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Climate and Moisture Variability in a Tropical Forest: Long-term Records from Barro Colorado Island, Panamá

Donald M. Windsor

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ABSTRACT

Windsor, Donald M. Climate and Moisture Variability in a Tropical Forest: Long-term Records from Barro Colorado Island, Panamá. *Smithsonian Contributions to the Earth Sciences*, number 29, 145 pages, 35 figures, 11 text tables, 40 appendix tables, 1990.—Long-term environmental monitoring results are presented documenting the seasonality experienced by the lowland tropical forest on Barro Colorado Island, Panamá. A dry season has developed during each of the past 62 years, typically starting in late December or early January and ending with the first heavy rains in late April or early May. Solar radiation totals climb during dry seasons to monthly levels 50% higher than normal in the wet season. Average daily maximum temperatures increase by two degrees C while average daily minimum temperatures increase by roughly one degree C. Development of the dry season is accompanied by a doubling in average daily windspeed and a drop of ten percent in average midday relative humidity.

Annual rainfall on Barro Colorado Island averages 2612 mm (1925–1989), 90% of which falls in the months of May through November. Rainfall on Barro Colorado Island and seven other sites in the middle of the isthmus has decreased significantly over time. The only long-term rainfall records without decreasing trend come from coastal sites, suggesting that convective, but not orographic, rainfall, has diminished during the last sixty years. Further, annual rainfall appears to be influenced by factors associated with El Niño events. Higher than normal rainfall tends to occur the year before and lower than normal rainfall tends to occur the year of such events. Dry-season forest and clearing temperatures on Barro Colorado Island were elevated during each of the three El Niño events occurring in the past 16 years.

Storms that drop most of their moisture in a minute or two are common during the wet season on Barro Colorado Island. The soils of Lutz catchment are steep and clay rich. Most moisture in storage resides in the upper 10 cm. Available soil moisture is largely depleted by mid- to late dry season.

Actual evapotranspiration, calculated as the difference between rainfall and runoff and changes in storage for each of 14 years averaged 64 percent of annual rainfall. Eighty-five percent (1534 mm) of annual rainfall was returned directly to the atmosphere as vapor in the dryest of the past 16 years (1976) while only 47% (1953 mm) was returned in the wettest year (1983). Comparison of average evapotranspiration and rainfall characteristics from 18 temperate and tropical hydrological studies suggests a loose positive relationship exists between these two quantities in forested ecosystems.

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Contents

Climate and Moisture Variability in a Tropical Forest: Long-term Records from Barro Colorado Island, Panamá

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Introduction

The duration and intensity of tropical seasons vary considerably more than one might expect from the invariant yearly cycle in the midday position of the sun. Dry seasons can be short or prolonged, drier than normal or broken up by brief periods of heavy rain. Wet seasons may vary greatly in the intensity and frequency of rainstorms and in the frequency and length of periods without rain. Important elements of tropical climate are probably neither as constant nor as predictable as is widely assumed. Climatic variability impressed biologists working on Barro Colorado Island in the 1960s and eventually led to a long-term monitoring study, the "Environmental Sciences Program" (ESP) whose goal was to document long-term variability in the physical environent in parallel with long-term observations on selected plant and animal populations. Results from the early part of this program are examined in Leigh et al. (1982).

The history of environmental research on Barro Colorado Island dates from the early 1920s. W.C. Allee (1926) was the first ecologist to attempt to characterize the physical environment on Barro Colorado Island. Using a ridge-top *Hura crepitans* tree in the northern part of the island as an instrument platform, Allee gathered readings on wind movement, solar radiation, and evaporation from subcanopy and compared these to readings from the understory and other sites in Panamá during the dry season of 1924. He was impressed by the physical rigors of the dry season and the buffering the forest canopy provided the forest understory. The first continuous records of climate on Barro Colorado Island were begun by the Panamá Canal Company in April 1925 when a rain gauge was installed in the lab clearing. This instrument was the only monitor of the physical environment for the next 45 years. Things changed abruptly in 1971 when STRI (Smithsonian Tropical Research Institute) scientists, Stan Rand and Nicholas Smythe, instituted a program that included continuous monitoring of runoff from a 10 ha catchment, and weekly assessments of soil moisture content, as well as weekly checks of plant phenology (Leigh and Smythe, 1978; Leigh and Windsor, 1982), periodic censuses of mammal populations (Smythe, 1978; Smythe et al., 1982), and what became a continuous operation of light traps for insects (Smythe et al., 1982; Wolda, 1978a,b, 1982). Smythe selected the Lutz catchment as the focus for the physical monitoring effort and supervised the mapping of the catchment, installation of the Lutz weir and light traps for catching night-flying insects, erection of instrument towers, and the systematic collection of many other types of environmental data over the first five years of the program—some of which have been carried on for another 10 or more years and are projected to continue indefinitely.

This report attempts to consolidate and summarize the large volume of environmental data collected on Barro Colorado Island and its surroundings. For some variables, this is a 15–17 year record ending sometime after March 1988, the end of the 1987 hydrologic year. Other variables were studied for shorter periods, primarily to investigate spatial differences in the physical environment. This report, then, includes the period covered earlier in four preliminary ESP reports on biotic studies and physical monitoring at Barro Colorado Island and Galeta Point Marine Lab (Rubinoff, 1973; Windsor, 1974, 1975, 1976). This report includes some data from that period that escaped inclusion in the early reports. Hourly records were not included because of their large volume. Preparation of this report necessitated the organization and printing of most hourly data. Copies of these data may be obtained by writing to the Smithsonian Tropical Research Institute, Apartado 2072, Balboa, Republic of Panamá. Finally, several tables and graphs

Donald M. Windsor, Smithsonian Tropical Research Institute, Apartado 2072, Balboa, Republic of Panamá.

are included presenting the long-term rainfall data gathered by the Panamá Canal Commission for a number of stations across the Isthmus of Panamá.

ACKNOWLEDGMENTS.—The terrestrial Environmental Sciences Program in Panamá was largely the inspiration of Stan Rand and Nicholas Smythe. Smythe first installed physical monitoring equipment and supervised the program for approximately seven years. Egbert Leigh has continually spoken in behalf of the monitoring program and has supervised the program at critical stages. Leigh's scrutiny of the weir and its water level recorder is the main reason we now have a long and little-broken record of stream discharge. Full-time technicians on the project who deserve thanks include Miguel Estribé, Gary Chen, Gary Stump, Milton Clark, Douglas Rocha, and Raul Rios. Bonifacio de Leon has always helped in data collection when asked and for 15 years kept the weir basin in good order. In the beginning, Ben Morgan constructed the weir in the Lutz catchment. William Dietrich greatly expanded our understanding of the physical processes at work in Lutz. Thanks are due Michael Keller for sharing his unpublished data on soil characteristics of BCI. The Panamá Canal Commission, especially meteorologist Mike Hart and hydrologists Joe Brady and Joe Corelli, have been extremely helpful in filling our requests for environmental information on numerous occasions. Finally, I must thank my colleagues at STRI and members of my family for the time to get these numbers together.

Setting

Barro Colorado Island (lat. 9°10′N, long. 79°51′W) was formerly the highest hill (maximum elevation, 171 m) along the northward flow of the Chagres River toward the Caribbean (Figure 1). Waters of the Chagres River were first impounded by the partial completion of the Gatun dam in 1910. When the waters of Gatun Lake reached their present level several years later, the fifteen square kilometers of Barro Colorado Island formed the largest island separated by these waters from the mainland. Under the custodianship of the Smithsonian Tropical Research Institute, the flora and fauna of Barro Colorado Island continue to be subjects of intense international scientific activity.

The Lutz catchment is a 10.1 ha forested area on the northeastern slope of Barro Colorado Island, not unrepresentative of the many small catchments draining away from the center of the island. Located immediately to the east of the lab clearing and dormitory area, the Lutz catchment (Figure 2) is immediately accessible to the scientists on the island. Human traffic within the catchment, however, is discouraged to minimize damage to the drainage characteristics and vegetation of the area. The highest point in the catchment is approximately 120 m (above mean sea level), 50 m lower than the highest point on the island plateau. The lowest point in the catchment considered in this report is the site of the weir (Figure 3*a*) at an elevation of approximately 60 m (the greater catchment actually terminates at the shore of Gatun Lake, elevation aproximately 25 m). Straight-line distance from the weir to the upper boundary along Barbour Trail is approximately 300 m. Thus, the catchment is steep and small, a distinct advantage when attempting to quantify the entry and exit of moisture to the area. A 42 m walk-up tower 10 m upslope from the weir provides a vertical transect through one bit of the forest and gives a view over most of the catchment. The top of the tower is judged to emerge roughly 6–8 m above an irregular canopy (Figure 3*b*).

Meteorological readings have been recorded in two principal areas, the lab clearing and the weir (including tower). The physical aspects of the clearing, a grass-covered area between Chapman House and the lab building (Figure 3*c*), have changed little since the start of the program. However, because of the proximity to buildings, the location must be regarded as less than ideal and readings should not be automatically regarded as representative of forest understory, canopy, or light gap conditions. Readings from this site are most useful as an index against which data from other parts of Barro Colorado Island can be compared. Lutz tower, located near the weir in the lower portion of the catchment (Figure 2), provides data more representative of the forest on Barro Colorado Island. Data are recorded at the base and at stations along the 40 m climb to the top.

Climate

RAINFALL

Appendix Tables A1–A4

Records on Barro Colorado Island rainfall were initiated in April of 1925 and continued until present by the Panamá Canal Commission (PCC). There are no missing monthly or annual totals over this entire period. Hourly, daily, and weekly totals (Figure 4) are available from January 1929 onward; however, several gaps (1–30 Nov 1957, 18 Mar–17 Apr 1963, and 12 Sep–18 Oct 1963) limit the usefulness of these data series for some purposes. Rainfall was initially read from chart records with 0.25 mm (0.01 in) precision until 1 Sep 1971 and with 2.5 mm (0.1 in) precision thereafter. Although the PCC rain gauge on Barro Colorado Island was relocated from time to time, all sites are thought to have been located between the current position on the roof of the dormitory (50 m above mean sea level, 25 m above the surface of Gatun Lake) and the water tank, roughly 100 m away and 10 m higher in elevation. Additionally, the ESP has maintained since 1971 a tipping-bucket gauge and one or two rainfall collectors in the lab-clearing. Rain collectors are read once per day, and because daily readings are occasionally missed, the rainfall for that day is included with that of the next. Hence, data from collectors ought to be analyzed for intervals longer than one or two days, preferably weeks, months, and years. Compared to data from these collectors, the PCC gauge and ESP tipping gauges have tended to underestimate rainfall by from 2% to 12%, depending

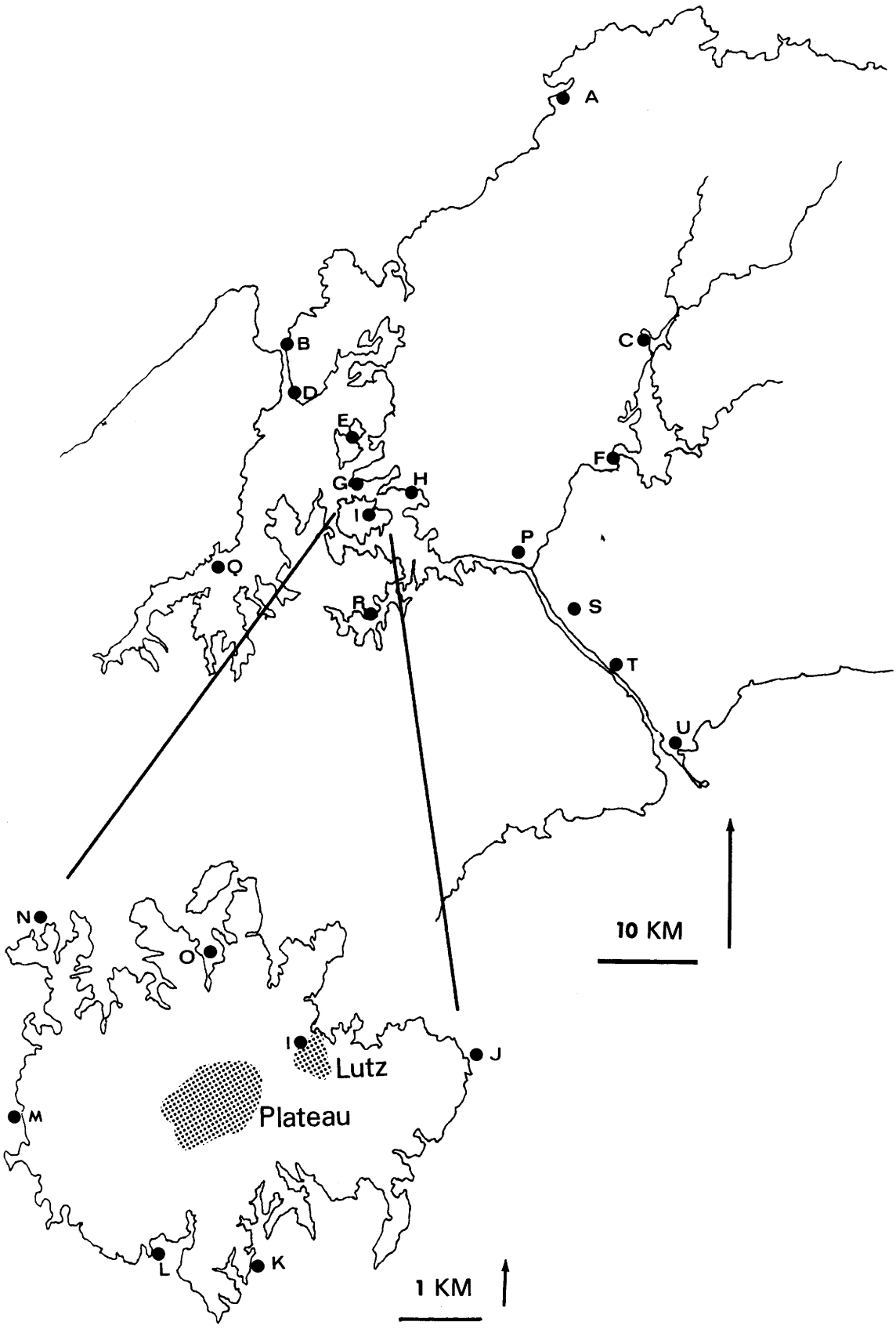


FIGURE 1.—Location of Barro Colorado Island on Isthmus of Panamá, distribution of rain gauges across the isthmus (A = Porto Belo, B = Colon, C = Salamanca, D = Gatun, E = Monte Lirio, F = Madden Dam (Alajuela), G = Bohio, H = Frijoles, I = Barro Colorado Island, J–O = BCI perimeter gauges, P = Gamboa, Q = Las Raices, R = Caño, S = Summit Gardens, T = Pedro Miguel, U = Balboa) and location of the Lutz catchment and plateau on Barro Colorado Island.

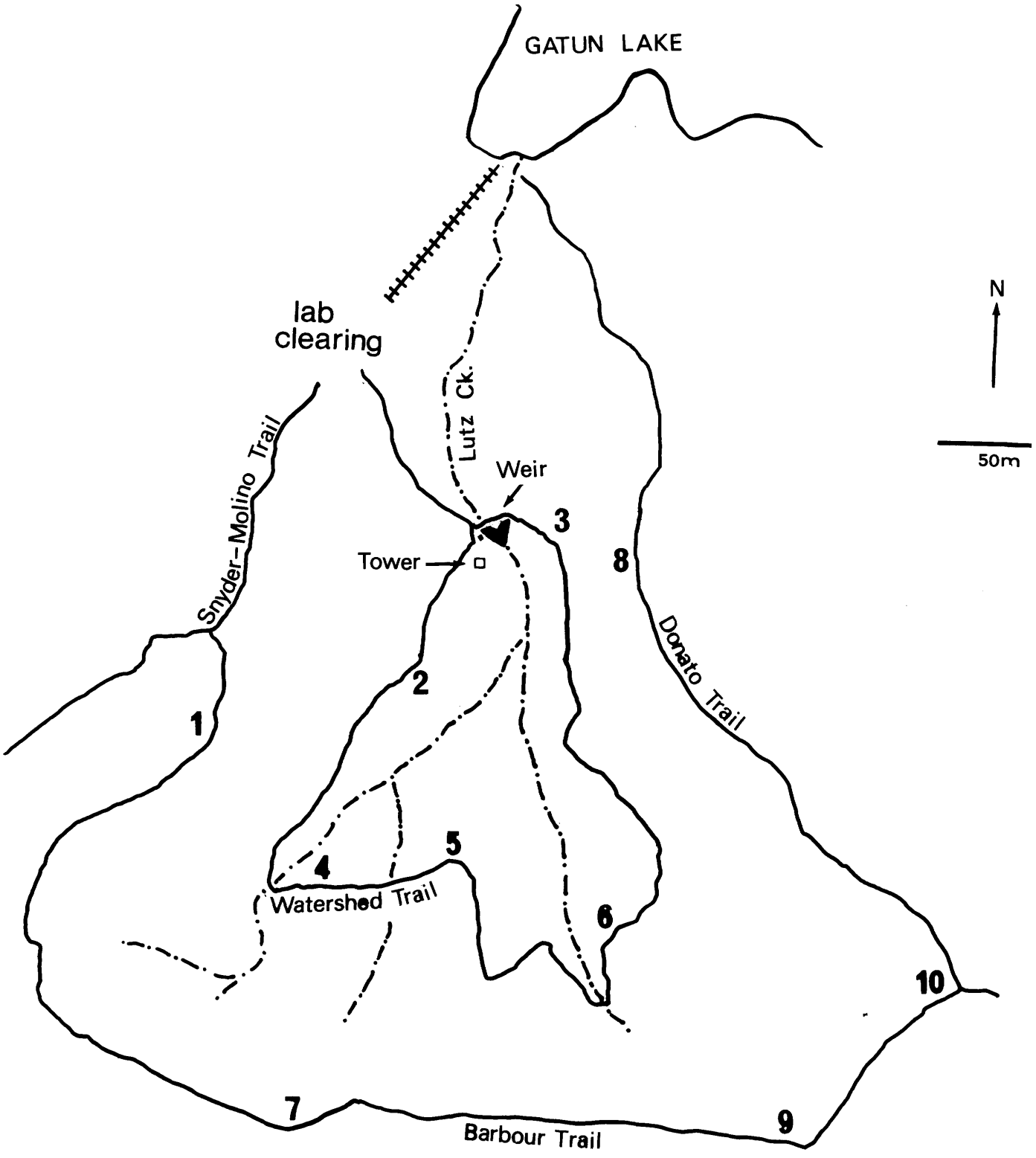


FIGURE 2.—Rough map of the Lutz catchment; numbers indicate soil sampling sites utilized since 1981. Prior to 1981 samples were taken along a 20 m transect extending from station 2 on the watershed trail toward Lutz Creek.

on year. Tipping bucket gauges are particularly useful in the study of temporal characteristics of individual storms. A DP101 Datapod (Omnidata International, Logan, Utah) installed in May 1983 digitally records the number of "tips" (0.254 mm of rainfall) per minute.

ANNUAL TOTALS.—Annual rainfall on Barro Colorado Island, according to the Panamá Canal record, averages 2612 mm (1925–1986, Sdv = 446, n = 62). Barro Colorado Island registered its lowest rainfall (1679 mm) in 1976 and its highest (4133 mm) in 1981 (Figure 5). The frequency distribution of annual rainfall totals is moderately platykurtic and hence bears only a modest fit to a normal distribution. The departure from normality may be produced in part by presence of a long-term trend in the record. That is, annual totals bear a significant negative correlation with year of record. Using the slope of the least squares regression line as an indicator of trend, rainfall on Barro Colorado Island appears to be decreasing at the average rate of 8 mm per year (1925–1986). The trend is significant despite the massive rainfall in 1981. Other stations in mid-isthmus with long-term records also display a decline in rainfall (Appendix Table A4). Monte Lirio, 12 km north of Barro Colorado Island, exhibits the strongest decline of all stations with at least 45 years of data. Long-term trends appear to be strongest at sites located in mid-isthmus (Figure 6*b*). Records from stations along either coast do not contain significant trends.

The Monte Lirio rainfall record may provide a good indication of how annual rainfall may have varied in the two decades before records were begun on Barro Colorado Island. Monte Lirio data, as well as data from Colon, Gatun, and Gamboa, indicate 1909–1910 was the wettest two-year period of the century. More rain was registered in each of these years at Monte Lirio than fell in the recent extremely wet year, 1981. The 7.22 m of rain in 1909 is still the maximum for Colon in over 132 years of record.

The lack of long records from other regions in central Panamá obscures the eastern and western limits of this apparent rainfall anomaly. A similar rainfall anomaly appears to exist in northwestern Costa Rica (Windsor and Rand, 1985; Fleming, 1986), and Flohn (1969) presents the decreasing records from several Brazilian locations. Although these two areas are distinct in many ways, they do share the characteristic of being immediately to the south or southwest of mountainous terrain. Because prevailing winds are from the north and northeast, both areas are in "rain shadows," areas where advected moisture is blocked and convection consequently becomes relatively a much more important source of moisture.

What could cause a decrease in rainfall over mid-isthmus? Commonly it is suggested that downward trends in Panamá are simply statistical artifacts. This could be claimed with some justification if only one or perhaps two of the 17 longest records (greater than 44 years) displayed anomalous trends. However, Spearman correlation coefficients are negative at 14 sites and positive at only three. The probability of obtaining these results by chance is the same as flipping 14 heads in 17 tosses—less than one chance in two-hundred! Further, 10 of 14 correlation coefficients negative in sign are individually significant at the $p = 0.05$ level or less. None of the stations has a significant positive trend. Therefore, it seems safe to conclude that rainfall within the catchment of the Panamá Canal has changed (diminished) significantly in this century. Although this trend could disappear or reverse before the end of the century, its presence in the rainfall record through 1989 is hard to contest.

Convection, the daily heating and subsequent rise of moist air followed by turbulence and thunderstorms, is clearly an important generator of tropical rainfall (Dickinson, 1981; Henderson-Sellers, 1981). Has convection weakened over the middle of the isthmus while the supply of advected moisture (moisture derived from adjacent areas) and its orographic delivery (air forced upward over topographic relief leading to condensation and rainfall) along the coasts remained constant? Any process that increases the reflectivity of the land produces a cooler surface, one that tends to weaken convection. A more reflective land surface is a sure consequence of converting tropical forest to pasture or degraded land as has occurred in recent decades over nearly all of the Pacific side of Panamá (Pinker et al., 1980). Additionally, the percent of rainfall rushing off the disturbed land as runoff probably increases, while soil and vegetational moisture stores decrease, thereby further diminishing the return of vapor by evaporation and transpiration (Gentry and Lopez-Parodi, 1980). If deforestation does affect climate in the way suggested here, we might predict effects will be seen first in 'reas with s)milar geographical characteristics, viz. areas where convection is the primary source of rainfall.

Could changes in rainfall in the middle of the Isthmus of Panamá be the result of creating Gatun Lake (1910) and Madden Lake (1934), both of which are near the middle of the isthmus where trends are strongest? Lake effects would include cooling, weakened convection, and possibly lower rainfall. These effects, however, would be expected to appear in a step-wise rather than progressive fashion. The behavior of annual totals in Figure 5 is not totally inconsistent with this explanation. Rainfall has continued to decrease over the past two to three decades, however, well after the formation of the second reservoir.

Climatologists have been particularly concerned about the effects of increasing concentrations of atmospheric carbon dioxide and increasing temperatures due to the "greenhouse" effect (Broecker, 1975). Computer models of general circulation project increasing rainfall for regions within five degrees of the Equator and poleward of 30 to 35 degrees and possible decreases in rainfall between these two areas. A comprehensive review of long-term rainfall records from the entire northern hemisphere by Bradley et al. (1987) found that trends in precipitation are essentially consistent with the computer models. Thus, the Panamá records are consistent with computer models of changing global circulation as the result of

FIGURE 3.—Photographs taken in 1987 of Lutz creek weir (top left); forest canopy looking south from top of Lutz tower (bottom left); and lab clearing and instrument shelter (above).

increasing carbon dioxide.

In summary, at least two rainfall anomalies occur in lower Central America, one of which appears centered within the Chagres River watershed and the Panamá Canal. A number of competing explanations based on local, regional, and global environmental change can be advanced.

SEASONAL DIFFERENCES IN RAINFALL.—The seasonal distribution of rainfall in Central America and its underlying causes have been discussed by Ellis (1962), Vivo Escoto (1964), Portig (1965, 1976), and Coen (1983). The seasonal rhythm of rainfall is thought to be driven primarily by the effects of the changing zenithal position of the sun. The most intense warming of the Earth's surface occurs over land at the latitude where the sun is near the zenith at midday. Thus, the sun maximally warms a narrow belt of land that oscillates between 23 degrees north and south latitude during the course of a year. A loose band of low pressure and cloudiness, wider over land than ocean, is usually situated near the theoretical belt of maximal warming. This band of cloudiness and low pressure is referred to as the Intertropical Convergence Zone (ITCZ).

The northward movement of the ITCZ and the dry season-breaking rains it generates usually lag behind the sun's crossing of the zenith by several weeks. The sun is at its zenith over Panamá on or near 20 April (week 15) and 21 August (week 33). Rainfall on Barro Colorado Island normally returns to wet season levels by week 18 (Figure 7). Weekly rainfall has three noticeable peaks on or around weeks 20, 32, and 45. The final peak occurs in November–nearly 10 weeks after the sun's zenithal position has moved south of Panamá. Thus, factors other than the zenithal position of the sun, perhaps the strength of circulation patterns in subtropical areas, seem also to affect seasonal distribution of rainfall. Rainfall during the latter part of the wet season and early dry season may be influenced, for example, by "northers"—southward invasions of polar air—that may produce heavy and unseasonal rainfall. These events may, in turn, dramatically influence the phenological patterns of tropical forest trees (Foster, 1982).

Biologists commonly wish to know when the dry and wet seasons begin and end. Because there is no commonly accepted criterion for what constitutes either season there is no simple answer. Indeed, organisms probably have a diverse way of gauging seasonal transitions and their estimates might vary considerably. As a first start, however, we can assume that many organisms, especially plants, will respond to changes in soil moisture. A moving average that sums one-half of rainfall

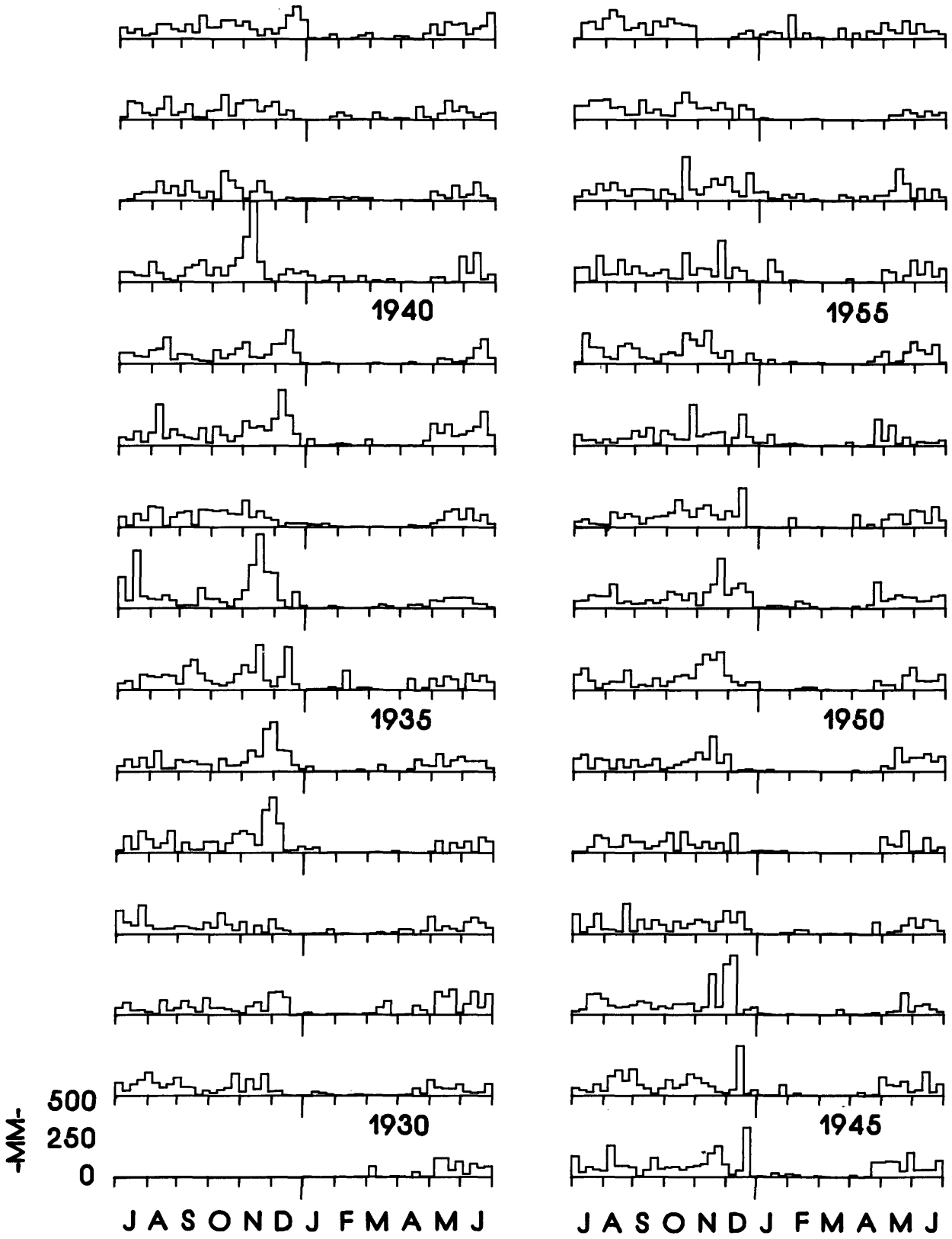
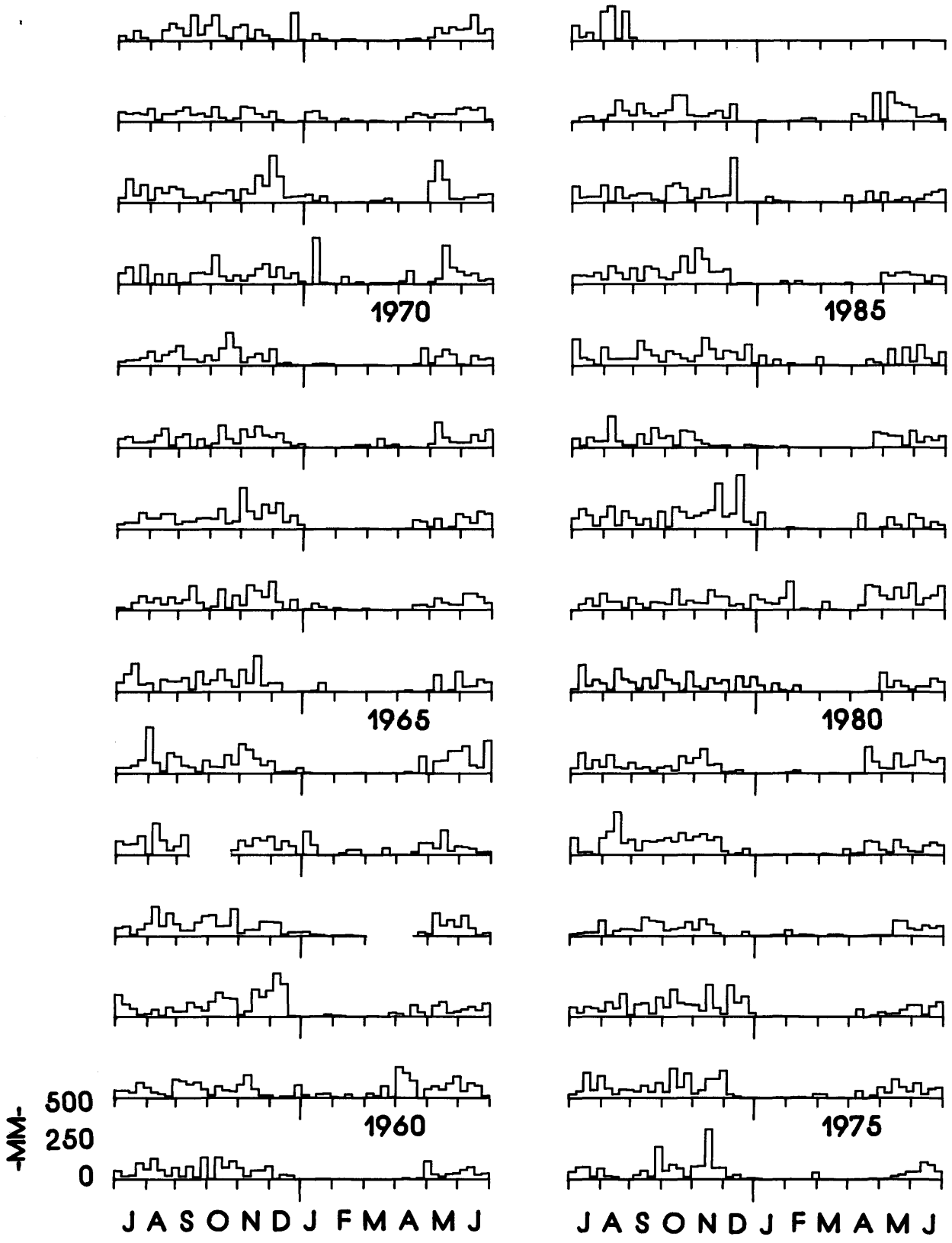


FIGURE 4.—Record of weekly rainfall recorded on Barro Colorado Island January 1929 to August 1988 by the Panamá Canal Commission. Breaks in x-axis signify weeks of missing data.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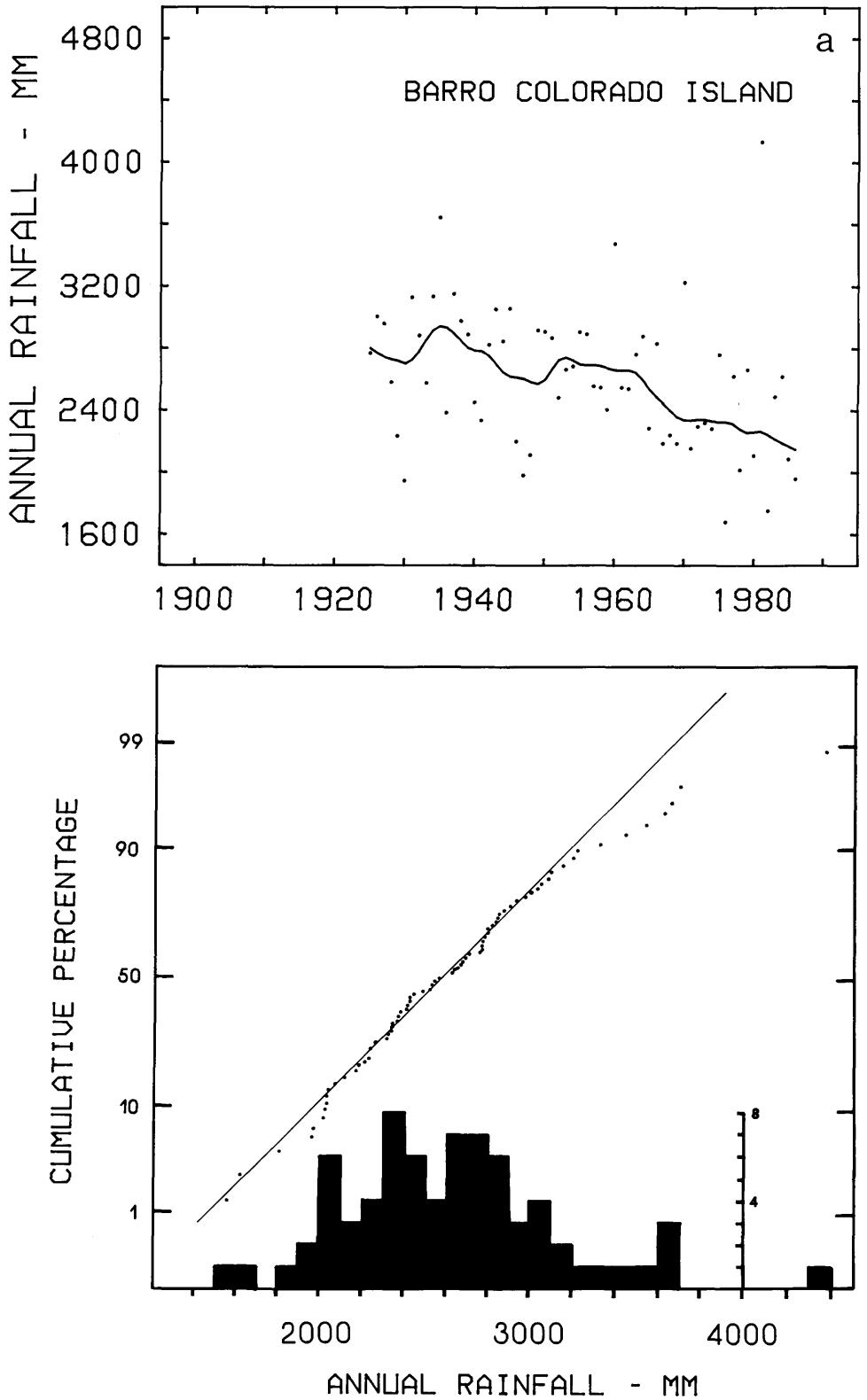
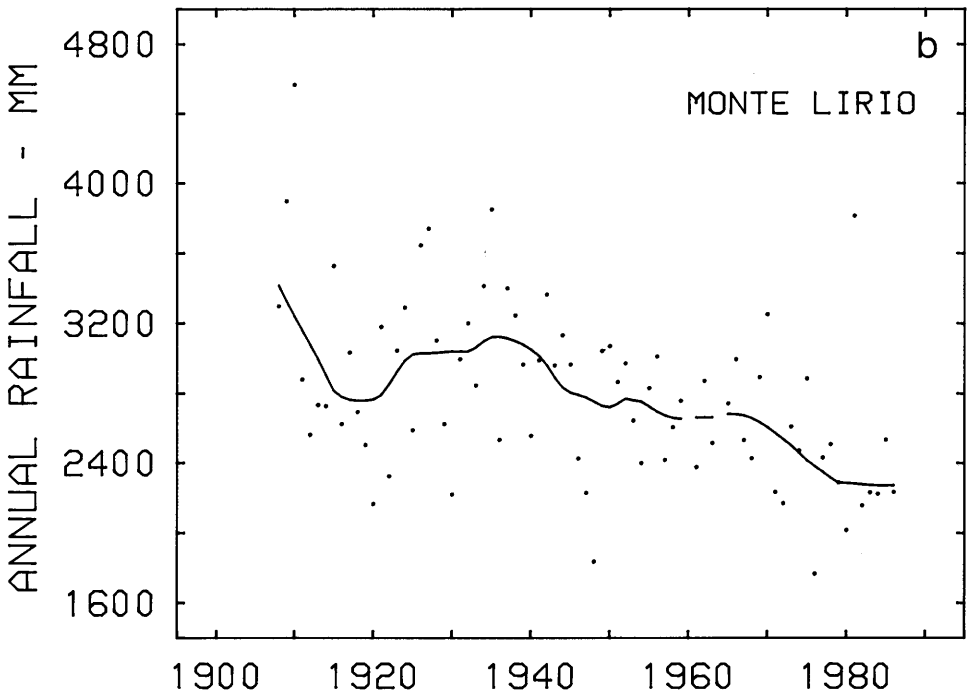


FIGURE 5.—Distribution of annual rainfall totals and cumulative probabilities of differing annual rainfall totals for (*a*) Barro Colorado Island and (*b*) Monte Lirio. Cumulative probabilities were plotted on "normal probability paper" so that, had annual rainfall been normally distributed, these points would have formed a straight line. Annual rainfall totals (dots) received at the same two sites were smoothed (line) using Cleveland's LOWESS algorithm (F = 0.2; Wilkinson, 1986).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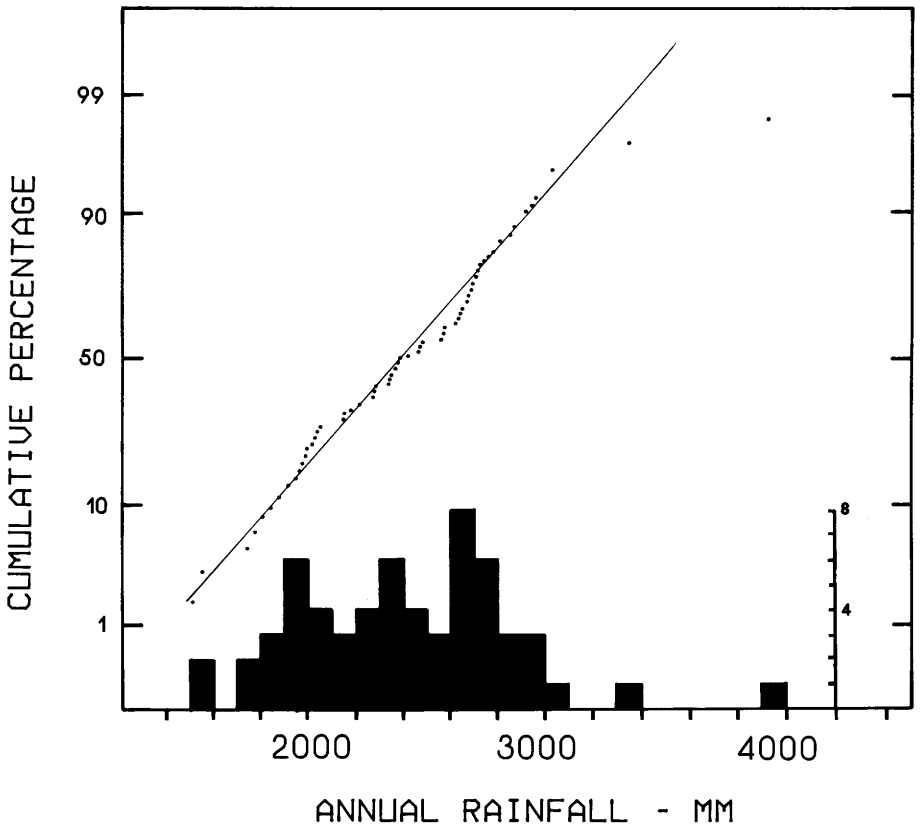
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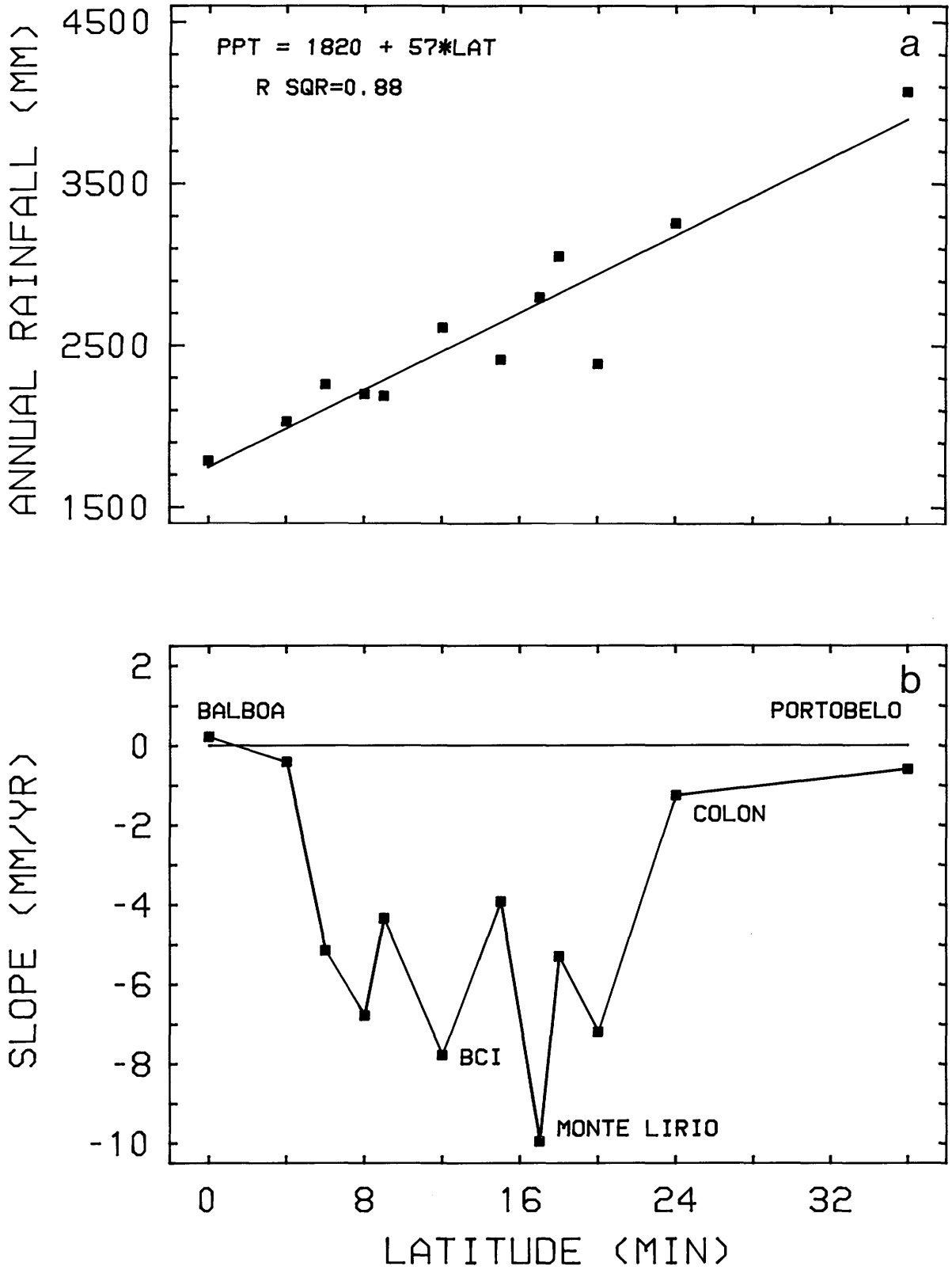

FIGURE 6.—Average annual rainfall for (*a*) twelve stations distributed south to north across the Isthmus of Panamá, and (*b*) slope of a linear regression line fitted to annual rainfall totals over time for each of the same stations.

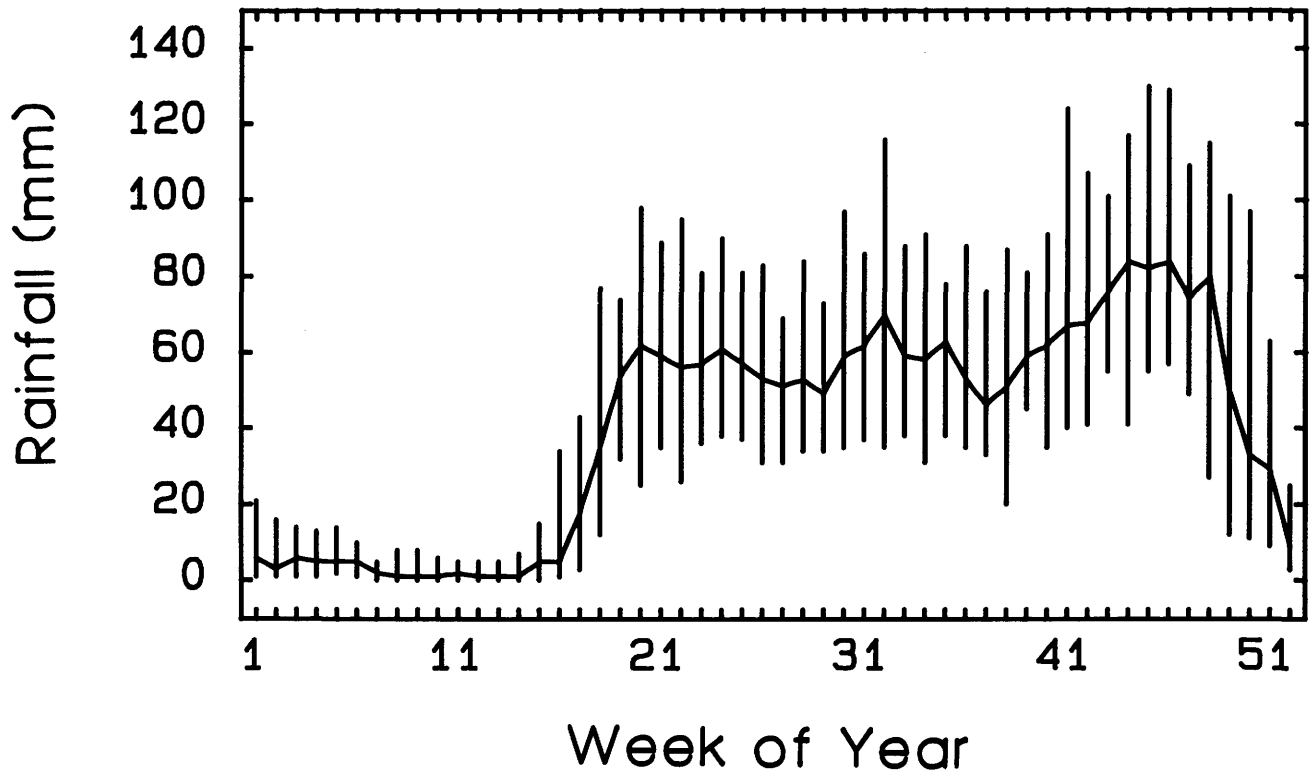

FIGURE 7.—Median (line) and first and third quartiles (bars) of weekly rainfall on Barro Colorado Island for years 1929–1984.

at time "t", one-fourth of rainfall at "t-1," one-eighth of rainfall at "t-2,"...etc., produces a curve that closely parallels observed values of soil moisture (percent by weight). Further, when this sum is less than 20 mm, soil moisture is usually at or less than 30%—a suitable break point for determining dryness or wetness. I have used this procedure to classify all weeks in the rainfall record since 1929 as either dry or wet (Table 1). Next, I defined the start of the dry season as any run of three "dry" weeks. Similarly, the wet season was defined as any run of three "wet" weeks. Although, clearly, there are reversals in conditions, especially wet periods appearing during dry seasons, the method is reasonably objective while agreeing with most people's subjective feel for the change of tropical seasons on Barro Colorado Island. Figure 8 was constructed from the likely starting dates employing this procedure. The modal start of the dry season is the second week of the year although the start has been as early as week 48 and as late as week 11. The distribution of wet season starting dates is narrower. Most wet seasons begin between weeks 16 and 19 (mode = week 18). The median length of dry seasons is 17 weeks (76% of dry seasons lasted 13 to 19 weeks).

The march of daily probabilities of rainfall across the year follows much the same pattern as the quantity of rainfall by date (Figure 9). The probability of measurable rainfall on a daily basis is least (0.2) during the third week of March, but climbs rapidly through the last two weeks of April and first two weeks of May. Highest daily probabilities of rainfall come in late October and early November when the chance of rainfall exceeds 0.8.

The convectional nature of rainfall on Barro Colorado Island is clearly demonstrated by the highly non-uniform distribution (Figure 10). Probability of rainfall is always highest in the four hours following midday. Highest hourly probabilities of rainfall ($p>0.2$) occur between 1300 and 1600 hrs during weeks 20–22 and 36–45. Dry season probabilities of rain are low, of course, at all hours of the day. Starting in week 17, however, the probability of rain increases sharply.

Afternoon rainfall may be stronger at some sites on the isthmus than others. For example, the likelihood of afternoon rainfall (calculated for the entire year based on data from 1980–1984) on Barro Colorado Island is nearly twice that at the Galeta Point Marine Laboratory located just off the Caribbean coast 6 km northeast of Colon (Figure 11). Afternoon rainfall is four to five times as likely as evening rainfall at Barro Colorado Island, only 1.5 to 2 times as likely at Galeta. The forested surface of Barro Colorado Island is quickly heated by the sun causing surrounding air to rise, cool, condense, and release moisture as rain in the unstable conditions of a tropical thunderstorm in the middle afternoon. The relatively cool ocean surface at Galeta is far less effective at heating the surrounding air. As air moves inland it is forced to rise and the resulting "orographic rainfall" may account for the more even hourly distribution of rainfall observed on the Caribbean coast.

TABLE 1.—Distribution of dry and wet weeks within and among years on Barro Colorado Island, 1929-1988; moisture status of a week is determined from rainfall according to formula given in text. (Dash = dry, x = wet, nd = total number of dry weeks, sd = numbered week when dry season starts, sw = numbered week when wet season starts, ld = total number of weeks in dry season, lw = total number of weeks in wet season, blank spaces indicate missing data.)

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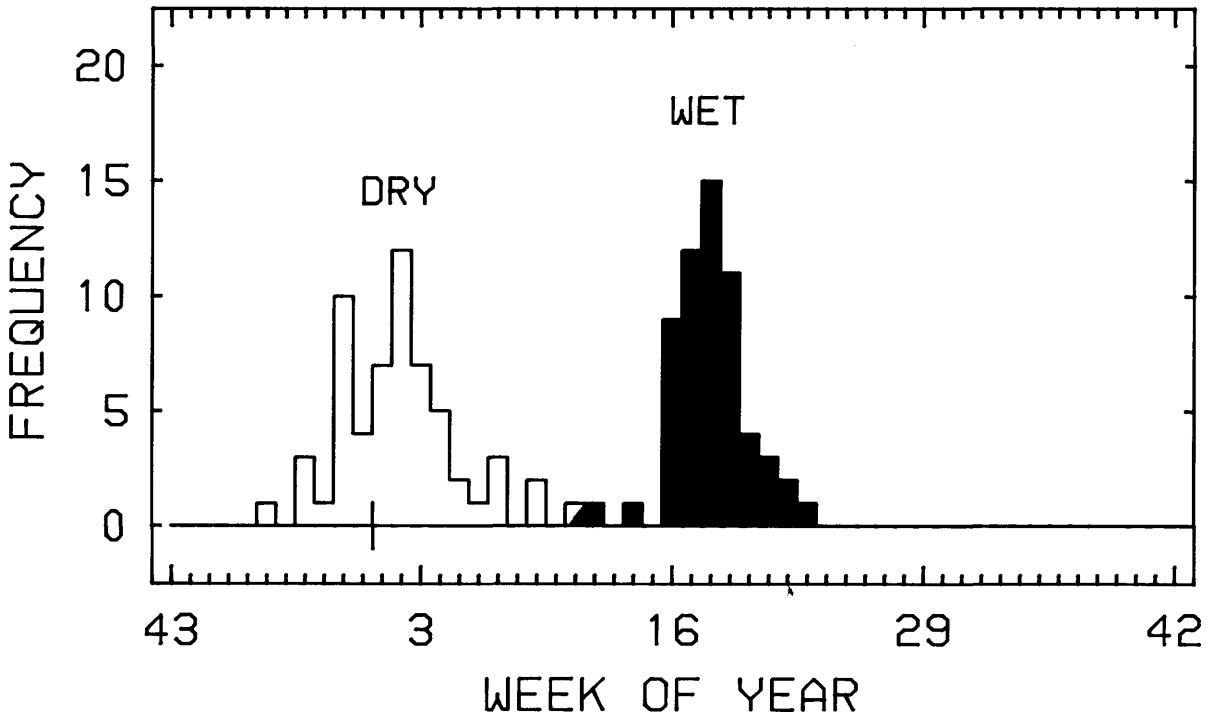


FIGURE 8.—Distributions of onset dates for dry and wet seasons on Barro Colorado Island (1929–1988).

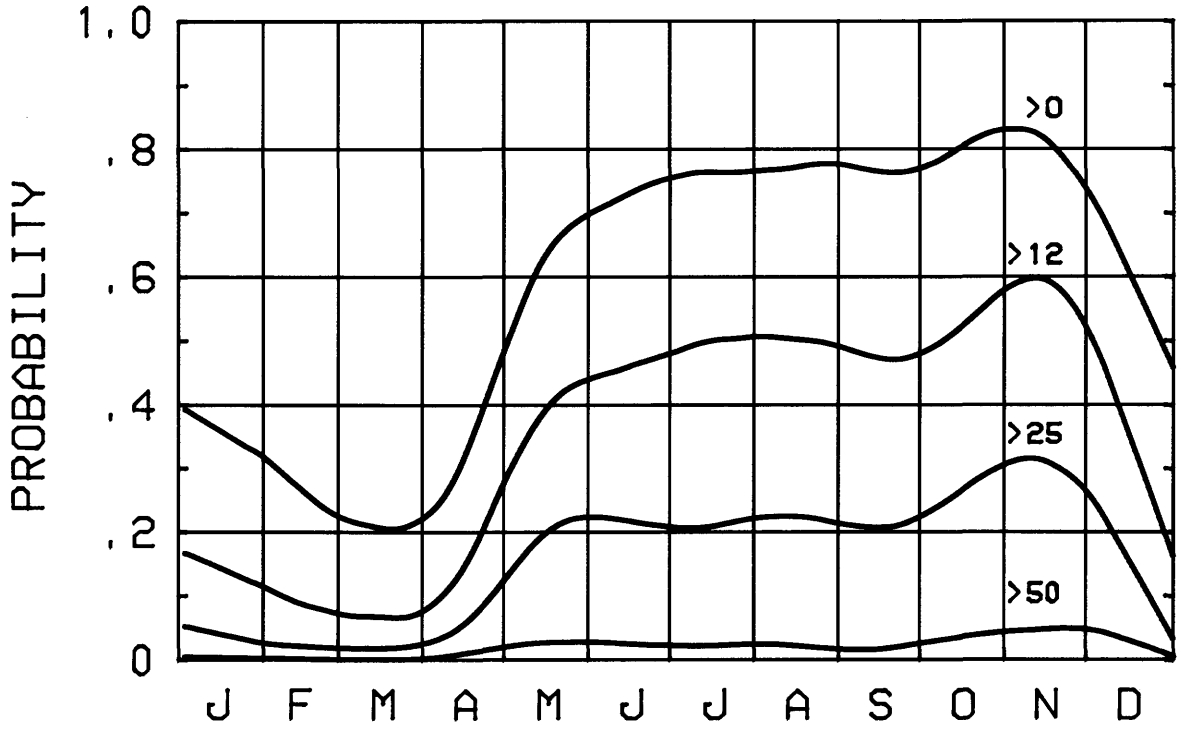


FIGURE 9.—Probability for any particular day of the year of obtaining a measurable amount of rainfall (>0), an amount greater than 12.7 mm (>12), greater than 25.4 mm (>25) and greater than 50.8 mm (>50). Probabilities were calculated from 58 years of daily rainfall records for Barro Colorado Island.

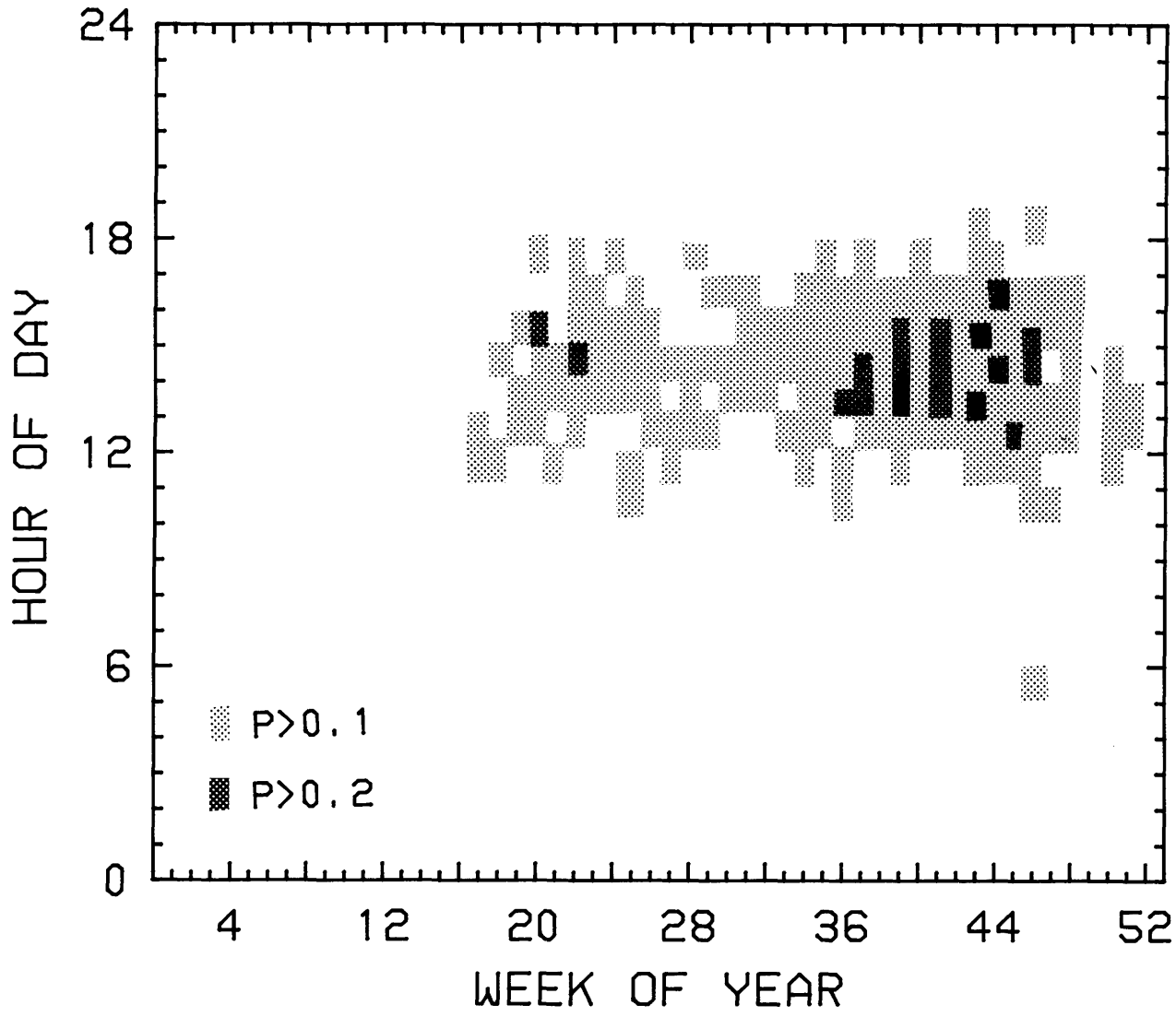


FIGURE 10.—Distribution of higher probabilities (>0.1 and >0.2) of obtaining rainfall within the day and across the year on Barro Colorado Island. Data were compiled from the record beginning in 1929 and ending with 1984.

On Barro Colorado Island a high proportion of the rain associated with a convective storm may fall in a very few minutes within storms lasting an hour or longer (Figure 12). Between May 1983 and December 1985 there were 64 storms with rainfall totalling at least 25 mm for which we have detailed records (Table 2). The median duration of these storms was 150 minutes (range: 17–1269 min). Ten mm or more of rain fell in a single minute in 23 of these storms. The maximum rainfall in a single minute exceeded 30% of the total catch in 21 storms, 50% in 8 storms. The highest intensity was 92 mm, which fell in a single minute of a 116 mm storm, 2 July 1983. Relatively low-intensity rainfall (<2.5 mm/min) characterizes the remaining time in most storms. Although intense rainfall can occur at any time within a storm, there was a significant tendency for peak intensities to occur more commonly in the first half of the storm (41 of 64). The effects of high-intensity rainfall may be observed in overland flow ("surface runoff")

TABLE 2.—Quantity (percent) of rain falling during the minutes of highest and next to highest intensity; 64 storms each totalling at least 25 mm were sampled from 1983 through 1985.

Percent of storm falling in one minute	Number of storms	
	One minute interval of storm receiving greatest catch of rain	One minute interval of storm receiving next-to-greatest catch of rain
0–10	32	60
11–20	11	3
21–30	0	0
31–40	6	1
41–50	7	0
51–60	4	0
61–70	1	0
71–80	2	0
81–90	0	0
91–100	1	0
Total	64	64

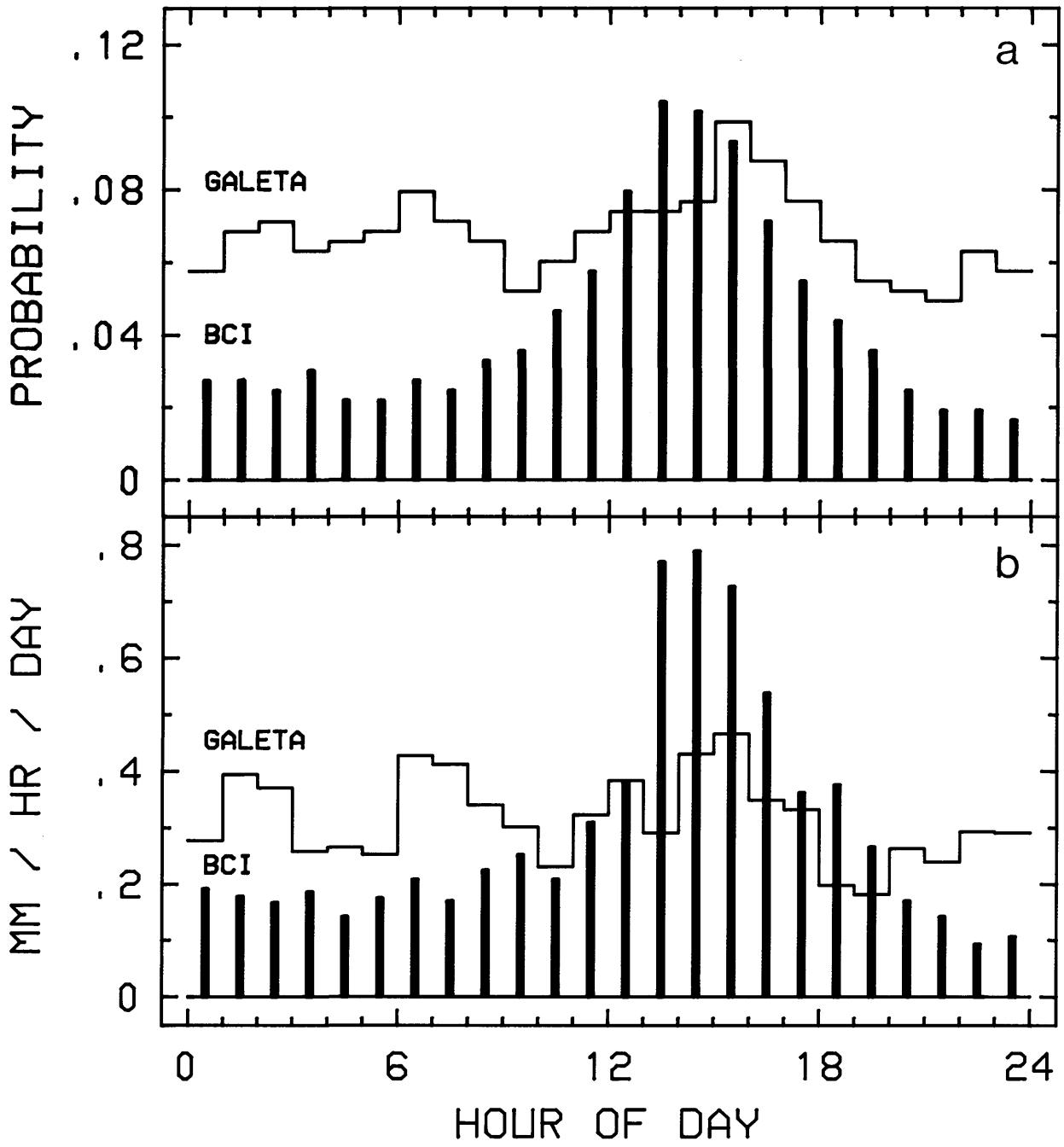


FIGURE 11.—Comparison of coastal (Galeta Point Marine Laboratory) and continental (Barro Colorado Island) rainfall characteristics in Panamá: (*a*) probability of rainfall by hour and (*b*) quantity of rainfall (in mm) by hour for 1980–1984.

when rates of infiltration are exceeded.

Rain storms on Barro Colorado Island tend to be of short duration. Defining a rain storm as an uninterrupted sequence of hours with measurable rain, there were 3795 rain events between 1970 and 1984 or roughly 250 per year (Table 3). Seventy percent of these events lasted one hour or less. Forty-six percent of all rain events in this period occurred in the latter half of the wet season (Sep–Dec), 42% in the first half of the wet season (May–Aug) and the remaining 12% in the dry season. In addition to being far fewer in number, dry season rains are often shorter as 78% lasted one hour or less.

PREDICTABILITY.—Are there predictable aspects of rainfall on Barro Colorado Island? Hourly, daily, and weekly rainfall totals are all serially correlated (Table 4). Thus, the best predictor of rainfall on a particular day is knowledge of rainfall on the previous few days. Similarly, rainfall during a particular

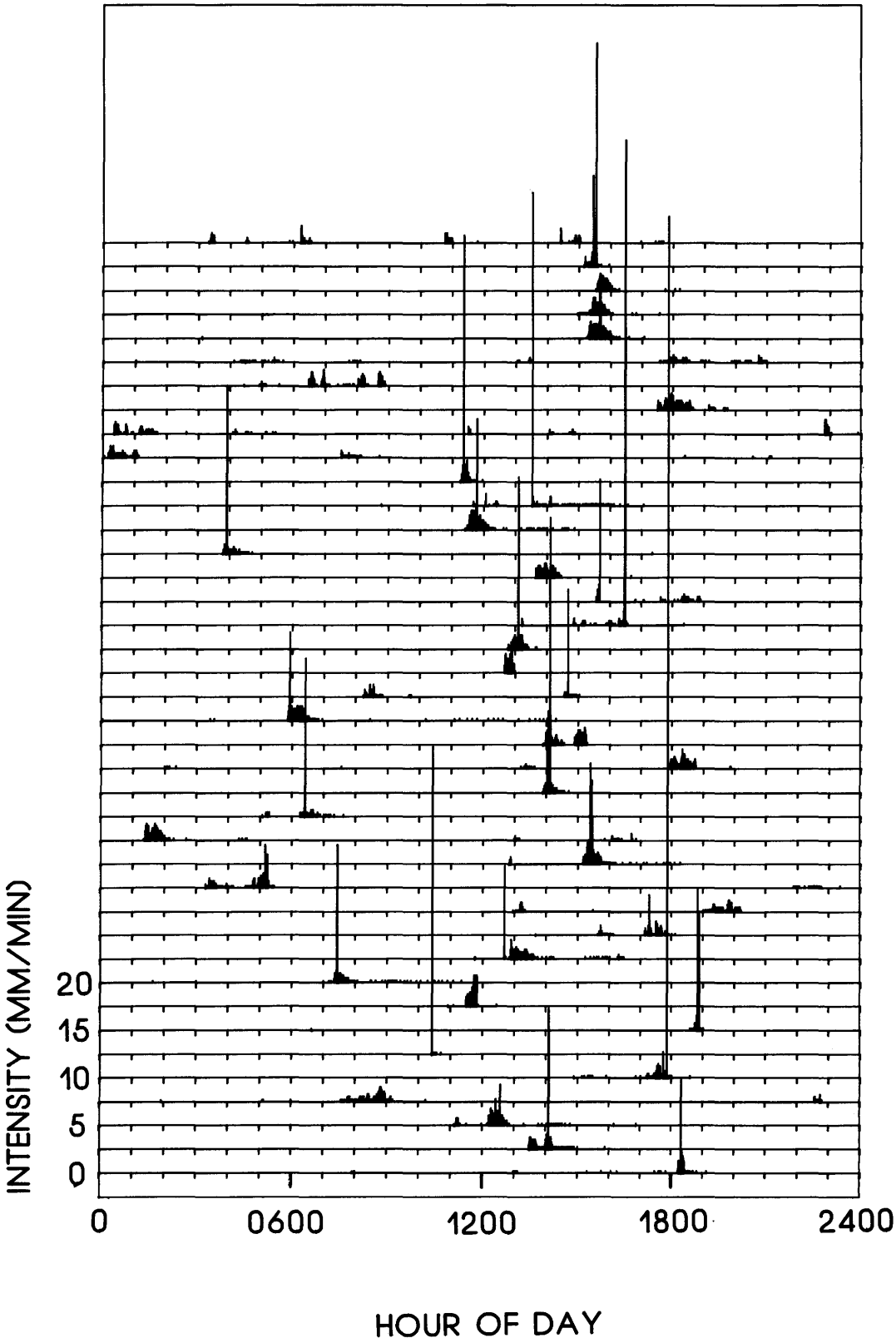


FIGURE 12.—Intensity of rainfall by minute for 40 days (each horizontal axis represents one day). All days with total accumulation of at least 25 mm, occurring between May 1983 and December 1985, were included in graph.

TABLE 3.—Frequencies of rain storms of varying duration and intensity for dry season, early wet season, and late wet season compiled from hourly tipping bucket data (PCC) for years 1970–1984.

Duration (hours)	Dry season Jan–Apr	n	Early wet season May–Aug	n	Late wet season Sep–Dec	n	Total	n
0–1	0.779	391	0.701	1092	0.693	1202	0.708	2685
1–2	0.135	68	0.202	314	0.201	348	0.192	730
2–3	0.042	21	0.063	98	0.063	110	0.060	229
3–4	0.018	9	0.021	32	0.028	48	0.023	89
4–5	0.010	5	0.009	14	0.009	15	0.009	34
>5	0.016	8	0.005	8	0.007	12	0.007	28
Intensity (mm/hr)								
<2.5	0.633	318	0.500	779	0.472	819	0.505	1916
2.5–5	0.139	70	0.130	203	0.148	257	0.140	530
5–7.5	0.056	28	0.065	101	0.093	161	0.076	290
7.5–10	0.048	24	0.058	91	0.060	104	0.058	219
10–12.5	0.022	11	0.039	60	0.035	60	0.035	131
12.5	0.102	51	0.208	324	0.193	334	0.187	709
Total		502		1558		1735		3795

week is most likely to resemble that during the preceding week, and so on. Rand and Rand (1979) investigated the predictability of rainfall on Barro Colorado Island using modeling techniques. An autoregressive model was first constructed where rainfall in any week was considered a constant plus another constant times the rainfall during the previous week (lag = 1) plus another constant times the rainfall during the previous week (lag = 2), etc. Only the final three lags were useful in predicting weekly rainfall, giving an r^2 of 0.41. This suggested that knowledge of rainfall from three consecutive weeks permits one to reduce uncertainty about the next week's rainfall by roughly 40%. The degree to which weekly rainfall can be predicted from preceding rainfall is interesting because this information should be available to most organisms.

TEMPORAL AND SPATIAL VARIABILITY.—One may ask if rainfall is more variable in any particular time of the year. The question can be further refined by asking whether there are times of greater absolute and relative variability. The standard deviation of cube root transformed weekly rainfall provides an estimate of the absolute variability. The coefficient of variation (standard deviation divided by the mean) computed for the same transformed values provides a relative estimate of variability. Absolute variability graphed through the year in Figure 13 is level through both wet and dry seasons with two small peaks occurring during the seasonal transitions (weeks 14–18 and 45–52). Relative rainfall variability, however, climbs throughout the dry season with highest values occurring in weeks 12–14.

The long term meteorological records collected at many sites across the isthmus by the Panamá Canal Company reveal that average annual rainfall increases rapidly and consistently as one moves north across the Isthmus of Panamá. Rainfall on the Pacific coast averages roughly 1700 mm per year and increases to over 4000 mm per year on the Caribbean coast near Portobelo–an increase of roughly 35 mm per year per km (Figure 5*a*). The long-term average from Barro Colorado Island fits close to the regression line.

From these observations, one can calculate that rainfall ought to be roughly 100 mm higher on the north side of Barro Colorado Island. The catch of rainfall on different sides of Barro Colorado Island has been examined (Rand and Rand, 1982). Rainfall in seven collectors placed around Barro Colorado Island (Figure 1) was read at two week intervals over a four-year period. The results (Table 5) suggest that annual rainfall does not vary greatly across Barro Colorado

TABLE 4.—Partial autocorrelation coefficients calculated for Barro Colorado Island rainfall record divided into intervals (lags) of differing length ("n" = number of elements in each time series).

Lag	Day	Week	Month	Year
1	0.561	0.589	0.421	–0.160
2	0.270	0.247	–0.086	0.019
3	0.202	0.159	–0.144	–0.163
4	0.177	0.069	–0.150	0.017
5	0.164	–0.007	–0.127	–0.172
6	0.104	–0.004	–0.089	0.044
7	0.116	–0.027	–0.252	0.009
8	0.060	–0.075	–0.206	–0.141
9	0.073	–0.050	–0.060	–0.074
10	0.072	–0.079	0.044	–0.070
11	0.064	–0.015	0.263	0.229
12	0.065	–0.047	0.346	–0.159
13	0.031	–0.052	0.020	–0.268
14	0.046	–0.045	–0.035	–0.167
15	0.036	–0.040	–0.099	–0.048
n	4096	2808	720	61

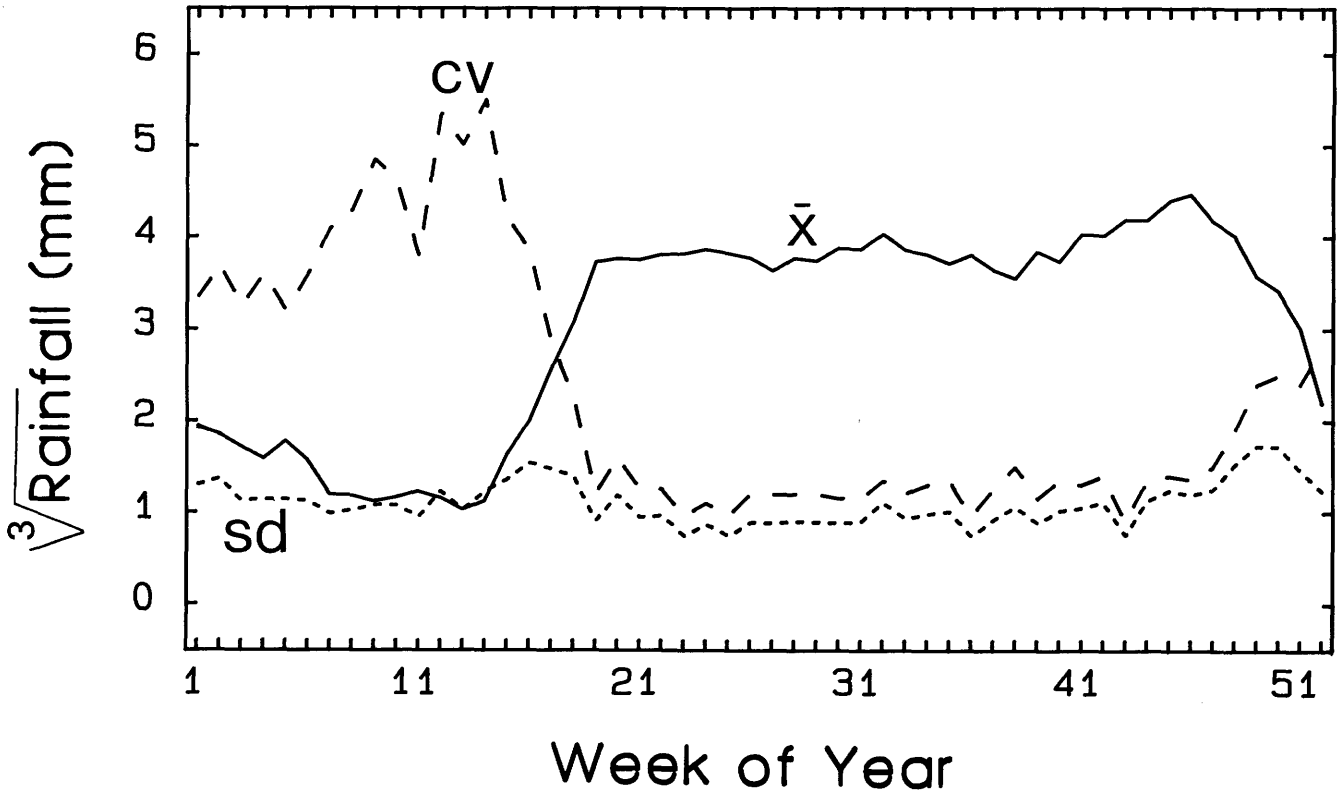


FIGURE 13.—Average (line), standard deviation (dots) and coefficient of variation (dashes) of cube root transformed values of weekly rainfall on Barro Colorado Island.

Island. When consecutive readings from all gauges are compared by simple correlation, correlation coefficients for each pair of gauges were found to range from 0.83 to 0.96 in 1972, 0.55 to 0.98 in 1974 and 0.70 to 0.95 in 1975. However, readings from particular weeks often varied considerably between sites presumably reflecting actual differences in the intensities of particular storms at different points on the island. The greatest difference that can be seen in seasonal totals between these gauges occurred in the wet season of 1975 when a total of 2409 mm was logged for site J, while only 1986 mm was logged at station L on the opposite side of the island. Of the eight estimates of rainfall (4 dry seasons and 4 wet seasons), the northern gauges (I,N,O,J) averaged slightly higher in seven instances (2-sided binomial probability,

TABLE 5.—Rainfall accumulations (mm) in six collectors located around perimeter of Barro Colorado Island (J–O) and collector located in laboratory clearing (I). (Collector identification corresponds with those used in Figure 1.)

Collector location	Dry season				Wet season			
	1972	1973	1974	1975	1972	1973	1974	1975
North side								
I	22.0	7.8	6.4	6.4	204.7	243.5	218.0	244.7
N	23.5	3.9	3.0	6.2	191.4	–	192.9	240.9
O	23.1	8.7	4.1	5.0	172.8	231.0	192.0	206.1
J	19.9	9.6	4.7	5.4	190.7	246.2	194.0	211.1
Average	22.1	7.5	4.6	5.8	189.9	240.2	199.2	225.7
South side								
K	20.3	5.5	4.1	5.5	200.3	–	200.8	213.3
L	19.7	6.4	5.0	5.5	181.8	222.0	181.6	198.6
M	23.1	6.4	3.8	5.1	165.0	241.8	183.4	222.5
Average	21.0	6.1	4.3	5.4	182.4	231.9	188.6	211.5

p = 0.07). Annual totals for the four gauges on the north side average approximately 60 mm more than the south side gauges (M,L,K). Thus, although these data do not show a significant difference between the north and south sides of the island, they vary in a pattern consistant with the north to south gradient known to exist across the isthmus. Additionally, although the north side of the island may receive slightly more rainfall, it is also the side of the island more exposed to dry season winds and thus potentially under greater stress during the dry season.

THE EL NIÑO CONNECTION.—The El Niño is a warm south-flowing surface current that appears off the coast of Ecuador and Peru in December of most years. In some years, the current is far stronger than in others and is associated with a lack of ocean upwelling, a decline in the fisheries industries, and heavy rains in normally dry areas of the Peruvian and Ecuadorian coast. Only these stronger events are now referred to as El Niño. It is now established that El Niño events are not just a regional phenomenon but are part of an atmospheric circulation pattern extending across the entire Pacific basin. Atmospheric pressure conditions in the western and eastern Pacific tend to cycle in opposite directions over time ("Southern Oscillation") (Rasmussen and Hall, 1983).

The El Niño of 1982–1983, perhaps the strongest such event of this century, brought devastating drought to the rain forests of eastern Borneo (Leighton and Wirawan, 1986) and Malaysia (Ashton et al., 1988), overheating and death to the Pacific coast of Panamá (Glynn, 1984), devastating storms and shortage of nutrients to the kelp beds of southern California (Zimmerman and Robertson, 1985; Dayton and Tegner, 1984), and uncommonly high tides to the shores of the Pacific northwest (Paine, 1986). This devastating event sparked much interest in the El Niño Southern Oscillation (Rasmussen, 1985; Rasmussen and Wallace, 1983), and previous occurrences of El Niño were found to coincide significantly with previous periods of drought in the rain forests of eastern Borneo and eastern Peninsular Malaysia (but not on the western sides) (Ashton et al., 1988).

The appearance of El Niño in the eastern Pacific near Panamá coincided with the early termination of that year's wet season on Barro Colorado Island, and a dry season of uncommon ferocity. S.P. Hubbell (pers. comm.) found mortality rates for old-forest tree species calculated after the 1982–1983 El Niño event averaged 3% per year, considerably higher than the 1% per year Putz and Milton (1982) reported for the same forest during an earlier period. Flowering and fruit production were greatly reduced or eliminated in most tree species whose phenologies were being observed by the Environmental Sciences Program on Barro Colorado Island.

The wettest year of the century on the Isthmus of Panamá appears to have been 1981. Four and one-half meters of rain fell during the wet season on Barro Colorado Island. This period of extreme raininess came to a close only six months before the onset of the 1982–1983 El Niño. Were these independent climatic events or do years of heavier rainfall often tend to precede El Niño years in Panamá? A history of El Niño events in the Pacific along with their relative intensities has been published by Quinn et al. (1978). These values (a five point scale, 0–4) for each year since 1842 were cross correlated with annual rainfall totals (detrended) from the six Panamanian stations with longest records (Colon, Monte Lirio, BCI, Gamboa, Pedro Miguel, and Balboa). This type of analysis allows one to examine the correlation, if any, between rainfall either one, two, or more years (lag) before or after El Niño events. The results in Figure 14 indicate that none of the many correlations generated had coefficients exceeding r = 0.35. Nevertheless, each station generated at least one or two significant correlations within lags of −7 to +7 years. In particular, significant correlations occur at lags of −1 (3 occurrences), 0 (5 occurrences) and +4 (2 occurrences). Additionally, the pattern of correlations among sites is strikingly similar. Two particular correlations are noteworthy. Firstly, the strong positive correlation at a lag of −1 suggests that Panamanian rainfall in one year tends to be positively correlated with the El Niño index the following year. Thus, especially heavy rains tend to fall in Panamá the year before a strong El Niño develops. This relationship is different than that observed in Peru and Ecuador, where heavy rainfall tends to accompany strong El Niño currents. Secondly, the strong negative correlation between rainfall and the El Niño index at a lag of zero suggests that rainfall during El Niño years in Panamá is usually lower than normal. Thus, annual rainfall tends to shift from higher than normal to lower than normal before and during the expression of an El Niño in Panamá. Overall, cross correlation indicates a linkage may exist between Panamanian rainfall and the El Niño-Southern Oscillation and suggests some degree of temporal predictability may exist in rainfall among years.

Hurricanes and tropical depressions appear to have had little direct influence on rainfall in Panamá as the tracks of major storms are all well to the north and east during this century. The recent passage of Hurricane Joan (October 1988) along a path at one point only a few hundred miles north of central Panamá, suggests that major cyclonic events are not to be discounted entirely.

TEMPERATURE

Appendix Tables B1–B11

Shaded air temperature has been measured since 1971 on Barro Colorado Island in the lab clearing and 100 m away in the forest near the Lutz weir at a height of approximately 1.5 m by Taylor max-min thermometers (Taylor Instruments, Arden, North Carolina). Thermometers were checked against other thermometers of similar manufacture at irregular intervals to assure calibration. Thermometer assemblies were initially suspended from metal posts with a sheet of copper metal providing shade; in 1980 they were moved to wooden, louvered

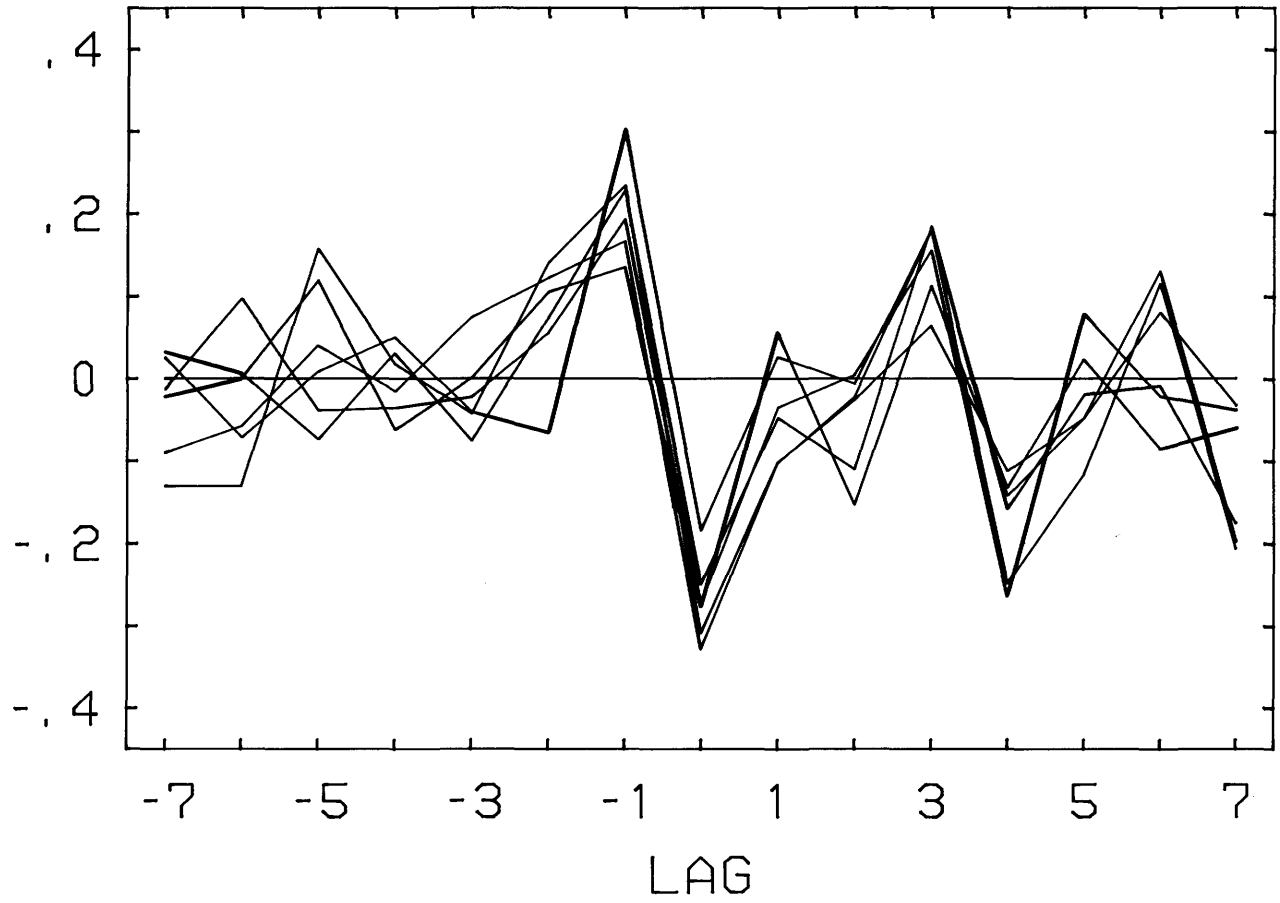


FIGURE 14.—Correlation coefficients generated by the cross correlation of El Niño index and annual rainfall records offset ("lagged") by −7 to +7 years. Six longest annual rainfall records from the isthmus were cross correlated against El Niño index, producing the six curves.

instrument shelters. Smaller wooden instrument shelters were used between 1981 and 1984 to house thermometers at the base (1 m), in the middle (20 m), and at the top (40 m) of the Lutz tower. Later, all but the max-min thermometer in the clearing were replaced by Omnidata DP212 datapod recorders and sensors. These recorders sampled temperature six times per hour, computed an average hourly temperature and stored this average in an EPROM memory chip. Data were removed and cleared at intervals not exceeding 42 days.

The general pattern of average monthly temperature change through the year is summarized in Figure 15. Clearing maximum temperatures reach their lowest average (30.6°C) in November and climb steadily over the dry season to their highest average (32.3°C) during April (mean of monthly means from 17 years). Clearing minimum temperatures reach their lowest average (22.8°C) in October and climb steadily over the dry season to their highest average (23.6°C) in May. Thus, the range of mean maximum temperatures through the year is roughly twice that of mean minimum temperatures. While maximum temperatures peak in the late dry season, minimum temperatures peak in the first three months of the wet season.

Temperature records from Barro Colorado Island since 1971 suggest that temperatures are trending upwards (Figure 16). Lab clearing minimum temperatures display the clearest increase while maximum temperatures are approximately level. Forest records also display an upward trend; however, the series is shorter than from the clearing (due to change to different sensors). The warming during the three El Niño events is evident and the effect of the severest of these in 1982–1983 on the series accentuates the upward trend. At the least, these data suggest that temperature records from other stations in Panamá should be examined for longer term trends.

Cleveland's LOWESS algorithm was used to smooth the long series of individual maximum and minimum temperture readings (detrended) from the clearing and forest (Figure 17). This procedure produced a moving average even though data were unequally spaced along the abscissa (Wilkinson, 1986). Unequal spacing resulted from days when no readings were taken—especially on weekends. The F parameter, the approximate fraction of all points used in computation of each value, was set at 0.005 so that finer detail in the time series was

preserved. The two periods of highest maximum lab clearing temperatures in the series occurred in the dry seasons of 1973 and 1983. The two periods of highest maximum forest temperatures occurred in the dry seasons of 1977 and 1983. Minimum temperatures from clearing and forest were similar over much of the series. Both curves indicate the dry seasons of 1977 and 1983 produced the warmest minimum temperatures in the series. Thus the three warmer-than-usual years on BCI in the past 16 years coincided with and were almost certainly produced by the three El Niño events: 1972–1973, 1976–1977, 1982–1983. Maximum temperatures run one to four degrees C warmer in the clearing than in the forest understory over much of the record. Clearing and forest temperature maxima are closest during the dry season of some years, perhaps during periods of canopy deciduousness. Minimum temperatures, on the other hand, do not appear to vary consistently between forest understory and lab clearing over the series, with the exception of 1980, when understory minimum temperatures averaged roughly one-half degree higher than lab clearing minimum temperatures. The deep drop in forest minimum temperatures during the last three months of 1978 and first few months of 1979 are notable. A similar but less severe cool period occurred during the 1975–1976 dry season.

Maximum and minimum temperatures were recorded at heights of 1, 20, and 40 m above the forest floor for slightly more than two years on the Lutz tower. Maximum temperatures at 40 m are roughly the same as those measured in the clearing at 1.5 m (Figure 18). The lowest maximum temperatures come from 1.5 m and intermediate temperatures from the intermediate height. Maximum temperatures at the above canopy station average roughly 2°C more than readings near the forest floor. Minimum temperatures occur in an opposite pattern. Minimum temperatures are lowest at 40 m, intermediate at 20 m and highest just above the forest floor. Thus, sometime between the times minimum and maximum temperatures normally occur (0500 and 1300 hrs) the temperature structure of the forest air reverses. A similar temperature inversion in a Thailand forest disappeared at sunrise (Pinker, 1980).

Relative Humidity

Appendix Tables C1–C9

Atmospheric humidity has been measured using the traditional methods of wet- and dry-bulb psychrometry. A hand-held psychrometer has been used to estimate dry- and wet-bulb temperatures at midday in the lab-clearing and at 1 m in the forest from mid-1971 until the end of 1981 and from early 1986 onward. Wet- and dry-bulb temperatures were recorded automatically from 1983 through 1986. At each station (clearing, forest 1 m, and forest 40 m) Omnidata datapod (DP 212), 2-channel recorders were used to record average hourly temperature of continuously aspirated dry and wet temperature sensors. "Muffin fans" of the type used to circulate air in microcomputers were used to draw air through a 2 cm PVC tube and past the dry and wet temperature sensors. Distilled water was delivered to a cotton wick covering the wet sensor using a modified hospital "intravenous feeder." Relative humidity was later determined by computer using "look-up" values from a standard psychrometric table.

Strong seasonal cycles in relative humidity are evident in the monthly averages recorded in both clearing and forest (Figure 19). Wet season relative humidity readings averaged between 90% and 95% in the forest understory and 80%–85% in the lab clearing. Dry season relative humidity averaged 70%–80% in the forest understory and 62%–72% in the lab clearing. Thus, throughout the year, relative humidity in the forest understory is roughly 10% higher than in the lab clearing (Figure 20).

Vertical differences in relative humidity within the forest are evident in a study of midday meteorological conditions on the Lutz tower at heights of 1, 13, 26, and 40 m between August 1977 and July 1979 (Figure 21). Average, monthly, midday, relative humidity in this period was roughly 10% to 15% higher near the forest floor than above the canopy. Readings at the two intermediate heights were barely distinquishable from one another but were clearly intermediate to the stations above and below them. The relationship of these measurements to ones recorded in the lab clearing are shown in Figure 22. It appears that during months when relative humidity is high on Barro Colorado Island, relative humidity at 40 m on the tower is 5% to 10% lower than in the clearing. During periods when relative humdity is lower, clearing and above-canopy readings are very nearly the same. Subcanopy stations appear to give consistently higher readings than registered in the clearing, readings that increase as stations are nearer the forest floor.

Air Movement

Appendix Tables D1–D5

Hourly wind speed and wind direction have been recorded on Barro Colorado Island using a number of different instruments. The majority of measurements used in creating a longterm record come from two mechanical, chart-recording anemometers (MRI Mechanical Weather Station model 1072, Meteorological Research Inc., Altadena, California). The first of these was installed on the roof of Chapman House in the lab clearing in 1971 where it functioned satisfactorily until June 1978. A new instrument of the same design and manufacture was installed in January 1979 atop Lutz tower. An Omnidata DP214 anemometer station was installed in 1983 when problems developed with the second MRI unit. The Omnidata instrument was less reliable than the former instrument and was discontinued in August 1987. The repaired second MRI unit was reinstalled in January 1988 and continues in service. Attempts are underway to obtain a fully automated digital

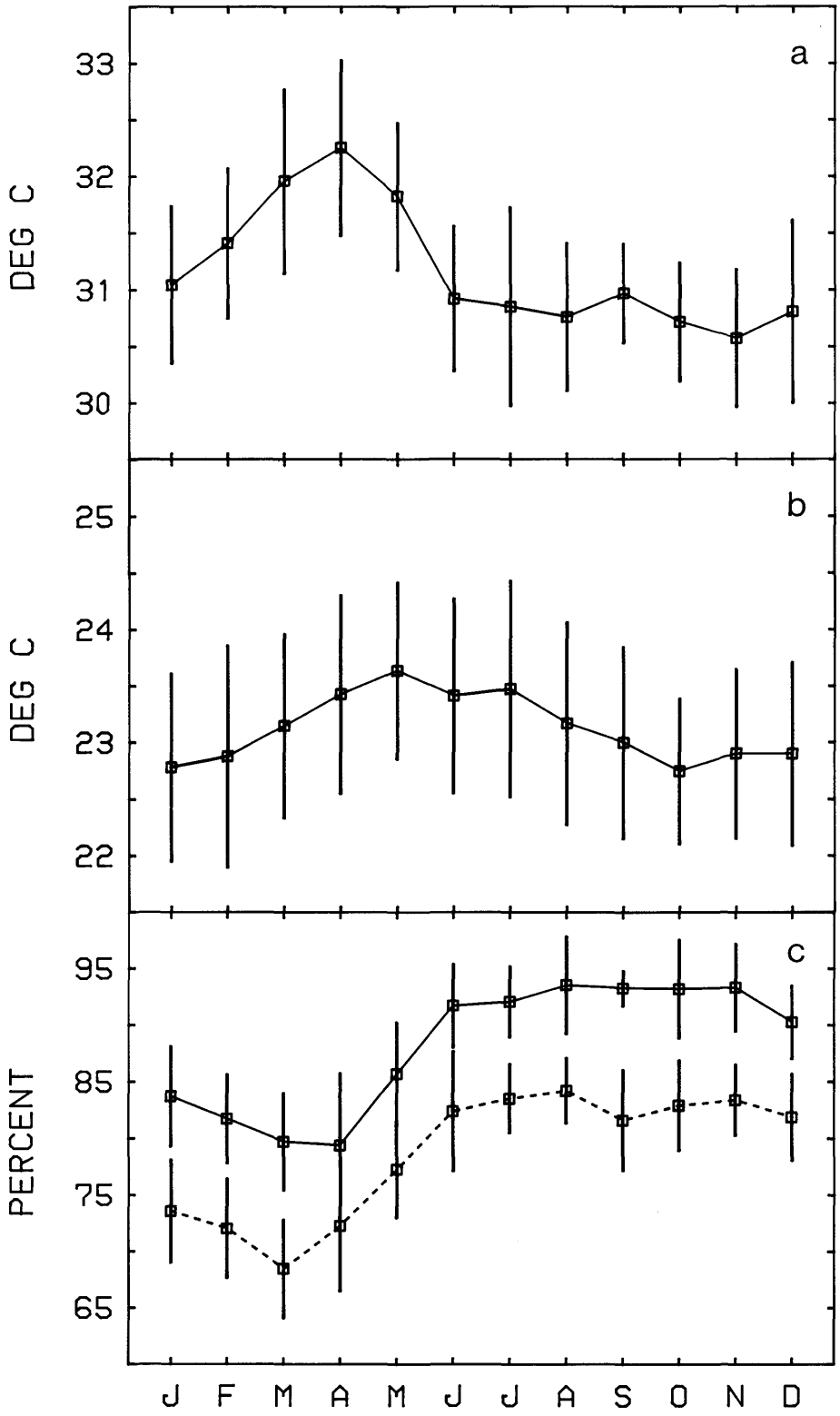
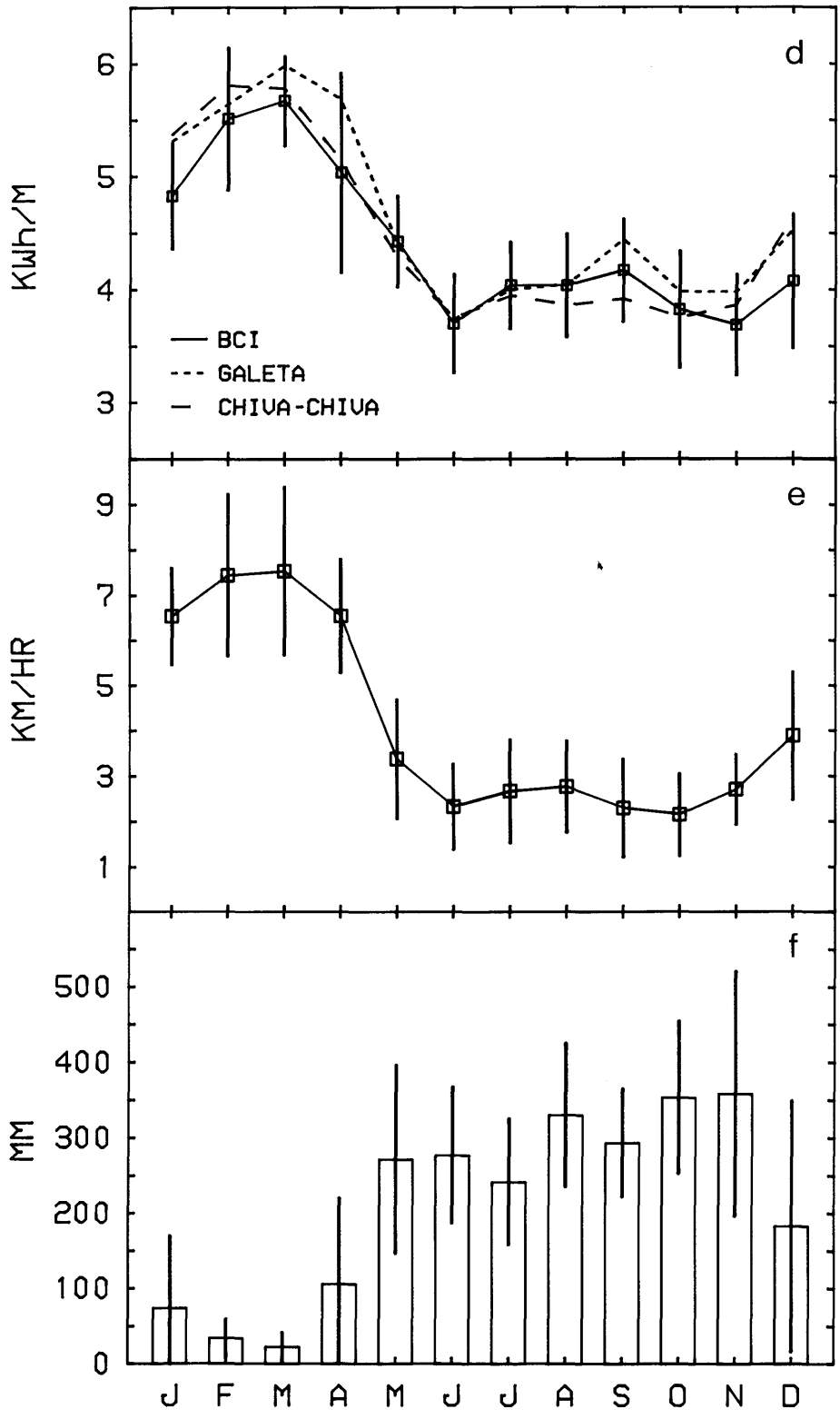


FIGURE 15.—Average (±1 standard deviation) monthly values of (*a*) maximum temperature in the clearing, (*b*) minimum temperature in the clearing, (*c*) midday relative humidity in the clearing and forest (dashed line), (*d*) daily solar radiation on Barro Colorado Island compared to Galeta Point and Chiva-chiva, (*e*) daily windspeed at canopy level, and (*f*) rainfall in the clearing.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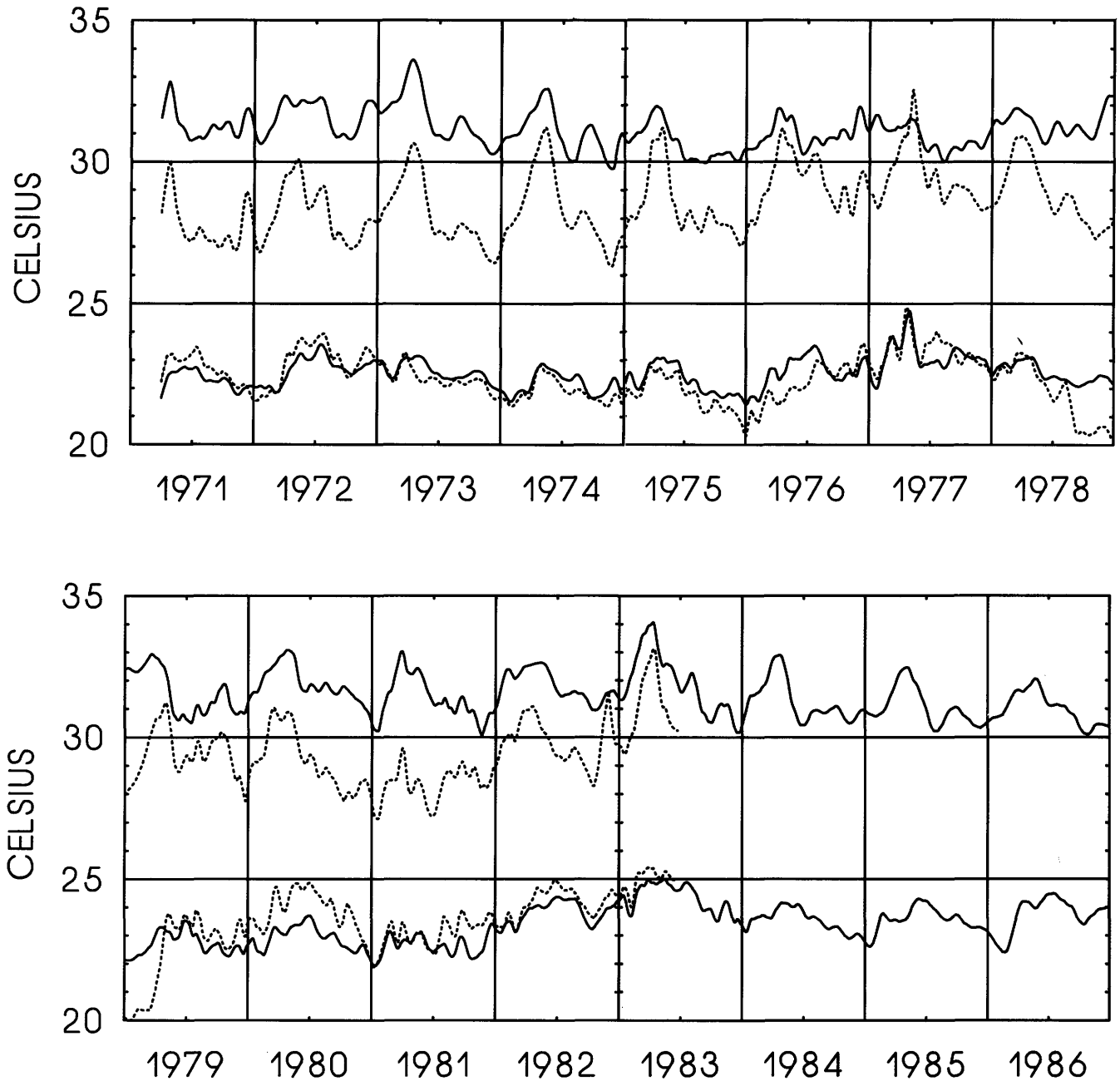


FIGURE 16.—Smoothed daily maximum and minimum temperatures in the lab clearing (solid line) and forest understory near the Lutz weir (dashed line), 1971–1986. Each time series was detrended before plotting.

record of windspeed and direction using other sensors and data loggers.

A totalizing anemometer was placed in the lab clearing next to the evaporation pan (height of 0.2 m) in April 1983 and daily windrun was recorded from it until December 1987. Spot readings of wind velocity at midday were taken at four elevations on the Lutz tower between July 1978 and August 1979 using a Thermonetics Series 102 hot wire anemometer (Thermonetics Corp., San Diego, California) (Figure 21*a*). The average daily wind velocities on Barro Colorado Island and at Galeta Point Marine Laboratory (also an MRI anemometer, Cubit et al., 1988) on the Caribbean coast are compared in Figure 23. Assuming the instruments had roughly similar frictional characteristics, data indicate peak dry season winds on Barro Colorado Island are roughly a third as strong as those along the Caribbean coast. Air movement during the wet season on Barro Colorado Island is roughly 1/3 to 1/2 of that registered on the Caribbean coast.

Spot midday measurements of windspeed using a hotwire anemometer at four levels on the Lutz tower between August

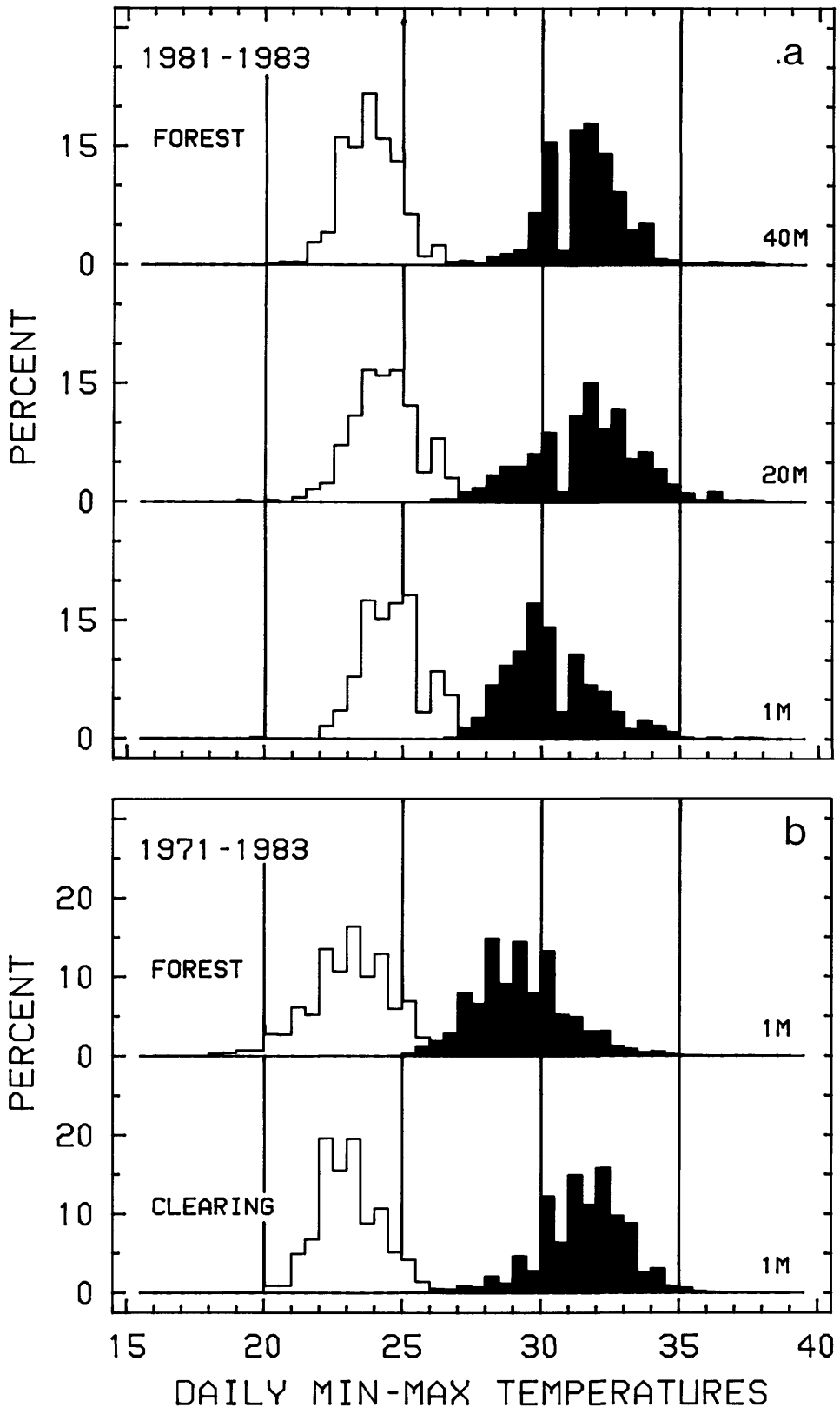


FIGURE 17.—Comparison of daily minimum and maximum temperatures recorded (*a*) near forest floor, mid-level, and above canopy-level, and (*b*) between lab clearing and forest at 1 m.

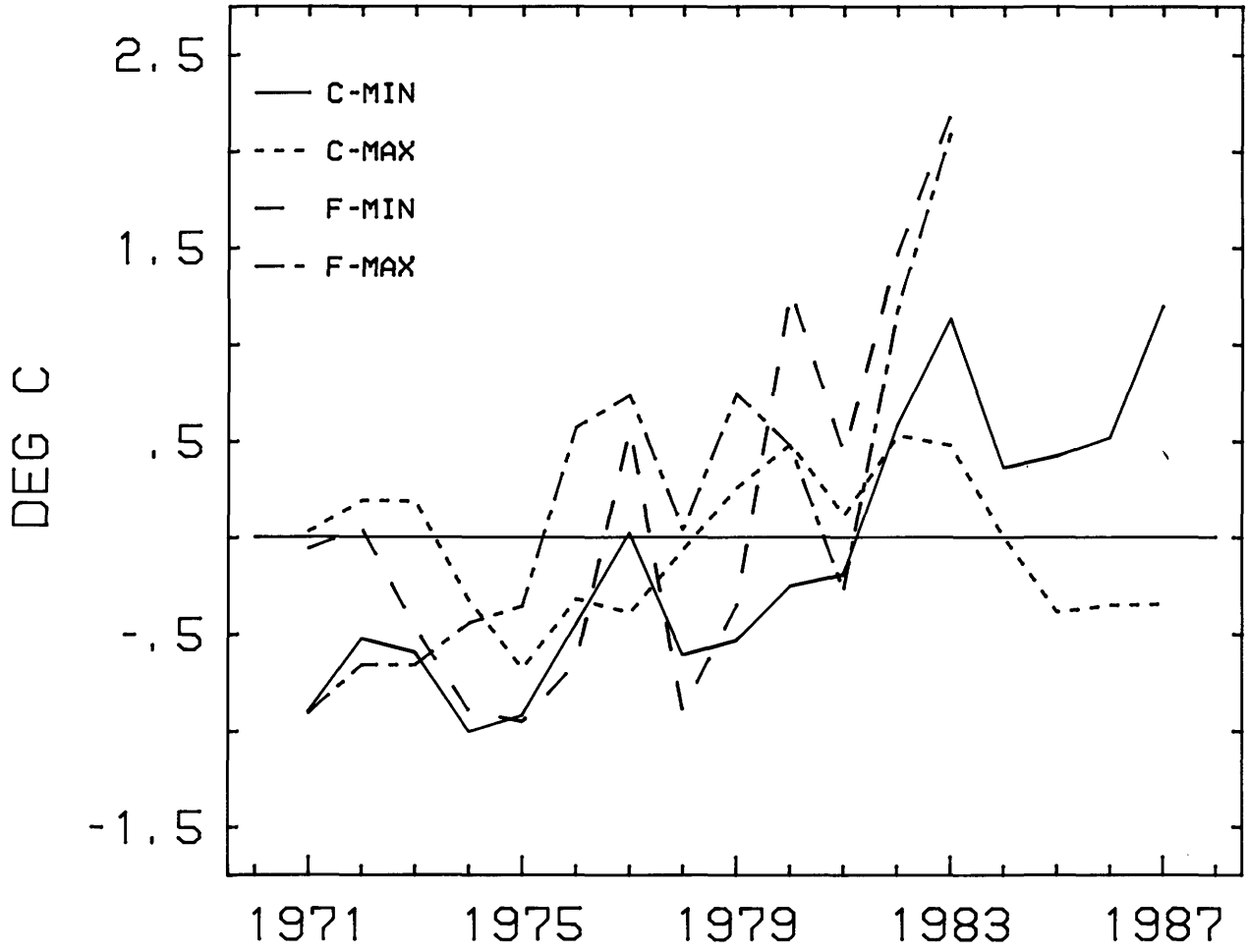


FIGURE 18.—Departures from long-term averages of annual average minimum and maximum temperatures recorded in lab clearing and forest at height of 1.5 m.

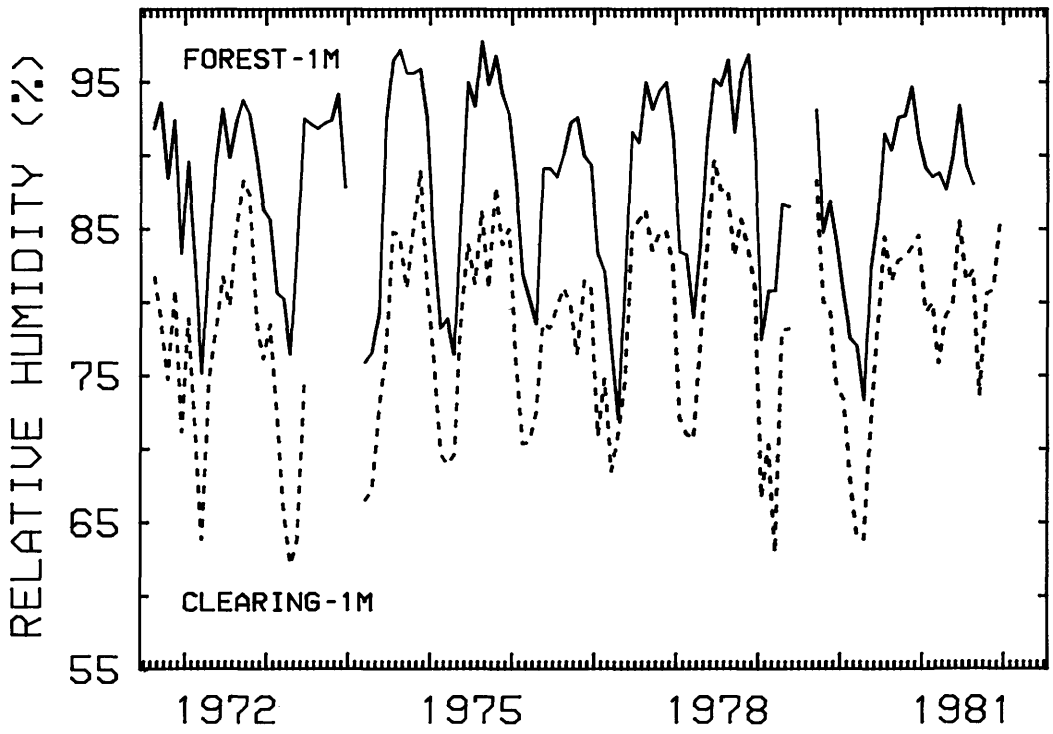


FIGURE 19.—Average of monthly, midday, relative humidity in clearing and forest understory from late 1971 through mid-1981.

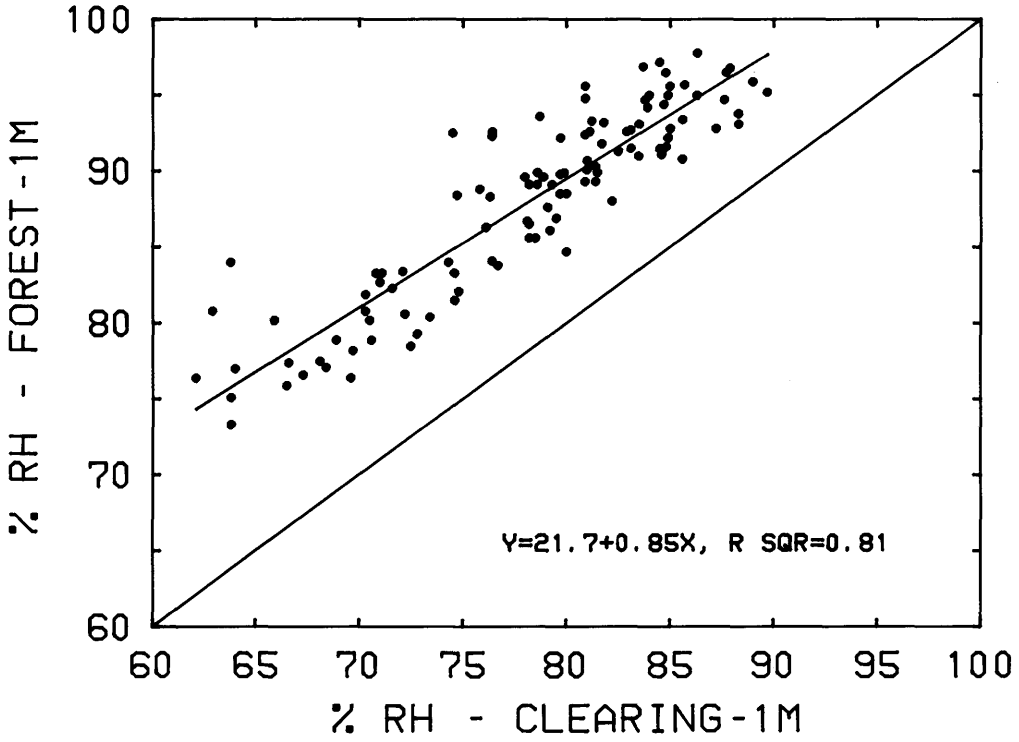


FIGURE 20.—Midday relative humidity above forest floor compared to clearing values taken at same time.

1977 and July 1978 reveal the large differences in windspeed within and above the forest (Figure 12*c*). Subcanopy windspeeds increase over the entire dry season while above-canopy windspeed reaches a maximum in January. Subcanopy windspeeds would have to be monitored during other dry seasons, and at other sites on Barro Colorado Island, to know how general this pattern is.

Daily wind vectors, indicators of both direction and velocity, have been plotted in Figure 24 for the years 1981 through 1984. These data demonstrate the drop in wind velocity (length of each vector) that occurs as the wet season commences at about day 120 of each year. They also show the early start of the trade winds in November 1982 accompanying the onset of the El Niño event that persisted until mid-1983.

SOLAR RADIATION

Appendix Tables E1-E3

Global shortwave radiation has been measured on Barro Colorado Island atop a 27 m tower (Feb 1973-Jul 1975) and the 40 m Lutz tower (May 1977-Jan 1982) by the Radiation Biology Lab using Eppley pyrranometers. Because of lightning strikes and equipment failures there are many gaps in this record. Since March 1983 incoming solar radiation has been measured with a Li-Cor LI200SB pyrranometer (Li-Cor, Inc., Lincoln, Nebraska) (400–1100 nm) attached to an Omnidata DP211 datapod at the top of the Lutz tower. The datapod records hourly the average output (mv) sensed at 10-minute intervals. Sensor output was factory calibrated to give an output of 5 mv/La (= 1.0 cal/cm^2/min or 11.622 Wh/m^2). Sensors were replaced with new or recalibrated sensors yearly. A Li-Cor 190SB, quantum sensor (400–700 nm wave band), was installed July 1985 to provide a measure of photosynthetically active radiation ("PAR") alongside the pyrranometer atop the Lutz tower. Alan Smith has installed additional pyrranometer and PAR sensors under "shadow bands" to estimate diffuse and direct components of global radiation. These measurements are not included in this report.

A "sunburn meter" has been maintained on the Lutz tower as a service to the Center for Photobiology, Temple University, since 1979. This meter produces an electric current proportional to intensity in short ultraviolet (UV) wavelengths, integrates the current until a preset dose is obtained, then stores the count and resets the integrator. A count of 400 represents the amount of UV producing slight reddening of untanned white skin. A count of 1000 in 30 min equals the maximum anticipated UV expected on a clear day with sun directly overhead. Shortwave radiation and UV values are often tightly correlated. Regression of shortwave values on UV values can be useful in reconstructing daily solar radiation or checking to see if values are within range.

Global radiation (400–1100 nm) on Barro Colorado Island climbs steeply during the dry season, reaching a monthly maximum of 5.7 KWh/m^2 in March (Table 6). Wet season

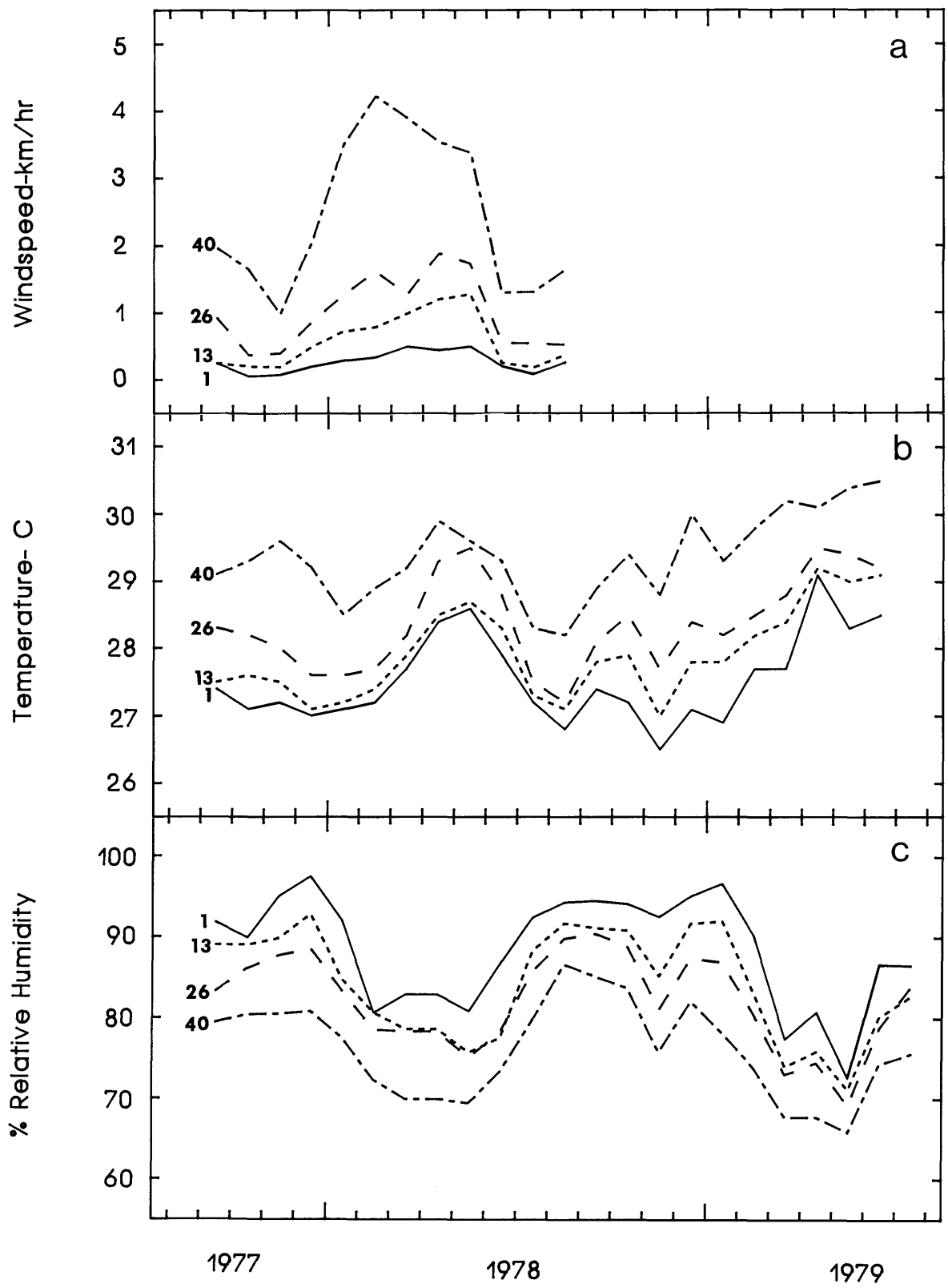


FIGURE 21.—Average monthly values of (*a*) midday instantaneous windspeed, (*b*) shaded air temperature, and (*c*) relative humidity measured on the Lutz tower at 1, 13, 26, and 40 m above forest floor between September 1977 and July 1979.

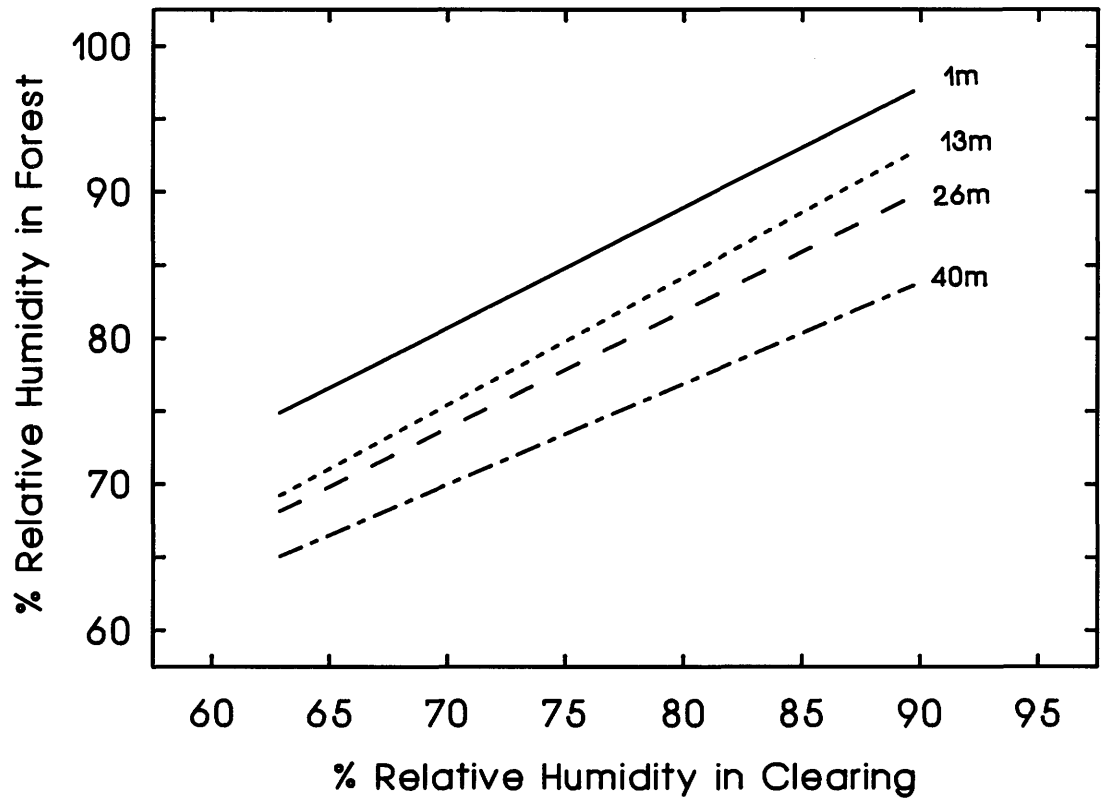


FIGURE 22.—Relationships obtained from regressing relative humidity values in forest at heights of 1, 13, 26, and 40 m against values obtained in lab clearing (September 1977 through July 1979).

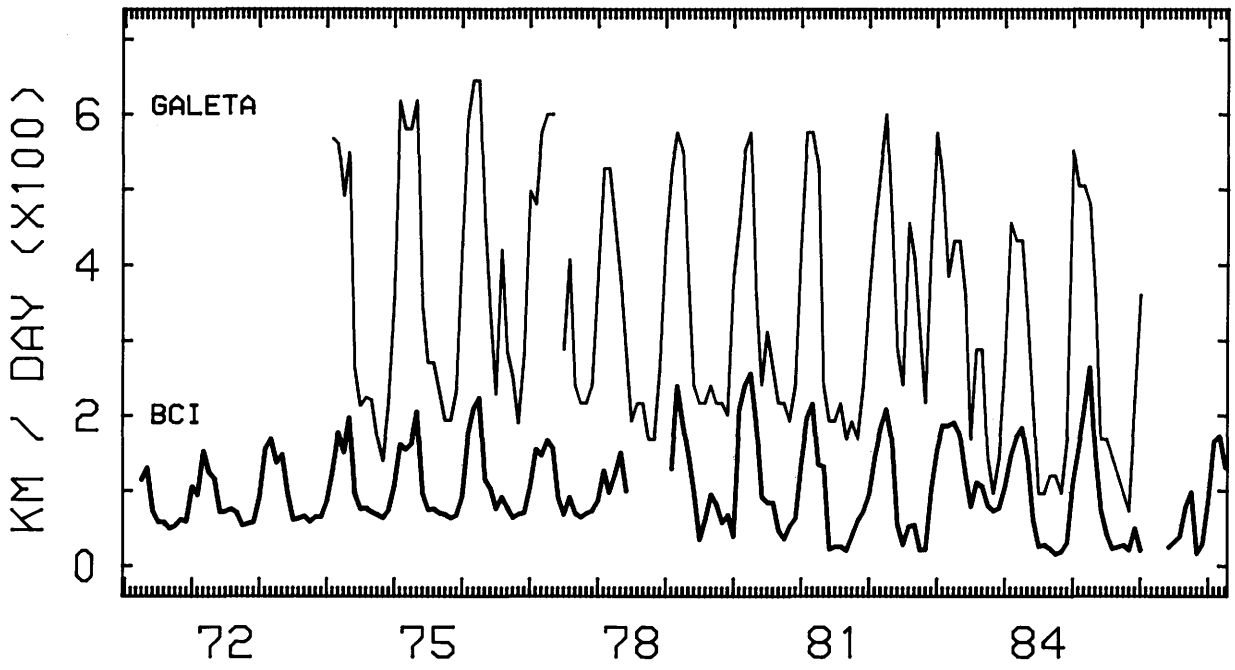


FIGURE 23.—Comparison of average daily windrun at coastal (Galeta Point Laboratory) and continental (Barro Colorado Island) stations from 1971 through 1986.

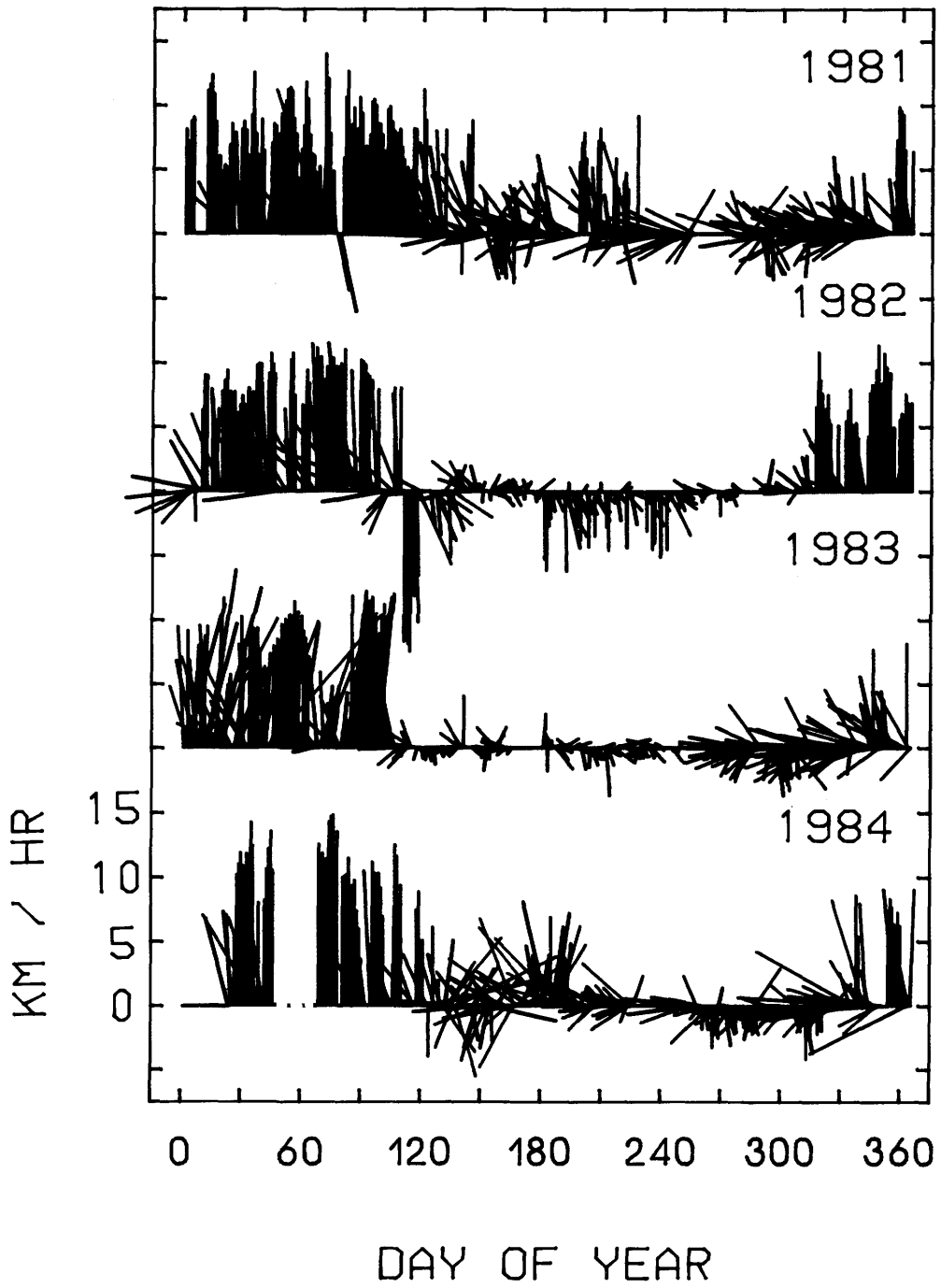


FIGURE 24.—Daily wind mean-vectors for four years on Barro Colorado Island. North winds indicated by vectors extending straight up, south winds straight down, etc.. Length of vector indicates magnitude of daily windrun.

(June through November) radiation varies little from month to month (3.7–4.2 KWh/m^2), averaging 3.9 KWh/m^2—74% of average dry season radiation. Lowest average daily solar radiation values occur in June, October, and November, roughly 3.7 KWh/m^2. Average monthly values of global radiation measured on Barro Colorado Island (Figure 15*d*) agree closely with values recorded at the Galeta Point Marine Station (Cubit et al., 1988), 22 km north on the Caribbean coast and Chiva-Chiva Antenna farm, 35 km southeast near the Pacific coast (Becker, 1987).

Moisture Availability

GEOLOGY AND SOIL CHARACTERISTICS

The geology of Barro Colorado Island has been described by Woodring (1958) and that of the Lutz catchment in

TABLE 6.—Average daily solar radiation (Wh/m²) received on Barro Colorado Island by month and year.

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1973			4984	5332	4767	3787	4627	4661	4701	4642	3789	4818
1974	5116	5939	5831	5268	4997	4675	3876	4673	4687	4123	4224	4759
1975		6458	6035	5889	4447	3470	3745					
1976												
1977					4674	3587	4529	4170	4312	4341		
1978												
1979							4508	4235	4674	4315	3096	4197
1980	5078	5235	5838	5355	4153	3716	3811	3895	4044	3546		
1981				3144	3959	3176	3889	3536	4032	3638	3370	3026
1982	3975											
1983			5253	5441	4154	4065	4183	4371	3675	3965	4154	3539
1984	5245	5414	6141	5562	4464	3266	3578	3273	3560	3471	3497	4182
1985	4834	5163	5677	5610	4173	3400	4186	3926	4282	3703	4174	4022
1986	4958	5727	5847	4640	4968	3911	3989	3798	3739	3080	3621	4252
1987	4584	4651	5459	4096	3928	3623	3537	3839		3207	3242	3868
1988	4969	4684	5407	5690	3893							
1989	5423	5776	6361	6013	5174	3754	3942	3900	4328	3788	3508	4320
Avg	4909	5450	5712	5170	4448	3745	3984	4023	4186	3816	3676	4125
Min	3975	4651	4984	3144	3928	3176	3383	3273	3560	3080	3096	3026
Max	5423	6458	6361	6013	5174	4675	4627	4673	4701	4642	4224	4818
n	9	9	11	12	13	13	14	13	12	13	11	11
SD	450	627	427	864	450	430	397	419	410	473	403	539

particular by Dietrich et al. (1982). Three different types of bedrock, one igneous and two sedimentary, underlie the Lutz catchment. A stream with a wide, flat-bedrock bottom bisects the lower portion of the catchment and gives no indication of a significant outlet for water from the catchment other than through the weir. Lutz creek flows in most months of the year, but, in the middle and late dry season (March and April) of normal and dry years, flow ceases.

The Lutz catchment is entirely forested and trees greater than 60 cm dbh in 1 ha quadrats were identified and mapped in the mid-1970s (Thorington et al., 1982). Although slope in all sections of the catchment has not been sampled, slope characteristics can be drawn from the work of Putz and Milton (1982) who did estimate slopes in the quadrats mapped by Thorington. Roughly 75% of each of the three plots in the upper catchment had slopes <15 degrees and 25% were in the 15–30 degree class. Closer to the weir, a fourth plot had 46% of its area falling in the <15 degree class, 45% in the 15–30 degree class, and 9% in the 30–45 degree class. Soils on Barro Colorado Island have been classified as Frijoles Clay by Bennett (1929) and Knight (1975). In an unpublished report on the soils of Barro Colorado Island, Michael Keller has identified five different soil series: two alfisols and three oxisols. Of the two orders, oxisols are the more highly weathered. Oxisols occur on the plateau and the eastern one-quarter of the island. The Lutz catchment falls entirely within the alfisols. Soil samples were removed from ten sites within the catchment (the same sites from which soil moisture is monitored) and ten sites on the plateau in 1983 and physical characteristics were determined in laboratories of the University of Panamá. These analyses (Table 7) indicate that Lutz soils have a clay content that is considerably higher than soils on the plateau (40% vs 26%). Sand content, on the other hand, is high on the plateau (47%) and lower in Lutz (35%). Soils of the Lutz catchment and the island plateau appear to have approximately the same silt content (25%–27%). These determinations are in agreement with Keller's soil classifications. Additionally, the high clay content of the soils on the relatively steep slopes of Lutz should translate into very low infiltration rates (0–4 mm/hr; Dunne and Leopold, 1978:171) when the soil is saturated. Periods of high rates of surface runoff or "overland flow" have been noted during the late wet season; however, they have yet to receive systematic study.

SOIL MOISTURE

Appendix Tables F1–F5

Moisture residing in the soils of the Lutz catchment has been determined gravimetrically from 11 Dec 1974 until the end of 1989 at one or two week intervals (Figure 25). Several changes in methodology instituted during this period have affected the distributions of values obtained. From the start of the study until October 1979 two soil moisture plugs were removed from the upper 5 cm of soil at each of five stations along a 20 m transect in the lower catchment—approximately 50 m from the Lutz tower along the catchment trail (see station "2" in Figure 2). These samples represented only a small range of topography within the Lutz catchment and an earlier study (Dietrich et al., 1982) used them only as an index of moisture

TABLE 7.—Comparison of chemical and physical characteristics of soils taken from the Lutz catchment and the plateau on Barro Colorado Island. Analyses were performed by Departamento de Suelos, Facultad de Agronomia, Universidad de Panamá.

Site	Soil type (%)						Chemical composition							
	Sand	Silt	Clay	Moist 15 atm	Organ. mat.	N	PPM				MEQ/100 gm			
							P	K	Na	Mn	Ca	Mg	CEC	PH
Plateau														
1	38	26	36	33.4	4.98	0.385	tr	85.7	28	185.3	3.10	1.47	45.55	4.6
2	62	20	18	32.9	2.93	0.255	2.0	193.4	18	82.9	4.86	1.47	43.18	5.3
3	50	32	18	33.6	4.39	0.348	7.8	69.8	20	136.6	5.36	1.13	35.20	5.1
4	54	32	14	36.1	4.39	0.402	tr	125.2	33	130.0	3.33	1.48	33.75	4.7
5	32	24	44	36.4	4.10	0.557	4.5	111.2	19	105.9	4.70	1.51	36.85	5.1
6	30	40	30	36.2	4.39	0.314	2.0	194.4	19	97.1	4.38	1.43	36.61	4.7
7	28	18	54	35.1	2.20	0.425	tr	379.3	39	130.1	6.37	1.70	36.07	5.9
8	68	18	14	37.8	2.93	0.360	2.0	95.3	21	11.0	2.36	0.57	46.00	4.3
9	54	30	16	33.1	2.11	0.362	tr	184.1	25	139.6	4.07	1.27	30.98	4.8
10	56	26	18	35.1	4.39	0.323	3.0	75.9	17	107.1	2.93	1.14	31.45	4.4
Avg	47	27	26	35.0	3.68	0.373	2.1	151.4	24	112.6	4.15	1.32	37.56	4.9
Lutz														
1	36	26	38	59.4	3.09	0.535	tr	179.1	33	105.3	12.05	1.83	67.74	5.1
2	38	22	40	51.7	2.11	0.357	1.0	254.6	28	53.7	14.12	1.80	72.13	5.9
3	24	26	50	67.6	3.81	0.558	1.0	189.4	41	45.4	35.45	1.80	89.42	5.5
4	34	22	44	46.9	2.05	0.133	9.6	385.3	33	34.9	43.15	1.78	96.70	5.6
5	32	26	42	52.8	3.22	0.224	tr	321.7	33	67.7	39.65	1.78	87.78	5.2
6	48	34	18	31.4	1.22	0.079	5.4	111.2	42	62.7	6.35	1.69	37.92	4.3
7	26	26	48	45.2	3.22	0.255	3.8	261.2	31	75.9	10.55	1.82	61.49	5.3
8	34	14	52	79.8	4.39	0.334	14.0	96.3	32	48.6	50.35	1.59	80.03	7.1
9	34	26	40	39.1	4.10	0.331	4.5	24.1	36	80.9	7.69	1.66	43.65	5.4
10	44	28	28	42.5	4.39	0.416	tr	73.6	41	62.6	5.98	1.58	52.94	4.9
Avg	35	25	40	51.6	3.16	0.322	3.9	189.7	35	63.8	22.53	1.73	68.98	5.4

conditions. Sampling depth was increased to the upper 10 cm of soil in October 1979. Additionally, the location of sampling was changed during the last week of January 1981 to ten stations spread out across the catchment (Figure 2), thereby sampling a wider range of moisture conditions. Two samples were withdrawn at each site, one from the top 10 cm, a second from 30 to 40 cm. For approximately two and one-half years, beginning in June 1981, 0–10 cm and 30–40 cm samples were additionally removed at ten stations along Wheeler and Zetek trails on the island plateau. Sampling stations were spaced at 100 m intervals starting approximately 50 m beyond the old tower clearing near the center of the island. During the first six months, sampling in Lutz and on the plateau rarely was conducted on the same day. In succeeding months samples from Lutz and the plateau were removed on the same day, thereby facilitating comparisons between the two sites. An "Oakfield punch" was used to remove the approximately 2.5 cm diameter soil cores. Late in the dry season an augur was used to remove hard soil. Samples were returned to the lab in tinned canisters, weighed, and placed in a 105°C oven to dry to constant weight (2–3 days). Dry and tare weights were then determined and gravimetric soil moisture (GSM) was calculated as the change in weight due to drying expressed as a percent of the original wet weight:

$$GSM = \frac{(\text{Wet wt} - \text{Tare wt}) - (\text{Dry wt} - \text{Tare wt})}{(\text{Wet wt} - \text{Tare wt})} \times 100.$$

Three collections were performed concurrently at both "index sites" at 0–5 cm and the array of sites at 0–10 cm depths in mid- and late April 1983 (before and after the first heavy rains of that wet season). The equation

$$\text{GSM array sites} = 11.6 + (0.61 \times \text{GSM index sites}).$$

obtained through regression of these samples (df = 2, r = 0.99), suggests that soil moisture values from 1975 through 1979 can be adjusted to better reflect catchment-wide soil moisture conditions. When this adjustment was performed, wet season soil moisture was decreased by an average of two to three percent; dry season values were little affected. Soil moisture determinations between October 1979 and 1981 were not adjusted because they were taken from deeper samples and tended to be drier than in the earlier protocol.

For the purposes of calculating the actual volume of water present in the soils of the catchment, adjusted GSM was

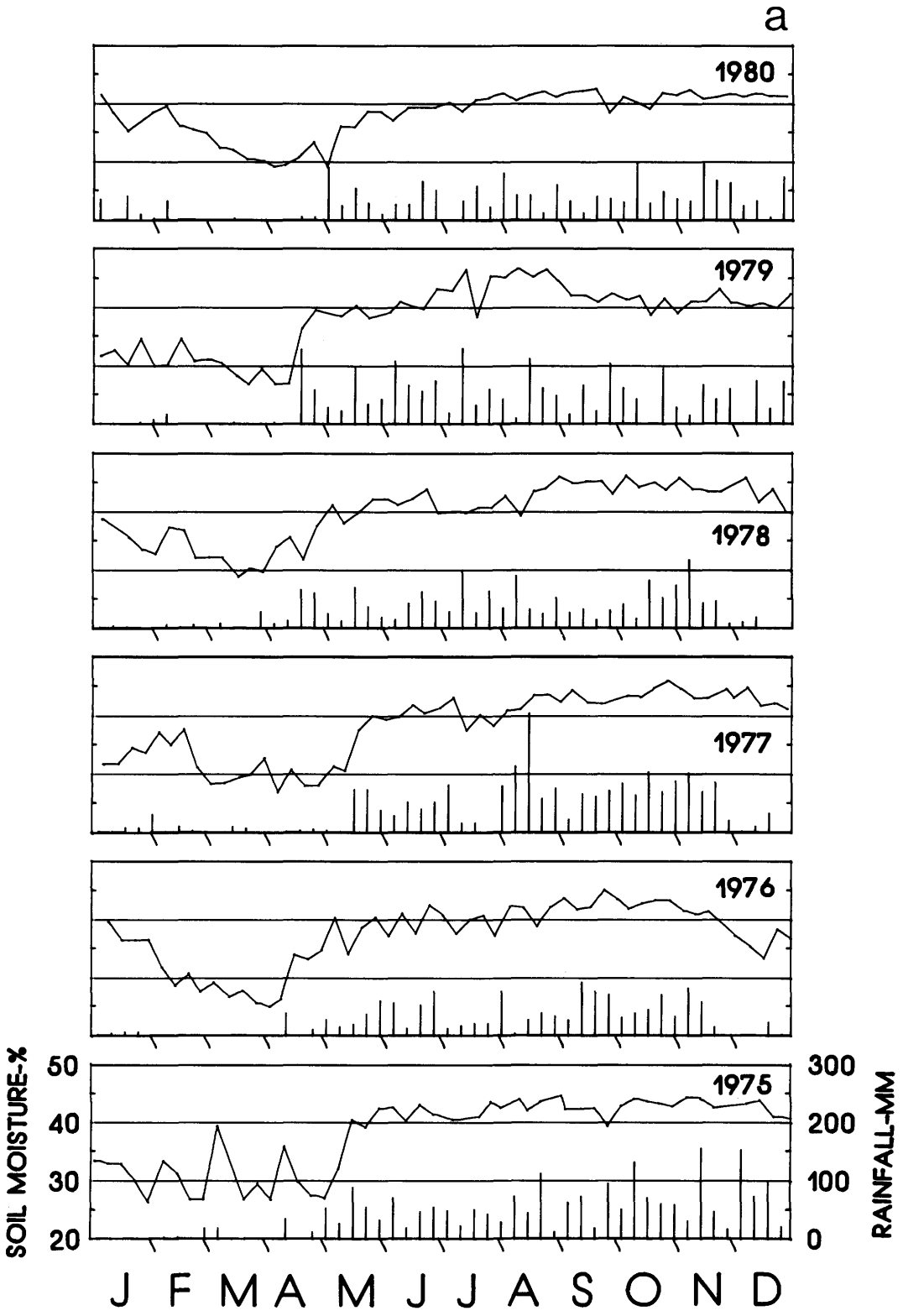
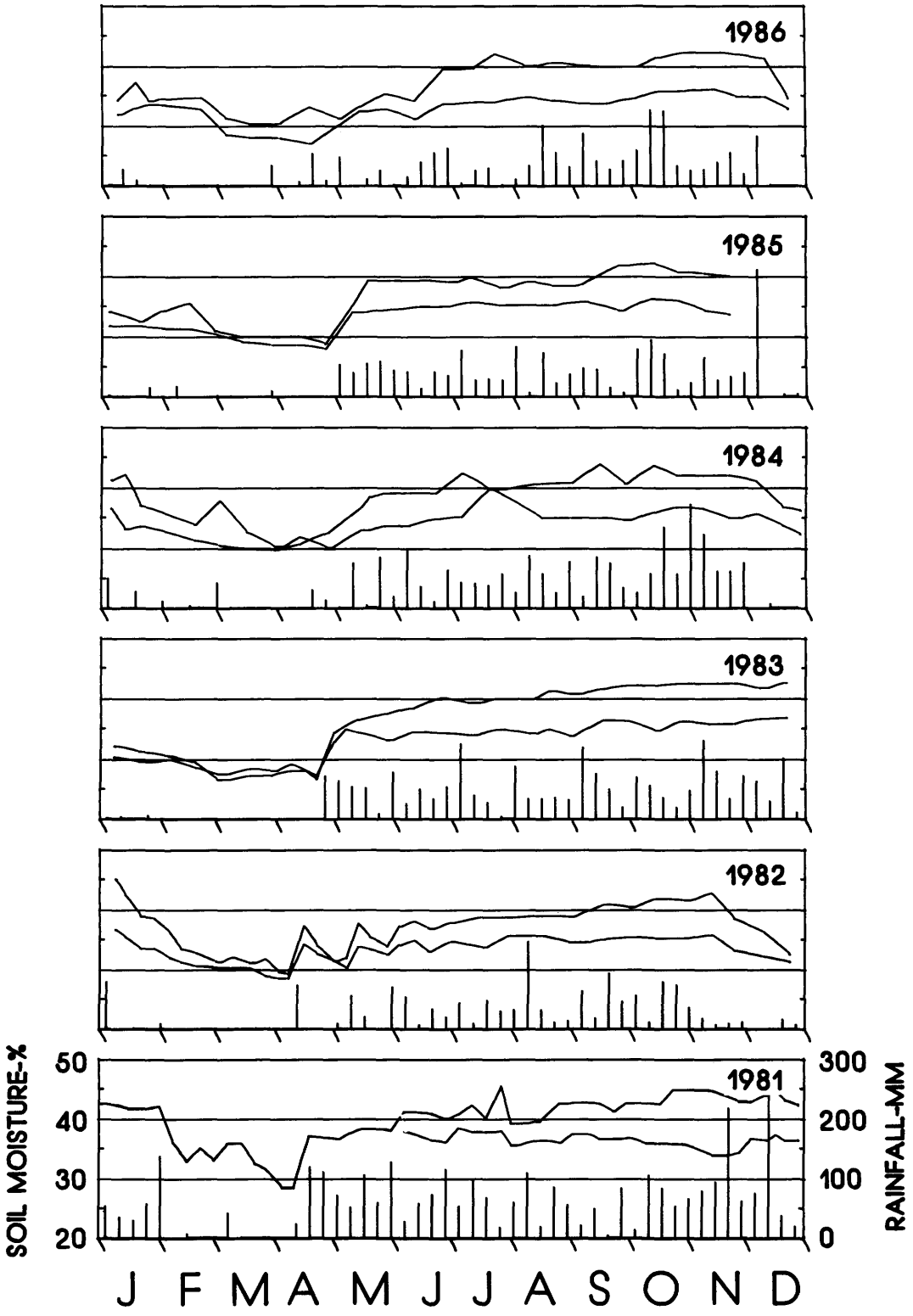


FIGURE 25.—Values of soil moisture (percent by weight) monitored (*a*) in the Lutz catchment between 1975 and August 1987, and (*b*) on the plateau between 1981 and early 1984 in relation to weekly rainfall (vertical bars). Where two lines occur on a graph, lower indicates soil moisture at 30–40 cm, upper indicates soil moisture at 0–10 cm.


1986
1985
1984
1983
1982
1981
SOIL MOISTURE-%
50
40
30
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300
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100
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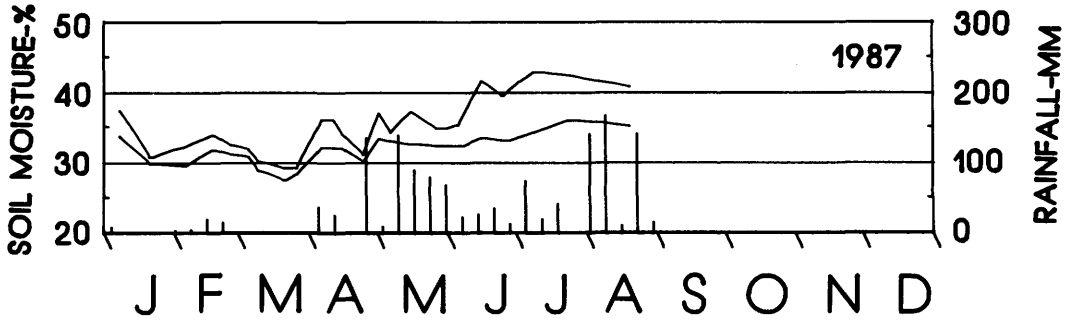
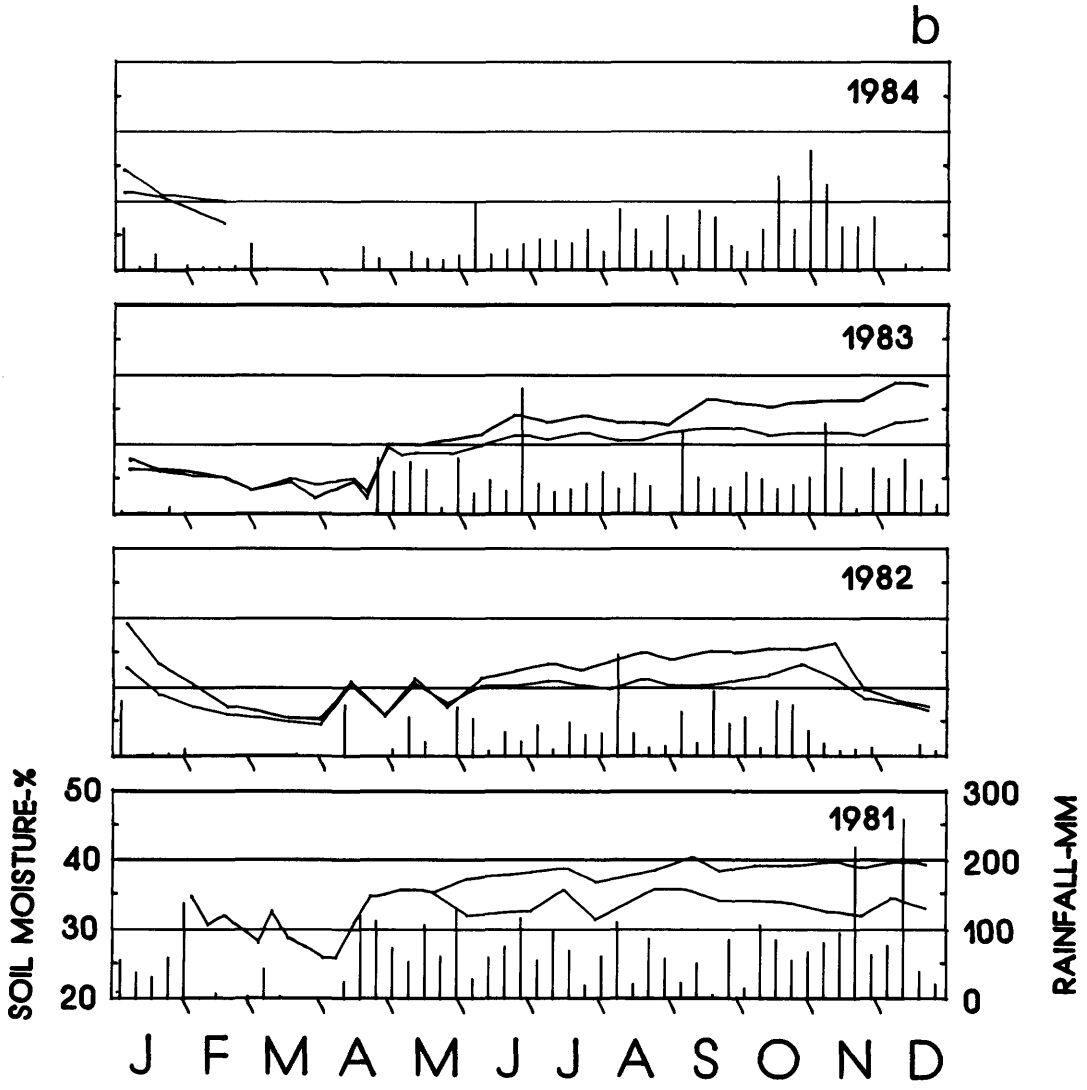
RAINFALL-MM
J F M A M J J A S O N D


SOIL MOISTURE-%
50
40
30
20
1987
300
200
100
0
RAINFALL-MM
J F M A M J J A S O N D


b
1984
1983
1982
1981
SOIL MOISTURE-%
50
40
30
20
300
200
100
0
RAINFALL-MM
J F M A M J J A S O N D

transformed to soil moisture by volume (VSM) following Dietrich et al. (1982:31):

$$VSM = \frac{100 \times GSM \times (\text{Bulk Density of dry soil})}{(100 - GSM) \times (\text{Density of Water})}$$

Bulk density appears to vary with depth according to the unpublished report on the soils of Barro Colorado Island by Michael Keller. Samples taken from two alfisols on opposite sides of Barro Colorado Island (Armour 24 and Barbour-Lathrop Trails) increased from 0.6 to 0.7 gm/cm^3 in the first 20 cm to values between 0.9 and 1.2 gm/cm^3 at greater depth. Accordingly, a bulk density of 0.7 gm/cm^3 is assumed in the conversion of GSM to VSM for 0–10 cm samples, 1.1 gm/cm^3 for samples 30 cm and deeper.

"Available Moisture" is defined as the quantity of water in the soil that is potentially extractable by plants. Available moisture is calculated as the soil depth times the proportion of the depth occupied by water (i.e., VSM). An average soil depth of 1.1 m is assumed in this study as in Dietrich et al. (1982); however, because both surface (0–10 cm) and deep soil (30–40 cm) moisture measurements were taken, the total available moisture can be adjusted to reflect actual differences with depth by computing and then summing the moisture content for 0–10, 10–30, and 40–110 cm sections. Soil moisture and bulk density for 10–30 cm is assumed to be the arithmetic average of the soil directly above and below (Table 8). Soil from 40–110 cm was assumed to have the same moisture and bulk density characteristics as soil at 30–40 cm. These assumptions seemed reasonable after viewing the depth

TABLE 8.—Values of parameters used in calculations of total available moisture in Lutz catchment soils, Jan 1975 through May 1988 (AWC = available water capacity).

Soil characteristic	Zone 1	Zone 2*	Zone 3	total
Sample depth (mm)	0–100	100–300	300–1200	1200
Sample thickness (mm)	100	200	900	
Bulk density (gm/cm)	0.7	1	1.1	
Min moist by wt (%)	28	28	28	
Max moist by wt (%)	45	41	38	
Min moist by vol (%)	27.2	38.9	42.8	
Max moist by vol (%)	57.3	69.5	67.4	
AWC (mm)	30	61	222	313

*Zone 2 soil moisture was estimated by averaging shallow and deep samples.

TABLE 9.—Average soil moisture conditions at each of ten sites in the Lutz Catchment, Jun 1981–Aug 1987, and the plateau, Jun 1981–Mar 1984.

Rank	Lutz 0–10 cm Site	Avg	Sd	Cv	Lutz 30–40 cm Site	Avg	Sd	Cv
1	9	32.1	4.7	14.7	8	30.4	4.5	14.8
2	10	34.0	5.8	17.2	9	30.6	2.8	9.1
3	6	34.5	6.1	17.6	10	30.7	2.8	9.2
4	1	36.5	6.5	17.8	6	30.7	3.4	11.1
5	4	37.2	3.8	10.2	7	34.0	2.6	7.7
6	7	38.2	5.9	15.4	2	34.3	3.8	11.1
7	2	39.3	6.3	16.0	1	34.5	3.7	10.8
8	5	41.6	5.5	13.2	4	35.6	3.5	9.7
9	3	41.6	6.1	14.6	3	36.2	3.8	10.4
10	8	42.5	6.0	14.2	5	36.9	3.2	8.7
Avg		37.7	5.7	15.1		33.4	3.4	10.3
	Plateau 0–10 cm Site	Avg	Sd	Cv	Plateau 30–40 cm Site	Avg	Sd	Cv
1	6	31.1	5.70	18.3	6	28.1	4.58	16.3
2	1	31.5	5.33	16.9	3	29.4	3.35	11.4
3	3	31.9	4.99	15.6	1	29.7	3.29	11.1
4	2	31.9	4.39	13.8	7	29.8	3.71	12.5
5	5	32.2	6.26	19.4	5	29.8	3.36	11.3
6	10	32.3	4.86	15.1	10	29.8	3.17	10.7
7	4	32.5	5.55	17.1	9	29.8	3.45	11.6
8	9	32.6	5.22	16.0	2	29.9	2.91	9.7
9	7	34.3	5.98	17.5	4	30.2	3.99	13.2
10	8	36.2	5.79	16.0	8	32.0	3.63	11.3
Avg		32.6	5.4	16.6		29.8	3.5	11.9

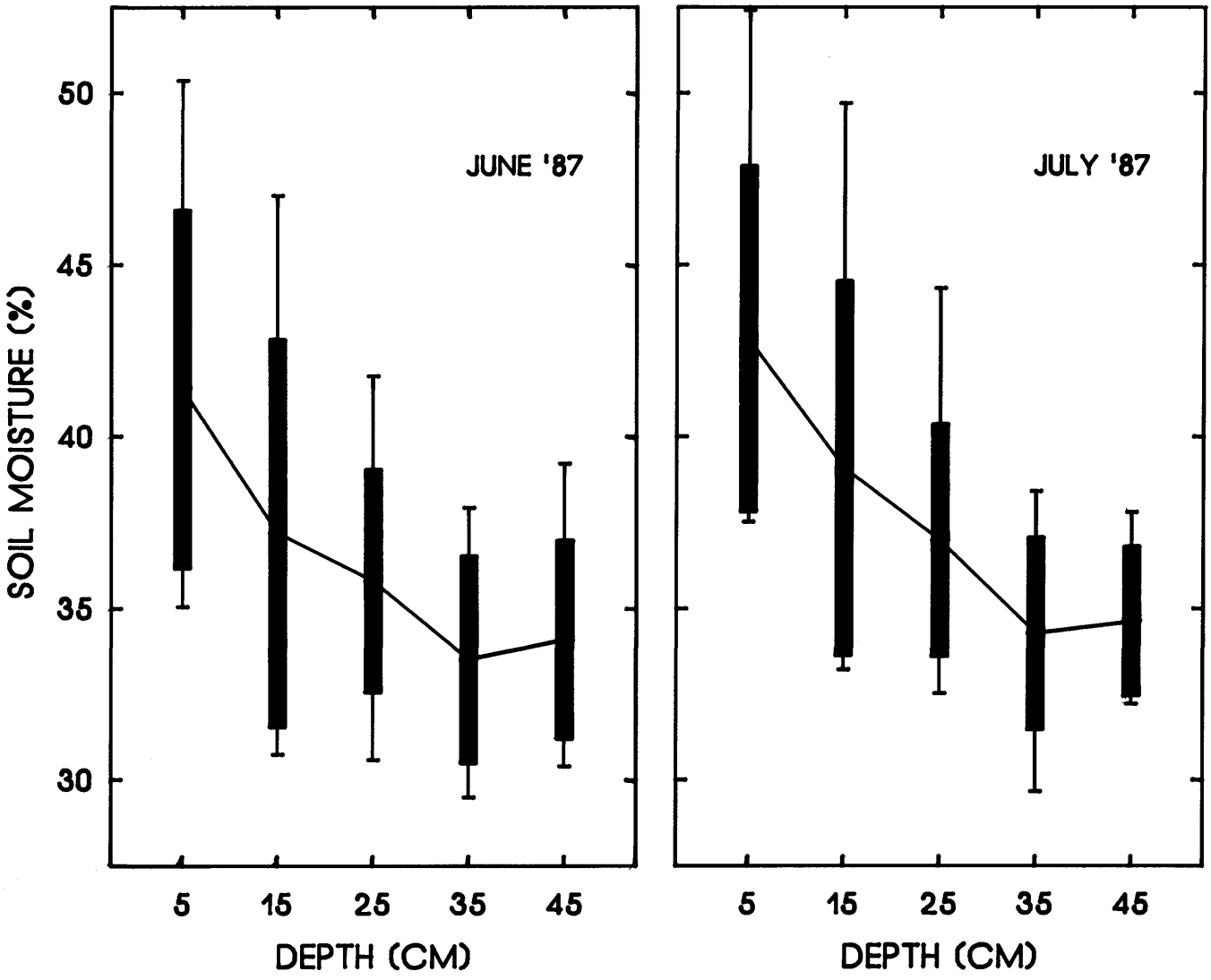


FIGURE 26.—Average, standard error, and range of soil moisture values by sample depth for two collections during wet season in the Lutz catchment.

vs soil moisture curves from cores removed in June and July 1987 (Figure 26). Soil moisture decreased monotonically in these two samples to a depth of 30–40 cm after which it either remained constant or increased slightly. A greater number of these determinations, especially some taken during the dry season, and more soil depth measurements will considerably improve the quality of future moisture budgets for the Lutz catchment.

Samples taken from the same depth but at different sample stations within the catchment give quite different soil moisture determinations (Figure 27). Stations giving the lowest overall mean soil moisture (stations 9 and 10, Table 9) are those located along the upper boundary of the catchment with little if any drainage into the sampling area (Figure 2). Stations giving the highest overall mean soil moisture (stations 3 and 8, Table 9) are those located in the lower reaches of the catchment. Soil moisture determinations differ considerably between the Lutz catchment and the island plateau. Average surface soil moisture determinations taken on the same date in the two areas when plotted against one another show a clear linear relationship (Figure 28*a*). When surface soil moisture is higher in the Lutz catchment soil moisture is proportionately higher on the plateau. The slope of the relationship, however, is less than one. Maximum surface soil moisture observed in Lutz was roughly 45%, on the plateau roughly 34%. Minimum values were 23% on the plateau and 27% in the catchment. Thus, at both extremes, plateau samples generally had lower soil moisture values than catchment samples.

Soil samples taken from a depth of 30–40 cm can differ markedly in soil moisture from samples taken at a depth of 0–10 cm. Unlike 0–10 cm samples, 30–40 cm samples reach maximum values (late wet season samples) at roughly 40%

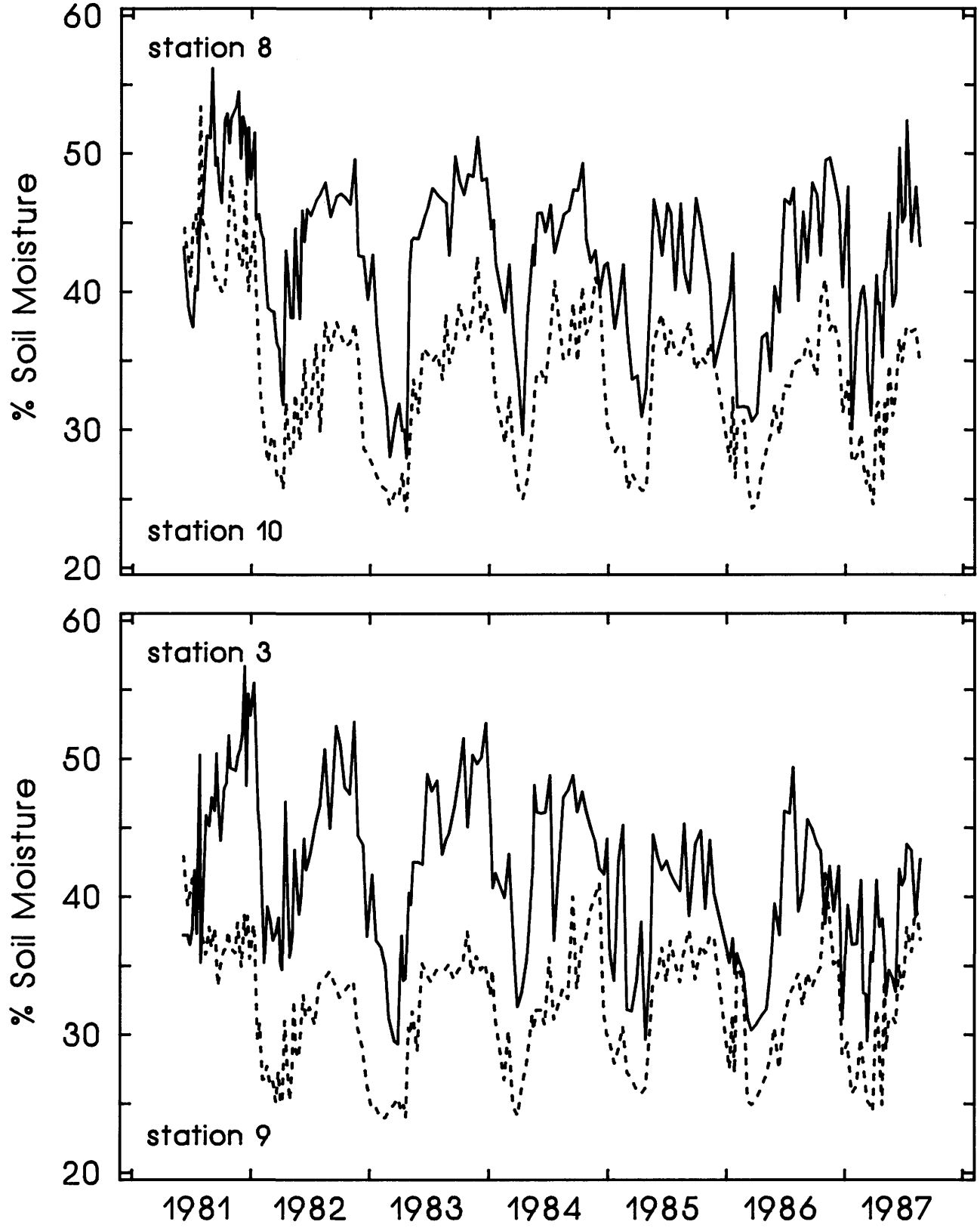


FIGURE 27.—Two comparisons of monthly average soil moisture values obtained high (stations 9 and 10) and low (stations 8 and 3) in the Lutz catchment, 1981–1987.

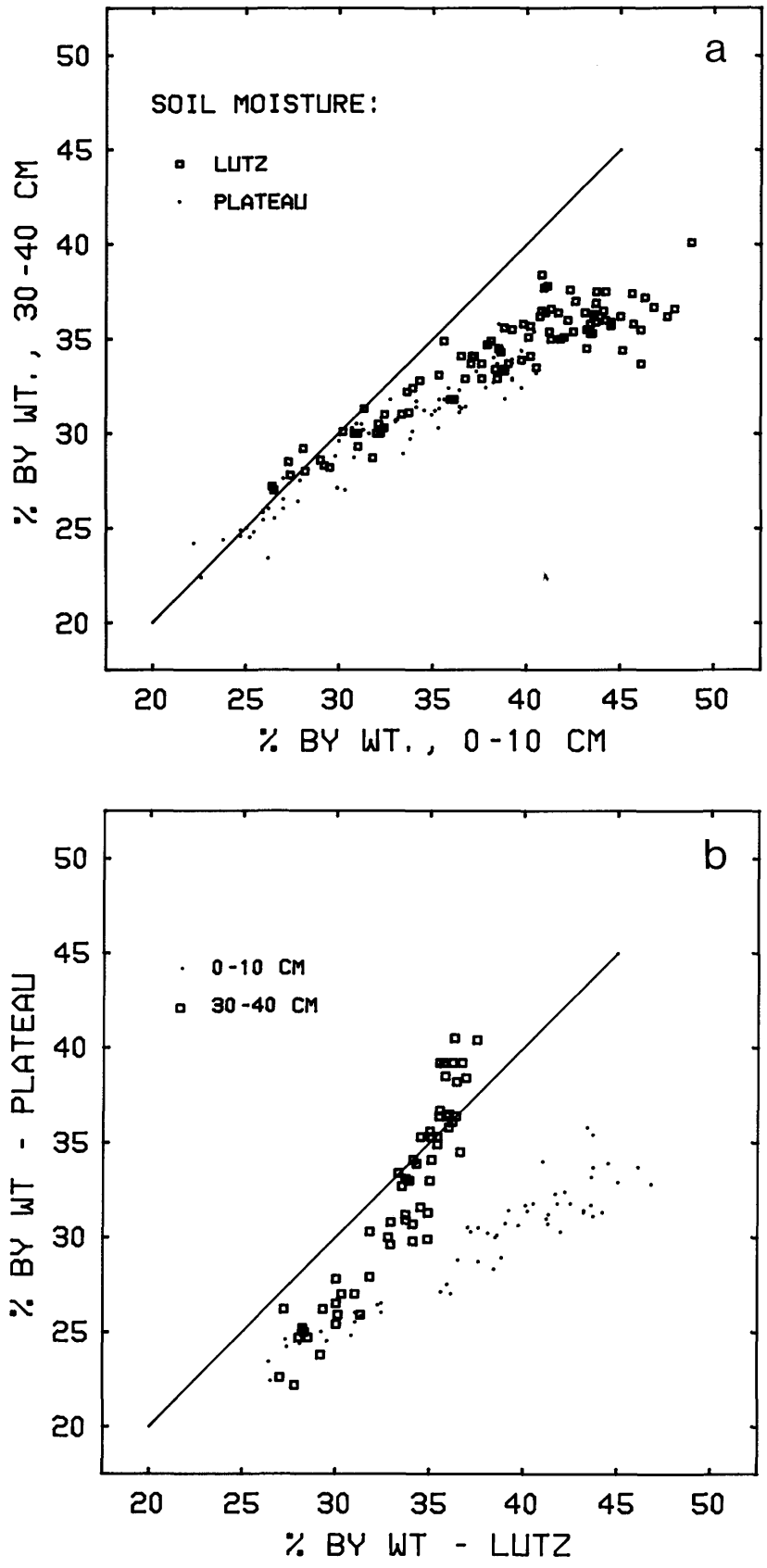


FIGURE 28.—Scatter-plot comparisons of simultaneous soil moisture determinations for (*a*) different depths and (*b*) areas. Each data point is an average of ten sample sites within each area for a particular date between June 1981 and February 1984.

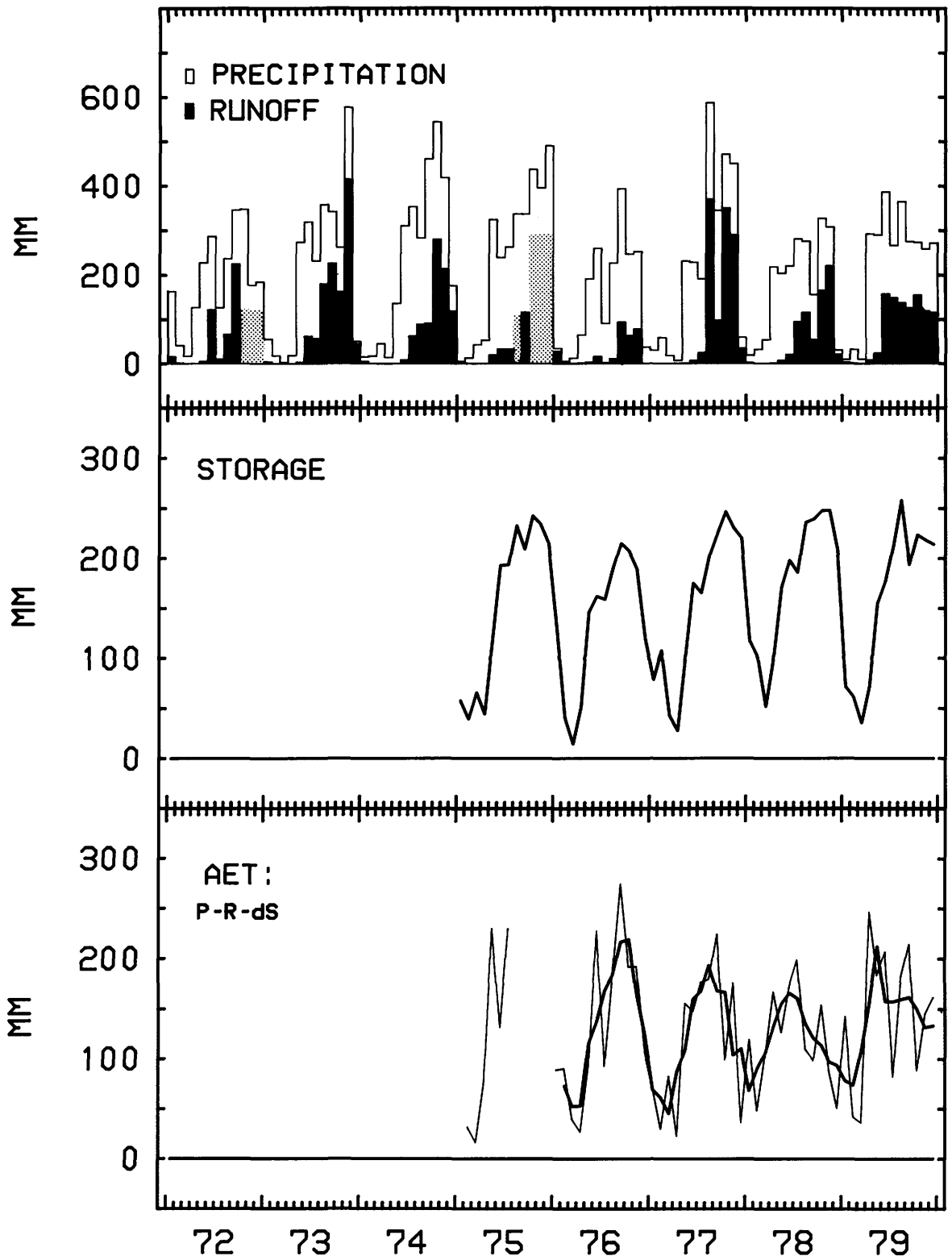
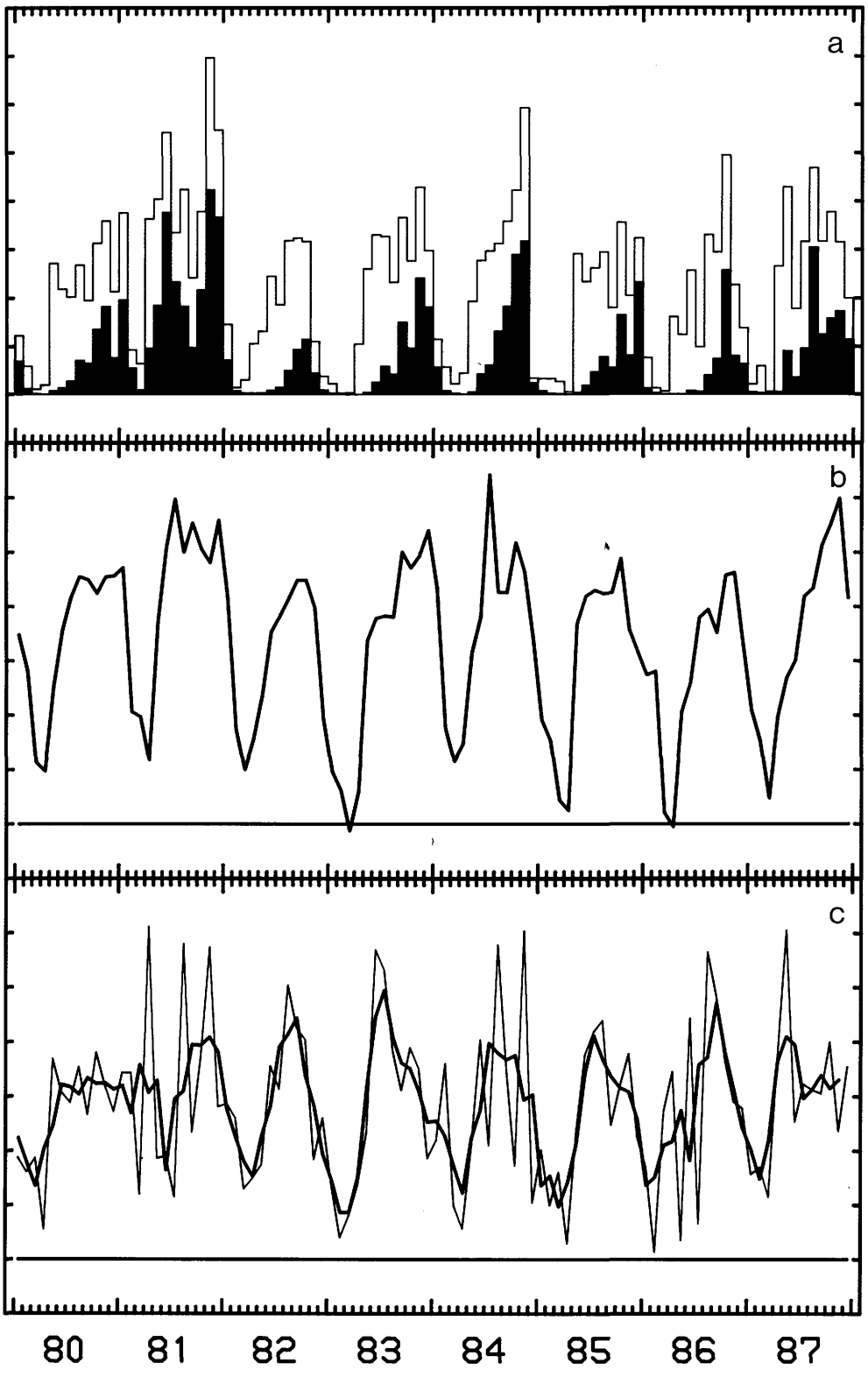


FIGURE 29.—Quantity of (*a*) rainfall and runoff, (*b*) moisture equivalents held in soil, and (*c*) actual evapotranspiration (AET) calculated as the difference between rainfall, runoff, and changes in storage (thicker of two lines represents three-term, equally weighted, moving average of AET) in the Lutz catchment by month between 1975 and 1987.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on the plateau but only 37% in Lutz (Figure 28*b*). Minimum values (dry season samples) reached by deep samples are roughly the same as surface samples. Intermediate values form a curvilinear rather than linear array. When the rainy season begins, the moisture content of soil at 30–40 cm rises more rapidly on the plateau than in the Lutz catchment. Movement of moisture is probably impeded or trapped by deep soils and an underlying andesitic cap as evidenced by the "swamp" on one part of the plateau.

RUNOFF

Appendix Tables G1–G2

"Runoff" or "stream discharge" from the Lutz catchment is determined from water level recorded behind a sharp-crested, 120 degree, V-notch weir contructed in 1971. The bottom of the V-notch is roughly 1.5 m above bedrock and impounds a 15–18 m body of water, roughly 6 m wide at the weir and 8 m long. Transported sediments accumulate behind the weir over time substantially reducing the volume of the basin. The basin is shovelled clean one to three times per year depending on the frequency of high intensity rainstorms. Height of water in the weir pond has been recorded continuously by a Stevens A-71 strip-chart, water level recorder (Leupold and Stevens Inc., Beaverton, Oregon). Water level is transcribed using a Hewlett Packard 9830 computer and digitizer, converted to flow rate, and integrated, giving daily volume leaving the catchment expressed in this report as mm rainfall equivalents. Discharge (Q in ft^3/sec) is calculated from water level (H in ft) according to the following formula: $Q = 4.43 \times H^{2.449}$ (Hertzler, 1938) and then converted to metric units. The runoff record (Figure 29*a*) includes two major gaps occurring in 1972 and 1975. Runoff is used below to estimate evapotranspiration.

EVAPOTRANSPIRATION

Appendix Table H1

The recycling of moisture from tropical forests has attracted attention in recent years as large-scale deforestation and land degradation continue in the Amazonian and extra-Amazonian tropics (Salati and Vose, 1984). A central concern is whether the removal of tropical forest will lead to change in regional climate and moisture availability. Therefore, it is important to obtain estimates of the rate of return of moisture to the atmosphere from a variety of landscapes, temperate and tropical, forested and deforested.

Evapotranspiration is moisture returning to the atmosphere in the form of vapor from a given surface area. As such it is the sum of moisture evaporated from leaf and litter surfaces and moisture transpired by plants. There are a variety of methods for estimating evapotranspiration including (1) measuring evaporation directly from a standardized surface, (2) differencing rainfall, runoff, and changes in storage ("moisture budget"), (3) measuring differences in isotope concentrations in rainfall and runoff, (4) radiosonde measuring water vapor concentration and flux, and (5) using energy balance equations.

Rates of evaporation were measured on Barro Colorado Island from June 1981 until February 1984. A U.S. Weather Bureau Class-A Evaporation pan (1.22 m in diameter, 25.4 cm deep) sitting on a 10 cm high wooden scaffold permitting a free flow of air around and under the pan was located in the laboratory clearing. Evaporation was determined as the amount of water needed to bring the surface back to a predetermined depth, approximately 50 mm below the limit of the sides of the pan, after 24 hours. Evaporation readings were taken simultaneous with measurements of air and pan-water maximum and minimum temperatures, daily windrun, and precipitation, usually around 0900 hrs each morning. Because rainfall since the last reading was sufficient to cause overflow from the pan, evaporation was not calculated if the rainfall in the previous 24 hours exceeded 50 mm.

After a two-month trial period, evaporation readings were initiated in June of 1981. They were terminated in January 1984. The median daily evaporation rate for the entire study was 3.8 mm/dy (Figure 30). The median was 4.4 mm/day for dry season days and 3.0 mm/dy for rainy season days. The latter is probably an overestimate because evaporation on days of high rainfall was omitted. Average monthly evaporation rates ranged from a low of 2.5 to a high of 4.8 mm/dy. Maximum air temperature, maximum water temperature, solar radiation, and windrun were all highly correlated with evaporation rate (Figure 31). Evaporation rate correlated best with maximum daily temperature of the water in the pan. However, maximum daily water temperature only accounted for 55% of the variance in observed rates of pan evaporation.

Average monthly pan evaporation rates are plotted in Figure 32 in relation to actual evapotranspiration (rainfall minus runoff minus changes in storage), potential evapotranspiration calculated using the Penman and the Thornthwaite methods (Dunne and Leopold, 1978). Pan evaporation rates are similar to results from the Penman method. Both methods show an increase in rate during dry season months as expected. The Thornthwaite formula generates evapotranspiration values 20 mm per month higher than either the pan or Penman method for wet season months. Mid-dry season values of pan, Penman, and Thornthwaite methods are fairly similar although conditions during the 1982–1983 El Niño event seem to drive Thornthwaite values slightly higher than pan and Penman values. Actual evapotranspiration appears to reach values nearly twice that of the other methods during the wet season. Peak wet season evapotranspiration rates reach 250 to 300 mm per month; the average is roughly 200 mm per month. Dry season values routinely fall below 50 mm per month. The high evapotranspiration rates in the dry season of 1982 follow an extremely wet year and coincide with the onset of the 1982–1983 El Niño event.

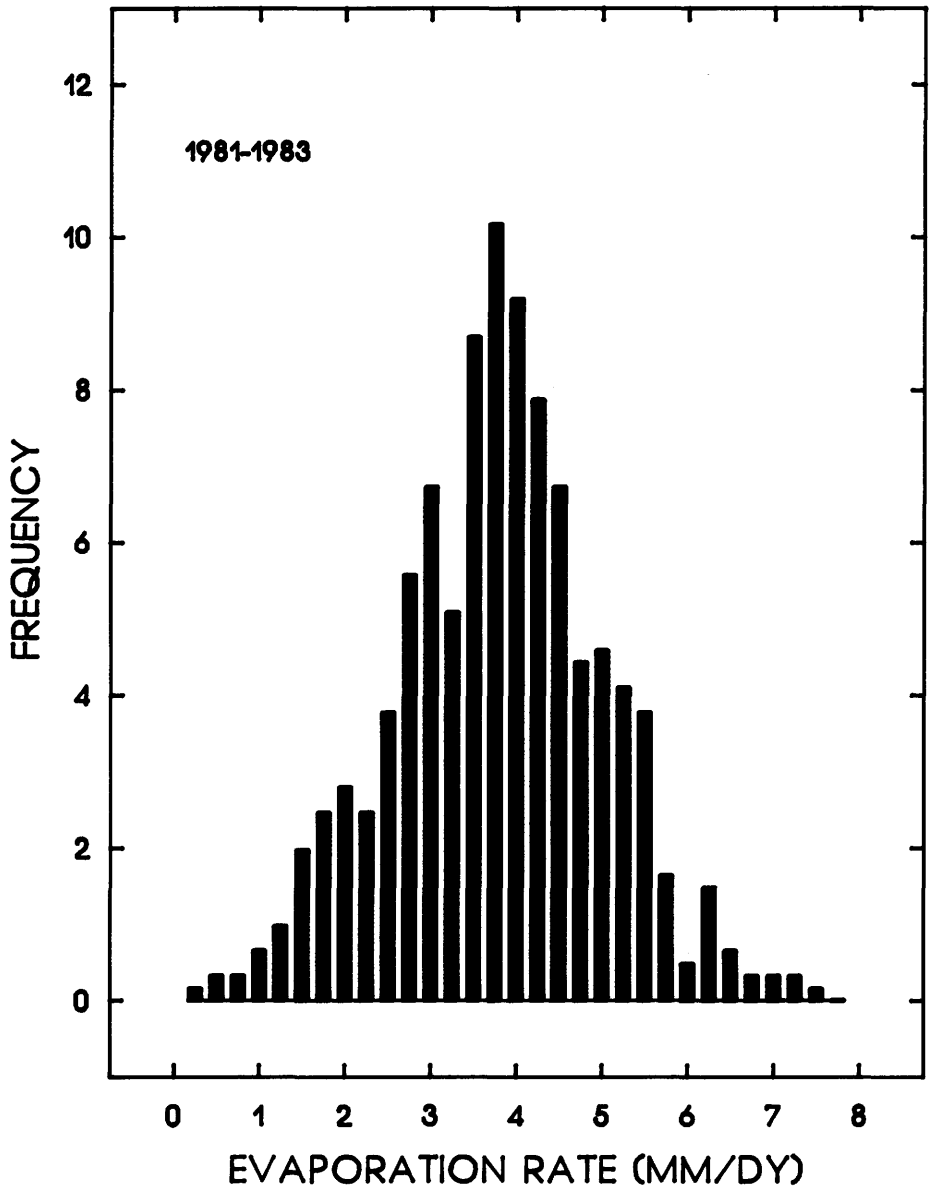


FIGURE 30.—Frequency histogram of daily evaporation readings taken from a class A pan in lab clearing, Barro Colorado Island between June 1981 and January 1984.

Perhaps the most direct method of estimating evapotranspiration requires the measurement of rainfall, runoff, and changes in soil storage. Changes in soil moisture can be minimized by reconciling the moisture budget over an "hydrologic year" such that the moisture in storage in the beginning month is near that in the final month. The "hydrologic year" in the seasonal tropics can be broken in the mid- to late dry season when runoff is at its minimum and when moisture available to plants is near zero. If these conditions are met then evapotranspiration for the year is very nearly equal to precipitation minus runoff.

Estimates of annual rainfall, runoff, and moisture in storage for the Lutz catchment, 1973–1987, are summarized in Table 10. The catchment received, on average, 2587 mm of rain per year during this period (1975 has been omitted due a gap in the runoff record). Runoff averaged 929 mm per year (36% of annual rainfall). Average changes in soil moisture storage that should have been close to zero were +2 mm per year (range: −56 to +64 mm/yr). Estimated actual evapotranspiration (rainfall minus runoff minus changes in soil storage) averaged 1656 mm per year (64% of annual rainfall).

Annual estimates of evapotranspiration include both the wettest and driest of the past 62 years on Barro Colorado Island. In the dry El Niño years of 1976 and 1982 evapotranspiration was 84.2% and 84.1% of rainfall, respectively. Evapotranspiration in 1981, the wettest year since 1909,

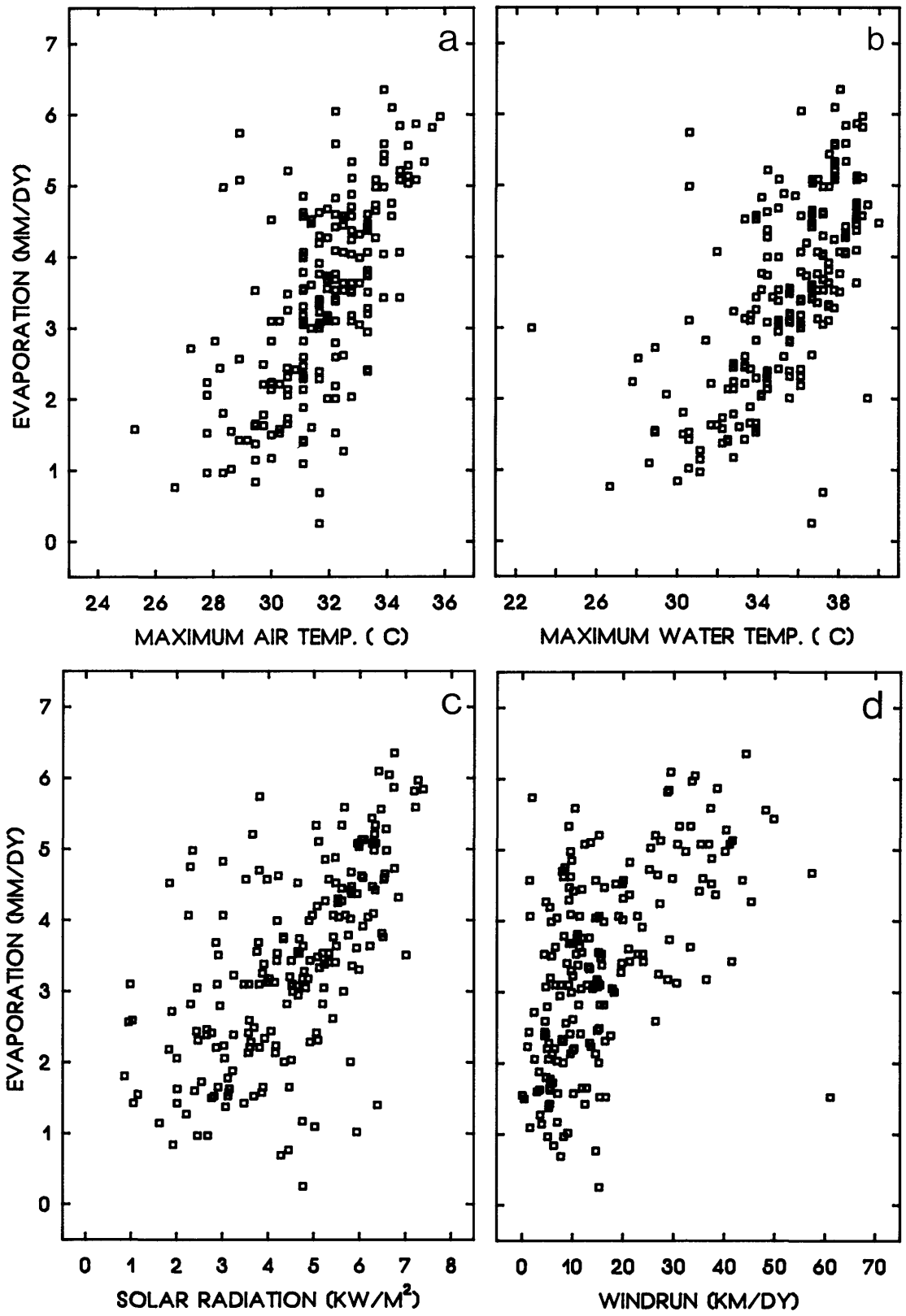


FIGURE 31.—Pan evaporation rate versus (*a*) maximum air temperature, (*b*) maximum water temperature, (*c*) solar radiation, and (*d*) windrun.

was only 46.9% of rainfall. Other years fell within these extremes generating a positive linear relationship between annual quantities of rainfall and runoff ($n = 14$, $p<0.01$, $r^2 = 0.95$) and between rainfall and evapotranspiration ($n = 14$, $p<0.01$, $r^2 = 0.48$) (Figure 34). As above, the soil moisture term was small, however, neglecting the term altogether leads to a poorer regression of evapotranspiration on rainfall ($n = 14$, $p<0.02$, $r^2 = 0.40$). In absolute terms, years of higher rainfall are years of greater runoff; however, the relationship is less than one to one because evapotranspiration also is greater. Generally, an increase in annual rainfall of 500 mm leads to a 400 mm increase in runoff and a 100 mm increase in evapotranspiration.

Evaporation measured with a Class-A pan in the laboratory clearing produced values considerably lower than the evapotranspiration values obtained above by the moisture budget. Evapotranspiration over the 30 month pan evaporation study summed to 4576 mm, pan evaporation 3298 mm. While pan evaporation rates were routinely one-half of actual evapotranspiration values during wet season months they were considerably higher than actual evapotranspiration during dry season months in the Lutz catchment. Thus, on an annual basis pan evaporation was only 70% of actual evapotranspiration. Pan evaporation rates are probably only useful as an index of forest evapotranspiration if (1) values are summed over intervals of at least one year and (2) if a correction factor is determined. A suitable factor to correct annual evaporation on Barro Colorado Island is roughly 1.4.

How do the estimates of evapotranspiration from Barro Colorado Island compare to those from other studies? Table 11 summarizes evapotranspiration estimates from catchments in both the north-temperate and low latitudes. Evapotranspiration is highest for the Maryland and Florida catchments with low slope and high rainfall, lowest for the forested mountainous catchments at Hubbard Brook, Walker Branch, and Coweeta. Both rainfall and evapotranspiration are generally higher in the tropics. However, estimates of evapotranspiration rates in the Amazon basin vary considerably between studies. Two separate Brazilian studies (Leopoldo et al., 1982; Franken and Leopoldo, 1984) report evapotranspiration as 65% and 81% of annual precipitation (roughly 2000 mm). Other methods of estimating evapotranspiration (vapor flux, isotope ratios, energy budgets) reviewed by Salati and Marques (1984) suggest evapotranspiration over the entire Amazon basin may be closer to 50% of average annual precipitation. Shuttleworth (1988), using an energy budget approach to calculate transpiration and measurements of interception, estimated that 50% of rainfall was returned as vapor from Brazilian forest during two years (two year rainfall was 5454 mm). Jordan and Heuveldop (1981), working on the northern edge of the Amazon basin at San Carlos de Río Negro, Venezuela, estimated evapotranspiration by tritium dilution, pan evaporation, and an energy budget model as 59%, 48%, and 44% of average annual precipitation (3664 mm). The middle estimate was accepted and has been the one usually cited. Thus, there is still a relatively broad range of estimates of evapotranspiration (45%–81% of annual rainfall) for the Amazon basin.

Evapotranspiration has been calculated in several short studies on hydrological conditions in Panamanian forests. The earliest (McGinnis et al., 1968), conducted during wet season months in the Darien Province, reported that roughly 67% of rainfall (1768 mm in 221 days) returned as either evaporation or transpiration. Read (1977, 1979) constructed a moisture budget for the forest on Isla de Majé based on a two year record of rainfall and canopy interception. Evapotranspiration was indirectly estimated as 70% of annual rainfall. Estimates of evapotranspiration considerably lower than those for Barro Colorado Island were obtained during a 4-year study conducted by the Panamá Canal Commission on the Río Agua Salud, a mainland catchment roughly 9 km east of Barro Colorado Island (Table 11). Results from a collection of hydrological studies in both temperate and tropical latitudes indicate a loose ($r^2 = 0.56$) among-site relationship between average annual evapotranspiration and precipitation (Figure 35). The average value from Barro Colorado Island appears to lie comfortably close to the principal axis through the data. Clearly, there are many other variables affecting this relationship that are ignored. Nevertheless, from a diverse collection of studies, some much more thorough than others, evapotranspiration appears to fall between 50 and 60 percent of rainfall in average years.

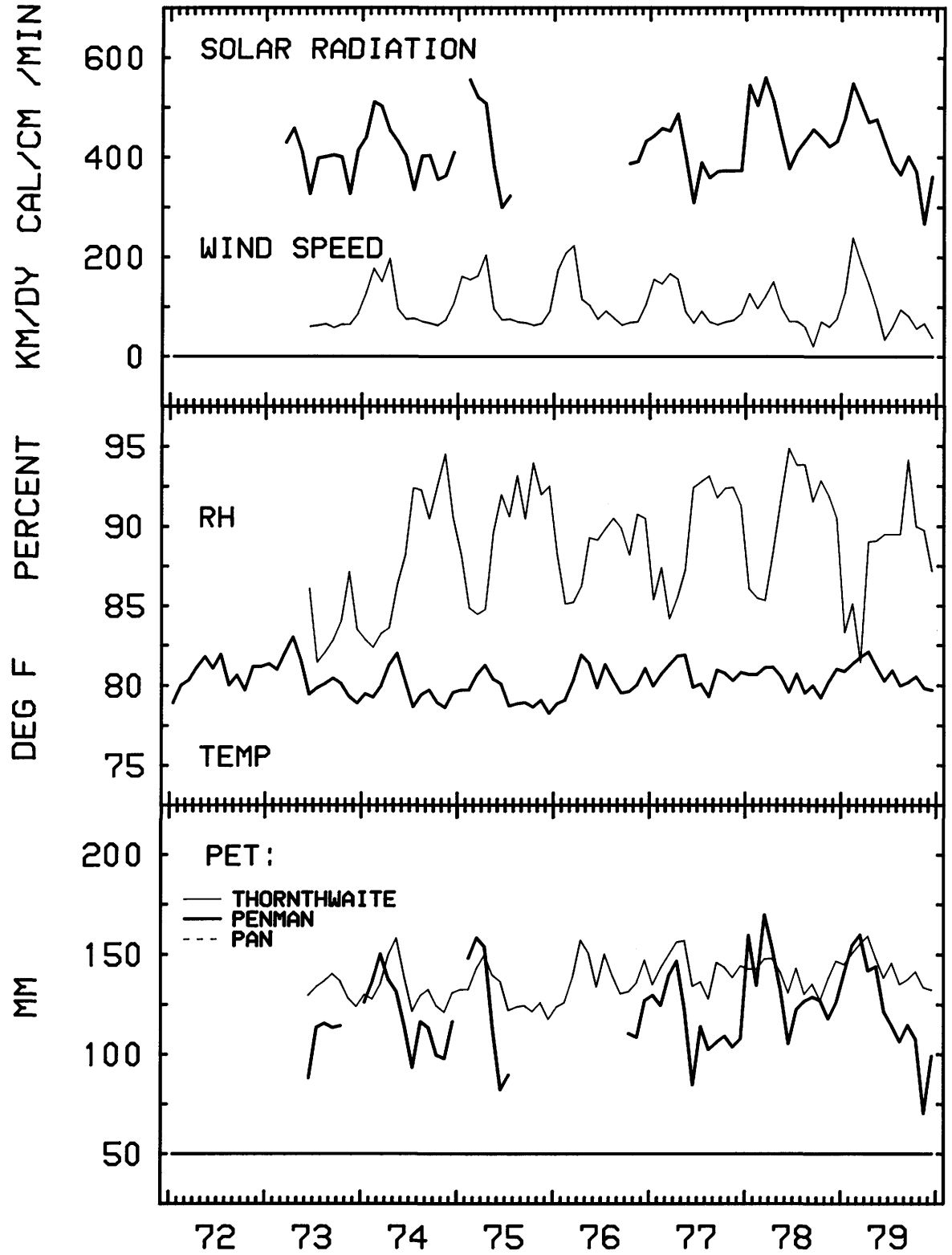
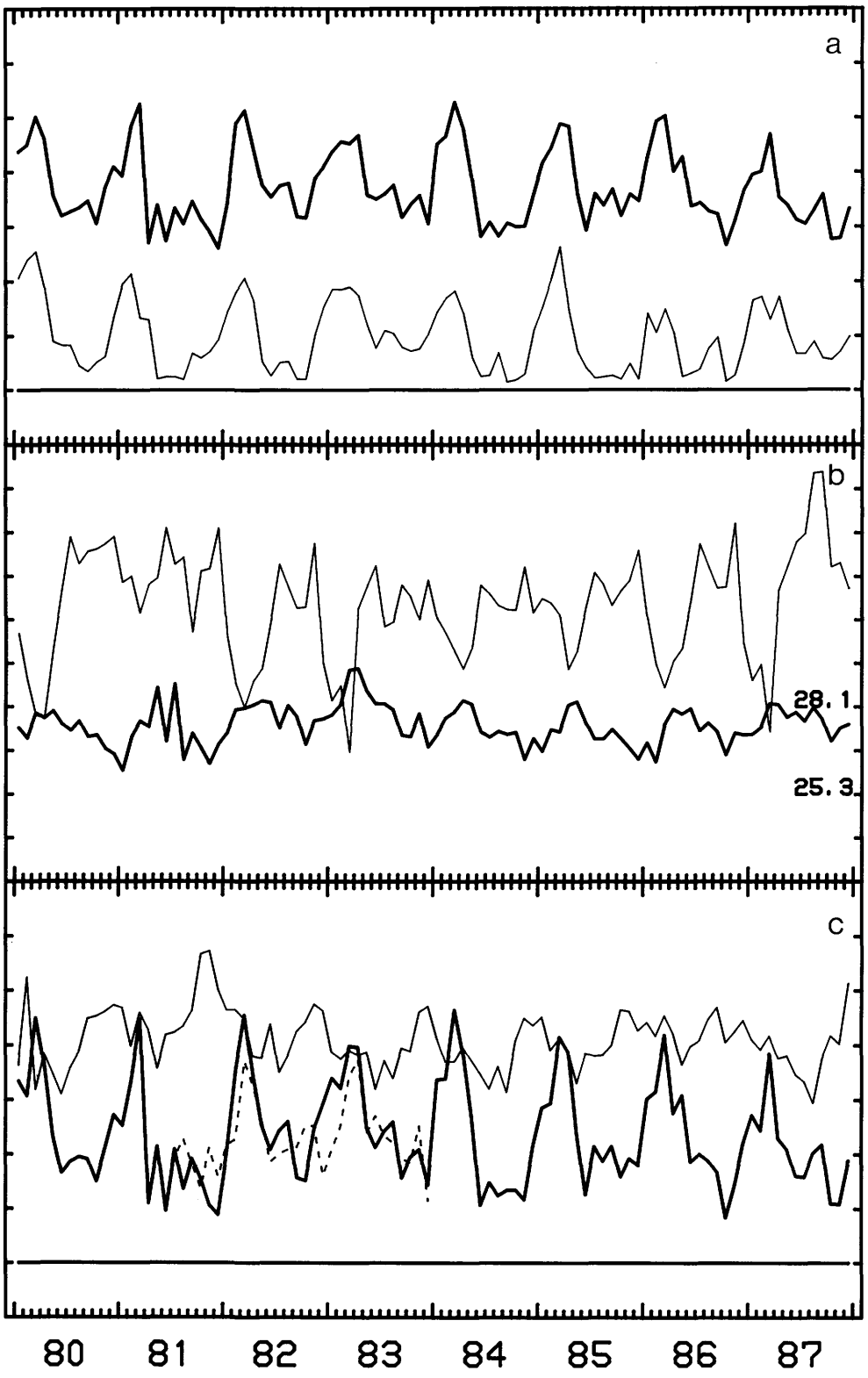


FIGURE 32.—Monthly values of (*a*) solar radiation and windspeed, and (*b*) relative humidity and temperature used to calculate (*c*) potential evapotranspiration using the Penman method. Observed rates of pan evaporation and Thornthwaite estimates of PET are also included in latter panel.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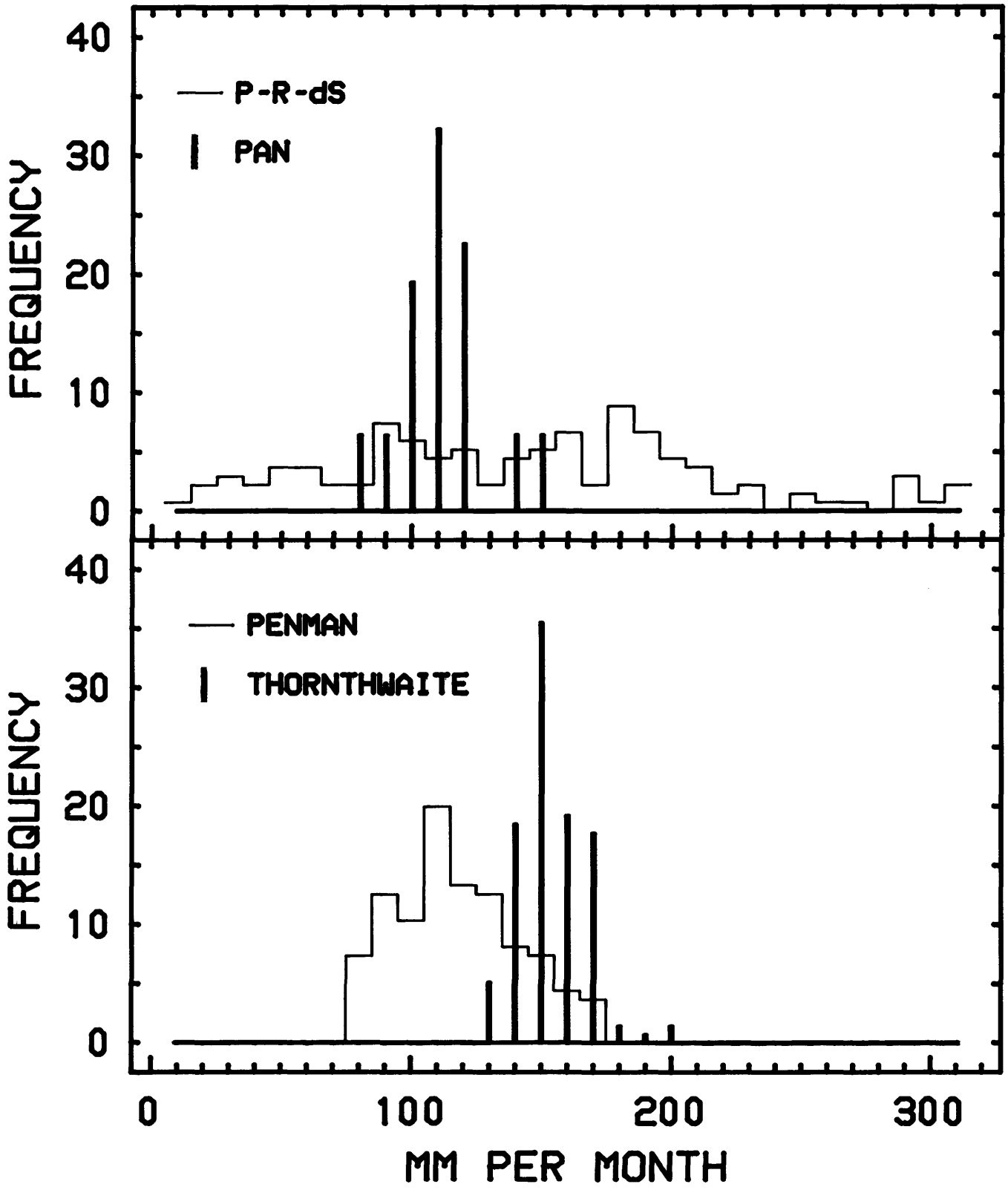

FIGURE 33.—Comparison of observed measurements of pan evaporation and actual evapotranspiration rates by month with calculated rates of potential evapotranspiration using Penman and Thornthwaite methods.

TABLE 10.—Moisture budget for the Lutz catchment (units are mm rainfall equivalents; soil storage for first two years assumed to be zero).

Hydrologic year	Rain	Runoff	% Runoff	Soil storage	Rain-runoff-storage	% Rain-runoff-storage
1973	2529	1161	45.9	-	1368	54.1
1974	2570	868	33.8	-	1702	66.2
1976	1890	271	15.8	28	1591	84.2
1977	2698	1176	43.9	9	1514	56.1
1978	2093	705	32.9	-16	1404	67.1
1979	2901	1074	37.7	21	1807	62.3
1980	2620	842	33.7	42	1737	66.3
1981	4165	2260	53.1	-49	1953	46.9
1982	1824	346	15.9	-56	1534	84.1
1983	2849	870	32.8	64	1916	67.2
1984	2646	1079	39.4	-36	1603	60.6
1985	2273	700	30.3	-12	1584	69.7
1986	2232	540	24.8	14	1679	75.2
1987	2927	1121	38.3	19	1787	61.0
Avg	2587	929	34.2	2	1656	65.8
Sd	556	464	10.1	35	169	10.1
Cv	22	50	29.5	1479	10	15.4

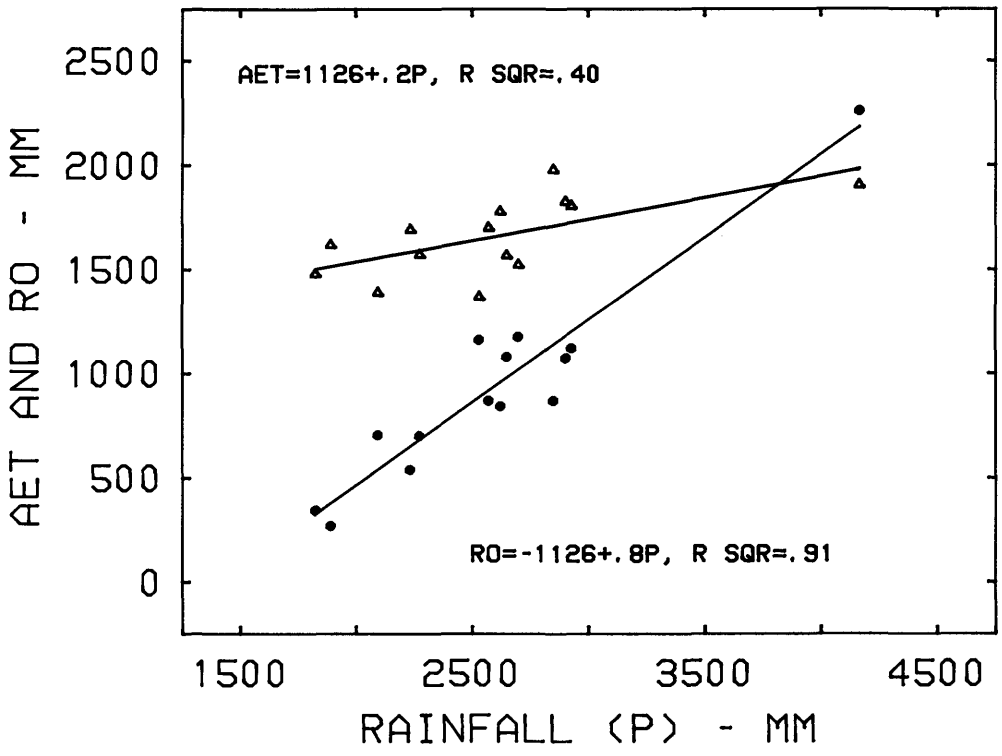

FIGURE 34.—Annual quantities of moisture leaving the Lutz catchment as evapotranspiration and runoff in relation to quantities of moisture entering the catchment as rainfall.

TABLE 11.—Partial listing of annual water balance relationships for catchments in North and South America and Asia (P = precipitation; R = runoff in mm equivalents).

Location	catch-ments	Yrs	Avg. P	Avg. R	% R	P-R	% P-R	Reference
Hubbard Brook, NH	6	5	1222	718	58.8	504	41.2	Likens et al., 1970
Chesapeake, MD	7	3	1140	285	25.0	855	75.0	Chirlin et al., 1977
Var. rivers, MD	11	35	1090	383	35.1	707	64.9	Chirlin et al., 1977
Mahantango Creek, PA	1	?	1068	427	40.0	641	60.0	Gburek, 1977
Walker Branch, TN	1	6	1510	861	57.0	649	43.0	Henderson et al., 1977
Coweeta, SC	2	30	1813	955	52.7	858	47.3	Swift et al., 1987
Tallahassee, FL	1	2	2540	312	12.3	2228	87.7	Turner et al., 1977
BCI, Panama	1	13	2561	915	35.7	1645	64.2	this report
Agua Salud, Panama	1	4	2572	1472	57.2	1100	42.8	unpublished data, PCC
Bayano, Panama	1	2	2010	510	25.4	1500	74.6	Read, 1977
Darien, Panama	1	<1	1768	707	40.0	1061	60.0	McGinnis et al., 1968
San Carlos, Venez.	1	2	3664	1759	48.0	1905	52.0	Jordan and Heuveldop, 1981
Manaus, Brazil	1	2	2293	635	27.0	1659	73.1	Franken and Leopoldo, 1984
Canton, China	1	1	1720	569	33.1	1151	66.9	Lockwood, 1976
Hong Kong, China	1	1	2128	907	42.6	1221	57.4	Lockwood, 1976
Sungai Gombak, Malay	1	1	2500	750	30.0	1750	70.0	Lockwood, 1976
Selangor, Malay.	1	1	2702	1726	63.9	976	36.1	Lockwood, 1976

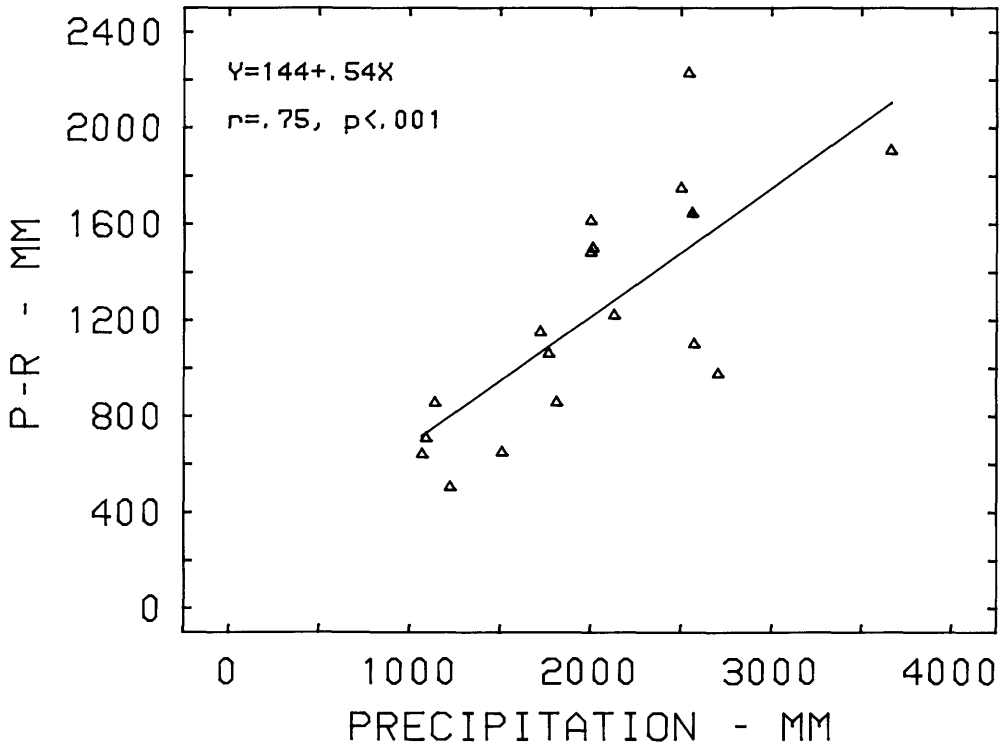

FIGURE 35.—Correlation existing between precipitation and evapotranspiration obtained from eighteen hydrological studies.

Appendix A: Rainfall

TABLE A1.—Daily rainfall (mm) on Barro Colorado Island recorded at 900 hrs by the ESP, 1971–1989.

1971	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1				0	0	2	12	0	10	0	12	8
2				0	4	2	11	14	12	84	28	0
3				0	0	2	25	12	4	0	17	0
4				0	0	0	1	46	0	3	10	0
5				0	5	0	20	4	76	0	19	14
6				0	25	27	1	5	2	0	5	0
7				2	112	0	16	5	0	0	13	1
8				0	76	1	5	1	17	4	23	0
9				0	18	2	1	3	5	5	6	0
10				0	94	7	0	9	0	15	29	0
11				0	3	3	1	2	0	7	10	0
12				1	50	15	13	2	4	0	12	0
13				0	23	0	38	0	3	0	0	0
14				0	3	6	2	30	30	0	0	0
15				0	0	1	3	2	0	2	10	0
16				0	60	2	0	0	4	0	3	0
17				0	5	10	9	0	5	0	9	1
18				0	17	4	1	0	3	0	32	0
19				0	22	0	21	1	10	7	0	0
20				0	22	9	6	30	3	1	16	0
21				0	56	11	7	20	0	0	0	0
22				0	1	1	14	12	48	0	0	0
23				0	0	13	0	0	0	3	7	0
24				0	0	0	40	0	2	0	0	0
25				8	2	23	1	8	18	0	5	8
26				8	0	0	6	19	5	15	22	0
27				0	3	8	5	3	3	5	34	0
28				2	2	3	1	54	3	0	0	0
29				0	2	4	0	4	0	10	0	0
30				0	0	22	10	4	4	7	3	0
31					17		11	4		1		0
Total				20	621	178	280	294	270	168	324	31

1972	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0	0	0	0	15	1	0	0	15	0	4	0
2	3	3	0	0	4	5	3	0	0	43	4	0
3	4	0	0	0	1	17	18	0	22	19	25	0
4	8	0	0	0	4	19	0	0	9	28	9	0
5	25	0	1	0	1	51	0	0	0	24	0	0
6	17	0	0	0	0	1	0	0	0	3	14	2
7	14	1	6	0	26	1	12	0	2	38	0	0
8	30	2	0	0	1	1	3	1	1	0	1	0
9	30	20	0	0	0	18	0	0	3	0	0	11
10	0	1	2	2	16	0	0	4	10	4	0	0
11	0	0	2	29	6	12	3	0	28	2	5	0
12	0	0	0	1	0	51	5	0	10	10	16	1
13	5	0	0	0	0	3	0	18	6	12	16	0
14	0	2	5	0	0	4	0	2	10	3	29	1
15	3	0	1	0	43	0	0	33	20	0	4	0
16	0	0	0	0	0	0	0	1	72	0	0	0
17	9	0	0	0	0	0	0	0	9	0	0	0
18	15	0	0	11	0	0	0	6	0	7	0	0
19	0	0	0	9	0	0	0	1	0	10	3	57
20	0	0	0	3	0	81	48	7	11	0	0	74
21	0	12	0	28	27	2	14	1	19	2	1	27
22	0	0	0	8	14	0	0	3	0	8	0	0
23	0	1	0	7	0	6	0	24	1	19	0	11
24	0	0	0	15	0	0	14	0	28	4	34	2
25	0	0	0	7	0	2	0	39	1	3	0	0
26	0	0	0	2	0	8	1	33	5	35	1	1
27	0	0	0	1	7	1	6	47	8	0	8	0
28	0	0	0	0	9	0	0	1	39	14	1	0
29	0	0	0	3	44	0	0	13	0	44	0	0
30	0		0	1	7	5	0	0	16	1	0	1
31	3		1		0		1	5		17		0
Total	163	41	17	127	228	287	126	237	346	348	177	185

1973	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	1	0	0	0	6	0	3	4	78	2	0	0
2	0	0	2	0	7	0	0	35	1	8	33	6
3	0	0	0	0	6	0	30	4	0	10	3	0
4	0	0	0	0	0	0	5	1	0	0	0	0
5	0	0	0	0	0	25	8	6	6	0	0	0
6	0	1	0	1	1	2	2	38	11	18	0	0
7	0	0	0	0	23	23	0	7	7	16	29	1
8	0	0	0	0	37	2	0	0	3	0	5	2
9	0	0	0	0	9	16	1	5	0	2	10	6
10	0	0	0	1	0	2	1	19	2	2	6	14
11	14	0	0	1	0	4	25	55	5	0	13	10
12	0	8	0	3	0	116	0	0	1	0	85	1
13	21	0	0	1	0	0	5	7	0	99	38	0
14	5	0	0	0	0	0	8	36	29	0	18	0
15	1	0	0	0	8	0	36	11	3	0	28	0
16	4	6	0	0	3	14	9	2	18	0	80	0
17	1	0	0	0	0	11	2	10	1	0	102	6
18	0	1	0	0	14	2	14	0	1	20	0	0
19	0	1	0	0	13	14	20	8	1	0	0	0
20	8	1	0	2	0	0	25	1	11	15	0	0
21	0	0	0	0	0	3	0	0	0	23	0	0
22	0	0	0	11	0	9	0	1	2	0	0	0
23	0	0	0	0	4	9	11	1	0	0	1	0
24	1	0	0	0	0	0	3	2	0	0	0	0
25	0	0	0	0	39	10	1	65	128	3	0	0
26	0	0	0	0	4	12	1	3	0	6	78	0
27	0	0	0	0	38	3	2	36	0	6	15	0
28	0	0	0	0	6	0	4	3	0	5	21	0
29	0	0	0	0	21	30	12	0	34	0	10	0
30	0	0	0	0	34	12	0	0	0	17	0	0
31	0	0	0	0	1	0	4	0	0	10	0	0
Total	55	18	3	19	274	319	231	358	341	261	577	45

1974	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	4	0	5	0	0	3	0	8	3	1	8	44
2	4	0	0	0	0	0	18	0	0	4	3	79
3	1	0	34	0	0	0	21	5	0	0	19	7
4	0	1	0	1	0	6	1	25	1	14	13	0
5	3	0	1	0	0	0	0	18	0	14	0	1
6	0	0	0	0	2	0	0	43	0	0	1	0
7	0	0	0	0	0	0	0	11	27	28	3	8
8	0	0	2	1	0	0	2	1	0	1	30	22
9	1	0	0	2	0	3	0	0	0	19	8	3
10	0	0	0	0	8	18	4	44	1	50	3	0
11	0	1	0	0	0	42	1	0	100	22	4	3
12	0	1	0	0	0	27	9	2	1	4	4	0
13	0	0	0	0	0	8	0	2	66	46	10	0
14	0	0	0	0	1	11	10	0	30	57	1	0
15	0	0	0	0	2	0	8	0	30	10	31	4
16	0	3	0	0	0	0	22	0	33	0	44	4
17	0	0	0	0	0	0	1	0	5	1	0	1
18	0	0	1	0	18	64	123	0	47	0	34	0
19	0	0	0	0	6	51	9	3	0	30	2	0
20	0	0	0	0	0	18	0	20	5	0	4	0
21	0	0	0	3	0	0	0	0	5	8	41	0
22	0	0	0	0	0	0	20	44	3	39	21	0
23	0	0	0	3	0	10	3	3	0	4	37	0
24	2	0	0	0	32	10	10	0	0	78	6	0
25	0	0	0	0	3	0	1	0	0	21	22	0
26	0	1	0	0	20	2	3	1	2	8	3	0
27	0	5	0	0	2	17	3	19	25	5	1	0
28	0	4	2	4	0	5	0	1	10	50	8	0
29	0	0	0	0	0	13	46	14	25	14	39	0
30	0	0	0	0	6	0	1	15	41	1	18	0
31	0	0	0	0	37	0	39	3	0	15	0	0
Total	15	17	45	14	136	310	353	283	460	544	418	176

TABLE A1.—Continued.

1975	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	2	0	5	0	0	4	2	6	0	0	9	6
2	0	0	0	0	48	0	18	12	0	13	35	4
3	0	0	0	0	21	0	6	0	1	24	3	1
4	0	0	12	0	1	2	20	6	0	0	0	22
5	0	0	1	0	0	16	26	7	10	25	7	4
6	0	1	23	0	0	0	0	41	0	4	9	43
7	0	0	0	0	0	0	0	22	72	2	1	56
8	0	1	0	0	0	71	10	28	9	1	6	3
9	0	0	0	43	0	0	0	0	1	34	3	38
10	0	0	1	0	0	3	7	0	10	3	13	50
11	0	0	0	0	1	0	0	1	0	20	4	25
12	0	0	0	0	0	0	10	2	2	10	7	61
13	0	0	0	0	31	6	2	30	0	66	0	3
14	1	2	0	0	5	15	0	6	0	30	30	5
15	0	2	0	1	3	2	12	2	90	23	52	0
16	2	0	0	0	14	3	0	0	2	0	60	13
17	0	0	0	0	0	0	1	9	0	10	8	0
18	0	0	0	0	9	0	0	0	2	15	53	5
19	0	0	0	0	42	1	8	10	9	3	19	4
20	0	0	0	0	43	5	66	6	9	28	0	8
21	0	0	0	0	0	14	0	32	0	14	0	38
22	0	0	0	0	0	4	1	0	0	8	4	60
23	0	0	0	0	8	16	11	58	0	8	20	4
24	0	0	0	0	0	17	1	12	6	15	5	3
25	0	0	0	9	20	3	5	32	18	25	29	0
26	0	0	0	0	14	0	24	2	3	5	1	4
27	0	0	0	0	0	10	22	0	5	21	0	5
28	0	8	0	0	28	25	1	6	35	6	2	19
29	0		0	0	33	13	3	7	5	1	9	1
30	0		0	0	0	8	3	0	48	18	2	0
31	0		0		4		4	0		4		2
Total	5	13	43	53	325	239	263	337	337	437	395	490

1976	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0	0	2	0	2	0	0	0	4	0	0	0
2	0	0	3	0	3	0	0	61	26	0	13	0
3	0	0	0	0	0	18	0	8	0	0	16	0
4	0	0	0	0	1	2	17	25	0	0	11	0
5	5	0	0	0	14	0	0	0	0	2	33	0
6	0	0	0	0	13	0	3	0	0	22	0	3
7	0	0	0	0	2	40	0	0	14	1	0	0
8	0	0	0	0	0	2	0	0	0	14	38	0
9	5	0	0	0	0	16	0	0	4	0	4	0
10	0	0	0	46	4	8	0	0	45	0	28	0
11	0	0	0	3	0	0	0	2	0	0	16	0
12	0	0	0	0	0	0	18	18	0	32	29	0
13	0	0	5	0	1	0	5	0	31	0	22	0
14	0	0	0	0	1	5	0	0	23	4	23	0
15	0	0	0	0	0	4	0	0	3	7	0	0
16	1	0	0	0	0	0	0	16	26	0	0	0
17	7	0	0	0	1	0	0	5	23	0	6	0
18	1	0	1	0	0	0	0	1	27	4	0	5
19	0	0	0	0	23	0	0	0	13	37	0	0
20	1	0	0	0	4	34	0	9	0	0	8	0
21	0	0	0	0	0	32	7	0	19	12	2	11
22	3	0	0	3	5	2	24	0	0	30	4	8
23	8	0	2	2	28	0	16	26	19	3	0	7
24	3	0	0	0	1	47	0	3	16	5	0	0
25	0	0	0	0	3	5	0	1	10	40	0	0
26	1	1	0	1	3	0	2	35	13	3	0	0
27	0	2	0	4	5	0	0	0	30	7	0	3
28	0	0	0	1	62	38	0	0	43	2	0	0
29	0	0	0	4	0	0	0	0	1	14	1	0
30	0		0	3	0	6	0	15	6	4	0	0
31	0		0		14		0	0		4		0
Total	34	3	13	65	191	260	91	227	394	247	253	37

1977	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0	0	0	0	0	20	28	50	82	47	4	0
2	0	38	0	0	0	0	0	5	0	3	14	1
3	0	0	0	0	0	0	0	8	10	0	42	0
4	0	0	0	0	0	0	0	0	1	9	0	0
5	0	0	0	0	1	0	40	1	0	11	10	3
6	0	0	0	0	4	0	21	0	11	1	20	0
7	0	2	0	0	0	26	47	60	4	56	30	0
8	0	2	0	0	0	5	4	48	0	15	39	0
9	2	0	0	0	0	0	8	4	0	13	0	0
10	2	0	0	0	2	6	3	0	15	3	51	0
11	0	0	0	1	0	0	0	1	0	51	12	0
12	0	0	0	1	0	28	0	33	7	7	5	1
13	0	0	0	5	0	18	0	0	0	0	10	7
14	0	0	0	0	0	10	0	0	26	3	15	1
15	0	0	0	0	0	15	0	63	22	24	15	1
16	0	1	0	0	0	1	10	78	0	0	0	0
17	0	15	0	0	7	0	10	7	40	40	3	0
18	1	1	10	0	33	5	3	71	10	5	0	0
19	3	0	0	0	24	40	0	36	0	69	50	34
20	3	0	0	0	8	4	8	30	30	4	0	11
21	7	0	0	0	34	1	0	14	37	4	0	0
22	9	1	0	0	34	4	0	8	0	3	0	0
23	0	0	0	0	1	5	0	8	2	25	43	0
24	0	0	0	0	5	0	0	0	0	25	22	0
25	0	0	0	0	0	0	2	0	0	1	0	0
26	0	0	0	0	16	18	1	1	1	4	35	0
27	0	0	0	0	37	0	1	42	9	15	3	1
28	0	0	7	0	0	11	0	7	2	3	27	0
29	0		0	0	0	13	0	0	25	26	0	0
30	3		0	0	0	1	0	5	10	5	1	1
31	0		0		28		6	6		0		0
Total	30	59	18	7	231	228	191	587	344	471	449	60

1978	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0	2	0	0	0	1	0	3	3	0	2	0
2	0	0	0	0	16	0	8	2	5	4	5	0
3	1	0	0	2	0	0	0	2	0	0	13	0
4	0	0	0	6	0	12	0	8	10	0	5	0
5	0	0	0	0	0	0	1	10	13	0	0	1
6	0	7	1	0	0	11	2	8	0	20	31	2
7	0	0	0	0	0	0	10	60	0	26	4	1
8	0	2	0	0	5	0	0	0	0	8	3	1
9	1	0	0	0	0	5	21	0	0	0	78	0
10	3	7	0	5	12	0	4	38	10	11	15	0
11	0	0	0	0	1	5	85	0	15	1	8	2
12	3	0	0	3	1	13	0	0	10	9	15	17
13	0	2	11	0	0	0	1	0	22	1	15	0
14	0	0	0	14	0	6	11	0	0	0	0	0
15	0	2	0	0	5	36	31	42	1	36	5	4
16	2	0	0	0	3	3	1	4	0	24	3	0
17	0	0	1	58	2	0	1	0	3	29	2	0
18	1	0	0	28	60	15	0	0	3	11	8	0
19	0	0	0	1	22	15	16	0	0	2	20	2
20	0	0	0	0	0	15	0	10	5	1	21	0
21	0	0	2	0	9	13	5	23	3	3	1	0
22	0	0	0	0	10	13	5	1	4	3	7	0
23	2	2	0	0	0	0	3	0	8	19	36	0
24	0	7	0	9	2	2	14	1	0	10	0	0
25	1	0	0	22	7	5	0	1	5	5	0	0
26	0	0	0	1	33	5	1	0	2	10	0	1
27	0	2	0	1	0	23	61	0	10	1	8	0
28	0	0	0	0	0	2	0	19	0	0	4	0
29	0		11	0	0	22	0	37	21	30	0	0
30	1		3	69	10	0	1	5	3	47	0	0
31	4		25		5		0	0		19		0
Total	19	32	54	218	204	220	281	275	156	327	308	31

TABLE A1.—Continued.

1979	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0	0	0	0	27	0	0	9	0	0	0	0
2	2	10	0	0	8	10	5	13	0	16	0	31
3	0	0	0	0	0	0	6	1	10	28	3	1
4	0	0	0	1	2	0	0	5	0	1	19	0
5	0	0	0	1	5	4	6	26	0	8	5	0
6	0	0	0	2	0	57	0	3	9	27	12	0
7	0	0	0	2	0	78	6	2	11	0	2	0
8	2	0	0	2	0	0	0	5	2	6	3	0
9	0	1	0	0	0	0	9	9	0	12	1	0
10	0	0	0	0	0	0	2	3	8	32	9	4
11	1	0	0	0	0	0	0	0	26	1	0	0
12	0	20	0	0	0	0	65	0	0	7	45	0
13	0	1	0	0	32	4	4	13	6	4	6	0
14	0	0	5	0	45	3	9	12	1	0	2	0
15	0	0	1	0	1	34	25	61	25	0	15	9
16	0	0	0	0	51	13	5	21	22	0	0	89
17	0	0	0	23	12	34	28	1	0	0	3	13
18	0	0	0	90	6	0	2	25	1	0	2	9
19	0	0	1	1	2	17	0	16	0	0	10	7
20	0	0	0	0	6	8	2	13	0	0	7	0
21	0	0	0	0	0	1	6	11	0	1	3	4
22	0	0	0	0	0	15	5	11	4	4	0	0
23	0	0	0	94	5	3	5	13	22	40	31	4
24	5	0	0	0	0	10	55	15	0	2	7	0
25	0	0	0	0	0	12	0	13	1	40	0	0
26	0	0	0	59	27	47	12	0	7	28	0	0
27	0	0	0	0	11	3	7	14	1	2	16	0
28	0	0	2	11	0	10	0	1	35	12	1	41
29	0		0	5	7	0	0	7	40	5	0	50
30	0		1	0	42	27	5	0	45	0	58	3
31	0		0		1		0	44		0		6
Total	9	33	10	293	290	387	266	365	275	273	259	272

1980	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	13	1	0	0	0	5	8	14	25	2	0	17
2	36	5	0	0	0	0	1	2	5	29	0	5
3	3	0	0	0	0	0	0	2	1	10	0	0
4	2	0	0	0	0	0	0	0	0	1	15	3
5	0	6	0	0	0	1	0	69	5	0	0	0
6	0	10	0	0	120	0	0	1	0	3	5	3
7	0	29	0	0	1	7	0	0	25	2	23	0
8	0	3	0	0	1	9	0	10	2	0	13	0
9	0	0	0	0	6	0	0	0	0	3	0	25
10	0	0	0	0	1	5	0	0	10	0	0	2
11	0	0	0	0	0	13	1	1	1	99	1	0
12	0	1	2	0	0	1	0	0	3	1	3	0
13	0	0	0	0	21	28	5	48	0	5	51	11
14	0	0	0	0	7	0	1	3	0	9	13	18
15	0	0	5	0	0	0	17	0	3	16	26	11
16	2	3	0	0	0	0	28	12	8	23	27	7
17	1	0	0	10	0	0	0	0	0	0	2	0
18	0	0	0	0	18	2	9	1	25	1	1	5
19	48	0	0	0	2	14	35	41	14	0	0	0
20	2	0	0	0	12	5	14	0	11	0	0	3
21	0	0	0	0	39	0	14	2	0	1	2	0
22	3	0	0	3	24	36	22	7	0	11	1	0
23	2	0	0	4	4	36	0	1	0	1	53	0
24	9	0	0	2	3	0	17	0	0	9	15	1
25	1	0	0	0	1	1	0	0	0	1	15	0
26	0	2	0	0	1	0	1	0	6	12	3	4
27	0	0	0	0	0	0	0	7	7	23	21	38
28	0	0	0	0	3	4	1	4	0	18	23	13
29	0	0	0	0	6	20	11	25	0	4	45	28
30	0		0	0	0	31	10	5	43	26	0	14
31	0		4		2		8	13		4		5
Total	123	59	11	20	272	218	202	268	195	314	359	213

1981	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0	65	0	0	0	34	2	0	13	7	3	2
2	0	0	0	0	44	0	0	20	9	1	4	2
3	22	2	0	0	2	21	0	31	0	0	0	7
4	18	0	0	0	28	104	18	0	24	9	56	0
5	3	0	1	1	0	0	1	27	0	0	17	62
6	1	0	3	0	17	2	7	4	2	1	2	4
7	11	0	20	0	0	19	8	0	1	8	21	13
8	32	0	0	1	4	0	38	1	4	3	27	10
9	13	0	9	0	0	15	6	2	0	10	5	10
10	0	0	24	0	0	0	2	6	33	72	1	9
11	0	0	1	0	2	2	15	7	0	13	14	17
12	0	0	1	0	31	0	2	73	31	0	44	57
13	28	0	0	0	18	39	47	66	1	32	8	152
14	3	0	4	18	19	0	38	3	7	1	5	102
15	0	0	1	5	58	1	29	0	0	41	47	15
16	22	0	0	19	0	42	8	0	0	45	33	9
17	0	17	0	15	10	2	7	0	0	2	0	1
18	0	0	0	130	60	0	30	8	0	22	19	1
19	2	1	0	6	12	41	0	9	0	2	11	0
20	5	1	0	14	0	6	1	0	2	5	31	4
21	0	0	0	2	0	5	46	3	1	16	125	30
22	0	2	1	7	0	20	1	15	0	0	19	1
23	21	0	0	9	20	3	0	0	3	62	66	1
24	1	0	0	11	10	1	0	0	11	0	14	19
25	0	1	0	12	39	40	1	7	0	0	7	0
26	0	2	1	10	1	0	10	90	24	0	43	2
27	0	0	0	95	0	0	1	0	18	8	3	0
28	0	1	0	3	19	5	1	1	3	1	1	1
29	1		0	8	0	133	2	31	35	5	22	12
30	86		0	0	2	6	13	16	20	7	50	1
31	105		0		10		1	4		3		1
Total	376	93	64	364	405	543	335	424	242	379	697	547

1982	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	12	0	3	0	0	51	0	0	6	0	0	0
2	12	11	20	0	0	0	0	2	1	3	3	0
3	56	0	0	0	9	3	0	2	4	3	0	0
4	7	0	0	0	0	31	0	1	25	45	38	0
5	7	0	0	0	0	3	30	4	17	7	3	0
6	10	0	0	0	5	64	0	30	11	5	0	0
7	20	0	0	0	0	0	13	39	12	10	0	0
8	3	0	0	0	0	6	0	90	4	1	15	0
9	0	0	0	0	6	3	14	8	19	13	3	0
10	2	0	0	11	13	0	0	0	0	0	2	2
11	0	0	0	34	50	0	0	0	7	1	2	0
12	1	0	0	3	0	0	1	1	7	2	4	0
13	2	0	0	52	9	3	7	51	2	5	6	0
14	0	1	0	4	0	3	1	0	0	1	0	0
15	0	0	0	0	0	0	1	0	4	12	0	1
16	0	0	0	0	0	5	7	3	5	0	0	0
17	1	0	0	0	8	0	0	38	4	0	0	0
18	0	0	0	0	0	0	0	0	1	34	0	1
19	0	0	0	0	11	0	21	4	0	17	0	0
20	0	0	0	0	12	16	41	2	44	33	0	0
21	0	0	0	0	0	25	2	6	30	13	0	0
22	0	0	0	0	0	0	0	6	53	12	4	22
23	0	0	0	1	0	0	0	14	2	0	8	0
24	0	0	0	0	1	5	0	0	25	8	0	0
25	0	0	7	0	0	1	0	2	9	35	1	0
26	0	0	0	1	0	2	11	1	3	8	7	0
27	5	0	0	0	0	2	14	0	0	22	14	0
28	7	0	0	0	0	22	1	0	0	4	0	0
29	0		0	0	0	1	17	7	14	18	0	0
30	0		0	1	8	0	6	3	14	5	0	4
31	0		0		0		0	3		0		4
Total	146	14	30	106	132	245	186	319	324	316	111	38

TABLE A1.—Continued.

1983	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	4	0	0	0	0	1	17	3	20	7	12	25
2	0	0	0	0	11	2	0	40	3	17	0	2
3	0	0	0	0	6	33	122	0	30	0	1	0
4	2	0	0	0	35	52	0	1	5	28	20	18
5	0	0	0	0	1	6	1	0	5	1	25	3
6	0	0	0	0	0	6	37	32	10	7	5	57
7	0	0	0	0	35	0	0	1	7	30	2	3
8	0	0	0	0	2	0	4	0	50	2	56	1
9	0	0	0	0	0	14	0	0	0	19	7	0
10	0	0	0	0	1	2	12	9	65	0	0	0
11	1	0	0	0	1	7	0	8	20	0	2	6
12	0	0	0	0	0	0	1	28	0	18	79	3
13	1	0	0	0	55	14	0	0	18	0	0	7
14	1	0	0	0	17	0	34	0	11	36	47	0
15	1	0	0	0	13	0	1	0	1	0	1	0
16	0	0	0	0	4	2	0	0	36	0	0	9
17	0	0	0	0	1	51	0	1	1	12	0	25
18	0	1	2	0	36	4	3	40	16	0	46	57
19	0	0	0	0	7	0	0	6	0	21	10	2
20	0	0	0	0	1	5	0	3	17	3	1	47
21	0	1	0	0	2	9	0	16	3	6	36	13
22	0	0	0	0	0	1	10	6	1	11	1	4
23	0	0	0	0	0	3	31	9	14	2	5	0
24	0	0	0	0	1	28	2	2	7	2	2	0
25	0	0	0	0	0	0	0	5	0	11	0	1
26	0	0	0	0	2	0	0	0	5	1	0	0
27	10	0	0	74	7	0	0	6	1	11	1	6
28	3	0	1	9	15	0	0	1	18	1	0	1
29	0		0	21	8	49	2	4	5	2	56	0
30	0		0	2	0	43	5	0	0	0	10	9
31	0		0		0		43	11		29		0
Total	22	3	4	106	261	331	327	232	367	277	429	298

1984	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	68	0	17	0	0	18	31	1	48	0	120	1
2	0	0	0	0	0	3	4	15	0	16	0	1
3	0	0	0	0	0	0	0	11	24	6	0	0
4	0	9	1	0	0	1	0	0	2	6	0	0
5	0	0	0	0	0	17	11	0	0	0	69	0
6	6	1	0	0	0	59	20	0	3	1	28	0
7	1	2	0	3	0	30	16	0	16	0	4	0
8	0	1	0	0	0	26	6	0	0	0	0	0
9	0	0	0	0	0	3	2	1	46	20	58	0
10	0	0	2	0	1	0	4	79	0	6	40	0
11	1	1	0	0	4	20	15	20	69	12	18	0
12	4	0	0	0	27	4	4	2	1	37	1	0
13	0	3	0	0	28	1	0	13	0	3	3	0
14	0	2	0	0	12	0	37	5	5	0	2	16
15	0	0	0	0	0	1	3	28	0	10	9	0
16	30	0	0	0	4	11	41	1	0	3	0	0
17	1	0	1	0	2	20	0	0	1	1	3	0
18	1	0	0	21	3	5	1	2	0	37	60	0
19	0	0	0	0	0	1	0	46	7	70	3	1
20	0	0	0	0	0	0	0	3	58	8	15	2
21	0	0	0	0	0	0	0	2	21	50	0	0
22	0	0	0	0	30	1	0	7	0	2	9	0
23	0	0	0	0	2	2	8	18	0	0	50	0
24	0	0	0	0	6	5	2	1	0	34	0	0
25	0	7	0	0	12	8	0	0	0	38	0	0
26	0	0	0	0	54	32	51	0	0	1	9	2
27	0	13	0	0	4	1	9	3	2	1	7	0
28	0	1	0	21	0	0	0	3	1	0	76	0
29	0	17	0	0	2	5	20	54	0	3	12	0
30	0		1	0	2	8	11	0	55	1	0	0
31	0		0		1		1	0		58		0
Total	115	57	22	45	194	278	298	313	359	423	594	24

1985	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0	0	0	0	2	28	9	25	0	3	0	0
2	0	0	1	0	0	25	0	28	25	0	0	0
3	0	0	6	0	0	0	0	1	0	15	0	12
4	0	0	0	0	8	5	0	25	2	3	0	8
5	0	0	5	0	11	7	50	10	5	0	0	14
6	3	0	1	0	53	40	21	9	3	70	5	118
7	4	0	0	1	2	0	15	1	23	7	55	72
8	0	0	0	0	7	4	22	7	0	13	7	73
9	0	0	1	0	9	2	1	2	3	62	20	4
10	0	4	0	0	10	1	0	2	24	1	0	3
11	0	24	1	0	7	0	12	0	25	36	0	1
12	0	0	1	1	12	2	7	0	0	8	0	1
13	0	0	0	0	3	2	6	1	5	10	31	0
14	1	0	0	0	6	3	0	4	10	5	11	0
15	0	1	0	1	0	1	12	1	5	7	10	0
16	0	0	0	0	0	4	5	15	5	14	6	0
17	0	0	0	0	20	16	0	13	1	7	0	1
18	0	2	0	0	0	2	3	0	0	30	12	0
19	0	1	0	0	54	1	23	65	0	0	1	0
20	0	0	0	0	0	0	0	27	10	10	0	0
21	0	0	0	0	7	0	0	1	10	13	21	3
22	0	0	0	0	0	29	0	0	0	5	16	3
23	0	0	0	0	2	11	18	0	10	0	0	0
24	0	0	0	0	0	17	13	0	4	0	8	6
25	1	0	0	0	61	1	5	12	0	0	0	0
26	18	0	0	0	15	21	0	12	0	0	2	4
27	1	0	3	0	0	10	3	5	0	0	1	0
28	4	0	6	0	0	2	0	0	0	11	0	0
29	0		2	0	0	0	4	29	6	19	0	0
30	0		0	0	0	0	11	1	4	5	0	0
31	0		0		2		23	0		1		0
Total	33	33	27	5	292	234	263	296	180	356	205	324

1986	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0	0	0	45	1	0	2	0	0	0	6	0
2	0	0	0	1	0	0	0	0	3	4	13	2
3	0	0	1	1	0	6	0	6	4	6	0	31
4	0	1	0	0	5	1	0	8	8	46	0	0
5	0	0	0	0	51	9	3	2	1	12	20	19
6	2	0	0	0	7	3	3	3	0	1	6	1
7	0	1	0	1	0	0	3	24	10	1	0	66
8	0	0	0	0	0	0	1	0	44	15	0	5
9	0	0	0	1	0	1	2	0	33	62	0	2
10	0	0	0	0	0	4	21	0	34	48	38	1
11	0	0	1	4	0	14	6	1	1	15	5	4
12	2	0	0	0	0	3	1	23	9	38	0	1
13	1	1	1	0	0	26	0	0	1	5	7	0
14	12	1	0	8	0	3	0	88	2	3	8	0
15	41	0	0	1	0	13	0	7	31	4	4	0
16	0	1	0	1	0	7	13	3	3	23	5	0
17	1	0	0	0	5	3	8	35	14	44	15	0
18	0	3	0	30	5	7	1	4	1	33	4	0
19	0	0	0	28	0	2	0	2	13	8	19	0
20	0	1	0	15	10	0	3	3	2	15	5	0
21	0	4	1	3	5	0	3	24	11	1	0	0
22	3	0	0	0	12	20	22	0	1	54	35	2
23	0	0	0	2	8	9	0	4	10	2	7	0
24	0	0	1	7	4	48	0	5	1	1	25	0
25	4	0	1	1	3	0	1	45	1	10	1	0
26	2	0	0	0	0	0	0	1	5	5	0	2
27	2	1	0	0	7	1	0	0	3	5	0	1
28	0	0	0	4	1	25	0	0	0	5	5	1
29	2		0	4	0	40	6	40	18	30	0	0
30	4		0	8	0	15	1	0	29	1	0	0
31	0		0		0		0	3		1		0
Total	76	13	6	161	124	257	99	331	295	495	227	138

TABLE A1.—Continued.

1987	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0	3	1	0	1	35	1	22	35	25	0	0
2	0	0	0	1	2	1	3	18	13	7	20	0
3	0	2	0	2	0	18	1	0	9	0	17	4
4	0	0	0	0	0	3	28	0	36	9	39	5
5	1	0	0	17	1	3	0	0	21	0	9	25
6	11	0	0	27	1	16	19	2	2	17	0	17
7	0	0	0	0	0	2	7	0	0	0	44	19
8	0	0	0	0	18	4	36	62	30	3	41	12
9	0	5	0	1	108	2	5	49	0	27	0	25
10	1	1	0	30	39	0	0	0	0	8	11	0
11	0	3	0	0	0	0	9	90	3	0	0	4
12	0	26	0	0	0	10	1	10	0	0	0	1
13	0	0	0	1	12	2	4	7	2	3	0	13
14	1	0	0	0	57	2	7	0	15	5	0	3
15	0	0	2	0	1	14	1	0	35	0	5	0
16	0	0	0	0	2	0	1	0	11	67	3	70
17	0	0	2	0		6	27	0	0	31	6	0
18	0	0	1	0	54	2	5	7	0	11	0	1
19	0	0	0	0		5	0	1	7	0	0	0
20	0	19	0	2		23	0	0	25	22	15	0
21	0	1	0	0	82	4	15	1	0	3	36	1
22	0	0	0	3	10	0	5	112	9	54	11	0
23	0	0	0	2	7	9	0	50	0	7	0	0
24	0	0	0	0	0	2	2	0	4	1	11	0
25	1	0	0	23	0	4	1	13	38	9	26	0
26	0	0	1	68	3	0	0	4	8	0	13	0
27	0	0	0	12	0	1	0	7	0	13	2	0
28	4	1	0	61	8	2	0	9	0	8	4	0
29	2		0	6	7	2	1	4	14	6	0	0
30	1		0	9	2	7	63	0	1	18	2	0
31	0		0		15		76	0		23		0
Total	21	59	5	266	429	178	317	468	317	378	315	200

1988	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0	0	0	0	0	0	29	1	0	41	0	41
2	0	0	0	0	4	4	0	1	92	3	28	67
3	0	0	0	0	0	0	1	28		25	3	107
4	0	0	0	0	0	0	1	0		1	0	14
5	0	1	0	0	4	1	7	1		8	0	24
6	0	0	0	0	4	0	0		52	52	28	2
7	0	0	0	0	25	2	8	33	24	1	0	3
8	0	2	4	0	1	0	2	4	0	3	22	
9	0	1	0	0	1	1	5	12	0	4	28	10
10	0	2	0	0	26	4	1	1	54	0	16	8
11	0	0	0	0	33	7	11	0	23	21	16	0
12	0	0	0	0	16	3	0	0	2	5	3	0
13	0	2	0	0	13	15	11	0	37	17	10	6
14	0	1	0	0	1	1	0	0	0	25	43	0
15	1	0	0	0	0	9	1	1	3	6	36	0
16	0	0	0	13	3	0	43	1	0	24	5	0
17	7	1	1	0	1	0	2	1	6	4	0	20
18	0	0	0	0	2	82	4	6	3	8	13	
19	0	0	0	0	0	0	1	3	9	39	4	1
20	0	0	0	0	1	1	0	2	12	21	9	0
21	0	0	0	0	33	0	42	8	28	0	24	0
22	0	0	0	0	0	0	14	71	1	4	14	0
23	0	1	1	0	1	0	2	0	1	0	1	0
24	0	1	0	0	0	16	1	5	2	0	5	9
25	0	10	0	0	0	4	15	1	2	0	4	1
26	1	8	1	1	80	7	9	0	10	0	0	0
27	1	5	0	0	22	46	9	11	70	5	2	0
28	3	2	1	0	2	15	0	7	16	3	2	0
29	0	0	2	0	1	5	1	20	3	1	6	0
30	0		3	0	11	3	25	2	32	20	17	0
31	0		0		0		1	1		75		8
Total	13	35	12	14	282	225	247	217	480	312	339	312

1989	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0	0	0	0	0	0	2	0	0	0	9	33
2	0	0	0	0	0	1	9	14	11	1	7	19
3	2	0	0	0	0	5	5	25	35	2	0	3
4	0	0	0	1	32	0	22	5	0	2	2	5
5	4	0	0	0	0	0	1	0	0	28	0	18
6	0	0	5	1	0	30	22	0	3	1	1	0
7	8	0	0	0	0	0	5	8	14	0	48	2
8	0	0	0	0	0	0	5	3	7	0	23	0
9	0	2	0	0	0	7	6	1	0	8	10	0
10	0	4	0	0	0	18	0	5	0	20	13	6
11	0	0	0	0	0	0	8	28	1	1	6	0
12	0	0	0	0	0	0	1	0	0	33	0	0
13	0	0	0	5	0	0	0	1	1	2	2	0
14	0	0	0	1	11	0	25	12	10	0	20	0
15	1	0	0	0	37	0	0	4	0	7	17	0
16	0	0	0	0	0	0	0	11	0	4	2	0
17	0	1	0	0	0	18	0	0	18	34	2	0
18	0	0	7	0	0	9	2	52	1	5	1	0
19	0	0	0	0	4	0	4	6	18	5	11	0
20	0	0	3	0	4	15	2	21	1	2	1	0
21	0	0	0	0	0	63	5	2	0	52	0	0
22	0	0	0	0	0	6	9	0	14	44	112	0
23	0	0	0	0	7	1	1	5	0	36	1	0
24	0	13	0	1	1	0	30	8	0	44	7	0
25	0	24	0	2	4	6	6	0	0	23	17	39
26	1	11	0	0	3	8	16	33	0	12	7	65
27	0	15	0	0	0	1	1	0	4	0	0	30
28	0	10	0	0	21	3	0	1	4	36	0	15
29	0		12	0	8	0	5	7	0	2	6	4
30	0		0	0	4	0	4	2	11	0	34	0
31	1		0		4		90	0		19		2
Total	14	80	29	11	136	190	194	253	153	402	359	239

TABLE A2.—Weekly rainfall on Barro Colorado Island as recorded by the PCC, 1929–1986.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
1929	9	0	1	1	3	0	0	2	0	63	0	1	8	2	0	34	7	4	116	119	46	96	23	81	59	67
1930	2	24	15	8	2	0	5	9	1	2	4	0	0	7	8	47	14	94	54	44	46	71	27	15	23	74
1931	19	2	0	6	7	6	2	1	11	5	46	89	0	3	4	58	31	4	141	115	159	16	66	143	50	129
1932	4	1	7	30	2	5	0	0	3	2	14	1	14	31	26	1	21	109	23	53	32	18	75	103	73	41
1933	23	35	0	3	2	0	0	1	1	6	2	3	19	1	0	1	1	12	72	0	59	34	69	6	97	70
1934	34	4	1	1	1	5	1	13	0	0	42	5	0	0	17	75	42	34	110	37	72	93	65	41	70	24
1935	9	9	3	21	9	117	3	18	13	4	0	1	2	0	69	1	18	73	29	85	67	9	100	60	92	53
1936	0	0	4	14	4	0	0	1	0	6	25	11	0	0	22	27	9	54	44	68	68	67	65	31	30	7
1937	16	14	23	7	3	0	5	0	2	2	1	0	0	0	15	6	7	26	46	98	113	49	113	42	80	23
1938	42	3	4	8	14	8	0	2	36	0	0	5	1	0	6	2	33	135	78	132	59	68	91	119	210	67
1939	0	1	10	1	0	0	0	1	1	8	1	0	1	3	14	0	0	0	36	28	10	20	39	96	153	40
1940	42	1	10	40	40	5	3	40	3	13	2	22	0	2	0	0	2	35	34	1	6	161	61	180	23	52
1941	12	11	10	23	23	16	22	15	18	0	2	0	5	0	5	1	7	60	35	17	92	24	39	110	36	17
1942	3	1	0	22	47	26	6	6	0	42	13	0	13	8	0	83	21	5	40	117	55	83	46	18	41	50
1943	9	0	9	30	3	1	9	25	39	1	3	0	20	15	3	2	35	92	29	105	89	99	31	65	84	159
1944	6	1	27	9	23	11	0	0	8	3	0	0	0	13	0	7	91	93	102	95	41	150	45	45	43	102
1945	3	3	3	65	2	15	0	1	1	3	2	2	0	4	22	3	9	114	69	61	89	25	35	145	22	70
1946	8	2	1	0	7	0	1	0	0	1	2	36	5	5	1	11	19	1	22	46	134	23	57	69	36	19
1947	0	0	0	9	6	27	22	0	3	5	2	0	6	0	0	1	76	1	15	21	59	100	43	92	82	22
1948	12	12	7	14	1	0	0	4	0	0	1	1	3	1	2	0	0	101	55	40	137	13	15	93	17	36
1949	3	13	1	1	1	1	0	0	0	0	2	1	0	9	0	5	3	38	21	150	63	88	85	113	64	92
1950	3	1	0	1	1	11	21	15	1	8	0	2	3	0	3	2	58	35	36	5	92	141	60	54	60	97
1951	5	19	20	12	6	47	33	10	0	0	6	1	0	17	0	24	163	54	65	86	71	69	48	51	77	83
1952	1	2	1	1	58	5	1	0	5	0	1	0	1	80	5	21	1	50	86	80	24	108	100	28	126	44
1953	19	68	8	10	15	7	0	0	0	5	2	1	23	0	0	8	161	35	125	16	54	7	26	18	18	34
1954	0	27	0	5	17	2	2	5	11	0	2	0	0	1	5	20	50	79	10	19	74	136	85	62	118	10
1955	7	138	69	1	14	6	2	1	2	0	0	0	23	1	5	3	0	78	65	7	44	136	52	126	38	84
1956	57	16	9	40	21	42	0	10	2	0	0	35	21	2	27	4	33	36	66	195	107	18	74	7	69	22
1957	12	3	0	0	2	1	4	8	1	0	0	0	0	0	0	1	0	0	30	30	63	41	22	52	30	45
1958	26	45	36	1	145	3	33	6	8	0	3	65	1	34	2	48	34	98	56	35	108	35	92	44	49	27
1959	0	0	6	1	0	4	0	0	0	0	0	2	1	0	12	0	12	109	34	19	35	42	61	80	31	38
1960	18	0	24	29	5	1	21	0	2	25	9	73	5	188	155	107	1	54	74	52	36	264	44	89	75	13
1961	2	4	1	18	6	5	0	0	1	7	0	1	27	17	0	73	29	2	70	97	26	37	50	66	41	84
1962	28	8	5	0	8	6	9	0	0	1	1						23	11	141	69	101	58	128	50	8	19
1963	141	60	0	0	2	15	33	30	0	0	0	41	1	0	0	21	70	73	38	149	27	51	44	38	17	21
1964	6	0	0	0	0	0	0	6	0	0	5	0	0	0	11	2	103	0	74	80	138	140	170	52	37	200
1965	1	11	56	2	3	1	0	2	1	4	1	0	0	7	13	0	0	13	102	6	15	122	36	38	78	60
1966	6	42	20	0	15	3	0	0	10	0	1	0	0	0	1	31	37	20	72	49	34	36	102	106	84	45
1967	0	3	1	8	2	0	2	7	8	0	4	5	3	2	7	55	43	14	63	6	18	92	75	38	108	93
1968	0	0	2	0	0	5	3	19	22	1	54	14	20	1	5	0	1	24	151	62	35	30	34	76	42	106
1969	5	15	14	8	2	3	1	1	9	7	0	0	4	1	0	14	104	26	57	99	70	11	3	60	40	48
1970	0	284	13	3	5	46	5	16	0	12	8	12	5	22	82	2	0	18	40	239	106	81	56	70	27	37
1971	54	13	39	0	5	1	5	7	0	13	15	29	0	2	1	0	1	130	255	143	25	21	35	32	55	56
1972	58	71	25	0	5	23	3	10	0	10	5	0	3	0	30	53	41	28	48	46	48	84	94	74	91	15
1973	0	41	13	0	3	10	8	0	3	0	0	3	0	0	10	15	0	20	79	48	84	69	76	157	48	74
1974	5	0	0	0	3	0	3	0	43	3	0	0	3	0	3	3	8	0	8	25	36	51	51	104	91	53
1975	0	0	3	0	0	5	5	0	23	23	0	3	0	0	43	0	15	66	33	112	69	41	89	23	58	69
1976	3	5	8	8	0	0	0	0	0	0	3	3	0	0	48	0	13	33	18	23	46	76	71	15	66	97
1977	3	3	10	10	38	3	13	5	0	0	13	10	0	0	3	5	8	5	3	94	94	48	36	66	51	66
1978	0	5	3	0	0	8	3	8	0	10	3	0	36	10	15	84	76	30	15	89	46	23	18	53	79	58
1979	0	0	0	5	10	20	0	0	0	0	5	0	3	5	0	206	74	36	28	122	43	53	137	84	71	94
1980	43	3	53	13	5	41	3	0	0	0	5	0	0	0	0	8	10	43	79	46	81	13	15	46	84	64
1981	69	46	41	74	175	3	10	0	5	53	5	0	0	0	30	152	155	91	66	135	76	163	36	74	99	147
1982	102	3	5	5	13	3	3	0	0	0	0	5	0	0	94	0	0	13	71	25	0	89	69	10	43	25
1983	5	8	0	10	0	0	0	0	0	0	3	0	0	0	0	0	91	81	69	66	13	99	33	64	43	69
1984	64	5	36	0	15	3	8	5	53	5	3	0	0	0	0	38	18	5	97	8	109	25	124	46	15	81
1985	5	0	0	20	3	23	0	0	5	5	3	0	13	0	3	0	0	69	51	71	76	56	53	18	53	46
1986	3	36	13	5	5	0	0	5	5	3	0	0	43	0	10	69	13	61	3	15	33	5	20	51	71	81
Avg	17	19	11	10	14	10	5	5	6	6	6	8	6	9	15	25	33	45	61	67	63	67	61	65	62	61
Sd	27	43	15	15	30	18	9	8	11	12	11	19	10	27	27	40	41	38	43	51	36	50	33	39	36	38
Cv	156	221	135	145	218	180	160	150	185	197	195	220	167	311	186	160	125	83	71	76	57	75	55	59	58	62
Min	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	5	3	6	8	7
Max	141	284	69	74	175	117	33	40	53	63	54	89	43	188	155	206	163	135	255	239	159	264	170	180	210	200

TABLE A2.—Continued.

27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	Tot
80	33	72	97	144	80	53	71	109	55	50	7	31	18	37	52	137	28	99	42	138	23	29	4	1	3	2231
44	75	30	31	16	6	91	27	43	87	48	20	104	45	43	37	24	13	52	80	26	137	146	109	1	6	1941
145	76	53	177	55	31	34	36	52	44	36	28	75	42	131	61	24	77	620	52	10	92	35	20	2	6	3132
19	102	26	132	87	32	58	133	5	61	21	24	68	70	12	59	118	138	115	50	261	340	182	19	18	46	2883
37	76	31	83	29	128	22	23	72	58	66	45	49	1	80	41	40	60	132	95	263	305	135	127	44	26	2584
43	59	8	95	86	78	95	86	40	147	185	104	60	40	31	51	100	156	109	277	62	24	81	263	40	5	3109
192	52	356	77	59	54	82	51	15	18	19	124	61	62	26	25	57	113	265	454	225	214	53	8	99	19	3645
66	12	83	43	128	120	10	61	91	98	15	107	106	103	109	84	80	166	62	99	59	43	6	25	27	28	2387
51	37	87	27	77	248	47	99	63	47	40	107	22	118	66	30	59	149	111	121	93	163	338	185	74	4	3153
68	71	49	41	84	93	161	27	61	53	28	20	18	84	37	60	94	135	44	36	57	121	125	205	71	8	2974
65	64	46	38	127	60	20	9	40	90	108	137	45	94	45	102	152	278	496	129	22	4	46	83	55	113	2933
5	13	43	56	51	117	47	90	32	119	58	20	59	10	182	126	82	18	59	121	56	2	5	21	12	19	2197
21	114	104	45	29	67	140	31	48	97	18	14	55	65	155	30	102	124	119	55	85	113	33	59	8	1	2332
70	39	64	23	33	90	92	60	44	88	42	142	72	75	116	120	83	108	61	24	61	35	67	144	199	121	2822
127	33	61	47	39	191	71	68	60	10	45	119	52	59	65	47	63	73	85	147	189	80	18	41	301	7	3055
46	35	22	70	30	118	158	92	162	68	46	13	44	96	48	69	134	111	79	59	24	9	38	304	13	34	2839
27	38	127	132	99	58	45	53	62	88	74	37	54	40	67	68	74	26	51	251	52	310	368	7	35	48	3059
123	13	44	125	30	25	16	188	19	91	33	87	57	17	81	40	68	93	75	21	79	143	75	136	30	0	2214
12	12	39	107	92	38	39	108	68	67	29	44	70	123	17	128	54	32	67	29	62	11	120	2	2	14	1978
80	107	22	80	72	20	75	28	73	33	42	78	15	25	45	62	78	122	77	217	56	107	0	9	15	6	2112
98	136	62	14	41	55	52	122	23	37	25	74	27	55	89	97	75	160	220	189	235	93	54	31	51	51	2917
50	56	84	76	75	149	37	49	30	34	57	35	57	106	90	55	96	23	101	151	307	88	129	156	103	11	2911
35	49	22	15	17	91	59	85	67	22	55	70	74	94	169	107	66	117	140	77	49	100	69	239	5	3	2866
66	33	35	17	39	18	44	43	90	54	110	14	89	71	40	36	249	59	69	79	87	3	48	189	55	22	2484
14	184	102	96	44	28	108	129	95	42	31	14	58	73	54	186	149	113	202	70	37	79	3	8	64	26	2668
91	96	11	164	50	51	139	53	100	57	41	58	81	28	22	181	49	89	82	39	255	30	91	73	11	3	2684
27	67	41	102	67	108	68	31	74	71	67	8	68	44	10	268	73	41	84	135	100	147	60	27	167	52	2908
87	87	120	118	126	75	85	34	33	121	45	66	29	26	105	170	109	73	78	59	105	71	3	89	66	7	2897
6	98	110	61	125	174	140	57	69	97	25	107	77	125	98	88	81						12	32	52	8	2494
52	24	31	99	66	128	61	27	74	24	81	19	135	8	135	75	114	73	23	57	55	86	5	34	25	2	2545
45	45	35	93	67	37	24	9	113	106	84	98	57	19	72	50	40	83	140	58	17	15	507	12	9	86	2411
138	82	54	17	24	50	10	60	37	39	93	65	40	102	152	120	113	15	38	171	126	167	269	207	9	0	3557
52	68	10	44	82	184	67	142	79	38	35	87	127	134	62	70	167	19	43	44	91	89	86	15	25	20	2546
83	65	71	116	7	193	93	31	54	121							33	89	55	103	88	115	35	84	55	4	2553
37	38	55	84	284	71	18	128	107	51	40	14	79	45	37	115	58	181	149	95	53	77	10	14	13	43	2767
59	110	175	49	56	5	76	66	68	90	21	125	50	75	138	75	34	137	57	220	44	58	58	4	1	3	2877
20	8	50	90	52	77	40	82	47	69	150	52	10	26	128	17	91	76	153	122	83	177	87	8	65	8	2359
32	45	38	100	70	70	98	97	33	51	50	74	75	63	124	37	52	253	113	67	151	103	160	46	86	29	2833
55	69	35	33	41	76	120	16	66	88	7	54	13	29	134	55	27	112	66	129	76	63	90	35	12	25	2184
30	38	41	54	89	32	70	90	128	44	40	25	64	35	106	201	115	25	55	78	30	101	15	21	4	0	2238
69	108	10	121	9	66	3	67	13	11	71	76	62	179	52	26	56	26	57	99	130	47	106	41	70	16	2195
32	145	51	110	21	91	65	100	86	37	34	7	47	68	57	81	20	84	58	166	107	287	165	37	44	39	3227
58	49	58	46	83	17	50	51	74	97	46	64	33	91	28	10	25	94	86	51	30	64	15	0	0	8	2162
33	8	64	20	3	5	66	109	81	36	157	41	97	157	33	15	84	104	15	69	36	10	10	0	170	8	2296
48	79	74	20	66	23	15	0	84	30	56	20	198	56	94	69	18	79	89	305	74	76	18	33	8	13	2403
23	46	152	51	135	61	23	53	48	41	76	41	91	41	175	66	147	53	51	117	117	168	23	8	0	3	2299
61	28	64	53	36	91	56	142	15	79	91	23	119	64	168	89	76	74	38	198	58	20	196	91	127	25	2761
15	20	25	28	97	5	33	48	41	33	117	97	114	38	48	56	89	41	104	74	18	0	3	0	28	3	1707
104	20	20	3	102	145	249	41	130	33	86	84	89	94	97	124	94	61	155	91	86	48	3	13	41	0	2596
36	127	33	81	43	114	41	30	66	33	41	18	38	51	20	104	66	94	150	53	58	10	5	20	0	0	2004
23	165	41	76	53	13	142	79	61	20	84	28	132	79	53	3	122	36	18	84	53	76	3	94	33	91	2657
3	3	130	28	104	8	99	10	76	36	25	51	36	48	107	46	71	46	41	117	86	97	15	58	8	94	2093
69	132	86	23	76	140	25	109	69	28	64	8	107	18	135	107	69	84	102	119	279	79	97	330	48	28	4133
56	13	61	38	41	188	41	15	18	81	23	119	58	71	15	102	94	46	25	10	13	15	0	0	20	13	1753
160	51	36	8	112	43	43	46	41	152	97	64	25	89	71	46	25	61	168	102	43	91	81	38	130	18	2492
56	53	48	74	33	112	74	33	99	25	109	97	43	33	74	173	74	221	157	79	79	97	0	10	5	0	2619
99	36	38	36	107	10	94	30	48	61	58	20	10	102	122	91	15	30	84	36	43	51	272	3	8	10	2085
8	33	38	5	15	43	130	71	41	112	53	36	53	76	163	160	43	33	36	51	71	25	107	5	0	0	1956
58	62	62	65	68	78	69	64	63	62	59	57	65	65	82	82	79	88	107	107	92	91	83	67	46	22	2599
40	41	52	41	46	57	46	40	32	34	36	39	36	38	48	53	43	58	101	79	73	78	100	81	57	28	465
69	67	85	63	67	73	67	62	50	54	62	68	55	58	58	64	54	65	94	73	79	86	121	122	123	128	18
3	3	8	3	3	5	3	0	5	10	7	7	10	1	10	3	15	13	15	10	10	0	0	0	0	0	1707
192	184	356	177	284	248	249	188	162	152	185	142	198	179	182	268	249	278	620	454	307	340	507	330	301	121	4133

TABLE A3.—Monthly rainfall on Barro Colorado Island as recorded by the PCC, 1925–1986.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Tot
1925	66	28	20	102	147	345	345	340	351	564	351	109	2769
1926	28	74	13	8	216	447	381	310	307	353	559	310	3005
1927	76	36	33	193	483	371	343	315	272	246	414	173	2954
1928	46	13	56	43	239	239	244	424	206	302	475	295	2581
1929	13	3	71	43	351	251	318	399	175	251	310	48	2233
1930	48	15	8	84	259	183	185	150	295	155	300	267	1948
1931	30	25	140	97	432	381	465	196	196	323	782	69	3134
1932	46	8	30	112	196	300	323	272	175	356	790	279	2885
1933	64	3	30	3	178	239	231	259	231	163	831	353	2583
1934	38	20	46	147	305	229	269	310	508	348	500	391	3111
1935	42	150	13	94	257	302	726	209	231	219	1056	343	3643
1936	20	5	41	58	295	137	269	345	328	503	300	86	2388
1937	64	5	5	28	325	262	211	493	251	323	472	716	3155
1938	56	30	36	84	424	490	264	356	155	351	244	485	2974
1939	13	3	10	18	79	340	231	241	384	399	925	297	2939
1940	117	66	38	8	231	315	140	297	274	414	241	58	2200
1941	58	76	23	13	203	218	300	305	185	442	394	112	2329
1942	71	41	69	114	279	163	226	290	356	475	208	531	2822
1943	48	43	56	74	373	363	269	391	264	259	546	371	3058
1944	58	20	13	165	404	262	188	544	185	434	183	389	2845
1945	74	18	8	41	345	259	353	312	257	254	523	620	3063
1946	13	8	43	36	206	201	315	267	272	229	381	249	2217
1947	10	53	13	79	122	307	191	300	241	335	185	142	1979
1948	46	5	5	74	274	160	292	267	170	272	516	30	2111
1949	18	3	3	23	305	396	340	254	180	368	833	201	2924
1950	5	48	13	69	201	373	315	292	183	356	615	445	2913
1951	56	97	8	216	310	277	137	287	244	493	411	328	2863
1952	61	10	3	140	315	300	152	231	282	432	241	318	2484
1953	109	18	30	168	234	97	404	396	145	465	490	109	2664
1954	30	33	5	79	282	307	384	328	284	333	434	185	2685
1955	231	13	23	10	269	343	292	290	236	414	467	323	2911
1956	142	53	56	66	422	175	498	241	287	472	315	173	2901
1957	15	15	0	3	163	152	277	556	315	437	457	104	2494
1958	109	185	76	119	310	226	241	315	269	391	183	119	2545
1959	8	5	3	33	226	211	226	218	373	229	259	620	2410
1960	76	25	114	465	396	292	292	178	241	495	419	569	3564
1961	30	5	18	140	201	272	188	500	338	437	274	152	2556
1962	48	18	3	46	325	257	338	335	345	213	351	274	2553
1963	201	79	43	163	231	152	325	480	206	259	549	81	2769
1964	6	6	5	116	400	494	443	217	290	428	407	67	2880
1965	71	8	5	28	251	206	198	251	302	277	584	178	2360
1966	81	5	10	81	175	348	236	361	251	325	602	356	2832
1967	13	13	13	112	160	343	221	277	178	302	386	165	2182
1968	3	46	91	15	292	259	165	404	180	475	262	46	2238
1969	43	13	10	127	254	152	312	152	221	315	330	259	2189
1970	300	71	36	107	457	216	338	358	132	277	508	427	3226
1971	106	17	57	3	573	161	247	239	257	178	300	25	2162
1972	157	38	18	140	221	292	127	246	348	363	157	188	2296
1973	53	20	5	25	300	353	241	170	305	267	582	81	2403
1974	5	15	38	13	112	290	330	279	249	452	396	119	2299
1975	3	18	41	58	315	229	226	333	315	424	356	445	2761
1976	23	0	5	66	191	249	89	216	368	251	216	33	1707
1977	25	58	23	15	244	218	180	630	295	414	429	64	2596
1978	8	18	48	196	183	211	290	284	135	312	295	25	2004
1979	5	30	8	310	249	384	325	330	272	257	272	224	2664
1980	112	48	5	20	259	208	193	257	168	292	351	180	2093
1981	399	20	61	340	411	470	315	406	216	340	648	505	4133
1982	114	18	5	94	168	178	170	295	287	290	102	30	1750
1983	23	0	3	94	246	284	305	229	345	269	422	269	2489
1984	104	69	23	58	236	272	236	343	279	538	439	20	2619
1985	25	25	23	5	287	203	251	236	163	358	196	310	2083
1986	61	8	46	97	109	226	86	297	257	452	185	132	1956
Avg	65	31	29	90	273	272	274	311	258	349	423	240	2614
Sd	70	34	28	84	97	88	102	96	72	96	196	170	456
Cv	108	110	98	94	36	32	37	31	28	28	46	71	17
Min	3	0	0	3	79	97	86	150	132	155	102	20	1707
Max	399	185	140	465	573	494	726	630	508	564	1056	716	4133

TABLE A4.—Annual rainfall totals for 17 PCC gauges located across central Panamá, 1863–1986.

Site:	Port-obelo	Crist-obal	Sala-manca	Gatun	Monte Lirio	Ala-juela	Chili-brillo	Bo-hio	Fri-joles	BCI	Gam-boa	Trin-idad	Las Raices	Sum-mit	Cano	Pedro Mig.	Bal-boa
Elev.(m)	30	30	121	30	30	91	61	33	30	45	30	30	30	82	30	45	76
Long.	79°40′	52′	35′	56′	52′	38′	37′	51′	48′	51′	42′	59′	59′	39′	49′	37′	34′
Lat.	9°34′	22′	18′	16′	15′	13′	12′	12′	11′	10′	7′	6′	6′	4′	4′	2′	8°58′
1863		3411															
1864		3135															
1865		2696															
1866		3295															
1867																	
1868		3049															
1869		2914															
1870		3801															
1871		2529															
1872		4280															
1873		2213															
1874		3498															
1875																	
1876																	
1877																	
1878																	
1879																	2152
1880																	1683
1881																	1792
1882		3152															1158
1883		2930															
1884		2198									2398						
1885		3714									2476						
1886		3484									2613						
1887		3934									3459						
1888											2607						
1889											1923						
1890		3920									2668						
1891		3168									1973						
1892		3688									2651						
1893		3350									2959						
1894		3904									2307						
1895		3849															
1896		3340															
1897		3506						4311			2726						
1898		2935						5197			2099						
1899		3380						3022			2032						1917
1900		2947				2775		3351			1996						2232
1901		2737				3120		4353			2326						2322
1902		2841				2409		2800			2483						
1903		3208				2944		2963			2527						
1904		3256				2417		2712			2196						
1905		2928		3783		2005		2610			1942						
1906		3507		3706		3113		2898			2409						1817
1907		3187		2800		1828		2371			1982						1613
1908		3498		3031	3295	2699		3022			1969	2756				1967	1524
1909	6027	4659		4170	3896	3862		3853			3102	3754				2808	2131
1910	4321	3808		3968	4565	3328		4078			2946	3914				2448	1925
1911	3783	2864		2522	2877	2287		1960			1795	2324				1629	1628
1912	3749	2986	2293	2840	2559	2127	2243		2658		2262	2616	2617		2326	1923	1823
1913	4348	3333	2044	2865	2733	1966	2307		2777		2192	2471	2471		2969	1769	1676
1914		3371	2254	2341	2724	2274	2498		2334		1965	2278	2280		2423	1917	1638
1915		3880	3015	3718	3528	2507	2747		3121		2059	2715	2715		2663	1954	1695
1916		2628	2976	2460	2621	2794	3026		1983		2367	2507	2508		2465	2430	1958
1917		2990	3129	3557	3034	2625	2851		2739		2602	2824	2823		2569	2277	1748
1918		3182	2248	2570	2690	2115	2314	2243	2316		1917	1877	1878		1970	1679	1392
1919	3745	2561	2235	2309	2501	2070	2792	2496	2421		1575	2007	2008		2160	1605	1553
1920	3470	2808	2717	2040	2163	2520	2935	1783	2387		2410	2177	2177		2175	2063	1687
1921	3939	2922	2524	3132	3179	2567	2886	2850	3114		2188	2550	2550		2531	1737	1801
1922	3973	2442	2256	2726	2322	2254	2251	1999	2448		2060	2598	2598		2025	2132	1492
1923	3786	3506	2428	3168	3045	2441	2831	2519	2878		2396	2776			2155	1746	1370
1924	3898	3659	2641	3300	3290	2368	2993	2608	2486		2326	2779		2173	2398	2374	2084

TABLE A4.—Continued.

Site:	Port-obelo	Crist-obal	Sala-manca	Gatun	Monte Lirio	Ala-juela	Chili-brillo	Bo-hio	Fri-joles	BCI	Gam-boa	Trin-idad	Las Raices	Sum-mit	Cano	Pedro Mig.	Bal-boa
Elev.(m)	30	30	121	30	30	91	61	33	30	45	30	30	30	82	30	45	76
Long.	79°40′	52′	35′	56′	52′	38′	37′	51′	48′	51′	42′	59′	59′	39′	49′	37′	34′
Lat.	9°34′	22′	18′	16′	15′	13′	12′	12′	11′	10′	7′	6′	6′	4′	4′	2′	8°58′
1925	3479	2911	1960	2666	2585	2042	2326	2051	2659	2764	1981	2776		2226	2309	1972	1669
1926	4148	3758	2717	3346	3646	2436	2691	2296	2813	3003	2253	2537		2387	2346	2126	1864
1927	4717	4181	3414	3301	3741	2484	2313	2729	2938	2956	1934	3175		2134	2362	1999	1686
1928	4062	3468	2718	3316	3100	2413	2233	2485	2311	2579	2067	3167		2393	2495	2138	2137
1929	3555	2911	1950	2510	2621	2510	2368	2033	2213	2231	1913	2225		1829	2271	1827	1710
1930	3847	2566	1754	2617	2216	1915	1868	1724	2063	1943	1822	2484		1820	1686	1876	1313
1931	4137	3354	3095	3258	2996	2820	2454	2831	3126	3129	2306	3030		2410	2617	2077	1925
1932	4156	3466	3135	3812	3200	2790	2755	3066	3049	2880	2317	2929		2408	2878	2145	1847
1933	3218	3461	2461	3552	2843	2299	2147	2106	2812	2573	2155	2967		2157	2055	1742	1839
1934	4002	3536	2500	3590	3414	2865	2016	2566	3302	3134	2370	2832		2284	2560	2189	1995
1935	5187	4367	4076	4147	3850	3453	3409	3233	3514	3642	2909	3670		2530	2999	2359	2116
1936	2998	2904	2627	2837	2530	2089	2251	2008	2393	2380	2254	2334		1764	2289	1832	1489
1937	4872	4169	3198	3592	3401	2755	3022	2522	2939	3150	2630	3119		2719	2689	2420	2164
1938	4529	4130	2992	3889	3243	2582	2631	2686	3051	2974	2862	3112		2826	3265	2790	2168
1939	3980	3209	2019	3261	2963	2192	2104	2383	2262	2888	1883	2316		1716	1994	1721	1591
1940	4138	3112	2016	2644	2553	2006	1845	1994	2622	2449	1948	2332		1878	1775	1481	1400
1941	4396	3612	2550	3144	2989	2134	2160	2159	2764	2332	1767	2413		2115	2124	1907	1846
1942	3780	4041	2208	3576	3364	2529	2450	2678	2764	2822	2407	2931	2546	2335	2332	2494	1779
1943	4530	3206	2324	3310	2958	2514	2686	2409	3060	3053	2263	3117	2808	2284	2088	2162	1825
1944	4690	3520	2849	3502	3132	2491	2407	2565	2852	2845	1937	2858	2606	2295	2278	2070	1947
1945	3792	3356	1941	3704	2963	2220	2104	2533	2952	3058	2064	2804	2164	2295	2431	1989	1622
1946	4331	3214	2294	3094	2424	2022	2035	2532	2398	2197	1660	2250	1884	1930	1858	1605	1365
1947	3518	2860	2518	2298	2225	2086	2019		2378	1979	1812	2487	1858	1984	2146	2060	1485
1948	3257	2563	2020	2480	1834	2007	2024		2319	2111	1955	2240	1864	1850	1857	1750	1490
1949	4375	3449	2482	3468	3043	2240	2140		2621	2918	2030	2865	2373	2083	2479	2011	1739
1950	4241	3790	2475	3288	3071	2442	2442		2736	2906	2180	2997	2545	2096	2338	2085	1838
1951	3828	2905	2186	2731	2863	2332	2264		3386	2865	1798	2332	1843	1795	2044	1789	1622
1952	4442	4008	2436	3183	2972	2469	2693		2861	2479	1995	2718	2008	2036	1998	1875	2134
1953	4103	3012	2563	2918	2641	2170	2222		2766	2664	1822	3180	2203	1950	2101	1885	1720
1954	3813	3319	2220	3452	2397	2393	2240		2576	2685	2297		1894	2496	2389	2567	2132
1955	3522	2980	2118	2948	2830	2335	2087		2774	2906	1976	2990	2874	2198	2369	2256	2139
1956	4232	3808	2353	3733	3012	2850	2457		2664	2891	2056		2344	2226	2327	1763	2114
1957	3061	2721	1508	2605	2415	2005	2098		2235	2553	2122		1893	2002	1972	1936	1591
1958	4021	3329	1900	3095	2605	2015	2225		2375	2545	1768		2032	2202	1812	1915	1904
1959	4072	3224	1890	2847	2757	1468				2403	1885		2557			1760	1785
1960	4367	4219	2580	3876		2696				3475	2402		2546			2504	1882
1961	3369	2617		2877	2374	2526				2545	2141		2014			2077	1645
1962	4234	3704		3419	2872	2303				2537	1850			1868		1923	1767
1963	4417	2777	2240	2839	2512	2612				2761	2158			2130		2327	1616
1964	3659	2832		2569		2371				2878	2122			2130		2110	1711
1965	4765	3331		3176	2741	2223				2281	1950			2119		2100	1868
1966	4923	3580	2700	3737	2996	2711				2830	2027		2809	2307		2584	2448
1967	4303	3164	2481	3051	2528	2613				2182	2097		1932	2355		2023	2054
1968	3520	2620	2091	2669	2425	2739				2238	2154		1576	2074		2015	1547
1969	3754	3239	2154	3202	2893	2262				2184	1981		2307	1837		2079	1855
1970	4886	4224	2879	3952	3251	2859				3226	2614			2954		2487	1799
1971	3652	2883	1947	2588	2231	2604				2151	2153		1949	2102	2101	1935	1879
1972	4292	2991	1633	2501	2167	2377				2296	2327		1935		2073	1948	2187
1973	3310	2819	2477	2297	2609	1986				2319	2146		2167		2146	1778	2101
1974	3916	3317	2093	3114	2469	1989				2278	2174		2126		2217	1981	1530
1975	4541	3007	2746	3294	2885	2436				2761	2405		2332		2405	2070	2581
1976	3479	2327	1405	2492	1765	1547				1679	1280		1745		1829	1648	1308
1977	4155	3076	1773	2088	2431	2258				2621	2068		1796		2167	1976	1316
1978	4896	2677	2385	2306	2507	2256				2014	2177		1938		2301	2040	2029
1979		3204	2477	2870	2286	2230				2664	1877		2057		2108	2047	1364
1980		2981	2156	2413	2014	2413				2105	2080		1994		1862	1981	1288
1981		4384	2598	4128	3813	2504				4133	2512		2591		3490	2286	2525
1982		2390	1656	2616	2154	1763				1750	1821		1659		1552	1638	1593
1983		3203	2327	2560	2230	2410				2489	2101		2075		1753	1519	1859
1984		2738	2238	2131	2220	2433				2619	2482		1831		2347	2126	1557
1985		3239	2329	2565	2532	2578				2083	1793		2014		1831	2131	1610
1986		2337	1989	2433	2230					1956	1793		1857		1778	2106	1717
Avg	4069	3257	2388	3055	2799	2413	2423	2718	2685	2612	2188	2726	2199	2171	2259	2031	1789
n	65	114	71	82	77	86	47	44	47	62	101	47	51	45	63	79	88
Cv	13.2	15.6	19.1	17.6	18.1	15.9	14.4	26.2	12.8	17.3	15.6	15.6	15.5	12.5	16.1	13.6	16.1
Slope	-0.59	-1.25	-7.19	-5.29	-9.95	-3.92	-10.3	-25.5	1.97	-7.77	-4.34	0.818	-6.78	-1.01	-5.14	-0.4	0.227
r	0.021	0.085	0.346	0.223	0.451	0.254	0.404	0.543	0.077	0.307	0.374	0.026	0.453	0.052	0.317	0.033	0.021
p	0.5	0.5	0.005	0.05	0.001	0.02	0.005	0.001	0.5	0.02	0.001	0.5	0.001	0.5	0.02	0.5	0.5

Appendix B: Temperature

TABLE B1.—Daily maximum-minimum temperatures (tenths of degree C) in the laboratory clearing, Barro Colorado Island, Panamá, 1971–1989.

1971	--Jan--		--Feb--		--Mar--		--Apr--		--May--		--Jun--		--Jul--		--Aug--		--Sep--		--Oct--		--Nov--		--Dec--	
day	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min
1							310	210	340	225	320	230	305	225	310	225	315	230	325	225	300	220	310	225
2							315	210	330	220	325	230	345	223	315	225	310	225	315	215	290	220	310	225
3							320	205	300	230	330	225	270	225	315	225	320	220					330	225
4							315	210	330	240	300	230	295	225	315	220			305	220	310	220		
5							325	220	325	225	305	230	300	225	310	220			300	220	300	220		
6							320	225	270	230	325	220	300	225	300	215	315	215	320	225			325	220
7							325	235	315	230	330	225	310	230	300	210	310	220	320	235	310	215	325	225
8							310	225	315	215	300	230	320	232	290	215	330	220	325	230	300	220	325	225
9							320	220	285	220	300	240	315	235	315	220	320	215	310	235	280	220	325	230
10							320	230	325	223	310	245	320	230	305	225	300	220			320	205	320	215
11									315	225	315	225	320	245	275	225	300	220			280	210		
12							320	225	325	235	300	220	310	225	310	230	335	225	315	225	270	215		
13							325	230	310	225			310	215	300	220	300	230	325	225	300	215	330	215
14							320	225	290	230	320	210	295	225			315	210	325	225			320	225
15							320	221	310	225	310	225	295	215			295	220			305	215	320	225
16							320	220	310	220	325	235	315	225	300	220	315	215			300	230	325	225
17							330	220	315	220	300	230			315	225	320	220			300	225	320	230
18							330	215	300	225	300	220			320	220			315	215	260	215		
19							315	220	315	225			293	225	315	225			320	215	320	220		
20							335	220	310	220	285	216	300	235			305	215	305	220			320	210
21							335	220	330	225	305	235	320	235			315	230	315	225	315	210	325	215
22							330	222	300	225	300	230	325	235	320	215	300	230	320	225	320	210	320	220
23							325	235	305	225	305	225	330	240	320	220	305	225			320	210	320	220
24							330	225	310	220	310	230	310	205	310	230	320	235			320	215	315	215
25							350	230	330	225	315	225	290	225	305	230	285	220	315	225	310	215	305	200
26							330	230	310	235	320	240	305	242	315	225			325	220	310	220		
27							340	230	310	230	310	225	295	230	300	220			315	220			315	210
28							340	225	325	240	315	225	330	220			320	220	320	220			320	220
29							340	218			300	225	315	230	310	215	285	220	320	220	315	210	315	225
30							340	235			300	225	295	220	330	230	300	225	310	220	290	225	310	220
31									305	225			262	205	320	235			295	220			310	220
Avg							326	223	312	226	310	228	307	227	309	223	310	222	316	223	302	217	319	220
n							29	29	29	29	28	28	29	29	26	26	24	24	23	23	24	24	24	24
Sd							10	8	15	6	11	7	17	9	11	6	12	6	8	5	16	6	7	7
Max							350	235	340	240	330	245	345	245	330	235	335	235	325	235	320	230	330	230
Min							310	205	270	215	285	210	262	205	275	210	285	210	295	215	260	205	305	200

1972	--Jan--		--Feb--		--Mar--		--Apr--		--May--		--Jun--		--Jul--		--Aug--		--Sep--		--Oct--		--Nov--		--Dec--	
day	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min
1			315	225	320	230			320	235	325	240			325	240			320	225	315	225		
2	320	220	315	225	300	230	340	235	305	230			330	240	325	235								
3	330	230	315	245			330	245	310	235					325	235							330	225
4	300	225					325	245	320	245	330	235	325	240			315	220						235
5	295	225			325	235	330	245			330	230	310	235			320	245	310	215	325	220	330	230
6	275	220	315	220	315	220	320	230			330	230	305	225	325	235	325	235			300	225		
7			315	225	320	220			330	235	275	230			320	230	305	245			315	225	330	235
8			305	215	320	215			325	240	300	220			315	240					315	230		
9	290	210	285	240	310	205	325	235	290	225			330	220	295	230			320	225	320	225		
10	300	225	315	220	305	205	325	215	320	225			330	240	290	225	315	225	295	225			325	215
11	295	235					285	230	325	240	305	215	290	215			305	225	305	225			315	230
12	315	225			315	210	315	225			320	215	310	235			305	245	275	215	325	230	333	240
13	320	220	305	215	320	210	325	225			320	230	325	245	325	230	320	245			310	215	325	235
14			315	210	315	220			335	230	320	230			320	220	315	230			315	230	330	249
15			310	215	310	215			305	240	325	235			325	225			310	220	335	235		
16	315	210	305	220	320	220	335	225	320	230			335	245	280	225			310	230	320	230		
17	280	190	310	220			330	230	335	240			330	250	300	225	310	210	315	235			325	230
18	285	215					305	225	335	230	355	235	325	245	302	230	310	235	315	240			285	225
19	300	225			330	210	295	215			305	215	330	225			320	235	290	230	325	225	295	225
20	305	225			320	220	290	215			265	215	290	235	290	220	290	218			315	240	310	220
21	300	220	310	210	320	210			330	225	325	225			270	225	300	238			305	235	325	225
22	295	185	310	225	330	215			320	230	320	220			275	220								
23	310	220	305	215	325	210	310	215	325	230			325	225	310	230			305	215	325	225		
24	310	205	315	225			300	225	320	230			295	225	310	225	325	220	305	225				
25	310	215					310	225	305	245	310	220	315	245			310	225	295	228			320	215
26	315	220			330	215	330	230			290	235	330	230			305	225	290	230	325	225	310	230
27	310	215	320	220	325	220	330	225			330	245	325	240	315	215	305	220			310	235		
28			315	230	330	225					335	240			290	225	305	225			330	230	315	205
29			325	225	325	230			320	225	335	235			310	235			315	230	315	225		
30	310	220					330	225	320	245			325	240	305	225			300	215	330	225		
31	295	230							315	235			330	245	285	225			315	220				
Avg	303	218	311	222	320	218	318	228	320	234	317	228	320	235	306	228	311	230	305	225	319	228	319	228
n	24	24	20	20	22	22	21	21	22	22	21	21	21	21	24	24	19	19	18	18	20	20	16	17
Sd	13	11	8	9	8	8	15	9	11	7	20	9	14	9	17	6	9	10	12	7	9	6	13	10
Max	330	235	325	245	330	235	340	245	335	245	355	245	335	250	325	240	325	245	320	240	335	240	333	249
Min	275	185	285	210	300	205	285	215	290	225	265	215	290	215	270	215	290	210	275	215	300	215	285	205

TABLE B1.—Continued.

1973	--Jan--		--Feb--		--Mar--		--Apr--		--May--		--Jun--		--Jul--		--Aug--		--Sep--		--Oct--		--Nov--		--Dec--	
day	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min
1	330	230	325	245	328	225	340	220	320	250			300	220	285	220			310	225	310	225		
2	320	245					325	215	330	240			305	215	305	205			315	225				
3	320	240					340	218	325	240	305	225							290	220			300	210
4	320	245	335	235	315	225	345	235			280	230	320	220			325	215					295	215
5			325	220	315	235	330	250			265	230	320	220	310	225	325	225			315	225	295	225
6			320	215	320	230					275	225			295	215	325	230			300	228	312	218
7	325	230	325	220	318	220			320	230	290	235			285	225					275	225	310	215
8	320	240	330	210	315	212	350	225	320	230			330	235	305	240			310	220	310	225		
9	305	245	315	215			345	235	335	235					315	245	325	220	315	225	315	230		
10	315	235					345	230	340	235	325	230	320	235					305	235			300	212
11	315	225	325	210	325	220	330	240			275	225	300	235			320	215	305	240			300	215
12			310	210	320	240	340	225			315	220	320	235	325	200	315	225			285	215	280	215
13			315	215	330	240			340	240	315	225			315	230	310	225			255	220	295	215
14	310	220	325	222	325	240			325	235	325	235			320	225					315	228	302	210
15	300	225	328	225	330	240	330	235	320	220			305	225	310	225			315	225	315	225		
16	315	225					325	225	285	220			300	228	295	225	325	215	305	235	285	225		
17	315	230					335	225	285	225	320	225	310	225			295	220	275	225			310	215
18	310	230			335	230	345	235			305	228	295	225			305	220	310	225			306	215
19			315	232	320	240					305	225	310	225	325	225			310	225	300	220	300	226
20			335	245	295	230			310	225	310	225			300	220	315	230			300	225	312	228
21	315	215	325	232	325	240			330	235	295	225			325	225					310	230	301	230
22	325	225	310	210	325	250	345	215	340	235			320	210										
23	320	230					300	215	330	230			320	220	325	235	320	235	310	225	315	230		
24							335	225	310	230	300	215	280	225			315	235	320	225				
25	325	235	315	212	335	230	345	235					310	220			305	215	305	225				
26			322	232	345	235	355	240			315	220	300	225	325	220			300	225	295	225	310	218
27			320	215	335	225					285	215			330	215	305	225			295	230	315	230
28	325	232			330	228			320	230	315	235			300	225					300	228	300	220
29					328	230			315	210			305	220	310	230			310	225	310	220		
30	315	225					355	235					295	210	318	230	310	225	315	225				
31	305	240							295	220			310	218					320	235				
Avg	317	232	322	222	324	232	338	229	320	231	301	226	308	223	311	224	315	223	308	227	300	225	302	218
n	21	21	19	19	21	21	20	20	20	20	19	19	21	21	21	21	16	16	19	19	19	19	18	18
Sd	7	8	7	11	10	9	12	9	16	9	18	6	11	7	13	10	9	7	10	5	16	4	8	6
Max	330	245	335	245	345	250	355	250	340	250	325	235	330	235	330	245	325	235	320	240	315	230	315	230
Min	300	215	310	210	295	212	300	215	285	210	265	215	280	210	285	200	295	215	275	220	255	215	280	210

1974	--Jan--		--Feb--		--Mar--		--Apr--		--May--		--Jun--		--Jul--		--Aug--		--Sep--		--Oct--		--Nov--		--Dec--	
day	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min
1			300	200			330	210	310	230			290	208	298	215			301	218	298	217	285	245
2	215	305					315	220	330	225			262	225					312	218			290	220
3	310	220					310	220	328	220	305	222	295	226			322	219	310	220			300	216
4	300	228	310	210	310	225	320	215			310	235					316	225	318	222			308	229
5			300	220	310	220	330	225			313	235	302	226	300	230	316	220			307	202	310	225
6			305	220	310	220			335	223	322	240			310	215	330	222			310	218	310	220
7	312	220	305	210	305	235			340	230	325	245			282	222			318	216	320	220	300	220
8	295	230	305	205	310	235	330	220	340	228			310	235	270	225			320	217	320	221	290	240
9	310	222					310	225	350	225			310	245	298	238	330	218	310	212			310	220
10	310	228					320	228	345	222	322	215	320	240			270	212	300	220			312	224
11	310	222	312	210	320	220	325	215			318	228	320	228			300	212	300	210	300	220	310	225
12			305	200	315	215					300	218	321	212	312	219	305	230			308	210	310	225
13			302	220					346	225	305	220			262	220	320	216			290	220	310	238
14	310	215	310	215	310	220			296	225	308	218			302	228					302	220	312	224
15	300	210	315	220	312	216	325	230	308	235			310	205	305	228			322	210	300	215	310	225
16	315	210					315	245	278	225			273	195	320	236	302	215	322	210	280	220	300	210
17	315	215					320	245	350	222	325	229	312	225			302	218	300	220			312	217
18	320	215			320	220	300	235			300	215	312	215			320	207	290	220	300	220	312	210
19			310	210	315	215	300	250			315	220	265	212	315	235	320	208			297	227	320	217
20			330	215	315	210			334	217	313	230			320	240	320	228			270	222	300	215
21	300	210	310	225	310	215			332	236	310	234			300	240			305	220	272	218	312	220
22	310	210	305	230	325	215	320	240	330	235			309	212	318	227			292	220	272	216	305	210
23	310	210					305	230	380	228			280	225	290	220			262	218	290	210	310	228
24	311	213					315	230	320	220	310	223	295	230			319	210	305	225	280	220	310	225
25	308	220	315	230	330	200	320	240			300	220	300	230			318	212	300	218	285	235		
26			315	225	320	218	330	240			301	228	280	225	312	218	312	218			302	222	310	218
27			310	220	315	215					305	228			290	230					300	229	320	220
28	310	215	305	220	315	215			320	226	301	220			295	220					318	238	315	220
29	320	220			320	210			322	245			290	218	312	225			312	212	285	228	310	218
30	315	230							319	232			272	228	302	223	318	215	290	217	315	235	310	210
31	312	220							318	219			290	215					295	222			310	198
Avg	305	222	309	216	315	218	318	230	329	227	310	226	296	222	301	226	313	217	304	217	297	221	307	221
n	22	22	19	19	19	19	19	19	22	22	20	20	22	22	21	21	18	18	21	21	24	24	30	30
Sd	21	19	7	9	6	8	9	11	21	6	8	8	18	12	15	8	14	6	14	4	15	8	8	9
Max	320	305	330	230	330	235	330	250	380	245	325	245	321	245	320	240	330	230	322	225	320	238	320	245
Min	215	210	300	200	305	200	300	210	278	217	300	215	262	195	262	215	270	207	262	210	270	202	285	198

TABLE B1.—Continued.

1975	--Jan--		--Feb--		--Mar--		--Apr--		--May--		--Jun--		--Jul--		--Aug--		--Sep--		--Oct--		--Nov--		--Dec--	
day	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min
1	310	200	320	228	308	216	330	226	325	225	300	230	260	225	290	230			310	230	280	210	309	210
2	310	205			280	218	312	231	322	221	322	243	276	219	330	230	301	220	310	212	280	210	292	202
3	315	205	310	212	312	203	320	240		228	304	215	305	236	330	230	320	218	310	206	300	220	282	205
4	320	218	318	210	302	221	330	220		228	300	232	295	220	295	230	320	215			312	224	286	208
5	290	218	310	210	312	222	320	220	312	221	315	245	270	210	286	226	293	230	294	228	305	219	290	210
6	320	220	309	215	321	221	300	220	320	227	312	228	270	200	286	222	280	215	300	217	290	221	310	220
7	290	222	310	218	310	221	321	210	325	222	300	226	292	225	280	222	302	228	300	220	300	215	330	228
8	298	222	300	228	300	226	320	232	320	228	300	226	300	216	331	218	301	218	298	222	325	220	290	217
9	300	225	300	218	300	224	320	238	320	236	310	238	302	212	310	220	310	218	295	220	310	225	283	211
10	305	222	310	220	312	231	318	230	290	240	308	237	305	236	310	220	300	211	290	220	310	221	270	210
11	300	220	310	220	309	230	330	230	290	240	310	240	310	232	309	231	300	213			275	212	240	220
12	290	240	310	228	323	240	320	220	312	232	319	242	300	230	307	245	300	219			290	216	250	215
13	315	230	310	218	330	240	320	220	310	232	320	237	320	220	292	208	302	220			312	217	310	240
14	310	220	280	220	340	219	320	237	312	235	310	215	280	213	312	213	290	220	302	205	312	220	310	230
15	310	226	310	210	298	224	328	220	318	230	300	238		212	290	218	307	212	310	205	335	220	300	232
16			310	210	288	226	311	229	299	218	328	221	300	220	308	216	278	217	315	218		225	292	240
17	310	230	310	220	322	230	320	230	300	230	310	221	308	228	316	224	310	215	302	212	253	208	315	222
18	298	240	318	228	320	225	331	228	318	240	310	220	300	230	297	222	318	221	310	218	291	212	315	217
19	300	230	319	212	321	215	320	238	300	225	310	225	320	208	295	215	315	220			308	258	308	228
20	315	230	318	228	324	228	320	238	298	222	305	232	310	210	265	220	288	220	320	218	315	230	330	230
21	302	237	342	210	320	225	320	245	315	241	300	244	286	213	299	218	288	220	272	225	310	250	316	218
22	322	231	308	220	288	220	321	242	320	240	310	230	298	225	295	220	299	220	290	218	300		272	215
23	308	230	298	226	308	220	318	238	320	228	295	218	310	213	300	220	300	220	300	212			292	218
24	312	212	315	218	317	232	311	237	295	220	300	235	300	224	310	220	301	222	295	231	289	210	280	210
25	288	218	320	222	325	235	315	230	290	220	270	230	300	228	292	219	310	220	310	208	298	220		
26	308	230	306	227	320	242	300	240			290	229	320	215	270	217	318	220	310	208	289	228	290	200
27	300	225	307	220	322	242	300	240	320	227	310	215	291	230	290	215	290	230	290	218			308	210
28	310	226	316	222	300	240	319	222	302	222	308	225	300	230	297	213	310	220	312	220	315	218	328	220
29	314	237			315	230	320	207	318	220	320	220	301	228	297	210	303	210	310	220	305	220	305	200
30	306	228			308	246	325	215	300	230	295	222	272	215			300	220	301	212	300	240	310	200
31	311	225			338	232			300	230			300	225					322	218			303	215
Avg	306	224	311	219	313	227	319	229	310	229	306	229	297	221	300	221	302	219	303	217	300	222	297	217
n	30	30	27	27	31	31	30	30	28	30	30	30	30	31	29	29	29	29	26	26	27	27	30	30
Sd	9	10	10	6	14	9	8	10	11	7	11	9	15	9	16	7	11	5	11	7	16	11	21	11
Max	322	240	342	228	340	246	331	245	325	241	328	245	320	236	331	245	320	230	322	231	335	258	330	240
Min	288	200	280	210	280	203	300	207	290	218	270	215	260	200	265	208	278	210	272	205	253	208	240	200

1976	--Jan--		--Feb--		--Mar--		--Apr--		--May--		--Jun--		--Jul--		--Aug--		--Sep--		--Oct--		--Nov--		--Dec--	
day	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min
1			300	200	290	228	328	222	290	228	315	230	300	232	290	240	315	240	330	225	250	240	320	230
2	312	210	301	198	300	230	320	212	300	230	300	225	310	240	300	230	270	210	300	220	310	250	325	220
3	312	210	307	210	310	233	328	220	322	223	290	220			310	235	310	220	300	220	310	230	330	220
4	302	210	310	220	315	213	328	228	320	230	300	230	292	222	310	220	320	240	330	220	300	240	290	210
5	292	210	312	225	320	221			312	232	300	230	310	230	300	195	310	250	320	220	270	237	270	220
6	310	208	310	222			320	238	320	225	300	230	320	230	300	238			312	230	300	220	310	220
7	295	201	280	220	290	222	322	230	325	225	302	239	320	239	300	240	320	220	315	240	310	220	330	320
8	305	225	300	220	300	220	340	220	310	230	290	228	315	250	308	240	330	230	310	220	300	240	330	310
9	302	219	312	208	310	220	330	232	300	240	310	228	300	300	310	235	312	220	280	226	320	220	340	235
10	302	210	302	200	320	215	350	280	322	232			300	230	320	240	310	220	280	226	310	235	320	240
11	300	210	305	228	322	230	390	230	340	230	310	236	300	230	320	230	290	220	280	220	300	240	280	230
12	310	212	310	218	320	232	420	230	330	230	310	236	308	250	310	230	308	220	320	230	300	220	270	240
13	310	222	300	229	302	228	410	210	338	250	310	236	261	260	293	240	320	250	340	240	280	220	350	240
14	317	235			290	228	320	245	321	230	300	238	290	290	290	228	320	230	325	220	270	220	320	248
15	300	230			312	232	290	208			310	230	320	240	300	220	290	220	320	220	310	215	340	240
16	300	230			315	230	399	214			288	229	300	240	310	222	290	230	270	220	310	220	340	230
17	310	220	312	198	312	235	324	205	321	255	305	238	277	251	318	230	310	205	280	220	320	224	300	220
18	310	220	316	210	326	228	310	208	301	248	300	242	300	290	310	222	300	210	340	210	330	215	290	240
19	298	229	318	212	301	235	318	210	330	222	300	240	330	230	300	320			320	220	310	210	290	240
20	300	226	316	215	308	238	320	205	310	240	300	220	320	234	280	230	325	225	310	228	280	220	320	230
21	305	230	300	220	282	240	298	215	320	242	300	220	310	230	300	220	270	235	320	220	288	220	320	230
22	303	218	300	220	320	232	310	230			308	222	320	220	310	220	290	230	315	230	320	230	320	230
23	300	205	325	222	319	239	315	235	310	232	310	250	290	222	300	230	290	235	290	220	320	230	320	215
24	300	220	326	218	306	232			320	225	310	220	300	230	310	230	260	190	270	220	320	220	300	240
25	300	220	300	230	310	220	290	238	320	230	300	220	300	240	310	234	320	210	300	210	325	248	300	240
26	310	223	310	228	310	218	312	235	315	225	300	220	310	230	310	210	300	220	305	220	330	242	300	240
27			312	210	306	215	340	230	315	230	300	240	330	228	290	222	310	215	310	228	280	230	315	230
28	310	215	300	220	300	216	298	230		220	278	230	320	250			310	220	318	230	270	220	310	205
29	319	199	300	220	318	230	310	230	298	220	280	240	320	240			320	225	320	225	340	230	300	220
30	302	200			316	228	310	220	310	220	300	232	318	245	300	230	300	220			340	225	310	220
31	300	200			312	210							290	240	315	250							280	220
Avg	305	216	307	216	309	227	330	225	316	231	301	231	306	242	304	232	304	224	308	223	304	228	311	235
N	29	29	26	26	30	30	28	28	26	27	29	29	30	30	29	29	28	28	29	29	30	30	31	31
Sdv	6	10	9	9	11	8	34	15	12	9	9	8	15	19	10	20	17	13	19	7	22	10	21	24
Max	319	235	326	230	326	240	420	280	340	255	315	250	330	300	320	320	330	250	340	240	340	250	350	320
Min	292	199	280	198	282	210	290	205	290	220	278	220	261	220	280	195	260	190	270	210	250	210	270	205

TABLE B1.—Continued.

1977	--Jan--		--Feb--		--Mar--		--Apr--		--May--		--Jun--		--Jul--		--Aug--		--Sep--		--Oct--		--Nov--		--Dec--	
dia	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min
1	300	240	330	220	330	240	330	220	325	260	310	215	354	218	250	210	300	210			330	230	300	240
2	300	220	330	220	310	240	300	220	310	250	300	230	308	224	295	205	305	238			325	230	290	230
3	320	225	320	220	305	220	290	240	315	215	300	220	314	232	300	235			300	240	310	240		
4	320	235	300	220	300	240	330	220	315	240	298	228			300	235			310	230				
5	310	210	290	220	310	245	320	210	340	230	288	210	300	215	290	235			300	225			310	240
6	320	240	280	230	310	250	325	200	340	250	315	235	280	195			320	230	305	230			315	245
7	330	230	310	220	310	245	330	245	300	250	295	220	280	220			305	240	310	230	285	235	285	265
8	310	220	320	220	310	240	300	235	300	260	315	230	350	228	275	225	330	240			300	230	290	245
9	300	210	320	250	315	240	290	220	300	260	320	220			305	235	330	240			325	230	300	240
10	320	215	320	245	300	240	300	240	300	255	310	240			290	220					310	225		
11	312	248	330	235	320	235	300	235	325	250	310	235	315	230	310	220			300	220	300	230		
12	310	250	300	240	308	248	300	230	330	235	288	210	310	230	310	220	300	225	310	230			290	230
13	315	240	300	240	308	240	310	250	315	230	290	210	315	245			310	280	320	250			295	215
14	330	220	310	230	340	200	300	235	380	228	300	220	315	235			300	240	340	220	280	210	300	240
15	260	210	325	230	300	300	295	220	310	230	315	225	310	250	295	245	285	235			310	225	315	225
16	260	220	300	220	300	210	320	260	320	260	300	235	310	220	280	220	310	250			300	220	325	225
17	330	220	310	220	290	230	310	260	330	265	310	240	310	232	285	220			300	240	290	220		
18	320	220	300	237	280	230	330	240	330	245	310	260	300	240	275	210			300	230		230		
19	330	210	300	240	320	250	315	250	300	225	315	240	315	235	270	220	310	280	300	240			295	220
20	300	210	300	240	300	240	330	230	280	230	290	230	300	220			305	250	285	235			300	220
21	320	215	300	230	320	250	330	230	300	220	310	235	300	225			285	245	310	225	315	225	325	220
22	248	220	310	230	315	250	325	210	310	220	300	230	320	230	305	220	290	240			330	220	320	230
23	298	250	315	240	320	245	320	275	330	230	290	235			310	220	310	240			300	240	295	220
24	320	216	320	235	315	240	300	270	320	230	305	235			315	230								
25	312	218	325	225	320	210	310	265	315	230	290	230	310	245	310	245			335	235	295	245		
26	320	226	320	230	300	220	320	240	305	235	316	248	300	235			300	230	315	230				
27	320	218	310	220	300	220	315	260	330	220			300	220			300	210	315	240			390	235
28	320	240	325	225	320	225	310	250			310	230	300	230			295	220	300	230	310	250	330	240
29	298	226			325	240	315	255			270	220	320	245	320	245	300	220			320	220	325	230
30	270	220			320	250	310	280			270	220			300	258	310	230			315	235	312	224
31	330	215			310	230			320	235					310	210			305	230				
Avg	308	224	311	230	311	238	313	240	318	239	301	229	310	229	295	227	305	238	308	232	308	230	310	232
N	31	31	28	28	31	31	30	30	28	28	29	29	24	24	22	22	21	21	19	19	19	20	21	21
Sd	21	12	13	9	12	17	13	20	18	14	13	11	16	12	17	13	12	18	13	7	14	9	22	12
Max	330	250	330	250	340	300	330	280	380	265	320	260	354	250	320	258	330	280	340	250	330	250	390	265
Min	248	210	280	220	280	200	290	200	280	215	270	210	280	195	250	205	285	210	285	220	280	210	285	215

1978	--Jan--		--Feb--		--Mar--		--Apr--		--May--		--Jun--		--Jul--		--Aug--		--Sep--		--Oct--		--Nov--		--Dec--	
dia	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min
1			310	240	325	230			315	230	305	225			305	220			305	225	305	230	330	230
2			320	255	310	228			290	240	320	220			310	220			295	230	310	220		
3	320	220	290	250	325	230	315	220	315	230			300	225	300	228			310	228				
4	310	230					325	225	320	230			340	230	320	230			320	225			336	220
5	325	220					320	225	320	240	225	280	315	230			330	215	320	220			320	220
6	330	220	310	220	320	230	320	225			300	225	316	230			320	225			310	220	330	220
7					320	235	310	240			300	220	310	228	300	220	330	220			315	225	335	230
8			290	235	325	230			320	220	315	230			295	220	320	230	305	220	310	225	310	230
9	340	210	300	245	320	235			305	230	295	220			305	225			300	220	290	250		
10	295	230	315	225	320	225	315	230	340	230			310	214	215	215			300	185				
11	290	220					330	235	330	230			315	220	300	225	310	220	310	220			310	225
12	300	215					325	225	315	235	300	220	340	220			310	225					310	220
13	305	210	325	205	310	225	320	249			300	220	320	220			315	200			300	220	305	215
14			310	200	230	260	290	220			320	220	310	228	300	240	305	210			305	220	325	230
15			310	220	325	225			305	240	290	190			315	215	320	210	315	220	310	220	320	220
16	340	200	310	220	320	230			310	235	300	200			310	210			310	218	300	225		
17	330	205	325	220	310	220	305	220	310	225			320	225	290	250			320	220	320	230		
18	305	230					300	230	320	220			330	240	300	240	300	220	310	240			330	224
19	320	210					325	230	310	230	320	230	308	219			320	220	310	225			320	220
20	315	230			320	230					310	220	320	224			300	230			290	220	325	220
21			330	225	290	240	315	235			340	222	300	224	310	215	310	220			320	220		
22					320	238			320	230	310	225			330	230	330	220	290	220	315	220	330	225
23	315	240	325	225	318	240			290	250	320	230							320	220				
24	310	245	300	220			320	230	280	220			330	210	315	235			315	215	330	226		
25	310	249					320	240	300	220			320	245	310	235	310	210	290	215				
26	320	235					310	240	300	220	300	230	325	230			310	225	310	215			325	210
27	320	250	315	220	330	240	315	230			320	220	300	210			315	220	310	230	330	230	330	230
28			325	255	330	250					305	230	315	220	330	225	315	225			320	235	325	220
29					300	220					300	220			300	215	295	220			340	235	320	220
30	305	235			320	235			310	220	310	222			290	210			290	225	340	230		
31	320	225			310	220			310	220			320	225	320	215			290	230				
Avg	315	225	312	228	314	233	316	231	311	229	305	224	317	225	303	224	314	219	307	221	314	226	323	223
n	21	21	17	17	22	22	18	18	22	22	22	22	21	21	22	22	19	19	22	22	19	19	19	19
Sd	13	14	12	16	20	9	10	8	13	8	21	15	11	8	22	10	10	7	10	10	14	8	9	5
Max	340	250	330	255	330	260	330	249	340	250	340	280	340	245	330	250	330	230	320	240	340	250	336	230
Min	290	200	290	200	230	220	290	220	280	220	225	190	300	210	215	210	295	200	290	185	290	220	305	210

TABLE B1.—Continued.

1979	--Jan--		--Feb--		--Mar--		--Apr--		--May--		--Jun--		--Jul--		--Aug--		--Sep--		--Oct--		--Nov--		--Dec--	
dia	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min
1			320	230					330	230	320	230	310	250	310	220	310	220	285	215	335	225	325	220
2	330	230	320	215			335	230	330	230	290	225	315	240	310	230	320	220	320	225	335	215	305	227
3	320	230					330	235	330	235	310	230	315	245	295	230	310	220	305	225	320	230	308	245
4	315	230					320	240	325	235	310	225	300	240	320	220	320	230	280	230			325	228
5	320	230	325	270	340	210	300	230	305	235	290	220	310	240	320	240	325	235	280	235	310	228	300	225
6			325	230			305	230	325	250	305	220	305	240	325	250	326	236	315	235	315	225	312	236
7			330	215					325	245	300	220	325	245	320	240	290	220	280	225	310	228	320	240
8	320	200	325	220					330	250	310	230			320	230	310	220	315	230	310	225	315	245
9	330	210	315	230			330	230					300	250	315	235	320	230	325	225	315	225	310	232
10									325	230			300	240	320	250	300	230	305	220	320	230	320	223
11	325	200					330	240	330	245	325	230	310	230	320	240	320	228	325	225			318	232
12	320	200	320	215	335	215	335	260	325	230	320	225	285	210	280	200	310	228	310	225			320	235
13			320	230	330	228			300	225	330	235	300	225	330	240	302	220	315	225	320	222	340	230
14			315	220	330	228			325	225	315	235	320	240	290	230	275	225	330	235	270	220	310	230
15	320	210	310	205	330	230			295	235	300	226	310	220	300	220	300	220	335	230	300	225	290	220
16	330	220	320	220	320	230	340	250	305	220	310	235	290	220	290	220	310	220	315	230			278	210
17	330	225					325	230	330	230	310	235	280	220	310	220	310	230	320	230	300	220	295	220
18	330	230					290	230	310	230	300	230	300	220	310	230	330	230	330	230			300	220
19	325	230			325	215	310	240	310	230	300	240	304	230	310	220	315	230	345	230	320	222	300	215
20			330	230	320	210	310	245	315	225	245	230	290	228	310	230	310	230	335	225	280	226	308	212
21			325	235	325	210					300	230	400	240	310	220	300	225	330	220	280	225	265	215
22	330	200	320	240	330	200			315	230	300	220	320	240	290	220	318	225	315	220			310	210
23					330	200	325	220	310	225			300	215	300	215	320	220	315	215	290	220	272	245
24	330	214					320	230	300	235			300	235	300	225	265	210	290	215	290	220	306	211
25	320	230					340	240	310	230	300	230	300	235	310	220	315	225	310	215			302	213
26	320	215			350	210	335	225	325	235	300	230	310	230	300	220	330	235	310	220	300	220	315	210
27					350	230	320	230	290	240	315	230	320	230	280	225	320	230	320	215	310	228	320	210
28					330	240	325	220			305	240	400	240	290	230	310	235	320	225	300	220	270	225
29	340	210			332	234	325	225	290	230	315	235	310	230	270	220	310	230	310	220	310	238	297	215
30	320	230			340	240	330	225	290	220	325	245	320	220	315	220			300	215	325	230	310	230
31	315	225							290	230			325	220	320	218			330	215			310	235
Avg	325	218	321	227	332	221	323	234	314	233	306	230	312	232	306	227	310	226	314	224	307	225	306	225
n	20	20	15	15	16	16	21	21	28	28	26	26	30	30	31	31	29	29	31	31	23	23	31	31
Sd	6	12	5	15	9	13	13	10	14	8	16	6	26	10	15	10	14	6	17	6	17	5	17	11
Max	340	230	330	270	350	240	340	260	330	250	330	245	400	250	330	250	330	236	345	235	335	238	340	245
Min	315	200	310	205	320	200	290	220	290	220	245	220	280	210	270	200	265	210	280	215	270	215	265	210

1980	--Jan--		--Feb--		--Mar--		--Apr--		--May--		--Jun--		--Jul--		--Aug--		--Sep--		--Oct--		--Nov--		--Dec--	
dia	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min
1			310	230			330	245	345	225			325	240	310	220	325	230	315	230	320	230	280	230
2	300	230	315	220			325	230	350	240	310	230	320	240	315	235	280	230	310	225	225	290	300	235
3	310	240			330	216	325	220	340	240	338	238	300	240			300	220	320	220	320	230	330	225
4	315	235	315	210	328	220	335	235			340	240	325	240	320	238	330	230	320	230			325	225
5	318	245	310	220	320	218	330	230			330	240	330	245	325	220	330	230	315	225	330	220	315	220
6	320	240	320	215	325	220			360	230	310	240			320	230	310	240	290	220	323	215	300	220
7	325	240	270	210	325	235			300	235	290	230	330	250	310	235	310	230	290	220	305	210	320	225
8	328	250	310	220	325	240	330	222	290	230			310	230	310	220	305	230	315	225	310	210		
9	328	239	320	230			330	220	340	230	300	235	325	240	310	240	310	238	325	225			320	225
10	320	240			325	235	330	205	355	240	300	230	325	240			310	235	325	230	320	220	290	230
11	328	234	320	220	330	240	330	210			300	230	315	225	320	230	310	235	320	215	320	225	300	235
12	318	275	330	225	305	230	310	210	335	240	290	230	325	230	335	250	325	250	320	220	310	220	325	240
13			330	225	320	240			330	220	310	225			320	220	280	235			310	220	310	225
14			330	220	310	235	335	202	315	210	300	230	320	230	335	225			335	230	300	225		
15	320	210	320	225	305	225	335	220	335	250			295	240	320	230	310	230	310	230	325	225	310	220
16	300	220	320	220			335	245	335	235	330	250	300	240	310	225	320	228	300	220	300	220		
17	315	218			325	230	330	235	340	240	320	250	320	230					320	270	310	220	310	220
18	310	215	315	215	320	240	320	240			330	240	320	240	315	224	290	225	315	240	330	228	315	230
19	260	210	320	225	325	230			310	230	325	235	320	220	330	220	280	230	320	220	320	225	305	230
20			315	225	330	235			330	240	290	220			320	224	280	235	325	225	325	225	320	250
21	310	220	325	225	330	238	340	248	320	220	325	230	320	230	320	240			320	230	330	230	315	230
22	310	210							300	230			300	240	325	225	320	220	330	225	325	230	310	225
23	310	225					320	220	290	230	325	219	233	233	310	230	330	230	310	230	300	220	290	230
24	315	230			340	218	320	220	315	240	325	219	325	220			340	225	328	230	315	230	310	220
25	300	260	320	218	320	240	310	225			310	240	305	230	330	230	340	235	330	240	312	229	295	220
26	320	240	330	225	325	200					315	240	320	230	335	250	305	245			280	225	300	225
27	330	235	330	225	330	250			330	240	305	250			325	240	320	220	330	225	300	230	310	215
28	310	240	330	230.	340	245	325	235	330	230	320	250	320	228					300	230			310	215
29	320	239	330	228	320	245	330	240	320	230			300	222					300	230	295	225	310	210
30	328	230							325	230	330	230	310	230					315	210	305	225	260	210
31	315	230			340	238			320	230			310	240					300	225			300	200
Avg	314	233	319	222	325	232	327	227	326	233	315	235	313	234	320	230	311	232	316	227	310	226	307	224
n	27	27	23	23	24	24	21	21	25	25	25	25	27	27	23	23	24	24	29	29	27	27	28	28
Sd	14	15	13	6	9	11	8	13	18	8	15	9	19	8	8	9	18	7	12	10	21	14	14	10
Max	330	275	330	230	340	250	340	248	360	250	340	250	330	250	335	250	340	250	335	270	330	290	330	250
Min	260	210	270	210	305	200	310	202	290	210	290	219	233	220	310	220	280	220	290	210	225	210	260	200

TABLE B1.—Continued.

1981	--Jan--		--Feb--		--Mar--		--Apr--		--May--		--Jun--		--Jul--		--Aug--		--Sep--		--Oct--		--Nov--		--Dec--	
dia	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min
1	300	205	300	215			346	245	337	230	330	230	305	213	322	240	310	210	315	230	325	215	318	225
2	310	220	302	230	332	242	332	250	334	223	290	230	316	220	300	225	300	215	310	230	305	215	295	215
3	300	225	310	235	330	250	330	240	335	220	295	225	320	232	311	210	325	220	340	270	325	220	305	235
4	305	215	318	230	320	250	335	235	326	230	308	228	262	221	285	225	300	218	310	230	325	220	310	235
5	310	220	322	236	310	245	338	232	300	232	330	232			300	215	340	240	315	230	320	225	315	220
6	305	220	330	210	310	230	338	238	340	226	345	235	300	220	290	230	370	220	315	230	315	230	305	220
7	315	225	325	230	290	225	330	230	340	230			320	225	340	230	280	240	310	225	305	230	315	220
8	300	225	322	224	328	224	330	225	330	228	300	220	330	220	305	230	300	225	300	225	285	220	305	225
9	280	228	315	230	328	225	336	230	297	225	300	220	305	230	315	220	298	230	295	220	290	230	325	230
10	315	225			310	230	326	230			310	225	310	230	310	230	305	215	305	220	300	220	260	230
11			320	235	300	235	336	225	340	220	320	230	300	220	285	235	280	225	295	215			289	222
12	315	220	315	232	320	232	316	245	328	554	330	238	295	225	310	225	320	240			305	225	261	233
13	280	218	315	226	325	220			316	230	308	218	315	220	275	220	290	240	315	220	280	225	278	239
14	285	210	320	230	325	225	340	220	325	235	290	230	300	230	290	225	330	220	320	230	300	220	261	244
15	290	220	315	215	318	225	320	225			330	230	310	230	325	225	310	210	305	220	305	215	294	239
16	280	210	300	215	330	210	310	220			340	220	300	220	330	225	315	235	305	220	285	220	297	244
17	305	225	270	228	325	210	327	222	331	230	280	220	280	220	340	225	285	225	300	225	285	225	311	250
18	305	230	300	235	320	212	321	225			320	225			230	223	300	215	310	225	300	230	322	244
19	270	220	315	240	330	210					320	222	290	220	320	210	330	260	305	225	295	225	317	244
20	300	220	320	235	340	215	289	219	330	245	285	222	277	220	320	225	330	260	305	220	305	225	311	239
21	320	210	301	235	330	225	300	220	340	250	335	235			290	220	325	235	315	225	295	220	317	239
22	310	225	320	225	325	215	324	231	330	255					275	230	330	240	305	225	275	225	289	228
23	300	215	320	230	336	222	298	233	295	232	290	230			350	240	315	240	290	215	300	220	322	233
24	290	210	300	230	345	223	309	230			324	232	331	240	295	225	325	235	305	220	295	220	278	228
25	310	215	315	225	330	240					330	210	312	228	320	220	305	235	315	215	305	225	322	239
26	302	220	325	235	330	225			340	230	293	223	300	220	300	210	330	235	325	225	305	230	317	239
27	315	215	320	235	330	225	290	225	344	240	320	230	325	225	310	220	320	250			300	230	311	233
28	300	225	310	240	322	230	270	222			280	290	340	240	300	220	280	230	310	220	295	225	300	244
29	305	230			330	222	306	226	315	235			320	225	325	215	340	220	325	225	305	225	333	250
30	300	220			320	230	310	230	315	233			340	240	310	240	315	215	320	220	310	220	317	233
31	300	220			330	230							326	220	260	210			310	220			311	222
Avg	301	220	313	229	324	227	320	230	327	247	312	229	309	225	304	224	313	230	310	225	301	223	304	234
n	30	30	27	27	30	30	26	26	22	22	26	26	26	26	31	31	30	30	29	29	29	29	31	31
Sd	12	6	12	8	11	11	18	8	14	68	19	14	19	7	24	8	20	13	10	10	13	5	19	9
Max	320	230	330	240	345	250	346	250	344	554	345	290	340	240	350	240	370	260	340	270	325	230	333	250
Min	270	205	270	210	290	210	270	219	295	220	280	210	262	213	230	210	280	210	290	215	275	215	260	215

1982	--Jan--		--Feb--		--Mar--		--Apr--		--May--		--Jun--		--Jul--		--Aug--		--Sep--		--Oct--		--Nov--		--Dec--	
dia	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min
1	317	233	322	244	324	244	322	239			344	239	328	261			306	233	328	233	317	244		
2	294	228	306	233	311	244	322	233			328	256	317	253			319	233			311	239	317	250
3	294	228	322	228	322	228			344	233	344	244			317	250	336	244					325	250
4	311	233	328	228	317	233			339	239	333	222			311	239			322	222	316	225	325	242
5	300	222	317	239	317	211	328	233	317	239					325	247			300	228	322	231		
6	300	228	322	250	311	222	317	239	328	244			306	239	328	244	317	239	306	228			322	233
7	289	222	328	244	317	228	317	239	322	239	328	228	283	244			283	242	306	239			325	239
8	322	228	333	244			344	244			328	239	311	250			311	242	286	233	314	233	317	228
9	300	228	322	239							311	244	333	233	317	233	317	244	311	225	300	242	311	239
10	322	228	328	244					339	239	289	233			317	242	294	264			319	250	311	239
11	317	228	333	244					317	244	322	244			325	247			317	228	319	250	322	239
12	317	233	322	244			339	233	289	247			328	244	311	256			314	231			317	242
13	317	239	328	250			267	217	322	244			278	228	333	239	308	242	303	233			319	250
14	306	244	333	233			322	233	322	244	339	239	314	244			317		317	244	322	244	322	250
15	322	239	339	239	333	233	311	233			333	250	311	244			333	244	317	233			311	250
16	317	239	328	239	317	228	317	233			328	247	322	247	311	250	317	239					325	247
17	294	228	322	239	339	222			333	236	311	244	317	250	322	244		236					311	244
18	317	233	311	228	328	228			339	244	306	244			294	242	311	239	306	228			317	239
19	322	233	328	228	322	235	322	233	333	239			322	236	311	236			292	233			317	217
20	339	233	328	233	328	233	322	233	322	236			256	217	308	256	314	222	297	239			317	222
21	328	233	322	222	328	233	328	244	322	227	339	239	308	244			306	233	281	233			311	247
22	333	233	322	217	328	246	322	256			317	244	311	250			314	217	311	233	375	233	311	239
23	317	228	322	222	317	244	333	256			322	244	322	247	325	239	322	244			311	228	311	250
24	328	233	322	228	333	250			328	239	300	244					306	236			308	231	317	239
25	322	239	306	239	322	239			306	239	306	239			322	250			300	231	303	253	322	239
26	333	222	317	228	322	250	328	244	311	233	311	244	317	244	319	239			300	231	300	239	325	239
27	294	222	328	233			333	250	317	244			278	236	317	253	317	228	303	231	278	228	322	239
28	322	217	317	244	333	233	333	256	333	244	317	239	286	242	319	253	336	239	306	231			311	222
29	322	222			333	250	333	244			314	250	311	233			333	239	317	228	333	225	322	239
30	322	228			333	250	311	239			317	250	300	236	306	236	322	239	300	222	317	236		
31	317	228			328	244									333	256					311	244	311	211
Avg	315	230	323	236	324	236	322	240	324	240	321	242	307	242	318	245	315	238	306	231	315	238	318	239
n	31	31	28	28	23	23	21	21	20	20	23	23	22	22	21	21	22	22	23	23	18	18	28	28
Sd	13	6	8	9	8	10	15	9	13	5	14	7	19	9	9	7	13	9	11	5	18	9	5	10
Max	339	244	339	250	339	250	344	256	344	247	344	256	333	261	333	256	336	264	328	244	375	253	325	250
Min	289	217	306	217	311	211	267	217	289	227	289	222	256	217	294	233	283	217	281	222	278	225	311	211

TABLE B1.—Continued.

1983	--Jan--		--Feb--		--Mar--		--Apr--		--May--		--Jun--		--Jul--		--Aug--		--Sep--		--Oct--		--Nov--		--Dec--	
day	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min
1	283	189	317	228	336	264	339	244	322	244	356	247	283	244	311	250	322	244	300	247	297	225	311	231
2	319	244	314	231	331	261	344	239	319	244	333	261	289	247	272	239	317	244	289	228	311	236	306	225
3	314	244	325	233	344	258	347	250	314	250	322	233	317	236	319	250			314	250	317	239	311	233
4	303	238	317	247	344	244	347	261	306	233	311	244	286	244	322	250	317	233	319	239	317	244	289	233
5			317	228	339	231	339	256	322	247	314	244	317	256	333	272	328	233	303	244	317	233	311	233
6	322	244	322	228	328	236	344	267	325	256	328	239	314	236	322	250	311	239	294	233	311	244	311	233
7	314	246	325	228	328	239	347	256	322	258			331	250	294	239	278	233	294	233	317	244	253	236
8	322	264	333	242	347	233	347	242	322	247	333	247	325	250	333	250	283	222	267	239	306	261	311	233
9	311	244	317	217	339	244	344	244	322	256	319	244	311	256	333	250	322	247	300	228	306	222	278	228
10	308	250	339	211	339	244	342	250	331	261	322	244	282	239	333	244	300	244	311	222	306	247	306	228
11	303	253	325	219	336	250	339	261	339	261	311	239	333	250	328	239	283	239	314	239	328	261	300	233
12	317	253	322	222	319	250	342	256	344	266	319	250	306	250			294	222	311	239	311	250	292	233
13	314	239	333	231	319	239	350	244	322	244	339	250	317	247	328	242	328	233	297	244			294	228
14	311	239	325	244	322	225	339	239	261	244	336	256	339	250	325	256	306	239	317	239	314	278	294	228
15	311	250	322	239	328	233	344	242	267	247	336	253	306	250	331	267	311	244	283	239	308	233	328	239
16	308	239	322	239	361	247	328	247	281	236	328	256	317	261	333	264	322	239	311	228	314	233	303	239
17	314	239	333	244	350	256	339	256	306	247	339	242	322	250	333	250			311	228	317	244	294	239
18	306	242	333	233	344	253	328	256	336	244	250	233	311	244	306	222			317	233	314	239	283	233
19	317	247	319	244	369	253	344	236	333	250	311	250	289	261	278	222			311	228	294	244	272	236
20	314	244	317	250	361	256	358	275	319	247	342	250	339	261	311	239	256	228	322	233	311	250	294	183
21	311	247	292	247	333	256	356	239	328	247	286	250	333	258			278	228	300	228	311	250	278	183
22	322	247	325	253	358	266	353	239	336	258	325	256	333	233	322	250	319	236	317	228	289	244	294	239
23			325	256	339	267	333	250	325	256	314	250	311	228	311	239	300	239	322	228	308	247	322	244
24	328	247	322	256	336	253	322	261	322	261	311	239	306	228	311	239	317	244	325	225	311	244	311	256
25	331	253	331	247	331	236	347	256	328	256	300	228	311	244	289	244	319	250	325	247	322	250	311	250
26	322	247	319	256	333	244	350	256	333	256	328	236	322	256	269	247	308	247	303	244	319	244	317	244
27	314	244	331	256	319	250	339	250	328	242	317	253	328	256	294	244	317	250	283	244	328	244	300	250
28	292	247	347	253	339	253	272	244	328	261	333	256	333	272	300	244	281	253	317	244	325	242	317	250
29	311	244			328	258	261	236	314	239	322	233	333	244	319	239	297	244	317	244			306	244
30	325	233			336	236	303	250			283	239	283	244	300	250	297	244	311	239	317	233	311	244
31	317	222			333	233			328	247			300	244	311	239			303	233			300	233
Avg	313	243	324	239	338	247	336	250	319	250	320	246	314	248	313	246	304	239	307	236	312	244	300	234
n	29	29	28	28	31	31	30	30	30	30	29	29	31	31	29	29	26	26	31	31	28	28	31	31
Sd	10	12	10	13	12	11	21	9	19	8	20	8	17	10	19	11	18	8	13	8	9	11	16	15
Max	331	264	347	256	369	267	358	275	344	266	356	261	339	272	333	272	328	253	325	250	328	278	328	256
Min	283	189	292	211	319	225	261	236	261	233	250	228	282	228	269	222	256	222	267	222	289	222	253	183

1984	--Jan--		--Feb--		--Mar--		--Apr--		--May--		--Jun--		--Jul--		--Aug--		--Sep--		--Oct--		--Nov--		--Dec--	
day	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min
1	367	222	319	231	311	263	317	256	328	236	306	233	272	239	306	239			319	225	303	225	306	239
2	289	222			319	233	322	231	339	236	306	244	294	236	308	231					317	233		
3	306	228	317	247	311	228	331	233	344	239	300	233	300	231			325	228					319	236
4	306	217	311	247	311	244	300	247	333	250	325	250					308	239	319	239			317	239
5	317	222	317	233	319	233	336	233	322	256	322	236	314	236			306	253	311	244	311	228	292	231
6	311	217	311	244	319	244	336	231	333	253	289	239			314	233	308	239			300	231	308	233
7	289	222	311	239	303	250	342	244	350	242	264	239	300	228	328	253	286	233			269	217		
8	300	217	303	236	308	244	322	244	328	244	289	225	311	228	322	250			314	233	317	222		
9	306	233	311	239	317	242			336	236	306	233	283	233	311	256					292	219	322	233
10	294	228	317	233	319	228	336	219	325	250	311	244	314	236	319	225	319	228	308	228				
11	289	239	306	242	311	233	336	219	314	247	306	242	306	242			303	225	306	236			311	233
12	311	222	306	239	322	236	297	236	328	239	297	233	319	236			294	231	311	231	294	219	308	217
13	311	228	308	233	328	250	361	250	322	233	317	236	317	233	308	228	306	239			306	225	308	236
14	311	233	317	233	317	247	322	253	300	233	308	247	311	239	319	242	306	225			306	219	306	233
15	317	239	317	239	328	242			319	236	306	250	289	244	294	239			306	236	294	231		
16	308	236	319	228	319	244	336	242	294	233	311	250	297	225	286	244			308	247			311	239
17	292	233	319	231	319	222	333	244	306	236	322	233	306	244	297	239	322	228	303	247				
18	317	233			317	219	278	239	303	244	292	244	322	236			314	233	331	239			311	225
19	319	244	319	233	319	219	322	253	306	256	292	242	294	244			297	231	319	231			306	217
20	319	244			331	219			322	256	317	256			319	231					314	231	317	222
21	322	244	328	239	322	233	322	244	339	256	333	256					308	228			303	239	306	228
22	322	228	328	236	319	239			328	239	322	244									314	244		
23	317	228	325	242	328	244	319	242	306	242	306	244	317	225					311	233	303	233		
24	317	233							314	242	311	250	314	225	317	225	319	228	314	236			317	228
25	322	242	311	244			333	233	325	236	286	239	317	236					300	225				
26	322	239	328	244	328	231	333	242	322	231	294	242	317	250			328	236			311	231	306	228
27	325	233	322	228	328	233	322	242	297	236	297	231	289	242	322	233	308	233			281	233	317	239
28	314	233	317	242			325	244	328	239	303	242			283	239	314	253			267	231	306	233
29	317	231	322	236	344	228	325	242	322	244	319	239			292	219					269	222		
30	317	231			344	244	331	236	314	250	283	239	317	239	311	236			303	233	300	228		
31	311	242			322	239			300	244			289	231					308	225			322	222
Avg	312	231	316	238	321	237	326	240	321	242	305	241	305	236	309	237	310	234	311	235	298	228	311	231
n	31	31	25	25	28	28	25	25	31	31	30	30	24	24	18	18	18	18	17	17	20	20	20	20
Sd	14	8	7	6	9	10	16	9	14	7	15	7	13	7	13	10	11	8	7	7	15	7	7	7
Max	367	244	328	247	344	263	361	256	350	256	333	256	322	250	328	256	328	253	331	247	317	244	322	239
Min	289	217	303	228	303	219	278	219	294	231	264	225	272	225	283	219	286	225	300	225	267	217	292	217

TABLE B1.—Continued.

1985	--Jan--		--Feb--		--Mar--		--Apr--		--May--		--Jun--		--Jul--		--Aug--		--Sep--		--Oct--		--Nov--		--Dec--	
day	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min
1			317	228	314	242	328	239	325	225	300	242	314	239	286	236			314	239	308	228		
2	317	228							333	225	272	233	311	244	286	242			314	239				
3	317	233					328	231			294	228	317	256	306	244	322	233	317	236			314	233
4	311	239	317	219	308	244	317	233			292	236	311	239			267	228	317	239			297	233
5	306	233	311	239	300	244					283	236	317	239	314	231	308	233			308	214	258	233
6	306	228	322	239	306	231			322	233					269	239	303	239			306	228	275	231
7	300	222	311	242					311	231	325	233			294	242	306	239	294	225	311	233	261	233
8	311	228	319	250	306	233	325	239	286	239					281	242	289	239	311	244	306	239	244	233
9	303	219							319	239			269	231			308	239	306	233			275	231
10			308	219			328	247	314	247	314	231	289	231			303	231	294	242			300	233
11	314	228	283	233	314	244	311	250			300	242	311	239					311	244			311	236
12			278	244	314	231	322	250			325	247	311	247	314	231	300	231					292	233
13			311	247	314	233			328	236			311	242	314	253					317	231	303	236
14	311	219	300	239	311	239			314	242			289	247	322	250							308	236
15	303	225	306	236	317	228	319	239					289	236	306	239			311	236			306	233
16	300	231							333	242			311	247			319	228	297	233	311	236		
17	308	222					319	242	325	242	317	233					311	239					308	231
18	306	228	303	233	319	225	317	250			314	250					325	250	308	239	308	236	311	231
19	314	222	300	242	317	228	322	253			339	247			308	228	311	250	322	250	311	236	306	236
20			303	250	317	222			336	236	328	244			297	233	311	244			294	244	306	242
21	314	222	314	247	322	206			322	256	333	256			300	242			300	228	306	233		
22			311	247	322	233	325	228	325	244	333	256							294	233	256	233		
23	303	214	322	247			328	228	317	242			307	236	322	233	319	231	311	233			311	225
24	308	225					336	228	319	250	311	233	306	233			311	256	317	233				
25	300	228			267	228	333	228	344	250	306	247	267	250			311	239	300	233	294	228		
26			317	225	317	250	331	222			286	253			322	228	311	239			297	228	303	225
27			314	236	311	239			319	247	294	239			311	222	322	236			306	233	294	242
28	300	217	308	242		239					311	250			308	242			322	239				
29					311	233	347	225	328	261			319	236	308	233			300	228				
30	300	219					336	231	325	253			292	233	281	236	317	233	297	244				
31	306	231							322	253			289	244					258	225				
Avg	307	226	308	238	311	234	326	237	322	242	309	242	302	240	303	237	309	238	305	236	303	232	294	233
n	22	22	21	21	19	20	18	18	21	21	20	20	19	19	20	20	20	20	22	22	15	15	20	20
Sd	6	6	11	9	12	10	8	10	11	9	18	8	15	7	15	7	13	7	14	6	14	7	20	4
Max	317	239	322	250	322	250	347	253	344	261	339	256	319	256	322	253	325	256	322	250	317	244	314	242
Min	300	214	278	219	267	206	311	222	286	225	272	228	267	231	269	222	267	228	258	225	256	214	244	225

1986	--Jan--		--Feb--		--Mar--		--Apr--		--May--		--Jun--		--Jul--		--Aug--		--Sep--		--Oct--		--Nov--		--Dec--	
day	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min
1							319	239	311	250	331	244	281	239	325	261								
2							303	239	325	256	322	247	300	244			319	236					300	214
3					317	211	311	242			333	236					311	233	311	233	311	236	303	231
4			317	217	286	239	314	247			344	239			317	250	317	239	308	236			317	244
5			306	211	314	236			319	233	342	242			317	244	308	242	303	233				
6	317	222			314	225			297	247	311	239							292	233			306	244
7			306	211	311	228	322	239	314	242			322	242	303	250			317	233	317	236	300	233
8	311	228					322	233	314	239			267	244			322	247						
9							317	233	319	236	322	239	308	253			322	250	303	228			294	239
10	311	239			317	231					319	250	308	247			308	244	292	225	311	236	311	233
11					311	231	300	239			283	247	306	253	325	258	303	244					289	244
12					311	225			325	228	303	228			317	233	322	239			308	244	300	247
13			314	214	322	225			325	231	314	231			303	244	297	247			281	242	300	244
14	317	233	308	228	322	233	328	253	328	228			317	247	300	233	286	244	308	231	278	242	300	239
15	289	239					331	256	342	222			319	253	269	231	278	231	303	233	306	256	311	244
16							311	244	319	244	311	233	314	244			294	236	272	231			311	244
17	306	222			328	225	328	258			319	247	272	239			328	233	272	236	322	242	300	239
18			314	225	328	231	294	239			300	250	272	231	303	239	306	247			292	250	300	233
19			297	222	328	233			333	244	314	247					256	236			308	239	311	239
20	311	228	292	228	328	256			308	253	331	256			319	242	292	239	294	228	286	236	306	250
21			300	225	314	253			319	244			322	247	303	228	308	233	292	239				
22	306	228					303	228	289	244			306	228	314	242	300	236	278	236			304	245
23							322	250	303	236	333	239	278	225			300	233	308	239			301	247
24	306	239	317	217	311	242	311	244			292	239	303	256			317	239	306	247	322	233	311	243
25			314	217	311	236	317	247			303	244	**319**	**244**	311	236	308	244			297	233		
26			300	211	319	242			336	239	306	256	**292**	**236**			308	242					318	239
27	306	228	308	222					333	239	314	253			300	247							300	239
28			311	211					286	231			317	253	319	253			300	231	308	225	294	233
29									303	239			319	228	286	242	319	231	303	228			300	239
30	306	233					322	244	322	239	328	239					311	233	294	228			311	233
31	306	233							319	239			308	256					289	233			301	239
Avg	307	231	307	218	316	233	315	243	317	239	317	243	302	243	308	243	306	239	297	233	303	239	304	239
n	12	12	14	14	18	18	18	18	23	23	22	22	21	21	17	17	25	25	20	20	14	14	26	26
Sd	7	6	7	6	10	10	10	8	14	8	15	7	18	9	14	9	16	6	12	5	14	7	7	7
Max	317	239	317	228	328	256	331	258	342	256	344	256	322	256	325	261	328	250	317	247	322	256	318	250
Min	289	222	292	211	286	211	294	228	286	222	283	228	267	225	269	228	256	231	272	225	278	225	289	214

TABLE B1.—Continued.

1987	--Jan--		--Feb--		--Mar--		--Apr--		--May--		--Jun--		--Jul--		--Aug--		--Sep--		--Oct--		--Nov--		--Dec--	
day	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min
1			306	233	311	250	333	261	289	244	317	242	278	228			311	233	311	222			311	
2	300	244	300	239	308	253	311	239	306	250	286	256	303	242			300	233	311	228			317	
3	306	239	303	254			317	239			306	253	300	250			311	222	283	239	289	222	306	
4	300	244	317	250	331	253	328	239	319	247	322	244	300	233			322	239	333	244	272	228	272	
5	294	244	306	256	319	247	317	239	317	250	303	244	289	244	328	239	294	239			289	233	250	
6	301	239	311	250	317	256	281	247	314	242	306	239	289	236	317	244	317	250	322	233				
7	283	233	317	228	317	239	319	250	317	244	317	256	311	256	333	250			328	239	311	228	289	
8	300	217	306	250	311	244	328	267	294	244	317	253	308	247	311	228	317	233	322	239			267	
9	301	217	306	228	314	228	300	250	267	233	322	253	297	253	317	244	289	233	267	233	306	228	294	
10	300	222	294	239	319	222	311	247	272	228	314	272	300	261			317	239	306	244	311	233	278	
11	306	250	272	228	319	222	328	261	306	261	311	261	322	261	306	239	317	239	317	239	328	261	300	
12	311	250	268	239	317	239	311	261	331	264	311	250	306	256	311	244	317	256			328	261	283	239
13	300	256	292	239	317	239	314	264	317	261	306	261	319	250	317	239	322	256	339	233	328	250	294	239
14	311	244	306	228	300	233	339	267	297	256	294	250	317	253	311	239			328	233	317	250	283	233
15	302	244			294	228	322	258	308	250	289	222	311	261	311	261							300	233
16	309	239			308	228			300	250	300	250	317	250	322	261	311	233	317	233	311	239	311	244
17	300	250	317	217	319	242					311	256	283	250			328	244	283	239	311	256	322	250
18	300	256	317	250	306	236			303	231	308	247	294	250	333	256	306	256	283	239	328	261	317	256
19			311	254	322	250					292	253	300	244	322	256	317	261			339	261	322	244
20	311	248	311	244	322	256	328	242					325	250	311	256	322	250	311	222	317	244	322	250
21	317	239	294	250	317	261	319	264	311	244			333	244	322	250			294	233	294	244	328	250
22	306	228	311	250	317	239	322	258	300	233	319	253	272	250			300	228	322	233	311	244	322	250
23	301	238	308	244	328	239	306	261	306	233	317	261	283	250			322	244	300	239	322	239	322	250
24	294	250	298	256	344	244	325	250			314	253	322	256			328	233	283	244	311	233	322	250
25	300	239	306	261	347	256	294	244			281	242	294	250	322	239	294	228	283	250	300	233	317	244
26	306	239	294	261	353	247	300	233	322	236	314	253	294	244	311	256	294	239			306	239	311	244
27	304	249	322	261	333	250	297	247	322	244	289	250			306	244	300	244	300	233	300	228	322	233
28	306	248	300	250	339	239	278	244	314	256	306	250			322	239			294	228	300	200	322	239
29	303	233			328	228	289	253	297	256	317	250	317	244	272	222	322	244	311	228	289	200	322	244
30	294	250			322	233	281	233	328	261	294	264	328	239			328	239	267	228	311	244	322	244
31	300	250			342	247			317	261			294	239					300	222			322	250
Avg	302	241	304	245	321	242	311	251	307	247	306	251	304	248	315	245	312	241	304	235	309	238	306	244
n	29	29	26	26	30	30	26	26	25	25	28	28	29	29	20	20	25	25	26	26	25	25	30	20
Sd	6	10	12	12	13	10	17	10	15	10	11	9	15	8	13	10	12	10	19	7	15	16	20	6
Max	317	256	322	261	353	261	339	267	331	264	322	272	333	261	333	261	328	261	339	250	339	261	328	256
Min	283	217	268	217	294	222	278	233	267	228	281	222	272	228	272	222	289	222	267	222	272	200	250	233

1988	--Jan--		--Feb--		--Mar--		--Apr--		--May--		--Jun--		--Jul--		--Aug--		--Sep--		--Oct--		--Nov--		--Dec--	
day	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min
1	333	256			289	222	333	244	333	244	328	256	306	233	317	239	283	233	289	233	300	233	306	228
2	333	256	317	244	306	228	333	244	294	244	322	244	300	233	306	244	311	233	300	233	289	233	267	228
3	322	244	317	250	311	233	322	256	350	244	294	244	311	233	300	233			311	233	311	233	267	222
4	322	244	322	239	322	244	328	239	344	250	322	256	300	244	300	233			300	233	294	244	278	222
5	322	250	311	244	322	244	322	250	322	239	333	256	278	233	311	244			306	239	311	244	283	222
6	311	244	333	244	322	244	333	256	322	250	322	256	283	239			322	233	300	233	311	244	300	228
7	322	244	333	244			328	250			322	244	317	228	311	233	317	244	300	244	317	244	294	217
8	322	244	300	250	322	233	328	244			322	250	294	239	322	233	306	244	289	233	311	233		
9	333	244	300	250	322	228	322	233	322	244	328	250	300	244	311	239	317	239	289	233	300	239	300	217
10	333	233	311	244	317	233	322	244	317	256	294	250	300	244	311	244	311	233	300	244	278	233	289	222
11	317	239	317	250	306	222	311	244	289	256	289	233	294	239	300	239	267	233	317	233	300	233	300	233
12	311	233	317	244	322	233	322	233	322	256	289	233	272	233	311	239	300	233	300	228	289	233	311	233
13	317	250	333	233	333	222	333	239	300	244	311	233	317	233	311	244	311	233	300	233	300	233	311	244
14	311	239	344	256	328	228	333	233	306	233	311	228	317	244	311	244	306	244	306	233	283	228	294	233
15	300	244	317	250	333	222	328	244			328	244	294	239	317	239	311	244	278	228	256	233	311	222
16	333	233	322	244	311	228	344	256	311	244	317	244	311	289	289	233	311	244	289	228	256	233	294	233
17	333	244	328	250	317	244	333	244	322	250	289	233	300	244	300	244	311	256	283	233	289	233	278	233
18			322	239	317	244	322	233	333	256	289	233	311	239	317	244	311	256	306	233	289	233		
19	322	211	317	244			322	228	322	256	289	233	278	239	300	239	317	233			289	233	300	228
20	306	222	333	233			328	233	333	239	294	233	294	244			300	228	267	228	300	233	306	228
21	322	222	344	256	328	250	328	244	322	256	283	233	294	239			300	233	261	233	311	233	311	233
22	322	228	317	250	317	261	339	233	322	256	317	244	294	233	317	233	317	239	289	244	294	233	311	222
23	333	233	311	244	311	250	333	233	322	256	322	250	267	233	306	239	311	239	300	233	300	222	306	222
24	333	233	311	244	317	256	322	244	322	267	311	233	289	244	322	233	300	256	322	239	289	239	289	222
25	311	228	306	233	317	256	333	239	333	267	289	233	300	233	306	239	289	256	317	244	289	233	300	233
26	311	239	300	233	333	244	322	244	328	244	289	222	289	244	306	239	317	244	283	239	289	222	300	233
27	311	244	344	233	333	244	333	250	283	233	306	222	250	233	300	244	278	233	300	233	289	222	317	233
28	300	222	333	233	317	244	333	250	278	244	322	239	289	244	311	233	311	239	311	239	294	228	311	233
29	317	239	300	244	322	244	339	256	300	233	311	244	300	239	306	239	306	244	289	233	294	233	311	233
30	333	233			289	250	322	244	322	244	311	244	300	233	289	239	300	233	289	233	289	239	311	239
31	333	244			367	244			333	244			289	233	300	239			300	228			300	233
Avg	321	238	320	244	320	239	329	243	318	248	309	241	295	240	307	239	305	240	296	235	294	234	298	229
n	30	30	28	28	28	28	30	30	28	28	30	30	31	31	28	28	27	27	30	30	30	30	29	29
Sd	10	10	13	7	14	11	7	8	17	9	15	10	15	10	8	4	13	8	14	5	14	6	13	7
Max	333	256	344	256	367	261	344	256	350	267	333	256	317	289	322	244	322	256	322	244	317	244	317	244
Min	300	211	300	233	289	222	311	228	278	233	283	222	250	228	289	233	267	228	261	228	256	222	267	217

TABLE B1.—*Continued.*

1989	--Jan--		--Feb--		--Mar--		--Apr--		--May--		--Jun--		--Jul--		--Aug--		--Sep--		--Oct--		--Nov--		--Dec--	
day	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min
1	300	233	300	233	303	247	322	211	322	239	317	256	311	244	300	244	311	244	311	233	300	239	311	239
2	311	233	311	233	300	239	322	211	322	244	300	250	300	233	311	239	311	244	317	239	278	233	283	233
3	317	233	300	233	300	239	322	228	322	244	300	256	300	222	289	222	300	233	267	239	289	233	300	222
4	306	233	300	233	278	222	317	239	306	239	322	233	289	233	289	244	311	244	306	239	311	233	294	233
5	300	233	300	222	322	233	317	250	283	233	328	233	294	244	311	244	300	233	294	211	322	244	311	233
6	300	228	300	222	322	236	322	250	311	233	306	239	289	211	311	244	306	233	267	211	300	244	289	228
7	278	233	306	239	311	228	317	244	311	244	294	233	300	228	267	244	294	233	300	244	294	239	306	233
8	300	233	300	244	322	233	322	244	311	233	322	233	278	233	311	244	300	233	322	244	300	233	311	233
9	306	228	306	228	311	244	322	244	311	233	322	250	300	233	311	244	311	244	300	233	267	239	300	233
10	306	233	300	222	306	239	322	250	322	239	300	256	306	244	261	244	300	244	300	222	283	228	294	233
11	306	228	289	233	300	244	322	250	322	239	311	256	322	239	283	233	317	244	311	233	294	244	306	233
12	306	222	300	233	300	233	317	239	333	239	317	250	306	244	300	233	317	244	289	233	289	233	294	233
13	311	222	306	233	289	211	322	244	311	244			311	250	300	233	311	233	294	233	300	228	289	228
14	300	233	306	239	289	206	322	244	333	233	300	250	317	250	306	244	322	239	311	244	311	239	300	244
15	300	233	300	239	294	217	311	244	322	239	311	244	300	256	289	244	317	244	322	244	311	239	311	239
16	311	233	300	228	306	239	322	244	328	244	328	256	322	267	300	222	311	244	322	233	289	244		
17	311	233	300	217	306	228	317	239	322	250	300	244	322	250	278	244	322	233	289	239	289	244		
18	311	233	300	233	311	222	328	256	333	256	300	244	317	250	283	217	322	239	300	233	278	250	322	228
19	306	244	300	222	311	222	322	244	328	256	311	250	294	244	300	244	317	228	272	228	267	244	311	228
20	300	233	300	222	306	222	317	233	333	233	294	239	311	239	300	233	300	233	289	239	311	250		
21	300	244	311	217	300	222	322	239	322	244	294	239	289	233	300	228	289	233	267	233	317	244		
22	300	244	311	244	311	222	311	239	322	244	289	244	289	233	300	250	300	239	267	233	317	233		
23	306	244	311	244	311	228	311	239	322	233	294	250	300	244	306	244	311	233	289	233	278	233		
24	306	250	278	228	317	222	322	239	267	233	300	233	311	233	294	228	311	233	300	233	306	239		
25	300	250	278	222	311	222	300	244	322	233	311	233	289	239	311	233	322	233	311	233	278	233		
26	300	233	278	222	311	222	333	250	317	239	306	233	311	233	322	244	317	250	294	228	278	222		
27	306	233	283	222	317	222	322	233	311	256	300	233	300	233	311	244	306	233	311	244	311	222	328	222
28	300	233	289	244	300	233	322	239	311	256	322	233	300	222	306	244	311	233	311	244	317	244	267	222
29	300	233			283	222			300	233	311	244	311	244	306	228	300	233	311	244	300	250	283	222
30	311	233			311	217	322	233	306	239	278	244	300	244	250	233	300	233	306	239	300	233	289	222
31	317	222			311	222			317	233			317	233	283	233			311	239			300	222
Avg	317	234	299	231	305	228	320	240	316	241	307	243	303	239	296	238	309	238	299	235	296	238	300	230
n	21	31	28	28	31	31	29	29	31	31	29	29	31	31	31	31	30	30	31	31	30	30	22	22
Sd	7	7	10	8	11	10	6	10	14	7	12	8	11	11	16	8	9	6	17	8	15	7	14	6
Max	330	250	311	244	322	247	333	256	333	256	328	256	322	267	322	250	322	250	322	244	322	250	328	244
Min	300	222	278	217	278	206	300	211	267	233	278	233	278	211	250	217	289	228	267	211	267	222	267	222

TABLE B2.—Monthly average maximum (above) and minimum temperatures (tenths of degree C) in the laboratory clearing, Barro Colorado Island, Panamá, 1971–1989.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1971				326	312	310	307	309	310	316	302	319
1972	303	311	320	318	320	317	320	306	311	305	319	319
1973	317	322	324	338	320	301	308	311	315	308	300	302
1974	305	309	315	318	329	310	296	301	313	304	297	307
1975	306	311	313	319	310	306	297	300	302	303	300	297
1976	305	307	309	330	316	301	306	304	304	308	304	311
1977	308	311	311	313	318	301	310	295	305	308	308	310
1978	315	312	314	316	311	305	317	303	314	307	314	323
1979	325	321	332	323	314	306	312	306	310	314	307	306
1980	314	319	325	327	326	315	313	320	311	316	310	307
1981	301	313	324	320	327	312	309	304	313	310	301	304
1982	315	323	324	322	324	321	307	318	315	306	315	318
1983	313	324	338	336	319	320	314	313	304	307	312	300
1984	312	316	321	326	321	305	305	309	310	311	298	311
1985	307	308	311	326	322	309	302	303	309	305	303	294
1986	307	307	316	315	317	317	302	308	306	297	303	304
1987	302	304	321	311	307	306	304	315	312	304	309	306
1988	321	320	320	329	318	309	295	307	305	296	294	298
1989	304	299	305	320	316	307	303	296	309	299	296	300
Avg	310	313	319	323	318	309	307	307	309	307	305	307
Sd	6.5	7.0	8.1	7.2	5.8	6.0	6.6	6.5	3.9	5.3	6.8	7.8

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1971				223	226	228	227	223	222	223	217	220
1972	218	222	218	228	234	228	235	228	230	225	228	228
1973	232	222	232	229	231	226	223	224	223	227	225	218
1974	222	216	218	230	227	226	222	226	217	217	221	221
1975	224	219	227	229	229	229	221	221	219	217	222	217
1976	216	216	227	225	231	231	242	232	224	223	228	235
1977	224	230	238	240	239	229	229	227	238	232	230	232
1978	225	228	233	231	229	224	225	224	219	221	226	223
1979	218	227	221	234	233	230	232	227	226	224	225	225
1980	233	222	232	227	233	235	234	230	232	227	226	224
1981	220	229	227	230	247	229	225	224	230	225	223	234
1982	230	236	236	240	240	242	242	245	238	231	238	239
1983	243	239	247	250	250	246	248	246	239	236	244	234
1984	231	238	237	240	242	241	236	237	234	235	228	231
1985	226	238	234	237	242	242	240	237	238	236	232	233
1986	231	218	233	243	239	243	243	243	239	233	239	239
1987	241	245	242	251	247	251	248	245	241	235	238	244
1988	238	244	239	243	248	241	240	239	240	235	234	229
1989	234	231	228	240	241	243	239	238	238	235	238	230
Avg	228	229	231	235	237	235	234	232	231	228	230	229
Sd	7.8	9.0	7.8	8.0	7.5	8.0	8.6	8.3	8.0	6.2	7.1	7.4

TABLE B3.—Daily maximum-minimum temperatures (tenths of degree C), 1 m elevation, Lutz catchment, Barro Colorado Island, Panamá, 1971–1989.

1971	--Jan--		--Feb--		--Mar--		--Apr--		--May--		--Jun--		--Jul--		--Aug--		--Sep--		--Oct--		--Nov--		--Dec--	
day	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min
1							278	215	305	240	275	230	269	231	297	230	279	233	275	229	272	220	270	225
2							273	213	300	200	258	232	243	225	301	240	268	224	272	218	258	221	280	228
3							288	213	271	239	255	220	335	240	279	230	255	221					300	220
4							290	215	300	248	278	235	265	232	288	225			268	219	265	220		
5							295	225	289	222	285	230	267	232	270	233			267	220	264	221		
6							290	231	254	221	260	225	276	229	262	217			280	228			292	220
7							291	237	281	234	251	227	278	232			272	224	271	232			298	225
8							282	232	283	225	273	230	270	243			278	230	278	232	268	224	305	227
9							285	235			279	240	279	238	287	222	266	216	272	234	252	220	298	230
10							290	240	315		276	243	290	238	265	232	266	220			252	208	295	217
11									310	230	277	225			255	223	275	225			252	221		
12							290	237	308	230	270	225	288	233	270	234	280	228	272	228	245	215		
13							292	232	278	232			252	223	264	222	261	231	280	226			300	220
14							290	231	265	235	282	216	274	240			275	212	280	224			300	222
15					266	223	290	230	285	235	268	228	263	232			258	222			265	219		
16					273	227	299	235	270		262	237	270	227	265	219	265	220			272	230	284	225
17					266	223	295	227	285	225	278	237			305	227	272	222			272	228	275	228
18					273	225	298	225	266	225	267	225			319	227			280	221	248	218		
19					275	223	299	225	289	229			271	231	277	228			275	219	275	220		
20						216	299	221	278	225	265	210	272	238			275	219	269	222			302	212
21							302	227	280	232	269	233	283	245			270	232	278	225			300	215
22							301	230	267	232	284	239	290	239	269	225	265	229	275	226	290	210	302	212
23						228	300	240	275	225	265	228	285	242	272	229	268	229			294	215	292	219
24					280	225	301	235	280	220	300	245	275	262	269	235	275	236			278	220		
25					275	220	300	232	300	227	279	233					261	225						
26					282	219	300	235	280	236	285	255	276	237	287	228			280	222	282	218		
27							310	235	285	233	280	230	269	234	260	228			270	220			275	200
28					272	242	316	231	285	243	267	225	252	223			280	223	275	221			270	218
29					278	215	306	225			265	235	289	233			254	222	274	228	273	218	269	222
30					278	218	304	241			265	225	277	223	292	230	262	225			280	222	270	219
31									291	227			246	217	282	239								
Avg					274	223	295	229	285	230	272	231	274	234	279	228	269	225	275	225	268	219	289	220
n					11	13	29	29	28	26	28	28	27	27	22	22	23	23	20	20	20	20	20	20
Sd					5	7	9	8	15	9	11	9	17	9	16	6	8	6	4	5	13	5	13	7
Max					282	242	316	241	315	248	300	255	335	262	319	240	280	236	280	234	294	230	305	230
Min					266	215	273	213	254	200	251	210	243	217	255	217	254	212	267	218	245	208	269	200

1972	--Jan--		--Feb--		--Mar--		--Apr--		--May--		--Jun--		--Jul--		--Aug--		--Sep--		--Oct--		--Nov--		--Dec--	
day	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min
1			272	212	286	230			292	239	305	245			300	248			272	202	265	220		
2	280	208	272	228	272	229	302	237	302	238			302	246	300	240								
3	280	228	278	232			300	252	308	242					305	248							285	235
4	272	205					300	252	280	242	290	238	288	242			280	238					282	245
5	258	195			290	232	302	252			285	234	282	242			282	245	272	220	272	202	282	235
6	252	198	277	220	282	219	290	242			290	244	272	232	290	242	288	232						
7			279	222	282	218			315	233	262	235			302	235	282	248			278	222	288	238
8			280	212	280	218			312	245	278	232			285	245					268	235		
9	257		270	224	278	204	295	238	270	223			290	222	272	232			278	228	278	235		
10	267	225	275	215			290	218	288	230			298	230	265	228	280	228	265	230			278	225
11	262	232					258	235	318	245	268	223					275	238	272	230			280	235
12	270	225			280	206	278	232			252	220	278	220			272	238	250	220	278	232	288	245
13	260	202	274	204	282	208	298	238			272	235	295	250	298	238	280	245			272	202	292	238
14			270	212	278	215			312	212	285	235			255	228	280	222			265	232	285	245
15			270	214	278	212			300	245	300	238			260	228			278	222	275	240		
16	262	212	278	218	288	215	310	235	312	238			295	250	255	232			272	238	275	238		
17		230	280	214			306	235	297	243			300	253	270	228	268	195	278	218			285	235
18	258	185					268	220	320	240	308	240			315	225	280	240	278	220			265	195
19	264	221			295	208	262	221			272	228	295	230			280	238	262	238		235	262	228
20	268	222			288	220	268	221			248	224	268	240	262	228	258	215			285	245	268	225
21			278	204	285	212			302	230	275	233			252	228	265	238			270	225	275	228
22			270	228	295	215			288	232	280	228			252	225								
23	274	218			292	209	280	215	295	235			290	228	280	235			262	195	278	205		
24	270	210	278	218			290	227	280	235			262	228	280	202	280	212	265	228				
25	270	215					312	230	275	255	282	228	282	245			268	218	300	195			275	215
26	270	220			298	222	300	234			258	237	295	234			260	212	262	235	275	200	270	228
27	272	218	285	222	298	230	330	232			298	247	288	245	275	190	268	210			275	242		
28			280	230	300	232					302	243			265	222	258	228			282	234	272	212
29			288	224	292	236			288	228	295	243							275	200	300	232		
30	275	215					305	222	280	248			298	242	278	228			265	225	280	235		
31	268	212							288	242			300	250	262	225			265	228				
Avg	267	214	277	219	287	219	293	233	296	237	281	235	288	238	277	230	274	228	271	221	276	227	278	230
n	21	21	19	19	21	21	21	21	22	22	21	21	19	19	23	23	19	19	18	18	18	19	17	17
Sd	7	12	5	8	8	9	18	11	14	9	17	7	11	10	19	13	9	14	10	13	8	14	8	13
Max	280	232	288	232	300	236	330	252	320	255	308	247	302	253	315	248	288	248	300	238	300	245	292	245
Min	252	185	270	204	272	204	258	215	270	212	248	220	262	220	252	190	258	195	250	195	265	200	262	195

TABLE B3.—Continued.

1973	--Jan--		--Feb--		--Mar--		--Apr--		--May--		--Jun--		--Jul--		--Aug--		--Sep--		--Oct--		--Nov--		--Dec--	
day	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min
1	282	222	290	248	300	218	302	225	285	202			268	185	262	218			280	225	275	232		
2							295	220	305	180			278	215	268	185			278	222				
3	285	240					312	215	300	180	275	218							260	218			266	208
4	282	240	295	238	288	225	312	235			262	228	282	212			282	205	255	220			260	212
5			288	225	285	230	308	250			252		262	225	278	215	290	222			290	225	346	215
6			282	218	295	235					253	225			268	185	280	230			268	225	269	215
7	282	235	282	225	288	210			305	210	268	228			260	228					258	230	271	214
8	282	242	292	215	285	215	315	222	290	248			300	230	272	238			280		258	220		
9	285	245	290	220			315	232	302	212					278	242	285	220		225	252	208		
10	282	212					302	230	302	238	288	225	290	220					272	225			215	
11	280	215	285	212	300	215	302	240			255	220	270	232			285	218	275	232			267	214
12			265	212	292	245	310	225			275	220	290	228	272	218	275	222			212	212	252	210
13			278	218	298	242			308	238	272	222			280	232	272	225			248	180	256	211
14	278	212	288	225	298	245			300	210	295	232			280	205					252	190	265	204
15	262	222	285	232	295	240	300	212	285	218			275		268	225			280	230	260	218		
16	280	232					305	232	260	215			278	228	265	225	285	208	270	228	258	230		
17	282	235					300	222	262	220	292	222	272				262	220	260	218			272	
18	282	232			300	240	315	238			270	228	268	202			268	218	288	225			257	212
19			285		295	238					258	230	270	182	278	222			280	295	270	215	255	224
20				228	275	225			285	198	278	220			270	222	288	230			272	220	258	225
21	282	218	292	235	288	242			302	232	265	225			280	230					275	225	252	219
22	280	230	285	215	290	248	310	210	308	235			282	208										
23	288	230					280	218	298	215			280		298	230	280	225	282	205	280	226		
24							305	225	282	230	268		258	225			282	232	275	215				
25	300	238	295	215	305	230	315	235					278	218			268	205	275	215				
26			298	222	305	235	325	240			272		268	225	278				270	225	265	220	272	213
27			298	215	305	228					268	215			280	210	270	225			269	228	274	225
28	298	238			298	228			288		290	225			262	220					268	225	270	218
29					298	232			285				275	220		220			280	225	268	218		
30	282	205					325	230					265	212	278	232	272	212	285	230				
31	275	235							265				278	215					280	225				
Avg	282	229	287	223	294	232	308	228	291	217	271	224	276	216	274	220	278	220	275	226	263	218	265	215
n	20	20	18	18	21	21	20	20	20	17	19	16	21	18	20	20	16	16	19	19	19	19	18	16
Sd	7	11	8	10	8	11	10	10	15	19	13	5	10	14	9	15	8	8	9	17	16	13	24	6
Max	300	245	298	248	305	248	325	250	308	248	295	232	300	232	298	242	290	232	288	295	290	232	346	225
Min	262	205	265	212	275	210	280	210	260	180	252	215	258	182	260	185	262	205	255	205	212	180	215	204

1974	--Jan--		--Feb--		--Mar--		--Apr--		--May--		--Jun--		--Jul--		--Aug--		--Sep--		--Oct--		--Nov--		--Dec--	
day	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min
1			277	201			301	209	288	230			275	202	273	212			269	214	268	219	282	212
2	265	198					300	218	308	223			251	180					280	213			258	
3	261						291	216	310	220	281	203	279	218			288	202	280	213			261	210
4	272	222	280	207	286	193	299	212			300	229					277	222	272	219			268	221
5			277	218	282	217	304	223			297	229	274	223	280		289	222			276	200	273	218
6			272	222	281	223			318	220	307	229			289	209	288	222			270	202	260	220
7	277	219	271	212	286	229			322	227	306	229			269	218			282	216	268	218		215
8	273	229	266	209	285	230	310	218	317	226			287	230	283	221			270	220	267	222	269	245
9	282	220					300	222	323	227			288	231	282	233	288	218	272	212			265	206
10	275	222					300	225	328	221	313		297	235			288	213	270	217			270	218
11	278	220	280	210	288	221	315	190			290	223	275	223			288	213	275	209	268	217	272	231
12			271	202	288	215					285	175	262	206	260	254	310	210			268	203	268	220
13			272	203					327	224	270	218			250	202	278	220			268	205	278	230
14	280	215	282	216	281	220			316	231	290				272	222					265	202	280	230
15	266	206	280	221	290	232	318	228	295	230			280		283	229			280	210	265	220	280	220
16	272	206					310	232	336	225			252	189	295	234	266		270	219	248	218	273	198
17	280	217					310	240	313	222	318	228	280	210			272	212	290	218			268	213
18	277	216			290	218	283	234			283	208	282	206			277	206	268	219	269	205	262	209
19			292	208	288	216	288	231			307	173	250		292	216	272	233			263	222	270	209
20			290	188		208			304	209	298	228			299		285	222			253	220	269	212
21	278	202	278	225	289	215			314	234	277	230			281	236			271	222	252	210	275	228
22	280	211	285	230	295	213	306	228	308	232			290		288	227			272	218	252	208	246	268
23	272	210					287	226	310	226			270	210	282	212			272	217	258	242	268	220
24	262	211					299	226	254	213	279	221	297	256			276	210	276	218	260	218	290	219
25	290	219	315	228	299	201	305	241			278	220	280	228			278	227	270	212	262			
26			279	222	300	215	313	238			289	225	264	225	282	217	278	217			262	210	280	212
27			295	211	298	214					285	206			282	228					267	225	278	215
28	282	230	275	209	300	200			302		278	177			287	218					250	220	278	212
29	282	203			294	214	313	219	308	242			215	223	282	194			270	212	262		278	220
30	282	227					290	222	300	229			260	223	278	201	278	210	265	211	275	220	268	181
31	280	221							294	217			273	209					268	224			278	200
Avg	276	215	281	213	290	215	302	224	309	225	292	214	272	217	280	220	282	216	273	216	263	215	271	218
n	22	21	19	19	18	19	21	21	22	21	20	18	22	19	21	19	18	17	21	21	24	22	29	29
Sd	7	9	11	10	6	10	10	11	17	7	13	19	18	17	11	14	10	8	6	4	7	10	9	15
Max	290	230	315	230	300	232	318	241	336	242	318	230	297	256	299	254	310	233	290	224	276	242	290	268
Min	261	198	266	188	281	193	283	190	254	209	270	173	215	180	250	194	266	202	265	209	248	200	246	181

TABLE B3.—Continued.

1975	--Jan--		--Feb--		--Mar--		--Apr--		--May--		--Jun--		--Jul--		--Aug--		--Sep--		--Oct--		--Nov--		--Dec--	
day	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min
1	268	205	280	228	278	220	315	218	322	222	280	180	275	215	279	223			282	223	272	210		195
2	270				282	212	312	231	321	219	260	195	279	210	270	220	288	215	288	221	272	210	274	210
3	277	202	280	211	281	200	313	232	298	220	270	211	275	206	286	234	287	210	265	200	272	216	260	200
4	260	224	287	206	280	219	322	218	306	228	290	229	275	228	279	190	280	211			280	212	260	206
5	280	220	280	203	270	220	300	220	302	218		226	275	238	269	220	283	222	281	223	280	212	270	209
6	277	203	269	211	260	220	310	226	310	222	280	222	270	230	277	221	285	211	309		275	217	288	
7	267	221	272	216	274	219	306	210	320	221	298	220	282	212	266	208	298	216	272	228	270	210	268	210
8	270	212	272	228	280	228	306	230	309	222	308	226	288	230	265		287	215	278	217	288	212	314	196
9	274	224	286	210	282	228	297	217		231	293	232	278	210	278	220	282	215	268	219	282	202	280	190
10	278	219	277	215	285	230	299	232	310	240	292	230	290	222	286	218	282	213	266	215	292	206	269	207
11	278	222	278	220	286	222	301	228	310	220	260	235	292	230	283	233	280	217			265	221	252	215
12	298	226	279	226	298	236	305	218	306	228	290	239	295	240	290	237	282	212			267	209	262	215
13	285	219	275	219	299	237	300	218	293	220	290	230	298	216	280	208	286	212			280	216	276	248
14	281	212	308	218	302	218	302	231	277	230	270	255	268	200	260	208	288	200	290	201	282	221	270	220
15	275	222	278	208	304	216	312	218	261	227	270	228	270		270	211	286	210	271	220	278	220	278	220
16			278	210	298	228	305	228	268	216	275	190	280	212	272	233	265	204	280	211	287	212	272	210
17	279	221	288	230	296	226	319	224	276	216	268	218	278	220	288	222	287	211	276	208	273		272	213
18	268	228	282	225		224	309	222	274	226	268	227	286	222	272	220	284	210	285	210	269	208	277	211
19	288	220	287	212		212	318	235	277		270	230	280	202	282	208	288	210			273	210	268	218
20	288	222	278	218		226	318	238	278	220	280	229	290	220	260	190	288	210	280	211	282	220	286	220
21	280	210	294	200		223	308	240	293	236	286	228	267	220	270	211	276	210	262		282	216		
22	285	228	290	220	298	225	301	235	295	235	260	210	287	220	270	216	287	214	275		288		262	201
23	279	230	288	220	308	226	320	232	302	222	270	227	296	211	276		283	213	272	210			254	201
24	280	209	287	189	308	231	309	235	280	226		232	281	219	284	230	280	216	282	226	283		264	190
25	266	210	289	225	306	228	321	220	300	226	267	226	290	226	280	202	279	216	280	208	270	220		
26	280	200	293	224	298	239	288	238			288	225	268	208	273	202	276	212	290	226	277	216	272	190
27	278	205	287	218	314	240	288	238	300		285	209	272	233	270	204	286	226	282	206			286	206
28	285	228	288	204	308	230	304	220	280	218	260	200	280	216	265	207	288	228	276	215	280	217	270	230
29	289	229			316	226	320	203	295	218	290	200	288	219	253	202	279	207	280	208	280	208	270	194
30	289	229			310	230	320	212	292	228	280	198	268	208			277	216	282	208			266	197
31	277	222			312	227			268	225			280	218					260	210			268	209
Avg	278	218	283	215	294	225	308	226	294	224	279	220	281	219	274	215	283	213	278	214	278	213	272	208
n	30	29	27	27	27	31	30	30	29	28	28	30	31	30	29	27	29	29	26	23	27	24	28	28
Sd	8	9	8	10	15	8	9	9	17	6	13	16	9	10	9	12	6	6	10	8	7	5	12	13
Max	298	230	308	230	316	240	322	240	322	240	308	255	298	240	290	237	298	228	309	228	292	221	314	248
Min	260	200	269	189	260	200	288	203	261	216	260	180	267	200	253	190	265	200	260	200	265	202	252	190

1976	--Jan--		--Feb--		--Mar--		--Apr--		--May--		--Jun--		--Jul--		--Aug--		--Sep--		--Oct--		--Nov--		--Dec--	
day	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min
1			270	184	278	220	300	212	289	216	300	188	300	232	300	230	295	220	283	230	290	228	292	232
2	276	198	270	193	282	222	310	206	280	228	300	230	305	220	290		265		280	220	280	230	290	230
3	276	198	272	200	280	228	300	216	310	226	288	216			292	240	288	220	300	230	280	240	290	225
4	276	198	276	219	289	210	300	220	310	220	288	210	290	219	310	240	295	240	290	223	270	230	300	220
5	290	201	280	220	292	218			310	219	300	218	300	216	300		280	230	285	230	260	218	296	226
6	272	200	283	217			302	228	290	220	300	220	300	218	300				276	229	290	210	290	235
7	280	199	300	210	290	220	316	228	220	211	300	220	310	226	300		300		285	235	278	200	290	240
8	278	226	300	210	290	220		216	300	210	282	216	310	191	316		300	240	280	230	280	190	290	240
9	280	210	307	201	293	214	320	223	300	200	290	220	305	231	310		294	228	300	220	270	230	300	240
10	278	208	277	206	291	210	372	220	320	229	289	216	300	228	312	239	280	170	300	220	280	240	302	245
11	308	208	280	236	298	220	390	240	311	266	299	219	300	230	299	235	282	200	300	220	280	250	270	226
12	278	203	293	210	312	228	320	204	308	231	300	220	292	210	290	210	300	210	290	230	260	225	300	210
13	283	218	280	220	282	218	310	210	310	245	300	220	263	221	293	240	300	232	295	228	300	210	300	240
14	288	230			290	218		212	310	196	298	180	291	220	300	210	290		285	230	270		300	246
15	275	220			296	212		220			296	225	301	230	300	210	270	222	290	220	275	210	300	240
16	280	219			296	225	323	182			284	216	300	220	293	230	275	232	290	236	270	210	310	240
17	308	208	302	195	300	228	314	200	315	215	298	224	286	230	290	230	280	200	300	240	284	218	300	230
18	276	216	288	196	315	220	320	225	315	220	300	228	300	226	292	224	300	210	295	220	295	240	300	240
19	276	220	289	205	280	228	295	202	310		300	226	312	222	290	220			290	225	290	240	300	240
20	278	215	292	207	270	218	336	198	312	210	288	188	311	230	290		290		288	226	280	210	289	218
21	290	221	288	210	300	220	319	210	300	240	286	210	310	231	300	238	220		290	233	280	210	295	240
22	279	211	300	222	300	222	302	220			294	220	290		290	180	286		290	230	290	220	295	240
23	272	207	292	218	302	218	311	229	300	239	302	235	308		280	210	272	200	300	240	290	230	285	220
24	276	210	278	229	298	222			281	228	300	209	310	226	280	230	270	182	296	220	290	230	300	240
25	276	210	282	215	302	210	310	219	300	222	278	208	310	226	278	240	268	220	300	230	292	244	300	240
26	282	221	293	222	298	202	276	230	300	200	368	218	300		278		280	226	295	230	298	244	288	246
27			285	207	300	202	264	219	304	228	300	230	312	235	288	230	280	226	284	226	300	240	280	230
28	281	208	288	228	300	200	276	202	300	212	290	216	301	225			280		278	232	310	230	275	213
29	282	197	290	218	299	220	315	218	270	210	275	228	300	235			282	230	290	240	300	240	280	220
30	273	198			302	196	298	210	288	216	289	220	304	227	280	230	280	230			290	230	280	225
31	270	184			298	192							300	230	292	250							280	210
Avg	281	209	287	211	294	216	312	215	299	221	296	216	301	224	294	227	282	218	291	228	284	226	292	232
n	29	29	26	26	30	30	25	28	27	26	30	30	30	27	29	21	28	21	29	29	30	29	31	31
Sd	9	10	10	12	10	9	26	12	19	15	15	12	10	9	10	15	16	18	7	6	12	15	9	11
Max	308	230	307	236	315	228	390	240	320	266	368	235	312	235	316	250	300	240	300	240	310	250	310	246
Min	270	184	270	184	270	192	264	182	220	196	275	180	263	191	278	180	220	170	276	220	260	190	270	210

TABLE B3.—Continued.

1977	--Jan--		--Feb--		--Mar--		--Apr--		--May--		--Jun--		--Jul--		--Aug--		--Sep--		--Oct--		--Nov--		--Dec--	
day	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min
1	300	220	290	230	305	240	310	225	310	255	300	225	260	229	250	210					290	230	290	240
2	300	220	290	240	310	240	310	218	300	250	280	230	286	228	270	220	280	248			285	240	280	200
3	280	230	290	225	290	248	310	220	340	230	295	232	300	232	280	240			312	230	312	248		
4	285	240	290	230	285	245	310	220	320	236	320	230			290	240			295	240				
5	288	248	270	220	300	220	300	210	330	240	310	220	310	230	290	240			295	240			280	225
6	290	230	270	220	294	246	310	230	330	225	310	225	260	235			300	220	290	230			285	220
7	285	240	290	230	300	270	315	225	320	240	295	230	260				290	245	290	235	315	235	285	235
8	300	220	280	230	290	260	310	218	320	240	280	240	262	225	280		300	248			280	238	285	240
9	290	218	300	230	290	260	310	240	320	240	300	230			290	230	310	240			310	225	290	235
10	400	225	295	230	300	245	310	240	340	240	296	240			280	230					315	238		
11	282	232	300	240	295	245	320	240	325	240	300	210	300	230	280	230			285	215	310	200		
12	290	238	290	240	300	220	315	240	345	240	306	220	300	235	296	220		245	284	214			285	200
13	290	240	290	220	310	220	290	240	335	240		220	305	248			290	230	295	230			270	220
14	290	220	325	240	315	230	290	245	338	248	290	220	310	250			285	225	300	225	280	225	280	230
15	300	220	330	240	310	230	295	250	325	240	300	230	308	250	280	250	280	220			275	210	285	230
16	300	220	280	230	310	240	300	258	340	230	289	245	300	230	270	220	285	225			270	220	285	230
17	300	230	280	220	285	240	300	258	340	245	290	240	300	250	270	245			290	238	275	225		
18	290	200	282	220	290	240	310	248	340	235	302	248	290	243	270	240			290	230	274	228		
19	270	220	290	220	296	230	328	255	335	235	291	232	290	245	255	228	295	230	280	230			285	215
20	275	220	290	230	296	240	330	255	270	230	290	240	295	233			295	215	280	245			270	200
21	270	218	300	230	300	240	330	250	300	220	285	245	290	230			295	225	300	260	285	225	280	220
22	250	230	300	220	300	240	325	255	292	212	285	240	310	245	285		280	230			290	225	280	230
23	276	226	288	238	310	240	300	245	305	231	285	240			300	245	290	248			280	220	280	220
24	275	216	300	240	310	240	320	250	301	230	290	240			295	230								
25	274	215	300	220	300	212	300	250	310	232	290	240	300	245	290	245			290		280	230		
26	277	230	290	230	290	210	300	245	300	225	373	241	290	248			300	230	290	225				
27	290	216	300	240	290	210	305	255	315				280	240			325	215	285	235			290	240
28	290	230	305	235	298	230	295	250	300	220	290	240	290	235	304	259	280	220	290	240	280	235	290	240
29	276	210			310	240	295	245	290	210	275	230	300	250	290	210	275				280	235	290	225
30	300	230			300	238	320	250	300	220	265	240			284		290	225			290	235	310	266
31	280	220			310	233			350	230					305	238			285	230				
Avg	289	225	293	230	300	237	309	241	319	234	296	233	292	239	283	234	292	231	291	233	289	228	285	227
n	31	31	28	28	31	31	30	30	31	30	28	29	24	23	23	20	19	19	19	18	20	20	21	21
Sd	23	10	13	8	8	14	11	14	19	10	19	9	16	8	14	13	12	11	7	10	15	11	8	15
Max	400	248	330	240	315	270	330	258	350	255	373	248	310	250	305	259	325	248	312	260	315	248	310	266
Min	250	200	270	220	285	210	290	210	270	210	265	210	260	225	250	210	275	215	280	214	270	200	270	200

1978	--Jan--		--Feb--		--Mar--		--Apr--		--May--		--Jun--		--Jul--		--Aug--		--Sep--		--Oct--		--Nov--		--Dec--	
day	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min
1			295	245	310	235			305	230	290	220			290	220			290	205	280	205	285	210
2			290	245	305	220			290	225	300	225			295	220			270	210	270	200		
3	290	215	300	245	305	220	295	220	300	230			290	210	288	220			284	212				
4	290	230					295	220	310	225			268	224	286	190			285	210			280	205
5	285	220					305	225	310	235	200	270	275				290	200	285	200			275	205
6	280	230	305	230	315	220	310	230			295	230	280	220			290	205			270	205	280	210
7					310	235	310	230			285	225	286	210	280		290	200			280	210	270	210
8			290	220	310	235			310	220	300	230			285	225	285	215			275	210	260	200
9	290	225	290	230	300	228			290	235	290	225			285	230			285	195	270	210		
10	285	225	290	230	290	230	315	220	305	230			286		275	220			270	205				
11	270	220					320	240	310	225			278	210	280	220	285	200	275	200			275	205
12	275	215					320	230	300	230	305		252	218			285	200	280	210			270	205
13	280	210	290	210	330	235	314	240			285	230	268	214			285	185			270	200	260	195
14			290	205	320	230	310	235			300	225	278	205	310	230	280	195			270	205	280	210
15			285	210	301	230			300	240	270	220			315	220	280	210	280	200	270	200	280	200
16	280	205	292	218	310	238			274	210	285	205			290	210			280	198	270	200		
17	280	210	295	235	300	230	290	225	290	210			289	194	280	235			275	200	265	195		
18	280	220					295	240	295	200			274	230	290	230	275	200	280	200			275	202
19	290	220					310	245	295	215	302	234	275	210			285	205	280	205			270	205
20	290	220			310	240	286	234			285	210					335	215			200	255	280	205
21			305	225	310	240	320	225			280	220			295	200	270	210			270	200		
22					308	234			300	200	274				295	230	262	206	275	200	270	210	275	200
23	290	220	300	220	310	236			290	235	254	212							275	200				
24	288	242	315	220			320	240	270	225			290	215	290	235			260	200	275	210		
25	284	236					268	238	285	230			300	240	285	240	280	190	270	205				
26	290	240					290	225	270	215	288	210	300	230			270	210	270	210			280	190
27	295	240	300	225	320	240	285	230			276		280	215			280	200			280	210	280	210
28			310	240	326	242	304	228			288	210	285	225	295	225	285	210			285	220	280	205
29					330	235					282				280	200	265	205	280	210	290	220	280	205
30	290	230			295	230			300	240	268	220			280	195			275	210	290	215		
31	305	220			295	230			290	206			300	225	285	200								
Avg	286	223	297	227	310	232	303	231	295	223	282	223	282	217	289	219	283	203	277	204	271	209	276	204
n	21	21	17	17	22	22	20	20	22	22	22	18	19	17	22	21	19	19	21	21	19	19	19	19
Sd	7	10	8	12	11	6	14	7	12	12	22	14	12	11	9	14	15	8	7	5	18	13	7	5
Max	305	242	315	245	330	242	320	245	310	240	305	270	300	240	315	240	335	215	290	212	290	255	285	210
Min	270	205	285	205	290	220	268	220	270	200	200	205	252	194	275	190	262	185	260	195	200	195	260	190

TABLE B3.—Continued.

1979	--Jan--		--Feb--		--Mar--		--Apr--		--May--		--Jun--		--Jul--		--Aug--		--Sep--		--Oct--		--Nov--		--Dec--	
day	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min
1			280	200					315	230	295	225	300	251	300	230	320	200			300	225	270	230
2	280	205					310	210	320	235	285	230	295	245	300	230	350	250	305	230	320	220	275	239
3	285	210					300	215	315	240	295	235	300	245	285	240	350	250	295	230	290	240	285	241
4	285	205					320	215	315	245	295	230	290	230	300	200	295	235	280	230			290	235
5	280	205	290	195	300	195	280	210	305	250	280	225	290	250	300	250	300	240	285	235	300	225	280	230
6			290	210			290	205	320	250	280	225	285	240	305	250	310	230	310	230	300	225	285	240
7			290	200					315	250	280	220	300	240	300	245	290	230	285	230	305	230	290	250
8	280	185	290	200					320	250	285	230			300	240	300	230	295	235	308	225	295	250
9	280	190	285	210			300	200					295	250	310	240	300	220	315	230	320	225	292	248
10									320	240			295	245	310	250	290	250	300	225	295	225	295	240
11	280	185					310	220	320	255	350	240	295	230	315	250	300	220	300	230			286	242
12	280	180	280	200	300	200	310	235	325	240	295	235	295	225	300	200	300	224	320	230			290	240
13			285	210	298	209			295	230	300	240	290	230			300	222	290	230	300	230	295	240
14			280	200	294	205			325	225	290	240	310	230	285	245	270	230	300	230	275	225	290	240
15	280	190	275	195	285	200			285	240	290	220			290	230	285	220	310	230	290	224	290	230
16	280	210	290	200	290	210	315	220	290	230	280	235	280	225	280	230	300	220	295	230			252	220
17	285	205					305	210	230	230	280	235	280	235	295	225	290	240	310	230	270	260	265	230
18	280	210					270	210	310	230	300	205	280	218	300	230	310	240	320	230			270	230
19	280	205			300	200	295	220	290	235	290	240	300	228	325	235	300	230	325	230	300	220	270	225
20			295	210	300	190	305	220	295	230	260	235	280	224	295	235	300		320	230	270	220	272	221
21			295	215	305	190					275	235	310	240	290	225	285	235	300	230	270	240	270	220
22	285	185	290	220	305	180			300	225	290	230			280	225	330	240	300	230			315	220
23					305	180	305	200	290	240			290	230	285	225	340	250	295	220	270	230	295	238
24	280	195					312	208	295	240			280	240	285	230	270	220	270	225	275	230	270	220
25	285	210					330	240	305	240	290	228	285	240	315	220	300	230	290	220			275	220
26	280	200			320	190	315	225	315	240	285	240	290	235			320	235	290	220	300	220	275	219
27					320	210	300	235	285	245	300	235	290	240	275	230	310	235	300	225	290	220	280	230
28					305	220	300	225			290	230	310	240	280	235	310	240	300	220	285	230	265	240
29	290	190			302	214	305	230	280	240	300	235	280	240	270	225	300	230	295	220	290	230	270	225
30	285	210			320	220	320	225	280	235	315	240	310	230	290	230	290	230	290	220	295	235	275	235
31	280	205							280	230			305	230	300	210			300	225			285	240
Avg	282	199	287	205	303	201	305	218	301	238	291	231	293	236	295	231	304	232	300	228	292	228	281	233
n	20	20	14	14	16	16	21	21	28	28	26	26	28	28	29	29	30	29	30	30	23	23	31	31
Sd	3	10	6	7	10	12	13	11	20	8	16	8	10	8	13	13	19	11	12	4	15	9	13	9
Max	290	210	295	220	320	220	330	240	325	255	350	240	310	251	325	250	350	250	325	235	320	260	315	250
Min	280	180	275	195	285	180	270	200	230	225	260	205	280	218	270	200	270	200	270	220	270	220	252	219

1980	--Jan--		--Feb--		--Mar--		--Apr--		--May--		--Jun--		--Jul--		--Aug--		--Sep--		--Oct--		--Nov--		--Dec--	
day	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min
1			300	230			320	250	320	240			300	250	280	235	290	230	280	240	280	245	270	230
2	286	232	300	230			300	250	320	260	300	240	290	250	280	250	260	240	300	240	320	240	280	230
3	280	238			300	224	290	240	320	240	310	240	280	250			270	225	310	230	280	245	300	230
4	280	240	300	220	320	220	310	250			300	240	290	250	300	238	280	250	280	245			300	220
5	290	250	300	220	300	230	315	250			300	260	300	260	290	240	295	245	305	245	290	230	280	225
6	290	280	270	218	310	235			340	235	290	255			290	240	280	260	290	240	270	230	280	225
7	300	240	260	215	320	240			330	250	290	240	300	250	280	250	280	250	270	230	270	225	310	230
8	300	248	280	240	320	250	300	240	275	245			300	240	280	240	290	240	270	245	280	225		
9	310	240	280	235			305	240	305	250	285	245	300	250	325	250	295	240	280	240			290	220
10	310	240			320	240	305	225	300	250	280	240	300	250			280	250	290	250	310	230	270	230
11	300	240	300	220	310	240	300	225			280	250	300	245	300	240	290	250	275	225			285	240
12	290	240	290	230	295	240	290	220	320	250	270	240	330	250	295	240	300	250	270	240	280	240	290	230
13			290	245	300	250			300	230	280	240			310	230	280	250			270	230	280	230
14			300	235	320	240	310	220	310	235	280	240	295	240	290	245			290	240	260	240		
15	300	240	290	240	310	240	300	235	290	250			270	240	285	250	256		275	240	275	240	280	220
16	290	220	280	230			310	220	310	250	310	260	325	250	280	240	283	233	275	240	270	240		
17	290	220			320	240	320	240	310	250	300	250	290	250					280	240	270	240	280	220
18	290	230	285	230	320	240	300	240			300	260	290	250	290	230	256	224	280	250	300	240	290	225
19	270	220	290	230	300	250			280	260			290	240	290	230	261	258	280	230	280	240	290	230
20			300	230	315	250			310	280	300	230			290	230	261	231	310	240	290	230	290	230
21	280	228	300	230	310	240	330	218	295	250	290	240	290	240	280	245			315	240	295	225	290	230
22	270	214											280	240	285	240	294	231	290	240	295	235	285	225
23	280	235					300	240	320	300			290	250	290	250	294	233	280	245	320	220	280	235
24	290	240			328	220	320	250	290	280	299	230	290	230			303	225	280	250	280	230	290	230
25	280	240	300	220	300	260	280	240			285	250	275	250	300	240	302	236	280	250	310	230		
26	310	250	310	220	290	260					280	250	280	250			287	233			275	225	280	225
27	300	250	290	240	310	260			310	250	285	260			300	250	256	219			280	230	290	210
28	280	250	295	245	315	260	290	245	300	250	290	260	300	240					290	240			270	220
29	310	240	300	230	310	260	300	280	285	250			280	270					280	250			270	210
30	310	230							290	250	300	240	325	250					285	220	285	235	250	210
31	290	240			300	240			290	250			275	250					265	250			270	200
Avg	292	238	292	230	310	243	305	239	305	252	291	246	294	248	291	241	281	239	285	241	285	234	283	224
n	27	27	23	23	24	24	21	21	24	24	23	23	27	27	22	22	24	23	28	28	25	25	27	27
Sd	12	13	11	9	10	12	12	14	16	15	10	9	15	7	11	7	15	11	13	8	16	7	12	9
Max	310	280	310	245	328	260	330	280	340	300	310	260	330	270	325	250	303	260	315	250	320	245	310	240
Min	270	214	260	215	290	220	280	218	275	230	270	230	270	230	280	230	256	219	265	220	260	220	250	200

TABLE B3.—Continued.

1981	--Jan--		--Feb--		--Mar--		--Apr--		--May--		--Jun--		--Jul--		--Aug--		--Sep--		--Oct--		--Nov--		--Dec--	
	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min
1	275	205	266	215			305	250	300	230	289	228	267	236	283	250	283	222	294	239	294	228	278	222
2	280	220	270	235	300	240	300	255	296	223	267	228	275	222	278	239	278	222	294	244	283	228		
3	285	220	280	235	300	250	300	245			268	223	281	233	294	217	294	239			300	233		
4	260	210	286	232	300	250	300	240	290	225	270	224	257	220	272	233	278	194	300	239	306	283	294	250
5	280	225			280	250	302	242	275	230	278	233			283	217	300	233	278	244	294	239	294	233
6	280	230	290	215	285	232	308	240	290	225	294	237	268	217	283	239	306	217	294	244	294	242	283	233
7	285	230	290	215	265	225	300	230	290	230			278	228	300	244	278	233	294	239	289	244	289	233
8	270	230	290	230	280	228	298	225	290	230	278	222	261	211	289	239	289	233	283	239	278	228	283	239
9	260	220	288	238	288	225	295	234	270	226	267	217	289	228	294	228	289	239	278	233	278	239	278	239
10	280	220			280	240	290	235			278	222	283	227	289	233	286	222	278	233	289	233	267	244
11			290	240	275	235	303	250	300	220	289	228	276	219	278	244	272	233	283	228			278	239
12	280	220	285	238	285	232	290	250	277	226	322	239	267	222	294	233	294	233			283	239	267	228
13	260	210	285	230	285	220			268	230	275	214	274	214	272	225	283	228	283	233	272	233	272	239
14	260	210	285	230	285	225	300	220	285	235			333	222	278	233	300	233			278	222	272	244
15	265	210	278	220	280	222	280	225			283	222	311	228	294	239	272	233	283	233	289	228	283	242
16	260	220	285	220	290	210	270	220			294	228	285	219	306	239	283	244	289	228	272	228	283	244
17	270	225	280	220	285	215	265	222	280	230	261	250	261	217	300	239	283	233	278	233	272	239	289	239
18	275	230	270	230	280	245	276	224			269	222			300	233	289	228	289	233	289	239	306	244
19	255	220	280	240	290	220					275	217			289	233	294	244	289	233	283	244	300	244
20	270	220	290	240	290	220	255	219	295	245	258	222			292	236	294	244	289	233	289	239	294	239
21	280	220	300	240	285	230	270	220	295	250					278	228	306	244	292	239	289	228	289	233
22	280	225	285	220	280	220	285	232	300	255					267	244	303	250	283	239	278	233	278	233
23	275	215	285	245	290	225	270	230	280	231	267	233			300	233	300	250	278	228	283	233	289	239
24	255	220	320	240	300	228	272	230			278	231	285	237	300	233	300	244	289	222	278	233	272	233
25	280	220	275	225	290	235					278	211	278	239	278	236	292	247	294	228	278	239	294	239
26	275	220	285	230	295	230			280	220	259	221	283		283	222	300	233	300	239	283	217	294	233
27	280	220	285	235	285	240	270	230	300	235	272	231	283	256	283	233	272	233			283	239	294	239
28	270	230	278	240	295	225							300	244	283	233	278	239	289	233	283	239	294	239
29	290	230			298	225	270	225	276	240			294	236	300	222	283	217	300	239	294	233	300	250
30	265	220			290	230	270	230	288	234			283	228	283	228	294	222	289	233	283	233	300	244
31	270	220			300	240							289	250	261	222			289	233			289	232
Avg	272	221	285	231	288	230	286	233	287	232	277	226	282	228	287	233	289	233	288	235	285	236	286	238
n	30	30	26	26	30	30	25	25	21	21	23	23	24	23	31	31	30	30	27	27	29	29	29	29
Sd	9	7	10	9	8	10	15	11	10	9	14	9	16	11	11	8	10	12	7	5	8	11	10	6
Max	290	230	320	245	300	250	308	255	300	255	322	250	333	256	306	250	306	250	300	244	306	283	306	250
Min	255	205	266	215	265	210	255	219	268	220	258	211	257	211	261	217	272	194	278	222	272	217	267	222

1982	--Jan--		--Feb--		--Mar--		--Apr--		--May--		--Jun--		--Jul--		--Aug--		--Sep--		--Oct--		--Nov--		--Dec--	
day	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min
1	294	239	294	239	305	244	311	244			317	239	300	261			289	233	294	244	294	239	322	250
2	283	228	283	228	289	239	306	239			300	261	300	256			300	233			294	244	322	253
3	283	228	300	228	294	228			317	244	311	244			294	256	292	236					347	253
4	289	233	306	233	294	233			308	244	306	228			292	247			281	219	294	233	333	250
5	283	228	300	244	300	217	372	239	306	250					300	250			278	239	300	233		
6	283	228	306	250	300	222	306	239	311	244			294	244	300	236	294	239	278	233			311	242
7	278	228	300	250	300	233	317	244	303	244	300	239	278	247			278	244	283	244			317	239
8	289	228	306	250			328	244			306	239	294	256			283	247	278	239	294	239	319	233
9	294	228	306	239							289	250	300	233	292	233	300	244	283	228	283	244	283	244
10	300	228	306	244					317	244	278	244			289	250	286	244			297	253	281	244
11	294	233	306	244					294	244	294	250			300	253			289	233	300	253	308	244
12	294	233	306	250			322	233	283	256			300	250	294	261			286	236			303	261
13	294	244	306	250			272	222	292	250			272	233	306	233	292	242	281	239			306	250
14	300	244	306	233			294	233	306	250	317	239	286	244			297	256	289	250	325	244	303	253
15	300	244	306	239	311	239	294	239			300	261	294	250			294	250	292	233			289	256
16	294	239	300	239	306	233	306	233			300	250	306	250	300	253	297	247					303	253
17	283	233	300	233	317	228			311	244	289	250	294	256	300	247		239					292	250
18	300	233	294	233	311	228			306	250	289	250			281	253	289	244	283	228			294	250
19	300	228	300	228	304	244	311	233	311	244			300	239	294	239			278	233			294	228
20	311	239	300	239	311	233	311	239	292	233			261	222	294	258	294	228	275	244			294	231
21	306	233	278	233	311	233	317	244	278	244	306	244	286	247			278	233	269	239			300	247
22	300	233	294	217	317	250	317	256			289	250	294	256			289	222	286	239	331	239	289	242
23	300	228	300	222	306	250	311	256			294	250	300	256	300	239	286	244			367	228	283	250
24	306	233	300	228	317	256			306	244	289	256					289	242			344	236	289	250
25	306	239	294	239	311	233			289	250	289	244			303	256			281	236	322	256	306	247
26	300	233	300	228	306	250	311	244	300	239	289	250	294	244	300	247			281	236	286	244	306	242
27			306	228			317	256	294	250			267	244	306	261	292	233	278	233				
28	286	222	300	250			322	261	311	250	294	244	272	247	300	239	303	247	278	233			278	225
29	294	222			317	233	328	250			289	256	286	239			303	244	286	231	311	233		
30	300	228			300	256	294	244			300	256			292	236	292	244			303	244		
31	294	228			306	250							283	239	306	256								
Avg	295	232	300	237	306	238	313	243	302	246	297	248	289	246	297	248	292	241	282	236	309	241	303	246
n	30	30	28	28	22	22	21	21	20	20	23	23	22	22	21	21	22	23	22	22	16	16	26	26
Sd	8	6	7	9	8	11	18	9	11	5	10	8	12	9	6	9	7	7	6	7	22	8	16	9
Max	311	244	306	250	317	256	372	261	317	256	317	261	306	261	306	261	303	256	294	250	367	256	347	261
Min	278	222	278	217	289	217	272	222	278	233	278	228	261	222	281	233	278	222	269	219	283	228	278	225

TABLE B3.—Continued.

1983 day	--Jan-- max	min	--Feb-- max	min	--Mar-- max	min	--Apr-- max	min	--May-- max	min	--Jun-- max	min	--Jul-- max	min	--Aug-- max	min	--Sep-- max	min	--Oct-- max	min	--Nov-- max	min	--Dec-- max	min
1	306	222	294	233	316	266	328	247	311	250	325	253												
2	356	250	303	239	311	264	333	242	314	247	317	264												
3	311	244	308	242	325	258	336	256	300	250	300	233												
4	300	238	297	256	317	250	333	264	300	231	294	247												
5			306	233	319	236	325	261	311	244	289	250												
6	311	250	303	231	314	250	317	272	322	261	294	244												
7	292	250	303	239	322	244	331	264	311	250														
8	297	250	300	244	325	239	333	247	306	250	311	250												
9	292	250	306	225	317	236	333	256	306	256	306	244												
10	294	256	297	217	317	250	333	250	317	261	300	247												
11	283	256	303	228	317	256	333	261	328	264	286	231												
12	297	253	306	231	311	256	331	261	325	269	300	253												
13	294	239	306	239	308	253	336	253	317	244	311	253												
14	289	239	303	250	311	228	328	250	272	247	300	258												
15	289	228	303	250	308	239	336	250	269	250	311	256												
16	289	242	303	244	328	250	322	256	278	242	311	256												
17	289	239	311	239	333	261	339	250	292	250	311	233												
18	294	247	300	242	339	261	322	261	317	244	267	244												
19	294	250	297	247	342	256	331	244	308	250	294	253												
20	294	250	294	253	336	258	344	250	300	253	317	250												
21	300	247	283	247	322	261	344	244	300	250	283	247												
22	294	256	300	258	336	272	342	244	319	261	306	261												
23			303	264	325	272	322	256	311	258	300	250												
24	300	250	308	261	322	256	319	264	306	264														
25	306	256	311	253	317	244	336	261	317	261														
26	300	250	308	256	319	244	336	261	319	256														
27	294	244	317	258	314	250	333	250	314	256														
28	281	253	319	258	331	256	272	247	308	256														
29	294	250			314	261	267	239	306	242														
30	303	258			328	244	292	244																
31	294	233			322	239			292	250														
Avg	298	247	303	244	321	252	326	254	306	252	302	249												
n	29	29	28	28	31	31	30	30	30	30	22	22												
Sd	13	8	7	12	9	11	18	8	14	8	13	8												
Max	356	258	319	264	342	272	344	272	328	269	325	264												
Min	281	222	283	217	308	228	267	239	269	231	267	231												

1984 day	--Jan-- max	min	--Feb-- max	min	--Mar-- max	min	--Apr-- max	min	--May-- max	min	--Jun-- max	min	--Jul-- max	min	--Aug-- max	min	--Sep-- max	min	--Oct-- max	min	--Nov-- max	min	--Dec-- max	min
1			280	235	280	240	250	235	260	230	270	235	265	240	270	230	265	230	280	240	270	230	240	215
2			280	235	280	235	245	225	260	235	260	240	270	240	265	235	280	240	270	240	260	230		
3			280	250	285	245	260	220	260	245	275	235	280	240	255	235	275	245	260	245	255	225		
4			280	245	290	240	250	225	270	245	280	240	275	245	260	240	270	240	280	240	265	235		
5			275	240	275	250	240	230	265	240	260	240	255	230	275	240	270	245	280	240	255	230		
6			280	245	280	250	255	225	265	240	250	240	260	235	290	255	260	235	265	240	245	230		
7			265	240	290	250	255	235	260	235	260	230	275	235	285	255	270	240	275	240	260	215		
8			280	245	290	235	255	230	260	230	270	230	260	245	280	255	270	240	265	235	255	225		
9			280	245	285	235	245	215	260	240	270	240	275	240	280	225	270	225	270	230	250	215		
10			270	240	285	240	255	220	270	235	280	245	265	240	265	225	260	230	270	235	240	220		
11			270	240	295	240	260	230	260	235	265	245	280	240	250	235	260	230	275	240	255	220		
12			280	240	290	250	265	240	250	230	275	235	275	240	270	235	270	235	270	235	260	225		
13			280	240	295	250	260	235	255	230	275	240	270	235	280	250	270	230	260	245	255	225		
14			280	240			255	235	250	230	275	250	260	240	265	245	255	225	265	240	255	220		
15			285	240			255	235			280	250	260	225	260	240	275	235	270	240	260	230		
16			285	235			250	230	260	235	285	245	270	240	265	245	280	230	270	245	260	230		
17			280	240	235	215	255	235	260	240	265	230	280	245	270	240	270	235	270	240	260	225		
18			280	240	240	215	255	235	270	245	265	240	260	240	275	230	260	240	270	235	265	230		
19			280	240	245	225	255	235	270	245	280	240	270	235	270	235	260	230	270	235	260	230		
20			285	240	240	215	260	235	265	235	290	255	265	235	275	240	265	230	270	235	255	235		
21	280	245	290	250	245	225	260	235	260	235	285	250	265	240	255	240	265	230	270	240	260	230		
22	275	235	280	240	245	235	255	230	255	235	270	245	275	230	265	240	265	230	275	240	255	220		
23	275	230	275	240	250	235	260	225	260	230	275	240	275	235	255	230	285	235	275	235	240	220		
24	285	235	285	250	250	230	255	235	255	230	260	240	280	240	265	230	285	240	270	235	250	220		
25	280	245	285	235	245	225	260	235	245	230	265	240	280	240	280	240	285	240	275	235	255	225		
26	285	240	275	235	245	230	260	235	250	235	270	245	270	255	285	250	270	235	270	240	235	220		
27	285	240	285	245	245	220	260	235	260	235	265	230	280	245	260	235	275	235	270	240	235	220		
28	280	235	275	235	245	220	260	235			275	245	275	245	265	225	285	245	285	230	230	220		
29	275	235	280	240	260	230	260	230			260	240	275	245	270	225	270	230	265	235	240	205		
30	270	240			255	235	265	225			260	240	260	235	270	240	275	225	265	235	240	210		
31	280	240			250	235							270	235	275	240			260	225				
Avg	279	238	279	241	265	234	256	231	260	236	271	241	270	239	269	238	271	235	270	238	253	224		
n	11	11	29	29	28	28	30	30	26	26	30	30	31	31	31	31	30	30	31	31	30	30		
Sd	5	4	5	4	21	11	6	6	6	5	9	6	7	6	10	9	8	6	6	4	10	7		
Max	285	245	290	250	295	250	265	240	270	245	290	255	280	255	290	255	285	245	285	245	270	235		
Min	270	230	265	235	235	215	240	215	245	230	250	230	255	225	250	225	255	225	260	225	230	205		

TABLE B3.—Continued.

1985 day	--Jan-- max	min	--Feb-- max	min	--Mar-- max	min	--Apr-- max	min	--May-- max	min	--Jun-- max	min	--Jul-- max	min	--Aug-- max	min	--Sep-- max	min	--Oct-- max	min	--Nov-- max	min	--Dec-- max	min
1											269	231	281	231	286	236							260	230
2			270	220	275	240			297	222			281	228	286	242							260	230
3			270	230							261	219	283	228	306	244					255	210	260	235
4			275	230			292	222			256	225	283	228			278	217			260	215	240	230
5			280	235							267	225	281	225	275	217	267	222			260	230	245	230
6			275	235					289	225					275	219					255	225	240	230
7			280	240	270	210			278	211	281	219			267	222	272	225			250	225	240	230
8			270	240	270	235	294	228	261	228			281	203	261	228	272	225			245	235	245	230
9			260	215					283	228			250	211			272	225			255	240	250	230
10			250	230			294	239	275	231	283	217	258	225			272	222			265	240	260	235
11			250	230	270	240	289	239			283	233	269	228							260	235		
12			270	240	270	230	292	236			283	231	272	233	278	219	272	222			265	240		
13			270	240	275	215			289	217	272	233	272	233	275	239					260	225		
14			270	230	275	225			289	225			256	236							255	230		
15			270	225			292	228					278	222	283	233					260	230		
16			265	230	280	230			292	236			278	222							245	230		
17			265	230	275	220	292	236	294	225	278	222									260	235		
18			265	240	285	220	289	242			278	236									260	230		
19			265	235	280	230	292	242			292	236	264	217	278	217					255	230		
20			275	240	280	205			294	217	283	239			267	214					260	235		
21			270	235	280	220			283	247	283	236			267	217					240	230		
22			280	245	280	200	292	222	289	233	281	239									250	230		
23			275	240	280	210	294	217	283	233			272	222	278	217					250	230		
24			275	240			300	219	300	236	289	222	292	228							250	230		
25			275	240	280	220			300	236	275	231	289	222							255	230		
26			275	225			297	217			267	231			281	217					260	225		
27			270	235	280	210			283	236	264	222			283	217					255	230		
28			275	240							278	244			275	222					255	225		
29							306	217	289	247			278	225	278	233					260	225		
30							300	219	286	244			267	222	278	228					255	240		
31									289	239			258	231										
Avg			270	234	277	221	294	228	287	231	276	230	273	225	278	225	272	223			256	230		
n			27	27	17	17	15	15	20	20	20	20	21	21	19	19	7	7			28	28		
Sd			7	7	5	12	4	9	9	10	9	8	11	7	9	10	3	3			6	7		
Max			280	245	285	240	306	242	300	247	292	244	292	236	306	244	278	225			265	240		
Min			250	215	270	200	289	217	261	211	256	217	250	203	261	214	267	217			240	210		

1986 day	--Jan-- max	min	--Feb-- max	min	--Mar-- max	min	--Apr-- max	min	--May-- max	min	--Jun-- max	min	--Jul-- max	min	--Aug-- max	min	--Sep-- max	min	--Oct-- max	min	--Nov-- max	min	--Dec-- max	min
1																	270	230	270	235	255	235	244	230
2															270	245	270	230	245	230	260	235	235	220
3															275	245	270	230	260	225	275	210	247	235
4															280	240	265	235	250	205	270	245	252	240
5															270	240	260	240	255	230	270	245	250	245
6															260	245	275	245	265	230	275	255	241	230
7															270	245	280	240	255	230	275	250	243	235
8															275	250	275	240	240	225	270	245	246	240
9															285	255	265	235	245	225	270	240	246	235
10															285	255	265	245	235	220	275	245	244	230
11															275	220	270	240	250	225	275	255	248	235
12															260	230	260	230	245	230	265	250	254	245
13															270	230	255	240	260	230	260	250	245	235
14															245	235	245	225	255	230	260	250	243	230
15															265	225	250	225	245	230	280	255	245	235
16															265	240	270	225	240	225	265	245	244	235
17															255	235	265	225	245	230	270	245	241	230
18															255	240	250	230	250	225	280	250	242	230
19															270	240	255	235	250	230	260	245	247	235
20															265	230	260	230	250	235	265	245	251	240
21															260	225	255	230	245	235	270	240	252	245
22															270	240	260	230	260	230	275	245	248	240
23															260	240	260	230	260	235	265	240	249	240
24															255	230	265	235	255	240	265	240	245	240
25															255	230	260	240	250	235	265	240	248	240
26															260	240	270	235	255	230	265	235	243	230
27															280	240	260	235	255	230	265	240	239	225
28															260	235	260	225	255	220	265	240	238	225
29															255	235	260	225	255	230	270	240	244	225
30															260	240	265	230	245	225	265	240	245	235
31															270	235			255	230			241	230
Avg															266	238	263	233	252	229	268	243	245	234
n															30	30	30	30	31	31	30	30	31	31
Sd															10	8	8	6	8	6	6	8	4	6
Max															285	255	280	245	270	240	280	255	254	245
Min															245	220	245	225	235	205	255	210	235	220

TABLE B3.—Continued.

1987 day	--Jan-- max	min	--Feb-- max	min	--Mar-- max	min	--Apr-- max	min	--May-- max	min	--Jun-- max	min	--Jul-- max	min	--Aug-- max	min	--Sep-- max	min	--Oct-- max	min	--Nov-- max	min	--Dec-- max	min
1	260	235	235	220			295	240			270	235	250	235										
2	265	240					280	245			260	245	245	215										
3	265	230	280	245			280	230			265	245	255	235										
4	250	230	280	240			280	235			265	240	260	240										
5	245	230	270	225			280	235			265	240	250	215										
6	235	225	265	230	280	240	250	230			265	225	245	220										
7			255	220	280	240	270	240			265	230	250	225										
8			240	225	280	230	285	245	260	235	270	240	245	230										
9			240	220	280	235	270	250	250	235	275	245	250	235										
10	250	225	255	230	280	220	270	235	245	225	270	245	250	235										
11	250	240	265	230	285	220			265	240	270	255	260	240										
12	250	235	265	225	280	215			285	250	280	235	260	240										
13	245	235	265	220	285	235			280	255	270	250	255	235										
14	240	230	275	230	270	230			260	245	270	255	250	230										
15	245	230	275	240	265	215			275	245	260	220												
16	245	235	275	240	270	215			260	240	260	220												
17	250	235	280	245	285	225			260	225	265	240												
18	250	240	255	235	270	240			265	225	270	245												
19	250	240	275	240	290	235			265	240	260	240												
20	250	235	275	240	285	245			270	245	280	245												
21	245	225	265	240	285	250			275	235	270	255												
22	240	225	275	245	280	245			260	235	265	250												
23	240	230	270	255	285	235			255	230	275	245												
24	240	225			300	235			240	230	265	240												
25	250	230			305	240			270	230	250	240												
26	235	225			305	250			275	240	260	230												
27	235	220			300	240			270	240	255	240												
28					305	240			275	240	260	240												
29	240	225			290	240			260	245	260	235												
30	240	235			290	235			275	250	260	240												
31	240	225			300	230			280	250														
Avg	246	231	265	234	286	234	276	239	266	239	266	240	252	231										
n	27	27	22	22	26	26	10	10	24	24	30	30	14	14										
Sd	8	6	13	10	11	10	11	6	11	8	7	9	5	8										
Max	265	240	280	255	305	250	295	250	285	255	280	255	260	240										
Min	235	220	235	220	265	215	250	230	240	225	250	220	245	215										

1988 day	--Jan-- max	min	--Feb-- max	min	--Mar-- max	min	--Apr-- max	min	--May-- max	min	--Jun-- max	min	--Jul-- max	min	--Aug-- max	min	--Sep-- max	min	--Oct-- max	min	--Nov-- max	min	--Dec-- max	min
1															265	235	260	235			250	235	260	235
2															265	245	270	230			250	235	240	225
3															260	235			265	230				
4															260	240			260	235	265	240		
5													265	235	270	255			265	240			250	215
6													250	240			275	240	265	235			255	220
7													275	230			270	240	260	240	270	240	250	215
8													260	240	275	235	265	240			265	235		
9															270	245	275	240			260	240	255	220
10															270	240					255	230		
11													260	240	270	240			270	235				
12													250	240	275	240	275	230					265	225
13													270	230			270	230	260	235			265	240
14													270	240			270	235	265	235	260	230	260	235
15											280	240	260	240	270	240	270	240			240	235	265	225
16											280	250			250	235	265	240			240	235	260	235
17											260	240			265	240			260	230	250	235		
18													270	240	270	240			260	235	255	235		
19													255	235	260	240	275	230					255	230
20											260	230	260	240			260	230	250	230			265	230
21											250	240					260	230	245	230	270	235	265	235
22											270	250	260	235	275	230	265	235			260	235	260	225
23											280	250			260	240	265	240			260	225	260	225
24											270	240			265	230			270	240				
25													265	230	265	235			270	240	255	230		
26													250	245	270	240	270	240	255	240				
27											260	230	235	230			250	230	265	235			270	225
28											270	240	250	245			260	240	265	235	260	240	270	235
29											265	245	265	240	265	235	265	240			260	230	270	235
30											270	240			260	240	265	230			260	235	270	235
31															260	240			260	230				
Avg											268	241	259	238	266	239	267	235	262	235	257	234	261	228
n											12	12	18	18	23	23	21	21	18	18	19	19	20	20
Sd											9	6	10	5	6	5	6	5	6	4	8	4	8	7
Max											280	250	275	245	275	255	275	240	270	240	270	240	270	240
Min											250	230	235	230	250	230	250	230	245	230	240	225	240	215

TABLE B3.—Continued.

1989	--Jan--		--Feb--		--Mar--		--Apr--		--May--		--Jun--		--Jul--		--Aug--		--Sep--		--Oct--		--Nov--		--Dec--	
day	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min
1			265	235	272	249			290	245	280	250			265	245					265	240	260	240
2			275	235	265	240			290	245	270	250			265	240			270	240	250	230		
3	270	230	270	235	270	240	285	225	280	250			270	235	250	220			240	240				
4	265	235					280	240	275	235					255	230			260	240			250	230
5	265	235					280	255	255	240	290	235	260	230			270	230	260	220			250	230
6	260	230	270	220	275	235	285	250			270	250	260	215			265	240	235	215	270	235	250	230
7			270	240	270	230	280	250			255	245	255	230	270	240	260	235			250	240	255	235
8			270	245	280	235					275	250			270	245	255	235			250	235		
9	265	230	270	230	270	245					285	250			270	250					245	240		
10	265	235	265	225	330	245	280	250	285	240			260	235	240	237			270	225				
11	270	255					285	250					265	240	250	235	270	240	255	240			265	230
12	265	225					280	250	300	240	275	250	265	245			265	245	250	230			250	240
13	270	230	270	225	265	215	285	250					275	250			265	235	250	235	250	230	250	235
14			270	240	260	210	280	250			265	250	270	250	265	235	270	240			260	240	255	240
15			265	240	260	220			300	235	280	245			255	245	275	240			260	240	260	240
16			265	230	270	230			285	245	295	250			260	230			265	240	255	240		
17	270	230	265	220	270	240	285	250	280	250			280	260	250	240			250	235	260	240		
18	270	240					295	250	295	255			270	250	250	215	270	240	250	240			265	230
19	270	240					280	250	290	255	275	245	260	245			270	230	240	230			260	230
20	270	235			270	230	285	235			260	240	270	235			260	235	250	230	265	240		
21			275	225	265	230	290	240			255	240	260	230	260	225	250	230			265	245		
22			275	245	275	230			290	235	255	250			265	250	255	240			270	230		
23	270	240	275	250	280	233			290	240	255	250			265	250			250	230				
24	270	250	260	220			285	250	240	235	260	260	260	235	260	225			260	230	260	240		
25	270	250					270	240	275	235	260	260	250	235	270	230	270	230	255	235				
26	270	225					290	255	270	240	265	235	260	230			270	250	250	230				
27	265	235	250	220	275	235	285	240			260	235					270	230	260	240	260	225		
28			260	240	265	235	280	250			270	240	260	220	275	240	270	240			260	240		
29					270	230					270	245			265	230	260	235			260	250	270	220
30					270	220			280	235	250	245			230	225			270	235	260	230		
31	275	225			275	225			270	240			270	235	250	235			260	245				
Avg	268	236	268	233	273	232	283	247	281	242	268	247	264	237	259	236	265	237	255	234	259	237	257	233
n	19	19	19	19	22	22	20	20	19	19	23	23	19	19	23	23	19	19	21	21	19	19	13	13
Sd	3	8	6	9	14	10	5	7	15	7	12	7	7	11	11	10	7	5	10	7	7	6	7	6
Max	275	255	275	250	330	249	295	255	300	255	295	260	280	260	275	250	275	250	270	245	270	250	270	240
Min	260	225	250	220	260	210	270	225	240	235	250	235	250	215	230	215	250	230	235	215	245	225	250	220

TABLE B4.—Monthly average maximum (above) and minimum temperatures (tenths of degree C), 1 m elevation, in the Lutz catchment, Barro Colorado Island, Panamá, 1971–1989.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1971			274	295	285	272	274	279	269	275	268	289
1972	267	277	287	293	296	281	288	277	274	271	276	278
1973	282	287	294	308	291	271	276	274	278	275	263	265
1974	276	281	290	302	309	292	272	280	282	273	263	271
1975	278	283	294	308	294	279	281	274	283	278	278	272
1976	281	287	294	312	299	296	301	294	282	291	284	292
1977	289	293	300	309	319	296	292	283	292	291	289	285
1978	286	297	310	303	273	282	293	289	283	258	271	275
1979	282	287	303	305	301	291	293	295	304	300	292	281
1980	292	292	310	305	305	291	294	291	281	285	285	283
1981	272	285	288	286	287	277	282	287	289	288	285	286
1982	295	300	306	313	302	297	289	297	292	282	309	303
1983	298	303	321	326	306	302						
1984	279	279	265	256	260	271	270	269	271	270	253	
1985		270	277	294	287	276	273	278	272		256	
1986								266	263	252	268	245
1987	246	265	286	276	266	266	252					
1988						268	259	266	267	262	257	261
1989	268	268	273	283	281	268	264	259	265	255	259	257
Avg	279	285	292	298	292	282	280	280	279	275	274	276
Sd	12.4	10.8	14.6	16.0	15.2	11.4	13.2	10.9	10.7	13.4	14.9	14.4

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1971			223	229	230	231	234	228	225	225	219	220
1972	214	219	219	233	237	235	238	230	228	221	227	230
1973	229	223	232	228	217	224	216	220	220	226	218	215
1974	215	213	215	224	225	214	217	220	216	216	215	218
1975	218	215	225	226	224	220	219	215	213	214	213	208
1976	209	211	216	215	221	216	224	227	218	228	226	232
1977	225	230	237	241	234	233	239	234	231	233	228	227
1978	223	227	232	231	248	224	256	219	203	230	210	204
1979	199	205	201	218	238	231	236	231	232	228	228	233
1980	238	230	243	239	252	246	248	241	239	241	234	224
1981	221	231	230	233	232	226	228	233	233	235	236	238
1982	232	237	238	243	246	248	246	248	241	236	241	246
1983	247	244	252	254	252	249						
1984	238	241	234	231	236	241	239	238	235	238	224	
1985		234	221	228	231	230	225	225	223		230	
1986								238	233	229	243	234
1987	231	234	234	239	239	240	231					
1988						241	238	239	235	235	234	228
1989	236	233	232	247	242	247	237	236	237	234	237	233
Avg	225	227	228	233	236	233	234	231	227	229	227	226
Sd	12.2	10.9	11.6	9.7	10.2	10.6	10.8	8.7	10.0	7.3	9.5	11.0

TABLE B5.—Daily maximum-minimum temperatures (tenths of degree C), 20 m elevation, Lutz tower, Barro Colorado Island, Panamá, 1981–1983.

1981 day	--Jan-- max	min	--Feb-- max	min	--Mar-- max	min	--Apr-- max	min	--May-- max	min	--Jun-- max	min	--Jul-- max	min	--Aug-- max	min	--Sep-- max	min	--Oct-- max	min	--Nov-- max	min	--Dec-- max	min
1															306	200	283	211	300	228	306	231	278	228
2															256	222	283	211	300	233	300	222	278	217
3															325	206	311	228			306	228	300	244
4																	278	189	311	228	317	228	308	244
5															283	214	317	222	267	233	306	233	294	233
6															278	222	306	211	306	233	300	239	306	233
7															300	233	267	228	289	228	294	239	311	233
8															283	228	289	222	278	228	278	228	294	233
9															294	222	283	231	272	222	278	233		
10															283	228	289	211	294	222	294	233	278	239
11															269	239	278	222	283	217			294	233
12															294	222	289	222			283	233	261	228
13															256	222	283	217	294	222	272	233		
14															269	225	322	217					272	239
15															306	228	283	222	283	222	294	228	283	239
16															311	228	289	233	283	217	278	228	289	244
17															300	233	278	228	272	222	278	239		
18															311	222	294	217	294	228	292	239		
19															289	222	289	250	283	228	289	239	311	244
20															300	228	289	233	289	222	294	233	294	239
21															272	217	311	239	294	228	294	228	300	233
22															294	233	306	239	283	228	272	233	278	233
23															311	228	306	239	278	217	289	233	317	233
24															289	228	306	233	294	222	283	231	272	228
25															289	225	278	233	300	222	289	239	317	239
26															283	211	311	228	306	228	294	250	317	239
27															289	222	267	222					311	239
28															283	222	267	233	300	228	289	239		244
29															306	217	289	206	311	233	306	228	328	250
30															294	228	306	211	300	233	289	239	300	244
31															244	211			300	228			300	228
n															30	30	30	30	27	27	27	27	26	27
Avg															289	223	291	224	291	226	291	234	296	236
Sd															18	8	15	12	12	5	11	6	17	7
Min															244	200	267	189	267	217	272	222	261	217
Max															325	239	322	250	311	233	317	250	328	250

1982 day	--Jan-- max	min	--Feb-- max	min	--Mar-- max	min	--Apr-- max	min	--May-- max	min	--Jun-- max	min	--Jul-- max	min	--Aug-- max	min	--Sep-- max	min	--Oct-- max	min	--Nov-- max	min	--Dec-- max	min
1	311	239	311	228	306	244	311	250			356	233	322	264			311	228	342	233	319	233	325	250
2	300	228	294	239	294	244	306	239			339	256					311	236			306	236	336	253
3	289	228	317	228	306	233			283	233	333	239			311	253	314	256					339	250
4	356	233	311	239	300	239			325	236	328	222			311	244			325	225	322	239		
5	289	228	306	250	306	211	372	244	328	239					328	244			283	231	319	231		
6	294	228	306	261	311	222	300	239	333	244			308	239	328	239			300	228			344	236
7	278	222	300	250	300	239	317	244	336	236	339	228	283	244			317	233	303	239			347	231
8	306	228	317	250			322	244			333	233	311	244			314	244	286	233	314	233	339	233
9	289	228	306	239							311	244	328	225	322	228	311	244	308	222	297	239	314	236
10	311	233	306	244					339	236	278	233			319	247	303	239			317	250	303	242
11	311	233	306	250					328	244	317	244			325	247			319	231	322	247	336	244
12	300	239	300	250			328	233	294	244			325	247	311	256			317	231			328	250
13	294	244	306	256			261	211	333	244			272	228	322	231	317	236	297	233			328	253
14	300	244	306	244			311	233	325	244	339	239	317	239			333	247	328	242	322	242	333	256
15	300	244			311	244	306	233			333	250	317	250			325	242	311	231			300	256
16	306	250	311	239	306	239	306	239			322	244	328	242	319	250							328	247
17	278	239			322	233			339	233	306	244	311	239	317	244	328	233					300	250
18	300	233	300	233	311	233			344	244	300	244			283	269	322	239	294	225			317	250
19	300	233	300	228	304	244	317	239	344	233					322	233			300	231			317	222
20	311	244	300	239	306	239	311	244	311	233			317	217	311	256	322	222	289	239			328	225
21	306	233			311	244	317	250	292	244	333	233	311	244			300	231	272	233			319	250
22	311	244	306	217	311	256	306	256			322	244	322	250			322	222	317	233	328	233	314	239
23	306	228	300	233	306	250	303	256			317	244	317	250			336	244			317	228	322	244
24			300	239	317	256			350	239	300	250									322	231	322	244
25	311	239	294	244	306	239			300	244	300	236			328	233			300	228	300	256	333	244
26	311	233	300	228	317	256	322	244	317	233	311	244			322	239			308	228	294	239	333	239
27			306	233			328	244	311	244			331	236	317	256	331	228	308	231				
28	311	217	300	250			333	256	333	244	317	233	278	239	317	228	344	239	294	228			311	236
29	306	217			322	233	322	244			311	247	311	231			333	239	311	228	328	247		
30	306	233			294	256	300	236			317	250	297	233	319	228	328	239			331	244		
31					300	250									333	256							294	206
n	28	28	25	25	22	22	21	21	20	20	23	23	19	19	20	20	20	20	22	22	16	16	26	26
Avg	303	234	304	240	308	241	314	242	323	240	320	241	311	240	318	244	321	237	305	231	316	239	324	242
Sd	14	8	6	10	7	11	20	10	19	5	17	8	16	10	10	11	11	8	16	5	11	8	14	11
Min	278	217	294	217	294	211	261	211	283	233	278	222	272	217	283	228	300	222	272	222	294	228	294	206
Max	356	250	317	261	322	256	372	256	350	244	356	256	331	264	333	269	344	256	342	242	331	256	347	256

TABLE B5.—Continued.

1983 day	--Jan-- max	min	--Feb-- max	min	--Mar-- max	min	--Apr-- max	min	--May-- max	min	--Jun-- max	min	--Jul-- max	min	--Aug-- max	min	--Sep-- max	min	--Oct-- max	min	--Nov-- max	min	--Dec-- max	min
1	283	244	314	231	325	264	344	244	322	253	364	247												
2	331	256	317	233	317	261	336	236	319	244	333	261												
3	322	247	328	239	331	256	350	253	314	250	322	228												
4	301	236	311	250	322	247	336	261	311	228	306	244												
5			306	233	328	231	328	261	333	247	308	244												
6	322	253	311	228	331	244	317	264	333	256	317	239												
7	311	250	325	231	339	242	333	261	319	253														
8	322	250	311	244	342	233	339	239	322	244	344	244												
9	306	250	317	217	328	228	333	247	322	253	322	242												
10	306	253	319	264	328	253	333	250	333	261	325	244												
11	294	256	322	219	325	256	347	261	339	261	311	236												
12	314	253	328	222	314	256	333	256	331	267	322	244												
13	311	242	325	233	311	244	331	239	311	244	339	250												
14	303	236	322	253	311	225	331	247	311	244	333	250												
15	306	222	306	253	319	233	322	247	267	247	336	253												
16	308	250	306	244	356	247	314	253	281	236	328	256												
17	317	244	322	244	356	253	339	258	306	244	327	248												
18	311	244	311	239	347	253	322	258	347	242	339	233												
19	319	247	306	244	367	250	342	239	331	250	311	256												
20	308	242	300	256	344	256	356	244	317	247	342	247												
21	322	249	281	242	322	256	356	236	325	244	278	244												
22	306	250	311	253	356	267	353	239	336	261	331	256												
23			306	258	328	267	322	253	325	256	314	247												
24	314	250	311	256	322	258	322	256	314	264														
25	314	253			325	239	342	256	322	256														
26	306	250	314	253	314	247	336	261	328	256														
27	311	239	325	256	314	247	325	242	322	250														
28	289	244	336	256	328	256			322	256														
29	314	250			311	261	272	236	317	239														
30	322	256			328	244	300	239																
31	311	233			331	233			333	244														
n	29	29	27	27	31	31	29	29	30	30	22	22												
Avg	310	247	314	243	330	249	332	250	320	250	325	246												
Sd	10	7	11	13	14	11	17	9	16	8	17	8												
Min	283	222	281	217	311	225	272	236	267	228	278	228												
Max	331	256	336	264	367	267	356	264	347	267	364	261												

TABLE B6.—Monthly average maximum (above) and minimum temperatures (tenths of degree C), 20 m elevation, Lutz tower, Barro Colorado Island, Panamá, 1981–1983.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1981								289	291	291	291	296
1982	303	304	308	314	323	320	311	318	321	305	316	324
1983	310	314	330	332	320	325						

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1981								223	224	226	234	236
1982	234	240	241	242	240	241	240	244	237	231	239	242
1983	247	243	249	250	250	246						

TABLE B7.—Daily maximum-minimum temperatures (tenths of degree C), 40 m elevation, Lutz tower, Barro Colorado Island, Panamá, 1981–1983.

1981 day	--Jan-- max	min	--Feb-- max	min	--Mar-- max	min	--Apr-- max	min	--May-- max	min	--Jun-- max	min	--Jul-- max	min	--Aug-- max	min	--Sep-- max	min	--Oct-- max	min	--Nov-- max	min	--Dec-- max	min
1															339	256	311	222	322	239	322	217	278	222
2															311	256	306	228			311	211	278	221
3															333	214	328	233			322	222	303	239
4																	286	196	333	233	328	217	317	239
5															311	222	356	228	322	233			311	228
6															367	244	322	222	328	239	278	261	306	222
7															361	239	333	233	311	233	306	233	306	222
8															317	239	333	233	300	233	289	222	300	228
9															322	228	311	239	311	228	294	228		
10															311	233	317	222	322	233	308	222	283	233
11															294	244	311	233	300	222			300	228
12															322	233	322	228			306	222	261	222
13															281	233	317	222	328	228	283	222		
14															294	233	328	228					278	233
15															328	214	306	233	372	228	306	217	300	233
16															333	233	333	244	317	228	306	217	300	233
17															322	244	294	233	328	233	294	228		
18															344	233	333	222	317	233	306	228		
19															372	222	322	244	317	233	300	231	306	233
20															328	239	322	244	339	250	306	228	306	228
21															300	228	333	244	333	233	306	222	297	222
22															300	233	328	250	322	233	283	228	289	222
23															333	222	356	250	300	233	300	222	306	222
24															317	233	328	244	328	228	300	222	289	217
25															311	233	333	244	328	233	317	228	311	228
26															317	222	344	233	311	261	306	211	311	228
27															311	233	300	233					306	228
28															294	233	311	244	317	222	306	228	306	228
29															328	222	333	217	322	228	311	222	317	239
30															311	228	328	222	311	222	300	222	300	239
31																			311	222			294	222
n															29	29	30	30	26	26	26	26	27	27
Avg															321	233	323	232	321	232	304	224	298	228
Sd															21	10	16	12	14	8	12	9	13	6
Min															372	256	356	250	372	261	328	261	317	239
Max															281	214	286	196	300	222	278	211	261	217

1982 day	--Jan-- max	min	--Feb-- max	min	--Mar-- max	min	--Apr-- max	min	--May-- max	min	--Jun-- max	min	--Jul-- max	min	--Aug-- max	min	--Sep-- max	min	--Oct-- max	min	--Nov-- max	min	--Dec-- max	min
1	311	228	306	222	306	239	300	239			333	228	311	256			294	219	319	225	311	225	306	239
2	306	217	300	228	294	239	294	239			322	250					319	247			311	228	314	242
3	294	222	300	222	300	228			322	225	333	228			308	239	319	247					317	244
4	311	222	311	228	294	233			317	231	322	222			311	233			311	219	317	228		
5	306	217	300	239	294	206	306	233	319	233					311	233			289	219	314	222		
6	300	222	300	244	306	211	300	228	317	233			314	228	311	228			306	217			319	225
7	289	211	300	239	300	228	311	233	311	228	328	222	283	233			314	222	303	231			322	219
8	311	217	306	239			311	239			322	228	300	233			300	239	289	225	308	228	317	222
9	294	228	300	228							308	239	322	217	317	222	306	233	311	211	300	228	314	231
10	311	222	306	239					322	228	294	222			303	244	297	231			317	244	311	233
11	306	228	306	239					322	236	322	239			306	239			300	222	317	242	314	247
12	294	228	300	239					322	239			311	239	314	247			308	219			306	244
13	294	233	306	244			261	206	328	233			278	239	311	222	303	228	311	225			303	244
14	300	233	306	233			322	228	311	233	328	228	319	239			319	239	317	239	317	222	317	244
15	306	239			306	239	311	222			322	244	306	244			311	239	311	222			300	247
16	294	239	317	228	300	233	311	233			317	239	311	233	306	239							322	239
17	294	239			306	228			322	228	317	236	308	239	317	239	314	228					300	239
18	300	222	300	222	303	228			333	233	303	239			297	233	311	228	306	214			294	239
19	300	228	306	222	300	233	311	228	333	222					308	222			294	222			294	222
20	317	233	300	228	300	233	300	233	314	225			311	211	306	250	300	211	292	228			300	214
21	306	228			300	233	300	244	289	233	322	233	306	239			311	222	267	225			297	239
22	317	233	294	211	300	253	300	244			317	233	306	244			311	211	314	222	306	222	297	228
23	300	228	294	233	294	239	306	247			317	239	308	244			331	233			303	217	317	236
24			294	233	311	244			328	233	300	244									308	222	322	239
25	311	228	294	239	308	233			300	239	300	228			317	228			306	222	300	244	322	233
26	311	228	300	222	311	244	306	233	306	228	317	233			317	228			311	222	294	228	317	233
27			311	228			311	239	306	239			311	231	308	253	311	219	306	222				
28	300	211	306	244			311	253	311	239	317	228	283	231			333	228	306	219			300	225
29	317	211			306	228	317	233			311	239	300	222			319	228	317	211	319	222		
30	300	228			294	244	300	231			311	244	297	222	303	222	322	233			311	233		
31					300	239									319	247							311	211
n	304	226	302	232	302	233	304	234	317	232	317	234	305	234	310	235	312	229	304	222	310	228	310	234
Avg	28	28	25	25	22	22	20	20	20	20	23	23	19	19	19	19	20	20	22	22	16	16	26	26
Sd	8	8	5	9	5	10	12	10	11	5	10	8	12	10	6	10	10	10	12	6	7	8	9	10
Min	317	239	317	244	311	253	322	253	333	239	333	250	322	256	319	253	333	247	319	239	319	244	322	247
Max	289	211	294	211	294	206	261	206	289	222	294	222	278	211	297	222	294	211	267	211	294	217	294	211

TABLE B7.—Continued.

1983 day	--Jan-- max	min	--Feb-- max	min	--Mar-- max	min	--Apr-- max	min	--May-- max	min	--Jun-- max	min	--Jul-- max	min	--Aug-- max	min	--Sep-- max	min	--Oct-- max	min	--Nov-- max	min	--Dec-- max	min
1	278	250	300	222	317	258	317	239	306	244	350	236												
2	311	244	300	228	306	253	317	231	311	233	328	250												
3	300	236	311	228	314	247	333	244	308	244	314	217												
4	300	233	294	239	314	239	322	250	306	222	317	233												
5			300	233	317	228	322	250	322	244	300	239												
6	306	242	300	222	314	236	306	256	319	244	328	233												
7	300	239	308	225	317	231	319	250	317	244														
8	306	244	300	233	325	228	325	231	317	242	328	242												
9	300	244	308	217	317	222	317	236	317	247	308	231												
10	300	242	300	203	314	244	317	242	319	253	322	233												
11	294	244	197	203	314	244	322	250	325	256	308	231												
12	300	239	314	219	314	256	319	244	333	258	317	239												
13	294	231	317	228	294	233	317	239	306	233	328	239												
14	289	228	306	242	297	222	308	239	306	233	331	244												
15	289	217	294	256	300	225	311	236	267	239	328	247												
16	300	239	300	233	342	225	306	244	283	231	319	244												
17	292	231	311	233	333	242	322	247	308	239	307	228												
18	303	231	300	231	325	244	311	247	333	233	333	222												
19	300	239			353	244	322	231	322	242	311	256												
20	306	236	289	244	336	250	331	239	317	239	333	239												
21	311	244	281	233	322	247	333	228	317	242	278	233												
22	311	253	306	244	339	256	333	233	325	250	322	247												
23			294	247	317	256	311	247	317	247	311	239												
24	317	239	306	244	306	250	322	250	311	256														
25	311	242			308	231	328	244	311	247														
26	306	239	306	244	306	244	319	256	317	244														
27	308	231	322	247	300	242	311	233	317	239	239													
28	300	233	333	244	322	247			317	244	244													
29	300	242			306	250	272	225	314	233	233													
30	267	239			311	236	303	231																
31	306	225			311	233			325	239	239													
n	28	28	25	25	30	30	28	28	29	29	21	21	21											
Avg	301	237	300	233	316	240	317	241	314	242	318	237	237											
Sd	9	7	23	13	13	10	12	9	13	8	13	9	9											
Max	317	253	333	256	353	256	333	256	333	258	333	256	256											
Min	267	217	197	203	294	222	272	225	267	222	278	217	217											

TABLE B8.—Monthly average maximum (above) and minimum temperatures (tenths of degree C), 40 m elevation, Lutz tower, Barro Colorado Island, Panamá, 1981–1987.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1981								321	323	321	304	298
1982	304	302	302	304	317	317	305	310	312	304	310	310
1983	301	300	316	317	314	318	315	313	305	308	314	298
1984	282	287	291	299	299	280	264		284	285	278	283
1985	274			290	296	290				283		256
1986			284	283	294	296	286	289	291	278	287	285
1987	281	281	299	290	288	292	290					
Avg	288	293	298	297	301	299	292	308	303	297	298	288
Sd	11.7	8.7	10.9	11.3	10.4	13.8	17.5	11.9	14.1	15.6	13.6	16.9

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1981								233	232	232	224	228
1982	226	232	233	234	232	234	234	235	229	222	228	234
1983	237	233	240	241	242	237	245	243	236	232	236	233
1984	233	238	238	237	239	238	227		227	227	223	234
1985	228			236	236	234				226		228
1986			230	237	236	237	240	237	232	228	236	236
1987	238	237	238	240	238	242	240					
Avg	232	235	236	238	237	237	237	237	231	228	230	232
Sd	4.8	2.8	3.7	2.3	3.1	2.6	6.2	3.8	3.2	3.5	5.5	2.9

TABLE B9.—Hourly average shade temperatures (tenths of degree C), laboratory clearing, Barro Colorado Island, Panamá, 1983–1987.

	Hour of day																								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Avg
1983:																									
Jun	260	257	257	255	255	255	255	255	256	260	263	270	271	276	275	276	276	275	271	270	268	266	265	261	265
Jul	270	266	262	262	259	258	258	260	270	283	299	313	323	325	327	324	317	308	300	292	287	282	278	273	288
Aug	260	262	258	257	256	257	262	267	277	287	294	294	297	299	296	289	285	279	272	269	266	259	262	262	274
Sep	246	246	245	243	243	243	249	260	269	276	283	285	279	268	268	262	256	250	247	245	245	245	243	244	256
Oct	237	236	236	235	235	235	242	255	269	280	288	290	287	280	270	259	251	245	242	240	240	239	238	238	253
Nov	236	234	234	234	234	234	240	253	266	277	286	288	287	281	268	257	249	244	240	240	239	238	237	236	252
Dec	240	238	238	238	236	236	241	252	266	280	290	294	292	284	273	263	253	249	247	245	244	242	241	241	256
1984:																									
Jan	235	234	232	231	229	228	227	230	244	268	289	299	302	302	296	281	268	258	250	245	241	240	239	237	254
Feb	240	239	238	237	236	234	235	241	257	278	293	299	303	301	294	281	270	262	255	251	248	245	243	242	259
Mar	245	243	243	242	240	239	241	250	268	283	297	299	302	302	298	288	279	271	263	257	253	253	251	251	265
Apr																									
May																									
Jun																									
Jul	236	236	235	235	234	233	234	244	257	268	277	282	281	276	272	267	261	255	248	243	241	240	238	237	251
Aug	235	235	234	233	232	234	240	254	264	273	280	282	276	270	263	256	251	244	241	239	238	237	237	236	249
Sep	232	231	230	229	229	229	230	241	257	270	280	284	286	277	265	258	252	245	239	236	234	234	234	233	247
Oct																									
Nov	228	227	226	225	225	224	224	231	244	261	270	277	276	273	264	258	252	243	236	234	232	232	229	229	242
Dec	232	231	230	230	229	229	235	247	268	281	290	293	290	284	272	264	255	247	243	241	239	237	235	234	252
1985:																									
Jan	231	231	230	229	229	226	233	244	264	281	286	293	293	287	270	260	253	244	242	239	237	236	236	233	250
Feb																									
Mar	236	234	234	232	231	229	229	239	261	279	295	303	309	308	300	285	272	260	251	246	244	243	240	238	258
Apr	239	238	237	235	233	235	249	269	287	303	311	314	312	307	296	282	269	258	252	248	245	244	242	239	264
May	244	243	242	241	240	240	239	241	253	271	286	300	304	305	298	290	278	269	260	253	250	249	247	246	262
Jun	243	242	241	241	240	239	239	240	250	265	277	286	292	289	280	272	267	262	256	251	249	247	245	244	257
Jul	242	241	240	240	239	238	237	235	236	244	260	271	279	284	287	285	278	268	262	257	251	246	244	242	254
Aug	240	240	238	237	237	236	235	234	234	242	257	270	282	292	293	284	275	268	262	256	250	246	244	242	254
Sep	240	240	238	238	238	236	236	236	244	261	276	289	297	296	292	281	271	263	257	249	245	243	241	242	256
Oct	239	237	236	236	235	234	234	241	255	269	281	285	284	280	272	267	260	252	247	243	241	240	239	239	252
Nov	239	237	237	236	235	234	233	234	243	257	274	283	291	291	288	278	269	262	255	249	246	244	242	240	254
Dec	236	234	234	233	232	232	233	237	248	264	277	283	284	285	281	273	264	257	250	245	242	240	238	236	252
1986:																									
Jan	242	241	240	239	237	236	235	239	252	270	284	294	296	296	289	277	268	260	253	248	246	245	243	243	257
Feb	232	230	227	225	224	223	222	228	247	274	291	301	306	309	302	286	275	263	253	246	241	238	233	232	254
Mar	244	242	241	240	239	238	237	237	248	270	290	305	315	316	315	308	294	281	268	259	254	251	249	247	266
Apr	250	249	248	247	245	245	244	245	254	271	287	297	301	301	298	294	286	276	266	260	256	255	253	252	266
May	249	246	245	243	242	241	239	241	254	272	287	298	304	307	306	304	296	284	272	262	257	253	251	249	267
Jun	248	247	246	245	244	243	242	242	252	266	279	293	302	305	301	291	276	267	262	256	252	251	250	249	263
Jul	251	250	249	249	248	247	246	246	252	264	278	288	294	296	296	289	283	275	266	259	257	255	253	253	265
Aug	249	248	248	248	247	246	245	245	251	265	278	290	293	295	289	285	280	272	264	257	253	250	250	249	263
Sep	243	241	240	240	240	238	237	238	247	259	272	280	290	296	293	285	272	262	255	248	246	245	243	243	257
Oct	239	237	237	236	236	236	235	236	244	257	267	276	282	283	280	273	264	256	249	243	240	240	239	239	251
Nov	244	243	243	241	240	240	240	241	248	262	280	291	294	293	286	281	274	266	257	251	248	245	244	244	259
Dec	243	241	240	240	240	238	237	237	244	257	278	290	297	298	295	291	279	269	262	255	251	248	245	243	260
1987:																									
Jan	245	245	244	243	242	241	241	241	246	258	277	291	300	302	301	294	281	271	263	256	252	248	247	245	261
Feb	244	243	242	242	240	239	239	239	245	259	276	288	296	299	300	296	286	273	263	255	250	248	246	245	261
Mar																									
Apr	251	251	250	250	250	248	249	248	251	263	274	278	284	287	286	279	278	267	260	255	253	250	252	250	261
May	240	240	240	238	236	235	236	238	256	275	281	285	289	288	287	281	274	268	257	250	247	244	242	241	257
Jun	245	245	245	245	244	244	241	240	249	261	268	275	279	286	285	283	278	268	259	252	248	248	246	245	258
Jul	253	254	253	251	251	250	249	247	252	262	272	284	293	297	297	291	285	277	270	264	259	257	255	254	266
Aug	251	251	250	248	248	248	248	248	258	272	284	296	302	301	292	288	281	273	264	259	256	255	254	252	266
Sep	244	261	243	243	239	238	237	258	280	287	284	289	309	306	280	269	263	256	250	247	246	245	245	243	259
Oct	243	242	241	241	240	239	239	241	250	264	278	288	294	295	292	286	277	268	260	253	250	247	245	244	259
Nov																									
Dec																									

TABLE B10.—Hourly average shade temperatures (tenths of degree C), 1 m elevation, Lutz catchment, Barro Colorado Island, Panamá, 1984–1987.

	Hour of day																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Avg
1984:																									
Jan		246		244		241		239		250		270		279		273		266		256		250		247	
Feb	249	246	249	245	247	243	247	243	244	253	254	270	272	278	278	275	274	265	262	257	256	253	251	249	257
Mar	241	241	240	239	238	237	236	239	242	245	251	256	261	261	261	260	258	255	252	249	246	243	242	241	247
Apr	237	237	237	235	235	234	233	233	237	243	247	250	252	252	254	252	249	246	243	241	240	239	238	238	242
May	241	240	241	243	244	246	246	246	248	249	251	252	253	252	247	246	244	242	241	240	239	238	238	238	246
Jun	248	247	248	246	245	245	245	247	252	257	262	264	267	265	263	261	258	257	254	252	252	250	250	249	253
Jul	245	245	244	244	244	243	242	243	245	250	256	261	265	265	262	261	260	257	255	252	249	248	247	246	251
Aug	246	245	245	244	244	244	242	243	245	249	255	260	264	266	264	261	258	255	254	251	249	248	247	246	251
Sep	241	241	240	239	239	239	238	239	241	247	254	261	264	266	264	259	256	253	249	246	245	243	243	242	248
Oct	243	242	242	241	241	241	241	243	249	256	262	267	268	264	258	254	251	248	246	245	244	243	243	243	249
Nov	230	230	229	228	228	227	227	227	229	234	240	245	249	250	248	246	243	241	237	234	233	232	231	231	235
Dec	220	218	215	210	208	205	203	203	203	208	215	220	225	223	225	223	218	213	205	200					
1985:																									
Jan																									
Feb	239	238	239	239	239	237	236	235	236	242	252	259	264	269	267	265	261	257	252	248	244	243	241	241	248
Mar	239	237	235	234	233	232	229	227	232	239	244	259	265	269	273	269	265	260	255	249	245	243	242	238	247
Apr																									
May																									
Jun	265	266	266	266	266	266	266	265	269	275	280	285	289	288	285	279	279	274	272	271	271	269	268	267	273
Jul	272	267	267	265	265	262	262	262	263	270	278	282	285	288	288	285	283	283	280	275	273	270	270	270	275
Aug	226	225	224	223	224	222	221	222	226	231	236	242	248	249	249	244	241	239	237	234	231	230	228	227	233
Sep																									
Oct																									
Nov	235	235	234	234	231	232	231	234	237	241	246	250	253	254	252	249	247	244	242	241	240	238	237	237	241
Dec	235	235	235	235	235	235	235	235	238	241	244	246	247	248	248	248	244	243	240	239	238	236	235	235	239
1986:																									
Jan																									
Feb																									
Mar																									
Apr																									
May																									
Jun																									
Jul																									
Aug	246	245	245	244	244	244	243	242	243	246	251	257	260	263	260	259	258	256	253	250	248	246	246	246	249
Sep	240	240	239	239	238	238	237	237	238	242	246	251	257	258	257	256	251	247	246	243	242	241	240	240	244
Oct	235	234	233	233	232	232	231	231	233	237	241	243	246	247	248	247	245	242	240	236	236	236	235	234	238
Nov	251	249	249	248	248	247	247	247	247	252	257	259	264	265	264	262	261	260	257	254	253	252	251	251	254
Dec	240	240	240	238	238	237	237	236	237	241	245	249	256	258	258	258	256	254	250	247	244	244	241	240	245
1987:																									
Jan	234	234	234	233	233	233	233	232	233	236	238	240	242	243	243	242	240	238	237	235	235	235	234	234	237
Feb	240	240	239	239	238	236	236	238	241	247	253	260	264	264	264	261	256	253	249	248	245	244	243	243	247
Mar	244	243	241	240	239	237	236	235	237	244	255	266	278	282	284	282	276	271	264	259	255	252	249	246	255
Apr	247	247	245	244	243	242	241	242	244	249	255	262	265	266	267	267	264	262	257	253	252	251	249	248	253
May	245	245	245	244	243	243	242	243	245	249	253	255	260	261	262	262	259	257	254	252	250	248	248	247	251
Jun	248	248	248	248	248	247	246	246	247	250	254	257	260	262	262	261	258	255	251	250	248	248	248	248	252
Jul	238	237	238	236	236	234	231	231	233	236	239	242	244	249	246	244	242	241	239	238	237	239	239	238	240
Aug																									
Sep																									
Oct																									
Nov																									
Dec																									

TABLE B11.—Hourly average shade temperatures (tenths of degree C), 40 m elevation, Lutz catchment, Barro Colorado Island, Panamá, 1983–1987.

	Hour of day																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Avg
1983:																									
Mar	254	253	252	251	250	249	256	271	286	293	298	299	300	300	296	289	278	268	263	261	259	257	256	255	271
Apr	257	255	255	254	252	251	259	272	282	292	300	307	306	304	302	296	286	273	266	264	262	261	259	258	274
May	257	256	255	253	253	253	260	273	289	302	306	308	310	305	299	290	282	272	265	262	260	259	258	257	275
Jun	252	251	250	249	249	251	260	275	290	300	311	305	306	298	295	286	280	271	261	259	257	256	254	252	272
Jul	253	253	252	252	251	250	254	267	282	295	301	308	301	293	289	282	278	269	261	257	257	255	255	254	269
Aug	252	251	250	248	247	248	252	266	279	294	301	305	300	297	293	282	273	265	276	258	257	255	254	254	269
Sep	244	243	243	242	241	240	246	259	273	283	289	292	294	287	276	268	261	254	248	247	246	246	245	244	258
Oct	239	238	239	238	238	237	242	256	267	280	293	299	297	291	280	265	254	246	244	243	243	241	240	240	256
Nov	244	243	242	242	240	239	243	257	270	285	302	309	303	296	287	272	259	252	250	249	248	246	246	245	261
Dec	240	240	238	238	237	238	239	249	259	269	283	284	281	282	275	268	260	251	248	246	245	244	243	242	254
1984:																									
Jan	243	242	240	239	238	236	235	246	255	266	273	277	279	277	277	271	264	256	251	250	248	246	245	244	254
Feb	248	246	246	243	244	243	243	252	263	271	279	283	283	282	276	271	266	260	255	253	251	250	248	248	258
Mar	246	246	243	242	241	241	246	258	266	276	282	288	290	289	284	278	272	261	256	255	252	250	249	248	261
Apr	250	248	247	245	244	241	243	254	267	277	288	293	293	294	290	284	275	267	260	258	255	253	252	250	264
May	247	245	245	244	244	243	246	256	267	280	287	294	292	287	278	272	267	261	256	254	252	250	249	248	261
Jun	246	246	244	243	242	241	241	246	254	263	269	273	275	273	269	266	261	256	254	252	250	251	248	247	255
Jul	231	237	243	245	249	246	247	247	247	246	243	241	240	240	239	237	235	234	235	235	234	235	236	234	241
Aug																									
Sep	235	235	234	233	233	231	231	232	240	251	261	269	273	276	272	263	257	251	246	240	238	237	237	236	246
Oct	237	236	236	234	234	233	233	234	240	251	261	269	276	279	273	265	254	247	243	240	238	238	238	238	247
Nov	231	230	230	229	227	227	227	226	233	245	254	262	267	271	269	263	258	252	244	238	238	235	235	233	242
Dec	243	241	240	238	239	237	237	238	244	257	266	272	278	280	279	275	271	265	257	251	249	247	245	245	254
1985:																									
Jan	236	235	234	233	233	232	231	232	238	250	258	265	269	271	273	270	267	262	253	247	244	241	241	238	248
Feb																									
Mar																									
Apr	246	245	243	241	241	240	238	237	239	251	262	269	280	284	285	285	285	280	272	263	256	253	250	248	258
May	247	245	244	243	243	241	240	240	252	269	274	284	287	290	285	280	273	265	259	253	251	251	250	249	259
Jun	260	256	252	248	248	247	246	245	245	246	246	246	245	244	243	243	250	261	267	291	294	276	269	265	256
Jul																									
Aug																									
Sep																									
Oct	235	234	233	233	232	231	229	230	238	252	260	269	273	273	270	263	260	254	248	242	239	237	236	236	246
Nov																									
Dec	234	233	232	232	231	230	231	232	235	241	246	251	255	255	253	251	248	245	241	239	237	237	235	234	240
1986:																									
Jan																									
Feb																									
Mar	241	239	237	236	237	236	234	234	240	256	266	278	280	283	282	282	276	272	261	250	246	244	243	241	253
Apr	247	246	246	243	243	244	244	244	250	261	270	277	276	275	271	272	266	261	257	253	251	251	249	249	256
May	247	245	244	242	242	240	239	241	251	267	275	281	286	288	288	287	279	272	264	256	253	252	250	249	260
Jun	246	245	244	244	242	241	241	241	250	260	273	283	289	290	286	279	268	262	258	252	250	249	247	247	258
Jul	249	248	248	248	247	246	245	244	250	260	270	276	280	282	280	276	271	266	260	255	253	252	251	251	259
Aug	247	247	246	245	245	244	243	243	250	262	272	279	281	280	275	274	269	263	257	251	248	247	247	248	257
Sep	242	241	240	239	239	238	237	237	245	257	269	278	283	281	279	271	261	254	250	246	244	243	242	242	252
Oct	234	234	233	232	232	231	231	231	240	250	258	266	270	271	268	264	256	250	243	237	236	236	235	235	245
Nov	277	278	276	272	268	267	261	251	248	247	246	246	246	245	242	242	241	240	239	238	238	247	260	270	253
Dec	246	246	245	244	245	244	242	240	244	256	265	272	276	277	276	274	270	265	254	249	246	246	247	248	255
1987:																									
Jan	244	243	243	242	241	241	240	241	244	255	266	272	277	278	279	275	272	266	257	251	247	247	247	244	255
Feb	247	246	244	244	243	242	242	242	244	254	264	271	276	278	277	278	275	269	260	252	250	248	248	247	256
Mar	247	245	244	243	241	240	239	240	249	265	278	288	292	295	295	292	287	280	268	259	255	252	249	248	262
Apr	251	249	249	248	247	246	246	247	256	268	274	278	277	276	279	277	276	270	263	254	254	253	252	250	260
May	247	247	246	244	243	243	243	245	253	265	272	279	283	281	281	276	270	265	259	254	252	251	250	249	258
Jun	252	251	251	251	251	249	249	249	256	267	274	280	284	288	284	280	275	267	261	256	254	253	252	252	262
Jul	251	251	250	249	248	246	243	243	248	258	268	275	281	284	282	276	270	267	262	257	255	254	253	253	259
Aug																									
Sep																									
Oct																									
Nov																									
Dec																									

Appendix C: Relative Humidity

TABLE C1.—Midday relative humidity, laboratory clearing, Barro Colorado Island, Panamá, 1971–1989.

1970	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												
20												
21												
22												
23												
24												
25												
26												
27												
28												
29												
30												
31												
Avg												
Min												
Max												

1971	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1									77	67	83	87
2								84	97	79	75	73
3								92				75
4										79	77	
5								84			71	
6								76		68		72
7									72	70		70
8									66	81	94	74
9								77	82	84	88	85
10								99	76		93	65
11								73			92	
12								80		62	69	
13								94	78	78		64
14									89	88		71
15									69		77	
16								71	67		87	78
17								71	77		98	70
18								76		75	79	
19								97		70	71	
20									76	69		61
21									98	70		63
22									78	75	72	67
23								80	72		75	62
24								81	98		73	
25								70	75			
26								99		79	92	
27										72		66
28										75		66
29									80	78	85	77
30								74	68		66	77
31								74				
Avg								82	79	75	81	71
Min								99	98	88	98	87
Max								70	66	62	66	61

1972	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1		75	68		76	71		77	89		76	70
2		73	75		92			82		78	77	
3	82	80		64	78		85	77				
4	78	67		61	81			77				75
5	91			63	73	86	72		83			
6	93		65	66		82	83		76	85	83	79
7	98	69	62	69		92	91	78	88			
8		71	62		74	89		76	89		80	
9		78	60		94	80		91			75	
10	77	73	67	89	83		67	78		88	83	
11	88	67		98	75		100	78	89	89		
12	82			69	74	96			98	98		70
13	75		67	70		63	72		88	87	83	74
14	96	64	63	70		80	72	99	90		78	82
15		65	67		98	66		90	99		80	78
16		67	61		78	75		90		85	83	
17		63	60	66	64		74	80		74	80	
18	89	70		89	73		73	78	80	82		95
19	72			77	67	98			82	89		85
20	80		69	84		98	92		100	98	74	77
21	72		69	83		74	78	92	87		84	69
22		61	55		73	76		100			79	
23		92	54		70	98		77				
24	63	66	62	83	72		92	75		84	75	
25	69	81			83		78	99	94	98		
26	65		61	69	76	86	82		84	96		
27	66		61	67		82	74		87	80	74	66
28	67	68	69	80		71	75	91	97		81	69
29		70	62			74		83	78		75	
30					80	81		85		95	73	
31	76				83		74	98		76		
Avg	79	71	64	75	78	82	80	85	88	87	79	76
Min	63	61	54	61	64	63	67	75	76	74	73	66
Max	98	92	75	98	98	98	100	100	100	98	84	95

1973	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1		82		77		66		62		70	67	
2	74	66	71	65	60		62			70		
3	79			70								72
4	74			81	58	86				89		86
5	84	69	70	92		75	66		55	71	70	55
6		78	61			79	71	77	58		73	
7		67	63		83	86		85	74			95
8	72	65	66		54	64		69			83	
9	76	67	55	72	55		66	75				
10	83	71		73	52			57	57	67		69
11	90			75		98				81		68
12	97	80	61	76		72	72		59	78		75
13		72	59	83		82		53	72		73	52
14			66		61	64		58	59		85	68
15	78	73	67		72	69		74		63	77	
16	67	73	70	73	71		65	69		84		
17	80			77	79		67	64	71	74		72
18	85			73	70				71	61		64
19	77					90			65	76		62
20		70	73				77	65			67	66
21			74		51				87		73	62
22	72	81	80		48	76					63	
23	76	69	79	88	56		49			55		
24	74			79	58		71	70	63	64	98	
25				75	89	55	56		94	68		
26	72		61	76					67	65		66
27			62	70			66	60			74	74
28			56			56			67		71	
29	72		63								80	
30			60		67		62	55		63	87	
31	87						63	70		67		
Avg	78	72	66	76	64	75	65	66	68	70	76	69
Min	67	65	55	65	48	55	49	53	55	55	63	52
Max	97	82	80	92	89	98	77	85	94	89	98	95

TABLE C1.—Continued.

1974	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1					67		96	83		96	85	
2					83		89			79		92
3				64	67	76	100		76	82		85
4			89			76			83			79
5			69	67		70	79	83	79		66	89
6			64		62	70		89	79		92	92
7					79	70		92			92	82
8			67	64	60		76	85			96	85
9				61	62		73	86	89			82
10				60	89	67	79		76			75
11			82	57		76			76		85	93
12			60			85	85	96	67		85	89
13					60	67		89	100		79	77
14			67		76	73		73			82	68
15			78	64	92			74			92	67
16				72	82		96	82	76		100	88
17				75	75	82	67		79			89
18			64	76		72	92		78		85	82
19			61	70		67	85	77	73		96	82
20			66		54	82		82	76		88	85
21			61		62	78		89			96	85
22			64	78	62		92	82			100	73
23				70	100		92	89			92	96
24				64	85	79	72		82		78	82
25			58	65		79	92		76	89	89	
26				73		79		92	92		85	72
27			61			76		92			92	69
28			61		70	85		76			93	73
29			59	64	71			85		89	100	67
30				67	70		82	79	85	75		75
31							79			85		78
Avg			67	67	73	75	85	85	80	85	89	81
Min			58	57	54	67	67	73	67	75	66	67
Max			89	78	100	85	100	96	100	96	100	96

1975	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	76	73	76	67	69	93	92	89		82	75	89
2	78		49	64	92	89	85	73	72	96	75	92
3	75	65	66	64		73	100	73	92	89	78	88
4	66	75	96	64	73	85	92	76	85		82	89
5	67	82	75	65	61	92	78	96	93	96	82	85
6	78	78	92	78	65	96	71	100	73	89	92	92
7	82	88	66	63	60	73	76	89		96	69	82
8	78	72	76	70	76	73	92	92	78	82	73	89
9	82	68	70	96	68	83	76	92	82	96	85	
10	78	69	69	70	73	76	48	82	92	89	96	96
11	80	65	75	64	73	79	79	76	75		88	
12	73	75	69		64	76	82	85	85		82	89
13	78	71	61		100	89	75	96	67		78	100
14	78	69	67	73	79	70	75	96	79	85	85	85
15	85	53	62	75	100	85	82	82	81	89	88	82
16		57	61	61	79	89	79		89	72	92	85
17	76	70	67	61	85	85	85		64	82	96	82
18	76	70	69	67	85	89	85		76	69	85	92
19	78	72	67	86	92	85	64	96	82		85	85
20	85	70	64	86	85	76	96	89	89	96	89	85
21	89	72	64	67	73	100	82	93	78	96	75	85
22	82	57	53	64	73	85	76	82	72	96	79	96
23	82	73	62	73	88	76	92	79	85	85		88
24	75	75	69	64	73	96	77	79	78	82	88	78
25	39	67	85	76	85	82	82	85	82	96	96	
26	72	66	73	70		79	76	89	85	96	89	
27	78	67	70	70	96	85	92	82	82	75		61
28	82	82	62	69	77	80	79	82	82	89	85	56
29	76		70	61	81	80	82	92	89	89	73	75
30	72		62	61	100	92	82		78	82	85	85
31	76		70		73		85			92		85
Avg	76	70	69	70	79	84	81	86	81	88	84	85
Min	39	53	49	61	60	70	48	73	64	69	69	56
Max	89	88	96	96	100	100	100	100	93	96	96	100

1976	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1		62	72	67	80		79	92		72		79
2	85	71	75	76	75	68	73	92	92	73	100	76
3	92	68	76	61	76	76	85	89	92	73	82	73
4	72	72	69	72	78	92		89	64	73	100	79
5	88	72	72	85	76	78	89	89	79	70	100	72
6	75	72	67		75	73	89	72	89	79	100	92
7	78	78		73	100	73	71	79		65	85	89
8	82	68	69	84	100	88	79	92	79	85	92	85
9	82	71	72	52	79	78	79	73	79	73	96	82
10	78	68	67	57	73	76	67	65	82		92	73
11	59	72	64	63	77		79	80	85		92	83
12	75	69	70	66	79	74	79	79	85		85	
13	75	76	72	67	65	73	96	92	73	50	85	73
14	75		73	72	82	73	92	70	60	79	76	77
15	82		73	77	73	78	82	73	88	79	78	92
16	92		69	66		89	68	85	85	67	70	67
17	72	66	65	66		79	73	80	85	79	67	82
18	72	61	73	74	57	70	85	76	67	85	76	89
19	78	66	75		67	73	79	61	73	65	61	
20	79	72	88	61	92	79	67	82		100	66	
21	82	58	73	61	67	79	79	79	85	89	73	79
22	76	60	73	66	82	79	73	85	82	78	85	100
23	60	78	67	67		73	100	85	92	78	73	100
24	78	81	72	79	82	74	85	85	100		74	78
25	78	67	67		92	79	73	85	100		79	61
26	78	66	61	92	79	92	79	93	73	47	82	78
27		78	73	82	63	70	70	92	79	82	79	85
28	72	72	67	76	73	73	76	64	57	89	61	100
29	65		67	93	100	92	73		59	79	93	71
30	72		67	96	79	89	96		76	100	65	79
31	62		67		79		77	72				72
Avg	76	70	71	72	79	78	80	81	80	76	82	81
Min	59	58	61	52	57	68	67	61	57	47	61	61
Max	92	81	88	96	100	92	100	93	100	100	100	100

1977	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	88	56	70	62	73	82	96	96	89		79	85
2	78	100	64	85	70	85	85	73	100		79	92
3	67	67	67	78	67	82		89		82	85	
4	72	73	70	61	64	73		72		92		
5	76	82	67	51	100	78	100	79		100		86
6	72	100	70	67	49	82	88		86	70		89
7	64	75	62	55	85	89	92		82	85	92	92
8	72	78	67	78	78	100	92	100	83		89	85
9	71	73	72	61	78	82		85	86		86	100
10	76	73	72	53	76	79		85			93	
11	67	78	67	78	67	80	77	79		100	96	
12	72	78		82	73	78	71	79	96	85		92
13	67	62	67	75	77	92	71		76	68		92
14	57		45	72	74	73	79		76	89	92	76
15	78	59	63	85	73	85	89	100	92		85	76
16	70	75	69	79	57	85	85	100	72		85	73
17	72	100	100	79	61	79	96	100		85	82	
18	57	78	100	60	79	79	82	100		82	85	
19	66	78	62	78	100	68	83	100	68	82		92
20	69	78	65	67	85	73	92		82	100		79
21	78	67	66	64	72	93	85		79	73	79	72
22	100	67	63	70	79	100	77	79	89		72	78
23	61	67	58	79	63	85		86	77		85	82
24	64	70	55	85	57	85		100				
25	75	73	56	66	78	93	82	79		85	89	
26	85	92	85	61	78	89	78	79	92	82		
27	85	72	85	73	79		100		73	89		89
28	52	73	57	79	67	79	85		83	79	79	73
29	61		70	82	85	100	83	68	100		79	78
30	61		67	66	92	100		64	73		86	52
31	61		70		76			93		82		
Avg	71	76	68	71	75	84	86	86	84	85	85	83
Min	52	56	45	51	49	68	71	64	68	68	72	52
Max	100	100	100	85	100	100	100	100	100	100	96	100

TABLE C1.—Continued.

1978	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1		100	68		79	89		93		79	83	76
2		68	57		93	89		100		92	73	
3	72	85	57	67	80		96	100		86		
4	85			70	71		100	93		85		93
5	72			62	74		85		68			92
6	78	67	73	70		96	100		73		85	92
7			67	67		85	92	92	79		93	85
8		70	61		79	83		80	96		76	100
9	79	79	62		100	93		100		92	76	
10	78	82	73	68	61		93	100		79		
11	85			65	73		100	79	73	85		67
12	67			89	76	100	89		68	82		100
13	61	55	67	68		68	89		100		89	89
14		85	67	100		93	85	76	73		85	62
15		82	63		100	100		100	85	82	93	70
16	53	70	60		100	78		74		82	100	
17	69	72	72	92	83		92	89		79	100	
18	69			76	73		92	73	83	100		64
19	82			92	85	76	85		73	89		93
20	61		61	76			92		100			79
21		57	89	79		96	89	100	100		76	
22			73		89	86		68	93	79	79	70
23	67	72	79		100	100				82		
24	78	64		89	89		52	70		92	86	
25	67			100	89		83	86	76	72		
26	72			73	93	96	85		79	92		82
27	70	62	60	52		98	82		82		100	73
28		67	96	77		86	73	82	85		74	70
29			85			100		100	96		68	82
30	61		64		82	82		89		100	79	
31	88		100		67		85	85		85		
Avg	72	73	71	77	83	90	88	88	83	86	84	81
Min	53	55	57	52	61	68	52	68	68	72	68	62
Max	88	100	100	100	100	100	100	100	100	100	100	100

1979	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1		92			63						67	79
2	73	61		76	63						78	79
3	69			70	65					92	92	83
4	61			92	79					88		
5	59	79	60	79	92					78	79	70
6		63		85	71					88	85	70
7		67			80					92	85	70
8	72	57			80					67	70	79
9	61	78		82						92	74	72
10					71					89	73	73
11	64			71	79					82		68
12	59	70	55	73	82					82		67
13		62	58		92					85	88	65
14		67	62		89					72	88	82
15	70	66	64		79					79	73	92
16	67	79	68	73						77		79
17	64			85	92				60	73	73	73
18	70			85	85				73			72
19	64		59	83	67				80	64	76	76
20		67	56	80					96	72	88	67
21		73	67						92	78	82	78
22	67	73	59						89	92		75
23			61	74					92	81	82	
24	64								96	65	76	64
25	78			89					96	82		64
26	67		52	79					96	76	67	61
27			74						89	75	81	67
28			73	73					100		79	92
29	59		73	89					89	89	80	77
30	72		65	60						73	92	73
31	72			63						76		89
Avg	67	70	63	78	78				88	80	79	74
Min	59	57	52	60	63				60	64	67	61
Max	78	92	74	92	92				100	92	92	92

1980	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1		63	61	58		85	80	83			89	89
2	82	61		65	52		74	89	89	83	82	
3	82			67	57	68	82	77	96	89	73	
4	79	60	52	64	62	66	83		76	89	79	73
5	73	85	58	57		74	74	79	77	85		89
6	73	81	57	63		92	80	92	76	82		79
7	62	88	64		82	82		77	89	82	79	76
8	83	69	57		82	92	89	80	89	85	76	83
9	65	72	67	67	76		83	85	85	85	75	
10	60			51	64	82	79	89	80	79		85
11	76	73	63	51	65	79	86		82	82	75	89
12	73	62	61	51		85	89	83	86	89		73
13		67	77	54	66	85	82	74	69	73	85	85
14		57	67		92	82		77	85		85	85
15	78	72	67	76	68	74	89	86		85	92	
16	67	64	65	51	66		96	82	79	78	82	96
17	73			62	67	79	89	96	79	85		
18	69	79	63	58	82	73	83			80		85
19	82	72	56	76		67	86	77	89	76		85
20		62	54		79		85	83	89	77		82
21	67	67	64		83	76		79	96	85	79	79
22	79		60	70	79	70	96	73		82	83	82
23	72						93	85	76	85	92	78
24	78			96	79	77	74	79	68	82	89	
25	79	62	78	69	68	77	89		73	93	85	96
26	71	59	73	67		76	77	66	73	74	92	96
27	86	64	60			79	76	80	100		89	89
28	65	67	67		61	74		83	88		89	72
29	67	61	76			80	**83**			85		
30	73		70	67	73		**89**			83		92
31	69				73		**96**			92		92
Avg	73	68	64	64	72	78	85	81	83	83	84	85
Min	60	57	52	51	52	66	74	66	68	73	73	72
Max	86	88	78	96	92	92	96	96	100	93	92	96

1981	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	75	89		73	73	78	72	86	85	70	79	89
2	76	96	76	70		85	67	85	82	68	73	93
3	96		96	65	80	89	96	96	78	82	86	93
4		85		70	86	89	89	82	85	62	82	
5	89	61	79	68	79	93		92	63	64	79	89
6	76		82	82	73	93	79	85	85	67		92
7	85	76	72	62	86			86	76	79	82	86
8		96	92	64	82	89	82	80	82	72	96	86
9	79	79		67	79	92	82	100	76		80	92
10	71		96	79		86	76	85			96	
11		83	79	72	82	86	76	86		72		96
12	81	67	85		96	92			72	82		73
13	81	76	67		80		79		62	78		92
14	65	75		72	96	96	76	76				82
15	78	79	67	82		73	85	83	67	96		69
16	66	96	64	78		92	89	83			77	
17	73	92	73			82	82	67	64	96	77	73
18	92	79	86	96		69		82	56	82	89	93
19	59	73	67				79	82	64	85	89	
20	82	89	67	96	77	73			70	96		79
21	73	70	64	82	77	93			79	96		79
22	79	92	56	85	89			79	100		67	96
23	88	75	64	96	89	79		73	70		37	82
24	82		70	96		79	89		70	96		89
25	82	61	79			96	80	82	76	88	96	92
26	79	65	100		67	82	86	79	73	88	73	
27		76	70	96	37	89	77	85		77		
28	85	79	70	88		92		73	73	73	78	72
29	75		76	88	96		77	75	70		85	67
30	78		73	77	73		86		65	80	89	96
31	96						86	73		86		89
Avg	79	80	76	79	80	86	81	82	74	81	81	86
Min	59	61	56	62	37	69	67	67	56	62	37	67
Max	96	96	100	96	96	96	96	100	100	96	96	96

TABLE C1.—Continued.

1986	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1				72		67	82	73				
2				64	77	60	68		73			
3			75	67		79			73	82	73	67
4		75	76	67		56			82	72		
5		72	70		92	76		89	85	67		
6			64		78					68		
7		72	61	60	67		92	77		76	79	
8				67	70							
9				64	51	68	76		72			89
10	76		61			100	76		76	92	79	64
11			72			82	77	79	73			80
12			67		59	79		82	79		100	79
13		64	67		64	79		82	78		96	77
14	82	64	67	65	50		83	96		52		51
15	82			92	69		80	65	78	96		64
16				67	89	74	100		68			78
17	72		55	100		80			73	96	96	72
18		82	67	64		74	85	88	100		82	72
19		85	67		79	68			92		88	82
20		75	64		73	68		89	74	82		
21			76		100		100	92	79			
22	78			65	82		96	77	79	73		72
23					70	89	82		64	70		86
24		61	75			78			79		82	79
25		63	61			85		71	96			
26		64	64		65	76			79			64
27	69	60			82	80		68				64
28		67			61		83			79		78
29					64		76	89	78	85		64
30	72					100				92		75
31	72				65							62
Avg	75	70	67	70	72	77	84	81	79	79	86	72
Min	69	60	55	60	50	56	68	65	64	52	73	51
Max	82	85	76	100	100	100	100	96	100	96	100	89

1987	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1		73	73	64	82	92	73	96	93	89		64
2	59	76	64			80	76	92	96	85		92
3	59	68		64		77	85		90	86	92	88
4	67	67	64	73	74	86	78		96	89	78	88
5	66	73	67	72	70	85	100		93		92	67
6	75	65	58	79	60	80	74	93	93	80		
7	72		54			80		86		82	92	88
8	64	46	64	82	100	68	82	96	92			
9	66	68	54	73	96	77	83	93	93	85	73	82
10	65	78	56		78	89	77		89	83	77	82
11	80		60	77	66		83	93	93	73	65	89
12	59	78	62	68	76	85	83		90		68	82
13	73	65	53	74	92	93			93	70	86	81
14	73	72	75	76		79	93	93			85	85
15	76		64	73	82		77	96				100
16	79		59		82	100	85	93	93	53	85	73
17	79	67	72			83	82		93	85	74	77
18	71	64	65		78	92	78	90	93	85	71	60
19		61	65			74	74	93	86		79	79
20	64	82	62	71			77	93	92	75		93
21	64	67	72	77	82		100	90		73	79	80
22	62	79	62	82	82	83	100		93	85	79	68
23	66	82	61	68	92	80			90	82	85	68
24		64	65	82		85	93		96	72	85	
25		70	65	82		80	89	93	93	96	100	64
26	67	67	60	92		89	93	93	92		96	73
27	64	72	56	100	73	89		93	93	73	79	93
28	64	73	60		92	80		77		72	92	73
29			60	96	68	85			74	96	67	64
30	67		56	100	93	92	96		100	85	79	86
31	67		56		86		93			92		62
Avg	68	70	62	78	81	84	85	92	92	81	82	79
Min	59	46	53	64	60	68	73	77	74	53	65	60
Max	80	82	75	100	100	100	100	96	100	96	100	100

1988	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	67		54	65	65	65	85	79	79	89	89	100
2	65	76	63	65	68	89	74	89	61	100	73	96
3	65	70	58	65	77	66	85	85		82	85	92
4	65	58	73	73	89	56	85	79		79	79	100
5	65	74	65	60	83	59	82	86		73	67	79
6	57	65	65	68	92	74	83		68	100	83	76
7	64	89		54	100	77	82	96	79	77	100	73
8	61	77	54	63	100	77	100	80	71	80	100	
9	78	70	60		77	82	89	77	79	68	100	89
10	78	73	82	81	93	100	83	82	85		89	83
11	67	68	52	92	96	60	96	76	83	82	93	82
12	62	55	65	53	100	60	89	73	100	85	82	79
13	67	65	65	59	96	80	77	86	73	73	85	85
14	92	68	52	56		64	85	86	76	96	100	60
15	61	60	57	74		65	96	89	73	100	100	82
16	89		57	82	68	83	89	86	77	89	89	96
17	73	65	78	65	74	76	83	82	93	76	89	85
18		62	77	68	74	85	100	100	93	100	96	
19	61	62	90	73	96	92	79	77	82	100	96	76
20	64	76	83	61	100	85	85	81	85	100	89	57
21	57	68	68	56	96	83	100	81	76	92	89	64
22	61	77	61	63	90	77	100	79	79	68	73	67
23	81	96	57	65	66	79	79	65	100	84	76	82
24	57	64	60	65	74	89	79	89	83	73		80
25	73	82	67	60	66	92	89	73	83	76	92	83
26	59	85	65	65	100	61	100	85	100	79	82	80
27	71	55	65	57	100	67	93	93	85	61	85	67
28	50	66	62	73	89	93	89	93	79	96	82	76
29	64	71	82	65	65	73	100	93	80	89	89	77
30	60		73	65	93	82	86	85	89	100	77	79
31	65		61		68		80	85		85		82
Avg	67	70	66	66	85	76	88	84	82	85	87	80
Min	50	55	52	53	65	56	74	65	61	61	67	57
Max	92	96	90	92	100	100	100	100	100	100	100	100

1989	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	82	64	59	65	60	78	88	64	85		89	82
2	68	58	73	65	73	92	88	85	92	96	85	76
3	92	58	60	51	96	68	82	96	92	85	73	92
4	82	60	75	67	82	68		61	89	78	73	64
5	78	60	75	65	67	100	78	83	73	88		82
6	100	64	79	65	78	82	82	92	64	67	89	76
7	78	66	55	73	77	76	88	77	92		100	96
8	76	58	67	65	78	64	85	65	67		96	85
9	64	60	67	65	65	89	85	92	92		96	79
10	61	61	56	62	53	86	65	85		73	78	76
11	72	64	81	64	47	83	79	96	89	100	76	85
12	73	59	85	67	60	78	67	82	78	89	76	82
13	67	61	56	67	100		67	82	64	57	78	67
14	89	75	59	70	74	70	86	92	65	67	67	64
15	73	65	63	65	67	60	68	89	85	73	82	73
16	76	57	72	61	68	77	76	92	67	100	96	
17	64	59	63	64	63	80	85	92	78	92	96	
18	67	61	64	64	68	80	85	85	76	88	96	60
19	61	61	65	57	60	100	82	92	67	89	89	68
20	72	54	51	47	62	82	82	85	92	100	76	
21	83	67	59	67	62	100	100	76	85	88	74	
22	83	67	61	64	77	96	85	82	65	100	92	
23	72	85	61		92	82	78	92	85	67	85	
24	75	81	72	93	76	82	75	77	65	89	92	
25	61	58	72	60	89	89	100	67	65	82	100	
26	64	81	67	67	73	76	89	85	76	76	76	
27	64	64	74	60	82	61	79	85	65	68	59	100
28	50	76	100	64	92	79	75	68	76	89	82	92
29	50		55		76	92	76	88	78		82	88
30	61		61	65	65	65	76	82		67	83	79
31	72		48		73		89	57		67		79
Avg	72	64	66	65	73	81	81	82	77	82	84	79
Min	50	54	48	47	47	64	65	57	64	57	59	60
Max	100	85	100	93	100	100	100	96	92	100	100	100

TABLE C2.—Midday relative humidity, 1 m elevation, Lutz catchment, Barro Colorado Island, Panamá, 1971-1981.

1970	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												
20												
21												
22												
23												
24												
25												
26												
27												
28												
29												
30												
31												
Avg												
Min												
Max												

1971	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1									98	79	95	97
2								95	98	91	87	95
3								88				81
4										94	94	
5								92			96	
6								95		84		85
7									89	81		89
8									91	95	98	85
9								96	91	96	97	90
10								99	94		96	84
11								88			97	
12								85		78	91	
13								97	97	87		73
14									94	98		80
15									93		94	
16								91	96		94	80
17								82	95		98	91
18								95		95	91	
19								97		91	82	
20									95	88		73
21									99	82		77
22									89	89	86	82
23								94	91		88	75
24								91	100		94	
25								86	93			
26								98		86	98	
27										85		80
28										88		91
29									94	93	93	77
30								89	82		80	82
31								87				
Avg								92	94	88	92	83
Min								99	100	98	98	97
Max								82	82	78	80	73

1972	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1		89	78		86	93		90	91		91	83
2		89	82		97			88		88	91	
3	95	88		88	91		89	83				
4	92	85		67	94			89				85
5	93			69	88	98	94		92			
6	98		78	70		92	82		90	91	86	85
7	98	78	71	76		98	98	85	95			
8		86	76		92	93		85	97		91	
9		91	78		94	95		91			84	
10	94	88	82	92	98		76	93		95	91	
11	95	85		98	92		100	90	92	93		
12	93			87	80	98			98	98		85
13	89		81	78		89	84		86	89	95	84
14	98	87	75	73		92	82	99	96		90	87
15		74	79		97	84		95	99		92	80
16		78	73		85	93		94		90	91	
17		76	80	72	78		86	91		86	87	
18	96	78		93	92		85	92	96	91		98
19	85			83	85	98			88	94		91
20	86		78	90		99	97		99	99	88	91
21	88		74	94		95	96	98	96		91	93
22		71	68		92	92		99			89	
23		92	58		77	99		86				
24	79	75	73	94	92		98	90		91	97	
25	80	88			93		92	99	98	99		
26	90			81	88	97	92		93	96		82
27	78		67	80		90	96		95	92	96	78
28	74	77	73	97		76	84	98	98		90	
29		78	73			92		92	84		87	
30			80		94	95		95		99	82	
31	91				86		85	99		86		
Avg	90	83	75	83	90	93	90	92	94	93	90	86
Min	74	71	58	67	77	76	76	83	84	86	82	78
Max	98	92	82	98	98	99	100	99	99	99	97	98

1973	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1		88		77	85	89				70		96
2	82	83	89	65	84		62	93		70		69
3	80			70	83			96				85
4	82			81		90				89		
5	86	73	82	92		92	66		83	71	94	86
6		85	82		89	92	71	93	86		98	
7		76	79		86	97		89	90		96	
8	79	73	79		74	92		94			94	87
9	83	77	77	72	78		66	91				100
10	88	79		73	77			95	91	67		92
11	98			75		98				81		85
12	98	83	79	76		95	72		89	78	98	92
13		80	75	83	75	95		91	97		97	
14			84		90	86		93	88		95	
15	89	88	76		90	84		95		63	92	94
16	79	81	84	73	88		65	94		84	98	88
17	86			77	82		67	89	95	74		87
18	86			73					93	61		85
19	85					95			99	76	90	83
20			87		79	89	77	92			89	
21			89		65	95			92		88	
22	86	86	90		87	94						
23	81	76	83	88	97		49			56	92	
24	92			79	89		71	92	92	64		
25				75		97	57		99	68		
26	81		72	76					93	66	98	91
27			75	70		99	66	91			96	86
28			73			87			98		94	
29	81		76		90			88			94	
30			72		93		62	93		63		
31	90						63			67		
Avg	86	81	80	76	84	93	65	92	92	70	94	88
Min	79	73	72	65	65	84	49	88	83	56	88	69
Max	98	88	90	92	97	99	77	96	99	89	98	100

TABLE C2.—Continued.

1974	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1					72		100	92		92	100	
2					76		96			96		100
3				72	73	92	100		92	92		96
4			85			85			100	92		96
5			78	72		79	92	100	96		92	92
6			75		73	82		100	96		92	96
7					67	85		100			100	92
8			78	66	78		92	100			96	92
9				96	61		89	96	100			100
10				67	85	96	96		100			92
11			88	76		96			92		96	96
12			85			100	96	100	92		92	92
13					70	89		100	100		96	92
14			75		89	100		96			96	89
15			85	75	100			93			96	89
16				72	63		84	96	96		92	92
17				85	79	88	96		100			96
18			72	85		96	100		96		96	92
19			72	78		89	100	89	92		100	92
20			75		72	100		100	96		96	92
21			72		82	96		96			100	96
22			75	85	73		100	100			100	96
23				78	100		100	100		96	96	89
24				69	96	100	100		96		85	100
25			69	70		85	100		89	96	100	
26				78		85		100	100		96	85
27			75			100		100			96	88
28			72		82	96		92			92	88
29			60	78	85			96		100	100	93
30				82	89		96	96	92	96		88
31							100			100		85
Avg			76	77	79	92	97	97	96	96	96	93
Min			60	66	61	79	84	89	89	92	85	85
Max			88	96	100	100	100	100	100	100	100	100

1975	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	85	76	67	72	96	92	100	100		96	92	96
2	88		72	69	92	96	96	92	100	96	92	96
3	88	75	85	72	65	96	100	92	100	100	92	96
4	85	81	100	72	66	96	92	96	100		96	100
5	85	96	96		82	100	78	100	100	89	96	100
6	88	85	96	92	76	82	78	100	85	100	100	96
7	92	92	82	63	76	92	92	96		100	92	92
8	89	78	79	75	82	93	96	100	100	100	89	96
9	88	82	73	100	73	96	96	92	96	100	100	
10	85	78	82	85	67	93	93	92	100	92	96	100
11	67	78	85	72	82	89	96	96	92		100	
12	62	82	82		75	85	96	96	96		96	100
13	85	84	69		96	100	85	100	92		96	100
14	88	88	75	70	85	85	92	100	92	100	96	92
15	89	68	72	88	100	92	92	100	96	96	69	92
16		82	83	69	96	100	92		96	92		92
17	89	59	78	69	100	100	96		92	96	100	88
18	82	78	72	72	85	100	100		92		96	96
19	82	78	72	61	92	96	76	100	96		100	78
20	89	61	72	67	93	96	92	100	96	100	92	71
21	92	75	69	75	93	96	96	100	92	100	96	
22	88	72	82	69	79	92	89	100	92	96	85	100
23	92	82	100	78	96	96	100	96	92	96		96
24	85	78	73	78	89	100	92	96	96	96	96	92
25	70	75	88	89	79	100	100	100	96	92	100	
26	53	72	76	85		96	85	100	92	92	96	
27	85	75	75	85	100	93	96	100	92	96		71
28	96	92	79	75	89	96	100	100	85	100	100	92
29	85		67	69	100	96	100	100	100	96	85	88
30	85		73	72	79	100	96		96	100		96
31	85		73		100		100			100		96
Avg	84	79	79	76	86	95	93	98	95	97	94	93
Min	53	59	67	61	65	82	76	92	85	89	69	71
Max	96	96	100	100	100	100	100	100	100	100	100	100

1976	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1		100	78	75	89		96	85	93	92		92
2	92	81	85	78	85	85	85	85	100	89	92	100
3	92	81	96	78	88	89	92	89	92	92	88	92
4	88	85	88	92	96	100		100	78	92	100	92
5	96	88	78	85	85	96	100	93	85	92	85	78
6	92	81	78		88	79	100	92	93	92	92	92
7	88	85		82	100	79	89	96		92	79	100
8	92	71	85	67	100	96	85	79	85	100	92	93
9	100	85	85	67	92	92	89	85	93	100	92	89
10	85	81	75	64	92	96	89	82	89		100	89
11	88	78	72	75	79	84	79	82	89		96	92
12	85	81	75	81	75	82	89	93	96		92	
13	88	78	78	78	79	79	92	96	92	85	100	85
14	81		88	72	92	79	96	89	93	89	92	92
15	88		75	66	93	92	93	92	100	89	96	82
16	92		75	72		96	82	92	100	100	85	89
17	88	74	75	82		85	89	85	100	93	78	92
18	85	72	75	78		89	82	89	85	92	96	100
19	84	78	85		67	85	85	85	92	85	75	
20	92	78		72	96	64	79	82		100	78	72
21	92	82	88	67	93	92	85	96	92	92	85	92
22	92	78	89	75	85	96	93	96	96	100	85	100
23	65	85	72	72		92	100	100	92	92	92	100
24	85	92	85	89	96	85	89	96	100		89	92
25	85	78	78		100	96	85	92	100		85	72
26	88	75	78	92	92	92	85	92	92	85	92	72
27		88	78	78	89	92	89	92	92	85	92	85
28	92	78	78	73	85	92	85	85	82	96	92	100
29	81		84	100	85	96	89		85	92	100	88
30	84		78	100	85	96	79		96	100	85	81
31	100		71		100		85	92				88
Avg	88	81	80	78	89	89	89	90	92	93	90	89
Min	65	71	71	64	67	64	79	79	78	85	75	72
Max	100	100	96	100	100	100	100	100	100	100	100	100

1977	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	72	84	85	66	76	85	100	100	96		92	92
2	72	92	78	66	76	92	92	96	100		92	100
3	85	82	78	66	67	82		92		96	92	
4	85	85	82	66	67	67		85		92		
5	85	72	72	60	100	66	100	82		100		92
6	78	72	85	67	76	88	96		96	89		92
7	82	85	72	67	79	96	96		93	89	100	100
8	92	85	75	67	79	100	100	100	85		100	100
9	92	78	66	76	79	92		100	85		92	92
10	92	85	82	67	75	100		92			96	
11	82	82	72	78	73	78	76	100		100	100	
12	78	72	85	78	73	78	85	93	100	93		96
13	78	72	85	88	70	100	76		85	85		96
14	82	78	55	78	64	100	85		89	100	100	100
15	85	75	72	78	56	88	92	100	92		100	88
16	85	88	75	48	54	100	92	100	93		92	89
17	78	100	100	85	67	79	89	100		100	92	
18	72	92	100	75	100	100	89	100		92	92	
19	78	85	85	85	100		89	100	89	96		96
20	71	92	89	76	100	93	100		82	92		85
21	85	78	72	76	92	96	89		100	89	89	82
22	100	78	63	67	92	100	89	96	100		89	85
23	85	72	72	72	92	100		96	93		96	85
24	85	78	65	69	92	92		100				
25	85	78	69	72	85	93	96	92		100	100	
26	89	85	72	69	92		92	93	96	100		
27	96	100	72	73	85		96		85	100		92
28	72	78	82	76	92	100	85		96	89	96	78
29	92		78	72	92	100	85	93	100		92	85
30	85		79	73	85	100		82	100		100	92
31	85		73		96			92		92		
Avg	83	82	77	72	81	91	91	95	93	94	95	91
Min	71	72	55	48	54	66	76	82	82	85	89	78
Max	100	100	100	88	100	100	100	100	100	100	100	100

TABLE C2.—Continued.

1978	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1		100	76		78	92		93		92	92	89
2		82	78		100	89		100		96	100	
3	85	88	78	72	82		100	100		93		
4	85			78	79		100	100		93		89
5	82			70	79		96		93			96
6	92	88	75	79		100	100		93		96	100
7			72	76		96	100	100	93		100	96
8		88	69		82	85		89	92		96	100
9	85	92	75		100	100		100		100	100	
10	96	96	78	73	89		85	100		89		
11	88			76	76		96	92	100	100		96
12	78			96	89	100	100		89	100		100
13	78	65	78	79		93	100		100		100	100
14		92	75	100		96	89	93	85		100	82
15		92	69		100	100		100	88	100	100	85
16	82	82	75		100	85		93		96	100	
17	82	82	82	93	93		92	96		85	100	
18	82			89	96		92	93	96	100		85
19	78			92	89	75	89		92	92		96
20	72		72			100			100		100	92
21		72	89	77		100		100	100		92	
22			76		100	100		82	96	92	92	92
23	78	78	85		100	100				100		
24	92	85		100	96		96	96		100	96	
25	89			100	89		83	100	52	85		
26	85			88	92	96	100		82	100		85
27	75	72	67	75		96	96		96		100	78
28		78	92	85		96	93	100			96	78
29			100			100		100	100		96	85
30	75		75		100	100		100		100	93	
31	92		100		92		93	96		100		
Avg	83	84	79	84	91	95	95	97	92	96	97	91
Min	72	65	67	70	76	75	83	82	52	85	92	78
Max	96	100	100	100	100	100	100	100	100	100	100	100

1979	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1		92	92		72						76	96
2	85	82	82	79	76						92	85
3	69			79	79					92	82	89
4	75			96	96					92		
5	78	89	89	82	96						92	82
6		82	82	100	83					92	89	82
7		82	82		79				85	59	81	82
8	78	78	78		86					82	85	82
9	75	89	89	85						92	82	82
10					79					89	85	78
11	72			79	82					92		85
12	69	78	78	76	92					85		72
13		82	82		96					92	92	78
14		82	82	100						85	88	88
15	78	82	82		89					85	85	92
16	89	78	78	85						79		85
17	78			100	92				83	89	82	88
18	78			96	88				89			88
19	82			85	85				93	76	92	81
20		75	75	86					88	78	92	82
21		69	69						100	82	92	88
22	75	72	72						96	85		89
23				79					96	92	92	
24	85								96	85	88	78
25	78			93					96	88		72
26	72			100					96	78	82	81
27									96	85	88	75
28				82					96		85	92
29	75			96						89	85	89
30	75			70						78	92	82
31	82									82		92
Avg	77	81	81	87	86				93	85	87	84
Min	69	69	69	70	72				83	59	76	72
Max	89	92	92	100	100				100	92	92	96

1980	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1		78	78	73		88	82	89			96	100
2	85	72	72	79	61		76	96	96	96	88	
3	89			78	70	85	79	93	100	100	96	
4	85	71	71	85	64	65	93		92	96	92	82
5	73	80	80	66		79	96	86	83	96		96
6		81	81	75		92	93		96	96		85
7	75	92	92		89	82		92	96	100	96	92
8	78	82	82		96	96	89	89	79	100	96	96
9	78	88	88	75	89		83	92	96	92	92	
10	76			62	89	85	85	96	89	96		92
11	72	78	78	57	82	92	79		96	92	92	96
12	78	81	81	59		92	79	85	92	96		92
13		78	78	72	73	92	96	80	96	92	96	96
14		72	72		88	89		89	92		100	100
15	85	78	78	75	75	89	100	96		92	96	
16	78	78	78	64	85		96	89	92	76	100	96
17	81			69	76	85	96	100	96	100		
18	88	89	89	78		82	96			92		89
19	85	72	72	79		83	100	86	92	92		82
20		75	75		85		100	89	96	88		92
21	78	75	75		89	88		92	96	92	92	85
22	81			76	92	82	100	73		82	96	89
23	85						96	92	89	96		84
24	85			85	89		93	92	89	65		
25	85	75	75	82	82	82			85	96	92	92
26	79	66	66	75		89	100	96	85	92	92	
27	89	72	72			82	92	89	100		100	
28	78	72	72		85	85		96	100		92	85
29	72		66			85	85			96		
30	78			76	85		96			96		92
31	75				85		100			96		92
Avg	80	78	77	73	82	86	92	90	93	93	95	91
Min	72	66	66	57	61	65	76	73	79	65	88	82
Max	89	92	92	85	96	96	100	100	100	100	100	100

1981	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	85	100	100	76	85	96	92	89				
2	81	100	100	96		92	89	93				
3	96			79		96						
4		88	88	72	92	96	96	77				
5	100	81	81	73	85	96		81				
6	88			89	93	92	89	85				
7	96	89	89	63	89		85	96				
8		89	89	88	89	100	92	96				
9	92	92	92	82	89	96	93					
10				82			89	100				
11		92	92	78	96		85	96				
12	78	75	75									
13	92	88	88		93		85					
14	71	78	78	92	96		82	96				
15	84	88	88	96		89	82	92				
16	69	100	100	96		96	85					
17	89	96	96			92	88	67				
18	96	92	92	100		92		92				
19	92	89	89					74				
20	92	92	92	96	85	92						
21	88	85	85	92	82							
22	92	88	88	96	96			81				
23	96	81	81	96	92	79		82				
24	96			100		89	93					
25	88	68	68			100	92	92				
26	88	92	92		89	92	96	89				
27	88	92	92	92	89	96	83	96				
28	88	89	89				93	85				
29	96			92	96		93	92				
30	96		89	89	82		89					
31			96					85				
Avg	89	89	89	88	90	93	89	88				
Min	69	68	68	63	82	79	82	67				
Max	100	100	100	100	96	100	96	100				

TABLE C3.—Midday relative humidity, 13 m elevation, Lutz catchment, Barro Colorado Island, Panamá, 1977–1980.

1977	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1								100	85		93	85
2								96			100	92
3								92		89	92	
4								92				
5								92				75
6									93	82		82
7									89	89		100
8									85		100	85
9								96			82	92
10								96			100	
11								93				
12									88			100
13									85	85		89
14									85		100	
15								100	92		92	82
16									93		85	
17										92	92	
18										89	96	
19									79	92		
20									92			81
21									100	89	100	82
22								79			72	78
23								93	89		92	92
24												
25								76		100		
26								82	92			
27									92	100		82
28									92	96	100	72
29								82			85	78
30								76	82		96	78
31								79		75		
Avg								89	89	90	93	85
Min								76	79	75	72	72
Max								100	100	100	100	100

1978	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1		96	76							89		89
2		73	61		100					89	92	
3	75	88	69	72	82		100	89		93		
4	75			75	79		96	85		93		93
5	72			70	79				76			92
6	75	78	72	75		82			79		85	92
7			69	78		96	96	100	79		100	96
8		78	75		85	89		85			82	100
9	75	78	78			96				89	100	
10	88	96	78	67	76		82			89		
11	92			73	76			92		92		78
12	85			93	89		92		79			
13	88	59	69			89	92		100			92
14			72				92	89	82		96	78
15		78							85	92		79
16	75	76				85		76		96		
17	82	78	75	79	93		92	93		78		
18	78			82	96		89	85	85			66
19	75			88	89	89			93	89		78
20	75		75	79							92	72
21		75	89	79		96		100			89	
22			78			92		89	100	96	82	89
23	78	75	78			100				100		
24	92	85			96		85	93		82	96	
25	85				96		82	100	82	100		
26	78			88		96			78			78
27	75	72	70	72		92	92		75			72
28		72	88	72		89	93	96			96	66
29			100			100			100		93	85
30	75		66		100	89		92		100	93	
31	100				89		93	89				
Avg	81	79	76	78	88	92	91	91	85	92	92	83
Min	72	59	61	67	76	82	82	76	75	78	82	66
Max	100	96	100	93	100	100	100	100	100	100	100	100

1979	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1		78			70						79	82
2	85	82		79							85	85
3	72			79						92	78	86
4	78			96	96					85		
5	72	72	67	79						82	78	75
6		82			73					85	85	72
7		67			77				79	88	82	79
8	75	78								92	78	82
9	72	89		85							79	78
10					83					79	82	67
11	69			79	76					89		66
12	66	67		76						89		72
13		75	89							89	85	72
14		75	82		92					75	85	85
15	75	82	79							78	96	88
16	82	76	79	82						89		75
17	72				92				70	76	78	72
18	66			89	85				85			88
19	78		54	79					93	76	85	75
20		72	66	83						76		78
21		72	67						96	78	92	81
22	72	72	57						85	78		82
23			67	73					96	96	89	
24	85								96	76	82	72
25	75			79					96	88		63
26	69		64	85					96	72	65	75
27			76						89	78		75
28			78	76					100		82	92
29	72		72							85	76	75
30	72		70	64						76	92	76
31	72									78		92
Avg	74	76	71	80	83				90	83	83	78
Min	66	67	54	64	70				70	72	65	63
Max	85	89	89	96	96				100	96	96	92

1980	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1			66	67								
2	78	63		79								
3				75	61							
4	79	62	65	69	64							
5	73	80	65	61								
6		78	64									
7	72	88	69									
8	76	72	72									
9	72	75	63	75								
10	76			59								
11	72	73	75									
12	66	78	72	59								
13			89	65								
14		72	72									
15	78	75	72	72								
16	72	75	72	64								
17	78			67								
18	78	82	67	76								
19	81	67	72	79								
20		65	66									
21	72	72	82									
22	75		65	73								
23	75											
24	82			81								
25	75	65	78	72								
26	73	64	72	72								
27	82		73									
28	75	66	70									
29	69	66										
30	73		78	64								
31	72											
Avg	75	72	71	70	63							
Min	66	62	63	59	61							
Max	82	88	89	81	64							

TABLE C4.—Midday relative humidity, 26 m elevation, Lutz catchment, Barro Colorado Island, Panamá, 1977–1980.

1977	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1								92	89		85	82
2								85			96	96
3								85		82	92	
4								85				
5								85				76
6									89	75		79
7									85	89		100
8									73		92	82
9								82			78	100
10								85			93	
11								82				
12									85			100
13									85	82		89
14									85		92	
15								92	92		92	85
16									89		79	
17										92	92	
18										79	92	
19									73	89		
20									82			75
21									92	85	93	75
22								85			72	75
23								96	89		85	85
24												
25								73		100		
26								79	92			
27									92	100		76
28									92	100	100	67
29								78			79	72
30								73	79		93	85
31								76		79		
Avg								83	86	88	89	83
Min								73	73	75	72	67
Max								96	92	100	100	100

1978	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1		96	72							82		82
2		76	61		100					92	89	
3	72	88	69	72	79		100	89		82		
4	69			75	73		85	89		93		89
5	75			70	76				73			89
6	78	75	72	76		79			76		82	92
7			72	78		100	96	100	73		93	93
8		78	75		82	85		82			85	96
9	75	78	78			100				85	100	
10	85	96	75	70	70		85			78		
11	92			73	76			96		79		78
12	82			93	89		92		79			
13	85	62	69			93	96		100			85
14			72				85	85	85		92	82
15		78							88	92		72
16	65	72				89		79		89		
17	78	78	75	82	93		85	93		73		
18	72			82	96		82	82	79			66
19	78			85	89	79			79	89		82
20	75		75	79							78	67
21		72	89	79		92		89			72	
22			78			89		85	96	96	79	75
23	78	78	82			92				92		
24	85	82			96		96	89		85	93	
25	82				92		82	96	72	92		
26	78			96		96			75			75
27	72	72	67	66		92	92		76			76
28		72	85	76		85	93	96			93	72
29			100			100			85		89	78
30	72		61		96	85		82		100	85	
31	100				79		96	89				
Avg	78	78	75	78	86	90	90	89	81	87	87	81
Min	65	62	61	66	70	79	82	79	72	73	72	66
Max	100	96	100	96	100	100	100	100	100	100	100	96

1979	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1		78			67						73	78
2	85	78		76							82	76
3	72			70						92	76	83
4	75			92	100					85		
5	72	72	67	79						79	85	78
6		76			77					88	85	73
7		67			80				79	85	78	79
8	72	78								73	76	76
9	66	82		82							73	78
10					79					79	78	67
11	69			79	79					82		67
12	63	69		73						78		73
13		69	78							76	88	72
14		75	75		92					69	82	85
15	78	78	76							78	72	88
16	78	79	79	79						82		72
17	72				92				64	64	82	66
18	72			92	89				79			82
19	72		50	79					93	64	89	72
20		72	61	86						73		72
21		72	67						96	78	92	81
22	75	72	60						89	75		75
23			70	73					92	96	85	
24	89								96	76	78	66
25	75			73					96	88		63
26	62		61	85					89	72	72	65
27			76						85	78		72
28			75	76					96		79	92
29	69		72							82	76	76
30	72		70	67						67	92	76
31	72									79		72
Avg	73	74	69	79	84				88	78	81	75
Min	62	67	50	67	67				64	64	72	63
Max	89	82	79	92	100				96	96	92	92

1980	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1			66	67								
2	76	66		76								
3				72	62							
4	79	59	63	66	62							
5	70	80	61	58								
6		75	61									
7	67	88	66									
8	73	63	67									
9	72	75	63	72								
10	73			60								
11	72	73	75									
12	69	75	72	54								
13			93	67								
14		72	69									
15	75	71	72	72								
16	72	65	69	64								
17	72			67								
18	78	82	67	76								
19	81	57	66	79								
20		66	63									
21	76	66	66									
22	72		65	76								
23	69											
24	78			74								
25	76	66	75	75								
26	76	61	72	72								
27	89		67									
28	69	66	67									
29	64	66										
30	67		75	67								
31	69											
Avg	73	70	69	69	62							
Min	64	57	61	54	62							
Max	89	88	93	79	62							

TABLE C5.—Midday relative humidity, 40 m elevation, Lutz catchment, Barro Colorado Island, Panamá, 1977–1981.

1977	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1								89	70		83	85
2								85			83	92
3								82		86	85	
4								85				
5								85				73
6									89	75		67
7									85	79		89
8									68		85	79
9								78			76	100
10								82			83	
11								85				
12									82			92
13									79	74		85
14									85		85	
15								89	92		88	73
16									67		79	
17										76	85	
18										73	79	
19									73	82		
20									85			71
21									89	70	79	61
22								85			70	75
23								85	67		76	72
24												
25								73		93		
26								73	92			
27									79	93		61
28									82	86	79	70
29								62			79	72
30								62	83		80	78
31								70		79		
Avg								79	80	81	81	78
Min								62	67	70	70	61
Max								89	92	93	88	100

1978	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1		72	62							85		76
2		61	64		96					85	70	
3	72	85	57	75	79		92	85		93		
4	72			61	67		78	89		89		73
5	72			76	71				68			82
6	76	78	64	67		85			73		76	89
7			64	67		85	93	100	67		73	85
8		82	61		79	80		82			76	92
9	72	67	60			100					100	
10	72	75	67	67	73		85			70		
11	78			89	79			89		79		78
12	67			83	79		85					
13	61	52	61			70	85		100			67
14			59				89	76	73		89	60
15		78							78	78		82
16	75	70				85		76		85		
17	72	67	69	73	89		89	89		62		
18	75			73	85		85	76	76			69
19	72			78	79	85			73	85		66
20	61		67	67							79	72
21		57	89	70		92		79			70	
22			79			82		82	92	85	70	70
23	72	69	79			96				89		
24	85	67			92		79	73		70	86	
25	79				85		83	100	72	85		
26	67			96		96			70			72
27	69	72	73	66		92	85		67			61
28		67	78	67		85	71	79			80	58
29			100			96			76		71	78
30	61		66		82	85		85		92	76	
31	88				61		93	79				
Avg	72	70	69	73	80	88	85	84	76	82	78	74
Min	61	52	57	61	61	70	71	73	67	62	70	58
Max	88	85	100	96	96	100	93	100	100	93	100	92

1979	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1		79	79		61						62	72
2	76	72	72	73							76	79
3	69			67						88	60	73
4	67			89	79					85		
5	64	72	72	67						76	89	75
6		62	62		73					82	76	73
7		64	64		80				79	82	82	76
8	69	57	57							79	76	73
9	61	76	76	82							64	78
10					77					76	76	64
11	61			73	64					82		66
12	64	67	67	73						82		64
13		61	61							67	96	73
14		67	67		82					64	78	82
15	70	72	72							82	70	84
16	76	79	79	73						67		75
17	67				89				65	65	82	72
18	56			82	78				73			81
19	67			79					80	61	76	72
20		64	64	83						73		66
21		64	64						85	75	82	84
22	72	59	59						89	76		65
23				68					88	78	78	
24	85								92	75	76	64
25	72			68					85	92		57
26	66			79					79	73	63	66
27									89	72		76
28				76					96		79	84
29	61									79	76	73
30	64			57						67	78	75
31	66									76		76
Avg	68	68	68	74	76				83	76	76	73
Min	56	57	57	57	61				65	61	60	57
Max	85	79	79	89	89				96	92	96	84

1980	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1				60			77	76			82	96
2	79	61	61	89	61		65	82	85	82	85	
3				72	65	67	85	96	96	85	96	
4	76	61	61	66	59	67	79		76		79	79
5	67	74	74	58		73	83	80	79	89		85
6		71	71				79		82	85		79
7	67	88	88		82	82				92	72	82
8	73	63	63		89		79	76	79	85	75	76
9	67	65	65	67	76		76	76	82	82	75	
10	62			60	60	82	82	78	79	78		85
11	67	67	67		70	76	82		89	78	76	89
12	67	63	63	64			79	83	83	92		79
13		76	76	61	65	88	79	68	70	65	85	82
14		72	72			85		77	85		85	85
15	78	75	75	73	67	77	92	79		85	76	
16	70	83	83	60	67		85	79	85	85	85	92
17	59			67	66	82	79	96		85		
18	75	83	83	73		77	79			82		79
19	78	57	57	79		65	82	68	89	82		89
20		58	58		68		83	82	89	67	70	79
21	76	61	61			73		85	92	79	78	79
22	64			76	82		89	76		73	79	72
23	76						96	82	83	96		78
24	75			74	76		77	83	67	82	85	
25	76	58	58	72	70	77	96		76	82	82	82
26	64	61	61	67		76	82	67	85	83		
27	89	63	63			76	82	79	96		89	
28	89	70	70		68	73		89	88		85	72
29	65		64			77				85		
30	56			67	85		89			85		
31	66									82		88
Avg	71	68	68	69	71	76	82	80	83	83	81	82
Min	56	57	57	58	59	65	65	67	67	65	70	72
Max	89	88	88	89	89	88	96	96	96	96	96	96

TABLE C5.—Continued.

1981	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	71	89		67	76	78	72	89		72	76	82
2		96	76	93		89	76	89		76	70	83
3	88		82	76		78		92		78	79	82
4		88	100	72	89	82	96	85		62		
5		78	73	76	76	83		85		63		92
6	78			78	70	82				69		85
7	92	72	69	62	79			93		76	82	
8		96	89	63		92	82	82		75		
9	79	78	81	69		85	79	100			73	
10	64		81	76			78	92				
11		82	72	75	82		82	85		70		
12	71	72								82		73
13	74	75	66		73		82					
14	65	75		70			82	79				75
15		88	72	82		73	89	79				78
16	62	92	69				96				73	
17	72	85	72			75	72	67	72	78	76	73
18	85	85	75			78		78	69	76		
19	78	85	72					62	64		89	
20	78	82	66	78	73	73			72			92
21	75	69	72	76	76				72	96		73
22	78		69					82	75		67	
23	92	78	64		89	92		72	75		67	82
24	72	78	72	96		73	85		72	92		92
25	96	63	72					85				
26	78	75	75		67	82		75	76	82	70	
27	78	76	75	92	67	92	74	85		76		
28	78	76	72				83	73	67	76	78	72
29	82			82			73	78	93		89	76
30			76	76	70				76		78	
31	78						83	73		89		96
Avg	78	81	74	77	76	82	81	82	74	77	76	82
Min	62	63	64	62	67	73	72	62	64	62	67	72
Max	96	96	100	96	89	92	96	100	93	96	89	96

TABLE C6.—Monthly average midday relative humidity at different sites on Barro Colorado Island, Panamá, 1971–1981, 1986–1989.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
						..clearing..						
1971								82	79	75	81	71
1972	79	71	64	75	78	82	80	85	88	87	79	76
1973	78	72	66	76								
1974			67	67	73	76	85	85	81	85	89	81
1975	76	70	69	70	79	84	81	86	81	88	84	85
1976	76	70	71	73	79	78	80	81	80	76	82	81
1977	71	75	68	71	75	85	86	86	84	85	85	83
1978	72	71	71	77	83	90	88	88	83	86	84	81
1979	67	70	63	78	78				88	80	79	74
1980	73	68	64	64	72	78	85	81	83	83	84	85
1981	79	80	76	79	80	86	81	82	74	81	81	86
1986	75	70	67	70	72	77	84	81	79	79	86	72
1987	68	70	62	79	81	84	85	92	92	81	82	79
1988	67	70	66	66	85	76	88	84	82	85	87	80
1989	72	64	66	65	73	81	81	82	77	82	84	79
Avg	73	71	67	73	78	81	84	84	83	82	83	79
						....1 m.....						
1971								92	94	88	92	83
1972	90	83	75	83	90	93	90	92	94	93	90	86
1973	86	81	80	76	84	93	65	92	92	70	94	88
1974			76	77	79	92	97	97	96	96	96	93
1975	84	78	79	76	86	95	93	98	95	97	94	93
1976	88	82	80	79	89	89	89	90	92	93	90	89
1977	83	82	77	72	81	92	91	95	93	94	95	91
1978	83	83	79	84	91	95	95	97	92	96	97	91
1979	77	81	81	87	86				93	85	87	84
1980	80	78	77	73	82	86	92	90	93	93	95	91
1981	89	89	89	88	90	93	89	88				
Avg	85	82	79	79	86	92	89	93	93	90	93	89

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
						....13 m....						
1977								89	89	90	92	85
1978	81	77	76	78	88	92	91	91	85	92	92	83
1979	74	76	71	80	83				90	83	83	78
1980	75	72	71	70	63							
						....26 m....						
1977								83	86	88	88	83
1978	78	77	75	78	86	90	90	89	81	87	87	81
1979	73	74	69	78	84				88	78	81	75
1980	73	70	69	69	62							
						....40 m....						
1977								79	80	81	81	78
1978	72	69	69	73	80	88	85	84	76	82	78	74
1979	68	68	68	74	76				83	76	76	73
1980	71	68	68	69	71	76	82	80	83	83	81	82
1981	78	80	74	77	76	81	81	82	73	77	77	82

TABLE C7.—Hourly average relative humidity, laboratory clearing, Barro Colorado Island, Panamá, 1983–1987.

	Hour of day																									
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Avg	Min	Max
1983:																											
Nov	98	97	98	97	99	99	99	98	94	88	81	75	73	78	82	88	90	94	94	96	96	96	98	97	92	73	99
Dec	97	97	97	97	98	98	98	97	94	90	85	82	82	83	85	88	90	92	94	95	97	97	97	97	93	82	98
1984:																											
Jan	98	98	98	98	98	98	97	93	85	78	75	76	79	83	88	92	93	94	96	97	97	97	97	98	92	75	98
Feb	95	95	95	96	96	97	95	92	86	79	75	73	74	75	79	83	87	88	90	91	93	94	95	95	88	73	97
Mar	93	94	94	95	95	96	96	91	85	81	77	77	76	76	78	82	85	88	89	91	92	93	93	93	88	76	96
Jul	98	99	99	99	99	99	100	99	97	92	88	84	82	82	83	86	87	90	93	95	97	97	99	99	93	82	100
Aug	99	99	99	99	100	100	100	98	94	90	86	83	83	85	88	91	93	95	97	98	98	99	99	99	95	83	100
1985:																											
Jun	98	98	99	99	98	99	99	99	99	97	92	88	84	83	82	87	89	91	92	94	95	96	96	97	94	82	99
Jul	97	97	98	98	98	98	97	98	98	96	93	89	86	84	84	83	86	89	89	91	93	95	96	96	93	83	98
Aug	97	98	98	98	98	98	98	98	99	98	95	91	87	86	87	89	91	92	95	95	95	96	97	97	95	86	99
Sep	97	97	98	97	97	97	98	98	97	91	82	76	74	76	79	83	86	89	91	93	94	96	96	96	91	74	98
Oct	97	97	98	97	97	98	98	96	92	87	84	84	85	86	89	91	92	94	95	96	96	97	97	97	93	84	98
Nov	95	97	96	96	95	96	96	96	95	91	85	82	80	81	83	87	90	91	92	94	94	95	95	96	92	80	97
Dec	95	96	95	95	96	95	96	95	92	87	82	81	81	80	82	85	88	89	91	92	94	94	95	95	90	80	96
1986:																											
Feb	93	93	93	94	93	93	94	92	83	66	60	56	52	51	54	59	64	69	78	80	87	88	93	92	78	51	94
Mar	93	93	94	94	94	94	94	96	95	88	77	72	69	70	71	73	76	80	85	88	90	91	92	92	86	69	96
Apr	92	93	92	93	94	94	95	94	95	93	84	79	78	77	79	79	81	84	86	88	90	91	92	93	88	77	95
May	94	94	94	94	95	95	95	94	93	88	78	75	73	72	72	73	75	79	84	87	89	90	92	93	86	72	95
Jun	95	95	95	94	95	94	95	95	93	88	83	77	75	76	78	81	87	89	91	91	93	94	94	94	89	75	95
Jul	94	94	94	94	95	95	95	95	93	88	82	79	77	77	77	79	82	84	88	90	90	92	92	93	88	77	95
Aug	94	94	94	93	94	94	94	94	93	87	81	76	76	75	78	80	82	85	88	90	92	93	93	94	88	75	94
Sep	94	94	94	94	94	95	95	95	92	88	83	79	75	73	75	78	83	87	90	92	93	93	94	93	88	73	95
Oct	94	95	95	95	95	94	95	95	94	89	85	82	80	80	82	84	87	90	92	93	94	94	94	94	91	80	95
Nov	95	95	95	95	95	95	95	94	94	91	86	83	83	84	86	86	89	91	93	94	94	95	95	95	91	83	95
Dec	92	92	93	92	93	93	93	93	91	88	81	77	76	75	75	77	81	84	86	88	89	90	92	92	87	75	93
1987:																											
Jan	92	92	92	93	94	93	94	93	92	89	86	80	80	80	81	81	83	84	86	88	90	90	90	91	88	80	94
Feb	91	91	92	92	92	92	93	93	93	91	87	82	80	79	80	80	80	83	86	89	90	90	90	91	88	79	93
Mar	91	92	93	93	93	93	94	93	90	85	81	75	74	72	73	74	76	79	83	87	89	90	91	91	86	72	94
Apr	91	91	91	91	91	92	93	92	90	85	82	80	80	81	79	80	80	82	85	90	90	91	91	32	87	79	93
May	96	96	97	98	98	97	97	96	92	90	89	86	86	87	86	88	90	91	92	94	94	95	95	96	93	86	98
Jun	98	98	98	98	98	99	98	97	94	91	88	88	87	87	86	89	91	93	94	96	96	96	97	95	94	86	99
Jul	97	97	97	97	98	97	98	98	96	93	90	87	85	83	84	86	89	90	92	94	95	96	96	97	93	83	98

TABLE C8.—Hourly average relative humidity, 1 m elevation, Lutz catchment, Barro Colorado Island, Panamá, 1984, 1986–1987.

	Hour of day																									
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Avg	Min	Max
1984:																											
Feb	91	91	92	91	92	91	91	91	93	92	93	90	87	83	83	81	82	83	86	87	89	90	91	90	89	81	93
Mar	90	89	90	91	90	92	91	92	91	89	85	80	75	72	73	73	74	77	80	81	84	86	88	90	84	72	92
Apr	92	93	93	93	94	94	94	95	92	89	85	80	77	77	77	78	79	81	83	86	88	89	90	92	87	77	95
1986:																											
Aug	97	98	97	98	97	97	97	97	97	98	98	95	95	94	94	95	95	94	96	96	97	97	97	97	96	94	98
Sep	98	98	99	98	98	98	99	99	99	99	98	98	96	95	94	95	96	97	97	97	98	98	98	98	97	94	99
Oct	97	98	99	99	98	98	99	98	99	99	99	99	98	97	97	98	97	98	97	98	98	98	98	98	98	97	99
Nov	91	91	91	92	91	92	91	91	92	92	91	91	91	91	91	91	91	91	91	90	91	90	91	91	91	90	92
Dec	97	96	96	97	96	97	97	96	97	98	97	97	93	93	92	92	92	92	94	94	96	95	96	96	95	92	98
1987:																											
Jan	94	93	94	94	93	93	94	91	94	94	93	88	93	93	95	92	92	88	90	90	91	92	92	93	92	88	95
Feb	93	92	93	93	94	95	94	95	94	93	89	86	84	83	83	85	87	88	89	90	92	93	93	92	90	83	95
Mar	93	93	94	93	93	94	94	94	94	93	89	85	81	80	79	80	81	83	85	87	88	89	91	92	88	79	94
Apr	96	95	95	95	96	96	97	96	96	96	96	92	92	92	92	92	93	92	94	94	94	95	96	96	94	92	97
May	96	97	96	96	96	96	97	97	97	97	95	95	94	93	93	93	93	94	94	95	95	96	96	96	95	93	97
Jun	97	97	97	97	97	97	97	97	97	97	96	96	96	95	95	95	95	96	96	96	97	96	96	96	96	95	97

TABLE C9.—Hourly averge relative humidity, 40 m elevation, Lutz catchment, Barro Colorado Island, Panamá, 1984–1987.

	Hour of day																									
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Avg	Min	Max
1984:																											
Jan	91	91	92	92	92	93	93	95	94	94	90	87	84	83	82	84	86	86	87	87	89	90	90	90	89	82	95
Feb	95	94	96	95	96	96	96	96	95	92	90	87	85	87	88	90	91	92	91	92	93	93	94	94	92	85	96
Mar	95	94	96	95	96	96	96	96	95	92	90	87	85	87	88	90	91	92	91	92	93	93	94	94	92	85	96
Jun	96	97	97	97	97	97	97	96	93	88	84	83	82	83	85	87	89	92	92	94	95	94	95	96	92	82	97
Jul	96	95	94	93	92	93	93	93	94	92	92	93	92	93	94	94	96	96	93	96	97	97	97	97	94	92	97
Sep	96	95	94	93	92	93	93	93	94	92	92	93	92	93	94	94	96	96	93	96	97	97	97	97	94	92	97
Oct	98	98	98	98	98	99	98	96	93	88	85	83	82	82	84	89	92	94	96	96	97	97	97	98	93	82	99
Nov	97	98	97	97	98	98	98	98	97	91	88	84	83	81	82	84	86	89	92	94	94	96	95	97	92	81	98
Dec	91	91	91	92	92	92	89	84	81	78	75	74	74	76	77	79	83	85	87	88	89	89	90	90	85	74	92
1985:																											
Jan	89	89	90	90	90	90	90	90	87	82	78	76	75	74	74	75	77	77	82	84	85	87	88	89	84	74	90
Mar	95	94	96	95	96	96	96	96	95	92	90	87	85	87	88	90	91	92	91	92	93	93	94	94	92	85	96
Apr	86	87	88	89	89	89	90	90	89	83	78	74	69	68	67	67	67	70	73	77	81	83	84	85	80	67	90
May	94	95	96	96	95	96	97	96	92	85	83	79	78	76	78	81	85	88	90	91	93	93	94	94	89	76	97
Jun	91	92	94	95	94	95	96	96	96	96	96	96	96	96	96	96	94	90	88	86	84	85	87	88	93	84	96
1986:																											
Jun	96	97	97	98	98	98	98	98	94	91	86	82	80	81	82	84	87	89	90	92	94	96	96	97	92	80	98
Jul	94	95	95	95	95	95	95	96	93	88	84	82	81	81	81	83	84	85	89	91	92	93	93	93	90	81	96
Aug	94	95	95	94	94	95	95	96	92	88	84	82	81	81	81	83	84	85	89	91	92	93	93	93	90	81	96
Sep	97	97	98	98	98	99	98	98	96	92	88	85	83	85	84	87	90	93	94	96	96	97	97	97	93	83	99
Oct	99	99	98	99	99	99	99	99	97	95	93	92	90	90	91	93	94	96	96	98	98	98	99	99	96	90	99
Nov	85	85	86	88	88	90	91	95	95	96	97	97	97	97	98	97	97	98	98	98	98	96	92	89	94	85	98
Dec	96	97	97	97	97	97	98	97	96	96	94	89	87	90	89	91	92	92	95	95	96	96	96	96	94	87	98
1987:																											
Jan	92	92	92	93	94	93	94	93	92	89	86	80	80	80	81	81	83	84	86	88	90	90	90	91	88	80	94
Feb	91	91	92	92	92	92	93	93	93	91	87	82	80	79	79	80	80	83	86	89	90	90	90	91	88	79	93
Mar	91	92	93	93	93	93	94	93	90	85	81	75	74	72	73	74	76	79	83	87	89	90	91	91	86	72	94
Apr	91	91	91	91	91	92	93	92	90	85	82	80	80	81	79	80	80	82	85	90	90	91	91	92	87	79	93
May	96	96	97	98	98	97	97	97	93	89	89	86	86	87	87	88	90	91	92	94	94	95	96	96	93	86	98
Jun	98	98	98	98	98	98	98	98	95	91	89	89	88	87	86	88	90	92	93	95	96	96	97	97	94	86	98
Jul	97	97	97	97	98	97	98	98	96	93	90	87	85	83	84	86	89	90	92	94	95	96	96	97	93	83	98

Appendix D: Air Movement

TABLE D1.—Daily average wind direction at canopy level, Barro Colorado Island, Panamá, 1971–1987.

1971	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1		56		161	189	281	267	328	284	297	335	335
2		83		241	175	308	283	315	331	337	350	1
3		45		305	176	309	305	247	296	259	350	133
4		45		167	175	305	245	243	251	203	333	135
5		86		161	247	315	296	335	321	270	343	126
6		128		174	283	290	201	313	283	256	324	0
7		185		181	296	312	307	315	283	348		101
8		180		178	296	249	237	343	227	289		357
9		164		171	277	241	166	309	340	292	190	351
10		137	90	154	264	296	243	303	238	333	152	124
11		64	90	146	306	327	296	325	242		142	274
12		45	96	159	315	268	306	275	286	325	137	347
13		40	119	161	268	230	285	267	350	212	143	354
14		40	183	193	255	247	299	316	299	263	131	356
15		62	96	180	254	321	230	332	204	200	117	358
16		51	67	207	203	328	249	337	316	296	109	6
17		45	69	246	269	296	284	100	347	255	147	355
18				276	262	340	306	355		107	50	354
19				236	302	323	278	330		298	51	351
20	103			228	256	338	255	306	228	248	21	332
21	108			254	289	195	288	236	356	315	33	345
22	29			254	309	300	179	72	340	355	67	0
23	174		135	257	305	294	203	63	320	285	143	8
24	12		115	287	211	309	281	357	349	39	76	123
25	79		141	198	286	241	297	349	344	336	106	52
26	81		188	176	237	285	289	286	12	333	135	25
27	42		225	163	283	276	309	302	93	70	126	337
28	41		203	158	187	311	315	232	281		129	307
29	45		254	243	205	310	285		302	350	136	343
30	43		201	146	283		291		189	305	165	236
31	45		233		335		288					221

1972	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0	116	356	38	9	79	320	29	164	228	240	135
2	129	41	0	61	118	109	2	22	232	221	220	165
3	112	60	4	356	12	110	2	5	225	245	259	175
4	186	350	0	0	67	105	106	2	208	211	234	47
5	170	8	0	0	69	121	350	356	218	216	242	281
6	116	0	2	0	29	106	120	44	207	216	251	55
7	181	2	0	0	2	167	6	10	193	224	238	216
8	169	25	0	0	10	123	128	15	176	240	212	132
9	131	97	0	0	138	154	120	118	192	263	212	88
10	115	94	0	4	73	155	12	94	189	229	230	87
11	109	5	5	0	153	162	98	146	215	210	228	274
12	110	354	48	62	174	157	292	167	210	199	177	347
13	5	327	348	5	128	94	296	157	218	219	225	354
14	4	349	81	6	354	134	94	316	197	214	234	356
15	148	357	74	22	55	146	3	332	115	238	245	358
16		57	357	353	128	25	14	337	216	218	200	6
17		121	350	6	116	14	11	220	227	270	150	355
18	127	117	29	355	137	26	13	201	221	201	248	354
19	96	93	326	62	293	33	357	174	209	185	240	351
20	2	0	43	135	29	29	10	240	169	232	235	332
21	6	351	28	128	41	157	63	263	203	216	199	345
22	51	358	358	169	86	117	123	205	250	201	203	0
23	46	0	347	146	186	71	106	199	257	215	142	8
24	0	0	347	158	10	104	123	206	150	225	126	123
25	6	11	338	354	281	127	129	211	229	203	261	52
26	15	10	338	69	179	121	101	202	219	197	238	25
27	11	0	0	124	10	129	137	242	193	212	236	337
28	0	0	355	352	0	111	134	256	282	231	202	307
29	0	356	335	18	205	349	46	84	235	243	228	343
30	4		46	145	283	332	22	121	310	213	157	236
31	75		290		335		357	217		249		221

1973	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	85	121	157	216	189	349	320	29	332	322	340	199
2	91	109	163	153	192	311	2	22	204	317	339	165
3	88	46	169	151	180	297	2	5	202	308	334	175
4	88	332	186	315	170	313	106	2	204	231	327	47
5	90	345	157	190	174	311	350	356	201	226	314	281
6	90	355	173	197	230	292	120	44	195	318	251	55
7	86	3	193	173	273	298	6	10	307	334	238	216
8	86	13	224	186	352	272	128	15	342	249	212	132
9	198	56	268	180	213	210	120	118	316	340	212	88
10	196	186	199	178	169	210	12	94	333	118	23	87
11	229	68	163	178	169	326	98	146	329	272	228	274
12	177	85	168	194	156	321	292	167	321	343	262	347
13	101	71	182	196	199	227	296	157	340	229	285	354
14	78	146	180	163	249	280	94	316	339	214	289	356
15	148	112	182	165	202	323	3	332	311	209	312	358
16	130	142	206	180	329	320	14	337	329	246	316	6
17	152	163	230	171	328	343	11	220	268	221	193	355
18	203	181	207	205	332	337	13	201	210	230	189	354
19	140	165	326	183	309	329	357	174	201	235	211	351
20	163	180	43	215	197	293	10	240	330	302	197	332
21	265	165	241	349	201	319	63	263	332	321	212	345
22	215	169	210	169	215	332	123	205	328	272	300	0
23	215	153	185	146	319	325	106	199	333	276	321	8
24	99	184	195	298	343	318	123	206	348	309	347	123
25	94	173	6	328	326	339	247	211	341	307	319	52
26	97	188	200	262	335	342	258	202	224	325	303	25
27	94	150	168	205	337	342	137	242	311	211	157	337
28	93	160	198	205	312	205	134	256	340	328	119	307
29	97		203	185	313	349	46	84	328	351	242	343
30	90		182	178	331	332	22	121	39	326	157	236
31	90		181		331		8	217		341		221

1974	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	290	11	21	356	15	242	330	103	170	261	282	117
2	204	63	10	351	184	271	319	110	175	281	291	99
3	180	46	2	205	336	349	281	97	203	288	270	64
4	207	332	0	317	157	340	319	122	206	300	319	321
5	29	0	21	358	73	234	308	109	213	282	310	332
6	331	0	78	358	50	203	317	113	307	285	312	103
7	34	24	48	0	59	216	197	106	247	293	307	118
8	135	133	23	345	48	333	208	15	280	244	305	132
9	135	57	17	321	94	333	262	77	297	288	283	29
10	174	4	240	315	38	293	342	149	292	295	305	306
11	17	347	4	315	13	301	174	125	286	285	333	7
12	10	357	161	318	343	229	125	146	122	247	308	315
13	354	358	94	316	340	227	9	104	126	229	278	335
14	350	360	18	330	152	195	32	106	128	214	291	327
15	293	8	7	315	159	309	45	336	129	301	283	203
16	47	4	16	315	153	180	14	99	143	273	323	108
17	2	0	0	315	171	180	11	17	212	271	306	105
18	355	0	6	313	123	315	24	350	168	311	299	118
19	264	0	349	327	326	318	67	217	201	158	8	81
20	157	21	342	328	359	332	90	279	330	142	70	111
21	332	83	344	324	306	309	63	261	332	311	96	49
22	3	3	225	317	169	315	353	299	328	311	100	2
23	198	2	88	327	162	227	278	277	333	335	130	354
24	343	0	293	323	144	252	44	309	145	343	137	67
25	354	9	7	315	153	234	47	254	271	313	125	82
26	347	4	351	315	134	256	52	306	285	336	162	40
27	228	356	19	315	118	247	54	285	223	308	143	351
28	59	10	48	315	14	314	50	312	278	337	122	329
29	358		339	354	348	322	46	291	283	299	126	316
30	0		155	354	191	273	22	304	283	259	110	325
31	358		13		315		78	270		280		310

TABLE D1.—Continued.

1975	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	293	0	251	214	187	342	39	279	313	79	230	200
2	337	348	234	210	196	236	90	289	324	105	291	187
3	276	341	318	220	193	350	76	292	328	41	270	199
4	340	315	316	199	160	28	45	273	0	106	285	175
5	344	139	338	196	23	36	31	264	288	282	305	166
6	357	139	328	195	217	298	329	288	263	100	289	153
7	344	108	250	223	293	196	307	264	274	60	168	175
8	352	27	239	243	311	16	288	297	276	78	181	157
9	349	345	228	231	197	19	302	307	355	81	192	166
10	62	12	236	207	212	17	279	224	338	218	261	41
11	356	1	247	218	205	252	257	274	324	89	289	106
12	10	0	245	246	35	251	53	160	302	76	168	-90
13	336	347	232	238	214	302	52	297	312	229	180	219
14	334	6	235	210	255	350	73	296	333	47	272	355
15	328	4	236	224	35	31	326	284	350	352	144	6
16	318	351	243	227	337	326	117	253	289	38	323	21
17	334	14	235	217	345	347	90	289	311	335	153	32
18	315	19	240	225	253	7	11	319	279	85	276	175
19	264	330	229	218	10	344	15	334	171	158	233	187
20	157	21	230	220	333	345	70	317	48	68	203	80
21	332	316	222	203	259	30	69	250	20	83	258	142
22	3	271	214	183	274	15	90	328	71	113	266	109
23	335	354	209	189	17	29	278	5	145	152	287	117
24	316	243	191	195	64	56	44	349	177	248	249	207
25	343	228	229	186	331	53	47	353	133	248	238	246
26	2	244	194	187	45	56	52	328	135	173	309	255
27	41	307	195	188	41	37	54	301	158	110	135	253
28	3	272	204	192	20	62	297	350	156	170	199	147
29	6		213	113	358	2	297	358	140	165	239	261
30	358		232	245	38	56	279	326	87	211	189	269
31	342		227		290		288	273		249		203

1976	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	135	150	150	62	187	342	176	279	168	203	193	357
2	244	152	144	210	196	130	200	289	188	199	147	311
3	227	150	152	220	71	153	199	292	192	130	183	314
4	155	142	156	199	334	188	236	273	201	146	171	247
5	111	142	154	6	306	116	31	264	131	165	184	120
6	99	139	154	20	351	117	342	201	222	207	124	157
7	180	141	142	7	95	141	29	146	0	214	183	90
8	199	138	177	12	344	129	317	94	181	162	152	46
9	111	144	190	61	321	6	322	136	239	158	162	353
10	94	142	161	52	317	2	280	161	193	97	180	327
11	126	138	142	41	317	358	321	112	193	189	167	276
12	113	135	152	350	346	16	103	183	180	149	207	356
13	126	135	140	350	69	46	265	222	69	179	191	1
14	118	161	140	53	95	114	347	226	118	102	216	50
15	116	150	152	12	301	121	315	219	254	112	243	144
16	124	130	148	335	315	120	296	190	225	181	238	211
17	139	143	154	0	316	120	298	237	235	167	188	234
18	133	156	152	17	31	86	306	312	189	141	208	329
19	133	196	167	347	97	154	315	252	137	231	225	8
20	142	149	154	26	23	116	276	217	117	210	197	0
21	148	135	142	11	81	139	347	225	190	189	218	222
22	148	271	167	10	111	99	84	189	193	180	178	357
23	157	135	150	345	150	23	87	190	252	191	203	4
24	141	135	171	195	113	53	30	182	220	198	20	329
25	142	137	173	186	77	10	96	197	171	197	31	6
26	155	140	110	85	77	54	247	183	287	221	96	38
27	155	159	195	154	135	105	324	189	227	168	86	31
28	152	157	204	55	106	108	342	184	82	225	170	264
29	152	150	213	150	110	103	315	177	203	206	100	3
30	180		232	150	117	180	306	188	235	203	56	357
31	149		45		120		288	195		211		10

1977	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	12	40	93	69	32	204	231	220	132	284	14	71
2	31	195	62	62	60	140	113	211	174	264	35	86
3	39	357	60	64	51	136	79	124	189	275	350	73
4	7	25	128	84	141	163	195	93	99	281	11	87
5	6	41	113	125	202	221	236	203	130	241	6	61
6	13	0	103	83	170	233	219	211	192	207	15	51
7	20	0	80	47	207	164	217	237	181	214	183	34
8	30	0	50	97	110	120	212	258	119	162	152	56
9	79	2	81	58	242	159	212	173	189	158	311	84
10	24	58	90	27	206	230	252	155	193	97	18	294
11	10	20	121	300	196	216	23	226	184	262	16	75
12	7	2	120	313	142	185	77	163	134	260	28	88
13	2	30	110	111	101	195	93	158	193	230	22	86
14	267	32	70	97	136	250	103	157	203	233	30	73
15	33	17	80	87	211	238	132	189	149	239	29	46
16	76	19	88	101	168	188	227	177	189	257	2	61
17	25	2	92	107	239	235	166	187	187	263	24	71
18	61	0	111	89	180	205	102	189	205	262	32	77
19	12	0	115	68	223	154	141	173	194	245	71	38
20	5	34	81	90	232	209	220	191	215	252	30	310
21	13	67	90	90	207	105	215	194	252	284	27	44
22	53	34	108	74	173	217	111	238	284	2	357	1
23	47	20	75	110	203	105	118	186	260	21	50	330
24	13	52	59	238	232	102	180	178	272	243	87	315
25	124	31	65	153	203	158	118	189	251	329	84	349
26	132	20	80	172	274	169	98	192	198	17	55	359
27	98	58	105	148	153	309	324	194	186	30	78	12
28	75	98	110	94	128	222	342	185	266	27	73	338
29	141		98	47	112	231	117	143	296	33	90	332
30	120		51	71	195	212	130	123	271	9	78	21
31	113		56		251		226	221		7		23

1978	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	340	291	327		68							
2	55	313	10		341							
3	340	306	338		317							
4	302	317	322		318							
5		341	333		315							
6	303	351	336		18							
7	300	319	317		35							
8	49	45	19		50							
9	343	27	49		63							
10	346	2	58		266							
11	55	311	324		278							
12	62	283	313		307							
13	64	292	337									
14	16	43	311	156								
15	275	44	299	10								
16	298	288	283	33								
17	85	305	289	71								
18	36	3		78								
19	65	317		60								
20	309	328		54								
21	297	352		29								
22	306	303		50								
23	315	289		102								
24	315	296		93								
25	345	318		70								
26	350	344		68								
27	320	315		3								
28	308	307		327								
29	287			9								
30	310			71								
31	310											

TABLE D1.—Continued.

1979	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1		4	350	355	256	180		203	166	336	191	309
2		7	9	349	250	191		192	166	315	323	340
3		7	10	354	204	258		337	243	279	223	302
4		6	5	162	303	208		350	180	224	261	287
5		9	15	208	307	176		328	180	293	236	305
6		6	7	335	348	189		309	167	228	247	345
7		4	7	4	355	146		321	153	191	201	342
8		13	9	9	338	149		314	156	171	339	278
9		352	26	9	350	203		9	191	167	260	
10			47	21	2	170		7	169	154	231	
11	328	17	43	2	12	193	313	3	175	144	171	
12	337	10	65	7	203	217	257	351	176	178	155	
13	336	13	93	15	269	230	243	279	180	153	165	
14	344	0	93	4	302		233	321	155	165	300	
15	328	2	90	3	308		252	310	146	159	287	
16	312	16	90	340	223		226	274	170	178	333	
17	350	21		282	324		251	234	177	176	278	
18	6	13		276	330		305	231	165	163	221	
19	13	11		333	334		272	240	157		219	
20	4	17		352	336		307	241	247		222	
21	330	9		320	355		234	269	292		212	
22	357	3		203	323		261	283	196		239	
23	341	15		172	299		318	208	304		349	
24	355	349		82	316		282	156	284		354	
25	11	352		217	323		219	233	267		272	
26	356	6		243	278		321	276	283		249	
27	335	5	17	179	280		7	211	250	180	247	
28	346	346	17	144	245		353	153	263	166	285	
29	6		5	237	216		224	171	207	144	266	
30	3		7	260	163		245	176	270	149	285	
31	10		0		132		262	170		175		

1980	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1		0	0	356	355	194	353	258		227	256	254
2		0	0	0	345	185	21	302	235	174	246	314
3		0	0	0	180	176	0	336	192	178	325	0
4		0	0	358	67	113	5	306	180	182	240	0
5		0	0	0	0	29	6	300	335	164	181	340
6		358	0	0	351	332	11	314	345	173	180	277
7		341	0	0	333	15	5	331	239	175	174	350
8		0	0	0	0	314	339	238	213	167	180	358
9		348	0	0	353	311	330	229	246	164	180	354
10		355	0	0	157	297	4	190	237	165	180	282
11		0	0	0	5	271	2	222	281	211	207	288
12		0	0	352	26	214	296	326	290	187	239	324
13		0	0	352	20	251	327	14	257	23	202	213
14		0	0	348	279	197	311	295	346	257	178	228
15		0	0	1	192	347	325	293	291	258	175	286
16		0	0		169	32	327	296	203	247	184	263
17		327	0		50	319	341	262	179	268	200	290
18		343	0	0	19	16	11		172	256	176	330
19		317	0	0	273	45	17		258	266	332	0
20		357	0	0	337	241	311		242	298	0	0
21		0	0	0	312	194	283		211	227	342	0
22		358	0	0	335	270	277		180	215	25	0
23	355		0	0	249	317	206		180	328	261	357
24	351		0	0	171	317	233		177	261	233	0
25	358	349	0	349	23	314	211		11		251	0
26	357	349	0	336	18	355	268		219	210	288	353
27	0	0	0	0	190	356	314		210	214	310	354
28	0	0	0	0	190	6	306		173	261	297	229
29	0	0	0	0	234	7	255		169	256	259	354
30	0		0	0	261	335	335		196	207	349	2
31	0		340		347		323			166		0

1981	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	358	344	353	2	166	194	8	166	154	266	175	184
2	9	338	0	0	176	185	180	110	152	241	155	270
3	0	0	0	5	169	176	72	157	178	237	173	285
4	349	0	0	0	180	113	8	137	162	197	180	319
5	3	0	336	0	176	29	343	67	165	281	206	341
6	2	358	246	0	173	332	154	70	183	297	276	298
7	353	0	331	0	163	15	157	23	350	254	241	311
8	356	3	338	3	151	314	154	20	180	291	229	238
9	2	7	357	0	163	311	121	229	246	235	255	256
10	2	358	11	0	147	297	44	135	237	191	300	252
11	9	2	13	0	187	271	303	123	281	199	343	352
12	358	26	358	358	180	214	326	198	290	211	273	0
13	5	13	4	340	180	251	98	170	257	200	227	353
14	17	23	300	342	279	197	50	157	346	250	277	298
15	349	0	5	352	291	347	61	176	291	235	273	219
16	7	0	5	353	220	32	85	215	203	240	299	328
17	2	0	355	349	264	319	127	192	179	337	240	354
18	9	2	328	265	209	16	356	172	172	308	260	358
19	11	0	270	215	324	45	170	161	258	264	277	358
20	4	0	347	175	342	241	126	180	242	290	218	321
21	3	0	4	206	0	194	283	231	211	264	251	326
22	343	0	28	282	271	270	340	156	180	188	249	346
23	309	0	0	208	303	317	180	150	180	166	208	287
24	323	2	3	343	78	317	165	161	177	174	208	242
25	345	0	3	349	140	314	180	182	11	169	214	0
26	13	2	0	319	167	355	178	177	219	199	262	333
27	3	0	3	284	190	356	158	143	210	219	271	304
28	13	5	3	189	190	6	173	293	173	176	290	316
29	2		358	161	347	167	58	318	169	178	216	0
30	0		353	173	183	3	126	186	196	173	228	342
31	358		2		347		176	171		182		209

1982	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	291	344	0	0	271	118	180	180	127	163	307	0
2	259	0	0	0	262	170	175	168	141	196	263	0
3	235	349	0	0	264	20	170	164	158	200	198	0
4	208	357	0	357	174	45	135	146	163	167	0	0
5	226	358	330	323	146	349	163	174	126	280	0	335
6	178	0	342	307	164	55	108	157	131	331	325	0
7	343	0	337	358	177	144	138	32	105	320	322	355
8	342	0	0	0	168	152	157	50	180	280	344	333
9	0	357	358	323	138	65	162	152	292	208	358	0
10	0	345	0	290	91	27	178	180	242	191	353	0
11	0	358	355	253	24	9	172	120	320	199	284	0
12	0	0	0	209	165	58	5	173	327	144	333	0
13	288	0	0	194	178	0	247	180	0	200	0	0
14	340	0	0	205	167	157	171	157	240	250	0	0
15	0	0	0	328	138	3	162	176	303	335	0	0
16	2	328	0	0	15	340	157	215	175	291	0	0
17	358	257	0	347	247	345	180	150	180	337	0	0
18	358	324	0	358	4	286	180	127	171	34	0	0
19	347	324	358	0	354	165	25	161	281	8	0	0
20	0	358	0	180	353	23	161	178	256	319	0	0
21	0	339	357	180	325	348	172	136	223	323	358	357
22	0	358	0	180	341	247	180	133	276	290	351	0
23	0	0	357	180	324	140	151	180	311	288	347	7
24	0	0	334	180	319	114	159	180	284	289	0	5
25	0	0	306	178	301	168	180	156	174	246	341	0
26	0	357	355	180	334	118	164	175	180	257	298	0
27	0	358	349	178	354	38	26	180	160	317	337	0
28	0	0	358	165	327	161	6	148	208	327	0	0
29	0		0	312	23	172	145	92	170	331	0	0
30	0		0	260	176	180	170	180	167	325	0	0
31	0		0		337		178	163		298		0

TABLE D1.—Continued.

1983	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0	0	0	0	0	23	309	354	257	163	229	330
2	0	0	0	0	315	356	341	234	236	196	267	358
3	0	0	0	0	304	248	349	0	311	200	287	306
4	0	0	0	0	347	173	353	0	230	167	0	247
5	0	0	0	0	336	180	276	0	270	299	0	221
6	0	0	0	0	351	173	326	206	270	331	325	265
7	343	0	0	0	353	167	342	171	225	340	322	337
8	342	0	0	0	345	176	0	0	298	349	312	358
9	0	0	2	0	358	90	162	0	20	16	182	289
10	0	355	349	0	355	331	178	0	206	26	226	329
11	0	3	0	0	0	306	172	307	198	14	200	280
12	0	343	0	0	0	186	5	349	242	332	280	289
13	0	0	0	0	327	219	314	0	311	311	302	350
14	0	0	0	0	284	180	261	0	296	216	312	346
15	0	0	0	0	275	336	309	0	303	157	325	310
16	0	0	358	0	286	349	247	0	175	172	293	295
17	0	0	173	0	249	197	0	344	180	203	343	256
18	0	0	173	0	226	354	0	280	171	165	305	288
19	0	0	93	0	180	351	0	161	281	180	303	311
20	343	0	0	0	315	23	0	178	256	161	310	315
21	0	0	0	0	342	340	347	136	223	177	260	307
22	358	0	0	0	0	295	270	133	276	289	253	357
23	0	0	0	332	0	290	190	180	311	254	325	0
24	0	0	0	0	0	189	354	335	284	324	352	0
25	0	0	0	0	347	0	358	273	174	327	357	0
26	349	0	0	0	354	0	0	285	180	270	357	0
27	324	332	0	314	339	298	0	280	160	291	293	0
28	358	0	0	269	298	301	345	250	208	287	217	330
29	0		0	353	326	268	350	283	170	324	245	351
30	0		0	0	334	256	335	295	167	320	230	355
31	0		0		169		324	264		225		0

1984	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	341	0	7	2	3	167	309	354	257	217	229	257
2	358	0	0	13	3	171	341	234	236	276	267	173
3	0	0	3	355	3	211	343	0	311	313	315	175
4	357	0	7	358	351	333	314	0	230	260	354	280
5	358	0	2	7	352	262	264	0	270	187	330	304
6	7	0	353	0	5	301	212	206	270	244	243	4
7	0	2	0	354	0	328	221	171	225	309	326	4
8	3	3	0	319	0	236	342	0	298	235	356	7
9	349	358	0	91	0	328	299	0	20	241	310	4
10	315	0	0	0	0	350	238	0	206	317	269	353
11	0	2	0	7	0	221	4	307	198	302	283	7
12	0	0	0	0	0	214	11	349	242	307	242	358
13	0	0	0	5	4	349	281	0	357	322	201	322
14	0	0	0	353	0	335	261	0	285	311	266	0
15	0	0	0	1	0	319	309	0	204	282	242	7
16	0	2	0	2	2	276	247	0	180	340	294	3
17	0	0	0	7	7	237	0	344	213	238	295	11
18	0	7	0	11	0	336	0	280	256	313	352	7
19	0	15	0	3	5	7	0	161	227	229	304	15
20	0	5	0	7	3	355	0	178	187	258	236	0
21	353	356	0	356	347	286	347	136	176	219	252	3
22	357	352	0	320	356	299	270	133	187	151	205	0
23	3	1	0	178	3	328	190	180	180	332	266	0
24	3	3	0	351	25	322	354	335	187	353	157	0
25	332	3	2	3	0	293	358	273	203	4	169	0
26	334	3	7	353	248	323	0	285	323	3	241	357
27	5	5	3	2	206	323	0	280	353	4	298	0
28	2	0	3	0	174	325	345	250	315	285	205	3
29	0	0	7	5	354	297	350	283	295	324	178	357
30	0		350	5	315	287	335	295	254	356	182	351
31	0		354		298		324	264		343		0

1985	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0	336	0	0	3	226	309	354	257	217	165	257
2	0	357	3	3	40	163	341	234	236	173	171	173
3	0	351	0	18	3	198	219	0	311	196	144	175
4	0	0	0	358	23	184	348	14	230	200	159	280
5	3	0	0	7	337	322	191	334	350	113	197	304
6	0	0	0	0	280	233	321	51	317	71	187	4
7	0	0	7	354	283	318	259	39	328	45	304	4
8	0	3	3	319	300	271	311	258	290	24	281	7
9	0	0	0	91	240	304	313	182	211	87	347	4
10	0	347	0	0	323	326	1	165	262	70	356	353
11	0	268	3	7	188	0	44	332	308	25	355	339
12	7	0	0	0	154	357	300	349	284	42	356	357
13	3	0	0	5	176	316	325	0	77	41	275	2
14	0	0	0	353	27	298	304	284	294	57	274	2
15	0	0	0	1	11	293	344	261	307	101	292	0
16	0	0	0	2	11	280	355	266	334	175	325	0
17	0	0	7	7	225	353	168	233	340	105	349	0
18	0	0	0	11	166	349	262	234	2	133	351	358
19	0	3	0	3	13	7	260	256	327	234	351	0
20	0	3	11	7	7	355	284	177	187	274	308	2
21	0	0	353	356	3	286	254	155	176	253	251	0
22	0	0	337	320	354	299	217	355	187	290	237	322
23	0	3	0	178	290	328	174	342	180	199	255	347
24	0	0	0	351	273	322	354	353	187	182	157	339
25	0	0	3	3	256	293	358	273	203	182	169	0
26	357	0	0	353	316	323	0	285	323	152	241	353
27	0	0	7	2	327	323	0	280	353	126	298	338
28	356	0	3	0	308	325	345	250	315	172	205	268
29	0		0	5	357	297	350	283	295	181	178	349
30	0		0	5	326	287	335	295	254	161	182	357
31	357		0		304		324	264		169		353

1986	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	353	0	0	0	3	187	0	354	257	217	165	345
2	358	0	3	3	321	183	10	234	182	173	171	324
3	0	17	0	18	326	140	81	0	75	196	329	330
4	0	2	0	358	69	181	24	14	130	99	303	328
5	3	1	0	7	75	176	43	334	322	31	355	304
6	0	14	0	0	358	172	357	51	322	0	0	4
7	0	5	358	354	173	78	84	39	318	159	338	4
8	322	0	358	319	309	25	311	258	0	146	275	7
9	328	2	0	91	333	169	313	313	3	120	214	4
10	349	0	0	0	163	85	88	0	331	111	259	353
11	334	0	52	7	318	69	44	7	330	146	253	339
12	355	0	359	0	354	71	300	341	337	193	224	271
13	331	0	17	5	63	58	325	244	345	181	202	239
14	357	0	19	353	33	74	304	8	46	137	227	224
15	353	0	7	295	21	79	344	304	41	101	323	266
16	0	0	358	282	11	49	355	284	159	175	310	268
17	358	0	0	258	140	62	168	312	98	105	274	309
18	0	0	0	213	180	42	262	208	39	133	338	349
19	317	3	357	159	13	16	260	180	93	234	293	297
20	326	3	358	138	7	341	284	157	131	274	306	0
21	320	0	0	132	3	19	254	52	52	253	274	0
22	351	0	358	126	354	56	217	20	32	290	353	0
23	0	3	353	178	290	109	174	2	0	199	0	0
24	0	0	358	351	273	30	354	98	187	182	276	0
25	0	0	0	3	256	50	358	113	203	182	357	0
26	2	0	0	353	180	13	0	329	323	152	344	0
27	0	0	7	2	180	18	0	32	353	126	318	0
28	0	0	3	0	184	17	345	169	315	172	316	0
29	0		0	5	193	117	350	205	295	181	354	0
30	0		0	5	182	181	335	295	254	161	353	0
31	0		0		178		324	264		169		332

TABLE D1.—Continued.

1987	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	312	0	339	0	257							
2	358	358	358	358	330							
3	342	0	357	320	325							
4	302	357	358	0	344							
5	355	351	0	355	9							
6	0	0	357	0	353							
7	357	355	0	0	339							
8	347	0	358	0	306							
9	351	0	0	335	267							
10	328	0	14	357	306							
11	353	346	2	0	355							
12	358	0	0	0	358							
13	0	358	0	0	334							
14	0	344	343	355	323							
15	0	309	0	353	255							
16	358	298	355	353	230							
17	355	345	341	353	290							
18	357	351	337	355	301							
19	331	358	348	355	264							
20	0	357	355	341	222							
21	358	357	358	342	221							
22	341	0	345	325	352							
23	358	0	314	324	216							
24	355	0	132	257	341							
25	357	0	99	304	355							
26	0	0	346	317	353							
27	0	0	351	345	318							
28	0	0	348	346	343							
29	0		2	303	345							
30	0		358	243	348							
31	0		352		340							

TABLE D2.—Number of hours wind was recorded in each octant by month and year at canopy level, Barro Colorado Island, Pamamá, 1971–1987.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1971												
N	25	3	6	43	82	107	69	165	148	118	139	395
NE	161	220	10	6	6	5	2	47	37	64	45	6
E	34	33	91	8	23	11	11	11	10	13	60	24
SE	5	8	48	130	29	3	43	23	10	21	200	83
S	28	92	66	312	233	130	162	131	100	118	126	130
SW	20	26	26	16	15	34	28	29	68	48	3	24
W	0	2	51	60	110	100	158	60	92	75	13	42
NW	4	6	24	91	188	293	263	175	103	127	38	16
1973												
N	10	77	55	107	161	207	10		250	215	96	2
NE	26	24	4	9	4	5	1		5	4	7	0
E	422	138	10	6	4	6	1		5	9	5	0
SE	48	109	77	54	55	7	3		15	5	22	1
S	63	203	392	354	290	154	19		209	204	130	13
SW	96	30	48	42	30	20	3		67	107	42	0
W	34	29	47	42	62	64	3		40	70	40	0
NW	3	62	26	29	138	204	16		129	124	180	5
1975												
N	322	286	37	14	99	88	28	113	247	25	17	106
NE	14	30	23	20	186	287	106	37	63	22	25	62
E	21	22	6	1	20	71	138	5	11	156	6	41
SE	19	42	7	5	22	8	18	76	84	117	113	130
S	58	39	101	265	105	10	14	66	92	32	84	209
SW	8	67	416	370	210	106	29	93	144	41	60	67
W	4	48	98	17	46	91	171	102	28	50	136	77
NW	176	104	56	28	56	59	87	252	36	112	120	46
1977												
N	338	418	31	26	29	6	22	16	11	60	135	115
NE	151	73	142	170	59	9	22	42	29	78	219	48
E	105	84	404	313	173	164	197	125	90	15	144	324
SE	39	45	104	62	100	95	67	42	74	43	4	21
S	49	35	45	49	62	77	98	243	186	35	5	7
SW	39	16	3	30	146	151	135	200	167	39	32	3
W	22	0	15	41	163	172	91	66	82	257	54	48
NW	1	1	0	29	8	6	5	10	76	40	35	176
1979												
N	291	477	230	284	246	23	119	197	61	56	87	97
NE	51	141	136	96	36	10	27	43	8	3	13	1
E	2	2	87	20	19	16	10	27	21	14	9	1
SE	0	0	8	35	28	46	10	41	113	112	36	4
S	3	4	4	77	75	109	77	105	344	233	139	17
SW	13	1	3	88	137	66	98	160	81	58	168	28
W	13	6	0	42	92	19	74	93	41	19	60	14
NW	121	41	11	78	100	9	56	78	51	44	132	78
1981												
N	595	606	539	428	144	8	156	77	21	92	119	330
NE	76	47	52	12	20	10	132	59	4	16	6	7
E	0	0	0	0	0	0	0	8	0	0	2	0
SE	0	0	17	26	90	2	68	123	38	50	32	2
S	1	0	14	99	251	11	296	309	93	261	206	84
SW	17	5	67	93	74	3	10	23	4	201	181	128
W	6	7	5	0	2	0	0	0	0	7	20	21
NW	49	5	50	62	18	5	46	18	3	101	145	115
1983												
N	586	649	672	651	451	282	430	317	41	144	219	423
NE	0	2	0	3	3	10	2	14	47	65	8	17
E	0	0	0	0	0	4	0	0	0	15	0	1
SE	0	0	16	3	7	27	9	7	25	37	10	7
S	0	0	49	13	52	241	34	43	6	83	50	0
SW	0	3	4	0	57	95	102	97	144	123	230	147
W	0	4	0	8	71	0	6	44	13	32	30	56
NW	36	14	3	36	103	61	56	38	46	123	66	93
1985												
N	349	310	352	26	132	84	127	118	132	111	163	397
NE	5	4	14	3	40	1	31	40	25	81	13	8
E	0	0	0	0	3	2	20	10	3	46	2	0
SE	0	0	0	0	15	5	21	55	9	142	48	0
S	0	0	0	0	36	38	65	74	22	191	111	10
SW	1	3	0	0	47	27	80	78	71	67	74	13
W	0	11	3	0	39	18	59	54	40	25	41	10
NW	3	8	3	0	44	41	91	68	39	46	95	55
1987												
N	615	599	566	519	314	22						
NE	0	0	14	1	10	7						
E	0	0	8	0	6	3						
SE	0	0	25	0	6	0						
S	0	3	30	4	62	17						
SW	9	17	3	60	81	20						
W	11	1	5	36	70	31						
NW	79	52	93	100	195	44						

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1972												
N	306	484	503	423	270	248	331	148	19	12	7	5
NE	5	10	5	7	13	30	8	2	18	5	2	16
E	49	64	25	19	46	66	66	103	146	108	180	91
SE	184	65	57	113	118	115	175	69	12	22	16	7
S	97	30	86	89	138	182	99	90	122	99	80	3
SW	12	5	20	21	36	3	12	129	237	303	191	28
W	16	19	23	10	9	8	16	88	162	174	232	34
NW	9	19	5	4	7	28	37	10	4	11	12	8
1974												
N	340	433	393	163	194	149	63	40	14	88	129	178
NE	36	44	91	29	112	53	105	12	0	5	16	32
E	21	32	36	3	40	10	90	87	13	2	36	76
SE	50	36	67	9	91	15	20	195	184	98	153	173
S	150	28	57	20	181	125	54	58	113	65	87	69
SW	53	11	79	28	32	144	45	16	20	46	46	15
W	23	5	7	3	5	45	58	62	50	101	40	16
NW	71	30	14	439	58	131	114	236	182	250	208	185
1976												
N	367	481	325	273	100	216	56	25	52	31	79	320
NE	109	95	225	33	14	38	21	41	90	96	81	51
E	22	22	13	56	130	92	135	95	59	105	95	67
SE	60	0	12	55	134	146	53	45	46	37	37	23
S	23	24	3	81	43	157	35	176	196	181	202	81
SW	14	0	16	2	3	13	26	184	187	239	164	108
W	9	5	24	14	27	11	119	57	79	42	53	60
NW	136	1	6	44	210	35	197	2	11	6	9	10
1978												
N	58	145	56	55	31							
NE	35	32	25	37	19							
E	150	46	57	154	69							
SE	19	10	7	45	3							
S	5	9	3	8	6							
SW	14	3	2	4	4							
W	91	144	67	29	58							
NW	333	283	180	62	88							
1980												
N	198	603	705	545	156	210	288	87	130	81	97	454
NE	0	0	0	8	149	100	102	46	12	11	43	6
E	0	1	0	2	7	19	13	1	5	7	8	3
SE	0	0	0	3	43	10	5	3	26	52	15	0
S	0	6	0	8	113	98	22	30	266	292	268	44
SW	0	4	3	10	134	82	106	97	115	129	136	79
W	0	5	2	7	76	108	128	79	73	42	49	51
NW	10	40	5	17	54	71	70	28	45	52	72	78
1982												
N	550	564	642	287	196	263	96	78	111	132	503	692
NE	2	0	0	3	36	49	70	54	28	33	3	13
E	2	0	0	1	3	1	0	3	2	7	0	0
SE	1	0	0	17	81	86	89	105	100	31	5	0
S	63	8	3	264	215	247	444	405	249	48	5	0
SW	39	24	8	48	23	7	2	3	105	74	22	5
W	17	3	6	27	50	0	3	1	20	140	86	13
NW	44	62	69	59	115	59	16	0	54	88	63	6
1984												
N	662	645	699	550	511	123	47		38	107	46	269
NE	15	40	28	75	39	18	6		2	20	6	34
E	0	0	0	3	4	3	2		1	4	1	1
SE	0	0	0	4	7	7	1		7	20	23	5
S	0	0	0	31	20	27	17		76	27	91	17
SW	3	0	1	23	29	73	24		59	60	46	7
W	11	5	4	10	16	59	20		15	41	42	6
NW	53	6	12	24	22	38	10		13	79	88	25
1986												
N	459	258	438	5	97	192	74	145	141	34	272	347
NE	5	18	33	3	29	76	20	33	65	10	11	0
E	0	2	4	6	45	74	27	35	42	17	1	1
SE	0	2	8	51	65	144	22	43	74	73	5	0
S	29	0	1	38	147	140	16	97	80	72	78	20
SW	5	0	1	21	24	32	0	33	28	14	94	54
W	7	0	2	12	4	4	1	29	21	7	64	42
NW	103	2	20	30	101	58	13	87	61	14	136	88

TABLE D3.—Circular average (above) and standard deviation of monthly wind direction by octant (N = 1, NE = 2, etc.) at canopy level on Barro Colorado Island, Panamá, 1971–1986.

	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Jan	2	2	3	1	1	1	2	8	1	1	1	1	1	1	1	1
Feb	2	2	4	4	1	1	1	8	1	1	1	1	1	1	1	1
Mar	2	4	5	2	6	1	3	8	2	1	1	1	1	1	1	1
Apr	1	7	5	6	6	1	3	2	1	1	1	7	1	1	1	5
May	2	8	6	4	7	2	5	1	8	8	5	7	1	1	8	4
Jun	4	6	8	1	1	3	5		5	8	2	2	7	8	8	3
Jul	4	1	7	4	1	8	5		7	8	4	5	1	8	8	2
Aug	5	3		3	8	5	5		7	7	5	5	8		7	1
Sep	5	1	8	3	8	5	5		5	6	5	5	7	6	8	2
Oct	4	3	7	7	3	5	7		5	5	6	8	8	8	4	4
Nov	6	6	7	2	6	5	2		7	6	6	1	7	7	7	8
Dec	3	4	5	8	5	1	2		8	1	8	1	8	1	1	1
Jan	1.3	2.1	1.4	2.1	1.2	1.2	1.4	1.6	0.8	0.2	0.6	1.1	0.2	0.4	0.2	0.8
Feb	1.5	0.8	1.9	0.9	1.6	0.7	1.2	1.2	0.6	0.4	0.4	0.6	0.3	0.3	0.4	0.4
Mar	1.7	1.2	1.3	1.7	1.1	0.9	1.0	1.4	0.9	0.2	1.0	0.4	0.8	0.3	0.3	0.5
Apr	1.3	1.1	1.6	1.6	0.9	1.7	1.4	1.7	1.9	0.6	1.7	2.6	0.5	0.9	0.3	1.8
May	1.9	1.5	2.2	1.4	2.8	2.3	2.2	1.8	1.9	2.6	1.9	2.8	1.2	0.9	1.8	3.1
Jun	2.1	1.7	1.7	2.0	1.8	2.1	1.8		1.5	2.0	2.6	2.9	2.7	1.7	1.8	2.2
Jul	1.3	2.1	2.2	1.7	2.3	2.2	1.9		1.9	1.6	2.4	1.5	1.3	1.9	2.0	1.6
Aug	2.4	1.7		1.5	1.7	1.6	1.5		2.2	1.8	1.5	1.3	1.5		2.4	2.4
Sep	1.5	1.2	2.1	1.4	2.7	1.9	1.7		1.4	1.8	1.3	1.9	2.0	1.6	1.7	2.3
Oct	1.4	1.7	2.0	1.9	2.4	1.8	1.8		1.5	1.6	1.6	1.7	2.2	1.7	2.2	1.7
Nov	0.9	1.6	1.9	1.4	1.9	2.0	1.4		1.8	1.8	1.8	0.9	1.8	1.9	2.2	1.6
Dec	1.7	2.4	1.7	1.2	2.2	2.1	1.7		1.3	1.3	1.6	0.3	1.3	0.9	0.7	1.1

TABLE D4.—Average daily wind speed (km/hr) at canopy level, Barro Colorado Island, Panamá, 1971–1987.

1971	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1				5.3	5.2	1.7						4.9
2				3.9	4.7	2.0	2.6			2.1	2.0	3.9
3				3.0		2.9	2.3	2.6	1.9		1.6	3.0
4				3.4	7.8		2.9	2.4	3.0			2.6
5				5.0	3.2	2.6	2.6	2.2	2.2			2.6
6				7.1	2.2	2.8	5.0	2.1	2.0			2.7
7					2.4	1.8	2.6	1.8	2.9	2.2		3.0
8				8.9	2.6	1.7	2.5	1.9		2.2		4.5
9				10.7		2.6	3.9	2.5		2.4		4.5
10				9.6		2.5	2.4	2.3	4.1		1.9	3.1
11				9.0	2.9	2.0	2.3	2.1	5.0		2.3	2.9
12					2.0	2.0	2.4	1.9	3.5		3.1	3.9
13			4.9	7.7	1.8	3.5	2.5	1.8		2.4	2.3	7.5
14			2.9		2.0	2.6		2.1	2.4	2.4	2.2	5.1
15			4.1		2.4	1.9	2.8	2.0	2.5	2.1	2.1	5.0
16			3.5		2.3	2.3	1.7	2.3	2.2		2.6	3.4
17				3.6		2.4	1.4	2.6			2.0	5.2
18				3.4		1.7	1.9	2.0			2.4	6.4
19					2.0	2.3		1.6			2.8	5.9
20					2.9	2.0	3.0	2.5		3.8	3.7	3.0
21					2.2	4.5	2.7	1.9			3.4	4.2
22					2.1	2.4	3.0	2.4		2.5	3.2	7.2
23				2.3	2.7	2.8	2.6	1.8		3.0	2.4	
24				2.5	3.8		1.5	1.5	1.5	2.1	3.3	3.7
25			4.5	3.8		2.7	2.2	1.9	1.9	2.1	1.9	3.5
26			4.7			2.5	2.1	1.6	1.9	2.0	2.6	4.5
27			4.3			2.1		1.8	2.4		2.4	4.5
28						1.7	2.0		2.3		2.7	5.8
29			2.9	3.7			2.5				2.3	9.1
30			4.7	5.3	2.8		1.9				1.8	
31			3.9		2.4							1.8
Avg			4.0	5.5	3.0	2.4	2.5	2.1	2.6	2.2	2.5	4.4

1972	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	3.1	5.0	8.4	3.3	3.1	2.6	4.2	3.8	2.0	2.0	2.3	2.9
2	2.5	4.1	6.0	3.1	3.0	2.8	4.7	4.3	2.0	2.0	2.0	
3	2.3	4.6		7.5	2.6	2.7	3.0	4.6	2.2	2.5	1.9	
4	1.8	8.1		13.1	2.4	3.5	3.2	5.3	2.4	2.6	1.7	
5	2.4	10.8	6.7		3.0		3.9	3.4	2.3	2.6	2.0	
6	1.4	7.6	8.1		6.3		4.8	4.8	2.5	2.1	1.9	
7	1.5	5.9	10.6	11.4	5.8		3.5	6.0	2.9	2.6	2.9	
8	3.3	2.7	7.7	6.3	2.1		3.0	2.9	2.6	1.7	3.1	
9	3.8	3.0	8.5	4.6	3.3	2.4	3.8	2.8	2.7	2.2	2.6	
10	3.2	4.7	7.0	5.2	2.0		2.8	2.7	2.7	1.9	2.2	
11	2.3	5.7	3.7	3.9	2.5	2.6	2.4	1.8	2.5	2.5	2.3	
12	3.2	4.2	5.9	2.7	2.4	1.6	1.6		2.5	2.8	2.2	
13	2.6	4.6	3.8	6.8	3.6	2.0	2.2		2.3	1.8	1.7	
14		5.0	4.0	4.5	2.4	2.4	7.8		2.2	1.6	2.1	
15		4.2	5.5	4.5	1.8	3.6	3.5		2.9	3.1	1.6	
16		2.7		4.4	2.0	4.6	3.0		2.6	2.4	2.3	
17		3.3	4.4	5.7	2.3	4.6	3.2	2.6	1.7		2.3	
18	2.5	3.2	3.3	3.0	3.2	3.7	3.3	2.4	2.8		2.5	
19		12.3	3.8	2.8	3.1	2.9	3.5	2.6	2.9	2.7	2.4	
20	6.4	8.9	4.8	2.4	3.0	2.4	2.9	1.7	2.9	2.5	2.6	
21	4.4	12.5	6.0	2.2	3.1	1.9	2.1	2.3	2.2	2.0	2.2	
22	2.9	10.1	4.7	3.0	2.0	3.1	2.5	2.1	1.9	2.2	2.2	
23	3.9	8.0	3.8	2.7		2.7	2.7	2.9	2.8	2.3	3.1	
24	6.0	6.5	5.3	2.8	3.1	2.5	2.3	2.5	2.3	2.6	2.7	
25	4.7	5.1	4.3	3.1	2.5	2.0	2.5	2.6	2.3	2.6	3.6	
26	5.9	7.7	5.4	3.3	3.5	1.9	1.9	1.7	1.9	2.9	2.6	
27	9.0	10.0	5.2	3.3		2.3	2.3	2.6	1.6	2.5	2.1	
28	9.3	5.9	4.6	4.5		5.8	2.6	1.9	2.2	2.3	2.1	
29	5.2		3.5			5.7	3.1	2.1	2.4	2.6	2.3	
30	3.0		2.9	2.5		3.4	2.9	2.6	1.6	1.8	4.4	
31	2.7		3.6				2.8	2.5		2.0		
Avg	3.8	6.3	5.4	4.5	3.0	3.0	3.2	3.0	2.4	2.3	2.4	

1973	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	8.1	5.5	9.4	4.8	6.5	2.1			2.1		2.8	
2	6.1	6.2	7.3	4.9	6.0	1.9			3.5	2.2	2.8	
3	8.5	12.0	6.2	4.9	6.1	3.1			4.8	2.4	2.1	
4	9.2		5.8	3.6	7.2	2.5			4.4	3.1	2.0	2.9
5	10.3	8.6	7.7	5.0	6.2	2.3			3.2	3.0		3.1
6	10.5	6.0	7.1	6.5	3.8	2.1			3.5	3.1		4.0
7	9.6	5.7	6.4	7.1	3.4	2.9		2.5	2.7	2.5		2.6
8	4.9	5.0	3.5	4.7	2.1	3.1		2.8	2.4	2.9		2.1
9	3.4	2.8	3.7	4.1	3.4	3.1		2.6	3.0	2.7		3.2
10	3.3	3.3	3.7	7.1	3.6	5.2			2.4	2.1		3.4
11	2.5	6.4	4.1	10.2	7.5	2.3		3.3	2.2	2.5		2.0
12	2.9	6.9	5.8	7.2	8.3	2.4			3.1			3.4
13	11.8	5.8	8.3	6.1	5.2	3.2			2.5	3.2	2.5	2.6
14		3.6	8.6	9.2	5.6	2.8		2.6	2.2	2.7	2.8	3.0
15		4.6	6.9	9.7	4.0	2.6			1.9	4.0	1.9	2.8
16			4.4	9.3	2.0	2.2			1.7	3.0	1.9	3.1
17	4.3	9.5	4.0	5.8	2.7	1.7		3.0	2.7	4.5	3.6	5.2
18	3.2	6.2		4.8	2.0	2.4		2.5	3.1	3.3	5.0	6.2
19		9.1		5.9	2.9	1.7		1.7	4.2	3.5	4.5	4.9
20	3.7	7.4		4.0	4.8	2.5		2.1	2.0	2.9	3.5	3.4
21	2.6	11.2			4.9	2.1		3.6	2.5	2.9	2.9	5.3
22	2.8	7.5	5.4		4.0	2.0		3.1	1.8	2.1	2.0	6.3
23	2.9	6.6	8.6		2.8	1.9		2.2	2.2		2.1	3.8
24	5.8	6.8	4.6			2.9				2.6	2.2	3.5
25	8.0	8.6	3.5	4.1	2.7			2.2	2.3	2.6	2.6	2.3
26	7.0	7.7	3.5	3.3	1.9	1.9		2.6	2.5	2.1	2.3	2.7
27	7.0	8.6	3.7	4.5	2.6			3.5	2.1	2.4	2.2	4.2
28	5.3	6.6	6.4	6.1	1.7			3.3	1.9	2.3	2.6	4.1
29	8.9		4.5	9.7	2.6			4.4	2.3	2.3		3.2
30	11.4		5.1	9.5	1.8			3.4	2.3	2.3		3.8
31	10.1		5.8		2.5			2.3		2.1		2.1
Avg	6.5	6.6	5.7	6.2	4.0	2.5		2.8	2.7	2.8	2.7	3.5

1974	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	2.6	5.4	8.2	4.6	5.1	3.2	2.6	3.0	4.7	2.4	3.3	3.1
2	3.4		6.8	5.1	4.0	2.8	2.6	3.3	4.6	2.7	2.9	2.5
3	3.1		9.4	3.3	4.8	2.8	2.5	3.6	2.6	2.7	4.4	3.2
4		5.8	8.2	4.9	3.1	3.2	3.9	3.3	3.3	3.4	3.5	6.4
5		9.3	5.6	7.7	3.7	3.7	3.1	2.6	3.1	2.6	3.1	5.4
6		12.4	5.8	8.9	5.6	4.4	3.2	2.3	2.9	3.4	3.4	2.9
7		6.0	6.7	8.6	4.9	5.4	4.6		3.0	2.3	2.9	3.1
8		4.6	7.6	6.7	4.3	3.0	4.4		3.3	2.3	2.6	2.8
9	4.8	4.9	5.9	5.2		3.1	3.5		2.3	2.0	3.9	3.9
10	3.5	9.5	4.6	8.1	4.6		2.5	2.9	2.4	2.5	3.4	6.0
11	3.0	8.4	7.9	11.9	5.2		3.9	2.8	3.0	2.9	3.8	4.2
12	5.9	6.1	3.9	9.2	4.6	2.3		2.3	2.8	3.4	3.2	4.9
13	10.3	6.4	4.9	7.6	5.4		3.3	3.0	1.9		3.3	5.9
14	7.3	8.1	6.1	7.5	3.2			3.0	2.9		3.3	5.0
15	4.6	7.1	8.7	8.5	2.6	4.4		4.2	2.5		3.8	3.8
16	3.6	5.8	8.7	8.8	4.1	4.6	3.0	3.1	2.2	2.7	2.2	3.2
17	5.8	8.1	11.6	9.0	3.0	3.7		3.2	3.0	2.8	2.4	3.0
18	7.0	5.6	7.1	9.4	4.1	2.9	3.7	2.7		2.5		4.0
19	4.6	5.9	6.7	9.4	4.5	2.7	2.9			2.9	3.4	3.9
20	4.0	4.1	7.4	7.3	4.3	2.1	2.4	3.2			2.9	3.2
21	5.3	4.0	5.0	9.7	3.7	2.4		3.2			3.5	3.2
22	4.6	7.5	3.8	10.8	3.8	2.0		2.8		2.5	2.4	7.6
23	4.0	11.7	3.2	8.6	2.0	2.9		2.4		2.3	2.5	6.8
24	5.8	12.1	5.0	8.4	2.9	2.9		3.0		2.0	2.3	3.8
25	7.6	9.8	4.6	11.2	2.9	3.7		3.3	2.8	2.5	2.3	3.2
26	4.3	9.8	6.1	10.7	3.1	2.6		2.7	2.2	2.5	2.2	4.5
27	3.8	10.7	6.2	13.1	3.4	2.4	2.5	2.2	2.9	1.9	2.3	8.2
28	4.0	9.2	4.9		4.5	2.7		3.0	3.3	2.1	2.8	5.6
29	9.0		5.9		5.6	2.7		3.1	2.6	2.2	3.7	5.3
30	10.2		3.5	5.1		2.6		2.5	2.5	3.0	3.6	6.2
31	8.1		3.9			2.6		3.2		2.6		4.2
Avg	5.4	7.6	6.3	8.2	4.0	3.1	3.2	3.0	2.9	2.6	3.1	4.5

TABLE D4.—Continued.

1975	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	4.5	11.5	5.3	7.2	8.1	3.5	2.2	3.3	2.8			3.8
2	5.1	6.7	5.2	7.3	4.7	2.0	3.9	3.3	3.3	3.3		3.4
3	5.1	6.5	3.9	7.2	3.5	3.2	2.8	2.5	2.1	2.8		3.1
4	5.3	5.9	3.3	11.7	5.9	3.0	3.6	2.4	3.0			2.7
5	6.3	3.1	3.8	7.8	4.2	2.4	2.5	2.6	2.5		2.6	
6	8.8	4.0	5.1	8.9	5.3	3.0	2.9	3.2	3.3		2.0	2.9
7	8.5	2.7	6.7	7.5	3.7	3.5	3.7	2.7	4.1		2.7	2.5
8	8.2	4.8	7.9	5.4	3.5	2.9	3.5	2.7	3.1	2.8	2.6	2.5
9	7.8	7.0	9.7	6.7	5.2	3.5	3.6	2.5	2.7	2.1	2.4	3.0
10	4.5	7.2	8.5	7.1	7.4	3.3	4.8	2.7	2.3	2.5	2.2	
11	4.8	7.9	6.0	7.3	5.3	3.8	4.4	3.1	2.8	2.3	2.0	3.4
12	6.5	9.0	4.6	6.7	3.9	4.6	2.5	4.1	2.9		3.0	3.4
13	9.6	8.1	6.5	5.5	4.4	4.3	2.8	3.0	2.9			2.7
14	8.0	11.5	7.4	8.4	2.8	3.3	2.6	2.8	2.8			10.7
15	9.9	8.9	7.8	6.0	2.9	2.3	3.5	2.8	3.0	2.8		5.9
16	9.1	8.3	6.2	10.0	3.4	2.5	3.0	2.3	2.6	2.9		5.3
17	7.6	6.5	6.2	9.0	2.7	2.6	3.5	2.4	3.1	3.6		5.3
18		4.5	5.4	9.4	3.7	2.5	3.0	3.6	3.3		2.3	3.1
19		4.6	5.1	10.7	3.8	3.0	2.5	2.6			2.8	3.6
20			8.0	11.7	3.3	3.9	2.5	3.1	4.0		3.0	3.3
21					3.8	2.8	3.0	3.6	3.4	2.6	2.5	3.8
22		5.2	6.1	15.5		2.7			3.5	2.5	2.5	3.7
23		3.5	5.5	13.7	3.1	2.3	3.2	2.6	2.9		1.9	
24	7.8	4.8	8.1	10.5	3.0	3.0	2.5	3.1	2.8	2.9	2.8	4.1
25	4.9	10.3	6.3	8.5	4.5	3.4		3.4	2.6	2.5	2.7	3.2
26	5.7	7.8	10.5	9.3	3.4	3.1		2.1	2.7	1.3		2.9
27	5.1	3.3	11.5	9.5	2.4	3.2		3.1	2.6		4.5	3.3
28	5.1	4.6	9.5	6.5	3.3	2.4		2.8	2.9			3.4
29	6.8		8.0	4.3	2.0	2.6	3.3	3.1	2.7		3.7	4.1
30	7.8		4.6	4.9	2.9	3.5	3.1	2.8		2.1	3.9	3.5
31	7.3		6.7		3.2		3.7	2.6		2.4		2.9
Avg	6.8	6.5	6.7	8.4	4.0	3.1	3.2	2.9	2.9	2.6	2.8	3.6

1976	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	4.4	6.0					2.4		3.0	3.1	2.5	3.4
2	6.5	10.0	9.9	9.8			2.5	6.5	3.0		2.6	4.6
3	4.0	9.0	8.8				2.2			2.4		4.4
4	4.6	6.9	6.3				2.6		2.5	3.6	3.2	4.0
5	4.7	8.3	7.7		4.2						3.4	3.5
6	8.7		8.3	6.2	6.9	3.1			2.6	2.7	2.7	3.0
7	5.0		7.0	4.4	4.2	2.9				2.6	3.0	3.0
8	4.5	9.4	8.7	4.0	3.3	3.1		2.6	2.8	2.8	2.4	3.6
9	6.1	10.3	5.4	4.2	4.0	2.6	4.2		3.0	2.8	3.0	5.0
10	9.4	10.6	6.9	4.1	8.5	3.0	3.4	2.9			2.1	6.1
11	8.6	10.2	7.7	4.4	8.3	3.4	3.8	3.3	2.8		2.8	3.8
12	5.3	9.8	9.6	4.8	9.6	5.2	3.7	3.4			2.2	3.8
13	5.8	9.9	10.9	5.9	4.2		4.0	2.6	2.8	3.0		3.8
14	10.4	10.8	11.4	5.9	3.6	3.2	3.5	2.9	3.3			4.6
15	11.0		12.9	4.7	2.8			3.3	3.2		2.5	4.8
16	8.3	6.2	11.5	4.0	3.9	3.7	3.6	3.3	2.8	3.2	3.0	3.6
17	6.7	6.1	15.2	4.6	6.4	2.8	4.7		2.8		2.8	2.8
18	10.9	6.2	14.0	4.3	5.8	2.8	5.1		3.0	2.8	2.5	3.0
19	10.9	4.2	11.5	4.6	4.0	3.0	7.2	3.6	3.2	3.2	2.6	4.8
20	8.7	7.7	10.8	5.2	3.7		5.5	3.6	3.0	2.6	2.3	6.1
21	9.8		8.7	3.8	3.1		3.8	3.0	4.1	2.7	3.4	4.7
22	8.7		9.9	4.8	3.5		3.4		2.6	2.9	2.3	3.2
23	6.1		11.2	7.0	2.8	2.9	4.0	2.8	2.6	3.8	2.3	5.0
24	8.6	11.0	7.9	5.2	2.4	3.0	3.6	2.8	2.6	2.8	3.1	3.2
25	8.2	9.4	9.3		2.8		4.2	3.0		3.6	5.5	5.4
26	6.8	8.8	6.6		3.0	3.8	3.6	3.4	2.6	3.4	5.9	6.9
27	7.7	5.0		3.4	3.0		3.2	2.5	2.4	2.3	3.0	6.3
28	6.3	9.5		3.0	3.3	3.6	3.5	2.6			3.0	4.2
29	6.3			3.8		2.8	3.8	2.6		3.2	2.4	3.2
30	4.8			2.9	3.4		3.8	2.2	2.6			4.4
31					2.9		4.0	3.2		2.4		5.8
	7.3	8.4	9.5	4.8	4.4	3.0	3.8	3.1	2.9	2.9	2.9	4.3

1977	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	8.0	4.6	8.3	7.2		2.7	2.3	2.7	3.3	2.9	2.4	2.4
2	5.6	3.3	11.9	6.9	5.9	3.3	4.5	2.9	2.7	3.1	2.9	2.8
3	4.4	5.0	10.2	6.4	5.2	3.6	4.2	3.9	3.0	3.6	2.7	2.5
4	10.4	4.6	4.7	5.2	3.5	2.9	3.6	3.8	4.0	3.1	2.7	3.2
5		4.4	6.2	4.4	3.6	2.3	2.9	2.7	2.8		3.4	3.1
6	7.3	7.1	5.4	7.4		2.7	2.8	3.0				
7	10.1	9.3	8.4	8.4	3.2	3.1	3.3	2.5	3.4			3.0
8	7.8	9.8	14.9	5.1	4.5	4.2	3.4	2.4	3.8			3.3
9	4.0	9.3	11.6	8.6	3.2	3.3	3.6	2.6	3.0			4.1
10	5.8	6.1	5.7	10.8	2.9	2.7	2.4	2.8	3.8		3.3	4.6
11	9.0	6.1	4.5	10.5	3.2	3.0	5.9	2.6	3.4		2.8	3.5
12	10.7	9.3	3.8	8.3	3.7	2.4	5.6	3.5	3.1	2.3	3.2	3.9
13	8.9	5.8	4.8	7.0	4.5	2.3	6.1	3.0	2.6	2.8	2.4	3.3
14	4.0	4.1	6.7	6.5	4.8	3.6	6.3	3.6	2.9	2.9	2.3	3.0
15	4.2	4.8	7.1	6.1	3.2	2.2	4.1	3.1	3.0	2.9	2.3	3.5
16	3.8	6.0	8.3	4.3	4.5	2.4	2.3	2.6	2.6	2.9	2.2	3.2
17	6.3	5.7	6.2	4.7		2.9	2.6	2.5	2.8	2.4	2.5	2.8
18	6.5	7.6	4.4	6.5	3.0		4.9	2.6	2.0	2.7	2.8	2.8
19	10.8	8.9	5.4	10.6	4.2		3.1	2.7	3.0	2.7	2.6	2.8
20	12.7	5.8	7.8	7.7	3.3		2.4	2.8	3.3	2.6	2.9	4.8
21	9.7	4.5		7.2	3.1	2.3	2.9	2.4		2.9	3.0	3.9
22	6.1	7.1	5.5	7.5	3.0	1.9	4.0	2.8	2.0	2.5		4.0
23	4.3	6.4	6.4	3.4	3.6	3.5	4.9	2.5	2.6	2.0		5.4
24	5.8	4.6	5.6	3.5	3.7	4.2		2.9	3.1		4.4	4.9
25	3.5	6.2	6.3	3.7	3.1	2.6		2.5	2.2		4.2	3.9
26	3.6	4.8	7.6	3.6	2.9	2.2		2.8		3.9	3.5	3.6
27	3.8	4.2	4.7	3.3	3.7	2.4		2.6	2.8		3.3	4.0
28	3.8	5.0	4.9	6.0	3.4	2.3		3.2	2.4	3.5		4.5
29	2.6		5.8	6.9	4.6	3.0		3.3	2.2	2.5		4.3
30	3.3		5.4	6.3	3.4	2.2	3.2	3.4	2.7	2.8	2.9	3.7
31	3.8		9.6		2.3		2.6	2.9				4.0
Avg	6.4	6.1	6.9	6.5	3.7	2.8	3.8	2.9	2.9	2.9	2.9	3.6

1978	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	4.0	10.1	3.6		2.5							
2	3.5	8.3	1.6		3.5							
3	5.1	8.4	2.6		5.3							
4		5.4	3.0		6.0							
5		3.2	2.1		4.1							
6		3.1	8.2		2.8							
7	5.2	4.6	5.5		3.8							
8	3.4	1.9	3.2		2.7							
9	5.5	1.6	3.3		2.5							
10	4.6	1.4	3.5		5.3							
11	3.0	3.1	6.0		6.3							
12	3.1	3.5	7.0									
13	3.0	3.3	5.0									
14	4.2	1.5	4.8									
15	8.6	2.8	7.2	5.5								
16	3.1	3.9	11.2	6.0								
17	2.5	2.9		5.5								
18	2.4	1.4		4.3								
19	2.4	3.1		5.1								
20	3.9	2.8		6.8								
21	6.2	1.8		8.5								
22	7.6	5.7		6.7								
23	9.3	7.8		6.8								
24	6.1	7.4		5.7								
25	2.9	3.2		7.1								
26	4.9	2.4		7.1								
27	8.8	4.7		7.9								
28	8.5	3.2		7.6								
29	8.6			5.1								
30	6.6			4.2								
31	6.0											
	5.1	4.0	4.9	6.2	4.1							

TABLE D4.—Continued.

1979	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1		11.8	7.3	6.6	4.2	3.5		3.2	3.1	3.0	3.1	3.1
2		11.4	11.8	6.9	3.7	2.5		3.0	2.8	3.1		3.3
3		13.0	11.0	6.0	3.3	3.8		4.9	3.9	4.3		5.0
4		10.2	11.5	2.4	3.8	3.4		6.6	3.6	3.2		3.8
5		8.3	10.5	3.0	5.0	3.8		0.0	3.5	4.0	3.6	3.7
6		7.8	10.3	5.6	7.2	3.5		4.4	3.1	3.0	3.7	3.2
7		6.7	9.4	7.9	6.4	2.5		4.7	4.4	3.0		3.9
8		8.8	8.8	10.0	4.5	4.5		4.3	4.1	3.4		5.3
9		6.8	12.7	11.7	4.7	3.0		3.3	3.2	2.2	2.1	4.4
10		6.8	13.2	10.9	7.3	3.2		8.4	3.3	3.2		4.0
11		12.0	15.5	9.9	6.9	3.7		9.2	4.8	2.8	1.4	9.6
12	6.2	13.4	15.9	9.3	2.3	4.1	3.0	7.1	4.5	2.8	2.2	
13	5.5	11.8	14.4	10.8	2.7		3.3	5.0	3.5	2.7	4.8	
14	9.1	9.7	15.7	11.3	3.7		3.3	3.1	3.8	3.2	2.9	
15	12.5	9.9	15.3	8.8	3.7		3.4	4.2	3.2	3.5	3.0	
16	10.3	11.5		6.2	3.4		3.3	3.3	3.2	3.3	2.7	
17	11.0	13.6		3.9			2.5	3.2	3.1	3.7	3.1	
18	11.6	12.4		4.8	3.8		2.9	3.3	3.3	3.4	4.2	
19	11.5	11.7		4.9	4.8		3.1	2.7	5.0	3.3	3.6	
20	6.6	12.4		6.3	4.0		3.7	4.0	3.6	3.4	2.9	
21	5.3	13.1		3.0	4.7		3.0	2.8			2.5	
22	6.9	10.0		3.3	3.5		3.5	2.7	4.5		2.4	
23	4.7	9.1		4.1	2.5		3.7	3.2	3.4			
24	5.9	6.2		4.3	2.6		2.6	2.9	3.6			
25	10.8	6.5		3.6	4.4		4.0	3.5	3.6		3.5	
26	7.2	8.3		3.2	3.5		4.6	2.8	3.6		5.0	
27	5.1	9.3		3.4	2.7		8.3	3.4	4.5		4.0	
28	4.6	6.8	14.4	4.0	3.1		6.5	3.2	3.7			
29	10.4		12.7	3.1	2.3		4.0	4.3	3.3			
30	8.5		11.7	4.1	3.7		3.3	3.1	3.2	3.5	4.0	
31	8.9		10.2		3.3		4.3	2.7		3.6		
Avg	7.7	10.0	12.2	6.1	4.1	3.4	3.8	4.0	3.7	3.3	3.2	4.5

1980	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1		10.5		5.2	5.1	2.8	6.8	1.4		2.4	2.1	2.7
2		11.9		8.4		3.2	8.2	0.4		2.1	2.6	4.1
3		11.3			4.2	3.4	5.1	1.7	0.2	2.2	2.6	6.2
4		14.3			4.0	2.9	6.9	1.8	0.3	1.6	2.1	8.6
5		12.5		10.5	5.9	3.2	6.2	1.8	0.7	1.6	2.3	5.4
6		10.2		11.2	6.2	2.6	7.3	1.0	0.4	2.0	2.0	3.8
7		7.5		10.4	4.6	2.8	6.4	1.2	0.1	1.6	1.5	5.6
8		8.0		10.3		2.1	3.8	1.6	0.1	1.7	3.8	8.4
9		7.1		10.4	2.0	3.2	3.2	1.5	0.2	2.1	4.2	8.0
10		5.6	12.6	9.2	4.0	3.2	6.1	1.6	0.5	2.4	2.6	2.8
11		8.2	10.2	7.0	3.9	2.0	4.9	1.3	2.5	1.7	2.4	3.6
12		10.7	11.9		5.2	2.3	3.1	2.5	3.1	2.6	2.7	2.8
13		12.2	11.4		5.9	1.9	3.5	4.0	2.0	2.7	2.1	2.1
14		13.6	11.5	4.3	3.6	3.2	2.9	2.4	3.2	3.2	2.2	2.6
15		10.6	14.3	5.1	3.2	5.1	3.9	2.2	2.4		2.2	2.3
16			14.8	9.4	3.4	7.0	2.3		1.4	3.0	2.0	2.1
17			14.9	12.6	5.6	3.4	3.0		1.1	1.2	1.4	3.4
18			12.2	11.7	6.0	4.8	2.9		1.9	1.8	1.8	
19			13.6	7.5	2.3	3.4	1.6		1.9	3.0		
20				9.4	3.5	2.7			1.7	3.0		7.1
21					2.9		2.5		1.7	1.3		8.4
22			10.0				2.2		3.4			7.7
23			10.1		1.6	3.2	1.2		3.3		1.9	6.4
24	6.9		10.3			3.2	2.1		1.8		2.1	9.2
25	7.2		11.5		2.8	3.7	1.7		2.6		2.0	7.3
26	7.4			4.0	3.3	3.3	1.4		1.5		1.6	6.3
27	5.8		9.4	5.2	3.0	4.7	2.5			2.6	2.5	4.7
28	10.2		9.8	7.5	3.4	4.0	1.8			1.7	2.5	3.4
29	11.1		7.4	8.9	4.4	4.0	2.2		3.2	2.0	3.0	5.8
30	11.9		6.0		2.6	2.6	2.0		2.3	3.1	4.5	6.4
31	10.9		3.6		3.2		1.7			2.4		9.1
	8.9	10.3	10.8	8.4	3.9	3.4	3.6	1.8	1.7	2.2	2.4	5.4

1981	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	9.5	6.6	5.4	11.3	0.7	0.8	0.8	1.4				2.0
2	11.4	4.8	9.2	11.8	0.8	1.8	1.8		1.2	2.4	3.5	
3	9.2	9.2	8.6	11.9	1.1	0.9	0.9		0.2	1.7	2.3	2.9
4	4.9	9.7	7.2	10.2	0.5	0.6	0.6	1.6	0.1	2.3	2.2	3.4
5	8.1	9.4	2.0	11.9	0.9	1.1	1.1	1.8	0.0	2.6	2.9	4.9
6	8.0	5.8	0.9	10.3	1.3	1.8	1.8	0.6	0.4		3.0	3.2
7	6.9	9.4	3.0	10.6	0.4	1.7	1.6	0.2	0.5	2.5	3.1	3.4
8	6.9	5.7	3.4	12.1	0.7	1.0	1.0			2.6	2.9	3.5
9	8.8	9.6	7.2	9.0	0.7	0.7	0.7			2.7	2.4	3.2
10	9.5	7.7	8.3	10.2	0.8	1.1	1.1			2.7	3.2	2.8
11	9.9	7.4	10.3	11.3	0.4	0.3	0.3	1.3		2.5	4.2	3.6
12	9.6	11.7	6.0	7.4	0.1	0.7	0.8	0.1		2.3	3.5	7.8
13	14.0	10.2	4.9	2.3		1.0	1.0	0.5		2.5	3.7	5.7
14	10.6		2.2	4.0		0.5	0.5	0.9		2.1	2.6	3.9
15	7.3	8.0	4.9	1.8			1.0	1.0		2.5	3.5	2.9
16		5.4	3.1	4.5	0.5		0.6	0.7		1.4	3.3	4.6
17	11.8	8.5	3.5	4.2	0.3		1.6	0.5		3.7		4.5
18	12.7	9.2	2.9	1.8	0.6		0.1	0.8		2.7	3.0	4.5
19	9.5	9.7	1.6	1.6	1.4		1.7	0.7		2.7	3.2	3.9
20	5.0	8.9	4.1	0.7	2.3		0.9	0.4		2.0	3.0	4.3
21	5.8	10.1	4.4	1.0	4.1			1.0		1.8	3.0	3.1
22	5.5	9.7	1.5	1.9	1.7			0.7		2.4	2.1	3.4
23	3.0	10.5	2.3	1.8	0.9		1.5	1.3		2.6	2.5	
24	3.1	10.0	6.0	1.3	0.5		1.4	0.4		3.7	2.1	
25	3.8	11.5	12.3	2.2	0.7		0.6	0.8		3.4	2.0	
26	6.5	10.3	11.9	1.8			0.9				4.7	
27	6.1	10.7	11.5	1.4			0.8			1.3	3.6	3.6
28	7.9	9.8	8.9	0.9			0.6	1.7			3.2	4.4
29	8.4		4.3	1.0			0.7	0.5		2.2	2.5	8.2
30	10.3		3.5	0.9	0.5	2.7	1.1	0.2		2.3	2.5	4.7
31	8.1		6.9			0.8	3.8			2.8		2.8
Avg	8.1	8.9	5.6	5.4	1.0	1.1	1.1	0.8	0.4	2.5	3.0	4.0

1982	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1			6.7	9.9	1.9	1.3	6.2	4.6	1.6	1.1	0.9	5.2
2	2.9	8.1		9.1		0.7	2.2	0.3	1.8	0.5	0.6	4.8
3	3.0	6.2	9.4	9.0		1.3	1.6	1.2	1.0	0.4	1.0	5.3
4	2.8	6.8	8.5	8.1	2.7	1.1	0.7	1.2	1.6	0.3		4.1
5	2.4	7.6	3.9	4.3	3.2	0.4	1.6	2.3	0.9	0.5		
6	2.4	9.8	4.1	5.8	4.0	0.9	0.8	0.6	0.6	0.7	2.0	
7	3.9	10.0	4.9	8.6	3.5	1.3	2.0	0.9		0.7	1.8	2.7
8	4.1	10.0	11.2	7.9	3.8	1.3	0.5	0.6		0.7	2.1	2.2
9		7.7	11.5	5.1	2.2	0.6	3.7	1.7			2.8	4.3
10	6.3	6.6	10.5	3.0	1.4	0.1	6.3	4.4	0.6		2.7	7.7
11	9.1	8.5	7.6	3.0	1.8	0.9	4.5	1.2	1.2		0.8	8.3
12	9.0	9.2	8.7	1.8	3.1	1.2	0.7	2.6			0.9	8.3
13	3.7	10.7	9.7	3.5	5.2	0.8	0.7				6.6	9.5
14	5.0	9.9	9.7	2.9	3.2	1.2	2.1		0.7		10.9	11.4
15	7.2	9.1	8.5	6.0	2.8	0.8	2.5		1.0		8.7	7.9
16	6.4	4.5	8.8	8.1	2.1		1.7		0.3		7.7	8.4
17	7.4	3.5	9.7	6.8	1.8	1.0	2.8		0.8		5.6	10.8
18	8.0	3.6	9.7	7.6		0.8	3.8	1.3	0.5		6.5	9.7
19	6.2	5.4	10.4	8.1	1.4	0.6	0.6	2.8	0.9	2.5	7.5	8.5
20	7.8		10.0		1.1	0.8	1.9	3.1	0.6		5.3	9.3
21	8.7	5.1	11.6	11.8	1.1	0.9	1.8	0.7	0.4	1.3	5.6	6.9
22	9.5	6.5	11.1	8.3	2.4	0.7	4.4	1.2	1.2	0.4	2.7	5.0
23		10.3	8.7	11.9	2.8	0.7	1.9	4.6	0.9	0.7	3.2	3.4
24	7.8	10.8	5.8	12.6	1.1	1.2	2.5	4.0	0.3	0.6	5.2	4.0
25	7.4	7.5	4.7	10.3	1.8	0.8	3.5	1.7	0.5	0.4	5.1	5.6
26	7.8		8.9	8.1	1.8	1.1	0.8	1.8	1.9	0.8	2.2	6.1
27	6.1		7.2	6.6	2.0	1.2	0.2	5.2	0.8	0.5	4.0	5.7
28			9.4	5.9	1.4	1.4	0.7	1.5	0.4	0.5	5.5	7.6
29	6.7			1.7	0.7	2.8	1.1	2.0	0.3	0.2	6.3	6.9
30	7.4		10.2	1.8	0.9	5.3	1.1	4.6	0.6	0.9	8.0	4.9
31	6.3		10.1		0.6		2.8	3.6		1.3		6.9
	6.1	7.7	8.7	6.8	2.2	1.2	2.2	2.3	0.9	0.8	4.4	6.6

TABLE D4.—Continued.

1983	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	8.2	6.1	8.4	6.8	8.9	3.9	2.6	3.1	3.9		3.2	2.8
2	7.2	5.5	11.9	4.5	4.2	3.3	4.4	3.3	2.7		2.8	4.4
3	7.0	9.3	10.5	7.7	3.9	2.5	3.4	4.2	2.8			3.7
4	8.8	12.6	7.7	10.3	4.4	2.7	6.2	5.9	3.5			2.5
5	9.1	7.8	6.2	10.5	4.3	2.2	3.1	3.6	3.7	3.2		2.6
6		6.1	6.1	10.0	3.9	3.5	3.3	2.7	3.1			3.1
7		6.0	4.8	8.6	7.1	3.5	4.1	3.9	2.9			4.3
8		8.9	3.9	8.6	4.3	3.1		4.1	3.7	3.4		4.7
9		6.5	5.2	7.7	8.0	3.1		4.8	3.7		3.4	4.2
10		4.5	9.1	6.5	6.8	3.4		3.5	2.4	4.1	2.4	2.5
11		4.8	11.4		8.1	3.0		3.5	2.4		2.6	2.6
12	11.2	4.3	14.1	9.7		3.1		7.3	2.7	2.7	3.2	2.8
13	11.7	7.1	12.1	9.9	4.3	2.6	4.5		2.9	2.3	2.7	3.1
14	12.4	8.6	7.8	8.7	3.3	3.8	2.8			2.1	2.3	2.6
15	11.0	8.4	3.9	8.1	3.2	4.1	2.8	9.2		3.4	2.8	3.8
16	8.8	6.5	4.9	7.8	2.4	3.3	3.3			3.3	3.5	3.4
17	5.9	7.8	4.7	7.9	2.7	2.8	5.7			3.3	3.4	2.7
18	6.1	9.4	4.5	8.2	2.3	3.6	7.2			3.2	3.8	3.5
19	4.8	10.0	6.1	6.8	3.1	3.9	8.0			3.1	3.8	3.4
20	4.2	10.4	5.8	5.8	2.5	2.1	5.9			2.9	2.8	3.6
21	5.2	11.3	5.9	4.3	4.8	3.3				3.6	2.6	3.1
22	5.4	11.5	10.7	5.2	7.7	2.9	2.7			3.0	2.8	4.3
23	7.0	11.2	12.7	4.3	7.1	2.6	2.2			3.6	3.7	7.3
24	8.6	9.0	8.1	4.9	8.9	2.5	3.6			3.2	3.3	9.9
25	7.0	7.8	8.5	8.2	6.3	3.9	5.2	2.7		3.0	6.1	9.6
26	6.0	4.4	9.8	8.2	5.6	4.7	7.3	3.1		2.1	4.7	9.3
27	3.5	4.2	7.4	3.6	4.6	3.4	8.3	3.0		2.8	3.3	6.6
28	7.9	6.6	8.2	3.0	4.2	4.2	5.4	3.6		3.2	2.6	3.7
29	8.2		10.7	4.5	3.1	3.6	4.4	2.6		2.6	2.2	4.0
30	8.8		9.4	11.3	3.3	2.5	3.8	3.0		2.4	3.2	4.5
31	8.1		5.4		3.6		4.6	3.6		2.8		6.4
Avg	7.7	7.7	7.9	7.3	4.9	3.2	4.6	4.0	3.1	3.0	3.2	4.4

1984	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	4.5	10.0		9.8								
2	5.7	8.7		10.5								
3	6.5	9.3		8.6								
4	4.4			5.6	3.5							
5	4.5			5.8	3.0							
6	4.9			5.8	4.7							
7	6.5			7.2	4.4							
8	6.3			8.5	4.6							
9	4.3	10.8		8.7	3.9							
10	3.2	8.0		7.7	2.1							
11	3.9	4.4		5.0	1.8							
12	4.1	5.0		1.7	3.3							
13	6.6	6.2	11.0	1.6	3.6							
14	8.8	5.9	10.7	3.0	1.6							
15	5.7	7.5	11.2	4.6	1.9							
16	4.0	6.4	12.3	4.3	1.1							
17	4.6	7.2	11.9	5.4	1.8							
18	6.7	7.2	8.9	6.4	1.4							
19	5.3	7.1	6.5	8.1	3.7							
20	7.3	6.0	5.2	8.3	4.2							
21	8.3	8.2	4.8	6.6	2.6							
22	9.4	6.2	5.4	5.5	1.7							
23	7.7	7.5	6.2	6.8	0.4							
24	6.3	6.6	5.3	3.5								
25	7.3	4.4	6.1	3.0								
26	7.8											
27	7.2		8.5									
28	6.7		6.6									
29	8.0											
30	5.6		3.3									
31	5.8		7.4									
	6.1	7.1	7.7	6.1	2.8							

1985	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	7.5	3.0	15.2	7.1		2.3					1.8	
2	7.5	2.9	21.3	7.5		1.1					1.8	
3	6.8	4.9	10.9	3.8	6.7	1.1	0.3	0.2		0.4	1.2	
4		6.0	12.9		8.3	2.0	0.5	0.2		0.2	0.9	
5		5.3	12.5		7.2	1.7	0.5	0.2		0.3	1.5	
6		6.5	10.8		4.6	0.8	0.5	1.1	1.0	0.9	1.1	
7		5.4	11.1		2.5	0.9	0.3	1.3	1.3	0.8	1.1	
8	9.1	8.7	10.8		2.8	0.8	0.5	1.1	1.3	0.9	1.5	
9	4.4	6.2	14.9		1.8	1.6	0.6	1.1	1.2	0.6	4.1	
10	7.9	6.0	14.8		1.1	2.1	0.7	1.2	1.6	0.6	2.7	
11	6.9	2.0	15.2		1.6	2.9	0.4	2.8	1.4	0.9	3.5	
12	9.0	7.1	10.4		1.5	2.8	1.1	2.4	1.0	1.7	6.1	0.3
13	7.5	10.7	10.4		0.8	1.9	1.7	1.6	0.9	1.2	1.6	0.9
14	8.0	10.5	10.4		1.4	1.6	1.7	1.4	0.8	0.7	1.2	0.8
15	8.1	9.9	7.5		3.1	1.7	1.2	1.7	1.2	0.4	1.6	0.7
16	7.4	10.3	7.7		3.8	0.6	1.9	0.8	0.9	0.8	1.3	0.3
17	6.6	10.3	7.5		1.6	4.6	1.0	0.4	1.5	0.1	2.6	0.8
18	5.2	11.5	7.7		3.9	1.0	0.7	0.5	1.6	1.5	4.2	0.8
19	3.5	9.5	6.9		4.3		1.5	0.1		1.4	2.2	1.0
20	3.8	9.2	5.8		5.4		1.3	0.7		1.4	1.6	1.1
21	5.5	9.3	4.9		4.0		1.1	1.3		0.9	1.2	1.1
22	4.8	10.1	5.6		2.0		1.0	1.0		0.4	2.0	0.5
23	7.1	11.7	8.2		1.9					1.2	1.0	1.4
24	10.2	10.5	13.6		3.4					0.9		0.9
25	7.2	10.6	15.4		1.4					0.8		1.1
26	5.9	11.1	15.1		1.2					0.7		0.6
27	5.3	14.0	15.9		1.5					1.1		0.9
28	2.5	15.3	11.7		2.0					0.9		0.7
29	4.1		10.2		1.5					1.3		0.7
30	7.2		10.1		1.6					0.7		1.3
31	2.8		5.8		2.5					0.4		0.9
Avg	6.4	8.5	11.0	6.1	2.9	1.8	0.9	1.0	1.2	0.8	2.1	0.8

1986	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.6	0.7				1.2	0.9					0.9
2		0.8				1.2	1.7					0.7
3		0.9				1.2	1.5		2.3			1.5
4		0.7	0.4			1.2	1.6		2.9		0.8	
5		0.8	0.8			1.2	1.7		1.2	0.4	1.9	
6		0.8	0.8			1.3	1.8		2.9	0.7	3.4	
7		0.8	0.8			1.2			2.0	0.6	1.2	
8	0.0	0.8	0.8			1.2			1.7	0.7	0.7	
9	0.1	0.9	0.8			0.5		1.8	2.0	0.6	0.5	
10	0.2	0.8	0.8			1.3	2.1	2.1	3.2	0.6	0.8	
11	0.2	0.8	1.1			1.2		2.9	2.7	0.8	0.4	
12	0.2	0.6	1.1			1.4		2.9	2.9	0.8	0.9	
13	0.2	0.0	1.1			1.2		2.6	5.3	0.7	0.5	0.7
14	0.4		1.2			1.3		2.6	5.4	0.7	0.7	0.8
15	0.9		1.1	0.9		1.4		3.1	5.7	0.5	1.6	0.9
16	1.2		1.2	1.3		1.3		3.0	6.2	0.6	0.6	0.6
17	1.5		1.0	1.7		1.3		3.0	6.4	0.8	1.3	1.4
18	1.1		1.0	1.5		1.4		2.1	5.7	0.6	2.5	1.6
19	1.0		1.0	2.0		1.4		3.6	6.2	0.7	0.8	1.0
20	1.2		1.2	1.6		1.3		3.9	6.3	0.5	0.7	5.0
21	1.4		1.3	1.4		1.5		3.7	6.7	0.5	0.8	5.9
22	2.2		1.1	0.6		1.4		4.0	6.6	0.8	1.8	4.0
23	1.8		1.0			1.5		4.1		1.2	1.2	4.0
24	1.1		0.9			1.5		4.0		0.5	1.6	5.8
25	1.2		0.9			1.4		3.8		0.5	2.0	6.5
26	1.4		0.0		0.7	1.4		4.2		0.6	1.2	5.0
27	3.4				0.9	1.6		3.9		0.5	1.1	6.0
28	3.3				1.0	1.7		4.6			0.7	7.8
29	2.3				1.2	1.8		3.2			1.2	11.7
30	0.8				1.2	1.3					1.1	6.5
31	0.7				1.2							3.0
Avg	1.1	0.7	0.9	1.4	1.0	1.3	1.6	3.3	4.2	0.7	1.2	3.7

TABLE D4.—Continued.

1987	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	2.7	8.6	6.5	4.6		1.9						
2	5.3	5.9	7.4	3.7		1.5						
3		5.9	9.2	5.8		1.5						
4		6.9		4.5		1.2						
5	7.3	6.5		6.0		1.1						
6	8.5	6.1		7.1		1.2						
7	4.5	3.8		3.9	2.1							
8	2.9	7.9		3.6	3.7							
9	3.2	13.0		8.5	2.5							
10	4.0	10.5	8.4	9.0	4.6							
11	6.2	9.1	6.2	7.3	4.3							
12	7.7	5.6	5.5	6.4	5.6							
13	9.0	4.0	4.9	5.3	4.1							
14	10.0	3.1	3.6	3.9	3.2							
15	8.8	2.2	4.0	3.4	1.5							
16	7.3	2.3	5.4	1.3	1.9							
17	7.4	2.7	7.0	1.7	1.3							
18	6.6	4.6	4.6	1.5	1.6							
19	6.2	7.1	5.1	2.0	1.1							
20	8.2	7.9	5.0	1.6	1.9							
21	7.4	5.7	4.5	1.4	1.3							
22	3.3	6.3	5.1		2.0							
23	6.1	7.7	4.2		0.9							
24	6.7	8.8	5.5		1.6							
25	5.9	11.8	5.7		1.5							
26	6.4	12.5	6.5		1.3							
27	9.2	15.5	4.3		1.6							
28	9.4	9.1	2.5		2.0							
29	9.7		3.1		2.4							
30	10.5		4.1		2.8							
31	12.2		4.7		2.5							
Avg	7.0	7.2	5.3	3.0	2.4	1.4						

TABLE D5.—Average hourly wind speed (km/hr) at canopy level, Barro Colorado Island, Panamá, 1971–1987.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1971:																								
Jan																								
Feb																								
Mar	3	3	3	3	3	2	3	6	8	8	8	8	7	6	6	7	6	5	5	4	4	3	2	2
Apr	3	3	4	3	3	3	4	7	8	8	8	8	8	8	8	7	7	6	5	4	4	4	4	3
May	2	2	2	2	2	2	2	3	4	5	5	5	5	5	4	4	3	2	2	2	2	2	2	2
Jun	2	2	2	2	2	2	2	2	3	3	4	4	4	4	3	3	3	2	2	2	2	2	2	2
Jul	2	2	2	2	1	2	2	2	3	3	4	4	4	4	4	3	3	2	2	2	2	2	2	2
Aug	1	1	1	1	1	1	1	2	3	3	4	4	3	3	3	2	2	1	2	2	2	2	1	1
Sep	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	1	1	1	1	1	1
Oct	2	2	2	2	2	2	2	3	4	4	4	4	5	4	3	2	2	2	2	2	2	2	2	2
Nov	2	2	2	2	2	2	2	3	3	4	4	4	4	3	3	3	2	2	2	2	2	2	2	2
Dec	2	2	3	2	2	2	2	4	7	8	7	8	8	7	7	7	5	4	4	3	3	2	3	3
1972:																								
Jan	3	3	2	2	3	2	2	4	5	6	6	6	6	6	5	5	5	4	3	3	3	3	3	3
Feb	4	4	5	4	4	4	5	7	10	10	9	9	9	9	9	8	8	6	5	5	5	5	4	4
Mar	3	3	3	3	3	4	8	9	8	9	9	9	8	8	7	6	4	4	4	3	3	3	2	2
Apr	3	3	3	3	3	4	5	7	7	6	7	7	7	6	7	6	5	4	4	4	4	3	3	3
May	2	2	2	2	2	2	3	4	4	4	5	5	5	5	5	4	3	2	2	2	2	2	2	2
Jun	2	2	2	2	2	2	2	3	4	4	5	5	5	5	6	4	3	2	2	2	2	2	2	2
Jul	2	2	2	2	2	2	3	4	4	4	5	5	5	4	4	4	3	3	2	2	3	2	2	3
Aug	3	3	2	2	2	2	2	4	4	4	4	4	4	4	4	4	3	2	2	2	2	2	2	2
Sep	2	2	2	2	2	3	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2
Oct	2	2	2	2	2	2	2	3	3	3	4	4	4	3	3	2	2	2	2	2	1	2	2	2
Nov	1	2	2	2	2	2	2	3	3	4	4	4	4	4	3	3	2	2	2	2	2	2	2	2
Dec																								
1973:																								
Jan	5	4	5	4	4	5	5	7	10	9	10	10	10	10	8	7	7	6	5	5	5	5	5	5
Feb	5	5	4	4	4	4	4	7	10	10	10	11	11	10	9	9	9	7	6	6	5	5	5	5
Mar	4	4	3	4	4	3	4	6	8	8	9	9	9	9	9	7	6	5	5	4	4	5	4	4
Apr	4	3	3	3	3	4	6	9	9	10	10	10	10	9	9	8	7	6	5	4	4	3	3	4
May	3	2	2	2	2	2	4	6	6	6	7	7	6	6	5	4	4	3	3	3	3	3	3	2
Jun	2	2	2	2	2	2	2	3	4	4	4	4	4	4	3	2	2	2	2	2	2	2	2	2
Jul	1	1	2	1	1	1	4	9	5	5	4	5	3	5	3	2	1	1	2	2	1	2	2	1
Aug	2	2	2	2	2	2	2	3	4	4	4	5	5	4	4	3	3	2	2	2	2	2	2	2
Sep	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2
Oct	2	2	2	2	2	2	2	3	4	5	5	4	5	4	4	3	2	2	2	2	2	2	2	2
Nov	2	2	2	2	2	2	2	3	3	4	4	5	4	4	4	3	3	2	2	2	2	2	2	2
Dec	2	2	2	2	2	2	2	3	4	6	6	6	7	6	5	5	4	3	3	3	3	2	2	2
1974:																								
Jan	4	3	3	3	3	3	3	3	6	8	8	8	8	8	9	8	7	6	6	5	4	4	4	4
Feb	5	6	5	5	5	5	5	7	10	12	11	10	10	10	10	10	9	8	7	6	6	5	5	5
Mar	4	4	4	4	3	3	3	5	9	10	9	10	11	11	10	9	8	7	6	5	5	4	4	4
Apr	6	6	6	6	5	6	7	10	12	11	10	11	11	11	12	10	10	9	8	7	7	6	6	6
May	3	3	3	2	2	2	2	4	6	7	7	8	7	7	6	5	5	3	3	3	3	3	2	2
Jun	2	2	2	2	2	2	2	3	4	5	5	5	5	5	5	5	3	2	2	2	2	2	2	2
Jul	2	2	3	2	2	2	2	3	3	4	5	5	5	4	4	4	3	3	3	3	3	3	3	3
Aug	2	3	2	2	2	2	2	2	3	3	4	5	5	5	5	4	3	3	3	2	2	2	2	2
Sep	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2	2
Oct	2	2	2	2	2	2	2	2	3	3	4	4	5	5	4	4	2	2	2	2	2	2	2	2
Nov	3	3	3	3	2	2	3	3	3	4	4	5	4	5	4	3	3	3	3	2	3	3	3	3
Dec	3	3	3	3	3	3	3	3	4	5	6	7	8	8	8	7	6	5	5	4	4	4	4	3
1975:																								
Jan	5	5	4	4	4	5	5	4	5	6	8	10	11	11	11	10	9	9	8	7	5	5	5	5
Feb	5	4	4	4	4	4	4	4	6	10	11	10	9	10	9	9	9	7	7	6	5	5	5	4
Mar	4	4	4	4	5	5	4	5	8	10	10	10	10	11	9	9	8	7	7	6	6	6	5	5
Apr	5	6	6	6	6	5	5	7	11	13	11	11	11	12	13	12	11	10	8	8	8	7	7	6
May	3	3	2	2	3	2	2	4	6	6	6	6	6	6	7	5	4	3	3	3	3	3	3	3
Jun	2	2	2	2	3	2	2	2	3	4	4	4	5	5	5	4	3	3	3	3	2	3	2	2
Jul	2	2	2	2	2	2	2	2	3	4	4	5	5	5	5	4	3	3	3	3	3	3	3	2
Aug	2	2	2	2	2	2	2	2	3	4	4	5	4	5	4	4	3	3	2	2	2	2	2	2
Sep	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2
Oct	2	2	2	2	2	2	2	2	3	4	4	4	5	4	3	3	3	2	2	2	2	2	2	2
Nov	2	2	2	2	2	2	2	2	3	4	4	4	4	5	5	4	3	3	2	2	2	2	2	2
Dec	3	3	3	3	3	3	3	3	4	5	6	6	7	5	6	5	4	4	3	3	3	3	3	3
1976:																								
Jan	5	5	5	5	5	5	5	5	8	10	11	11	12	12	11	10	9	8	6	6	6	5	5	5
Feb	6	5	6	7	7	8	8	9	12	13	12	12	11	11	11	10	10	9	8	8	7	7	6	7
Mar	7	7	7	7	7	8	8	10	13	12	11	12	11	11	11	11	10	10	10	9	8	8	8	7
Apr	6	7	8	7	8	7	7	6	6	5	4	3	3	3	3	4	3	4	3	3	3	4	5	5
May	3	3	3	3	3	3	3	4	5	5	5	7	7	6	6	5	5	5	4	4	3	3	3	3
Jun	2	2	3	2	2	2	2	2	3	4	5	5	5	5	5	5	4	4	3	3	2	2	2	2
Jul	3	4	3	2	2	3	3	3	4	4	5	6	5	6	6	5	4	4	3	3	3	3	4	4
Aug	3	2	3	3	3	3	3	4	4	4	4	4	4	4	4	3	3	3	2	3	2	3	3	3
Sep	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2
Oct	2	2	2	2	2	2	2	2	3	4	5	4	5	5	4	4	3	3	2	2	2	2	2	2
Nov	2	2	2	2	2	2	2	2	3	4	5	4	5	4	4	4	3	3	3	3	2	2	2	2
Dec	3	3	3	3	3	3	3	3	3	6	6	6	6	6	6	6	6	5	5	4	3	3	3	3

TABLE D5.—Continued.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1977:																								
Jan	5	5	5	5	5	6	6	7	7	8	8	9	9	8	8	7	7	7	7	6	5	5	6	5
Feb	5	5	5	4	4	5	5	6	6	7	8	8	8	8	8	8	8	7	6	6	5	5	5	4
Mar	5	5	4	4	5	5	7	8	9	9	9	10	10	10	10	9	8	8	6	5	5	5	6	5
Apr	6	6	5	5	6	5	5	6	6	7	7	7	7	7	8	7	7	7	7	7	6	7	7	7
May	2	2	3	3	3	3	3	3	5	5	6	6	6	6	6	6	5	3	3	3	2	3	2	2
Jun	2	2	2	2	2	2	2	2	2	3	4	4	5	4	4	4	4	3	2	3	2	2	2	2
Jul	4	3	4	3	3	3	3	4	5	5	5	5	6	5	5	4	4	3	3	3	3	3	3	4
Aug	2	2	2	2	2	2	2	3	4	4	5	4	4	4	4	3	3	3	2	2	2	2	2	2
Sep	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2	2
Oct	2	2	3	3	2	2	2	3	3	4	4	4	5	5	4	3	2	2	2	2	2	2	2	3
Nov	3	3	3	3	3	2	2	3	4	4	4	5	4	4	3	3	3	2	3	3	3	3	3	3
Dec	3	3	3	3	3	3	2	3	3	5	6	6	6	6	5	5	4	3	3	3	3	3	3	3
1978:																								
Jan	4	3	2	4	2	2	4	3	4	7	8	8	10	9	7	9	6	6	8	6	4	5	4	3
Feb	4	3	3	5	3	2	4	2	2	6	2	4	8	4	4	8	5	4	7	3	3	4	2	3
Mar	3	3	2	3	3	3	3	3	4	6	9	9	9	7	7	9	6	6	6	4	4	5	4	3
Apr	6	5	5	6	4	6	7	7	8	9	9	9	9	8	9	7	5	5	3	4	4	5	5	6
May	3	3	2	2	2	2	2	4	5	6	6	6	7	7	6	5	5	4	4	3	4	3	3	3
Jun																								
Jul																								
Aug																								
Sep																								
Oct																								
Nov																								
Dec																								
1979:																								
Jan	4	4	4	4	4	4	4	4	5	6	6	7	7	7	7	7	7	6	6	6	5	5	5	5
Feb	9	9	8	8	8	8	8	8	9	11	12	12	13	12	12	13	12	12	10	9	9	9	9	9
Mar	7	7	6	7	7	6	6	7	8	8	9	9	9	10	10	10	9	9	8	8	8	8	7	7
Apr	5	5	5	5	5	4	5	5	6	6	6	7	8	9	9	9	8	7	6	6	5	5	5	5
May	3	3	3	3	2	3	3	3	4	4	5	5	5	6	6	6	6	5	5	4	3	3	3	3
Jun	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1
Jul	2	2	2	2	2	2	2	2	2	3	3	3	4	4	4	3	3	3	2	2	2	3	2	2
Aug	3	3	3	4	3	3	3	3	4	4	4	5	6	6	6	5	5	4	3	4	3	3	3	3
Sep	4	4	4	4	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	3	3	3	3	3
Oct	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2
Nov	3	3	2	3	3	2	2	2	3	3	3	4	3	4	4	3	3	3	3	3	3	3	3	2
Dec	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	1	1	2	2	1	2	2
1980:																								
Jan	7	7	7	9	8	7	8	9	9	9	11	11	11	11	11	10	10	9	8	7	7	7	7	7
Feb	9	9	9	9	9	8	8	10	11	12	12	11	11	11	12	12	12	12	10	8	8	9	9	8
Mar	9	9	9	9	9	9	10	11	12	13	13	13	13	13	13	12	12	11	10	9	10	9	9	9
Apr	6	6	5	5	5	5	6	8	10	11	11	11	11	11	10	10	9	8	8	7	7	7	6	6
May	3	2	2	2	3	2	2	3	4	5	6	6	6	6	6	5	5	4	3	3	3	2	2	2
Jun	2	2	2	2	2	2	2	3	4	4	5	6	6	6	5	4	4	4	3	3	3	3	3	3
Jul	3	3	3	3	3	3	2	3	4	4	4	5	5	5	5	5	4	4	3	3	3	3	3	3
Aug	2	2	2	2	2	2	2	2	2	1	2	3	3	3	5	3	2	1	1	2	1	1	1	1
Sep	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1
Oct	2	2	2	2	2	2	2	3	3	3	3	3	3	4	3	2	2	2	1	2	1	2	2	2
Nov	2	2	2	2	2	2	2	3	3	3	3	4	5	4	4	4	3	3	2	2	2	2	2	2
Dec	5	5	5	5	5	4	5	5	6	7	7	8	8	8	8	7	6	5	5	5	5	5	5	5
1981:																								
Jan	7	7	6	7	6	6	6	7	9	10	11	11	11	11	11	11	10	10	9	8	7	7	7	7
Feb	8	8	7	7	8	8	7	8	9	10	10	12	11	12	12	11	10	9	9	8	7	7	7	8
Mar	3	4	4	4	4	3	3	3	4	6	7	8	9	9	9	9	9	8	7	5	5	4	4	4
Apr	5	4	5	4	4	4	4	4	5	5	6	7	7	7	7	7	7	7	6	6	5	5	5	5
May	0	0	0	0	0	0	0	0	1	1	1	2	2	2	2	2	2	1	1	1	0	0	0	0
Jun	1	0	0	0	0	1	1	0	1	1	1	2	3	3	2	2	2	1	1	1	1	0	0	0
Jul	0	0	0	0	0	0	0	0	0	1	2	2	3	3	3	2	2	1	1	1	1	1	0	0
Aug	0	1	0	0	0	0	0	0	0	1	1	2	2	2	3	2	1	1	0	0	0	0	0	0
Sep																								
Oct	2	2	1	2	2	2	1	2	2	3	3	4	4	4	4	4	3	3	2	2	2	2	2	2
Nov	2	3	2	2	2	2	2	2	2	2	3	4	5	5	5	4	4	3	3	3	3	3	2	2
Dec	3	3	3	3	3	3	3	3	3	4	5	5	6	6	5	5	5	5	4	4	3	3	3	3
1982:																								
Jan	5	5	5	5	4	4	4	4	5	6	7	7	8	8	8	8	8	7	7	6	6	5	5	5
Feb	7	6	6	6	6	6	6	6	5	5	6	7	9	9	10	10	11	10	10	9	9	8	7	7
Mar	7	7	7	7	7	7	6	6	8	8	10	11	11	11	12	11	11	11	10	9	8	8	8	7
Apr	6	5	5	5	5	5	5	4	6	7	8	8	9	10	10	10	9	9	8	7	6	6	6	6
May	1	1	1	1	1	0	1	1	1	2	3	3	4	4	5	4	4	4	3	3	2	2	2	1
Jun	1	0	0	1	0	0	0	0	1	1	1	2	2	3	3	2	2	2	1	1	1	1	1	1
Jul	2	1	2	2	1	1	1	1	1	2	3	3	3	4	4	4	4	3	3	2	2	2	1	1
Aug	2	2	2	2	3	1	1	1	2	2	2	3	4	4	4	4	3	3	2	2	1	2	1	2
Sep	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0
Oct	0	0	0	0	1	0	0	0	1	1	1	1	2	2	2	2	2	1	0	0	1	0	0	0
Nov	3	4	3	3	3	3	3	2	3	4	5	5	6	6	7	6	6	5	4	4	4	4	4	4
Dec	6	5	5	5	5	5	5	4	4	5	7	8	8	9	9	9	9	8	8	7	6	6	6	6

TABLE D5.—Continued.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1983:																								
Jan	7	7	7	7	7	7	6	8	9	10	10	10	10	11	10	10	9	7	7	6	6	6	6	6
Feb	6	7	6	7	7	6	6	6	6	7	8	9	10	11	10	10	10	9	8	8	8	7	7	7
Mar	6	6	6	6	6	5	6	6	8	9	10	11	11	11	11	11	11	10	8	8	7	7	7	6
Apr	5	5	6	5	6	5	5	5	7	7	9	10	10	10	10	10	10	9	8	8	7	7	6	6
May	4	4	4	4	4	4	4	4	4	5	5	6	6	7	7	7	7	7	6	5	4	4	4	4
Jun	2	2	2	2	2	2	2	2	3	3	4	4	5	5	5	5	4	4	4	3	3	3	2	2
Jul	4	4	4	4	5	4	4	4	4	5	5	5	6	6	6	5	5	5	4	4	5	4	4	4
Aug	3	3	4	4	4	3	3	3	3	4	4	5	6	6	6	6	5	5	5	5	5	4	4	4
Sep	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Oct	2	2	2	2	2	2	2	2	2	3	3	3	3	4	4	4	5	5	4	4	3	3	2	2
Nov	3	2	3	3	3	3	3	2	2	3	3	3	3	3	3	4	4	5	5	4	4	4	3	3
Dec	5	5	5	5	5	5	5	4	4	4	4	4	4	4	4	4	4	4	4	4	4	5	5	5
1984:																								
Jan	6	6	6	6	6	5	5	5	5	5	5	5	6	6	6	7	7	7	7	7	7	7	6	6
Feb	7	6	6	6	6	6	6	6	6	6	6	6	7	8	9	9	10	9	9	9	8	8	7	6
Mar	6	6	6	5	6	6	6	7	7	8	9	9	9	10	10	10	10	9	9	8	8	8	7	6
Apr	5	4	4	4	4	4	5	5	6	7	7	8	8	8	8	8	8	7	6	6	5	5	5	5
May	2	1	2	2	2	2	2	2	2	3	3	3	4	3	4	3	4	3	3	2	2	2	2	2
Jun		1		1		1		1		1		1		1		1		1		1		1		1
Jul		1		1		1		2		1		2		2		1		1		1		1		1
Aug																								
Sep	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1
Oct		1		1		1		1		1		1		1		1		1		1		1		1
Nov		2		2		1		1		1		1		1		1		1		1		2		2
Dec		4		4		3		4		5		6		6		5		5		5		4		4
1985:																								
Jan		6		6		6		5		6		7		8		9		8		6		5		5
Feb		8		8		7		8		9		10		10		10		9		8		8		8
Mar		12		13		13		12		11		12		0		11		11		13		13		13
Apr		9		9		8		6		4		4		0		7		5		6		7		7
May		3		3		3		3		3		4		4		3		2		3		3		3
Jun		2		1		1		1		2		2		2		2		2		2		2		2
Jul	1	1	1	1	2	2	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1
Aug	1	1	1	1	1	1	1	1	2	2	2	2	2	2	1	1	1	1	0	1	1	1	1	1
Sep	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Oct	0	1	1	1	1	1	1	0	1	1	1	1	1	2	2	1	1	1	1	1	0	0	0	0
Nov	2	2	2	2	2	1	1	2	2	2	2	3	4	4	3	2	2	2	2	1	2	1	1	2
Dec	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	0	0	1	1	1	1	1
1986:																								
Jan																								
Feb																								
Mar																								
Apr																								
May	1	1	1	1	1	1	1	1	1	1	1	2	2	1	2	2	1	1	1	1	1	1	1	1
Jun	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	1	1	1	1	1	1	1	1	1
Jul	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Aug	3	3	3	3	3	2	2	2	3	4	4	4	4	4	4	4	5	4	3	3	3	3	3	3
Sep	4	4	4	4	4	4	4	5	5	5	5	5	4	4	4	4	4	3	3	3	3	4	4	3
Oct	1	1	1	0	1	0	0	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
Nov	1	1	1	1	1	1	1	1	0	1	1	1	2	2	2	2	2	2	2	1	1	1	1	1
Dec	4	4	4	4	3	3	3	3	3	3	3	3	4	4	4	4	4	4	4	4	3	4	3	4
1987:																								
Jan	7	8	8	7	7	7	7	7	6	7	7	7	6	6	6	6	6	7	7	7	7	7	7	7
Feb	8	8	8	7	8	7	7	7	7	7	7	7	7	7	7	6	6	7	7	7	7	8	7	8
Mar	6	6	6	6	6	7	6	6	6	5	4	4	4	5	5	5	5	5	5	6	6	5	5	6
Apr	5	5	4	4	4	4	4	4	3	2	3	4	4	5	5	4	4	5	4	5	5	5	5	5
May	2	2	3	2	2	2	2	4	2	2	2	2	3	3	3	3	3	2	3	2	2	2	2	3
Jun	1	2	2	2	2	2	2	1	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1

Appendix E: Solar Radiation

TABLE E1.—Daily solar radiation (Wh/m²) measured by Eppley Pyrranometers on Barro Colorado Island, Panamá, 1973–1975, 1977, 1979–1989.

1973 Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1		4703	4379	4671	4407	2301	2816		5462	3403	5405
2			5172		4897	4358	5043		3391	5091	3870
3		3105		3586	3093		6601	3775	2542		5356
4		4163	6992		3912	4742	4989	6473	2078	4621	5096
5			5108	4779	3982	2905		6117	5161	2085	
6		4995	6086		2579	4236		4821	5957	3327	
7		6757	5247	3993		6184	5110	6304	5656	1747	
8		4474		5772		5276	5222	5657	4018	3356	
9				6447		3560	4754	6185	6299	2998	
10			3499	6298			3921	4642	4011	1550	
11		6254	5322	6571			3742	6005	2441	3696	
12		4731	5846	5985			6372		1618	2889	
13		6474	3996	4959				3603	3396	3315	
14		5273	4629					5283	3520	3844	
15		5645	4945	2724			3825	4158	5205		
16		4939		1592			3728	4072	1445		5971
17		4486		3202			5939	3058	3640		5043
18		6021	6837	4937			5734	4512	5494		4685
19		5445	5495	4234			3900	3639	3660	5485	5575
20		4011	6117				2389	7017	5581	5736	3702
21		4753	3448				6266	4507	5633	5611	5723
22		4051	4695	6251			2449	1373	5954	3770	5557
23		4166	5481	5690			6175	5419	5546	1223	4294
24		4932	6015	6065			4022	4622	5334	3406	5054
25		6567		5604		4906	5000	3650	6123	5281	5182
26			6357	4170		4933	5166	5280	6478	3493	5756
27			6913	3775		4854	4987	3177	6592	4549	3738
28			5832			4700	2431	3806	6203	4761	4947
29		5269	4190	4832	4625	5635	5919	3319	5630	3299	5792
30			5368	4157	2799	3872	4697	6442	3965	6177	3762
31		3417		4111		6935	4661		5882		1852
n		23	24	24	8	15	27	27	31	25	20
Avg		4984	5332	4767	3787	4627	4661	4701	4642	3789	4818
Sd		1004	1018	1305	930	1229	1257	1356	1547	1369	1042
Min		3105	3448	1592	2579	2301	2389	1373	1445	1223	1852
Max		6757	6992	6571	4897	6935	6601	7017	6592	6177	5971

1974	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	5624	6233	6017	4305	6173	4752	2242	5411	2668	4552	3765	2630
2	5856	6569	3919	6239	5948	3614	4095	3656	5987	3312	5296	1536
3	5234	5841	5262	5976	5898	4886	2721	5534	5277	3203	3273	5762
4	4052	4343	6082	6270	4351	5573	3280	3678	5578	6070	918	6015
5	5231	6206	6164	6209	4105	6230	5399	4509	6047	4632	4685	4868
6	4716	5050	6829	5814	6184	4310	4851	2696		6714	6227	3559
7	4867	4441	6122	5875	6663	4586	3846	4986		4873	5134	5162
8	4701	5688	6787	4806	5173	4736	4649	5262		4430	4476	3754
9	4979	4893	5519	6153	6233	2751	5001	2681		3497	3376	4846
10	4049	6036	4861	6261	5788	4531	3435	3720		2326	3132	5669
11	5315	6345	6047	6108	7036	4470	943	4028		5265	2356	5446
12	2136	7054	6596	5532	6628	3560	4242	1796		3468	5743	5072
13	5319	5987	7026	6365	4020	6051	3619	5047		3591	5363	4962
14	5806	6418	6077	6362	4931	4427	3976	6849		3940	6061	5297
15	5223	6257	4521	4782	2071	6329	1919	5690		4194	4033	4694
16	4464	5187	5477	4938	5811	6569	4294	5551		4524	3335	4882
17	5907	5430	4826	4180	3488	3470	4879	4721		1945	6136	3674
18	5254	6698	5626	5176	6795	6544	2314	4266		6402	4410	5255
19	5642	5905		3923	6440	4442	5331	4601		1792	3536	3958
20	5491	3904		4887	6368	3844	4428	4021		4580	4613	4448
21	4997	5848		3674	4892	1962	5633			5036	4680	4450
22	5534	6414		4907	3170	2563	4639			2078	3586	5072
23	5863	6524		6423	1144	6559	5897		4195	4915	4638	4716
24	4209	6743		6383	3733	5433	954		4473	2807	3467	4796
25	5250	6494		6040	4105	5008	3825		5678	4996	5210	5640
26	6313	6700		5060	4923	6168	2226		4108	4431	4136	5770
27	4665	6566		3513	5735	3640	4657		1168	4692	2468	5757
28	5287	6509		2964	5609	3581	4351	6634	5897	3490	3826	4142
29	5616		6087	4915	4654	5079	4213	5528	5764	3493	4678	6067
30	6091		5641	3997	4068	4581	2858	6060	4090	5564	4156	5548
31	4890		6966		2786		5445	5227		2988		4071
n	31	28	21	30	31	30	31	24	13	31	30	31
Avg	5116	5939	5831	5268	4997	4675	3876	4673	4687	4123	4224	4759
Sd	808	818	846	1027	1491	1256	1337	1266	1524	1276	1219	1020
Min	2136	3904	3919	2964	1144	1962	943	1796	1168	1792	918	1536
Max	6313	7054	7026	6423	7036	6569	5897	6849	6047	6714	6227	6067

1975 Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1		6327	6455	5342	4623	2381					
2		6456	6118	1162	2156	3752					
3		6125	6953	3832	4554	3279					
4			6103	5870	3643	2305					
5			2761		2075	3118					
6			7305	6993	3682	3160					
7		5634	6155	6619	5817	5608					
8		5946	5663	5368	4807	3578					
9		6299	2894	5585							
10		6087	5607	5269							
11		3464		4216	5369						
12		6177		3803	5646	2981					
13		6556		2871	2026	3660					
14		7032		3112	6247	3154					
15		6717		1863	2081	5162					
16		6599	7344	4807	2099	4422					
17		6255	6446	3624	2869	5111					
18		6083	5698		1923						
19			6195		2739						
20			6574	5166							
21			5241	5517							
22			6185	5814		5403					
23			6666	2137		2837					
24			6495	5207	1600	6026					
25	6560	4438	4959	6741	3094	2626					
26	6355	5750	5324	5463	2812						
27		6684	5820	1763	4064						
28			4805	4341	3517						
29			7138	2226	4155	2556					
30			6316	5244	1685						
31				4550		3784					
n	2	18	25	28	24	20					
Avg	6458	6035	5889	4447	3470	3745					
Sd	205	875	1162	1625	1458	1179					
Min	6355	3464	2761	1162	1600	2305					
Max	6560	7032	7344	6993	6247	6026					

1977	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1						4188	4512	3253	5736	5094		
2						3383	4635	4537	5988	6424		
3					6745	5090	5968	4670	5008	4965		
4					5981	5018	5783	4743		2969		
5					4115	3532	1428	3795		4106		
6					7205	3717	3834	4509		5289		
7					6004	4030	1824		4834	4020		
8					5563	2483	2668		6627	2337		
9					5157	5712	6117	4797	4398	4587		
10					3975	5114	3564		1598	2609		
11						3003	6619		5542	3457		
12						3146	4643	7176	3189	3472		
13						2453	5753	6091	4377	5892		
14							5640	3051	4357	5008		
15						4427		3363	4013	6039		
16						3210		2731	4822	3186		
17						4522		2006	4267			
18						2746		3658	2588			
19						4506	4818		6499			
20						3777	2522		5483			
21					1584	2390	4991		3730			
22					3857		6793		3165			
23							6255		3792			
24					5781	3834	5411		5835			
25					4671		3566		2683			
26					3458		4705		1860			
27					5757		2905		4676			
28					3962	2167	4802		3853			
29					2941	1642	6277		2709			
30					4490	1996	4555		4791			
31					2884		1686					
n					18	24	27	14	27	16		
Avg					4674	3587	4529	4170	4312	4341		
Sd					1515	1126	1588	1406	1365	1304		
Min					1584	1642	1428	2006	1598	2337		
Max					7205	5712	6793	7176	6627	6424		

TABLE E1.—Continued.

1979	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1									2986		6216	
2									5534		4765	2891
3									6580		4320	4160
4											1607	3576
5										3824	890	4406
6										2124		5098
7										4609	1607	
8												3136
9											5308	2803
10											3836	5576
11											3540	5295
12											1978	
13											1890	5294
14									2546		3180	3220
15									4715			1398
16									4764		2301	3644
17									5654		3406	
18									4357		5115	
19							3290		6115		1917	
20							4050		3487		1838	
21							6033				2020	
22							2235	2991				5370
23							3534	5211				4506
24							3494	2876		3743		5077
25							2935	6330		4203		5862
26							5605	3991		4460		4977
27							6430	3570		5340		5707
28							5742	1681		4064		2198
29							6064	6608		3266		4319
30							4105	4702		6041		4217
31							5081	4386		5794		3811
n							13	10	10	11	18	23
Avg							4508	4235	4674	4315	3096	4197
Sd							1440	1634	1419	1190	1590	1223
Min							2235	1681	2546	2124	890	1398
Max							6430	6608	6580	6041	6216	5862

1980	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1		5770		5733	6599	3894	5508	3342	2637	3290		
2		6278		3647	5682	6172	4780	6125	1818	2925		
3	3855	6483		5898	6527	5476	4719	3644	6274	4799		
4	4458			5672	6132	3962			5844	3399		
5	5176	1747			3437	2408			4030	3142		
6	5669	3154			2118	2564	4740		1394	2910		
7	4701	2210	6871	4744	1176	1102	3405	1072	3176	3435		
8	5702	5681	6755	6290	2588	4020	3498	4262	3766	2543		
9	5498	4667	6455	7175	6323	2415	5965	4303	4641	5332		
10	5878	6089	4158	7385	5793	2804	2894	5020	4217	2912		
11	5728	5672	4983	7019	5005	2756	4125	5259	5604	3720		
12	5531		6394	6909	4860	1827	5939	4634	5151	5324		
13	5995	6471	6148	6819	3185	4962	2586	4915	3456	4859		
14	6067	6189	5134	6779	1620	5455	3647	3715	3244	3840		
15	4746		4878	5689	3316	5393	1899	3955	3230	2295		
16	5423	6447	6015	6711	6199	3693	4505	1004	4215	2750		
17	5665	4957	6517	4298	4755	3909	3205	3974	4381	4426		
18	3231		6398		1990	4973	2395	4404	2620	4320		
19			7073		5200	2200	4800	3233	2655	5818		
20	4679	5390			2598	3794	2182	4300	2182	3044		
21	3815				4282		3265	4345	5143	4144		
22	4952		7101	1643	1464	5133	2853	2575	5664	3265		
23	4786		7052	3493	3732	2689	5347	5674	6161	3777		
24	2768		6564	2471	5392	5393	3534	5744	6364	3818		
25			4129	4978	5027	3934	3109	5925	4834	3764		
26	5859	6559	5286	4610	4181	2982	4837	3539	971	1569		
27	4677		5625	3572	4634	2674	3185	3265	2066	2288		
28	5988		5291	5071	3459	3971	3648	2293	6609	3619		
29	6145		4161	5346	3958	2794	4258	1795	3743	2449		
30	4694		5434	6568	4233	4419	2912	2391	5229	2418		
31	5432		5861		3291		2777	4341		3717		
n	27	16	23	24	31	29	29	28	30	31		
Avg	5078	5235	5838	5355	4153	3716	3811	3895	4044	3546		
Sd	899	1595	978	1588	1602	1311	1142	1388	1603	1013		
Min	2768	1747	4129	1643	1176	1102	1899	1004	971	1569		
Max	6145	6559	7101	7385	6599	6172	5965	6125	6609	5818		

1981	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1					4744		5599	2276	3618		4508	2958
2					5190		4951	4357	6194	4001	4949	3904
3					5055		1698	2542	3244	2922	4040	3689
4					2682		1831	2965	3831	2832	4645	2523
5					4684		4011	2494	5082	3830	4838	1400
6					5646		4653	4313	2382	4286	3676	3785
7					3364		4594	2797	2916	3736	2020	2914
8					3040		3129	3616	3155	2010	2663	2436
9					4249		3365	2929	4789	4128	3624	1591
10					4482		3328	2802	2920	3126	4071	1624
11					2971	6468	3282	4550	3352	3848	936	1103
12					2972	2057	3464	1448	5041	3583	3043	1093
13					5886	2317	4917	2385	4943	5284	2726	519
14					1200	4529	3854	5614	3478	3482		2193
15					1160	5181	3309	5212	4483	3664		2908
16				1724	3322	1181	1999	5726	1783	3247	3146	3253
17				3528	3445	2938	4872	5457	3805	4400	4437	4378
18				2009	3893		2149	4142	5347	3088	3042	4053
19				2413	5291		5492	4105	4060	3295	3184	2289
20				2919	5194		3686	1502	5495	4446	3381	2531
21				6377	4560		3705	3030	4589	3104	2549	2149
22				3836	1435		5638	3001	5079	1990	2709	3974
23				3065	2440		5406		5161	3775	2583	1993
24				2833	3625		4888	1907	3047	5385	3789	4076
25				2509	5471	1840	4082	2367	4679	5078	2766	5032
26				1118	6937	3981	3902	5305	2345	3586	3674	5255
27				1340		2142	3658	2958		2805	3578	4758
28				3343		2894	3590	6318		4866	3601	4288
29				4446		2437	3063	4334		2905	2745	3820
30				5695		3322	4096	1786		3055	3427	2810
31							4339	3836		3384		4518
n				15	26	13	31	30	26	30	28	31
Avg				3144	3959	3176	3889	3536	4032	3638	3370	3026
Sd				1542	1517	1557	1098	1381	1152	861	911	1280
Min				1118	1160	1181	1698	1448	1783	1990	936	519
Max				6377	6937	6468	5638	6318	6194	5385	4949	5255

1982	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	3676											
2	2845											
3	2772											
4	2256											
5	2499											
6	2094											
7	4899											
8	4699											
9	5373											
10	5379											
11	5514											
12	4820											
13	4850											
14												
15												
16												
17												
18												
19												
20												
21												
22												
23												
24												
25												
26												
27												
28												
29												
30												
31												
n	13											
Avg	3975											
Sd	1365											
Min	2094											
Max	5514											

TABLE E1.—Continued.

1983	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1				6067	4564			1070		907	5755	3945
2				5750	4462		4043	5215	3652	5704	4871	4736
3				6206	3717		2550	3722	4355	4164	5308	3429
4				6011	5588		4718	6420	5420	3661	3117	3098
5				4020	5467		2349	3019	4378	1768	4345	3717
6				5853	2889		5267	2950	1926	2373	4578	3420
7				6318	3754		5895	4862	940	1428	3992	3494
8				6099	3540		4987	6034	6225	4392	4885	2359
9				6160	5276		2336	4294	2177	5708	4890	3908
10			6071	6490	4718		6234		1563	5597	4997	2773
11			5043	5113	4773		2791	3368	2801	4029	2657	3340
12			5588	5727	4271		5257	6583	4843	3029	5429	4504
13			6378	6932	335		6541	6462	3503	3485	2991	4290
14			5378	6053	558		2443	6002	5574	2573	4708	4331
15			6295	5592	2303		5029	5713	5574	4685	4825	3331
16				6774	3731	6141	2829	4597	2708	5532	5611	1847
17				5253	4476	2205	4034	2912	3438	6257	4722	1819
18				7095	4178	4169	6034	1010	2373	5039	4052	1935
19				6983	3736	6346	5936	3098	3950	6057	4080	3247
20				6904	3652	1103		5439	2052	3452	3550	1759
21				6081	6499	5206		4108	4517	5811	1931	2908
22				4494	5113	2298		3950	4243	5113	2750	4745
23				3443	5118	2168		5341	5834	5983	3643	4471
24			4699	5806	5308	2661			3973	5387	5476	4634
25			4155	6476	5392	6741			3424	3010	5248	5015
26			3829	5457	4573	4448			4927		5332	4001
27			4331	428		3652			2215	4829	2126	4364
28			3857	358		5708	3112		3550	1498	2931	
29			5746	3001			2252		2996	2001	2550	4569
30			5834	6285			3773		3438	2712	3257	2680
31			6332				3606			2754		3489
n			14	30	26	13	22	22	29	30	30	30
Avg			5253	5441	4154	4065	4183	4371	3675	3965	4154	3539
Sd			967	1715	1448	1946	1496	1660	1395	1633	1146	974
Min			3829	358	335	1103	2252	1010	940	907	1931	1759
Max			6378	7095	6499	6741	6541	6583	6225	6257	5755	5015

1984	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	3540	6351	6150	5597	7090	4048	2764	3378	4131	4299	4913	2875
2	5285	5802	6323	5829	5620	2401	3302	2847	4997	3071	2429	4048
3	4969	3875	5792	3517	6937	4215	5276	2233	3098	1703	3210	3964
4		5732	5090	5373	4643	3852	3182	3098	4159	4997	4076	2345
5	5360	5066	6537	6802	5862	2540	1926	4243	2736	4773	2708	4634
6	3098	6025	3754	6644	5588	614	3545	5611	865	2652	2540	4773
7	3661	4099	3280	4699	3908	1172	5136	3266	2708	3433	4969	4578
8	5727	6453	6402	6518	5932	3266	2010	2624	3992	2624	2121	4745
9	4466	6304	5834	6374	6117	4466	4410	3294	4857	4578	3489	4243
10	3708	3154	7048	6955	4117	4187	3238	3657	1787	4215	2903	4550
11	5094	4159	5857	6597	4201	1982	4410	1117	3573	4662	4327	5053
12	5420	4257	6481	6416	4983	3992	5806	4299	4076	2764	4801	5136
13	5788	6471	7002	4080	2582	4969	2791	4299	3126	2066	4327	2903
14	6299	6513	5899	5532	6951	3378	2652	2540	2205	2038	2736	4159
15	4927	6653	7067	5853	3085	2764	1787	1787	3796	3629	4131	3713
16	4010	6802	6816	3931	4327	4215	4383	3071	5080	3433	4187	3238
17	5392	6537	6676	1559	2568	2847	4718	2261	3322	2875	3489	4438
18	5671	5536	7058	5641	3587	2317	2736	5053	2066	2931	5025	3713
19	5308	5369	7188	5954	4648	5918	4634	3852	2261	4466	2205	5192
20	5825	5597	7183	6070	4843	4745	2931	3657	3350	4745	3629	3378
21	5760	6448	7007	4292	2736	3741	2875	1117	3601	4745	3210	4801
22	5532	5457	7034	4883	3071	2652	4885	3545	3796	4243	2987	3573
23	5657	4504	5443	6475	3601	3545	3294	921	6420	2903	1396	3796
24	6318	3871	6681	7332	5080	3098	4438	4243	5080	2540	4745	4829
25	6672	5462	6997	5014	3015	3322	4131	4662	4997	4103	5053	4215
26	6067	4183	6239	5118	2973	3768	2261	4857	3378	2624	2484	4076
27	6327	4997	5592	5183	5541	3852	4801	2205	3936	3238	1424	3126
28	6081	5778	6196	5350	4955	3071	2512	2038	3685	4801	2624	4885
29	5560	5555	4906	6523	3880	1898	3852	4829	977	3154	4271	4913
30	4145		5653	6760	3043	1144	2791	3824	4745	2736	4494	4410
31	5681		5173		2903		3433	3043		2568		5332
n	30	29	31	30	31	30	31	31	30	31	30	31
Avg	5245	5414	6141	5562	4464	3266	3578	3273	3560	3471	3497	4182
Sd	938	1033	982	1246	1389	1211	1100	1225	1284	986	1109	777
Min	3098	3154	3280	1559	2568	614	1787	921	865	1703	1396	2345
Max	6672	6802	7188	7332	7090	5918	5806	5611	6420	4997	5053	5332

1985	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	5220	4662	5054	5806	6169	1870	4299	3489	3824	4699	5222	4280
2	5220	6085	3629	6420	6364	2038	3545	4745	5667	3338	5083	4699
3	5360	5778	4271	5918	2875	3152	4131	3703	1898	5118	6374	3164
4	4550	5499	4829	6420	5276	2199	3852	4152	4299	2315	5781	1245
5	4745	5639	6225	3433	2819	5378	2931	1531	3861	2268	3955	1454
6	3517	5136	5974	6169	2066	3964	4550	3128	2943	4141	4548	1721
7	5220	5750	5974	6476	1898	3489	4410	2890	3489	5967	3454	1884
8	5332	4410	5471	6085	4662	4131	3238	3301	5350	3966	1477	3164
9	5304	4299	5555	6420	3657	3378	4718	2484	2710	2175	2617	2745
10	5192	2680	4020	4076	2233	4299	4327	6197	2547	3745	4676	4559
11	5248	3294	6057	5080	4355	2819	4299	4997	5374	3338	4908	2594
12	5304	4606	6141	5750	3266	3154	5499	5778	4722	3396	5187	3431
13	5750	5053	5332	5611	4131	4243	3545	5667	4908	2954	5036	5083
14	4634	6281	5220	4634	5136	4271	3880	2652	3059	2838	3385	5083
15	4634	5806	6309	3545	5220	3992	3489	3406	4059	3350	4327	5094
16	5276	4548	6504	4773	5499	2317	6895	3741	5327	3745	2896	5141
17	4997	3824	6504	5192	3461	2847	6979	2652	6025	3292	4536	5548
18	4578	4138	6085	6560	5053	3266	2959	2233	3815	5187	5583	5467
19	5443	4793	6839	3713	5304	3964	4969	3629	3768	4257	3594	5676
20	5639	5466	6895	5360	4941	4076	4550	4020	3443	3652	4117	5443
21	4745	4791	6755	6002	3908	3936	8235	4773	3408	3815	512	4129
22	4969	5198	6783	5527	2261	2931	3489	5108	4734	2791	4338	5025
23	4271	5537	5750	6755	5695	4159	2456	4745	4955	5722	2687	5455
24	4662	6175	6141	6644	5695	4801	2736	3713	6211	3233	3536	4269
25	4103	6201	5080	5778	3629	2764	3406	3043	5920	4932	4722	3071
26	2652	5916	5667	6002	4857	2708	4020	2791	5943	5234	5234	4792
27	4997	6417	1926	6755	4159	3210	3936	5527	3513	3838	4280	2896
28	2791	6579	6532	6588	4076	2373	4913	4466	3722	3140	3524	4850
29	4662		6560	6839	3406	3210	3378	3154	4990	3245	5862	3908
30	5415		6392	3964	4745	3071	3713	4076	3978	1442	3768	4152
31	5415		5499		2540		2429	5918		3664		4664
n	31	28	31	30	31	30	31	31	30	31	30	31
Avg	4834	5163	5677	5610	4173	3400	4186	3926	4282	3703	4174	4022
Sd	750	982	1100	1046	1285	864	1322	1210	1160	1080	1308	1330
Min	2652	2680	1926	3433	1898	1870	2429	1531	1898	1442	512	1245
Max	5750	6579	6895	6839	6364	5378	8235	6197	6211	5967	6374	5676

1986	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	5495	6108	6694	4044	5690	5634	2817	4574	4853	4686	3068	4212
2	5634	6053	6248	4993	5132	6136	4128	2957	3765	2287	2594	3682
3	3933	5523	5662	6276	3096	5774	3514	4351	4212	3152	4574	5132
4	5160	5997	4658	4686	2036	5216	2957	5272	4574	2371	2957	4295
5	3933	5941	6778	4407	3347	3682	3933	3542	3208	3208	4630	3793
6	4742	6053	6359	5076	5104	4602	3654	3347	3849	6359	5467	1952
7	5160	6108	6889	6527	5355	4295	2036	5634	4184	2482	4351	2566
8	5411	5439	6610	6053	6332	5411	4379	5774	3180	614	4546	3180
9	5383	5941	6248	6861	7029	4797	3291	5244	2008	2343	3291	3598
10	5718	5411	6025	3542	6108	1674	3542	4742	3570	1367	4881	2678
11	3793	5383	6053	3710	6750	2259	4435	2399	4714	3877	3821	4351
12	3459	5467	6806	3765	6499	4797	1869	3208	3765	2343	1339	4546
13	3263	6220	6276	6276	6610	4853	5634	3654	2622	3793	1701	4797
14	2789	6499	6220	6108	6889	1534	6192	1841	1590	4295	2622	5216
15	5606	6610	6583	3375	6080	3431	3459	4714	2901	2203	5048	4742
16	5690	5746	6917	6136	2789	3793	1618	3682	4630	1729	1646	4044
17	5941	5244	7224	1450	6666	3459	2287	2733	5662	1506	2203	4881
18	5913	4267	6220	1897	6666	3849	5039	2259	725	3208	4184	4602
19	5941	4156	5690	1367	3431	5160	5162	4463	2901	2594	2203	4937
20	5634	4825	3765	2120	4630	3793	6108	2176	3514	3905	2984	4881
21	6053	3905	4630	3291	976	3012	3227	5132	3570	1897	1785	4463
22	4853	6555	6248	4267	3403	3012	2361	4463	4240	4909	4937	4658
23	5774	6527	4686	3180	2957	2510	4576	3319	4965	4881	2427	4379
24	5523	5048	5941	5021	4407	3989	5401	2482	4379	2622	3933	2789
25	5829	5634	6861	6025	5802	4602	4056	4100	2538	1729	4463	4965
26	3654	6722	5523	5132	4630	3514	5496	3403	4909	2566	5188	5411
27	4491	6248	5662	6108	2176	4519	4527	5634	3347	2761	3933	4351
28	5690	6722	2594	7112	3738	2817	4136	1813	2845	3877	5021	4351
29	3180		6359	6332	6889	2678	5331	2482	4714	3765	4770	5327
30	5132		2901	4072	6415	2538	4512	3626	6248	3124	4072	3905
31	5551		5941		6387			4714		5021		5132
n	30	28	31	30	31	30	30	31	30	31	30	31
Avg	4958	5727	5847	4640	4968	3911	3989	3798	3739	3080	3621	4252
Sd	1002	777	1150	1668	1757	1240	1277	1206	1210	1297	1256	886
Min	2780	3905	2594	1367	976	1534	1618	1813	725	614	1339	1952
Max	6048	6722	7224	7112	7029	6136	6192	5774	6248	6359	5467	5411

TABLE E1.—Continued.

1987	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	4797	4491	3682	6164	4602	1618	4853	3542		1615	2817	5438
2	4937	3682	5662	4825	4240	2817	5299	1562		941	2148	3514
3	5021	5188	3710	5662	5857	4630	3235	4965		2104	948	1227
4	4546	4072	5327	4546	5411	3263	3738	5439		2045	3347	641
5	4546	5132	5746	1729	5327	3180	1562	5076		1371	3319	2621
6	2817	5802	5411	4072	5216	5523	5857	5802		1534	697	3849
7	5355	5634	5523	5132	3431	4853	1729	3012		1267	1004	1757
8	5383	5634	4742	2957	1199	3263	3849	2901		198	4407	4127
9	5551	4156	5857	2259	809		3459	1925		1232	4630	3179
10	4574	1729	6415	4546	3849	2733	4240	1952		1790	5244	3598
11	4686	586	6080	4267	4937	4295	3849	3989		2231	5132	4657
12	4156	4184	6387	5216	4602	2343	6694	5021		1209	4435	2510
13	5160	5718	6583	6332	1144	1841	2678	2148		2150	3542	1701
14	4937	5467	4128	5355	3654	2343		4770		872	2427	2845
15	4825	6053	6136	6192	2259	3682	2984	4937		1557	1897	2231
16	3710	5774	5969	5913	2064	4016	2120	4323		976	3291	5494
17	3738	5997	4491	5802	5327	4184	3626	4546		1151	4658	5104
18	4463	4602	6220	5160	5048	2455	3654	3849		1046	5188	5020
19	3068	5774	5383	2399	4491	5634	5746	4044		1255	2650	3849
20	5104	2957	4993	4295	4519	3738	4825	4686		1023	1674	4155
21	5244	5746	3319	4407	2399	3068	725	3654		2127	3291	
22	4770	4519	4993	3403	3542	6248	1646	3989		3208	3570	
23	3654	4267	5885	4937	1674	4463	4100	5021		2733	4240	5048
24	3431	5634	5578	3542	5774	2455	3570	2008		2622		5076
25	4128	2901	5355	2901	6527	5969	2957	3877		2594		5438
26	4881	5467	5551	2733	4156	2064	2315	2789		2845	1422	5299
27	5383	3180	6276	1590	4658	4184	3124			2706	4434	5438
28	5132	5885	5244	2789	3319	4909	4295			3291	3988	5299
29	4546		5746	2064	4658	3180	4742		1708	1088	5020	5104
30	4630		6610	1701	4016	2120	2371		930	3235	5104	4183
31	4937		6220		3068		2259			3821		3765
n	31	28	31	30	31	29	30	26	2	31	28	29
Avg	4584	4651	5459	4096	3928	3623	3537	3839	1319	1866	3376	3868
Sd	706	1404	878	1514	1518	1311	1421	1241	779	898	1442	1447
Min	2817	586	3319	1590	809	1618	725	1562	930	198	697	641
Max	5551	6053	6610	6332	6527	6248	6694	5802	1708	3821	5244	5494

1988	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	3681	4463	6415	6583	2482	4531	4303	4070	3935	3621	2956	1622
2	4434	4435	5160	6555	5244	2530	4977	2716	6855	5164	5629	2758
3	5466	3989	5857	4463	5299	7153	4202	3804	3775	4290	4534	2988
4	5187	4853	5383	5132	2678	6379	1440	5433	5333	4374	5858	1521
5	5354		5467	6583	4491	4286	3475	4389	4923	4420	4760	5060
6	5076	5606	5355	6499	1925	4018	4274	3687	5012	3973	5634	4715
7	5131	3654	5969	5969	2817	5374	5187	2362	4444	3944	2734	4584
8	5048	4323	6108	6025	5913	5824	2824	4747	5922	2988	3163	2606
9	5076	4212	5411	5439	4016		3843	6087	4818	3794	2409	3748
10	5299	4853	3682	3180	1952	1980	3981	3221	1907	4653	2985	4964
11	4936	5160		4016	3403	2421	2328	5884	3507	4779	4092	4945
12	5299	5802	6527	6499	1869	3500	6010	3500	3637	3672	4294	4601
13	4629	5885	6527	6387	2566	5244	5283	3528	5480	3736	2059	3019
14	4434	6080	6387	5997	2984	4590	2474	4024	4295	2480	1430	6062
15	5243	5439	5969		5327	5269	3065	2475	4362	1993	1326	3450
16	3319	5439	5969	5383	6080	2687	3035	4207	5546	3222	3149	2557
17	4685	5578	4044	6220	7140	2094	3859	5022	2494	3921	3428	4921
18	5187	5523	5076	6276	3542	4439	1330	2477	5036	2075	2892	4932
19	5215	5885	4742	6108	2733	3267	3206	4573	3179	1797	3612	4826
20	5104	5523	5774	5216	3514	2557	3616	4985	3340	1384	5827	5726
21	5466	4993	5411	6053	5467	4935	3615	2307	5848	2781	3181	5461
22	5550	3375	4128	6443	3933	6045	1334	4369	4503	5711	5623	5946
23	5438	4156	5802	6443	4156	3405	3566	4471	3960	5187	3945	4683
24	4964	4435	4240	6387	4880	3161	2607	4881	2913	5398	3492	4950
25	5522	3124	6415	4463	4545	3834	2253	5362	3614	2721	3905	5737
26	5020	3989	5802	6136	2083	4827	910	3470	1667	3218	4909	5734
27	4100	3626	5634	5857	2967	6578	3196	3615	4504	4389	4308	5578
28	4462	3793	5969	4937	2193	4766	3652	3613	4720	2810	3964	5119
29	5187	2957	2371	5299	5837	4336	2090	2875	4266	4369	3505	4831
30	5438		4742	4463	6002	3458	3993	4319	2261	6353	3316	3822
31	5076		5885		4801		4930	4138		4222		4521
n	31	28	30	29	31	29	31	31	30	31	30	31
Avg	4969	4684	5407	5690	3963	4258	3383	4020	4202	3788	3764	4387
Sd	540	930	969	907	1463	1369	1229	1001	1204	1170	1204	1230
Min	3319	2957	2371	3180	1869	1980	910	2307	1667	1384	1326	1521
Max	5550	6080	6527	6583	7140	7153	6010	6087	6855	6353	5858	6062

1989	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	5837	6571	4868	7326	5182	3347	3570	4848	4451	6137	2063	2977
2	5329	6297	4916	7476	4772	1499	3110	3217	4140	2068	3906	3738
3	4355	6622	6865	7561	2952	5940	4676	3482	2724	3933	4740	3643
4	4030	6678	5622	6292	3013	5067	3664	6635	4374	3655	4502	4895
5	4234	6480	5520	5870	6521	2305	2877	5177	3876	1820	3766	3311
6	2320	4995	6062	5959	5389	3031	3408	2125	2638	5849	2722	5609
7	4707	5351	7196	5356	5945	5248	3126	3999	3751	5794	2667	4409
8	4955	4896	7250	6185	6054	4384	4044	6006	5442	2467	1477	4972
9	5617	6291	6273	6364	6692	3151	4541	1801	1722	2156	2316	3927
10	6148	6123	6352	6523	7300	3635	5019	2448	5268	4097	4608	5053
11	5909	5955	4829	3809	7635	3739	4131	4754	3522	2153	3581	3065
12	6561	6747	6687	6484	5993	3815	5120	3699	3653	3836	3845	3600
13	5482	6070	6628	6772	3629	3545	3560	4162	4722	4445	5307	4718
14	5063	4039	5963	6406	3987	5732	4472	2321	5588	4805	4288	5239
15	5318	6112	7218	6885	6292	5546	6385	2750	5260	5291	3943	5042
16	3923	6615	6375	4119	4652	2806	3892	2731	4583	2235	2770	5705
17	5875	6332	6054	6261	6183	3438	3294	1807	5484	3548	1613	4823
18	6310	7197	6329	5853	5554	5482	2838	5566	4667	1472	2052	5552
19	6181	6800	6555	6924	5887	1470	3683	2209	4644	3849	4606	5568
20	6065	7026	6522	7203	6368	3065	3101	4584	3179	857	5154	5525
21	4986	5861	7383	3665	4825	2458	2650	4247	4593	1093	4736	4967
22	5475	5092	7494	4654	6167	2875	4302	4472	5009	2652	2314	5641
23	5909	4508	7410	6552	1203	3082	3648	3818	4727	4586	4864	4976
24	5193	4076	6574	2806	4530	3089	4518	5524	6768	6009	2559	5224
25	5766	5379	5510	6480	4229	4085	4248	4782	4920	3205	549	1175
26	5730	2242	6952	6799	6270	3401	3829	4131	3058	6158	4895	1163
27	6598	5024	4617	4525	3731	4613	4131	4291	5153	5810	5236	1985
28	5419	6336	4836	7289	2176	5308	5270	4035	4705	3062	3812	3443
29	6584		7129	5702	5986	1897	4537	1580	2531	4379	3064	3538
30	6684		7593	6296	6048	5570	2561	3981	4689	5844	3296	5286
31	5537		7610		5225		3989	5730		4166		5157
n	31	28	31	30	31	30	31	31	30	31	30	31
Avg	5423	5776	6361	6013	5174	3754	3942	3900	4328	3788	3508	4320
Sd	925	1089	890	1190	1468	1261	836	1321	1071	1580	1250	1254
Min	2320	2242	4617	2806	1203	1470	2561	1580	1722	857	549	1163
Max	6684	7197	7610	7561	7635	5940	6385	6635	6768	6158	5307	5705

TABLE E2.—Daily values of photosynthetically active radiation (PAR) measured by Li-190S quantum sensors at 40 m elevation on the Lutz tower (Einsteins/m²/dy), 1985–1989.

1985	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1										39.3	40.0	33.3
2										20.6	38.6	37.2
3										28.5	48.0	25.2
4										19.0	43.3	10.4
5										18.0	30.8	12.4
6										31.8	35.0	13.8
7										45.9	27.1	14.8
8										31.1	12.0	23.6
9										17.4	20.0	20.6
10										28.9	35.4	34.1
11										26.5	36.7	21.3
12										26.1	39.3	26.6
13										23.3	38.2	38.4
14										22.5	26.5	38.0
15										25.8	33.4	38.2
16										29.5	22.3	39.2
17										25.8	34.7	41.6
18										38.2	42.6	41.0
19										32.4	27.6	42.6
20										28.4	30.7	41.6
21										29.2	4.9	32.0
22										21.7	34.1	37.4
23										43.6	21.2	40.2
24										24.9	26.9	32.5
25										38.6	35.7	23.8
26										39.5	40.3	35.0
27									31.0	30.5	32.1	22.5
28									39.9	23.6	27.5	36.1
29									33.4	24.6	44.1	30.2
30										11.5	29.1	32.0
31										28.1		36.0
Avg									34.8	28.2	31.9	30.7

1986	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	40.6			31.1		39.9	20.9	37.0	37.2	34.4	22.3	27.8
2	42.0			37.9		44.8	26.1	22.5	13.5	17.3	19.4	37.7
3	29.5			46.8		41.0	13.1	31.1	16.0	23.2	27.5	8.5
4	39.6			35.7		37.6	16.3	37.7	19.4	18.4	33.3	11.8
5	30.0		50.3	33.6		27.6	16.0	26.6	18.7	23.8	25.3	15.6
6	35.1		47.4	37.0		34.4	16.1	25.1	14.5	44.9	34.3	12.5
7	38.2		51.0	46.5		31.4	5.6	39.7	15.1	19.6	29.1	18.9
8	40.3		48.4	44.6		38.4	20.7	40.6	10.4	5.6	10.7	23.5
9	40.3		46.2	51.8		36.0	22.8	37.0	8.2	18.0	13.2	26.8
10	42.2		44.4	28.4		13.8	28.4	34.0	18.3	11.5	19.9	18.6
11	28.9		44.9	28.8		17.6	33.1	18.1	17.6	29.2	36.3	29.8
12	26.9		50.7	28.8		35.0	16.0	23.2	20.6	18.3	12.7	32.7
13	25.1		46.5	46.5		33.0	42.3	27.2	16.1	28.4	18.0	32.4
14	21.7		45.9	45.2		12.4	45.4	14.8	10.7	31.4	30.0	36.6
15	42.2		48.7			25.8	26.5	35.6	12.1	17.4		33.6
16	42.0		50.8			27.9	15.1	27.9	1.3	14.4		29.7
17	43.8		52.3			26.5	19.4	21.2	39.5	11.7		36.1
18	44.4		45.9			28.2	37.4	18.3	6.0	25.1		35.6
19	43.9		41.9			38.7	36.3	33.8	22.3	19.4	24.5	37.7
20	41.6		29.2			27.9	38.4	17.1	26.5	29.5	15.7	37.3
21	44.9		34.4			22.9	23.2	37.4	26.9	15.0	35.7	34.4
22			46.1			23.8	14.8	32.5	31.0	34.6	19.6	35.4
23			35.0			19.9	27.9	25.5	36.1	35.6	29.1	34.6
24			43.9			30.2	37.7	19.6	31.8	20.4	33.7	22.6
25			50.4			34.8	25.9	32.0	18.9	13.7	36.6	37.0
26			41.5			26.8	36.0	26.8	36.6	20.2	30.7	40.9
27			42.0		16.7	55.0	33.4	42.5	24.9	21.5	36.7	33.7
28			20.9		28.2	34.8	27.4	15.6	21.3	28.9	37.9	35.0
29			47.4		48.8	33.7	36.6	20.3	34.4	27.2	32.3	40.6
30			22.8		45.9	32.5	32.0	28.2	45.4	23.6	34.0	31.4
31			44.4		45.5		41.6	34.0		37.4		39.0
Avg	37.3		43.5	38.8	37.0	31.1	26.9	28.5	21.7	23.2	26.9	29.9

1987	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	34.8	34.0	29.4	44.7	35.1	15.3	30.4	27.9			22.7	
2	39.2	27.5	41.3	38.2	33.3	24.6	32.7	13.9			20.9	
3	38.4	37.3	30.2	45.4	45.7	37.0	21.7	37.0			9.6	
4	34.6	32.5	33.7	37.4	42.6	27.7	23.9	41.5			29.6	
5	34.3	38.6	46.0	16.0	41.5	26.3	11.7	39.4			29.3	
6	22.5	42.8	43.7	35.1	50.0	43.3	36.5	43.3			7.9	
7	40.0	42.0	43.9	41.9	28.3	36.9	13.1	23.4			10.6	
8	40.9	40.6	39.1	25.5	12.0	35.8	25.2	22.7			36.2	
9	42.9	31.1	45.4	19.4	10.9	32.6	22.6	16.8				
10	33.6	15.3	50.3	36.5	31.7	19.9	28.9	17.0				
11	34.8	7.2	46.9	32.6		30.5	25.9	31.1				
12	31.8	30.2	49.1	40.9	36.3	17.6	43.0	37.4				
13	38.0	40.9	49.5	46.4	11.7	13.9	18.5	18.3				
14	35.9	40.2	31.8	39.4	30.2	18.1	27.8	37.5				
15	38.6	44.8	48.2	46.3	19.4	26.7	24.4	37.4				
16	27.5	42.6	45.3	43.4	18.0	26.9	17.5	32.2				
17	30.2	43.5	36.0	43.6	42.8	28.1	28.9	33.1				
18	33.6	34.0	48.2	39.0	40.1	18.8	28.6	28.8				
19	24.6	43.2	42.1	19.3	35.0	36.5	43.3	31.2				
20	38.3	23.8	40.6	34.9	35.8	26.0	37.2	36.9				
21	40.6	43.1	27.3	34.4	20.9	21.2	7.6	28.3				
22	37.6	33.7	39.8	27.7	27.7	38.2	14.7	30.9		23.8		
23	30.4	30.7	46.0	6.1	15.5	29.2	31.5	37.6		21.6		
24	28.4	41.3	44.0	28.0	50.8	16.9	28.6	17.1		19.9		
25	33.0	23.3	41.6	23.8	49.5	38.2	24.1	30.0		20.2		
26	37.7	40.8	42.9	22.0	32.9	14.6	19.1	22.6		22.7		
27	40.9	27.8	48.9	13.7	38.3	26.7	25.4			21.0		
28	39.2	43.2	41.1	22.9	26.7	31.5	33.3			25.2		
29	34.6		44.5	17.9	43.2	21.5	36.8			9.8		
30	36.1		51.6	15.5	32.8	14.8	20.1			24.3		
31	37.4		49.5		25.1		19.6			28.9		
Avg	35.2	34.9	42.5	31.3	32.1	26.5	25.9	29.8		21.7	20.8	

1988	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	29.3	38.9	48.6	46.8	20.4	30.0	27.5	24.6	24.1	21.0	16.8	9.0
2	36.3		40.0	46.0	38.9	16.9	32.5	16.7	41.6	30.5	30.6	14.6
3	43.5	36.3	44.5	33.9	39.5	47.6	27.3	22.8	23.2	25.4	25.4	15.1
4			41.9	34.9	21.8	43.0	9.5	33.4	32.9	26.0	32.8	8.2
5	43.4	40.6	40.0	46.3	34.4	28.8	21.8	27.4	30.2	26.5	27.0	25.1
6	41.6	44.8	42.1	46.8		26.8	27.3	22.9	30.9	23.5	31.9	23.3
7		31.5	46.0	42.9	20.7	32.8	32.9	14.7	27.0	23.2	15.7	22.4
8		34.2		43.5	42.0	37.6	18.0	29.1	36.8	17.6	18.0	13.8
9	41.9		42.2	39.8	28.0		24.2	37.6	29.9	22.1	13.6	19.4
10	41.9	39.6		25.2	13.6	12.6	25.1	20.3	12.1	27.5	16.4	25.8
11		41.8		30.2	24.0	14.1	14.5	36.7	21.5	28.0	22.3	25.9
12		45.9		47.0	13.9	20.3	37.8	22.0	22.2	21.2	23.1	24.3
13	37.6	45.5		46.3	17.6	29.5	34.1	22.2	32.7	21.7	11.7	16.4
14		48.3		42.7	20.4	26.9	16.2	25.3	26.0	14.5	8.3	32.0
15		42.7		26.2	34.8	30.1	19.8	15.5	26.3	11.6	7.4	19.4
16	27.5	42.5		40.1	40.6	16.3	19.2	25.9	33.9	18.4	16.9	14.6
17	37.7	44.4		47.0	47.3	13.0	23.9	31.2	15.3	22.0	18.0	26.2
18	41.7			47.3	24.3	24.4	8.4	15.5	30.2	11.8	15.3	27.0
19		38.4	34.8	45.9	20.5	18.7	19.7	27.8	19.0	10.1	18.6	26.7
20		42.3	43.3	39.7	22.7	14.8	22.6	30.4	20.0	7.6	29.5	31.8
21	44.2	37.8	41.0	44.7	34.9	29.5	22.2	14.2	35.1	15.0	16.7	31.0
22		27.9		47.7	26.4	38.5	8.3	26.2	27.5	30.1	28.3	33.2
23	43.5	33.4	44.2	47.7	29.3	22.1	21.7	27.5	24.0	28.3	20.9	26.5
24	41.8		33.3	48.0	32.8	19.8	16.1	30.0	17.7	30.2	18.6	27.7
25				35.1	31.0	23.3	13.8	32.7	21.7	15.3	20.5	32.3
26	41.3	32.3	45.2	45.4	13.2	29.6	5.5	21.6	10.2	18.1	25.8	32.4
27	35.1	29.5	42.9	43.7	17.2	41.6	18.5	22.1	26.4	24.6	23.2	31.9
28		30.5	44.7	36.3	12.8	30.4	21.8	21.9	27.7	15.9	21.4	29.4
29	42.0			40.3	34.1	28.1	12.8	17.5	25.0	23.7	18.7	27.9
30	44.7		34.5	34.3	35.6	22.3	23.3	25.7	13.5	34.8	17.3	22.3
31	42.9		42.3		30.1		29.5	24.9		23.6		25.5
Avg	39.9	38.6	41.7	41.4	27.4	26.5	21.2	24.7	25.5	21.6	20.4	23.9

TABLE E2.—Continued.

1989	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	32.7	47.6	36.7	52.7	38.3	25.6	26.5	34.0	28.6	39.3	13.9	18.5
2	30.3	45.9	37.0	53.9	35.7	11.9	23.3	22.7	25.7	13.6	25.6	23.0
3	25.1	48.4	50.4	54.5	22.8	44.1	34.2	23.6	17.6	24.9	30.9	22.6
4	23.4	48.8	41.6	46.0	23.3	37.8	26.3	46.0	28.1	22.6	29.5	30.6
5	24.2	47.2	41.0	43.4	48.2	18.1	21.4	37.3	25.7	11.3	24.6	20.9
6	13.5	37.1	44.4	44.4	40.4	21.9	24.9	15.1	17.3	36.8	18.0	35.4
7	26.1	39.7	52.8	40.4	43.7	39.1	22.7	26.5	23.3	38.1	17.3	28.1
8	27.6	36.9	53.3	45.3	45.1	33.0	29.3	39.0	34.0	16.6	9.8	31.3
9	31.0	45.9	47.0	46.8	49.6	23.9	31.8	12.4	11.3	14.0	14.5	25.1
10	44.7	44.4	47.3	48.1	53.8	27.5	36.3	16.2	32.7	24.9	28.0	31.9
11	43.4	44.2	36.5	28.8	55.8	27.9	30.3	30.9	23.8	13.6	22.4	19.6
12	47.8	49.5	48.8	47.5	44.3	27.8	37.5	23.8	24.7	23.1	24.5	23.0
13	40.8	44.7	48.3	49.6	27.9	26.4	26.5	27.3	30.7	27.3	33.8	29.9
14	37.8	30.5	44.3	47.2	30.2	43.1	32.5	15.4	36.5	30.6	27.3	33.1
15	39.6	44.5	52.7	50.2	45.9	41.5	46.3	17.6	35.2	33.5	25.0	31.7
16	29.6	47.6	46.7	31.1	35.4	21.6	28.8	17.1	30.0	14.8	17.6	35.5
17	43.4	46.1	44.6	46.0	46.2	25.7	24.2	12.0	36.0	21.5	10.2	30.7
18	46.4	52.3	46.8	42.9	41.3	40.3	21.0	34.3	30.5	9.3	13.0	35.0
19	45.7	49.2	47.9	50.2	43.9	11.5	26.2	14.9	30.0	22.7	28.4	34.7
20	44.8	51.0	48.2	52.3	47.3	22.7	22.7	28.9	20.7	5.7	32.6	34.7
21	37.3	43.1	53.9	27.8	36.4	18.4	19.2	27.7	29.6	7.1	30.5	31.4
22	40.4	37.7	54.7	35.0	46.0	20.9	29.9	29.4	32.3	16.5	15.1	35.2
23	43.2	33.3	54.0	48.1	9.7	22.7	26.1	24.3	30.8	28.3	30.6	31.2
24	38.4	29.6	48.7	21.6	33.0	23.5	31.1	35.4	45.0	37.7	16.3	33.2
25	42.0	39.2	40.6	48.1	31.1	30.6	30.2	32.5	33.0	21.3	3.8	7.7
26	42.1	17.5	50.9	50.3	46.5	25.4	27.0	26.2	20.6	38.4	30.0	7.5
27	47.9	36.3	34.6	34.5	28.5	34.2	29.9	26.9	33.2	36.2	33.0	12.4
28	39.7	46.6	36.0	53.0	16.9	38.2	38.3	26.3	31.0	20.6	24.7	21.1
29	48.0		51.4	42.3	43.8	14.5	31.7	10.5	17.1	28.8	19.4	21.8
30	48.2		54.6	46.4	45.2	41.1	18.4	25.2	29.2	38.4	20.5	33.1
31	40.7		54.6		38.9		26.9	37.4		27.5		32.3
Avg	37.6	42.3	46.8	44.3	38.6	28.0	28.0	25.7	28.1	24.0	22.4	27.2

TABLE E3.—Daily counts recorded by the Temple University UVB sunburn meter atop Lutz tower, Barro Colorado Island, Panamá, 1978–1979, 1981–1987.

1978	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1											6109	7633
2											8580	7125
3											6988	7532
4											8361	6329
5											5884	4574
6											8401	7902
7											6160	7278
8											6648	2743
9											6397	3929
10											5973	8071
11											4058	8043
12											5369	6123
13											7505	7090
14											6662	6181
15											7044	5712
16											6867	6938
17											5221	6018
18											4687	7245
19											5961	6422
20											5204	7109
21											7720	7327
22											7511	6189
23											8417	5155
24											7040	6909
25											6897	6274
26											3370	6337
27											4936	6882
28											7944	6102
29											7930	5251
30											7357	6055
31												6121
n											30	31
Avg											6573	6406
Sd											1314	1163

1979	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	7266	5083	8944	6332	10637	2944	5895	7794	5639			
2	6856	6833	7965	6524	10730	6878	7867	5924	6955			
3	6918	8243	8250	8365	9769	8856	6692	7494	8611			
4	5763	6338	8376	1400	3652	3466	7343	6967	9394			
5	5042	7053	6952	5997	8070	6754	5434	7398	9658			
6	5814	6712	7642	5066	8363	8759	4178	2695	8760			
7	6733	6655	7688	4274	7780	5005	8624	7280	9459			
8	6093	7948	8834	6530	6977	8654	5924	6249	10254			
9	5837	5632	5958	5564	5807	9778	3491	7614	1404			
10	6853	7532	6777	8121	7048	9505	4019	7907	7046			
11	7481	7945	8085	8011	6664	9094	3562	6662	7101			
12	7091	7675	7403	6310	4828	7882	6467	7924	5282			
13	7576	7427	8682	7859	4989	6225	6459	5382	3383			
14	7301	4960	6933	7254	5840	1373	7306	5821	6934			
15	6270	4790	7248	6540	6851	8813	5581	8927	5108			
16	7706	5308	6835	6570	3533	7489	4091	7273	6966			
17	7430	6888	8919	6615	6964	5586	8119	8603	9936			
18	6090	7706	8533	7658	6159	8977	6121	5320	7506			
19	6192	7020	8778	8537	8800	5060	7274	6838	9044			
20	7500	5968	9440	8242	8889	2364	7689	7230	6293			
21	7582	7147	9422	4691	8235	7455	9250	5691	9061			
22	6818	6036	9382	1860	5910	5321	2719	6980	8643			
23	6960	6893	9421	9544	8261	7760	7934	4977	1630			
24	7585	6579	8461	10623	8853	6232	4460	7110	7918			
25	7521	8145	7153	10534	9520	8259	5263	5161	9560			
26	7999	6900	7133	5077	7823	2517	7624	7251	7335			
27	8086	8364	7397	6329	3745	7071	8658	6388	7779			
28	8038	8135	8413	10401	4272	4843	8335	1476	6422			
29	7129		7251	9674	2447	8470	6695	7662	1515			
30	5435		7404	10832	2583	8586	4904	8858	7484			
31	7672		6644		7566		7510	6663				
n	31	28	31	30	31	30	31	31	30			
Avg	6924	6854	7946	7044	6825	6666	6306	6630	7069			
Sd	798	1017	939	2296	2223	2311	1719	1573	2421			

1981	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1			6302	7345	6795	3893	7043	2972	4964	6058	5480	4057
2			7400	6496	7513	1704	6487	5992	7716	5764	6532	4878
3			5870	8628	7329	3504	2468	3492	3709	3752	5617	4658
4		6041	4530	6421	4116		3081	3954	4566	3785	6462	3259
5		7089	5050	8187	7138	7472	5815	3298	7271	5218	6383	2013
6		7359		6349	7514	3097	6576	5950	3023	5356	5005	4863
7		6041		6233	5472	3896	6582	3884	3815	4783	2697	3484
8		5788	4788	7048	4464	2359	4592	4993	4523	2986	3706	3283
9		5879	3099	6194	6125	4729	4490	4675	6001	5564	4700	2022
10		5906	4998	6277	6864	7194	5157	4047	3744	4349	4929	2056
11		5022	6253	4120	4578	8679		6591	4165	5336	1335	1568
12		5538	6380	5821	4109	3080	5167	2219	6349	4453	3804	1635
13		5807	7881	4588	7919	3642	6596	3061	6075	6966		
14		5980	6849	7514	2072	6624	5584	7384	4497	4307		
15		6754	8401	3512	1860	7361	4552	6346	5263	4585		3792
16			9016	5495	4700	1864	2926	6769	2461	4086		4927
17			8235	5219	4496	4578	6553	6761	5210	5597	5730	4661
18		6506	9011	3118	5374	5407	3191	5135	7170	4076	4160	2819
19		6801	8355	3657	7041	2552	7524	5293	5266	4378	4069	2956
20		3623	7523	4397	6930	7069	4945	1840	7152	2814	4449	2824
21		7101	4050	8714	6269	8150	4529	3788	5906	4046	3382	4607
22		6830	8081	5979	2077	3338	7673	6074	6504	3025	3686	
23		4277	7546	5903	3702	5549	7429	7454	6018	6254	3240	
24		4930	6534	5520	5410	4838	5224	4067	3731	7128	4879	
25		7088	6495	3938	7889	2572	5736	2957	6400	6706	3581	
26		5074	7097	2096	8409	3530	5032	6878	4939	5179	4465	
27		4814	7670	2487	6276	3158	4808	3847	3369	3918	4561	
28		4960	8383	5239	2990	4489	4753	7769	2782	6543	4544	
29			5398	6321	3859	3334	4141	5317	6665	3908	3665	4687
30			7032	8347	5780	5158	5427	2288	6151	4301	4436	3961
31			7370		4847		5705	5426		4708		5535
n		23	29	30	31	29	30	31	30	31	26	22
Avg		5879	6745	5705	5481	4580	5326	4856	5180	4836	4442	3570
Sd		970	1500	1728	1801	1923	1345	1661	1424	1139	1169	1183

1982	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1			4975	7849	6233		4461	6116	5474	7140		5241
2		7143		8182	4604	4300	2730	3140	6043	4444		5628
3		7137		7671	6883	5901	3231	4542	3697	3052	4287	5044
4		6608	8467	8042	6391	6166	3359	6182	3996	4186	5891	5499
5		6403	8276	5452	6686		4348	5693	5201	4132		4471
6		5893	7946	8272	7214			4901	3403	5312		5357
7		6872	7947	6774	7850	5955		3356	4240	2755		5047
8		7235	7899	6453	4671	4730		2755	3381	5047		3153
9		7339	8159	5175	3374	3280		6631	4888	5489	5763	4224
10		7198	6893	1803	5245	5355	7048	6160	4830	4211	5118	5227
11		6882	7721	8545	3449		4980	4385	5850	5078	2143	4848
12		7422	7138	1235	6174		1772	4050	6300	4326	3030	5350
13		7494	7821	6302	7649		5265	5222	6707	5200	5753	4805
14		6255	6732	7362	7730		5668	4322	5300	5912	4897	4344
15		7500	5512	7004	7519	4245	6774	5878	7200	2923	5008	4516
16		6463	7577	6976	7707	4135	5748	3506	1772	2959	5143	3935
17		5860	7497	7764	8602	3556	5442	4700	5506	2450	5675	5199
18		7676	7036	7219	6210	5339	3749	5951	4867	5322	5962	5672
19		7392	7331	8069	3359		760	5407	5567	4389	6212	5716
20		7782	7051	8253	4692		6838	6204	4387	1870	5469	5394
21		6769	7218	8173	6322		6617	2571	2788	6823	5950	4093
22		7918	5712	3927	6372	3458	5053	3924	6913	4566	5833	4169
23		7915	6276	6412	6514	2743	3836	6229	4865	5549	6259	4565
24		6732	5125	7052	4276	3553	5278	4663	2983	6509	4968	5305
25		5546	7150	7400	5596	5444	3433		2193		3129	5462
26		5421	7532	7508	5352	5544	1706		7501		2218	5401
27		5122	6680	7717	6552	3848	3281		7832		3699	4167
28		7222	7804	7444	7723	5418	5001		5451		5119	4814
29			4095	3491	4708		5429		5809		5321	5428
30			7882	6397	6605		5824		5973		5309	4225
31			8379				6243					3164
n		27	29	30	30	18	27	24	30	24	24	31
Avg		6859	7098	6664	6075	4609	4588	4854	5031	4569	4923	4821
Sd		758	1078	1821	1411	1029	1630	1192	1506	1359	1187	681

TABLE E3.—Continued.

1983	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	5297	6405					3235	1009	7104	1480	8088	
2	5656	6498				4359	6639	4545	4674	8010	6898	
3	4538	5981				2778	4152	2876	6490	6358	7835	
4	5464	5797	6960			3393	6822	4624	8544	5451	4838	
5	5449	6018	6112			4336	3645	2446	6613	2965	6622	
6	5195		7227			5137	6344	2473	2790	3791	7178	4734
7	5328	6137	6961			6804	8729	4104	1418	2336	5710	4597
8	3992	6856	5897			3335	7027	5376	8890	6279	6799	3505
9	4047	6437	6822			5285	3721	3322	3306	8310	7002	5299
10	3664	6585	6744			4365	8473	8557	2429	8259	7413	4256
11	5266	2084	5256			5081		5083	4455	6488	4589	4799
12	3734	6602	5650			5124		8858	7698	4760	7553	5995
13	5284	6515	5831			4748		9027	5458	5388	4569	5611
14	5913	5686	5320			5831	2572	8019	8580	4124	6149	5334
15	5915	5526	6107			5645	5260	8267	8770	7139	6580	4806
16	5217	6357	6062			2952	2724	6572	4387	7317	7623	2933
17	5584	1214	4226			1589	3907	4233	5344	8515	6612	
18	5410	900	5726			4072	6161	1529	3630	7265	5705	
19	5512	616	3571			6162	5368	4731	5819	8529	5833	4751
20	5668	378	4654			1042	4837	8744	3228	5072	5313	2808
21	4651	4580	5948			5193	4025	6314	6403	8631	3210	4138
22	4244	5460	5352			2093	2889	5937	5885	7577	4395	6233
23	4955	6008	5202			2076	1219	7530	8526	8563	5434	6074
24	4924	4121	4782			2379	4894	3571	6125	7865	7329	6104
25	5091	5199	4176				5104	1932	4932	4856	6479	5914
26	5027	5460	3711				5763	4821	6944	3510	7199	5218
27	3639	6361	4060				5587	7332	3210	7136	3430	5840
28	6117	5927	4034				2717	6103	5083	2216	4075	5250
29	6277		5331				2400	6698	4576	3108	3975	5514
30	5597		5906				3828	4757	4896	4009		3853
31	6525		6628				3535	8607		4333		4452
n	31	27	28			23	28	31	30	31	29	24
Avg	5135	5026	5509			4077	4699	5419	5540	5795	6015	4917
Sd	746	2009	1028			1534	1819	2327	2001	2149	1368	953

1984	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	5175	7852	8417	7538	8990	5246	4731	4861	6470	7242		5294
2	6707	7744	8413	8303	7742	3884	4951	4278	7815	4739	4491	4382
3	6215	5925	8332	5251	9335	6498	7903	3553	5256	3148	5196	5201
4	3290	7581	7186	7572	6770	5545	4833	4106	6539	7882	6123	3813
5	5529	6847	9084	9046	8152	4043	3208	6297	4094	7463	4635	5877
6	4499	7812	4979	9131	7656	996	5864	8138	1319	4262	4648	6210
7	4723	5384	5107	6680	5535	2128	7341	4840	4698	5555	7539	5825
8	7173	8510	9080	8028	8073	5470	3305	3962	6744	4500	3678	6255
9	5988	7996	8330	7664	8514	6424	6424	4771	7890	6967	5126	5300
10	5096	4653	9615	8803	6025	6480	4616	5341	2743	6780	4604	5702
11	6722	6071	7929	7879	6491	3369	6119	2294	6037	7305	6223	6503
12	6666	6069	8492	7826	7250	6437	7721	6992	6087	4580	6297	6330
13	7065	8391	8940	5178	4136	7043	4064	6489	5162	3607	6001	4190
14	7512	8630	8239	6977	9665	4585	3818	3833	3600	3687	4371	5284
15	5945	8808	9147	7819	4838	4206	2495	2924	6532	5977	6605	5129
16	5086	8955	9537	5322	6919	6331	6365	5141	8050	5563	6182	4402
17	6548	8691	9387	2745	3882	4477	6593	3635	6012	4788	5669	5541
18	6918	7445	9947	7912	5258	3631	3924	7847	3425	4737	7122	5000
19	6285	7138	10247	8308	7276	8022	6838	6010	3619	7284	3605	6405
20	7109	7540	9991	8455	7129	6922	4550	5930	5856	7357	5788	4703
21	7147	8322	10357	6204	4095	5697	4941	2024	6524	7366	5241	6051
22	6868	7553	9446	6952	4933	4141	7378	4752	5871	6395	4681	4974
23	6695	6220	7931	8968	5133	5730	5077	1689	9765	5048	2505	5129
24	7677	5653	8861	9345	7552	4609	6386	6803	8186	4007	6472	5885
25	7694	7315	9424	7118	4930	5374	5631	7347	8087	6550	6714	5953
26	7215	6092	8708	6743	4892	5839	3334	7743	5868	4831	3747	5321
27	7700	6764	7513	7466	9143	5945	7177	3146	6124	5706	2555	4651
28	7568	8236	8614	6830	7843	4939	4331	3417	6149	7967	5841	6442
29	6893	7378	6981	8993	8021	3140	5743	7727	1694	5389	4501	6301
30	5601		6873	9171	4690	1864	4417	5925	7749	4896		5935
31	7355		7187		4827		5340	5013		2776		6758
n	31	29	31	30	31	30	31	31	30	31	28	31
Avg	6409	7296	8461	7474	6635	4967	5336	5059	5799	5624	5220	5508
Sd	1066	1118	1285	1440	1694	1600	1423	1774	1946	1455	1266	746

1985	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	6776	7625	6878	8145	8174	2805	5766	3781	5521		7191	
2	6644	7773	5626	9290	8122	3298	7052	6462	7366		7722	5969
3		7547	6500	8468	4543	4611	4793	5346	2598		8061	6188
4		7069	7300	9230	7126	3340		5944	5220		7428	4789
5	6361	6889	8821	5443	4585	7579	3188	2450	6320		5795	
6	5182	6454	8164	9100	3677	7584	6705	4579	4441		6105	2816
7	6873	7150	8862	9410	2781	3826	6472	4262	5458		5017	3032
8	6966	6004	7344	8750	7363	6484	3356	4809	6309		2247	4405
9	6852	6000	7611	8723	5990	3771	5686	3913			3682	4180
10	6761	3945		6247	3579	5067	6268	8740			5785	4366
11	6861	5078	7601	7758	6780	6396	6788	6739			6580	3488
12	6962	6324	8967	7193	4905	4141	4603	7411			6615	5227
13	7322	6868	7729	7757	5905	4714	3298	7289			6595	4873
14	6264	8285	7334	7125	7169	6355	3840	3765			5084	6219
15	6453	7961	9097	4597	7076	4313	3481	4825			6000	6165
16	6788	6175	6883	6300	7586	3568		5453			4572	5996
17	6483	5169	8925	6948	5786	4418		3885			5741	6314
18	6242	5605	8480	8534	7902	5915		3446			7041	6120
19	6918	6515	9519	5482	8019	6171	4835	5503			4725	6559
20	7415	7449	9507	7303	6959	6679	4527	5792			5370	6548
21	6316	6512	9794	8131	8033	6526	7577	6361			799	5218
22	6295	7077	9633	7738	4671	3637	3414	7370			5767	5771
23	6147	7548	7613	8729	8092	5541	3520	6904			3766	6430
24	6412	8435	8282	9063	7785	6742	3124	4754			4804	5389
25	5805	8471	6726	7302	5487	3062	8244	4245			5881	3610
26	4113	8075	7194	8526	7317	3157	7246	3863		6880	6369	5212
27	7152	8770	2933	8951	6183	6216	5631	7413		5647	4890	3824
28	4342	8996	8942	8725	5736	2177	6599	6108		3977	5245	5510
29	6442		9107	8831	4934	3379		3910		4887	7081	5074
30	7133		9030		6750	5837	4178	5532		2355	4839	5447
31	7306		8354		3882		1670	8313		5201		5582
n	29	28	30	29	31	30	26	31	8	6	30	29
Avg	6468	6992	7959	7855	6222	4910	5072	5457	5404	4825	5560	5183
Sd	769	1182	1399	1253	1543	1514	1677	1540	1340	1406	1533	1058

1986	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	6526	7885		5665		7874	5430	6430	7171	6768	4436	5210
2	6624	7637	8255	7539	7368	8408	6713	3849	6872	3338	3714	3932
3	5109	6867	7396	8468	4926	7707	3994	5490	6195	4698	6263	5683
4	6162	7339	7906	7075	3041	7466	5449	6714	6072	4873	3804	5251
5	4948	7359	9089	5726	5088	5494	4628	3733	4581	5241	5660	4862
6	5406	7648	8427	6384	6702	7221	4830	4455	5456	8285	6130	3035
7	6191	7995	8923	7796	7485	5908	2208	7613	5956	4141	5552	3805
8	6707	7111	8546	8324	8508	7024	6528	6916	4224	1158	5762	4273
9	6215	7511	8377	9666	9104	6431	6261	6574	2801	3752	4679	4735
10	6220	6822	8546	5325	7758	2297	4904	6235	5230	2384	6160	3521
11	4936	6854	8018	5350	8415	3378	5467	3373	6366	5868	5320	5341
12	4563	7002	9192	5858	8319	6713	3016	4344	5163	3956	2234	5508
13	4350	8306	8679	8464	8398	6468	6906	5013	3961	6178	2421	5244
14	4070	8623	8351	8371	8687	2229	7470	2753	2616	6539	630	5741
15	7109	8727	8450	5303	7722	4653	4565	6519	4694	3384	6170	5021
16	6719	7876	9112	8082	4381	5578	2413	5265	5850	3015	2215	4435
17	7177	7710	9321	2267	8779	5277	3374	4011	7209	2106	3044	5168
18	7273	6091	7908	3436	8659	5632	6185	3480	1155	4815	4808	5209
19	7244	5407	7021	2117	5390	7177	6330	6017	4114	4005	3133	1964
20	6847	6200	5190	3437	6101	5365	7442	3051	5018	5837	4234	5634
21	7405	5822	5570	5619	1745	3905	4053	6495	5273	2704	2731	1177
22	6196	8672	8118	6587	5017	4762	3034	5959	6599	7183	5946	5372
23	7455	8733	6126	4539	4452	4094	5640	4717	7112	6823	3684	5496
24	7277	6971	8081	6775	6438	5709	6611	3498	6509	4130	5017	3581
25	7559	7475	9056	8166	8339	6439	5028	5740	3481	2589	5286	5468
26	5144	8825	6973	7450	6768	5366	6722	4947	6073	3682	5955	5953
27	6107	8556	7768	8232	3647	6378	5582	7147	4460	4028	4870	5019
28	7471	9096	3830	9210	5495	4158	5123	2259	4716	5430	5741	5020
29	4888		8670	8562	9337	4419	6528	3502	6831	2589	5835	2550
30	6800		4337	5551	8195	3864	5565	5417	8569	3819	4821	4822
31	7019		8468		8627		7134	6619		6656		5835
n	31	28	30	30	30	30	31	31	30	31	30	31
Avg	6249	7540	7790	6511	6763	5580	5327	5101	5344	4515	4542	4641
Sd	1021	948	1406	1965	1985	1559	1434	1442	1562	1689	1453	1159

Table E3.---(cont.)

TABLE E3.—Continued.

1987	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1		5943	5510	7384	6138							
2	5864	5007	7310	6424	5607							
3	5794	6223	4880	7319	7774							
4	5388	5622	7481	6261	7021							
5	5479	6699	7845	2870	6355							
6	3864	7057	7585	6398								
7	6012	7195	7799	7114								
8	5990	6816	6824	4490								
9	6277	6027	8307	2984								
10	5450	2825	8863	6283	5733							
11	5373	1225	8002	5818	7000							
12	4993	5106	8109	6752	6607							
13	5913	7440	8109	7861	1770							
14	5785	6847	5507	6221	5194							
15	6117	7677	7958	7623	3600							
16	4591	7447	7597	7671	3439							
17	4610	7497	6178	7188	8005							
18	5385	6009	7989	6576								
19	3667	7639	6578	3448								
20	6046	4013	6798	6405								
21	6233	7334	4160	6180								
22	5453	6052	6658	4905								
23	4902	4996	7790	6748								
24	4363	7349	6900	5048								
25	5182	4352	6813	4326								
26	6217	7445	6737	4050								
27	6433	3840	8045	2477								
28	6471	7628	6406	4203								
29	5536		7567	2870								
30	6132		8572	2872								
31	6663		8515									
n	30	28	31	30	13							
Avg	5539	6047	7206	5559	5711							
Sd	742	1601	1091	1665	1748							

Appendix F: Soil Moisture

TABLE F1.—Moisture content of soils (percent wet weight, average of ten sites) at 0–5, 0–10, and 30–40 cm, in Lutz catchment, 1975–1989.

1975		1976		1977		1978		1979		1980		1981			1982		
									0–5					30			30
date	0–5	date	0–5	date	0–5	date	0–5	date	0–10	date	0–10	date	0–10	–40	date	0–10	–40
02-Jan	33.5	09-Jan	39.6	06-Jan	31.8	05-Jan	38.8	04-Jan	31.8	04-Jan	41.5	01-Jan	42.6		08-Jan	46.8	36.7
09-Jan	32.9	16-Jan	36.4	14-Jan	31.8	19-Jan	35.7	11-Jan	32.7	10-Jan	38.5	09-Jan	42.1		13-Jan	43.5	35.3
16-Jan	32.7	23-Jan	36.4	21-Jan	34.3	26-Jan	33.5	18-Jan	30.1	18-Jan	35.6	15-Jan	41.4		21-Jan	38.8	33.3
23-Jan	30.1	30-Jan	36.5	28-Jan	33.5	02-Feb	32.7	25-Jan	34.6	31-Jan	38.4	22-Jan	41.8		28-Jan	38.3	33.4
30-Jan	26.4	06-Feb	31.8	04-Feb	37.1	09-Feb	37.3	01-Feb	30.0	07-Feb	39.6	31-Jan	42.2		05-Feb	36.1	31.8
07-Feb	33.3	13-Feb	28.6	10-Feb	35.1	17-Feb	36.8	08-Feb	30.2	14-Feb	36.2	07-Feb	36.0		11-Feb	33.3	31.0
14-Feb	31.3	20-Feb	30.6	17-Feb	37.6	23-Feb	32.2	15-Feb	34.6	21-Feb	35.4	14-Feb	32.8		19-Feb	32.4	30.3
21-Feb	26.8	26-Feb	27.6	24-Feb	31.2	02-Mar	32.2	22-Feb	30.8	28-Feb	34.9	21-Feb	35.1		01-Mar	31.0	30.0
28-Feb	26.7	04-Mar	29.2	03-Mar	28.3	09-Mar	32.1	01-Mar	31.1	06-Mar	32.4	28-Feb	32.9		09-Mar	32.1	30.5
07-Mar	39.3	12-Mar	26.7	10-Mar	28.5	17-Mar	28.9	08-Mar	30.4	13-Mar	31.9	07-Mar	35.9		18-Mar	30.8	30.0
21-Mar	26.8	19-Mar	27.8	18-Mar	29.5	23-Mar	30.3	16-Mar	28.3	20-Mar	30.4	14-Mar	36.1		26-Mar	31.8	28.7
28-Mar	29.4	26-Mar	25.6	24-Mar	30.0	30-Mar	29.6	22-Mar	26.8	29-Mar	30.0	21-Mar	32.4		02-Apr	29.5	28.2
04-Apr	26.7	02-Apr	24.9	31-Mar	32.7	06-Apr	34.0	29-Mar	29.4	03-Apr	29.2	27-Mar	31.3		07-Apr	29.0	28.6
11-Apr	35.8	08-Apr	26.4	07-Apr	27.0	13-Apr	35.7	05-Apr	26.9	09-Apr	29.5	04-Apr	28.4		15-Apr	37.2	34.1
18-Apr	29.8	15-Apr	33.9	14-Apr	30.7	20-Apr	31.8	12-Apr	26.8	16-Apr	30.7	10-Apr	28.7		22-Apr	33.9	32.4
25-Apr	27.4	22-Apr	33.1	21-Apr	28.1	27-Apr	37.5	19-Apr	36.4	24-Apr	33.3	18-Apr	37.0		30-Apr	31.3	31.3
02-May	26.9	29-Apr	34.7	28-Apr	28.1	05-May	40.9	26-Apr	39.5	01-May	29.6	02-May	36.4		07-May	32.0	30.0
09-May	31.9	06-May	40.2	06-May	31.3	11-May	38.1	09-May	38.4	08-May	36.0	09-May	37.7		13-May	37.6	33.7
16-May	40.3	13-May	34.1	12-May	30.5	19-May	40.0	17-May	40.3	15-May	35.9	15-May	38.3		19-May	35.3	33.1
23-May	39.1	20-May	38.5	19-May	37.5	26-May	41.8	24-May	38.2	22-May	38.6	23-May	38.2	37.8	28-May	33.6	32.2
30-May	42.4	27-May	40.4	26-May	39.8	01-Jun	42.3	04-Jun	39.2	29-May	38.5	06-Jun	41.1	37.8	03-Jun	37.1	34.1
06-Jun	42.7	03-Jun	37.1	02-Jun	39.3	08-Jun	41.2	09-Jun	40.9	04-Jun	37.1	20-Jun	40.7	36.2	11-Jun	38.1	34.9
13-Jun	40.2	10-Jun	41.0	09-Jun	39.8	16-Jun	43.6	21-Jun	39.6	12-Jun	39.3	27-Jun	39.8	35.8	18-Jun	36.7	32.9
20-Jun	43.0	17-Jun	37.6	16-Jun	41.8	23-Jun	44.0	28-Jun	42.7	19-Jun	39.3	04-Jul	40.8	38.4	30-Jun	37.9	34.7
27-Jun	41.4	24-Jun	42.4	22-Jun	40.4	29-Jun	39.8	06-Jul	42.8	26-Jun	39.3	11-Jul	42.3	37.6	16-Jul	38.8	33.4
07-Jul	40.4	01-Jul	40.8	30-Jun	41.4	06-Jul	43.7	13-Jul	46.4	03-Jul	40.2	18-Jul	40.9	37.7	29-Jul	38.8	35.6
21-Jul	41.0	08-Jul	37.6	07-Jul	43.1	13-Jul	39.8	19-Jul	38.4	10-Jul	38.7	26-Jul	48.8	40.1	13-Aug	40.2	35.7
27-Jul	44.2	15-Jul	39.9	14-Jul	37.5	20-Jul	40.8	26-Jul	45.3	17-Jul	40.6	31-Jul	39.2	35.5	30-Aug	38.6	34.3
01-Aug	45.1	22-Jul	40.8	21-Jul	40.1	27-Jul	40.8	02-Aug	46.3	24-Jul	41.1	15-Aug	40.8	36.5	17-Sep	42.0	35.1
11-Aug	44.7	28-Jul	37.2	28-Jul	38.3	03-Aug	47.5	09-Aug	47.1	31-Jul	41.8	25-Aug	43.4	35.8	30-Sep	41.2	35.4
15-Aug	44.4	05-Aug	42.2	04-Aug	40.8	11-Aug	39.4	17-Aug	45.7	07-Aug	40.5	01-Sep	44.2	37.5	14-Oct	41.8	35.0
22-Aug	44.5	12-Aug	42.0	11-Aug	41.2	18-Aug	46.3	24-Aug	47.0	14-Aug	41.5	10-Sep	43.7	37.5	29-Oct	42.5	35.4
02-Sep	46.0	19-Aug	40.0	18-Aug	44.3	24-Aug	44.7	30-Aug	46.0	21-Aug	42.2	15-Sep	44.1	36.5	12-Nov	43.7	35.9
04-Sep	43.4	26-Aug	42.1	25-Aug	43.7	31-Aug	46.6	06-Sep	42.1	28-Aug	42.1	22-Sep	41.0	36.4	24-Nov	38.4	32.9
12-Sep	42.4	02-Sep	44.5	01-Sep	42.3	07-Sep	46.5	13-Sep	42.0	04-Sep	42.0	29-Sep	42.6	37.0	10-Dec	35.9	31.8
19-Sep	42.6	09-Sep	41.7	07-Sep	46.4	14-Sep	45.7	20-Sep	40.9	11-Sep	42.3	09-Oct	44.5	35.7	23-Dec	32.4	31.0
26-Sep	40.6	16-Sep	42.3	15-Sep	45.0	22-Sep	45.3	27-Sep	42.3	18-Sep	42.7	16-Oct	44.5	35.9			
03-Oct	47.0	23-Sep	45.0	22-Sep	42.9	28-Sep	43.1	******	****	25-Sep	38.5	23-Oct	46.1	35.5			
10-Oct	45.7	30-Sep	43.5	06-Oct	44.6	05-Oct	46.5	05-Oct	41.3	02-Oct	41.0	28-Oct	45.7	35.8			
17-Oct	45.3	06-Oct	41.9	13-Oct	46.0	12-Oct	44.8	12-Oct	42.0	09-Oct	40.2	13-Nov	46.1	33.7			
23-Oct	45.0	13-Oct	42.9	20-Oct	45.5	20-Oct	46.9	18-Oct	40.6	16-Oct	39.0	20-Nov	46.3	37.2			
30-Oct	43.8	20-Oct	43.4	27-Oct	46.4	26-Oct	44.6	25-Oct	41.5	23-Oct	41.8	27-Nov	45.1	34.4			
07-Nov	46.1	28-Oct	43.1	03-Nov	45.2	02-Nov	47.2	01-Nov	39.1	30-Oct	41.4	03-Dec	47.9	36.6			
14-Nov	44.7	04-Nov	42.4	10-Nov	44.0	09-Nov	45.8	08-Nov	41.0	06-Nov	42.5	11-Dec	47.5	36.2			
21-Nov	43.4	10-Nov	40.9	17-Nov	43.7	17-Nov	44.3	16-Nov	41.0	13-Nov	40.9	16-Dec	45.6	37.4			
08-Dec	44.1	17-Nov	41.4	24-Nov	45.2	24-Nov	45.6	23-Nov	43.2	20-Nov	41.1	21-Dec	45.0	36.2			
15-Dec	44.5	01-Dec	37.2	01-Dec	44.3	07-Dec	45.9	29-Nov	40.9	27-Nov	41.7	28-Dec	43.1	36.4			
22-Dec	41.9	09-Dec	35.3	08-Dec	45.6	14-Dec	41.7	08-Dec	40.2	04-Dec	42.1						
31-Dec	43.0	16-Dec	33.3	15-Dec	42.6	21-Dec	43.9	14-Dec	40.7	11-Dec	41.9						
		23-Dec	38.2	22-Dec	42.2	28-Dec	40.1	23-Dec	39.9	18-Dec	41.3						
		30-Dec	36.7	29-Dec	44.0			30-Dec	42.2	27-Dec	41.2						

TABLE F1.—Continued.

1983			1984			1985			1986			1987			1988			1989		
date	0-10	30-40	date	0-10	30-40	date	0-10	30-40	date	0-10	30-40	date	0-10	30-40	date	0-10	30-40	date	0-10	30-40
07-Jan	32.2	30.0	05-Jan	41.3	36.6	04-Jan	34.3	31.6	08-Jan	34.3	31.7	07-Jan	37.4	33.5	13-Jan	32.5	31.6	06-Jan	40.0	34.3
20-Jan	31.0	29.3	12-Jan	43.4	35.3	19-Jan	32.3	31.5	17-Jan	37.2	33.0	20-Jan	31.6	29.8	27-Jan	34.9	32.5	13-Jan	37.0	32.2
04-Feb	30.2	30.1	20-Jan	37.0	33.7	31-Jan	34.3	31.2	24-Jan	34.2	33.6	04-Feb	32.2	29.4	11-Feb	31.7	30.5	20-Jan	35.5	31.9
18-Feb	29.2	28.3	17-Feb	33.7	31.1	14-Feb	35.6	31.1	31-Jan	34.6	33.3	17-Feb	33.9	31.8	25-Feb	31.7	29.6	27-Jan	33.2	31.6
01-Mar	26.4	27.2	01-Mar	37.8	30.3	27-Feb	31.0	30.2	20-Feb	33.9	33.3	25-Feb	32.4	31.0	11-Mar	31.8	29.8	03-Feb	31.3	30.9
18-Mar	27.3	28.5	15-Mar	32.5	29.6	13-Mar	29.7	29.0	05-Mar	31.2	28.3	05-Mar	31.6	30.6	17-Mar	29.6	31.1	10-Feb	31.3	30.5
29-Mar	27.4	27.8	29-Mar	30.2	29.4	29-Mar	30.3	28.4	17-Mar	30.1	27.8	09-Mar	30.1	28.8	24-Mar	29.4	28.9	17-Feb	31.3	29.9
08-Apr	28.1	29.2	11-Apr	30.8	31.8	11-Apr	32.3	28.6	02-Apr	30.6	27.7	20-Mar	29.1	27.3	30-Mar	28.8	28.9	24-Feb	33.2	30.3
15-Apr	28.2	28.0	26-Apr	32.1	29.9	25-Apr	28.7	27.7	17-Apr	33.1	26.8	26-Mar	29.5	28.4	07-Apr	28.4	28.3	02-Mar	36.9	30.5
21-Apr	26.5	27.0	13-May	36.8	33.0	09-May	35.1	34.0	02-May	31.0	30.1	06-Apr	35.9	32.1	14-Apr	28.4	28.9	10-Mar	34.5	31.0
30-Apr	34.3	32.8	17-May	38.4	33.1	17-May	39.3	34.4	13-May	33.2	32.4	11-Apr	36.0	31.9	21-Apr	31.0	29.4	17-Mar	32.0	29.8
06-May	35.6	34.9	25-May	39.2	33.8	31-May	39.2	34.7	26-May	35.3	32.9	15-Apr	34.0	31.8	28-Apr	28.6	28.2	23-Mar	31.2	28.8
12-May	36.5	34.1	07-Jun	39.3	33.9	13-Jun	39.6	35.1	10-Jun	34.0	31.0	24-Apr	31.1	30.0	05-May	29.5	28.8	30-Mar	32.6	30.0
27-May	37.6	32.9	20-Jun	39.1	34.9	28-Jun	38.9	35.2	25-Jun	39.4	33.7	01-May	36.9	33.3	12-May	36.6	33.3	06-Apr	30.4	29.8
10-Jun	38.5	34.5	04-Jul	42.4	35.4	09-Jul	39.9	35.8	11-Jul	39.8	34.1	06-May	34.3	32.9	19-May	35.6	33.8	14-Apr	30.3	28.1
24-Jun	40.2	34.1	18-Jul	42.3	42.0	24-Jul	38.0	35.0	22-Jul	42.0	34.1	15-May	37.1	32.4	01-Jun	37.2	33.4	21-Apr	29.3	28.9
08-Jul	39.0	33.7	14-Aug	40.8	34.8	08-Aug	39.2	35.2	07-Aug	39.9	34.9	26-May	34.7	32.1	15-Jun	38.8	33.6	28-Apr	28.7	28.6
24-Jul	40.1	35.1	30-Aug	41.0	35.1	21-Aug	38.2	35.4	21-Aug	40.7	34.0	05-Jun	35.4	32.1	30-Jun	39.4	34.4	05-May	32.3	30.2
09-Aug	39.7	33.9	13-Sep	43.8	35.2	05-Sep	38.8	36.0	04-Sep	40.0	33.5	15-Jun	41.4	33.5	13-Jul	40.5	34.6	12-May	30.3	29.2
19-Aug	41.3	35.0	26-Sep	40.5	34.3	24-Sep	41.8	34.2	18-Sep	39.6	33.9	24-Jun	39.3	33.0	27-Jul	40.4	35.6	18-May	32.7	31.0
30-Aug	40.5	33.5	11-Oct	43.6	36.0	11-Oct	42.3	36.3	03-Oct	39.8	34.7	02-Jul	41.5	33.7	10-Aug	41.0	34.7	26-May	34.4	30.8
16-Sep	41.7	36.4	23-Oct	41.8	36.8	25-Oct	40.5	35.8	15-Oct	41.5	35.8	08-Jul	42.8	34.3	24-Aug	44.3	35.5	02-Jun	35.5	31.8
29-Sep	42.2	36.0	06-Nov	42.1	36.3	08-Nov	40.2	34.2	29-Oct	42.4	36.0	23-Jul	42.1	35.9	08-Sep	41.8	35.1	16-Jun	33.1	31.3
13-Oct	43.2	34.5	20-Nov	41.7	34.7	21-Nov	38.8	33.5	12-Nov	42.4	36.2	05-Aug	41.3	35.4	22-Sep	44.8	36.4	23-Jun	37.9	34.3
26-Oct	43.6	36.2	04-Dec	40.8	35.8				25-Nov	41.8	34.7	19-Aug	40.5	34.9	07-Oct	41.7	35.5	30-Jun	37.7	33.5
10-Nov	43.2	35.5	18-Dec	37.4	33.5				10-Dec	41.0	34.7	03-Sep	40.8	36.2	26-Oct	41.8	35.1	06-Jul	38.8	34.4
24-Nov	44.2	36.0	27-Dec	36.0	32.1				22-Dec	34.6	32.7	25-Sep	43.4	36.6	09-Nov	43.5	34.8	13-Jul	37.1	32.8
07-Dec	43.6	36.3										09-Oct	41.9	36.8	23-Nov	41.9	35.2	20-Jul	36.2	33.2
21-Dec	43.7	36.9										22-Oct	42.6	37.3	06-Dec	43.4	35.8	28-Jul	40.4	34.2
												05-Nov	43.6	37.1	21-Dec	40.5	33.7	11-Aug	40.3	34.5
												20-Nov	44.6	38.1				25-Aug	38.5	33.0
												02-Dec	39.8	34.8				08-Sep	40.3	36.3
												18-Dec	43.9	35.6				21-Sep	41.3	34.4
												30-Dec	37.1	34.2				06-Oct	40.6	33.6
																		27-Oct	40.2	35.1
																		09-Nov	40.9	34.4
																		24-Nov	41.0	32.9
																		07-Dec	41.4	33.7
																		29-Dec	41.8	33.8

TABLE F2.—Monthly average moisture content of soils (percent wet weight) at 0–10 cm and 30–40 cm in the Lutz catchment by hydrologic year, 1975–1989.

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Sample depth, 0--10 cm:															
Jan	31.3	36.1	32.6	35.1	32.2	38.5	42.0	41.9	31.6	40.5	33.6	35.1	34.5	33.7	34.2
Feb	30.0	30.1	34.5	34.1	31.5	36.5	34.2	34.0	29.7	33.7	33.3	33.9	32.8	31.7	31.8
Mar	31.8	28.3	30.3	30.9	29.8	31.2	33.9	31.4	27.1	33.5	30.0	30.6	30.1	29.9	33.4
Apr	30.4	30.9	29.2	34.1	32.3	30.7	31.4	32.2	29.3	31.5	30.5	31.8	34.2	29.1	29.7
May	35.2	36.9	34.1	38.3	37.4	35.7	37.6	34.6	36.6	38.1	37.9	33.2	35.8	33.9	32.4
Jun	39.6	37.8	38.6	39.9	38.7	38.7	40.5	37.5	39.4	39.2	39.2	36.7	38.7	38.5	36.1
Jul	39.7	37.6	38.0	39.2	40.7	40.5	42.4	38.8	39.6	42.4	38.9	40.9	42.1	40.4	38.1
Aug	41.9	39.4	40.1	42.0	43.2	41.6	42.1	39.4	40.5	40.9	38.7	40.3	40.9	42.6	39.4
Sep	40.5	40.9	41.4	42.2	39.6	41.4	43.1	41.6	41.9	42.1	40.3	39.8	42.1	43.3	40.8
Oct	42.4	40.4	42.6	42.6	41.3	40.7	45.2	42.2	43.4	42.7	41.4	41.3	42.3	42.6	40.4
Nov	41.9	39.4	41.7	42.7	41.0	41.5	45.8	41.1	43.7	41.9	39.5	42.1	44.1	42.7	40.9
Dec	40.8	35.2	41.1	40.4	40.8	41.6	45.8	34.1	43.7	38.1	37.3	37.8	40.3	40.2	41.6
Sample depth, 30--40 cm:															
Jan	30.1	32.6	30.8	32.1	30.6	33.9	35.7	34.7	29.6	35.2	31.4	32.9	31.7	32.1	31.6
Feb	29.5	29.6	31.8	31.6	30.3	32.8	31.6	31.0	29.2	31.1	30.6	33.3	30.7	30.1	30.4
Mar	30.4	28.6	29.6	29.9	29.4	30.1	31.5	29.8	27.9	29.8	28.7	28.1	28.8	29.7	30.0
Apr	29.7	29.9	29.1	31.6	30.7	29.8	30.2	30.9	29.2	30.8	28.2	27.3	31.5	28.7	28.8
May	32.2	33.0	31.6	33.8	33.3	32.4	34.4	32.2	34.0	33.3	34.3	31.8	32.7	31.9	30.3
Jun	34.4	33.5	33.9	34.6	33.9	34.0	36.6	34.1	34.3	34.4	35.1	32.4	32.9	33.8	32.7
Jul	34.4	33.4	33.6	34.2	35.0	34.9	37.9	34.5	34.4	38.7	35.4	34.1	34.6	35.1	33.7
Aug	35.6	34.3	34.7	35.7	36.3	35.4	36.1	35.0	34.2	35.0	35.3	34.5	35.1	35.1	33.8
Sep	34.9	35.1	35.4	35.7	34.4	35.3	37.0	35.3	36.2	34.7	35.1	33.7	36.4	35.7	35.4
Oct	35.8	34.8	36.0	36.0	35.3	35.0	35.7	35.2	35.4	36.4	36.1	35.5	37.1	34.9	34.3
Nov	35.6	34.3	35.5	36.0	35.2	35.4	35.1	34.4	35.8	35.5	33.9	35.4	37.6	35.5	33.6
Dec	35.0	32.2	35.2	34.8	35.0	35.4	36.6	31.4	36.6	33.8	33.4	33.7	34.9	34.0	33.8

TABLE F3.—Estimated monthly average moisture content of shallow (0–10 cm), medium (10–30 cm) and deep (30–120 cm) catchment soils is expressed as percent by weight, percent of volume, and mm equivalents, 1975–1989. Total available water content (t-awc) of average soil column calculated in mm equivalents.

	sm-%wt			sm-%vol			sm-mm			t-awc
	0-10	10-30	30-120	0-10	10-30	30-120	0-10	10-30	30-120	0-120
Jan-75	31.3	30.7	30.1	31.8	44.3	47.5	4.6	10.8	41.9	57.3
Feb-75	30.0	29.8	29.5	30.0	42.4	46.0	2.8	6.9	29.1	38.8
Mar-75	31.8	31.1	30.4	32.7	45.2	48.1	5.5	12.6	47.9	66.0
Apr-75	30.4	30.0	29.7	30.5	42.9	46.4	3.3	8.0	32.5	43.8
May-75	35.2	33.7	32.2	38.0	50.8	52.1	10.8	23.7	83.9	118.5
Jun-75	39.6	37.0	34.4	46.0	58.8	57.8	18.8	39.8	134.7	193.2
Jul-75	39.7	37.1	34.4	46.0	58.9	57.8	18.8	39.9	135.0	193.8
Aug-75	41.9	38.7	35.6	50.4	63.2	60.7	23.2	48.5	161.3	233.0
Sep-75	40.5	37.7	34.9	47.7	60.5	58.9	20.5	43.2	145.2	209.0
Oct-75	42.4	39.1	35.8	51.5	64.2	61.5	24.3	50.7	167.9	242.9
Nov-75	41.9	38.7	35.6	50.5	63.3	60.8	23.3	48.7	161.9	233.9
Dec-75	40.8	37.9	35.0	48.3	61.1	59.4	21.1	44.5	149.0	214.6
Jan-76	36.1	34.3	32.6	39.5	52.3	53.2	12.3	26.7	93.5	132.5
Feb-76	30.1	29.9	29.6	30.2	42.6	46.2	3.0	7.3	30.3	40.6
Mar-76	28.3	28.5	28.6	27.6	39.8	44.1	0.4	1.8	11.8	14.1
Apr-76	30.9	30.4	29.9	31.3	43.7	47.0	4.1	9.6	37.8	51.4
May-76	36.9	34.9	33.0	40.9	53.7	54.2	13.7	29.7	102.8	146.2
Jun-76	37.8	35.7	33.5	42.6	55.5	55.4	15.4	33.1	113.7	162.3
Jul-76	37.6	35.5	33.4	42.2	55.1	55.2	15.0	32.3	111.3	158.6
Aug-76	39.4	36.9	34.3	45.6	58.4	57.5	18.4	39.1	132.3	189.8
Sep-76	40.9	38.0	35.1	48.4	61.2	59.4	21.2	44.6	149.3	215.0
Oct-76	40.4	37.6	34.8	47.5	60.3	58.8	20.3	42.8	143.8	206.8
Nov-76	39.4	36.9	34.3	45.5	58.4	57.5	18.3	39.0	132.0	189.3
Dec-76	35.2	33.7	32.2	38.0	50.8	52.1	10.8	23.8	84.0	118.6
Jan-77	32.6	31.7	30.8	33.9	46.5	49.1	6.7	15.2	56.3	78.2
Feb-77	34.5	33.1	31.8	36.9	49.6	51.3	9.7	21.4	76.3	107.4
Mar-77	30.3	29.9	29.6	30.4	42.7	46.3	3.2	7.7	31.6	42.5
Apr-77	29.2	29.2	29.1	28.9	41.2	45.1	1.7	4.5	20.9	27.1
May-77	34.1	32.9	31.6	36.3	49.0	50.8	9.1	20.1	72.4	101.6
Jun-77	38.6	36.3	33.9	44.0	56.9	56.4	16.8	35.9	122.6	175.3
Jul-77	38.0	35.8	33.6	42.9	55.8	55.7	15.7	33.7	115.7	165.1
Aug-77	40.1	37.4	34.7	46.9	59.8	58.4	19.7	41.8	140.7	202.3
Sep-77	41.4	38.4	35.4	49.5	62.3	60.2	22.3	46.8	156.3	225.4
Oct-77	42.6	39.3	36.0	51.9	64.7	61.7	24.7	51.5	170.5	246.8
Nov-77	41.7	38.6	35.5	50.1	62.9	60.5	22.9	47.9	159.5	230.3
Dec-77	41.1	38.2	35.2	48.9	61.7	59.7	21.7	45.6	152.4	219.6
Jan-78	35.1	33.6	32.1	37.8	50.6	52.0	10.6	23.4	82.8	116.9
Feb-78	34.1	32.8	31.6	36.2	48.9	50.8	9.0	20.0	71.8	100.8
Mar-78	30.9	30.4	29.9	31.3	43.7	47.0	4.1	9.6	37.9	51.5
Apr-78	34.1	32.8	31.6	36.2	48.9	50.8	9.0	20.0	72.0	101.1
May-78	38.3	36.1	33.8	43.5	56.4	56.1	16.3	35.0	119.6	170.9
Jun-78	39.9	37.2	34.6	46.5	59.3	58.1	19.3	40.9	137.9	198.1
Jul-78	39.2	36.7	34.2	45.1	58.0	57.2	17.9	38.2	129.5	185.6
Aug-78	42.0	38.8	35.7	50.7	63.5	61.0	23.5	49.2	163.4	236.2
Sep-78	42.2	39.0	35.7	51.1	63.9	61.2	23.9	49.9	165.6	239.5
Oct-78	42.6	39.3	36.0	52.0	64.8	61.8	24.8	51.7	171.1	247.6
Nov-78	42.7	39.3	36.0	52.1	64.8	61.8	24.9	51.8	171.3	248.0
Dec-78	40.4	37.6	34.8	47.5	60.4	58.8	20.3	43.0	144.3	207.6
Jan-79	32.2	31.4	30.6	33.2	45.7	48.5	6.0	13.7	51.4	71.1
Feb-79	31.5	30.9	30.3	32.2	44.7	47.7	5.0	11.6	44.4	60.9
Mar-79	29.8	29.6	29.4	29.7	42.0	45.8	2.5	6.2	26.6	35.3
Apr-79	32.3	31.5	30.7	33.3	45.9	48.6	6.1	14.0	52.4	72.6
May-79	37.4	35.3	33.3	41.8	54.6	54.9	14.6	31.5	108.6	154.7
Jun-79	38.7	36.3	33.9	44.2	57.0	56.5	17.0	36.3	123.6	176.8
Jul-79	40.7	37.9	35.0	48.1	60.9	59.2	20.9	44.0	147.7	212.6
Aug-79	43.2	39.7	36.3	53.2	65.9	62.6	26.0	54.1	178.1	258.2
Sep-79	39.6	37.0	34.4	46.0	58.8	57.8	18.8	39.9	134.9	193.5
Oct-79	41.3	38.3	35.3	49.3	62.1	60.0	22.1	46.5	155.1	223.7
Nov-79	41.0	38.1	35.2	48.7	61.5	59.6	21.5	45.3	151.4	218.2
Dec-79	40.8	37.9	35.0	48.2	61.0	59.3	21.0	44.3	148.4	213.8

TABLE F3.—Continued.

	sm-%wt			sm-%vol			sm-mm			t-awc
	0-10	10-30	30-120	0-10	10-30	30-120	0-10	10-30	30-120	0-120
Jan-80	38.5	36.2	33.9	43.8	56.7	56.3	16.6	35.6	121.5	173.7
Feb-80	36.5	34.7	32.8	40.3	53.1	53.8	13.1	28.4	99.0	140.5
Mar-80	31.2	30.6	30.1	31.7	44.2	47.4	4.5	10.6	41.1	56.2
Apr-80	30.7	30.2	29.8	31.0	43.4	46.8	3.8	8.9	35.6	48.3
May-80	35.7	34.1	32.4	38.9	51.7	52.8	11.7	25.6	89.9	127.2
Jun-80	38.7	36.3	34.0	44.2	57.1	56.6	17.0	36.4	124.1	177.5
Jul-80	40.5	37.7	34.9	47.6	60.4	58.9	20.4	43.1	144.7	208.2
Aug-80	41.6	38.5	35.4	49.8	62.6	60.3	22.6	47.4	157.9	227.8
Sep-80	41.4	38.4	35.3	49.4	62.2	60.1	22.2	46.6	155.6	224.5
Oct-80	40.7	37.8	35.0	48.0	60.8	59.1	20.8	43.9	147.1	211.7
Nov-80	41.5	38.5	35.4	49.8	62.5	60.3	22.6	47.3	157.6	227.5
Dec-80	41.6	38.5	35.4	49.9	62.7	60.4	22.7	47.5	158.3	228.6
Jan-81	42.0	38.8	35.7	50.7	63.5	61.0	23.5	49.2	163.5	236.2
Feb-81	34.2	32.9	31.6	36.4	49.1	50.9	9.2	20.4	73.1	102.7
Mar-81	33.9	32.7	31.5	35.9	48.6	50.6	8.7	19.4	70.0	98.1
Apr-81	31.4	30.8	30.2	32.0	44.4	47.6	4.8	11.1	42.9	58.7
May-81	37.6	36.0	34.4	42.3	56.4	57.8	15.1	34.9	135.0	185.0
Jun-81	40.5	38.6	36.6	47.7	62.8	63.5	20.5	47.8	186.5	254.8
Jul-81	42.4	40.1	37.9	51.5	67.0	67.0	24.3	56.3	218.2	298.8
Aug-81	42.1	39.1	36.1	50.9	64.3	62.3	23.7	50.7	175.3	249.6
Sep-81	43.1	40.0	37.0	53.1	66.8	64.5	25.9	55.8	195.4	277.1
Oct-81	45.2	40.4	35.7	57.7	67.9	61.1	30.5	58.0	164.5	253.1
Nov-81	45.8	40.5	35.1	59.3	68.0	59.5	32.1	58.1	149.9	240.1
Dec-81	45.8	41.2	36.6	59.2	70.1	63.4	32.0	62.3	185.2	279.5
Jan-82	41.9	38.3	34.7	50.4	62.0	58.4	23.2	46.2	140.7	210.1
Feb-82	34.0	32.5	31.0	36.0	48.1	49.4	8.8	18.4	59.5	86.7
Mar-82	31.4	30.6	29.8	32.1	44.1	46.6	4.9	10.4	34.3	49.5
Apr-82	32.2	31.5	30.9	33.2	46.1	49.2	6.0	14.3	57.5	77.8
May-82	34.6	33.4	32.2	37.1	50.2	52.4	9.9	22.6	86.0	118.5
Jun-82	37.5	35.8	34.1	41.9	55.8	57.0	14.7	33.8	128.2	176.7
Jul-82	38.8	36.6	34.5	44.3	57.8	57.9	17.1	37.8	136.1	191.1
Aug-82	39.4	37.2	35.0	45.6	59.3	59.3	18.4	40.8	148.2	207.3
Sep-82	41.6	38.5	35.3	49.9	62.5	60.0	22.7	47.1	154.8	224.7
Oct-82	42.2	38.7	35.2	51.1	63.1	59.7	23.9	48.3	152.1	224.3
Nov-82	41.1	37.7	34.4	48.7	60.6	57.7	21.5	43.3	133.8	198.7
Dec-82	34.1	32.8	31.4	36.3	48.7	50.3	9.1	19.7	67.9	96.6
Jan-83	31.6	30.6	29.6	32.4	44.2	46.4	5.2	10.5	32.0	47.7
Feb-83	29.7	29.4	29.2	29.6	41.7	45.3	2.4	5.6	22.5	30.4
Mar-83	27.1	27.5	27.9	26.0	37.8	42.5	-1.2	-2.1	-3.1	-6.4
Apr-83	29.3	29.2	29.2	28.9	41.3	45.4	1.7	4.8	23.6	30.1
May-83	36.6	35.3	34.0	40.4	54.5	56.6	13.2	31.2	124.2	168.5
Jun-83	39.4	36.8	34.3	45.4	58.3	57.5	18.2	38.9	132.1	189.2
Jul-83	39.6	37.0	34.4	45.8	58.7	57.6	18.6	39.5	133.5	191.6
Aug-83	40.5	37.3	34.2	47.6	59.5	57.1	20.4	41.3	128.4	190.1
Sep-83	41.9	39.1	36.2	50.6	64.1	62.4	23.4	50.5	176.7	250.6
Oct-83	43.4	39.4	35.4	53.6	65.0	60.2	26.4	52.1	156.8	235.4
Nov-83	43.7	39.7	35.8	54.2	65.9	61.3	27.0	54.0	166.3	247.3
Dec-83	43.7	40.1	36.6	54.3	67.1	63.6	27.1	56.3	186.9	270.3
Jan-84	40.5	37.9	35.2	47.7	61.0	59.8	20.5	44.2	153.2	217.9
Feb-84	33.7	32.4	31.1	35.6	47.9	49.6	8.4	18.0	61.1	87.4
Mar-84	33.5	31.6	29.8	35.3	46.3	46.6	8.1	14.8	34.6	57.4
Apr-84	31.5	31.1	30.8	32.1	45.2	49.0	4.9	12.6	56.0	73.6
May-84	38.1	35.7	33.3	43.1	55.5	54.8	15.9	33.2	108.4	157.4
Jun-84	39.2	36.8	34.4	45.1	58.2	57.6	17.9	38.6	133.6	190.1
Jul-84	42.4	40.5	38.7	51.4	68.1	69.3	24.2	58.4	238.7	321.2
Aug-84	40.9	37.9	35.0	48.4	61.1	59.2	21.2	44.4	147.4	213.0
Sep-84	42.1	38.4	34.7	51.0	62.4	58.6	23.8	47.1	142.0	212.8
Oct-84	42.7	39.5	36.4	52.2	65.4	62.9	25.0	53.0	181.0	259.1
Nov-84	41.9	38.7	35.5	50.5	63.2	60.6	23.3	48.5	160.2	232.0
Dec-84	38.1	35.9	33.8	43.0	56.1	56.2	15.8	34.3	120.2	170.4

TABLE F3.—Continued.

	sm-%wt			sm-%vol			sm-mm			t-awc
	0-10	10-30	30-120	0-10	10-30	30-120	0-10	10-30	30-120	0-120
Jan-85	33.6	32.5	31.4	35.5	48.2	50.4	8.3	18.6	68.3	95.2
Feb-85	33.3	32.0	30.6	34.9	47.0	48.6	7.7	16.2	52.3	76.2
Mar-85	30.0	29.4	28.7	30.0	41.6	44.3	2.8	5.3	13.4	21.5
Apr-85	30.5	29.3	28.2	30.7	41.5	43.2	3.5	5.3	3.5	12.3
May-85	37.9	36.1	34.3	42.6	56.5	57.5	15.4	35.2	132.7	183.3
Jun-85	39.2	37.2	35.1	45.2	59.2	59.6	18.0	40.6	150.9	209.6
Jul-85	38.9	37.2	35.4	44.6	59.1	60.3	17.4	40.4	157.2	215.1
Aug-85	38.7	37.0	35.3	44.2	58.8	60.0	17.0	39.7	155.1	211.8
Sep-85	40.3	37.7	35.1	47.3	60.5	59.4	20.1	43.2	149.6	212.9
Oct-85	41.4	38.7	36.1	49.4	63.2	62.1	22.2	48.6	173.6	244.3
Nov-85	39.5	36.7	33.9	45.7	58.0	56.3	18.5	38.1	121.9	178.6
Dec-85	37.3	35.4	33.4	41.6	54.7	55.2	14.4	31.6	111.3	157.3
Jan-86	35.1	34.0	32.9	37.8	51.5	54.0	10.6	25.2	100.8	136.6
Feb-86	33.9	33.6	33.3	35.9	50.6	54.8	8.7	23.3	108.3	140.3
Mar-86	30.6	29.3	28.1	30.9	41.5	42.9	3.7	5.2	0.9	9.8
Apr-86	31.8	29.5	27.3	32.7	41.9	41.2	5.5	6.1	-14.3	-2.8
May-86	33.2	32.5	31.8	34.7	48.1	51.3	7.5	18.5	76.7	102.7
Jun-86	36.7	34.5	32.4	40.6	52.8	52.6	13.4	27.7	88.6	129.7
Jul-86	40.9	37.5	34.1	48.4	60.0	56.9	21.2	42.1	126.5	189.9
Aug-86	40.3	37.4	34.5	47.3	59.7	57.9	20.1	41.6	135.7	197.4
Sep-86	39.8	36.8	33.7	46.3	58.1	55.9	19.1	38.4	118.0	175.5
Oct-86	41.3	38.4	35.5	49.2	62.3	60.6	22.0	46.9	160.2	229.0
Nov-86	42.1	38.8	35.4	51.0	63.4	60.4	23.8	49.0	158.4	231.2
Dec-86	37.8	35.7	33.7	42.5	55.6	55.9	15.3	33.5	117.7	166.6
Jan-87	34.5	33.1	31.7	36.9	49.4	51.0	9.7	21.1	73.6	104.4
Feb-87	32.8	31.8	30.7	34.2	46.6	48.7	7.0	15.3	53.5	75.8
Mar-87	30.1	29.4	28.8	30.1	41.7	44.5	2.9	5.6	15.1	23.6
Apr-87	34.2	32.8	31.5	36.4	48.9	50.5	9.2	20.0	69.3	98.5
May-87	35.8	34.2	32.7	39.0	52.1	53.4	11.8	26.4	95.8	134.0
Jun-87	38.7	35.8	32.9	44.2	55.7	53.9	17.0	33.7	99.6	150.2
Jul-87	42.1	38.4	34.6	51.0	62.3	58.2	23.8	46.8	139.0	209.5
Aug-87	40.9	38.0	35.1	48.4	61.3	59.6	21.2	44.8	151.1	217.2
Sep-87	42.1	39.2	36.4	50.8	64.6	63.0	23.6	51.3	181.5	256.5
Oct-87	42.3	39.7	37.1	51.2	65.8	64.8	24.0	53.7	198.2	276.0
Nov-87	44.1	40.8	37.6	55.2	69.1	66.3	28.0	60.3	211.2	299.6
Dec-87	40.3	37.6	34.9	47.2	60.2	58.9	20.0	42.6	145.3	207.9
Jan-88	33.7	32.9	32.1	35.6	49.0	51.9	8.4	20.2	82.2	110.8
Feb-88	31.7	30.9	30.1	32.5	44.7	47.3	5.3	11.6	40.3	57.3
Mar-88	29.9	29.8	29.7	29.9	42.5	46.4	2.7	7.1	32.8	42.6
Apr-88	29.1	28.9	28.7	28.7	40.6	44.2	1.5	3.4	12.8	17.6
May-88	33.9	32.9	31.9	35.9	49.1	51.6	8.7	20.4	79.5	108.6
Jun-88	38.5	36.1	33.8	43.8	56.6	56.2	16.6	35.4	120.3	172.2
Jul-88	40.4	37.8	35.1	47.5	60.7	59.5	20.3	43.6	150.2	214.1
Aug-88	42.6	38.9	35.1	52.0	63.6	59.5	24.8	49.3	150.2	224.3
Sep-88	43.3	39.5	35.7	53.4	65.2	61.1	26.2	52.7	164.5	243.3
Oct-88	42.6	38.6	34.9	50.2	62.9	60.5	23.0	48.1	159.7	230.7
Nov-88	42.7	39.1	35.5	52.1	64.1	60.5	24.9	50.4	159.4	234.7
Dec-88	40.2	37.1	34.0	47.1	59.0	56.7	19.9	40.2	124.7	184.8
Jan-89	34.2	32.9	31.6	36.4	49.1	50.9	9.2	20.4	72.7	102.4
Feb-89	31.8	31.1	30.4	32.6	45.1	48.0	5.4	12.4	47.2	65.0
Mar-89	33.4	31.7	30.0	35.2	46.5	47.2	8.0	15.2	39.6	62.8
Apr-89	29.7	29.3	28.8	29.5	41.4	44.6	2.3	4.9	16.2	23.5
May-89	32.4	31.4	30.3	33.6	45.7	47.9	6.4	13.6	45.5	65.4
Jun-89	36.1	34.4	32.7	39.5	52.4	53.5	12.3	27.0	96.1	135.4
Jul-89	38.1	35.9	33.7	43.2	56.0	55.9	16.0	34.3	117.6	167.8
Aug-89	39.4	36.6	33.8	45.4	57.7	56.1	18.2	37.5	119.8	175.5
Sep-89	40.8	38.1	35.4	48.3	61.5	60.2	21.1	45.3	156.5	222.8
Oct-89	40.4	37.4	34.3	47.5	59.7	57.5	20.3	41.6	132.7	194.6
Nov-89	40.9	37.3	33.6	48.5	59.4	55.7	21.3	41.0	116.5	178.7
Dec-89	41.6	37.7	33.8	49.9	60.5	56.1	22.7	43.1	119.4	185.2

TABLE F4.—Moisture content of soils (percent wet weight, average of ten sites) on the plateau by date and depth, 1981–1984.

1981			1982			1983			1984		
date	0–10	30–40	date	0–10	30–40	date	0–10	30–40	date	0–10	30–40
			06-Jan	39.2	32.8	07-Jan	27.8	26.4	04-Jan	34.5	31.2
			20-Jan	33.4	28.9	20-Jan	26.2	26.0	20-Jan	30.9	30.5
04-Feb	34.6		04-Feb	30.3	27.0	04-Feb	25.9	25.4	17-Feb	29.9	27.1
11-Feb	30.6		19-Feb	27.0	26.0	18-Feb	25.0	25.0			
18-Feb	32.0		03-Mar	26.5	25.5	01-Mar	26.2	23.4			
05-Mar	28.1		18-Mar	25.4	24.8	18-Mar	24.7	24.6			
11-Mar	32.4		01-Apr	25.2	24.5	29-Mar	22.2	24.2			
18-Mar	28.7		14-Apr	30.7	30.3	08-Apr	23.8	24.4			
25-Mar	27.5		29-Apr	25.9	25.8	15-Apr	24.7	24.9			
02-Apr	25.9		12-May	31.2	30.5	21-Apr	22.6	22.4			
08-Apr	25.9		26-May	27.0	27.6	30-Apr	30.0	29.6			
16-Apr	30.8		10-Jun	31.3	30.2	06-May	29.9	27.1			
23-Apr	34.6		25-Jun	32.4	30.3	12-May	29.8	28.8			
29-Apr	35.0		09-Jul	33.5	30.9	27-May	30.8	28.7			
06-May	35.7		23-Jul	32.3	30.1	10-Jun	31.6	30.0			
20-May	35.2		05-Aug	33.8	29.7	24-Jun	34.1	31.4			
04-Jun	37.3	33.3	19-Aug	35.1	31.2	08-Jul	33.1	30.7			
18-Jun	37.8	32.4	31-Aug	33.9	30.1	23-Jul	34.1	31.7			
02-Jul	38.2	32.7	18-Sep	35.3	30.3	08-Aug	33.0	30.6			
16-Jul	38.9	35.7	29-Sep	34.9	31.0	19-Aug	33.0	30.7			
30-Jul	36.7	31.4	14-Oct	35.6	31.8	30-Aug	32.7	31.8			
25-Aug	38.5	35.8	28-Oct	35.3	31.8	16-Sep	36.4	32.3			
10-Sep	40.4	35.4	12-Nov	36.4	31.1	29-Sep	35.8	32.4			
22-Sep	38.2	34.0	25-Nov	29.6	28.3	13-Oct	35.3	31.3			
08-Oct	39.2	33.9	10-Dec	27.9	27.5	26-Oct	36.1	31.7			
23-Oct	39.2	33.7	23-Dec	27.0	26.5	10-Nov	36.4	31.4			
09-Nov	39.7	32.4				24-Nov	36.5	31.3			
24-Nov	38.8	31.8				08-Dec	40.5	33.2			
07-Dec	39.7	34.4				22-Dec	38.4	33.7			
22-Dec	39.2	32.9									

TABLE F5—Monthly average moisture content of soils (percent wet weight) at 0–10 cm and 30–40 cm on the plateau by date, 1981–1984.

	.....depth 0–10 cm.....				..depth 30–40 cm..		
	1981	1982	1983	1984	1982	1983	1984
Apr		30.4	27.3	25.3		26.8	25.4
May		35.5	29.1	30.2		29.0	28.2
Jun		37.6	31.8	32.9	32.8	30.3	30.7
Jul		37.9	32.9	33.6	33.2	30.5	31.2
Aug		38.5	34.2	32.9	35.8	30.3	31.0
Sep		39.3	35.1	36.1	34.7	30.7	32.4
Oct		39.2	35.5	35.7	33.8	31.8	31.5
Nov		39.3	33.0	36.5	32.1	29.7	31.3
Dec		39.4	27.4	39.4	33.6	27.0	33.4
Jan		36.3	27.0	32.7	30.8	26.2	30.9
Feb	32.4	28.7	25.5	29.9	26.5	25.2	27.1
Mar	29.2	26.0	24.4		25.2	24.0	

Appendix G: Stream Discharge

TABLE G1.—Total daily runoff in cubic meters from the 10 ha Lutz catchment, 1972–1988.

1972	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	15	10	1	0	2	1	13	64	497	643	339	
2	14	10	0	0	3	17	38	4	269	1143	248	
3	14	10	1	0	2	7	13	11	589	1162	856	
4	13	8	2	0	2	6966	11	0	283	540	371	
5	64	7	4	0	1	10	16	0	63	4873	274	
6	64	6	0	0	1	17	11	0	61	671	349	
7	46	5	0	0	5	10	12	0	37	208	237	
8	165	6	0	0	1	48	26	0	53	330	177	
9	414	18	0	0	6	36	101	0	511	198	139	
10	150	10	0	4	3	36	19	1	170	141	102	
11	81	5	1	4	3	238	6	1	195	109	89	
12	55	5	1	1	2	677	8	1	176	107	202	34
13	42	5	1	0	2	136	6	3	282	71	131	34
14	46	5	6	0	167	48	18	1	8441		1408	33
15	38	4	5	0	10	27	36	412	717			30
16	30	3	0	0	5	19	17	10	376			20
17	29	2	0	1	4	12	10	5	222			20
18	76	2	0	0	3	18	16	4	206	117		414
19	75	4	0	1	3	2902	14	3	275	66		3299
20	43	6	0	2	3	315	224	3	228	54		1144
21	27	3	2	5	0	133	77	1	146	53		415
22	20	2	1	3	2	66	57	1	541	178		150
23	18	2	0	1	1	92	59	74	250	97		125
24	16	3	0	2	1	103	68	22	182	75		112
25	17	3	0	1	0	129	16	9	209	842		100
26	15	3	0	2	1	28	18	1529	895	234		98
27	14	1	0	1	1	19	11	3625	570	258		86
28	13	1	0	2	1	18	6	434	566			78
29	11	3	0	2	282	20	8	237	359			65
30	11		0	4	11	11	64	143	5159			48
31	10		0		2		4	77				32
Total	1645	151	26	39	529	12157	1005	6673	22527			

1973	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	48	1	0	0	0	6	325	70	3831	482	203	505
2	37	1	1	0	0	4	141	63	1433	390	1214	477
3	24	1	0	0	0	4	511	55	730	362	256	323
4	19	1	0	0	0	5	274	578	509	315	417	270
5	20	1	0	0	0	44	223	225	378	293	291	217
6	19	2	0	0	0	20	154	161	277	323	254	189
7	18	4	0	0	1	97	95	122	297	377	820	174
8	15	2	0	0	0	38	95	1050	255	417	583	162
9	14	1	0	0	1	87	72	412	332	306	597	217
10	18	1	0	0	0	29	61	270	194	269	439	267
11	22	1	0	0	0	15	155	205	112	237	737	482
12	46	2	0	0	0	3759	80	398	166	208	5708	254
13	22	2	0	0	0	221	49	3164	155	4418	1911	175
14	18	2	0	0	0	70	48	628	402	1221	2482	139
15	16	2	0	0	0	36	378	397	257	789	4945	114
16	12	1	0	0	0	36	210	994	519	642	8858	110
17	11	1	0	0	0	41	173	713	329	473	1944	113
18	8	1	0	0	2	64	213	527	266	509	945	86
19	11	2	0	0	2	148	266	367	230	366	572	69
20	21	1	0	0	0	81	470	282	222	338	442	69
21	12	3	0	0	0	47	429	312	171	681	322	71
22	9	3	0	0	0	55	219	301	160	407	274	64
23	7	1	0	0	0	100	145	253	150	304	845	55
24	6	0	0	0	0	99	134	197	148	256	318	58
25	10	1	0	0	8	94	123	159	5918	225	1598	80
26	4	1	0	0	1	129	136	142	1040	204	947	50
27	3	1	0	0	49	113	122	2252	552	308	1215	46
28	3	0	0	0	7	81	106	614	700	221	719	42
29	3		0	0	7	347	93	1476	2113	182	761	42
30	3		0	0	281	342	70	1085	780	338	875	42
31	3		0		25		63	543		343		45
Total	478	40	1	0	384	6211	5635	18017	22627	16205	41493	5010

1974	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	40	4	0	0	0	2	24	708	132	370	480	5462
2	39	6	6	0	0	2	20	386	102	272	382	2079
3	38	4	4	0	0	2	169	209	73	315	772	912
4	58	2	1	0	0	2	43	139	66	318	560	550
5	31	2	1	0	0	1	24	108	61	263	407	369
6	29	2	0	0	0	0	19	873	124	372	316	282
7	33	2	0	0	0	0	15	1685	123	315	549	217
8	19	2	0	0	0	0	10	697	93	383	546	339
9	18	2	0	0	0	2	8	359	68	1657	400	183
10	17	2	0	0	0	14	8	244	62	1508	319	153
11	20	2	0	0	0	18	10	1106	55	896		138
12	16	1	0	0	0	11	8		423	547		104
13	13	1	0	0	0	4	8		300	4149	428	79
14	14	0	0	0	0	4	15	193	725	1573	211	69
15	14	0	0	0	0	3	79	148	435	852	899	78
16	11	0	0	0	0	1	62	118	278	559	1778	87
17	10	0	0	0	1	145	35	91	671	409	800	79
18	9	0	0	0	3	290	3385	77	435	521	632	70
19	9	0	0	0	1	75	209	64	253	359	434	64
20	8	1	0	0	0	73	102	62	229	324	220	61
21	7	1	0	0	0	40	102	99	190	720	1437	61
22	7	0	0	0	0	19	97	78	161	574	2977	57
23	8	0	0	0	0	20	70	333	143	2246	1047	50
24	7	0	0	0	1	15	53	191	119	1617	681	49
25	5	0	0	0	5	11	38	133	103	957	923	44
26	5	0	0	0	2	18	38	116	203	659	525	40
27	8	0	0	0	1	17	42	105	205	1758	401	38
28	6	0	0	0	0	17	74	69	740	1315	924	36
29	4		0	0	0	20	378	145	1920	885	768	34
30	5		0	0	11	15	708	137	606	610	1523	28
31	4		0		3		386	222		696		26
Total	512	34	12	0	28	841	6239		9098	27999		11838

1975	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	31	3	0	0	0	24	57	87	126	521	1528	
2	28	3	0	0	41	24	87	66	121	831	832	
3	24	4	0	0	18	17	117	49	82	568	601	
4	23	4	0	0	15	28	294	53	81	958	628	
5	23	4	0	0	14	28	291	40	908	528	530	
6	21	3	0	0	9	20	125	33	644	375	391	
7	20	4	0	0	3	1898	75	30	278	281	349	
8	19	3	0	0	1	299	63	833	191	549	270	
9	19	3	0	34	0	38	40	1669	160	425	240	
10	18	3	0	4	0	13	27	1851	134		418	
11	18	3	0	1	0	6	17	352	111		175	
12	16	2	0	0	25	2	21	192	87		252	
13	12	2	0	0	41	5	15	138	77		1603	
14	12	4	0	0	18	7	18	103	2251		2591	
15	12	4	0	0	5	5	26	416	728	1127	3648	
16	13	6	0	0	6	3	15	197	358	796	1885	
17	13	5	0	0	13	3	11		230	1042	4077	
18	11	0	0	0	36	1	9		187	660	1909	
19	19	0	0	0	253	1	10		171	454		
20	16	1	0	0	35	2	376		146	662		
21	10	0	0	0	26	12	116	119	125	921		
22	8	0	0	0	13	18	62	493	106	750		
23	7	0	0	0	12	65	60	429	87	568		
24	6	0	0	0	17	48	41	4151	104	824		
25	7	0	0	1	18	31	359	1902	160	1130		
26	8	0	0	1	21	25	167	2259	97	1419		
27	7	0	0	0	497	53	302	1278	955	898		
28	6	0	0	0	626	440	190	556	328	601		
29	5		0	0	131	113	118	388	1669	703		
30	4		0	0	52	61	87	290	887	506		
31	3		0		35		66	219		461		
Total	439	61	0	41	1981	3290	3262		11589			

TABLE G1.—Continued.

1984	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	2141	40	25	1	1	20	151	149	733	426	1875	419
2	462	42	33	1	1	20	95	121	404	428	1464	329
3	275	37	29	2	0	22	78	153	294	361	743	250
4	212	40	18	1	0	43	67	143	235	283	1672	214
5	173	34	14	1	0	56	143	130	194	178	1866	193
6	167	31	10	0	0	1340	173	109	279	134	845	178
7	135	35	11	1	0	1150	184	94	203	128	562	171
8	122	39	12	1	0	122	132	97	175	280	643	193
9	119	31	14	0	0	50	105	79	1163	152	2275	129
10	115	26	10	0	0	84	125	74	3859	139	2771	110
11	110	34	9	0	16	81	105	2866	989	172	1146	93
12	98	34	8	0	4	49	89	658	546	855	671	86
13	82	27	6	0	20	38	507	798	434	282	472	129
14	79	38	10	0	8	36	210	456	327	259	390	90
15	74	22	6	0	2	32	698	305	295	202	308	82
16	386	21	4	0	3	58	561	229	247	175	257	71
17	99	18	5	14	1	69	246	589	124	1107	2725	62
18	90	18	3	5	2	59	160	298	145	4696	690	58
19	84	18	3	2	2	47	116	228	2449	1068	604	57
20	76	30	3	2	2	36	114	871	1301	3027	369	54
21	69	17	1	1	15	41	84	579	635	1008	299	53
22	66	14	6	1	5	33	67	348	415	576	601	48
23	59	17	3	0	6	30	58	334	322	1443	1548	44
24	60	14	1	0	9	33	50	273	239	1969	672	39
25	62	11	1	0	353	23	747	352	189	977	428	40
26	52	12	2	0	30	172	232	279	160	617	342	36
27	51	14	2	6	19	63	184	218	141	464	580	32
28	53	15	1	13	17	59	206	186	182	430	3291	32
29	43	18	1	3	16	38	193	154	1275	403	1132	30
30	41		3	0	13	383	149	1525	406	589	568	26
31	41		2		16		121	492		6202		52
Total	5697	746	258	55	560	4285	6150	13186	18362	29030	31809	3401

1985	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	20	13	4	0	0	83	79	56	92	86	148	200
2	21	8	8	0	1	57	32	507	119	101	118	219
3	21	12	21	0	6	30	20	563	127	72	106	420
4	28	12	12	0	0	49	842	351	107	48	100	459
5	30	10	8	0	8	294	293	509	84	143	99	600
6	32	8	2	0	17	98	201	348	83	1505	931	7498
7	33	8	2	0	6	65	267	301	232	309	360	4029
8	20	10	2	0	5	33	260	212	141	785	235	4659
9	22	11	3	0	4	34	131	171	477	1483	643	1272
10	22	12	3	0	9	28	112	132	744	1631	361	737
11	28	15	2	0	11	20	108	108	471	673	279	507
12	34	15	1	0	17	13	102	92	281	465	233	391
13	39	12	1	0	8	16	86	72	338	413	219	311
14	32	11	1	0	2	21	81	61	268	312	201	248
15	23	11	1	0	1	22	132	73	233	403	175	209
16	14	12	1	0	1	35	130	116	216	1239	348	178
17	25	14	1	0	8	30	147	67	169	2264	214	152
18	22	6	1	0	96	19	249	1384	151	1003	184	137
19	23	13	1	0	13	17	127	566	148	617	159	114
20	21	6	1	0	10	15	99	221	138	454	182	101
21	18	3	1	0	9	48	84	410	125	359	306	113
22	31	2	1	0	4	80	78	287	110	296	280	92
23	33	3	1	0	4	116	72	189	120	255	230	82
24	21	3	1	0	32	89	116	137	112	215	187	81
25	15	6	1	0	104	107	99	106	75	186	160	76
26	48	7	1	0	43	140	67	94	63	169	136	70
27	15	1	2	0	19	135	61	154	54	174	682	74
28	15	2	3	0	17	91	51	104	65	151	272	69
29	14		1	0	10	66	58	91	94	340	187	65
30	20		1	0	9	58	56	75	90	173	367	60
31	17		1		26		507	323		205		56
Total	757	247	90	1	502	1908	4744	7881	5527	16531	8102	23276

1986	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	45	17	3	0	2	0	39	5	45	127	326	224
2	48	19	2	0	6	2	37	3	46	1213	208	148
3	44	22	2	0	23	6	45	9	40	547	572	203
4	42	17	2	0	11	4	50	6	37	348	308	122
5	65	15	3	0	7	5	46	5	48	217	229	2929
6	54	11	2	0	5	1	23	4	884	226	237	655
7	51	10	1	0	2	1	16	7	667	2368	173	365
8	26	20	1	0	1	1	13	10	1665	1817	578	258
9	74	15	1	0	1	7	14	4	414	1477	250	189
10	58	10	1	1	1	3	15	4	172	1742	176	177
11	58	10	1	1	0	12	17	4	115	990	114	140
12	59	9	1	0	0	11	13	21	82	500	97	112
13	61	8	1	1	0	12	16	16	235	339	133	91
14	63	8	0	0	0	7	22	1055	234	317	87	77
15	79	6	0	0	1	8	18	116	229	1712	78	67
16	47	7	0	5	1	8	15	53	148	1814	201	56
17	32	10	0	20	1	10	13	84	119	943	319	46
18	32	5	0	24	4	4	18	230	127	614	174	43
19	32	4	0	9	3	3	12	88	167	774	116	38
20	32	7	0	14	7	19	12	61	123	2782	857	36
21	32	8	0	8	7	17	17	230	115	840	360	34
22	21	7	0	5	13	123	15	100	87	522	883	35
23	28	8	0	4	10	44	13	53	75	463	429	27
24	28	7	0	2	2	21	12	60	79	637	277	27
25	27	3	0	1	4	12	11	775	108	420	202	23
26	26	3	0	2	8	28	8	241	89	517	170	44
27	22	4	0	7	3	207	8	91	128	406	132	87
28	17	3	0	2	1	122	9	66	785	347	110	35
29	17		0	6	1	68	7	208	248	277	91	14
30	18		0	2	0	45	5	279	148	228	75	15
31	19		0		0		3	120		246		14
Total	1255	273	22	114	122	809	563	4009	7459	25768	7958	6331

1987	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	15	15	6	0	10	230	63	1491	434	357	480	137
2	16	13	4	0	8	265	60	942	195	258	966	120
3	18	14	2	0	7	243	48	461	845	294	2012	119
4	20	13	1	4	4	164	213	274	1045	213	791	157
5	22	12	1	13	5	193	214	297	639	380	537	262
6	17	12	1	12	2	194	156	199	425	240	1469	421
7	19	11	2	1	1	140	135	186	829	188	2554	582
8	24	10	2	1	70	109	683	5401	518	586	1042	466
9	25	7	1	41	1991	91	272	2154	354	427	614	912
10	26	6	1	48	215	80	225	5380	274	300	671	353
11	25	23	1	17	57	89	169	1117	233	241	363	270
12	25	15	1	10	32	73	147	668	196	206	278	335
13	20	12	0	9	543	76	123	466	224	172	235	238
14	13	8	0	8	472	114	113	323	1020	1057	198	192
15	16	10	0	6	120	84	102	256	536	1001	175	3973
16	17	11	0	3	562	83	91	247	350	478	181	618
17	15	11	0	2	402	81	192	184	264	1105	141	381
18	13	6	1	2	155	80	118	154	215	552	117	279
19	16	5	0	2	86	66	102	133	199	531	172	230
20	16	31	1	1	1499	220	82	110	471	535	714	194
21	13	11	1	0	1074	107	172	5877	284	382	568	187
22	10	10	1	0	404	87	116	1376	210	1781	257	165
23	11	7	1	1	224	106	85	533	137	646	225	146
24	13	4	0	1	153	96	82	409	754	452	174	123
25	9	4	0	30	135	77	69	328	410	445	1168	90
26	8	2	0	34	82	88	59	272	287	423	402	80
27	8	2	0	45	64	80	57	256	227	338	280	74
28	11	3	0	205	82	45	47	263	228	287	221	74
29	12		0	60	67	62	459	260	222	684	186	74
30	11		0	16	88	66	3283	264	440	626	156	73
31	14		0		448		1861	218		621		73
Total	501	288	28	573	9061	3486	9599	30499	12463	15805	17347	11397

TABLE G1.—Continued.

1980	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	1255	54	13	2	0	7	69	90	586	593	243	635
2	894	57	12	2	0	6	41	64	388	453	188	483
3	558	46	12	2	0	2	34	47	295	286	182	335
4	422	39	10	1	0	2	19	1584	221	209	194	261
5	331	53	12	1	27	4	14	453	188	197	151	233
6	260	57	9	1	162	5	15	173	416	151	532	201
7	205	169	8	1	10	9	11	106	312	134	525	154
8	165	87	8	0	4	5	9	101	251	114	346	175
9	155	61	7	0	1	3	3	74	195	106	295	303
10	154	54	8	0	2	7	6	48	219	4030	271	155
11	155	48	7	0	2	7	11	45	174	570	249	116
12	137	37	8	1	3	36	7	648	156	255	1268	143
13	132	38	7	0	9	25	20	205	144	251	641	278
14	121	33	8	0	5	10	6	111	143	247	776	320
15	114	30	7	0	3	8	40	96	149	759	1142	268
16	110	29	4	0	2	3	76	67	142	377	1022	207
17	99	30	4	4	5	3	37	80	223	262	647	130
18	365	31	4	1	19	9	489	526	139	208	509	122
19	174	26	3	2	4	15	107	217	161	171	347	112
20	129	19	2	1	325	12	233	82	247	141	287	95
21	121	24	2	0	22	41	501	164	208	172	278	80
22	110	24	2	1	65	586	255	217	138	125	277	71
23	97	17	2	2	39	116	165	178	112	125	1692	62
24	127	18	2	2	20	35	157	158	88	130	798	51
25	99	17	3	1	12	25	94	120	87	137	558	46
26	85	17	3	2	7	23	70	118	96	640	403	44
27	80	17	3	1	9	26	54	112	80	630	863	542
28	72	18	3	0	8	36	39	272	64	351	552	1086
29	64	18	3	0	12	229	33	230	675	898	2261	448
30	59		1	0	8	113	56	282	194	508	848	267
31	51		2		7		83	487		332		196
Total	6903	1169	178	29	793	1409	2752	7155	6490	13561	18343	7620

1981	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	154	1695	43	6	758	456	1570	151	368	369	218	579
2	206	756	34	6	505	445	977	143	288	279	142	452
3	351	551	42	6	602	6092	885	228	545	201	2056	355
4	358	363	33	6	408	1425	606	597	334	187	769	592
5	240	271	31	6	481	702	583	312	259	151	418	2157
6	156	200	65	6	361	688	451	365	228	156	262	927
7	903	133	45	5	285	495	1703	575	199	189	583	676
8	616	111	48	6	201	457	1926	302	160	185	777	490
9	418	111	123	6	160	423	467	221	135	2416	474	712
10	301	109	50	6	88	332	401	190	689	1149	358	551
11	183	78	40	6	129	263	398	184	151	561	2416	3594
12	159	65	37	6	474	287	323	159	1104	1078	671	1290
13	463	74	25	6	523	939	723	1947	237	470	561	11423
14	179	97	28	6	1389	392	2976	2122	195	758	545	4950
15	376	86	23	7	1869	352	1283	957	151	3147	2457	1686
16	263	79	17	6	704	2160	863	566	111	1249	1135	917
17	175	103	20	11	1620	522	1397	394	121	1122	697	611
18	107	75	20	1944	2036	889	678	309	173	692	937	446
19	112	66	17	135	885	729	513	280	152	520	1101	351
20	105	60	18	95	600	553	434	220	124	748	2654	339
21	96	54	29	56	415	556	1593	359	124	426	6881	758
22	228	47	26	70	448	471	478	172	120	2400	4621	315
23	124	49	13	63	380	361	360	290	109	759	2215	705
24	82	44	13	63	687	1540	306	160	215	494	1022	299
25	67	41	14	176	534	898	327	125	701	359	2306	235
26	62	42	11	4510	345	456	213	132	189	355	919	195
27	52	47	9	1447	355	347	184	3576	243	294	632	173
28	47	49	12	467	284	8788	231	669	1204	255	1164	335
29	573		10	322	203	3468	158	294	646	275	2410	207
30	1920		7	213	211	2252	151	443	444	209	898	133
31	10581		10		588		143	1842		242		206
Total	19657	5459	910	9667	18529	37736	23301	18283	9719	21693	42298	36655

1982	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	247	80	33	4	4	18	14	45	32	115	173	44
2	2170	54	32	5	6	19	14	42	246	104	164	47
3	443	43	14	2	6	12	21	43	203	956	145	34
4	326	39	13	3	4	12	17	42	200	371	1071	38
5	398	36	10	2	3	13	100	80	219	264	270	36
6	627	32	9	3	5	108	101	69	173	236	217	59
7	366	28	17	2	2	48	39	140	140	196	178	33
8	278	29	10	2	5	12	43	750	225	232	243	28
9	241	26	9	3	11	13	50	259	169	193	141	30
10	200	29	9	26	11	17	52	128	137	185	135	25
11	172	27	8	9	21	12	58	98	85	152	132	19
12	156	22	6	69	18	12	62	78	152	114	203	22
13	134	22	10	31	12	11	28	61	87	99	141	27
14	128	20	7	21	10	18	14	1383	65	87	124	26
15	116	20	7	15	10	27	19	135	76	124	103	18
16	106	21	5	11	19	29	20	85	74	189	79	30
17	84	21	4	9	35	37	19	71	70	253	79	33
18	95	20	3	9	12	27	11	223	109	248	81	28
19	80	17	5	7	10	30	432	248	628	295	67	27
20	74	20	5	5	10	117	70	159	1502	1409	51	21
21	74	16	4	5	10	48	48	132	2151	607	60	21
22	69	14	2	5	6	22	35	123	700	411	67	48
23	61	12	4	4	7	22	21	89	231	319	85	41
24	61	12	8	1	8	31	17	78	545	846	47	33
25	65	13	17	2	5	21	18	125	310	453	49	25
26	63	15	8	2	4	18	37	73	211	1189	97	20
27	84	21	4	3	20	50	14	89	169	600	68	17
28	56	19	5	4	16	37	13	55	181	458	52	19
29	56		6	3	13	31	69	42	184	353	47	20
30	47		3	4	13	16	45	45	133	257	43	20
31	52		2		13		42	44		203		27
Total	7130	730	279	270	329	888	1543	5031	9408	11518	4413	915

1983	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	34	1	0	0	4	6	135	224	192	378	308	688
2	23	1	0	0	2	44	1971	78	132	285	225	467
3	28	2	0	0	1	502	869	648	479	430	283	500
4	20	1	0	0	1	73	200	224	259	399	240	375
5	18	1	0	0	1	36	408	127	288	299	641	1825
6	18	1	0	0	20	29	135	94	238	326	393	918
7	4	1	0	0	7	21	98	181	1110	321	298	523
8	2	0	0	0	2	20	65	152	488	440	2245	414
9	3	0	0	0	1	20	65	108	1890	381	546	323
10	7	1	0	0	1	17	48	90	1469	412	403	277
11	9	1	0	0	1	20	38	71	714	390	3571	244
12	9	1	0	0	0	24	36	65	620	260	1188	210
13	10	1	0	0	98	19	370	133	466	766	1185	238
14	7	0	0	0	19	14	111	129	349	590	1816	167
15	6	1	0	0	19	8	115	76	958	419	949	135
16	6	1	0	0	14	11	110	58	642	358	593	326
17	5	0	0	0	154	309	106	50	935	350	344	1371
18	7	0	0	0	33	70	96	43	610	268	2098	2111
19	4	0	0	0	17	35	87	36	420	239	574	690
20	3	0	0	0	13	29	70	390	362	196	429	2473
21	2	1	0	0	9	25	38	152	354	216	1540	1064
22	2	0	0	0	11	22	120	101	256	211	554	629
23	8	0	0	0	8	126	76	245	312	177	502	467
24	7	0	0	0	3	83	54	137	209	137	347	361
25	2	0	0	0	2	35	48	120	190	148	256	287
26	2	0	0	0	3	21	37	89	163	184	217	239
27	5	0	0	28	9	18	27	83	174	139	204	216
28	3	0	0	9	12	17	26	89	390	123	1545	174
29	2		0	5	9	610	28	81	221	114	629	155
30	2		0	4	9	277	224	81	186	342	43	192
31	1		0		10		78	67		367		129
Total	258	16	0	46	493	2541	5890	4223	15074	9663	24166	18189

TABLE G1.—Continued.

1976	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	111	56	2	2	0	16	9	2	5	92	43	2
2	144	53	1	1	0	14	6	10	59	68	42	1
3	184	47	3	2	3	26	6	5	30	52	33	0
4	208	46	4	2	5	21	11	432	14	41	251	0
5	178	45	4	1	6	16	8	38	20	41	435	0
6	159	42	4	1	9	17	7	202	21	41	337	0
7	114	34	4	1	6	132	7	49	11	41	206	0
8	93	24	2	0	7	29	7	26	6	479	620	0
9	95	18	1	0	6	51	6	19	252	205	306	0
10	92	19	2	48	2	45	5	14	179	144	1263	1
11	99	17	2	31	1	31	5	12	118	113	1129	1
12	86	9	2	15	1	22	10	8	95	83	872	1
13	78	7	1	11	3	16	4	6	70	69	474	1
14	73	5	1	7	6	28	2	14	193	71	808	1
15	75	4	1	10	7	24	2	12	349	60	285	2
16	74	5	1	7	5	11	3	12	548	47	205	3
17	69	5	1	6	3	10	3	10	275	38	122	3
18	69	5	2	6	2	6	3	9	196	37	87	2
19	66	6	1	3	16	44	1	4	100	525	85	3
20	51	5	1	2	5	54	1	1	719	160	55	4
21	52	6	0	2	7	302	4	0	521	113	45	2
22	54	6	0	1	31	41	23	1	394	1251	34	0
23	60	6	0	0	18	24	11	1	264	222	25	3
24	64	4	0	1	14	338	6	11	315	259	19	3
25	66	4	0	0	13	45	5	11	1359	847	15	3
26	63	3	0	0	15	27	4	6	478	408	9	4
27	60	4	0	0	43	114	4	12	1707	272	6	2
28	62	2	1	0	77	102	2	151	697	243	6	0
29	60	3	1	0	22	16	2	28	255	162	4	0
30	56		2	0	15	15	2	21	147	73	3	0
31	56		2		18		10	15		51		0
Total	2772	488	48	160	369	1635	176	1140	9397	6306	7823	43

1977	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	3	0	0	0	0	5	86	2	586	625	210	224
2	2	6	0	0	0	1	33	39	277	258	2578	160
3	2	0	0	0	0	0	22	678	250	203	415	
4	1	0	0	0	0	0	14	116	160	154	303	
5	1	0	0	0	0	4	234	79	174	139	1053	
6	1	0	0	0	0	2	240	47	111	2944	1057	
7	1	0	0	0	0	5	1170	32	78	882	1462	151
8	1	0	0	0	0	1	145	259	51	673	1947	144
9	1	0	0	0	0	2	120	6062	44	473	665	123
10	0	0	0	0	0	2	76	6772	62	1483	3416	118
11	0	0	0	0	0	13	44	3072	48	915	821	108
12	0	0	0	0	0	83	31	1346	40	621	502	116
13	0	0	0	0	0	46	22	351	107	377	683	109
14	0	0	0	0	0	35	18	156	231	441	861	109
15	0	0	0	0	0	34	16	83	164	290	520	90
16	0	0	0	0	0	13	16	52	588	1620	356	78
17	0	0	0	0	0	7	21	2131	251	1046	259	73
18	0	0	0	0	9	119	24	5209	261	15075	3696	69
19	0	0	0	0	12	55	14	3896	171	1143	493	67
20	0	0	0	0	6	21	12	1015	1378	535	305	406
21	0	0	0	0	8	13	12	1368	588	358	224	125
22	0	0	0	0	7	10	14	745	303	296	1747	88
23	0	0	0	0	5	8	7	833	208	502	620	73
24	0	0	0	0	4	6	7	450	146	1011	652	71
25	0	0	0	0	3	9	4	267	113	338	622	61
26	0	0	0	0	31	8	2	169	106	436	1547	54
27	0	0	0	0	4	13	3	91	75	288	912	49
28	0	0	0	0	1	22	2	91	185	963	472	45
29	0		0	0	0	19	2	1054	173	421	335	41
30	0		0	0	8	123	2	320	2744	270	247	32
31	0		0		12		39	175		256		37
Total	13	6	0	0	110	679	2452	36960	9673	35036	28980	

1978	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	29	0	0	3	12	5	85	118	153	92	614	185
2	25	0	0	9	6	3	67	91	122	82	461	120
3	19	0	0	6	3	5	50	78	244	72	562	106
4	10	1	0	0	2	4	40	61	290	62	364	96
5	9	0	0	0	1	6	30	51	148	297	293	84
6	8	2	0	1	1	6	26	94	113	853	889	117
7	13	0	0	3	2	7	33	112	87	174	693	60
8	12	1	0	1	1	4	110	1130	83	131	430	55
9	11	1	0	1	2	3	80	2470	207	239	2803	67
10	10	0	0	2	0	3	218	432	204	133	2792	71
11	11	0	0	5	0	10	3570	310	224	203	1018	72
12	11	1	0	9	0	11	281	1122	440	130	1133	112
13	10	0	0	0	0	7	177	371	495	109	1095	97
14	10	1	0	0	0	8	126	223	227	92	784	82
15	9	0	0	0	0	98	505	172	172	3221	537	112
16	4	1	0	0	0	48	203	247	157	2149	465	65
17	1	2	1	0	196	24	134	811	146	605	359	62
18	1	2	1	0	169	61	190	295	123	364	361	52
19	1	1	1	1	35	172	129	194	101	268	891	54
20	1	1	2	0	12	191	95	151	97	228	437	46
21	1	1	1	0	9	202	83	126	89	207	569	45
22	2	1	0	0	6	106	71	773	120	353	502	41
23	3	1	0	0	4	60	173	186	92	425	358	35
24	0	0	0	1	4	47	98	96	89	287	1794	31
25	1	0	0	4	165	40	74	94	77	297	455	31
26	1	0	0	0	42	39	1532	69	106	200	350	30
27	0	0	1	0	18	358	681	85	79	130	297	34
28	1	0	2	0	12	218	227	82	695	702	301	31
29	0		1	33	9	230	147	145	126	688	250	24
30	0		0	82	8	101	118	1052	103	2703	208	22
31	0		0		7		91	313		1019		22
Total	214	17	10	161	726	2077	9444	11554	5409	16515	22065	2061

1979	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	24	7	1	0	29	77	426	179	352	490	169	631
2	19	4	1	0	18	73	279	184	302	1038	151	432
3	16	4	1	0	8	50	250	148	232	606	168	333
4	18	4	1	0	7	34	222	191	181	483	234	300
5	15	3	0	0	4	557	377	503	308	378	181	268
6	14	3	0	0	8	5836	171	286	233	1122	262	230
7	14	4	0	0	5	619	157	204	181	534	152	201
8	13	5	0	0	5	199	149	162	144	564	147	178
9	18	7	0	0	5	105	129	136	125	1140	165	163
10	14	15	0	0	1	92	108	144	383	608	175	128
11	10	6	0	0	2	67	1733	121	269	416	133	102
12	10	5	0	0	2	57	656	98	183	366	1186	86
13	10	4	0	0	17	48	415	80	155	298	337	83
14	12	8	0	1	371	220	567	66	1647	251	450	204
15	12	6	0	4	40	181	1525	251	488	215	550	78
16	8	3	0	5	486	173	991	1333	320	177	436	2084
17	8	4	0	6	178	984	791	627	234	161	364	697
18	8	5	0	6	101	281	485	772	185	156	395	353
19	9	6	0	3	67	406	346	939	154	148	337	297
20	9	6	0	3	50	250	274	975	135	138	309	220
21	8	4	0	46	38	105	223	755	127	129	305	169
22	8	2	0	191	22	184	218	667	112	357	787	144
23	8	2	0	9	16	175	1363	659	224	220	513	116
24	7	2	0	3	19	562	968	689	126	2957	404	94
25	11	2	0	492	14	908	440	740	101	608	325	91
26	5	2	0	50	43	1365	454	689	97	504	295	93
27	5	2	0	9	67	506	320	621	395	297	413	96
28	4	1	0	11	64	413	239	589	1440	431	271	2346
29	4		0	8	431	276	190	361	2886	282	405	635
30	5		0	21	222	959	179	310	852	229	1890	349
31	4		0		108		184	259		190		321
Total	330	126	4	868	2448	15762	14829	13738	12571	15493	11909	11522

TABLE G1.—Continued.

1988	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	98	14	8									
2	85	13	7									
3	105	14	4									
4	135	12	4									
5	143	16	5									
6	103	19	9									
7	59	20	8									
8	47	23	2									
9	49	18	4									
10	47	14	3									
11	51	14	2									
12	44	16	2									
13	40	7	2									
14	36	6	1									
15	38	10	2									
16	32	8	2									
17	37	5	4									
18	36	7	3									
19	41	6	2									
20	34	6	2									
21	27	11	2									
22	24	14	1									
23	23	5	1									
24	19	7	1									
25	19	3	1									
26	19	11	1									
27	20	6	1									
28	29	6	1									
29	18	6	1									
30	13		1									
31	14		1									
Total	1483	315	87									

TABLE G2.—Monthly quantities of moisture (mm equivalents) leaving the Lutz catchment as runoff, entering as rainfall, remaining as soil moisture, and the sum of entry (+), exit (–) and changes in storage (+ or –). A yearly reconciliation of these quantities is presented at the bottom, 1972–1987 (ra = rainfall, ro = runoff, sm = soil moisture).

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Apr	0.4	0.0	0.0	0.4	1.6	0.0	1.6	8.7	0.3	8.7	2.7	0.5	0.6	0.0	1.1	5.7
May	5.3	3.8	0.3	19.8	3.7	1.1	7.3	24.5	7.9	24.5	3.3	4.9	5.6	5.0	1.2	90.6
Jun	121.6	62.1	8.4	32.9	16.4	6.8	20.8	157.6	14.1	157.6	8.9	25.4	42.9	19.1	8.1	34.9
Jul	10.0	56.4	62.4	32.6	1.8	24.5	94.4	148.3	27.5	148.3	15.4	58.9	61.5	47.4	5.6	96.0
Aug	66.7	180.2	89.0		11.4	369.6	115.5	137.4	71.5	137.4	50.3	42.2	131.9	78.8	40.1	305.0
Sep	225.3	226.3	91.0	115.9	94.0	96.7	54.1	125.7	64.9	125.7	94.1	150.7	183.6	55.3	74.6	124.6
Oct		162.1	280.0		63.1	350.4	165.2	154.9	135.6	154.9	115.2	96.6	290.3	165.3	257.7	158.1
Nov		414.9	213.4		78.2	289.8	220.7	119.1	183.4	119.1	44.1	241.7	318.1	81.0	79.6	173.5
Dec		50.1	118.4		0.4	34.2	20.6	115.2	76.2	115.2	9.1	181.9	34.0	232.8	63.3	114.0
Jan	4.8	5.1	4.4	27.7	0.1	2.1	3.3	69.0	3.3	71.3	2.6	57.0	7.6	12.5	5.0	14.8
Feb	0.4	0.3	0.6	4.9	0.1	0.2	1.3	11.7	1.3	7.3	0.2	7.5	2.5	2.7	2.9	3.2
Mar	0.0	0.1	0.0	0.5	0.0	0.1	0.0	1.8	0.0	2.8	0.0	2.6	0.9	0.2	0.3	0.9

Rainfall (mm):

Apr	128.5	19.4	13.9	53.7	66.0	7.1	220.4	295.6	20.2	367.1	107.3	106.8	45.3	5.4	163.0	265.9
May	230.4	276.5	137.3	327.8	193.3	233.3	205.5	293.0	274.4	408.6	133.0	263.2	196.0	295.2	125.2	429.0
Jun	289.4	322.6	313.5	241.3	262.7	230.2	222.6	390.6	220.3	547.9	247.8	334.4	280.7	236.1	259.6	177.8
Jul	127.8	233.7	356.8	265.4	91.7	192.5	283.7	269.0	204.3	337.8	188.2	330.4	300.7	265.3	99.5	316.7
Aug	239.1	361.5	285.6	340.5	229.4	592.4	278.2	368.8	271.1	428.4	321.9	234.8	316.2	298.8	333.9	468.4
Sep	349.9	344.8	251.5	340.4	397.5	347.6	157.2	278.2	196.7	244.1	327.4	370.4	362.3	181.7	297.5	316.7
Oct	351.2	264.0	549.4	441.3	249.0	475.3	330.5	276.1	316.6	382.8	319.6	279.4	426.9	359.8	499.7	377.7
Nov	178.3	582.7	422.0	398.7	255.1	453.7	310.9	261.1	362.7	704.3	111.6	433.3	599.4	206.8	229.0	315.1
Dec	187.3	45.7	177.4	494.9	37.4	60.1	30.9	274.6	215.3	552.0	38.0	300.9	24.5	327.3	139.1	199.6
Jan	55.4	15.3	5.4	34.7	30.3	19.0	9.5	123.9	380.2	147.0	22.7	115.8	33.8	76.8	21.2	13.3
Feb	17.7	17.4	13.5	3.4	59.2	32.5	33.1	59.4	93.5	14.2	2.7	57.8	33.4	13.1	59.6	35.2
Mar	2.6	45.6	43.3	13.1	18.2	54.5	10.5	11.2	64.9	30.7	3.6	22.3	27.0	6.3	5.3	11.9

Available moisture in soil (mm):

Apr				43.8	51.4	27.1	101.1	72.6	48.3	58.7	77.8	30.1	73.6	12.3	-2.8	98.5
May				118.5	146.2	101.6	170.9	154.7	127.2	185.0	118.5	168.5	157.4	183.3	102.7	134.0
Jun				193.2	162.3	175.3	198.1	176.8	177.5	254.8	176.7	189.2	190.1	209.6	129.7	150.2
Jul				193.8	158.6	165.1	185.6	212.6	208.2	298.8	191.1	191.6	321.2	215.1	189.9	209.5
Aug				233.0	189.8	202.3	236.2	258.2	227.8	249.6	207.3	190.1	213.0	211.8	197.4	217.2
Sep				209.0	215.0	225.4	239.5	193.5	224.5	277.1	224.7	250.6	212.8	212.9	175.5	256.5
Oct				242.9	206.8	246.8	247.6	223.7	211.7	253.1	224.3	235.4	259.1	244.3	229.0	276.0
Nov				233.9	189.3	230.3	248.0	218.2	227.5	240.1	198.7	247.3	232.0	178.6	231.2	299.6
Dec				214.6	118.6	219.6	207.6	213.8	228.6	279.5	96.6	270.3	170.4	157.3	166.6	207.9
Jan			57.3	132.5	78.2	116.9	71.1	173.7	236.2	210.1	47.7	217.9	95.2	136.6	104.4	110.8
Feb			38.8	40.6	107.4	100.8	60.9	140.5	102.7	86.7	30.4	87.4	76.2	140.3	75.8	57.3
Mar			66.0	14.1	42.5	51.5	35.3	56.2	98.1	49.5	-6.4	57.4	21.5	9.8	23.6	42.6

Difference between rainfall, runofff and storage (mm):

Apr	128.1	19.4	13.9	75.5	27.1	22.4	169.2	249.6	27.8	397.8	76.4	69.8	28.6	14.6	174.5	185.2
May	225.1	272.7	137.0	233.4	94.8	157.8	128.4	186.4	187.6	257.9	89.0	119.9	106.6	119.1	18.5	302.9
Jun	167.8	260.4	305.1	133.6	230.3	149.6	174.7	210.8	155.9	320.5	180.6	288.3	205.2	190.8	224.5	126.7
Jul	117.7	177.3	294.4	232.2	93.6	178.2	201.7	84.8	146.2	145.5	158.4	269.1	108.0	212.4	33.8	161.4
Aug	172.4	181.3	196.7		186.8	185.6	112.1	185.8	179.9	340.2	255.4	194.1	292.7	223.2	286.3	155.8
Sep	124.6	118.5	160.5	248.6	278.3	227.8	99.7	217.1	135.2	90.9	215.9	159.1	178.8	125.4	244.9	152.7
Oct		101.9	269.5		194.1	103.6	157.2	91.0	193.8	252.0	204.8	197.9	90.4	163.1	188.4	200.2
Nov		167.8	208.6		194.5	180.3	89.8	147.5	163.5	598.2	93.1	179.7	308.4	191.6	147.3	118.0
Dec		-4.4	59.0		107.6	36.6	50.7	163.9	138.0	397.3	130.9	96.0	52.1	115.9	140.4	177.3
Jan	50.6	10.1	1.0	89.1	70.6	119.6	142.7	94.9	369.2	145.1	69.0	111.3	101.4	84.9	78.4	95.6
Feb	17.3	17.0	12.9	90.5	30.0	48.4	42.0	80.9	225.8	130.3	19.8	180.8	50.0	6.7	85.2	85.5
Mar	2.5	45.4	43.3	39.2	83.1	103.7	36.1	93.8	69.5	65.0	40.4	49.7	80.7	136.5	57.3	25.7

Moisture balance (mm):

ra	2157.5	2529.0	2569.6	2955.4	1889.7	2698.2	2092.9	2901.4	2620.3	4165.0	1823.8	2849.4	2646.4	2272.6	2232.4	2927.3
ro	-	1161.4	867.8	-	270.7	1175.5	704.7	1073.9	841.8	2260.2	345.9	869.9	1079.3	700.2	539.5	1121.2
sm	(0)	(0)	(0)	-51.9	28.4	9.0	-16.2	20.9	41.8	-48.5	-55.9	63.8	-35.9	-11.7	13.7	19.0
ra-ro	-	1367.6	1701.8	-	1619.0	1522.6	1388.2	1827.5	1778.5	1904.8	1477.8	1979.5	1567.0	1572.3	1692.9	1806.1
ra-ro-dsm	-	1367.6	1701.8	-	1590.6	1513.6	1404.4	1806.5	1736.7	1953.3	1533.7	1915.6	1602.9	1584.0	1679.2	1787.0
%ro	-	45.9	33.8	-	14.3	43.6	33.7	37.0	32.1	54.3	19.0	30.5	40.8	30.8	24.2	38.301
%ra-ro	-	54.1	66.2	-	85.7	56.4	66.3	63.0	67.9	45.7	81.0	69.5	59.2	69.2	75.8	61.048

Appendix H: Evaporation

TABLE H1.—Daily evaporation (mm/dy) from Class-A evaporation pan in laboratory clearing, Barro Colorado Island, Panamá, 1981–1983.

1981

1981	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1						3.2	2.3	3.0	3.3	3.5	1.8	1.5
2						1.1	3.3	0.4	2.7	3.3	3.1	1.8
3						3.1	3.9		4.1	2.0	3.3	5.3
4							2.0	1.3	3.7	3.8		2.4
5						1.6			2.8	1.5	4.3	
6						4.2	3.3	5.8	3.3	2.7	3.1	1.8
7						2.2	3.9	2.9	0.9	3.3	4.0	4.1
8						2.2	3.8	2.0	2.1	2.8	2.8	2.8
9						2.6	2.6	2.4	2.1	1.9	2.0	2.5
10						1.3	2.2	2.7			2.5	1.5
11						4.2	3.2	8.4	1.3	2.5		
12						4.8	1.8		2.1			
13									3.1		1.7	
14						2.8		1.8	3.9	3.4	2.6	
15						1.2	6.1	3.8	3.2			5.7
16							3.5	3.2	1.4		4.4	2.9
17						0.7	1.1	4.6	0.8	1.8	2.0	2.0
18						2.8		4.8	2.4	5.0	4.0	3.7
19							1.2	3.6	2.9	2.5	2.5	2.6
20						1.6		2.1	2.4	2.5	5.0	1.8
21								0.9	4.4	2.7		1.5
22								8.7	3.3	1.2	2.9	1.4
23						1.5	3.8	5.1	4.0			2.8
24						4.1	4.3	5.1	4.7	2.6		2.9
25						4.9	3.9	2.2	2.0	3.0	2.6	2.8
26						1.1	5.9		7.5	3.3		3.6
27						2.9	3.0	2.6	3.6	3.1	3.3	4.1
28						1.3	2.8	1.6	4.6	1.5	2.2	3.5
29							2.3		4.9	3.6	5.2	4.7
30								5.8	4.9	2.2		2.8
31							2.4	1.8		2.3		2.6
n						22	23	25	29	25	22	26
mm/dy						2.5	3.2	3.5	3.2	2.7	3.4	2.9
Sd						1.3	1.2	2.0	1.3	0.8	1.0	1.1
mm/mo						75	98	107	96	84	103	90

1982

1982	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	4.3	4.1	2.1	3.9	3.1		4.0	1.1	2.5	3.3	7.1	3.0
2	3.6	3.9	7.3	4.9	3.1	4.1	2.8	1.1	4.7		3.4	3.2
3		3.8	3.1	5.0	3.1	3.0	2.8	1.1	3.5			3.3
4	3.8	4.0	3.8	5.0	3.4	5.0	2.8	2.9				2.7
5	2.1	3.6	2.7	5.0	3.7		2.8	2.6		3.4	3.9	
6	2.2	3.3	4.6	3.3	4.6		2.8	6.1		2.6		2.8
7	6.8	3.4	3.8	4.8	4.2		2.0		2.9	4.1		3.3
8	3.3	4.1		4.6	3.4	4.9	2.9		3.1	1.3		2.6
9	2.7	3.9			3.4	2.6	4.5		3.5	3.3	3.4	1.3
10	3.6	4.1			3.4	1.3	3.5	3.7	2.4		3.6	2.2
11	3.8	4.1				2.7	3.5	3.4		4.2	3.1	3.1
12	3.8	3.8			1.7		3.5	2.3		2.4	3.8	2.7
13	4.2	4.2			5.0		2.0			1.1		3.5
14	3.4	4.4		2.9	4.3	8.3	2.4		2.9	2.5		2.8
15	2.5	3.8	4.3	3.6	5.2	4.1	3.6		3.5	4.8		2.5
16	2.0	4.2	3.6	3.7	5.2	2.6	4.8	8.8				2.6
17	1.6	3.4	5.3	5.4	5.2	1.9	3.2	6.0	1.1			2.5
18	2.6	2.7	5.1	5.4	5.3	1.4	3.9	2.3	2.9			3.6
19	3.3	4.9	4.8	5.4	5.2		3.9	4.0		4.1		3.4
20	3.3	4.3	4.4	5.1	4.5			3.3		6.3		3.5
21	3.1	5.1	4.9	5.3	1.8		3.7		5.0	2.1		3.2
22	3.6	3.2	6.4	5.1	3.6	3.4	3.8			4.3	0.5	4.2
23	3.0	2.8	5.5	2.0	3.6	2.5	3.1		3.6		4.4	2.1
24	3.9	4.6	3.2	4.2	3.6	2.1	2.8	3.2			3.7	2.5
25	3.4	4.0	3.2	4.2	2.1	1.9	2.8	3.2		2.9	2.8	3.4
26	3.4	2.6	5.3	4.2	3.1	3.0	2.8	2.7		3.3	2.3	3.4
27	3.5	3.0	6.0	4.8	2.8	3.8	1.8	3.9		3.3	1.3	3.0
28	3.3	4.0	6.0	4.8	3.4	3.8	1.2		4.0	2.6		3.1
29	2.9		7.0	5.3		2.7	3.7		5.0	3.9	2.7	2.4
30	3.5		4.1	1.8		2.6	8.7	0.2	4.5	0.8	3.0	
31	4.4		4.0				1.1	4.0				2.4
n	30	28	24	25	27	21	30	20	16	22	16	29
mm/dy	3.4	3.8	4.6	4.4	3.7	3.2	3.2	3.3	3.4	3.7	3.8	2.9
Sd	0.9	0.6	1.3	1.0	1.0	1.5	1.3	1.9	1.0	1.2	1.4	0.5
mm/mo	104	107	143	131	116	97	100	102	103	113	113	90

1983

1983	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.4	4.1	4.2	5.0	4.6	5.5		2.3	5.6	2.1	2.2	
	3.3	4.1	3.4	5.2	3.2	4.3	5.7		0.7	2.6	3.3	2.1
	4.0	3.9	4.7	5.0	4.5	5.1		3.6		3.6	4.2	2.5
	1.7	4.1	4.1	5.6	3.3		1.0	2.5		3.7	4.3	7.6
			4.6	5.4	4.4	2.8	2.4	4.1	4.7	2.2	3.2	1.9
	3.4	3.9	4.6	3.4	4.1	2.2		9.4	3.1		3.1	
	2.8	3.6	5.3	5.1	4.8	3.8	3.0	1.4	2.1		0.3	1.6
	3.4	4.2	4.1	5.3	3.4	3.8	4.5	2.4				2.1
	2.4	4.2	4.3	5.1	1.5	3.6	2.8	4.5	3.1	4.5	3.5	1.0
	2.1	4.2	4.8	6.1	3.6	2.7	2.4	3.2		2.3	2.3	2.4
	1.6	4.1	5.0	6.4	3.4	3.0	3.8	5.1	7.7	4.5	3.5	3.1
	6.0	4.5	4.3	4.6	4.1	2.8	1.7	2.8	1.1	3.5		1.4
	4.1	4.4	4.7	5.1		3.8	3.4		5.3	1.6		3.5
	3.6	4.8	6.0	5.6		3.0	7.8	4.6	5.2	2.3		1.7
	4.0	3.8	3.8	5.1	0.8	4.3	1.7	4.3	4.0	1.0	2.4	2.0
	4.0	3.8	4.6	4.4	1.4	3.6	3.4	4.4	2.0	3.2	3.0	3.1
	3.6	6.6	5.1	6.2	1.7		2.8	3.3		3.8	3.4	0.8
	3.3	2.4	4.1	4.9			4.0			3.8		
	3.4	4.6	3.9	5.8	2.9	1.4	5.1	2.2		4.9		2.7
	3.7	3.9	4.1	6.0	2.0	4.7	4.0	1.4		4.1	2.3	
	3.6	2.0	3.9	5.8	3.1	1.5			1.5	2.2	4.6	
	3.2	4.8	5.5	5.3	4.7	2.6	3.5		3.1	4.6	1.4	1.6
	3.1	4.2	5.3	3.7	3.5	1.6	4.6	3.4	2.8	3.4	2.4	2.2
	3.1	4.3	4.6	2.6	3.5	4.1	0.7	3.8	3.9	3.6	2.3	3.6
	3.6	4.2	4.0	5.1	4.2	1.5	2.6	1.9	3.1	4.4	3.7	3.0
	3.8	3.5	3.8	5.9	4.3	3.5	3.8	0.9	2.4	1.6	3.7	3.0
	4.1	3.1	3.1		4.0	3.1	4.6	6.7	3.3	1.8	4.0	2.2
	1.9	3.6	3.4	1.1	5.0	2.4	4.4	2.5	2.8	3.2	1.3	3.0
	3.9		3.2	2.6	3.9		2.4	2.8	2.5	0.7		2.6
	4.3		5.1	1.5	4.7		5.0	2.5	1.8	1.1		4.1
	3.7		4.6		4.7			2.5		6.5		1.2
n	30	27	31	29	28	26	26	26	22	28	23	26
mm/dy	3.3	4.0	4.4	4.8	3.6	3.9	3.5	3.4	3.3	3.1	3.8	2.5
Sd	1.0	0.7	0.6	1.3	1.1	1.0	1.5	1.7	1.6	1.3	1.0	1.3
mm/mo	102	113	136	144	110	118	109	105	98	96	113	79

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