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MONTHLY  
MICROCLIMATIC SUMMARY

NOVEMBER 1967

ENVIRONMENTAL DATA BASE  
FOR REGIONAL STUDIES IN THE HUMID TROPICS

USATECOM Project No. 9-4-0013-01

US ARMY  
TROPIC TEST CENTER  
Fort. Clayton, Canal Zone

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NOVEMBER 1967

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USATECOM Project No. 9-4-0013-01

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## MONTHLY MICROCLIMATIC SUMMARY

### Introduction

Monthly microclimatic data summarized in this series of reports were collected by the US Army Tropic Test Center and the Weather Engineers of Panama Corporation under the project, Environmental Data Base for Regional Studies in the Humid Tropics. The project is sponsored by the Advanced Research Projects Agency of the Department of Defense and by the Army Research Office, Office of the Chief of Research and Development. It is an investigation of microclimatic, air chemistry, vegetation, soils, micro-biological, and macrofaunal conditions at selected sites in the principal tropical environments of the Panama Canal Zone and the Rio Hato Military Reservation. The objective of the project is to assemble quantitative environmental data for RDT&E purposes.

Sites. Data summarized in this report were collected at the Albrook Forest and Chiva Chiva sites. Figure 1 shows the site locations within the Isthmus of Panama. Geographic coordinates are shown below:

Albrook Forest	09° 01'N,	79° 33'W
Chiva Chiva	09° 01'N,	79° 35'W

The Chiva Chiva open site and the Albrook Forest site are paired for comparative study of environmental conditions in a tropical semideciduous forest and in a large clearing. Both are located in a region where the annual precipitation is approximately 80 inches and there is a pronounced dry season. The other satellite sites were located primarily for soil studies purposes. Albrook and Fort Kobbe have climatic regimes similar to the principal sites.

The Albrook and Chiva Chiva main sites are approximately four kilometers apart. Each has a 46 meter walk-up tower and an air-conditioned building to house the recording equipment and observers. Both sites are approximately 30 meters above sea level. The top of the forest canopy at the Albrook site is about 26.5 meters above the ground.

Instrumentation. A wide range of climatic elements are measured at the Albrook and Chiva Chiva sites. Types of observations and frequencies are shown on Figure 2. The towers at the Albrook and Chiva Chiva sites are similarly oriented. Sensing equipment is mounted at several levels on the towers to provide measurements through the vertical profile. Additional instruments are emplaced in the immediate vicinity on or near the ground. All instrument exposures are duplicated at each site. Figures 3, 4, and 5 show the instrument array at these sites.

Data Reduction and Storage. All data, as applicable, are recorded at or reduced to each full hour and transposed to punch cards. These punch cards, together with all raw data, are stored in the Tropic Test Center Technical Library Annex.

The relative humidity data contained in this report required some adjustment due to the difficult problems in maintaining hair hygrometers in the humid tropics. The hygrometers show saturation at a time when the psychrometer shows a relative humidity well below 100%. For this reason the hourly measurements made by means of a hair hygrometer have been modified on the basis of simultaneous psychrometer readings of other levels. Details will be given in the fourth Semiannual Report. It can be assumed that the means of relative humidity presented in this volume are very close to the true means.



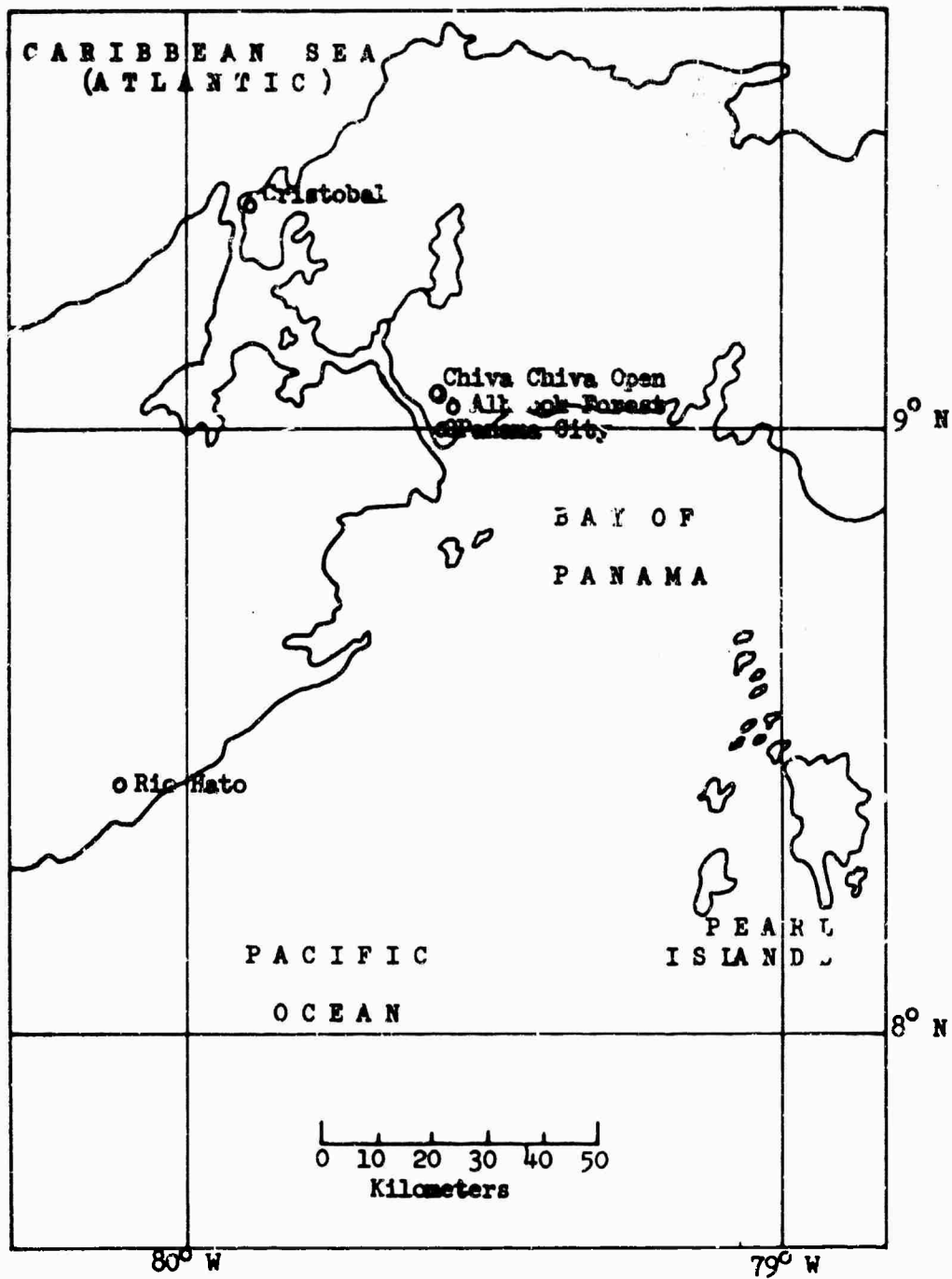


FIGURE 1. LOCATION MAP, ISTHMUS OF PANAMA

FIGURE 2. FREQUENCY OF OBSERVATIONS

# Element	0.5	1.0	2.0	4.0	13.5	26.5	30.0	32.0	39.0	46.0	Frequency
<u>Temperature:</u>											
Dry Bulb	1	2	2	2	1	1	-	-	-	1	Hourly*
Wet Bulb	1	-	2	2	-	-	-	-	-	-	Hourly*
Relative Humidity:	1	2	2	2	1	1	-	-	-	1	Hourly*
Barometric Pressure:	-	1	-	-	-	-	-	-	-	-	Continuously
Evaporation:	1	-	-	-	2	2	-	-	-	-	Once Daily
<u>Precipitation:</u>											
Recording Gage	-	1	-	-	-	-	-	-	-	2	Continuously
Manual Gage	-	2	-	-	-	-	-	-	-	-	4 Times Daily
<u>Wind:</u>											
Direction	-	-	-	-	-	-	-	2	2	-	Continuously
Speed	-	-	-	3	-	3	2	2	2	-	Hourly

\* Observation made with sling psychrometer; when recorders are inoperative.

# Instrument descriptions are contained in the Environmental Data Base semiannual reports.

1. Albrook and Chiva Chiva
2. Albrook only
3. Chiva Chiva only

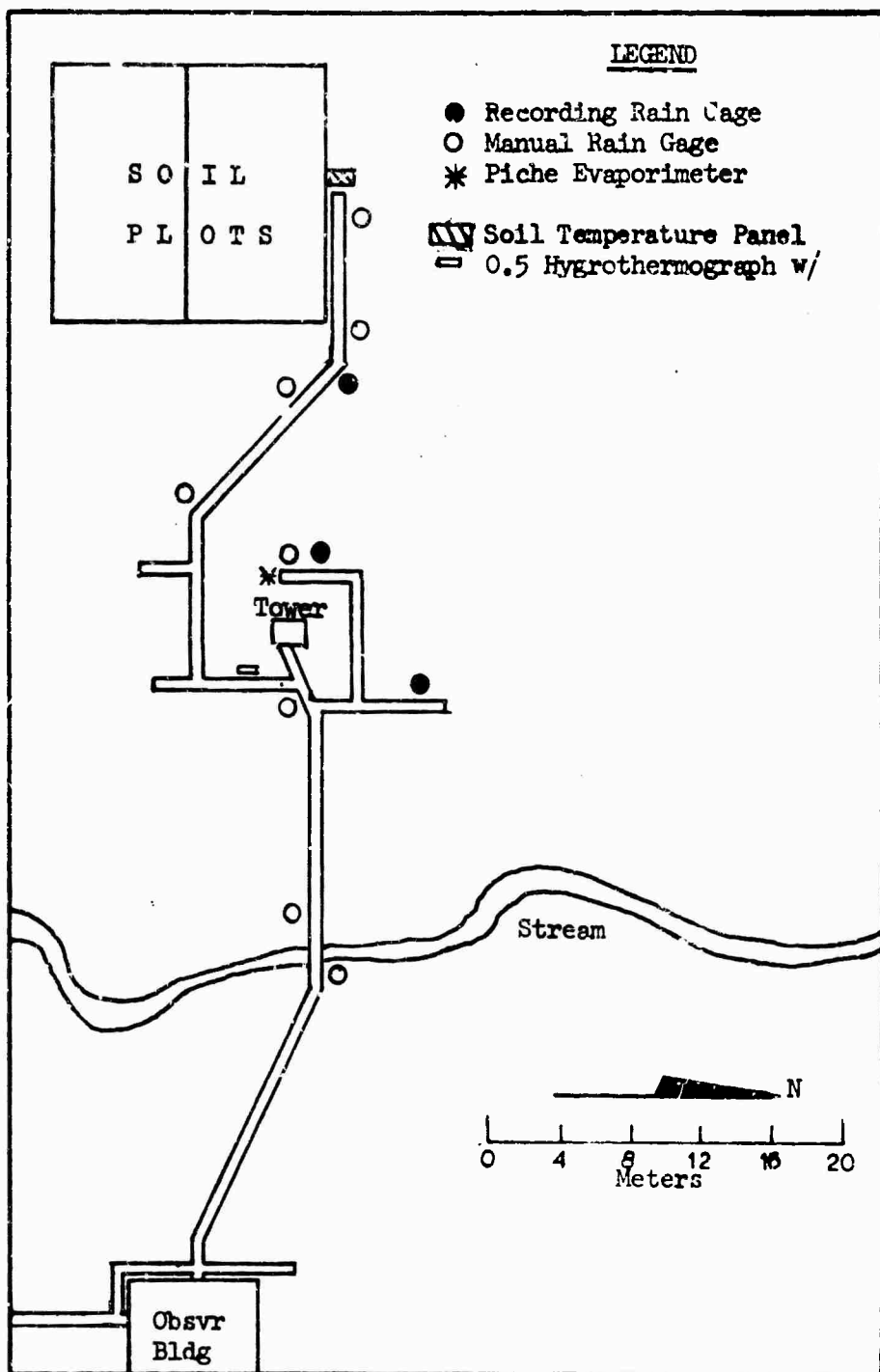


FIGURE 3.

ALBROOK FOREST SITE, GENERALIZED PLOT

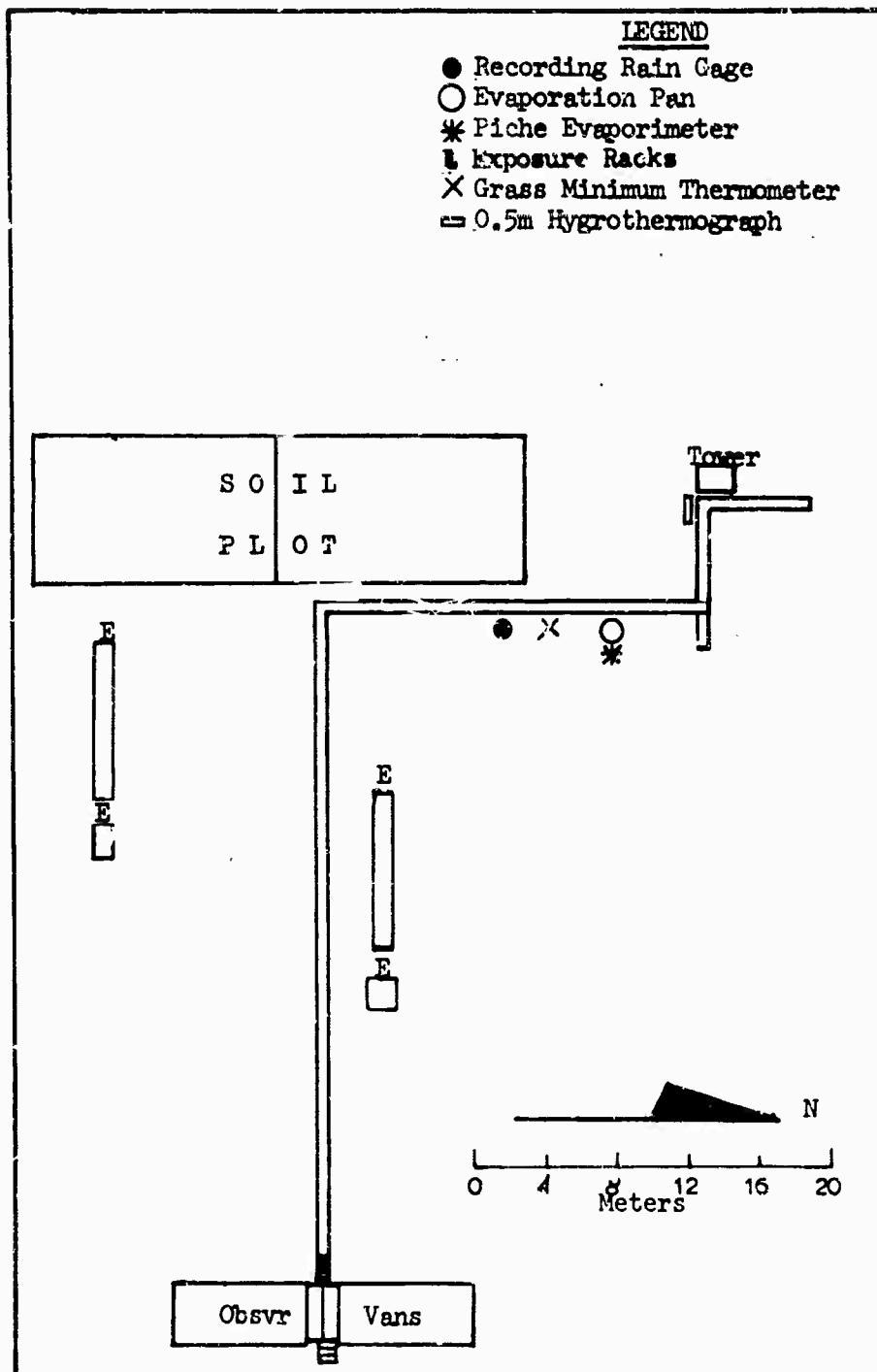


FIGURE 4.

CHIVA CHIVA OPEN, GENERALIZED . JT

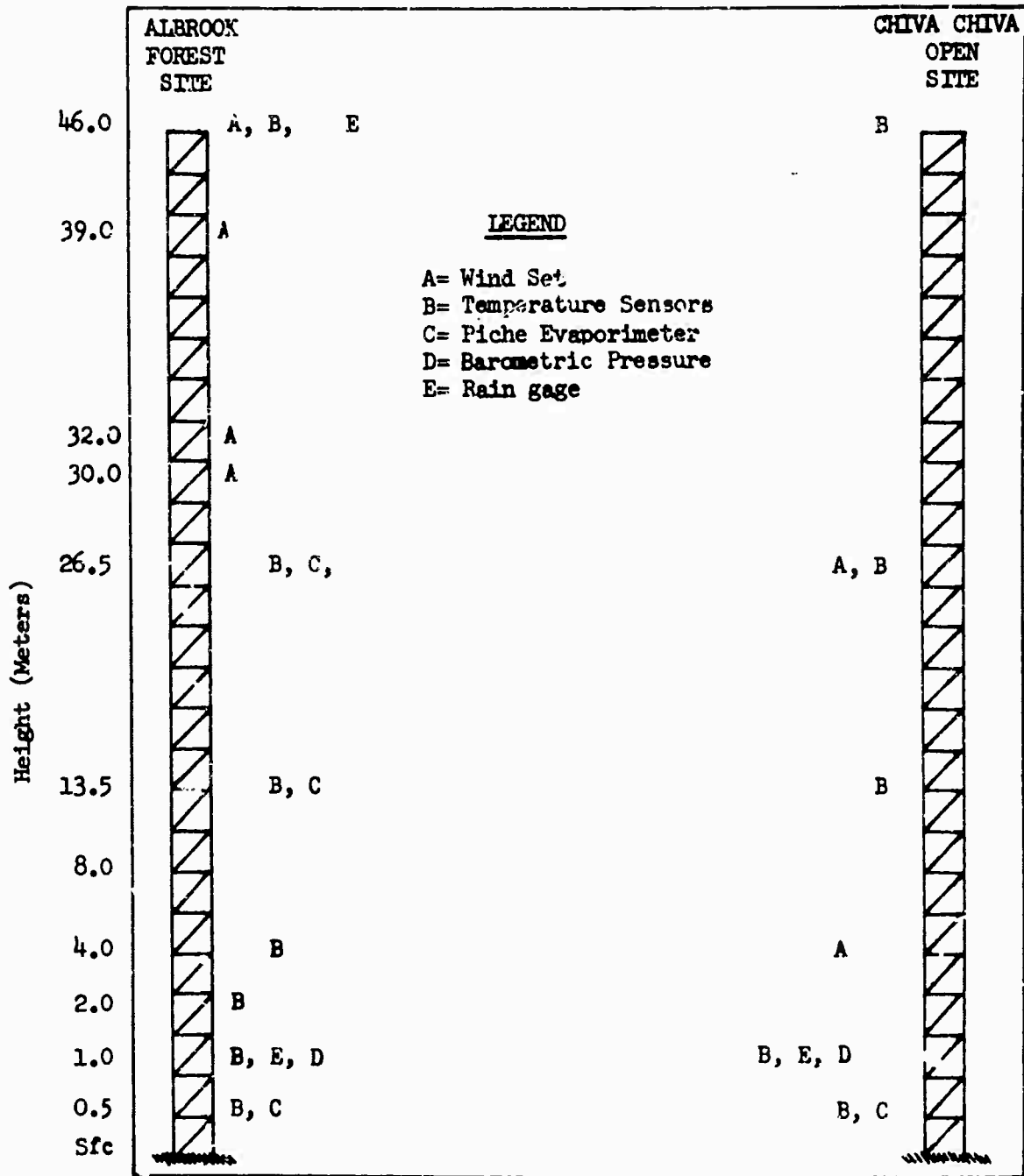


FIGURE 5. INSTRUMENT LOCATION ON TOWERS

**SUMMARY OF METEOROLOGICAL OBSERVATIONS**  
**HOURLY DATA**  
 NOVEMBER 1967

Exposure	Site	Level	Monthly Means of Air Temperature by Hour (°F)																								Monthly Summary			
			01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	No. of Obs.	Min.	Mean	Max.
16.0 m			74.5	74.2	73.9	73.8	73.9	74.6	76.4	78.6	80.5	81.9	80.7	80.3	80.1	79.3	78.4	77.3	76.5	76.0	75.5	75.2	74.8	74.6	720	70.7	77.0	86.6		
28.5 m			This level was not instrumented for air temperature at this time																											
26.5 m			73.6	73.5	73.3	73.2	73.1	73.2	73.5	76.1	78.5	80.8	82.1	82.2	81.3	80.3	80.0	79.2	78.0	76.2	75.1	74.5	74.2	74.1	73.8	73.6	720	69.3	76.4	85.5
13.5 m			74.1	74.0	74.6	73.7	73.6	73.6	73.7	75.3	77.1	79.3	80.8	81.5	80.9	80.2	79.9	79.3	78.4	77.4	76.3	75.7	75.3	74.9	74.4	715	69.5	76.6	85.5	
8.0 m			This level was not instrumented for air temperature at this time																											
4.0 m			73.8	73.8	73.6	73.5	73.4	73.4	73.9	75.9	77.6	79.2	80.0	80.3	79.4	78.8	78.2	77.3	76.2	75.5	75.1	74.7	74.4	74.0	74.0	705	70.0	76.1	85.1	
4.0 m			73.6	73.4	73.5	73.4	73.4	73.4	73.5	75.0	76.7	78.4	79.7	79.8	79.2	78.9	79.6	77.9	77.2	76.2	75.4	74.9	74.5	74.2	73.9	73.8	716	69.5	75.8	83.5
1.0 m			73.7	73.7	73.6	73.5	73.5	73.5	74.4	74.7	76.1	78.3	79.5	78.9	78.6	78.5	77.9	77.2	76.3	75.4	75.0	74.6	74.3	74.1	73.8	718	69.5	75.7	83.5	
0.5 m			73.7	73.7	73.6	73.5	73.5	73.5	74.4	74.7	76.1	78.3	79.5	78.9	78.6	78.4	77.8	77.2	76.2	75.5	75.0	74.6	74.4	74.1	73.9	718	69.4	75.7	82.5	

Attock Forest site)

SUMMARY OF METEOROLOGICAL OBSERVATIONS  
HOURLY DATA  
NOVEMBER 1967

Exposure	Monthly Ranges of Air Temperature by Hour (°F)																								Monthly Summary*	
	Site	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23		24
10.5 m	4.	4.7	4.7	4.6	4.6	4.4	4.4	5.2	5.2	4.5	10.7	12.6	12.7	13.1	10.7	11.2	12.0	11.1	5.2	5.9	5.3	3.7	4.9	6.0	4.4	
24.5 m	This level was not instrumented for air temperature at this time																									
47.5 m	3.	3.6	4.9	5.1	4.8	4.8	4.7	4.9	4.9	5.4	11.4	10.7	10.5	10.1	8.9	3.4	3.4	3.4	3.4	3.4	3.4	3.8	3.5	4.2	6.0	
13.5 m	7.5	7.5	7.2	6.0	5.1	4.3	4.2	4.2	4.2	4.2	10.7	10.7	9.6	9.6	7.1	5.7	5.0	4.2	5.5	5.5	5.5	6.0	6.0	4.7		
47.5 m	This level was not instrumented for air temperature at this time																									
10.5 m	3.	5.4	5.5	5.2	5.5	5.3	5.3	5.3	5.3	5.7	7.4	8.1	11.1	8.2	7.2	7.7	5.9	4.0	5.7	4.2	4.9	5.0	5.5	6.0		
47.5 m	6.1	5.3	5.6	5.1	5.5	5.4	5.4	5.4	5.4	5.4	7.4	7.4	7.4	7.4	7.6	6.9	6.1	4.2	4.9	4.9	5.0	5.4	5.9	6.4		
13.5 m	5.5	5.5	5.5	5.1	5.4	5.4	5.4	5.4	5.4	5.4	6.7	6.7	6.7	6.7	6.7	6.4	6.2	3.8	4.7	5.1	5.0	5.0	4.9	6.5		
47.5 m	5.3	5.8	5.9	5.4	5.4	5.4	5.4	5.4	5.4	5.4	7.4	7.4	7.4	7.4	7.4	6.1	5.8	4.0	4.1	5.0	5.0	5.0	4.9	6.4		
10.5 m	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	11.4	11.4	11.4	11.4	11.4	9.1	7.0	6.7	7.1	9.6	6.0	6.1	6.0	5.1		
47.5 m	4.	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	10.2	11.4	11.2	10.8	11.4	9.5	7.0	6.2	6.7	9.0	5.3	5.5	5.2	5.6		
13.5 m	4.1	4.7	3.4	4.1	4.1	4.1	4.1	4.1	4.1	4.1	6.3	8.0	10.8	11.7	11.0	12.4	10.0	7.7	6.4	5.7	9.0	5.9	6.5	6.0		
47.5 m	This level was not instrumented for air temperature at this time																									
10.5 m	This level was not instrumented for air temperature at this time																									
47.5 m	This level was not instrumented for air temperature at this time																									
13.5 m	This level was not instrumented for air temperature at this time																									
47.5 m	3.	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	10.3	10.5	3.5	10.1	11.8	12.3	9.0	7.5	6.8	5.4	5.7	5.9	6.3	5.2	6.5	

\* No monthly summary was computed for the ranges.

SUMMARY OF METEOROLOGICAL OBSERVATIONS

HOURLY DATA

NOVEMBER 1967

Exposure	Monthly Means of Relative Humidity by Hour (%)																								Monthly Summary					
	Site	Level	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	No. of Obs.	Min.	Mean	Max.
Mltoek (Forest site)	46.0 m		94	94	94	94	94	94	94	85	81	76	76	80	81	81	83	86	87	89	91	91	91	92	92	93	719	59	88	99
	28.5 m		This level was not instrumented for relative humidity at this time																											
	26.5 m		97	97	96	97	96	96	96	93	88	82	78	79	81	84	85	87	90	95	95	96	96	96	96	97	710	65	91	99
	13.5 m		97	97	97	97	97	96	96	96	95	92	87	93	82	84	85	87	89	91	93	94	95	95	96	96	96	716	66	92
8.0 m		This level was not instrumented for relative humidity at this time																												
4.0 m		97	97	97	97	97	97	97	95	93	90	89	89	91	92	92	92	95	96	96	97	97	97	97	97	704	75	95	100	
2.0 m		99	99	99	99	99	99	99	99	98	97	94	92	92	93	93	95	96	96	98	98	98	99	99	99	711	73	97	100	
1.0 m		99	98	98	99	99	99	98	98	97	95	93	93	94	94	96	96	97	98	98	98	98	98	98	98	718	75	97	100	
0.5 m		99	99	99	99	99	99	99	99	98	96	95	96	95	96	97	97	98	98	99	99	99	99	99	99	717	81	98	100	

46.0 m		96	96	96	96	96	96	96	96	93	90	85	82	79	81	83	86	88	88	90	91	92	94	94	95	96	684	62	91	100
28.5 m		This level was not instrumented for relative humidity at this time																												
26.5 m		95	95	96	95	95	95	95	95	92	88	82	79	76	80	82	83	84	86	89	91	93	93	94	94	656	61	90	100	
13.5 m		97	97	97	97	97	97	96	96	94	89	84	90	77	81	83	84	86	88	91	93	95	96	96	97	646	60	91	100	
8.0 m		This level was not instrumented for relative humidity at this time																												
4.0 m		This level was not instrumented for relative humidity at this time																												
2.0 m		This level was not instrumented for relative humidity at this time																												
1.0 m		This level was not instrumented for relative humidity at this time																												
0.5 m		97	97	97	97	97	97	96	89	84	79	76	75	81	81	82	83	87	87	92	94	95	96	97	97	696	60	90	100	

(Chiva (open site))



**SUMMARY OF METEOROLOGICAL OBSERVATIONS**  
**HOURLY DATA**  
 NOVEMBER 1967

Exposure	Monthly Ranges of Relative Humidity by Hour (%)																								Monthly Summary*
	Site	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
46.0 m	13	8	9	10	8	11	12	15	22	28	36	38	36	35	30	36	27	18	20	18	17	16	19	11	
28.5 m									This level was not instrumented for relative humidity at this time																
26.5 m	4	4	4	4	4	4	4	12	19	25	31	31	32	30	27	33	28	18	12	5	5	4	4	3	
13.5 m	7	6	6	6	6	6	7	11	18	21	29	29	31	32	28	32	30	19	11	12	9	9	8	7	
8.0 m								This level was not instrumented for relative humidity at this time																	
4.0 m	10	9	6	8	8	9	8	11	18	19	21	23	24	24	24	24	15	11	11	10	8	9	8	8	
2.0 m								6	9	10	17	18	27	24	26	16	13	9	9	5	7	5	5	5	
1.0 m								5	6	10	13	17	23	20	25	14	12	9	8	7	5	8	5	6	5
0.5 m	1	3	1	4	1	4	5	6	8	14	17	17	18	16	13	9	7	5	5	4	5	4	6	4	

\* No monthly summary was computed for the ranges.

46.0 m	10	8	9	10	8	11	12	15	22	28	36	38	36	35	30	36	27	18	20	18	17	16	19	11	
28.5 m									This level was not instrumented for relative humidity at this time																
26.5 m	4	4	4	4	4	4	4	12	19	25	31	31	32	30	27	33	28	18	12	5	5	4	4	3	
13.5 m	7	6	6	6	6	6	7	11	18	21	29	29	31	32	28	32	30	19	11	12	9	9	8	7	
8.0 m								This level was not instrumented for relative humidity at this time																	
4.0 m	10	9	6	8	8	9	8	11	18	19	21	23	24	24	24	15	11	11	10	8	9	8	8		
2.0 m								6	9	10	17	18	27	24	26	16	13	9	9	5	7	5	5	5	
1.0 m								5	6	10	13	17	23	20	25	14	12	9	8	7	5	8	5	6	5
0.5 m	1	3	1	4	1	4	5	6	8	14	17	17	18	16	13	9	7	5	5	4	5	4	6	4	

SUMMARY OF METEOROLOGICAL OBSERVATIONS  
 HOURLY DATA  
 NOVEMBER 1967

Exposure	Site	Code	Monthly Mean <sup>2</sup> of other Elements by Hour																								Monthly Summary			
			01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	No of Obs.	Min.	Mean	Max.
Albrook (Forest site)	WB (4.0 m)		73.1	73.0	72.9	72.7	72.9	72.5	73.1	74.7	75.7	76.6	77.1	77.5	77.0	76.6	76.7	76.2	75.9	75.1	74.4	74.1	73.8	73.5	73.2	73.1	704	66.8	74.7	80.0
	WB (2.0 m)		73.4	73.3	73.2	73.1	73.1	73.0	73.3	74.6	76.1	76.9	77.7	77.8	77.4	77.1	77.3	77.0	76.4	75.7	75.0	74.5	74.2	74.0	73.7	73.5	715	69.5	75.1	80.5
	WB (0.5 m)		73.6	73.5	73.4	73.3	73.2	73.1	73.3	74.7	76.1	77.1	78.0	78.2	77.8	77.6	77.6	77.3	76.7	75.9	75.2	74.8	74.3	74.2	73.9	73.7	717	69.5	75.3	80.6
	BP		.750	.733	.722	.716	.724	.736	.758	.777	.791	.796	.779	.757	.731	.706	.687	.683	.694	.707	.726	.746	.761	.771	.772	.758	716	.620	.741	.860
Albrook (Open site)	P1		0.01	0.00	0.00	0.01	0.05	0.17	0.01	0.03	0.03	0.04	0.07	0.08	0.45	0.05	0.10	0.13	0.12	0.32	0.08	0.17	0.02	0.01	0.10	0.00	75	0.01	1.83	1.43
	P2		0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.00	0.02	0.02	0.03	0.29	0.02	0.11	0.15	0.04	0.45	0.03	0.01	0.00	0.00	0.00	0.09	0.03	43	0.01	4.70	0.82
	P4		0.00	0.00	0.00	0.00	0.03	0.09	0.01	0.00	0.02	0.00	0.02	0.05	0.25	0.02	0.09	0.13	0.10	0.07	0.03	0.08	0.02	0.00	0.04	0.04	44	0.01	4.40	0.69

Albrook (Open site)	WB (4.0 m)		72.8	72.8	72.7	72.3	72.3	72.4	73.6	75.8	77.1	77.8	78.2	78.6	77.8	77.5	77.4	76.8	76.1	75.2	74.7	74.1	73.7	73.4	73.3	73.2	597	67.5	75.0	81.0
	BP		.841	.822	.811	.806	.812	.829	.850	.870	.884	.887	.873	.846	.821	.796	.779	.776	.785	.801	.820	.841	.856	.864	.863	.855	720	.685	.833	.950
	P3		0.05	0.05	0.02	0.01	0.04	0.10	0.03	0.00	0.06	0.02	0.28	0.11	0.10	0.14	0.08	0.06	0.01	0.01	0.10	0.15	0.13	0.01	0.02	0.01	48	0.01	4.08	0.75

W - Wetness; WB - Wetness below 1.0 m; WP - Wetness at 1.0 m; W - Precipitation at 1.0 m; in open area (in.)  
 B - Barometric pressure; BP - Barometric pressure at 1.0 m; B - Precipitation at 1.0 m; above canopy (in.)  
 P - Precipitation; P1 - Precipitation at 1.0 m; P2 - Precipitation under full canopy (in.)  
 P3 - Precipitation at 1.0 m; P4 - Precipitation under open canopy (in.)  
 Monthly totals are substituted for the mean in the monthly summary.

SUMMARY OF METEOROLOGICAL OBSERVATIONS

HOURLY DATA

NOVEMBER 1967

Exposure	Site Code <sup>1</sup>	Monthly Ranges <sup>2</sup> of other Elements by Hour																								Monthly Summary*
		01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
Atbrook (Forest site)	WB (4.0 m)	6.6	6.7	7.0	7.5	7.9	8.0	8.0	6.0	5.1	5.8	4.1	6.0	5.9	5.9	5.8	6.5	5.5	5.3	5.8	5.5	5.9	5.9	7.0	6.7	
	WB (2.0 m)	6.0	5.0	5.1	5.1	5.2	5.6	5.8	4.1	4.0	4.1	5.3	4.7	6.7	5.1	6.4	6.0	5.5	3.4	3.9	4.6	4.2	4.6	6.0	5.9	
	WB (0.5 m)	6.1	5.1	5.1	5.0	5.2	5.1	5.3	4.0	3.4	4.4	5.4	4.9	6.5	5.0	5.8	5.7	4.7	3.1	3.4	4.7	4.3	4.2	5.3	5.8	
	8P	.130	.135	.145	.135	.135	.140	.135	.135	.135	.140	.150	.135	.140	.130	.135	.125	.130	.130	.125	.130	.130	.140	.145	.220	
Atbrook (open site)	P1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	1.42	0.09	0.18	0.50	0.23	0.60	0.11	0.60	0.00	0.00	0.18	0.00	
	P2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.80	0.03	0.14	0.23	0.06	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.02	
	P4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.67	0.03	0.24	0.41	0.12	0.09	0.00	0.12	0.00	0.00	0.03	0.00	
Atbrook (open site)	WB (0.5 m)	7.5	6.0	5.9	5.2	6.0	7.0	6.0	5.2	6.0	5.3	5.2	5.0	7.2	5.2	6.8	4.8	4.8	4.9	4.1	5.3	6.0	6.5	5.0	6.0	
	8P	.145	.140	.145	.125	.130	.135	.130	.130	.165	.175	.180	.160	.145	.150	.155	.160	.160	.135	.135	.140	.140	.135	.125	.140	
	P5	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.72	0.23	0.23	0.49	0.06	0.11	0.00	0.00	0.16	0.00	0.00	0.00	0.00	0.00	

\* No monthly summary was computed for the ranges.

P2 - Precipitation under full canopy (in.)  
 P4 - Precipitation under open canopy (in.)

P1 - Precipitation at 1.0 m. in open area (in.)  
 P5 - Precipitation at 46.0 m. above canopy (in.)

1. All data are in inches unless otherwise noted.

SUMMARY OF METEOROLOGICAL OBSERVATIONS

HOURLY DATA

NOVEMBER 1967

Exposure	Monthly Means of Wind Speed by Hour (miles/hr.)																								Monthly Summary					
	Sit.	level	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	No. of Obs.	Min.	Mean	Max.
		39.0 m	5	5	4	5	5	4	4	5	5	6	6	6	6	6	5	5	5	5	5	5	6	5	4	5	688	0	5	14
		32.0 m	3	3	3	3	3	3	3	4	3	4	4	4	4	4	3	3	3	3	3	3	3	3	2	3	711	0	3	11
		30.0 m	0	0	0	0	0	4	2	4	4	4	4	6	3	4	5	2	6	7	12	10	12	16	10	10	21	0	6	16
		Albrook (Forest site)																												

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		26.0 m	3	2	3	3	3	3	3	4	5	6	6	7	8	7	7	7	5	5	4	3	3	3	3	712	0	4	16
		4.0 m	2	2	2	2	2	2	2	3	4	5	5	5	6	5	6	6	4	4	3	3	3	2	2	555	0	3	14
		Forest site (open area)																											



ALBROOK (Forest site) NOVEMBER 1967

Relative Frequencies\* of Wind Directions by Hour at 39.0 m.  
( % )

Hr Dir	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
N	3.3	3.3		3.3		10.0					6.7	13.3	6.7			10.3	3.4	3.4	3.4	3.3			3.3	3.3
NNE				3.3	3.3	3.3	6.7			6.7	6.7									3.3	3.3			3.3
NE	3.3	3.3	3.3	6.7			3.3		3.3			3.3		3.3	10.0			6.9			3.3	3.3		3.3
ENE	3.3	3.3	3.3				3.3	3.3	3.3				3.3	6.7									3.3	
E	3.3		3.3		3.3	3.3	10.0	10.0	3.3			3.3	10.0		3.3	3.4			3.4	3.3	6.7	3.3		
ESE							6.7		3.3			3.3	3.3	3.3		6.9							3.3	3.3
SE		3.3	3.3	3.3					6.7	6.7	10.0	3.3	6.7		3.3	6.9	6.9	3.4				3.3	3.3	
SSE		3.3									6.7			3.3	3.3	3.4	6.9	3.4						3.3
S				6.7	3.3			3.3		20.0	20.0	26.7	23.3	23.3	20.0	17.2	24.0						3.3	
SSW	16.7	23.3	6.7	13.3	20.0	3.3	6.7	16.7	16.7	20.0	16.7	20.0	16.7	13.3	13.3	10.3	6.9	6.9	10.3	15.7	3.3	20.0	13.3	13.3
SW	13.3	23.3	13.3	13.3	13.3	26.7	13.3	13.3	33.3	16.7	16.7	3.3	10.0	6.7	16.7	6.9	10.3	17.2	13.7	13.3	26.7	10.0	6.7	16.7
WSW	20.0	13.3	16.7	16.7	30.0	20.0	26.7	30.0	10.0	10.0		3.3		16.7	3.3	6.9	10.3	20.6	20.6	26.7	30.0	23.3	20.0	23.3
W	20.0	13.3	23.3	20.0	3.3	16.7	20.0	6.7	10.0	13.3	6.7	6.7	13.3	16.7	3.3	13.7	24.0	20.6	20.6	13.3	13.3	20.0	26.7	16.7
WNW	3.3		3.3	6.7	10.0	3.3	3.3	6.7	10.0	3.3	6.7	6.7	3.3	3.3	10.0		3.4	13.7	10.3	6.7	6.7		3.3	3.3
NW	6.7	6.7	3.3	3.3	6.7	6.7		6.7			3.3			3.3	10.0	10.3		3.4	6.9	3.3		3.3	10.0	6.7
NNW	6.7		6.7	3.3	3.3	3.3	3.3			3.3		6.7	3.3			3.4	3.4	3.4		6.7	3.3	6.7	3.3	
CALM		3.3	6.7	3.3	6.7	3.3	3.3	3.3										3.4	3.4	3.3	3.3	3.3	3.3	3.3

\* Note: Due to rounding, percentage totals do not equal 100%.

IMPRESORA S. A. 85115

ALBROOK (Forest site) NOVEMBER 1967

Relative Frequencies\* of Wind Directions by Hour at 32.0 m.  
( % )

Hr \ Dir	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
N	13.3	3.3	3.3	16.7	3.3	3.3	10.0		6.7	3.3	6.7	6.7	13.3	10.0	3.3	6.9	10.3	10.3	10.3	10.0	6.7	16.7	6.7	10.0
NNE	3.3		3.3					3.3		10.0		3.3		3.3	6.7	3.4	3.4				6.7	3.3	6.7	2.3
NE	3.3	3.3	6.7			3.3	3.3				6.7	3.3		3.3	6.7			6.9	6.9	6.7	3.3		3.3	3.3
FNE		3.3		3.3		3.3		6.7	3.3	3.3	6.7		3.3		3.3	3.4		3.4						
E		3.3	3.3	3.3			3.3	3.3	3.3		3.3	3.3	3.3		3.3	3.4				3.3		6.7	3.3	3.3
ESE	3.3					3.3	3.3	6.7	3.3			3.3	3.3	6.7				3.4				6.7		
SE			3.3			6.7	3.3		3.3				6.7			10.3	3.4	3.4						
SSE		3.3					3.3		6.7	3.3		10.0	3.3				3.4							
S		3.3		3.3						13.3	26.7	13.3	23.3	23.3	23.3	20.6	17.2			3.3				
SSW		3.3	3.3							3.3	3.3	6.7	3.3			3.4		3.4		3.3				
SW				3.3	6.7				6.7	13.3	10.0	10.0	6.7	3.3				3.4		6.7				
WSW	3.3	3.3	3.3			3.3	6.7	3.3		3.3	6.7	6.7		6.7	6.7	3.4		3.4				6.7	3.3	3.3
W	13.3	14.0	3.3	3.3	13.3	3.3	6.7	3.3	6.7	3.3	6.7		10.0	6.7	10.0	3.4	13.7		10.3	10.0	6.7	3.3	3.3	13.3
WNW	6.7	14.0	6.7	6.7	6.7	14.3	6.7	6.7	16.7	6.7	6.7	6.7	3.3	10.0	13.3	3.4	6.9	3.4	10.3		3.3	3.3	13.3	6.7
NW	6.7	26.7	36.7	16.7	13.3	25.3	23.3	40.0	16.7	20.0	10.0	10.0	13.3	6.7	10.0	24.0	24.0	30.9	17.2	30.0	33.3	26.7	26.7	20.0
NNW		6.7	6.7	6.7	6.7	6.7	20.0	20.0	23.3	13.3	10.0	6.7	6.7	13.3	13.3	10.3	10.3	24.0	30.9	20.0	20.0	20.0	23.3	23.3
CALM				14.3	14.3	14.0	10.0	5.7	3.3	3.3	10.0	10.0	6.7	6.7	3.4	3.4	10.3	10.3	6.9	6.7	13.3	10.0	10.0	13.3

\* Note: Due to rounding, percentage totals do not equal 100%.

IMPRESORA S. A. 11811

CHIVA CHIVA (Open site) NOVEMBER 1967

Relative Frequencies\* of Wind Directions by Hour at 26.5 m.  
(%)

Hr	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
N	10.0	3.3	10.0			13.7	13.3	6.7	5.7	10.3	6.9	27.5	17.2	16.7	10.0	10.0	10.0		6.9	13.3		3.3	10.0	6.7
NNE	3.3	6.7	3.3	3.3	3.3			3.3	3.3					3.3	3.3		3.3	6.7			3.3	3.3		
NE			3.3	13.3			3.3			3.4			3.4	6.7		3.3		3.3	6.9		6.7	3.3		6.7
ENE							3.3			3.4								3.3	3.4			3.3	6.7	3.3
E					3.3		6.7			3.4	6.9		6.9								3.3	3.3		
ESE			3.3						3.3							3.3			3.4					3.3
SE									3.3	6.9	3.4	6.9	6.9	6.7	6.7	3.3	6.7	3.3		3.3			3.3	3.3
SSE	3.3	3.3							3.3		3.4	6.9	3.4	6.7		6.7		3.3		3.3				
S		3.3							6.7		13.7	13.7	20.6	13.3	16.7	6.7	6.7							
SSW						3.4										3.3	3.3	3.3						
SW		3.3								6.9						3.3								
WSW								3.3						3.2	3.3		6.7		3.4					3.3
W	3.3	3.3			6.7		6.7			3.4	6.9	3.4	3.4			3.3	3.3		6.9	6.7		6.7	3.3	3.3
WNW	3.3	3.3	6.7		6.7		6.7	6.7	6.7		10.3	3.4	6.9			6.7	6.7	6.7		3.3	3.3	16.7	6.7	6.7
NW	3.3	50.0	3.3	3.3	3.3	40.1	40.0	50.0	3.3	3.3	37.8	24.0	17.2	30.0	40.0	33.3	33.3	37.8	34.3	33.3	60.0	33.3	50.0	46.7
NNW	6.7	10.0	16.7	16.7	16.7	17.2	16.7	20.6	26.7	24.0	10.3	13.7	13.7	13.3	20.6	16.7	13.3	23.3	17.2	23.3	16.7	16.7	10.0	10.0
CA/M	16.7	13.3	16.7	16.7	16.7	17.2	3.3	6.7	6.7	3.4							6.7	10.0	17.2	10.0	6.7	6.7	10.0	10.0

\* Note: Due to rounding, percentages totals do not equal 100%.

IMPRESORA S. A. 11511



CHIVA CHIVA (Open site) NOVEMBER 1967

Relative Frequencies\* of Wind Directions by Hour at 4.0 m.  
(%)

Dir	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
N	10.0	10.0	3.3		20.0	6.7	6.7	6.7	6.7	20.0	10.0	13.3	3.3	13.3	10.0	13.3	6.7	3.4	6.7	16.7		3.3	6.7	3.3
NNE	3.3		3.3	6.7		13.3	10.0	6.7	3.3	3.3			6.7	10.0		3.3	6.7	3.4		6.7	13.3			
NE	6.7	16.7	3.3	10.0	6.7	6.7	6.7				3.3	3.3	1.7		3.3			6.9	3.3			10.0	3.3	3.3
ENE		3.3	6.7	3.3	3.3	3.3														3.3	3.3	3.3		
E	3.3		6.7	3.3	3.3	3.3				3.3		3.3	6.7					3.4			3.3	3.3	3.3	
ESE						3.3											6.7	6.9				3.3		
SE	3.3	6.7	3.3	10.0					3.3			3.3	6.7		3.3	3.3		3.4	6.7			3.3	10.0	3.3
SSE		3.3	3.3						6.7		3.3	13.3				10.0		3.4						
S	3.3			3.3			6.7	3.3		3.3	10.0	3.3	10.0	10.0	6.7	10.0			3.2		3.3	3.3	3.3	
SSW		3.3			3.3	3.3		3.3	3.3			3.3			3.3	6.7			6.7					
SW			3.3	3.3	3.1			6.7	10.0	3.3			3.3		3.3	6.7				13.3	6.7			
WSW	5.7		3.3		3.3			3.3	3.3		10.0	6.7	3.3		3.3		6.7	3.4	3.3		3.3	3.3	6.7	3.3
W	20.0	20.0	6.7	16.7		10.0	20.0	10.0	13.3	13.3	13.3	6.7	16.7	6.7	3.3	13.3	3.3		10.0	13.3	3.3	16.7	6.7	26.7
WNW	10.0	10.0	20.0	10.0	20.0	10.0	10.0	13.3	6.7	6.7	10.0	3.3		6.7	13.3	10.0	10.0	13.7	13.3	6.7	10.0	3.3	10.0	13.3
NW	13.3	13.3	16.7	10.0	16.7	20.6	20.0	23.3	30.0	13.3	26.7	13.3	16.7	33.3	20.0	10.0	23.3	20.6	20.0	20.0	30.0	16.7	26.7	20.0
NNW	6.7	6.7	10.0	6.7	6.7	3.3	6.7	13.3	3.3	16.7		13.3	6.7	3.3	16.7	13.3	13.3	24.0	10.0	3.3	13.3	3.3	6.7	3.3
CALM	6.7	6.7	6.7	13.3	13.3	6.7	13.3	10.0	10.0	10.0	13.3	13.3	13.3	13.3	10.0	10.0	13.3	10.3	26.7	13.3	13.3	23.3	3.3	3.3

\* Note: Due to rounding, percentage totals do not equal 100%.

# SUMMARY OF NON HOURLY DATA

NOVEMBER 1967

Summary of Elements with Non-hourly Frequencies of Observation						
Site	Element, Units and Exposure	Description	Number of Obs.	Minimum Value	Mean or Total Value	Maximum Value
Albrook (Forest site)	Evaporation <sup>3</sup> (in. at 3 levels)	Piche (26.5 m)	21	0.004	2.201*	0.232
		Piche (13.5 m)	17	0.006	0.688*	0.092
		Piche ( 0.5 m)	7	0.006	0.213*	0.061
	Precipitation from Raingauge Network <sup>2</sup> (in. at 1.0 meters)	Gauge # 1	33	0.01	6.16*	1.05
		Gauge # 2	35	0.01	11.02*	1.32
		Gauge # 3	34	0.01	8.74*	1.20
		Gauge # 4	33	0.01	8.37*	1.14
		Gauge # 5	33	0.01	8.49*	1.19
		Gauge # 6	34	0.01	8.95*	1.08
		Gauge # 7	32	0.01	9.91*	1.33
Gauge # 8		33	0.01	7.47*	0.91	
Chiva Chiva (Open site)	Evaporation <sup>3</sup> (in. at 0.5 meters)	Piche	24	0.006	3.179*	0.299
		Pan	23	0.039	4.187*	0.640

2 - Six hourly observations  
3 - Daily observations

\* Total Values