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A STUDY OF THE RELATIONSHIP BETWEEN
HEAT AND HUMIDITY AND CARDIAC MORTALITY

by

Patrick E. Browning

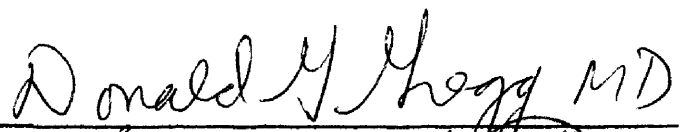
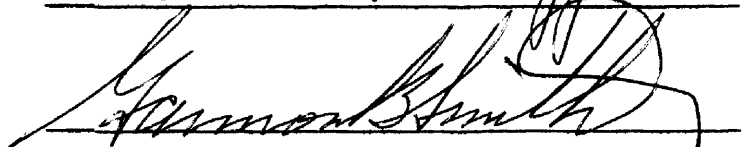
A Research Project submitted to the faculty
of the Medical University of South Carolina
in partial fulfillment of the requirements for
the degree of Master in Health Sciences
in the College of Allied Health Sciences.

Master in Health Sciences Program

1982

Approved by:


Chairman, Advisory Committee

ABSTRACT

Approximately fourteen hundred cardiac related calls were run by Greenville County Emergency Medical Service ambulance personnel in 1980. Four hundred seventy of these patients died. A study was undertaken to determine the relationship that heat and humidity had on these cardiac mortalities.

Various statistical procedures utilized in the study indicate that of the sample studied, fewer deaths occurred in the hottest temperatures on the average day while the coldest temperatures produced the highest average daily death rate. Humidity studies showed that the higher the humidity, the lower the average daily death rate.

High heat and high humidity shown in the combined form of the National Weather Service's Discomfort Index indicated that as heat and humidity rise on the Discomfort Index Scale, the death rate also rises.

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CHAPTER I

INTRODUCTION

Significance of the Problem

According to statistics issued by the American Heart Association and quoted in the 1981 World Almanac,¹ one million Americans will suffer heart attacks this year and 650,000 of these will die.

Medical science continues to make a concerted effort to eliminate heart disease but with only limited success. Therefore, the emphasis has broadened to include educating the public on preventive measures. Risk factors relating to heart disease are identified for the public so that appropriate measures may be taken to avoid developing heart disease.

Authorities hope that this effort to identify risk factors will result in a reduction in the number of heart attacks and subsequent deaths. Unfortunately, risk factors are numerous and cover a wide range of possibilities: cholesterol levels, blood pressure, tobacco smoking, abnormal glucose tolerance, gout, menopause and oral contraceptives, obesity, physical activity, type of personality behavior

¹Hana Umdauf Lane, ed., The World Almanac and Book of Facts-1981 (New York: Newspaper Enterprise Association, Inc., 1980), p. 147.

family history, alcohol consumption and psychosocial factors.²

Two factors that have been accepted by the public as risk factors over the years are related to climate: heat and humidity.

Greenville County, South Carolina is favored with a mild climate throughout the winter but becomes quite hot and humid in the summer. Because of this, earlier research was not related to any climate approximating Greenville County, South Carolina. For this reason, research was begun to determine whether heat and humidity are associated with cardiac mortality.

Statement of the Problem

This research proposes to study the relationship between heat and humidity as represented by a Discomfort Index and cardiac mortality in Greenville County, South Carolina.

Null Hypothesis

There is no direct relationship between cardiac mortality and an increase in heat and humidity.

Limitations

This study will concern itself with only those

²Eugene Braunwald, M.D., ed., Heart Disease - A Textbook of Cardiovascular Medicine - Volume 2 (Philadelphia: N. B. Saunders Company, 1980), pp. 1246-1278.

cardiac mortality calls that were answered by Greenville County Emergency Medical Services (GCEMS) between January 1, 1980 and December 31, 1980.

This study will only consider those cardiac mortality calls in the Greenville County area.

Furthermore, patients studied will be considered only as one occurrence per call per day. Revived patients who go into cardiac arrest twice or multiple times on one call will be considered only once per call. Patients who have occurrences of multiple cardiac arrests on multiple occasions will be considered on each occasion when the arrests fall on different days.

Delimitations

This study will not consider cardiac mortality that is quite obviously caused by phenomena other than weather-related heat and humidity (i.e., traumatic cardiac arrest from accidents, murders, suicides, terminally ill patients, choking, respiratory ailments, etc.)

A separate distinction for cardiac arrest patients that are revived will not be made. Patients once identified as in the mortality category will be studied as such.

Patients whose primary care was rendered first by an ambulance crew other than by Greenville County Emergency Medical Services personnel will not be considered in this study. This will eliminate statistics related to backup calls to assist other counties' units.

Assumptions

All cases studied are assumed to be in cardiac arrest or dead on arrival either as a direct result of heat and/or humidity or that the heat and/or humidity contributed to a medical infirmity that caused cardiac arrest.

This study assumes that all patients who were identified as "in cardiac arrest" or "dead on arrival" were, indeed, as they were identified.

All data records used are assumed to be accurate.

Definition of Terms

Cardiac arrest is a condition in a patient in which the patient is determined to be pulseless as observed by lack of palpable pulses, absence of blood pressure, possible absence of respiratory effort, possible absence of electrical output of heart compatible with life as determined by cardiac monitor and/or defibrillator paddles, possible dilated pupils or a combination of any or all of the above symptoms.

Dead on Arrival (DOA) is the cessation of life with the absence of: palpable pulses, blood pressure, respiratory effort, electrical output of any type as determined by cardiac monitor and/or defibrillator paddles, and dilated pupils. Rigor mortis may be present or absent. The body may be disfigured or discolored. The body may be obviously dead by its location and/or cause of death (i.e.,

decapitation, skeletal remains only, decomposition, dismemberment, etc.).

Acclimatization will be the gradual action of the human body automatically adjusting to the changes in the climate from season to season.

Cardiac mortality or mortality will be used to describe any patient pulseless, apneic (not breathing) and in either cardiac arrest or dead.

Trip ticket will refer to a data gathering instrument filled out on each patient to identify the patient, record medical data and provide billing information.

Heat will mean the air temperature--degree of heat contained in the surrounding air in Fahrenheit degrees.

Hyperthermia will refer to high temperatures in the surrounding air.

Humidity will mean relative humidity which is the ratio of the quantity of vapor actually present to the greatest amount possible at the given temperature. Complete saturation of the air would be designated as 100 percent relative humidity and partial saturation would be indicated by smaller numbers.³

Discomfort index formula will refer to the formula devised to combine air temperature with the relative humidity. There are many such formulas with varying

³South Carolina Advanced EMT (Paramedic) Textbook.
No other information available.

degrees of complexity. The reader is referred to the Bibliography section to Applied Climatology by Griffiths, page 74.

Discomfort index scale will refer to that scale in the Applied Climatology reference in the Bibliography section by Griffiths, page 74. The scale graphically depicts the combined values of air temperature and relative humidity to produce a discomfort index number, indicating a level of bodily discomfort produced by these combined elements.

Mortality for the purposes of this study will include both DOA's (those patients "biologically" dead, i.e., no pulse or respirations and declared dead with no attempt made at resuscitation) and cardiac arrests (those patients determined to be "clinically" dead meeting the same criteria as the above, i.e., no pulse or respirations but declared viable due to special circumstances such as short length of time without signs of life, basic life support in progress by bystanders, patient age and other considerations). Once the patient is "dead", he is included in the mortality category.

Average expected daily death rate will mean the average number of deaths per day as determined by dividing the number of deaths occurring during the year by the number of days in the year.

CHAPTER II

LITERATURE REVIEW

Few Studies Consider Heat and Humidity

Few studies have been done to investigate the relationship of heat and humidity to heart attack. Studies have been done that investigate the relationship of heat alone to heart attack/cardiovascular stress. Several noteworthy studies in this area are the studies by Marmor (1975), Burger and Fuhrman (1964), Hew, Tucker, Bersohn and Seftel (1969) and Taggart, Parkinson and Carruthers (1972) as identified and quoted by Ellis and Nelson (1978).¹

Acclimatization and Heart Attack Effects

Marmor (1975)² observed that fewer persons died in the early summer heat waves, but more people died in late summer heat waves. Marmor questions whether the use of air conditioning in the early summer lowers the possibility of heatstroke, heat stress and subsequent cardiovascular collapse and death. The gain in the number of deaths later in the summer when temperatures are even hotter may, then,

¹F. P. Ellis and Frieda Nelson, "Mortality in the Elderly in a Heat Wave in New York City, August, 1975," Environmental Research, 15, 504-512, June, 1978.

²M. Marmor, "Heat Wave Mortality, New York City," Archives of Environmental Health, 30, 1975.

be caused by the lack of acclimatization due to the use of air conditioning.

Burch and Miller (1969) refer to Shattuck (1933) for the statement that the "(mortality) . . . toll is higher in more northern cities during heat waves than in cities of the south because of less acclimatization of the northern populace. . . ." ³

Research Differences

Ellis and Nelson (1978) ⁴ state that Heyes (1955) in Dallas, Avierinos (1955) in Egypt, Burch and De Pasquale (1962) in New Orleans, and Ellis (1972, 1973) for the United States as a whole, report an increased frequency of myocardial infarction (heart attack) in the summer months in some heat wave years.

Rogot and Padgett (1976) ⁵ in an extensive study that covered thirty-two cities, five years and forty percent of the population of the United States, contend that mortality occurred least frequently in the 60's and 70's (degrees Fahrenheit), in areas normally identified as cool areas.

³George E. Burch, M.D. and Gordon C. Miller, M.D., "The Effects of a Warm, Humid Environment on Patients with Congestive Heart Failure," Southern Medical Journal, July, 1969, pp. 816-821.

⁴Ibid.

⁵E. Rogot and S. J. Padgett, "Association of Coronary and Stroke Mortality with Temperature and Snowfall in Selected Areas of the United States," American Journal of Epidemiology, 103, 1976.

They also found that the warmer areas studied (Miami, Tampa, Houston, Phoenix) had the lowest mortality rates between 80° and 89°F. and that there was no sudden rise in mortality above this range such as there was in the cool weather regions of the country.

MacPherson, Ofner and Welch (1967) had quite the opposite finding in their study. Contrary to Rogot and Padgett, MacPherson, Ofner and Welch state in their study:

. . . As the temperature rises, the number of deaths decreases to a minimum in the temperature interval 70-79°F. and thereafter rises sharply again so that the temperature interval of 80-89°F. is almost as unfavorable as the interval 50-59°F.⁶

Noteworthy is the similarity in climate between the two areas: Miami, Tampa, Houston and Phoenix in the Rogot and Padgett study and New South Wales, Australia in the MacPherson, Ofner and Welch study. (Similarity in climate was determined by temperatures listed for analysis in each study.)

Cold Weather and Cardiac Mortality

Ellis and Nelson (1978)⁷ cite Rogot and Blackwelder (1970) in Memphis and Rogot (1973, 1974) in Chicago in stating that cardiac mortality was higher in winter months than summer months for their studies. In the Memphis study,

⁶R. K. MacPherson, F. Ofner and J. A. Welch, "Effect of the Prevailing Air Temperature on Mortality," British Journal of Preventive Social Medicine, 21, 17-21, January, 1967.

⁷Ibid.

. . . the average number of deaths per day from arteriosclerotic heart disease from January, 1959 to December, 1961 were highest (3.6) when the average temperature was below 30°F. and declined to a low of 2.12 when the average temperature was between 80° and 90°F.⁸

The Rogot study of 1967 stated that there was an "inverse linear relationship between deaths from coronary artery disease and air temperature."⁹

Kutschenreuter (1959) found that "mortality is higher during cold winters and hot summers and lower during warm winters and cool summers."¹⁰

Kutschenreuter, in this study, cites Gordon and Eckhart (1958) as referring to "the general inverse relationship of temperature and death" in their data from a 1957 study in New York City. He also says that the same general relationship has been shown in curves and data for particular diseases both here and abroad by other researchers: Jenss (1958) in Buffalo, New York and Tromp (1959) in the Netherlands.

⁸E. Rogot and W. C. Blackwelder, "Association of Cardiovascular Mortality in Memphis, Tennessee with Weather," Public Health Report, 85, 25-39.

⁹E. Rogot, "Association of Cardiovascular Mortality with Weather--Chicago, 1967." In Air Conditioning, Climatology and Health, American Society of Heating, Refrigeration and Air Conditioning Engineers Symposium, Washington, D.C., August 22-25, 1971. A.S.H.R.E., New York.

¹⁰P. H. Kutschenreuter, "A Study of the Effects of Weather on Mortality," New York Academy of Sciences USA 22: 126-138, 1959.

Anatomy and Physiology and the Elimination of Bodily Heat

Body heat is the product of metabolism in the body. Normally, this heat is passed out of the body by being carried in the body's blood supply to peripheral areas where the heat then passes through the skin into the cooler area outside the body.¹¹

Physically, heat travels from areas of high temperature to areas of lower temperature. The difference between temperatures in two areas is known as the temperature gradient. When heat flows from a high temperature area to a low temperature area, this phenomenon is called the "flow down a temperature gradient." The greater the difference between the high temperature and the low temperature, the faster the loss of heat.

In the body, heat sensors in the brain control the body's build-up of heat by two methods. First, by "ordering" the small blood vessels and capillaries near the surface of the body, just under the outer skin layer, to dilate, allowing more blood in the vessels and thus allowing more heat to be eliminated down the temperature gradient through the skin. If the outside temperature is higher than the temperature inside the body, or the temperatures are relatively close, the temperature gradient is small or the reverse procedure takes place: the body will actually

¹¹South Carolina Advanced EMT (Paramedic) Textbook.
No other information available.

absorb the outside heat.

As the body temperature then increases even more, the vessels dilate even more, taking more blood from the vital organs and blood vessels and forcing the heart to pump faster and with more contractile force to enable the blood that is still available to circulate to the periphery. As the heart works harder and faster pumping blood into dilated blood vessels and capillaries, a "pooling effect" takes place. As blood pools away from the heart in the veins, there is a reduction in the amount of oxygenated blood in the vital organs. This type of strain on the heart as well as the vital organs can prove dangerous or even fatal.

A second line of defense against the build-up of body heat is the evaporation of perspiration from the skin surface. Unfortunately, the elderly do not perspire efficiently and often not at all, thus limiting the benefit of this second line of defense or eliminating it altogether.

Evaporation is the process of a water molecule absorbing enough energy to allow the molecule to break away from other water molecules.¹² Energy in this situation is heat. When the molecule absorbs enough heat from the body (thus cooling the body), the molecule breaks away (evaporation has occurred).

¹²Kutschenreuter, 126-138.

When the humidity in the air is high, perspiration is not readily evaporated and the body's second line of defense is compromised or eliminated. Thus, an individual moving about at even a normal pace in high heat and high humidity can put a severe strain on the heart.

Research Related to Hyperthermia and Humidity

Taggart, Parkinson and Carruthers (1972) created an environment of high heat and high humidity in a sauna bath and studied the electrocardiogram tracings of thirty-five participants. Seventeen of these participants had apparently normal hearts and eighteen participants had coronary heart disease as established by previous myocardial infarctions.

In addition to the expected increase in heart rate above 100 beats per minute (tachycardia), exposure to the sauna of the normal subjects resulted in many subjects rapidly developing changes on the electrocardiogram that resembled those changes that normally indicate an inadequate blood flow to the heart muscle itself (ischemia). These ischemic changes were not apparent when the same subjects exercised to produce a comparable tachycardia.

This finding suggests that conditions in the sauna (presumably high heat and/or high humidity) cause stress in a normal heart to the extent that circulation to the heart muscle is compromised.

In both groups of participants, ventricular ectopic beats, which are indicative of electrical abnormalities in the electromechanical function of the heart, occurred in one out of every four participants.

The Taggart, Parkinson and Carruthers study takes on added significance when generalized to a hot, humid climate rather than the controlled atmosphere of a sauna bath.

In reference to the ischemia related changes in the Taggart, Parkinson, Carruthers study, Ellis, Nelson and Pincus (1974) state that during the heat waves in New York City in July, 1972 and September, 1973, that of those victims who died during these heat waves who were 65 years of age or older, that ischemic heart disease was the most common cause of death.¹³

Other research indicates that physiologically, heat and/or humidity increase stress on the cardiovascular system (Koroxenidis, Shepherd and Marshall, 1961).¹⁴ Research by Heyer, Teng and Barris (1955)¹⁵ shows that with

¹³F. P. Ellis, F. Nelson and L. Pincus, "Mortality During Heat Waves in New York City July, 1972 and August and September, 1973," Environmental Research, 10, 1-13, 1975.

¹⁴Gabriel T. Koroxenidis, John T. Shepherd and Robert J. Marshall, "Cardiovascular Response to Acute Heat Stress," Journal of Applied Psychology, 16: 869-72, September, 1961.

¹⁵Howard E. Heyer, M.D., H. C. Teng, M.D. and William Barris, M.D., "The Increased Frequency of Acute Myocardial Infarction During Summer Months in a Warm Climate," American Heart Journal, 49, 1955.

the profound alteration in the circulatory system brought on by extremely hot weather that it is obvious that body functions are greatly upset. Further, they state that patients who already have arteriosclerosis could develop a heart attack under these stressful conditions.

In more general terms, Burch and Miller cite Shattuck (1933) and Schuman, Anderson and Oliver (1964) that mortality increases in hot weather for a number of diseases. Burch and Miller in this same study relate details of their own research in which patients with a compromised cardiovascular system (congestive heart failure) were exposed to environmental extremes of heat and humidity. Burch and Miller's conclusion was that

. . . the patients with severe congestive heart failure were unable to tolerate a warm and humid atmosphere. Although their hearts attempted to increase the work necessary to cope with the stress of the heat, the cardiac insufficiency was too extensive to provide the additional pumping power. Thus, these patients were found to develop exacerbations in their congestive heart failure with further, ever-progressive impairment of their state of health. . . .¹⁶

Summary

Literature has been cited to indicate that a physiological danger exists in every person when heat and humidity are unusually high, even in the acclimated person.

¹⁶George E. Burch, M.D. and Gordon C. Miller, M.D., "The Effects of Warm, Humid Environment on Patients with Congestive Heart Failure," Southern Medical Journal, July, 1969.

As one ages, and susceptibility to cardiac problems increases, more than a passing notice must be given to the weather prediction to avoid unnecessary climate extremes that may place one's health in jeopardy.

Studies reviewed on the subject have often had conflicting conclusions regarding the relationship of heat and humidity to cardiac arrests and deaths. Thus, the results tend to be less generalizable. Studies related herein do not identify an area studied that has a climate closely resembling that of the Greenville County, South Carolina area.

CHAPTER III

DATA SOURCES

Primary Data

Primary data sources include:

1) Records from the National Weather Service files at the Greenville-Spartanburg Airport, Greer, South Carolina. These records were contained in one large volume with two pages of weather related statistics recorded for each day in the study. Temperature and humidity were the only statistics needed for the study. (A) The average (mean) temperature for each day had already been calculated. This number was taken directly from the form and written by hand on the data collection sheets. (B) Humidity records were not conveniently averaged. The high and low humidity for the twenty-four hour period on a given date were recorded by hand on the data collection sheets.

2) Records from Greenville County Emergency Medical Services (EMS) files. Each form filled out by the emergency medical personnel for each call that was run in 1980 was categorized into two categories: mortality and non-mortality calls. Each of the records for the 10,642 calls that were run by EMS in 1980 was categorized.

Target Population

The population studied was determined by its close proximity, characteristics, availability and representativeness to the area to be studied. Greenville County, South Carolina was not representative of localities of earlier research and, thus, was selected to determine heat and humidity effects on mortality for this type area.

Greenville County, South Carolina is located south of the Blue Ridge Mountains in the Piedmont region of the state of South Carolina. The close proximity of the mountain range to the county provides protection from harsh winter storms and yet the county is not far enough in the south of the country to closely approximate Tampa and Miami where previous studies were done.¹

Greenville County has a mild year round climate as witnessed by the average temperature of 59.8°F. over the decade of 1970-1980.

Sample

For the purposes of this study, the year 1980 was selected for study. This selection was made because 1980 was the year during the decade that had: (1) the same temperature as the decade average and (2) complete records available.

¹E. Rogot and S. J. Padgett, "Association of Coronary and Stroke Mortality with Temperature and Snowfall in Selected Areas of the United States," American Journal of Epidemiology, 103, 1976.

Greenville County EMS was formed in 1975, thus, records were available only from 1975-1980.

The sample size, due to the 1980 parameters, was limited to 470 cases of cardiac arrest and dead on arrival patients handled by Greenville County EMS.

Data Collection Instruments

(A) Simple notebook paper was used for data collection at the Greenville-Spartanburg Airport. Forms utilized at the National Weather Service office at the airport are included in the appendix of this study.

(B) A sample "trip ticket" as used by Greenville County EMS is also included in the appendix.

As can be seen by observing the trip ticket: various information is required of the patient regarding his identity, address, place of employment and other pertinent personal data. This information is gathered: 1) from the patient (as happens occasionally, the patient has a cardiac arrest after supplying the information); 2) from family or friends of the victim; 3) from hospital emergency department records; or 4) from police agencies.

Further information includes other pertinent personal history information (private M.D., drug allergies, medications being taken, etc.). Legal releases and agreement-to-pay sub-forms are also a part of the overall form.

Medically, the remainder of the form is self-explanatory.

There are two additional areas of note: one is the form left with the hospital emergency department records clerk to list drugs and supplies used on the call so that the patient or his estate may be billed for the supplies and drugs used (EMS re-supplies its ambulances from hospital stock); and a small block for the hospital evaluation of resuscitative efforts.

Of primary importance to this study are several noticeably small blocks adjacent to the patient's name and address. Underneath the blocks for the "call no." (a cross-reference number between the dispatcher, hospital and EMS forms) and date are form blocks: "out signal", "out code", "in signal" and "in code".

The "out signal" is the dispatcher's code number for her subjective assessment of the patient's major complaint as determined from questioning while taking the call. This symbol per se is of no importance to this study.

The "out code" is virtually always "3". This code designates the call as an emergency to be responded to with use of red lights and siren. Greenville County EMS is an "all emergency" system. Therefore, all calls should be code three. (Exceptions do exist, but are rare. Examples include, but are not limited to: responding to standby status at the scene of a large fire, law enforcement stake-out, assisting other agencies in need of manpower in rescues and other related calls of a non-acute emergency.) "In code" is insignificant to this study. Code one is a

routine return to the hospital--no lights, no siren; code three, of course, is with red lights and siren.

Of prime importance is the "in signal". The emergency medical personnel determine with sophisticated training and equipment the "objective" condition of the patient by physical examination, treatment, tests and by medical conference with emergency department physicians by phone or two-way radio. The physician then orders treatment or absence of treatment by these paramedic-relayed criteria.

In some situations (i.e., cardiac arrest, dead on arrival) the physician is not contacted at all or is not contacted until predetermined and pre-set standing protocols are carried out.

When the patient is finally placed in the ambulance for transport to the emergency department, the personnel moving the patient determine the appropriate code number for the patient's condition by his observation and treatment of the patient. He then gives the code via radio to the dispatcher who records the code for cross-reference.

For the purposes of this study, only two particular codes are considered: Signal 9 - "dead on arrival" or Signal 83 - "cardiac arrest". Patients who are declared signal 83 at any time during time spent with them remain coded as signal 83, even if the patient is revived.

Signal 9's or signal 83's that were caused by trauma (traffic accident, gunshot wound, stabbing, etc.), are not considered. This information would be noted in

the "Summary of Findings" section on the trip ticket.

A patient may be signal 83 classified several times (i.e., the patient may regain a pulse and respirations, arrest again, etc.) but will be classified "Signal 83" only once per call for the purposes of this study. Of course, anyone classified "Signal 9" would be so classified (and counted) only once. A patient could be signal 83 and signal 9, but only on different days--signal 83 and revived to be hospitalized, go home and be signal 9 on another occasion.

Some knowledge of the workings of this form is necessary to be certain that the data is transferred accurately. However, some personal bias may be included due to this writer's knowledge of particular paramedics' inflection and the existence of paramedic jargon in the "Summary of Findings."

The area to the right of the patient's name in the block for recording of times involved in the call: (1) time the caller called in; (2) time the ambulance was dispatched; (3) time the ambulance got enroute; (4) time arrived at the scene; (5) time left the scene; (6) time arrived at the hospital; (7) time left hospital; and (8) time back at the station.

Rationale for Data Type

This data was selected because of: (1) the simplicity and uniformity of categorization (i.e., either signal

83 or signal 9); (2) time element for this research; and (3) availability of complete records.

Seeking approval for use of hospital records would have been time consuming and the non-uniformity of categorization (i.e., congestive heart failure--cardiac arrest--irreversible, myocardial infarction with cardiac arrest, etc.) would have created many considerations unrelated to the scope of this study.

The selected data required only a delineation between cardiac arrest and dead on arrival thus simplifying data collection.

Data Acquisition

As stated earlier, each trip ticket was individually checked to determine the possibility of "9" or "83" showing in the "In Signal" block of the trip ticket. If either number was found, the "Summary of Findings" was read to determine the cause--traumatic or non-traumatic. Only non-traumatic cardiac arrests and deaths were counted.

In tallying statistics from trip tickets, if a bona fide "9" or "83" occurred and was non-traumatic in nature, the time was noted and a tally mark was made for that date. All 366 days in 1980 were completed (1980 was a leap year).

The daily temperature average, as determined by the National Weather Service, was noted beside its respective date.

The humidity, which was not averaged for each day by the National Weather Service, was treated as follows: the median daily humidity was used (mid-point between the high and low humidities).

CHAPTER IV

DATA ANALYSIS

Methodology

Analysis of the data included the following methods:

1) Charts were made for each month listing temperature, humidity and mortality for each day. Charts were studied for obvious indications of positive or negative association of heat and/or humidity to mortality figures. No obvious indications were found.

2) Monthly averages were calculated for temperature, humidity and mortality. Yearly totals were also calculated. Comparisons of mortality totals were made between the six coldest months (as determined by the six months with the lowest average temperatures) and the six warmest months (those six months with the highest average temperatures). Totals were as follows: cold weather months (January, February, March, October, November, December) showed a mortality total of 249; warm weather months (April, May, June, July, August, September) showed a mortality total of 221. The difference (6 percent of total number of mortality cases) was twenty-eight.

As can be seen, contrary to studies quoted by Ellis and Nelson (1978), Heyes (1955), Avierinos (1955), Burch

and De Pasquale (1962) and Ellis (1972, 1973), the sample of the Greenville County EMS records for 1980 shows that mortality rates were higher in colder months (6 months--183 days) than warmer months (6 months--183 days).

3) Totals were gathered on the number of mortalities in ten-degree increments (i.e., 20-29°F., 30-39°F., etc.) of temperature. (That is, the number of days having an average daily temperature falling between 20 and 29°F., 30 and 39°F. etc. and having at least one mortality occurring, were totaled.) Average number of mortalities occurring in each category were noted and compared in the form used by Rogot and Blackwelder (1970) in their Memphis study¹ (i.e., ten-degree increments but one total only for temperatures less than 30°F.). Table 1 shows a summary of the analysis.

TABLE 1

COMPARISON OF GREENVILLE STUDY WITH MEMPHIS STUDY

Area	Average Mortalities Per Day	
	Temp. Less Than 30°F.	Temp. 80-89°F.
Greenville County 1980	1.27	0.94
Memphis*	3.60	2.12

*According to Rogot and Blackwelder Study (1970).

¹E. Rogot and W. C. Blackwelder, "Association of Cardiovascular Mortality in Memphis, Tennessee with Weather," Public Health Report, 85, 1970.

In Table 1, the Greenville County study shows a similarity to the Memphis study in that both studies show a drop in mortality rate as the temperature increases. The percentage of drop is not quite the same (Greenville: 1.27 to 0.94 = .033 difference or a 25.9% reduction; Memphis: 3.60 to 2.12 = 1.48 difference or a 41.1% reduction) but the similarity remains.

4) For comparative purposes, tables were set up to categorize mortalities into groups of respective temperature increments (Table 2) and humidity increments (Table 3).

TABLE 2
MORTALITIES AND MORTALITY AVERAGES IN
TEN-DEGREE TEMPERATURE INCREMENTS*

Index (in degrees Fahrenheit)	Mortalities Occurring	Number of Days	Average Deaths Per Day
10-19	0	0	0
20-29	9	9	1.0
30-39	38	28	1.36
40-49	89	67	1.33
50-59	113	83	1.36
60-69	79	49	1.61
70-79	93	78	1.19
80-89	49	52	0.94
90-99	<u>0</u>	<u>0</u>	<u>0</u>
Totals	470	366	1.28

*Average temperature for 1980 in Greenville County was 60.01°F.

TABLE 3
MORTALITIES AND MORTALITY AVERAGES
IN TEN-PERCENT HUMIDITY INCREMENTS*

Index (in ten-percent increments)	Mortalities Occurring	Number of Days	Average Deaths Per Day
10-19	0	0	0
20-29	0	0	0
30-39	16	7	2.29
40-49	43	33	1.30
50-59	87	67	1.30
60-69	140	118	1.19
70-79	108	82	1.32
80-89	53	41	1.29
90-99	<u>23</u>	<u>18</u>	<u>1.28</u>
Totals	470	366	1.28

*Average humidity for 1980 in Greenville County was 66.68%.

A study of Table 2 shows that the 80-89^oF. category lists an average daily death rate of 0.94 deaths. This finding would coincide with the Rogot and Padgett (1976) observation that "warm weather" cities studied had fewer mortalities in the 80-89^oF. range than did "cool weather" cities (Greenville County could reasonably be classified as a warm weather city along with Miami, Tampa, Phoenix and Houston from the Rogot and Padgett (1976) study).

5) Comparisons were made with the number of mortalities and temperature and humidity in ten-degree and ten-percent intervals respectively. These findings identify the climate at which the public was at greatest risk.

Table 2 indicates that the temperature interval of 60-69^oF. was the time of greatest risk to the public. The death rate on days when the temperature averaged between 60 and 69^oF. was 26 percent higher than the average expected daily death rate.

Conversely, the average daily death rate in the interval when the temperature averaged between 20 and 29^oF. was 21 percent lower than the average expected daily death rate while the temperature interval of 80-89^oF., as mentioned previously in reference to Rogot and Padgett (1976), is 27 percent lower than the average expected daily death rate.

Referring to Table 3 on Humidity Increments, it can be seen that the table indicates that very low humidity is compatible with a higher average daily death rate. Optimum humidity for life would be indicated in the 60-69 percent interval: the daily death rate falls 7 percent below the expected average daily death rate.

6) Further analyses were done to determine whether temperature and humidity averages of one day gained (went up), lost or remained constant and the effects of these changes (or lack of change) on the average daily death rate. Table 4 indicates effects of these changes.

TABLE 4

MORTALITIES AND MORTALITY AVERAGES ON
DAYS GAINING, LOSING OR REMAINING
CONSTANT IN TEMPERATURE

Temperature Change	Number of Days	Mortalities Occurring	Avg. Deaths Per Day
Gain	169	211	1.25
Loss	146	200	1.37
Same	<u>50</u>	<u>59</u>	<u>1.18</u>
Totals	365*	470	1.29

*Calculations change due to "number of days" changing from 366 to 365. Since no data was recorded from 1979 or 1981, gain, loss or remained constant cannot be calculated from last day of 1979 or to first day of 1981.

From Table 4 it can be surmised that as Oechsli and Buechley (1965) noted in the National Weather Service's pamphlet Heat Wave² "increased mortality in a heat wave tends to follow maximum temperatures by about one day--the day it takes to overwork a tired circulatory system."

Table 5 shows a graphic display of a breakdown in statistics on humidity changes and the average number of mortalities per day. As is shown, when humidity remains unchanged from one day to the next, the chance of dying on that day increases .42 over the average expected death rate. This is an increase of 32.5 percent.

²U.S., Superintendent of Documents, Heat Wave, Washington, D.C.: U.S. Government Printing Office, 1972.

TABLE 5

MORTALITIES AND MORTALITY AVERAGES ON
DAYS GAINING, LOSING OR REMAINING
CONSTANT IN HUMIDITY

Humidity Change	Number of Days	Mortalities Occurring	Avg. Deaths Per Day
Gain	171	216	1.26
Loss	180	230	1.28
Same	<u>14</u>	<u>24</u>	<u>1.71</u>
Totals	365*	470	1.29

*Calculations change due to "number of days" changing from 366 to 365. Since no data was recorded from 1979 or 1980, gain, loss or remained constant cannot be calculated from last day of 1979 or to first day of 1981.

An analysis of 1980 mortality figures was compared to the Discomfort Index which is a scale devised by the National Weather Service and is derived from a formula that combines heat and humidity into a single index number in order to relate a level of discomfort to a particular number on the scale. The higher the temperature and humidity, the higher the index number.

Table 6 shows a breakdown of deaths occurring in 1980 in Greenville County beginning with 55, the lowest number utilized by the National Weather Service on the Discomfort Index Scale.

Table 6 also shows that the higher the index number, the greater the number of mortalities. The lower half of

the table when totaled shows 28 deaths and the higher half totals 127 deaths. This fact could lead one to conclude that the higher the temperature and humidity, the greater the rate of mortality. Certainly, for the Discomfort Index range this is true. The scope of the study, however, includes 315 deaths that fell below the range of the Discomfort Index.

TABLE 6
DISCOMFORT INDEX/MORTALITY OCCURRENCES

55/2	59/0	63/0	67/0	71/9	75/15	79/10
56/0	60/4	64/1	68/10	72/13	76/14	80/8
57/0	61/3	65/4	69/5	73/22	77/11	81/0
58/0	62/0	66/4	70/7	74/1	78/10	82/2

Correlations were calculated on the relationship between (A) the number of mortalities occurring by month in 1980 and temperature averages by month in 1980 and (B) the number of mortalities occurring by month in 1980 and humidity averages by month in 1980.

A) The correlation coefficient resulting from temperature averages and number of mortalities showed no marked relationship between heat and mortality in this particular situation. The correlation was relatively low and negatively correlated at $-.46$.

B) The correlation coefficient resulting from humidity averages and number of mortalities showed a

negative relationship of $-.66$ which was accepted at the $.05$ level of significance. This statistic shows that as humidity rises, mortality drops in this particular study.

It should be noted that correlation done for (A) and (B) did not have the months ranked in the same position for both heat and humidity and thus a correlation could not be calculated between the two groups of data.

A t-test was calculated on means of the warm weather months and the cold weather months and was found to be 0.852 , well below the required 2.23 for acceptance at the $.05$ level of significance. Thus, the null hypothesis is accepted.

Supplementary Conclusions

The following conclusions may be reached from data presented herein:

A. HEAT

1. The highest daily death rate occurred on the days having the coldest temperatures.
2. The lowest daily death rate occurred on the days having the warmest temperatures.

B. HUMIDITY

1. The highest daily death rate occurred on the days having the lowest humidity.
2. The highest daily death rate occurred when humidity remained constant over two or more days.

3. In the sample studied, the relationship between humidity and mortality was that as humidity rose, mortality dropped.

C. HEAT AND HUMIDITY

For the interval covered on the combined heat/humidity Discomfort Index, the higher the index, the higher the mortality.

Implications of the Study

This study has identified many researchers whose studies are in conflict on the effect heat and humidity has on cardiac mortality. More studies must be undertaken in which a consistent method is used in even wider localities to determine the effect heat and humidity have on the body.

Science has identified risk factors to man that are within man's ability to control. Researchers should continue efforts to identify those elements, such as heat and humidity, which are beyond man's knowledge to control, but may be avoided when they pose a special risk. Studies such as the one contained herein are an example of the type needed.

APPENDIX

APPENDIX 1

COLD WEATHER VS. WARM WEATHER MONTHS (IN DEGREES FAHRENHEIT)

Cold Weather			Warm Weather		
Month	Temperature Average	No. of Mortalities	Month	Temperature Average	No. of Mortalities
January	44.13	24	April	59.27	38
February	39.59	39	May	68.48	48
March	47.84	51	June	74.73	31
October	57.58	46	July	81.74	32
November	49.6	35	August	79.65	34
December	<u>43.61</u>	<u>54</u>	September	<u>73.9</u>	<u>38</u>
Totals	47.06	249	Totals	72.96	221

APPENDIX 2

HIGH HUMIDITY VS. LOW HUMIDITY MONTHS (IN PERCENT)

High Humidity			Low Humidity		
Month	Average Humidity	No. of Mortalities	Month	Average Humidity	No. of Mortalities
September	73.9	38	December	57.32	54
June	73.13	31	February	60.10	39
January	71.71	24	April	60.17	38
October	70.42	46	March	64.35	51
August	69.35	34	November	64.70	35
July	<u>67.77</u>	<u>32</u>	May	<u>67.19</u>	<u>48</u>
Totals	71.38	205	Totals	62.31	265


April 2, 1982

Mr. Patrick E. Browning
Route 3 - 1 Meherrin Court
Greenville, South Carolina 29609

Dear Pat:

Greenville County Emergency Medical Service has been pleased to cooperate with you in the records survey to complete a study of cardiac mortality in relation to your research project for the Medical University of South Carolina.

Sincerely,


J. K. Moseley, Acting Director (Formerly)
Greenville County Emergency Medical Service

APPENDIX 4

GREENVILLE COUNTY EMERGENCY MEDICAL SERVICES

REVIEW

PARAMEDIC REPORT

REPORT NO.

CALL NO.	PATIENT'S NAME	AGE	TIMES REQ'D.
DATE	ADDRESS	RACE	DISPATCH
MEDIC NO.	CITY	STATE	ZIP
PHONE	SEX	ENROUTE	
OUT CODE	EMPLOYER	D.O.B.	AR SITE
OUT SIG.	INCIDENT LOCATION:	TRANSPORTED TO	A. BENNETT
IN CODE		<input type="checkbox"/> G. GENERAL	N. GREENVILLE
IN SIG.		<input type="checkbox"/> G. MEMORIAL	ST. FRANCIS
		<input type="checkbox"/> HILLCREST	
SPEEDOMETER START	SITE	DEST.	CREW: 2.
			AT STATION
MEDICAID I.D. NUMBER	SOC. SEC. NO. OR MEDICARE NO.		BASE FEE \$
Program/County:	Account No.	Family	Letter
RESPONSIBLE PARTY	AUTO TAG NO.		MILEAGE OUTSIDE COUNTY \$
ADDRESS			TOTAL CHARGES \$
			AMOUNT PAID \$
			PAID BY CHECK <input type="checkbox"/>
CITY	STATE	ZIP	

WAIVER OF LIABILITY UPON REFUSAL TO BE TRANSPORTED:

In my best judgement, I do not feel as though I need the services of Greenville County Emergency Medical Services, and therefore elect not to be transported. My decision shall also stand as a release from any service charge by Greenville County Emergency Medical Services on this call.

Patient Signature: _____

PARAMEDIC

I HEREBY GUARANTEE PAYMENT FOR ALL CHARGES INCURRED FOR SERVICES RENDERED HEREWITH. I authorize any holder of medical or other information about me to release to the Social Security Administration or its intermediaries or carrier any information needed for this or a related Medicare claim. I permit a copy of this authorization to be used in place of the original, and request payment of medical insurance benefits either to myself or to the party who accepts assignment.

SIGNED _____

DIFFICULTIES	TO SITE	<input type="checkbox"/> MECH.	<input type="checkbox"/> TRAFFIC	<input type="checkbox"/> OTHER	WEATHER	<input type="checkbox"/> CLEAR	<input type="checkbox"/> SNOW
	TO DEST.	<input type="checkbox"/> MECH.	<input type="checkbox"/> TRAFFIC	<input type="checkbox"/> OTHER		<input type="checkbox"/> FOG	<input type="checkbox"/> OTHER

EQUIPMENT USED:	<input type="checkbox"/> LIFE PAK'S	<input type="checkbox"/> PORTO POWER	<input type="checkbox"/> LONG BACK/BOARD	<input type="checkbox"/> SPLINT	<input type="checkbox"/> CERVICAL COLLAR	<input type="checkbox"/> BURN PACK	<input type="checkbox"/> SCOP STRETCHER
	<input type="checkbox"/> JAWS OF LIFE	<input type="checkbox"/> MAST SUIT	<input type="checkbox"/> SHORT B/BOARD	<input type="checkbox"/> TRACTION SPLINT	<input type="checkbox"/> OB PACK	<input type="checkbox"/> DEMAND VALVE/OXYGEN	<input type="checkbox"/>

PATIENT'S NAME				EQUIPMENT AND SUPPLIES USED:			
Qty.	Item	Qty.	Item	Qty.	Item	DRUGS	DRUGS
_____	Angiocath _____ Ga.	_____	E.T. Tube _____ Size	_____	Normal Saline 500cc	_____	Aminophylline 500 mg. (20cc)
_____	Backcheck IV Set	_____	EKG Monitoring Pads	_____	0.5 Dextrose/4.5 Saline 500cc	_____	Aspirin 100 mg. (10cc)
_____	Mini-Oral IV Set	_____	Pad. EKG Pads	_____	#18 1 1/2" Needles	_____	Atorax 100 mg. (10cc)
_____	Tubing Extension Set	_____	EKG Gel	_____	Suoclavian Catheters	_____	Atropine 1 mg.
_____	3" Armboard	_____	Blood Tubes-Red	_____	5cc Syringe & Needle	_____	Benadryl 50 mg. (1cc)
_____	18" Armboard	_____	Blood Tubes-Purple	_____	5cc Syringe	_____	Calcium Chloride (10%) (10cc)
_____	20cc Syringes	_____	Oral Airways _____ Size	_____	10cc Syringe	_____	Decadron 20 mg. (5cc)
_____	2 Ga. Catheter Tie Syringe	_____	Ace Bandages 2"	_____	NG Tube	_____	Dextrose, 50% (50cc)
_____	02 Connecting Tubing	_____	Ace Bandages 3"	_____	Dextrotricks	_____	Dilantin 250 mg.
_____	02 Cannula	_____	Ace Bandages 4"	_____	Cervical Collars	_____	Dopamine 200 mg. (5cc)
_____	02 Mask	_____	Ace Bandages 6"	_____	Sterile Towels	_____	Epinephrine 1:1000
_____	Yankaver Suction Tip	_____	Kling Bandages	_____	Surgical Pads	_____	Epinephrine 1:10,000 (10cc)
_____	#10 Suction Catheter	_____	Kerlix Bandages	_____	1 x 2 Gauze Pads	_____	Isuprel 1 mg. (5cc)
_____	#14 Suction Catheter	_____	Dermatol Tape	_____	4 x 4 Gauze Pads	_____	Isudrel
_____	Suction Tubing	_____	Nasal Airway	_____	Alcohol Pads	_____	
_____	Lances	_____	Lactated Ringers 1000cc	_____	Bersaline Pads	_____	
_____	Prod. Razors	_____	DSW 500cc	_____		_____	

Call No. _____
Paramedic's Signature _____

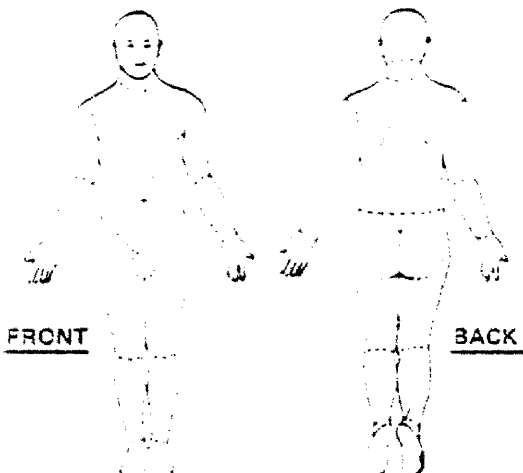
PATIENT CHART

GREENVILLE COUNTY EMERGENCY MEDICAL SERVICES
PARAMEDIC REPORT

REVIEW

REPORT NO.

PATIENT'S NAME				DATE	AGE	RACE, SEX
LAST	FIRST	INITIAL	SUFFIX			
PATIENT'S COMPLAINT						PVT. M.D. NAME
MEDICATIONS TAKEN BY PATIENT AT HOME			MEDICATION WITH PATIENT <input type="checkbox"/> YES <input type="checkbox"/> NO		DRUG ALLERGY	
LEVEL OF CONSCIOUSNESS	1. Alert and Oriented	2. Drowsy/Confused	3. Response to Verbal Stimuli	4. Response to Mild Pain	5. Response to Deep Pain	6. No Response to Deep Pain
RESPIRATION RATE	PULSE RATE	<input type="checkbox"/> Thready <input type="checkbox"/> Irregular	<input type="checkbox"/> Regular <input type="checkbox"/> Absent	Blood Pressure		Dextrost. x
PUPILS:	1. Dilated	2. Constricted	3. Unreactive	4. Reactive	5. <input type="checkbox"/> Dysconjugate	6. <input type="checkbox"/> Conjugate
SKIN	1. <input type="checkbox"/> Cyanotic	2. <input type="checkbox"/> Pale	3. <input type="checkbox"/> Flushed	4. <input type="checkbox"/> Normal	5. <input type="checkbox"/> Moist	6. <input type="checkbox"/> Dry
					7. <input type="checkbox"/> Cool	8. <input type="checkbox"/> Hot

FLOW CHART	SYMPTOMS	 <p>FRONT BACK</p>	MONITOR
TIME	1. Bleeding		
LEVEL OF CONSCIOUSNESS:	Per		BASIC CPR
RESP.	2. Cough		E-TUBE
EKG RHYTHM	3. Nausea/Vomiting		EGTA
PULSE	4. Numbness		DRAW BLOOD <input type="checkbox"/> RED <input type="checkbox"/> PURPLE
B/P	5. Pain		ORAL AIRWAY
SKIN COLOR	6. Paralysis		NASAL AIRWAY
PUPILS	7. Weakness		SUCTIONED
	8. Other _____		

IV LINES	CC _____ ANGIO _____ CC _____ ANGIO _____	SUMMARY OF FINDINGS:
MEDICATION		

STATUS ON ARRIVAL/TO ER/PULSE: <input type="checkbox"/> PRESENT <input type="checkbox"/> ABSENT	
TOTAL VOL. FLUIDS INFUSED	
GREENVILLE HOSPITAL SYSTEM RESUSCITATION	
1. RETURN TO PRE-ARREST STATUS <input type="checkbox"/> YES <input type="checkbox"/> NO	
2. COMPLICATIONS OF RESUSCITATION:	
3. COMMENTS:	
4. LEFT HOSP. ALIVE AT _____	
DIED AT	CAUSE OF DEATH
AUTOPSY	REVIEWED BY
	MD CONTACTED <input type="checkbox"/> YES <input type="checkbox"/> NO NAME OF M.D. () _____
	BY <input type="checkbox"/> RADIO <input type="checkbox"/> PHONE <input type="checkbox"/> DIRECT () _____
	FORM COMPLETED BY _____
	SIGNATURE _____ PARAMEDIC

PATIENT CHART

APPENDIX 5 Local Climatological Data



MONTHLY SUMMARY

LATITUDE 34° 54' N LONGITUDE 82° 13' W ELEVATION (GROUND) 157 FT. STANDARD TIME USED: EASTERN HAN #03970

NOVEMBER 1980 GREENVILLE-SPARTANBURG AP

DATE	TEMPERATURE °F					DEGREE DAYS BASE 65°	WEATHER TYPES IN DATES OF OCCURRENCE	SNOW, ICE PELLETS ON GROUND 07AM IN.	PRECIPITATION			AVG. STATION PRESSURE IN. ELEV. FEET M.S.L.	WIND				SUNSHINE		SKY COVER TENTHS		DATE
	MAXIMUM	MINIMUM	AVERAGE	DEPARTURE FROM NORMAL	AVERAGE DEP. POINT				WATER EQUIVA- LENT IN.	SNOW, ICE PELLETS IN.	WINDY DIR.		MAXIMUM SPEED M.P.H.	AVERAGE SPEED M.P.H.	FASTEST MILE DIRECTION	MINUTS	PERCENT OF POSSIBLE	SUNRISE TO SET	MOONRISE TO HIGHT		
1	71	44	58	5	26	7	0	0	0	0	29.06	29	1	7	16	NW	646	100	0	0	1
2	66	42	54	1	40	11	0	0	0	0	29.19	10	2	2	12	NW	582	90	0	0	2
3	63	43	53	0	42	12	0	0	0	0	29.27	04	3	2	10	NW	314	49	0	0	3
4	63	50	57	0	50	15	0	0	0	0	29.00	26	2	2	11	NW	34	8	0	0	4
5	61	46	54	0	35	15	0	0	0	0	29.33	35	0	0	18	NW	477	75	0	0	5
6	59	34	47	1	22	18	0	0	0	0	29.05	26	0	0	12	NW	336	100	0	0	6
7	59	34	47	1	40	18	0	0	0	0	29.44	22	0	0	21	NW	589	43	0	0	7
8	51	33	42	2	33	19	0	0	0	0	29.10	01	0	0	10	NW	332	100	0	0	8
9	51	33	42	2	33	19	0	0	0	0	29.07	23	0	0	2	NW	332	100	0	0	9
10	53	34	44	1	33	19	0	0	0	0	29.97	23	11	4	12	NW	630	100	0	0	10
11	53	34	44	1	33	19	0	0	0	0	29.98	33	0	0	16	NW	630	100	0	0	11
12	58	33	45	0	33	19	0	0	0	0	29.14	01	0	0	16	NW	628	100	0	0	12
13	45	33	39	2	27	16	0	0	0	0	29.47	20	0	0	13	NW	526	100	0	0	13
14	54	41	55	4	15	10	0	0	0	0	29.15	22	0	0	15	NW	677	27	0	0	14
15	60	57	59	0	0	0	0	0	0	0	29.48	04	0	0	12	NW	0	0	0	0	15
16	58	49	54	0	0	0	0	0	0	0	29.09	05	0	0	14	NW	0	0	0	0	16
17	49	41	45	1	37	20	0	0	0	0	29.08	05	1	3	17	NW	0	0	0	0	17
18	55	32	44	1	36	21	0	0	0	0	29.36	24	2	2	18	NW	65	11	0	0	18
19	44	25	37	3	23	24	0	0	0	0	29.23	14	2	3	17	NW	615	100	0	0	19
20	50	29	40	2	25	26	0	0	0	0	29.27	04	3	3	14	NW	461	75	4	4	20
21	59	29	44	1	23	23	0	0	0	0	29.21	36	5	3	17	NW	559	41	0	0	21
22	56	27	42	1	23	23	0	0	0	0	29.34	16	1	1	17	NW	359	59	0	0	22
23	45	43	44	1	16	11	0	0	0	0	29.29	03	0	0	14	NW	0	0	0	0	23
24	52	43	48	1	0	0	0	0	0	0	29.00	03	4	2	14	NW	0	0	0	0	24
25	56	38	47	1	0	0	0	0	0	0	29.17	36	6	4	15	NW	332	55	0	0	25
26	47	32	40	2	25	25	0	0	0	0	29.11	04	10	3	11	NW	204	34	0	0	26
27	41	37	39	2	25	25	0	0	0	0	28.95	04	3	5	10	NW	0	0	0	0	27
28	46	36	41	1	24	24	0	0	0	0	28.95	24	2	7	10	NW	203	34	0	0	28
29	57	32	45	2	20	20	0	0	0	0	28.93	24	11	8	13	NW	581	97	0	0	29
30	59	28	44	2	21	21	0	0	0	0	29.19	20	4	4	9	NW	600	100	0	0	30

SUM	SUM	TOTAL		TOTAL		TOTAL		TOTAL		FOR THE MONTH:				TOTAL		SUM		SUM	
1781	1176	462		462		NUMBER OF DAYS		4		0.29		09		34		1		23	
AVG	AVG	AVG	DEP	AVG	DEP	PRECIPITATION		DEP		DATE		29		18642		50		4	
59.4	39.2	49.3	1.7	26	42	0.01 INCH		0		18642		50		4		4		2	
NUMBER OF DAYS		TOTAL		TOTAL		GREATEST IN 24 HOURS AND DATES		GREATEST DEPTH ON GROUND OF SNOW,		SNOW, ICE PELLETS		ICE PELLETS OR ICE AND DATE							
3		0		0		0		0		0		0		0		0		0	

* EXTREME FOR THE MONTH - LAST OCCURRENCE IF MORE THAN ONE.
 † TRACE AMOUNT.
 ‡ 0.00 ON AN EARLIER DATE, OR DATES.
 § VISIBILITY 3/4 MILE OR LESS.
 ¶ FIGURES FOR WIND DIRECTIONS ARE TENS OF DEGREES CLOCKWISE FROM TRUE NORTH. 00 = CALM.
 DATA IN COLS. 6 AND 12-15 ARE BASED ON 7 OR

MORE OBSERVATIONS PER DAY AT 3-HOUR INTERVALS.
 † FASTEST MILE WIND SPEEDS ARE FASTEST OBSERVED ONE-MINUTE VALUES WHEN DIRECTIONS ARE IN TENS OF DEGREES. THE † WITH THE DIRECTION INDICATES PEAK GUST SPEED.
 ANY ERRORS DETECTED WILL BE CORRECTED AND CHANGES IN SUMMARY DATA WILL BE ANNOTATED IN THE ANNUAL SUMMARY.

SUMMARY BY HOURS

HOUR	LOCAL TIME	SKY COVER	STATION PRESSURE	TEMPERATURE				RELATIVE HUMIDITY	WIND SPEED	DIRECTION	SPEED M.P.H.
				AIR	NET	WET BULB	DEW PT.				
01	4:29	09	45	41	35	72	6	4	35	2	2
04	4:29	08	43	40	35	70	6	6	01	2	5
07	4:29	10	42	38	34	75	6	7	35	1	2
10	4:29	12	50	44	36	62	6	4	32	2	0
13	5:29	08	57	47	36	62	4	5	27	2	2
16	5:29	05	58	48	36	50	10	0	23	1	3
19	4:29	08	50	44	37	65	5	8	32	1	4
22	4:29	10	47	42	36	70	5	3	26	1	3

HOURLY PRECIPITATION (WATER EQUIVALENT IN INCHES)

DATE	1 2 3 4 5 6 7 8 9 10 11 12												1 2 3 4 5 6 7 8 9 10 11 12												DATE
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	
1																									1
2																									2
3																									3
4		.34	.23	.05	.23	.18																			4
5																									5
6																									6
7																									7
8																									8
9																									9
10																									10
11																									11
12																									12
13																									13
14																									14
15												.15	.27	.35	.11	.32	T	T	T	T	T	T	T	T	15
16	T	T										.05	.32	T	.03	.11	.32	.05	.31	.35	T	T	T	T	16
17																									17
18		T	T	T																					18
19																									19
20																									20
21																									21
22																									22
23																									23
24	T	.05	.05	.10	.34	.08	.14	.33	T	T	T	T	T	.02	.01	.31	T	T	T	T	T	T	T	T	24
25																									25
26																									26
27																									27
28		.09	.09	.12	.12	.05	.12	.07	.09	.04	.01	.01	T	T	T	T	T	T	T	T	T	T	T	28	
29																									29
30																									30

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noaa NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION / ENVIRONMENTAL DATA AND INFORMATION SERVICE
Daniel B. Mitchell
 DIRECTOR, NATIONAL CLIMATIC CENTER

Local Climatological Data



MONTHLY SUMMARY

LATITUDE 34° 54' N LONGITUDE 82° 13' W ELEVATION (GROUND) 957 FT. STANDARD TIME USED: EASTERN HUAN #03870

DATE	TEMPERATURE °F				DEGREE DAYS BASE 65°		WEATHER TYPES ON DATES OF OCCURRENCE 1 FOG 2 HEAVY FOG 3 THUNDERSTORM 4 ICE PELLETS 5 HAIL 6 BLAZE 7 DUSTSTORM 8 SMOG, HAZE 9 SCATTERED SMOG	SNOW, ICE PELLETS OR ICE ON GROUND AT 07AM IN.	PRECIPITATION		STATION PRESSURE IN.	WIND			SUNSHINE		SKY COVER TENTHS		DATE	
	MAXIMUM	MINIMUM	AVERAGE	DEPARTURE FROM NORMAL	AVERAGE DEN POINT	HEATING (ISLAND BASIS WITH JAN.)			COOLING (ISLAND BASIS WITH JAN.)	WATER EQUIV. IN.		SNOW, ICE PELLETS IN.	RESULTANT DIR.	RESULTANT SPEED M.P.H.	AVERAGE SPEED M.P.H.	FASTEST MILE	MINUTES	PERCENT OF POSSIBLE		SUNRISE TO SUNSET
1	84	64	74	1.4	59	0	0	0	0	0	29.04	05	3.6	5.5	9	NE	811	93	4	1
2	89	64	77	1.4	65	0	0	0	0	0	29.11	22	5.1	7.0	14	SW	763	88	4	4
3	91	71	81	3.3	70	0	0	0	0	0	29.08	23	5.9	7.0	17	SW	404	47	9	3
4	92	73	83	3.8	72	0	0	0	0	0	29.06	15	1.3	3.9	19	SW	328	38	8	9
5	95	71	83	3.3	71	0	0	0	0	0	29.00	26	6.0	7.0	14	SW	821	35	0	1
6	94	74	84	3.6	67	0	0	0	0	0	29.00	35	6.0	7.0	22	SW	775	30	2	3
7	96	69	78	1.9	65	0	0	0	0	0	29.06	03	6.0	7.0	13	SW	825	35	2	1
8	93	64	79	1.9	68	0	0	0	0	0	29.05	20	5.4	6.0	14	SW	808	34	1	3
9	98	73	86	3.9	70	0	0	0	0	0	29.03	20	1.9	5.8	23	NE	562	35	1	3
10	98	71	85	3.7	71	0	0	0	0	0	28.96	23	5.1	6.5	10	SW	448	32	9	9
11	96	72	84	3.6	72	0	0	0	0	0	28.99	34	4.0	4.9	10	SW	731	86	1	3
12	95	72	84	3.6	72	0	0	0	0	0	28.91	12	1.7	3.7	6	S	716	83	1	2
13	98	74	86	3.9	73	0	0	0	0	0	28.98	04	3.2	5.0	14	SW	643	75	6	6
14	90	75	83	3.3	73	0	0	0	0	0	29.03	06	6.2	6.9	10	NE	633	74	4	5
15	93	74	84	3.5	73	0	0	0	0	0	29.06	18	3.9	5.3	10	SW	695	81	2	3
16	99	75	87	3.9	73	0	0	0	0	0	28.97	23	1.1	4.6	9	NE	679	59	3	2
17	100	72	86	3.8	72	0	0	0	0	0	28.94	16	3.5	3.9	5	SE	433	81	6	7
18	91	71	81	3.3	69	0	0	0	0	0	29.01	12	3.1	6.3	22	E	798	79	6	6
19	93	71	82	3.4	70	0	0	0	0	0	29.12	12	3.9	4.6	8	SE	679	94	2	2
20	93	72	83	3.5	70	0	0	0	0	0	29.16	18	4.9	5.8	12	SW	770	70	3	3
21	94	72	83	3.5	69	0	0	0	0	0	29.14	20	6.0	7.2	12	SW	756	89	4	4
22	91	71	81	3.3	68	0	0	0	0	0	29.05	17	7.4	8.1	13	SW	676	80	8	7
23	85	72	79	3.0	69	0	0	0	0	0	28.94	14	1.6	3.3	11	NW	227	27	9	8
24	89	68	79	1.0	67	0	0	0	0	0	28.97	08	4.3	6.0	10	E	605	72	6	6
25	90	69	80	1.1	67	0	0	0	0	0	29.04	08	4.9	6.0	10	E	651	77	4	3
26	91	68	80	1.0	66	0	0	0	0	0	29.00	36	3.0	4.8	20	E	422	50	5	5
27	87	67	77	1.2	67	0	0	0	0	0	28.94	07	2.6	4.5	11	N	232	28	8	9
28	99	72	86	3.9	69	0	0	0	0	0	28.80	01	1.5	6.6	9	SW	432	51	6	7
29	90	69	80	1.1	65	0	0	0	0	0	28.91	03	4.2	5.2	9	SW	773	92	3	2
30	94	68	81	1.2	65	0	0	0	0	0	28.97	35	1.9	3.6	8	SW	871	93	0	0
31	96	69	83	2.4	66	0	0	0	0	0	29.04	22	2.8	4.2	14	SW	789	89	2	1
SUM		2864	2187	74.4	1.4	519	0	0	0	0	29.00	15	6	5.6	30	W	14768	132	139	
AVE		92.4	70.5	81.5	3.2	69	0	0	0	0	29.00	15	6	5.6	30	W	26475	75	4.3	2.5
MAXIMUM TEMP		100	72	86	3.8	72	0	0	0	0	28.94	16	3.5	3.9	5	SE	433	81	6	7
MINIMUM TEMP		64	64	64	1.4	59	0	0	0	0	29.04	05	3.6	5.5	9	NE	811	93	4	1
TOTAL		24	0	0	0	41	0	0	0	0	13	0	0	0	0	0	0	0	0	0
NUMBER OF DAYS		24	0	0	0	41	0	0	0	0	13	0	0	0	0	0	0	0	0	0
GREATEST IN 24 HOURS AND DATES		100	72	86	3.8	72	0	0	0	0	28.94	16	3.5	3.9	5	SE	433	81	6	7
GREATEST DEPTH ON GROUND OF SNOW, ICE PELLETS OR ICE AND DATE		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

JULY 1980 GREENVILLE-SPARTANBURG AP

SUMMARY BY HOURS

HOUR	LOCAL TIME	SKY COVER TENTHS	AVERAGES					RESULTANT WIND	
			STATION PRESSURE IN.	AIR °F	WET BULB °F	DEW PT. °F	RELATIVE HUMIDITY %	WIND SPEED M.P.H.	DIRECTION
01	5	29.00	75	71	68	80	3.8	06	2
04	4	29.00	72	69	67	84	3.9	02	3
07	4	29.02	73	70	68	85	4.4	35	7
10	4	29.04	83	78	70	67	6.4	23	8
13	4	29.02	89	75	70	54	7.1	17	9
16	4	28.97	90	75	69	50	8.2	12	10
19	5	28.97	85	74	70	61	6.5	12	11
22	5	29.01	78	72	69	74	3.9	11	6

HOURLY PRECIPITATION (WATER EQUIVALENT IN INCHES)

HOUR	A. M. HOUR ENDING AT												P. M. HOUR ENDING AT											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
1																								
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26																								
27																								
28		.01	.05																			.01	.24	
29																								
30																								
31																								

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 DIRECTOR, NATIONAL CLIMATIC CENTER

OBSERVATIONS AT 3-HOUR INTERVALS

HOUR	SKY COVER CLR BKN OVC	CELLING HIGHS LWS	VISI- BILITY MILES	WEATHER	TEMPERATURE					WIND DIR	SPEED KNOTS	SKY COVER CLR BKN OVC	CELLING HIGHS LWS	VISI- BILITY MILES	WEATHER	TEMPERATURE					WIND DIR	SPEED KNOTS	SKY COVER CLR BKN OVC	CELLING HIGHS LWS	VISI- BILITY MILES	WEATHER	TEMPERATURE					WIND DIR	SPEED KNOTS
					AIR * F	WET BULB * F	DEW PT. * F	REL. HUM. %	DIR							AIR * F	WET BULB * F	DEW PT. * F	REL. HUM. %	DIR							AIR * F	WET BULB * F	DEW PT. * F	REL. HUM. %	DIR		
01	0	UNL	15		69	51	57	58	104	0	0	UNL	12		DAY 32	67	63	61	81	100	0	10	1250	7		DAY 33	80	72	69	69	26	5	
04	0	UNL	15		64	50	57	78	101	0	0	UNL	12		DAY 32	73	71	70	90	100	0	10	1250	7		DAY 33	72	69	68	97	18	4	
07	0	UNL	15		56	52	57	78	104	0	0	UNL	12		DAY 32	65	62	61	87	100	0	10	1250	7		DAY 33	70	67	66	90	23	5	
10	0	UNL	15		71	66	63	54	105	0	0	UNL	12		DAY 32	82	69	62	51	123	0	10	1250	7		DAY 33	75	72	70	95	23	9	
13	4	UNL	15		81	76	73	47	110	0	0	UNL	10		DAY 32	96	72	66	51	123	0	10	1250	7		DAY 33	85	82	80	95	23	10	
16	6	UNL	15		84	80	77	43	125	0	0	UNL	10		DAY 32	98	75	70	55	120	0	10	1250	7		DAY 33	90	87	85	95	23	9	
19	0	UNL	15		85	81	78	44	111	0	0	UNL	10		DAY 32	98	74	69	59	125	0	10	1250	7		DAY 33	86	83	81	95	23	9	
22	0	250	15		73	69	60	54	100	0	0	250	15		DAY 32	78	72	70	77	122	0	10	1250	7		DAY 33	76	73	72	92	37	4	
01	10	110	3		76	73	71	95	100	0	5	UNL	7		DAY 34	73	70	69	97	100	0	10	1130	7		DAY 35	90	73	70	72	26	9	
04	7	100	3		70	67	65	97	100	0	3	UNL	7		DAY 34	66	64	63	90	100	0	10	1250	7		DAY 35	81	72	68	65	27	9	
07	7	250	3		75	73	72	97	100	0	3	UNL	7		DAY 34	72	70	69	90	124	0	10	1250	7		DAY 35	91	72	68	65	31	10	
10	10	120	7		81	76	74	79	100	0	3	UNL	7		DAY 34	85	78	76	72	25	0	10	1250	7		DAY 35	97	76	70	67	36	10	
13	6	UNL	4		89	78	74	61	115	4	1	UNL	8		DAY 34	95	78	73	54	29	8	10	1250	7		DAY 35	92	76	70	49	02	11	
16	10	40	4		89	79	75	63	105	5	0	UNL	10		DAY 34	95	78	71	46	30	9	10	1250	7		DAY 35	93	73	64	38	36	12	
19	10	250	7		74	71	70	87	118	5	0	UNL	10		DAY 34	80	77	72	56	22	8	10	1250	7		DAY 35	88	72	65	47	36	7	
22	10	250	6		73	71	70	10	134	4	0	UNL	12		DAY 34	80	74	72	77	123	7	10	1250	7		DAY 35	81	70	64	56	36	9	
01	0	UNL	15		71	66	64	79	100	0	0	UNL	7		DAY 36	70	67	65	94	100	0	10	1250	7		DAY 37	79	74	72	79	21	4	
04	0	UNL	15		70	66	64	81	103	0	0	UNL	7		DAY 36	68	64	63	10	100	0	10	1250	7		DAY 37	74	69	66	76	03	4	
07	0	UNL	15		71	66	64	75	103	0	0	UNL	7		DAY 36	70	67	66	90	115	0	10	1250	7		DAY 37	74	64	67	78	24	4	
10	4	UNL	12		78	71	67	63	103	0	0	UNL	7		DAY 36	82	70	68	61	124	0	10	1250	7		DAY 37	84	74	70	43	24	6	
13	5	UNL	10		84	72	67	57	104	0	2	UNL	8		DAY 36	89	75	69	52	122	0	10	1250	7		DAY 37	92	78	73	54	18	7	
16	0	UNL	10		86	71	64	49	105	0	1	UNL	10		DAY 36	92	76	69	47	119	12	10	1250	7		DAY 37	98	79	70	10	04	1	
19	0	UNL	8		82	72	67	51	103	0	1	UNL	10		DAY 36	89	77	72	57	116	12	10	1250	7		DAY 37	98	78	74	63	14	1	
22	0	UNL	7		72	67	65	79	100	0	4	250	7		DAY 36	74	70	69	74	122	8	10	1250	7		DAY 37	83	71	70	65	22	1	
01	2	UNL	10		74	72	69	72	105	4	0	100	12		DAY 38	74	73	72	44	25	5	10	1250	7		DAY 39	75	72	70	95	36	4	
04	0	UNL	7		75	70	68	79	124	5	0	UNL	12		DAY 38	72	71	70	93	100	0	10	1250	7		DAY 39	72	70	69	10	00	0	
07	0	250	4		76	72	71	97	123	3	0	UNL	8		DAY 38	76	71	71	95	100	0	10	1250	7		DAY 39	78	73	71	73	62	4	
10	0	250	6		86	77	74	68	122	0	0	UNL	7		DAY 38	97	79	76	70	34	6	10	1250	7		DAY 39	96	77	74	68	08	1	
13	0	UNL	7		85	80	74	51	125	0	0	UNL	7		DAY 38	81	79	74	58	36	6	10	1250	7		DAY 39	80	77	74	54	16	4	
16	0	40	7		72	69	67	84	122	0	0	UNL	10		DAY 38	74	71	71	51	36	9	10	1250	7		DAY 39	74	76	69	44	16	4	
19	0	250	15		74	69	67	50	117	0	0	UNL	10		DAY 38	74	71	71	63	36	9	10	1250	7		DAY 39	86	80	78	77	14	4	
22	0	250	10		73	71	70	40	100	0	0	UNL	10		DAY 38	74	72	72	74	35	4	10	1250	7		DAY 39	80	74	72	77	00	0	
01	0	250	12		70	75	71	92	136	4	10	50	5		DAY 40	78	75	74	98	104	8	10	1250	7		DAY 41	76	73	71	85	06	3	
04	0	UNL	8		75	72	71	97	136	3	0	50	5		DAY 40	74	74	73	98	103	9	10	1250	7		DAY 41	75	71	69	82	00	3	
07	0	UNL	8		74	71	70	97	101	3	0	50	5		DAY 40	76	74	73	90	04	7	10	1250	7		DAY 41	76	72	70	98	12	3	
10	0	UNL	10		86	77	73	65	122	4	5	UNL	8		DAY 40	94	77	74	74	05	7	10	1250	7		DAY 41	94	77	74	72	20	9	
13	0	UNL	10		94	80	75	54	100	0	9	35	6		DAY 40	96	77	73	65	07	9	10	1250	7		DAY 41	90	74	75	1	22	6	
16	0	UNL	10		97	80	74	48	109	0	1	UNL	10		DAY 40	98	77	72	59	12	4	10	1250	7		DAY 41	93	80	76	78	19	7	
19	0	250	10		89	79	75	53	105	5	0	UNL	7		DAY 40	86	77	72	67	10	7	10	1250	7		DAY 41	88	81	78	72	13	2	
22	0	UNL	7		82	77	75	79	104	9	0	UNL	7		DAY 40	81	73	71	92	07	5	10	1250	7		DAY 41	81	76	74	74	15	6	
01	0	UNL	5		77	73	71	77	118	5	0	UNL	3		DAY 42	76	71	69	79	21	5	10	1250	7		DAY 43	81	76	72	74	15	5	
04	0	UNL	6		77	72	70	79	123	5	0	UNL	2		DAY 42	78	69	68	97	16	3	10	1250	7		DAY 43	73	68	66	79	12	9	
07	0	UNL	4		77	73	72	85	125	4	0	UNL	7		DAY 42	79	72	69	74	100	0	10	1250	7		DAY 43	71	68	67	87	35	5	
10	0	UNL	5		90	80	76	64	136	3	0	UNL	7		DAY 42	85	78	75	72	117	7	10	1250	7		DAY 43	93	72	67	59	22	4	
13	0	UNL	5		86	81	76	53	127	4	7	UNL	7		DAY 42	87	78	73	46	14	4	10	1250	7		DAY 43	98	74	67	50	18	4	
16	0	40	5		91	82	79	68	130	0	4	UNL	7		DAY 42	97	79	73	40	14	4	10	1250	7		DAY 43	89	77	72	59	09	3	
19	0	300	3		84	75	71	65	136	0	4	UNL	7		DAY 42	81	79	76	60	14	5	10	1250	7		DAY 43	85	76	72	65	09	5	
22	0	UNL	12		78	72	70	77	100	0	10	250	5		DAY 42	84	76	73	70	14	3	10	1250	7		DAY 43	77	72	70	79	04	3	
01	2	UNL	12		74	71	70	97	100	0	0	UNL	15		DAY 44	80	73	70	72	116	4	10	1250	7		DAY 45	76	71	69	74	17	5	
04	0	UNL	12		72	69	68	97	100	0	0	UNL	15		DAY 44	76	72	70	82	24	4	10	1250	7		DAY 45	72	69	68	97	22	4	
07	0	UNL	12		73	72	71	90	104	5	1	UNL	10		DAY																		

OBSERVATIONS AT 3-HOUR INTERVALS

HOUR	SKY COVER	WIND	TEMPERATURE				WIND	WIND	WIND	WIND	WIND	WIND	WIND	WIND	WIND	WIND	WIND	WIND	WIND	WIND
			AIR	WET BULB	DEW PT.	MIX														
DAY 01																				
01	0	UNL	50	43	38	59	101	5	0	UNL	5	0	UNL	5	0	UNL	5	0	UNL	5
04	10	50	42	39	36	79	106	3	0	UNL	3	0	UNL	3	0	UNL	3	0	UNL	3
07	10	50	42	39	36	79	106	3	0	UNL	3	0	UNL	3	0	UNL	3	0	UNL	3
10	10	50	58	47	38	51	109	4	0	UNL	4	0	UNL	4	0	UNL	4	0	UNL	4
13	10	50	60	50	39	46	116	5	0	UNL	5	0	UNL	5	0	UNL	5	0	UNL	5
16	10	50	65	52	40	40	118	5	0	UNL	5	0	UNL	5	0	UNL	5	0	UNL	5
19	10	50	71	52	42	52	120	5	0	UNL	5	0	UNL	5	0	UNL	5	0	UNL	5
22	10	50	51	47	42	72	120	5	0	UNL	5	0	UNL	5	0	UNL	5	0	UNL	5
DAY 02																				
01	0	UNL	49	45	41	74	116	4	0	UNL	4	0	UNL	4	0	UNL	4	0	UNL	4
04	10	50	45	43	40	83	122	3	0	UNL	3	0	UNL	3	0	UNL	3	0	UNL	3
07	10	50	46	44	43	89	116	3	0	UNL	3	0	UNL	3	0	UNL	3	0	UNL	3
10	10	50	62	55	49	63	120	3	0	UNL	3	0	UNL	3	0	UNL	3	0	UNL	3
13	10	50	69	57	49	53	122	3	0	UNL	3	0	UNL	3	0	UNL	3	0	UNL	3
16	10	50	69	58	50	57	118	3	0	UNL	3	0	UNL	3	0	UNL	3	0	UNL	3
19	10	50	64	57	51	63	118	3	0	UNL	3	0	UNL	3	0	UNL	3	0	UNL	3
22	10	50	57	53	50	79	100	3	0	UNL	3	0	UNL	3	0	UNL	3	0	UNL	3
DAY 03																				
01	0	UNL	55	52	50	83	100	0	0	UNL	0	0	UNL	0	0	UNL	0	0	UNL	0
04	10	50	52	50	49	90	102	0	0	UNL	0	0	UNL	0	0	UNL	0	0	UNL	0
07	10	50	63	42	31	93	124	13	0	UNL	13	0	UNL	13	0	UNL	13	0	UNL	13
10	10	50	59	5	56	63	125	13	0	UNL	13	0	UNL	13	0	UNL	13	0	UNL	13
13	10	50	74	57	44	34	125	15	0	UNL	15	0	UNL	15	0	UNL	15	0	UNL	15
16	10	50	74	53	32	24	125	16	0	UNL	16	0	UNL	16	0	UNL	16	0	UNL	16
19	10	50	65	48	27	24	131	10	0	UNL	10	0	UNL	10	0	UNL	10	0	UNL	10
22	10	50	52	43	31	45	135	7	0	UNL	7	0	UNL	7	0	UNL	7	0	UNL	7
DAY 04																				
01	0	UNL	62	60	59	90	121	7	0	UNL	7	0	UNL	7	0	UNL	7	0	UNL	7
04	10	50	62	60	59	90	121	7	0	UNL	7	0	UNL	7	0	UNL	7	0	UNL	7
07	10	50	63	42	31	93	124	13	0	UNL	13	0	UNL	13	0	UNL	13	0	UNL	13
10	10	50	59	5	56	63	125	13	0	UNL	13	0	UNL	13	0	UNL	13	0	UNL	13
13	10	50	74	57	44	34	125	15	0	UNL	15	0	UNL	15	0	UNL	15	0	UNL	15
16	10	50	74	53	32	24	125	16	0	UNL	16	0	UNL	16	0	UNL	16	0	UNL	16
19	10	50	65	48	27	24	131	10	0	UNL	10	0	UNL	10	0	UNL	10	0	UNL	10
22	10	50	52	43	31	45	135	7	0	UNL	7	0	UNL	7	0	UNL	7	0	UNL	7
DAY 05																				
01	0	UNL	47	40	30	52	116	9	0	UNL	9	0	UNL	9	0	UNL	9	0	UNL	9
04	10	50	45	38	29	51	116	3	0	UNL	3	0	UNL	3	0	UNL	3	0	UNL	3
07	10	50	44	37	28	49	116	7	0	UNL	7	0	UNL	7	0	UNL	7	0	UNL	7
10	10	50	51	41	27	39	116	4	0	UNL	4	0	UNL	4	0	UNL	4	0	UNL	4
13	10	50	57	44	25	34	101	8	0	UNL	8	0	UNL	8	0	UNL	8	0	UNL	8
16	10	50	61	46	27	27	101	15	0	UNL	15	0	UNL	15	0	UNL	15	0	UNL	15
19	10	50	56	44	28	24	101	10	0	UNL	10	0	UNL	10	0	UNL	10	0	UNL	10
22	10	50	48	40	28	46	101	9	0	UNL	9	0	UNL	9	0	UNL	9	0	UNL	9
DAY 06																				
01	0	UNL	45	38	28	51	101	4	0	UNL	4	0	UNL	4	0	UNL	4	0	UNL	4
04	10	50	40	35	28	62	103	4	0	UNL	4	0	UNL	4	0	UNL	4	0	UNL	4
07	10	50	39	35	30	70	101	4	0	UNL	4	0	UNL	4	0	UNL	4	0	UNL	4
10	10	50	39	35	30	70	101	4	0	UNL	4	0	UNL	4	0	UNL	4	0	UNL	4
13	10	50	57	45	30	36	112	10	0	UNL	10	0	UNL	10	0	UNL	10	0	UNL	10
16	10	50	53	40	31	39	118	6	0	UNL	6	0	UNL	6	0	UNL	6	0	UNL	6
19	10	50	66	49	30	26	114	6	0	UNL	6	0	UNL	6	0	UNL	6	0	UNL	6
22	10	50	52	43	33	49	114	4	0	UNL	4	0	UNL	4	0	UNL	4	0	UNL	4
DAY 07																				
01	6	UNL	53	45	37	55	117	5	0	UNL	5	0	UNL	5	0	UNL	5	0	UNL	5
04	10	50	52	45	40	62	116	5	0	UNL	5	0	UNL	5	0	UNL	5	0	UNL	5
07	10	50	51	47	43	74	104	6	0	UNL	6	0	UNL	6	0	UNL	6	0	UNL	6
10	10	50	56	5	46	89	100	3	0	UNL	3	0	UNL	3	0	UNL	3	0	UNL	3
13	10	50	54	5	51	53	101	5	0	UNL	5	0	UNL	5	0	UNL	5	0	UNL	5
16	10	50	54	57	52	65	104	5	0	UNL	5	0	UNL	5	0	UNL	5	0	UNL	5
19	10	50	60	57	54	81	105	5	0	UNL	5	0	UNL	5	0	UNL	5	0	UNL	5
22	10	50	59	57	55	97	104	5	0	UNL	5	0	UNL	5	0	UNL	5	0	UNL	5
DAY 08																				
01	6	UNL	53	45	37	55	117	5	0	UNL	5	0	UNL	5	0	UNL	5	0	UNL	5
04	10	50	52	45	40	62	116	5	0	UNL	5	0	UNL	5	0	UNL	5	0	UNL	5
07	10	50	51	47	43	74	104	6	0	UNL	6	0	UNL	6	0	UNL	6	0	UNL	6
10	10	50	56	5	46	89	100	3	0	UNL	3	0	UNL	3	0	UNL	3	0	UNL	3
13	10	50	54	5	51	53	101	5	0	UNL	5	0	UNL	5	0	UNL	5	0	UNL	5
16	10	50	54	57	52	65	104	5	0	UNL	5	0	UNL	5	0	UNL	5	0	UNL	5
19	10	50	60	57	54	81	105	5	0	UNL	5	0	UNL	5	0	UNL	5	0	UNL	5
22	10	50	59	57	55	97	104	5	0	UNL	5	0	UNL	5	0	UNL	5	0	UNL	5
DAY 09																				
01	6	UNL	53	45	37	55	117	5	0	UNL	5	0	UNL	5	0	UNL	5	0	UNL	5
04	10	50	52	45	40	62	116	5	0	UNL	5	0	UNL	5	0	UNL	5	0	UNL	5
07	10	50	51	47	43	74	104	6	0	UNL	6	0	UNL	6	0	UNL	6	0	UNL	6
10	10	50	56	5	46	89	100	3	0	UNL	3	0	UNL	3	0	UNL	3	0	UNL	3
13	10	50	54	5	51	53	101	5	0	UNL	5	0	UNL	5	0	UNL	5	0	UNL	5
16	10	50	54	57	52	65	104	5	0	UNL	5	0	UNL	5	0	UNL	5	0	UNL	5
19	10	50	60	57	54	81	105	5	0	UNL	5	0	UNL	5	0	UNL	5	0	UNL	5
22	10	50	59	57	55	97	104	5	0	UNL	5	0	UNL	5	0	UNL	5	0	UNL	5
DAY 10																				
01	0	UNL	49	41	33	56	121	3	0	UNL	3	0	UNL	3	0	UNL	3	0	UNL	3
04	10	50	47	41	33	59	125	5	0	UNL	5	0	UNL	5	0	UNL	5	0	UNL	5
07	10	50	47	41	34	61	124	5	0	UNL	5	0	UNL	5	0	UNL	5	0	UNL	5
10	10	50	30	48	36	41	122	8	0	UNL	8	0	UNL	8	0	UNL	8	0	UNL	8
13	10	50	46	5	37	24	127	9	0	UNL	9	0	UNL	9	0	UNL	9	0	UNL	9
16	10	50	50	52	33	26	122	12	0	UNL	12	0	UNL	12	0	UNL	12	0	UNL	12
19	10	50	57	49	27	22	122	9	0	UNL	9	0	UNL	9	0	UNL	9	0	UNL	9
22	10	50	57	44	29	14	126	5	0</											

OBSERVATIONS AT 3-HOUR INTERVALS

HOUR	SKY COVER	WIND DIRECTION	WIND SPEED	VISIBILITY	TEMPERATURE					WEATHER	TEMPERATURE					WEATHER													
					AIR F	WET BULB	DEW PT.	REL. HUM.	DIR		AIR F	WET BULB	DEW PT.	REL. HUM.	DIR														
01	0 UNL	00	00	00	24	20	10	55	35	0	0 UNL	15	19	16	07	59	35	4	0 UNL	15	25	21	07	44	106	0			
04	0 UNL	00	00	00	22	19	08	50	35	0	0 UNL	15	20	18	05	52	35	4	0 UNL	15	23	20	09	50	105	0			
07	0 UNL	00	00	00	21	17	05	50	34	0	0 UNL	15	18	16	05	52	35	4	0 UNL	15	25	21	09	49	105	0			
10	0 UNL	00	00	00	24	17	03	40	34	0	0 UNL	15	21	19	07	44	33	3	0 UNL	15	20	17	09	49	105	0			
13	0 UNL	00	00	00	24	16	03	40	34	0	0 UNL	15	21	19	07	44	33	3	0 UNL	15	20	17	09	49	105	0			
16	0 UNL	00	00	00	24	16	03	40	34	0	0 UNL	15	21	19	07	44	33	3	0 UNL	15	20	17	09	49	105	0			
19	0 UNL	00	00	00	24	16	03	40	34	0	0 UNL	15	21	19	07	44	33	3	0 UNL	15	20	17	09	49	105	0			
22	0 UNL	00	00	00	23	17	05	48	34	0	0 UNL	15	22	20	08	43	34	3	0 UNL	15	25	22	09	42	106	0			
DAY 04											DAY 05					DAY 06													
01	0 UNL	00	00	00	31	26	18	54	41	5	0 UNL	15	22	19	09	57	36	4	0 UNL	13	4	0	12	51	101	23	92	100	0
04	0 UNL	00	00	00	32	26	17	45	42	4	0 UNL	15	22	19	09	57	36	4	0 UNL	13	4	0	12	51	101	23	92	100	0
07	0 UNL	00	00	00	30	26	17	58	40	2	0 UNL	15	21	18	08	50	36	5	0 UNL	13	4	0	12	51	101	23	92	100	0
10	0 UNL	00	00	00	31	25	17	43	40	2	0 UNL	15	20	18	08	54	36	5	0 UNL	13	4	0	12	50	101	23	96	100	0
13	0 UNL	00	00	00	34	25	16	34	38	12	0 UNL	15	20	18	08	54	36	5	0 UNL	13	4	0	12	50	101	23	96	100	0
16	0 UNL	00	00	00	34	25	16	29	34	12	0 UNL	15	20	18	08	54	36	5	0 UNL	13	4	0	12	50	101	23	96	100	0
19	0 UNL	00	00	00	30	24	16	39	35	6	0 UNL	15	20	18	08	54	36	5	0 UNL	13	4	0	12	50	101	23	96	100	0
22	0 UNL	00	00	00	26	22	15	48	34	0	0 UNL	15	20	18	08	54	36	5	0 UNL	13	4	0	12	50	101	23	96	100	0
DAY 07											DAY 08					DAY 09													
01	0 UNL	00	00	00	29	23	28	36	34	4	0 UNL	12	29	26	20	59	106	5	0 UNL	0	0	0	0	34	32	28	72	127	0
04	0 UNL	00	00	00	24	23	20	45	36	0	0 UNL	12	25	24	20	51	106	4	0 UNL	0	0	0	0	32	31	26	72	100	0
07	0 UNL	00	00	00	24	21	19	49	35	0	0 UNL	12	25	24	20	51	106	4	0 UNL	0	0	0	0	32	31	26	72	100	0
10	0 UNL	00	00	00	24	19	24	75	10	1	0 UNL	12	24	22	19	47	107	4	0 UNL	0	0	0	0	32	31	26	72	100	0
13	0 UNL	00	00	00	24	17	22	53	10	0	0 UNL	12	24	22	19	47	107	4	0 UNL	0	0	0	0	32	31	26	72	100	0
16	0 UNL	00	00	00	24	15	25	53	10	0	0 UNL	12	24	22	19	47	107	4	0 UNL	0	0	0	0	32	31	26	72	100	0
19	0 UNL	00	00	00	26	14	23	59	10	0	0 UNL	12	24	22	19	47	107	4	0 UNL	0	0	0	0	32	31	26	72	100	0
22	0 UNL	00	00	00	26	14	23	69	10	0	0 UNL	12	24	22	19	47	107	4	0 UNL	0	0	0	0	32	31	26	72	100	0
DAY 10											DAY 11					DAY 12													
01	0 UNL	00	00	00	31	13	12	76	10	4	0 UNL	12	25	24	22	49	100	0	0 UNL	0	0	0	0	32	31	26	69	100	0
04	0 UNL	00	00	00	24	14	11	96	10	0	0 UNL	12	24	23	21	48	100	0	0 UNL	0	0	0	0	32	31	26	69	100	0
07	0 UNL	00	00	00	24	13	12	103	10	0	0 UNL	12	24	23	21	48	100	0	0 UNL	0	0	0	0	32	31	26	69	100	0
10	0 UNL	00	00	00	24	12	11	103	10	0	0 UNL	12	24	23	21	48	100	0	0 UNL	0	0	0	0	32	31	26	69	100	0
13	0 UNL	00	00	00	24	11	10	103	10	0	0 UNL	12	24	23	21	48	100	0	0 UNL	0	0	0	0	32	31	26	69	100	0
16	0 UNL	00	00	00	24	10	9	103	10	0	0 UNL	12	24	23	21	48	100	0	0 UNL	0	0	0	0	32	31	26	69	100	0
19	0 UNL	00	00	00	24	9	8	103	10	0	0 UNL	12	24	23	21	48	100	0	0 UNL	0	0	0	0	32	31	26	69	100	0
22	0 UNL	00	00	00	24	8	7	103	10	0	0 UNL	12	24	23	21	48	100	0	0 UNL	0	0	0	0	32	31	26	69	100	0
DAY 13											DAY 14					DAY 15													
01	0 UNL	00	00	00	31	1	1	101	10	4	0 UNL	12	27	25	21	79	100	0	0 UNL	15	0	0	0	33	30	24	70	100	0
04	0 UNL	00	00	00	23	2	1	106	10	4	0 UNL	12	26	24	20	74	100	0	0 UNL	15	0	0	0	33	29	24	75	100	0
07	0 UNL	00	00	00	23	2	1	106	10	4	0 UNL	12	26	24	20	74	100	0	0 UNL	15	0	0	0	33	29	24	75	100	0
10	0 UNL	00	00	00	25	3	1	106	10	4	0 UNL	12	26	24	20	74	100	0	0 UNL	15	0	0	0	33	29	24	75	100	0
13	0 UNL	00	00	00	23	3	1	106	10	4	0 UNL	12	26	24	20	74	100	0	0 UNL	15	0	0	0	33	29	24	75	100	0
16	0 UNL	00	00	00	23	3	1	106	10	4	0 UNL	12	26	24	20	74	100	0	0 UNL	15	0	0	0	33	29	24	75	100	0
19	0 UNL	00	00	00	23	3	1	106	10	4	0 UNL	12	26	24	20	74	100	0	0 UNL	15	0	0	0	33	29	24	75	100	0
22	0 UNL	00	00	00	23	3	1	106	10	4	0 UNL	12	26	24	20	74	100	0	0 UNL	15	0	0	0	33	29	24	75	100	0
DAY 16											DAY 17					DAY 18													
01	0 UNL	00	00	00	50	46	40	64	42	7	0 UNL	15	31	28	4	43	105	2	0 UNL	15	0	0	0	26	22	12	55	104	5
04	0 UNL	00	00	00	49	45	45	59	39	7	0 UNL	15	29	27	3	39	101	5	0 UNL	15	0	0	0	27	23	13	58	100	0
07	0 UNL	00	00	00	48	43	49	100	25	5	0 UNL	15	27	25	2	35	101	5	0 UNL	15	0	0	0	27	23	13	58	100	0
10	0 UNL	00	00	00	52	52	52	100	25	5	0 UNL	15	27	25	2	35	101	5	0 UNL	15	0	0	0	27	23	13	58	100	0
13	0 UNL	00	00	00	53	47	41	54	36	6	0 UNL	15	28	27	3	35	105	6	0 UNL	15	0	0	0	27	23	13	58	100	0
16	0 UNL	00	00	00	49	41	32	62	35	3	0 UNL	15	28	27	3	35	105	6	0 UNL	15	0	0	0	27	23	13	58	100	0
19	0 UNL	00	00	00	47	31	21	62	38	6	0 UNL	15	28	27	3	35	105	6	0 UNL	15	0	0	0	27	23	13	58	100	0
22	0 UNL	00	00	00	43	28	19	56	40	6	0 UNL	15	28	27	3	35	105	6	0 UNL	15	0	0	0	27	23	13	58	100	0
DAY 19											DAY 20					DAY 21													
01	0 UNL	00	00	00	29	24	15	58	40	0	0 UNL	15	41	34	24	53	102	4	0 UNL	15	0	0	0						

Local Climatological Data



MONTHLY SUMMARY

LATITUDE 34° 54' N LONGITUDE 92° 13' W ELEVATION (GROUND) 957 FT. STANDARD TIME USED: EASTERN HBAN 403870

DATE	TEMPERATURE °F			DEGREE DAYS BASE 59°	WEATHER TYPES ON DATES OF OCCURRENCE	SNOW, ICE PELLETS OR ICE ON GROUND	PRECIPITATION		AVG. STATION PRESSURE IN.	WIND			SUNSHINE		SKY COVER TENTHS		DATE		
	MAXIMUM	MINIMUM	AVERAGE				WATER EQUIVA- LENT IN.	SNOW, ICE PELLETS IN. M.P.H.		RESULTANT DIR	RESULTANT SPEED M.P.H.	PASTEST MILE DIRECTION	MINUTES	PERCENT OF POSSIBLE	SUNRISE TO SUNSET	MIDNIGHT TO MIDNIGHT			
1	40	21	31	5	34	0	0	0	29.99	05	14	4	21	NE	0	0	10	10	1
2	37	20	28.5	2	41	0	0	0	29.99	01	10	4	22	NE	0	0	9	9	2
3	43	11	27	2	38	0	0	0	29.99	15	28	12	22	NE	0	0	9	9	2
4	57	25	42	20	23	0	0	0	29.99	11	10	10	24	SW	0	0	9	9	4
5	54	40	47	17	17	0	0	0	29.99	36	24	14	24	SW	0	0	9	9	4
6	50	31	40.5	10	18	0	0	0	29.99	12	14	4	24	SW	0	0	9	9	6
7	58	37	47.5	16	18	0	0	0	29.99	25	25	9	24	SW	0	0	9	9	6
8	58	53	55.5	14	14	0	0	0	29.99	27	20	5	16	SW	0	0	9	9	9
9	58	53	55.5	14	14	0	0	0	29.99	27	20	5	16	SW	0	0	9	9	9
10	58	53	55.5	14	14	0	0	0	29.99	27	20	5	16	SW	0	0	9	9	9
11	58	53	55.5	14	14	0	0	0	29.99	27	20	5	16	SW	0	0	9	9	9
12	58	53	55.5	14	14	0	0	0	29.99	27	20	5	16	SW	0	0	9	9	9
13	58	53	55.5	14	14	0	0	0	29.99	27	20	5	16	SW	0	0	9	9	9
14	58	53	55.5	14	14	0	0	0	29.99	27	20	5	16	SW	0	0	9	9	9
15	58	53	55.5	14	14	0	0	0	29.99	27	20	5	16	SW	0	0	9	9	9
16	58	53	55.5	14	14	0	0	0	29.99	27	20	5	16	SW	0	0	9	9	9
17	58	53	55.5	14	14	0	0	0	29.99	27	20	5	16	SW	0	0	9	9	9
18	58	53	55.5	14	14	0	0	0	29.99	27	20	5	16	SW	0	0	9	9	9
19	58	53	55.5	14	14	0	0	0	29.99	27	20	5	16	SW	0	0	9	9	9
20	58	53	55.5	14	14	0	0	0	29.99	27	20	5	16	SW	0	0	9	9	9
21	58	53	55.5	14	14	0	0	0	29.99	27	20	5	16	SW	0	0	9	9	9
22	58	53	55.5	14	14	0	0	0	29.99	27	20	5	16	SW	0	0	9	9	9
23	58	53	55.5	14	14	0	0	0	29.99	27	20	5	16	SW	0	0	9	9	9
24	58	53	55.5	14	14	0	0	0	29.99	27	20	5	16	SW	0	0	9	9	9
25	58	53	55.5	14	14	0	0	0	29.99	27	20	5	16	SW	0	0	9	9	9
26	58	53	55.5	14	14	0	0	0	29.99	27	20	5	16	SW	0	0	9	9	9
27	58	53	55.5	14	14	0	0	0	29.99	27	20	5	16	SW	0	0	9	9	9
28	58	53	55.5	14	14	0	0	0	29.99	27	20	5	16	SW	0	0	9	9	9
29	58	53	55.5	14	14	0	0	0	29.99	27	20	5	16	SW	0	0	9	9	9
30	58	53	55.5	14	14	0	0	0	29.99	27	20	5	16	SW	0	0	9	9	9
31	58	53	55.5	14	14	0	0	0	29.99	27	20	5	16	SW	0	0	9	9	9

MARCH 1980
 GREENVILLE-SPARTANBURG AP

SUMMARY BY HOURS										
HOUR	LOCAL TIME	STATION	PRESSURE	TEMPERATURE			RELATIVE HUMIDITY %	WIND SPEED M.P.H.	DIRECTION	SPEED M.P.H.
				AIR °F	WET BULB °F	DEW PT. °F				
01	3	28	39	45	41	35	70	5	01	1
04	6	28	38	43	40	35	65	7	02	2
07	9	29	31	41	38	33	76	5	03	2
10	12	29	33	47	42	34	65	9	02	4
13	15	29	31	52	45	36	59	10	01	1
16	18	28	36	55	46	31	54	10	01	1
19	21	29	37	51	45	36	61	6	01	1
22	24	28	39	47	43	36	57	7	01	1

DATE	1. H. HOUR ENDING AT												2. H. HOUR ENDING AT											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
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Daniel B. Mitchell
 DIRECTOR, NATIONAL CLIMATIC CENTER

USCOMM--NOAA--ASHEVILLE 147-30780 375

OBSERVATIONS AT 2-HOUR INTERVALS

HOUR	SFC CORR	WIND DIR	WIND SPC	VIS	WEATHER	TEMPERATURE					WIND					WIND DIR	WIND SPC	VIS	WEATHER	TEMPERATURE					WIND					WIND DIR	WIND SPC	VIS	WEATHER	
						AIR	WET BULB	DEW P	REL HUM	DIR	SPD	DIR	SPD	DIR	SPD					AIR	WET BULB	DEW P	REL HUM	DIR	SPD	DIR	SPD	DIR	SPD					
01	0	UNL	15		DAY 31	24	20	10	55	35		UNL	5		DAY 32	19	6	37	53	36		UNL	8		DAY 33	26	27	07	44	06		UNL	8	

NOTES
CEILING
UNL INDICATES UNLIMITED

WEATHER
K TORNADO
T THUNDERSTORM
S SQUALL
R RAIN
RS RAIN SHOWERS
BR FREEZING RAIN
L DRIZZLE
ZL FREEZING DRIZZLE
S SNOW
SP SNOW PELLETS
IC ICE CRYSTALS
SN SNOW SHOWERS
SG SNOW GRAINS
P ICE PELLETS
H HAIL
F FOG
RF ICE FOG
GF GROUND FOG
BD BLOWING DUST
BM BLOWING SAND
BS BLOWING SNOW
BY BLOWING SPRAY
K SMOKE
H HAZE
D DUST

WIND
DIRECTIONS ARE THOSE FROM WHICH THE WIND BLOWS. INDICATED IN TENS OF DEGREES FROM TRUE NORTH; I.E., 09 FOR EAST, 18 FOR SOUTH, 27 FOR WEST. ENTRY OF 00 IN THE DIRECTION COLUMN INDICATES CALM.

SPEED IS EXPRESSED IN KNOTS; MULTIPLY BY 1.65 TO CONVERT TO MILES PER HOUR.

STATION YEAR & MONTH
GREENVILLE SPARTANBURG SC 90 02

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FIRST CLASS

Local Climatological Data

MONTHLY SUMMARY



LATITUDE 34°54' N LONGITUDE 82°13' W ELEVATION GROUND 957 FT. STANDARD TIME USED: EASTERN HAN #03879

DECEMBER 1979 GREENVILLE-SPARTANBURG AP

DATE	TEMPERATURE °F				DEGREE DAYS BASE 65°		WEATHER IN DATE OF OCCURRENCE	SNOW, ICE PELLETS IN	PRECIPITATION		STATION PRESURE IN.	WIND				SUNSHINE		SKY COVER TENTHS		DATE
	MAXIMUM	MINIMUM	AVERAGE	DEPARTURE FROM NORMAL	AVERAGE	DEW POINT			WATER EQUIVALENT IN	SNOW, ICE PELLETS IN.		RESULTANT DIR	RESULTANT SPEED M.P.H.	AVERAGE SPEED M.P.H.	FASTEST HILLS	MINUTES	PERCENT OF POSSIBLE	SUNRISE TO SUNSET	MIDNIGHT TO MIDNIGHT	
1	54	20	37	-9	20	28	0	0	0	29.13	22	5.9	8.3	18	SH	600	100	0	0	2
2	41	23	32	-13	14	33	0	0	0	29.35	24	7.6	10.5	26	N	599	100	0	0	3
3	44	29	31	-14	12	34	0	0	0	29.50	26	2.1	4.9	9	NE	597	100	0	0	4
4	51	34	43	-2	25	22	0	0	0	29.22	20	3.9	5.9	10	SE	597	100	0	0	5
5	50	29	43	-2	25	22	0	0	0	29.38	23	3.9	5.9	10	SE	598	100	0	0	6
6	51	29	43	-2	25	22	0	0	0	29.38	23	3.9	5.9	10	SE	598	100	0	0	7
7	50	34	41	-3	27	18	0	0	0	29.20	21	5.3	6.2	14	N	594	100	0	0	8
8	49	29	40	-3	27	18	0	0	0	29.41	21	4.4	4.9	9	NE	593	100	0	0	9
9	63	30	47	4	29	18	0	0	0	29.29	21	5.3	6.2	14	NE	594	99	0	0	10
10	65	36	51	9	42	14	0	0	0	29.27	21	5.4	7.5	17	SH	570	96	0	0	11
11	58	46	57	4	53	0	0	0	0	29.24	23	6.1	6.3	12	SH	520	20	9	9	12
12	54	52	56	5	58	7	0	0	0	29.09	22	3.4	5.5	11	SH	500	0	0	0	13
13	58	37	48	5	36	17	0	0	0	29.22	24	6.0	7.3	14	NE	499	85	8	8	14
14	49	32	41	-2	26	24	0	0	0	29.32	25	6.0	8.3	16	NE	544	92	2	5	15
15	54	41	48	5	37	17	0	0	0	29.08	22	7.4	11.4	11	NE	571	12	0	0	16
16	48	31	40	-2	26	25	0	0	0	29.22	25	9.9	9.9	29	N	589	0	0	0	17
17	50	25	38	-4	19	27	0	0	0	29.37	21	3.6	4.0	13	SH	527	89	4	4	18
18	52	25	44	-2	21	21	0	0	0	29.34	23	4.7	5.5	13	SH	489	100	0	0	19
19	53	37	45	3	25	20	0	0	0	29.33	25	6.5	8.6	16	NE	517	88	0	0	20
20	53	36	43	3	22	22	0	0	0	29.35	25	6.5	8.6	16	NE	498	100	0	0	21
21	50	40	45	3	35	20	0	0	0	29.10	25	3.3	3.3	9	NE	500	100	0	0	22
22	50	49	54	4	48	11	0	0	0	29.12	19	4.3	3.3	3	SH	438	25	10	10	23
23	35	49	56	4	52	9	0	0	0	28.86	21	7.0	7.0	20	SH	340	45	9	9	24
24	55	40	47	5	35	19	0	0	0	28.88	23	3.3	7.3	11	N	590	100	0	0	25
25	55	37	50	9	31	18	0	0	0	29.37	35	1.1	4.3	11	SH	547	39	2	3	26
26	59	30	49	7	28	16	0	0	0	29.29	35	5.0	5.0	0	N	547	39	2	3	27
27	56	32	44	2	21	21	0	0	0	29.29	28	4.7	5.0	0	NE	535	91	5	4	28
28	50	32	46	4	10	19	0	0	0	29.21	23	2.6	3.9	9	SH	449	78	9	9	29
29	52	37	45	3	42	20	0	0	0	29.30	30	3.9	3.5	4	NE	409	18	10	10	30
30	47	44	46	4	44	19	0	0	0	28.83	24	4.8	4.9	15	NE	420	2	0	0	31

* EXTREME FOR THE MONTH - LAST OCCURRENCE IF MORE THAN ONE.
 † TRACE AMOUNT.
 ‡ ALSO IN AN EARLIER DATE, 14 DATES.
 § HEAVY FOG - VISIBILITY 1/4 MILE OR LESS.
 ¶ FIGURES FOR WIND DIRECTIONS ARE °S OF 20-DEGREES CLOCKWISE FROM TRUE NORTH. 00 = CALM.
 DATA IN COLS. 6 AND 12-15 ARE BASED ON 7 OR MORE OBSERVATIONS PER DAY AT 3-HOUR INTERVALS. FASTEST HILLS WIND SPEEDS ARE FASTEST OBSERVED ONE-MINUTE VALUES WHEN DIRECTIONS ARE IN °S OF DEGREES. † WITH THE DIRECTION INDICATES PEAK WIND SPEED.
 ‡ ANY ERRORS DETECTED WILL BE CORRECTED AND CHANGES IN SUMMARY DATA WILL BE ANNOTATED IN THE ANNUAL SUMMARY.

SEASON TO DATE
 SNOW, ICE PELLETS 5.3 INCH
 NUMBER OF DAYS 3
 MAXIMUM TEMP 1155
 MINIMUM TEMP 1296
 THUNDERSTORMS 0
 PRECIPITATION 3.02 INCH
 HEAVY FOG 6
 CLEAR 15 PARTLY CLOUDY 4 CLOUDY 2

SUMMARY BY HOURS

HOUR	WIND DIR	WIND S.P.	TEMPERATURE				WIND	
			AIR °F	WET BULB °F	RELATIVE HUMIDITY %	WIND S.P. M.P.H.	DIRECTION	SPEED M.P.H.
01	4	29.13	41	37	31	5	32	13
04	5	29.13	39	36	31	7	33	5
07	5	29.15	38	35	30	7	35	9
10	4	29.18	45	40	32	6	40	9
13	5	29.19	53	44	32	6	25	9
16	5	29.10	55	45	32	4	25	4
19	5	29.11	46	41	33	6	22	6
22	5	29.13	44	39	32	6	30	0

HOURLY PRECIPITATION (WATER EQUIVALENT IN INCHES)

DATE	A.M. HOUR ENDING AT												P.M. HOUR ENDING AT											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
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Saniel B. Mitchell
 DIRECTOR, NATIONAL CLIMATIC CENTER

OBSERVATIONS AT 3-HOUR INTERVALS

HOUR	MO	DA	TIME	VISI-BILITY	WEATHER	TEMPERATURE					WIND					VISI-BILITY	WEATHER	TEMPERATURE					WIND											
						AIR*	WET BULB**	DRY BULB**	REL. HUM.†	DIR.	SPEED	DIR.	SPEED	AIR*	WET BULB**			DRY BULB**	REL. HUM.†	DIR.	SPEED	AIR*	WET BULB**	DRY BULB**	REL. HUM.†	DIR.	SPEED							
DAY 01																																		
01	0	UNL	20			26	24	20	78	19	5	0	UNL	20			39	32	21	48	24	10	0	UNL	20			24	21	12	60	02	4	
04	0	UNL	20			24	23	19	81	19	5	0	UNL	20			32	29	21	61	20	4	0	UNL	20			22	20	12	65	03	7	
07	0	UNL	20			22	21	18	85	36	4	5	0	UNL	20			32	27	15	49	31	3	0	UNL	20			13	18	13	77	01	4
10	0	UNL	20			33	30	25	72	19	5	5	0	UNL	20			33	26	11	40	35	3	0	UNL	20			35	28	14	42	05	6
13	0	UNL	20			47	37	30	37	20	10	10	0	UNL	20			38	30	20	30	22	0	0	UNL	20			30	21	10	29	31	5
16	0	UNL	30			53	35	27	24	22	10	10	0	UNL	30			41	31	29	27	15	0	0	UNL	30			44	33	10	25	7	5
19	0	UNL	20			45	35	18	34	23	11	4	0	UNL	20			33	26	12	42	36	8	0	UNL	20			29	25	14	53	00	0
22	0	UNL	20			41	33	19	41	24	9	9	0	UNL	20			26	22	13	58	36	3	0	UNL	20			26	23	14	60	24	0
DAY 02																																		
DAY 03																																		
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NOTES
UNL INDICATES UNLIMITED

- WEATHER
- T TORNADO
 - T THUNDERSTORM
 - Q SQUALL
 - R RAIN
 - RM RAIN SHOWERS
 - DR FREEZING RAIN
 - U DRIZZLE
 - CL FREEZING DRIZZLE
 - S SNOW
 - SP SNOW PELLETS
 - IC ICE CRYSTALS
 - SM SNOW SHOWERS
 - SG SNOW GRAINS
 - IP ICE PELLETS
 - F HAIL
 - IF ICE PEG
 - GF GROUND FOG
 - BF BLOWING FOG
 - BN BLOWING SAND
 - BS BLOWING SNOW
 - BY BLOWING SPRAY
 - X SMOKE
 - H HAZE
 - O OUST

WIND

DIRECTIONS ARE THOSE FROM WHICH THE WIND BLOWS, INDICATED IN DEGREES FROM TRUE NORTH; I.E., 09 FOR EAST, 18 FOR SOUTH, 27 FOR WEST. ENTRY OF 00 IN THE DIRECTION COLUMN INDICATES CALM.

SPEED IS EXPRESSED IN KNOTS; MULTIPLY BY 1.6 TO CONVERT TO MILES PER HOUR.

GREENVILLE SPARTANBURG SC 79 12

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