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MONTHLY
MICROCLIMATIC SUMMARY

MARCH 1967

ENVIRONMENTAL DATA BASE
FOR REGIONAL STUDIES IN THE HUMID TROPICS

USATECOM Project No. 9-4-0013-01

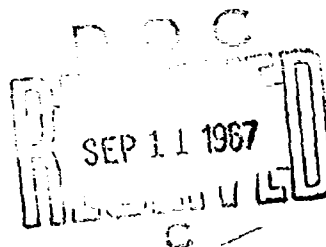
US ARMY
TROPIC TEST CENTER
Fort Clayton, Canal Zone

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MONTHLY
MICROCLIMATIC SUMMARY

MARCH 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, 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
Fort Kobbe (satellite)	08° 54'N, 79° 34'W
Fort Sherman (satellite)	09° 16'N, 79° 59'W
Albrook (satellite)	09 00'N, 79° 33'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.

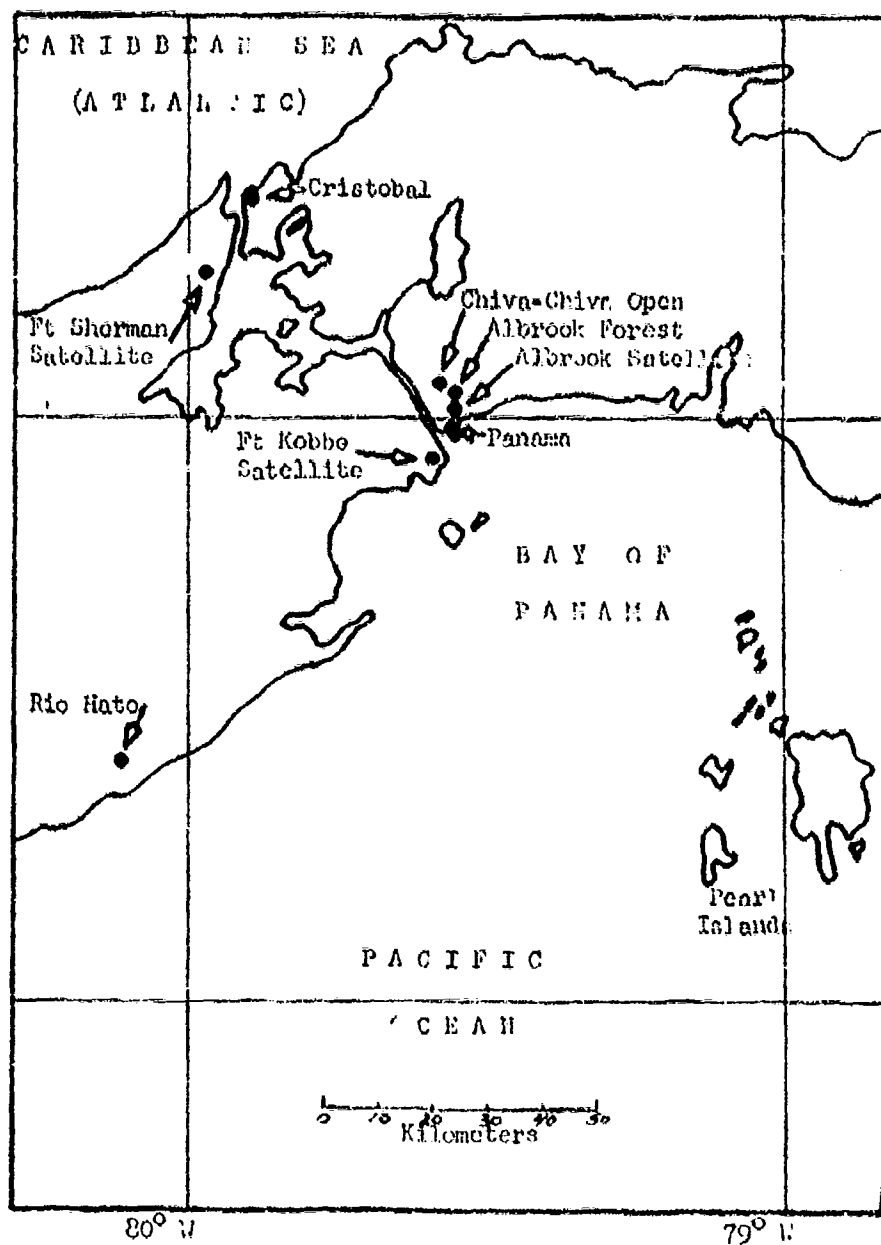


FIGURE 1.
LOCATION MAP, ISTHMUS OF PANAMA

FIGURE 2. FREQUENCY OF OBSERVATIONS

Element	Site	Height (meters)						Frequency
		0.5	1.0	2.0	4.0	8.0	13.5	
Temperature:								
Dry Bulb	2	2	1	2	2	2	2	2
Wet Bulb	-	2	-	2	2	-	-	-
Glass Minimum	4	-	-	-	-	-	-	-
WBT Index	-	-	2	-	-	-	-	-
Relative Humidity	-	2	1	2	2	2	2	2
Barometric Pressure	-	-	2	-	-	-	-	-
Evaporation	2	-	-	-	-	-	-	3
Precipitation:								
Recording Gage	-	-	1	-	-	-	-	3
Manual Gage	-	-	3	-	-	-	-	-
Stem Flow	-	-	3	-	-	-	-	-
Wind:								
Direction	-	-	-	-	5	-	-	2
Speed	-	-	-	2**	5	-	2**	2
								Hourly**/Continuously

1. All sites
2. Albrook and Chiva Chiva
3. Albrook only
4. Chiva Chiva only
5. Main sites

* Observation made with sling psychrometer when recorders are imperative.

** hourly.

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

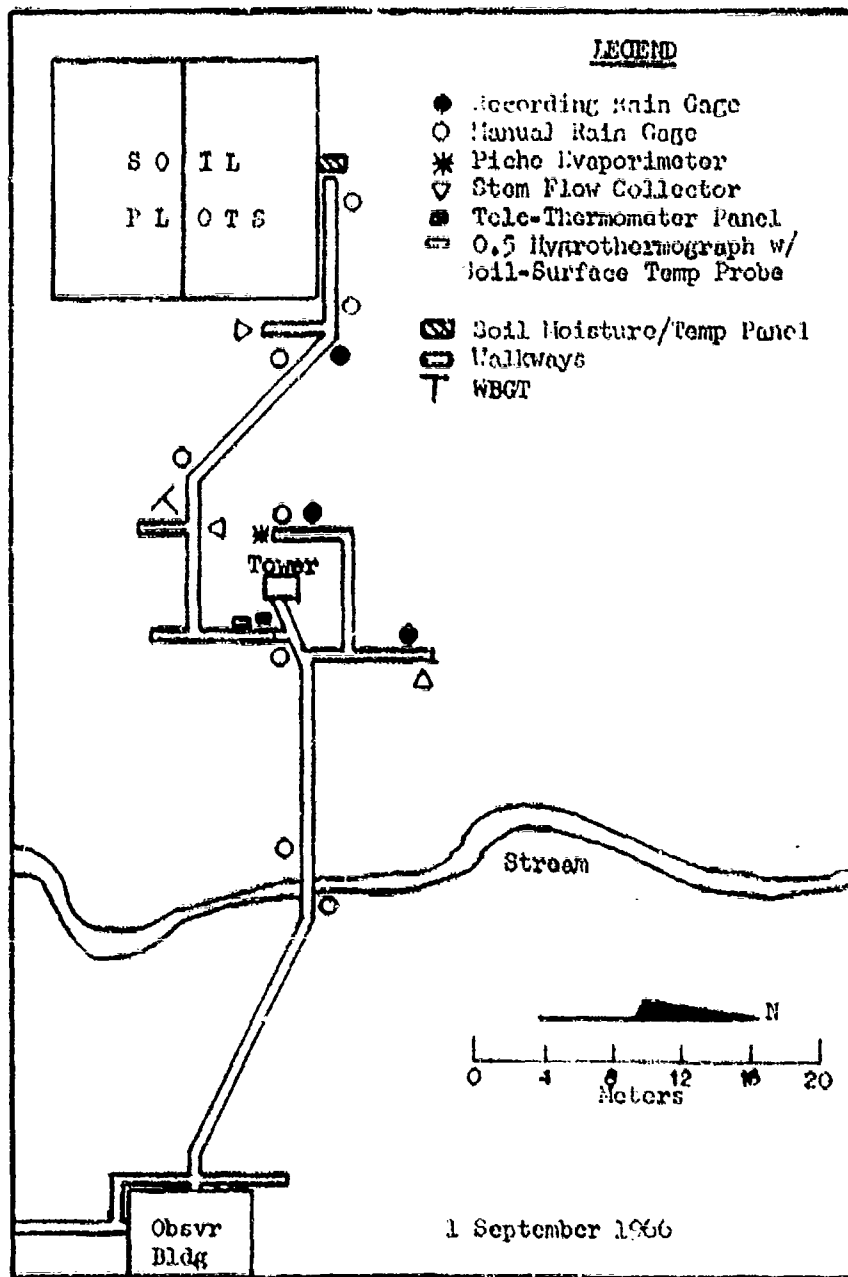


FIGURE 3.
ALBROOK FOREST SITE, GENERALIZED PLOT

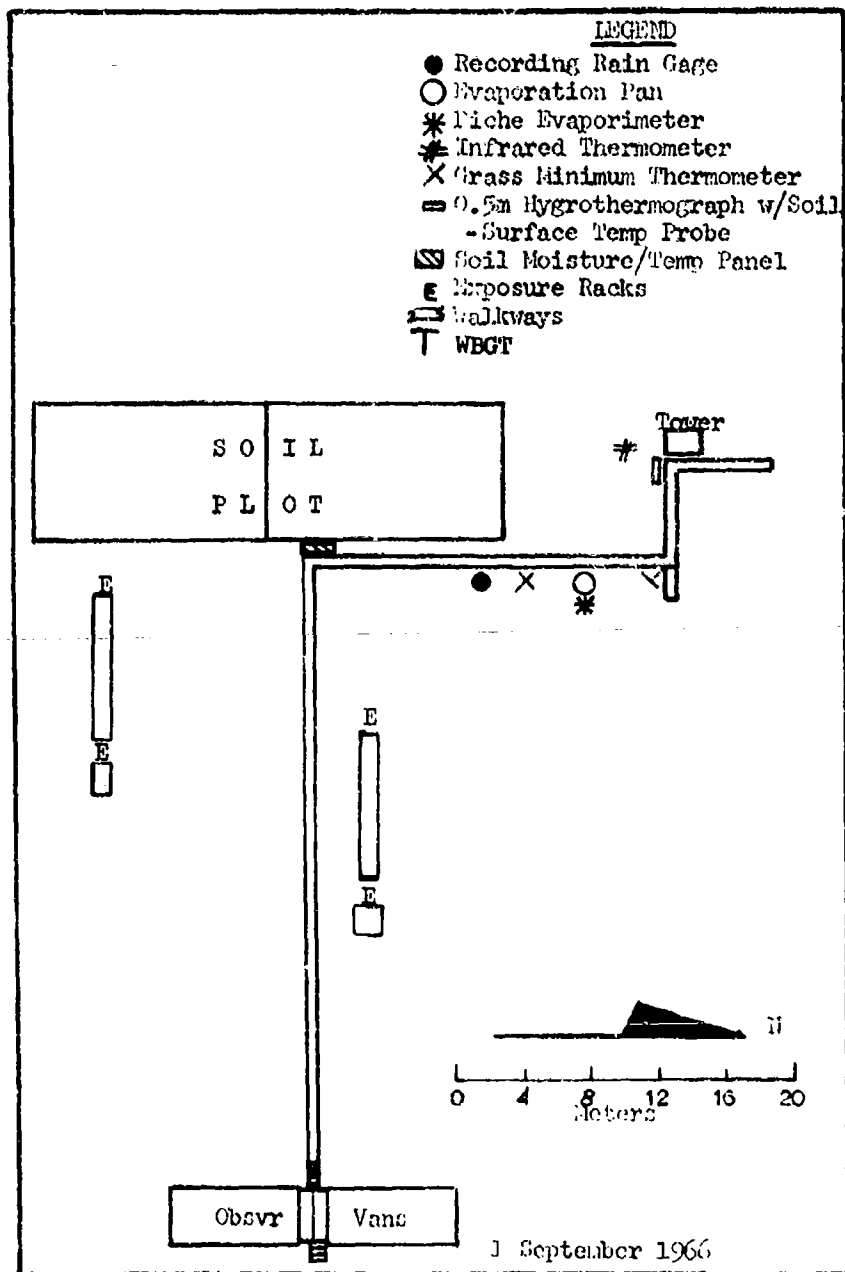


FIGURE 4.
CHIVA CHIVA OPEN, GENERALIZED PLOT

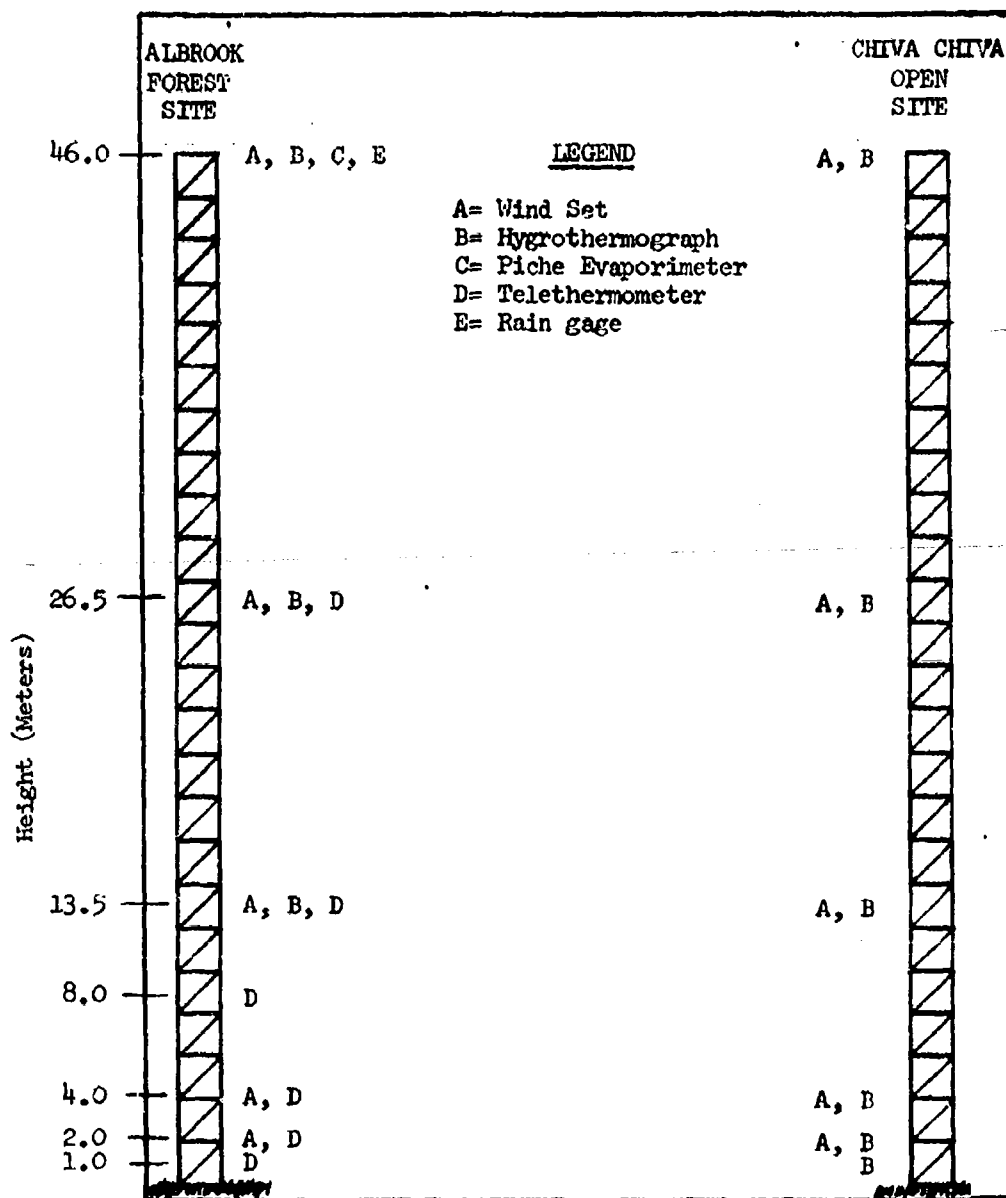


FIGURE 5.
INSTRUMENT LOCATION ON TOWERS

SUMMARY OF METEOROLOGICAL OBSERVATIONS

HOURLY DATA

MARCH 1967

Exposure		Monthly Means of Air Temperature by Hour (°F)																								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.	Mean	Max.	
Altbrook (Forest site)	46.0 m	74.3	74.6	73.8	73.5	73.3	73.1	74.0	76.8	80.5	92.5	84.4	85.4	85.5	84.8	84.4	84.0	82.7	79.9	77.8	76.7	75.8	75.3	75.0	74.6	744	69.6	3.4	89.3
	28.5 m	74.0	73.6	73.3	73.0	72.9	72.4	74.1	77.9	81.2	83.2	84.5	85.5	85.7	85.1	85.0	84.6	83.6	80.3	77.5	76.3	75.5	74.9	74.5	73.8	744	67.6	78	90.3
	26.5 m	73.8	73.5	73.2	72.9	72.7	72.7	73.7	77.5	81.3	83.8	85.3	86.4	86.4	86.1	85.9	85.0	83.6	80.1	77.3	76.1	75.2	74.8	74.5	73.8	744	68.2	78.6	95.3
	13.5 m	73.1	72.6	72.2	72.1	71.9	71.6	72.3	75.8	81.4	82.6	84.1	84.6	85.0	84.1	83.7	83.0	82.6	79.4	77.0	75.6	74.8	74.1	73.6	73.1	744	67.2	77.5	88.3
	8.0 m	72.4	72.0	71.6	71.3	71.2	71.1	72.0	75.1	79.5	82.3	84.8	85.5	85.2	84.6	84.3	83.4	82.2	79.7	77.1	75.5	74.6	73.6	73.1	72.6	742	66.2	77.3	89.7
	4.0 m	71.9	71.5	71.1	70.9	70.5	70.4	71.3	75.4	79.7	83.2	85.2	86.0	85.7	85.0	84.4	83.7	82.0	79.3	76.5	75.0	74.0	73.1	72.7	72.2	737	65.7	77.1	89.9
	2.0 m	71.8	71.4	71.1	70.9	70.5	70.4	71.1	74.8	79.4	82.9	85.0	85.9	85.5	85.1	84.5	83.5	81.9	79.2	76.5	74.8	73.9	73.1	72.6	72.1	737	65.7	76.9	89.6
	1.0 m	71.9	71.4	71.1	70.9	70.6	70.2	71.0	74.6	80.7	83.3	85.1	86.0	86.3	85.8	85.4	84.1	82.6	79.6	76.9	75.6	74.4	73.5	72.8	72.3	744	66.3	77.3	91.0
	0.5 m	72.4	72.0	71.6	71.4	71.1	71.0	71.1	73.7	77.9	81.7	84.7	85.5	85.8	85.1	84.4	83.8	82.5	80.1	77.5	75.9	74.8	73.9	73.2	72.8	744	67.6	77.2	89.7

46.0 m	74.3	74.1	73.9	73.6	73.3	73.0	73.4	75.8	79.6	81.9	84.1	85.1	85.6	85.4	84.6	84.1	82.3	80.5	78.0	77.0	75.9	75.4	74.9	74.7	744	69.7	78.3	88.1
28.5 m							This level was not instrumented for air temperature at this time																					
26.5 m	74.4	74.1	73.7	73.5	73.1	72.8	73.2	75.9	79.8	82.0	84.2	85.1	85.6	85.6	84.8	84.4	82.6	80.7	78.4	77.3	76.2	75.7	75.1	74.8	738	70.0	78.4	88.7
13.5 m	74.0	73.6	73.3	73.0	72.5	72.1	72.5	75.7	79.9	82.4	84.5	85.5	86.1	86.1	85.2	84.5	82.8	80.6	78.2	77.1	75.9	75.4	74.8	74.4	741	67.9	78.2	89.3
8.0 m							This level was not instrumented for air temperature at this time																					
4.0 m	73.5	72.9	72.6	72.0	71.8	71.2	72.6	77.9	81.8	84.1	86.2	87.3	87.9	87.2	86.7	85.6	83.8	80.8	78.1	76.8	75.6	74.8	74.5	73.8	743	66.5	78.7	90.9
2.0 m	73.2	72.7	72.5	71.7	71.5	70.9	72.5	78.3	82.4	84.7	86.9	87.9	88.4	87.9	87.2	86.1	84.0	80.9	78.1	76.8	75.6	74.7	74.2	73.6	742	65.6	78.8	91.9
1.0 m	72.8	72.4	72.1	71.5	71.0	70.2	72.7	79.8	83.9	87.0	89.2	90.7	90.9	90.3	89.1	87.6	85.1	81.3	78.1	76.8	75.5	74.6	74.0	73.4	744	64.0	79.5	95.5
0.5 m	72.8	72.3	72.1	71.5	71.2	70.6	72.2	79.4	84.7	87.8	90.4	91.2	91.3	89.4	87.8	86.8	84.1	80.5	77.2	75.9	74.8	74.1	73.5	73.1	744	66.3	79.3	95.6

SUMMARY OF METEOROLOGICAL OBSERVATIONS

HOURLY DATA

MARCH 1967

Exposure	Monthly Ranges of Air Temperature by Hour (°F)																								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
Albrook (Forest site)	46.0 m		4.5	4.5	5.0	4.8	5.2	5.6	7.0	6.4	4.9	5.3	5.1	11.7	10.0	16.6	14.7	7.3	7.4	7.7	4.1	3.4	3.8	3.8	4.2	4.4	
	28.5 m		8.4	9.1	6.0	7.9	7.0	7.9	9.3	7.2	6.0	5.7	7.9	11.8	9.6	19.7	15.7	10.2	10.8	7.7	7.2	4.7	4.2	6.2	4.9	6.9	
	25.5 m		5.6	5.2	5.8	7.8	6.6	7.0	10.1	7.5	6.7	7.8	7.7	14.1	12.6	22.8	21.6	13.8	10.6	7.6	6.1	3.1	4.8	5.7	5.1	6.3	
	13.5 m		9.2	9.0	7.6	8.0	7.3	7.7	7.9	4.6	6.0	6.6	6.4	13.1	9.9	17.3	14.3	9.7	9.7	6.4	7.0	4.9	4.9	5.8	6.5	7.1	
	8.0 m		10.1	9.9	8.2	8.9	7.9	9.4	12.6	6.1	3.6	5.4	6.4	14.2	9.8	19.2	15.5	11.2	8.9	6.7	7.0	5.7	5.4	6.3	7.5	7.9	
	4.0 m		8.0	8.7	8.8	7.9	8.3	8.6	8.7	5.3	4.5	5.5	DTF	DTF	DTF	DTF	16.0	11.7	9.4	7.7	7.3	6.9	5.8	6.9	7.9	8.3	
	2.0 m		8.0	8.8	8.8	8.0	7.8	DTF	8.6	5.6	3.9	5.5	DTF	DTF	DTF	DTF	16.7	11.5	9.7	8.0	7.3	7.2	6.3	6.7	7.9	8.2	
	1.9 m		6.4	6.1	5.7	5.0	6.4	7.7	8.4	4.9	8.0	7.9	5.6	14.9	11.5	19.5	17.2	11.7	10.6	9.1	8.2	6.8	6.0	5.0	5.3	5.9	
	0.5 m		6.8	6.9	6.9	6.4	6.6	7.5	6.8	4.9	3.5	4.8	6.0	12.9	12.5	15.3	17.6	10.9	9.5	8.9	7.6	8.6	5.9	5.7	5.8	6.4	

Note: DTF, indicates date of doubtful validity.

* No monthly summary was computed for the ranges.

45.0 m	4.8	5.6	5.5	5.7	5.6	6.1	6.8	5.7	5.6	5.5	4.2	10.4	9.9	9.0	10.7	6.5	5.4	5.1	4.5	3.7	3.5	3.0	3.7	3.8
28.5 m																								
25.5 m	4.7	5.3	6.4	6.2	5.7	6.1	6.8	6.5	5.6	5.7	5.1	9.9	9.4	9.5	10.6	7.1	6.7	6.9	4.4	4.8	3.8	2.9	3.3	4.7
13.5 m	6.4	7.1	7.0	6.6	6.6	8.1	8.2	8.7	4.7	5.7	5.1	10.5	9.4	10.1	11.9	7.3	6.0	6.5	4.6	3.8	3.6	4.4	4.8	6.6
8.0 m																								
4.0 m	8.4	9.2	8.5	7.6	8.4	9.9	9.3	4.3	6.5	5.1	5.6	11.3	10.9	11.2	9.1	8.7	6.2	5.6	4.3	3.3	3.3	6.1	7.0	8.4
2.0 m	9.2	9.7	8.2	8.3	8.0	10.6	10.1	5.6	5.9	5.0	7.1	11.9	11.4	10.9	9.3	8.6	6.4	5.6	4.7	2.5	3.2	6.2	7.1	9.4
1.0 m	8.8	9.8	8.4	8.1	8.1	12.7	10.2	7.5	7.6	9.0	12.2	15.0	14.5	12.0	11.3	10.4	7.4	6.0	5.0	2.9	3.6	4.9	6.9	8.0
0.5 m	7.9	8.1	6.7	6.3	6.9	8.5	8.2	5.8	5.6	7.7	11.8	15.9	14.0	14.3	13.6	7.4	6.8	5.1	3.9	3.0	3.2	3.7	5.8	7.3

the ranges.

This level was not instrumented for air temperature at this time

This level was not instrumented for air temperature at this time

(Thiva Thiva (Open site))

SUMMARY OF METEOROLOGICAL OBSERVATIONS

HOURLY DATA

MARCH 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		83.0	84.0	85.0	85.0	85.0	86.0	85.0	81.0	69.0	62.0	56.0	54.0	54.0	56.0	58.0	59.0	68.0	72.0	75.0	78.0	80.0	82.0	82.0		744	40.0	72.0	93.0						
	28.5 m										This level was not instrumented for relative humidity at this time																									
	26.5 m		84.0	84.0	84.0	84.0	84.0	84.0	83.0	80.0	68.0	61.0	56.0	55.0	55.0	56.0	57.0	59.0	60.0	57.0	75.0	79.0	81.0	82.0	83.0	83.0		742	43.0	73.0	93.0					
	13.5 m		88.0	88.0	88.0	89.0	89.0	90.0	90.0	86.0	73.0	63.0	58.0	55.0	56.0	58.0	60.0	60.0	61.0	56.0	72.0	79.0	82.0	84.0	86.0	85.0		741	42.0	75.0	94.0					
	8.0 m										This level was not instrumented for relative humidity at this time																									
	4.0 m		92.0	92.0	93.0	93.0	94.0	94.0	93.0	85.0	72.0	63.0	58.0	55.0	58.0	60.0	62.0	62.0	64.0	70.0	77.0	82.0	85.0	88.0	89.0	90.0		738	37.0	78.0	100.0					
	2.0 m		92.0	93.0	93.0	94.0	94.0	95.0	94.0	88.0	73.0	65.0	59.0	56.0	59.0	60.0	62.0	64.0	65.0	72.0	78.0	83.0	86.0	88.0	90.0	91.0		738	39.0	79.0	100.0					
	1.0 m		91.0	92.0	92.0	93.0	94.0	94.0	94.0	91.0	77.0	68.0	60.0	58.0	59.0	61.0	62.0	64.0	66.0	72.0	78.0	81.0	84.0	87.0	89.0	90.0		742	43.0	79.0	98.0					
0.5 m		91.0	92.0	93.0	92.0	94.0	94.0	93.0	90.0	79.0	69.0	61.0	59.0	59.0	60.0	62.0	64.0	65.0	71.0	77.0	81.0	84.0	86.0	89.0	90.0		744	42.0	79.0	99.0						

10

46.0 m	82.0	82.0	82.0	82.0	83.0	83.0	83.0	83.0	83.0	79.0	70.0	62.0	57.0	54.0	53.0	53.0	55.0	56.0	58.0	64.0	69.0	75.0	78.0	80.0	81.0	82.0	744	43.0	70.0	93.0
28.5 m										This level was not instrumented for relative humidity at this time																				
26.5 m	80.0	81.0	80.0	81.0	81.0	81.0	81.0	81.0	81.0	77.0	58.0	60.0	56.0	52.0	52.0	54.0	55.0	58.0	64.0	70.0	75.0	78.0	80.0	80.0	80.0	80.0	741	40.0	59.0	81.0
13.5 m	80.0	81.0	80.0	81.0	81.0	81.0	81.0	81.0	81.0	76.0	68.0	60.0	55.0	52.0	51.0	54.0	53.0	54.0	58.0	63.0	70.0	75.0	79.0	80.0	80.0	80.0	744	39.0	59.0	96.0
8.0 m										This level was not instrumented for relative humidity at this time																				
4.0 m	84.0	86.0	87.0	88.0	89.0	89.0	89.0	89.0	88.0	75.0	64.0	57.0	52.0	49.0	49.0	50.0	52.0	53.0	57.0	63.0	70.0	75.0	78.0	81.0	82.0	84.0	743	35.0	71.0	100.0
2.0 m	85.0	87.0	87.0	89.0	89.0	90.0	91.0	89.0	89.0	75.0	64.0	57.0	52.0	50.0	50.0	51.0	52.0	54.0	58.0	64.0	71.0	75.0	79.0	81.0	83.0	84.0	742	35.0	71.0	98.0
1.0 m	84.0	84.0	83.0	84.0	84.0	84.0	84.0	84.0	84.0	75.0	66.0	57.0	52.0	49.0	48.0	48.0	51.0	51.0	56.0	64.0	71.0	77.0	81.0	83.0	83.0	83.0	744	35.0	70.0	84.0
0.5 m	86.0	87.0	88.0	88.0	89.0	89.0	90.0	89.0	89.0	73.0	61.0	54.0	49.0	46.0	46.0	50.0	52.0	53.0	58.0	65.0	73.0	78.0	81.0	83.0	85.0	86.0	744	34.0	71.0	98.0

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SUMMARY OF METEOROLOGICAL OBSERVATIONS

HOURLY DATA

MARCH 1967

Exposure		Monthly Ranges of Relative Humidity 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		
Albrook (Forest site)	Site	Level																									
		45.0 m	8.0	8.0	7.0	7.0	13.0	12.0	5.0	13.0	21.0	18.0	18.0	24.0	28.0	38.0	44.0	34.0	40.0	34.0	19.0	12.0	10.0	9.0	13.0	9.0	
		28.5 m							This level was not instrumented for relative humidity at this time																		
		26.5 m	8.0	7.0	5.0	5.0	4.0	3.0	5.0	12.0	14.0	16.0	15.0	26.0	25.0	50.0	50.0	33.0	36.0	37.0	20.0	11.0	7.0	7.0	9.0	5.0	
		13.5 m	11.0	11.0	9.0	10.0	20.0	8.0	9.0	13.0	23.0	20.0	19.0	25.0	29.0	49.0	49.0	39.0	40.0	41.0	32.0	20.0	12.0	10.0	11.0	12.0	
		9.0 m							This level was not instrumented for relative humidity at this time																		
		4.0 m	19.0	15.0	18.0	20.0	16.0	13.0	19.0	21.0	18.0	18.0	24.0	23.0	33.0	63.0	55.0	50.0	42.0	40.0	29.0	23.0	19.0	19.0	21.0		
		2.0 m	19.0	14.0	14.0	21.0	15.0	14.0	18.0	22.0	18.0	20.0	28.0	24.0	33.0	61.0	58.0	59.0	46.0	39.0	30.0	23.0	20.0	20.0	20.0	20.0	
		1.0 m	13.0	11.0	13.0	13.0	9.0	9.0	15.0	21.0	26.0	26.0	32.0	35.0	30.0	54.0	55.0	51.0	47.0	36.0	23.0	19.0	14.0	16.0	13.0	16.0	
	0.5 m	15.0	9.0	12.0	10.0	11.0	14.0	15.0	17.0	27.0	25.0	30.0	36.0	33.0	51.0	54.0	47.0	45.0	35.0	29.0	21.0	20.0	16.0	13.0	15.0		

* No monthly summary was computed for the ranges.

46.0 m	8.0	8.0	7.0	6.0	5.0	7.0	6.0	13.0	14.0	15.0	17.0	22.0	24.0	17.0	29.0	19.0	25.0	26.0	22.0	17.0	14.0	10.0	11.0	9.0					
28.5 m								This level was not instrumented for relative humidity at this time																					
26.5 m	6.0	7.0	6.0	5.0	4.0	6.0	5.0	12.0	10.0	16.0	17.0	20.0	29.0	21.0	33.0	24.0	26.0	30.0	24.0	15.0	11.0	8.0	7.0	6.0					
13.5 m	6.0	6.0	6.0	4.0	4.0	6.0	6.0	12.0	12.0	20.0	21.0	23.0	30.0	23.0	34.0	27.0	27.0	31.0	24.0	11.0	9.0	7.0	11.0	6.0					
8.0 m								This level was not instrumented for relative humidity at this time																					
4.0 m	17.0	18.0	21.0	21.0	24.0	25.0	23.0	20.0	13.0	16.0	22.0	21.0	28.0	28.0	25.0	30.0	26.0	27.0	22.0	13.0	12.0	14.0	16.0	18.0					
2.0 m	18.0	19.0	21.0	21.0	20.0	24.0	25.0	25.0	13.0	14.0	19.0	22.0	23.0	26.0	22.0	26.0	23.0	26.0	17.0	11.0	11.0	16.0	17.0	18.0					
1.0 m	5.0	4.0	5.0	8.0	7.0	7.0	9.0	15.0	15.0	16.0	17.0	22.0	30.0	23.0	36.0	29.0	24.0	27.0	21.0	12.0	10.0	8.0	6.0	5.0					
0.5 m	11.0	12.0	11.0	15.0	15.0	20.0	17.0	17.0	13.0	19.0	22.0	27.0	29.0	27.0	30.0	27.0	25.0	24.0	16.0	12.0	15.0	12.0	14.0	13.0					

SUMMARY OF METEOROLOGICAL OBSERVATIONS

HOURLY DATA

MARCH 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)	70.1	69.9	69.7	69.5	69.4	69.3	69.9	72.2	72.9	73.4	73.6	73.6	74.0	73.5	73.9	73.5	72.7	72.0	71.3	71.0	70.8	70.6	70.4	70.2	744	65.3	71.6	77.9
	WB	(2.0 m)	70.1	69.9	69.7	69.5	69.4	69.3	69.8	72.2	73.0	73.6	73.7	73.6	74.0	73.7	74.0	73.7	73.0	72.3	71.5	71.1	70.9	70.7	70.5	70.2	744	65.3	71.6	77.5
	WB	(0.5 m)	70.5	70.4	70.2	70.0	69.9	69.8	69.8	71.6	73.2	73.9	74.1	74.2	74.3	74.1	74.1	74.1	73.6	72.9	72.0	71.6	71.3	71.1	70.9	70.6	744	66.1	72.0	77.1
	BP		.786	.770	.757	.751	.753	.761	.780	.797	.810	.814	.810	.786	.760	.736	.713	.709	.708	.718	.740	.760	.780	.794	.802	.800	744	.615	.766	.930
	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	0.80	0.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	732	0.03	0.50	0.80
	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	0.35	0.75	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	744	0.13	0.41	0.75
	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	0.43	0.86	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	744	0.01	0.43	0.85
	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	0.45	0.75	0.07	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	744	0.01	0.32	0.75

Note: Total (Mean) for P1 includes 6-hourly readings which are not included in hourly means.

Chive Chive (Open site)	WB (4.0 m)	70.2	70.0	70.0	69.6	69.5	69.2	70.1	72.2	72.7	72.7	72.8	73.2	73.2	73.0	73.2	72.5	72.2	71.5	71.0	71.0	70.8	70.6	70.7	70.3	744	65.2	71.3	77.4
	WB (2.0 m)	70.1	69.9	69.8	69.5	69.5	69.0	70.2	72.3	73.0	73.1	73.3	73.4	73.8	73.6	73.6	72.1	72.7	71.9	71.2	71.2	70.9	70.7	70.6	70.3	744	65.4	71.5	77.1
	WB (0.5 m)	69.9	69.6	69.5	69.1	69.0	69.0	70.0	73.0	74.1	74.6	74.9	74.6	74.6	74.3	74.1	73.6	72.9	71.9	71.0	71.0	70.8	70.6	70.3	70.1	744	64.7	71.7	77.9
	BP	.881	.864	.850	.845	.848	.860	.877	.894	.908	.913	.906	.884	.858	.832	.811	.805	.810	.825	.844	.861	.882	.883	.898	.896	743	.095	.858	.995
	P5	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	744	0.00	0.00	0.00

WB - Wet bulb temperature (°F)
BP - Barometric pressure (in. of Hg minus 29.0)

² Monthly means of precipitation are computed for precipitation days. Precipitation totals are substituted for the mean in the monthly summary.

P5 - 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.)

SUMMARY OF METEOROLOGICAL OBSERVATIONS

HOURLY DATA

MARCH 1957

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
Albrook (Forest site)	WB	(4.0 m)	5.9	5.8	5.3	7.1	6.8	6.7	6.2	4.1	4.2	4.9	6.7	6.3	7.5	8.1	9.4	7.7	8.0	6.3	5.5	5.3	4.8	5.7	5.8	6.6	
	WB	(2.0 m)	5.9	6.0	6.5	7.2	6.8	6.5	6.3	4.0	5.1	5.1	6.6	5.9	8.1	7.8	7.5	6.5	7.8	6.0	5.5	5.2	4.8	5.3	5.9	6.9	
	WB	(0.5 m)	6.0	5.8	5.9	6.4	6.8	6.8	6.4	3.9	5.7	4.5	4.9	4.9	5.0	5.7	6.9	7.1	6.3	5.6	5.5	5.1	5.1	4.8	5.5	5.8	
	SP		.170	.170	.175	.180	.180	.185	.190	.190	.160	.185	.185	.195	.195	.215	.210	.210	.210	.200	.200	.190	.175	.170	.165	.170	
	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	0.20	0.00	0.64	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	
	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	
	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	

* No monthly summary was computed for the ranges.

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 46.0 m above canopy (in.)
P2 - Precipitation under full canopy (in.)

WB - Wet bulb temperature (°F)
RP - Barometric pressure (in. of Hg minus 29.0)

² Monthly ranges of precipitation are computed for precipitation days.

MARCH 1957

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SUMMARY OF METEOROLOGICAL OBSERVATIONS

HOURLY DATA

MARCH 1967

Exposure		Monthly Ranges of Wind Speed by Hour (miles/hr.)																								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
Albrook (Forest site)	45.0 m		11.0	5.0	7.0	6.0	8.0	10.0	9.0	12.0	12.0	13.0	10.0	13.0	15.0	14.0	17.0	15.0	16.0	12.0	8.0	7.0	9.0	8.0	8.0	6.0	
	28.5 m									This level was not instrumented for wind speed at this time																	
	26.5 m		6.0	6.0	5.0	5.0	6.0	6.0	7.0	7.0	9.0	8.0	9.0	10.0	11.0	10.0	10.0	5.0	5.0	6.0	5.0	7.0	5.0				
	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		2.0	2.0	1.0	1.0	2.0	3.0	2.0	1.0	2.0	3.0	3.0	5.0	3.0	4.0	3.0	2.0	2.0	1.0	2.0	1.0	2.0	2.0			
	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																		

* No monthly summary was computed for the ranges.

45.0 m	9.0	13.0	11.0	14.0	13.0	15.0	14.0	13.0	13.0	13.0	16.0	14.0	12.0	14.0	18.0	20.0	14.0	15.0	14.0	12.0	10.0	10.0	11.0	8.0	13.0
35.5 m	This level was not instrumented for wind speed at this time																								
26.5 m	7.0	9.0	8.0	12.0	11.0	12.0	14.0	12.0	13.0	14.0	13.0	12.0	12.0	12.0	18.0	13.0	15.0	13.0	12.0	8.0	7.0	9.0	7.0	11.0	
13.5 m	10.0	10.0	8.0	10.0	10.0	12.0	12.0	13.0	18.0	23.0	15.0	25.0	25.0	31.0	21.0	25.0	15.0	13.0	9.0	11.0	10.0	8.0	11.0		
8.0 m	This level was not instrumented for wind speed at this time																								
4.0 m	5.0	8.0	7.0	7.0	6.0	9.0	12.0	11.0	10.0	11.0	12.0	12.0	13.0	15.0	16.0	10.0	11.0	9.0	5.0	7.0	7.0	5.0	7.0		
2.0 m	5.0	5.0	4.0	5.0	5.0	8.0	9.0	11.0	11.0	13.0	13.0	13.0	15.0	15.0	13.0	17.0	12.0	8.0	6.0	6.0	7.0	6.0	6.0		
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																								

Chilwa Crivo (Open site)

ALBROOK (Forest site) MARCH 1967

Relative Frequencies * of Wind Directions by Hour at 46.0 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			3.3			6.6		6.6	16.1	9.7	25.8	12.9	16.1	16.5	20.6	23.3	13.3	16.1	10.0		6.6	3.3	5.3	
NNE										3.2	3.2	6.4	9.7		13.3	5.6		3.2						
NE								3.3		6.6	3.2		3.2			6.6	6.6							
ENE										6.4	3.2	3.2			3.3									
E									3.2					3.3	3.3	3.3								
ESE			3.3									3.2		3.3		5.6								
SE										3.2	6.4		6.4	10.0										
SSE											3.2	3.2	6.4	3.3	3.3									
S											3.2	9.7	6.4	3.3	3.3						3.3			
SSW									3.2															
SW	3.3			3.3				3.3				3.2			6.6									
WSW	10.0	5.6	10.0	3.3	13.3	6.6	10.0	6.6	3.2		3.2	3.2	3.2	6.6	3.3	6.6		6.4		3.3	3.3	3.3		3.3
W	49.8	59.8	36.6	66.4	59.8	59.8	56.4	52.1	16.1	9.7	6.4	5.4	3.2	3.3	3.3	6.6	13.3	5.7	23.3	29.9	33.2	46.6	53.1	49.8
WNW	20.0	13.3	20.0	13.3	16.5	10.0	20.0	6.6	16.1	9.7	16.1	6.4	19.4	3.3	6.6	10.3	3.3	5.4	23.3	13.3	29.9	23.3	23.3	15.6
NW	13.3	13.3	26.6	6.6	10.0	10.0	3.2	13.3	25.8	22.6	19.4	19.4	16.1	5.6	23.3	20.0	16.6	29.0	23.3	39.9	10.0	23.3	10.0	23.3
NNW	3.3	5.6		6.6		3.3	3.2	3.3	16.1	29.0	6.4	22.6	9.7	25.6	10.0	10.0	43.2	25.8	20.0	13.3	10.0		10.0	5.6
CALM						3.3	5.6	3.3									3.3	3.2			3.3			

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

ALBROOK (Forest site) MARCH 1967

		Relative Frequencies * of Wind Directions by Hour at 26.5 m (%)																							
Dir	Rel	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		6.6					10.0	3.3	13.3	12.9	25.8	12.9	12.9	6.4	15.6	15.6	26.6	32.2	29.0	29.0	29.9	10.6	3.3		3.3
NNE		3.3		6.6		3.3		3.3	3.3	9.7	12.9	12.9	6.4	9.7	3.3	3.3	23.3	10.0	3.2	5.5					
NE							3.3		3.3	3.2	3.2	6.4	12.9	6.1	15.6	20.0	15.6	6.6	9.7						3.3
ENE							3.3		3.3	3.2	6.4	3.2	9.7	6.4	6.6	3.3	3.3		3.2					3.3	
E										9.7	9.7	6.4		3.2		3.3	3.3		6.4		3.3	5.3			
ESE									3.3	6.4		3.2	3.2	6.4	6.6	3.3		6.6							
SE											3.2	3.2	3.2	6.4	10.0			6.6							
SSE										3.2	3.2		3.2		3.3		3.3								
S										3.2		9.7	3.2	6.4		10.0									
SSW												3.2			6.6	6.6	3.3								
SW					3.3								3.2	3.2		3.3							3.3		
WSW						3.3					3.2														
W		3.3	12.3	3.3	6.6		10.0	6.6	3.3		3.2				3.3			6.6	5.4	10.0					
WNW		13.3	5.6	20.0	13.3	13.3	10.0	10.0	16.6	12.9	3.2	12.9		6.4	13.3		6.6	6.6	9.7	6.6	6.6	3.3	6.6	20.0	3.3
NW		39.9	46.6	33.2	43.2	63.1	33.2	36.6	33.2	19.4	9.7	16.1	16.1	12.9	3.3	10.0	10.0	6.6	9.7	20.0	20.0	33.2	36.6	33.2	20.0
NNW		26.6	20.0	20.0	23.3	13.3	13.3	29.9	13.3	16.1	16.1	9.7	25.8	12.9	10.0	16.6	6.6	10.0	15.1	29.0	26.6	33.2	29.9	23.3	26.6
CALM		6.6	13.3	16.6	10.0	6.6	13.3	10.0	5.6					3.2		3.3	5.6	5.6	6.4	6.6	13.3	16.6	16.6	6.6	16.6

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

ALBROOK (Forest site) MARCH 1967

		Relative Frequencies * of Wind Directions by Hour at 4.0 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		6.6	6.6	3.3	6.6	3.3	6.6	6.6		9.7	16.1	6.4	12.9	12.9	3.3	10.0		13.3	9.7	10.0		6.6	6.6		3.3
NNE			3.3					3.3	3.3	3.2	3.2	3.2	3.2	3.2	10.0	3.3	3.4	3.3	6.4		6.6			3.3	
NE								3.3	6.6					3.2	6.6	13.3		20.0	16.1					3.3	3.3
ENE											3.2	12.9	3.2	6.4	6.6	3.3	10.3								3.3
E									6.6	6.4	9.7	6.4	6.4	6.4	10.0	6.6	13.7	6.6	9.7		3.3				
ESE											3.2	9.7	3.2	6.4	6.6	3.3		6.6							
SE										3.2	6.4		22.6		3.3		10.3	3.3							
SSE										3.2	6.4		3.2		3.3	3.3			3.2						
S																									
SSW	3.3	3.3					3.3	3.3	3.3	22.6	16.1	16.1	9.7	16.1	16.6	20.0	13.7	6.6	6.4	3.3	3.3				
SW		3.3	6.6						3.3		3.2	6.4	3.2	3.2	3.3		3.4					3.3		3.3	
WSW			3.3		3.3						3.2	9.7	12.9			3.3	3.4								
W	3.3	6.6						3.3	26.6	6.4	6.4	6.4		9.7	6.6		3.4	3.3	3.2	13.3					
WNW	16.6	6.6	20.0	16.6	6.6	10.0	10.0	10.0	3.3	6.4		6.4	6.4	6.4	6.6	3.3	10.3	16.6	3.2	6.6	3.3	6.6	6.6	6.6	20.0
NW	20.0		10.0	20.0	33.2	6.6	6.6	6.6	10.0	9.7	12.9	9.7	12.9	9.7	3.3	13.3			3.2	3.3	3.3	16.6	10.0	16.6	13.3
NNW	3.3	10.0	6.6	3.3	3.3	13.3	3.3								3.3		3.4				3.3	3.3	6.6	10.0	6.6
CALM	46.6	56.4	53.1	46.6	39.9	43.2	53.1	43.2	12.9					12.9	6.6	10.0	24.0	20.0	29.0	53.1	66.4	53.1	63.1	49.8	36.6

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

CHIVA CHIVA (Open site) MARCH 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		3.2	9.7		3.2	6.4	19.4	9.7	9.7	25.8	32.2	16.1	19.4	38.7	32.2	29.0	25.8	22.6	35.5	22.6	12.9	6.4	12.9	9.7	3.2
NNE		3.2			3.2		3.2			9.7	3.2	6.4	9.7	3.2	6.4	6.4	3.2	3.2	3.2						
NE																									
ENE										3.2	3.2														
E												3.2			3.2										3.2
ESE														6.4											
SE							3.2					3.2	3.2		3.2	3.2									
SSE													3.2									3.2			
S																3.2	3.2								
SSW					3.2																				
SW																									
WSW																									
W		3.2			6.4		3.2						3.2		3.2	3.2	3.2	3.2							3.2
WNW		6.4	3.2	6.4			9.7	3.2	6.4	3.2		3.2		9.7	6.4	9.7		6.4			3.2	3.2			
NW		51.6	54.8	58.1	64.5	67.7	32.2	67.7	51.6	29.0	35.5	32.2	25.8	32.2	16.1	32.9	32.2	16.1	19.4	22.6	32.2	45.2	51.6	51.6	64.5
NNW		32.2	32.2	35.5	19.4	22.6	29.0	19.4	32.2	29.0	25.8	35.5	35.5	9.7	29.0	32.2	32.2	48.4	41.9	54.8	51.6	45.2	32.2	38.7	25.8
CALM						3.2																			

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

CHIVA CHIVA (Open site) MARCH 1957

Relative Frequencies * of Wind Directions by Hour at 26.5 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	51.6	64.5	54.8	54.8	41.9	41.9	35.5	48.4	49.8	38.7	45.2	32.2	32.2	12.9	22.6	45.2	41.9	35.5	48.4	38.7	67.7	51.6	56.4	61.3
NNE	9.7	3.2	6.4	6.4	6.4	12.9	9.7	3.2	16.6	16.1	16.1	25.8	9.7	38.7	35.5	9.7	32.2	29.0	29.0	22.6	12.9	16.4	13.3	9.7
NE					3.2		3.2	9.7	10.0	22.6	16.1	16.1	29.0	16.1	6.4	12.9	9.7	16.1	3.2	3.2		3.2		
ENE		3.2				3.2			3.3				3.2	3.2	3.2	6.4	3.2	3.2						
E					3.2	3.2			3.3			3.2						3.2						3.2
ESE						3.2				3.2			3.2											
SE						3.2		3.2			6.4			3.2	3.2									
SSE												6.4		3.2										
S													3.2			3.2								
SSW															3.2									
SW						3.2																		
WSW																				3.2		3.2		
W			3.2	3.2	3.2		3.2									3.2								
WNW	3.2	3.2	6.4		3.2		3.2	3.2				3.2		3.2			3.2							3.2
NW	9.7	6.4	9.7	9.7	6.4	6.4	16.1	12.9	3.3		3.2		3.2	12.9	19.4	3.2	3.2			3.2	9.7	9.7	3.3	6.4
NNW	25.8	19.6	19.6	25.8	32.2	22.6	29.0	19.4	13.3	19.4	12.9	12.9	16.1	6.4	6.4	16.1	6.4	16.1	16.1	29.0	9.7	16.1	26.6	16.1
CALM																								

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

CHIVA CHIVA (Open site) MARCH 1967

		Relative Frequencies * of Wind Directions by Hour at 4.0 m (%)																							
Dir.	HL	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		3.2	6.4	12.9	3.2	9.7	16.1	12.9	3.2	29.0	22.6	29.0	22.6	32.2	32.2	19.4	12.9	32.2	19.4	35.5	19.4	3.2	6.4	9.7	6.4
NNE		6.4	9.7		6.4	6.4	12.9	6.4	6.4	6.4	6.4	3.2	3.2	12.9	12.9	6.4	12.9	6.4	3.2	3.2		6.4		3.2	
NE							9.7	3.2		3.2		3.2							6.4				3.2		3.2
ENE						3.2	3.2																		
E						3.2	6.4			3.2						3.2								3.2	
ESE												3.2		3.2	3.2										
SE						3.2								3.2		3.2							3.2		
SSE								3.2				3.2	6.4		3.2										
S																3.2	3.2								
SSW								3.2																	
SW			3.2																						
WSW			3.2	3.2	3.2	3.2		6.4																	
W		6.4	9.7	6.4	3.2	6.4		6.4	3.2				3.2		3.2	3.2		6.4				3.2			
WNW		16.1	3.2	9.7	12.9	12.9	3.2	9.7	19.4	6.4		3.2	6.4	6.4	6.4	16.1	6.4	3.2			6.4				
NW		58.1	45.2	45.2	58.1	41.9	32.2	25.8	51.6	29.0	32.2	25.8	22.6	22.6	9.7	16.1	35.5	19.4	16.1	6.4	38.7	51.6	51.6	58.1	64.5
NNW		9.7	19.4	22.6	12.9	9.7	16.1	19.4	16.1	25.8	35.5	29.0	35.5	19.4	29.0	29.0	29.0	22.2	54.8	54.8	35.5	35.5	25.8	16.1	3.2
CALM								3.2																	

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

SUMMARY OF NON HOURLY DATA

MARCH 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 1.5 meters)	Index value	434	65.6	76.0	83.2
		Dry bulb temp.	434	66.3	80.8	91.0
		Wet bulb temp.	434	65.4	73.5	81.0
		Black bulb temp.	434	66.6	82.2	95.5
	Evaporation ³ (in. at 4 levels)	Piche (46.0 m)	31	0.451	22.869*	0.970
		Piche (26.5 m)	31	0.281	14.324*	0.580
		Piche (13.5 m)	31	0.110	7.433*	0.311
		Piche (0.5 m)	31	0.061	5.957*	0.281
	Precipitation from Raingauge Network ² (in. at 1.0 meters)	Gauge # 1	1	1.42	1.42*	1.42
		Gauge # 2	1	1.39	1.39*	1.39
		Gauge # 3	2	0.02	1.68*	1.66
		Gauge # 4	2	0.01	1.63*	1.62
		Gauge # 5	2	0.01	1.48*	1.47
		Gauge # 6	2	0.01	1.84*	1.83
		Gauge # 7	2	0.02	1.46*	1.44
		Gauge # 8	1	1.56	1.56*	1.56
	Stem Flow ² (in. at 2.0 meters)	Small tree	1	36.62	36.62*	36.62
		Medium tree	1	3.80	3.80*	3.80
		Large tree	1	2.18	2.18*	2.18
Chiva Chiva (Open site)	WBGT Index ¹ (at 1.5 meters)	Index value	434	63.8	78.8	88.5
		Dry bulb temp.	434	64.0	84.0	95.5
		Wet bulb temp.	434	64.0	73.7	78.0
		Black bulb temp.	434	63.0	94.0	115.0
	Evaporation ³ (in. at 0.5 meters)	Piche	31	0.390	19.010*	0.769
		Pan	31	0.048	8.591*	0.363
	Minimum Grass temp ³ (°F at grass tips)	None	26	DTF.	65.5	71.5

1 - Hourly observations between 0600 and 1900 hours inclusive

2 - Six hourly observations

3 - Daily observations

Note: DTF. indicates data of doubtful validity.

* Total Values

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13. ABSTRACT

This report contains detailed microclimatic data for March 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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