In addition to the daily determination of the weather situation and the making of weather charts, certain other meteorological investigations were carried on; viz, regular observations of temperature and humidity with the aspiration psychrometer. These had the remarkable result of indicating an excessive dryness of the air in the presence of a high-pressure area. The following observations were made on August 21:

Time	Latitude, North.	Longitude, West.	Air temperature.	Absolute humidity.	Relative humidity.	Water temperature.
	° ′	° ′	°C.	Mm.	%	°C.
8 a. m.	40 26	67 21	18.3	9.1	52	18.4
12 noon	40 38	65 34	21.0	7.6	30	25.3

From the above it may be seen that on that day the air was exceedingly dry, both with a low and a high water-temperature. The mighty reservoir of the Atlantic Ocean was almost without effect on the condition of the air; and the explanation of this fact is to be found in the strong descending currents of the high-pressure area, an explanation confirmed by the extraordinary clearness of the air on that day. These observations were an indication that the *Kaiserin* was not running into the low to the eastward. (See Chart IX, fig. 3.)

On August 27, just before we entered the English Channel, the weather map was finished by about 1 p. m. On this day a severe cyclonic storm lay over the North Sea. About three hours were required for the transmission of the telegrams from the observatory at Aachen, by way of the Marconi station at Crookhaven.

Thus for the first time during the entire voyage of a steamer, have the surrounding weather conditions been followed and weather maps made on the basis of direct observations transmitted by wireless telegraphy from both ships and shore stations. Also, both on the outward and home journey, so long as the *Kaiserin* was in communication with the English coast observations were forwarded from the ship to the observatory at Aachen. The shortest time of transmission for the latter message was 2 hours and 45 minutes.

At a meeting of the administrative board of the Public Weather Service, held at Hamburg October 1, the use of wireless telegraphy in meteorological work was the subject of a lively discussion, and the author laid before the meeting, at which were present representatives of the Imperial Ministry of the Interior, the Post Office, and the Ministry of Marine, both the telegrams received during the voyage and the original weather maps made on shipboard, together with the "Internationale Dekadenberichte" [of the Deutsche Seewarte] for August. A special committee was appointed, charged with making preparations for a further investigation of this subject. The committee is composed of a representative of the Deutsche Seewarte, the Director of the Royal Prussian Meteorological Institute (Doctor Hellmann), Director Polis of Aachen, and representatives of the Hamburg-American Line and the North German Lloyd Company.

To what extent wireless weather reports from the ocean would be of service to practical meteorology in Europe only the future can determine, but that they would be of great value can hardly be doubted. This year's investigations at sea have at least proven that the transmission of such reports is safe and sure, and also that it is feasible to make [daily synoptic] weather charts on the ocean itself.

In connection with the above paper it is only proper to state that some of the European meteorologists are not so sanguine as Doctor Polis regarding the benefits to be derived from wireless reports, whether for use on shipboard or for the land forecasts of western Europe. An especially pessimistic view of the matter is exprest by Dr. E. Herrmann, of the Deutsche Seewarte, in the nautical magazine Hansa, of September 26, 1908.

The experience of the British Meteorological Office in dealing with wireless reports from naval vessels is, on the whole, encouraging, but emphasizes the necessity of a careful control of the barometer readings thus received. The investigations of Mr. Ernest Gold appear to show that barometer readings on board ship are generally too low in strong winds.[2]

Beginning with February, 1909, a series of tests of the efficiency and utility of wireless weather telegraphy, extending over a period of three months, will be carried on jointly by the Meteorological Office and the Deutsche Seewarte. It is understood that arrangements have been made whereby all the principal transatlantic steamship lines will forward wireless weather reports to the above-named offices. The results of these experiments are to be presented to the International Commission on Weather Telegraphy, which meets in London June 21, 1909.—*C. F. T.*

REMARKABLE SNOW-STORM AT GRAND HAVEN, MICH.

By C. H. ESHLEMAN, Observer. Dated Grand Haven, Mich., November 20, 1908.

A very remarkable snow-storm occurred at Grand Haven, Mich., on November 14, 1908. Between about 1 a. m. and 6 p. m., 12.5 inches of snow fell. This is by far the heaviest 24-hour fall in November on record here, and was exceeded only once in any other month, viz, on January 22–23, 1898, when 13.6 inches fell. The snowfall records at this station began with the season of 1889–90 and extend to the present time, except for the period July 1, 1903, to August 1, 1905, when the regular Weather Bureau station had been discontinued. The rate of fall in the recent snowfall was very large, the average rate from about 3 a. m. to 1 p. m. being about 1 inch per hour.

But remarkable as the snow was in its amount, it was no less remarkable for its limited and well-defined extent. It covered a strip of country that extended inland only about 15 or 20 miles, and along the lake for a distance of about 70 or 80 miles. The greatest falls occurred 6 or 7 miles from the lake, beginning a little south of Grand Haven, and extending northward 20 or 30 miles. Along this line depths of 16 to 18 inches were reported. Beyond the limits first mentioned the amount decreased rapidly, so that 15 or 20 miles farther on the depth was rarely more than 1 or 2 inches, and in the majority of cases even less. Fishermen who were out on the lake 15 or 20 miles from shore report that very little snow occurred there.

Grand Haven appears to be located about midway between the northern and southern extremities of the area. At Ludington and St. Joseph, to the northward and southward, respectively, but beyond the limits the amounts were very small. None of the other Weather Bureau stations in the Lake region reported more than 1 or 2 inches, some of them only a trace.

It may be said that the particular section covered by the snow has a nearly southwestward exposure to the lake, and beyond the limits defined the trend of the shore changes somewhat. The general direction of the winds over Lake Michigan during the storm was southerly to westerly. At Grand Haven, however, the direction was somewhat variable, being southeasterly most of the time, occasionally shifting to southwesterly. About noon it shifted to westerly, and after that the rate of fall diminished gradually.

It is possible that the intermixture caused by the varying wind direction, of masses of air having different moistures and temperatures was a potent factor. There were no marked local changes in temperature or pressure. The phenomenon appears interesting as an extreme instance of the effect of a peculiar lake exposure on the weather of particular localities.

[2] "Comparison of ships' barometer readings with those deduced from land observations; with notes on the effect of oscillatory motion on barometer readings." (Q. J. R. Meteor. Soc., April, 1908, p. 97–108.)

It may be mentioned also that on November 13, the morning before the deep snow, something similar, altho on a much smaller scale, occurred. Grand Haven had 2.4 inches of snow and Grand Rapids only a trace. On both mornings the snow began soon after midnight, and the general distributions of pressure were somewhat similar. In both cases the local wind direction was somewhat variable, but on the 13th the heavy snow occurred, with a light northerly wind.

TORNADOES IN WISCONSIN, NOVEMBER 25, 1908.

[Extract from the Monthly Climatological Report, Wisconsin Section, November, 1908.]

During the evening of November 25 a well-defined tornado occurred at Stevens Point, Wis. The most remarkable feature of the storm is the season during which it occurred. Altho Wisconsin is visited by tornadoes on an average of about three each year, this is the first one recorded during the colder half of the year. On September 29, 1881, there were tornadoes at Wautoma, Waushara County, and at Montana, Buffalo County, the one at the latter place causing great destruction to property and injuring twelve people. Practically all other tornadoes reported in the State since the establishment of the Weather Bureau have occurred during the months of May to August.

From the 17th of November, this year, until the 26th the temperature was considerably above the normal in Wisconsin. On the morning of the 23d an atmospheric depression was over the Panhandle of Texas. This storm moved rapidly northward across western Lake Superior, and was closely followed in nearly the same track by another and more energetic plateau storm which was central over western Wisconsin at 7 p. m. November 25.

The tornado on this evening began shortly after 7 o'clock in the town of Grant, Portage County, about 7 miles east of Grand Rapids, and moved northeastward to Stevens Point and slightly beyond, a distance of about 12 miles. The path of the tornado varied between 20 and 300 feet. Owing to the darkness, only those in the country saw the funnel-shaped cloud which is usually observed. One man at Stevens Point lay within 50 feet of the path of the storm as it past, but he could not distinguish any particular shape. Another man saw it from a distance of about 200 yards as it crost the street. To him it appeared to be a light colored mass of clouds.

About 3 miles from where the tornado was first observed in the town of Grant, Portage County, Charles Laufer, sr., was killed by falling timbers when his house was destroyed and Mrs. Laufer and her daughter were severely injured. The house and all the furniture were broken into small pieces and distributed a quarter of a mile along the path of the storm. Several other buildings were completely destroyed in the open country, and in the village of Meehan.

At Stevens Point many buildings were wrecked and other damage done, but as the storm did not pass thru the residence district no lives were lost. The damage to buildings and other property in Stevens Point is estimated at $100,000.

Mr. G. L. Culver, cooperative observer at Stevens Point, who furnished a detailed report of this tornado, says: "The wind had been blowing all morning from the northeast and east, but swung around later in the day to the south and at 7 o'clock in the evening it was blowing steadily from the southwest, but not very strong. The tornado occurred at 7:30 p. m., and at 8 p. m. the sky was clear and there was scarcely any wind. The next morning, however, the wind was blowing strong from the west and southwest, with clouds all day. * * * At some points the width of the path was no more than 20 to 25 feet, as in one place it took a section of the lattice fence 20 feet long; at other places the effects of the whirl was seen for about 75 yards in width."

During the same evening, but about thirty minutes earlier, another severe storm past about 2 miles west of Rudolph, in Wood County, and extended north-northeast to Junction City, Portage County. Elisha Hook, a farmer living near Junction City, was severely injured and died two days later, and six others were injured.—*W. C. Devereaux.*

SEVERE WIND-STORMS IN OHIO, AUGUST 12 AND 17 1908.

By J. WARREN SMITH, Section Director. Dated Columbus, Ohio, September 26, 1908.

On August 12, considerable damage was done in LeMoyne, Wood County, by high wind. A well-defined funnel-shaped cloud was observed. It moved in a northeasterly direction, and the path of greatest damage was about 100 feet in width and about 1 mile in length. One barn was blown down and a buggy was overturned. Fruit trees and fences suffered, but the total damage was not great. The storm occurred about 5 p. m.

During a thunder-squall at 2:40 p. m. on August 17, two spans (or sections) of a bridge across the Muskingum River, between Philo and Duncans Falls, Ohio, were blown from the piers into the river. Moderate damage was done to fruit and shade trees by the wind, the hail injured growing crops and lightning struck a number of houses. The squall was accompanied by 0.79 inch of rain.

The path of greatest destruction was about 400 feet wide and the estimated damage $4,000. Mr. Louis Hardtla, cooperative observer at Philo, has sent a very complete drawing of the locality and a photograph of the bridge, taken thirty minutes after the damage was done. He states that the damage was not done by a tornado, but by a straight-line squall. The path of the squall could be traced from about 3 miles west of Philo to three-fourths of a mile east; hail extended farther in both directions.

The river flows almost directly east for several miles above Philo, and then turns to the south opposite the village. It narrows down considerably at this point and runs between bluffs about 200 feet in height. A house was blown down a short distance above the bridge. The observer was injured by lightning.

SEVERE WIND-STORMS IN NEW MEXICO AND OKLAHOMA.

W. W. Chilton, of Clayton, Union County, N. Mex., reports that severe winds visited this region during the night of November 5, 1908, doing damage to the amount of $40,000 to $50,000 and causing the death of three persons. From his report it appears that a hard, straight wind began to blow at Clayton at 8:15 p. m. of the 5th of November, and rapidly increased in force until at 8:30 p. m. an extra hard puff occurred, which resulted in much damage to the large 2-story brick court-house and to other houses and stock. The report states that the whole upper story of the court-house was blown off and the walls cracked.

Simultaneously with the destructive puff in Clayton, occurred a similar puff 2 or 3 miles west of Clayton. Here one man was killed, perhaps by falling timbers, and several houses were destroyed.

After this hour the wind is reported to have died down to "a fairly hard ordinary blow," which continued until about 2 a. m. of November 6, when it again blew quite hard; then came an extra hard "streak" which, passing 2 or 3 miles east of Clayton, destroyed several buildings and killed two persons. About this same time, 2 a. m., a similar hard blow destroyed a number of buildings at a point a little west of Kenton, Okla., which is almost due north-northeast of Clayton, N. Mex.

Mineral, Okla., was also visited by a severe wind which resulted in the death of a man. All five of these blows are reported to have been south winds.

Mr. Chilton, in his report, expresses the conviction that these winds must have been tornadic whirls, the first one, at Clayton, having a path from 20 to 100 yards wide; but he is careful to state that the characteristic funnel-shaped cloud was not observed, perhaps, as he says, on account of the darkness of the night. Mr. Chilton has been in both "hard straight blows" and well-defined tornadoes, so that his words "judging from the way things were piled around, this must have been a regular funnel-shaped cloud" are entitled to some weight; but he also describes the whole as having been "a hard, straight blow, 6 to 10 miles wide and 50 miles long, lasting five or six hours, and at its worst (8:30 p. m. and 2 a. m.), with at least three funnel-shaped clouds," which he did not see and are not reported by others.

The winds experienced at Clayton, Kenton, etc., occurred in a very shallow trough of low pressure pitching northward and northeastward and gradually increasing in depth from the 5th of November to the morning of the 6th.—*C. A. jr.*