

# UNITED STATES SIGNAL SERVICE

## MONTHLY WEATHER REVIEW.

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### INTRODUCTION.

This REVIEW is based on reports for September, 1890, from 2,387 regular and voluntary observers. These reports are classified as follows: 168 reports from Signal Service stations; 118 reports from United States Army post surgeons; 6 reports of rainfall observations of the United States Geological Survey in Arizona and New Mexico; 1,544 monthly reports from state weather service and voluntary observers; 31 reports from Canadian stations; 166 reports through the Central Pacific Railway Company; 354 marine reports through the co-operation of the Hydrographic Office, Navy Department; marine

reports through the "New York Herald Weather Service;" monthly weather reports from the local weather services of Alabama, Arkansas, Colorado, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Michigan, Minnesota, Mississippi, Missouri, Meteorological Report of the Missouri State Board of Agriculture, Nebraska, New England, New Jersey, New York, North Carolina, North and South Dakota, Ohio, Oregon, Pennsylvania, South Carolina, Tennessee, and Texas, and international simultaneous observations. Trustworthy newspaper extracts and special reports have also been used.

### CHARACTERISTICS OF THE WEATHER FOR SEPTEMBER, 1890.

The month was cooler than the average September in all districts east of the Rocky Mountains, save in eastern Maine, the Canadian Maritime Provinces, southern Virginia, North Carolina, at Jacksonville, Fla., and Rio Grande City, Tex. The month was cooler than usual west of the Rocky Mountains, except along the Pacific coast between the 35th and 43d parallels and north of the 46th parallel. The greatest departures below the average temperature were noted from eastern Kansas and Indian Territory to the west part of the lower lake region, where they exceeded 4°, and the most marked departures above the average temperature occurred in the Canadian Maritime Provinces, North Carolina, and Arizona, where they were more than 2°. At stations in the middle Mississippi and Red River valleys, and at Key West, Fla., the month was the coldest, and at Fort Apache, Ariz., it was the warmest September on record. The highest temperature reported by a regular station of the Signal Service was 110° at Yuma, Ariz., and by a voluntary observer, 122°, at Volcano Springs, Cal. The lowest temperature reported by a regular station of the Signal Service was 24° at Fort Washakie, Wyo., and by a voluntary observer, 7°, at Climax, Colo. At Key West and Pensacola, Fla., New Orleans, La., in southeast Texas, at Oswego, N. Y., Springfield, Ill., Valentine, Nebr., Huron, S. Dak., Fort Custer and Helena, Mont., Fort Elliott, Tex., Keeler, Cal., and Tatoosh Island, Wash., the minimum temperature was as low or lower than previously reported for September. Compared with the average date of first killing frost the killing frost of the 8th in western Colorado, of the 24th in northern New Jersey, of the 25th in southeast Pennsylvania, and of the 28th in central Missouri was about one week early; that of the 1st in northeastern Pennsylvania, and of the 13th generally in Kansas was about three weeks early. The killing frost of the 12th in north-central Nebraska; of the 13th generally in Iowa and South Dakota, southeast Michigan, and east-central Colorado; of the 19th in central Nebraska; of the 24th generally in New England; of the 25th in central and northern New York, was about seasonable. The killing frost of the 8th in west-central Minnesota; of the

17th in western lower Michigan, and of the 28th in central Ohio was about one week late; that of the 13th in northeast Wisconsin, of the 20th in east-central Wisconsin, and of the 27th in southeast Wisconsin was about two weeks late, when compared with the average date of first killing frost in the respective regions. A notable feature of the month was a severe cold wave which advanced from the Northwest over the central valleys west of the Mississippi on the 13th, attended by unprecedentedly low temperature and early frost.

The precipitation was generally in excess of the average for September in the Atlantic coast states, from the south Atlantic coast westward to the southeast slope of the Rocky Mountains and the middle Rio Grande valley, and from the middle and south Pacific coasts northwestward to the upper Missouri valley; and the precipitation was deficient from the upper lakes southwestward over the east part of the middle and southern plateau regions, over northeast Florida, along the west Gulf coast, on the north Pacific coast, and over the north part of the northern plateau region. Among the most marked excesses in precipitation noted are: 11.35 inches at Savannah, Ga., 9.55 inches at Key West, Fla., over 5.00 inches at Charlotetown, P. E. I., Albany, N. Y., Charleston, S. C., Augusta, Ga., and Memphis, Tenn., and more than 4.00 inches at New York City. At Brownsville, Tex., the deficiency was 6.86 inches, and it exceeded 4.00 on the coast of Washington. At stations in New York, eastern Virginia, South Carolina, Georgia, southern Florida, Arkansas, central Indiana, Ohio, northwestern Minnesota, central Montana, central Texas, central and southern California, the precipitation was the heaviest, and in northern Texas, Utah, and on the north Pacific coast it was the least ever reported for September. Excessive precipitation injured cotton in parts of North Carolina, South Carolina, Georgia, Alabama, Mississippi, and Arkansas, and damaged corn in southwest Missouri. The rain of the 28-29th caused some injury to raisin grapes in California. The first snow of the season occurred in Montana on the 5th; in central and northwestern Wyoming on the 6th; in North Dakota on the 11th; in South Dakota and northern Minnesota on the 12th; in northern Michigan and Wisconsin on the 13th; and at Tyler's Creek,

W. Va., on the 28th. Snow fell at Mount Washington, N. H., on the 23d, 24th, and 28th. The greatest depth of snowfall for the month, 17 inches, was reported at Blackfeet Agency, Mont.; 8.2 inches was reported at Climax, Colo.; 6.00 inches at Choteau, Mont.; and 2.00 inches at Fort Logan, Mont., and New England City and Steele, N. Dak.

Destructive storms were reported in Iowa and Wisconsin on the 1st; on Long Island, in West Virginia, Illinois, Iowa, South and North Dakota on the 5th; in West Virginia on the 6th; in West Virginia, Ohio, Illinois, and Texas on the 7th; in Pennsylvania on the 8th; in Indiana on the 9th; in New York on the 9-10th; near Eagle Pass, Tex., on the 10th; in Pennsylvania, New York, and Ohio on the 11th; in New York, West Virginia, and Arkansas on the 12th; in Maryland, New York, Pennsylvania, Ohio, and northern Michigan on the 13th;

in Florida and Texas on the 15th; on Long Island, in Rhode Island, southeastern Massachusetts, Pennsylvania, and Florida on the 16th; in New York, northern New Jersey, Connecticut, and Arizona on the 17th; in New Jersey, Iowa, and Florida on the 18th; in Georgia on the 21st; in Florida and Arkansas on the 22d; in Arkansas on the 23d; in Tennessee on the 24th; in North Carolina on the 25th; and in Florida on the 27th. Destructive floods occurred in central and western New York, central and western Pennsylvania, West Virginia, Ohio, Connecticut, and near Eagle Pass, Tex., from the 10th to the 15th. Drought prevailed in northern Missouri, east-central and southeastern Iowa, southeastern Kansas, southeastern South Dakota, and northwestern Oregon. Noteworthy auroral displays were reported at Fort Buford, N. Dak., on the 19th, and at Columbus, Ohio, on the 28th.

### ATMOSPHERIC PRESSURE (expressed in inches and hundredths).

The distribution of mean atmospheric pressure for September, 1890, as determined from observations taken daily at 8 a. m. and 8 p. m. (75th meridian time), is shown on chart II by isobars. The departure of the mean pressure for September, 1890, obtained from observations taken twice daily at the hours named, from that determined from hourly observations, varied at the stations named below, as follows:

Station.	Departure.	Station.	Departure.
Eastport, Me .....	+ .007	Memphis, Tenn .....	+ .001
Boston, Mass .....	+ .010	Chicago, Ill .....	— .001
New York City .....	+ .012	Saint Louis, Mo .....	— .001
Philadelphia, Pa .....	+ .011	Saint Paul, Minn .....	— .001
Washington City .....	+ .014	Santa Fe, N. Mex .....	— .009
Savannah, Ga .....	+ .008	Denver, Colo .....	— .005
Buffalo, N. Y .....	+ .007	Fort Assiniboine, Mont .....	— .007
Detroit, Mich .....	+ .006	Salt Lake City, Utah .....	— .011
Cincinnati, Ohio .....	+ .006	San Francisco, Cal .....	— .015
Duluth, Minn .....	+ .003	San Diego, Cal .....	— .016

The mean pressure was highest from the upper Mississippi valley eastward to the Atlantic coast between the 33d and 45th parallels, where it was above 30.10, the highest mean value, 30.15, being noted at stations in the west part of the lower lake region, and on the south New England and middle Atlantic coasts. The mean pressure was lowest over the west part of the southern plateau region, where it was below 29.85, the lowest mean value, 29.80, being noted at Yuma, Ariz. From the middle and southeast slopes of the Rocky Mountains northeastward over the upper lake region and south of east to the south Atlantic coast, and on the Pacific coast north of the Columbia River the mean pressure was above 30.05, and from the northern plateau region southwestward over the Pacific coast, southward over the middle and southern plateau regions, and southeastward over the Rio Grande Valley, and on the northeast slope of the Rocky Mountains and thence northward over the British Possessions the mean pressure was below 30.00.

A comparison of the pressure chart for September with that of the preceding month shows that there was an increase in mean pressure, save along the immediate Pacific coast, over the southwest part of the southern plateau region, and from Tennessee southeastward over the south Atlantic coast and Florida, southward over the east Gulf states, and southwestward over the west Gulf coast. The greatest increase in mean pressure occurred from the Saint Lawrence Valley and the east part of the lower lake region southward to the Atlantic coast between the 40th and 45th parallels, where it exceeded .10, and the increase in mean pressure exceeded .05 over the entire country north of the 40th parallel and east of the northern plateau region. In districts where the mean pressure was lower than for the preceding month the decrease was less than .05. A general comparison of the September chart with that of the preceding month shows that the area of high pressure central over the south Atlantic states in August greatly extended its limits, with included values

about the same; that the mean pressure along the north Pacific coast remained about the same; that there was an increase in mean pressure of more than .05 in the upper Missouri valley and the British Possessions to the northward; and that slight changes occurred in the area of low pressure central over the west part of the southern plateau region.

The mean pressure was above the normal, save within an area extending from eastern Tennessee and western Georgia westward to east-central Texas, and from the central part of the northern plateau region southward over the Pacific coast to the 35th parallel. The greatest departures above the normal pressure occurred from the Atlantic coast north of the 40th parallel westward to the Missouri valley, and in the British Possessions north of North Dakota and Montana, where they exceeded .05. In districts where the mean pressure was below normal the departures were less than .05.

The monthly barometric ranges at regular stations of the Signal Service are shown in the table of Signal Service data on the last two pages of the REVIEW.

### AREAS OF HIGH PRESSURE.

Eight areas of high pressure were observed within the limits of stations of observation during the month of September. The general course of movement of these areas was to the southeast while passing over the eastern half of the United States, while those observed farther to the westward moved generally to the southeast until the centre reached the 40th parallel, after which the movement was to the eastward over the Lake region. Three areas were observed on the Pacific coast, two of which were traced eastward to the Atlantic, while the third disappeared after reaching the middle plateau region. The usual tendency of areas of high pressure on the Pacific coast to move to the north of east while approaching the coast and to the south of east after passing to the east of the coast line obtained during the month of September. The mean latitude of the tracks of the areas of high pressure during September was to the north of the normal track for that month, and they were most frequently observed over the east portions of the Lake region and the upper Saint Lawrence valley, six of the areas having reached the coast north of Hatteras, N. C.

The following is a general description of the weather conditions observed during the transit of each area of high pressure over the region of observation:

I.—The month opened with a well-defined area of high pressure covering the eastern portion of the United States and central over the upper Ohio valley, and a second area of high pressure covering the region far to the north of North Dakota. The trough of low pressure extending from Lake Superior southwestward separated these areas of high pressure on the 1st, but the succeeding reports showed a rapid increase of pressure over the north portion of the Lake region, apparently forcing the barometric trough to the westward, and resulting