Meteorological Annual Report for 1997

by

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ANNUAL METEOROLOGICAL REPORT FOR 1997 (U)

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Executive Summary

An analysis of meteorological data collected at the Savannah River Site (SRS) in 1997 shows that overall weather conditions for the year were relatively cool and wet. The average temperature for 1997 was 63.7°F which is about 1°F below the annual average for the 30-year period 1968-97. June 1997 had the lowest average temperature of any June in the 34 years for which temperature records are available at SRS ; moreover, the average temperature for the summer months (June, July, and August) was the third lowest for any summer on record. Conversely, the average temperature for March 1997 was the highest for any March in the 34-year record. Temperature extremes for 1997 ranged from a minimum of 18.6°F on January 18 to a maximum of 99.1°F on August 15.

Wet weather during the last three months of the year was due to the development of a strong El Nino event (NOAA, 1998). Total rainfall for December 1997, 10.19 inches, was the highest for a December in the 46 year period of record for precipitation. Monthly rainfall was above average each month except March, May, and August. The greatest 24-hour rainfall during the year was 2.82 inches on December 24. Daily rainfall in excess of 2 inches occurred on April 28, June 28, and September 25. No snow was recorded.

The annual average wind speed at the Central Climatology meteorology tower near N Area was 5.8 mph which is very nearly equal to the average wind speed at that station for the 7-year period 1991-97. The 1997 data also showed a slightly higher frequency of west to northwest winds and a slightly lower frequency of northeast winds than was observed in the 5-year period 1992-96. A winter storm which developed over the Mid-Atlantic States March 30-31 produced the most notable period of sustained strong winds. Daily and 15-minute average wind speeds of 15.3 miles per hour (mph) and 25.1 mph, respectively, were recorded at Central Climatology.

Monthly average relative humidity for the year was lowest during the spring months (52 percent in April) and highest in the summer and fall (79 percent in October). The average relative humidity for the year was 70 percent and the average daily minimum relative humidity, which typically occurs during the afternoon, was 46 percent.

No tropical weather systems affected the SRS region in 1997. Tropical weather activity in the Atlantic basin during the year was below average due to the effects of the developing El Nino (NOAA, 1998)

Summary plots of 1997 daily minimum/maximum temperature, 24-hour total

precipitation, daily minimum relative humidity, and daily average wind speed are shown in Figure 1.

Introduction

General SRS Climate

The southeastern U. S. has a humid subtropical climate characterized by relatively short, mild winters and long, warm, and humid summers (Oliver and Fairbridge, 1987).

Summer-like weather conditions typically last from May through September, when the area is under the influence of the western extension of the semi-permanent Atlantic subtropical anticyclone (i.e. the 'Bermuda' high). Winds in summer are light and cold fronts generally remain well north of the area. Daily high temperatures during the summer months exceed 90°F on more than half of all days on the average. The persistent heat and humidity often result in scattered afternoon and evening thunderstorms.

The influence of the Bermuda high begins to wane during the fall, resulting in lower humidity and more moderate temperatures. Average rainfall during the fall is usually the least of the four seasons.

The weather is quite changeable during the winter months, as mid-latitude low pressure systems and fronts migrate through the region. Weather conditions frequently alternate between warm, moist, subtropical air from the Gulf of Mexico region and cool, dry polar air. The Appalachian Mountains to the north and northwest of the SRS help to moderate the extremely cold temperatures associated with occasional outbreaks of Arctic air. As a result, less than one-third of winter days have minimum temperatures below freezing on the average and days with temperatures below 20°F are infrequent. Measurable snowfall is rare.

Spring is characterized by a higher frequency of occurrence of tornadoes and severe thunderstorms than the other seasons. Although spring weather is somewhat windy, temperatures are mild and the humidity is relatively low.

Detailed descriptions of the climate of the SRS are contained in Hunter (1989), Hoel (1984), and Weber (1993).

SRS Meteorological Monitoring Program

The Atmospheric Technologies Group (ATG) of SRTC collects, archives, and analyzes basic meteorological data supporting a variety of activities at SRS

including the design, construction, and operation of nuclear and non-nuclear facilities, emergency response, environmental compliance, resource management, and environmental research.

The ATG maintains a network of eight 200-foot meteorological observation towers located at A, C, D, F, H, K, L, and P areas. Additional meteorological instrumentation is located at the Central Climatology facility near N-area, which includes a 200-foot observation tower, and on the 1000-foot WJBF-TV tower near Beech Island, SC. Measurements of wind speed, direction, turbulence, air temperature, and dew point temperature are taken at a height of 200 feet above ground on all of the site towers. Identical measurements are made on the Central Climatology tower at heights of 13, 58, 116, and 200 feet. Additional measurements conducted at Central Climatology consist of precipitation, evaporation, solar radiation, barometric pressure, and soil temperature. At the WJBF-TV tower, measurements of wind speed, direction, turbulence, and air temperature are recorded at seven levels through 1000 feet. A measurement from each sensor in the network is taken at 1.5-second intervals by a centrally located computer. Fifteen minute averages and standard deviations are computed and stored in a relational database.

Additional measurements of temperature and relative humidity are taken with a hygrothermograph mounted in a standard National Weather Service 'cotton region' instrument shelter adjacent to Building 773-A. Data from the hygrothermograph are continuously output to a strip chart recorder. Daily maximum and minimum values of temperature and relative humidity are manually extracted from the strip charts and entered into a computer database. Daily precipitation is measured with a plastic wedge rain gauge located adjacent to the instrument shelter. Rainfall measurements are taken once per day, usually around 9 AM. Data collection at or near the 773-A site has been conducted since 1952 and the data have been used extensively in basic descriptions of the SRS climate. The data recorded at this site are subject to a manual quality control inspection to ensure the reasonableness of the data; nevertheless, some errors may be present in the data record.

A map showing each of the measurement locations is given in Attachment A. Parker and Addis (1994) and Kurzeja (1993) provide detailed descriptions of the ATG meteorological monitoring facilities and instrumentation.

Data Sources for the 1997 Annual Meteorological Report

This report contains tabular and graphical summaries of data collected during 1997 for temperature, precipitation, relative humidity, wind, barometric pressure, and solar radiation. Most of these data were collected at the Central

Climatology facility. (Relative humidity is calculated from measurements of dew point temperature.) Summaries of temperature and relative humidity were generated with data from the lowest level of measurement at the Central Climatology tower (13 feet above ground). Wind speed summaries were generated with data from the second measurement level (58 feet above ground). Wind speed measurements from this level are believed to best represent open, well-exposed areas of the Site. In addition, seasonal and annual summaries of the joint frequency of occurrence of wind direction sector by wind speed category (i.e. wind roses) are provided for the Central Climatology tower (200-foot level only) and each of the eight area towers.

Long-term averages and extremes of temperature, precipitation, and relative humidity are based on data collected from the 773-A instrument shelter through 1994 and the Central Climatology from 1995 to the present.

Valid data recovery for the onsite monitoring towers in 1997 is summarized below:

	Tower	Data Recovery (%)
Area Towers:	A-Area	93.8
	C-Area	96.3
	D-Area (61m)	98.1
	F-Area	98.5
	H-Area	95.6
	K-Area	97.8
	L-Area	96.0
	P-Area	97.2
Central Climatology:	61-m	91.9
	36-m	91.5
	18-m	91.1
	4-m	96.8

Data Summaries

Overview

Annual and monthly averages and extremes for each of the meteorological variables summarized this report are given in Table 1. Plots of daily minimum and maximum temperatures, 24-hour total precipitation, daily minimum relative humidity, and daily average wind speed are shown in Figure 1.

The first three months of the year were dominated by a persistent presence of the

south Atlantic subtropical high over Florida. This pattern produced frequent periods of relatively warm, moist southwesterly airflow over the southeast U. S. Above average temperatures were observed at SRS in January (+2.3°F), February (+3.6°F), and March (+6.5°F). The average temperature for March 1997 (63.6°F) was the warmest of any March in the 34 years for which temperature records are available at SRS. Temperatures below freezing were observed only 3 days in February and March, well below the average of 12 'freezing' days for these months.

A temporary weakening of the subtropical high in mid-January brought Arctic high pressure into the region on two occasions. The coldest day of the year occurred on January 18 when the morning low dropped to 18.6°F, following a high temperature of only 36°F the previous day.

A winter storm which developed over the Mid-Atlantic States March 30-31 produced the most notable period of sustained strong winds. Daily and 15-minute average wind speeds of 15.3 miles per hour (mph) and 25.1 mph, respectively, were recorded at Central Climatology. Otherwise, winds were relatively light during the winter period as the persistent subtropical high kept winter storms well north of the area.

Frequent periods of relatively cool weather affected much of the eastern U. S. during the remainder of 1997 (NOAA, 1998). For April through August, the cool weather was the result of re-development of a negative phase North Atlantic oscillation (NAO). The NAO is an unusual hemispheric circulation pattern which produces an intensification and southward migration of the polar jet stream across central and eastern North America (NOAA, 1997).

Observed temperatures for April, May, and June were all more than three degrees below their respective 30-year averages. Moreover, the June 1997 average of 74.0°F (4.7°F below average) was the lowest for any June in the 34 year record and the average temperature for the summer months of 1997 (June, July, and August) was the third lowest for any summer on record.

A temporary repositioning of the 'Bermuda' high over the southeast U. S. brought relatively hot weather to SRS on two occasions: late June and mid August. The hottest temperature of the year, 99.1°F was recorded August 15. High temperatures during the summer reached 90°F or higher on 50 days, which is about one-third less than the annual average total of 76 days.

Cool, cloudy, and increasingly wet weather over the last three months of the year ~~was~~ ^{were} the result of storminess associated with a strengthening subtropical jet stream over the southern half on the U. S. The subtropical jet, characterized by strong west to east winds aloft, becomes very pronounced during the Northern

Hemisphere cool season when mature El Nino conditions are present in the eastern Pacific. Above normal rainfall was observed during September through December. Furthermore, total rainfall in December 1997 (10.12 inches) was the greatest for any December in the 46 years of precipitation records at SRS. The greatest 24-hour rainfall for the year, 2.82 inches, occurred on December 24.

Detailed Summaries by Variable

Temperature

Figure 2 shows a plot of 1997 daily minimum and maximum temperature. Annual and monthly average temperatures for the 30-year period 1968-97 are summarized in Table 2 and plotted in Figures 3 and 4.

Temperatures for 1997 ranged from a minimum of 18.6°F, observed on the morning of January 18, to a maximum of 99.1°F, observed on the afternoon of August 15. The average temperature for 1997 was 63.7°F which is about 1°F below the average for the 30-year period 1968-97.

July was the warmest month of the year with an average daily maximum of 90.3°F and an average daily minimum of 70.2°F; December was the coldest month with an average daily high of 55.4°F and an average daily low of 38.5°F. Monthly average temperatures for 1997 were below their respective 30-year averages for each month except January, February and March. March was particularly warm with an average temperature that was the highest of any March in the 34 years for which temperature records are available. Conversely, the average temperature for June was the lowest for any June on record. The months of April, May, and November also were particularly cool with monthly average temperatures generally more than 3°F below their respective 30-year averages. High temperatures greater than 90°F were observed on only 50 days during the year (see Fig. 5). The average number of days per year with temperatures equal to or exceeding 90°F is 74. Nearly half of the total 'hot' days for 1997 occurred in July (19 days). Minimum temperatures below 32°F were observed on 26 days, which is less than the 30-year mean of 37 'freeze days' per year.

Precipitation

Daily precipitation for 1997 is summarized graphically in Figure 6. Annual and monthly rainfall since 1968 is summarized in Table 3 and plotted in figures 7 and

8, respectively.

Rainfall of 0.01 inches or more was observed on 112 days during the year. The maximum 24-hour rainfall was 2.82 inches on December 24. Daily rainfall in excess of 2 inches also occurred on April 28, June 18, and September 25.

Total precipitation for 1997 was 62.4 inches, which is about 12.4 inches above the average annual total for the 30-year period 1968-97. Annual rainfalls greater than the 1997 total has occurred only twice in the 46 years for which precipitation records are available (1971 and 1964). Above average rainfall was recorded in every month except March, May, and August. The total rainfall for December 1997, 10.12 inches, was the highest for any December over the 46 years of record.

Relative Humidity

A plot of daily minimum and maximum relative humidity is shown in Figure 9. Annual average relative humidity and monthly average minimum relative humidity, is plotted in figures 10 and 11, respectively.

The lowest relative humidity observed in 1997 was 14 percent on April 1, associated with a strong high pressure over the southeast US. Daily minimum relative humidity was frequently less than 30 percent during the winter and spring months, but rarely below 40 percent during the summer and fall.

The average relative humidity for 1997 was 70 percent, slightly higher than the average value of 68 percent for the 30-year period 1968-97. The average daily maximum for 1997 was 88.4 percent and the average daily minimum was 43.4 percent. Monthly average relative humidity ranged from 52.5 percent in April to 79.2 percent in October. The monthly averages of daily minimum relative humidity in 1997 were below 30-year averages during the spring as high pressure dominated the area, and greater than the 30-year averages during the early to mid summer period and throughout a relatively wet fall.

Wind

A plot of daily average wind speed for 1997 is shown in Figure 12. The annual average wind speed (surface) was 5.8 mph, which is very nearly equal to an average of 5.7 mph at Central Climatology over the 7-year period 1991-97. Monthly average speeds ranged from 7.0 mph in March to 4.2 mph in November. A winter storm, which developed over the Mid-Atlantic States March 30-31, produced the most notable period of sustained strong winds. Daily and 15-minute average wind speeds of 15.3 miles per hour (mph) and 25.1 mph, respectively. The maximum instantaneous gust for the year, 58.3 mph, occurred during a thunderstorm on April 23.

Annual and seasonal wind rose plots for wind data collected at the 200-foot level of the Central Climatology tower are shown in figures 13 and 14, respectively. Annual and seasonal wind roses for a five-year data set, 1992-96, are shown in figures 13 and 15, respectively. *(The 5-year wind rose data set is comprised primarily of measurements from the H-area tower, approximately 3 miles northeast of Central Climatology).*

The annual wind rose for 1997 shows west to northwest winds occurred about 1 percent more often, and northeast winds occurred about 1 percent less often than were observed during the 1992-96 period (Fig. 13). The annual average wind speed at the 200-foot level of the Central Climatology tower was 9.2 mph, slightly higher than the average of 9.0 mph over the 7-year period 1991-97.

Wind roses for the A, C, D, and F area towers and for the H, K, L, and P area towers are shown in figures 16 and 17, respectively. Wind roses for each of the area towers are similar, except for the D-area tower. Since the D area is located in the Savannah River valley, channeling of the wind by nearby higher terrain to the northeast and southwest resulted in slightly higher frequencies of northwest and southeasterly winds than was observed at the other towers. Annual average wind speeds for the area towers ranged from 7.7 mph at the D area tower to 9.2 mph at the C and P area towers. The frequency statistics used to generate the wind rose plots in figures 13-17 are summarized in Appendix A.

Barometric Pressure

Average barometric pressure for 1997 was 1005.8 millibars (mb). The lowest daily average value, 985 mb, occurred on April 23 as a low pressure system moved over the area. The highest daily average value, 1024.6 mb, occurred on February 18 during the passage of a strong Arctic high pressure. Daily average barometric pressure is plotted in Figure 18. The greatest variability in daily average pressure occurred in January through March and again in November through December as mid-latitude low pressure systems and fronts begin to migrate through the area.

Solar Radiation

The average daily total solar radiation for the year was 374 langleys per day (ly/day). Monthly average daily values ranged from 530 ly/day in July to 185 ly/day in December. A comparison of observed daily solar radiation to a theoretical, clear sky maximum was performed to infer relative cloudiness. The theoretical values were estimated from tables in Budyko (1974). March, April and August were the 'sunniest' months with an observed average daily solar radiation in excess of 70 percent of the theoretical maximum for the month.

December was the 'cloudiest' month with an observed average daily solar radiation of 56 percent of the theoretical maximum. Daily total solar radiation is plotted in Figure 19.

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Table 1. Means and Extremes of SRS Meteorological Data for 1997

Month	Temperatures (°F)												Precipitation (in)						
	Average				Extremes				Number of Days				Total	Departure	Greatest in 24 Hrs	Date	No. of Days		
	Daily Maximum	Daily Minimum	Month	Departure	Highest	Date	Lowest	Date	Maximum Above 90 °F	Maximum Above 100 °F	Minimum Below 32 °F	Minimum Below 20 °F					Greater Than 0.01 in.	Greater Than 0.1 in.	Greater Than 0.5 in.
Jan	57.6	38.7	48.2	2.3	74.5	1/25	18.6	1/18	0	0	11	1	4.73	0.25	1.14	1/16	10	7	5
Feb	63.1	42.8	52.9	3.6	81.7	2/27	25.2	2/12	0	0	3	0	6.11	1.78	1.77	2/22	8	5	5
Mar	75.2	52.0	63.6	6.5	83.9	3/28	32.4	3/4	0	0	0	0	3.04	-1.70	1.44	3/14	6	4	2
Apr	73.1	49.2	61.2	-3.4	82.3	4/21	32.7	4/18	0	0	0	0	3.98	0.93	2.40	4/28	9	4	1
May	79.5	57.4	68.5	-3.6	88.3	5/26	42.8	5/5	0	0	0	0	3.19	-0.61	0.87	5/3	8	5	4
Jun	82.4	65.6	74.0	-4.7	91.0	6/26	55.8	6/6	5	0	0	0	7.32	2.65	2.14	6/28	12	9	5
Jul	90.3	70.2	80.2	-1.7	97.4	7/4	61.3	7/31	19	0	0	0	5.94	0.42	1.51	7/24	13	11	4
Aug	90.5	67.6	79.0	-1.4	99.1	8/16	58.7	8/25	17	0	0	0	2.22	-3.05	0.78	8/18	8	5	1
Sep	85.0	65.0	75.0	-0.7	96.7	9/20	52.4	9/6	9	0	0	0	5.41	1.66	2.57	9/25	8	6	3
Oct	73.6	54.5	64.1	-1.6	86.1	10/6	38.3	10/27	0	0	0	0	5.49	1.96	1.93	10/26	9	7	3
Nov	61.7	41.5	51.6	-4.6	71.7	11/21	25.7	11/17	0	0	4	0	4.87	1.87	1.70	11/13	11	7	3
Dec	55.7	38.5	47.1	-1.9	68.8	12/1	26.1	12/8	0	0	8	0	10.12	6.30	2.82	12/24	10	7	7
Year	74.0	53.6	63.8	-0.9	99.1	8/16	18.6	1/18	50	0	26	1	62.42	12.45	2.82	12/24	112	77	43

Table 1. Means and Extremes of SRS Meteorological Data for 1997 (cont'd)

Month	Wind Speed (mph)				Barometric Pressure (mb)					Solar Radiation (ly)						Relative Humidity (%)				
	Monthly Average	Max 15-min Average	Max Instantaneous	Date	Average	Lowest	Date	Highest	Date	Average Daily Total	% of Theoretical Max	Minimum Daily Total	Date	Maximum Daily Total	Date	Avg. Daily Maximum	Avg. Daily Minimum	Monthly	Lowest	Date
Jan	6.9	26.9	44.4	1/24	1009.2	992.1	1/9	1020.8	1/14	219.6	0.61	33.4	1/9	350.8	1/17	81.9	41.9	64.4	19.7	1/25
Feb	5.4	17.3	32.6	2/21	1011.5	1001.2	2/8	1024.6	2/18	259.2	0.58	28.3	2/13	428.0	2/17	84.1	44.7	67.1	26.5	2/5
Mar	7.0	25.1	56.6	3/31	1007.3	993.2	3/22	1019.8	3/16	408.9	0.72	140.7	3/21	603.4	3/31	77.2	35.6	56.9	17.1	3/22
Apr	6.8	23.1	58.3	4/23	1004.1	985.4	4/23	1017.0	4/10	476.9	0.70	123.8	4/27	658.5	4/18	71.3	33.5	52.5	13.8	4/1
May	5.8	19.4	38.9	5/25	1005.4	995.5	5/13	1014.9	5/5	500.5	0.67	189.0	5/27	719.3	5/6	86.7	39.6	62.9	22.0	5/16
Jun	5.4	15.1	40.2	6/14	1003.4	994.2	6/2	1010.3	6/10	472.4	0.60	178.1	6/6	655.9	6/10	92.5	52.9	76.1	27.6	6/10
Jul	4.8	20.3	37.3	7/9	1004.4	996.9	7/3	1012.3	7/31	530.9	0.69	104.9	7/31	696.5	7/10	94.9	51.4	76.3	34.8	7/4
Aug	5.0	22.9	40.4	8/18	1005.4	998.0	8/21	1012.1	8/8	504.5	0.71	235.2	8/9	660.1	8/26	93.5	42.9	70.8	27.7	8/8
Sep	5.3	19.8	34.1	9/3	1003.6	994.0	9/28	1012.4	9/22	377.7	0.62	55.2	9/25	613.1	9/6	92.1	46.3	72.7	25.0	9/20
Oct	4.5	20.0	33.9	10/28	1006.8	994.5	10/27	1016.1	10/10	300.9	0.60	35.7	10/26	488.3	10/2	95.4	55.4	79.2	33.4	10/3
Nov	4.2	22.0	27.7	11/3	1005.4	988.0	11/30	1020.6	11/17	254.7	0.64	38.7	11/13	414.5	11/4	96.0	50.2	77.7	23.6	11/27
Dec	6.1	21.7	35.5	12/31	1003.6	987.8	12/1	1017.0	12/31	185.3	0.56	18.2	12/24	350.5	12/28	94.8	51.8	77.3	26.8	12/17
Year	5.6	26.9	58.3	11/17	1005.8	985.4	4/23	1024.6	2/18	374.3	0.64	18.2	12/24	719.3	5/6	88.4	45.5	69.5	13.8	4/1

Table 2. Monthly and Annual Average and Extreme Temperatures, 1968-1997

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1968	43.5	43.4	57.1	66.5	71.3	80.0	83.1	82.8	77.0	67.0	55.4	45.9	64.4
1969	46.5	46.6	51.5	64.5	70.5	80.3	83.3	77.6	72.8	66.1	52.1	45.4	63.1
1970	39.0	47.2	55.9	66.8	74.2	79.0	81.1	80.8	78.6	67.0	51.6	49.3	64.2
1971	44.6	46.4	49.5	63.4	70.7	81.3	80.7	80.4	75.2	70.2	55.5	56.9	64.6
1972	51.7	45.6	57.6	67.4	72.4	75.3	79.7	80.6	77.2	64.8	54.4	53.2	65.0
1973	46.1	45.9	60.7	61.9	70.5	77.7	79.1	74.5	70.5	62.4	59.0	50.3	63.2
1974	59.6	50.8	62.2	66.2	75.3	77.5	81.5	80.9	75.3	64.5	56.6	49.0	66.6
1975	51.4	53.2	55.8	63.9	75.6	79.1	79.7	82.4	75.7	68.7	59.3	48.5	66.1
1976	44.2	55.7	61.5	64.8	68.9	75.6	80.4	78.0	73.1	60.1	48.7	44.8	63.0
1977	35.3	47.1	60.0	66.9	73.3	80.6	83.6	80.6	77.9	62.1	58.2	46.7	64.4
1978	39.3	41.3	54.2	65.7	70.9	79.7	82.1	81.2	77.1	65.6	60.7	49.6	64.0
1979	42.1	44.6	57.5	64.5	71.3	75.1	79.6	80.5	73.4	64.8	57.4	47.4	63.2
1980	45.9	44.3	52.6	63.5	71.2	78.3	83.8	82.5	79.2	62.7	52.8	46.0	63.6
1981	40.4	48.5	53.0	67.0	68.6	81.3	81.3	76.3	74.0	62.1	54.4	43.2	62.5
1982	43.0	50.0	58.9	62.4	75.7	78.8	80.9	80.1	75.0	66.2	58.7	54.8	65.4
1983	43.3	48.0	55.3	59.4	66.8	76.7	84.3	83.9	74.8	67.2	56.4	45.8	63.5
1984	45.0	51.7	56.5	62.6	71.9	80.1	80.1	80.8	74.0	73.4	53.4	56.9	65.5
1985	42.9	49.5	60.2	67.5	74.5	80.8	81.1	79.7	75.7	70.8	65.5	45.4	66.1
1986	45.4	54.6	57.9	66.4	74.4	82.7	86.9	80.1	78.4	67.1	61.3	49.3	67.0
1987	46.2	48.6	56.5	62.3	74.5	79.9	82.8	83.8	76.6	60.7	59.1	52.9	65.3
1988	42.3	47.8	56.8	64.2	70.4	76.8	81.6	81.4	75.4	61.2	58.0	49.1	63.8
1989	52.2	52.0	58.3	64.2	70.6	79.8	81.4	80.9	75.3	67.3	52.4	44.2	64.9
1990	54.9	57.5	60.0	64.0	72.9	80.5	83.7	83.8	79.0	69.4	59.9	54.6	68.4
1991	47.9	54.1	60.3	69.2	76.9	79.5	83.6	81.2	77.4	68.1	55.4	54.0	67.3
1992	49.5	54.1	57.2	65.0	71.2	78.9	83.7	80.7	76.9	65.0	57.1	48.0	65.6
1993	51.7	47.8	53.2	58.9	69.7	78.2	83.6	80.0	75.2	62.8	55.2	43.6	63.3
1994	41.5	50.1	60.2	68.0	71.2	82.3	81.8	81.2	77.4	67.2	62.3	53.3	66.4
1995	45.5	49.9	58.6	65.9	73.5	75.0	79.9	79.0	71.8	65.9	50.8	43.8	63.3
1996	44.6	50.1	50.6	61.6	72.9	76.5	79.3	76.0	72.7	62.1	51.6	48.8	62.2
1997	48.2	52.9	63.3	61.2	68.5	74.0	80.2	79.0	75.0	64.1	51.6	47.0	63.7

Avg	45.8	49.3	57.1	64.5	72.0	78.7	81.8	80.4	75.6	65.6	56.2	48.9	64.7
Lowest Mon	35.3	41.3	49.5	58.9	66.8	74.0	79.1	74.5	70.5	60.1	48.7	43.2	62.2
Yr Lowest	1977	1978	1971	1993	1983	1997	1967	1973	1973	1976	1976	1981	1996
Rec Low	-3	10	11	29	38	48	56	56	41	28	18	5	-3
Yr Rec	1985	1996	1980	1983	1989	1984	1963	1986	1967	1976	1970	1962	1985
Highest Mon	59.6	57.5	63.3	69.2	76.9	82.7	86.9	83.9	79.2	73.4	65.5	56.9	68.4
Yr Highest	1974	1990	1997	1991	1991	1986	1986	1983	1980	1984	1985	1971	1990
Rec High	86	86	90	99	102	105	107	107	104	96	89	82	107
Yr Rec	1975	1989	1974	1986	1963	1985	1986	1983	1990	1986	19874	1984	1986

Table 3. Monthly and Annual Rainfall, 1968-1997

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1968	3.98	0.94	1.49	2.12	3.46	6.20	3.88	4.27	2.24	3.00	3.39	2.73	37.70
1969	2.00	2.46	3.38	4.09	3.02	3.95	2.71	5.42	4.56	1.16	0.40	4.19	37.34
1970	2.79	2.69	7.36	1.38	4.16	3.46	4.85	3.79	1.71	5.01	1.68	4.92	43.80
1971	5.11	4.16	8.68	2.92	2.98	5.92	10.53	8.76	3.80	5.95	2.31	2.89	64.01
1972	8.91	4.42	2.82	0.57	4.72	6.57	2.64	6.05	1.47	1.20	3.56	5.23	48.16
1973	5.36	5.26	6.38	4.58	3.50	10.89	6.04	3.81	3.71	1.22	0.31	4.64	55.70
1974	2.58	7.03	2.87	2.93	4.15	2.79	4.08	6.27	3.22	0.08	2.19	3.83	42.02
1975	4.98	6.64	5.91	4.42	5.15	3.84	8.55	3.83	5.18	1.74	3.41	2.03	55.68
1976	4.18	1.08	3.83	2.50	10.90	4.35	1.95	1.64	5.48	4.92	4.19	5.08	50.10
1977	3.72	1.63	6.86	1.27	1.76	2.47	3.42	7.30	5.50	4.27	1.63	3.86	43.69
1978	10.02	1.32	3.07	3.53	3.64	3.43	4.14	5.11	4.06	0.06	3.54	1.88	43.80
1979	3.59	7.74	3.09	6.49	8.94	1.54	7.85	2.12	6.13	1.35	3.95	2.17	54.96
1980	5.12	3.48	10.96	1.69	3.49	2.99	0.90	2.03	5.86	2.14	2.50	1.91	43.07
1981	0.89	5.02	4.72	2.07	6.90	4.29	3.97	5.79	0.54	2.81	1.00	9.55	47.55
1982	3.94	4.45	2.50	5.68	2.72	4.27	11.48	5.00	4.62	3.87	2.40	4.83	55.76
1983	3.77	7.21	6.77	5.77	1.67	6.57	4.85	6.32	3.46	1.92	5.38	4.15	57.84
1984	3.51	7.09	6.05	8.00	9.79	2.54	7.28	5.52	0.60	0.31	0.90	1.38	52.97
1985	3.01	6.91	1.31	0.84	1.70	4.61	8.10	4.37	0.49	6.34	6.36	2.48	46.52
1986	1.46	3.56	4.08	1.44	3.83	3.00	2.96	10.89	1.54	4.18	5.82	5.82	48.58
1987	7.39	7.55	4.97	0.69	3.57	5.64	4.86	4.92	3.55	0.29	2.74	1.41	47.58
1988	4.15	3.18	2.90	4.75	2.85	7.11	1.78	6.77	4.40	3.39	2.16	2.91	46.35
1989	1.42	3.59	5.52	4.89	2.60	6.67	11.46	3.27	4.87	3.35	2.99	4.41	55.04
1990	3.07	2.38	2.37	1.21	2.95	0.89	7.31	8.07	0.62	19.62	3.11	1.57	53.17
1991	7.03	1.84	5.44	4.73	3.06	2.17	7.89	9.26	4.40	0.99	1.55	3.32	51.68
1992	4.45	3.89	2.98	2.40	1.34	6.27	3.69	4.84	6.38	3.11	7.78	2.86	49.99
1993	7.50	3.62	8.37	1.75	1.43	3.27	3.12	2.48	7.29	4.13	1.87	1.81	46.64
1994	4.80	3.91	6.42	1.04	1.45	5.08	7.47	3.47	1.67	10.01	3.05	4.62	52.99
1995	6.95	7.97	0.91	1.28	1.77	8.15	5.71	6.92	5.75	2.64	2.38	4.47	54.90
1996	3.97	2.71	7.27	2.62	3.31	3.36	6.24	7.70	4.03	2.35	1.65	3.49	48.70
1997	4.73	6.11	3.04	3.98	3.19	7.67	5.94	2.22	5.41	4.6	5.69	10.19	62.77

Avg	4.48	4.33	4.74	3.05	3.80	4.67	5.52	5.27	3.75	3.53	3.00	3.82	49.97
Min	0.89	0.94	0.91	0.57	1.31	0.89	0.90	1.04	0.49	0.06	0.21	0.46	28.82
Yr Min	1981	1968	1995	1972	1965	1990	1980	1963	1985	1963	1958	1955	1954
Max	10.02	7.97	10.96	8.20	10.90	10.89	11.48	12.34	8.71	19.62	7.78	10.19	73.47
Yr Max	1978	1995	1980	1961	1976	1973	1982	1964	1959	1990	1992	1997	1964

Figure 1. Summary of Daily Data for 1997

Figure 2. 1997 Daily High and Low Temperatures

Figure 3. SRS Annual Average Temperature 1968-1997

Figure 4. SRS Monthly Average Temperature

Figure 5. Number of Freezing (<32 F) and Sweltering (>90 F) Days

Figure 6. 1997 Daily Precipitation

Figure 7. SRS Annual Precipitation 1968-1997

Figure 8. SRS Monthly Precipitation

Figure 9. 1997 Daily High and Low Humidity

Figure 10. SRS Annual Average Humidity 1968-1997

Figure 11. SRS Monthly Average Minimum Humidity

Figure 12. 1997 Daily Average Wind Speed

FIGURE 13. Annual Wind Rose Plots

Windrose plot depicts the frequency of the direction from which the wind is blowing and the wind speeds

FIGURE 14. Seasonal Wind Roses for 1997

Winter 97

Spring 97

Summer 97

Fall 97

Wind Speed Class Boundaries
(Meters/Second)

Windrose plot depicts the frequency of the direction from which the wind is blowing and the wind speeds

FIGURE 15. Seasonal Wind Roses, 1992-96

Winter 1992-96

Spring 1992-96

Summer 1992-96

Fall 1992-96

0.0 2.0 4.0 6.0 8.0 12.0

Wind Speed Class Boundaries
(Meters/Second)

Windrose plot depicts the frequency of the direction from which the wind is blowing and the wind speeds

FIGURE 16. Annual Wind Rose Plots for A, C, D, and F Towers, 1997

Windrose plot depicts the frequency of the direction from which the wind is blowing and the wind speeds

FIGURE 17. Annual Wind Rose Plots for H, K, L, and P Towers, 1997

H Area Tower

K Area Tower

L Area Tower

P Area Tower

Wind Speed Class Boundaries
(Meters/Second)

Windrose plot depicts the frequency of the direction from which the wind is blowing and the wind speeds

Figure 18. 1997 Daily Average Barometric Pressure

Figure 19. 1997 Daily Solar Radiation