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MONTHLY
MICROCLIMATIC SUMMARY

FEBRUARY 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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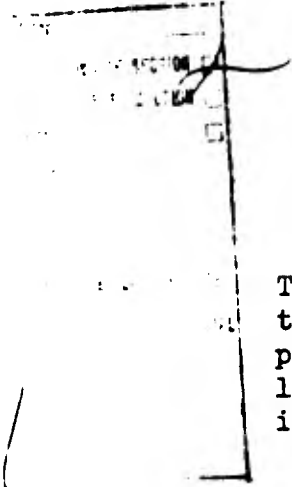
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MONTHLY
MICROCLIMATIC SUMMARY

FEBRUARY 1968

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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, microbiological, 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 Semianual Report. It can be assumed that the means of relative humidity presented in this volume are very close to the true means.

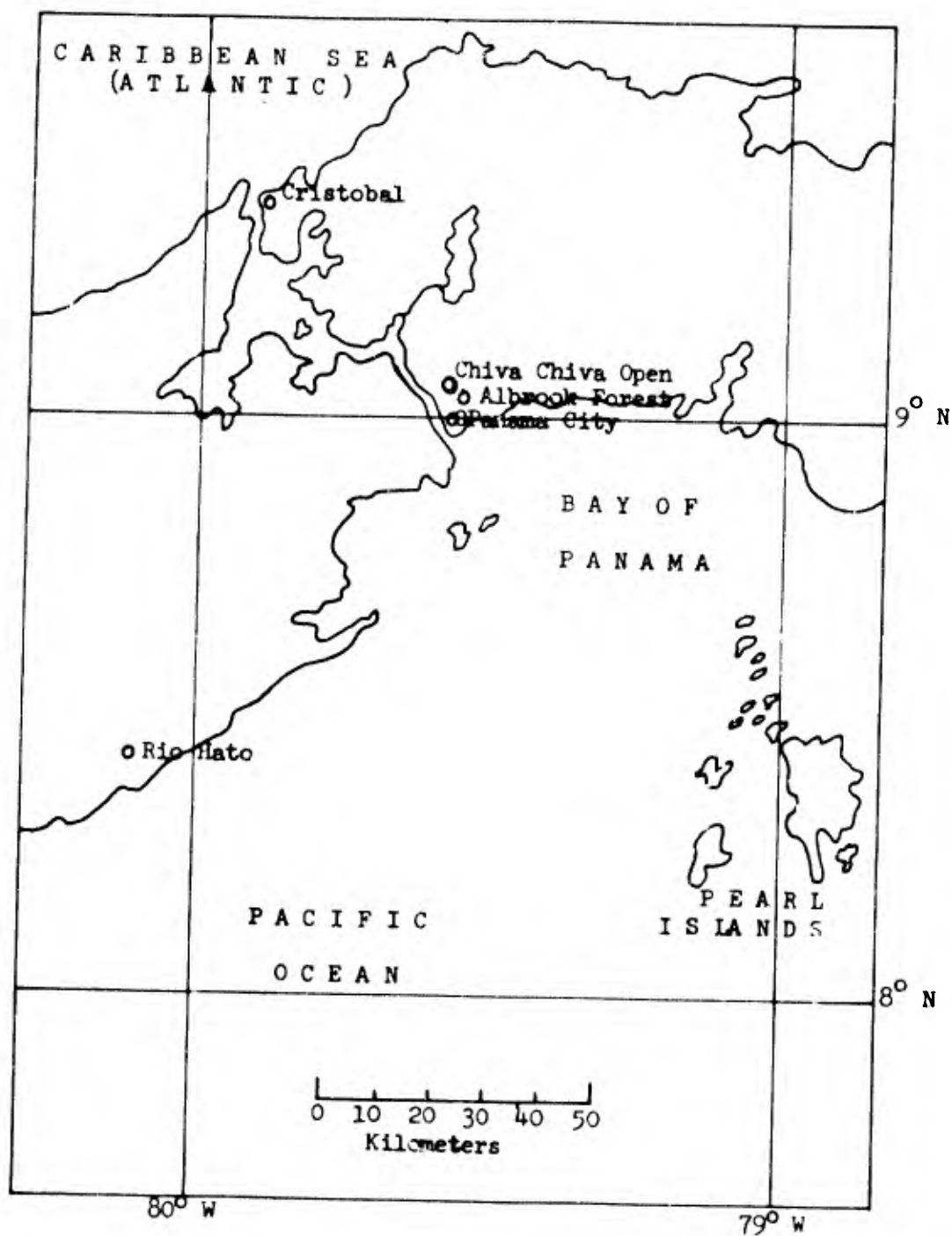


FIGURE 1. LOCATION MAP, ISTHMUS OF PANAMA

FIGURE 2. FREQUENCY OF OBSERVATIONS

# Element	<u>Height (meters)</u>										<u>Frequency</u>
	<u>Sfc</u>	<u>0.5</u>	<u>1.0</u>	<u>2.0</u>	<u>4.0</u>	<u>8.0</u>	<u>13.5</u>	<u>26.5</u>	<u>28.5</u>	<u>46.0</u>	
<u>Temperature:</u>											
Dry Bulb	-	1	1	1	1	-	1	1	-	1	Hourly*/Continuously
Wet Bulb	-	1	-	1	1	-	-	-	-	-	Hourly*/Continuously
Grass Minimum	3	-	-	-	-	-	-	-	-	-	Once Daily
<u>WBGT Index</u>											
	-	-	1	-	-	-	-	-	-	-	Hourly (0600-1900 EST)
<u>Relative Humidity</u>											
	-	1	1	1	1	-	1	1	-	1	Hourly*/Continuously
<u>Barometric Pressure</u>											
	-	-	1	-	-	-	-	-	-	-	Continuously
<u>Evaporation</u>											
	-	1	-	-	-	-	2	2	-	2	Once Daily
<u>Precipitation:</u>											
Recording Gage	-	-	1	-	-	-	-	-	-	2	Continuously
Manual Gage	-	-	2	-	-	-	-	-	-	-	4 Times Daily
Stem Flow	-	-	-	2	-	-	-	-	-	-	4 Times Daily
<u>Wind:</u>											
Direction	-	-	-	-	1	-	-	1	-	1	Continuously
Speed	-	-	-	3**	1	-	3**	1	-	1	Hourly**/Continuously
1. Albrook and Chiva Chiva											
2. Albrook only											
3. Chiva Chiva only											
* Observations made with sling psychrometer when recorders are inoperative.											
** Hourly											
# Instrument descriptions are contained in the Environmental Data Base semiannual reports.											

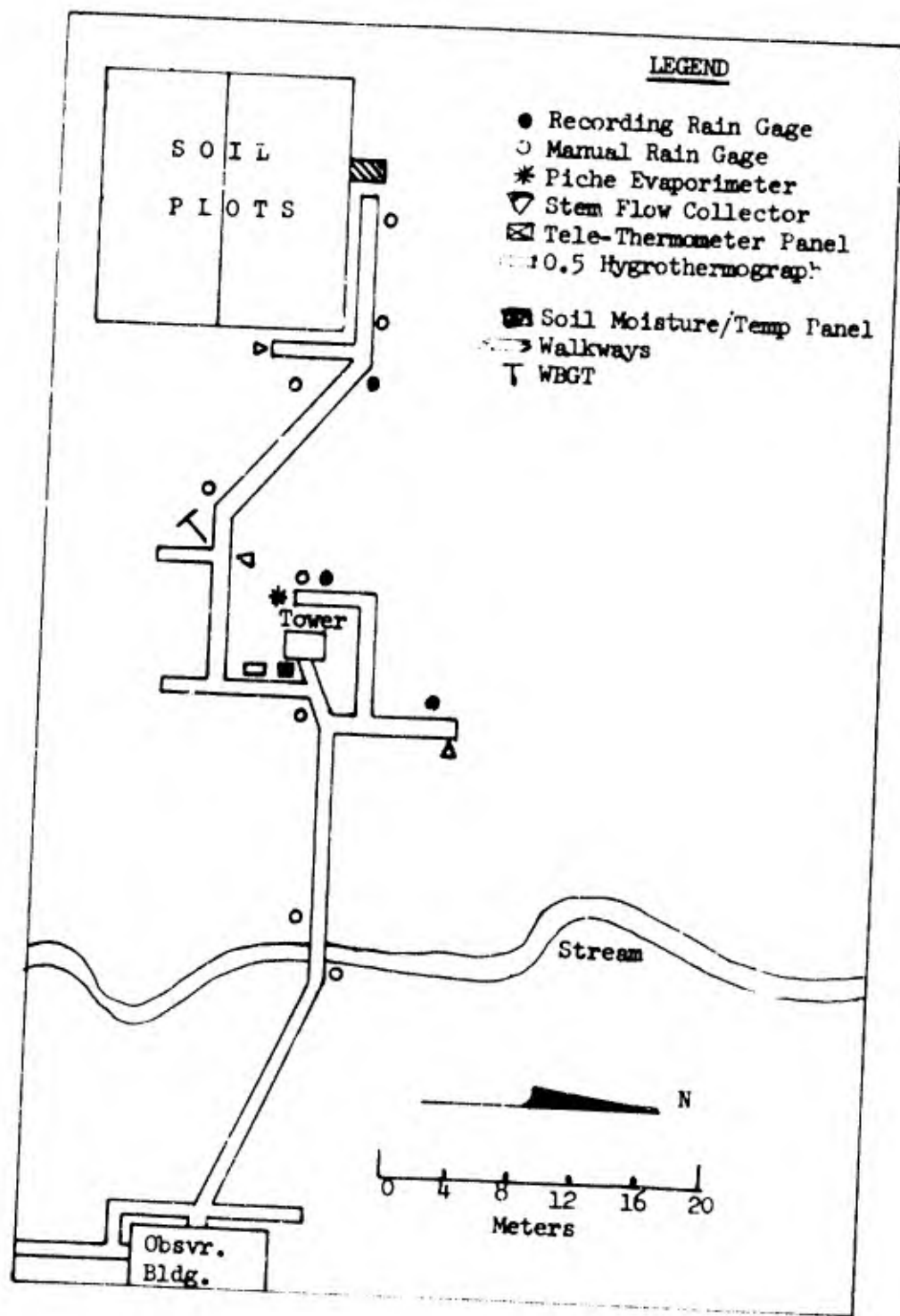


FIGURE 3. ALBROOK FOREST SITE, GENERALIZED PLOT

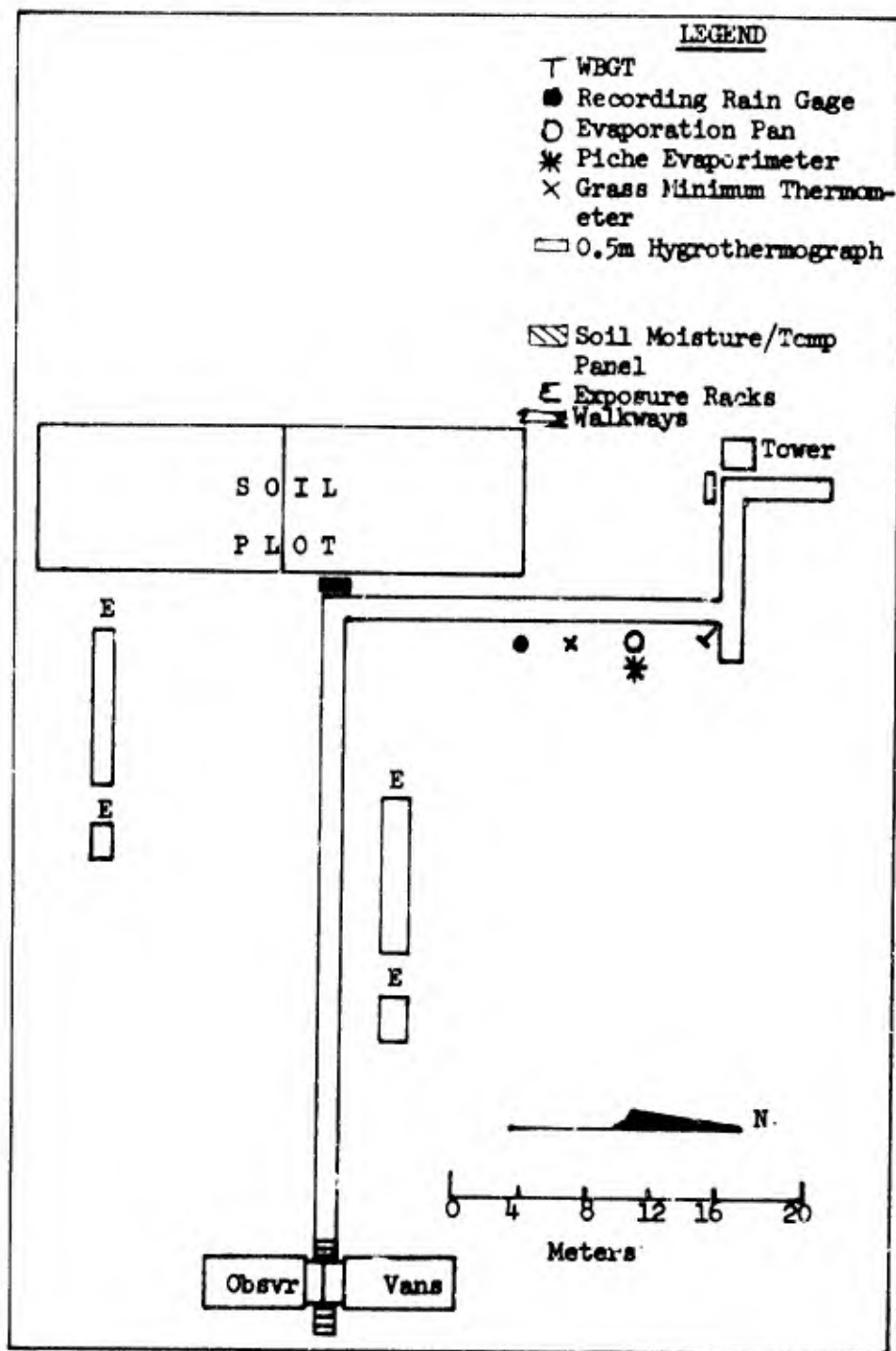


FIGURE 4. CHIVA CHIVA OPEN, GENERALIZED PLOT

SUMMARY OF METEOROLOGICAL OBSERVATIONS
HOURLY DATA
FEBRUARY 1967

Exposure		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.
Albrook (Forest site)	46.0 m	74.1	73.9	73.6	73.4	73.3	73.3	73.5	75.6	79.5	81.7	84.0	84.9	85.2	85.4	85.7	84.6	82.9	80.8	77.9	76.6	75.6	75.1	74.6	74.5	672	71.2	78.3	88.5
	26.5 m	This level was not instrumented for air temperature at this time																											
	26.5 m	73.3	73.1	72.8	72.6	72.5	72.3	73.2	76.6	81.1	83.5	85.4	86.5	86.5	87.0	87.0	85.8	83.9	80.9	77.3	75.9	75.0	74.5	74.0	73.8	670	68.1	78.5	90.5
	13.5 m	73.2	72.8	72.6	72.3	72.0	71.7	71.8	74.3	78.8	81.5	83.6	84.9	85.4	85.6	85.7	84.6	83.2	80.5	77.7	76.2	75.3	74.5	74.0	73.6	672	67.8	77.8	88.5
	8.0 m	This level was not instrumented for air temperature at this time																											
	4.0 m	72.2	71.9	71.9	71.5	71.1	70.8	71.1	74.2	78.6	81.4	83.5	84.9	85.4	85.2	85.6	84.1	82.2	79.2	76.5	75.0	74.1	73.4	73.0	72.7	670	67.3	77.0	98.5
	2.0 m	72.0	71.9	71.8	71.4	71.0	70.6	70.3	73.9	78.2	81.1	83.3	84.8	85.3	85.1	85.6	84.2	82.3	79.2	76.4	74.9	74.0	73.3	72.8	72.6	670	66.1	76.9	88.7
	1.0 m	72.1	71.8	71.7	71.3	70.9	70.9	71.1	73.9	78.0	81.0	83.4	85.2	85.6	85.8	86.2	84.7	82.6	79.4	76.3	75.4	74.2	73.6	73.1	72.6	667	67.3	77.0	89.5
	0.5 m	72.7	72.4	72.2	71.9	71.6	71.3	71.2	73.7	77.5	80.4	82.7	84.4	84.8	85.0	85.0	84.3	82.4	79.8	77.2	75.7	74.7	74.1	73.5	73.2	668	68.0	77.1	88.2

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Chiva Chiva (Open site)	46.0 m	74.2	74.1	73.9	73.6	73.4	73.3	73.4	75.2	78.8	81.2	83.6	84.5	84.9	85.3	85.3	84.5	82.9	80.8	78.1	76.8	75.8	75.4	75.0	74.6	672	70.1	78.3	87.3
	28.5 m	This level was not instrumented for air temperature at this time																											
	26.5 m	74.1	73.9	73.6	73.4	73.1	73.0	73.0	75.2	78.9	81.6	83.9	84.9	85.3	85.8	85.6	84.9	83.3	81.1	78.5	77.0	76.1	75.5	75.1	74.6	671	70.1	76.4	88.4
	13.5 m	73.9	73.7	73.3	73.2	72.8	72.6	72.6	75.1	78.9	81.5	83.9	84.9	85.3	85.7	85.7	85.0	83.2	81.1	78.3	76.9	75.8	75.4	74.9	74.5	668	69.3	78.2	87.7
	8.0 m	This level was not instrumented for air temperature at this time																											
	4.0 m	73.2	73.2	72.9	72.6	72.1	72.1	72.6	77.4	80.6	83.4	85.5	86.7	86.9	87.3	87.1	86.1	83.8	80.6	77.9	76.3	75.3	75.0	74.5	73.9	671	67.6	78.6	90.1
	2.0 m	72.9	72.8	72.6	72.3	71.6	71.7	72.4	77.6	81.1	83.8	86.1	87.2	87.3	87.8	87.7	86.5	84.0	80.5	77.5	76.0	75.2	74.7	74.2	73.4	670	67.7	78.6	91.2
	1.0 m	73.2	72.9	72.6	72.4	71.9	71.0	72.1	78.8	82.5	86.2	88.4	89.8	89.5	90.0	89.0	88.3	84.6	81.1	77.8	76.8	75.5	75.0	74.4	73.9	660	66.5	79.4	94.0
	0.5 m	72.7	72.5	72.2	72.0	71.3	71.1	72.1	80.2	85.0	88.1	90.3	91.3	91.5	91.4	90.6	88.3	85.6	81.7	77.7	75.9	74.9	74.4	73.7	73.1	671	67.1	79.9	94.4

SUMMARY OF METEOROLOGICAL OBSERVATIONS

HOURLY DATA

FEBRUARY 1967

Exposure		Monthly Ranges 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		
Albrook (Forest site)	46.0 m	5.0	4.5	4.0	3.9	4.0	4.1	3.9	4.4	9.8	9.3	7.3	6.2	14.6	9.9	6.0	13.2	11.2	9.0	6.4	4.5	3.3	3.5	4.2	4.0		
	28.5 m									This level was not instrumented for air temperature at this time																	
	26.5 m	6.3	7.0	5.6	5.9	6.0	7.5	6.2	7.1	9.7	9.2	6.9	6.5	15.9	12.4	9.4	12.1	11.3	8.3	4.9	4.4	5.1	4.5	5.3	5.6		
	13.5 m	4.2	5.2	5.8	6.1	6.1	6.5	7.9	7.5	8.3	6.0	5.5	5.6	13.6	11.5	7.5	10.0	10.5	8.1	5.6	4.3	5.1	5.2	5.0	4.8		
	8.0 m									This level was not instrumented for air temperature at this time																	
	4.0 m	5.5	6.0	6.8	7.3	7.0	6.4	8.3	6.5	6.8	6.5	6.1	5.9	13.5	11.5	7.3	8.9	9.8	6.0	3.6	5.4	4.6	5.8	6.1	5.9		
	2.0 m	5.6	5.8	6.7	7.4	6.8	6.6	8.5	6.7	6.5	6.5	6.5	6.4	13.7	11.6	7.9	9.0	9.5	5.9	4.2	5.3	4.5	5.8	6.3	5.8		
	1.0 m	6.1	6.0	6.4	6.2	6.5	6.3	7.1	6.6	6.1	6.0	6.9	5.4	15.0	13.0	9.5	9.8	10.0	6.1	7.1	4.9	4.8	4.5	5.4	5.6		
	0.5 m	5.3	5.3	5.9	5.9	6.2	5.8	6.4	8.8	7.4	7.2	7.0	7.1	13.8	12.4	8.2	9.0	9.5	6.7	4.1	4.8	4.5	4.3	4.4	4.8		

* No monthly summary was computed for the ranges.

Chiva Chiva (Open site)	46.0 m	5.8	6.1	5.0	5.2	5.0	4.6	4.6	5.4	7.4	6.1	4.7	5.6	14.0	10.7	7.1	6.5	7.7	4.9	3.5	3.7	3.3	3.8	4.8	5.2			
	28.5 m	This level was not instrumented for air temperature at this time																										
	26.5 m	5.3	5.7	5.2	6.0	4.7	4.7	5.2	5.4	7.5	4.9	4.8	6.0	14.1	11.7	7.9	7.0	8.4	5.2	3.5	2.3	3.0	3.3	4.1	4.6			
	13.5 m	5.8	6.0	6.7	5.9	6.1	5.8	5.6	5.6	5.9	4.5	4.6	6.0	14.3	11.0	7.0	6.9	9.0	5.3	4.2	3.6	3.1	3.9	4.3	4.5			
	8.0 m	This level was not instrumented for air temperature at this time																										
	4.0 m	6.5	7.0	7.5	7.0	7.0	8.0	7.5	6.7	7.5	4.9	5.6	7.7	13.4	10.3	4.7	4.3	8.4	4.3	3.1	3.3	3.3	4.2	4.0	5.9			
	2.0 m	6.6	7.3	7.5	6.8	7.8	7.3	7.5	7.5	7.4	7.6	5.0	5.7	7.8	15.7	10.4	5.4	4.8	9.5	3.6	2.2	3.0	2.8	3.8	4.6	5.5		
	1.0 m	6.1	7.4	7.5	7.5	7.4	8.7	8.5	8.4	9.9	7.6	8.0	12.2	18.5	12.0	13.0	6.5	9.8	4.0	3.3	3.6	3.5	4.1	5.1	5.0			
	0.5 m	6.5	7.2	7.7	7.3	8.0	8.2	7.6	10.2	10.9	7.7	8.6	10.7	17.9	10.6	5.8	4.7	8.5	4.5	3.2	3.1	3.8	4.1	6.1	5.4			
	the ranges.																											

SUMMARY OF METEOROLOGICAL OBSERVATIONS
HOURLY DATA
FEBRUARY 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.		
Albrook (Forest site)		46.0 m	84	84	84	85	85	84	81	71	66	59	55	53	53	52	54	59	65	72	76	80	82	83	83	672	36	72	90			
		28.5 m							This level was not instrumented for relative humidity at this time																							
		26.5 m	87	88	88	88	89	87	81	70	64	59	56	55	55	54	57	61	68	76	80	83	85	85	87	670	36	75	98			
		13.5 m	89	90	90	90	91	92	92	88	76	67	61	58	57	57	55	58	60	66	73	79	83	85	86	88	672	38	76	100		
		8.0 m								This level was not instrumented for relative humidity at this time																						
		4.0 m	92	93	93	94	95	95	95	91	78	69	63	60	59	59	57	61	64	71	78	82	86	89	90	91	570	38	79	100		
	2.0 m	92	93	93	94	95	96	96	92	80	71	65	61	59	60	58	62	65	72	79	78	97	90	91	91	670	40	80	100			
	1.0 m	92	92	92	93	93	94	95	94	80	71	64	61	60	60	59	61	65	71	79	84	87	89	90	91	672	45	80	98			
	0.5 m	91	91	91	92	93	93	94	91	83	74	65	64	62	61	61	62	67	73	79	82	85	87	89	89	668	43	80	100			

1

Chiva Chiva (Open site)	46.0 m	64	84	85	85	86	86	86	86	81	73	66	58	54	53	52	51	53	58	64	72	77	80	81	82	83	672	29	72	96
	28.5 m									This level was not instrumented for relative humidity at this time																				
	26.5 m	85	85	86	86	87	37	86	81	72	65	58	55	53	52	52	53	58	64	72	78	81	82	83	84	669	31	73	96	
	13.5 m	86	86	86	87	88	88	87	80	71	63	57	54	53	52	52	54	59	65	72	78	81	82	83	85	572	32	-	98	
	8.0 m									This level was not instrumented for relative humidity at this time																				
	4.0 m	88	88	89	90	91	91	90	79	71	63	57	54	54	52	52	53	59	66	73	78	81	82	85	87	672	34	74	100	
	2.0 m	89	90	90	91	93	93	92	79	70	63	56	54	54	52	51	53	59	67	74	79	82	84	86	88	670	35	75	99	
	1.0 m	88	88	89	90	92	91	91	78	68	60	53	52	50	48	49	51	55	63	73	78	82	83	85	87	669	30	73	98	
	0.5 m	88	88	89	90	91	92	91	73	62	55	51	48	48	47	48	52	55	63	73	79	82	83	85	87	671	33	72	97	

SUMMARY OF METEOROLOGICAL OBSERVATIONS
HOURLY DATA
FEBRUARY 1967

Exposure		Monthly Ranges 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		
Althook (Forest site)	46.0 m	17	15	15	14	13	12	11	11	18	29	20	25	43	35	49	47	37	26	18	16	16	16	16	15		
	28.5 m																										
	26.5 m	13	14	12	11	10	14	14	20	26	27	22	21	47	50	39	52	46	36	20	15	11	14	19	19		
	13.5 m	19	19	18	14	14	15	15	15	25	26	24	27	45	53	44	52	48	49	35	32	22	22	23	24		
	8.0 m																										
	4.0 m	16	15	10	13	9	11	15	18	25	31	27	33	48	55	43	51	58	41	30	29	22	16	21	20		
	2.0 m	16	12	12	12	9	9	13	12	24	21	26	32	48	53	45	48	57	41	30	28	20	15	18	19		
	1.0 m	11	9	15	10	7	6	10	12	23	23	20	28	44	48	42	47	49	37	25	21	16	13	14	12		
	0.5 m	12	12	15	12	14	12	10	13	24	25	26	34	50	46	49	53	52	46	29	24	22	18	16	17		

* No monthly summary was computed for the ranges.

Altitude	20	19	18	17	16	15	9	17	16	21	24	44	48	41	39	50	25	20	12	13	16	13	18
1-6.0 m																							
2-8.5 m																							
2-6.5 m	18	15	13	15	15	15	11	19	15	18	26	43	48	41	36	48	23	19	11	12	15	13	17
13.5 m	22	17	16	17	17	16	17	12	17	15	19	23	42	51	37	34	47	23	18	13	15	17	14
4.0 m	23	19	16	13	15	16	15	20	24	25	16	27	46	48	35	31	48	22	23	17	19	17	21
2.0 m	23	14	15	15	14	11	15	20	26	23	20	28	46	48	33	28	46	22	21	15	20	19	15
3.0 m	14	17	17	15	14	16	15	18	26	23	19	30	49	43	36	39	44	20	19	15	17	19	16
1.5 m	14	15	14	15	14	17	14	19	30	23	23	32	42	41	29	18	41	25	19	15	18	14	17

SUMMARY OF METEOROLOGICAL OBSERVATIONS HOURLY DATA FEBRUARY 1967

Exposure		Monthly Means ² of other Elements by Hour																								Monthly Summary			
Site	Code ¹	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)	70.4	70.4	70.4	70.1	70.0	69.8	70.1	72.1	73.3	73.6	73.9	74.1	74.0	73.9	73.5	73.5	73.0	72.2	71.5	71.2	71.2	71.2	70.9	70.8	672	66.5	71.9	77.7
	WB (2.0 m)	70.4	70.4	70.5	70.1	70.0	69.8	70.1	72.2	73.5	73.9	74.1	74.3	74.1	74.0	73.8	73.2	72.5	71.7	71.4	71.2	71.3	70.9	70.7	672	66.3	71.0	76.1	
	WB (0.5 m)	70.7	70.5	70.4	70.3	70.1	70.0	69.9	71.4	73.6	74.2	74.5	74.4	74.5	74.5	74.4	74.1	73.7	73.2	72.3	71.7	71.5	71.4	71.2	71.1	668	66.4	72.2	77.9
	BP	.775	.758	.746	.737	.739	.749	.770	.787	.804	.809	.801	.777	.750	.726	.700	.691	.693	.706	.726	.746	.766	.783	.792	.786	672	.640	.755	.895
	P1	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.13	0.03	0.00	0.17	0.14	0.01	0.00	0.00	0.00	0.00	0.00	8	0.01	0.53	0.17
P2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.02	0.00	0.19	0.08	0.00	0.00	0.00	0.00	0.00	0.00	4	0.02	0.36	0.19	
P3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.01	0.00	0.12	0.04	0.00	0.00	0.00	0.00	0.00	0.00	4	0.01	0.22	0.12	
P4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.18	0.01	0.00	0.23	0.03	0.00	0.00	0.00	0.00	0.00	0.00	4	0.01	0.50	0.13	

Chive Chive (Open site)	WB (4.0 m)	70.7	70.7	70.6	70.4	70.2	70.3	70.6	72.7	73.5	73.7	73.6	73.6	73.7	73.5	73.4	73.0	72.6	72.2	71.5	71.4	71.2	71.2	71.1	672	67.1	71.9	77.1	
	WB (2.0 m)	70.7	70.7	70.6	70.4	70.2	70.3	70.7	72.9	73.7	74.0	73.9	74.0	74.0	73.9	73.8	73.3	73.0	72.3	71.7	71.5	71.3	71.2	71.3	671	67.2	72.1	77.2	
	WB (0.5 m)	70.2	70.1	69.9	69.9	69.5	69.4	70.2	73.5	74.7	75.4	75.6	75.5	75.4	75.1	74.9	74.4	73.3	72.3	71.3	71.2	71.1	70.9	70.7	671	65.6	72.2	78.9	
	BP	.866	.851	.839	.831	.833	.845	.864	.875	.900	.907	.900	.876	.949	.821	.798	.789	.792	.805	.825	.842	.859	.879	.884	.879	672	.725	.851	.999
	PS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2	0.04	0.24	0.20

WB - Wet bulb temperature (°F)
 BP - Barometric pressure (in. of Hg minus 29.0)
 PS - Precipitation at 1.0 m. in open area (in.)
 P1 - Precipitation at 46.0 m. above canopy (in.)
 P2 - Precipitation under full canopy (in.)
 P3 - Precipitation under drip canopy (in.)
 P4 - Precipitation under open canopy (in.)

Monthly means of precipitation are computed for precipitation days. Precipitation totals are substituted for the mean in the monthly summary.

SUMMARY OF METEOROLOGICAL OBSERVATIONS
 HOURLY DATA
 FEBRUARY 1967

Exposure		Monthly Ranges ² of other Elements by Hour																								Monthly Summary*			
Site	Code ¹	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24				
Albreck (Forest site)	WB (4.0 m)	4.5	5.2	5.7	5.7	5.5	6.4	6.2	5.0	4.9	5.0	5.5	6.6	5.0	6.7	7.8	6.2	8.1	5.0	5.6	3.8	4.2	4.4	5.5	5.0				
	WB (2.0 m)	4.5	4.9	5.6	5.7	5.6	6.0	6.7	5.5	5.2	5.0	6.5	6.6	5.5	6.9	8.1	6.4	8.6	4.9	5.7	4.5	3.7	4.7	5.3	5.0				
	WB (0.5 m)	5.1	4.9	5.2	5.5	5.6	5.6	6.5	6.7	6.2	4.6	5.5	5.5	5.7	4.9	7.0	6.1	7.2	6.2	5.2	4.3	3.5	3.7	4.6	5.0				
	BP	.150	.155	.155	.145	.145	.145	.150	.140	.14	.145	.130	.150	.130	.135	.130	.120	.120	.130	.135	.135	.130	.145	.150	.150				
	P1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
	P2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
	P3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
	P4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			

* No monthly summary was computed for the ranges.

Albreck (Forest site)	WB (4.0 m)	5.0	4.9	4.6	4.6	5.9	5.0	4.4	4.4	5.5	5.3	5.3	5.5	4.8	5.6	8.2	7.3	7.7	4.4	4.6	4.2	3.4	4.6	5.9	4.2		
	WB (2.0 m)	4.4	4.4	5.2	4.4	5.7	4.7	4.4	3.9	3.9	4.9	5.5	5.4	4.6	5.7	7.4	6.8	7.1	4.8	3.9	3.5	3.2	4.3	4.3	4.1		
	WB (0.5 m)	5.4	5.2	5.3	4.6	5.7	6.6	5.4	5.2	3.7	4.8	4.5	4.4	3.8	5.8	8.0	4.2	6.3	4.4	4.5	3.3	3.6	4.9	4.7	4.1		
	BP	.170	.165	.160	.165	.160	.170	.170	.170	.165	.164	.140	.155	.145	.145	.135	.145	.140	.143	.145	.145	.150	.160	.160	.155		
	P3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		

WB - Wet bulb temperature (°F)
 BP - Barometric pressure (in. of Hg minus 29.9)
 P3 - Precipitation under drip canopy (in.)
 P4 - Precipitation under open canopy (in.)

PS - Precipitation at 1.0 m. in open area (in.)
 P1 - Precipitation at 46.9 m. above canopy (in.)
 P2 - Precipitation under full canopy (in.)

Monthly ranges of precipitation are computed for precipitation days.

SUMMARY OF METEOROLOGICAL OBSERVATIONS

HOURLY DATA

FEBRUARY 1967

Site	Exposure Level	Monthly Means of Wind Speed by Hour (miles/hr.)																								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)	46.0 m	5	5	5	5	5	5	5	4	7	8	10	11	11	10	9	9	9	7	6	6	5	5	5	5	5	654	0	7	22
	28.5 m	This level was not instrumented for wind speed at this time																												
	26.5 m	3	2	3	2	3	2	2	2	4	4	5	5	6	5	4	4	4	2	3	2	2	3	3	3	654	0	3	12	
	13.5 m	This level was not instrumented for wind speed at this time																												
	8.0 m	This level was not instrumented for wind speed at this time																												
	4.0 m	1	0	0	1	0	1	0	0	1	1	1	2	2	1	1	1	1	0	0	0	0	0	0	0	0	635	0	1	5
	2.0 m	This level was not instrumented for wind speed at this time																												
	1.0 m	This level was not instrumented for wind speed at this time																												
	0.5 m	This level was not instrumented for wind speed at this time																												

[illegible]

ALBROOK (Forest site) FEBRUARY 1967

Relative Frequencies* of Wind Directions by Hour at 46.0 m. (%)																								
Dir \ 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					7.6				11.5	15.4	11.5	18.5	21.4	10.7	35.7	21.4	17.9	10.7	3.6		10.7			
NNE								3.9		3.9	7.6		7.0	7.0	3.6	3.6	7.0							
NE									7.6		3.9		3.6	7.0			3.6							
ENE										3.9														
E										3.9				3.6		3.6								
ESE													3.6											
SE								3.9				3.7												
SSE																								
S												3.7												
SSW																								
SW											3.9		3.6	3.6				3.6						
WSW					11.5			7.6	3.9		3.9					7.0		3.6	3.6			7.0	3.6	7.0
W	62.9	51.8	59.2	62.9	53.9	65.5	65.5	73.1	30.8	7.6	7.6	14.8	14.3	3.6	10.7	7.0	10.7	17.9	28.6	39.3	42.9	50.0	39.3	42.9
WNW	14.6	29.6	22.2	18.5	19.2	23.0	15.4	3.9	11.5	19.2	7.6	3.7	7.0	7.0	17.9	7.0	25.0	14.3	17.9	14.3	14.3	14.3	25.0	28.6
NW	18.5	11.1	14.8	11.1	3.9			3.9	7.6	26.9	38.4	22.2	17.9	25.0	14.3	25.0	17.9	46.4	32.1	35.7	28.6	25.0	17.9	14.3
NNW						3.9	7.6		23.1	15.4	15.4	33.3	21.4	28.6	17.9	25.0	17.9	3.6	14.3	10.7		3.6	10.7	7.0
CALM	3.7	7.3	3.7	7.3	3.9	7.6	7.6	7.6		3.9				3.6							3.6		3.6	

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

ALBROOK (Forest site) FEBRUARY 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	7.3		3.7			3.9	3.9		3.9	7.6	15.4	22.2	17.9	25.0	17.9	10.7	10.7			10.7	7.0	3.6		7.0
NNE				3.7						11.5	3.9			10.7		7.0	3.6	7.0	10.7	7.0	3.6		3.6	
NE								3.9		15.4	7.6	7.3	3.6	7.0	10.7	10.7	3.6	3.6	3.6					
ENE									3.9	15.4	7.6		3.6					3.6			3.6		3.6	
E								3.9	3.9	3.9	3.9	3.7		3.6	10.7		3.6	3.6	3.6					
ESE										7.6	7.6	3.7							3.6					
SE									7.6			3.7	7.0	3.6			3.6							
SSE								3.9	3.9	3.9		3.7				3.6							3.6	
S															3.6	7.0	3.6			3.6				
SSW											3.9		3.6	3.6		3.6				3.6				
SW		3.7							3.9	3.9				10.7	7.0			3.6						
WSW	3.7	3.7		3.7	11.5		15.4	15.4					3.6					3.6						7.0
W	14.8		22.2	25.9	26.9	38.4	7.6	19.2	11.5			11.1	7.0	7.0	10.7	3.6	7.0	7.0	10.7	7.0	14.3	14.3	14.3	14.3
WNW	4.5	25.9	37.0	18.5	30.8	26.9	38.4	15.4	19.2	3.9	11.5	14.8	21.4	7.0	7.0	7.0	17.9	14.3	14.3	7.0	25.0	35.7	32.1	28.6
NW	11.1	48.1	22.2	18.5	23.0	15.4	19.2	23.0	19.2	15.4	23.0	18.5	14.3	7.0	14.3	32.1	28.6	42.9	35.7	39.3	21.4	25.0	21.4	32.1
NNW	14.8	3.7	3.7	18.5	3.9	3.9	3.9	7.6	19.2	7.6	15.4	7.3	10.7	14.3	10.7	1.3	14.3	10.7	17.9	21.4	10.7	10.7	7.0	10.7
CALM	3.7	14.8	11.1	11.1	3.9	11.5	11.5	3.9	3.9	3.9							3.6	3.6		14.3	7.0	7.0	7.0	

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

ALBROOK (Forest site) FEBRUARY 1967

		Relative Frequencies* of Wind Directions by Hour at 4.0 m. (%)																							
Dir	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			3.7	7.3			3.9	7.6	7.9		3.9	16.1	7.6	3.7		10.7	3.6	7.0	3.7	7.0	3.6			10.7	
NNE		7.3	3.7	3.7	3.7	3.9	3.9	3.9		3.9			11.5	14.9		3.6	3.6				3.6			7.0	3.6
NE										7.6		12.0	7.6	3.7		3.6	10.7	10.7	7.3						
ENE										3.9	7.6	7.9		7.3	3.7		3.6	10.7		3.6					
E										3.9		4.0	3.9	14.9	11.1	3.6	3.6	7.0							
ESE										4.0	3.9		3.7	3.6		3.6									
SE										3.9	3.9	4.0	3.9		3.7	7.0	7.0			3.6					
SSE										3.9		4.0	3.9			3.6		3.6							
S											3.9	12.0	3.9	7.3	3.7	10.7	3.6	7.0	7.3	3.6	3.6				
SSW		3.7			7.3		7.6			3.9	3.9			7.3	11.1	10.7	10.7	7.0			3.6				
SW			3.7							15.4	11.5	12.0	11.5	11.1	14.8	17.9		3.6	3.7	3.6	3.6				
WSW			3.7		3.7	3.9	3.9		4.0		7.6	4.0	7.6	7.3	3.7	3.6	10.7		3.7	3.6					3.6
W		7.3	7.3	7.3		7.6	3.9		7.9	11.5	7.6	4.0	19.2	7.3		3.6	3.6		7.3	3.6	7.0	3.6			
WNW		3.7			3.7	7.6	3.9	7.6	7.9	7.6	11.5	7.9	3.9	7.3		3.6	7.0		7.3	7.0	7.0	7.0	7.0	3.6	10.7
NW		25.9	14.8	14.8	29.6	7.6	34.6	15.4	12.0	3.9	3.9		3.9	3.7	22.2		10.7	3.6	3.7	3.6	10.7	10.7	10.7	14.3	21.4
NNW		3.7	3.7	7.3	7.3	11.6		11.6		3.9	3.9					3.6			7.0	3.7		3.6			
CALM		48.1	59.4	59.2	44.5	57.8	38.4	53.9	60.2	26.9	30.8	7.9	7.6	3.7	22.2	10.7	21.4	28.6	51.8	57.1	57.0	75.0	82.1	64.3	60.7

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

CHIVA CHIVA (Open site) FEBRUARY 1967

Relative Frequencies* of Wind Directions by Hour at 26.5 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	64.3	35.7	60.7	66.6	50.0	39.3	32.1	60.7	60.7	25.9	37.0	39.3	53.6	46.4	50.0	60.7	64.3	53.6	57.1	57.1	67.9	71.4	64.3	67.9
NNE	7.0	21.4	10.7	11.1	3.6	17.9	10.7	3.6	21.4	22.2	18.5	32.1	21.4	28.6	10.7	10.7	17.9	28.6	28.6	35.7	14.3	14.3	17.9	7.0
NE				3.7		3.6			3.6	33.3	25.9	17.9	10.7	10.7	32.1	21.4	3.6	7.0	7.0	3.6	3.6		3.6	3.6
ENE									3.6	7.3	7.3	7.0	3.6											
E																	3.6							
ESE																								
SE																								
SSE																								
S										3.7				3.6										
SSW																								
SW																								
WSW												3.6												
W			3.6			3.5		3.6																3.6
WNW																								
NW		7.0	7.0	7.3	10.7	7.0	10.7	3.6																
NNW	21.4	28.6	14.3	7.3	35.7	25.0	35.7	28.6	10.7	11.1	7.3		10.7	3.6	7.0	7.0	10.7	3.6	7.0	3.6	10.7	7.0	14.3	14.3
CALM	7.0	7.0	3.6	3.7		3.6	10.7																	3.6

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

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CHIVA CHIVA (Open site) FEBRUARY 1967

		Relative Frequencies* of Wind Directions by Hour at 4.0 m.																							
		(%)																							
Dir	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		10.7	7.0	14.3	10.7		17.9	7.0	7.0	17.9	22.2	29.6	35.7	25.0	32.1	32.1	25.0	25.0	21.4	21.4	21.4	17.9	17.9	10.7	17.9
NNE			7.0	3.6			3.6	7.0		7.0	29.6	14.8	14.3	10.7	7.0	10.7	14.3		3.6	3.6	3.6			7.0	
NE					3.6	3.6	7.0	7.0			3.7		3.6					3.6							
ENE												3.7													
E					3.6																				
ESE																									
SE																									
SSE																									
S																									
SSW									3.6			3.7													3.6
SW		3.6	3.6																						3.6
WSW								3.6																	
W		3.6	3.6			7.0		7.0			3.7			3.6		3.6						3.6			
WNW		7.0	10.7	17.9	7.0	32.1		3.6	10.7		3.7	3.7		3.6	3.6	3.6		7.0	3.6	3.6					
NW		46.4	46.4	28.6	42.9	32.1	39.3	60.7	35.7	32.1	25.9	11.1	21.4	28.6	32.1	35.7	32.1	10.7	17.9	17.9	28.6	35.7	39.3	32.1	46.4
NNW		25.0	21.4	28.6	32.1	25.0	14.3	7.0	32.1	42.9	14.8	29.6	25.0	32.1	17.9	17.9	25.0	53.6	53.6	53.6	42.9	39.3	42.9	42.9	25.0
CALM		3.6		7.0			10.7	3.6	3.6						3.6										

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

SUMMARY OF NON HOURLY DATA

FEBRUARY 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)	WBGT Index ¹ (at 1.0 meters)	Index value	392	67.0	76.2	85.0
		Dry bulb temp.	392	66.8	80.3	89.9
		Wet bulb temp.	392	66.5	74.0	89.9
		Black bulb temp.	392	68.5	81.5	98.0
	Evaporation ³ (in. at 4 levels)	Piche (46.0 m)	28	0.159	19.302*	1.025
		Piche (26.5 m)	28	0.098	12.023*	0.616
		Piche (13.5 m)	28	0.024	5.994*	0.311
		Piche (0.5 m)	28	0.018	4.376*	0.226
	Precipitation from Raingauge Network ² (in. at 1.0 meters)	Gauge # 1	2	0.13	0.51*	0.41
		Gauge # 2	2	0.12	0.58*	0.46
		Gauge # 3	2	0.10	0.67*	0.57
		Gauge # 4	2	0.09	0.47*	0.38
		Gauge # 5	2	0.09	0.53*	0.43
		Gauge # 6	2	0.09	0.43*	0.33
		Gauge # 7	2	0.09	0.53*	0.43
		Gauge # 8	2	0.09	0.37*	0.28
	Stem Flow ² (in. at 2.0 meters)	Small tree	1	0.46	0.46*	0.46
		Medium tree	1	0.44	0.44*	0.44
		Large tree	1	0.15	0.15*	0.15
Chiva Chiva (Open site)	WBGT Index ¹ (at 1.0 meters)	Index value	392	66.0	78.9	87.3
		Dry bulb temp.	392	66.5	83.4	94.0
		Wet bulb temp.	392	66.0	74.0	94.0
		Black bulb temp.	386	65.3	93.7	116.0
	Evaporation ³ (in. at 0.5 meters)	Piche	27	0.159	14.990*	0.781
		Pan	27	0.163	7.144*	0.346
	Minimum Grass temp ³ (°F at grass tips)	None	27	60.5	65.8	76.4

1 - Hourly observations between 0600 and 1900 hours inclusive

2 - Six hourly observations

3 - Daily observations

* Total Value

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13. ABSTRACT This report contains detailed microclimatic data for February 1967 from specific sites in the Panama Canal Zone and vicinity. The data are presented in tabular form, summarized for hourly and/or daily observations from surface to 46-meter levels. Elements listed are: temperature, pressure, precipitation, wind speed and direction, relative humidity, and evaporation.			

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