

STUDIES BY FORECAST OFFICIALS.

HIGH AREAS NORTH OF THE ST. LAWRENCE VALLEY
IN OCTOBER, NOVEMBER, AND DECEMBER.

By Prof. E. B. GARRIOTT (dated November, 1893).

The areas of high barometric pressure that appear north of the St. Lawrence River in October, November, and December usually advance to that region from Minnesota or the Dakotas in twenty-four hours. A large proportion of the high areas of this class pass from western Quebec to the Canadian Maritime Provinces in twenty-four hours; a less frequent path, and one that is followed in exceptional cases only in November and December, is from western Quebec southeastward off the middle Atlantic coast. The Saint Lawrence high areas generally show pressure 30.20 to 30.30; as the fall advances, however, higher pressures appear, and values above 30.50 obtain about once a month in November and December.

With the appearance north of the St. Lawrence of a high area in October an area of low pressure usually occupies the Canadian Maritime Provinces, and another the extreme northwest. If a low area is not shown in the Northwest one will appear within twelve hours. Twenty-four hours before the high area reaches the region north of the St. Lawrence River, and when it occupies a position in the Northwest, a temperature fall of 10° or more occurs in the upper Lake Region and the Ohio Valley, and rain falls from the eastern Lake Region over the Atlantic Coast States north of Virginia. Twelve hours before the high area reaches western Quebec, and when it is central over the upper Lake Region, a temperature fall of 10° or more occurs from the lower Lakes over the interiors of New York, Pennsylvania, and New England, and the western limit of the rain area reaches the Middle Atlantic and New England States. Twenty-four hours after the high area appears north of the St. Lawrence the rain area has passed to sea and the temperature has begun to rise over the interior of the Middle Atlantic and New England States. Within thirty-six hours after the appearance of the high area north of the St. Lawrence fine weather with rising temperature obtains over the Middle Atlantic and New England States, and a fall in temperature is noted only over the Canadian Maritime Provinces. When October high areas pass southeastward from the St. Lawrence Valley a marked fall in temperature occurs over the South Atlantic States. When the high area passes eastward over northern New England and the St. Lawrence Valley easterly winds will be attended by cloudy weather and sometimes by rain along the immediate middle Atlantic and south New England coasts.

In November the relative positions and movements of the high areas and their attending low areas are practically the same as noted for the preceding month, and no material difference is shown in the temperature and rain conditions which attend them. In December, however, the greater magnitude of the high areas occasions marked differences in conditions and effects when compared with those noted for the fall months. Twenty-four hours before a December high area appears north of the St. Lawrence, and when it occupies Minnesota or the Dakotas, a low area appears on the north Pacific Coast, rain or snow falls over the lower Lakes, and in 60 per cent of the instances noted a marked fall in temperature occurs over the Middle Atlantic and New England States. Twenty-four hours after the high area appears north of the St. Lawrence (and when it has advanced to Nova Scotia, and the north Pacific Coast low area has advanced to the northwestern Lake Region) rain or snow falls along the middle Atlantic and New England coasts and the temperature continues low over the Atlantic Coast States from Vir-

ginia to Maine. Within thirty-six hours after a high area appears north of the St. Lawrence in December fine weather with rising temperature prevails over the middle Atlantic and New England States.

In conclusion, it may be stated that the high areas of the type above referred to average about two per month, or about one-fourth of the high areas traced for the months of October, November, and December. Their appearance north of the St. Lawrence is preceded by rain or snow and falling temperature over the Middle Atlantic and New England States, and is followed within thirty-six hours by fair weather and rising temperature over those districts.

WEATHER FORECASTS IN THE STATE OF MISSOURI.

By H. C. FRANKENFIELD, Local Forecast Official (dated December 4, 1895).

[Extract from complete paper now in press.]

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In compiling the data upon which to base any deductions regarding the successful forecasting of Missouri weather, only the observations and maps for a limited number of years have been used, namely, from July, 1889, to June, 1894, inclusive. It would, of course, have been preferable to have used more, but lack of time prevented, and, in any event, it was thought that the different storm types are so distinct, both as to locality and season, that fairly accurate results could be obtained with but five years' data.

PRECIPITATION.

In all 549 more or less well-defined lows were studied, and of these all but three, or one-half of 1 per cent, originated somewhere to the westward of the State of Missouri. Of these three, two backed in from the south Atlantic Coast sufficiently to cause precipitation, local in one case and general in the other, and comparatively light in both. The other originated within the State. It was only of moderate energy, not very well defined, and caused general thunderstorms with a substantial amount of rain.

By far the greater portion of the lows which moved over the country first appeared in the British Northwest Territory in the Province of Alberta. Twenty-six per cent were of this type, but only 32 per cent of these caused precipitation in the State of Missouri. A considerable number, 9 per cent, moved eastward from the north Pacific Coast, and of these 49 per cent caused precipitation in Missouri. An almost equal number originated in the middle Plateau, but 80 per cent of these caused precipitation. Seven per cent originated in the southern Slope, and 87 per cent of these caused precipitation. Seven per cent also originated in the extreme northwest, east of the Rocky Mountains, but only 49 per cent of these caused precipitation in our State. Six per cent originated in the southern Plateau and 91 per cent of these caused precipitation. Only 2 per cent originated in Mexico or the west Gulf States, but 92 per cent of these caused precipitation. Rain or snow also followed fifty-six cases of irregular and unsettled conditions, indicated on the weather maps by the curving away from each other of the isobars and isotherms, leaving an open space between. These usually caused rain within a reasonable time, and 10 per cent of them developed into well-defined lows, one in April, 1893, becoming a storm of exceptional severity by the time it reached the middle Slope. These irregular arrangements of the isobars and isotherms, when they occur in the Southwest and West, indicate the presence of conditions which will almost invariably cause precipitation in Missouri in from twenty-four to thirty-six hours; the interval depends upon the distance of the irregular conditions from the State when first noticed.

No precipitation at all occurred from the lows originating in Manitoba and the Missouri Valley.

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It appears that at times precipitation will be caused in Missouri, usually within twenty-four hours, by high areas, mostly of decided character, in the Slope or Plateau regions. The pressure is generally above the normal over the remainder of the country, although there are sometimes lows of slight intensity moving across the Gulf of Mexico, or else over the extreme north, particularly in the winter. In nearly all the cases the amounts of precipitation were light, and, except in summer, were evidently caused by condensation by the low temperatures accompanying the highs. In the summer the conditions were generally unsettled and somewhat confused, causing local showers, principally thunderstorms.

It is worthy of note that the highs rarely moved across the Mississippi River, except with greatly decreased energy. Many were dissipated west of the river, normal equilibrium evidently having been restored by the precipitation.

The following conditions usually precede precipitation from high areas:

(a) High of decided character in the northern or middle Slope or middle Plateau, and elsewhere pressure normal or above.

(b) Cold wave covering the central valleys and West except in summer.

(c) Isothermal gradients usually quite steep, about 10° per 100 miles (except in summer), either in southeast Nebraska and southwest Iowa, or in Missouri, or in western Kentucky and western Tennessee, and less than one-half as steep to the northwestward, with the isotherms extending in a northeasterly direction.

(d) Frequently in winter a low of slight intensity over the Gulf of Mexico, and sometimes over the extreme north, although these latter lows do not appear to have any effect on the result.

(e) Northeasterly winds, shifting later to easterly and southeasterly. One peculiar form of high pressure area, with conditions somewhat different from the above, caused precipitation in Missouri in about 83 per cent of the cases investigated. The pressure was generally high over the whole country east of the Rocky Mountains, but the belt of highest pressure extended in oval form over the States immediately north of Missouri, sometimes reaching farther west to Nebraska and as far east as West Virginia, but with the highest belt extending from eastern Nebraska to western Illinois. The weather was cloudy, with northerly winds, and the temperatures ranged from 30° to 40° within the State of Missouri,

although much lower in one case. The isotherms extended across the State in a horizontal direction parallel to the long axes of the oval isobars above mentioned. Precipitation from high areas always followed in twenty-four hours and was usually light in amount.

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TEMPERATURE.

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The following general conclusions were deduced from a study of the origin and progress of cold waves:

I.—The severity of the cold wave depends largely upon the lowest reading of the barometer, the proximity of the center of the low to the State, its position with reference to the State, and the intensity of the succeeding high.

II.—Owing to the latitude of Missouri and the rapid easterly movement of the lows from November to April inclusive, nearly all the cold waves are of comparatively short duration.

III.—“The most marked cold waves occur with a low in Missouri and a high in Montana or North Dakota.” (Hammon.)

IV.—When a low passes to the southeast west of Missouri there will be no marked fall in temperature, as the winds will blow from some northerly direction in advance of the low, and there will not be much rise in temperature. In cases of this sort it is perhaps better to forecast colder in twenty-four hours, followed by warmer within twelve hours after that, as the high following the low will cause warmer southerly winds without regard to the intensity of the former, and the extent of the cold wave in the West and Northwest.

V.—“A low in Missouri and a high in Minnesota affect eastern Missouri, but not materially western Missouri.” (Hammon.)

VI.—A Mexican low passing through Missouri produces a severe cold wave lasting at least from thirty-six to forty-eight hours.

VII.—A low in Colorado moving rapidly eastward, e. g., to the upper Lakes in twenty-four hours, causes a decided cold wave of short duration in about thirty-six hours. A considerable rise in temperature may be expected within thirty-six hours after, unless the high is reinforced by another coming down from the extreme north, in which case the low temperature will persist for a day or two longer.

VIII.—When a low moves across the extreme north the fall in temperature in Missouri will not be very great, but if the temperature is already comparatively high, the fall is likely to be sufficient to justify a cold wave warning. These cold waves are in all cases of very short duration.

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NOTES BY THE EDITOR.

THE VALUE OF WEATHER BUREAU FORECASTS.

With respect to the value of the Weather Bureau forecasts Dr. Isaac M. Cline writes in the Monthly Bulletin of the Texas Weather Service for August, as follows:

A West Indian hurricane touched the Texas coast country on August 29, when gales were reported from Port Lavaca westward to Brownsville, extending into the interior as far north as Rio Grande City, where much damage was done by the wind. Boats in port were damaged to some extent at Brownsville and Corpus Christi, and several houses were blown down at Rio Grande City and Brownsville. Forecasts showing the location of this storm were received from the chief office at Washington for three or four days before the storm reached the coast. These forecasts were given wide distribution and everybody kept well informed in regard to the progress of the storm. It is reported from Brownsville that had not these warnings been given much damage would have been done, which was avoided by the timely preparations. This was the case generally all along the coast, as the warnings caused many vessels to remain in port until all danger was over.

High tides were reported from all along the coast and the sea swells at Galveston, Tex., at 8 a. m. on the 29th were the highest which have occurred since July 5, 1891. There was no material damage done at this place, except there was slight erosion on the beach and some jetty piling washed off. The exact damage done by this storm along the west gulf is not definitely known.

THE GREAT DROUGHT OF 1845 IN NORTHERN OHIO.

This drought is described by Mr. Seabury Ford in a letter to S. P. Hildreth, as published in the American Journal of Science, March, 1846, (2), Vol. I, p. 207, as follows:

The district of country which suffered the most was about 100 miles in length, and 50 or 60 in width, extending nearly east and west parallel with Lake Erie, and in some places directly bordering on the shore of this great inland sea. There was no rain from the last of March or the first of April until the 10th of June, when there fell a little rain for one day, but no more until the 2d of July, when there probably fell half an inch, as it made the roads a little muddy. From