

NORTH ATLANTIC METEOROLOGY.

[Pressure in inches and millimeters; wind-force by Beaufort scale.]

NORMAL CONDITIONS.

The normal barometric pressure for October over the North Atlantic Ocean, as deduced from international simultaneous meteorological observations taken at Greenwich noon and not reduced to standard gravity, is lowest, 29.70 (754), in a small oval including southern Iceland and southern Greenland. A similar oval of 29.70 (754) covers the North Pacific from the southern portion of Alaska to Kamchatka between N. 45° and N. 60°. The areas of highest pressure, 30.10 to 30.16, cover the eastern portion of the United States and the eastern portion of the North Atlantic Ocean, and also that portion of the Pacific immediately west of California. The isobar of 29.90 incloses a depression that extends from the coast of Labrador to southern Sweden and northeastward over the Polar Sea to the North Pacific Ocean.

As compared with September, the mean pressures in October are higher over the entire United States, and also over the Arctic regions and the whole of Asia. The maximum rise is 0.20 in central Asia, 0.10 in the Arctic region, and 0.10 in the central Rocky Mountain plateau.

The general path of storm centers in October is appreciably the same as for September. The general velocity of movement of storm centers moving eastward over the United States is 26 miles per hour, and over the Atlantic Ocean 19 miles; the velocity of the West Indian hurricanes moving westward, 16 miles, and during the time of recurving, when the motion is mostly northward, 9 miles.

NORTH ATLANTIC STORMS.

The following paragraphs give some account of the areas of low pressure and strong winds on the North Atlantic Ocean during October, 1894. Daily charts are compiled at the Weather Bureau showing the atmospheric conditions over the United States, Europe, and the Atlantic Ocean, as nearly as practicable at Greenwich noon, and afford a basis for approximating the locations and paths of the more important areas of high and low pressure.

The individual low pressures are enumerated as follows:

A. This was central on the 1st, a. m., off the coast of New England, N. 38°, W. 67°, and was a continuation of area *G* of the month of September. The first few days of October, like the last few of September, presented numerous barometric depressions in the North Atlantic Ocean. On the 1st the hurricane area *A* was breaking up and by the 3d had merged with *C* and *D*, forming a large area central at N. 48°, W. 43°. The hurricane *A* was encountered by the steamship *Arabian Prince* on the 1st in N. 35° 40', W. 73° 20'. The combined low pressures *A*, *C*, and *D* moved slowly eastward and disappeared on the 6th at N. 57°, W. 23°.

B. This was the hurricane referred to as No. IV of the U. S. series. It appears to have begun on the 1st off the coast of Panama and Colombia, and passed northeastward between Cuba and Yucatan on the 6th, northward through the eastern portion of the Gulf of Mexico on the 7th and 8th, and northeast on the south Atlantic and mid-Atlantic coasts on the 9th and 10th. On the latter date it joined with low No. VII of the U. S. series, and on the 12th these were central over Newfoundland. On the 13th these united with low area *F* of the North Atlantic series, and the resulting depression broke up by the 16th. When passing through the Gulf, this hurricane was encountered by the *Cayo Romano* and the *Johann Ludwig* on the 8th in about N. 27° 50', W. 87° 45'; by the *Stephen Bishop* and *Aeme* on the 9th. When passing over the Atlantic, this hurricane was encountered by the *Allah* and the *Ben. Nevis* on the 13th, by the *Tauric* and *Elmville* on the 14th, and by the *Anvers* on the 15th.

The low pressure that prevailed at the center of this hurricane and the intense violence of the winds over a very small region near the center are well shown by the following extracts from the log book of the *Johann Ludwig*, Captain Jespersen, which arrived at Pensacola in a disabled condition on the morning of the 14th:

October 6, 8 a. m., N. 28° 45', W. 86° 25', wind NE. 10, barometer 29.96; 8 p. m., N. 28° 38', W. 86° 35', wind E. to NE. 11, barometer 29.94. 7th, 8 a. m., N. 28° 22', W. 86° 58', wind E. to NE. 11, barometer 29.86; 8 p. m., N. 28° 15', W. 87° 25', wind E. 12, barometer 29.54. 8th, a. m., N. 28° 10', W. 88° 13', wind E. 12, barometer 28.88; 8 p. m., N. 28° 03', W. 87° 55', wind NW. 10, barometer 29.50.

From 8.30 a. m. to 10 a. m. of the 8th, nearly calm. Intensely disturbed sea. At 10 a. m. of the 8th, wind shifted to north and barometer began to rise rapidly. The strongest wind occurred about 2 p. m. of the 8th. At 6.30 a. m., of the 8th, rigging was cut away to save vessel from capsizing. The sea was full of foam; and the sea, air, and clouds had seemingly merged into one. After sundown of the 8th to the morning of the 9th, wind moderating from northwest; clear, settled weather by night of the 9th.

C. This was central on the 1st at N. 50°, W. 38°, as a severe hurricane center. It moved slowly northeastward, but was joined on the 3d by areas *A* and *D*, forming a resulting oval depression and whirl that occupied the greater part of the Atlantic between Cape Breton and Ireland, but which broke up on the 6th in N. 55°, W. 25°. Among the vessels that experienced this hurricane were the *Pomeranian*, *Washington*, and *Buenos Ayrean* on the 1st; *Barbedian*, *Braunschweig*, *Tancarville*, and *Unionen* on the 2d; *Vcendam*, *Washington*, *Sachem*, *Saale*, *Barbedian*, and *Othello* on the 3d; *Hungaria*, *Scandinavian*, *State of Nebraska*, *Braunschweig*, and *Micmac* on the 4th.

D. This small disturbance appears on the maps of the 1st, 2d, and 3d. It moved from N. 40°, W. 55°, to N. 43°, W. 48°, after which it merged into the combined areas *A* and *C*.

E. This was central on the 6th, a. m., in Labrador, and was a continuation of No. I of the U. S. series. It passed eastward rapidly and was central on the 7th at N. 54°, W. 40°, after which the center moved northeast, passing between Iceland and Scotland on the 10th and North Cape on the 12th, at which time low pressure prevailed in a trough reaching from this region southwest beyond the Azores, within which were included at least three separate whirls. On the 13th this low pressure rapidly moved southward over northern Europe, and on the 14th was central near the southern end of Sweden. On the 16th it was central in Russia.

F. This was a continuation of U. S. series No. V, which was central north of the Lake region on the 8th, a. m., and on the coast of Newfoundland on the 10th, a. m. The center now moved rapidly toward the east-southeast, joining with the smaller hurricane center, and on the 11th, a. m., it was central at N. 44°, W. 39°. By the 12th this depression had enlarged and apparently included two distinct whirls, but as observations are missing from the central portion, we shall consider the general center at N. 45°, W. 30°. By the 13th this general depression had merged with *B*, forming an oval whose central lowest pressure was still not far from N. 45°, W. 30°. The two whirls *B* and *F* maintained their integrity until the 15th, by which time they had united into one central at about N. 48°, W. 30°, and by the 16th had disappeared, leaving only a small depression, which appears to have moved southeastward toward Portugal, and passing over that region on the 18th expanded into an extensive moderate depression over central Europe on the 19th. The following vessels reported low pressures and high winds in connection with this depression: *Hungaria*, *Scandinavia*, *Sedgemore*, *La Campine*, *Chicago*, *Martello*, and *Elmville* on the 9th; *Bovic*, *Virginia*, *Werra*, and *Durham City* on the 10th; *British Empire* on the 12th.

G. This was the hurricane No. XII of the U. S. series. On the 10th pressure had begun to fall, and the winds had begun to show a cyclonic whirl off the coast of Venezuela west of Trinidad. This whirl moved slowly northward, and on the 12th, noon, was near Martinique, approximately central at N. 15°, W. 63°. It was at this time undoubtedly of small dimensions.

At Port au Prince, Haiti, the observer noted low pressure on the 14th, noon, which continued until the 18th, noon, with clear weather, light winds, and no rain.

Mr. Jos. Ridgway, Jr., observer at St. Thomas, sends the following account of the weather attending the hurricane:

On the 13th, evening, it was reported here that there was a hurricane to the southwest of Barbados, but the daily weather reports did not indicate anything so serious, though it had been quite plain some days that there was an evident barometric depression which indicated heavy rain (not unusual at this season), but nothing more. However, late at night (13th) and early morning we had wind strong from east to southeast, then south and southwest, with torrents of rain. Beginning on the night of the 12th, the rainfall here varied in different localities of the island from 70 to 100 lines (9 to 12 inches). Strange to say, at St. Croix there were but 30 lines. Judging from damage reported, wind must have blown at St. Lucia with hurricane force. Information from Vieuxfort (south side) reports great damage to property in that district, many factories being wrecked, the English church also being destroyed, and the cane crop totally gone at Calderac and Deunery. The fields were quite submerged, and the sugar and cocoa crops of this island are considered to be entirely destroyed. Serious landslips and all roads blocked.

By the 14th, noon, the center had passed to the north of St. Thomas, and had become the southern whirl in a depression that stretched northward to the St. Lawrence and included in its northern portion the low area No. LX of the U. S. series. According to the reports of the steamship *Herschel*, which left Santa Lucia at 1 p. m. of the 12th for New York, she was in the center of this whirl on the 16th, from 10 a. m. to 8 p. m., during which period the barometer was always below 28.20 and was lowest, 27.50, at 4 p. m. This low pressure is one of the lowest on record at sea level. The location was about N. 25° 40' and W. 66° 35'. The hurricane winds and blinding rain that accompanied this center were of the severest type. At Bermuda, on the 16th, at 7 a. m., the barometer was 30.13, wind northeast, force 6, with indications of the approaching hurricane. On the 17th, 7 a. m., the barometer was 29.94, southeast, force 3, with heavy surf from the south; at noon, 29.47, southeast, force 7; at 2 p. m., 29.45, northeast, force 9; at 4 p. m., 29.68, northeast, force 7, with a surf from the southeast, whence we infer that the storm center passed on the eastern side of Bermuda. On the 18th, noon, it was apparently central at N. 34°, W. 60°, and was now the southern portion of a depression that extended northward beyond Labrador and included the low area No. XI of the U. S. series. As usual in such cases, the southern whirl now began to rapidly die out and had disappeared on the 20th, while the northern center expanded and continued. Among the vessels experiencing this hurricane were the *San Giorgio* and the steamship *Herschel* on the 16th. The reports from numerous stations in Cuba on the 13th, 14th, 16th, and 17th show that the low pressure throughout the island and the gusty, rainy weather induced considerable anxiety lest another hurricane similar to that of September was about to visit the island, and telegrams of information were widely distributed both by the authorities of Cuba and the United States.

Mr. Rafael Junquera, observer at St. Jago de Cuba, communicates the following extracts from the log book of the captain of the Spanish steamer *Antinog y Menendez* coming from Manzanillo to that port; the steamer had to go into Niquero, a small port on the other side of Cape Cruz, to protect herself from the storm:

Left Manzanillo for St. Jago de Cuba at 10.30 a. m., October 17, 1894; barometer, 29.93; thermometer, 79. 2 p. m., barometer, 29.85; thermometer, 80; wind moderate from northeast, sky cloudy, drizzling. 3 p. m., barometer, 29.80; thermometer, 80; wind fresh from southeast with violent gusts and torrential rain; lower clouds moving with moderate velocity from east-

southeast, cumulus clouds from south-southwest. 4.30 p. m., barometer, 29.79; thermometer, 77. 5.30 p. m., barometer, 29.70; thermometer, 77. 6 p. m., minimum barometer, 29.67; thermometer, 78; anchored at Niquero; wind strong from southeast and much rain; the gusts of wind were very violent, inclining to southerly; lower clouds moved with great velocity from southeast, cumulus from southwest. 8 p. m., barometer, 29.74; thermometer, 79; wind weak from second and third quadrants; continuous rain; lower clouds moving at intervals with great velocity. 10 p. m., barometer, 29.70; thermometer, 79. At midnight the wind changed to the southwest; rain. 3 a. m., wind became weaker from first quadrant; mist. 2 p. m., wind southeast and south; squalls. 8 p. m., wind south-southwest followed by rain. 3 a. m., October 19, rain ceased, weather improving; barometer rising very slowly.

The schooner *B. Frank Nealley*, on her route from New York to Puerto Rico, passed near the vortex of this storm in N. 30°, W. 71° on the 26th, at 3 a. m., when she had a north-northwest gale of about 70 miles, with the barometer 29.30, the wind having veered 8 points in twelve hours. The vessel was at one time probably within 100 miles of the center of the storm.

H. This was the hurricane low No. XIV of the United States series. On the 20th the circulation of the winds indicated the presence of a disturbance north of the Windward Islands, central at about N. 20°, W. 60°; this moved slowly westward and by the 22d was at N. 23°, W. 64°, and by the 24th, at N. 26°, W. 74°, at which time it was turning toward the north and northwest, and by the 26th, noon, it was central at N. 36°, W. 68°. The northeasterly course of this storm was very rapid, being central on the 28th at N. 46°, W. 46°; on the 29th, N. 49°, W. 40°; here its rapid progress ceased, being central on the 30th at N. 48°, W. 34°; 31st, N. 50°, W. 30°. On this latter date this area had approached the low area described under *I* as resulting from the breaking up of the area *I G* and which was then near the coast of Great Britain. Among the many vessels that encountered this storm were the following: *La Flandre*, *Manitoba*, *Francisco*, and *Spain*, all of which report pressure below 28.8 on the 28th; *Massachusetts*, *American*, *Donau*, and *Maryland*, which report the lowest pressure, 28.2, on the 29th; *Amsterdam* on the 30th.

I. This was a continuation of low No. IX of the U. S. series, which was central over Lake Huron on the 13th, noon, and over the mouth of the St. Lawrence on the 15th, noon. At this time the hurricanes *B* and *G* were respectively east and south of *I*, and an extensive area of high pressure was extending southwestward over Iceland and the North Atlantic, while an equally extensive area of low pressure was advancing southeastward over the Dominion of Canada. Under these circumstances the low area *I* ceased its eastward motion on the 15th and was overtaken by the depression approaching from Canada, which was No. XI of the U. S. series. The combined area was central in Labrador on the 17th, while the hurricane *G* extended and was included in the same general depression. On the 18th *I* was central near the Straits of Belle Isle, and on the 19th at about N. 53°, W. 50°. After this date the hurricane *G* died away or was merged into *I* and the combined depressions extended on the 20th as an oval trending northwest and southeast and central at about N. 50°, W. 37°, while the combined depressions *B* and *F* were in the Bay of Biscay. On the 21st these low areas *B F* and *I G* formed the eastern and western end of a trough that reached from Newfoundland to Denmark, and on the 22d, noon, this trough of 29.7 had extended southwestward by combination with the hurricane *H*, so that it stretched from the Bahamas over Bermuda and the Azores to southern Ireland and England and western France, while a little farther to the east an adjoining depression extended into Russia. This long trough, which is a phenomenon rarely presented on the Atlantic, was immediately broken up by the rapid movement of an area of high pressure southeastward over the United States and a corresponding movement northward over the Mediterranean, so that the map of the 24th shows the depression *I G* central as a

severe storm over Ireland and the hurricane *H* central near the Bahamas, while high pressures prevailed between these two depressions as also over central Europe and over the United States. From the 25th to the 30th *I G* broke up into several whirls, some of which moved northeastward over Sweden and others lingered in the neighborhood of Great Britain. Among the vessels that encountered the low areas *I* and *I G* were the *Obdam*, *Hecla* and *Meier* on the 18th; *Brazilian* and *Pomeranian* on the 19th; *Bayonne* and *Zaan-dam* on the 20th; *Hecla* and *Suram* on the 23d; *Pomeranian*, *Manitoba*, *Venetia*, *Donau*, and *Acme* on the 24th; *Venetia* and *Christine* on the 25th.

OCEAN FOG.

The limits of fog belts west of the fortieth meridian, as reported by shipmasters, are shown on Chart I by dotted shading. Near the Banks of Newfoundland fog was reported on 13 dates; between the fifty-fifth and sixty-fifth meridians on 5 dates; and west of the sixty-fifth meridian on 3 dates. Compared with the corresponding month of the last seven years, the dates of occurrence of fog near the Grand Banks numbered 1 less than the average; between the fifty-fifth and sixty-fifth meridians, 1 more than the average; and west of the sixty-fifth meridian, the number was the average for October.

OCEAN ICE.

The positions of icebergs and field ice reported for October, 1894, are shown on Chart I by crosses.

The following table shows the southern and eastern limits of the regions within which icebergs or field ice were reported for this month during the last twelve years:

Southern limit.			Eastern limit.		
Month.	Lat. N.	Long. W.	Month.	Lat. N.	Long. W.
October, 1883	46 56	46 22	October, 1883	46 56	42 22
October, 1884	Off Cape Race.		October, 1884	46 56	50 55
October, 1885	48 21	47 12	October, 1885	48 21	47 12
October, 1886	41 34	49 43	October, 1886	46 03	46 37
October, 1887	42 58	50 02	October, 1887	42 58	50 02
October, 1888	51 43	55 36	October, 1888	51 43	55 36
October, 1889	44 32	49 28	October, 1889	46 30	45 59
October, 1890	44 47	49 33	October, 1890	47 56	45 45
October, 1891	48 04	48 27	October, 1891	48 04	48 27
October, 1892	Straits of Belle Isle		October, 1892	52 34	51 00
October, 1893	49 57	59 32	October, 1893	52 47	51 16
October, 1894	45 11	49 05	October, 1894	48 33	48 10
Mean	46 24	50 30	Mean	48 17	48 37

Ice was reported south of the fiftieth parallel on 11 dates: 1st, 2d, 3d, 4th, 11th, 12th, 13th, 14th, 16th, 19th, and 21st. For October, 1893, ice was reported south of the fiftieth parallel only on 2 dates. In an area extending from the Straits of Belle Isle to near the fifty-second meridian ice was reported on 6 dates: 1st, 2d, 5th, 6th, 10th, and 11th. The southern limit of ice was about one and one-half degrees south of the average southern limit for October; and the easternmost ice reported was about one-half degree east of the average.

TEMPERATURE OF THE AIR.

[In degrees Fahrenheit.]

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 country occupied by our observers; such isotherms are controlled largely by the local topography, and should be drawn and studied in connection with a contour map.

DIURNAL PERIODICITY.

The regular diurnal period in temperature is shown by the hourly means given in Table V for all stations having self-registers.

NORMAL TEMPERATURE.

In Table II, for voluntary observers, the mean temperature is given for each station, but in Table I, for the regular stations of the Weather Bureau, both the mean temperatures and the departures from the normal are given for the current month. In the latter table the stations are grouped by geographical districts, for each of which is given the average temperature and departure from the normal; the normal for any district or station may be found by adding the departures to the current average when the latter is below the normal and by subtracting when it is above.

DEPARTURES FROM NORMAL TEMPERATURE FOR OCTOBER, 1894.

As compared with the normal for October the mean temperatures for the current month were decidedly in excess in Ontario, Quebec, and southwestward to Kansas, Nebraska, and Texas. The ridge of greatest excess includes the following: Rockliffe, 5.2; Chatham, 4.2; Kingston, 4.0; Parry Sound, 4.3; Topeka, 5.8; Wichita, 3.7; Dodge City and Abilene, 3.6.

Considered by districts, the mean temperatures for the current month show the following departures from normal temperatures:

Positive departures: New England, 2.1; middle Atlantic' 0.9; west Gulf, 1.1; Ohio Valley and Tennessee, 0.7; lower Lake, 2.0; upper Lake, 1.7; North Dakota (extreme northwest), 1.4; upper Mississippi, 1.3; Missouri Valley, 2.4; northern slope, 2.0; middle slope, 3.2; southern slope (Abilene), 3.6; southern plateau, 2.2; middle plateau, 1.8; northern plateau, 0.2; north Pacific, 1.0; south Atlantic, 0.0.

Negative departures: Key West, 1.3; east Gulf, 0.3; north Pacific, 1.4; southern Pacific, 0.3.

For certain voluntary stations of rather long periods of observation the normal and extreme mean temperatures and the departures are shown in detail in Table X a, which is now placed among the meteorological tables instead of being inserted in the text as heretofore.

YEARS OF HIGHEST MEAN TEMPERATURE FOR OCTOBER.

The mean temperature for October, 1894, was the highest on record at regular Weather Bureau stations as shown in the following table, which also gives the highest previous record:

Stations.	October, 1894.		Highest previous.	
	Mean temperature.	Departure from normal.	Temperature.	Year.
Corpus Christi, Tex.	74.8	+1.8	74.7	1892
Palestine, Tex.	69.8	+3.1	69.7	1883
Abilene, Tex.	68.8	+3.6	67.1	1893
Wichita, Kans.	61.4	+3.7	59.8	1893
Topeka, Kans.	59.9	+5.8	59.3	1892
Kansas City, Mo.	59.4	+2.9	59.0	1892
Pueblo, Colo.	54.4	+2.4	53.2	1889
Cheyenne, Wyo.	49.2	+3.2	48.3	1875
Parkersburg, W. Va.	56.0	+1.7	55.6	1893
Vineyard Haven, Mass.	56.6	+3.5	56.4	1893
Nantucket, Mass.	54.9	+1.1	54.2	1893
Northfield, Vt.	47.8	+3.7	47.6	1893

YEARS OF LOWEST MEAN TEMPERATURE FOR OCTOBER.

The mean temperature for October, 1894, was not the lowest on record at any regular Weather Bureau stations.