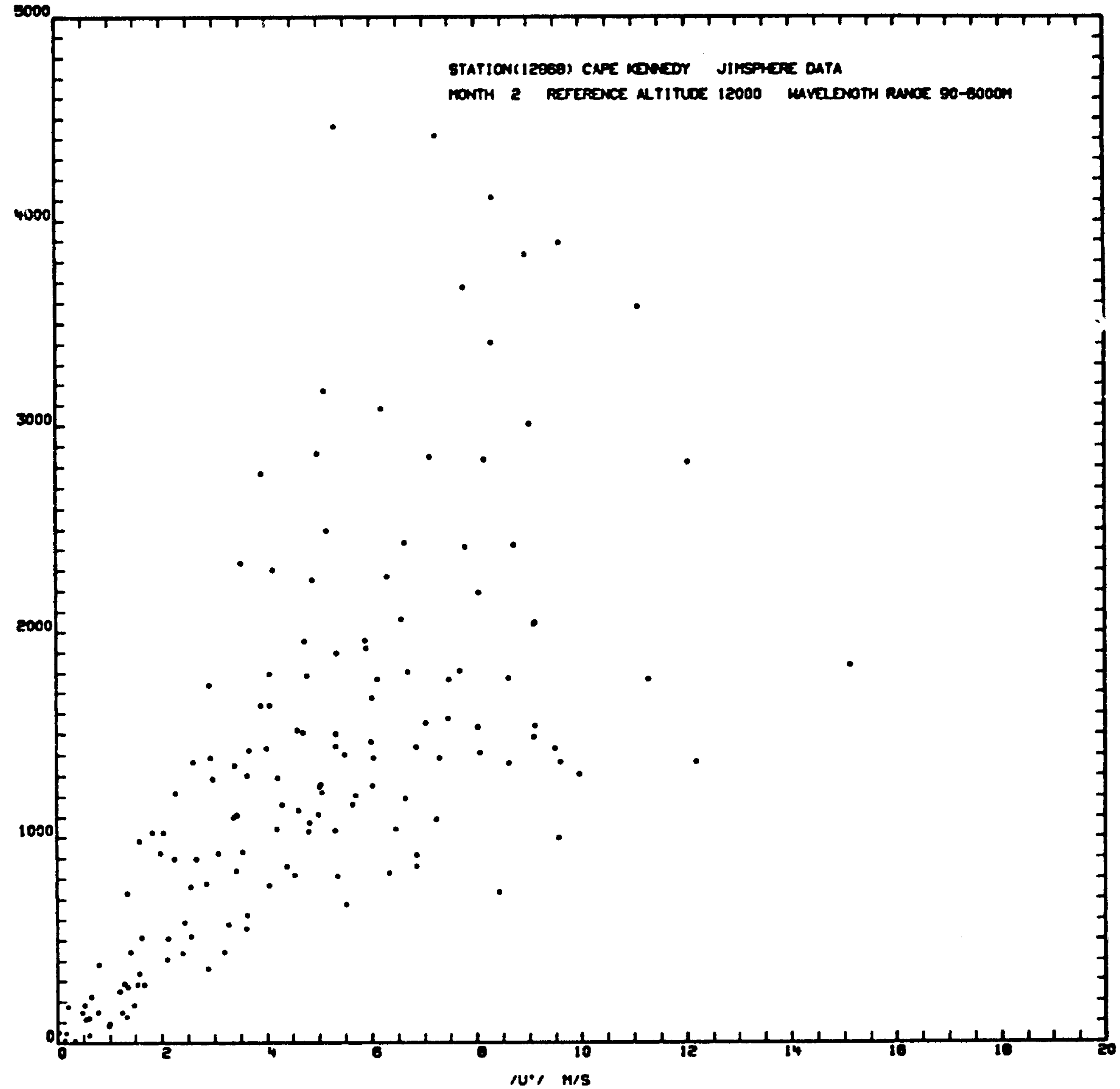
20
/V'/ M/S


STATION(12868) CAPE KENNEDY JIMSPHERE DATA
MONTH 2 REFERENCE ALTITUDE 12000 WAVELENGTH RANGE 90-6000M
5000
4000
3000
2000
1000
0
L
C
M
0
2
4
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12
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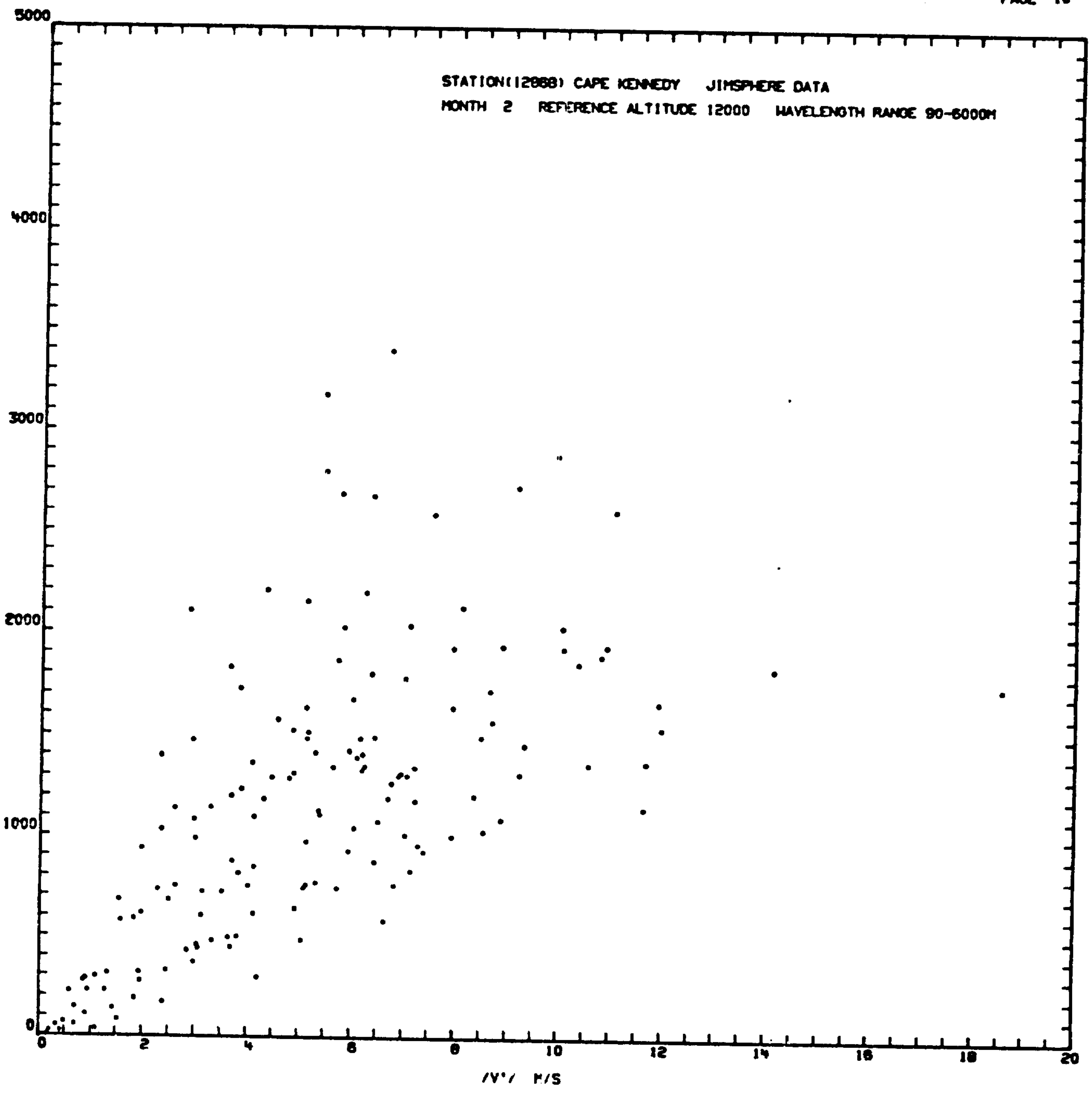
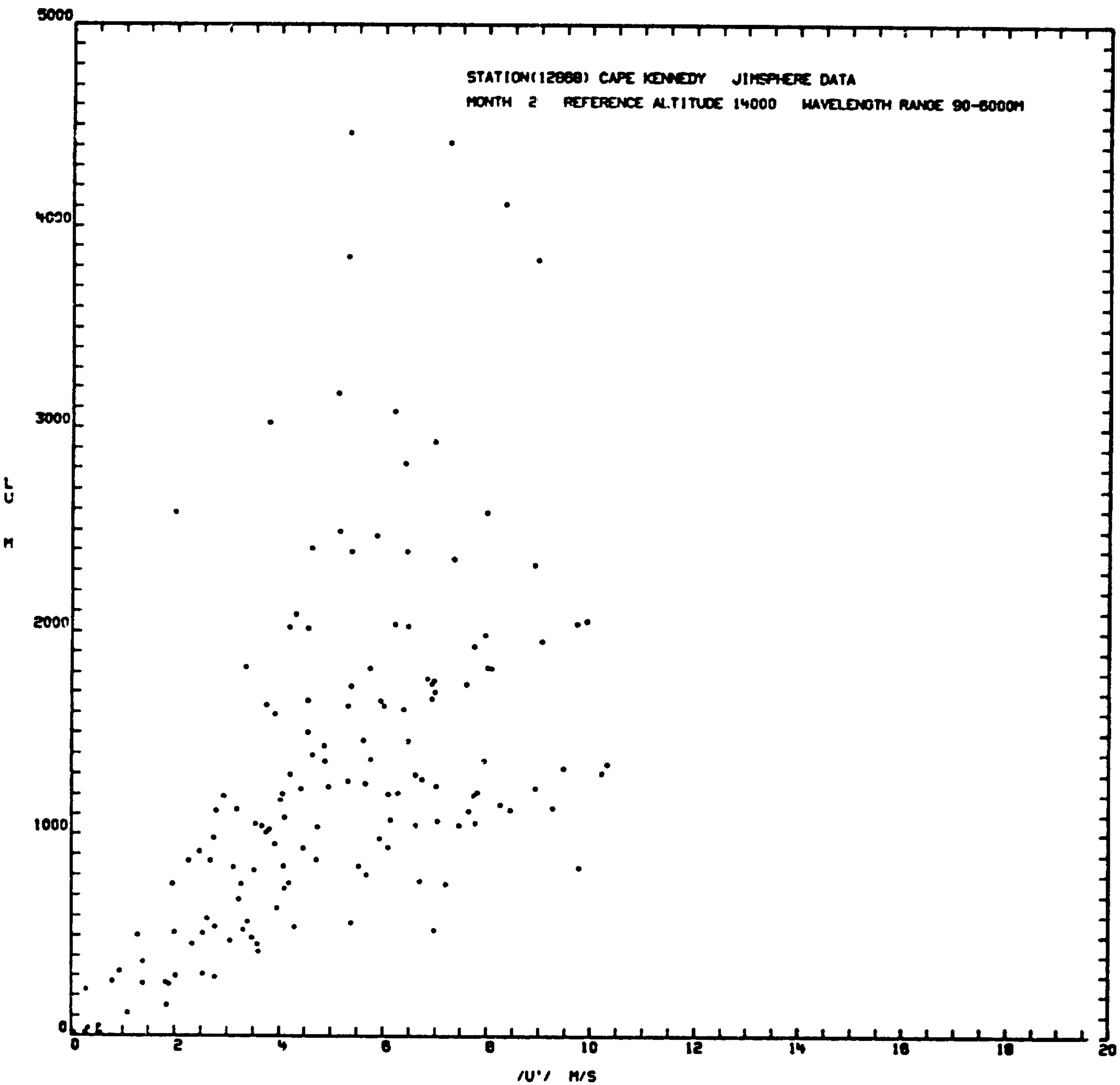
16
18
20
/U'/ M/S


STATION(12868) CAPE KENNEDY JIMSPHERE DATA
MONTH 2 REFERENCE ALTITUDE 12000 WAVELENGTH RANGE 90-6000M
L V M
/V'/ M/S
0
1000
2000
3000
4000
5000
0
2
4
6
8
10
12
14
16
18
20


STATION(12888) CAPE KENNEDY JIMSPHERE DATA
MONTH 2 REFERENCE ALTITUDE 14000 WAVELENGTH RANGE 90-6000M
5000
4000
3000
2000
1000
0
M
/U'/ M/S
0
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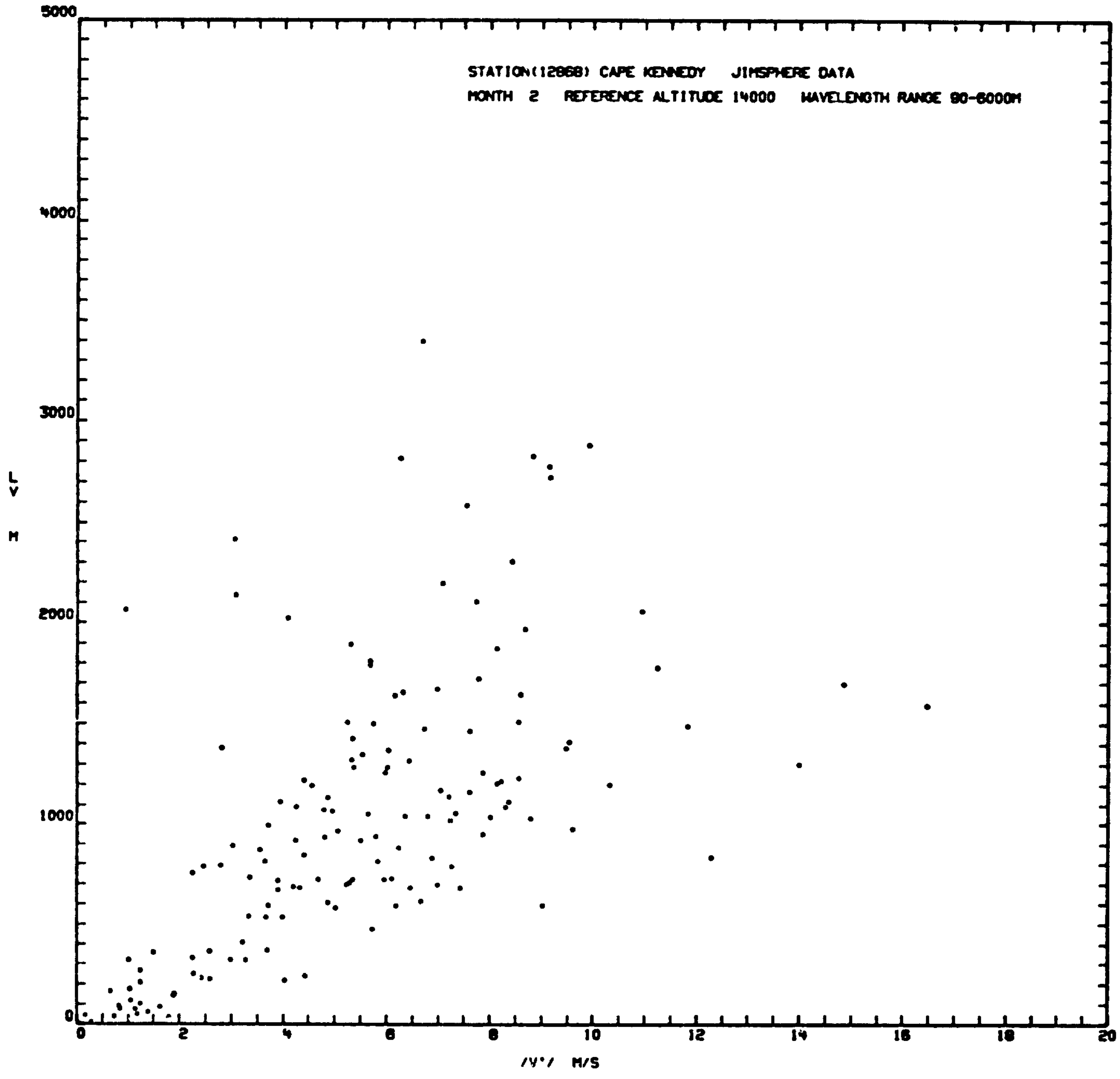
18
20


STATION(12868) CAPE KENNEDY JIMSPHERE DATA
MONTH 2 REFERENCE ALTITUDE 14000 WAVELENGTH RANGE 90-6000M
5000
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/V'/ M/S

APPENDIX B. GUST STATISTICS

This Appendix contains gust and gust length statistics at six reference altitudes (4, 6, ..., 14 km) for the month of February at KSC for four wavelength ranges. Statistics calculated for the months of April and July have been calculated, but are not included in this Appendix.

The notation in the computer output format does not correspond exactly with that used in the body of this report. The following differences are noted:

Text	Table	Definition
$\lvert u' \rvert$	ABS(u MAX)	Absolute value of u component gust
$\lvert v' \rvert$	ABS(v MAX)	Absolute value of v component gust

Units are not noted in the tables. Gust is expressed in meters/second and gust length in meters.

Variances and covariances and correlations are summarized in symmetric matrix tables. A matrix code and definitions of the various elements are provided at the top of each page.

Means, standard deviations, and gamma distribution parameters, γ and β, are listed for each variable. In addition, the mean and standard deviation of the altitude difference between u component gust and v component gust is also listed (UHMAX-VHMAX).

STATION(12868) - CAPE KENNEDY
DATA - JIMSPHERE
MONTH : 2
REFERENCE ALTITUDE : 4000M
WAVELENGTH RANGE : 90-420M

X(1)=ABS(UMAX) X(3)=ABS(VMAX)
X(2)=LU X(4)=LV

OUTPUT MATRIX CODE

11	12	13	14
	22	23	24
		33	34
			44

VARIANCE - COVARIANCE MATRIX

.0551	5.9570	.0133	.2578
5.9570	4699.4781	-.0106	788.7619
.0133	-.0106	.0632	8.0874
.2578	788.7617	8.0874	5592.0646

CORRELATION MATRIX

1.0000	.3702	.2259	.0147
.3702	1.0000	-.0006	.1539
.2259	-.0006	1.0000	.4302
.0147	.1539	.4302	1.0000

	X(1)	X(2)	X(3)	X(4)
MEAN	.3926	142.3911	.4023	154.4666
SD	.2347	68.5527	.2514	74.7801
GAMMA	2.7977	4.3144	2.5620	4.2668
BETA	7.1252	.0303	6.3677	.0276

UHMAX - VHMAX

MEAN = -2.8333
SD = 77.2067

ION(12868) - CAPE KENNEDY
- JIMSPHERE
H : 2
RENCE ALTITUDE : 6000M
LENGTH RANGE : 90-420M

=ABS(UMAX) X(3)=ABS(VMAX)
=LU X(4)=LV

UT MATRIX CODE

12	13	14
22	23	24
	33	34
		44

****

IANCE - COVARIANCE MATRIX

.0446	5.1564	.0112	.5766
5.1564	4727.7195	1.3530	324.5191
.0112	1.3530	.0402	7.5213
.5766	324.5189	7.5213	4060.0126

****

RELATION MATRIX

1.0000	.3550	.2650	.0428
.3550	1.0000	.0982	.0741
.2650	.0982	1.0000	.5888
.0428	.0741	.5888	1.0000

****

	X(1)	X(2)	X(3)	X(4)
N	.3695	149.8187	.3521	133.4203
	.2112	68.7584	.2005	63.7182
MA	3.0595	4.7477	3.0842	4.3845
A	8.2808	.0317	8.7604	.0329

****

MAX - VMMAX

N = 9.8333
= 84.4890

ION(12868) - CAPE KENNEDY
-- JIMSPHERE
H : 2
RENCE ALTITUDE : 8010M
LENGTH RANGE : 90-420M

=ABS(UMAX) X(3)=ABS(VMAX)
=LU X(4)=LV

UT MATRIX CODE

12	13	14
22	23	24
	33	34
		44

IANCE - COVARIANCE MATRIX

.0621	5.6281	.0124	-.6573
5.6281	5168.0443	2.1000	781.5797
.0124	2.1000	.0491	4.6474
-.6573	781.5797	4.6474	3525.5329

RELATION MATRIX

1.0000	.3142	.2247	-.0444
.3142	1.0000	.1318	.1831
.2247	.1318	1.0000	.3532
-.0444	.1831	.3532	1.0000

	X(1)	X(2)	X(3)	X(4)
N	.4048	135.5096	.3712	128.6076
	.2492	71.8891	.2216	59.3762
MA	2.6387	3.5532	2.8059	4.6915
A	6.5191	.0262	7.5590	.0365

AX - VHMAX

N = 8.8333
= 79.0642

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ION(12868) - CAPE KENNEDY
- JIMSPHERE
H : 2
RENCE ALTITUDE : 100 0M
LENGTH RANGE : 90-42CM

=ABS(UMAX) X(3)=ABS(VMAX)
=LU X(4)=LV

UT MATRIX CODE

12	13	14
22	23	24
	33	34
		44

****

IANCE - COVARIANCE MATRIX

.0726	3.8788	.0279	1.8413
3.8788	3462.0306	1.1599	883.1332
.0279	1.1599	.0896	3.3187
1.8413	883.1332	3.3187	3780.0763

****

RELATION MATRIX

1.0000	.2439	.3453	.1111
.2439	1.0000	.0657	.2434
.3453	.0657	1.0000	.1803
.1111	.2434	.1803	1.0000

****

	X(1)	X(2)	X(3)	X(4)
N	.4499	117.1096	.4561	113.3351
	.2695	59.0087	.2993	61.4823
MA	2.7884	3.9387	2.3220	3.3980
A	6.1971	.0336	5.0906	.0300

****

AX - VMAX

N = 6.6667
= 70.5721

ION(12868) - CAPE KENNEDY
-- JIMSPHERE
H : 2
RENCE ALTITUDE : 1200CM
LENGTH RANGE : 90-420M

=ABS(UMAX)   X(3)=ABS(VMAX)
=LU   X(4)=LV

UT MATRIX CODE
12 13 14
22 23 24
33 34
44

****

IANCE - COVARIANCE MATRIX

.1195	7.8475	-.0023	.8519
7.8475	4140.3198	-1.5863	1080.1680
-.0024	-1.5863	.2256	7.5363
.8519	1080.1679	7.5363	4365.1996

****

RELATION MATRIX

1.0000	.3528	-.0124	.0373
.3528	1.0000	-.0519	.2541
-.0124	-.0519	1.0000	.2401
.0373	.2541	.2401	1.0000

****

	X(1)	X(2)	X(3)	X(4)
N	.5196	107.3046	.7493	112.0313
	.3457	64.3453	.4750	66.0697
MA	2.2586	2.7808	2.4888	2.8752
A	4.3472	.0259	3.3212	.0257

****

AX - VHMAX

N = 6.3333
= 71.8398

ION(12868) - CAPE KENNEDY
- JIMSPHERE
M : 2
RENCE ALTITUDE : 14000M
LENGTH RANGE : 90-420M

=ABS(UMAX)   X(3)=ABS(VMAX)
=LU   X(4)=LV

UT MATRIX CODE

12	13	14
22	23	24
	33	34
		44

IANCE - COVARIANCE MATRIX

.1399	7.9855	.0396	-1.5849
7.9855	4661.0539	-6.5039	368.1645
.0396	-6.5039	.2605	3.9066
-1.5849	368.1645	3.9066	2956.6901

RELATION MATRIX

1.0000	.3128	.2077	-.0779
.3128	1.0000	-.1866	.0992
.2077	-.1866	1.0000	.1408
-.0779	.0992	.1408	1.0000

	X(1)	X(2)	X(3)	X(4)
N	.6172	105.7011	.8537	96.6665
	.3743	68.2719	.5104	54.3755
MA	2.7237	2.3970	2.7977	3.1604
A	4.4131	.0227	3.2771	.0327

AX - VMMAX

N = -1.3333
= 55.5469

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STATION(12868) - CAPE KENNEDY
DATA - JIMSPHERE
MONTH : 2
REFERENCE ALTITUDE : 4000M
WAVELENGTH RANGE : 90-997M

X(1)=ABS(UMAX)
X(2)=LU
X(3)=ABS(VMAX)
X(4)=LV

OUTPUT MATRIX CODE

11	12	13	14
	22	23	24
		33	34
			44

VARIANCE - COVARIANCE MATRIX

.1907	20.6399	.0815	11.0066
20.6399	13979.4832	3.9736	976.3557
.0815	3.9736	.2704	24.3058
11.0066	976.3565	24.3058	15267.5662

CORRELATION MATRIX

1.0000	.3998	.3588	.2040
.3998	1.0000	.0646	.0666
.3588	.0646	1.0000	.3783
.2040	.0666	.3783	1.0000

	X(1)	X(2)	X(3)	X(4)
MEAN	.8367	266.9105	.9296	288.7235
SD	.4366	118.2349	.5200	123.5620
GAMMA	3.6720	5.0961	3.1964	5.4600
BETA	4.3685	.0191	3.4383	.0189

UHMAX - VHMAX

MEAN = 4.8333
SD = 140.4600

STATION(12868) - CAPE KENNEDY
DATA - JIMSPHERE
MONTH : 2
REFERENCE ALTITUDE : 6000M
WAVELENGTH RANGE : 90-997M

X(1)=ABS(UMAX) X(3)=ABS(VMAX)
X(2)=LU X(4)=LV

OUTPUT MATRIX CODE

11	12	13	14
	22	23	24
		33	34
			44

****

VARIANCE - COVARIANCE MATRIX

.2123	31.3989	.0430	.2003
31.3989	15356.4344	3.1730	-806.5260
.0430	3.1730	.2036	26.1082
.2003	-806.5252	26.1082	15997.6447

****

CORRELATION MATRIX

1.0000	.5500	.2067	.0034
.5500	1.0000	.0567	-.0515
.2067	.0567	1.0000	.4575
.0034	-.0515	.4575	1.0000

****

	X(1)	X(2)	X(3)	X(4)
MEAN	.8042	264.9831	.8258	289.2602
SD	.4607	123.9211	.4512	126.4826
GAMMA	3.0471	4.5724	3.3494	5.2302
BETA	3.7889	.0173	4.0559	.0181

****

UHMAX - VHMAX

MEAN = -1.6667
SD = 152.4593

STATION(12868) - CAPE KENNEDY
DATA - JIMSPHERE
MONTH : 2
REFERENCE ALTITUDE : 8000M
WAVELENGTH RANGE : 90-997M

X(1)=ABS(UMAX) X(3)=ABS(VMAX)
X(2)=LU X(4)=LV

OUTPUT MATRIX CODE

11	12	13	14
	22	23	24
		33	34
			44

****

VARIANCE - COVARIANCE MATRIX

.2422	28.3946	.0656	5.1666
28.3946	15267.6383	6.9213	1483.3775
.0656	6.9213	.1937	27.0713
5.1666	1483.3775	27.0713	17580.6475

****

CORRELATION MATRIX

1.0000	.4669	.3029	.0795
.4669	1.0000	.1273	.0905
.3029	.1273	1.0000	.4639
.0795	.0905	.4639	1.0000

****

	X(1)	X(2)	X(3)	X(4)
MEAN	.8224	256.8174	.8006	268.2373
SD	.4921	123.5623	.4401	132.5920
GAMMA	2.7925	4.3199	3.3089	4.0927
BETA	3.3954	.0166	4.1330	.0153

****

UHMAX - VHMAX

MEAN = -12.1667
SD = 140.6700

STATION(12868) - CAPE KENNEDY
DATA - JIMSPHERE
MONTH : 2
REFERENCE ALTITUDE : 10000M
WAVELENGTH RANGE : 90-997M

X(1)=ABS(UMAX) X(3)=ABS(VMAX)
X(2)=LU X(4)=LV

OUTPUT MATRIX CODE

11	12	13	14
	22	23	24
		33	34
			44

****

VARIANCE - COVARIANCE MATRIX

.2727	25.8320	.0645	7.3788
25.8320	16098.7533	-1.0854	2705.7047
.0845	-1.0854	.3495	43.3172
7.3788	2705.7051	43.3172	18895.7263

****

CORRELATION MATRIX

1.0000	.3913	.2748	.1032
.3913	1.0000	-.0145	.1551
.2748	-.0145	1.0000	.5330
.1032	.1551	.5330	1.0000

****

	X(1)	X(2)	X(3)	X(4)
MEAN	.8449	230.1564	.9107	227.2907
SD	.5203	126.8809	.5912	137.4617
GAMMA	2.6372	3.2904	2.3731	2.7340
BETA	3.1212	.0143	2.6057	.0120

****

UHMAX - VHMAX

MEAN = -15.0000
SD = 131.9701

STATION(12868) - CAPE KENNEDY
DATA - JIMSPHERE
MONTH : 2
REFERENCE ALTITUDE : 12000M
WAVELENGTH RANGE : 90-997M

X(1)=ABS(UMAX)   X(3)=ABS(VMAX)
X(2)=LU   X(4)=LV

OUTPUT MATRIX CODE

11	12	13	14
	22	23	24
		33	34
			44

VARIANCE - COVARIANCE MATRIX

.5130	46.1336	.1365	7.5969
46.1336	16722.6599	8.0648	2929.9386
.1365	8.0648	.6394	33.5854
7.5969	2929.9388	33.5854	17809.3547

CORRELATION MATRIX

1.0000	.4981	.2384	.0795
.4981	1.0000	.0780	.1698
.2384	.0780	1.0000	.3147
.0795	.1698	.3147	1.0000

	X(1)	X(2)	X(3)	X(4)
MEAN	1.1532	239.2719	1.4140	238.5037
SD	.7162	129.3159	.7996	133.4517
GAMMA	2.5924	3.4236	3.1270	3.1941
BETA	2.2490	.0143	2.2114	.0134

UHMAX - VHMAX

MEAN = -9.3333
SD = 122.8352

ORIGINAL PAGE IS

STATION(12868) - CAPE KENNEDY
DATA - JIMSPHERE
MONTH : 2
REFERENCE ALTITUDE : 14000M
WAVELENGTH RANGE : 90-997M

X(1)=ABS(UMAX)   X(3)=ABS(VMAX)
X(2)=LU   X(4)=LV

OUTPUT MATRIX CODE

11	12	13	14
	22	23	24
		33	34
			44

****

VARIANCE - COVARIANCE MATRIX

.5529	47.3703	.1626	-.3528
47.3703	19534.8958	11.9265	6094.8087
.1626	11.9265	.8662	55.8180
-.3528	6094.8087	55.8180	19717.4622

****

CORRELATION MATRIX

1.0000	.4558	.2349	-.0034
.4558	1.0000	.0917	.3105
.2349	.0917	1.0000	.4271
-.0034	.3105	.4271	1.0000

****

	X(1)	X(2)	X(3)	X(4)
MEAN	1.2316	235.0146	1.6450	224.0275
SD	.7436	139.7673	.9307	140.4185
GAMMA	2.7435	2.8273	3.1354	2.5454
BETA	2.2276	.0120	1.9026	.0114

****

UHMAX - VHMAX

MEAN = 20.5000
SD = 136.8715

STATION(12863) - CAPE KENNEDY
DATA - JIMSPHERE
MONTH : 2
REFERENCE ALTITUDE : 4000M
WAVELENGTH RANGE : 90-2470M

X(1)=ABS(UMAX) X(3)=ABS(VMAX)
X(2)=LU X(4)=LV

OUTPUT MATRIX CODE

11	12	13	14
	22	23	24
		33	34
			44

****

VARIANCE - COVARIANCE MATRIX

.7848	178.5826	.1223	6.6630
178.5826	101969.8516	21.1326	20088.7583
.1223	21.1326	.8987	118.8293
6.6630	20088.7549	118.8293	102376.0566

****

CORRELATION MATRIX

1.0000	.6313	.1456	.0235
.6313	1.0000	.0698	.1966
.1456	.0698	1.0000	.3918
.0235	.1966	.3918	1.0000

****

	X(1)	X(2)	X(3)	X(4)
MEAN	1.6373	600.6027	1.7697	530.8789
SD	.8859	319.3272	.9480	319.9626
GAMMA	3.4160	3.5379	3.4647	3.2958
BETA	2.0864	.0059	1.9691	.0057

****

UHMAX - VHMAX

MEAN = 26.8333
SD = 344.8701

STATION(12868) - CAPE KENNEDY
DATA - JIMSPHERE
MONTH : 2
REFERENCE ALTITUDE : 6000M
WAVELENGTH RANGE : 90-2470M

X(1)=ABS(UMAX)   X(3)=ABS(VMAX)
X(2)=LU   X(4)=LV

OUTPUT MATRIX CODE

11	12	13	14
	22	23	24
		33	34
			44

****

VARIANCE - COVARIANCE MATRIX

.8097	163.9941	.1737	25.4684
163.9941	101781.7549	35.3022	11306.5402
.1737	35.3022	.9327	172.1056
25.4684	11306.5369	172.1056	103849.6641

****

CORRELATION MATRIX

1.0000	.5712	.1998	.0878
.5712	1.0000	.1146	.1100
.1998	.1146	1.0000	.5530
.0878	.1100	.5530	1.0000

****

	X(1)	X(2)	X(3)	X(4)
MEAN	1.6215	579.4374	1.8557	667.0985
SD	.8999	319.0325	.9658	322.2556
GAMMA	3.2470	3.2987	3.6922	4.2853
BETA	2.0025	.0057	1.9896	.0064

****

UHMAX - VHMAX

MEAN = 33.8333
SD = 323.4947

STATION(12868) = CAPE KENNEDY
DATA - JIMSPHERE
MONTH : 2
REFERENCE ALTITUDE : 8000M
WAVELENGTH RANGE : 90-2470M

X(1)=ABS(UMAX)   X(3)=ABS(VMAX)
X(2)=LU   X(4)=LV

OUTPUT MATRIX CODE

11	12	13	14
	22	23	24
		33	34
			44

****

VARIANCE - COVARIANCE MATRIX

.8802	182.1108	.1025	5.3288
182.1108	125070.8184	55.7825	12872.1879
.1025	55.7825	1.1478	249.1447
5.3288	12872.1879	249.1447	118722.7373

****

CORRELATION MATRIX

1.0000	.5489	.1020	.0165
.5489	1.0000	.1472	.1056
.1020	.1472	1.0000	.6749
.0165	.1056	.6749	1.0000

****

	X(1)	X(2)	X(3)	X(4)
MEAN	1.7162	593.9193	1.8110	619.8135
SD	.9382	353.6535	1.0714	344.5617
GAMMA	3.3461	2.8203	2.8574	3.2358
BETA	1.9497	.0047	1.5778	.0052

****

UHMAX - VHMAX

MEAN = 28.1667
SD = 412.4153

STATION(12868) - CAPE KENNEDY
DATA - JIMSPHERE
MONTH : 2
REFERENCE ALTITUDE : 10000M
WAVELENGTH RANGE : 90-2470M

X(1)=ABS(UMAX) X(3)=ABS(VMAX)
X(2)=LU X(4)=LV

OUTPUT MATRIX CODE

11	12	13	14
	22	23	24
		33	34
			44

VARIANCE - COVARIANCE MATRIX

1.1761	234.1799	.3624	36.5282
234.1799	134705.0801	57.3934	26702.6643
.3624	57.3933	1.7801	274.1405
36.5282	26702.6643	274.1405	147718.2207

CORRELATION MATRIX

1.0000	.5884	.2504	.0876
.5884	1.0000	.1172	.1893
.2504	.1172	1.0000	.5346
.0876	.1893	.5346	1.0000

	X(1)	X(2)	X(3)	X(4)
MEAN	1.8983	639.1374	2.2487	680.2996
SD	1.0845	367.0219	1.3342	384.3413
GAMMA	3.0639	3.0325	2.8436	3.1330
BETA	1.6141	.0047	1.2632	.0046

UHMAX - VHMAX

MEAN = 46.3333
SD = 367.1538

STATION(12868) - CAPE KENNEDY
DATA - JIMSPHERE
MONTH : 2
REFERENCE ALTITUDE : 14000M
WAVELENGTH RANGE : 90-2470M

X(1)=ABS(UMAX) X(3)=ABS(VMAX)
X(2)=LU X(4)=LV

OUTPUT MATRIX CODE

11	12	13	14
	22	23	24
		33	34
			44

****

VARIANCE - COVARIANCE MATRIX

2.4842	330.7785	1.0129	66.8272
330.7785	137709.2266	77.2983	31492.4429
1.0129	77.2983	4.0031	390.6417
66.8272	31492.4463	390.6417	121945.9121

****

CORRELATION MATRIX

1.0000	.5655	.3212	.1214
.5655	1.0000	.1041	.2430
.3212	.1041	1.0000	.5591
.1214	.2430	.5591	1.0000

****

	X(1)	X(2)	X(3)	X(4)
MEAN	2.8799	639.7771	3.5663	587.8611
SD	1.5761	371.0919	2.0008	349.2076
GAMMA	3.3385	2.9723	3.1772	2.8339
BETA	1.1593	.0046	.8909	.0048

****

UHMAX - VHMAX

MEAN = 15.6667
SD = 368.6833

STATION(12868) - CAPE KENNEDY
DATA - JIMSPHERE
MONTH : 2
REFERENCE ALTITUDE : 4000M
WAVELENGTH RANGE : 90-6000M

X(1)=ABS(UMAX)   X(3)=ABS(VMAX)
X(2)=LU   X(4)=LV

OUTPUT MATRIX CODE

11	12	13	14
	22	23	24
		33	34
			44

VARIANCE - COVARIANCE MATRIX

2.6504	462.5779	-.3647	-208.4491
462.5779	170799.2227	-149.7229	-76066.6133
-.3647	-149.7228	1.7712	638.3315
-208.4491	-76066.6133	638.3315	446166.7695

CORRELATION MATRIX

1.0000	.6875	-.1683	-.1917
.6875	1.0000	-.2722	-.2756
-.1683	-.2722	1.0000	.7181
-.1917	-.2756	.7181	1.0000

	X(1)	X(2)	X(3)	X(4)
MEAN	1.9114	625.1430	2.0017	606.1550
SD	1.6280	413.2786	1.3309	667.9572
GAMMA	1.3784	2.2881	2.2621	.8235
BETA	.7212	.0037	1.1301	.0014

UHMAX - VHMAX

MEAN = -62.5000
SD = 658.6383

STATION(12868) - CAPE KENNEDY
DATA - JIMSPHERE
MONTH : 2
REFERENCE ALTITUDE : 12000M
WAVELENGTH RANGE : 90-2470M

X(1)=ABS(UMAX)   X(3)=ABS(VMAX)
X(2)=LU   X(4)=LV

OUTPUT MATRIX CODE

11	12	13	14
	22	23	24
		33	34
			44

VARIANCE - COVARIANCE MATRIX

2.9428	338.0330	.7783	84.8580
338.0330	113818.4629	80.1879	29900.9897
.7783	80.1879	3.2297	413.8292
84.8581	29900.9932	413.8292	156217.3945

CORRELATION MATRIX

1.0000	.5841	.2525	.1252
.5841	1.0000	.1323	.2242
.2525	.1323	1.0000	.5826
.1252	.2242	.5826	1.0000

	X(1)	X(2)	X(3)	X(4)
MEAN	2.6323	576.8489	3.0654	607.4380
SD	1.7154	337.3699	1.7971	395.2372
GAMMA	2.3545	2.9236	2.9095	2.3618
BETA	.8945	.0051	.9491	.0039

UHMAX - VHMAX

MEAN = -18.1667
SD = 322.5626

STATION(12868) - CAPE KENNEDY
DATA - JIMSPHERE
MONTH : 2
REFERENCE ALTITUDE : 6000M
WAVELENGTH RANGE : 90-6000M

X(1)=ABS(UMAX) X(3)=ABS(VMAX)
X(2)=LU X(4)=LV

OUTPUT MATRIX CODE

```
11  12  13  14
    22  23  24
        33  34
            44
```

VARIANCE - COVARIANCE MATRIX

2.8014	933.5877	.8454	189.8227
933.5877	566843.5859	350.0473	118800.5986
.8454	350.0472	3.3736	706.7689
189.8227	118800.5850	706.7689	398521.6445

CORRELATION MATRIX

1.0000	.7409	.2750	.1797
.7409	1.0000	.2531	.2500
.2750	.2531	1.0000	.6095
.1797	.2500	.6095	1.0000

	X(1)	X(2)	X(3)	X(4)
MEAN	2.6902	1115.4594	3.2117	1174.5381
SD	1.6737	752.8902	1.8367	631.2857
GAMMA	2.5834	2.1950	3.0577	3.4616
BETA	.9603	.0020	.9520	.0029

UHMAX - VHMAX

MEAN = 50.5068
SD = 615.4161

STATION(12868) - CAPE KENNEDY
DATA - JIMSPHERE
MONTH : 2
REFERENCE ALTITUDE : 8000M
WAVELENGTH RANGE : 90-6000M

X(1)=ABS(UMAX) X(3)=ABS(VMAX)
X(2)=LU X(4)=LV

OUTPUT MATRIX CODE

```
11  12  13  14
    22  23  24
        33  34
            44
```

****

VARIANCE - COVARIANCE MATRIX

3.5021	1184.2853	.9022	169.3388
1184.2853	735397.3359	312.5666	55322.5503
.9022	312.5666	4.3073	1018.4218
169.3388	55322.5503	1018.4218	523272.6680

****

CORRELATION MATRIX

1.0000	.7380	.2323	.1251
.7380	1.0000	.1756	.0892
.2323	.1756	1.0000	.6784
.1251	.0892	.6784	1.0000

****

	X(1)	X(2)	X(3)	X(4)
MEAN	3.2008	1220.9341	3.3275	1214.9832
SD	1.8714	857.5531	2.0754	723.3759
GAMMA	2.9254	2.0270	2.5705	2.8211
BETA	.9140	.0017	.7725	.0023

****

UHMAX - VHMAX

MEAN = -48.5000
SD = 673.3059

STATION(12868) - CAPE KENNEDY
DATA - JIMSPHERE
MONTH : 2
REFERENCE ALTITUDE : 10000M
WAVELENGTH RANGE : 90-6000M

X(1)=ABS(UMAX)　　X(3)=ABS(VMAX)
X(2)=LU　　X(4)=LV

OUTPUT MATRIX CODE

11	12	13	14
	22	23	24
		33	34
			44

****

VARIANCE - COVARIANCE MATRIX

5.7804	1457.2729	1.7423	326.4252
1457.2729	674544.5859	351.4210	116873.2617
1.7423	351.4211	8.6636	1178.0950
326.4252	116873.2617	1178.0950	528037.8984

****

CORRELATION MATRIX

1.0000	.7380	.2462	.1868
.7380	1.0000	.1454	.1958
.2462	.1454	1.0000	.5508
.1868	.1958	.5508	1.0000

****

	X(1)	X(2)	X(3)	X(4)
MEAN	3.7574	1377.6360	4.2515	1233.9004
SD	2.4042	821.3066	2.9434	726.6622
GAMMA	2.4424	2.8136	2.0864	2.8833
BETA	.6500	.0020	.4907	.0023

****

UHMAX - VHMAX

MEAN = -48.5000
SD = 844.5355

STATION(12868) - CAPE KENNEDY
DATA - JIMSPHERE
MONTH : 2
REFERENCE ALTITUDE : 12000M
WAVELENGTH RANGE : 90-6000M

X(1)=ABS(UMAX)   X(3)=ABS(VMAX)
X(2)=LU   X(4)=LV

OUTPUT MATRIX CODE

11	12	13	14
	22	23	24
		33	34
			44

VARIANCE - COVARIANCE MATRIX

8.8797	1855.3629	2.5244	121.3086
1855.3630	922407.7031	50.7343	-63972.6841
2.5244	50.7343	10.1483	1461.5043
121.3086	-63972.6841	1461.5043	520353.0469

CORRELATION MATRIX

1.0000	.6483	.2659	.0564
.6483	1.0000	.0166	-.0923
.2659	.0166	1.0000	.6360
.0564	-.0923	.6360	1.0000

	X(1)	X(2)	X(3)	X(4)
MEAN	4.8647	1356.6716	5.2280	1147.0913
SD	2.9799	960.4206	3.1856	721.3550
GAMMA	2.6651	1.9954	2.6933	2.5287
BETA	.5478	.0015	.5152	.0022

UHMAX - VHMAX

MEAN = -48.5000
SD = 684.5750

STATION(12868) - CAPE KENNEDY
DATA - JIMSPHERE
MONTH : 2
REFERENCE ALTITUDE : 14000M
WAVELENGTH RANGE : 90-6000M

X(1)=ABS(UMAX)　　X(3)=ABS(VMAX)
X(2)=LU　　X(4)=LV

OUTPUT MATRIX CODE

11	12	13	14
	22	23	24
		33	34
			44

VARIANCE - COVARIANCE MATRIX

6.0018	1150.3496	1.6439	185.3245
1150.3496	780012.9531	11.7362	118126.4102
1.6439	11.7362	9.3960	1291.0477
185.3245	118126.3965	1291.0477	495277.6680

CORRELATION MATRIX

1.0000	.5317	.2189	.1075
.5317	1.0000	.0043	.1901
.2189	.0043	1.0000	.5985
.1075	.1901	.5985	1.0000

	X(1)	X(2)	X(3)	X(4)
MEAN	5.0082	1310.8749	5.4234	1031.1996
SD	2.4499	883.1834	3.0653	703.7597
GAMMA	4.1791	2.2030	3.1304	2.1470
BETA	.8345	.0017	.5772	.0021

UHMAX - VHMAX

MEAN = -88.4354
SD = 669.4167

APPENDIX C. THEORETICAL PROBABILITIES

This appendix contains lists of probabilities, P(X), where

$$P(X) = \int_0^X f(x)dx$$

where f(x) is the univariate gamma probability density function derived from the parameters γ and β[1] calculated from sample statistics. The univariate gamma distribution and its parameters are defined in Section II. These theoretical probabilities are calculated for absolute component gusts and associated gust lengths for the month of February at Cape Kennedy for six reference altitudes (4, 6, ..., 14 km) and four wavelength ranges.

Similar sets of probability calculations have been completed for the months of April and July, but are not included in this Appendix.

The notation in the computer output format does not correspond exactly with that used in the body of this report; refer to the table in Appendix B for an explanation of the differences.

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[1] The parameter "beta" listed in the computer listings is β^*; where $\beta^* = 1/\beta$.

STATION: CAPE KENNEDY
DATA: JIMSPHERE
MONTH: 2
WAVELENGTH RANGE: 90-420 M

THEORETICAL PROBABILITY DISTRIBUTION: GAMMA
ABS UMAX (M/S)

ALT(KM)	4	6	8	10	12	14
GAMMA	2.797703058	3.059501350	2.538694137	2.798361073	2.258609831	2.723749220
BETA	.140347043	.120760675	.153396269	.151366543	.230032185	.226597581

X	P(X)	P(X)	P(X)	P(X)	P(X)	P(X)
.0625	.016007638	.013988146	.017891020	.011527110	.016824655	.005693812
.1250	.081459056	.080364286	.084207366	.060648222	.057617753	.033995574
.1875	.186553928	.193356270	.186344715	.143658474	.141515439	.077116626
.2500	.310182050	.328415263	.304639388	.245722046	.227714822	.139659429
.3125	.434902534	.453843930	.423707075	.355585339	.317970216	.212923368
.3750	.549705632	.596119529	.533943452	.453514362	.406597525	.291565385
.4375	.649141617	.689086462	.630495705	.551484747	.499995993	.371217325
.5000	.731613733	.771591455	.711785017	.647463724	.566139303	.449620152
.5625	.797831714	.835287027	.778232098	.720524929	.634091318	.521540716
.6250	.849675739	.883060932	.831311174	.781073451	.693675479	.583603109
.6875	.889456473	.918075226	.872941054	.830257714	.745194368	.647101466
.7500	.919482380	.943257906	.905104995	.859562104	.789227456	.702825412
.8125	.941836752	.961087145	.929645797	.900546052	.826504141	.749911907
.8750	.958287850	.973543420	.948175833	.924690977	.857805299	.790725254
.9375	.970274821	.982197925	.962039195	.943321496	.883909531	.825766757
1.0000	.978934214	.988032110	.972330637	.957574591	.905545752	.855605811
1.0625	.985142827	.992022373	.979913234	.969397461	.923387870	.880832337
1.1250	.989564814	.994707502	.985473632	.975561524	.938030754	.902024247
1.1875	.992695749	.996502243	.989531562	.982683964	.949999236	.919726461
1.2500	.994900897	.997694537	.992471531	.987251297	.959745742	.934439152
1.3125	.996446647	.998482339	.994594917	.990642451	.967655448	.945611565
1.3750	.997525528	.999000236	.996122524	.993149593	.974057853	.956641175
1.4375	.998275533	.999339245	.997217558	.994995959	.979223810	.964874171
1.5000	.998795085	.999560207	.997999774	.996350984	.983382344	.971609354
1.5625	.999153845	.999703653	.998557359	.997341931	.986722305	.977102093
1.6250	.999400832	.999796428	.998953335	.998064697	.989399197	.981568647
1.6875	.999570332	.999856241	.999233872	.998590305	.991543447	.985191055
1.7500	.999686323	.999894701	.999432184	.998971589	.993250151	.988121703
1.8125	.999765530	.999919303	.999572061	.999247491	.994613074	.990487233
1.8750	.999819465	.999934986	.999670453	.999446598	.995697804	.992392577
1.9375	.999856122	.999944910	.999739528	.999590226	.996557888	.993924193
2.0000	.999880962	.999951214	.999787956	.999693431	.997244097	.995153166
2.0625	.999897756	.999955177	.999821812	.999767505	.997785490	.996137515
2.1250	.999909148	.999957521	.999845453	.999820560	.998215795	.996924609
2.1875	.999916755	.999959134	.999861911	.999858513	.998555318	.997553065
2.2500	.999921859	.999960020	.999873318	.999885509	.998823531	.998054072
2.3125	.999925226	.999960549	.999881208	.999904986	.999035125	.998452909
2.3750	.999927454	.999960780	.999885625	.999918510	.999202059	.998770066

2.4375	.999928899	.999960892	.999893335	.999928333	.999333486	.999021895
2.5000	.999929823	.999960966	.999892861	.999935202	.999435922	.999221645
2.5625	.999930426	.999960966	.999894559	.999940082	.999519238	.999379911
2.6250	.999930732	.999960966	.999895662	.999943510	.999582142	.999505170
2.6875	.999930903	.999960966	.999895429	.999945916	.999632234	.999604166
2.7500	.999931000	.999960966	.999895809	.999947593	.999671639	.999682367
2.8125	.999931045	.999960966	.999897040	.999948747	.999702451	.999744028
2.8750	.999931045	.999960966	.999897167	.999949552	.999726593	.999792521
2.9375	.999931045	.999960966	.999897264	.999950051	.999745481	.999830849
3.0000	.999931045	.999960965	.999897264	.999950439	.999763240	.999860972

STATION: CAPE KENNEDY
DATA: JIMSPHERE
MONTH: 2
WAVELENGTH RANGE: 90-420 M

THEORETICAL PROBABILITY DISTRIBUTION: GAMMA
ABS VMAX (M/S)

ALT(KM)	4	6	8	10	12	14
GAMMA	2.562003404	3.094185405	2.805939810	2.321975201	2.488759499	2.797729015
BETA	.157043364	.114149935	.132293105	.196440.12	.301091553	.335143457
X	P(X)	P(X)	P(X)	P(X)	P(X)	P(X)
.0625	.019852504	.015507304	.018221954	.020269193	.005220813	.002169729
.1250	.089460052	.088685570	.091534378	.092366365	.025477580	.013044832
.1875	.193632534	.211201981	.206685871	.171494154	.050624572	.035045906
.2500	.312343303	.354572536	.338953428	.272920553	.107779731	.067830474
.3125	.430661105	.495000578	.469119156	.375954531	.163519079	.109800110
.3750	.539551474	.618682049	.585939869	.473791941	.224613490	.159864735
.4375	.634602033	.720189661	.684564762	.562628530	.289295530	.212861866
.5000	.714504115	.799411662	.764275937	.640762731	.352352031	.269781638
.5625	.779804438	.858955532	.826635443	.707864322	.415080231	.327876471
.6250	.832015455	.902419001	.874197915	.764433682	.475243233	.385701593
.6875	.873036690	.933411673	.909749018	.811423309	.531994492	.442115273
.7500	.904808588	.955093466	.935883410	.849986151	.584804532	.495255545
.8125	.929125242	.970022075	.954834424	.881316170	.633394003	.547511712
.8750	.947549477	.980163448	.968415803	.905553991	.677673735	.595476970
.9375	.961387124	.986973703	.978054580	.925736414	.717696346	.639921069
1.0000	.971707642	.991501622	.984834686	.942774379	.753614783	.680750556
1.0625	.979350731	.994485548	.989569278	.955448583	.785650337	.717979798
1.1250	.984979481	.996437564	.992851160	.965415935	.814065479	.751699314
1.1875	.989103549	.997705236	.995114505	.973220386	.839147527	.782063276
1.2500	.992111325	.998523608	.996665536	.979307901	.861191334	.809261270
1.3125	.994295955	.999048986	.997725837	.984039322	.880487978	.833508141
1.3750	.995875744	.999384575	.998445615	.987705357	.897323747	.855031602
1.4375	.997015758	.999597722	.998932876	.990537718	.911955675	.874063224
1.5000	.997836344	.999733016	.999261498	.992720246	.924645022	.890831716
1.5625	.998423937	.999818154	.999482356	.994395005	.935615249	.905559079
1.6250	.998843993	.999871566	.999633347	.995684947	.945075456	.918452308
1.6875	.999143451	.999905109	.999729186	.996669988	.953217506	.929711066
1.7500	.999356520	.999925719	.999795305	.997422434	.960207793	.939515604
1.8125	.999507971	.999938809	.999839746	.997996345	.966199139	.948036216
1.8750	.999615245	.999946773	.999867707	.998433337	.971322397	.955422118
1.9375	.999691106	.999951553	.999885926	.998765513	.975697555	.961811937
2.0000	.999744524	.999954611	.999899358	.999017715	.979427929	.967329353
2.0625	.999782324	.999956377	.999907635	.999208945	.982603297	.972084805
2.1250	.999808878	.999957375	.999912985	.999353528	.985302549	.976176530
2.1875	.999827489	.999957941	.999915449	.999462985	.987594239	.979691535
2.2500	.999840543	.999958187	.999913577	.999545526	.989537172	.982706562
2.3125	.999849525	.999958299	.999923085	.999607950	.991182559	.985287037
2.3750	.999855921	.999958344	.999923934	.999654741	.992574495	.987497978

2.4375	.999860324	.999958344	.999921449	.999690272	.993750602	.989385016
2.5000	.999863319	.999958344	.999921687	.999716811	.994743436	.990995146
2.5625	.999865390	.999958344	.999921821	.999736749	.995580845	.992367394
2.6250	.999866769	.999958344	.999921918	.999751739	.996285385	.993535586
2.6875	.999867555	.999958344	.999921918	.999762915	.996880352	.994529061
2.7500	.999868311	.999958344	.999921918	.999771290	.997379935	.995373085
2.8125	.999868616	.999958344	.999921918	.999777518	.997799903	.996089466
2.8750	.999868818	.999958344	.999921918	.999782145	.998152594	.996696897
2.9375	.999868922	.999958344	.999921918	.999785595	.998449551	.997211561
3.0000	.999869011	.999958344	.999921918	.999788143	.998696799	.997647233

STATION: CAPE KENNEDY
DATA: JIMSPHERE
MONTH: 2
WAVELENGTH RANGE: 90-420 M

THEORETICAL PROBABILITY DISTRIBUTION: GAMMA
U (M)

ALT(KM)	4	5	9	10	12	14
GAMMA	4.314357817	4.747665895	3.553154618	3.938693553	2.780832395	2.397036015
BETA	33.004011154	31.556274176	38.137836456	29.733099699	38.586133071	44.076566200

X	P(X)	P(X)	P(X)	P(X)	P(X)	P(X)
5.0000	.000006603	.000001777	.000052604	.000335576	.000665712	.001645306
10.0000	.000116380	.000041931	.000559694	.000478506	.004213243	.009153595
15.0000	.000592693	.000252535	.002137460	.002070751	.011863491	.019978469
20.0000	.001816910	.000869964	.005373459	.035539201	.024073310	.035865985
25.0000	.004219667	.002207332	.010745213	.011920045	.040835514	.059286780
30.0000	.008219577	.004616564	.018603140	.021472979	.061885711	.083603844
35.0000	.014188123	.008452309	.029145170	.034650746	.086784357	.112152894
40.0000	.022423367	.014040627	.042469394	.051602042	.115005885	.143286496
45.0000	.033133181	.021657686	.058551237	.072293247	.145991929	.175397761
50.0000	.046435540	.031514955	.077288510	.096539419	.179175118	.210932713
55.0000	.062361239	.043752396	.098507309	.124038313	.214017246	.245395733
60.0000	.080862051	.058435573	.121984526	.154403716	.250009120	.282350726
65.0000	.101621596	.075561751	.147462525	.187195731	.286693369	.319419684
70.0000	.125067517	.095063162	.174662601	.221946929	.323649989	.354279578
75.0000	.150383957	.116816846	.203295285	.259184057	.360523824	.387658403
80.0000	.177523522	.140653832	.233074583	.295445137	.397003826	.424330700
85.0000	.206218367	.166368987	.263715260	.333292425	.432825020	.459113000
90.0000	.236190069	.193730591	.294943496	.371321712	.467772351	.493859237
95.0000	.267158084	.222489955	.326521013	.409168359	.501665159	.522455340
100.0000	.298846811	.252388671	.358193959	.445510702	.534363155	.552020198
105.0000	.330991317	.283166889	.389769670	.483071398	.565772548	.581891716
110.0000	.363341726	.314568948	.421042703	.519617027	.595803075	.609633341
115.0000	.395666525	.346348602	.451850008	.552956469	.624409266	.635025921
120.0000	.427754764	.378272973	.482045658	.585938409	.651562832	.661065713
125.0000	.459417410	.410125554	.511505120	.617448181	.677254416	.684761956
130.0000	.490487911	.441708852	.540124230	.647474298	.701493653	.707134530
135.0000	.520622190	.472844735	.567817904	.675754923	.724291362	.728211969
140.0000	.550298139	.503376171	.594519729	.702473648	.745697172	.749029768
145.0000	.578814760	.533166781	.620175429	.727556907	.765717365	.765628727
150.0000	.605293546	.562100527	.644751415	.751019612	.784427993	.784053817
155.0000	.632663243	.590081528	.668223172	.772892386	.801873212	.803352886
160.0000	.657886714	.617031991	.690579833	.793218598	.818098918	.815575800
165.0000	.681933639	.642892190	.711815713	.812051576	.833171393	.827773620
170.0000	.704778284	.657617857	.731943913	.829452761	.847145392	.842997812
175.0000	.726425074	.691180333	.750975184	.845480567	.860093297	.855299801
180.0000	.746877111	.713553561	.768931583	.853230066	.872041337	.865733504
185.0000	.766149536	.734763364	.785839543	.873749845	.883079843	.877339918
190.0000	.784265235	.754725940	.801729731	.885121921	.893253153	.887176454

195.0000	.801253527	.773646243	.816635324	.897420034	.902619875	.895287598
200.0000	.817148976	.791366975	.830595134	.907716952	.911232747	.904718946
205.0000	.831993257	.807976745	.843647890	.917083733	.919143385	.912513927
210.0000	.845819354	.823509902	.855831675	.925589152	.926401168	.919714667
215.0000	.858683502	.838004552	.867183349	.933299221	.933053076	.925361024
220.0000	.870619506	.851502046	.877759114	.940276973	.939143680	.932490908
225.0000	.881683052	.864046127	.887585074	.945582139	.944715127	.938140295
230.0000	.891919205	.875682086	.896705924	.952271104	.949807349	.943343170
235.0000	.901371829	.886456154	.905164666	.957396768	.954456732	.948131591
240.0000	.910090208	.896414983	.912997417	.962008692	.958699033	.952535726
245.0000	.918118723	.905604590	.920243137	.966152929	.962565539	.955583887
250.0000	.925501555	.914071463	.926939564	.969872244	.966089774	.960302658
255.0000	.932281435	.921860129	.933119021	.973206192	.969297349	.963716894
260.0000	.939499518	.929014459	.938813432	.976191275	.972215064	.965849811
265.0000	.944195226	.935576878	.944069155	.978861056	.974867485	.969723053
270.0000	.949405177	.941588141	.948902048	.981246240	.977277175	.972356834
275.0000	.954169119	.947087303	.953345364	.983375320	.979464956	.974769899
280.0000	.958514869	.952111539	.957427819	.985273071	.981450095	.975979747
285.0000	.962478369	.956695622	.961179645	.986963786	.983253342	.979002535
290.0000	.966088660	.960875727	.964617439	.988468401	.984881957	.980853312
295.0000	.969373874	.964680575	.967767474	.989806280	.986363028	.982545979
300.0000	.972363425	.968140963	.970655477	.990994774	.987693197	.984093390
305.0000	.975072965	.971284471	.973298870	.992049791	.988909170	.985507481
310.0000	.977534339	.974137485	.975715652	.992985457	.990004459	.985799270
315.0000	.979765899	.976724200	.977924563	.993814722	.990994652	.987978938
320.0000	.981787331	.979067184	.979942232	.994549096	.991887462	.989055574
325.0000	.983616941	.981197455	.981783379	.995198995	.992697709	.990039104
330.0000	.985271510	.983104452	.983464159	.995773566	.993427449	.990934394
335.0000	.986766912	.984836161	.984995991	.996281505	.994085035	.991751693
340.0000	.988117166	.986399122	.986391972	.996729963	.994680119	.992496759
345.0000	.989335549	.987808545	.987663060	.997125722	.995215848	.993175790
350.0000	.990434185	.989078797	.988823083	.997474782	.995693793	.993794404

STATION: CAPE KENNEDY
DATA: JIMSPHERE
MONTH: 2
WAVELENGTH RANGE: 90-420 M

THEORETICAL PROBABILITY DISTRIBUTION: GAMMA
LV (M)

ALT(KM)	4	6	8	10	12	14
GAMMA	4.266753395	4.384461343	4.691454961	3.398041243	2.875244375	3.150429001
BETA	36.202405683	30.430253029	27.413098335	33.353083273	39.964095546	30.536507082
X	P(X)	P(X)	P(X)	P(X)	P(X)	P(X)
5.0000	.000005303	.000007314	.000004105	.000138862	.000477839	.003389228
10.0000	.000091445	.000133975	.000091408	.001310527	.003217634	.003096607
15.0000	.000461796	.000694357	.000529001	.004639974	.009417673	.007880974
20.0000	.001411515	.002148334	.001755477	.011[illegible]716	.019632353	.021742075
25.0000	.003277552	.005014479	.004320224	.021012523	.034011599	.039651269
30.0000	.006397304	.009793467	.008781314	.034923705	.052432551	.061715404
35.0000	.011078380	.016917356	.015652710	.052789509	.074594045	.087322218
40.0000	.017578671	.026717970	.025350915	.074459538	.100085567	.121258371
45.0000	.026095016	.039411985	.038169693	.099640418	.128441999	.155900589
50.0000	.036758610	.055100248	.054264787	.127941003	.159168638	.195184059
55.0000	.049635412	.073774321	.073665612	.159910258	.191775421	.235650035
60.0000	.064733104	.095328350	.096282021	.192067966	.225794263	.277480084
65.0000	.081992335	.119577946	.121915718	.225928746	.260781478	.320015794
70.0000	.101324337	.146274352	.150294470	.253020229	.296334911	.362675062
75.0000	.122589174	.175122913	.181079101	.299896119	.332092740	.404952496
80.0000	.145619005	.205798500	.213887670	.337145142	.367735979	.445419977
85.0000	.170223087	.237960242	.249329863	.379396548	.402987771	.485728929
90.0000	.196195150	.271262598	.283989009	.411322966	.437612929	.525601253
95.0000	.223320052	.305366974	.320473463	.447641160	.471414150	.562824048
100.0000	.251379572	.339948265	.357391316	.483111314	.504230693	.599242573
105.0000	.280157365	.374702215	.394395482	.517535090	.535934091	.631752969
110.0000	.309443049	.409379181	.431153453	.550752960	.565425510	.663295142
115.0000	.339035537	.443637278	.467393984	.592641058	.595632397	.692845052
120.0000	.369745517	.477343916	.502841018	.61310774[illegible]	.623505220	.723413305
125.0000	.398397401	.510275251	.537294179	.642090149	.650014646	.745029989
130.0000	.427633540	.542271033	.570572965	.659550449	.675148576	.767747049
135.0000	.456970027	.573193916	.602535307	.695472710	.698909715	.791633748
140.0000	.485477004	.602935539	.633072197	.719859563	.721313037	.811760907
145.0000	.513443541	.631414510	.662109987	.742729239	.742383793	.833239490
150.0000	.540717781	.659570759	.689582519	.764112945	.762155473	.847138330
155.0000	.567202404	.694364970	.715477958	.784051958	.780668237	.862560719
160.0000	.592834939	.709776183	.739785641	.902595584	.797967203	.875602948
165.0000	.617560879	.731800079	.762513138	.919500943	.814101458	.887340704
170.0000	.641338900	.753445931	.783703260	.835727431	.829122730	.900927504
175.0000	.669139149	.773739597	.803381965	.850938993	.843084387	.911395133
185.0000	.685940705	.792697951	.821603335	.954000548	.855040739	.920850046
190.0000	.706739434	.910379223	.838427208	.975978739	.868046292	.929375059
190.0000	.725517983	.926807146	.953917353	.997737103	.879155152	.937051378

195.0000	.795296702	.842053212	.868192091	.899946843	.889423569	.943950817
200.0000	.763082400	.956160387	.881172297	.939065505	.899894431	.953193568
205.0000	.779892296	.869187176	.893083033	.915856796	.907627732	.955694325
210.0000	.795749331	.881191529	.903937526	.924980140	.915663711	.963663125
215.0000	.810676254	.892231997	.913815176	.932192408	.923054329	.965105355
220.0000	.824765005	.902366735	.922785893	.939857788	.929859295	.969072081
225.0000	.837865978	.911653530	.930914417	.944897629	.936096251	.972613153
230.0000	.850192487	.920149328	.938265866	.950390362	.941815530	.975762434
235.0000	.861719236	.927907638	.944905549	.955371410	.947055414	.978565092
240.0000	.872481808	.934982322	.950887491	.959883578	.951851877	.981062733
245.0000	.882516339	.941423547	.956274435	.963966593	.956239851	.983278707
250.0000	.891859114	.947279960	.961112775	.967657484	.960249346	.985245317
255.0000	.900546186	.952596988	.965453401	.970990643	.963909231	.985993081
260.0000	.908613242	.957417838	.969341982	.973997980	.967253054	.988533989
265.0000	.916095309	.951783446	.972823505	.976708807	.970295532	.989901572
270.0000	.923025592	.955731889	.975929267	.979150273	.973072551	.991111226
275.0000	.929443290	.959298750	.978701144	.981347300	.975603593	.992180347
280.0000	.935368523	.972517312	.981172122	.983322747	.977901317	.993124634
285.0000	.940842234	.975418337	.983371464	.985097565	.979993972	.993958056
290.0000	.945891120	.978030391	.985325745	.986690968	.981895993	.994693100
295.0000	.950543560	.980379865	.987063102	.988120429	.983624011	.995343973
300.0000	.954826571	.982491054	.988603391	.989401951	.985193027	.995911673
305.0000	.958765835	.984386317	.989963322	.990550026	.986615875	.995414103
310.0000	.962385699	.986086160	.991175665	.991577916	.987909373	.995855101
315.0000	.965709217	.987609379	.992245317	.992497586	.989073215	.997244760
320.0000	.968758384	.988973118	.993187514	.993319914	.990143148	.997586310
325.0000	.971552745	.990193384	.994023318	.994054932	.991101354	.997885300
330.0000	.974112377	.991283521	.994753144	.994711183	.991973956	.998149563
335.0000	.975454943	.992257916	.995405935	.995297389	.992759177	.998380720
340.0000	.978597276	.993126541	.995975292	.995819755	.993473237	.998583347
345.0000	.980555110	.993901588	.996479072	.996285819	.994114049	.998763961
350.0000	.982343040	.994592287	.996919177	.996701188	.994695939	.998915581

STATION: CAPE KENNEDY
DATA: JIMSPHERE
MONTH: 2
WAVELENGTH RANGE: 90-997 M

THEORETICAL PROBABILITY DISTRIBUTION: GAMMA
RMS UMAX (M/S)

ALT(KM)	4	6	8	10	12	14
GAMMA	3.671984613	3.047145873	2.792456448	2.637207419	2.592360616	2.743519068
BETA	.227867253	.263928924	.294512074	.320387080	.444839872	.448921055

X	P(X)	P(X)	P(X)	P(X)	P(X)	P(X)
.125	.004852223	.011295117	.014361899	.016264900	.008217619	.005557875
.250	.040793451	.066358412	.073873516	.077082780	.040857789	.030579114
.375	.120462525	.163526492	.171114914	.172349514	.096368168	.076519121
.500	.233493000	.284289133	.287680995	.284524877	.168070089	.139065042
.625	.361531503	.410371413	.407575522	.399342183	.248936437	.212503579
.750	.488234531	.528992124	.520133838	.507454626	.333052926	.291438736
.875	.602819279	.633130968	.619588017	.603767611	.415973838	.371447072
1.000	.699995078	.720155736	.703748159	.686248951	.494645983	.449202597
1.125	.778532423	.790241800	.772699535	.754828990	.567177698	.522449404
1.250	.839674540	.845089495	.827789016	.810557224	.632575527	.589783385
1.375	.885871179	.887038887	.870928548	.855019376	.690500714	.650487675
1.500	.919931976	.918527208	.904160313	.889965191	.741065437	.704357092
1.625	.944538429	.941796996	.929412298	.917090796	.784674227	.751511894
1.750	.962010987	.958767734	.948380083	.937925108	.821899354	.792345755
1.875	.974236101	.971005268	.962487176	.953783292	.853397660	.827362411
2.000	.982680924	.979743667	.972889520	.965759411	.879848070	.857141398
2.125	.988449477	.985930197	.980502695	.974742211	.901912205	.882282257
2.250	.992351189	.990277067	.986037783	.981439158	.920209654	.903371349
2.375	.994967133	.993310831	.990038387	.986405209	.935304433	.920960888
2.500	.996707313	.995415442	.992914736	.990070082	.947699122	.935556747
2.625	.997856736	.996867642	.994972996	.992763028	.957834005	.947617833
2.750	.998611145	.997864693	.996439546	.994734056	.966089629	.957529761
2.875	.999103352	.998546280	.997480392	.996171564	.972791232	.965654251
3.000	.999422833	.999010302	.998216473	.997216545	.978214212	.972292613
3.125	.999629185	.999325022	.998735338	.997973926	.982589856	.977694965
3.250	.999761827	.999537721	.999099955	.998521395	.986111067	.982079908
3.375	.999846742	.999681003	.999355525	.998916075	.988937750	.985629564
3.500	.999900877	.999777257	.999534138	.99[illegible]199972	.991201706	.988495916
3.625	.999935240	.999841690	.999659674	[illegible]03693	.993011132	.990805082
3.750	.999956995	.999884702	.999745242	[illegible]49598	.994454466	.992661424
3.875	.999970675	.999913357	.999805361	.999653891	.995603606	.994150713
4.000	.999979280	.999932393	.999846958	.999728307	.996517025	.995343313
4.125	.999984637	.999945015	.999875695	.999781340	.997241855	.996294592
4.250	.999987982	.999953337	.999895521	.999819033	.997816123	.997057341
4.375	.999990009	.999958798	.999909140	.999845766	.998270534	.997663483
4.500	.999991223	.999962367	.999918468	.999864675	.998629533	.998145737
4.625	.999991946	.999964677	.999924839	.999878049	.998912811	.998528861
4.750	.999992378	.999966174	.999929167	.999887519	.999136023	.998832799
4.875	.999992549	.999967171	.999932088	.999894157	.999311820	.999073707
5.000	.999992646	.999967687	.999934077	.999898821	.999447998	.999264292

STATION: CAPE KENNEDY
DATA: JIMSPHERE
MONTH: 2
WAVELENGTH RANGE: 90-997 M

THEORETICAL PROBABILITY DISTRIBUTION: GAMMA
ABS VMAX (M/S)

ALT(KM)	4	6	8	10	12	14
GAMMA	3.196353823	3.349373221	3.308929831	2.373067319	3.127003223	3.135413647
BETA	.290838148	.246556506	.241956282	.383776620	.452201653	.525595158
X	P(X)	P(X)	P(X)	P(X)	P(X)	P(X)
.125	.006290340	.007373125	.008464257	.019043912	.002061841	.001295862
.250	.042050993	.051614111	.057300112	.079602802	.014693845	.009552263
.375	.112765145	.139097260	.151151348	.168109864	.042660985	.028594780
.500	.209137883	.255364256	.273076538	.269802637	.085955539	.059294656
.625	.318193518	.382006347	.403305050	.373657919	.141993403	.100662913
.750	.428603247	.504454032	.527017720	.472545329	.207148783	.150724819
.875	.532405518	.613821067	.635724515	.562426791	.277683515	.207120799
1.000	.624975488	.706133805	.726078935	.641463153	.350247744	.267486688
1.125	.704326250	.780819684	.798115529	.709262736	.422102332	.329673275
1.250	.770266262	.839287877	.853719078	.766315006	.491172802	.391855642
1.375	.823784210	.883871235	.895542346	.813591331	.556009382	.452570391
1.500	.866311416	.917143539	.926342212	.852277659	.615701295	.510708511
1.625	.899556451	.941533578	.948628075	.883605219	.669775054	.565483145
1.750	.925179966	.959143512	.964515030	.908750281	.718093768	.616385169
1.875	.944691107	.971694179	.975696780	.928780489	.760766692	.663135149
2.000	.959392712	.980538957	.983480260	.944631867	.798072532	.705636248
2.125	.970368870	.986711122	.988846146	.957104333	.830397770	.743931539
2.250	.978497523	.990980960	.992513858	.966868542	.858188570	.778166771
2.375	.984474115	.993912153	.995001957	.974478237	.881915107	.808559068
2.500	.988840173	.995910503	.996678323	.980384901	.902045779	.835371554
2.625	.992011189	.997264430	.997800946	.984953120	.919030018	.858893067
2.750	.994302280	.998176560	.998548552	.988474578	.933287114	.879422683
2.875	.995949663	.998787954	.999043934	.991181076	.945199907	.897258192
3.000	.997129031	.999195851	.999370664	.993255533	.955111936	.912687778
3.125	.997969978	.999466777	.999585249	.994841591	.963327490	.925984375
3.250	.998567447	.999646023	.999725603	.996051423	.970112793	.937402062
3.375	.998990417	.999764174	.999817118	.996972367	.975698501	.947174154
3.500	.999288931	.999841742	.999876522	.997672021	.980282776	.955512337
3.625	.999499016	.999892548	.999914959	.998202555	.984034486	.962606966
3.750	.999646410	.999925666	.999939702	.998604193	.987096764	.968627602
3.875	.999749511	.999947183	.999955617	.998907708	.989590295	.973724298
4.000	.999821521	.999961130	.999965817	.999136768	.991616003	.978028908
4.125	.999871641	.999970108	.999972254	.999309376	.993258111	.981656708
4.250	.999906436	.999975875	.999976322	.999439262	.994586587	.984707981
4.375	.999930553	.999979518	.999978863	.999536894	.995659314	.987269402
4.500	.999947213	.999981835	.999980450	.999610171	.996523932	.989415780
4.625	.999958679	.999983288	.999981396	.999665082	.997219657	.991211303
4.750	.999966547	.999984153	.999981955	.999706186	.997778537	.992710896
4.875	.999971934	.999984689	.999982193	.999736957	.998226881	.993961439
5.000	.999975599	.999984913	.999982335	.999759942	.998585[illegible]62	.995002776

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OF POOR QUALITY

STATION: CAPE KENNEDY
DATA: JIMSPHERE
MONTH: 2
WAVELENGTH RANGE: 90-997 M

THEORETICAL PROBABILITY DISTRIBUTION: GAMMA
LU (M)

ALT(KM)	4	6	8	10	12	14
GAMMA	5.096127510	4.572417617	4.319932282	3.290437847	3.423570365	2.827344239
BETA	52.375165462	57.952509403	59.449395657	69.947028160	69.889573097	83.122339795

X	P(X)	P(X)	P(X)	P(X)	P(X)	P(X)
10.000	.000001304	.000004781	.000010042	.000169369	.000109486	.000468159
20.000	.000038067	.000098899	.000175313	.001493855	.001056888	.003072473
30.000	.000256693	.000549067	.000883054	.005094160	.003799102	.008869544
40.000	.000950457	.001780278	.002676020	.011795009	.009128615	.018348277
50.000	.002534895	.004300218	.006140996	.022100261	.017598043	.031639607
60.000	.005495371	.008625335	.011823387	.036231721	.029521902	.048639580
70.000	.010328907	.015221728	.020171746	.054183183	.045005542	.069091813
80.000	.017492700	.024465829	.031507998	.075774765	.063983185	.092645584
90.000	.027365055	.036622341	.046017381	.100701960	.086256904	.118897421
100.000	.040220302	.051836611	.063752332	.128577430	.111532730	.147421010
110.000	.056216772	.070137759	.084645425	.158965271	.139452230	.177788427
120.000	.075395705	.091449232	.108527534	.191406202	.169619009	.209584998
130.000	.097688502	.115603882	.135148296	.225448404	.201620221	.242419323
140.000	.122929743	.142361343	.164196869	.260643423	.235043457	.275929693
150.000	.150873693	.171425980	.195321551	.296576526	.269489579	.309787769
160.000	.181212366	.202464148	.228147460	.332364787	.304582190	.343700305
170.000	.213593639	.235120030	.262291770	.369163215	.339973565	.377439365
180.000	.247638475	.269029483	.297376372	.405166999	.375349537	.410691492
190.000	.282956351	.303831838	.333037943	.440611914	.410430811	.443356223
200.000	.319158588	.339179274	.368935615	.475273456	.444973942	.475247937
210.000	.355869364	.374744251	.404756434	.508965045	.478770696	.506223634
220.000	.392734412	.410224892	.440218978	.541535564	.511646822	.536190376
230.000	.429427516	.445348620	.475075278	.572866440	.543459915	.565067724
240.000	.465654910	.479874291	.509111539	.602868602	.574097112	.592780270
250.000	.501157954	.513593026	.542147636	.631479368	.603472538	.619301185
260.000	.535714343	.546328090	.574035935	.658659190	.631524496	.644599907
270.000	.569137901	.577933937	.604659401	.684388734	.658212855	.668664932
280.000	.601277597	.608294532	.633929357	.708666019	.683516338	.691496857
290.000	.632015683	.637321368	.661782987	.731503628	.707429353	.713106558
300.000	.661265299	.664951153	.688180588	.752926409	.729962654	.733513445
310.000	.688967712	.691143297	.713102959	.772969119	.751135059	.752743974
320.000	.715089425	.715877362	.736548640	.791674502	.770977497	.770830341
330.000	.739619002	.739150509	.758531362	.809091493	.789528079	.787809335
340.000	.762564339	.760975003	.779077746	.825273693	.806831151	.803721160
350.000	.783949502	.781375974	.798224822	.840277977	.822935775	.818638627
360.000	.803812027	.800389059	.816018149	.854163274	.837894425	.832516260
370.000	.822200425	.818058461	.832509935	.866989702	.851761930	.845489740
380.000	.839171812	.834435187	.847757295	.878817640	.864594489	.857575200
390.000	.854789823	.849575281	.861820824	.889707059	.876448900	.868818797
400.000	.869122662	.863538295	.874763437	.899716899	.887381807	.879266277
410.000	.882241569	.876386344	.886649172	.908904687	.897449121	.888967664
420.000	.894219406	.888182715	.897542149	.917326212	.906705752	.897951901
430.000	.905129455	.898991063	.907506123	.925035074	.915204957	.906276710
440.000	.915044308	.908874564	.916600565	.932082690	.922998272	.913978375

450.000	.924035288	.917895265	.924895287	.938517950	.930135138	.921096735
460.000	.932171665	.926113675	.932439879	.944387227	.936662883	.927669838
470.000	.939520054	.933588147	.939293817	.949734420	.942626499	.933734141
480.000	.946149186	.940374888	.945510698	.954600796	.948068656	.939324237
490.000	.952104680	.946527399	.951141320	.959025078	.953029551	.944473036
500.000	.957458630	.952096477	.956233919	.963043563	.957547151	.949211746
510.000	.962259710	.957130067	.960833639	.966689989	.961656958	.953569710
520.000	.966558151	.961673312	.964982718	.969995879	.965392259	.957574710
530.000	.970400594	.965768456	.968720660	.972990379	.968784042	.961252786
540.000	.973830312	.969454825	.972084112	.975700654	.971861184	.964628316
550.000	.976887263	.972769171	.975107163	.978111649	.974650517	.967724286
560.000	.979608193	.975745454	.977821149	.980366498	.977176920	.970562041
570.000	.982026845	.978415012	.980255082	.982366458	.979463354	.973161601
580.000	.984173991	.980806820	.982435584	.984171063	.981531046	.975541621
590.000	.986077800	.982947439	.984387070	.985798277	.983399533	.977719359
600.000	.987763792	.984861255	.986131892	.987264529	.985086893	.979711041
610.000	.989255160	.986570567	.987690479	.988584913	.986609489	.981531575
620.000	.990572929	.988095693	.989081435	.989773221	.987982623	.983194835
630.000	.991735980	.989455268	.990321688	.990841985	.989220098	.984717666
640.000	.992761441	.990666106	.991426677	.991802670	.990334630	.986099996
650.000	.993664682	.991743550	.992410310	.992665716	.991337993	.987364806
660.000	.994459510	.992701441	.993285194	.993440628	.992240451	.988518209
670.000	.995158195	.993552364	.994062774	.994135976	.993051939	.989569567
680.000	.995771863	.994307645	.994753331	.994759664	.993781112	.990527511
690.000	.996310301	.994977489	.995366186	.995318770	.994436055	.991400026
700.000	.996782385	.995571099	.995909676	.995819755	.995023929	.992194377

STATION: CAPE KENNEDY
DATA: JIMSPHERE
MONTH: 2
WAVELENGTH RANGE: 90-997 M

THEORETICAL PROBABILITY DISTRIBUTION: GAMMA
LV (M)

ALT(KM)	4	6	8	10	12	14
GAMMA	5.460021675	5.230170906	4.092652678	2.734007806	3.194053859	2.545373589
BETA	52.879544258	55.306065559	65.541288376	83.134619713	74.671171188	88.013589859

X	P(X)	P(X)	P(X)	P(X)	P(X)	P(X)
10.000	.000000358	.000000627	.000014564	.000636673	.000189621	.001021486
20.000	.000013429	.000020254	.000220323	.003925522	.001577424	.005581622
30.000	.000104905	.000145303	.001026126	.010923213	.005212343	.014490095
40.000	.000431077	.000563351	.002952880	.022018940	.011826284	.027850131
50.000	.001246192	.001559509	.006529275	.037221198	.021847383	.045431096
60.000	.002884916	.003489624	.012224264	.056307229	.035449985	.066829702
70.000	.005730703	.006743678	.020408612	.078915832	.052609030	.091557970
80.000	.010179491	.011708587	.031337705	.104609005	.073150272	.119095929
90.000	.016605346	.018735918	.045149105	.132913938	.096793645	.148924345
100.000	.025332045	.028117215	.061869739	.163351702	.123189291	.180545053
110.000	.036612436	.040067693	.081428895	.195456650	.151946628	.213493215
120.000	.050615907	.054717903	.103674192	.228789153	.182657210	.247344268
130.000	.067423356	.072112218	.128388576	.262943499	.214912247	.281717153
140.000	.087028473	.092212776	.155306984	.297552325	.248315575	.316275109
150.000	.109343918	.114907417	.184131788	.332288507	.282492999	.350724757
160.000	.134211026	.140020227	.214546572	.366865352	.317098524	.384814169
170.000	.161411634	.167323546	.246227948	.401035421	.351818234	.418330241
180.000	.190680994	.196550468	.278855342	.434588607	.386372350	.451095629
190.000	.221720815	.227407036	.312118951	.467349615	.420515697	.482965581
200.000	.254211757	.259583652	.345725704	.499175165	.454037189	.513824612
210.000	.287824810	.292765308	.379403781	.529951043	.486758463	.543583348
220.000	.322231401	.326640449	.412905596	.559589125	.518532045	.572175525
230.000	.357111856	.360908296	.446009591	.588024415	.549239084	.599555008
240.000	.392162308	.395284761	.478521045	.615212306	.578786050	.625693209
250.000	.427100118	.429506831	.510272048	.641125880	.607106246	.650576562
260.000	.461667672	.463335797	.541120932	.665753558	.634149104	.674204312
270.000	.495634954	.496559180	.570950948	.689096726	.659885973	.696586512
280.000	.528800912	.528991609	.599668875	.711167723	.684303410	.717742145
290.000	.560993932	.560475476	.627203241	.731968065	.707401834	.737697534
300.000	.592071347	.590879433	.653502427	.751586705	.729193516	.756484963
310.000	.621918328	.620098062	.678532653	.769998536	.749700561	.774141416
320.000	.650446407	.648050152	.702276014	.787263215	.768953204	.790707350
330.000	.677591473	.674676768	.724728502	.803423852	.786988229	.806225933
340.000	.703311689	.699939296	.745898210	.818526298	.803847507	.820742115
350.000	.727585144	.723817401	.765803419	.832617983	.819576919	.834301956
360.000	.750407413	.746306852	.784471080	.845747404	.834225148	.846951939
370.000	.771789476	.767417394	.801935218	.857963420	.847842693	.858738743
380.000	.791755207	.787170656	.818235502	.869314812	.860461307	.869708456
390.000	.810339354	.805598363	.833416037	.879849739	.872193016	.879904528
400.000	.827585533	.822740480	.847524285	.889615521	.883029759	.889377318
410.000	.843544327	.838643476	.860609964	.898658238	.893042788	.898164041
420.000	.858271755	.853358895	.872724339	.907022588	.902282342	.906308383
430.000	.871827632	.866942033	.883919358	.914751627	.910797328	.913850509
440.000	.884274334	.879450664	.894247107	.921886779	.918634996	.920828991

450.000	.895675749	.890944019	.903759181	.928467609	.925840855	.927280694
460.000	.906096138	.901481971	.912506342	.934531912	.932458542	.933240727
470.000	.915599398	.911124207	.920538068	.940115497	.938529588	.938742414
480.000	.924248420	.919929594	.927902341	.945252389	.944093496	.943817422
490.000	.932104371	.927955782	.934645347	.949974671	.949187681	.948495582
500.000	.939226486	.935258366	.940811411	.954312637	.953847446	.952805132
510.000	.945671581	.941891305	.946442790	.958294675	.958106011	.956772573
520.000	.951493770	.947905973	.951579593	.961947575	.961994588	.960427836
530.000	.956744440	.953351282	.956259780	.965296306	.965542369	.963772397
540.000	.961471982	.958273560	.960519187	.968364283	.968776636	.966864116
550.000	.965721965	.962716497	.964391410	.971173368	.971722841	.969697483
560.000	.969536871	.966721021	.967907988	.973743826	.974404655	.972298592
570.000	.972956255	.970325485	.971098423	.976094671	.976844087	.974685304
580.000	.976016842	.973565534	.973990120	.978243470	.979061507	.976874240
590.000	.978752628	.976474278	.976608574	.980206557	.981075756	.978880823
600.000	.981194861	.979082383	.978977479	.981999069	.982904300	.980719447
610.000	.983372286	.981418110	.981118731	.983635046	.984563224	.982407450
620.000	.985311270	.983507492	.983052604	.985127427	.986067355	.983945116
630.000	.987035878	.985374471	.984797768	.986488186	.987433356	.985355966
640.000	.988568060	.987040766	.986371316	.987728402	.988664769	.986646540
650.000	.989927769	.988526531	.987789102	.988858275	.989782117	.987826645
660.000	.991133139	.989849925	.989065565	.989887170	.990792967	.988905355
670.000	.992200583	.991027549	.990214020	.990823746	.991707012	.989891003
680.000	.993144892	.992074430	.991246507	.991675943	.992533088	.990791321
690.000	.993979476	.993004285	.992174149	.992451079	.993279338	.991613433
700.000	.994716413	.993829384	.993006997	.993155859	.993953116	.992363833

STATION: CAPE KENNEDY
DATA: JIMSPHERE
MONTH: 2
WAVELENGTH RANGE: 90-2470 M

THEORETICAL PROBABILITY DISTRIBUTION: GAMMA
ABS UMAX (M/S)

ALT(KM)	4	6	8	10	12	14
GAMMA	3.415997714	3.247025579	3.346126676	3.063889325	2.354511023	3.338483363
BETA	.479302086	.499379475	.512887217	.619559079	1.117963657	.862626545
X	P(X)	P(X)	P(X)	P(X)	P(X)	P(X)
.2500	.006928034	.008649005	.006528288	.006926114	.008478117	.001359432
.5000	.050616847	.057495708	.046704912	.043790549	.038486710	.011163561
.7500	.138577947	.150013922	.127514036	.113915779	.086464202	.034871307
1.0000	.256377000	.269637547	.236866381	.207787370	.147056950	.073695357
1.2500	.384965669	.397456445	.358200330	.313270036	.215221146	.125958469
1.5000	.509149142	.519305803	.477735221	.420021642	.286800228	.188503800
1.7500	.619688302	.626975223	.586537443	.520793110	.358606897	.257709667
2.0000	.712523349	.717103243	.680135332	.611313216	.428333957	.330116555
2.2500	.787166052	.789551020	.757319696	.689657338	.494410884	.402759247
2.5000	.845183790	.845981538	.818911389	.755532540	.555854037	.473299168
2.7500	.889075451	.888843484	.866786212	.809658989	.612130076	.540033109
3.0000	.921553820	.920736223	.903208293	.853300221	.663039543	.601833403
3.2500	.945147924	.944063745	.930426098	.887938380	.708621949	.658056259
3.5000	.962022938	.960880786	.950460270	.915067531	.749080472	.708441503
3.7500	.973932207	.972854756	.965016872	.936074756	.784723818	.753017016
4.0000	.982240319	.981289119	.975475408	.952181712	.815922506	.792014711
4.2500	.987977847	.987174571	.982916132	.964425288	.843076617	.825800784
4.5000	.991904914	.991247460	.988164142	.973661453	.866592713	.854820497
4.7500	.994571574	.994045280	.991837226	.980581932	.886868037	.879556045
5.0000	.996369518	.995954588	.994390368	.985735983	.904279903	.900495864
5.2500	.997574069	.997249790	.996154085	.989553653	.919179425	.918113463
5.5000	.998376414	.998123720	.997365616	.992367491	.931887962	.932853408
5.7500	.998907991	.998710521	.998193614	.994432203	.942695871	.945123322
6.0000	.999258541	.999102764	.998756871	.995941021	.951862827	.955289990
6.2500	.999488667	.999363884	.999138415	.997039489	.959618852	.963678241
6.5000	.999639131	.999537073	.999395840	.997836448	.966166265	.970572159
6.7500	.999737136	.999651514	.999568880	.998412818	.971681915	.976217575
7.0000	.999800719	.999726884	.999684803	.998828419	.976319388	.980825230
7.2500	.999841861	.999776401	.999762215	.999127276	.980211504	.984574199
7.5000	.999868378	.999808803	.999813773	.999341615	.983472638	.987615742
7.7500	.999885432	.999829955	.999848008	.999494992	.986200780	.990076721
8.0000	.999896348	.999843732	.999870673	.999604486	.988479756	.992062949
8.2500	.999903306	.999852657	.999885634	.999682516	.990380906	.993662238
8.5000	.999907732	.999858432	.999895483	.999737963	.991964787	.994947068
8.7500	.999910541	.999862134	.999901943	.999777310	.993282802	.995977134
9.0000	.999912307	.999864519	.999906175	.999805182	.994378313	.996801339
9.2500	.999913394	.999866016	.999908939	.999824889	.995287895	.997459590
9.5000	.999914065	.999867007	.999910742	.999838792	.996042326	.997984380

SYM						
9.7500	.999914467	.999867596	.999911889	.999848559	.996667467	.998402037
10.0000	.999914721	.999867961	.999912620	.999855414	.997185014	.998733945
10.2500	.999914825	.999868199	.999913082	.999860220	.997613087	.998997316
10.5000	.999914885	.999868281	.999913365	.999863565	.997966908	.999205932
10.7500	.999914922	.999868333	.999913536	.999865882	.998259090	.999371015
11.0000	.999914922	.999868378	.999913611	.999867506	.998500176	.99950[illegible]482

STATION: CAPE KENNEDY
DATA: JIMSPHERE
MONTH: 2
WAVELENGTH RANGE: 90-2470 M

THEORETICAL PROBABILITY DISTRIBUTION: GAMMA
ABS VMAX (M/S)

ALT(KM)	4	6	8	10	12	14
GAMMA	3.484732240	3.692172885	2.857386768	2.840550065	2.909506410	3.177150220
BETA	.507837944	.502602600	.633801132	.791632250	1.053587899	1.122480601

X	P(X)	P(X)	P(X)	P(X)	P(X)	P(X)
.2500	.005034521	.003348453	.010186866	.005950654	.002333325	.000937113
.5000	.039282245	.029818723	.056756330	.034619279	.014999195	.007262532
.7500	.112539880	.091986652	.137595724	.087848073	.041217919	.022361585
1.0000	.215802817	.185311146	.239570210	.159983313	.080481765	.047407290
1.2500	.333833117	.297053427	.349385180	.243603593	.130528744	.082020834
1.5000	.452803686	.413849328	.456989180	.331902765	.188456772	.124896325
1.7500	.563090563	.525356963	.556015149	.419534963	.251340255	.174269505
2.0000	.659398884	.625150651	.643161818	.502742961	.316549357	.228239998
2.2500	.739818856	.710236251	.717328899	.579176039	.381890479	.284977105
2.5000	.804675773	.780099757	.778828867	.647601917	.445641883	.342839506
2.7500	.855546825	.835762560	.828775935	.707612008	.506530710	.400434401
3.0000	.894550785	.879032150	.868656665	.759363383	.563680753	.456636023
3.2500	.923894905	.911984839	.900052227	.803371653	.616548419	.510578364
3.5000	.945620663	.936648749	.924473844	.840354465	.664857633	.561632797
3.7500	.961486697	.954836376	.943276770	.871119335	.708539337	.609377906
4.0000	.972936459	.968076587	.957625620	.896487527	.747678250	.653566614
4.2500	.981113695	.977607153	.968490690	.917245306	.782468177	.694093689
4.5000	.986900374	.984399565	.976661593	.934115671	.813175492	.730965622
4.7500	.990962103	.989197925	.982769057	.947744124	.840110280	.764273718
5.0000	.993792370	.992560953	.987309366	.958694413	.863604210	.794171192
5.2500	.995751612	.994901292	.990668088	.967450164	.883993894	.820853658
5.5000	.997099847	.996519469	.993141748	.974420495	.901609041	.844543509
5.7500	.998022623	.997631788	.994956255	.979947373	.916764334	.865477361
6.0000	.998651125	.998392344	.996282317	.984313764	.929754056	.883896284
6.2500	.999077223	.998909824	.997248173	.987751782	.940849155	.900038525
6.5000	.999364927	.999260299	.997949466	.990450554	.950295821	.914134160
6.7500	.999558419	.999496713	.998457216	.992563009	.958315291	.926401488
7.0000	.999688096	.999655567	.998823859	.994212180	.965104684	.937044531
7.2500	.999774717	.999761909	.999087937	.995496526	.970838159	.946251772
7.5000	.999832392	.999832861	.999277711	.996494479	.975668535	.954195537
7.7500	.999870673	.999880031	.999413796	.997268274	.979729161	.961032078
8.0000	.999896005	.999911323	.999511182	.997867048	.983135648	.966901936
8.2500	.999912716	.999932013	.999580741	.998329535	.985987879	.971930727
8.5000	.999923714	.999945641	.999630332	.998686112	.988371730	.976230115
8.7500	.999930941	.999954604	.999665625	.998960607	.990360714	.979898743
9.0000	.999935679	.999960467	.999690704	.999171562	.992017552	.983023435
9.2500	.999938749	.999964289	.999708466	.999333441	.993395656	.985680185
9.5000	.999940731	.999966785	.999721050	.999457471	.994540215	.987935416

SYM						
9.7500	.999942012	.999968395	.999729924	.999552436	.995489560	.989846855
10.0000	.999942839	.999969423	.999736205	.999625012	.996275969	.991464503
1C.2500	.999943346	.999970078	.999740608	.999680392	.996926576	.992831618
10.5000	.999943659	.999970488	.999743685	.999722637	.997464232	.993985444
10.7500	.999943852	.999970742	.999745846	.999754786	.997908048	.994958036
11.0000	.999943934	.999970876	.999747343	.999779254	.998274006	.995776854

STATION: CAPE KENNEDY
DATA: JIMSPHERE
MONTH: 2
WAVELENGTH RANGE: 90-2470 M

THEORETICAL PROBABILITY DISTRIBUTION: GAMMA
LU (M)

ALT(KM)	4	6	8	10	12	14
GAMMA	3.537905365	3.298702329	2.820323080	3.032525688	2.923556268	2.972311646
BETA	169.770711899	175.656164169	210.585546494	210.760747910	197.310686111	215.245626450
X	P(X)	P(X)	P(X)	P(X)	P(X)	P(X)
40.0000	.000406642	.000717476	.001650258	.000891200	.001469572	.001000756
80.0000	.003954875	.005974164	.010256326	.006381939	.009693932	.006903390
120.0000	.013881702	.019206817	.028112150	.019003008	.027412062	.020134317
160.0000	.032175363	.041936218	.055313575	.039623316	.054988998	.041410045
200.0000	.059469504	.074149873	.090851941	.068026721	.091490027	.070394492
240.0000	.095332240	.114827711	.133207431	.103346953	.135337532	.106147606
280.0000	.138622135	.162389226	.180694848	.144376228	.184717391	.147428049
320.0000	.187805077	.215025935	.231664592	.189775540	.237824420	.192893347
360.0000	.241700648	.270928092	.284613613	.238212610	.293002173	.241227582
400.0000	.297156546	.328426469	.338239651	.288447112	.348813705	.291218184
440.0000	.354160853	.386070583	.391459763	.339378636	.404068083	.341797471
480.0000	.410905402	.442662209	.443407204	.390068714	.457819413	.392060243
520.0000	.466313183	.497258827	.493415814	.439745545	.509349786	.441265699
560.0000	.519540660	.549158350	.540997908	.487797663	.558143899	.488829389
600.0000	.569964036	.597873345	.585819490	.533760764	.603859998	.534309372
640.0000	.617156029	.643100299	.627675466	.577301353	.646300778	.577389553
680.0000	.660858221	.684687808	.666466042	.618198581	.685385644	.617861887
720.0000	.700952083	.722606316	.702175438	.656326368	.721125874	.655608989
760.0000	.737431213	.756920271	.734853044	.691636555	.753602266	.690587804
800.0000	.770375714	.787763931	.764597215	.724143259	.782947227	.722814605
840.0000	.799929656	.815320760	.791541666	.753909148	.809328526	.752351999
880.0000	.826282039	.839806430	.815844238	.781033553	.832936913	.779297382
920.0000	.849650726	.861455008	.837677613	.805642232	.853975937	.803773321
960.0000	.870269731	.880508386	.857222095	.827878840	.872653969	.825919576
1000.0000	.888379030	.897207849	.874659993	.847898096	.889178172	.845884253
1040.0000	.904216886	.911788173	.890171155	.865860090	.903750062	.863828763
1080.0000	.918014117	.924473278	.903929815	.881925951	.916562289	.879903391
1120.0000	.929990210	.935473360	.916102342	.896253966	.927796476	.894264102
1160.0000	.940350704	.944983266	.926845632	.908998035	.937621929	.907050198
1200.0000	.949285507	.953181595	.936306208	.920304805	.946194887	.918434463
1240.0000	.956968337	.960230537	.944619842	.930312954	.953658514	.928521983
1280.0000	.963556640	.966276295	.951911293	.939152256	.960142940	.937449299
1320.0000	.969191857	.971449599	.958294496	.946943223	.965765685	.945334166
1360.0000	.974000283	.975866713	.963872924	.953797005	.970632352	.952285327
1400.0000	.978093959	.979630448	.968740143	.959815383	.974837393	.958402552
1440.0000	.981571682	.982831270	.972980291	.965091147	.978464894	.963776946
1480.0000	.984520167	.985548384	.976668857	.969708480	.981589384	.968491353
1520.0000	.987015225	.987850897	.979873240	.973743372	.984276704	.972620488

SYM						
1560.0000	.989122711	.989798866	.982653365	.977264181	.986594894	.9762[illegible]2462
1600.0000	.990899816	.991444387	.985062391	.980332173	.988564834	.979387358
1640.0000	.992395678	.992832303	.987147450	.983002149	.990261145	.982139669
1680.0000	.993653424	.994001336	.988950074	.985322848	.991712719	.984537907
1720.0000	.994708903	.994984664	.990506925	.987337545	.992953524	.986625172
1760.0000	.995593548	.995810755	.991850115	.989084668	.994012967	.988439858
1800.0000	.996333987	.996503897	.993007876	.990598127	.994916685	.990015879
1840.0000	.996952936	.997084782	.994004853	.991907790	.995686784	.991383292
1880.0000	.997469693	.997571081	.994862601	.993039966	.996342443	.992568538
1920.0000	.997900613	.997977756	.995600015	.994017839	.996900134	.993594982
1960.0000	.998259574	.998317525	.996233419	.994861677	.997374125	.994483106
2000.0000	.998558238	.998601034	.996777073	.995589152	.997776620	.995250948

STATION: CAPE KENNEDY
DATA: JIMSPHERE
MONTH: 2
WAVELENGTH RANGE: 90-2470 M

THEORETICAL PROBABILITY DISTRIBUTION: GAMMA
LV (M)

ALT(KM)	4	6	8	10	12	14
GAMMA	3.295799434	4.285278499	3.233848665	3.133043498	2.361813158	2.833884567
BETA	176.245811462	155.672143936	191.545890808	217.136987686	257.178684235	207.440009163
X	P(X)	P(X)	P(X)	P(X)	P(X)	P(X)
40.0000	.000715845	.000064529	.000656306	.000606598	.003771941	.001653105
80.0000	.005952314	.001025285	.005312400	.004665940	.017752924	.010345833
120.0000	.019125456	.004751617	.016894603	.014509112	.041718014	.028450099
160.0000	.041748026	.013317115	.036747905	.031221057	.074167185	.056075262
200.0000	.073811352	.028359214	.064972566	.054952465	.113295283	.092186049
240.0000	.114306577	.050800524	.100836333	.085226782	.157329217	.135217004
280.0000	.161667623	.080818697	.143120544	.121186055	.204662977	.183432285
320.0000	.214100542	.117954369	.190380223	.161774745	.253907975	.235134903
360.0000	.269808389	.161277847	.241126217	.205870753	.303902764	.288782001
400.0000	.327131990	.209564665	.293944266	.252374377	.353702769	.343040764
440.0000	.384627908	.261452612	.347556061	.300265148	.402560476	.396807052
480.0000	.441102084	.315567739	.400905486	.348634824	.449901637	.449201427
520.0000	.495613690	.370616607	.453070600	.396703225	.495300870	.499552276
560.0000	.547460273	.425446786	.503359564	.443022064	.538458265	.547372222
600.0000	.596152514	.479080807	.551246576	.489470791	.579177842	.592331961
640.0000	.641383998	.530729271	.596362427	.533247471	.617348306	.634234130
680.0000	.682999827	.579788499	.638472535	.574856758	.652926311	.672988750
720.0000	.720966570	.625828072	.677454799	.614096470	.685921982	.708590925
760.0000	.755344801	.668571830	.713278376	.650844090	.716386564	.741101220
800.0000	.786265053	.707875825	.745984286	.685043566	.744402260	.770629123
840.0000	.813907325	.743705310	.775668405	.716693170	.770073593	.797318961
880.0000	.838484220	.776112616	.802466661	.745834433	.793520465	.821337976
920.0000	.860227145	.805216663	.826542646	.772542410	.814872473	.842867933
960.0000	.879375719	.831184760	.848077394	.796917133	.834264487	.862096764
1000.0000	.896169372	.854217134	.867261179	.819076568	.851832949	.879213318
1040.0000	.910841405	.874534011	.884287015	.839150451	.867713183	.894403078
1080.0000	.923614554	.892365091	.899345666	.857275449	.882037364	.907844938
1120.0000	.934698269	.907941326	.912622020	.873591021	.894932888	.919708923
1160.0000	.944286779	.921488814	.924292423	.888236403	.906521320	.930154867
1200.0000	.952558361	.933224127	.934522875	.901348062	.916917711	.939331494
1240.0000	.959674992	.943351366	.943468034	.913057826	.926230028	.947376072
1280.0000	.965782888	.952060029	.951270573	.923491590	.934559137	.954414278
1320.0000	.971012853	.959523998	.958061084	.932768434	.941998586	.960560679
1360.0000	.975481369	.965901293	.963958308	.940999940	.948634818	.965918891
1400.0000	.979291484	.971334167	.969069578	.948290028	.954547390	.970582381
1440.0000	.982533939	.975949720	.973491304	.954734802	.959809147	.974634945
1480.0000	.985288247	.979860693	.977309719	.960422590	.964486711	.978151567
1520.0000	.987623900	.983166471	.980601586	.965434298	.968640685	.98119[illegible]5

SYM						
1560.0000	.989601299	.985954121	.983435042	.969843604	.972326070	.983836025
1600.0000	.991272785	.988299675	.985870205	.973717310	.975592755	.986115441
1640.0000	.992683589	.990269125	.987960085	.977115802	.978485771	.988083250
1680.0000	.993872672	.991919421	.989751175	.980093546	.981045708	.989780240
1720.0000	.994873621	.993299641	.991284207	.982699372	.983309135	.991242118
1760.0000	.995715074	.994451895	.992594734	.984977067	.985308886	.992500141
1800.0000	.996421605	.995412178	.993713729	.986965671	.987074427	.993581668
1840.0000	.997014157	.996211134	.994668074	.988700017	.988632075	.994510620
1880.0000	.997510508	.996874794	.995481171	.990211025	.990005426	.995307811
1920.0000	.997925937	.997425228	.996173173	.991526164	.991215520	.995991334
1960.0000	.998273201	.997881129	.996761538	.992669739	.992281109	.996576957
2000.0000	.998563200	.998258144	.997261286	.993663266	.993218929	.997078262

ORIGINAL PAGE IS
OF POOR QUALITY

STATION: CAPE KENNEDY
DATA: JIMSPHERE
MONTH: 2
WAVELENGTH RANGE: 90-6000 M

THEORETICAL PROBABILITY DISTRIBUTION: GAMMA
ABS UMAX (M/S)

ALT(KM)	4	6	8	10	12	14
GAMMA	1.378424019	2.583431572	2.925381243	2.442409605	2.665124804	4.179145575
BETA	1.306647165	1.041338846	1.094147757	1.538462617	1.825320959	1.198385805

X	P(X)	P(X)	P(X)	P(X)	P(X)	P(X)
.250	.058315060	.005604689	.002016078	.003252933	.001100181	.000038208
.500	.152037781	.029108008	.013177332	.016265122	.006468124	.000587809
.750	.247412210	.070508113	.036656504	.039317098	.017337657	.002712465
1.000	.337997101	.126010679	.072308707	.071156731	.033911268	.007659213
1.250	.421241641	.191071743	.118330937	.110040216	.055867117	.016535059
1.500	.496266678	.261424851	.172238478	.154245036	.082608871	.030136992
1.750	.563019723	.333556630	.231428463	.202050125	.113409260	.048893193
2.000	.621872343	.404752366	.293488476	.252012979	.147497879	.072970679
2.250	.673406146	.473051004	.356346775	.302895110	.184115514	.101846106
2.500	.718292557	.537136532	.418325756	.353680424	.222547119	.135334059
2.750	.757223696	.596214540	.478138823	.403559648	.262140706	.172698719
3.000	.790872976	.649894252	.534856327	.451908302	.302316796	.213207491
3.250	.819873229	.698084868	.587856971	.498262294	.342571590	.256057229
3.500	.844805919	.740909100	.636774935	.542293668	.382476002	.300490263
3.750	.866196848	.778633684	.681448199	.583787687	.421672046	.345759120
4.000	.884515941	.811615482	.721871734	.622622244	.459867653	.391185861
4.250	.900179513	.840260573	.758156799	.658749513	.496830527	.436170597
4.500	.913553834	.864994355	.790496789	.692180075	.532381803	.480199471
4.750	.924959339	.886240311	.819139458	.722969465	.566389516	.522846920
5.000	.934675053	.904405832	.844364762	.751206741	.598762438	.563773707
5.250	.942943074	.919872828	.866467945	.777005166	.629444234	.602721699
5.500	.949972749	.932992481	.885746658	.800494455	.658408046	.639504795
5.750	.955944672	.944082864	.902491786	.821914559	.685651578	.674010597
6.000	.961014107	.953428537	.916980959	.841310565	.711192727	.706171706
6.250	.965314597	.961281314	.929474346	.858529024	.735065624	.735976867
6.500	.968960427	.967862278	.940212317	.874214835	.757317334	.763452545
6.750	.972049430	.973363981	.949414194	.888308987	.778004847	.788657151
7.000	.974665232	.977953047	.957278058	.900946997	.797192514	.811673842
7.250	.976879261	.981772788	.963981353	.912257619	.814949885	.832604229
7.500	.978752300	.984946005	.969681807	.922362328	.831349887	.851562977
7.750	.980336189	.987577312	.974518716	.931374714	.846467206	.868673106
8.000	.981675051	.989755578	.978614390	.939400345	.860377416	.884062216
8.250	.982806325	.991555870	.982075721	.946536914	.873155214	.897859022
8.500	.983761832	.993041568	.984995574	.952874199	.884874381	.910191081
8.750	.984568626	.994265907	.987454459	.958494529	.895606644	.921187662
9.000	.985249631	.995273508	.989521772	.963472933	.905421361	.930953346
9.250	.985824302	.996101677	.991257221	.967877686	.914385118	.939616822
9.500	.986309081	.996761548	.992711984	.971770659	.922561467	.947280265
9.750	.986717924	.997339129	.993929759	.975207761	.930010721	.954043761
10.000	.987062655	.997795857	.994947858	.978239499	.936789922	.960000172
10.250	.987353259	.998169606	.995797962	.980911136	.942952767	.965235159
10.500	.987598121	.998475157	.996506952	.983263403	.948549576	.969827160
10.750	.987804428	.998724604	.997097589	.985332713	.953627437	.973847727
11.000	.987976220	.998928306	.997589096	.987151675	.958230250	.977361754

11.250	.988124564	.999094352	.997997694	.988749370	.962398730	.980427906
11.500	.988247834	.999229617	.998337045	.990151666	.966170728	.983098991
11.750	.988351583	.999339700	.998618618	.991381578	.969581209	.985422328
12.000	.988438912	.999429271	.998852037	.992459580	.972662404	.987440199
12.250	.988512389	.999502093	.999045387	.993403874	.975444071	.989190295
12.500	.988574184	.999561220	.999205410	.994230531	.977953561	.990706131
12.750	.988626167	.999609210	.999337733	.994953752	.980215952	.992017336
13.000	.988669887	.999648117	.999447048	.995586134	.982254267	.993150137
13.250	.988706656	.999679670	.999537311	.996138774	.984089516	.994127624
13.500	.988737576	.999705218	.999611802	.996621482	.985740967	.994970098
13.750	.988763541	.999725886	.999673210	.997042894	.987226121	.995695412
14.000	.988785371	.999742627	.999723807	.997410588	.988560982	.996319190
14.250	.988803700	.999756165	.999765463	.997731306	.989760138	.996855095
14.500	.988819130	.999767125	.999799736	.998010881	.990836784	.997315034
14.750	.988832057	.999775931	.999827929	.998254500	.991802976	.997709431
15.000	.988842905	.999783039	.999851115	.998466708	.992669620	.998047255
15.250	.988852009	.999788821	.999870174	.998651475	.993446611	.998336397
15.500	.988859646	.999793433	.999885783	.998812273	.994142897	.998583667
15.750	.988866039	.999797128	.999898605	.998952180	.994766578	.998794898
16.000	.988871403	.999800116	.999909103	.999073826	.995324954	.998975255
16.250	.988875888	.999802485	.999917708	.999179609	.995824687	.999129094
16.500	.988879628	.999804392	.999924742	.999271534	.996271782	.999260210
16.750	.988882780	.999805897	.999930516	.999351367	.996671617	.999371871
17.000	.988885388	.999807104	.999935232	.999420680	.997029029	.999466896
17.250	.988887578	.999808066	.999939062	.999480858	.997348413	.999547750
17.500	.988889396	.999808818	.999942198	.999533094	.997633748	.999616429
17.750	.988890916	.999809437	.999944754	.999578394	.997888498	.999674767
18.000	.988892175	.999809861	.999946840	.999617688	.998115912	.999724306
18.250	.988893248	.999810234	.999948531	.999651760	.998318858	.999766296
18.500	.988894075	.999810539	.999949902	.999681279	.998499930	.999801941
18.750	.988894805	.999810703	.999951020	.999706849	.998661391	.999832109
19.000	.988895379	.999810830	.999951899	.999729015	.998805344	.999857657
19.250	.988895856	.999810927	.999952637	.999748200	.998933665	.999879278
19.500	.988896251	.999810994	.999953225	.999764800	.999047980	.999897525
19.750	.988896586	.999811046	.999953680	.999779187	.999149784	.999912962
20.000	.988896817	.999811098	.999954060	.999791622	.999240480	.999925978

STATION: CAPE KENNEDY
DATA: JIMSPHERE
MONTH: 2
WAVELENGTH RANGE: 90-6000 M

THEORETICAL PROBABILITY DISTRIBUTION: GAMMA
ABS VMAX (M/S)

ALT(KM)	4	6	8	10	12	14
GAMMA	2.262116373	3.057688206	2.570522487	2.086388141	2.693250597	3.130355656
BETA	.884866066	1.050383732	1.294471487	2.037747681	1.941145316	1.732503653
X	P(X)	P(X)	P(X)	P(X)	P(X)	P(X)
.250	.017372802	.001582466	.003424921	.005015745	.000858993	.000291327
.500	.071659298	.011206965	.018213411	.020545711	.005173660	.002318027
.750	.149949521	.032589254	.045298703	.044517512	.014100757	.007416900
1.000	.240406934	.066186557	.083171928	.075108220	.027950478	.016411340
1.250	.334189951	.110585803	.129521267	.110682271	.046576988	.029689034
1.500	.425357626	.163480194	.181907648	.149829263	.069577488	.047302809
1.750	.510278590	.222290859	.238069404	.191358548	.096410656	.069362070
2.000	.587011367	.284535609	.296052318	.234280460	.126471955	.094609309
2.250	.654785655	.348026436	.354249716	.277783584	.159142498	.123481473
2.500	.713598743	.410955627	.411395401	.321211785	.193820532	.155157760
2.750	.763919778	.471912649	.466533259	.364042599	.229941262	.189095810
3.000	.806480691	.529861095	.518976614	.405867413	.266988412	.224759316
3.250	.842133775	.584094487	.568265036	.446373940	.304500271	.261631843
3.500	.871758327	.634183884	.614122838	.485330623	.342071708	.299239539
3.750	.896202840	.679924361	.656421103	.522573158	.379353665	.337148950
4.000	.916251726	.721285142	.695144631	.557992831	.416050710	.374976221
4.250	.932608791	.758365490	.730363742	.591526344	.451917667	.412387501
4.500	.945891867	.791357309	.762210697	.623147331	.486755393	.449098289
4.750	.956634164	.820514180	.790860638	.652858973	.520406432	.484871492
5.000	.965289503	.846127011	.816516206	.680687897	.552750453	.519514322
5.250	.972240157	.868504830	.839395374	.706678875	.583699822	.552874736
5.500	.977805041	.887960471	.859722346	.730890460	.613195345	.584837481
5.750	.982248276	.904800236	.877720408	.753391452	.641202398	.615320161
6.000	.985787079	.919316590	.893606916	.774257757	.667707138	.644268863
6.250	.988599107	.931783453	.907589689	.793570049	.692713253	.671654940
6.500	.990828879	.942453466	.919864662	.811411738	.716238923	.697470807
6.750	.992593549	.951556712	.930614360	.827867217	.738314152	.721726753
7.000	.993987605	.959300466	.940007262	.843020685	.758978419	.744447961
7.250	.995087013	.965869822	.948197544	.856955089	.778278619	.765671588
7.500	.995952711	.971428812	.955325380	.869751371	.796267167	.785444319
7.750	.996633410	.976121657	.961517394	.881487809	.813000619	.803820282
8.000	.997167908	.980074555	.966887340	.892239586	.828538194	.820859045
8.250	.997587033	.983397260	.971536987	.902078561	.842940718	.836623989
8.500	.997915350	.986184798	.975556992	.911072947	.856269702	.851180919
8.750	.998172164	.988519065	.979027718	.919287242	.868586577	.864596851
9.000	.998372905	.990470387	.982020244	.926782325	.879951969	.876939140
9.250	.998529620	.992098942	.984597251	.933615200	.890425302	.888274498
9.500	.998651840	.993456006	.986813821	.939839341	.900064327	.898668431
9.750	.998747088	.994585164	.988718219	.945504546	.908924818	.908184677
10.000	.998821221	.995523408	.990352675	.950657263	.917060338	.916884869
10.250	.998878919	.996301964	.991754055	.955340594	.924522109	.924828067
10.500	.998923756	.996947199	.992954426	.959594458	.931358859	.932070747
10.750	.998958595	.997481346	.993981697	.963455796	.937616780	.938666463
11.000	.998985589	.997922987	.994860031	.966958731	.943339534	.944665983

11.250	.999006547	.998287752	.995610461	.970134720	.948568158	.950117052
11.500	.999022745	.998588711	.996251076	.973012671	.953341253	.955064461
11.750	.999035284	.998836771	.996797487	.975619189	.957694955	.959550135
12.000	.999045014	.999041021	.997263297	.977978684	.961662956	.963613115
12.250	.999052532	.999209061	.997660004	.980113536	.965276740	.967289798
12.500	.999058321	.999347188	.997997701	.982044235	.968565583	.970613889
12.750	.999062791	.999460623	.998284973	.983789541	.971556596	.973616570
13.000	.999066204	.999553719	.998529166	.985366575	.974274971	.976326704
13.250	.999068849	.999630049	.998736642	.986790992	.976743937	.978770785
13.500	.999070890	.999692574	.998912826	.988077037	.978985064	.980973251
13.750	.999072440	.999743767	.999062344	.989237726	.981018096	.982956484
14.000	.999073610	.999785654	.999189161	.990284868	.982861377	.984741013
14.250	.999074511	.999819905	.999296635	.991229258	.984531656	.986345679
14.500	.999075174	.999847874	.999387696	.992080688	.986044392	.987787597
14.750	.999075681	.999870710	.999464802	.992848031	.987413712	.989082471
15.000	.999076031	.999889337	.999530077	.993539408	.988652609	.990244552
15.250	.999076337	.999904536	.999585338	.994162135	.989772961	.991286874
15.500	.999076515	.999916904	.999632038	.994722866	.990785666	.992221184
15.750	.999076620	.999926962	.999671511	.995227590	.991700649	.993058227
16.000	.999076717	.999935150	.999704897	.995681815	.992526971	.993807711
16.250	.999076754	.999941818	.999733068	.996090487	.993272915	.994478449
16.500	.999076806	.999947242	.999756828	.996458054	.993946031	.995078363
16.750	.999076828	.999951616	.999776892	.996788569	.994553171	.995614700
17.000	.999076828	.999955185	.999793828	.997085705	.995100603	.996093966
17.250	.999076828	.999958061	.999808088	.997352771	.995594017	.996522039
17.500	.999076828	.999960400	.999820068	.997592725	.996038571	.996904232
17.750	.999076828	.999962270	.999830179	.997808315	.996438988	.997245282
18.000	.999076828	.999963783	.999838687	.998001933	.996799491	.997549474
18.250	.999076828	.999965012	.999845818	.998175792	.997123979	.997820683
18.500	.999076828	.999965996	.999851830	.998331875	.997415952	.998062417
18.750	.999076828	.999966778	.999856874	.998471983	.997678593	.998277768
19.000	.999076828	.999967404	.999861121	.998597726	.997914732	.998469554
19.250	.999076828	.999967895	.999864653	.998710535	.998127036	.998640269
19.500	.999076828	.999968305	.999867640	.998811737	.998317800	.998792164
19.750	.999076828	.999968596	.999870129	.998902507	.998489209	.998927280
20.000	.999076828	.999968842	.999872223	.998983882	.998643160	.999047443

STATION: CAPE KENNEDY
DATA: JIMSPHERE
MONTH: 2
WAVELENGTH RANGE: 90-6000 M

THEORETICAL PROBABILITY DISTRIBUTION: GAMMA

LU (M) ALT(KM)	4	6	8	10	12	14
GAMMA	2.288088679	2.195049405	2.027040333	2.813573688	1.995384187	2.203031242
BETA	273.216236115	508.170516968	602.323509216	489.639183044	679.904937744	595.032333374

X	P(X)	P(X)	P(X)	P(X)	P(X)	P(X)
100.000	.028521612	.009891316	.010985396	.002041564	.009508991	.006982052
200.000	.111656066	.040687610	.041427940	.012504308	.035574333	.029411652
300.000	.223654062	.087376051	.085153450	.033846484	.073111237	.064519202
400.000	.343854979	.144790206	.137559248	.065834419	.118468903	.109053951
500.000	.459308945	.208527632	.195069933	.106970047	.168790638	.160026766
600.000	.563131317	.275109544	.254965369	.155240271	.221859971	.214907508
700.000	.652503319	.341912281	.315217320	.208534768	.275976866	.271645937
800.000	.727080874	.407037869	.374348987	.264874246	.329856850	.328633569
900.000	.787881874	.469177172	.431318093	.322524697	.382548515	.384646114
1000.000	.836563811	.527484633	.485421196	.380042501	.433366068	.438782489
1100.000	.874983780	.581470773	.536216155	.436278511	.481834272	.490407158
1200.000	.904949315	.630913101	.583459951	.490358900	.527643204	.539098829
1300.000	.928092390	.675784118	.627058811	.541654319	.570612364	.584605813
1400.000	.945818432	.716194555	.667028956	.589744151	.610660464	.626808517
1500.000	.959299117	.752348751	.703465469	.634380452	.647781856	.665688232
1600.000	.969488204	.784510896	.736518227	.675454058	.682027251	.701301351
1700.000	.977147989	.812979206	.766373068	.712964147	.713488363	.733758859
1800.000	.982878983	.838067181	.793237507	.746991709	.742285721	.763209455
1900.000	.987148799	.860089786	.817329884	.777677298	.768559083	.789826609
2000.000	.990317978	.879354008	.838871315	.805202514	.792459860	.813798316
2100.000	.992662229	.896152265	.858079776	.829775050	.814145274	.835319162
2200.000	.994390920	.910758525	.875166066	.851616949	.833774067	.854584180
2300.000	.995662168	.923425920	.890330814	.870955475	.851502962	.871785074
2400.000	.996594638	.934385866	.903762765	.888016202	.867484286	.887106448
2500.000	.997276977	.943847954	.915637761	.903017916	.881864391	.900723875
2600.000	.997775219	.952000625	.926118307	.916169278	.894782171	.912802577
2700.000	.998138294	.959012188	.935353518	.927666359	.906368576	.923496589
2800.000	.998402387	.965032086	.943479449	.937691249	.916746080	.932944443
2900.000	.998594165	.970192336	.950619623	.946411550	.926028557	.941289127
3000.000	.998733178	.974609241	.956885688	.953980021	.934321374	.948638290
3100.000	.998833813	.978384666	.962378167	.960535124	.941721566	.955104880
3200.000	.998906560	.981607586	.967187218	.966201462	.948318146	.960787557
3300.000	.998959050	.984355532	.971393548	.971090570	.954192467	.965775251
3400.000	.998996891	.986695915	.975069068	.975301877	.959418654	.970147975
3500.000	.999024123	.988687031	.978277847	.978923425	.964064144	.973977476
3600.000	.999043711	.990379274	.981076747	.982033059	.968189970	.977327771
3700.000	.999057762	.991816141	.983516112	.984699279	.971851356	.980256081
3800.000	.999067850	.993035085	.985640489	.986982211	.975098148	.982813224
3900.000	.999075070	.994068295	.987489223	.988934457	.977975242	.985044360
4000.000	.999080211	.994943371	.989096940	.990601845	.980523072	.986989461
4100.000	.999083892	.995683889	.990494125	.992024258	.982777819	.988683827
4200.000	.999086522	.996310055	.991707601	.993236408	.984772019	.990158759
4300.000	.999088377	.996839225	.992760904	.994268239	.986534737	.991441779
4400.000	.999089688	.997266156	.993674636	.995145716	.988091968	.992557086

4500.000	.999090604	.997663319	.994466871	.995891169	.989467017	.993525974
4600.000	.999091245	.997981444	.995153405	.996523924	.990680538	.994367182
4700.000	.999091685	.998249605	.995748043	.997060530	.991750963	.995097071
4800.000	.999091975	.998475544	.996262841	.997515239	.992694736	.995730072
4900.000	.999092191	.998665795	.996708319	.997900210	.993526474	.996278726
5000.000	.999092296	.998825508	.997093633	.998225875	.994259194	.996754013

STATION: CAPE KENNEDY
DATA: JIMSPHERE
MONTH: 2
WAVELENGTH RANGE: 90-6000 M

THEORETICAL PROBABILITY DISTRIBUTION: GAMMA
LV (M)

ALT(KM)	4	6	8	10	12	14
GAMMA	.823512509	3.461643010	2.821061254	2.883335263	2.528703481	2.147024006
BETA	736.060485840	339.300743103	430.683021545	427.942047119	453.628239678	480.292625427

X	P(X)	P(X)	P(X)	P(X)	P(X)	P(X)
100.000	.139864177	.001047200	.002812841	.002423437	.005338227	.012537358
200.000	.269495543	.009255846	.016975443	.015224703	.026806979	.049655485
300.000	.372578040	.030201372	.045201254	.041481218	.064325669	.103987738
400.000	.457298990	.065740233	.086461683	.080602306	.114691570	.169000255
500.000	.528019793	.114824770	.138168762	.130320957	.174059164	.239504719
600.000	.587595142	.174731577	.197269494	.187774779	.238816954	.311624944
700.000	.638084516	.242059570	.260809503	.250035736	.305908263	.382593330
800.000	.681056842	.313400481	.326203559	.314712383	.372911852	.450527240
900.000	.717748255	.385728497	.391339656	.379481047	.438013304	.514226884
1000.000	.749154441	.456582420	.454590145	.442717638	.499929894	.573005505
1100.000	.776089951	.524112344	.514773741	.503174230	.557820462	.626552284
1200.000	.799228549	.587044753	.571095087	.559987999	.611196391	.674824223
1300.000	.819132179	.644605435	.623077184	.612619363	.659840845	.717962660
1400.000	.836272597	.696426049	.670495674	.660789207	.703739271	.756229930
1500.000	.851047829	.742450356	.713319249	.704420514	.743022300	.789962036
1600.000	.863794975	.782848999	.751658261	.743587017	.777919382	.819533937
1700.000	.874800555	.817946777	.785722204	.778470106	.808722831	.845334709
1800.000	.884308703	.848163836	.815785319	.809323281	.835760094	.867750250
1900.000	.892527901	.873969927	.842159696	.836444288	.859373055	.887151673
2000.000	.899636552	.895850532	.865174778	.860153362	.879903212	.903887875
2100.000	.905787587	.914282702	.885162197	.880777083	.897681229	.918281458
2200.000	.911112234	.929718986	.902445041	.898636565	.913019985	.930626422
2300.000	.915723294	.942577496	.917330354	.914039232	.926210351	.941188045
2400.000	.919717774	.953236625	.930104576	.927273579	.937518969	.950203434
2500.000	.923179246	.962033160	.941030972	.938606098	.947187416	.957883003
2600.000	.926179692	.969262794	.950348437	.948279627	.955432512	.964412086
2700.000	.928781234	.975182131	.958271652	.956513077	.962447256	.969953284
2800.000	.931037515	.980011657	.964991733	.963502049	.968402237	.974648371
2900.000	.932994761	.983939111	.970677666	.969419844	.973447345	.978620464
3000.000	.934692986	.987123407	.975477777	.974418990	.977713518	.981976233
3100.000	.936166763	.989697792	.979521595	.978632972	.981314696	.984807462
3200.000	.937446006	.991773576	.982921600	.982177950	.984349534	.987193242
3300.000	.938556589	.993443191	.985775054	.985154398	.986903161	.989201322
3400.000	.939520866	.994782932	.988165684	.987649046	.989048675	.990889676
3500.000	.940358311	.995855652	.990165271	.989736423	.990848921	.992307752
3600.000	.941085666	.996712767	.991835266	.991480209	.992357515	.993497647
3700.000	.941717505	.997396290	.993227944	.992934778	.993620098	.994495176
3800.000	.942266427	.997940347	.994387783	.994146384	.994675644	.995330691
3900.000	.942743406	.998372622	.995352432	.995154247	.995557182	.996029980
4000.000	.943157859	.998715542	.996153787	.995991573	.996292546	.996614784
4100.000	.943518080	.998987171	.996818662	.996686384	.996905379	.997103445
4200.000	.943831161	.999201886	.997369751	.997262284	.997415617	.997511528
4300.000	.944103330	.999371469	.997825980	.997739062	.997840176	.997852072
4400.000	.944339946	.999505147	.998203345	.998133324	.998192906	.998136073

4500.000	.944545634	.999610394	.998515137	.998459101	.998485893	.998372771
4600.000	.944724530	.999693207	.998772547	.998728029	.998728998	.998569913
4700.000	.944880068	.999758258	.998984851	.998949759	.998930618	.998734042
4800.000	.945015319	.999809258	.999159805	.999132484	.999097645	.998870596
4900.000	.945132948	.999849238	.999303848	.999282897	.999235980	.998984158
5000.000	.945235264	.999880552	.999422342	.999406584	.999350443	.999078542