MONTHLY WEATHER REVIEW.

Editor: Prof. CLEVELAND ABBE.

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INTRODUCTION.

The REVIEW for November, 1895, is based on reports from 2,759 stations occupied by regular and voluntary observers, classified as follows: 149 from Weather Bureau stations; 35 from U. S. Army post surgeons; 2,416 from voluntary observers; 33 from Canadian stations; 96 received through the Southern Pacific Railway Company; 30 from U. S. Life-Saving stations; international simultaneous observations are received from a few stations and used together with trustworthy newspaper extracts and special reports.

The WEATHER REVIEW is prepared under the general editorial supervision of Prof. Cleveland Abbe. Unless otherwise specifically noted, the text is written by the Editor, but the statistical tables are furnished by Mr. A. J. Henry, Chief of the Division of Records and Meteorological Data. A special acknowledgment is made of the hearty cooperation of Prof. R. F. Stupart, Director of the Meteorological Service of the Dominion of Canada.

CLIMATOLOGY OF THE MONTH.

GENERAL CHARACTERISTICS.

During November the mean temperature was in excess throughout the Atlantic States and Lake Region. The precipitation was also in excess in New England and thence westward over the Lake Region and Ohio Valley. The principal storm of the month was that which passed from the Gulf States on the 24th northeastward over the Lake Region on the 25th, and with respect to which a special bulletin was published. Local storms, properly so-called, such as belong especially to the warm season of the year, were not reported during November. The drought that has prevailed during some months throughout the Mississippi basin was ended by the general rain of this month but, on the other hand, precipitation was below the normal in the Rocky Mountain and Pacific Coast regions. The auroral display between the 9th and 12th was reported as one of the brightest on record. The rivers continued near or below the low water mark, but the Ohio rose slightly. The Mississippi in Minnesota and the Missouri in North and South Dakota were generally frozen over before the close of the month.

ATMOSPHERIC PRESSURE.

[In inches and hundredths.]

The distribution of mean atmospheric pressure reduced to sea level, as shown by mercurial barometers, not reduced to standard gravity, and as determined from observations taken daily at 8 a. m. and 8 p. m. (seventy-fifth meridian time), is shown by isobars on Chart II. That portion of the reduction to standard gravity that depends on latitude is shown by the numbers printed on the right-hand border.

The *mean pressures* during the current month were highest in the middle Plateau Region, and nearly as high in the middle portion of the Appalachian region. A region of high pressure extended from Oregon southeast to the Gulf of Mexico and thence northeast to Newfoundland. The highest were: Idaho Falls, 30.25; Lander, 30.24; Winnemucca and Salt Lake City, 30.22: Carson City, Knoxville, Chattanooga, Raleigh, Lynchburg, Washington, and Harrisburg, 30.21; Parkersburg, 30.20. Mean pressures were lowest in Arizona, and also in Manitoba and Saskatchewan. The lowest were: Yuma, 30.00; San Diego and Los Angeles, 30.02; Havre, 30.05; St. Vincent, Duluth, and Marquette, 30.06.

As *compared with the normal* for November the mean pressure was in excess throughout the Lake Region and Atlantic States. The greatest excesses were: St. Johns, 0.19; Sydney, 0.18; Eastport, 0.17; Halifax and Bermuda, 0.16. Pressures were slightly deficient in the Plateau Region and middle Rocky Mountain Slope; the greatest deficits were: Calgary, 0.05; Havre, 0.04; San Diego and Rapid City, 0.03.

As *compared with the preceding month* of October, the pressures, reduced to sea level, show a decided rise over the Rocky Mountain and Pacific Coast regions, and a still larger rise over the Atlantic States and Lake Region. The greatest rises were: Eastport, 0.16; Portland, Me., and Nantucket, 0.15; Northfield, Boston, Block Island, New Haven, Sault Ste. Marie, and Yuma, 0.14. The greatest falls were: Concordia, 0.04; Kansas City, Springfield, Mo., Wichita, Dodge City, Havre, and Tatoosh Island, 0.03.

AREAS OF HIGH AND LOW PRESSURE, NOVEMBER, 1895.

By Prof. H. A. HAZEN.

The accompanying table exhibits some of the salient features of the place of origin and disappearance of highs and lows during November, whereas Charts I and IV show the paths in detail. There were but four highs and ten lows during the month of sufficient definiteness to be numbered. In previous studies of these conditions (WEATHER REVIEW, 1888, p. 246, and 1890, pp. 173, 174), I have shown that the velocities of the high and succeeding low have been fairly comparable, and seemed to show a common cause for the movement. During the current November, however, there is no similarity whatever in the figures. The average duration of highs has been 9.4 days, and of lows only 2.2 days. The velocities were 21, and 34 miles per hour, respectively, for the two conditions.

The table, however, does not show the actual velocity of highs while moving from the Rocky Mountains to the Atlantic Ocean. It is well known that highs very frequently delay for days at a time in the great Plateau regions of the west, and also off the south Atlantic Coast. An examination of Chart IV will show clearly this bunching of the highs, and it will also show that after the motion was fairly well started the lines joining points at 12-hour intervals in the paths do not differ very widely in length for either highs or lows.

Movements of centers of areas of high and low pressure.

Number.	First observed.			Last observed.			Path.		Average velocities.	
	Date.	Lat. N.	Long. W.	Date.	Lat. N.	Long W.	Length.	Duration.	Daily.	Hourly.
High areas.		°	°		°	°	*Miles.*	*Days.*	*Miles.*	*Miles.*
I	1, a.m.	38	92	9, a.m.	29	78	3,220	8.0	402	16.8
II	3, p.m.	51	115	15, a.m.	46	59	4,680	11.5	407	16.9
III	12, p.m.	41	126	23, a.m.	45	60	6,440	10.5	613	25.6
IV	21, a.m.	54	113	28, p.m.	41	71	4,610	7.5	615	25.6
Sums							18,950	37.5	2,037	
Mean of 4 paths									509	21.0
Mean of 37.5 days									505	21.0
Low areas.										
I	1, a.m.	29	80	3, a.m.	44	63	1,500	2.0	750	31.2
II	2, p.m.	41	116	4, p.m.	50	94	1,460	2.0	730	30.4
III	4, a.m.	39	112	5, p.m.	50	96	1,360	1.5	907	37.8
IV	9, a.m.	40	83	10, p.m.	46	58	1,325	1.5	883	36.8
V	13, a.m.	40	101	14, p.m.	50	85	1,245	1.5	830	34.6
VI	16, a.m.	53	105	18, p.m.	50	63	2,000	2.5	800	33.3
VII	18, p.m.	39	94	21, p.m.	48	60	2,055	3.0	685	28.6
VIII	22, a.m.	35	96	23, p.m.	47	72	1,510	1.5	1,007	42.0
IX	24, a.m.	26	96	26, p.m.	49	71	1,525	2.5	610	25.4
X	26, p.m.	50	125	30, a.m.	47	59	3,490	3.5	997	41.5
Sums							17,470	21.5	8,199	
Mean of 10 paths									820	34.2
Mean of 21.5 days									813	33.9

HIGH AREAS.

I. This high is found central over Missouri on the first day of the month. Its motion was toward Lake Ontario, which it reached on the morning of the 2d. It remained nearly stationary off the middle Atlantic Coast for five days, and then moved to the Florida coast, where it disappeared on the morning of the 9th. The highest pressure observed was 30.66 at New York on the morning of the 4th. No temperature falls of any consequence accompanied this high.

II. Was first noted to the north of Montana on the evening of the 3d. Its motion was extremely slow for six days when it reached Nebraska. On the morning of the 10th it reached Missouri, and from there it moved in a northeast direction down the St. Lawrence Valley, and disappeared off Nova Scotia on the 15th. The highest pressure recorded was 30.68 over Nova Scotia on the evening of the 14th. The greatest fall in temperature was 44° at Huron on the morning of the 6th.

III. This was the only high that originated off the California coast during the month. It was first noted on the evening of the 12th. It advanced due east to Nevada in the next twenty-four hours, and remained stationary there for nearly five days. On the evening of the 18th either a portion of the air from this high was transferred to the north of Montana or else a new high started in at that point. In the next two days, either by a system of motions or transferences, this high had changed position to the central Gulf of Mexico. Thence it moved along the Atlantic Coast, reaching Nova Scotia on the morning of the 23d. The motions or transferences of this high were extremely erratic as this description shows. It is an open question whether there was any actual motion of any definite atmospheric condition or not; it is certain that there was no actual motion of any body of air that might have been found on the Pacific Coast on the 13th. On the 18th heavy snows occurred near the center of the high to the north of Montana, amounting to 7 inches at Prince Albert in twelve hours. It has been noted that in this region fully half of the precipitation occurs in the rear of storms and in the forefront of advancing highs, conditions under which we have, in the eastern part of the country, our clearest and driest weather. This anomalous condition is, I think, not due to easterly winds in the rear of the low blowing from Hudson Bay and carrying moisture from that great body of water to this arid region. The body of water is not sufficient to produce such marked efforts at distances of 1,200 or 1,500 miles. It is probable that moisture from the Pacific Ocean influences the air in these high layers, and there is a condensation of moisture through a great cooling. There would be a strong tendency to an increase of moisture through the westerly upper air currents blowing from the Pacific toward the storm. It should be noted that in no case are these rains excessive in highs, or to the rear of lows, but they are mostly sporadic in their character. As the storms approach the Mississippi Valley the precipitation gradually dries out from the rear of the storms and shifts to the front, being fed by the moister air from the Lakes and Gulf. Nor further precipitation is noted in this high in its march or change of position to the sea. The highest pressures noted were 30.70 to the north of Montana on the evening of the 18th, just at the time of the snows mentioned above, and 30.74 at Sydney on the morning of the 23d.

The greatest fall in temperature occurred in Missouri on the evening of the 19th and was 32° in twenty-four hours. It should be noted that the cold wave in the upper air which had advanced between this high and the preceding low No. VII continued to advance notwithstanding the apparent stoppage of the high or its detour by the Gulf of Mexico. A fall of 40° in twenty-four hours was reported from Vermont on the morning of the 21st.

IV.—This high appeared to the north of Montana on the morning of the 21st; sporadic snow amounting to 1 inch occurred at Bismarck in twelve hours by the evening of the 21st. At first its change of position was toward the south-southeast for two days then it remained nearly stationary two and one-half days in Wyoming, then moved to Texas; recurving, it moved northeast, reaching Long Island Sound on the evening of the 28th. The highest pressure reported was 30.70 at Washington, D. C., on the morning of the 28th. The greatest fall in temperature occurred on the evening of the 22d and was 46° in northern Texas.

LOW AREAS.

I.—This low was noted on the 1st off the Atlantic coast of Florida. It disappeared off Nova Scotia on the 3d not having moved into the interior. The heaviest rain was at Nantucket, 0.86 in twelve hours.

II.—This was first noted in Nevada on the evening of the 2d. Its motion was east and northeast disappearing or fading out in Manitoba the evening of the 4th. Almost without rain, except a little on the last day at Duluth. Lowest pressure, 29.60, at Huron, S. Dak., on the evening of the 3d.

III.—On the 3d, p. m., the former low had caused a trough or depression extending to the southwest, and the next morning III started in Utah, with a pressure of 29.62 at Salt Lake City. This storm also moved in exactly the same path as its predecessor and disappeared in Manitoba the evening of the 5th. Light rain or snow occurred at its center. Lowest pressure, 29.36, at Winnipeg the evening of the 5th.

IV.—This storm developed in Ohio in a trough extending from the western Gulf to the lower Lakes on the morning of the 9th. It should be noted that this was the same trough in which III had developed six days before. The eastward advance of this trough had been greatly hindered by the very

slow advance of high No. I on the Atlantic Coast. After this storm was fairly well organized it advanced with great rapidity and disappeared off Nova Scotia on the morning of the 10th. The aforementioned trough continued to advance broadside forward giving heavy rains over a vast region and did not leave its final trace on the coast till the morning of the 13th, when it deposited 1.74 inch of rain at Hatteras in twenty-four hours. A wind of 56 miles per hour was reported at Hatteras on the evening of the 12th.

V.—This storm originated in Kansas on the morning of the 13th, though twelve hours before there had been rain in northern Texas and Kansas. It moved very rapidly in a northeast direction and disappeared to the north of Lake Superior the evening of the 14th; lowest pressure, 29.72, at Port Arthur the morning of the 14th.

VI.—This storm originated to the north of Montana on the morning of the 16th with a pressure of 29.56 at Battleford. Its motion was very rapid toward the east tending south and it disappeared in the Gulf of St. Lawrence the evening of the 18th; lowest pressure, 29.34, at Port Arthur the morning of the 17th. It was characterized by very slight rainfall during its progress and by rather moderate winds for the barometric gradients noted.

VII.—While No. VI was passing eastward a long trough was noted stretching toward the southwest to Texas. This trough was without precipitation, however, except at the extreme northeast end. On the evening of the 18th No. VII was first noted as a sort of condensation in this trough over Missouri. This storm also moved northeast with great rapidity and disappeared over Newfoundland the evening of the 21st. As it approached the coast its conditions became very much intensified, a pressure of 28.74 being noted at Chatham the morning of the 21st. Here, as in a previous case, the wind velocity, 47 miles at Block Island, was entirely incommensurate with the barometric gradients noted.

VIII.—This storm was a concentration of the conditions forming a trough stretching from Arkansas to the Pacific Coast. It first took shape in Arkansas on the morning of the 22d. Its motion was very rapid in a northeasterly direction to the St. Lawrence Valley, where it disappeared the afternoon of the 23d; rains accompanying were generally light; the heaviest was 1.48 of an inch in twenty-four hours at Cairo on the 23d; lowest pressure, 29.86, at Fort Smith on the morning of the 22d.

IX.—The trough from VIII stretched to the west Gulf, and there this (the only Gulf storm of the month) was energized or concentrated on the morning of the 24th, with a pressure of 30.02 at Galveston. This was by far the severest storm of the month, and was regarded as of sufficient importance to call for a Special Bulletin (No. 2 of 1895).

The following quotations are made from this Bulletin:

The morning map of the 25th showed an extended trough of low pressure covering the lower Mississippi and Ohio valleys, with the center near Vicksburg, 29.68 inches. Storm signals were ordered for the lower Lakes and information signals on the upper Lakes, giving notice of this storm twenty-four and thirty-two hours in advance of dangerous gales.

The storm moved to the east of north at 33 miles per hour between the morning and evening reports of the 25th, causing heavy rains in the lower Ohio and Mississippi valleys, and heavy snows in the states north of the Ohio River. It was central at Louisville on the evening of the 25th. Considerable damage from high winds occurred in the Ohio Valley and Tennessee, but the storm did not reach its maximum intensity till the night of the 25th, when it passed from the Ohio Valley to the north of Lake Huron, moving at 75 miles per hour between 8 p. m. of the 25th and 8 a. m. of the 26th. This was one of the severest storms in the lower Lake region. Mean velocities were, at Detroit, 76, Cleveland, 72, and Erie, 60 miles per hour, and at Buffalo that night 68 miles per hour. The storm was followed by a cold wave throughout the lower Mississippi Valley on the morning of the 26th, which extended eastward to the Atlantic Coast on the morning of the 27th, causing freezing temperatures as far south as the central portions of the Gulf States, and frosts along the east Gulf Coast and in northern Florida.

Warnings for high winds and cold waves were fully sent out in the case of this storm.

X.—This storm seems to have originated very near the north Pacific Coast on the evening of the 26th. Its motion was generally eastward with a slight bend to the southward as it crossed the Mississippi Valley, reaching the Gulf of St. Lawrence on the morning of the 30th. The storm had but slight intensity and the precipitation was slight. Lowest pressure, 29.50, at Spences Bridge on the morning of the 27th. A disturbed region existed in the extreme northwest on the last days of the month, but the path of the storm was not definite enough to be charted.

LOCAL STORMS.

By A. J. HENRY, Chief of Division of Records and Meteorological Data.

The term "local" storm has been used in this chapter as applying to the phenomena of thunderstorms and wind gusts of more than usual severity. These may occur, in isolated cases, in groups, or they may be general over one or more States, but as a rule they die out with nightfall. The typical local storm is particularly a phenomenon of the warmer months of the year, and is rarely observed in its full development in winter. The caption "local" storm, is therefore not so appropriate as might be desired for the matter appearing herein during the colder months of the year.

The early part of the month was singularly free from storms of any description; on the 14th and 15th, however, considerable havoc was wrought on the Long Island and New Jersey coasts by high northeasterly gales and the heavy breakers accompanying a slight depression that passed along the coast on those dates. The damage to bulkheads, jetties and piers, was estimated to be very great.

The weather conditions on Sunday the 24th were unsettled. Rain was falling from the Mississippi Valley to the Gulf of St. Lawrence, and snow in western Nebraska, Kansas, and northern Texas. Rain was also falling on the Gulf Coast, but a definite storm center was not yet visible on the daily weather maps. The latter appeared, however, twenty-four hours later, and moved to the Great Lakes as a severe storm of wind, rain, snow, and sleet, whose boundaries extended from the eastern slope of the Rocky Mountains to the Atlantic Seaboard. Telegraphic and telephonic communication and railway traffic were interrupted in all sections covered by the storm. The wind in places reached a very high velocity and caused immense damage. In the oil fields of western Ohio alone the loss was estimated to have been $300,000. The storm was most severe in the central valleys and passed over the Lakes and beyond our boundaries on the 26th.

TEMPERATURE OF THE AIR.

[In degrees Fahrenheit.]

The mean temperature is given for each station in Table II, for voluntary observers. Both the mean temperatures and the departures from the normal are given in Table I for the regular stations of the Weather Bureau.

The *monthly mean temperature* published in Table I, for the regular stations of the Weather Bureau, is the simple mean of all the daily maxima and minima; for voluntary stations a variety of methods of computation is necessarily allowed, as shown by the notes appended to Table II.

The *regular diurnal period* in temperature is shown by the hourly means given in Table IV for 29 stations selected out of 82 that maintain continuous thermograph records.

The *distribution* of the monthly mean temperature of the air over the United States and Canada is shown by the dotted isotherms on Chart II; the lines are drawn over the high irregular surface of the Rocky Mountain Plateau, although the temperatures have not been reduced to sea level, and the isotherms, therefore, relate to the average surface of the