Meteorological Annual Report for 1994 (U)

by

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Meteorological Annual Report for 1994

at the Savannah River Site

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Contents

Executive Summary 1

Introduction 3

Data Summaries 5

Temperature 5

Precipitation 5

Relative Humidity 5

Winds 5

Barometric Pressure 6

References 6

List of Figures

Figure 1. Daily averages for temperature minimum and maximum, pressure, relative humidity, and precipitation for 1994 2

Figure 2. 1994 SRTC daily high and low temperatures 7

Figure 3. SRTC annual average temperature 1964-1994 8

Figure 4. SRTC monthly average temperature 9

Figure 5. SRTC number of freezing and sweltering days 10

Figure 6. 1994 SRTC daily precipitation 11

Figure 7. SRTC annual precipitation 1964-1994 12

Figure 8. SRTC monthly precipitation 13

Figure 9. 1994 SRTC daily low humidity 14

Figure 10. SRTC monthly average low relative humidity 15

Figure 11. 1994 SRTC daily high and low humidity 16

Figure 12. Annual wind rose 17

Figure 13. Seasonal wind rose 1994 18

Figure 14. Seasonal wind rose 1987-91 19

Figure 15. 1994 daily average barometric pressure 20

Attachment A. Map of the Savannah River Site showing the location for the meteorological towers 21

Executive Summary

An analysis of basic meteorological data collected at the Savannah River Site (SRS) shows that the year 1994 was slightly warmer and drier than average. In most months, average minimum and maximum temperatures were near or slightly above the average for the 31-year period of 1964 through 1991. Above-average warmth was particularly evident in November and December. January of 1994 was a relatively cold month because of a major influx of Arctic air during the middle of the month. Observed temperatures for the year ranged from 10⁰ F in January to 98⁰ F in June and August. Although total annual precipitation was slightly below average, monthly total precipitation for October was the second highest since 1964. Observed wind direction for 1994 was generally consistent with long-term patterns. Persistent high pressure to the north of the area during the autumn months resulted in above average frequencies of northeasterly winds.

Annual and seasonal wind speeds in 1994 were slightly above average. Observed daily minimum/maximum temperature, total precipitation, minimum relative humidity, and average barometric pressure are summarized in Figure 1.

Figure 1. Daily averages for temperature minimum and maximum, pressure, relative humidity, and precipitation for 1994

Introduction

The Environmental Technology Section (ETS) of the Savannah River Technology Center (SRTC) collects and archives basic meteorological data that supports a variety of SRS activities including design, construction and operation of nuclear and non-nuclear facilities, environmental compliance, resource management, and research. This report provides summaries of data collected during 1994 for temperature, precipitation, relative humidity, wind, and barometric pressure. Summaries include plots of daily or seasonal data and, where possible, graphical comparisons of the 1994 data to climatology.

Temperature, precipitation, and relative humidity data that are presented in this report were recorded at the 773-A (SRTC) weather station. Temperature and relative humidity are measured by a hygrothermograph mounted in a standard National Weather Service "cotton region" instrument shelter. 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 a.m.

Wind data were collected at the H-Area meteorological tower, one of nine towers at SRS operated by ETS. The H-Area tower data were selected because of the proximity of this location to the geographic center of SRS. The wind measurements are taken at a height of 200 feet above ground. Barometric pressure data were recorded at the ETS Climatology Site tower near Central Shops. A map showing each of the measurement locations is given in Attachment A. Reference 1 and 2 provide complete descriptions of the ETS meteorological monitoring facilities and instrumentation. Additional climatological descriptions of SRS can be found in References 3 and 5.

Data Summaries

Temperature

Temperatures for 1994 ranged from 10° F, observed on the mornings of January 16 and 19, to 98° F observed on the afternoons of June 21 and 25 and August 30 (Figure 2). The average temperature for 1994 was 67° F, which is about 2 degrees above the average for the 31-year period of 1964 through 1994 (Figure 3). (The annual average temperatures in Figure 3 should be considered approximate as they are based on averages of observed daily minima and maxima.) June was the warmest month of the year with an average daily maximum of 91° F and an average daily minimum of 73° F; January was the coldest month with an average daily high of 52° F and an average daily low of 31° F (Figure 4). Monthly averages for 1994 were near or slightly above average in all months except January, which was about 4° F below the 31-year average. The relatively cold average temperatures for January were because of an outbreak of Arctic air over the eastern United States during the middle of the month (Reference 6). Daily high temperatures were greater than 90° F on 20 days during the months of June and July. Minimum temperatures were below 32° on 15 days in January (Figure 5). The number of "freeze days" in November and December were much below average.

Precipitation

Rainfall was observed on 87 days during the year (Figure 6). Daily amounts greater than 2 inches were observed on 5 days. Total precipitation for 1994 was 47.16 inches; average annual precipitation for the 31-year period of 1964 through 1994 was 49.73 inches (Figure 7). Relatively dry periods were observed in April-May and August-September. Relatively rainy periods occurred in March, July, and October. October's monthly total of 10.01 inches was the second wettest October since 1964 (Figure 8).

Relative Humidity

Relative humidity is defined as the ratio of the vapor pressure of ambient air to its saturation vapor pressure. As the ambient temperature cools to the dew point temperature (assuming constant pressure), morning values of relative

humidity can often approach 100%, even when the moisture content of the atmosphere is relatively low. Therefore, observations of afternoon minimum relative humidity provide a more meaningful indicator of prevailing atmospheric moisture than maximum values.

Lowest values of daily minimum relative humidity were observed in March and April, averaging 26% and 27%, respectively (Figure 9). Highest daily minimums occurred in October through December. Minimum values greater than 40% were consistently observed during the summer (Figure 10). The greatest daily variations in relative humidity were observed during January through May and October through December. These variations reflect a progression of weather systems through the area that produce alternating periods of relatively moist subtropical air from the Atlantic or Gulf of Mexico and drier continental air. Atmospheric moisture exhibits much less variability during the summer, as area weather patterns are dominated by relatively moist subtropical air associated with the semi-permanent "Bermuda high". A plot of the complete record of daily minimum and maximum relative humidity is shown in Figure 11. Instrument limitations prohibit reliable measurement of relative humidity above 90%.

Winds

Wind direction observations for 1994 show a slightly higher occurrence of northeasterly and southwesterly winds than were observed during the 5-year period of 1987 through 1991 (Figure 12). Although autumn typically exhibits a relatively high frequency of northeast winds, 1994 was quite unusual as northeast winds were observed more than 20% of the time (Figures 13 and 14). The frequent occurrence of northeast winds during this period was the result of a series of strong, persistent high pressure areas over the northeast United States in September and October (Reference 6). The summer was characterized by a relatively high occurrence of southwesterly winds from a fairly persistent position of the sub-tropical "Bermuda" high pressure off of the southeast U.S. coast. Strong high-pressure areas associated with the Arctic outbreaks in January resulted in a somewhat higher occurrence of westerly winds for the winter period (Reference 6). Wind direction patterns for spring of 1994 were fairly typical. Annual and seasonal wind speeds for 1994 were slightly greater than the 1987-91 averages.

Barometric Pressure

Average barometric pressure for 1994 was 1006 millibars (mb). The lowest daily average value, 985 mb, occurred on March 16; the highest daily average value, 1024 mb, occurred January 10 (Figure 15). Relatively high variability in daily average pressure was observed in the months of January through March, associated with the progression of relatively strong weather systems through the area. A long-term record of atmospheric pressure for SRS is not readily available.

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Figure 2. 1994 SRTC daily high and low temperatures

Figure 3.

SRTC annual average temperature 1964-1994

Figure 4. SRTC monthly average temperature

Figure 5. SRTC number of freezing and sweltering days

Figure 6. 1994 SRTC daily precipitation

Figure 7. SRTC annual precipitation 1964-1994

Figure 8. SRTC monthly precipitation

Figure 9. SRTC daily low humidity

Figure 10. SRTC monthly average low relative humidity

Figure 11. 1994 SRTC daily high and low humidity

Figure 12. Annual wind rose (Note- Directions are compass sectors from which the wind is blowing.)

Figure 13. Seasonal wind rose 1994 (Note—Directions are compass sectors from which the wind is blowing.)

Figure 14. Seasonal wind rose 1987-91 (Note-Directions are compass sectors from which the wind is blowing.)

Figure 15. 1994 daily average barometric pressure

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Attachment A. Map of the Savannah River Site showing the location of the meteorological towers.

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