

tation for the current month was the greatest on record at: Block Island, 9.42; Narragansett Pier, 8.25; Jupiter, 6.49; Cincinnati,\* 6.80; Columbus, Ohio, 7.45; Pittsburg,\* 5.11; Oswego,\* 6.56; Sandusky,\* 6.21; Toledo,\* 5.41; Rapid City,\* 1.16; Spokane, 5.85; Walla Walla, 5.15. It was the least on record at: Tampa, 0.63; Vicksburg,\* 1.37; Des Moines, 0.34; Phoenix and Yuma, 0.00.

The total accumulated monthly departures from January 1 to the end of the current month are given in the second column of the following table; the third column gives the current accumulated precipitation expressed as a percentage of its normal value.

Districts.	Accumulated departures.		Districts.	Accumulated precipitation.	
	Inches.	Perct.		Inches.	Perct.
New England .....	+ 0.20	100	Middle Atlantic .....	- 4.10	90
Florida Peninsula .....	+ 11.30	123	South Atlantic .....	- 4.80	91
Middle Slope .....	+ 0.60	103	East Gulf .....	- 5.90	88
Southern Slope .....	0.00	100	West Gulf .....	- 11.30	72
Southern Plateau .....	+ 3.70	148	Ohio Valley and Tenn.....	- 1.90	95
Middle Plateau .....	+ 0.30	103	Lower Lake .....	- 3.50	89
Northern Plateau .....	+ 2.30	116	Upper Lake .....	- 2.90	91
South Pacific .....	+ 0.60	106	North Dakota .....	- 1.50	92
			Upper Mississippi Valley .....	- 2.00	94
			Missouri Valley .....	- 3.80	87
			Northern Slope .....	- 0.50	96
			North Pacific .....	- 0.70	96
			Middle Pacific .....	- 2.80	88

SNOWFALL.

The total monthly snowfall at each station, if any occurs, is given in Tables I and II. The geographical distribution of snowfall is shown on Chart VI. It will be seen that snow was general throughout Pennsylvania, New York, and the New England States, also throughout Michigan and the States westward to the Pacific. Practically no snow fell in Kansas except in the extreme northwestern portion. The snowfall of Montana, Idaho, and eastern Washington was quite heavy.

In Canada, Prof. R. F. Stupart reports snow as follows:

British Columbia: Snow on the ground from 6 to 16 inches. Northwest Territories: The precipitation was above the average and was mostly in the form of snow. The observer at Regina says: We have had a good deal of snow, but farther north, in the timber skirting the Qu'Appelle Valley, it is reported that there is at least 2 feet of snow and badly drifted; here there can not be more than 9 inches. From Swift Current a heavy snowfall is reported. Manitoba: Minnedosa, sleighing on the 15th, but roads bare in some places; at Emerson, snowfall only 3 inches. Ontario: The amount of snow on the ground at the end of the month was only from 1 inch in the southern portions to 12 inches in the northern portions. Quebec: Not more than 2 inches of snow reported in this Province. Maritime Provinces: Very little snow, not more than 2.20 inches.

HAIL.

The following are the dates on which hail fell in the respective States:

Arizona, 13. Arkansas, 15. California, 6, 22. Connecticut, 11. Delaware, 15. Idaho, 20. Illinois, 8. Indiana, 11, 26. Maryland, 2, 11, 17. Massachusetts, 9. Missouri, 8, 15. Nevada, 12, 24. New Jersey, 4, 11, 14, 16, 22, 29. New York, 9, 25. North Carolina, 23. North Dakota, 9. Oregon, 5, 6, 7, 13, 14, 16, 21. Pennsylvania, 2, 3, 11, 16. Virginia, 2, 11. West Virginia, 11.

SLEET.

The following are the dates on which sleet fell in the respective States:

Arkansas, 28. California, 6. Connecticut, 8, 15, 29. Idaho, 6, 13, 22, 23, 29. Illinois, 15, 24, 25, 26. Indiana, 1, 9, 11, 24. Iowa, 12, 15, 25, 26. Kansas, 15. Kentucky, 23. Maine, 25, 29. Maryland, 14, 23, 29. Massachusetts, 8, 29. Michigan, 5, 10, 11, 14, 15, 24, 26. Minnesota, 4, 5, 10, 13, 14, 24, 25, 29. Missouri, 15. Montana, 3, 5, 12, 19. Nebraska, 4,

\* Observations cover a period of over twenty-five years.

9, 10, 22, 23, 24, 25, 26. Nevada, 3, 6. New Hampshire, 8, 9, 10, 11, 21. New Jersey, 13, 16, 22. New York, 6, 8, 9, 11, 12, 14, 16, 25, 27, 29. North Dakota, 13, 14. Ohio, 7, 9, 11, 12, 14, 16, 19, 22, 24, 25, 29. Oregon, 5, 6, 13, 19, 22, 28, 29, 30. Pennsylvania, 2, 10, 11, 14, 16, 22, 29. Rhode Island, 9. South Dakota, 4, 11, 13. Utah, 6, 24, 25. Vermont, 11, 12, 26. Virginia, 11, 14, 28, 29. Washington, 3, 7, 13, 14, 20, 23, 29, 30. West Virginia, 14, 28, 29. Wisconsin, 5, 10, 11, 14, 15, 25, 26.

WIND.

The prevailing winds for November, 1897, viz, those that were recorded most frequently, are shown in Table I for the regular Weather Bureau stations.

The resultant winds, as deduced from the personal observations made at 8 a. m. and 8 p. m., are given in Table VIII. These latter resultants are also shown graphically on Chart IV, where the small figure attached to each arrow shows the number of hours that this resultant prevailed, on the assumption that each of the morning and evening observations represents one hour's duration of a uniform wind of average velocity. These figures indicate the relative extent to which winds from different directions counterbalanced each other.

Maximum wind velocities are given in Table I, which also gives the altitudes of Weather Bureau anemometers above the ground. Maxima of 50 miles or more per hour were reported during this month as follows (maximum velocities are averages for five minutes; extreme velocities are gusts of shorter duration, and are not given in this table):

Stations.	Date.	Velocity.	Direction.	Stations.	Date.	Velocity.	Direction.
Block Island, R. I. ....	9	54	nw.	Chicago, Ill. ....	1	52	ne.
Buffalo, N. Y. ....	6	56	w.	Do. ....	10	55	sw.
Do. ....	12	54	w.	Do. ....	14	50	se.
Fort Canby, Wash. ....	8	50	se.	Cleveland, Ohio. ....	11	68	w.
Do. ....	9	58	s.	Denver, Colo. ....	10	51	w.
Do. ....	16	66	se.	Eastport, Me. ....	12	60	ne.
Do. ....	17	87	se.	Lexington, Ky. ....	9	50	w.
Do. ....	18	88	se.	New York, N. Y. ....	9	54	w.
Do. ....	20	56	se.	Do. ....	13	52	nw.
Carson City, Nev. ....	10	59	sw.	Portland, Oreg. ....	18	52	s.
Do. ....	19	52	sw.	Woods Hole, Mass. ....	9	57	sw.
Do. ....	21	51	sw.	Do. ....	10	52	w.
Cheyenne Wyo. ....	10	54	w.	Do. ....	12	60	sw.

ATMOSPHERIC ELECTRICITY.

Numerical statistics relative to auroras and thunderstorms are given in Table IX, which shows the number of stations from which meteorological reports were received, and the number of such stations reporting thunderstorms (T) and auroras (A) in each State and on each day of the month, respectively.

Thunderstorms.—The dates on which the number of reports of thunderstorms for the whole country were most numerous were: 8th, 64; 9th, 59; 14th, 62; 26th, 58.

Reports were most numerous from: Illinois, 83; Indiana, 49; Missouri, 59; Ohio, 56.

Thunderstorm days were most numerous in: Illinois, 14; Indiana, 10; Missouri and Ohio, 12.

In Canada.—Thunderstorms were reported at Grand Manan on the 6th and 9th.

Auroras.—The evenings on which bright moonlight must have interfered with observations of faint auroras are assumed to be the four preceding and following the date of full moon, viz, from the 4th to the 12th, inclusive. On the remaining twenty-one days of this month 54 reports were received, or an average of about 2 per day. The dates on which the number of reports of auroras for the whole country especially exceeded this average were: 2d, 4; 17th and 24th, 8.

Reports were most numerous from: Montana, 6; Nevada, 7; North Dakota, 8.

The number of reports was a large percentage of the number of observers in: North Dakota, 17; Montana, 16; Nevada, 15.

In Canada.—Auroras were reported on the following dates: Father Point, 4; Quebec, 16, 17; Toronto, 11; White River, 18; Minnedosa, 15, 16, 21, 24; Medicine Hat, 23, 30; Battleford, 27; Banff, 14.

**SUNSHINE AND CLOUDINESS.**

The quantity of sunshine, and therefore of heat, received by the atmosphere as a whole is very nearly constant from year to year, but the proportion received by the surface of the earth depends upon the absorption by the atmosphere, and varies largely with the distribution of cloudiness. The sunshine is now recorded automatically at 21 regular stations of the Weather Bureau by its photographic, and at 45 by its thermal effects; at one of these stations records are kept by both methods. The photographic record sheets show the apparent solar time, but the thermometric records show seventy-fifth meridian time; for convenience the results are all given in Table X for each hour of local mean time. In order to complete the record of the duration of cloudiness these registers are supplemented by special personal observations of the state of the sky near the sun in the hours after sunrise and before sunset, and the cloudiness for these hours has been added as a correction to the instrumental records, whence there results a complete record of the duration of sunshine from sunrise to sunset.

The average cloudiness of the whole sky is determined by numerous personal observations at all stations during the daytime, and is given in the column "average cloudiness" in Table I; its complement, or percentage of clear sky, is given in the last column of Table X for the stations at which instrumental self-registers are maintained.

**COMPARISON OF DURATIONS AND AREAS.**

The sunshine registers give the *durations* of effective sunshine whence the durations relative to possible sunshine are derived; the observers' personal estimates give the percentages of *area* of clear sky. These numbers have no necessary relation to each other, since stationary banks of clouds may obscure the sun without covering the sky, but when all clouds have a steady motion past the sun and are uniformly scattered over the sky, the percentages of duration and of area agree closely. For the sake of comparison, these percentages have been brought together, side by side, in the following table, from which it appears that, in general, the instrumental records of percentages of durations of sunshine are almost always larger than the observers' personal estimates of percentages of area of clear sky; the average excess for November, 1897, is 7 per cent for photographic and 6 per cent for thermometric records.

The details are shown in the accompanying table, in which

the stations are arranged according to the *total possible duration* of sunshine, and not according to the *observed duration*. In obtaining the total possible sunshine the value for the parallel of latitude nearest the station is used.

*Difference between instrumental and personal observations of sunshine.*

Stations.	Latitude.	Apparatus.	For whole month.		Instrumental record of sunshine.				
			Total possible.	Personal.	Photographic.	Difference.	Thermometric.	Difference.	
Key West, Fla.	24 34	T.	326.2	65				73	+13
Tampa, Fla.	27 57	T.	323.5	61				68	+3
Galveston, Tex.	29 18	P.	321.7	61	66	+5			
New Orleans, La.	29 58	T.	319.7	58				57	-1
Jacksonville, Fla.	30 20	T.	319.7	58				63	+15
Savannah, Ga.	32 05	P.	315.0	48	66	+8			
Vicksburg, Miss.	32 22	T.	315.9	65				66	+1
San Diego, Cal.	32 43	P.	314.0	83	85	+2			
Charleston, S. C.	32 47	T.	314.0	62				64	+2
Phoenix, Ariz.	33 28	P.	314.0	78	91	+15			
Atlanta, Ga.	33 45	T.	312.2	85				64	-1
Los Angeles, Cal.	34 03	P.	312.2	81	88	+7			
Wilmington, N. C.	34 14	T.	312.2	65				72	+7
Little Rock, Ark.	34 45	T.	310.1	54				73	+19
Chattanooga, Tenn.	35 04	T.	310.1	52				56	+4
Santa Fe, N. Mex.	35 41	P.	308.3	70	81	+11			
Raleigh, N. C.	35 45	T.	308.3	56				67	+11
Knoxville, Tenn.	35 56	T.	308.3	56				61	+3
Nashville, Tenn.	36 10	T.	306.3	52				55	+3
Fresno, Cal.	36 48	T.	305.7	63				78	+15
Dodge City, Kans.	37 45	P.	304.0	66	74	+8			
San Francisco, Cal.	37 48	T.	304.0	44				59	+15
Louisville, Ky.	38 15	T.	304.0	40				54	+14
St. Louis, Mo.	38 38	T.	301.5	46				52	+6
Washington, D. C.	38 54	P.	301.5	49	55	+6			
Kansas City, Mo.	39 05	P.	301.5	52	53	+1			
Cincinnati, Ohio	39 06	T.	301.5	43				44	+1
Parkersburg, W. Va.	39 18	T.	301.5	31				31	0
Baltimore, Md.	39 18	T.	301.5	48				55	+7
Atlantic City, N. J.	39 22	P.	301.5	44	59	+15			
Denver, Colo.	39 45	P.	299.7	47	66	+19			
Indianapolis, Ind.	39 46	T.	299.7	37				42	+9
Philadelphia, Pa.	39 57	T.	299.7	36				47	+11
Columbus, Ohio	39 58	T.	299.7	37				36	-1
Harrisburg, Pa.	40 16	T.	299.7	29				47	+18
Pittsburg, Pa.	40 32	T.	297.3	29				34	+5
New York, N. Y.	40 42	T.	297.3	34				50	+16
Salt Lake City, Utah	40 46	P.	297.3	40				45	+5
Eureka, Cal.	40 48	P.	297.3	39	33	0			
Cheyenne, Wyo.	41 08	P.	297.3	52	61	+9			
Omaha, Nebr.	41 16	P.	294.9	50				20	+4
Cleveland, Ohio	41 30	T.	294.9	16				55	+0
Des Moines, Iowa	41 35	T.	294.9	55				32	+1
Chicago, Ill.	41 53	T.	294.9	31				16	+11
Erie, Pa.	42 07	T.	294.9	26				32	+4
Binghamton, N. Y.	42 08	T.	294.9	24				27	+8
Detroit, Mich.	42 20	T.	294.9	23				40	+18
Boston, Mass.	42 21	T.	294.9	42				42	+0
Dubuque, Iowa	42 30	T.	294.9	35				35	+0
Albany, N. Y.	42 39	T.	293.3	23				23	+0
Buñalo, N. Y.	42 58	T.	292.8	12				23	+11
Yankton, S. Dak.	42 54	T.	292.3	48				55	+10
Rochester, N. Y.	43 08	T.	292.3	20				21	+8
Idaho Falls, Idaho	43 29	T.	292.3	30				33	+3
Portland, Me.	43 38	T.	289.7	84				42	+8
Northfield, Vt.	44 10	P.	289.7	20	27	+7			
Huron, S. Dak.	44 21	T.	289.7	35				47	+2
Eastport, Me.	44 54	P.	287.2	26	37	+11			
St. Paul, Minn.	44 58	P.	287.2	37	40	+3			
Minneapolis, Minn.	44 59	T.	287.2	37				80	+23
Portland, Oreg.	45 32	T.	284.1	15				23	+8
Helena, Mont.	46 34	P.	284.1	15	12	-3			
Bismarck, N. Dak.	46 47	P.	281.0	29	33	+4			
Tacoma, Wash.	47 16	T.	281.0	51	61	+10			
Seattle, Wash.	47 38	T.	278.0	12				16	+6
Spokane, Wash.	47 40	T.	278.0	12				4	-8

**CLIMATE AND CROP SERVICE.**

By JAMES BERRY, Chief of Climate and Crop Service Division.

The following extracts relating to the general weather conditions in the several States and Territories are taken from the monthly reports of the respective sections of the Climate and Crop Service. The name of the section director is given after each summary.

Snowfall and rainfall are expressed in inches.

*Alabama.*—The mean temperature was 54.6°, or 0.6° above normal; the highest was 85°, at Newburg on the 14th, and the lowest, 21°, at Jasper on the 30th. The average precipitation was 2.03, or 0.97 below normal; the greatest monthly amount, 6.58, occurred at Riverton, and the least, 0.50, at Highland Home.—*F. P. Chaffee.*

*Arizona.*—The mean temperature was 55.0°, or normal; the highest was 101°, at Maricopa, and the least, 9°, at Snowflake. The average precipitation was 0.02, or 0.83 below normal; the greatest monthly