quake was felt; the rain poured down in torrents; few who have read, few who have heard related what a hurricane is, can form but a very imperfect idea of the horrifying contention of the elements.

About noon the wind suddenly chopped round to ENE; the gale at this time was more moderate: the rain had subsided. Before 4 p. m. the gale was from the SE in dreadful gusts;[11] at 7 p. m. the rain poured down in torrents, the lightning was vivid, incessant, and terrific; a more dismal night could not be pictured in any mind; the sudden blasts of wind and rain betokened a continuation of this most frightful storm; luckily, however, before the dawn of day it moderated; at daylight on the 20th the wind was SE fresh and strong, and continued so till noon when it moderated.

Between figs. 8 and 9 another might have been inserted showing an oscillation of the center to the south of Port Antonio about noon, but it was not considered necessary.

It is greatly to be hoped that the publication of these notes may bring to light further information. For instance, we want to know how Annotto Bay and Port Maria, 30 and 40 miles west of Port Antonio, respectively, fared under a gale from the north for at least twenty-four hours. The last hurricane, in 1903, was moving rapidly, at the rate of 20 miles an hour, yet during the short time the wind was north at these places it drove the sea ashore in a most threatening manner.

Pending further inquiry, it may be remarked that without barometers, or without barometers in proper order, it would seem impossible for people in those days to arrive at any conclusion as to the nature of a "hurricane" by noting, however carefully, the varying directions of the wind.

[11]Fig. 9—The wind remained southeast all night, showing that the center continued to move southwestward.—*M. H.*

CLIMATOLOGY OF JACKSONVILLE, FLA., AND VICINITY.

By T. FREDERICK DAVIS, Observer, U. S. Weather Bureau. Dated Jacksonville, Fla., January 31, 1908.

Situation and general remarks.—To Jacksonville belongs the distinction of being the farthest west of any city on the Atlantic seaboard. Its longitude and latitude are 81° 39′ W. and 30° 20′ N.

The city is situated on slightly rolling ground on the north bank of the St. Johns River, and has a river frontage of 2½ miles. The back country is generally flat. In a direct line the city is 16 miles from the ocean.

Under normal conditions the climate is equable, altho there are often clear, cold, bracing days in winter and high midday temperatures in summer. Early spring and late autumn are the most pleasant seasons of the year, as they are characterized by pleasant temperatures and a greater percentage of clear skies.

The changes in weather conditions in this vicinity are due chiefly to the shifting of the areas of high and low barometric pressure over the country, the amount of the change depending upon the proximity and strength of the influencing factor. In winter a spell of rainy weather is nearly always followed by a shift of wind to westerly, thru the south quadrant, and by colder weather within twelve to twenty-four hours. The storms that give these winter rains are principally of the southwestern type, originating in the west Gulf of Mexico, or in Mexico. Their normal course is northeasterly, and their influence upon local weather conditions begins when they are not more than 400 miles distant, or, in other words, about as far away as the State of Mississippi. The wind here is then northeasterly, and, as the storm progresses northeastward, it veers gradually to southeast and south, when with a rapid shift it goes to westerly, and the cold air of the advancing high-pressure area is ushered in. These conditions typify our cold waves.

In summer stagnant pressure conditions prevail. The presence in this vicinity of the West Indian storms, known as hurricanes, always produces a marked departure from normal weather conditions. These storms, fortunately, are not of frequent occurrence. So far as they affect local weather conditions, they may be divided into two classes: (1) those that recurve into the Atlantic Ocean over the lower peninsula and (2) those that enter the east Gulf and recurve about latitude 29°. Storms of the former class seldom affect conditions here, except occasionally by causing heavy rains; but with those of the second class there are experienced all the phases connected with storms of the tropical type.

Meteorological records.—The data in the tables for the period June, 1829, to August, 1833, are from the records of Judge F. Bethune, made at his plantation some 5 miles south of Jacksonville. Terdaily readings were made—about the hours of sunrise, 1 p. m., and 8 p. m., local mean time—of a thermometer that was exposed on his front porch, but unfortunately no more is known of this exposure.

The record from 1838 to January, 1872, was made by Dr. A. S. Baldwin, a man of scientific turn of mind, with a leaning toward meteorology. The lapses in this record were due to the Indian and the Civil wars. The best thermometers then obtainable were used. Doctor Baldwin's observations were made terdaily—at 7 a. m., 2 p. m., and 9 p. m., local mean time. The thermometer was exposed on the front door facing of his porch, and the instrument was well sheltered from the direct and reflected rays of the sun. Until December, 1861, the elevation was 13 feet 11 inches above sea level; beginning February, 1866, it was 20 feet, probably due to his removal to another residence two blocks farther north. In both locations the instrument was about 7 feet above the ground.

On September 11, 1871, the United States Signal Service (whose meteorological work was transferred to the United States Weather Bureau on July 1, 1891) established a station here, in the Masonic Hall Building, occupied until September 19, 1871, during which time partial observations, only, were taken. September 20, 1871, the station was removed to the Freedman's Bank Building, Pine and Forsyth streets. This office was occupied until July 21, 1880. Here the thermometers were exposed in the regulation window shelter, 20 feet above the ground. The rain gage was on the top of the building, 64 feet above the ground and 69 feet above sea level. The third office was in the Astor Building, Bay and Hogan streets, and was occupied from July 22, 1880, to July 31, 1902. The elevations of the instruments above ground were: Thermometers, 37 feet, exposed in a window shelter until October 1, 1886, when they were placed in a roof shelter 69 feet above ground; rain gage, 57 feet; anemometer, 84 feet. To reduce to sea level add 7½ feet. On August 1, 1902, the station was removed to its present location, Dyal-Upchurch Building, Bay and Main streets. Here the elevations of the instruments above the ground are: Anemometer, 129 feet; thermometers, 101 feet; rain gage, 88 feet—the ground being about 7 feet above sea level.

In Table 3 the annual minimum temperatures for the years not covered by Judge Bethune's and Doctor Baldwin's records were compiled by Maj. George R. Fairbanks, historian, who collected these data from various reliable sources.

Time used.—The entries of time until January 1, 1885, were local mean time; after that date, standard ninetieth meridian time, which is thirty-three minutes slower than local mean time, is used.

Discussion of mean temperatures.—The mean temperatures, Table 1, prior to January, 1874, were obtained by the formula $(7+2+9) \div 3$, but this gives a mean somewhat higher than the true mean. The formula $(7+2+9+9) \div 4$ gives a result very near the true mean temperature. The "Correction" line in the middle of Table 1 represents the ten-year mean of actual differences for each month between these two formulas, and these values should be applied to the Bethune and Baldwin means, and to the means of the first section, as a reduction to the true mean temperature. In finding these corrections the formulas were applied directly to the Bethune records, 1829-1833; the Baldwin records, 1844-1846 and 1871, and to the Signal Service records of 1872 and 1873. Since January, 1874, the mean monthly and annual temperatures have been obtained by the formula (mean max. + mean min.) ÷ 2.

TABLE I.—*Mean temperatures (Fahrenheit).*

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
	°	°	°	°	°	°	°	°	°	°	°	°	°
1829....	......	......	......	......	......	81.6	82.8	84.4	80.3	72.2	59.0	64.6	.....
1830....	61.1	61.6	67.6	70.4	76.7	81.0	82.8	82.2	78.3	72.2	67.3	61.0	71.8
1831....	53.1	56.8	65.5	70.7	73.3	79.8	83.0	81.4	77.8	73.1	65.3	52.6	69.4
1832....	56.2	66.9	62.2	70.3	76.5	78.3	81.9	80.3	79.6	73.3	63.0	61.3	70.8
1833....	60.0	61.4	63.8	71.1	78.0	81.7	81.5	82.3	......	......	......	......	.....
1838....	57.4	63.2	62.2	70.2	76.2	80.0	82.9	82.4	76.5	71.6	63.7	54.4	70.1
1839....	54.6	56.7	62.2	66.3	78.5	86.0	85.5	83.4	78.9	72.0	60.0	49.0	69.4
1840....	51.5	60.2	67.0	70.0	76.0	83.5	85.0	84.0	78.5	71.0	57.0	53.3	69.8
1841....	59.2	51.0	69.8	72.0	......	......	......	......	......	......	......	......	.....
1844....	55.7	56.6	63.4	72.6	80.6	82.0	84.5	80.4	77.6	70.2	66.2	52.6	70.2
1845....	57.2	56.5	64.3	74.2	76.0	82.3	84.0	82.0	79.2	69.3	59.3	48.4	69.4
1846....	54.6	57.6	64.2	69.3	77.8	80.2	80.4	81.4	79.9	70.6	61.1	58.1	69.6
1847....	59.3	58.0	61.8	72.8	75.1	81.1	80.0	82.4	78.8	73.0	64.4	53.9	70.0
1848....	58.0	54.0	65.2	70.2	77.3	81.3	80.8	80.0	78.3	70.6	55.4	63.3	69.5
1849....	54.7	54.1	67.6	69.7	75.8	79.2	80.2	82.2	76.3	70.2	61.6	59.3	69.2
1850....	64.1	56.8	65.0	71.1	76.7	78.2	82.9	84.7	80.7	70.2	62.5	59.0	70.9
1851	57.4	63.2	63.3	70.1	76.2	80.3	82.8	82.5	76.4	71.5	69.0	54.0	70.6
1852....	47.6	61.2	61.7	69.6	78.6	78.3	81.2	80.5	78.6	73.8	63.0	60.4	69.5
1853....	52.6	60.9	65.0	71.5	77.3	78.9	81.7	82.6	77.6	69.3	64.3	53.4	69.6
1854....	57.5	60.4	68.2	65.2	76.4	80.5	83.3	82.7	80.9	71.2	59.3	49.4	69.6
1855....	55.3	54.9	60.5	70.3	76.5	78.4	81.3	82.2	80.6	76.1	68.9	59.0	69.5
1856....	47.7	53.4	61.7	70.7	76.8	81.6	82.9	82.3	76.3	68.1	64.4	54.5	68.4
1857....	48.7	62.4	59.0	63.6	72.9	80.3	79.4	80.4	78.7	67.0	60.7	61.5	67.9
1858....	59.4	57.5	61.9	69.9	76.2	79.3	82.3	82.0	75.5	73.0	57.6	62.0	69.7
1859....	54.5	60.1	66.9	71.2	75.5	80.7	80.6	80.3	80.2	70.1	64.0	58.4	70.2
1860....	55.4	62.3	63.0	72.3	75.9	81.5	83.4	80.5	79.2	69.7	61.4	53.5	69.8
1861....	......	60.3	64.0	69.6	78.4	81.6	80.5	80.3	79.2	73.4	63.3	59.1	.....
1866....	......	50.4	61.6	71.2	77.0	79.2	......	83.0	80.7	71.2	60.6	52.0	.....
1867....	51.6	61.4	62.7	69.0	74.4	79.6	83.9	81.0	79.3	70.4	63.2	59.8	69.7
1868....	56.8	55.4	65.9	71.0	77.3	78.9	82.1	82.9	80.5	72.3	58.8	51.5	69.4
1869....	58.8	58.5	62.7	67.5	72.3	79.0	81.1	82.3	77.9	67.3	57.3	54.7	68.3
1870....	57.6	54.4	60.4	66.3	74.8	78.6	83.2	82.4	77.9	72.4	61.9	52.8	68.6
1871....	55.5	63.1	67.0	72.0	74.6	80.2	81.8	80.8	77.4	74.6	64.5	55.6	70.6
1872....	51.9	......	......	......	......	......	......	......	......	......	......	......	.....
Means*	55.6	58.5	64.0	70.1	76.3	80.4	82.2	81.9	78.6	71.0	62.2	56.2	†69.8
Corr'n ‡	−0.4	−0.5	−0.5	−0.9	−0.7	−0.6	−0.5	−0.5	−0.4	−0.4	−0.4	−0.4	−0.5
1871....	......	......	......	......	......	......	......	......	......	71.3	63.7	53.7	.....
1872....	50.6	53.9	59.0	70.6	78.1	81.0	80.8	80.9	77.5	67.8	56.5	50.1	67.2
1873....	51.9	59.0	59.0	69.1	75.4	80.1	83.2	81.3	78.3	66.2	58.9	55.9	68.2
1874....	54.4	58.6	65.9	69.2	74.6	81.6	79.8	81.0	77.2	69.1	64.6	59.0	69.6
1875....	57.4	55.8	64.2	65.8	74.6	80.0	85.3	78.9	77.9	66.4	64.6	57.8	69.1
1876....	59.2	60.0	60.0	68.4	75.2	81.8	84.8	82.4	80.0	65.4	59.2	48.6	68.8
1877....	57.2	55.6	60.0	67.5	72.2	81.8	83.0	81.4	79.8	71.8	62.4	56.2	69.1
1878....	52.6	56.4	65.0	71.0	77.4	80.4	83.2	84.4	78.0	69.8	61.8	53.4	69.4
1879....	54.2	55.4	65.3	67.2	74.2	79.5	84.2	82.0	77.2	74.2	64.0	62.8	70.0
1880....	62.8	61.5	69.0	72.3	74.2	82.2	83.5	81.6	77.8	69.7	62.0	55.2	71.0
1881....	53.2	58.4	59.7	67.4	75.8	83.2	84.4	82.2	80.9	75.6	66.4	62.0	70.8
1882....	62.8	61.8	67.4	71.4	74.8	81.2	82.0	82.8	78.6	73.5	60.8	54.3	71.0
1883....	58.2	65.2	60.6	71.0	73.8	81.8	84.4	81.8	77.2	75.4	64.1	61.4	71.2
1884....	52.0	63.1	67.0	68.8	77.2	77.2	83.2	80.2	77.8	73.1	62.3	58.6	70.0
1885....	56.7	55.0	58.2	68.6	74.8	81.0	83.3	82.2	79.5	68.4	61.0	54.0	68.6
1886....	51.3	54.2	60.2	67.0	76.0	81.2	81.9	81.6	79.4	70.2	60.1	53.6	68.1
1887....	50.4	66.2	60.2	67.8	74.1	78.8	82.8	81.8	76.6	70.6	60.8	55.6	68.8
1888....	58.0	61.0	60.9	71.3	75.0	80.6	81.9	82.5	77.0	69.9	61.6	53.6	69.4
1889...	55.2	52.4	59.1	67.8	74.6	78.2	81.9	79.7	78.1	67.3	63.9	62.0	68.4
1890....	63.4	64.8	60.2	69.8	74.4	81.8	81.0	80.4	79.1	71.3	65.6	55.9	70.6
1891....	54.2	65.6	61.6	67.4	72.8	81.1	81.2	82.3	77.6	66.9	60.0	59.6	69.2
1892....	53.0	58.0	60.0	69.4	75.2	77.8	81.7	81.4	76.8	69.2	59.9	57.6	68.3
1893....	49.2	61.6	60.6	72.6	75.3	80.0	83.6	81.4	78.9	70.9	62.0	58.8	69.6
1894....	58.6	58.8	66.0	68.6	75.3	78.0	80.5	82.2	78.6	71.5	61.4	57.7	69.8
1895....	56.1	47.6	63.0	67.2	73.8	80.2	81.8	82.9	79.1	69.7	61.0	53.5	68.0
1896....	53.5	57.2	60.8	70.0	77.7	79.9	82.2	82.8	79.2	70.4	67.4	53.8	69.6
1897....	52.1	60.0	68.8	69.0	73.2	83.4	82.4	82.2	76.3	71.7	65.3	58.5	70.2
1898....	59.2	55.6	66.7	66.7	76.5	81.4	82.0	82.1	79.8	70.0	62.6	54.8	69.8
1899....	55.2	55.4	64.6	66.0	78.3	80.1	81.2	82.8	77.4	71.8	64.6	54.9	69.4
1900....	52.7	54.7	61.2	69.4	74.6	79.6	82.2	84.2	80.4	74.4	63.5	56.1	69.4
1901....	54.2	52.4	60.4	63.2	75.4	78.9	82.6	80.5	78.0	69.5	56.4	52.8	67.0
1902....	52.2	50.6	62.4	67.2	77.8	80.3	83.0	81.0	77.4	71.9	65.9	57.1	68.9
1903....	52.8	59.2	66.8	65.5	72.5	77.9	81.2	82.0	76.8	68.8	59.6	50.4	67.8
1904....	50.3	56.6	65.6	66.4	73.0	77.6	80.4	80.4	78.0	70.3	60.6	55.6	67.9
1905....	49.8	52.8	63.4	68.7	78.1	79.6	82.0	79.9	79.8	70.4	63.8	53.5	68.5
1906....	56.0	54.3	60.6	68.6	73.2	80.8	80.4	81.4	80.1	68.2	62.9	56.0	68.5
1907....	61.1	58.2	69.8	64.0	74.8	78.3	81.7	81.8	79.0	68.3	62.2	55.6	69.6
Means §	55.0	57.7	62.9	68.4	75.1	80.2	82.4	81.7	78.4	70.3	62.3	55.9	†69.2
Hi'est ‖	64.1	66.9	69.8	74.2	80.6	86.0	85.5	84.7	80.9	75.6	69.0	64.6	71.8
Lowest ‖	47.6	47.6	58.2	63.2	72.2	77.2	79.4	78.9	75.5	65.4	55.4	48.4	67.0

* Bethune and Baldwin records.
† Average of the monthly means appearing on this line.
‡ See "Discussion of mean temperatures," in text.
§ Signal Service and Weather Bureau records.
‖ All records.

Barometric pressure.—The mean pressure for the year, at sea level and under standard gravity, is 30.06 inches. In the curve of monthly means there are two maxima and two minima; the highest mean pressure is in January, with a secondary maximum in July; the lowest mean pressure is in May, with a secondary minimum in September. The highest pressure ever recorded at this station was 30.70 inches, on January 23, 1883; the lowest, 29.06 inches, occurred during the prevalence of a hurricane, at 6 p. m., August 27, 1893.

TABLE 2.—*Maximum temperatures (Fahrenheit).*

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
	°	°	°	°	°	°	°	°	°	°	°	°	°
1829.....	......	......	......	......	......	92	93	92	91	82	78	80	....
1830.....	74	81	84	84	90	95	96	95	89	82	78	76	96
1831.....	72	79	84	86	88	90	92	89	88	87	78	68	92
1832.....	77	78	78	84	90	90	92	89	89	84	80	74	92
1833.....	74	81	82	83	91	92	90	92	......	......	......	......	....
1839.....	80	80	84	88	93	101	97	96	95	88	79	68	101
1840.....	74	78	85	94	92	98	96	94	94	91	79	76	98
1841.....	80	79	84	90	......	......	......	......	......	......	......	......	....
1844.....	76	79	87	93	.91	89	96	94	90	84	79	76	96
1845.....	73	78	81	87	89	94	95	93	92	85	76	74	95
1846.....	71	68	80	84	93	95	93	90	90	82	79	76	95
1847.....	76	78	81	87	86	92	91	90	86	84	80	78	92
1848.....	75	79	84	84	93	88	91	91	89	80	73	78	93
1849.....	73	76	84	84	88	91	91	93	85	82	74	74	93
1850.....	79	78	82	86	89	91	97	95	94	86	77	80	97
1851.....	83	82	79	84	82	95	94	90	84	83	83	77	95
1852.....	70	83	85	87	93	92	90	90	91	87	77	79	93
1853.....	74	77	84	80	92	91	91	93	89	84	79	71	93
1854.....	76	76	87	83	90	94	95	96	93	85	81	72	96
1855.....	74	77	86	89	101	89	96	92	91	86	82	78	101
1856.....	70	79	83	87	88	93	92	95	88	81	84	76	95
1857.....	72	81	85	81	91	91	89	95	92	81	82	80	95
1858.....	77	77	83	86	91	92	96	94	86	85	79	78	96
1859.....	76	79	84	89	92	94	95	91	92	84	79	79	95
1860.....	76	79	83	92	92	97	98	93	89	87	80	72	98
1861.....	......	75	83	85	94	98	92	91	92	86	79	74	98
1866.....	......	78	86	96	96	100	......	102	99	88	84	77	102
1867.....	79	86	89	88	92	97	98	94	93	88	86	80	98
1868.....	81	78	90	92	97	98	101	97	94	88	85	72	101
1869.....	79	79	84	91	92	97	96	100	91	87	78	78	100
1870.....	82	80	87	91	95	95	97	94	93	87	85	73	97
1871.....	80	84	87	92	90	95	96	95	93	90	86	80	96
1872.....	81	......	......	......	......	......	......	......	......	......	......	......	....
1871.....	......	......	......	......	......	......	......	......	......	84	82	76	....
1872.....	76	79	82	90	96	101	104	99	92	86	81	78	104
1873.....	76	79	82	89	94	96	96	95	95	83	83	79	96
1874*....	77	81	87	91	98	99	93	100	92	86	83	79	100
1875.....	80	82	85	86	94	99	101	95	98	86	84	81	101
1876.....	80	83	82	88	95	99	101	98	97	83	82	71	101
1877.....	80	75	81	85	96	99	100	95	96	85	84	74	100
1878.....	74	74	86	87	98	96	97	98	92	85	80	74	98
1879.....	80	79	86	88	91	96	104	96	90	86	83	79	104
1880.....	77	81	86	91	95	100	97	96	91	85	82	78	100
1881.....	72	78	80	88	96	99	99	96	94	88	83	79	99
1882.....	78	79	88	85	90	96	94	96	94	86	80	76	96
1883.....	76	83	79	88	90	95	98	94	90	92	83	78	98
1884.....	72	79	85	88	91	92	96	94	89	92	79	75	96
1885.....	78	73	79	88	89	96	95	94	92	85	81	76	96
1886.....	73	73	84	86	92	94	94	94	92	87	82	76	94
1887.....	76	84	80	89	91	95	100	97	95	88	78	76	100
1888.....	81	82	84	88	93	96	98	96	92	86	83	74	98
1889.....	74	81	81	88	94	95	97	94	95	90	86	80	97
1890.....	80	83	85	88	89	97	96	94	92	90	84	80	97
1891.....	80	86	82	86	92	100	95	97	89	89	80	80	100
1892.....	77	78	84	88	91	94	95	96	92	88	85	80	96
1893.....	72	82	84	90	93	95	100	95	96	88	84	77	100
1894.....	79	80	87	85	95	92	93	96	96	90	82	80	96
1895.....	79	76	84	85	90	96	96	97	94	89	84	80	97
1896.....	75	79	88	92	95	97	100	96	96	87	85	74	100
1897.....	76	84	82	88	93	99	99	99	94	89	83	80	99
1898.....	81	76	87	86	97	96	98	94	93	90	81	78	98
1899.....	78	81	86	85	96	97	96	98	93	87	81	76	98
1900.....	73	79	79	87	90	94	97	101	96	86	85	77	101
1901.....	76	75	82	85	93	94	97	93	92	84	79	76	97
1902.....	77	77	83	86	93	98	101	98	91	87	81	79	101
1903.....	78	81	80	82	93	90	97	97	92	86	81	76	97
1904.....	75	80	86	86	92	91	94	93	93	92	80	76	94
1905.....	75	79	81	88	92	95	94	91	94	86	81	78	95
1906.....	80	75	81	89	91	95	91	96	93	89	83	77	96
1907.....	77	77	91	83	89	94	97	95	94	87	83	78	97
Highest.	83	86	91	96	101	101	104	103	99	92	86	81	104
Lowest..	70	68	78	80	82	88	89	89	84	80	73	68	91

* Maximum thermometers were first used January 11, 1874; prior to that date the maximum temperatures in the table are from eye observations.

Temperature.—On the average January is the coldest month of the year, altho the annual minimum temperature occurs most frequently in December, and the lowest temperatures ever recorded were in February. The mean temperature reaches its lowest point during the first week of January, and its highest in the second decade of July. The daily minimum temperatures thruout the year nearly always occur about the time of sunrise; the daily maximum temperature in winter occurs about 2 p. m., in spring and late autumn at 1 p. m., and in August and September about noon. The greatest number of consecutive days with the maximum temperature 90°, or above, was 31 days, in 1896, from July 20 to August 19, inclusive. The greatest number of consecutive days with the minimum temperature 32°, or below, was 8 days, in December, 1901, from the 16th to the 23d, inclusive.

TABLE 3.—*Minimum temperatures (Fahrenheit).*

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
	°	°	°	°	°	°	°	°	°	°	°	°	°
1829	.....	.....	.....	.....	.....	74	76	77	72	60	33	42	...
1830	38	40	40	46	66	64	76	72	64	52	48	30	30
1831	28	32	46	52	56	70	75	70	60	56	41	34	28
1832	22	40	30	52	64	66	76	75	71	52	38	34	22
1833	25	34	32	61	62	71	75	74	.....	.....	.....	.....	25
1835	.....	8	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	8
1836	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	33
1837	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	33
1838	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	23
1839	40	36	32	52	64	71	71	74	64	61	33	29	29
1840	30	32	40	56	66	69	74	74	69	46	34	32	30
1841	25	28	34	52	.....	.....	.....	.....	.....	.....	.....	.....	25
1842	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	27
1843	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	27
1844	24	29	38	52	.....	75	74	68	51	40	52	29	24
1845	34	30	40	49	66	70	76	71	66	50	32	20	20
1846	30	42	44	52	66	70	67	75	66	54	28	33	28
1847	25	34	42	59	60	75	73	75	68	56	30	28	25
1848	42	32	40	51	57	72	71	72	63	52	34	44	32
1849	32	22	46	42	59	74	72	74	66	32	44	44	22
1850	44	36	46	50	64	66	76	74	64	46	32	32	32
1851	32	42	46	54	62	72	70	72	54	45	40	23	23
1852	20	38	40	53	63	70	70	70	72	58	38	39	20
1853	38	32	44	47	58	69	73	74	63	47	51	34	32
1854	34	35	47	47	56	61	73	71	71	55	32	28	28
1855	33	30	33	53	61	68	74	74	73	44	40	34	30
1856	26	26	42	51	65	73	73	74	58	51	45	24	24
1857	16	44	42	42	54	72	74	72	64	42	27	39	16
1858	38	38	34	49	66	70	74	75	64	62	38	40	34
1859	30	39	45	53	64	70	70	75	70	50	35	36	30
1860	40	44	40	58	58	69	74	73	65	53	25	32	25
1861	32	42	43	54	61	73	70	73	59	57	45	38	32
1862	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	31
1863	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	30
1864	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	29
1865	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	27
1866	.....	24	39	52	64	65	.....	72	68	48	37	30	24
1867	32	32	42	50	57	72	74	73	73	52	42	35	32
1868	29	36	44	50	64	70	74	74	62	55	35	20	20
1869	36	38	32	43	58	70	72	73	68	44	34	31	32
1870	32	28	44	39	60	71	75	77	72	52	40	19	19
1871	33	42	52	55	55	72	68	72	59	58	41	29	29
1872	29	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	...
1871	.....	.....	.....	.....	.....	.....	.....	.....	.....	58	42	30	...
1872	28	33	42	56	57	70	75	74	70	46	31	27	27
1873	24	38	31	52	64	64	74	74	70	40	30	32	24
1874*	35	37	37	42	52	68	69	66	56	49	40	35	35
1875	40	32	40	44	52	62	70	66	59	43	43	28	28
1876	30	36	31	47	54	66	71	70	66	43	36	24	24
1877	31	37	36	45	48	63	68	70	67	50	31	29	29
1878	33	32	39	50	55	66	72	68	67	46	41	27	27
1879	25	35	44	39	60	62	68	68	61	52	34	36	25
1880	45	42	43	42	58	69	70	70	62	46	39	19	19
1881	33	34	39	37	63	66	70	70	69	54	32	41	32
1882	32	38	47	56	54	65	71	69	65	51	38	28	28
1883	29	40	40	52	54	68	70	70	62	59	43	30	29
1884	21	37	42	47	62	62	69	70	64	49	39	33	21
1885	32	32	38	47	56	68	71	70	68	49	36	32	32
1886	15	24	37	44	56	67	70	65	66	44	36	27	15
1887	22	38	36	38	55	64	69	68	55	40	26	31	22
1888	28	32	35	49	56	64	68	67	55	50	38	28	28
1889	31	31	39	44	50	54	70	64	57	45	30	35	30
1890	40	44	27	47	53	66	66	64	65	43	39	30	27
1891	30	31	38	34	54	68	66	70	65	45	33	32	30
1892	32	36	29	43	52	67	66	68	66	42	35	30	29
1893	24	41	28	53	57	68	68	69	61	45	32	35	24
1894	36	33	32	48	46	62	68	68	62	52	33	14	14
1895	26	14	40	45	55	62	70	70	64	52	35	28	14
1896	24	27	35	43	53	66	70	64	58	50	45	34	24
1897	21	34	48	44	53	68	68	68	49	54	46	36	21
1898	24	27	42	42	52	64	67	70	69	40	36	33	24
1899	38	10	26	41	61	60	67	69	54	54	45	30	10
1900	23	18	38	42	59	67	68	70	63	59	38	39	18
1901	32	29	30	45	55	65	70	68	64	51	33	20	20
1902	27	30	37	46	64	65	69	66	65	47	36	24	24
1903	28	29	48	47	60	62	69	69	61	41	26	26	26
1904	28	33	42	50	59	64	69	68	65	50	40	31	28
1905	17	26	44	43	63	66	69	69	70	52	45	35	17
1906	37	33	35	42	49	68	68	70	65	44	33	24	24
1907	38	33	53	40	59	62	70	70	68	46	43	31	31
Highest	45	44	53	61	66	75	76	77	73	62	52	44	35
Lowest	15	8	26	34	46	54	66	64	49	32	25	14	8

* Minimum thermometers were first used January 11, 1874; prior to that date the minimum temperatures in the table are from eye observations.

Precipitation.—There are two rainy and two dry seasons. The principal maximum occurs in September, with a secondary maximum in March. The dry months are April and November. The winter rains are generally due to the influence of storms of the southwestern type. The summer afternoon rains are largely in the form of thundershowers.

Abnormally high temperature in winter is usually followed within thirty-six hours by rain. In summer high midday temperatures are followed in the afternoon by thundershowers.

Snow occurs seldom, the low temperatures of winter being due to the cold, dry, non-moisture-bearing winds of anticyclones.

TABLE 4.—*Precipitation, in inches.*

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1851						9.97	1.87	9.95	7.72	2.21	3.82	1.24	.....
1852	0.75	4.60	3.60	3.80	7.00	7.50	4.47	6.70	9.60	3.60	1.25	0.75	53.62
1853	2.00	0.60	2.50	0.45	1.52	3.24	7.40	2.70	9.45	9.70	2.25	3.95	45.76
1854	3.02	2.15	1.31	4.35	4.45	5.80	6.67	8.90	10.40	1.50	3.55	4.20	56.30
1855	1.45	1.50	5.35	1.15	1.00	5.42	2.15	6.15	4.34	2.55	2.72	4.10	37.88
1856	5.90	3.05	5.75	1.33	4.05	4.42	10.85	7.25	1.10	2.20	3.48	2.93	52.31
1857	1.17	0.60	2.92	2.81	2.40	3.75	9.20	10.55	3.78	2.01	1.45	6.30	46.94
1858	3.15	5.38	3.55	1.25	3.00	1.06	7.66	3.51	10.48	2.00	2.15	2.35	45.54
1859	1.98	2.30	5.45	2.15	1.45	1.95	6.75	12.15	5.05	2.50	3.35	1.80	46.88
1860	0.35	4.60	2.70	3.70	3.75	3.40	6.40	8.05	17.50	7.95	0.55	2.05	61.00
1861	.....	2.55	0.80	3.95	3.48	1.56	9.95	7.85	4.45	3.20	0.80	1.00	.....
1866	.....	4.20	3.65	1.70	2.95	4.12	.....	10.50	2.25	3.15	0.10	1.60	.....
1867	4.62	4.95	4.10	1.85	2.85	10.49	11.07	8.00	14.60	4.70	0.40	0.93	68.56
1868	2.80	2.25	1.35	2.82	3.85	12.40	7.70	4.70	6.15	3.20	0.25	2.05	49.52
1869	4.05	7.45	2.40	4.25	0.81	7.66	5.51	5.60	7.00	4.15	1.65	3.65	54.18
1870	1.05	2.25	5.40	3.20	1.50	8.15	2.65	4.40	9.35	7.10	5.29	1.95	52.29
1871	0.80	1.80	7.15	0.60	4.65	16.75	3.95	13.70	7.52	.....	.....	.....	.....
Av'g*	2.36	3.14	3.62	2.46	3.04	6.33	6.52	8.17	7.69	3.86	2.07	2.55	§51.81
1871	.....	.....	.....	.....	.....	.....	.....	.....	.....	3.62	3.53	2.65	.....
1872	3.44	2.70	7.32	2.43	1.25	6.67	2.92	6.41	10.79	6.37	1.76	4.81	56.87
1873	3.96	0.59	5.29	0.59	5.52	8.41	7.75	6.21	10.47	5.65	2.88	3.38	60.67
1874	0.82	7.33	2.13	1.60	5.38	5.92	7.48	6.89	7.07	0.10	2.94	0.65	48.31
1875	4.48	8.93	1.80	2.98	9.08	5.41	0.14	10.19	4.50	4.49	2.18	3.42	57.60
1876	0.61	3.05	5.41	7.89	1.87	4.17	2.82	8.07	3.73	8.92	2.60	6.12	55.26
1877	2.65	1.09	2.53	3.01	2.47	10.47	4.82	4.82	5.15	6.75	4.49	3.32	51.57
1878	3.14	5.32	2.37	5.38	1.52	5.03	4.63	2.85	21.12	3.81	1.39	3.86	60.42
1879	0.63	3.51	1.35	2.97	4.25	1.25	5.44	8.39	8.24	9.45	1.24	0.46	47.18
1880	3.17	6.17	1.69	1.50	6.24	3.00	5.94	8.96	5.21	16.25	6.09	1.29	65.51
1881	9.12	1.12	2.89	4.57	2.61	2.82	7.61	10.23	4.58	2.87	3.41	2.86	54.69
1882	2.58	1.09	0.89	5.23	2.20	5.14	5.75	5.65	4.39	10.30	5.70	4.34	53.26
1883	4.77	0.48	3.84	4.48	3.16	7.05	6.88	7.63	7.28	7.26	0.09	0.42	53.34
1884	4.78	2.45	2.63	2.32	5.45	6.89	6.02	5.21	5.68	4.12	5.43	4.04	55.02
1885	7.18	5.23	5.66	1.24	7.74	8.98	7.16	7.56	19.63	3.86	0.50	7.76	82.00
1886	2.81	1.87	6.74	3.08	2.81	4.78	14.97	6.25	4.91	2.47	0.97	3.20	54.86
1887	4.34	0.34	3.51	4.15	7.15	9.68	8.90	5.76	9.40	1.57	0.10	3.70	58.60
1888	0.49	4.38	1.57	0.93	5.46	2.92	8.30	4.89	11.15	6.00	4.16	2.88	53.13
1889	5.89	3.85	1.38	3.95	0.51	6.89	8.24	5.25	8.49	1.26	0.51	T.	46.22
1890	0.63	0.51	2.89	0.95	9.20	1.80	9.70	4.26	4.88	9.07	2.26	1.37	47.52
1891	1.19	0.32	4.02	1.72	2.78	3.31	4.08	3.67	10.83	4.43	1.53	3.46	41.34
1892	3.99	0.77	0.76	0.11	1.34	6.38	3.16	4.84	14.04	3.34	0.64	2.52	41.89
1893	0.98	6.87	8.90	2.67	4.18	4.66	4.54	10.02	6.09	4.48	1.76	3.08	58.23
1894	2.29	3.44	3.12	0.83	1.49	4.93	7.10	9.24	16.63	3.24	3.72	0.81	56.84
1895	4.63	3.61	3.63	4.40	2.26	4.98	11.21	2.54	4.66	0.58	3.12	1.18	46.80
1896	2.53	1.66	2.51	0.49	1.24	9.41	4.25	6.16	2.19	3.03	4.55	2.17	40.19
1897	1.89	7.10	1.60	5.18	1.35	5.01	3.67	6.27	16.23	6.00	1.56	4.83	60.69
1898	0.43	2.10	2.04	2.45	1.81	2.13	12.03	5.44	3.46	6.74	2.34	4.74	45.71
1899	3.98	3.38	1.35	3.21	1.86	4.52	6.12	3.90	5.10	2.73	0.07	2.35	38.57
1900	1.71	3.17	7.95	7.34	2.90	8.45	3.83	2.07	4.33	7.14	1.06	3.90	53.85
1901	2.64	6.76	6.57	1.08	5.31	9.64	4.26	6.12	7.38	1.37	0.36	2.73	54.22
1902	0.08	3.64	4.20	2.02	1.82	3.65	6.69	4.74	12.78	5.90	4.18	5.82	55.52
1903	4.44	5.23	2.55	1.54	14.80	3.22	2.54	6.60	2.80	2.83	3.82	1.66	52.03
1904	6.77	2.70	1.35	0.81	2.90	4.92	5.25	2.74	6.09	11.70	2.26	1.68	49.17
1905	1.80	4.65	6.47	2.02	6.68	2.72	5.14	10.97	6.18	2.89	0.60	5.65	55.77
1906	3.46	3.06	1.03	0.30	14.31	4.58	8.96	5.38	2.29	2.39	0.01	1.09	46.86
1907	0.14	0.55	0.76	5.27	5.40	2.71	5.55	6.53	10.44	1.37	1.96	4.39	45.07
Av'g†	3.01	3.31	3.35	2.80	4.34	5.35	6.22	6.19	8.01	4.97	2.32	3.04	§52.91
Gr'st‡	9.12	8.93	8.90	7.89	14.80	16.75	14.97	13.70	21.12	16.25	6.09	7.76	82.00
Least‡	0.08	0.32	0.76	0.11	0.51	1.06	0.14	2.07	1.10	0.10	0.01	T.	37.88

Seasonal ‡: Winter, 8.98; spring, 10.07; summer, 18.64; autumn, 14.77.
T Indicates amount too small to measure.
* Baldwin record
† Signal Service and Weather Bureau records.
‡ All records.
§ Total of monthly means on this line.

In July 82 per cent of the rains occur between 7 a. m. and 7 p. m., and 81 per cent of these, or 66 per cent of all the rains of the month, occur in the afternoon—between noon and 7 p. m. Only 18 per cent are at night—7 p. m. to 7 a. m.—65 per cent of which are between midnight and 7 a. m. In January the rains are more equally distributed between day and night. In this month 64 per cent occur in the daytime—between 7 a. m. and 7 p. m.—68 per cent of which are between noon and 7 p. m.; while of the 36 per cent that occur at night, 67 per cent are between 7 p. m. and midnight. This computation is based on the time of occurrence and not on the amount of fall.

Damaging droughts have been known in all the months of the year, except August and September. On an average of one year in four precipitation is quite insufficient at some stage of the crop-growing season. The greatest drought in the history of the station prevailed from October 27, 1889, to February 28, 1890, during which period there fell only 1.65 inches of rain, this being a minus departure from the normal of 10.5 inches. Between November 23, 1889, and January 1, 1890, merely a sprinkle (amount too small to measure) fell.

Relative Humidity.—The mean relative humidity, at three different hours of observation, computed from records for 17 or 20 years, is given in Table 5, and is plotted in fig. 1. The mean of the three series is also computed and plotted.

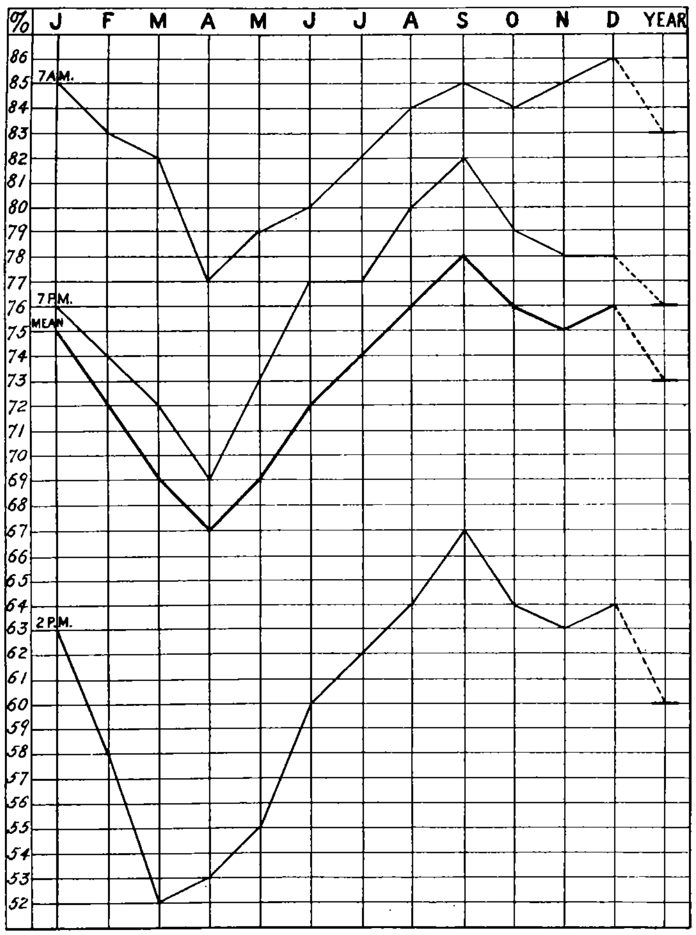

FIG. 1.—Mean relative humidity at Jacksonville, Fla., as given in Table 5.

Wind.—The prevailing winds are from the northeast during the colder months of the year, and from the southwest in summer. For the year, as a whole, 40 per cent of the winds are from the northeast and 25 per cent from the southwest, the remaining 35 per cent being more or less equally distributed among the six other principal directions of the compass.

During winter 75 per cent of the winds are from a northerly quadrant, northeast to northwest. In spring 55 per cent are from a southerly quadrant, southeast to southwest. In summer 80 per cent of the winds are southerly, southeast to southwest, with southwest largely predominating. In autumn fully 90 per cent of the winds are northerly, northeast to northwest.

During periods of abnormally high temperature in late spring, summer, and early autumn, the winds are light and from a westerly quadrant; at other seasons from northeast to southeast. During periods of abnormally cold weather the winds are from the north or northwest in spring; from west to northwest in winter; and from northeast in summer and autumn.

The wind velocities are least about sunrise, when the temperature gradients are weakest. After 6 a. m. there is a gradual increase in velocity until the afternoon maximum is attained at 3 o'clock; thereafter there is a gradual decrease in velocities until about midnight. In summer the highest wind velocities are generally from the south or southwest, and occur in short thundersqualls. In winter the maximum velocities, as a rule, are from the southwest and west.

Weather.—The highest percentage of sunshine occurs during the months of least rainfall—April and November. In January and February cloudiness is greatest in the early morning and late in the afternoon, the skies being usually clear to cloudless at midday. July is the month of least sunshine. Long, drizzling rains are of greatest frequency during December. The average yearly sunshine is 50 per cent.

Frost.—With cloudless sky, calm or very gentle breeze, and relative humidity 65 per cent or more, a light frost will form when the air temperature near the ground is as high as 45°, and with a temperature of 36° the deposit will be heavy.

There is practically no danger of frost in this vicinity before the last decade of October, and a killing frost has never occurred in autumn before the second decade of November. The latest light frost in spring in the past fifty years was April 28, and the latest killing frost April 6.

Cold waves at Jacksonville.—Notable freezes and minimum temperatures:

	°F.
1835, February 8	8
1857, January 19	16
1870, December 24	19
1880, December 30	19
1886, January 12	15
1894, December 29	14
1895, February 8	14
1899, February 13	10
1900, February 18	18
1905, January 26	17

1766. John Bartram, the botanist, says the night of January 2 was the fatal night that destroyed the lime, citron, and banana trees in St. Augustine, together with many curious evergreens up the river that were nearly twenty years old, and many flowering plants and shrubs that were never before hurt. Bartram, who was then camping on the St. Johns River above Volusia, says the morning of January 3 was clear and cold; thermometer 26°, and wind northwest. The ground was frozen an inch thick on the banks of the river.[1]

1799. The temperature was very low.[1]

1828. On April 6 a heavy frost was very destructive to vegetation; the temperature at Picolata, Fla., was as low as 28°.[1]

1835. The great freeze, par excellence, occurred on February 8 of this year, when the temperature went as low as 8° at Jacksonville. The St. Johns River was frozen several rods from the shore and afforded a spectacle as new as it was distressing. All fruit trees were killed to the ground and many of them never started again, even from the roots.[1]

1845. On December 21 a temperature of 20° was recorded at Jacksonville.

1852. January 13 a cold wave prevailed and the temperature was as low as 20°.

1857, January 19 and 20. Ice two inches in thickness formed on pools and along the margin of the river on the morning of the 19th, when the temperature fell to 16°; some people tried to skate. It was the coldest day since the great freeze of 1835. On the morning of the 20th the temperature was as low as 18°.

TABLE 5.—*Means, averages, and extremes.*

Meteorological conditions.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Temperature—1874-1907:													
Mean daily maximum ° F.	64.1	66.6	72.3	77.5	83.9	88.5	90.7	89.9	85.7	78.2	71.0	65.1	77.8
Mean daily minimum ° F.	46.4	48.9	54.0	59.1	66.2	72.0	74.1	73.6	71.1	62.7	54.0	47.2	60.8
Mean daily range ° F.	18	18	18	18	18	16	17	16	15	16	17	18	17
Maximum greatest daily range ° F.	38	40	36	34	33	29	30	30	28	34	33	41	41
Minimum greatest daily range ° F.	16	24	23	17	17	19	19	17	16	21	22	21	16
Mean monthly range ° F.	48	47	46	42	37	29	26	27	30	39	46	47	39
Maximum monthly range ° F.	58	71	60	52	49	41	36	34	45	48	56	66	71
Minimum monthly range ° F.	32	38	32	29	29	27	22	21	22	26	36	38	21
Average number of days with maximum 90° or above	0	0	0	0	4	12	17	15	4	0	0	0	52
Average number of days with maximum 95° or above	0	0	0	0	0	3	5	3	0	0	0	0	11
Average number of days with minimum 36° or below	5	3	1	0	0	0	0	0	0	0	1	4	14
Average number of days with minimum 32° or below	2	1	0	0	0	0	0	0	0	0	0	2	5
Relative humidity:													
Mean, 7 a. m. (1888-1907) per cent.	85	83	82	77	79	80	82	84	85	84	85	86	83
Mean, 2 p. m. (1872-1888) per cent.	63	58	52	53	55	60	62	64	67	64	63	64	60
Mean, 7 p. m. (1888-1907) per cent.	76	74	72	69	73	77	77	80	82	79	78	78	76
Mean, 7 a. m., 2 p. m., and 7 p. m. per cent.	75	72	69	67	69	72	74	76	78	76	75	76	73
Precipitation—1872-1907:													
Greatest amount in any twenty-four hours; inches and hundredths.	3.09	3.99	4.47	4.81	9.06	5.12	4.55	6.18	9.86	5.15	3.75	4.43	9.86
Wind—1891-1907:													
Average hourly velocity miles per hour	7.9	8.9	8.7	8.9	8.2	7.9	7.7	7.3	7.7	8.5	7.5	7.8	8.1
Maximum velocity for five minutes (1872-1907) miles per hour.	57	75	61	51	56	62	47	55	70	62	40	51	75
direction	sw.	sw.	s.	sw.	se.	sw.	sw.	w.	se.	se.	sw.	sw.	sw.
Prevailing wind direction (1872-1907)	ne.	ne.	sw.	sw.	ne.	sw.	sw.	sw.	ne.	ne.	ne.	n.	ne.
Weather—1872-1907:													
Average number of clear days.	10	10	12	13	12	8	8	8	9	12	11	11	124
Average number of partly cloudy days	11	9	12	11	14	15	16	17	12	11	11	11	150
Average number of cloudy days	10	9	7	6	5	7	7	6	9	8	8	9	91
Average cloudiness, sunrise to sunset (1891-1907) scale 0 to 10.	5.3	5.4	4.7	4.3	4.5	5.3	5.7	5.5	5.5	5.1	4.9	5.1	5.1
Average number of rainy days 0.01 inch or more.	9	9	8	7	10	13	15	15	14	10	8	8	126
Greatest number of rainy days	17	14	19	13	16	19	26	22	21	18	17	15	148
Least number of rainy days	3	3	3	2	3	5	2	6	7	1	1	0	95
Average number of thunderstorms	1	1	2	3	6	12	14	11	5	2	1	1	59
Greatest number of thunderstorms	3	5	6	11	18	20	23	27	17	6	7	6	95

1868 and 1870. On December 25, 1868, and again on December 24, 1870, freezes occurred with temperatures of 20° and 19°, respectively. During these freezes many young buds were killed, young orange seedlings were frozen to the ground, and much fruit was destroyed.

1873, 1876, and 1879. The freezes of January 19, 1873, minimum temperature 24°; December 3, 1876, minimum 24°; and January 7, 1879, minimum 25°, wrought havoc to fruit, but did no lasting harm to trees.

1880. On December 30 the temperature fell to 19°, and great damage resulted to oranges, lemons, limes, guavas, and other fruit then on the trees. The trees were not greatly injured.

1886. Very great damage was done to fruit and young trees by the freeze of January 12.

1894. The freeze of December 29 killed all fruit on the trees, together with many young trees. Some of the more hardy fruit trees, altho damaged greatly, shortly after the freeze showed signs of recovery.

1895, February 8. This freeze was remarkable in that it followed so closely that of December 29 of the previous year. There was little fruit left to be injured, but all fruit trees were killed to the ground.

1897. On January 28 the temperature fell to 21°, and young fruit stock was damaged and vegetables nearly destroyed.

1899, February 13. The minimum temperature on the morning of the 13th was 10°, and all fruit trees, many of which were just beginning to recover from the freeze of 1895, were killed. Young stock and vegetables of every description were destroyed. Some forest trees were also killed. The temperature was below freezing all day, the highest point reached being 27°. The facilities in hand were insufficient to protect vegetables against such severe cold, altho the low temperatures were accurately forecast.

1900. On February 18 the minimum temperature was 18°, and much damage resulted to early vegetables.

1901 and 1905. The freezes of December 21, 1901, minimum temperature 20°, and of January 26, 1905, minimum 17°, damaged vegetables very much.

1906. On December 24 a minimum temperature of 24° was recorded, and considerable damage resulted to plants and vegetables.

Notes on snow and sleet.—In 1774 there was a snow storm that extended over most of Florida. The inhabitants long afterwards spoke of it as an extraordinary white rain.[1]

1852, January 13. Snow fell all the forenoon. The total amount was one-half inch (unmelted).

1855, February 28. A few flakes of snow fell.

1868, January 29. Light sleet fell during the night.

1869, February 28. There was a flurry of snow in the forenoon.

1873, January 10. A few flakes of snow fell at 7:25 a. m.

1875, February 4 and 5. Light sleet occurred between midnight and sunrise on both these dates.

1879, January 4. Sleet began at 7 p. m. and turned to rain at 8:30 p. m. On the following morning (the 5th) everything out of doors, such as trees, shrubbery, etc., was covered with ice. The weight of the ice broke the limbs of many orange trees.

1892, December 27. Light snow flurries occurred at intervals during the day.

1893, January 18. Sleet and snow fell in this city shortly after midnight. It began as sleet, turned to snow, and then to rain.

1895, February 14. At 6:22 p. m. light sleet began to fall, continuing about five minutes, when it turned to snow; snow ended in five minutes. Light snow began again at 7:20 p. m., and ended at 8 p. m.

1899, February 12 and 13. At 9:45 p. m. of the 12th, rain changed to sleet, and this to snow at 10:15 p. m. Snow continued during the night, ceasing before sunrise on the 13th. At 7 a. m. of the latter date snow on the ground was 2 inches deep, with a temperature of 10°. In sheltered places the snow remained unmelted for several days.

[1] Extracts from a paper read before the Florida State Horticultural Society by Maj. Geo. R. Fairbanks, May 8, 1895.

1901, December 16. Light snow flurries occurred at 1 p. m., and sleet fell at intervals during the afternoon.

1907, February 7. A light snow flurry occurred in the immediate vicinity of the city during the early afternoon.

Hurricanes.—The season of greatest frequency of hurricanes is from September 1 to October 15. During September the mean track of these storms lies near and almost parallel to the east Florida coast. The dates on which severe tropical storms prevailed in the vicinity of Jacksonville are given below. It will be noted that since 1841 nineteen hurricane years have occurred, and in seven of these two or three hurricanes have visited this section within one season:

1842, October 5-6	1881, August 27.
1846, October 12	1881, October 6.
1848, October 12	1882, September 10-11.
1851, August 18	1882, October 11.
1852, October 9	1885, October 10-11.
1854, September 8	1888, September 9.
1871, August 17-18	1888, October 11.
1871, August 24	1893, June 15-16.
1874, September 28	1893, August 27.
1876, September 16	1893, October 12.
1878, July 11-12	1894, September 26.
1878, September 9-11	1894, October 9.[2]
1878, October 21-22	1896, September 29.
1880, August 29-30	1899, October 5.

TABLE 6.—*Dates of frost.*

Year.	Light frost.		Killing frost.	
	First in autumn.	Last in spring.	First in autumn.	Last in spring.
1844	October 30	March 22	December 12	February 11
1845	November 4	February 9	November 28	February 8
1846	November 20	January 22	November 26	January 25
1854	November 14	April 19	November 29	January 2
1855	October 26	March 23	December 11	March 2
1856	December 8	March 29	December 17	February 5
1857	October 26	April 22	November 20	January 23
1858	November 10	April 28	None	March 3
1859	November 2	March 20	November 15	January 24
1860	November 3	March 14	November 25	None
1861	December 24	April 18	None	....
1866	November 24	March 30	December 11	February 16
1867	November 13	March 16	None	February 10
1868	November 2	March 5	November 21	January 31
1869	October 28	April 14	November 22	March 1
1870	November 16	April 18	December 23	February 22
1871	November 17	February 20	December 5	January 10
1872	November 16	March 4	November 16	February 4
1873	October 21	March 6	November 20	March 5
1874	December 8	January 15	December 8	January 9
1875	October 28	February 12	December 15	February 6
1876	November 20	March 22	December 1	March 22
1877	November 12	February 21	November 30	January 5
1878	November 29	March 5	December 28	February 12
1879	November 4	April 6	November 21	January 20
1880	November 16	April 13	November 16	None
1881	November 4	April 5	November 25	April 2
1882	November 15	February 6	December 17	February 6
1883	November 3	March 23	December 16	March 13
1884	November 25	February 21	December 3	February 21
1885	November 16	March 19	November 26	March 10
1886	October 29	March 11	December 6	March 11
1887	October 31	April 2	November 21	January 19
1888	November 11	March 15	December 20	February 29
1889	November 29	April 8	November 30	February 8
1890	November 1	March 17	December 29	March 17
1891	November 18	April 6	November 18	April 6
1892	October 26	April 16	November 12	March 20
1893	November 16	March 20	November 25	March 5
1894	November 7	March 31	November 12	March 27
1895	November 21	April 5	December 4	February 17
1896	October 19	April 5	December 22	March 21
1897	November 4	January 30	December 6	January 30
1898	October 23	April 8	December 6	February 22
1899	November 6	April 11	December 30	March 8
1900	November 10	April 14	None	February 25
1901	October 17	April 22	December 16	March 7
1902	November 28	April 1	December 26	February 18
1903	October 25	February 22	November 19	February 18
1904	November 14	March 15	December 29	February 12
1905	November 2	April 17	None.	February 16
1906	November 12	March 23	November 13	None
1907	October 29	April 15	December 5	February 9
Average	November 8	March 19	December 4	February 14

Earliest frost in autumn, October 17. Latest frost in spring, April 28. Earliest killing frost in autumn, November 12. Latest killing frost in spring, April 6.

[2] This is the hurricane that caused the destruction of Cedar Keys, Fla.

Tornadoes and waterspouts.—These phenomena are of rare occurrence in this part of the State.

1872, March 10. Shortly after midnight a violent wind and rainstorm past over the city. Two and a half miles north a tornado unquestionably occurred; its path varied from three-quarters to 1 mile in width, and extended from a point a short distance west of the Panama road to the St. Johns River. Large trees were uprooted or twisted off; several dwellings and barns were demolished, the inmates being more or less seriously injured, and some stock killed. It is stated that the tall grass was cut off as if by a mower and banked against prostrate trees by the wind.

1874, August 6. At 8:30 a. m. a waterspout was observed in the river about 4 miles southwest of the city. It began in a cloud which approached the river from the southwest. Just prior to the completion of the spout the water was greatly agitated; but when the funnel-shaped cloud united with the water the agitation quickly subsided and the surface of the river resembled a mirror. This phase lasted fifteen minutes, when the column gradually drew away from the water and contracted in diameter, rolled itself into a ball and rapidly disappeared into the cloud.

1882, September 10. A tornado occurred at Darbyville, Fla. (about 30 miles west of Jacksonville), at 9:50 p. m., causing great destruction. Several buildings were blown to pieces, seriously injuring five or more persons. Large trees were uprooted, and numbers of cattle and hogs were killed.

1888, April 18. A large waterspout was reported as having occurred about 2 miles up the river at 10:25 a. m.

1907, April 18. A severe hail and windstorm swept over the city at 3:40 p. m. On the south side of the river the storm assumed the nature of a tornado, causing much damage to Dixieland Amusement Park and to several manufacturing plants. A tugboat was sunk and the captain drowned, and another man was blown from a pile driver and drowned. No very serious damage resulted in the city, except the breakage of glass by the hail.

Auroras.—The auroral light has not been observed here since 1882. There appears to have been a period of special frequency from 1870 to 1877.

1859, August 28. The auroral light was plainly visible during the early evening.

1859, September 2. Brilliant aurora during the evening and night; the entire heavens were illumined. Many amusing incidents are told of how the more ignorant inhabitants imagined the end of the world was at hand.

1870. The aurora borealis was very brilliant on September 24, and it was again observed on October 14 and 25.

1872, February 4. The aurora was visible from 7:25 p. m. until nearly 9 p. m. It was in the form of one complete arch, with streamers projecting upward. The streamers were of rose tint. Again, on October 14 there was an aurora of moderate brilliancy about 7 p. m.

1876, May 2. Polar bands were visible in the northwest during the evening.

1877, June 4. The aurora borealis was visible from 8 until 10 p. m. When it was first observed it resembled a band of reflected light extending from N. 20° E. to N. 40° W., with the center of the arch not more than 25° above the horizon. There were no streamers.

1882, November 17. The auroral light was observed from 8:15 to 9:05 p. m. The color was a uniform pale red tint, extending to the height of 30° and from 110° W. to 20° E. The display was well marked, and attracted general attention.

Earthquakes.—The occurrence of earthquake shocks in this vicinity is of much interest. In the records of this office mention is made of these, as follows:

1879, January 12. At 11:40 p. m. slight earthquake shocks were felt thruout the city and continued thirty seconds. The motion appeared to be from northwest to southeast, and a rumbling noise was reported to have been heard during the shocks. Earthquake shocks were felt in Lake City, Fla., at the same time.

1886, August 31. Earthquake shocks were felt in this city from 8:52 p. m. to 9:03 p. m. The first vibrations were light, but were continuous for a minute and a half, when three or four severe shocks occurred in quick succession, the most violent of which was at 8:53:30 p. m. This building (the Astor Building) vibrated with the shocks and seemed to move from east to west, as the swaying of a railroad train along a straight track, with now and then a sudden lurch, as if the train had turned a sharp curve. The windows, doors, and furniture rattled, and it was difficult for one to stand without support. Distinct earthquake shocks were felt in the city on September 1, at 3:30 a. m. and 3 p. m.; on the 3d, at 10:03 p. m.; 5th, at 10:15 and 10:18 p. m.; 8th, at 12:34 p. m.; 9th, at 12:47 p. m., and on October 22, a shock was felt thruout the city at 4:24 a. m., lasting fifteen seconds, and with energy sufficient to rattle dishes, windows, etc.

The great earthquake shock began in the city of Charleston within a few seconds of 8:51 p. m., ninetieth meridian time, on August 31, 1886.

1893, June 20. An earthquake shock was felt at 10:07 p. m. The duration was about ten seconds and the motion vibratory and continuous, direction northeast to southwest, intensity moderate.

THE UTILIZATION OF MIST, FOG, DEW, AND CLOUD.

In the MONTHLY WEATHER REVIEW, October, 1898, and March, 1899,[1] we suggested methods by which the fog and cloud particles driven by the wind over a region where but little rain falls could be caught and led to the roots of plants and thus made as effective as rain in promoting the growth of useful vegetation. If the large quantity of water that drips from leaves in foggy weather could be quickly conducted to the soil and conserved at a depth of a few inches, it would largely replace the defect of rainfall in a droughty season.

It would seem that the formation of dew also may be intensified and accelerated, so that dew, properly so called, can be led directly to the absorbing rootlets of plants. A dew-pond, however, need not rely wholly upon dew; it may be so constructed that dew, fog-drip, and rain shall all be utilized to maintain the pond. The experiments that have been successful in the moist climate of Great Britain, as explained in the following article by E. A. Martin, are surely worth trying in many portions of the United States.—*C. A.*

DEW-PONDS.

By EDWARD A. MARTIN, F. G. S.

[Reprinted from Knowledge and Scientific News, May and June, 1907, omitting the illustrations.]

The literature devoted to the subject of dew-ponds is of a very scanty nature, whilst those writers who have dealt with the subject differ considerably amongst themselves as to the principles, if any, on which such ponds are formed, and also, indeed, as to whether the ponds have any right to be called "dew-ponds" at all.

In considering the subject, it is, of course, primarily necessary to recognize clearly how dew is formed, but even in what appears to be such an elementary matter as this there is not a unanimity of opinion. Many meteorologists still maintain the old theory, which is certainly the popular theory, that dew is formed by the precipitation of the aqueous vapour already existing in the lower layers of the atmosphere, when the radiation of heat from the earth has caused its surface to be in the condition to chill below the dew-point the layer of saturated air in contact with it. Precipitated moisture may appear in the form of dew, hoar-frost, mist, fog, or cloud, but in dew and hoar-frost there is precipitation without a cloudy intermediary. Freest radiation of heat from the earth's surface takes place when there are no clouds to reflect to earth the heat which it gives off at night. If there are no clouds, the chilling of the ground and of the layer of air in contact with it will be considerable, and the temperature may be reduced to the dew-point.

During the last twenty years the acceptance of Dr. J. Aitken's theory has been rapidly growing, that dew is really formed from the moisture which rises out of the soil with the radiation of heat, and that it is this which is precipitated when the air into which it passes has been so reduced in temperature as to be unable to hold it as aqueous vapour. If this theory be the correct one it would at once dispose of the suggestion altogether that dew-ponds are fed and filled by true dew, since the acquisition of dew could only then be obtained at the expense of itself by earlier evaporation.

Messrs. Hubbard, in their "Neolithic Dew-Ponds and Cattle-ways," give some details as to the formation of these ponds, although the source of their information is not stated. They say that there is at least one wandering gang of men, who will construct for the modern farmer a dew-pond which will contain more water in the heat of summer than during the winter rains. The space hollowed out for the purpose is first thickly covered with a coating of dry straw. The straw is in turn. covered by well-chosen, finely-puddled clay, and the upper surface of the clay is then closely strewn with stones. The margin of the straw has to be effectually protected by the clay, since if it becomes wet it will cease to attract the dew, as it ceases to act as a nonconductor of heat and "becomes of the same temperature as the surrounding earth." This would, of course, follow quickly if a runnel or spring were allowed to drain into the pond. The puddled clay is chilled by the process of evaporation, and the dry straw prevents the heat of the earth after a hot day from warming the clay.

It is very certain, however, that many alleged dew-ponds are not formed on this plan. This description, it will be observed, clearly presupposes that dew is formed out of the aqueous vapour already existing in the atmosphere, so that if Doctor Aitken's theory is correct, it would seem that a new name is needed to describe water that is precipitated out of the atmosphere in such a case, without the intermediate condition of mist or cloud. Such might be called "invisible mist." Some remarks by G. G. Desmond in the "Nature Notes Column" of the Daily News gave a different arrangement for the basis of the dew-pond. It was there stated that first a bed of concrete is laid down; this is covered with straw, over which is placed another layer of concrete. I have been unable to trace the authority on which this is based.

In a private letter from the maker of some ponds on the "Duke of Norfolk Downs" and on Amberley Mount, it is stated that the highest parts are chosen, as they are "more exposed to the weather" than lower down, the inference being that they are filled by the moisture-laden winds blowing in from the southwest, no consideration being given whatever to any artificial attempt to attract dew-precipitation. But as R. H. Scott says, dew can never appear when there is much wind, for the air can not remain long enough in contact with the soil for any material reduction of its temperature and consequent condensation of moisture to take place. (Int. Sci. Series, Vol. XLVI). The "weather" referred to can only, therefore, be mist or fog.

In 1877 Mr. H. P. Slade discarded the term "dew-ponds" in favour of "artificial rain-ponds," and scouted the idea that dew had any part in filling ponds at all. His remarks dealt practically with one pond, the greatest diameter of which was 69½ feet, which was constructed in 1836 at a cost of £40. It was

[1] Vol. xxvi, p. 466; Vol. xxvii, p. 113.