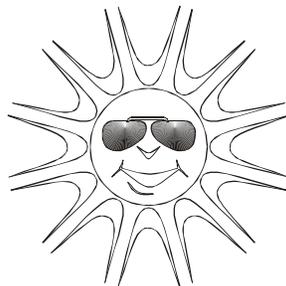


**Smithsonian Tropical Research Institute**

**1996 Meteorological and Hydrological  
Summary for  
Barro Colorado Island**

**Prepared by: Steven Paton**





## Introduction

This is the fourth of a series of yearly reports summarising each past year's meteorological and hydrological monitoring program on Barro Colorado Island (BCI) that the Smithsonian Tropical Research Institute maintains as part of its Terrestrial-Environmental Sciences Program (T-ESP). This report is not meant to be exhaustive in its coverage in that it summaries only some of the most 'important' or interesting parameters available. Any comments on how future yearly summaries could be improved would be appreciated.

## Setting

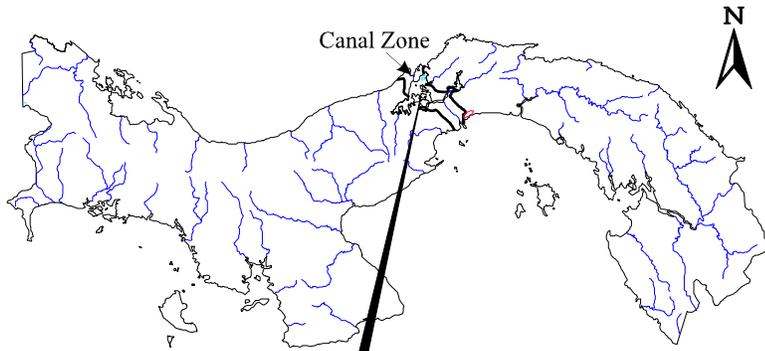
The meteorology and hydrology monitoring programs on BCI are described in detail in Climate and Moisture Variability in a Tropical Forest: Long-term Records from Barro Colorado Island, Panamá. Windsor (1990). Much of the information on the next five pages has been extracted from this source.

BCI (9°10'N, 79°51'W) is a completely forested, 1500 ha island, rising 137m above Lake Gatun. The island receives an average of 2650 mm of rain per year. The meteorological year is divided into two parts: a pronounced dry season (approximately from mid-December to the end of April), and a wet season (May to mid-December). On average, only 230 mm of rain falls during the dry season. Relative humidity, soil moisture, air pressure, solar radiation, evapotranspiration, wind speed and direction all show marked wet/dry season differences. On the other hand, temperature varies relatively little throughout the year.

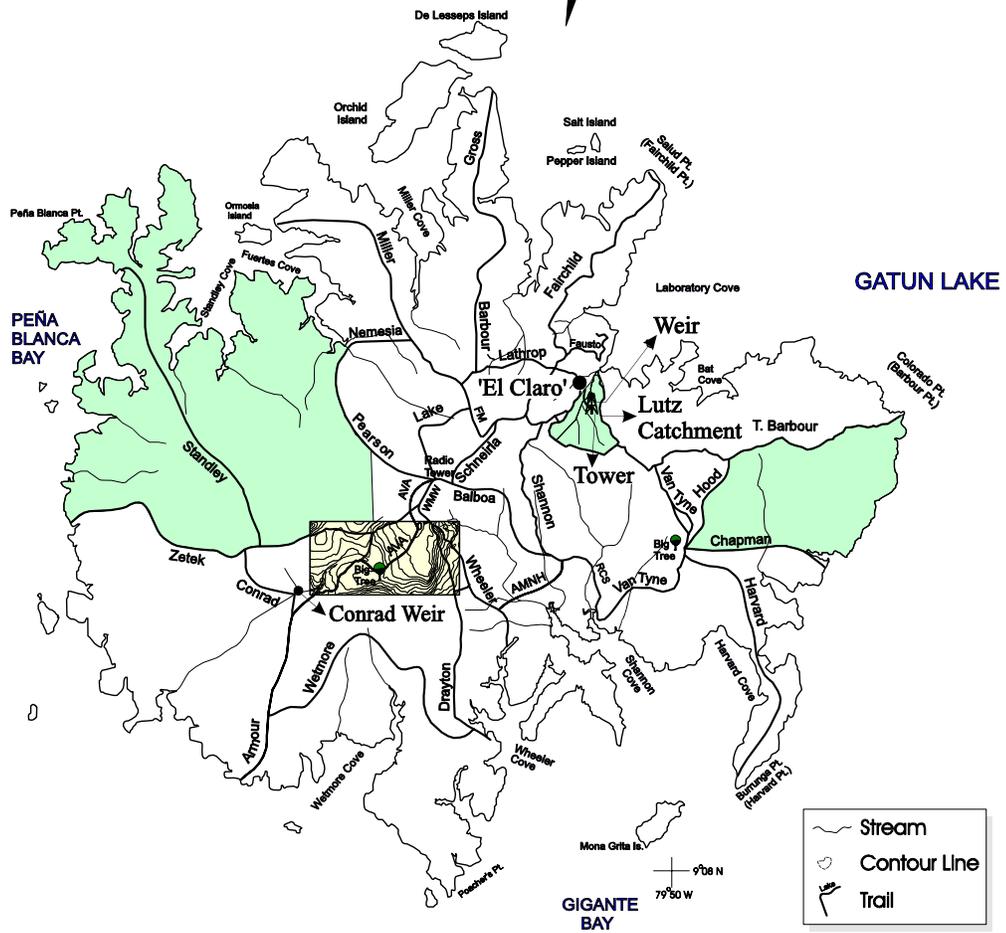
This report summarises data taken from two locations: a 42 m walk-up tower located within the Lutz catchment, and a small clearing ('El Claro') located among several laboratory buildings (see map on the following page). The tower, with sensors at 10 m intervals, provides a vertical meteorological transect through the forest canopy. The Lutz catchment on the Northeast slope of BCI and is probably typical of many small catchment areas on the island. The catchment has been estimated to encompass 10 ha, however recent estimates have placed the size of the catchment closer to 9.6 ha. A new survey of the entire catchment area will be needed to resolve the apparent discrepancy. The Lutz catchment is located immediately south-west of the laboratory clearing and dormitory area. The Clearing is a grass-covered area located near several laboratory buildings. The physical aspects of the Clearing itself have changed little over time. However, the removal in the last two years of several nearby buildings and trees may have affected the local climate around the Clearing.

Data were collected using two different methods: electro-mechanically (electronic sensors, data loggers, chart recorders, ETgages, etc.), and manually (rain gauges, max-min thermometers, sling psychrometers, soil samples) by a technician - Mr. Raúl Ríos. In general, manual readings tend to provide the most accurate measurements over the long-term and as a result, when both types of data are available, the manual readings are used.

**Some of the disadvantages of these measurements are that they are not available for each day and are usually taken only once a day (once a week for soil samples). Some summaries (temperature, relative humidity, and soil humidity) are based entirely on manual measurements. Other summaries (solar radiation, wind direction) are based entirely on electro-mechanical measurements. Finally, some summaries (evapotranspiration, rainfall and wind speed) are based on combinations of manual and electro-mechanical measurements.**



# Barro Colorado Island



## The Data

This report summarises the following data:

Lutz Tower	1m	temperature relative humidity
	40m	temperature relative humidity wind speed and direction solar radiation evapotranspiration
Lutz catchment		run-off soil moisture
'El Claro'		temperature relative humidity rainfall evapotranspiration

### Rainfall

Rainfall was collected by rain gauges in the Clearing, and by tipping buckets in both the Clearing and near the Lutz weir. The rain gauges were read at approximately 9:00 am every day except weekends and holidays. Tipping buckets provide continuous rainfall information, but tend to underestimate total rainfall by between 2% and 12% and for that reason are not used to provide data on absolute rainfall totals. Tipping buckets generate 'events' for every 0.254 mm of rainfall recorded. The underestimation seems to be due to the instruments' inability to properly record intense periods of rainfall. In order to 'fill in' the missing rain gauge data, a computer program was written by the author that uses tipping bucket rainfall data to distribute the rain gauge data for those days when readings were not made. The program takes the total rainfall collected in the rain gauge and divides it up proportionally according to the rainfall patterns detected by the tipping buckets. The estimated rainfall for the missing days is exactly equal to the rainfall collected by the rain gauge. The daily rainfall for the Clearing is shown on page 7.

Page 8 shows the monthly totals for this year. The graph on the same page compares this year's monthly totals with the average monthly totals ( $\pm$ SD) for the period 1929 to 1996.

Page 9 shows yearly rainfall totals for all year since 1925. A time series graph and frequency histogram are presented for these data.

Page 10 breaks yearly rainfall approximately into wet and dry seasons. The seasons were defined, somewhat arbitrarily, as: Dry Season (Jan. 1 to April 30) and Wet Season (May 1 to Dec. 31). The two graphs on this page are frequency histograms showing the distribution of rainfalls (1929 to 1995) for the Dry and Wet Seasons. The arrow  $\longrightarrow$  in each graph shows the rainfall for 1996 in relation to previous years. The small cross bar  $\text{—|—}$  above each graph represents the mean (vertical bar) and the standard deviation (horizontal bar) for the period 1929 - 1995.

Pages 11 and 12 show an analysis of rainfall 'events' (*storms*). For convenience, and again somewhat arbitrarily, I have defined a storm as any continuous period of rain separated by at least an hour from any other rainfall. Since this analysis required the timing of rainfall events, tipping bucket data were used. As a result, the absolute size of rainfall events should be considered as only a rough comparison since they will tend to disproportionately underestimate the size of storms - larger storms will be more underestimated than smaller ones. Keeping this in mind, the tables and graphs on this page compare the maximum storm size and the average storm size and duration per month for the period 1972 to 1995 and for the year 1996.

### Run-off

Run-off at the Lutz catchment area was determined from the water level in a 120° V-notch weir. The height of the water was recorded by three separate instruments: continuously by a Stevens A-71 strip-chart, water level recorder and at five-minute intervals with an ISCO Bubble Flow Meter. Data from each of these devices are converted (either directly or through a digitizing process) into run-off ( $\text{m}^3$ ) and then into rainfall equivalents.

Daily Lutz creek weir run-off totals are shown on page 13. These data are shown in terms of the equivalents of precipitation in mm. These values are calculated by taking the run-off and dividing by the total surface area of the catchment area (9.6 ha). In this way, the run-off can be more conveniently compared to the amount of rainfall.

Pages 14 shows the total monthly run-off. The graph on the bottom of page 15 compares average monthly run-off for the period 1973 to 1995 with 1996. The graph on the top of page 15 compares monthly accumulated precipitation with month accumulated run-off (in rainfall equivalents).

### Soil Moisture

Soil moisture was determined gravimetrically based on samples collected every two weeks. Samples are taken at two depths (0-10cm and 30-40cm) from ten sites in the Lutz catchment area. Samples of approximately 2.5 cm soil cores are made with an 'Oakfield punch'. Page 16 shows the average soil moistures (% water by wet weight of soil) per

month at each sample depth. The graph on the same page compares monthly averages for the period 1986 to 1995 with those for 1996.

### **Relative Humidity**

Relative humidity was measured using the traditional method of wet and dry-bulb psychrometry. Measurements in the Clearing, at the base and top of the Lutz tower (1m and 40m, respectively) were made at approximately 12:30 p.m. using a Taylor Sling Psychrometer. Data were also collected on an hourly basis by dataloggers attached to newly installed Vaisala electronic temperature/humidity sensors. These data are not reported in this yearly summary.

The average monthly relative humidities are shown in tabular and graphical form on pages 17 and 18, respectively.

### **Temperature**

Shaded air temperature was measured in the Clearing, at the base and the top of the Lutz tower by Taylor max-min thermometers. Measurements were made by hand at approximately 8:15 am. Data were also collected on an hourly basis by dataloggers attached to newly installed Vaisala electronic temperature/humidity sensors. These data are not reported in this yearly summary. The average monthly maximum and minimum temperatures for these three locations are shown in tabular and graphical form on page 19 and 20, respectively.

### **Solar Radiation**

Global solar radiation was measured at the top of the Lutz tower using a Li-Cor LI200SB pyrranometer attached to a datalogger. Hourly average ( $\text{w/m}^2/\text{h}$ ), maximum and minimum ( $\mu\text{W/m}^2/\text{min}$ ) was recorded. A Li-Cor 190SB sensor recorded Photosynthetically Active Radiation (PAR) similarly.

Page 21 shows the Daily Global Radiation values and Page 22 shows the Daily PAR values. Page 23 shows total monthly Global radiation and PAR.

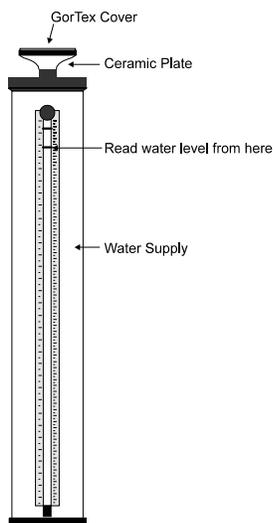
## Wind Speed and Direction

Hourly average, maximum and minimum wind speed plus average wind direction was recorded at the top of the Lutz tower using a Model 05035 Young Anemometer connected to a data logger.

Page 24 shows the average and maximum daily wind speeds. The page 25 shows average wind direction. The angles indicated in the table and graph on this page represent the direction from which the wind was predominately blowing on a given day. Page 26 shows the monthly average wind speeds and directions for the year.

## Estimated Evapotranspiration and Water Balance

### ETgauge



Evapotranspiration was added to the meteorological program on BCI beginning on December of 1992 and is estimated using ceramic plate atmometers known as ETgages. ETgages estimate evapotranspiration by allowing water to be drawn up through a ceramic disk and out through a GorTex cover. A recent study by Fontain and Todd (Measuring Evaporation with Ceramic Bellani Plate Atmometers, 1993, Water Resources Bulletin, Vol. 29, No. 5, p. 785-795) found that such devices perform very well compared with more traditional methods of measuring evaporation.

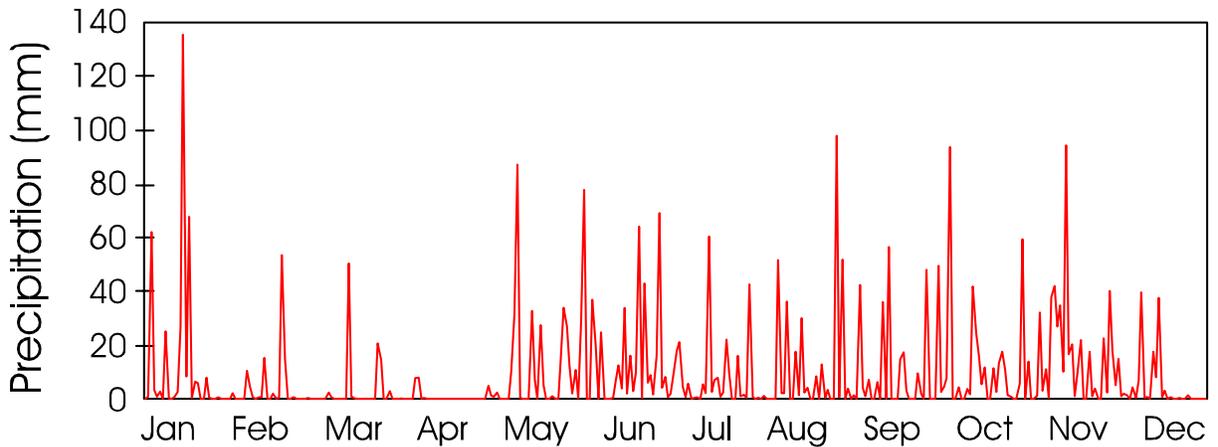
There are two ETgages currently being used on BCI: one in the Clearing located at a height of 1.5m and a second on the top of the 40m tower near the Lutz weir. ETgages are read at approximately the same time of day and with the same frequency and the rain gauges on BCI. In addition, the ETgauge located on the tower is equipped to electronically record (in conjunction with a Datalogger) the timing of the evaporation of every 0.254mm.

The data from the ETgages are used to estimate the total water balance for the Lutz catchment. Water balance is calculated as: Rainfall - Weir run-off - Evapotranspiration.

The results from the ETgages and the estimated water balance (Precipitation - (Run Off + Evapotranspiration)) for the Lutz Tower for from Nov. 1993 to the end of 1996 are given on page 27.

### Daily Rainfall (mm) on BCI recorded at 900 hrs

	Jan.	Feb.	Mar	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1	0.0	0.0	0.0	0.0	2.3	0.0	10.3	1.1	1.3	2.5	0.0	14.9
2	0.8	0.0	0.0	0.0	0.0	0.0	18.0	0.0	0.0	4.4	0.0	1.0
3	62.0	0.0	0.0	7.7	0.0	36.8	21.1	0.0	42.4	7.6	1.2	1.8
4	3.2	0.0	2.3	7.9	0.0	20.3	4.4	0.0	4.1	93.7	32.1	1.3
5	0.8	10.4	0.5	0.0	0.0	0.0	0.6	0.0	0.9	0.0	2.9	0.0
6	2.6	4.3	0.0	0.3	10.2	24.8	5.6	51.6	7.1	0.0	11.0	4.3
7	0.0	0.5	0.0	0.0	31.5	0.0	0.0	2.0	0.0	4.3	0.3	0.3
8	25.1	0.0	0.0	0.0	87.1	0.0	0.3	2.0	0.0	0.0	37.8	6.8
9	0.1	0.5	0.0	0.0	0.3	0.0	0.5	36.1	6.2	0.0	42.0	39.6
10	0.0	0.6	0.0	0.0	0.0	0.3	0.0	0.0	0.0	3.7	26.8	0.3
11	0.5	15.2	50.3	0.0	0.0	6.9	5.3	0.0	35.9	1.7	34.7	0.7
12	2.5	0.0	0.8	0.0	0.0	12.4	2.0	17.5	0.0	41.8	10.0	0.0
13	26.6	0.0	0.1	0.0	32.6	3.8	60.4	1.3	56.4	24.6	94.2	17.5
14	135.4	1.8	0.0	0.0	7.1	33.8	2.5	30.0	0.0	16.2	16.5	8.0
15	8.3	0.1	0.0	0.0	0.0	1.8	6.9	2.3	0.0	5.3	20.2	37.5
16	67.7	0.3	0.0	0.0	27.4	16.0	7.9	4.1	0.0	11.7	1.0	0.5
17	0.3	53.4	0.0	0.0	5.1	2.8	0.8	0.0	14.7	0.0	9.9	3.0
18	6.4	14.9	0.0	0.0	0.0	9.7	2.3	0.0	17.3	0.0	21.8	0.0
19	5.8	0.0	0.0	0.0	0.0	64.0	22.1	8.4	3.0	11.3	0.0	0.6
20	0.0	0.0	0.0	0.0	1.0	0.3	9.4	0.0	0.0	2.5	0.0	0.0
21	0.0	0.6	20.6	0.0	0.1	42.9	0.0	12.8	0.0	13.2	17.5	0.0
22	7.9	0.0	14.5	0.0	0.0	5.9	0.0	0.3	0.0	17.5	1.0	0.3
23	0.4	0.0	0.0	0.0	14.9	8.8	15.9	3.3	9.4	10.9	3.8	0.0
24	0.0	0.0	0.0	0.0	33.9	1.6	1.0	0.0	1.8	1.3	0.0	0.0
25	0.0	0.0	2.8	0.0	26.8	15.7	1.5	0.0	0.0	0.8	0.0	1.3
26	0.5	0.3	0.0	0.0	12.1	69.1	0.3	97.8	48.0	0.0	22.4	0.0
27	0.0	0.0	0.0	0.0	1.9	4.1	42.6	0.5	0.0	0.0	2.2	0.0
28	0.0	0.0	0.0	4.9	10.7	8.1	0.6	51.8	0.0	5.6	40.1	0.0
29	0.0	0.0	0.1	1.2	0.1	0.6	0.0	0.0	0.0	59.4	17.8	0.0
30	0.0		0.0	0.8	29.0	1.8	0.4	3.8	49.5	0.0	5.1	0.0
31	2.0		0.0		77.7		0.0	0.0		13.8		0.0



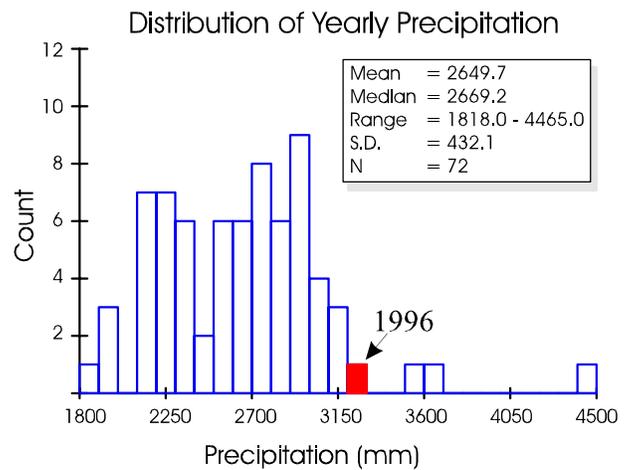
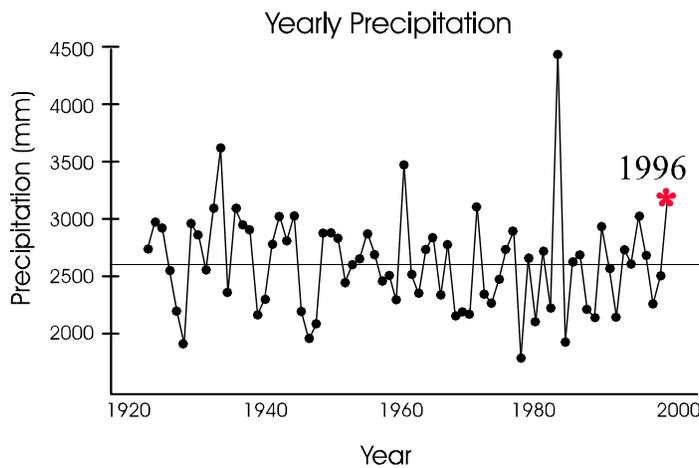
## Monthly Rainfall at 'El Claro' - Rain Guage

### Rainfall (mm)

	<b>Average</b>	<b>S.D.</b>	<b>1996</b>
<b>January</b>	<b>64.8</b>	<b>65.4</b>	<b>358.8</b>
<b>February</b>	<b>31.5</b>	<b>34.6</b>	<b>102.7</b>
<b>March</b>	<b>33.3</b>	<b>35.4</b>	<b>91.9</b>
<b>April</b>	<b>91.5</b>	<b>87.6</b>	<b>22.7</b>
<b>May</b>	<b>279.5</b>	<b>104.3</b>	<b>411.9</b>
<b>June</b>	<b>266.9</b>	<b>87.1</b>	<b>389.8</b>
<b>July</b>	<b>278.0</b>	<b>98.3</b>	<b>245.1</b>
<b>August</b>	<b>309.8</b>	<b>92.4</b>	<b>326.6</b>
<b>September</b>	<b>273.5</b>	<b>86.1</b>	<b>298.1</b>
<b>October</b>	<b>352.4</b>	<b>93.5</b>	<b>353.7</b>
<b>November</b>	<b>415.5</b>	<b>193.3</b>	<b>467.2</b>
<b>December</b>	<b>237.0</b>	<b>169.0</b>	<b>159.3</b>
<b>Total</b>	<b>2649.7</b>		<b>3227.8</b>

## Yearly Rainfall (mm) at 'El Claro' - Rain Gauge

Year	Rain	Year	Rain	Year	Rain
1925	2764.0	1949	2916.2	1973	2506.0
1926	3003.0	1950	2908.3	1974	2770.0
1927	2956.1	1951	2863.8	1975	2923.0
1928	2579.1	1952	2481.6	1976	1818.0
1929	2228.3	1953	2637.5	1977	2685.0
1930	1940.6	1954	2684.3	1978	2132.0
1931	2981.5	1955	2910.3	1979	2742.0
1932	2878.6	1956	2729.7	1980	2252.0
1933	2581.9	1957	2482.1	1981	4465.0
1934	3109.5	1958	2545.1	1982	1960.0
1935	3642.6	1959	2317.0	1983	2654.0
1936	2384.3	1960	3500.4	1984	2726.0
1937	3117.6	1961	2545.6	1985	2242.0
1938	2969.0	1962	2373.4	1986	2167.6
1939	2932.9	1963	2767.1	1987	2955.2
1940	2195.8	1964	2875.3	1988	2602.9
1941	2332.2	1965	2357.1	1989	2176.2
1942	2816.9	1966	2807.7	1990	2767.5
1943	3055.4	1967	2181.4	1991	2642.4
1944	2838.7	1968	2223.5	1992	3047.5
1945	3058.9	1969	2192.5	1993	2719.2
1946	2221.0	1970	3141.2	1994	2285.2
1947	1978.2	1971	2373.6	1995	2531.1
1948	2105.7	1972	2292.0	1996	3227.8





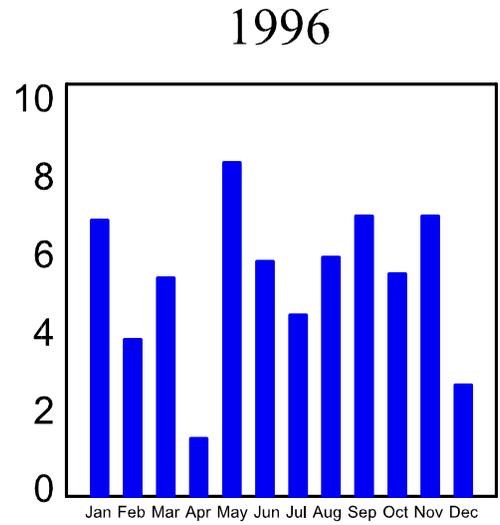
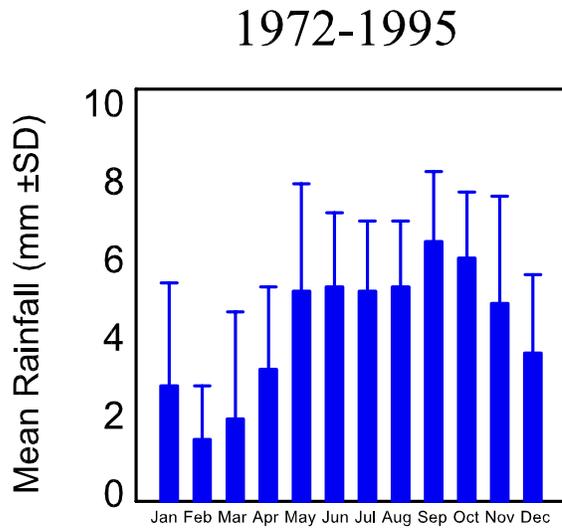
## Storm Analysis

	Max. Rainfall per Storm			Storm Duration (min.)		
	1984-95		1996	1984-95		1996
	Mean	S.D.		Mean	S.D.	
<b>January</b>	16.7	16.0	99.1	28.9	18.0	64.3
<b>February</b>	8.3	7.8	49.0	26.2	29.8	41.0
<b>March</b>	10.7	12.2	29.7	36.7	47.8	55.6
<b>April</b>	27.7	34.0	6.9	36.6	26.2	27.3
<b>May</b>	48.2	31.6	74.9	52.9	19.1	78.5
<b>June</b>	48.8	21.0	55.6	52.9	10.1	60.3
<b>July</b>	52.3	26.4	48.8	47.5	9.7	44.0
<b>August</b>	48.0	15.8	67.6	45.4	10.9	56.1
<b>September</b>	51.8	22.0	50.3	57.7	11.7	56.8
<b>October</b>	46.5	27.6	51.8	58.7	10.9	47.9
<b>November</b>	37.9	19.2	37.1	46.4	23.2	68.0
<b>December</b>	38.8	27.6	21.1	34.7	21.8	34.2

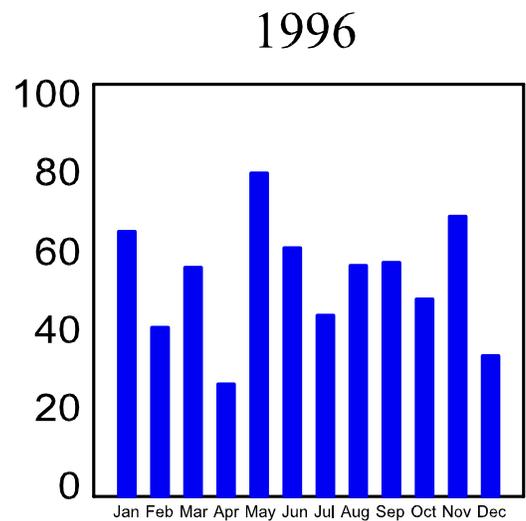
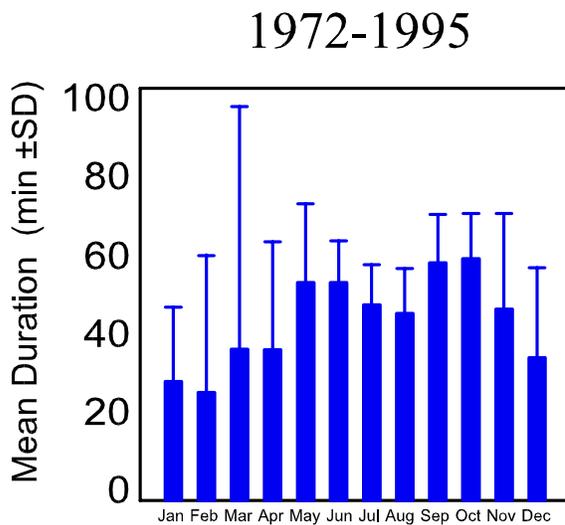
### Av. Rainfall per Storm (mm)

	1984-94		1996
	Mea	S.D.	
	<b>January</b>	2.8	2.5
<b>February</b>	1.5	1.3	3.8
<b>March</b>	2.0	2.3	5.3
<b>April</b>	3.2	2.0	1.4
<b>May</b>	5.1	2.6	8.1
<b>June</b>	5.2	1.8	5.7
<b>July</b>	5.1	1.7	4.4
<b>August</b>	5.2	1.6	5.8
<b>September</b>	6.3	1.7	6.8
<b>October</b>	5.9	1.6	5.4
<b>November</b>	4.8	2.6	6.8
<b>December</b>	3.6	1.9	2.7

## Average Monthly Storm Size



## Average Monthly Storm Duration



### Daily Lutz Weir Run-off (mm .eq.)

	Jan.	Feb.	Mar	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
<b>1</b>	2.9	1.3	0.2	0.2	0.1	2.8	5.6	2.1	5.0	2.5	2.1	8.9
<b>2</b>	22.8	1.2	0.2	0.2	0.1	6.1	4.6	1.9	10.7	2.6	2.1	6.3
<b>3</b>	7.5	1.1	0.2	0.2	0.1	5.7	7.8	1.8	5.3	45.5	21.2	5.3
<b>4</b>	4.6	1.0	0.2	0.3	0.1	5.0	5.5	8.7	4.0	8.2	3.8	4.3
<b>5</b>	3.8	1.2	0.2	0.2	0.1	3.2	4.4	3.1	4.0	5.0	4.2	4.2
<b>6</b>	3.2	0.9	0.2	0.2	0.2	2.9	3.4	2.6	3.2	3.8	3.2	3.5
<b>7</b>	6.2	0.8	0.2	0.3	6.1	2.8	2.9	2.4	2.8	3.2	5.9	3.4
<b>8</b>	3.8	0.8	0.3	0.3	1.0	2.0	2.5	10.7	2.4	2.7	21.4	13.3
<b>9</b>	2.8	0.7	0.3	0.3	0.3	1.6	2.3	4.9	2.2	2.5	16.2	5.9
<b>10</b>	2.3	0.7	0.3	0.2	0.2	1.6	2.1	4.8	1.9	2.3	16.0	3.6
<b>11</b>	2.1	1.0	1.5	0.2	0.2	1.6	2.0	4.2	11.5	11.4	25.8	3.1
<b>12</b>	2.1	0.6	0.4	0.2	0.7	1.6	24.3	3.3	27.5	12.8	34.1	2.7
<b>13</b>	56.3	0.6	0.3	0.1	0.5	1.3	7.4	7.8	7.6	9.0	38.5	5.2
<b>14</b>	36.6	0.5	0.3	0.2	0.4	6.7	4.4	5.3	4.8	5.8	23.3	16.0
<b>15</b>	49.9	0.5	0.3	0.1	0.8	5.4	4.4	4.1	5.6	5.9	11.7	7.2
<b>16</b>	18.9	0.5	0.3	0.1	0.9	3.8	3.6	3.3	3.7	4.0	10.7	4.7
<b>17</b>	9.9	5.3	0.3	0.1	0.5	3.1	3.1	3.1	5.8	3.2	12.4	3.7
<b>18</b>	7.7	1.7	0.3	0.1	0.4	2.7	5.5	2.6	3.7	5.9	6.4	3.2
<b>19</b>	5.7	0.9	0.3	0.1	0.3	26.0	4.3	2.3	3.1	3.0	4.8	2.7
<b>20</b>	4.5	0.7	0.4	0.1	0.3	17.0	5.6	2.4	2.7	3.9	3.8	2.5
<b>21</b>	5.6	0.7	0.8	0.1	0.2	11.6	4.1	2.2	2.4	4.9	7.4	2.5
<b>22</b>	3.9	0.6	0.8	0.1	0.2	6.5	3.0	1.9	2.4	5.1	3.6	2.3
<b>23</b>	2.9	0.5	0.3	0.1	3.7	5.6	3.5	1.9	2.0	4.1	3.0	2.1
<b>24</b>	2.5	0.4	0.3	0.1	6.4	6.0	2.7	2.9	2.0	3.3	2.5	1.6
<b>25</b>	2.2	0.4	0.2	0.1	2.0	36.4	2.3	36.9	4.7	2.8	9.6	1.4
<b>26</b>	2.0	0.4	0.2	0.1	1.4	10.4	3.3	9.1	2.7	2.4	3.1	1.2
<b>27</b>	1.9	0.3	0.2	0.1	1.1	7.0	9.6	26.5	2.1	2.1	10.0	1.3
<b>28</b>	1.8	0.3	0.2	0.1	1.1	5.4	4.1	11.3	15.7	2.1	10.7	1.4
<b>29</b>	1.6	0.3	0.2	0.1	1.6	4.2	3.2	6.5	4.4	21.2	9.1	1.2
<b>30</b>	1.6		0.2	0.1	28.2	3.7	2.7	4.8	3.0	5.9	15.9	1.0
<b>31</b>	1.6		0.2		8.8		2.3	3.9		3.4		0.9

## Monthly Run-off at Lutz Weir

### Run-off (mm eq.)

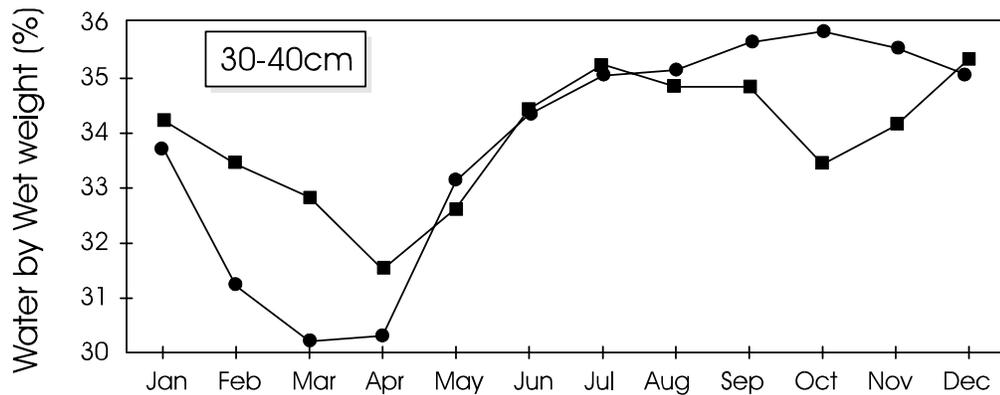
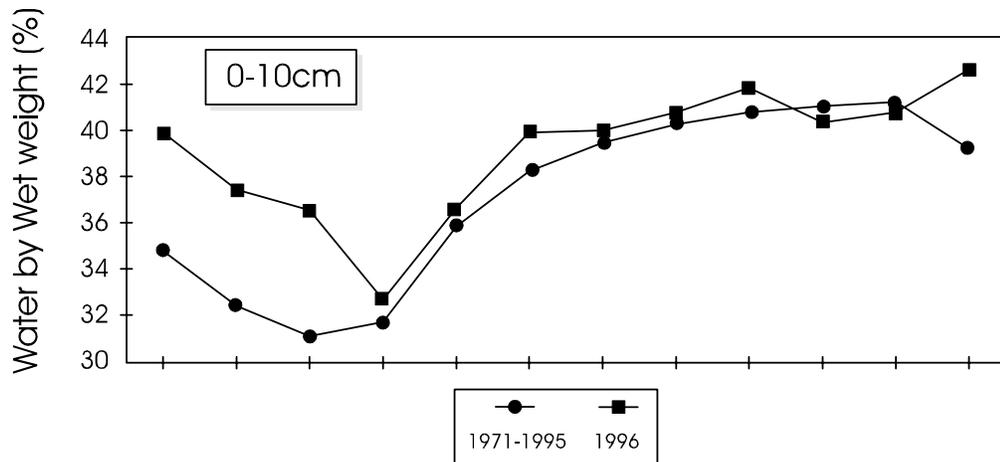
	Long-term Averages (1972 - 1995)				
	Peak	Delayed	Base	Total	S.D.
<b>January</b>	9.7	1.7	16.2	27.6	47.6
<b>February</b>	0.1	0.3	5.0	5.5	12.1
<b>March</b>	0.1	0.2	1.2	1.6	2.5
<b>April</b>	4.1	0.7	1.8	6.6	23.7
<b>May</b>	12.6	4.6	10.6	27.8	49.0
<b>June</b>	20.6	5.8	20.1	46.6	75.8
<b>July</b>	24.1	7.9	34.5	66.5	51.2
<b>August</b>	51.1	13.1	57.1	121.3	81.0
<b>September</b>	51.3	13.2	65.2	129.7	71.5
<b>October</b>	77.4	17.7	101.1	196.2	84.5
<b>November</b>	82.3	20.1	116.1	218.5	104.8
<b>December</b>	44.9	9.4	71.1	125.4	106.9
<b>Total</b>	378.3	94.8	500.1	973.3	

	1996			
	Peak	Delayed	Base	Total
<b>January</b>	134.9	16.4	129.7	281.0
<b>February</b>	3.2	2.8	19.7	25.6
<b>March</b>	0.3	1.3	8.7	10.3
<b>April</b>	0.0	0.0	4.4	4.5
<b>May</b>	41.1	9.1	17.7	67.8
<b>June</b>	70.8	15.6	113.5	199.9
<b>July</b>	33.1	10.2	103.3	146.7
<b>August</b>	72.7	14.7	102.0	189.3
<b>September</b>	56.1	9.7	93.2	159.0
<b>October</b>	87.7	10.4	102.5	200.6
<b>November</b>	137.1	19.0	178.2	334.3
<b>December</b>	24.3	5.2	97.1	126.7
<b>Total</b>	661.3	114.3	970.0	1745.6

## Monthly Run-off at Lutz Weir

## Lutz Catchment Soil Moisture

	Long-term Average (1972-1995)				1996	
	0-10 cm		30-40 cm		0-10 cm	30-40 cm
	Mean	S.D.	Mean	S.D.		
<b>January</b>	35.8	3.0	33.7	3.2	41.3	34.2
<b>February</b>	32.8	2.2	31.2	1.5	38.5	33.4
<b>March</b>	31.2	2.2	30.2	1.8	37.5	32.8
<b>April</b>	31.7	2.6	30.3	1.9	33.1	31.5
<b>May</b>	36.7	2.4	33.1	1.8	37.6	32.6
<b>June</b>	39.4	2.1	34.3	2.3	41.3	34.4
<b>July</b>	40.8	1.7	35.0	1.4	41.4	35.2
<b>August</b>	41.5	1.9	35.1	1.0	42.3	34.8
<b>September</b>	42.3	1.6	35.6	1.8	43.5	34.8
<b>October</b>	42.8	2.0	35.8	0.9	41.8	33.4
<b>November</b>	42.9	1.7	35.5	2.1	42.3	34.1
<b>December</b>	40.5	2.7	35.0	2.3	44.4	35.3



## Relative Humidity (%)

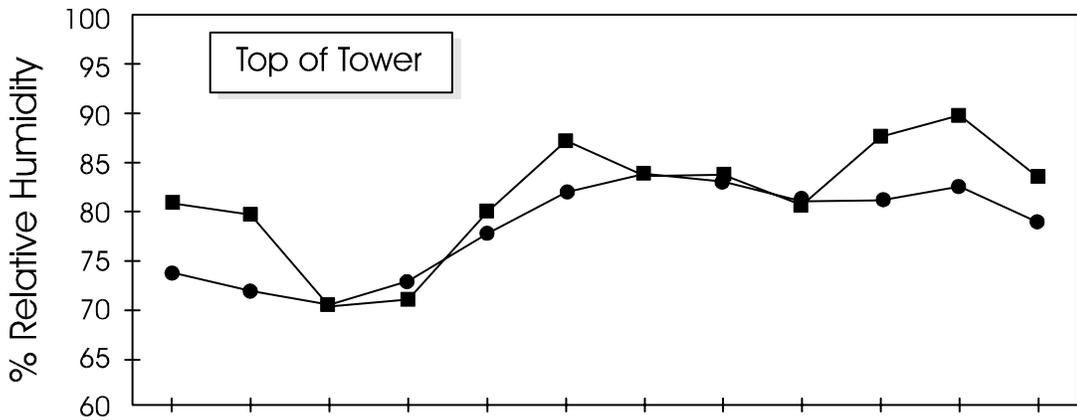
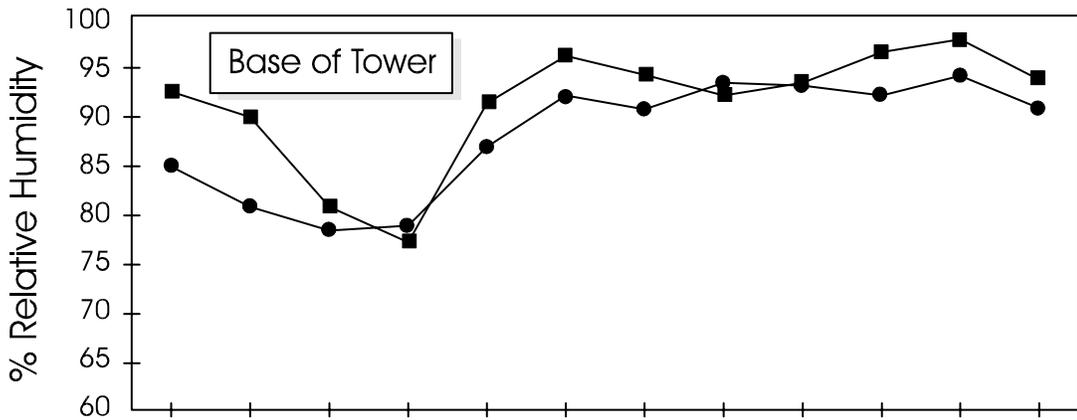
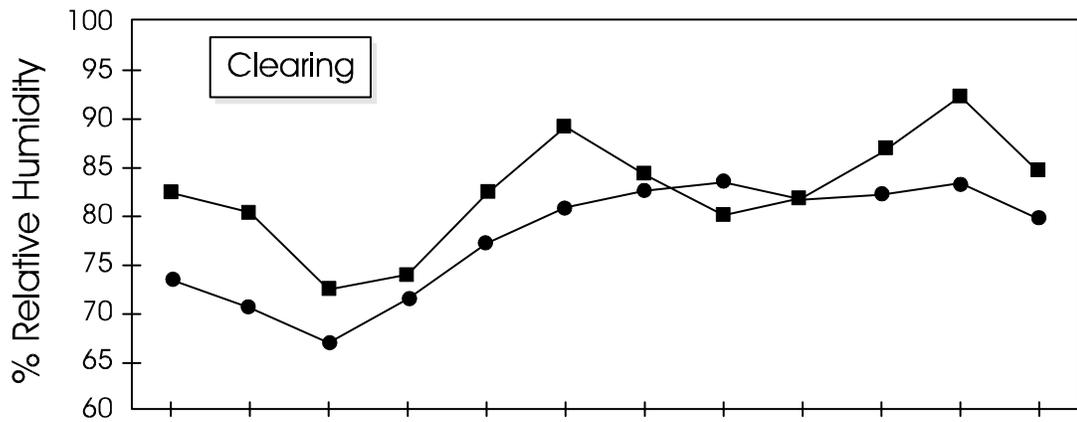
### Long-term Average (1972-1995)

	<b>'El Claro'</b>		<b>1m</b>		<b>40m</b>	
	<b>Mean</b>	<b>S.D.</b>	<b>Mean</b>	<b>S.D.</b>	<b>Mean</b>	<b>S.D.</b>
<b>January</b>	73.4	4.2	84.7	3.3	73.5	3.2
<b>February</b>	70.4	3.4	80.5	3.1	71.6	3.8
<b>March</b>	67.0	3.3	78.2	3.6	70.4	2.6
<b>April</b>	71.1	4.9	78.5	4.9	72.5	2.5
<b>May</b>	77.0	4.9	86.6	4.0	77.6	3.8
<b>June</b>	81.1	4.2	92.0	2.5	82.6	3.9
<b>July</b>	82.2	4.8	90.6	7.3	83.5	2.1
<b>August</b>	83.1	5.0	93.1	2.7	82.9	2.4
<b>September</b>	81.4	5.4	92.8	1.9	80.9	3.6
<b>October</b>	81.9	4.2	92.1	6.5	80.5	3.6
<b>November</b>	83.3	3.6	93.9	2.8	82.5	4.0
<b>December</b>	79.4	4.1	90.4	2.7	78.2	3.4

### 1996

	<b>'El Claro'</b>	<b>1m</b>	<b>40m</b>
<b>January</b>	82.2	92.3	80.7
<b>February</b>	80.2	89.7	79.5
<b>March</b>	72.3	80.6	70.1
<b>April</b>	73.8	77.0	70.8
<b>May</b>	82.1	91.1	79.8
<b>June</b>	89.0	95.9	87.1
<b>July</b>	84.1	94.0	83.5
<b>August</b>	79.9	91.9	83.6
<b>September</b>	81.7	93.2	80.5
<b>October</b>	86.3	96.3	87.5
<b>November</b>	92.1	97.6	89.7
<b>December</b>	84.3	93.5	83.3

### Relative Humidity (%)



## Temperature Maximum & Minimum (°C)

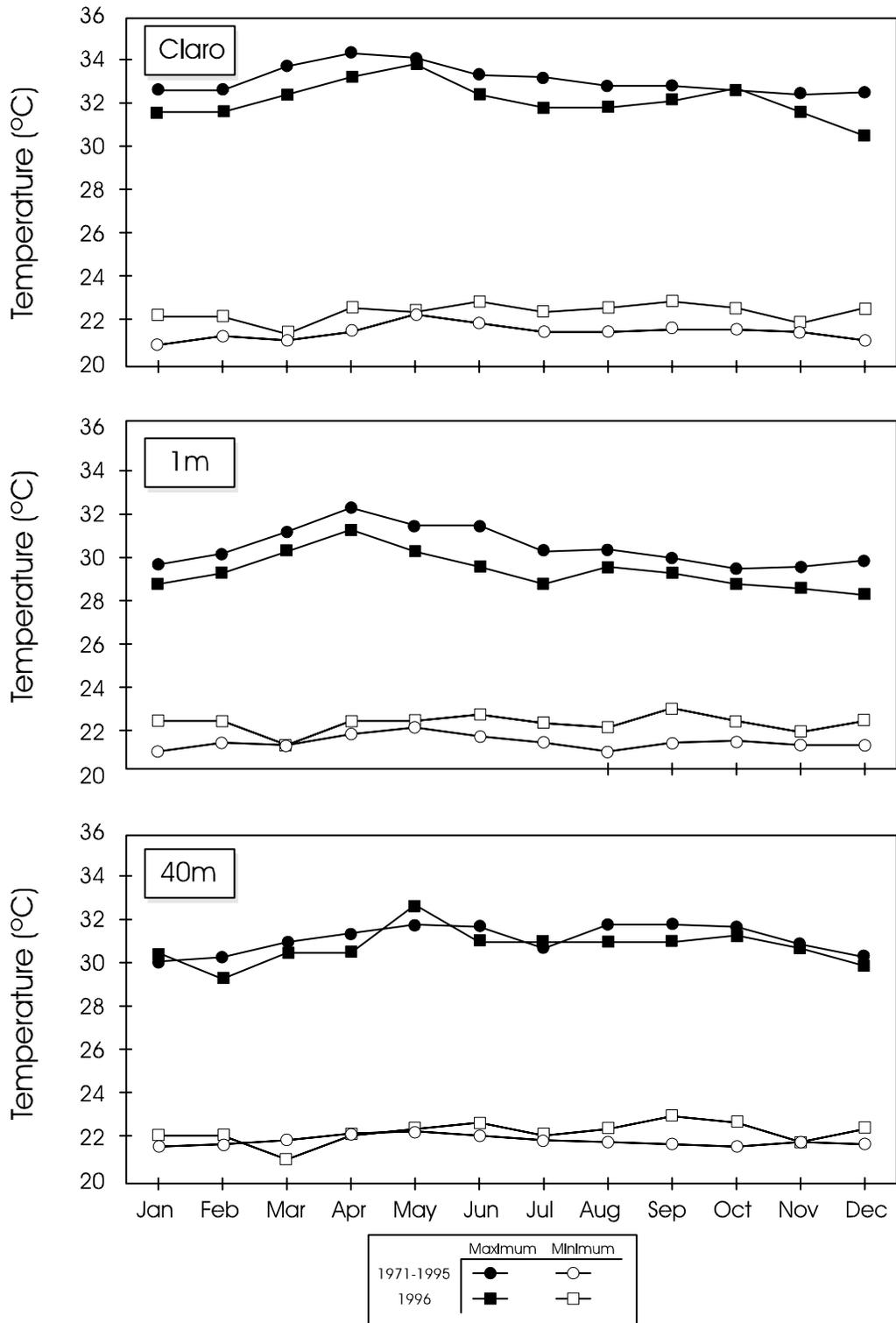
### Long-term Average (1972-1995)

	<b>‘El Claro’</b>		<b>1m</b>		<b>40m</b>	
	<b>Maximum</b>	<b>Minimum</b>	<b>Maximum</b>	<b>Minimum</b>	<b>Maximum</b>	<b>Minimum</b>
<b>January</b>	32.6	21.1	29.4	20.9	30.1	21.7
<b>February</b>	32.6	21.4	29.8	21.3	30.3	21.9
<b>March</b>	33.8	21.3	30.9	21.2	31.0	22.0
<b>April</b>	34.4	21.7	31.9	21.7	31.4	22.3
<b>May</b>	34.2	22.4	31.1	22.0	31.9	22.4
<b>June</b>	33.4	22.1	31.2	21.6	31.6	22.2
<b>July</b>	33.2	21.7	29.8	21.2	30.8	21.9
<b>August</b>	32.9	21.7	30.0	20.8	31.7	21.9
<b>September</b>	32.8	21.7	29.7	21.3	31.7	21.8
<b>October</b>	32.7	21.7	29.3	21.4	31.7	21.7
<b>November</b>	32.4	21.7	29.3	21.2	31.0	22.0
<b>December</b>	32.5	21.3	29.5	21.2	30.4	21.9

### 1996

	<b>‘El Claro’</b>		<b>1m</b>		<b>40m</b>	
	<b>Maximum</b>	<b>Minimum</b>	<b>Maximum</b>	<b>Minimum</b>	<b>Maximum</b>	<b>Minimum</b>
<b>January</b>	31.7	22.2	28.5	22.3	30.6	22.2
<b>February</b>	31.7	22.2	29.0	22.3	29.4	22.2
<b>March</b>	32.5	21.1	30.0	21.5	30.6	21.1
<b>April</b>	33.3	22.2	31.0	22.7	30.6	22.2
<b>May</b>	33.9	22.5	30.0	22.5	32.8	22.2
<b>June</b>	32.5	22.8	29.3	23.0	31.1	22.5
<b>July</b>	31.9	22.2	28.5	22.5	31.1	22.1
<b>August</b>	31.9	22.5	29.3	22.7	31.1	21.9
<b>September</b>	32.2	23.1	29.0	23.0	31.1	22.8
<b>October</b>	32.8	22.8	28.5	22.7	31.4	22.2
<b>November</b>	31.7	21.9	28.3	22.0	30.8	21.7
<b>December</b>	30.6	22.5	28.0	22.7	30.0	22.2

### Temperature Maximum & Minimum (°C)

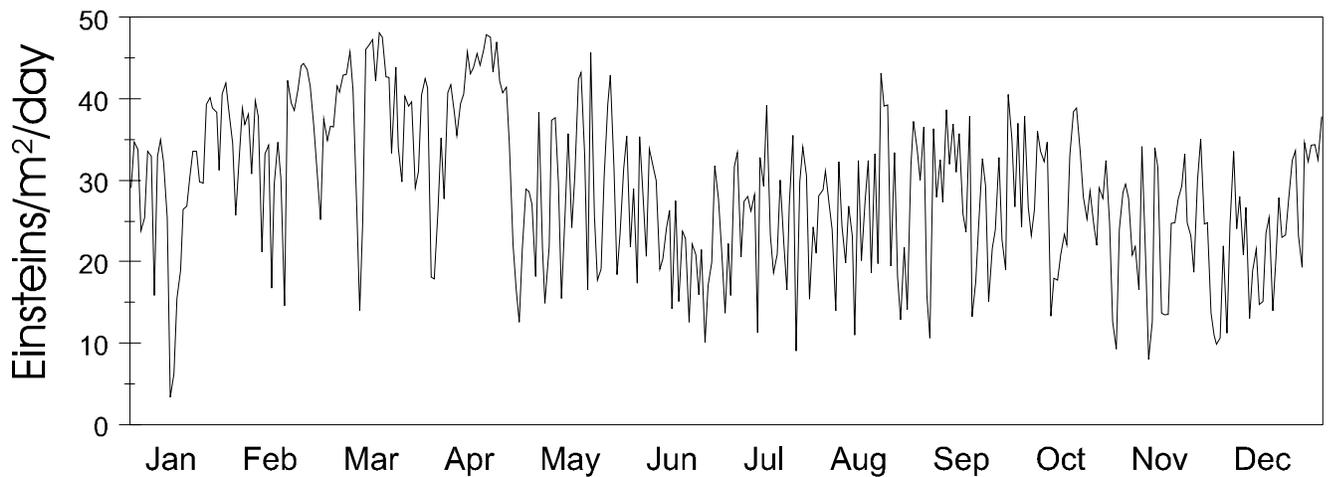


## Daily Total Radiation (W/m<sup>2</sup>/day)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1	4379.8	5140.0	5233.2	6337.0	4447.7	5451.1	1910.4	4755.4	2270.8	5850.1	4498.4	3255.6
2	5310.0	3797.0	5516.2	2546.5	4422.7	3232.4	3297.5	4096.2	1397.6	4018.9	4209.8	1497.6
3	5175.5	4985.3	5591.6	2564.6	4169.0	4394.5	2256.5	3575.9	5604.5	3458.1	3080.0	3668.2
4	3581.6	5839.8	6480.2	3810.7	2733.4	2504.2	4847.2	1960.3	4227.9	3991.5	3246.1	5141.1
5	3774.9	5616.9	6291.9	5355.3	6073.5	5445.6	5116.3	4941.5	4980.4	5551.9	2369.3	3589.0
6	5262.8	5848.7	6620.5	4211.3	3269.9	4401.2	3028.0	3639.2	4136.3	5144.3	5246.6	4245.5
7	4980.2	4639.0	6755.8	6374.2	2167.4	3042.1	4144.4	2905.8	5988.4	4943.9	3012.8	3073.5
8	2216.8	6108.7	7208.7	6527.0	3363.9	5204.2	4240.7	4051.2	4892.0	5334.3	988.5	4020.4
9	5007.5	5710.8	6362.4	5772.7	5848.5	4855.5	3955.8	3447.8	5700.8	1842.9	1741.7	1806.0
10	5332.9	3097.5	3944.0	5352.1	5977.0	4569.1	4271.8	1469.2	4733.7	2603.5	5231.1	2746.0
11	4868.1	5122.8	1938.0	6057.1	4552.5	2783.6	1512.6	4965.0	5499.3	2572.4	4821.4	3196.2
12	3723.9	5231.9	3707.1	6426.8	2317.1	2991.7	5027.3	2957.6	3896.7	3082.3	1912.8	2075.3
13	400.7	2360.3	7229.4	7155.3	4073.9	3614.8	4447.1	4141.4	3536.2	3487.3	1872.7	2139.2
14	800.9	4380.4	7434.3	6680.4	5480.3	3959.5	6071.7	4965.4	5846.5	3277.7	1880.4	3510.0
15	2219.0	5329.7	7519.9	6826.5	3617.1	1988.3	3468.1	2708.6	1830.7	5064.7	3705.4	3835.4
16	2735.3	4673.1	6480.4	7067.9	4666.9	4159.3	2712.6	5095.4	2528.1	5949.7	3711.1	1952.6
17	4058.8	2106.7	7494.8	6856.6	6587.2	2138.6	3080.9	2893.3	3697.7	6026.2	4178.1	2969.5
18	4127.7	6738.7	7468.5	7158.0	6730.7	3542.3	4578.2	6712.9	4996.6	5139.8	4456.5	4212.8
19	4789.1	6316.6	6651.6	7483.5	5056.9	3405.0	3297.1	6053.1	4463.0	4231.3	5097.0	3422.3
20	5340.4	6136.7	6617.2	7513.5	2365.6	1726.1	2360.2	6083.3	2133.2	3795.1	3707.7	3472.9
21	5184.6	6473.0	5047.2	6739.6	7132.8	3296.6	4069.8	2846.3	3209.7	4352.2	3460.2	4173.9
22	4571.5	6931.1	6798.2	7317.4	3864.3	3084.9	5472.7	5121.9	3572.7	3691.7	2724.9	4967.9
23	4602.9	6977.9	5185.8	6444.3	2565.8	2270.4	1155.4	2636.2	5025.6	3267.1	4580.4	5165.7
24	6210.1	6745.3	4513.1	6273.8	2790.7	3184.7	4542.1	1774.3	3371.8	4408.4	5396.3	3460.2
25	6270.0	6399.3	6214.7	6346.0	4627.2	1315.8	5236.7	3233.8	2775.3	4207.5	3686.5	2818.8
26	6060.9	5508.0	6113.3	5158.4	6094.1	2461.8	4660.8	1974.9	6289.7	4964.8	3712.4	5322.9
27	6010.6	4750.8	6077.8	3221.8	6685.5	2918.5	2187.6	4870.9	5413.4	3688.9	1904.1	4942.4
28	4702.3	3689.8	4329.6	2369.3	4815.6	4859.2	3630.6	5739.3	4042.7	1745.8	1461.8	5277.6
29	6250.9	5710.4	4685.8	1733.2	2676.9	4201.4	3102.2	5201.6	5713.7	1185.5	1285.5	5284.2
30	6538.2		6287.9	3214.8	3487.1	3227.1	4257.6	4582.1	3630.4	3583.9	1397.9	4973.0
31	5864.6		6635.4		4810.2		4378.7	5637.8		4326.0		5837.1

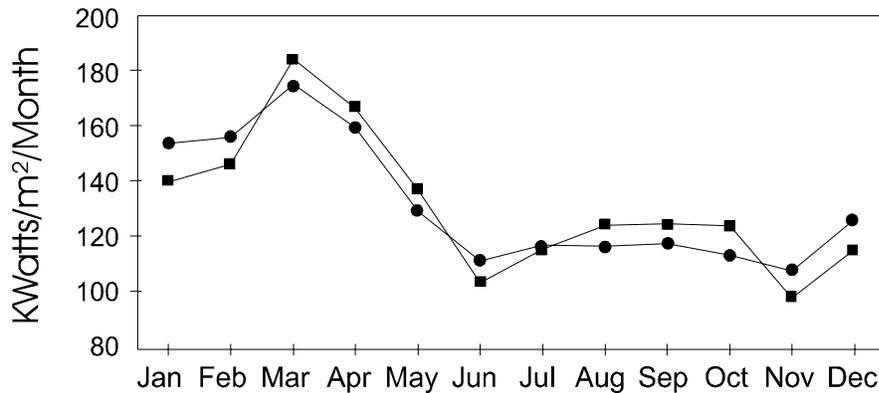
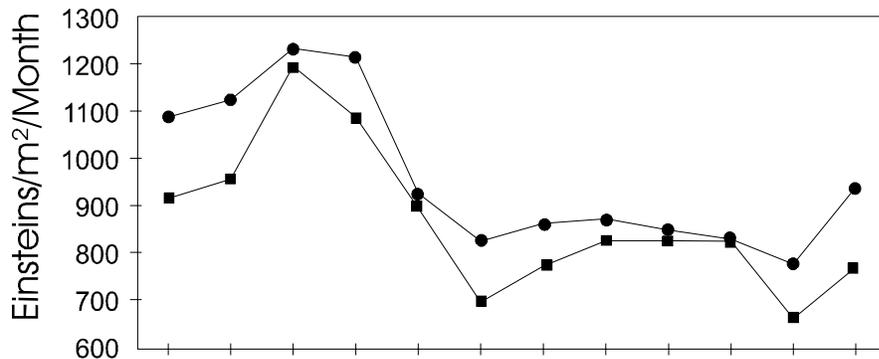
### Daily Total PAR (Einsteins/m<sup>2</sup>/day)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1	29.0	34.5	34.9	41.3	28.9	35.4	13.7	31.1	15.9	37.8	29.6	21.9
2	34.7	25.7	36.6	18.1	28.6	21.8	22.2	27.1	10.6	26.6	27.8	11.2
3	33.8	33.0	36.5	17.9	27.0	28.9	15.8	23.9	36.3	23.2	20.9	24.5
4	23.8	38.9	41.5	26.1	18.2	17.3	31.7	14.0	27.9	26.5	21.9	33.5
5	25.4	36.8	40.8	35.2	38.3	35.4	33.3	32.3	32.5	36.0	16.5	24.0
6	33.5	38.1	42.9	27.7	21.6	29.0	20.6	24.3	27.3	33.5	34.1	28.0
7	32.9	30.8	43.0	40.7	14.9	20.6	27.4	19.8	38.7	32.3	20.5	20.8
8	15.8	39.8	45.7	41.7	21.9	33.9	28.0	26.8	32.0	34.7	8.1	26.6
9	32.9	37.8	41.0	38.2	37.3	31.7	26.2	23.1	36.9	13.3	12.7	13.1
10	35.0	21.2	26.8	35.5	37.6	30.0	28.2	11.0	31.0	18.0	34.0	18.8
11	32.2	33.2	14.0	39.4	29.7	19.1	11.3	32.4	35.7	17.8	31.5	21.6
12	25.4	34.3	25.0	40.6	15.5	20.3	32.8	20.1	25.9	20.9	13.7	14.7
13	3.4	16.8	46.0	45.7	26.0	24.1	29.2	27.4	23.7	23.4	13.5	15.1
14	6.2	29.5	46.6	43.1	35.7	26.3	39.2	32.4	37.8	22.1	13.5	23.5
15	15.5	34.7	47.3	43.8	24.2	14.2	23.2	18.6	13.2	33.0	24.7	25.5
16	18.9	30.2	42.1	45.5	30.6	27.5	18.6	33.2	17.5	38.4	24.7	14.0
17	26.4	14.6	48.1	44.1	42.3	15.1	20.9	19.7	24.7	38.9	27.6	20.2
18	26.8	42.2	47.6	46.0	43.2	23.7	30.0	43.1	32.6	33.5	29.3	27.8
19	30.4	39.5	42.7	47.9	33.0	22.9	22.2	39.1	29.3	27.9	33.2	23.0
20	33.5	38.6	42.6	47.6	16.5	12.6	16.5	39.3	15.1	25.3	24.7	23.3
21	33.5	41.1	33.3	43.3	45.7	22.2	26.9	19.4	21.7	28.7	23.2	27.6
22	29.8	44.0	43.9	47.0	25.7	20.9	35.5	33.4	23.9	24.6	18.7	32.4
23	29.6	44.3	34.1	42.1	17.7	15.9	9.1	18.2	32.8	22.0	30.1	33.6
24	39.3	43.6	29.8	40.7	19.1	21.5	29.8	12.9	22.7	29.0	35.1	23.2
25	40.1	41.5	40.3	41.4	30.3	10.1	34.1	21.8	19.0	27.8	24.6	19.3
26	38.9	36.5	39.1	34.4	39.3	17.1	30.6	14.1	40.5	32.4	24.7	34.6
27	38.3	31.4	39.6	22.1	43.0	19.9	15.4	31.8	35.2	24.6	13.7	32.3
28	31.2	25.1	29.0	16.6	31.5	31.8	24.2	37.2	26.8	12.7	11.0	34.3
29	40.6	37.5	31.1	12.6	18.4	27.7	21.0	33.9	37.0	9.3	9.9	34.4
30	41.9		40.4	21.5	23.4	21.8	28.1	30.1	24.2	24.0	10.6	32.5
31	38.3		42.4		31.5		28.8	36.5		28.5		37.8



## Total Monthly Solar Radiation

	Long-term Average (1972-1995)				1996	
	PAR _____ (Einsteins/m <sup>2</sup> /month)		Pyranometer _ (W/m <sup>2</sup> /month)		PAR	Pyran.
	Mean	S.D.	Mean	S.D.		
January	1087.6	176.6	154200	15230.6	916.9	140352.5
February	1124.4	154.8	156400	10647.5	995.1	152366.1
March	1231.8	195.4	175300	36198.2	1194.6	184434.5
April	1213.5	124.5	159800	14023.2	1087.9	166895.9
May	926.8	141.0	129700	16180.6	896.6	137471.0
June	826.7	80.3	111800	10596.3	698.6	104229.5
July	864.8	97.5	117500	12350.3	774.6	116318.5
August	873.9	96.0	117100	14122.3	828.0	125037.8
September	850.9	50.1	118100	8468.1	828.3	125405.5
October	830.8	76.7	113800	10929.9	826.5	124787.6
November	778.6	111.1	108300	9286.5	664.0	98577.3
December	939.6	121.4	126800	15885.7	773.0	116052.8

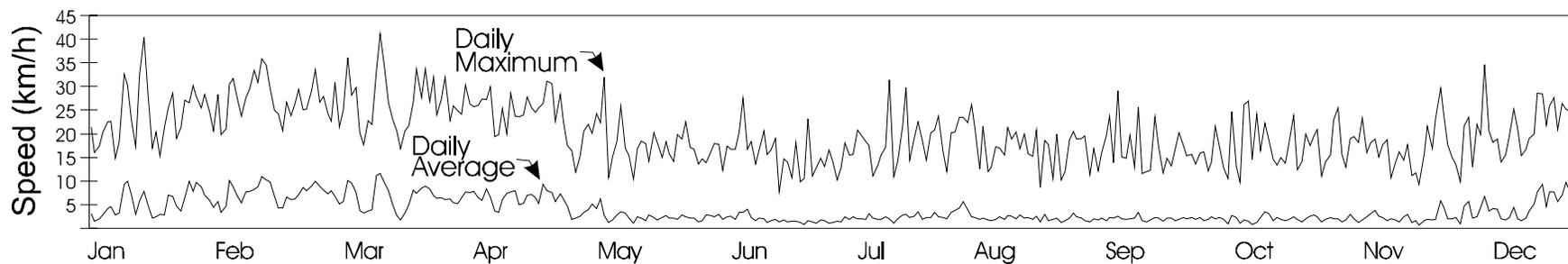


Month



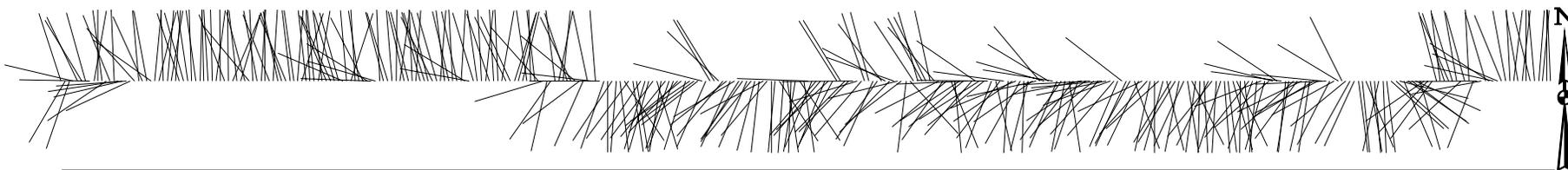
## Daily Average and Maximum Wind Speed (km/h)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.												
1	3.2	21.5	5.6	28.2	6.8	30.8	6.4	24.1	3.4	20.6	2.7	16.0	1.2	14.1	4.4	14.0	1.7	11.0	1.9	12.1	2.1	12.3	2.3	13.5
2	1.5	16.0	3.4	19.9	5.1	21.4	7.6	30.3	4.0	21.9	2.4	17.9	1.5	10.3	5.6	13.7	1.4	11.3	2.4	14.0	2.1	13.1	0.9	9.8
3	2.0	17.4	4.7	21.0	5.7	25.0	7.6	26.2	5.1	20.1	3.0	17.7	1.4	12.7	3.9	13.4	2.0	13.6	2.0	10.6	1.3	12.2	4.7	21.8
4	2.8	20.2	10.0	30.4	10.1	36.0	7.9	25.8	4.2	24.2	1.9	12.2	2.4	10.2	2.4	12.7	1.8	12.1	2.4	12.2	1.8	13.0	5.7	23.5
5	4.2	22.4	8.8	31.6	9.5	28.1	6.5	26.0	6.2	22.4	2.4	17.4	1.9	13.0	2.3	13.2	2.1	13.9	1.9	12.9	3.0	13.9	2.1	13.0
6	4.5	22.6	6.7	27.3	7.6	29.8	5.9	27.3	2.7	31.9	2.6	16.8	2.4	13.2	1.8	12.5	1.6	12.3	0.9	10.5	2.0	12.5	2.5	22.0
7	2.9	14.9	5.4	23.8	3.8	20.3	8.4	27.1	1.2	10.8	1.9	16.8	2.0	9.9	2.2	14.0	2.3	11.6	2.7	13.6	1.2	10.1	4.5	19.7
8	3.2	18.3	7.7	27.6	3.3	17.7	6.6	29.9	1.8	15.2	3.4	20.4	2.0	12.9	1.8	11.9	2.2	13.8	2.3	13.1	1.8	10.9	6.7	34.7
9	9.3	32.5	7.8	29.5	3.7	22.8	3.7	19.4	2.8	18.5	3.4	27.5	1.9	12.4	1.6	13.0	2.5	13.9	1.1	9.7	2.4	14.1	3.6	20.7
10	10.0	30.3	8.3	33.4	3.9	21.9	3.3	19.8	3.5	25.9	4.0	16.7	3.2	12.3	1.9	9.6	2.0	13.6	1.8	11.3	3.1	13.6	4.2	18.2
11	7.3	23.2	8.7	30.9	11.1	33.3	6.1	25.4	3.3	17.0	2.3	18.3	2.2	11.1	2.4	13.2	1.9	14.1	1.5	12.1	4.0	28.8	4.1	18.8
12	3.0	17.3	11.0	35.8	11.6	41.0	7.4	20.0	2.2	15.3	1.7	13.6	1.9	13.3	1.9	11.3	2.0	11.6	0.8	12.2	2.5	12.2	2.0	14.0
13	5.8	32.4	10.3	34.5	9.5	33.8	7.8	28.6	1.1	10.4	2.2	16.2	1.9	11.1	2.7	14.1	2.1	13.0	1.2	12.9	2.3	12.9	1.8	15.5
14	7.8	40.4	9.8	29.6	8.0	26.6	8.0	23.7	2.4	16.8	2.1	20.6	2.4	14.0	2.6	13.8	3.4	12.9	2.3	14.0	1.6	13.1	2.4	19.5
15	5.0	28.7	6.7	24.9	4.9	22.9	4.9	23.5	2.1	18.5	1.2	15.6	2.0	12.8	2.1	13.6	1.7	11.6	3.6	13.9	2.0	10.7	4.4	25.2
16	2.2	17.0	4.3	24.2	2.7	20.7	5.3	24.0	1.7	17.9	1.6	16.5	1.1	11.0	2.8	13.4	1.4	12.1	3.1	12.3	1.7	13.9	2.0	21.1
17	2.5	20.4	4.3	20.6	1.8	16.8	7.0	27.7	2.8	14.1	1.9	18.9	2.1	12.7	2.2	14.0	1.8	12.2	1.6	13.0	1.4	13.2	1.6	15.4
18	3.0	15.2	6.6	26.7	3.3	20.6	7.2	25.4	2.3	20.2	1.3	7.6	2.8	13.2	2.3	13.8	2.3	11.4	2.4	13.3	2.4	12.8	2.2	16.7
19	2.9	21.2	6.0	23.9	5.0	21.7	6.5	24.5	1.8	18.3	1.8	14.7	3.0	13.5	1.9	12.5	2.1	12.5	1.9	14.1	2.9	14.1	3.6	18.9
20	7.0	25.5	6.2	26.2	8.1	26.6	5.3	25.4	2.3	15.0	1.3	14.0	2.3	13.7	2.6	13.8	1.5	11.8	1.6	13.8	1.2	11.2	5.2	19.9
21	6.8	28.5	7.2	29.3	7.4	33.6	9.3	26.3	2.7	18.3	1.5	10.7	2.5	13.8	1.4	8.7	2.2	13.9	1.9	13.7	1.6	11.8	7.6	28.6
22	4.8	19.0	8.7	25.1	8.4	27.6	8.0	31.1	2.2	15.7	1.5	18.2	3.5	14.0	3.0	13.6	2.2	13.2	2.4	13.6	0.7	9.2	9.4	28.4
23	3.7	21.3	8.0	25.2	8.9	33.6	7.5	30.5	2.2	14.2	1.2	9.8	1.9	12.4	1.6	11.4	1.7	13.3	1.9	12.4	1.6	15.6	4.7	21.9
24	6.4	27.1	8.9	29.0	8.4	26.8	5.7	22.6	1.9	19.8	0.8	10.5	2.3	13.5	1.8	10.5	1.9	13.1	1.4	14.1	1.9	21.6	7.6	25.8
25	9.9	26.5	10.0	33.5	6.9	32.0	7.3	28.2	2.8	18.9	1.6	23.1	2.3	14.0	2.2	11.7	2.3	11.6	2.1	13.1	1.7	16.9	7.6	27.6
26	7.8	30.2	8.9	26.6	6.4	24.0	6.3	22.6	2.5	22.5	1.4	11.0	3.4	13.2	1.1	10.2	2.0	13.1	2.6	14.1	1.9	23.2	5.7	20.9
27	9.7	27.9	8.1	27.8	6.4	27.2	4.7	17.5	2.2	17.1	1.1	12.9	2.4	11.8	1.7	12.1	2.3	12.8	2.9	14.1	5.8	29.6	7.0	26.4
28	8.8	25.4	7.3	24.3	6.1	32.0	1.9	16.5	2.2	16.7	1.8	14.8	2.3	13.5	2.2	13.8	1.9	13.6	2.5	12.7	4.4	23.9	9.6	25.2
29	7.1	28.3	8.0	22.7	6.2	22.7	2.1	11.8	1.4	13.7	1.6	13.1	2.1	12.1	3.3	12.9	2.4	14.0	1.3	11.1	2.0	17.7	7.5	24.6
30	5.9	24.7			5.4	25.9	2.5	15.2	1.7	14.7	1.0	16.6	3.4	13.0	2.4	13.7	1.6	14.1	1.9	14.0	2.0	14.9	7.7	25.8
31	4.4	20.6			5.3	24.8			2.8	13.9			3.8	13.7	2.2	13.2			2.3	14.0			6.6	21.8



### Average Daily Wind Direction

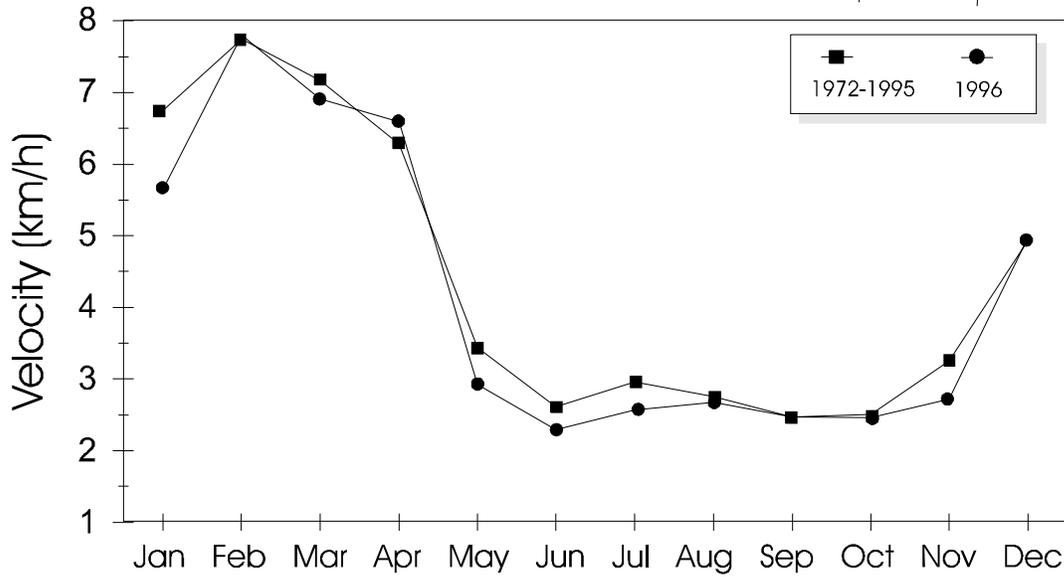
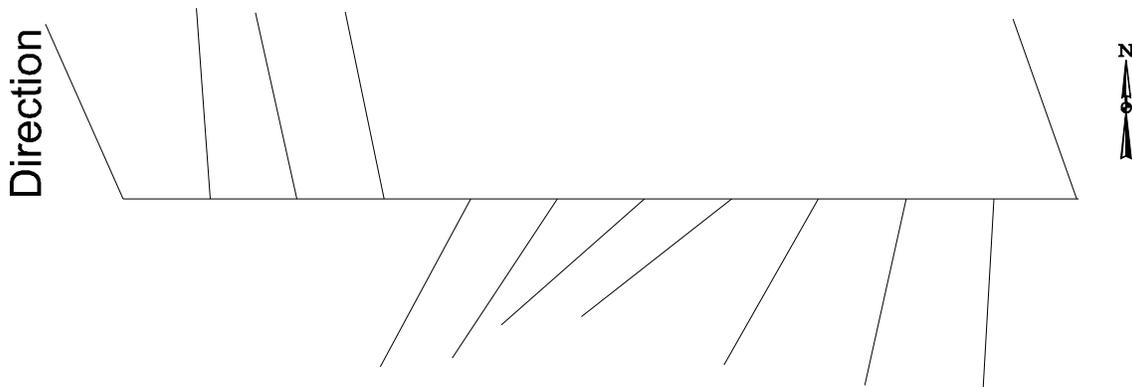
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1	341.5	351.6	353.7	333.9	352.7	231.5	145.5	333.4	279.3	211.7	244.4	224.2
2	210.9	357.6	356.8	343.9	11.2	197.7	171.5	347.3	202.5	191.7	192.8	216.3
3	199.3	352.1	354.7	4.5	5.7	236.2	272.4	319.0	215.1	205.0	188.7	345.8
4	283.4	1.5	9.6	353.2	341.5	234.0	202.3	243.3	191.1	170.8	239.3	352.3
5	334.2	358.3	352.4	346.7	333.8	232.4	221.0	215.3	170.8	153.0	243.3	341.7
6	328.8	356.4	337.4	356.8	309.3	283.7	221.1	230.3	217.6	187.9	275.8	336.0
7	344.3	358.6	335.3	347.6	233.3	204.1	202.1	157.9	199.1	181.4	267.6	342.4
8	271.2	7.3	343.0	3.5	204.2	328.8	227.2	175.0	259.4	176.8	207.5	349.8
9	10.4	359.7	344.2	300.8	347.7	328.0	208.5	236.5	236.9	206.7	241.7	227.5
10	359.9	338.6	293.1	280.3	276.7	346.4	327.5	230.6	267.4	219.4	300.9	344.1
11	352.8	359.4	355.0	343.2	355.5	327.5	328.0	267.7	231.8	183.2	332.9	356.8
12	236.2	22.8	18.3	351.8	270.2	220.1	224.9	221.7	222.1	197.8	231.3	201.4
13	337.3	353.8	356.6	356.9	199.1	232.4	224.8	304.3	264.7	175.3	209.6	269.6
14	357.5	16.4	351.2	6.0	180.2	204.5	269.6	237.7	258.5	173.3	205.3	259.7
15	261.6	344.8	332.7	341.0	214.0	240.2	253.2	232.0	250.7	163.9	172.5	343.6
16	257.3	320.2	301.7	356.6	184.1	212.4	221.0	270.4	220.9	154.3	174.0	302.4
17	266.4	357.6	272.2	357.5	173.4	216.1	341.2	201.0	203.5	180.3	157.4	282.7
18	245.6	349.2	286.2	9.8	145.9	203.1	344.9	167.0	307.6	173.8	170.6	292.6
19	317.5	3.5	357.7	333.9	216.7	219.2	204.8	217.9	205.6	218.1	174.8	337.3
20	355.2	359.5	345.4	335.6	171.2	194.4	215.6	277.5	209.7	200.4	192.8	349.4
21	334.9	338.2	343.1	17.8	170.8	186.2	322.7	183.5	159.4	186.1	177.2	357.1
22	349.7	3.3	355.6	15.0	214.5	242.9	297.3	236.2	206.2	249.6	173.5	6.6
23	305.5	348.4	0.7	13.5	197.2	220.4	224.7	247.7	245.1	196.1	131.6	350.2
24	5.1	342.9	8.0	351.9	196.2	180.2	289.1	209.7	222.3	230.1	103.8	6.8
25	13.8	337.9	346.9	358.6	217.2	185.6	256.0	181.6	192.6	284.2	156.5	359.8
26	358.1	353.6	345.7	353.9	162.9	147.0	233.1	194.6	179.9	303.6	124.1	345.8
27	5.0	352.1	357.7	318.3	189.2	184.4	186.9	235.6	228.2	277.8	126.4	354.8
28	9.3	4.2	3.9	253.3	219.0	171.3	137.3	257.9	195.5	185.6	114.4	4.5
29	4.0	17.6	344.8	193.0	199.5	181.9	326.3	319.7	165.7	189.5	163.2	5.4
30	341.8		343.0	215.4	200.9	189.7	344.1	285.7	211.4	227.5	235.8	0.3
31	344.3		345.6		223.8		331.3	301.0		217.0		357.4



Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

## Average Monthly Wind Speed and Direction

	Long-term Av. (1972-1995)			1996	
	Speed	S.D.	Direction	Speed	Direction
<b>January</b>	6.7	2.3	3.5	5.64	336.0
<b>February</b>	7.8	2.4	7.7	7.79	355.9
<b>March</b>	7.3	2.5	5.0	6.90	347.4
<b>April</b>	6.4	1.7	354.5	6.58	348.3
<b>May</b>	3.5	1.1	313.4	2.91	208.3
<b>June</b>	2.6	0.9	284.0	2.27	213.3
<b>July</b>	3.0	1.1	323.7	2.55	228.4
<b>August</b>	2.8	0.9	263.6	2.66	231.8
<b>September</b>	2.5	1.1	234.0	2.45	209.4
<b>October</b>	2.5	1.0	227.6	2.44	192.4
<b>November</b>	3.2	1.3	262.4	2.71	183.0
<b>December</b>	5.0	1.8	340.7	4.94	340.2



## Estimated Evapotranspiration and Water Balance

	<b>Evapotranspiration (mm eq.)</b>		<b>Net Water Balance (mm eq.)</b>	
	<b>'El Claro'</b>	<b>40 m</b>	<b>'El Claro'</b>	<b>40 m</b>
<b>January</b>	<b>46.0</b>	<b>110.0</b>	31.8	-32.2
<b>February</b>	<b>75.0</b>	<b>139.5</b>	2.1	-62.4
<b>March</b>	<b>96.5</b>	<b>158.5</b>	-14.9	-76.9
<b>April</b>	<b>110.5</b>	<b>168.5</b>	-92.3	-150.3
<b>May</b>	<b>47.0</b>	<b>91.5</b>	297.1	252.6
<b>June</b>	<b>8.0</b>	<b>42.0</b>	184.2	150.2
<b>July</b>	<b>49.6</b>	<b>50.8</b>	46.4	45.2
<b>August</b>	<b>60.7</b>	<b>83.6</b>	76.6	53.7
<b>September</b>	<b>64.0</b>	<b>72.5</b>	75.1	66.6
<b>October</b>	<b>54.0</b>	<b>72.0</b>	99.1	81.1
<b>November</b>	<b>29.5</b>	<b>37.0</b>	108.5	101.0
<b>December</b>	<b>49.0</b>	<b>92.5</b>	-21.5	-65.0

Net Water Balance (1994-96)