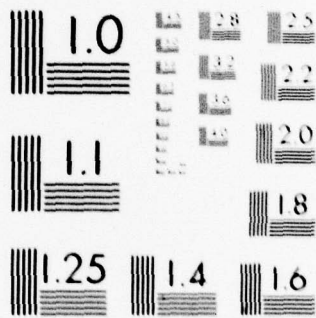


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PERFORMANCE EVALUATION OF THE OPTICAL CROSSWIND PROFILER.(U)  
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# PERFORMANCE EVALUATION OF THE OPTICAL CROSSWIND PROFILER

AUGUST 1979

By  
**Ruben Rodriguez**  
and  
**William J. Vechione**

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US Army Electronics Research and Development Command  
**ATMOSPHERIC SCIENCES LABORATORY**  
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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) Field measurements of integrated path crosswinds were made at Biggs Optical Range, Biggs Army Airfield, Fort Bliss, Texas, during the period of 31 January to 8 March 1978. The measurements were made with the Optical Crosswind Profiler (OCP), a bistatic system that measures crosswinds at six locations along its path by detecting and analyzing the movement of atmospheric scintillations. This report describes the performance evaluation test, test support equipment, and data collection methodology. Data collected with this sensor were compared		

20. ABSTRACT (cont)

Cal → to integrated path wind averages measured by the calibrated anemometer array.

This report presents X-Y scatter plots, derived weighting functions, and wind measurement comparison plots. Results of this test showed that the alignment procedure is lengthy and tedious. Furthermore, simultaneous alignment of the six OCP sensors is very difficult to attain. However, once a sensor is aligned at 500 m, wind velocity values measured with it fall within 8 percent of the values obtained from the calibrated anemometer array. Operation at 2000 m is not reliable due to difficulties in obtaining and retaining alignment.

PREFACE

The authors thank Messrs. Glenn Hoidale, David Favier, and William Hatch of the Atmospheric Sensing Division and Messrs. John Hines and Charles White of the Meteorological Support Division for their assistance in manning the Meteorological Optical Measuring System and the Optical Range at Biggs Army Airfield, Fort Bliss, Texas, during the conduct of the test. Also, the authors thank SP4 Ted R. Caprio for his help in plotting some of the data presented in this report.

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## INTRODUCTION

The state of the atmosphere affects tactical army operations; in particular it can determine the deployment and use of weapon systems. To increase relative combat power of friendly forces, meteorological parameters must be measured at the time and location of the action. An important parameter in atmospheric measurements, particularly for ballistic weapon employment, is the crosswind velocity along the trajectories of the projectiles.

The purpose of this report is to present the results of the evaluation of the Optical Crosswind Profiler (OCP), a sensor designed to measure average crosswinds at six points along its path of operation. This evaluation is based on comparative data taken during a test period of 31 January to 8 March 1978 at Biggs Optical Range (BOR), Biggs Army Airfield, Fort Bliss, Texas. Included as part of the report are daily weather summaries of atmospheric parameters prevailing at BOR.

The OCP is an active optical system designed to measure the crosswind velocity at six regions along the path extending from the receiver to the transmitter. Although the OCP was tested under actual field conditions, the evaluation tests were conducted cognizant that the OCP is presently a research instrument and not yet intended for prolonged field use without proper reconfiguration.

This report presents results of collected data, with an evaluation and analysis that determine the accuracy and applicability of the OCP.

This work was accomplished by personnel of the Atmospheric Sensing Division, Atmospheric Sciences Laboratory, under DA Task 1L162111AH71A3.

## INSTRUMENTATION REQUIREMENT

Crosswinds along a ballistic projectile trajectory contribute significantly to the total weapon error. Walters<sup>1</sup> has shown that direct fire crosswind errors on representative armor projectiles are significantly greater than head and tail wind errors. To increase the first-round-hit probability, crosswinds must be accurately known just before firing. Knowledge and application of crosswind information to fire control systems can also increase the standoff range of friendly weapons without degrading their accuracy.

<sup>1</sup>D. L. Walters, 1975, "Crosswind Weighting Functions for Direct-Fire Projectiles," ECOM Report 5570, Atmospheric Sciences Laboratory, White Sands Missile Range, NM

Several remote crosswind sensors have been developed in the recent past. Four systems were evaluated at BOR during the test period. The evaluation results of the OCP are presented in this report. The results of the other system evaluations are reported separately.<sup>2,3</sup>

The OCP is a bistatic crosswind measurement system that can: (1) be used in research that may improve present wind measurement techniques, (2) aid in the characterization of the atmosphere, especially as related to high energy laser propagation effects, and (3) serve as a reference system in evaluating and analyzing future wind measurement systems.

The concept of operational feasibility was shown by the Saturation Resistant Crosswind Sensor (SRCS),<sup>4,5</sup> which is a predecessor system of the OCP. Basically, the OCP consists of six SRCS, each with a weighting function maximized at a different range such that all six together sample the crosswind velocity at six regions along the path of operation. In 1977, an exploratory development prototype of the OCP was completed and this is the system evaluated and discussed herein. Results of the OCP performance evaluation will contribute the necessary data base to continue future crosswind development and to satisfy stated tactical requirements.

#### SYSTEM DESCRIPTION

The components of the OCP include a transmitter, a receiver, and a power supply. The transmitter consists of two incoherent light sources of different sizes.<sup>5</sup> The smaller source has an optical aperture of 8.4 cm in diameter and uses a frosted quartz-iodine lamp at the focus of a concave mirror. The larger light source has an aperture of 27.9 cm in diameter and uses a quartz-iodine lamp at the focus of a Fresnel lens.

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<sup>2</sup>R. Rodriguez, 1979, "Evaluation of the Passive Remote Crosswind Sensor," ERADCOM Report, ASL-TR-0032, Atmospheric Sciences Laboratory, White Sands Missile Range, NM

<sup>3</sup>R. Rodriguez and W. J. Vechione, 1979, "Evaluation of the Saturation Resistant Crosswind Sensor," ERADCOM Report ASL-TR-0035, Atmospheric Sciences Laboratory, White Sands Missile Range, NM

<sup>4</sup>G. R. Ochs, S. F. Clifford, and Ting-i Wang, 1976, "Laser Wind sensing: the effects of saturation of scintillation," Applied Optics, Vol 15, No. 2, pp 403-408

<sup>5</sup>G. R. Ochs, Ting-i Wang, and E. J. Goldenstein, 1977, "An Optical System for Profiling Wind and Refractive-Index Fluctuation," ECOM Report 77-7, Atmospheric Sciences Laboratory, White Sands Missile Range, NM

The receiver consists of three pairs of apertures that measure 6.7, 9.8, and 15.2 cm in diameter. A concave mirror at each one of these apertures collects the wind data and focuses the data on a dual photodiode. A pre-amplifier is collocated with each photodiode to amplify the signal at the source, thereby avoiding transmission of low level signals which are very susceptible to noise pickup.

The three pairs of apertures in the receiver, in combination with the two transmitter light sources, are equivalent to six sensors, but each with a different weighting function due to the difference in receiver and transmitter optics. By "peaking" each of these sensors at a different range, crosswind velocity can be measured at six localized regions along the path of operation. Figures 1a and 1b show a front and rear view of the OCP that was evaluated, while table 1 summarizes its characteristics.

Because the OCP consists of six SRCS units, the method of operation of the OCP is essentially the same as for a single SRCS. The operation of the SRCS is based on detection of the scintillation patterns produced by thermal gradients and transported by the wind. As each of the photodiodes detects the incoming signal,<sup>4</sup> the fluctuations in irradiance are combined by the analyzer to obtain a covariance function. The slope of this curve at zero delay time is inversely proportional to the time needed for a particular scintillation pattern to travel from one detector to the other. Since the distances between photodiodes is constant, the analyzer then derives the wind velocity from the slope of the covariance function. A block diagram of the OCP (figure 2) illustrates the functional block electronics required for operation. This circuit is virtually identical to that of the SRCS.<sup>3</sup>

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<sup>4</sup>G. R. Ochs, S. F. Clifford, and Ting-i Wang, 1976, "Laser Wind sensing: the effects of saturation of scintillation," Applied Optics, Vol 15, No. 2, pp 403-408

<sup>3</sup>R. Rodriguez and W. J. Vechione, 1979, Evaluation of the Saturation Resistant Crosswind Sensor, ERADCOM Report ASL-TR-0035, Atmospheric Sciences Laboratory, White Sands Missile Range, NM



Figure 1a. OCP receiver (front view).

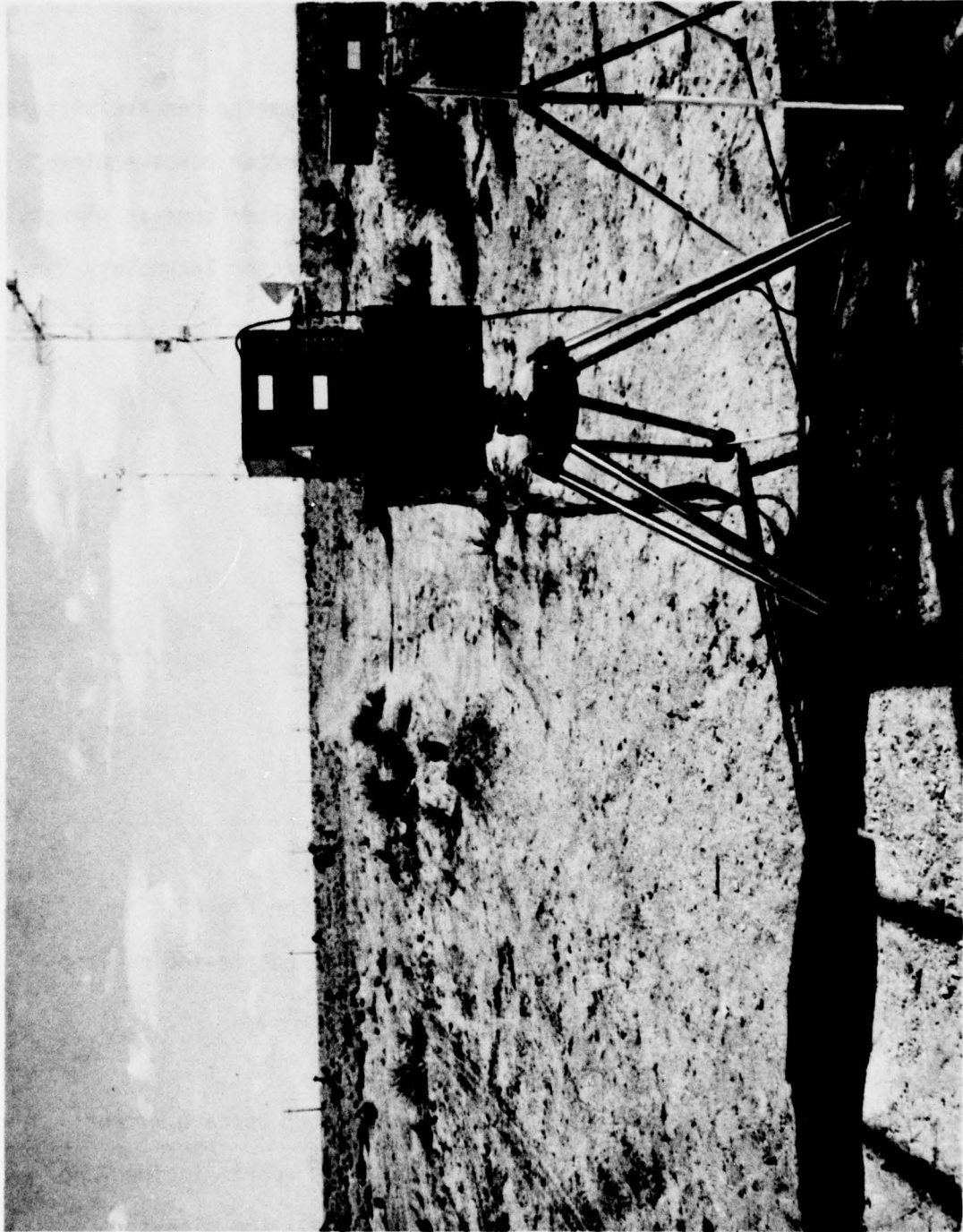


Figure 1b. OCP receiver (rear view).

TABLE 1. OPTICAL CROSSWIND PROFILER CHARACTERISTICS

Receiver

Optics Section

Optics	Two 15.2 cm diameter concave mirrors
	Two 9.8 cm diameter concave mirrors
	Two 6.7 cm diameter concave mirrors
Detectors	Six United Detector Technology Pin Spot 2D Photodiodes
Field of View	10 mrad
Size	43 x 45 x 30 cm

Electronics Section

Function Switch	Run and calibrate
Scale Switch	5, 10, 20 m/sec
Location Switch	1, 2, 3, 4, 5, 6
Size	25 x 30 x 32 cm
Power Requirements	120 V AC

Transmitter

Large Source

Optics	27.9 cm diameter Fresnel lens
Lamp	55 W, 12 V DC quartz-iodine lamp
Size	57 x 30 x 28 cm

Small Source

Optics	8.4 cm diameter concave mirror
Lamp	35 W, 12 V DC quartz-iodine lamp
Size	43 cm long, 17.5 cm diameter

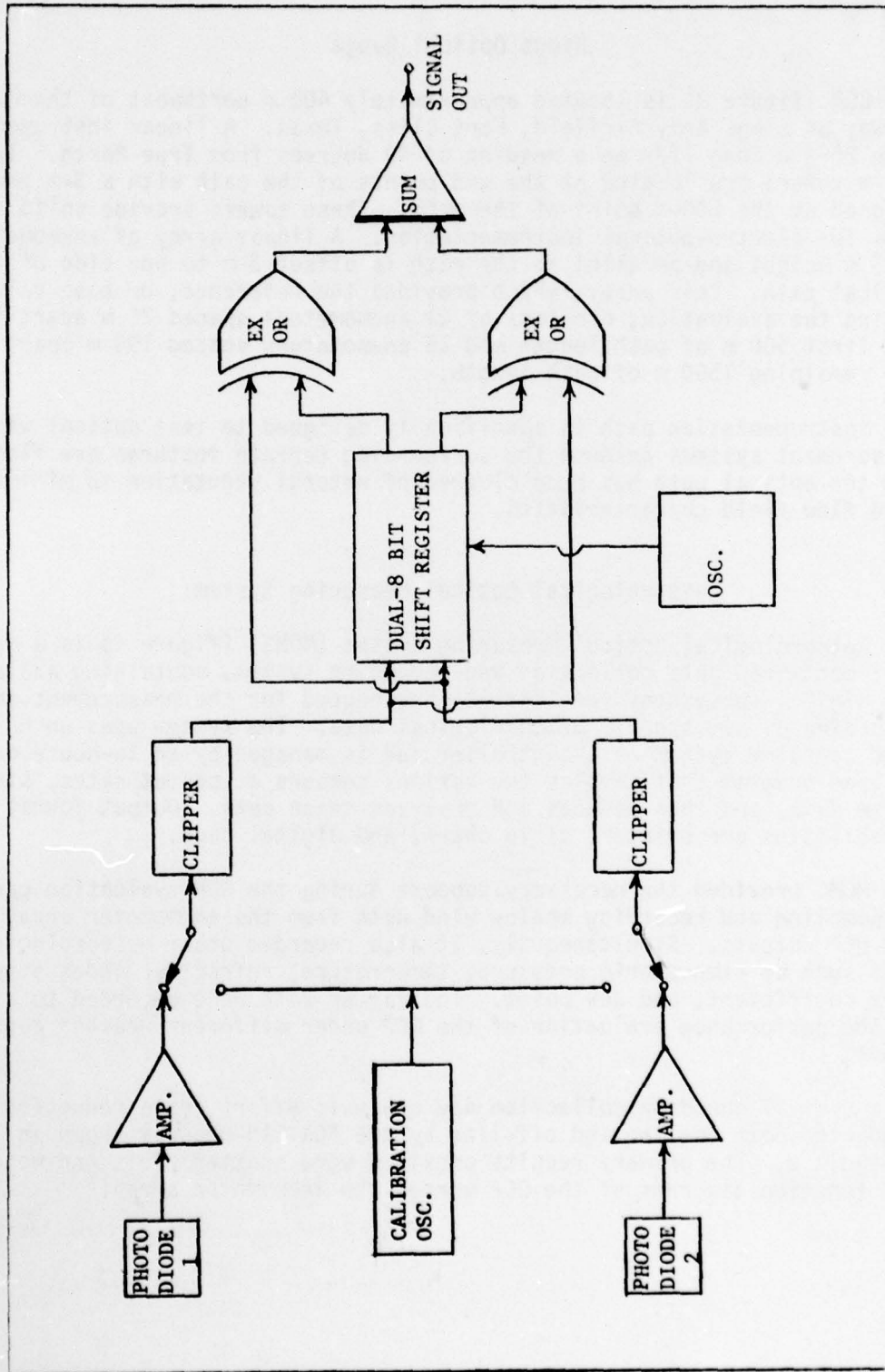


Figure 2. OCP block diagram.

## TEST SUPPORT

### Biggs Optical Range

The BOR (figure 3) is located approximately 400 m northwest of the main runway at Biggs Army Airfield, Fort Bliss, Texas. A linear instrumented path 2064 m long lies on a heading of 49 degrees from True North. Two 3.5-m towers are located at the end points of the path with a 3-m tower aligned at the 500-m point of the path. These towers provide solid test beds for electro-optical instrumentation. A linear array of anemometers at 3 m height and parallel to the path is offset 3 m to one side of the optical path. This array, which provided the reference, or base values during the evaluation, consists of 21 anemometers spaced 25 m apart for the first 500 m of path length and 15 anemometers spaced 100 m apart for the remaining 1500 m of path length.

The instrumentation path is specifically designed to test optical wind measurement systems because the surrounding terrain features are flat, and the optical path has been cleared of natural vegetation to minimize wind flow field characteristics.

### Meteorological Optical Measuring System

The Meteorological Optical Measuring System (MOMS) (figure 4) is a mobile, self-contained data collection and reduction system, containing analog and digital subsystems specifically engineered for the measurement and recording of atmospheric meteorological data. The system uses an HP 2100 computer system as a controller and is managed by an in-house developed program that samples the various sensors at preset rates, stores these data, and then reduces and analyzes these data. Output format capabilities are printer, strip chart, and digital tape.

The MOMS provided the necessary support during the OCP evaluation period by sampling and recording analog wind data from the anemometer array and OCP outputs. Simultaneously, it also recorded other meteorological data such as atmospheric pressure, temperature, refractive index structure coefficient, and dew point. The latter data were recorded to aid in the performance evaluation of the OCP under different weather conditions.

As a part of the data collection and analysis effort, data reduction was conducted both on-line and off-line by the FORTRAN program shown in appendix D. The primary results provided were scatter plots and weighting function diagrams of the OCP versus the anemometer array.

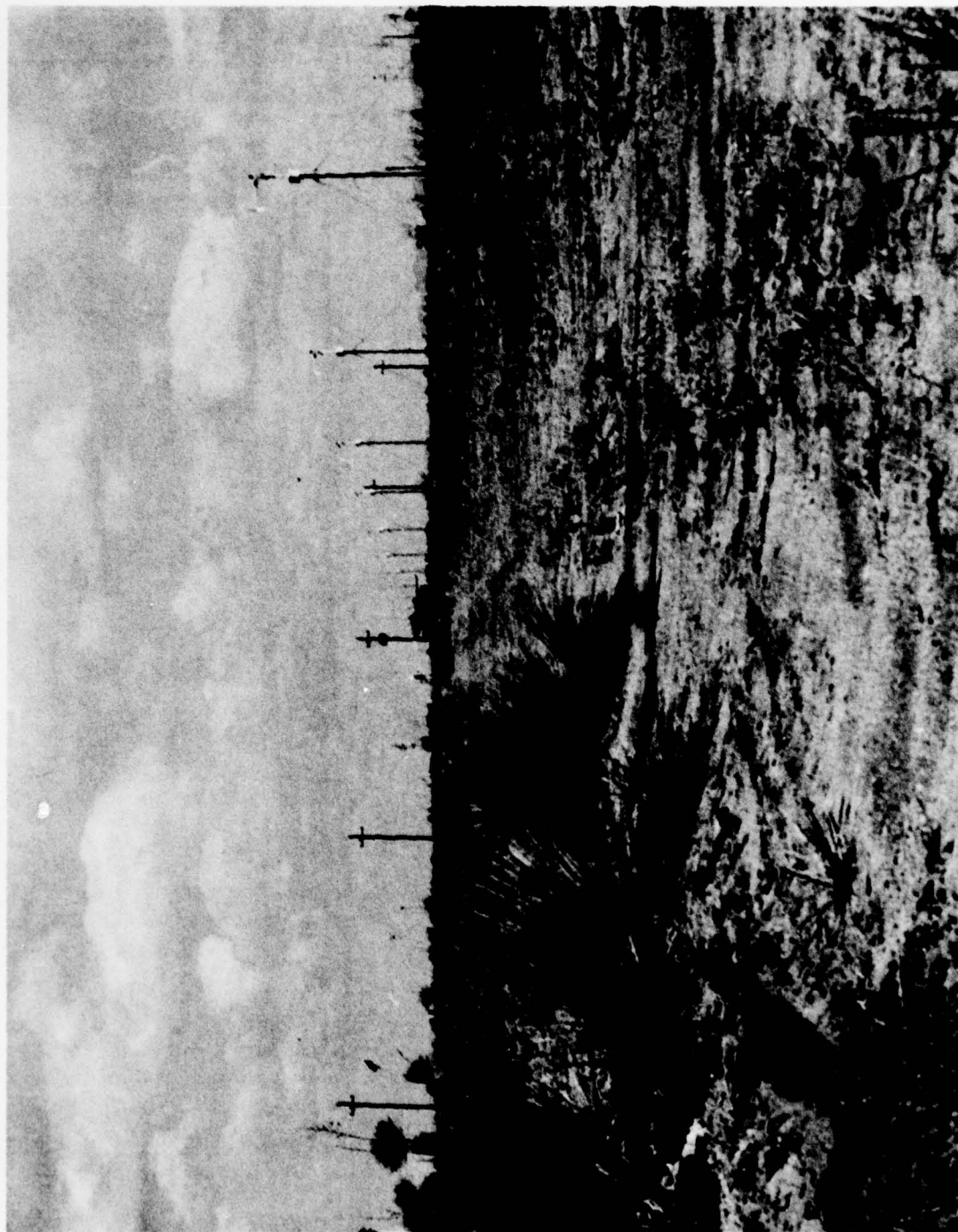


Figure 3. Biggs optical range.

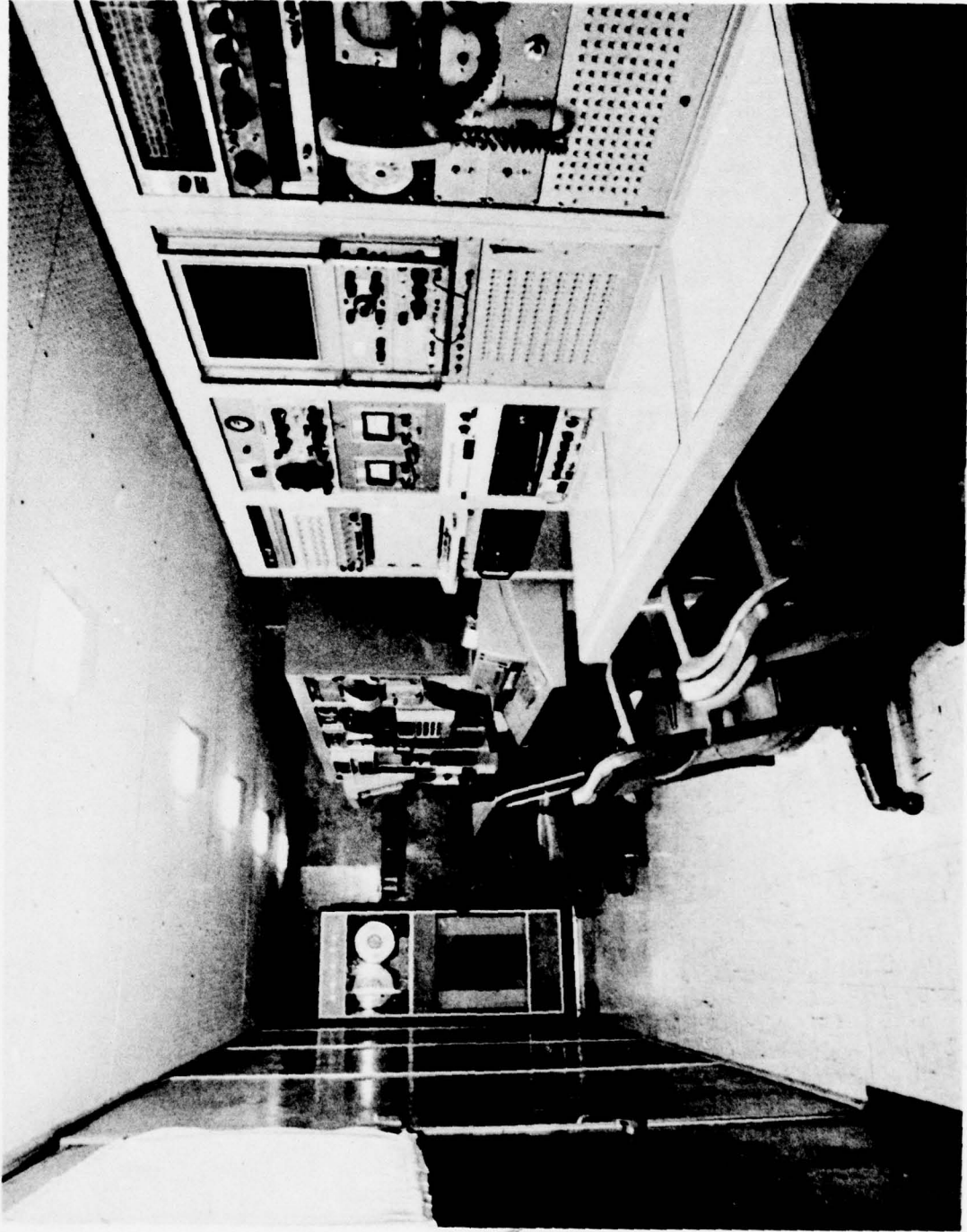


Figure 4. Meteorological optical measuring system.

## Remote Sensing Van

The Remote Sensing Van (RSV) is a 5-ton, 6 by 6, M820 expandable van which contains inherent prime-mover mobility and provides test-bed facilities. The RSV "folds" to standard van width for transport and expands to 4.3 m for in situ operation. The RSV is a stable platform for optical equipment tests and provides test-bed facilities by housing test equipment and ancillary support equipment. An environmental isolation partition with two 30 by 45 cm integral optical windows has been fabricated for use so that the rear doors can be opened for optics line of sight test capability while test environmental conditions inside the RSV are retained. A "downrange" view of the RSV in operating configuration is shown in figure 5.

The RSV provided shelter for the OCP during inclement weather thus preventing test interruptions.

## TEST DESCRIPTION AND PROCEDURES

### General

The OCP evaluation mission was twofold: to determine the accuracy and weighting function of the OCP, and to evaluate effects due to vibration and weather conditions (i.e., rain, overcast) on OCP operation.

Operational setup of the OCP involves placing the receiver at one end of the path and the transmitter (two separate light sources) at the other end. To insure proper operation, the light sources should have an angular separation of 6.8 mrad, and the smaller light source should be on the left as viewed from the receiver. Although the transmitter light sources can be aligned with the naked eye, the transmitter could be aligned faster and more accurately by attaching a 7.5 cm retroreflector to the receiver. The receiver was initially aligned by using the built-in sight, but the final alignment consisted of adjusting the receiver slowly in azimuth and elevation while using a small mirror to observe the images of the light sources on the dual photodiodes. Before the receiver is considered aligned, each of the light sources must be visible in the proper half of each of the six dual photodiodes.

After the alignment procedure was completed, the receiver and both transmitting light sources were secured firmly to avoid any deterioration of the signal and also to prevent "false signal" generation due to vibration.

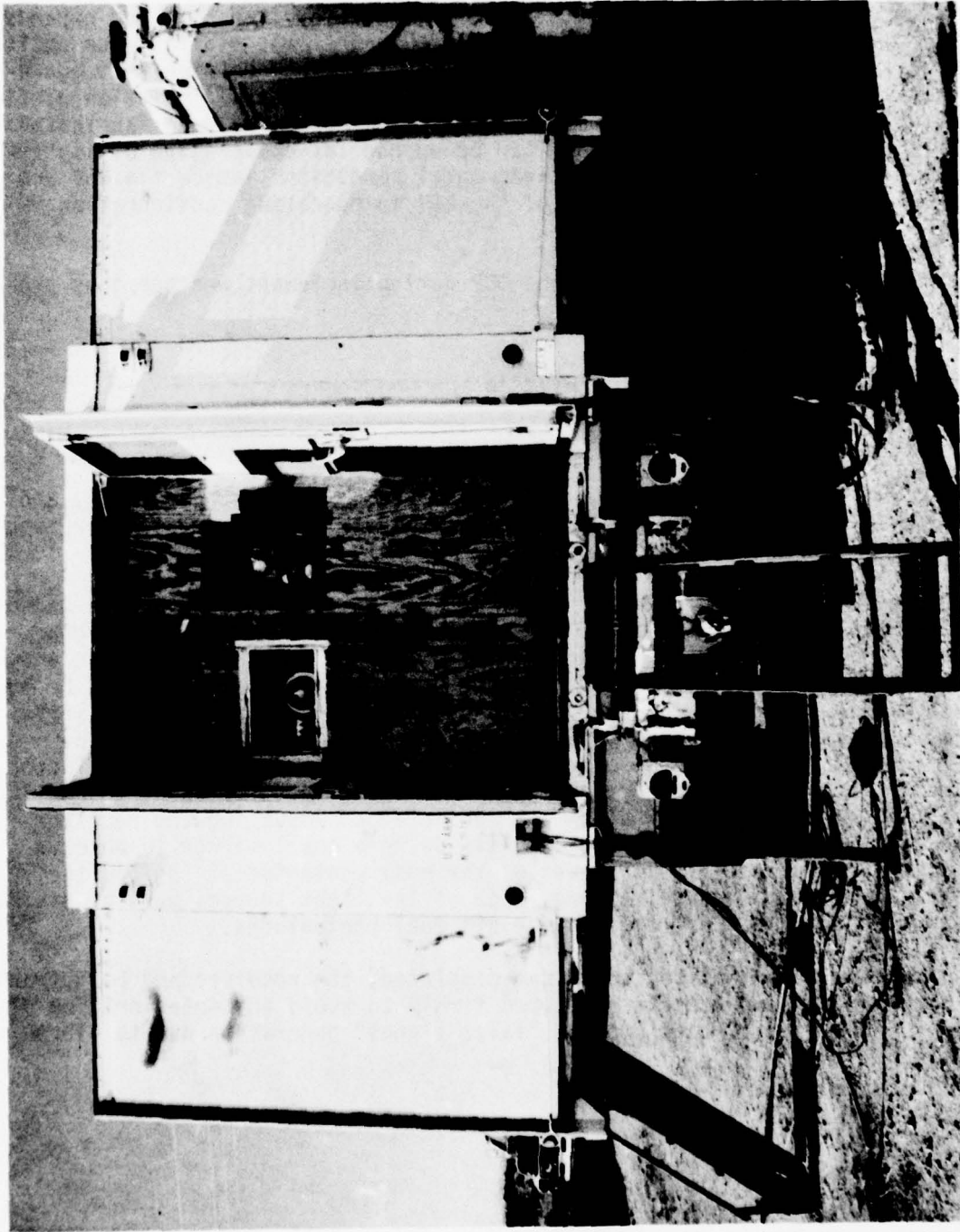


Figure 5. Remote sensing van.

## Ranges

The OCP was tested at 500 and 2000 m path lengths. Signal-to-noise ratio (SNR) at 500 m was sufficient for proper lock-on, but extending the range to 2000 m decreased the SNR and increased the alignment difficulties to such a degree that proper operation was intermittent.

## Weather Conditions

Because the OCP is an active system, its operation is not limited to daytime use. In fact, the operating range increases at night due to the absence of extraneous light that tends to degrade the SNR. Operation on clear or overcast days was reliable at 500 m; however, operation became erratic during light rain and finally ceased under heavy rain.

Atmospheric conditions during the entire test period ranged from very low thermal turbulence to values large enough to saturate the Campbell Laser Crosswind System Model CA-9 at ranges larger than 500 m. A detailed summary of weather conditions existing during the test period is shown in appendix C. This appendix is included to provide the prevailing weather conditions during the test period for all evaluated systems. These data are from the National Weather Service located at the El Paso International Airport approximately 6 km from BOR.

## DATA COLLECTION AND RESULTS

### Mathematical Background

In statistical bivariate analysis, a scatter plot is useful for the evaluation of measured experimental data. During the OCP test, scatter plots were generated to aid in the accuracy evaluation.

The abscissa values for the scatter plots were determined by the output of the reference anemometer array, while the ordinate values were those from one of the OCP outputs. Each pair of values, taken at the same time, was considered as a coordinate in the scatter plot, and a large number of these pairs were used in each plot to make the comparison statistically meaningful. The FORTRAN IV program developed to sample and plot the experimental data is included in appendix D.

The usefulness of the scatter diagram in evaluation analysis is indicated by the three plots shown in figure 6. Plot A shows a scatter plot that consists of a straight line with a 45-degree slope and passing through the origin. This case depicts a one-to-one correspondence, or complete agreement, between the reference and evaluated systems.

X = CMA Value  
 Y = OCP Value

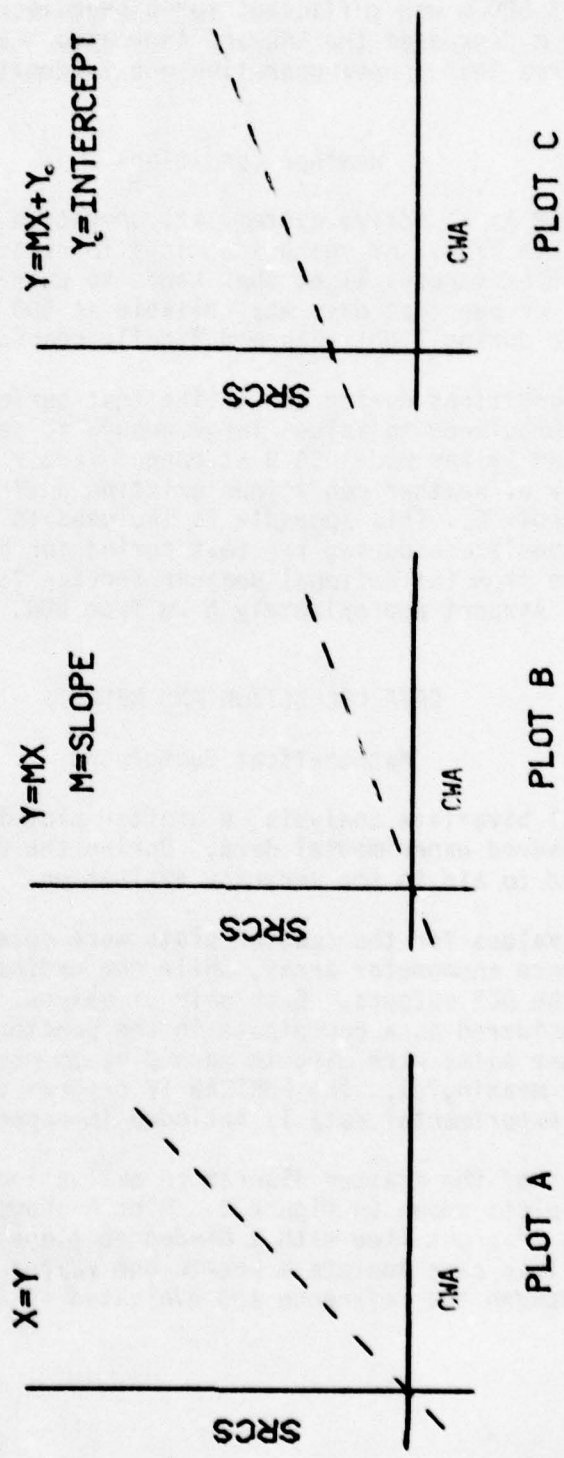


Figure 6. Typical scatter plots.

Plot B, where the slope of the line is no longer 45 degrees, indicates that the ordinate values have to be adjusted by including a multiplicative factor in the mathematical expression relating the reference and evaluated systems. Plot C shows a further change: the resultant line no longer passes through the origin. This signifies that an offset value,  $Y_0$ , must be added to the final mathematical relation.

All pairs of points plotted to construct a scatter diagram will very seldom fall in a straight line; therefore, after all the data pairs generated during the OCP test were plotted, a straight line was fitted by using the least squares method.<sup>6</sup> The resultant line was then expressed as

$$Y = A_0 + A_1 X$$

where the constant coefficients are given by the expressions

$$A_0 = \frac{(\sum Y)(\sum X^2) - (\sum X)(\sum XY)}{N(\sum X^2) - (\sum X)^2}$$

and

$$A_1 = \frac{N(\sum XY) - (\sum X)(\sum Y)}{N(\sum X^2) - (\sum X)^2}$$

where N indicates the number of ordered pairs  $(X_n, Y_n)$ .

The above equations show that the method of least squares allows extreme values to affect the final result considerably. Therefore, during the data collection phase, care was taken to investigate extremely offset values to insure that they were legitimate and not caused by mechanical or electrical system malfunctions. Also it is necessary to consider the values close to zero carefully and prudently because of the fact that the mechanical anemometers have a certain amount of friction which generates erroneous results when the wind velocity is below the threshold value of the anemometers. However, the anemometers used minimized this anomaly because they were research quality propeller anemometers.

<sup>6</sup>Athanasios Papoulis, 1965, Probability, Random Variables, and Stochastic Processes, McGraw-Hill Book Company, New York

Scatter plots can be generated by using either a straight average or a weighted average of the mechanical anemometer outputs as the abscissa values. The weighted average values should be weighted according to the weighting function of the instrument being tested, the OCP in this case. However, before these weighted values could be used, the OCP weighting function had to be determined. The weighting function is computed by considering different groups of anemometer outputs as a least squares basis set; that is, the OCP wind measurements, denoted by  $W_s$ , are represented as a linear combination of  $m$  different groups of anemometer outputs,  $W_i$ , so that

$$W_s = \sum_{i=1}^m a_i W_i ,$$

where  $a_i$  are the correlation coefficients determined by an  $m^{\text{th}}$  order least squares analysis. Various sets of coefficients,  $a_i$ , are obtained by employing different groupings of anemometers.

#### Results of Data Analysis

The weighting functions and scatter plots obtained for the different operating ranges are shown in appendix A. For path length of 500 m the values of the OCP are related to those of the computed wind average (CWA) by the following formulas:

$$Y_1 = 0.437X - 0.084$$

$$Y_2 = \text{Undefined}$$

$$Y_3 = 0.538X - 0.048$$

$$Y_4 = 0.358X + 0.941$$

$$Y_5 = 0.827X - 0.084$$

$$Y_6 = \text{Undefined}$$

where the subscripts 1 through 6 indicate each of the six readings generated by the OCP. Sensors 2 and 6 could not be calibrated before the test because of malfunctioning preamplifiers and/or faulty wiring. Because of the tight test schedule and the method of hard-wiring used in the electronic boards, it was not feasible to correct the problems at the test site. Intermittently, data were collected by sensors 2 and 6, but these data are not presented in this report because they are unreliable and inaccurate.

Because the OCP consists of six sensors that have to be aligned simultaneously, the alignment procedure is extremely tedious and time-consuming. Most of the time, only three or four sensors can be aligned properly, which is easily seen in the data gathered on 3 March 1978 and presented in appendix B in the form of comparison plots. At the beginning of this data collection phase, sensors 1 and 3 were properly aligned, while 4 and 5 were not maximized. At approximately 1010, sensor 2 fell out of alignment. The entire OCP was realigned at 1040 with the result that sensors 4 and 5 began to collect data; but alignment of sensor 3 was not maximized, and sensor 1 fell completely out of alignment. The weighting function diagrams and scatter plots also show the lack of simultaneous alignment.

Figure 7 is a representative plot that exemplifies the method of data presentation. The scatter plot and weighting function are combined in a figure to show a more complete analysis of each sensor.

Comparison of the time function plots when the OCP operated over a 500-m range shows that when the sensors are aligned their measured value falls within 8 percent of the value measured by the CWA at least 90 percent of the time. However, it is extremely difficult to align all six sensors simultaneously and have them remain in alignment.

The alignment problem increased considerably when the OCP was operated over the 2000-m range. The alignment procedure became almost impossible to perform and the results obtained were unreliable. For this reason, data from the OCP operating at the 2000-m range were not collected.

#### CONCLUSIONS

On the 500-m range and under predominant area weather conditions (no rain, hail, or snow), each of the OCP sensors, when aligned properly, measured crosswind averages within 8 percent of those measured by the CWA. However, under moderate to severe adverse weather conditions, the OCP was not accurate or reliable in operation due to a decrease of SNR below its operating threshold.

The receiver and both transmitting light sources should be solidly attached to a firm foundation to eliminate any vibration which is interpreted by the OCP as signal information and thus generates erroneous results. If at all possible, the receiver and transmitter should be placed inside buildings and operated through windows in order to remain aligned.

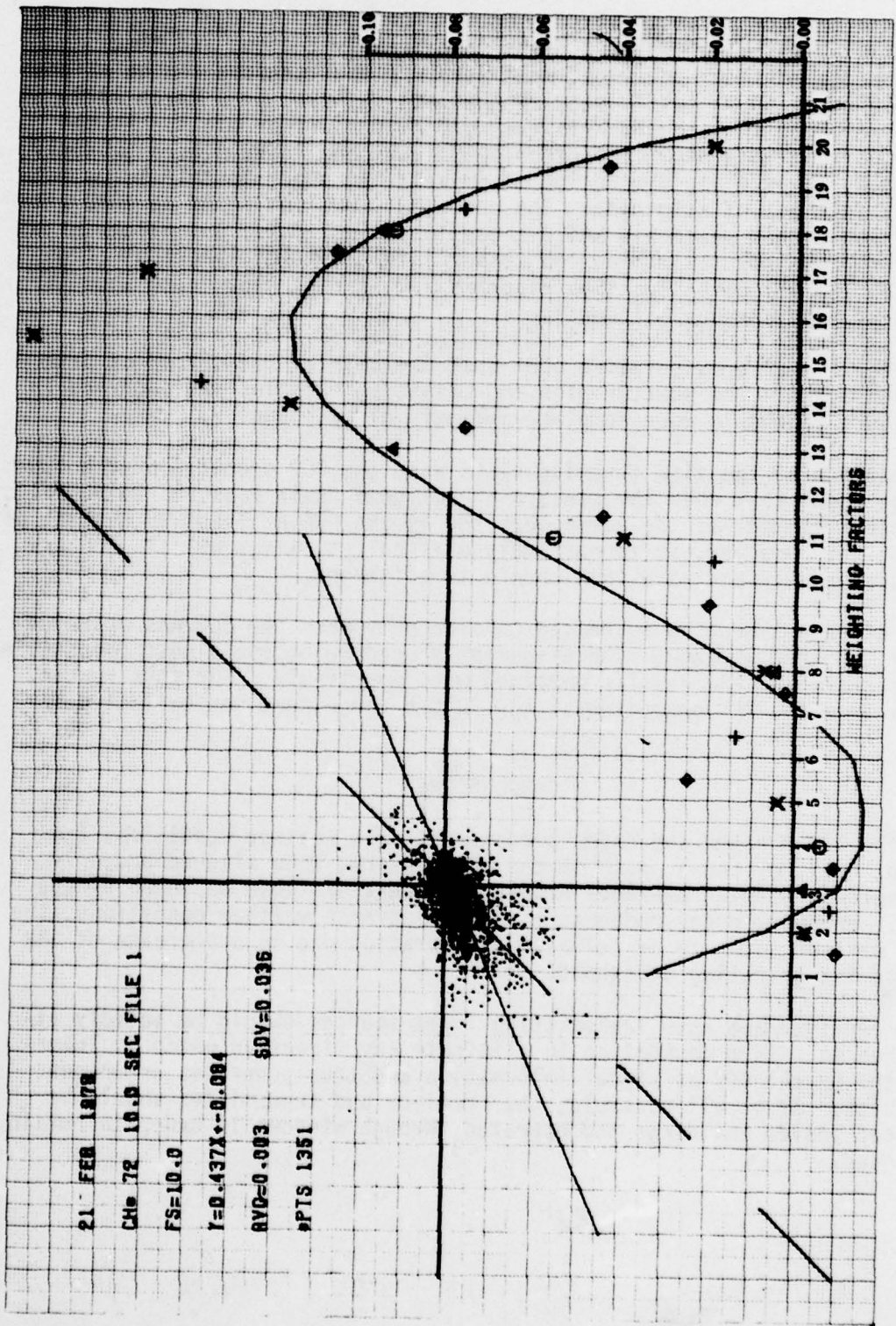


Figure 7. Scatter plot and weighting function. OCP: sensor 1, 500-m range.

The OCP transmitting light sources should be aligned by using a retro-reflector at the receiver and a boresighted telescope at the transmitter end. The receiver alignment should be checked by observing the dual photodiodes and corrected if necessary so that each light source can be observed in half of each of the six photodiodes. This procedure is lengthy and tedious and is almost impossible to perform when the range is 2000 m or more because reflected image of the small light source is not visible on the photodiode surfaces.

Troubleshooting of the circuit boards in the electronic section of the receiver was difficult because the circuit boards were "wired-in" and therefore could not be easily pulled out or interchanged.

At a range of 2000 m or more, operation of the OCP was erratic, and no reliable data could be collected.

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1. Walters, D. L., 1975, "Crosswind Weighting Functions for Direct-Fire Projectiles," ECOM Report 5570, Atmospheric Sciences Laboratory, White Sands Missile Range, NM.
2. Rodriguez, R., 1979, "Evaluation of the Passive Remote Crosswind Sensor," ERADCOM Report ASL-TR-0032, Atmospheric Sciences Laboratory, White Sands Missile Range, NM.
3. Rodriguez, R., and W. J. Vechione, 1979, "Evaluation of the Saturation Resistant Crosswind Sensor," ERADCOM Report ASL-TR-0035, Atmospheric Sciences Laboratory, White Sands Missile Range, NM.
4. Ochs, G. R., S. F. Clifford, and Ting-i Wang, 1976, "Laser Wind sensing: the effects of saturation of scintillation," Applied Optics, Vol 15, No. 2, pp 403-408.
5. Ochs, G. R., Ting-i Wang, and E. J. Goldenstein, 1977, "An Optical System for Profiling Wind and Refractive-Index Fluctuation," ECOM Report 77-7, Atmospheric Sciences Laboratory, White Sands Missile Range, NM.
6. Papoulis, Athanasios, 1965, Probability, Random Variables, and Stochastic Processes, McGraw-Hill Book Company, New York.

APPENDIX A. OCP SCATTER PLOTS AND WEIGHTING FUNCTIONS

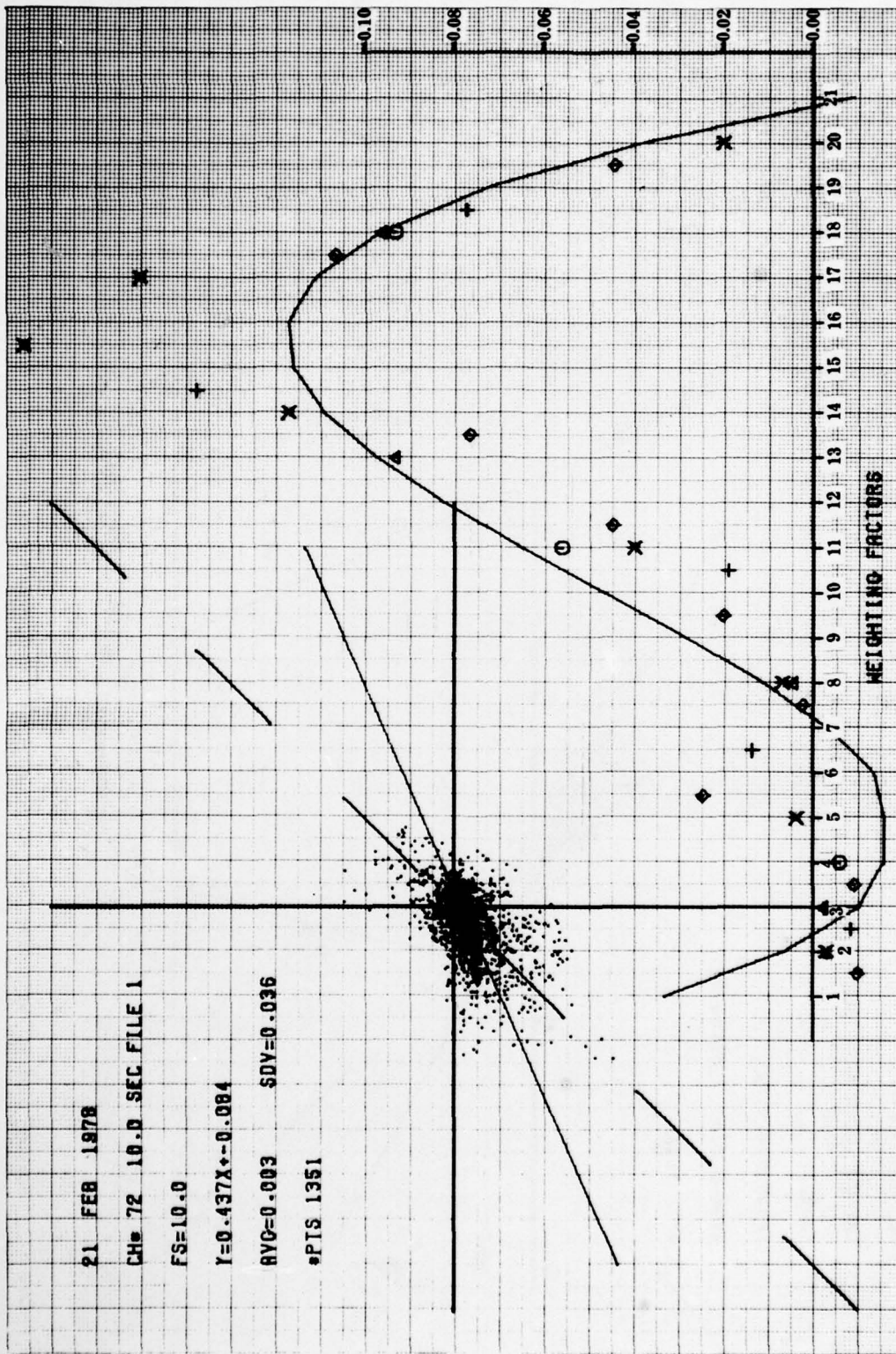


Figure A-1. Scatter plot and weighting function. OCP: sensor 1, 500-m range.

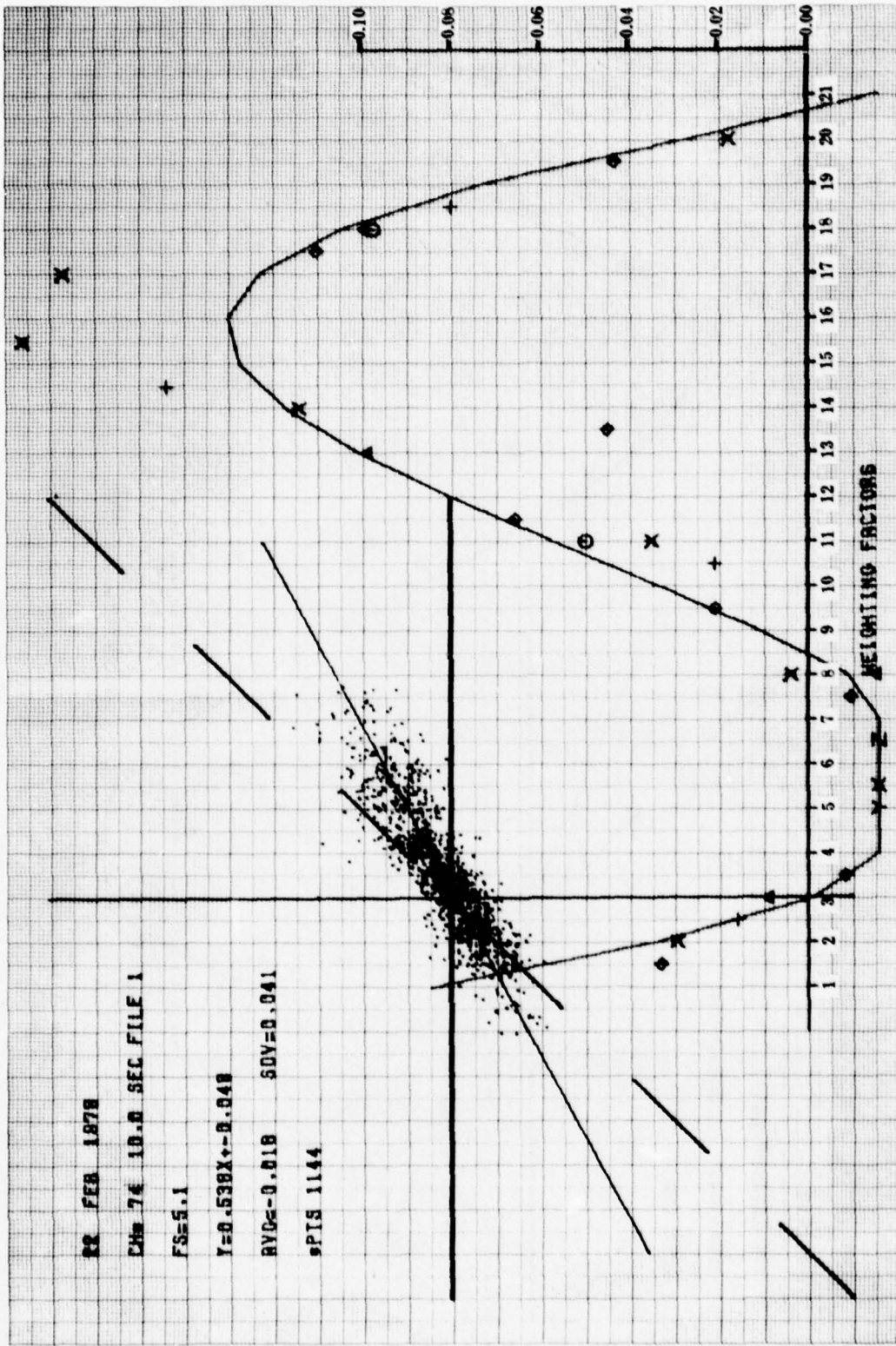


Figure A-2. Scatter plot and weighting function. OCP: sensor 3, 500-m range.

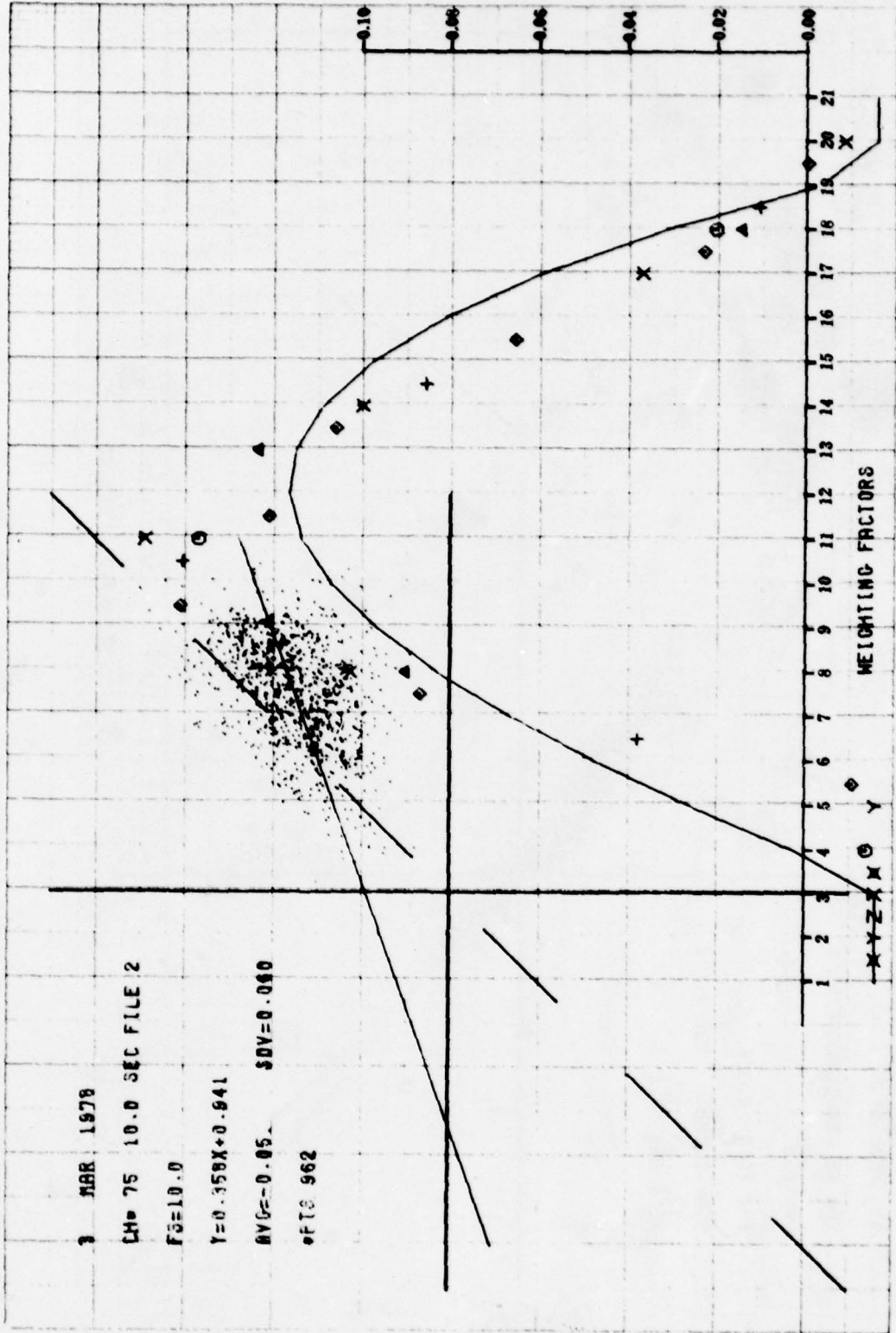


Figure A-3. Scatter plot and weighting function. OCP: sensor 4, 500-m range.

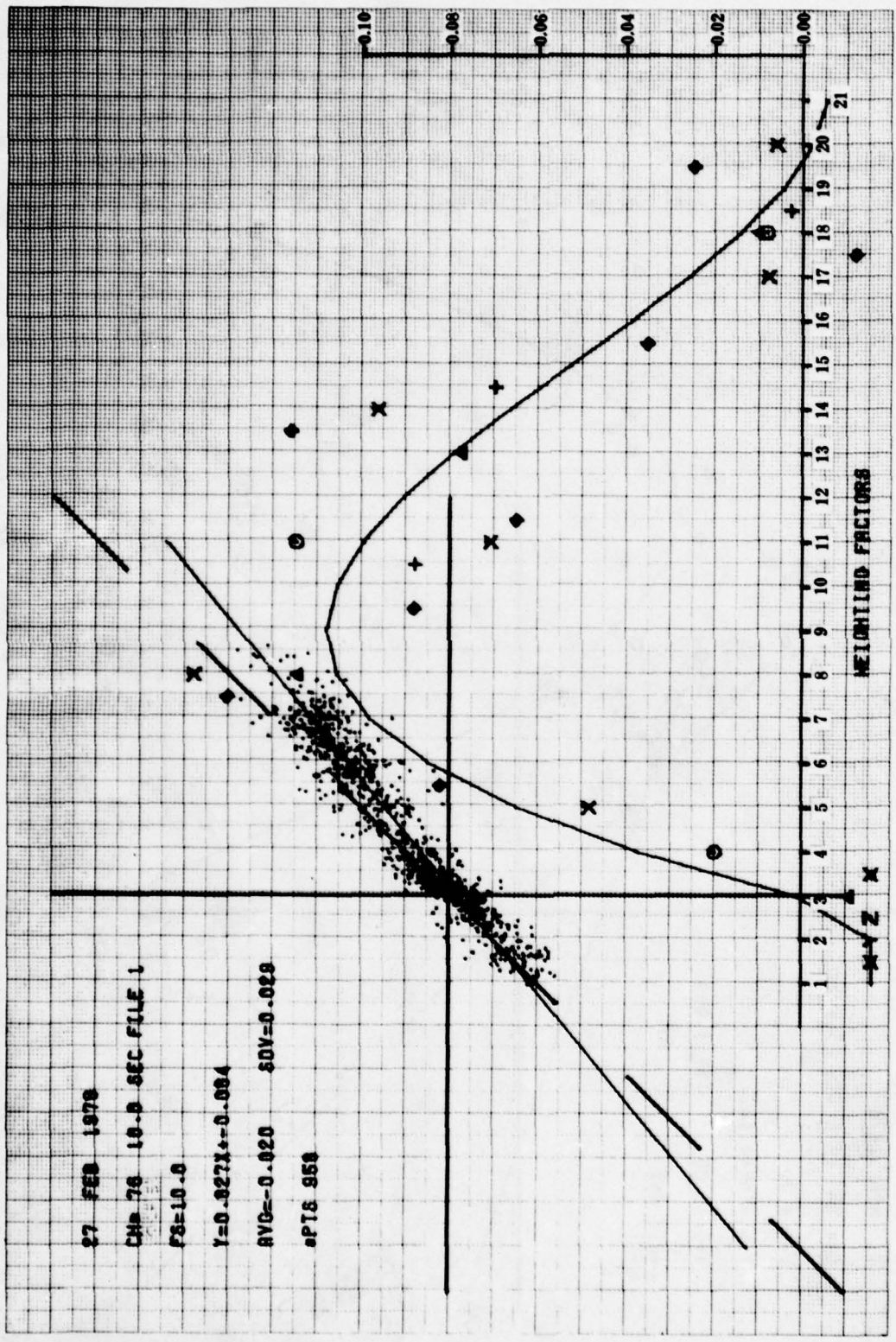


Figure A-4. Scatter plot and weighting function. OCP: sensor 5, 500-m range.

APPENDIX B. OCP WIND MEASUREMENT COMPARISON PLOTS

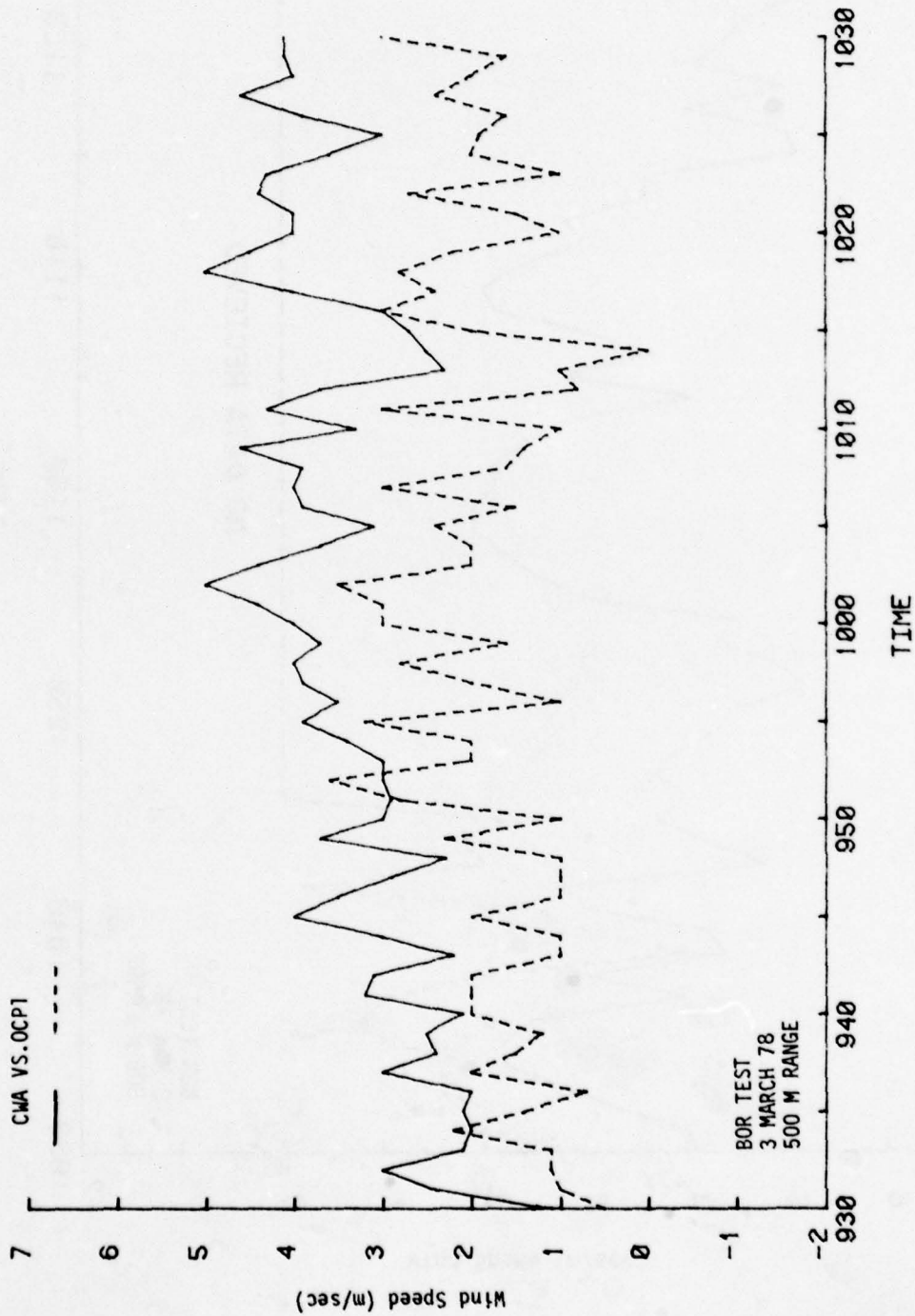


Figure B-1a. Wind comparison plot.

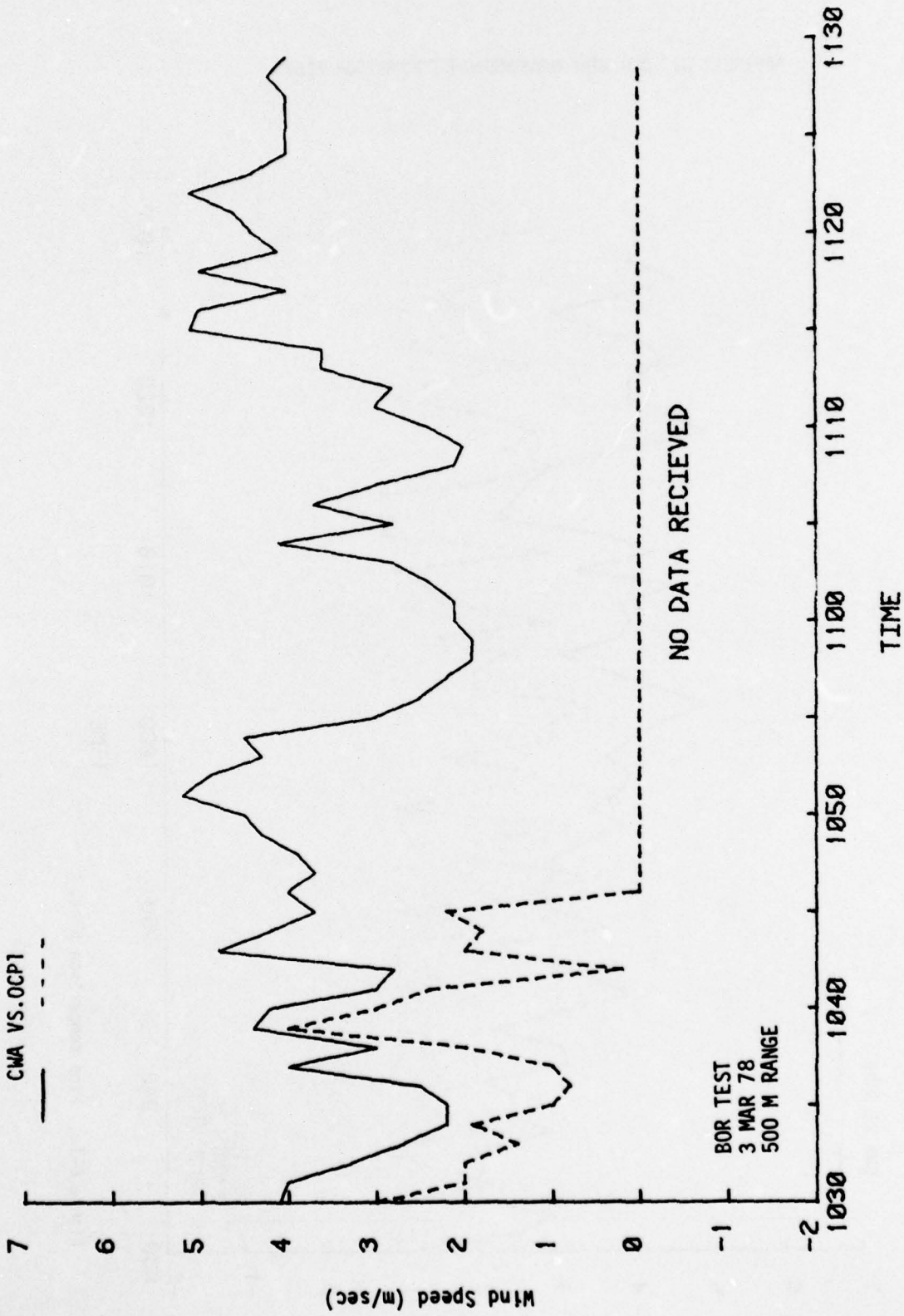


Figure B-1b. Wind comparison plot.

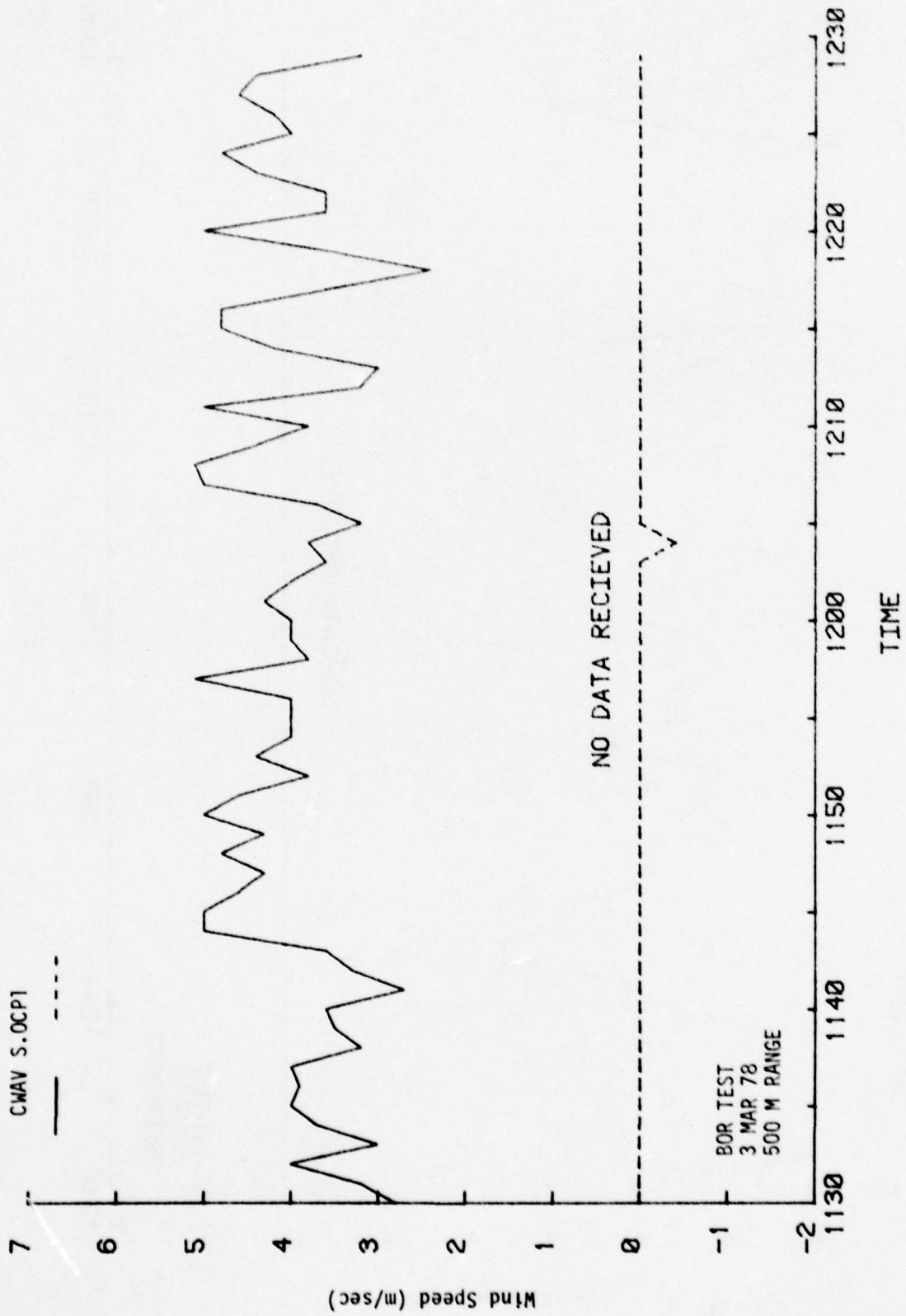


Figure B-1c. Wind comparison plot.

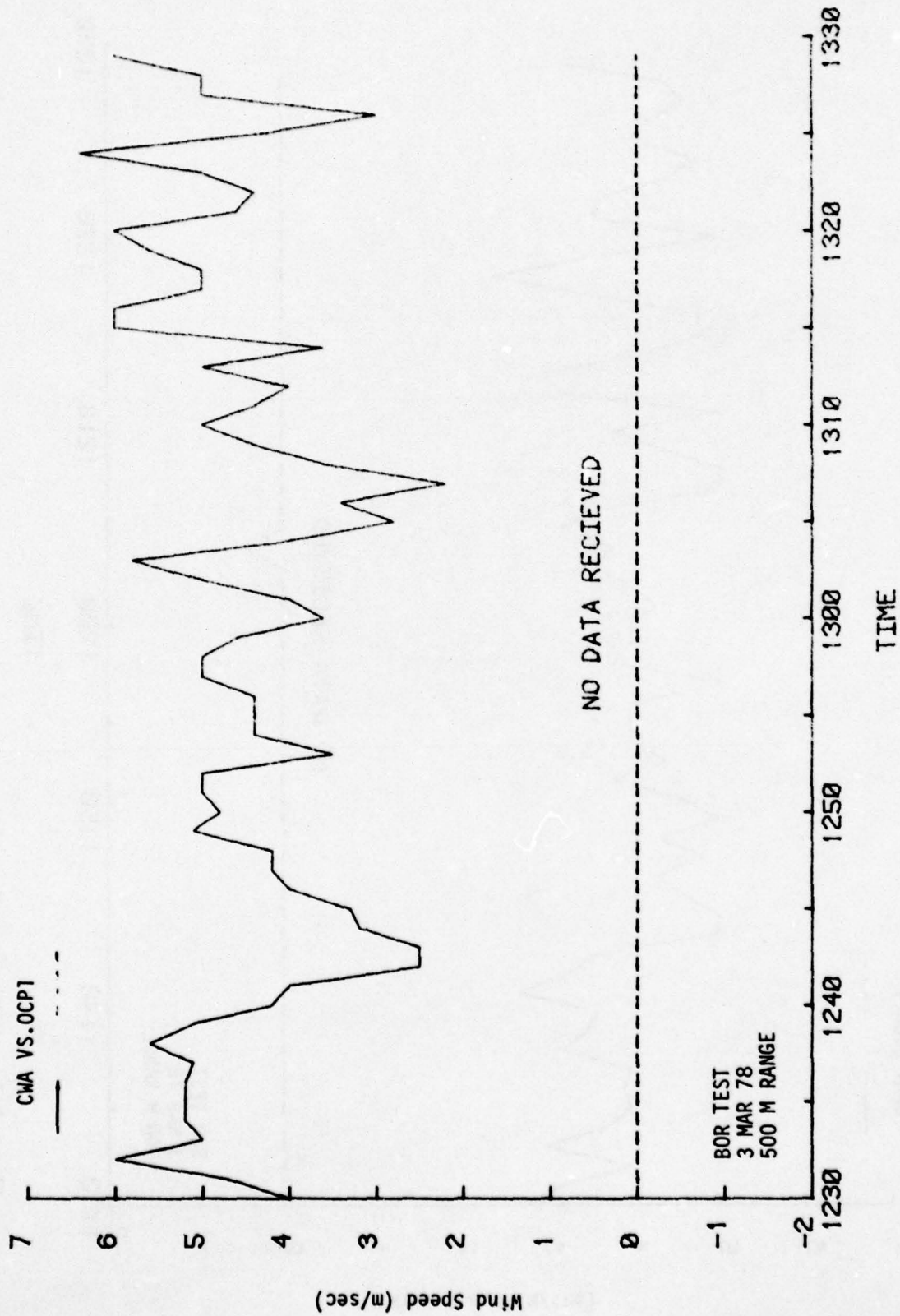


Figure B-1d. Wind comparison plot.

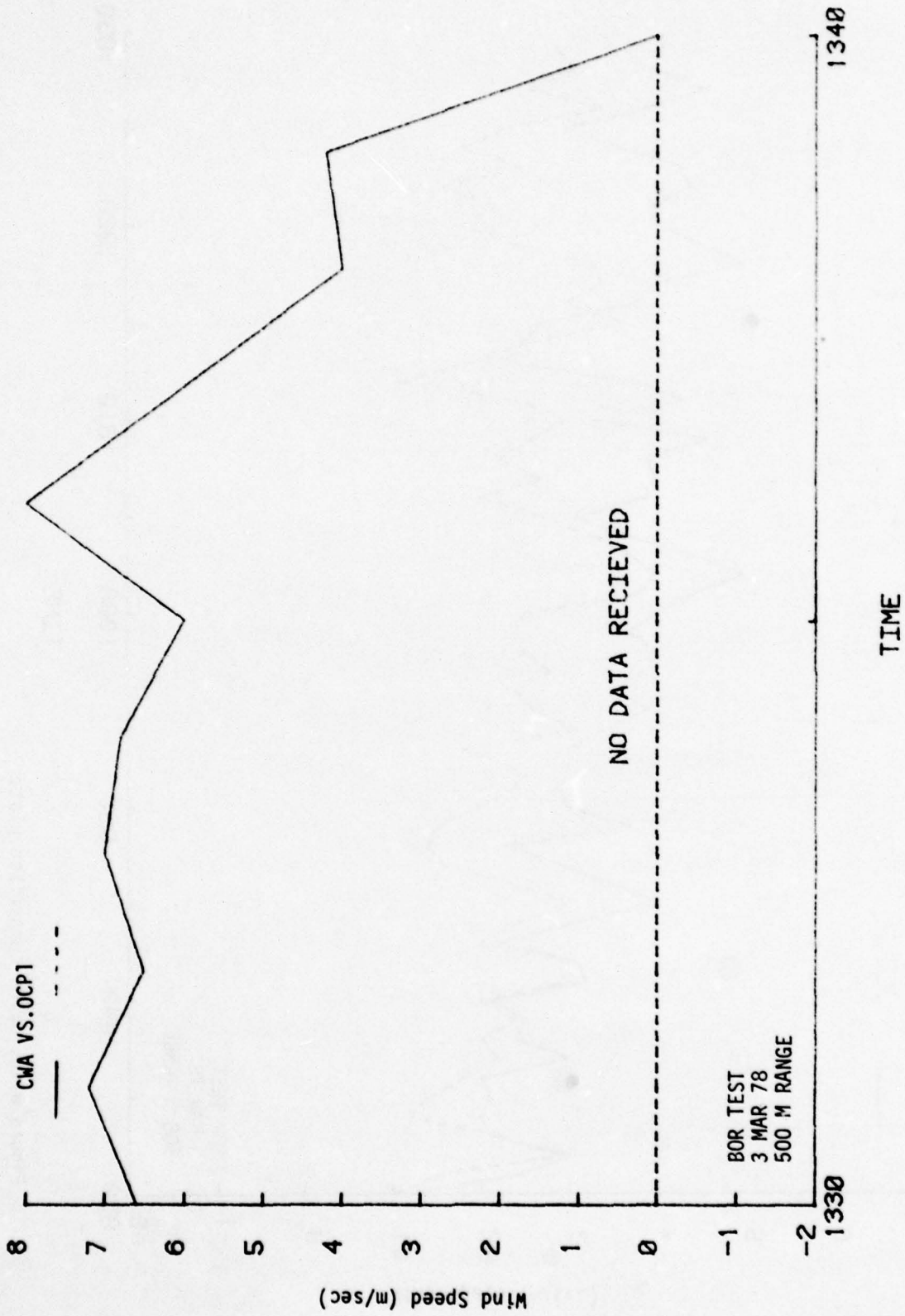


Figure B-1e. Wind comparison plot.

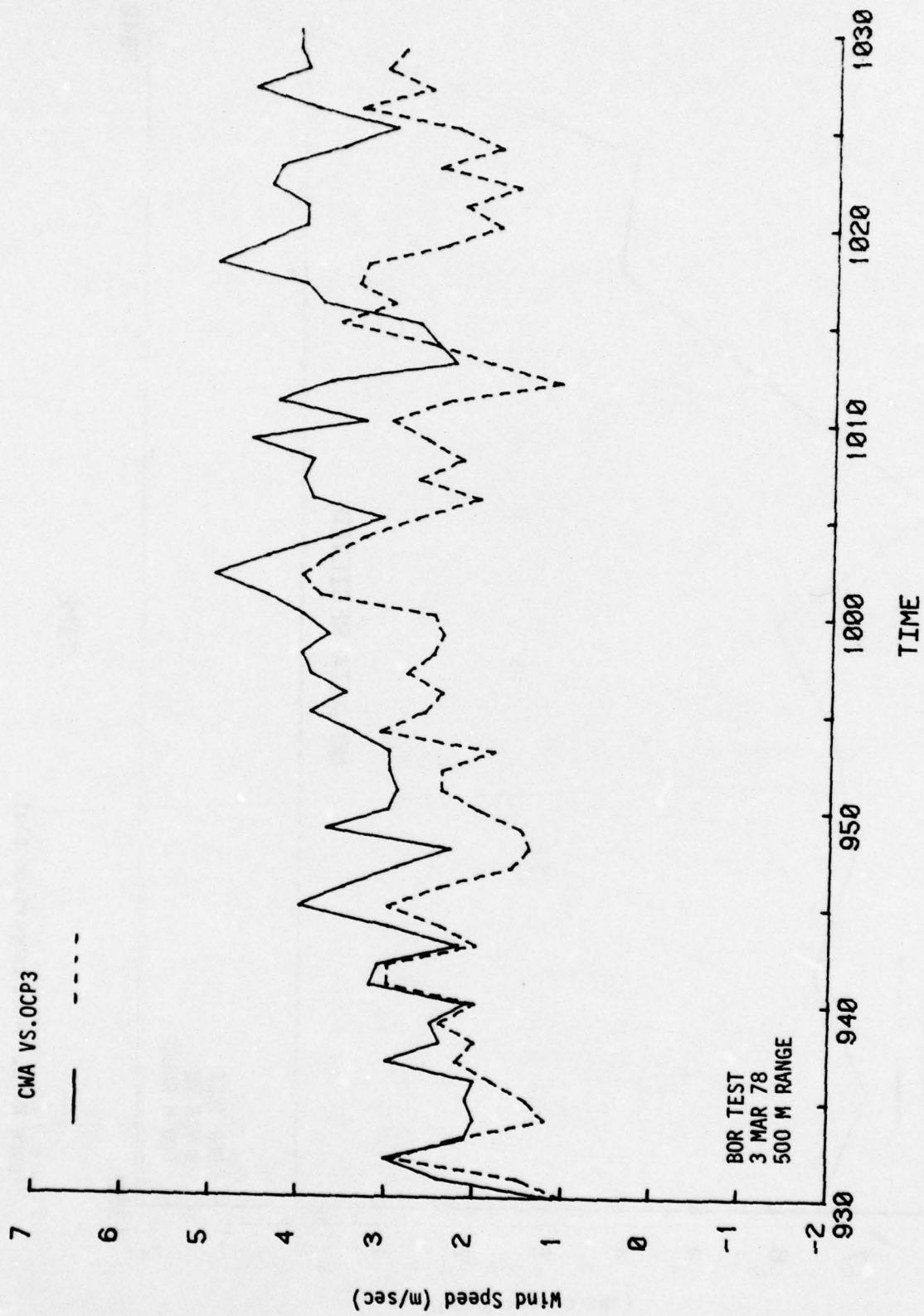


Figure B-2a. Wind comparison plot.

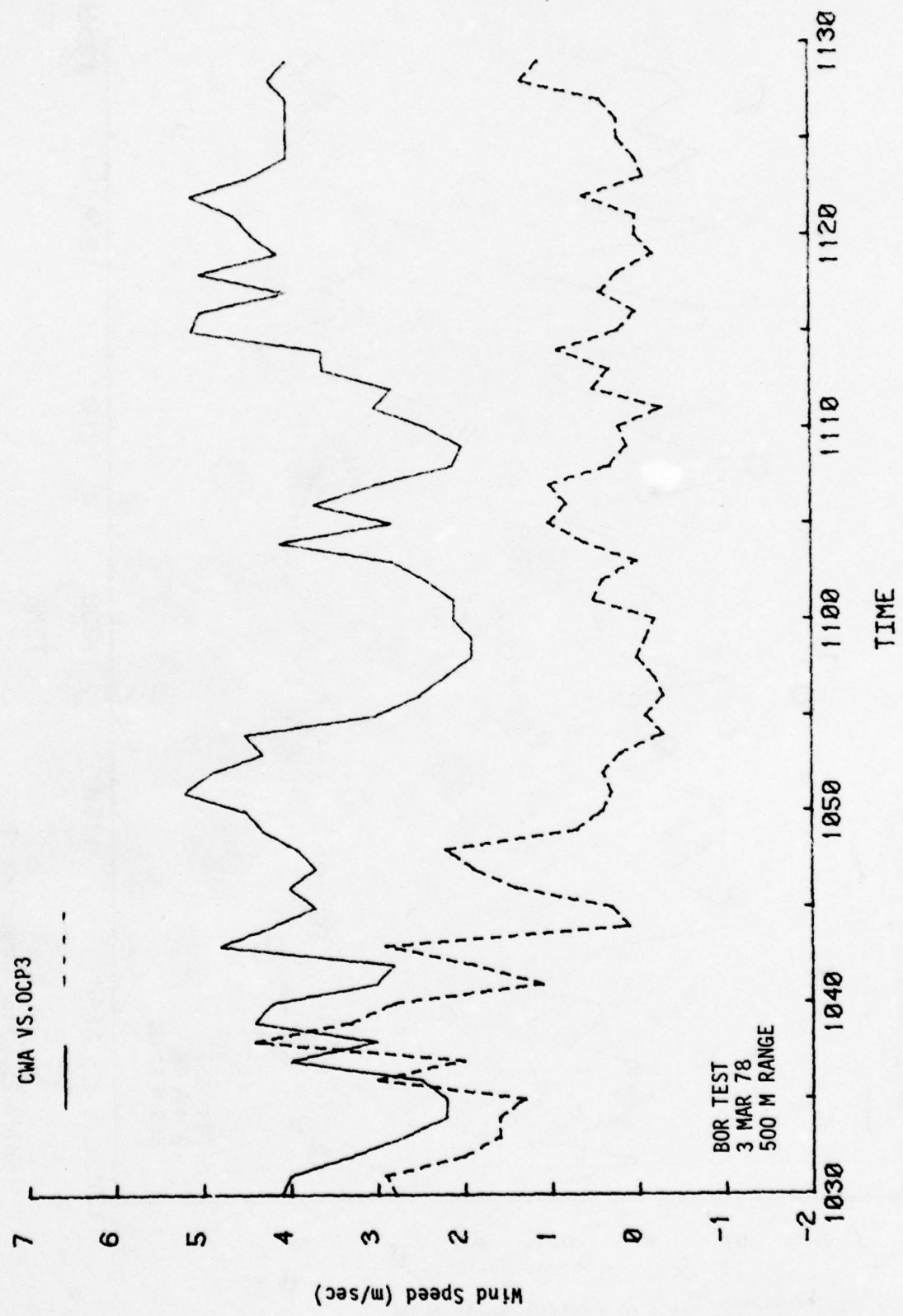


Figure B-2b. Wind comparison plot.

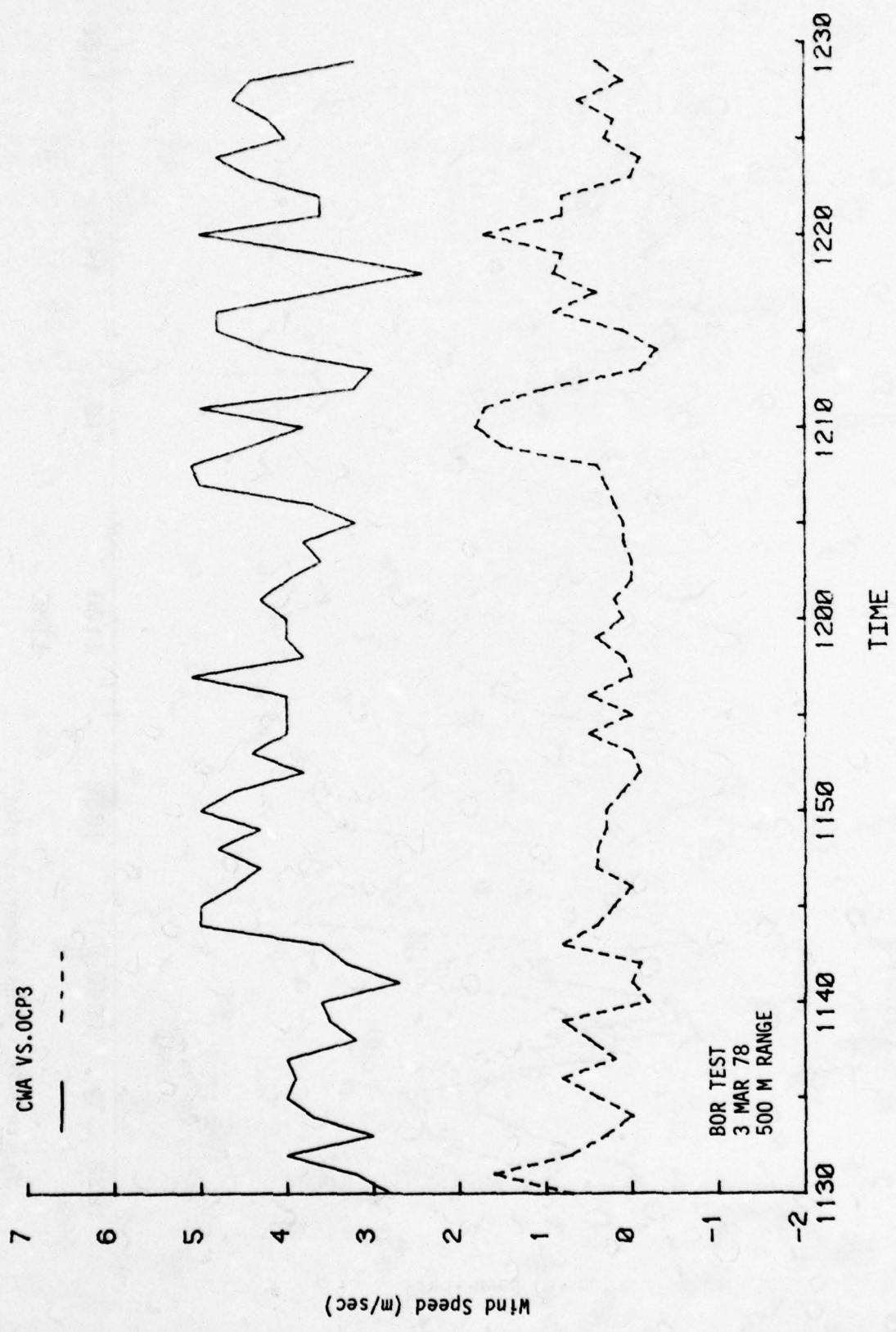


Figure B-2c. Wind comparison plot.

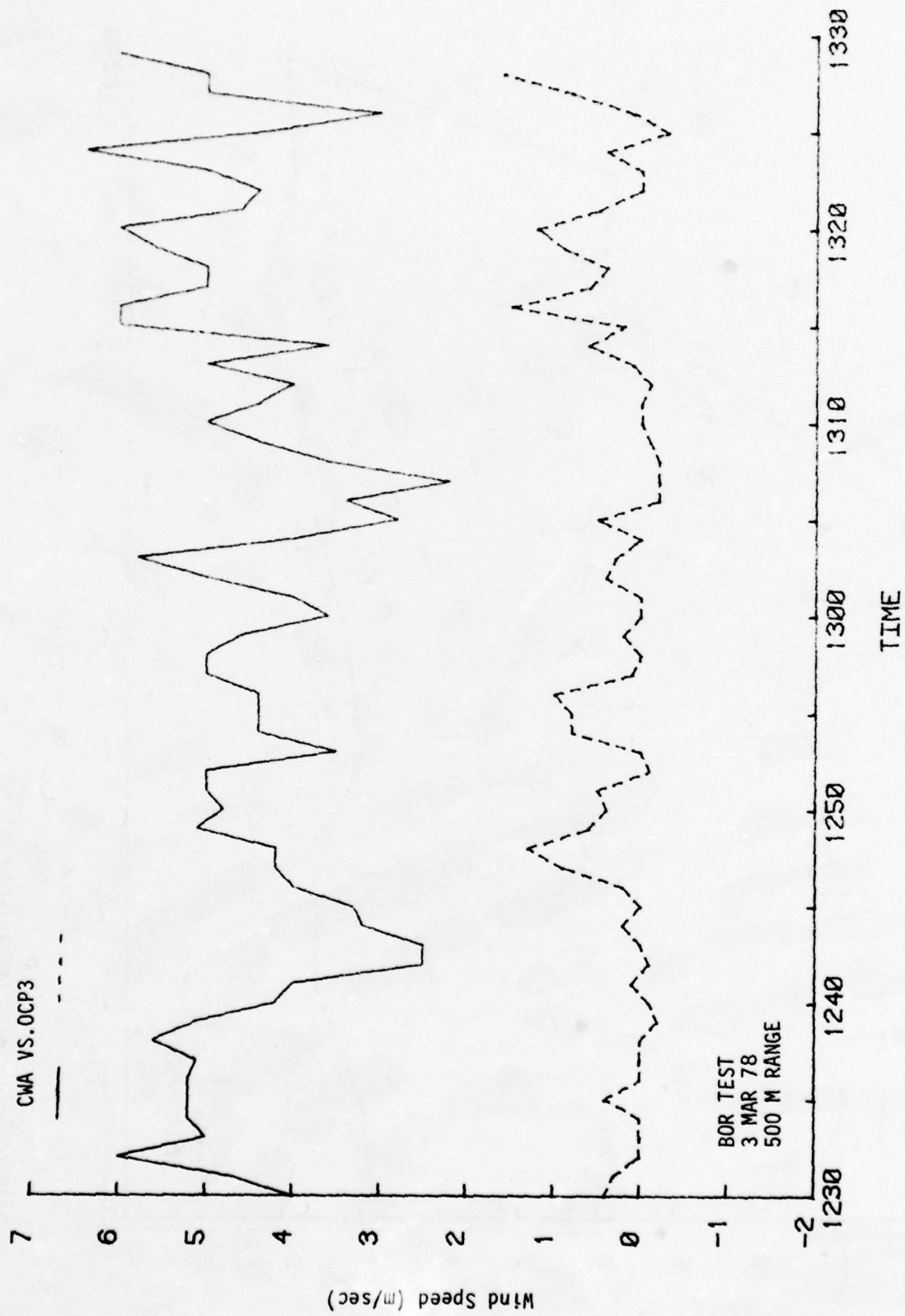


Figure B-2d. Wind comparison plot.

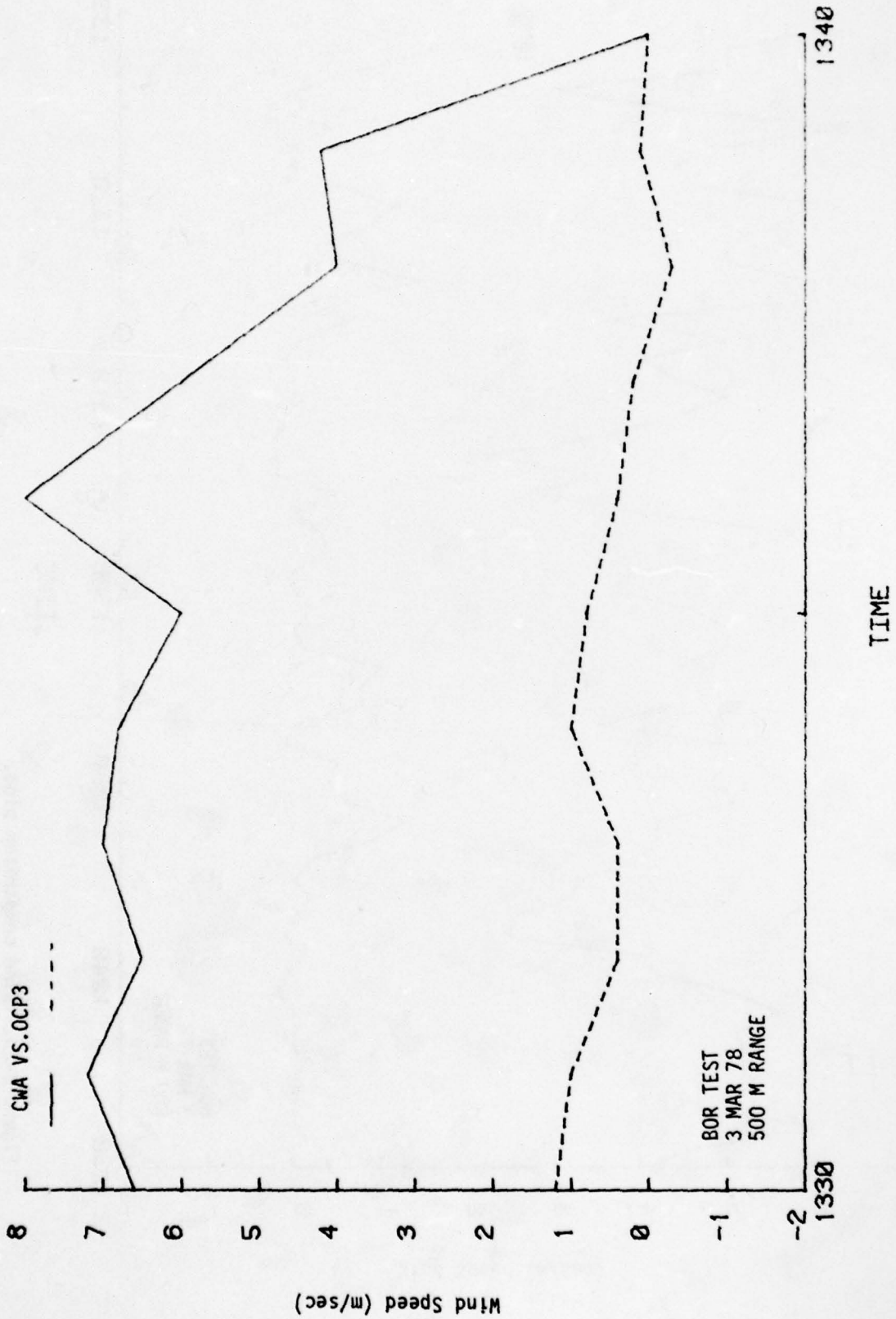


Figure B-2e. Wind comparison plot.

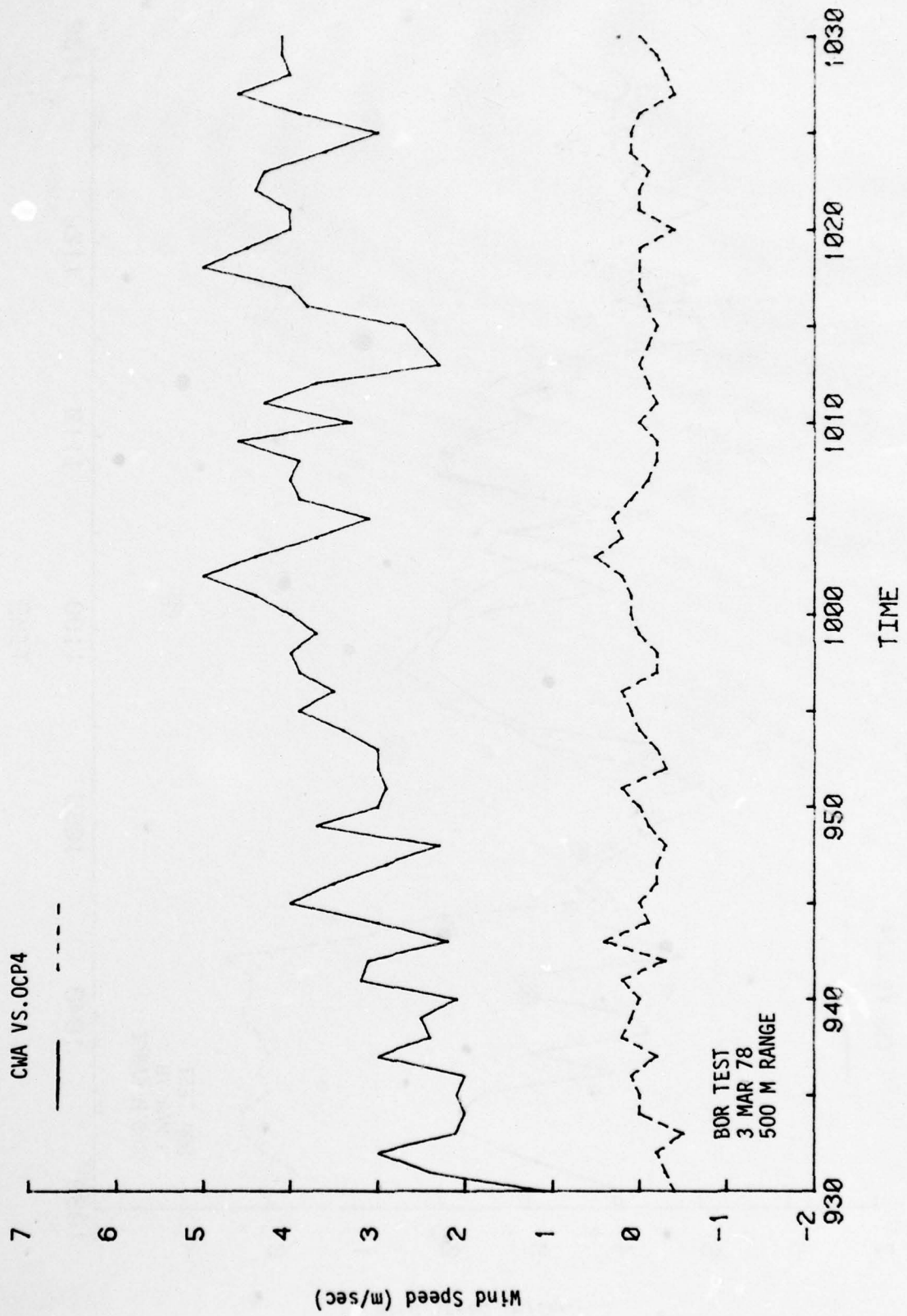


Figure B-3a. Wind comparison plot.

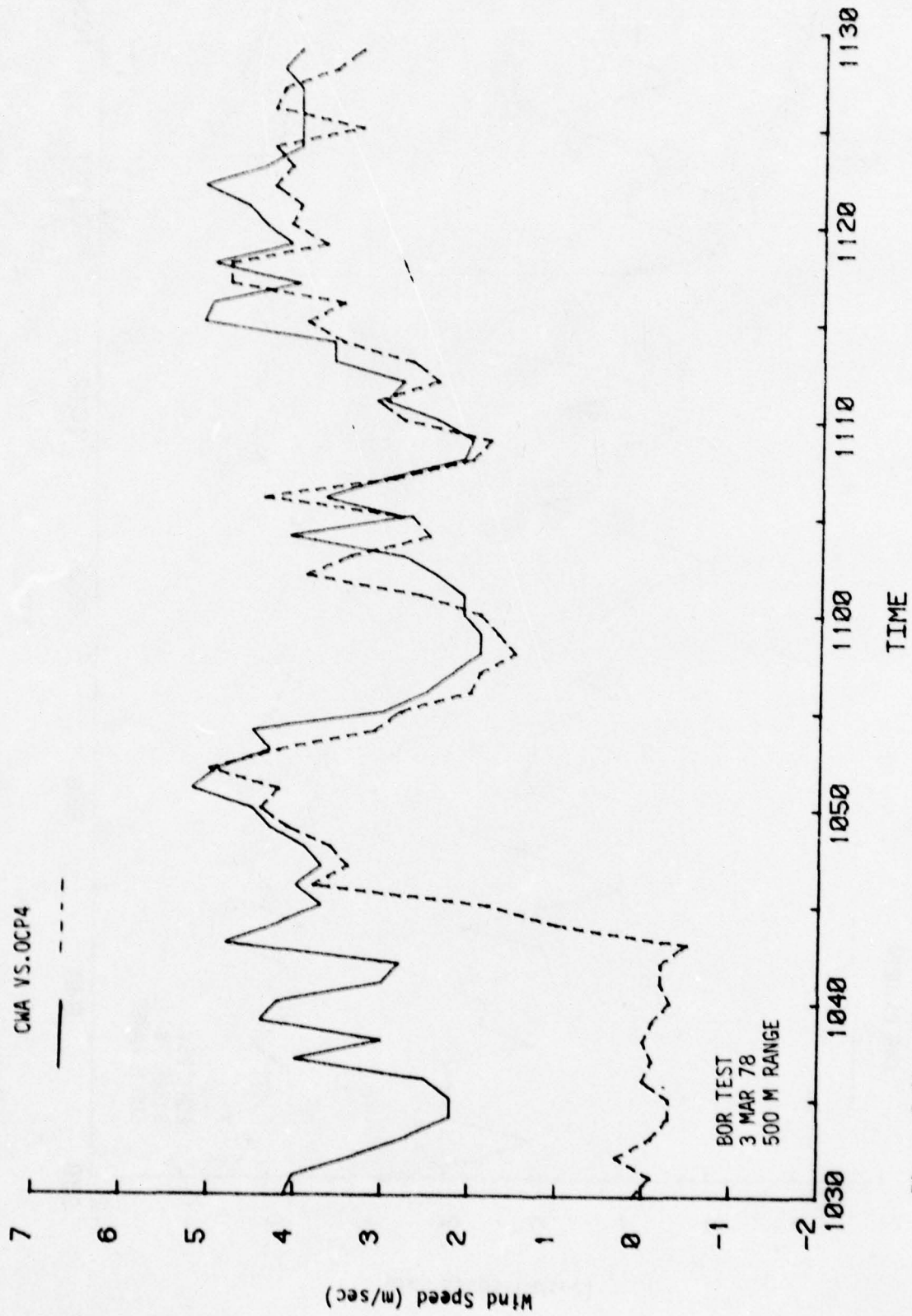


Figure B-3b. Wind comparison plot.

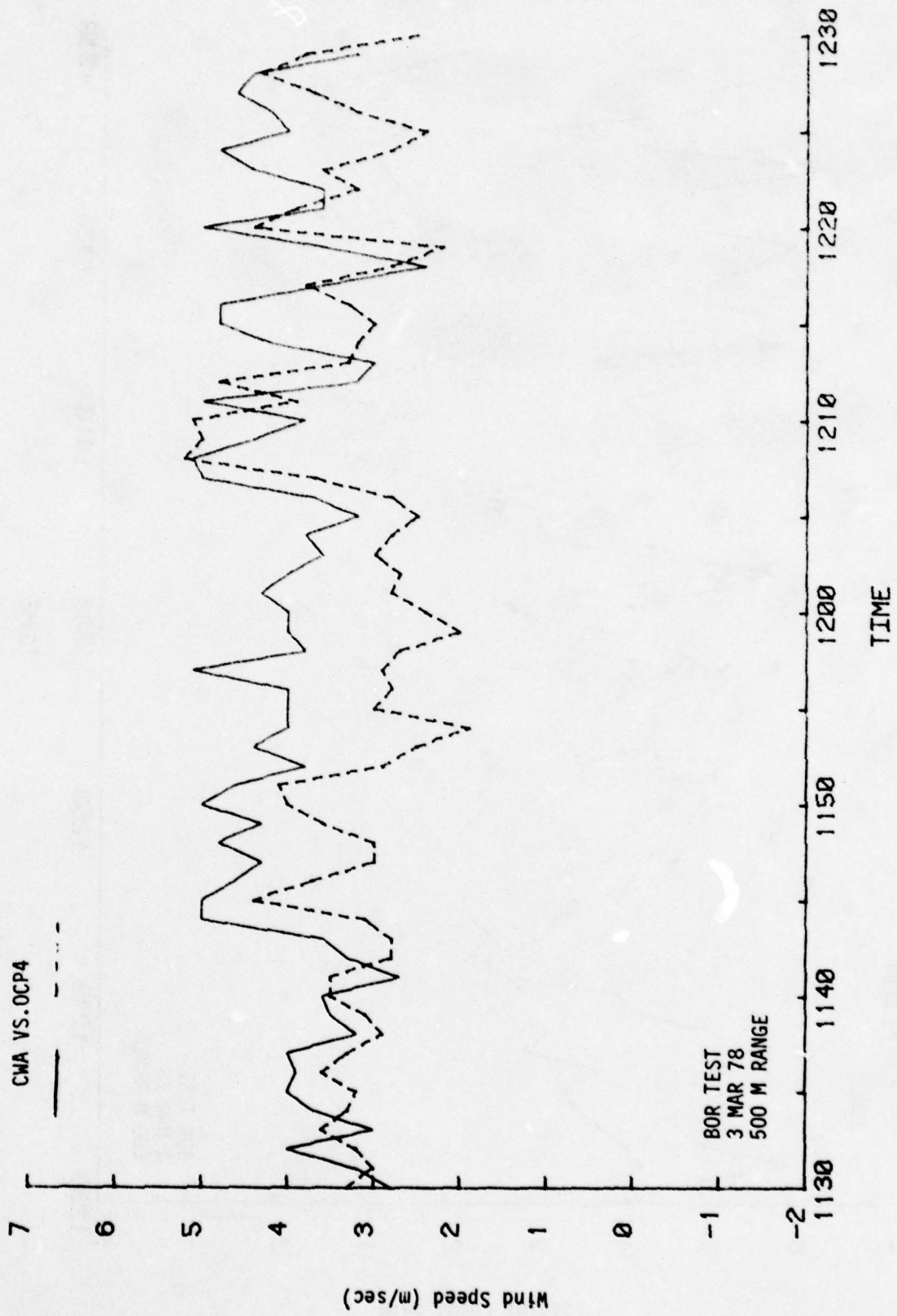


Figure B-3c. Wind comparison plot.

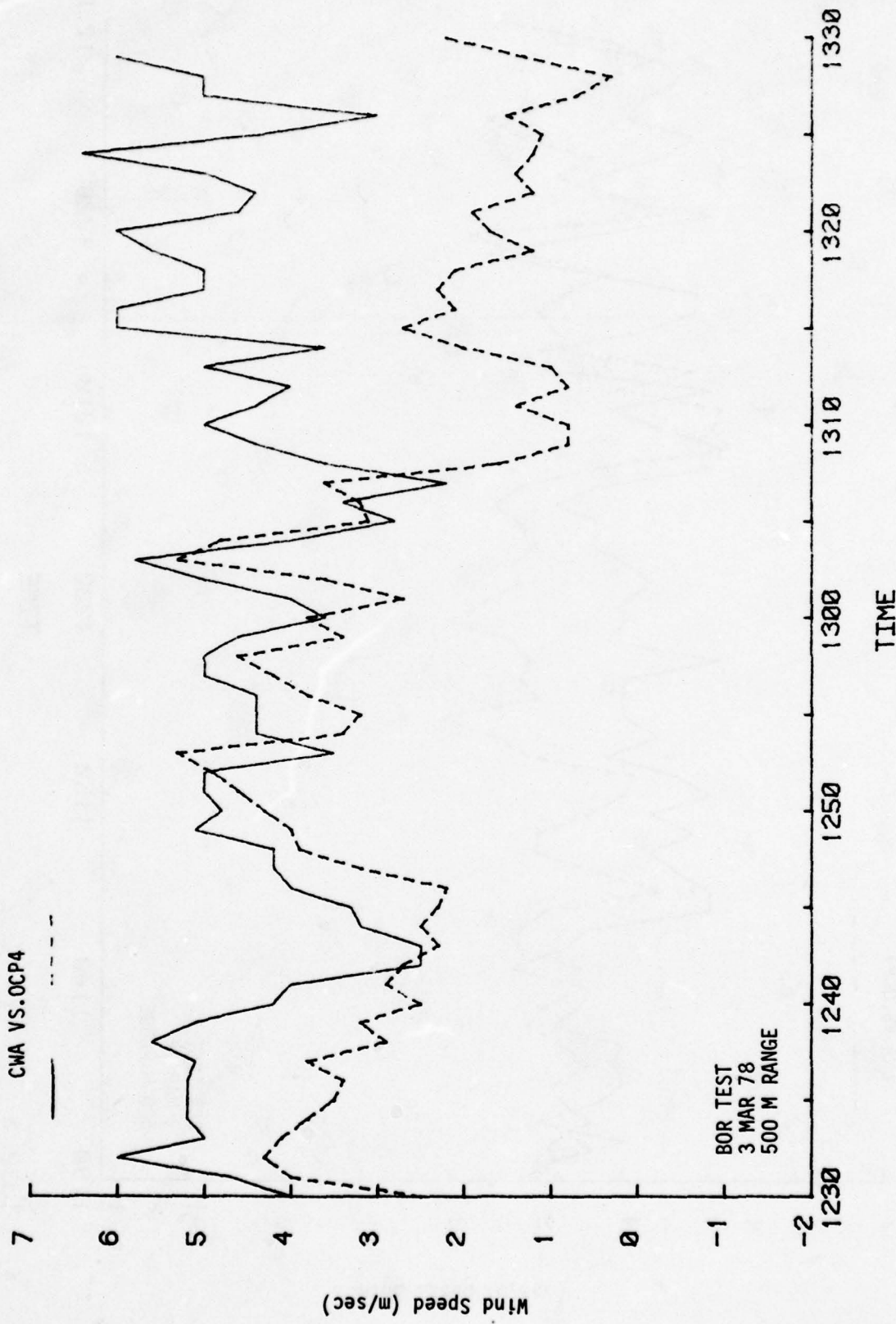


Figure B-3d. Wind comparison plot.

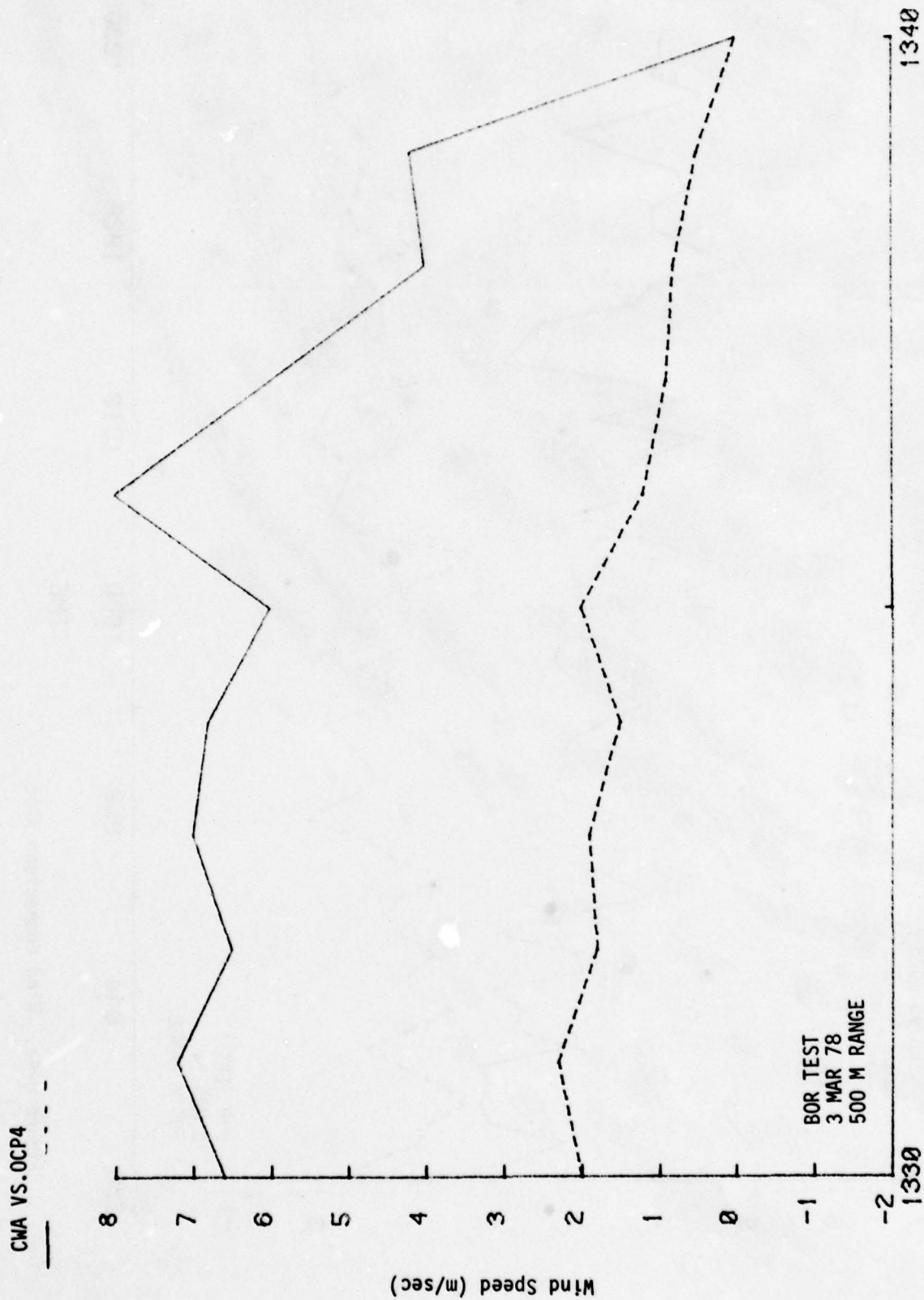


Figure B-3e. Wind comparison plot.

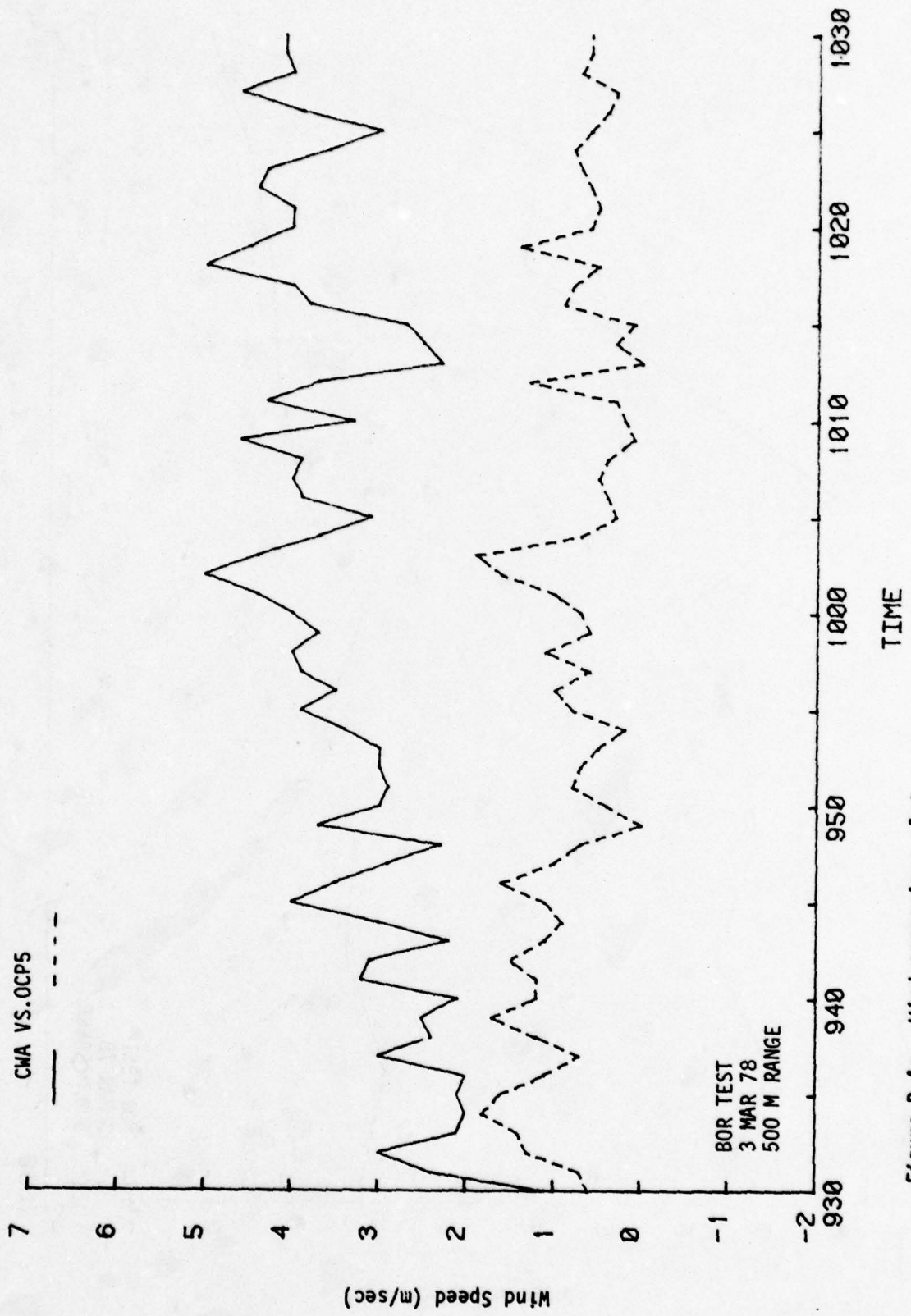


Figure B-4a. Wind comparison plot.

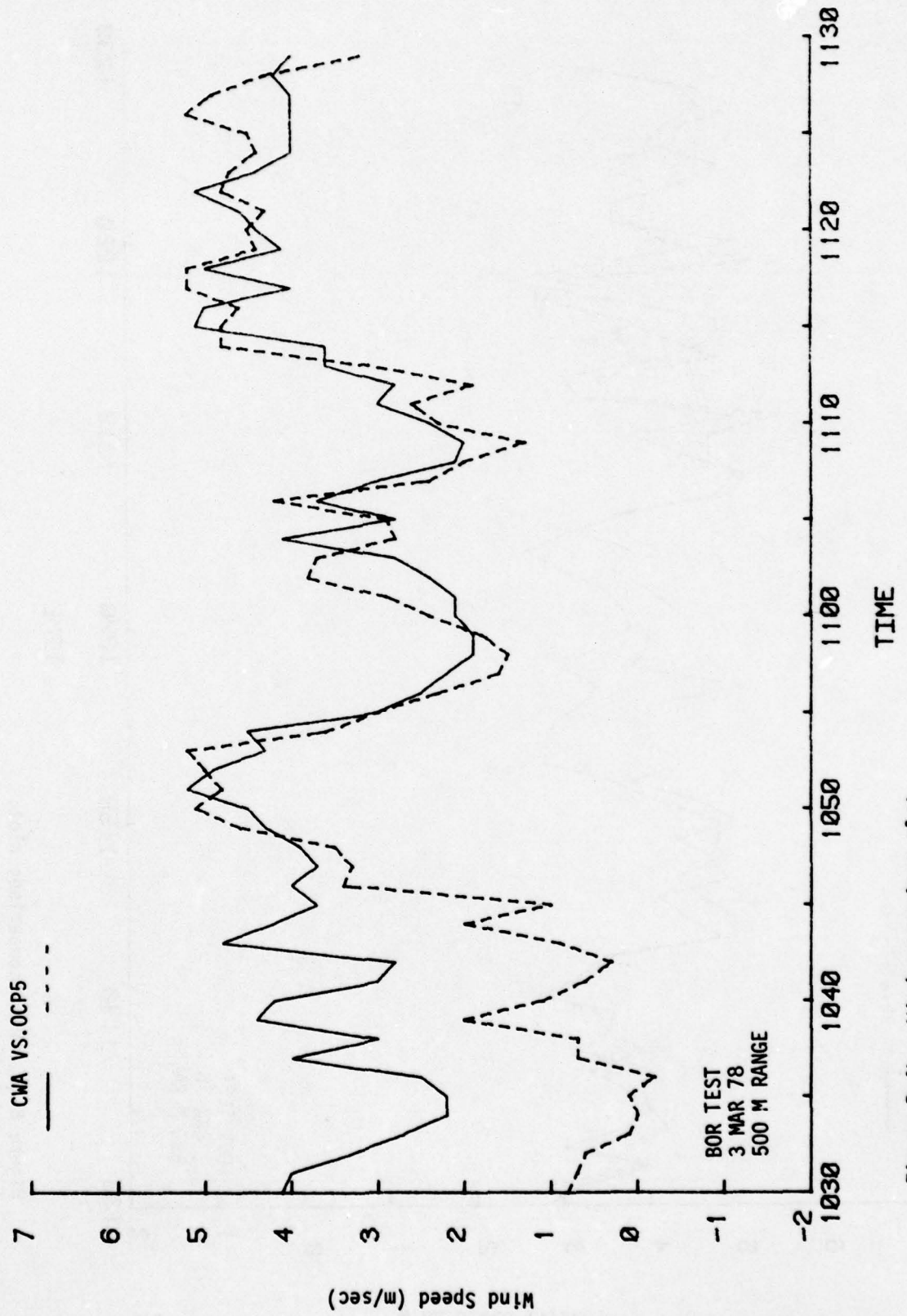


Figure B-4b. Wind comparison plot.

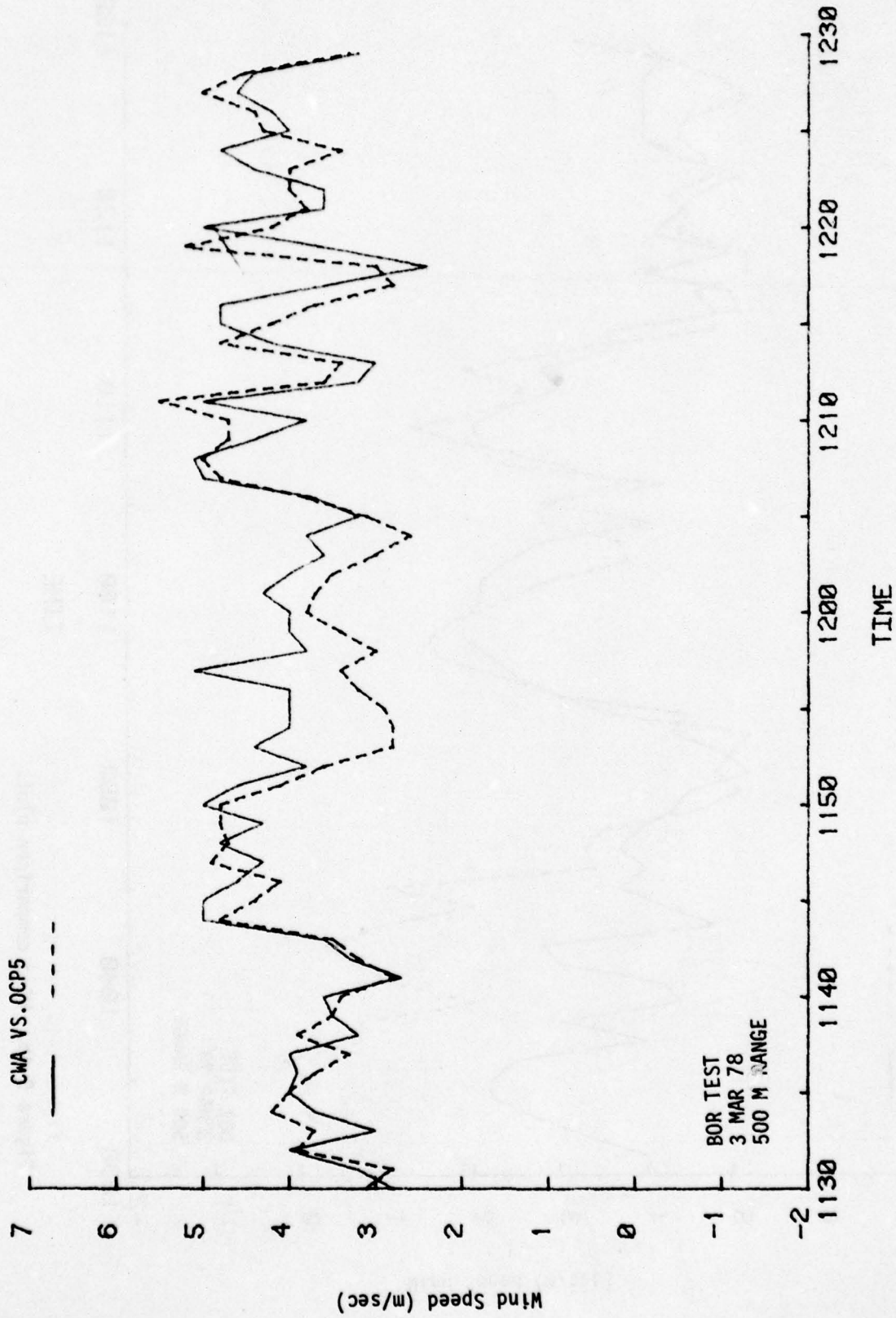


Figure B-4c. Wind comparison plot.

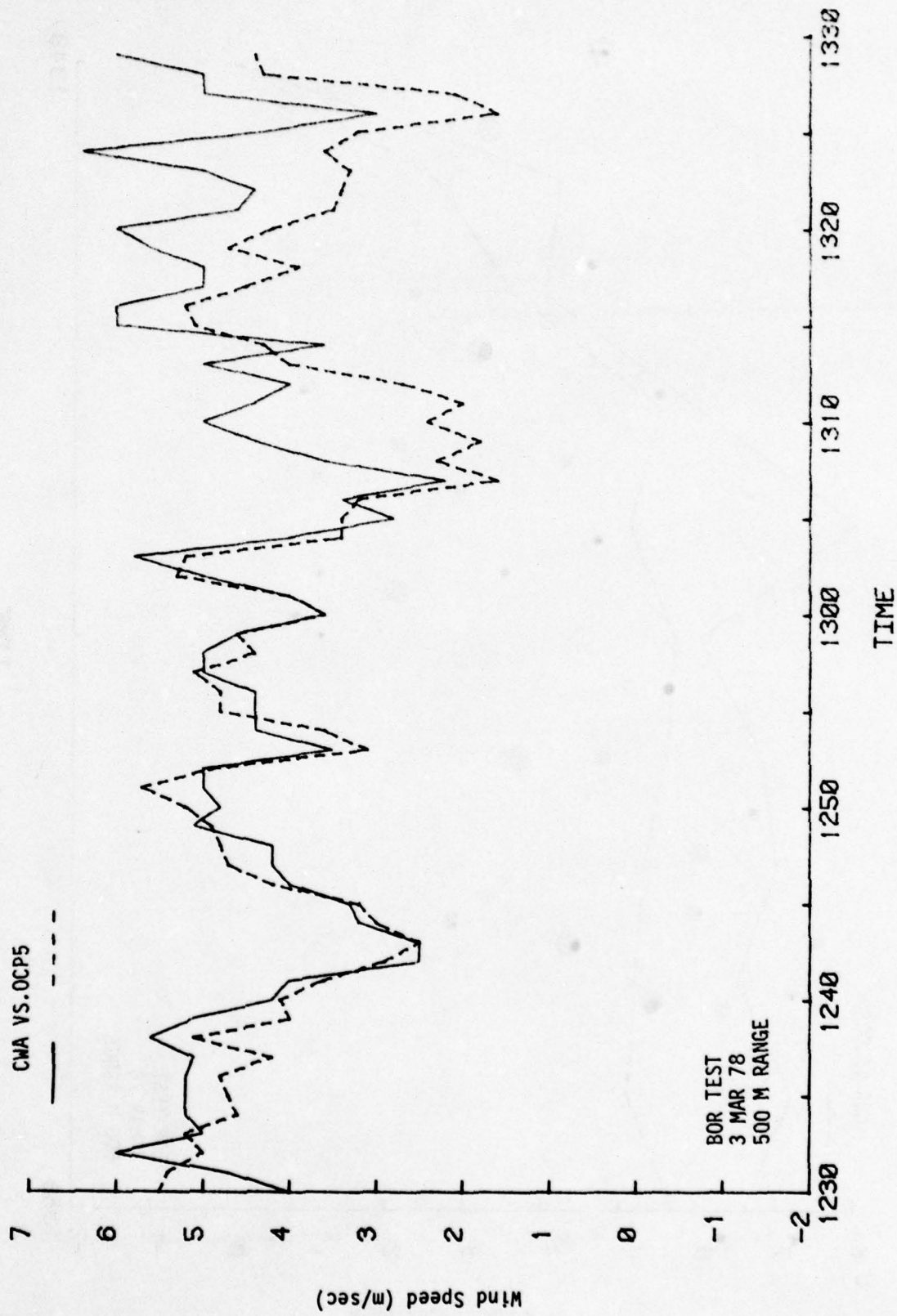


Figure B-4d. Wind comparison plot.

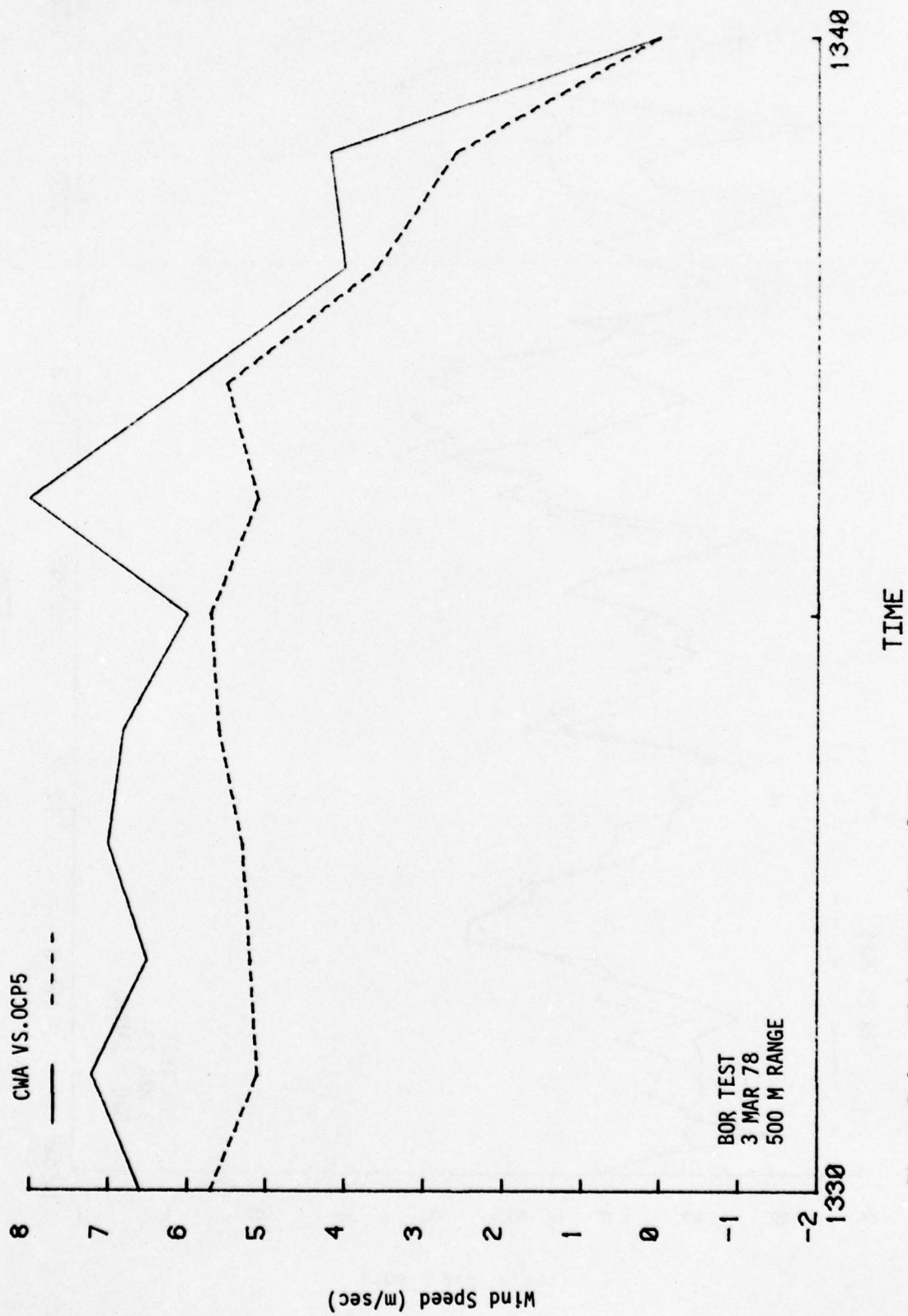


Figure B-4e. Wind comparison plot.



U.S. DEPARTMENT OF COMMERCE  
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION  
NATIONAL WEATHER SERVICE

STATION  
El Paso, International Airport, TX

PRELIMINARY LOCAL CLIMATOLOGICAL DATA

MONTH MARCH YEAR 1978

LATITUDE 31° 48' N LONGITUDE 106° 24' W GROUND ELEVATION (ft) 3918 STANDARD TIME MTN

DAY	TEMPERATURE (°F)				DEGREE DAYS (Base 65°)		PRECIPITATION (In.)		SNOW ICE PELLETS ON GROUND AT 5AM	WIND			SUNSHINE		WEATHER OCCURRENCES	SKY MID TO MID	PK MPH	GUST DIRT	TIME	
	MAXI- MUM	MINI- MUM	AVER- AGE	DE- PARTURE FROM NORMAL	HEAT- ING	COOL- ING	TOTAL (Water Equivalent (mm))	SNOW- FALL ICE PELLETS		AVERAGE SPEED (mp.h.)	FASTEST MILE	DIREC- TION	TOTAL (hrs. and min.)	PER- CENT OF POS- SIBLE						MINUTES OF SUNSET (7:00 AM)
1	68	52	60	+9	5	0	0.07	0	0	12.2	30	25	153	22	9		8	49	W 2054	
2	70	52	61	+10	4	0	T	0	0	12.8	30	23	330	48	8		7	41	SW 0156	
3	70	52	61	+10	4	0	0	0	0	18.5	29	28	601	87	5		4	41	SW 1031	
4	67	33	50	-2	15	0	0	0	0	7.8	14	20	667	96	4		2	18	W 0348	
5	77	51	64	+12	1	0	T	0	0	14.3	29	26	528	76	8		6	49	SW 2302	
6	65	47	56	+4	9	0	T	T*	0	13.4	23	23	483	69	8	5	7	37	SW 0113	
7	55	35	45	-7	20	0	T	0	0	6.0	27	28	285	41	7		5	30	W 0001	
8	69	30	50	-2	15	0	0	0	0	6.0	15	24	704	100	0		0	21	SW 1021	
9	77	37	57	+4	8	0	0	0	0	7.0	15	23	684	97	2		2	23	SW 0133	
10	68	47	58	+5	7	0	0	0	0	18.6	35	26	666	94	3		2	62	SW 1258	
11	66	44	55	+2	10	0	0	0	0	10.3	21	29	710	100	0		0	32	W 0016	
12	65	35	50	-3	15	0	T	0	0	12.4	29	26	410	58	6		5	46	SW 1807	
13	59	42	51	-3	14	0	0	0	0	17.2	25	27	540	76	4		4	40	W 2154	
14	65	40	53	-1	12	0	0	0	0	15.1	23	27	716	100	0		0	35	W 1925	
15																				
16																				
17																				
18																				
19																				
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22																				
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25																				
26																				
27																				
28																				
29																				
30																				
31																				
SUM																				
AVG																				

TEMPERATURE DATA      PRECIPITATION DATA      WEATHER      SYMBOLS USED IN COLUMN 16

AVERAGE MONTHLY \_\_\_\_\_ TOTAL FOR THE MONTH \_\_\_\_\_ IN      NUMBER OF DAYS - \_\_\_\_\_

DEPARTURE FROM NORMAL \_\_\_\_\_ DEPARTURE FROM NORMAL \_\_\_\_\_ IN      CLEAR (Scale 0-3) \_\_\_\_\_ 1 - FOG

HIGHEST \_\_\_\_\_ ON \_\_\_\_\_ GREATEST IN 24 HRS \_\_\_\_\_ ON \_\_\_\_\_ PARTLY CLOUDY (Scale 4-7) \_\_\_\_\_ 2 - FOG WITH VISIBILITY 1 MILE OR LESS

LOWEST \_\_\_\_\_ ON \_\_\_\_\_ SNOWFALL, ICE PELLETS \_\_\_\_\_ 3 - THUNDER

NUMBER OF DAYS WITH - \_\_\_\_\_ TOTAL FOR THE MONTH \_\_\_\_\_ IN      CLOUDY (Scale 8-10) \_\_\_\_\_ 4 - ICE PELLETS

MAX. 32° OR BELOW \_\_\_\_\_ GREATEST IN 24 HRS \_\_\_\_\_ ON \_\_\_\_\_ WITH 0.01 INCH OR MORE PRECIP \_\_\_\_\_ 5 - HAIL

MAX. 90° OR ABOVE \_\_\_\_\_ GREATEST DEPTH ON GROUND \_\_\_\_\_ ON \_\_\_\_\_ WITH 0.10 INCH OR MORE PRECIP \_\_\_\_\_ 6 - GLAZE OR RIME

MIN. 32° OR BELOW \_\_\_\_\_ WITH 0.50 INCH OR MORE PRECIP \_\_\_\_\_ 7 - GUSTSTORM OR SANDSTORM

MIN. 0° OR BELOW \_\_\_\_\_ WITH 1.00 INCH OR MORE PRECIP \_\_\_\_\_ 8 - SMOKE OR HAZE

HEATING DEGREE DAYS (Base 65°) \_\_\_\_\_ 9 - BLOWING SNOW

TOTAL THIS MONTH \_\_\_\_\_ 10 - TORNADO

DEPARTURE FROM NORMAL \_\_\_\_\_

SEASONAL TOTAL \_\_\_\_\_

DEPARTURE FROM NORMAL \_\_\_\_\_

COOLING DEGREE DAYS (Base 65°) \_\_\_\_\_

TOTAL THIS MONTH \_\_\_\_\_

DEPARTURE FROM NORMAL \_\_\_\_\_

SEASONAL TOTAL \_\_\_\_\_

DEPARTURE FROM NORMAL \_\_\_\_\_

MAXIMUM PRECIPITATION

Δ (Minutes)	5	10	15	20	30	45	60	90	120	180
PRECIPITATION (Inches)										
ENDED DATE										
TIME										

BAROMETRIC PRESSURE (Corrected to sea level) \_\_\_\_\_

\_\_\_\_\_ \*T-Hail

MONTHLY AVERAGE STATION \_\_\_\_\_

HIGHEST SEA-LEVEL \_\_\_\_\_

LOWEST SEA-LEVEL \_\_\_\_\_

APPENDIX D. FORTRAN IV DATA PLOT PROGRAMS

!MLTMC T=00004 IS ON CR00002 USING 00020 BLKS R=0146

```

0001 FTN4,L
0002 PROGRAM MLTMC,3
0003 C*****
0004 C MLTMC IS USED TO LOAD COMMON WITH THE DESIRED
0005 C PARAMETERS FOR MAG TAPE ANALYSIS WITH MLTMC.
0006 C*****
0007 COMMON F,S(22),IT(6)
0008 COMMON A7(4,4),B7(4),XP7(4),NA7,NS7(4),SB7,BA7(4)
0009 COMMON A6(5,5),B6(5),XP6(5),NA6,NS6(5),SB6,BA6(5)
0010 COMMON A5(5,5),B5(5),XP5(5),NA5,NS5(5),SB5,BA5(5)
0011 COMMON A4(6,6),B4(6),XP4(6),NA4,NS4(6),SB4,BA4(6)
0012 COMMON A3(8,8),B3(8),XP3(8),NA3,NS3(8),SB3,BA3(8)
0013 COMMON A2(11,11),B2(11),XP2(11),NA2,NS2(11),SB2,BA2(11)
0014 COMMON P,NB,MN,IS,MS,IARRY
0015 COMMON IW1,IW2,IW3,IW4,IW5,IWZ
0016 COMMON MT(21)
0017 COMMON XC,YC,SN, SX,SY,SXX,SYX,DA,DS
0018 DIMENSION IP(5)
0019 CALL RMPAR(IP)
0020 LU1=IP(1)
0021 LU2=IP(2)
0022 LU3=IP(3)
0023 LP=IP(4)
0024 IF(LU1.EQ.0)LU1=1
0025 IF(LU2.EQ.0)LU2=1
0026 IF(LU3.EQ.0)LU3=1
0027 IF(LP.EQ.0)LP=1
0028 C ZERO OUT ARRAYS
0029 DO 1 I=1,11
0030 DO 1 J=1,11
0031 A2(I,J)=0.0
0032 B2(I)=0.0
0033 XP2(I)=0.0
0034 NS2(I)=0
0035 BA2(I)=0.0
0036 IF(I.GT.8.OR.J.GT.8)GO TO 1
0037 A3(I,J)=0.0
0038 B3(I)=0.0
0039 XP3(I)=0.0
0040 NS3(I)=0
0041 BA3(I)=0.0
0042 IF(I.GT.6.OR.J.GT.6)GO TO 1
0043 A4(I,J)=0.0
0044 B4(I)=0.0
0045 XP4(I)=0.0
0046 NS4(I)=0
0047 BA4(I)=0.0
0048 IF(I.GT.5.OR.J.GT.5)GO TO 1
0049 A5(I,J)=0.0
0050 B5(I)=0.0
0051 XP5(I)=0.0
0052 NS5(I)=0
0053 BA5(I)=0.0
0054 A6(I,J)=0.0
0055 B6(I)=0.0
0056 XP6(I)=0.0
0057 NS6(I)=0
0058 BA6(I)=0.0

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0059      IF(I GT 4 OR J GT 4)GO TO 1
0060      A7(I,J)=0.0
0061      B7(I)=0.0
0062      XP7(I)=0.0
0063      NS7(I)=0
0064      BA7(I)=0.0
0065      1  CONTINUE
0066      NA7=0
0067      SB7=0.0
0068      NA6=0
0069      SB6=0.0
0070      NA5=0
0071      SB5=0.0
0072      NA4=0
0073      SB4=0.0
0074      NA3=0
0075      SB3=0.0
0076      NA2=0
0077      SB2=0.0
0078      C  ZERO SUMS FOR WLTM1
0079      P=0.0
0080      DA=0.0
0081      DS=0.0
0082      SN=0.0
0083      SX=0.0
0084      SY=0.0
0085      SYX=0.0
0086      SXX=0.0
0087      C  GET CALIBRATION AND WEIGHTS FOR WLTM1.
0088      IF(LP.NE.1)WRITE(LP,199)
0089      199  FORMAT(1H1,2X,"CALIBRATION FACTORS FOR REAL TIME ANALYSIS"/
0090      *1H0,2X,"WEIGHTS FOR ANEMOMETERS ARE"/)
0091      IF(LU1.EQ.1)WRITE(1,99)
0092      99  FORMAT("INPUT WEIGHTS"/)
0093      DO 2 I=1,21
0094      IF(LU1.EQ.1)WRITE(1,98)I
0095      READ(LU1,*)WT(I)
0096      IF(LP.NE.1)WRITE(LP,198)I,WT(I)
0097      2  CONTINUE
0098      98  FORMAT(I2,3X,"_")
0099      198  FORMAT(1H ,I2,F10.5)
0100      IF(LU2.EQ.1)WRITE(1,97)
0101      97  FORMAT("INPUT XCAL, YCAL",3X,"_")
0102      READ(LU2,*)XC,YC
0103      IF(LP.NE.1)WRITE(LP,197)XC,YC
0104      197  FORMAT(1H0,2X,"XCAL,YCAL ARE",F10.7," ",F10.7)
0105      IF(LU2.EQ.1)WRITE(1,96)
0106      96  FORMAT("INPUT # OF SENSOR",3X,"_")
0107      READ(LU2,*)IS
0108      IF(LP.NE.1)WRITE(LP,196)IS
0109      196  FORMAT(1H0,2X,"SENSOR #",I4)
0110      IF(LU2.EQ.1)WRITE(1,95)
0111      95  FORMAT("INPUT TIME INTERVAL IN MINUTES FOR WLTM3",3X,"_")
0112      READ(LU2,*)MN
0113      IF(LP.NE.1)WRITE(LP,195)MN
0114      195  FORMAT(1H0,2X,"LEAST SQUARES READOUT EVERY",I3," MINUTES")
0115      C  DETERMINE IF .5K OR 2K WANTED.
0116      IF(LU2.EQ.1)WRITE(1,93)
0117      93  FORMAT("ENTER 0 FOR .5K OR 2 FOR 2K",3X,"_")
0118      READ(LU2,*)IARRY

```

```

0119      IF(IARRY.EQ.0)WRITE(LP,193)
0120      IF(IARRY.EQ.2)WRITE(LP,200)
0121  193  FORMAT(1H0,2X,"ANALYSIS FOR THE 1/2 K ARRAY")
0122  200  FORMAT(1H0,2X,"ANALYSIS FOR THE 2 K ARRAY")
0123      IF(LU3.EQ.1)WRITE(1,92)
0124  92   FORMAT("INPUT 0 OR 1 FOR SUBS DESIRED"/
0125      *"OR TO DESIGNATE OTHER PARAMETERS")
0126      IF(LP.NE.1)WRITE(LP,192)
0127  192  FORMAT(1H0,2X,"SUBS DESIRED OR OTHER PARAMETERS")
0128  91   FORMAT("IW1",3X,"_")
0129  90   FORMAT("IW2",3X,"_")
0130  89   FORMAT("IW3",3X,"_")
0131  88   FORMAT("IW4",3X,"_")
0132  87   FORMAT("IW5",3X,"_")
0133  191  FORMAT(1H ,2X,"IW1",I5)
0134  190  FORMAT(1H ,2X,"IW2",I5)
0135  189  FORMAT(1H ,2X,"IW3",I5)
0136  188  FORMAT(1H ,2X,"IW4",I5)
0137  187  FORMAT(1H ,2X,"IW5",I5)
0138      IF(LU3.EQ.1)WRITE(1,91)
0139      READ(LU3,*)IW1
0140      IF(LP.NE.1)WRITE(LP,191)IW1
0141      IF(LU3.EQ.1)WRITE(1,90)
0142      READ(LU3,*)IW2
0143      IF(LP.NE.1)WRITE(LP,190)IW2
0144      IF(LU3.EQ.1)WRITE(1,89)
0145      READ(LU3,*)IW3
0146      IF(LP.NE.1)WRITE(LP,189)IW3
0147      IF(LU3.EQ.1)WRITE(1,88)
0148      READ(LU3,*)IW4
0149      IF(LP.NE.1)WRITE(LP,188)IW4
0150      IF(LU3.EQ.1)WRITE(1,87)
0151      READ(LU3,*)IW5
0152      IF(LP.NE.1)WRITE(LP,187)IW5
0153      WRITE(1,85)
0154  85   FORMAT("ENTER FILE # ON TAPE",3X,"_")
0155      READ(1,*)IW2
0156      IF(LP.NE.1)WRITE(LP,185)IW2
0157  185  FORMAT(1H0,2X,"TAPE FILE #",I2)
0158      WRITE(1,84)
0159  84   FORMAT("INPUT TIME INTERVAL IN SECONDS",3X,"_")
0160      READ(1,*)MS
0161      IF(LP.NE.1)WRITE(LP,184)MS
0162  184  FORMAT(1H0,2X,"AVERAGING TIME IS",I3," SECONDS")
0163      WRITE(1,83)
0164  83   FORMAT("/"THAT'S ALL, THANKS")
0165      STOP
0166      END
0167      END#

```

#MLTNG T=00004 IS ON CR00002 USING 00014 BLKS R=0114

```
0001 FTH4.L
0002 PROGRAM MLTNG.3
0003 C*****
0004 COMMON F,S(22),IT(6)
0005 COMMON A7(4,4),B7(4),XP7(4),NA7,NS7(4),SB7,BA7(4)
0006 COMMON A6(5,5),B6(5),XP6(5),NA6,NS6(5),SB6,BA6(5)
0007 COMMON A5(5,5),B5(5),XP5(5),NA5,NS5(5),SB5,BA5(5)
0008 COMMON A4(6,6),B4(6),XP4(6),NA4,NS4(6),SB4,BA4(6)
0009 COMMON A3(8,8),B3(8),XP3(8),NA3,NS3(8),SB3,BA3(8)
0010 COMMON A2(11,11),B2(11),XP2(11),NA2,NS2(11),SB2,BA2(11)
0011 COMMON P,NB,MN,IS,MS,IARRY
0012 COMMON IW1,IW2,IW3,IW4,IW5,IWZ
0013 COMMON WT(21)
0014 COMMON XC,YC,SN, SX,SY,SXX,SYX,DA,MS
0015 DIMENSION ITM(5),IDT(94),IDATA(100)
0016 DIMENSION ST(37)
0017 DIMENSION NW4(3),MON(2)
0018 EQUIVALENCE (ITM(1),IDATA(1)),(IY,IDATA(6)),
0019 *(IDT(1),IDATA(7))
0020 DATA NW4/2HWL,2HTM,2H4 /
0021 1 CONTINUE
0022 CALL EXEC(3,611B)
0023 CALL EXEC(13,9,ISTAT)
0024 ISTAT=IAND(ISTAT,1B)
0025 IF(ISTAT.NE.0)GO TO 1
0026 ISTAT=IAND(ISTAT,200B)
0027 IF(ISTAT.EQ.0)GO TO 2
0028 CALL EXEC(3,311B)
0029 2 CONTINUE
0030 CALL EXEC(1,111B,IDATA,100)
0031 CALL EXEC(3,211B)
0032 SEC=MS
0033 IF(MS.EQ.0)SEC=0.5
0034 IDAY=ITM(5)
0035 LIT=ITM(3)
0036 CALL DATE(IDAY,MON,IY)
0037 WRITE(6,99)IS,SEC,IW3,ITM(4),ITM(3),ITM(2),IDAY,MON,IY
0038 99 FORMAT(1H,"ANALYSIS OF CH #",I3," WITH",F5.1," SEC AVG." /
0039 *1H," WITH SLIDE FACTOR OF",I3 /
0040 *1H," FOR DATA BEGINNING",I3," :",I2," :",I2," ON",I3,IX,2A2,I
0041 CALL EXEC(11,ITM,IY)
0042 IDAY=ITM(5)
0043 CALL DATE(IDAY,MON,IY)
0044 WRITE(6,98)ITM(4),ITM(3),ITM(2),IDAY,MON,IY
0045 98 FORMAT(1H,"ANALYSIS STARTED",I3," :",I2," :",I2," ON",I3,IX,
0046 IF(IW1.EQ.0)GO TO 3
0047 CALL MLTMS
0048 3 CONTINUE
0049 DO 67 IRPT=1,32767
0050 F=0.0
0051 DO 4 I=1,37
0052 4 ST(I)=0.0
0053 DO 6 I=1,200
0054 CALL EXEC(1,111B,IDATA,100)
0055 CALL EXEC(13,9,ISTAT)
0056 ISTAT=IAND(ISTAT,200B)
0057 IF(ISTAT.NE.0)GO TO 68
0058 F=F+1.
```

```

0059      DO 5 J=1,36
0060 5      ST(J)=ST(J)+FLOAT(IDT(J))
0061      ST(37)=ST(37)+FLOAT(IDT(18))
0062      IF(MS.EQ.0)GO TO 7
0063      ISTAT=MOD(ITM(2),MS)
0064      IF(ISTAT.NE.0)GO TO 6
0065      IF(ITM(1).GE.50)GO TO 6
0066      GO TO 7
0067 6      CONTINUE
0068 7      CONTINUE
0069      DO 8 J=1,6
0070 8      IT(J)=IDATA(J)
0071      IF(IT(3).EQ.LIT)GO TO 9
0072      ISMTM=IT(3)+IT(4)*1000B
0073      CALL PSSW(ISMTM)
0074      LIT=IT(3)
0075 9      CONTINUE
0076 C      CHECK FOR .5K OR 2K RANGE
0077      IF(IARRY.LE.1)GO TO 12
0078      K=0
0079      DO 10 I=1,21,4
0080      K=K+1
0081 10     S(K)=ST(1)*XC/F
0082      DO 11 I=22,36
0083      K=K+1
0084 11     S(K)=ST(1)*XC/F
0085      GO TO 14
0086 12     CONTINUE
0087      DO 13 I=1,21
0088 13     S(I)=ST(1)*XC/F
0089 14     CONTINUE
0090      S(22)=ST(37)*YC/F
0091 C      SUM ALL POINTS.
0092      P=P+F
0093      IF(IW1.EQ.0)GO TO 15
0094      CALL WLTM1
0095 15     CONTINUE
0096      CALL WLTM2
0097      IF(MN.EQ.0)GO TO 67
0098      MO=MOD(IT(3),MN)
0099      IF(MO.NE.0)GO TO 67
0100      IF(IT(2).NE.0)GO TO 67
0101      IF(IT(1).GE.50)GO TO 67
0102      CALL WLTM3
0103 67     CONTINUE
0104 68     CONTINUE
0105      IF(IW2.LE.1)GO TO 16
0106      CALL EXEC(3,211B)
0107      CALL EXEC(3,1411B)
0108      GO TO 17
0109 16     CALL EXEC(3,411B)
0110 17     CONTINUE
0111      IF(IW4.NE.1)GO TO 18
0112      CALL WLTM5
0113 18     CONTINUE
0114      CALL WLTM3
0115      CALL EXEC(10,NW4)
0116 69     CONTINUE
0117      STOP
0118      END

```

0119

END\*

SULTM1 T=00004 IS ON CR00002 USING 00006 BLKS R=0043

```
0001 FTN4,L
0002     SUBROUTINE WLTM1
0003 C*****
0004 C     WLTM1 IS USED TO MAKE THE CORRELATION PLOT OF A SENSOR
0005 C     VERSUS A WEIGHTED AVERAGE OF 21 ANEMOMETERS FROM DATA
0006 C     FROM MAG TAPE
0007 C*****
0008     COMMON F,S(22),IT(6)
0009     COMMON A7(4,4),B7(4),XP7(4),NA7,NS7(4),SB7,BA7(4)
0010     COMMON A6(5,5),B6(5),XP6(5),NA6,NS6(5),SB6,BA6(5)
0011     COMMON A5(5,5),B5(5),XP5(5),NA5,NS5(5),SB5,BA5(5)
0012     COMMON A4(6,6),B4(6),XP4(6),NA4,NS4(6),SB4,BA4(6)
0013     COMMON A3(8,8),B3(8),XP3(8),NA3,NS3(8),SB3,BA3(8)
0014     COMMON A2(11,11),B2(11),XP2(11),NA2,NS2(11),SB2,BA2(11)
0015     COMMON P,NB,MN,IS,MS,IARRY
0016     COMMON IW1,IW2,IW3,IW4,IW5,IWZ
0017     COMMON WT(21)
0018     COMMON XC,YC,SN, SX,SY,SXX,SYX,DA,DS
0019     CALL PLTLU(10)
0020     CALL SFACT(15,10)
0021     Y=S(22)
0022     X=0.0
0023     DO 1 I=1,21
0024 1     X=X+S(I)*WT(I)
0025     SN=SN+1.0
0026     D=(Y-X)/10.
0027     DA=DA+D
0028     DS=DS+D*D
0029     SX=SX+X
0030     SY=SY+Y
0031     SYX=SYX+Y*X
0032     SXX=SXX+X*X
0033     Z=ABS(X)
0034     IF(Z.GE.4.75)X=4.75*X/Z
0035     X=X+5.0
0036     Z=ABS(Y)
0037     IF(Z.GE.4.75)Y=4.75*Y/Z
0038     Y=Y+5.0
0039     CALL PLOT(X,Y,3)
0040     CALL PLOT(X,Y,2)
0041     CALL PLOT(X,Y,3)
0042 69     CONTINUE
0043     RETURN
0044     END
0045     END$
```

SWLTM2 T=00004 IS ON CR00002 USING 00021 BLKS R=0205

```
0001 FTN4.L
0002 SUBROUTINE WLTM2
0003 C*****
0004 C WLTM2 IS USED TO LOAD THE ARRAYS FOR THE LEAST SQUARES
0005 C CORRELATION FIT TO WEIGHTING FACTORS FOR DATA FROM MAG
0006 C TAPE.
0007 C*****
0008 COMMON F,S(22),IT(6)
0009 COMMON A7(4,4),B7(4),XP7(4),NA7,NS7(4),SB7,BA7(4)
0010 COMMON A6(5,5),B6(5),XP6(5),NA6,NS6(5),SB6,BA6(5)
0011 COMMON A5(5,5),B5(5),XP5(5),NA5,NS5(5),SB5,BA5(5)
0012 COMMON A4(6,6),B4(6),XP4(6),NA4,NS4(6),SB4,BA4(6)
0013 COMMON A3(8,8),B3(8),XP3(8),NA3,NS3(8),SB3,BA3(8)
0014 COMMON A2(11,11),B2(11),XP2(11),NA2,NS2(11),SB2,BA2(11)
0015 COMMON P,NB,MN,IS,MS,IARRY
0016 COMMON IW1,IW2,IW3,IW4,IW5,IWZ
0017 COMMON WT(21)
0018 COMMON XC,YC,SN, SX,SY,SXX,SYX,DA,DS
0019 DIMENSION D(11),NS(11),XP(11)
0020 IF(IW2.GT.1.)GO TO 68
0021 NB=0
0022 NA7=0
0023 NA6=0
0024 NA5=0
0025 NA4=0
0026 NA3=0
0027 NA2=0
0028 DO 67 INOW=1,IW5
0029 GO TO (1,2,3,4,5,6),INOW
0030 1 JCNT=4
0031 KCNT=7
0032 GO TO 7
0033 2 JCNT=5
0034 KCNT=6
0035 GO TO 7
0036 3 JCNT=5
0037 KCNT=5
0038 GO TO 7
0039 4 JCNT=6
0040 KCNT=4
0041 GO TO 7
0042 5 JCNT=8
0043 KCNT=3
0044 GO TO 7
0045 6 JCNT=11
0046 KCNT=2
0047 7 CONTINUE
0048 NA=1
0049 DO 9 J=1,JCNT
0050 NS(NA)=0
0051 XP(NA)=0.0
0052 DO 8 K=1,KCNT
0053 L=(J-1)*KCNT+K+IW3
0054 IF(L.LT.1.OR.L.GT.21)GO TO 8
0055 IFLAG=L
0056 NS(NA)=NS(NA)+1
0057 XP(NA)=XP(NA)+FLOAT(L)
0058 8 CONTINUE
```

```

0059      IF(NS(NA).EQ.0)GO TO 9
0060      ADEC=NS(NA)
0061      XP(NA)=XP(NA)/ADEC
0062      NA=NA+1
0063  9     CONTINUE
0064      NA=NA-1
0065      GO TO (10,12,14,16,18,20),INOW
0066  10    NA7=NA
0067      IF(IFLAG.LT.21)NA7=0
0068      NB=NB+NA7
0069      DO 11 J=1,JCNT
0070      XP7(J)=XP(J)
0071  11    NS7(J)=NS(J)
0072      GO TO 67
0073  12    NA6=NA
0074      IF(IW3.LE.-6)IFLAG=0
0075      IF(IFLAG.LT.21)NA6=0
0076      NB=NB+NA6
0077      DO 13 J=1,JCNT
0078      XP6(J)=XP(J)
0079  13    NS6(J)=NS(J)
0080      GO TO 67
0081  14    NA5=NA
0082      IF(IFLAG.LT.21)NA5=0
0083      NB=NB+NA5
0084      DO 15 J=1,JCNT
0085      XP5(J)=XP(J)
0086  15    NS5(J)=NS(J)
0087      GO TO 67
0088  16    NA4=NA
0089      IF(IFLAG.LT.21)NA4=0
0090      NB=NB+NA4
0091      DO 17 J=1,JCNT
0092      XP4(J)=XP(J)
0093  17    NS4(J)=NS(J)
0094      GO TO 67
0095  18    NA3=NA
0096      IF(IW3.LE.-3)IFLAG=0
0097      IF(IFLAG.LT.21)NA3=0
0098      NB=NB+NA3
0099      DO 19 J=1,JCNT
0100      XP3(J)=XP(J)
0101  19    NS3(J)=NS(J)
0102      GO TO 67
0103  20    NA2=NA
0104      IF(IFLAG.LT.21)NA2=0
0105      NB=NB+NA2
0106      DO 21 J=1,JCNT
0107      XP2(J)=XP(J)
0108  21    NS2(J)=NS(J)
0109      CONTINUE
0110      IW2=2
0111  68    CONTINUE
0112      IF(NA7.LE.0)GO TO 25
0113      L=0
0114      DO 24 J=1,NA7
0115      KJ=NS7(J)
0116      D(J)=0.0
0117      DO 22 K=1,KJ
0118      L=L+1

```

```

0119      D(J)=D(J)+S(L)
0120 22    CONTINUE
0121      ADEC=KJ
0122      D(J)=D(J)/ADEC
0123      B7(J)=B7(J)+S(22)*D(J)
0124      DO 23 I=1,J
0125 23    A7(I,J)=A7(I,J)+D(I)*D(J)
0126 24    CONTINUE
0127 25    CONTINUE
0128      IF(NA6.LE.0)GO TO 29
0129      L=0
0130      DO 28 J=1,NA6
0131      D(J)=0.0
0132      KJ=NS6(J)
0133      DO 26 K=1,KJ
0134      L=L+1
0135      D(J)=D(J)+S(L)
0136 26    CONTINUE
0137      ADEC=KJ
0138      D(J)=D(J)/ADEC
0139      B6(J)=B6(J)+S(22)*D(J)
0140      DO 27 I=1,J
0141 27    A6(I,J)=A6(I,J)+D(I)*D(J)
0142 28    CONTINUE
0143 29    CONTINUE
0144      IF(NA5.LE.0)GO TO 33
0145      L=0
0146      DO 32 J=1,NA5
0147      D(J)=0.0
0148      KJ=NS5(J)
0149      DO 30 K=1,KJ
0150      L=L+1
0151      D(J)=D(J)+S(L)
0152 30    CONTINUE
0153      ADEC=KJ
0154      D(J)=D(J)/ADEC
0155      B5(J)=B5(J)+S(22)*D(J)
0156      DO 31 I=1,J
0157 31    A5(I,J)=A5(I,J)+D(I)*D(J)
0158 32    CONTINUE
0159 33    CONTINUE
0160      IF(NA4.LE.0)GO TO 37
0161      L=0
0162      DO 36 J=1,NA4
0163      D(J)=0.0
0164      KJ=NS4(J)
0165      DO 34 K=1,KJ
0166      L=L+1
0167      D(J)=D(J)+S(L)
0168 34    CONTINUE
0169      ADEC=KJ
0170      D(J)=D(J)/ADEC
0171      B4(J)=B4(J)+S(22)*D(J)
0172      DO 35 I=1,J
0173 35    A4(I,J)=A4(I,J)+D(I)*D(J)
0174 36    CONTINUE
0175 37    CONTINUE
0176      IF(NA3.LE.0)GO TO 41
0177      L=0
0178      DO 40 J=1,NA3

```

```

0179      D(J)=0.0
0180      KJ=NS3(J)
0181      DO 38 K=1,KJ
0182      L=L+1
0183      D(J)=D(J)+S(L)
0184 38    CONTINUE
0185      ADEC=KJ
0186      D(J)=D(J)/ADEC
0187      B3(J)=B3(J)+S(22)*D(J)
0188      DO 39 I=1,J
0189 39    A3(I,J)=A3(I,J)+D(I)*D(J)
0190 40    CONTINUE
0191 41    CONTINUE
0192      IF(NA2.LE.0)GO TO 69
0193      L=0
0194      DO 44 J=1,NA2
0195      D(J)=0.0
0196      KJ=NS2(J)
0197      DO 42 K=1,KJ
0198      L=L+1
0199      D(J)=D(J)+S(L)
0200 42    CONTINUE
0201      ADEC=KJ
0202      D(J)=D(J)/ADEC
0203      B2(J)=B2(J)+S(22)*D(J)
0204      DO 43 I=1,J
0205 43    A2(I,J)=A2(I,J)+D(I)*D(J)
0206 44    CONTINUE
0207 69    CONTINUE
0208      RETURN
0209      END
0210      END$

```

SWLTM3 T=00004 IS ON CR00002 USING 00011 BLKS R=0091

```
0001 FTN4,L
0002 SUBROUTINE WLTM3
0003 C*****
0004 C WLTM3 IS USED TO COMPUTE THE FIT FOR WEIGHTING FACTORS
0005 C FOR DATA FROM MAG TAPE.
0006 C*****
0007 COMMON F,S(22),IT(6)
0008 COMMON A7(4,4),B7(4),XP7(4),NA7,NS7(4),SB7,BA7(4)
0009 COMMON A6(5,5),B6(5),XP6(5),NA6,NS6(5),SB6,BA6(5)
0010 COMMON A5(5,5),B5(5),XP5(5),NA5,NS5(5),SB5,BA5(5)
0011 COMMON A4(6,6),B4(6),XP4(6),NA4,NS4(6),SB4,BA4(6)
0012 COMMON A3(8,8),B3(8),XP3(8),NA3,NS3(8),SB3,BA3(8)
0013 COMMON A2(11,11),B2(11),XP2(11),NA2,NS2(11),SB2,BA2(11)
0014 COMMON P,NB,MN,IS,MS,IARRY
0015 COMMON IW1,IW2,IW3,IW4,IW5,IWZ
0016 COMMON WT(21)
0017 COMMON XC,YC,SN,SK,SY,SXX,SYX,DA,DS
0018 DIMENSION A(11,11)
0019 WRITE(6,99)IT(4),IT(3),P
0020 99 FORMAT(1H0,"AT",I3," ",I2," WITH",F10.0," POINTS")
0021 DO 69 L=1,IW5
0022 GO TO (1,3,5,7,9,11),L
0023 1 CONTINUE
0024 IF(NA7.LE.0)GO TO 69
0025 DO 2 J=1,NA7
0026 BA7(J)=B7(J)
0027 DO 2 I=1,J
0028 A(I,J)=A7(I,J)
0029 2 A(J,I)=A7(I,J)
0030 NG=7
0031 MTS=4
0032 CALL W3SUB(A,B7,XP7,NA7,NS7,SB7,BA7,NG,MTS)
0033 IF(NG.EQ.7)GO TO 69
0034 NB=NB-NA7
0035 NA7=-1
0036 GO TO 69
0037 3 CONTINUE
0038 IF(NA6.LE.0)GO TO 69
0039 DO 4 J=1,NA6
0040 BA6(J)=B6(J)
0041 DO 4 I=1,J
0042 A(I,J)=A6(I,J)
0043 4 A(J,I)=A6(I,J)
0044 NG=6
0045 MTS=5
0046 CALL W3SUB(A,B6,XP6,NA6,NS6,SB6,BA6,NG,MTS)
0047 IF(NG.EQ.6)GO TO 69
0048 NB=NB-NA6
0049 NA6=-1
0050 GO TO 69
0051 5 CONTINUE
0052 IF(NA5.LE.0)GO TO 69
0053 DO 6 J=1,NA5
0054 BA5(J)=B5(J)
0055 DO 6 I=1,J
0056 A(I,J)=A5(I,J)
0057 6 A(J,I)=A5(I,J)
0058 NG=5
```

```

0059      MTS=5
0060      CALL W3SUB(A,B5,XP5,NA5,NS5,SB5,BA5,NG,MTS)
0061      IF(NG.EQ.5)GO TO 69
0062      NB=NB-NA5
0063      NA5=-1
0064      GO TO 69
0065  7     CONTINUE
0066      IF(NA4.LE.0)GO TO 69
0067      DO 8 J=1,NA4
0068      BA4(J)=B4(J)
0069      DO 8 I=1,J
0070      A(I,J)=A4(I,J)
0071  8     A(J,I)=A4(I,J)
0072      NG=4
0073      MTS=6
0074      CALL W3SUB(A,B4,XP4,NA4,NS4,SB4,BA4,NG,MTS)
0075      IF(NG.EQ.4)GO TO 69
0076      NB=NB-NA4
0077      NA4=-1
0078      GO TO 69
0079  9     CONTINUE
0080      IF(NA3.LE.0)GO TO 69
0081      DO 10 J=1,NA3
0082      BA3(J)=B3(J)
0083      DO 10 I=1,J
0084      A(I,J)=A3(I,J)
0085  10    A(J,I)=A3(I,J)
0086      NG=3
0087      MTS=8
0088      CALL W3SUB(A,B3,XP3,NA3,NS3,SB3,BA3,NG,MTS)
0089      IF(NG.EQ.3)GO TO 69
0090      NB=NB-NA3
0091      NA3=-1
0092      GO TO 69
0093  11    CONTINUE
0094      IF(NA2.LE.0)GO TO 69
0095      DO 12 J=1,NA2
0096      BA2(J)=B2(J)
0097      DO 12 I=1,J
0098      A(I,J)=A2(I,J)
0099  12    A(J,I)=A2(I,J)
0100      NG=2
0101      MTS=11
0102      CALL W3SUB(A,B2,XP2,NA2,NS2,SB2,BA2,NG,MTS)
0103      IF(NG.EQ.2)GO TO 69
0104      NB=NB-NA2
0105      NA2=-1
0106  69    CONTINUE
0107      RETURN
0108      END
0109  C*****
0110      SUBROUTINE W3SUB(A,B,XP,NA,NS,SB,BA,NG,MTS)
0111      DIMENSION A(11,11),B(MTS),XP(MTS),NS(MTS),BA(MTS)
0112      M=NA
0113      SB=0.0
0114      A11=A(1,1)
0115      IF(A11.EQ.0)GO TO 68
0116      DO 1 I=2,M
0117  1     A(1,I)=A(I,1)/A11
0118      BA(1)=BA(1)/A11

```

```

0119      DO 5 J=2,M
0120          J1=J-1
0121      DO 3 I=J,M
0122          AS=0.0
0123      DO 2 K=1,J1
0124  2      AS=AS+A(I,K)*A(K,J)
0125          A(I,J)=A(I,J)-AS
0126      IF(I.GT.J)A(J,I)=A(I,J)/A(J,J)
0127  3      CONTINUE
0128          BS=0.0
0129      DO 4 K=1,J1
0130  4      BS=BS+A(J,K)*BA(K)
0131          AJJ=A(J,J)
0132      IF(AJJ.EQ.0)GO TO 68
0133  5      BA(J)=(BA(J)-BS)/AJJ
0134          MI=M-1
0135      DO 7 I=1,MI
0136          BS=0.0
0137      MI=M-I
0138          MI1=MI+1
0139      DO 6 J=MI1,M
0140  6      BS=BS+A(MI,J)*BA(J)
0141          BA(MI)=BA(MI)-BS
0142  7      CONTINUE
0143          WRITE(6,99)NG
0144  99      FORMAT(1H0,"FOR GROUPS OF",I3)
0145          WRITE(6,98)(NS(J),J=1,M)
0146  98      FORMAT(1H,"#",11I6)
0147          WRITE(6,97)(XP(J),J=1,M)
0148  97      FORMAT(1H,"X",11F6.1)
0149          WRITE(6,96)(BA(J),J=1,M)
0150  96      FORMAT(1H,"Y",11F6.3)
0151      DO 8 I=1,M
0152          SB=SB+BA(I)
0153  8      CONTINUE
0154          WRITE(6,95)SB
0155  95      FORMAT(1H,"SUM OF WEIGHTS =",F8.5)
0156      GO TO 69
0157  68      CONTINUE
0158          WRITE(6,94)NG
0159  94      FORMAT(1H0,"FOR GROUPS OF",I3," MATRIX IS SINGULAR")
0160          NG=-1
0161  69      CONTINUE
0162          RETURN
0163          END
0164          END$

```

#WLTM4 T=00004 IS ON CR00002 USING 00012 BLKS R=0097

```
0001 FTN4,L
0002     PROGRAM WLTM4,3
0003 C*****
0004 C     WLTM4 IS A PROGRAM WHICH NORMALIZES THE RESULTS OF WLTM3,
0005 C     PLOTS, REPORTS, AND PUNCHES A TAPE OF THESE RESULTS.
0006 C     IT CAN ALSO RESCHEDULE WLTMG FOR A REPEAT WITH A DIFFERENT
0007 C     SLIDE FACTOR.
0008 C*****
0009     COMMON F,S(22),IT(6)
0010     COMMON A7(4,4),B7(4),XP7(4),NA7,NS7(4),SB7,BA7(4)
0011     COMMON A6(5,5),B6(5),XP6(5),NA6,NS6(5),SB6,BA6(5)
0012     COMMON A5(5,5),B5(5),XP5(5),NA5,NS5(5),SB5,BA5(5)
0013     COMMON A4(6,6),B4(6),XP4(6),NA4,NS4(6),SB4,BA4(6)
0014     COMMON A3(8,8),B3(8),XP3(8),NA3,NS3(8),SB3,BA3(8)
0015     COMMON A2(11,11),B2(11),XP2(11),NA2,NS2(11),SB2,BA2(11)
0016     COMMON P,NB,MN,IS,MS,IARRY
0017     COMMON IW1,IW2,IW3,IW4,IW5,IWZ
0018     COMMON WT(21)
0019     COMMON XC,YC,SN,SX,SY,SXX,SYX,DA,DS
0020     DIMENSION NMG(3)
0021     DATA NMG/2HWL,2HTM,2HG /
0022     CALL EXEC(3,1004B)
0023     WRITE(4,99)NB
0024 99    FORMAT(I3)
0025     DO 7 M=1,IW5
0026     GO TO (1,2,3,4,5,6),M
0027 1     IF(NA7.LE.0)GO TO 7
0028     NG=7
0029     MTS=4
0030     CALL W4SUB(XP7,NA7,NS7,SB7,BA7,NG,MTS)
0031     GO TO 7
0032 2     IF(NA6.LE.0)GO TO 7
0033     NG=6
0034     MTS=5
0035     CALL W4SUB(XP6,NA6,NS6,SB6,BA6,NG,MTS)
0036     GO TO 7
0037 3     IF(NA5.LE.0)GO TO 7
0038     NG=5
0039     MTS=5
0040     CALL W4SUB(XP5,NA5,NS5,SB5,BA5,NG,MTS)
0041     GO TO 7
0042 4     IF(NA4.LE.0)GO TO 7
0043     NG=4
0044     MTS=6
0045     CALL W4SUB(XP4,NA4,NS4,SB4,BA4,NG,MTS)
0046     GO TO 7
0047 5     IF(NA3.LE.0)GO TO 7
0048     NG=3
0049     MTS=8
0050     CALL W4SUB(XP3,NA3,NS3,SB3,BA3,NG,MTS)
0051     GO TO 7
0052 6     IF(NA2.LE.0)GO TO 7
0053     NG=2
0054     MTS=11
0055     CALL W4SUB(XP2,NA2,NS2,SB2,BA2,NG,MTS)
0056 7     CONTINUE
0057     CALL EXEC(11,IT)
0058     WRITE(6,98)IT(4),IT(3),IT(2)
```

```

0059 98   FORMAT(1H0,"ANALYSIS COMPLETED",I3,":",I2,":",I2)
0060     CALL EXEC(3,1004B)
0061     IF(IW4.EQ.1)GO TO 69
0062     IF(IW3.GE.0)GO TO 69
0063     IW3=IW3+1
0064     IF(IW3.EQ.0)IW4=1
0065     IW1=0
0066     IW2=1
0067 C     ZERO OUT ARRAYS FOR WLT2 AND 3
0068     DO 8 I=1,11
0069     DO 8 J=1,11
0070     A2(I,J)=0.0
0071     B2(I)=0.0
0072     NS2(I)=0
0073     IF(I.GT.8.OR.J.GT.8)GO TO 8
0074     A3(I,J)=0.0
0075     B3(I)=0.0
0076     NS3(I)=0
0077     IF(I.GT.6.OR.J.GT.6)GO TO 8
0078     A4(I,J)=0.0
0079     B4(I)=0.0
0080     NS4(I)=0
0081     IF(I.GT.5.OR.J.GT.5)GO TO 8
0082     A5(I,J)=0.0
0083     B5(I)=0.0
0084     NS5(I)=0
0085     A6(I,J)=0.0
0086     B6(I)=0.0
0087     NS6(I)=0
0088     IF(I.GT.4.OR.J.GT.4)GO TO 8
0089     A7(I,J)=0.0
0090     B7(I)=0.0
0091     NS7(I)=0
0092 8     CONTINUE
0093     P=0.0
0094     CALL EXEC(10,NMG)
0095 69    CONTINUE
0096     STOP
0097     END
0098 C*****
0099     SUBROUTINE W4SUB(XP,NA,NS,SB,BA,NG,MTS)
0100     DIMENSION XP(MTS),NS(MTS),BA(MTS)
0101     CALL PLTLU(10)
0102     CALL SFACT(15.,10.)
0103     CALL LLEFT
0104     CALL PLOT(0.0,0.0,-1)
0105     CALL PLOT(3.5,1.0,3)
0106     SB=ABS(SB)
0107     DO 1 I=1,NA
0108     BA(I)=BA(I)/(SB*FLOAT(NS(I)))
0109     XV=XP(I)/2.+3.5
0110     YP=BA(I)*50.+1.
0111     IF(YP.LE.0.2)YP=0.2
0112     IF(YP.GE.9.8)YP=9.8
0113     CALL SYMB(XV,YP,0.14,NG,0.0,-1)
0114 1     CONTINUE
0115     WRITE(6,99)NG
0116 99    FORMAT(1H0,"NORMALIZED WEIGHTS FOR GROUPS OF",I3)
0117     WRITE(6,98)(NS(I),I=1,NA)
0118 98    FORMAT(1H,"#",11I6)

```

```
0119      WRITE(6,97)(XP(I),I=1,NA)
0120 97    FORMAT(1H,"X",11F6.1)
0121      WRITE(6,96)(BA(I),I=1,NA)
0122 96    FORMAT(1H,"Y",11F6.3)
0123      WRITE(4,95)(NG,NS(I),XP(I),BA(I),I=1,NA)
0124 95    FORMAT(12,"",I3,"",F5.1,"",F9.5)
0125      CALL LLEFT
0126      RETURN
0127      END
0128      END*
```

SWLTM5 T=00004 IS ON CR00002 USING 00018 BLKS R=0142

```
0001 FTN4,L
0002 SUBROUTINE WLTMS
0003 C*****
0004 C WLTMS IS A PROGRAM WHICH WILL REPORT THE NECESSARY
0005 C INFORMATION ON PLOTS AND DRAW THE GRID IF REQUIRED.
0006 C*****
0007 COMMON F,S(22),IT(6)
0008 COMMON A7(4,4),B7(4),XP7(4),NA7,NS7(4),SB7,BA7(4)
0009 COMMON A6(5,5),B6(5),XP6(5),NA6,NS6(5),SB6,BA6(5)
0010 COMMON A5(5,5),B5(5),XP5(5),NA5,NS5(5),SB5,BA5(5)
0011 COMMON A4(6,6),B4(6),XP4(6),NA4,NS4(6),SB4,BA4(6)
0012 COMMON A3(8,8),B3(8),XP3(8),NA3,NS3(8),SB3,BA3(8)
0013 COMMON A2(11,11),B2(11),XP2(11),NA2,NS2(11),SB2,BA2(11)
0014 COMMON P,NB,MN,IS,MS,IARRY
0015 COMMON IW1,IW2,IW3,IW4,IW5,IWZ
0016 COMMON WT(21)
0017 COMMON XC,YC,SN,SK,SY,SXX,SYX,DA,DS
0018 DIMENSION NA(2),NS(2),NP(2),NFS(2),NFL(2)
0019 DIMENSION MON(2),NCH(2),NSEC(2)
0020 DATA NA/2HAV,2HG=/,NS/2HSD,2HV=/
0021 DATA NP/2H#P,2HTS/
0022 DATA NFL/2HFI,2HLE/,NFS/2HFS,2H= /
0023 DATA NSEC/2HSE,2HC /
0024 DATA NCH/2HCH,2H# /
0025 NY=54475B
0026 NX=54053B
0027 CALL PLTLU(10)
0028 CALL SFACT(15.,10.)
0029 CALL LLEFT
0030 CALL PLOT(0.0,0.0,-1)
0031 IF(IW1.EQ.0)GO TO 5
0032 CALL PLOT(0.5,5.0,3)
0033 CALL PLOT(9.5,5.0,2)
0034 CALL PLOT(5.0,0.5,3)
0035 CALL PLOT(5.0,9.5,2)
0036 CALL DASH(0.5,0.5,0.5,0.5,-1)
0037 CALL DASH(0.5,0.5,9.5,9.5,1)
0038 IF(IW1.LE.1)GO TO 69
0039 D=SX*SY-SN*SXX
0040 A=(SX*SY-SN*SYX)/D
0041 B=(SX*SYX-SY*SXX)/D
0042 X=-4.0
0043 1 CONTINUE
0044 Y=A*X+B
0045 Z=ABS(Y)
0046 IF(Z.LE.4.75)GO TO 2
0047 X=X+.5
0048 GO TO 1
0049 2 CONTINUE
0050 X=X+5.
0051 Y=Y+5.
0052 CALL PLOT(X,Y,3)
0053 X=4.0
0054 3 CONTINUE
0055 Y=A*X+B
0056 Z=ABS(Y)
0057 IF(Z.LE.4.75)GO TO 4
0058 X=X-0.5
```

```

0059      GO TO 3
0060  4    CONTINUE
0061      X=X+5.
0062      Y=Y+5.
0063      CALL PLOT(X,Y,2)
0064      DATT=DA/SN
0065      DSTT=SQRT((DS/SN)-DATT*DATT)
0066  5    CONTINUE
0067      CALL LLEFT
0068      CALL PLOT(0.,0.,-1)
0069      IDAY=IT(5)
0070      IYEAR=IT(6)
0071      CALL DATE(IDAY,MON,IYEAR)
0072      DAY=IDAY
0073      YEAR=IYEAR
0074      FILE=IWZ
0075      CHN=IS
0076      SEC=MS
0077      IF(MS.EQ.0)SEC=0.5
0078      FS=5./(XC*30.)
0079      CALL NUMB(1.0,9.0,0.14,DAY,0.0,-1)
0080      CALL SYMB(1.56,9.0,0.14,MON,0.0,3)
0081      CALL NUMB(2.25,9.0,0.14,YEAR,0.0,-1)
0082      CALL SYMB(1.0,8.5,0.14,NCH,0.0,3)
0083      CALL NUMB(1.56,8.5,0.14,CHN,0.0,-1)
0084      CALL NUMB(2.25,8.5,0.14,SEC,0.0,1)
0085      CALL SYMB(2.85,8.5,0.14,NSEC,0.0,3)
0086      CALL SYMB(3.40,8.5,0.14,NFL,0.0,4)
0087      CALL NUMB(4.10,8.5,0.14,FILE,0.0,-1)
0088      IF(IW1.EQ.0)GO TO 69
0089      CALL SYMB(1.0,8.0,0.14,NFS,0.0,3)
0090      CALL NUMB(999.0,999.0,0.14,FS,0.0,1)
0091      CALL SYMB(1.0,7.5,0.14,NY,0.0,2)
0092      CALL NUMB(999.0,999.0,0.14,A,0.0,3)
0093      CALL SYMB(999.0,999.0,0.14,NX,0.0,2)
0094      CALL NUMB(999.0,999.0,0.14,B,0.0,3)
0095      CALL SYMB(1.0,7.0,0.14,NA,0.0,4)
0096      CALL NUMB(999.0,999.0,0.14,DATT,0.0,3)
0097      CALL SYMB(3.0,7.0,0.14,NS,0.0,4)
0098      CALL NUMB(999.0,999.0,0.14,DSTT,0.0,3)
0099      CALL SYMB(1.0,6.5,0.14,NP,0.0,4)
0100      CALL NUMB(1.60,6.5,0.14,SN,0.0,-1)
0101      CALL LLEFT
0102  69    CONTINUE
0103      IF(IW1.EQ.1)IW1=2
0104      RETURN
0105      END
0106      END$

```

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